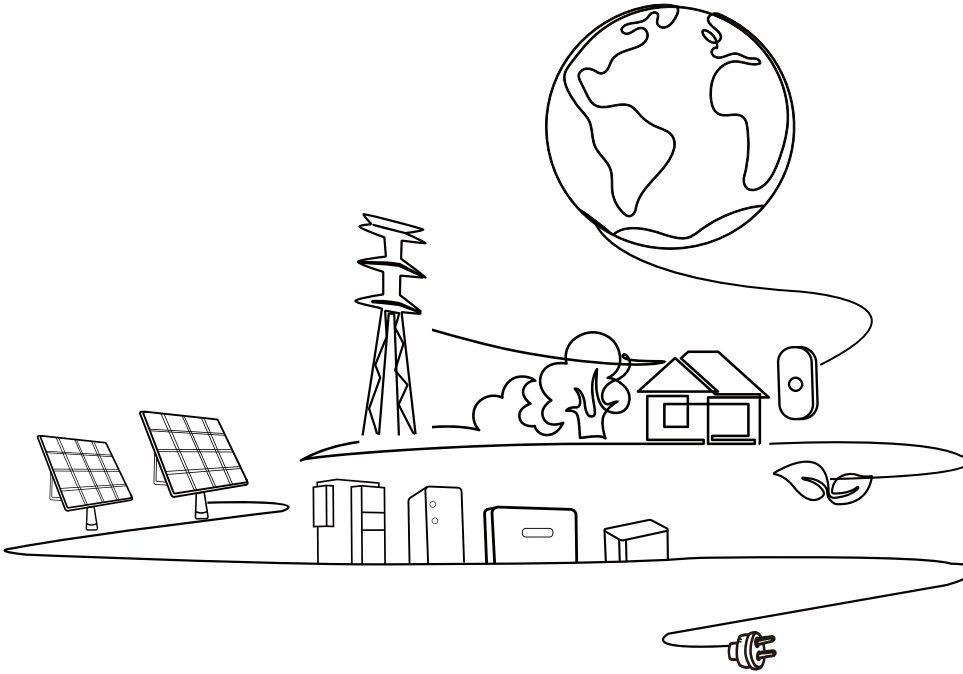
User Manual

Commercial and Industrial Energy Storage Battery

BHF-X Series

Issue V1.0

Date 2026-10-14



LIVOLTEK

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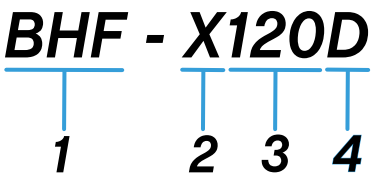
About the Manual

Validity

This manual is valid for the following products:

- BHF-X80D
- BHF-X100D
- BHF-X120D

Model Description



No.	Item	Description
1	**Product Name**	"B" stands for Battery, "H" for High-voltage, "F" for LFP.
2	**Battery Cabinet Type**	"X" stands for Outdoor Cabinet-type Energy Storage System.
3	**Rated Energy**	Rated energy is about 120 kWh.
4	**Product Series**	"D" stands for battery cabinet (with no inverter or PCS).

Target Group

This document is intended for qualified persons and operators. Only qualified persons are allowed to perform the activities marked in this document with a warning symbol and the caption "Qualified person". Tasks that do not require any particular qualification are not marked and can also be performed by operators. Qualified persons must have the following skills:

- Have basic knowledge and installation skills of the product.
- Training to deal with risks associated with installing, repairing, and using electrical devices, and batteries.
- Training in the installation and commissioning of electrical devices and installations.
- Knowledge of all applicable laws, regulations, standards, and directives.
- Knowledge of and compliance with this document and all safety information.
- Successful participation in a training course on commissioning the device with the Livoltek manufacturer.

Levels of Warning Messages

The following levels of warning messages may occur when handling the product.

DANGER

Indicates risk of Electric Shock which will result in death or serious injury if not avoided.

WARNING

Indicates a situation of moderate potential hazard that could result in death or serious injury if not avoided.

CAUTION

Indicates a low level of potential hazard that, if not avoided, could result in moderate or minor injury to personnel.

NOTE

Emphasis and additions to the content may also provide tips for optimizing the use of the product.

Release Note

Version	Version Update Record	Date
V1.0	Initial release.	2026-10-14

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1 Safety

1.1 Safety Precaution

The manual describes the installation, electrical connection, commissioning, maintenance of the battery. Please read it carefully before operating. To prevent personal injury and property damage and to ensure long-term operation of the product, please read and follow all the instructions and cautions on the battery and in this user manual during installation, operation or maintenance at all times.

DANGER

Danger to life from electric shock.

- Before performing any work on the battery, make sure the battery is power off and the DC isolator is disconnected.
- Do not short connect the DC connectors of the battery, which may cause electric shock to personnel and damage to the product.
- Do not touch DC connectors of the battery.
- If an error occurs, contact your local distributor or qualified electricians.

WARNING

- Only authorized personnel are allowed to install the battery or perform servicing and maintenance.
- The power should be disconnected before attempting any maintenance or cleaning or working to the battery.

NOTE

- Do not open the battery or change any components without authorization.
- Appropriate methods must be adopted to protect battery from electro-static discharge (ESD), any damage caused by ESD is not warranted by the manufacturer.

1.2 Response to Emergency Situations

1.2.1 Leaking Batteries

If the battery leaks electrolyte which is corrosive, avoid contact with the leaking liquid or gas. Direct exposure to the liquid or gas may lead to skin irritation or chemical burns. If one is exposed to the leaked substance, do these actions:

- **General Advice:** Immediate medical attention is required. Show the safety data sheet (SDS) to the doctor in attendance.
- **Eye Contact:** Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician if feel uncomfortable.
- **Skin Contact:** Take off contaminated clothing and shoes immediately. Wash off with plenty of water for at least 15 minutes and consult a physician if feel uncomfortable.
- **Ingestion:** Do not induce vomiting. Never give anything by mouth to an unconscious person. Call a physician or Poison Control Center immediately.
- **Inhalation:** Move victim into fresh air. If breathing is difficult, give oxygen. Do not use mouth to mouth resuscitation if victim ingested or inhaled the substance. If not breathing, give artificial respiration and consult a physician immediately.
- **Protecting of First-aiders:** Ensure that medical personnel are aware of the substance involved. Take precautions to protect themselves and prevent spread of contamination.

1.2.2 Wet Batteries or Damaged Batteries

- If the battery is wet or submerged in water, do not try to access it.
- If the battery seems to be damaged, they are not fit for use and may pose a danger to people or properties.
- Please pack the battery in its original container, and then return it to your distributor.

1.2.3 Fire

The battery may catch fire when it is put into fire. In case of a fire, please make sure that a dry chemical, carbon dioxide or alcohol-resistant foam extinguisher is nearby. Do not use a solid water stream as it may scatter or spread fire.

1.2.4 Advice for Firefighters

- In any fire, wear self-contained breathing apparatus (MSHA/NIOSH approved or equivalent) and full protective gear.
- Fight fire from a safe distance, with adequate cover.
- Prevent fire extinguishing water from contaminating surface water or the ground water system.

1.3 Handling and Storage Precautions

- Handling is performed in a well-ventilated place.
- Wear suitable protective equipment.
- Avoid contact with skin and eyes.
- Keep away from heat/sparks/open flames/ hot surfaces.
- Take precautionary measures against static discharges.
- Keep containers tightly closed.
- Keep containers in a dry, cool and well-ventilated place.
- Keep away from heat/sparks/open flames/ hot surfaces.
- Store away from incompatible materials and foodstuff containers.

1.4 Limitation of Liability

Any product damage or property loss caused by the following conditions Livoltek does not assume any direct or indirect liability.

- Product modified, design changed or parts replaced without Livoltek authorization;
- Changes, or attempted repairs and erasing of series number or seals by non Livoltek technician;
- System design and installation are not in compliance with standards and regulations;
- Failure to comply with the local safety regulations;
- The product has been improperly stored in distributor's or end user's premises;
- Transport damage (including painting scratch caused by movement inside packaging during shipping). A claim should be made directly to shipping or insurance company as soon as the container/packaging is unloaded and such damage is identified;
- Failure to follow any/all of the user manual, the installation guide and the maintenance regulations;
- Improper use or misuse of the device;
- Insufficient ventilation of the device;
- The maintenance procedures relating to the product have not been followed to an acceptable standard;
- Force majeure (violent or stormy weather, lightning, overvoltage, fire etc.)
- Damages caused by any external factors.

1.5 Symbols on the Label

Item	Description
CE	CE Mark.
	**Warning:** General warning sign
	**Caution:** Risk of Electric Shock Disconnect all incoming power and turn off the product before working on it.
	Caution: hot surface
	Danger to life due to high voltage. Disconnect all power supplies before performing any operations on the product.
	Do not short circuit the battery.
	Keep the battery away from flame or ignition sources.
	Keep the battery away from children.
	Follow the instruction in this manual for service and replacement.
	**WEEE Mark.** All electrical and electronic products should be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or the local authorities. The correct disposal of your old appliance will help prevent potential negative consequences for the environment and human health. For more detailed information about disposal of your old appliance, please contact your city office, waste disposal service or the shop where you purchased the product.

2 Product Overview

The BHF-X Series battery cabinet is purpose-built for commercial and industrial applications, ideal for factories, shopping malls, and data centers. It supports peak-valley arbitrage, backup power, and solar energy storage, offering versatile energy solutions. With a cabinet-mounted design for easy installation and intelligent charge/discharge strategies, it helps reduce electricity costs, maximize renewable energy utilization, and enable efficient, sustainable energy management.

2.1 Appearance

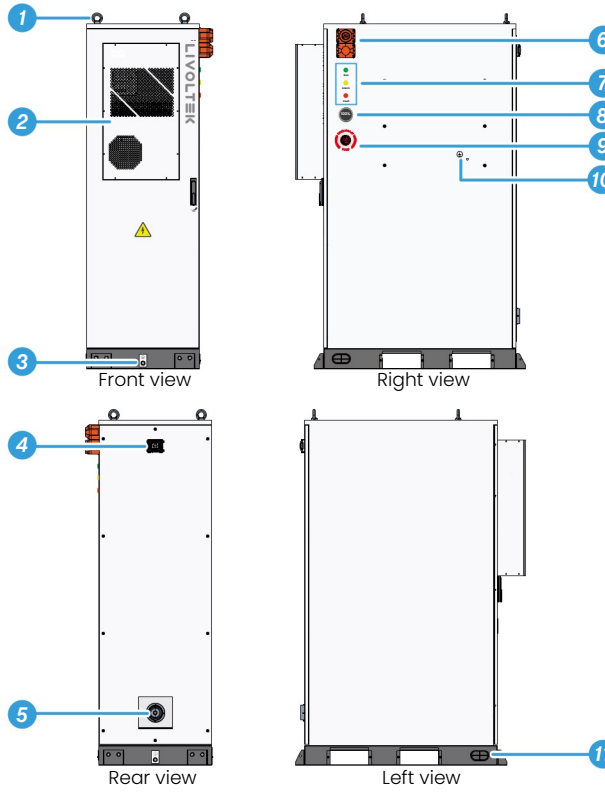
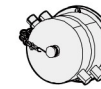


Figure 2-1 Appearance

No	Item	Description
1	Hook	For lifting and transporting the battery cabinet.
2	Air conditioner	To regulate the temperature inside the battery cabinet.

No	Item	Description
3	Grounding terminal	To ground the whole system.
4	Explosion relief valve	To prevent explosions of the system or equiment due to excessive internal pressure.
5	Fire hose coupling	To connect to the interface of the water supply system. European Standard:  American Standard: 
6	Sound and light alarm	Simultaneously emits sound and light alarm signals.
7	Indicators	To display the status information of all processess running on the system.
8	Real-time battery capacity	To display the current battery capacity.
9	Emergency stop button	To shut down the system in emergency circumstances.
10	Grounding terminal	To ground the inverter enclosure.
11	Cable inlet	For cables connection.

NOTE

- Unscrew the cap of the fire hose coupling and connect the fire hose to it.

2.2 Product Sizes

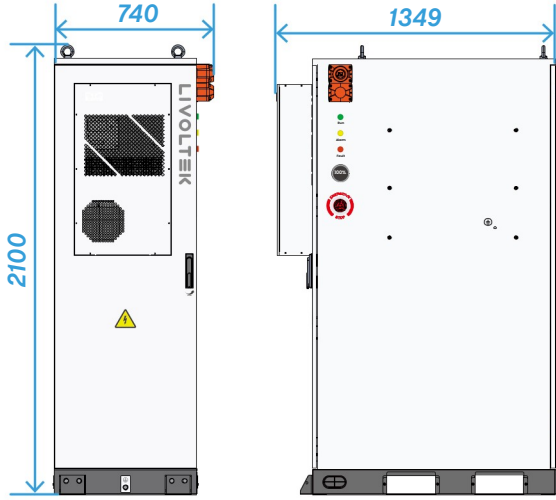


Figure 2-2 Dimensions (mm)

2.3 Interior of the Battery Cabinet

NOTE

- The structure and appearance of the equipment are subject to the actual device.

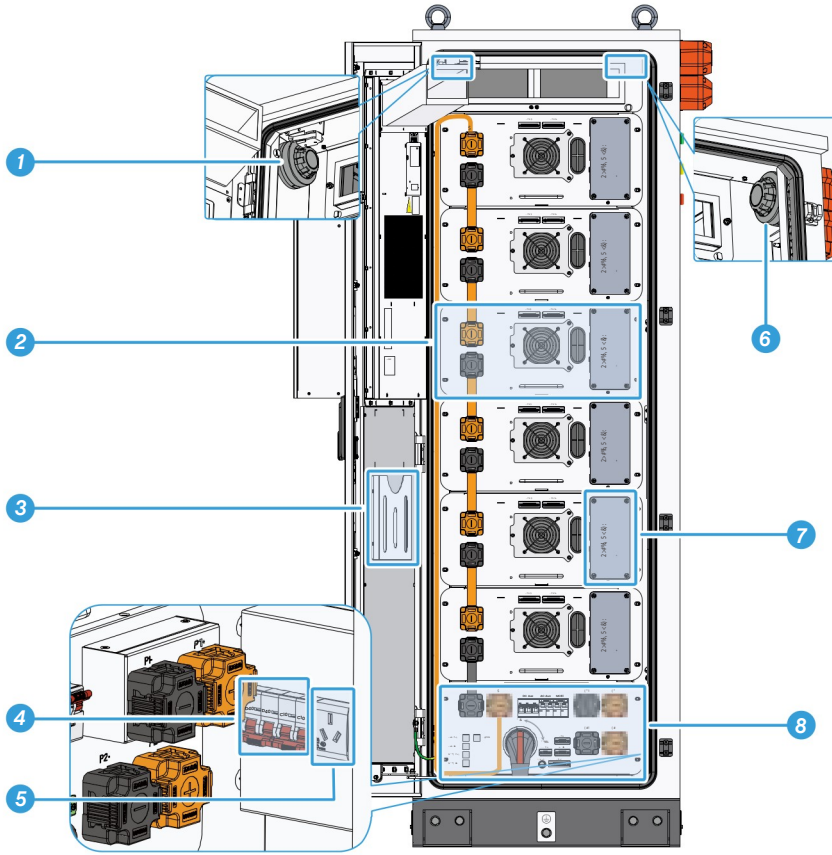


Figure 2-3 Battery Cabinet Interior

No	Item	Description
1	Temperature detector	To monitor the temperature inside the cabinet; if abnormal, the sound and light alarm will be activated.
2	Battery pack	/
3	Document rack	To place device document.

No	Item	Description
4	D40 & C10 circuit breaker	**D40:** for AC power input; **C10:** for the socket protection.
5	Socket	For on-site maintenance use.
6	Smoke detector	To detect smoke inside the cabinet. Upon detection, the sound and light alarm will be activated.
7	BMU	/
8	Control box	/

2.3.1 Battery Pack

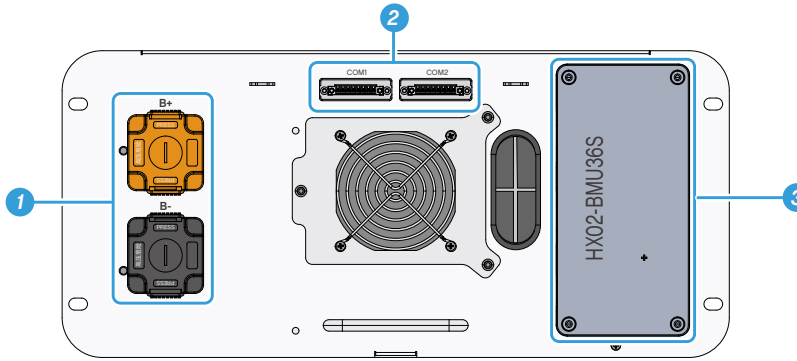


Figure 2-4 Connection Area of Battery Pack

No.	Item	Description
1	B+/ B- terminal	Power+/Power- terminal
2	COM1/ COM2 terminal	Communication terminals of battery packs
3	BMU	Battery management unit

2.3.2 Control Box

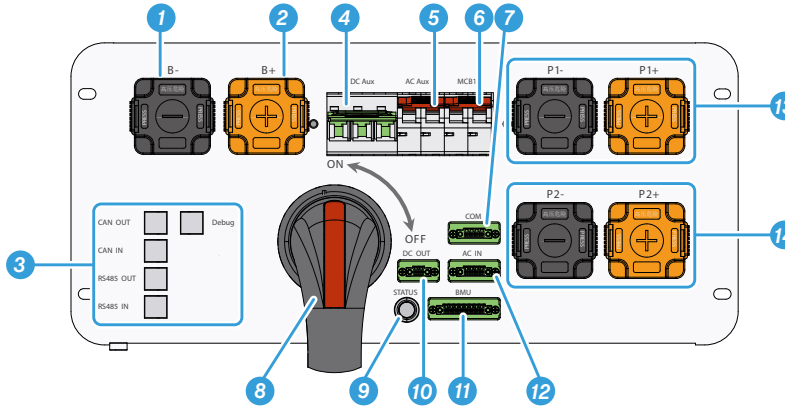


Figure 2-5 Connection Area of Control Box

No.	Item	Description
1	B- terminal	To connect to the negative terminal of the battery pack.
2	B+ terminal	To connect to the positive terminal of the battery pack.
3	CAN OUT/ CAN IN/ RS485 OUT/ RS485 IN/ Debug port	• **CAN OUT:** battery capacity expansion communication port • **CAN IN:** inverter communication port or battery capacity expansion communication port • **RS485 OUT/ RS485 IN:** 485 communication port • **Debug:** debugging port
4	DC Aux breaker	DC auxiliary circuit breaker
5	AC Aux breaker	AC auxiliary circuit breaker
6	MCB1 breaker	Cabinet auxiliary circuit breaker
7	COM port	Cabinet auxiliary power output port
8	Isolation switch	Disconnect the battery circuit if needed
9	STATUS indicator	System status indicator
10	DC OUT port	DC auxiliary power output port
11	BMU port	Battery pack communication output port
12	AC IN port	AC power input port
13	P1+/ P1- terminal	Positive/ negative terminal for battery capacity connection
14	P2+/ P2- terminal	Positive/ negative DC output terminal

3 Transportation and Storage

3.1 Transportation

- For better protection of the equipment, transportation with packaging is recommended;
- Transportation of equipment 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 railroad transportation and air transportation. Speed limit requirements for land transportation: 80 km/h on flat roads, 60 km/h on rugged roads, in case of conflict, please refer to local traffic regulations.

3.1.1 Forklift

- When using a forklift to move to ensure that the forklift has enough load capacity, and pay attention to the center of gravity of the equipment needs to fall between the feet of the forklift to prevent personal injury and equipment damage;
- Recommended fork knife length ≥1.3 m, width 80 cm ~ 160 cm, thickness 25 mm ~ 60 mm.

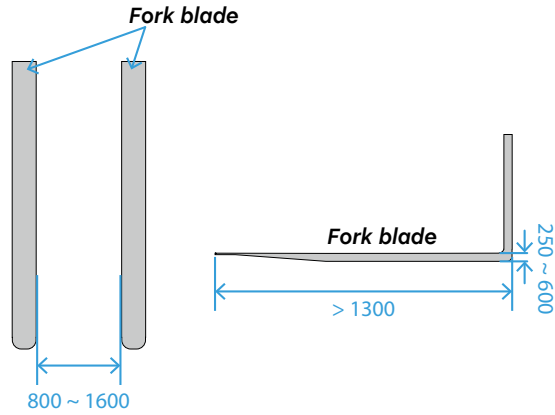


Figure 3-1 Fork Blade (Dimensions in mm)

- Forklifts with a battery system need to have a load capacity of ≥3 t; forklifts without it need to have a load capacity of ≥1.5 t;
- Before moving the device, please pay attention to the center of gravity position of the load, and fully secure the load on the forklift by securing measures, such as ropes or bindings. In addition, please designate a person to supervise for safety concerns during transportation.

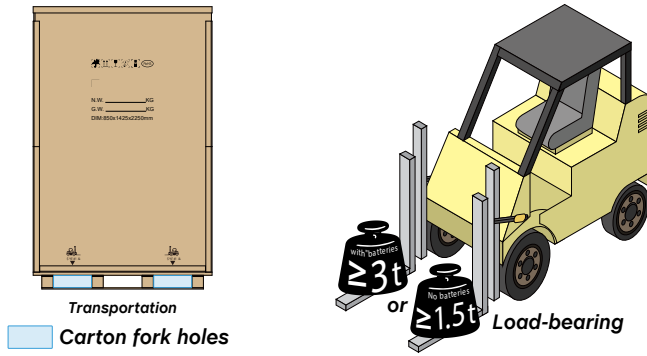


Figure 3-2 Carton Fork Holes and Load-bearing

- Before unpacking, please accurately insert the fork blade into the fork holes on the carton when moving the device.

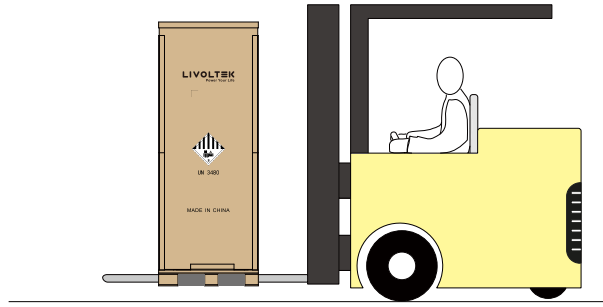


Figure 3-3 Transporting the Carton (example)

3.1.2 Hoisting

A hoist operator with good operational skills and safety awareness, who must be trained and certified, shall be operated according to the local laws and regulations.

- After unpacking, the following requirements must be met when working with cranes and lifting ropes: crane hoisting capacity ≥ 5 t, hoisting operating radius ≥2 m.
- Before hoisting, please check:
  - Lifting tools are complete, tested and fully secured.
  - The device door is closed and locked to avoid accidental opening.
  - The lifting rope's quality must meet standards, and it shall be fully secured, to avoid falling and fraying.
- Do not hoist outdoors in rain, snow, wind and other bad weather.
- It is recommended to hoist devices in sequence and to ensure that the hoist moves in the same direction.

3.2 Storage

3.2.1 Product Packaging

In order to keep the product in a better state of protection during transportation, it is packed in specific wooden crates.

Table 3-1 Packaging Parameters

Parameters	Clarification
Sizes	The external dimensions of the fully packaged product, including all protective materials (e.g., foam, pallet, or carton).
Weights	The gross weight of the product, including the cabinet, internal components, and all packaging materials. The net weight of the battery cabinet.
Markings	Symbols, icons, or text printed on the packaging to ensure safe transportation and storage. Face up, careful placement, etc.

NOTE

Please refer to the actual product markings.

3.2.2 Product Storage

The product shall not be stored in an exposed outdoor location if the product is not immediately transported or installed for use in a storage location that complies with the following conditions:

Table 3-2 Requirements for Product Storage Conditions

Parameters	Request
Ambient storage temperature [°C]	+10 ~ +30
Storage relative humidity [%]	< 95% (no condensation)
Altitude [m]	<2000

NOTE

Long-term storage of batteries is not recommended. There will be capacity loss in long term storage of lithium batteries, the general irreversible capacity loss of lithium batteries is 3% ~ 10% after 12 months of storage at the recommended storage temperature. Battery packs should be stored and shipped for a total of no more than 6 months (counting time from shipment). Beyond 6 months a recharge and SOC calibration is required, at a minimum to 50% SOC. failure to recharge as required may affect the performance and service life of the battery.

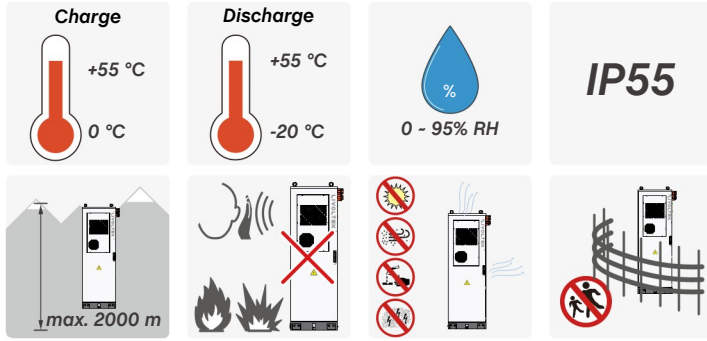
4 Installation Preparations

4.1 Installation Site Condition

4.1.1 Environment

The installation site is critical to the safety, service life, and performance of the product, and it should be convenient for electrical connections, operation, and maintenance.

- Operating Temperature Range: 0 °C to +55 °C for charging; -20 °C to +55 °C for discharging.
- Ambient Humidity: 0% to 95% RH (non-condensation).
- Maximum Altitude: 2000 meters.
- The installation site must provide adequate air circulation.
- Away from areas with excessive dust, sand, or airborne particulates.
- Away from concentrated heat, open flames, or other high-temperature sources.
- Away from locations containing flammable, explosive, or combustible materials.
- Away from spaces where corrosive chemicals or vapors are present.
- Away from zones with intense electromagnetic interference or powerful transmitting antennas.
- Away from area subject to severe mechanical vibration or acoustic noise.
- Away from environments with harmful levels of radiation.
- Away from locations prone to accumulation of conductive or magnetic metallic dust.
- Away from areas where toxic, hazardous, or noxious gases may be generated or accumulate.
- Away from conditions that promote the growth of mold, fungi, or other microorganisms.



4.1.2 Location Requirements

The installation site shall meet the following requirements:

- Laws, regulations and industry standards: The selection of installation sites must strictly comply with local laws, regulations, and related industry standards.
- Fire safety: Fire extinguishers must be configured at the installation site according to the local fire codes, and a port for the water fire extinguishing system shall be reserved.
- Installation location: It is recommended to install the device outdoors.
- Safety spacing:
  - The installation distance between the device and residential areas, population centers, or production buildings should meet the requirements of the local fire codes and standards.
  - If the safety spacing cannot be met, a firewall that meets the requirements of the local fire codes must be built between the device and adjacent buildings. During the planning phase, it is crucial to consider the space for transportation, installation and maintenance of the device.
- Flood and waterlogging prevention:
  - Avoid low-lying and flood-prone areas.
  - Since winds and wind-driven waves from rivers, lakes, and seas can affect the device.
  - If a large amount of water flows in or through the energy storage power station, drainage facilities should be set up.
  - If the installation site is prone to water accumulation, take waterproof measures, including but not limited to installing water baffles, configuring a drainage system, or raising the height of the foundation to prevent device damage.
- Avoid liquid intrusion: The installation area should be far away from the area where liquid is likely to be generated or leaked to avoid device failure.
- Good transportation: Good transportation for the installation site.
- Reserve space: During the planning phase, please consider the space for capacity expansion or connection in parallel in the future.
- Avoiding bad soil: Do not install devices on the undesirable soil that are prone to deformation and settlement.
- Keeping away from salt-damaged and polluted areas.
- Additional fence: For security reasons, the installation area should be surrounded by locking fences or walls accessible to qualified persons only.

4.1.3 Installation Foundation Requirements

According to the product size in advance to select the equipment installation location, good positioning and fixing; recommended foundation as shown below.

- Type of foundation material:
  - Non-combustible materials such as solid bricks or concrete;
  - Steel.
- The foundation's bearing capacity shall exceed 5 t. Otherwise, a retest is required.
- The bottom of the foundation pit must be strengthened and filled. The surface of the foundation shall be solid, flat and level (horizontal error ≤3 mm, tilt angle ≤5°). Sunken or tilted foundation is not acceptable.
- A qualified drainage facility, of which the drainage capacity meets the requirements of the heaviest rain records in local history,shall be established according to the local geological conditions and municipal drainage standards.

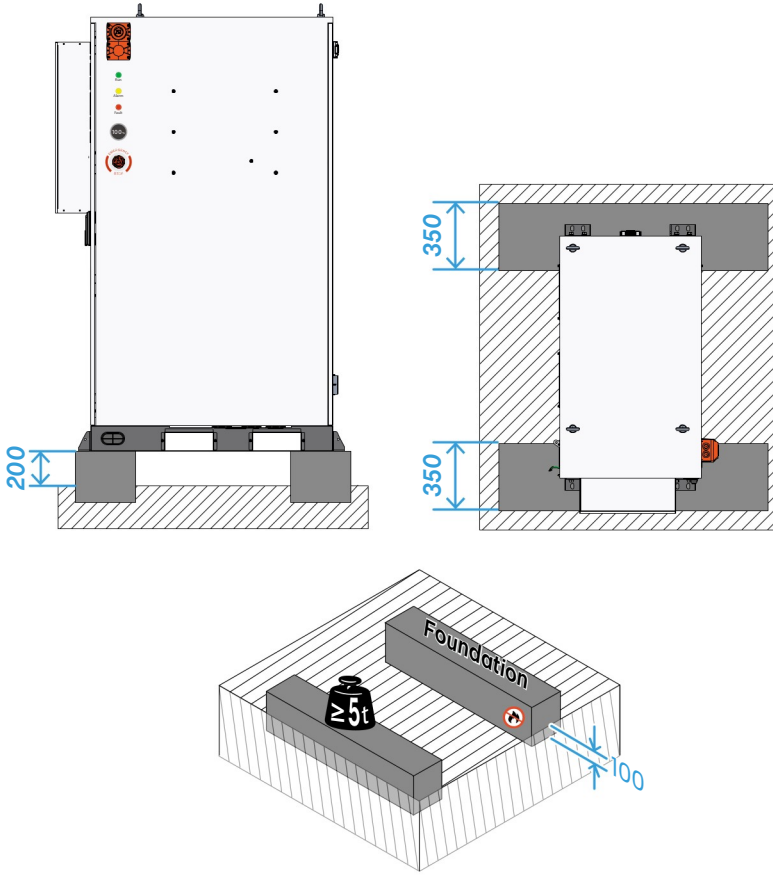


Figure 4-1 Foundation Requirements (Dimensions in mm)

4.1.4 Angle and Space Requirements

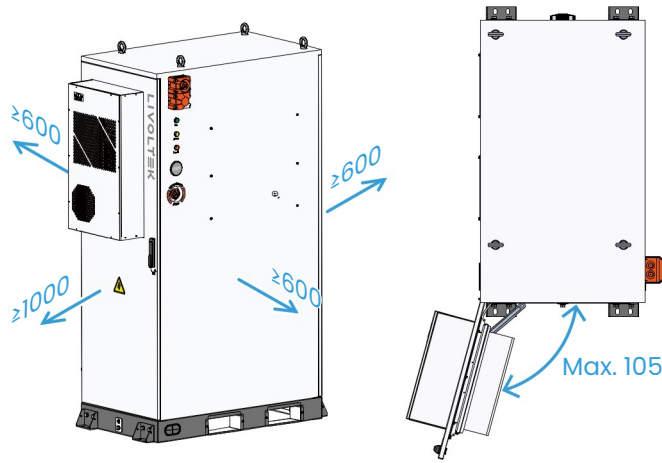


Figure 4-2 Angle and Space Requirements (Dimensions in mm)

4.1.5 Clearance Requirements for Multiple Cabinets

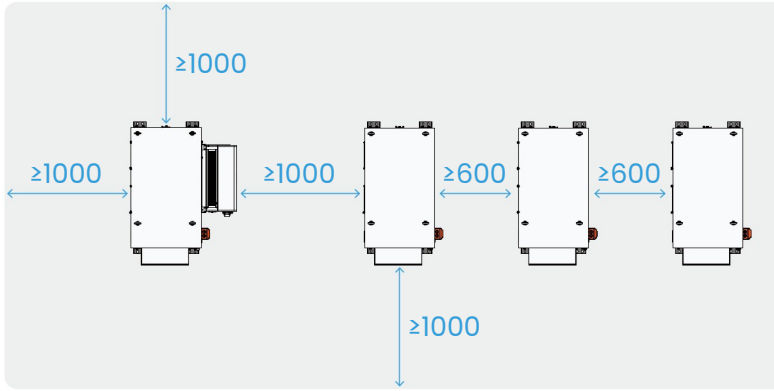


Figure 4-3 Clearance Requirements for Multiple Cabinets (Dimensions in mm)

4.2 Tools Preparations

4.2.1 Tools Requirements

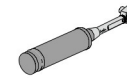

wire crimper

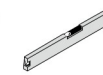

Diagonal pilers


Pneumatic drill


Straight screwdriver


Cross screwdriver


Torque wrench


Spirit level


Pencil


Knife


Rubber mallet


Crimping tool for TJ45 connector


Crimping tool for ferrules


Wire stripper


Hydraulic press


Heat gun


Multimeter


Tape Measure


Safety helmet


Safety goggles


Mask


Protective cloth


Insulated gloves


Safety shoes


Fire extinguisher


Crane


Forklift

4.2.2 Additionally Required Materials

Table 4-1 Additionally prepared materials

No.	Item	Recommended conductor cross-section
1	PE cable	No less than 16 mm² (5 AWG) outdoor copper cable
2	DC power cable	No less than 42 mm² (1 AWG) outdoor copper cable
3	AC power cable	• No less than 8 mm² (8 AWG) outdoor copper cable • No less than 3 mm² (12 AWG) outdoor copper cable
4	Network cable	No less than CAT5 network cable
5	Cable for dry contact wiring	• Shielded twisted pair cables in compliance with applicable local standards • 0.2 ~ 0.4 mm²

* Other sizes of grounding cable that meet local standards and safety regulations can be used for grounding connections. But Livoltek shall not be held liable for any damage caused.

5 Unpacking and Inspection

5.1 Unpacking

- The equipment undergoes 100% testing and inspection before shipping from the manufacturing facility. However, transport damage may still occur. Before unpacking, please verify that the model and outer packing materials for damage, such as holes and cracks.
- Due to the package height exceeding 2 m, please take necessary precautions for working at heights when removing the outer packaging.
- When unpacking, please handle all packaging materials properly for future storage or relocation of this equipment.
- After unpacking, please check if the equipment is intact and if all accessories are complete. If there is any damage or missing accessories, please contact your dealer immediately for assistance.

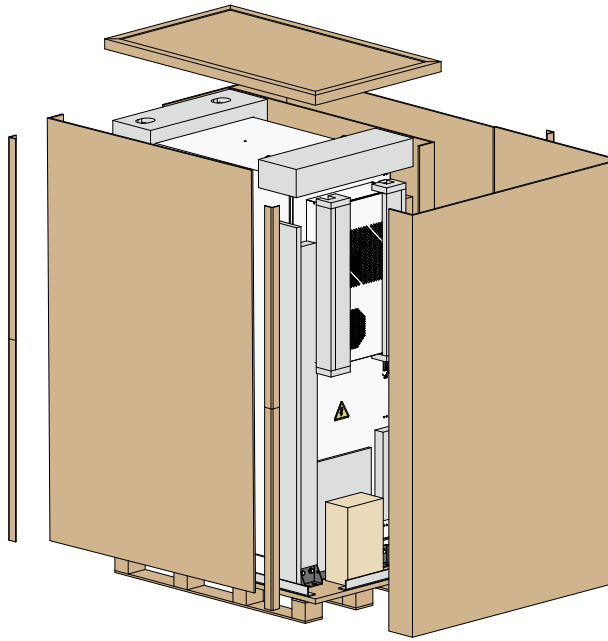


Figure 5-1 Unpacking the carton

5.2 Scope of Delivery

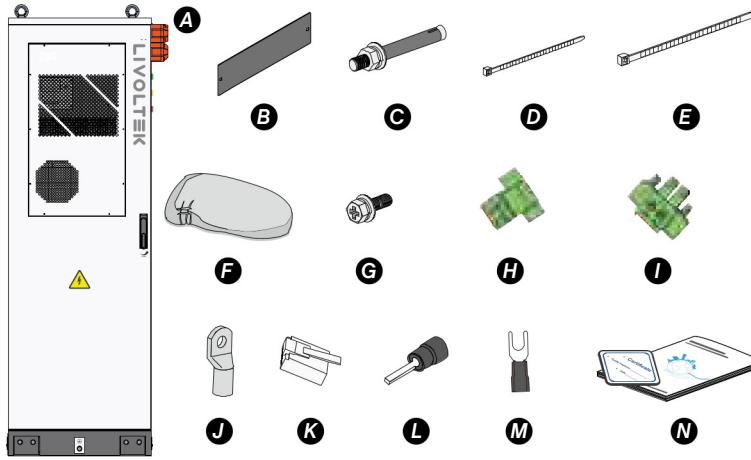


Figure 5-2 Scope of Delivery of Control Box

No.	QTY	Item	Description
A	1 pc	Battery cabinet	/
B	4 pcs	Cover plate	To
C	8 pcs	M12 × 120 expansion bolt	To secure angle supports to fix the battery cabinet to the ground.
D	10 pcs	4 × 200 mm zip tie	To differentiate wire harnesses.
E	20 pcs	8.5 × 500 mm zip tie	To differentiate wire harnesses.
F	4 pcs	Fireproofing mudsesiccant	To seal the cable entry to prevent insects, moisture, and dust from entering.
G	12 pcs	M5 × 12 combination screw	To secure cover plates to the cabinet.
H	2 pcs	Female terminal block	For emergency stop dry contact connection.
I	2 pcs	Male terminal block	For emergency stop dry contact connection.
J	6 pcs	Ring terminal	To assemble battery power cables and connect to battery power ports.
K	3 pcs	RJ45 connector	To assemble network cables and connect them for communication.
L	6 pcs	Blade terminal	To assemble power cables and connect to D40 circuit breaker in the battery cabinet.
M	2 pcs	Spade terminal	To assemble power cables and connect to C10 circuit breaker in the battery cabinet.
N	2 pcs	Document	User Manual & Certificate.

5.3 Product Handling Requirements

⚠ *QUALIFIED PERSON*

Step 1: Unscrew and remove the screws fixing the cabinet to the pallet.

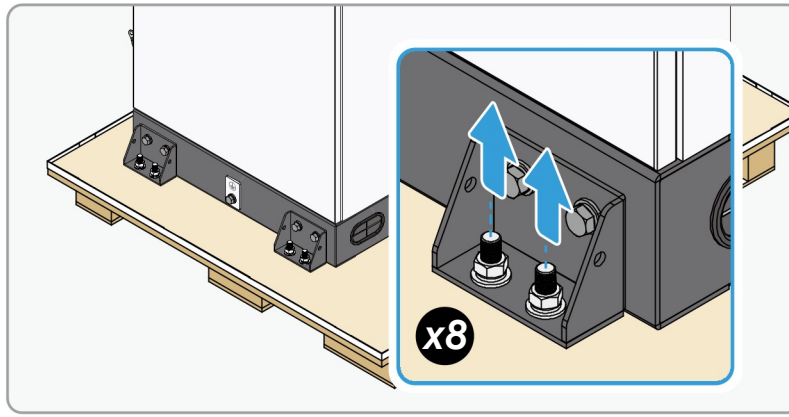


Figure 5-3 Removing Screws at the Bottom of the Cabinet

Step 2: Transport the device.

- Transport by forklift truck

NOTE

- Before relocating the cabinet through a forklift truck, make sure you have secured the cabinet properly without any risks of tipping over.

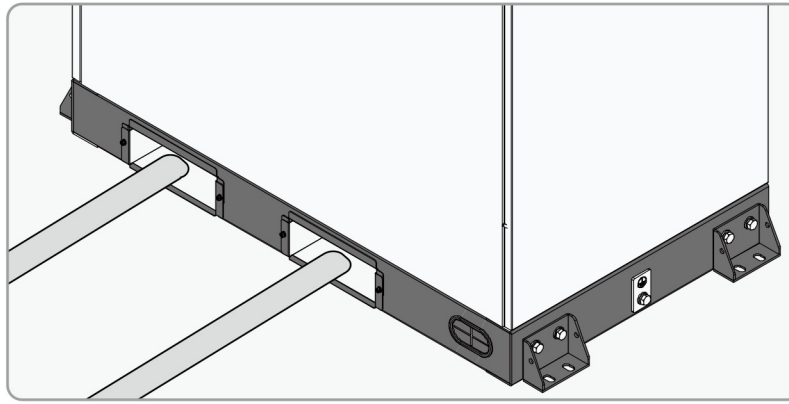


Figure 5-4 Lifting the Device by Forklift

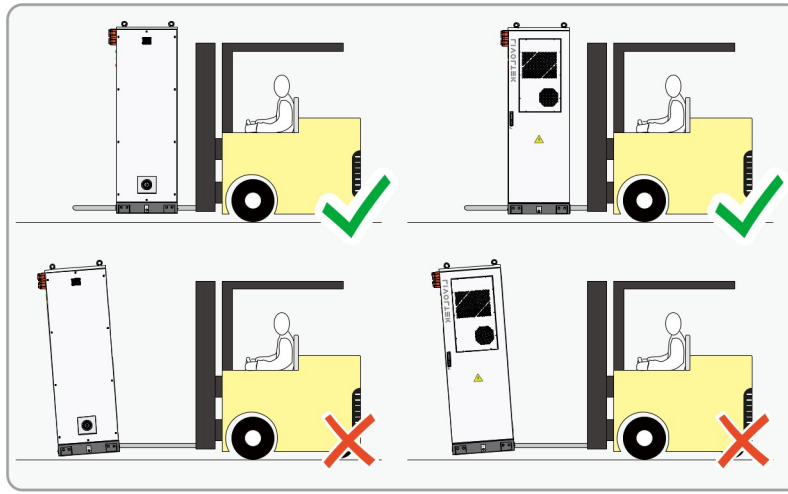


Figure 5-5 Lifting Requirements

- Construct by hoisting ready-built components into place
  - Secure the rope to the hooks and hoist the cabinet with a crane.
  - After sitting the cabinet on the right position, remove ropes.

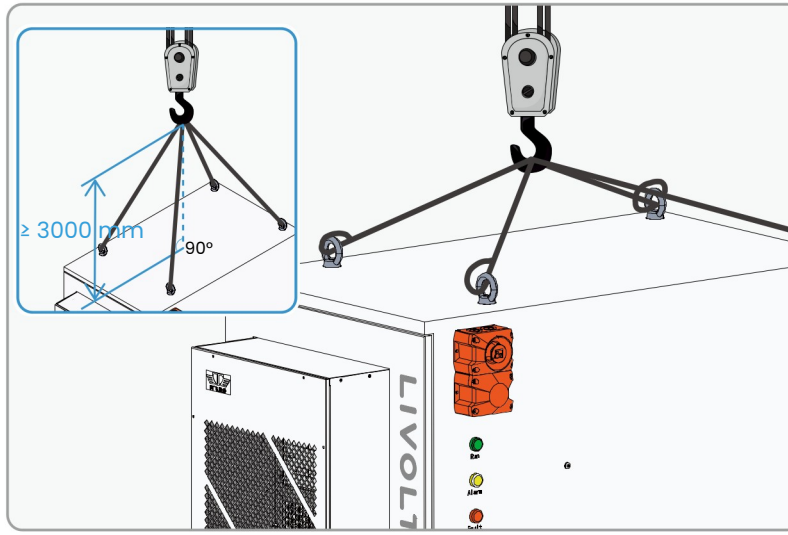


Figure 5-6 Lifting the Device by a Crane

6 Mechanical Installation

⚠ QUALIFIED PERSON

NOTE

At least four installers are required to install the product.

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:

Step 1: Sitting the cabinet on the right position, and then mark the drilling holes through the angle supports of the cabinet.

Step 2: Draw holes on the foundation surface.

Step 3: Drill holes (Ø 13 mm) with reference to the hole distances.

Step 4: Nail expansion bolts (M12 × 120) **C** into the drilled holes, remove the nuts on the expansion bolts, and position the equipment on the foundation with a forklift truck so that the equipment fixing holes are aligned with the pre-buried expansion bolts on the foundation, and tighten the nuts.

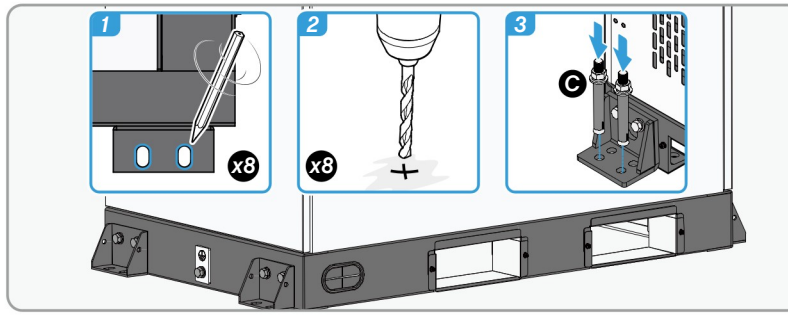


Figure 6-1 Securing the Cabinet

Step 5: Remove pre-installed protective brackets. Install four cover plates **B** at the front and rear side of the cabinet bottom and secure them with combination screws **G**.

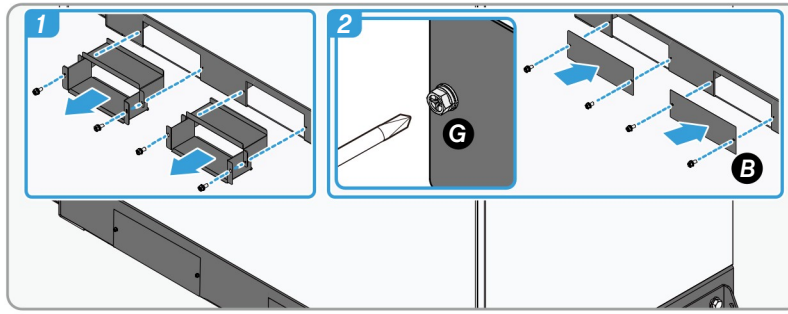


Figure 6-2 Securing Cover Plates

7 Electrical Connection

⚠ QUALIFIED PERSON

DANGER

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

1. Check that all switches in the equipment are disconnected before wiring to ensure that the equipment is not energized;
2. Disconnect the grid switch before wiring and make sure the cable is not energized if the product is connected to the grid;
3. To determine the correct phase sequence of the cable, you can add brown, black, grey and blue different colors of insulation sheath or marking to distinguish, to prevent phase sequence error;
4. Cable terminals and copper row connections need to be compressed, screws to choose the right length, so as not to affect the insulation and tightening;
5. Lay communication and power cables as separately as possible, and ensure that the cable insulation is not damaged during the laying process;
6. 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;
7. All cables should be connected to the ropriate phase sequence after entering the device through the access holes at the bottom or on the right and left side of the cabinet;
8. After the wiring is completed, use fireproofing mudsesiccant Ⓕ to seal the wiring leaks to prevent external insects and rodents from entering and damaging the equipment or cables.

7.1 Grounding Connection

Step 1: Remove the pre-installed screw from the grounding terminal. Strip the outer jacket of the PE cable to the ropriate length. Cut a length of heat shrink tubing, thread it through the stripped cable, and install a ring terminal.

Step 2: To crimp the terminal, pull the heat shrink tubing over the crimp area and heat it with a heat gun.

Step 3: Attach the ring terminal assembled with the PE cable to the grounding terminal and bolt it in place on the left and right side of the cabinet. And connect the other end to the grounding copper bar.

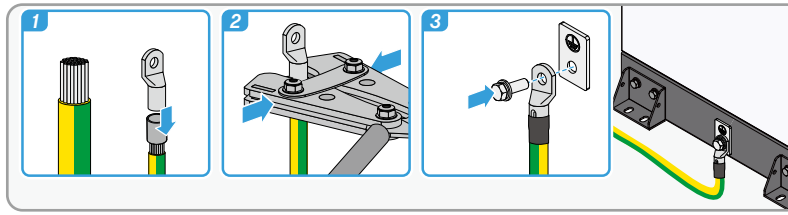


Figure 7-1 PE Cable Connection

7.2 Opening the Battery Cabinet Door

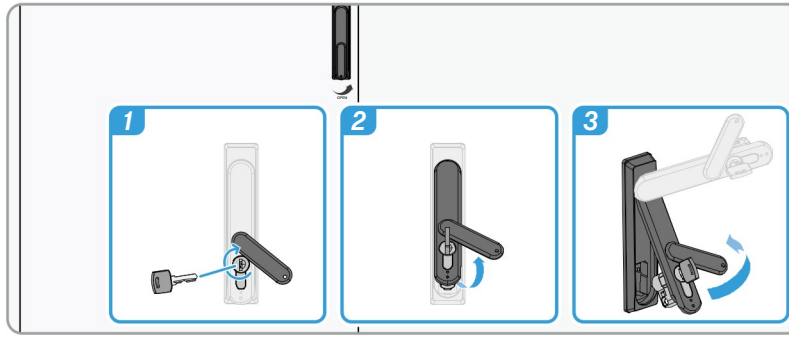


Figure 7-2 Cabinet Door Opening

7.3 Battery Cable Connection

7.3.1 Power Cable Connection

Step 1: Strip the insulation at an appropriate length off power cables. Insert a ring terminal Ⓙ into the stripped end and then crimp the terminal.

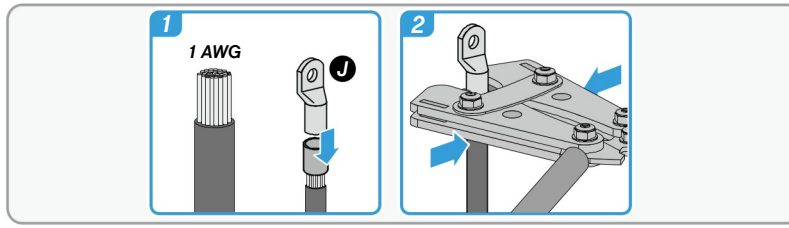


Figure 7-3 Strip and Assemble Power Cables

Step 2: Connect assembled battery cables to battery port **P1+**, **P1−**, **P2+**, **P2−** inside the battery cabinet.

NOTE

When connecting battery power cables, only remove the terminal cap from either the positive or negative terminal at a time. After the cable is connected and secured, reinstall the terminal cap before proceeding to install the next power cable. Do not remove multiple power terminal caps simultaneously to prevent short circuits.

- Pinch both sides of the terminal cap and remove one terminal cap from any port.
- Remove the screw pre-installed from the battery port.
- Install the assembled battery power cable on the battery port and secure the cable with the original screw.
- Install the terminal cap back to the battery port.

- Repeat these steps to complete battery power cable connection as needed.

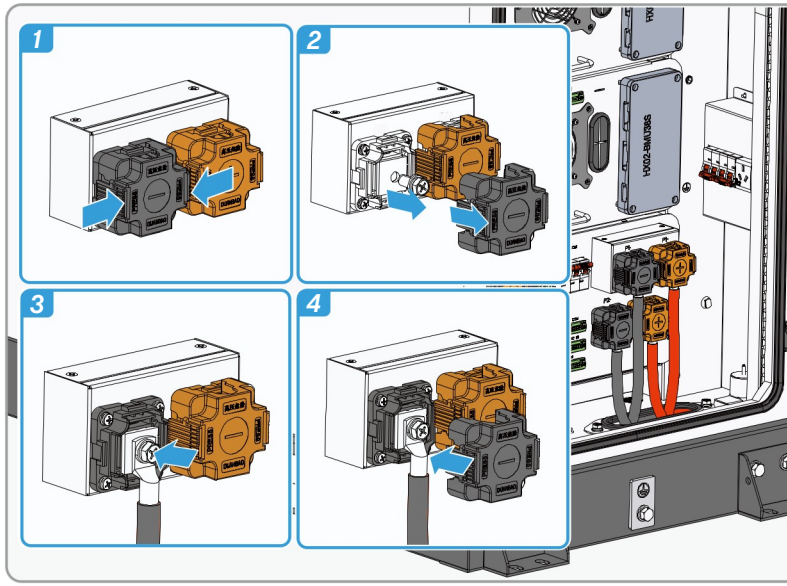


Figure 7-4 Battery Power Cable Connection

7.3.2 Communication Connection

Table 7-1 CAN IN/ CAN OUT Pin Definition

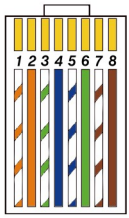
Pin			CAN IN Pin Definition	CAN OUT Pin Definition
	1	Orange/white	CAN2H	CAN2H
	2	Orange	CAN2L	CAN2L
	3	Green/white	CAN2G	CAN2G
	4	Blue	GND	GND
	5	Blue/white	ID_IN	ID_OUT
	6	Green	NC	NC
	7	Brown/white	NC	NC
	8	Brown	NC	NC

Table 7-2 RS485 IN/ RS485 OUT Pin Definition

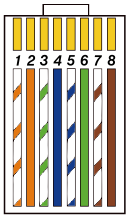
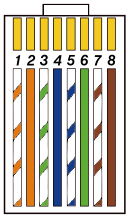
Pin			RS485 IN Pin Definition	RS485 OUT Pin Definition
	1	Orange/white	RS485A1	RS485A1
	2	Orange	RS485B1	RS485B1
	3	Green/white	RS485G1	RS485G1
	4	Blue	NC	NC
	5	Blue/white	NC	NC
	6	Green	RS485G0	RS485G0
	7	Brown/white	RS485B0	RS485B0
	8	Brown	RS485A0	RS485A0

Table 7-3 Debug Pin Definition

Debug Pin Definition			
	1	Orange/white	CAN0H
	2	Orange	CAN0L
	3	Green/white	CAN0G
	4	Blue	/
	5	Blue/white	/
	6	Green	RS485G0
	7	Brown/white	RS485B0
	8	Brown	RS485A0

Wiring Procedure

Step 1: Strip a network cable, insert the stripped end into a RJ45 connector Ⓚ in accordance with the pin definition above as needed and then crimp the connector.

Step 2: Connect the assembled network cable to the corresponding port of the control box inside a cabinet.

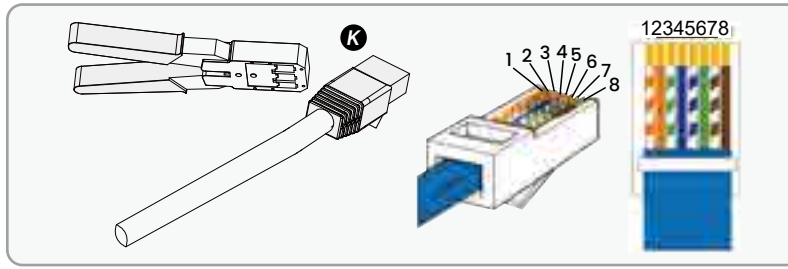


Figure 7-5 Assemble Network Cables

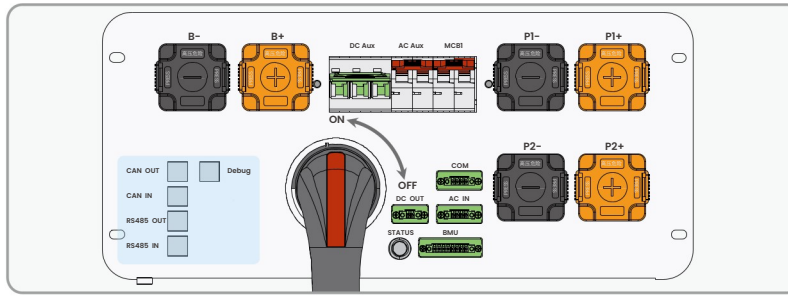


Figure 7-6 Communication Connection

7.4 Battery and Inverter Connection

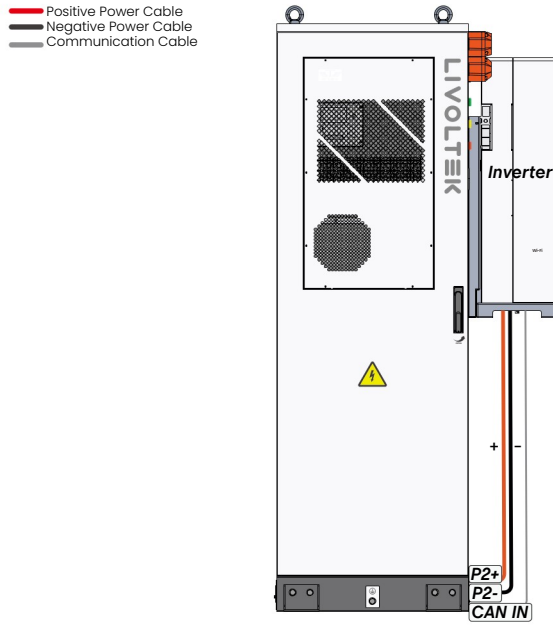


Figure 7-7 Battery and Inverter Connection

NOTE

The inverter in the figure above are for reference only.

For cable connections on the inverter side, refer to the user manual of the inverter connected.

If the battery cabinet is connected to a HP3-40~60KS1 series inverter, scan the QR code on the back cover of this user manual and refer to ***HP3-40~60KS1 Series Inverter and BHF-X Series Battery Cabinet Installation Guideline*** to complete device installation.

7.5 Parallel Connection

Up to another three battery cabinets can be connected in parallel to the master battery cabinet for battery capacity expansion. Please refer to the parallel diagram below for connection.

7.5.1 Parallel Connection Diagram

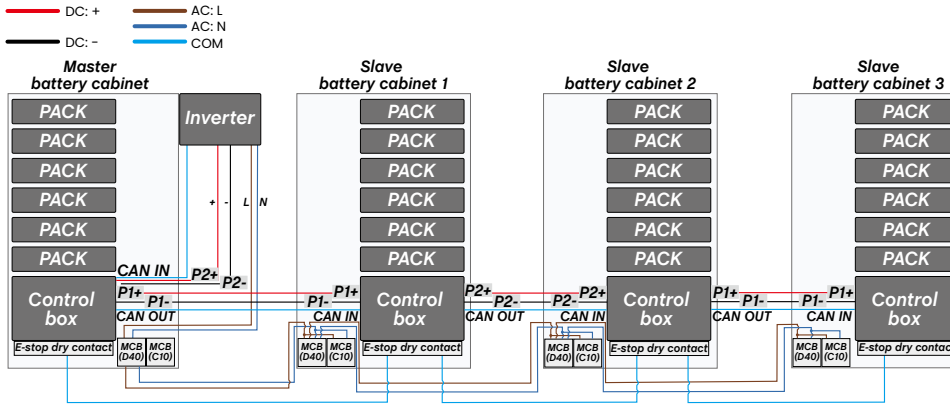


Figure 7-8 Parallel Connection Diagram

> **NOTE**
>
> In this parallel connection diagram, the master battery cabinet refers to the battery cabinet connected to an inverter.

7.5.2 Parallel Connection Among Battery Cabinets

7.5.2.1 Power Cable Connection

Step 1: Refer to "7.3.1 Power Cable Connection" to strip and assemble power cables.

> **NOTE**
>
> When connecting battery power cables, only remove the terminal cap from either the positive or negative terminal at a time. After the cable is connected and secured, reinstall the terminal cap before proceeding to install the next power cable. Do not remove multiple power terminal caps simultaneously to prevent short circuits.

Step 2: Refer to "7.4 Battery and Inverter Connection" to connect **P2+**, **P2-** port on the master battery cabinet to the corresponding ports on the inverter respectively.

Step 3: Connect **P1+**, **P1-** port on the master battery cabinet to **P1+**, **P1-** port on the slave cabinet 1 with the assembled cables respectively.

Step 4: Connect **P2+**, **P2-** port on the slave cabinet 1 to **P2+**, **P2-** port on the slave cabinet 2 with the assembled cables respectively.

Step 5: Connect **P1+**, **P1-** port on the slave cabinet 2 to **P1+**, **P1-** port on the slave cabinet 3 with the assembled cables respectively.

7.5.2.2 Communication Cable Connection

Step 1: Refer to "7.3.2 Communication Connection" to strip and assemble communication cables in accordance with the pin definition of **CAN IN** and **CAN OUT** port.

Step 2: Remove the pre-installed connector with resistor from the **CAN OUT** port of all control boxes except the last slave cabinet for cable connection.

Step 3: Refer to "7.4 Battery and Inverter Connection" to connect the **CAN IN** port on the master battery cabinet to the corresponding port of the inverter.

Step 4: Connect the **CAN OUT** port on the master battery cabinet to the **CAN IN** port on the slave cabinet 1 with an assembled network cable.

Step 5: Connect the **CAN OUT** port on the slave cabinet 1 to the **CAN IN** port on the slave cabinet 2 with an assembled network cable.

Step 6: Connect the **CAN OUT** port on the slave cabinet 2 to the **CAN IN** port on the slave cabinet 3 with an assembled network cable.

7.5.2.3 Power Cable Connection Among D40 and C10 Circuit Breakers inside Battery Cabinets

Cable Connection on the Master Battery Cabinet

Step 1: Scan the QR code on the back cover of this user manual and refer to ***HP3-40-60KS1 Series Inverter and BHF-X Series Battery Cabinet Installation Guideline*** to connect the AC cables from the inverter to the D40 circuit breakers and the other two cables to C10 circuit breakers inside the master battery cabinet as illustrated below.

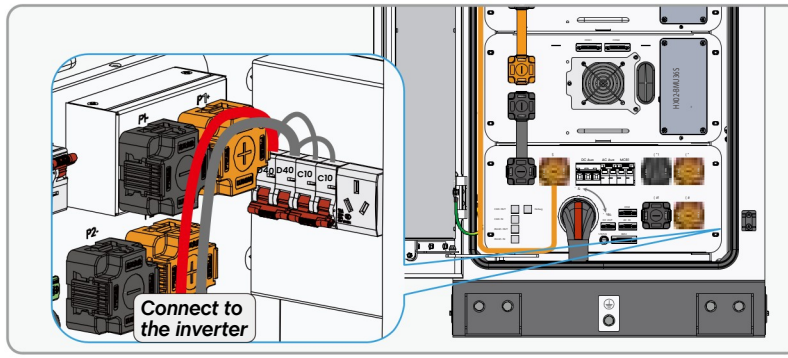


Figure 7-9 Circuit Breaker Cable Connection Between Master Battery Cabinet and Inverter

Step 2: Strip one end of another two power cables at an appropriate length, connect the

stripped cable to a blade terminal Ⓛ and then crimp the terminal.

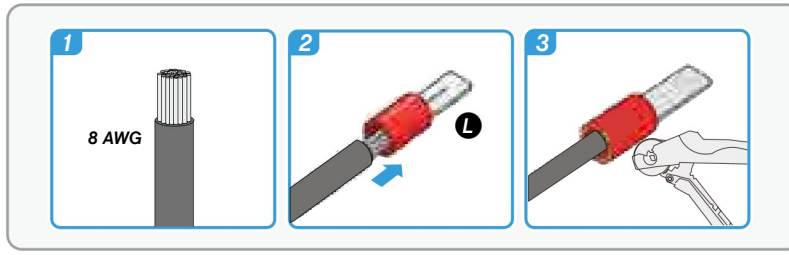


Figure 7-10 Assemble Cables

Step 3: Connect the two assembled cables to the ports at the bottom of **D40** circuit breakers. Then connect the other end of cables to the slave cabinet 1.

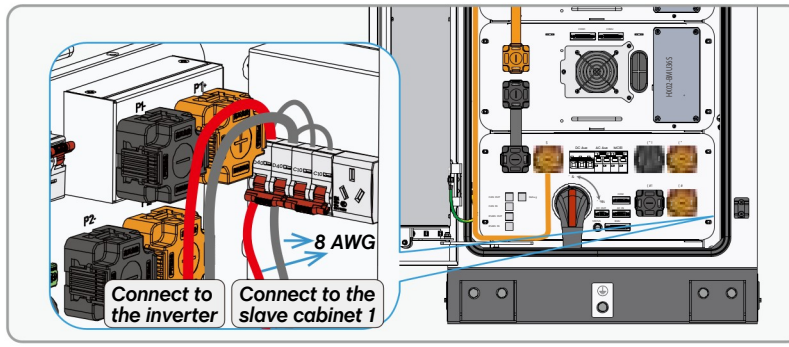


Figure 7-11 Circuit Breaker Cable Connection Between Master Battery Cabinet and Slave Cabinet 1

Cable Connection on Slave Cabinets Installed Between the Master Battery Cabinet and the Last Slave Battery Cabinet

Step 1: Strip the two 8 AWG cables from the **D40** circuit breakers on the master cabinet or on the previous slave cabinet. Strip another two 12 AWG cables.

Step 2: Install a 8 AWG cable and a 12 AWG cable into one blade terminal Ⓛ and crimp the terminal. Assemble two pairs of cables in this way.

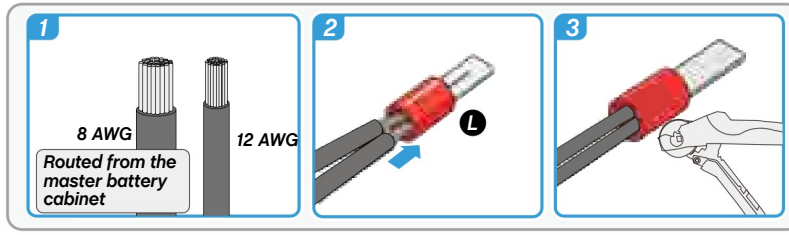


Figure 7-12 Assembe Cables

Step 3: Strip the other end of the two 12 AWG cables, crimp them with spade terminals Ⓜ respectively.

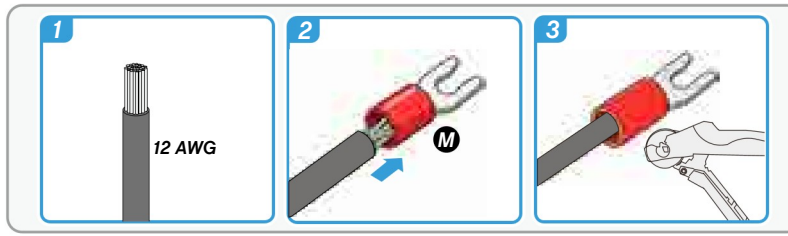


Figure 7-13 Assembe Cables

Step 4: Connect the blade terminals Ⓛ to **D40** circuit breakers on the current cabinet respectively. And then connect the spade terminal Ⓜ to **C10** circuit breakers on the current cabinet respectively.

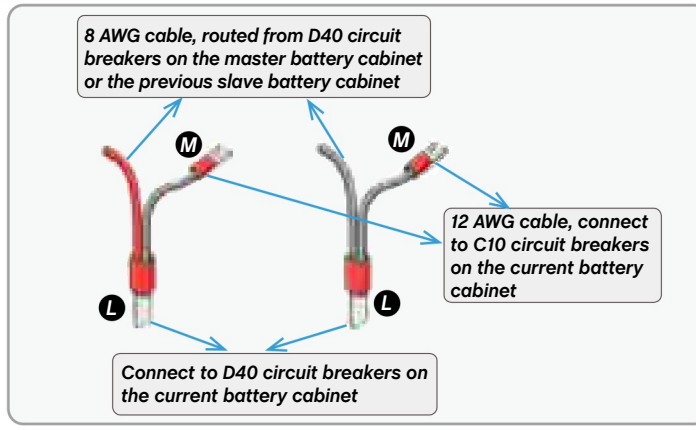


Figure 7-14 Assembled Cables

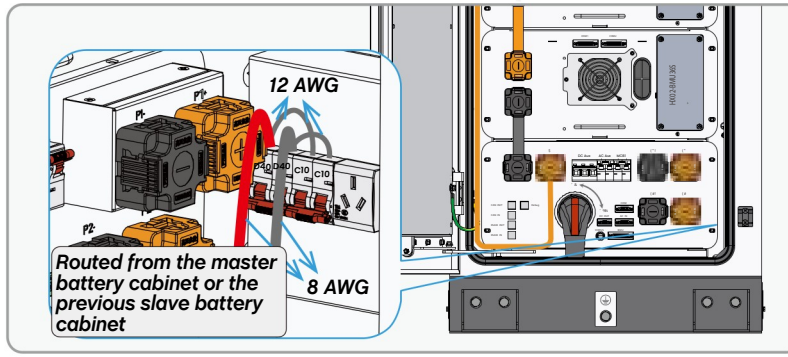


Figure 7-15 Circuit Breaker Cable Connection Between Master Cabinet or Previous Slave Cabinet and Current Cabinet

Step 5: Strip another two 8 AWG power cables, connect the stripped end to a blade terminal (L) and then crimp the terminal.

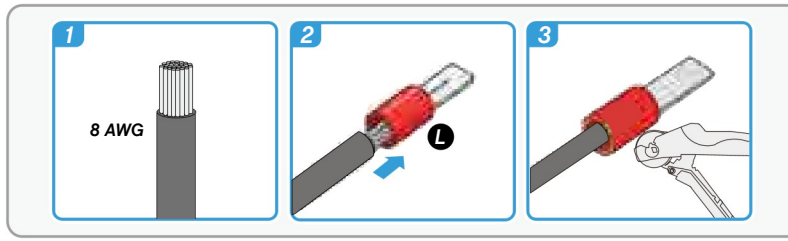


Figure 7-16 Assembe Cables

Step 6: Connect the two assembled 8 AWG cables to the top of **D40** circuit breakers on the current cabinet. And connect the other end of cables to the top of **D40** circuit breakers on the next slave cabinet.

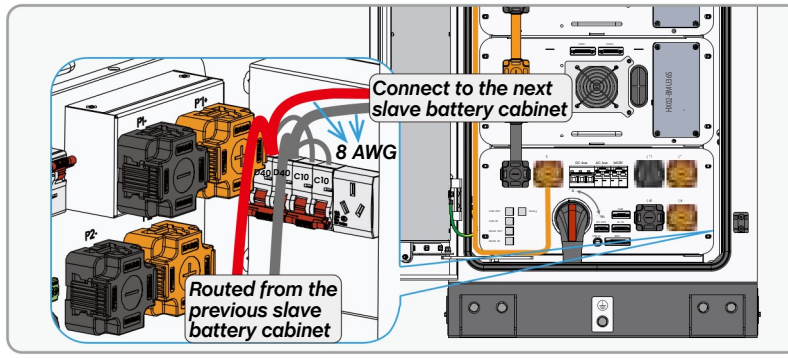


Figure 7-17 Circuit Breaker Cable Connection Between Current Cabinet and the Next Slave Cabinet

Cable Connection on the Last Slave Battery Cabinet

- Strip the two 8 AWG cables from the **D40** circuit breakers on the previous slave cabinet. Strip another two 12 AWG cables.
- Install a 8 AWG cable and a 12 AWG cable into one blade terminal (L) and crimp the terminal. Assemble two pairs of cables in this way.

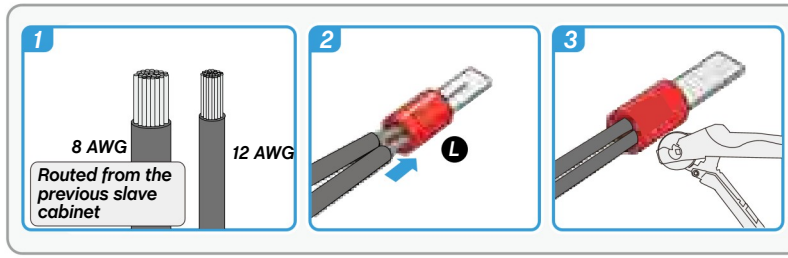


Figure 7-18 Assembe Cables

- Strip the other end of the two 12 AWG cables, crimp them with spade terminals Ⓜ respectively.

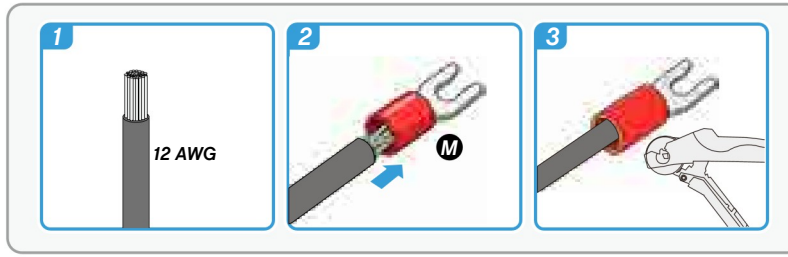


Figure 7-19 Assembe Cables

- Connect the cables with blade terminals Ⓛ to the top of the **D40** circuit breakers on the last slave cabinet respectively. And then connect the two cables with spade terminals Ⓜ to the top of the **C10** circuit breakers on the slave cabinet.

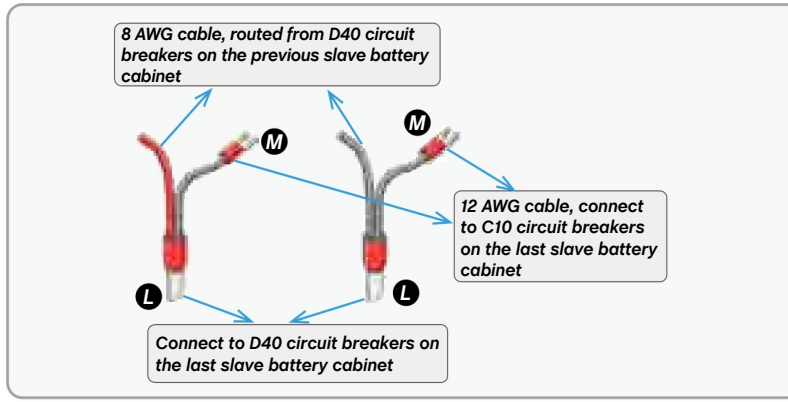


Figure 7-20 Assembled Cables

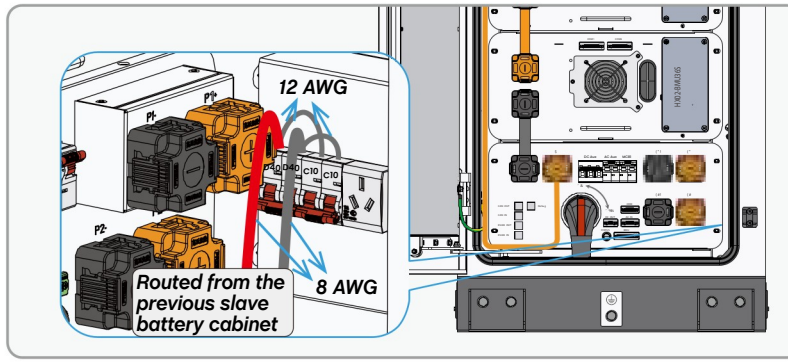


Figure 7-21 Circuit Breaker Cable Connection Between the Previous Slave Cabinet and the Last Slave Cabinet

7.5.2.4 Emergency Stop Dry Contact Connection Among Cabinets

Step 1: Strip both ends of shielded twisted pair cables, connect the stripped end to a ferrule as needed and then crimp the ferrule.

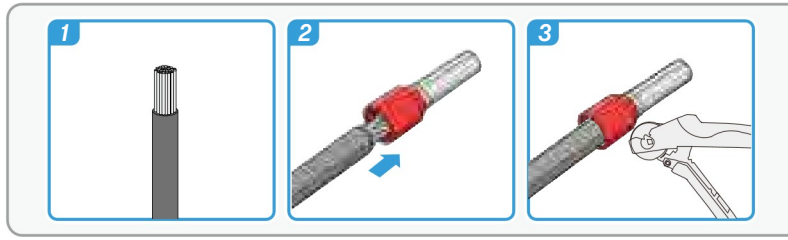


Figure 7-22 Assembe Cables

Step 2: Connect one end of an assembled cable to a male terminal block Ⓘ and the other end to a female terminal block Ⓗ. And secure terminal blocks and the cable with a straight screwdriver.

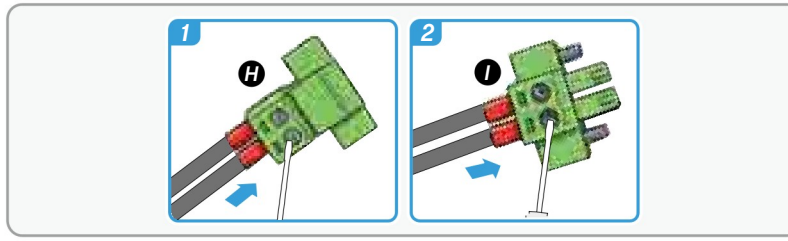


Figure 7-23 Assembe Terminal Blocks

Step 3: Connect one end of the cable assembled with a male terminal block Ⓘ(as shown in the figure below) to the pre-installed female terminal block inside the master battery cabinet and secure the two terminal blocks with a straight screwdriver.

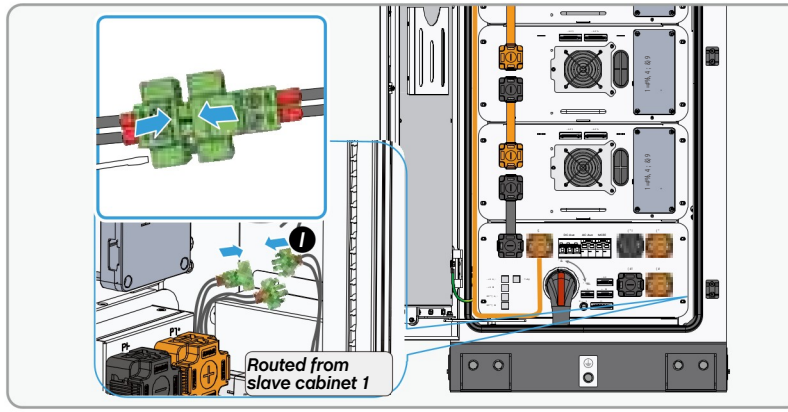


Figure 7-24 Terminal Block Connection inside the Master Battery Cabinet

Step 4: Connect the other end of the cable with a female terminal block H from the master battery cabinet to the pre-installed male terminal block in the slave cabinet 1 and secure the two terminal blocks with a straight screwdriver.

Step 5: Then connect one end of another cable with a male terminal block I to the pre-installed female terminal block in the slave cabinet 1 and secure the two terminal blocks with a straight screwdriver.

Step 6: Connect the other end of the cable with a female terminal block H from the slave cabinet 1 to the pre-installed male terminal block inside the slave cabinet 2 and secure the two terminal blocks with a straight screwdriver.

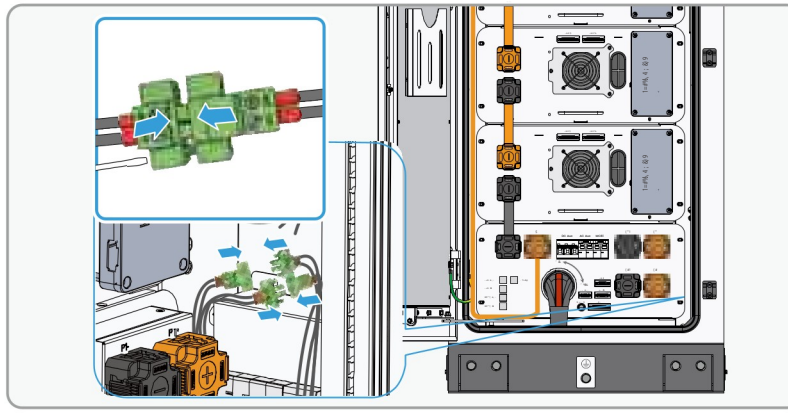


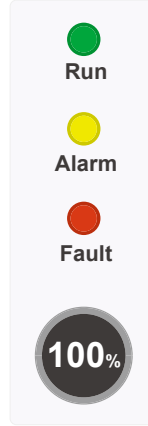
Figure 7-25 Terminal Block Connection Among Slave Battery Cabinets

Step 7: Then connect one end of another cable with a male terminal block I to the pre-installed female terminal block in the slave cabinet 2 and secure the two terminal blocks with a straight screwdriver. Connect the other end of the cable with a female terminal block H to the pre-installed male terminal block in the slave cabinet 3 and secure the two terminal blocks with a straight screwdriver.

8 Operation

⚠ QUALIFIED PERSON

8.1 Indicator



"**100%**" refers to the real-time battery cabinet capacity.

Table 8-1 Cabinet Indicator Status

Device Status	Indicator Status
A fault is triggered. Or fault and alarm are triggered simultaneously.	The red **Fault** indicator lights up.
An alarm is triggered.	The yellow **Alarm** indicator and green **Run** indicator light up.
There is no fault or alarm.	The green **Run** indicator lights up.

Table 8-2 STATUS Indicator of the Control Box

Indicator	Fault Condition	Indicator Status
STATUS 	Battery Level 1 Fault/ Battery Level 2 Fault/ Debugging Communication Timeout/ Display Communication Timeout/ only alarm triggered	The **STATUS** indicator light flashes alternately yellow and green.
	Battery Level 3 Fault, only fault triggered/ fault and alarm triggered at the same time	The **STATUS** indicator light is solid red.
	No fault or alarm	The **STATUS** indicator light is solid green.

8.2 Pre-power Checklist

WARNING

- Please pay attention to battery voltage range.
- The battery cannot be started if the battery voltage range is exceeded to avoid damage to the equipment.

Check the following items before starting the battery:

1 **Appearance Check**

a. Appearance of the equipment is intact, no damage, no rust and no paint loss. If there is any paint loss, please carry out the paint refinishing operation;

b. Equipment labels are clearly visible and damaged labels should be replaced promptly.

3 **Grounding Check:** the cabinet has two grounding points, and grounding is secure; the cabinet grounding conductor is reliably connected to the cabinet grounding copper row.

4 **Cable Check**

a. The cable protection layer is well wired with no visible damage;

b. The terminals are made in accordance with specifications, and the connection is firm and reliable;

c. Each cable is clearly labeled at both ends, and the alignment meets the principle of separation of strong and weak power, leaving a margin at the turn, and shall not be strained;

d. Cable mounting bolts have been tightened, cable pulling without loosening; cable crossing hole blocking has been completed.

e. The battery system output wiring harness is correctly connected to the positive and negative terminals of the battery and inverter to avoid misconnection and reverse connection.

f. The communication cables in the battery system are correctly and securely connected.

7 **Copper Row Inspection:** no obvious cracks or deformation of copper rows, fastening of screws at the lap joints, no misalignment of scribed markings, no debris on the copper rows.

8 **Component Check:** all circuit breakers are disconnected inside the cabinet; all circuit breakers between the battery cabinet and other power supply equipment are disconnected.

8.3 Turn On/Off the Battery

- When turn it on the battery, rotate the **isolation switch** on the control box to **ON** position firstly, turn on the **DC Aux**, **AC Aux** and **MCB1** circuit breakers on the control box, and then turn on **D40** and **C10** circuit breakers at the bottom right inside the cabinet.
- When turn it off the battery, turn off the **DC Aux**, **AC Aux** and **MCB1** circuit breakers firstly, turn off **D40** and **C10** circuit breakers and then rotate the **isolation switch** to **OFF** position.

8.4 Battery Cabinet SN Number Input

When the battery cabinet is connected to an inverter, write the SN number of the battery to facilitate battery-related information queries on the cloud platform.

CAUTION

Writing the battery cabinet SN to the inverter requires assistance from Livoltek technicians.

Step 1: Plug a USB-to-RS485 communication cable into the WiFi port on the inverter and connect the other end of the cable to a laptop.

Step 2: Power on the inverter.

Step 3: Use a serial port tool to send the command **01 03 B5 FE 00 01 C3 F6**. A response of **01 03 02 FF FF B9 F4** indicates normal communication.

Step 4: Request Livoltek technical personnel to assist with writing the battery cabinet SN number(example: BSAA33S9KC480011) and get an auto-generated Modbus command.

Step 5: Copy this Modbus command and send it via the serial port tool. A success response **01 10 A4 34 00 0A 22 F0** will be returned.

Step 6: Send the command **01 03 A4 34 00 0A A7 3**, paste the returned data to Livoltek technical personnel to confirm whether the SN number was written successfully.

If the battery cabinet is connected to a HP3-40~60KS1 series inverter, scan the QR code on the back cover of this user manual and refer to ***HP3-40~60KS1 Series Inverter and BHF-X Series Battery Cabinet Installation Guideline*** to complete device installation.

8.5 Emergency Stop

When the product is malfunctioning or a critical situation requires emergency shutdown, you can perform the following emergency shutdown operations:

Step 1: Press the emergency power-off button EPO.

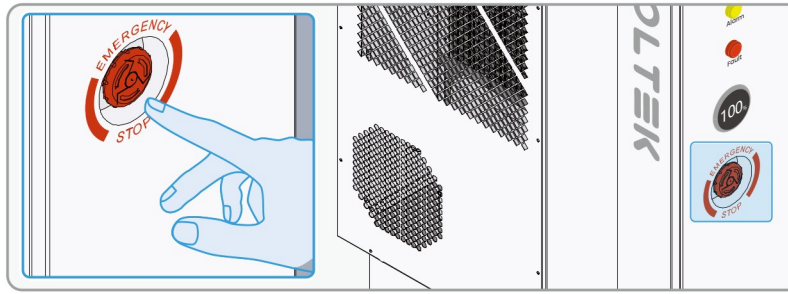


Figure 8-1 Emergency stop

Step 2: Break out all auxiliary power switches of the system.

Step 3: Reset the EPO button after determining that the fault or hazard is cleared and operation is required.

8.6 Routine Maintenance

Item	Check Notes	Period
Inventory Battery Maintenance	• It is recommended to charge the battery system once every 6 months starting from the initial charge. • When the equipment is not used for an extended period, discharge the battery to an SOC of 45%–55% and disconnect the battery to prevent over-discharge. • During system storage, regular inspections should be carried out by qualified personnel.	once every six months
Ambient Temperature and Humidity Inspection	• Check whether the temperature in the ambient temperature records is within the operating range. • Check whether the humidity in the ambient humidity records is within the operating range.	
Functional Check	• Check the operating status of the DC contactor: Send start/stop commands with the power disconnected and verify that the system operates normally. • Measure whether the output voltage is within the specified range. • Check whether the current, voltage, and temperature in the battery pack operation records are within the operating range.	
Switchgear and Battery Modules	Please check the following items and take immediate corrective actions if any non-conformity is found: • Check whether there are flammable materials on top of the battery pack. • Check whether the battery pack is secured to the base plate and whether there is any corrosion. • Check the enclosure for damage, peeling paint, oxidation, etc. • Check the battery pack for foreign objects, dust, dirt, and condensation.	once a year
Wire and Cable Layout	Before inspection, all internal equipment of the battery packs must be powered off! If any non-conformity is found during the inspection, take immediate corrective actions: • Check whether the cable wiring is short-circuited and complies with specifications. If any abnormality is found, correct it immediately. • Check whether all cable entry/exit ports of the battery pack are properly sealed. • Check whether there is any internal water seepage in the battery pack. • Check whether the power cables and copper busbars are loose, and tighten them according to the torque specified above. • Check the power cables and communication cables for damage, especially cuts where the cables are exposed on metal surfaces.	

Item	Check Notes	Period
Grounding	• Check whether the grounding is correct. The grounding resistance shall not exceed 4Ω.	once a year
Fan	• Check whether the fan is faulty (e.g., rotor stuck or stopped). • Check whether the fan makes abnormal noise during operation.	
Fasteners	• Check whether the screws in the battery pack are missing or rusted.	
Battery Pack Status and Cleanliness	• Check the following items. If any non-conformity is found, take immediate corrective actions: • Check the battery pack and internal equipment for damage or deformation. • Check whether there is any abnormal noise during the operation of internal equipment. • Check whether the internal temperature of the battery pack is excessively high. • Check whether the humidity and dust inside the battery pack are within the normal range, and clean the battery pack if necessary. • Check whether the air inlet and outlet vents of the battery pack are blocked.	
Warning Signs	• Check whether the warning signs and labels are clear and legible.	
Wires and Cables	• Check whether the switchgear and battery modules are correctly connected, and whether the battery modules are also correctly connected.	
Corrosion	• Check the battery pack for internal oxidation or rust.	

8.7 Decommission

Decommission the battery in the system after the inverter is decommissioned. Proceed as follows to decommission the battery.

- De-energize both the PV and grid sides of the inverter.
- Manually turn off the **DC Aux**, **AC Aux** and **MCB1** circuit breakers firstly, turn off **D40** and **C10** circuit breakers and then rotate the **isolation switch** to **OFF** position to power off the battery system.
- Ten minutes after the system is powered off, disconnect all cables among batteries and other devices.

9 Technical Specifications

Model	BHF-X80D	BHF-X100D	BHF-X120D
Battery Parameters			
Battery Type	LiFePO4		
Rate Capacity [Ah]	314		
Battery Configuration	1P20S		
Number of Modules	4	5	6
Rated Battery Voltage [V]	256	320	384
Operating Voltage Range [V]	224~288	280~360	336~432
Rated Energy [kWh]	80	100	120
Rated Charge/Discharge Current [A]	157/ 157		
Max Charge/Discharge Current [A]	179.4/ 179.4		
System Parameters			
Depth of Discharge	90%		
Operating Temperature [℃]	Charge: 0~55; Discharge: -20~55		
Operating Humidity [%]	0~95 (non-condensation)		
Operating Altitude [m]	2000 (＞ 2000 derating)		
Warranty [years]	10@70%SOH, 25℃ , 0.5P		
Communication	RS485/ Wi-Fi/ CAN/ DI/ DO		
Temperature Control Mode	Smart air cooling		
Ingress Protection	IP55		
Dimensions (W × H × D) [mm]	740 × 2100 × 1349		
Weight [kg]	945	1085	1218

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