

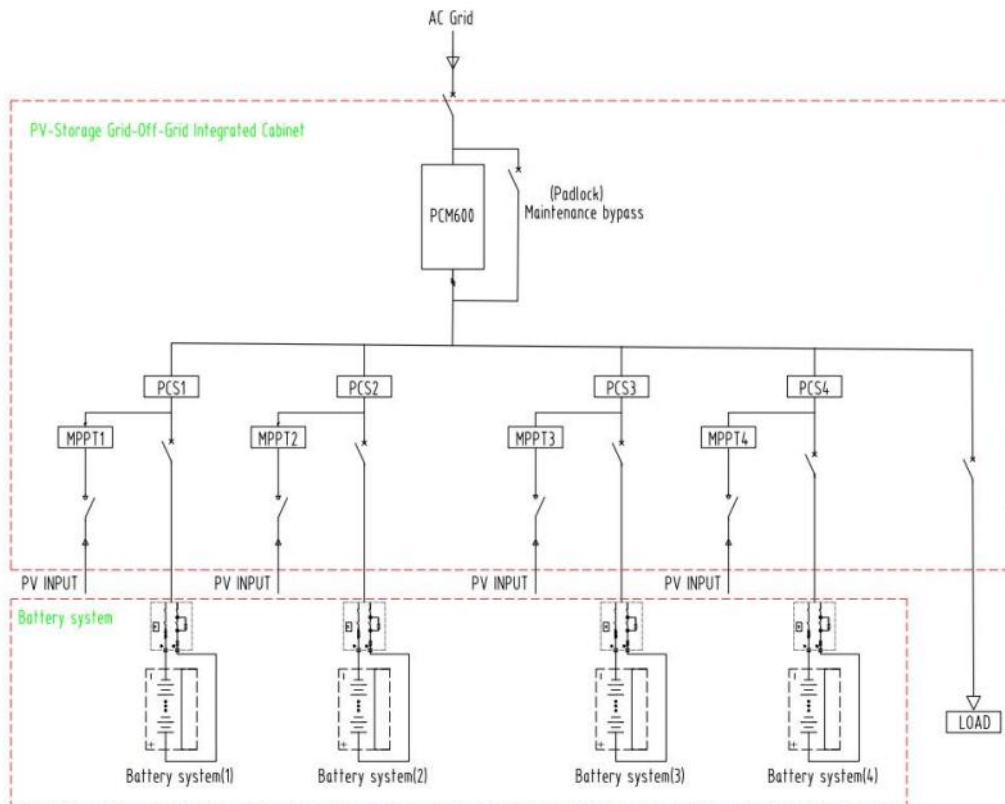
Contents

1. Product Overview	- 1 -
1.1. Application Scenarios and Introduction	1
1.2. Product Appearance	- 1 -
1.3. System Main Technical Parameters	- 2 -
1.4. System Main Components	- 3 -
2. System Components Introduction	- 4 -
2.1. Component Schematic	- 5 -
2.2. Cell Parameters	- 5 -
2.3. Battery Pack Parameters	- 6 -
2.4. Battery Cluster Parameters	- 7 -
2.5. High-voltage PDU Introduction	- 9 -
2.6. Integrates hybrid inverter system Introduction	- 11 -
2.7. Battery Management System Introduction	- 13 -
2.8. Fire Protection System Introduction	- 16 -
2.9. Air conditioner Introduction	- 18 -
2.10. Container and Auxiliary Power Distribution System	- 19 -
3. EMS User Manual	- 21 -
3.1. APP and Cloud Platform Configuration Guide	- 22 -
3.2. 4G/Wifi Communication Stick	- 22 -
3.3. Mobile Cloud Platform (APP)	- 23 -
3.4. PC (Web) Cloud Platform	- 28 -
4. Lifting, Transportation and Storage	- 31 -
4.1. Hoisting Operations	- 31 -
4.2. Transportation Operations	- 32 -
4.3. Storage	- 33 -
5. Foundation Construction	- 34 -
6. Equipment Installation	- 36 -
6.1. Installation Instructions	- 36 -
6.2. Pre-installation Preparation	- 36 -
6.3. Electrical Connections	- 38 -
6.4. Battery Connection	- 45 -
7. Product Operation	- 50 -
7.1. Power-on Procedure for Energy Storage System	- 50 -
8. Battery System Maintenance Instructions	- 56 -
8.1. Pre-Maintenance Notes	- 57 -
8.2. System Usage Requirements	- 57 -
8.3. Maintenance Precautions	- 58 -
8.4. Battery Maintenance	- 58 -
8.5. System Maintenance	- 59 -
8.6. Fire Protection System Maintenance	- 60 -
9. Emergency Incident Abnormal Handling	- 63 -
9.1. Emergency Abnormal Handling Methods	- 63 -
10. Appendix: Inspection Items	- 64 -
11. Warranty Instructions	- 66 -

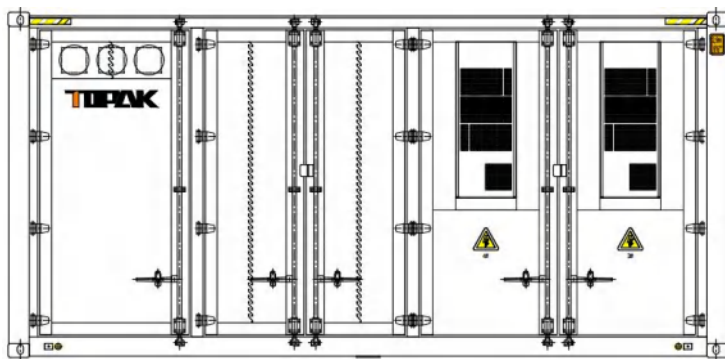
1.1. Application Scenarios and Introduction

The TP-G500-1028-CF PV-Energy Storage Integrated Cabinet, our company's standardized product, is composed of 3.2V/314Ah lithium iron phosphate (LFP) batteries. It is mainly used for constructing microgrid energy storage systems, supporting functions such as self-generation for self-use and emergency backup power supply. Its typical application scenarios include industrial applications, hotels, shopping malls, data centers, microgrids, and industrial parks. With a system PCS of 500kW, a PV MPPT with 480kW, and a 600kW off-grid switching switch, a rated capacity of 1028kWh, the container integrates key components: battery pack, high-voltage PDU, hybrid inverter, temperature control system, fire protection module, AC power distribution unit (AC PDU), Battery Management System (BMS). It also supports APP functionality.

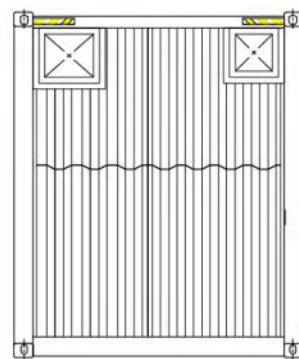
This product supports operation in grid-connected and off-grid modes. The hybrid inverter adopts a three-phase five-wire system. The reference for the electrical system topology diagram is as follows: (PV part provided by the user).



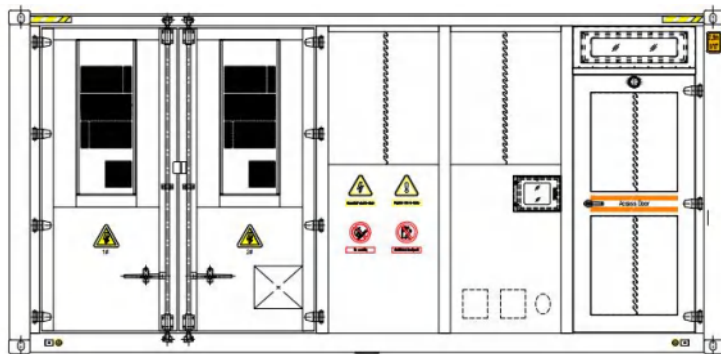
1.3. Product Appearance



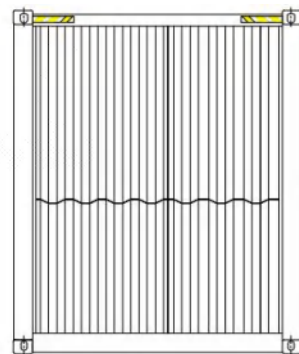
Front view (left)



Front view (rear)



Front view (left)



Front view (rear)

1.4. System Main Technical Parameters

Table 1 System Main Technical Parameters

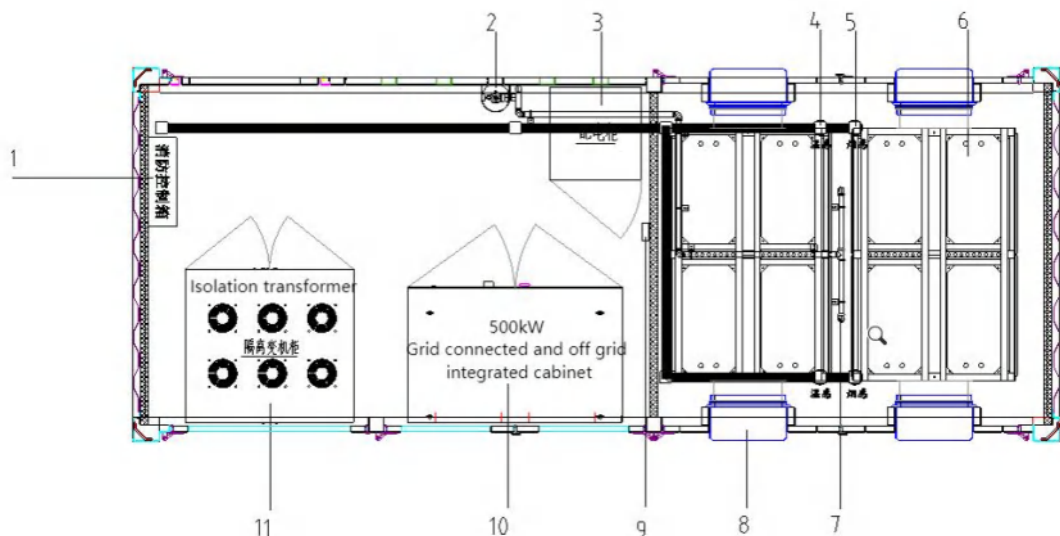
No.	Item	Specifications	Remarks
1	Nominal Capacity	1028kWh	
2	Nominal Voltage	819.2V	
3	DC Voltage Range	640-934.4V	
4	Rated Charge/Discharge Current	157A	
5	Rated Charge/Discharge Power	500kW	
6	Grid-side Voltage Range	AC400V $\pm$ 10%	
7	Inverter Wiring Method	Three-phase four-wire	
8	Support Operation Mode	On-grid or Off-grid	
9	System Efficiency	$\geq$ 89%	AC side @25 $\pm$ 2 $^{\circ}$ C 0.5P
10	Power Factor	-1~1	
11	Storage Temperature Range ($^{\circ}$ C)	-30 $^{\circ}$ C~60 $^{\circ}$ C	
12	Operating Temperature Range	Discharge: -20~55 $^{\circ}$ C; Charge: 0~55 $^{\circ}$ C	
13	Optimal Operating Temperature	25 $\pm$ 2 $^{\circ}$ C	
14	Cycle Life	$\geq$ 7000 times	@25 $\pm$ 2 $^{\circ}$ C , 0.5P,EOL $\geq$ 70%
15	Relative Humidity	RH $\leq$ 95%	no condensation
16	Altitude	$\leq$ 3000m	>3000m@90%>4000m@80% reduced capacity operation
17	IP Rating	IP54	
18	Cabinet Dimensions	6058*2438*2896 (mm)	Length*Width*Height
19	Weight	Approximately 16,000 kg	
20	External Communication Interface	WIFI	
21	System Design Life	$\geq$ 15 years	
22	External Electrical Interface	3P4W: Recommended 240mm ² *2	GRID
		3P4W: Recommended 240mm ² *2	Smart Port
		PE: Recommended 75mm ²	Backup Port
		PV1~PV4: Recommended 50mm ²	PV1+/PV1-

1.5. System Main Components

Table 2 System Main Components

No.	Item	Specifications	Unit	Quantity	Remarks
1.1	Battery Cluster	1P256S, 819.2V, 314Ah	cluster	4	64 packs
1.2	BMU	battery management unit	PCS	64	Inside the battery pack
1.3	PDU High-Voltage Cabinet	1000V250A (including BCU)	Unit	4	
1.4	Hybrid Inverter	500kW (125*4)	Unit	1	Includes MPPT and an off-grid switching switch
1.5	Industrial Air-Conditioner	3KW with dehumidification function	Unit	4	
1.6	Fire Protection	thermostatic aerosol	PCS	64	Inside the battery pack
		containing perfluorohexane, monitoring, tubing, etc.	Unit	1	system level
1.7	distribution box	auxiliary system power supply	Unit	1	
1.8	video surveillance system	Explosion-proof camera + switch	Unit	1	
1.9	lighting system	explosion-proof lighting lamp	PCS	4	
2.0	energy management system	EMS	Unit	1	

2. System Components Introduction



2.1. Component Schematic

No.	Component Abbreviations
1	fire control box
2	perfluoroacetone fire extinguishing system
3	AC distribution box
4	Temperature sensor*2
5	Smoke sensor*2
6	Battery Rack*4
7	Fire pipes and sprinkler heads
8	Industrial Air Conditioner*4
9	Explosion-proof camera
10	On Grid and Off Grid Integrated cabinet
11	Isolation transformer (optional, reserved space)

2.2. Cell Parameters

The TP-G500-1028-CF product adopts brand-new Grade A lithium iron phosphate (LFP) batteries (3.2V/314Ah), featuring high energy density, long cycle life, low cost, safety, and environmental friendliness. It has been widely applied in energy storage systems.

Table 3. Cell Parameters

No.	Item	Specifications	Remarks
1	Cell Type	LiFePO ₄	
2	Rated Voltage	3.20V	
3	Rated Capacity	314Ah	
4	Rated Energy	1004.8Wh	
5	Internal Resistance (1KHz)	≤0.18mΩ	
6	Standard Charge-discharge Rate	0.5P	
7	Maximum Charge-discharge Rate	0.5P	
8	Charge/Discharge Cut-off Voltage	2.5V~3.65V	

No.	Item	Specifications	Remarks
9	Cycle Life	>8000 times	@25±2℃, 0.5P,EOL≥70%
10	Cell Calendar Life	>15 years	
11	Battery Degradation Rate	Less than 6% degradation every three years	
12	Charge-discharge efficiency	≥93%	@25±2℃, 0.5P
13	Charging Temperature Range	0℃~60℃	
14	Discharge Temperature Range	-20℃~60℃	
15	Storage Temperature Range	-20℃~45℃	one month
16	Optimal Operating Temperature	20℃~30℃	
17	Energy Storage Humidity	≤95%	no condensation
18	Weight	5600 g ± 300 g	
19	Dimensions (L*W*H)	173.7*71.7*207.2mm	

2.3. Battery Pack Parameters

The TP-G500-1028-CF product adopts 3.2V/314Ah LFP cells. Each battery pack contains 16 cells, with a configuration of 1P16S. Reference for the appearance diagram is as follows:



Table 4. Battery Pack Parameters

Item	Specifications
Rated Energy	16.07kWh
Rated Voltage	51.2V
Voltage Range	40V~58.4V
Battery Type	Lithium iron phosphate battery
Cell Capacity	314Ah
Series-parallel Configuration	1P16S
Maximum Charge/discharge Current	157A
Discharge Ambient Temperature	-20℃~55℃
Charge Ambient Temperature	0℃~55℃
Storage Environment	0℃~40℃
Transportation Environment	-20℃~60℃
IP Rating	IP20
Dimensions (W*D*H)	W424mm*D796.5mm*H231mm (±3mm)
Weight	115kg (±2kg)

2.4. Battery Cluster Parameters

A battery cluster is a unit composed of multiple battery packs connected in a certain electrical way, including components such as battery racks, energy storage batteries, power and sampling circuits, and electrical interfaces. A single battery cluster consists of 16 pcs 1P16S battery packs and one high-voltage PDU.

The reference picture is as follows:

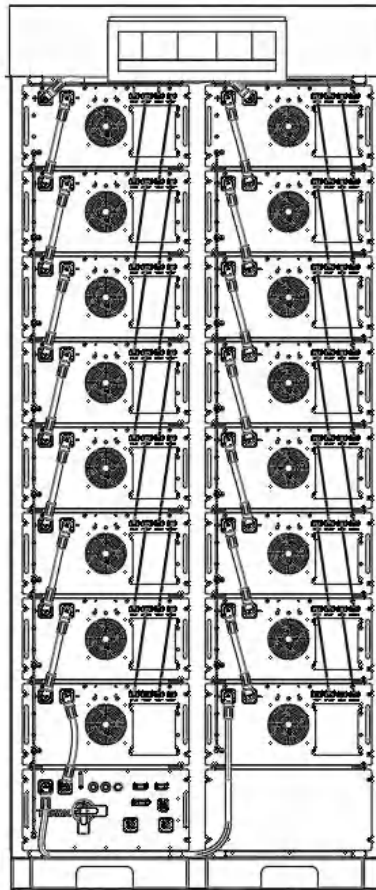


Table 5 Battery Cluster Technical Parameters

No.	Item	Specifications	Remarks
1	Battery Cluster Energy (kWh)	257	
2	Configuration	1P16S	Total 16 PACKS
3	Nominal Voltage (V)	819.2	
4	Operating Voltage Range (V)	640-934.4V	
5	Rated Charge-discharge Rate	$\leq 0.5P$	
6	Rated Charge-discharge Current	157A	

2.5. High-voltage PDU Introduction

The high-voltage PDU of the energy storage system mainly serves as a high-voltage power circuit management unit, and acts as an intermediate unit connecting battery clusters and the hybrid inverter. It features IP20 protection and provides functions such as battery cluster voltage and current collection, as well as control and protection of battery cluster circuit contactors.

The high-voltage PDU components such as circuit breakers, contactors, fuses, current sensors, Battery Cluster Control and Management Module (BCU), and DC/DC modules. The high-voltage cabinet was fully designed with the electrical characteristics, heat dissipation performance, safety performance, and maintainability and operability. It features a rational spatial layout, along with compact structure, flexible configuration, safety and reliability.

The Battery Cluster Control and Management Module (BCU) has optional LAN, CAN, and RS-485 communication bus interfaces. It enables communication between the high-voltage PDU and the Battery Management Unit (BMU), between the Energy Storage Battery Management System (BCU) and the hybrid inverter, thus realizing control, protection, and data communication functions for the energy storage battery clusters.

2.5.1. Main Function Description of High-voltage PDU:

- Supports DC-24V power supply and dual-power supply via DC/DC at the battery pack terminal;
- Supports power supply for the Energy Storage Battery Management Unit (BMU), with the supply power configurable based on the number of BMU modules;
- Supports CAN communication with the Energy Storage Battery Management Unit (BMU) to realize collection and management of battery cluster information;
- Supports LAN and CAN communication with the Battery Management System (BCU) to achieve information interaction;
- Supports communication control and dry contact control for hybrid inverters, as well as CAN communication and RS-485 communication;
- Supports automatic addressing function for BMU;
- Supports digital signal input detection, which can detect switch status signals, etc.;
- Supports battery cluster terminal voltage detection, terminal current detection, and battery cluster insulation status detection;
- This high-voltage cabinet supports system allowable parameters: total voltage of battery cluster $\leq 1000V$, maximum current of battery cluster $\leq 250A$.

2.5.2. Product Overall Dimensions:

Product dimensions (depth*width*height): 675.7*470*231mm (including mounting lugs);

The high-voltage PDU is mounted via fixing lugs. The horizontal hole spacing of the lugs is 446mm, and the vertical hole spacing is 170mm. The fixing holes on the lugs are open slotted holes, secured with four M6 screws.

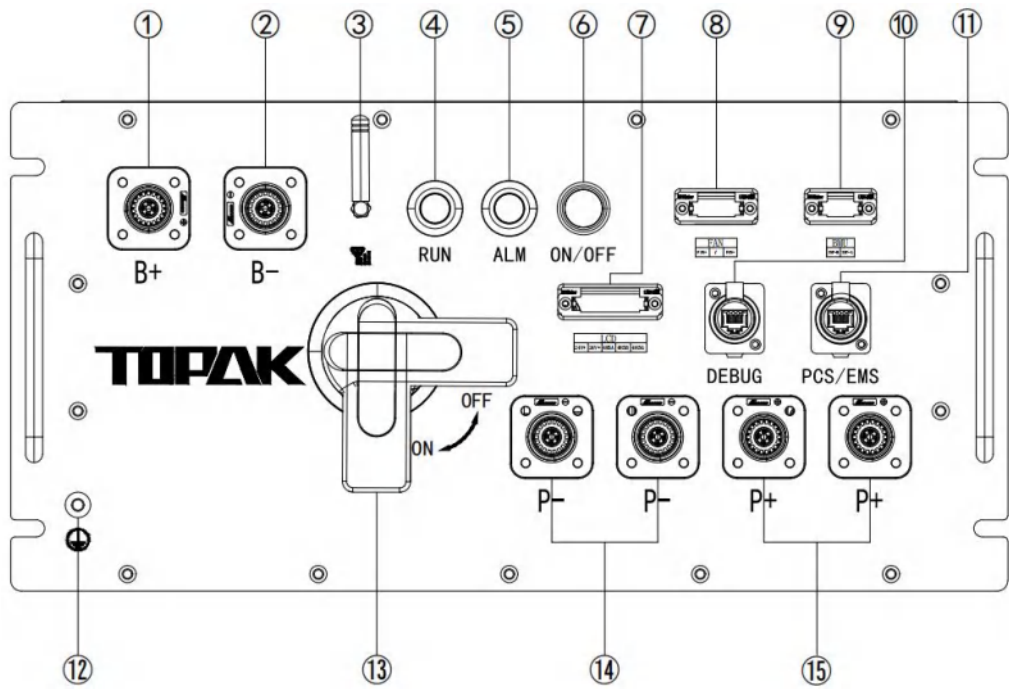


Table 6. Content of the panel screen printing

No.	Silk Screen Content	Description
①	B+	Battery module connects to the negative input of PDU
②	B -	Battery module connects to the positive input of PDU
③		WIFI can be used for external data reading and upgrading
④	RUN	PDU Running light
⑤	ALM	PDU Alarm light
⑥	ON/OFF	PDU Power switch
⑦	LCD	Display screen power supply interface
⑧	FAN	Fan power supply interface
⑨	BMU	PACK to PDU communication interface
⑩	DEBUG	PDU debugging interface
⑪	PCS /EMS	Connect to the PCS/EMS communication output interface
⑫		PDU ground point
⑬	ON-OFF	PDU main switch
⑭	P-	PDU module connects to the positive output of the inverter
⑮	P+	PDU module connects to the negative output of the inverter

2.6. Integrates hybrid inverter system Introduction

The system integrates hybrid inverter modules(MPPT &PCS), PCM, AC/DC power distribution units, diesel generator controls, and lightning protection devices. It supports grid connection, diesel generators, photovoltaic systems, and battery banks. Designed for applications such as solar-storage-diesel microgrids and backup power systems, it enables multi-unit parallel operation. Key use cases include: solar-storage microgrids, backup power solutions, emergency power supplies, diesel-storage systems, construction sites, oilfield operations, and off-site construction projects.

Product features:

- The off-grid rapid switching is less 10ms.
- The charging efficiency is more than 99.3% with multi-channel DC coupling.
- Hybrid modes, grid farming.
- It has built-in anti-backflow, self-use, peak shaving and valley filling.
- Supports parallel operation.
- The ALL IN ONE design enables rapid deployment, simple on-site debugging, and

Product appearance:

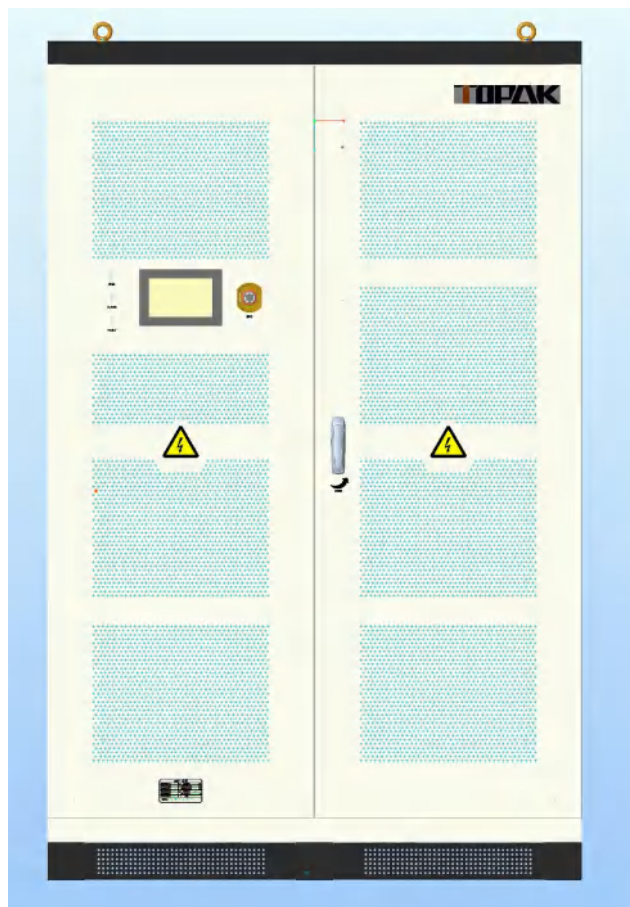


Table 7 Product Specific Parameters

model	TP-SP 500HCG2
Battery parameters	
Maximum battery voltage	950V
Minimum battery voltage	680V
Rated battery voltage range	680V-900V
Maximum battery current	200A*4
PV parameter	
Photovoltaic power	120KW*4
Maximum PV voltage	950V
Minimum PV voltage	200V
Rated MPPT voltage range	600V-900V
Maximum input current	200A*4
AC side (grid connection)	
Power rate	500kVA
Rated current	724A
Rated grid voltage	400V/230V
Grid voltage range	-20%~ 15%
Grid imbalance	125%
Frequency range	50Hz/47Hz~52Hz(60Hz/57Hz~62Hz)
Current harmonics	<3% (over 30% load)
Power factor	-1~ 1
AC side (off-grid)	
output rating	500kVA
maximum output	550kVA
rated output current	724A
maximum output current	796.4A
rated voltage	400V/230V
output voltage harmonics	<2% (resistive load)
degree of unbalanced	100%
frequency range	50/60Hz
Overload Current 1 (I1)	$I_e \cdot 1.1 < I_{load} \leq I_e \cdot 1.25$ 100s
Overload Current 2 (I2)	$I_e \cdot 1.25 < I_{load}$ 300ms

system parameter	
Time of switching off the grid and grid	Active: 0ms; Passive: <10ms
Number of cabinets parallel	3 units (MAX)
EMS function	SOC balancing, peak shaving and valley filling, self-consumption, surplus power grid connection, cloud platform, anti-reverse flow, oil-electric hybrid
isolation transformer	NO
bypass function	800A
levels of protection	IP20
size	W*H*D=1350*2200*850mm
weight	≈850kg
temperature range	-30~60°C (rated at 45°C)
Humidity range	10-95%
cooling-down method	forced air cooling
height	4000m (use at reduced rate for distances over 2000m)

2.7. Battery Management System Introduction

The Battery Management System (BMS) adopts a two-level architecture. Each battery pack is managed by a Battery Management Unit (BMU) that oversees 16 battery cells. The BMU is responsible for cell voltage and temperature collection, balancing, and other functions. The BMU communicates via CAN bus. The cell information of the battery (including cell voltage, cell temperature, cell SOC, cell SOH, and balancing status, etc.) is transmitted upwards by the BMU.

Each battery cluster is equipped with one Battery Control Unit (BCU), which performs total voltage and current collection of the battery cluster and controls the battery pack contractor. The BCU can upload battery information, fault alarms, data logs, etc., and communicates with the PCS (Power Conversion System) and monitoring system. It adopts CAN communication for the PCS and Ethernet communication for the monitoring system.

2.7.1. Slave Control Unit BMU Specifications

The Slave Control Unit BMU realizes real-time monitoring of the battery status by accurately collecting the voltage and temperature of each single cell battery. The module has a reliable data communication function. During system operation, it can realize communication with the main control unit of the battery management system or other necessary devices.

Its external dimensions are as follows:

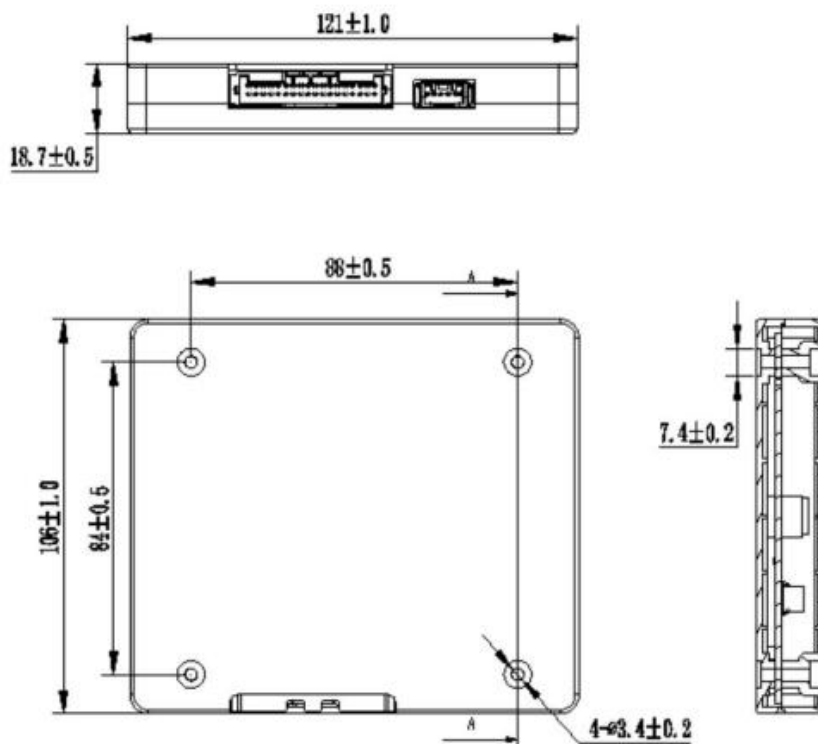


Table 8. Slave Control Unit BMU Parameters

No.	Item	Specifications	
1	Temperature Detection	Maximum Detection Quantity	9 channels
		Detection Accuracy	$\pm 1^{\circ}\text{C}$
		Detection Range	$-40^{\circ}\text{C} \sim 125^{\circ}\text{C}$
2	Voltage Detection	Detection Quantity	18 channels
		Detection Accuracy	$\pm 5\text{mV}$
		Detection Range	1.0VDC~5VDC
3	Balancing Type	Passive balancing, can provide a balancing current of less than 100mA	
4	Communication Interface	CAN	
5	Supply Voltage	24VDC	
6	Operating Temperature	$-40^{\circ}\text{C} \sim +60^{\circ}\text{C}$	
7	Storage Temperature	$-40^{\circ}\text{C} \sim +80^{\circ}\text{C}$	
8	Altitude	$\leq 3000\text{m}$	
9	Maximum Power Consumption of the Device	$\leq 0.8\text{W}$	
10	Maximum number of managed battery strings	18	

2.7.2. Main Control Unit BCU Specifications

As the control core of the battery management system (BMS), the Master Control Unit (BCU) realizes the detection of individual battery cell voltage, temperature, and other parameters through communication with slave control units. It also detects external characteristic parameters of the battery pack, including total voltage, charging/discharging current, and insulation resistance to ground. Based on appropriate algorithms, it estimates and monitors the internal states of lithium batteries (such as capacity, State of Charge [SOC], and State of Health [SOH]). On this basis, it achieves charging/discharging management, thermal management, insulation detection, cell balancing management, and fault alarm for the lithium battery pack. The BCU can exchange data with devices such as Power Conversion Systems (PCS), Energy Management Systems (EMS), and human-machine interfaces (HMIs) via communication buses, and communicate with Battery Management Units (BMUs) through a daisy chain. Reference pictures of the product are as follows:



Table 9. Main Control Unit BCU Parameters

No.	Item	Specifications
1	Equipment Model	BCU
2	Current Detection	0A~±300A (optional)
3	Voltage Sampling Accuracy	1% (rated)
4	Communication Interface	RS485, CAN
5	Supply Voltage	24VDC
6	Equipment Power Consumption	≤3W

No.	Item	Specifications
7	Operating Temperature	-40℃~+65℃
8	Ambient Humidity	≤95%
9	Altitude	≤4000m
10	Maximum Number of Managed BMUs	64 PCS
11	SOC Calculation Error	≤5%

2.8. Fire Protection System Introduction

(1) Overall

The energy storage battery compartment is protected as a unit, with a fire prevention strategy combining modular layout and centralized control. The prefabricated fire protection system for energy storage batteries provides a comprehensive safety solution, while the automatic fire alarm system enables early detection of fires.

Early detection and warning systems are crucial for rapid fire suppression, isolating ignition sources and radiation to prevent the spread of flames and avoid greater damage.

(2) Battery compartment

A. The battery compartment employs a full-immersion fire suppression system, utilizing a single perfluorohexanone (PFOH) fire extinguishing unit installed in the electrical compartment. The unit comprises PFOH cylinder assemblies, solenoid valves, and other components, with the piping network arranged within the energy storage compartment.

B. The battery compartment's fire detection system consists of combustible gas detectors (composite detectors), explosion-proof point-type temperature sensors, and explosion-proof point-type smoke detectors. When a fire detector or combustible gas detector (composite detector) detects a fire hazard, it triggers an alarm signal. The signal is transmitted to the fire alarm controller, which then activates audio-visual alarm devices to sound the alarm.

C. The battery compartment is centrally equipped with a single gas pipeline and two gas nozzles for protection. When smoke and temperature sensors trigger an alarm, the system simultaneously sends a fire alarm signal to the fire alarm controller. The controller then activates the fire extinguisher valve, releasing the extinguishing agent through the pipeline into the battery compartment, thereby achieving compartment-level protection.

D. Energy Storage Ventilation System: A dedicated ventilation system for energy storage units, consisting of two independent sections—exhaust and inlet. When the combustible gas concentration in the battery compartment reaches the preset alarm threshold, the fire suppression system automatically activates the ventilation system to expel the gas. When the gas fire suppression system initiates compartment-level fire suppression, the ventilation system automatically shuts off.

Fire alarm logic diagram for battery compartment:

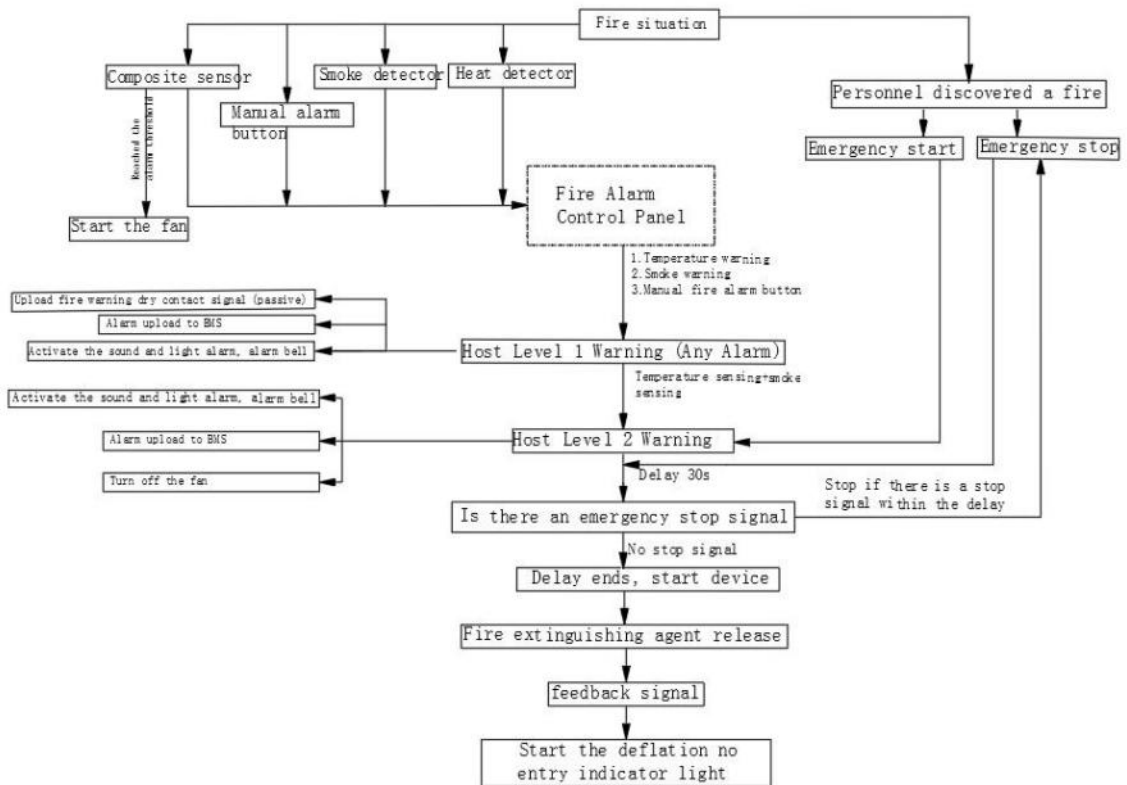


Table 10 Fire Protection System Configuration List

No.	Product Name	unit	quantity	remarks
1	Fire Alarm Controller of Gas Extinguishing Controller	PCS	1	
2	standby battery	PCS	2	
3	Communication module	PCS	2	
4	Fire Prevention and Control Device for Lithium-ion Power Battery-Sensor	PCS	2	
5	explosion-proof smoke detector	PCS	2	
6	explosion-proof temperature detector	PCS	2	
7	Emergency start/stop button	PCS	1	
8	audible and visual alarm	PCS	1	
9	deflagration indicator	PCS	1	
10	manual alarm button	PCS	1	
11	alarm bell	PCS	1	
12	input-output module	PCS	2	
13	electric relay	PCS	3	

No.	Product Name	unit	quantity	remarks
14	Module box	PCS	1	
15	exhaust blower	PCS	1	
16	air intake louvers	PCS	1	
17	concentration display module	PCS	1	
18	pressure relief port	PCS	1	
19	Perfluorohexane gas cylinder, solenoid valve, pressure gauge, electric start line feedback line, etc.	PCS	1	

2.9. Air conditioner Introduction

The energy storage system employs four 3KW industrial air conditioners to provide zoned temperature control for four battery clusters, and dehumidification functionality. This ensures the temperature difference of container batteries remains within 8°C, effectively enhancing the overall cycle life of the system.

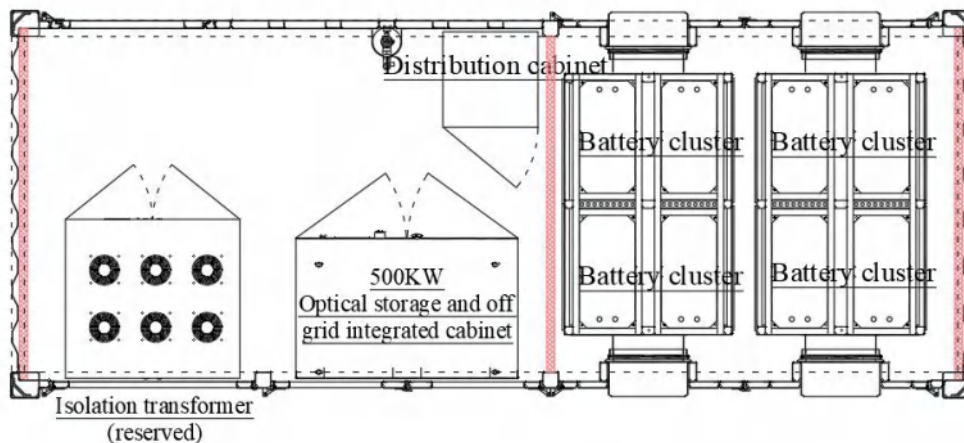
Table 11 Technical Parameters of Industrial Air Conditioning

Type	Item	Unit	Specifications
Size and Installation	Dimensions (H*W*D)	mm	1300*500*250
	Including Flange Overall Dimensions (H*W*D)	mm	1350*550*250
	Weight	Kg	60
	Installation Method	embedded installation	
	Installation Environment	outdoors	
Environment and Protection	Operating Environment Temperature	℃	-40 to +55
	Noise	dB(A)	70
	Service Life	Years	>10

Type	Item	Unit	Specifications
	IP Rating	IP65	
	Refrigerant	R134a	
	RoHS Certification	yes	
Performance	Power Supply Range	220±15%VAC~50Hz	
	Cooling Capacity (L35/L35)	W	3000
	Rated Power (L35/L35)	W	1110
	Rated Current (L35/L35)	A	5.0
	Maximum Operating Current	A	10
	Heating Capacity (Optional)	W	2000
	Circulating Air Volume	m3/h	850

2.10. Container and Auxiliary Power Distribution System

The system integrates battery systems, PV, on-grid and off-grid integrated cabinets, distribution cabinets, isolation transformers (with reserved positions only), and other equipment into a 20-foot container unit. It includes battery clusters, PDU (Power Distribution Unit), lighting systems, power distribution systems, monitoring systems, and access control switches.



Container layout reference

All wiring in the container is internally routed, including power lines, communication cables, and control cables, with the container's incoming and outgoing wiring arranged in a bottom-in, bottom-out configuration. Lithium batteries (installed on battery brackets) are mounted on the ground.

The auxiliary equipment such as air conditioning, lighting, and fire protection system in the container are powered by a unified power supply method. The container is designed with both general lighting and emergency lighting devices.

The non-equipment area at the bottom of the container must be lined with high-quality flame-retardant insulating mats that provide insulation voltage of at least 3kV and a thickness of no less than 5mm. The container is designed with excellent maintainability and replaceability, facilitating equipment maintenance, repair, and replacement. By default, the container design complies with the C3 corrosion resistance standard.

The container steel structure utilizes high-weather-resistant steel plates with a flat roof design for easy stacking. The load-bearing framework is coated with specialized treatment. During its 15-year service life, the container maintains unlimited full-load lifting capacity. Under real-world operating conditions, its appearance, mechanical strength, and corrosion resistance ensure compliance with 15-year service requirements. The container's protection rating is IP54 or higher.

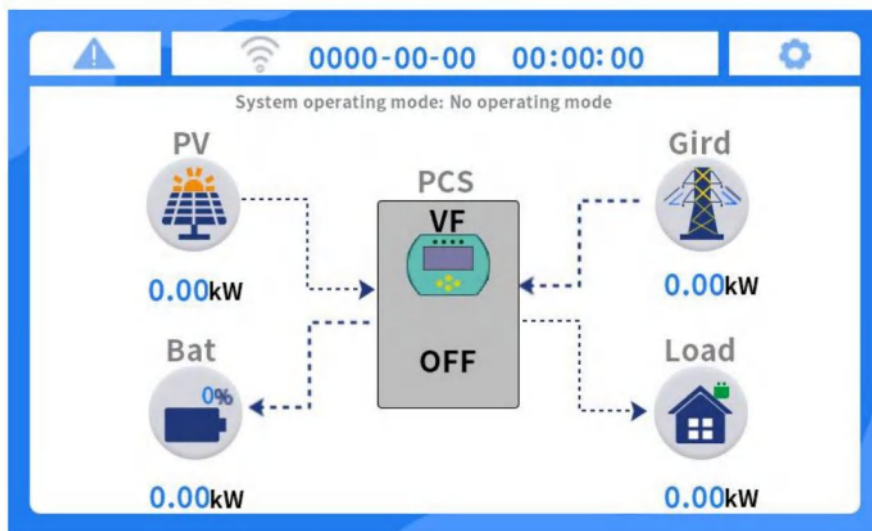
The container meets the basic installation requirements for crane installation, offering both bolted and welded mounting options. The bolted and welded points are reliably connected to the container's non-functional conductive conductors (such as the metal shell). Additionally, it provides two grounding points in the form of copper bars, meeting the strictest electrical standards.

The design also includes: external emergency stop; strength to meet the overall adjustment and transportation; the exterior adopts the flat door design, the appearance design is beautiful.



3. EMS User Manual

After powering on, the EMS enters its preset operating mode, with the system interface as follows:



(1) Fault/Warning: A gray icon indicates no warning or fault. A yellow icon indicates a warning. A red icon indicates a fault.

(2) WiFi icon: Shows whether the communication bar is online. When the communication bar is online, the WiFi icon is blue; when offline, the WiFi icon is gray.

(3) Time

(4) Settings button: Click this button to open the settings interface.

(5) Photovoltaic section: Includes photovoltaic power, photovoltaic icon, and energy flow. Click the photovoltaic icon to view detailed information.

(6) Grid section: displays grid power (positive values indicate converter power consumption, negative values indicate converter discharge), current, and grid icons. Click the grid icon to view detailed grid information.

(7) Converter section: When the converter icon is green (on), or gray (off), click the icon to access the converter details page.

(8) Battery section: displays battery power (positive values indicate discharge, negative values indicate charge), energy flow, battery SOC, and battery icon. Click the battery icon to view detailed information.

(9) Load section: includes load power, energy flow, and load icons. Click the load icon to view detailed information.

(10) Working Mode: Displays the current EMS working mode in real time.

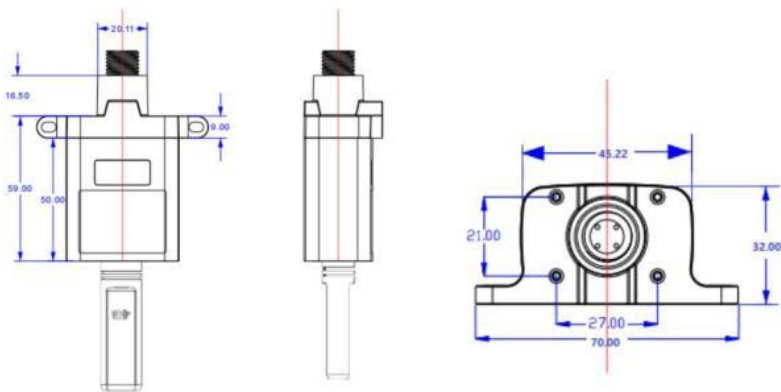
Note: Refer to the EMS User Manual for specific settings.

3.1. APP and Cloud Platform Configuration Guide

To access the APP and cloud platform, you must first connect to the communication stick. The cloud platform offers both a PC web version and a mobile version. The web version URL is <https://www.valueclouds.com/#!/system/upgradeManagement>, while the mobile version requires downloading the APP.

3.2. 4G/Wifi Communication Stick

3.2.1. Product Appearance



unit : mm

3.2.2. Product Interface



Definition of 4G/Wifi module's aviation plug-in interface

No.	Pin definition	description
1	GND	power supply ground
2	VCC	Input DC voltage: DC5V-DC12V
3	RS485-A	RS485 Interface A/+
4	RS485-B	RS485 Interface B/-



4G/Wifi module indicator light

order number	Silk screen name	description
1	PWR/ source	Light on: External power input
2	COM/ equipment	Light on: Subordinate device responds
3	NET/ networking	Light on: Connected to the base station
4	SRV/Lianyun	Light on: Connected to the specified server

3.3. Mobile Cloud Platform (APP)

Step 1: Register and log in to the APP

Scan the QR code with your phone to download the APP.



IOS APP



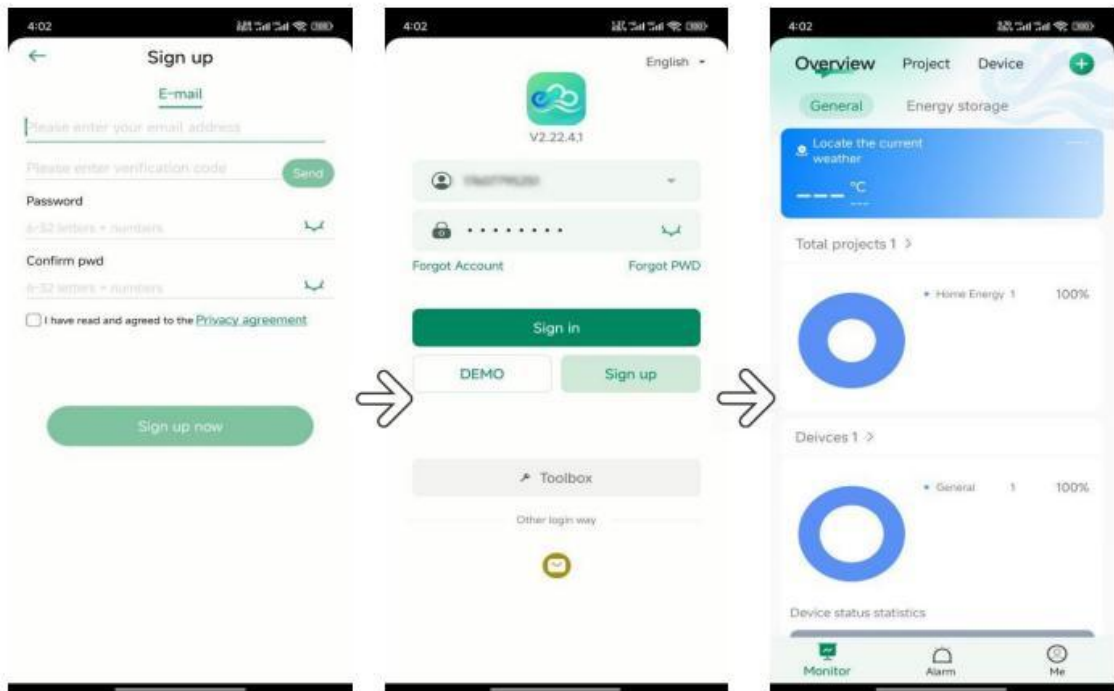
Android APP

Open the mobile app and sign in. If you don't have an account, register one first. Note: The same account and password work on both PC and mobile. Register a cloud platform account → Sign in → Access the cloud platform

Step 2: Connect the Wi-Fi communication stick to the network

The 4G version of the communication stick is plug-and-play, while the Wifi version requires Bluetooth pairing. Here are the steps to pair the Wifi version with Bluetooth.

Note: The Wifi version of the communication stick cannot connect to 5G Wifi. If you use a Wifi communication stick without 4G Wifi, you can enable 4G hotspot on your phone and connect the Wifi module to the phone hotspot.

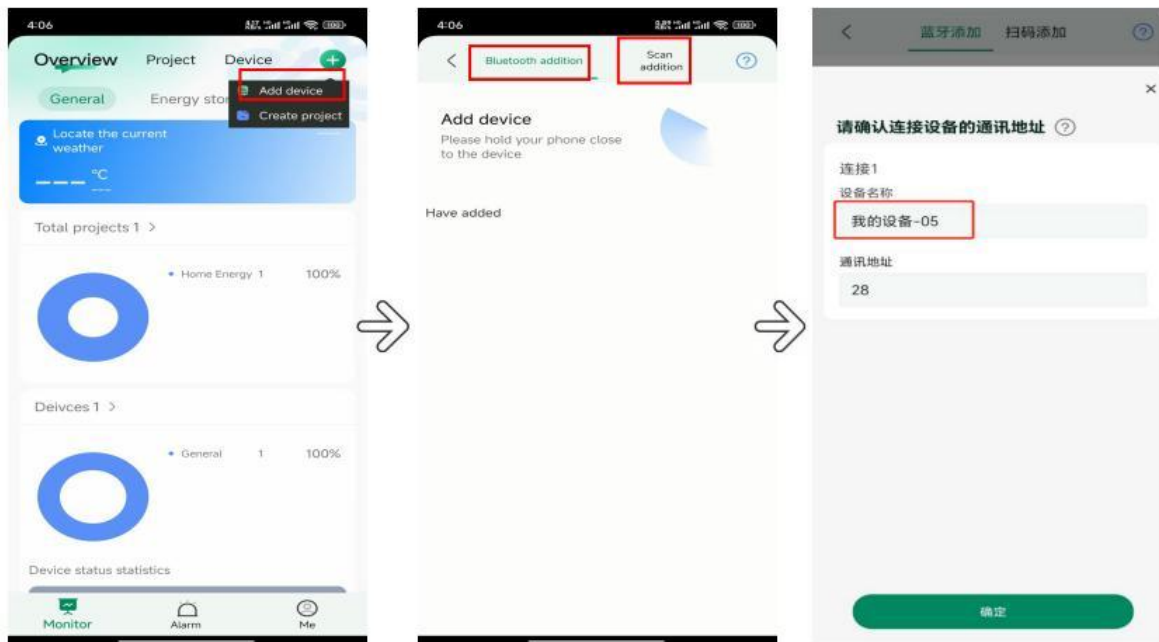


In the APP, go to My → Click Network Setup → Select Bluetooth pairing → Choose the corresponding WiFi communication stick → Connect.

3.3.1. Add 4G/Wifi communication stick devices on the mobile app**(1) Add the Wifi version of the communication stick**

To add a Wifi-enabled device, follow these steps. If it is your first time adding the device, configure the network settings as described in Section 3.3. After configuration, the device will automatically join your current account.

Click the top-left corner to add a device → Scan the device via Bluetooth (or scan the data collector QR code to add) → Click Add Device → Change the device name.

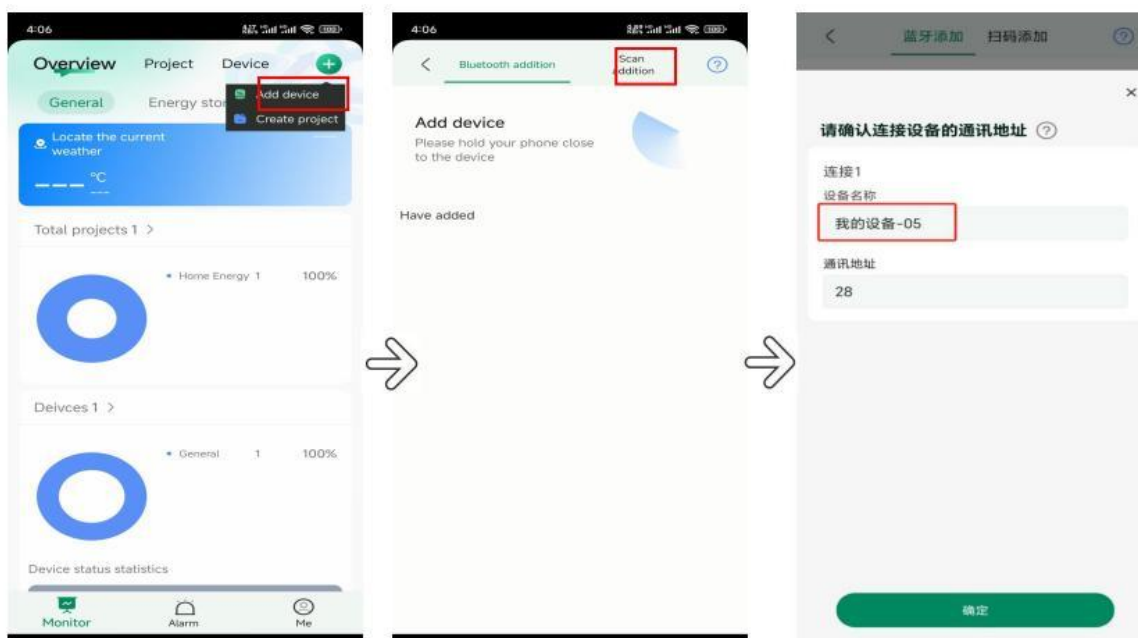


Note: We recommend changing the device name to the project address or project name.

(2) Add the 4G version of the communication stick

Add a 4G version of the communication device.

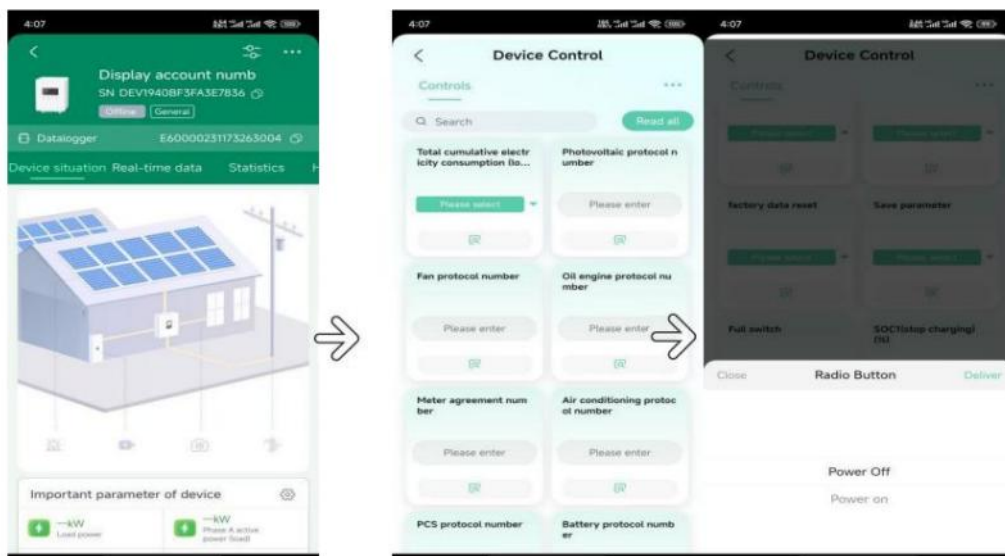
Click Add Device in the top-left corner → Scan the QR code to add the scanning communication stick → Click Add Device → Change the device name. Note: It is recommended to change the device name to the project address or project name.



3.3.2. Mobile App for Remote Control

When the device connects to the network, you can control it through the cloud platform.

How to use: Go to the device page → Click the control icon in the top left corner to enter the control page → Select the function → Dispatch



One-click read: Retrieve the current EMS settings.

EMS Mode: Select the EMS operation mode from the following options: Standalone, Grid-connected PV, or Time Function.

PCS protocol number: Select a PCS model.

Battery protocol: Select the battery protocol.

Restore factory settings: Parameters will revert to factory defaults (do not set unless necessary)

Save parameters: Save configuration settings.

Power on/off: Turn the device on or off.

SOC1 (Charging Stop): The battery stops charging when its SOC reaches the cutoff level (actual SOC $\geq$ set value), whether from photovoltaic or grid sources.

SOC2 (Off-grid, PV Limiting Point):

SOC3 (Off-grid, diesel shutdown): The EMS shuts down the diesel generator when the SOC reaches or exceeds this threshold.

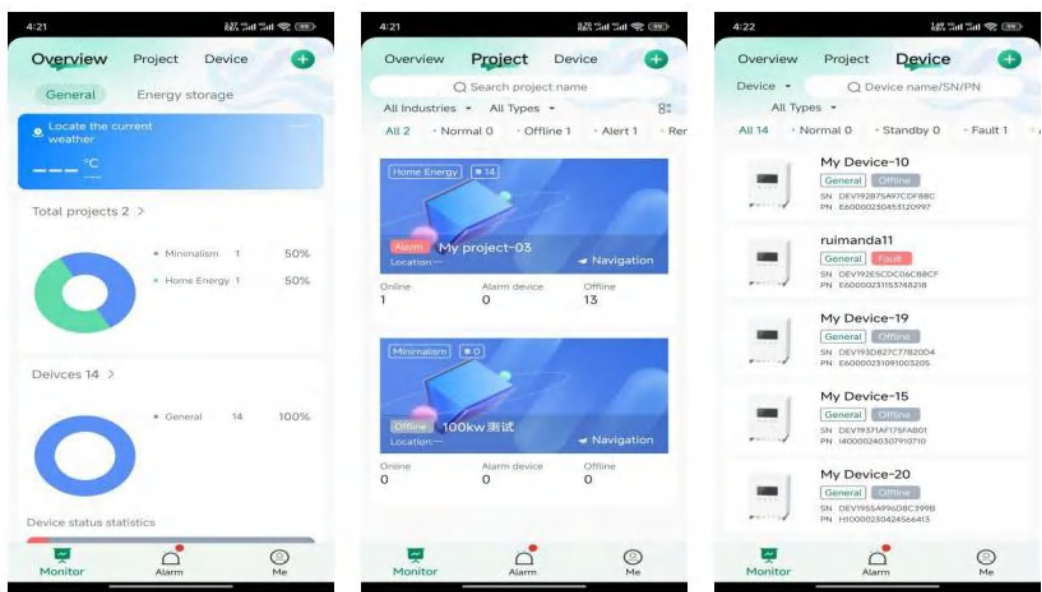
SOC4 (Off-grid, diesel engine startup): The EMS activates the diesel generator when the SOC is below or equal to this threshold.

SOC5 (Grid-connected charging stopped, off-grid shutdown):

SOC6 (Machine Shutdown):

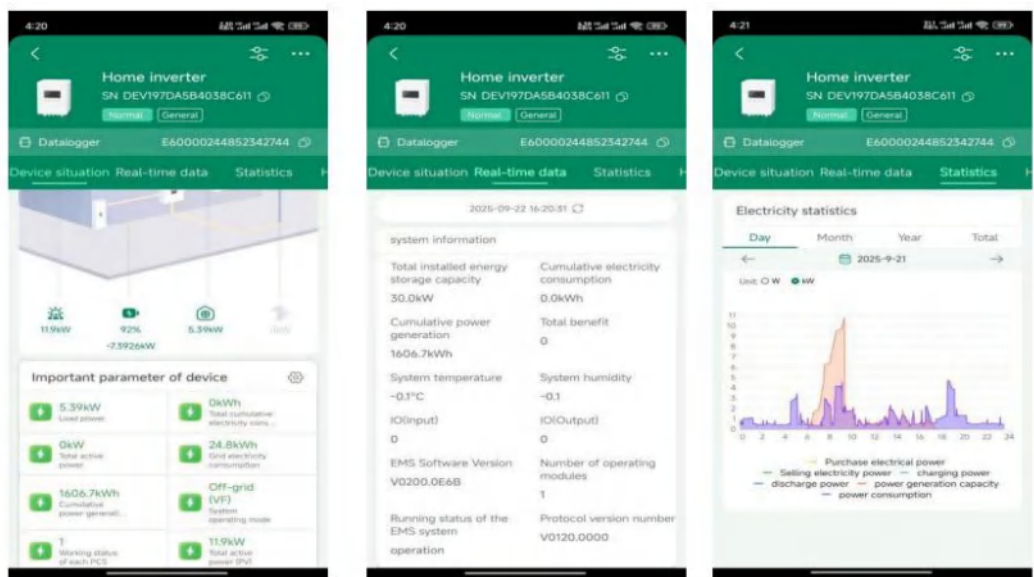
3.3.3. Mobile APP Page Description

To view system data, log in to your account, then click on the device you want to view. Find the device in the list and click it.



Main interface: View your account overview, including the number of projects and total devices.
Project list interface: Projects are categorized by type, and a project can be linked to multiple devices.
Device list: View all devices linked to your account by device numbers.

Device interface:



(FIG.) Equipment overview

(FIG.) Real-time parameters

(FIG.) Data statistics

Device overview: View the device's running status

Real-time parameters: Monitor the system's operational status, PCS data, BMS data, load and grid information, system details, as well as diesel generator and wind turbine data.

Data statistics: View power generation and consumption data.

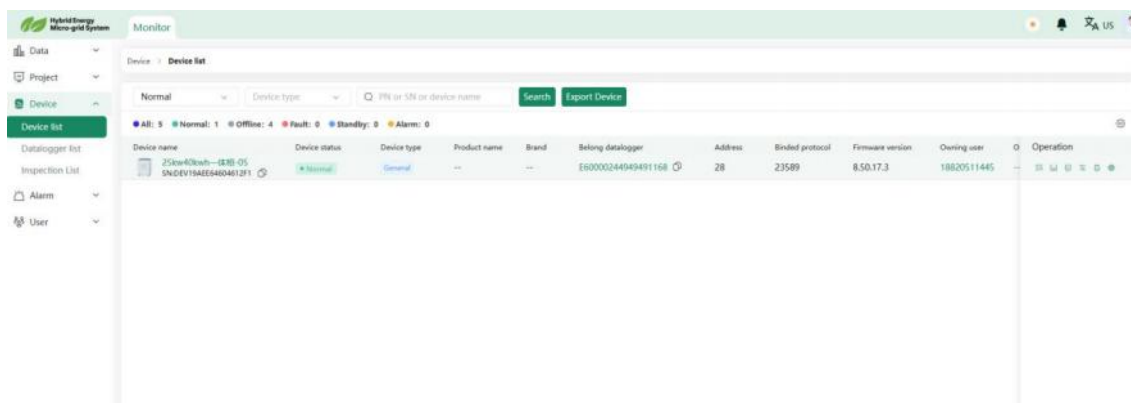
3.4. PC (Web) Cloud Platform

If the communication stick is the Wi-Fi version, first configure the Bluetooth pairing as described in Section 6.2.2. The web portal URL is: <https://smartems.valueclouds.com/#/entry>. If you don't have an account, register one first.

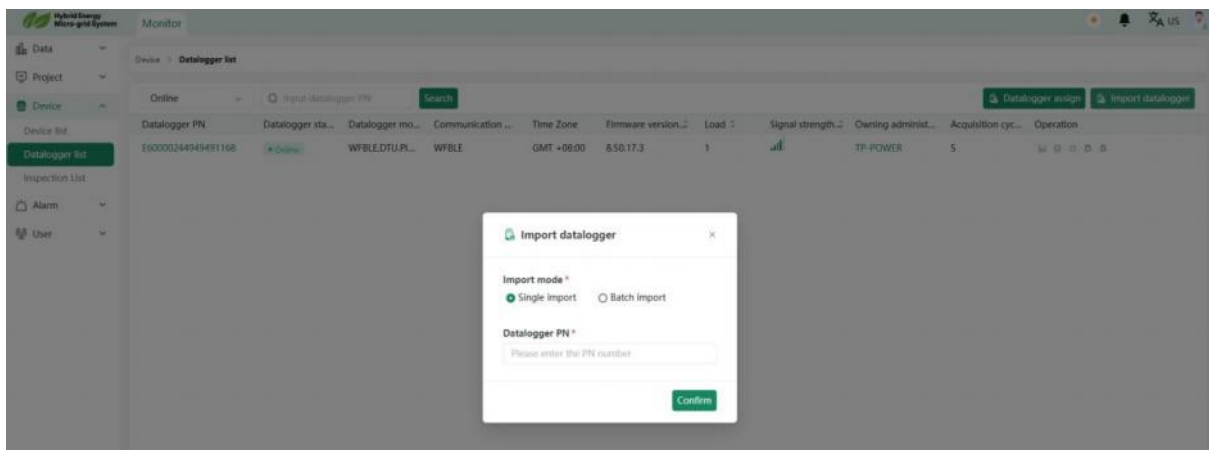
PC login interface

3.4.1. Add 4G/Wifi communication stick devices on the PC (web interface)

To add a 4G/Wifi communication stick device, first log in to the PC web page. If the device is already added, skip this section. The steps to add a 4G/Wifi communication stick device are as follows:

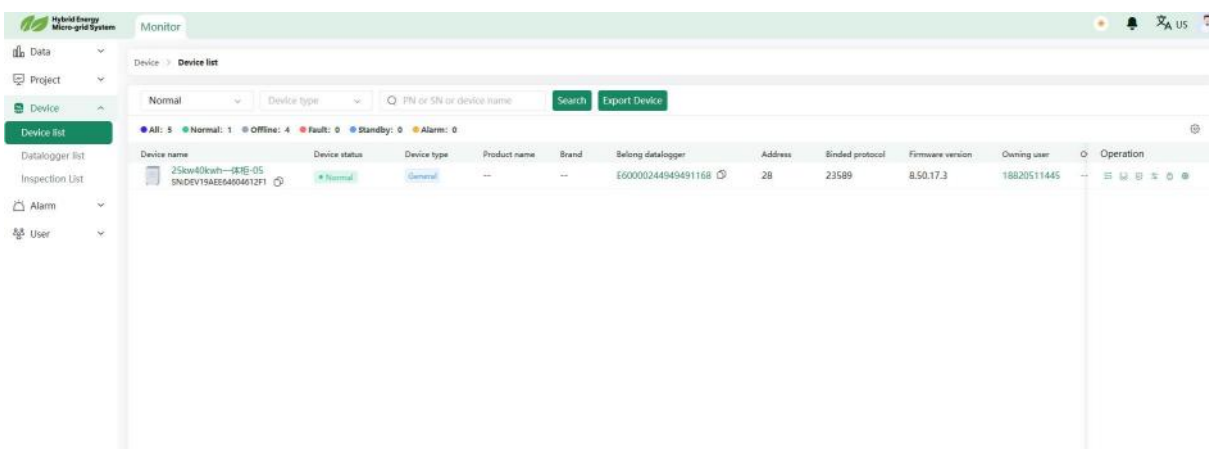


- In the device list, find the Add Device button in the top-left corner and click it.
- Enter the PN number, which is displayed under the 4G/Wifi communication stick QR code. The device name should be set as the project address, and the device address does not need to be changed.

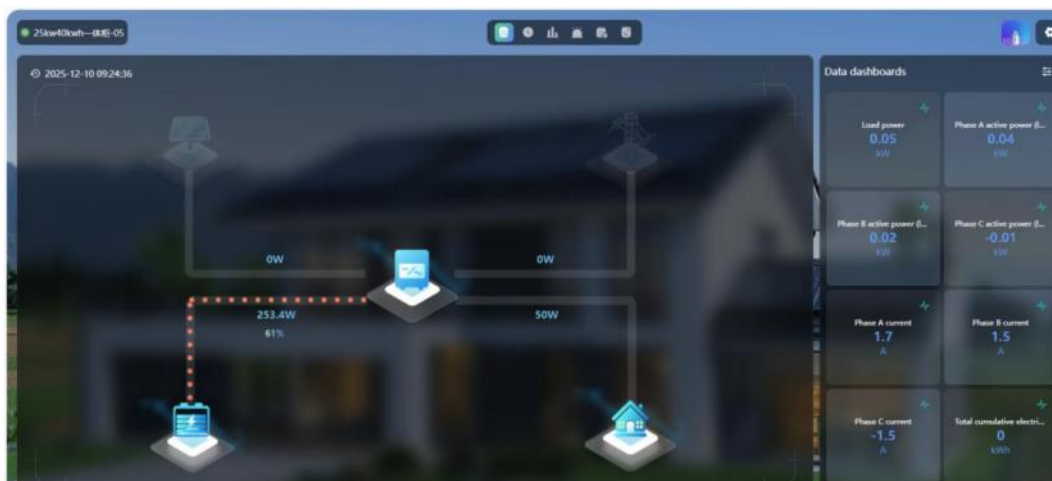


3.4.2. View system data on PC (web browser)

- Click to view the device



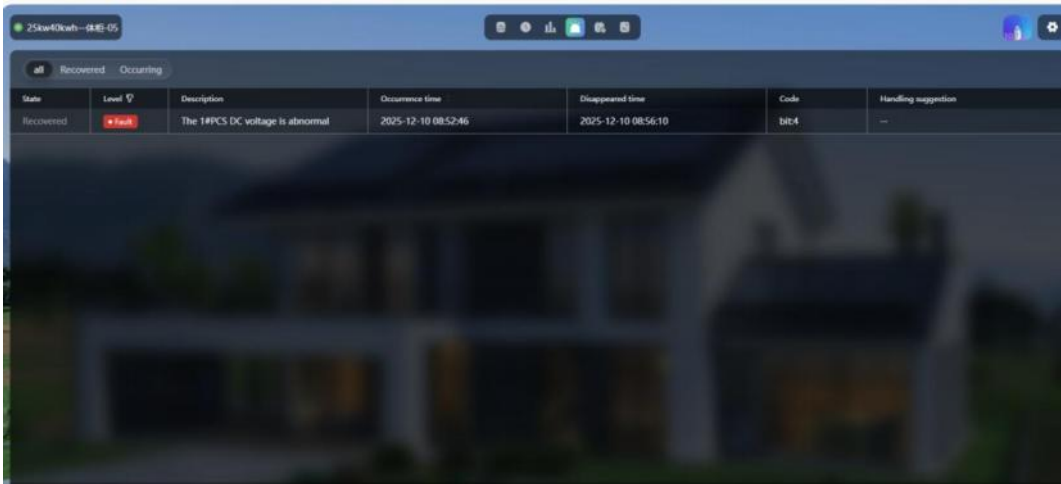
- The system information includes the following details



(Figure) Energy flow diagram



(Chart) System, operational status, load, and other information



Device alarm



(Chart) Historical data

Click the download icon in the upper  right corner of the historical data interface to download historical data.

4. Lifting, Transportation and Storage

4.1. Hoisting Operations

4.1.1. Precautions for Hoisting



Throughout the entire lifting operation, strict adherence to the crane's safety operating procedures is mandatory. Personnel are strictly prohibited from standing within a 10-meter radius of the operational area, particularly beneath the crane boom and under any lifting or moving machinery, to prevent casualties. In the event of adverse weather conditions such as heavy rain, dense fog, or strong winds, lifting operations must be halted.

4.1.2. Pre-lifting Preparation

1) Crane preparation:

The total weight of the equipment is approximately 16 tons. Select a crane based on this weight. Recommended model: over 30 tons.

2) Hoisting equipment preparation:

Steel wire rope, unloading buckle, support bar, etc.

4.1.3. Hoisting Process

1) When loading and unloading goods, a crane of appropriate tonnage must be used. For hoisting operations, nylon slings (or straps) or steel cables may be employed.

2) The hoisting process must strictly follow the hoisting diagram, as detailed in the attached diagram below.

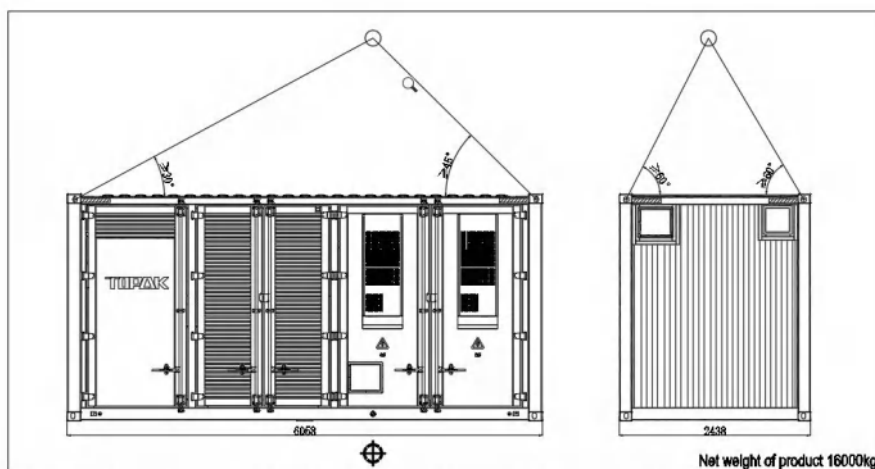
3) During lifting, the container must be kept stable with an incline angle $\leq 5^\circ$.

4) The lifting process should be performed slowly, with constant monitoring of the box's balance to prevent excessive speed.

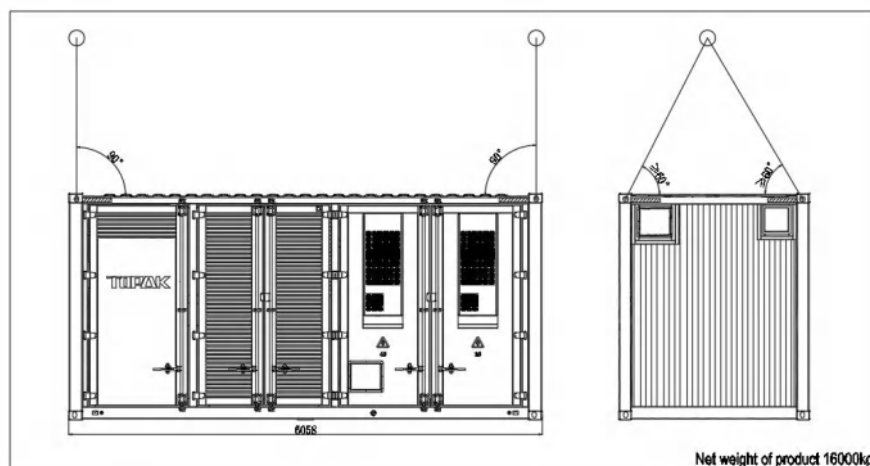
5) The tilt angle during horizontal movement should not exceed 15° .

6) During the entire lifting operation, no personnel shall be present beneath the container or crane.

4.1.4. Schematic Diagram of Energy Storage System Hoisting



1028kWh Container - Single Crane Lifting Diagram (for reference only)



1028kWh Container - Double Crane Lifting Diagram (for reference only)

Energy storage system container is suitable for land and sea transportation. It should be covered and protected from sun during transportation, and be loaded and unloaded in a civilized manner. It should be protected from direct rain, snow and mechanical impact during transportation.

4.2. Transportation Operations

4.2.1. Transportation Environment Requirements

To maximize battery performance, the battery pack must meet the following requirements during storage and transportation based on battery characteristics:

Average daily storage temperature: $\leq 20^{\circ}\text{C}$

Humidity: $\leq 95\%$, no condensation.

4.2.2. Pre-factory Preparation of Energy Storage System

1) Any external openings in the container must be sealed with panels and sealing strips before shipment to ensure the internal equipment remains undisturbed during transportation.

2) To prevent transportation damage and paint film scratches, a rainproof canvas cover can be optionally installed on each container for enhanced protection, depending on the client's preference.

3) During maritime transport, the following additional marks must be affixed: the container owner's code, container number, weight, and other relevant identifiers.

4) For maritime transport, MSDS certification must be obtained and a Class 9 hazardous material label must be affixed.

4.2.3. Road Transportation

1) Observe traffic rules;

2) Due to the presence of batteries inside container equipment, speeding is prohibited. On flat asphalt roads, the highway speed limit is 70 km/h, while in curves, the speed should be reduced to 50 km/h. On urban roads, the speed limit is 40 km/h. Avoid sudden acceleration and sudden braking.

3) Exercise extreme caution on uneven surfaces like asphalt roads, and keep your speed below 50 km/h.

4) Transporting on rough and bumpy roads is prohibited;

5) Goods shall be securely fastened; inspect the fastening once before departure; inspect the fastening every 4 hours during transportation.



During transportation and handling, always keep the mechanical parameters of the energy storage system in mind: Dimensions (length × width × height): 6058×2438×2896mm (20HQ); Weight: 16 tons.

4.3. Storage

During storage, the system shall be kept in a dry warehouse, protected from direct sunlight and rain. The warehouse must be free of harmful gases, flammable or explosive products, and corrosive chemicals. Avoid mechanical impact, heavy pressure, and strong magnetic fields. Direct sunlight exposure should be avoided. The distance from heat sources must be no less than 2 m, and the distance from walls, windows, or air inlets must be at least 50 cm.

The average daily storage temperature should be $\leq 20^{\circ}\text{C}$.

Storage temperature: Short-term storage temperature range (within 1 month): -20 to 45°C ;

Long-term storage temperature: 0°C to 35°C .

Storage humidity: $\leq 95\%$, no condensation;

Under these specified conditions:

It is recommended to perform a discharge and recharge cycle every three months to maintain the battery's State of Charge (SOC) within the optimal range of 15% to 40%.

Capacity verification and reinspection are required every 12 months.



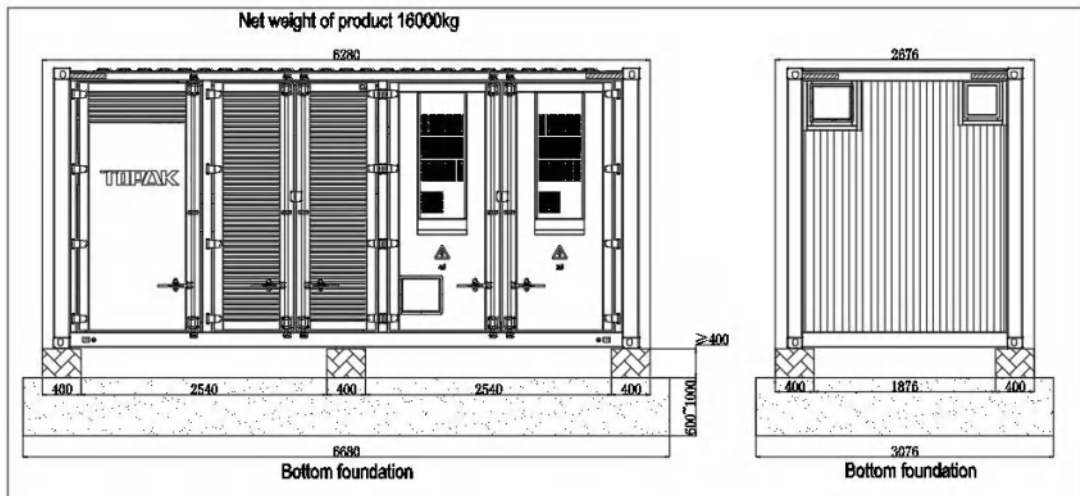
The company shall not be liable for any damage to the energy storage system caused by users failing to comply with the storage methods and requirements specified in this manual.

5. Foundation Construction

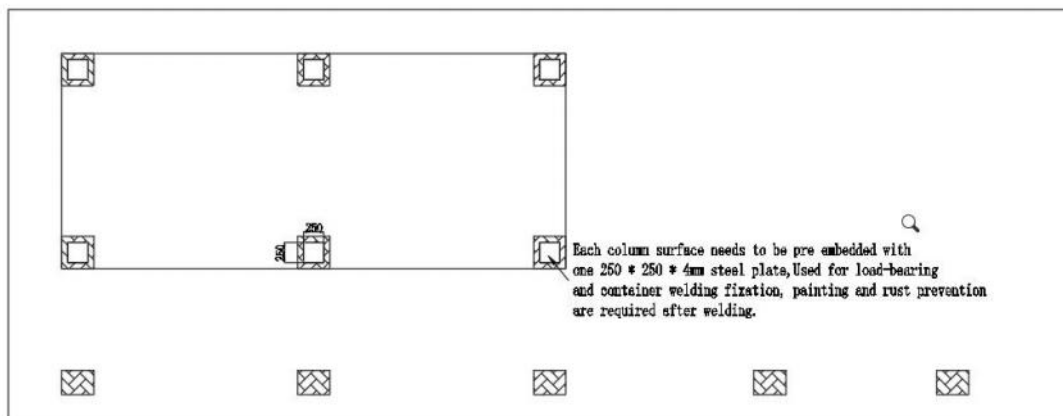
When selecting a site for foundation work, please follow these principles:

- 1) The installation site's climate conditions and soil geology (including stress wave emission and groundwater level) should be thoroughly evaluated.
- 2) The surrounding environment should be dry, well-ventilated, and located away from flammable and explosive areas.
- 3) The foundation soil must maintain adequate compaction. The recommended soil density at the installation site should be $\geq 98\%$. If the soil is loose, take necessary measures to ensure foundation stability.

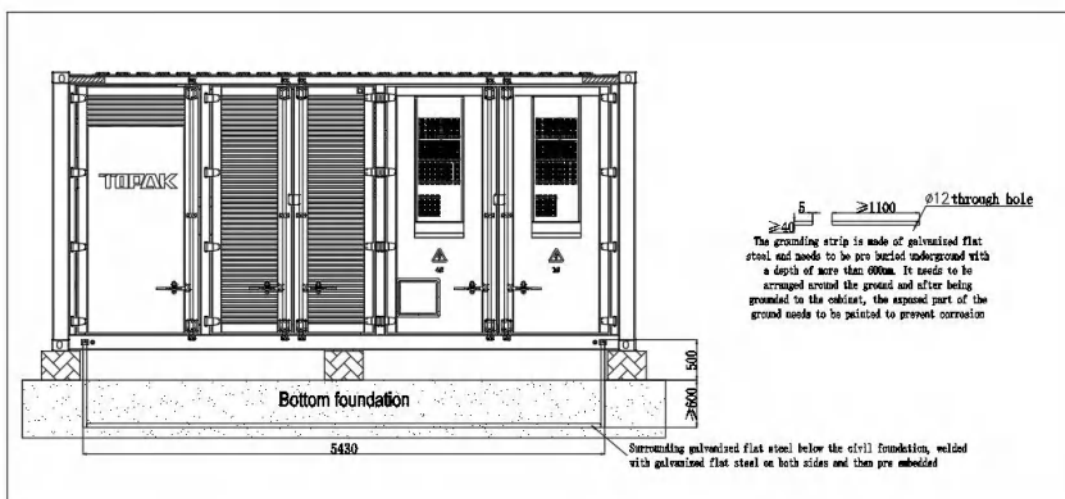
The reference dimensions for foundation design are as follows:



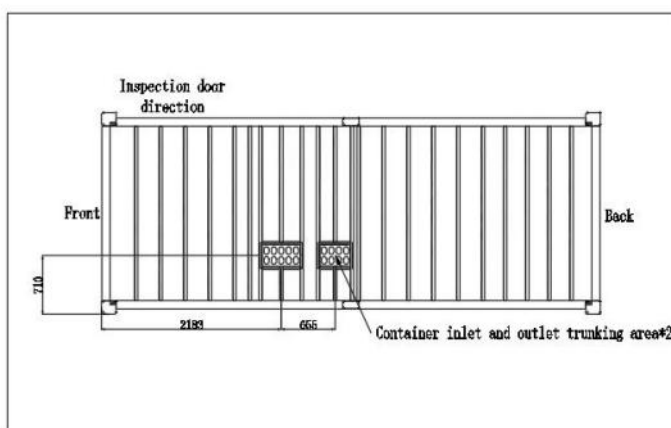
1028kWh container foundation assembly diagram (for reference only)



Schematic diagram of 1028kWh container foundation (for reference only)



1028kWh container grounding diagram (for reference only)



Schematic diagram of the bottom of a 1028kWh container (for reference only)

6. Equipment Installation

6.1. Installation Instructions

All internal components of the energy storage system are pre-tested and securely connected before leaving the factory. On-site installation requires: container mounting, DC power cable connections, AC external cable connections, auxiliary power supply cables, and container grounding. The installation sequence is illustrated in the diagram below.

Installation	Installation description
Pre-installation preparation	<p>Inspect the appearance of the container and all functional cabinets for any damage.</p> <p>Inspect containers and functional cabinets for any device damage or detachment.</p> <p>Verify all components are intact and not missing</p> <p>Confirm the installation environment meets the requirements</p> <p>Verify if the project site has equipment for container lifting</p>
Structural installation	<p>Move the energy storage system container to the prefabricated foundation using a crane</p> <p>Fixed container according to project requirements</p>
electrical connection	<p>connection point</p> <p>Connect the DC-side cable of PCS</p> <p>Connect external communication and power cables</p>

6.2. Pre-installation Preparation

6.2.1. Inspection of Deliverables

Compare the equipment delivery list to verify whether the quantity of equipment matches the list.

6.2.2. Equipment Inspection

Check if the received equipment matches the ordered model.

Check whether the equipment is intact both internally and externally without any damage.

If any instructions are included in the packaging box, please keep them properly.



Ensure the installed equipment matches the ordered model and is undamaged.

6.2.3. Installation Environment Requirements

The installation environment of energy storage system enclosures shall meet the following requirements:

project	ask
Installation site	Surface slope $\leq 1^\circ$ Seismic resistance > 8
ambient temperature	$-30 \sim +50^\circ\text{C}$
relative humidity	$\leq 95\%$, no condensation
above sea level	$< 3000\text{m}$

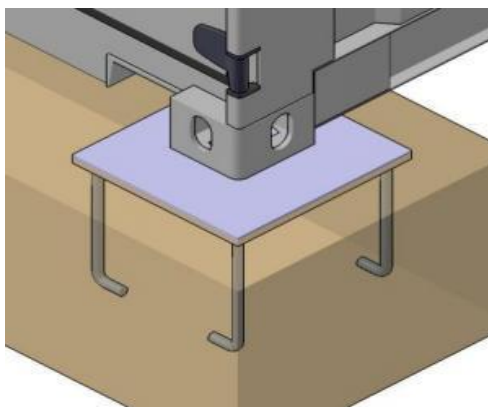
6.2.4. Container Installation Steps

(1) Installation and fixation of container body

At the site, a crane (recommended lifting capacity: over 30 tons) is used to slowly hoist the entire energy storage system onto the precast foundation.

The installation method of containers should be selected based on site conditions. A sufficiently strong concrete foundation must be provided at the container base. During installation, adequate support must be ensured at the four corner pieces and bottom side beams of the container.

The container is secured by welding, where the four corner fittings at the base are directly welded to the embedded steel plates. The fixation method is illustrated in the figure below:

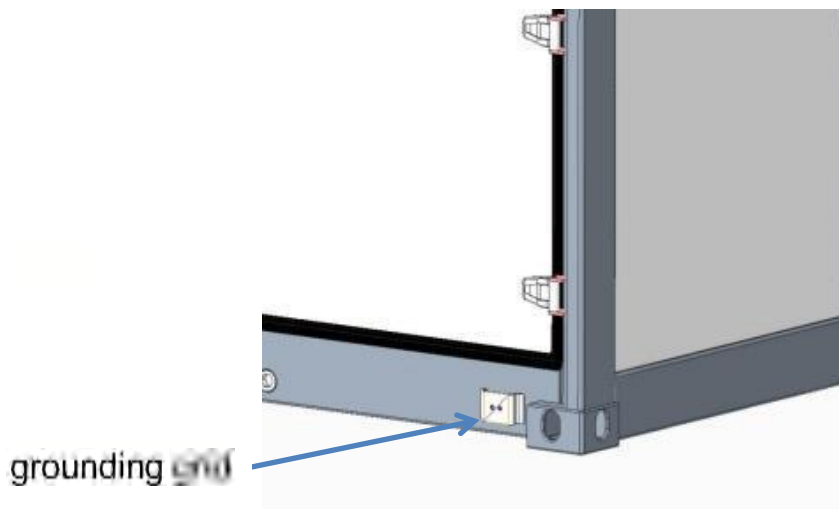


Schematic diagram of container welding fixation

(2) Container grounding connection

The bolted fastening points of the container must reliably connect to the container's non-functional conductive conductors. Additionally, the container provides two grounding points via a grounding busbar, and the grounding points supplied to users must establish reliable equipotential connections with the container's non-functional conductive conductors. The effective cross-sectional area of the grounding system must be no less than 250mm^2 . The grounding resistance must be $\leq 4\Omega$, and the connection impedance must be $\leq 0.1\Omega$.

The grounding bar inside the container is connected to the battery cabinet, the comprehensive cabinet and other grounding lines to the internal grounding bar, and the grounding bar is led out to the external grounding equipment.



Position diagram of container grounding grid

6.3. Electrical Connections

6.3.1. Electrical Safety Precautions

 <p>Warning</p>	<p>High voltage hazard! Electric shock hazard! Do not touch live parts! Ensure both AC and DC sides are de-energized before installation. Do not place the device on flammable surfaces.</p>
 <p>Warning</p>	<p>The intrusion of sand and moisture may damage the electrical equipment in the energy storage system or impair its operational performance. Avoid electrical connections during sandstorms or when the ambient relative humidity exceeds 95%. The connection work will be started when the weather is clear and dry.</p>
 <p>Warning</p>	<p>Before wiring, check the polarity of all input cables to ensure each input is correctly polarized. During electrical installation, avoid forcefully pulling cables or wires to prevent insulation damage. The necessary auxiliary measures should be taken to reduce the stress on the cable or wire. After each wiring step, conduct a thorough inspection to verify proper and secure connections.</p>

6.3.2. Pre-wiring Preparation

(1) Installation tool preparation

order number	Tool name	key
1	insulating gloves	
2	eye shield	
3	insulant shoe	
4	coverall	
5	safety helmet	
6	bolt driver	
7	connection cover cutting pliers	
8	hydraulic wrench	
9	heat gun	

order number	Tool name	key
10	multimeter	
11	torque spanner	
12	marker pen	

(2) Prepare the cables.

The selected cables must meet the following requirements:

The conductor must have sufficient current-carrying capacity, which includes but is not limited to the following factors:

environmental aspect

conductor insulation material type

Cable laying method

Cable Material and Cross-Sectional Area

The diameter of the cable must be selected according to the maximum current-carrying capacity, and the length must be left with a margin.

The specifications and materials of three-phase AC output cables should be consistent.

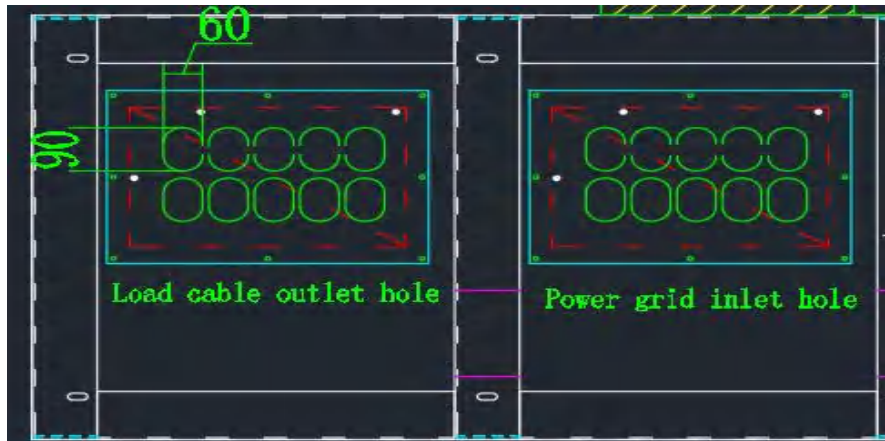
Make sure to use flame-retardant cables.



The cables used must comply with local laws and regulations. The cable diagrams in this manual are for reference only. Please select cables according to local cable standards.

(3) Schematic diagram of the container bottom opening

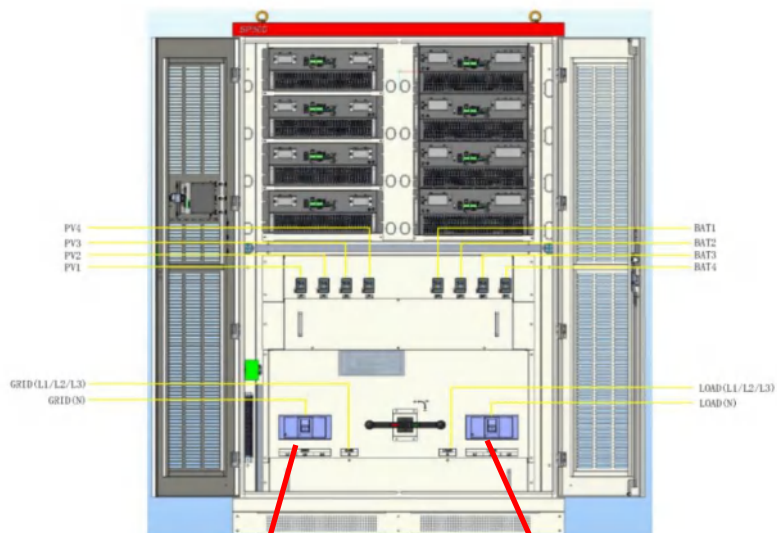
The energy storage container features an integrated cabinet-side AC/DC power cable (communication line) inlet at its base, with detailed specifications for hole locations and diameters.



Schematic diagram of the bottom opening of the container

6.3.3. AC/DC Cables (PV&GRID&LOAD Wiring)

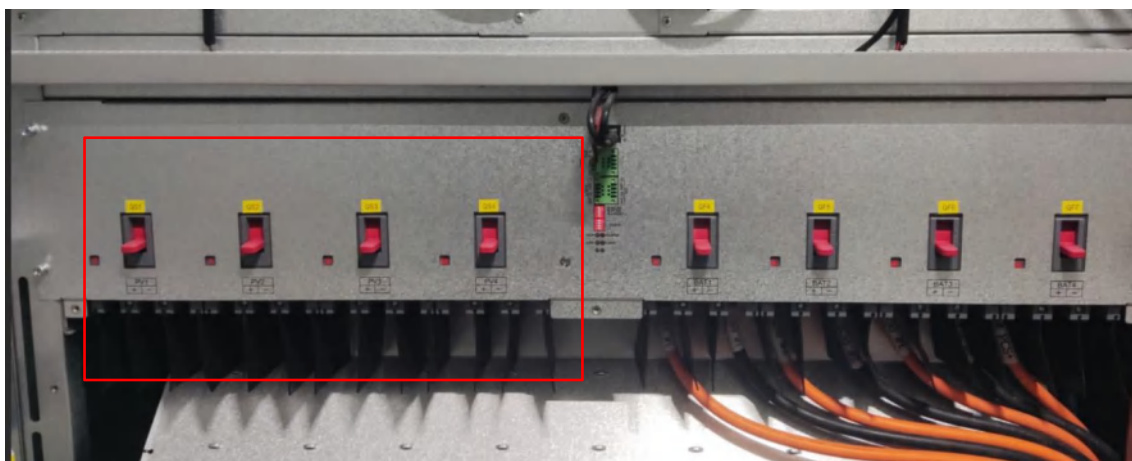
The integrated on-grid and off-grid cabinet for optical storage and power supply features AC-side grid input ports and load output ports through its bottom-mounted wiring entry. The wiring positions are illustrated in the diagram below, and the field installation must follow the electrical wiring diagram for proper connections.



GRID



LOAD

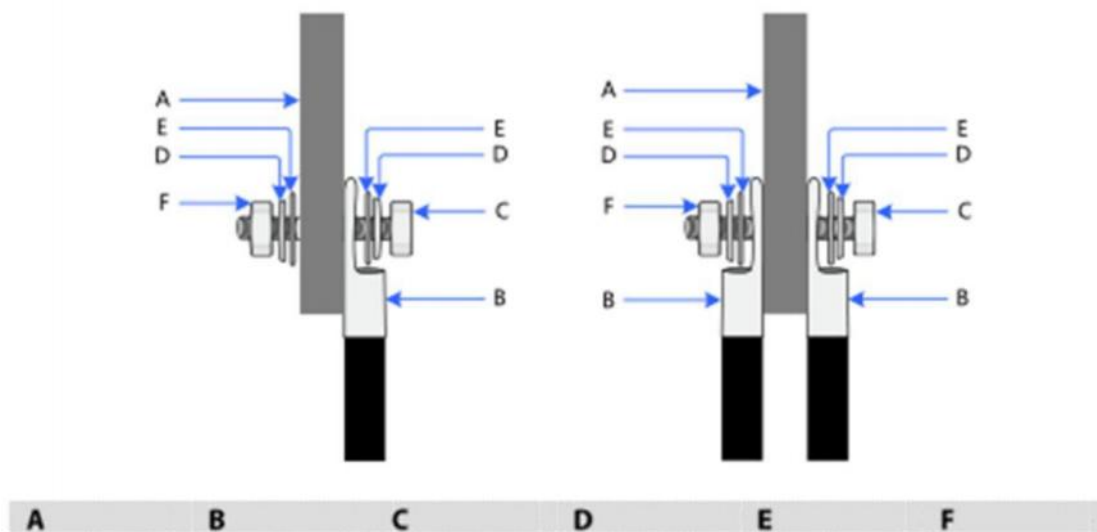


Port definition:

name	function	remarks
PV1~PV4	PV input circuit breaker	OT terminal (SC50-10), recommended 50mm ² cable
BAT1~BAT4	PCS battery input circuit breaker	OT terminal (SC50-10), recommended 50mm ² cable
GRID(A\B\C\N)	PCS AC input circuit breaker	OT terminal (SC95-10), recommended for 240mm ² x 2 cables
LOAD(A\B\C\N)	PCS AC output circuit breaker	OT terminal (SC95-10), recommended for 240mm ² x 2 cables
PE	grounding busbar	OT terminal (SC16-6), recommended 16mm ² cable



- ◆ The power terminals for PV and BAT inputs are secured with M10 screws from the circuit breaker, using power cables with a torque of 25N·m.
- ◆ The power terminals for AC input and output are secured with M12 screws. Use the included screws to fasten the power cable with a torque of 34N·m. Refer to the diagram below for the cable-to-copper busbar connection specifications.
- ◆ The module must be reliably grounded during operation, as poor grounding may cause electric shock hazards and module damage. The fastening torque for the fixing screws is 7N·m.
- ◆ The components should be secured with the recommended torque. Excessive torque may damage the terminals, while insufficient torque may cause poor contact.



A: TMY B: Copper terminal C: Nut Bolt D: Back-up plate E: Flat Washer F: Nut
Connection Diagram of Cable and Copper Busbar



AC/DC cable wiring procedure:

Step 1: Verify that all output switches on the DC side are in the open state.

Step 2: Strip the insulation from the cable end. The length to be removed should be approximately 5mm beyond the depth of the copper nose crimping hole.

Step 3: Select appropriate copper crimping tools for crimping according to the chosen cable specifications.

- 1) Insert the exposed copper core portion of the stripped wire end into the crimping hole of the copper connector nose.
- 2 Use a terminal crimping machine to secure the copper nose wire, with a minimum of two crimping operations required.

Step 4: Install the heat shrink sleeve.

- 1) Select a heat-shrink sleeve matching the cable size, with its length extending approximately 2cm beyond the copper nose crimping tube.
- 2) Place the heat-shrink sleeve over the copper terminal to fully cover its crimping hole.
- 3) Heat the heat-shrink sleeve with a heat gun to achieve thermal shrinkage.

Step 5: Wiring

- 1) Select screws, spring washers, flat washers, and nuts compatible with the copper nose for connection and fixation to the copper busbar, and tighten them to the recommended torque.

6.3.4. Cable Connection Confirmation

- Before formal power-on, inspect all system connection cables to ensure reliable connections, no aging, breakage, or insulation damage.
- Verify that the DC power cable's positive and negative terminals in the integrated photovoltaic-storage and off-grid cabinet are properly connected.
- Verify the correct phase sequence connection of the AC power supply cables for the integrated photovoltaic-storage and off-grid cabinet.
- Check that all communication cables are properly and reliably connected to the terminals.

6.3.5. Wiring and Operation Instructions

After all electrical cable connections are completed, the following steps must be performed:

- Conduct a thorough and meticulous inspection of all wiring to ensure no connections are missing or loose.
- The outlet hole and the gap around the light storage and off-grid integrated cabinet are sealed with fireproof and waterproof materials.

- Restore all protective covers to their original secure position.
- Check the interior of the container to ensure no tools or equipment are left inside.



Failure to achieve proper sealing may allow moisture and dust ingress. Failure to achieve proper sealing may permit rodent entry.

Lock the cabinet door and the box door.

Step 1: Reinstall the removed wiring area protective cover in reverse order.

Step 2: After completing the installation of the wiring area protective cover, secure the light-storage and off-grid integrated cabinet door, remove the key, and store it properly.

Step 3: Finally, secure the electrical cabinet door lock, remove the key, and store it properly.



Ensure that the sealing strips around cabinet doors and box doors are free from breaks or damage. Ensure that the sealing strips around cabinet doors and box doors do not curl when closing.

6.4. Battery Connection

6.4.1. Precautions

(1) Electrical shock hazard

Operating equipment under power is strictly prohibited.

Ensure both AC and DC side equipment are de-energized prior to installation.

Ensure you are wearing the necessary protective equipment when installing;

(2) Environmental impact

Avoid performing equipment connection in environments with humidity exceeding 95%.

Avoid connecting equipment in areas with strong wind and sand.

The connection of equipment should be avoided in the environment of corrosive gas and combustible gas.

(3) Wiring Requirements

According to the connection diagram, connect and confirm the primary and secondary connection lines of the equipment.

Ensure correct cable polarity during wiring to prevent dangerous situations such as short circuits.

During device connection, avoid forcefully pulling the cables to prevent damage to the terminal blocks and insulation layer of the cables. After each wiring step is completed, carefully inspect whether the cables are correctly and securely connected.

6.4.2. Cable Connections

Tools Preparation

order number	Tool name	key
1	insulating gloves	
2	insulant shoe	
3	coverall	
4	Power cable	

Step 1: Before connecting the power cable, wear necessary protective equipment such as insulated gloves and insulated shoes.

Step 2: Open the battery compartment door and prepare for cable cluster connections. Before connecting power and communication cables between PACKs and between PACKs and the high-voltage box, switch the high-voltage box DC isolator to the "OFF" position.



Diagram of switch in high voltage box

Step 3: Connect the communication cables between PACKs and between PACKs and the high-voltage box. For example, consider one Rack: (Note: All connections are pre-installed before shipment)

- 1) Connect the communication cable connectors to the COM ports of battery PACK1 through PACK4 respectively;



PACK: Communication and Fan Power Cables

- 2) Insert the communication cable connector into the slave control interface of the high-voltage box.

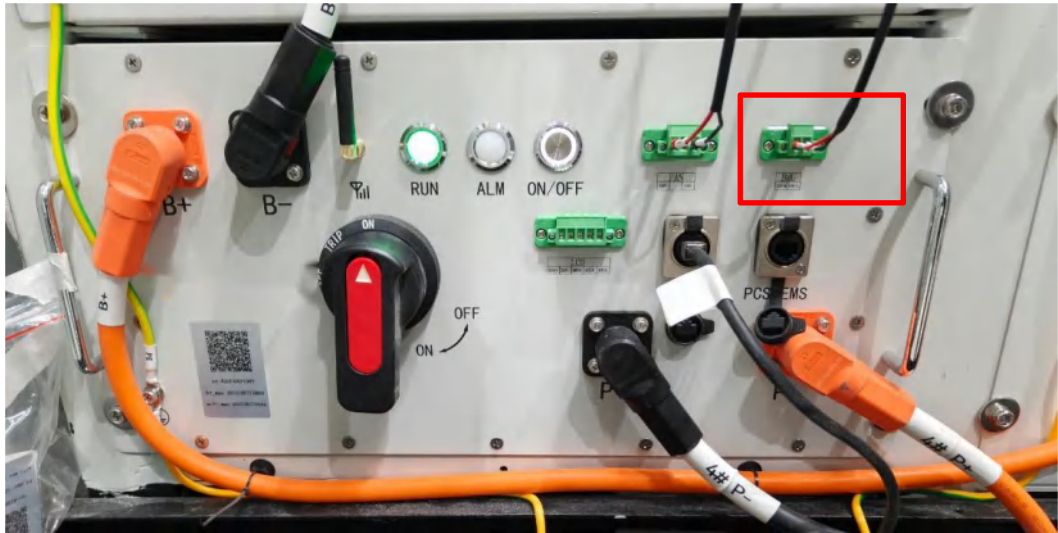


Figure 6-4-2 (3) Communication Interface of the High-Voltage Box

Step 4: Connect the power cables between PACKs and between PACKs and the high-voltage box. For example, consider a RACK:

- 1) Connect the positive terminal B+ of PACK1 to the negative terminal B-of PACK2;
- 2) Connect the positive terminal B+ of PACK2 to the negative terminal B-of PACK3;
- 3) Connect the positive terminal B+ of PACK3 to the negative terminal B-of PACK4;
- 4) Connect the positive terminal B+ of PACK16 to the B+ terminal of the high-voltage box;
- 5) Connect the B-terminal of PACK1 to the B-terminal of the high-voltage box;

Step 5: After completing the wiring operation, a thorough inspection must be performed to ensure the wiring is correct and secure.



Schematic diagram of communication and power cable between PACKs



The positive plug is orange and the negative plug is black.

The positive terminal of the plug should be inserted into the positive terminal of the socket, and the negative terminal should be inserted into the negative terminal of the socket.

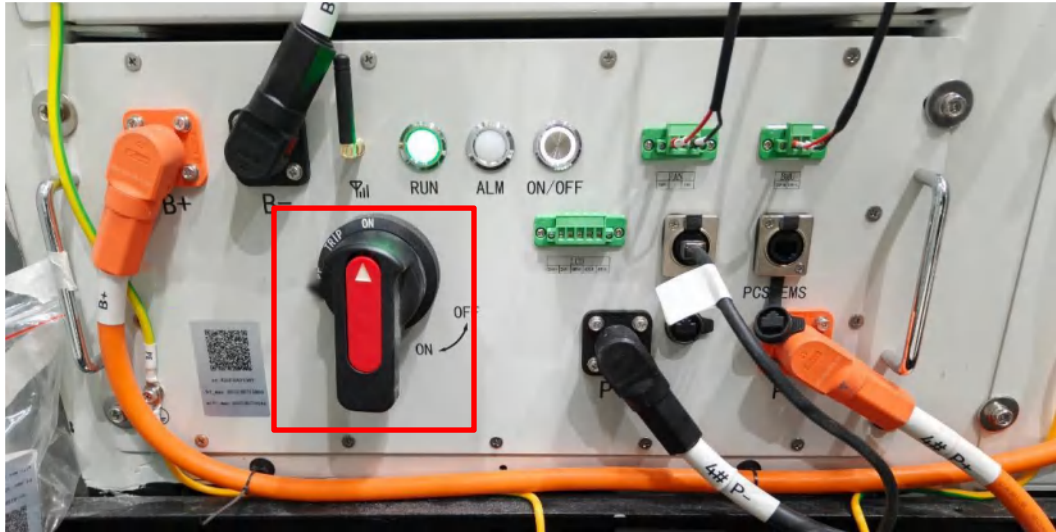
When the plug is securely inserted, it will make a 'click' sound, indicating a firm connection.

7. Product Operation

7.1. Power-on Procedure for Energy Storage System

7.1.1. Pre-Power-On Inspection

- 1) Check whether the main switch on the high-voltage panel is open;



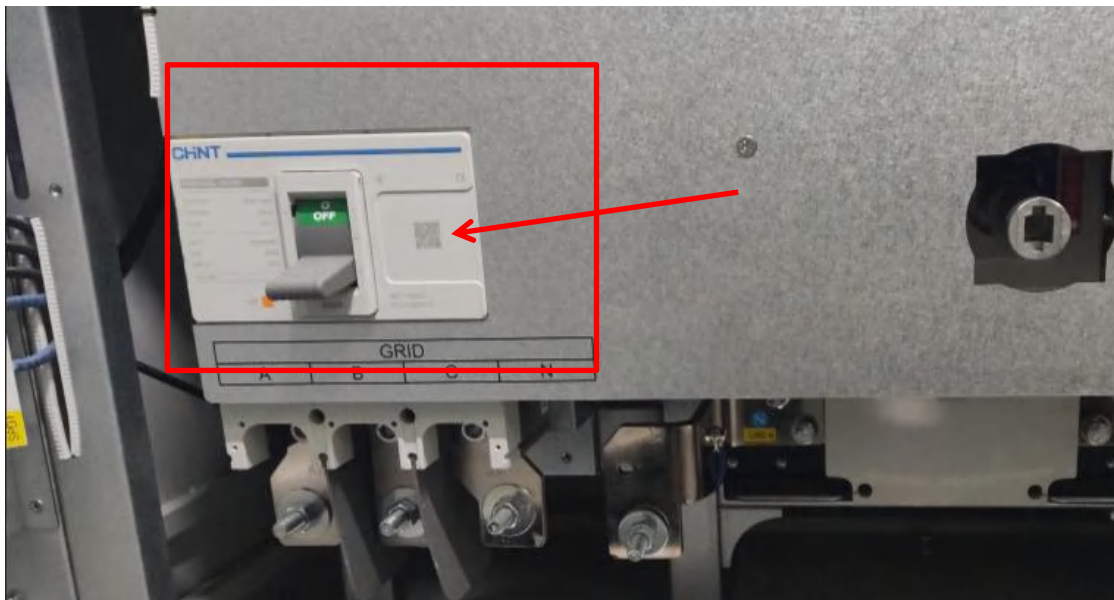
High-voltage box switch

- 2) Inspect the reliability of power cable connections between battery packs and between battery packs and the high-voltage box.
- 3) Check all communication and power cables to ensure their connection terminals are securely connected.
- 4) Check whether the communication, power supply harnesses, and power cables on the high-voltage box panel are properly connected;

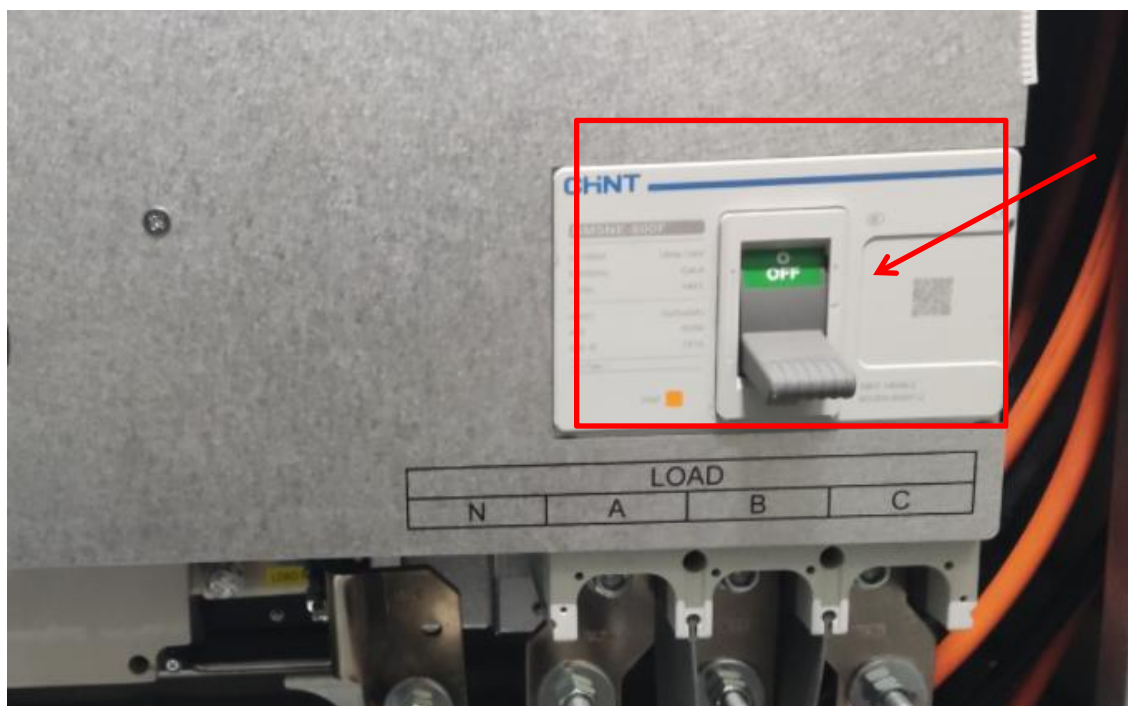
7.1.2. Power-on Procedure for Energy Storage System

Step 1:

- 1) The main AC-side circuit breaker in the integrated closed energy storage and off-grid cabinet (see figure below)
- 2) Turn on the load switch; (see the figure below)
- 3) The sequence of the Aux Power Diagram1 is: main switch and branch circuit switches (air conditioning) --QFM1, QF1, QF2, QF3, QF4, QF5, QF6
- 4) Sequentially close the ATS switch (including branch circuit switches: fire protection, lighting) --QF10, QFC0, QFA1, QFA2, QFA3, QFA4, QFA5, QFA6
- 5) Operate the main switch and backup power switch in the fire control room;

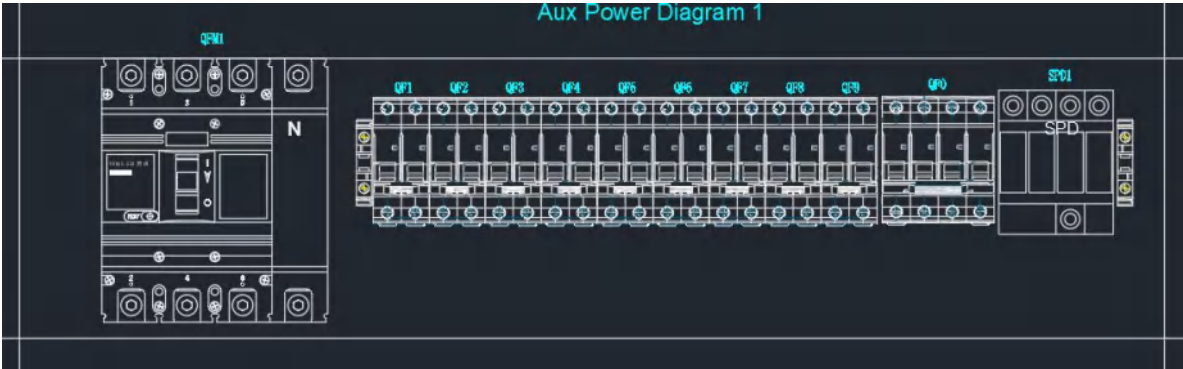


AC side main circuit breaker



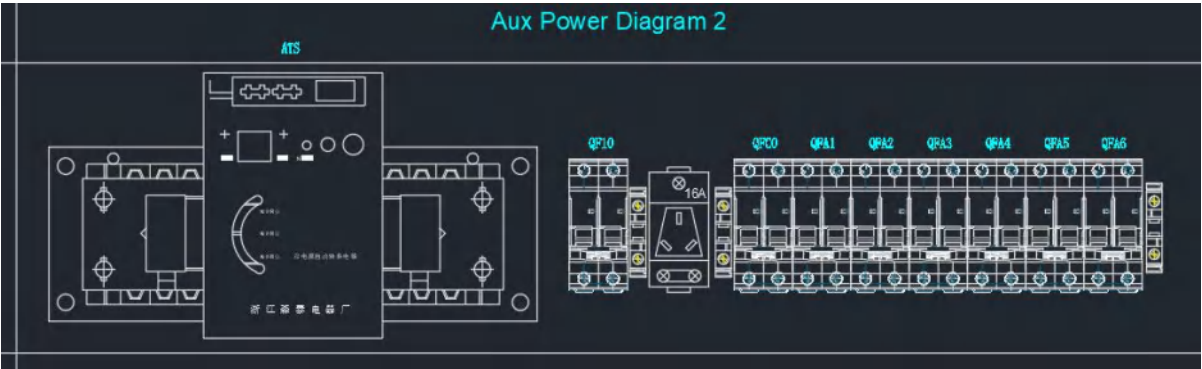
load switch

For the power diagram and the code/function of the 1st circuit breaker, please refer to the table below.



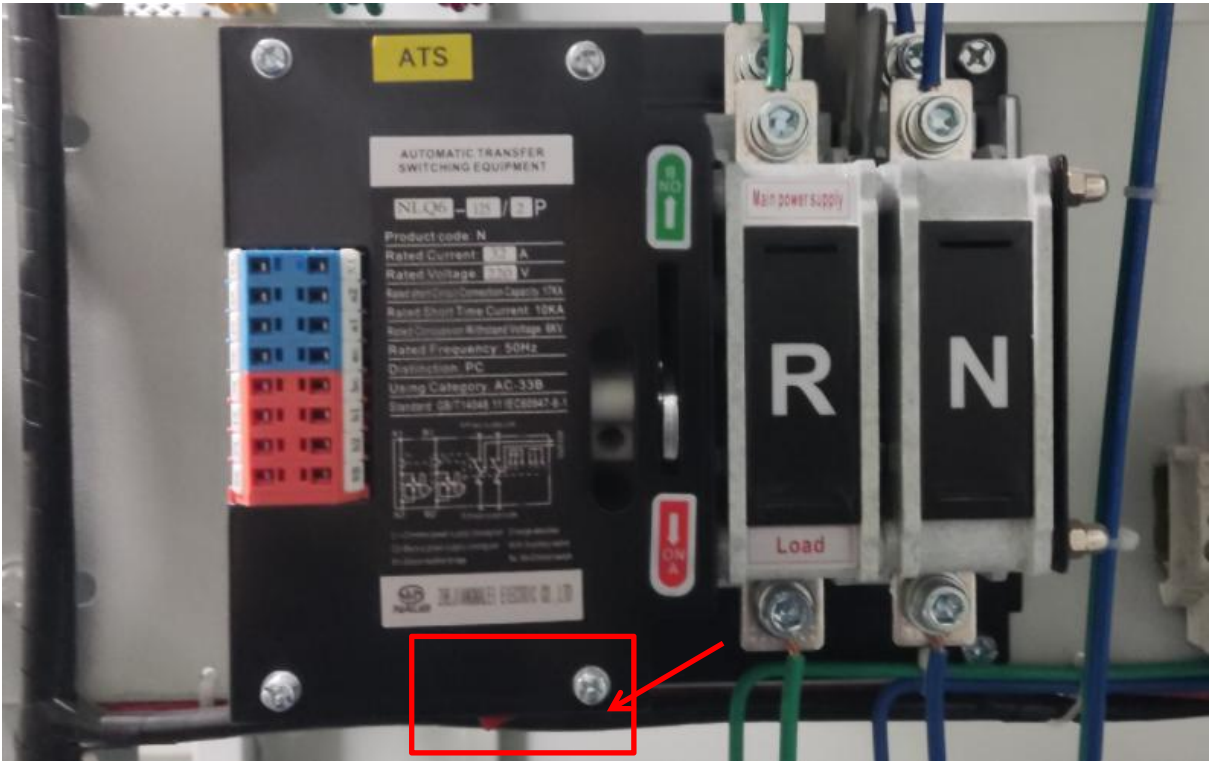
order number	circuit breaker code	switches
1	QFM1	auxiliary AC main circuit breaker
2	QF1	Industrial Air Conditioner 1 Switch
3	QF2	Industrial Air Conditioner 2 Switch
4	QF3	Industrial Air Conditioning 3 Switches
5	QF4	Industrial Air Conditioner 4 Switches
6	QF5	UPS mains switch
7	QF6	emergency lighting
8	QF7	fire reserve
9	QF8,9	reserve

For the power diagram and the code/function of the two circuit breakers, please refer to the table below.

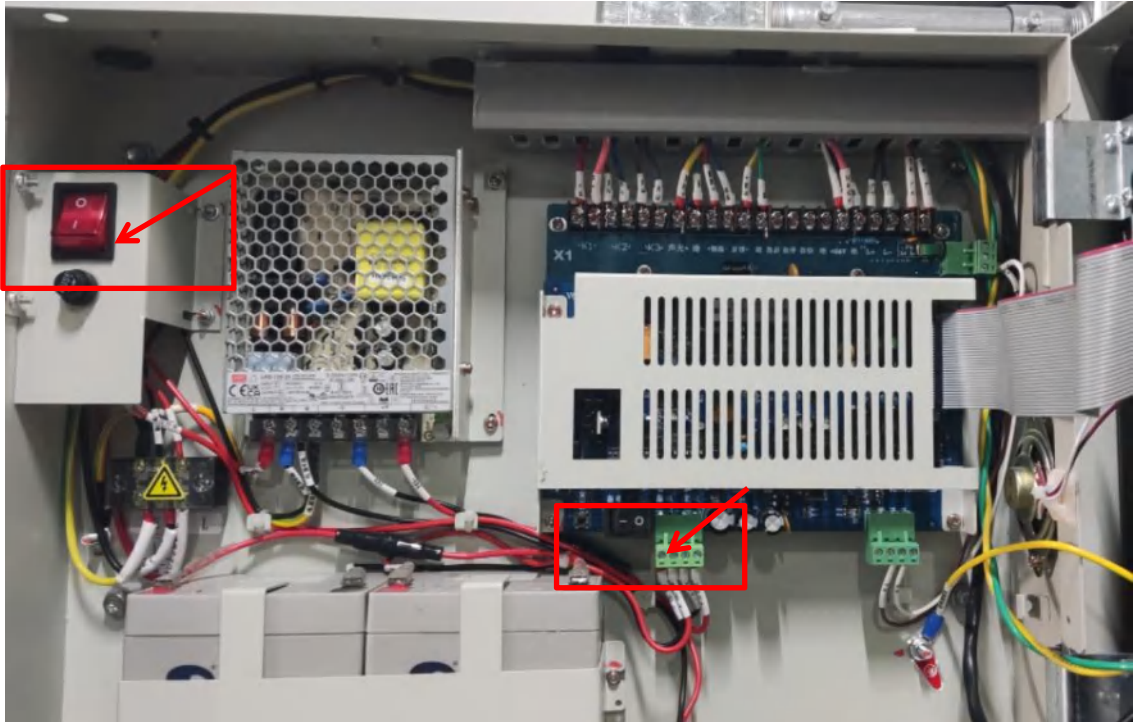


order number	circuit breaker code	switches
1	QF10	AC220V mains power input
2	QFC0	UPS mains switch

order number	circuit breaker code	switches
3	QFA1	AC/DC 24V power switch
4	QFA2	EMS power supply (backup)
5	QFA3	AC/DC 24V water immersion, camera power switch
6	QFA4	fire system power switch
7	QFA5	lighting system power switch
	QFA6	Power switch for socket



ATS switch position



Step 2: Turn on the power switches of PCS1, PCS2, PCS3, and PCS4 in sequence.



Step 3: Turn on the PV1, PV2, PV3, and PV4 PV access switches in sequence (if PV access is enabled)



Step 4: Sequentially close the DC circuit breakers of each battery cluster. Monitor the indicator lights on the high-voltage box. Once the battery cluster is powered, the EMS automatically sends a closing relay command to the BCU in the high-voltage box. After the BCU completes its self-check, it will engage the main positive and negative DC relays, completing the power-up for that cluster. After confirming no faults, the system enters the charging and discharging state.

order number	name	state	explain
1	power light	light on	The high-voltage box is powered normally.
2	fault indicating lamp	light on	The system is malfunctioning, including hardware failures, internal communication failures, battery failures, etc.



high voltage box power indicator

7.1.3. Power-off Procedure for Energy Storage System

Step 1: Turn off the power supply ON/OFF for each cluster high-voltage box and the main power switch in sequence.

Step 2:

- 1) Sequentially close all branch circuit breakers in the Aux Power Diagram2 (fire protection, lighting): QF10, QFC0, QFA1, QFA2, QFA3, QFA4, QFA5, QFA6, and ATS switch.
- 2) Turn off sequentially the auxiliary power circuit breakers (air conditioning) - QFM1, QF1, QF2, QF3, QF4, QF5, QF6, and the main switch;
- 3) Turn off the fire control cabinet switch

Step 3: Turn off the load switch.

Step 4: Turn off the power switches of PCS1, PCS2, PCS3, and PCS4 in sequence.

Step 5: Turn off the PV1, PV2, PV3, and PV4 photovoltaic connection switches in sequence.

Step 6: Close the main circuit breaker on the AC side.

8. Battery System Maintenance Instructions

order number	term	description
1	normal operation	The system that works every day
2	interval run	A system with an irregular monthly operation frequency that cannot guarantee daily operation.
3	Left unused for too long	Battery system that has not been activated for more than 3 consecutive months

8.1. Pre-Maintenance Notes



In clear weather, it is recommended to open the container door for ventilation and dehumidification of the equipment.



Do not perform door maintenance on battery containers during rainy, humid, or windy conditions. If unavoidable, the company will not be held liable for any resulting losses.

Avoid opening the container door during humid conditions such as rain, snow, or dense fog. When the door is closed, ensure the sealing strips around it are not curled.



To reduce the risk of electric shock, do not perform any maintenance or repair operations beyond those specified in this manual. If necessary, contact the company's customer service or a third-party authorized service provider for maintenance or repair.

8.2. System Usage Requirements

8.2.1. Requirements for Normal Operation of the System

Perform battery maintenance on the system every twelve months to prevent battery damage. Refer to Section 8.4 for specific maintenance procedures.

The system was inspected every 12 months and the inspection records were kept.

8.2.2. System Usage Requirements for Long-term Disuse

The recommended SOC range for energy storage batteries is 15% to 40%. Avoid storing cells below 15% SOC for extended periods. When batteries are not in use, promptly disconnect power-consuming devices.

The energy storage system should be inspected every three months and the inspection records should be kept.

The battery should be maintained every three months to prevent damage.

Before the first use of the long storage system, the battery system should be fully charged at least once to restore the battery performance to the best state.



If the energy storage system is left unused for a long time, it will cause irreversible damage to the battery. Please ensure regular maintenance.

8.3. Maintenance Precautions

Before the maintenance and repair of the system, the personnel must first disconnect the main switch on the high-voltage box panel, ensuring that the DC circuit breaker is in the OFF state and the fire protection system is in manual mode. After the maintenance and repair are completed, the high-voltage box must be in the ON state and the fire protection system must be in automatic mode.

8.4. Battery Maintenance

To ensure the long-term safe and reliable operation of the energy storage system, please read and follow the following instructions carefully:

Maintenance process:

When batteries require long-term storage, they should be charged to 15-40%SOC and stored in a dedicated facility.

For long-term battery storage, perform a discharge and recharge every three months to maintain the State of Charge (SOC) between 15% and 40%. Conduct a battery condition check via the Battery Management System (BMS) every three months, with a maximum storage duration of six months. Before final grid connection, if ambient temperature drops below 10°C, first adjust the system to ambient temperature (25°C $\pm$ 3°C). After a 10-hour rest period, perform a full charge at 0.2C rate, then conduct charge-discharge cycles under actual operating conditions.



Before performing battery maintenance operations, ensure the environment and system are safe, with no alarms or malfunctions.

8.5. System Maintenance

8.5.1. Electrical System Maintenance

Maintenance Project	Maintenance standard	Maintenance cycle	detection mode	Exception handling
power supply of wiring panel Reliability of Cable and Signal Cable	Electrical and signal cables are not loose	6 months	visualization	After a 10-minute power outage, use a screwdriver to tighten any loose cables.
	Electrical cables and signals The cable shows no signs of aging or damage. Loss, abnormal fever, and its He is abnormal.	6 months	visualization	Replace the power cable after a 10-minute power outage. Signal cable
	No dust on the wiring panel	6 months	visualization	After a 10-minute power outage, clean the area thoroughly with a brush. dust
Ensure the circuit breaker operates normally	Circuit abnormalities (such as short circuits) Road) automatic clutch	6 months	visualization	Replace the maintenance circuit breaker after a 10-minute power outage. The breaker is located inside the electrical control box.

The above maintenance cycle is only a recommended value and can be adjusted according to actual planning.

8.5.2. Fan Maintenance

Maintenance Project	Maintenance standard	Maintenance cycle	detection mode	exception handling
fan operation reliability	The fan is dust-free, with no foreign object blockage at the air outlet.	6 months	visualization	After a 10-minute power outage, use a brush to clean the dry surface. Clean the dust from the fan and remove foreign objects from the air inlet.
	The fan blades are intact, and the fan rotates smoothly without any issues. abnormal sound	6 months	visualization	After a 10-minute power outage, tighten the fan. Check for interference from internal cables or other sources. The fan is running. If the fan fails, replace it.

The above maintenance cycle is only a recommended value and can be adjusted according to actual planning.

8.6. Fire Protection System Maintenance

Maintenance interval	Person type	Maintenance content
weekly	client	<p>protection zone</p> <p>Daily cleaning</p> <p>Visual inspection of the pipeline and nozzle condition</p> <p>cylinder</p> <p>Check the pressure status</p>

Maintenance interval	Person type	Maintenance content
monthly	client	<p>Reserve (visual inspection)</p> <p>Daily cleaning</p> <p>Pipes and nozzles condition</p> <p>Keep the protected area unchanged</p> <p>Blockage of the damper or duct valve</p> <p>2. Equipment (Visual Inspection)</p> <p>Gas cylinder (pressure gauge, support, damage condition)</p> <p>detector (cleanliness)</p> <p>Hand-cranked starter (no blockage)</p> <p>Nozzle (not clogged)</p> <p>3. Detection equipment (visual inspection)</p> <p>Ensure they are installed in the correct position</p> <p>Ensure they are not damaged</p> <p>Make sure they are clean and not covered with grease, dust, paint, or any other dirt.</p> <p>4. Hand-operated starter</p> <p>Ensure they have not been modified without authorization</p> <p>Ensure the circuit of the hand-cranked starter is not blocked.</p> <p>5. Alarm devices</p> <p>Check for dust accumulation</p> <p>Check for corrosion</p> <p>Check for damage</p> <p>6. Pipeline Network</p> <p>Ensure the distribution pipe network is installed securely.</p> <p>Ensure the nozzle is installed in the correct position</p> <p>Ensure the nozzle is free from dust, grease, or paint, and that the spray is not obstructed.</p> <p>7. All components</p> <p>Check for signs of damage</p>

Only through regular fire system inspections can the proper operation of the fire suppression system be ensured. The maintenance requirements for the fire system are listed in the table below:

		<p>Locate and reconnect disconnected components</p> <p>Locate and tighten loose connections</p> <p>Detect corrosion</p> <p>Find twisted or dented parts</p> <p>8. Bottle valve pressure gauge</p> <p>Check the pressure inside the cylinder and ensure it is within the working pressure range.</p> <p>9. Steel cylinder</p> <p>Ensure all cylinders are securely mounted on the brackets.</p> <p>Check the corrosion condition.</p> <p>Check for damage.</p> <p>Check missing parts</p> <p>10. Starter</p> <p>Check if the launcher is installed in the correct location</p> <p>Check all startup pipelines</p> <p>Check if the circuit is not altered or disconnected</p> <p>11. Pressure switch</p> <p>Ensure all pressure switches are installed</p> <p>Correct the non-start position</p> <p>12. Control Panel</p> <p>Check visually that the control panel and spray device are functioning properly (green light on during operation).</p> <p>If a fault occurs (yellow light on), contact the company's after-sales service.</p>
every 3 months	Maintenance personnel	Monthly inspection items include performance testing of all valve actuator components and all electrical equipment.
every 6 months	Maintenance personnel	Maintenance items every 3 months plus check medication dosage
Every 12 months	Maintenance personnel	<p>Maintenance items every 6 months plus visual inspection</p> <p>Start and release the hose protection zone (seal test)</p>

9. Emergency Incident Abnormal Handling

9.1. Emergency Abnormal Handling Methods

9.1.1. Fire

Step 1: Evacuate personnel from the scene to a safe area, demarcate a safety isolation zone, and call emergency services based on the situation at the scene.

Step 2: Under the premise of ensuring personal safety, perform the following procedures when conditions permit:

If the wiring harness is smoking or on fire, use a carbon dioxide or dry powder fire extinguisher to put out the fire.

In case of accidental inhalation of dense smoke, seek immediate medical attention and move to a safe location.

Step 3: Notify the system manufacturer to obtain further processing recommendations.



If a fire is caused by abnormal charging or discharging, immediately cut off the power supply before attempting to extinguish the fire.

9.1.2. Floods

Step 1: Evacuate personnel to a safe area and demarcate a safety isolation zone, regardless of whether the system is powered on.

Step 2: Notify the system supplier to perform maintenance after the water has evaporated.

Step 3: Do not start the system until the manufacturer provides the security assessment results.

9.1.3. Battery Drop/Impact

- In the event of noticeable odors, damage, smoke, or fire, immediately evacuate personnel, promptly report to the authorities, and contact professional personnel. The professionals shall use firefighting equipment to extinguish the fire and handle the situation under safe conditions.
- When the appearance shows no obvious deformation or damage, and no noticeable odor, smoke, or fire occurs, proceed with the operation under the premise of ensuring safety:
- Professional personnel shall use mechanical tools to transfer the battery to an open and safe location, contact our company's service engineers, and leave it undisturbed for 1 hour while monitoring the battery temperature within $\pm 10^{\circ}\text{C}$ of

room temperature before further processing.

➤ On-site energy storage system: Evacuate personnel, close the container door of the energy storage system, and have professionals use mechanical tools to transfer the batteries to an open and safe area. Leave them undisturbed for 1 hour before disposal.

9.1.4. Recycling of Faulty Batteries

- Please dispose of used batteries in accordance with local laws and regulations. Do not dispose of batteries as household waste. Improper disposal of batteries may cause environmental pollution or explosion.
- If the battery leaks or is damaged, contact technical support or a battery recycling company for disposal.
- When the battery reaches the end of its service life and becomes unusable, contact a battery recycling company for disposal.
- Avoid exposing used batteries to high temperatures or direct sunlight.➤
- Avoid exposing waste batteries to high humidity or corrosive environments.
- The faulty battery must be discarded immediately by contacting a battery recycling company to prevent environmental pollution.

9.1.5. Battery Recycling

Before attempting to disable or log out of the system, contact your local after-sales team. Your local after-sales team can provide a list of qualified partners in your area to help ensure proper disposal of retired equipment.

10. Appendix: Inspection Items

Inspection items	Inspection method	Yes/No	exception record
Is the fire extinguishing system complete?	visualization		
Is the fire extinguishing system still valid?	visualization		
Is the cooling system complete?	visualization		
Is the air duct of the cooling system blocked?	visualization		

Inspection items	Inspection method	Yes/No	exception record
Is the appearance of the electrical cabinet deformed?	visualization		
Is the exterior of the electrical cabinet rusted or damaged?	visualization		
Is there moisture inside the electrical cabinet?	visualization		
Is the low-voltage wiring harness loose or damaged?	visualization		
Is the high-voltage cable bundle loose or damaged?	visualization		
Whether the wiring harness interferes with structural components	visualization		
Ablation of high-voltage connections	visualization		
Are the fastening bolts of the structural components loose or missing?	visualization		
Is there a foul odor in the battery room?	visualization		
Presence of pungent odor in the electrical cabinet	visualization		
Is there a burnt odor at the high-voltage connection site?	visualization		
Is the summary data complete?	supervisory computer		
Are the single-cell voltage data complete?	supervisory computer		
Are the temperature data of the monomer complete?	supervisory computer		
Check for abnormal alarms in the alarm bar	supervisory computer		
Note: If any abnormalities are detected during the inspection, please report them immediately and contact the relevant personnel for handling.			

11. Warranty Instructions

The warranty period shall follow the commercial contract terms. During this period, if any component of the product is damaged due to manufacturing defects or design flaws, or fails to meet the contractual specifications, the company shall provide free repairs or replacements to the purchaser. This service continues until the equipment structure is improved and the product is supplied free of charge, except in the following cases:

(1) All types of malfunctions caused by improper use, maintenance, or repair of the product as specified in this manual.

(2) The product has been subjected to water immersion, impact, or other damages beyond its tolerance.

(3) Unauthorized modification, installation, disassembly, or adjustment of the battery system without company authorization.

(4) Damage caused by customers handling battery system failures without company authorization.

(5) Quality issues caused by the use of non-genuine parts supplied by our company.

(6) Damage caused by using charging equipment that does not meet national standards or improper charging operations.

(7) Both parties shall be exempt from liability for damages caused by force majeure (e.g., earthquakes, typhoons, floods, chemical pollution, lightning, hail, mudslides, falling rocks, fires, political disasters) or intentional damage, as well as any secondary compensation arising from such damages.

Our company reserves the right to interpret this specification and modify it at its sole discretion, as permitted by law. Any changes will take effect without prior notice.