

User Manual

HY Tech

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1. About this Manual

1.1 Applicability

Please read the product manual carefully before installation, operation or maintenance. This manual mainly introduces the product information, installation and wiring, configuration and debugging, troubleshooting and maintenance of the outdoor C&I energy storage system (hereinafter referred to as the energy storage system). This manual is applicable to the following energy storage system models :

HY-129kWh-50KW

1.2 Target Group

This manual is suitable for those who transport, install, and operate the integrated PCS. Qualified persons must have the following skills:

- Have certain electronic, electrical wiring, and mechanical expertise, and be familiar with electrical and mechanical schematic diagrams.
- Be familiar with the composition and working principle of the integrated PCS; be familiar with the design and working principle of the integrated PCS and its front and back level equipment.
- Have received professional training related to electrical equipment installation and commissioning.
- Understand how the product works and how to operate the product.
- Have emergency response capabilities for dangerous or unexpected situations during installation or trial operation.
- Be familiar with the relevant standards and codes of the country where the project is located.
- Understand and follow this manual and all safety information.

1.3 Symbols Used

Symbols used have the following meaning:

	**DANGER!** 'Danger' indicates a hazard with a high level of risk that, if not avoided, will result in death or serious injury.
	**WARNING!** 'Warning' indicates a hazard with a medium level of risk that, if not avoided, will result in death or serious injury.
	**CAUTION!** 'Caution' indicates a hazard with a low level of risk that, if not avoided, could result in minor or moderate injury.
NOTICE	**NOTICE!** 'Notice' indicates a situation that, if not avoided, could result in equipment or property damage.

	**NOTE!** 'Note' provides tips that are valuable for the optimal operation of the product.

Table 1-1 Symbols used

1.4 Designation in the Document

Designation in this document	Designation in this document complete description
STS	Static Transfer Switch
EMS	Energy Management System
BMS	Battery Management System
BMU	Battery Management Unit
BCU	Battery Control Unit
PCS	Power Conversion System
SOC	State of Charge
PDU	Power Distribution Unit

Table 1-2 Designation in this document

2.Safety

2.1 General Safety

The energy storage system should be used in an environment that meets the requirements of the design specifications. Failure to follow proper usage guidelines may result in equipment malfunction, component damage, personal injury, property damage, and other issues. Please note that the energy storage system's quality assurance does not cover any such problems. Installation, operation, and maintenance of equipment should comply with local laws, regulations, and norms. The safety precautions in the manual are intended only as a supplement to local laws, regulations, and norms. The company shall not be liable in the event of any of the following circumstances.

- The installation and use environment exceeds the provisions of relevant international, national and regional standards.
- Does not operate under the conditions of use described in this manual.
- Disassemble, alter the product or modify the software code without authorization.
- Failure to follow the product's operating instructions and safety warnings, and documentation.
- Equipment damage caused by abnormal natural environment (force majeure, such as earthquakes, fires, storms, floods, mudslides, etc.).
- Damage caused by storage conditions not meeting the requirements of the product documentation.
- Damage to the hardware or data of the device due to customer negligence, incorrect operation, or intentional damage.
- System damage due to third-party or customer reasons, including relocation and installation systems that do not meet the requirements of this manual and damage caused by adjustments, alterations, or removal of identifying marks that do not meet the needs of this manual.
- Defects, malfunctions, or damages resulting from acts, events, omissions, or accidents beyond the seller's reasonable control, including power or electrical failures, theft, war, riot, civil commotion, terrorism, intentional or malicious damage, etc.
- The installation and various operations of the integrated PCS must comply with the relevant standards and regulations of the country/region where the project is located.

- The battery cabinet is equipped with an automatic fire extinguishing system and the fire switch should not be triggered unless it is an emergency.

2.2 Important Safety Instructions

	**DANGER!** The equipment has a high voltage, and irregular operation may cause electric shock or fire, resulting in death, personal injury, or property damage. Please follow the operation sequence and safety precautions given in this manual and other related documents, and standardize the operation: ◆ Please check that the cable connection is fastened before the device. Inspect the machine for damage, such as holes, dents, or other signs of possible damage inside. Check that the internal parts of the equipment are kept the same, and it is forbidden to change the structure and installation order of the equipment without authorization. ◆ It is forbidden to clean the electrical parts inside the equipment with water. If you find liquid entering the device, press the emergency stop immediately off and notify the site management. ◆ It is forbidden to carry out installation, wiring, maintenance, and replacement operations with electricity. Contact should be measured before touching any conductor surface or terminal point voltage, and confirm that the protective ground wire of the equipment or parts to be serviced is reliably grounded to confirm that there is no risk of electric shock. ◆ Do not approach the equipment except those operating the equipment. The device has not been installed or confirmed by a professional Yes, do not power up the device. When powering up for the first time or operating the main circuit live, at least two personnel must be on site.



WARNING!

◆ Battery pack Leakage

If the battery packs leak electrolytes, contact with the leaking liquid or gas should be avoided. The electrolyte is corrosive, and the contact may cause skin irritation and chemical burns. If one is exposed to the leaked substance, do these actions:

· Inhalation: Evacuate the contaminated area, and seek medical help immediately.

· Eye contact: Rinse eyes with flowing water for 15 minutes and seek medical help immediately.

· Skin contact: Wash the affected area thoroughly with soap and water and seek medical help immediately.

· Ingestion: Induce vomiting and seek medical help immediately.

◆ The battery packs and their components should be protected from damage when transporting and handling.

· Do not impact, pull, drag, or step on the battery packs.

· Do not insert unrelated objects into any part of the battery packs.

· Do not throw the battery pack into a fire.

· Do not soak the battery packs in water or seawater.

· Do not be exposed to strong oxidizers.

· Do not short-circuit the battery packs.

· The battery packs cannot be stored at high temperatures (more than 50°C).

· The battery packs cannot be stored directly under the sun.

· The battery packs cannot be stored in a high-humidity environment. Do not use the battery packs if it is defective, or cracked, broken or otherwise damaged, or fails to operate.

· Do not attempt to open, disassemble, repair, tamper with, or modify the battery packs. The battery packs are not user-serviceable.

· Do not use cleaning solvents to clean the battery packs.



CAUTION!

◆ Risk of injury due to the weight of the battery pack injuries may result if the battery pack is lifted incorrectly or dropped while being transported or installed.

· Transport and lift the battery pack carefully. Take the weight of the battery pack into account.

· Wear suitable personal protective equipment for all work on the energy storage system.

◆ If the battery has not been installed within 6 months of shipment from the factory, the battery must be recharged until the State of Charge (SOC) is greater than 50% for maintenance.

NOTICE

CAUTION!

◆ Firefighting Measures

· The battery packs may catch fire when it is put into the fire. In case of a fire, please ensure an ABC or carbon dioxide extinguisher is nearby. Water cannot be used to extinguish the fire. Full protective clothing and self-contained breathing apparatus are
for the firefighters to extinguish the fire.

◆ Damage to the energy storage system due to under voltages

· If the energy storage system doesn't start at all, please contact HY Tech after-sales service within 48 hours. Otherwise, the battery could be permanently damaged.

	**NOTE!** ◆ Electrical installation and maintenance must be carried out by competent electricians according to local regulations.

Table 2-2 Important safety instructions

2.3 Explanation of Symbols

Symbols on Label:

Symbol	Explanation
	Do not disconnect or disassemble by untrained personnel.
	Do not short circuit.
	Do not expose the battery to open flame, heat or sparks, as there is a risk of fire or explosion.
	Keep the battery packs away from children.
	Observe the documents Observe all documents supplied with the system.
	Warning! Metal parts of the batteries are always under voltage. Do not short-circuit the batteries! In case of a short-circuit may flow very high currents and cause burns. By Touching conductive parts can cause cardiac arrhythmia and shock.
	The battery contains corrosive electrolytes. Please avoid contact with the leaked substance.
	WEEE designation Do not dispose of the system together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.

Table 2-3 Explanation of symbols

2.4 Electrical Safety

2.4.1 Wiring Requirements

- Please select the cable that meets the requirements of local laws and regulations. The same type of cables should be tied together, different types of cables should be placed separately, and mutual winding or cross-laying should be prohibited.
- When the wiring is completed or left for a short time during the wiring process, it is necessary to immediately block the cable port and close the cabinet door to avoid the entry of small animals.
- The cables used in the energy storage system must be firmly connected and well insulated, and the specifications must meet the requirements. The position of the cable through the pipe or the wire hole must be protected to avoid the cable being damaged by sharp edges, burrs, etc.
- After the completion of the cable connection, it is necessary to use the cable bracket and the cable clamp to be reliably fixed. The cable in the backfill soil area ensures that it is closely fitted to the ground to prevent deformation or damage caused by the force of the cable when the backfill soil is loaded.
- The use of cables in high-temperature environments may cause aging and damage to the insulation layer and between the cable and the heating device or the periphery of the heat source area.
- In order to ensure the safety of construction, all cables should be installed above 0 ° C. When handling cables, especially in low-temperature environments, they should be taken lightly.

2.4.2 Grounding Requirements

- It is prohibited to destroy the grounding conductor. The grounding body of the equipment should be permanently connected to the protective grounding grid. Before operating the equipment, the electrical connection of the equipment should be checked to ensure that the equipment is reliably grounded.
- The grounding impedance of the equipment meets the requirements of national standard IEC62477-1 and local electrical standards.
- It is prohibited to operate the equipment when the grounding conductor is not installed. When installing the equipment that needs to be grounded, the protective ground wire must be installed first; when the equipment is removed, the protective ground wire must be finally released.
- When a ground fault occurs in the integrated PCS, there may be fatal high voltage in the parts that are not charged originally. Dangerous if accidentally touched! Before operation, please ensure that there is no ground fault in the system, and also take relevant protective measures.

2.4.3 Live Line Measurement

There are high voltages in the equipment in the integrated PCS, and accidental touch may cause fatal electric shock hazards. Therefore, during live measurement, you should:

- Take appropriate protection (such as wearing insulating gloves, etc.).
- There must be an accompanying person to ensure personal safety.

2.4.4 Maintenance Requirements

- Before connecting or removing the cable, the protective switch of the corresponding circuit must be disconnected.
- Use the multimeter of the corresponding voltage level to check whether it is charged to ensure that the device has been completely powered off.
- If there is a charged body nearby, please use an insulation board or insulation belt to block or wrap it.
- After the grounding wire is used to reliably connect the circuit to be repaired with the grounding circuit, the operation and

maintenance is carried out.

	**WARNING!** Before connecting the cable, it is necessary to confirm that the line label identification is correct before connecting. If the device has multiple inputs, all inputs of the device should be disconnected, and the device can be operated after the device is fully powered down. After the overhaul is completed, the grounding wire between the overhaul circuit and the grounding circuit is disassembled.

2.4.5 Mechanical Safety

- The bottom apron must be removed when forklifting without wooden boxes. Take-off and landing should be taken lightly to avoid impact or vibration.
- In the process of transportation, the center of gravity of the box should fall in the middle of the two forks on the forklift. Prohibit long-distance handling or inversion, tilt.
- When transporting equipment, it may cover the operator's line of sight due to the large volume of the equipment, and it is necessary to arrange auxiliary personnel to assist in the completion.
- In order to ensure the safety of drilling outside the equipment, the appropriate position should be selected before drilling to ensure that it will not cause short circuits and other effects.
- In the process of drilling, the equipment should be blocked to prevent the debris from falling into the equipment, and the debris should be cleaned in time after drilling.
- When handling equipment by hand, it is necessary to prepare for load-bearing, wear protective gloves, wear anti-shoes, and other safety protective equipment.
- Carefully move the device during the equipment handling process to avoid impact or drop. Avoid scratching the surface of the equipment and damaging parts or cables.

2.4.6 Battery Safety

The Company shall not be liable for any damage to the batteries provided by the Company due to the following reasons:

- Due to customer reasons, the battery is not charged and accepted in time, resulting in overdue storage, capacity loss, or irreversible damage.
- Due to improper operation or not in accordance with the requirements of the battery caused by the fall of mechanical damage, leakage, rupture, etc.
- The customer or third party did not inform the company to change the battery usage scenario. Including but not limited to self-connecting the battery to an additional load, mixing with other brands of batteries, mixing with batteries with different rated capacities, etc.
- The direct damage to the battery is caused by the operating environment of the field equipment or the external power parameters that cannot meet the requirements of the normal operating environment. Including the actual operating temperature of the battery is too high or too low, the power grid is bad, and the power outage is frequent.
- Customers do not correctly set the battery operation management parameters or improper maintenance, resulting in frequent over-discharge of the battery, customer on-site expansion, or long-term inability to fully charge.
- The customer did not carry out the correct maintenance of the battery according to the operating manual of the supporting equipment, including but not limited to not checking whether the battery terminal screw is tightened regularly.
- The battery was stolen and lost.

- Battery beyond the warranty period.

Battery exception handling measures:

- When electrolyte leakage or abnormal odor occurs, avoid contact with the leaked liquid or gas. Non-professionals, please do not approach; please contact the professionals immediately.
- The electrolyte is corrosive, and contact may cause skin irritation and chemical burns. If you come into contact with the battery electrolyte, you need to immediately clean the contact area with a lot of water and soap and immediately seek medical help.
- After the battery drops (whether with packaging material or not), it is prohibited to continue to use. If the appearance is not obviously deformed or damaged and there is no obvious smell, smoke, or fire, under the premise of ensuring safety, the battery is transferred to an open and safe place for one hour for post-treatment, and contact the company's technical service engineer.
- When the battery has obvious odor, damage, smoke, and fire after falling, the personnel should be evacuated immediately and alerted in time. Professionals use fire protection facilities to extinguish the fire under the condition of ensuring safety.

2.4.7 Maintenance and Replacement

	**WARNING!** When installing, maintaining and overhauling the equipment, make sure that: The energy storage battery has been completely disconnected. Clear warning signs at the point of disconnection to ensure no accidental reconnection.

- It is forbidden to open the cabinet door in the weather of rain, snow, lightning, dust, fog, and so on.
- Before the parts are taken out of the cabinet, please make sure that the other pieces on the cabinet are not loose.
- During the maintenance of the equipment, insulating materials should be used to cover the live parts nearby.
- Before the fan is powered off and stops rotating, any item is prohibited from contacting the running fan (such as fingers, components, screws, etc.). Please do not power on the device before troubleshooting.
- During the live inspection of the system, attention should be paid to the danger warning signs on the equipment to avoid standing at the cabinet door.
- Devices other than battery packs must wait for about 15 minutes after powering down to ensure that the device is powerless before operating the machine.
- After the power components of the energy storage system are replaced, or the wiring is changed, manual wiring detection is required to avoid the abnormal completion of the system operation.
- If any battery packs are damaged, they must be replaced with new ones. Please ensure that the voltage of the replacement battery pack is the same as that of the other battery packs.
- After the relevant operations of maintenance and replacement, the cabinet door should be locked in time, and the key should be properly kept.

2.4.8 Arc Protection

	**WARNING!** In order to avoid unnecessary casualties and equipment damage, the product must be operated strictly according to the description in this manual. If the operation is improper, it may cause an arc hazard and may even cause fire, explosion, and other risks. The company will not be liable for accidents such as arcs, fires, explosions, and other accidents caused by failure to follow the signs or product manual.

Improper handling, as described below, may cause arcing, fire, explosion and other hazards inside the machine. In an accident, it must be handled by qualified professionals. If not handled properly, existing accidents may cause a broader range of malfunctions or accidents.

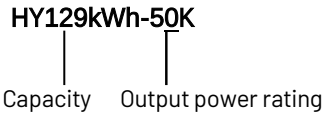
- Plug and unplug the DC side high-voltage cables of each device under power.
- Touch potentially live cable ends that are not insulated.
- Touch copper bars, terminals, or other parts inside the machine that may be live.
- Power cable connections are loose.
- Parts such as screws accidentally dropped into the power module.
- Improper operation by untrained and unqualified operators, etc.

Before working on the equipment, the area of operation must be pre-assessed for arc risk. If there is a risk of arcing:

- Operators must have received relevant safety training in advance.
- Try best to assess the area where shock may occur.
- Wear appropriate protective clothing before working in areas of potential electric shock.

3. Product Introduction

3.1 Model Description



3.2 Product Overview

HY129kWh-50KW series outdoor energy storage cabinet integrates an energy storage battery, PCS, energy management monitoring system, power distribution system, environmental control system, and fire control system. PCS is used to facilitate maintenance and expansion. Pre-maintenance of outdoor cabinets can reduce floor space and maintenance channels. It has the characteristics of safety, reliability, rapid deployment, low cost, high energy efficiency, and intelligent management.

In typical application scenarios, the operation strategy of an energy storage system is as follows:

Optical storage combination: real-time access to local load power, photovoltaic power generation priority spontaneous self-use, residual power storage; if the photovoltaic power is insufficient to provide local load, the battery is preferred to store energy.

3.3 System Chart

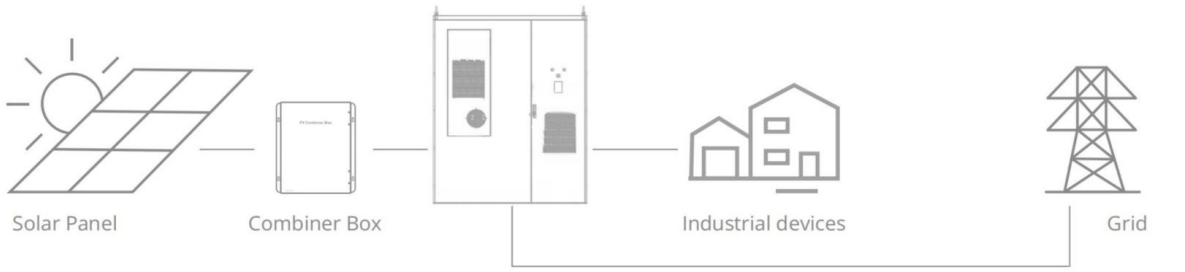


Figure 3-1 Energy storage cabinet system block diagram

3.4 Product Characteristic

3.4.1 Mechanical Parameters

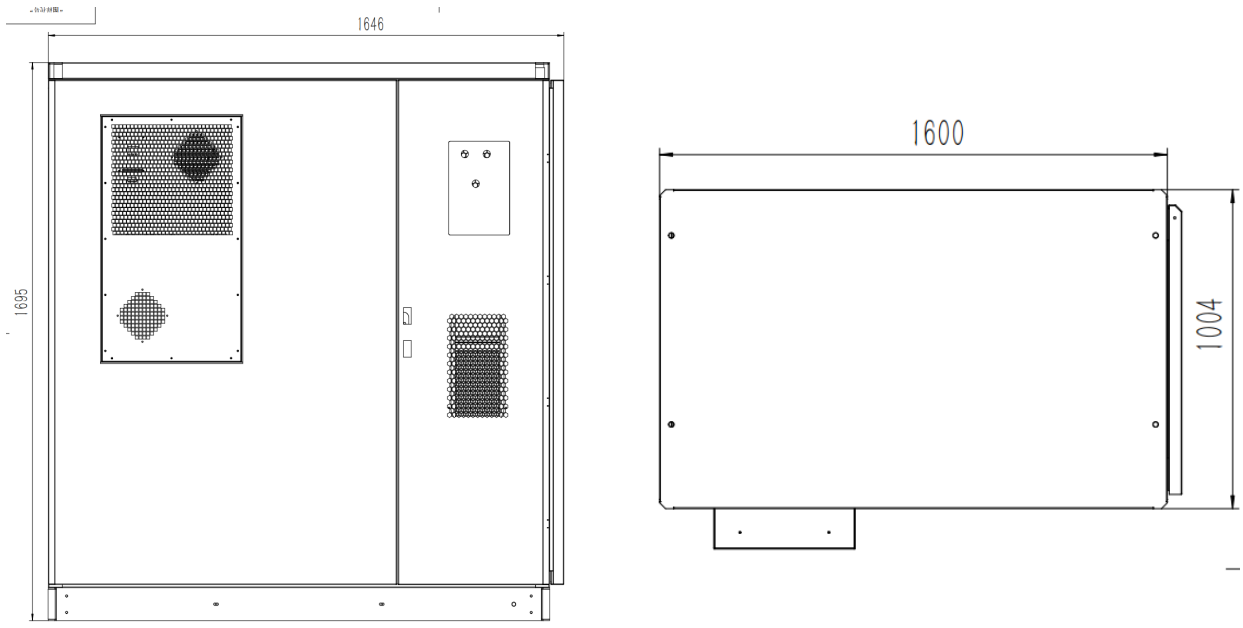


Figure 3-2 Battery cabinet diagram

3.4.2 Product Characteristic

System productization, integrated energy storage battery, PCS, energy management monitoring system, power distribution system, environmental control system, fire control, etc., to fully control the system operation status and risk.

Configure rack-type modular PCS, support multi-machine parallel, good scalability; according to the system capacity requirements of microgrid and other scenarios, the number of PCS modules and the total battery power can be selected, and the typical configuration is 100kWh/129kWh/209kWh/215kWh.

IP54 protection level is the perfect response to all types of outdoor weather.

The door-mounted embedded integrated air conditioner does not occupy the cabinet space, improves the available space of the outdoor cabinet, and the top structure has a better waterproof effect.

The local control screen can realize diversified functions such as system operation monitoring, energy management strategy formulation, and remote equipment upgrade.

3.5 Technical Data

Battery Pack information	
Name:	Battery Pack
Model:	Pack-16280
Type:	Rechargeable Lior Li-ion
Battery Cell	
Cell Technology:	Li-ion (LFP)
Capacity(Ah):	280
Cell Quantity(pcs):	16
Battery Parameters	
Normal Voltage (Vdc):	51.2
Rated Capacity(Ah):	280
Rated Energy(Wh):	14336
Max Voltage(Vdc):	58.4
Max Charge Voltage(Vdc):	56.8
Discharge Cut-off Voltage(Vdc):	43.2
Standard Charge Current(A):	140
Max Charge Current(A):	155
Standard Discharge Curent(A):	140
Max Discharge Current(A):	155
Others	
Designaton:	795*495*230mm
Communication:	RS485/CAN
Operation Temperature(℃):	0~50
Storage Temperalure(℃):	-20~50
Humidity:	<95%
Altitude(m):	<3000

Max. Efficiency	98.8%
Protection	
Reverse Connection Protection	Yes
DC Switch	Yes
Over-Temperature Protection	Yes
Grid Monitoring / Earthing Fault Detection	Yes
Insulation Monitoring	Yes
DC / AC Surge Protection	DC Type II; AC Type III
General Data	
Dimensions (W * H * D)	1600*1700*1000mm
Weight	2100kg
Topology	Transformerless
IP Protection	IP54
Operation Temperature Range	-20~55℃(>45℃) Dweating
Operation Humidity Range	0~95%(No Condensing)
Cooling Method	Intelligent Air Cooling
Max. Operation Altitude	3000m
Communication Port	RS485 / CAN
Standards	UN38.3; IEC/EN 62619; IEC/EN61000; IEC62477; IEC62109; EN50549-1; VDE4105; VDE0126

Table 3-1 Technical data

3.6 Parts Introduction

3.6.1 Battery pack

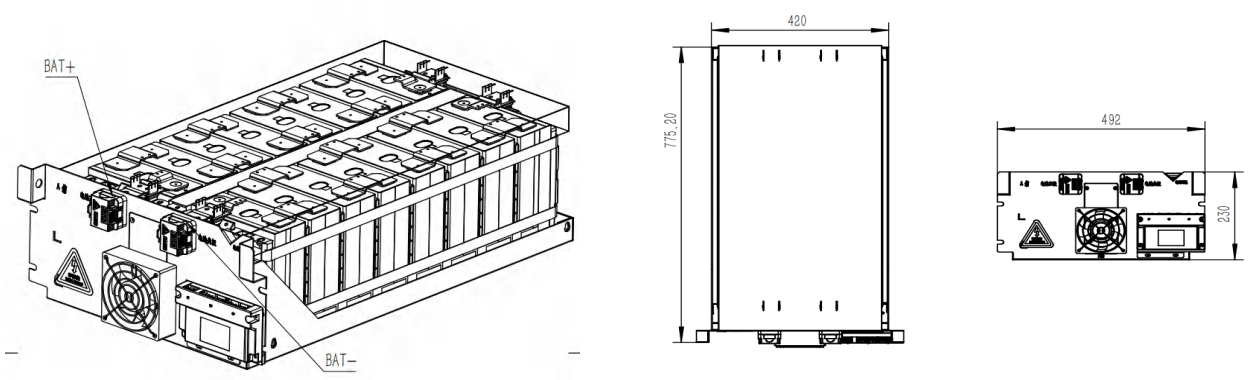


Figure 3-3 Dimensions of battery pack

Model	**pack 16280**
General parameters	
Dimensions(W * H * D)	492.0*230.0*775.2mm

Weight	110kg
Installation site	Outdoor
IP protection	IP20
Operation humidity	5%~95% (No condensing)
Operation temperature	-20℃~+55℃
Max. operation altitude	⩽ 3000m
Communication port	Ethernet; CAN
Communication protocol	CAN; MODBUS TCP / IP
Cooling method	Air conditioner
Standards	UN38.3; IEC61000
Technical parameters	
Battery type	LF280Ah
Total battery capacity	129kWh
Number of modules	16S1P*9
Nominal voltage	460.8V
Operating voltage range	360~ 525.6V
Charge / Discharge rate	⩽ 0.5C
Depth of discharge	95%

Table 3-2 Energy storage system data

3.6.2 Battery Management System

An energy storage management system consists of a battery management system (BMS) and an energy management system (EMS). The battery we choose comes with a BMS system, which is divided into two levels: BMU and BCU.

The BMU is located in the battery box, which completes the data acquisition of the single-cell information inside the battery box and uploads the data to the BCU. At the same time, the balance between the single cells in the battery box is completed according to the instructions issued by the BCU.

The BCU is in the main control box (PDU) and manages the battery cabinet. It accepts the detailed data uploaded by the BMU inside the battery, samples the voltage and current of the battery cabinet, calculates and corrects the SOC, and is responsible for the pre-charging and charging and discharging management of the battery cabinet and uploads the relevant data to EMS. BCU is responsible for the operation and management of the entire battery cabinet, receives the data uploaded by BMU, analyzes and processes it, and transmits the battery cabinet data to EMS.

The system communication is based on EMS. EMS uploads battery information to regulate PCS according to BMS and feedback on PCS status to BMS. Deye itself can be used as EMS.

3.6.3 PCS

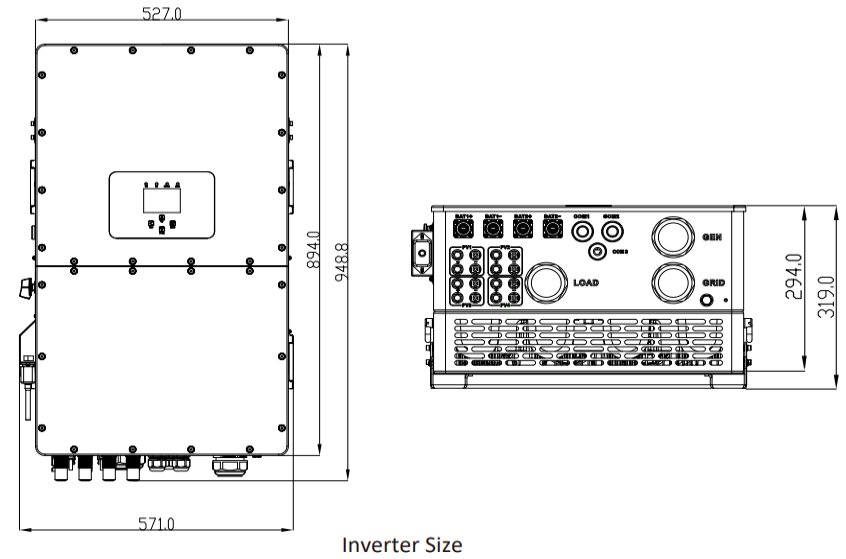


Figure 3-4 Dimensions of SUN-50K-SG01HP3-EU-BM3

Technical Data

www.deyeinverter.com

Model	SUN-29.9K-SG01HP3-EU-BM3	SUN-30K-SG01HP3-EU-BM3	SUN-35K-SG01HP3-EU-BM3	SUN-40K-SG01HP3-EU-BM4	SUN-50K-SG01HP3-EU-BM4
Battery Input Data					
Battery Type	Lithium-ion				
Battery Voltage Range (V)	160-800				
Max. Charging Current (A)	50+50				
Max. Discharging Current (A)	50+50				
Charging Strategy for Li-ion Battery	Self-adaption to BMS				
Number of Battery Input	2				
PV String Input Data					
Max. DC Input Power (W)	38870	39000	45500	52000	65000
Max. DC Input Voltage (V)	1000				
Start-up Voltage (V)	180				
MPPT Voltage Range (V)	150-850				
Rated DC Input Voltage (V)	600				
Max. Operating PV Input Current (A)	36+36+36			36+36+36+36	
Max. Input Short-Circuit Current (A)	55+55+55			55+55+55+55	
No. of MPP Trackers/ No. of Strings per MPP Tracker	3/2+2+2			4/2+2+2+2	
AC Input/Output Data					
Rated AC Input/Output Active Power (W)	29900	30000	35000	40000	50000
Max. AC Input/Output Apparent Power (VA)	29900	33000	38500	44000	55000
Rated AC Input/Output Current (A)	45.4/43.4	45.5/43.5	53.1/50.8	60.7/58	75.8/72.5
Max. AC Input/Output Current (A)	45.4/43.4	50/47.9	58.4/55.8	66.7/63.8	83.4/79.8
Max. Three-phase Unbalanced Output Current (A)	60	60	60	70	83.3
Max. Continuous AC Passthrough (grid to load) (A)	200				
Peak Power (off-grid) (W)	1.5 times of rated power, 10s				
Power Factor Adjustment Range	0.8 leading to 0.8 lagging				
Rated Input/Output Voltage/Range (V)	220/380V, 230/400V 0.85Un-1.1Un				
Rated Input/Output Grid Frequency/Range(Hz)	50/45-55, 60/55-65				
Grid Connection Form	3L+N+PE				
Total Current Harmonic Distortion THDi	<3% (of nominal power)				
DC Injection Current	<0.5% In				
Efficiency					
Max. Efficiency	97.60%				
Euro Efficiency	97.0%				
MPPT Efficiency	>99%				

Equipment Protection	
Integrated	DC Polarity Reverse Connection Protection, AC Output Overcurrent Protection AC Output Overvoltage Protection, AC Output Short Circuit Protection, Thermal Protection DC Terminal Insulation Impedance Monitoring, DC Component Monitoring, Ground Fault Current Monitoring Power Network Monitoring, Island Protection Monitoring, Earth Fault Detection, DC Input Switch Overvoltage Load Drop Protection, Residual Current (RCD) Detection, Surge protection level
Surge Protection Level	TYPE II(DC), TYPE II(AC)
Interface	
Communication Interface	WIFI, RS485, CAN
General Data	
Operating Temperature Range (℃)	-40 to +60°C, >45°C Derating
Permissible Ambient Humidity	0-100%
Permissible Altitude	2000m
Noise (dB)	≤65
Ingress Protection(IP) Rating	IP 65
Inverter Topology	Non-Isolated
Over Voltage Category	OVC II(DC), OVC III(AC)
Cabinet Size (WxHxD mm)	527×894×294 (Excluding Connectors and Brackets)
Weight (kg)	80
Type of Cooling	Intelligent Air Cooling
Warranty	5 Years/10 Years the Warranty Period Depends the Final Installation Site of Inverter, More Info Please Refer to Warranty Policy
Grid Regulation	IEC 61727, IEC 62116, CEI 0-21, EN 50549, NRS 097, RD 140, UNE 217002, OVE-Richtlinie R25, G99, VDE-AR-N 4105
Safety / EMC Standard	IEC/EN 61000-6-1/2/3/4, IEC/EN 62109-1, IEC/EN 62109-2

Table 3-3 PCS parameters

3.6.4 Environmental Control System

The energy storage system is equipped with environmental control units such as smoke detectors, water immersion sensors, and fire fighting, which can fully control the operation status of the system. Environmental control system diagram:

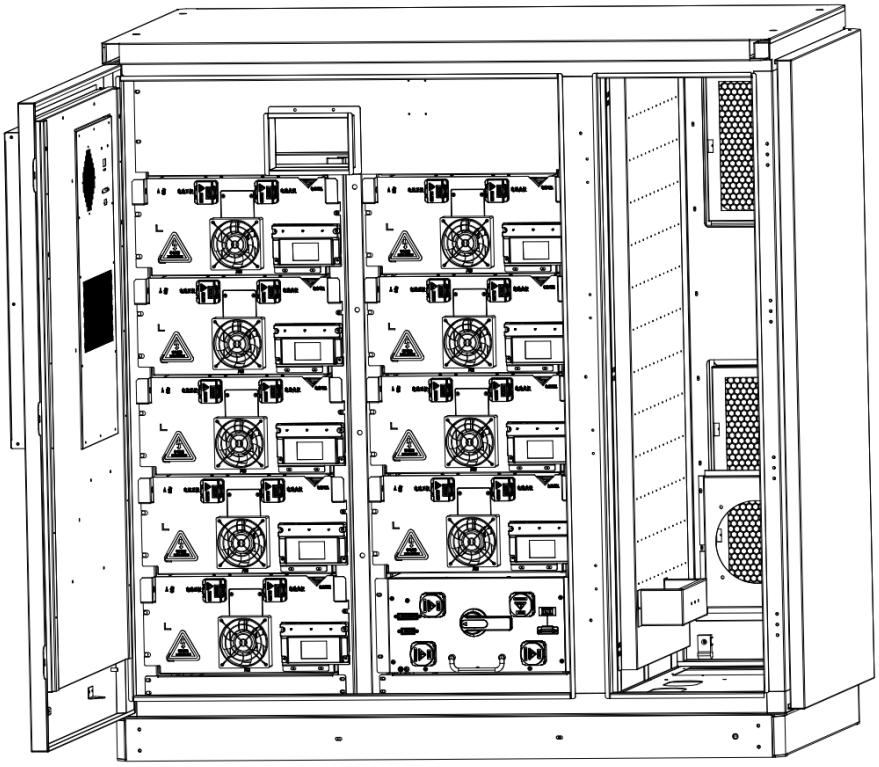


Figure 3-5

3.6.4.1 Smoke Detector

The detector is a non-coding type, which is directly connected to the DC power supply when working. When working normally, the working indicator light flashes. When the alarm is on, the alarm indicator light is on. The detector has a pair of output contacts, and the contacts are closed/disconnected after the alarm.

Model	**Smoke detector**
Operating voltage	DC9-33V, DC48V ; AC220V (Optional)
Static current	30-50 uA (DC24V)
Alarm current	52mA (DC24V)
Warning indication	Red LED
Operating temperature range	-20 ~ +60℃
Environmental humidity	⩽ 95%RH (Non-condensation)
Coverage area	When the space height is 6m ~ 12m, the protection area of a detector is 80 m^2 for the general protection site, and the protection area is 60 m^2 when the space height is below 6m.
Size (Diameter *Height)	100*42mm

Table 3-4 Smoke detector parameters

3.6.4.2 Water Sensor

The water sensor is a new type of water immersion transmitter installed on the split guide rail of the contact monitoring and protection probe, which is mainly used to determine whether there is a danger of water accumulation at the contact point of the examination.

Model	Water Sensor
Supply voltage	DC 24V (12V~36V)
Operating temperature range	-20℃ ~ 80℃
Environmental humidity	≤ 95%RH
False alarm rate	＜ 100ppm
Static power consumption	0.5W
Maximum alarm power consumption	1.8W
Sensitivity	Avoid using the neutral position, the factory setting defaults to 2 speeds. Gear level1: 0kΩ~4kΩ Gear level2: 0kΩ~10kΩ Gear level3: 0kΩ~22kΩ Gear level4: 0kΩ~300kΩ

Table 3-5 Water sensor parameters

3.6.4.3 Fire Protection System

Fire protection system is a new type of environmental protection fire product at the world's advanced level. Working principle: When the ambient temperature reaches the starting temperature of the heat-sensitive line or contacts the open fire, the heat-sensitive line spontaneously combusts and passes it to the aerosol series fire extinguishing device. After the Fire protection system receives the starting signal, the internal fire extinguishing agent is activated, and the nano-aerosol fire extinguishing agent is quickly generated and ejected to achieve rapid fire extinguishing.

Model	Fire protection system
Operating temperature range	-45℃ ~ 5 4 ℃
Environmental humidity	≤ 95%RH
Blowing time	≤ 14s
Spraying lag time	≤ 5s
Nozzle thermal spacing	Thermal spacing for 400°C, 200°C and 75°C is 0.05m, 0.12m and 0.3m respectively
Shell surface temperature	≤ 150℃
Name and content of oxidant	Potassium nitrate, silver nitrate 50% ~ 58%
Size(Width* Height * Depth)	68.5*255*46mm
Weight	860g ± 30g

Table 3-6 Fire protection system parameters

3.6.4.4 Travel Switch

The travel switch is used here to detect whether the cabinet door is closed or not. If the cabinet door is left open, an alarm message is displayed on the EMS. It works on the principle of switching control of circuits by applying mechanical force to the contacts.

3.6.4.5 External Air Conditioner

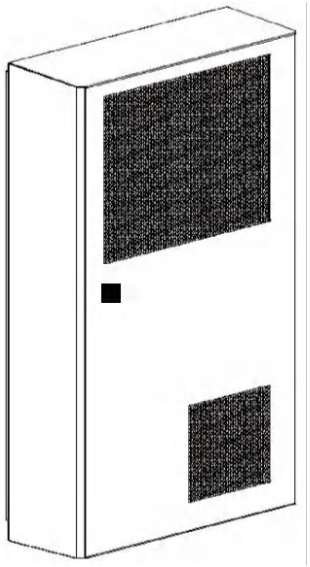


Figure 3-6

The external air conditioner is used to dissipate heat from the energy storage system. Configuring this air conditioner can provide a stable and suitable temperature and humidity environment for the energy storage system.

Model	External air conditioner
Operating temperature range	-30℃ ~ 45℃
Noise	65dB
Enclosure	IP54
Refrigerant	R134a
Cooling capacity L35/L35	2000W
Calorisation	1000W
Dehumidification switch-on point	60%RH
Max. operating current L55/L55	5A
Internal circulation air volume	220 m^3/h
Power supply range	220VAC ± 15％V, 50Hz
Size(Width* Height * Depth)	495*495*195mm
Weight	30kg

Table 3-7 External air conditioner parameters

3.6.5 Isolation Transformer (Optional)

The energy storage system requires a separate isolation transformer in off-grid mode (T50 recommended); in on-grid and off-grid mode an STS is required, which already contains the isolation transformer.

Model	T50
Rated voltage	Three-phase 400V
Rated power	50kVA
Wiring group	Dyn11
Winding parameters	Uk=3%

Insulation level	Class H
Efficiency	97.8%
Operation Temperature Range	-25℃ ~ 50℃
Operation Altitude	⩽ 3000m
Enclosure	IP65
Size(Width* Height * Depth)	700*800*550mm
Weight	260kg

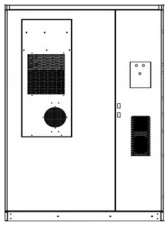
Table 3-8 Isolation transformer parameters

3.7 Package and Storage

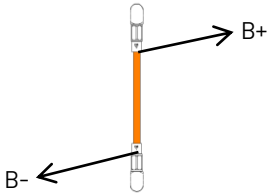
3.7.1 Package

ESS packaging is integrated, all pack modules are built into the cabinet, the power cord is disconnected during transportation, and the power cord is packaged separately

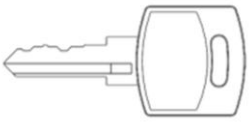
Please check whether the packaging is damaged before unpacking. If the packaging is damaged or the model is inconsistent, please do not unpack and contact after-sales as soon as possible.
After unpacking, please check whether the delivery is intact. If there is any abnormality, please contact after-sales as soon as possible.



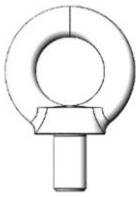
Battery cabinet*1



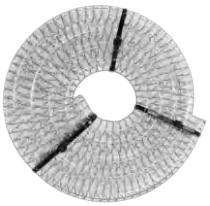
Power cables between battery clusters*16



Door key*4



Lifting Components*4



Air conditioning accessories*1



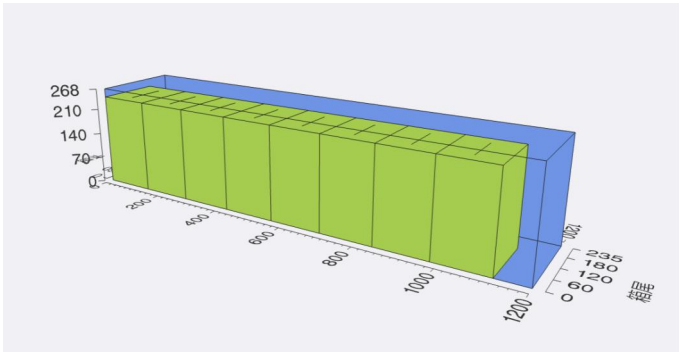
User Manual*1

Figure 3-7 Package

215kWH ESS LOAD

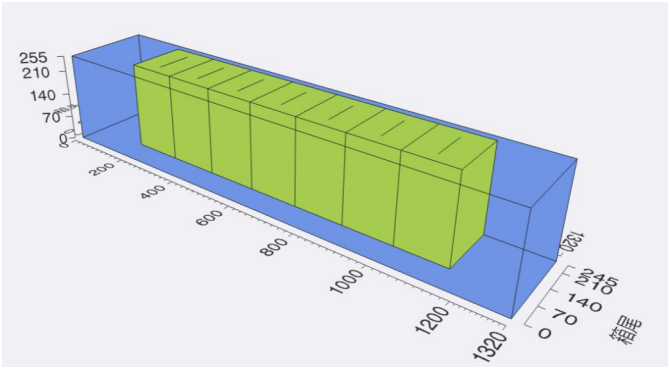
40ft Hq by sea





40ft Hq by truck





3.7.2 Storage Environment

If it isn't installed immediately after the delivery work is successfully completed, please properly store the HY100kWh-30KW according to the description in this section.

- In order to prevent condensation inside the HY100kWh-30KW , or if the bottom of the house is soaked by rainwater in the rainy
- season, the HY100kWh-30KW should be stored in an indoor environment, such as a large warehouse or in the workshop.
  If the battery packs are going to be kept for more than 30 days, adjust SOC to 40%-60% and dis-/charge them once every six months.

- If it must be stored outdoors due to on-site conditions, the HY100kWh-30KW must be raised. The specific elevation height should be reasonably determined according to the site's geological and meteorological conditions. If the ambient temperature is too low, heating should be provided for the internal equipment of the HY100kWh-30KW .
- Storage environment temperature: -20°C~50°C(less than one month); recommended long-term storage temperature: 20°C~30°C; storage relative humidity: 0~95%, non-condensing. The storage ground must be flat, free of water, no bumps or undulations.
- Effective measures must be taken to prevent rainwater, sand, and dust from intruding into the HY100kWh-30KW. At least the air inlet and outlet of the HY100kWh-30KW must be effectively protected.
- It is strictly forbidden to put the batteries into fire. Otherwise it might be exploded. It also might cause a fire to the Battery pack when the ambient temperature exceeds 150℃.
- Inspect at least once every half month to check whether the cabinet and internal equipment are in good condition.

4. System Installation

4.1 Installation Environment

- The level of the installation location should be above the highest historical water level in the area. The distance to airports, buried waste disposal sites, river banks, or dams should be greater than 2km.
- Select a well-ventilated area. Do not block the ventilation openings and heat dissipation system while the equipment is in operation to prevent fire from high temperatures.
- Installation space is sufficient to ensure that the surrounding equipment will not be affected by the heat generated by the product; the installation location ensures sufficient space for external wiring, easy access to transport, and reliable fire suppression system equipment.
- Keep the installation location away from sources of ignition, and do not place flammable or explosive materials around the equipment.
- If the equipment is installed in a place with lush vegetation, in addition to routine weeding, the ground below the equipment needs to be hardened to prevent weeds from growing.
- Do not install the energy storage system outdoors in salt-affected areas to prevent equipment corrosion and fire. Salt-affected areas are defined as areas within 2km of the coast or affected by sea breezes.
- 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 the entry of unauthorized personnel during the operation of the equipment, which may lead to personal injury or property damage.
- The equipment is installed in the area away from the liquid; should not be installed in the water pipe, air outlet, and other easy-to-produce condensation below the location; should not be installed in the air conditioning port, vents, machine room outlet windows, and other easy to leak below the area, to prevent the liquid from entering the internal caused by the short circuit of the equipment.

At least the following requirements should be met when constructing the foundation:

- The bottom of the foundation pit for building the foundation must be compacted and filled.
- The foundation should be sufficient to provide adequate load-bearing support for the integrated PCS.
- Elevate the integrated PCS to prevent rainwater from eroding the base and interior. It is suggested that the foundation should be about 300mm higher than the horizontal ground of the installation site.
- It is necessary to construct corresponding drainage measures in combination with local geological conditions.
- Construct concrete foundations of sufficient cross-sectional area and height. The construction party shall determine the

foundation height according to the site geology.

- Cable routing should be considered when constructing the foundation.
- The maintenance platform should be built around the foundation to provide convenience for later maintenance.
- Both ends of all pre-buried pipes are temporarily sealed to prevent impurities from entering; otherwise, it will be inconvenient to route later.

	**WARNING!** During the whole process of mechanical installation, the operators must follow the relevant standards and requirements of the project location.

4.2 Product Transport

- In order to keep the equipment in a better state of protection, it is recommended that the equipment be transported in packaging.
- Transport should be carried out in accordance with the marking requirements on the packaging to prevent personal injury and equipment damage.
- Energy storage batteries are not recommended for railway transport or air transport. Speed limit for land transport: 80km/h on flat roads, 60km/h on rough roads. If there is any conflict, please refer to local traffic regulations.

4.3 Product Handling

- When using a forklift to move, ensure that the forklift has sufficient load capacity, and note that the center of gravity of the equipment should fall between the legs of the forklift to prevent personal injury and equipment damage.
- With battery transfer, forklift truck loading capacity needs to be >3t; without battery transfer, forklift truck loading capacity needs to be >1.5t.
- Recommended fork knife length >1.5m, width 500mm±100mm, thickness ＜70mm.
- Transportation, moving and setting down of the DH215A-100K should be slow and steady.
- When using a forklift truck to transport equipment, it is important that it is operated by a professional operator.



Figure 4-1

4.4 Pre-installation Preparation

1. Before installing the product, you need to check whether the product is intact and undamaged. If you find any traces of damage, please keep the evidence and contact HY Tech.
2. If users are sure that there are no abnormalities in the product, please check that the accessories are complete according to the delivery list. Users can refer to the 3.7.1 Package.

3. Users need to prepare the relevant installation tools before installation. Refer to Table 4-1.
4. Before installation, the operator should be regulated to wear a helmet, insulated clothing, insulated gloves, and insulated boots.

No.	Tool	Function	Quantity
1	Screwdriver set	Wiring	1 set
2	Sleeve set	Wiring	1 set
3	Multimeter	Measuring current and voltage	1 pcs
4	Forklift	Move equipment	1 pcs
5	Screws, Nuts and Spacers	Fasteners	a certain number or amount
6	Installation jig	Move equipment	1 set
7	AC cable and neutral cable	Connect to municipal power supply	a certain number or amount
8	AC wiring terminals and heat shrinkable tube	Make cables	a certain number or amount
9	Wire stripper and Crimping plier	Make cables	1 set
10	Hot hair dryer	Shrink the heat shrink tubes	1 pcs

Table 4-1 Installation tool list

4.5 Mechanical Installation

After making sure that there is no abnormality in the product and all accessories are complete, you can refer to the following suggestions for mechanical installation:



NOTE!
If the energy storage system is transported by crane, the lifting assembly needs to be installed first. The lifting assembly can be found in the packaging.

1) According to the product size in advance, selecting the equipment installation location, positioning, and fixing, reference to the weight of the product, the choice of the installation location needs to have sufficient load-bearing strength and a reliable grounding point to ensure that the grounding resistance is less than 4 Ω .

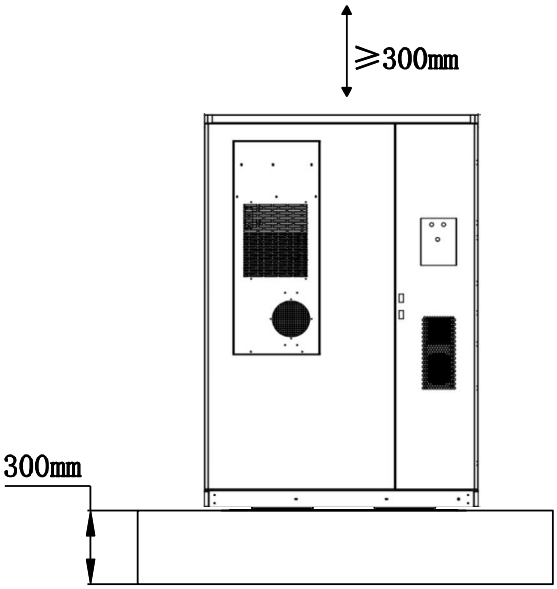


Figure 4-2 Basic reference

2) Reserve the space shown in the diagram to ensure that the work between battery cabinets is not affected.

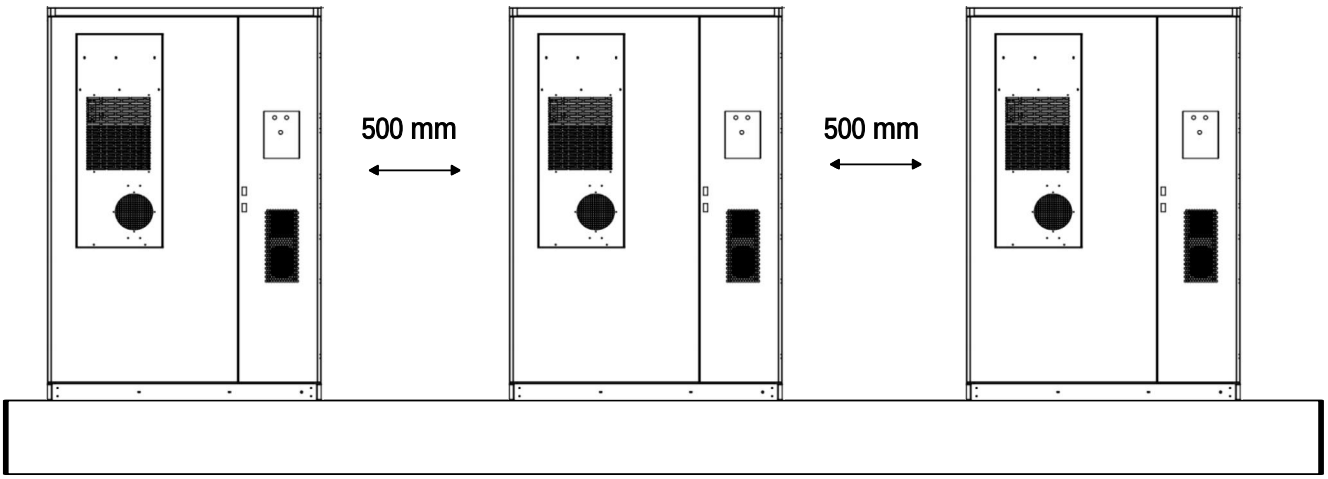


Figure 4-3 Installation Basic Reference

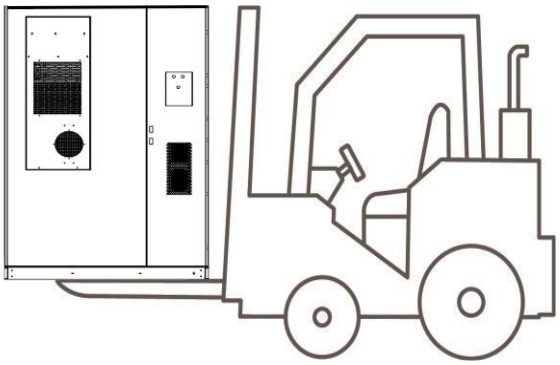


Figure 4-4 Forklift transportation

3) Foundation Requirements:

An unreasonable foundation construction plan will bring great difficulties or troubles to the placement of the integrated ESS, opening and closing doors, and later operation. Therefore, the installation foundation of the integrated ESS must be designed and constructed in advance according to certain standards to meet the requirements for mechanical support, cable routing, post-maintenance and overhaul, etc.

At least the following requirements should be met when constructing the foundation:

The bottom of the foundation pit for building the foundation must be compacted and filled.

The foundation should be sufficient to provide effective load-bearing support for the integrated ESS.

Elevate the integrated ESS to prevent rainwater from eroding the base and interior. It is suggested that the foundation should be about 300mm higher than the horizontal ground of the installation site.

It is necessary to construct corresponding drainage measures in combination with local geological conditions.

Construct concrete foundations of sufficient cross-sectional area and height. The foundation height shall be determined by the construction party according to the site geology.

Cable routing should be considered when constructing the foundation.

The maintenance platform should be built around the foundation to provide convenience for later maintenance.

According to the position and size of the cable inlet and outlet on the outdoor battery cabinet, reserve enough space for the AC/DC side cable trough and pre-embed the cable guide in the foundation construction.

Determine the specifications and quantity of perforating tubes according to the cable model and the number of incoming and outgoing lines.

4) Precautions for crane installation



1. Understand Cabinet Specifications**: Before starting, thoroughly understand the size, weight, and design requirements of the energy storage cabinet.

2. Select the Right Crane**: Choose a crane with the appropriate lifting capacity based on the weight and size of the energy storage cabinet.

3. Use Four Lifting Points**: Since the energy storage cabinet has four lifting points, ensure that all lifting points are correctly connected to the cabinet's hooks.

4. Balance the Lifting Slings**: Use four equal-length slings to ensure they are evenly distributed across the cabinet's four hooks to maintain balance during lifting.

5. Inspect Slings and Hooks**: Before lifting, carefully inspect the slings and hooks for any signs of wear or damage.

6. Lift Slowly**: During the lifting process, the operator should slowly raise the cabinet to avoid shaking or instability caused by rapid lifting.

7. Maintain a Steady Speed**: Keep a steady speed when moving the cabinet to avoid sudden stops or turns that could cause the cabinet to swing.

8. Monitor Cabinet Condition: Continuously monitor the condition of the cabinet during the lifting process to ensure no abnormalities occur.

9. Ensure Safe Distance: Keep a safe distance between the cabinet and other equipment or personnel to prevent collisions during lifting.

10. Professional Operation: Ensure that the operator has the appropriate qualifications and experience to safely operate the crane.

11. Ground Command: During the lifting process, there should be a professional ground commander to guide the operator in performing the correct operations.

12. Environmental Check: Before lifting, inspect the lifting area to ensure there are no obstacles or other potential hazards.

13. Emergency Stop: The operator should be ready to use the emergency stop button at any time to respond to any emergency situations.

14. Installation Location: Ensure that the installation location of the cabinet complies with design requirements, considering ventilation, maintenance access, and other relevant factors.

15. Securing and Grounding: After the cabinet is placed in the designated position, use appropriate securing devices to fix it and ensure the cabinet is grounded to prevent electrical faults.

16. Inspection and Testing: After installation, conduct a thorough inspection and testing to ensure the cabinet is installed correctly and functions properly.

17. Record and Documentation: Record the entire installation process, including any inspections, tests, and issues found, for future reference.

4.6 Electrical Connection

Electrical cabling is required in the field for the DC and AC sides as well as for external power and communications. HY Tech provides the wiring reference in Table 4-2 according to the product power and cable specification. Cable diameters should be selected in accordance with local cable standards. Factors affecting cable selection include current rating, cable type, laying method, ambient temperature, and maximum acceptable line loss.

Capacity	AC cable	Neutral cable	Earth
50kW	⩾3*50mm^2	⩾25mm^2	⩾16mm^2

Table 4-2 Cable diameter comparison table

4.6.1 Electrical Safety



DANGER!

Danger of high voltage! Danger of electric shock!

- Do not touch live parts!
- Please ensure that the AC and DC sides are not charged before installation.
- Do not place the energy storage system on the surface of combustible materials.



WARNING!

When performing an electrical installation, refer to the following recommendations for electrical installation：

- Check that all switches in the equipment are disconnected before wiring. Ensure that the equipment is not energized.
- Disconnect the grid switch before wiring and ensure the cable is not energized.
- To determine the correct phase sequence of the cable, you can add yellow, green, red, and black different colors of insulation sheath or marking to distinguish to prevent the phase sequence error.
- Cable terminals and copper row connections need to be compressed; screws should be selected to the right length so as not to affect the insulation and tightening.
- Lay communication and power cables as separately as possible, making sure that the cable insulation is not damaged during the laying process.
- The grounding cable must be reliably connected to the grounding copper row, and the cross-sectional area of the cable must meet the design requirements.
- All AC cables should be connected to the appropriate phase sequence after entering the device through the access holes on the bottom.
- After the wiring is completed, use fireproof mud to seal the leaks to prevent external insects and rodents from entering and damaging the equipment or cables.
- During electrical connection, bolts must be tightened strictly according to the torque described in this manual. Failure to observe the torque requirements may result in fire at the connection!



NOTE !

During the whole process of electrical connection, as well as all other operations on equipment such as integrated PCS, the following five safety rules must be observed：

Ensure that disconnection of the energy storage system does not accidentally energize it;

Disconnect all external connections to the integrated PCS and the device's internal power supply.

	Ensure that the energy storage system is completely de-energized when using a multimeter. Make the necessary grounding. Insulate and cover potentially live parts adjacent to the operating part with insulating cloth.

4.6.2 Connecting Battery Communication Cable

One end of the battery pack communication cable has been installed in the cable trough. The picture is just for showing the details.

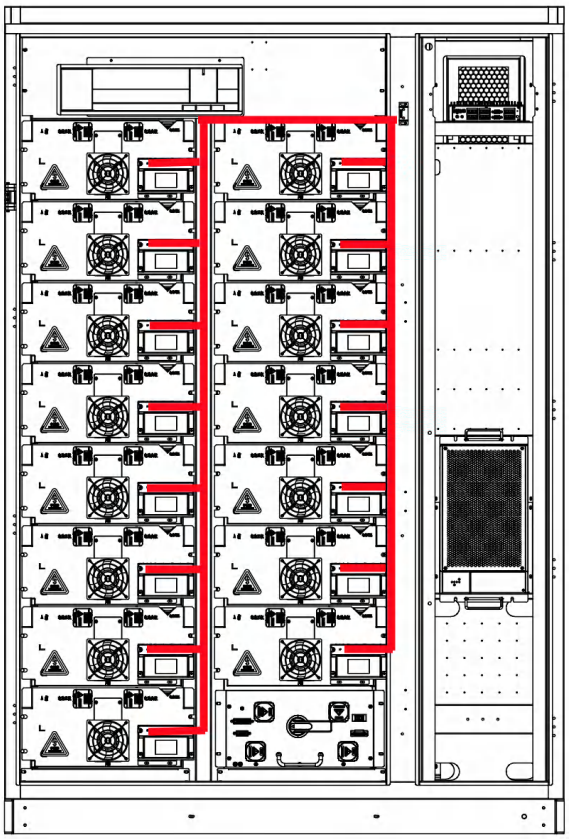
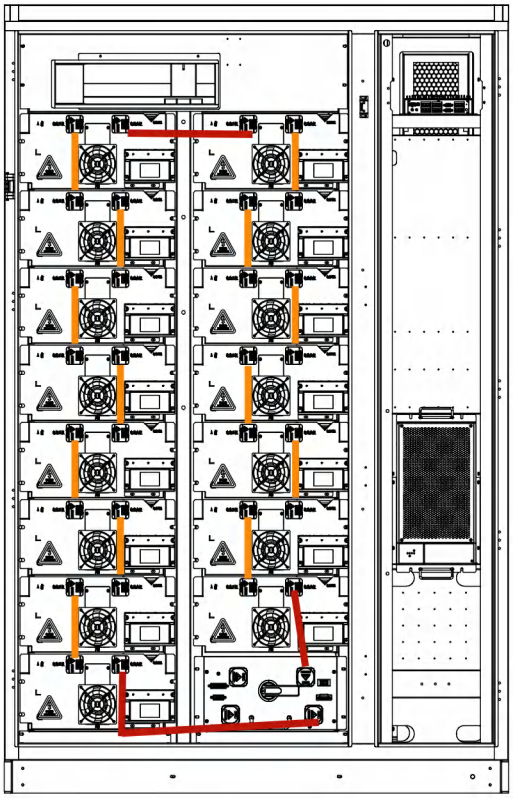


Figure 4-10

4.6.3 Connecting Battery Power Cable

Firstly, take out the power cable between the Battery packs from the accessory kit, then connect the positive pole of the first Battery pack to the negative bar of the second Battery pack, and so on from the bottom to the top, and finally connect the negative bar of the first Battery pack to the "B-" connector of the PDU, and connect the positive bar of the tenth Battery pack to the "B+" connector of the PDU.



The specific connection method is to connect the red cables first and then the orange cables.

Figure 4-11

4.6.4 Connecting PCS Communication Cable

The wiring from the high voltage box to the PCS is completed before shipment

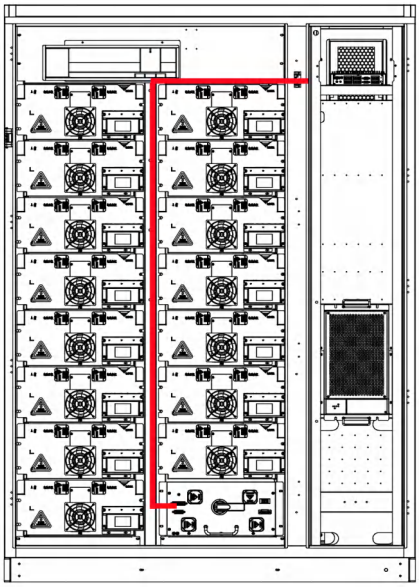


Figure 4-12

4.6.5 Connecting PCS Power Cable

The power line of PCS has been connected before shipment

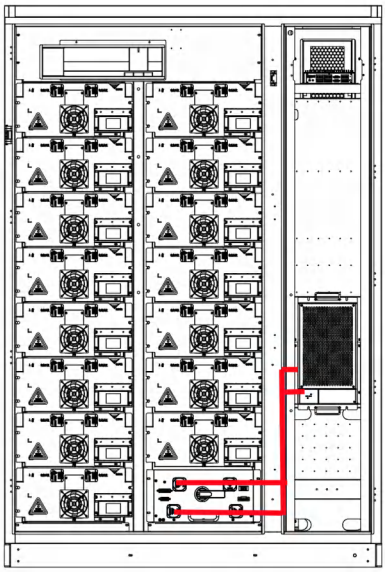


Figure 4-13

4.6.6 Connecting PCS AC Cable

The AC cable of PCS has been connected before shipment

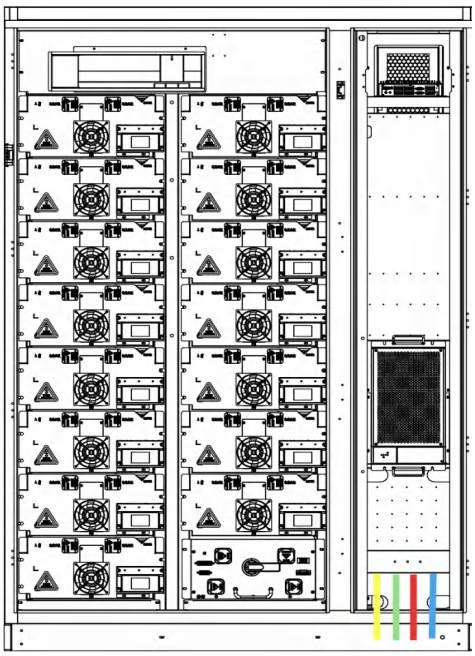


Figure 4-14

4.6.7 Connecting Mains

The inlet and outlet of the energy storage system are the bottom inlet and outlet, open the rear door of the cabinet, the wiring terminal is at the right bottom as shown in Figure 4-15. Connect L1/L2/L3/N/PE wires to the top lower row of the wiring terminal. The other end should be connected to the grid distribution box.

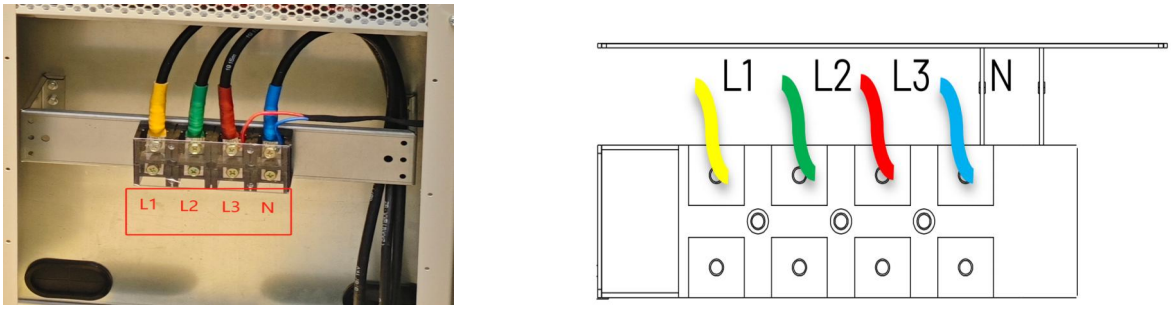


Figure 4-15

	NOTE! The wire colors shown in the picture are for illustration only. Users can decide according to the actual usage.

The cover of the wire box can only be fitted when the power and communication lines outside the cabinet and the main power are connected.

4.6.7 Meter Connection

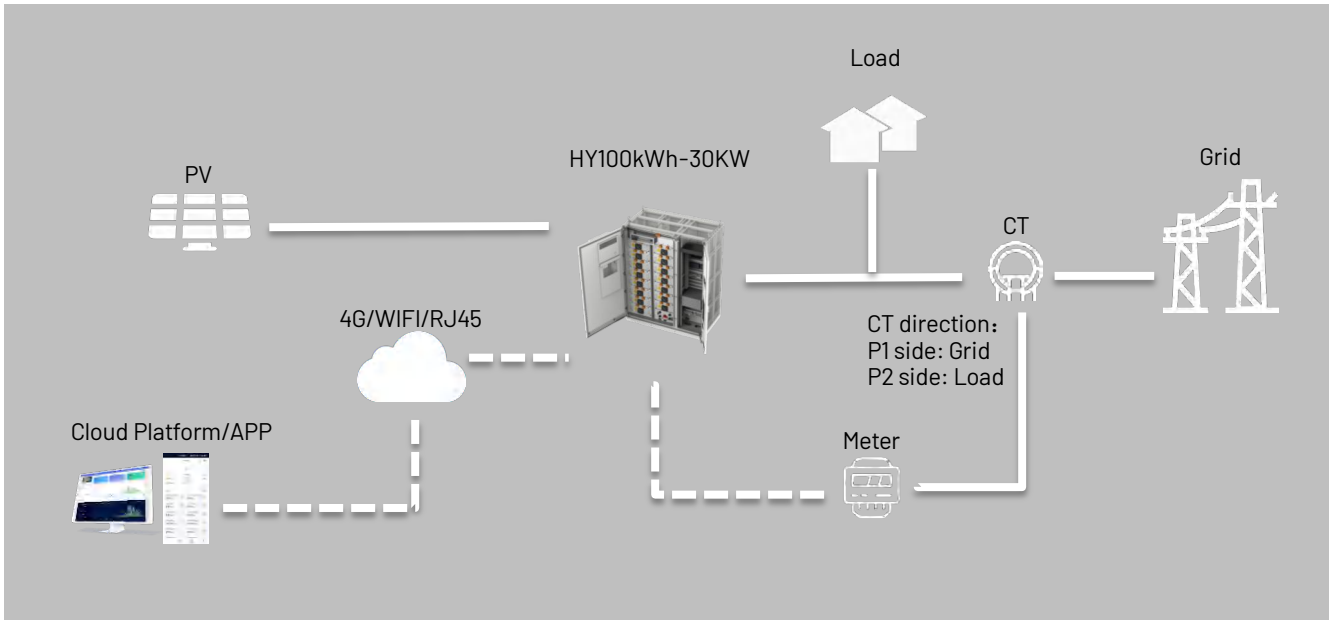


Figure 4-17 Electrical connection diagram

The energy storage system adopts DTSD1352-CT smart meter. The connect steps are as follows:

- Connect the meter output "Ua, Ub, Uc, N" to "L1, L2, L3, N" of the grid.
- Connect meter CT1 to Grid L1, CT2 to Grid L2, CT3 to Grid L3. Each CT needs to be connected to two wires: the inlet wire of the CT is connected to "Ia*, Ib*, Ic*" of the meter, and the outlet wire of the CT is connected to "Ia, Ib, Ic" of the meter.
- Connect the meter "21, 22" to "2A, 2B" of the EMS.

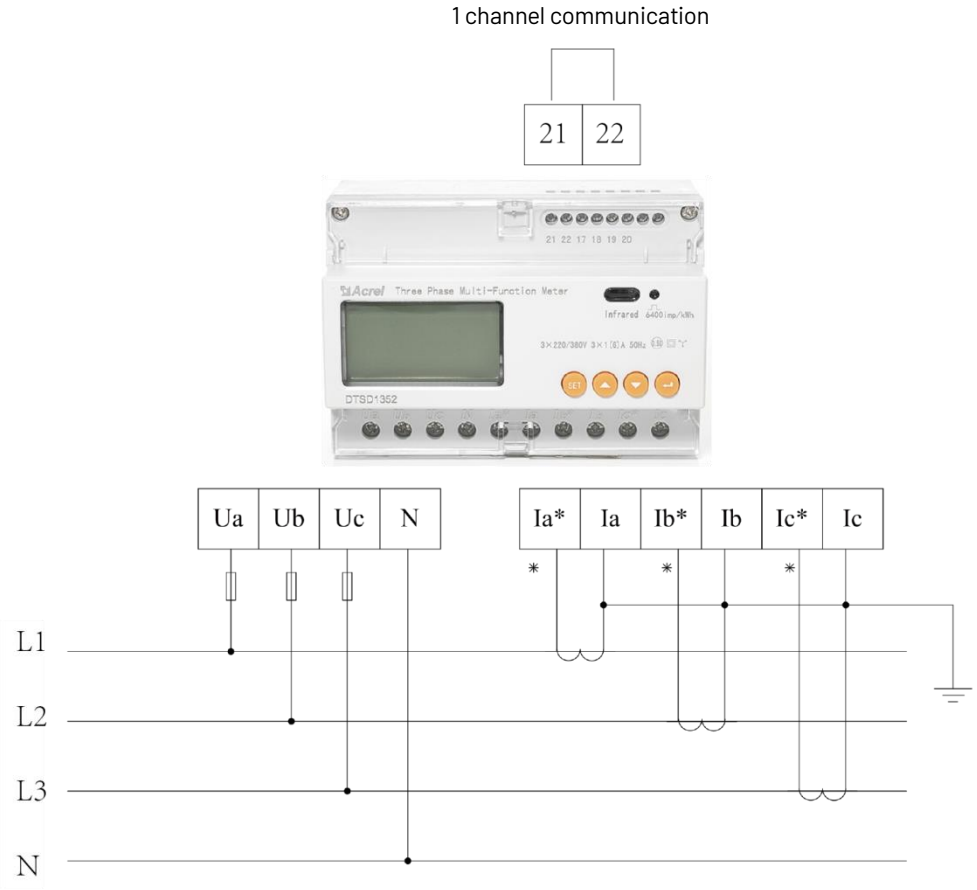


Figure 4-18 Meter wiring schematic

NOTE!

CT is not standard and has to be purchased by the customer. Recommended models are shown in the table below:

Rated current ratio	Accuracy class
200 / 5 (1)	0.5

The P1 side of the CT is connected to the grid and the P2 side is connected to the load.

5. Start-up and Commissioning

5.1 Pre-opening Check

Before running the HY129kWh-50KW, please make sure that the product has been installed following the specifications, and carry out a comprehensive and detailed inspection of the machine to ensure that all indicators are in line with the requirements beforeswitching on the machine.

(1) Exterior Inspection:

- The HY129kWh-50KW is in good condition, with no damage, no rust, and no paint loss. If there is any paint loss, please carry out a paint refinishing operation.
- The HY129kWh-50KW labels are clearly visible, and damaged labels should be replaced promptly.

(2) Ground check

- Box with a grounding point and grounded firmly, the box grounding conductor is reliably connected to the box grounding copper row.

(3) Cable check:

- The cable protection is well-wrapped with no visible damage.
- The terminals are made following specifications and are connected firmly and reliably.
- Each cable is clearly labeled at both ends. The alignment meets the principle of separation of strong and weak power, leaving a margin at the turn, and shall not be strained.
- Cable mounting bolts have been tightened, cable pulling without loosening, and cable crossing hole blocking has been completed.

(4) Copper row check:

- There is no obvious crack or deformation of the copper rows, the screws are tight at the lap joints, the scribe marking is not misplaced, and there is no debris on the copper rows.

(5) Component check

- The main breakers are all in the open position. Refer to Figure 5-1.

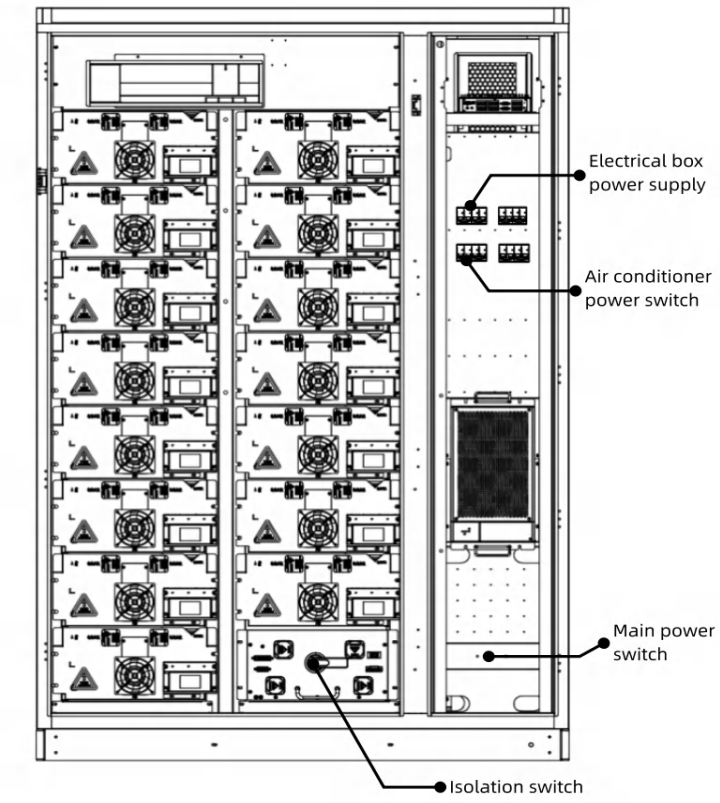


Figure 5-1 Distribution switch location diagram

5.2 Boot Operation

The product start-up operation process is as follows:

1) After confirming that the cables are connected correctly, switch on both PCS battery switches and the PV switch if using PV.
2) Turn breaker to ON to connect to the grid.
3) Use a multimeter to confirm that the grid voltage is within the intended range (400V+10%).
4) Referring to Figure 5-1, close the main power switch, then close the air conditioner power switch
5) The isolation switch hits ON, the system self-tests without error, the green light is always on, and the system is on high voltage.
6) PCS power-on self-test

5.3 Trial Operation

After the equipment has completed the installation of all electrical structures to meet the start-up conditions, to ensure that the energy storage system runs reliably and stably, the initial operation must be powered up by professional electrical engineers and technicians and set up the Run Mode and related parameters according to the project requirements:

1) Set the device control mode to "Manual Mode"
2) Observe the PCS, battery, and air-conditioning parameters during operation, and stop the machine promptly for testing if there is any abnormality.
3) Allow the device to run for 0.5 hours.

4) The device control mode is set to "Battery Backup"
5) Observe the PCS, battery, and air-conditioning parameters during operation, and stop the machine promptly for testing if there is any abnormality.
6) Allow the device to run for 0.5 hours.
7) After completing a one-hour trial run without any abnormality, switch off the system in the "Operation" interface and manually switch off the battery and air conditioner on the touch screen.
8) You can choose self-generation and self-consumption mode or other modes for formal commissioning according to the background and demand of the project

5.4 Switch Off

When the product needs daily maintenance, it needs to be shut down. The standard shutdown operation of the product is as follows:

1) Operate on the PCS to stop the system.
2) Operate on the PCS to bring the PCS down to high voltage and the PCS off.
3) Turn the isolation switch to OFF.
4) Turn off the air conditioner switche, and turn off the main air switch.
5) Turn the breaker to OFF to disconnect the grid.
6) Switch off both PCS battery switches and also switch off the PV switch.

5.5 Emergency Shut Down

When there is a malfunction of the product or a critical situation that requires emergency shutdown, you can perform the following emergency shutdown operations:

1) Press the emergency shutdown button.
2) Referring to Figure 5-1, disconnect the breaker and power supply.
3) Reset the EPO button after determining that the fault or hazard is cleared and operation is required.