



## **Optim US A100-HY-PLUS**

### **Lithium Iron Phosphate Battery Energy Storage System**

## **User Manual**

Information Version: 1.1

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# About This Manual

## Purpose

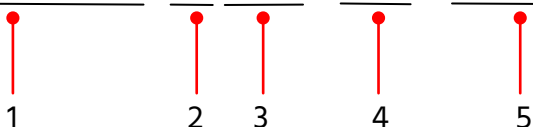
This manual describes the Lithium Iron Phosphate Battery Energy Storage System (hereinafter referred to as "the system" unless otherwise noted) from Pylontech in terms of its overview, installation, commissioning, maintenance, etc.

## Applicable Model

Optim US A100-HY-PLUS

## Product Name Description

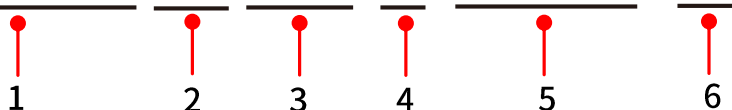
# Optim US A100-HY-PLUS



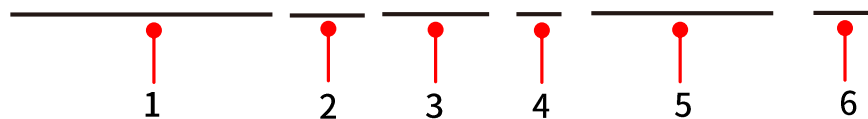
| No. | Designation                             | Description                                                 |
|-----|-----------------------------------------|-------------------------------------------------------------|
| 1   | Product Series                          | Optim US Series                                             |
| 2   | Cooling type of the system              | Air Cooling                                                 |
| 3   | The rated energy (in kWh) of the system | The rated energy of this system is 108 kWh/126kwh.          |
| 4   | Type of the cabinet                     | "HY" represents that the system includes a hybrid inverter. |
| 5   | Product Version                         | Version Code: PLUS                                          |

## Product Model Description

# Optim US-A1-M1D-A-60/126-EU



# Optim US-A1-M1D-A-50/108-EU



| No. | Designation                                                                               | Description                                                                                            |
|-----|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 1   | Product Series                                                                            | Optim US Series                                                                                        |
| 2   | "A" represents the type of cabinet system.<br>"1" is the serial number.                   | "A" represents "All in one cabinet (including the inverter)."                                          |
| 3   | Battery model used in the product                                                         | The product uses M1D battery.                                                                          |
| 4   | Product Version                                                                           | Version A                                                                                              |
| 5   | The rated power of the hybrid inverter (in kW)<br>The rated energy (in kWh) of the system | The rated power of the hybrid inverter is 60/50 kW.<br>The rated energy of this system is 126/108 kWh. |
| 6   | Sales territory                                                                           | The product is intended for European market.                                                           |

## Symbol Description

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

## Abbreviations

| Abbreviation | Designation                         |
|--------------|-------------------------------------|
| Pylontech    | Pylon Technologies Co., Ltd.        |
| AC           | Alternating Current                 |
| DC           | Direct Current                      |
| BMS          | Battery Management System           |
| BMU          | Battery Management Unit             |
| MPPT         | Maximum Power Point Tracking        |
| MCB          | Micro Circuit Breaker               |
| MCCB         | Moulded Case Circuit Breaker        |
| SOC          | State of Charge                     |
| SOH          | Battery State of Health, in percent |
| 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                  |
| MCU          | Microcontroller Unit                |

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# 1 Safety

## 1.1 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.

Qualified personnel must have the following skills:

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

## 1.2 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°C~ 40°C and the optimum temperature is: 10°C~ 40°C. 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.

### 1.3 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.

### 1.4 Establishment of Safety Warning Signs

During installation, maintenance, or repair, restrict access to authorized personnel only to prevent accidental activation or injury. Comply with 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.

### 1.5 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.

## **1.6 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.

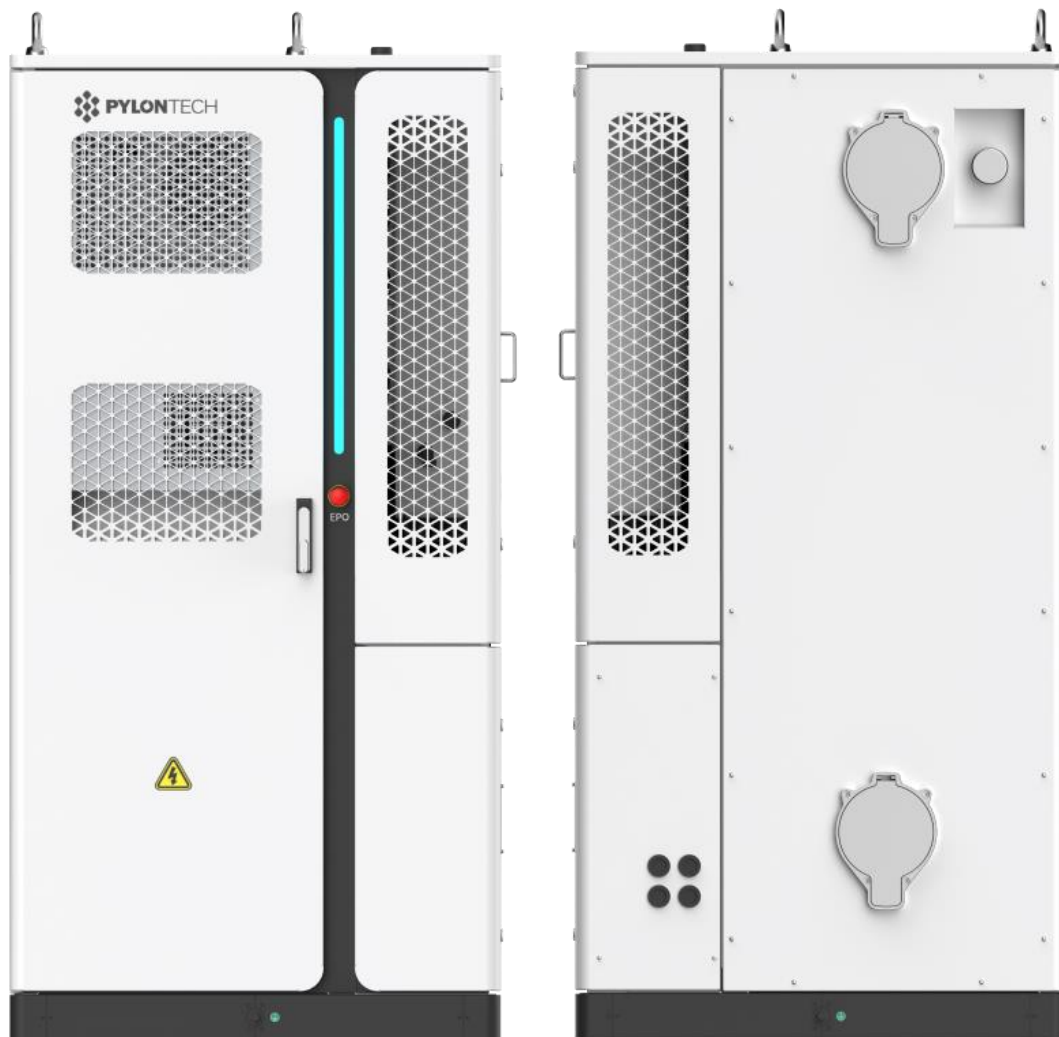
## **1.7 Moisture Protection**

- 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.

## 2 System Introduction

### 2.1 System Overview

The Optim US A100-HY-PLUS 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.



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

## 2.2 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.
- 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.
- Self-Consumption: The system prioritizes using PV energy for the load. Surplus energy charges the battery, with any excess exported to the grid. If PV generation falls short, the battery supplements the load; if both are insufficient, the grid makes up the difference.
- Backup Power: Upon grid failure, the inverter seamlessly switches to off-grid mode, utilizing battery power to ensure critical backup loads remain uninterrupted. Normal grid-tied operation resumes automatically once utility power is restored.

## 2.3 System Specifications

| Specifications     | Model Name                     | Optim US-A1-M1D-A-50/108-EU       | Optim US-A1-M1D-A-60/126-EU |
|--------------------|--------------------------------|-----------------------------------|-----------------------------|
| AC side Parameters | Rated AC Power (kW)            | 50                                | 60                          |
|                    | Rated AC Output Voltage (VAC)  | 380/400 Vac, 3W+N+PE              |                             |
|                    | Maximum AC Output Current (A)  | 76/72.2                           | 91.2/86.6                   |
|                    | Maximum DC Input Current (A)   | 80 × 2                            | 84 × 2                      |
|                    | Rated AC Output Frequency (Hz) | 50/60                             |                             |
|                    | Power Factor                   | >0.99 (0.8 leading - 0.8 lagging) |                             |
|                    | Overload Capacity              | 150% (10 seconds)                 |                             |

|                                |                                 |                                                                                 |                                                                                     |
|--------------------------------|---------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                |                                 | 160% (2 seconds)                                                                |                                                                                     |
|                                | On-Off Grid Switching           | < 10 ms                                                                         |                                                                                     |
| <b>Photovoltaic Parameters</b> | Number of MPPT                  | 4                                                                               |                                                                                     |
|                                | Max DC Input Power (kW)         | 100 kW                                                                          | 100 kW                                                                              |
|                                | MPPT Voltage Range (V)          | 150~850                                                                         |                                                                                     |
|                                | MPPT Starting Voltage (V)       | 180                                                                             |                                                                                     |
|                                | Max DC Input Current (A)/string | 4× 42                                                                           |                                                                                     |
| <b>Battery Parameters</b>      | Battery Type                    | Li-ion (LFP)                                                                    |                                                                                     |
|                                | Nominal Capacity (kWh)          | 108.5                                                                           | 126.6                                                                               |
|                                | Battery Item                    | Powercube-M1D                                                                   | Powercube-M1D                                                                       |
|                                | Battery Module Qty.             | 6                                                                               | 7                                                                                   |
|                                | DC Voltage Range (V)            | 302.4 ~ 388.8                                                                   | 352.8 ~ 453.6                                                                       |
|                                | Max. Operation Current (A)      | 160                                                                             | 160                                                                                 |
|                                | Cooling Type                    | Forced air cooling                                                              | Forced air cooling                                                                  |
| <b>General Parameters</b>      | Dimension (W × H × D, mm)       | 1050 × 2200 × 1300                                                              | 1050 × 2200 × 1300                                                                  |
|                                | Weight (Kg)                     | ≤ 1500                                                                          | ≤ 1620                                                                              |
|                                | Working Temperature Range (°C)  | -25~50                                                                          | -25~50                                                                              |
|                                | Storage temperature range (°C)  | -20°C ~60°C                                                                     | -20°C ~60°C                                                                         |
|                                | IP Rating                       | IP55                                                                            | IP55                                                                                |
|                                | Noise(dB)                       | ≤75                                                                             | ≤75                                                                                 |
|                                | Altitude(m)                     | ≤3000                                                                           | ≤3000                                                                               |
|                                | Humidity                        | 0~95%RH                                                                         | 0~95%RH                                                                             |
|                                | Sensor & Detector               | Smoke, CO                                                                       | Smoke, CO                                                                           |
|                                | Fire Extinguishing              | Aerosol                                                                         | Aerosol                                                                             |
|                                | Air Conditioner                 | 2 kW Cooling                                                                    | 2 kW Cooling                                                                        |
|                                | Anti-Corrosion                  | C3H                                                                             | C3H                                                                                 |
|                                | Authentication Level            | IEC62619, IEC62477-1, IEC63056, VDE2510-50, ISO 13849-1<br>IEC 62040-1, CE-LVD, | IEC62619, IEC62477-1, IEC63056, VDE2510-50, ISO 13849-1<br>IEC 62040-1, CE-LVD, IEC |

|  |  |                                   |                               |
|--|--|-----------------------------------|-------------------------------|
|  |  | IEC 61000, IEC 62933,<br>UL 9540A | 61000, IEC 62933, UL<br>9540A |
|--|--|-----------------------------------|-------------------------------|

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

## 2.4 Label Description

|                                                                                     |                                                                                                           |                                                                                     |                                                                                                                                                              |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | 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.                                                                                  |    | Delayed discharge. After the device is powered off, wait 10 minutes until the capacitors are fully discharged.                                               |
|    | Warning: flammable materials.                                                                             |   | Label for Waste Electrical and Electronic Equipment (WEEE) Directive                                                                                         |
|  | The certificate label for Safety by TÜVRheinland.                                                         |  | Separate Collection Symbol for Regulation concerning batteries and waste batteries (2023/1542/EU)                                                            |
|  | The certificate label for CE.                                                                             |  | Packages Transport packaging Design and materials handling To indicate the center of gravity of the transport package which will be handled as a single unit |
|  | To indicate the location of where forklift operators should insert the forks to lift and transport goods. |                                                                                     |                                                                                                                                                              |

## 2.5 Reference Standards

### 2.5.1 System Related Standards

| No. | Description                  | Code   |
|-----|------------------------------|--------|
| 1   | Transport of dangerous goods | UN38.3 |

### 2.5.2 Battery Related Standards

| No. | Description                                                                                                                                                                                    | Code             |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 1   | Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications           | IEC62619         |
| 2   | Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems. | IEC 63056        |
| 3   | Safety of machinery - Safety-related parts of control systems                                                                                                                                  | ISO 13849        |
| 4   | Stationary Energy Storage Systems with Lithium Batteries.                                                                                                                                      | VDE-AR-E 2510-50 |
| 5   | Safety requirements for power electronic converter systems and equipment - Part 1: General                                                                                                     | IEC 62477-1      |
| 6   | ANSI/CAN/UL Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems                                                                         | UL9540A          |
| 7   | Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity standard for residential, commercial and light-industrial environments                                            | IEC 61000-6-1    |
| 8   | Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for equipment in residential environments                                                                | IEC 61000-6-3    |
| 9   | Electromagnetic compatibility (EMC) –Part 6-7: Generic standards – Immunity requirements for                                                                                                   | IEC 61000-6-7    |

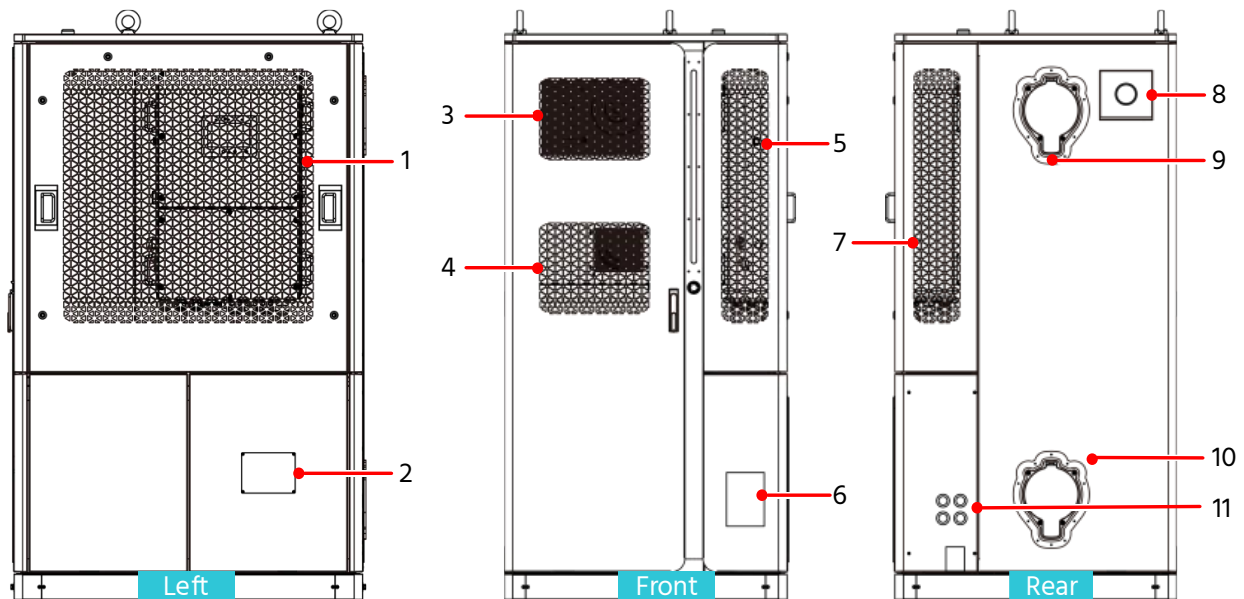
|    |                                                                                                                                    |               |
|----|------------------------------------------------------------------------------------------------------------------------------------|---------------|
|    | equipment intended to perform functions in a safety-related system (functional safety) in industrial locations                     |               |
| 10 | Electrical energy storage (ESS)systems-Part 5-2: Safety requirements for grid-integrated EES systems-Electrochemical-based systems | IEC 62933-5-2 |

\* Test Organization: TÜV Rheinland

Report: UL 9540A: 2025 (Fifth Edition) Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage

## 3 System Components

### 3.1 External Layout

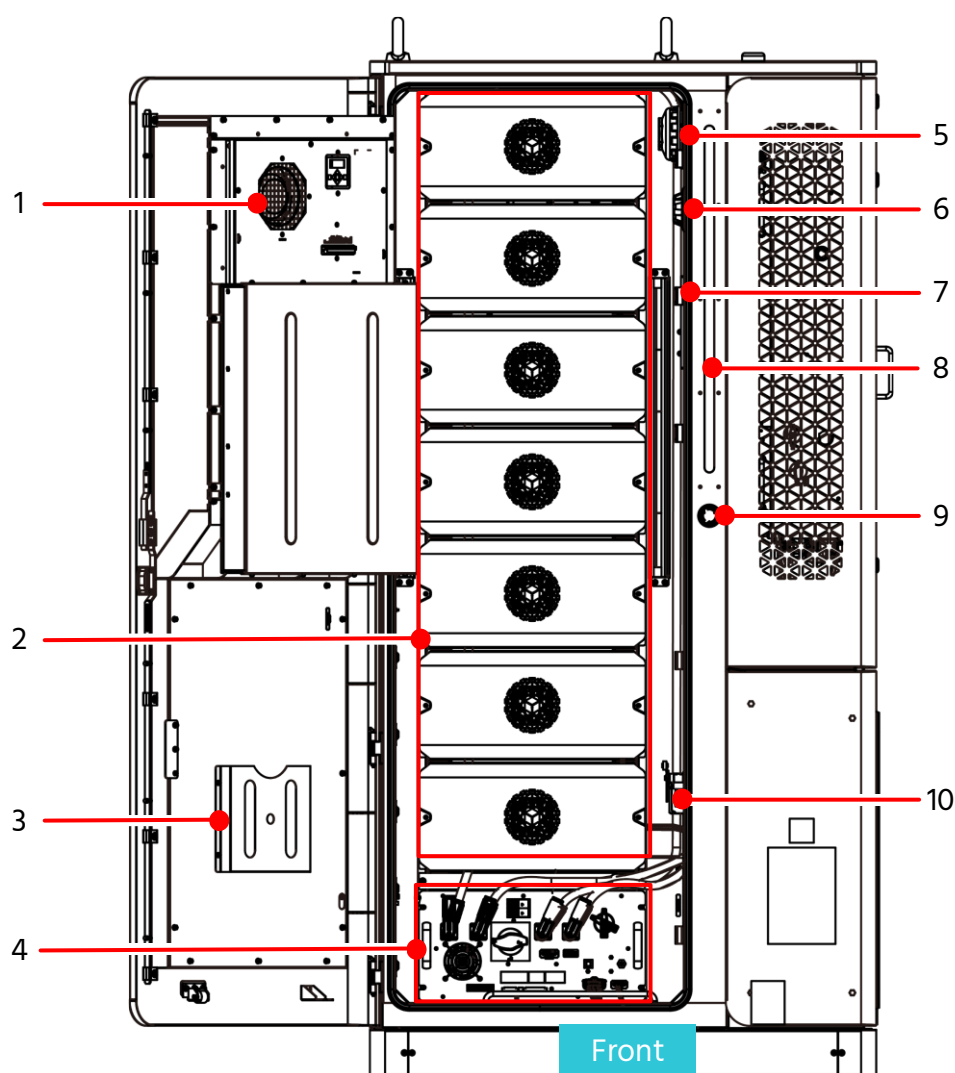


| NO. | Description                       | NO. | Description                        |
|-----|-----------------------------------|-----|------------------------------------|
| 1   | hybrid Inverter (inside)          | 6   | Noise Rating Plate                 |
| 2   | Product Nameplate                 | 7   | Air Outlet for the hybrid inverter |
| 3   | Air Outlet for Air Conditioner    | 8   | Water Pipe Joint                   |
| 4   | Air Inlet for Air Conditioner     | 9   | Explosion-proof Air Outlet         |
| 5   | Air Inlet for the hybrid inverter | 10  | Explosion-proof Air Inlet          |
|     |                                   | 11  | PV Cable Entry Holes               |

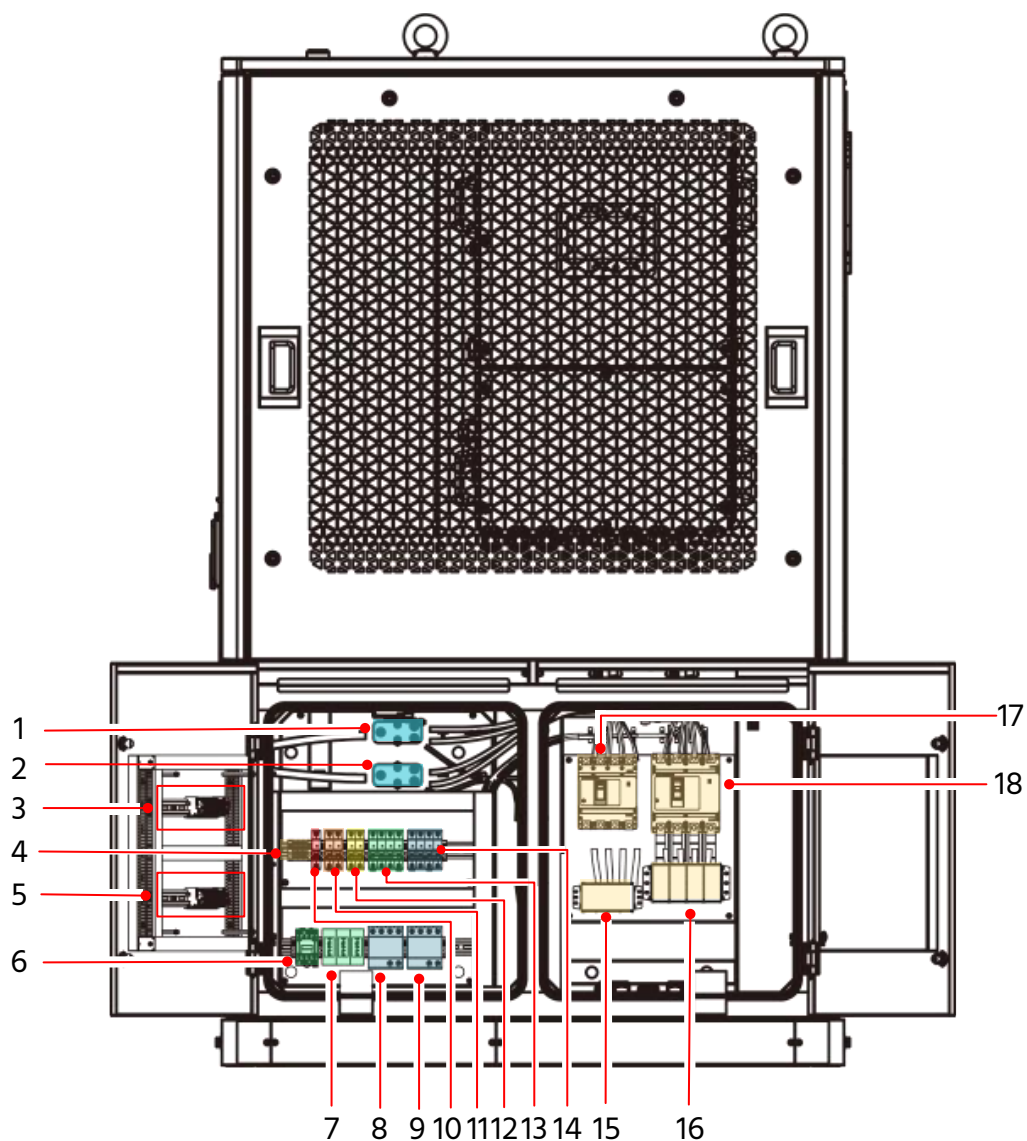
#### 3.1.1 Cabinet Body

| Item                       | Parameters                      |
|----------------------------|---------------------------------|
| Dimensions (W × D × H, mm) | 1050 × 1300 × 2200              |
| Texture and Color          | Outdoor Orange Texture, RAL9003 |
| IP Rating                  | IP55                            |
| Corrosion Resistance Grade | C3H                             |
| Maintenance                | Front and back doors available  |

## 3.2 Internal Layout



| NO. | Description     | NO. | Description                             |
|-----|-----------------|-----|-----------------------------------------|
| 1   | Air Conditioner | 6   | Smoke Detector                          |
| 2   | Battery Module  | 7   | Fixed Aerosol Fire-extinguishing Device |
| 3   | File Folder     | 8   | LED                                     |
| 4   | BMS             | 9   | EPO (Emergency Power OFF Switch)        |
| 5   | Gas Detector    | 10  | Limit Switch                            |



**Figure 4-4 Left View (Door Opened)**

| NO. | Description                    | NO. | Description            |
|-----|--------------------------------|-----|------------------------|
| 1   | X3                             | 10  | Fuse                   |
| 2   | X4                             | 11  | QF6                    |
| 3   | XD                             | 12  | QF5                    |
| 4   | XT                             | 13  | QF4                    |
| 5   | ZD                             | 14  | MCB (QF3)              |
| 6   | Relay (KA4)                    | 15  | TC Input Terminal (X2) |
| 7   | Relay (KA1~3)                  | 16  | TC Input Terminal (X1) |
| 8   | Surge Protective Device (SPD2) | 17  | MCCB (QF2)             |
| 9   | Surge Protective Device (SPD1) | 18  | MCCB (QF1)             |

### 3.2.1 Battery String

The battery system consists of 1 battery string, and one battery string contains 7 battery modules and 1 battery control module (BMS).

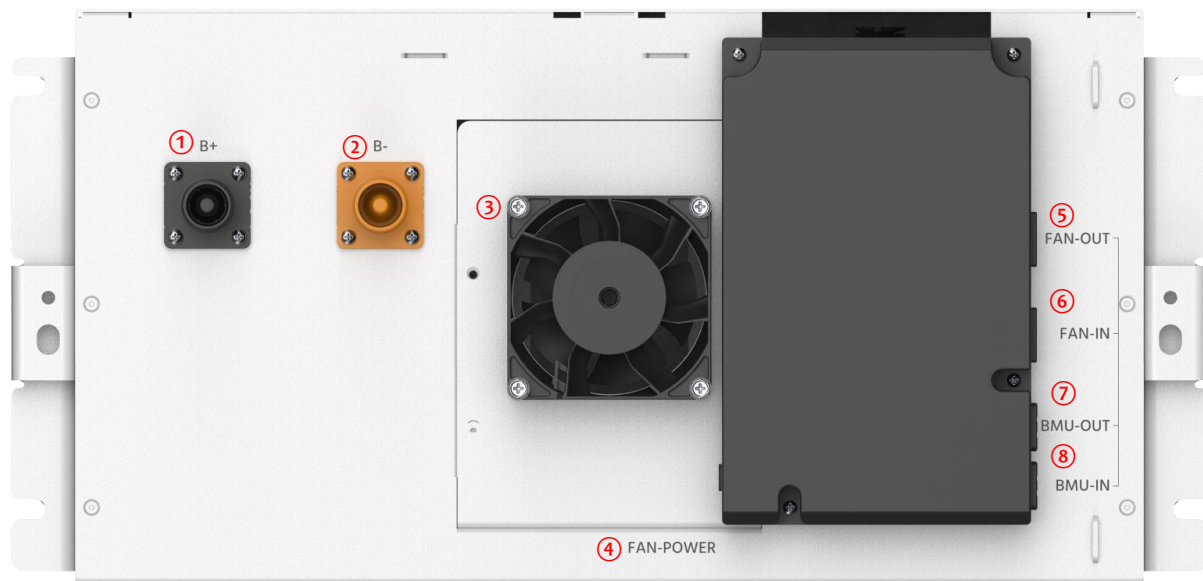
#### 3.2.1.1 Specifications of the Battery String

| Product Type                             | PowerCube-M1D-200                               |                                                 |
|------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| Battery Module Model                     | HM1D200F                                        |                                                 |
| Control Module Model                     | SM1D200ZA                                       |                                                 |
| System Capacity                          | 60kw/126kwh                                     | 50kW/108kwh                                     |
| Nominal Voltage (VDC)                    | 403.2                                           | 345.6                                           |
| Rated Capacity (Ah)                      | 314                                             | 314                                             |
| Total Storage Energy (kWh)               | 126.6                                           | 108.5                                           |
| Charge Upper Limit Voltage (VDC)         | 453.6                                           | 388.8                                           |
| Discharge Lower Limit Voltage (VDC)      | 352.8                                           | 302.4                                           |
| Nominal Current (Amps)                   | 157                                             | 157                                             |
| Maximum Continuous Current (Amps)        | 188                                             | 188                                             |
| Over Current/Duration (Amps/millisecond) | Charge 201@3 seconds<br>Discharge 201@3 seconds | Charge 201@3 seconds<br>Discharge 201@3 seconds |
| IP Rating/Protection Class               | IP20/I                                          | IP20/I                                          |
| Operation Temp. Range(°C)                | 2~55                                            | 2~55                                            |
| Communication type                       | CAN/485/LAN                                     | CAN/485/LAN                                     |
| Storage temp. range(°C)                  | -20~60                                          | -20~60                                          |
| Humidity (%)                             | 0~95                                            | 0~95                                            |
| Altitude (m)                             | ≤4000                                           | ≤4000                                           |
| Round-trip efficiency (%<br>@1C-rate)    | 95                                              | 95                                              |
| Depth of Discharge (%)                   | 95                                              | 95                                              |
| Operation cycle life*                    | >6000 (70%SOH)                                  | >6000 (70%SOH)                                  |
| Operation Life (year)                    | 10+                                             | 10+                                             |
| Cooling type                             | Air cooling                                     | Air cooling                                     |

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

#### 3.2.1.2 Battery Module

## Battery Module Front Interface



### ①② Power Terminals B+/B-

Connects battery in serial at power side.

### ③ Fan

Fan of the Battery Pack

### ④ FAN-POWER

Fan Power Supply and Speed Control

### ⑤ FAN-OUT

Fan Power Supply Output

### ⑥ FAN-IN

Fan Power Supply Input

### ⑦ BMU-OUT

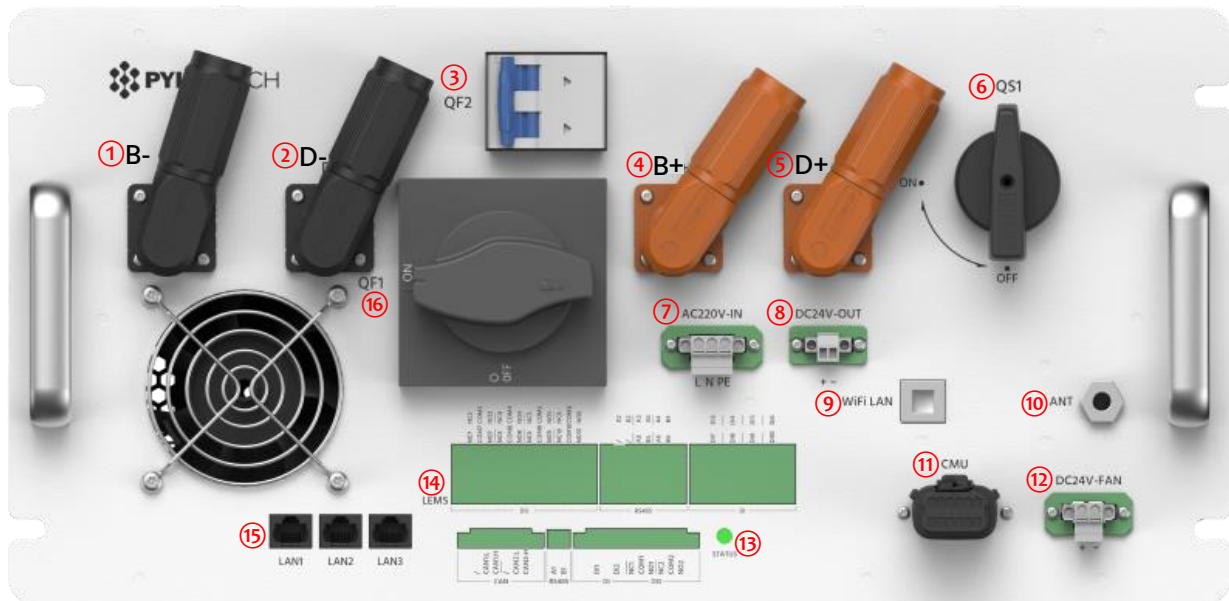
BMU power and communication cascade output

### ⑧ BMU-IN

BMU power and communication cascade input

### 3.2.1.3 Control Module

#### Control Module Front Interface



#### ⑤② Power Terminal D+/D-

External Power terminal: Connects battery system to the hybrid inverter.

#### ④① Power Terminal B+/B-

Connects battery modules in series.

#### ③ QF2

Miniature Circuit Breaker (MCB): controls AC mains supply to auxiliary power supply

#### ⑥ QS1

Isolation Switch: controls DC power supply to auxiliary system

#### ⑦ AC220V-IN

AC mains input interface for auxiliary power supply

#### ⑧ DC24V-OUT

24V DC power interface for outdoor cabinet

#### ⑨ WiFi LAN

WiFi LAN interface

#### ⑩ ANT

The antenna interface for wireless communication modules

#### ⑪ CMU

## BMU Communication Interface

### ⑫ DC24V-FAN

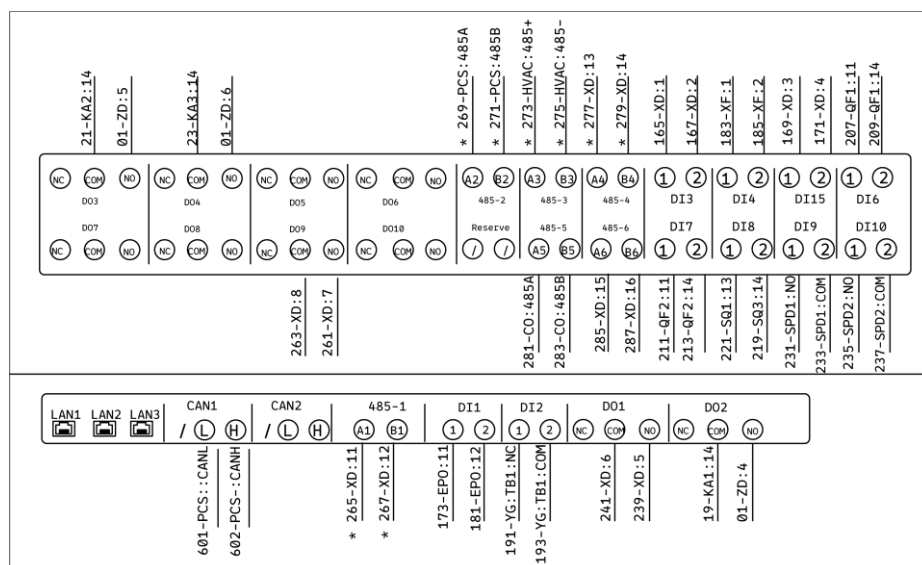
24V DC power interface for the fans of the battery packs

### ⑬ STATUS

Display the status of the battery system (Normal ●, Abnormal ●).

### ⑭ LEMS

Interfaces for connecting to LEMS



### ⑮ LAN1/LAN2/LAN3

External Communication Interface

### ⑯ QF1

Main DC Circuit Breaker: DC Switch for Main Circuit

## 3.2.2 Air Conditioner (MC20HDNC1A)

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:

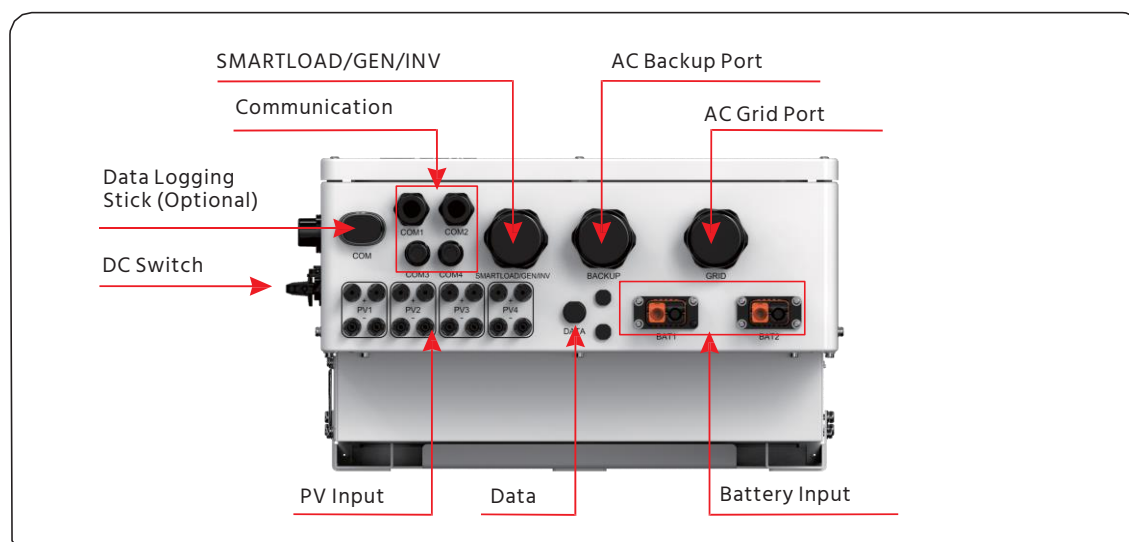
| Product Model |                | MC20HDNC1A                  |
|---------------|----------------|-----------------------------|
| Dimensions,   | Dimension (mm) | 446 (W) × 200 (D) × 746 (H) |

|                                        |                                        |                            |
|----------------------------------------|----------------------------------------|----------------------------|
| Weight & Mounting Method               | 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 <sup>3</sup> /h)   | 650                        |
| Power Supply                           | Power Supply Range (V, Hz)             | 187~254V, 50/60Hz          |
|                                        | Max. Operating Current (A)             | 6.5                        |

### 3.2.3 Hybrid Inverter (NECS-50HY-NV-YD)



#### Interfaces



| Terminal           | Description                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------|
| DC Switch          | This is the DC disconnect switch for the PV                                                  |
| COM                | The data logger gets connected here-only USB version of the loggers will work                |
| COM1               | RS485 and CAN communication cables and parallel cables should go through these               |
| COM2               | RS485 and CAN communication cables and parallel cables should go through these               |
| COM3               | Communication cables for 14PIN terminal block should go through these                        |
| COM4               | Communication cables for 14PIN terminal block should go through these                        |
| SMARTLOAD/GEN/INV  | Conduit for AC conductors to generator should be connected here                              |
| Backup             | Conduit for AC conductors to backup loads panel should be connected here                     |
| Grid               | Conduit for AC conductors to the main service panel should be connected here                 |
| PV Module Input    | Conduit for PV conductors should be connected here                                           |
| Battery Connection | Conduit for Battery conductors should be connected here                                      |
| DATA               | Extends the range of the inverter GPRS signal (Not applicable to the USA, Australia, Europe) |
| ON/OFF             | This button is on machine left side, used for inverter power on/off                          |

### NOTE

You may scan the QR code for the operation manual of the inverter.



## 3.3 Safety Features

This system is equipped with safety features that include a fire protection system as well as an

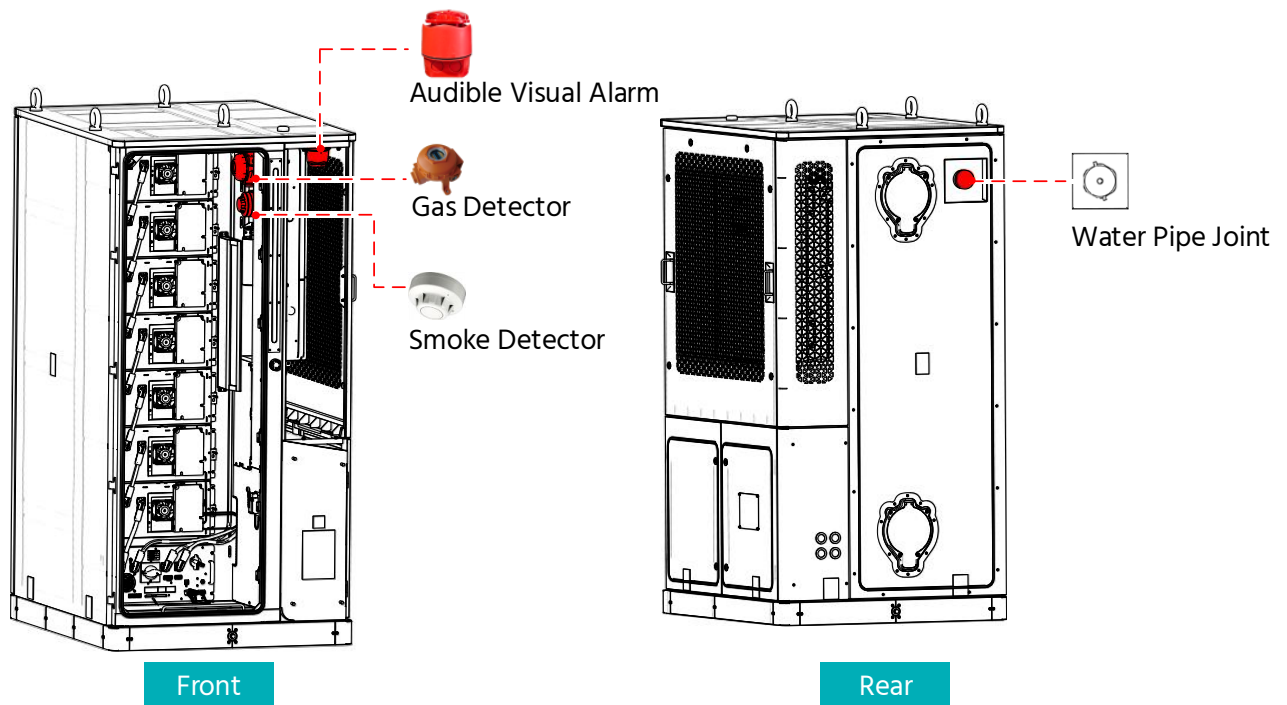
explosion proof ventilation system.

### 3.3.1 Fire Protection System

The fire protection system is mainly composed of fire alarm system and fire suppression system. The former consists of detectors and audible visual 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 audible visual alarm will alarm until the system is powered off. Please see the following for details.

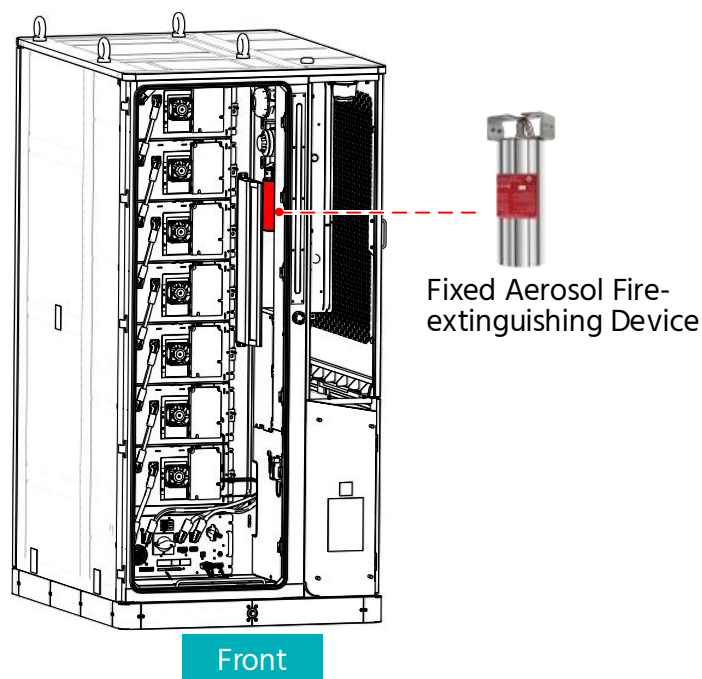
#### 3.3.1.1 Fire Alarm System



#### 3.3.1.2 Fire Suppression System

The outdoor battery cabinet is equipped with an aerosol fire extinguishing solution. The fire extinguishing mechanism of aerosol is mainly reflected in two aspects:

- The cooling effect of endothermic decomposition.
- The chemical inhibition of the gas phase and the solid phase plays a synergistic role between each other.

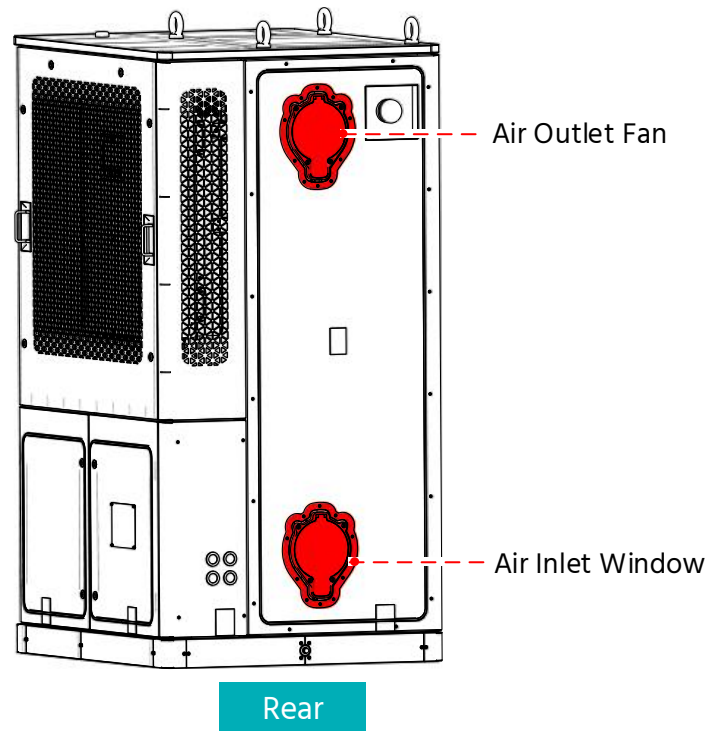


### Specifications of Fixed Aerosol Fire-extinguishing Device

|  | Technical Information                  |                                                                                                                                   |
|-------------------------------------------------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|                                                                                     | Product Model                          | JAD300-U01                                                                                                                        |
|                                                                                     | Mass of Compound                       | 300g                                                                                                                              |
|                                                                                     | Operating Temperature Range            | -40 °C~+54 °C                                                                                                                     |
|                                                                                     | Actuation Method                       | Electrical                                                                                                                        |
|                                                                                     | Discharge Time                         | 15 s (± 5 s)                                                                                                                      |
|                                                                                     | Oxidant Name and Content               | Potassium nitrate 59% ~ 69%                                                                                                       |
|                                                                                     | Nozzle 200 °C, 75 °C Thermal Clearance | 0.7 m, 1.3 m                                                                                                                      |
|                                                                                     | Minimum Design Application Density     | Class A: 105.3g/m <sup>3</sup> Class B: 78g/m <sup>3</sup> Class C: 105.3g/m <sup>3</sup> Fuel combination: 105.3g/m <sup>3</sup> |
|                                                                                     | Net Weight                             | 2320 (± 70 g)                                                                                                                     |
|                                                                                     | Standard Sizes                         | Ø76 × 192 mm                                                                                                                      |
|                                                                                     | Maximum Protection Space               | 5m <sup>3</sup>                                                                                                                   |
|                                                                                     | Device Finished Resistor               | 1.1 ± 0.2 Ω                                                                                                                       |
|                                                                                     | Electric Initiator Rated Current       | 2A/5ms                                                                                                                            |
|                                                                                     | Feedback                               | Normally open and closed (non-recoverable)                                                                                        |
|                                                                                     | Useful Time                            | 15 years                                                                                                                          |

### 3.3.2 Explosion-proof Ventilation System

The explosion-proof ventilation system actively monitors and exhausts hazardous gases to prevent the accumulation of flammable concentrations. By maintaining safe internal pressure and temperature, it critically reduces the risk of thermal runaway escalating into a fire or explosion.



## 4 Mechanical Installation

### 4.1 Checking Before the Installation

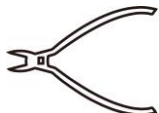
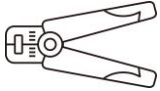
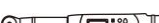
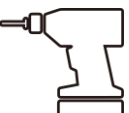
#### Checking the Outer Packing

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

### 4.2 Preparing Tools and PPE

| Tools                                                                               |                                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|    |    |    |      |     |    |
| Wire Cutter                                                                         | Crimping Modular Plier                                                              | Adjustable Wrench                                                                   | Wire Stripper                                                                         | Torque Wrench                                                                         | Screwdriver                                                                           |
|  |  |  |  |  |                                                                                       |
| Cable Tie                                                                           | Socket Wrench set                                                                   | Electric Drill                                                                      | 1000VDC Multimeter                                                                    | Electric Screwdriver                                                                  |                                                                                       |
| PPE (Personal protective equipment)                                                 |                                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |
|  |  |  |    |  |  |
| Insulating Gloves                                                                   | Anti-arc Flash Suit                                                                 | Safety Shoes                                                                        | Ear Protector                                                                         | Safety Goggles                                                                        | Anti-static Bracelets                                                                 |

#### NOTE:

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

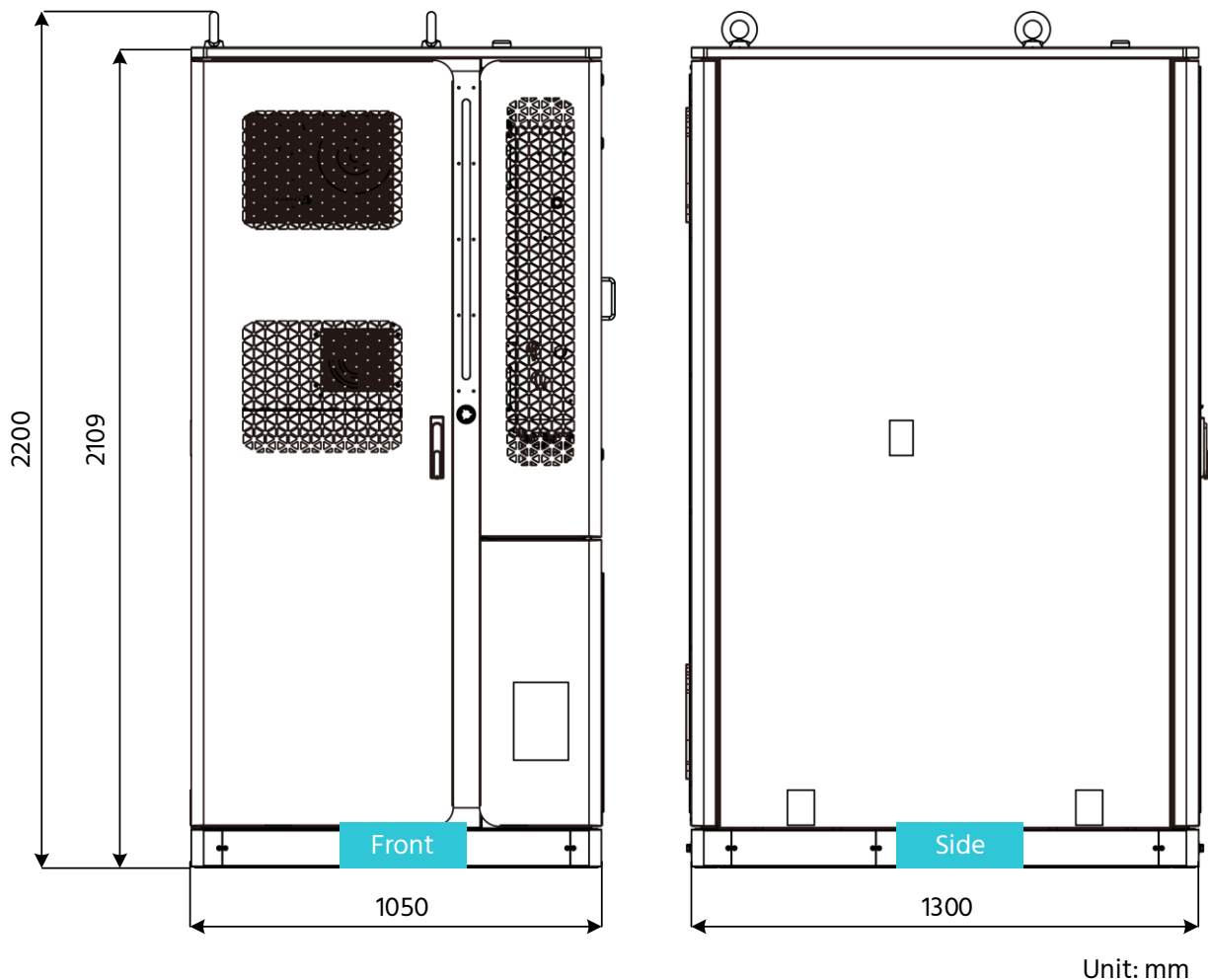
## 4.3 Selecting the Installation Sites

### 4.3.1 Working Environment Requirements

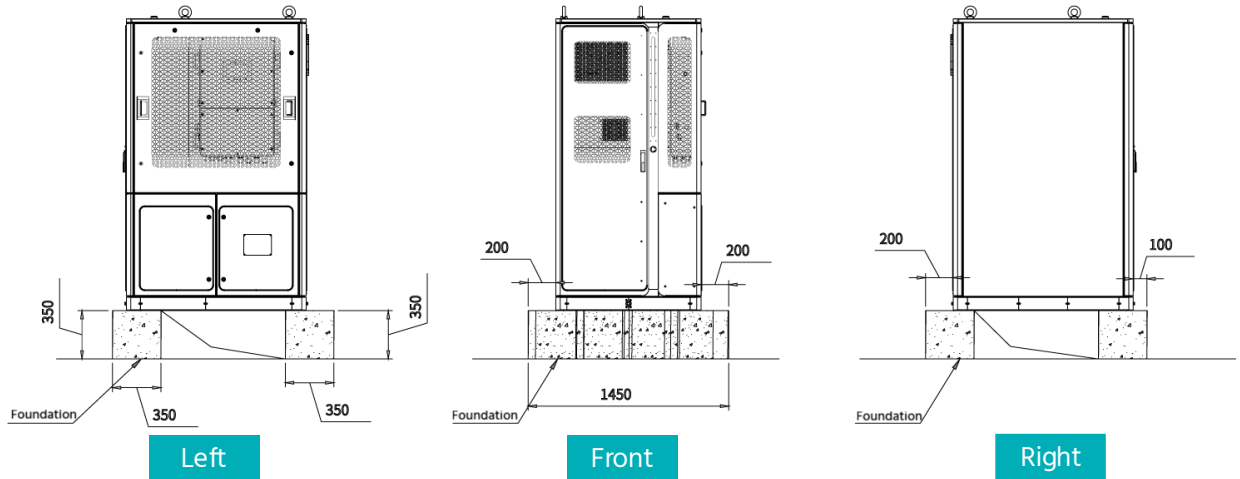
- Be sure to keep the cabinet away from high salt spray, corrosive environment, away from heat source and flammable and explosive materials.
- The installation environment should be as far away from the living area as possible. If there is a large flow of people at the installation site, it is recommended to install a fence.
- The ambient temperature should be guaranteed between  $-25\sim 50^{\circ}\text{C}$  to ensure that the indoor cabinet can operate properly. A heating or cooling system may be needed when necessary.

### 4.3.2 Installation Space Requirements

The external dimensions of the cabinet are as follows (including hybrid inverters).



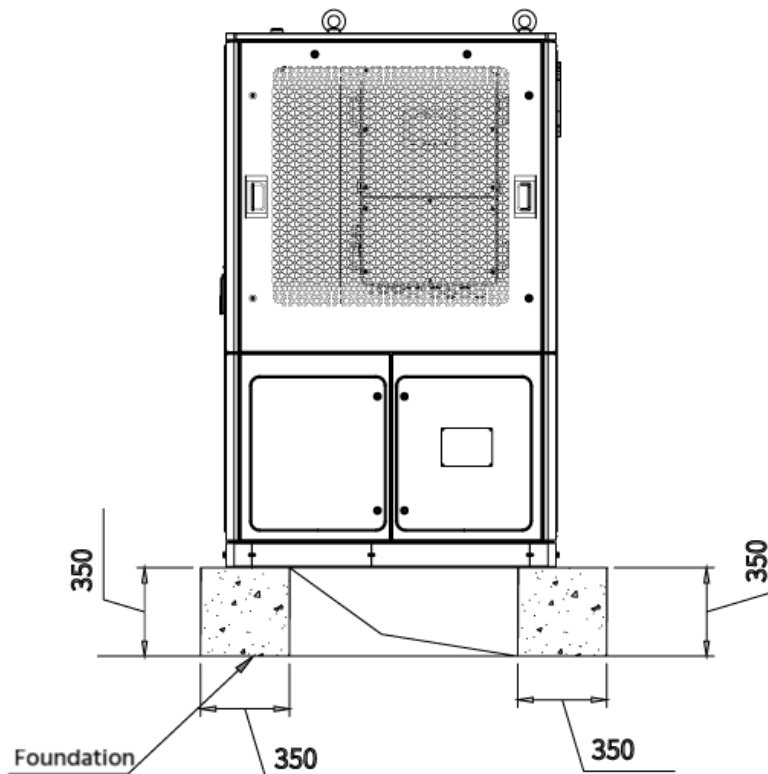
- The installation space for a single cabinet system is shown below (recommended spacing).



### 4.3.3 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 1450 kg).
- 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 350 mm above the level ground



- 
- 991
- 744
- 474
- 474
- 1231
- 25
- 18
- Ø18
- Unit: mm

**WARNING**

33

## 4.4 Handling of the Cabinet

The outdoor cabinet can be transported by crane or forklift.

### DANGER

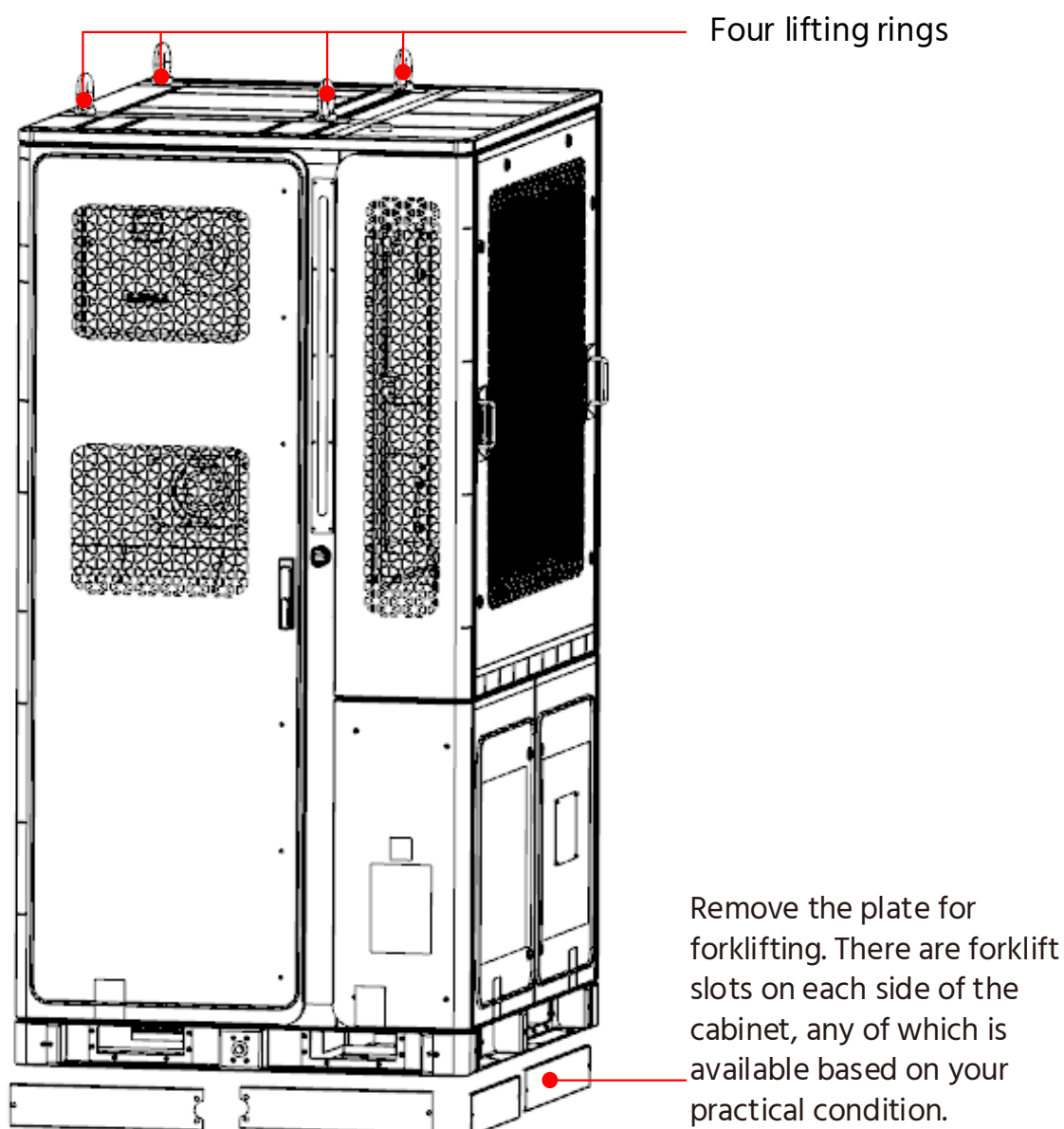
Pay attention to the falling risk which can cause severe injury or death. Do not stand under a lifted load. Make sure no unauthorized personnel are in the vicinity of a lifted load.

### 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



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 10 mounting holes (marked in red).



- 35

## 5 Electrical Wiring

### **DANGER**

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

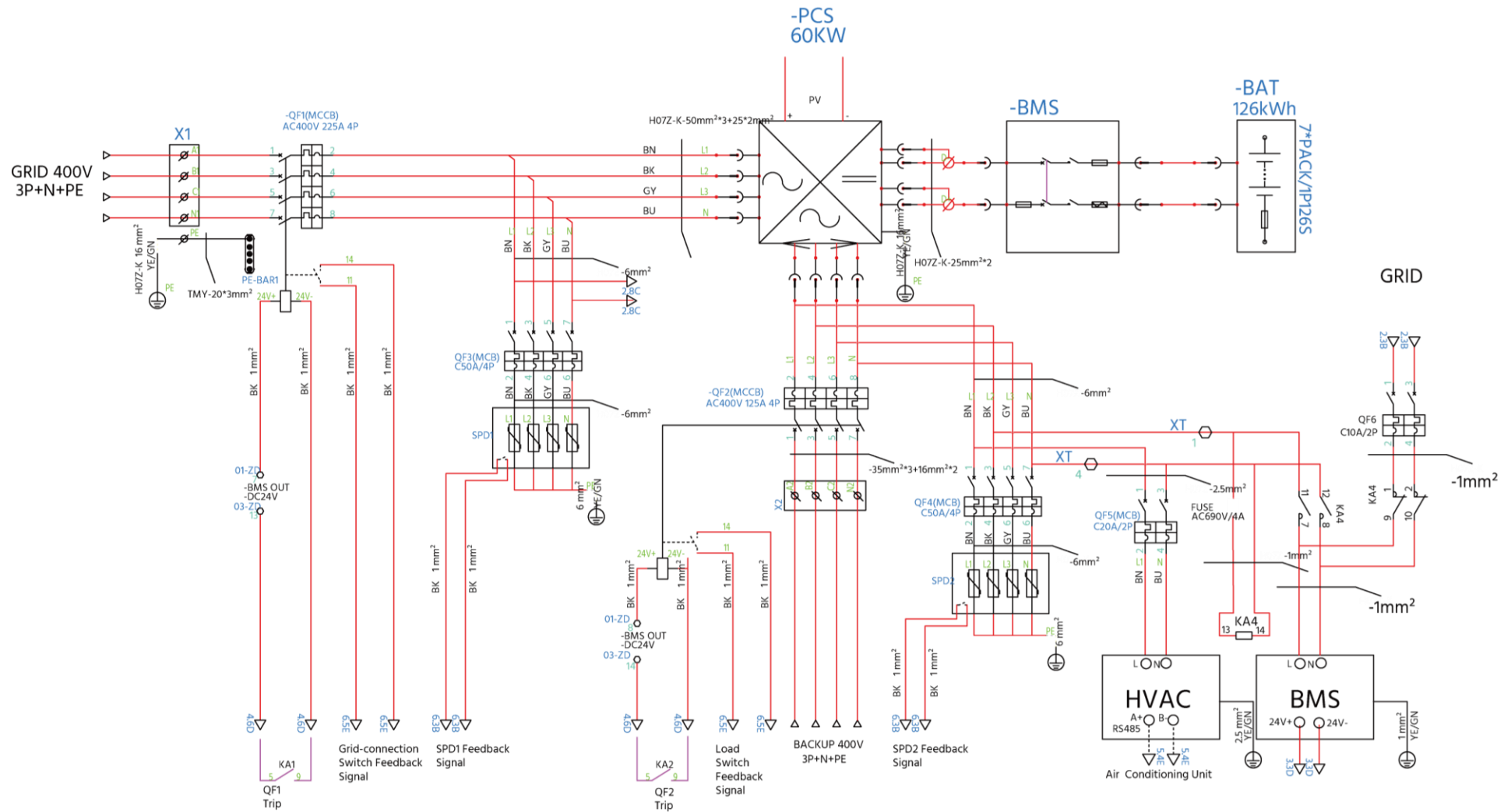
### **DANGER**

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.

## 5.1 System Diagram



## 5.2 Cable Requirements

For outdoor electrical equipment, the wire diameter of cables in cabinets shall be determined by the maximum current of both AC and DC sides, and an appropriate residual margin shall be allowed to cope with current fluctuations and environmental changes.

Please follow the cable specifications below.

| Cable                                 | Copper Wire Diameter Requirements               | Terminal Model             | Suggested Torque $\pm 10\%$ |
|---------------------------------------|-------------------------------------------------|----------------------------|-----------------------------|
| GRID -AC L1/L2/L3/N Cable             | $\geq 50 \text{ mm}^2 * 4$                      | SC50-10                    | 9 N·m                       |
| BACK UP -AC L1/L2/L3/N Cable          | $\geq 35 \text{ mm}^2 * 4$                      | SC35-8                     | 7 N·m                       |
| Ground PE-Cable                       | $\geq 25 \text{ mm}^2$                          | SC25-6                     | 5 N·m                       |
| Ground PE – Galvanized Flat Iron      | $\geq 25 \text{ mm}^2$                          | SC25-10                    | /                           |
| External Ethernet communication cable | Ultra Category 6 shielded cable                 | RJ45                       | /                           |
| External RS485 cable                  | Twisted shielded cable<br>$\geq 1 \text{ mm}^2$ | E1008 (1 mm <sup>2</sup> ) | /                           |

## 5.3 Electrical Connection

### DANGER

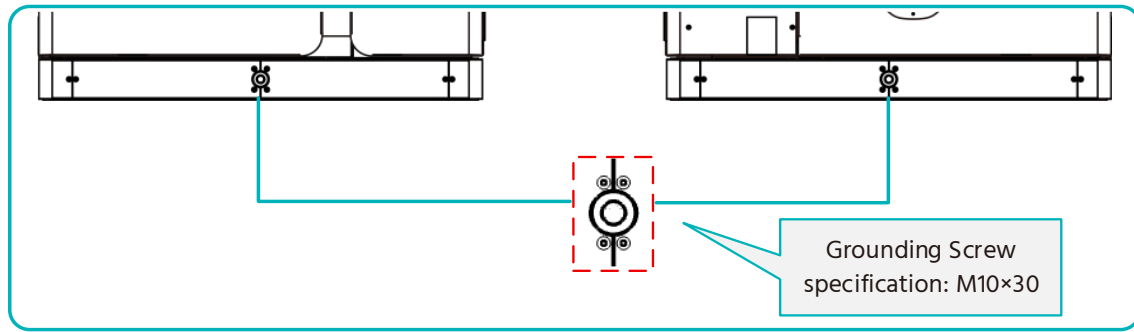
- This system is a high voltage AC system, operated by qualified and authorized person only.
- When wiring the cables, ensure that the energy storage system DC side and AC side are all disconnected.
- Whenever operating the system, wear suitable personal protective equipment (PPE) such as rubber gloves, rubber boots and goggles.

### 5.3.1 Grounding

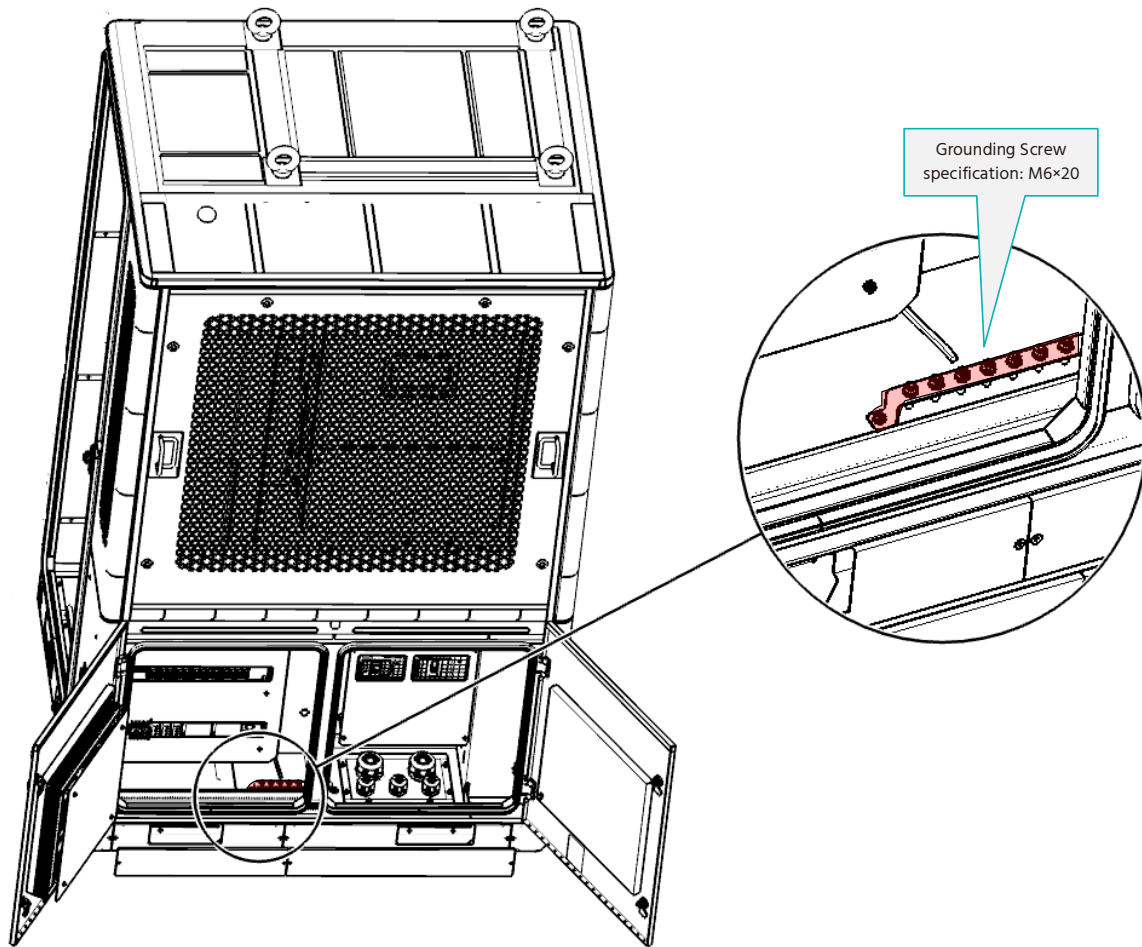
#### 5 DANGER

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 grounding points for cabinet grounding.

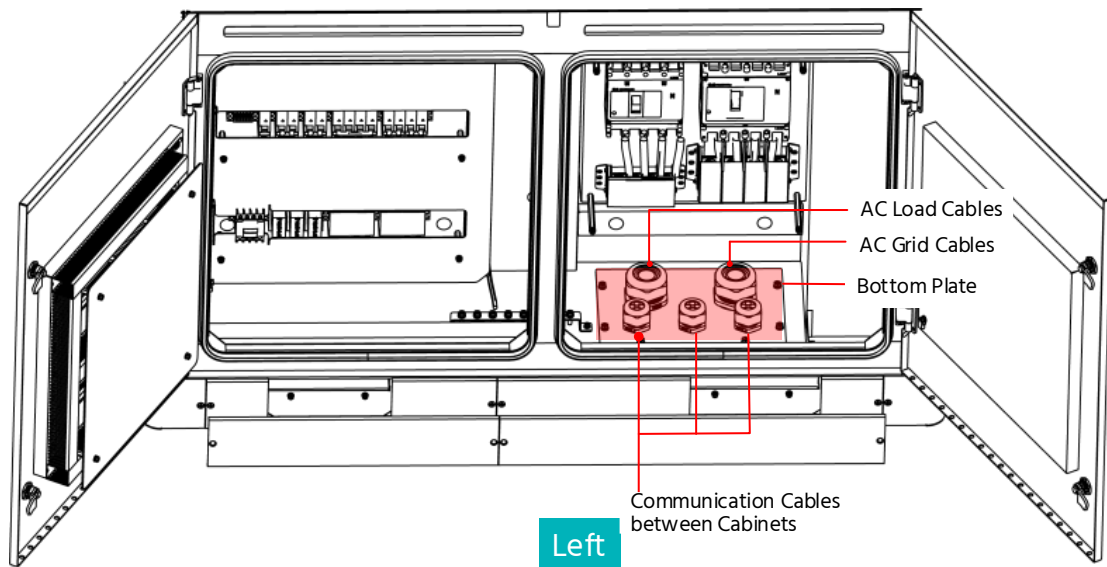


- Grounding copper bars: Grounding cable(s) connected to grounding bars inside the cabinet.

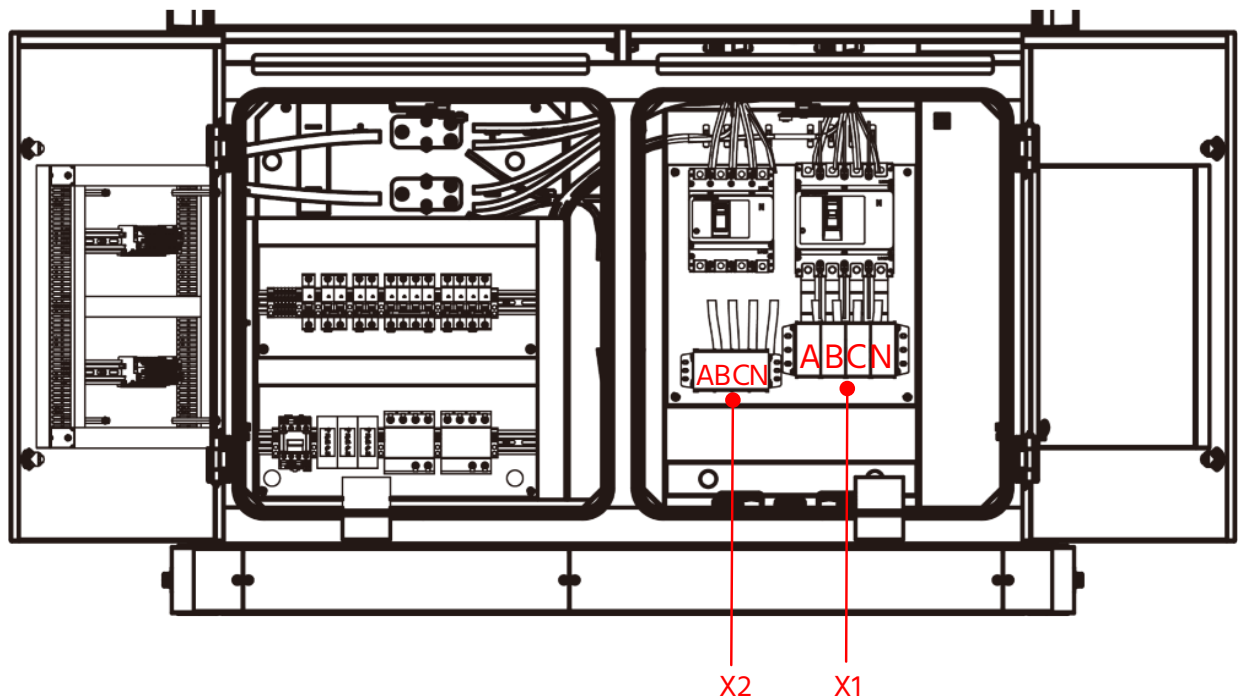


### 5.3.2 AC Side Cable Wiring

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



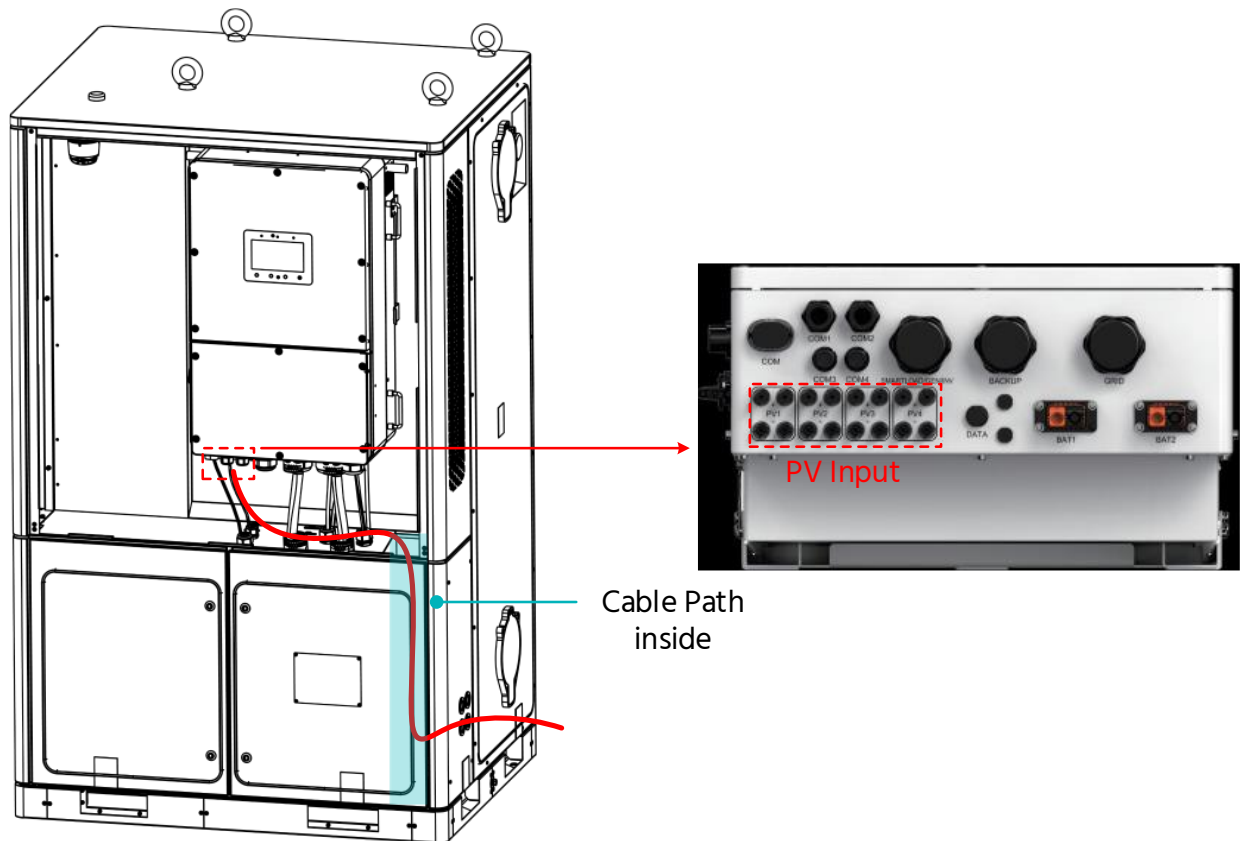
2. Feed the cables through the pre-opened holes in the plate. According to the labeling, connect the cables of each phase sequence in turn, and three opposite sequences are not allowed. After finishing wiring, replace the bottom plate and fasten the screws. And tighten the two gland heads.



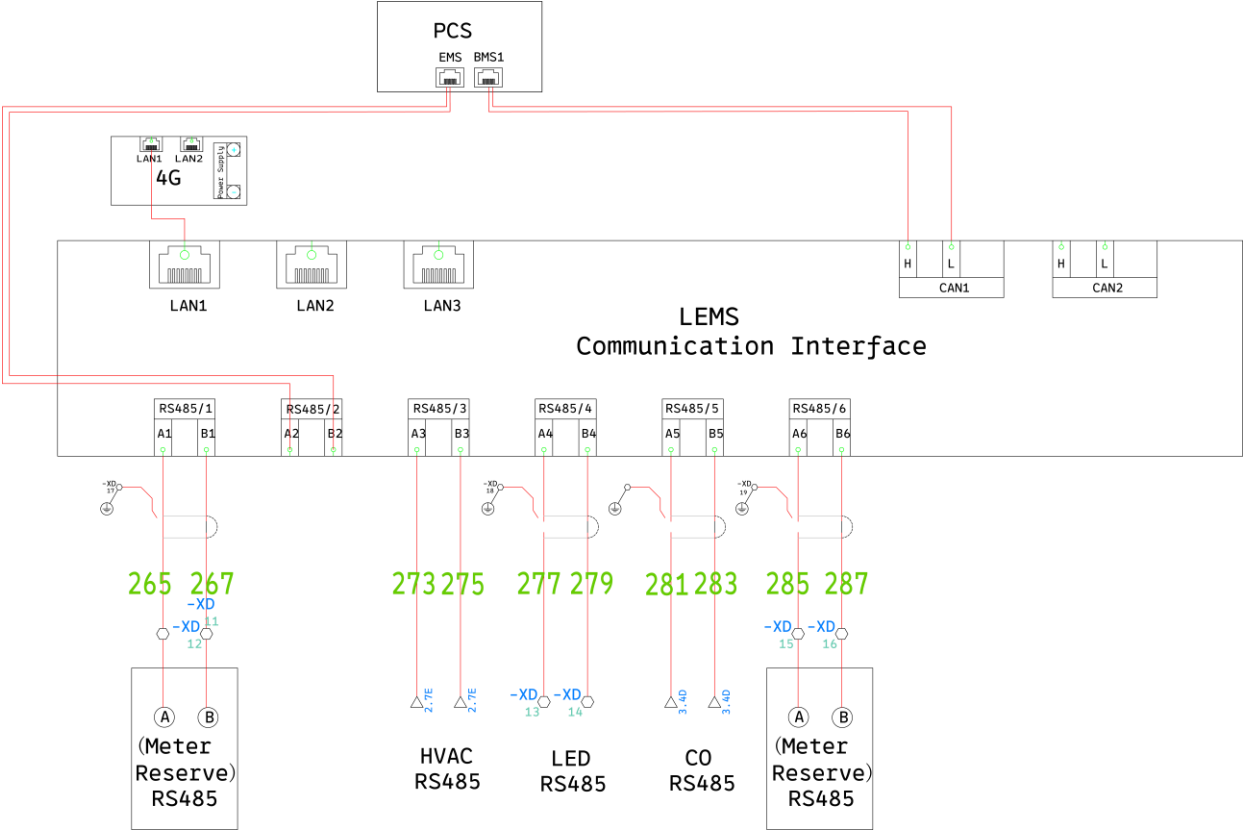
**NOTE:** Ensure that all connections are correct, and there is no overlap and no stress between the wires and sheet metal.

### 5.3.3 PV Side Cable Wiring

The simplified representation is shown below.



5.4 Communication Wiring



## 6 Commissioning

### 6.1 System Status

The battery cabinet system status can be viewed through the Status LED on the front door.

| Equipment Status   | Light Color                                                                                           | Dynamic Effect                                       | Descriptions                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Power-on Self-test | Colorful                                                                                              | Upward running light (from bottom to top)            |                                                                                                                                  |
| Charging           | Pylon Blue<br>       | Steady on (SOC) + Running light (from bottom to top) | SOC:10%~100%                                                                                                                     |
| Discharging        | Pylon Blue<br>       | Steady on (SOC) + Running light (from top to bottom) | SOC:10%~100%                                                                                                                     |
| Low Battery        | Red<br>            | Slow blink: off 5s, on 2s                            | SOC $\leq$ 10%                                                                                                                   |
| Shutdown           | Off                                                                                                   |                                                      |                                                                                                                                  |
| Standby            | Pylon Blue<br>     | Steady on                                            | 10%~100%                                                                                                                         |
| Warning            | Warning Yellow<br> | Fast blink: off 2s, on 1s                            | <sup>2</sup> System fault code: Level 2 warning status; or Battery string/Battery pack fault code: Level 2 warning status;       |
| Fault              | Red<br>            | Steady on                                            | <sup>2</sup> System fault code: Level 0, 1 warning status; or Battery string/Battery pack fault code: Level 0, 1 warning status. |

### 6.2 System Turning On

## WARNING

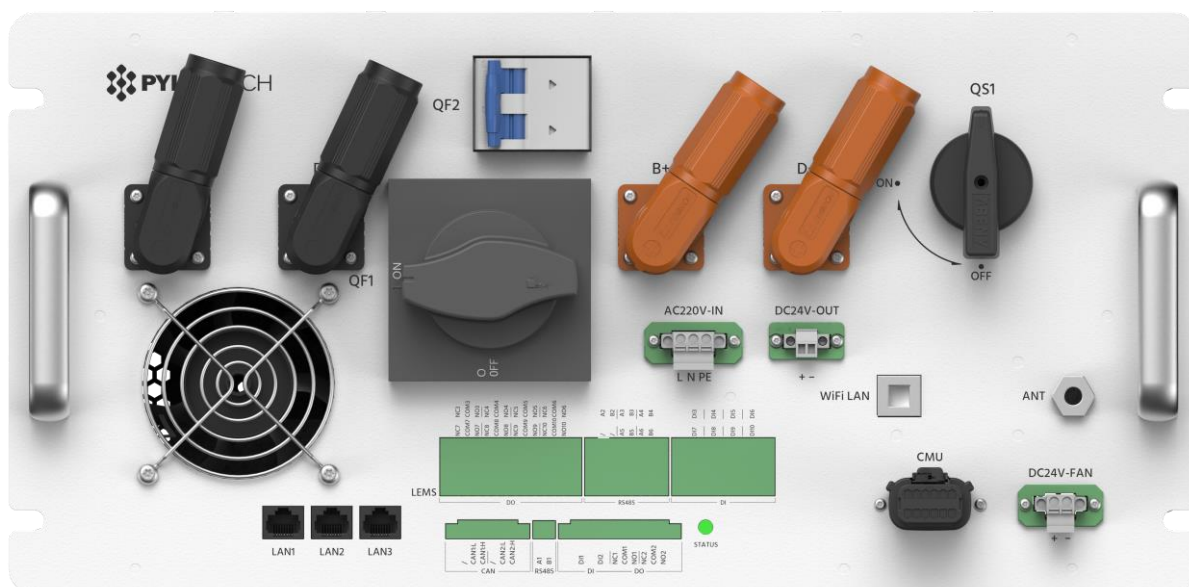
Double check all the power cables and communication cables. Ensure that the voltage of the hybrid inverter matches the voltage of the battery system. Check to make sure that all the power switches are OFF.

## WARNING

The external switches or breakers between The hybrid inverter 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 (molded case circuit breaker) (QF1), connect to the power grid.
2. Switch on the MCCB (molded case circuit breaker) (QF2), connect to the power BACK UP.
3. Switch on the MCB (micro circuit breaker) (QF3-4), connect to SPD.
4. Switch on the MCB (QF5), the air conditioner starts up.
5. Switch on the MCB (QF6), which is the BMS power supply.
6. Close the electrical compartment door.
7. Turn on the BMS according to the following operation.



- i. Switch on the MCCB (molded case circuit breaker) (QF1).
  - ii. Switch on the MCB (micro circuit breaker) (QF2).
  - iii. Switch on the disconnect (QF5).
8. Quickly close the cabinet door.
  9. Turn on the hybrid inverter: press the ON/OFF button on the left side of the inverter.
  10. Commission the hybrid inverter.  
Refer to **Chapter 5** of the hybrid inverter manual.

The hybrid inverter manual QR code:



**⚠ 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.

**📄 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 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.

### 7.1 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 to turn off the BMS QF1, QF2, QS1.
3. Turn off the MCB (QF6).
4. Switch off the MCB(QF5).
5. Switch off the MCB (QF3-4).
6. Switch off the MCCB (QF1-2).

### 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 hybrid inverter first prior to turning off the isolating switch in normal running condition.

## 7.2 Routine Maintenance

Due to the influence of ambient temperature, humidity, dust, vibration, etc., the internal components of the system or equipment will be aged or worn, which will lead to the potential failure of the system or equipment. Therefore, it is necessary to carry out routine 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.<br>(2) Check whether there is any abnormal sound in the operation of the energy storage system.<br>(3) Check whether the parameters are correct during system operation.<br>(4) Check whether the main devices are normal.<br>(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.<br>(2) Check the cleanliness of the fly nets.<br>(3) If necessary, a compressed air machine must be used to clean the system.<br> <b>NOTE:</b> 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.<br>(2) Check power cables and control cables for damage, especially cut marks on the skin in contact with metal surfaces.<br>(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 wiring                     | (1) Check whether the control terminal screws are loose and tighten them with a screwdriver.                                                                                                                                                                                                                                                                                                                                                                      | Officially run for six months, then                                                              |

|                                         |                                                                                                                                                                                                                                                                                                                                               |                                                                              |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| connection check                        | <p>(2) Check whether there is any color change in the wiring copper or screws.</p> <p>(3) Visually inspect the connections such as equipment terminals and the distribution of wiring.</p> <p>(4) Check the main circuit terminals for poor contact and screw locations for signs of overheating.</p>                                         | every six months to one year thereafter.                                     |
| Circuit breaker maintenance             | <p>(1) Routine inspection of all metal components for corrosion.</p> <p>(2) Annual inspection of contactors (auxiliary switches and micro-switches) to ensure that they are in good mechanical working order.</p> <p>(3) Check the operating parameters (especially voltage and insulation).</p>                                              | Officially run for six months, then every six months to one year thereafter. |
| SPD check                               | <p>(1) Annual inspection of cable connection to ensure that they are in good mechanical working order.</p> <p>(2) Check the operating parameters (especially voltage and insulation).</p>                                                                                                                                                     | Every 6 months to 1 year                                                     |
| Battery maintenance                     | <p>(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.</p> <p>(2) It is recommended that the battery be fully charged and equalized on a regular basis.</p> | Every 6 months to 1 year                                                     |
| Fixed Aerosol fire-extinguishing device | <p>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.</p> <p>The fire extinguishing equipment is maintenance-free for its own validity period.</p>                                                             | Officially run for six months, then every six months to one year thereafter. |
| Air conditioner maintenance             | <p>(1) Check whether the temperature of the air outlet is close to the cooling setting value, <math>\pm 2^{\circ}\text{C}</math>.</p> <p>(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.</p>                                  |                                                                              |
| Safety Functions                        | <p>(1) Check the stop function of the emergency stop button.</p> <p>(2) Simulate a shutdown and check shutdown signal communication.</p> <p>(3) Check the body warning signs and other equipment markings and replace them if they are found to be blurred or damaged.</p>                                                                    | Officially run for six months, then every year thereafter.                   |

## 7.2.1 Battery Maintenance



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.

### 7.2.2 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.

### 7.2.3 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 it with compressed air.    | 6 months             |

## 7.3

### 7.3 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.

#### 7.3.1 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        | DCOVErr input over voltage error (Bit3)         | D+ D- voltage extremely higher than battery system voltage.               | Check that if the hybrid inverter'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.<br>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.<br>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.<br>Check the connectivity and reliability of the power and communication cables.<br>Swap the current measurement board or BMS.<br>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.<br>Swap out the RED LED battery module.<br>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 swap the BMU of the module. |

### 7.3.2 Hybrid Inverter Trouble Shooting



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.<br>2. Confirm whether the inverter is controlled by an external third-party device.<br>3. Confirm whether the power setting of the inverter power control is limited.<br>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 in normal operation.                                                                                                                                                                                                                                                                                                                                                                              |
| LmtByFreq    | Frequency power limited                         |                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| LmtByVg      | The device is in the Volt-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.<br>2. Inverter factory test errors causing this mode to open, if you need to close, you can close 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-Var mode 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.<br>2. Inverter factory test errors causing this mode to open, if you need to close, you can close 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 gridstatus |                             |
| GridToLoad    | Grid to load                     |                             |

| Message Name | Information Description                          | Troubleshooting Suggestion                                                                                                                                      |
|--------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Surge Alarm  | On-site grid surge                               | 1. Grid side fault, restart the device.<br>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.<br>2. Confirm that the AC cable is properly connected.<br>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.<br>2. Confirm that the AC cable is properly connected.<br>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.<br>2. Measure battery voltage at plug.                                         |

|            |                       |                                                                                                                                                                    |
|------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OV-Vbackup | Inverting overvoltage | 1. Check whether the backup port wiring is normal<br>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 selection is 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 and inverter. 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<br>(1020 DATA:0001)  | DC 1 input overvoltage               | 1. Check if the PV voltage is abnormal<br>2. Restart the system, confirm that the fault continues                                                                                                                                                                                                        |
| OV-DC02<br>(1020 DATA:0002)  | DC 2 input overvoltage               |                                                                                                                                                                                                                                                                                                          |
| OV-BUS<br>(1021 DATA:0000)   | DC bus overvoltage                   | 1. Restart the system, confirm that the fault continues.                                                                                                                                                                                                                                                 |
| UN-BUS01<br>(1023 DATA:0001) | DC bus undervoltage                  |                                                                                                                                                                                                                                                                                                          |
| UNB-BUS<br>(1022 DATA:0000)  | DC bus unbalanced voltage            |                                                                                                                                                                                                                                                                                                          |
| UN-BUS02<br>(1023 DATA:0002) | Abnormal detection of DC bus voltage |                                                                                                                                                                                                                                                                                                          |
| DC-INTF.<br>(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<br>(1018 DATA:0000)     | A phase RMS<br>value overcurrent       | 1. Confirm that the grid is abnormal.<br>2. Confirm that the AC cable connection is not abnormal.<br>3. Restart the system, confirm that the fault continues. |
| OV-DCA-I<br>(1025 DATA:0000)   | DC 1 average overcurrent               | 1. Restart the system, confirm that the fault continues.                                                                                                      |
| OV-DCB-I<br>(1026 DATA:0000)   | DC 2 average overcurrent               |                                                                                                                                                               |
| GRID-INTF. (1030<br>DATA:0000) | AC hardware overcurrent<br>(abc phase) |                                                                                                                                                               |

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

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

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

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

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.

### 7.3.3

#### 7.3.3 Air Conditioner Trouble Shooting

##### 7.3.3.1 Fan Faults & Recovery Measures

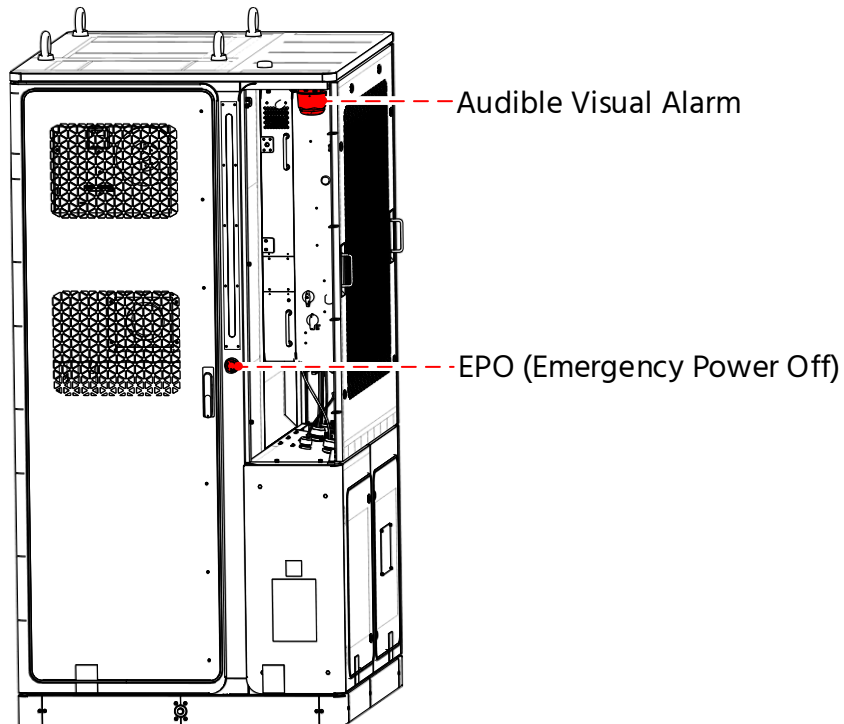
| Symptom                                            | Possible cause                                                   | Check items or processing method                                                                                                         |
|----------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                               |

### 7.3.3.2 Cooling System Failure & 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.<br><br>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 <i>Section 7.3.3.1 Fan Faults &amp; Recovery Measures</i> .                                                                                                                                                                                                                                                |
| The evaporator freezes up.   | The internal circulation fan is not running.      | Refer to table in <i>Section 7.3.3.1 Fan Faults &amp; Recovery Measures</i> .                                                                                                                                                                                                                                                    |
|                              | The capillary temperature sensor cannot work.     | Check whether the connection is normal. If it is abnormal, replace the capillary temperature sensor.                                                                                                                                                                                                                             |

## 7.4 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.



## 8 Shipment and Storage

### 8.1 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  $\leq 15^\circ$ . 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  $\leq 39\%$  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.

### 8.2 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-free 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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