marvel® Tech

ML 14.3K-HVR-01
User Manual

Contents

1. Introduction

This manual introduces the installation method of ML HVR-01. Please read this manual carefully before installation and follow the instructions of this manual for installation. If you are unsure about any requirements, recommendations or safety procedures described in this manual, please contact Marvel tech immediately for verification and advice. The information contained in this manual was accurate at the time of publication. However, our company reserves the right to change product design and technical specifications at any time without prior notice. Additionally, the illustrations in this manual are intended to help explain system configuration concepts and installation instructions. If the illustrations are inconsistent with the actual product, please refer to the actual product.

1.1 Symbol definition

It is only suitable for professionals who are familiar with local regulations and standards and electrical systems, have received professional training, and are familiar with the relevant knowledge of this product. In order to better use this manual, the following symbols are used in the manual to highlight relevant important information. Please read the symbols and instructions carefully.

⚠ Danger
Indicateing a potentially hazardous situation which, if not avoided, will result in death or serious injury.
⚠ Warning
Indicating a situation with moderate potential hazard which, if not avoided, co uld result in death or serious injury.
⚠ Caution
Indicating a situation with low potential hazard which, if not avoided, may result in modera te or minor personal injury.
Notice
The emphasis and supplement of the content may also provide tips or tricks for optimizing the use of the product, which can help you solve a certain problem or save you time.

2. Safety Precautions

The information on safety precautions contained in this document must be followed at all times when operating equipment.

Notice

The equipment has been designed and tested in strict accordance with safety regulations. However, as electrical equipment, relevant safety instructions must be followed before any operation on the equipment. Improper operation may result in serious injury or property damage.

2.1 General safety

Notice

• Due to product version upgrades or other reasons, the content of the document will be updated from time to time. Without special agreement, the content of the document cannot replace the safety precautions in the product label or user manual. All descriptions in the document are for usage guidance only.
• Please read this document carefully to understand the product and precautions before installing
• All operations on the e quipment must be performed by professional and qualified electrical technicians. The technicians must be familiar with the relevant standards and safety regulations of the pro ject location.
• When operating the e quipment, use insulated tools and wear personal protective e quipment to ensure personal safety. When touching electronic devices, you need to wear electrostatic gloves, electrostatic bracelets, anti-static clothing, etc. to protect the e quipment from static electricity damage
• Equipdmamenatg dea.mage or personal in jury caused by failure to install, use, and configure the battery in accordance with the documentation re quirements is not within the scope of the e quipment manufacturer 's responsibility. For more product warranty information, please visit the official website.

2.2 Battery safety

⚠ Danger

• The battery system is a high-voltage system, and high voltage exists when the equipment is running. Before operating the equipment in the system, make sure the e quipment is po wered off to avoid the risk of electric shock. When operating the equipment, you must strictly abide by all safety precautions in this manual and the safety signs on the e quipment.

• Inverters used with batteries must be approved by the battery manufacturer, and the approved inverter and battery matching list can be obtained through the official website.

• Do not disassemble, modify, or repair the battery or control box without official authorization from the e quipment manufacturer. Other wise, electric shock may occur or the e quipment may be damaged. The resulting losses are not within the scope of the e quipment manufacturer 's responsibility.

• Do not hit, pull, drag, squeeze, or step on the device, and do not place the battery in a fire, otherwise there is a risk of the battery exploding.

• Do not place the battery in a high-temperature environment. Make sure there is no heat source or direct sunlight near the battery. When the ambient temperature exceeds 60°C, a fire may occur.

• Do not use if the battery or high voltage box has obvious defects, cracks, damage or other conditions. Damage to the battery may cause electrolyte leakage.

• To protect the battery pack and its components from damage during transportation, please ensure that the transportation personnel are professionally trained. Record the operating steps during transportation and keep the e quipment balanced to avoid falling.

• The battery equipment is heavy. Please assign corresponding personnel according to the weight of the equipment to prevent the equipment from exceeding the weight range that the human body can carry and injuring people.

• If the battery fails to po wer on, please contact the after-sales service center as soon as possible. Other wise, the battery may be permanently damaged.

• Do not move the battery system while connecting external battery modules. If you need to replace the battery or add a battery, please contact the after-sales service center.

⚠ Caution

Make sure the battery system is not damaged during transportation and storage.

• The transporation must be carried out by trained professionals and operations during the process must be documented.

• Make sure the e quipment is placed firmly and cannot be tilted. Overturning may cause damage to the equipent and personal injury.

• The use of cables in high-temperature environments may cause the insulation layer to age and be damaged. The distance between the cable and the heating device or the periphery of the heat source area must be at least 30mm

• Cables of the same type should be bundled together, and cables of different types should be laid out at least 30mm apart. It is prohibited to entangle cross eachother

Symbol definition

	Potential dangers exist. Please take precautions when operating		Keep the battery away from open flames or ignition sources.
	High voltage hazard: There is high voltage during equipment operation. Ensure that the equipment is powered off before performing any operations.		Ensure that the battery is kept out of reach of children.
	Use the equipment reasonably. There is a risk of explosion under extreme conditions.		Do not use water to extinguish fires.
	The equipment contains corrosive electrolyte. Avoid contact with leaked electrolyte or volatile gases.		Dispose of the battery properly according to local laws and regulations; do not treat it as household waste. Either follow local disposal regulations or return it to the manufacturer.
	The battery contains flammable materials; beware of fire hazards.		Recycling symbol
	Before operating the equipment, please read the product manual thoroughly.	CE	CE certification mark
	Personal protective equipment must be worn during installation, operation, and maintenance processes.		Protective grounding connection point

2.3 Emergency Measures:

Battery Electrolyte Leakage

In case of electrolyte leakage from the battery module, avoid contact with the leaked liquid or gas. The electrolyte is corrosive, and contact may cause skin irritation and chemical burns. If accidentally exposed to the leaked substance, follow these procedures:

- **Inhalation:** Evacuate from the contaminated area and seek medical assistance immediately.
- **Eye Contact:** Rinse with clean water for at least 15 minutes and seek medical help immediately.
- **Skin Contact:** Thoroughly wash the affected area with soap and water and seek medical assistance immediately.
- **Ingestion:** Induce vomiting and seek medical aid immediately.

Fire Hazard:

- here is a risk of ignition when the temperature exceeds 150°C. If the battery ignites, toxic and harmful gases may be released.
- Ensure that there are carbon dioxide (CO2), Novac1230, or FM-200 fire extinguishers near the equipment.
- When extinguishing the fires, do not use water or ABC dry powder fire extinguishers. Firefighters must wear protective clothing and self-contained breathing apparatus.

3. Product Introduction

3.1 Product Overview

Functional Overview

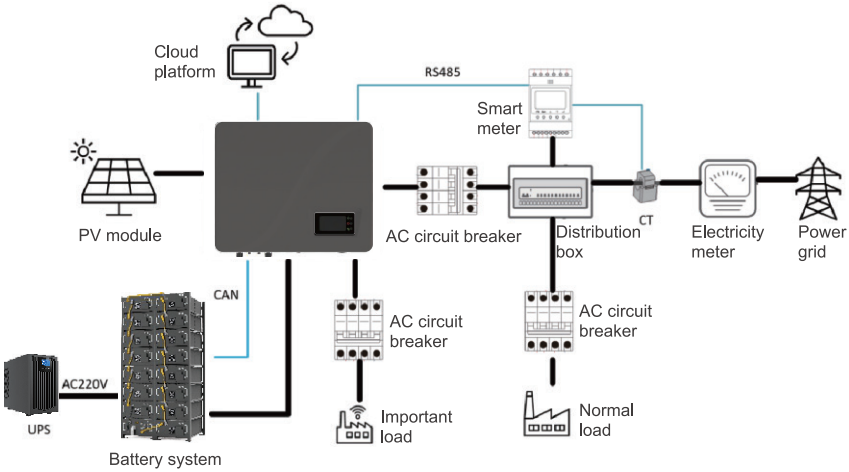
The battery system consists of battery modules and a high-voltage box, capable of storing and releasing electricity according to the requirements of the photovoltaic energy storage system. The input and output ports of this energy storage system are both high-voltage direct current.

Description of Available Power

Notice
•The battery system supports available power expansion, with a maximum of 14 battery modules supporting available power expansion. Expansion conditions must be strictly adhered to; for details, please contact your distributor or equipment manufacturer. Failure to expand according to the requirements may lead to under-voltage, over-voltage, or voltage difference faults in the battery system.

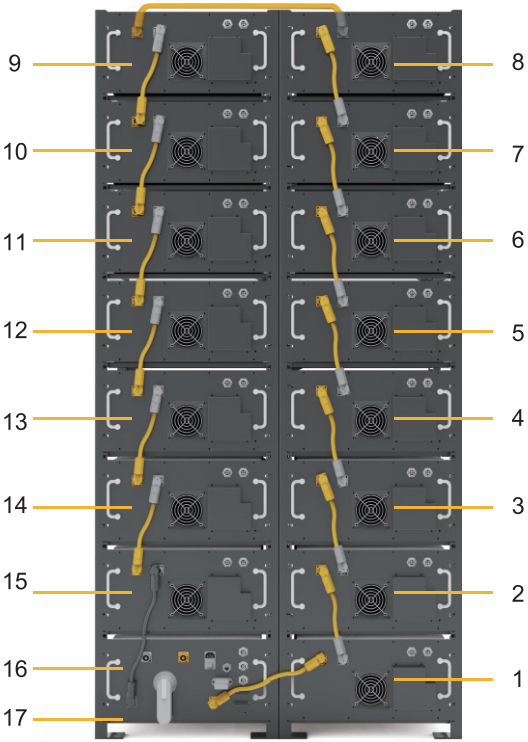
•The same energy storage system supports battery systems parallel connection, with a maximum of 10 clusters in parallel connection. Ensure that the available power of each cluster is consistent, and an additional combiner cabinet is required.

3.2 Application Scenario



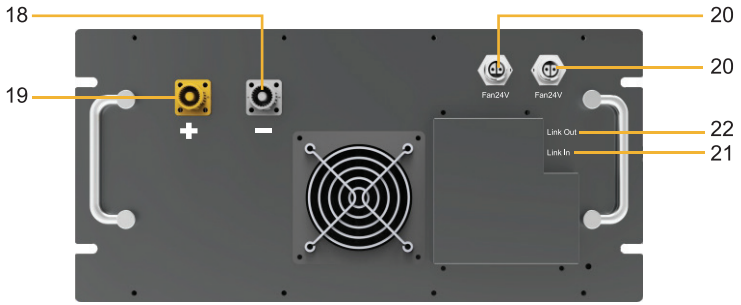
3.3 Appearance Definition

Battery system definition



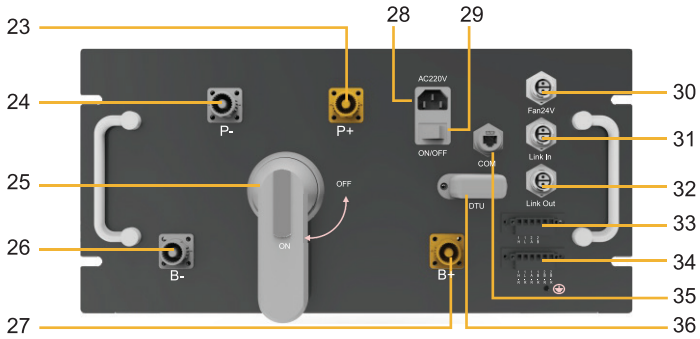
Serial No	Component	Remark
1-15	Battery modules 1-14	Contains cells and BMS controller
16	High voltage box	Contains BMS controller, contactors, fuses, circuit breakers, etc. to manage the charge and discharge of battery system
17	Bracket	Battery system bracket

Battery Module Interface Definition



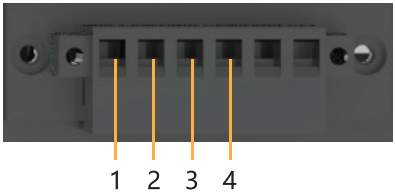
Serial No	Component	Definition
18	–	Battery module negative port
19	+	Battery module positive port
20	Fan24V	Battery module fan power supply port
21	Link Out	•The last battery module Link Out port is connected to the Link In port of the high voltage box •The Link Out port of other battery modules is connected to the Link In port of the lower battery module
22	Link In	•The Link In port of the first battery module is connected to the Link Out port of the high voltage box •The Link In port of other battery modules is connected to the Link Out port of the upper battery module.

High voltage box interface definition



Serial No.	Component	Definition
23	P+	The battery system positive output terminal is connected to the battery positive port of the PCS.
24	P-	The battery system negative output terminal is connected to the battery negative port of the PCS.
25	Load switch	Battery system power output switch
26	B-	Battery cluster input negative terminal
27	B+	Battery cluster input positive terminal
28	AC220V	The power supply input port of battery system BMS controller , UPS is recommended(Non-s tandard configuration) AC 220V power supply
29	ON/OFF	The power supply switch of the battery system BMS controller , when the input AC220V power supply has power, the power indicator lights up.
30	Fan24V	Battery module fan power supply output port
31	Link In	The communication addressing input port between high voltage box and the battery module,it is connect-ed to the Link Out port of the last battery module.
32	Link Out	The communication addressing output port between high voltage box and the battery module,it is connected to the Link In port of the first battery module.
33	CAN/H,CAN/L Interface	CAN/H,CAN/L communicate with PCS,or allows multiple clusters in parallel to communicate with SCU. RS485/A, RS485/B can be used to communicate with EMS.
34	Communication interface	120Ω resistance short interface for communication cable. When 120Ω resistance is required, short-circuit the corresponding port.
35	COM	Can be connected to an external display screen or EMS
36	DTU	Connect the DTU module to perform remote upgrades and update the BMS program

CAN/H,CAN/L
Interfaces are defined as follows:



1	2	3	4	5	6	7	8	9
CAN_H	CAN_L	RS485_A	RS485_B	-	-	-	-	-

4. Equipment Inspection and Storage

4.1 Inspection before acceptance

Before signing for the product, please check the following details:

• Check whether the outer packaging is damaged, such as deformation, holes, cracks or other signs that may cause damage to the equipment in the packaging box. If damaged, do not open the package and contact your dealer.

• Check whether the device model is correct. If there is any discrepancy, do not open the package and contact your dealer.

• Check whether the type and quantity of the deliveries are correct, and whether there is any damage to the appearance. If damaged, please contact your dealer.

4.2 Deliverables

Battery module

Serial No	Item	Qty
1	Fan power supply cable 350mm	1
2	Battery module power cable length 180mm	1
3	Slave control communication cable 24AWG 800mm	1
4	Cabinet screw M6*17mm	4
5	Ground screw M5*12mm	1
6	Battery module host	1

HV box

Serial No	Item	Qty
1	200A orange elbow plug	3
2	200A black elbow plug	3
3	Positive power cable length 5M	1
4	Negative power cable length 3M	1
5	Fan power supply cable 600mm	1
6	Fan power supply cable 2500mm	1
7	Long connecting cable between battery modules, cable length 600mm	1
8	Cold pressed SC50-10	2
9	Cold press terminal SC50-8	2
10	Cold pressed SC50-6	2
11	Three-pin plug power cable 10A 1.8M	1
12	PCS communication wire 0.5mm² 2000mm	3
13	Slave control communication line 20AWG 3000mm	1
14	Slave control communication line 20AWG 2000mm	1
15	Cabinet screw M6*17mm	4
16	Ground screw M5*12mm	1
17	High voltage box host	1

Bracket

Optional:

serial number	Item	Qty
1	Rear support bracket	12
2	Main bracket	8
3	Support plate	16

4.3 Equipment storage

If the equipment is not put into use immediately, please store it according to the following requirements.

• Make sure the outer packaging box has not been removed and the desiccant in the box has not been lost.

• It is recommended that the equipment installation be completed within 3 days after the packaging box is removed. If the equipment is not installed, the equipment must be repacked in the original packaging box for storage.

• Make sure that the stacking height and direction of the equipment are placed according to the instructions on the label on the packaging box.

• Ensure there is no risk of equipment tipping after stacking

• Make sure the equipment is stored away from flammable, explosive, corrosive and other items Make sure the device is stored in a cool place out of direct sunlight.

• Ensure that the storage environment is clean, the temperature and humidity range is appropriate, and there is no condensation.

• Battery storage SOC range: 25%~50%SOC, a charge and discharge cycle is required every 3 months of storage.

• Storage temperature range: -20~45°C for no more than 1 month; 0~35°C for no more than 1 year

• Storage humidity range: 0~95%RH without condensation. The battery interface cannot be installed when there is moisture and condensation.

5. System installation requirements

5.1 Installation requirements

Installation environment requirements

• The equipment cannot be installed in flammable, explosive, corrosive and other environments.

• The installation location must be out of the reach of children, and avoid installation in easily accessible locations to prevent scald injury. High temperatures may exist on the surface when the equipment is operating.

• The installation location must avoid water pipes, cables, etc. in the wall to avoid danger when drilling holes.

• The installation environment needs to be away from the sun, rain, snow, etc. It is recommended to install it in a sheltered installation location. If necessary, an awning can be built.

• The installation space should meet the equipment ventilation and heat dissipation requirements and operating space requirements.

• The equipment protection level should meet indoor installation requirements, and the temperature and humidity of the installation environment must be within a suitable range.

• The installation height of the equipment must be convenient for operation and maintenance. Ensure that the equipment indicators and all labels are easy to view, and the wiring terminals are easy to operate.
• The equipment installation altitude should be lower than the maximum working altitude(3000m).
• Stay away from strong magnetic field environments and avoid electromagnetic interference. If there is a radio station or wireless communication equipment below 30MHz near the installation location. Please ensure the distance between the battery and wireless electromagnetic
• Interference equipment is greater than 30m.

Installation carrier requirements

• The installation carrier cannot be made of flammable materials and must have fireproof properties.
• Please ensure that the mounting carrier is sturdy and reliable and can bear the weight of the device.
• The battery system needs to be installed close to the wall to prevent the battery from tipping over.

Installation angle requirements

• Make sure the equipment is installed horizontally and cannot be tilted or inverted.

Installation tools

	Tools		
Installation	Rubber mallet 	Star screwdriver 	Hammer drill（10 mm） 
	ESD gloves 	Safety goggles 	Anti-dust respirator 
	Safety shoes 	Level 	

6. Install the battery system

6.1 Handling equipment

⚠ Caution

• During transportation, turnover, installation and other operations, the laws, regulations and relevant standards of the country and region must be met.
• Before installation, the equipment needs to be transported to the installation site. To avoid personal injury or equipment damage during transportation, please pay attention to the following matters:
1. Please assign corresponding personnel according to the weight of the equipment to prevent the equipment from exceeding the weight range that the human body can carry and injuring people.
2. Please wear safety gloves to avoid injury.
3. Please ensure that the device remains balanced during transportation to avoid falling.

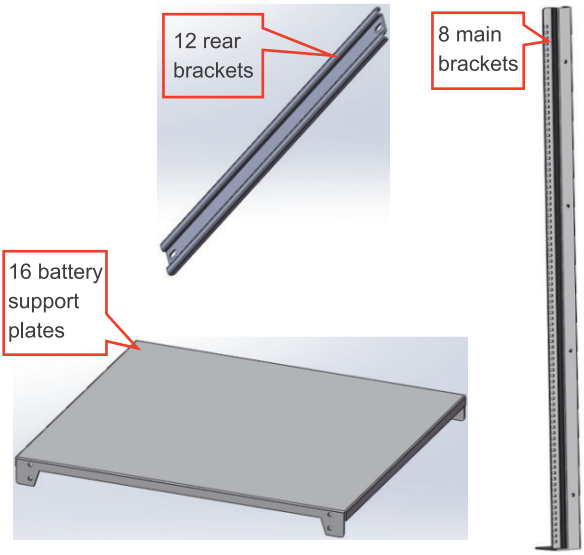
6.2 Install the battery system

Notice

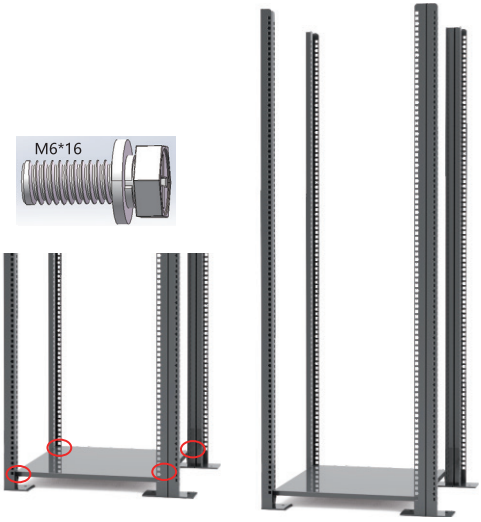
• This file takes the configuration composed of 14 batteries as an example to introduce the product installation and wiring steps.

Install the battery system bracket

Step 1 As shown in the picture below, take out all the bracket accessories from the packaging box



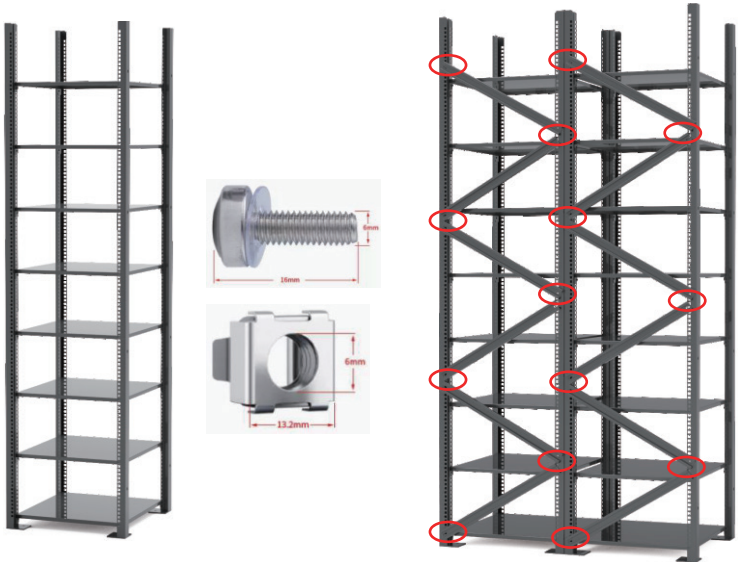
Step 2 As shown in the picture below, use M6*16 screws to fix the support plate and main bracket.



Step 3 As shown in the picture below, install all the remaining brackets in order.

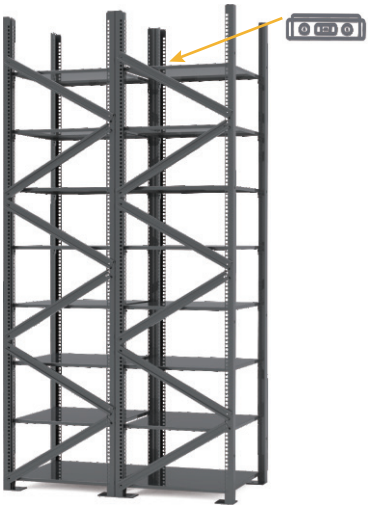
Step 4 Refer to the previous step. If the first support plate is not installed, install the other bracket in sequence.

Refer to the picture below and use M6*16 screws to install the rear bracket behind the bracket.

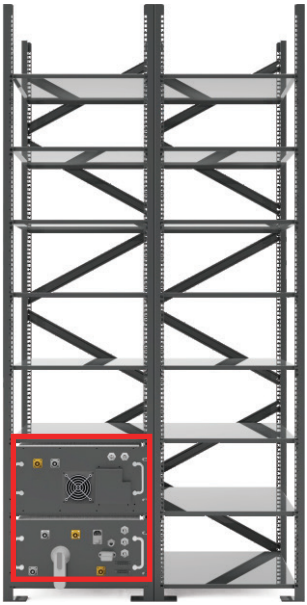


Install the battery system

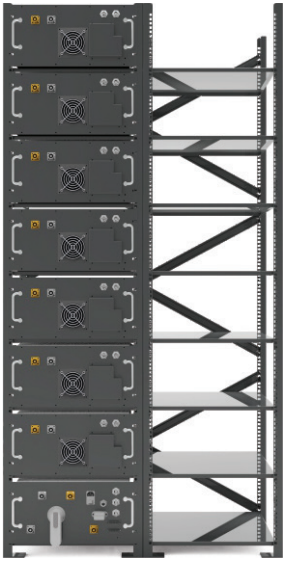
Step 1 Place the bracket 30mm away from the wall, with a horizontal angle of less than 2 degrees.

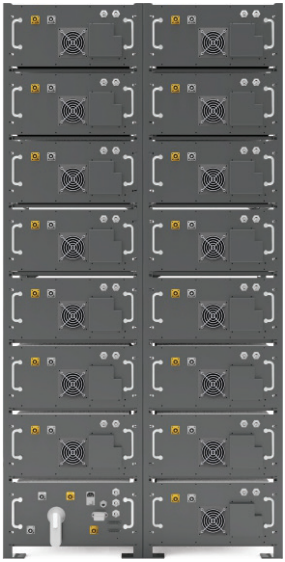


Step 2 As shown in the picture below, install the high-voltage box to the lower left corner of the bracket

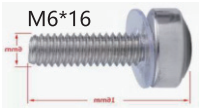


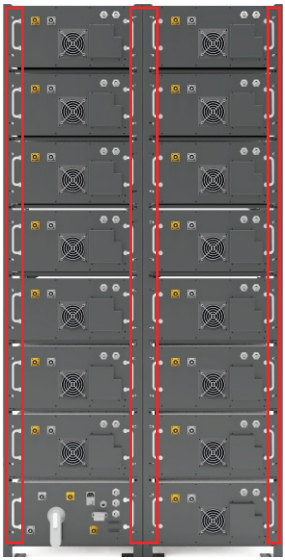
Step 3 Install the 15 battery modules on the bracket as shown in the picture below



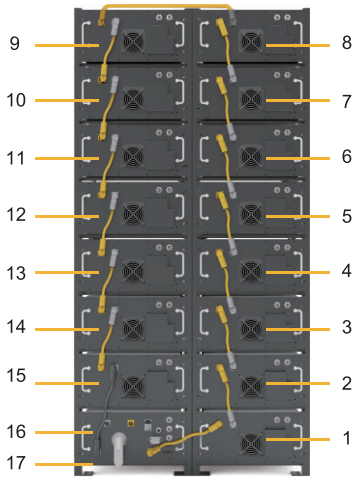


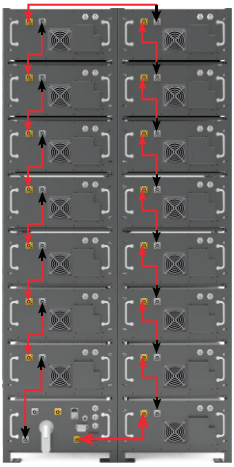
Step 4 As shown in the figure below, fix each battery module and high-voltage box with M6*16 screws



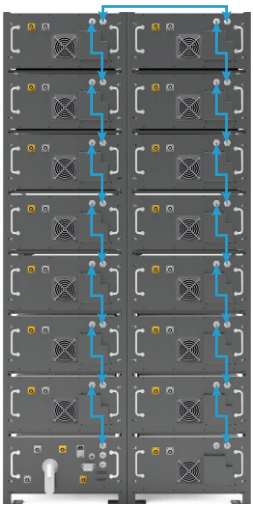


Step 5 As shown in the figure below, connect the high-voltage B+ port to the positive port of the first battery module, and the negative port of the first battery module is connected to the positive port of the second battery module, and so on. Connect the negative port of the 15th battery module to the B- port of the high voltage box.connect the Fan24V interfaces of 15 battery modules in series.

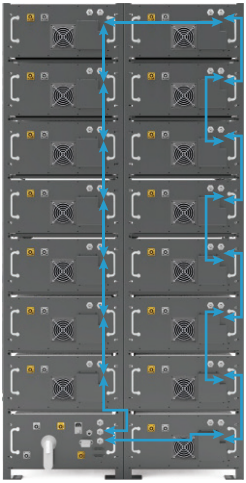




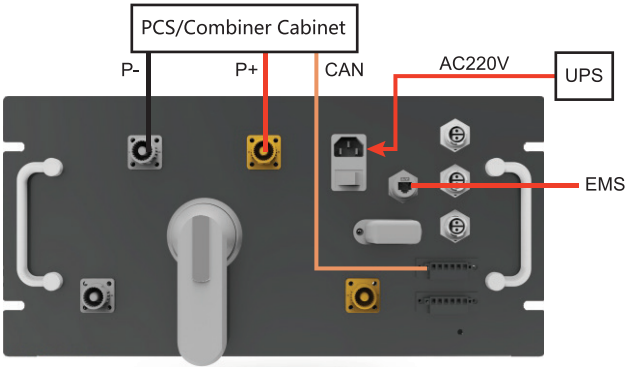
Step 6 As shown in the figure below, connect the Fan24V port of the high-voltage box to one of the Fan24V ports of the 15th battery module, and connect the other Fan24V port of the 15th battery module to one of the Fan24V ports of the 14th battery module and so on. Connect the Fan24V ports of 15 battery modules in series.



Step 7 As shown in the figure below, connect the Link In port of the high-voltage box to the Link In port of the first battery module. The Link Out port of the battery module is connected to the Link In port of the second battery module, and so on, the Link Out port of the 15th battery module is connected to the Link Out port of the high voltage box.



Step 9 As shown in the figure below, connect the P+, P-, and CAN ports of the high-voltage box to the PCS or combiner cabinet, and use UPS to provide power supply to the AC220V port of the high-voltage box.



7. Electrical Connections

7.1 Safety precautions

⚠ Danger

• The battery system is a high-voltage system, and high voltage exists during equipment operating. Before operating the equipment in the system, make sure the equipment is powered off to avoid the risk of electric shock. When operating the equipment, you must strictly abide by all safety precautions in this manual and the safety signs on the equipment.

• All operations, cables and component specifications used during electrical connection must comply with local laws and regulations

• Cables of the same type should be bundled together and arranged separately from cables of different types. It is prohibited to entangle or cross each other.

• When crimping the terminal, please ensure that the conductor part of the cable is in full contact with the terminal, and do not crimple the cable insulation and the terminal together, otherwise it may lead to the equipment cannot operate, or the terminal row is damaged due to the unreliable connection and heat after operation.

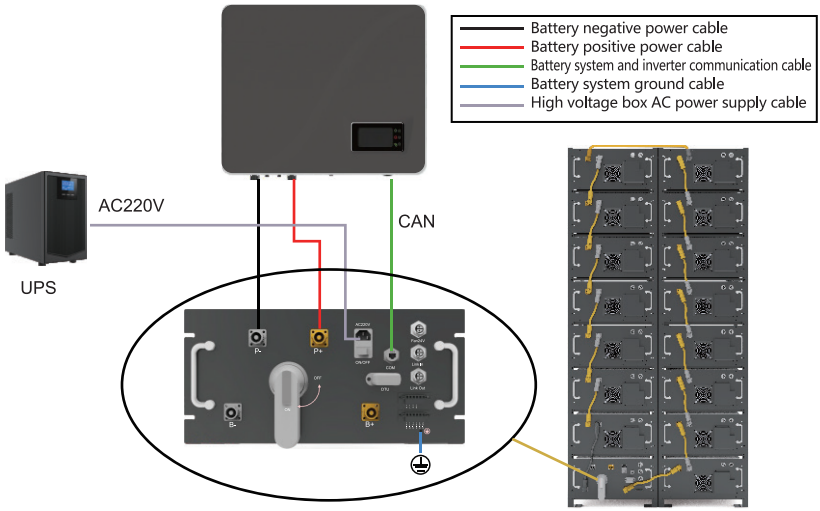
Notice

• When making electrical connection, please wear safety shoes, protective gloves, insulating gloves and other personal protective equipment as required.
• Only professionals are allowed to perform electrical connection related operations.
• The color of the cable in this figure is for reference only, and the specific cable specifications should comply with local regulations

7.2 Electrical Connection

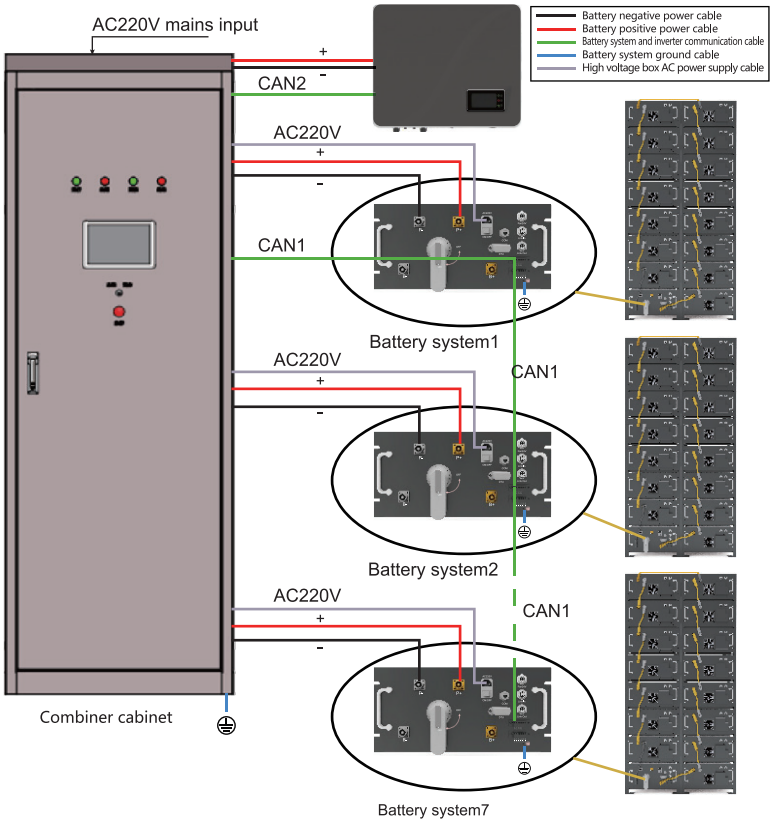
Notice

• Please refer to the figure below for the electrical connection of a single battery system.



Notice

• The same energy storage system supports battery systems parallel connection, with a maximum of 10 clusters in parallel connection. Ensure that the available power of each cluster is consistent.
• An additional combiner cabinet is required.
• Connect P+ and P- of all battery systems to the DC input bus of the combiner cabinet respectively
• Connect the CAN ports of all battery systems to the CAN1 port of the confluence control cabinet in series
• Only first battery and laster battery need short communication 120Ω
• Connect the CAN2 port of the combiner cabinet to the CAN port of the PCS, and connect the DC output bus of the combiner control cabinet to the DC input port of the PCS.
• The following takes the configuration of a 7-battery system as an example to introduce the electrical connections.



8. System Operation

8.1 Check before powering on

When powering on the battery system, be sure to check the following to prevent system damage.

Serial No	Inspection item
1	The equipment is installed firmly, the installation position is convenient for operation and maintenance, the installation space is convenient for ventilation and heat dissipation, and the installation environment is clean and tidy.
2	Protective ground wires, power wires, and communication wires must be connected correctly and securely.
3	The cable binding meets the wiring requirements, is reasonably distributed, and is not damaged.
4	Unused ports are blocked.

8.2 Power on the battery system

Step 1: Close the circuit breaker between the inverter and battery system (if installed)
Step 2: Connect the AC220V input power supply of the combiner cabinet (if any) and the high-voltage box, and close the load switch of the high-voltage box.
Step 3: Set the ON/OFF switch of the high-voltage box to the ON position and wait for the battery system to start running.
Step 4: Power on the inverter used in the system. If it is installed and used for the first time, select the battery model. For detailed operations, please refer to the corresponding Inverter user manual for the model.

9. Maintenance

9.1 Power off the battery system

⚠ Danger

• When operating and maintaining the battery system, please power off the battery system. Operating the device with power on may cause damage to the device or risk of electric shock.
• If the battery system is not equipped with a combiner cabinet, to restart the battery, set the ON/OFF switch of the high-voltage box to the OFF position, wait for the battery system to power off, then set the ON/OFF switch of the high-voltage box to the ON position, and wait for the battery system to power on to complete the battery management system restart.
• If the battery system is equipped with a combiner cabinet, to restart the battery, turn off the UPS output in the combiner cabinet and wait for the battery system to power off, then turn on the UPS output in the combiner cabinet and wait for the battery system to power on to complete the restart of the battery management system.

When switching off the battery system, please follow this sequence of steps to prevent damage to the system:
Step 1: Power off the inverter used in the system. For detailed operations, please refer to the user manual of the corresponding inverter model.
Step 2:Set the ON/OFF switch of the high-voltage box to the OFF position and wait for the battery system to switch off.
Step 3:Turn off the AC220V input power supply of the combiner cabinet (if any) and high voltage box, and disconnect the load switch of the high voltage box.
Step 4: Open the circuit breaker between the inverter and battery system (if installed).

9.2 Regular maintenance

⚠ Warning

• If you find any problems that may affect the battery or energy storage inverter system, please contact after-sales personnel, and it is prohibited to disassemble it without permission.
• If you find that the copper wire inside the conductive wire is exposed, please do not touch the high voltage hazard, please contact the after-sales personnel, and it is prohibited to disassemble it without permission.
• If other emergencies occur, please contact after-sales personnel as soon as possible and perform operations under the guidance of after-sales personnel, or wait for on-site operation by after-sales personnel.

Maintenance content	Maintenance cycle
Check whether the casing is damaged. If so, please repaint it or contact the after-sales service center.	Once every 6 months
Check whether the exposed wires are worn. If so, please replace the corresponding cables or contact the after-sales service center.	Once every 6 months
Check whether there is any debris accumulated around the battery. If so, please clean it to avoid affecting the heat dissipation of the battery.	Once every 6 months
Check for water or pests to avoid long-term battery intrusion	Once every 6 months

10. Technical Parameters

The confluence cabinet configuration is one of two options

Combiner cabinet technical parameters		
Item	Technical parameters	Technical parameters
Rated AC operating voltage frequency	AC220V 50/60Hz	AC220V 50/60Hz
Rated AC maximum current	32A	32A
AC uninterruptible power supply(UPS)	2000VA	2000VA
DC maximum working voltage	1000V	1000V
Rated DC maximum current	1250A	400A
IP degree	IP20	IP20
Average altitude	<3000M	<3000M
Dimension	800*600*2000mm	800*600*1800mm
weight	<300KG	<285KG

Mode	ML 6.9K-HVR-01	ML 10.2K-HVR-01	ML 14.3K-HVR-01
Rated Energy [kWh]	96.768	143.36	200.704
Cell Type	LFP(LiFePO4)		
Pack Capacity [kWh]	6.912	10.240	14.336
Pack Number	14		
Rated Voltage [V]	716.8		
Working Voltage Range [V]	627.2-817.6		
Efficiency(@0.5C-rate)	96%		
Max.Charging/Discharging Current@10sec [A]	135	200	250
Cycle Times	>6000 times(25C，0.5C，90%DOD,80%EOL)		
Communication	LAN/CAN/RS485		
IP Level	IP20		
Working Temp.Range [°C]	10 to 40		
Working Humidity Range	5-95 %(No Condensation)		
Max.Altitude [m]	3000		
Dimension [W*H*D mm]	593*1042*1622	593*1042*2064	736*1042*2064
Weight [KG]	1100KG	1500KG	2000KG
Fire Fighting	PACK Level Aerosol		
Battery Module Qty in series	up to 15		
clusters can be paralleled connected	up to 10		

11. Inverter DOD Settings

In order to ensure the normal operation of the battery, we recommend that the DOD settings of the inverter are as follows:

On-grid DOD:80%

Off-grid DOD:70%