▌Security Instructions

Please keep this manual for subsequent reference. This manual contains a detailed description of the installation and operation specifications of the solar panel, please be sure to read all the instructions and precautions carefully before proceeding with the installation or use.

■ Safety Warning

There are non-safe voltages inside the solar battery pack, and it is strictly prohibited for users to disassemble it privately. In case of equipment failure and need for maintenance, please contact professional maintenance personnel in time.

■ Precautions for Use

• Do not immerse the battery in water or allow it to get wet;
• Prohibit charging the battery in a fire source, high temperature environment, and avoid using or storing the battery near a fire source, heaters and other heat sources;
• If the battery is found to be leaking or emitting a strange odor, it should be immediately moved to an open, safe area;
• Please use the matching charging cable, and if it needs to be replaced, the connecting cable with the same wire diameter must be used;
• Pay attention to the direction of positive and negative poles when installing the battery, and the reverse is forbidden;
• It is forbidden to connect the battery directly to the wall socket or the cigarette lighter socket of the automobile;
• Do not put the battery into fire or heat it;
• Do not short-circuit the positive and negative terminals of the battery with wires or other metal objects, and prohibit the battery from being transported or stored with metal objects such as necklaces, hairpins, etc.;
• Do not use nails, sharp objects to pierce the battery casing, and do not strike the battery with a hammer or step on the battery with your feet.
• Avoid the battery to be bumped, thrown or other mechanical shocks;
• Prohibit the direct welding of the battery terminals;
• Strictly prohibit the disassembly of the battery in any way;
• It is prohibited to mix this battery with original batteries (such as dry cell batteries) or batteries of different capacities, models and varieties;
• If the battery has been stored for more than 3 months without use, it is recommended to replenish the battery.

■ Abnormal Handling

• If leakage or odor is found, move the battery to an open and safe area immediately. If the electrolyte touches your eyes, please do not rub, flush with plenty of water and seek medical advice immediately;
• If the battery is hot, deformed, discolored or other abnormalities, please stop using it, and if it is charging/discharging, take it out immediately;
• If the battery is smoky or on fire, please make sure of your own safety, and move the battery to a fireproof open area quickly (e.g. sandy ground, metal containers).

■ Environmental Protection Tips

• Discarded batteries should be recycled in accordance with local regulations.

▌ Specification

Model	51.2V 100Ah	
Battery Model	LiFePO₄ Battery	
Battery Energy	5.12kWh	
Internal Resistance	≤10mΩ	
Single Cell Capacity	100Ah	
Rated Operating Voltage	51.2V	
Standard Output Current	50A (Max.100A)	
Standard Input Current	20A (Max.100A)	
Overcharge Protection	58.4V	
Overcharge Protection Recovery	53.6V	
Overdischarge Protection	40V	
Overdischarge Protection Recovery	47.2V	
Charging Overcurrent Protection	110±10A/1±0.5s	
Discharging Overcurrent Protection	120±10A/10s	
Short Circuit Protection	Recovery Methods: a. Remove the Charger; b. Remove Loads	
Power Delivery	40% to 60%	
Equalization	Passive Equilibrium	
ParallelCapability	Up to 15 Units	
Power Failure Self-Consumption	≤300uA	
Battery Life	25℃	≥8000 Cycles, 70% SOH
	45℃	≥3000 Cycles, 70% SOH
Communication Protocol	RS485, RS232, CAN	
Recommend Charging Temperature	0℃ to 55℃/32℉ to 131℉	
Recommend Discharging Temperature	-20℃ to 65℃/-4℉ to 149℉	
Dimensions (L×W×H)	500 × 440 × 133mm/19.69 × 17.32 × 5.24inch	
Weight	41.35kg/91.16lbs	

Function Introduction
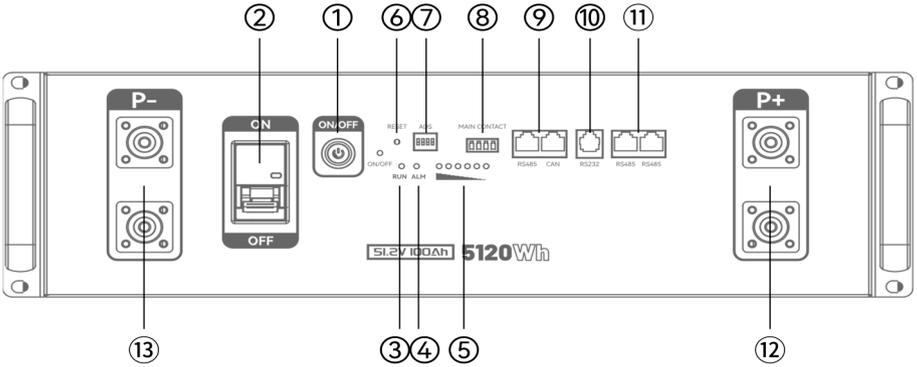
①	Mains Switch	Control Switch ON/OFF
②	Air Switch	Disconnect Input and Output
③	Operation Indicator	Operational Status
④	Alarm Indicator	Alerts
⑤	Battery Indicator	Remaining Capacity Display
⑥	Reset Switch	Press to Reboot or Shutdown
⑦	DIP Address	Address for Parallel Connection or Communication
⑧	Dry Contact	Normally Open or Normally Closed Signal Drive Relay
⑨	RS485 /CAN	External Communication
⑩	RS232	Internal Communication or Battery Parallel Use
⑪	RS485-1 /RS485-2	Internal Communication or Battery Parallel Use
⑫	Battery Positive	Positive Battery Terminal
⑬	Battery Negative	Negative Battery Terminal

■ Overcharge Protection and Recovery

1. Cell Overcharge Protection and Recovery

When the voltage of any cell is higher than the set value of the cell overcharge voltage, and the time of duration reaches the cell overcharge delay, the system enters the overcharge protection state, the charging MOS will turn off, and the battery cannot be charged. After the cell overcharge protection, when the voltage of all cells drops below the cell overcharge recovery value, the overcharge protection state is released. It can also be released by discharge.

2. Overall Overcharge Protection and Recovery

When the overall voltage is higher than the overall over-voltage set value, and the time of duration reaches the overall overcharge delay, the system enters the overcharge protection state, turns off the charging MOS, and cannot charge the battery.
When the overall voltage drops below the recovery value of the overall over-voltage protection, the overcharge protection state is released, and it can also be released by discharge.

■ Over-Discharge Protection and Recovery

1. Cell Over-Discharge Protection and Recovery

When the minimum cell voltage is lower than the set value of the over-discharge voltage of the cell, and the time of duration reaches the over-discharge delay of the cell, the system enters the over-discharge protection state, turns off the discharge MOS, and cannot discharge the battery. After the cell over-discharge protection occurs, charging the battery pack can release the over-discharge protection state.

2. Overall Over-Discharge Protection and Recovery

When the overall voltage is lower than the overall over-discharge voltage set value, and the time of duration reaches the overall over-discharge delay, the system enters the over-discharge protection state, turns off the discharge MOS, and cannot discharge the battery. After the overall over-discharge protection occurs, charging the battery pack can release the over-discharge protection state

■ Over-Current Protection and Recovery in Charging

When the charging current exceeds the charging protection current and the time of duration reaches the over-current detection delay time, the system enters the charging over-current protection state and cannot charge the battery. After the charging over-current protection occurs, it will automatically recover after a delay. If you want to automatically recover or not, you can set the corresponding release time to be longer; the charging over-current state can also be released by discharging.

■ Over-Current Protection and Recovery in Discharging

When the discharge current exceeds the discharge over-current protection current and the time of duration reaches the over-current detection delay time, the system enters the discharge over-current protection state and turns off the discharge MOS. Delayed automatic recovery after discharge over-current occurs, and the corresponding release time can be set longer if automatic recovery is required. Charging can also release the discharge over-current protect condition. Discharge has two-level over-current protection function, which has different response speeds for different current values, and protects the battery more reliably.

■ Temperature Protection and Recovery

1. High Temperature Protection and Recovery in Charging and Discharging

When the NTC detects that the temperature of the battery cell surface is higher than the setting of high temperature protection value during charging and discharging, the management system enters the high temperature protection state, the charging or discharging MOS is turned off, and the battery pack cannot be charged or discharged in this state.
When the temperature of the surface of the cell drops to the high temperature recovery set value, the management system recovers from the high temperature state and turns on the charge and discharge MOS again.

2. Low Temperature Protection and Recovery in Charging and Discharging

When the NTC detects that the temperature of the cell surface is lower than the setting of low temperature protection value during charging and discharging, the management system enters the low temperature protection state, the charging or discharging MOS is turned off, and the battery pack cannot be charged or discharged in this state.
When the temperature of the cell surface rises to the low temperature recovery set value, the management system recovers from the low temperature state and turns on the charge and discharge MOS again.

■ Balance Function

If the balancing switch is on, balancing will begin when the maximum cell voltage differential in the battery pack exceeds this value and will end when it falls below this value. For example, if you set the balancing start voltage differential to 10mV and the balancing stop voltage differential to 5mV, balancing will begin when the cell voltage differential exceeds 10mV and end when it falls below 5mV. (The recommended balancing start voltage differential is 0.005V for cells over 50Ah, and 0.01V for cells under 50Ah.) When the lowest cell voltage is below the set value of 2000mV, active balancing will not begin, even if the cell voltage differential exceeds the set value. The balancing current represents the continuous current used to discharge the high-voltage battery and charge the low-voltage battery during energy transfer. The maximum balancing current represents the maximum current during energy transfer, which does not exceed 3A.

■ Current Limiting Function

When the overcurrent condition is reached, the current limiting function is activated. The current limiting function is deactivated when any of the following conditions is met: 1. The difference between the charging voltage and the battery voltage is less than 0.3V; 2. The charging current is lower than 9.5A; 3. The charging mode is switched to the discharge mode; 4. The battery restarts.

■ Capacity Calculation

The SOC calculation of the battery pack can be accurately performed by integrating current and time. The full capacity and cycle capacity of the battery pack can be set through the host computer, and the capacity can be automatically updated after a complete charge and discharge cycle. It has the function of calculating the number of charge and discharge cycles. When the cumulative discharge capacity of the battery pack reaches the set cycle capacity, the number of cycles increases once.

■ Sleep and Arousal

Sleep: When any of the following conditions is met, the system is in low-power consumption mode.

    a. Monomer or overall over-discharge protection does not release within 30 minutes.

    b. When the on/off switch is off, it will be in the sleep mode after 3 seconds.

    c. The lowest monomer voltage is lower than the sleep voltage, and the time of duration reaches the sleep delay time (while meeting the condition of no communication, no protection, no balance, no current).

    d. The standby time is more than 1440 minutes (no communication, no charge and discharge).

    e. It closes down compulsively through the software of the upper computer.

Before it is in the sleep mode, you need to ensure that the input port is not connected to external voltage. Otherwise, it can not be in the low-power mode.

Arousal: When the system is in low-power consumption mode and meets any of the following conditions, the system exits the low-power consumption mode. And then it will be in the normal running mode:

    a. Connecting to the charger, and the output voltage of the charger should be more than 0.4V of the battery voltage.

    b. The on/off switch is on.

■ Communication

1. Serial Communication

The connection method: After installing the special driver for our communication tool on the computer, insert the USB end of the communication tool into the USB port of the computer, and connect the other end to the corresponding interface of the BMS that has been connected to the battery pack. Open the upper computer, click the communication port settings, select the COM port corresponding to the communication tool, and do not change other options. After confirming, click start to read the data in the protection.

2. CAN/RS485/RS232 Communication

CAN communication: The default communication rate is 500K. Please contact the sales to obtain the communication protocol.

RS485 communication: The BMS can use view various information of the battery pack through RS485 communication interface, including battery voltage, current, temperature, state, etc., The default baud rate is 9600bps. Please contact the sales to obtain the communication protocol.

RS232 communication: The BMS can communicate with the upper computer though the RS 232 communication tool and bluetooth interface, thereby you can monitor various battery information on the upper computer, including battery voltage, current, temperature, state, and information of battery production, etc.. The default baud rate is 9600 bps.

Note: Please refer to the configuration table to check whether the above communication has functions.
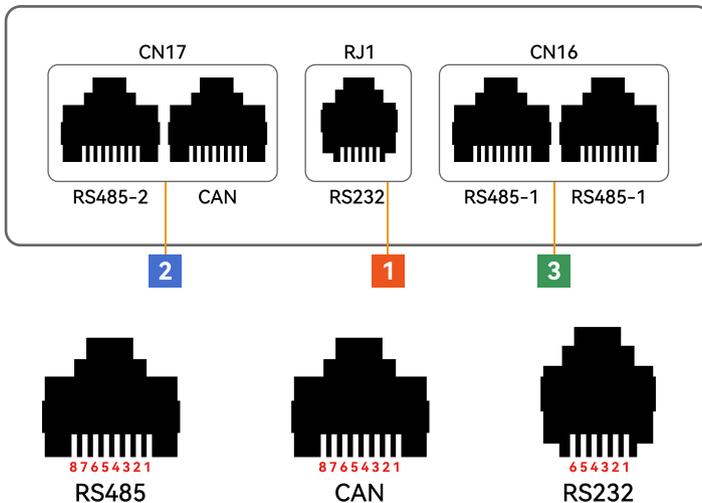
1	RS232 – Using 6P6C Vertical RJ11 Sockets
RJ11 pin	Definition Description
2	NC
3	TX (Veneer)
4	RX (Veneer)
5	GNDI

2	RS485 – Using 8P8C Vertical RJ45 Sockets		CAN – Using 8P8C Vertical RJ45 Sockets	
RJ45 pin	Definition Description	RJ45 pin	Definition Description
1, 8	RS485–B1	1, 2, 3, 6, 8	NC
2, 7	RS485–A1	4	CANH
3, 6	GND	5	CANL
4, 5	NC	7	GND

3	RS485 – Using 8P8C Vertical RJ45 Sockets		CAN – Using 8P8C Vertical RJ45 Sockets	
RJ45 pin	Definition Description	RJ45 pin	Definition Description
1, 8	RS485–B	1, 8	RS485–B
2, 7	RS485–A	2, 7	RS485–A
3, 6	GND	3, 6	GND
4, 5	NC	4, 5	NC

■ The Instructions of Buzzer

It buzzes for 0.25s in every 1 second when there is a fault. It buzzes for 0.25s in every 2 seconds while protecting. It buzzes for 0.25s in every 3 seconds while alarming. The buzzer function can be run or closed by the upper computer. And the buzzer is closed by factory default.
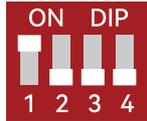
■ The Instructions of On/Off Switch

When the on/off switch is on, then the charge and discharge of MOS is turned on, and the BMS is in normal working state. When the on/off switch is off, then the charge and discharge of MOS is turned off, and the BMS is in the protection state. It is in deep sleep state at the same time, and it can not charge or discharge.
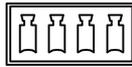
■ Dial Switch

Several battery PACKs in parallel, you can distinguish different PACKs by setting the address through the dial switch on the BMS. It is necessary to avoid setting the same Address.
Following is the dial switch definition.

■ The Instruction of Dry Contact and Reset Switch

MAIN CONTACT

Dry contact 1-PIN1 to PIN2 is off normally, and on during under voltage protection. Dry contact 2 to PIN3 to PIN4 is off normally and on during fault protection.

●
RESET

When the BMS is in the active state, press the button (3~6s) and release it, the BMS is hibernated (no charge), and the LED indicator lights are on successively for 0.5 seconds from the lowest power indicator.
When the BMS is in the activated state, press the button (6~10s) and release it, the BMS is reset, and all LED lights are on at the same time until the reset is complete. After the BMS is reset, the parameters and functions set by the upper computer are still retained. If the initial parameters need to be restored, it can be achieved by " restoring default values" of the upper computer, but the relevant running records and stored data remain unchanged (such as power, cycle times, protection records, etc.).

■ Table 1 LED Indicator Description

Table 1 LED Indicator Description

Status	Item	ON/OFF (LED9) 🟢	RUN (LED8) 🟢	ALARM (LED7) 🔴	SOC (LED6~1) 🟢🟢🟢🟢🟢🟢	Description
Power Off	Sleep Mode	OFF	OFF	OFF	OFF	All LEDs off
Static State	Normal	ON	Flash 1	OFF	Refer to Table 2	/
Static State	Alarm	ON	Flash 1	Flash 3	Refer to Table 2	/
Charging	Normal	OFF	OFF	OFF	Refer to Table 2	/
Charging	Alarm	ON	ON	Flash 3	Refer to Table 2	Over-Voltage Alarm, No Blinking
Charging	OV Protect	ON	ON	OFF	ON	/
Charging	Temperature, Over-Current, (Fail-Safe)	ON	OFF	ON	OFF	/
Discharging	Normal	ON	Flash 3	OFF	Refer to Table 2	/
Discharging	Alarm	ON	Flash 3	Flash 3	Refer to Table 2	/
Discharging	UV Protection	OFF	Flash 2	OFF	OFF	/
Discharging	Overcurrent, Short Circuit, Temperature, Fault Safety	ON	OFF	ON	OFF	/
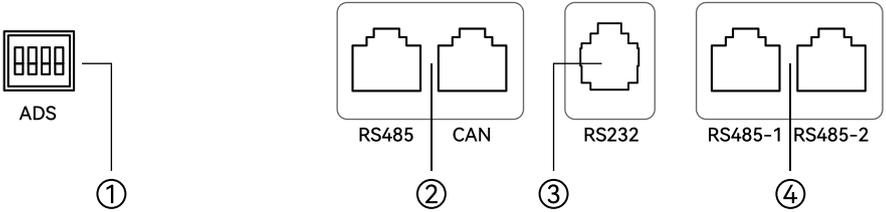
Table 2 SOC Indicator Description

State		Charging						Discharging					
LED 🟢		LED6 🟢	LED5 🟢	LED4 🟢	LED3 🟢	LED2 🟢	LED1 🟢	LED6 🟢	LED5 🟢	LED4 🟢	LED3 🟢	LED2 🟢	LED1 🟢
SOC(%)	0~16.6%	OFF	OFF	OFF	OFF	OFF	Flash 2	OFF	OFF	OFF	OFF	OFF	ON
SOC(%)	16.6~33.2%	OFF	OFF	OFF	OFF	Flash 2	ON	OFF	OFF	OFF	OFF	ON	ON
SOC(%)	33.2~49.8%	OFF	OFF	OFF	Flash 2	ON	ON	OFF	OFF	OFF	ON	ON	ON
SOC(%)	49.8~66.4%	OFF	OFF	Flash 2	ON	ON	ON	OFF	OFF	ON	ON	ON	ON
SOC(%)	66.4~83.0%	OFF	Flash 2	ON	ON	ON	ON	OFF	ON	ON	ON	ON	ON
SOC(%)	83.0~100%	Flash 2	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
RUN LED 🟢		ON						Blinks 3					

Table 3 LED Indicator Description

Mode	ON	OFF
Flash 1	0.25s	3.75s
Flash 2	0.5s	0.5s
Flash 3	0.5s	1.5s

Parallel Description

ADS

RS485 | CAN | RS232 | RS485-1 | RS485-2

① | ② | ③ | ④
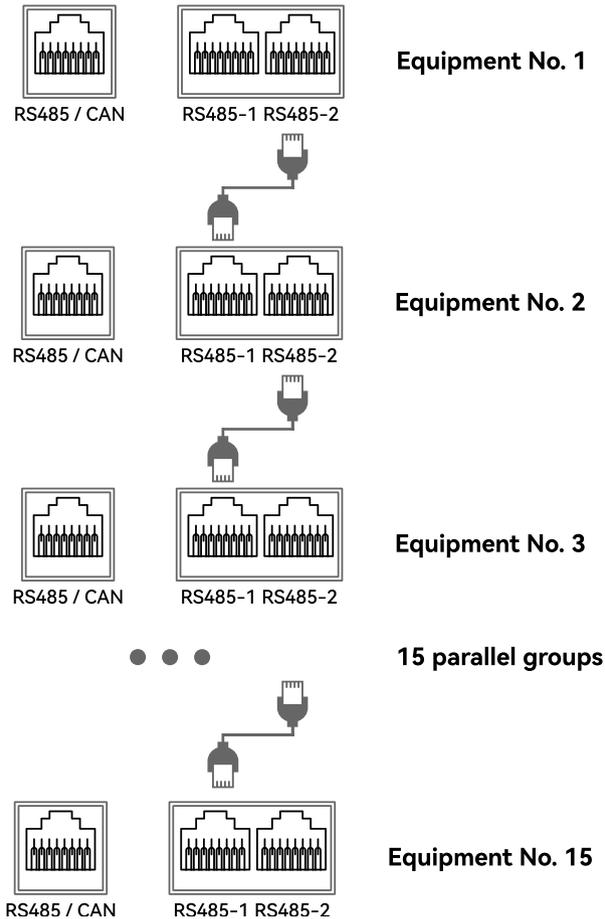
① Dip switch

② Communicate with the inverter

③ Connect to host computer

④ Parallel communication

■ Parallel Wiring Instructions

Interface Illustration:

RS485 / CAN   RS485-1 RS485-2   **Equipment No. 1**

RS485 / CAN   RS485-1 RS485-2   **Equipment No. 2**

RS485 / CAN   RS485-1 RS485-2   **Equipment No. 3**

• • •   **15 parallel groups**

RS485 / CAN   RS485-1 RS485-2   **Equipment No. 15**

■ Dip Switch

When connecting several battery packs in parallel, you can distinguish different packs by setting the address through the dip switch on the BMS. It is necessary to avoid setting the same address. Following is the dip switch definition.

Address NO.	Dip Switch Picture	Position of Dip Switch				Address NO.	Dip Switch Picture	Position of Dip Switch			
		#1	#2	#3	#4			#1	#2	#3	#4
1		ON	OFF	OFF	OFF	9		ON	OFF	OFF	ON
2		OFF	ON	OFF	OFF	10		OFF	ON	OFF	ON
3		ON	ON	OFF	OFF	11		ON	ON	OFF	ON
4		OFF	OFF	ON	OFF	12		OFF	OFF	ON	ON
5		ON	OFF	ON	OFF	13		ON	OFF	ON	ON
6		OFF	ON	ON	OFF	14		OFF	ON	ON	ON
7		ON	ON	ON	OFF	15		ON	ON	ON	ON
8		OFF	OFF	OFF	ON						

■ Parallel Communication Specification

Connect correctly the RS485B in parallel. Connect one end of the main BMS network cable to the link port OUT network port and the other end to the link port IN to the second parallel network port. Connect one end of the second parallel network cable to the link port OUT network port and the other end to the link port IN to the 3rd parallel network port. And connect parallel communication cables one by one.
Note: Please do not connect the cable to the wrong position; otherwise, the address assignment fails.

Connect correctly the RS485B in parallel. Connect one end of the main BMS network cable to the link port OUT network port and the other end to the link port IN to the second parallel network port. Connect one end of the second parallel network cable to the link port OUT network port and the other end to the link port IN to the 3rd parallel network port. And connect parallel communication cables one by one.
Note: Please do not connect the cable to the wrong position; otherwise, the address assignment fails.