



# Safety Precautions

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## Warning

- Please do not put the battery into water or fire, in case of explosion or any other situation that might endanger your life.
- Please connect wires properly while installation, do not reverse connect. To avoid short circuit, please do not connect positive and negative poles with conductor (Wires for instance).
- Please do not stab, hit, trample or strike the battery in any other way.
- Please shut off the power completely when removing the device or reconnecting wires during the daily use or it could cause the danger of electric shock.
- Please use dry powder extinguisher to put out the flame when encountering a fire hazard, liquid extinguisher could result in the risk of secondary disaster.
- For your safety, please do not arbitrarily dismantle any component in any circumstances unless a specialist or an authorized one from our company, device breakdown due to improper operation will not be covered under warranty.



## Caution

- We have strict inspection to ensure the quality when products are shipped out, however, please contact us if case bulging or another abnormal phenomenon.
- For your safety, device shall be ground connected properly before normal use to assure the proper use please make sure parameters among the relevant device are compatible.
- Please do not mixed-use batteries from different manufacturers, different types and models, as well as old and new together.
- Ambient and storage method could impact the life span and product reliability, please consider the operation environment abundantly to make sure device works in proper condition.
- For long-term storage, the battery should be recharged once every 6 months, and the amount of electric charge shall exceed 80% of the rated capacity.
- Please charge the battery in 18 hours after it discharges fully and starts over-discharging protection.

## **Preface**

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### **Manual declaration**

Our lithium iron phosphate battery energy storage system can provide energy storage solutions for photovoltaic power generation users through parallel combination. During the day, the excess power of photovoltaic power generation can be stored in the battery. At night or when needed, the stored electrical energy can be used to supply power to the electrical equipment, which can improve the efficiency of photovoltaic power generation, peak load shifting, and emergency power backup.

This user manual details the basic structure, parameters, basic procedures and methods of installation and operation and maintenance of the equipment.

# **1 Introduction**

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## **1.1 Brief Introduction**

Our lithium iron phosphate battery system is a standard battery system unit, customers can choose a certain number of battery pack according to their needs, by connecting parallel to form a larger capacity battery pack, to meet the user's long-term power supply needs. The product is especially suitable for applications with high operating temperatures, limited installation space, long power backup time and long service life.








## **1.2 Product Properties**

This product's anode materials are lithium iron phosphate, battery cells are managed effectively by BMS with better performance, the system's features as below:

- Comply with European ROHS, employ non-toxic, non-pollution environment-friendly battery.
- Anode materials are lithium iron phosphate (LiFePO<sub>4</sub>), safer with longer life span.
- Carries battery management system with better performance, possesses protection function like over-discharge, over-charge, over-current, abnormal temperature.
- Self-management on charging and discharging, single core balancing function.
- Flexible configurations allow parallel of multi battery for longer standby time.
- Self-ventilation with lower system noise.
- Less battery self-discharge, then recharging period can be up to 10 months during the storage.
- No memory effect so that battery can be charged and discharged shallowly.
- With wide range of temperature for working environment, -20°C ~+60°C, circulation span and discharging performance are well under high temperature.
- Less volume, lighter weight.



### 1.3 Product identity definition

	Be careful with your actions and be aware of the dangers.
	Battery voltage is higher than the safety voltage, direct contact with the risk of electric shock.
	This battery product meets European directive requirements.
	The battery meets the U.S. FCC specified standards.
	After the battery life is terminated, the battery can continue to be used after it recycled by the professional recycling organization and do not discard it at will.
<b>UN38.3</b>	The product meets the standards set by the United Nations Transport.
	The scrapped battery cannot be put into the garbage can and must be professionally recycled.
	The product must not be put into the fire.

## 2 Product Specification

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### 2.1 Size and Weight

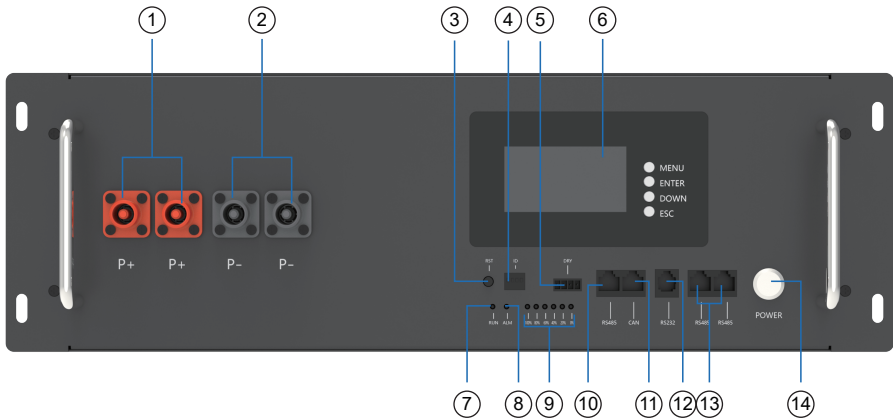
Product	Nominal Voltage	Nominal Capacity	Dimension	Weight
HS-GS5000W	51.2V	100Ah	L490*W452*H160mm	46KG

### 2.2 Performance Parameter

Item	Parameter value
Nominal Voltage(V)	51.2V
Voltage Range(V)	44.8V-56V
Nominal Capacity(Ah)	100Ah
Nominal Energy(Wh)	5120Wh
Charge Voltage Range(V)	56-57.6V
Cut-off Voltage(V)	44.8V
Recommend Charge Current(A)	50A
Max. Charging Current(A)	100A
Max. Discharging Current(A)	100A

### 2.3 Interface Definition

This section elaborates on interface functions of the front interface of the device.



Front view

Item	Name	Definition
1	BAT+	Battery pack positive
2	BAT-	Negative battery string
3	Reset button	Battery system fault reset button
4	Dip Switch	Used for identification of BMS parallel control, each BMS Address Switch must be different between parallel batteries.
5	Dry Contact Connector	Reserved for dry contact signal output.
6	Display	Battery information
7	RUN indicator	LED ,Normal battery operating indicator(Green)
8	Alarm indicator	LED,Battery fault indicator(Red)
9	SOC indicator	LED,Battery pack remaining power display
10	RS485-1 Communication	Single RJ45 terminal for inverter communication system connection only
11	CANBUS Communication	RJ45 terminal Used to connect the inverter communication system
12	RJ11 for RS232 Communication	One RJ11 connector for RS232 communication with computer for battery debug.
13	RS485-2 Communication	Two RJ45 terminals, used only for battery parallel communication.
14	Power switch	Used to wake up or shutdown the battery.

### 2.3.1 DIP switch definition and description

#### DIP switch description:

When the PACKs are used in parallel, the dip switches on the BMS can be used to set the address to distinguish between the different PACKs, avoiding BMS dip switches with the same address.

Refer to the following table for definitions:



Adress	Codes the switch position			
	#1	#2	#3	#4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

2.3.2 RS485/CAN Communication Interface Definition:

	RS485-Using 8P8C vertical RJ45 socket		CAN-Using 8P8C vertical RJ45 socket	
	RJ45 pin	Definition	RJ45 pin	Definition
	1、 8	RS485-B1	9、 10、 11、 14、 16	NC
	2、 7	RS485-A1	12	CANL
	3、 6	GND	13	CANH
4、 5	NC	15	GND	

2.3.3 RS232 Communication Interface Definition:

	RS232-Using 6P6C vertical RJ11 socket	
	RJ11 pin	Definition
	2	NC
	3	TX
	4	RX
5	GND	

2.3.4 RS485-2 Communication Interface Definition:

	RS485-Using 8P8C vertical RJ45 socket		RS485-Using 8P8C vertical RJ45 socket	
	RJ45 pin	Definition	RJ45 pin	Definition
	1、 8	RS485-B	9、 16	RS485-B
	2、 7	RS485-A	10、 15	RS485-A
	3、 6	GND	11、 14	GND
4、 5	NC	12、 13	NC	

2.3.5 LED working status indication

State		Charge						Discharge					
Capacity indicator light		L6	L5	L4	L3	L2	L1	L6	L5	L4	L3	L2	L1
Battery Power(%)	0~16.6%	off	off	off	off	off	Flash 2	off	off	off	off	off	Lighting
	16.6~33.2%	off	off	off	off	Flash 2	Lighting	off	off	off	off	Lighting	Lighting
	33.2~49.8%	off	off	off	Flash 2	Lighting	Lighting	off	off	off	Lighting	Lighting	Lighting
	49.8~66.4%	off	off	Flash 2	Lighting	Lighting	Lighting	off	off	Lighting	Lighting	Lighting	Lighting
	66.4~83.0%	off	Flash 2	Lighting	Lighting	Lighting	Lighting	off	Lighting	Lighting	Lighting	Lighting	Lighting
	83.0~100%	Flash 2	Lighting	Lighting	Lighting	Lighting	Lighting	Lighting	Lighting	Lighting	Lighting	Lighting	Lighting
Operation indicator		Lighting						Flash 3					

**2.3.6 Capacity indication instructions**

Flash mode	Bright	off
Flash 1	0.25S	3.75S
Flash 2	0.5S	0.5S
Flash 3	0.5S	1.5S

**2.3.7 LED status indicators:**

State		ON/OFF	RUN	ALM	The power level indicates the LED						Explain	
		●	●	●	●	●	●	●	●	●		
Shut down	Dormancy	off	off	off	off	off	off	off	off	off	off	All off
Standby	Normal	Lighting	Flash 1	off	According to the electricity instruction						Stand by	
	Alarm	Lighting	Flash 1	Flash 3							Module low voltage	
Charge	Normal	Lighting	Lighting	off	According to the electricity instruction (Power level indicates maximum LED flash 2)						Alarm when over-voltage light off	
	Alarm	Lighting	Lighting	Flash 3								
	Overcharge protection	Lighting	Lighting	off	Lighting	Lighting	Lighting	Lighting	Lighting	Lighting	If there is no charging, the indicator light is in standby state	
	Temperature, overcurrent, protection	Lighting	off	Lighting	off	off	off	off	off	off	Stop charging	
Discharge	Normal	Lighting	Flash 3	off	According to the electricity instruction							
	Alarm	Lighting	Flash 3	Flash 3								
	Undervoltage protection	Lighting	off	off	off	off	off	off	off	off	Stop discharge	
	Temperature, over-current, short-circuit, Reverse connection and failure protection	Lighting	off	Lighting	off	off	off	off	off	off	Stop discharge	
Fail		off	off	Lighting	off	off	off	off	off	off	Stop charging and discharging	

## 2.4 Battery Management System(BMS)

### 2.4.1 Voltage Protection

- **Discharging Low Voltage Protection:**

When any battery cell voltage is lower than the protection value during discharging. The over-discharging protection starts, and the battery buzzer makes an alarm sound. Then battery system stops supplying power to the outside. When the voltage of each cell recovers to rated return range, the protection is over.

- **Charging Over Voltage Protection:**

When total voltage or any battery cell voltage reaches the protection value during charging, battery stops charging. When total voltage or a cell recover to rated return range, the protection is over.

### 2.4.2 Current Protection

- **Over Current Protection in Charging:**

When the charging current is greater than the protection value, the battery buzzer alarms and the system stops charging. Protection is removed after rated time delaying.

- **Over Current Protection in Discharging:**

When the discharge current is greater than the protection value, the battery buzzer alarms and the system stops discharging. Protection is released after rated time delaying.



#### **Note:**

The buzzer sound alarm setting can be manually turned off on the background software, and the factory default is on.

### 2.4.3 Current Protection

- **Less/Over temperature protection in charging:**

When battery's temperature is beyond range of 0 C ~ +65 C during charging, temperature protection starts, device stops charging.

The protection is over when it recovers to rated return range.

- **Less/Over temperature protection in discharging:**

When battery's temperature is beyond range of -20 C ~ +65 C during discharging, temperature protection starts, device stops supplying power to the outside.

### 2.4.4 Other Protection

- **Short Circuit Protection:**

When the battery is activated from the shutdown state, if a short circuit occurs, the system starts short-circuit protection for 30 seconds.

- **Self-Shutdown:**

When device connects no external loads and power supply and no external communication for over 72 hours, device will dormant standby automatically.



#### **Caution**

Battery's maximum discharging current should be more than load's maximum working current.

## 3 Installation and Configuration

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### 3.1 Ready for installation

#### Safety Requirement

This system can only be installed by personnel who have been trained in the power supply system and have sufficient knowledge of the power system.

The safety regulations and local safety regulations listed below should always be followed during the installation.

- All circuits connected to this power system with an external voltage of less than 48V must meet the SELV requirements defined in the IEC60950 standard.
- If operating within the power system cabinet, make sure the power system is not charged. Battery devices should also be switched off.
- Distribution cable wiring should be reasonable and has the protective measures to avoid touching these cables while operating power equipment.
- when installing the battery system, must wear the protective items below:



The isolation gloves



Safety goggles



Safety shoes

#### 3.1.1 Environmental requirements

Working temperature:  $-20^{\circ}\text{C}\sim+55^{\circ}\text{C}$

Charging temperature range is  $0^{\circ}\text{C}\sim+55^{\circ}\text{C}$

Discharging temperature range is  $-20^{\circ}\text{C}\sim+55^{\circ}\text{C}$

Storage temperature:  $-10^{\circ}\text{C}\sim+35^{\circ}\text{C}$

Relative humidity:  $5\%\sim 85\%\text{RH}$

Elevation: no more than 4000m

Operating environment: Indoor installation, sites avoid the sun and no wind, nonconductive dust and corrosive gas.

And the following conditions are met:

- Installation location should be away from the sea to avoid brine and high humidity environment.
- The ground is flat and level.
- There is no flammable explosive near to the installation places.
- The optimal ambient temperature is  $15^{\circ}\text{C}\sim 30^{\circ}\text{C}$
- Keep away from dust and messy zones



## 3.1.2 Tools and data

Hardware tool

Name	
Screwdriver(word, cross)	Insulating tape
Wrench	Wire stripper
Inclined pliers	Electric drill
Needle nose pliers	

## 3.1.3 Technical preparation

### Electrical interface check

Devices that can be connected directly to the battery can be user equipment, power supplies, or other power supplies.

- Confirm whether the user's PV power generation equipment, power supply or other power supply equipment has a DC output interface, and measure whether the DC power output voltage meets the voltage range requirements in Table 2-2.
- Confirm that the maximum discharge current capability of the DC power interface of the user's photovoltaic power generation equipment, power supply or other power supply equipment should be less than the maximum charging current of the products used in Table 2-2. If the maximum discharge capacity of the DC power interface of the user's photovoltaic power generation equipment is greater than the maximum charging current of the products used in Table 2-2, the DC power interface of the user's photovoltaic power generation equipment shall have a current limiting function to ensure the normal operation of the user's equipment.
- Verify that the maximum operating current of the battery-powered user equipment (inverter DC input) should be less than the maximum discharge current of the products used in Table 2-2.

### The security check

- Firefighting equipment should be provided near the equipment, such as portable dry powder fire extinguisher.
- Automatic fire fighting system shall be provided for the case where necessary .
- No flammable, explosive and other dangerous articles are placed beside the battery.

### 3.1.4 Unpacking inspection

- When the equipment arrives at the installation site, loading and unloading should be carried out according to the rules and regulations, to prevent from being exposed to sun and rain.
- Before unpacking, the total number of packages shall be indicated according to the shipping list attached to each package, and the case shall be checked for good condition.

In the process of unpacking, handle with care and protect the surface coating of the object.

- Open the package, the installation personnel should read the technical document verify the list, according to the configuration table and packing list, ensure objects are complete and intact, if the internal packing is damaged, should be examined and recorded in detail.

### 3.1.5 Engineering coordination

Attention should be paid to the following items before construction:

- Power line specification.

The power line specification shall meet the requirements of maximum discharge current for each product.

- Mounting space and bearing capacity.

Make sure that the battery has enough room to install, and that the battery rack and bracket have enough load capacity.

- Wiring.

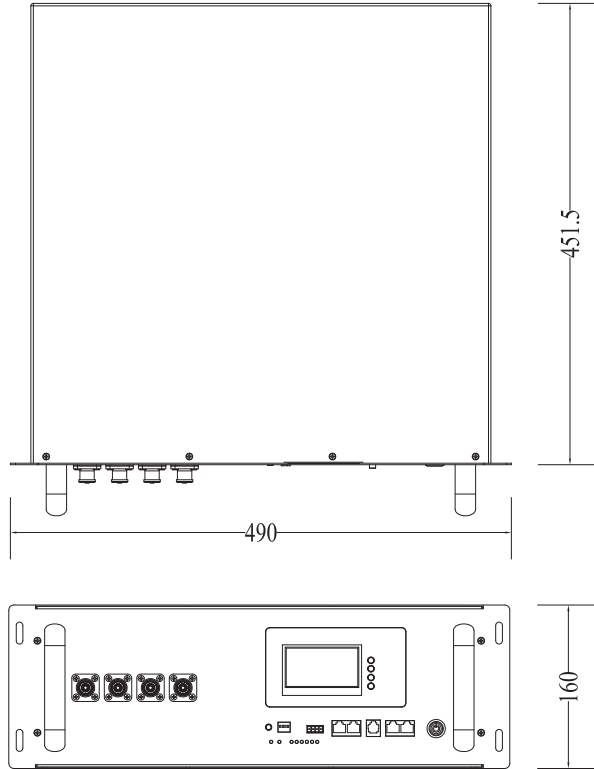
Make sure the power line and ground wire are reasonable. Not easy to short-circuit, water and corrosion.

## 3.2 Equipment installation

### 3.2.1 Installation steps

<b>Step1</b>	Installation preparation	Confirm that the ON/OFF switch on the front panel of unit is in the "OFF" state to ensure no live operation.
<b>Step2</b>	Mechanica installation	1. Battery placement position determination
		2. Cable harness pre-installed
		3. Battery module installation
<b>Step3</b>	Electrical installation	1. Ground cable installation
		2. Battery module parallel cable installation
		3. Battery module total positive cable installation
		4. Battery module total negative cable installation
		5. Internal RS485/CAN communication interface connection
<b>Step4</b>	Battery system self-test	1. Press the ON/OFF switch to the "ON" state
		2. BMS system power-on activation
		3. Check the system output voltage
		4. Shut down the system
<b>Step5</b>	Connecting inverter	1. Connect total positive & total negative cable of the battery system to the inverter
		2. Connect the external CAN/RS485 communication cable to the inverter

3.2.2 Product Size:



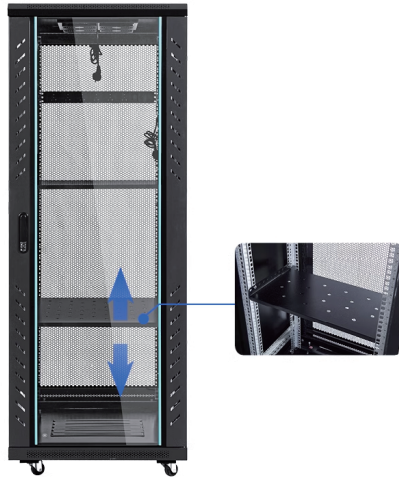
3.2.3 Accessories:(Optional)



Cables

### 3.2.4 Installation steps

1. Place the tray in the cabinet as shown below.

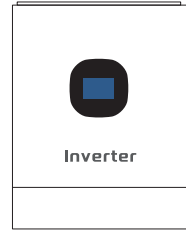
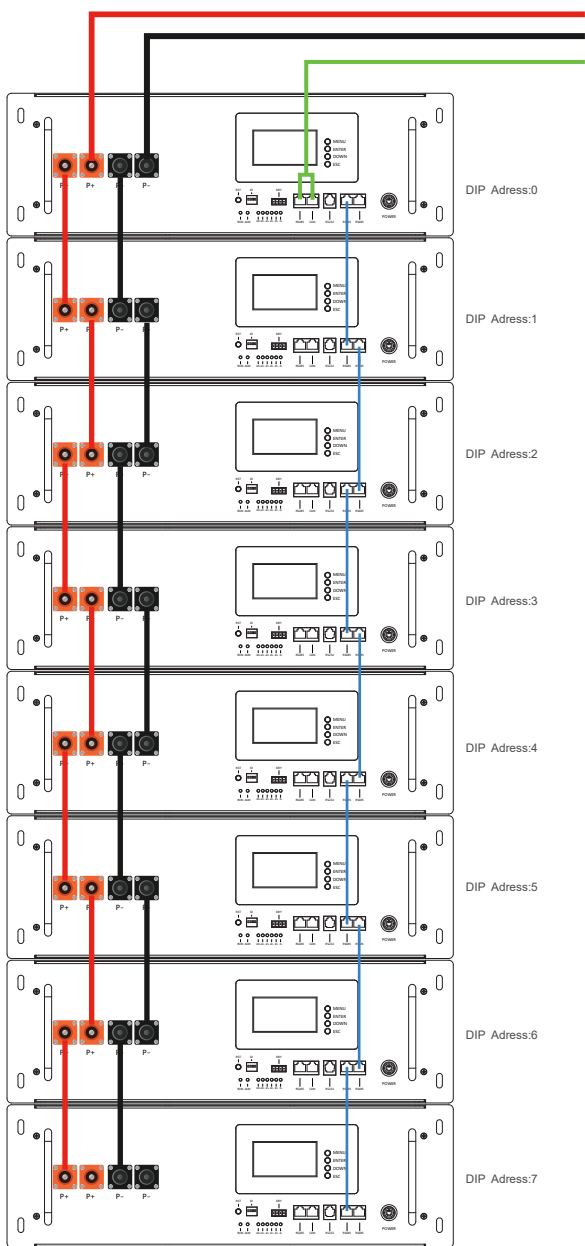


2. Place the battery pack in the cabinet as shown in the diagram below.



### 3.2.4 Parallel Connection Of Batteries

Recommended up to 8 units in parallel



5KW Inverter

- █ Battery parallel connection ports
- █ P+
- █ P-
- █ Communication interface between inverter and battery, optionally RS485 or CAN, depending on the inverter model.



Address	Codes the switch position			
	#1	#2	#3	#4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF

## 4 Communicate inverter

### 4.1 function introduction

This section describes how to modify the communication protocol of the BMS to the inverter via the UPLCD display. RS485 communication protocol supports inverter brands: (Pylontech, Growatt, Voltronic, LXP, DEYE, INVT, SRNE, etc.)

CAN Bus supports inverter brands: (Pylontech, Victron, Goodwe, Growatt, LXP, DEYE, SOFAR, GINLONG, SMA, MUST, etc.)

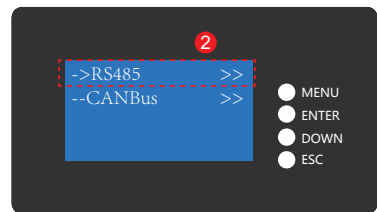
### 4.2 Communication settings

RS485 communication protocol:

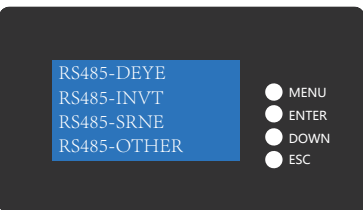
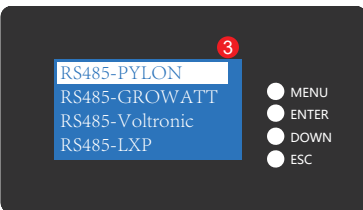
Step 1: Turn on the battery and select the PackSet option



Step 2: Select RS485 communication protocol

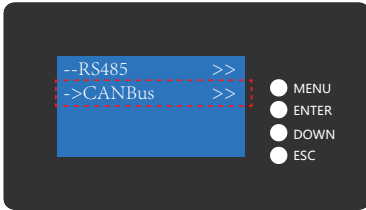


Step 3: Select the corresponding protocol type, Press enter to confirm

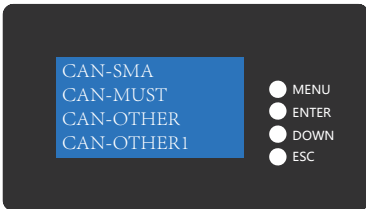
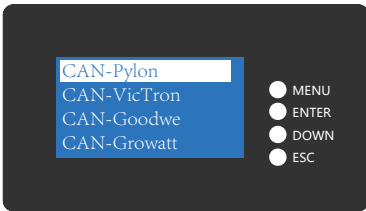


## CAN communication protocol:

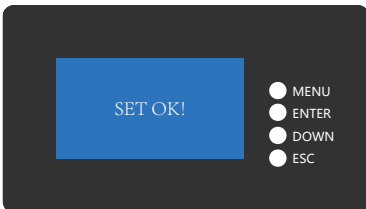
**Step 1:** Select CANBus communication protocol



**Step 2:** Select the corresponding protocol type



**Step 3:** Press enter to confirm, setup successful



### 4.3 Inverter protocol code remark

RS485 Protocol		
Protocol Code	Inverter brand	Compatible(Same protocol)
RS485-PYLON	PYLON TECH	MOTOMA/OPTi_Solar/Victron
RS485-GROWATT	Growatt	
RS485-Voltronic	Voltronic enery	
RS485-LXP	LUXPOWER	
RS485-DEYE	Deye	
RS485-INVT	invnt	
RS485-SRNE	SRNE	PACE



<b>CAN Protocol</b>		
<b>Protocol Code</b>	<b>Inverter brand</b>	<b>Compatible(Same protocol)</b>
CAN-PYLON	PYLON TECH	DEYE/Sunsynk/LUXPower/TBB/ SOFAR/ESENER(hybrid)
CAN-GOODWE	GOODWE	SOLARFAM
CAN-OTHER	PV1800F	
CAN-Growatt	Growatt	
CAN-Victron	Victron	SOROTEC/SMA
CAN-LXP	LUXPOWER	
CAN-DEYE	Deye	
CAN-SOFAR	SOFAR	PYLON
CAN-SMA	SMA	SOROTEC
CAN-GINLONG	GINLONG	
CAN-MUST	MUST Solar	

Performance characteristics

