

Lithium Iron Phosphate (LFP)

Battery Energy Storage System

PowerCube-M1D-200 Product Instruction

Information Version: 1.0

This instruction is for PowerCube-M1D-200 from Pylontech. PowerCube-M1D is a high voltage Lithium-Ion Phosphate Battery storage system. Please read this document before installing the battery and follow the instructions carefully during installation. Any confusion, please contact Pylontech immediately for advice and clarification.

Contents

1 Safety 4

1.1 Abbreviations Used in this Manual 5

2 System Introduction 6

2.1 Product Introduction 6

2.2 Specifications 7

2.2.1 Parameters of the Battery String 7

2.2.2 Battery Module 7

2.2.3 Control Module 9

3 **Battery Rack Installation 12**

3.1 Checking Before Installation 12

3.2 Preparing Tools and Instruments 12

3.3 Installation Space Requirements 13

3.4 Installation the Rack 13

4 **Control Module & Battery Module Installation 14**

4.1 Prerequisites 14

4.2 Install the Module 15

4.3 Securing the Rack 17

4.4 Rack Grounding 18

4.5 Connect the cables 19

5 Electrical and Communication Wiring 22

5.1 Cable List 22

5.2 Battery String Wiring Diagram 23

5.3 Cable Connection 23

6 Maintenance 24

6.1 System Turning On 24

6.2 System Turning Off 24

6.3 Routine Maintenance 25

6.3.1 Battery Maintenance 26

6.4 Trouble Shooting 27

6.4.1 Battery String Trouble Shooting 28

7 Shipment and Storage 29

7.1 Shipment 29

7.2 Storage 29

1 Safety

The PowerCube-M1D-200 is a high voltage DC system 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.

Skills of Qualified Personnel

Qualified personnel must have the following skills:

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

1.1 Abbreviations Used in this Manual

Abbreviation	Designation
Pylontech	Pylon Technologies Co., Ltd.
DOD	Depth of Discharge
BMS	Battery Management System
PCS	Power Conversion System
SOC	State of Charge

2 System Introduction

2.1 Product Introduction

PowerCube-M1D-200, a high voltage battery storage system based on lithium iron phosphate battery, is one of the newest energy storage products developed and produced by Pylontech. It can be used to provide reliable power for various types of equipment and systems. PowerCube-M1D is especially suitable for application scene of high power, limited installation space, restricted load-bearing and long cycle life.



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

2.2 Specifications

2.2.1 Parameters of the Battery String

Product Type	Battery System
Product Name	Rechargeable Li-ion Battery System
Model Name	PowerCube-M1D-200
Controller Type	SM1D200Z
Battery Module Type	HM1D200F
Cell Rated Capacity [Ah]	314
Nominal Voltage [V]	57.6*n (where n=6~15)
Rated Energy [Wh]	18086.4*n (where n=6~15)
Standard Charge Voltage [V]	65.7*n (where n=6~15)
Discharge Cut-off Voltage (V)	50.4*n (where n=6~15)
Standard Charging Power (W)	9043.2*n (where n=6~15)
Standard Discharging Power(W)	9043.2*n (where n=6~15)
Charge Temperature Range (°C)	1~58
Discharge Temperature Range (°C)	-27~58
Weight(Kg)	26+126.5*n (where n=6~15)
Dimensions: (LxWxH)mm	Battery pack: 890±3*470±2*226±2 Control Box: 750±3*422±2*230±2 Battery rack: 906±2*594±2*1093±5
Battery Structure	18S*n (where n=6~15)
Ingress Protection (IP)	IP20
Protective Class	Class I
Pollution Degree	PD 2
Cooling type	Air cooling
Altitude (m)	≤3000

2.2.2 Battery Module

The battery system consists of 1 battery string, and one battery string contains 3 battery modules and 1 battery control module (BMS).

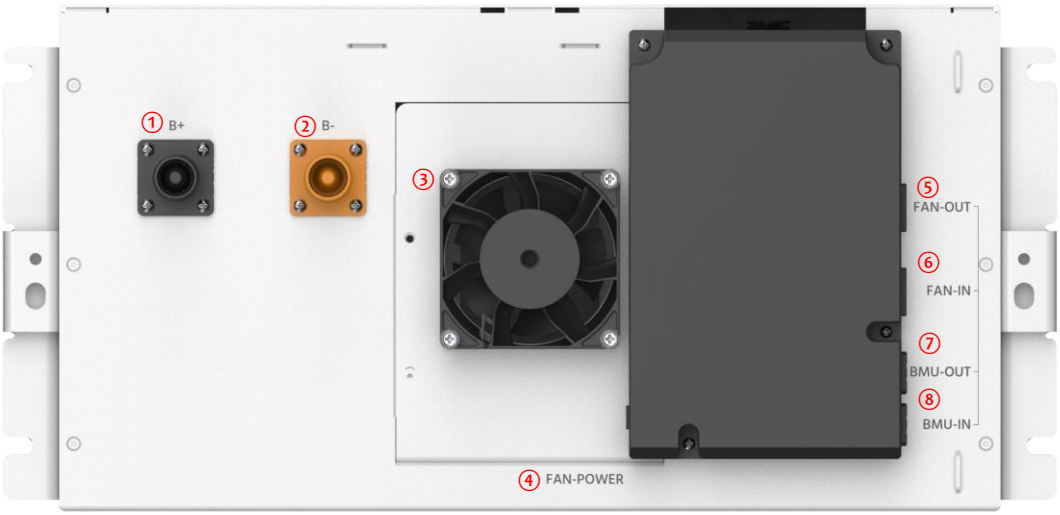
Product Type	Specifications
Cell Technology	Li-ion (LFP 314)
Battery Item	HM1D200F
Nominal Capacity (kWh)	18.086kWh

Product Type	Specifications
Battery Module Voltage (Vdc)	57.6
Dimension (W*D*H, mm)	890±3*470±2*226±2
Protection Class	IP20
Weight (kg)	126.5±2
Battery Module Capacity (AH)	314
PCBA power consumption (W)	< 2

Specifications of the Battery String

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

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

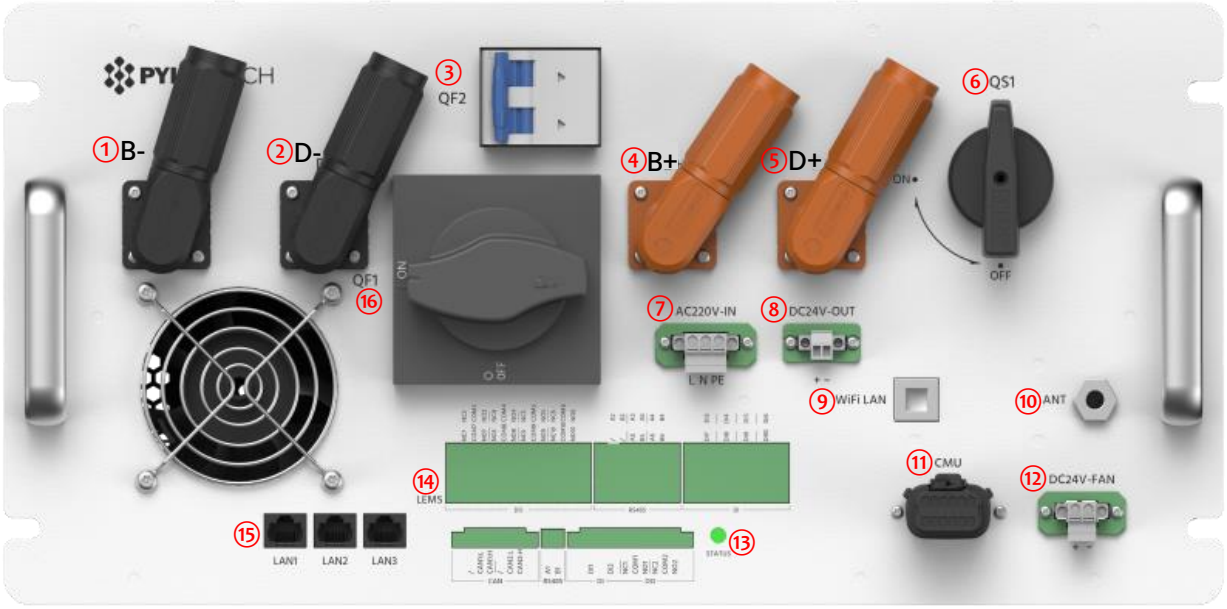
BMU power and communication cascade output

⑧ BMU-IN

BMU power and communication cascade input

2.2.3 Control Module

Control Module Front Interface



Product Type	SM1D200Z
Related Product	M1-D
AC Supply for BMS	230Vac/50Hz i=0.7*n (A) ,where n= n=6~15
System Operation Voltage (VDC)	270~1000
Operation Current (Maximum) (A)	200
PCBA power consumption (W)	< 4
Dimensions (W x D x H, mm)	750±3*422±2*230±2
Communication Protocol	MODBUS RTU\CAN\LAN
Protection Class	IP20

Product Type	SM1D200Z
Weight (kg)	26
Operation Life (year)	15+
Operation Temperature (℃)	-25~60
Storage Temperature (℃)	-30~65

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 🔴).

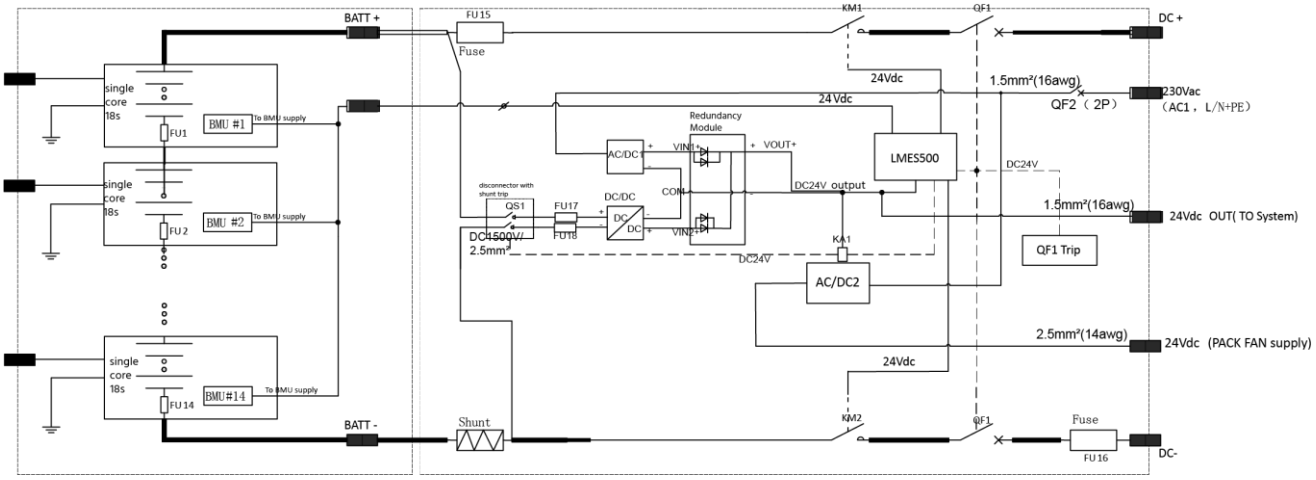
⑭ LAN1/LAN2/LAN3

External Communication Interface

⑮ QF1

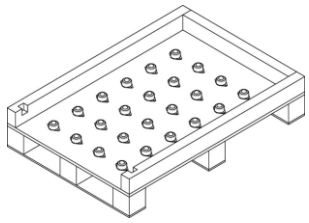
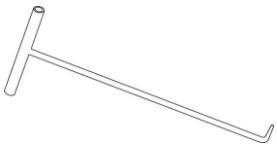
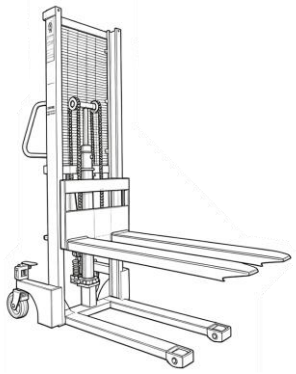
Main DC Circuit Breaker: DC Switch for Main Circuit

Diagram between battery modules and BMS

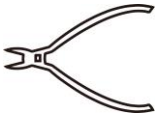
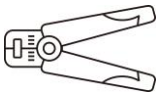
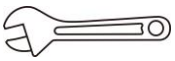
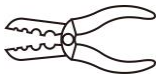
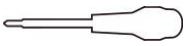
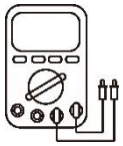
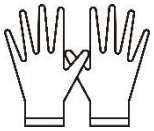


3 Battery Rack Installation

3.1 Checking Before Installation

		
Wooden Pallet	Hook	forklift

3.2 Preparing Tools and Instruments

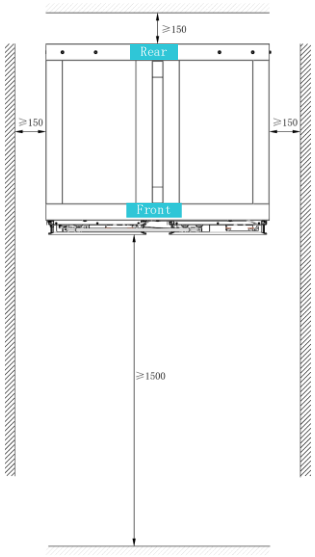
Tools					
					
Wire Cutter	Crimping Modular Plier	Adjustable Wrench	Wire Stripper	Torque Wrench	Screwdriver
					
Cable Tie	Socket Wrench set	Electric Drill	1000VDC Multimeter		r
PPE (Personal protective equipment)					
					
Insulating Gloves	Anti-arc Flash Suit	Ear Protector	Safety Shoes	Safety Goggles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

NOTE

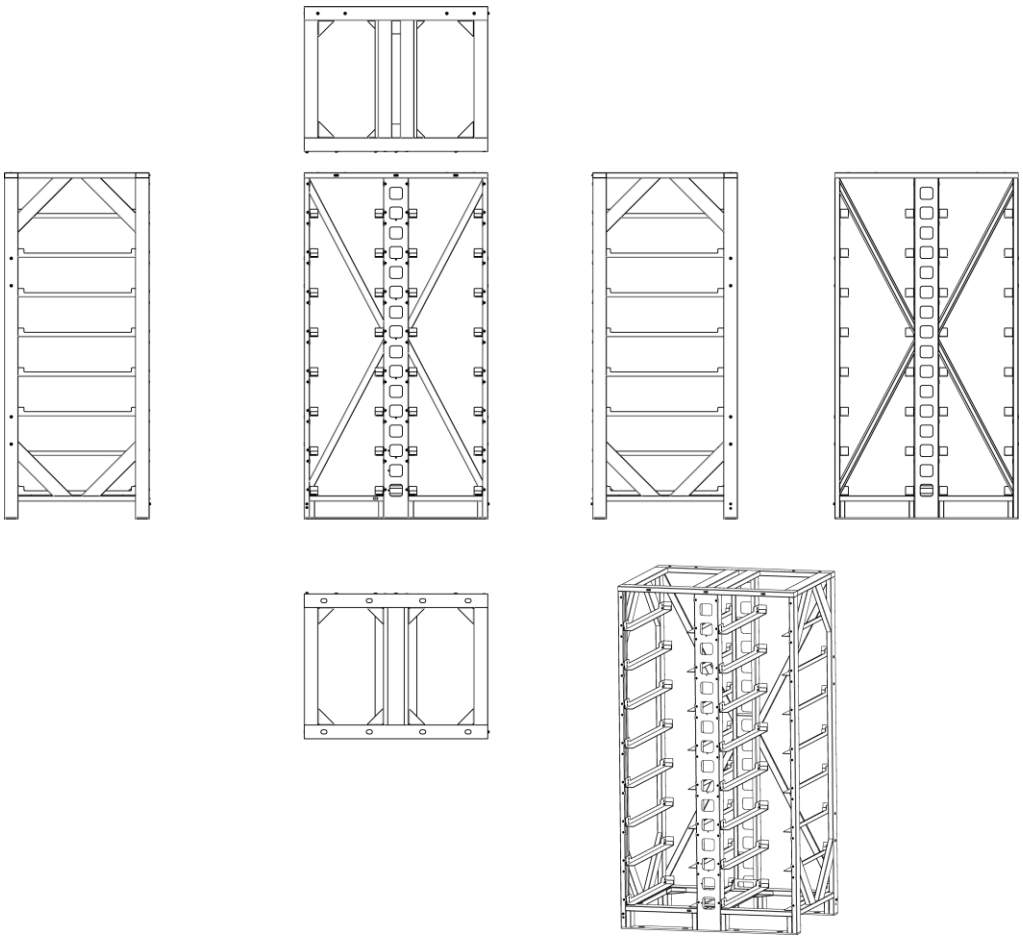
Use properly insulated tools to prevent accidental electric shock or short circuits. If insulated tools are not available, cover the entire exposed metal surfaces with available insulated alternatives,

except their tips, with electrical tape.

3.3 Installation Space Requirements



3.4 Installation the Rack



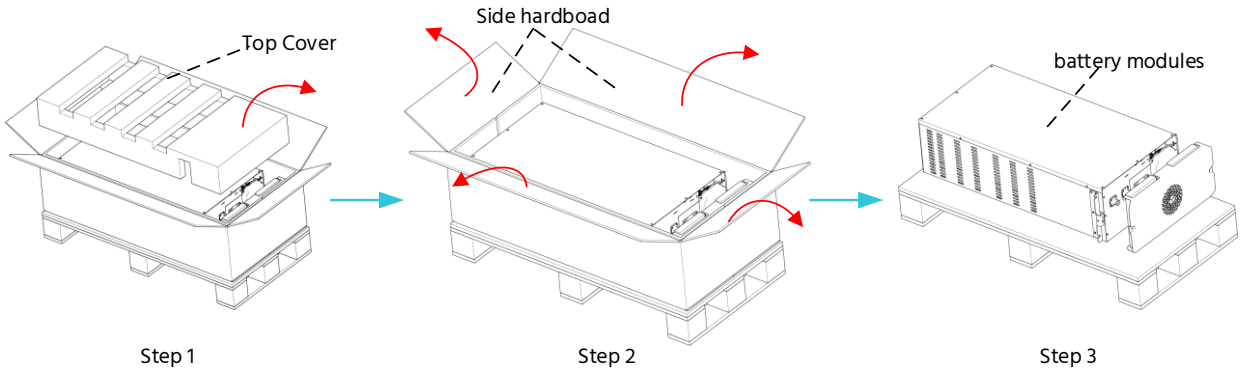
4 Control Module & Battery Module Installation

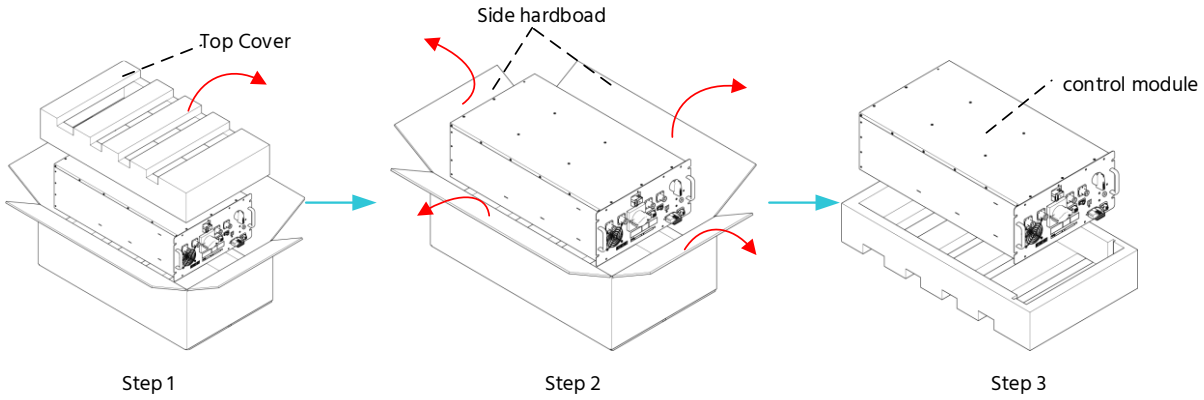
The method for mounting battery modules/control module onto the battery rack is identical. This chapter takes battery module installation as an example.

4.1 Prerequisites

The method for mounting battery modules/control module onto the battery rack is identical. This chapter takes battery module installation as an example.

Before mounting the battery module and control module onto the rack, lift off the top cover of the hardboard carton first, then take away the four side hardboards.





Note：

Move the battery module manually and place it in the rack.

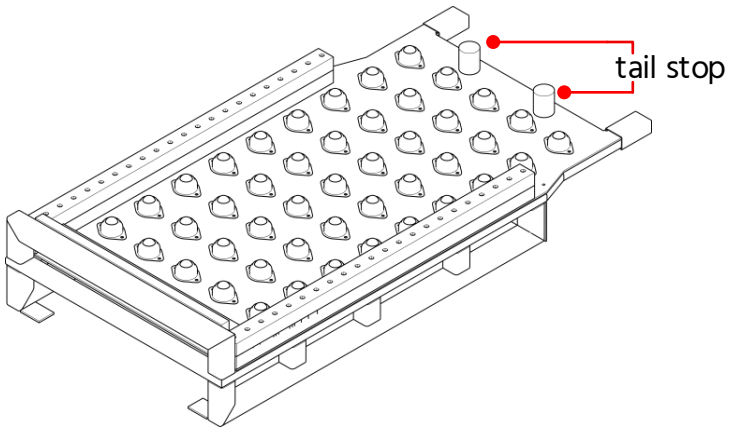
- One battery module weights 126.5kg. It ONLY can be handled by a lifting device.
- One control module weights 35kg (depending on your specific control module). It must be handled by at least two personnel.

It is suggested to use a special wooden pallet as below to install the battery module into the rack. The special wood pallet has evenly distributed rollers on the central of its top side. You can buy it

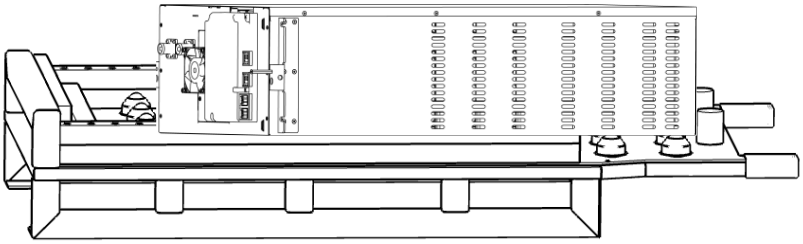
from Pylontech.

4.2 Install the Module

Step 1. Prepare a wooden pallet.

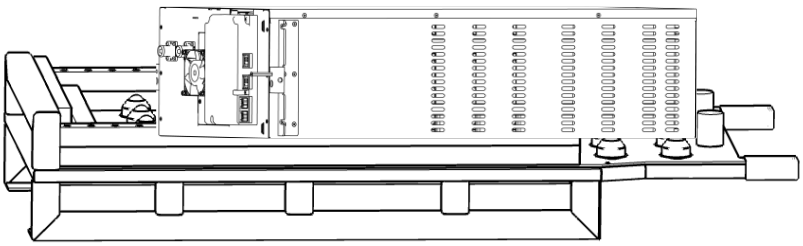


Step 2. Place the battery module (with base) and the wooden pallet in accordance with the diagram below, and ensure that the pallet's supporting surface and the battery module base are perfectly level.

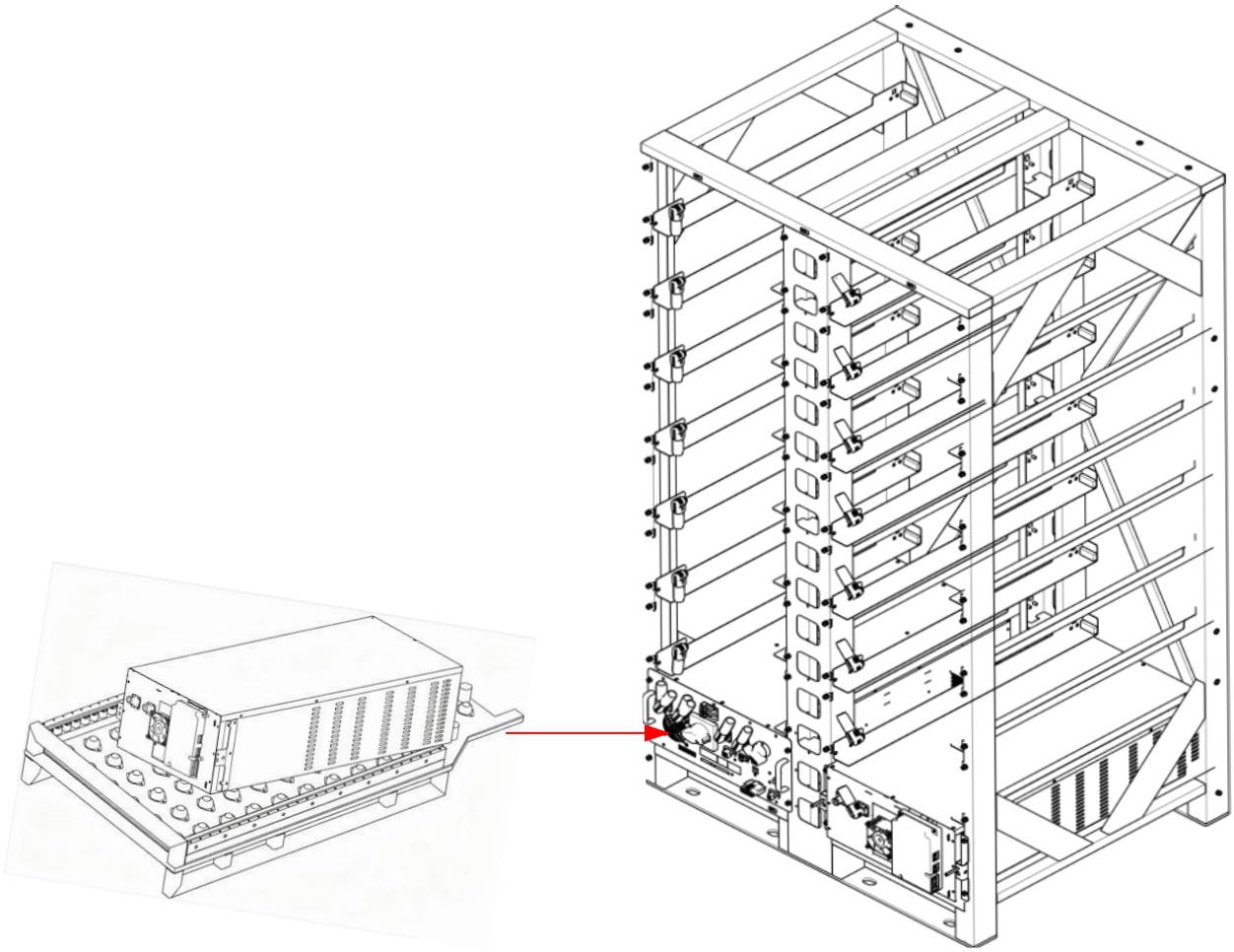


Step 3. Push the battery module onto the pallet manually or use a hook to pull the battery module on the pallet.

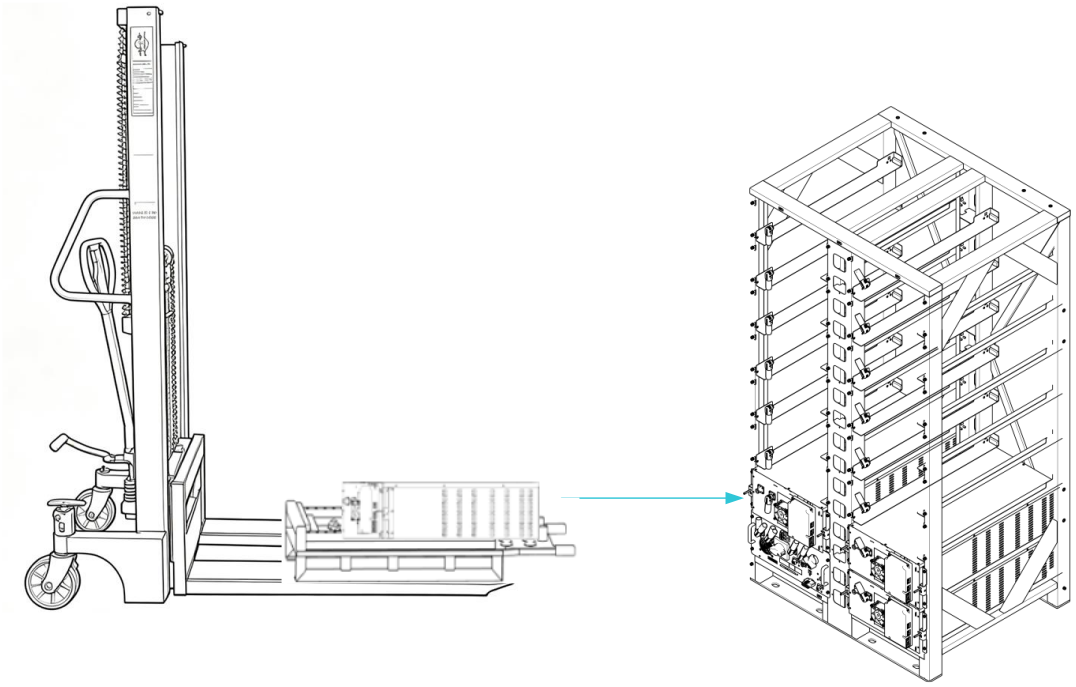
Step 4. After the battery module is completely placed onto the pallet, install the tail stop posts to prevent the battery from falling during lifting.



Step 5. Adjust the wooden pallet height, making sure the battery module is horizontally aligned with the lattice of the first layer of the rack..



Step 6. For installation above the second layer, lift the wooden pallet together with the battery module using a forklift. Adjust the wooden pallet height, making sure the battery module is horizontally aligned with the lattice of the rack.



NOTE

- The above picture is for illustration only. The actual rack prevails.
- The forklift is not provided by Pylontech. You shall prepare it by yourself.

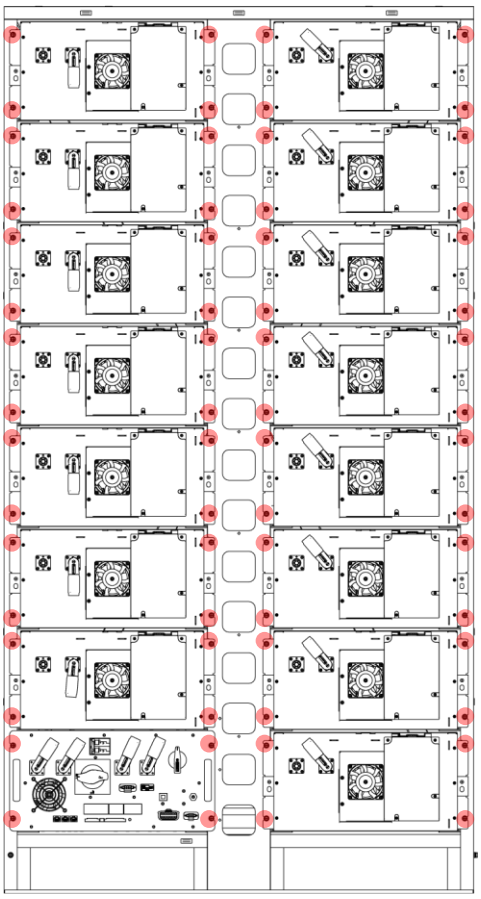
Step 7. Repeat the above steps to finish the installation of all battery modules and the control module.

DANGER

Danger: Falling can cause severe injury or death. Pay attention to the risk of battery module slipping down from the pallet after the wood piece is taken away. Make sure no unauthorized personnel are in the vicinity of a lifted load.

4.3 Securing the Rack

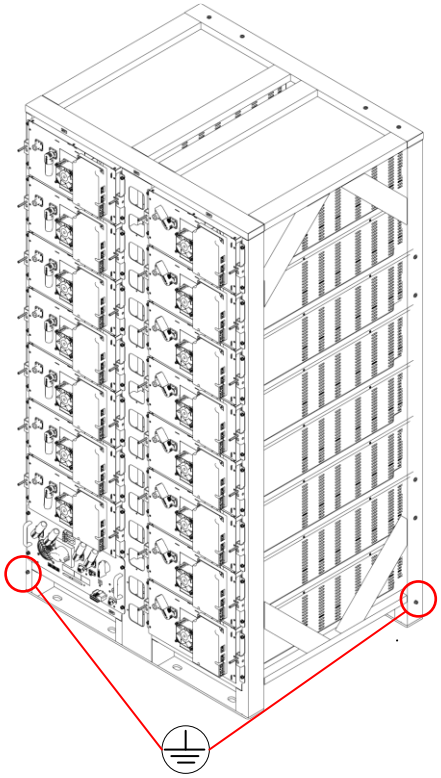
Secure the battery modules and the control module to the rack with M6 × 20 screws



4.4 Rack Grounding

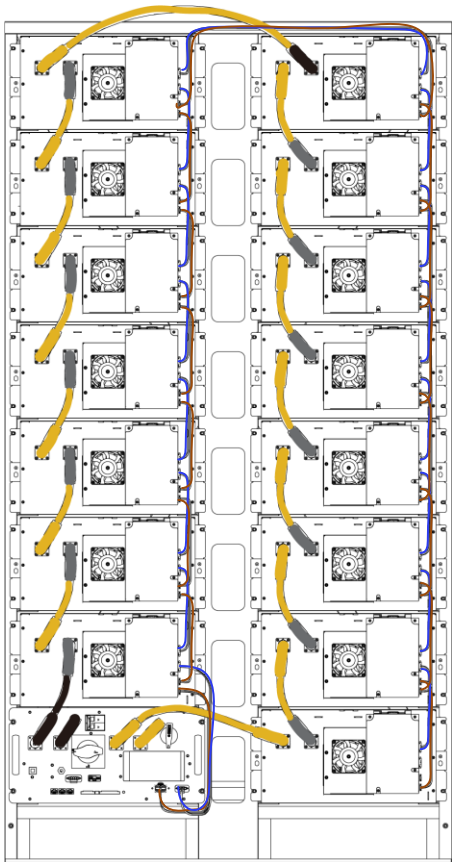
If there is a grounding metal frame outside the rack, for example, the metal angle steel frame at the bottom of the container, the mounting hole of the frame can be fixed directly with the metal frame of the container. Then reliable grounding can be ensured through the grounding of the container.

- The cable shall be copper with yellow-green color.
- The grounding cable can also be connected from the M6 grounding bolt on the frame base. Grounding cable must be ⩾4AWG.



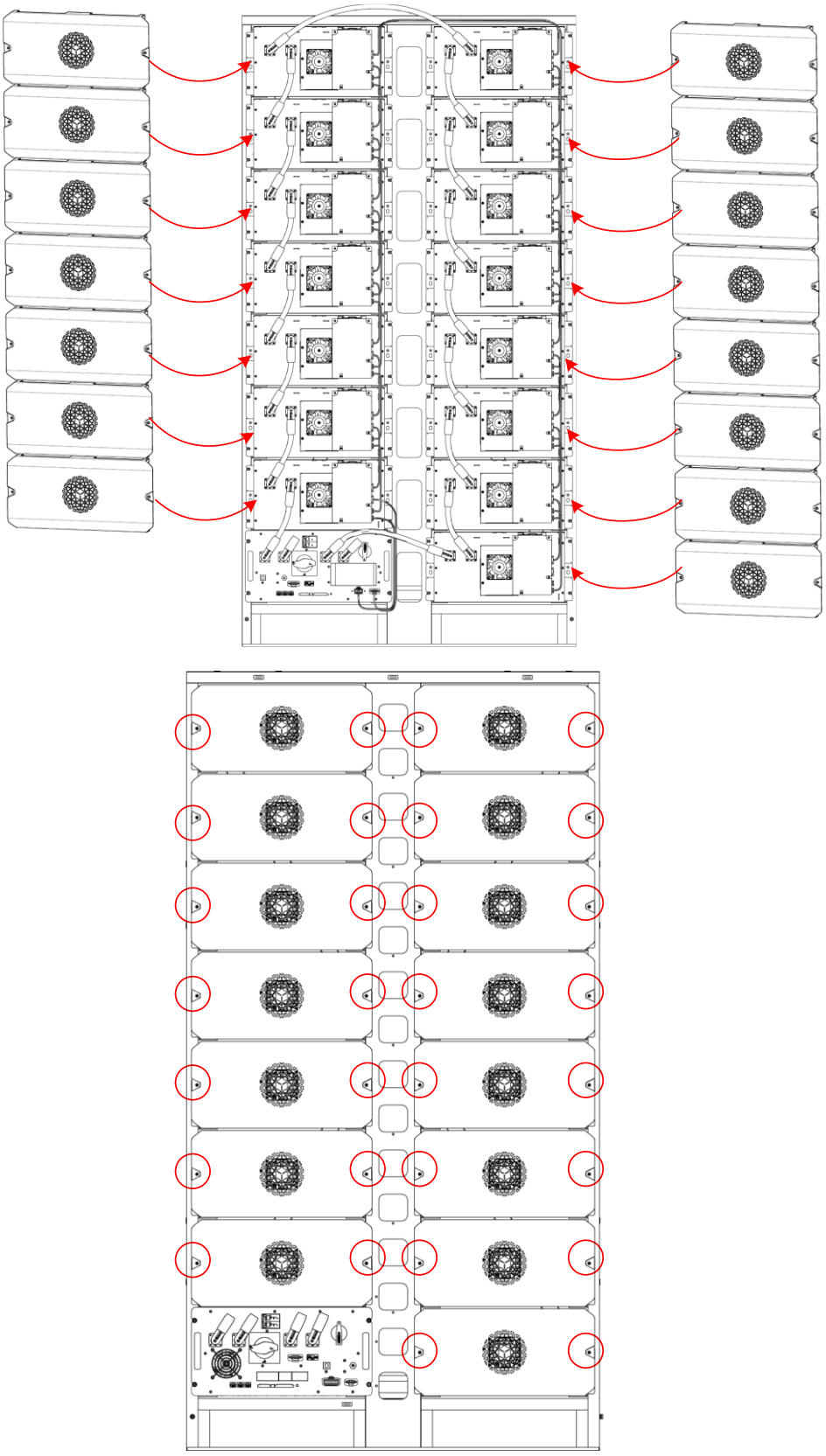
4.5 Connect the cables

Connect the cables according to the wiring diagram in *Section 5.2 Battery String Wiring Diagram*.

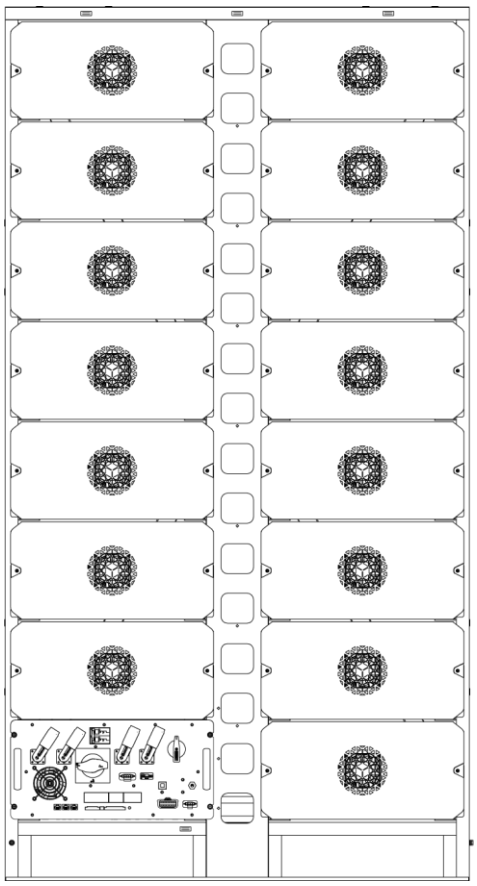


Install the covers

Snap the covers back onto the control module, and secure the covers to the battery modules with M6 × 16 screws, torquing to 1.7~2.2 N · m.



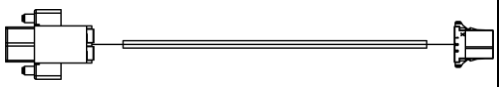
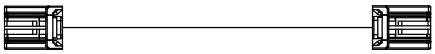
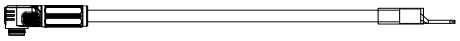
Step 8. Finish installation.



5 Electrical and Communication Wiring

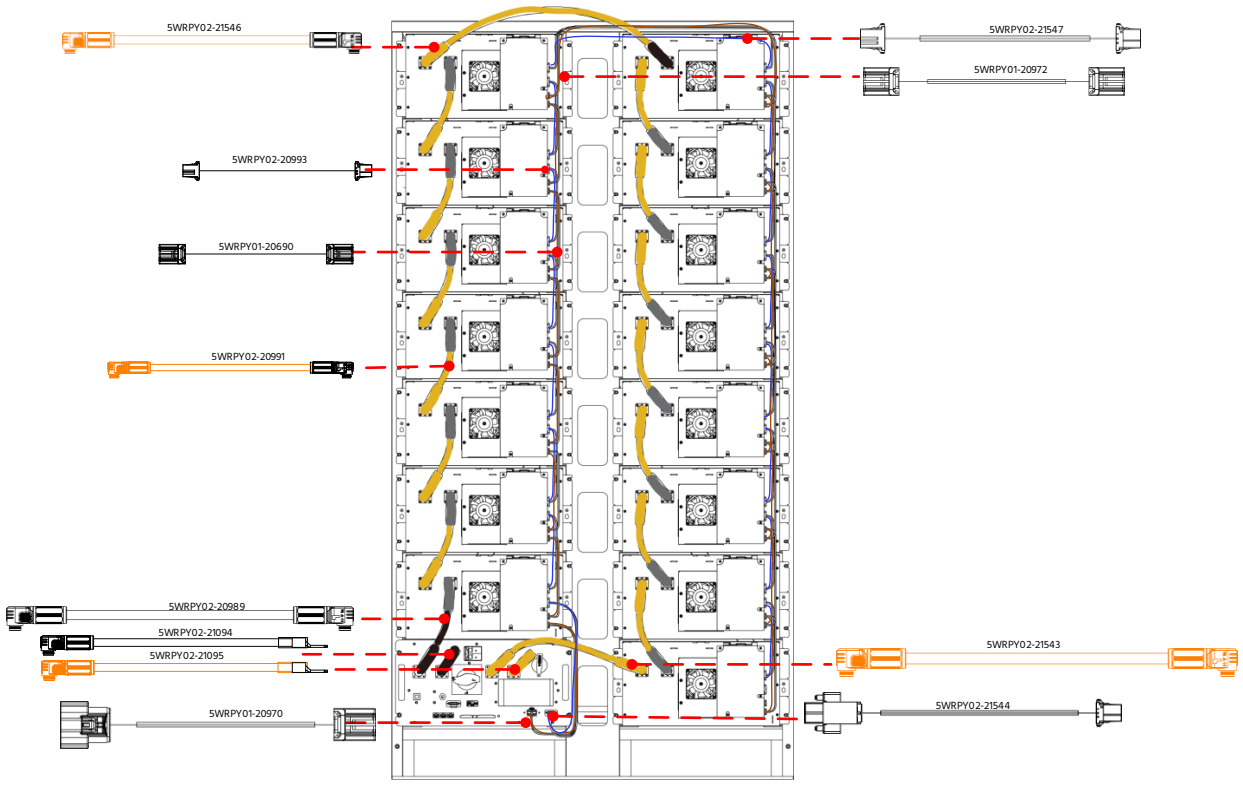
5.1 Cable List

2 columns (straight line arrangement, fully equipped (1 × BMS + 15 × pack))

Illustration	Material Code	Description	Num
	5WRPY02-20989	M1D_Master to PACK-_Power Cable	1
	5WRPY02-20991	M1D_Inter-PACK Power_Power Cable	13
	5WRPY02-21546	M1D_Inter-PACK Power_850mm_Power Cable	1
	5WRPY02-21543	M1D_Master to PACK+_445mm_Power Cable	1
	5WRPY02-21544	M1D_Master to PACK Fan Power_540mm_Power Cable	1
	5WRPY02-20993	M1D_Inter-PACK Fan Power_Power Cable	13
	5WRPY02-21547	M1D_Inter-PACK Fan Power_1040mm_Power Cable	1
	5WRPY01-20970	M1D_Master to PACK Communication_530mm_Signal Cable	1
	5WRPY01-20690	M1D_Inter-PACK Communication_310mm_Signal Cable	13
	5WRPY01-20972	M1D_Inter-PACK Communication_1230mm_Signal Cable	1
	5WRPY02-21094	M1D_D-_5000mm_ Power Cable	1
	5WRPY02-21095	M1D_D+_5000mm_ Power Cable	1

5.2 Battery String Wiring Diagram

2 columns (straight line arrangement, fully equipped (1 × BMS + 15 × pack))



5.3 Cable Connection

DANGER

Danger: The battery system is a high voltage DC system. Make sure the grounding of the rack is stable and reliable.

DANGER

Danger: All the plugs and sockets of the power cables between battery module and control module must be **orange to orange** and **black to black**. Otherwise it will cause personal injury.

DANGER

Danger: Do not short circuit or reverse connection of the battery system's anode and cathode.

CAUTION

Caution: Wrong communication cables connection will cause the battery system failure.

DANGER

Danger: After installation of battery modules and control modules into the rack, make sure the grounding is reliable and stable.

6 Maintenance

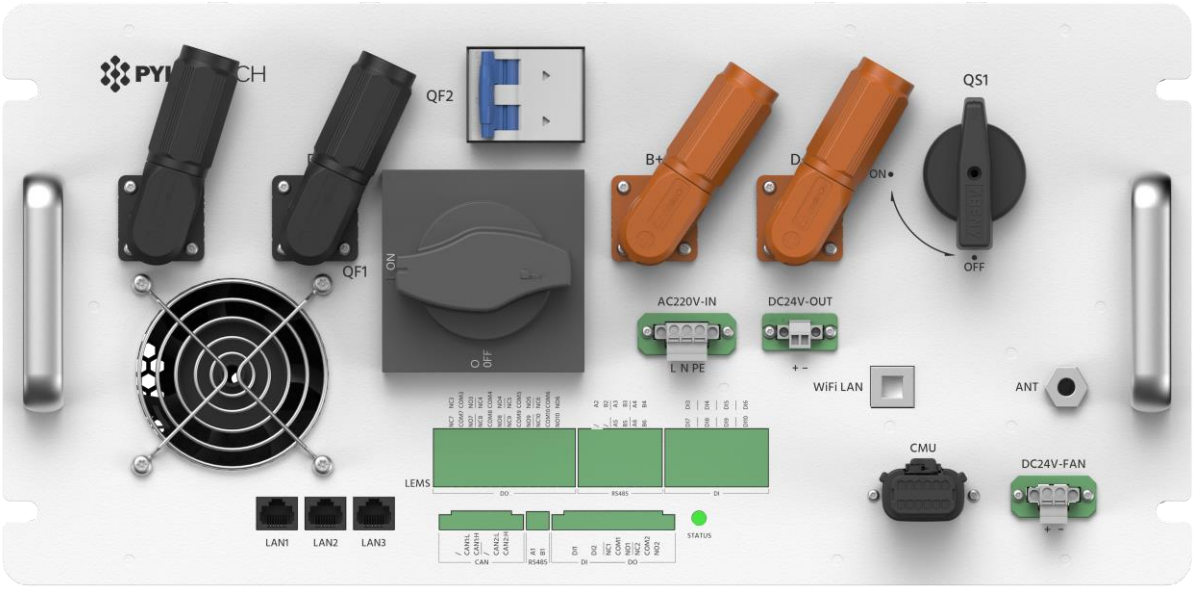
DANGER

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.

6.1 System Turning On

Turn on the BMS according to the following operation.



1. Switch on the MCCB (molded case circuit breaker) (QF1).
2. Switch on the MCB (micro circuit breaker) (QF2).
3. Switch on the disconnector (QS1).

6.2 System Turning Off

1. Turn off the PCS 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.

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 breaker 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 breaker in normal running condition.

6.3 Routine Maintenance

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

After the system is out of operation, you must wait at least 10 minutes before carrying out maintenance or overhaul operations on the system.

After the system is shut down, pay attention to:

- Ensure that the system is not accidentally re-powered on.
- Use a multi-meter to check that the system is completely shut down.
- The possible live parts adjacent to the operating part shall be covered with insulating cloth.
- Ensure that the escape routes are completely unblocked during the whole process of maintenance.

Recommended Schedule of Routine Maintenance Table

Inspection Content	Inspection method	Maintenance Intervals
System operation status and environment	(1) Observe the appearance of the energy storage system for damage or deformation. (2) Check whether there is any abnormal sound in the operation of the energy storage system. (3) Check whether the parameters are correct during system operation. (4) Check whether the main devices are normal. (5) Check whether the humidity and dust in the environment around the energy storage system, and all air inlet filters are functioning properly.	Every 6 months.
System cleanliness	(1) Check the cleanliness of the components. (2) Check the cleanliness of the fly nets. (3) If necessary, a compressed air machine must be used to clean the system.	Every 6 months to 1 year (depending on the dust content of the environment in which it is used).

Inspection Content	Inspection method	Maintenance Intervals
	NOTE: The system must be powered off when cleaning dust.	
Power circuit connection check	(1) Check power cable connections for looseness and retighten to the torque specified above. (2) Check power cables and control cables for damage, especially cut marks on the skin in contact with metal surfaces. (3) Check that the insulating wraps of the power cable terminals are not detached.	Officially run for six months, then every six months to one year thereafter.
Terminal and wiring connection check	(1) Check whether the control terminal screws are loose and tighten them with a screwdriver. (2) Check whether there is any color change in the wiring copper or screws. (3) Visually inspect the connections such as equipment terminals and the distribution of wiring. (4) Check the main circuit terminals for poor contact and screw locations for signs of overheating.	Officially run for six months, then every six months to one year thereafter.
Circuit breaker maintenance	(1) Routine inspection of all metal components for corrosion. (2) Annual inspection of contactors (auxiliary switches and micro-switches) to ensure that they are in good mechanical working order. (3) Check the operating parameters (especially voltage and insulation).	Officially run for six months, then every six months to one year thereafter.
Battery maintenance	(1) Perform normal charging and discharging operations on the battery system to check whether there are any abnormalities in the operating status of the battery, and to check whether the battery system indicator status is normal. (2) It is recommended that the battery be fully charged and equalized on a regular basis.	Every 6 months to 1 year
Safety Functions	(1) Check the stop function of the emergency stop button. (2) Simulate a shutdown and check shutdown signal communication. (3) Check the body warning signs and other equipment markings and replace them if they are found to be blurred or damaged.	Officially run for six months, then every year thereafter.

6.3.1 Battery Maintenance

⚠ DANGER

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

Voltage Inspection

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

SOC Inspection

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

Cable Inspection

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

Balancing

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

Output Relay Inspection

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

History Inspection

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

Environment Inspection

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

6.4 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.

6.4.1 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 cableissue	2. Open BMS case, check the connectivity and reliability of the internal power supply cables.
	Other error	3. If the problem persists, contact Pylontech service engineer.

- Section B During operation:

Open the mainframe monitor system and check the cause of the malfunction.

7 Shipment and Storage

7.1 Shipment

The outdoor battery cabinet is handled by forklift or hoisting.

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

Single cell's SOC shall ⩽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.

7.2 Storage

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

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

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

⚠ CAUTION

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