LIVOLTEK

User Manual

Industrial and Commercial Energy Storage System

Type: BHF-G series

BHF-G series.R110.V1.0

Contents

1. About This Manual

1.1 Products Covered by This Manual

Li-ion Battery: BHF-G Series energy storage system.

1.2 Target Group

This manual is intended for a qualified electrician. Any electrical installation and maintenance on the battery must be performed by qualified electricians in compliance with standards, wiring rules or requirements of local grid authorities or bodies.

1.3 Symbols Used

The following types of safety precautions and general information symbols are used in this manual. These important instructions must be followed during installation, operation and maintenance of the battery.

Symbol	Description
⚠ DANGER	Indicates a hazard with a high level of risk that, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazard with a medium level of risk that, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazard with a High level of risk that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a situation that, if not avoided, could result

	in equipment or property damage.

1.4 Storage of the Manual

Please keep the manual properly and operate in strict accordance with all safety and operating instructions in this manual. The information in this manual is subject to change without notice. Please check ***www.LIVOLTEK.com*** for more information.

2. Safety

The manual describes the installation, 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 this user manual during installation, operation or maintenance at all times.

2.1 Important Safety Instructions

⚠ DANGER

Danger to life from electric shock.

- Before performing any work on the battery, make sure the battery is power off and the DC Breaker 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 service 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.
- **NOTICE**
- Do not open the battery or change any components without authorization, otherwise the warranty commitment for the battery will be invalid.
- Appropriate methods must be adopted to protect battery from electrostatic discharge; any damage caused by ESD is not warranted by the manufacturer.

2.2 Response to Emergency Situations

2.2.1 Leaking Batteries

- If the battery leaks electrolyte which is corrosive, avoid contact with the leaking liquid or gas. Direct contact 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.

2.2.2 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 property.
- Please pack the battery in its original container, and then return it to your distributor

2.2.3 Fire

If 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.

2.2.4 Advice for Firefighters

- As 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.

2.3 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.

2.4 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.

3. Scope of Delivery

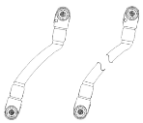
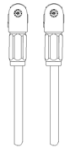
3.1 Battery Pack Package

				
A	B	C	D	E

The table below lists the quantity of each component

Object	Description	Quantity
A	Battery Pack	1
B	power cable	1
C	Communication cable	1
D	Bolts	Divers
E	Certificate	1

3.2 Control box Package

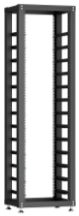
				
A	B	C	D	E

				
F	G	H		

The table below lists the quantity of each component

Object	Description	Quantity
A	Control Box	1
B	Power cable to Pack	1
C	Communication cable to Pack	1
D	Power cable to PCS	1pair
E	Communication cable to PCS	1
F	Bolts	Divers
G	User Manual	1
H	SDS Document	1

3.3 Rack Package

				
A	B			

The table below lists the quantity of each component

Object	Description	Quantity
A	Rack	1 pair

B	Bolts	Divers
C		
D		
E		

NOTE: Accessories for different applications may be different.

4 Product Description

Thank you for choosing the LIVOLTEK battery. The BHF-G Series battery is a series of High Voltage Lithium-ion battery. It is designed for industrial and commercial energy storage scenario. It must only be connected with an officially tested PCS.

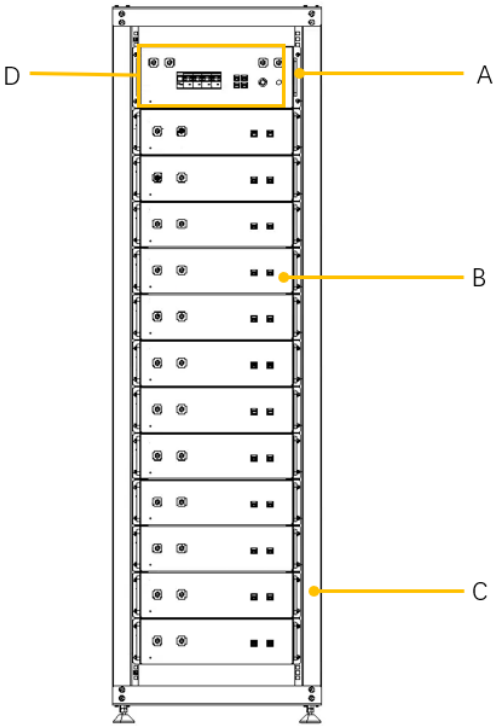


Figure 1. View of the BHF-G Series Lithium Battery

Position	Definition
A	Control Box
B	Battery Pack
C	Rack
D	Connection area

⚠ CAUTION

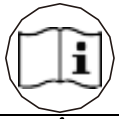
If the battery is not used or not installed for a long time, it is recommended to measure the voltage and charge it before use for better maintenance.

Icons on the Nameplate

Symbol	Explanation
	Caution, Risk of Danger
	Caution, Risk of Electric Shock
CE	CE marking The battery complies with the requirements of the applicable EU directives.

	Read the user manual before using
	WEEE Mark. The scrapped battery cannot be put into the garbage can and must be professionally recycled.

Icons on the warning label

Symbol	Designation
	Refer to the Operating Manual before using
	Caution, Risk of Danger
	Caution, Risk of Electric Shock
	Keep the battery away from open flame or ignition sources.
	Keep the battery away from children.
	Do not short circuit the battery.

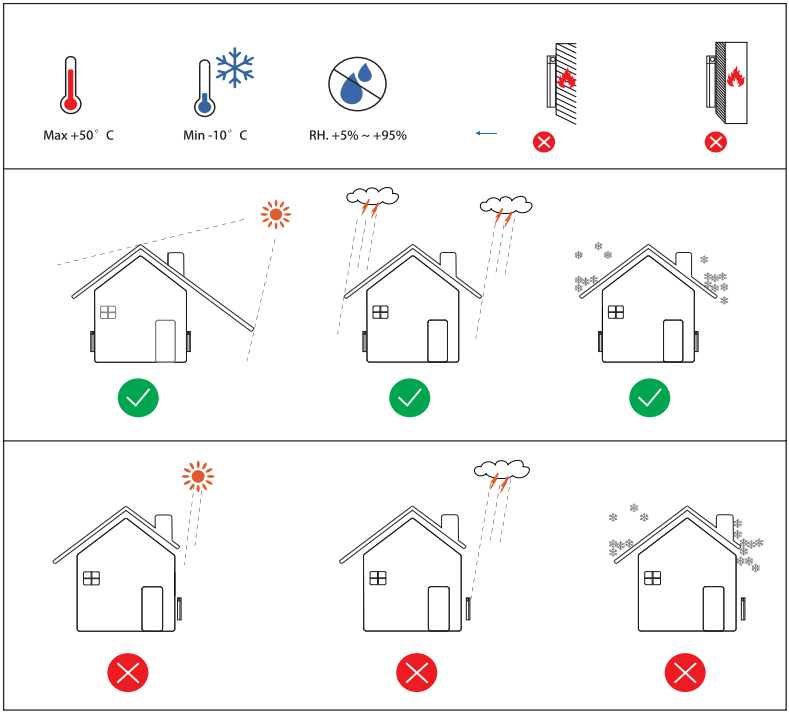
	WEEE Mark. The scrapped battery cannot be put into the garbage can and must be professionally recycled.

5 Mounting

5.1 Environment Requirements

Install the Battery System on the ground with sufficient bearing capacity and flatness. Increase the bearing capacity and flatness of the surface by laying the foundation, adding bearing plates and so on.

- Keep children away from the battery.
- The optimal ambient temperature for the battery is 15~35℃.
- Avoid exposing the equipment to direct sunlight or rain.
- Install the equipment away from heat/cold source.
- Do not install the equipment in the place where the temperature changes extremely.
- Install the equipment away from strong interferences to ensure its regular work.
- Do not install the equipment in places prone to accumulate water.
- Do not put inflammable or explosive matters near the equipment.



5.2 Tools

These tools are required to install the battery system.

			
Electric batch	Screw Driver	Marker	Hexagon keys
			

Tap measure	Multi-meter	Utility knife	Gradienter

It is recommended to wear the following safety gear when dealing with the battery system.

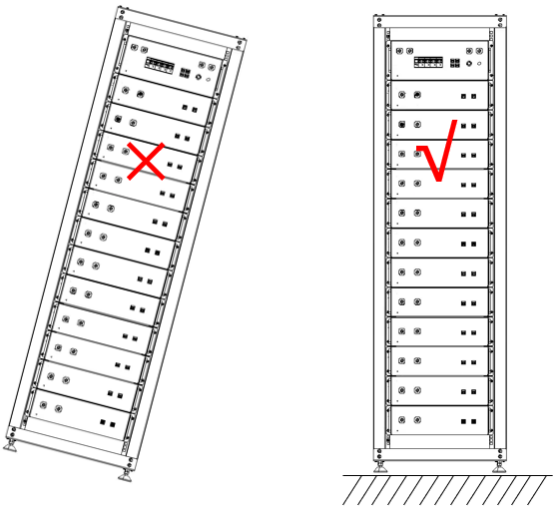
			
Insulated Gloves	Safety Goggle	Safety shoes	Dustproof Mask

5.3 Angle and Space Requirements

5.3.1 Angle requirement

⚠ CAUTION

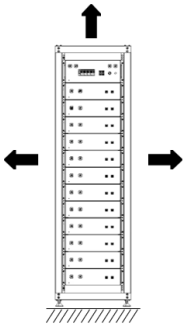
Never install the Battery horizontally, or with a forward tilt or with a backward tilt or even with upside down. Install the battery upright on the ground.



This battery is indoor version and can be only installed in an indoor location.The space around batteries recommended refer to the figure below.

5.3.2 Space requirement for the battery

⚠ CAUTION

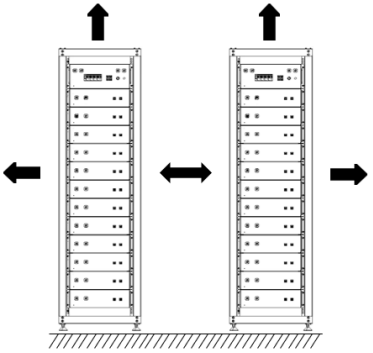


Position	Min. size/mm
Left	100
Right	100
Top	200
Back	100
Front	1000

5.3.3 Space requirement for expansion

⚠ CAUTION

The horizontal space between 2 adjacent batteries should exceed 10 mm.



Position	Min. size(mm)
Top	200
Back	100
Front	1000
Left of left battery	100
Right of right battery	100

5.4 Mounting the Battery

5.4.1 Unpack and Check for Transport Damage

Unpack the battery package and make sure the battery is intact during transportation. If there are any visible damages, such as cracks, or missing parts, please contact your dealer immediately.

5.4.2 Pre-installation check

- After opening the package, check if the package items are complete. If there is any part is missing, please contact your dealer immediately.
- Check and confirm the battery is power off and DC breaker is off before any further step.
- Turn on the DC breaker, when the battery self-test successfully, its green light turns on. If the red light is on, please contact your dealer immediately.
- Then go on to next step after turning off the battery.

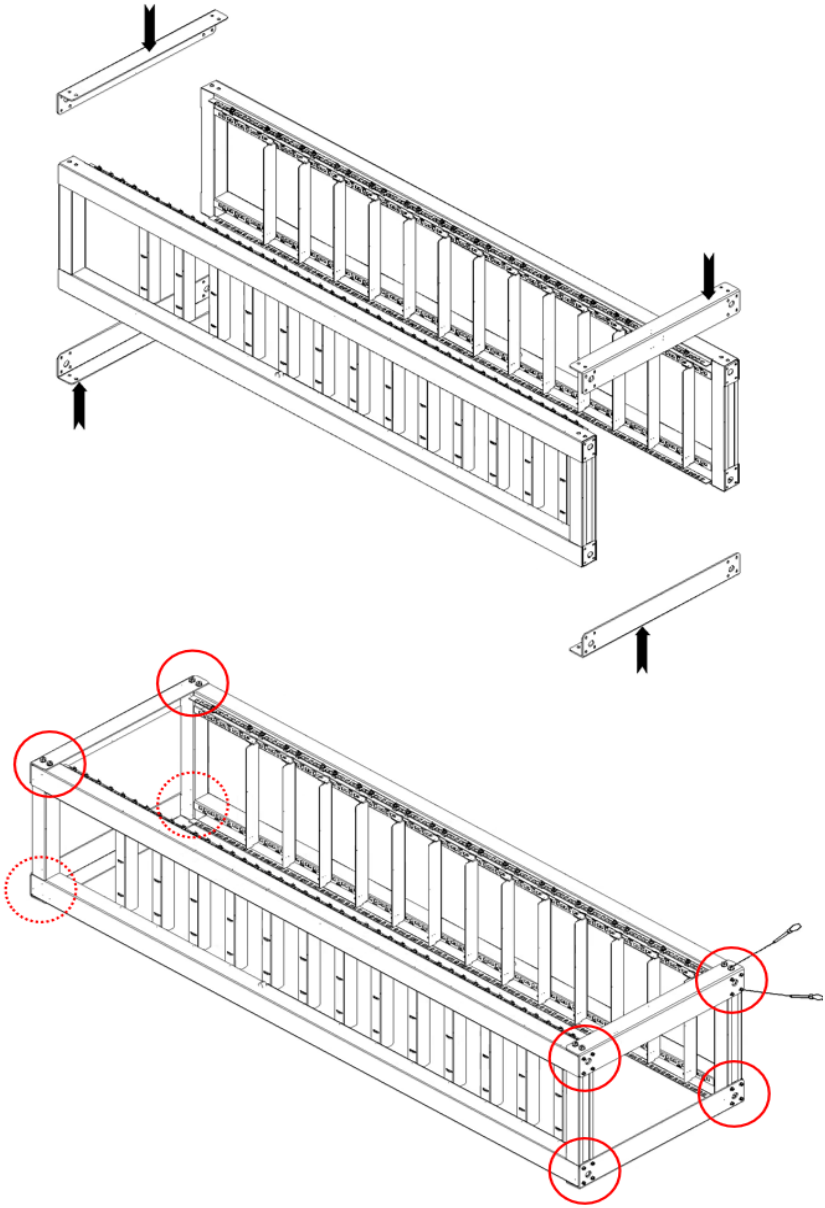
5.4.3 Procedure for PCS

For more detailed information and installation steps, please refer to the PCS user manual & quick installation guide.

5.4.4 Procedure for BHF-G series Application

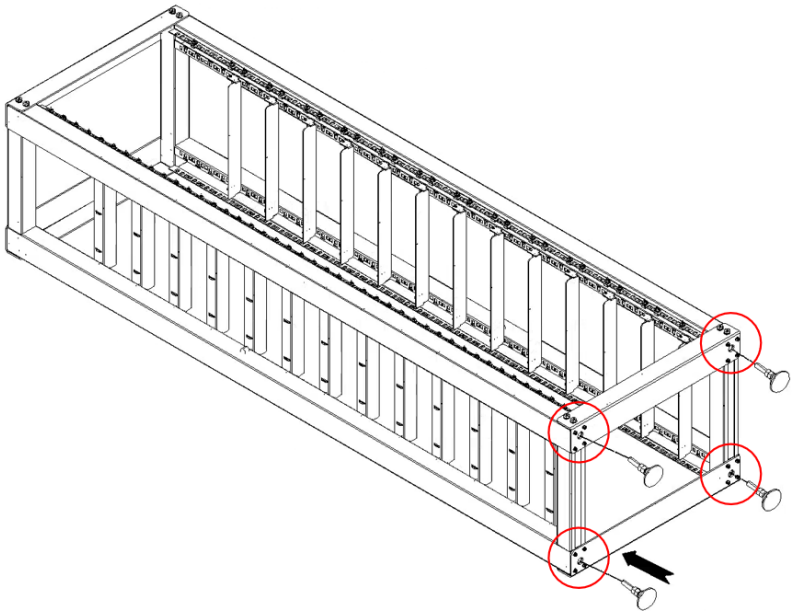
STEP 1: Assemble the rack

- Assemble the rack parts together, and then lock bolts to secure the rack.



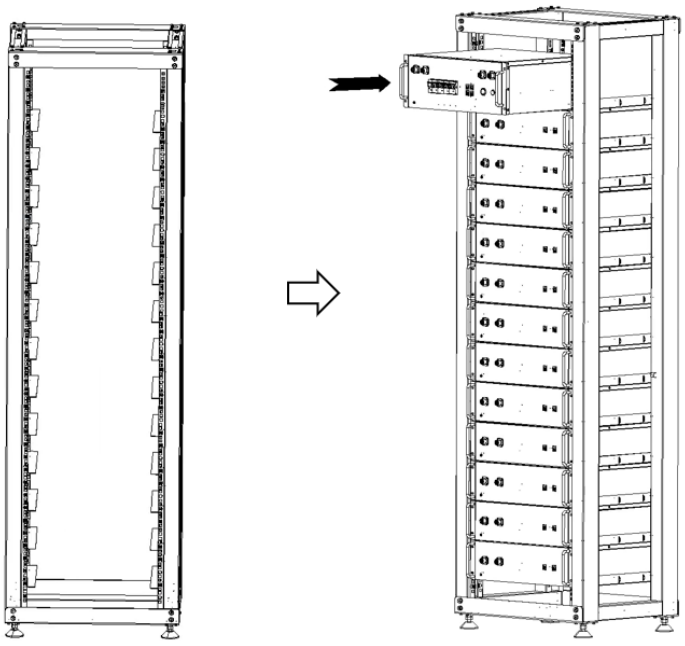
STEP 2: Install the feet of the rack

- Install the feet of the rack and make rack are level and stable when it is placed vertically.



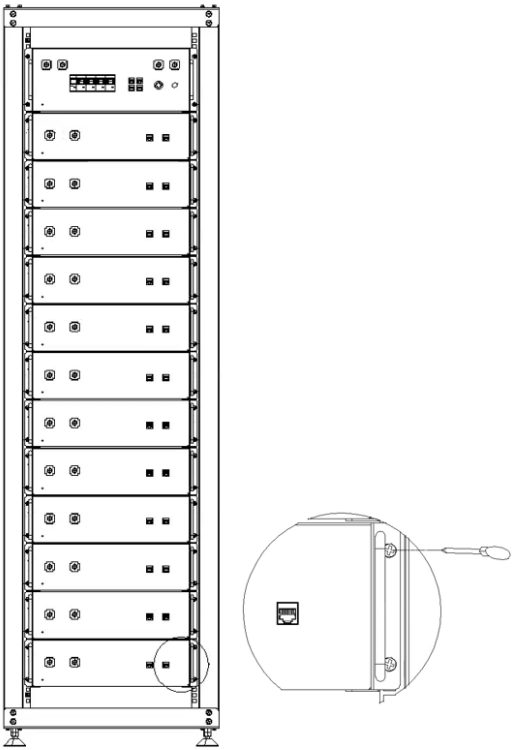
STEP 3: Install the module

- Install battery pack and control box into the rack from bottom to top.



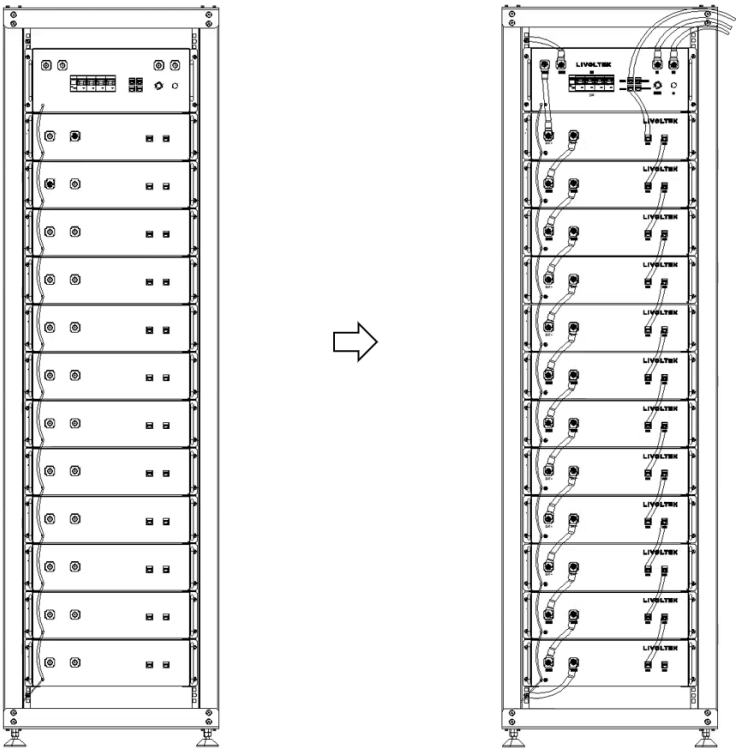
STEP 4: Secure the module

- Secure battery pack and control box to the rack.



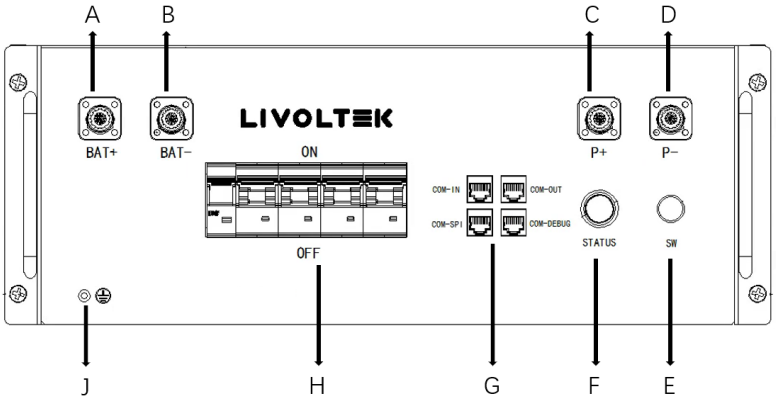
STEP 5: Connect electrical cables

- Connect ground cables between battery pack and control box and the rack;
- Make sure DC Breaker is off when you connect power cables;
- Connect power and communication(COM1, COM-SPI) cables between battery pack and control box, the BAT- of battery pack in the bottom connect the BAT- of control box;
- Connect power and communication(P+, P-, COM-IN) cables to PCS.

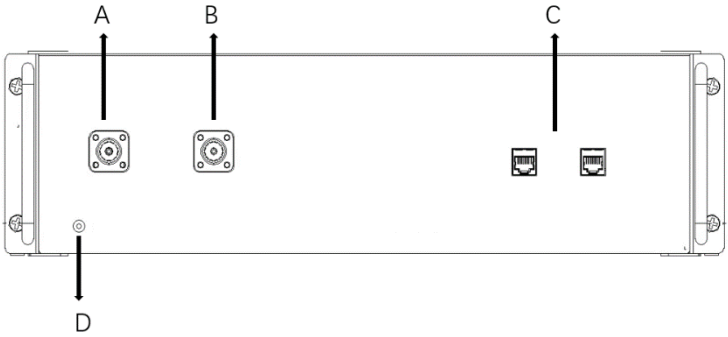


6 Electrical Connection

6.1 Overview of the Connection Area



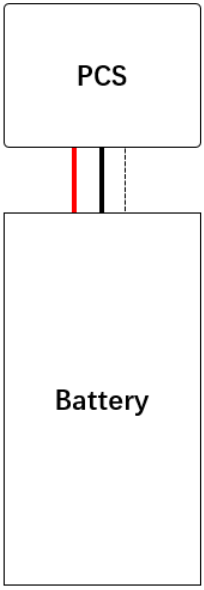
Position	Definition
A	Battery+
B	Battery-
C	P+
D	P-
E	Power switch
F	Status light
G	Communication port
H	DC Breaker
J	GND port



Position	Definition
A	Battery+
B	Battery-
C	Communication port
D	GND port

6.2 Battery Power Connection

Battery connection diagram



Red /Black solid line: Positive / Negative power cable

Black dotted line: CAN communication cable.

Procedure:

Before connecting the power cables, make sure the DC breaker of the battery is disconnected.

STEP 1:

Install the Quick-Plugs of power cable to the battery.

STEP 2:

Install the OT terminals ends of grounding cable to the grounding point of the battery system, then connect it the grounding point of PCS.

STEP 3:

Plug the other ends of power cables into PCS.

6.3 BMS Communication Connection

Please check whether the BMS communication cable in the accessory box is appropriate for the battery. If you are not sure for that, please confirm with your vendor.

Procedure:

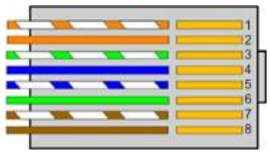
STEP 1:

Please insert the connector of the communication cable into the BMS Communication COM-IN port of battery.

STEP 2:

Please insert the other end of the cable in the corresponding port of PCS.

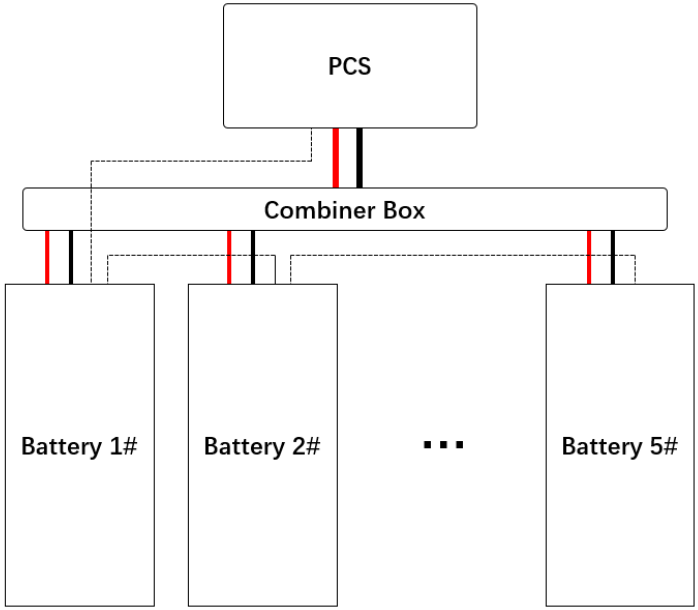
BMS Connector Pin Definition:

 RJ45	1	Reserved
	2	Reserved
	3	CAN1_GND
	4	CAN1_H
	5	CAN1_L
	6	DIG_IN2
	7	RS485_A1
	8	RS485_B1

6.4 Parallel Connection of Multi-batteries

Expandability: Up to 5 cluster of BHF-G series battery can be parallel connected in one system.

Parallel Connection Diagram (Expansion Application)



Red /Black solid line: Positive / Negative power cable

Black dotted line: CAN communication cable.

Procedure:

STEP 1:

a) Connect all the positive terminals (BAT+) of power ports of each battery to BAT+ of combiner box;

b) Connect all the negative terminals (BAT-) of power ports of each battery to BAT- of combiner box;

c) Connect output terminals(P+, P-) of combiner box to PCS DC terminals.

STEP 2:

- Connect the BMS ports of each battery. The COM-OUT of first battery should be connected to the COM-IN of second battery;
- Connect the COM-OUT of second battery to the COM-IN of third battery;
- Communication ports of other batteries are connected in the same way.

STEP 3:

- Connect the COM-IN of first battery to PCS communication port.

7 Operating of the Battery

7.1 LED Indicator

The LED indicates the operating status of the battery.

LED	Explanation
Green	Green light indicates the battery works well.
Red	Fault occurs in the battery. SOC ≤8%

When red light is on for a long time indicates fault occurs in the battery, please contact technical support for help.

7.2 Turn On/Off the Battery

- When turn it on the battery, turn on the DC breaker firstly, and then turn on the switch;
- When turn it off the battery, turn off the switch firstly, and then disconnect the DC breaker.
- Check the following items before starting the battery.
  - Check the battery system has been installed completely.
  - Check the appearance of the battery system is intact.
  - Check the battery system output wiring harness is correctly connected to the positive and negative terminals of the battery and PCS to avoid misconnection and reverse connection.

7.3 Commissioning Procedure

➢ Manually connect the DC breaker of all the batteries, then switch all the batteries on. Then BMS will enter the self-test state. Wait until the indicator is steady on in green, which indicates that the battery system is powered on and runs normally.

8 Decommission

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

- Manually switch all the batteries off, then disconnect the DC breaker of all the batteries.
- One minute after the DC breaker is disconnected, disconnect all cables between the battery and other devices.

9 Technical Data of Battery Pack

Electrical Data	**BHF-B51100**
Cell Type	LFP
Total Energy	5.12kWh
Depth of Discharge	90%
Usable Energy	4.6 kWh
Nominal Voltage	51.2V
Nominal Capacity	100Ah
Operating Voltage Range	43.2~57.6 V
Rated Charge/Discharge	50 A/50A

Max. Charge/Discharge	80A/100A
Max. Number of a Cluster	12 Units
Communication	CAN
Operating Temperature	Charge: 0~55℃ / Discharge: -20~55℃
Dimension(W*H*D)	420*436*132 mm
Weight	41kg
IP Protection Type	IP20

10 Technical Data of Battery System

Product model	BHF-G20	BHF-G25	BHF-G30	BHF-G35	BHF-G40
Nominal Voltage (V)	204.8	256	307.2	358.4	409.6
Operating Voltage Range（V)	172.8~ 230.4	216~ 288	259.2~ 345.6	302.4~ 403.2	345.6~ 460.8
Rate Capacity (Ah)	100				
Number of packs	4	5	6	7	8
Total Energy (kWh)	20.5	25.6	30.7	35.8	41.0
Usable Energy （kWh)	18.4	23.0	27.6	32.3	36.9

Rated Power (kW)	10.2	12.8	15.4	17.9	20.5
Max power (kW)	20.5	25.6	30.7	35.8	41.0
Rated Charge/ Discharge Current (A)	50/50				
Max charge/ Discharge Current (A)	80/100				
Depth of Discharge	90%				
Operating Temperature	Charge: 0~55℃ Discharge: -20℃~55℃				
Operating Humidity	5%~95%				
Operating Altitude	< 4000m				
Communication	CAN/RS485				
Cooling Type	Natural				
Ingress Protection	IP20				
Dimensions (mm)	545*480*2000	545*480*2000	545*480*2000	545*480*2000	545*480*2000
Weight (kg)	277	318	359	400	441

Product model	BHF-G45	BHF-G50	BHF-G55	BHF-G60
Nominal Voltage (V)	460.8	512	563.2	614.4
Operating Voltage Range (V)	388.8~ 518.4	432~ 576	475.2~ 633.6	518.4~ 691.2
Rate Capacity (Ah)	100			
Number of packs	4	5	6	7
Total Energy (kWh)	46.1	51.2	56.3	61.4
Usable Energy （kWh）	41.5	46.1	50.7	55.3
Rated Power (kW)	23.0	25.6	28.2	30.7
Max power (kW)	46.1	51.2	56.3	61.4
Rated Charge/ Discharge Current（A）	50/50			
Max charge/ Discharge Current （A）	80/100			
Depth of Discharge	90%			

Operating Temperature	Charge: 0~55℃ Discharge: -20℃~55℃			
Operating Humidity	5%~95%			
Operating Altitude	< 4000m			
Communication	CAN/RS485			
Cooling Type	Natural			
Ingress Protection	IP20			
Dimensions（mm）	545*480*2000	545*480*2000	545*480*2000	545*480*2000
Weight（kg）	482	523	564	605

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