PYLONTECH

Container A1000-OMNI

Battery Energy Storage System

Operation Manual

Information Version: 1.0

5PMPA08-00xxx

Legal Information

Disclaimer

The manual contains instructions for the use of the product. All the pictures and charts in this manual are for description and explanation only. Pylon Technologies Co., Ltd. reserves the right to change the information in the manual which is subject to change without further notice.

Please read this manual carefully before using the product and keep this manual for further reference. Failure to use the product in accordance with the manual may result in serious injuries, property damages and may void the warranty, for which Pylon Technologies Co., Ltd. shall not be liable.

Pylon Technologies Co., Ltd. makes no representations or warranties express or implied, with respect to all the information in this manual.

In the event of any conflicts between this manual and the applicable law, the latter prevails.

The final interpretation of this manual belongs to Pylon Technologies Co., Ltd.

Contents

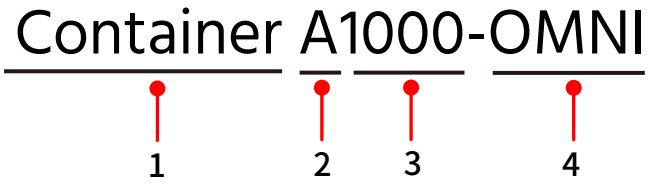
1 Information about this manual

1.1 Purpose

This manual describes the Container A1000-OMNI BESS system (hereinafter referred to as "the system" unless otherwise noted) from Pylontech in terms of its overview, installation, commissioning, maintenance, etc.

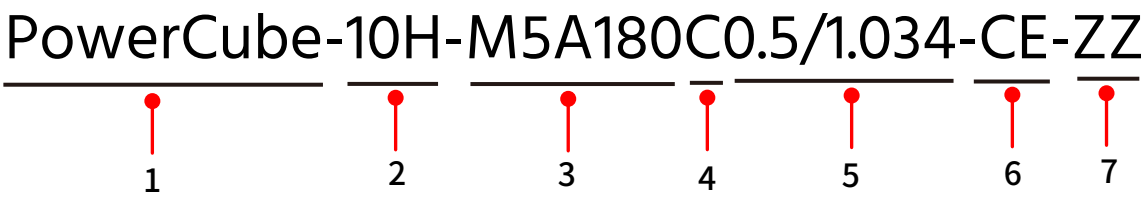
Please read this manual before installing the system and follow the instructions carefully during installation. In case of any confusion, please contact Pylontech immediately for advice and clarification (Contact information can be found on the back cover of the manual).

1.2 Product Name Description



No.	Designation	Description
1	Product type	Container BESS system
2	Cooling type of the system	Air Cooling
3	The rated energy (in kWh) of the system	The rated energy of this system is 1034.88 kWh.
4	Type of the container	“OMNI” represents all in one container (including the PCS).

1.3 Product Model Description



No.	Designation	Description
1	Product Series	PowerCube Series
2	Volume of the container	10ft container
3	Battery model used in the product	The product uses M5A180 battery module.
4	PCS type used for this system	"C" represents Centralized type PCS
5	The rated power of the PCS (in MW)/ The rated energy (in MWh) of the system	The rated power of the PCS is 0.5 MW. The rater energy of the system is 1.034 MWh.
6	Sales territory	The product meets CE related standards, intended for European market.
7	The fire protection configurations (Where zz=03)	03: Ventilation fan (optional configuration)

1.4 Explanation of Symbols

Symbol	Description
DANGER	**Danger**: Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	**Warning**: Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
CAUTION	**Caution:** Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTE	**Note:** Indicates additional information, emphasized contents, or important points helping you use the product better.

1.5 Abbreviations in this Manual

Abbreviation	Designation
Pylontech	Pylon Technologies Co., Ltd.
AC	Alternating Current
BESS	Battery Energy Storage System
BMS	Battery Management System
BMU	Battery Management Unit
DC	Direct Current
DOD	Depth of Discharge
EMS	Energy Management System
EU	European Union
MBMS	Master Battery Management System
MCU	Microcontroller Unit
NA	North America
PCS	Power Conversion System
SOC	State of Charge
SOH	State of Health
UPS	Uninterruptible Power Supply

2 Safety

Declaration

This system is only operated by authorized personnel. Read all safety instructions carefully prior to any work and follow these instructions at all times when working with the system.

Incorrect operation or work may cause:

- Injury or death to the operator or a third party.
- Damage to the system hardware and other properties belonging to the operator or a third party.

2.1 Symbols

	Read the manual before installing and operating the battery system.
	Must wear an ear protector.
	Must wear a safety helmet.
	General warning label indicating potential hazards.
	Warning: electric shock.
	Warning: flammable materials.
	Do not connect the positive and negative reversely.
	Keep away from flame or ignition sources.
	No access without permission.
	Grounding
	Recycle label.
	Label for Waste Electrical and Electronic Equipment (WEEE) Directive (2012/19/EU).
	The certificate label for CE.

2.2 Personal Requirements

Qualified personnel must have the following skills:

- Training in the installation and commissioning of the electrical system, as well as dealing with hazards.
- Knowledge of the manual and other related documents.
- Knowledge of the local regulations and directives.

2.3 Setting of Safety Warning Signs

During the installation, routine maintenance, overhaul and other operations of the system, to prevent irrelevant personnel from approaching and misoperation or accidents. Please observe the following:

- Obvious signs shall be set up at the front and rear switches of the maintenance equipment to prevent accidents caused by false closing
- Set up warning signs or safety warning tapes near the operation area.

2.4 Requirements for Escape Routes

To ensure that the staff can leave the site quickly in case of accident, please observe the following items:

In the process of equipment maintenance, overhaul and other operations, it is necessary to ensure that the escape routes are completely unblocked.

It is strictly prohibited to stack sundries in the escape way or occupy the escape way in any form.

2.5 Electrical Working

There is high voltage in the system, and accidental contact may lead to fatal electric shock danger, so when working with electricity, you should:

- Tag and lock the live area.
- Do a good job of protection, wear insulating gloves and shoes, and wear the corresponding level of anti-arc flashover clothing when necessary.
- There must be an escort to ensure personal safety.

2.6 Moisture Protection

The entry of moisture is very likely to damage electrical equipment! To ensure the normal use of various functions of the system, please observe the following items:

- Do not open the door of the system or equipment when the air humidity is above 95 %.
- Avoid maintenance or overhaul of the system in rainy or humid weather conditions.

In addition, the following protective or emergency measures should be taken according to the needs of the site:

- During the maintenance and overhaul of the system, relevant personnel shall take appropriate protective measures according to the needs of the site, such as wearing anti-noise earplugs, insulating shoes, insulating gloves and scalding gloves.

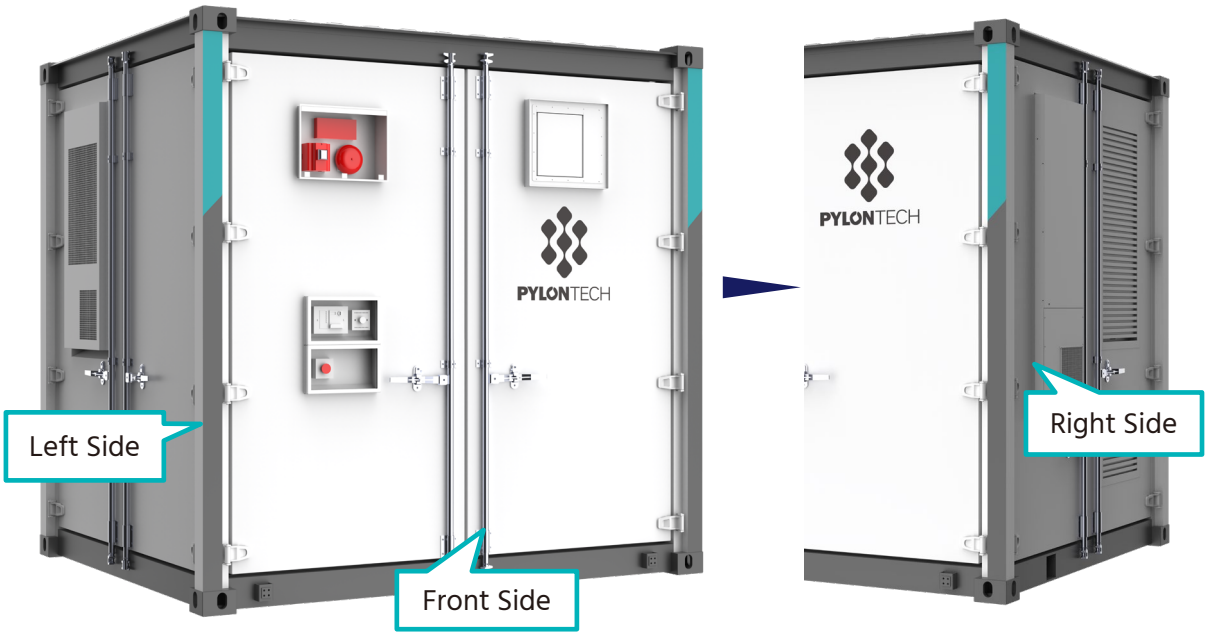
Take all necessary auxiliary measures to ensure the safety of personnel and equipment. Matters needing attention in the use of this manual:

- This manual cannot cover all possibilities during operation, maintenance and overhaul. Please contact our company in time if you encounter any situation that cannot be explained in the manual.
- In order to facilitate users to read and use this manual better, a large number of pictures are configured in the manual. All pictures are for illustration purposes only. Users should refer to the actual products received.

3 System Introduction

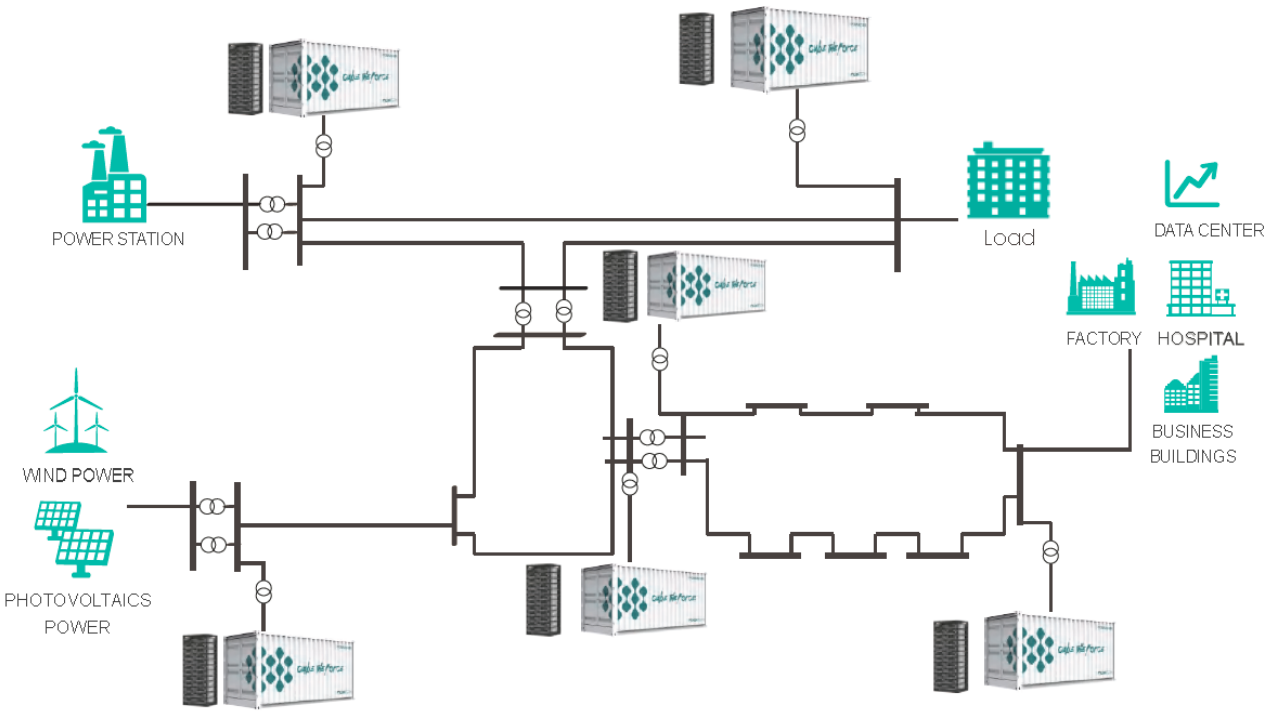
3.1 System Overview

This system is a high-voltage AC energy storage system based on lithium iron phosphate battery. The system adopts module series design, which can form all voltage platform systems within 1000V through standard 64V modules in series. Each group of high-voltage systems can also achieve the battery capacity required by users through parallel connection.



3.2 Application Scenario

Through reliable BMS system and high-performance balancing technology, the whole system is characterized by flexible configuration and high reliability. It can be widely used in grid energy storage, photovoltaic energy storage, container energy storage, microgrid energy storage, data room and other application scenarios that need high-voltage platform batteries. The system application is shown in the following figure.



3.3 System Specifications

System Specifications		PowerCube-10H-M5A180C0.5/1.034-CE-zz*
System	Cooling type	Air
	Operating temperature range (°C)	-20~50 (≥45°C, De-rating)
	Storage temperature range (°C)	-20~60
	Altitude (m)	≤4000m
	Pollution degree	PD3 (Outside), PD2 (Inside)
	Protective Class	I
	Dimensions L*W*H (mm)	2991 (-6,0) *2438 (-5,0) *2896 (-5,0)
	Overvoltage category	III
	IP degree	IP54
	Weight(T)	⩽12
	Fire extinguishing	Aerosol (ventilation system as an optional configuration)
DC Side	Rated energy (kWh)	1034.88
	Battery nominal Voltage (V)	704
	Battery Voltage range (V)	594~781
	Max current (A)	880
AC Side	Nominal power (kW)	500
	AC frequency (Hz)	50/60Hz (±2.5Hz)
	AC voltage (Vac)	380
	AC connection	3P3W+PE
	AC current (A)	760 (short term overload 836)
	Connection type of auxiliary supply	3P3W
	Auxiliary output and input voltage (Vac)	380V
	Auxiliary max output and input current (A)	60
	Auxiliary output and input frequency (Hz)	50/60(±2.5)

* zz=03, representing the fire extinguishing configuration: ventilation system (optional).

3.4 Layout of the Container

The external and internal layouts of the container are shown in the following figures.

- **External Layout**

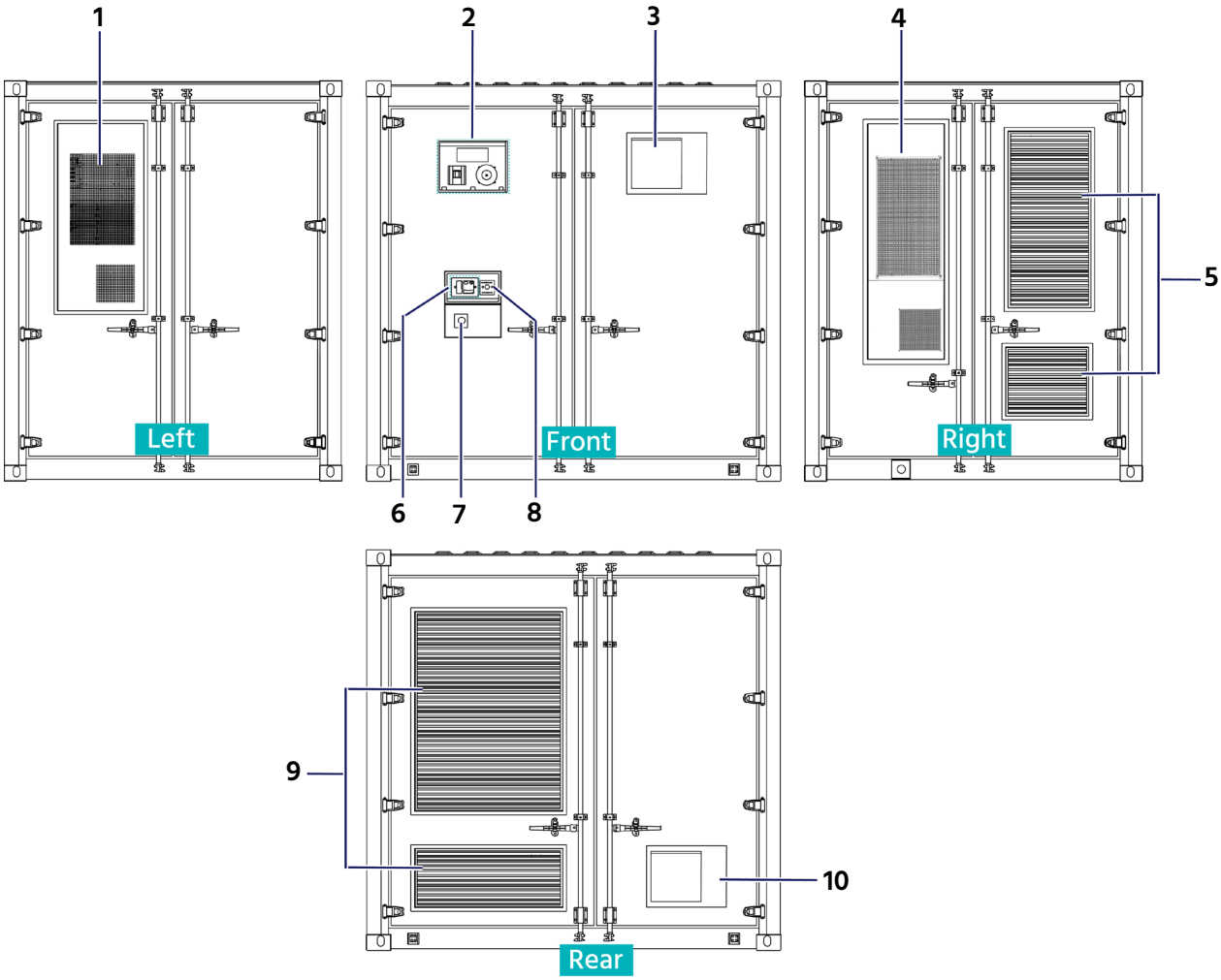


Figure	Description	Figure	Description
1	Air conditioner (5kW)	6	Keyswitch and manual release surface
2	Fire protection device*	7	EPO (Emergency Power OFF Switch)
3	Ventilation system (air outlet fan) (optional)	8	Extinguishant Hold Off Switch
4	Air conditioner (9kW)	9	Ventilation Window
5	Ventilation window	10	Ventilation system (air inlet fan) (optional)

For details, please see *section 3.8*

- **Internal Layout**

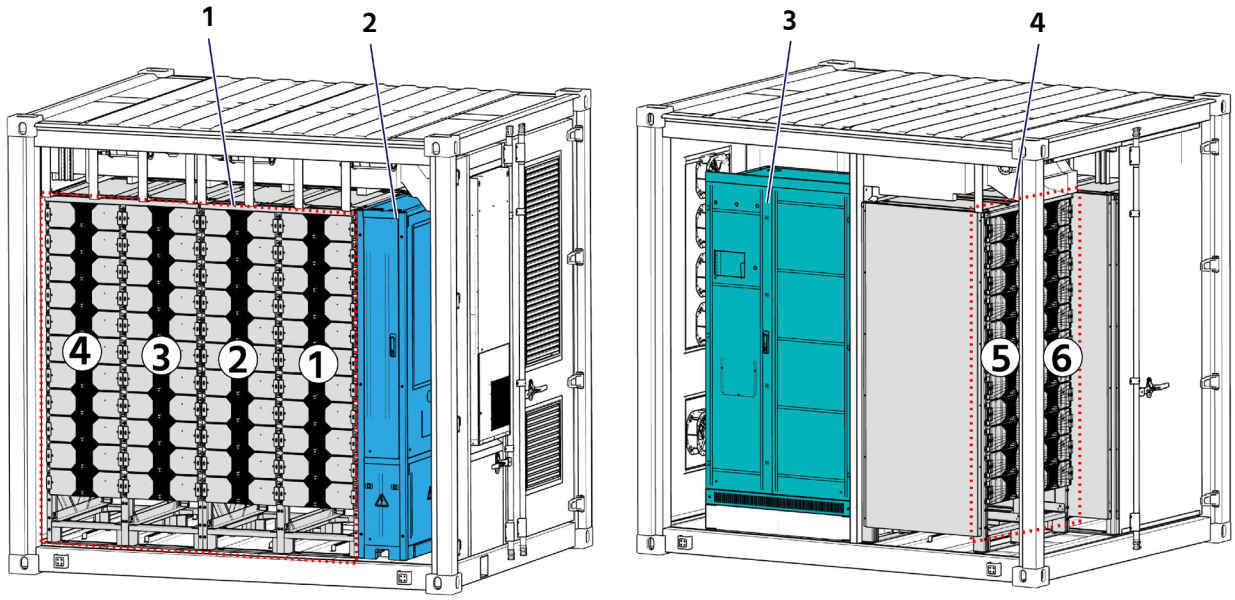


Figure	Description	Figure	Description
1	Battery String (4 strings-①②③④)	3	PCS (in the PCS compartment)
2	Communication and Confluence cabinet	4	Battery String (2 strings-⑤⑥)

3.5 Battery String

The AC ESS consists of 6 sets of 172.48 kWh battery strings (full configuration). The appearance of the battery strings is shown in the following figure.

Exterior view of two battery strings in one rack

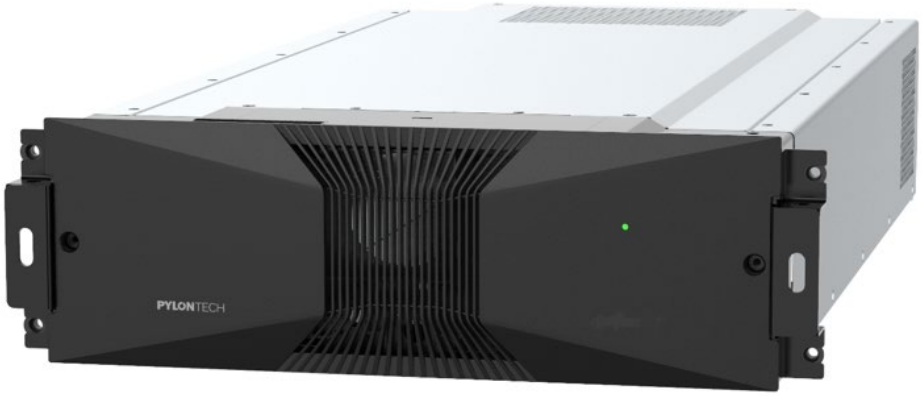
Specifications of the battery strings

Battery String	PowerCube-M5
Battery Module Model	HM5A180F
Control Module (BMS) Model	S1500M5A180L
Over Current/Duration (Amps/ millisecond)	12000 A /5 millisecond
Humidity (%)	5 – 95 (without condensing)
Round-trip efficiency (%, @0.5 C)	96%
Depth of Discharge (DOD) (%)	95%
Rated Current (Amps)	⩽122.5 (@0.5C)
Peak Current (Amps)	＜210A for 5 minutes ＜500A for 30 seconds
System Rated Capacity (Ah)	245
System Configuration Battery Module Quantity (pcs)	11 (full configuration)
Maximum Continuous Current (Amps)	180
Total Storage Energy (kWh)	1034.88 (full configuration)
System Rated Voltage (VDC)	704
Upper limit Charge Voltage (VDC)	781
Lower limit Discharge Voltage (VDC)	616

3.5.1 Battery Module

3.5.1.1 Battery Module Specifications

Each battery string contains 11 battery modules in total. The appearance and the specification of the battery module are shown as follows.

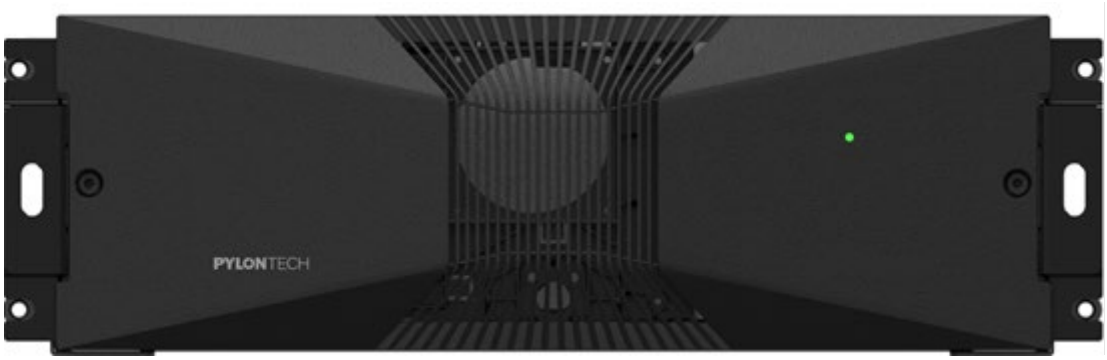


Specifications	HM5A180F
Cell Technology	LiFePO4 (LFP)
Battery Module Energy (kWh)	15.68
Battery Module Voltage (VDC)	64
Battery Module Capacity (Ah)	245
Power of BMU(W)	3
Power of Battery Module Fan (W)	15.6
Dimensions (W x D x H, mm)	515(W) x 935 (D) x 160.5(H)
Protection Class	IP20
Weight (kg)	115
Operation Cycle Life (cycle)*	＞7,000
Operation Temperature(°C)	0 ~ 50
Storage Temperature(°C)	-20 ~ 50
Transportation Certificate	UN38.3

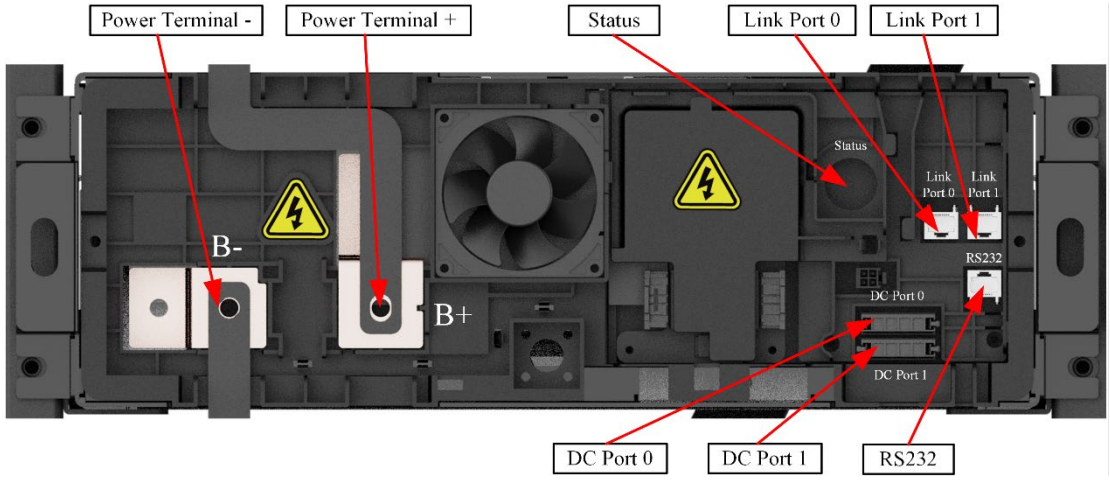
* Cycle life is defined based on specific operation conditions, for more details please check with Pylontech service team.

3.5.1.2 Battery Module Front Interface

Battery module with cover



Battery module without cover

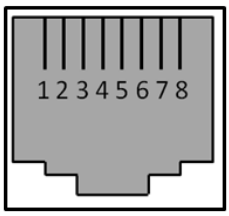


Power Terminal B+/B-
Connects battery modules in serial at power side.
Status
Status LED: indicates the battery module's status (Normal●, Abnormal●).
Link Port 0, 1
Link Port 0, 1 Communication Terminals: (RJ45 port), CAN communication, between multiple serial battery modules and the control module.
RS232 Terminal
Console Communication Terminal: (RJ45 port) follows RS232 protocol, for manufacturer or professional engineer to debug or service.
DC Port 0, 1
DC Port 0, 1 Terminals: the terminal is 4 pin of DC supply, which consists of 2 pins of 12V for BMU power supply, and 2 pins of 24V for fan power supply. DC Port 0 for DC power input, DC Port 1 for

DC power output.

Definitions of RJ45

No.	Link Port 0/1	RS232
1	---	---
2	GND	---
3	---	TX
4	CANH	---
5	CANL	---
6	---	RX
7	---	---
8	---	GND



RJ45 Port

RJ45 Plug

3.5.2 Control Module

3.5.2.1 Control Module Specifications

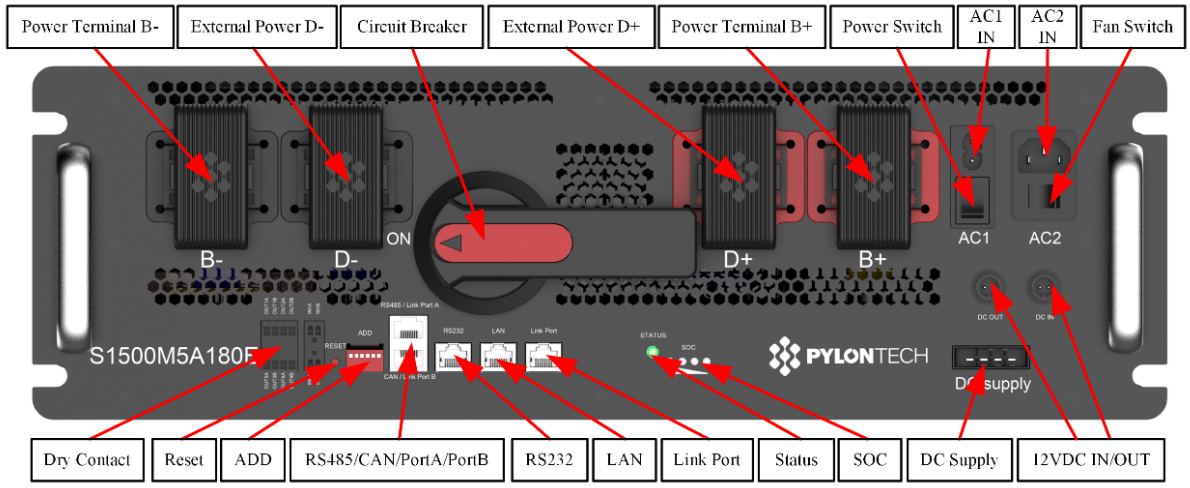
Each battery string contains one control module.

Specifications	S1500M5A180E
Related Product	M5A-180
AC Supply for BMS*	100~305 VAC/50/60Hz
Fan Power Consumption (W)	15.6 x n (where n = 1~11)
System Operation Voltage (VDC)	0~1500
Operation Current (Maximum) (A)	180
Self-consumption Power-Relay On(W)	16.5
Instantaneous power of relay engagement (W)**	65.4
Dimensions (W x D x H, mm)	460(W) x 858(D) x 160(H)
Communication Protocol	RS485(MODBUS RTU) \CAN\LAN
Protection Class	IP20
Weight (kg)	28
Operation Life (year)	15+
Operation Temperature (°C)	-20~65
Storage Temperature (°C)	-40~80

*AC power @100~305 VAC/50/60Hz supply to BMS and air fan separately.

** Instantaneous power consumption of each relay is 56.4W, happens when relay acting.

3.5.2.2 Control Module Front Interface



Power Terminal B+/B-

Connects battery modules in series.

Power Terminal D+/D-

External Power terminal: Connects battery system to the PCS.

Circuit Breaker

Controls the circuit breaker ON/OFF, and carries out shunt tripping function when system is overcurrent or short circuit.

Power Switch

Controls the BMS power supply ON/OFF.

AC1 Input for BMS power supply

AC Socket and Control Module Power Switch: External power supply for Control Module. Power Switch to control ON/OFF. Applied with UPS system.

AC2 Input for BMS power supply

AC Socket and FAN Power Switch: AC power input sockets for external power supply. Fan power Switch to control ON/OFF.

12VDC Input

IN: Back-up 12 VDC power supply port for BMS.

12VDC Out

OUT: Power supply for MBMS, to connect with MBMS' 12VDC IN.

DC Supply

Integrated with 12 VDC for BMU and 24 VDC for fans power supply, connects to battery module.

SOC (LED)

Battery Capacity Indicator: 4 green lights and each light represents 25% capacity.

Refer to **Table of LED Indicators Instructions** in *section 6.1* for details.

STATUS (LED)

Shows the status of battery module (Normal●, Abnormal●).

Refer to **Table of LED Indicators Instructions** in *section 6.1* for details.

Link Port (RJ45 port)

For communication between multiple serial battery modules and the control module.

LAN

Console Communication Terminal: (RJ45 port) follows Modbus protocol, used for communication between MBMS, switch or upper controller.

RS232

Console Communication Terminal: (RJ45 port) follows RS232 protocol, for manufacturer or professional engineer to debug or service.

RS485/ Link Port A (RJ45 port)

RS485 (for external communication) follows Modbus RTU protocol, for communication between the battery system and the PCS.

Link Port A (for internal communication): used for cascade communication between the BMSs; when the system is configured less than 6 battery strings, it is used for communication between the first battery string's BMS and the MBMS.

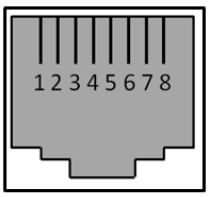
CAN / Link Port B (RJ45 port)

CAN (for external communication) follows CAN protocol, for communication between the battery system and the PCS.

Link Port B (for internal communication): used for cascade communication between the BMSs.

Definitions of RJ45 Port Pin

No.	CAN	RS485	RS232
1	---	---	---
2	GND	---	---
3	---	---	TX
4	CANH	---	---
5	CANL	---	---
6	---	GND	RX
7	---	RS485A	---
8	---	RS485B	GND



RJ45 Port

RJ45 Plug

ADD

6-bit dial switches to manually distribute the communication addresses of the battery system. Lower position is OFF, means "0". Upper position is ON, means "1". 1st bit to 5th bit are for address, and the 6th bit dial switch supports a 120Ω resistance.

Reset

Reset Button: Long press this button to restart the battery system.

Dry Contact

(Dry Contact Terminals): provide 2 input and 4 output dry contact signals.

In/Out	Function	Default State and Action
In1	Reserved	Normal close
In2	Emergency stop	Normal close, power relay open when signal received
Out1	Stop charging	Normal close, when suggested charge current is “0” shall open
Out2	Stop discharging	Normal close, when suggested discharge current is “0” shall open
Out3	Error	Normal close, when system error activated shall open
Out4	Current limit	Normal close, when current limit ≤5A activated shall open

3.6 Communication and Confluence Cabinet

The communication and confluence cabinet contains UPS, MBMS, micro circuit breakers, fuses, etc. The internal layout of the cabinet is in the following figure.

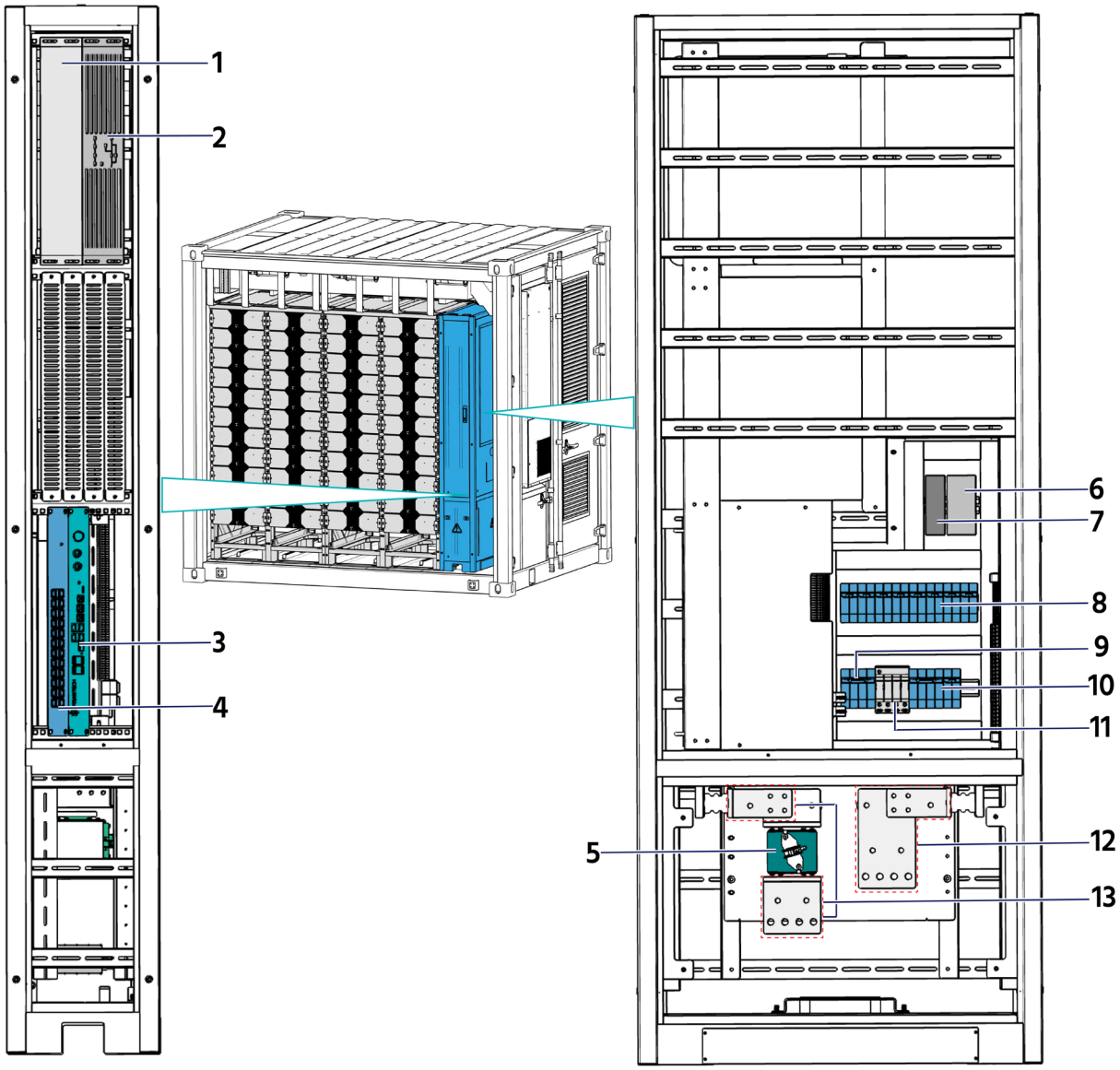


Figure	Description	Figure	Description
1	UPS Battery	8	Circuit Breakers (QF4~QF10)
2	UPS	9	Circuit Breakers (QF1)
3	MBMS (Master Battery Management System)	10	Circuit Breakers (QF2, QF3, QF11)
4	Switch	11	SPD (Surge Protection Device)
5	Fuse	12	Confluence bar (negative)
6	Power Switch (24V)	13	Confluence bar (positive)
7	Power Switch (12V)		

3.6.1 UPS

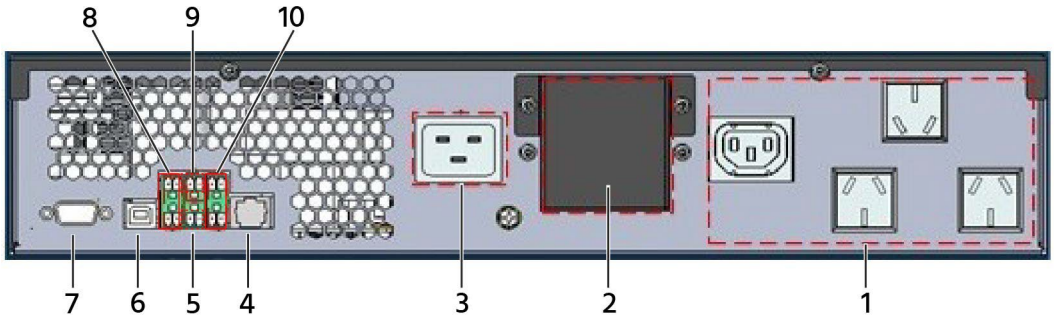
The electrical cabinet is equipped with an UPS to supply power for BMS, MBMS, ethernet switch, and other loads, so as to ensure that the system can still operate for a period of time in case of mains power failure.

3.6.1.1 Front Panel of the UPS

As shown in the following figure, the UPS front panel provides ventilation holes, operation and display panel, LED indicators and functional keys.

NO.	Description
1	Ventilation holes
2	Functional keys
3	Operation and display panel
4	LED indicators

3.6.1.2 Rear Panel of the UPS



NO.	Description	NO.	Description
1	Output outlet	6	USB port
2	Battery module port	7	Intellislot port (DB9)
3	Input outlet	8	Output dry contact port
4	Ethernet port	9	REPO (Remote Emergency Power Off) Port
5	Battery module number detection port	10	Input dry contact port

3.6.1.3 UPS Battery (US2000C)

1. Before normal operation, power cables of the UPS battery (US2000C) need to be connected in the following picture, connecting the orange cable to the orange terminal, and black cable to the black terminal.

2. Turn on the Power switch of US2000C. Press the “SW” button of US2000C for about 3 seconds, and observe the indicator light of the UPS host. If there is mains power, the indicator light is green, indicating normal startup.

When you need to shut down the UPS, turn off the Power switch of US2000C and observe the UPS LED light. If it is off, the UPS is shut down.

NOTE: For more detailed information of the UPS, please refer to the separate UPS manual.

3.6.2 MBMS

Master Battery Management System (MBMS) includes data acquisition and communication. Alarm and protection, control, energy state estimation, equalization and other functions.
The MBMS in the electrical cabinet is a three-level battery management system, which collects the information of each string, summarizes and communicates with PCS.

3.6.2.1 Basic Parameters of the MBMS

Item	Specification
Power Supply for MBMS	DC 12V
Self-consumption Power-Relay Off (W)	10
Dimensions (W x D x H, mm)	442×190×43.6
Communication Protocol	MODBUS RTU\CAN\LAN
Weight (kg)	2
Operation Life (year)	15+

3.6.2.2 Interface Panel of the MBMS

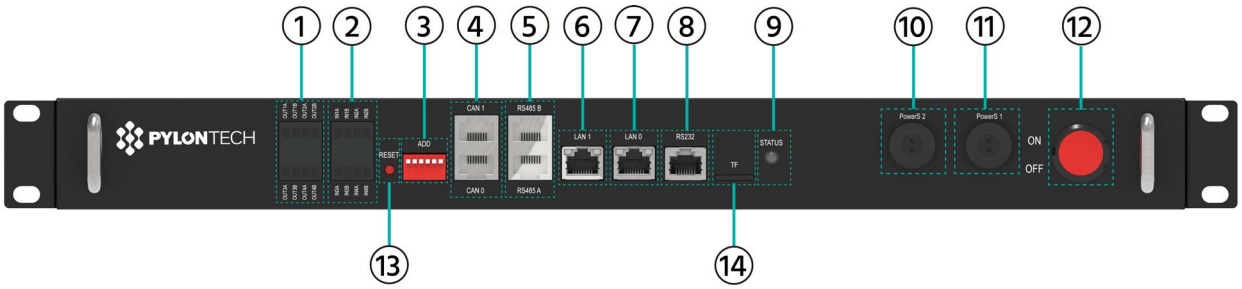


Figure	Description	Figure	Description
①	Dry Contact 1	⑧	RS232
②	Dry Contact 2	⑨	Status Indicator
③	ADD Switch	⑩	PowerS 2
④	CAN 1/ CAN 0	⑪	PowerS 1
⑤	RS485 B/RS485A	⑫	ON/OFF witch
⑥	LAN 1	⑬	RESET (button)
⑦	LAN 0	⑭	TF Card Slot

① ② Dry Contact

Dry Contact Terminal: provides 4 input and 4 output dry contact signal.

In/Out	Function	Normal State and Action
In1	Reserved	Normal close
In2	Reserved	Normal close
In3	Reserved	Normal close
In4	EPO	Normal open, turns close when press the EPO.
Out1	Prohibit charging signal	Normal close, when changes from open to closed, alarm indicator LED lights up.
Out2	Prohibit discharge signal	Normal close, when changes from open to closed, fault indicator LED lights up.
Out3	Fault signal	Normal close.
Out4	Current limit signal	Normal close, when changes from open to closed, The current will be limited.

③ ADD

ADD: 6-bit dial switches to manually distribute the communication address of the battery system. The lower position is OFF, which means "0". Upper position is ON, which means "1". 1st bit to 4th bit switches are for address, and the 5th and the 6th bit dial switches support a 120Ω resistance (Terminal Resistance).

④ CAN 0 & CAN 1

CAN Communication Terminal: (RJ45 port) follows CAN protocol, for communication between battery system and PCS. CAN 0 connects to BMS, CAN 1 connects to external equipment.

⑤ RS485 A & RS485 B

RS485 Communication Terminal: (RJ45 port) follows Modbus RTU protocol, for communication between battery system and PCS or external equipment.

⑥ LAN 1 Port

Console Communication Terminal: (RJ45 port) defined as external communication port (for max. 16 strings' external communication use), connects to PCS.

⑦ LAN 0 Port

Console Communication Terminal: (RJ45 port) defined as internal multi-strings' communication port (for max. 16 strings' internal communication using), combined with Ethernet switch for further connection to BMS.

⑧ RS232 Terminal

Console Communication Terminal: (RJ45 port) follows RS232 protocol, for manufacturer or professional engineer to debug or service.

⑨ Status (LED)

Indicates the status of the battery system (Normal🟢, Abnormal🔴).

⑩ PowerS 2

For 12VDC power supply to MBMS.

⑪ PowerS 1

For 12VDC power supply to MBMS.

⑫ ON/OFF Switch

For control MBMS ON and OFF.

⑬ RESET Button

Press to restart the MBMS.

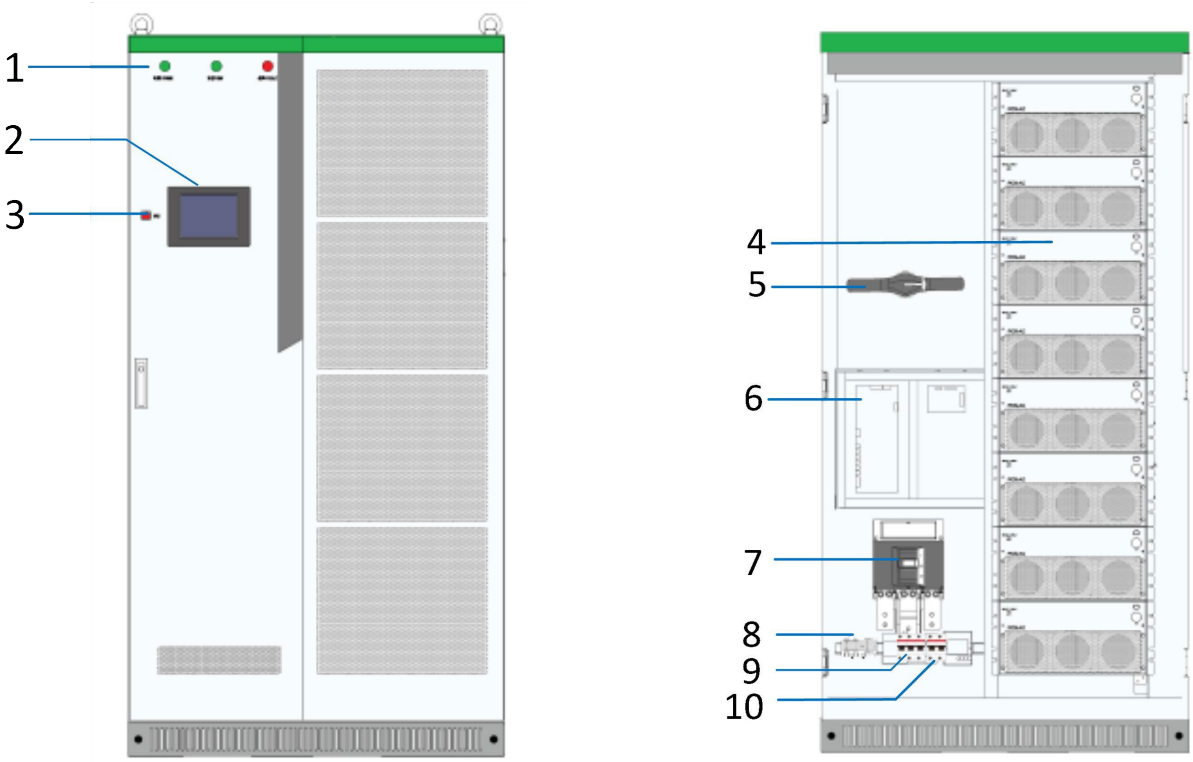
⑭ TF

To insert TF card. After inserting the TF card, be sure to screw back the protection cover over the card slot.

3.7 PCS

A bidirectional energy storage converter is a conversion device between the power grid and the battery, which can charge and discharge the battery. The direct current from the battery can be inverted into the alternating current that can be connected to the power grid, and the alternating current of the power grid can also be rectified into the direct current that can be charged into the battery. The bidirectional energy storage converter can be used in grid connection mode. Single stage topology is adopted, and the voltage input range is wide: 600-900V. PCS detail drawing and layout table are shown in the following chart.

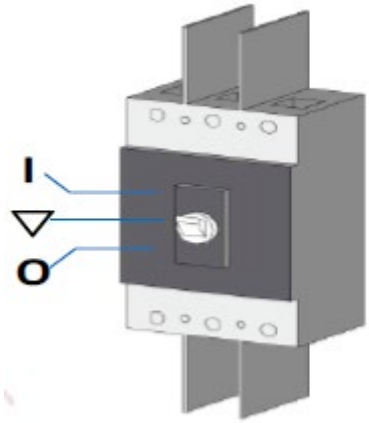
> **⚠ CAUTION**
>
> Do not place sundries in the PCS compartment.



1	Indicator light	**6**	Main control board
2	Touch screen	**7**	AC switch
3	Emergency stop switch	**8**	Wiring terminal
4	PCS-AC power module	**9**	SPD switch
5	Battery DC branch switch	**10**	Auxiliary power supply switch

3.7.1 AC Switch

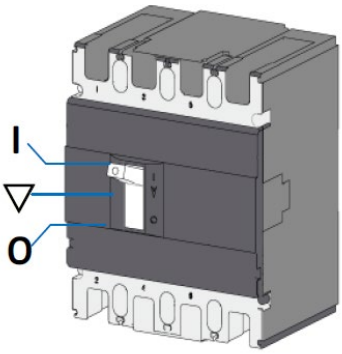
The AC switch is used to disconnect the PCS from the power grid.



Position	Designation	Description
I	Closing position	AC switch on
▽	Tripping position	AC switch tripping
O	Opening position	AC switch off

3.7.2 DC Switch

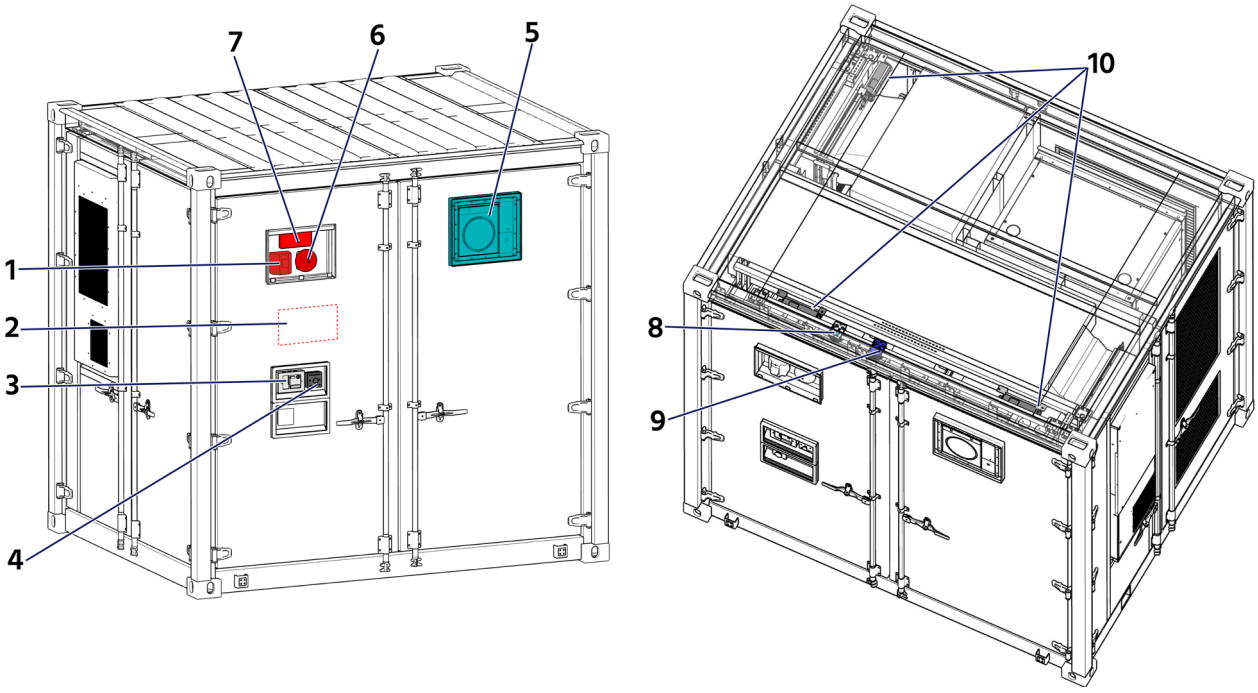
The DC switch is used to disconnect the battery from the PCS

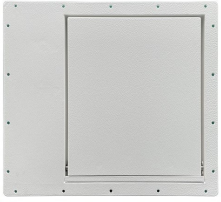


Position	Designation	Description
I	Closing position	DC switch on
▽	Tripping position	DC switch tripping
O	Opening position	DC switch off

3.8 Fire Protection System

The fire protection system is composed of the agent release control system and fire control panel. The former mainly contains a heat detector, a smoke detector, a sounder strobe, a bell, a gas release indicator, aerosols, etc. See the following figure for detailed positions.



No.	Description and Icon	No.	Description and Icon
1	Sounder Strobe 	6	Fire Bell 
2	Fire control panel (on the inner side of the door) 	7	Gas release indicator 
3	Keyswitch and manual release surface 	8	Smoke detector 
4	Extinguishant hold off switch 	9	Heat detector 
5	Ventilation system* (air outlet fan) (air inlet fan is on the rear) * Optional 	10	Aerosol 

3.9 Air Conditioning System

Before delivery, the parameters of the conditioning system have been set and no extra settings are needed for the customer.

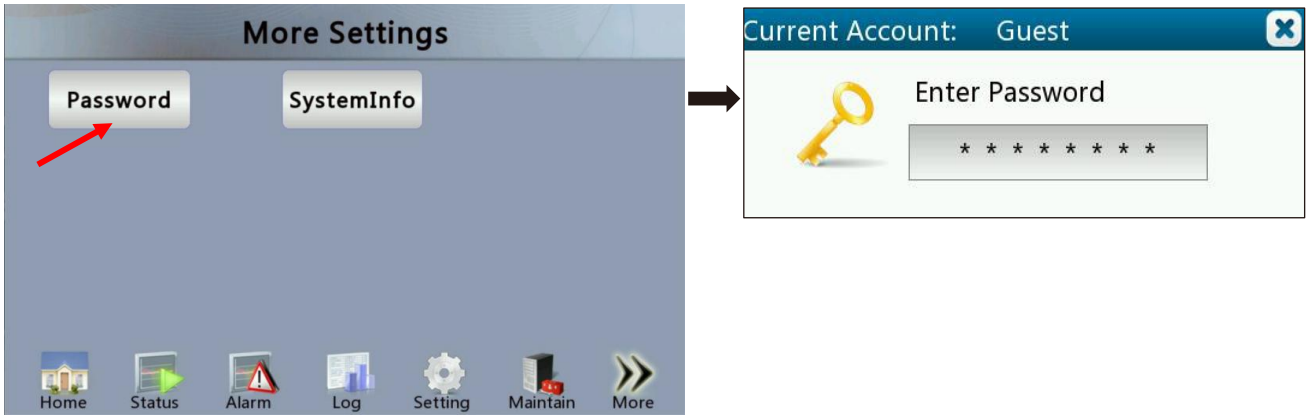
NOTE: For detailed information of the air conditioning system, please refer to the separate air conditioning system manual.

3.9.1 Air Conditioning System On and Off

- **ON**: On the main page, press the start button on the lower left. When the system is turned on, the device status on the upper left will be changed from "standby" to "running".
- **OFF**: On the main page, press the start button on the lower left and the system is turned off.

3.9.2 Password Input Interface

Click "more" on the main menu and click "password". And enter the password.



The default password is "0001". The user can change the temperature and humidity set point and temperature and humidity alarm point. Please check the alarm record and alarm history, as well as the system operating state. If the user does not enter the password before entering the parameter, it will automatically jump to the password interface when clicking the corresponding parameter input box.

The parameter can be changed after the password is entered correctly. As shown in the figure below.

3.9.3 Running State

The operating status includes: the current environmental state of the unit, the running state of the current unit, and the group control status of the current unit. Users can click on the upper "system state" interface and click to view.

3.9.4 System Settings

The system settings include time setting, temperature and humidity setting (option), String control configuration settings(option), account management settings (changing passwords).

To make the parameter settings: click the corresponding input box, and enter the desired value in the keyboard, as shown in the figure below.

4 Mechanical Installation

4.1 Checking Before the Installation

Checking the Outer Packing

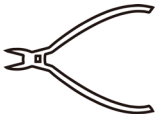
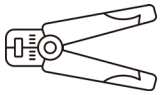
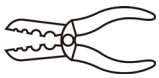
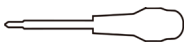
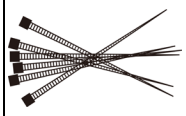
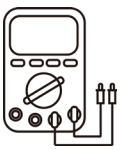
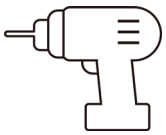
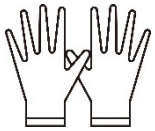
- After receiving the product, check the outer packing for damage, such as holes, cracks, deformation and so on. If any damage is found, contact the local retailer as soon as possible.

Checking the Deliverables

- After unpacking the product, check that the deliverables are complete. If any item is missing or damaged, contact the local retailer as soon as possible.

NOTE: The system shall be installed in accordance with local electrical, building, fire, and other codes or utility (grid) requirements applicable to the installation and equipment, and by qualified service personnel in accordance with the installation instructions and proper practices.

4.2 Preparing tools and PPE

<table>
<tr><th colspan="6">Tools</th></tr>
<tr><td> 
Wire Cutter</td><td> 
Crimping Modular Plier</td><td> 
Adjustable Wrench</td><td> 
Wire Stripper</td><td> 
Torque Wrench</td><td> 
Screwdriver</td></tr>
<tr><td> 
Cable Tie</td><td colspan="2"> 
Socket Wrench set</td><td> 
Electric Drill</td><td> 
1000VDC Multimeter</td><td> 
Electric Screwdriver</td></tr>
<tr><th colspan="6">PPE (Personal protective equipment)</th></tr>
<tr><td> 
Insulating Gloves</td><td> 
Anti-arc Flash Suit</td><td> 
Safety Shoes</td><td> 
Ear Protector</td><td> 
Safety Goggles</td><td> 
Anti-static Bracelets</td></tr>
</table>

NOTE: Use properly insulated tools to prevent accidental electric shock or short circuits. If insulated tools are not available, cover the entire exposed metal surfaces with available insulated alternatives, except their tips, with electrical tape.

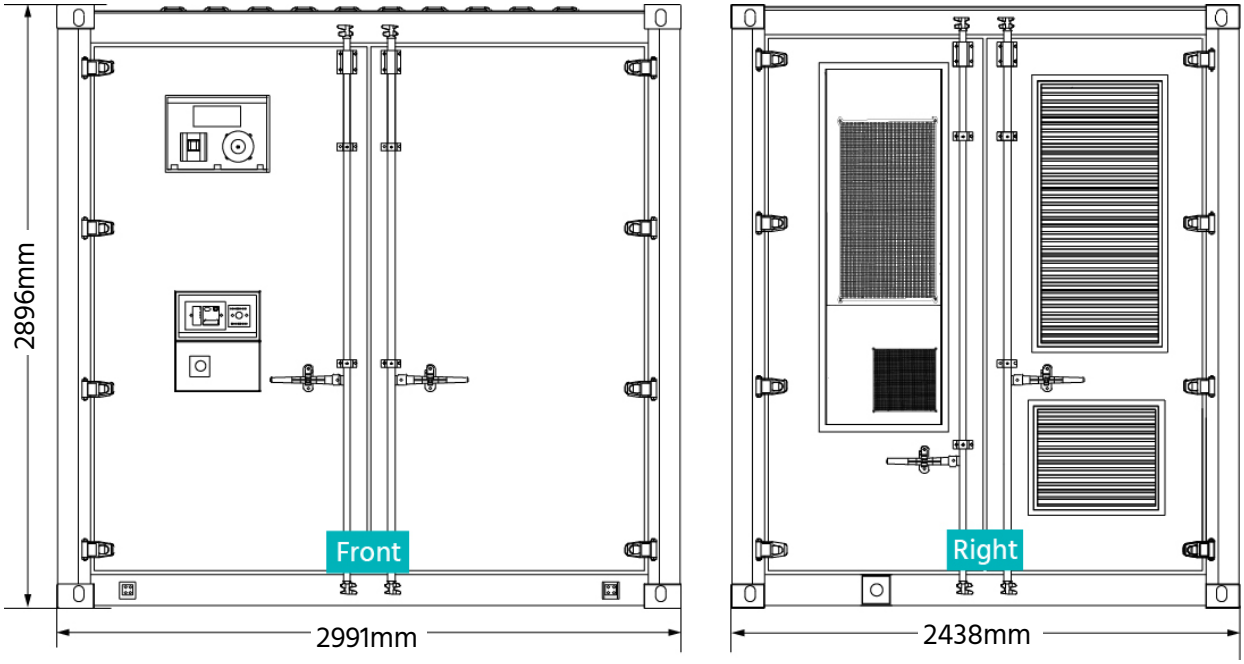
4.3 Installation Foundation Requirements

The installation site needs to meet the following requirements:

- The installation foundation should be able to bear the total weight of the whole outdoor cabinet system (about 12 tons).
- The installation foundation should be concrete or channel steel support structure, which should be flat, firm, safe and reliable. The installation foundation must meet the following height requirements, whichever is higher:
  - above the highest water level in the history of the area; or.
  - at least 300mm above the level ground.
- The BESS is fixed at the bottom, and holes should be pre-opened on the installation site in accordance with the fixed holes at the bottom of the cabinet. See the drawing below.

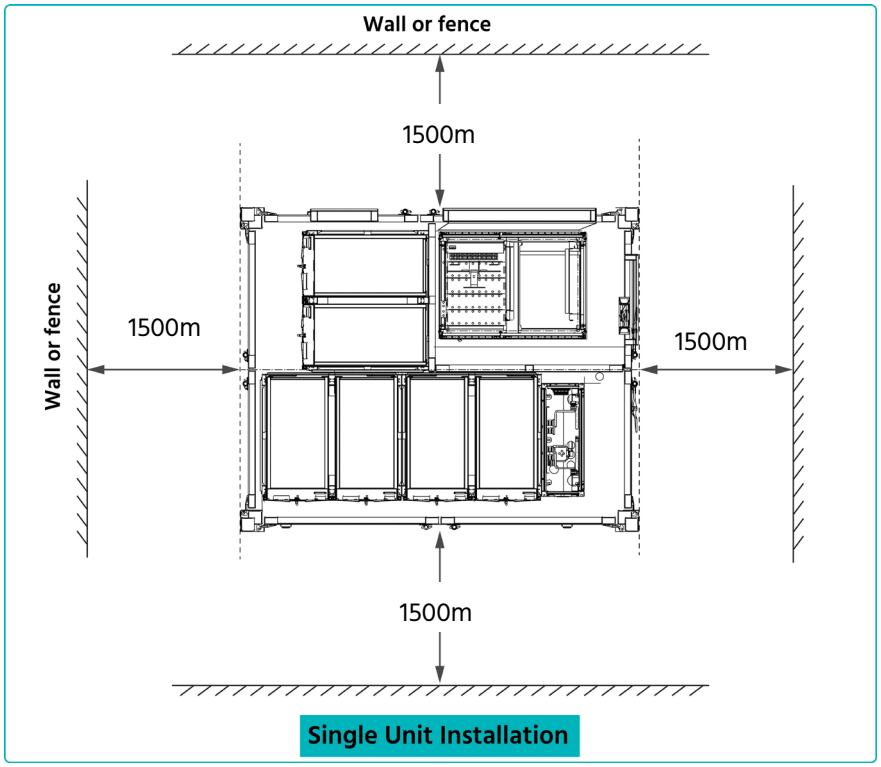
4.4 Installation Space Requirements

The external dimensions of the storage system are 2991 mm (W) x 2438 mm (D) x 2896 mm (H).



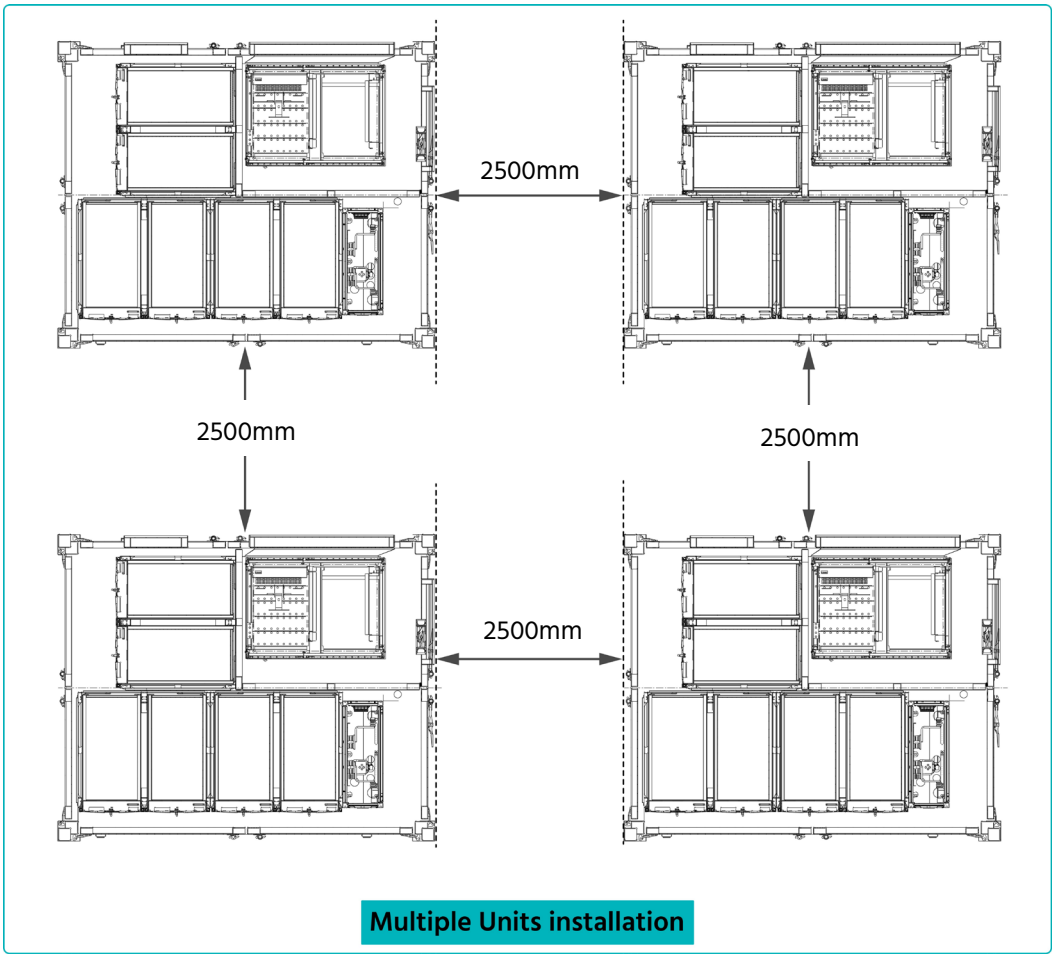
The installation site must have enough space to place the container.

- The installation space for a single BESS is shown below (recommended spacing).



Single Unit Installation

- The installation space for multiple BESS is shown below (recommended spacing).



Multiple Units installation

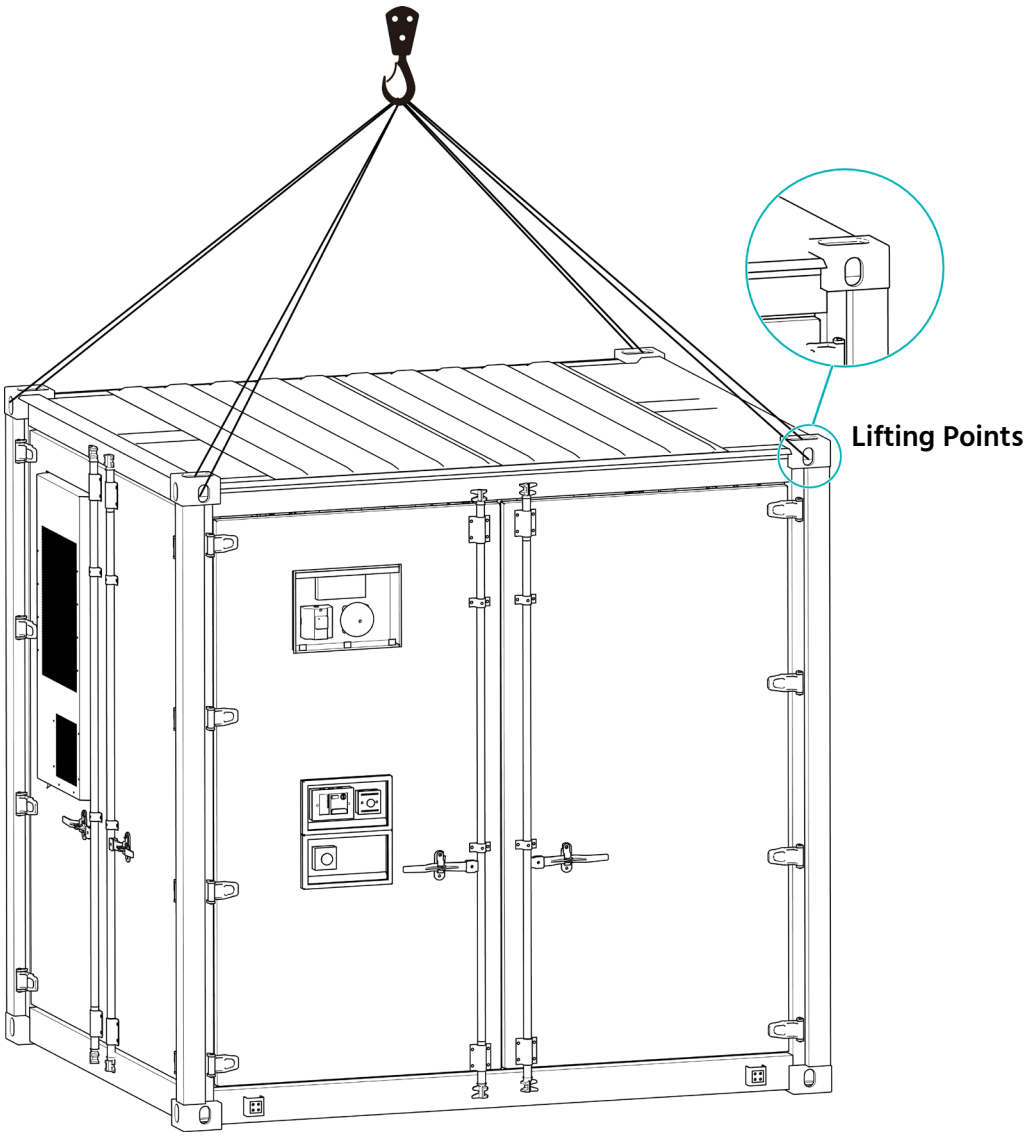
4.5 Hoisting

DANGER

There is danger during hoisting, please follow the following requirements.

- During the whole process of lifting the equipment, all safety operation standards and specifications of the country where the project is located shall be strictly observed.
- Do not stand within 10 meters of the operation area, especially under the lifting arm during lifting or moving, to avoid casualties.
- Do not perform the lifting work in case of bad weather conditions, such as heavy rain, fog, strong wind, etc.

The four lifting points of the container are shown in the following figure. Please use cranes and spreaders greater than or equal to 12 tons for equipment lifting.



NOTE:

- When lifting, the site safety must be ensured.
- During the hoisting operation, there should be professionals on site to command the whole process.
- The strength of the sling used should at least meet the lifting requirements of the equipment weight (approx. 12 tons).
- The lifting weight of crane and wire rope under load shall meet the weight of this product.
- Ensure that all sling connections are safe and reliable.
- The length of the sling can be adjusted according to the actual requirements on site.
- Ensure that the equipment is stable and free from deflection during the whole lifting process.
- Please use the supporting spreader to lift the equipment.
- Take all necessary auxiliary measures to ensure the safe and smooth lifting of the equipment.
- When lifting, protect the surface of the box to avoid paint scratches.

5 Electrical and Communication Wiring

DANGER

This system is a high voltage DC system, operated by qualified and authorized person only.

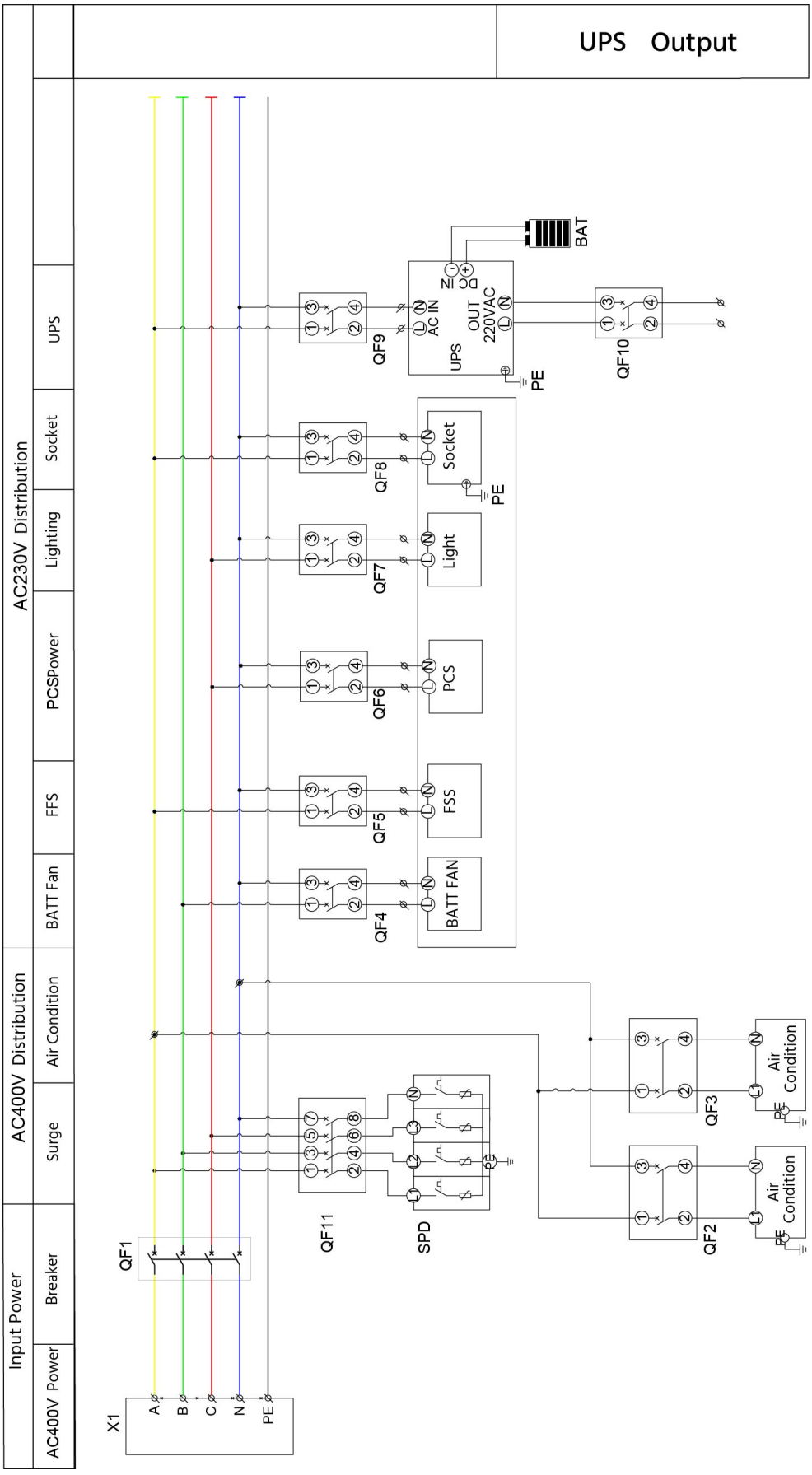
DANGER

When wiring the cables, ensure that the energy storage system DC side and AC side are all disconnected.

DANGER

Whenever operating the system, wear suitable personal protective equipment (PPE) such as rubber gloves, rubber boots and goggles.

5.1 System Diagram



5.2 Cable Requirements and Bolt Torque

- **Cable Requirements**

The wire diameter of the cables used in the outdoor cabinet must be selected in accordance with the maximum current of the AC side and DC side, and there must be a residual reservation.

Please follow the cable specifications below.

Cable	Wire Diameter Requirements	Terminal Model
AC Side Phase A	As the wires' diameters are related to the lengths of the wires, please refer to the separate PCS manual for details.	
AC side phase B		
AC side phase C		
AC side N phase		
Auxiliary Power cables	4x16 mm	SC16-8
Ground PE-Cable	6 AWG	SC16-8
Ground PE - galvanized flat iron	4x 30 mm	/RJ45
External Ethernet communication cable	Ultra Category 5 shielded cable	RJ45
External RS485 cable	Twisted shielded cable ≥ 1,5 mm2	E1510

- **Bolt Torque**

When fixing electrical cables, make sure that the cable terminals are completely tightened with the copper bars or terminal blocks to avoid heating or even fire of the cables caused by poor contact, and the following torque requirements should be met when the cables are connected:

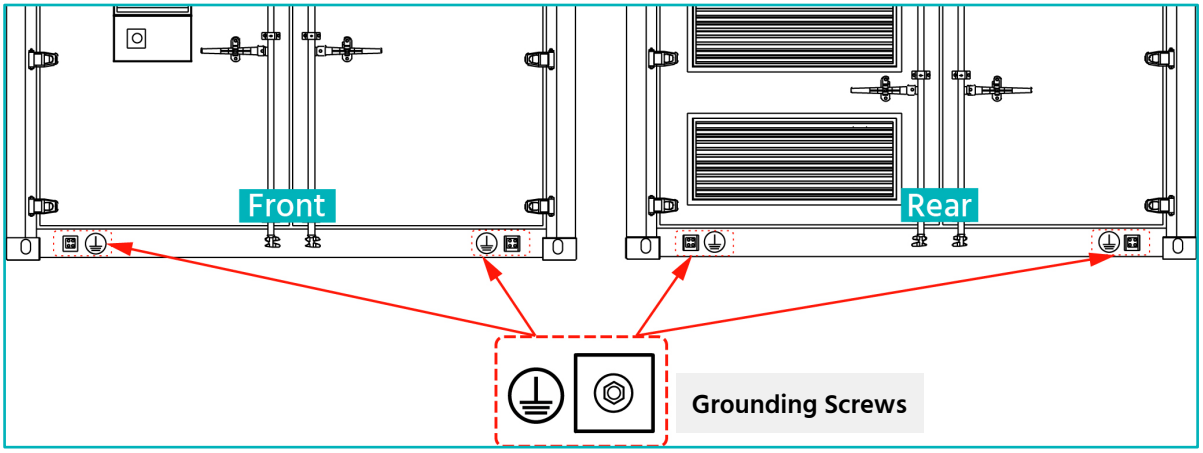
Screw Size	M3	M4	M5	M6	M8	M10	M12	M16
Torque (N•m)	0.9	2	4	7	17	35	55	119.5

5.3 Grounding

DANGER

Life-threatening electric shock may occur if the grounding is insufficient or absent. Before battery installation, make sure that the grounding points of the container are stable and reliable.

The system has four grounding points, as shown in the figure below.



- Before hoisting, the grounding grid should be laid. Connect the furthest two points for grounding connection.
- The grounding resistance is determined to be less than 4Ω and the grounding cable should be crimped.
- The grounding bar shall be solid polished copper or metal bar, with tinned or nickel plating, the grounding depth shall be >=2 meters inside the earth.

5.4 Door Opening

There are two file folders, one is on the inside of the container front door, the other is on the inside of confluence cabinet. Find the keys in the folders for standard operation.
Use the keys to open the other doors. And lock the doors after installation and keep the keys with the designated person or location.

5.5 Battery Energy Storage System Wiring

During transportation, each battery module in each string is disconnected. The cables need to be connected when they arrive at the site. Please refer to *section 5.4.2* for wiring diagram of the battery strings.

The cables from the battery control module to the electrical cabinet have been installed at the factory. Please check the installation status of the cables when they arrive at the site, and use a multimeter to check the cable connection.

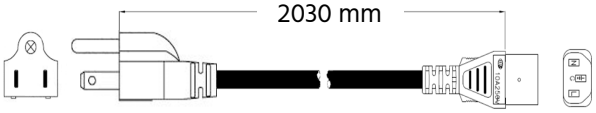
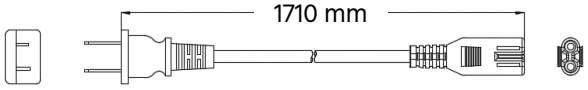
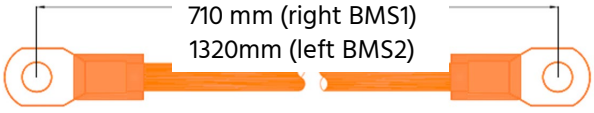
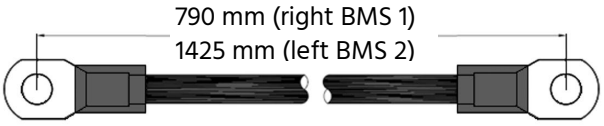
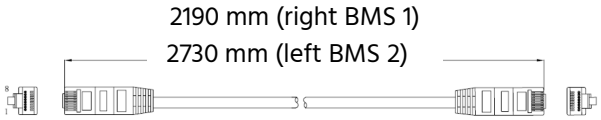
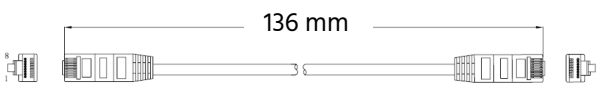
⚠ DANGER

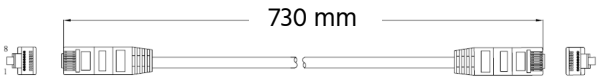
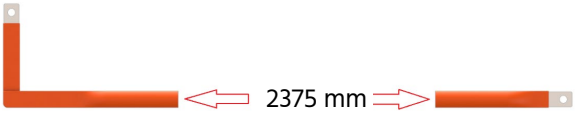
Do not connect the positive and negative reversely.

(1) Connect the positive and negative electrodes of the battery modules in series.

(2) Connect the internal and external communication cables of the battery string

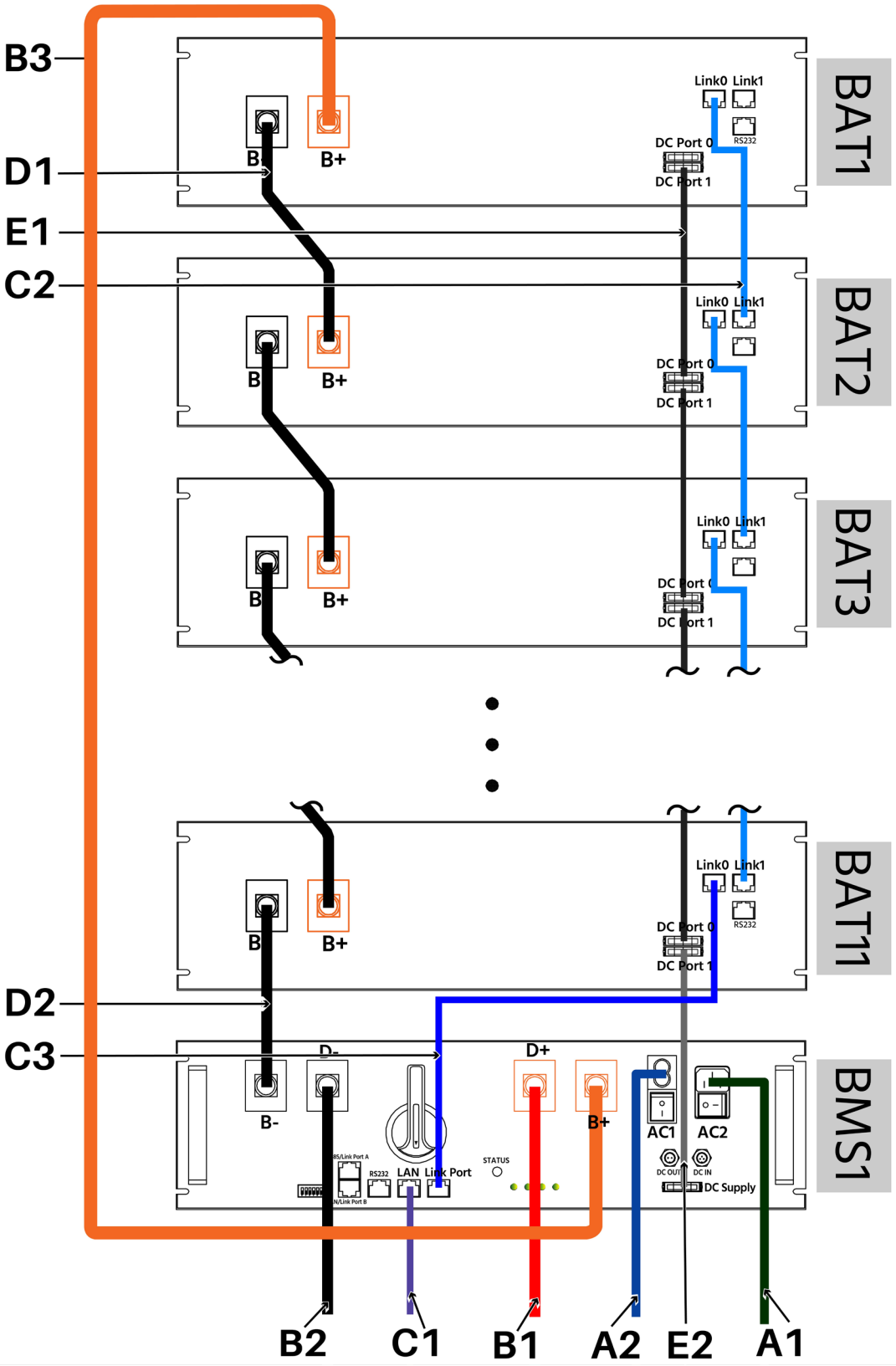
5.5.1 Cable List

Type	Item		Description
External Cables	A1	AC Power Cable/Black/Power Supply for AC2 socket of the BMS	
	A2	AC Power Cable/Black/Power Supply for AC1 socket of the BMS	
	B1	Power Cable/Orange/ 1/0 AWG (the right BMS 1 'D+' to DC Bus XT3) (the left BMS 2 'D+' to DC Bus XT4)	
	B2	Power Cable/Black 1/0 AWG (the right BMS 1 'D-' to DC Bus XT3) (the left BMS 2 'D-' to DC Bus XT4)	
	C1	Communication Cable/Black/Class six shielded twisted-pair cables/2 RJ45 terminal (the right BMS 1 'CAN/Link Port B' to MBMS 'CAN 1') (the left BMS 2 'CAN/Link Port B' to MBMS 'CAN 0')	
	C2	Communication Cable/Black/Class six shielded twisted-pair cables/2 RJ45 terminal (Battery Module Link Port 0 & 1, Communication cascade connection)	

	C3	Communication Cable/Black/Class six shielded twisted-pair cables/2 RJ45 terminal (Battery Module Link Port 0 to BMS Link Port 1 communication connection)	
	C4	Communication Cable/Black/Class six shielded twisted-pair cables/2 RJ45 terminal (Top Battery Modules, Link Port 0 & 1, Communication cascade connection)	
Internal Cables	B3	Power Cable/ Orange /0 AWG/ (BMS 'B+' to the top Battery Module 'B+')	
	D1	Copper bar/Black/195 x 92 x 20 x 3mm, (Battery Module 'B+"B-', down-to-up Serial Connection)	
	D2	Copper bar/Black/133 x 40 x 20 x 3mm, (BMS 'B-' to Battery module 'B-' connection connection)	 **NOTE:** Pay attention to the symbols of "BMS" and "BAT" on the copper bar.
	D3	Copper bar/ Black /468 x 145 x 20/15 x 3/4mm, (Battery module 'B+' to Battery module 'B-' connection)	
	D4	Copper bar/Orange/332 x 175 x 20 x 3mm, (Battery module 'B+' to BMS 'B+' connection)	
	E1	Power supply cable for battery modules Fan/ Black/ 14AWG/TE/1	E1: 175 mm E2: 190 mm E3: 890 mm 
	E2	Power supply cable for battery module Fan and BMS/Black/ 14AWG/TE/1	
	E3	Power supply cable for top battery modules Fan/ Black/ 14AWG/TE/1 L	

5.5.2 Wiring Diagram of Single Battery String System

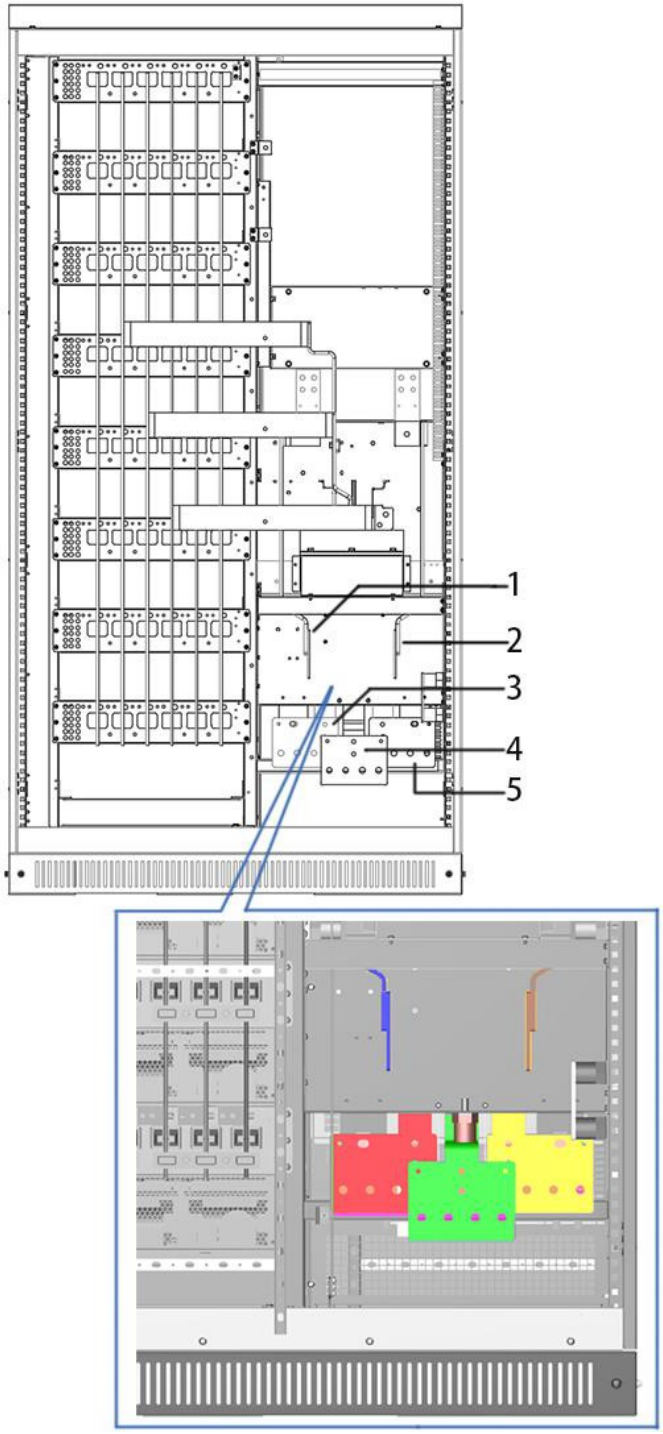
There are six battery strings in the container and two strings are in one battery rack. For single battery strings' system, the cable connection should be done according to the drawing below. The label numbers correspond to the cable list in *section 5.5.1.*



5.5.3 PCS Power Cable Connection

The bidirectional energy storage converter adopts a bottom in and bottom out wiring method, and the cable is vertically inserted into the cable trench through the wire hole on the base. Open the front door and remove the inner door baffle to see the wiring copper bar. For the requirements of connecting cables, single or multiple cables with appropriate wire diameters should be selected, and it is recommended that the current on a 1mm^2 wire be ⩽ 3A.

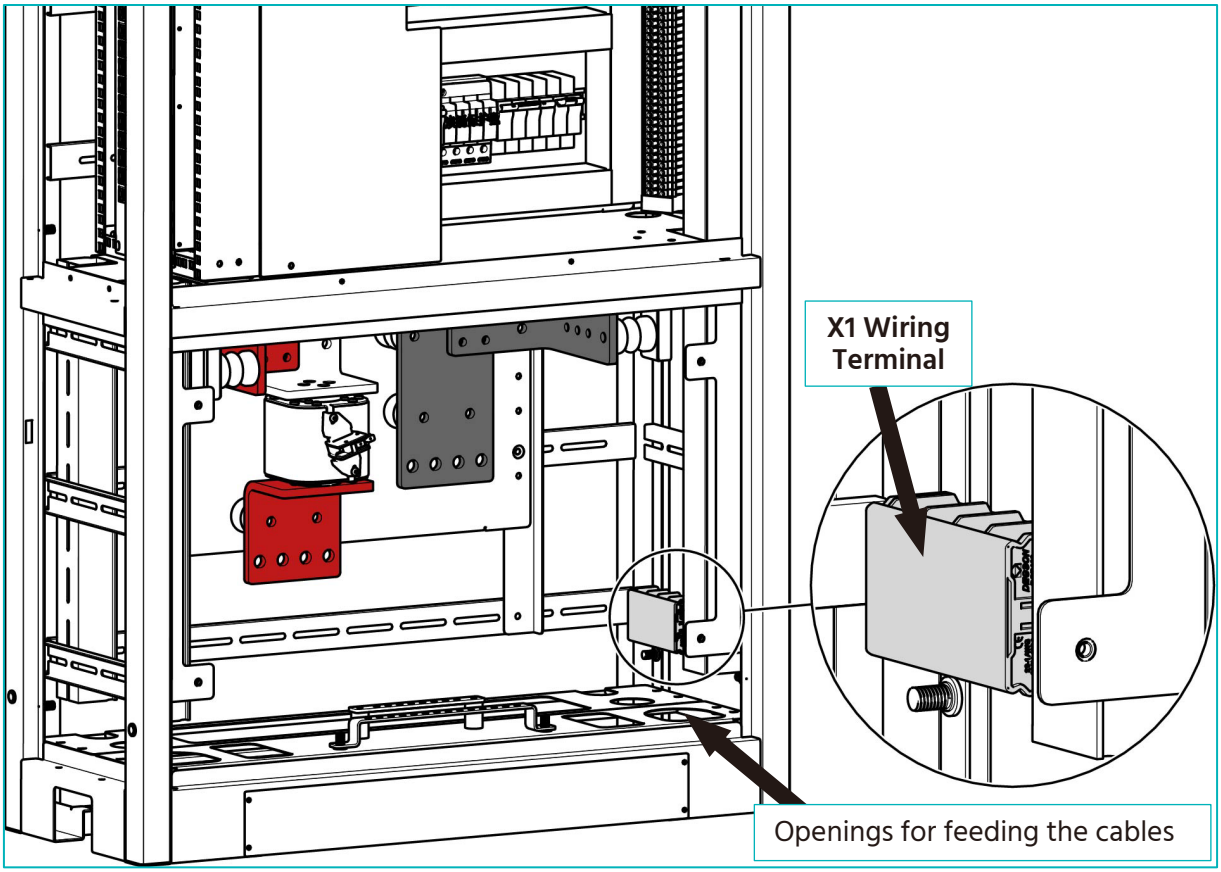
After opening the front door and removing the inner door baffle the copper connections is shown in the following figure.



No.	Designation	Description
1	Battery -*	Battery negative terminal
2	Battery +	Battery positive terminal
3	Grid C phase	C phase
4	Grid B phase	B phase
5	Grid A phase	A phase

5.6 AC Side Wiring

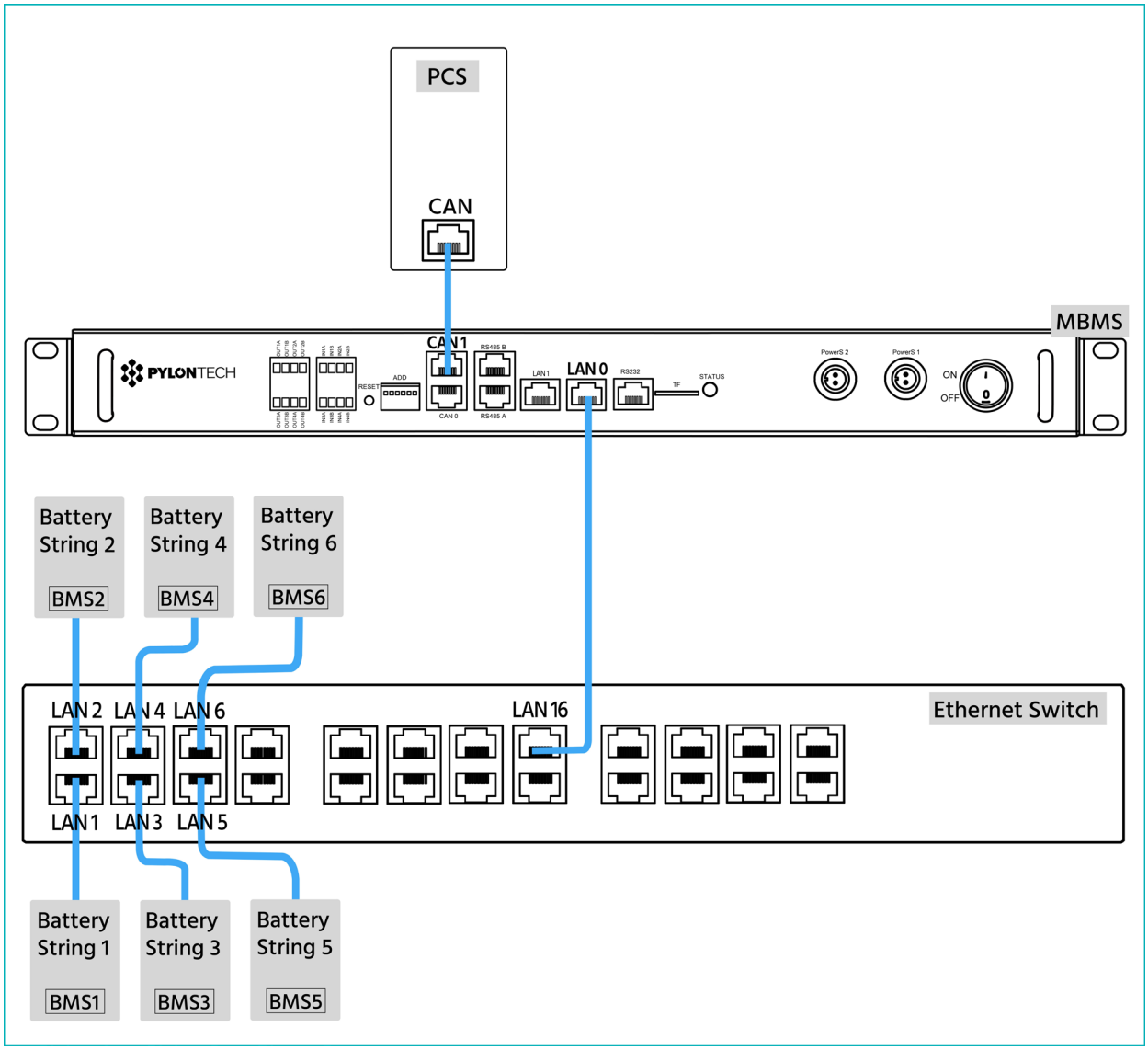
Feed the cables from the AC Grid through the openings at the bottom of the communication and confluence cabinet. According to the labeling, connect the cables of each phase sequence in turn, to the X1 wiring terminal, three opposite sequences are not allowed



3.

5.7 Communication Wiring

Please follow the diagram below for the system's communication wiring.

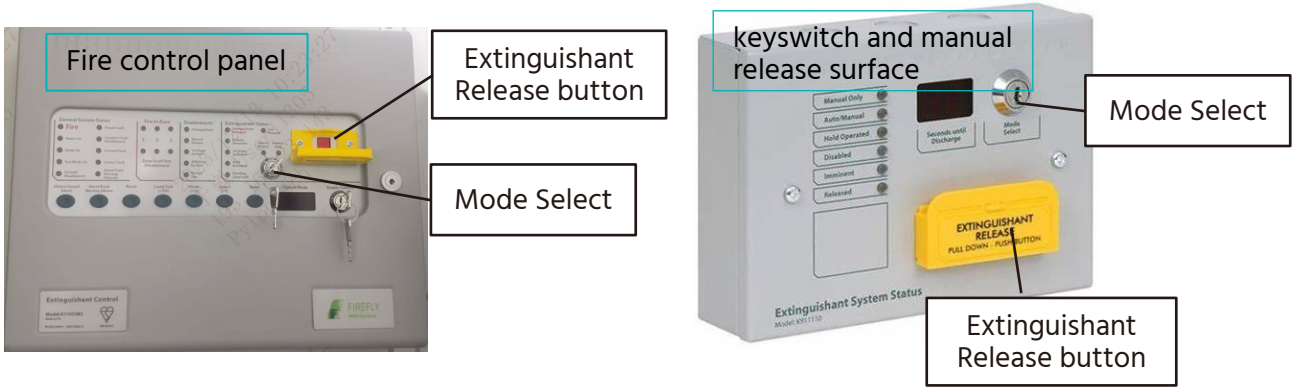


5.8 Fire-protection Preparation

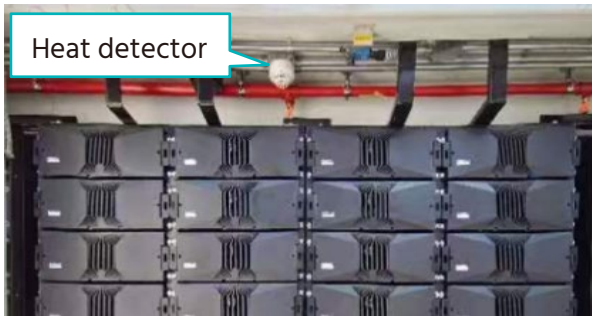
1. Set the fire control panel (on the inner side of the door) to Manual Only; Or set the keyswitch and manual release surface to Manual only. The operation positions are shown in the following figure.

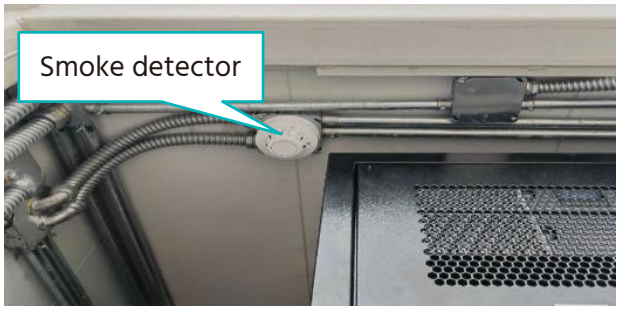
> **⚠ WARNING**
>
> If a fire occurs during the installation and debugging of the system, please manually open the yellow device shown below to press the Extinguishant Release button. If there is no fire, do not touch the Extinguishant Release button to prevent equipment damage.

There is extinguishant release button on both the fire control panel (on the inner side of the door) & keyswitch and manual release surface (on the front door of the container). Choose either one to press the extinguishant release button for fire protection.



2. Open all the doors and check all the detectors without covering plastic.





6 Commissioning

6.1 System Status

Container system status

View system status through EMS monitoring screen.

Battery String status

Status

Status LED: shows the battery module's status (RUN●, Alarm and Protection●).

SOC

Battery SOC capacity indicators: 4 green lights, each light represents 25% capacity.

Battery Status	Protection / Alarm / Normal	STATUS (green)	STATUS (red)	Capacity SOC				Description
		●	●	●	●	●	●	
Shut Down	Off	Off	Off	Off	Off	Off	Off	All off
Sleep	Normal	Flash 1	Off	Off	Off	Off	Off	Indicates Sleep Mode, to save the power.
Idle	Normal	Light	Off	Off	Off	Off	Off	Indicates save power mode.
	Alarm	Light	Off	Off	Off	Off	Off	Indicates the battery voltage or temperature is high or low.
	Protection	Off	Light	Off	Off	Off	Off	Indicates the battery voltage or temperature is over or under.
Charge	Normal	Light	Off	The highest capacity indicator LED flashes (Flash 1), others lighting.				The highest capacity indicator LED flashes (flash 2), others lighting, horse race lamp when SOC＞= DODH.
	Alarm	Light	Off					
	Protection	Off	Light	Off	Off	Off	Off	Stop charging, STATUS (red) lighting
Discharge	Normal	Flash 1	Off	Indicate based on capacity				Indicate based on capacity
	Alarm	Flash 1	Off					
	Protection	Off	Light	Off	Off	Off	Off	Stop discharging, STATUS (red) lighting.
Abnormal	Power On Fault	Off	Flash 2	Off	Off	Off	Off	Stop charging/discharging, STATUS (red) lighting.
	Other Fault	Off	light	Off	Off	Off	Off	
	STL Fault	Off	Flash 1	Flash 1				MCU self-check problem

NOTE: The flashing instructions:

Flash 1: 0.5 seconds light / 0.5 seconds off;

Flash 2: 1 second light / 1 second off.

6.2 System Turning On

⚠ WARNING

Double check all the power cables and communication cables. Ensure that the voltage of the inverter/PCS matches the voltage of the battery system. Check that all the power switches are OFF.

⚠ WARNING

MBMS must be switched on AFTER all battery strings finish self-check.

⚠ WARNING

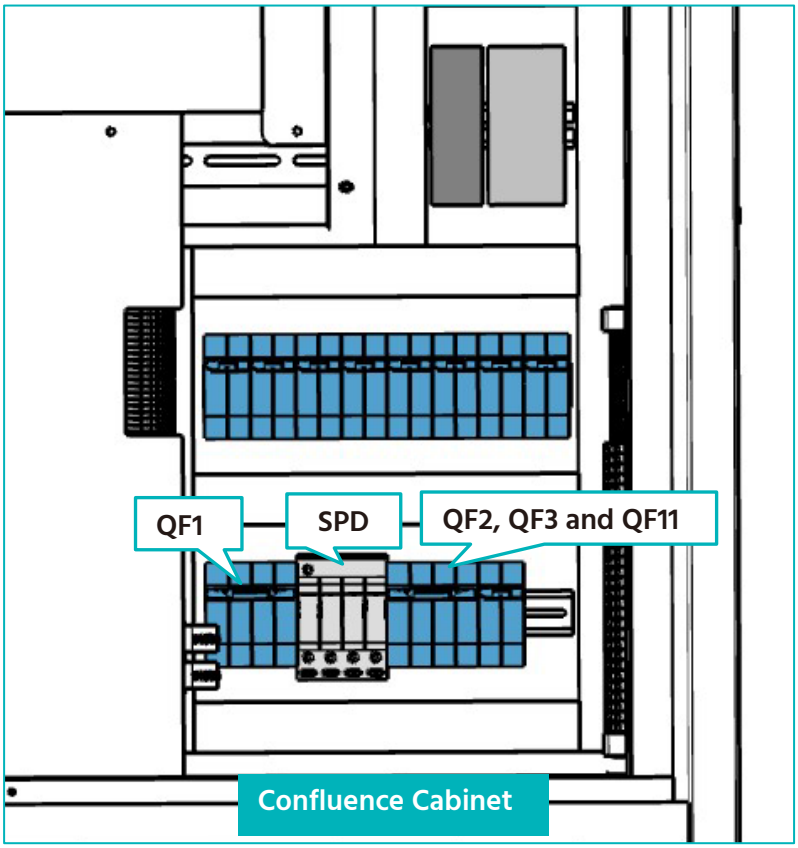
The external switches or breakers between PCS and battery string must be off before the battery system power on.

Preconditions

- Ensure that all micro circuit breakers in the communication and confluence cabinet are off.
- Ensure that the AC switch and DC switch of PCS are off.

Procedure

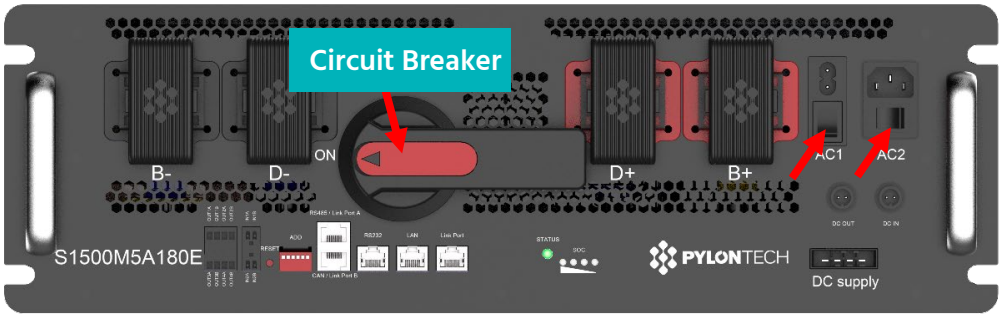
1. Switch on the circuit breaker QF1 (in the communication and confluence cabinet),
3. Switch on the circuit breaker QF11, and the light of the SPD (Switching Mode Power Supply) will be on.



4. Switch on the circuit breakers QF2 and QF3 of the air conditioners power supply, and the air conditioners will start automatically.
5. Switch on the circuit breakers QF4, QF5, QF6, QF7, QF8, QF9 and QF11 one after another.
6. Switch on the UPS following the steps below.
   (1) Hold the power button for 2 seconds until the LCD pops up the confirmation dialog box. (Note: if the battery is not available, no dialog box appears when pressing and holding the power button.)
   (2) Use  or  move the cursor, press the “Enter”  key to select "Yes", then the running indicator (green) flashes, the inverter is on, and the running indicator is solid on.
7. Turn on the battery control modules (BMS) of the battery strings according to the following operation.
   (3) Switch on the 1st BMS of the battery string.

NOTE: The second BMS can only be turned on after the first battery string’s self-check succeeds, which should be done within 30 seconds.

   (4) Turn on the power switch (AC1) and fan switch (AC2) of the BMS.



   (5) Turn on the circuit breaker of the BMS.

Instructions of the battery system self-check process:

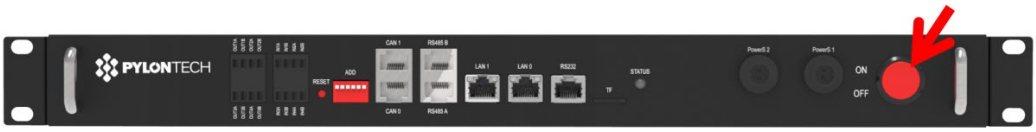
The battery string’s system will enter self-check mode once the system is power on.

- The status LEDs on the BMS and battery modules show green: if the BMS and all battery modules are working properly and the self-check is completed within 30 seconds, each status LED shows green, indicating that the self-check is finished.
- The status LED on the BMS turns red after 30 seconds: the BMS cannot receive signals from the upper-level device (MBMS) because of the communication outage. Then the status LED will turn red after 30 seconds. This does not mean that there is a failure, it is that the BMS is not communicating with the MBMS or PCS.
- The status LED on the BMS or battery module shows red from the beginning: if the status LED shows red from the beginning, it indicates that there is a failure of the battery. In this case, inspection of the battery module must be performed first.

⚠ WARNING

If there is any failure during the self-check, be sure to debug the failure prior to the next step.

8. Switch on the MBMS and after all the BMSs are turned on. The “STATUS” LED will light green.

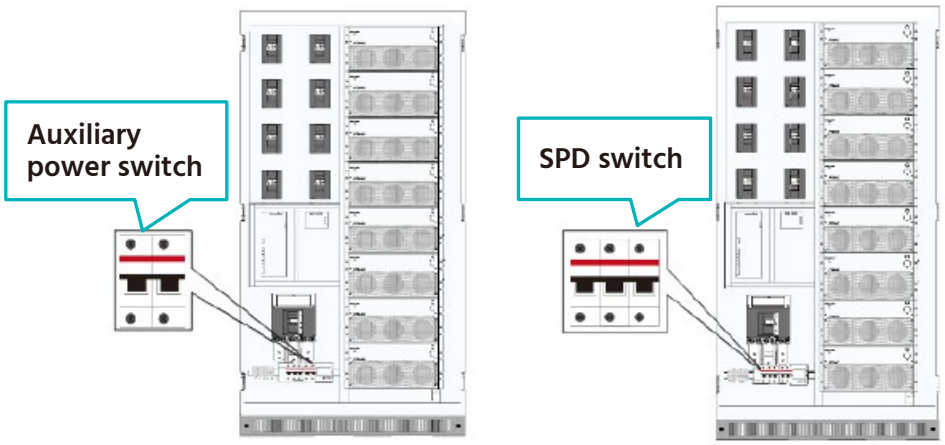


The “STATUS” LED of the BMS will light green automatically after 3 minutes’ self-check.

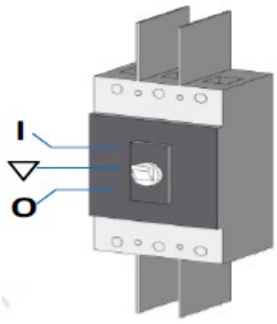
NOTE: External devices (PCS, EMS, etc.) should communicate with BESS through LAN, CAN or RS485. Otherwise the battery system will work abnormally.

9. Turn on the PCS following the steps below:

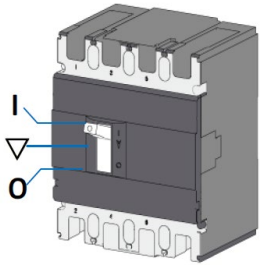
(1) Turn on the auxiliary power switch and SPD (surge protection device) switch shown in the following figure.



(2) Set the AC switch to the "I" position on the PCS side.



(3) Set the battery DC branch switch to the "I" position on the PCS side.



⚠ CAUTION

The whole Battery Energy Storage System (BESS) should be charged to full at first before commercial operation, or after it is left unused for a long time.

7 Maintenance

DANGER

This system is a high voltage AC system, operated by qualified and authorized person only.

DANGER

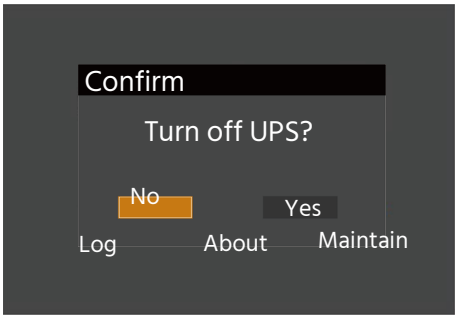
Before checking the failure, ensure to check that all the cables connection and the BESS system can be turned on normally.

NOTE: Before maintenance or long-term storage, ensure to turn the system off.

7.1 System Turning Off

Procedure

1. Disconnect the AC switch and DC switch of the PCS to ensure no current flowing through the battery strings.
2. Turn off the auxiliary power switch and SPD (surge protection device) switch on the PCS.
3. Turn off the power switch of the MBMS.
4. Turn off the BMS as follows:
   (1) Set the circuit breaker to "OFF" of the BMS.
   (2) Turn off the power switch (AC1) and fan switch (AC2) of the BMS.
5. Shutdown the UPS as follows if the system will be shut down for a long time (⩾3 days).
   (1) Long press the power button ⏻ on the front panel of the UPS.
   (2) Click "Yes" to confirm "Turn off UPS" on the display panel. After a while, the UPS shuts down.



6. Turn off all the circuit breakers in the confluence cabinet one after another if the system will be shut down for a long time(⩾3 days).

NOTE: Set the micro circuit breakers off in the confluence cabinet except UPS micro circuit breaker if the system will be shut down for less than 3 days.

⚠ CAUTION

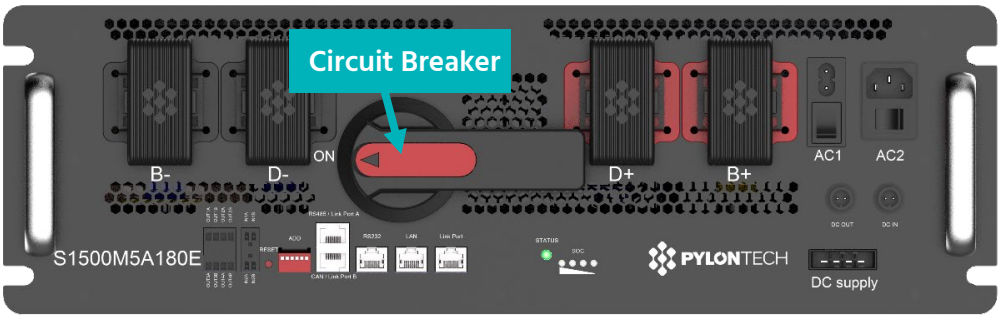
The UPS can be powered on if there is any equipment that needs working without power outage. Otherwise the UPS must be turned off to save its power.

⚠ CAUTION

Before changing the battery module for service, be sure to charge/discharge the replaced battery at the same open circuit voltage as the other ones in the battery module system. Otherwise the system needs long time to do balance for this new battery module.

⚠ WARNING

Do not turn off the circuit breaker during normal running status (unless emergency situation). Otherwise it will cause current surge to the rest battery strings. Be sure to turn off the PCS first prior to turning off the circuit breaker in normal running condition.



NOTE:

After installation, do not forget to register online for full warranty:

www.pylontech.com.cn/service/support

7.2 Routine Maintenance

Due to the influence of ambient temperature, humidity, dust, vibration, etc., the internal components of the system or equipment will be aged or worn, which will lead to the potential failure of the system or equipment. Therefore, it is necessary to carry out routine and regular maintenance on the system to ensure its normal operation and service life.

⚠ WARNING

Only qualified and authorized personnel can maintain the system. During maintenance, do not leave screws, washers, tools and other metal parts inside the equipment, otherwise the equipment may be damaged.

⚠ WARNING

After the system is out of operation, you must wait at least 10 minutes before carrying out maintenance or overhaul operations on the system. After the system is shut down, pay attention to:

- Ensure that the system is not accidentally re-powered on.
- Use a multi-meter or a stylus to check to ensure that the system is completely dead.
- The possible live parts adjacent to the operating part shall be covered with insulating cloth.
- During the whole process of maintenance and overhaul, it is necessary to ensure that the escape routes are completely unblocked.

Precondition

Set the fire control panel (on the inner side of the door) to Manual Only; Or set the keyswitch and manual release surface to Manual only. See *Section 5.8* for details.

Routine maintenance Schedule

The regular maintenance plan is formulated according to different equipment. Please refer to the following table and the recommended cycle for maintenance:

Project	Standard	Frequency
Battery string hardware	Whether the LED light on the main control box displays normally.	half a year
	Whether the relay inside the main control box can be disconnected normally	half a year
	Whether the LED on the battery pack displays normally.	half a year
	Whether there is abnormal sound or abnormal operation of the battery string fa.	half a year
Container	Check whether there are signs of aging and burning at the wiring bolts of the battery and the confluence cabinet, and shake them by hand to make sure that they are in a tight state.	one year
	Check the power cable and control cable for signs of broken skin. If there are any signs, it is necessary to add corresponding insulation measures or replace cables.	one year
	Check the connector for looseness, serious rust or oxidation on the terminal surface, and good contact.	one year
	Whether the grounding point is loose	one year
Air conditioner	PCS and containers should be cleaned or replaced with air filters to increase the air volume at the air inlet.	one year
	Check whether the air conditioner refrigerant is sufficient and replenish the refrigerant.	half a year

7.3 Fire protection system maintenance

Project	Standard	Method	Frequency
Fire protection system	Fire protection system linkage testing	Conduct fire system linkage testing	one year
	Bleed indicator light	Pull up pressure switch reset button	one year
	Smoke and temperature detectors, alarm bells	Use a fire test smoke temperature gun. If the smoke does not exceed the preset alarm value, the indicator light flashes once every 6 seconds; If the smoke exceeds the preset alarm value, stable indicator light on, fire extinguishing controller generates an alarm and triggers an alarm bell	one year
	Audible and visual alarm	Press the manual release button on the control panel.	one year
	UPS on the control board	Disconnect the power input from the control panel and allow the rear battery to power the control panel.	one year

7.4 Battery Maintenance

DANGER

The power must be turned off prior to any maintenance of the battery.

Voltage Inspection

Check the voltage of battery system through the monitor system. Check if the system has abnormal voltage. For example: Single cell's voltage is abnormally high or low.

SOC Inspection

Check the SOC of battery system through the monitor system. Check if the battery string is abnormal SOC.

Cable Inspection

Visual inspect all the cables of battery system. Check if the cables are broken, aging, or getting loose.

Balancing

The battery strings will become unbalanced if not fully charged for a long time. The balancing maintenance (full charged) should be done every 3 months and is usually done automatically by communication between the system and external device.

Output Relay Inspection

Under low load condition (low current), switch the output relay to OFF and ON to hear the clicking sound, which means this relay can be turned off and on normally.

History Inspection

Analyze the historical records to check if there is an accident (alarm and protection) and analyze the reasons.

Environment Inspection

Check the installation environment such as dust, water, insect etc.

7.5 Air conditioner Maintenance

NOTE: The maintenance periods below are only suggested values, and users can adjust them according to the actual plan.

7.5.1 Unit Appearance Maintenance

Maintenance Table

Maintenance Item	Maintenance Standard	Maintenance Cycle	Detection Mode	Processing Method
Unit appearance	The unit is clean and dust-free and free of dirt	3 months	Visual inspection	Use brush or cotton cloth to remove dust and dirt from the unit.
Condensatedrain	The condensate drain is not blocked.	6 months	Visual inspection	Clear the blockage after at least 1 minuteof power off.

7.5.2 Electrical System Maintenance

Maintenance Table

Maintenance Item	Maintenance Standard	Maintenance Cycle	Detection Mode	Processing Method
Reliability of electrical cables and terminals of wiring panel	No looseness of power cable	3 months	Visual inspection	Tighten loose cables with a screwdriver after at least 1 minuteof power off.
	There is no looseness in the power terminal.	3 months	Visual inspection	Re-fix the loose power terminal with ascrewdriver after at least 1 minute of power off.
	There is no aging, damage, abnormal heating and other abnormalities in the power cable	3 months	Visual inspection	Replace the power cable after at least 1minute of power off.
	There is no dust at the wiring panel.	3 months	Visual inspection	Clean up the dust witha brush after at least 1 minute of power off.

7.5.3 Fans Maintenance

Maintenance Table

Maintenance Item	Maintenance Standard	Maintenance Cycle	Detection Mode	Processing Method
Operational reliability of fan	There is no dust in the fan and no foreign matter blockage at the tuyere.	1 month	Visual inspection	After at least 1 minute of power off, clean the dust of the fan with a brush and clean the foreign matter at the tuyere.
	No abnormal noise in fan operation	1 month	Visual inspection	Use a screwdriver to tighten the fan after at least 1 minute of power off.

7.5.4 Condenser Maintenance

NOTE: The edges of the condenser and evaporator blades are sharp, please wear gloves for operation.

Maintenance Table

Maintenance Item	Maintenance Standard	Maintenance Cycle	Detection Mode	Processing Method
Condenser cleaning	The condenser is not dirty and blocked.	6 months	Visual inspection	After at least 1 minute of power off, use a water gun to flush the condenser until the water after flushing becomes clear.
	No serious deformation of the fins.	6 months	Visual inspection	Use tools such as tweezers or fin comb to calibrate after at least 1 minute of power off.

NOTE: For more maintenance information of the air conditioner, UPS and PCS, please refer to the separate product manuals.

8 Troubleshooting

The common faults and solutions during the commissioning of the energy storage system are shown in the following sections. If the problems cannot be solved according to this manual, please contact us. We need the following to help you better.

- Machine serial number, production date and software version
- Manufacturer, model and configuration information of the equipment
- Simple fault description
- Failure site photos

8.1 System Troubleshooting

Local monitoring checks the fault trigger location, which is divided into battery string fault, fire fault and air conditioning fault.

8.2 Battery String Failure

- Use a 232 to USB device to connect to the on-site PC, and at the same time, contact the after-sales engineer of Pylontech to obtain the CRT software and install the software.
- Connect RJ45 port to the 232 debugging port of the corresponding fault master, and connect USB port to the PC end of the computer. Open the control panel to read the port number, and select the port number of the software as the corresponding serial port.
- Connect the computer to WIFI or network and install sunflower remote software, opening the Batteryview debug APP.
- Contact the dispatched after-sales engineer for troubleshooting.

8.3 Fire Protection Failure

No.	Fault name	Checking method
1	Power Failure	There is no 230V AC power supply, and the system operates using backup batteries. If there is no power outage, or check the electrical fuse inside the panel.
2	Battery failure	Check if the two batteries are connected and connected together, Test the battery. Disconnect the battery and ensure that 28 volts can be measured on the battery charger lead.
3	Auxiliary 24V fault	The LED light indicates that the fuse protecting the R0V output has been activated and exceeds the rated value of the output.
4	Communication fault	Communication interruption between relay panels or accessory boards. Check all communication faults between repeaters and auxiliary boards to determine the root cause of the problem.
5	Manual release fault	Manual release switch input short circuit or open circuit. Remove the wiring and reinstall the end of the line. Check the wiring of the manual release circuit.
6	Release fault	Release switch input short circuit or open circuit. Remove the line and reinstall the end of the line. Check the wiring of the release pressure switch circuit.

NOTE: If other faults occur, please contact the suppliers.

8.4 Air Conditioner Failure

Fans faults and recovery measures Table 8.4-1

Fault Phenomenon	Possible Reasons	Inspection and Repair
The indoor fan does not run.	The unit is not powered on.	• Check if there is current at the unitpower input terminal. • Check whether the external circuitbreaker of the unit is switched on.
	The input power is abnormal, such as: powersupply overvoltage, undervoltage, or lack of phase.	Check whether the unit has corresponding alarms throughRS485 communication.
	The unit is on standbystatus.	Normal status. After the unit is powered on, it waits for 30s, andthen enters the automatic controllogic.
	The fan is stuck.	Check if there are any internalcomponents obstructing the operation of the fan, or foreign objects in the fan.
	The wiring terminal isloose.	Tighten the terminals.
	The fan is damaged.	If there is an internal circulation fan failure alarm, and the power connection is normal, and the fan has no foreign matter stuck, the fan may be damaged and the fan needsto be replaced.
	The control board is faulty.	If the above possible causes are eliminated, check whether the maincontrol board is faulty. If the main control board fails,replace it.
The outdoor fan does not run.	The compressor does not start.	The external circulation fan starts only after the compressor is started,and the high-pressure side refrigerant needs to reach a certain pressure.
	The fan is stuck.	Remove foreign objects.
	The wiring terminal is loose.	Tighten the terminals.
	The fan is damaged.	If there is no abnormality in the power connection of the condenserfan and the fan is not stuck with foreign matter, the fan may be damaged and the fan needs to be replaced.
	The control board is faulty	If the above possible causes are eliminated, please check whetherthe main control board is faulty. If the main control board fails,replace it.
Abnormal sound of fans	Fan bearing wear.	Replace the fan.
	Fan blades scratch otherobjects.	Check whether there are cables or other foreign objects interfering with the fan blades.
	Loose fan fixing bolts	Re-tighten the fixing bolts of the fan.

Cooling System faults and recovery measures 8.4-2

Fault Phenomenon	Possible Reasons	Inspection and Repair
Compressor not started.	Unpowered (standby)	Check the main power switch, and check whether the unit has been turned on through the control system operation interface.
	Loose circuit connection	Tighten the circuit connector.
	Open or short circuit.	Check the circuit for open circuit orshort circuit, and repair the main power supply.
	Inverter fault.	Replace the inverter.
	Control board fault.	Replace the control board.
	Compressor motor fault.	Replace the compressor.
Compressor does not work.	The control temperature isset too high and there is no cooling demand.	Check the air inlet and outlet temperature, and set the appropriatecontrol temperature.
High compressor discharge pressure.	Dirty condenser.	Clean the condenser.
	The external circulation fan does not run.	Refer to **Table 8.4-1** to confirm thetreatment measures for the phenomenon that the external circulation fan does not run.
	The internal circulation fandoes not run.	Refer to **Table 8.4-1** to confirm thetreatment measures for the phenomenon that the internal circulation fan does not run.
Evaporator freezes.	The internal circulation fandoes not run.	Refer to **Table 8.4-1** to confirm thetreatment measures for the phenomenon that the internal circulation fan does not run.

8.5 UPS Troubleshooting

8.5.1 List of UPS Alarm and Fault Message

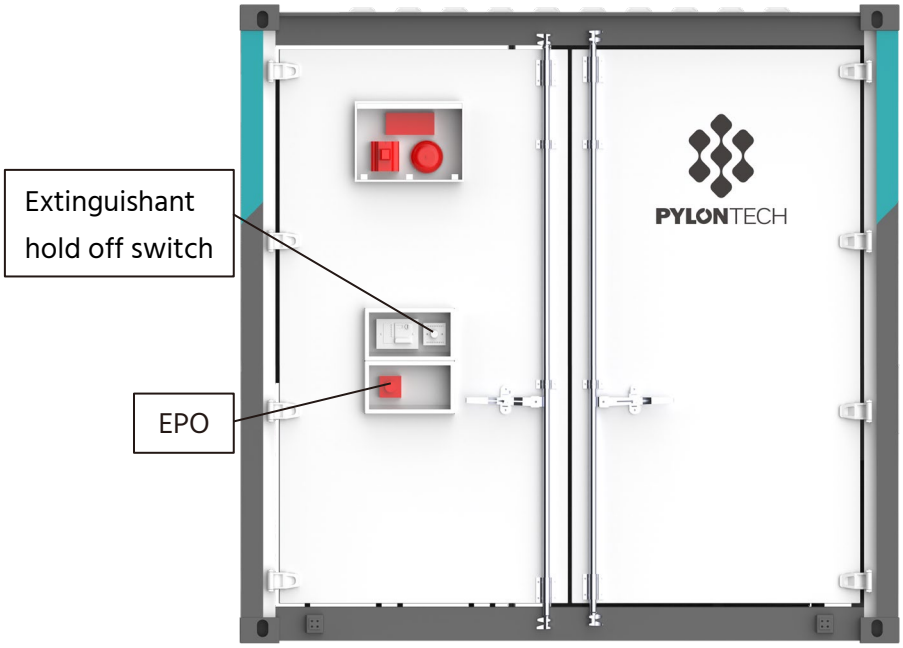
Alarm message	Description
Input abnormal	The rectifier and charger are off due to the mains voltage and frequency exceeding normal range. Check that the rectifier input phase voltage and frequency exceed the normal range or that the mains has powered off.
Rectifier overload	The output power is larger than the rectifier overload point. Check that the input voltage meets the output load, mains input 176V ~ 100V, the load 100% ~ 50% linear derating.
Inverter on failed	Check the input voltage, frequency and system settings.
Rectifier fault	The rectifier is faulty and off.
Charger fault	The charger output voltage is abnormal, and the charger is off.
DC/DC fault	The discharger is faulty, because the bus voltage exceeds the setting range when discharger starts or soft starts.
System over temperature	The internal heat sink temperature is too high, and the inverter is off. Only each module heat sink temperature decreased to the setting value can you silence the alarm. The system can automatically start after the overtemperature fault is solved. If over temperature occurs, please check: 1) Ambient temperature too high or not. 2) Dust is blocked or not. Fan fault or not.
Inverter overload	Inverter load capacity is larger than the rated value, overload delay time is up, inverter shuts down. If bypass is available, the system will transfer to the bypass mode, otherwise the output is failure. Check that the actual inverter load capacity, if overloaded, just reduce the load capacity, and the system will transfer to the inverter mode after five minutes with alarm cleared.
Inverter fault	The inverter is off when the inverter output voltage and current exceed the setting range. If bypass is available, the UPS will transfer to bypass mode, otherwise the system will power off.
Output pending	Remote shutdown is enabled, and the system will be off.
Output disabled	The system is in standby state, and the dry contact shutdown is enabled. Check whether the shutdown dry contact is enabled or not.
Battery module connection abnormal	If the number of battery cabinets detected exceeds 6, report abnormal connection of battery modules.
DC bus abnormal	The inverter is off when DC bus voltage is faulty. The load will transfer to bypass if the bypass is available.

Alarm message	Description
Bypass overcurrent	The bypass current exceeds the rated value. Overload delay time is up, inverter shuts down.
Bypass abnormal	Maybe caused by bypass voltage and frequency outside of range, bypass power-off and incorrect bypass cables connection. 1) Check that the bypass voltage and frequency are within the setting range. 2) Check the bypass cables connection.
Bypass abnormal in ECO mode	The ECO mode is available, and the bypass voltage and frequency are outside of the setting range. Check that the bypass input voltage and frequency are within the setting range.
Battery reversed	The battery positive and negative are reversed. Please reconnect the battery and check the battery.
Battery low pre-warning	This alarm occurs when the battery reaches the EOD. After the pre-warning, the battery capacity allows two minutes discharge at full load. The user can set the time ranging from 2～30mininutes, (2 minutes by default). Please shut down the load timely.
Battery voltage abnormal	When the battery is connected, the system checks that the battery voltage exceeds the normal setting range. Check that the battery terminal voltage exceeds the normal range.
No battery	Check the battery and battery cables connection.
Battery test fail	The battery low voltage is detected when the battery has manual or periodical self-test. Battery replacement is recommended.
Battery over temperature	Battery ambient temperature too high. Check that the battery ambient temperature is higher than setting value 40 ~ 60℃ (default: 50℃).
Battery mode	The UPS is on battery, and the inverter starts.
REPO	Shutdown caused by the REPO terminal Normally Closed contact open.
Output off, voltage is not zero	When there is no output, the system detects that the output has a voltage.
Output short	Check that the output cables are not shorted.
System fault	The alarm occurs when model identification is incorrect. Solution: Contact service manager.
Operating on inverter	The UPS output state is on inverter.
Bypass mode	The UPS is on bypass.
No output	The UPS has no output.
Internal communication fails	Check the communication cables are normal.

8.6 Emergency Disposal

8.6.1 EPO

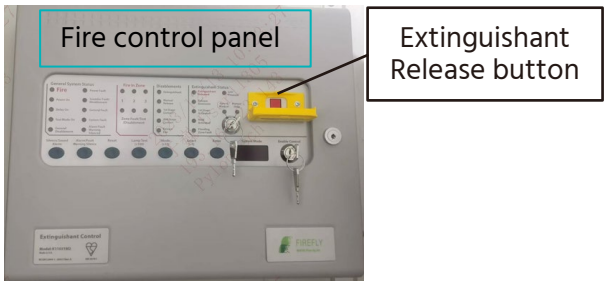
In case of fire or any situation beyond the control of anyone, please immediately tap the emergency stop button to stop the system. Do not touch the EPO during normal operation. To restore the system, first rotate the EPO button in the operating direction on the panel to make the button pop up, and then power on the system according to the power on steps.

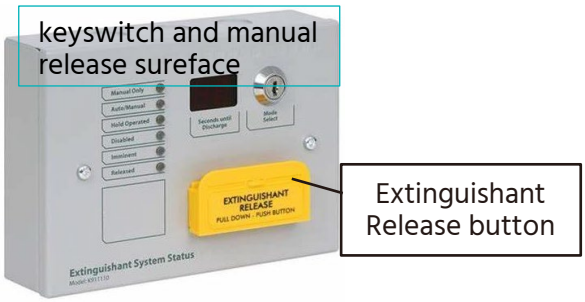


8.6.2 Fire protection emergency start/abort

> **⚠ WARNING**
>
> Do not operate the fire protection equipment when the system is free of fire, which may cause the system to fail to operate normally later.

In case of the event of fire, the fire protection system will start automatically. If the fire protection system does not act, please operate the fire emergency starting device for active fire protection. Choose either one below to press the extinguishant release button.





If any misoperation falsely triggers the fire protection system, please press the extinguishant hold off switch.

Annex 1: Cause and Effect Matrix for ESS Container Products

System Output / System Input	Notification			Action			Output signal		
	Bell Alarm	Horn Strobe Alarm	Gas Release Indicator LED Action	Agent Release Count-down Starts	Agent Release Count-down Pauses	Agent Release Count-down ends	Fire Alarm	Agent Release Signal	General Fault
Description	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Smoke detector alarm x 1	√						√		
Heat detector alarm x 1	√						√		
Heat detector alarm x 2	√						√		
Smoke and heat detector alarm	√	√	√	√		√	√	√	
Manual pull station action	√	√	√	√		√	√	√	
Pressing and holding abort station button					√				
Any fault of fire control panel									√

Instructions of the System Output Items (A~I)

Item	Instructions
A	Bell releasing alarm indicates a potential fire hazard.
B	Horn strobe releasing alarm indicates that fire extinguishing agents are to be released.
C	Gas release indicator LED lighting indicates not entering the space where fire extinguishing agents are to be released.
D	The countdown of agent releasing starts, and countdown period can be adjusted from 0 to 30 seconds.
E	The countdown of agent releasing is paused at 30 seconds by pressing and holding the abort station button.
F	The countdown of releasing agent has ended, and the agent has been released into the container.
G ~I	Output dry contact signals of external device and host.

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