User Manual

LiFePO4 Energy Storage Battery

HV48300 Max SE

Information Version: 1.0

Shanghai PYTES Energy Co., Ltd.

About This Document

This document describes the installation, electrical connections, commission, and troubleshooting of HV48300 Max SE High Voltage Energy Storage System (here in after referred as ESS). Before installing and operating the ESS, read this document carefully to understand the safety information as well as functions and features of t he ESS.

This document is intended for:

- Technical support engineers
- Hardware installation engineers
- Commissioning engineers
- Maintenance engineers

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Chapter 1
Safety Precautions

Overview

Before transporting, storing, installing, operating, using and maintaining the equipment, read this manual, follow it strictly, and follow all safety precautions marked on the equipment and in the manual. Compliance with relevant international, national or regional standards, and industry practices is required. The Company shall not be liable for any violation of the requirements for safe operation or for any violation of the safety standards for the design, manufacture and use of the equipment.

This equipment should be used in an environment that conforms to the design specifications, otherwise the equipment failure, abnormal equipment function or component damage that may be caused is not covered by the equipment quality warranty; otherwise, the Company shall not be liable for any personal injury or death, property damage, etc., that may be caused.

Transportation, storage, installation, operation, use, maintenance and all other operations should comply with applicable laws and regulations, standards and specifications. Reverse engineering, decompiling, disassembling, adapting, implanting or other derivative operations of the equipment software are prohibited, as well as researching the internal implementation logic of the equipment, obtaining the source code of the equipment software, and infringing on intellectual property rights in any way, or disclosing the results of any equipment software performance tests. The Company shall not be liable for any of the following circumstances or the results thereof:

- Damage to the Equipment caused by force majeure such as earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and extreme weather;
- Do not operate under the conditions of use described in this manual;
- The installation and use environment does not comply with relevant international, national or regional standards;
- Installation and use of equipment by unqualified personnel;
- Failure to follow the operating instructions and safety warnings in the product and documentation;
- Unauthorized disassembly, alteration of products or modification of software code;
- Damage caused by transportation by you or a third party commissioned by you;
- Damage caused by storage conditions that do not meet the requirements of the product documentation;
- Your own materials and tools do not meet the requirements of local laws and regulations and relevant standards;
- Damage caused by you or a third party that is negligent, willful, grossly negligent, improperly operated, or not caused by us.

1.1. Personal Safety

- The installation process is strictly prohibited to operate with electricity. It is prohibited to install or remove cables with electricity. The wire and cable cores will arc, spark or catch fire and explode at the moment of contact with the conductor, which can lead to fire or personal injury.
- When equipment is energized, unregulated and incorrect operation may produce a fire, electric shock, or explosion, resulting in injury, death, or property damage.
- It is strictly prohibited to wear watches, bracelets, bangles, rings, necklaces and other easily conductive objects during operation to avoid being burned by electric shock.
- Special insulated tools must be used during operation to avoid electric shock or short-circuit faults, and the insulation voltage rating must meet the requirements of local laws and regulations, standards and codes.
- The insulation voltage withstand level must meet the requirements of local laws and regulations, standards and codes.

- Specialized protective gear must be used during operations, such as wearing protective clothing, insulated shoes, goggles, helmets, insulated gloves, etc.

1.1.1. General Requirements

- Do not deactivate equipment protection devices and ignore warnings, cautions and precautions in manuals and on equipment.
- During the operation of the equipment, if a fault is found that may lead to personal injury or equipment damage, the operation should be terminated immediately, reported to the person in charge, and effective protective measures should be taken.
- Do not power up the unit without completing the installation or without confirmation from a professional.
- It is prohibited to contact the power supply equipment directly, with other conductors or indirectly through wet objects, and the voltage at the point of contact should be measured before contacting any conductor surface or terminal to confirm that there is no danger of electric shock.
- When the unit is in operation, the housing is hot and there is a danger of burns, so do not touch it.
- Do not allow fingers, parts, screws, tools or veneers to touch the running fan to avoid injury to hands or damage to the unit.
- In the event of a fire, immediately evacuate the building or equipment area and ring the fire alarm, or call the fire alarm. Under no circumstances should you re-enter a burning building or equipment area.

1.1.2. Personnel Requirements

- Personnel who operate equipment include professionals and trained personnel.
- Professional: A person who is familiar with the principles and construction of the equipment, who has experience in training or operating the equipment, and who is aware of the various potential sources and levels of hazard during the installation, operation and maintenance of the equipment.
- Trained Person: A person with the appropriate technical and safety training and experience necessary to be aware of the hazards that may be presented to him when carrying out an operation and to take steps to minimize the risk to himself or to other persons. Personnel responsible for the installation and maintenance of the equipment must be trained in the correct methods of operation and be aware of the various safety precautions and the relevant standards of the country/region in which they are working.
- Only qualified professionals or trained personnel are permitted to install, operate and maintain the equipment.
- Only qualified professionals are allowed to remove safety features and service equipment.
- Personnel in special scenarios such as electrical operation, work at heights, and operation of special equipment must have special operation qualifications required by the local country/region.
- Operators of medium-voltage equipment must hold a high-voltage electrician's license.
- Replacement of equipment or parts (including software) must be done by an authorized professional.
- Keep persons other than those operating the equipment away from the equipment.

1.2. Electrical Safety

- Before making electrical connections, make sure the unit is undamaged, otherwise electric shock or fire may result.
- Unregulated and incorrect operation may cause accidents such as fire or electric shock.
- During operation, foreign objects must be prevented from entering the interior of the equipment, as this may result in short-circuit failure or damage to the equipment, derating or loss of power to the load supply, and personal injury.
- When installing equipment that requires grounding, the protective ground wire must be installed first; when removing the equipment, the protective ground wire must be removed last. No cables are allowed to pass through the air inlet or outlet of the equipment.

1.3. Environmental Safety

- It is strictly prohibited to place the equipment in an environment where flammable or explosive gases or fumes are present, and it is forbidden to carry out any operation in such an environment.
- It is strictly prohibited to store flammable or explosive materials in the equipment area.
- It is strictly prohibited to place the equipment close to sources of heat or fire, such as fireworks, candles, heaters or other heat generating devices, as heat exposure to the equipment may result in damage to the equipment or cause a fire.
- The equipment should be installed in an area away from liquids, and it is strictly prohibited to be installed under water pipes, air outlets and other locations that are prone to condensation; it is strictly prohibited to be installed under air conditioning outlets, vents, server room outlet windows and other locations that are prone to leakage to prevent liquids from entering into the interior of the equipment and causing equipment malfunctions or short circuits.
- Do not block vents, cooling systems or cover with other items while the unit is in operation to prevent heat damage to the unit or fire.

1.4. Mechanical Safety

- Work at height must wear a helmet, safety belt or waist rope, tied to a solid and sturdy structural component, is strictly prohibited to hang on the moving not solid objects or sharp edges of the metal to prevent the hook slipped off the fall accident.
- Tools need to be prepared and qualified by professional organizations, prohibit the use of scarred and unqualified or beyond the inspection of the validity of the tool, to ensure that the tool is solid, not overloaded.
- Before installing the equipment into the cabinet, first make sure that the cabinet has been fixed well to avoid the cabinet being tilted and collapsed due to the unstable center of gravity, resulting in the installer being smashed and the equipment being broken and other problems.
- When pulling equipment out of the cabinet, be careful of equipment that may be unstable or heavy when installed in the cabinet to avoid being crushed or smashed.

1.5. Energy Storage System Security

- It is forbidden to open the cabinet door while the system is running.
- Avoid standing at the cabinet door (including within the opening range of the door) when the energy storage system is malfunctioning.
- Emergency evacuation of the site should be carried out when the fire audible and visual alarms are triggered.
- The energy storage system must be equipped with protective measures such as fences and walls, and safety warning signs must be erected for isolation to avoid entry of unauthorized personnel during the operation of the equipment, which may result in personal injury or property damage.

1.6. Battery Safety

- It is strictly prohibited to short-circuit the positive and negative terminals of the battery, otherwise it will cause a short circuit of the battery. Battery short-circuit will instantly generate a large current and release a large amount of energy, causing battery leakage, smoke, release of flammable gases, thermal runaway, fire or explosion. In order to avoid short-circuiting the battery, the battery is not allowed to be charged for maintenance.
- Do not expose the battery to high temperature environments or around heat generating devices such as high temperature sunlight, sources of ignition, transformers, heaters, etc. Overheating of the battery may cause leakage, smoke, release of flammable gases, thermal runaway, fire or explosion.
- It is strictly prohibited to subject the battery to mechanical vibration, dropping, collision, piercing by hard objects and pressure shock, or it may lead to battery damage or fire.

- It is strictly prohibited to disassemble, modify or damage the battery (e.g., inserting foreign objects, extruding with external force, immersing in water or other liquids), which may cause battery leakage, smoke, release of flammable gases, thermal runaway, fire or explosion.
- It is strictly prohibited for the battery terminals to come into contact with other metal objects, which may cause heat generation or electrolyte leakage.
- Using or replacing batteries of incorrect type poses a risk of fire or explosion. Use batteries of the specified type recommended by the manufacturer.
- Battery electrolyte is toxic and volatile. When electrolyte leakage occurs or there is an abnormal odor, avoid contact with the leaking liquid or gas. Non-professionals should stay away and contact a professional immediately to handle the situation. Professionals should wear goggles, rubber gloves, gas masks, protective clothing, etc., promptly power down the equipment and remove the leaking battery, and contact a technical engineer to handle the situation.
- A battery is a closed system that does not release any gases under normal operating conditions. If under extreme abuse, such as in fire, pinprick, extrusion, lightning strike, overcharging or other severe conditions that may lead to thermal runaway of the battery, it may lead to breakage of the battery or abnormal chemical reaction inside the battery, which may lead to leakage of electrolyte or generation of gases such as CO, H2, etc., the site should ensure that the measures for the discharge of flammable gases are normal, so as to avoid leading to combustion or corrosion of the equipment.
- Battery combustion produces gases that can irritate eyes, skin and throat.
- The battery should be installed in an area away from liquids, and it is strictly prohibited to be installed under air conditioning openings, vents, water pipes and other locations prone to water leakage to prevent liquids from entering the interior of the equipment causing equipment failure or short circuit.
- Battery installation and testing shall be equipped with firefighting facilities, such as fire sand, carbon dioxide fire extinguishers, etc., in accordance with the requirements of the construction standard specifications.
- Before putting into operation, it must ensure that fire protection facilities are in place that meet the requirements of local laws, regulations and codes.
- Before removing the packaging of the battery, storage and transit, to ensure that the outer box is intact and without damage, in accordance with the identification of the box is placed correctly, it is strictly prohibited to inverted, sideways, vertical, tilted placement, stacked in line with the requirements of the outer packaging of the yardage, to avoid any impact or fall, etc. caused by the battery damage to the end of life.
- After the battery is unpacked, it should be placed in the required direction, and it is strictly prohibited to place it upside down, sideways, upright, tilted and stacked, to avoid any impact or fall which may cause the battery to be damaged and scrapped.
- Regularly check whether the screws are tightened, whether there are rust, corrosion or other foreign objects, and dispose of them cleanly, otherwise the screws are falsely connected will lead to excessive connection voltage drop, and even burn the battery with a large amount of heat when the current is high.
- After discharging the battery, the battery should be recharged in a timely manner, otherwise the battery may be damaged due to over-discharge.

Chapter 2
System Introduction

2.1. Design Statement

HV48300 Max SE is a high voltage battery storage system based on lithium iron phosphate battery, which is one of the new energy storage products developed and produced by Pytes. It meets energy storage system demands for its long circle life, compact design, easy installation and wide compatibility with PCS.

The HV48300 Max SE energy storage system consists of a battery pack, high voltage energy storage inverter, UPS, an energy management system (EMS), fire protection system, and an air-conditioning system, which enables the bi-directional flow of electrical energy.

HV48300 Max SE is also equipped with built-in battery management system (BMS) to manage and monitor voltage, current and temperature etc. of cells. The more important, HV48300 Max SE BMS is designed for balancing charging and discharging to prolong battery cycle life.

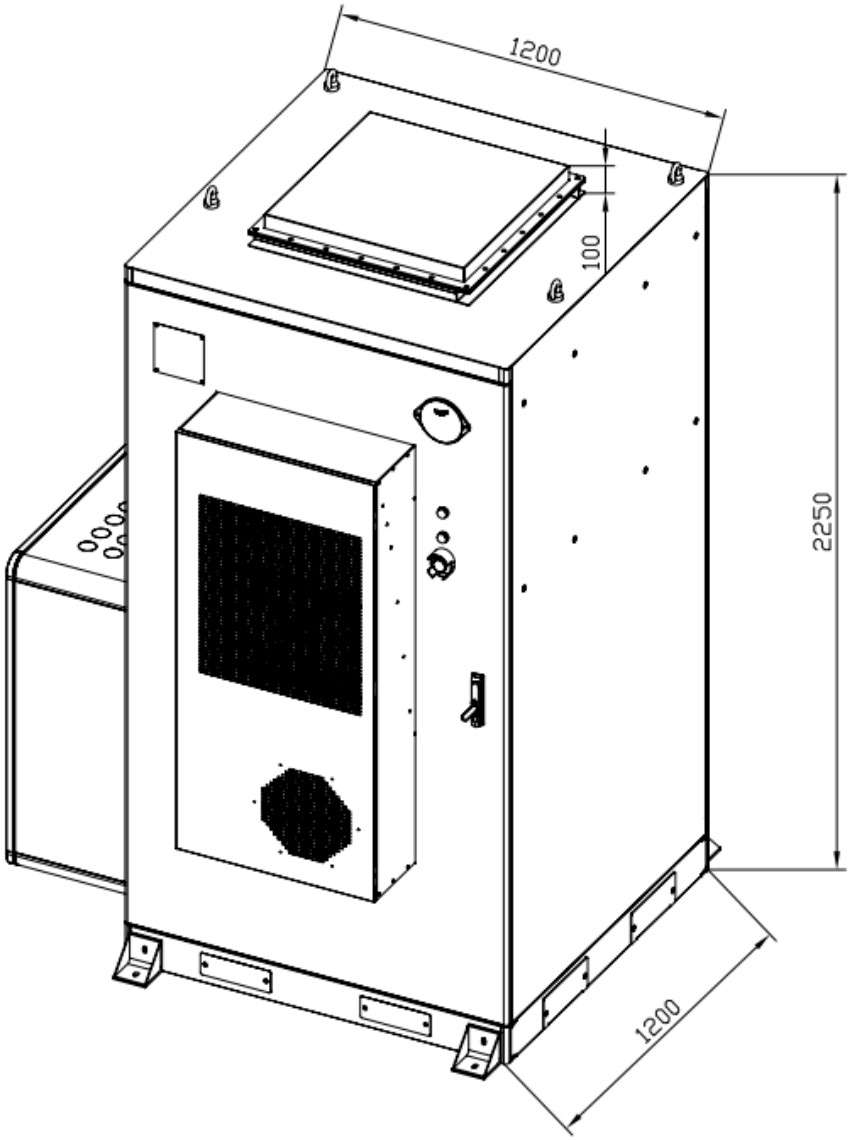

Figure 2.1: Dimensions of the HV48300 Max SE (mm)

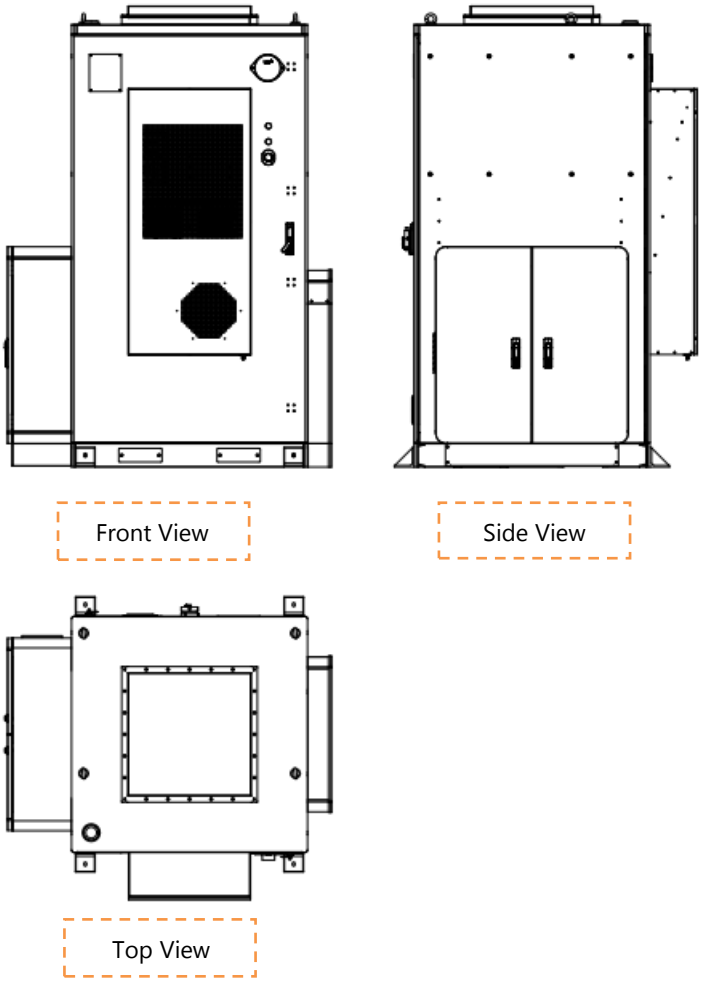

Figure 2.2: HV48300 Max SE Enclosure Dimensions (Top, Front, Side Views)

2.2. Features

Non-Toxic, Pollution Free and Environment Friendly

- Safe and Long Cycle Life
- Multi Protection Including over Charging/Discharging, over-Current and High/Low

Temperature by Battery management system (BMS)

- Charge/Discharging State self-Management and Cell Voltage Capacity Balancing
- Flexible Configuration with Wide compatibility with Various PCS
- More Reliable and Little System Noise with Nature cooling
- Wide Operation Temperature. Excellent Discharge Performance and Cycle Life
- Compact, Modular Design. Easy Installation, Maintenance and Replacement.

The system appearance layout is shown in Figure.

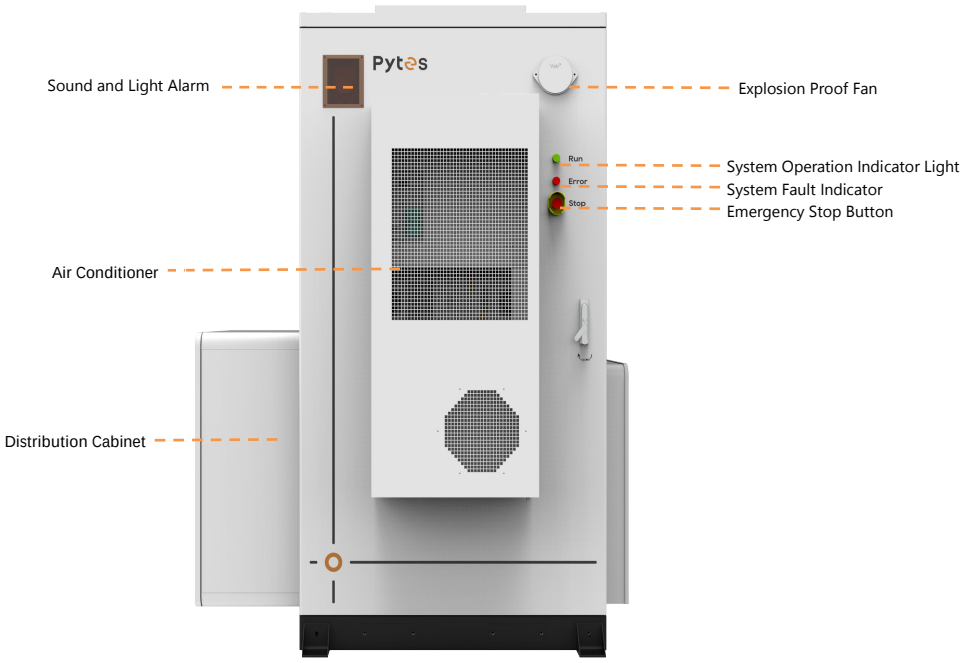

Figure 2.3: HV48300 Max SE appearance layout

2.3. System Topology

The system power topology is shown in Figure 3

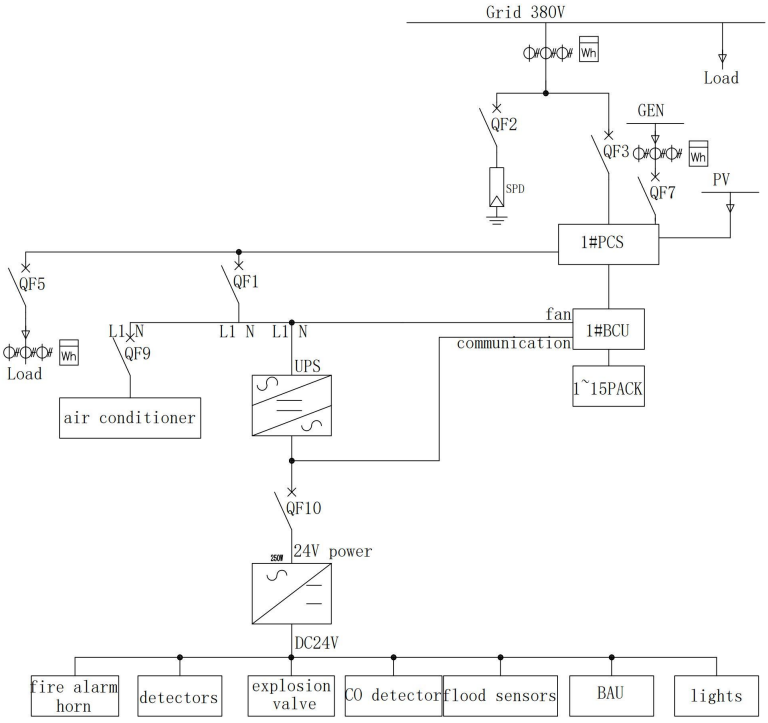

Figure 2.4: Power Supply Topology Diagram

2.4. Components

Note: This document uses the 241KWh system as an example. The actual structure of a model may vary.

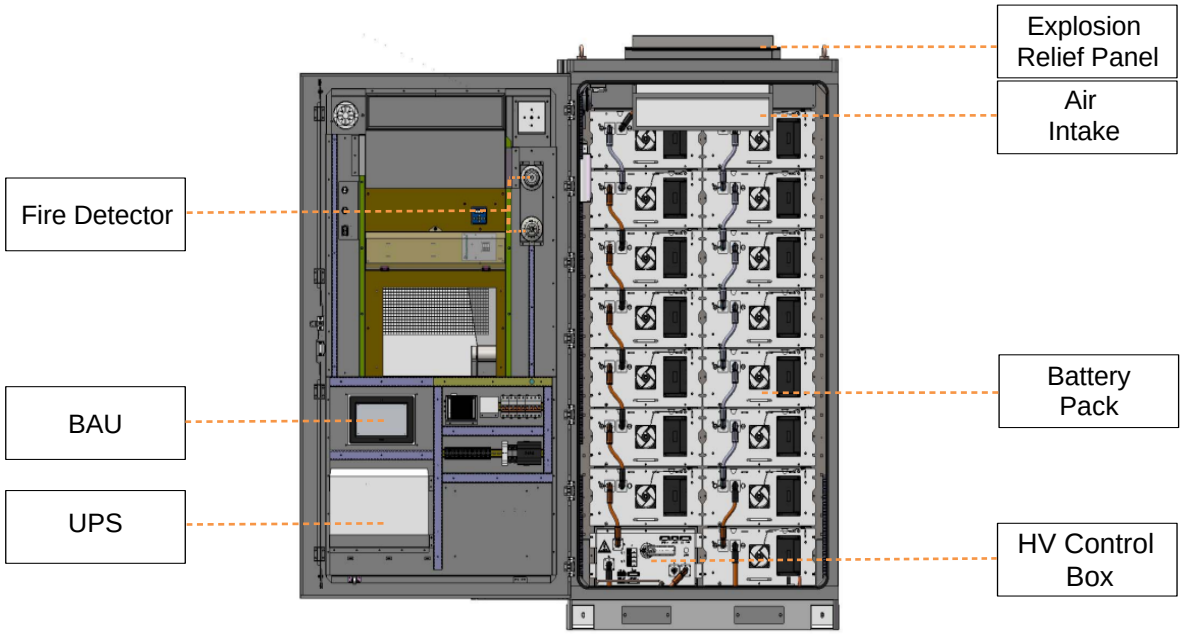

Figure 2.5: Components of the HV48300 Max SE

2.4.1. Basic Information of Battery Rack

Basic Information of Battery Rack：

Product Name	1P240S_314Ah_0.5P 1P240S_314Ah_0.5PAir Cooling Battery Rack
Configuration	1P240S

Table 2.1: Battery Rack Information

The H1P240S_314Ah_0.5P Air Cooling battery rack is composed of 15 pcs 1P16S air cooling battery packs, HV control box, several wire harness and rack frame, etc., where the air cooling battery pack consists of 2 1P8S battery modules, a BMU, a fanand some wiring harness, etc. And one battery pack is 1P16S, 15 pcs battery packs are connected in series, and the battery rack totals 1P240S.

The HV control box is composed of a BCU, relays, fuses, breakers, DC disconnecting switch, switching power supply and a number of wire harness, etc.

The battery management system (BMS) consists of 1 BCU and 15 pcs BMUs. And the BMS is mainly responsible for battery status information collection, SOC and SOH estimation, fault information alarm and processing, high-voltage power on and power-off control,and information interaction with other devices.

Components	Number & Units	Remark
Battery rack frame	1 pcs	
Battery pack	15pcs	
HV control box	1pcs	
HV harness	1 set	
LV harness	1 set	

Table 2.2: Air Cooling Battery Rack Constituent Parts

2.4.2. Electrical Schematic Diagram of Battery Rack

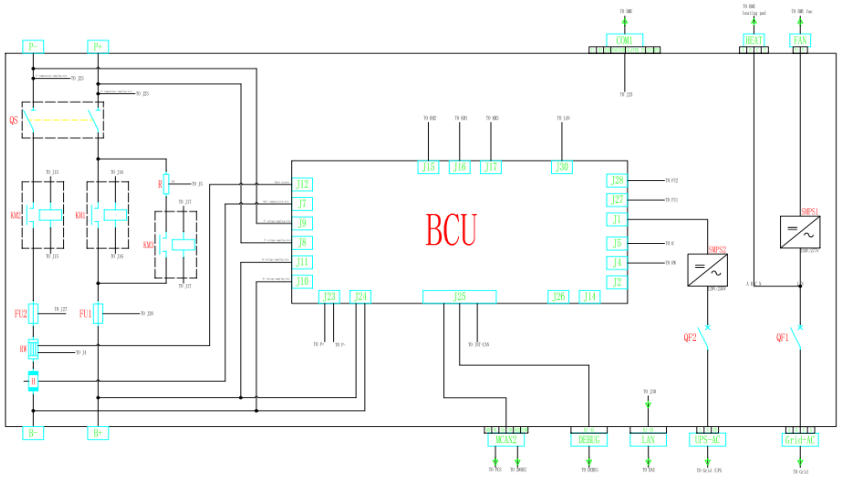

Figure 2.6: Electrical Schematic Diagram of Battery Rack

2.4.3. Battery Rack Main Parameter

No.	Item	Specifications	Remark
2.2.1	Nominal voltage	768V DC	Cell voltage 3.2V
2.2.2	Operating voltage range	672~864V DC	Recommended Cell voltage range 2.8~3.6V
2.2.3	Nominal capacity	314Ah	0.5C， 25℃
2.2.4	Nominal energy	241kWh	Cell voltage range 2.5V-3.6V
2.2.5	Configuration	1P240S	15 battery pack in series
2.2.6	Rated charge current	157A	1P240S
2.2.7	Maximum charge current	205A	Lasts 15s 1P240S
2.2.8	Rated discharge current	157A	1P240S
2.2.9	Maximum discharge current	205A	Lasts 15s 1P240S
2.2.10	Operating ambient temperature	Charging：0~55℃ Discharging：-25~55℃	
2.2.11	Storage temperature	-30~60℃	
2.2.12	Operating humidity	5%~95% RH	
2.2.13	Application altitude	≤2000m	

2.2.14	Dimension	69x57 x93inch (1750x1450x2350mm)	W×D×H
2.2.15	Weight	2000±100Kg	
2.2.16	IP level	IP55	
2.2.17	Cooling mode	Forced air cooling	
2.2.18	Auxiliary power supply	85 - 264VAC， 47~63Hz	Control box
2.2.19	Communication protocol	CAN	
2.2.20	Baud rate	250 Kbps	
2.2.21	Shipment SOC	30%SOC	
2.2.22	Noise level	≤70dB	
2.2.23	Rack standard Compliance	GB/T 36276， UN38.3， UL1973， UL9540A	

Table 2.3: HV48300 Max SE main battery rack parameter

2.4.4. HV control box

The panel diagram of HV control box is shown as the figure 2.7:

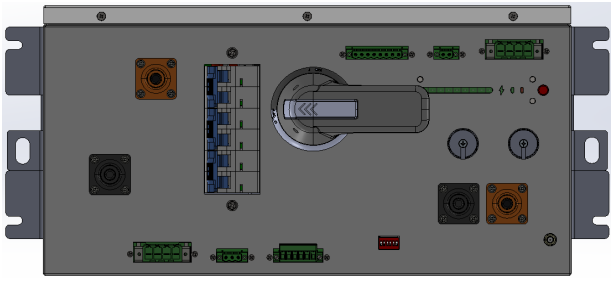

Figure 2.7: Interface of HV Control Box

No.	Item	Connector	Interface Definition	Remark
1	Battery +/High voltage output P+	Socket：ES-FT-BPC-B/S 35-70 OG SG Plug：ES-BPC-C 50-70 OG S	/	
2	Battery-/High voltage output P-	Socket：ES-FT-BPC-B/S 35-70 BK SG Plug：ES-BPC-C 50-70 BK SG	/	
3	UPS-AC Controller power input	Socket：5.08 socket-3Pin Plug：5.08 plug-3Pin	J1-1:220VAC-L J1-2:220VAC-N	UPS input
4	FAN-AC Fan power input	Socket：5.08 socket-3Pin	J1-3:220VAC-G J0-1:220VAC-L	

		Plug：5.08 plug-3Pin	J0-2:220VAC-N	
			J0-3:220VAC-G	
5	Debug	Socket：5.08 socket-4Pin Plug：5.08 plug-4Pin	J2-1:CAN_0H J2-2: CAN_0L J2-3: CAN_2H J2-4: CAN_2L	
6	Fan power supply 24VDC	Socket：5.08 socket-2Pin Plug：5.08 plug-2Pin	J3-1:DC24V+ J3-2: DC24V-	
7	INT-CAN Slave-controlled unit communication	Socket：5.08 socket-5Pin Plug：5.08 plug-5Pin	J4-1: DC24V+ J4-2: DC24V- J4-3:IO J4-4: CAN_0H J4-5: CAN_0L	
8	MCAN1 Display and control communication	Socket：5.08 socket-6Pin Plug：5.08 plug-6Pin	J5-1: CAN-2H J5-2: CAN-2L J5-3:DO7+ J5-4: DO7- J5-5:DO8+ J5-6: DO8-	Passive switch output
9	MCAN2 Display and control communication	Socket：5.08 socket-6Pin Plug：5.08 plug-6Pin	J6-1: CAN-2H J6-2: CAN-2L J6-3:RS485A J6-4: RS485B J6-5: DI8+ J6-6: DI8-	Passive switch input
10	EtherNet	Socket：SPRJS-5EPFFJ-TC7002 Plug：RJ45		

Table 2.4: Interface Information of HV Control Box

No.	Switch	Type	Function	Remark
1	QF2	Breaker	To connect and cut off the power supply of control system	
2	QF3	Breaker	To connect and cut off the fan power supply of control system	Fan power
3	QS1	Isolation switch	To cut off the output of battery system. (Cannot operate with load)	switch for (BMS) on the high-voltage control box

Table 2.5: Breakers and Switches Information

2.4.5. Battery Pack Interface

Interface Of Battery Pack The panel diagram of battery pack is shown as the figure 2.8:

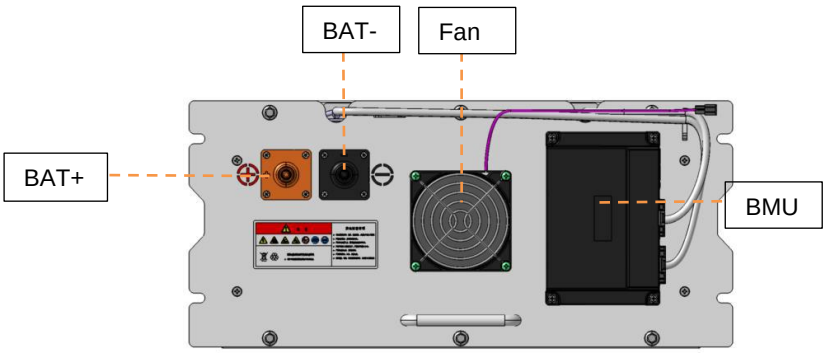

Figure 2.8: Interface of battery pack

2.4.6. Battery Pack Main Parameter

No.	Item	Specifications	Remark
1	Nominal voltage	51.2V DC	Cell voltage 3.2V
2	Operating voltage range	40~58.4V DC	Cell voltage range 2.5~3.65V
3	Nominal capacity	314Ah	0.5C ,25℃
4	Nominal energy	16.076kWh	0.5C ,25℃
5	Configuration	1P16S	2 battery module in series
6	Rated charge current	157A	
7	Maximum charge current	205A	Lasts 15s
8	Rated discharge current	157A	
9	Maximum discharge current	205A	Lasts 15s
10	Operating ambient temperature	Charging：0~55℃ Discharging：-25~55℃	
11	Storage temperature	-30~60℃	
12	Operating humidity	5%~95% RH	
13	Application altitude	≤2000m	
14	Dimension	L798±3*W498±1*H227±2mm	W=440mm without hangers
15	Weight	119±5kg	
16	Cooling mode	Forced air cooling	

17	Shipment SOC	30%SOC
18	Pack standard requirement	UN38.3 ， UL1973， UL9540A

Table 2.6: Battery Pack Main Parameter

2.4.7. Mechanical Interface of Battery Pack

The lifting holes for the battery Pack are shown in Figure 2.9, with four lifting holes for each battery pack, Applying to transportation and installation in different processes. Prohibit lifting at ventilation openings.

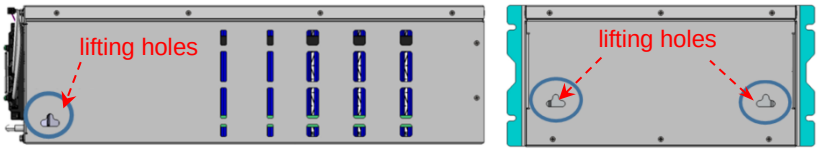

Figure 2.9: The Lifting Position of Battery Pack

The installation dimensions of the battery rack are shown as the Figure 2.10:

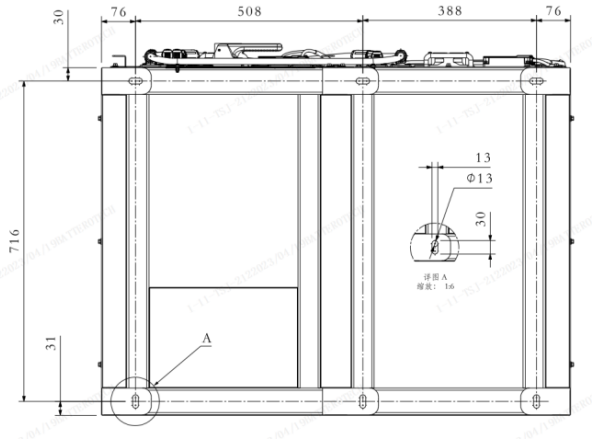

Figure 2.10: The installation dimensions of the battery Pack

2.5. Label Description

Pytes

Product Model: HV48300 Max SE — Rechargeable Li-ion Battery System

Battery Module	☐ (1P7S)×2	☐ 1P10S	☐ 1P11S	☐ 1P12S	☐ 1P13S	☐ 1P14S	☐ 1P15S
Rated Energy	112,53kWh×2	160,76kWh	176,84kWh	192,92kWh	208,99kWh	225,07kWh	241,15kWh
Rated Power	56,26kW×2	80,38kW	88,42kW	96,46kW	104,49kW	112,53kW	120,57kW
Rated Voltage	358,4V	512V	563,2V	614,4V	665,6V	716,8V	768V
Operating Voltage	325,5V~397,6V	465V~568V	511,5V~624,8V	558V~681,6V	604,5V~738,4V	651V~795,2V	697,5V~852V
Charge/Discharge Current	157A×2	157A					
Rated Capacity	314Ah×2	314Ah					
Dimensions (W x D x H)	68 x 57 x 92inch (1750 x 1450 x 2350mm)						
Weight (lb / kg)	5471 / 2482	4241 / 1924	4504 / 2043	4766 / 2162	5028 / 2281	5291 / 2400	5553 / 2519
Operating Temperature	-22°F~131°F (-30°C~55°C)						
Ingress Rating	IP 55						
Operating Altitude	≤ 6561.68 ft (2000m)						
Relative Humidity	5%~95% RH, non-condensing						

S/N:

Date:

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Figure 2.11: HV48300 Max SE Product specifications

2.6. Environmental control systems

2.6.1. Condensed Aerosol Fire Extinguishing System

2.6.1.1. Introduction：

The Condensed Aerosol Fire Extinguishing System is an advanced, environmentally friendly solution designed for total flooding applications in normally unoccupied areas, such as high-voltage Battery Energy Storage Systems (HV 48300). Utilizing ultra-fine potassium salt particles and inert gas, the system effectively suppresses fires through isol ation, suffocation, cooling, and chemical inhibition mechanisms. With zero ozone depletion potential (ODP) and global warming potential (GWP), it is safe for sensitive equipment and complies with international standards like NFPA 2010 and EN15276-2. The system is compact, reliable, and suitable for extinguishing Class A, B, and C fires, making it ideal for electrical cabinets, energy storage units, and other high-risk enclosures.

2.6.1.2. Technical Parameters：

Parameter	Value
Model	JAD300-U01
Extinguishing Agent	Potassium salt aerosol
Operating Temperature	-40°C to +54°C
Storage Humidity	≤95% relative humidity
Useful Life	15 years
Discharge Time	12.5 ± 2.5 seconds
Actuation Method	Electrical (24V DC)

Table 2.7: General Specifications of Condensed Aerosol Fire Extinguishing System

Parameter	Value
Discharge Port to Personnel	≥130 cm (temperature ≤75°C)
Discharge Port to Combustibles	≥70 cm (temperature ≤200°C)
Casing to Combustibles	≥13 mm

Table 2.8: Safety clearance

Standard	Class A	Class B	Class C	Fuel Combination
UL/ULC2775	105.3 g/m³	78 g/m³	N/A	105.3 g/m³
EN15276	105.3 g/m³	78 g/m³	105.3 g/m³	105.3 g/m³

Table 2.9: Fire Class Design Density

Parameter	Value
Size (without bracket)	Φ76 mm (±0.2 mm) × 192 mm (±1 mm)
Weight	2320 g (±2%)
Aerosol-Forming Compound	300 g (±6 g)

Table 2.10: Physical Dimensions of Firefighting System

2.6.1.3. Maintenance Steps

Monthly Inspections

- Verify electrical connections and continuity using an ohmmeter (initiator resistance: 1.0Ω ±0.2Ω).
- Check for physical damage (cracks, corrosion) or obstructions in discharge paths.
- Ensure isolate switches are functional and clearly marked.

Annual Maintenance

- Test all system components, including detectors and control panels.

- Inspect mounting brackets and tighten loose hardware.
- Clean generator surfaces and ensure compliance with clearance requirements.

Post-Discharge Actions

- Ventilate the area for ≥10 minutes before entry.
- Clean residue using vacuuming, compressed air, or contact cleaner spray (within 24 hours).
- Replace spent generators and dispose of them per local regulations.

End-of-Life Replacement

- Replace generators after 15 years or if expiration date is exceeded.

2.6.2. Compression Refrigerating Integrated Air Conditioner

2.6.2.1. Introduction：

The Outdoor Power Cabinet Air Conditioner by Envicool is a robust cooling solution designed for high-voltage Battery Energy Storage Systems (HV48300 Max SE), substations, and equipment enclosures. It maintains optimal temperature (-40°C to +55°C) and humidity, ensuring reliable operation of electrical components. Key features include 5000W cooling capacity, 2500W heating, RS485/MODBUS monitoring, and IP55 waterproof rating. The unit uses R134a eco-friendly refrigerant and supports optional hydrogen discharge fans for hazardous environments.

2.6.2.2. Technical Parameters：

Parameter	Value
Power Supply	230V AC ±10%, 50/60Hz
Cooling Capacity	5000W @50Hz / 5100W @60Hz (L35/L35)
Heating Capacity	2500W
Dimensions (W×D×H)	620×300×1350 mm (with flange: 671×300×1401 mm)
Weight	90 kg
Noise Level	≤70 dB(A)
IP Rating	IP55

Table 2.11: Environmental ranges and electrical specifications

Parameter	Value
Operating Temperature	-40°C to +55°C (outdoor)
Internal Airflow	1500 m^3/h
Humidity Control	4–20mA signal output (range: 40–90% RH)
Max Current	17.0A
Cooling Input Power	1850W @50Hz / 2050W @60Hz

Table 2.12: Core parameters of air conditioner

Corresponding Base Pin	Description
N/A	N/A
N/A	N/A
N/A	N/A
NO	The NO contact of the common alarm relay dry contact output
COM	The COM contact of the common alarm relay dry contact output
FAN-COM	Discharge hydrogen fan dry contact COM(optional)
FAN-NC	Discharge hydrogen fan dry contact NC (optional)
RS485+	RS485 communication ports (+) (upstream equipment monitoring interface.)
RS485-	RS485 communication ports (-) (upstream equipment monitoring interface.)
Hum	Humidity Signal Output(4-20mA)
Temp	Temperature Signal Output(4-20mA)
+12V	+12V Output (optional)
GND	GND Output
SMOKE	Smoke detector alarm input (optional)
WATER	Flooding alarm input (optional)
DOOR	Access control alarm input (optional)
L	Power L
N	Power N
PE	PE

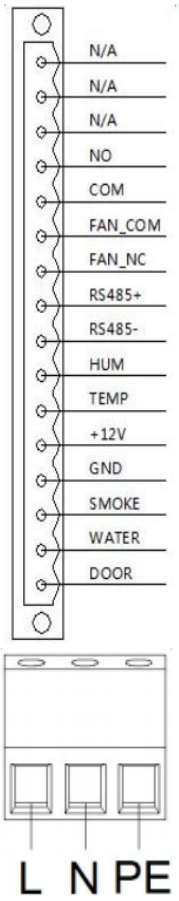


Table 2.13: Definition of power input terminal

2.6.2.3. Power on Steps

Close the AC input power switch, waited 30s, the internal cycle fan of the air conditioner will be started. If the internal cycle temperature meets the running condition, the cooling system will be started.

2.6.2.4. Maintenance Steps

Monthly Checks

- Inspect air filters for clogging; clean/replace if needed.
- Verify condenser/evaporator coils are free of debris.

Quarterly Tasks

- Test alarm outputs (NO/COM dry contacts) and RS485 communication.
- Calibrate temperature/humidity sensors (4–20mA signals).

Annual Maintenance

- Clean condenser with compressed air.
- Lubricate fan bearings and check for abnormal noise.
- Inspect electrical connections for corrosion/looseness.

Post-Event Actions

- After extreme weather (e.g., sandstorms), clean external vents.
- Reset fault alarms via LCD interface or MODBUS.

Chapter 3
Transportation and Storage

3.1. Transportation Requirements

DANGER

Load or unload batteries with caution. Otherwise, the batteries may be short circuited or damaged (such as leakage and crack), catch fire, or explode.

WARNING

Do not move a battery by holding its terminals, bolts, or cables. Otherwise, the battery may be damaged.

Keep batteries in the correct direction during transportation. They must not be placed upside down or tilted, and must be protected against falling, mechanical impact, rains, snows, and falling into water during transportation.

The packaging method of the battery pack should avoid pressure on the module in all directions, and the packaging method should limit the position of the battery pack to prevent it from shaking within the packaging. The pictorial marks of package, storage, and transportation on the package box should not be soiled or torn.

During transportation, the battery pack should be protected from rain, moisture, and handled with care. It is strictly prohibited to throw, roll, or invert it, and it is strictly prohibited to put it together with corrosive substances such as acids and alkalis. After all parts are properly packaged or boxed, protective measures should be taken during transportation to avoid loss, damage, and theft. During the unloading process, the product should be handled carefully to prevent falling, rolling, and heavy load pressure. During the handling and placement of batteries, forklifts with appropriate load carrying capacity should be used to avoid damage to the batteries.

Before unpacking, storage, and transportation, ensure that the packing cases are intact, and the batteries are correctly placed according to the labels on the packing cases. Do not place a battery upside down or vertically, lay it on one side, or tilt it. Stack the batteries according to the stacking requirements on the packing cases. Ensure that the batteries do not fall or get damaged. Otherwise, they will need to be scrapped.

Battery module is pre-charged to 30% SOC or custom required before shipment. The remaining capacity will be determined by storage time and condition before installation on the scene.

1. The battery modules meet UN38.3 standard.
2. Comply with laws towards dangerous goods transportation, in particular, the revised ADR (European Convention on the International Carriage of Dangerous Goods by Road).

3.2. Storage Requirements

DANGER

Ensure that batteries are stored in a dry, clean, and ventilated indoor environment that is free from sources of strong infrared or other radiations, organic solvents, corrosive gases, and conductive metal dust. Do not expose batteries to direct sunlight or rain and keep them far away from sources of heat and ignition.

If a battery is faulty (with scorch, leakage, bulge, or water intrusion), move it to a dangerous goods warehouse for separate storage. The distance between the battery and any combustible materials must be at least 3 m. The battery must be scrapped as soon as possible.

Place batteries correctly according to the signs on the packing case during storage. Do not place batteries upside down, lay them on one side, or tilt them. Stack batteries in accordance with the stacking requirements on the packing cases.

Store batteries in a separate place. Do not store batteries together with other devices. Do not stack batteries too high. If a large number of batteries are stored onsite, the site should be equipped.

CAUTION

Batteries should be used soon after being deployed onsite. Batteries that have been stored for an extended period should be charged periodically. Otherwise, they may be damaged.

- The storage environment must comply with local regulations and standards.
- The storage environment must be clean and dry. The product must be protected against rain and water.
- The air must not contain corrosive or flammable gases.
- The storage environment requirements are as follows:
  a. Within 1month: -20°C~50°C(-4°F~122°F),
     1-3months: 10°C~40°C(14°F~104°F),
     3-12months: > 0°C~30°C(32°F~86°F),
     recommended storage temperature: 20–30°C(68°F~86°F);
  b. Relative humidity: 5% to 80%

The battery pack should be stored in a dry, ventilated, and cool environment, away from ignition and heat sources, avoiding direct sunlight, high temperatures, corrosive gases, severe vibration, mechanical impact, and other conditions; The temperature should be controlled within the range of - 30℃ to 60℃, the relative humidity should not be greater than 85%, there should be no condensation, and the atmospheric pressure should be 86 kPa to 106 kPa. For long-term storage, it should be stored in a clean and ventilated room with a temperature of 0℃ ~ 45℃.

- If equipment except battery packs has been stored for more than two years, it must be checked and tested by professionals before use.
- Proof that the product is stored according to the requirements must be available, such as temperature and humidity log data, storage environment photos, and inspection reports.
- Ensure that batteries are delivered based on the "first in, first out" rule. Ensure that the storage duration starts from the latest charge time marked on the battery packing case and that the latest charge time is updated after every charge

Chapter 4
System Installation

4.1Installation Requirements

4.1.1. Basic Requirements

HV48300 Max SE Energy Storage Integrated Cabinet has a protection level of IP55 and can be installed outdoors, but should not be placed in a high humidity environment for a long period of time. Due to the noise generated during operation, the storage inverter should be installed in a location far away from residential areas and the installation location should be free of corrosive and flammable gases.

- The outdoor energy storage cabinet must be installed on a suitable concrete foundation with a fire-resistant surface and the converter inlet and outlet must not be obstructed.
- The installation floor is dry, level, free of stagnant water, and the floor is not loose enough to fully support the weight of the energy storage outdoor cabinet.
- Installation site environment: Temperature range: -20°C~55°C; Relative humidity range: 0~95%, non-condensing.
- Energy storage integration cabinet grounding resistance <4Ω.
- The control cabinet should be mounted in a location that ensures that the LED indicators and LCD touch screen are easily viewed.
- If the machine is placed directly outside, it is recommended to take the necessary shading measures to avoid the temperature of the machine rising due to direct sunlight, resulting in a reduction of the machine's operating capacity.

4.1.2. Outdoor Requirements

- The HV48300 Max SE can be operated in an ambient temperature range of -20°C to 55°C. When the temperature is above 45°C, the machine will run at a lower rate. When the temperature is below -20°C, it needs to be warmed u p before running at high power. The sunlight intensity should be ≤ 1200 W/m^2 and it is recommended that c onverters installed outdoors take the necessary shading measures.
- It is recommended that the integrated cabinet be installed in such a way as to ensure at least 1 meter of air duct for each side and front.
- The energy storage cabinet needs to be installed on a concrete foundation or a structure supported by a steel channel with a flame-retardant surface. It is necessary to ensure that the foundation is level, firm, safe and reliable, with sufficient bearing capacity, and it is strictly prohibited to install it in a place where the foundation is depressed or inclined.
- During foundation construction, the cable trench is pre-set according to the overall design of the power station and the location of the incoming and outgoing cables at the bottom of the energy storage cabinet.
- Pre-embedded holes need to be opened on the base, and the size of the pre-embedded holes must be exactly the same as the positioning holes in the base of the energy storage cabinet to ensure that the energy storage cabinet is firmly connected to the foundation.

4.1.3. Space Requirements

The Energy Storage Integration Cabinet must be installed at a sufficient distance from walls and other equipment to meet the requirements for the narrowest access aisles, evacuation routes, and ventilation. This subsection requires minimum space requirements for proper operation of the Energy Storage Integration Cabinet. If site conditions permit,

it is recommended that greater spacing be selected to ensure reliable and efficient operation of the Energy Storage Integration Cabinet.

4.1.4. Ventilation Requirements

Frequency converter operation will produce a lot of heat, high temperature will directly affect the electrical performance of the equipment, and even damage the equipment, so in planning the installation environment of the frequency converter, should give full consideration to the equipment's ventilation and heat dissipation needs, in order to ensure that the normal and efficient operation of the equipment.

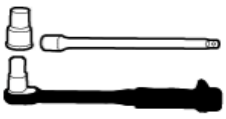
In order to ensure the reliable and efficient operation of the energy storage cabinet, please regularly clean the grills, filters and filter pads at the air inlet and outlet of the equipment, and regularly check whether the exhaust fan of the equipment is working properly, so as to meet the ventilation requirements of the integrated energy storage cabinet, whose installation environment needs to meet the following requirements.

- Energy storage cabinets should avoid installation in poorly ventilated locations with low airflow.
- The air intake should have an adequate supply of fresh air.
- The quality of the air must be ensured. If the air contains too much sand, dust and other suspended matter, the purity of the air can be improved by measures such as installing a filter at the air intake grille.
- The ventilation system of the energy storage cabinet must be independent of the ventilation system of other equipment and not affect each other. Cooling ducts should be designed by professionals in advance to avoid the cabinet being in the phenomenon of return air. At the same time, each combination must be sealed to prevent air leakage, and the sealing material chosen should be able to withstand temperatures of at least 80° Celsius. After installing the cooling air ducts, the cabinet should be checked for fixed screws, washers and other components.

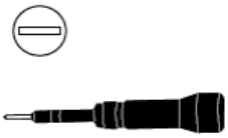
4.2. Preparing Tools and Instruments

The following tools are required before installation, as shown in Table 4.1:

Phillips Insulated Torque Screwdriver



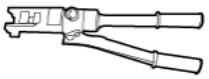
Insulated Torque Socket Wrenches (Incl. Extensions)



Insulated Torque Screwdriver

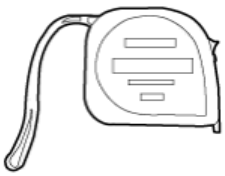
Art Knife

Wire Stripper



Hydraulic Press

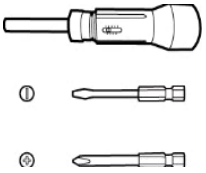
Multimeter (DC Voltage Range≥ 15000V DC)



Steel Tape Measure

Adjustable Wrench

Rubber Mallet



Torque Screwdriver

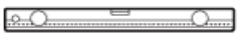
Allen Key

Hammer

Combination Sleeve

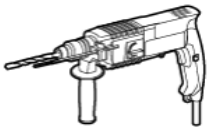
Open-End Torque Wrench

Combination Wrench



Level (Device Determine Horizontal)

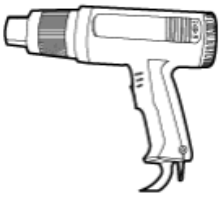
Dust Catcher



Pneumatic Drill

Drill 12mm

Heat Shrink Tubing

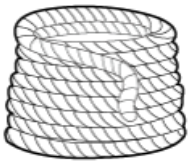


Heat Gun

Zip Ties

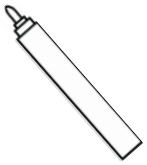
Insulated Ladder

Cable Cars



Sling

Forklift Trucks



(Permanent) Marker (Pen)

Terminal Crimping Pliers

Wire Stripper

Network Wiring Pliers

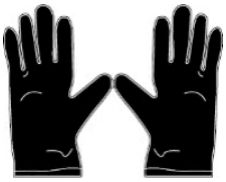
Ratcheting Crimping Pliers

Large Range Clamp Ammeter

Extra Large Range Clamp-On Ammeter

Infrared Thermometer

Universal Plug Conversion Socket



High-Voltage Insulated Gloves

Safety Goggles

Safety Helmets

Safety Footwear

Table 4.1: Installation Tools and PPE

4.3. Product Installation

4.3.1. Unpacking

The exterior of the energy storage outdoor cabinet package is shown in Figure 4.1. After it will be transported to the vicinity of the installation site, the shipping carton will be unpacked, and the disassembly steps are as follows.

1. Remove the top panel of the packing box.
2. Remove the wooden side panels of the packing box.
3. Remove the shielding material from the box.
4. Remove the anchors securing the outdoor energy storage cabinets to the shipping pallets.
5. Remove the outdoor energy storage cabinet and the transportation wooden pallet, and strictly prohibit the outdoor energy storage cabinet from being transported on the wooden pallet again.

Figure 4.1: ESS Cabinet Outer Packaging Picture

4.3.2. Verification of information

Before leaving the factory, the outdoor energy storage cabinet has been inspected and securely packed by Pytes staff. After removing the energy storage transportation packaging, please check the following items.

1. Check whether the data on the nameplate of the product matches with the ordering contract, e.g., product model, rated capacity, voltage level, etc.
2. Check that factory documentation and accessories are complete.
3. Check that the appearance of the storage outdoor cabinet is as described in this manual.
4. Check the energy storage outdoor cabinet for deformation, peeling paint, and loose parts.

The packing list for the energy storage outdoor cabinet is shown in Table 4.2.

No.	Name	Quantities
1	HV48300 Max SE Energy Storage Outdoor Cabinet (includes key , cable tray rack, and related accessories)	1 Set
2	HV48300 Max SE datasheet	1 Copy
3	inspection report	1 Copy

Table 4.2: HV48300 Max SE Packing list

Installation and commissioning can only be carried out if the inspection is correct and complete and if there is no damage to the outdoor cabinet of the energy storage, the inspection process, and in case of problems, please contact the transporter or Pytes technicians.

4.3.3. Installation of Rings

Install the top lifting ring of the energy storage system as shown in Figure 4.2.

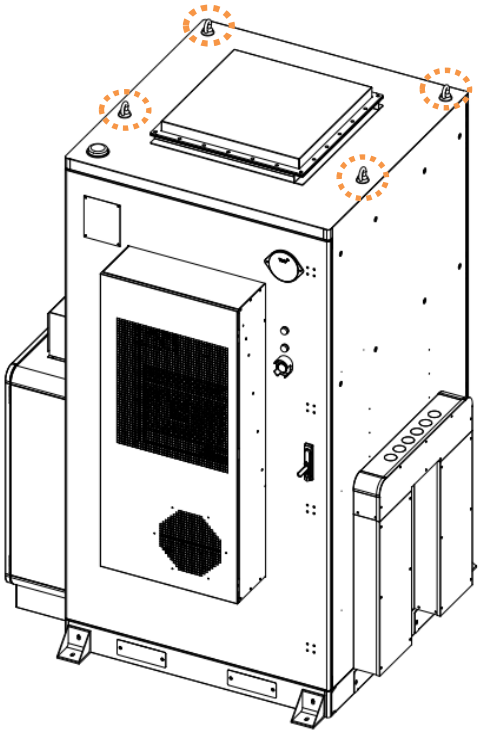


Figure 4.2. Top Ring Diagram of the System

4.3.4. Product Installation

Use a crane or forklift to place the energy storage system into the mounting position,

4.3.5. Product Fixation

Install the feet in the corners of the cabinet first, and use screws to secure the feet. As shown in Figure 4.3.

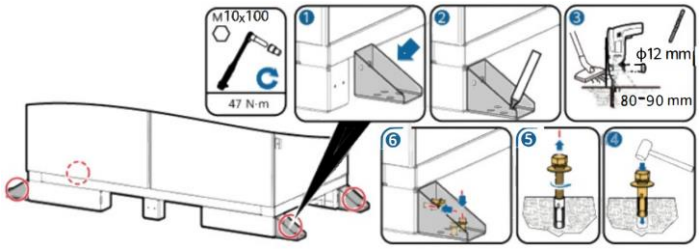


Figure 4.3: Installation Diagram of System Foundation

If the Energy Storage Cabinet is fixed to a channel, the cable trench should be laid and the channel cut out should conform to the installation requirements of the Energy Storage Cabinet before the unit is finally fixed. If the energy storage cabinet is fixed to a concrete floor, expansion screws should be used to fix the cabinet to the holes in the floor. The method of fixing the energy storage cabinet is shown in Figure 4.4. The following steps need to be followed to fix the energy storage integrated cabinet.

1. Select the appropriate tool to transport the energy storage cabinet to the mounting location and align the mounting holes.
2. Fix the energy storage cabinet on the foundation with M10×100 expansion bolts, or fix it on the steel base with M10×40 bolts through the waist hole of the base.
3. Install the bottom baffle of the energy storage cabinet to complete the fixed installation of the energy storage cabinet.

4.4. Electrical Connection

4.4.1. Security Rules

Make sure the mounting cables and equipment are not charged before installation. The capacitors inside the energy storage converter are hazardous energy storage devices and no flammable or explosive materials shall be placed in the vicinity of the energy storage converter All electrical connections shall be in accordance with the standards of the country in which the item of electrical connection requirements are located.

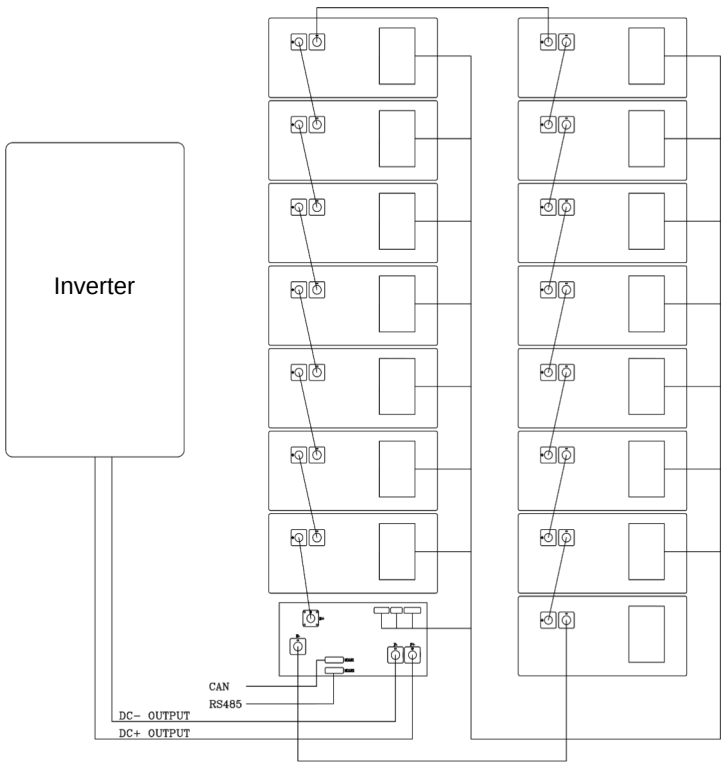


Figure 4.4: Electrical Wiring Diagram

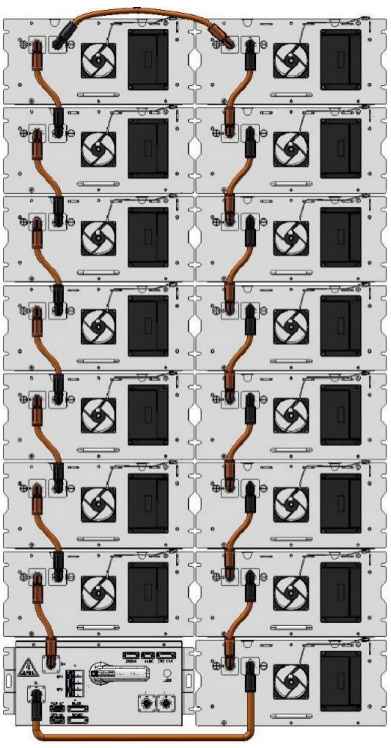


Figure 4.5: Diagram of Power Line Connections

The energy storage converter can only be connected to DC with the permission of the local electric utility and after installation by a qualified technician. Only a qualified electrician or competent person may make electrical connections to this product. Strictly observe the wiring symbols inside the unit.

The following safety rules must be observed during the electrical connection of the energy storage converter and during subsequent maintenance and repair operations.

1. All external connections to the energy storage converter and the unit's internal power supply are disconnected.
2. Ensure that the energy storage converter is not accidentally re-energized.
3. Use a multimeter to ensure that the energy storage converter is completely de-energized internally.
4. Make the necessary grounding and short-circuit connections.
5. Insulate and cover potentially energized parts adjacent to the operating section with fabric made of insulating material

4.4.2. Wiring components

The power supply cable of the outdoor cabinet for energy storage uses fixing screws and other components, and the equipment has been packaged in a uniform bag at the factory, so please pack it in strict accordance with the rules for tightening screws for cable connection When connecting cables, make sure that the joints are tightened. Poor connection or oxidization of the contact surfaces may lead to localized heat buildup, which in turn may cause fire and combustion When connecting the wiring, use appropriately sized copper wires and securely fasten them to the wiring copper strips using copper terminals.

4.4.3. Preparation Work

1. Open the front door of the outdoor energy storage cabinet.
2. Outdoor energy storage cabinets and other overall design of the bottom into the bottom out of the structure, the bottom of the storage cabinet is reserved for the user wiring entrance hole, all external wiring from the bottom of the machine to prevent foreign objects from entering. The bottom of the equipment has an inlet hole, which is sealed with sealing mud after the wiring is completed.

4.4.4. Cable requirements

Cable selection requirements are as follows:

The selected cable must have sufficient current-carrying capacity. The current-carrying capacity of a conductor is related to the environmental conditions, the type of conductor insulation, the method of laying, the wire and the cross-sectional area. The wire diameter of all cables must be selected according to the maximum current on both sides of the energy storage converter with allowances. Connecting wires on the same side should be of the same gauge and type. Please use flame retardant cables. Recommended specifications for connecting cable diameters are shown in Table 4.3:

(Electric) Cable	Conductor Diameter Requirements (Copper Core)	Mounting Bolt Specifications
Grid side phase A B C N	Recommended ≥107mm2	M10x30
Grounding wire	Recommended ≥40mm2	M10x30

Table 4.3: Recommended Specifications for Cables

Overloading of the cable is strictly prohibited, the current in the 1 mm^2 cable must not exceed 3A.

4.4.5. Important Safety Notes

- All connecting cables must be checked for insulation and integrity before all electrical wiring is carried out.
- Do not use poorly insulated, partially exposed, or damaged cables Make sure the polarity of either side of the cable is correct before wiring.
- When wiring, do not pull on the cables to avoid damaging their insulation. All cables should be left with a certain amount of bending space.

- Take the necessary auxiliary measures to minimize the stress on the cable.
- The length of the screws should be selected appropriately; excessively long screws may affect the insulating properties of the device.
- Installation should prevent part of the heat-shrinkable sleeve from being pinched between the copper nose and the copper row, or it may result in poor contact or even damage to the equipment.
- After each step of the wiring operation, the wiring should be carefully checked to ensure that it is correct and secure.
- Incorrect wiring can lead to fire and combustion, so pay attention to the order in which the wiring components are connected.
- When connecting, make sure the connection is secure. Poor connections or oxidized contact surfaces can lead to localized heat build-up, which in turn may cause fire and combustion.
- After all electrical connections have been made, the wiring should be thoroughly inspected to verify proper wiring and then the incoming gaps should be sealed with fireproof mud to prevent small animals from entering.

4.4.6. DC Side Wiring

Before wiring the DC side, the following checks should be performed.

- Measure the open-circuit voltage of the battery/busbar bank, confirm positive and negative cable rods, and mark them.
- High-voltage insulated gloves must be worn before any operation.
- The open-circuit voltage of the battery pack is strictly prohibited to exceed the maximum DC input voltage of the outdoor energy storage cabinet, and too high an open-circuit voltage will cause damage to the outdoor energy storage cabinet.
- The positive and negative terminals of the battery pack are connected to the positive and negative copper rows of the outdoor energy storage cabinet correspondingly, and cannot be connected inversely.
- When it clicks, the cable terminals are fully inserted and the connection is complete.

Step 1: Connect the positive terminal of the HV control box to the positive terminal of BAT1.

Step 2: Connect the battery modules in series, from the negative terminal ofBAT1 to the positiveterminal of BAT2, and th en connect the BAT1-BAT15's insequence.

Step 3: Connect the negative terminal of the HV control box to the negative terminal of the BAT15.

The final battery power line connection diagram, shown in Figure 4.6

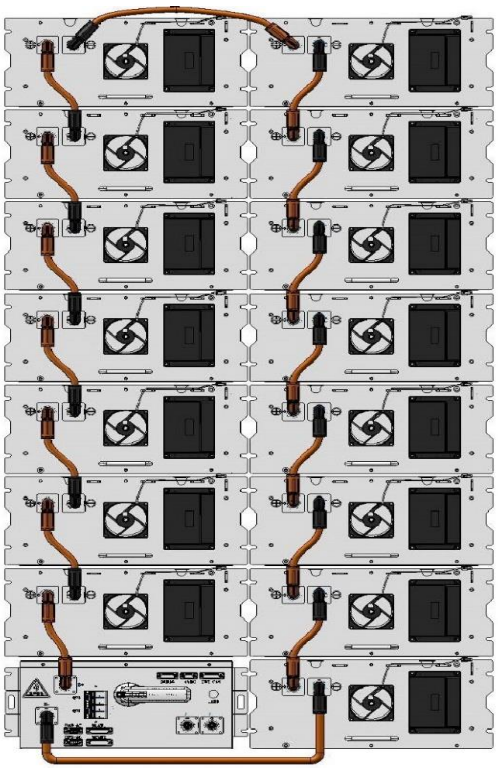


Figure 4.6: Diagram of Power Line Connections

Step 4: Connect the positive output terminal (P+) and negative output terminal (P-) of the HV control box to the positive and negative terminals of the PCS, respectively.
Connect its positive terminal to the inverter's battery positive terminal (B+), and its negative terminal to the inverter 's battery negative terminal (B-). As shown in figure 4.7.

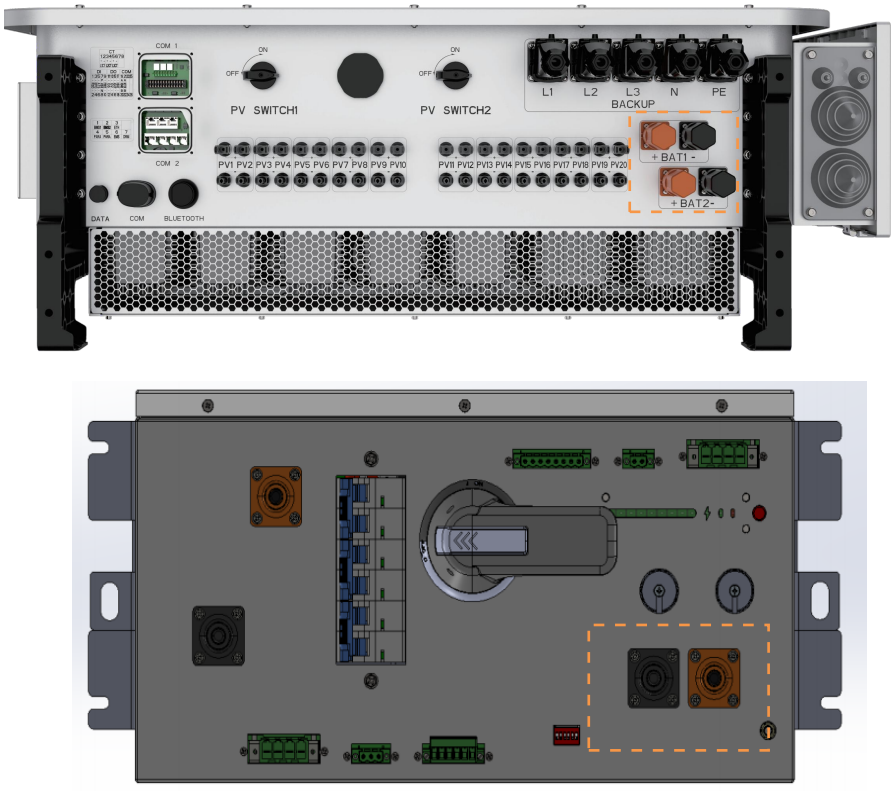


Figure 4.7: Single-Line Diagram

4.4.7. AC wiring

Before turning on the AC side, perform the following checks:

1. Measure the AC line voltage to ensure that the AC line voltage is within the normal AC voltage range of the energy storage outdoor cabinet.
2. Confirm the cable phase sequence and mark it.
3. Before wiring, ensure that the grid-side distribution circuit breaker is in the disconnected state and that both AC and DC disconnect switches are in the disconnected state.

The procedure for wiring the AC side cable is as follows:

1. Confirm that the grid distribution switch on the back stage of the AC side of the energy storage outdoor cabinet is off.
2. Verify that both the AC and DC disconnect switches of the energy storage outdoor cabinet are disconnected.
3. Determine the phase sequence of the AC connection cable and mark it.
4. Select the appropriate size of the bolts, and use a wrench to fix and connect the "L1" phase, "L2" phase, "L3" phase and "N"phase cables respectively to the grid connection circuit breakers QF3 of the grid connection cabinet, as shown in Figure 4.8.

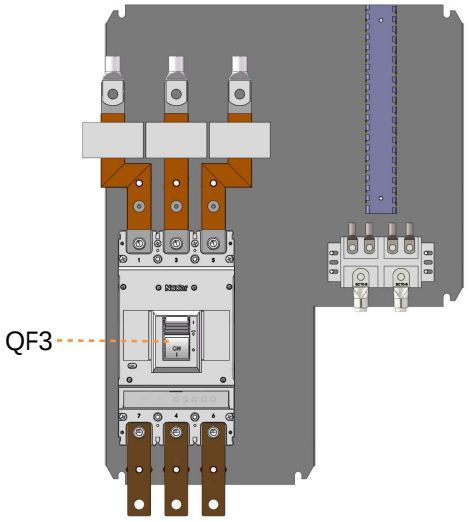


Figure 4.8: Single-Line Diagram

5.1. Personnel protection

Relevant operators must wear personal protective equipment (PPE) such as insulated gloves, goggles, safety gloves, helmets and safety shoes as shown in Figure 5.1.

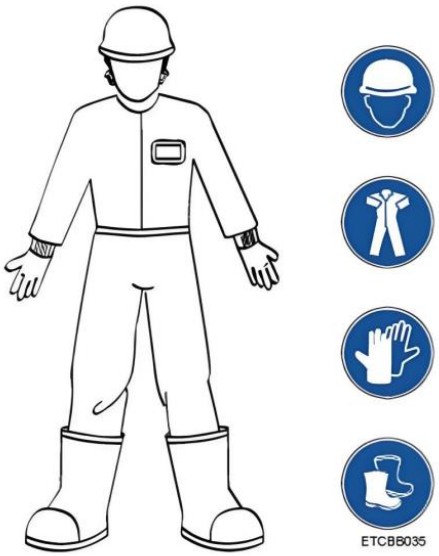
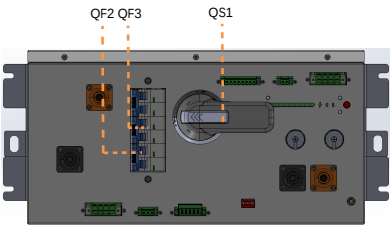


Figure 5.1 Illustration of Protective Equipment

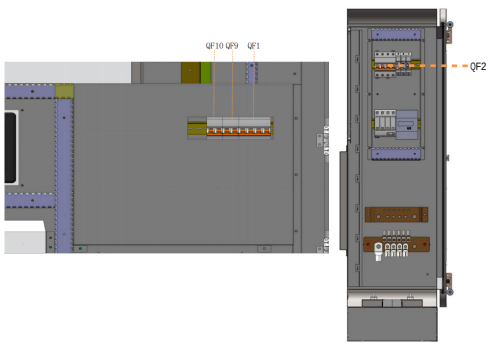
No.	Switch	Type	Switching State
1	QF2 (power supply of control system)	Breaker	turn off (electric switch)
2	QF3 (fan power supply of control system)	Breaker	turn off (electric switch)
3	QS1 (output of battery system)	Isolation switch	turn off (electric switch)
4	Grid Tie Cabinet Load Circuit Breaker	switch	turn off (electric switch)



5.2. Pre-opening check

Confirm the switching status as shown in Table 6.1 before turning on the power. Check the status of each switch listed in the table and put a warning sign "Commissioning/Maintenance, No Closing" on the operating position of the equipment; meanwhile, lock the grid-connected cabinet to prevent other personnel from mis-operation.

No.	Circuit Breaker	Function
1	QF1	Main switch for control section
2	QF2	Surge protector (lightning arrester) switch



No.	Circuit Breaker	Function
3	QF3	Main incoming circuit breaker
4	QF5	Load-side circuit breaker
5	QF7	Generator-side circuit breaker
6	QF9	Air conditioner circuit breaker
7	QF10	Switching power supply circuit breaker (24V power)

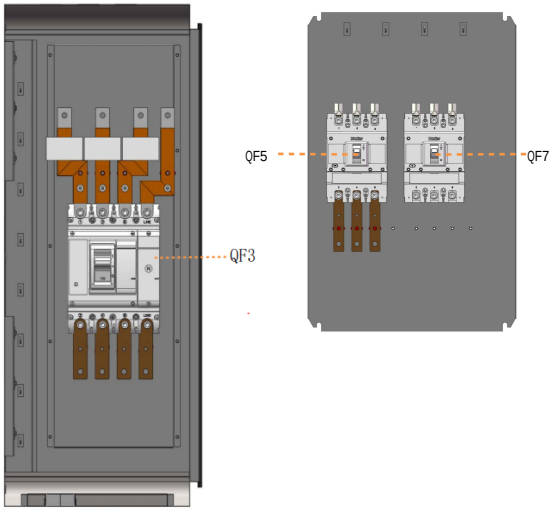


Table 5.1: HV48300 Max SE Pre-Operation Switching Status

5.3. Power-on operation

1. The operation must be performed by a professional electrical technician in compliance with local codes, while personal protection must be provided during operation. Specific personnel requirements can be found in the instructions in 6.1 above.
2. In the process of powering up, it should be observed while powering up, and the abnormal phenomenon is found that the battery is immediately powered down, and the reason is identified and solved.The battery should be powe red up immediately when abnormalities are found,and the causes should be identified and solved.

5.3.1. Startup sequence:

1. After all wiring is connected, close the QF2 surge protector switch to activate the lightning arrester.
2. Switch on QF3 and let the power grid supply power to PCS. The screen of one meter will light up.
3. Long press the leftmost button on the UPS, and release the button when the right side of the UPS screen displays 110-120,then the UPS startup successfully.

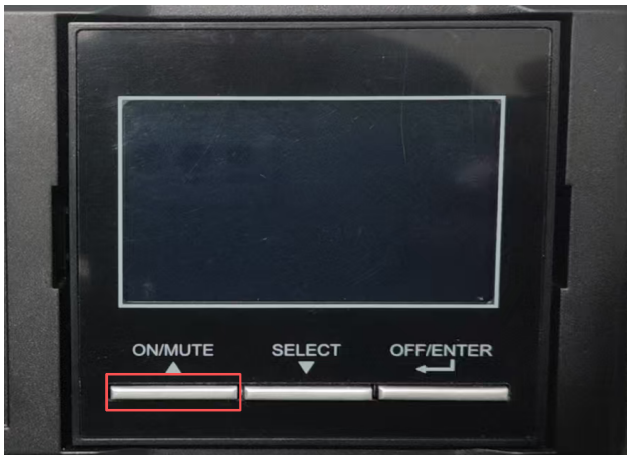


Figure 5.2: UPS Power On Button

4. Switch on the QF10 switch and the switch on the BCU in sequence.Then press the switch button in the upper left corner of BAU,and the system startup is complete.
5. Switch on the QF5 switch, start the control power supply while supplying power to the emergency load, and the

screen of an electric meter will light up.

6. Switch on the QF1 switch to supply power to the control section.
7. Switch on the QF9 switch and turn on the air conditioner.
8. If a diesel generator is connected, after connecting the generator to the hybrid inverter, close QF7 and the screen of an electric meter will light up.

5.4. Power-down operation

1. The operation must be performed by a professional electrical technician in accordance with local codes, while personal protection must be provided during operation. Specific personnel requirements can be found in the description in 1.1 above.
2. Prerequisites for power down, when the original operating state of the system is grid-connected, the system is connected to the grid and the system is running with power.

5.4.1. Shutdown Sequence:

1. When HV48300 Max SE is not running, long press the button switch in the upper left corner of BAU ,switch off QF9, QF 10 switches.
2. Switch off all the switches on the BCU.
3. Long press the button on the far right side of the UPS until the numbers on the screen changes, then release the button to successfully turn off the UPS.

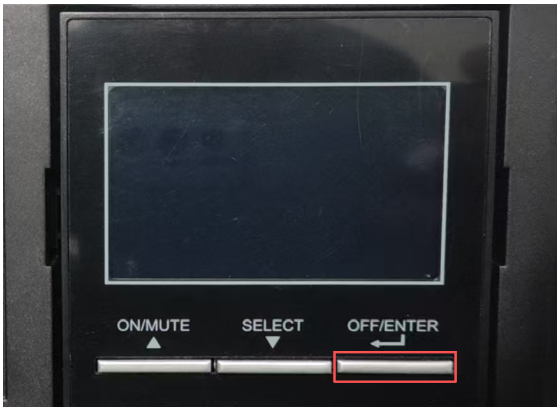


Figure 5.3: UPS Power Off Button

4. Switch off QF1 switch.
5. Switch off the QF5 and QF6 switches, and the screen of one meter will turn off.
6. Switch off QF3 and QF4 switches, one meter screen will turn off.
7. Switch off QF2 switch.
8. If a diesel generator is connected, wait until the generator is turned off before disconnecting QF7 and QF8, and the scr een of an electric meter will turn off.

Regular maintenance keeps the integrated energy storage plant in top condition and extends its service life.

CAUTION

Contact with energized parts may cause serious injury or even death. Before starting the cleaning and maintenance work, you must stop the equipment and cut off the power supply to make sure that the equipment is not in working condition; check to make sure that all the threaded connectors are tightened; the maintenance personnel is a trained and qualified professional with electrical related expertise and electrician's license; the maintenance personnel should wear personal protective equipment.

6.1. Maintenance Cycle

The maintenance intervals of the energy storage system are shown in Table 6.1

cyclicality	Maintenance projects
Every 6 months	Check electrical connections
Every 6 months	Clean power cables
(increased cleaning frequency depending on the amount of dust in the environment)	Cleaning Dust Mesh
Every 6 months	Cleaning the fan
Every 6 months	Checking the appearance of equipment, ventilation and airtightness of equipment rooms
Every 6 months	Checking PCS operational and historical parameters
Every 6 months	Measuring the temperature rise of power cables
Every 6 months	PCS maintenance

Table 6.1 Maintenance Projects and Cycles

6.2. Check Electrical Connections

Regularly check electrical connections for firmness and reliability. Inspect the Prefabricated Generating Station every 6 months. Locations to be inspected include:

1. Before performing maintenance, always make sure to disconnect all power sources to prevent electric shock;
2. Check the connection of the medium-voltage cables to see whether the bolts at the cable connections are loose, as well as whether there are phenomena such as melting, blackening, corrosion, etc.; if any of the above occurs, tighten the bolts or replace them with bolts of the same specifications in a timely manner;
3. Check whether the copper bar and cable connection are reliable; check whether the screws connecting the cable are loose and whether there is melting, blackening, corrosion, etc.; if the above situation occurs, tighten the bolts or replace the bolts with the same specifications in time;
4. Check whether the connection of the low voltage signal cable in the DC low voltage control panel is reliable, and whether the communication cable is loose. If the cable is loose, tighten it promptly.

6.3. Cleaning the power cord

Be sure to clean the power cord every six months. When cleaning the power cord, please note the following:

1. Before performing maintenance, always make sure that all power sources are turned off to avoid the risk of electric shock;
2. To avoid rusting of the cable connection area, do not use conductive liquids such as water to clean the power cord, and do not use any wet cloth to clean the power cord connector;
3. Remove dust from the insulation of the power cable with a dry cloth or dry brush, and clean the metal connectors and fixing screws with a dry brush;
4. The copper busbar connected to the power cable and the magnetic component connector also need to be cleaned of dust;
5. If any of the fixing bolts are rusty, replace them promptly.

6.4. Clean the fan.

Be sure to clean the fan every 6 months. When cleaning the fan, please note the following:

1. Before cleaning and replacing the dust wipes, make sure that all power sources are turned off to avoid the risk of electric shock.
2. Use a vacuum cleaner or air gun to clean the appearance of the fan and the blades at the dust and dirt, such as found broken fan blades, abnormal noise, unable to rotate and other abnormalities need to replace the fan.

6.5. Check Device Status

After the integrated energy storage plant has been in operation for 6 months, it is necessary to inspect its appearance as well as the ventilation and sealing between the equipment. Please note the following points during the inspection:

1. Check the appearance of the equipment for obvious deformation, dents, cracks and rust;
2. Check for foreign matter blockage in the air ducts at the air inlet and outlet of the PCS module;
3. Check whether the waterproof rubber strips of the front and rear door panels are cracked or detached.

Note: If any abnormality is found during the above inspection, please deal with it in time to avoid converter failure due to prolonged idling.

6.6. Check PCS Status

After the integrated energy storage power plant has been put into operation for 6 months, it is necessary to check the operation and historical parameters of the PCS. Through the monitoring backend of the power plant or our company's monitoring backend, check the real-time data of the running PCS to see if there is any abnormality in voltage, current, power, power factor and other related data. In addition, check its historical records to see if there are any abnormal alarms or faults.

6.7. Measuring cable temperature

After 6 months of operation of the integrated energy storage plant, it is necessary to check the temperature rise of the PCS DC and AC power cables.

Please note the following points during the inspection:

1. Use a thermal imaging analyzer to scan the DC and HV cables of the PCS in operation and check the DC and AC power cables of the equipment for abnormal temperatures. If abnormal temperatures are found in the power cables, take prompt action to prevent major malfunctions;
2. In the case of an abnormal increase in temperature of power cables, be sure to disconnect all power sources while handling the fault to avoid the risk of electric shock.

6.8. System Storage Requirements

1. Store on a level floor with the door closed tightly.

2. Temperature of storage environment: -30℃～ +60℃, relative humidity: 5% RH~95% RH.
3. SOC interval for storage battery storage: 48%～ 51%.
4. Perform inspections of the energy storage system every three months and keep records of the inspections.
5. Do battery maintenance on the system every three months to prevent causing battery damage.
6. Before the first use of the long-playing system, in order to activate the battery system needs to do at least one full charge, in order to restore the performance of the battery to the best state.

6.9. Battery Maintenance

6.9.1. Maintenance procedure

Option 1 (recommended when the battery system SOC is at the low end)

1. Discharge the battery system to the cut-off condition (average cell voltage＜ 3.1V or minimum voltage＜ 2.8V), then stop discharging and leave it for 1 hour.
2. Automatic full charging of the battery system (maximum cell voltage > 3.6 V), after charging, leave for 1 hour.
3. Stop discharging the battery system to 50%.

Option 2 (recommended when battery system SOC is at the high end)

1. Automatic full charging of the battery system (maximum cell voltage > 3.6V), after charging, leave it for 1 hour.
2. Discharge the battery system to the cut-off condition (average cell voltage＜ 3.1V or minimum voltage＜ 2.8V), then stop discharging and leave it for 1 hour.
3. Stop charging the battery system to 50%.

6.10. Battery Cluster Replacement

The battery cluster replacement procedure and requirements are as follows:

1. The operation must be performed by a professional electrical technician in accordance with local codes, while personal protection must be provided during operation. Specific personnel requirements can be found in the description in 1.1 above.
2. De-energize the equipment, ensuring that the grid-side distribution circuit breaker is in the disconnected state and that both the AC and DC disconnect switches are in the disconnected state.
3. Remove the battery cluster power and communication harnesses, and remove the front and rear battery cluster retaining bolts and front bezel
4. Remove the old battery using a forklift in conjunction with the Battery Cluster Installation Tool
5. Install the new battery cluster into the storage cabinet.
6. Reconnect the battery cluster power harness and communication harness to complete the battery cluster installation

6.11. Maintenance of firefighting systems

Open the cabinet door and observe that the temperature and smoke sensors are clean and undamaged in appearance. Low voltage on the outdoor cabinet, observe the temperature and smoke sensor indicators flashing every few seconds, i.e., normal operating conditions.

Chapter 7
Site Description

7.1. Site Selection Requirements

1. The installation level should be higher than the highest recorded water level in the area and at least 300mm above the horizontal ground level, and the installation location should not be in a low-lying area.
2. The energy storage system or energy storage plant must be located in an environment free from the risk of ignition and explosion.
3. Choose a well-ventilated place.

Site locations should avoid scenarios that are not recommended by industry standards and regulations, including, but not limited to, the following lots, districts, and places:

1. Strong vibration, strong noise sources and strong electromagnetic field interference areas.
2. Places that produce or have dust, fumes, harmful gases, corrosive gases, etc.
3. Places that produce or store corrosive, flammable and explosive substances.
4. Places with underground facilities.
5. There is rubber soil, weak soil layer and other adverse geological conditions, easy to accumulate water and easy to sink the ground.
6. Cisterns, water landscaping, and underneath water intake houses.
7. Earthquake faults and seismic zones with an intensity of defense higher than nine degrees.
8. Sections with direct hazards such as mudslides, landslides, quicksand, and caves.
9. Within the boundaries of mining trap (misalignment) zones.

7.1.1. Space Requirements

The minimum space requirements for installing O&M are shown in Figure 7.1 below.

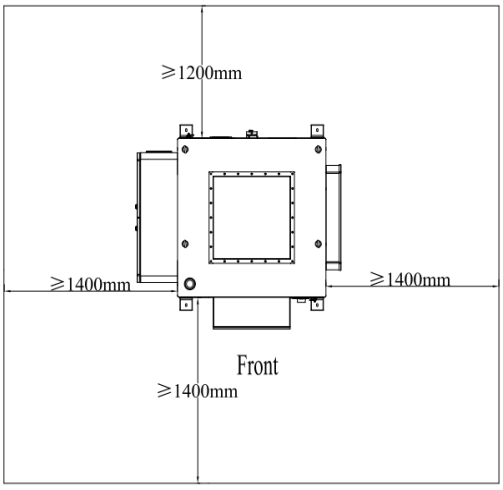


Fig.7.1 Installation space diagram

7.1.2. Foundation Requirements

1. The energy storage system must be installed on concrete or other noncombustible surfaces, and the mounting plane must be level, firm, and flat with sufficient bearing capacity. The installation plane must be level, firm, and flat, with sufficient bearing capacity, and depressions or tilting are prohibited.
2. The foundation plan is not to be taken as final construction drawings and is for reference only, please contact our product manager for details.

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