

# User Manual

## LV5200

In order to prevent improper operation before use, please carefully read this manual.



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# 1. Introduction

The document describes the installation, commissioning, maintenance and troubleshooting of the following low voltage battery listed below.  
LV5200

The battery chemistry of this product is Lithium Iron Phosphate. This manual is designed for qualified personnel only. The tasks described in this document should be performed by authorized and qualified technicians only.

After Installation the Installer must explain the user manual to the end user.

## 2. Symbols

	Caution, risk of electric shock.
	Do not place nor install near flammable or explosive materials.
	Install the product out of reach of children.
	Read the instruction manual before starting installation and operation.
	Do not dispose of the product with household wastes.
	Recyclable.
	Disconnect the equipment before carrying out maintenance or repair.
	Observe precautions for handling electrostatic discharge sensitive devices.
	Protective Class 1.
	Caution, risk of electric shock, energy storage timed discharge.



## 3. Safety

Any work on the Batteries should be handled by authorized technicians and hence it is understood that the technicians should familiarize themselves with the contents of this manual before any maintenance or installation is carried out on the system.

### 3.1 Handling

- Do not expose battery to open flame.
- Do not place the product under direct sunlight.
- Do not place the product near flammable materials. It may lead to fire or explosion in case of accident.
- Store in a cool and dry place with ample ventilation.
- Do not store the product near water sources.
- Store the product on a flat surface.
- Store the product out of reach of children and animals.
- Do not damage the unit by dropping, deforming, impacting, cutting or penetrating with a sharp object. It may cause leakage of electrolyte or fire.
- Do not touch any liquid spilled from the product. There is a risk of electric shock or damage to skin.
- Always handle the battery wearing the insulated gloves.
- Do not step on the product or place any foreign objects on it. This can result in damage.
- Do not charge or discharge damaged battery.
- Do not store the battery near water sources.

### 3.2 Installation

- Do not connect the LV5200 to inverter conductors or Photo-Voltaic conductors. This will damage the battery and may result in explosion.
- After unpacking, please check the product for damages and missing parts.
- Make sure that the inverter and battery is completely turned off before commencing installation.
- Do not interchange the positive and negative terminals of the battery.
- Ensure that there is no short circuit of the terminals or with any external device.
- Do not exceed the battery voltage rating of the inverter.
- Do not connect the battery to any incompatible inverter.
- Do not connect different battery types together.
- Please ensure that all the batteries are grounded properly.
- Do not open the battery to repair or disassemble. Only manufacturer is allowed to carry out any such repairs.
- In case of fire, use only dry powder fire extinguisher. Liquid extinguishers should not be used.
- Install the batteries only inside approved manufacturer enclosure. Installing the battery anywhere outside is strictly forbidden.
- Do not install the battery near water sources or places where the battery can get wet.
- Install the battery away from children or pets.
- Do not use battery in high static environment where the protection device might be damaged.
- Do not install with other batteries or cells.

### 3.3 Response to Emergency Situations

The battery can be used in single or multi in parallel. It is designed to prevent hazards or failures. However, manufacturer cannot guarantee their absolute safety.

Under exposure to the internal materials of the battery the following recommendations should be carried out by the user.

- If there has been inhalation, please leave the contaminated area immediately and seek medical attention.
- If there has been contact with eyes, rinse the eyes with running water for 15 minutes and seek medical attention immediately.
- If there has been contact with the skin, wash the contacted area with soap thoroughly and seek medical attention immediately.
- If there has been ingestion, induce vomiting and seek medical attention.

### Fire Situation

In situations where the battery is on fire, if it is safe to do so, disconnect the battery pack by turning of the switch to shut off the power to the system. Use FM-200 or Co2 fire extinguisher for the battery and an ABC fire extinguisher for the other parts of the system.


Under any fire situation, please evacuate the people from the building immediately before trying to extinguish it.

### Water Situation


The battery modules are not water resistant. Hence care should be taken not to get it wet. If you find the battery completely or partially submerged in water do not try to open. Contact authorized personnel or manufacturer for further instructions.

### 3.4 Warning Labels

Warning labels are attached on the battery pack.

  
**Rechargeable Li-ion Battery System**  
IFP29/176/208[16S]M/-10+50/95

Model No.:	LV5200
Rated Capacity:	100Ah
Nominal Energy:	5.12kWh
Nominal Voltage:	51.2Vdc
Voltage range:	43.2-57.6Vdc
Max.charge/ discharge Current:	100A/100A
Ingress Protection:	IP21
Protective Class:	I
Operating Temperature:	-15-55°C
Storage Temperature:	-20-50°C

**CAUTION**

-Do not disassemble the battery pack

-Do not short-circuit the battery


-Do not immerse the battery pack in water

-Do not leave the battery near fire

**Emergency Situations**

\* If leaking, fire, wet or damaged, switch off the breaker and go away from the battery.  
\* Do not touch the leaking liquid. Do not use water extinguisher. Please use sand or dry powder extinguisher.

**Manufacture:** FOXESS CO., LTD.  
Made in China 10-200-20110-03



## 4. Product Information

LV5200 photovoltaic energy storage system is a 48V energy storage system based on lithium-ion ferrous phosphate battery. It is equipped with a customized battery management system (BMS), which is designed for energy storage applications of household photovoltaic power generation users. In the daytime, the surplus power of photovoltaic power generation can be stored in the battery. At night or when necessary, the stored energy can be provided to the electrical equipment, it can improve the use efficiency of photovoltaic power generation, peak-load shifting, and provide emergency standby power.

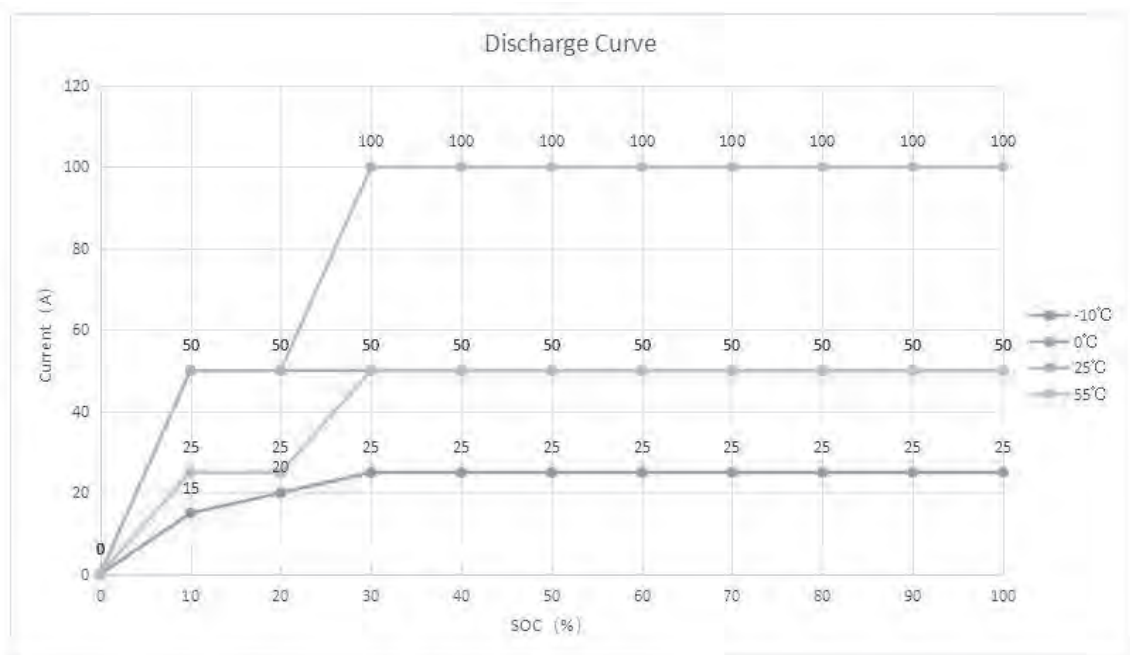
### 4.1 Battery Module Specifications

Specifications for Battery		Note
Battery module	LV5200	
Nominal capacity (Ah)	100	0.5C, 25±2°C
Nominal voltage (Vdc)	51.2	
Battery voltage range (Vdc)	43.2 - 57.6	
Max. continuous discharging current (A)	100	
Max. continuous charging current (A)	100	
Recommended charging current (CC-CV) (A)	100	
Charging cut off current (constant current and constant voltage) (A)	5	
Peak charging current (30s) (A)	105	
Peak discharging current (30s) (A)	150	
Cycle life	≥6000@25°C @90% DOD	
Storage temperature	-20°C - 50°C	
Operating temperature range	Charge: 0°C - 55°C Discharge: -15°C - 55°C	
Discharge capacity (Ah)	0°C±2 @ 1C @ 80% 25°C±2 @ 1C @ 100% 45°C±2 @ 1C @ 96%	
Energy density (wh / kg)	104	
Ingress protection	IP21	
Communication	RS485/CAN	
Weight (kg)	49	
Dimensions (L*W*H) (mm)	342*207*600	

Lithiumion Battery Module	
Model No.	LV5200
Nominal capacity	100Ah
Nominal energy	5.12kWh
Nominal voltage	51.2Vdc
Voltage range	43.2 - 57.6Vdc
Max. charge/discharge current	100A/100A
Ingress protection	IP21
Protective class	I
Operating temperature	- 15°C- 55°C
Storage temperature	- 20°C- 50°C

## 4.2 Battery Charge/discharge Curve

Current protection			
		Trigger	Recover
Battery charge	First level over current COC	$\geq 105\text{A}$ , Lasts 30s	$\geq 60\text{s}$ : Recover
	Second level over current COC2	$\geq 125\text{A}$ , Lasts 1s	$\geq 60\text{s}$ : Recover
Battery discharge	First level over current DOC	$\geq 110\text{A}$ , Lasts 300s	$\geq 60\text{s}$ : Recover
	Second level over current DOC2	$\geq 125\text{A}$ , Lasts 30s	$\geq 60\text{s}$ : Recover
	Third level over current SC	$\geq 155\text{A}$ , Lasts 1s	$\geq 60\text{s}$ : Recover



# 5. Product Features

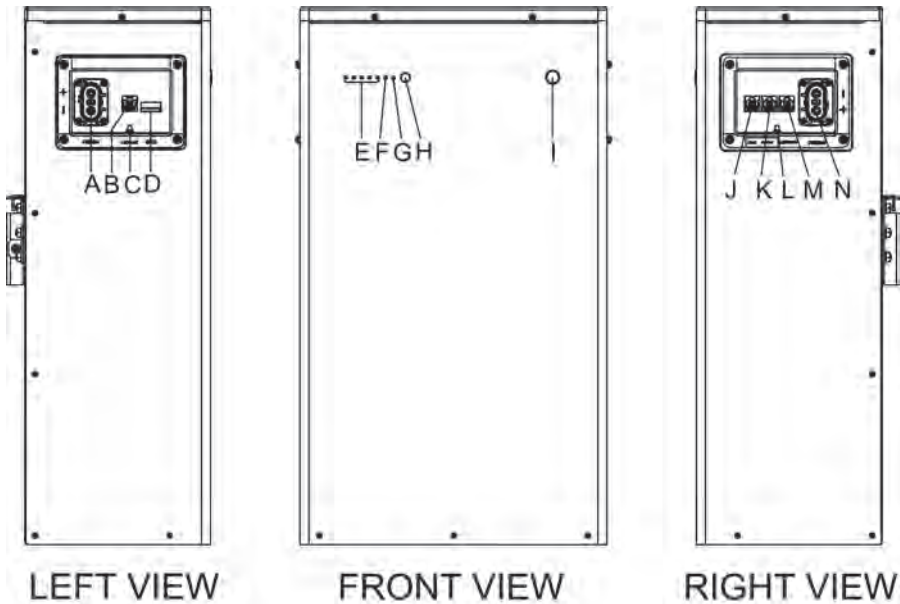
## 5.1 Battery System Features

The batteries have been fitted with multiple protection systems to ensure the safe operation of the system. Some of the protection system includes:

- Inverter interface protection: Over voltage, over current, external short circuit, reverse polarity, ground fault, over temp, in rush current.
- Battery Protection: Internal short circuit, over voltage, over current, over temp, under voltage.

The battery system contains the following Interface to allow it to connect and operate efficiently.

**Battery interface:**



Object	Description	Object	Description
A	POWER-1	H	Start button
B	LinkPort1	I	Power switch
C	Ground screw	J	CAN
D	Add switch	K	RS485/CAN
E	SOC LED	L	Ground screw
F	Alarm LED	M	LinkPort0
G	Running LED	N	POWER-2

### Running LED

This LED is used to indicate if the battery is operating effectively. A green light on this LED means the battery is ON and operating normally.

### Alarm LED

This LED is used to indicate if the battery is operating failure. A red light on this LED means the battery is operating abnormally.

### Communication parallel interface (Link Port0, Link Port1, RS485) and communication interface to inverter (CAN/RS485)

LV5200 has two 485 communication units in series operation, one for master control and one for slave control.

Network interface description: Link Port0 is connected to the upper battery module, Link Port1 is connected to the lower battery module. CAN / RS485 is the communication interface to the inverter.

The interface is defined as follows:



Pin configuration is as follows:

#### - Link Port0

Pin	Function definitions	Function declaration
1	B	RS485-B
2	A	RS485-A
3	GND	GND
4	NC	NC
5	NC	NC
6	GND	GND
7	A	RS485-A
8	B	RS485-B

#### - Link Port1

Pin	Function definitions	Function declaration
1	B	RS485-B
2	A	RS485-A
3	GND	GND
4	NC	NC
5	NC	NC
6	GND	GND
7	A	RS485-A
8	B	RS485-B

#### - RS485

Pin	Function definitions	Function declaration
1	B	RS485-B
2	A	RS485-A
3	GND	GND
4	NC	NC
5	NC	NC
6	GND	GND
7	A	RS485-A
8	B	RS485-B

#### - CAN

Pin	Function definitions	Function declaration
1	NC	NC
2	GND	GND
3	NC	NC
4	CANH	CANH
5	CANL	CANL
6	NC	NC
7	NC	NC
8	NC	NC

### Earth Terminal

This terminal is used to connect the battery to the earth for safety purposes.

### Handle

The handle is used to carry or move the battery.

### Power Terminal

A set of positive and negative terminals to connect the battery to the inverter. When you are unplugging the wires from the terminals, make sure you press the lock button and then pull it. When installing the plug, do not press the button and push the plug until you hear a click sound.

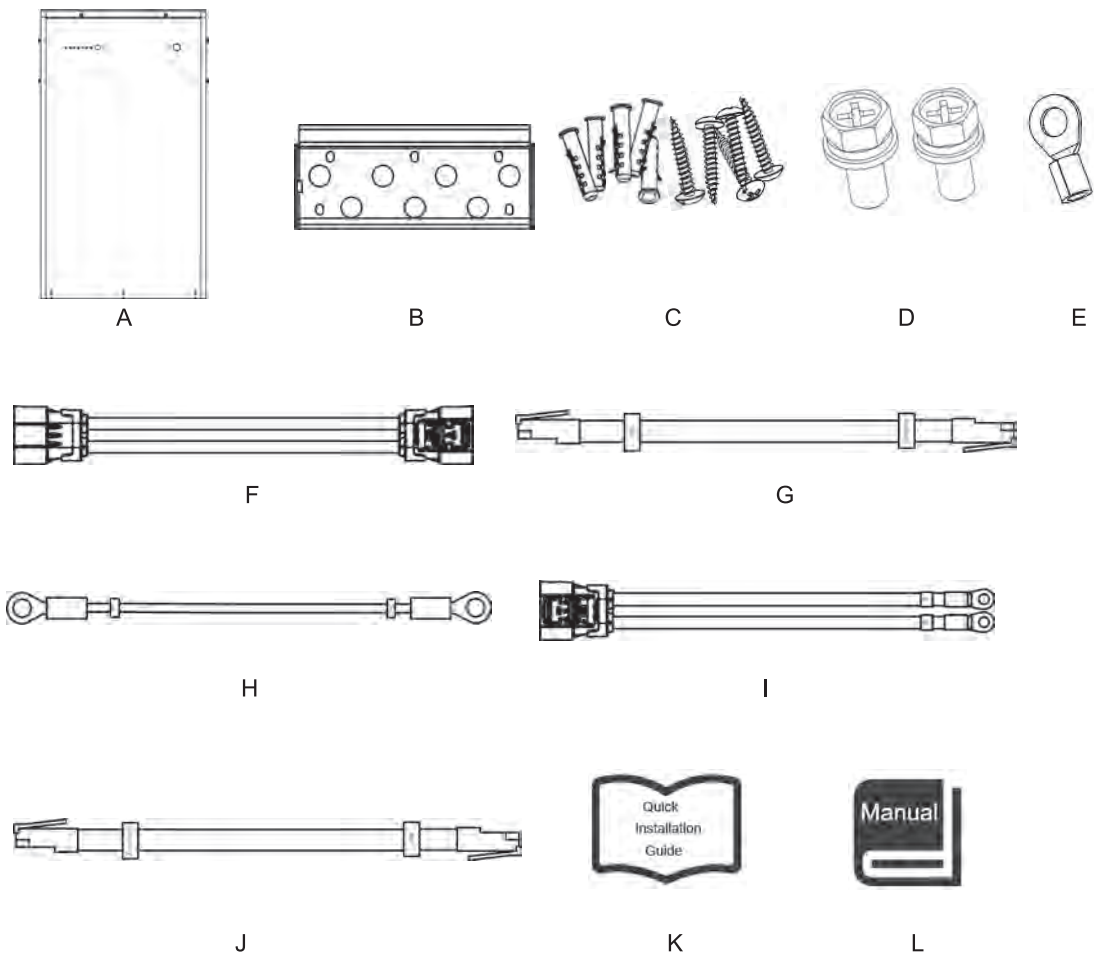
In addition to the above physical features, the battery has the following performance:

1. 90% Depth of Discharge;
2. Cycle life  $\geq 6000$  cycles.

## 6. Installation

### 6.1 Items in the package

Please check if following items are including with the package:



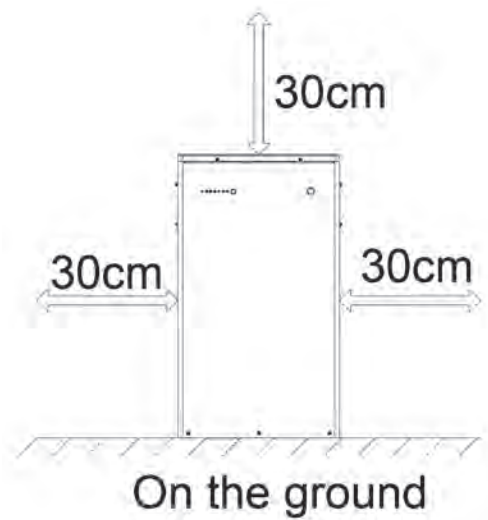
Object	Quantity	Description	Object	Quantity	Description
A	1	Low voltage battery	G	1	Communication network cable (0.5m)
B	1	Bracket	H	1	Ground wire (0.5m)
C	5	Expansion tubes & Expansion screws	I	1	Power line (2m) (Battery to inverter)
D	2	Hexagonal screws	J	1	Network cable (3m) (Battery to inverter)
E	1	Earth terminal	K	1	Installation guide
F	1	Power line (0.5m) (Battery to battery)	L	1	User manual

#### Note:

1. Please use only the components included with the battery pack to ensure proper installation. In the event of a component being damaged or missing, contact your distributor or reseller.
2. Object I and J are provided separately and are not included in the battery package. Please contact your distributor or reseller for availability.



## 6.2 Clearance



Position	Min size
Left	30cm
Right	30cm
Top	30cm
Bottom	On the ground

Make sure to leave a space of at least 30 cm. A clearance of at least 30 cm must be left around the battery pack for proper cooling.

**Note:** Make sure that the battery pack is always exposed to the ambient air. The battery pack is cooled by natural convection. If the battery pack is entirely or partially covered or shielded, it may cause the battery pack to stop operating.

## 6.3 Tools

The following tools will be required to install the battery.



Screw driver



Crimping modular



Safety shoes



Safety gloves



Safety goggles



Plier



Spanner



Multimeter

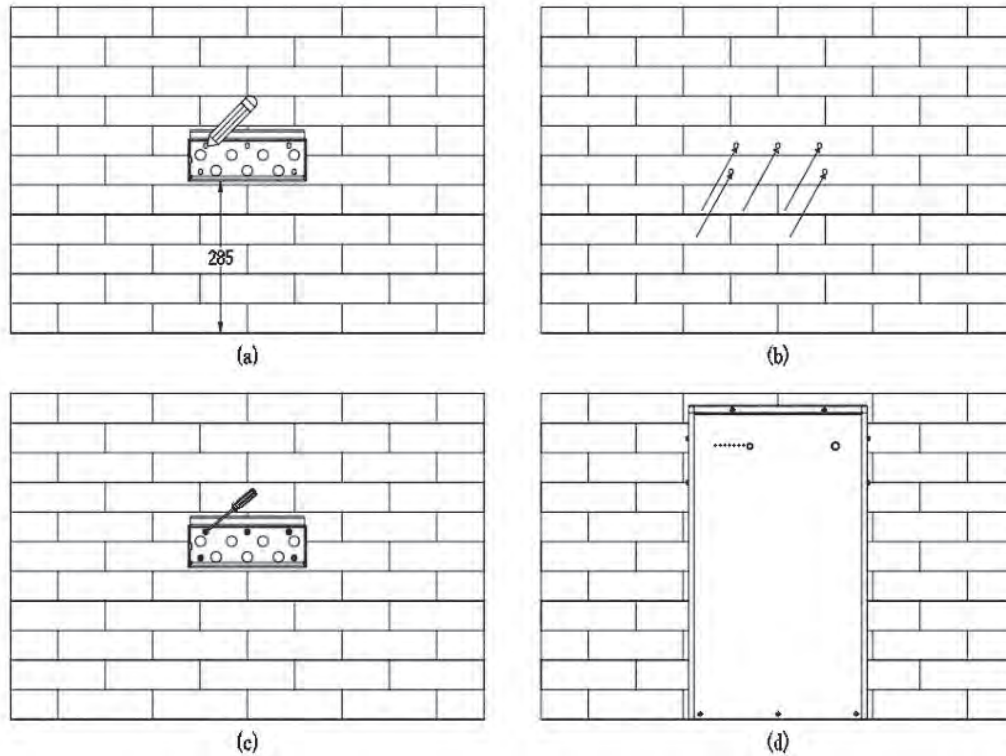


Ribbon



## 6.4 Installation Steps

### • Mounting



#### STEP-1

Measure and confirm that the bottom of the bracket is 285mm away from the ground, and mark the 5-hole positions on the bracket with a pen.

#### STEP-2

Drill holes with electric drill, make sure the holes are deep enough (at least 50mm) for installation, and then tighten the expansion tubes.

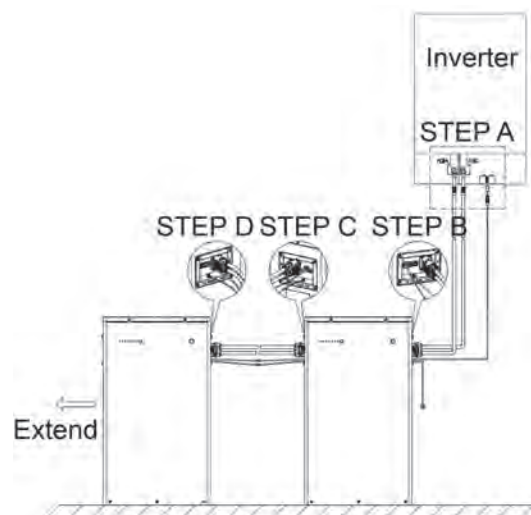
#### STEP-3

Install the expansion tubes in the holes, and tighten them. Then install the wall bracket by using the expansion screws.

#### STEP-4

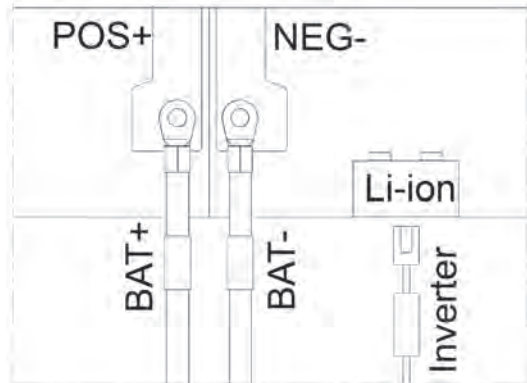
Hang the battery over the bracket, move the battery close to it, lower the battery, and make sure the 2 mounting bars on the back are fixed well with the 2 grooves on the bracket.

### • Wiring



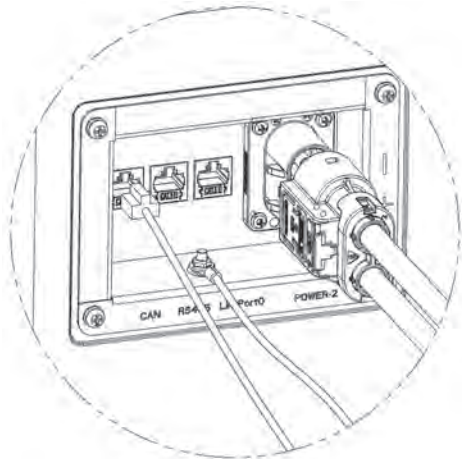
### STEP A

Connect BAT + to POS +, BAT – to NEG – respectively. Connect the battery communication network cable to the lithium battery communication port of the inverter.



### STEP B

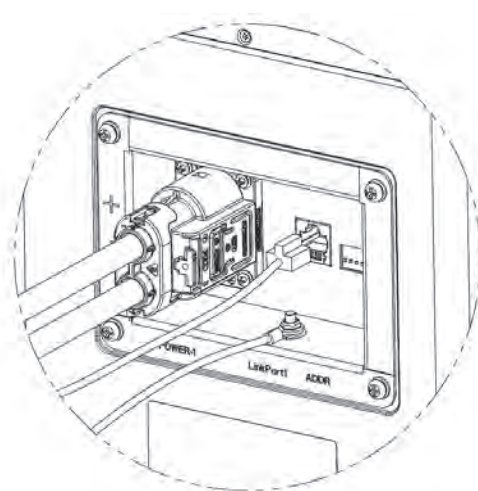
Plug the power plug into any output socket on the left or right of the battery. Connect the communication network cable to the CAN interface of the battery, connect the ground terminal of the battery with the ground wire, and lock the nut.



Note: Parallel multiple batteries, please refer to the following steps.

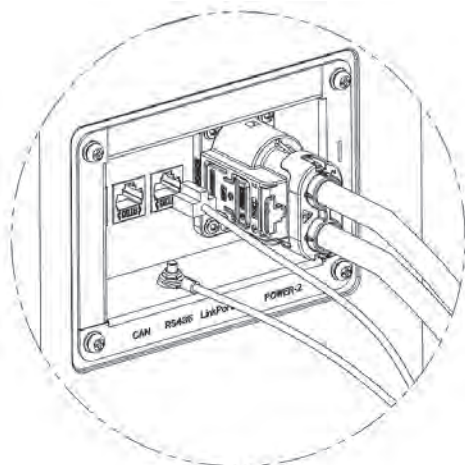
### STEP C

Plug the power line of the parallel battery into the remaining output socket, insert the communication line of the parallel battery into LinkPort1, and lock the ground nut.



#### STEP D

Plug the power line of the parallel battery into the remaining output socket, insert the communication line of the parallel battery into LinkPort0, and lock the ground nut.



#### STEP E

Repeat STEP C through STEP D to insert more batteries (up to 12 batteries).

### 6.5 System Start up

- When connected to the inverter, turn on the battery first to ensure that the battery voltage output is normal, then turn on the inverter.
- All installation and operation must comply with local electrical standards.
- Check all power cables and communication cables carefully.

#### 1. Turn on the POWER switch

Dial address selection

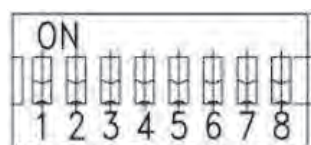
Definition of address switch for parallel batteries: When the battery pack is connected with multiple batteries in parallel, the address switch can be used to distinguish different pack addresses. The hardware address can be set by the address switch on the board. Addresses 1, 2, 3, and 4 represent the online number of batteries (only the host needs to be configured), 5, 6, 7, and 8 represent the slave address. The slave address needs to be continuous, and can support up to 12 batteries in parallel.

Single battery address setting: 0001 0000

Parallel batteries address setting: refer to the table below for the definition of address switch.

For example, three batteries are in parallel, and the address switch example is as follows:

Master dial: 0011 0000, slave 1 dial: 0000 0001, slave 2 dial: 0000 0010



Number of batteries	Master	Slave 1	Slave 2	Slave 3	Slave 4	Slave 5	Slave 6	Slave 7	Slave 8	Slave 9	Slave 10	Slave 11
1	0001 0000											
2	0010 0000	0000 0001										
3	0011 0000	0000 0001	0000 0010									
4	0100 0000	0000 0001	0000 0010	0000 0011								
5	0101 0000	0000 0001	0000 0010	0000 0011	0000 0100							
6	0110 0000	0000 0001	0000 0010	0000 0011	0000 0100	0000 0101						
7	0111 0000	0000 0001	0000 0010	0000 0011	0000 0100	0000 0101	0000 0110					
8	1000 0000	0000 0001	0000 0010	0000 0011	0000 0100	0000 0101	0000 0110	0000 0111				
9	1001 0000	0000 0001	0000 0010	0000 0011	0000 0100	0000 0101	0000 0110	0000 0111	0000 1000			
10	1010 0000	0000 0001	0000 0010	0000 0011	0000 0100	0000 0101	0000 0110	0000 0111	0000 1000	0000 1001		
11	1011 0000	0000 0001	0000 0010	0000 0011	0000 0100	0000 0101	0000 0110	0000 0111	0000 1000	0000 1001	0000 1010	
12	1100 0000	0000 0001	0000 0010	0000 0011	0000 0100	0000 0101	0000 0110	0000 0111	0000 1000	0000 1001	0000 1010	0000 1011

**Note:** "1" indicates that the Dip switch is "ON", "0" indicates that the Dip switch is "OFF". And it also indicates the position of the Dip switch. For example, "0001 0000" indicates that the 4th Dip switch is "ON", the rest are all "OFF".

- 1) Please change the address switch in the right position accordingly base on the system battery quantity before power on battery.
- 2) After pressing the power switch for 1s, all LEDs will be on and flashing, which indicates that the battery is started normally. After pressing the start button for 3s, the battery will turn on the discharge function.

## 7. Commissioning

There are seven LED indicators on the front of the battery packs to show its operating status.































### - Running LED indication

After start up, the running indicator light flashes, which indicates that the equipment is in normal operation.

### - Alarm LED indication

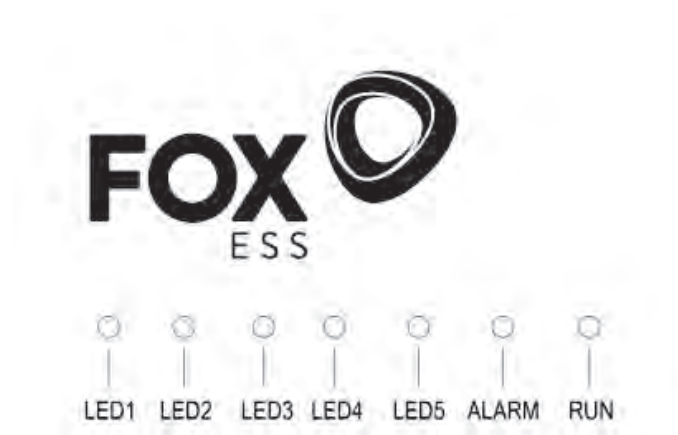
When the battery is in normal operation, the alarm LED is off, and after the fault occurs, the alarm LED is always on.

### - SOC LED indication

Status		Charge	Discharge	Stand by
=100%		On	On	Off
		On	On	
		On	On	
		On	On	
		On	On	
>100%>SOC>=80%		Flash	On	
		On	On	
		On	On	
		On	On	
		On	On	
80%>SOC>=60%		Off	Off	
		Flash	On	
		On	On	
		On	On	
		On	On	
60%>SOC>=40%		Off	Off	
		Off	Off	
		Flash	On	
		On	On	
		On	On	
40%>SOC>=20%		Off	Off	
		Off	Off	
		Off	Off	
		Flash	On	
		On	On	
20%>SOC>=0		Off	Off	
		Off	Off	
		Off	Off	
		Off	Off	
		Flash	On	

**Fault status indicated by indicator:**

- Off
- On
- ◐ Flash



Fault List	LED1	LED2	LED3	LED4	LED5	ALARM	RUN
Adc/afe Fault	◐	●	●	●	●	○	○
High Voltage Fault	●	◐	●	●	●	○	○
Low Voltage Fault	◐	◐	●	●	●	○	○
High Temperature	●	●	◐	●	●	○	○
Low Temperature	◐	●	◐	●	●	○	○
Over current	●	◐	◐	●	●	○	○
Over Voltage/Temperature	◐	◐	◐	●	●	○	○
Leakage Fault	●	●	●	◐	●	○	○
Inverter Comm Fault	◐	●	●	◐	●	○	○
Parallel Comm Fault	●	◐	●	◐	◐	○	○
Precharge Fault	◐	◐	●	◐	◐	○	○
Discharge/Recharge/Prohibit Charging low voltage	●	●	◐	◐	◐	○	○

## 8. Exclusion

The warranty shall not cover the defects caused by normal wear and tear, inadequate maintenance, handling, storage faulty repair, modifications to the battery or pack by a third party other than manufacturer or manufacturer agent, failure to observe the product specification provided herein or improper use or installation, including but not limited to the following.

- Damage during transport or storage.
- Incorrect Installation of battery into pack or maintenance.
- Use of battery pr pack in inappropriate environment.
- Improper, inadequate, or incorrect charge, discharge or production circuit other than stipulated herein.
- Incorrect use or inappropriate use.
- Insufficient ventilation.
- Ignoring applicable safety warnings and instructions.
- Altering or attempted repairs y unauthorized personnel.
- In case of force majeure (ex: lightning, storm, flood, fire, earthquake, etc.).
- There are no warranties-implied or express-other than those stipulated herein. manufacturer shall not be liable for any consequential or indirect damages arising or in connection with the product specification, battery or pack.

## 9. Troubleshooting and Maintenance

### 9.1 Maintenance

- 1) It is recommended that the battery storage time is not more than six months.
- 2) It is required to charge the battery at least once every 6 months, for this charge maintenance make sure the SOC is charged to higher than 90%.
- 3) Every year after installation. The connection of power connector, grounding point, power cable and screw are suggested to be checked. Make sure there is no loose, no broken, no corrosion at connection point. Check the installation environment such as dust, water, insect etc. Make sure it is suitable for IP21 battery system.
- 4) If the battery is stored for long time, it is required to charge them every six months, and the SOC should be higher than 90%.

### 9.2 Troubleshooting

When the red / green LED on the panel is flashing or normally on, it does not mean that the LV5200 is abnormal, it may be just an alarm or protection. Please check the 'LED status indicators' in chapter 7 for the detailed faulty definition before any trouble-shooting steps. In general, the alarm indication is normal without manual intervention. When the alarm triggering state is removed, LV5200 will automatically return to normal use.

#### - Problem determination based on the following points

- 1) Whether the green light on the power switch is on;
- 2) Whether the buzzer in BMS is on;
- 3) Whether the battery system can be communicated with inverter;
- 4) Whether the battery can be output voltage or not.

#### - Preliminary determination steps

- 1) Battery system cannot work, when DC switch on and POWER on, the LED doesn't light up or flash, please consider contact the local distributor.
- 2) The LED display of BMS is normal, but it cannot charge and discharge. Observe the display screen of inverter and there is no SOC. Please check whether the RS485 communication between BMS to inverter is well connected. If the connection is good, please replace a RS485 communication cable. If the SOC is still not visible on the inverter display screen, please contact the local distributor.
- 3) After the battery system is powered on, if you can see the alarm information on the LED and inverter display screen at the same time, please contact the local distributor.

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