



User Manual

Model: Powerbox4400LV/6100LV



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1 GENERAL Information

This manual introduces the BETTENERGY POWERBOX-4400LV/6100LV battery products. Please read this manual carefully before using the battery. For any questions, please contact the BETTENERGY / SEEKENER immediately for advice and clarification.

1.1 Validity

This user manual is applicable to BETTENERGY POWERBOX-4400LV/6100LV, This manual contains BETTENERGY POWERBOX-4400LV/6100LV information, usage, guidance, safety information, installation guide and details on common operation issues and subsequent maintenance measures.

1.2 Intended Use

BETTENERGY POWERBOX is an energy storage unit that is designed for residential application scenarios with the capability of short-term backup.

Notes:

BETTENERGY POWERBOX-4400LV/6100LV is not suitable for supporting life-sustaining medical devices. This product is intended for used only in accordance with the information provided in the enclosed documents and applicable local standards and regulations. Any other use may result in personal injury or property damage. The illustrations in this manual are only intended to help explain the concept of the system configuration, including use guidelines, safety precautions, common operating problems, and subsequent battery maintenance.

Alterations to the product, e.g. changes or modifications, are only permitted with the express written permission of SEEKENER. Unauthorized changes will not be allowed by warranty claims. SEEKENER shall not be liable for any damage resulting from such changes. Any use of the product other than described in the intended use section does not qualify as appropriate. The enclosed documentation is an integral part of this product. Please keep the documentation in a safe and convenient place for future reference. Product model labels (see Section 1.3) must be attached to the product.

1.3 Product Identification

The type labels were attached on the product, which contain the product identification information. For safe usage, the user must be well-informed of the contents in the type labels.

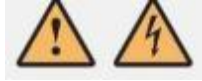
The Labels include:



2 Safety Measures

This section contains safety information that must always be observed when using or installing batteries. To prevent personal injury or property damage and ensure long-term

operation of the batteries.



Environmental requirements:

1. Do not expose the battery to temperature above 50 °C;
2. Do not place the battery near any heat source;
3. Do not expose the battery to moisture or liquid;
4. Do not expose the battery to a corrosive gas or liquid;
5. Do not expose the battery to a combustible gas or liquid;
6. Do not expose the battery to direct sunlight for extended periods of time;
7. Battery power terminals are not allowed to contact conductive objects, such as electric wires;
8. Place the battery in safe place that away from children and animals;

Operation Precautions:

1. Do not disassemble the battery;
2. Do not touch the battery pack with wet hands;
3. Do not smash, fall, or puncture the battery;
4. Do not reverse the polar series connection battery;
5. Do not short-circuit the terminal, and remove all metal jewelry items that may produce a short-circuit before installation and repair;
6. Always handle the products in accordance with the local safety regulations;
7. Store and use the battery in the user's manual;
8. Ensure reliable grounding;
9. Disconnecting all batteries to the wires before installation and repair;
10. Do not stack batteries outside the protective packaging during storage or handling;
11. The stacking of packaging batteries shall not exceed the quantity specified on the packaging;
12. Continued operation of a damaged battery may lead to dangerous situations, causing serious injuries such as electric shock or combustion;

3 Technical Parameters

Basic Parameters	Technical Specification	
Model	POWERBOX-4400LV	POWERBOX-6100LV
Battery Type	LiFePO ₄ , Lithium iron Phosphate	LiFePO ₄ , Lithium iron Phosphate
Nominal Capacity (Ah)	86A.h	120A.h
Nominal Voltage (V)	51.2V	51.2V
Total Energy	4400W.h	6100W.h
Depth of Discharge (90%DOD)	3960W.h	5490W.h
Maximum Charging Voltage (V)	56.8V	56.8V
End of Voltage (V)	49V	49V
Nominal charging current (A)	40A	60A
Maximum Charging Current (A)	50A	80A
Maximum Charging Power (W)	2560W	4096W
Nominal Discharge Current (A)	50A	60A
Nominal Discharge Power (W)	2560W	3072W
Maximum Discharge current (A)	60A	80A
Maximum Discharge Power (W)	3072W	4096W
Working Humidity	≤95%rh	
Store humidity	≤95%rh	

Working Altitude	$\leq 2000\text{m}$	
Maximum number of parallel	A maximum of 16 units are recommended	
Protection Level	IP20	
Net Weight (KG)	46KG	60KG
Dimensions (mm)	434 * 145 * 450mm	434 * 183 * 450mm
Product Certificate	CE,ROHS,UN38.3,MSDS,IEC-62619	
Circle Life	$\geq 5,000$ times, 80%DOD / 25°C/0.5C, 60%EOL	
Communication Port	CAN,RS485,RS232	
Operating temperature	-10°C ~ 55°C	
Storage temperature	$\leq 25^{\circ}\text{C}$, 12 months;	
	$\leq 35^{\circ}\text{C}$, 6 months;	
	$\leq 45^{\circ}\text{C}$, 3 months;	

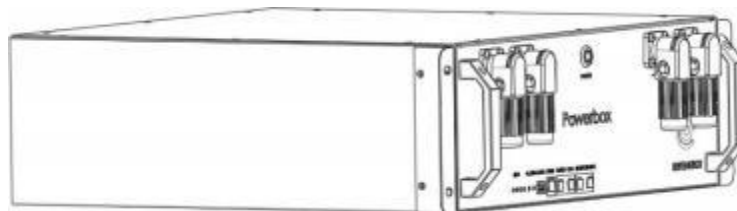
Note: Operating current derating according to the cell voltage and temperature.

4 Technical Items

No.	Name	Comment on this one
1	Discharge	Battery output power for load
2	Charge	Put the electricity in to the battery through the charger
3	Full Charge	The battery is fully charged with 100% SOC.
4	Standby	Ready for charging or discharging
5	Shutdown	Shutdown
6	SOC	State of Charging (Useable Capacity)
7	Battery voltage	Voltage between the battery B+ /B -
8	Single-string voltage	Single-cell voltage
9	Alarm	Indicates that the battery is in an abnormal state
10	Protection	The battery stops charging or discharging and is recoverable
11	Fault	Battery or BMS is damaged and need to be replaced
12	Over discharged	Battery is lack of electricity, and need to be charged in time

5 Product Overview

5.1 Brief Introduction

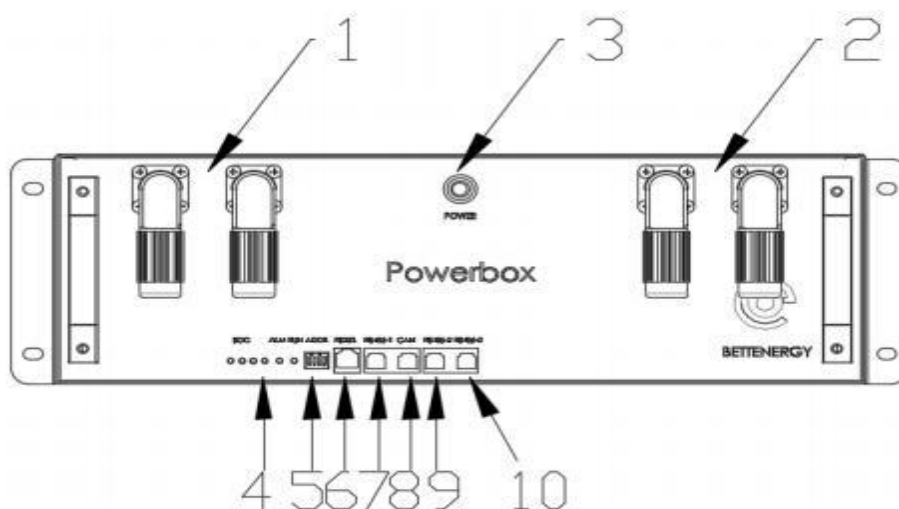


Product Overview: BETTENERGY POWERBOX-4400LV/6100LV is a Lithium battery energy storage system with an operating voltage range of between 49V~56.8V, it is used for household energy storage applications, in cooperation with low voltage inverters to achieve home energy storage purpose.

The product has a built-in B M S (Battery Management System) which can manage and monitor cells information, including voltage, current and the temperature. In addition, the BMS can balances battery charging to extend lifespan. BMS has the protections including over-discharge, overcharge, over-current, high / low temperature, etc.

The system can automatically manage the charging state, discharge state and balance state. Multiple batteries can be connected in parallel to expand storage capacity to meet larger capacity and longer power supporting duration requirements, and the BETTENERGY POWERBOX supports up to 16 parallel operation.

5.2 Interface Introduction



No.	Items	No.	Items
1	Battery Module Positive Pole	6	RS232
2	Battery Module Negative Electrode	7	RS485-1
3	Start Button	8	CAN
4	The LED Indicator	9	RS485-2
5	RS485	10	RS485-2

5.2.1 Start Button

Press the start button, release the button, and the button is locked.

The SOC LED light starts from left to right, and the RUN light shows the operating status.

5.2.2 LED Indicators Definition

SOC lamp: 4 in total, indicating the battery power.

ALM lamp: Fault alarm lamp, faulty or protected.

RUN lamp: Operation status lamp

Instructions for using the LED indicator lamp

LED Indicators Instructions

Status	Normal/ alarm and protection	Runn ing the light	Alarm	Power level indicator lamp				Description
		Green In color	Red in color	Green L4	Green L3	Green L2	Green L1	
Shutdown	Off	Off	Off	Off	Off	Off	Off	All Off
Standby	Normal	Flash-1	Off	Display according to the power quantity				Standby
	Alarm alarm	Flash-1	Flash 3	See the table below				Battery is at low voltage
Charge	Normal	Light	Turn-Off	See the table below				The alarm indicator is turned off during the overpressure alarm
	Alarm alarm	Light	Flash 3					
	Overcharge protection	Light	Off	Open	Open	Open	Open	If no charger is connected , the indicatpr light is Consistent with the standby shate
	Temperatur e, over current protection	Off	Light	Off	Off	Off	Off	Stop charging
Dischargi ng	Normal	Flash 3	Off	See the table below				
	Alarm alarm	Flash 3	Flash 3					
	Over- discharge Protection Ion	Off	Off	Off	Off	Off	Off	Turn off the discharge

Discharging	Temperature, over-current short-circuit protection	Off	Open	Off	Off	Off	Off	Turn off the discharge
Failure		Off	Open	Off	Off	Off	Off	Turn off the charge and discharge

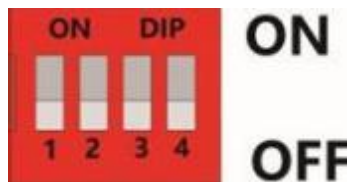
LED Flash Instructions:

Flash Mode	On	Off
Flash-1	0.25S	3.75S
Flash-2	0.5S	0.5S
Flash 3	0.5S	1.5S

Power Level Indication Description

Status		Charge				Discharge			
Capacity indicator lamp		L4	L3	L2	L1	L4	L3	L2	L1
Electricity level (%)	1~25%	Out	Out	Out	Flash-2	Out	Out	Out	Bright
	25~ 50%	Out	Out	Flash-2	Bright	Out	Out	Bright	Bright
	50~ 75%	Out	Flash-2	Bright	Bright	Out	Bright	Bright	Bright
	75~100%	Flash-2	Bright	Bright	Bright	Bright	Bright	Bright	Bright

5.2.3 Dial-up Switch Definition



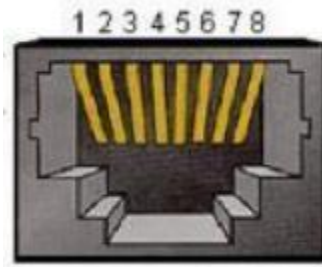
Schematic diagram of the dial-up switch

The dialing switch is used to set the battery BMS address, the code value to the ON position is 1, The code value dialed to 1234 is 0, The host address is 0 and the slave address is 1 ~ 15.

The dial-up address table is as follows

Dial-up code location				Add ress	Dial-up code location				Add ress	Dial-up code location				Add ress	Dial-up code location				Add ress
1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4	
0	0	0	0	0	0	0	1	0	4	0	0	0	1	8	0	0	1	1	12
1	0	0	0	1	1	0	1	0	5	1	0	0	1	9	1	0	1	1	13
0	1	0	0	2	0	1	1	0	6	0	1	0	1	10	0	1	1	1	14
1	1	0	0	3	1	1	1	0	7	1	1	0	1	11	1	1	1	1	15

5.2.4 The CAN port

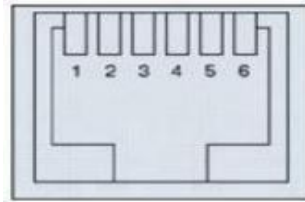


Interface	Definition Description
Pin1	The NC(is empty)
Pin2	The NC(is empty)
Pin3	The NC(is empty)
Pin4	CANH
Pin5	CANL
Pin6	The NC(is empty)
Pin7	The NC(is empty)
Pin8	The NC(is empty)

The CAN communication terminal (RJ45 port) follows the CAN protocol and connects to the inverter CAN communication

1. The BMS controls the charging current / charge voltage or discharge current / discharge voltage of the inverter, via CAN, based on the battery voltage and battery temperature.
2. If the battery capacity is less than 8%, the BMS control inverter forces the charges via CAN communication to avoid damage to the battery due to deep discharge.
3. If the SOC is below 97% for a consecutive month, the BMS control the inverter via CAN communication, charging the battery fully to correct the SOC error.

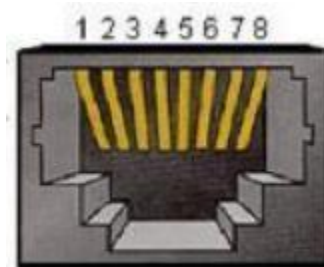
5.2.5 The RS232 Port



Interface	Definition Description
PIN1	NC
PIN2	NC
PIN3	RS232 tx
PIN4	RS232 rx
PIN5	GND
PIN6	NC

The RS232 communication terminal (RJ45 port) follows the RS232 protocol for commissioning or service by the manufacturer or professional engineer.

5.2.6 RS485-1



Interface	Definition Description
Pin1	RS485-B
Pin2	RS485-A
Pin3	RS485-GND
Pin4	NC
Pin5	NC
Pin6	RS485-GND
Pin7	RS485-A
Pin8	RS485-B

The RS485-1 communication terminal (RJ45 port) follows the RS485 protocol to

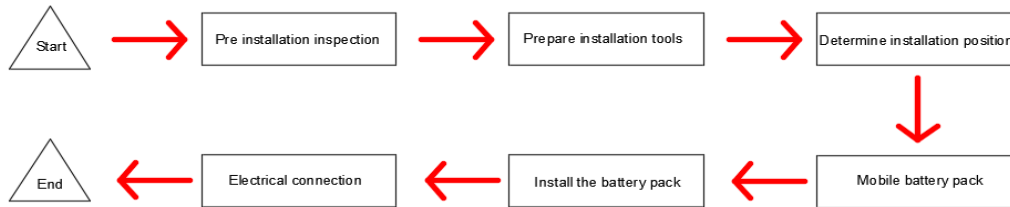
connect the inverter RS485 communication.

5.2.7 RS485-2



Interface	Definition Description
Pin1	RS485-B
Pin2	RS485-A
Pin3	RS485-GND
Pin4	The NC(is empty)
Pin5	The NC(is empty)
Pin6	RS485-GND
Pin7	RS485-A
Pin8	RS485-B

6 The Installation Guide



Installation Procedure Flowchart

6.1 Checking before Installation

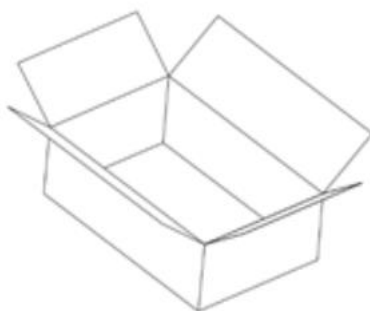
6.1.1 Check the packing










Packaging materials and components may be damaged during transportation. Therefore, check the outer packaging material before installing the battery. Check the surface of the packaging material for damage, such as holes and cracks. If any damage is found, do not unpacking the battery and contact the dealer as soon as possible. It is recommended that you remove the packaging material within 24 hours before installing the battery.

6.1.2 Check the Deliverables

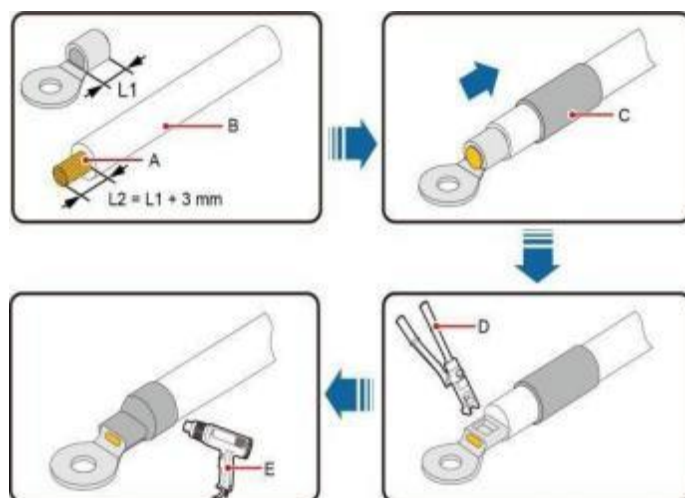
After opening the packing box, check that the random attachment is complete. If any damage or missing parts is found, please contact the dealer.

The following table shows the random components and mechanical components.

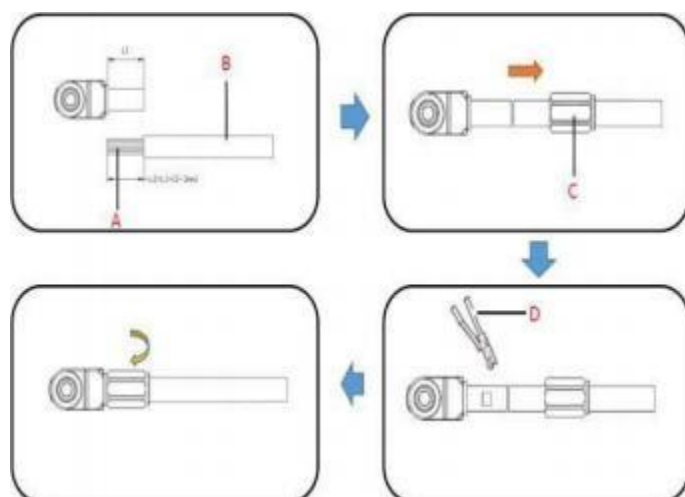


Packing list			
No.	Picture	Quantity	Description
1		1	Battery pack
2		2	Case fixing bracket
3		8	Chassis hanging ear screw (M4*10)
4		4	Case mounting ear retaining screws (M6*12)
5		2	Orange quick connector
6		2	Black quick connector
7		1	Certificate
8		1	Inspection report
9		1	Quality guarantee

Manufacturing of the power cable terminal:








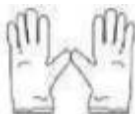





- (A) Copper-core wire (B) The insulation layer (C) Heat-shrink tube
(D) Hydraulic pliers (E) Hot-air gun



- (A) Copper-core Line (B) Insulation layer (C) Protective cover
(D) Hydraulic pliers

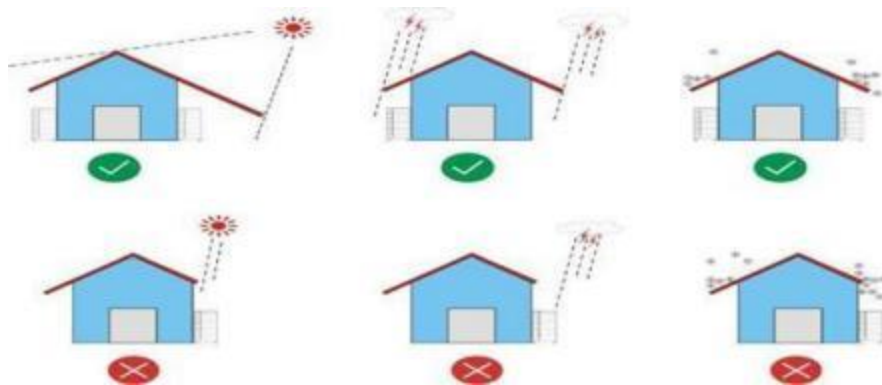
6.2 Tools

Type	Tools		
Installation Tools	Knife	Hammer drill	Socket wrench
			
	Rubber mallet	Cross Screwdriver	
			
	Incinometer	Measuring tape	
			
Protective Equipments	ESD gloves	Safety goggles	Anti-dust respirator
			
	Safety shoes		
			

6.3 Installation Requirements

6.3.1 Installation environment requirements

1. Install the battery in an indoor environment.
2. Place the battery in a safe position away from children and animals.
3. Do not place the battery near any heat source, and avoid generating sparks.
4. Do not expose the battery to moist air or liquid.
5. Do not expose the battery to direct sunlight.
6. Do not expose the battery to a combustible gas or liquid.



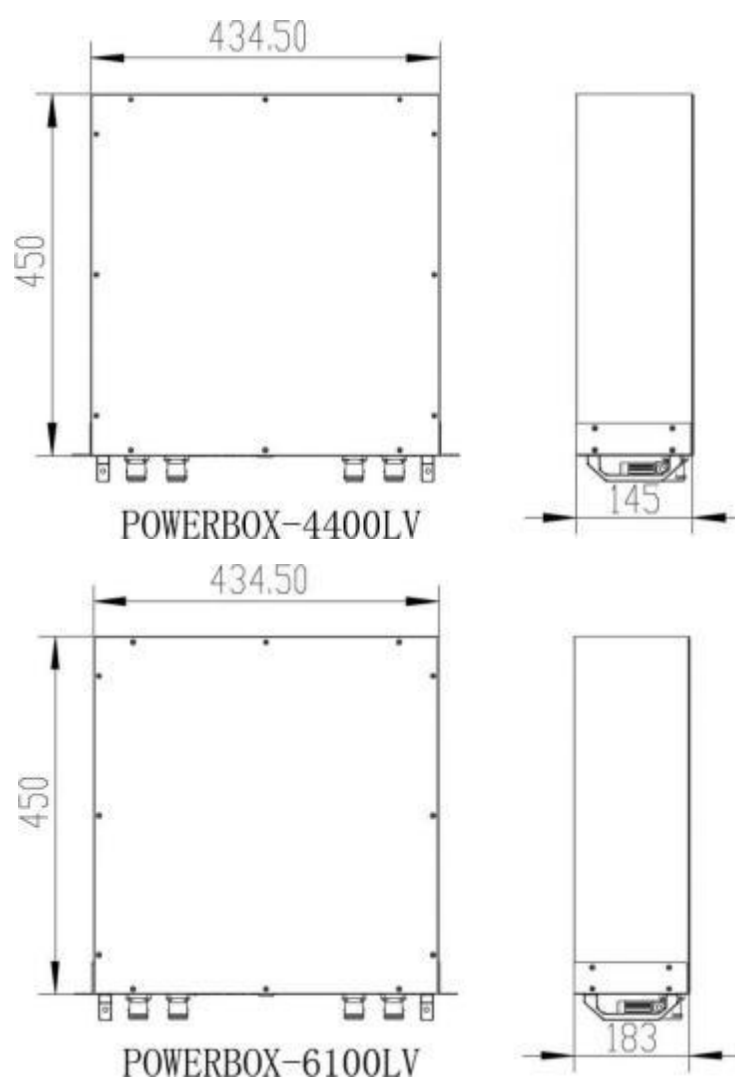
6.3.2 Installation Carrier requirements

1. The mounting carrier shall be fire resistant. Do not install batteries on flammable buildings.
2. The mounting bracket surface shall meet the requirements of bearing requirements.

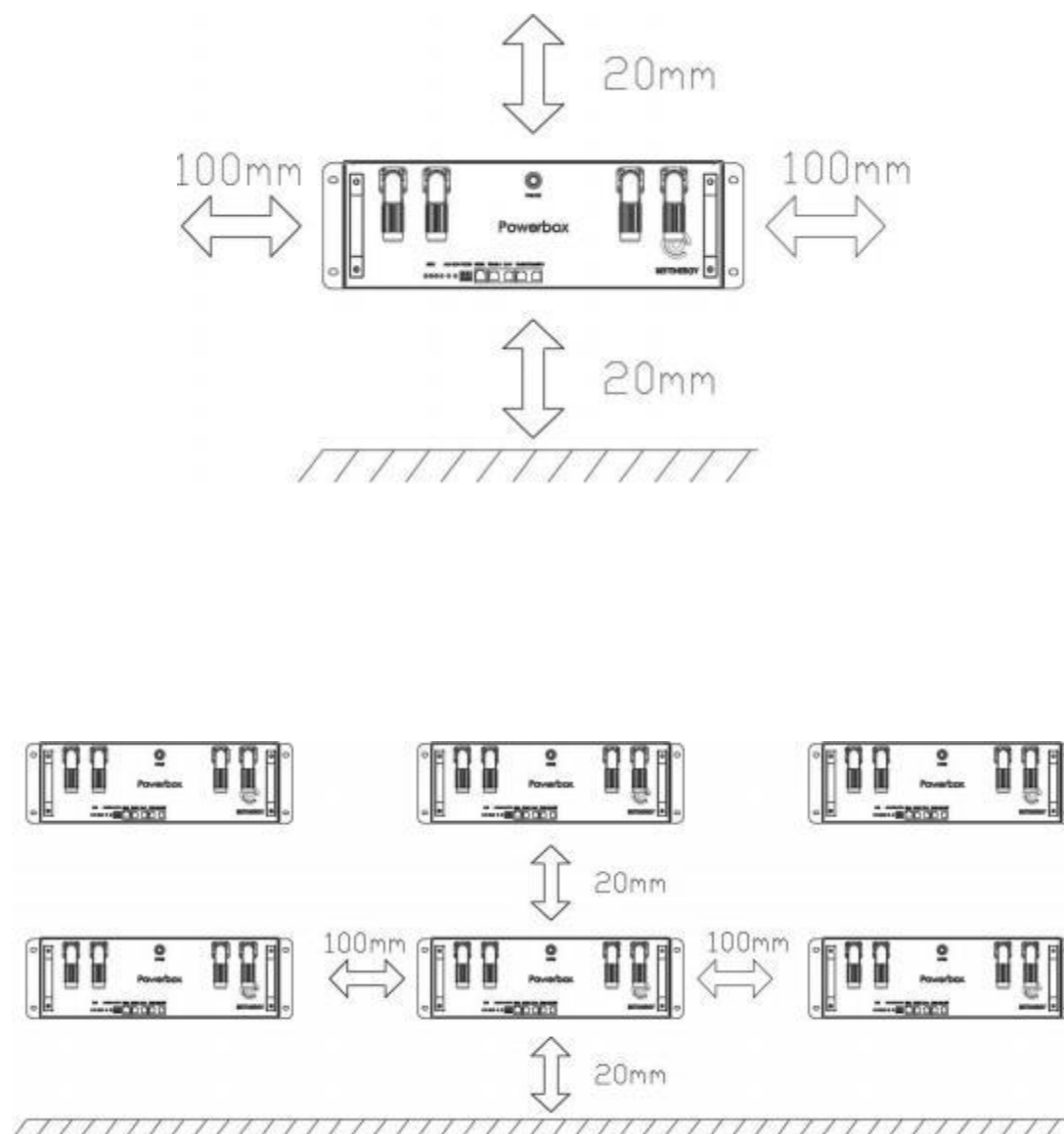


6.4 Installation Instructions

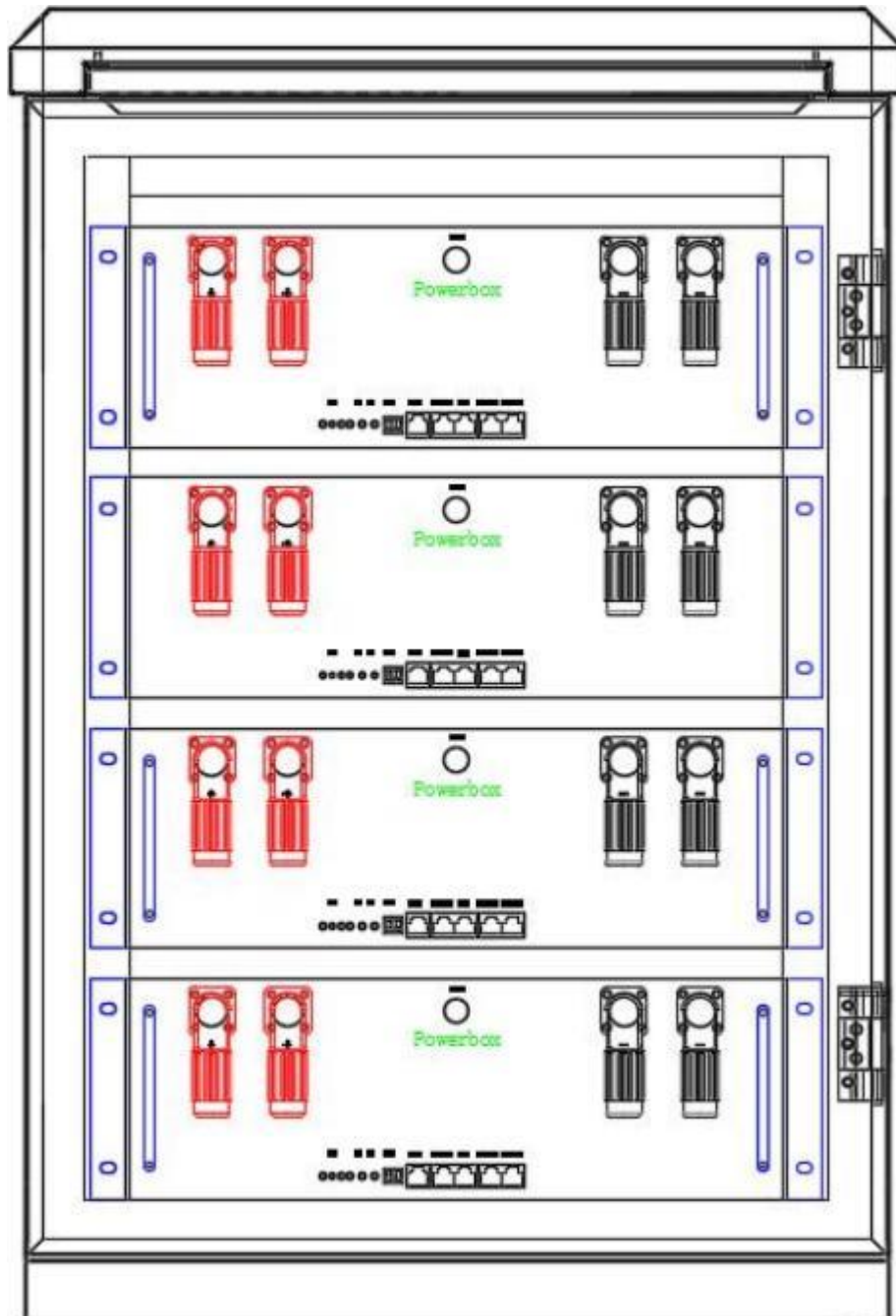
6.4.1 Overall Dimensions



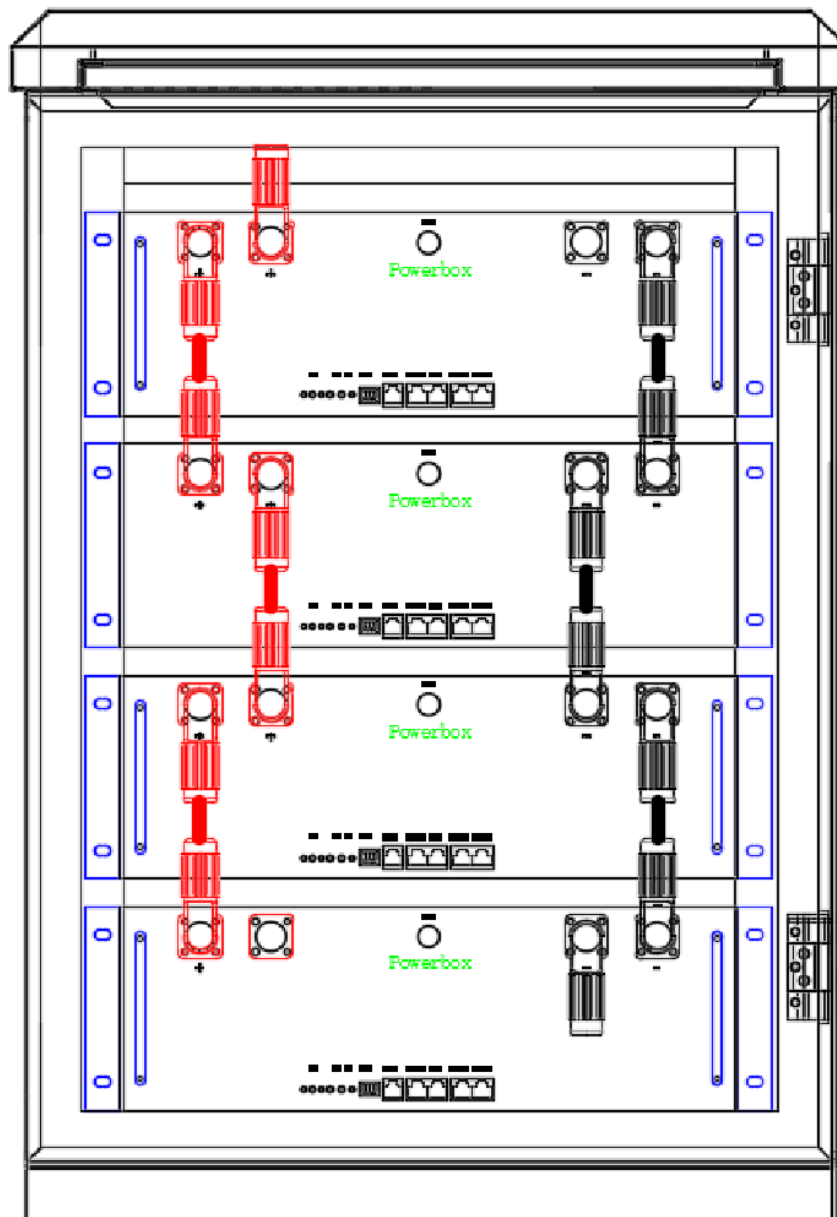
Minimum Installation distance between the battery pack and equipment:



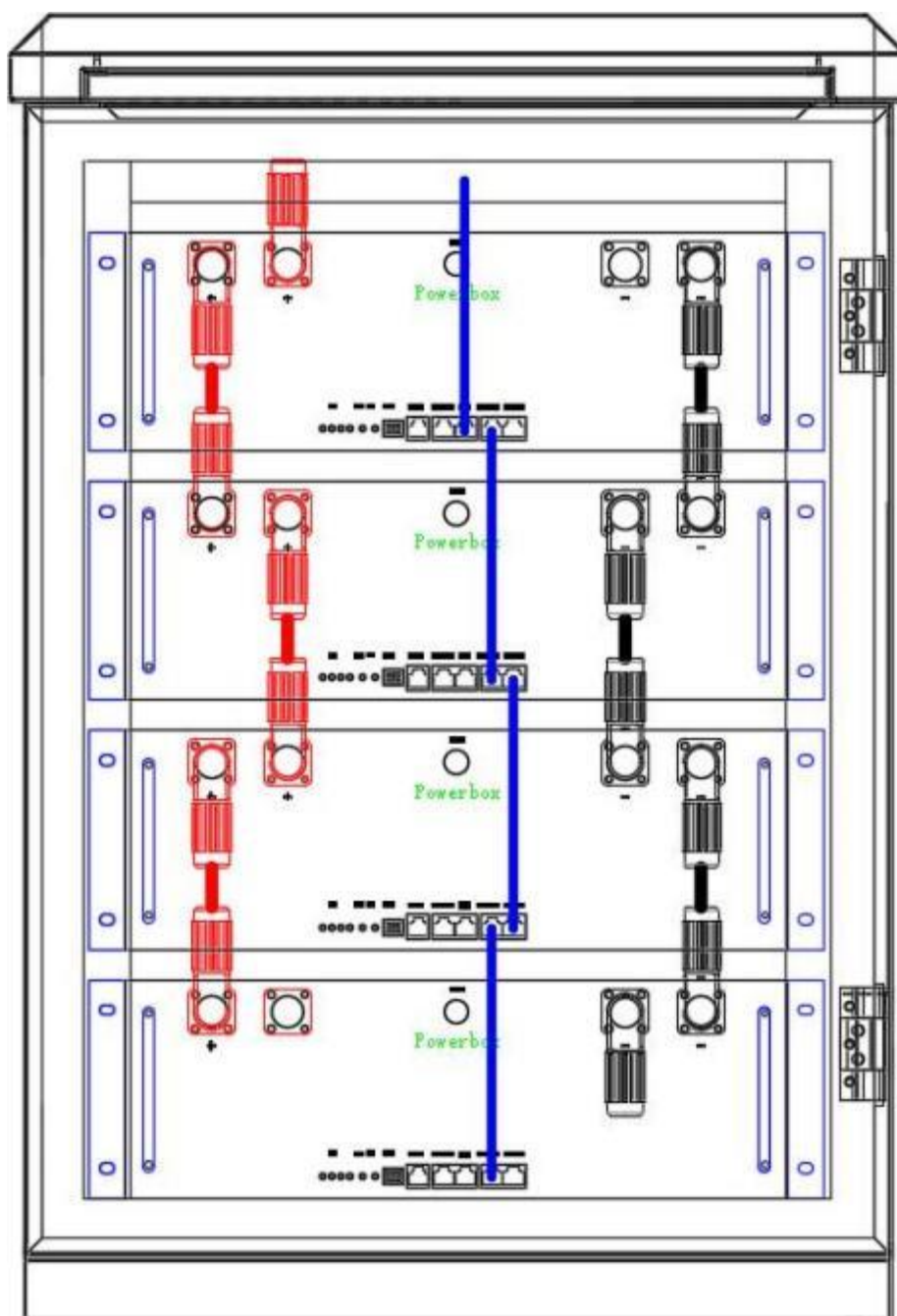
Step 1 Stack battery onto the battery



Step 2. Connect Power line

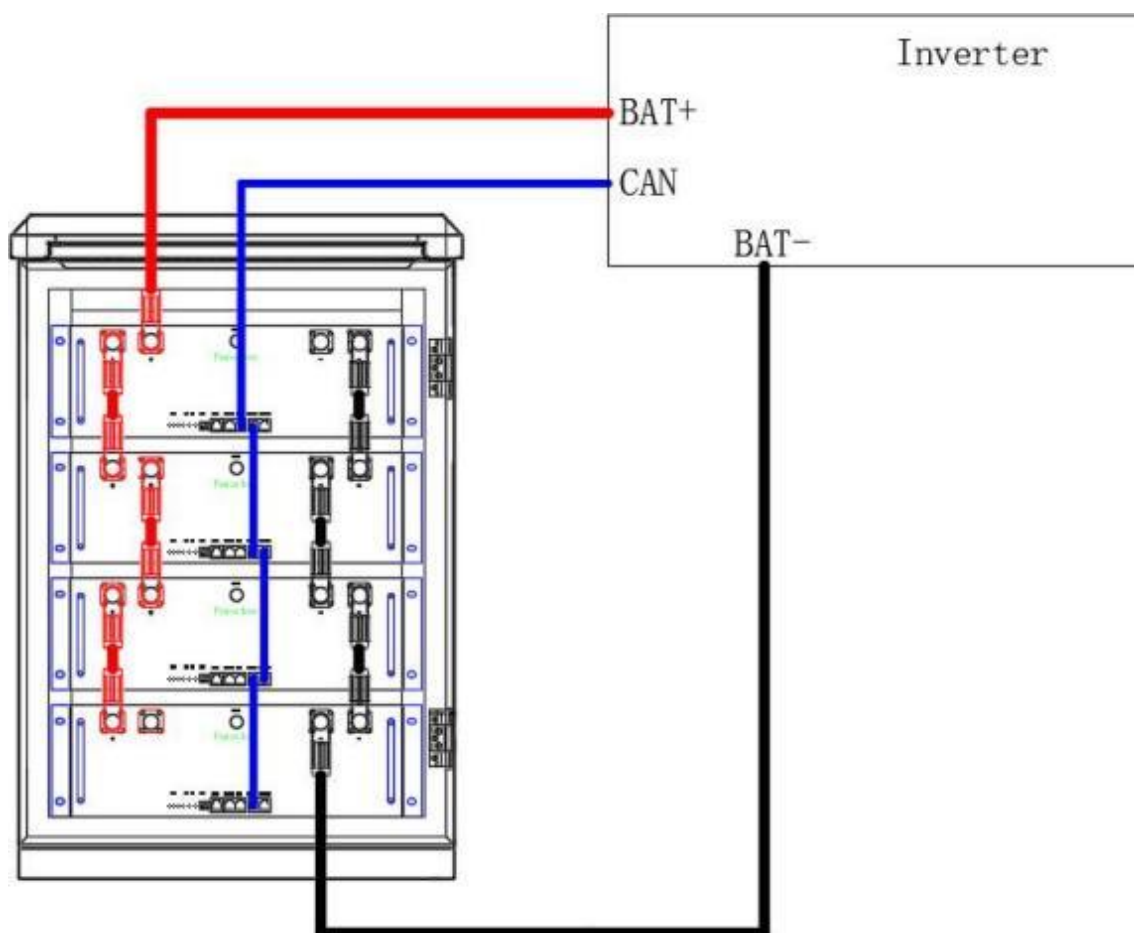


Step 3. Connect the PE line



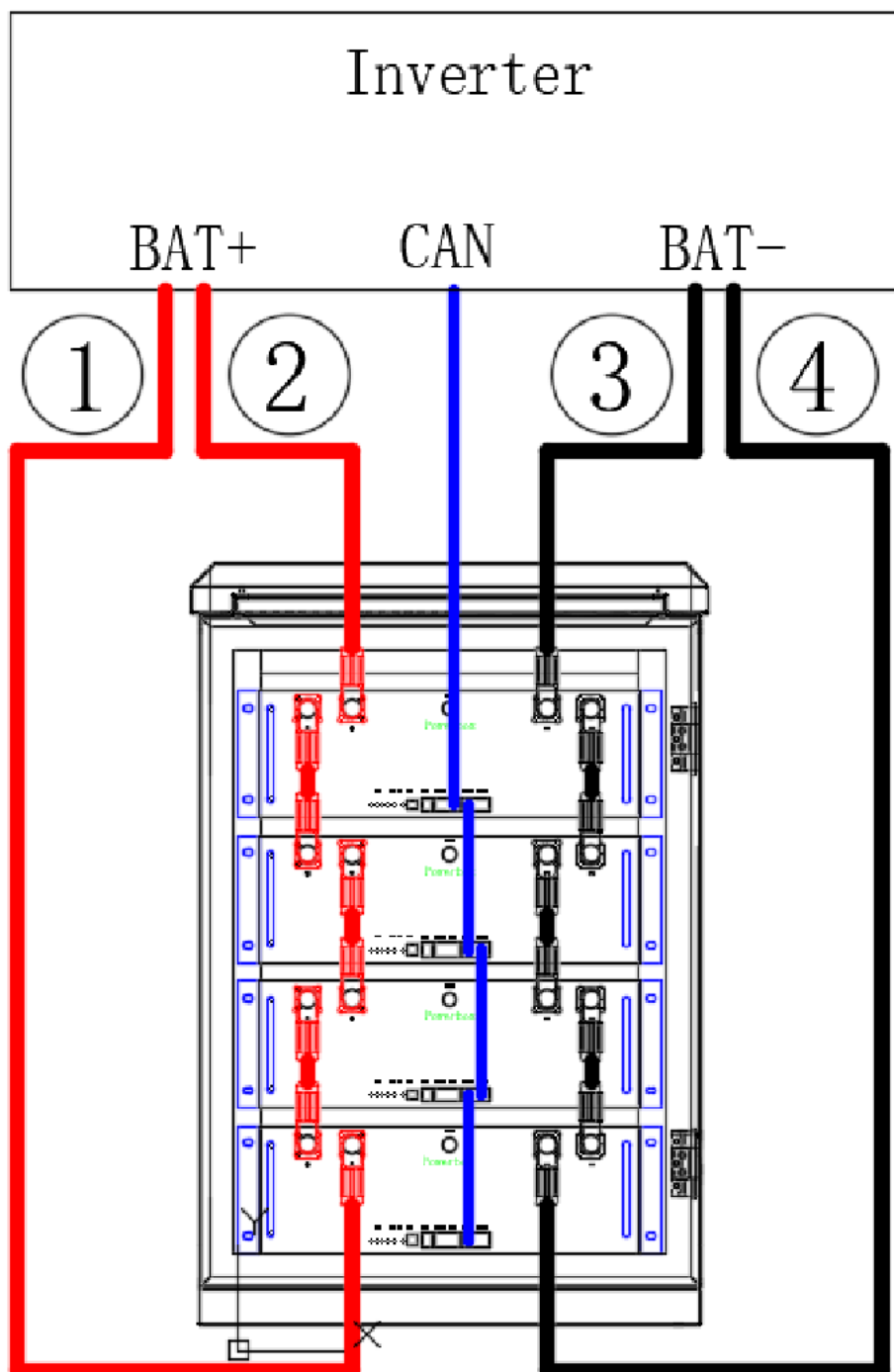
Step 4 Connect to the Inverter

Special Note: Use this connection mode if the inverter power is less than or equal to 5KW.

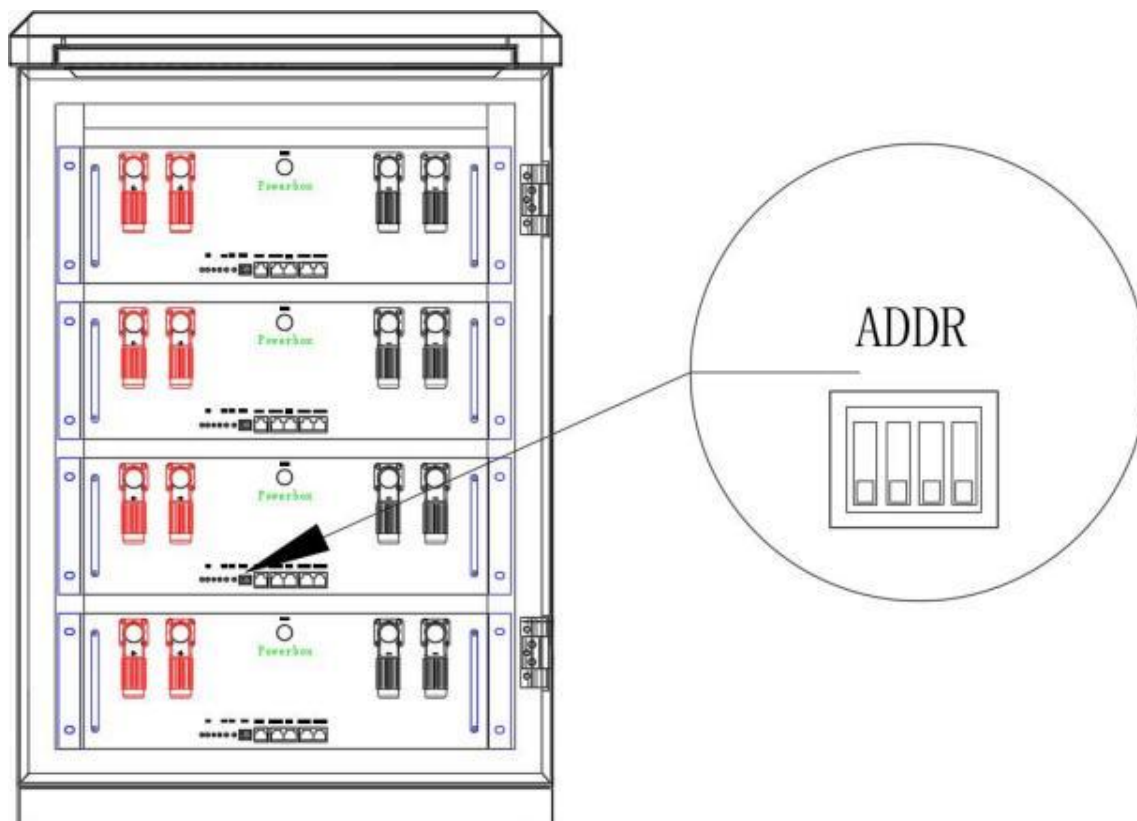


Special Note: If the inverter is greater than 5KW,, make sure 1 and 2,3 and 4.

Equal length of the connecting line.



Step 5. Set the BMS Communication Address



Refer to 5.2.3: The dialing rule is to set the battery module address (from top to bottom)

7 Cleaning and Maintenance

7.1 Cleaning

Caution: Power off the system before cleaning.

It is recommended to clean Power box periodically, if the shell is dirty, use a soft, dry brush or dust collector to remove dust. The enclosure shall not be cleaned with solvents, or corrosive liquids.

7.2 Maintenance

7.2.1 Recharge Requirements during Normal Storage

The battery shall be stored in an environment with a temperature range of $-10^{\circ}\text{C} \sim +45^{\circ}\text{C}$ and shall be maintained regularly according to the following table to 0.5C current is charged until 40%SOC after long storage.

Charging conditions during storage

Store the ambient temperature	Relative humidity of the storage environment	Storage time	SOC
Below -10°C		Prohibit	
$-10 \sim 25^{\circ}\text{C}$	5%~70%	\leq deadline for 12 months	$30\% \leq \text{SOC} \leq 60\%$
$25 \sim 30^{\circ}\text{C}$	5%~70%	\leq deadline for 6 months	$30\% \leq \text{SOC} \leq 60\%$
$35 \sim 45^{\circ}\text{C}$	5%~70%	\leq for 3 months	$30\% \leq \text{SOC} \leq 60\%$
Above 45°C		Prohibit	

7.2.2 Recharging requirements for excessive discharge

Charge the over-discharge (90%DOD) battery within the time of meeting the table below, otherwise the over-discharge battery module will be damaged.

Charging requirements for excessive battery discharge

Storage Environment Temperature	Storage Time	Note:
-10~25° C	≤on Day 15	The battery pack Disconnected to PCS
25~45° C	≤Day 7	
-10~45° C	≤for 12 hours	Battery pack connect to the Inverter

8 Common Issues and Solutions

8.1 Common Issues and Solutions

The user can monitor the operating status, warning, and alarm information through the inverter LCD display.

1. The battery cannot be turned on, and the LED indicator lights all turn off the battery depth discharge and requires charging first. If the external charger supply voltage is 51V or above and the battery still cannot be opened, contact Light Science.
2. The battery can be turned on but not charged or discharge If a red light -indicates a system abnormality, check the following values:

1) Temperature: Above 55°C or below-10°C, the battery protection turns on. Solution: Move the battery to-Normal operating temperature range between 10° C to 55° C.

2) Temperature: above 55 °C or below-10°C, the battery cannot discharge. Solution: Move the battery to-Normal operating temperature range between 10° C to 55° C.

3) Current : POWERBOX-4400LV If current is greater than 60A/POWERBOX-6100LV If current is greater than 80A, the battery protection will turn on. Solution: If the operating current is too high, change the power supply Side settings.

4) High voltage: If the battery voltage is above 57.6V or above, battery charging protection turns on. If the battery is full, discharge for a period of time. If the charging voltage is too high, change the power side Settings.

5) Low voltage: The battery discharge protection is turned on when the battery discharges to 49V or lower. Solution: keep the battery is charged until the red light is off. If the above five points , the fault is not found , turn off Battery and contact BETTENERGY/SEEKENER.

3. In multiple battery parallel systems, the SOC LED are different.

1) When first time installation, please charge in full first to balance the capacity gap;

2) If the minimum SOC LED indicator is less than 1 of the maximum SOCLED indicator, in operation and the SOC LED indicator is restored within 10 minutes, normal operation.

3) Before expanding the battery capacity, charge the online battery to 45%-50%SOC; After expanding the capacity, charge the battery system to balance the capacity gap. Ensure that the capacity difference before the parallel does not exceed 10%. If the capacity gap is large, it will take about two cycles to balance the capacity gap. The actual balance time depends on the capacity difference and the charge and discharge current. Excluding the above three points, if the SOC display still fails, contact SEEKENER.

8.2 Emergency

Please cut off the power supply and turn off the battery in an emergency.

If the battery pack is damp or immersed in water, do not get close to the battery, and then contact a Light Science Company or an authorized dealer for technical support.

Do not use water to fire when a fire! Only dry powder extinguishers; place the battery pack in a safe area if possible.

Battery leaking the electrolyte If the battery pack leaks the electrolyte, avoid contact with the leaking liquid or gas. If someone is exposed to the leaking material, do the following immediately.

Inhalation: evacuate the contaminated areas and seek medical treatment.

Contact: Rinse eyes with running water for 15 minutes and seek medical treatment

Contact skin: Wash the infected site with soap and water and seek medical treatment.

Swallow in: urge vomiting, and seek medical treatment.

Battery damage: Damaged battery is dangerous and must be treated with very carefully. Battery cannot be used or may be dangerous to person or property. If the battery pack is damaged, contact SEEKENER for handling.

8.3 Handling of the battery system

(1) The system treatment must comply with the locally applicable disposal regulations

of electronic waste and second-hand batteries.

- (2) Do not treat the battery system along with household waste.
- (3) Avoid exposing the battery to high heat or direct sunlight.
- (4) Avoid exposing the battery to high humidity or corrosive environments.
- (5) Do not expose the battery to a combustible gas or liquid.



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BETTENERGY

FUJIAN BETTENERGY TECHNOLOGY CO.,LTD



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