OPTIM US A300-HY

Lithium Iron Phosphate Battery Energy Storage System

User Manual

Information Version: 1.0

Legal Information

Disclaimer

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

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

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

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

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

About This Manual

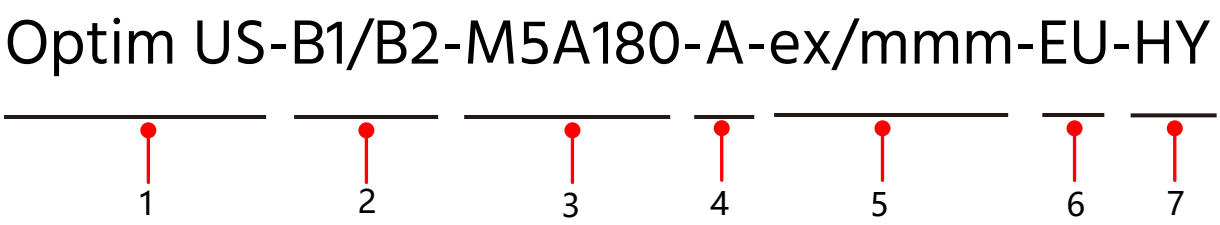
Purpose

This manual describes the OPTIM US A300-HY 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.

Product Name Description

No.	Designation	Description
1	Product Series	Optim US Series
2	Product Version & Battery Capacity	Version A Battery Capacity: 300 kWh
3	Product Category	HY: This product is an integrated product with two hybrid inverters (The inverter of this model refers to PCS).

Product Model Description



No.	Designation	Description
1	Product Series	Optim US Series
2	Number of Battery String in one system	"B1" represents there's one battery string in the system. "B2" represents there're two battery strings in the system.
3	Battery model used in the product	The product uses M5 battery.
4	Product Version	Version A
5	ex/nnn mmm/nnn	ex/nn: No PCS configured, capacity of battery only. mmm/nnn: mmm represents the power of the PCS; nnn represents the capacity of the battery . See *section 3.2.1 Battery String*Battery String for detailed battery string energy.
6	Sales territory	The product is aimed in Europe market.
7	Product Category	HY: This product is an integrated product with two hybrid inverters (The inverter of this model refers to PCS).

Explanation of Symbols

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

Label Description

	Read the manual before installing and operating the battery system.		Warning: electric shock.
	Grounding label.		Warning: flammable materials.
	Do not connect the positive and negative reversely.		Recycle label.
	Authorized personnel only.		The certificate label for CE.
	Keep away from flame or ignition sources.		Label for Waste Electrical and Electronic Equipment (WEEE) Directive (2012/19/EU).
	General warning label indicating potential hazards.		UL 9540 certification label by TÜV Rheinland.

Abbreviations

Abbreviation	Designation
Pylontech	Pylon Technologies Co., Ltd.
AC	Alternating Current
DC	Direct Current
BAT	Battery
BMS	Battery Management System
BMU	Battery Management Unit
PCS	Power Conversion System
SOC	State of Charge
UPS	Uninterruptible Power Supply
BESS	Battery Energy Storage System
EMS	Energy Management System
PMU	Power Management Unit
CMU	Control Management Unit
SPD	Surge Protecting Device
GND	Ground
EU	European Union
DOD	Depth of Discharge
MBMS-LC	Master Battery Management System
MCU	Microcontroller Unit

Contents

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 the dealing with hazards.
- Knowledge of the manual and other related documents.
- Knowledge of the local regulations and directives.

1.2 General Requirements

⚠ DANGER

Danger: Battery strings will produce high voltage DC power and can cause a lethal voltage and an electric shock. Only qualified personnel can perform the wiring of the battery strings.

⚠ DANGER

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

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 system is in operation. De-energize all multiple power sources and verify that there is no voltage.

⚠ WARNING

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

⚠ WARNING

Warning: For this system, working temperature is -40℃~ 55℃ and the optimum temperature is: 10℃~ 40℃. Out of the working temperature range may cause the battery system over/low temperature alarm or protection which will further lead to the cycle life reduction. It will affect the warranty terms as well.

⚠ WARNING

Warning: For battery installation, the installer shall refer to NFPA70 or similar local installation standard for operation.

⚠ CAUTION

Caution: Improper settings or maintenance can permanently damage the battery.

⚠ CAUTION

Caution: Incorrect PCS parameters will lead to the premature aging of battery or battery system failure.

There is high voltage in the system, and any accidental contact may lead to fatal electric shock. Be sure to observe the following when working with the system:

- Tag and lock the working area.
- There must be an escort to ensure personal safety.

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

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

- Establish visible signs at all circuit breakers for this product to prevent accidents caused by accidental closing of the circuit breaker.
- Establish warning signage or set up safety caution tape near the operating area.
- Always remove the cabinet 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-A300-HY is a high voltage battery storage system based on lithium iron phosphate battery. It connects the power grid with the storage battery through the energy storage converter PCS, 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 charging and discharging management of the battery system.

Main functions of the product

- Peak reduction and valley filling: it is realized by charging and discharging from the energy storage system in accordance with the requirements of the local electricity tariff with a fixed duration.
- Anti-backflow function: EMS adjusts the charging and discharging power of energy storage in real time by sampling the power of the grid to prevent backflow to the grid.

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.

Figure 2-1 Front View

Figure 2-2 Rear View

NOTE

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

2.1.1 Topological Graph

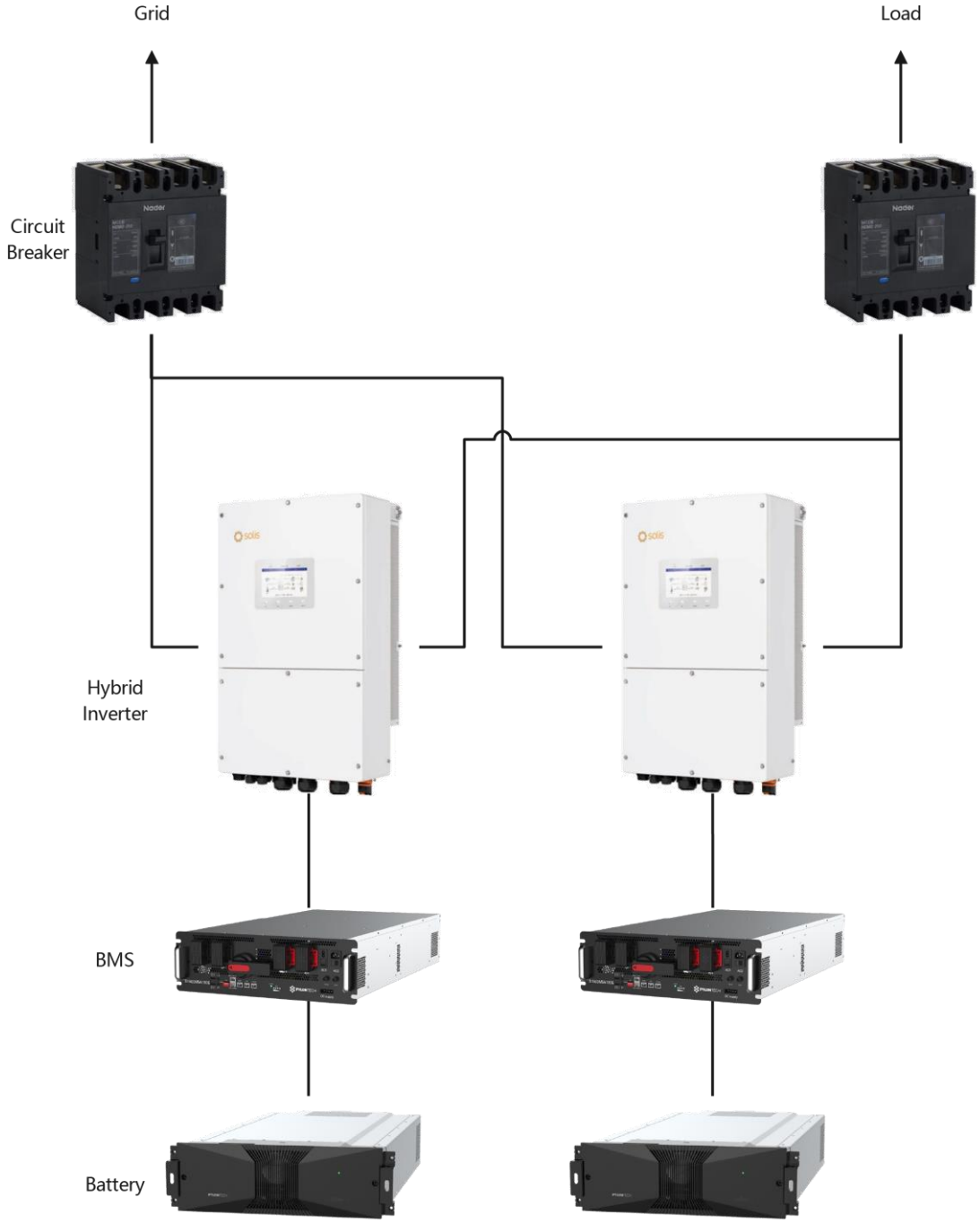


Figure 2-3 Topological Graph

2.2 System Specifications

Specifications	Model Name	Optim US-B1-M5A180-A-ex/mmm*-EU-HY (one string,8~21 batteries per string)	Optim US-B2-M5A180-A-ex/mmm*-EU-HY (two strings parallel,5~10 batteries per string)
Auxiliary Power Parameters	Rated Output Voltage (VAC)	400 V	
	Max. Output Current (A)	63	
	Rated Frequency (Hz)	50/60	
	Wiring Method	Three-phase four wire +PE	
DC side Parameters	Battery String Qty. (=Battery Control Module Qty.)	1	2
	Battery Module Qty.	n (where n=8~21)	n × 2 (where n= 5~10)
	Rated Capacity (Ah)	245	245 × 2
	Rated Energy (kWh)	15.68 × n (where n=8~21)	31.36 × n (where n=5~10)
	Rated Voltage of Battery String (V)	64 × n (where n=8~21)	64 × n (where n=5~10)
	Maximum DC current (A)	180	180 × 2
	Rated DC current (A)	122.5	122.5 × 2
System Parameters	External Dimensions of the outdoor cabinet (mm)	1500 ± 5 (W) x 2200 ± 5 (H) x 1480 ± 5 (D)	
	IP Rating of the outdoor cabinet	IP55	
	Cooling Type	Industrial Air Conditioner+ Forced Cooling	
	Weight (kg)	800 + 28 × m (Battery Control Module Qty.) + 115 × n (battery module Qty.)	
	Working Temperature range (℃) ⁂	-40~55	
	Relative Humidity	0-95% RH, non-condensing	
	Noise (dB)	65 @ 1 meter	
	Altitude (m)	4000	
	Fire Fighting Method	Aerosol	
	Handling Type	Applicable for hoist and forklift handling	
	External Communication Protocol	LAN (MODBUS TCP)/RS485(MODBUS RTU)/CAN	
	Wire feeding in and out method	Bottom in and bottom out	

* **mmm** represents the rated energy of the battery system.
(for Optim US-B1-M5A180-A-ex/mmm-EU-yy: mmm=125.44~329.28, in increments of 15.68)
(for Optim US-B2-M5A180-A-ex/mmm-EU-yy: mmm=156.8 ~313.6, in increments of 31.36)

2.3 Reference standards

2.3.1 System Related Standards

No.	Description	Code
1	Safety Standard (US)	UL9540
2	UN38.3 Safe Transport Standard	UN38.3
3	UL EMC Standard	EMC
4	Evaluating Thermal Runaway Fire Propagation	UL9540A*

* Test Organization: TÜV Rheinland
Report: UL 9540A: 2019 (Fourth Edition) Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage
Date: May.15th ,2024

2.3.2 Battery Related Standards

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

* Test Organization: TÜV Rheinland
Report: UL 9540A: 2019 (Fourth Edition) Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage
Date: Nov.07,2023

2.4 System Diagram

2.4.1 System Diagram

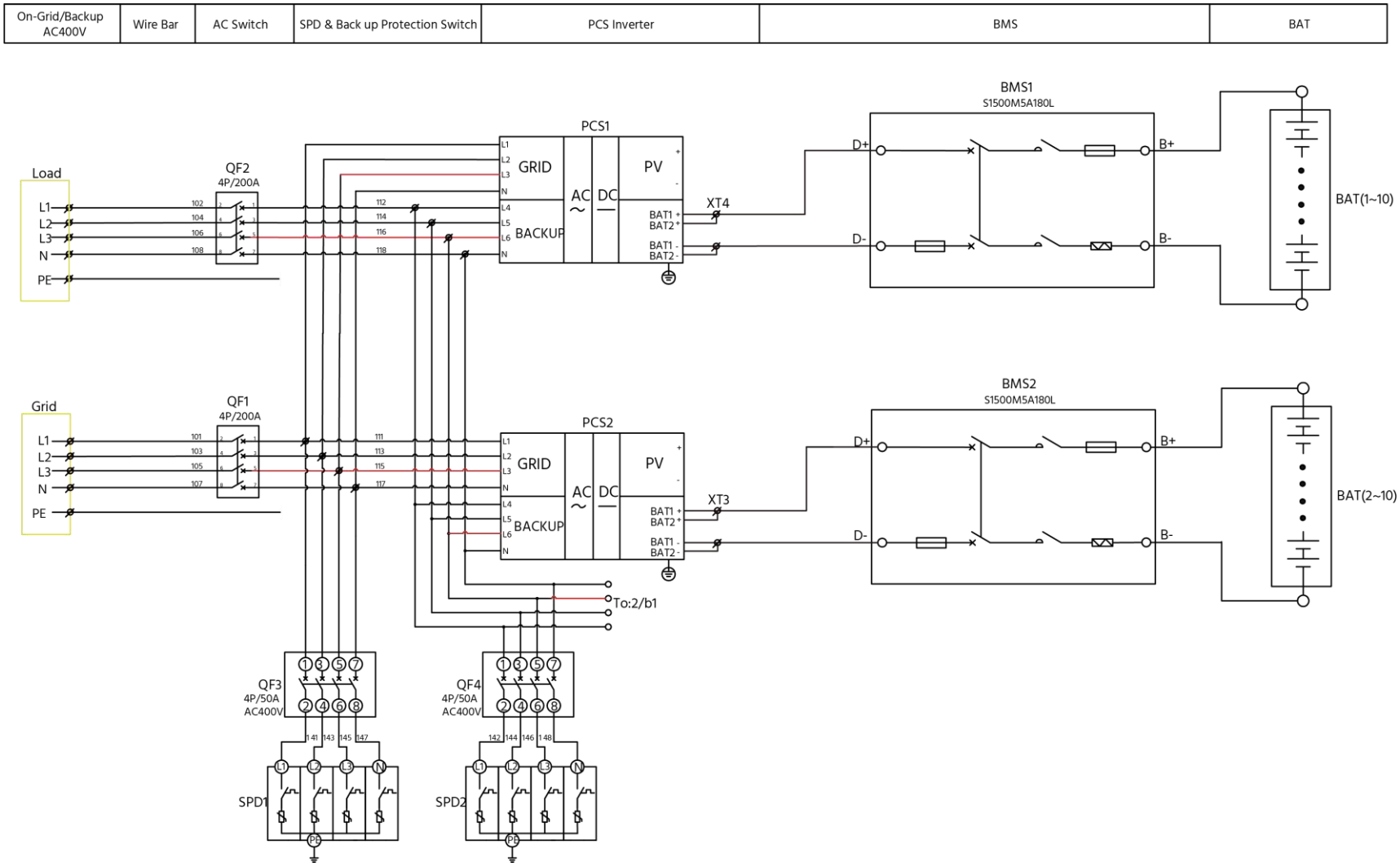


Figure 2-4 Main Circuit

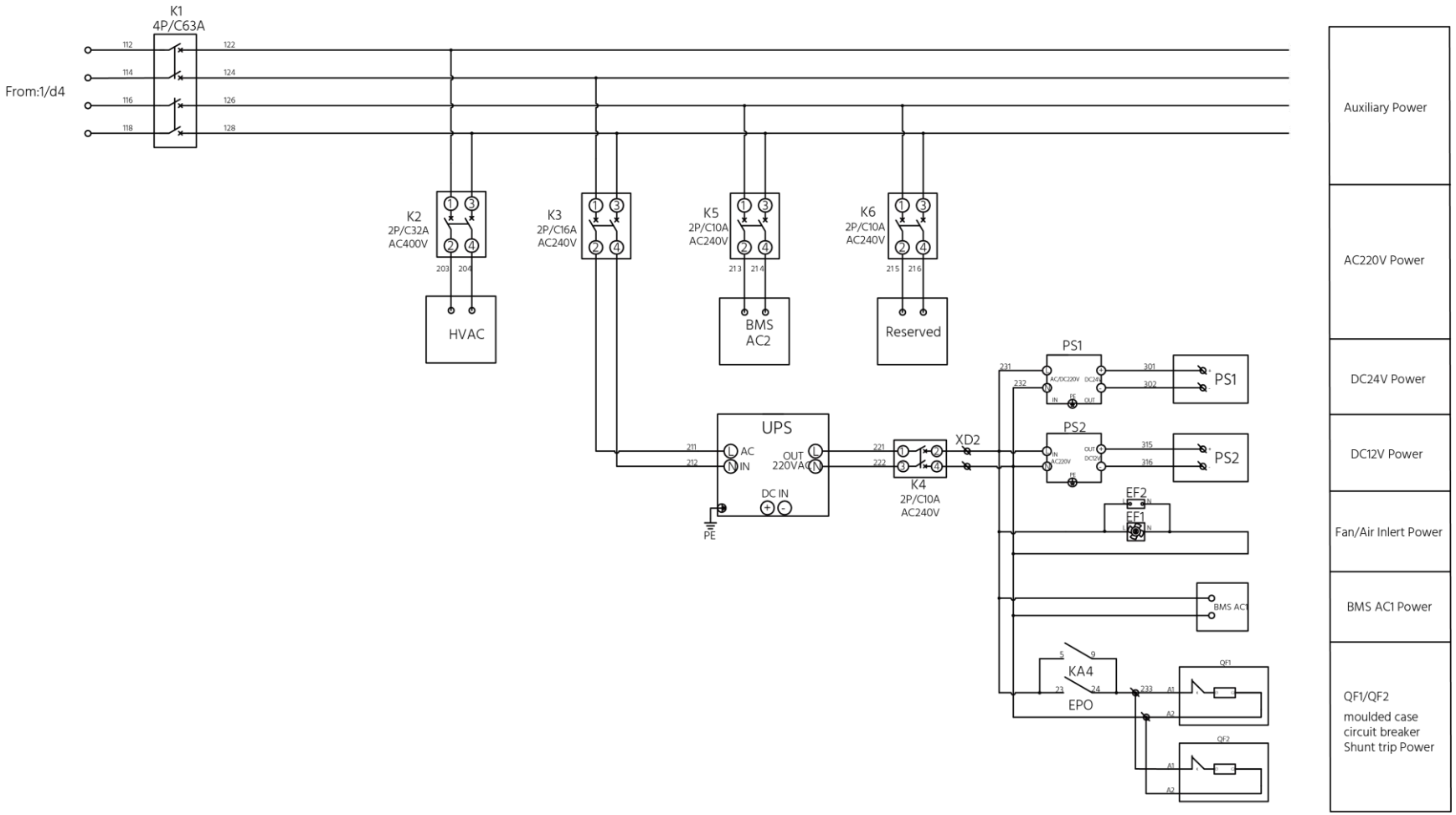


Figure 2-5 Auxiliary Circuit

3 System Components

3.1 Exterior Design

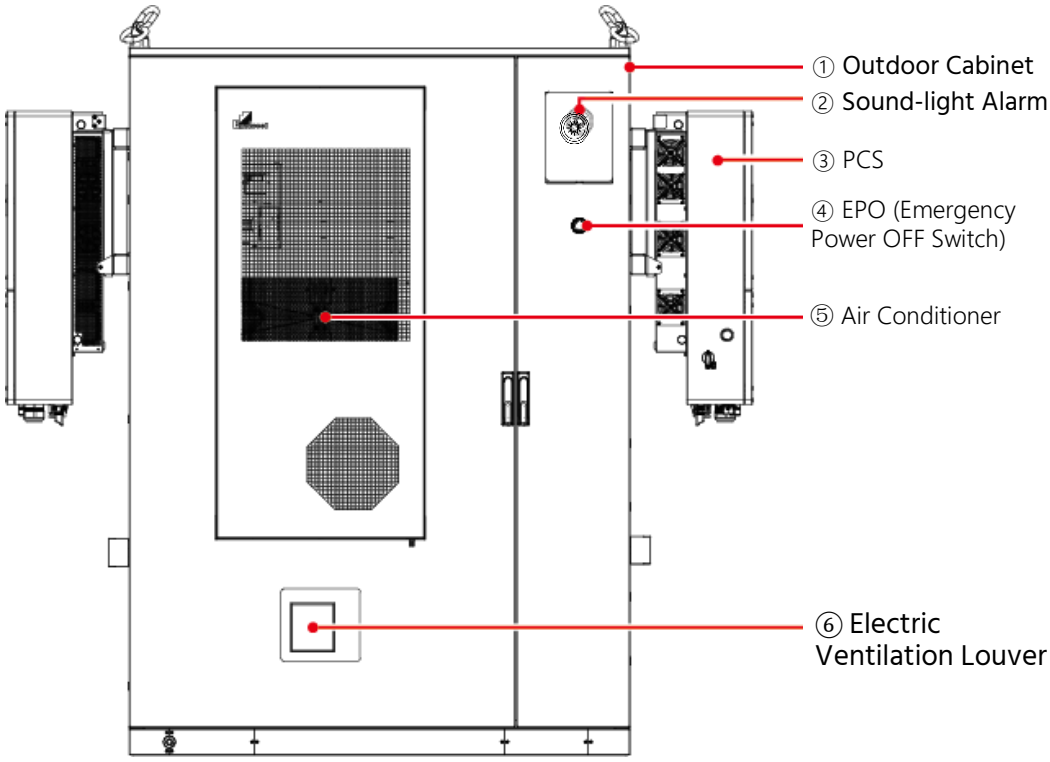


Figure 3-1 Front View (Door Closed)

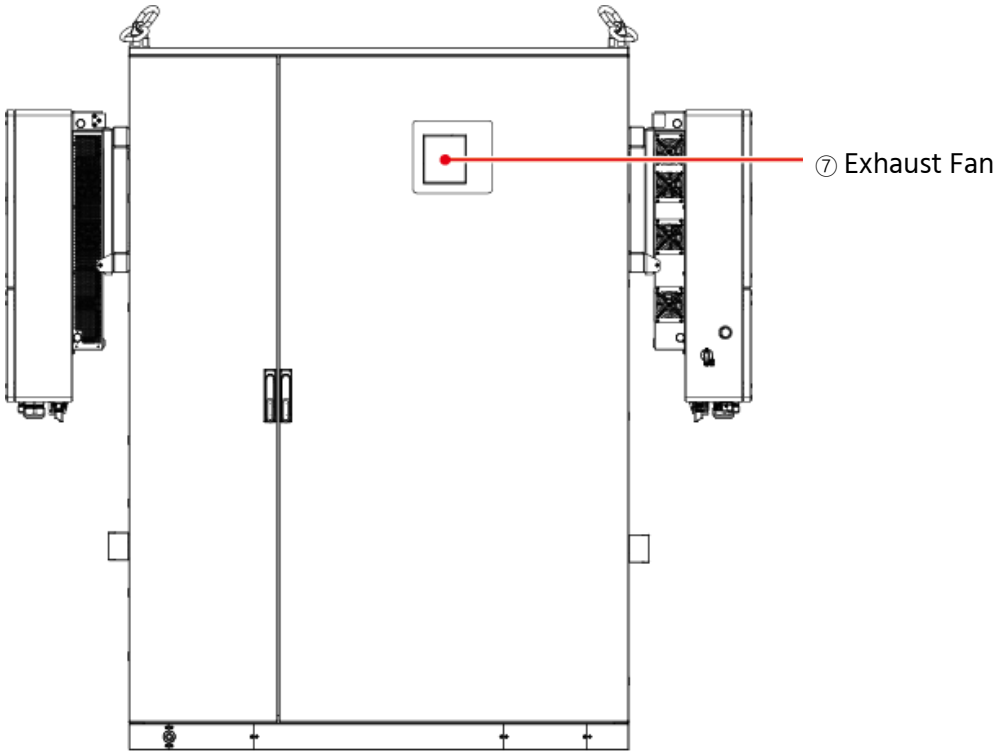


Figure 3-2 Rear View (Door Closed)

3.1.1 Outdoor Cabinet

3.1.1.1 Outdoor Cabinet Parameters

Item	Parameters
Dimensions (mm)	1500 (W) x 2200 (H) x 1250 (D)
Texture and Color	Outdoor Orange Texture RAL9003
IP Rating	IP55
Cabinet Plate Material	Cabinet body: SGCC, Bottom Base: Q235NH
Corrosion Resistance Grade	C3H
Maintenance	Front and back doors available
Safety Precautions	Outdoor lock

3.2 Interior Design

The outdoor battery cabinet is divided into left and right compartments. The left compartment mainly includes energy storage battery system, fire protection system, etc. And the right compartment is mainly for power supply and distribution system, communication control system, etc.

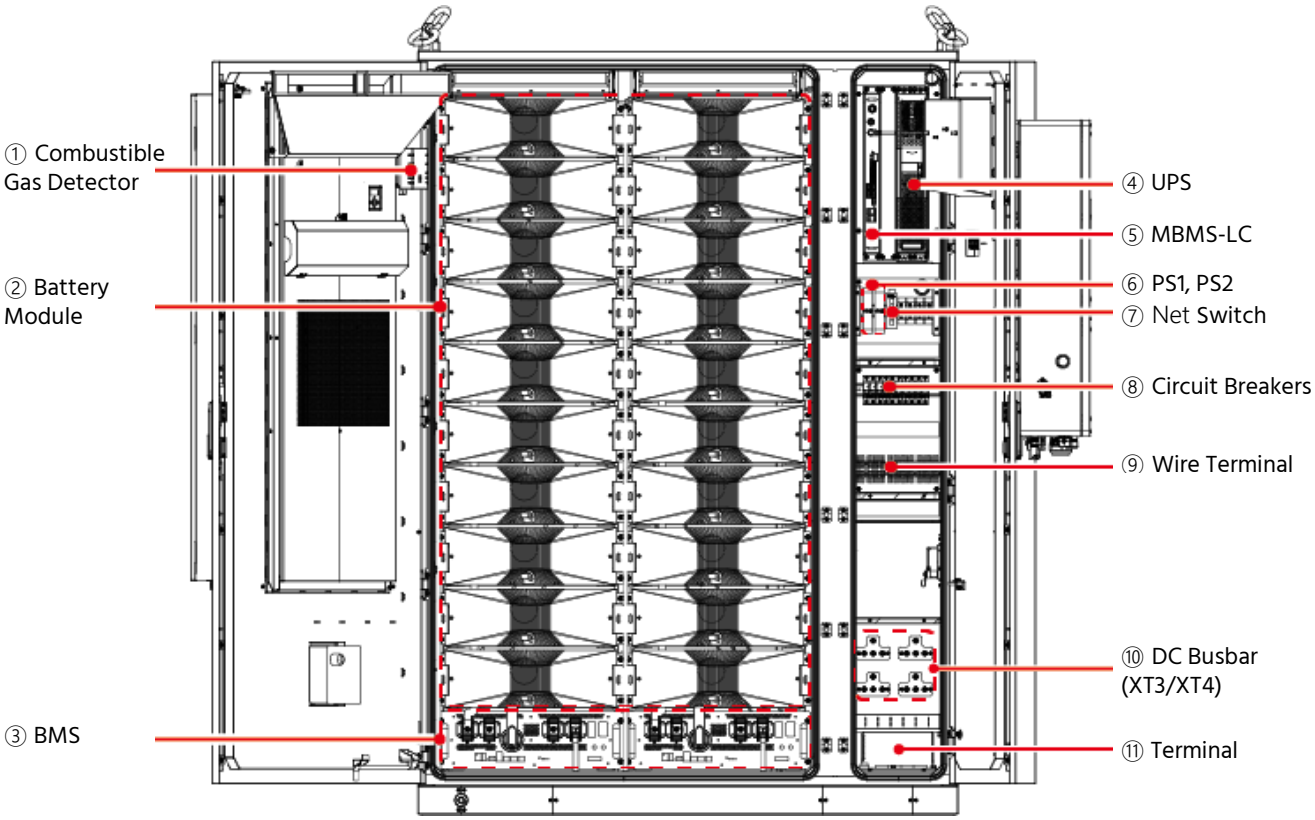


Figure 3-3 Front View (Door Opened)

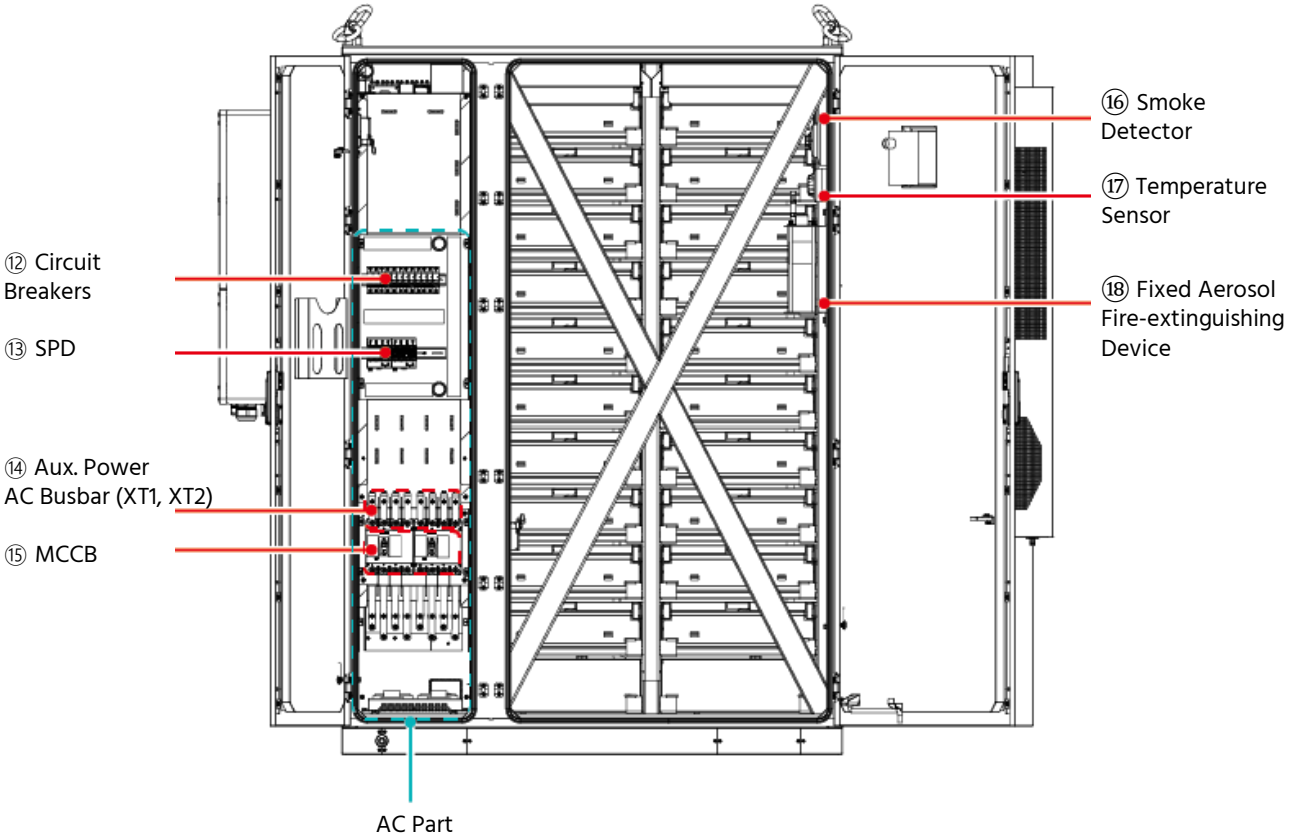


Figure 3-4 Rear View (Door Opened)

3.2.1 Battery String

The battery string consists of battery modules and battery control modules (BMS). There are two types of configurations of the battery string system (Type A and Type B).

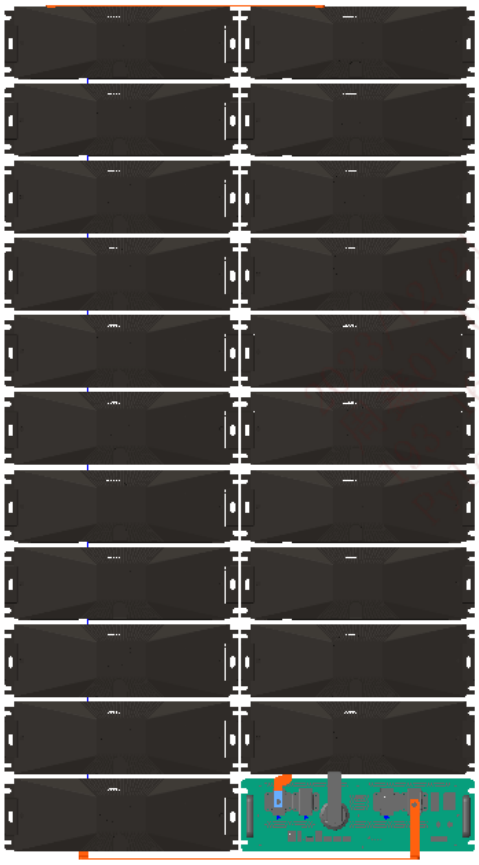
- **Type A: One string system:** One control Module (BMS)+ battery modules (8~21pcs).

  Model Name: Optim US-B1-M5A180-A-ex/mmm-EU-HY

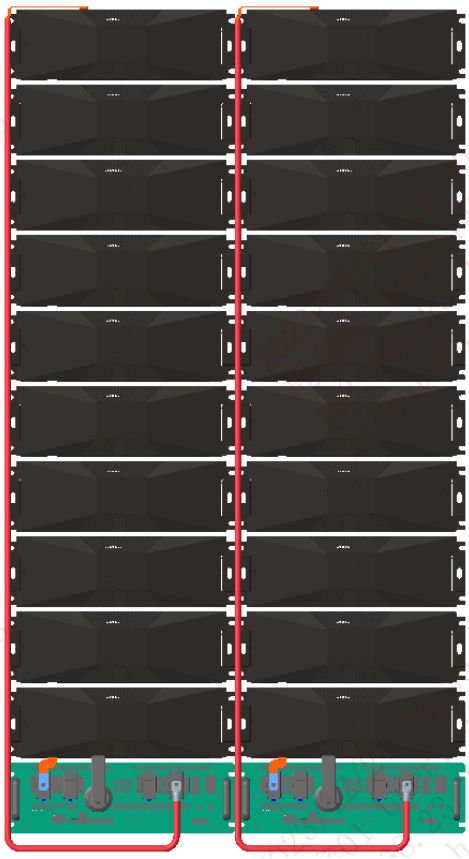
  (where mmm=125.44 to 329.28, in increments of 15.68; yy=01 to 05, in increments of 01, see details *in Section 3.2.1.1 3.2.1.1*)

- **Type B: Two strings' system:** Two control Modules (BMS)+ battery modules (10~20pcs).

  Optim US-B2-M5A180-A-ex/mmm-EU-HY (where mmm=156.8.88 to 313.6, in increments of 31.36; yy=01 to 05, in increments of 01, see details in *section 3.2.1.1*)



Type A (full configuration as an example)

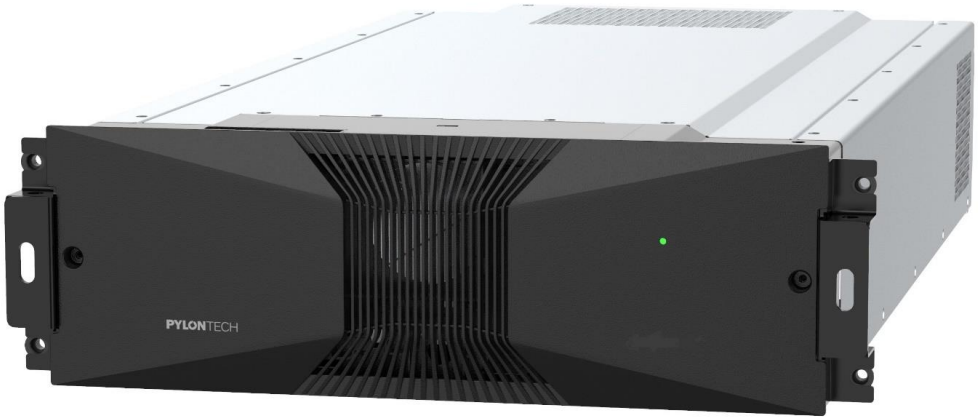


Type B (full configuration as an example)

3.2.1.1 Specifications of the Battery String

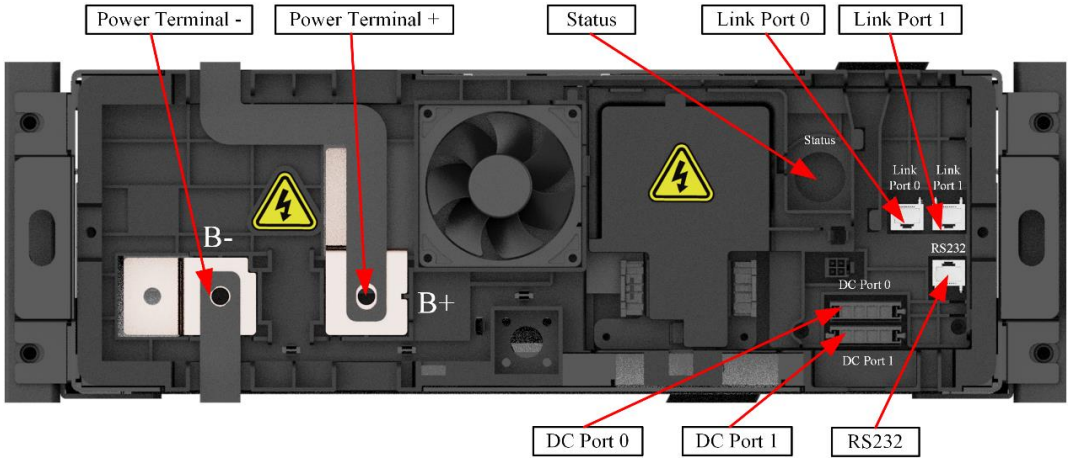
Related Product Model	Optim US-B1-M5A180-A-ex/mmm-EU-HY	Optim US-B2-M5A180-A-ex/mmm-EU-HY
Battery String	PowerCube-M5	
Battery Module Model	HM5A180F	
Control Module (BMS) Model	S1500M5A180E	
Over Current/Duration (Amps/ millisecond)	12000 A /5 millisecond	
Humidity (%)	5 ~ 95 (without condensing)	
Round-trip efficiency (%, @0.5 C)	95%	
Depth of Discharge (DOD) (%)	95%	
Rated Current (Amps)	≤122.5 (@0.5C)	≤122.5 × 2 (@0.5C)
Peak Current (Amps)	＜210A for 5 minutes ＜500A for 30 seconds	＜210A × 2 for 5 minutes ＜500A × 2 for 30 seconds
System Rated Capacity (Ah)	245	245 × 2
System Configuration Battery Module Quantity (pcs)	n (where n=8~21)	n × 2 (where n=5~10)
Maximum Continuous Current (Amps)	180	180 × 2
Total Storage Energy (kWh)	15.68 × n (where n=8~21)	31.36 × n (where n=8~10)
System Rated Voltage (VDC)	64 × n (where n=8~10)	64 × n (where n=8~10)
Upper limit Charge Voltage (VDC)	71 × n (where n=8~21)	71 × n (where n=8~10)
Lower limit Discharge Voltage (VDC)	56 × n (where n=8~21)	56 × n (where n=8~10)

3.2.1.2 Battery Module



Product Type	HM5A180F
Cell Technology	$LiFePO_4$ (LFP)
Battery Module Energy (kWh)	15.68
Battery Module Voltage (VDC)	64
Battery Module Capacity (Ah)	245
Power of BMU (Battery Management Unit) (W)	3
Power of Battery Module Fan (W)	15.6
Dimensions (W x D x H, mm)	515(W) × 935 (D) × 160.5(H)
Weight (kg)	115
Design Life (year)	15+
Transportation Certificate	UN38.3

Battery module without cover



Power Terminals B+/B-

Connects battery in serial at power side.

Status Light

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

Link Port 0/1

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

DC Port 0/1

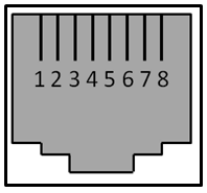
DC Port 0, 1 Terminals: the terminal is 4 pin of DC supply, which consists of 2 pins of 12V for BMU power supply, and 2 pins of 24V for fan power supply. DC Port 0 for DC power input, DC Port 1 for DC power output.

RS232 Terminal

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

Definitions of RJ45

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



RJ45 Port

RJ45 Plug

3.2.1.3 Control Module

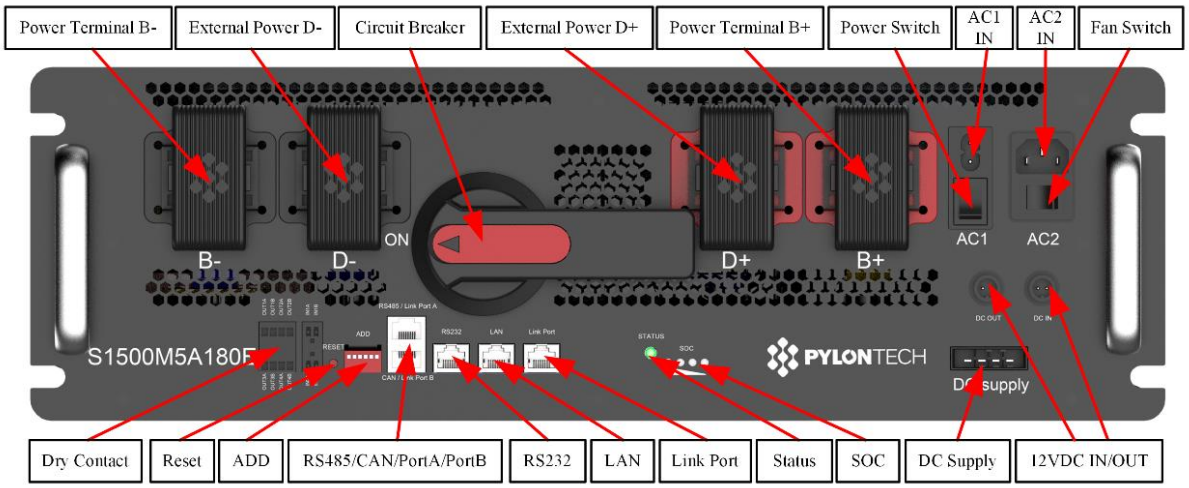
The appearance and the specifications of the control module are shown as follows.

Product Type	S1500M5A180E
Related Product	M5A-180
AC Supply for BMS*	100~305 VAC/50/60Hz
Fan Power Consumption (W) **	15.6
Operation Current (Maximum) (A)	180
Self-consumption Power-Relay On (W)	16.5
Instantaneous power of relay engagement(W)**	65.4
Dimensions (W × D × H, mm)	460(W) × 858(D) × 160(H)
Weight(kg)	28
Communication Protocol	RS485(MODBUS RTU)\CAN\LAN
Operation Life (year)	15

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

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

Control Module Front Interface



Power Terminal B+/B-

Connects battery modules in series.

Power Terminal D+/D-

External Power terminal: Connects battery system to the PCS.

Circuit Breaker

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

Power Switch

Controls the BMS power supply ON/OFF.

AC1 Input for BMS power supply

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

AC2 Input for BMS power supply

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

12VDC Input

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

12VDC Out

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

DC Supply

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

SOC (LED)

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

Refer to ***Table of LED Indicators Instructions*** in *section 6.1.1* for details.

STATUS (LED)

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

Refer to ***Table of LED Indicators Instructions*** in *section 6.1.1* for details.

Link Port (RJ45 port)

For communication between multiple serial battery modules and control module.

LAN

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

RS232

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

RS485/ Link Port A (RJ45 port)

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

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

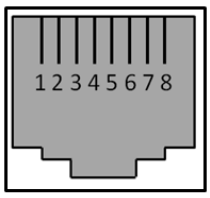
CAN / Link Port B (RJ45 port)

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

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

Definitions of RJ45 Port Pin

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



RJ45 Port

RJ45 Plug

ADD

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

Reset

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

Dry Contact

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

Dry Contact Terminal

In/Out	Function	Open and close state
In1	Reserved	Always close.
In2	Emergency power off	Always close, power relay open when signal received.
Out1	Stop charging	Always close, when suggested charge current is “0”, it shall open.
Out2	Stop discharging	Always close, when suggested discharge current is “0”, it shall open.
Out3	Error	Always close, when system error activated, it shall open.
Out4	Current limit	Always close, when current limit ≤5A activated, it shall open.

3.2.2 MBMS-LC

The outdoor cabinet communicates with the outer system through MBMS-LC.

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

3.2.2.1 Interface Panel of the MBMS-LC

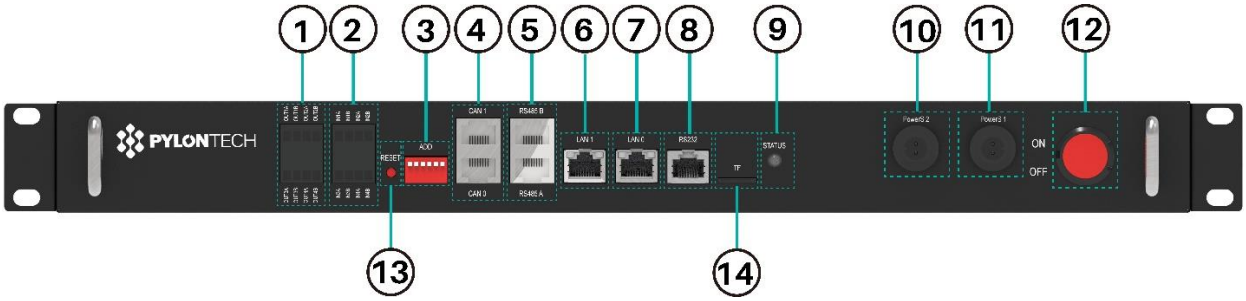


Figure	Description	Figure	Description
①	Dry Contact 1 (OUT1A, OUT1B, OUT2A, OUT 2B, OUT3A, OUT3B, OUT4A, OUT4B)	⑧	RS232
②	Dry Contact 2 (IN1A, IN1B, IN2A, IN2B, IN3A, IN3B, IN4A, IN4B)	⑨	Status (LED)
③	ADD Switch	⑩	PowerS 2
④	CAN 1/ CAN 0	⑪	PowerS 1
⑤	RS485 B/RS485A	⑫	ON/OFF Switch
⑥	LAN 1	⑬	RESET (button)
⑦	LAN 0	⑭	TF

①② Dry Contact

Dry Contact Terminal: provides 4 input and 4 output dry contact signal. See the following for dry contact definitions

In/Out	Function	State and Action
In1	Fixed aerosol fire-extinguishing device operating	Normal open, turn closed when signal received.
In2	UPS or Door Opening Alarm	Normal open, turn closed when signal received.
In3	Smoke detector or Temperature sensor giving alarm	Normal open, turn closed when signal received.
In4	EPO operating	Normal open, turn closed when signal received.
Out1	Breaker trip control	Normal open, when change from open to closed, breaker QF1 trips.
Out2	Explosion-proof ventilator control	Normal open, when turned closed, explosion-proof ventilator starts working.
Out3	PCS Emergency Stop	Normal open, when turned closed, PCS emergency stop starts action.
Out4	Communication Activating	• Independent two battery string(1000V) cabinet: Always open, when turned closed, communication between MBMS-LC and two BMSs activating.
	Reserved	• Multiple two battery string(1000V) cabinet parallel system & • Independent one battery string(1500V) cabinet: Normal open, turn closed when signal received.

③ ADD

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

④ CAN 0 & CAN 1

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

⑤ RS485 A & RS485 B

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

⑥ LAN 1 Port

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

⑦ LAN 0 Port

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

⑧ RS232 Terminal

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

⑨ Status (LED)

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

⑩ Power S2

For 12V DC power supply to MBMS-LC.

⑪ Power S1

For 12V DC power supply to MBMS-LC.

⑫ ON/OFF Switch

For control MBMS-LC ON and OFF.

⑬ RESET Button

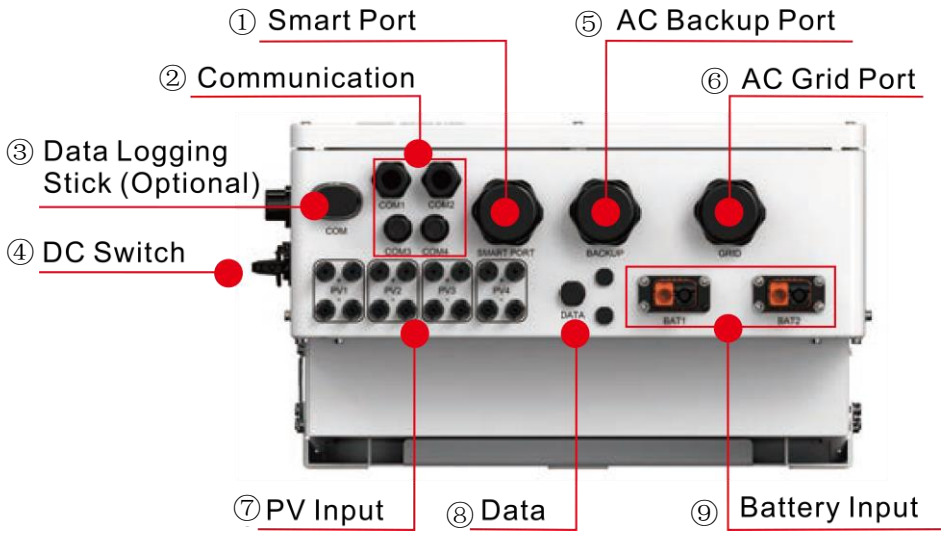
Press to restart the MBMS-LC.

⑭ TF

To insert TF card.

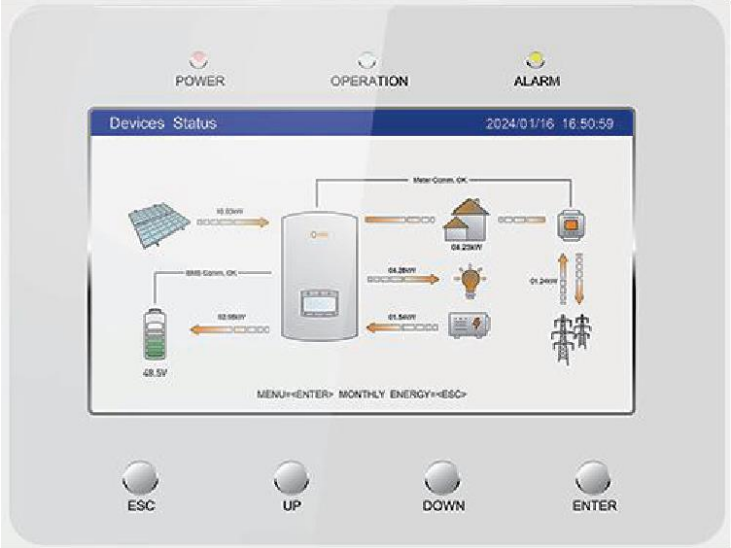
3.2.3 PCS (S6-EH3P(30-50)K-H)

3.2.3.1 Features and Controls of the PCS



No.	Terminal	Description
1	Smart Port	Conduit for AC conductors to generator should be connected here.
2	Communication	The data logger gets connected here – only USB version of the loggers will work. COM1 & COM2: RS485 and CAN communication cables and parallel cables should go through these. COM3 & COM4: Communication cables for 14 PIN terminal block should go through these.
3	Data Logging Stick	Optional
4	DC Switch	DC disconnect switch for the PV.
5	AC Backup Port	Conduit for AC conductors to backup loads panel should be connected here.
6	AC Grid Port	Conduit for AC conductors to the main service panel should be connected here.
7	PV Input	Conduit for PV conductors should be connected here.
8	Data	Extends the range of the PCS GPRS signal (Not applicable to the USA, Australia, Europe)
9	Battery Input	Conduit for battery conductors should be connected here.

3.2.3.2 Indicator Instructions



Description of indicators:

Indicators	Status	Description
POWER	Red light solid on	Normally powering
	OFF	Not working
OPERATION	Green light solid on	Normally powering
	OFF	No operation
ALARM	Yellow light solid on	Alarm
	OFF	Normal

Description of buttons:

Button	Description
ESC	"Escape", allows the user to exit, or cancel the operation.
UP	Upwards key, allows the user to increase the value or move forward to the next option.
DOWN	Downwards key, allows the user to decrease the value or move backward to the previous option.
ENTER	Running or executing command.

NOTE:

The screen will be automatically turn off after being idle for a few minutes to save power, click any operation button ("ESC"/"UP"/"DOWN"/"ENTER") to restart the screen, then press "Enter" into the main operation interface.

For more detailed information of the PCS, please refer to the separate *S6-EH3P(30-50)K-H User Manal.*

3.2.4 UPS (ITA-01K00AS1102C00)

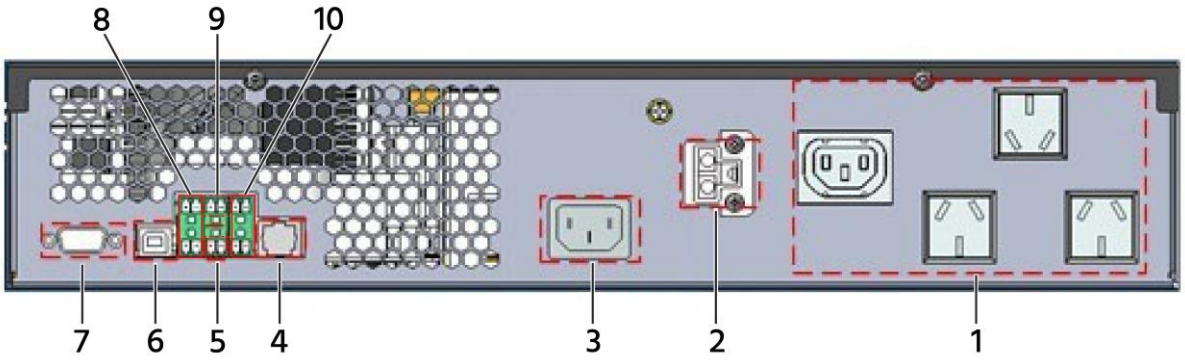
The cabinet is equipped with a set of UPS (uninterruptible power supply) to provide power for devices in the cabinet, as BMS, MBMS-LC, combustible gas detector, temperature sensor, smoke detector, etc.

3.2.4.1 Front Panel of the UPS

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

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

3.2.4.2 Rear Panel of the UPS



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

3.2.4.3 Introduction of the Operation and Display Panel

The Operation and Display panel is located on the front of the UPS. The display panel allows the user to operate and monitor the UPS, and to view the UPS parameters, UPS and battery status information and any alarm messages.

As shown blow, the display panel includes LCD screen, menu keys, LED indicators (Run indicator and Alarm indicator).

Item	Description
1	Menu keys
2	LCD
3	Run Indicator
4	Alarm Indicator
5	Power Button

LED Indicators

The LED indicators consist of the run indicator and alarm indicator. See the following table for description of these indicators.

Indicator	Color	State	Meaning
Run indicator	Green	On	UPS has output.
		Blinking	PCS is starting.
		Off	UPS has no output, PCS is starting.
Alarm indicator	Yellow	On	Alarm occurs.
	Red	On	Fault occurs.
	/	Off	No alarm, no fault.

Audible Alarm (Buzzer)

The UPS operation is accompanied with the following two different kinds of audible alarms.

Sound	Meaning
Continuous beep	Sound is generated when the UPS fault appears, such as fuse or hardware failure.
One beep every 0.5 seconds	Sound is generated when the UPS critical alarm appears, such as PCS overload.
One beep every second	Sound is generated when the UPS critical alarm appears, such as battery low voltage.
One beep every 3.3 seconds	Sound is generated when the UPS general alarm appears.

LCD and Functional Keys

The operation and display panel includes five functional keys, and the respective functions are described in the table below.

Functional key	Silk print	Description
Confirm		Used to confirm or enter.
Up		Used to page up, turn left or add value, etc.
Down		Used to page down, turn right or reduce value, etc.
Escape		Used to return, escape, cancel or forbid operation.
Power		Used to power on, power off or transfer to Bypass mode.

Prompt Window

A prompt window is displayed during the operation of the system to alert you to certain conditions and/or to require your confirmation of a command or other operation. The following table lists the prompts and meanings.

Prompt	Meaning
Cannot set this online, please shut down output.	If the user wants to change some important settings under condition of output (output voltage, output frequency, output phase No.), the prompt will appear.
Incorrect password, please input again.	The prompt will appear when the user incorrectly input the Settings password.
Operation failed, condition is not met.	The prompt will appear when the user wants to execute a certain operation but the condition is not met.
Password changed OK.	The prompt will appear when the user successfully changes the Settings password.
Fail to change password, please try again.	The prompt will appear when the user tries to change the Settings password but input two different new passwords.
The time cannot be earlier than system time.	The prompt will appear when the user set the time of 'Turn on delay' or 'Turn off delay ‘is earlier than the current system time.
Turn on failed, condition is not met.	When users press the power button (or execute the command of 'Turn on/Turn off/to Bypass' under 'Control' page), the prompt will appear.

3.2.4.4 Initial Start-up Guidance

1. Welcome Page

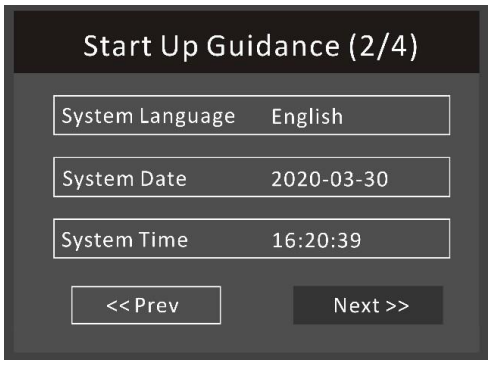
When the UPS is the initial start-up, the interface shown below will appear to guide the user to set basic parameters of the UPS.

Please refer to s*ection 0* for instructions on the use of UPS keys, and operate the system according to the function of each key.

Initial Start Up Guidance (1/4) Page

2. Language, Date and Time settings

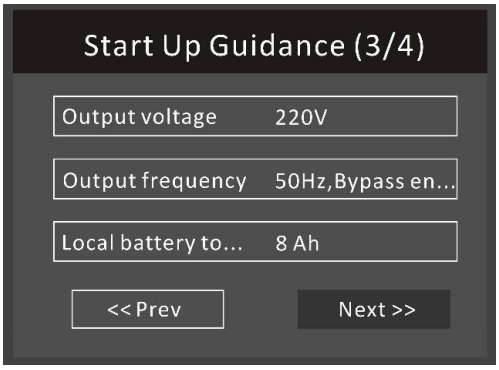
At this page, you can set the language, date and time you need. Click “Next “to start the guidance.



Initial Start Up Guidance (2/4) Page

3. Output and Battery Parameters Page

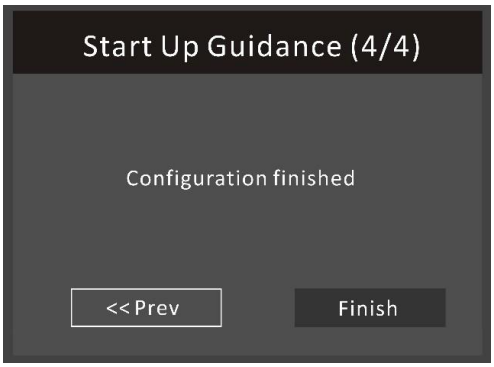
At this page, you can set the output voltage, output frequency and total Ah (According to the number of batteries connected, the settings can be changed, seeing the figure below.



Initial Start Up Guidance (3/4) Page

4. Finish Page

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



Initial Start-up guidance (4/4)

NOTE:

- The battery has been fully charged before delivery. However, some loss of capacity is inevitable during transportation and storage. Therefore, it is important to charge the battery for eight hours before the UPS is first put into operation to ensure it can provide adequate backup time.
- For more detailed information of the UPS, please refer to the separate UPS manual.

3.2.5 Air Conditioner

The outdoor cabinet is equipped with 5kW 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	**MC50HDNC1A CE**
Dimensions, Weight & Mounting Method	
Dimension (mm)	620 (W) × 300 (D) × 1350 (H)
Dimension (mm) (with flange)	671 (W)× 300 (D) × 1401 (H)
Weight (kg) (without coolant)	90
Environmental Protection & Performance	
Working Temperature Range (° C)	-40~+55
Noise Level (dB(A))	65
Corrosion-proof Grade	C4
IP Protection Level (for outdoor side)	IP55
Refrigerant	R134a
Cooling/Heating Capacity	
Cooling Capacity@ L35/L35 (W)	5000
Heating Capacity (W) Tu= ° C	3000
Power Consumption	
Rated Power Consumption @ L35/L35 (W)	1850
Rated Cooling Current (A)	9.1
Maximum Operation Current (A)	17.0
Airflow	
Airflow (m^3 /h)	1400
Power Supply	
Power Supply Range (V, Hz)	400V,3N~,50Hz

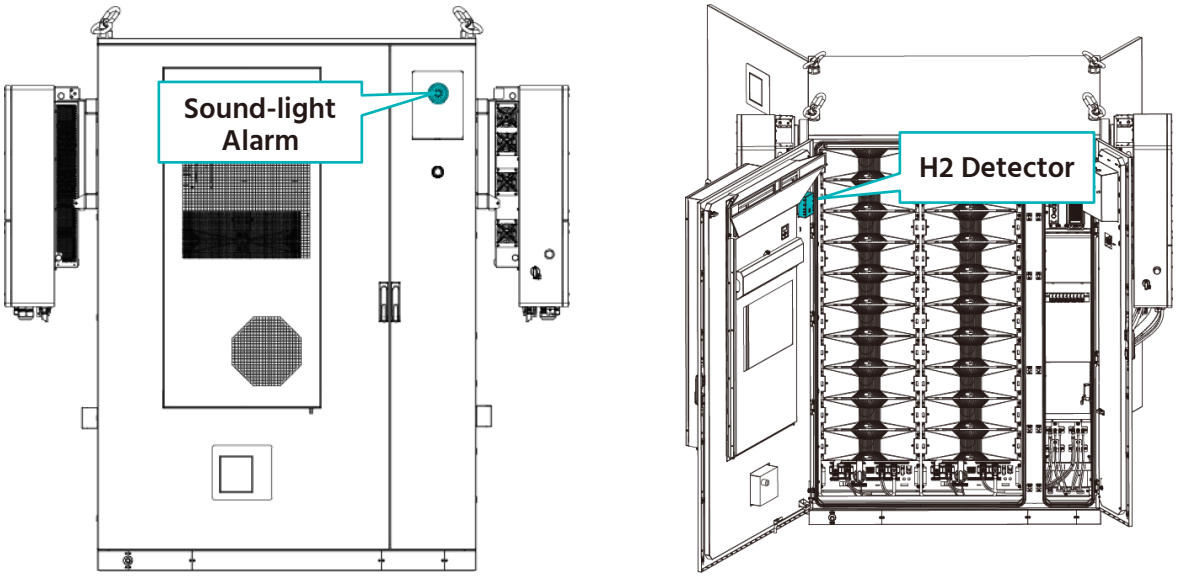
3.3 Safety Features

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

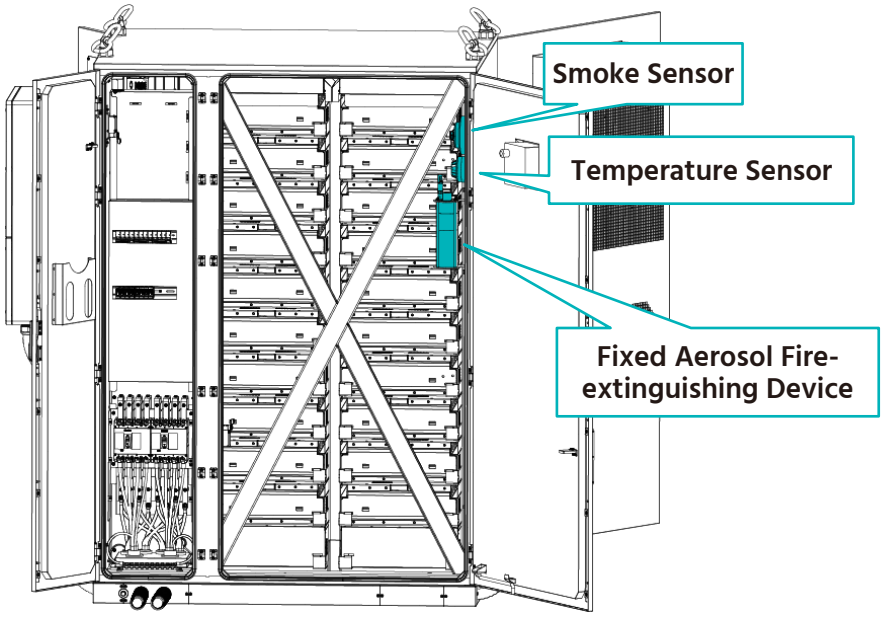
3.3.1 Fire Protection System

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

When a fire or other emergency occurs or the temperature reaches certain point, aerosols will be released from the fire extinguisher to suppress the fire. At the same time, the fire alarm will sound until the system is powered off.



Front View



Rear View

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

(1) The cooling effect of endothermic decomposition.

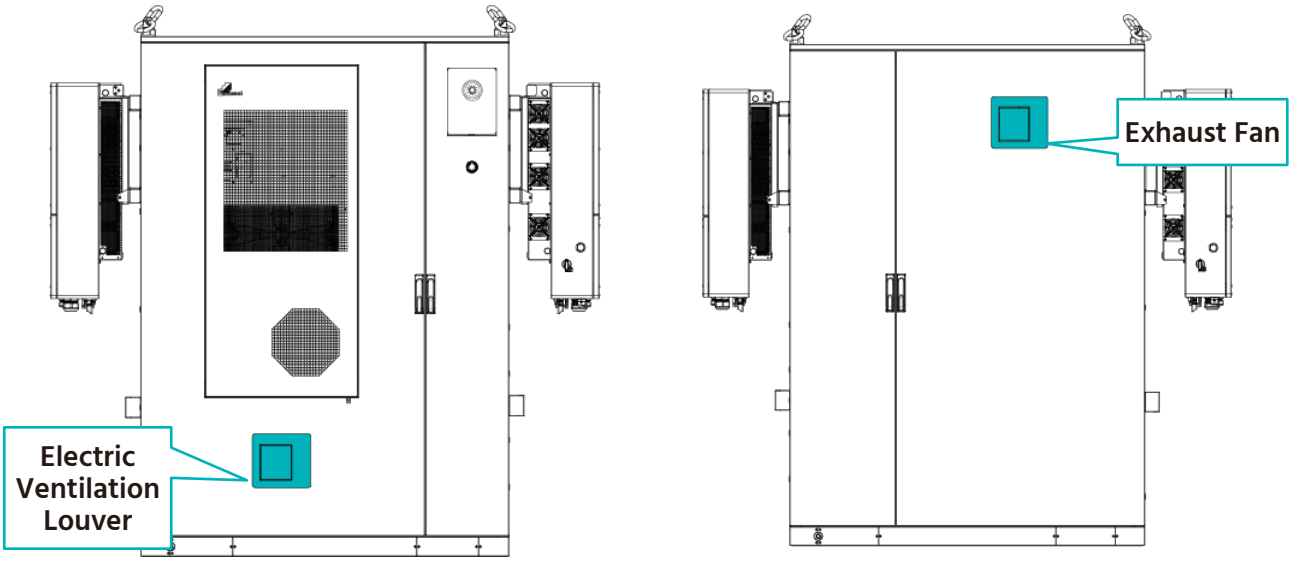
(2) The chemical inhibition of the gas phase and the solid phase plays a synergistic role between each other.

Specifications of Fixed Aerosol Fire-extinguishing Device

Picture	Item	Parameter
	Product Model	FP500S
	Dimensions of the Fixed Aerosol Fire-extinguishing Device (mm)	Ø84 × 295
	Aerosol Discharge Duration (second)	5~10
	Aerosol Discharge Lag Time (second)	3~4
	Thermal Clearance of Discharge Nozzle	0.3 meters (< 200 ^{o}C)； 1.0 meter (< 75 ^{o}C)
	Main Composition and Content	Nitrate of potash 77%, Epoxy resin polymer 18%
	Activating Signal	Heat start or minimum 1.5VDC/0.8A electrical start
	Feedback Signal	Dry Contact Signal
	Design Life (year)	15

3.3.2 Explosion proof and vent System

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



4 Mechanical Installation

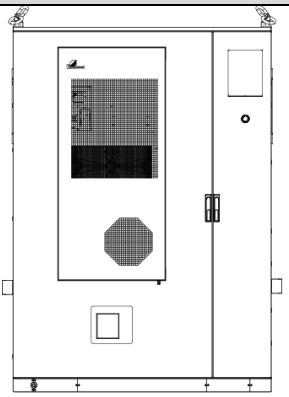
4.1 Checking Before the Installation

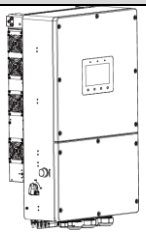
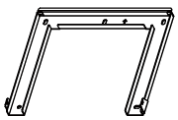
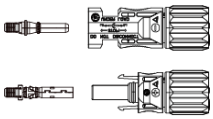
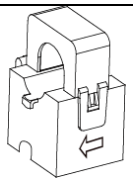
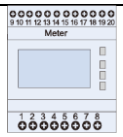
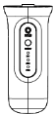
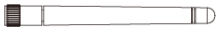
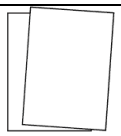
4.1.1 Checking the Outer Packing

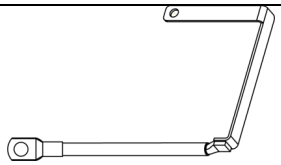
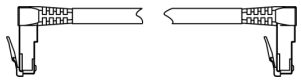
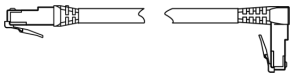
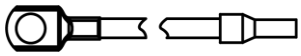
After receiving the product, check the outer packing for damage, such as holes, cracks, deformation and so on. If any damage is found, contact us as soon as possible.

4.1.2 Checking Deliverables

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

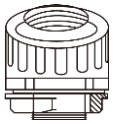
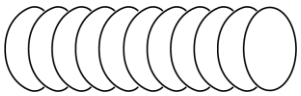
Cabinet × 1


PCS Set × 2				
 PCS × 1	 Back plate × 1	 Fastening screw × 4	 Expansion Bolt × 5	 DC connector × 8
 OT terminals × 13	 CAN cable(3m) × 1	 Battery terminal × 2	 Handle × 2	 Eastron Meter × 1
 CT × 3	 RJ45 connector × 11	 S2-WL-ST Stick × 1	 GPRS Antenna × 1	 Quick Installation Manual × 1

Cables				
Illustration	Length	Quantity	Material Code	Silk Screen
	175 mm	× 18	5WRPY02-01571	PACK FAN power supply_ Power cord
	190 mm	× 2	5WRPY02-01573	FAN power supply from main control to PACK_ Power cord
	2375 mm	× 2	5WRPY02-01659	PACK to control room B+_ Power cord
	136 mm	× 18	5WRPY01-00917	CAN communication between PACK_ Signal line
	560 mm	× 2	5WRPY01-00919	CAN communication between the main control and PACK_ Signal line
	2450 mm	× 1	5WRPY01-01205	BMS1 to PCS1_CAN_signal line
	3950 mm	× 1	5WRPY01-01206	BMS2 to PCS2_CAN_signal line
	5000 mm	× 1	5WRPY01-01207	PCS1 to PCS2 Communication_Signal Line
	2800 mm	× 1	5WRPY02-02364	XT3 to PCS2_BAT1+_power cable
	2850 mm	× 1	5WRPY02-02366	XT3 to PCS2_BAT2+_power cable
	1720 mm	× 1	5WRPY02-02368	XT4 to PCS1_BAT1+_power cable
	1770 mm	× 1	5WRPY02-02370	XT4 to PCS1_BAT2+_power cable
	2700 mm	× 1	5WRPY02-02363	XT3 to PCS2_BAT1-_Power_Cable
	2750 mm	× 1	5WRPY02-02365	XT3 to PCS2_BAT2-_Power_Cable
	1640 mm	× 1	5WRPY02-02367	XT4 to PCS1_BAT1-_Power Cable
	1690 mm	× 1	5WRPY02-02369	XT4 to PCS1_BAT2-_Power Cable
	1850 mm	× 1	5WRPY02-02308	QF1 to PCS1_GRID_L1_Power Cable
	3100 mm	× 1	5WRPY02-02314	QF1 to PCS2_GRID_L1_Power Cable
	1940 mm	× 1	5WRPY02-02318	QF2 to PCS1_LOAD_L4_power cable
	2940 mm	× 1	5WRPY02-02322	QF2 to PCS2_LOAD_L4_power cable
	1850 mm	× 1	5WRPY02-02311	QF1 to PCS1_GRID_L2_power cable
	3020 mm	× 1	5WRPY02-02315	QF1 to PCS2_GRID_L2_power cable
	1900 mm	× 1	5WRPY02-02319	QF2 to PCS1_LOAD_L5_power cable
	2880 mm	× 1	5WRPY02-02323	QF2 to PCS2_LOAD_L5_power cable
	1850 mm	× 1	5WRPY02-02312	QF1 to PCS1_GRID_L3_power cable
	3030 mm	× 1	5WRPY02-02316	QF1 to PCS2_GRID_L3_power cable
	1970 mm	× 1	5WRPY02-02320	QF2 to PCS1_LOAD_L6_power cable

	2930 mm	× 1	5WRPY02-02324	QF2 to PCS2_LOAD_L6_power cable
	1870 mm	× 1	5WRPY02-02313	QF1 to PCS1_GRID_N_power cable
	3040 mm	× 1	5WRPY02-02317	QF1 to PCS2_GRID_N_Power Cable
	1980 mm	× 1	5WRPY02-02321	QF2 to PCS1_LOAD_N_power cable
	2920 mm	× 1	5WRPY02-02325	QF2 to PCS2_LOAD_N_power cable

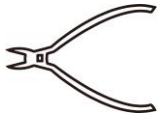
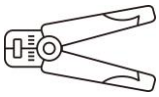
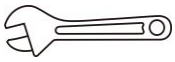
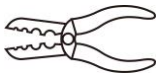
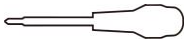
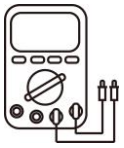
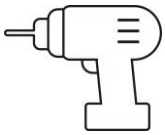
Copper Bars		
Illustration	Quantity	Material Code
	× 2	5STPT04-00315
	× 18	5STPT04-00317

Accessories			
Illustration	Specification / Length	Quantity	Material Code
 Corrugated Conduit Joint	M20 × 1.5	× 2	5STAS12-00042
	M25 × 1.5	× 4	5STAS12-00043
	M40 × 1.5	× 4	5STAS12-00044
	M50 × 1.5	× 2	5STAS12-00045
 Corrugated Conduit	AD15.8 / 9.9 m	× 3	5STAS20-00004
	AD25 / 8.515 m	× 4	5STAS20-00005
	AD42.5 / 9.43 m	× 4	5STAS20-00006

NOTE:

Some cables are provided by Pylontech on site. The actual situation prevails.

4.2 Preparing Tools and PPE

Tools					
 Wire Cutter	 Crimping Modular Plier	 Adjustable Wrench	 Wire Stripper	 Torque Wrench	 Screwdriver
 Cable Tie	 Socket Wrench set	 PVC Electrical Tape	 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 PVC electrical tape.

4.3 Preparing Accessories

Cable	Wire Diameter	Cable	Wire Diameter
LOAD-L1	1 × 50 mm^2	GRID-L1	1 × 70 mm^2
LOAD-L2	1 × 50 mm^2	GRID-L2	1 × 70 mm^2
LOAD-L3	1 × 50 mm^2	GRID-L3	1 × 70 mm^2
LOAD-N	1 × 50 mm^2	GRID-N	1 × 70 mm^2
LOAD-PE	1 × 25 mm^2	GRID-PE	1 × 35 mm^2

NOTE:

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

4.4 Selecting the Installation Sites

4.4.1 Working Environment Requirements

The following requirements must be met for installation:

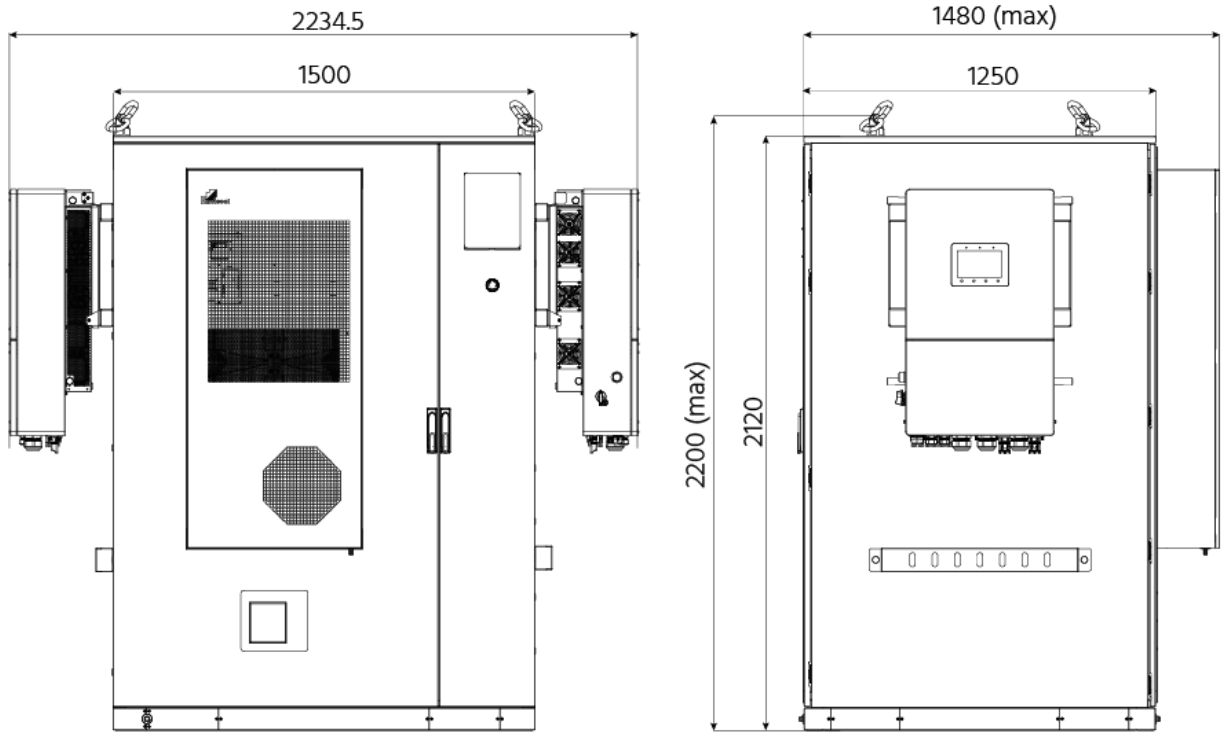
- The IP rating of the indoor cabinet is IP20. Be sure to keep away from high salt spray, corrosive environment, away from heat source and flammable and explosive materials.
- The ambient temperature should be guaranteed between -10 ~ 50℃ to ensure that the indoor cabinet can operate properly. A heating or cooling system may be needed when necessary.

4.4.2 Installation Space Requirements

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

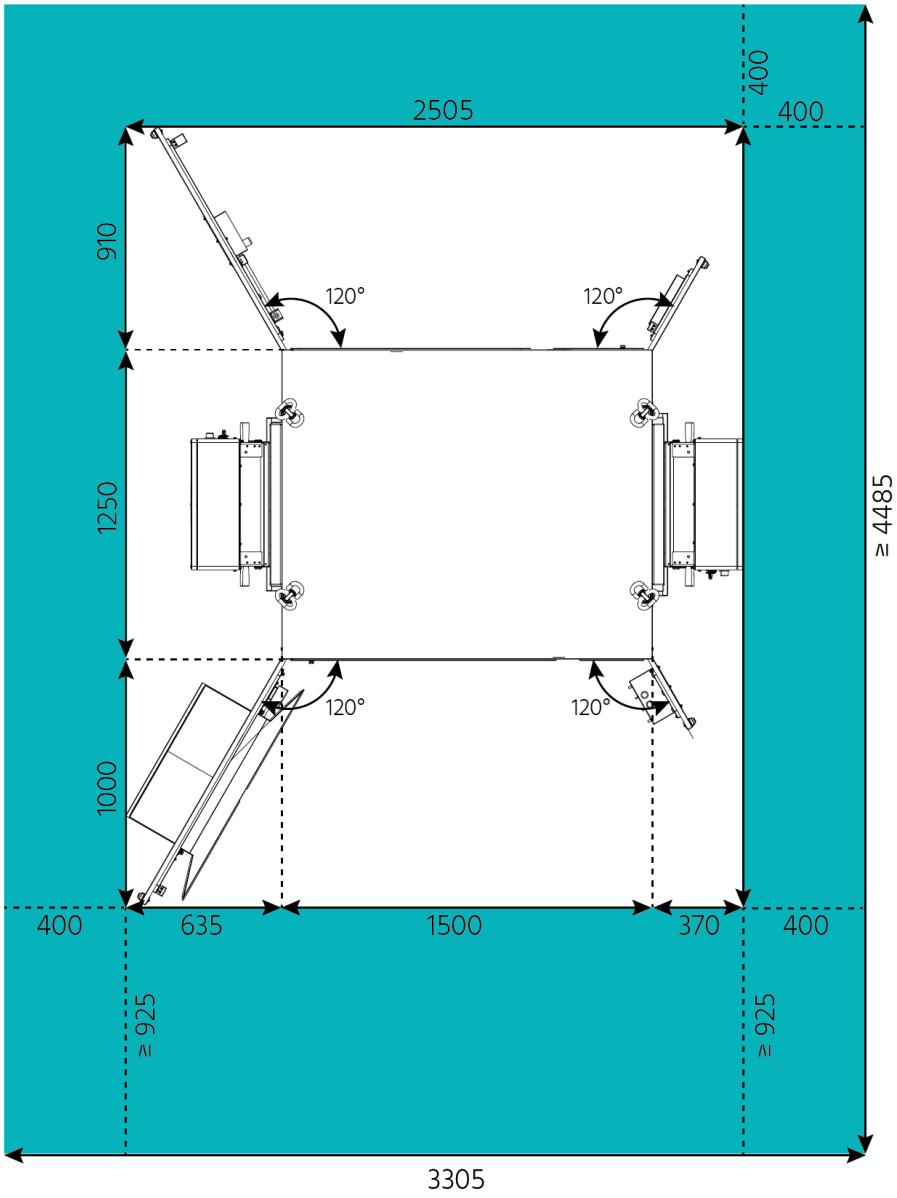
External dimensions of the system (without PCS): 1500 mm (W) × 1480 mm (D) × 2200 mm (H).

External dimensions of the system (with PCS): 2234.5 mm (W) × 1480 mm (D) × 2200 mm (H).



Unit: mm

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



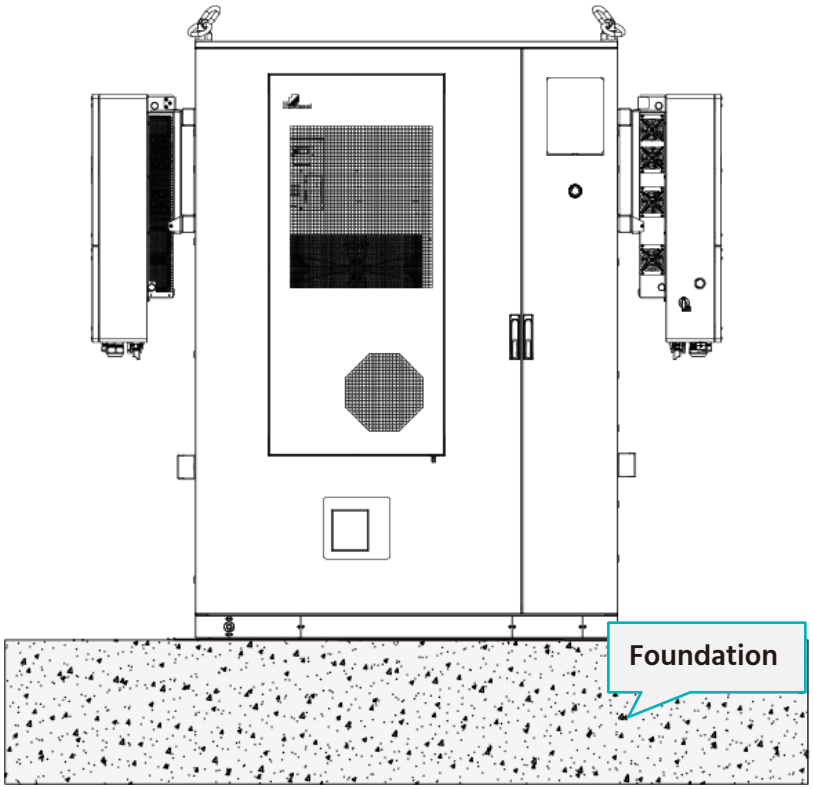
Recommended Maintenance Space

Unit: mm

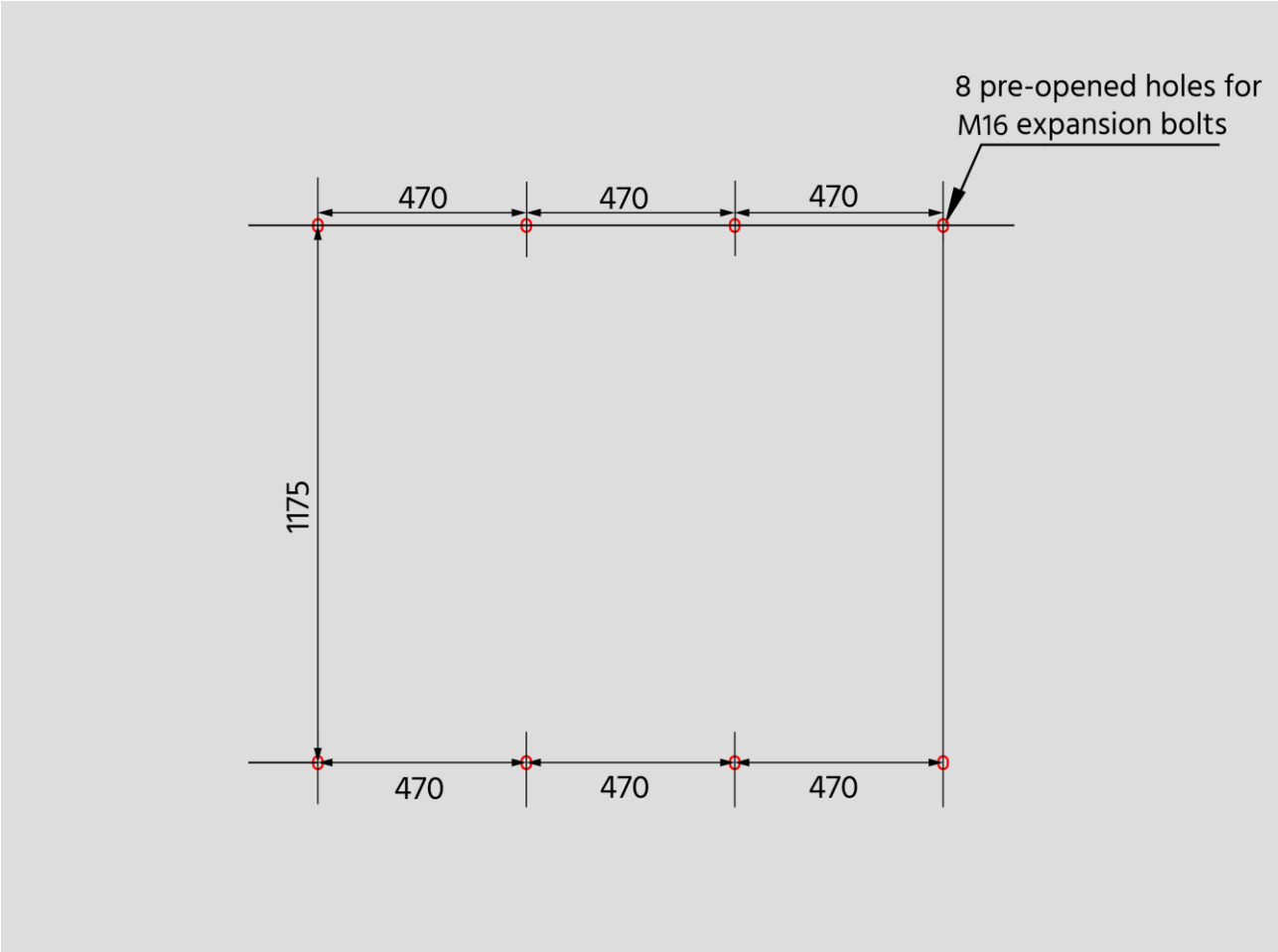
4.4.3 Installation Foundation Requirements

The installation site needs to meet the following requirements:

- The installation foundation should be able to bear the total weight of the whole outdoor cabinet system (about 3650 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 300 mm above the level ground



- The cabinet is fixed at the bottom, and holes should be pre-opened on the installation site in accordance with the positioning holes at the bottom of the cabinet. See the drawing below.



Locations of positioning holes in the foundation (Unit: mm)

⚠ WARNING

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

4.5 Handling of the Cabinet

The outdoor cabinet can be transported by crane or forklift.

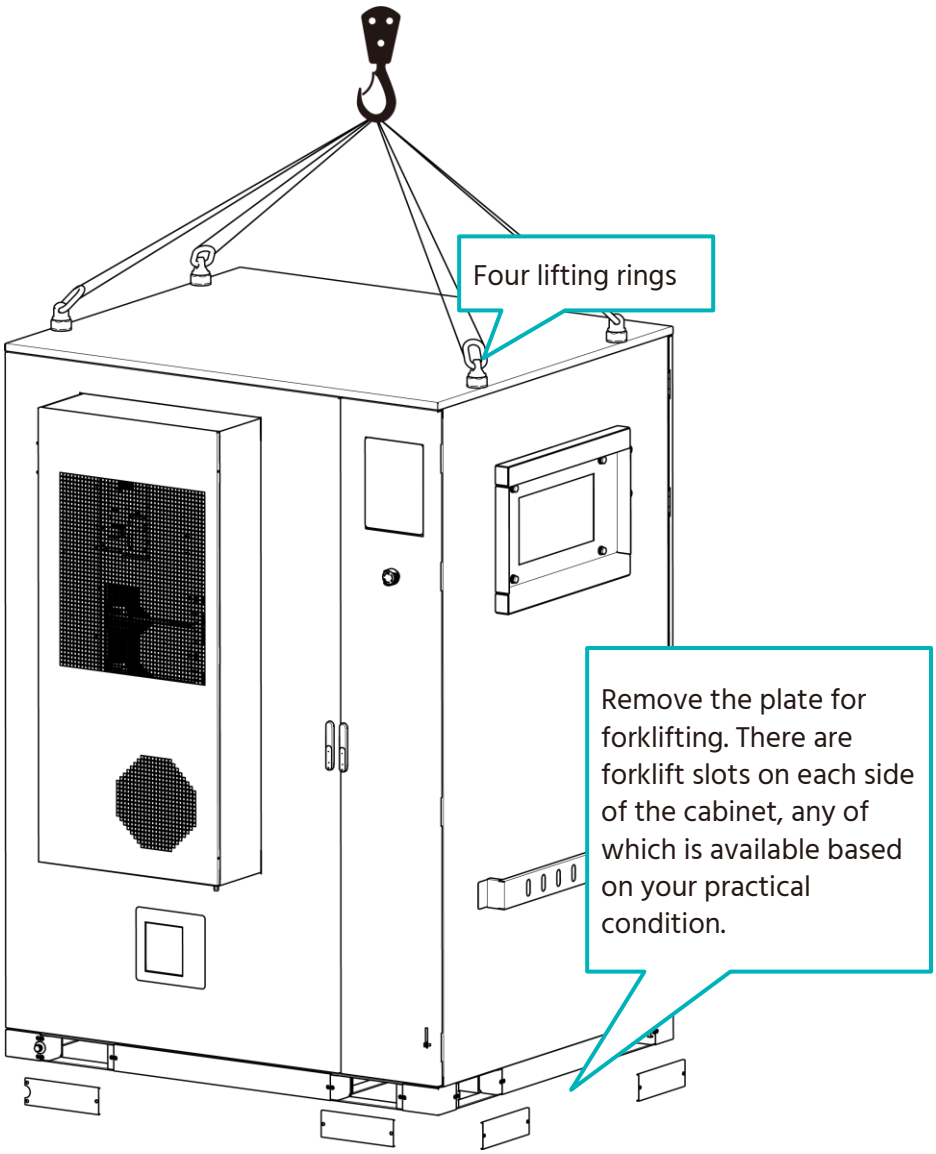
DANGER

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

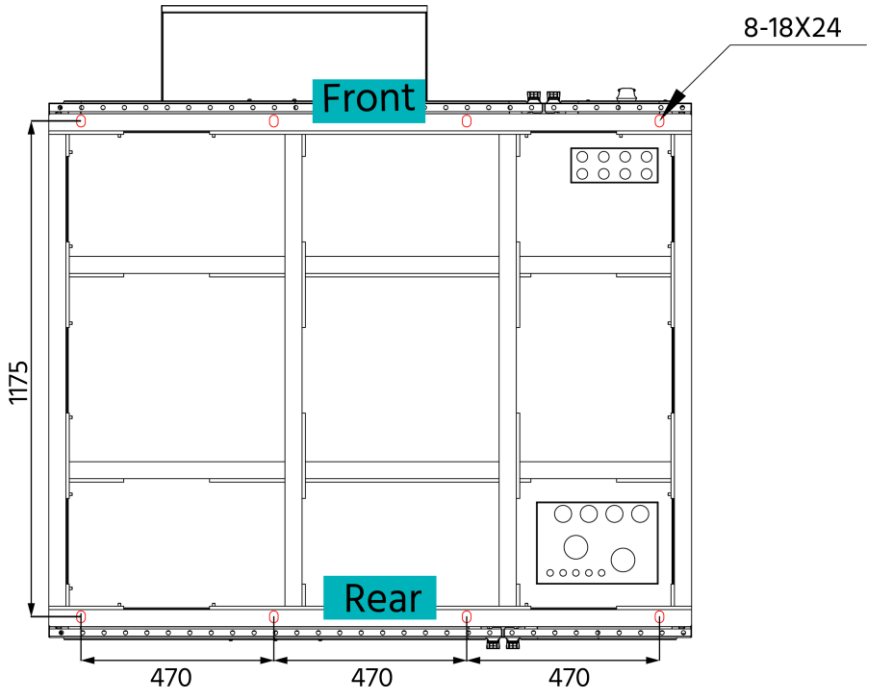
Caution: Pay attention to the center of gravity when lifting or forking the cabinet and keep the moving process slow, smooth and balanced.
During the moving process, the equipment should not be tilted at an angle of more than 5° and should not be suddenly lowered or lifted.

Positions of the lifting rings and forklift slots



4.6 Mechanical Installation Steps

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



Locations of positioning holes in the foundation (Unit: mm)

3. Use expansion bolts to secure the cabinet to the foundation.
4. Refer to *Section 4.7 PCS Installation* to Install the PCS.

4.7 PCS Installation

Please follow the steps below to mount the PCS to the outdoor cabinet.

NOTE

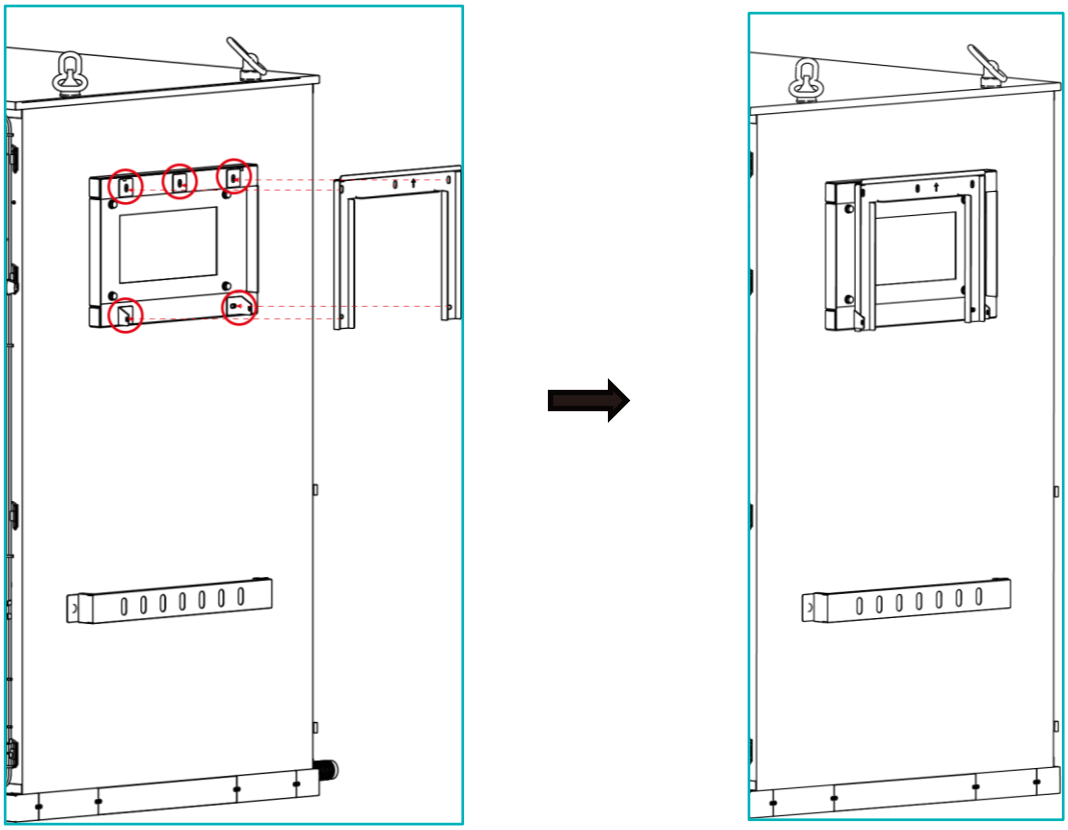
The following takes the case of installing the PCS on the right side, which also applies to the left side.

> **⚠ CAUTION**
>
> One PCS weighs 73kg. Four people are required to remove the PCS from the shipping box.

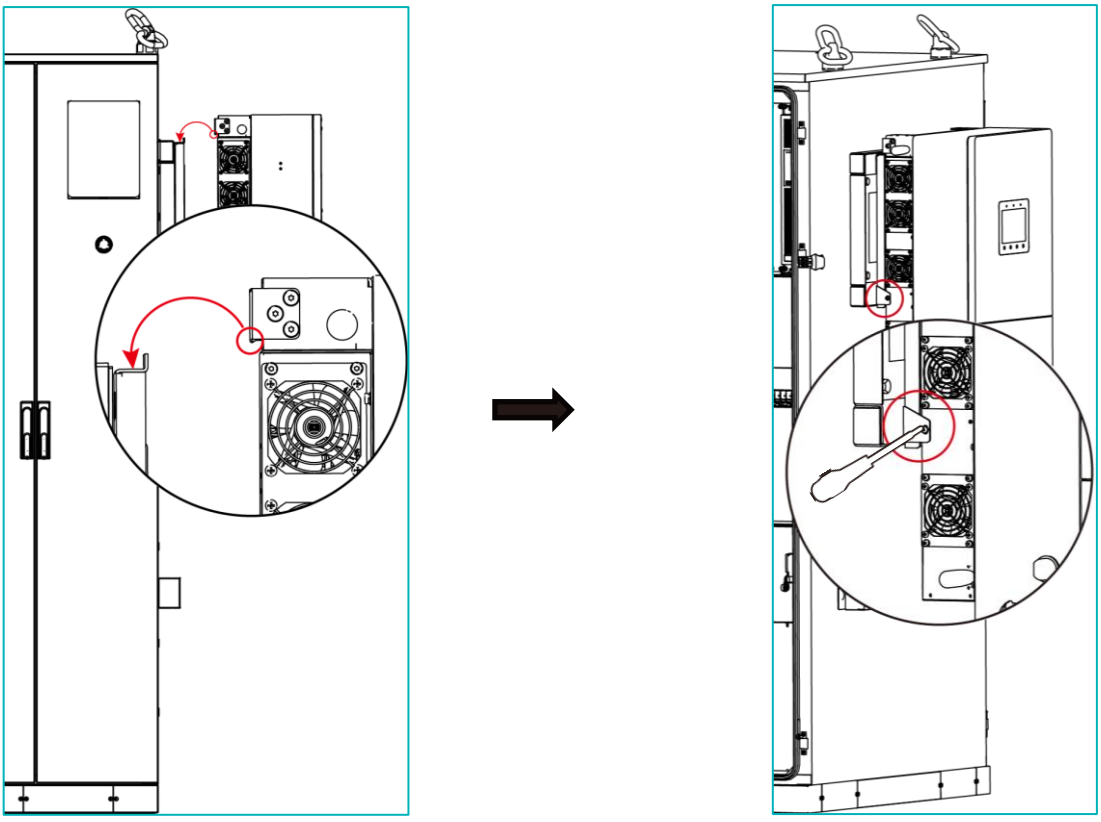
> **⚠ CAUTION**
>
> When setting the PCS down, do it slowly and gently. This ensures that the internal components and the outer chassis do not take any damage.

1. Use the handles integrated into the heat sink to remove the PCS from the carton.

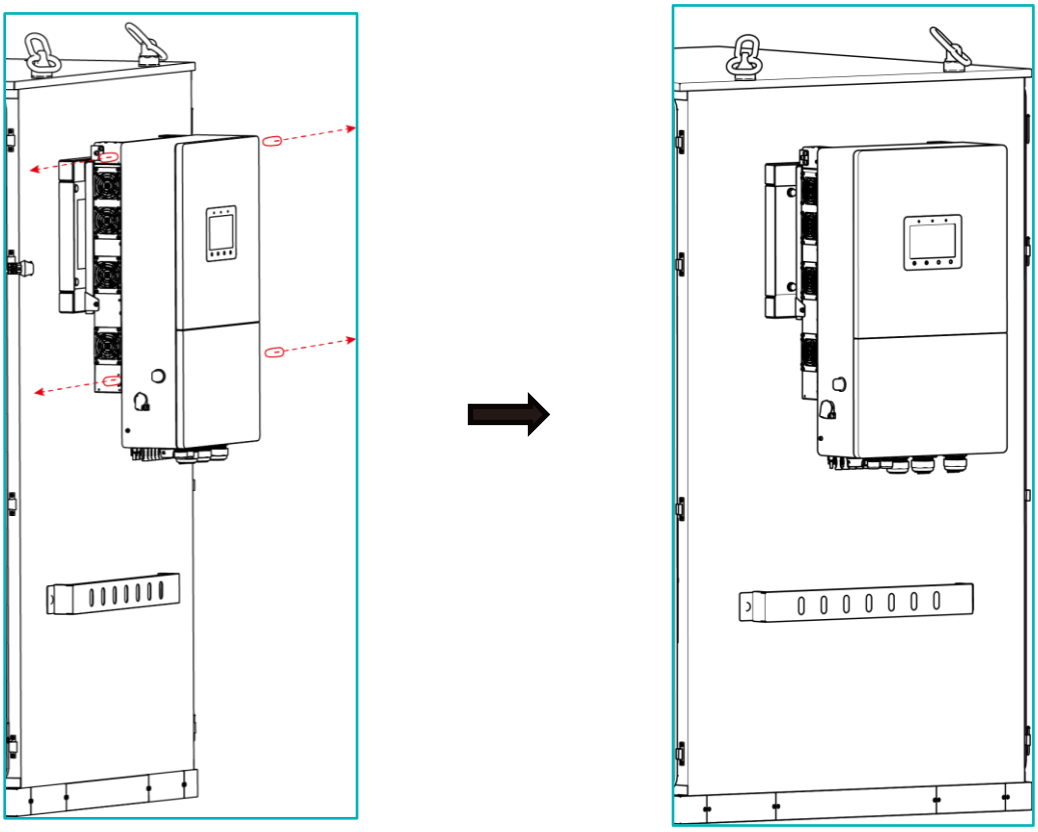
2. Align the five holes in the cabinet sideboard to secure the mounting bracket to the cabinet with five bolts.



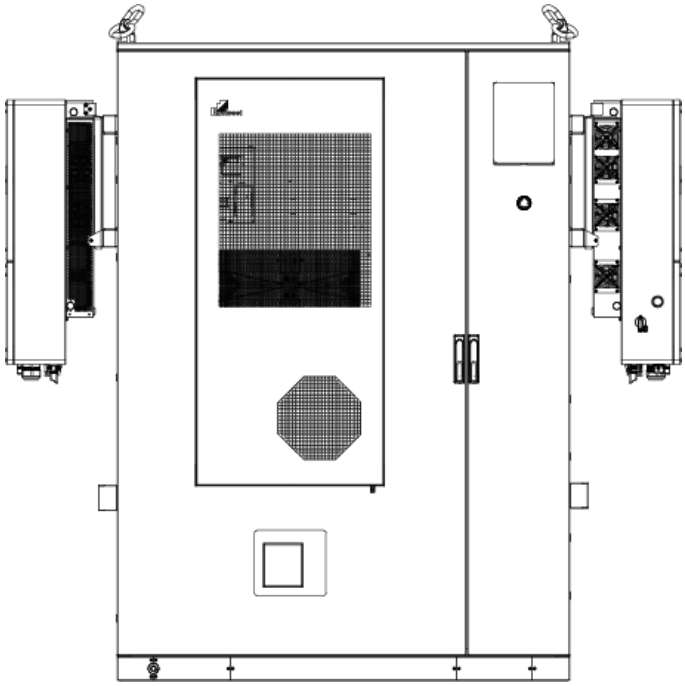
3. Lift up the PCS, and align the back bracket on the PCS with the convex section of the mounting bracket. Hang the PCS on the mounting bracket and tighten the screws on both sides to secure the PCS.



4. Remove the handles from PCS.

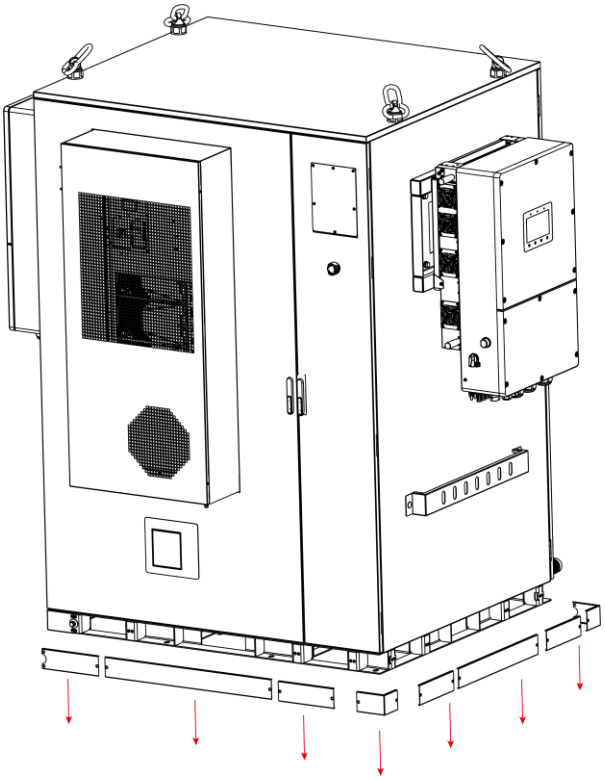


5. Repeat the steps above to install the other PCS on the left of the cabinet.



5 Electrical and Communication Wiring

Remove the bottom covers of the cabinet before running cables through the base.



DANGER

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

DANGER

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

DANGER

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

5.1 Bolt Torque

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

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

5.2 Grounding

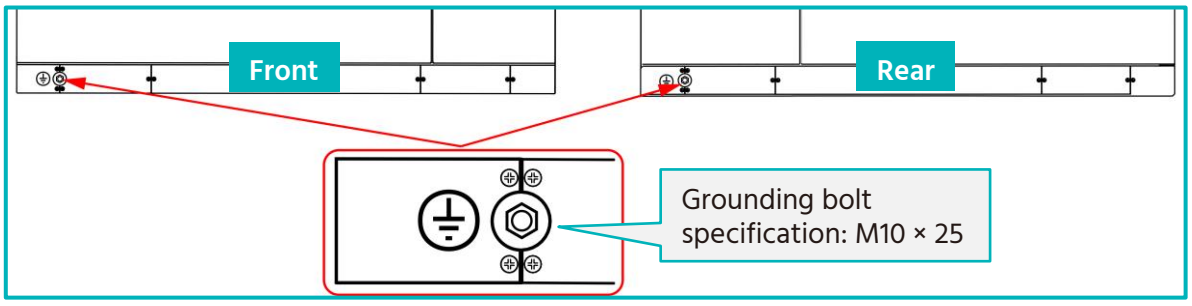
It is recommended to use copper wire for the chassis ground. Either solid conductor or stranded wire is acceptable. Refer to local code standard for wire sizing.

DANGER

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.

5.2.1 Cabinet Grounding

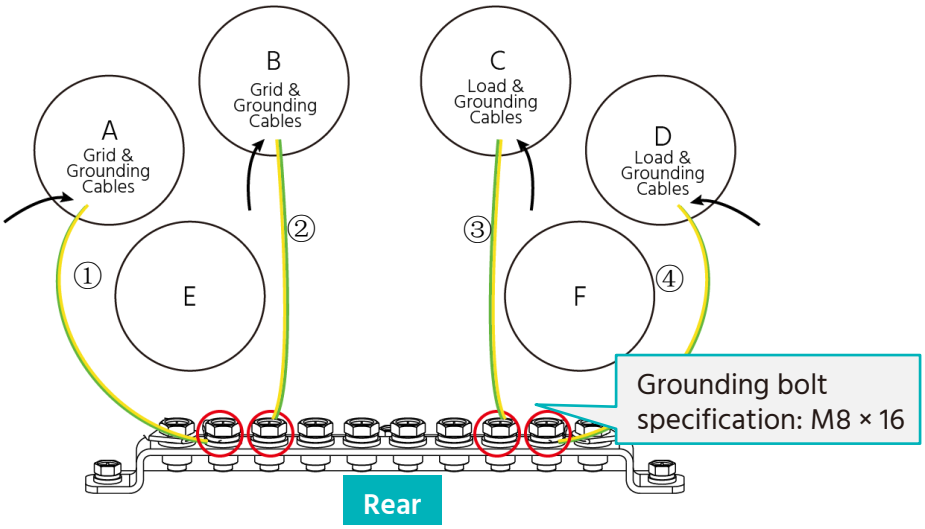
Attach the grounding cable to the grounding bolt (either location is available) of the cabinet base and fasten the terminal lug in place.



5.2.2 PCS Grounding

Connect the grounding cable(s) to the grounding copper bar inside the cabinet and fasten the terminal lug(s) in place.

Schematic diagram is as follows.



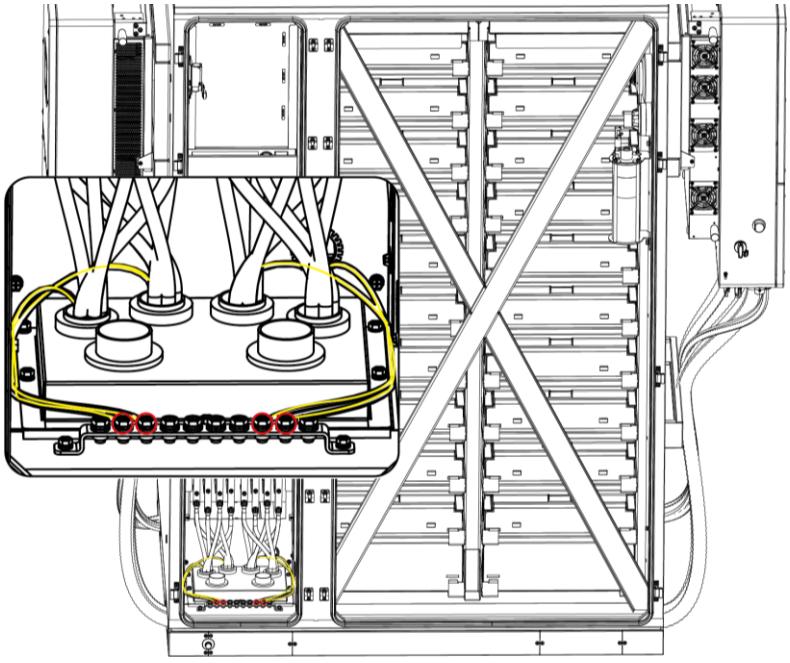
AC Part Grounding Connection

NOTE

Cable ② and ③ are provided by Pylontech on site.

Cable ① and ④ are prepared by yourself.

Scenario diagram is as follows.

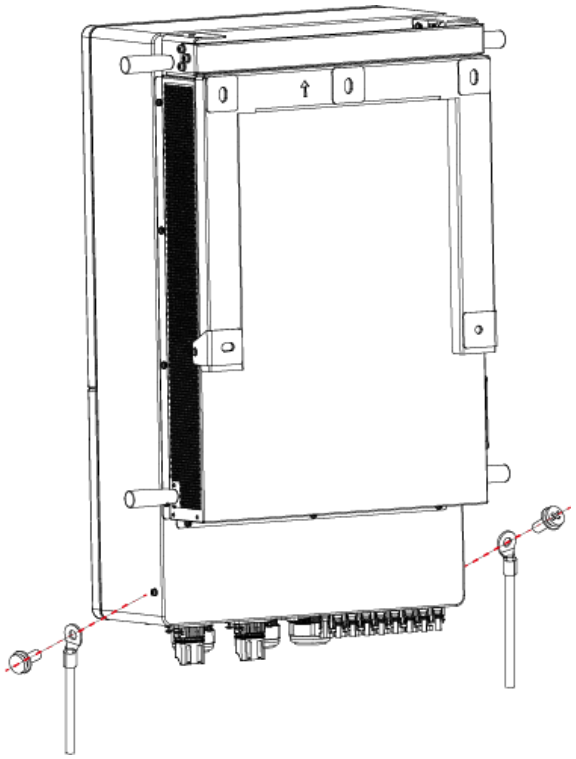


Rear View

An external ground connection is provided at the both sides of PCS.

Prepare OT terminals: M5. Use proper tooling to crimp the lug to the terminal.

Connect the OT terminal with ground cable to the right side of PCS. The torque is 3.5 N • m.



5.3 DC Side Cable Wiring

5.3.1 Battery to Battery Connection

DANGER

Danger: DO NOT connect the positive and negative reversely.

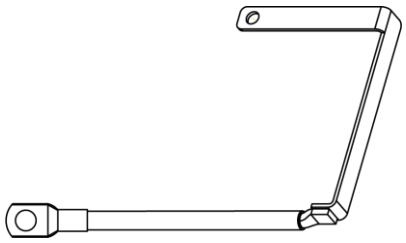
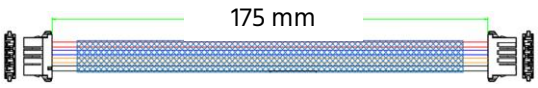
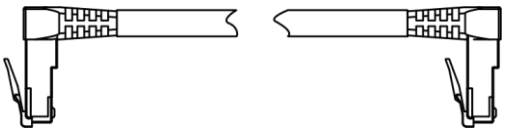
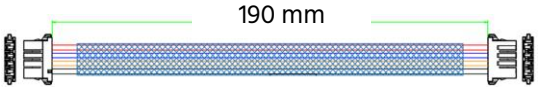
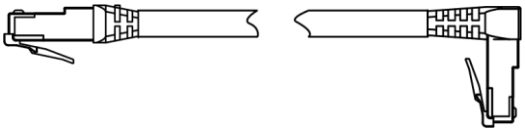
(1) Connect the positive and negative electrodes of the battery modules in series.

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

Copper Bar Preparation

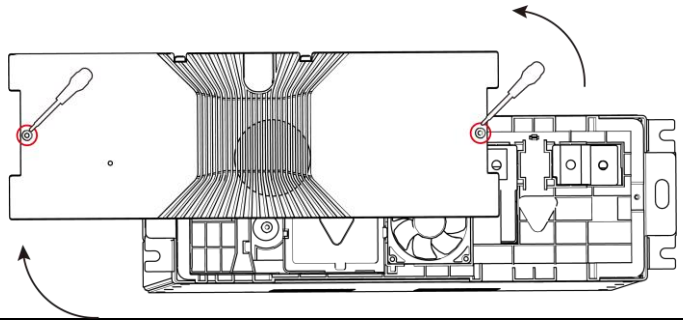
No.	Material Code	Picture
①	5STPT04-00315	
②	5STPT04-00317	

Cable Preparation

No.	Material Code	Description	Picture
③	5WRPY02-01659	PACK to control room B+_ Power cord	
④	5WRPY02-01571	PACK FAN power supply_ Power cord	
⑤	5WRPY01-00917	CAN communication between PACK_ Signal line	
⑥	5WRPY02-01573	FAN power supply from main control to PACK_ Power cord	
⑦	5WRPY01-00919	CAN communication between the main control and PACK_ Signal line	

Operation Steps

1. Remove all front covers from the battery modules.

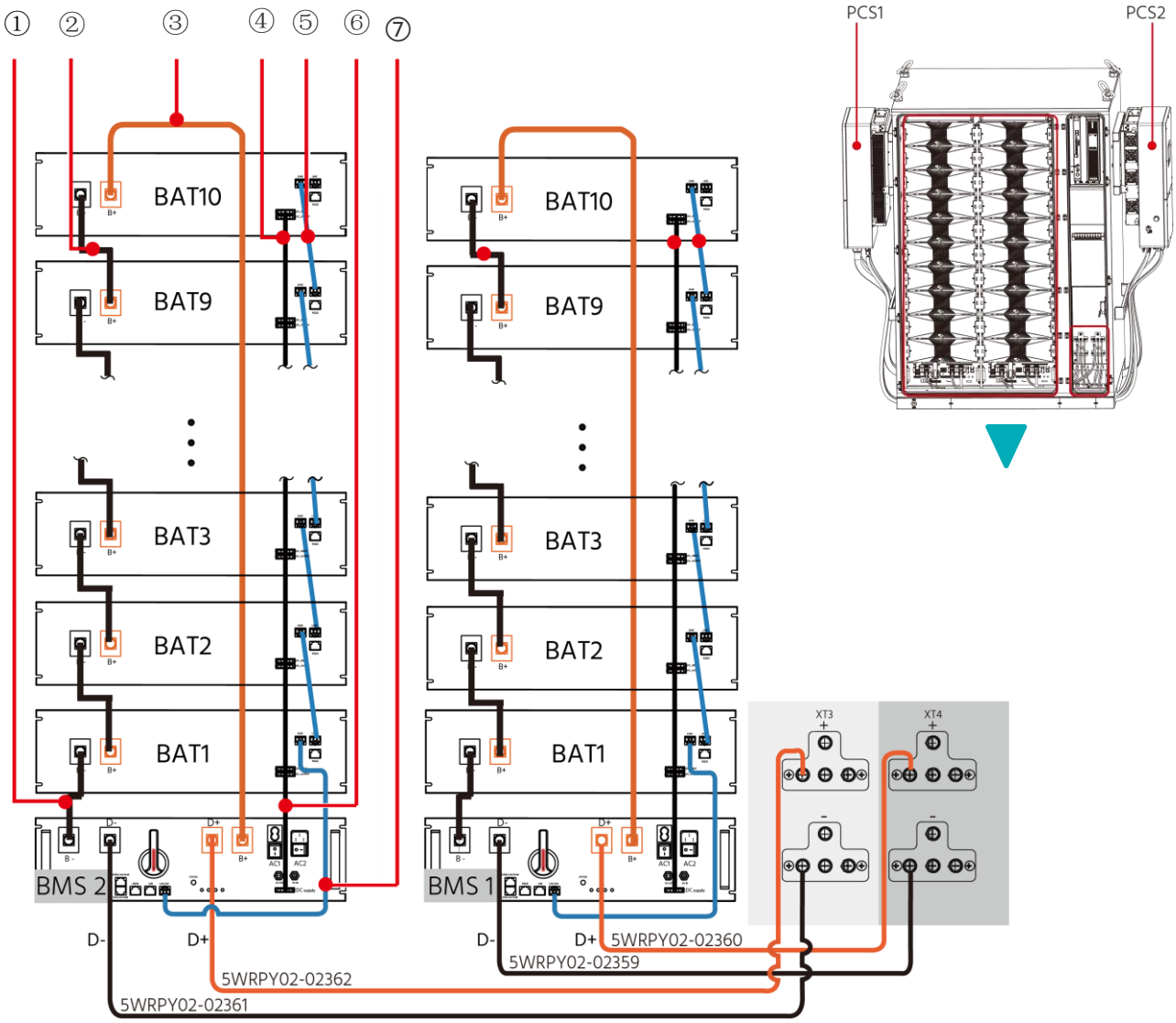


DANGER

Danger: For safety, whenever a battery module is connected, please install the cover back on immediately and tighten the screws. For torque requirements, refer to *section 0*

Bolt Torque.

2. Complete the battery wiring according to the following diagram.

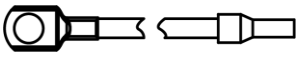
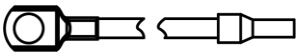
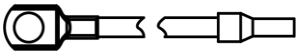
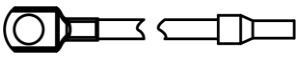


NOTE:

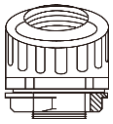
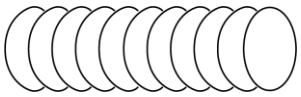
The cables connecting the BMS to the copper bars are pre-wired. No additional operations are required.

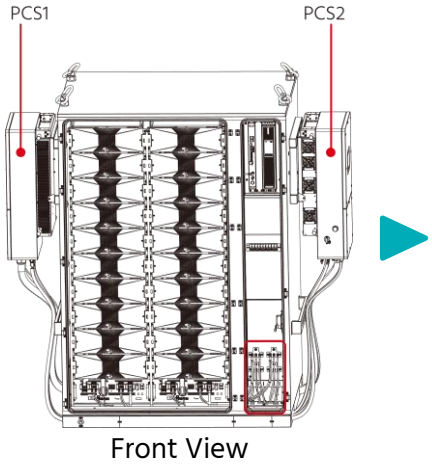
5.3.2 XT3/4 to PCS Connection

Cables Preparation

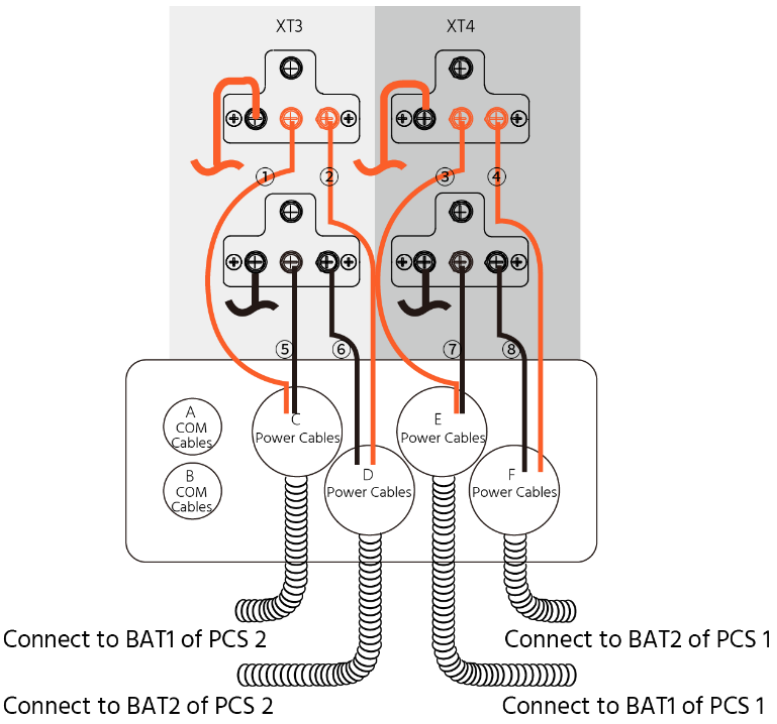
No.	Material Code	Description	Quantity	Picture
①	5WRPY02-02364	XT3 to PCS2_BAT1+_power cable	× 1	
②	5WRPY02-02366	XT3 to PCS2_BAT2+_power cable	× 1	
③	5WRPY02-02370	XT4 to PCS1_BAT2+_power cable	× 1	
④	5WRPY02-02368	XT4 to PCS1_BAT1+_power cable	× 1	
⑤	5WRPY02-02363	XT3 to PCS2_BAT1-_Power_Cable	× 1	
⑥	5WRPY02-02365	XT3 to PCS2_BAT2-_Power_Cable	× 1	
⑦	5WRPY02-02369	XT4 to PCS1_BAT2-_Power Cable	× 1	
⑧	5WRPY02-02367	XT4 to PCS1_BAT1-_Power Cable	× 1	

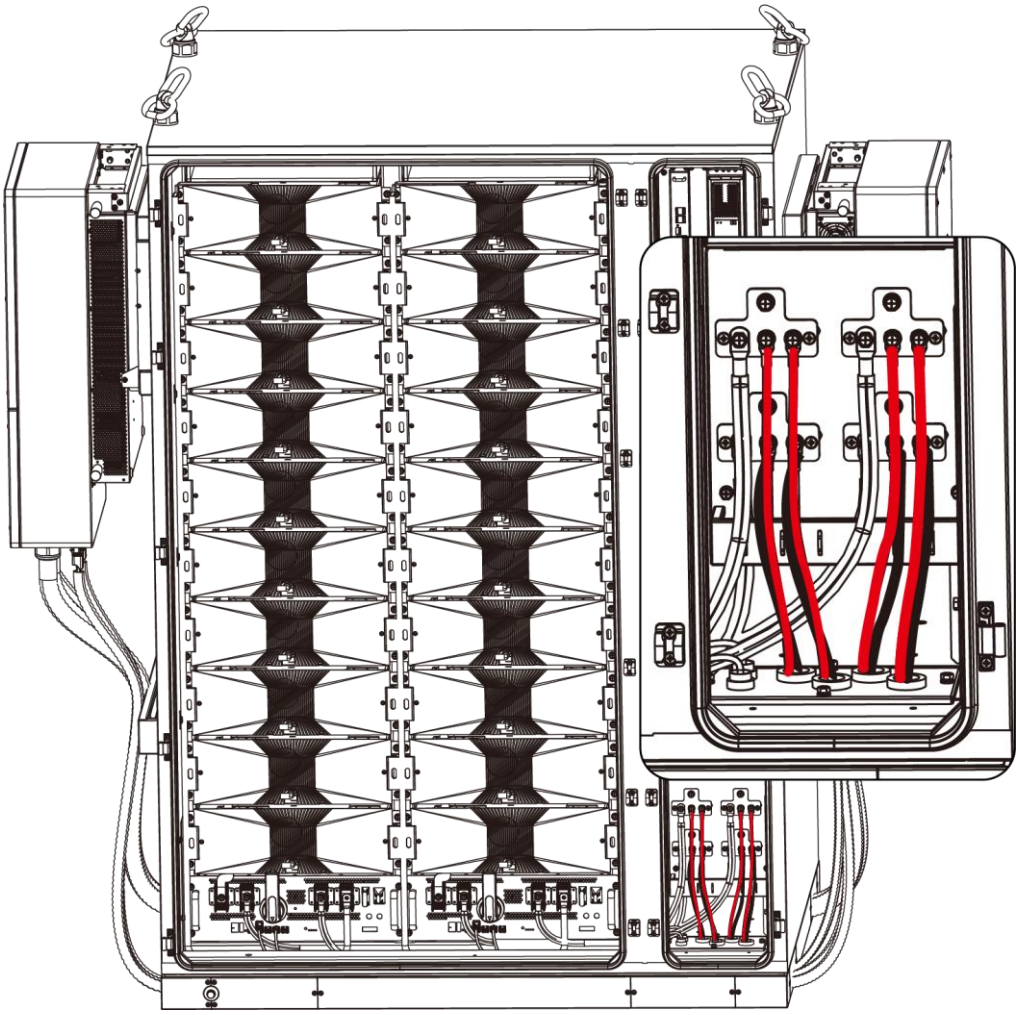
Accessories Preparation

Material Code	Specification	Description	Quantity	Picture
5STAS12-00043	M25 × 1.5	Cable Gland	× 4	
5STAS20-00005	8.515 m	Corrugated Conduit	× 4	


PCS1
PCS2

Front View


XT3
XT4
1
2
3
4
5
6
7
8
A
COM
Cables
B
COM
Cables
C
Power Cables
D
Power Cables
E
Power Cables
F
Power Cables
Connect to BAT1 of PCS 2
Connect to BAT2 of PCS 2
Connect to BAT2 of PCS 1
Connect to BAT1 of PCS 1

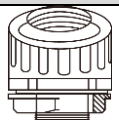
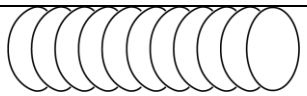


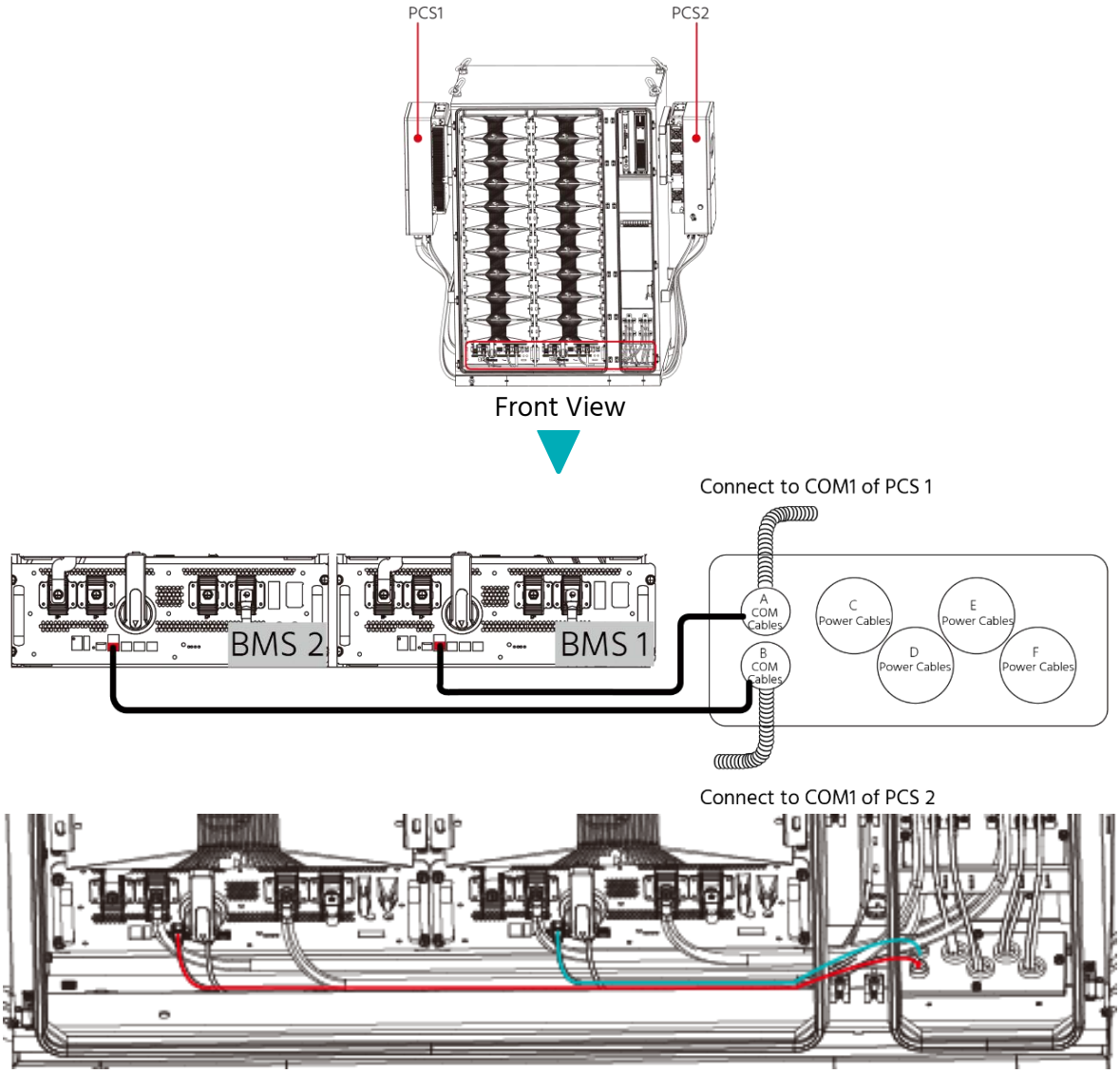
5.3.3 BMS to PCS Connection

Cables Preparation

Material Code	Description	Quantity	Illustration
5WRPY01-01205	BMS1 to PCS1_CAN_signal line	× 1	
5WRPY01-01206	BMS2 to PCS2_CAN_signal line	× 1	

Accessories Preparation

Material Code	Specification	Description	Quantity	Illustration
5STAS12-00042	M20 × 1.5	Cable Gland	× 2	
5STAS20-00004	9.9 m	Corrugated Conduit	× 2	



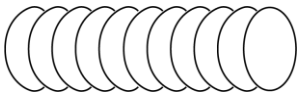
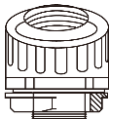
5.4 AC Side Cable Wiring

5.4.1 QF1 to AC Grid Port of PCS 1

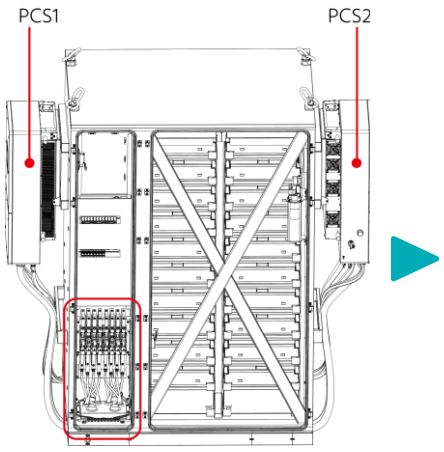
Cables Preparation

No.	Material Code	Description	Illustration
①	5WRPY02-02308	QF1 to PCS1_GRID_L1_Power Cable	
②	5WRPY02-02311	QF1 to PCS1_GRID_L2_power cable	
③	5WRPY02-02312	QF1 to PCS1_GRID_L3_power cable	
④	5WRPY02-02313	QF1 to PCS1_GRID_N_power cable	

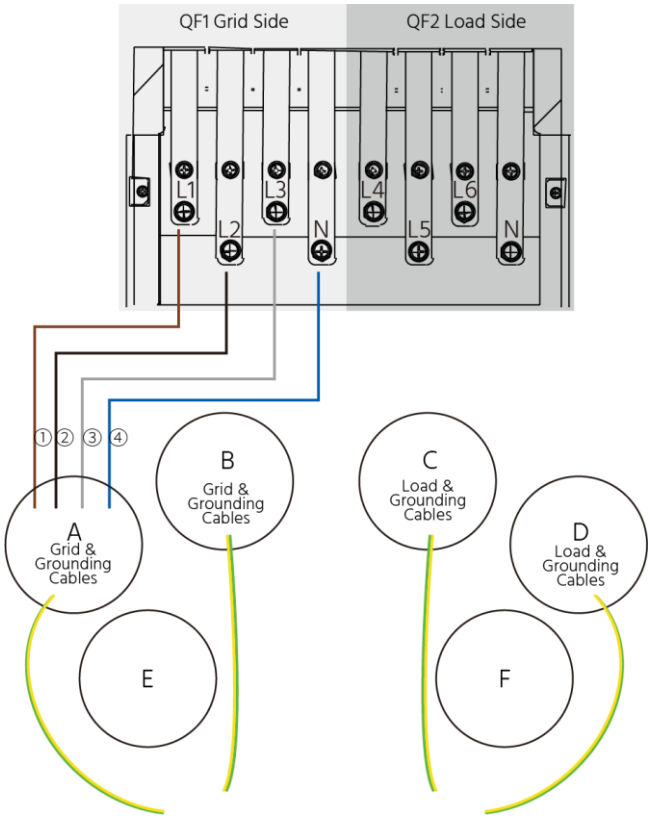
Accessories Preparation

Material Code	Specification	Description	Quantity	Illustration
5STAS20-00006	9.43 m	Corrugated Conduit	× 1	
5STAS12-00044	M40 × 1.5	Cable Gland	× 1	

Wiring Diagram



Rear View

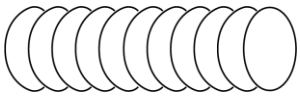
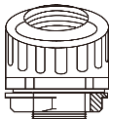


5.4.2 QF1 to AC Grid Port of PCS 2

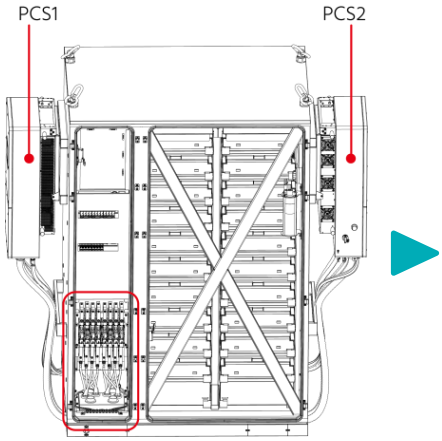
Cables Preparation

No.	Material Code	Description	Illustration
⑤	5WRPY02-02314	QF1 to PCS2_GRID_L1_Power Cable	
⑥	5WRPY02-02315	QF1 to PCS2_GRID_L2_power cable	
⑦	5WRPY02-02316	QF1 to PCS2_GRID_L3_power cable	
⑧	5WRPY02-02317	QF1 to PCS2_GRID_N_Power Cable	

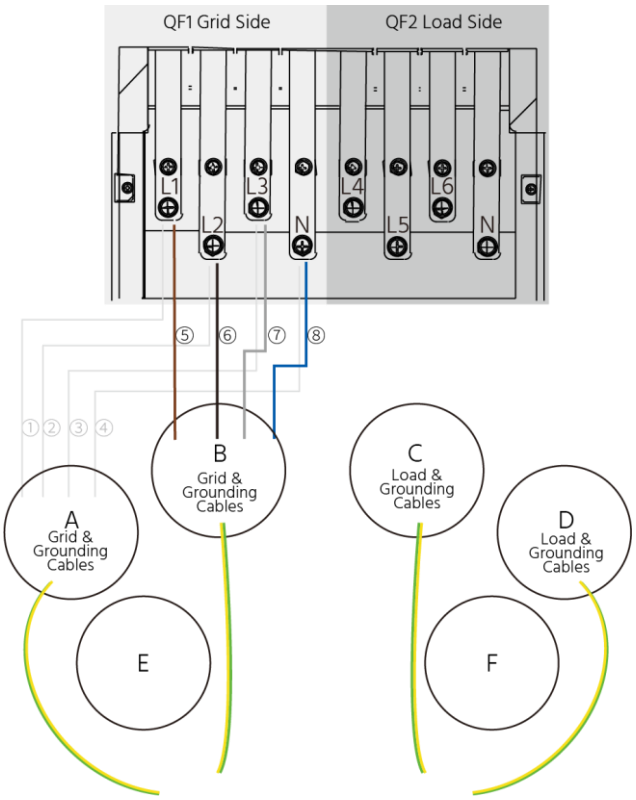
Accessories Preparation

Material Code		Description	Quantity	Illustration
5STAS20-00006	9.43 m	Corrugated Conduit	× 1	
5STAS12-00044	M40 × 1.5	Cable Gland	× 1	

Wiring Diagram



Rear View

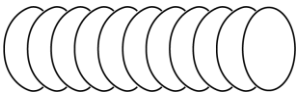
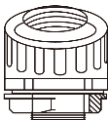


5.4.3 QF2 to Backup Port of PCS 1

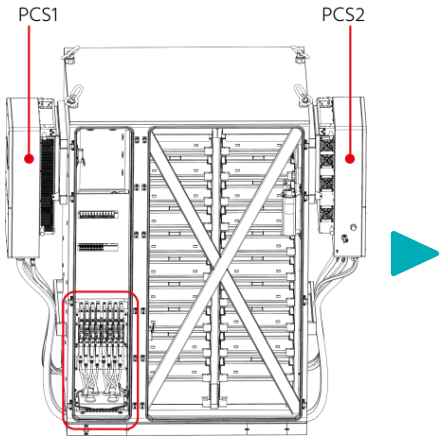
Cables Preparation

No.	Material Code	Description	Illustration
⑨	5WRPY02-02318	QF2 to PCS1_LOAD_L4_power cable	
⑩	5WRPY02-02319	QF2 to PCS1_LOAD_L5_power cable	
⑪	5WRPY02-02320	QF2 to PCS1_LOAD_L6_power cable	
⑫	5WRPY02-02321	QF2 to PCS1_LOAD_N_power cable	

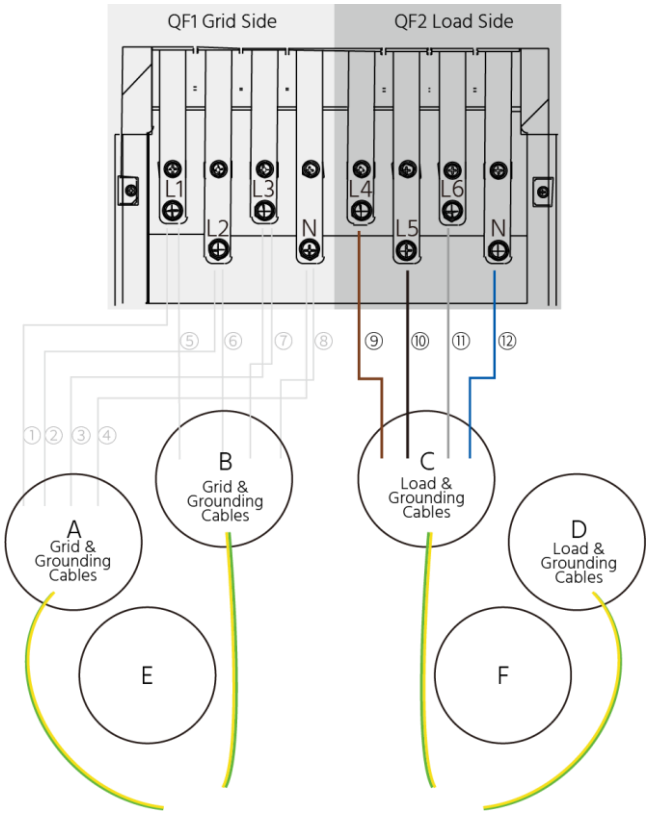
Accessories Preparation

Material Code	Specification	Description	Quantity	Illustration
5STAS20-00006	9.43 m	Corrugated Conduit	× 1	
5STAS12-00044	M40 × 1.5	Cable Gland	× 1	

Wiring Diagram



Rear View

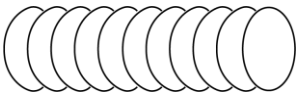
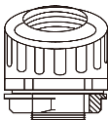


5.4.4 QF2 to Backup Port of PCS 2

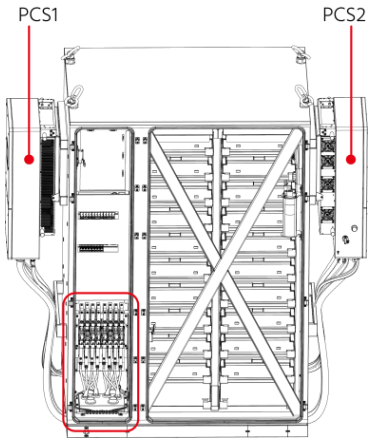
Cables Preparation

No.	Material Code	Description	Illustration
⑬	5WRPY02-02322	QF2 to PCS2_LOAD_L4_power cable	
⑭	5WRPY02-02323	QF2 to PCS2_LOAD_L5_power cable	
⑮	5WRPY02-02324	QF2 to PCS2_LOAD_L6_power cable	
⑯	5WRPY02-02325	QF2 to PCS2_LOAD_N_power cable	

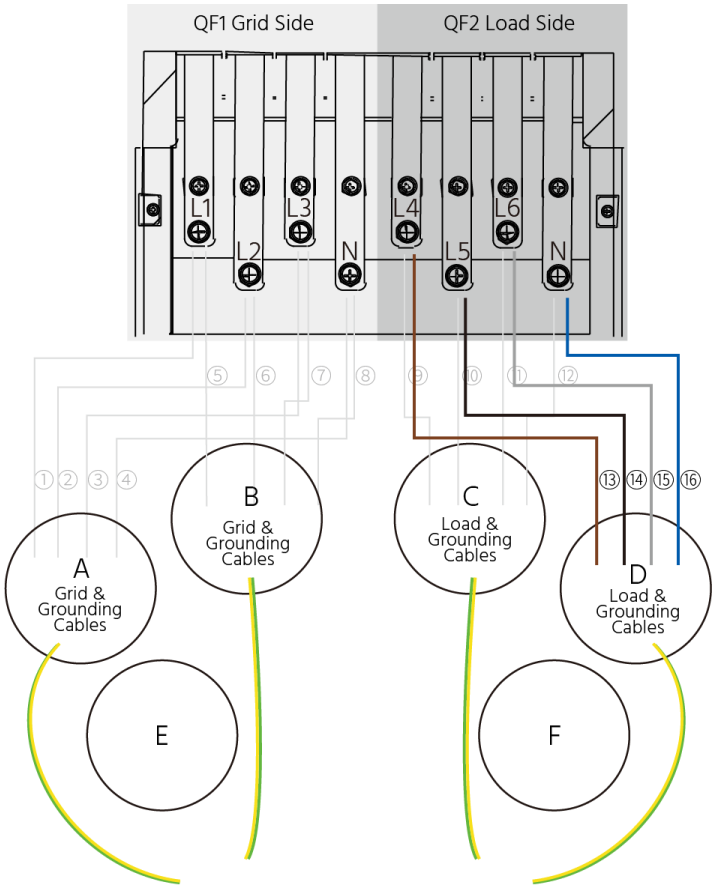
Accessories Preparation

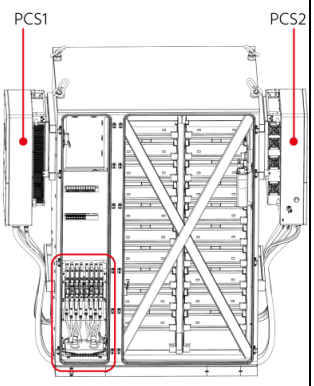
Material Code	Specification	Description	Quantity	Illustration
5STAS20-00006	9.43 m	Corrugated Conduit	× 1	
5STAS12-00044	M40 × 1.5	Cable Gland	× 1	

Wiring Diagram

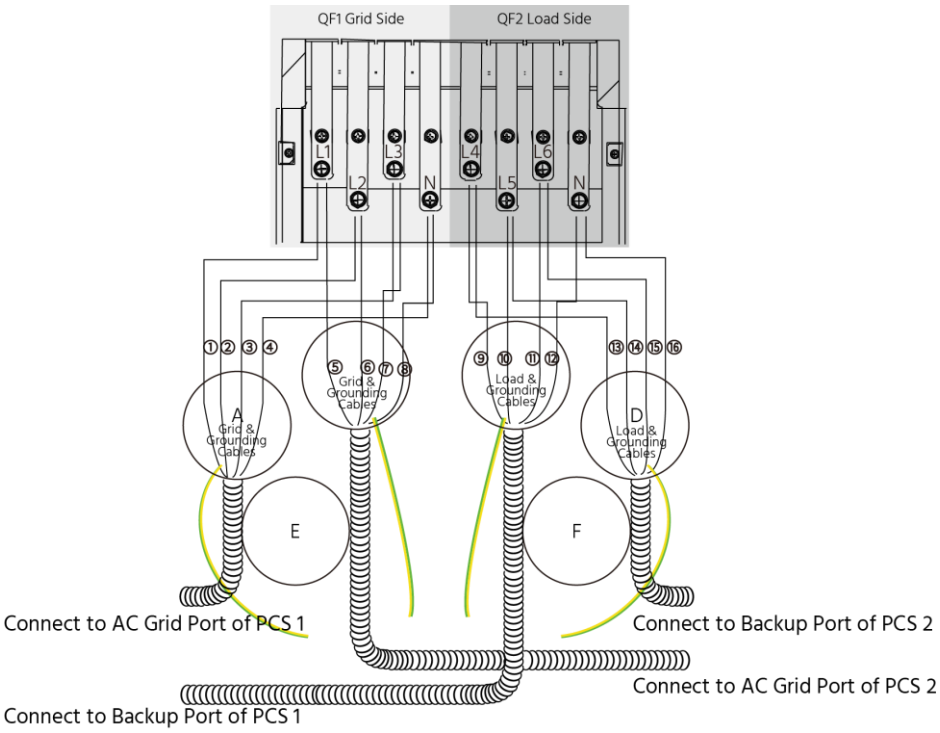


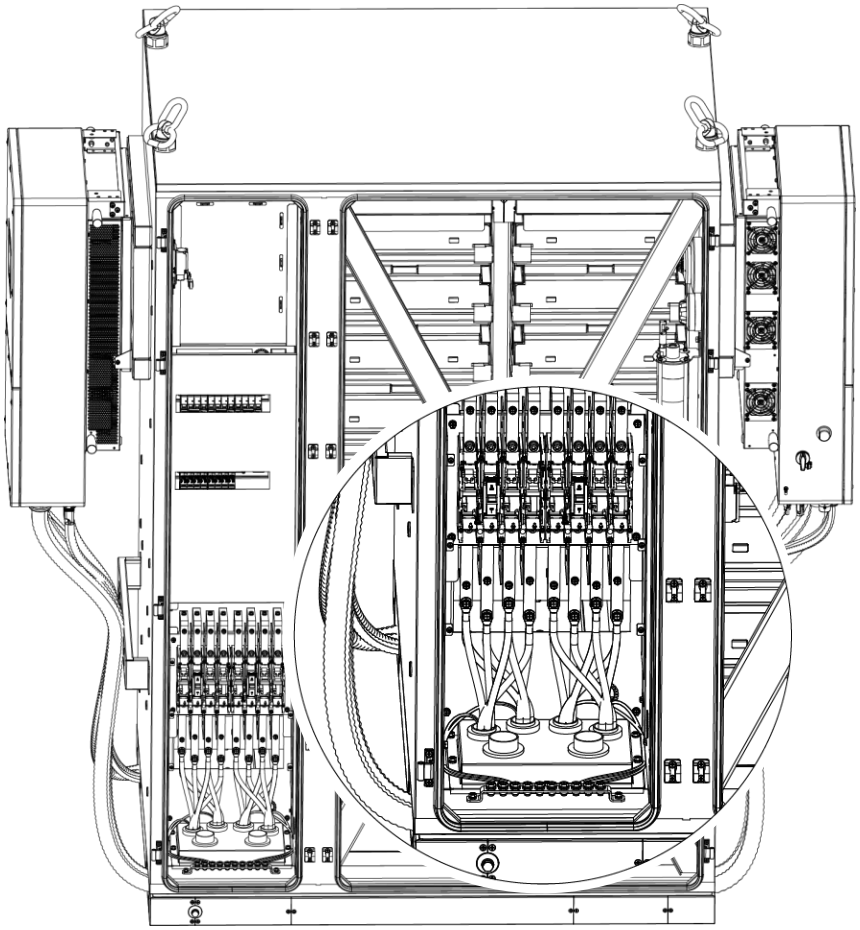
Rear View



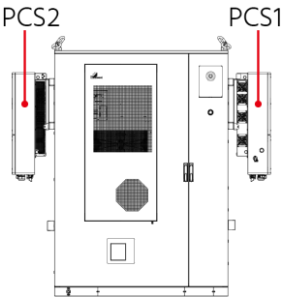

PCS1
PCS2

Rear View


QF1 Grid Side
QF2 Load Side
L1
L2
L3
N
L4
L5
L6
N
A
Grid & Grounding Cables
Grid & Grounding Cables
Load & Grounding Cables
D
Load & Grounding Cables
E
F
Connect to AC Grid Port of PCS 1
Connect to Backup Port of PCS 2
Connect to AC Grid Port of PCS 2
Connect to Backup Port of PCS 1



5.5 PCS Connection

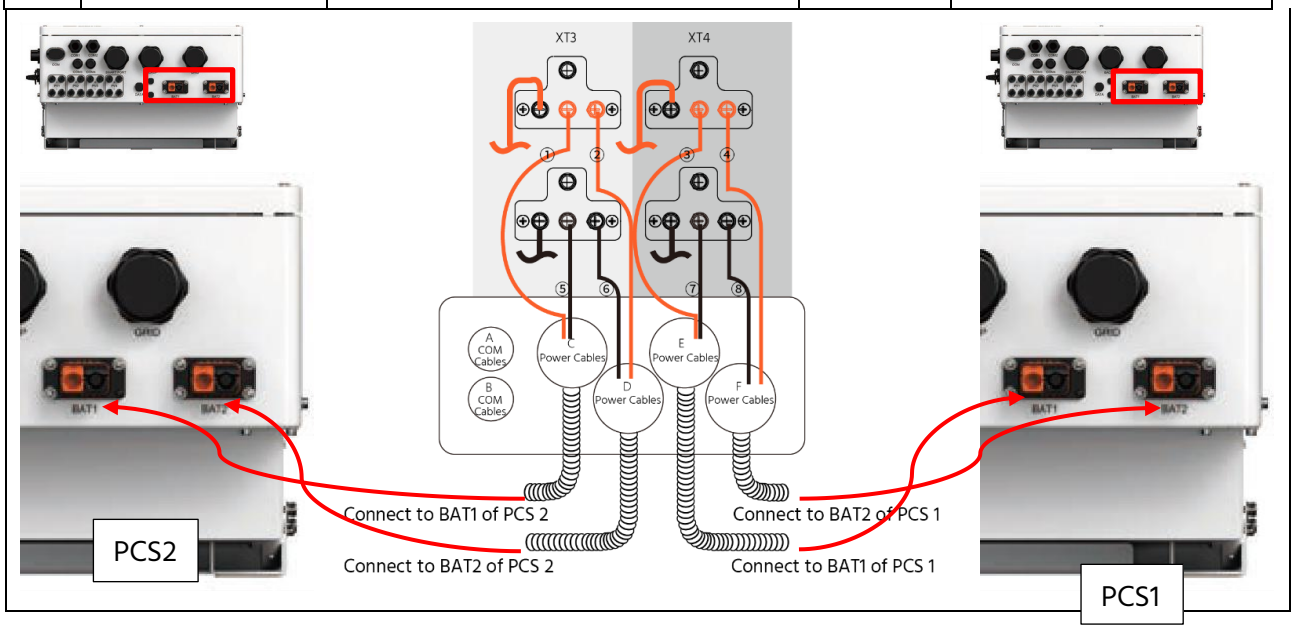


Front View

5.5.1 XT3/4 to PCS Connection

Cables Information

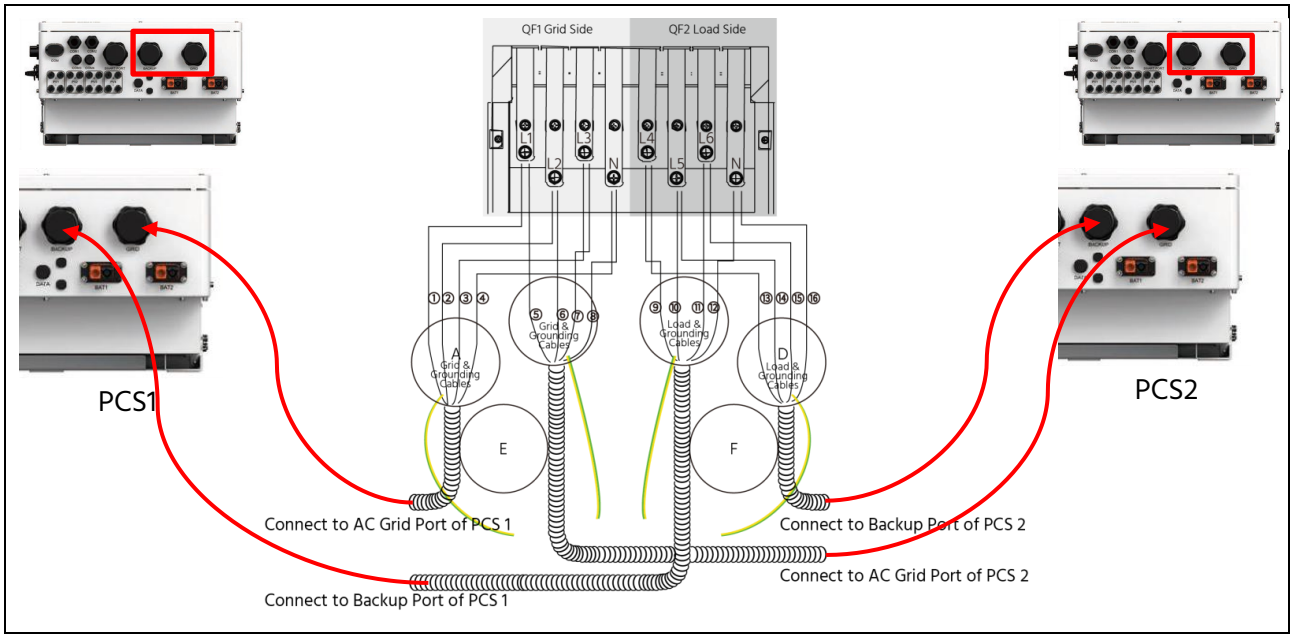
No.	Material Code	Description	Quantity	Picture
①	5WRPY02-02364	XT3 to PCS2_BAT1+_power cable	× 1	
②	5WRPY02-02366	XT3 to PCS2_BAT2+_power cable	× 1	
③	5WRPY02-02370	XT4 to PCS1_BAT2+_power cable	× 1	
④	5WRPY02-02368	XT4 to PCS1_BAT1+_power cable	× 1	
⑤	5WRPY02-02363	XT3 to PCS2_BAT1-_Power_Cable	× 1	
⑥	5WRPY02-02365	XT3 to PCS2_BAT2-_Power_Cable	× 1	
⑦	5WRPY02-02369	XT4 to PCS1_BAT2-_Power Cable	× 1	
⑧	5WRPY02-02367	XT4 to PCS1_BAT1-_Power Cable	× 1	

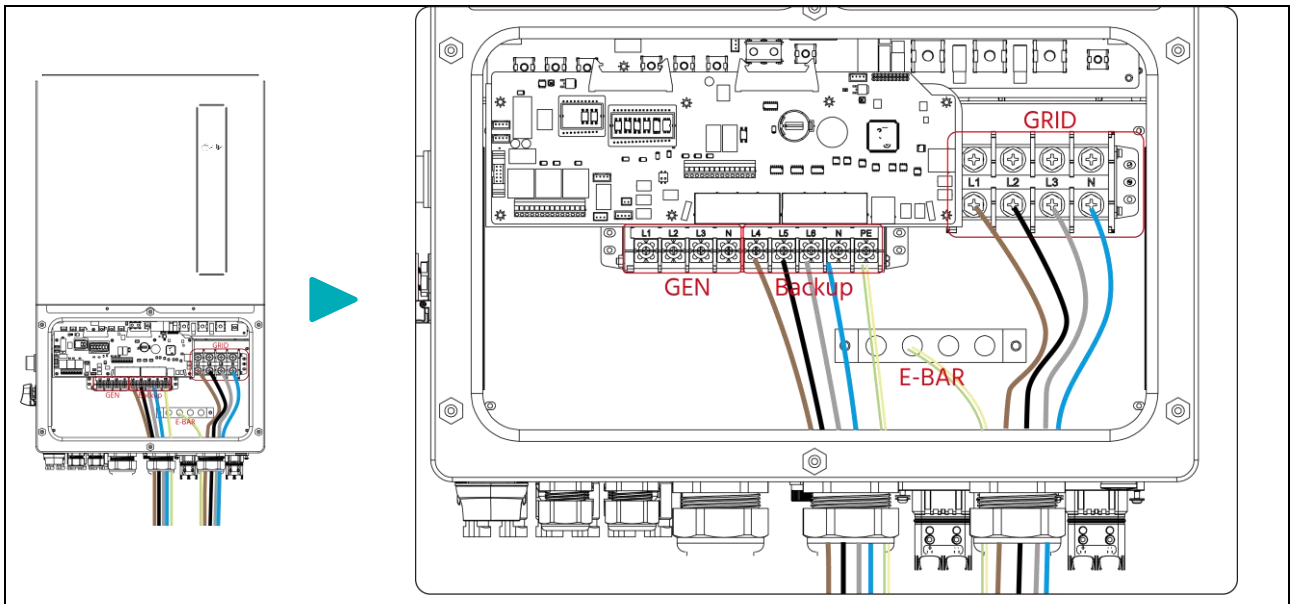


5.5.2 QF1/2 to PCS Connection

Cables Preparation

No.	Material Code	Description	Illustration
①	5WRPY02-02308	QF1 to PCS1_GRID_L1_Power Cable	
②	5WRPY02-02311	QF1 to PCS1_GRID_L2_power cable	
③	5WRPY02-02312	QF1 to PCS1_GRID_L3_power cable	
④	5WRPY02-02313	QF1 to PCS1_GRID_N_power cable	
⑤	5WRPY02-02314	QF1 to PCS2_GRID_L1_Power Cable	
⑥	5WRPY02-02315	QF1 to PCS2_GRID_L2_power cable	
⑦	5WRPY02-02316	QF1 to PCS2_GRID_L3_power cable	
⑧	5WRPY02-02317	QF1 to PCS2_GRID_N_Power Cable	
⑨	5WRPY02-02318	QF2 to PCS1_LOAD_L4_power cable	
⑩	5WRPY02-02319	QF2 to PCS1_LOAD_L5_power cable	
⑪	5WRPY02-02320	QF2 to PCS1_LOAD_L6_power cable	
⑫	5WRPY02-02321	QF2 to PCS1_LOAD_N_power cable	
⑬	5WRPY02-02322	QF2 to PCS2_LOAD_L4_power cable	
⑭	5WRPY02-02323	QF2 to PCS2_LOAD_L5_power cable	
⑮	5WRPY02-02324	QF2 to PCS2_LOAD_L6_power cable	
⑯	5WRPY02-02325	QF2 to PCS2_LOAD_N_power cable	



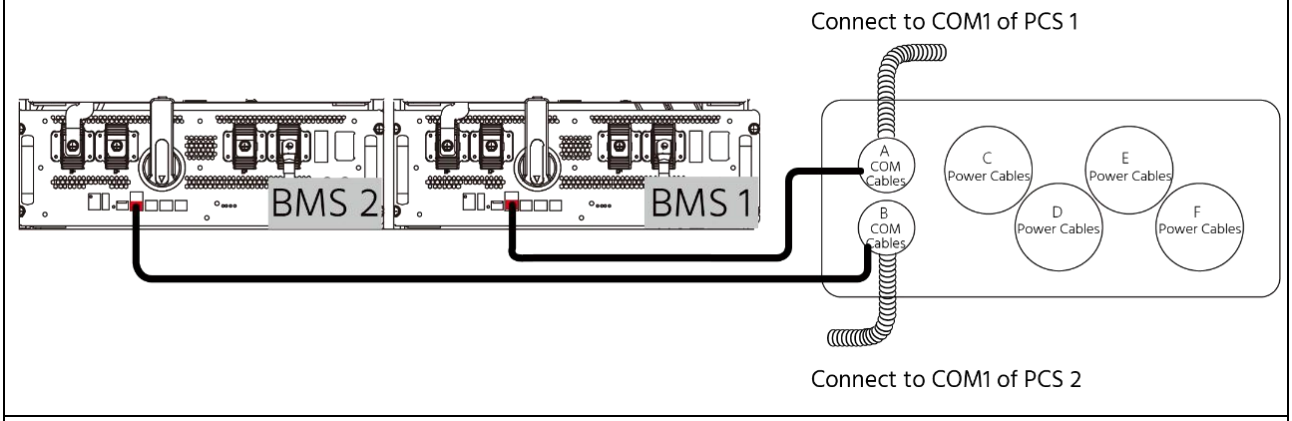


Inner Cable Connections of PCS

5.5.3 BMS to PCS Connection

Cable Information

Material Code	Description	Quantity	Illustration
5WRPY01-01205	BMS1 to PCS1_CAN_signal line	× 1	
5WRPY01-01206	BMS2 to PCS2_CAN_signal line	× 1	

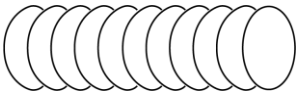
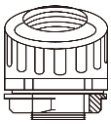


5.5.4 PCS1 to PCS2 Connection

Cables Preparation

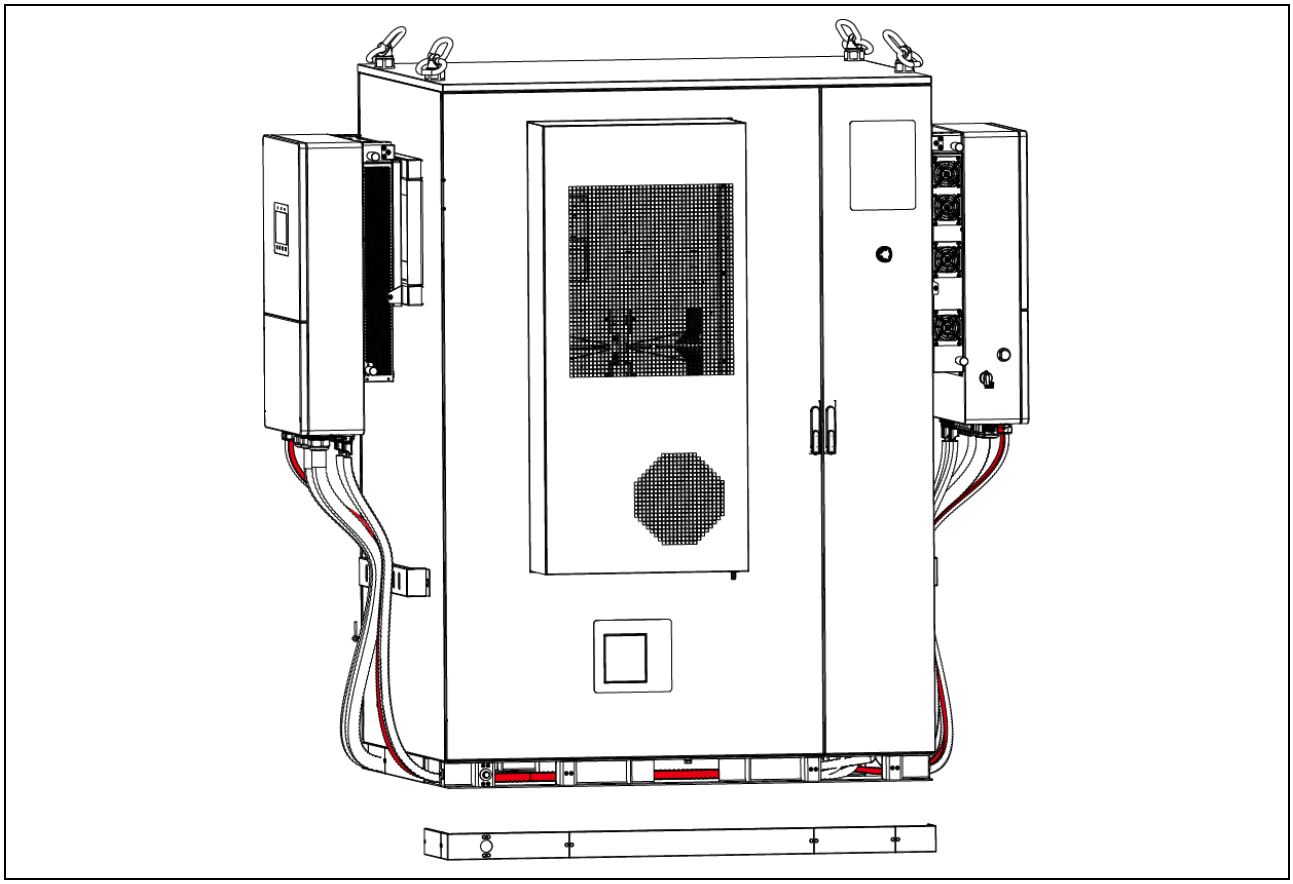
Material Code	Description	Quantity	Illustration
5WRPY01-01207	PCS1 to PCS2 Communication_Signal Line	× 1	

Accessories Preparation

Material Code	Specification	Description	Quantity	Illustration
5STAS20-00004	9.9 m	Corrugated Conduit	× 2	
5STAS12-00045	M50 × 1.5	Cable Gland	× 2	

PCS1

PCS2



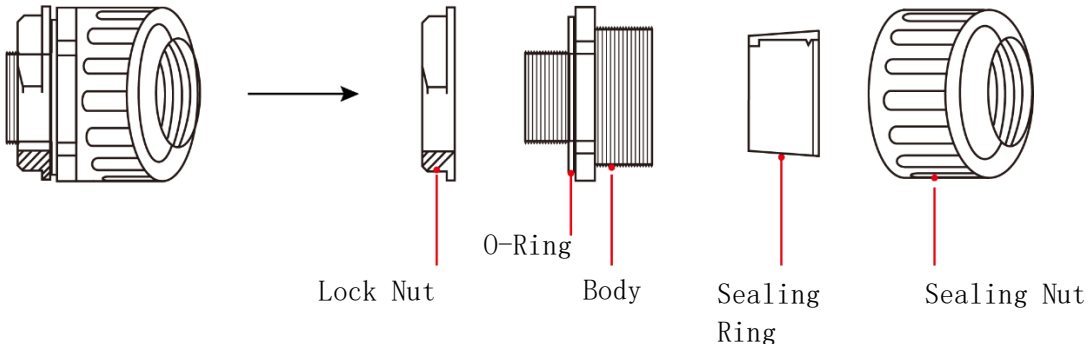
5.6 Cable Protection

5.6.1 Corrugated Conduit

To ensure that the cable does not shift or rotate during equipment operation and prevent moisture and dust from entering, please jacket the cables with corrugated conduit and secure the conduit to the fixing plate.

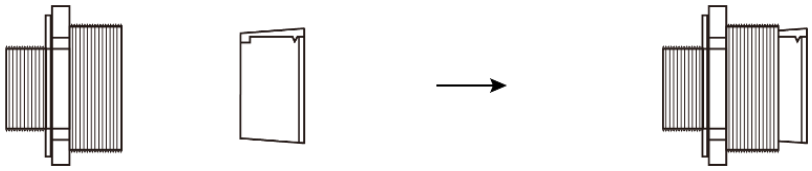
NOTE

- The cables are wrapped in corrugated conduit by default. Follow steps in this section if maintenance is required.
- After finish wiring, ensure that all connections are correct, and there is no overlap and no stress between the wires and sheet metal. Finally seal the gap part with fireproof mud.

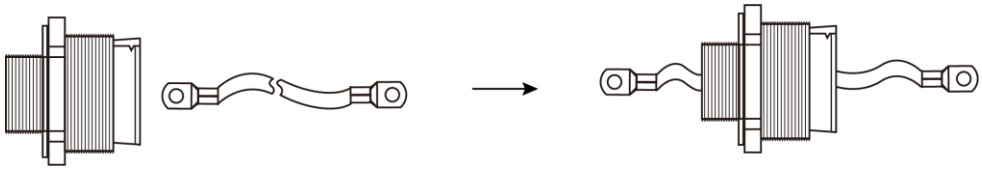


Corrugated Conduit Installation Steps

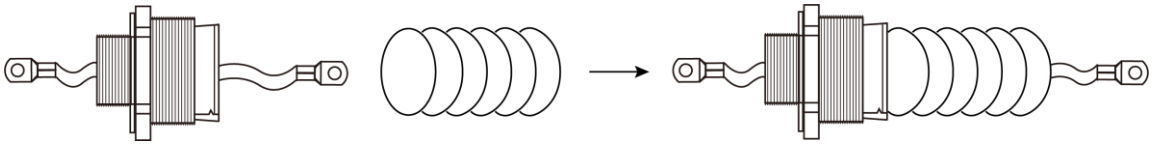
1. Snap the sealing ring into the body.



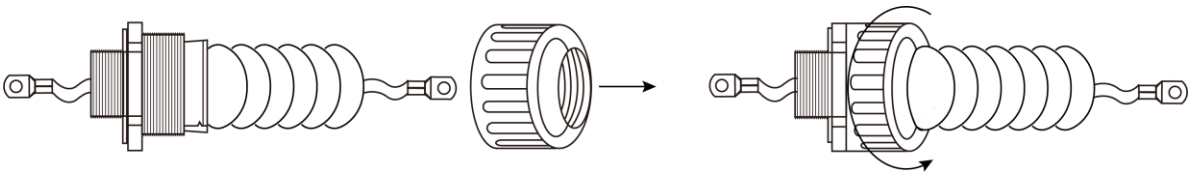
2. Thread the cable through the body.



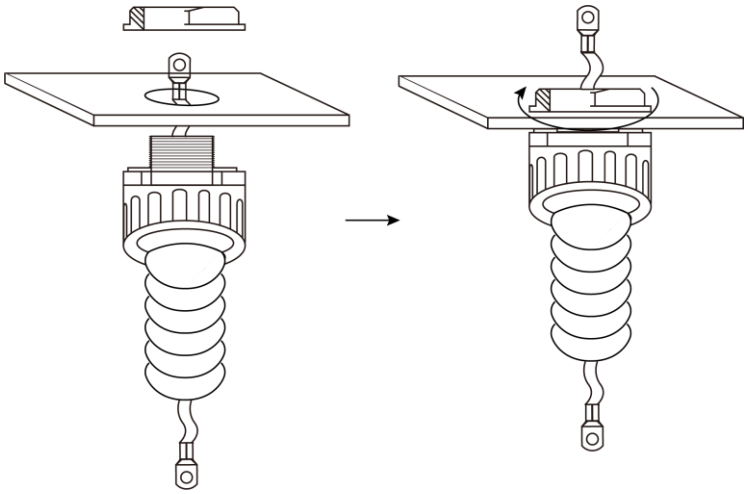
3. Snap the Corrugated Conduit into sealing ring.



4. Pass sealing nut through Corrugated Conduit and tighten sealing nut clockwise.

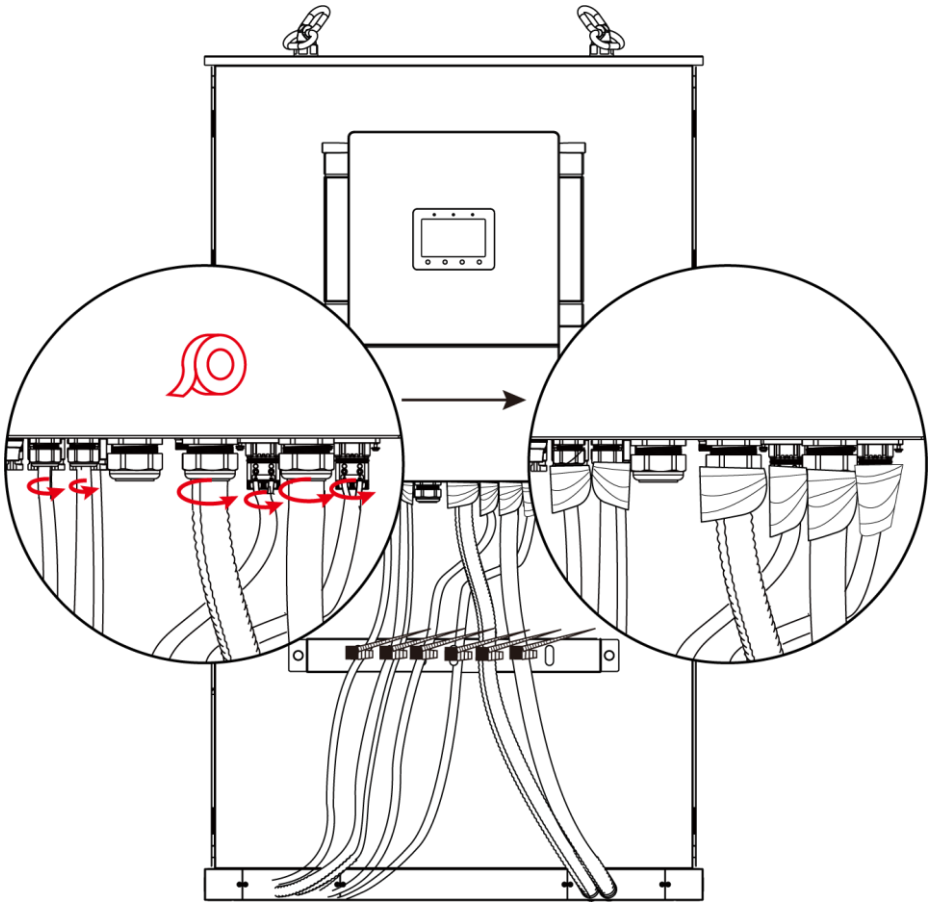


5. Pass the body through the retaining plate from below and tighten the nut clockwise.



5.6.2 PVC Electrical Tape

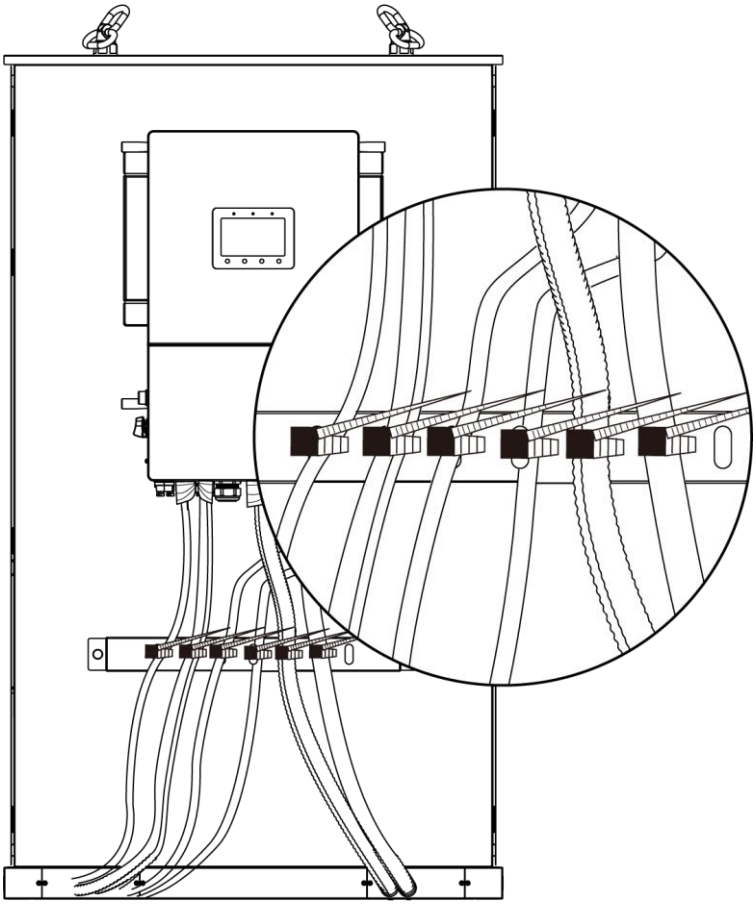
In order to prevent moisture and dust from entering, wrap PVC electrical tape around the cable glands until they are completely sealed.



Side View

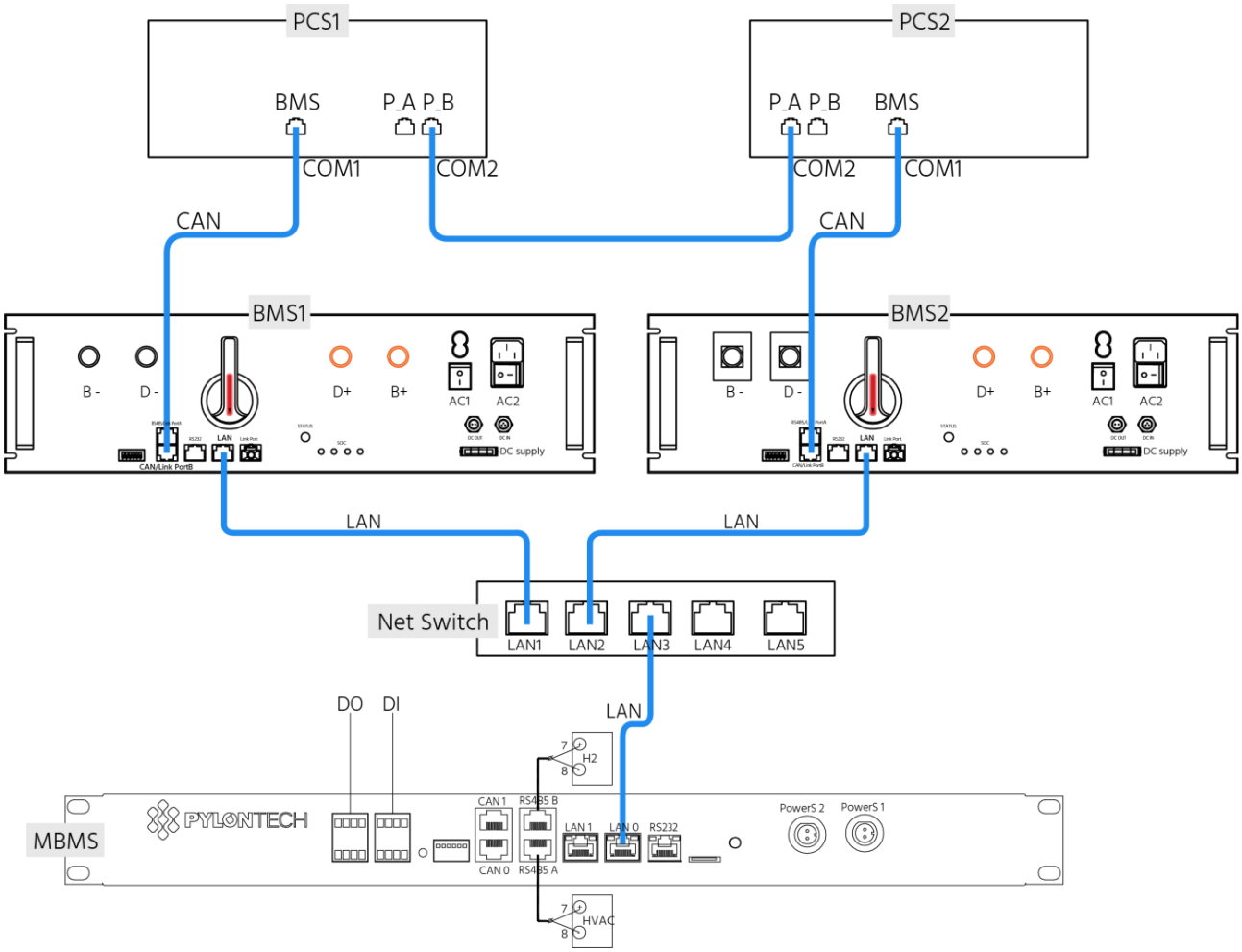
5.6.3 Cable Tie

In order to prevent the cables from accidentally falling off or being damaged and protect the cables from being damaged when the cabinet is moved, please use cable ties to fix the cables to the side brackets after the cables are connected.



Side View

5.7 Communication Schematic Diagram



6 Commissioning

6.1 System Status

6.1.1 Battery String Status

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

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

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

Table of LED Indicators Instructions

Battery Status	Protection/ Alarm/ Normal	STATUS (green)	STATUS (red)	Capacity SOC				Descriptions
		●	●	●	●	●	●	
Shut Down		Off	Off	Off	Off	Off	Off	All off
Sleep	Normal	Flash1	Off	Off	Off	Off	Off	Indicates Sleep Mode, to save the power.
Idle	Normal	Light	Off	Off	Off	Off	Off	Indicates save power mode.
	Alarm	Light	Off	Off	Off	Off	Off	Indicates the battery voltage or temperature is high or low.
	Protection	Off	Light	Off	Off	Off	Off	Indicates the battery voltage or temperature is too high or too low.
Charge	Normal	Light	Off	The highest capacity indicator LED flashes (flash 1), others lighting				The highest capacity indicator LED flashes (flash 1), others lighting, horse race lamp when SOC＞= DODH.
	Alarm	Light	Off					
	Protection	Off	Light	Off	Off	Off	Off	Stop charging, STATUS (red) lighting
Discharge	Normal	Flash1	Off	Indicate based on capacity				Indicate based on capacity
	Alarm	Flash1	Off					
	Protection	Off	Light	Off	Off	Off	Off	Stop discharging, STATUS (red) lighting.
Abnormal	Power On Fault	Off	flash 2	Off	Off	Off	Off	Stop charging/discharging, STATUS (red) lighting.
	Other Fault	Off	light	Off	Off	Off	Off	
	STL Fault	Off	flash 1	flash 1				MCU self-check problem.

NOTE: The flashing instructions:

flash 1 - 0.5 seconds light / 0.5 seconds off.

flash 2 – 1 second light / 1 second off.

6.2 System Turning On

⚠ WARNING

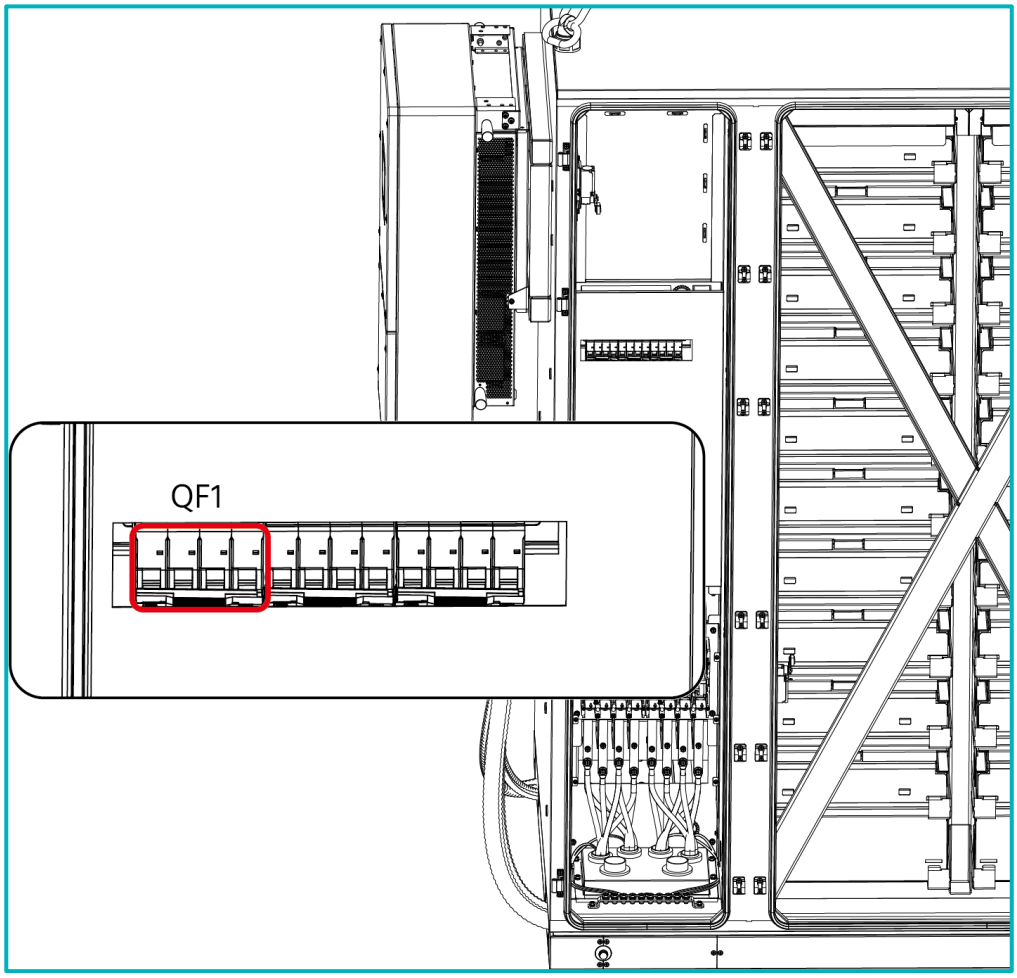
Warning: Double check all the power cables and communication cables. Ensure that the voltage of the PCS matches the voltage of the battery system. Check to make sure that all the power switches are OFF.

⚠ WARNING

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

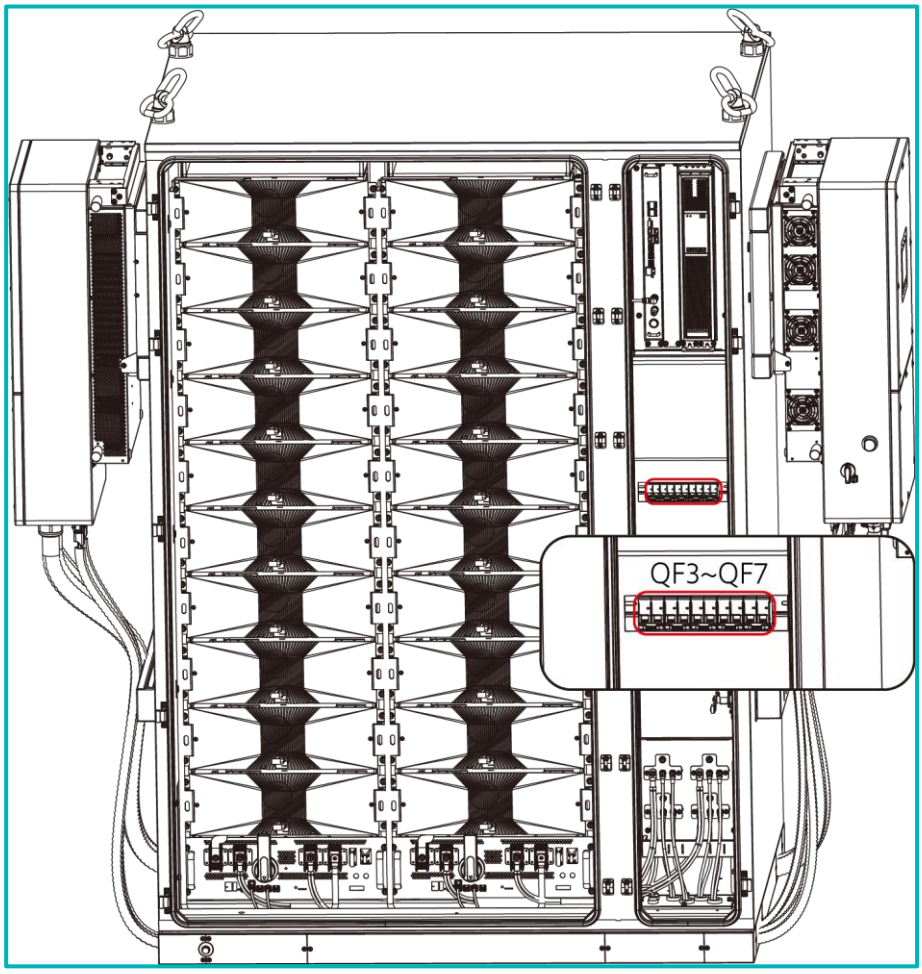
Procedure

1. Switch on the circuit breaker QF1, and the light of the Switching Mode Power Supply will be on.



Rear View

2. Switch on the circuit breaker QF3 of the air conditioner power supply, and the air conditioner will start automatically.
3. Switch on the UPS following the steps below.
   1) Hold the power button for 2 seconds until the LCD pops up the confirmation dialog box. (Note: if the battery is not available, no dialog box appears when pressing and holding the power button.)
   2) Use  or  move the cursor, press the “Enter”  key to select "Yes", then the running indicator (green) flashes, the PCS is on, and the running indicator is solid on.
   3) Check whether the PCS output voltage is normal and then close the external output circuit breaker.
   4) If the battery is not connected, the alarm indicator will turn yellow. If battery access, alarm indicator will be off.
   5) If this is the first time UPS is started, the start guide is opened to set the basic parameters of UPS, referring to *section 0*
   6)
   7) *Initial Start-up* Guidance. For detailed instructions on UPS display functions and settings, refer to *Section 0*
   8)
   9) *Introduction of the Operation and Display* Panel.
4. Switch on the circuit breakers QF5, QF6 and QF7 one after another.



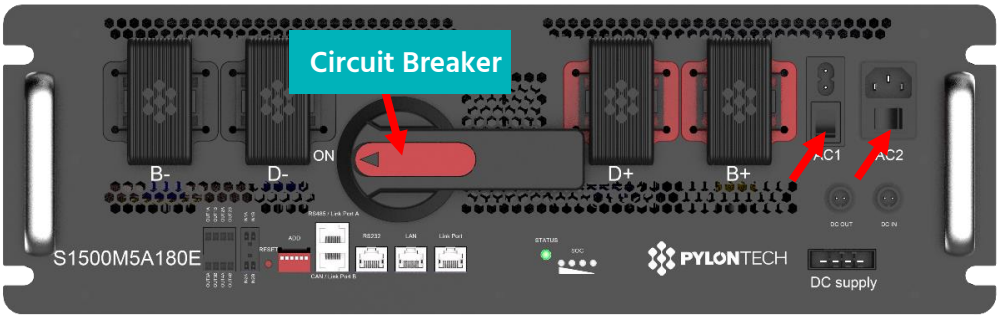
Front View

5. Turn on the BMS according to the following operation.

   (1) Switch on the 1st BMS (Battery Control Module) of battery string.

NOTE: The second BMS (if it is equipped with) can only be turned on after the first battery string's self-check succeeds, which should be done within 30 seconds.

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



7. Turn on the circuit breaker of the BMS.

Instructions of the battery system self-check process:

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

- The status LEDs on the BMS and battery modules show green: if the BMS and all battery modules are working properly and the self-check is completed within 30 seconds, each status LED shows

green, indicating that the self-check is finished.

- The status LED on the BMS turns red after 30 seconds: the BMS cannot receive signals from the upper-level device (MBMS-LC) because of the communication outage. Then the status LED will turn red after 30 seconds. This does not mean that there is a failure, it is that the BMS is not communicating with the MBMS-LC or PCS.
- The status LED on the BMS or battery module shows red from the beginning: if the status LED shows red from the beginning, it indicates that there is a failure of the battery. In this case, inspection of the battery module must be performed first.

> **⚠ WARNING**
>
> **Warning:** If there is any failure during the self-check, be sure to debug the failure prior to next step.

8. Switch on the MBMS-LC and after all the BMSs are turned on. The "STATUS" LED will light green.

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

NOTE:

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

6.3 PCS Commissioning

6.3.1 Pre-commissioning

- Make sure that no high voltage conductors are energized.
- Check all conduit and cable connection points ensure they are tight.
- Verify that all system components have adequate space for ventilation.
- Follow each cable to ensure that they are all terminated in the proper places.
- Ensure that all warning signs and labels are affixed on the system equipment.
- Verify that the PCS (inverter) is secured to the wall and is not loose or wobbly.
- Prepare a multimeter that can do both AC and DC amps.
- Have an Android or Apple mobile phone with Bluetooth capability.
- Install the Soliscloud APP on the mobile phone and register a new account.
- There are three ways to download and install the latest APP.

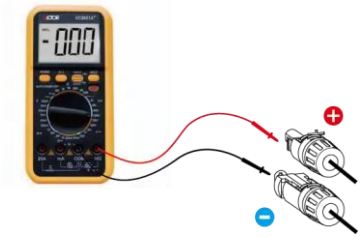
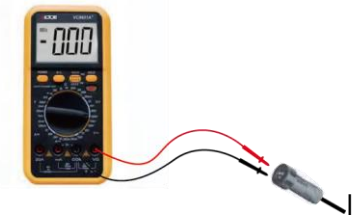
  (1) You can visit www.soliscloud.com.

  (2) You can search "Soliscloud" in Google Play or APP Store.

  (3) You can scan this QR code to download Soliscloud.

6.3.2 Power ON

1. With the DC switch off, energize the PV strings and then measure DC voltage of the PV strings to verify that the voltage and polarity are correct. Turn on the battery and check the battery voltage and polarity as well.

	
Measure DC voltage of PV strings and battery	Measure AC voltage and frequency

2. Turn on the OCPD for the system and then measure the AC voltages line to line and line to neutral. The backup side of the system will be off until commissioning is complete.

   Turn the OCPD back off for now.

3. Turn the DC switch on and then the OCPD(AC breaker) for the system.

   This PCS (inverter) can be powered on by PV only, battery only and Grid only.

   When the PCS (inverter) is powered on, the five indicators will be lighted at once.

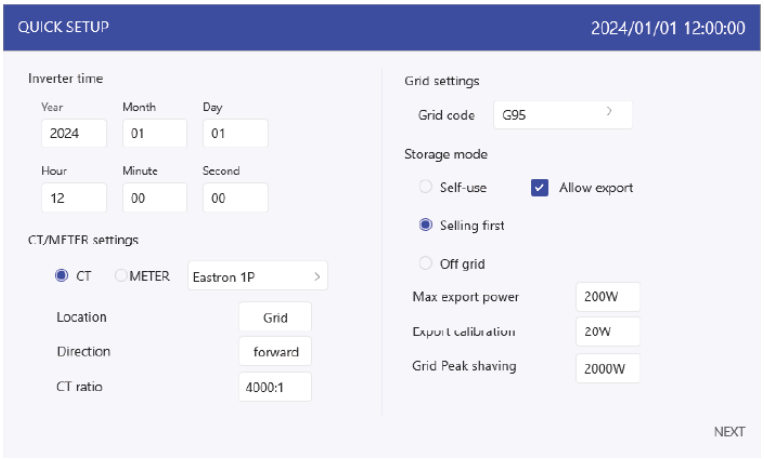
6.3.3 Power OFF

1. Turn off the AC breaker or AC disconnect switch to disable AC power to the PCS (inverter).
2. Turn off the DC switch of the PCS (inverter).
3. Turn off the battery breaker.
4. Use a multimeter to verify that the battery and AC voltages are 0V.

6.3.4 HMI Screen Setting

6.3.4.1 HMI Quick Setting

If this is the first time the PCS (inverter) has been commissioned, you will need to first go through the Quick Settings. Once this has been done, these settings can be changed later.
Inverter Time -> Meter Setting -> Grid Code -> Storage mode -> Battery Model



Inverter time:

Set PCS (inverter) time and date, default follow the phone.

CT/Meter setting:

Select the CT or Meter， Solis provide Eastron 3 phase meter, it is self-identifiable.
Set installation location: Grid side / Load side / Grid+PV inverter;
CT direction: When CT installed correctly, select “Forward”; when CT installed direction wrong, the sampling current of CT will be reversed when calculating the power, select “Reversal” to correct it.
Set CT ratio: default 60 (Solis provide ESCT-T50-300A/5A CT), if the user install their own CT, then need to set the CT ratio manually. If the system connected to Meter, then CT ratio need to be set on Meter.

Grid code:

Select grid code that meet the local regulations.

Storage mode:

All modes first priority is to use the available PV power to support loads. The different modes determine what the second priority, or use of the excess PV power, will be. Self-use / Selling first /

Off-grid are exclusive, the user could select only one mode.

Table of Description of Modes

Mode	Description
Self-use	PV power flow priority sequence: loads > battery > grid. In this mode, the system stores excess PV power into the battery after the loads are supplied. If "Allow export" turned on, when the battery is charged full, or there is no battery, the excess PV power will be exported(sold)back to the grid. If the system is set to not export any power, then the PCS (inverter) will curtail the PV power (derate the PCS (inverter) output power).
Selling first	PV power flow priority sequence: loads > grid > battery. In this mode, the system exports any excess PV power after the loads are supplied. If the export power quota has been met, then the remaining PV power will be stored in the battery. Notice: This mode should not be used if export power set to zero.
Off grid	PV power flow priority sequence: loads > battery. This mode only used when the system are not electrically connected to the grid at all. This mode is like Self-Use Mode, but the PV power will be curtailed if the PV power output is > battery power + load power

Under each mode, user could set other functions based on their requirements.

Table of Description of Mode Settings

Settings	Description
Max export power	Default: 1.1 times of rated power. Notice: if feed-in is not allowed, set Max export power to 0.
Export calibration	Range : -500w-500w, default 20w, settable. To compensate the deviation of CT/Meter in practical application.
Grid peak shaving	Default enable, default 2 times of rated power. Limit the power drawn from the grid to prevent from exceeding regulatory requirements or the power line capacity. It works only when the "battery reserve" turned on.

Battery setting:

1. Select Battery connection method： 1 Batt 1 DC / 1 Batt 2 DC / 2 Batt 1 DC; the connection method please refer to the following for Lithium battery wiring.

Lithium Battery Wiring

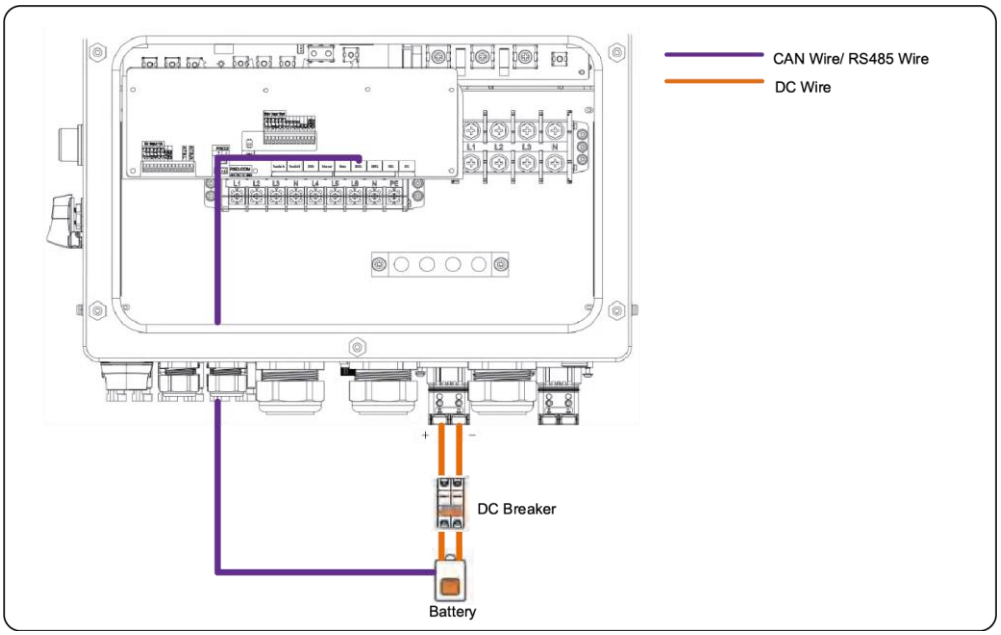
PCS (inverter) supports the 3 wirings methods to connect to lithium battery.
If you have only one battery, you MUST connect it to DC 1 port on PCS (inverter), and communication cable MUST be connected to BMS 1 port on the inside terminal block.

NOTE

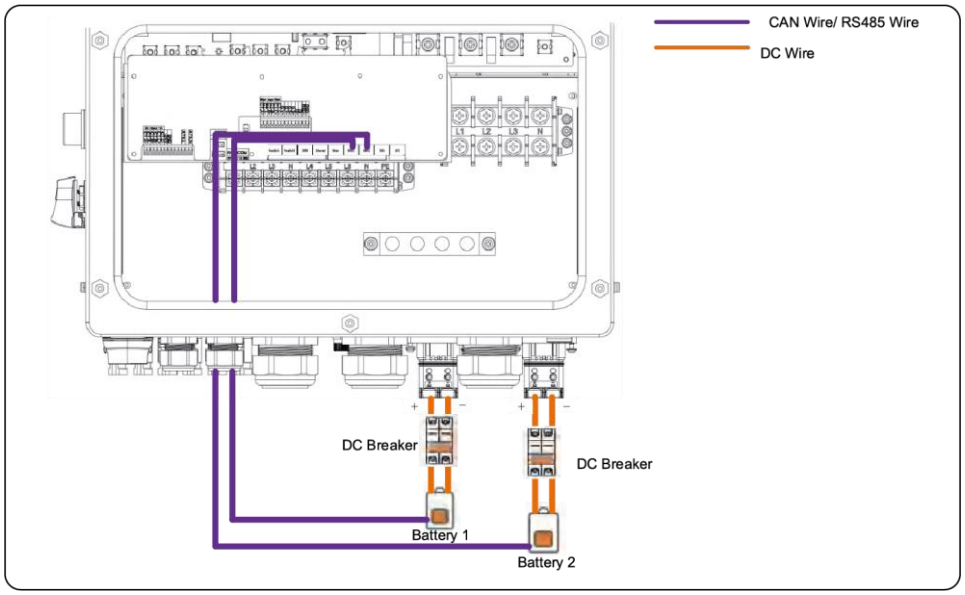
The condition for battery fully charging:

For this series of product, the compatible battery voltage should from 150-800V, but if you want the battery fully charging, you should know the condition (as the below table) for that. When the battery voltage between 400V-500V, the charging current can reach to the maximum value: 70A, and when battery voltage between 500-800 , the single channel charging capacity can reach to the 35KW. For an example. for 50K model, two batteries charging power can reach to 55kw (1.1 times of rated output power) in total.

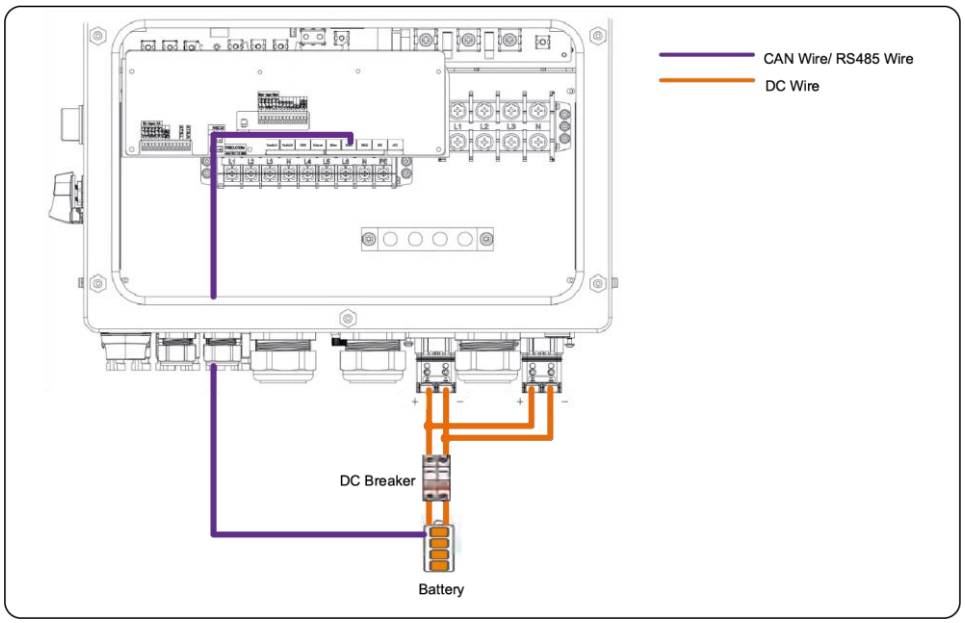
S6 –EH3P(29.9-50)K-H			
NO.	Battery voltage(V)	Battery Current(A)	Battery Power(KW)
1	150	30	4.5
2	200	38	7.6
3	300	54	16.2
4	400	70	28
5	500	70	35
6	550	64	35
7	600	58	35
8	700	50	35
9	800	44	35



Connection Method 1



Connection Method 2



Connection Method 3 (Default Connection Method)

NOTE

- For this battery wiring mode, the communication wire must be connected to the BMS 1 port of PCS (inverter).
- The suggested specification of external AC breakers are as following.
  - AC grid port: four-pole, 160A, Icc≥20KA, Icp, mr≥800A(5In)
  - Backup port: four-pole, 80A, Icc≥20KA, Icp, mr≥600A
  - Smart port: four-pole, 80A, Icc≥20KA, Icp, mr≥600A

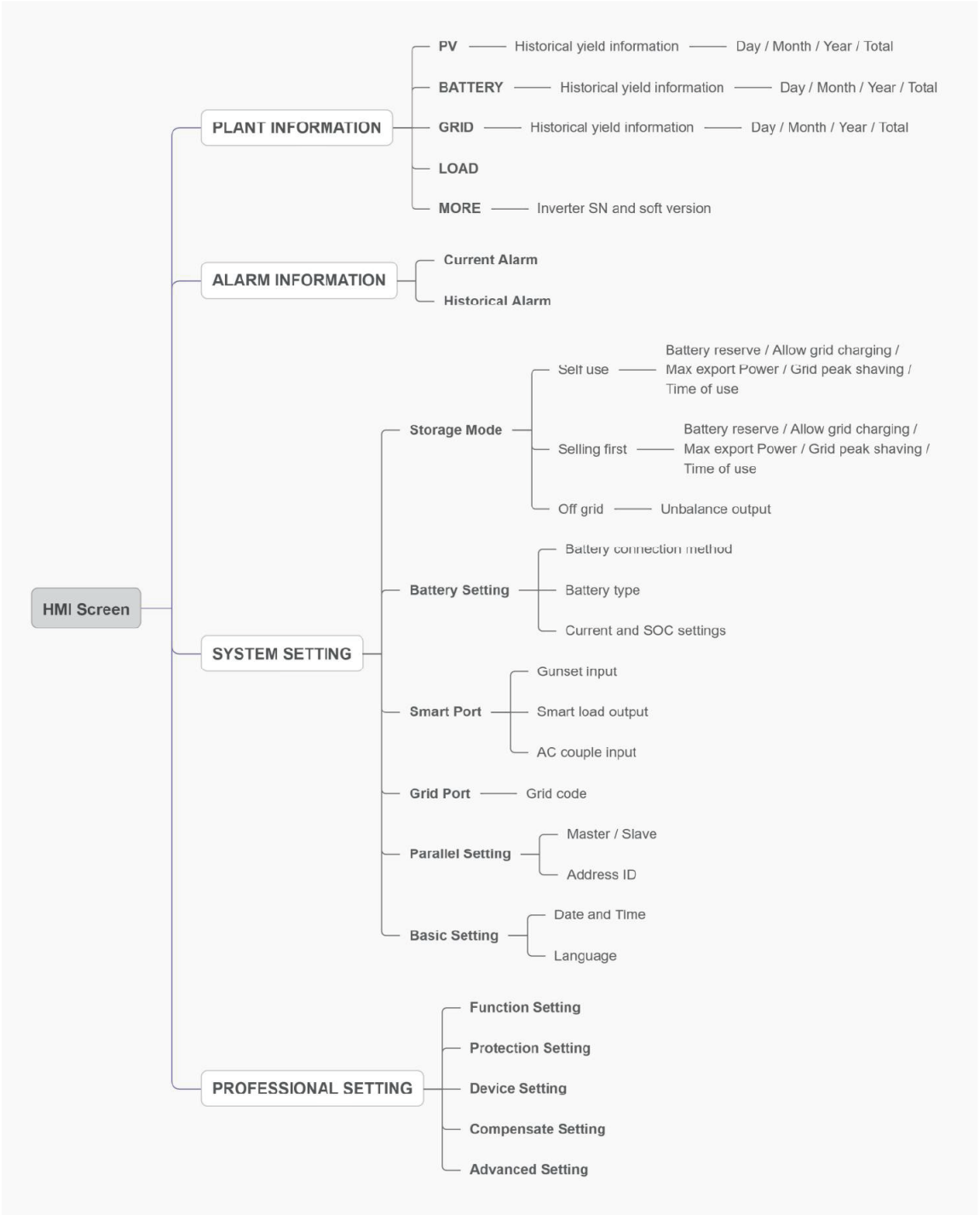
The temperature limit of wiring terminals for external connections should be lower than 85℃.

2. Select battery brand (if the connected battery is not on the list, please select "General_LiBat_HV").

3. Set Max charging/discharging current.

   If there are two batteries and share the same settings, please tick the box of "Batt2 Settings follow Batt 1".

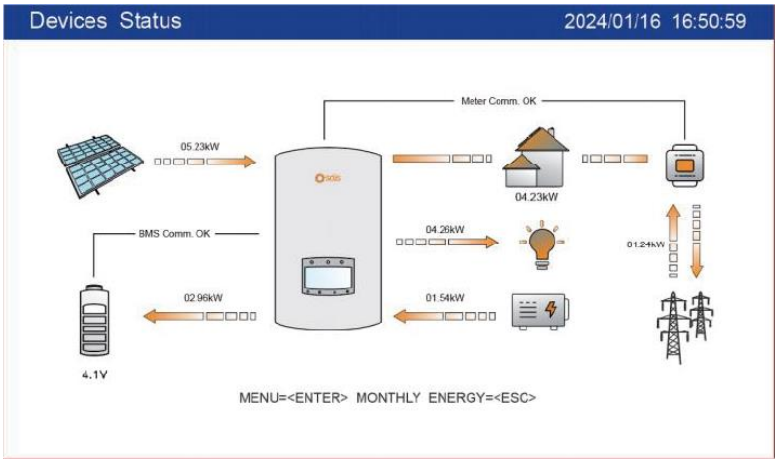
6.3.4.2 HMI Screen Operation System Overview



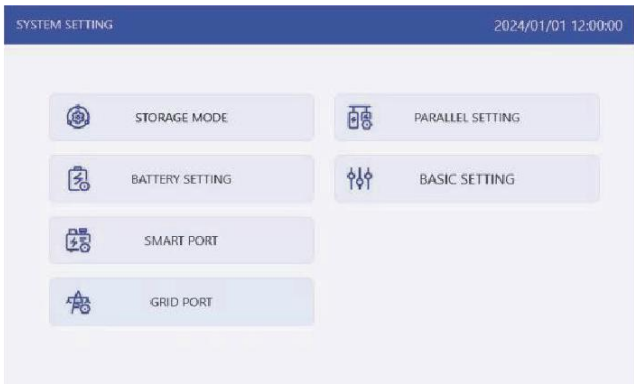
6.3.4.3 Detailed HMI Setting

1. Enter Home page

After quick setting, press “ENTER”, the screen displays the home page.



The screen will be automatically turn off after being idle for a few minutes to save power, click any operation button (”ESC”/”UP”/”DOWN”/ “ENTER”) to restart the screen, then press “Enter” into the main operation interface.



2. Enter “SYSTEM SETTING” interface

Press ”Down” button, then press “ENTER” into the “SYSTEM SETTING” interface.

3. Set “Storage Mode”

Use “UP” or “DOWN” key to select the desired mode, then press “ENTER”.
The Mode description please refer to *6.3.4.1 HMI Quick Setting*.

Table of Description of Storage Mode Settings

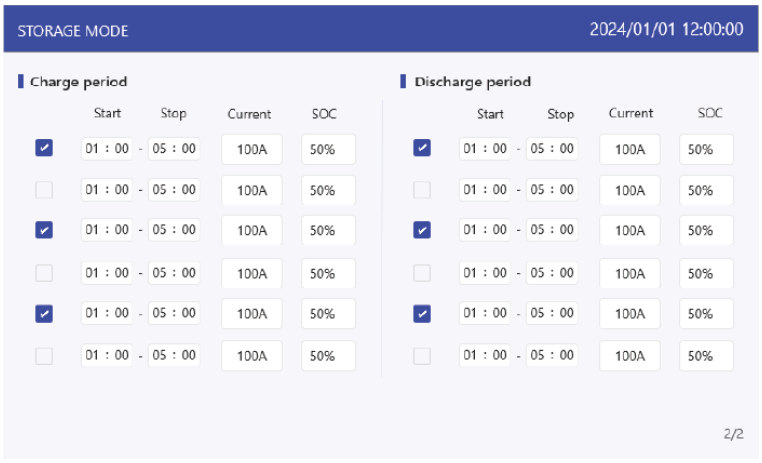
Settings	Description
Battery reserve	Range: 5~95%, default: 80%, settable. When battery SOC < set battery reserve SOC, battery will stop discharging.
Allow grid charging	Allow grid charging the battery when it enables. Notice: if "Allow Grid Charging" is turned on, the PCS (inverter) will use grid power to charge the battery only under two circumstances: The battery drains to the Force Charge SOC. When PV power output can't meet the set current value during the charge periods.
Max export power	Default: 1.1 times of rated power. Notice: if feed-in is not allowed, set Max export power to 0.
Export calibration	Range : -500w-500w, default 20w, settable. To compensate the deviation of CT/Meter in practical application.
Grid peak shaving	Default enable, default 2 times of rated power. Limit the power drawn from the grid to prevent from exceeding regulatory requirements or the power line capacity. It works only when the "battery reserve" turned on.

4. Set "Time of use" under each mode (Skip this step if no need)

Time of Use is for manual control of the battery charging/discharging. It is for customizing when the battery is allowed to charge and discharge power and at what rate, established by a current(amperage)setting.

(1) Charge period: battery charges with set current value until the charging cut-off voltage (settable), checking the box to control whether enable this charging period.

(2) Discharge period: battery discharges with set current value until the discharging cut-off voltage (settable), checking the box to control whether enable this discharging period.



5. Step 5: Set "Battery Setting"

Table of Description of Battery Mode Settings

Settings	Description
Max charge current	Max charge current, settable.
Max discharge current	Max discharge current, settable.
Over discharge	Range: 5~40%, default 20%, when battery SOC ＜ over discharge, it will stop discharging.
Recovery	Range: set Over discharge value +1% ~ set Over discharge value +20%; when battery SOC ＞ Recovery SOC, it will start charging, reserve the return difference value to avoid the battery repeatedly cross jump between charging and discharging.
Force charge	Range: set Over discharge value +1% ~ set Over discharge value +20%; when battery SOC ＞ Recovery SOC, it will start charging, reserve the return difference value to avoid the battery repeatedly cross jump between charging and discharging.
Max charge SOC	Charge cut-off SOC, battery stops charging when reach the Max. Charge SOC.

NOTE

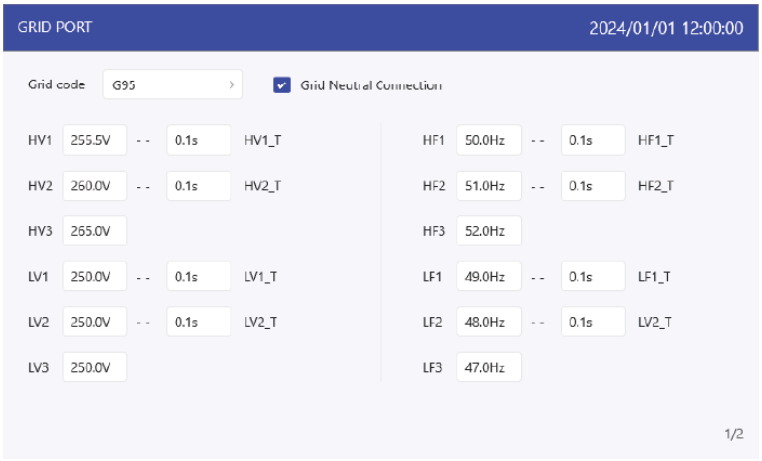
Force charge SOC ＜ Over discharge SOC ＜ Recovery SOC, otherwise the setting might be error.

6. Set “Grid Port”

(Skip this step if grid code is already set in quick setting)

Select grid code that meet the local regulations.

Three level of Over-voltage / under-voltage / Over-frequency / under-frequency are default based on grid code, there is no need to set the parameters in manual.



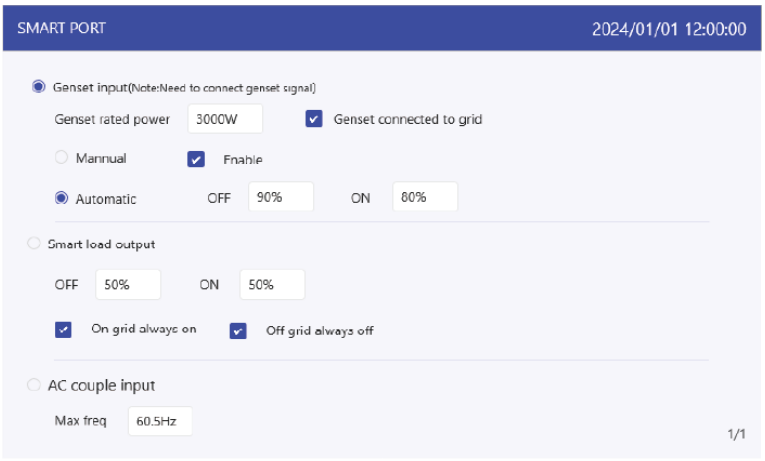
7. Set “Smart Port”

(Skip this step if the system is not connected to generators)

When it is connected to Generator, select “Gunset input”;

When it is connected to smart load like heat pump, select “Smart load output”.

When it is connected to Grid-tied PCS (inverter), select “AC coupled”.



Genset

The user need to input the “Genset rated power” by manual.

OFF: Generator stops charging SOC, settable, range:35~100%;

ON: Generator start charging SOC; settable, range:1~95%;

AC coupled:

OFF: Grid-tied PCS (inverter) stops charging SOC, settable, range:35~100%;

ON: Grid-tied PCS (inverter) start charging SOC; settable, range:1~95%;

8. Set parallel system

Set Master and Slave machine,

Set Master ID as: 1

Slave machine ID as: 2

Slave machine ID as: 3

..... and so on.

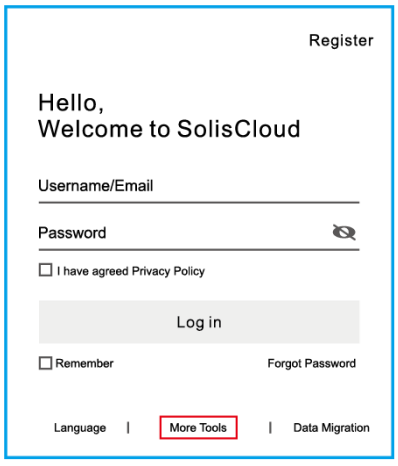
6.3.5 App Setting

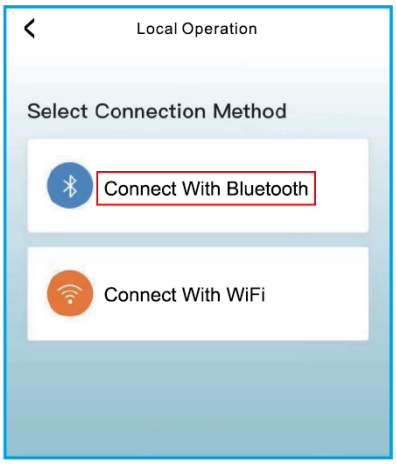
Please configure the App according to the actual needs. The following steps are for reference only.

6.3.5.1 Log in the APP via Bluetooth

1. Connect with Bluetooth.

Turn on Bluetooth switch on your mobile phone and then open the Soliscloud APP.
Click “More Tools”->“Local Operation”->“Connect with Bluetooth”

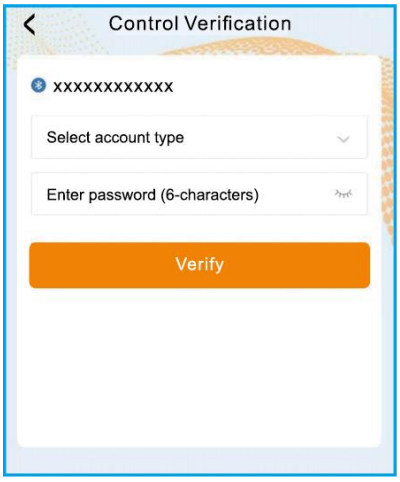


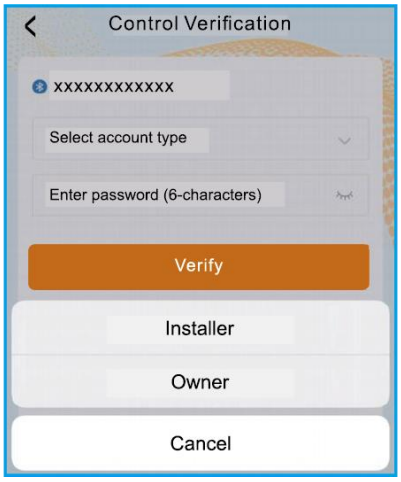


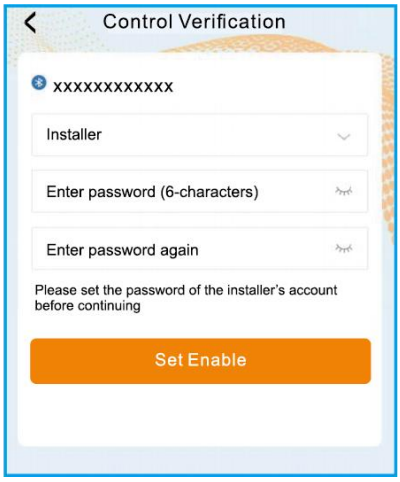
2. Select the Bluetooth signal from the PCS (inverter). (Bluetooth Name: Inverter SN)

3. Login account.

If you are the installer, please select the account type as Installer. If you are the plant owner, please select the account type as owner. Then set your own initial password for control verification. (The first log-in must be finished by installer in order to do the initial set up)







6.3.5.2 APP Quick Setting

If this is the first time the PCS (inverter) has been commissioned, you will need to first go through the Quick Settings. Once this has been done, these settings can be changed later.

Inverter Time -> Meter Setting -> Grid Code -> Storage mode -> Battery Model

Inverter time:

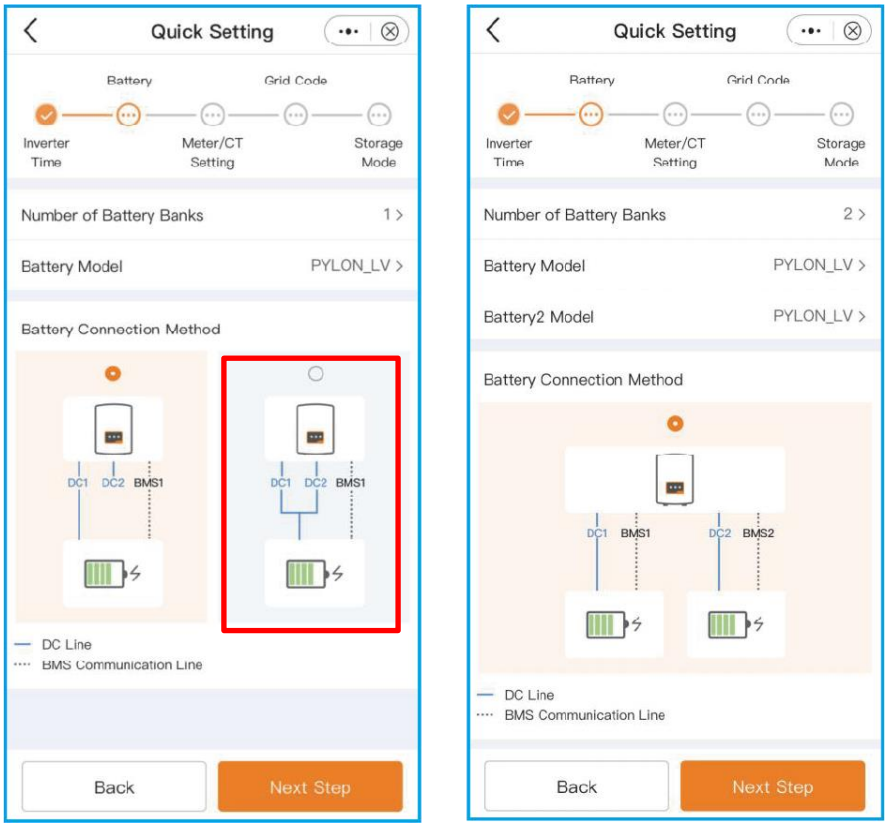
Set inverter time and date, tap the slider next to “Follow Phone Time”, then tap “Next step” at the bottom right corner.

Battery:

1. Select number of battery banks : 1-2;
2. Select battery model: if the connected battery brand is not on the list, please select

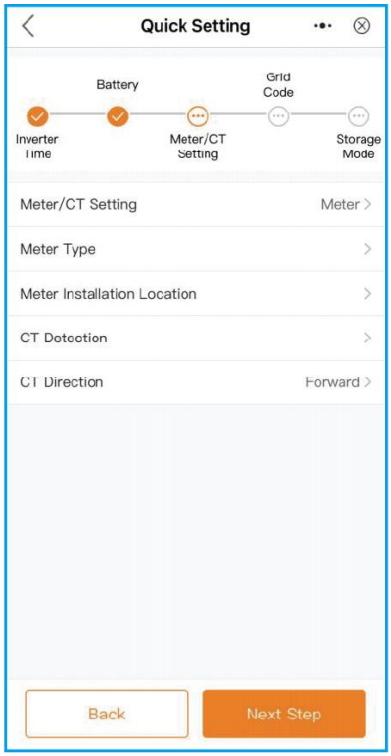
"General_LiBat_HV"

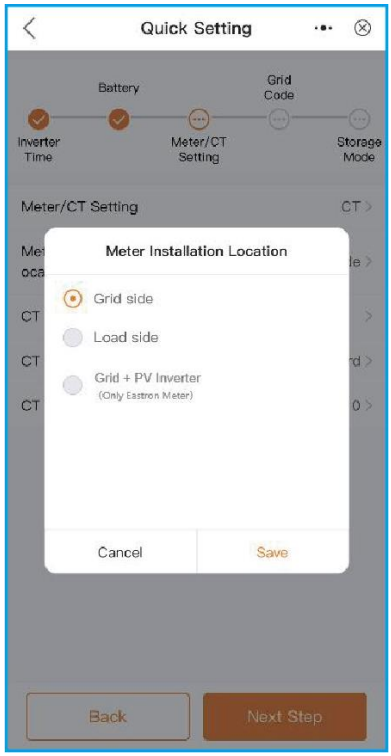
3. Select the battery connection method in the red box.



CT/Meter setting:

- Select CT or Meter;
- Set Meter type (Solis provide Eastron 3 phase meter, it is self-identifiable).
- Set Meter installation location: Grid side / Load side / Grid+PV inverter;
- Set CT ratio: default 60 (Solis provide ESCT-T50-300A/5A CT), if the user install their own CT, then need to set the CT ratio manually. If the system connected to Meter, then CT ratio need to be set on Meter.
- CT direction: When CT installed correctly, select "Forward"; when CT installed direction wrong, the sampling current of CT will be reversed when calculating the power, select "Reversal" to correct it.



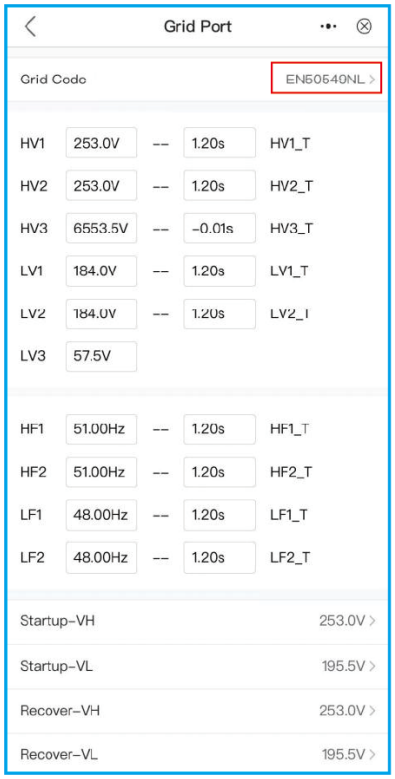


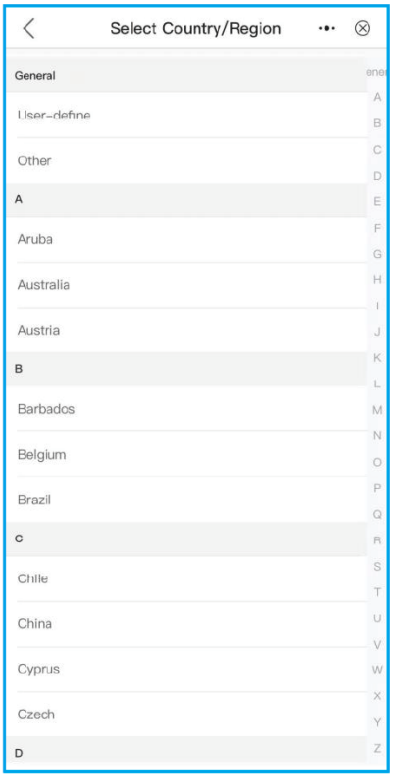
Grid code:

- Select grid code that meet the local regulations.

  Three level of Over-voltage / under-voltage / Over-frequency / under-frequency are default based on grid code, there is no need to set the parameters in manual.

- Select country/region according to the actual situation.





Storage mode:

ALL modes first priority is to use the available PV power to support loads. The different modes determine what the second priority, or use of the excess PV power, will be. Self-use / Selling first / Off-grid are exclusive, the user could select only one mode.

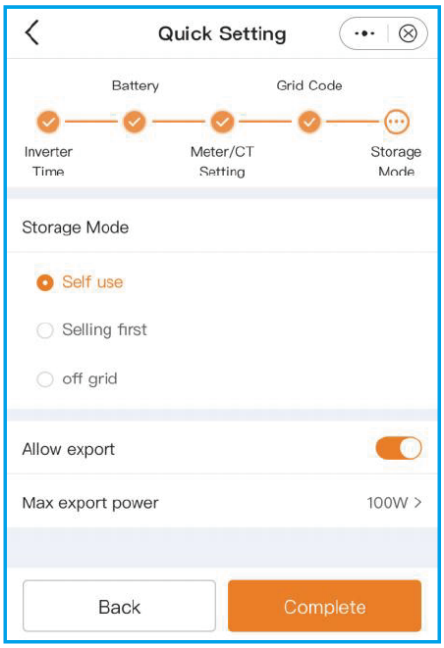
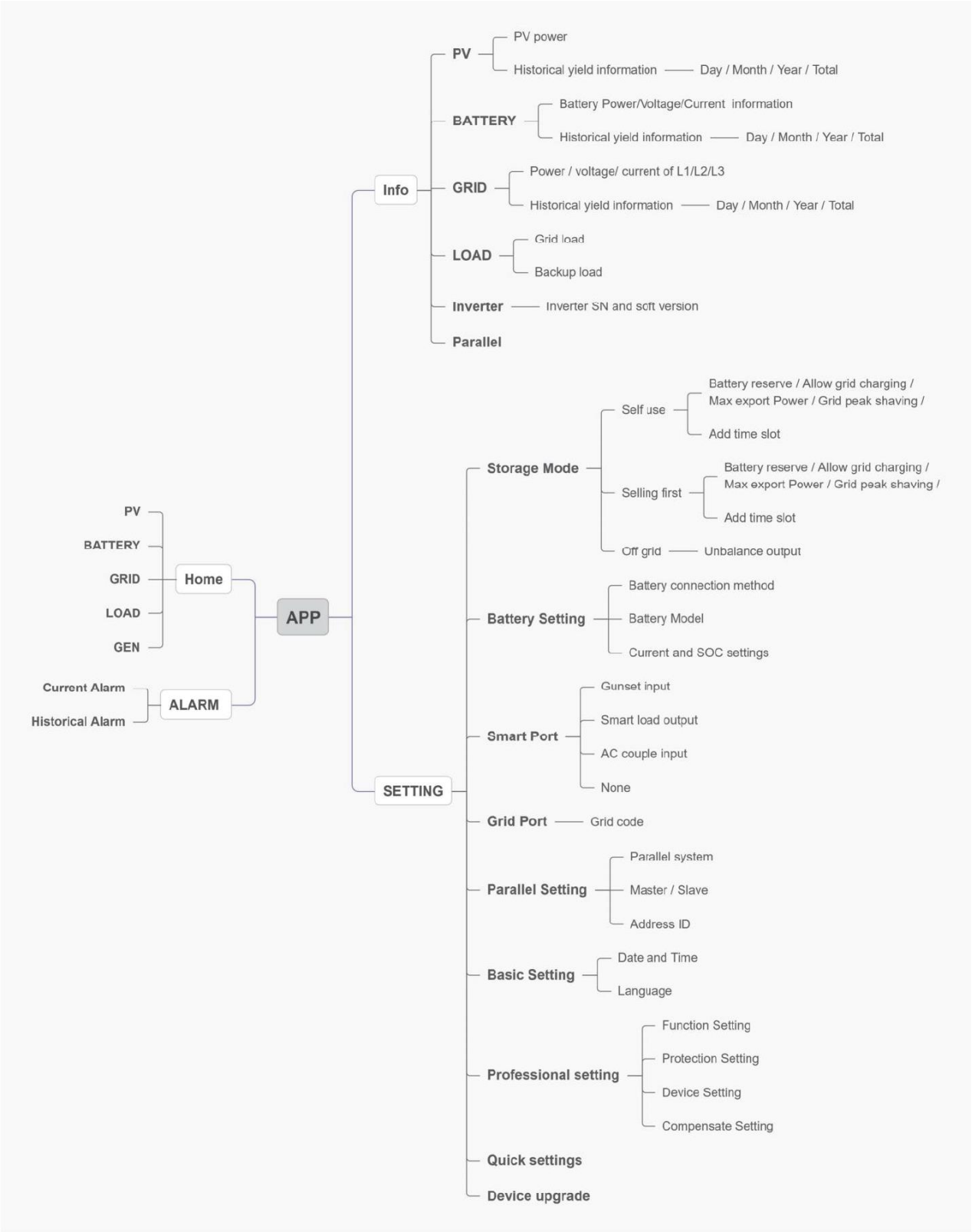


Table of Description of Storage Modes

Settings	Description
Self-use	PV power flow priority sequence: loads > battery > grid. In this mode, the system stores excess PV power into the battery after the loads are supplied. If the battery is charged full, or there is no battery, the excess PV power will be exported(sold)back to the grid. If the system is set to not export any power, then the PCS (inverter) will curtail the PV power (derate the PCS (inverter) output power).
Selling first	PV power flow priority sequence: loads > grid > battery. In this mode, the system exports any excess PV power after the loads are supplied. If the export power quota has been met, then the remaining PV power will be stored in the battery. Notice: This mode should not be used if export power set to zero.
Off grid	PV power flow priority sequence: loads > battery. This mode only used when the system are not electrically connected to the grid at all. This mode is like Self-Use Mode, but the PV power will be curtailed if the PV power output is > battery power + load power.

Once quick setting finished, tap “Complete”, the APP enter the homepage.

6.3.5.3 APP Interface Structure

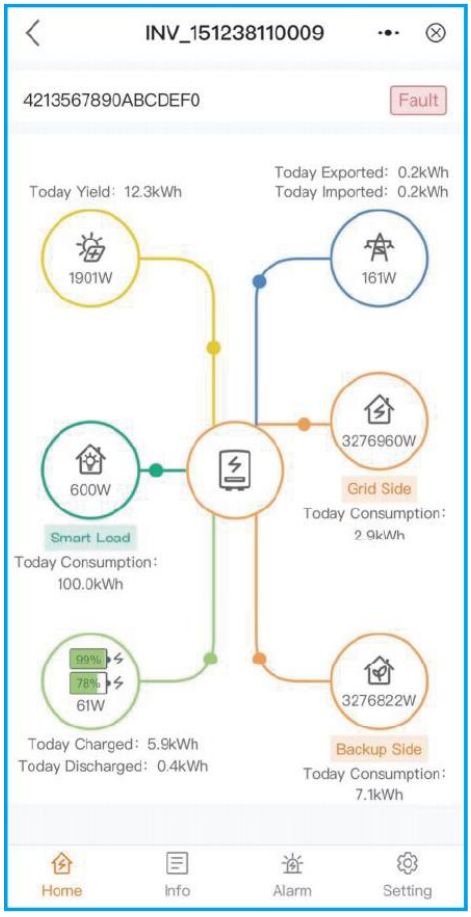


6.3.5.4 Home

This screen display energy production and consumption, as well as its flow. It shows the following data:

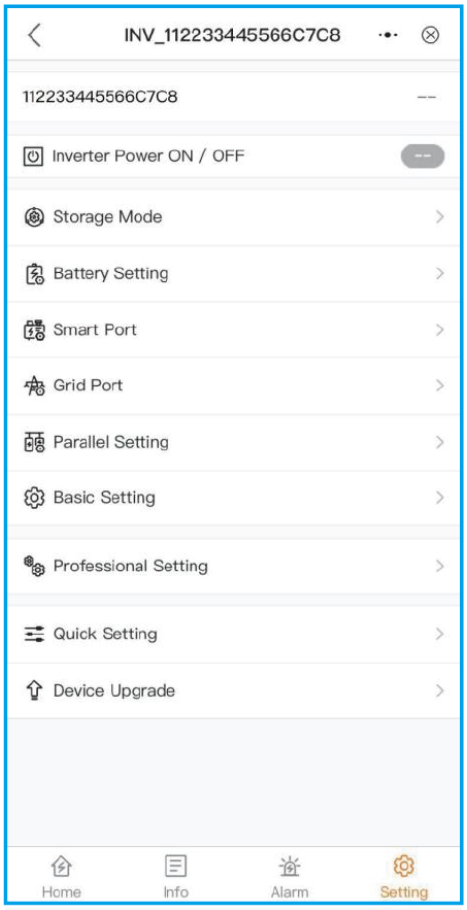
- Today yield of PV
- Today Imported/Exported of Grid
- Today Charged/Discharged of Battery
- Today Consumption of Grid-side load
- Today Consumption of Back-up load
- Today GEN yield.

At the bottom of page are four sub menus: Home, Info, Alarm and Settings.



6.3.5.5 Setting

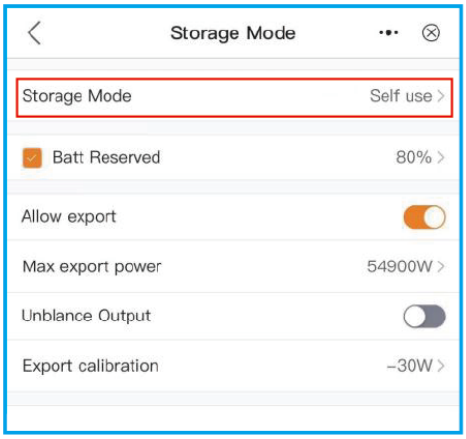
Under this page, the user could find quick setting and other detailed settings as follows:

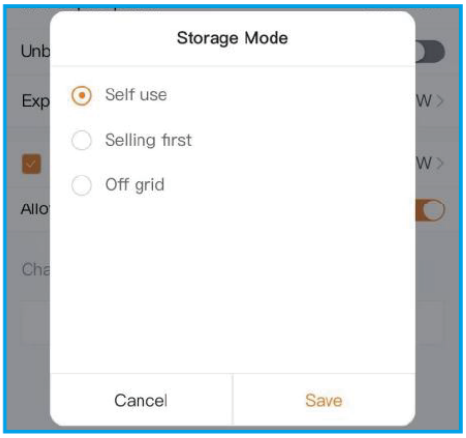


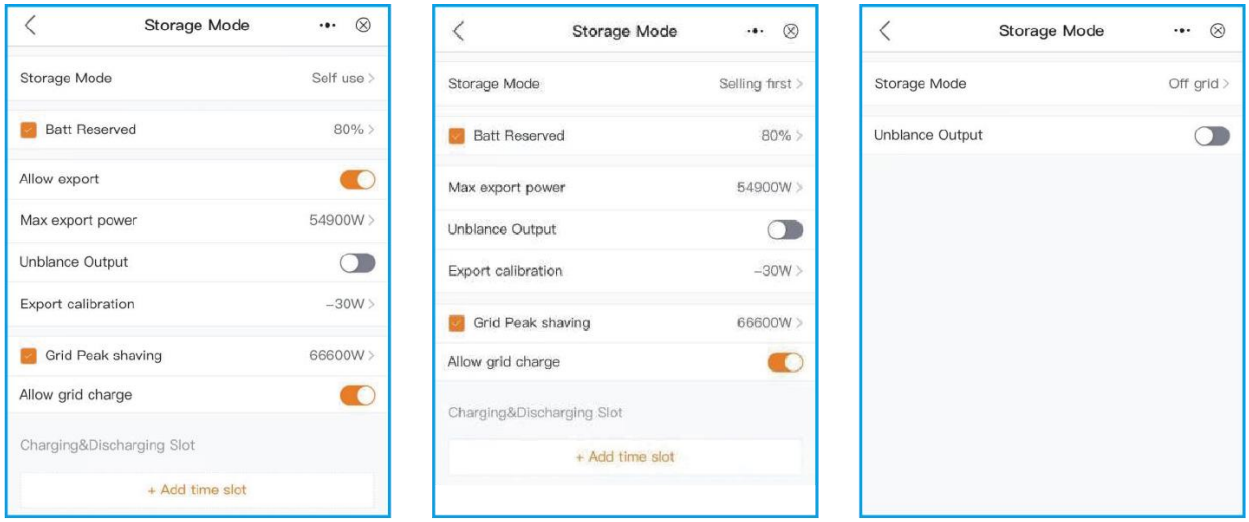
Storage mode

a. Select storage mode:

- Self-use / Selling first / Off-grid, these three modes are exclusive, the user could select only one mode. The modes definition could refer to *6.3.5.2 APP Quick Setting*.
- The Mode description please refer to *6.3.4.1 HMI Quick Setting*.







NOTE

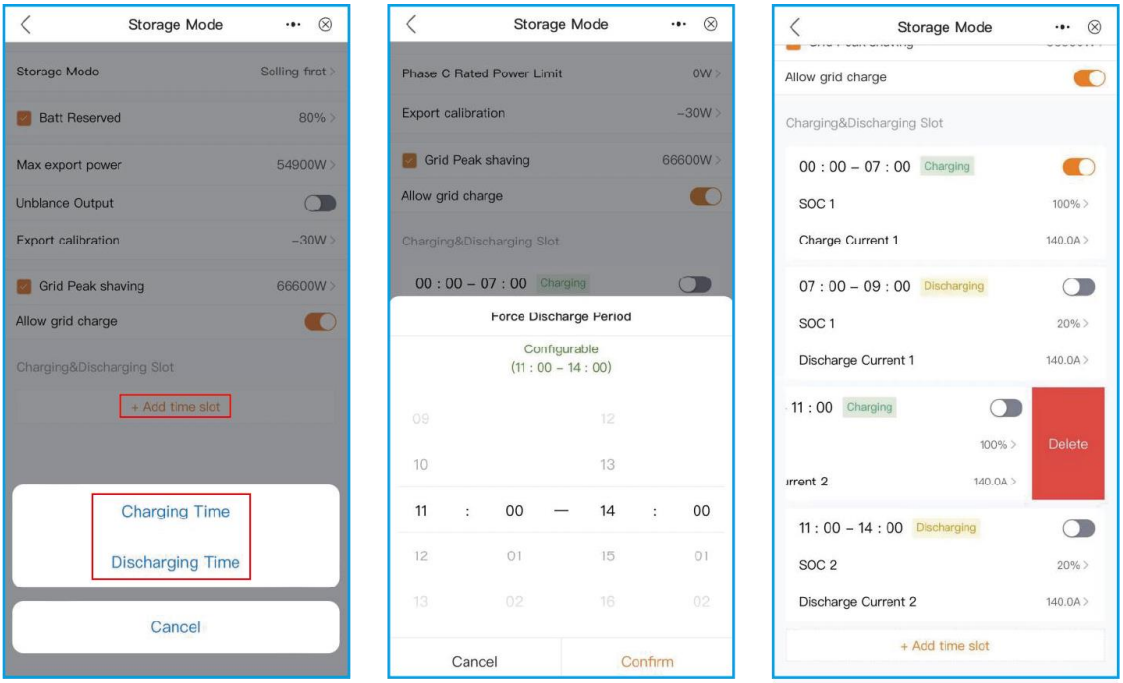
- "Allow export" can only be set in "Self use" mode;
- "Add time slot" can only be set in grid-connected mode (Self use" mode and " Selling first" mode).

Set mode operations:

Table of Set Mode Operations

Settings	Description
Battery reserved	Range: 5~95%, default:80%, settable. When battery SOC < set battery reserve SOC, battery will stop discharging.
Allow export	When it enables, the system is allowed to export power to grid.
Max export power	Default: 1.1 times of rated power. Notice: If feed-in is not allowed, set Max export power to 0.
Export calibration	Range : -500w-500w, default 20w, settable. To compensate the deviation of CT/Meter in practical application.
Allow grid charging	Allow grid charging the battery when it enables. Notice: if "Allow Grid Charging" is turned on, the PCS (inverter) will use grid power to charge the battery only under two circumstances: • The battery drains to the Force Charge SOC. • When PV power output can't meet the set current value during the charge periods.

Add Time Slot



Charge SOC: battery charging stops when reach the set SOC;

Discharge SOC: battery discharging stops when reach the set SOC.

NOTE

- Slide the switch to on, the battery charge/discharge with set charge/discharge current by following the set period
- Slide to the left of screen, the user could delete the current period setting.

Battery setting

(1) Set " Number of Battery Banks" and "Battery Model"

(2) Set "Battery Connection Method" : 1 Batt 1 DC / 1 Batt 2 DC / 2 Batt 1 DC;

(3) Set battery parameters

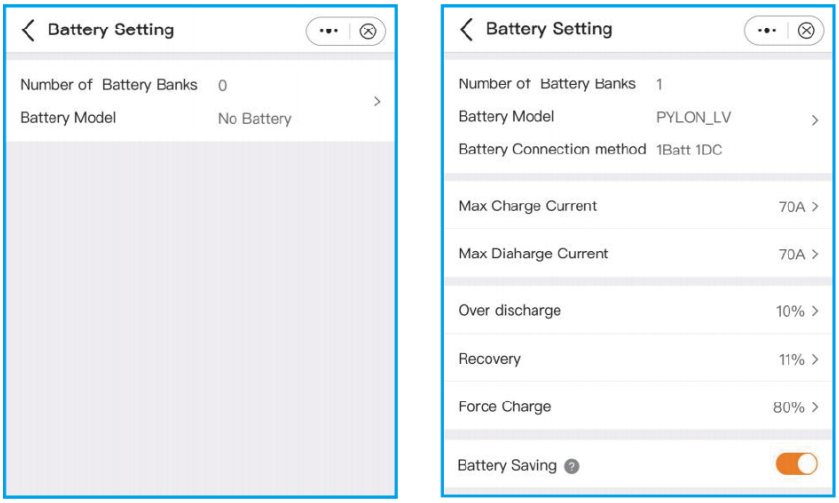


Table of Battery Setting

Settings	Description
Max charge current	Max charge current, settable.
Max discharge current	Max discharge current, settable.
Over discharge	Range : 5~40%, default 20%, when battery SOC < over discharge, it will stop discharging.
Recovery	Range : set Over discharge value +1% ~ set Over discharge value +20%; when battery SOC > Recovery SOC, it will start charging, reserve the return difference value to avoid the battery repeatedly cross jump between charging and discharging.
Force charge	Range : 4%~ set Over discharge value, when battery SOC < force charge SOC, the grid will charge the battery.

NOTE

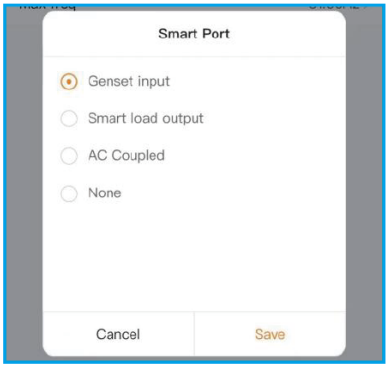
Force charge SOC < Over discharge SOC < Recovery SOC, otherwise the setting might be error.

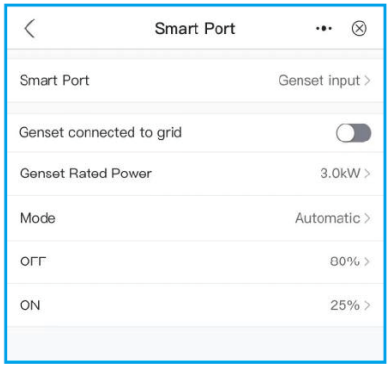
(4) If two battery banks share the same setting, then turn the "Apply Batt1 parameter values" on. It will match the settings of battery bank 1 automatically.

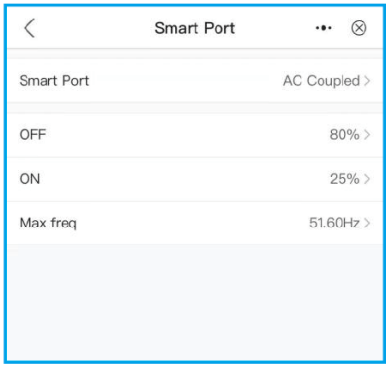
Smart port

Select smart port type

- When it is connected to Generator, select "Gunset input";
- When it is connected to smart load like heat pump, select "Smart load output";
- When it is connected to Grid-tied PCS (inverter), select "AC coupled".







Genset Rated Power: manual input.

OFF: Generator stops charging SOC, settable, range:35~100%;

ON： Generator start charging SOC; settable, range:1~95%;

AC coupled:

OFF: Grid-tied PCS (inverter) stops charging SOC, settable, range:35~100%;

ON: Grid-tied PCS (inverter) start charging SOC; settable, range:1~95%;

Grid port

Please refer to *6.3.5.2 APP Quick Setting*.

Parallel Setting

When there are ≥ 2 PCS(inverters) in parallel, turn the slider on

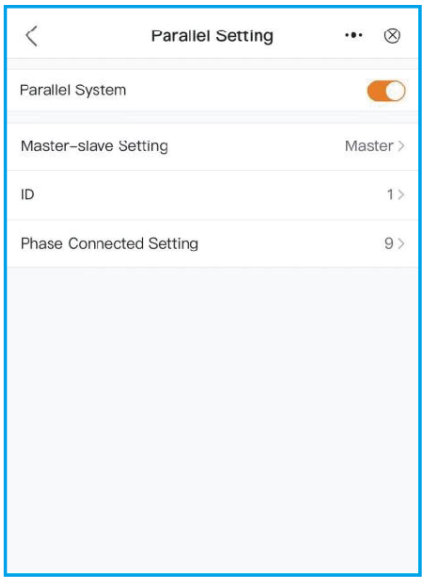
Set Master and Slave machine,

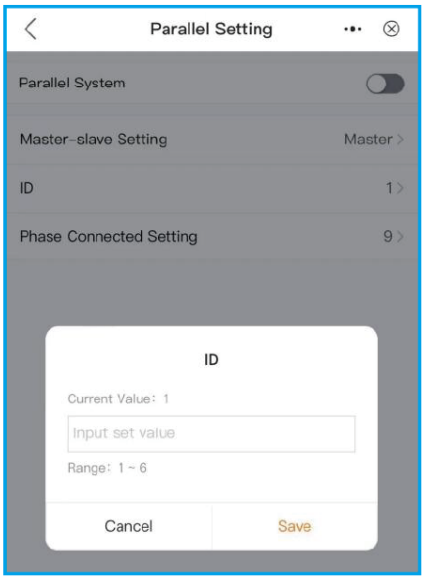
Set Master ID as: 1

Slave machine ID as: 2

.Slave machine ID as: 3

..... and so on.





Basic Setting

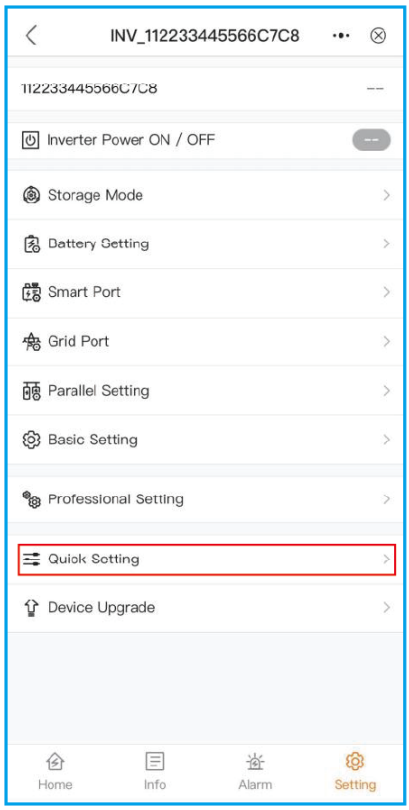
Set inverter time and date, tap the slider next to “Follow Phone Time”, then tap “Save”.

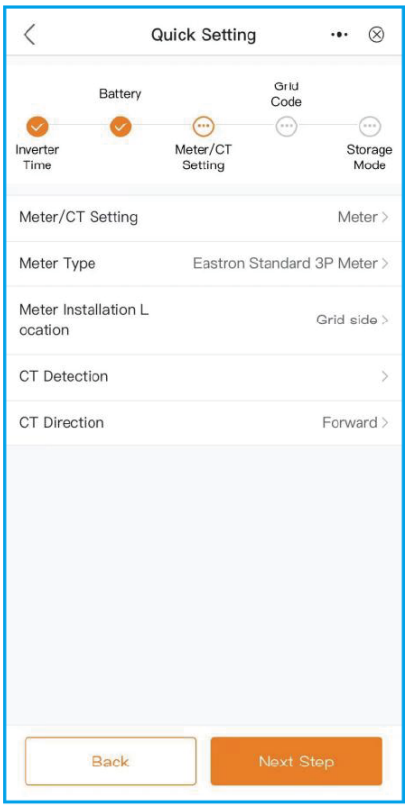
CT/Meter setting

There are two ways for CT/Meter setting, detailed setting please refer to “5.5.2 APP Quick setting”.

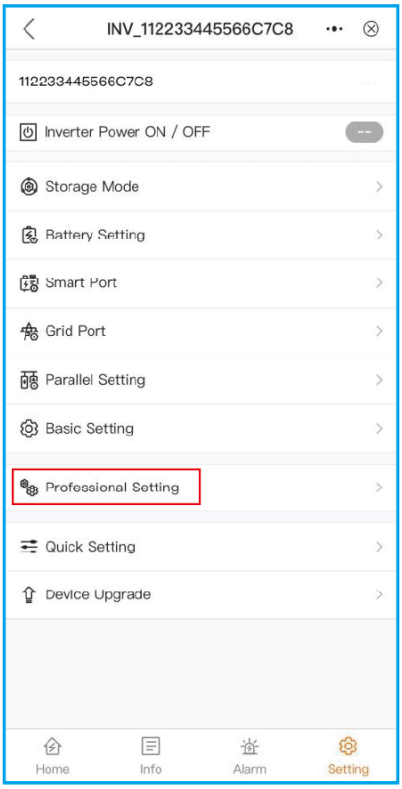
Please refer to *6.3.5.2 APP Quick Setting*.

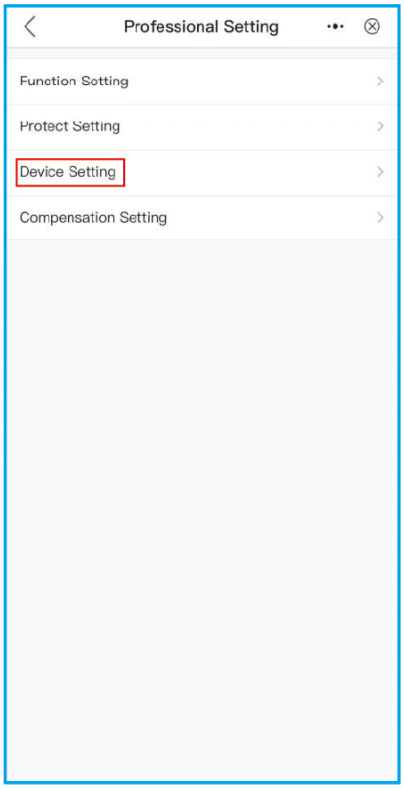
Method 1: Quick setting

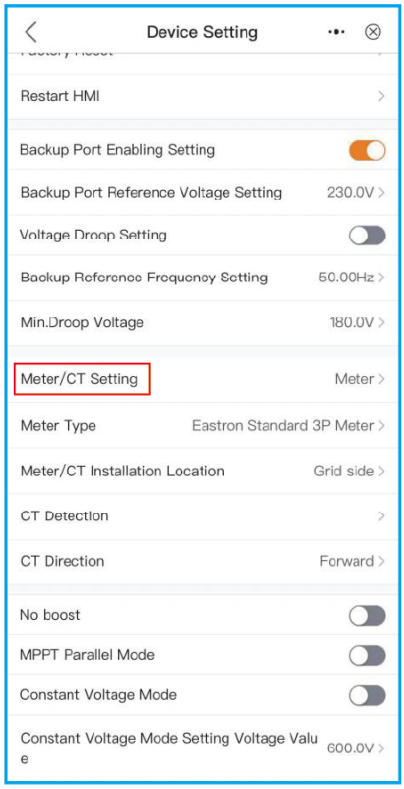




Method 2: Setting --- Professional Setting -- Device Setting --Meter/CT Setting







6.3.5.6 Alarm

The alarm page can display the current alarm and the historical alarms.

6.3.5.7 Information

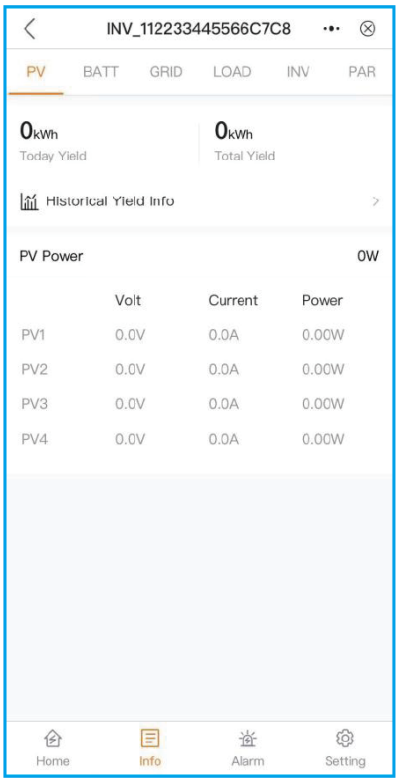
The use could Query information of PV / Battery / GRID / LOAD / INVERTER.
PV : it display each PV module Power/Voltage/Current, as well as historical yield information calculated by monthly / yearly / total, displayed with graphics;

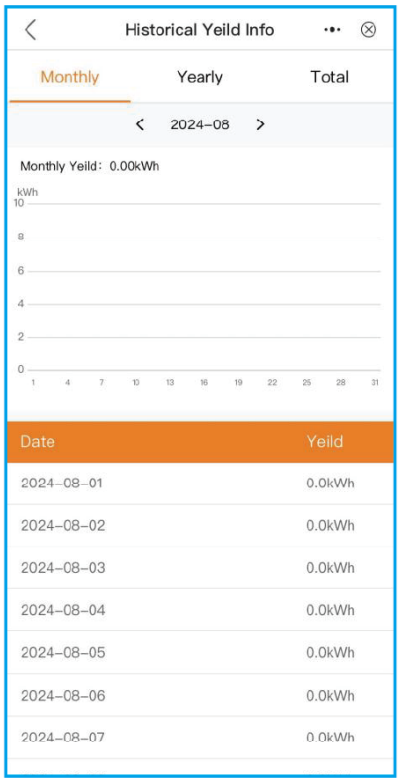
BATT: it display battery Power/Voltage/Current/SOC/SOH/Max.charging current / Max.discharging current, as well as historical battery charging and discharging information calculated by monthly / yearly / total, displayed with graphics;

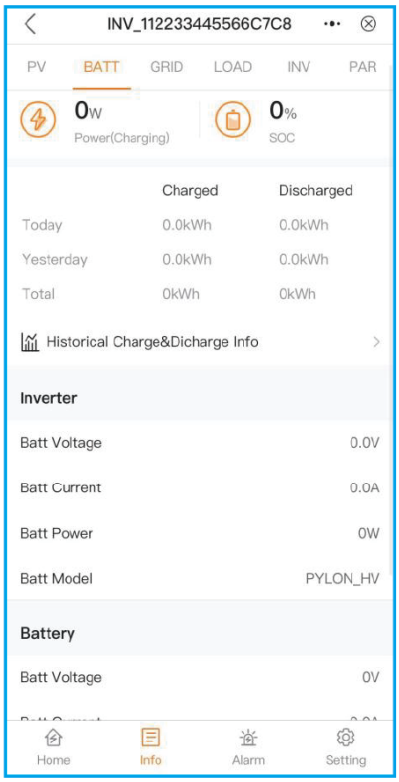
GRID: it display Active power / voltage/ current of L1/L2/L3, as well as historical exported/ imported information calculated by monthly / yearly / total, displayed with graphics;

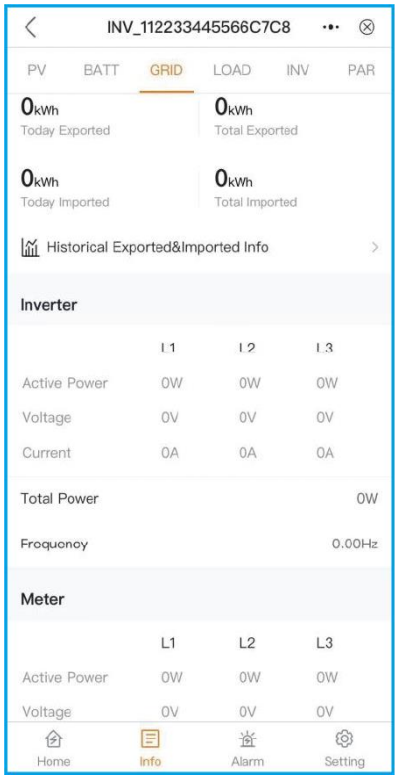
LOAD: it displays power/voltage of grid load, power/voltage/current of backup load;

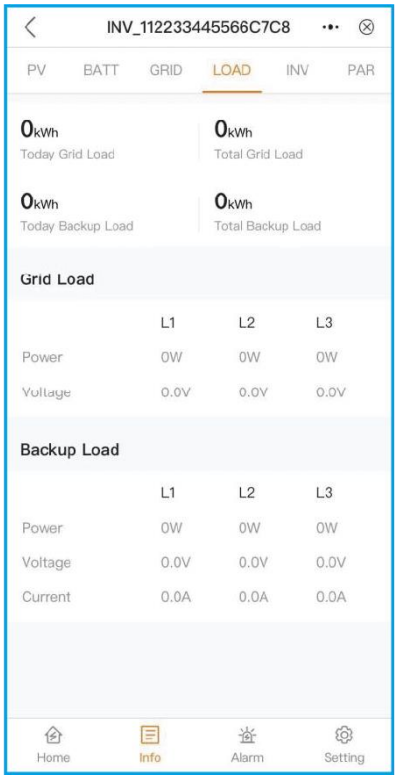
INV: it displays PCS (inverter) SN/model number, and software version.

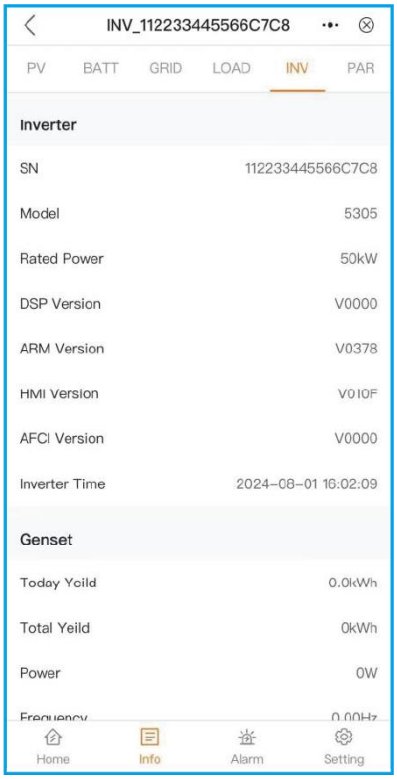







INV_112233445566C7C8
PV
BATT
GRID
LOAD
INV
PAR
0kWh
Today Exported
0kWh
Total Exported
0kWh
Today Imported
0kWh
Total Imported
Historical Exported&Imported Info
Inverter
L1
L2
L3
Active Power
0W
0W
0W
Voltage
0V
0V
0V
Current
0A
0A
0A
Total Power
0W
Froquency
0.00Hz
Meter
L1
L2
L3
Active Power
0W
0W
0W
Voltage
0V
0V
0V
Home
Info
Alarm
Setting


INV_112233445566C7C8
PV
BATT
GRID
LOAD
INV
PAR
0kWh
Today Grid Load
0kWh
Total Grid Load
0kWh
Today Backup Load
0kWh
Total Backup Load
Grid Load
L1
L2
L3
Power
0W
0W
0W
Voltage
0.0V
0.0V
0.0V
Backup Load
L1
L2
L3
Power
0W
0W
0W
Voltage
0.0V
0.0V
0.0V
Current
0.0A
0.0A
0.0A
Home
Info
Alarm
Setting


INV_112233445566C7C8
PV
BATT
GRID
LOAD
INV
PAR
Inverter
SN
112233445566C7C8
Model
5305
Rated Power
50kW
DSP Version
V0000
ARM Version
V0378
HMI Version
V010F
AFCI Version
V0000
Inverter Time
2024-08-01 16:02:09
Genset
Today Yeild
0.0kWh
Total Yeild
0kWh
Power
0W
Home
Info
Alarm
Setting

6.4 System Debug

Debug Procedure	Steps
Preparations for debug	Power on the BESS, referring to *Section 6.2* Before the whole BESS is power on, starting the load is not allowed! ***NOTE:*** Before powering on the BESS, be sure to setup all the parameters of the PCS and EMS at first.
System function test	Each component system debug: Power supply from the External Power Supply (e.g. UPS) is working normally. Communication Test: Check if the communication between the BESS and communicated devices is normal or not, alarm available or not. Power Conversion System Test: Before conjoint test be sure to test the PCS starting process at first. BESS Test: Charge/Discharge test; stop test at charging; stop test at discharging; current limiting function test, etc.
Trial operation test	After the system is debugged, run the system a period with low load, to test if the high voltage AC system is running smoothly.

7 Maintenance

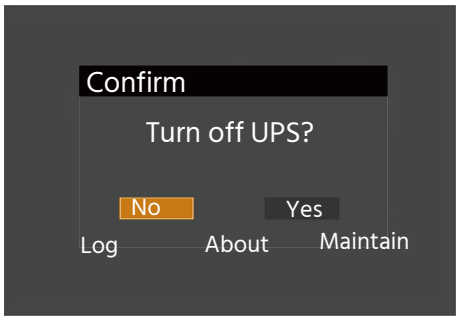
⚠ DANGER

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. Disconnect the "QF7", "QF6", "QF5", "QF4" and "QF3" breakers in the cabinet one by one.
2. Shut down the UPS as follows.
   (1) Long press the power button ⏻ on the front panel of the UPS.
   (2) Click "Yes" to confirm "Turn off UPS" on the display panel. After a while, the UPS shuts down.



3. Turn off the "Power Switch" of the MBMS-LC.
4. Turn off the BMS as follows:
   (1) Set the circuit breaker to "OFF" of the BMS.
   (2) Turn off the power switch (AC1) and fan switch (AC2) of the BMS.
5. Switch off the main breaker "QF1".

⚠ CAUTION

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

Warning: DO NOT turn off the circuit breaker during normal running status (unless emergency). Otherwise, it will cause current surge to the rest battery strings. Be sure to turn off the PCS first prior to turning off the circuit breaker 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 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.
- During the whole process of maintenance, it is necessary to ensure that the escape routes are completely unblocked.

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) If necessary, a compressed air machine must be used to clean the system. ***NOTE***: The system must be powered off when cleaning dust.	Every 6 months to 1 year (depending on the dust content of the environment in which it is used).
Power circuit connection check	(1) Check power cable connections for looseness and retighten to the torque specified above. (2) Check power cables and control cables for damage, especially cut marks on the skin in contact with metal surfaces. (3) Check that the insulating wraps of the power cable terminals are not detached.	Officially run for six months, then every six months to one year thereafter.
Terminal and 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.	Officially run for six months, then every six months to one year thereafter.

	(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.	
Circuit breaker maintenance	(1) Routine inspection of all metal components for corrosion. (2) Annual inspection of contactors (auxiliary switches and micro-switches) to ensure that they are in good mechanical working order. (3) Check the operating parameters (especially voltage and insulation).	Officially run for six months, then every six months to one year thereafter.
SPD* check	(1) Annual inspection of cable connection to ensure that they are in good mechanical working order. (2) Check the operating parameters (especially voltage and insulation).	Every 6 months to 1 year
Fuse* check	(1) Annual inspection of cable connection to ensure that they are in good mechanical working order. (2) Check the operating parameters (especially voltage and insulation).	Every 6 months to 1 year
Battery maintenance	(1) Perform normal charging and discharging operations on the battery system to check whether there are any abnormalities in the operating status of the battery, and to check whether the battery system indicator status is normal. (2) It is recommended that the battery be fully charged and equalized on a regular basis.	Every 6 months to 1 year
Aerosol fire extinguisher inspection	When the fire extinguishing equipment is in normal working condition, it is necessary to check the starting device (JR10 starter box, etc.) to make sure that the line is normal. The fire extinguishing equipment is maintenance-free for its own validity period.	Officially run for six months, then every six months to one year thereafter.
Air conditioner maintenance	(1) Check whether the temperature of the air outlet is close to the cooling setting value, ±2℃. (2) Check the degree of dust at the air inlet and outlet. And use a compressed air machine to clean and treat the dust at the air conditioner inlet and outlet.	Every 6 months
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.

***Specifications of electrical parts (needs maintenance)**

System Type	Part Name	Specification
One Battery String System (1500V)	SPD1 (Surge Protecting Device)	DS44-400 400V 20kA T2 4P
	SPD2 (Surge Protecting Device)	DS50PV(S)-1500/51
	Fuse	ESH5559 200A 1500VDC
One Battery String System (1000V)	SPD1 (Surge Protecting Device)	DS44-400 400V 20kA T2 4P
	SPD2 & SPD3 (Surge Protecting Device)	DS50PV(S)-1500/51
	Fuse	A22010-80A IR50kA 1000VDC

7.3 Battery Maintenance

DANGER

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 full 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 history 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.

7.4 Air conditioner Maintenance

To ensure the normal operation of the air conditioner, please perform regular maintenance referring to the following table.

NOTE: 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.

Check item	Action	Maintenance Intervals
Wiring	Visual check whether the wiring is loose.	One year
Fan faults	Turn the fan to check whether it is smooth and whether there is any abnormal noise.	One year
Condenser	Check the cleanness of the condenser and clean it with the compressed air.	Six months

7.5 UPS Maintenance

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

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

7.5.1 Fan Maintenance

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

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

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

7.5.2 Battery Maintenance

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

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

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

> ⚠ **CAUTION**
>
> **Caution:**
>
> 1) Check regularly the screws at the battery connection parts, and fasten the loosen ones immediately.
> 2) Make sure that the safety equipment is complete and that the function is normal, especially that the settings of the battery management parameters are normal.
> 3) Measure and record the internal temperature of the battery capsule.

4) Check whether the battery ports are damaged or hot, and whether the chassis and the covers are damaged.

7.5.3 Cleaning UPS

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

7.5.4 Checking UPS State

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

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

7.5.5 Checking UPS Functions

⚠ CAUTION

Caution: UPS functions checking operation may cause load power supply outage.

We recommend checking the UPS functions once every half year.

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

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

8 Troubleshooting

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

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

8.1 Battery String Troubleshooting

- Section A before starting up:

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

- Section B During operation:

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

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

Failure Type	Failure Definition	Possible Reason	Solution
External	Input RV Err (Bit4).	D+ D- reversely connected	Check the external power cables of the polarity and connection.
External	DC OV Err input over voltage error (Bit3).	D+ D- voltage extremely higher than battery system voltage.	Check that if the PCS's voltage matches the battery system.
External	Emergency stop (Bit13).	Command by external device via dry contactor.	Command by external device, not an erroractively reported by battery system.
Current Leakage	Current Leakage Error (Bit21).	Current Leakage >25mA	With insulation gloves, disconnect the battery system and contact Pylontech service engineer.

Self-test	Self-test module Initial Error (Bit16).	Self-test failed.	1. Restart the battery system. 2. If the problem persists, contact Pylontech service engineer.
Self-test	Self-test module coulomb error (Bit15).	Self-test failed.	Contact Pylontech service engineer.
Self-test	Self-test module detecting amount error (Bit14).	Self-test failed.	Contact Pylontech service engineer.
Self-test	Safety check failure (Bit11).	Chip self-test failed.	1. Restart the battery system. 2. If the problem persists, contact Pylontech service engineer.
Self-test	Self-test volt error (Bit10).	Battery cell voltage measurement mismatch with DCBUS voltage measurement.	Restart the battery system. Check the connectivity and reliability of the power and communication cables. Swap the current measurement board or BMS. If the problem persists, contact Pylontech service engineer.
Battery cell	Battery damage error (Bit6).	Battery cell voltage measured at <2.0V.	Restart the battery system. Swap out the RED LED battery module. Use multimeter to measure the battery module power terminal voltage, if is the same as the BMS reading value, then it`s a true cell damage. Otherwise please swap the BMU of the module.

8.2 UPS Troubleshooting

8.2.1 List of UPS Alarm and Fault Message

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

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

8.3 Air conditioner Troubleshooting

8.3.1 Common faults and recovery measures

Symptom	Possible cause	Check items or processing method
Internal cycling fan cannot start.	The return air temperature is low, and the unit enters the energy saving mode.	If the internal fan stop point is set as the cooling point in the operation setting, the internal fan will not stop.
	Triggered by alarm.	Some alarms are set to stop the running of the air conditioner when triggered. Check if there is any access control alarm, smoke alarm, AC over-voltage alarm or AC under voltage alarm.
	Main power supply failure.	Check the rated voltage of the AC input phase to see if the AC power fails or exceeds the range of 220V±15%.
	The fan gets stuck.	Check if there is any foreign object that blocks the fan.
	Loose terminal.	Check if the fan connecting terminal is loose.
The fan can run but the control function does not work.	The relay does not work.	Check if the relay fails.
		Check if the relay coil has AV voltage. If yes, replace the control panel.
The external hydrogen discharge fan does not work.	Setting error or the operating condition has not been satisfied.	Check if the operating cycle is set as "0" or it has not reached the hydrogen discharging cycle.
	Power cut-off.	Check the external power supply.

8.3.2 Cooling System Failure

The compressor does not start.	The power supply is not started (standby).	Check the main power switch, and check if the start-up interface is displayed.
The compressor does not work.	Loose circuit connection.	Tighten the circuit connectors.
	The compressor motor burns out.	Check the motor and replace it if any defect is found.
	There is no cooling demand.	Check the display of the temperature inside the cabinet and the compressor output status on the operation interface.
High discharge pressure.	Within shutdown delay.	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.
	Access control setting.	When the access control is set as ON, the air conditioner will stop after the access control is off for a certain period of time.
	Built-in temperature protection of the compressor.	Check if the relay contact has 220V AC voltage.

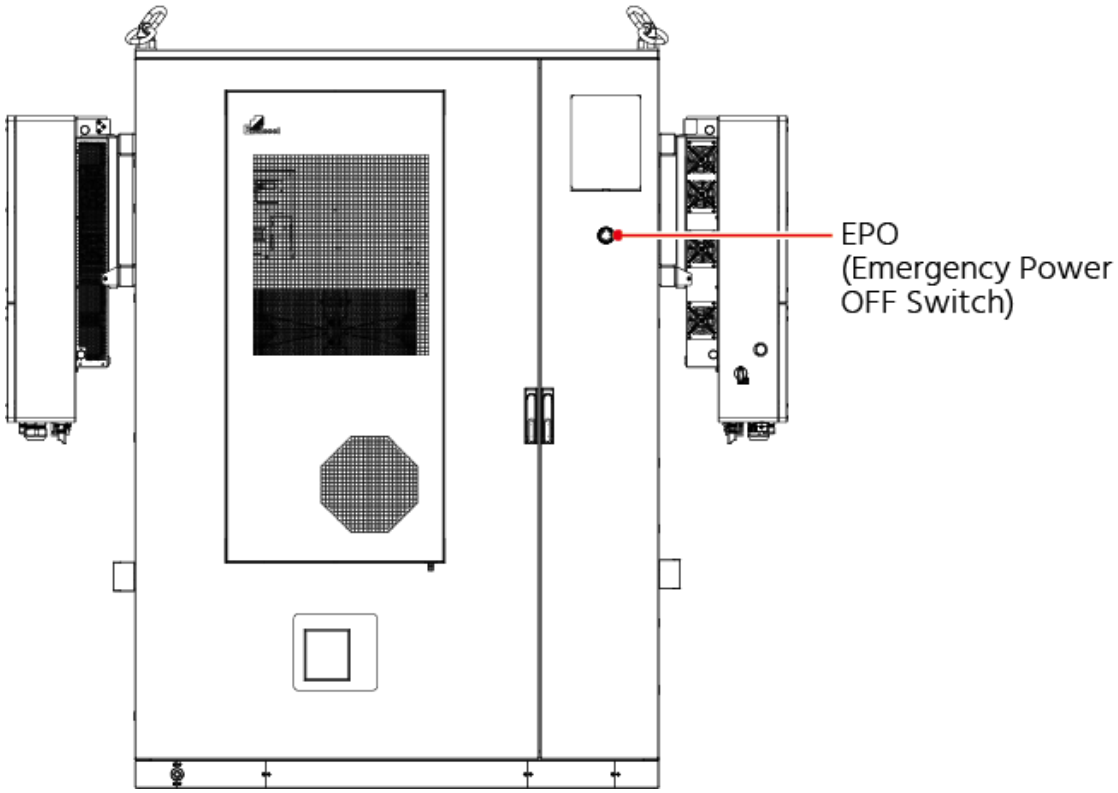
	High pressure switch disconnected.	The reference discharge voltage is too high.
	The condenser is cloggedby dirt.	Clean the condenser.
Large compressor noise.	The condenser fan does not work.	Check for any fan failure according to the relevant operation steps.
	The refrigerant flows to the compressor again	Check if the air suction unit is over-heated.
The compressor has intermittent cyclic operation.	The bearing is worn out because of the lubricant loss.	Replace the compressor.
	The compressor or pipe support is loose.	Tighten the fixing clamp.
	The connecting rod, valve or other rotating gear is broken.	Replace the compressor.
	Sensor fault.	Check if there is any display of sensor fault alarm.
The compressor protector trips or work cyclically.	The system is short of refrigerant.	Check if there is any leakage, repair the leaking part and add refrigerant.
	High discharge pressure.	Check the clogging state of the condenser filter, and check if the condenser fan or fan motor is blocked.
The compressor does not start.	The power supply is not started (standby).	Check the main power switch, and check if the start-up interface is displayed.

8.3.3 Controller Failure

Symptom	Possible cause	Check items or processing method
Frequent voltage alarm.	Power supply failure.	Check the external input power supply.
	Circuit sensor fault.	Replace the circuit board.

8.4 Emergency Disposal (EPO)

In case of fire or any situation beyond the control of anyone, please immediately snap 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.



8.5 PCS Troubleshooting

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 under controlled	1. Confirm whether the PCS is connected to an external EPM/meter to prevent reverse current. 2. Confirm whether the PCS is controlled by an external third-party device. 3. Confirm whether the power setting of the PCS power control is limited. 4. Verify settings in section 6.6.7 and check your meter readings.
LmtByDRM	DRM Function ON	1. No need to deal with it.
LmtByTemp	DRM Function ON	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. 2. PCS 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. 2. PCS 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	1. No need to deal with it.
Standby	Bypass run	
StandbySynoch	Off grid status to On grid status	
GridToLoad	Grid to load	
Surge Alarm	On-site grid surge	1. Grid side fault, restart the device. If it is still not eliminated, please contact the manufacturer's customer service.
OV-G-V01	Grid voltage exceeds the upper voltage range	1. Grid side fault, restart the device. If it is still not eliminated, please contact the manufacturer's customer service.
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.

OV-G-V05	Grid voltage RMS instantaneous overvoltage fault	2. Confirm that the AC cable is properly connected. 3. Restart the system and check if the fault persists.
OV-G-V04	Grid voltage exceeds the upper voltage range	
UN-G-V02	Grid voltage exceeds the lower voltage range	
OV-G-F02	Grid frequency exceeds the upper frequency range	
UN-G-F02	Grid frequency exceeds the lower frequency range	
NO-Battery	Battery is not connected	1. Check on information page 1 – Verify the battery voltage is within standards. 2. Measure battery voltage at plug.
OV-Vbackup	Inverting overvoltage	1. Check whether the backup port wiring is normal 2. Restart the system, confirm that the fault continues.
Over-Load	Load overload fault	1. Backup load power is too large, or some inductive load startup power is too large, need to remove some backup load, or remove the inductive load on the backup.
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 PCS and battery. Check cable conditions. Check to ensure you have it plugged in on the CAN port of the battery and PCS. 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 PCS connection point. Contact your battery manufacturer for further service.
UN-Vbatt	Battery overvoltage detected	1. Restart the system and check if the fault persists. If it is still not eliminated, please contact the manufacturer's customer service.
Fan Alarm	Fan alarm	1. Check if the internal fan is working correctly or jammed.
OV-DC01 (1020 DATA:0001)	DC 1 input overvoltage	1. Check if the PV voltage is abnormal 2. Restart the system, confirm that the fault continues
OV-DC02 (1020 DATA:0002)	DC 2 input overvoltage	
OV-BUS	DC bus overvoltage	1. Restart the system, confirm that the fault

(1021 DATA:0000)		continues.
UN-BUS01 (1023 DATA:0001)	DC bus undervoltage	
UNB-BUS (1022 DATA:0000)	DC bus unbalanced voltage	
UN-BUS02 (1023 DATA:0002)	Abnormal detection of DC bus voltage	
DC-INTF. (1027 DATA:0000)	DC hardware overcurrent (1, 2, 3, 4)	1. Check if the DC wires are connected correctly without loose connection.
OV-G-I (1018 DATA:0000)	A phase RMS value overcurrent	1. Confirm that the grid is abnormal. 2. Confirm that the AC cable connection is not abnormal. 3. Restart the system, confirm that the fault continues.
OV-DCA-I (1025 DATA:0000)	DC 1 average overcurrent	1. Restart the system, confirm that the fault continues.
OV-DCB-I (1026 DATA:0000)	DC 2 average overcurrent	
GRID-INTF. (1030 DATA:0000)	AC hardware overcurrent (abc phase)	
DCInj-FAULT (1037 DATA:0000)	The current DC component exceeds the limit	1. Confirm that the grid is abnormal. 2. Confirm that the AC cable connection is not abnormal. 3. Restart the system, confirm that the fault continues.
IGBT-OV-I (1048 DATA:0000)	IGBT overcurrent	1. Restart the system, confirm that the fault continues.
OV-TEM (1032 DATA:0000)	Module over temperature	1. Check whether the surrounding environment of the PCS has poor heat dissipation. 2. Confirm whether the product installation meets the requirements.
RelayChk-FAIL (1035 DATA:0000)	Relay failure	1. Restart the system, confirm that the fault continues.
UN-TEM (103A DATA:0000)	Low temperature protection	1. Check the working environment temperature of the PCS. 2. Restart the system to confirm if the fault continues.
PV ISO-PRO01 (1033 DATA:0001)	PV negative ground fault	1. Check whether the PV strings have insulation problems. 2. Check whether the PV cable is damaged.
PV ISO-PRO02 (1033 DATA:0002)	PV positive ground fault	
12Power-FAULT (1038 DATA:0000)	12V undervoltage failure	1. Check current leakage to ground. Verify your grounding. Verify all wires are in good condition and not leaking current to ground.
ILeak-PRO01 (1034 DATA:0001)	Leakage current failure 01 (30mA)	
ILeak-PRO02 (1034 DATA:0002)	Leakage current failure 02 (60mA)	

ILeak-PRO03 (1034 DATA:0003)	Leakage current failure 03 (150mA)	
ILeak-PRO04 (1034 DATA:0004)	Leakage current failure 04	
ILeak_Check (1039 DATA:0000)	Leakage current sensor failure	
GRID-INTF02 (1046 DATA:0000)	Power grid disturbance 02	1. Confirm whether the grid is seriously distorted. 2. Check whether the AC cable is connected reliably.
OV-Vbatt-H/ OV-BUS-H (1051 DATA:0000)	Battery overvoltage hardware failure / VBUS	1. Check if the battery circuit breaker is tripping. 2. Check if the battery is damaged.
OV-ILLC (1052 DATA:0000)	LLC hardware overcurrent	1. Check whether the backup load is overloaded. 2. Restart the system, confirm that the fault continues.
INI-FAULT (1031 DATA:0000)	AD zero drift overlink	1. Restart the system, confirm that the fault continues.
DSP-B-FAULT (1036 DATA:0000)	The master-slave DSP communication is abnormal	
AFCI-Check (1040 DATA:0000)	AFCI self-test failure	
ARC- FAULT (1041 DATA:0000)	AFCI failure	1. Verify connections are tight within your PV system. Arc fault settings can be changed in advanced settings if further adjustment is necessary.

NOTE

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

9 Shipment and Storage

9.1 Shipment

The outdoor battery cabinet is handled by forklift or hoisting.

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

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

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

9.2 Storage

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

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

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

⚠CAUTION

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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