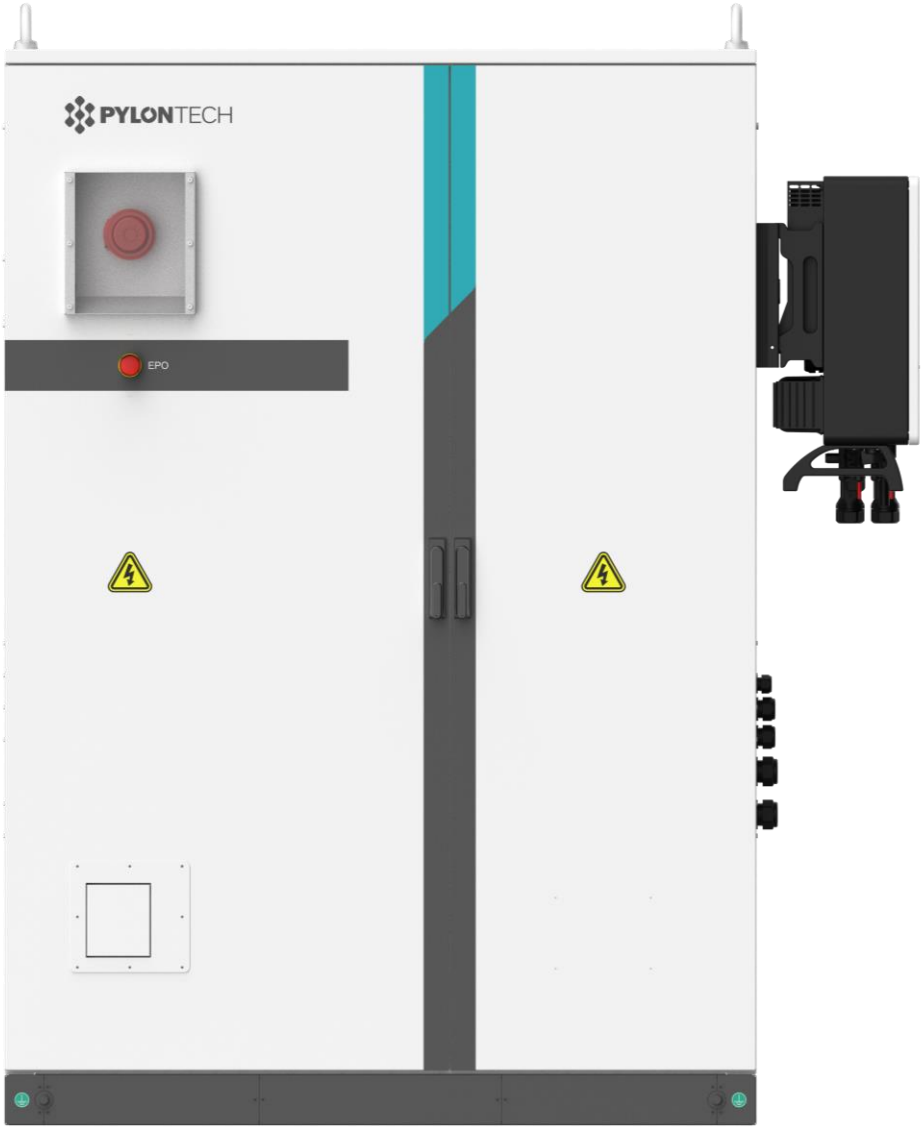


Optim US-A100-HY

Lithium Iron Phosphate Battery Energy Storage System

User Manual

Information Version: 1.0

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.

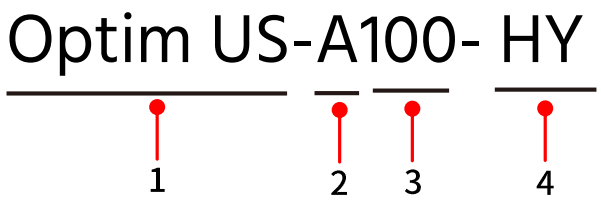
Contents

1 Information about this manual

1.1 Purpose

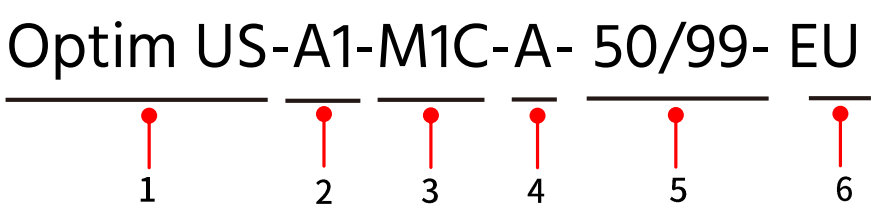
This manual describes the Optim US-A100-HY Lithium Iron Phosphate Battery Energy Storage System (hereinafter referred to as "the system" unless otherwise noted) in terms of its overview, installation, commissioning, maintenance, etc.

1.2 Product Model Description



No.	Designation	Description
1	Product Series	Optim US Series
2	Cooling type of the system	Air Cooling
3	The rated energy (in kWh) of the system	The rated energy of this system is 99 kWh.
4	Type of the cabinet	“HY” represents the hybrid inverter integrated cabinet.

1.3 Model Description



No.	Designation	Description
1	Product Series	Optim US Series
2	"A" represents the type of cabinet system. "1" is the serial number.	"A" represents "All in one cabinet (including the inverter)."
3	Battery model used in the product	The product uses M1C battery.
4	Product Version	Version A
5	The rated power of the PCS (in kW) The rated energy (in kWh) of the system	The rated power of the hybrid inverter is 50 kW. The rated energy of this system is 99 kWh.
6	Sales territory	The product is intended for European market.

1.4 Symbol Explanation

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
DC	Direct Current
PCS	Power Conversion System
BMS	Battery Management System
BMU	Battery Management Unit
MTTP	Maximum Power Point Tracking
MCB	Micro Circuit Breaker
MCCB	Moulded Case Circuit Breaker
SOC	State of Charge
SOH	Battery State of Health, in percent
UPS	Uninterruptible Power Supply
BESS	Battery Energy Storage System
EMS	Energy Management System
PMU	Power Management Unit
CMU	Control Management Unit
SPD	Surge Protecting Device
GND	Ground
EU	European Union
DOD	Depth of Discharge
MBMS	Master Battery Management System
MCU	Microcontroller Unit

2 Safety

2.1 Personal Requirements

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.

Arrange at least one escort to ensure the personal safety of the operator, and the operator 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 local regulations and directives.

2.2 Symbols

	Read the manual before installing and operating the battery system.		Keep away from flame or ignition sources.
	Do not connect the positive and negative reversely.		Authorized personnel only.
	General warning label indicating potential hazards.		Grounding label.
	Warning: electric shock.		Recycle label.
	Warning: flammable materials.		Label for Waste Electrical and Electronic Equipment (WEEE) Directive

2.3 General Requirements

⚠ DANGER

Only qualified personnel can perform the wiring of the battery strings. The high voltage DC power produced by battery strings can cause a lethal voltage and an electric shock.

⚠ DANGER

Lethal voltages are present in the battery terminals and cables. Severe injuries or death may occur if you touch the cables and terminals.

⚠ WARNING

Pulling out the connectors while the system is working could lead to battery system damage or personal injury. Do not pull out the connectors while the system is in operation. De-energize all multiple power sources and verify that there is no voltage.

⚠ WARNING

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

⚠ WARNING

For this system, working temperature is -25℃~ 40℃ and the optimum temperature is: 10℃~ 40℃. Out of the working temperature range may cause the battery system over/low temperature alarm or protection which will further lead to the cycle life reduction. It will affect the warranty terms as well.

⚠ WARNING

For battery installation, the installer shall refer to IEC 60364 or similar local installation standard for operation.

⚠ CAUTION

Improper settings or maintenance can permanently damage the battery.

2.4 Equipment Label Protection

- The warning labels on the outside and inside of the cabinet of this product contain important information for safe operation of this product. It is strictly prohibited to remove or damage them.

- This product is fitted with a nameplate that contains important information about the parameters related to the product. It is strictly prohibited to tear or damage it.

2.5 Establishment of Safety Warning Signs

When installing, performing routine maintenance, repairing, etc. on this product, to prevent uninvolved persons from approaching and causing accidental operations or accidents, please observe the following:

- Establish visible signs at all circuit breakers for this product to prevent accidents caused by accidental closing of the circuit breaker.
- Establish warning signage or set up safety caution tape near the operating area.
- Always lock the cabinet door, remove the door key and keep it in a safe place after operations such as maintenance or overhaul.

2.6 Precautions for Maintenance or Repairs

The product can be taken out of operation smoothly by performing the shutdown operation. When performing maintenance or overhaul operations on the equipment, please observe the following:

- Ensure that this product is not accidentally repowered.
- Use a multimeter to ensure that the product is completely free of electrical charge internally.
- Ensure the proper grounding connections.
- Cover potentially energized parts of the operating section with insulation using a cloth made of insulating material.
- Ensure that escape routes are completely clear throughout maintenance and repair.

2.7 Electrostatic Protection

- Contact or improper handling of printed circuit boards or other static-sensitive components can cause damage to the device.
- Avoid unnecessary contact with the circuit board.
- Observe electrostatic protection norms, such as wearing anti-static bracelets.

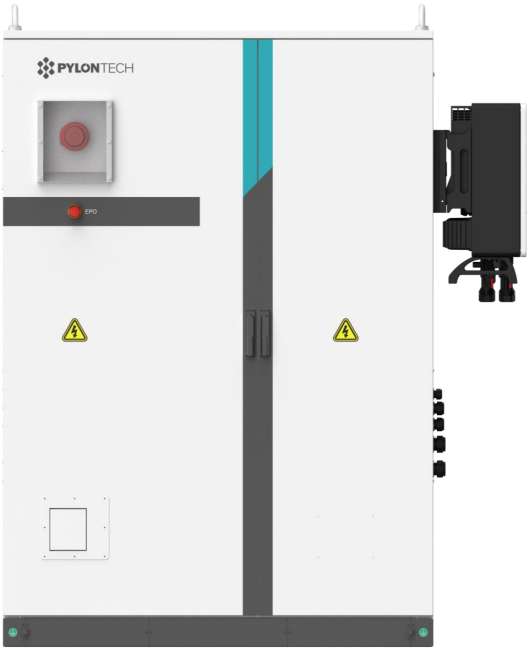
2.8 Moisture Protection

- Do not open the cabinet door when the air humidity is >95%.
- Avoid installation operations in rainy or humid weather conditions.
- Intrusion of moisture will most likely damage the product.

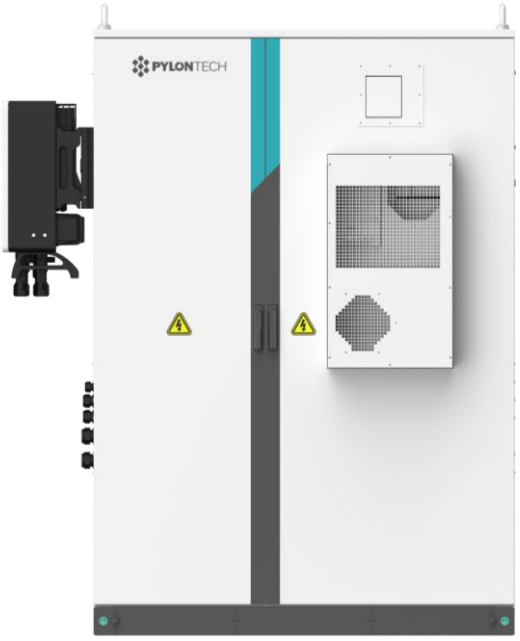
3 System Introduction

3.1 System Overview

The Optim US-A100-HY is a high voltage battery storage system based on lithium iron phosphate battery. This system is especially suitable for industrial and commercial application scenarios such as grid peak shaving and valley filling, power capacity increase, photovoltaic storage charging system, and backup power.



Front View



Rear View

NOTE: The above illustrations are for reference only, the appearance of the product is subject to the actual delivery.

3.2 System Description

The outdoor integrated battery energy storage system connects the power grid with the storage battery through the hybrid inverter and realizes the bidirectional energy transfer between the DC battery of the battery energy storage system and the AC grid by applying the principle of AC/DC conversion. It is realized through the control strategy:

- Charging and discharging management of the battery system.
- Tracking the power of the load on the grid side.
- Control of the charging and discharging power of the battery energy storage system, off-grid operation, and so on.

Main functions of the product

- Peak reduction and valley filling: it is realized by charging and discharging from the energy storage system in accordance with the requirements of the local electricity tariff with a fixed duration.
- Anti-backflow function: EMS adjusts the charging and discharging power of energy storage in real time by sampling the power of the grid to prevent backflow to the grid.
- Demand management: EMS adjusts the charging and discharging power of the energy storage system to avoid over-limit of the user's transformer.
- Local control and remote communication control.

3.3 System Specifications

Specifications	Model Name	Optim US-A1-M1C-A-100/104-EU (11 batteries per string, 2 strings in parallel)
AC side Parameters	Rated Power (kW)	50
	Rated Output Voltage (VAC)	220/380V; 230/400V
	Maximum Output Current (A)	83
	Rated Frequency (Hz)	50/60
	Wiring Method	Three-phase four wire +PE
Photovoltaic Parameters	Maximum Input Power(kW)	75
	Maximum Input Voltage(V)	1000
	Rated Input Voltage(V)	620
	MPPT Voltage Range(V)	200~850
	MPPT Starting Voltage(V)	135
	MPPT Interface Qty.	4
DC side Parameters	Battery Control Module (BMS) Qty.	1
	Battery String Qty. (same as BMS Qty.)	1
	Battery Module Qty.	21
	Rated Energy(kWh)	99
	Battery rated voltage(V)	672
	Maximum DC current (A)	100
System Parameters	Firefighting Configuration	Aerosol
	Cooling Type	Industrial Air Conditioner (2kW)
	Working Temperature Range (℃) *	-25~45
	Storage Temperature Range (℃)	-20~60
	Relative Humidity	0-95%RH, non-condensing
	Noise (dB)	≤75
	Altitude (m)	≤3000
	External Dimensions of Outdoor Cabinet (mm)	1500 ±5 (W) x 1125 ±5 (D) x 2195 ±5 (H)
	Corrosion Resistance Grade	C3H
	Weight (kg)	2000
	Installation Type	Cabinet installed on the ground. Applicable for hoist and forklift handling
	IP Rating of the outdoor cabinet	IP55

* In high (>40℃) or low temperature (<10℃) environment, the charging and discharging power of the battery system will be limited according to BMS operation logic.

3.4 Reference standards

3.4.1 System Related Standards

No.	Description	Code
1	UN38.3 Safe Transport Standard	UN3480

3.4.2 Battery Related Standards

No.	Description	Code
1	Safety Standard for Secondary Lithium Batteries	IEC62619 IEC63056 IEC62477-1 IEC62040-1
2	UN38.3 Safe Transport Standard	UN38.3
3	CE EMC Standard CE EMC Directive 2014/30/EU	EN IEC 61000-6-1:2019 EN IEC 61000-6-2:2019 EN 61000-6-3:2007+A1 EN 61000-6-4:2007+A1 IEC 61000-6-1:2016 IEC 61000-6-2:2016 IEC 61000-6-3:2006+A1 IEC 61000-6-4:2018
4	UCKA Standard	BS EN IEC 61000-6-2:2019 BS EN 61000-6-2:2005 BS EN 61000-6-4:2007+ A1
5	Battery Cell Safety Standard	UL1642
6	Battery Cell Safety Standard	UL1973
7	Battery Cell Safety Standard	JIS C 8715-2
8	Battery Safety Standard	UL9540A*
9	Safety Standard for Electrical Devices CE LVD Directive 2014/35/EU	IEC62477-1
10	Safety Standard for Lithium-ion Battery (US)	UL1973
11	Safety Standard for Lithium Battery (Germany)	VDE-AR-E 2510-50:2017

*Test Organization: TÜV Rheinland

Report: UL 9540A: 2019 (Fourth Edition) Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage

Date: Jan.10,2023

4 System Components

4.1 System Layout

The system mainly contains the following components.

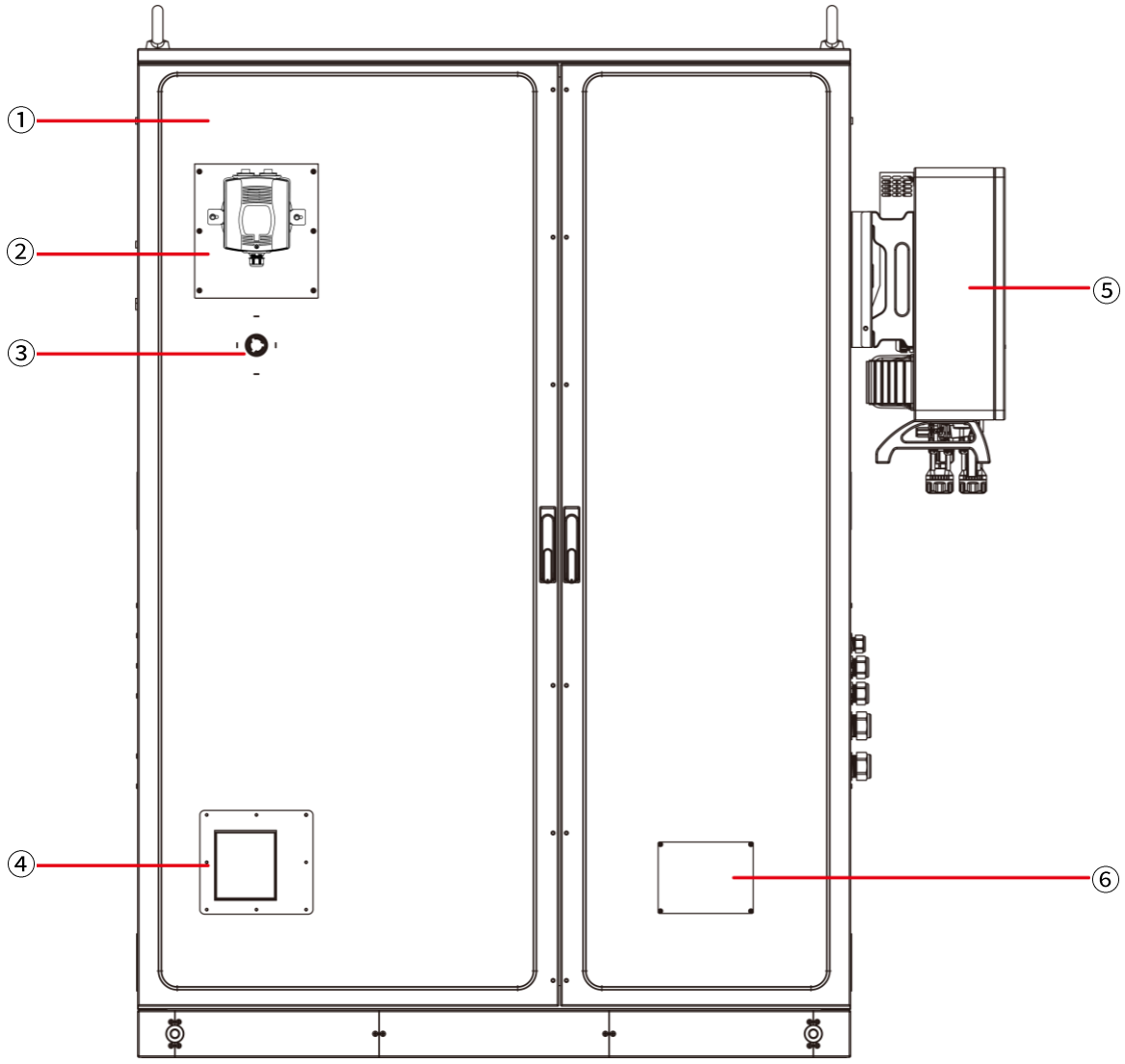


Figure 4-1 Front View (Door closed)

NO.	Description	NO.	Description
①	Outdoor cabinet	④	Electric ventilation louver (explosion proof system)
②	Sound-light Alarm	⑤	Hybrid Inverter
③	EPO (Emergency Power OFF Switch)	⑥	Product Nameplate

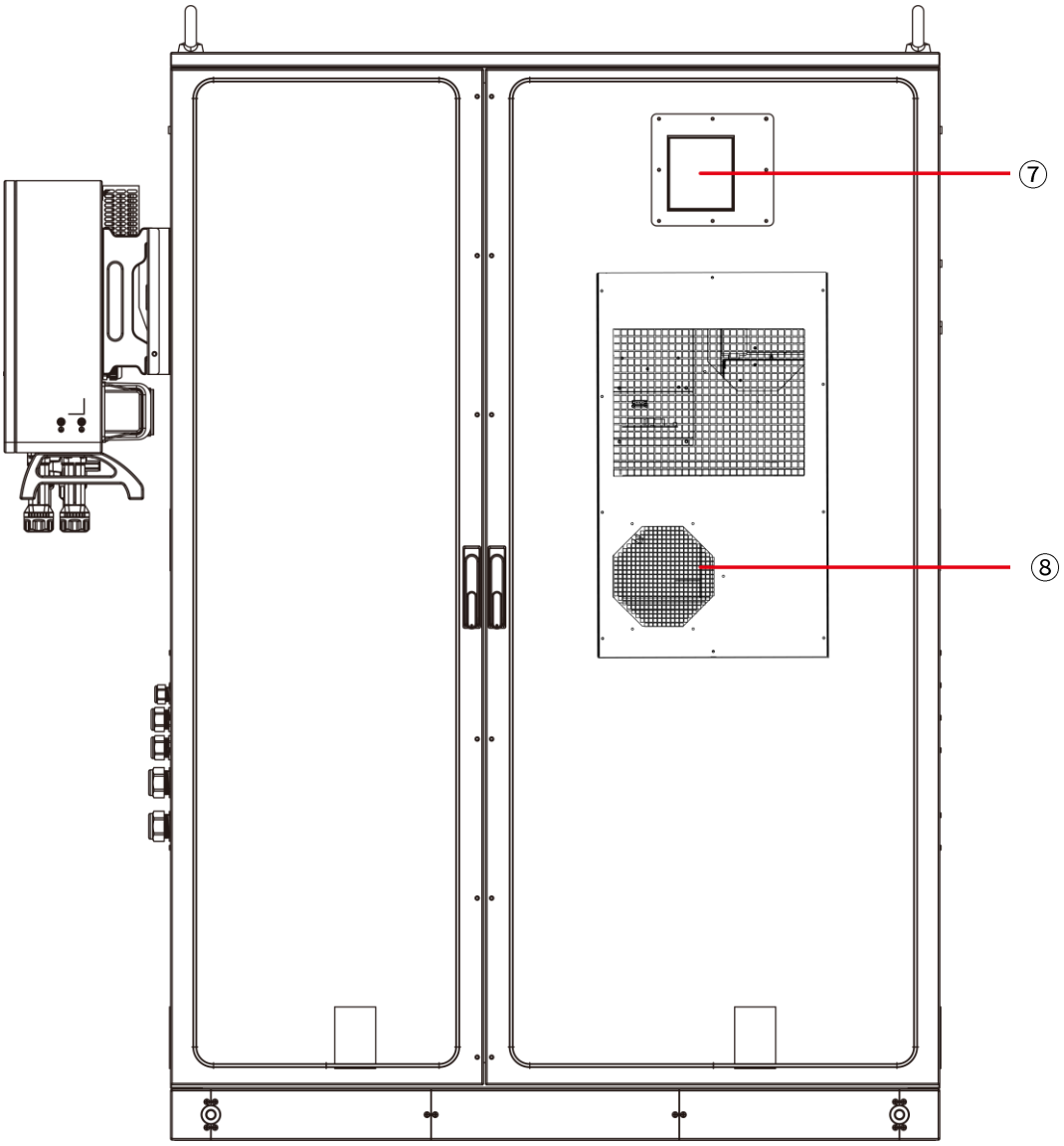


Figure 4-2 Rear View (Door closed)

NO.	Description	NO.	Description
⑦	Exhaust fan (explosion proof system)	⑧	Air Conditioner

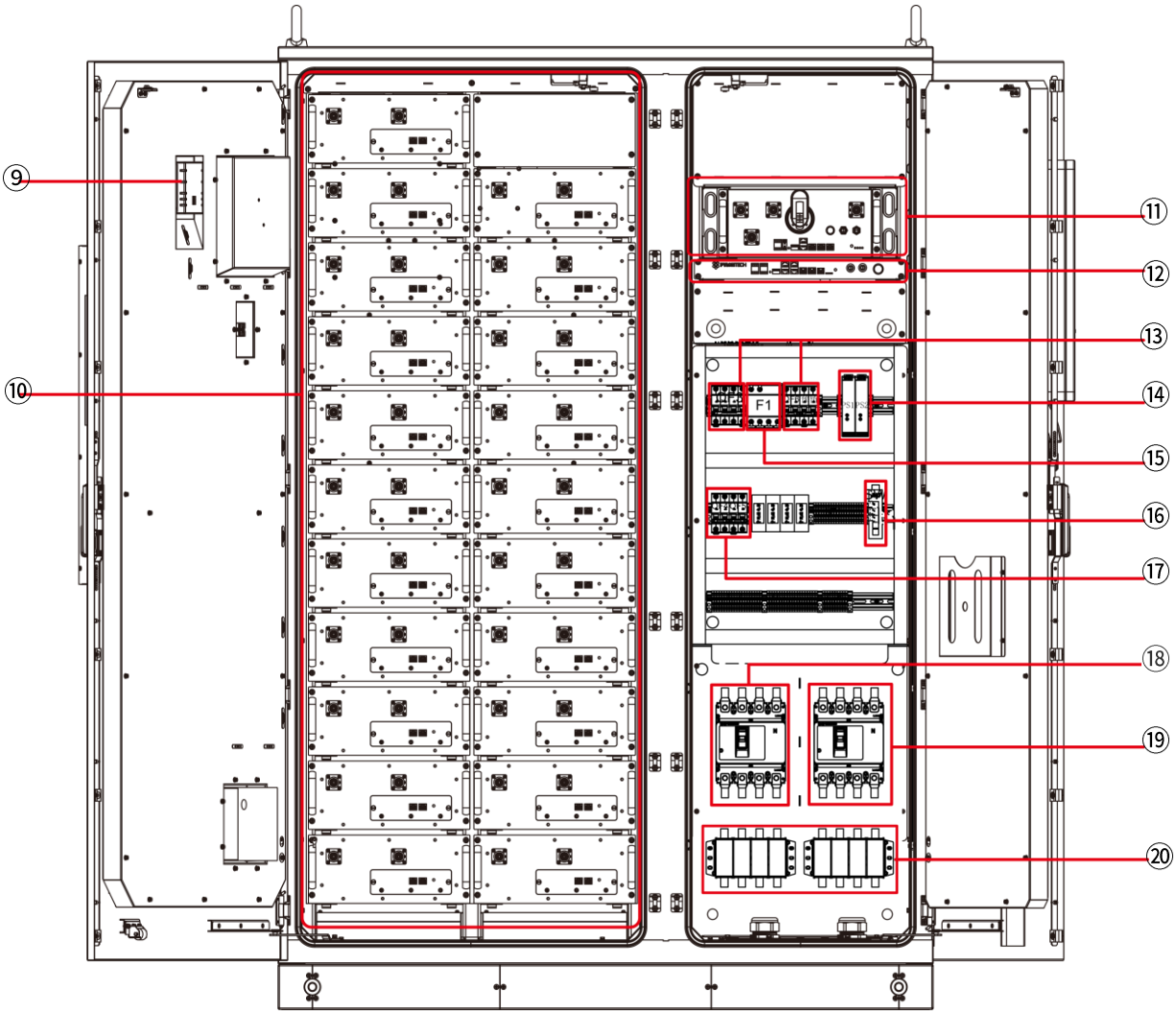


Figure 4-3 Front View (door open)

NO.	Description	NO.	Description
⑨	Gas Detector	⑮	SPD
⑩	Battery Module	⑯	Switch
⑪	Battery Control Module	⑰	Circuit Breaker
⑫	MBMS	⑱	MCCB (QF2)
⑬	Circuit Breaker	⑲	MCCB (QF1)
⑭	Switching Power Supply	⑳	TC Wiring Terminal

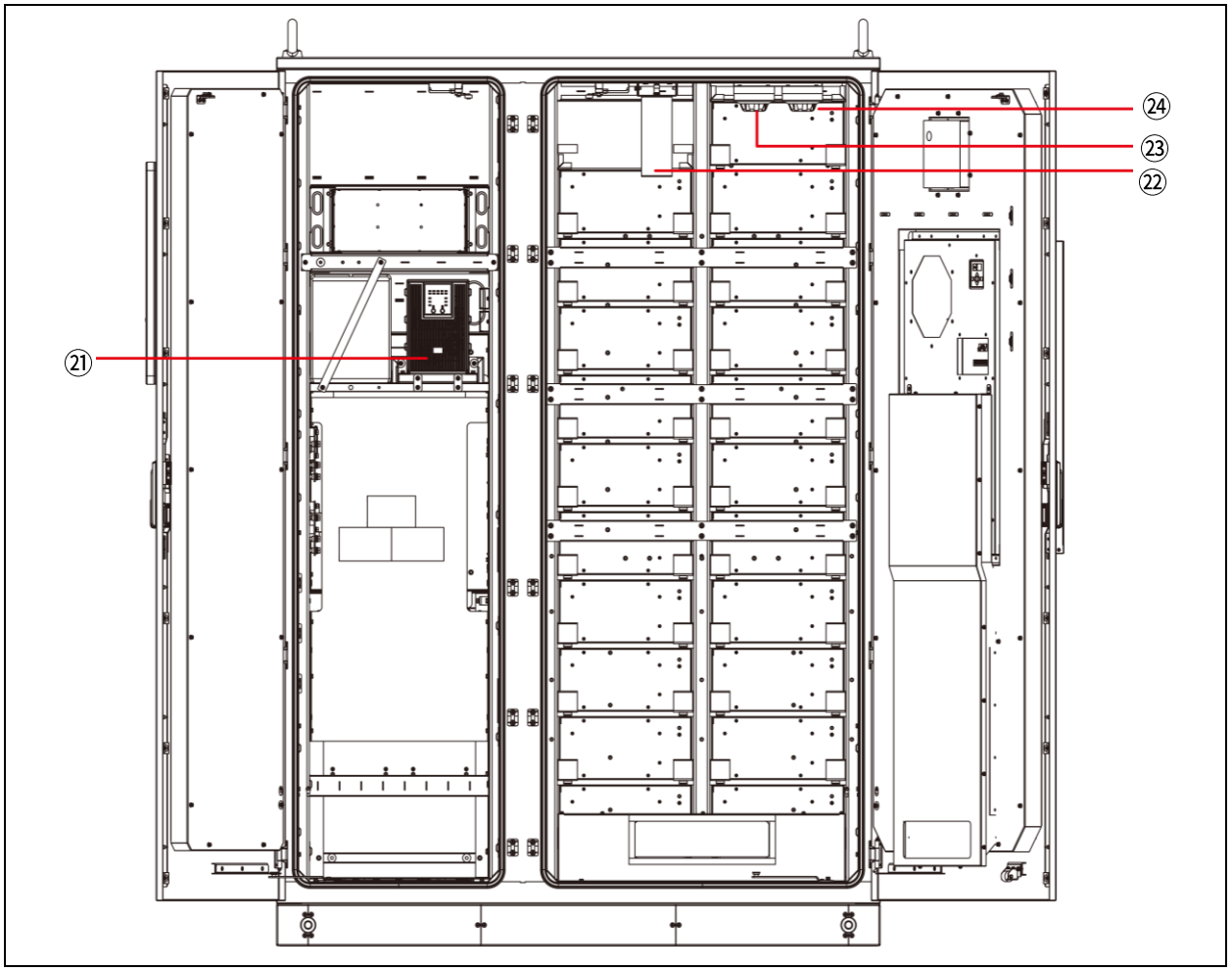
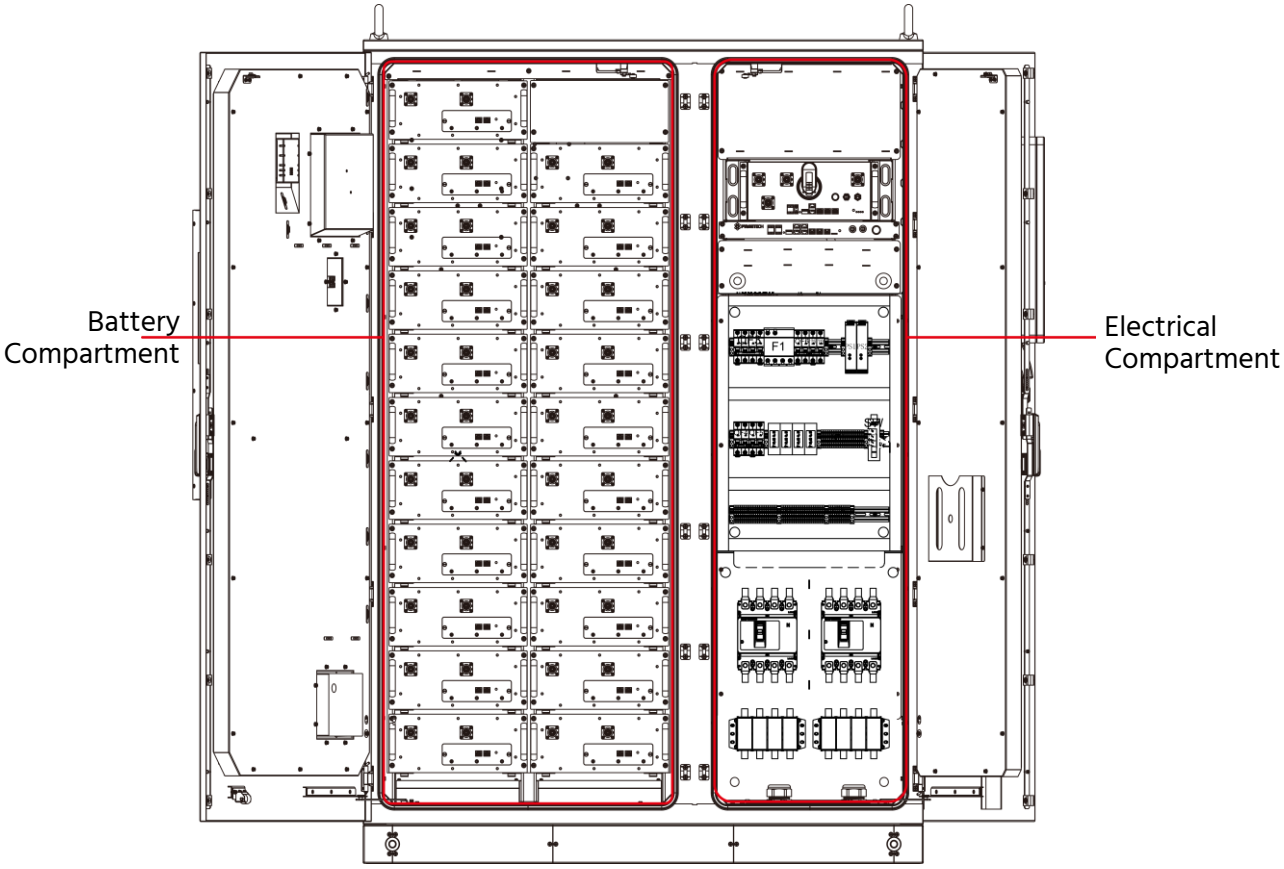


Figure 4-4 Rear View (door open)

NO.	Description	NO.	Description
㉑	UPS	㉓	Smoker Sensor
㉒	Fixed Aerosol Fire-extinguishing Device	㉔	Temperature Sensor

4.2 Outdoor Cabinet

The outdoor battery cabinet is divided into the battery and electric compartments. The battery compartment mainly includes an energy storage battery system, fire suppression system, etc. And the electrical compartment is mainly for power supply and distribution system, communication control system, etc.



Item	Parameters
Dimensions (mm)	1500±5 (W) x 1125±5 (D) x 2195±5 (H)
Texture and Color	Outdoor Orange Texture, RAL9003
IP Rating	IP55
Corrosion Resistance Grade	C3H
Maintenance	Front and back doors available

4.3 Battery String

The battery system consists of two battery strings, and one battery string contains 11 battery modules and 1 battery control module (BMS).

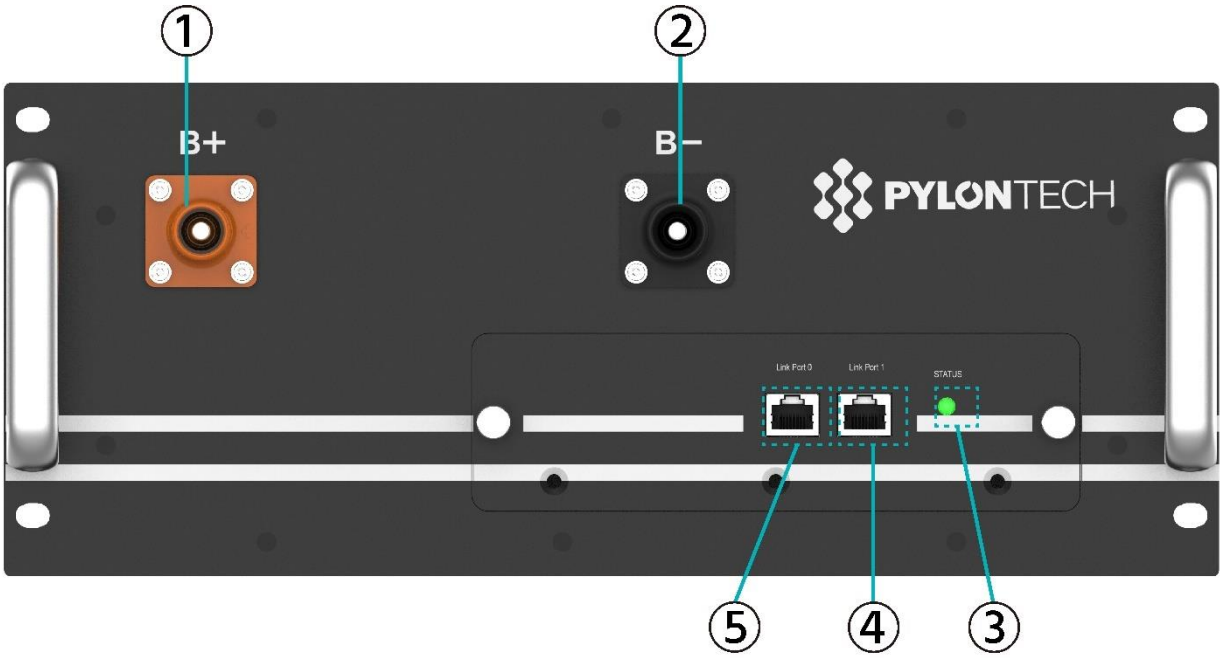
4.3.1 Specifications of the Battery String

Product Type	PowerCube-M1-C
Battery Module Model	SC1000-200J-C
Control Module Model	H32148-C
Nominal Voltage (VDC)	672
Rated Capacity (Ah)	148
Total Storage Energy (kWh)	99.5
Charge Upper Limit Voltage (VDC)	766.5
Discharge Lower Limit Voltage (VDC)	567
Nominal Current (Amps)	74
Maximum Continuous Current (Amps)	148
Peak Current (Amps)	220@15 seconds
Over Current/Duration (Amps/millisecond)	8000/2
IP Rating/Protection Class	IP20/I
Operation Temp. Range(°C)	10 ~ 40
Communication type	CANBUS/Modbus RTU/TCP/IP
Storage temp. range(°C)	-20 ~ 60
Humidity (%)	5 – 95 (without condensing)
Altitude (m)	<2,000
Round-trip efficiency (%, @1C-rate)	95
Depth of Discharge (%)	95
Operation cycle life*	>7,000
Operation Life (year)	15+
Cooling type	Natural cooling
Certification	UL1973, UL9540A, IEC62477-1, IEC62040-1, IEC62619, IEC63056, UKCA, CE LVD, CE EMC, UN38.3, VDE-AR-E 2510-50

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

4.3.2 Battery Module

Battery Module Front Interface



Item	Description	Item	Description
①	Power Terminal B+	④	Link Port 1
②	Power Terminal B-	⑤	Link Port 0
③	Status Light		

① ② Power Terminals B+/B-

Connects battery in serial at power side.

③ Status Light

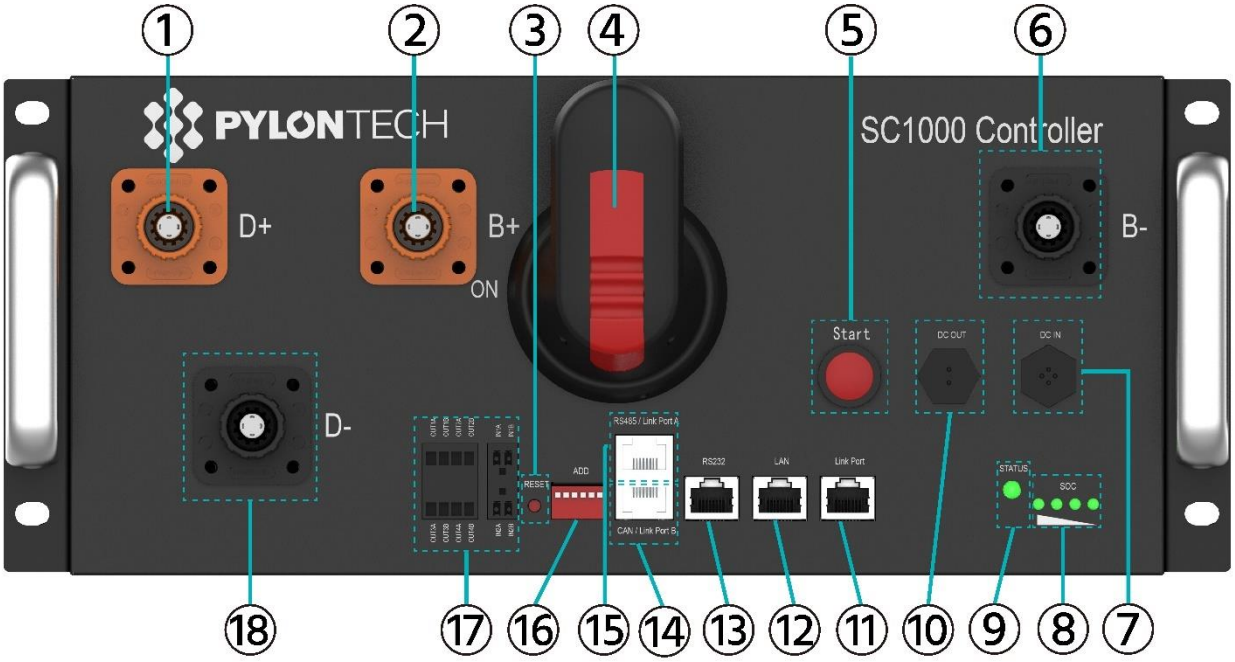
Shows the status of battery module (Normal●, Abnormal●).

④ ⑤ Link Port 0/1

Communication Terminal: (RJ45 port), CAN communication, between multiple serial battery modules and control module.

4.3.3 Control Module

Control Module Front Interface



Item	Description	Item	Description
①	Power Terminal (D+)	⑩	DC OUT
②	Power Terminal (B+)	⑪	Link Port
③	RESET (button)	⑫	LAN
④	Isolating Switch	⑬	RS232
⑤	Start (button)	⑭	CAN/Link Port B
⑥	Power Terminal (B-)	⑮	RS485/ Link Port A
⑦	DC IN	⑯	ADD
⑧	SOC (light)	⑰	Dry Contact
⑨	STATUS (light)	⑱	Power Terminal (D-)

①⑱ Power Terminal D+/D-

External Power terminal: Connects battery system to the PCS.

② ⑥ Power Terminal B+/B-

Connects battery modules in series.

③ RESET (button)

Long press this button to restart the battery system.

④ Isolating Switch

Controls the high voltage DC power output ON/OFF after the control module is powered on.

⑤ Start(button)

press “Start” button more than 5 seconds until the buzzer rings, to turn on the control module.

Black start function: If long press (>10 seconds) the “Start” button 30 seconds AFTER the control module is powered on. The “STATUS” light will become green which means black start function is enabled and relay will close and output for 10 minutes.

⑦ DC IN

(12VDC Input) back-up 12VDC power supply port.

⑧ SOC (light)

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

Refer to ***Table of LED Indicators Instructions*** in *section 5.1.1* for details.

⑨ STATUS (light)

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

Refer to ***Table of LED Indicators Instructions*** in *section 5.1.1* for details.

⑩ DC OUT

12VDC Output: Power supply for MBMS, to connect with MBMS’ 12VDC IN.

⑪ Link Port

Link Port Communication Terminal: (RJ45 port) follows internal protocol, for communication between multiple serial battery modules and control module.

⑫ LAN

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

⑬ RS232

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

⑭ CAN/Link Port B (RJ45 Port)

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

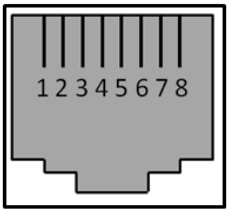
Link Port B (for internal communication): used for cascade communication between the BMSs.

⑮ RS485/Link Port (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.

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

⑯ ADD

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

⑰ Dry Contact

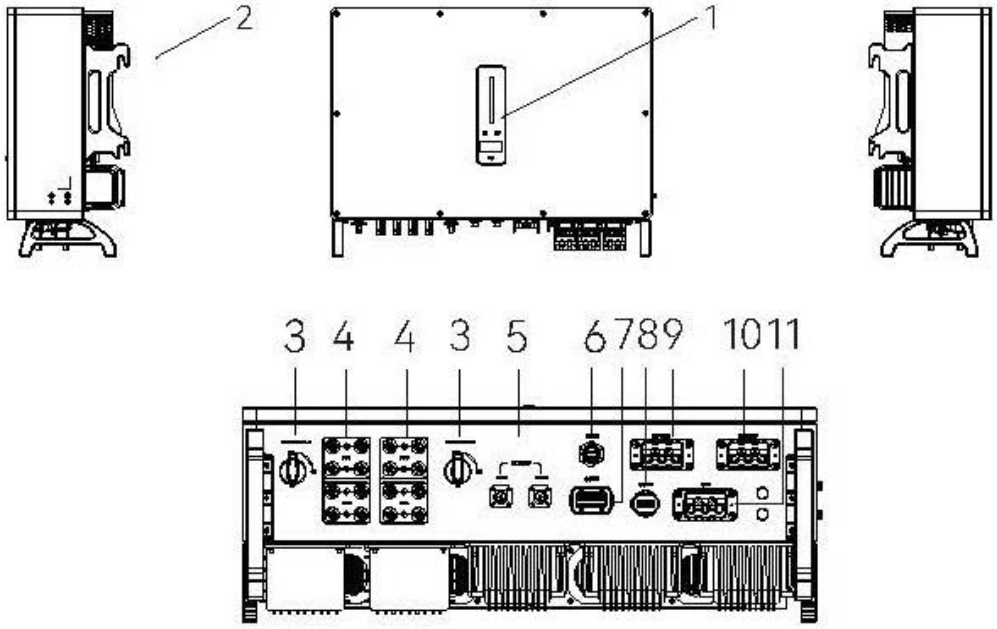
(Dry Contact Terminals): provide 2 input and 4 output dry contact signals.

Dry Contact Terminal

In/Out	Function	Open and close state
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.

4.4 Hybrid Inverter (MHT-25~50K)

4.4.1 Features and Controls of the Inverter

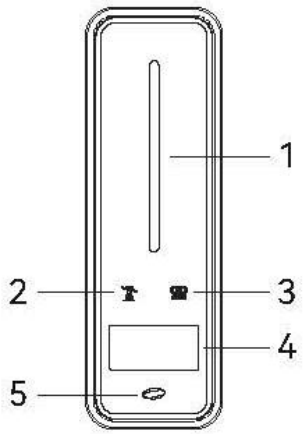


Wiring terminals are at the bottom of the inverter, as shown in the table below.

No.	Terminal	Description
1	Display and LED panel	Display the operation information and working states of the inverter.
2	Hanger	Used to hang the inverter on the wall-mounting bracket.
3	DC switch	Used to safely disconnect the DC circuit.
4	DC input terminal	PV connector(MHT-25~50K 8 pairs / MHT-40~50K-P 6 pairs)

5	Battery input terminal	Battery connector
6	COM1 port	WiFi/LAN/4G module connector
7	COM2 port	Meter/BMS/RS485/DRED/DO Connector
8	COM3 port	DO/0-10V AO/4-20mA AO Connector
9	On-grid output terminal	Used for On-grid output cable connection
10	Back-up output terminal	Used for Back-up output cable connection
11	Generator input terminal	Generator connector(This function is temporarily unavailable. Please contact Solinteg if necessary)

4.4.2 Indicator Instructions



Item	Indicator	Status		Description
1	ower and Indicator	Off		No power.
		Blue	Quick flashing	Inverter entered self-test status.
			Slow flashing	Inverter entered waiting status.
			Breathe flashing	Inverter works normal.
		Orange	Breathe flashing	Low battery warning, the battery power is about to reach the SOC protection value.
		Red	Always on	An alarm or fault is detected, view the fault info on the display.
2	Grid Indicator	Off	Grid lost.	
		Slow flashing	Inverter detected grid but not running in on-grid mode.	
		Always on	Inverter works in on-grid mode.	

3	Communica-tion Indicator	Green	Always on	The inverter communication is running nor-mally.
		Green	Flashing	The inverter communicates with EMS or Master inverter through RS485 or CAN.
		Orange	Always on	The inverter isn't communicating with Solin-teg smart meter.
		Red	Always on	The inverter isn't communicating with theBMS.
4	Display	Display off to save power, press the button to wake up the display.		
5	Button	Switch display information and set parameters by short press or long press.		

4.5 MBMS

The outdoor cabinet communicates with the outer system through MBMS.

4.5.1 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+

4.5.2 Interface Panel of the MBMS

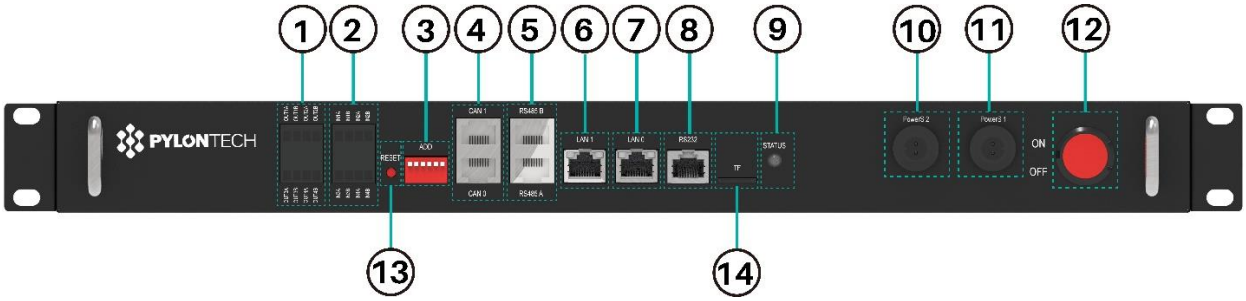


Figure	Description	Figure	Description
①	Dry Contact 1	⑧	RS232
②	Dry Contact 2	⑨	Status (LED)
③	ADD Switch	⑩	PowerS 2
④	CAN 1/ CAN 0	⑪	PowerS 1
⑤	RS485 B/RS485A	⑫	ON/OFF witch
⑥	LAN 1	⑬	RESET (button)
⑦	LAN 0	⑭	TF

①② Dry Contact

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

In/Out	Function	State and Action
In1	Aerosol feedback	Normal open, turn closed when signal received.
In2	Travel switch limit feedback	Normal close, turn open when signal received.
In3	Smoke Detector or Temperature Detector Alarm	Normal open, turn closed when signal received
In4	EPO feedback	Normal open, turn closed when signal received
Out1	Breaker trip control	Normal open, when change from open to closed, Relay KA3 energized, breaker QF1 & QF2 trip.
Out2	Explosion proof system	Normal open, when change from open to closed, Relay KA4 energized, explosion proof system works.
Out3	Reserved	Normal open.
Out4	Reserved	Normal open.

③ ADD

ADD: 6-bit dial switches to manually distribute the communication address of the battery system. 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.

4.6 UPS (SP1K-W)

The electrical cabinet is equipped with a UPS to supply power for computers, MBMS, control cabinet secondary, power distribution cabinet ammeter and other loads, so as to ensure that the system can still operate for a period of time in case of grid power failure, and enable the system off grid operation.

4.6.1 Display panel of the UPS

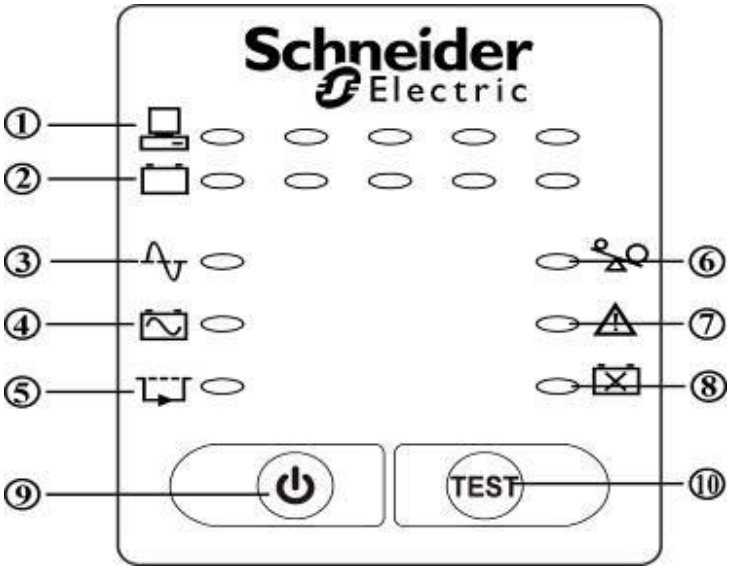
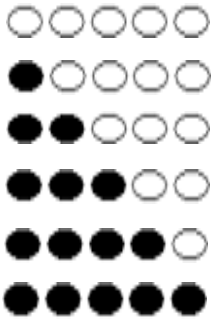
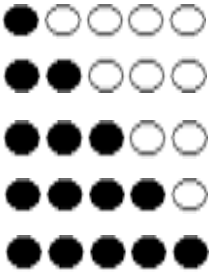
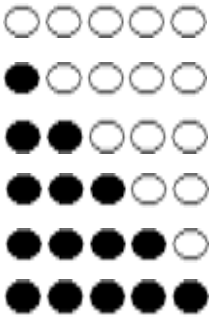


Figure	Indicator LED/ Button	Description	
1	Load Capacity Indicator LED	Six levels to indicate the Load Capacity: <5% —— All LEDs off 5%~25%——L1 LED ON 25%~45%——L1 and L2 LEDs ON 45%~65%——L1 to L3 LEDs ON 65%~85%——L1 to L4 LEDs ON >=85%——All LEDs ON	
2	Battery Capacity Indicator	Five levels to indicate the Battery Capacity: <24%——L1 LED ON 24%~48%——L1 and L2 LEDs ON 48%~72%——L1 to L3 LEDs ON 72%~96%——L1 to L4 LEDs ON >=96%——All LEDs ON	

2	Input Voltage Indicator	Six levels to indicate the input voltage: <192V—— All LEDs off 192~210V——L1 LED ON 210~229V——L1 and L2 LEDs ON 229~248V——L1 to L3 LEDs ON 248~266V——L1 to L4 LEDs ON >=266V——All LEDs ON	
3	Online Mode Indicator LED	The UPS uses grid power to realize dual power supply conversion between power supply and connected devices. That is, it works in online mode.	
4	Battery Power Supply Indicator LED	The UPS uses batteries to supply power to connected devices. That is, it works in battery mode.	
5	Bypass power supply Indicator LED	The UPS uses bypass power to supply power to connected devices. That is, it works in bypass mode.	
6	Overload Indicator LED	The UPS detects that the load exceeds the rated output power.	
7	Fault Indicator LED	The UPS detects an internal fault.	
8	Battery Replacement Indicator LED	The battery is disconnected, or the battery needs to be replaced.	
9	ON/OFF button of the UPS	After pressing this button for one second, the UPS will perform the following actions according to the current working mode: 1) If the UPS is not turned on and the grid is normal, the UPS will be enabled to enter online mode. 2) If the UPS is not turned on and the grid is abnormal, the UPS will be enabled to enter battery mode. 3) If the UPS is in online mode, the UPS will shut down and stop power supply. 4) If the UPS is in battery mode, the UPS will shut down and stop power supply.	

10	Battery self-check /Display input voltage/Mute button	1) Battery self-check function: In online mode, about 3 seconds after pressing this button, the UPS starts battery self-check. 2) Display input voltage function: In bypass mode and online mode, about 0.5 seconds after pressing this button, the UPS switches the battery capacity indicator to the input voltage indicator, and switches back to the battery capacity indicator 5 seconds later. 3) Mute function: In battery mode, after about 0.5 seconds after pressing this button, the UPS will turn off the buzzer. **NOTE:** The buzzer can be turned on manually after it is muted.

4.6.2 Interface Panel on the Rear

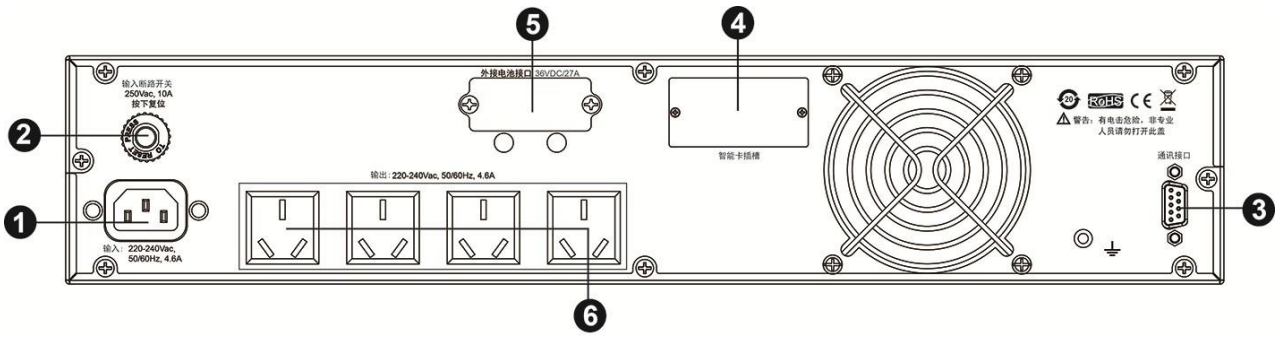


Figure	Functional Component	Description
1	Input Socket	IEC input port: Connect the UPS to the grid using the power cable delivered with the device. 1K and 2K UPS 10A input socket, 3KVA UPS 16A input socket.
2	Input Circuit Breaker	When overload occurs, press this button to reset the input circuit breaker.
3	RS232 Interface	Enables the UPS to communicate with the power management software through the serial communication cable so as to realize monitoring and management of the UPS.
4	Smart Slot	Used to install optional SNMP card (network management card), Relay I/O card, Modbus card to achieve more advanced communication and monitoring functions. After the SNMP card is selected, you can also select the EMD card to monitor the ambient temperature and humidity.
5	External battery	Connect the external battery to the UPS using the external battery

	connector	connection cable delivered with the device de. (Only available for the device with extended warranty.
6	Output Socket	10A. connects electronic devices such as computers, monitors or printers to these outlets.
7	Output Circuit Breaker	10A switch. When overload occurs, please first reduce the connected load devices and then press this button to reset the input circuit breaker.
8	Output terminal block	Use hard wires to connect AC devices.

⚠CAUTION

When the first time the battery is used, it takes five hours to charge the battery. If the charge time is less than 5 hours, the battery discharge time will be reduced.

4.7 Air Conditioner (EC20HDNC1U)

The outdoor cabinet is equipped with a 2kW industrial air conditioner to control the temperature and humidity of the battery compartment.

The energy storage battery system inside the cabinet is the main heat source. And the air conditioning parameters are selected based on its total heat generation to meet the requirements of this product in the target environment. The specific parameters of the air conditioning are as follows:

Product Model		**EC20HDNC1U**
Dimensions, Weight & Mounting Method	Dimension (mm)	446 (W) × 200 (D) × 746 (H)
	Dimension (mm) (with flange)	483 (W)× 200 (D) × 783 (H)
	Weight (kg)	35
Environmental Protection & Performance	Working Temperature Range (°C)	-40~+55
	Noise Level (dB(A))	65
	IP Protection Level (for outdoor side)	IP55
	Refrigerant	R134a
Cooling/Heating Capacity	Cooling Capacity@ L35/L35 (W)	2000/3000
	Heating Capacity (W) (Optional)	1050
Power Consumption	Rated Cooling Input Power@ L35/L35 (W)	850/1000
	Current@ L35/L35 (A)	3.8/4.5
Airflow	Internal Airflow (m^3 /h)	650
Power Supply	Power Supply Range (V, Hz)	187~254V, 50/60Hz
	Max. Operating Current (A)	6.5

4.7.1 Initial Start-up Guidance

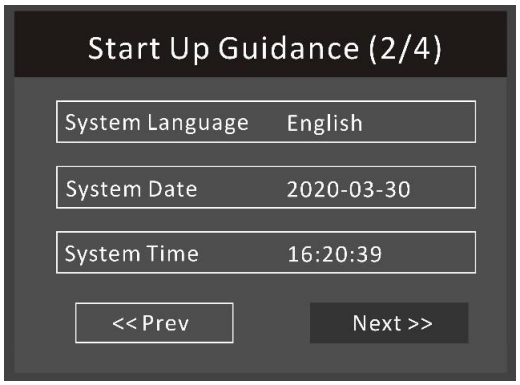
1. Welcome Page

When the UPS is the initial start-up, the interface shown below will appear to guide the user to set basic parameters of the UPS.

Initial Start Up Guidance (1/4) Page

2. Language, Date and Time settings

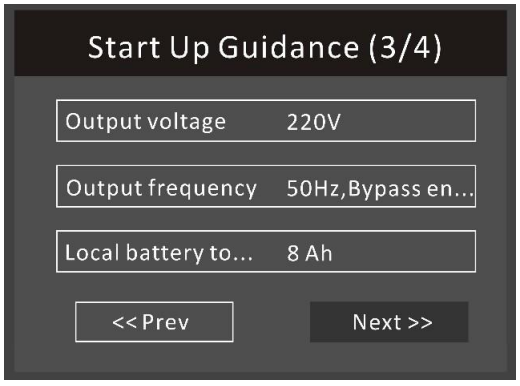
At this page, you can set the language, date and time you need. Click "Next "to start the guidance.



Initial Start Up Guidance (2/4) Page

3. Output and Battery Parameters Page

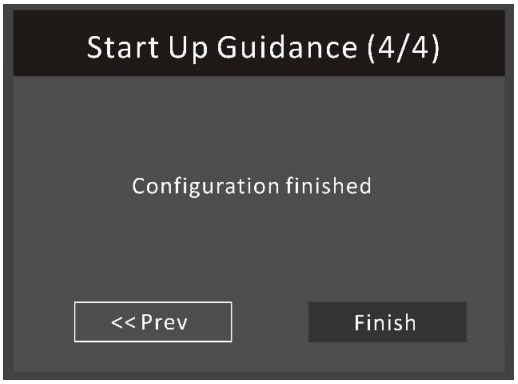
At this page, you can set the output voltage, output frequency and total Ah (According to the number of batteries connected, the settings can be changed, seeing the figure below.



Initial Start Up Guidance (3/4) Page

4. Finish Page

The interface shown in the following figure will appear. Click “Finish” to enter the Flow page, then the user can operate the UPS normally.



Initial Start-up guidance (4/4)

NOTE:

1) The battery was fully charged before delivery. However, some loss of capacity is inevitable during transportation and storage. Therefore, it is important to charge the battery for eight hours before the UPS is first put into operation to ensure it can provide adequate backup time.

2) For more detailed information of the UPS, please refer to the separate UPS manual.

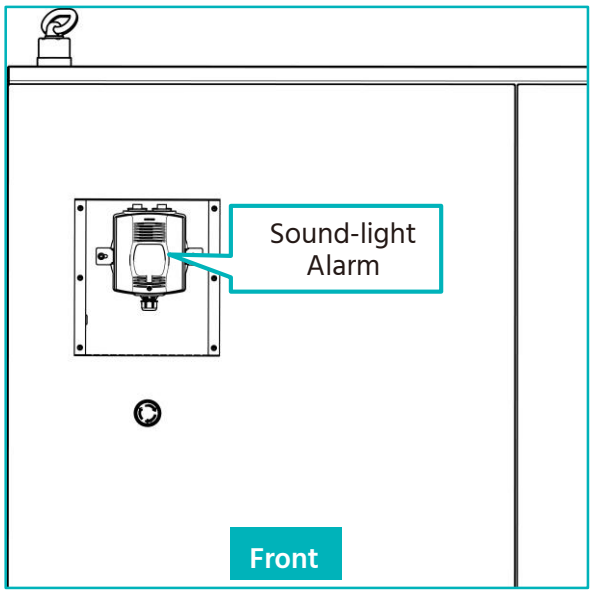
4.8 Safety Features

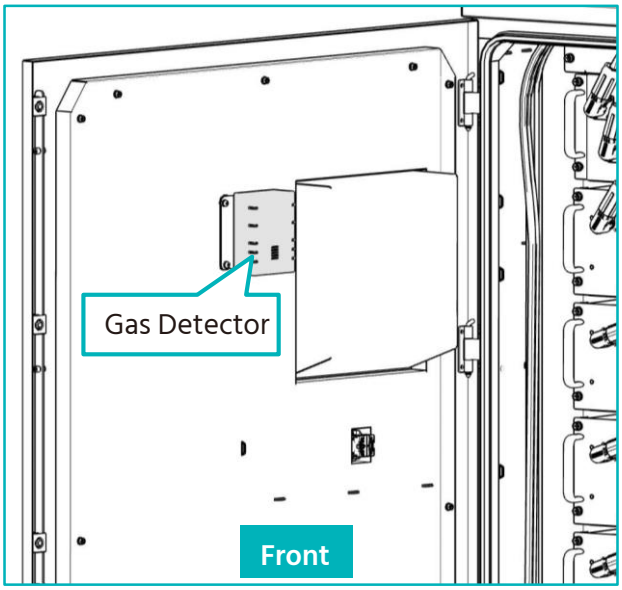
This system is equipped with safety features that include a fire protection system as well as an explosion proof and vent system.

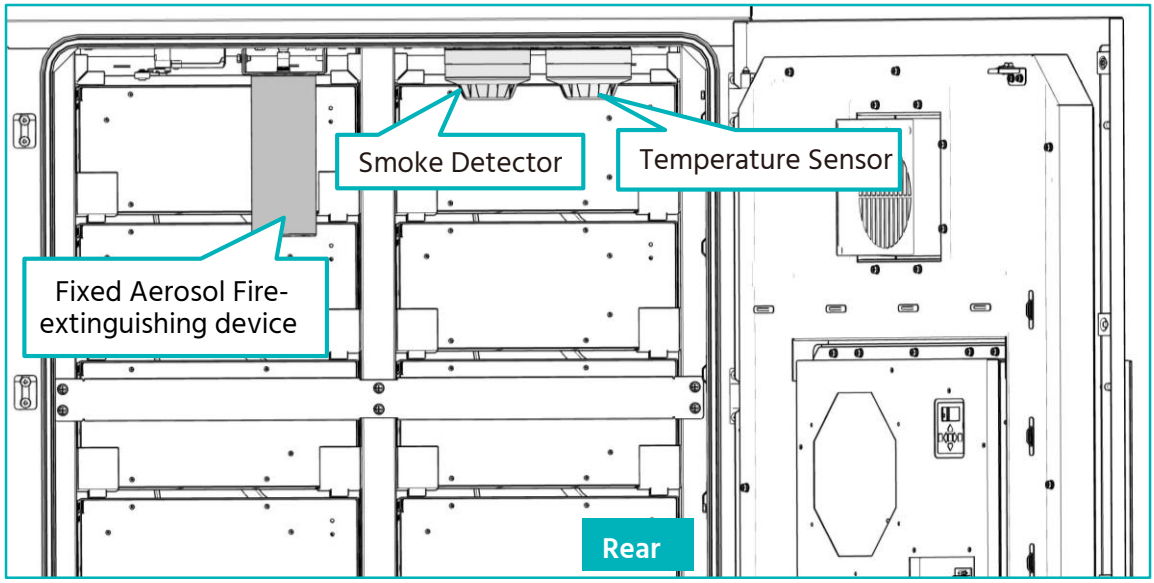
4.8.1 Fire Protection System Introduction

The fire protection system is mainly composed of fire alarm system and fire suppression system. The former consists of detectors and sound-light alarm. The latter consists of a fixed aerosol fire-extinguishing device.

When a fire or other emergency occurs or the temperature reaches a certain point, aerosols will be released to suppress the fire. At the same time, the sound-light alarm will alarm until the system is powered off. Please see the following for details.







The fire extinguishing mechanism of aerosol is mainly reflected in two aspects:

(1) The cooling effect of endothermic decomposition.

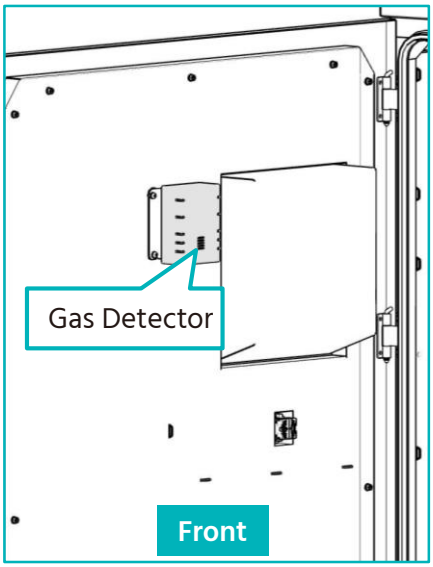
(2) The chemical inhibition of the gas phase and the solid phase plays a synergistic role between each other.

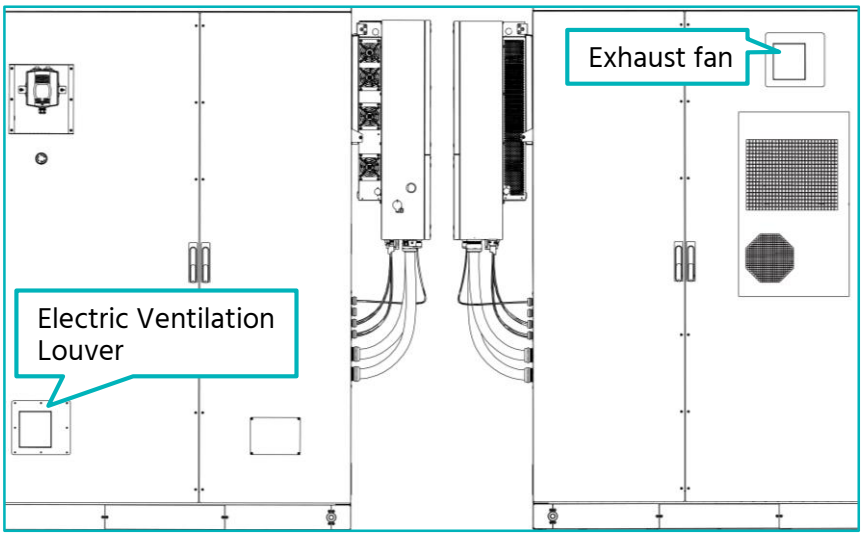
Specifications of fixed aerosol fire-extinguishing device

FP-200S	Technical Information	
	Product Model	FP-200S
	Activation mechanism	Thermal activation Electrical (minimum 1.5VDC, minimum 0.8A in 3~4 seconds)
	Activator type	Heating element with 2.3 ohm resistance
	Activate line supervision current	Maximum 5 mA
	Wight gross	1840 g
	Mass of FPC Compound	200 g
	Operational discharge time	5~10 seconds
	Discharge outlet	1
	Discharge length	2 meters
	Size	185 x 84 (mm) (including connector housing)
	Self-activation temperature	300 °C
	Fire Class	A, B, C, F

4.8.2 Explosion proof and vent system

The explosion proof and vent system includes an electric ventilation louver and an exhaust fan. The gas detector also contributes to the system. Please see the following for details.





5 Mechanical Installation

5.1 Checking Before the Installation

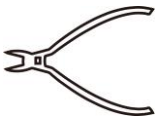
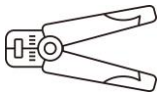
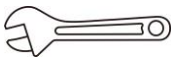
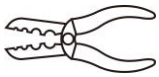
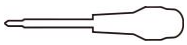
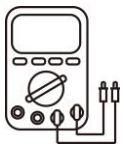
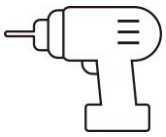
Checking the Outer Packing

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

Checking Deliverables

After unwrapping the package, check that the deliverables are complete. If any item is missing or damaged, contact us as soon as possible.

5.2 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.

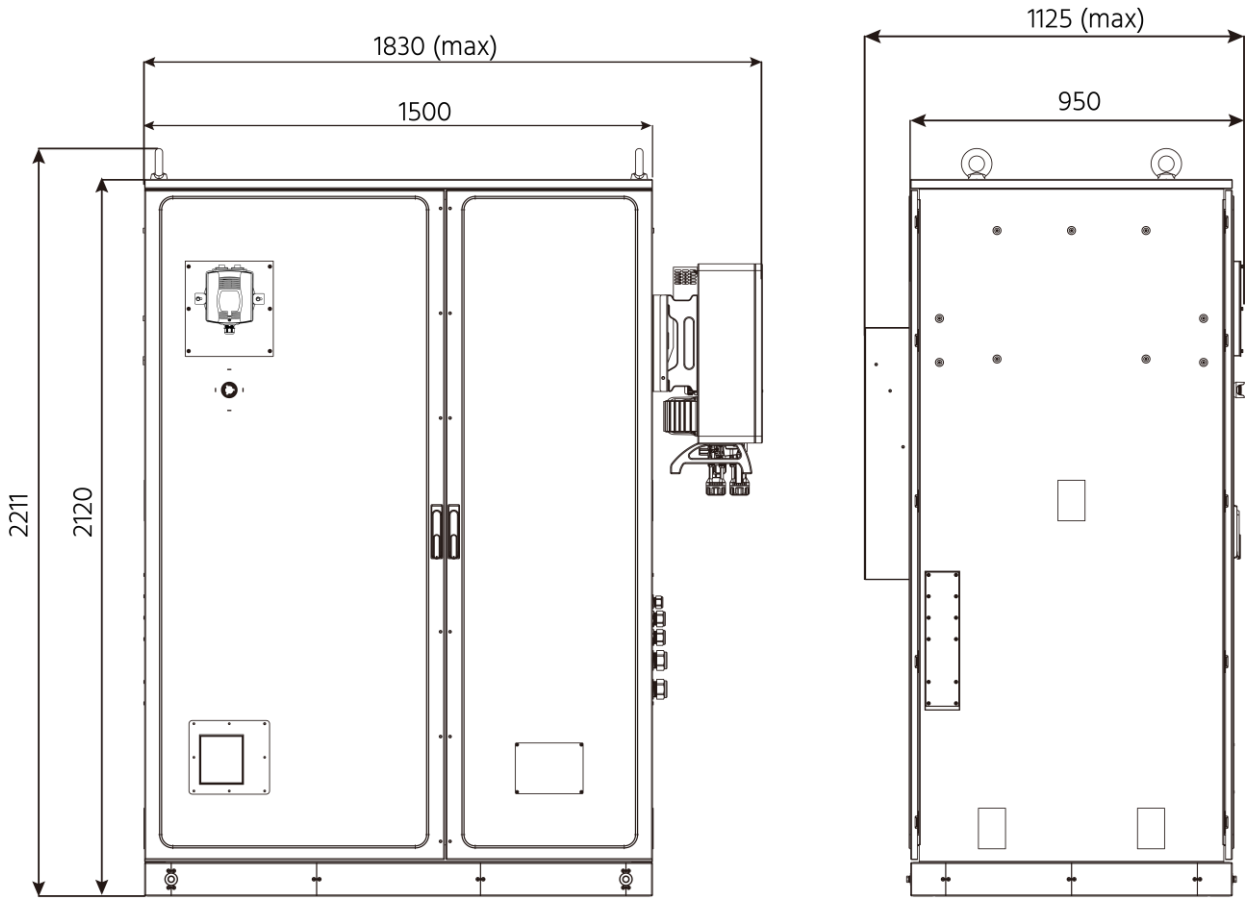
5.3 Selecting the Installation Sites

5.3.1 Working Environment Requirements

- Be sure to keep the cabinet away from high salt spray, corrosive environment, away from heat source and flammable and explosive materials.
- The installation environment should be as far away from the living area as possible. If there is a large flow of people at the installation site, it is recommended to install a fence.
- The ambient temperature should be guaranteed between -25~ 40℃ to ensure that the indoor cabinet can operate properly. A heating or cooling system may be needed when necessary.

5.3.2 Installation Space Requirements

- The external dimensions of the cabinet are as follows (including hybrid inverters) (unit: mm).

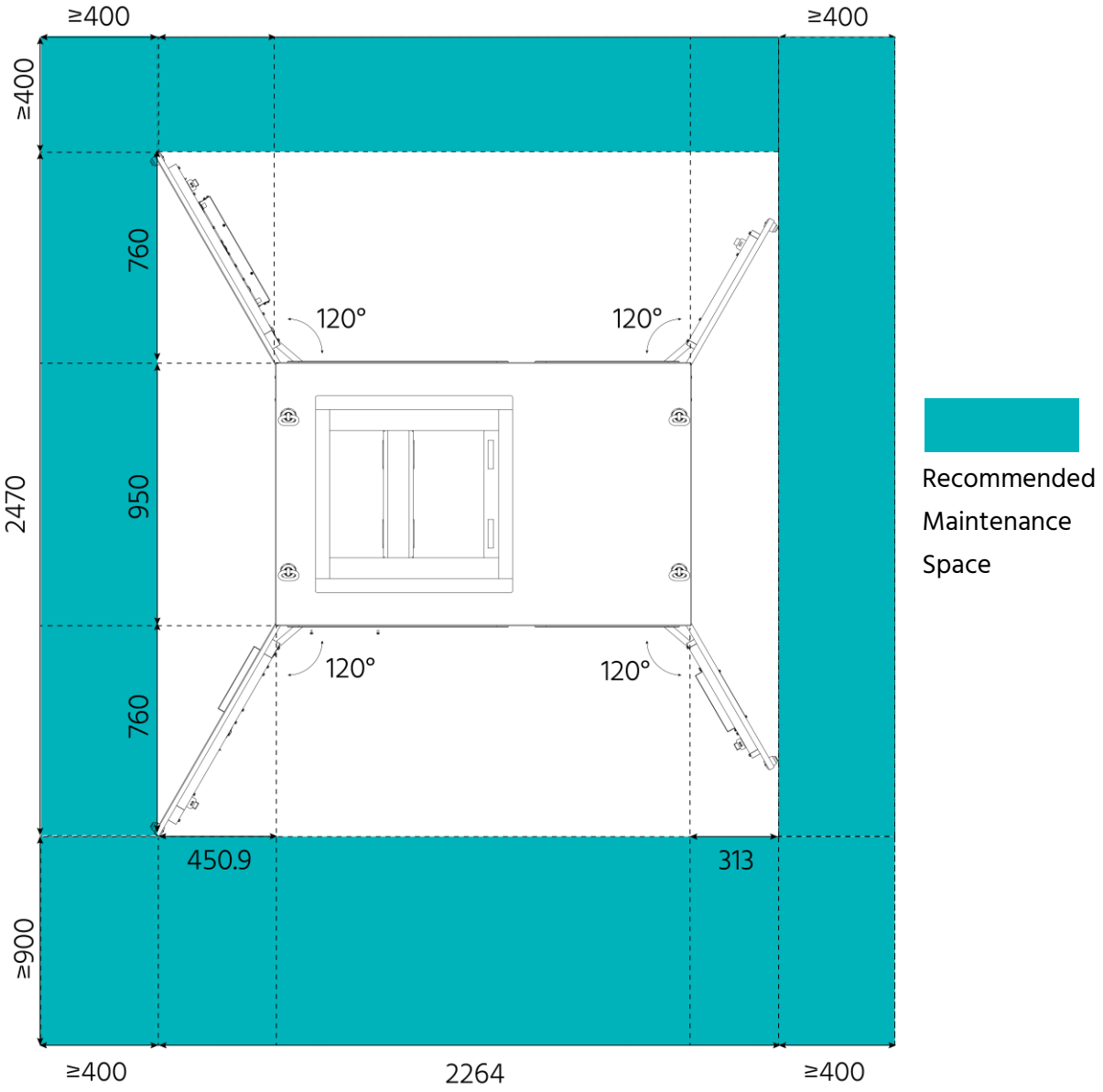


Unit: mm

Front View

Side View

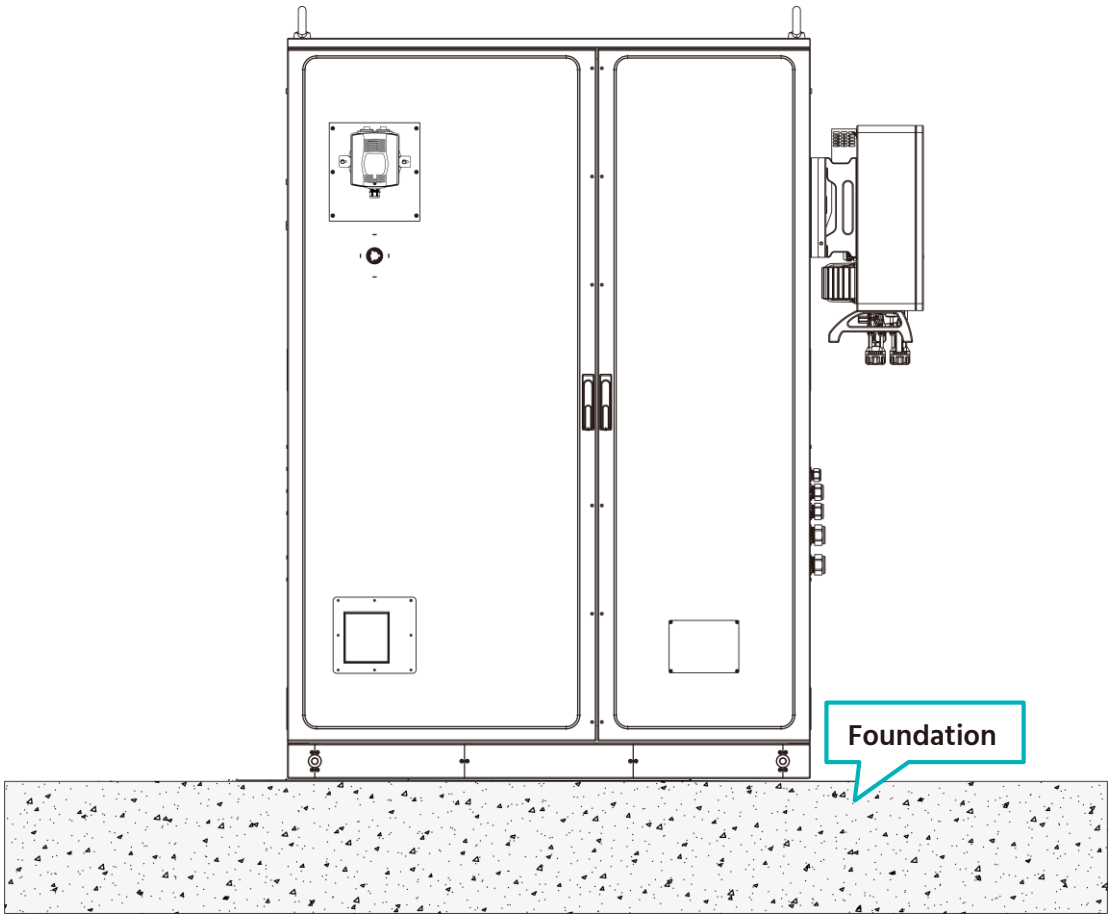
- The installation space for a single cabinet system is shown below (recommended spacing).



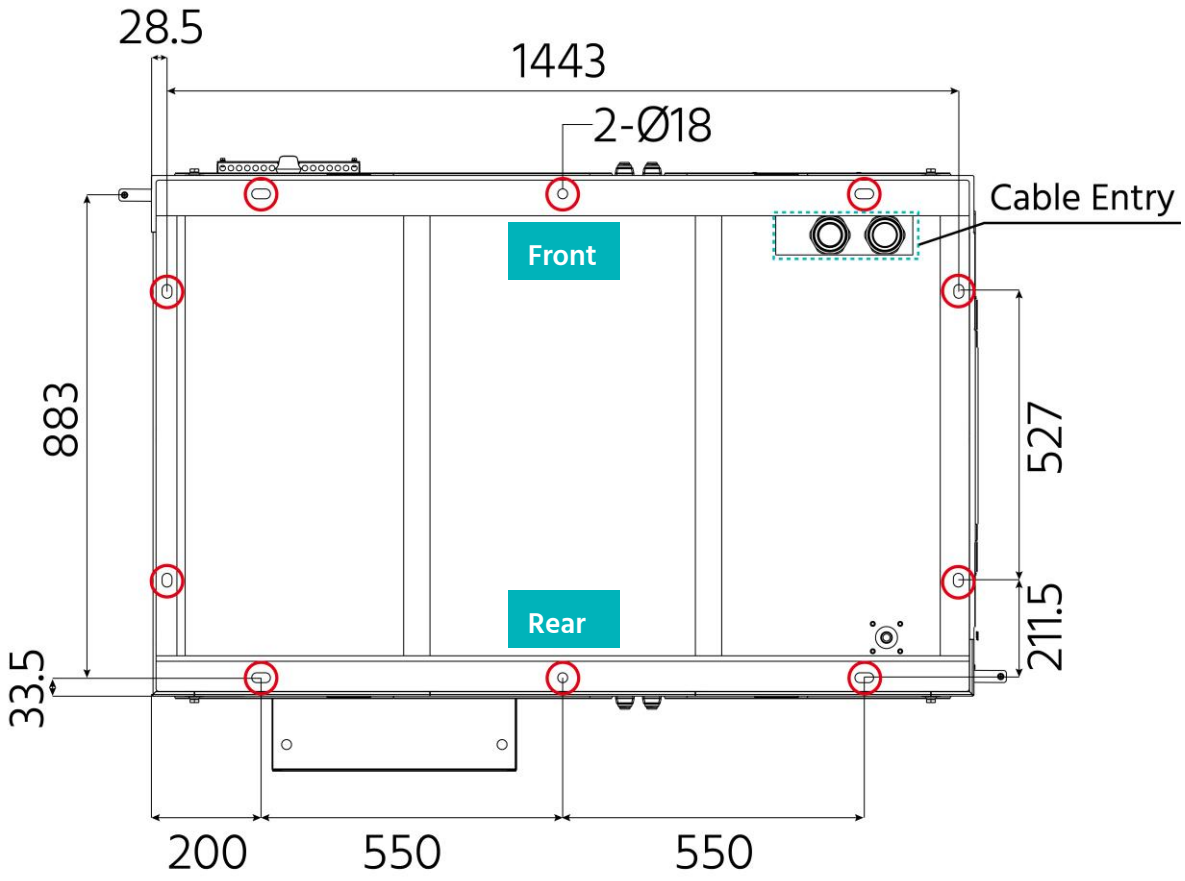
5.3.3 Installation Foundation Requirements

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 2000kg).
- 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 300 mm above the level ground



- The cabinet 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.



Positioning holes at the bottom of the cabinet (Unit: mm)

⚠ WARNING

The inlet and outlet holes in the lower part of the outdoor cabinet need to be sealed with fireproof mud after the cable is connected.
And the entire outdoor cabinet base needs to be sealed with fireproof mud, waterproof and insect-proof.

5.4 Handling of the Cabinet

The outdoor cabinet can be transported by crane or forklift.

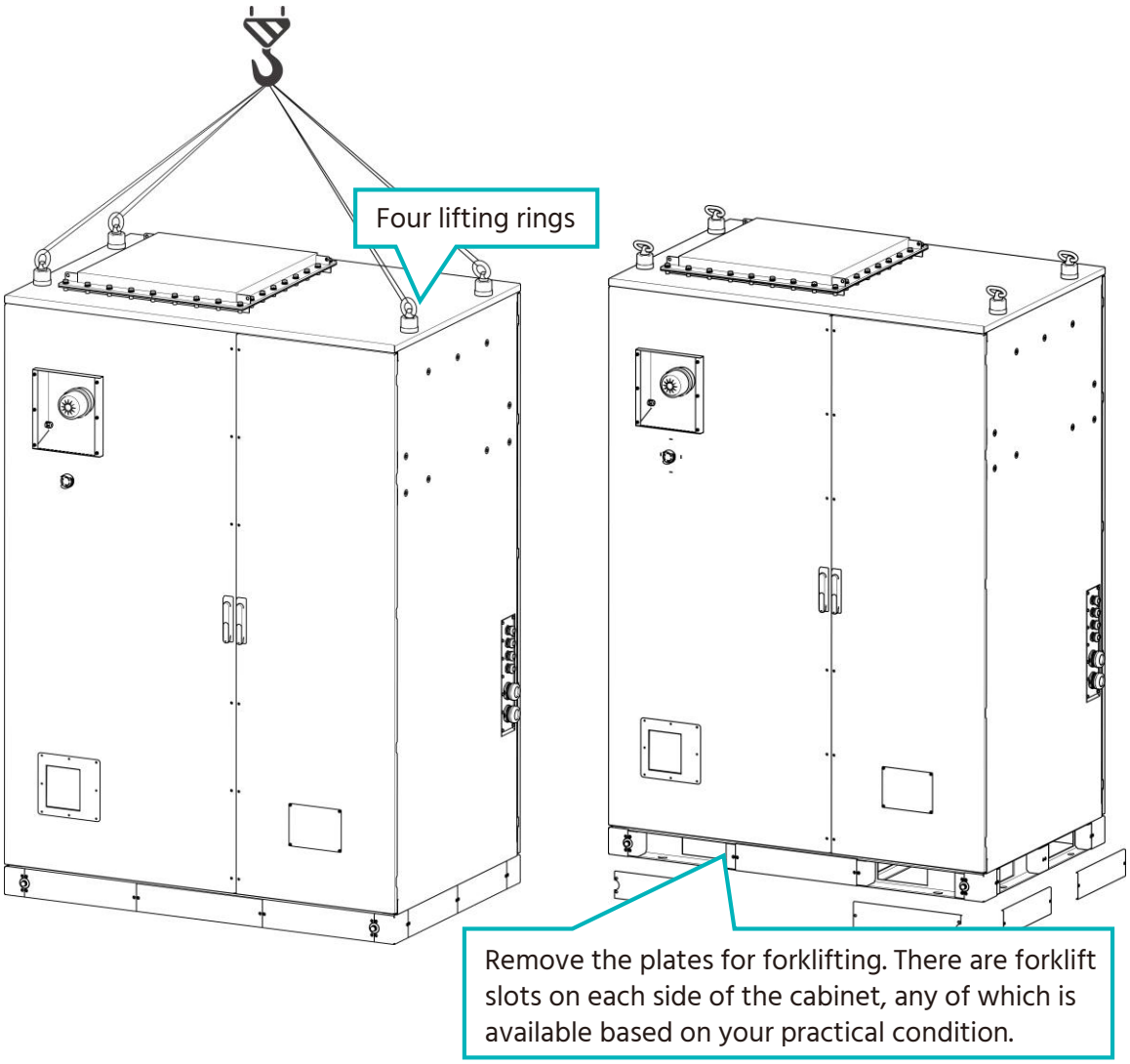
⚠ DANGER

Pay attention to the falling risk which can cause severe injury or death. Do not stand under a lifted load. Make sure no unauthorized personnel are in the vicinity of a lifted load.

⚠ CAUTION

Pay attention to the center of gravity when lifting or forking the cabinet and keep the moving process slow, smooth and balanced.
During the moving process, the equipment should not be tilted at an angle of more than 5° and should not be suddenly lowered or lifted.

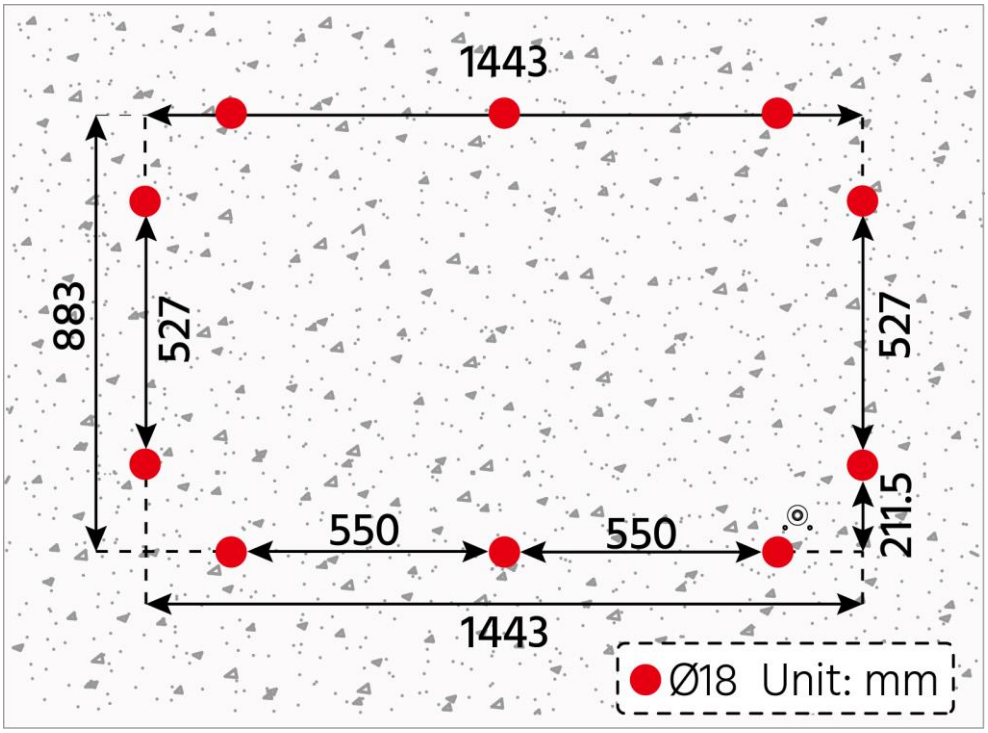
Positions of the lifting rings and forklift slots



* The above pictures are for illustration only. The actual appearance prevails.

5.5 Installation of the Cabinet

1. Before installation, make sure that the mounting dimensions of the foundation are consistent with the mounting holes of the Cabinet bottom base, as shown in the figure below.
2. Use a crane or forklift to place the cabinet on the mounting foundation, aligning the 8 mounting holes (marked in red).



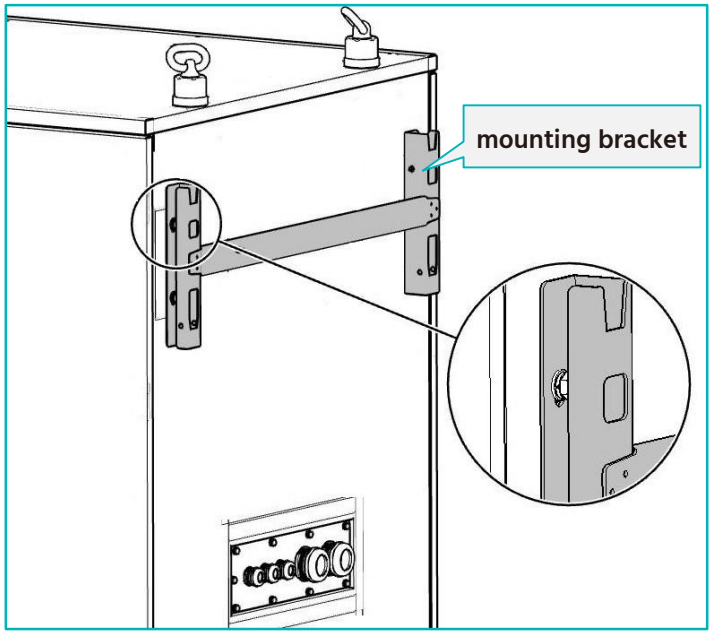
Mounting holes on the foundation

3. Use eight expansion bolts (M16) to secure the cabinet to the foundation.

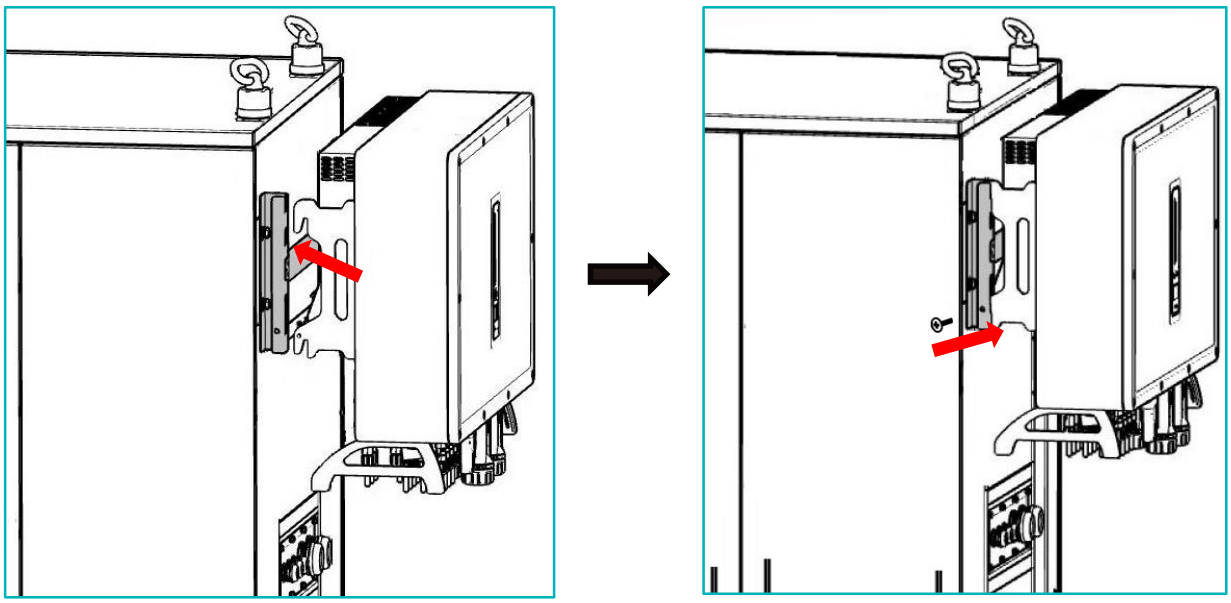
5.6 Installation of the Hybrid Inverter

Please follow the steps below to mount the hybrid inverter to the outdoor cabinet.

1. Aligning the four holes in the cabinet sideboard, fix the mounting bracket to the cabinet. Secure it with four bolts + washers (M10 x 25), shown as below.



2. Hang the inverter onto the embedded mounting bracket. Then secure the bolts+washers (M6) on both sides of the inverter to the bracket.



3. Repeat the steps above to install the other inverter on the cabinet.

6 Electrical Wiring

DANGER

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

DANGER

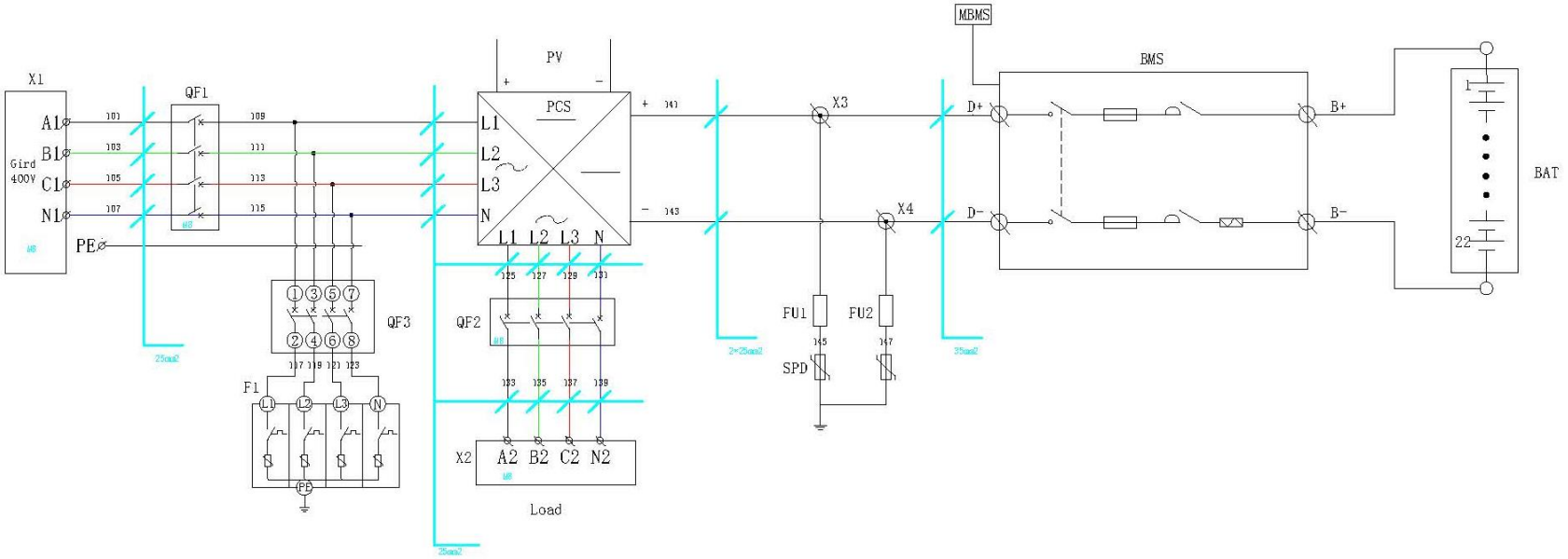
When wiring the cables, ensure that the energy storage system DC side and AC side are all disconnected.

DANGER

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

6.1 System Diagram

External control power supply						
Control supply ~AC400V power supply	MCCB	SPD	Hybrid inverter	SPD	BMS	BAT



注:电缆规格需符合欧标标准，A相棕色，B相黑色，C相灰色，N相蓝色，地线绿色或黄绿色条纹，正极红色，负极黑色

NOTE:Cable specifications must meet the EU standard, phase A Brown, phase B Black, phase C Gray, phase N Blue, ground cable light green or yellow-green, positive red, negative black.

6.2 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	Copper Wire Diameter Requirements	Terminal Model
AC Side Phase A	≥ 25 mm^2	SC25-10
AC side phase B	≥ 25 mm^2	SC25-10
AC side phase C	≥ 25 mm^2	SC25-10
AC side N phase	≥ 25 mm^2	SC25-10
Ground PE-Cable	≥ 16 mm^2	SC16-6
Ground PE - galvanized flat iron	≥ 4x 25 mm^2	/
External Ethernet communication cable	Ultra Category 6 shielded cable	/
External RS485 cable	Twisted shielded cable ⩾1 mm^2	E1008 (1 mm^2)

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

6.4 Electrical Connection Procedure

⚠ DANGER

This system is a high voltage AC 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

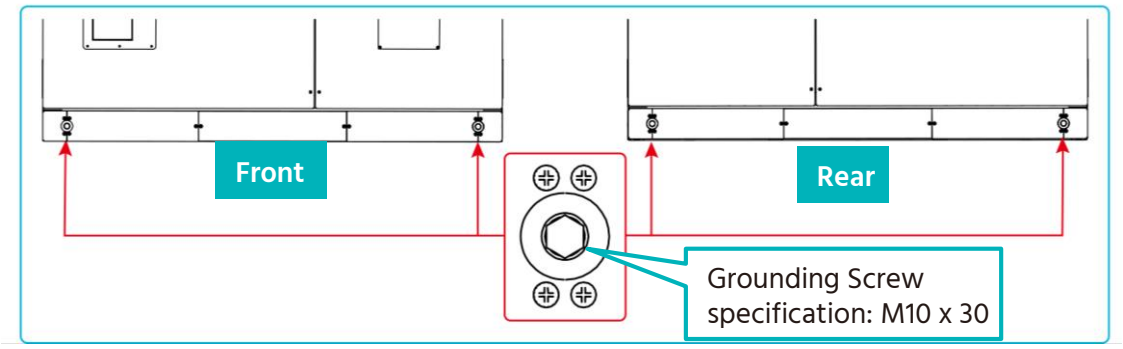
Whenever operating the system, wear suitable personal protective equipment (PPE) such as rubber gloves, rubber boots and goggles.

6.4.1 Grounding

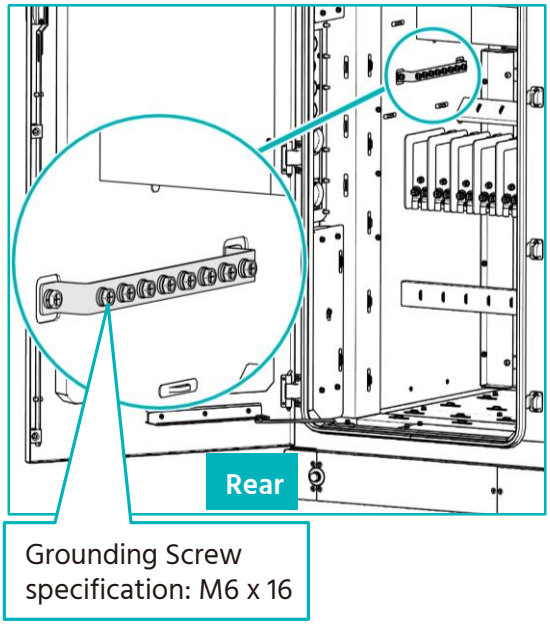
DANGER

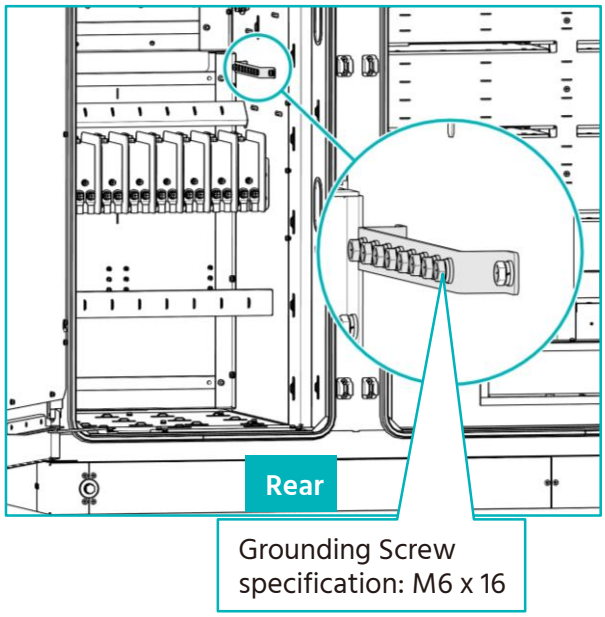
Life-threatening electric shock may occur if the grounding is insufficient or absent. Before installation, make sure that the grounding points of the battery energy storage system are stable and reliable.

- PE (to the ground): Choose one of the four grounding points for cabinet grounding.



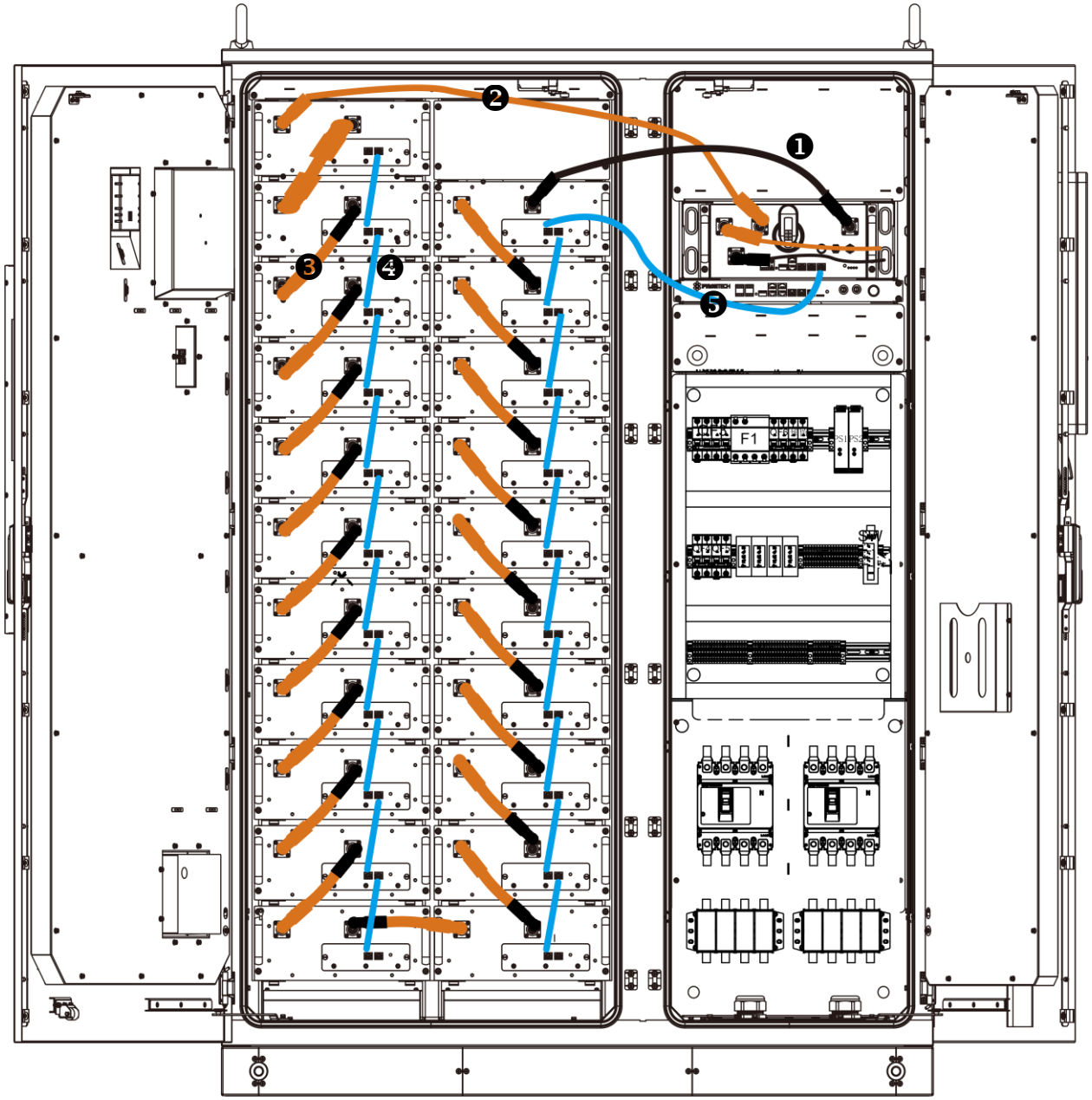
- Grounding copper bars: Grounding cable(s) connected to grounding bars inside the cabinet.





6.4.2 Battery Energy Storage System Wiring

During transportation, each battery module is disconnected. The cables need to be connected when they arrive at the site. Please refer to the following diagram for wiring connection.



❶	Power Cable - (battery module [B-] and BMS [B-] connection)
❷	Power Cable - (battery module [B+] and BMS [B+] connection)
❸	Power Cable (battery module upper and lower serial connection)
❹	Battery cascade communication cable
❺	Communication Cable (battery module and BMS connection)

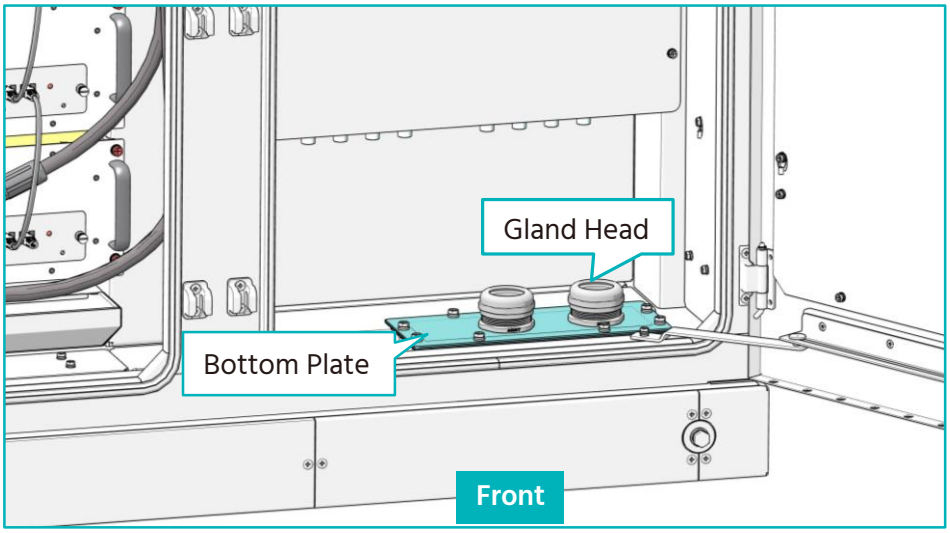
NOTE:

1) For details of how to connect the power cables from battery strings to the hybrid inverters, please see *section 6.4.3*.

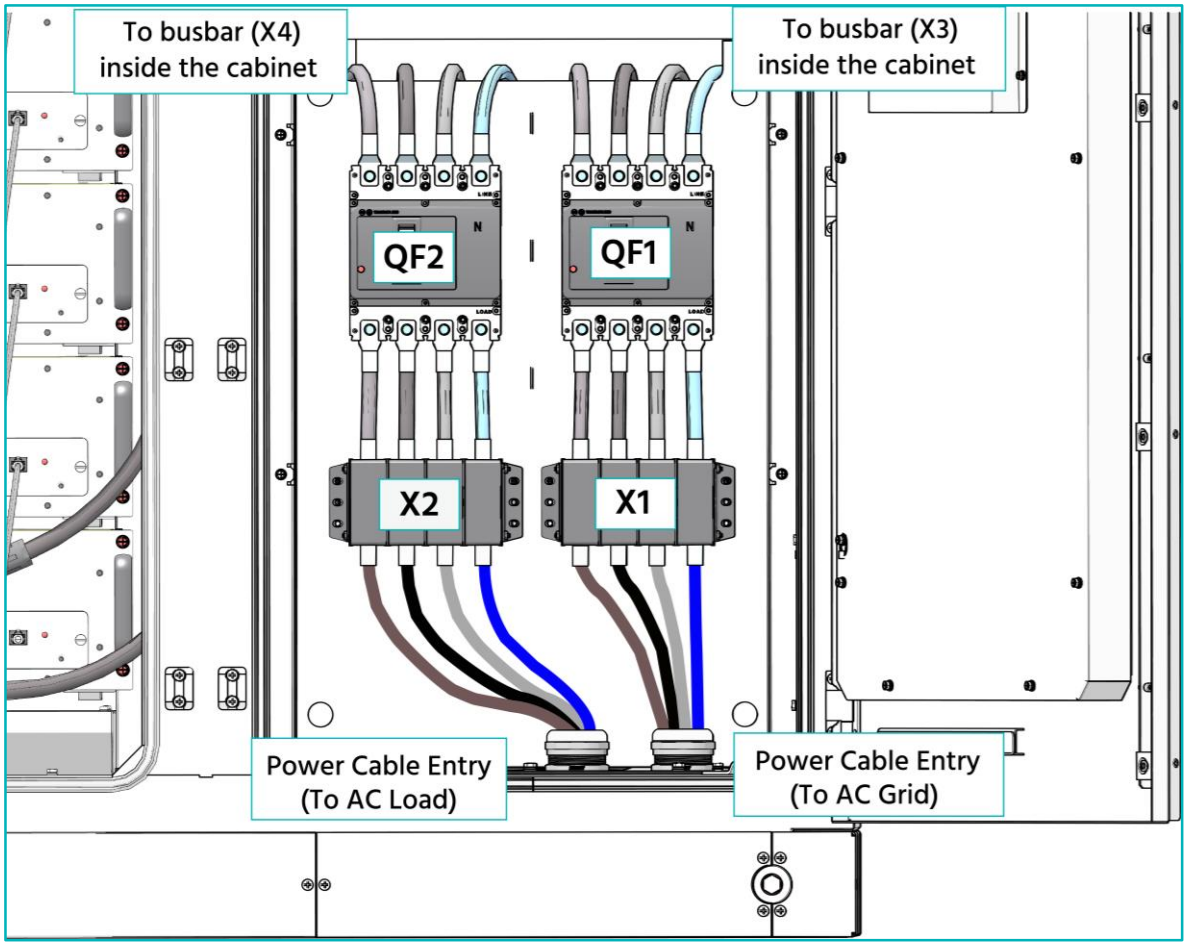
2) For details of communication wiring, please see *section 6.5*.

6.4.3 AC Side Cable Wiring

1. Unscrew to remove the bottom plate for feeding AC cables. And loose the two gland heads.



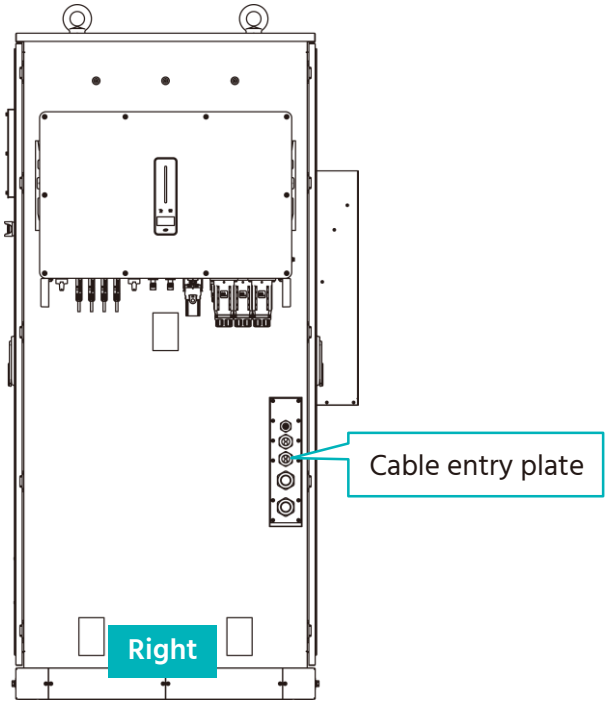
2. Feed the cables through the pre-opened holes in the plate. According to the labeling, connect the cables of each phase sequence in turn, and three opposite sequences are not allowed. After finishing wiring, replace the bottom plate and fasten the screws. And tight the two gland heads.



NOTE: Please see the next page for the locations of the **busbars**.

3. Connect the power cables from Hybrid Inverter as follows:

(1) Unscrew to remove the cable entry plate from the right side of the cabinet. And loose the gland heads.

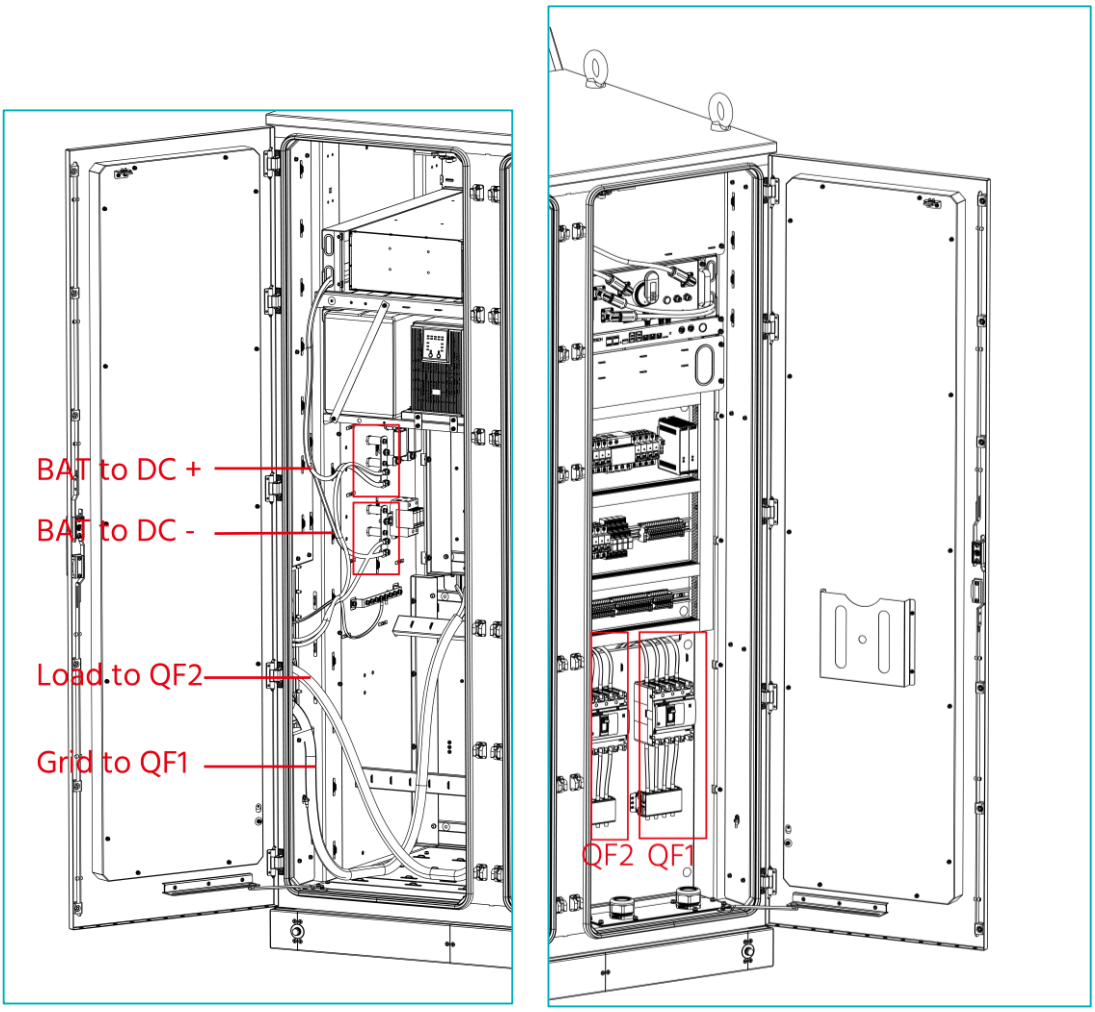


(2) Feed the power cables from the hybrid inverter through the pre-opened holes in the cable entry plate.

a. Connect the power cables from [BAT] ports of Hybrid Inverter to the DC busbar [X5-positive] and [X6-negative] inside the cabinet.

b. Connect the power cables from [Grid] port of Hybrid Inverter o the transfer bar [X3] inside the cabinet.

c. Connect the power cables from [Backup] port of Hybrid Inverter o the transfer bar [X4] inside the cabinet.

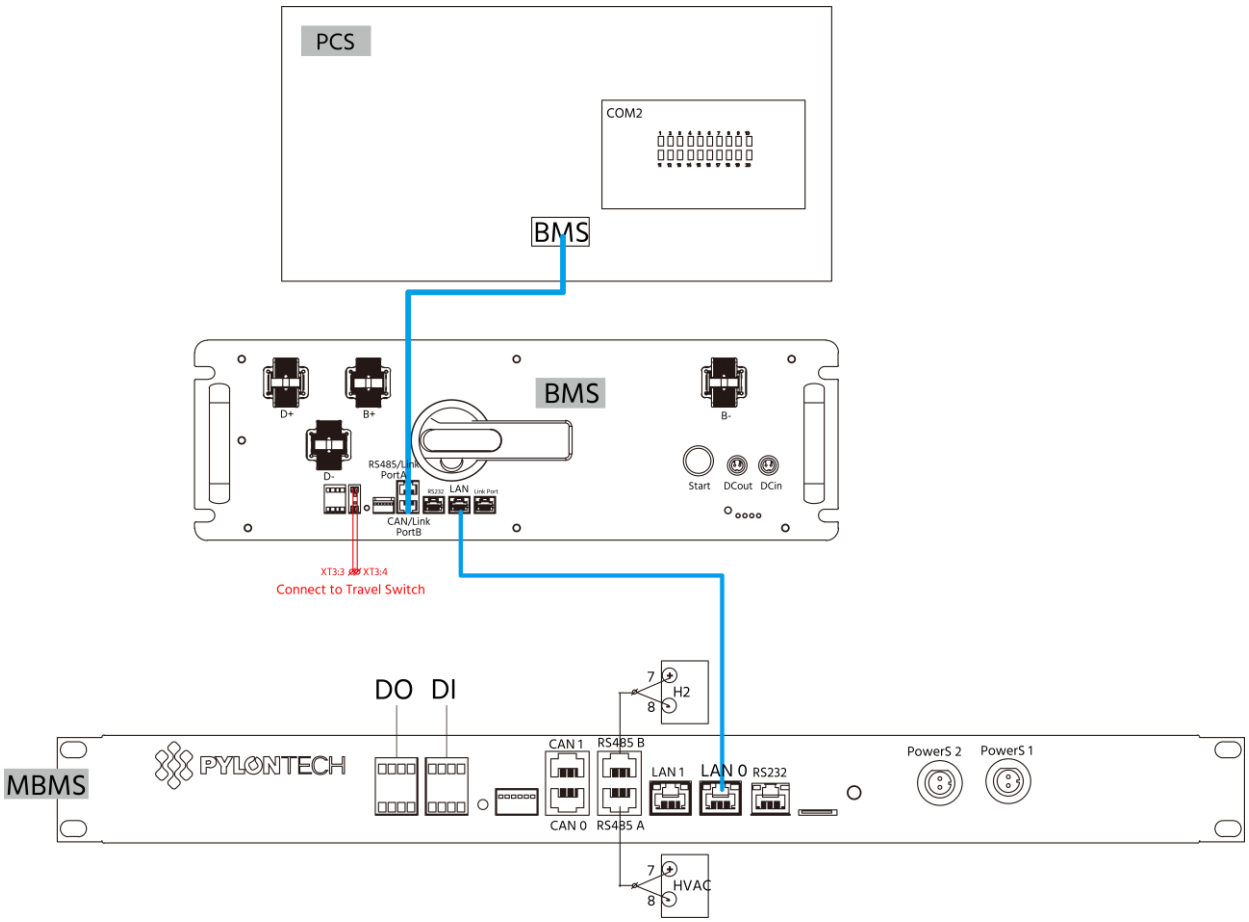


Rear View **Front View**

NOTE: Ensure that all connections are correct, and there is no overlap and no stress between the wires and sheet metal.

6.5 Communication Wiring

Please see the following schematic diagram for communication wiring.



7 Commissioning

7.1 System Status

7.1.1 Battery String Status

The battery string status can be viewed through the "STATUS "LED and "SOC" indicators on the BMS of the battery string. Following are the details:

"STATUS" LED: shows the status of battery module (RUN●, Alarm and Protection●).

"SOC" Indicators: 4 green lights and each one represents 25% capacity.

Table of LED Indicators Instructions

Battery Status	Protection/ Alarm/ Normal	STATUS (green)	STATUS (red)	Capacity SOC				Descriptions
		●	●	●	●	●	●	
Shut Down		Off	Off	Off	Off	Off	Off	All off
Sleep	Normal	Flash1	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 too high or too low.
Charge	Normal	Light	Off	The highest capacity indicator LED flashes (flash 1), others lighting				The highest capacity indicator LED flashes (flash 1), 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	Flash1	Off	Indicate based on capacity				Indicate based on capacity
	Alarm	Flash1	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.

7.2 System Turning On

⚠ WARNING

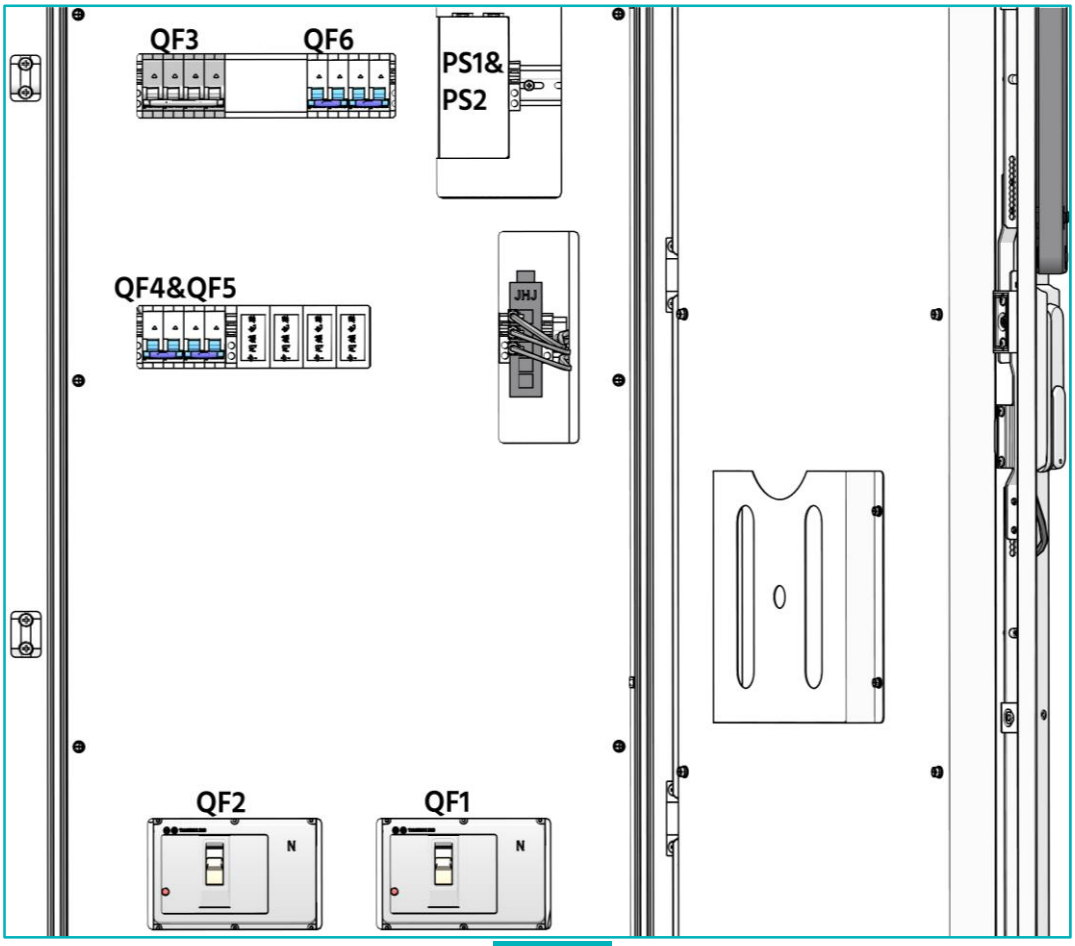
Double check all the power cables and communication cables. Ensure that the voltage of the PCS matches the voltage of the battery system. Check to make sure that all the power switches are OFF.

⚠ WARNING

The external switches or breakers between PCS and battery string must be off before the battery system power on. Make sure that all micro circuit breakers in the cabinet are off.

Procedure

1. Switch on the MCCB (moulded case circuit breaker) (QF1).
2. Switch on the MCB (micro circuit breaker) (QF3).
3. Switch on the MCCB (QF2).
4. Switch on the MCB (QF4), and the air conditioner will start automatically.
5. Switch on the MCB (QF5) of the UPS power supply. Turn on the UPS by pressing the power button ⏻ on the front panel for 2 seconds until the LCD pops up the confirmation dialog box.
6. Switch on the MCB (QF6). And the LEDs on the power switch (PS1 and PS2) will light up.



Front

7. Turn on the BMS1 according to the following operation.

(1) Set the isolating switch(①) to "ON" of the BMS.

(2) Press the "Start" button(②).

Press and hold the Start Button for more than 5 seconds until the buzzer rings, the "Status" led on the front panel will light on if the start-up is successful.

Power on:Press and hold⩾**5sec till** the buzzer rings
Mise sous tension: Appuyez et maintenez ⩾**5sec** jusqu'à ce que le buzzer sonne

⚠ CAUTION

DO NOT long press (> 10 seconds) the start button 30 seconds after the BMS is powered on, or it will go into "BLACK-START" mode.

Instructions of the battery system start process:

The battery string system will enter self-check mode automatically if it powers on successfully.

If the BMS and all battery modules are working normally, every status LED will light green. That means self-check is passed, which will be finished within 10 seconds.

Black-start function:

If long press (> 10 seconds) the start button 30 seconds after the BMS is powered on, the start function will be enabled, and the "STATUS" led will turn green. If "STATUS" led remains red, the black start function fails to activate. And it is needed to press and hold the start button again. The system will close relay and output for 10 minutes.

⚠ WARNING

If the black-start function is enabled, the terminals of D+ and D- will be electricity dangerous with high DC voltage output.

NOTE

- If the status LED lights red **30 seconds** after the BMS is powered on, it doesn't indicate there is a failure. It means that the BMS can't receive communication from upper-level equipment.
- If the status LED lights red **from the beginning**, it indicates that there is a failure of the battery.

⚠ WARNING

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

8. Repeat the operation procedure in **Step 7** above to turn on the BMS2.

9. Switch on the MBMS and after the BMSs are turned on. The "STATUS" LED will light green.

The Power Relays in BMS will close automatically after 3 minutes' self-check of MBMS. The "STATUS" LED of the BMS will light green.

NOTE

- When starting up for the first time, it is necessary to fully charge the battery for SOC calibration.
- After installing or restarting the system when it is not used for a long time, the entire energy storage system should be firstly fully charged.

7.3 System Debug

Debug Step	Actions
Preparations for debug	Turn on the BESS system, referring to *section 5.2*. Remark: Besides the BESS, if other equipment has its own system starting upsteps, be sure to follow its own system operation manual.
System function test	(1) Check to make sure the power supply from the UPS is working normally. (2) Communication Test: Check that if the communication between the BESS system and communicated devices are normal.
Trial operation test.	After the system is powered on, run the system a period as a test to check it works properly.

8 Maintenance

⚠ DANGER

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

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

8.1 System Turning Off

1. Turn off the hybrid inverter through the APP or the button on the inverter display.
2. Switch off the isolating switches of BMS 1 and BMS 2 respectively to turn off the BMSs.
3. Turn off the Power Switch of the MBMS.
4. Turn off the MCB (QF6).
5. Disconnect the MCB (QF5) of the UPS power supply. Long press the power button on the UPS front panel until the LCD pops up the confirmation dialog box. Then choose "Turn off UPS" on the display to shut down the UPS.
6. Switch off the MCB (QF4) in the cabinet one by one.
7. Switch off the MCCB (QF2).
8. Switch off the MCB (QF3).
9. Switch off the MCCB (QF1).

⚠ 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 isolating switch during normal running status (unless emergency). Otherwise, it will cause current surge to the rest battery strings. Be sure to turn off the PCS first prior to turning off the isolating switch in normal running condition.

8.2 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 maintenance on the system to ensure its normal operation and service life.

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 to check that the system is completely shut down.
- The possible live parts adjacent to the operating part shall be covered with insulating cloth.
- Ensure that the escape routes are completely unblocked during the whole process of maintenance.

Recommended Schedule of Routine Maintenance Table

Inspection Content	Inspection method	Maintenance Intervals
System operation status and environment	(1) Observe the appearance of the energy storage system for damage or deformation. (2) Check whether there is any abnormal sound in the operation of the energy storage system. (3) Check whether the parameters are correct during system operation. (4) Check whether the main devices are normal. (5) Check whether the humidity and dust in the environment around the energy storage system, and all air inlet filters are functioning properly.	Every 6 months.
System cleanliness	(1) Check the cleanliness of the components. (2) Check the cleanliness of the fly nets. (3) If necessary, a compressed air machine must be used to clean the system. **NOTE:** The system must be powered off when cleaning dust.	Every 6 months to 1 year (depending on the dust content of the environment in which it is used).
Power circuit connection check	(1) Check power cable connections for looseness and retighten to the torque specified above. (2) Check power cables and control cables for damage, especially cut marks on the skin in contact with metal surfaces. (3) Check that the insulating wraps of the power cable terminals are not detached.	Officially run for six months, then every six months to one year thereafter.
Terminal and	(1) Check whether the control terminal screws are loose and	Officially run for six

wiring connection check	tighten them with a screwdriver. (2) Check whether there is any color change in the wiring copper or screws. (3) Visually inspect the connections such as equipment terminals and the distribution of wiring. (4) Check the main circuit terminals for poor contact and screw locations for signs of overheating.	months, then every six months to one year thereafter.
Circuit breaker maintenance	(1) Routine inspection of all metal components for corrosion. (2) Annual inspection of contactors (auxiliary switches and micro-switches) to ensure that they are in good mechanical working order. (3) Check the operating parameters (especially voltage and insulation).	Officially run for six months, then every six months to one year thereafter.
SPD check	(1) Annual inspection of cable connection to ensure that they are in good mechanical working order. (2) Check the operating parameters (especially voltage and insulation).	Every 6 months to 1 year
Battery maintenance	(1) Perform normal charging and discharging operations on the battery system to check whether there are any abnormalities in the operating status of the battery, and to check whether the battery system indicator status is normal. (2) It is recommended that the battery be fully charged and equalized on a regular basis.	Every 6 months to 1 year
Fixed Aerosol fire-extinguishing device	When the fire extinguishing equipment is in normal working condition, it is necessary to check the starting device (JR10 starter box, etc.) to make sure that the line is normal. The fire extinguishing equipment is maintenance-free for its own validity period.	Officially run for six months, then every six months to one year thereafter.
Air conditioner maintenance	(1) Check whether the temperature of the air outlet is close to the cooling setting value, ±2℃. (2) Check the degree of dust at the air inlet and outlet. And use a compressed air machine to clean and treat the dust at the air conditioner inlet and outlet.	
Safety Functions	(1) Check the stop function of the emergency stop button. (2) Simulate a shutdown and check shutdown signal communication. (3) Check the body warning signs and other equipment markings and replace them if they are found to be blurred or damaged.	Officially run for six months, then every year thereafter.

8.2.1 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 is 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.

8.2.2 Hybrid Inverter Maintenance

The inverter does not require any regular maintenance. However, cleaning the heatsink will help the inverter dissipate heat and increase the lifetime of inverter. The dirt on the inverter can be cleaned with a soft brush.

> **⚠ CAUTION**
>
> Do not touch the surface when the inverter is operating. Some parts may be hot and could cause burns. Turn OFF the inverter and let it cool down before you do any maintenance or cleaning of inverter.

The Screen and the LED status indicator lights can be cleaned with cloth if they are too dirty to be read.

NOTE: Never use any solvents, abrasives, or corrosive materials to clean the inverter.

8.2.3 Air conditioner Maintenance

To ensure the normal operation of the air conditioner, please perform regular maintenance referring to the following ***Daily Maintenance Table***.

> **⚠CAUTION**
>
> All the maintenance shall be performed by qualified professionals. Please disconnect the AC power cables and the communication & alarm output cables of the air conditioner before any maintenance and connect them when the maintenance is completed.

Daily Maintenance Table		
Check item	**Action**	**Maintenance Interval**
Wiring	Visually check if the wiring is loose.	12 months
Fan abnormalities	Turn the fan to check if it is smooth and if there is any abnormal noise.	12 months
Drainage pipe	Visually check if the drainage mouth is blocked.	6 months
Condenser	Check the cleanness of the condenser and clean itwith compressed air.	6 months

8.2.4 UPS Maintenance

The UPS maintenance includes the fan maintenance, battery maintenance, UPS cleaning, UPS state check, and UPS function check.

⚠ CAUTION

Never attempt to carry out maintenance on the UPS while it is online. Ensure that the UPS has been switched off completely when performing any internal maintenance operations on it.

8.2.4.1 UPS Fan Maintenance

⚠ CAUTION

In order to avoid injury or damaging the device, wait until the fan is completely stationary before inserting fingers or any tools into it.

The UPS fans are expected to run for 20000 hours ~ 40000 hours continuously. The higher the ambient temperature, the shorter the fan life is.

During the UPS operation, please verify the fan status once every half year by confirming that air blows out from the ventilation holes on the rear panel.

8.2.4.2 UPS Battery Maintenance

⚠ CAUTION

1) Never reverse-connect the battery connections, otherwise the fire will occur.
2) Never attempt to open batteries since they contain electrolyte which is potentially harmful to personnel. In the event of accidental with electrolyte, wash the affected area with abundant, clean water, and seek medical assistance immediately.

The internal battery of the UPS is sealed, lead-acid, maintenance-free battery. The battery life depends on the ambient temperature, charge and discharge times. High ambient temperature and deep discharge shortens the battery life. To ensure the battery life, it is required to:

- Keep the ambient temperature ranging from 15°C to 25°C
- Prevent small current discharge. Continuous battery operation time exceeding 24 hours is strictly prohibited
- Charge the battery for at least 12 hours, if the battery hasn't been charged for three months at specified ambient temperature, or two months at high ambient temperature.

⚠ CAUTION

1) Check regularly the screws at the battery connection parts, and fasten the loosen ones immediately.
2) Make sure that the safety equipment is complete and that the function is normal, especially that the settings of the battery management parameters are normal.
3) Measure and record the internal temperature of the battery capsule.
4) Check whether the battery ports are damaged or hot, and whether the chassis and the covers are damaged.

8.2.4.3 Cleaning UPS

To ensure free airflow inside the UPS, clean the UPS periodically, especially the ventilation holes. If necessary, clean the UPS with a vacuum cleaner. Confirm that the ventilation holes are unobstructed.

8.2.4.4 Checking UPS State

It is recommended to check the UPS operation status once every half year. Check the following items:

1. Check if the UPS is faulty:
   1) if the alarm indicator is on, or
   2) if there are any active UPS alarms.
      a) Check if the UPS is operating in Bypass mode. Under normal conditions, the UPS operates in Normal mode; if you find that it is operating in Bypass mode, determine the reason (operator intervention, overload, internal fault, etc.).
      b) Check if the battery is discharging: If the grid power supply is normal, the battery should not discharge; if you find that it is operating in Battery mode, determine the reason (grid outage, battery test, operator intervention, etc.).

8.2.4.5 Checking UPS Functions

⚠ CAUTION

UPS functions checking operation may cause load power supply outage.

We recommend checking the UPS functions once every half year.

Backup the load data before conducting the UPS functions check. Procedures are as follows:

1. Press the power button to check if the buzzer beeps, indicators are ON, and the LCD display is normal.
2. Press the ESC key to check again if the indicators are ON, the LCD display is normal and the UPS has been transferred to the inverter mode.

8.3 Trouble Shooting

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.

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

8.3.1 Battery String Trouble Shooting

Battery String Failure

- Section A before starting up:

Failure Mode	Possible Reason	Solution
Battery system doesn't start up after correct wiring connection and starting procedure.	Power cable issue	1. Check the wiring connection and connectivity of the power cables.
	Internal cable issue	2. Open BMS case, check the connectivity and reliability of the internal power supply cables.
	PMU issue	3. Open BMS case, use multimeter to check PMU 12VDC output and CMU LEDs. If neither is on, please swap the PMU.
	Other error	4. If the problem persists, contact Pylontech service engineer.

- Section B During operation:

Error Code checked from BMS (Modbus protocol Appendix IV or CAN ID 0*4250&0*4290):

*The 'Failure Definition' and 'Failure Mode' column is reference from Pylontech Modbus protocol Appendix IV Error code 1 bit to present.

Failure Type	Failure Definition	Possible Reason	Solution
External	Input RV Err (Bit4)	D+ D- reversely connected	Check the external power cables of the polarity and connection.
External	DC OV Err input over voltage error (Bit3)	D+ D- voltage extremely higher than battery system voltage.	Check that if the PCS's voltage matches the battery system.
External	Emergency stop (Bit13)	Command by external device via dry contactor.	Command by external device, not an erroractively reported by battery system.
Current Leakage	Current Leakage Error (Bit21)	Current Leakage >25mA	With insulation gloves, disconnect the battery system and contact Pylontech service engineer.
Self-test	Self-test module Initial Error (Bit16)	Self-test failed.	1. Restart the battery system. 2. If the problem persists, contact Pylontech service engineer.
Self-test	Self-test module coulomb error (Bit15)	Self-test failed.	Contact Pylontech service engineer.
Self-test	Self-test module detecting amount error (Bit14)	Self-test failed.	Contact Pylontech service engineer.
Self-test	Safety check failure (Bit11)	Chip self-test failed.	1. Restart the battery system. 2. If the problem persists, contact Pylontech service engineer.
Self-test	Self-test volt error (Bit10)	Battery cell voltage measurement mismatch with DCBUS voltage measurement.	Restart the battery system. Check the connectivity and reliability of the power and communication cables. Swap the current measurement board or BMS. If the problem persists, contact Pylontech service engineer.
Battery cell	Battery damage error (Bit6)	Battery cell voltage measured at <2.0V.	Restart the battery system. Swap out the RED LED battery module. Use multimeter to measure the battery module power terminal voltage, if is the same as the BMS reading value, then it`s a true cell damage. Otherwise please swapthe BMU of the module.

8.3.2 Hybrid Inverter Trouble Shooting

DANGER

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

Message Name	Information Description	Troubleshooting Suggestion
Off	Control device to shutdown	1. Turn on the device in the ON/OFF Setting.
LmtByEPM	The device's output is undercontrolled	1. Confirm whether the inverter is connected to an external EPM/meter to prevent reverse current. 2. Confirm whether the inverter is controlled by an external third-party device. 3. Confirm whether the power setting of the inverter power control is limited. 4. Verify settings in section 6.6.7 and check your meter readings.
LmtByDRM	DRM Function ON	1. No need to deal with it.
LmtByTemp	Over temperature powerlimited	1. No need to deal with it, the device is innormal operation.
LmtByFreq	Frequency power limited	
LmtByVg	The device is in theVolt-Watt mode	1. Due to the requirements of local safety regulations, when the grid voltage is high,the Volt-watt working mode is triggered, which generally does not need to be dealt with. 2. Inverter factory test errors causing this mode to open, if you need to close, you canclose this mode in LCD, set the process: Main menu → Advanced Settings → Password 0010 → STD mode settings → Working Mode → Working mode: NULL → Save and exit.
LmtByVar	The device is in the Volt-Varmode of operation	1. Due to the requirements of local safety regulations, when the grid voltage is high,the Volt-watt working mode is triggered, which generally does not need to be dealt with. 2. Inverter factory test errors causing this mode to open, if you need to close, you canclose this mode in LCD, set the process: Main menu → Advanced Settings → Password 0010 → STD mode settings → Working Mode → Working mode: NULL → Save and exit.
LmtByUnFr	Under frequency limit	

Standby	Bypass run	1. No need to deal with it.
StandbySynoch	Off grid status to On grid status	
GridToLoad	Grid to load	

Message Name	Information Description	Troubleshooting Suggestion
Surge Alarm	On-site grid surge	1. Grid side fault, restart the device. If it is still not eliminated, please contact the manufacturer's customer service.
OV-G-V01	Grid voltage exceeds the upper voltage range	1. Confirm whether the power grid is abnormal. 2. Confirm that the AC cable is properly connected. 3. Restart the system and check if the fault persists.
UN-G-V01	Grid voltage exceeds the lower voltage range	
OV-G-F01	Grid frequency exceeds the upper frequency range	
UN-G-F01	Grid frequency exceeds the lower frequency range	
G-PHASE	Unbalanced grid voltage	
G-F-GLU	Grid voltage frequency fluctuation	
NO-Grid	No grid	
OV-G-V02	Grid transient overvoltage	
OV-G-V03	Grid transient overvoltage	1. Restart the system, confirm if that the fault continues.
IGFOL-F	Grid current tracking failure	1. Confirm whether the power grid is abnormal. 2. Confirm that the AC cable is properly connected. 3. Restart the system and check if the fault persists.
OV-G-V05	Grid voltage RMS instantaneous overvoltage fault	
OV-G-V04	Grid voltage exceeds the upper voltage range	
UN-G-V02	Grid voltage exceeds the lower voltage range	
OV-G-F02	Grid frequency exceeds the upper frequency range	
UN-G-F02	Grid frequency exceeds the lower frequency range	
NO-Battery	Battery is not connected	1. Check on information page 1 – Verify the battery voltage is within standards. 2. Measure battery voltage at plug.

OV-Vbackup	Inverting overvoltage	1. Check whether the backup port wiring is normal 2. Restart the system, confirm that the fault continues.
Over-Load	Load overload fault	1. Backup load power is too large, or some inductive load startup power is too large, need to remove some backup load, or remove the inductive load on the backup.

Message Name	Information Description	Troubleshooting Suggestion
BatName-FAIL	Wrong battery brand selection	1. Confirm whether the battery model selectionis consistent with the actual one.
CAN Fail	CAN Fail	1. Can failure is a failure of communication between inverter and battery. Check cable conditions. Check to ensure you have it plugged in on the CAN port of the battery andinverter. Check that you are using the right cable. Some batteries require a special battery from the battery manufacturer.
OV-Vbatt	Battery undervoltage detected	1. Verify battery voltage is within standards. Measure battery voltage at inverter connection point. Contact your battery manufacturer for further service.
UN-Vbatt	Battery overvoltage detected	1. Restart the system and check if the fault persists. If it is still not eliminated, please contact the manufacturer's customer service.
Fan Alarm	Fan alarm	1. Check if the internal fan is working correctly or jammed.
OV-DC01 (1020 DATA:0001)	DC 1 input overvoltage	1. Check if the PV voltage is abnormal 2. Restart the system, confirm that the fault continues
OV-DC02 (1020 DATA:0002)	DC 2 input overvoltage	
OV-BUS (1021 DATA:0000)	DC bus overvoltage	1. Restart the system, confirm that the fault continues.
UN-BUS01 (1023 DATA:0001)	DC bus undervoltage	
UNB-BUS (1022 DATA:0000)	DC bus unbalanced voltage	
UN-BUS02 (1023 DATA:0002)	Abnormal detection ofDC bus voltage	
DC-INTF. (1027 DATA:0000)	DC hardware overcurrent (1, 2, 3, 4)	1. Check if the DC wires are connected correctly without loose connection.

OV-G-I (1018 DATA:0000)	A phase RMS value overcurrent	1. Confirm that the grid is abnormal. 2. Confirm that the AC cable connection is not abnormal. 3. Restart the system, confirm that the fault continues.
OV-DCA-I (1025 DATA:0000)	DC 1 average overcurrent	1. Restart the system, confirm that the fault continues.
OV-DCB-I (1026 DATA:0000)	DC 2 average overcurrent	
GRID-INTF. (1030 DATA:0000)	AC hardware overcurrent (abc phase)	

Message Name	Information Description	Troubleshooting Suggestion
DCInj-FAULT (1037 DATA:0000)	The current DC component exceeds the limit	1. Confirm that the grid is abnormal. 2. Confirm that the AC cable connection is not abnormal. 3. Restart the system, confirm that the fault continues.
IGBT-OV-I (1048 DATA:0000)	IGBT overcurrent	1. Restart the system, confirm that the fault continues.
OV-TEM (1032 DATA:0000)	Module over temperature	1. Check whether the surrounding environment of the inverter has poor heat dissipation. 2. Confirm whether the product installation meets the requirements.
RelayChk-FAIL (1035 DATA:0000)	Relay failure	1. Restart the system, confirm that the fault continues.
UN-TEM (103A DATA:0000)	Low temperature protection	1. Check the working environment temperature of the inverter. 2. Restart the system to confirm if the fault continues.
PV ISO-PRO01 (1033 DATA:0001)	PV negative ground fault	1. Check whether the PV strings have insulation problems. 2. Check whether the PV cable is damaged.
PV ISO-PRO02 (1033 DATA:0002)	PV positive ground fault	
12Power-FAULT (1038 DATA:0000)	12V undervoltage failure	1. Check current leakage to ground. Verify your grounding. Verify all wires are in good condition and not leaking current to ground.
ILeak-PRO01 (1034 DATA:0001)	Leakage current failure 01 (30mA)	
ILeak-PRO02 (1034 DATA:0002)	Leakage current failure 02 (60mA)	

ILeak-PRO03 (1034 DATA:0003)	Leakage current failure 03 (150mA)	
ILeak-PRO04 (1034 DATA:0004)	Leakage current failure 04	
ILeak_Check (1039 DATA:0000)	Leakage current sensor failure	
GRID-INTF02 (1046 DATA:0000)	Power grid disturbance 02	1. Confirm whether the grid is seriously distorted. 2. Check whether the AC cable is connected reliably.
OV-Vbatt-H/ OV-BUS-H (1051 DATA:0000)	Battery overvoltage hardware failure / VBUS	1. Check if the battery isolating switch is tripping. 2. Check if the battery is damaged.

Message Name	**Information Description**	**Troubleshooting Suggestion**
OV-ILLC (1052 DATA:0000)	LLC hardware overcurrent	1. Check whether the backup load is overloaded. 2. Restart the system, confirm that the fault continues.
INI-FAULT (1031 DATA:0000)	AD zero drift overlink	1. Restart the system, confirm that the fault continues.
DSP-B-FAULT (1036 DATA:0000)	The master-slave DSP communication is abnormal	
AFCI-Check (1040 DATA:0000)	AFCI self-test failure	
ARC- FAULT (1041 DATA:0000)	AFCI failure	1. Verify connections are tight within your PV system. Arc fault settings can be changed in advanced settings if further adjustment is necessary.

NOTE: If the inverter displays any alarm message as listed in Table 7.1; pleaseturn off the inverter and wait for 5 minutes before restarting it. If the failure persists, please contact your local distributor or the servicecenter.

Please keep ready with you the following information before contacting us.

1. Serial number of Solis Singles Phase Inverter.
2. The distributor/dealer of Solis Singles Phase Inverter (if available).
3. Installation date.
4. The description of the problem together with necessary information, pictures, attachment.
5. The PV array configuration (e.g. number of panels, capacity of panels, number of strings, etc.).
6. Your contact details.

8.3.3 UPS Trouble Shooting

Problem and Possible Reason		Solution
The UPS can't be started.	The battery connection is incorrect.	Check that the battery connector is properly connected.
	NOT pressing the ON/OFF button.	Press the ON/OFF button to turn on the UPS.
	The UPS is not connected to the grid.	Check that both ends of the power cable between the UPS and the grid are securely connected.
	The voltage is too low or there's no grid voltage.	Use a table lamp to check the grid power supply connected to the UPS. If the light is very dim, check the grid voltage.
The UPS can't be shut down.	NOT pressing the ON/OFF button.	Press the ON/OFF button to turn off the UPS.
	Internal fault of the UPS.	DO NOT attempt to use UPS. Unplug the UPS and send it for repair in time.
UPS cannot provide the expected backup time.	The UPS battery was weakened by a recent power outage or the battery is at the end of its working life.	Charge the battery. The battery should be recharged after a long period of power outage. Frequent use or the high temperature operation will reduce the battery's working life. If the battery is at the end of its working life, consider replacing the battery even though the indicator LED has not yet lighted up.
Bypass overload alarm, UPS makes continuous alarm sound.	Overload of the UPS.	The connected device exceeds the maximum load specified in the technical specifications. The alarm will continue until the overload is eliminated. Disconnect unnecessary devices from the UPS to resolve overload issues.
Failure LED lights up.	Internal fault of the UPS.	DO NOT attempt to use UPS. Turn off the UPS and send it for repair in time.
Battery replacement indicator LED lights up.	(A short beep sounds every two seconds.) The battery is disconnected.	Check that if the battery connector is intact.
	Too low battery power.	Charge the battery for 24 hours. Then perform a self-check. If the problem persists after recharging, replace the battery.
	(The UPS makes a short beep for one minute and the battery replacement LED lights up. UPS repeats the alarm every 5 hours.) Battery self-check fails.	Perform a self-check procedure after 24 hours of battery charging to confirm the condition of battery replacement. If the battery self-test is successful, the alarm will stop and the LED light will go off.
Despite the presence of grid	The grid voltage is too high, too low, or unstable. Generators powered by cheap fuel cannot	Switch the UPS to another electrical outlet. Test the input voltage according to the grid voltage

power, the UPS still runs on batteries.	provide a stable voltage.	display.
On-line LED light	No LED lights up.	The UPS is running on battery or is not started.
	LED flashes.	The UPS is performing internal self-check.

8.3.4 Air Conditioner Trouble Shooting

8.3.4.1 Fan faults and recovery measures

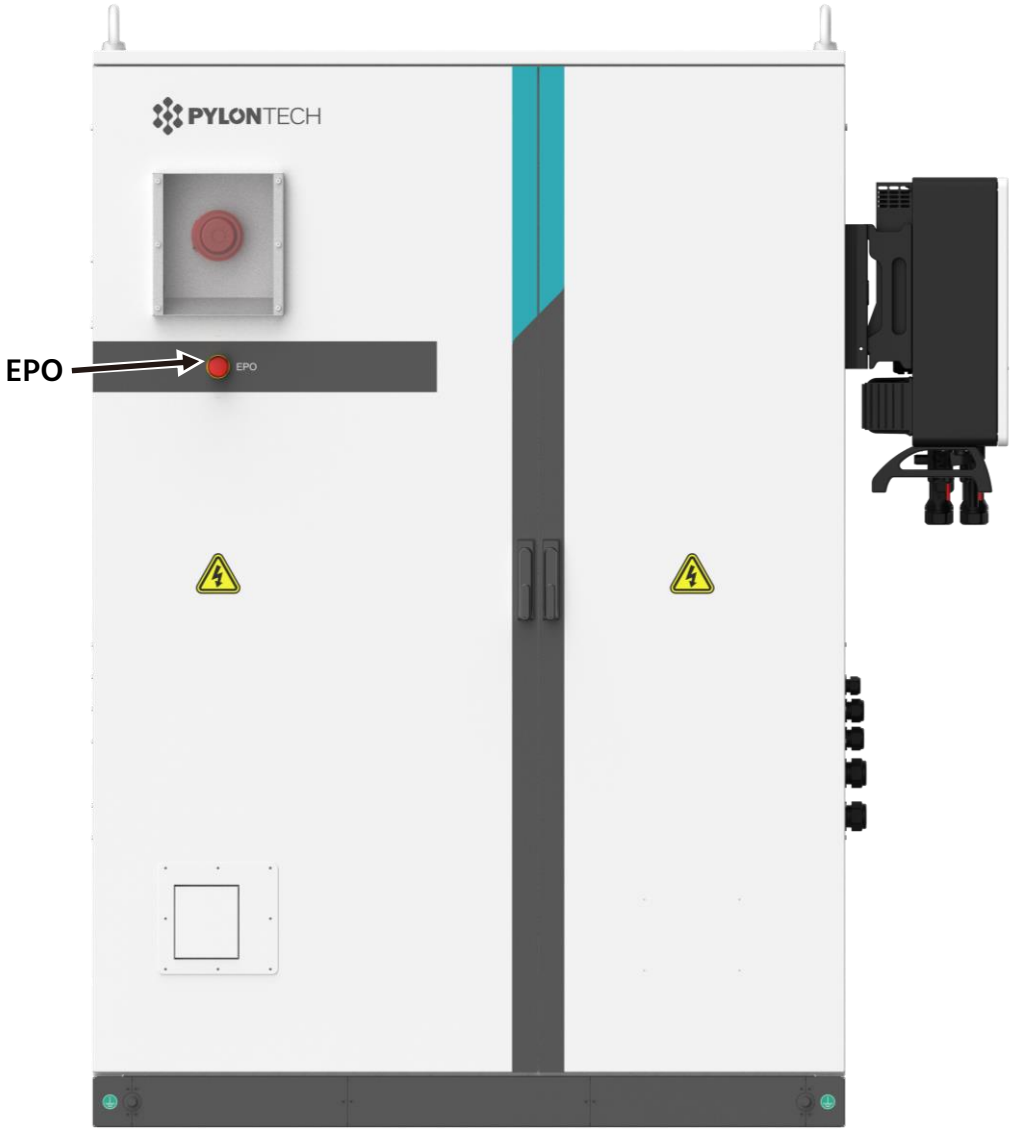
Symptom	Possible cause	Check items or processing method
Internal cycling fan cannot run.	Air conditioner is in the standby state.	It is a normal case. Air conditioner will get into the automatic control logic after being power on and in standby state for 30 seconds.
	The fan gets stuck.	Check if there is any foreign object that blocks the fan.
	The terminal is loose	Check if the fan connecting terminal is loose
External cycling fan cannot run.	The compressor does not start.	The outside fan can run after the compressor starts.
	The fan gets stuck.	Check if there is any foreign object that blocks the fan.
	The terminal is loose.	Check if the fan connecting terminal is loose.
Fan makes abnormal noise.	The bearing of fan wears	Replace the fan.
	The blades of fan scratch other objects	Check whether there are any interferences between the cable and the blades of the fan.
The external hydrogen discharge fan does not work.	Setting error or the operating condition has not been satisfied.	Check if the operating condition is satisfied.
	Power cut-off.	Check the external power supply.
	The fan cannot work	Replace the fan.
	The default is not opened.	Make sure whether there is an external fan linkage function configuration.

8.3.4.2 Cooling system failure and recovery measures

Symptom	Possible cause	Check items or processing method
The compressor cannot start.	The power supply is not available (standby).	Check the main power switch, and check if the startup interface is displayed.
	Loose circuit connection	Tighten the circuit connectors.
	The compressor motor burns out.	Check the motor and replace it if any defect is found.
The compressor cannot work.	There is no cooling demand within shutdown delay.	Check the display of the temperature inside the cabinet and the compressor output status on the operation interface. The compressor has the shortest shutdown time in normal state. If the temperature rises to the starting point during this period, the compressor still would not start until the time delay expires.
High discharge pressure.	The condenser is clogged by dirt.	Clean the condenser.
	The condenser fan does not work.	Refer to the table in *Section 6.4.3.1*.
The evaporator freezes up.	The internal circulation fan is not running.	Refer to table in *Section 6.4.3.1*.
	The capillary temperature sensor cannot work.	Check whether the connection is normal. If it is abnormal, replace the capillary temperature sensor.

8.4 Emergency Disposal (EPO)

In case of fire or any situation beyond the control of anyone, please immediately press the emergency power off button (EPO) to stop the system. DO NOT touch the EPO during normal operation. To restore the system, firstly rotate the EPO button in the operating direction on the door to make the button pop up, and then power on the system according to the power on steps.



9 Shipment and Storage

9.1 Shipment

The outdoor battery cabinet is handled by forklift or hoisting.

- The indoor battery cabinet is transported with battery. Therefore, ALWAYS avoid violent impact during handling.
- It should be fixed firmly during transportation, and no displacement is allowed in the carriage.
- During transportation, it should be placed and transported in strict accordance with the vertical direction, the tilt angle ≤ 15°. DO NOT transport the cabinet horizontally or sideways to avoid device vibration.
- DO NOT transport the cabinet with flammable, explosive, and corrosive items during transportation.
- DO NOT store the cabinet in an open warehouse during transit.
- DO NOT expose the cabinet to rain, snow or liquid substances.

Single cell's SOC shall remain around 55% according to customer requirement before shipment. The remaining capacity of battery, after shipment and before charging, is determined by the storage time and condition.

The battery modules should meet the UN38.3 certificate standard. In particular, special rules for the carriage of goods on the road and the current dangerous goods law should be observed.

9.2 Storage

Before storage the battery should be charged to 50~55% SOC.

For long-term storage, e.g. if it needs to be stored for a long time (more than 3 months), the battery should be stored in the temperature range for 5~45°C, relative humidity <65% clean, well-ventilated, and corrosive-gas-freed environment.

It is recommended to discharge and charge the battery every 3 months, and the longest discharge and charge interval shall not exceed 6 months.

⚠ CAUTION

If not following the above instructions for long term storage of the battery, the cycle life will decrease relative heavily.

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