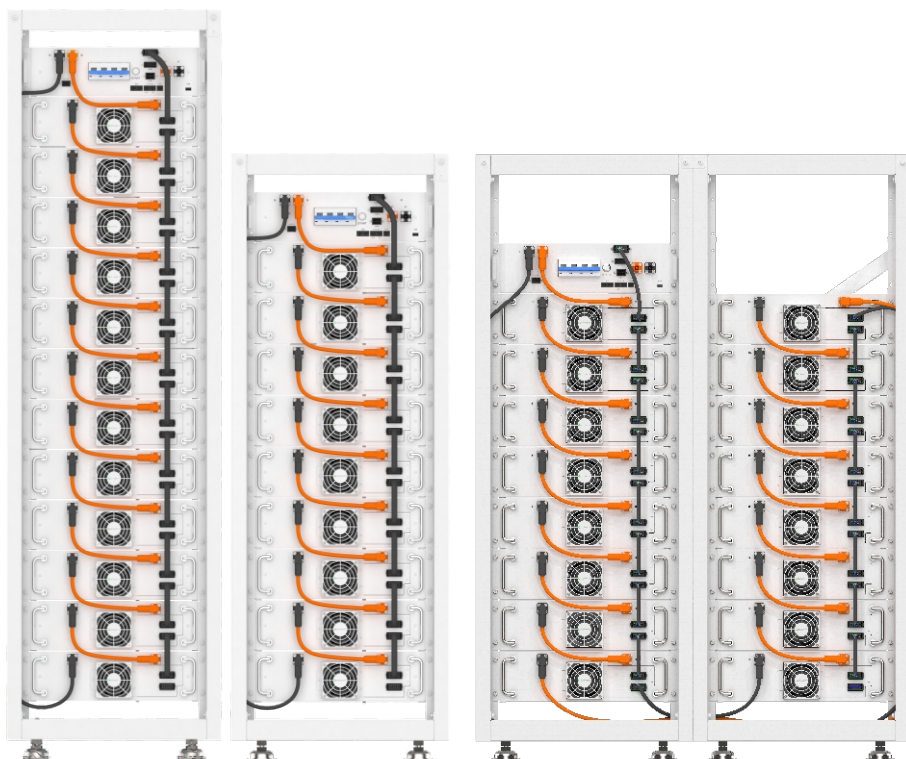




AXE 15.0~80.0H-1HR-E1 High Voltage Battery System User Manual

About This Document

This document introduces the AXE 15.0~80.0H-1HR-E1 High Voltage Battery System in terms of its installation, electrical connection, operation, commission, maintenance, and troubleshooting. Before installing and operating the AXE system, ensure that you are familiar with the product features, functions, and safety precautions provided in this document.

Symbol	Description
 WARNING	Indicates a potentially hazardous situation, if not avoided, could result in serious injury or death.

Change history

- Version 02
 - Label of model change
- Version 01
 - Add the description of the 75-80KWH battery system
- Version 00
 - First release

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1 Product Overview

1.1 Intended Use

The entire AXE 15.0~80.0H-1HR-E1 High Voltage Battery System includes a AXE 1000100-C1 (high voltage controller) and multiple AXE 5.0H-E1 EU (battery pack). Each AXE 5.0H-E1 EU consists of 100Ah cells which form 51.2V voltage battery pack via one parallel and sixteen serial connection (1P16S). Three to sixteen AXE 5.0H-E1 EU can be connected in serial to extend the capacity and power of energy storage system.

The AXE battery system powers the loads through PCS at nighttime without solar; when solar becomes available during daytime, solar energy powers the loads as a priority and store residual solar power into the AXE battery system.

1.2 Component Description

1.2.1 Appearance and Dimensions

AXE battery rack comes in two version. The standard version has 13 tiers, supports up to 12 battery modules; the smaller version has 10 tiers, supports up to 9 battery modules.

Standard version

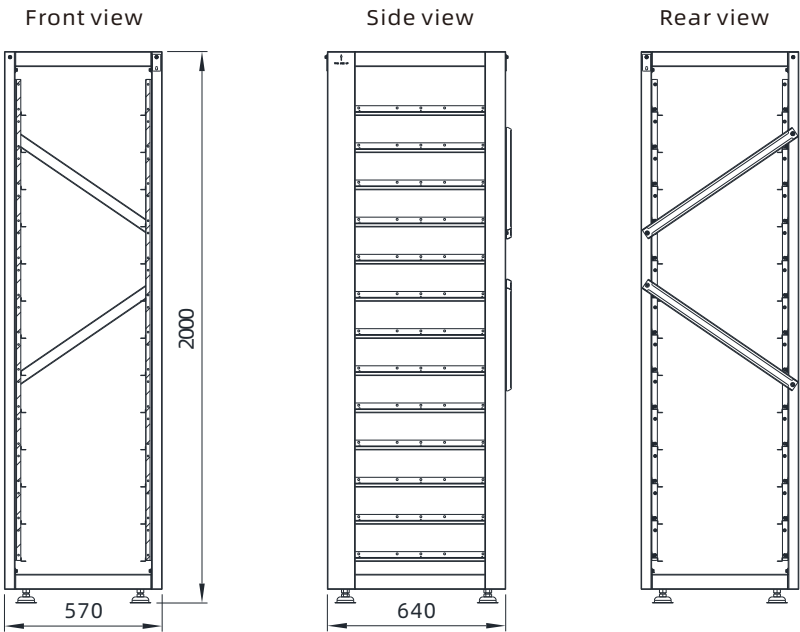


Fig 1.1 Appearance of the Standard Version

Smaller version

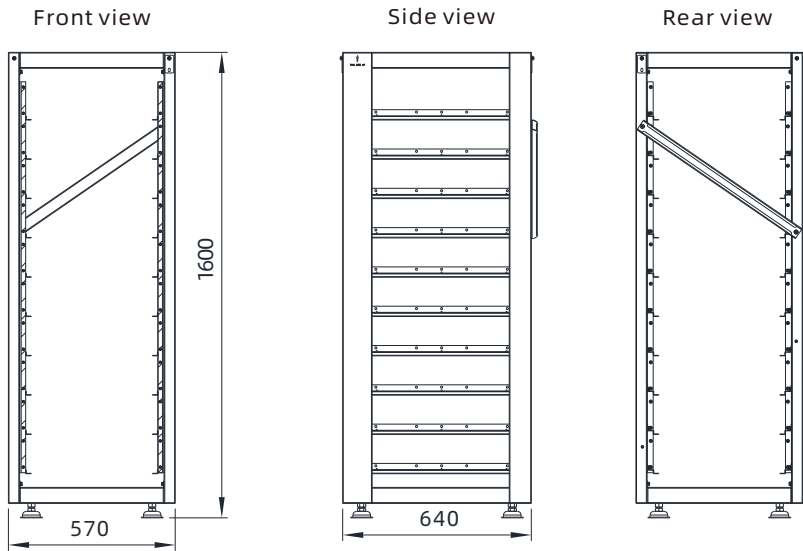


Figure 1.2 Appearance of the Smaller Version

1.2.2 AXE 1000100-C1 (High Voltage Box)

The AXE 1000100-C1 Control Module (CM) consists of battery control unit, DC breaker, power supply and communication terminals. The appearance of the Control Module is shown as below.

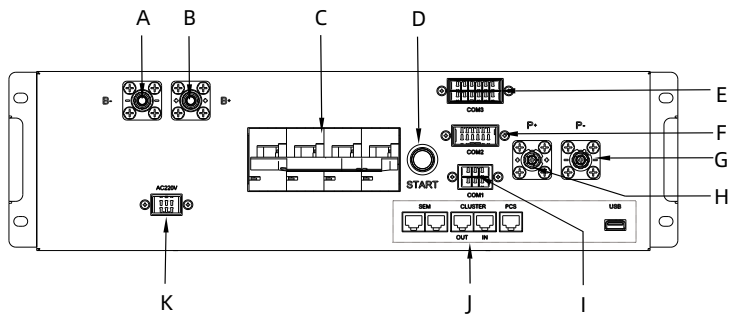


Figure 1.3 Front View of the AXE 1000100-C1

Position	Item	Description
A	BAT- power terminal	Connected to the negative power terminal of the battery cluster
B	BAT+ power terminal	Connected to the positive power terminal of the battery cluster
C	Circuit breaker	To control the battery output
D	Start button	To power on the energy storage system
E	COM3 communication terminal	Connected to the communication port of the battery pack's BM board ,FAN 24V power supply port and heating film power line
F	COM2 communication terminal	Connected to panel indicators, tripping control board and emergency stop switch, etc
G	PCS- power output terminal	Connected to the negative terminal on the DC side of the PCS
H	PCS+ power output terminal	Connected to the positive terminal on the DC side of the PCS
I	COM1 communication terminal	Connected to the RS485 communication port and the 24V power supply port of the EM (Environmental Monitor) board
J	Common wiring terminals	Connected to communication terminals of PCS, SEM and USB
K	Power supply port	Auxiliary AC 220V power input

1.2.3 AXE 5.0H-E1 EU (Battery Pack)

The AXE 5.0H-E1 EU Battery Module (BM) consists of battery cells, cooling fan, mechanical parts, Battery Management Unit (BMU) as well as power and communication terminals. The appearance of the product is shown below.

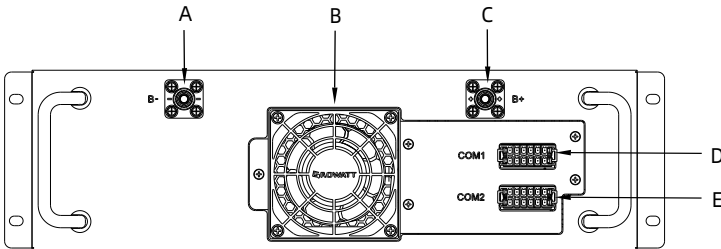


Figure 1.4 Front View of the AXE 5.0H-E1 EU

Position	Item	Description
A	Negative battery pack terminal	Negative battery pack connector
B	Cooling fan	For battery heat dissipation
C	Positive battery pack terminal	Positive battery pack connector
D	COM1 communication terminal	For communication between battery packs, FAN power supply and Heating film power line loop
E	COM2 communication terminal	For communication between battery packs, FAN power supply and Heating film power line loop

1.3 Working Principle and Function

The AXE 15.0-80.0H-1HR-E1 high voltage battery system is composed of a high voltage controller AXE 1000100-C1 and battery pack AXE 5.0H-E1 EU in series. It contains electrochemical batteries, battery control units, power and communication terminals, and mechanical parts.

A single cluster system can connect 3 to 16 packs in series to increase the capacity and power of the battery system. The entire battery system communicates with the inverter through CAN communication, and the operation stability is high.

- **Monitoring:** voltage, current and temperature detection of both single cells and battery system.
- **Protection and Alarm:** protection and alarms when over voltage, under voltage, over current, over temperature or under temperature occurs. See Appendix I for the details.
- **Report:** report all alarms and status data to PCS.
- **Series connection:** support the series connection of three to sixteen Battery Modules.
- **Power failure triggered by fault:** 10 minutes after the battery system and PCS communication is disconnected or 15 minutes after undervoltage protection.

2 Safety

When installing or using a battery system, the safety information contained in this section must always be followed. For safety reasons, it is the installer's responsibility to be familiar with this manual and all warnings before installation.

2.1 Basic Security

The battery system has been designed and tested in accordance with strict rules with international safety certification requirements. Before any installation or use of the battery system, please read all safety instructions carefully and always follow the relevant rules. Growatt is not responsible for any of the following circumstances or their consequences:

- Damage occurred during transportation.
- Incorrect transportation, storage, installation and use, or customer fails to convey the correct information about transportation, storage, installation and use to terminal customers.
- Non-professional installation.
- Failure to obey the rules of this operation instructions and safety precautions in this document.
- Unauthorized modifications or removal of the software package.
- The product's tamper label is damaged or the product lacks any parts (except authorized disassembly parts).
- Operation in extreme environments which are not allowed in this document.
- Repair, disassemble, or change packs without authorization and cause failure.
- Damage to shell labels or modifies date of production.
- Packs fail to be charged for more than six months.
- Damages due to force majeure (such as lightning, earthquakes, fire, and storms).
- Warranty expiration.

2.2 Safety Precautions

2.2.1 Environment Requirements

- Do not expose the battery to temperature above 50°C or heat sources.
- Do not expose the battery to moisture, corrosive gases or liquids.
- Do not expose the battery to direct sunlight for extended periods of time.
- Place battery in safe place away from children and animals.
- Battery power terminals shall not touch conductive objects such as wires.
- Do not dispose the battery in fire, which may cause an explosion.
- The battery system shall not come in contact with liquids.

2.2.2 Operation Precautions

- Do not touch the battery system with wet hands.
- Do not disassemble the battery system without permission.
- Do not crush, drop or pierce the battery pack and the high voltage controller.
- Dispose the batteries according to local safety regulations.
- Store and recharge battery in accordance with this manual.
- Ensure the connection of ground wire reliable.
- Remove all metal objects such as watches and rings that could cause a short-circuit before installation, replacement and maintenance.
- The pack shall be repaired, replaced or maintained by skilled personal that has been recognized.
- When storing or handling the battery, do not stack batteries without package.
- Do not broke the battery, the released electrolyte may be toxic and is harmful to skin and eyes.
- Packaged batteries should not be stacked more than specified number stipulated on the packing case.
- Do not use damaged, failed or deformed batteries, which may lead to high temperature or even dangerous accidents. Continued operation of damaged battery may result in electrical shock, fire or even worse.

2.3 Warning Labels

Symbols	Description
	Do not dispose in trash
	Lithium ion battery can be recycled
	Certification in European union area
	Electric shock hazard
	Explosive gas
	May leak corrosive electrolyte

Symbols	Description
	Heavy enough to cause severe injury
	Keep the Pack away from children
	Make sure the battery polarity well connected
	Do not expose to fire
	Observe the manual

 GROWATT Lithium Ion Battery	
Model	AXE 5.0H-E1 EU
Nominal Voltage	51.2V
Nominal/Rated Capacity	100Ah/90Ah
Nominal/Rated Energy	500Wh/4500Wh
Nominal Current	1C/100A
Operating Temperature	-10°C ~ +50°C
Ingress Protection	IP 20
Weight	44.1 kg
Dimensions (W / H / D)	482*131*580mm
    X Made in China	

 GROWATT AXE High Voltage Controller	
Model	AXE 1000100-C1
Operating Voltage Range	120V-1000Vdc
Max. Charge and Discharge Current	100A
Peak Discharge Current	150A, 30s
Operating Temperature	-30°C ~ +65°C
Ingress Protection	IP 20
Weight	14kg
Dimensions (W / H / D)	482*129*573mm
    X Made in China	

Figure 2.1 Nameplate of Control Module and Battery Pack

 GROWATT Energy Storage System	
System Mode/ Nominal Voltage/ Nominal Energy/ Max Output Power/ Operating Voltage Range	☐ AXE 15.0H-1HR-E1/153.6V/15kWh/ 15kW/139.2~172.8V ☐ AXE 20.0H-1HR-E1/204.8V/20kWh/ 20kW/185.6~230.4V ☐ AXE 25.0H-1HR-E1/256V/25kWh/ 25kW/232~288V ☐ AXE 30.0H-1HR-E1/307.2V/30kWh/ 30kW/278.4~345.6V ☐ AXE 35.0H-1HR-E1/358.4V/35kWh/ 35kW/324.8~403.2V ☐ AXE 40.0H-1HR-E1/409.6V/40kWh/ 40kW/371.2~460.8V ☐ AXE 75.0H-1HR-E1/768V/75kWh/ 75kW/696~864V ☐ AXE 80.0H-1HR-E1/819.2V/80kWh/ 80kW/742.4~921.6V
	Battery Type LiFePO ₄
	Max. Charge and Discharge Current 100A
	Operating Temperature -10°C~+50°C
	Relative Humidity 5% ~ 95%
	Protective Class Class I
	Ingress Protection IP20
Altitude	≤2000m
      X	
Made in China	

 GROWATT Energy Storage System	
System Mode/ Nominal Voltage/ Nominal Energy/ Max Output Power/ Operating Voltage Range	☐ AXE 45.0H-1HR-E1/460.8V/ 45kWh/45kW/417.6~518.4V ☐ AXE 50.0H-1HR-E1/512V/ 50kWh/50kW/464~576V ☐ AXE 55.0H-1HR-E1/563.2V/ 55kWh/55kW/510.4~633.6V ☐ AXE 60.0H-1HR-E1/614.4V/ 60kWh/60kW/556.8~691.2V
	Battery Type LiFePO ₄
	Max. Charge and Discharge Current 100A
	Operating Temperature -10°C~+50°C
	Relative Humidity 5% ~ 95%
	Protective Class Class I
	Ingress Protection IP20
Dimensions (W/D/H, mm)	570*640*2000
Altitude	≤2000m
      X	
Made in China	

Figure 2.2 Nameplate of Battery Rack

 WARNING	Performance de-rate may be initiated when the temperature is below 10°C.

2.4 Emergency Responses

Manufacturer takes foreseeable risk scenarios into consideration with the aim of reducing hazards and dangers. However, if the following situation occurs, do as below:

Situation Occurs	Description and action need
Leakage	Avoid touch of leaking liquid or gas. If you touch the leaking electrolyte, do as below immediately. Inhalation: Evacuate the contaminated area, and seek medical help. Eye contact: Rinse eyes with flowing water for 15 minutes, and seek medical help. Skin contact: Rinse contacted area thoroughly with soap and water, and seek medical help. Ingestion: Vomiting, and seek medical help.
On fire	It's hard for battery system ignite spontaneously. If the battery has caught a fire, do not try to extinguish the fire but evacuate people immediately.
Wet Packs	If the battery system is soaked or submerged in water, do not access it. Contact Growatt or distributors immediately for technical assistance.
Damaged shell	Damage to the shell is very dangerous, so special attention must be paid. They are no longer suitable for use and may be dangerous to personnel. If the battery case is damaged, please stop using it and contact Growatt or distributors.

Storage and Transportation 3

3.1 Storage Requirements

- Place the product follow the identification on the packing case during storage.
- Do not put the product upside down or sidelong.
- The defective product needs to be separated from other product.
- The storage environment requirements are as follows:
 - Place the product in a dry, clean and well ventilated place.
 - Keep the battery storage temperature between -20°C~50°C and charge the battery regularly:

Storage temperature	Storage RH	Storage period	Recharge period
<-20°C	/	Not permitted	/
-20°C ~ 25°C	5% ~ 95%	≤12 months	≤12 months
25°C ~ 35°C	5% ~ 95%	≤9 months	≤9 months
35°C ~ 50°C	5% ~ 95%	≤6 months	≤6 months
>50°C	/	Not permitted	/

Note:

If the battery is not charged when the permitted storage period illustrated above is exceeded, it might result in battery damage. Currently, the battery can only be charged via the inverter.

- Place the product away from corrosive and organic substances (including gas exposure).
- Free from direct exposure to sunlight and rain.
- At least two meters away from heat sources (such as a radiator) .
- Free from exposure to intensive infrared radiation.
- If the battery is over-discharged, recharge it to 40% SOC within 7 days.



NOTICE

If not follow the above instructions for long-term storage, the battery cycle life will be reduced or even damaged.

3.2 Transportation Requirements

➤ Battery pack has been certified in UN38.3 (Section 38.3 of the sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria) and SN/T 0370.2-2009 (Part 2: Performance Test of the Rules for the Inspection of Packaging for Exporting Dangerous Goods). Battery pack is classified as category 9 dangerous goods.

- The battery pack shall not be transported with other inflammable, explosive or toxic substances.
- Ensure the original Package and label complete and recognizable.
- Prohibit direct exposure to sunlight, rain, condensing water caused by temperature difference and mechanical damages.
- Prohibit to pile up more than twelve battery pack.
- There will be a drop in capacity during transportation and storage.
- Transportation temperature is between -20°C to 50°C, relative humidity: 5%~95%RH.

Installation 4

 WARNING	➤ The installation and use of batteries involve a lot of expertise. Therefore, please ensure that technicians have obtained relevant technical certificates before operation. ➤ Ensure to read the Guidance before installation in order to understand product information and safety cautions. ➤ Operators should be well trained technicians and fully understand the whole photovoltaic system, grid network, battery system, working principle and national regional standards. ➤ Installers must use insulating tools and wear safety equipment. ➤ Device damages caused by failure to comply with storage, transportation, installation and use requirements specified in Guidance are not covered by Warranty. ➤ Do not install or use battery near explosive or inflammable substances. ➤ Use battery in well-ventilated environment with temperature ranging from -10°C to 50°C, recommended operating temperature 10°C~30°C. When the ambient temperature is higher than 45°C or lower than 10°C, the battery's charge and discharge power may be derated. ➤ Maintain a minimum level of dust and dirt in the environment. ➤ Do not install battery in highly humid area such as bathroom. ➤ Please make sure that all battery pack connected in series are from the same batch, the same model and the same manufacturer. Do not mix old batteries with new batteries. Batteries undergone less than 300 cycles are defined as new batteries.
 NOTICE	➤ Before installing battery packs in series, make sure that the voltage difference of the battery pack must be less than or equal to 0.5V. ➤ When installing the batteries, we recommend that the manufacturing date of batteries in the same system should be within 3 months.

4.1 Installation Environment

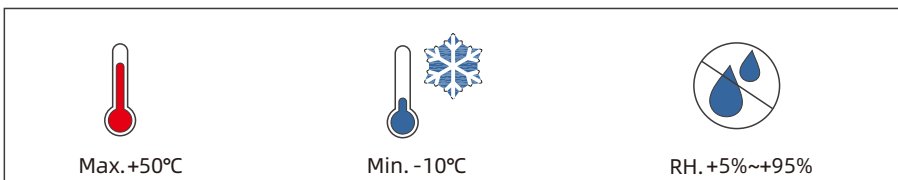
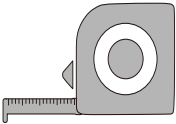
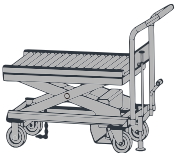


Fig 4.1 Installation Environment Requirement

4.2 Installation Tools

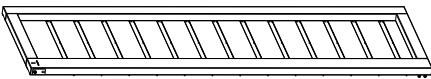
 Knife	 Cross-head screwdriver	 Wrench	 Measuring tape
 Electric screwdriver	 Level	 Forklift	 Lifting platform

4.3 Checking before installation

4.3.1 Pre-installation Check

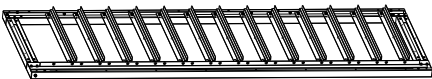
- Check the battery pack package before open it. If any abnormality is detected, do not open the package and contact your distributor.
- Check and confirm the battery pack is powered off before installation.
- Check the quantity of all parts inside according to the package list. If there is any part missing or damaged, please contact your distributor.

4.3.1.1 Introduction to the rack components



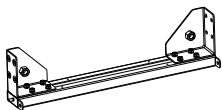
Right frame

A



Left frame

B



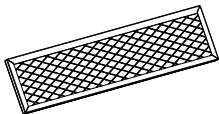
Horizontal frame

C



Diagonal support

D



Dust-proof net

E

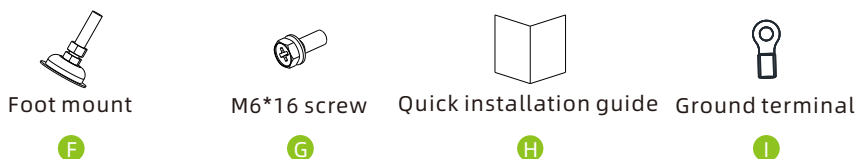
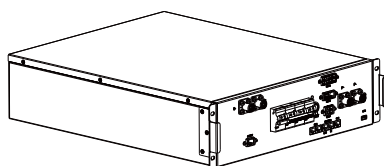


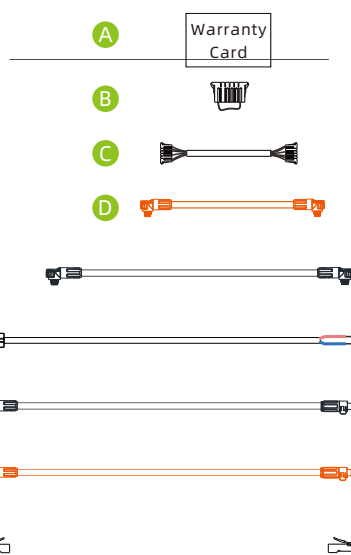
Figure 4.2 Rack Components

Version	Composition
Standard	A+ B+4*C+2*D+12*E+4*F+95*G+1*H+2*I
Smaller	A+ B+4*C+1*D+9*E+4*F+80*G+1*H+2*I

4.3.1.2 Checking the package of high voltage box



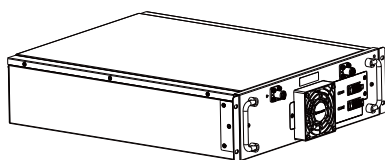
High voltage box (CM)



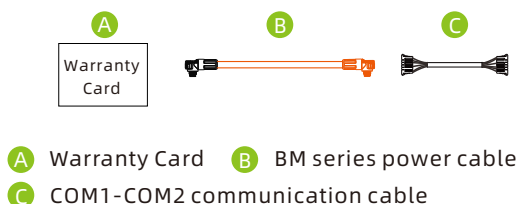
- A Warranty Card
- B Short-circuit connector cap
- C COM1-COM3 communication cable
- D BM-CM positive power cable
- E BM-CM negative power cable
- F BMS-AC cable
- G PCS-CM negative power cable
- H PCS-CM positive power cable
- I RJ45 Network cable

Figure 4.3 Components and Parts of High Voltage Box

4.3.1.3 Checking the package of battery module



Battery module (BM)



- A Warranty Card
- B BM series power cable
- C COM1-COM2 communication cable

Figure 4.4 Components and Parts of Battery Module

4.4 Installation

4.4.1 Installation of the Rack

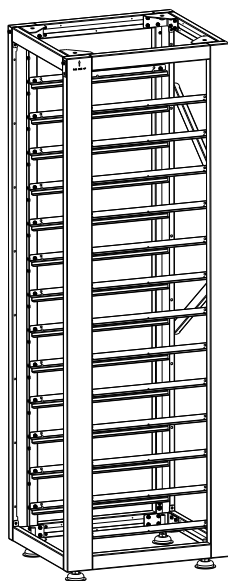
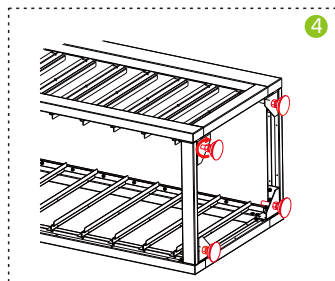
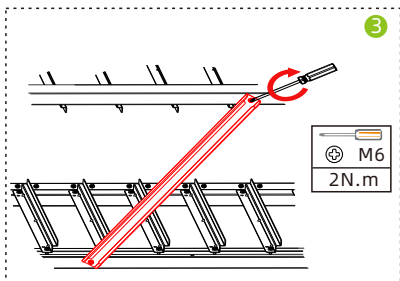
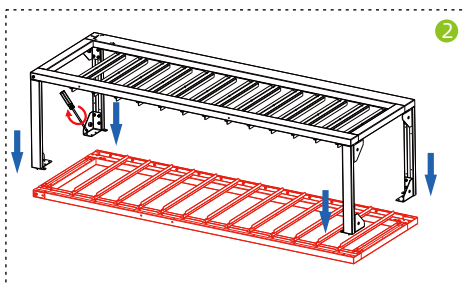
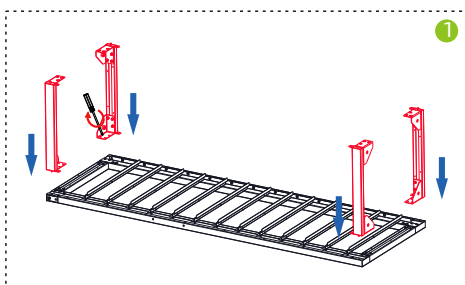
Step 1: Assemble the right frame, left frame and 4 horizontal frames to form a rectangular support rack.

Step 2: Secure the horizontal frames to the left and right frames using the M6 combination screws.

Step 3: Attach the two diagonal supports to the rear of the rectangular rack using the M6 combination screws.

Step 4: Rotate the four foot mounts to the bottom of the rack and tighten them with a wrench or by hand. Upon completion of installation, stand the rack upright.

Step 5: Stand the rack up and adjust the foot mount to ensure the rack is level.



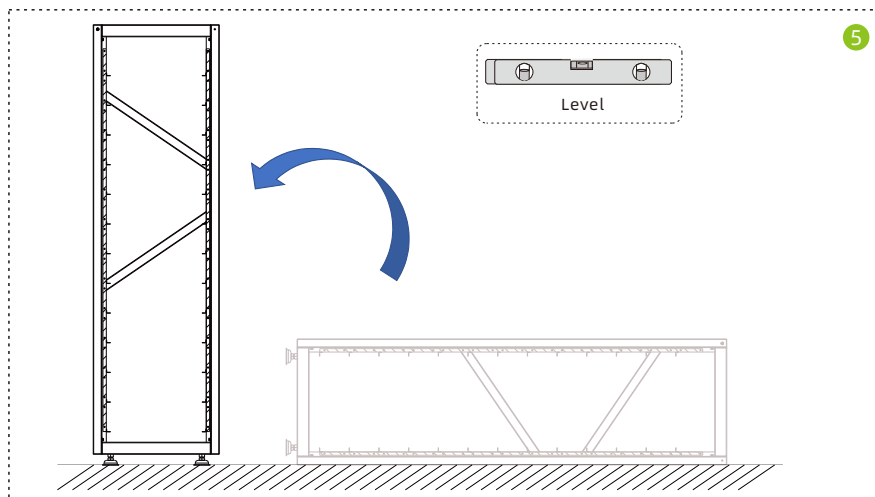


Figure 4.5 Procedure for Installing the Rack

4.4.2 Transportation of the Rack

When moving the equipment with a forklift, secure it properly according to the actual situation to avoid tip-overs. Note: Forklifts cannot transport racks with batteries installed.

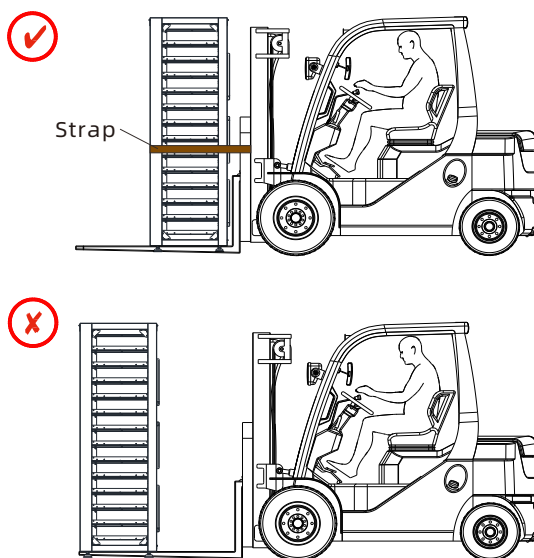


Figure 4.6 Forklift Handling Diagram

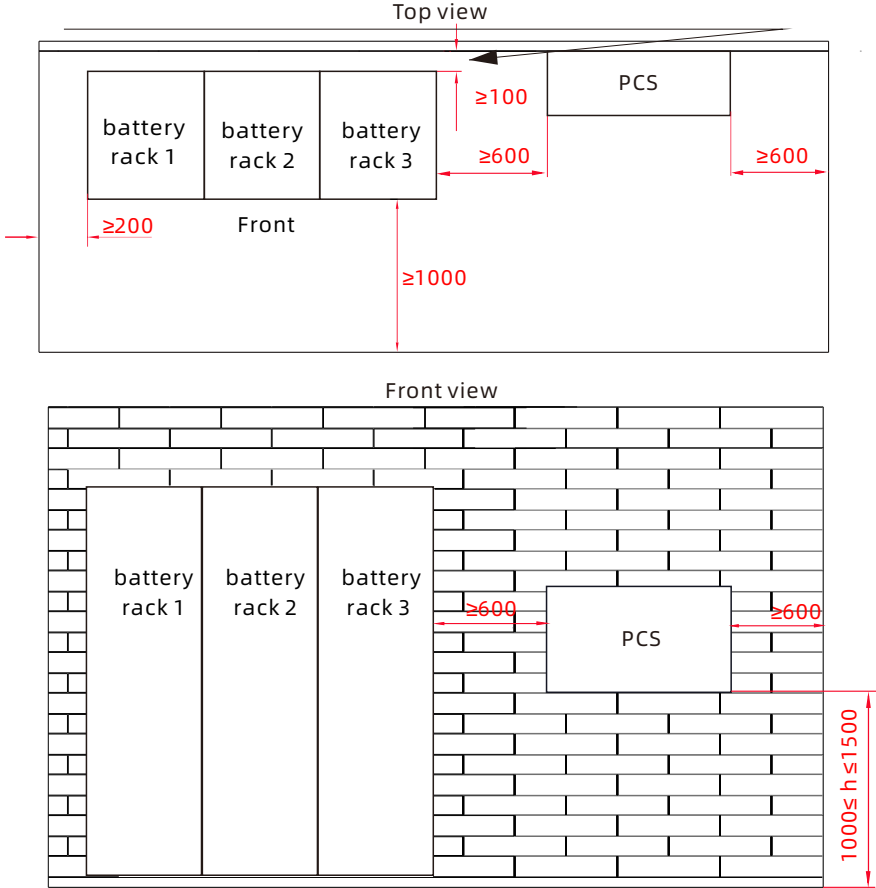
4.4.3 Installation of Environment Requirements

Note : The battery system is necessary to be installed in closed rooms at least 14km offshore, or closed rooms with air conditioning 5-14km offshore. The battery energy storage system may only be installed and operated in closed rooms, and works in an ambient temperature range of -10°C to 50°C and at a maximum humidity of 95%. The battery rack may not be exposed to direct sunlight or placed directly beside sources of heat.

➤ The clearance requirements of the AXE 15.0H-60.0H-1HR are shown below. Take the installation of three battery rack connected with the PCS (WIT 29.9-50K-XHU) as an example.

Unit: mm

For dust-proof net's maintenance accessibility , the clearance between the battery rack and wall surface can be increased appropriately.



➤ The clearance requirements of the AXE 75.0H-80.0H-1HR are shown below. Take the installation of eight battery rack connected with the PCS (WIT 50-100K-HU) as an example.

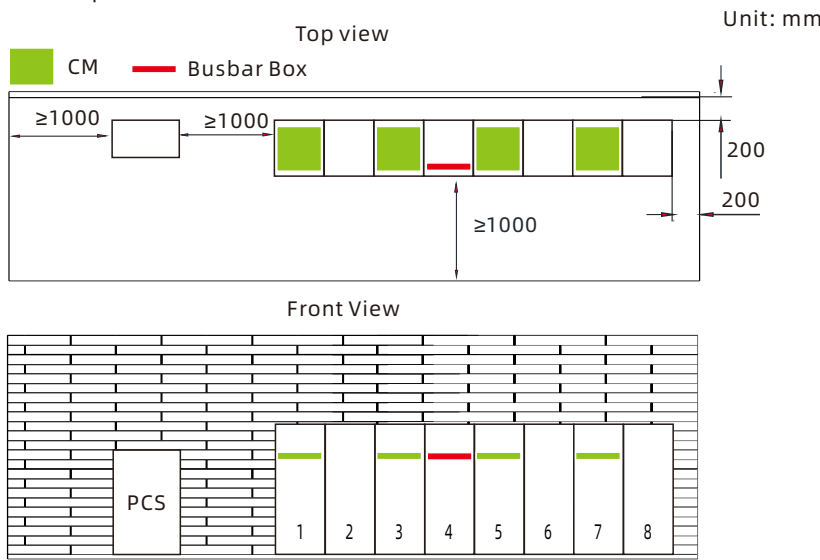


Figure 4.8 Top and Front View

4.5 Installation of Battery Modules and Cable Connections

4.5.1 Wiring of Ground Cable of the Rack

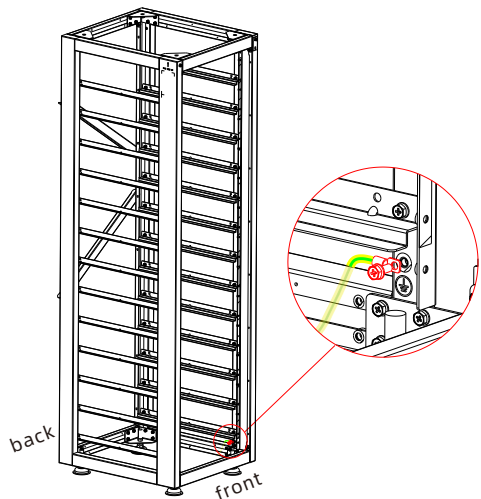


Figure 4.9 Rack Ground Cable Connection

4.5.2 Installation of Battery Modules

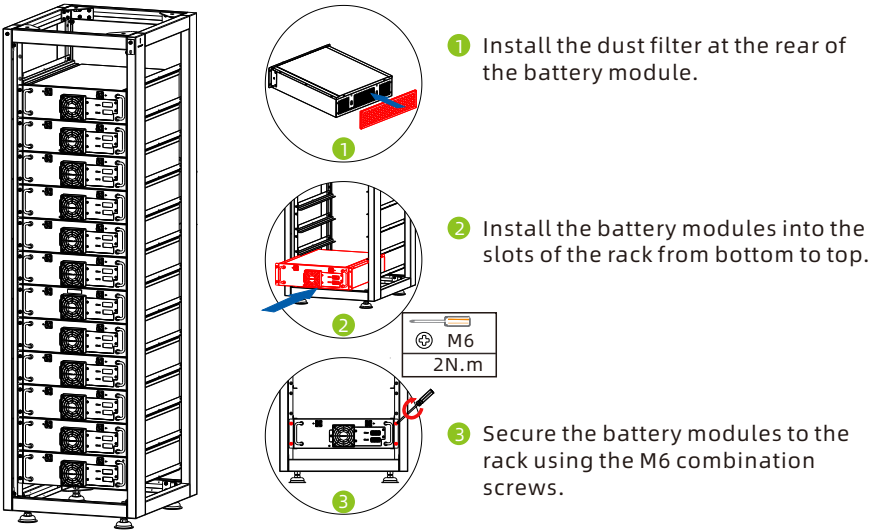


Figure 4.10 Battery Installation Procedure

4.5.3 Installation of the High Voltage Box

The high-voltage box can be installed on the top or bottom of the battery rack. Top mounting is preferred.

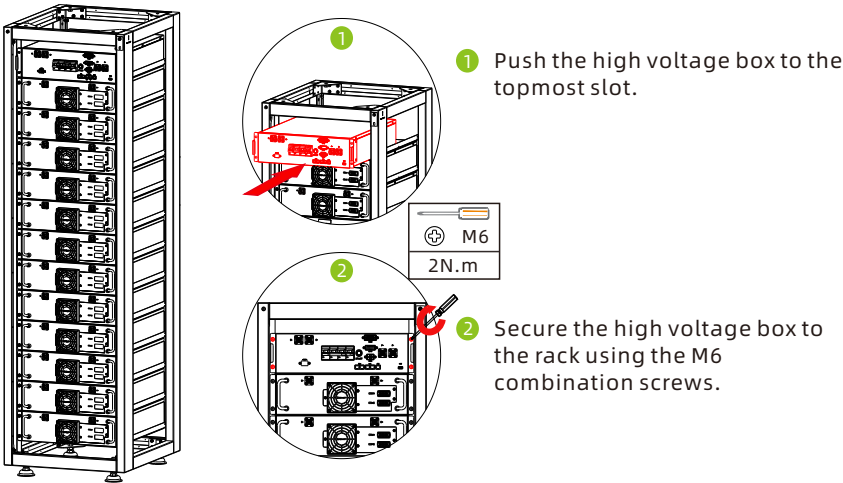


Figure 4.11 High Voltage Box Installation Procedure

4.5.4 Cable Connections

4.5.4.1 Wiring of power cables between battery modules

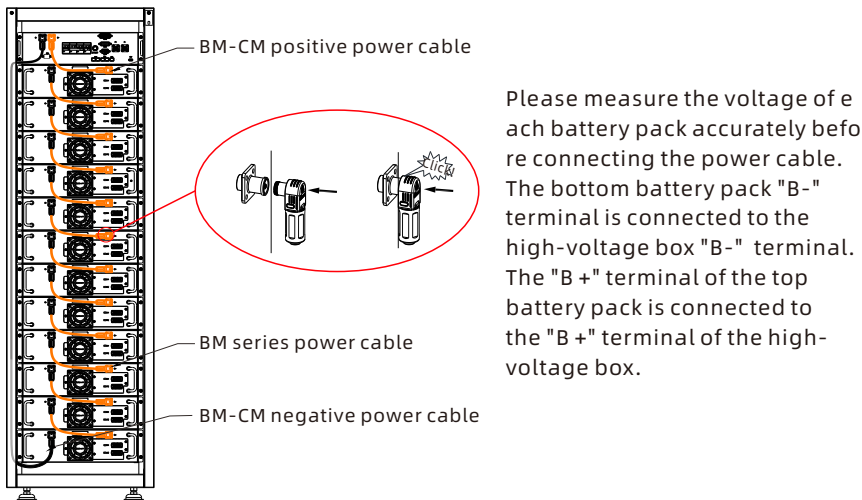


Figure 4.12 Battery installation Procedure Connect Power Cables

4.5.4.2 Wiring of communication cables between battery modules

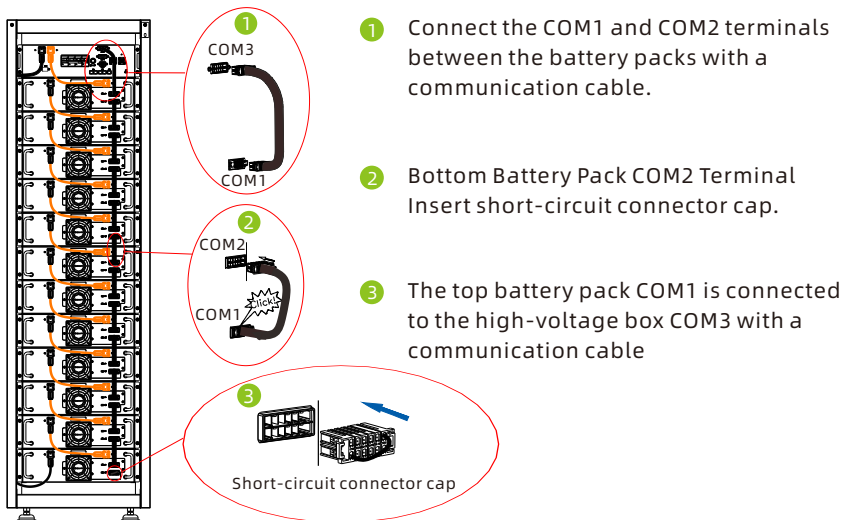


Figure 4.13 Battery installation Procedure Connect Communications Cables

4.5.4.3 Wiring of cables between the battery system and the PCS

A junction box is required when a single battery rack is connected to the WIT 29.9-50K-XHU, as shown below:

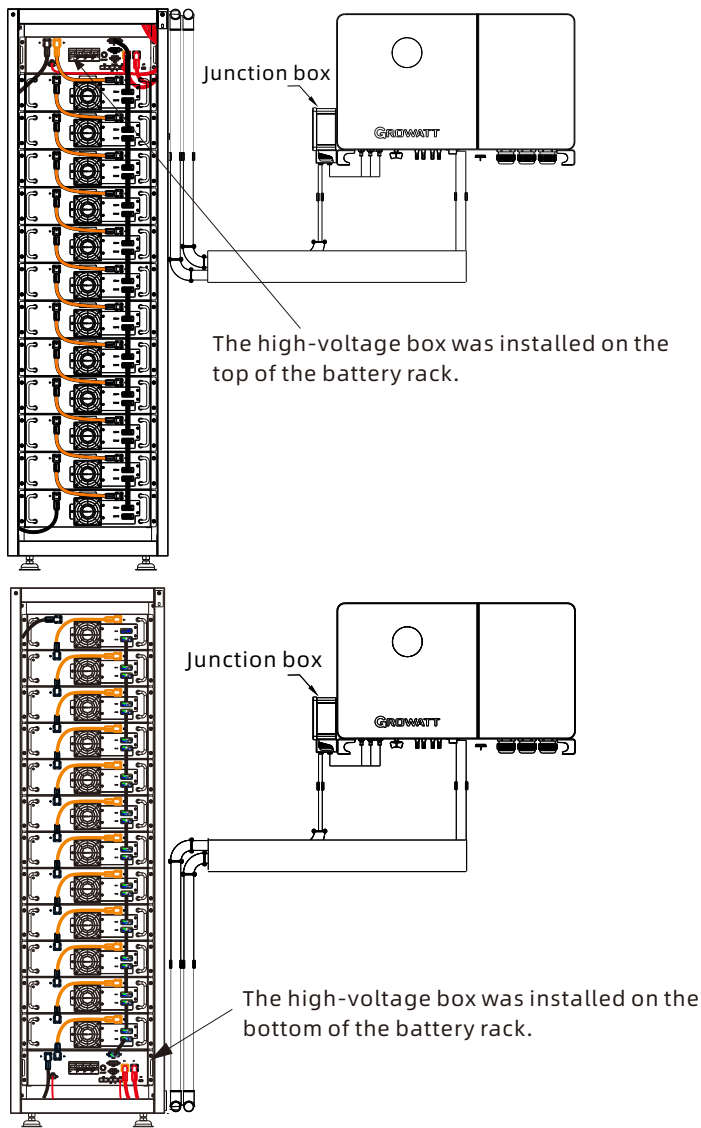


Figure 4.14 Single-cluster Wiring Diagram

The junction box is not required when multiple battery racks are connected to the WIT 29.9-50K-XHU. Up to 3 battery racks can be connected to the WIT 29.9-50K-XHU, as show below:

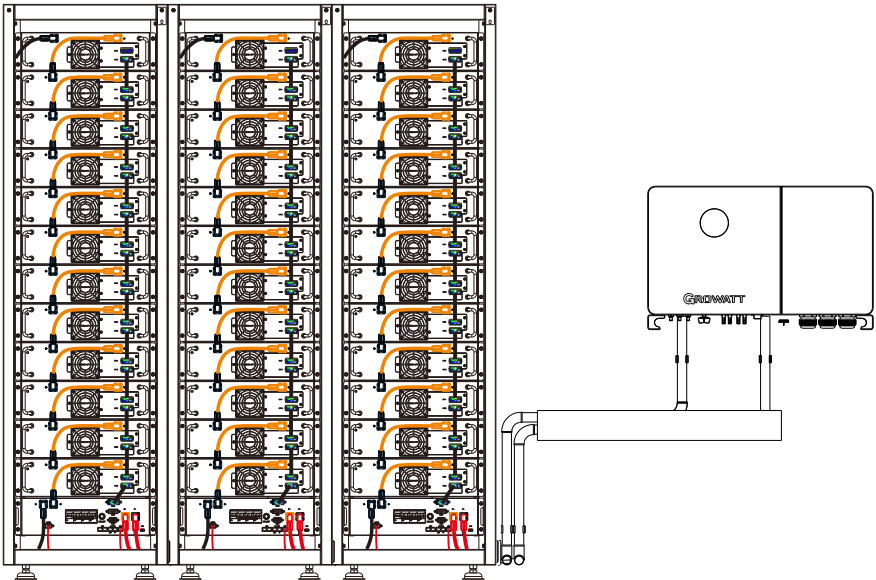


Figure 4.15 Multi-cluster Wiring Diagram

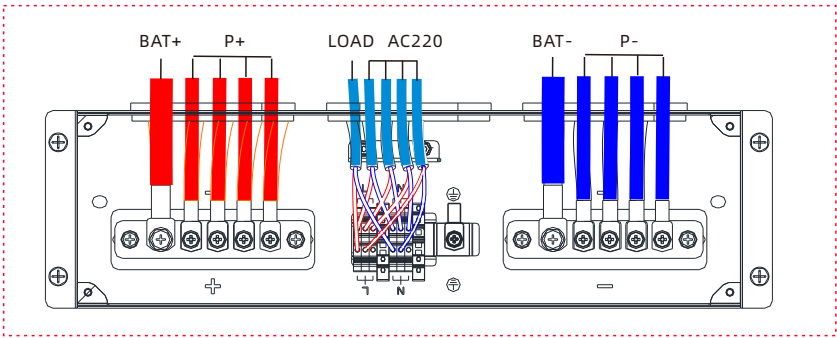
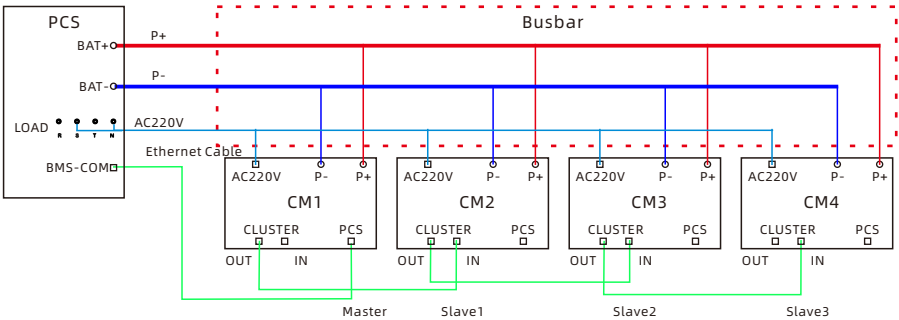
Cable requirements for connecting the battery cabinet and the WIT 29.9-50K-XHU:

- 1.AXE AC auxiliary power supply wiring: The AC 220V terminal of the high-voltage box should be connected to the AC terminals of the PCS. When connecting, choose a phase on the load terminals of PCS to connect (either one of R/S/T phase + N wire).
- 2.BMS communication wiring: The PCS terminal of the high-voltage box is connected to the BMS1/BMS2/BMS3 terminal of the PCS.
- 3.The P+/P- terminal of the high-voltage box is connected to the Battery+/Battery-terminal of the PCS.

4.5.4.4 Wiring of cables between the battery system and the WIT 50-100K

The busbar box is required when multiple clusters of battery working with WIT 50-100K-HU. Up to 4 clusters can be connected in parallel, as show below:

Busbar Box Wiring Enlargement Diagram



- PCS-Busbar+ PCS-Busbar- CM-Busbar+
- CM-Busbar Ethernet Cable AC Power Cable

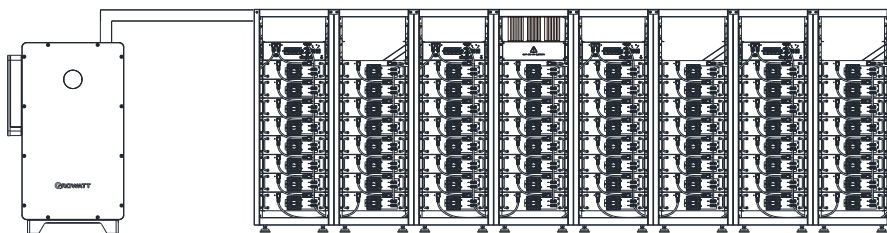


Figure 4.16 Multi-cluster Wiring Diagram

Cable requirements for connecting the battery cabinet and the WIT 50-100K-HU:

1. When working with the WIT 50-100K HU, the busbar box is necessary, the AC 220V and P± of the high-voltage box should be connected in parallel through the busbar box and then connected to the PCS.
2. AXE AC auxiliary power wiring: The AC 220V terminals of the high-voltage box should be connected to the AC busbar of the busbar box, and then through the busbar box, connected to the AC terminals of the PCS. When connecting, choose a phase on the load terminals of PCS to connect (either one of R/S/T phase +Nwire).
3. BMS communication wiring: The PCS terminal of the first cluster of high-voltage box is connected to the BMS terminal of the PCS. The OUT terminal of the CLUSTER terminal of the first cluster of high-voltage box is connected to the IN terminal of the CLUSTER terminal of the next cluster of high-voltage box, and this connection continues in this manner until the last cluster.
4. Power cable wiring: The P+ / P- terminals of the high-voltage box are connected to the B+ / B- busbars of the busbar box, and then through the busbars, they are connected to the B+ / B- terminals of the PCS.

5 Power On/Off the Battery System

 NOTICE	➤ The installation and use of batteries need to be operated by professional technicians. ➤ Do not contact any positions with potential difference. ➤ Prohibition sign should be hung on the battery: " Non - professionals, do not touch. ➤ If any abnormalities occur during the startup phase, power off the system immediately. After problem confirmed, proceed again. ➤ Make sure the inverter is turned off before checking the battery system.
--	---

5.1 Check Before Power-on

5.1.1 Routine Check

No.	Checking item	Acceptance criteria
1	Equipment appearance	• The equipment is intact, free from damage, rust or paint loss. If the paint flakes off, please re-paint the spotted area. • Equipment labels are clear and damaged labels should be replaced in time.
2	Cable appearance	• The cable sheath is properly wrapped with no visible damage. • The cable conduits are intact.
3	Cable connection	• Cables are connected at the designate positions. • Wiring terminals are prepared as required and connected reliably. • Labels on both end of each cable is clear and facing toward the same direction.
4	Cable routing	• Electrical cables and extra low voltage cables are routed separately. • The cables are neat and tidy. • Cable tie joints are evenly cut without burs. • Leave the cable slack at bending points to avoid stress. • Cables are routed neatly without twists or crossovers.
5	Switch	• The switch on the external AC distribution panel or the distribution panel is in the OFF position. • The switch on the high voltage box is in the OFF position.

5.1.2 Rack Inspection

No.	Checking item	Acceptance criteria
1	Installation	• Installation complies with the design requirements. • The rack is level, and each battery module can be properly installed.
2	Appearance	• The surface is free from cracks, dents and scratches. If the paint flakes off, re-paint the spotted area.
3	Cabinet grounding	• Each rack has at least one grounding point and should be grounded reliably. The site ground resistance should be less than or equal to 0.1Ω.
4	Label	• Labels are correct, clear and complete.

5.1.3 Internal Inspection

No.	Checking item	Acceptance criteria
1	Battery module	• The exterior of each battery module is free from damage.
2	High voltage box	• The exterior of the high voltage box is free from damage.
3	Foreign object	• All foreign objects have been removed from the rack, such as tools and leftover installation materials.

5.2 Power On/Off the Equipment

5.2.1 Power-on Procedure

1	Turn on the DC and/or PV Switch on the Inverter and the circuit breaker on the AC side according to the Inverter operating instructions.
2	Turn on the circuit breaker on the high voltage box.
3	Press and hold the START button on the high voltage box for more than 2 seconds.

5.2.2 Commissioning

Prerequisites:

1	All devices on site have passed the on-site tests.
2	The system has been powered on and no alarm/fault is reported.
3	The commissioning tools are available on site.

5.2.3 Power-off Procedure

1	Follow the steps in the manual or instructions of the inverter to turn it off and make sure it stops operating.
2	Turn off the DC and/or PV switch on the inverter and the circuit breaker on the AC side.
3	Turn off the circuit breaker on the high voltage box of battery system.

5.3 Electrical Schematic

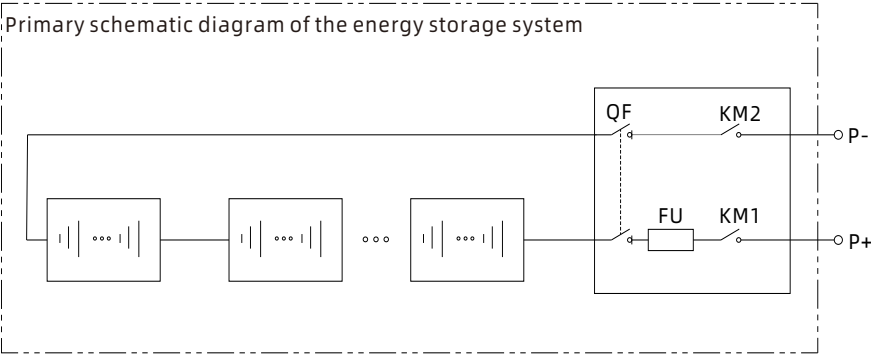


Figure 5.1 Primary schematic diagram of the energy storage system

Maintenance Guide 6

6.1 Preparation

Before maintenance, please make sure that the battery system is powered off and the DC circuit breaker is off.

6.2 Replacing the BM or the CM

Note:

Replace the battery if the following conditions occur: The internal circuit of the battery expansion module is faulty, the battery health reaches the end point, the battery appearance is deformed, damaged, or leaks.

- Wear safety gloves.
- Close the breaker and power off the battery system.
- Disconnect power cables and PACK communication cables of the battery system.
- Uninstall the safety screws on both sides of the battery pack or high voltage controller. Lift up the battery pack or high voltage controller.
- Put the battery pack or high voltage controller into the packing box according to the repair procedure and transport the battery pack or high voltage controller to the designated repair site.
- Install new battery pack or high voltage controller based on procedure specified in Section 4.



NOTICE

- If the battery is not used, it is recommended to charge and discharge the battery every 3 months to activate the chemical characteristics, and the maximum interval shall not exceed 6 months.
- According to the local pollution level, it is recommended that the dust-proof net should be cleaned every 3 to 6 months and replaced every 2 to 3 years.

6.3 System Failure Information List and Troubleshooting Suggestions

Error Indication	Error description	Error cause	Suggested actions
START LED			
 (START Green Light Flickers)	Discharge under voltage protection	Single cell voltage below the threshold for under-voltage protection	There is over-discharged risk. User should stop discharging and arrange recharge

Error Indication	Error description	Error cause	Suggested actions
START LED			
 (START Green Light Flickers)	Charge over voltage protection	Single cell voltage exceeding threshold for protection threshold	1. There is no safety threat; 2. User should stop charging. Wait for the battery system to automatically resolve the fault
	High temperature protection	The temperature exceeds the protection value	It is dangerous, please stop using the battery immediately, wait for the battery temperature to drop, the fault will be automatically resolved.
	Low temperature protection	The temperature is below the protection value	No safety risk, wait for the temperature to rise, the fault will be automatically resolved.
 (START Red Light Flickers)	Discharge short circuit	External short circuit of battery system	There is safety risk and user should stop using battery. User should contact installer to repair PCS and battery.
	Precharge short circuit		
	Precharge overtime		
	External CAN Communication failure	Communication loss between PCS and battery system	1. There is no safety threat and user should stop using battery. 2. Check if PCS and battery communication terminal is well connected. 3. If PCS and battery system cannot communicate when the communication wire is confirmed well connected, user should contact installer to repair battery.

Error Indication	Error description	Error cause	Suggested actions
START LED			
 (START Red Light on)	Interior Communication failure	Communication loss between two packs	1.Check whether the communication line between the battery pack and the battery pack is connected OK; 2.Check whether the communication line between the high voltage controller and the battery pack is connected OK.
	Voltage sampling anomaly protection	BMS Voltage sampling failure	There is safety risk and user should stop using battery. User should contact installer to repair battery.
	Current sampling fault	BMS current sampling failure	
	Main circuit fault	BMS main power circuit failure	There is safety risk and user should stop using battery. User should contact installer to repair battery.

6.4 Extension

New Battery Selection:

- 1) The battery should be of the same model.
- 2) The interval between the installation date and the production date of new battery models should not exceed half a year
- 3) The installation interval between the new battery and the original system battery should be shorter than or equal to one year.

Steps to Add the New Battery Module:

- 1) Configure the system to enter expansion mode and wait until the system SOC is discharged to 45%.
- 2) Turn off the inverter and battery and wait at least 5 minutes to ensure there is no voltage.
- 3) Connect the new battery module to the system.
- 4) Start the system and enable the one-click diagnostic function.
- 5) After the test is OK, disable the diagnostic function and expansion mode, and the module SOC will automatically balance within a few weeks.

Note:

- 1. If not follow this guide, the battery system performance will be affected or even unable operate properly.
- 2. If the new battery module SOC and the existing system are not at same level,the battery system capacity will be limit and SOC jumps.

6.5 BM Module Fan Maintenance & Dust Net Maintenance

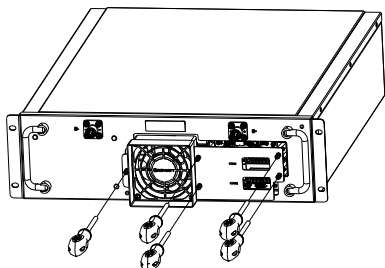
 NOTICE	• It must be operated by well-trained professional electrical technicians and follow the manual instructions. • Please disconnect the power and communication cables between BM modules or between BM module and CM module after the system is powered off, and then proceed with the operation.
 WARNING	• Do not use an air pump to clean the fan directly, as this may cause damage to the fan or blow dust and debris into the BM module, thereby contaminating the components. • Do not use an air pump to clean the dust-proof net directly, as this may blow dust and debris into the BM module and contaminate the components. • Do not rinse and clean the fan and dust-proof net directly with water, as this may cause damage or corrosion of the components.

Ventilation and heat dissipation are essential to protect the BM module from excessive heat, which can degrade the performance of the battery cells. The BM module is equipped with a cooling fan at the front. When the internal temperature of the BM module becomes too high, the fan will start to reduce the internal temperature. A dust-proof net is installed at the back of the BM module to prevent dust and debris from entering the interior of the BM module and contaminating the components, thereby affecting the performance of the module. If the BM module malfunctions due to excessive internal temperature, the probable causes and countermeasures are as follows:

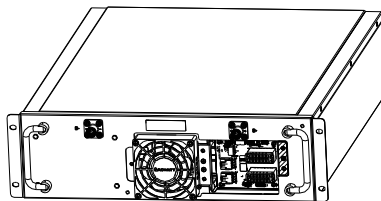
- 1) The fan or fan guard has excessive dust or blockage. Clean the fan and fan guard;
- 2) he fan is damaged,Replace the fan;
- 3) The dust-proof foam has excessive dust or blockage. Clean or replace the dust-proof foam;
- 4) The foam guard has excessive dust or blockage. Clean the foam guard.

6.5.1 Fan Cleaning and Replacement

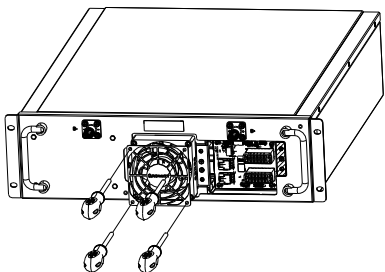
1. Before cleaning or replacing the fan, please disconnect the power and communication cables between BM modules or between BM module and CM module after the system is powered off, and then proceed with the operation;
2. Use a Phillips screwdriver to remove the fan cover plate and fan guard fixing screws, and then remove the fan cover plate and fan guard;
3. Pull out the fan. Disconnect the fan connector and remove the fan as needed;



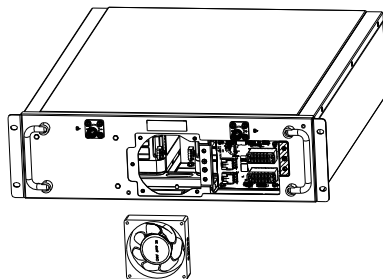
Remove the screws from the fan cover plate



Remove the fan cover plate



Remove the fan guard screws



Pull out or remove the fan

Figure 6.1 Fan Maintenance

4. Clean the fan and fan guard or replace the fan:
 - 1) Clean the fan and fan guard with a brush or damp cloth. Do not clean by rinsing with water directly;
 - 2) If necessary, the fan can be removed and cleaned separately;
 - 3) If the fan is damaged, the damaged fan needs to be removed and replaced with a new fan of the matched model;
 - 4) After cleaning, organize and connect the wiring harness;
 - 5) Confirm that the fan connector is securely connected, and then install the fan, fan guard and fan cover plate in order.
5. Connect the power and communication cables between BM modules or between BM module and CM module. After confirming that there are no errors, power on the system.

6.5.2 Cleaning and Replacement of Dust Screen

1. Before cleaning or replacing the dust-proof net, please disconnect the power and communication cables between BM modules or between BM module and CM module after the system is powered off, and then proceed with the operation;
2. Lift the dust-proof net slightly upwards with both hands, then move it backwards to remove it;

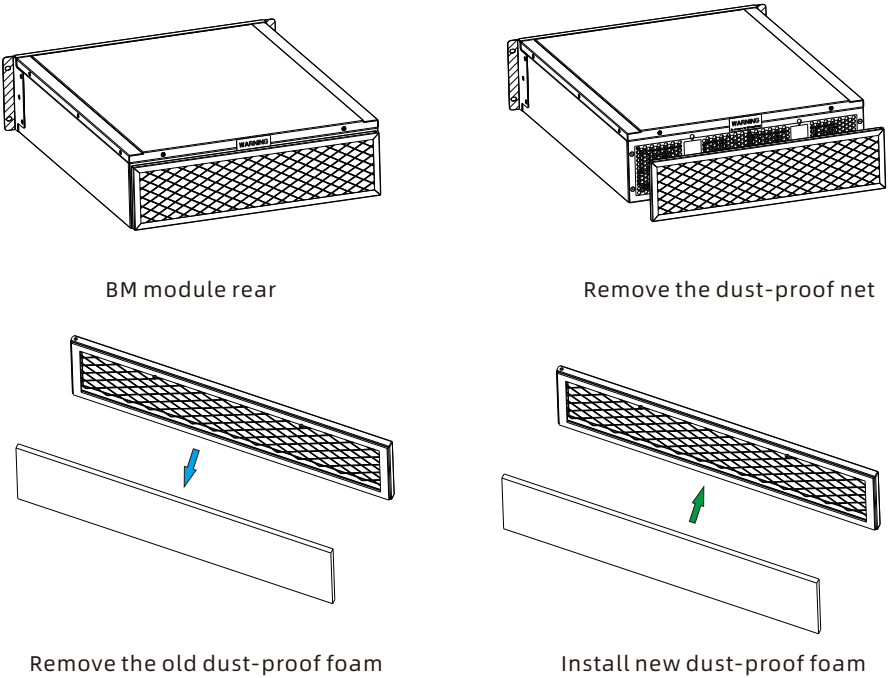


Figure 6.2 Dust Net Maintenance

3. Clean dust-proof foam and foam guard, or replace the dust-proof foam;
 - 1) If the dust-proof foam and foam guard have less dust or are easy to blow away. Use an air pump and brush to clean the dust-proof foam and foam guard;
 - 2) If the dust-proof foam has excessive dust or blockage and cannot be cleaned, or if it is damaged, it must be replaced with a new one;
 - 3) After cleaning or replacing, arrange the dust-proof foam flat;
 - 4) Replace the dust-proof foam in the foam guard, and then reinstall the dust-proof net.
4. Connect the power and communication cables between BM modules or between BM module and CM module. After confirming that there are no errors, power on the system.

Technical Specifications 7

7.1 AXE 1000100-C1 (Control Module)

NO.	Items	Specifications
1	Model	AXE 1000100-C1
2	Input/output voltage range	120V-1000Vdc
3	Rated current	100A
4	Operating ambient temperature	-10~50°C
5	IP rating	IP20
6	Communication method	CAN/RS485/USB/Daisy chain
7	Dimensions (W/D/H)	W482*D580*H131mm
8	Weight	≤15Kg
9	Certification	CE/IEC62619/IEC62477
10	Environment requirements	RoHS

7.2 AXE 5.0H-E1 EU (Battery Module)

NO.	Items	Specifications
1	Battery pack module	AXE 5.0H-E1 EU
2	Nominal capacity/energy	100Ah / 5kWh
3	Rated capacity/energy	90Ah / 4.5kWh
4	Nominal voltage	51.2V
5	Operating voltage	46.4~57.6V
6	Rated current(25°C)	100A
8	Battery type	Cobalt Free Lithium Iron Phosphate (LFP)
9	Operating ambient temperature	-10~50°C
10	Storage conditions	Temperature: -20°C~25°C/12 months; 25°C~35°C/9 months; 35°C~50°C/6 months; Humidity: 5%~95%RH
11	Cooling	Air-Cooling
12	Dimensions (W/D/H)	W482*D580*H131mm

NO.	Items	Specifications
13	Weight	≤47kg
14	Installation	Floor stand
15	Ingress protection	IP20
16	Cell safety certification	IEC62619/UL1973
17	safety certification	UN 38.3/IEC 62619/IEC 60730/ IEC62477/CE/ROHS
18	Transportation test standard	UN38.3
19	Environment requirements	RoHS
20	Battery designation	IFpP/51/161/119/[1P16S]M/-10+50/90
21	Cycle life	6000 cycles (@25±2°C, 0.5C, 60%EOL)

7.3 System Data

System Model	AXE 15.0H-1HR-E1	AXE 20.0H-1HR-E1	AXE 25.0H-1HR-E1	AXE 30.0H-1HR-E1	AXE 35.0H-1HR-E1
Energy capacity	15kWh	20kWh	25kWh	30kWh	35kWh
Usable capacity	13.5kWh	18kWh	22.5kWh	27kWh	31.5kWh
Rated power	15kW	20kW	25kW	30kW	35kW
Max output power	15kW	20kW	25kW	30kW	35kW
Nominal capacity	100Ah(@25°C)				
Rated capacity	90Ah(@25°C)				
Nominal voltage	153.6V	204.8V	256V	307.2V	358.4V
Operating voltage range	139.2~172.8V	185.6~230.4V	232~288V	278.4~345.6V	324.8~403.2V
Dimensions(mm)	Low Rack: 570*640*1600mm				
Weight	≤0.23t	≤0.28t	≤0.33t	≤0.38t	≤0.43t
Rated current	100A				
Max current	100A				
Fault current	120A				
DoD	90%				
Operating ambient temperature	-10°C~50°C				
RTE	>95%				
Battery pack in series	Maximum support 16 units in series, series voltage difference $\Delta V \leq 0.5V$				
Humidity	5%~95%				
Storage conditions	Temperature: -20°C~25°C/12 months; 25°C~35°C/9 months; 35°C~50°C/6 months; Humidity: 5%~95%RH				
Cooling method	Air-Cooling				
Installation	Floor stand				
Altitude	≤2000m				
Communication method	CAN/RS485/Daisy chain				

System Model	AXE 15.0H- 1HR-E1	AXE 20.0H- 1HR-E1	AXE 25.0H- 1HR-E1	AXE 30.0H- 1HR-E1	AXE 35.0H- 1HR-E1
Certification	UN 38.3/IEC 62619/IEC 60730/IEC 62477/CE/ROHS				
Transport certification	UN38.3				
IP rating	IP20				
Environmental requirements	RoHS				
Battery system	Secondary Li-ion Battery System				
Cycle life	6000 cycles (@25±2°C, 0.5C, 60%EOL)				

System Model	AXE 40.0H-1HR-E1	AXE 45.0H-1HR-E1	AXE 50.0H-1HR-E1	AXE 55.0H-1HR-E1	AXE 60.0H-1HR-E1
Energy capacity	40kWh	45kWh	50kWh	55kWh	60kWh
Usable capacity	36kWh	40.5kWh	45kWh	49.5kWh	54kWh
Rated power	40kW	45kW	50kW	55kW	60kW
Max output power	40kW	45kW	50kW	55kW	60kW
Nominal capacity	100Ah(@25℃)				
Rated capacity	90Ah(@25℃)				
Nominal voltage	409.6V	460.8V	512V	563.2V	614.4V
Operating voltage range	371.2~460.8V	417.6~518.4V	464~576V	510.4~633.6V	556.8~691.2V
Dimensions(mm)	Low Rack: 570*640*1600mm	High Rack: 570*640*2000mm			
Weight	≤0.48t	≤0.54t	≤0.59t	≤0.64t	≤0.69t
Rated current	100A				
Max current	100A				
Fault current	120A				
DoD	90%				
Operating ambient temperature	-10℃~50℃				
RTE	> 95%				
Battery pack in series	Maximum support 16 units in series, series voltage difference $\Delta V \leq 0.5V$				
Humidity	5%~95%				
Storage conditions	Temperature: -20℃~25℃/12 months; 25℃~35℃/9 months; 35℃~50℃/6 months; Humidity: 5%~95%RH				
Cooling method	Air-Cooling				
Installation	Floor stand				
Altitude	≤2000m				
Communication method	CAN/RS485/Daisy chain				

System Model	AXE 40.0H- 1HR-E1	AXE 45.0H- 1HR-E1	AXE 50.0H- 1HR-E1	AXE 55.0H- 1HR-E1	AXE 60.0H- 1HR-E1
Certification	UN 38.3/IEC 62619/IEC 60730/IEC 62477/CE/ROHS				
Transport certification	UN38.3				
IP rating	IP20				
Environmental requirements	RoHS				
Battery system	Secondary Li-ion Battery System				
Cycle life	6000 cycles (@25±2°C, 0.5C, 60%EOL)				

System Model	AXE 75.0H-1HR-E1	AXE 80.0H-1HR-E1
Energy capacity	75kWh	80kWh
Usable capacity	67.5kWh	72kWh
Rated power	75kW	80kW
Max output power	75kW	80kW
Nominal capacity	100Ah(@25°C)	
Rated capacity	90Ah(@25°C) 46.4,57.6	
Nominal voltage	768V	819.2V
Operating voltage range	696~864V	742.4~921.6V
Dimensions(mm)	2*Low Rack: 1140*640*1600mm	
Weight	≤0.91t	≤0.96t
Rated current	100A	
Max current	100A	
Fault current	120A	
DoD	90%	
Operating ambient temperature	-10°C~50°C	
RTE	> 95%	
Battery pack in series	Maximum support 16 units in series, series voltage difference $\Delta V \leq 0.5V$	
Humidity	5%~95%	
Storage conditions	Temperature: -20°C~25°C/12 months; 25°C~35°C/9 months; 35°C~50°C/6 months; Humidity: 5%~95%RH	
Cooling method	Air-Cooling	
Installation	Floor stand	
Altitude	≤2000m	
Communication method	CAN/RS485/Daisy chain	

System Model	AXE 75.0H-1HR-E1	AXE 80.0H-1HR-E1
Certification	UN 38.3/IEC 62619/IEC 60730/IEC 62477/CE/ROHS	
Transport certification	UN38.3	
IP rating	IP20	
Environmental requirements	RoHS	
Battery system	Secondary Li-ion Battery System	
Cycle life	6000 cycles (@25±2°C, 0.5C, 60%EOL)	

 NOTICE	• Method for calculating rated capacity: Rated capacity of the measured module: 90 Ah Number of modules connected in series: 3~16 Calculated rated capacity (Ah)= 90 Ah *1 =90Ah • The performance will be limited when the temperature is below 10°C.
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7.4 Battery System Designation

Mode	Battery Designation	Recommended Charge Instructions
AXE 15.0H-1HR-E1	IFpP/51/161/119/[(1 P16S)3S]M/-10+50/90	1.Constant current 100A charging to 162V; 2.Constant current 50A charging to 165V; 3.Constant current 25A charging to 165V; 4.Constant current 10A charging to 165V; 5.Constant current 5A charging to 165V;
AXE 20.0H-1HR-E1	IFpP/51/161/119/[(1 P16S)4S]M/-10+50/90	1.Constant current 100A charging to 216V; 2.Constant current 50A charging to 220V; 3.Constant current 25A charging to 220V; 4.Constant current 10A charging to 220V; 5.Constant current 5A charging to 220V;

Mode	Battery Designation	Recommended Charge Instructions
AXE 25.0H-1HR-E1	IFpP/51/161/119/[(1 P16S)5S]M/-10+50/90	1.Constant current 100A charging to 270V; 2.Constant current 50A charging to 275V; 3.Constant current 25A charging to 275V; 4.Constant current 10A charging to 275V; 5.Constant current 5A charging to 275V;
AXE 30.0H-1HR-E1	IFpP/51/161/119/[(1 P16S)6S]M/-10+50/90	1.Constant current 100A charging to 324V; 2.Constant current 50A charging to 330V; 3.Constant current 25A charging to 330V; 4.Constant current 10A charging to 330V; 5.Constant current 5A charging to 330V;
AXE 35.0H-1HR-E1	IFpP/51/161/119/[(1 P16S)7S]M/-10+50/90	1.Constant current 100A charging to 378V; 2.Constant current 50A charging to 385V; 3.Constant current 25A charging to 385V; 4.Constant current 10A charging to 385V; 5.Constant current 5A charging to 385V;
AXE 40.0H-1HR-E1	IFpP/51/161/119/[(1 P16S)8S]M/-10+50/90	1.Constant current 100A charging to 432V; 2.Constant current 50A charging to 440V; 3.Constant current 25A charging to 440V; 4.Constant current 10A charging to 440V; 5.Constant current 5A charging to 440V;
AXE 45.0H-1HR-E1	IFpP/51/161/119/[(1 P16S)9S]M/-10+50/90	1.Constant current 100A charging to 486V; 2.Constant current 50A charging to 495V; 3.Constant current 25A charging to 495V; 4.Constant current 10A charging to 495V; 5.Constant current 5A charging to 495V;
AXE 50.0H-1HR-E1	IFpP/51/161/119/[(1 P16S)10S]M/- 10+50/90	1.Constant current 100A charging to 540V; 2.Constant current 50A charging to 550V; 3.Constant current 25A charging to 550V; 4.Constant current 10A charging to 550V; 5.Constant current 5A charging to 550V;
AXE 55.0H-1HR-E1	IFpP/51/161/119/[(1 P16S)11S]M/- 10+50/90	1.Constant current 100A charging to 594V; 2.Constant current 50A charging to 605V; 3.Constant current 25A charging to 605V; 4.Constant current 10A charging to 605V; 5.Constant current 5A charging to 605V;
AXE 60.0H-1HR-E1	IFpP/51/161/119/[(1 P16S)12S]M/- 10+50/90	1.Constant current 100A charging to 648V; 2.Constant current 50A charging to 660V; 3.Constant current 25A charging to 660V; 4.Constant current 10A charging to 660V; 5.Constant current 5A charging to 660V;

Mode	Battery Designation	Recommended Charge Instructions
AXE 75.0H-1HR-E1	IFpP/51/161/119/[(1P 16S)15S]M/-10+50/90	1.Constant current 100A charging to 810V; 2.Constant current 50A charging to 825V; 3.Constant current 25A charging to 825V; 4.Constant current 10A charging to 825V; 5.Constant current 5A charging to 825V;
AXE 80.0H-1HR-E1	IFpP/51/161/119/[(1P 16S)16S]M/-10+50/90	1.Constant current 100A charging to 864V; 2.Constant current 50A charging to 880V; 3.Constant current 25A charging to 880V; 4.Constant current 10A charging to 880V; 5.Constant current 5A charging to 880V;

Appendix I

LED indication Control Mechanism

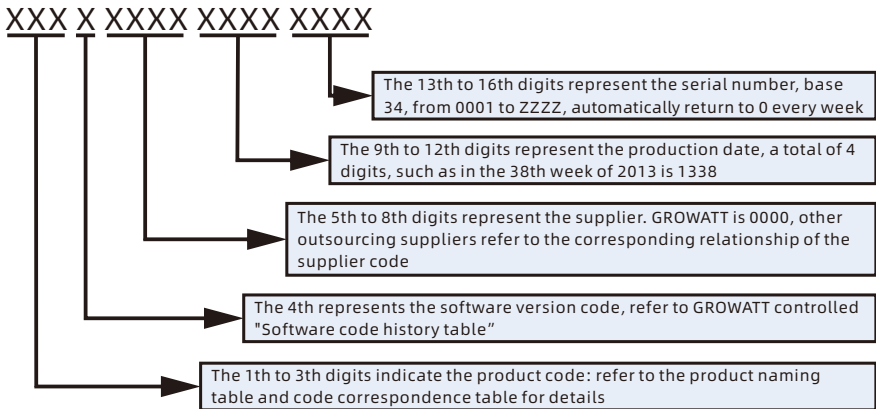
LED Light Definition		
Battery System Status	Items	High voltage box light display
		START LED Status
StandBy		○
Charge		○
Discharge		○
Update		⚙ (T=0.4S)
Fault Date export		⚙ (T=0.4S)
Warning	Cell charge overvoltage warning	⚙ (T=2S)
	PACK charge overvoltage warning	⚙ (T=2S)
	Cell discharge undervoltage warning	⚙ (T=2S)
	PACK discharge undervoltage warning	⚙ (T=2S)
	Charge or discharge high temperature warning	⚙ (T=2S)
	Charge or discharge low temperature warning	⚙ (T=2S)
	Charge or discharge overcurrent warning	⚙ (T=2S)
	Relay high temperature warning	⚙ (T=2S)
	High temperature environment warning	⚙ (T=2S)
	Cell Large voltage difference warning	⚙ (T=2S)
	Pack Large temperature difference warning	⚙ (T=2S)
Fault	Cell charge overvoltage protection	⚙ (T=2S)
	PACK charge overvoltage protection	⚙ (T=2S)
	Cell discharge undervoltage protection	⚙ (T=2S)

LED Light Definition		
Fault	PACK discharge undervoltage protection	⚙️ (T=2S)
	Charge or discharge high temperature protection	⚙️ (T=2S)
	Charge or discharge low temperature protection	⚙️ (T=2S)
	Charge or discharge overcurrent protection	⚙️ (T=2S)
	Relay high temperature protection	⚙️ (T=2S)
	High temperature environment protection	⚙️ (T=2S)
	Cell Large voltage difference protection	⚙️ (T=2S)
	Pack Large temperature difference protection	⚙️ (T=2S)
	Discharge short circuit	⚠️ (T=2S)
	Precharge short circuit	⚠️ (T=2S)
	Precharge overtime	⚠️ (T=2S)
	External CAN communication failure	⚠️ (T=2S)
	Interior communication failure	⊙
	Voltage sampling anomaly protection	⊙
	Current sampling fault	⊙
	Main circuit fault	⊙

Appendix II

➤ Barcode Coding Rules

Bar code number position:



1. The 1th to 3th digits indicate the product code : refer to the product naming table and code correspondence table for details.
2. The 4th represents the software version code , refer to GROWATT controlled "Software code history table".
3. The 5th to 8th digits represent the supplier code. GROWATT is 0000, the supplier D is 0001, and other outsourced suppliers are 0002/0003... , and so on, please refer to the corresponding relationship table of the supplier code.
4. The 9th to 12th digits represent the production date, which is represented by 4 digits, the year is represented by the first 2 digits, and the week is represented by the last 2 digits, for example, the 38th week of 2013 is 1338.
5. The 13th to 16th digits represent the serial number, 34 base , represented by 4 digits, and the characters 0 to Z are used. I and O in the letters are discarded. For example, the product number is SD00.0002100, the product code is ARJ, the software version is 0, the supplier D is 0001, the production date is 21th week in 2021, and the first barcode of the work order is ARJ0000121210001.





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Growatt New Energy

Shenzhen Growatt New Energy Co., Ltd.

4-13/F, Building A, Sino-German (Europe) Industrial Park,
Hangcheng Blvd, Bao'an District, Shenzhen, China

E service@growatt.com

W en.growatt.com

For local customer support, please visit <https://en.growatt.com/support/contact>

GR-UM-480-A-02 (PN: 044.0139202)