



## BMS specification

<b>Product name</b>	8~24 strings 300A Battery Management System
<b>Customer model</b>	
<b>product model</b>	AY-L24S300A-ES001
<b>Version</b>	REV1.0.0
<b>Time</b>	2024-10-22





## 1. Introduction

This Battery Management System supports a maximum of 24 strings, with parametric settings to accommodate different types of lithium battery, with UART communication, RS485 communication and CAN communication, extensible to connect Bluetooth module and LCD screen.

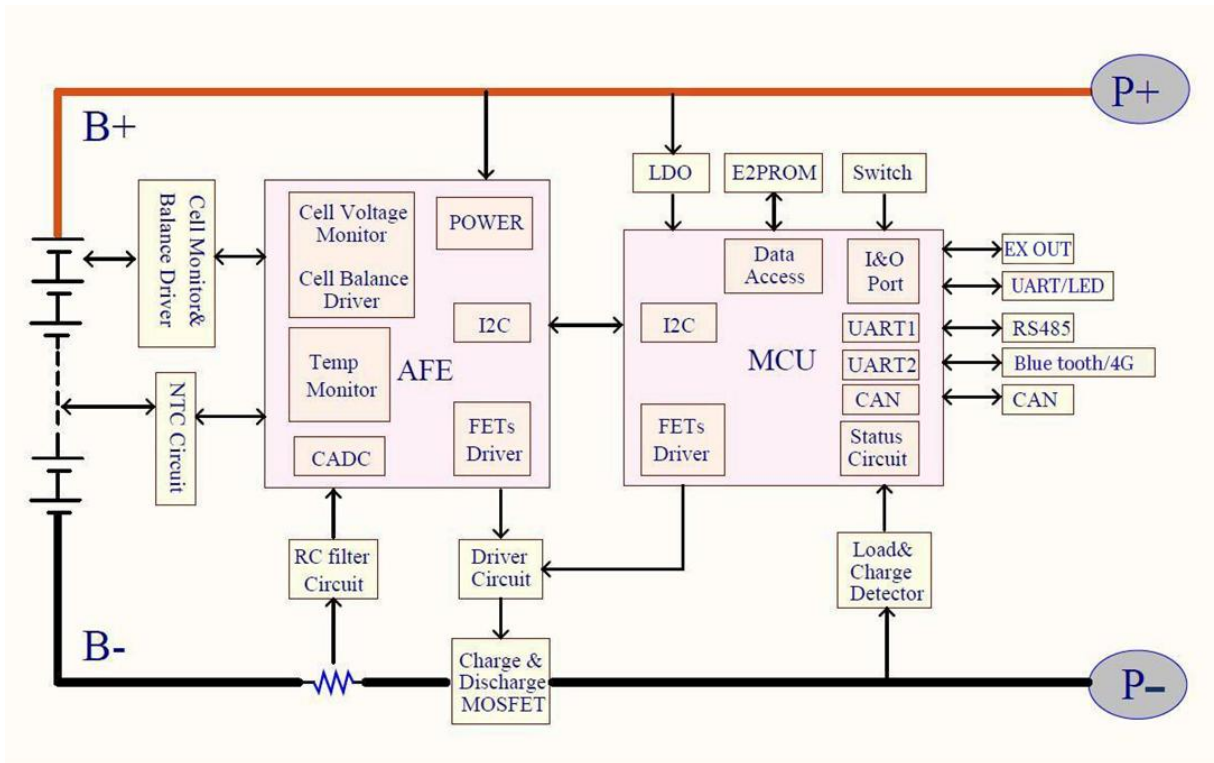
## 2. Functional characteristics

NO.	Item	Parameter specifications	NO.	project	Parameter specifications
1	Support battery string number	8-24 string	9	Number of temperature collection	3
2	Protection plate with rated working current	$\leq 300$ A	10	Temperature collection range	$-40^{\circ}\text{C}$ - $105^{\circ}\text{C}$
3	Protection plate power consumption	15 mA (dormant 150 $\mu\text{A}$ )	11	Temperature acquisition accuracy	$\pm 2^{\circ}\text{C}$
4	Single-cell voltage detection range	0-5V	12	Temperature sensor type	NTC
5	Precision of the monomer voltage detection	$\pm 10\text{mV}$	13	The SOC estimation accuracy	5-8%
6	Total voltage detection range	25-90 V	14	Operating temperature range of the protection plate	$-20^{\circ}\text{C}$ - $65^{\circ}\text{C}$
7	Accuracy of the total voltage detection	$\leq \pm 2\%$	15	Working humidity range of the protection panel	5%-90%
8	Current detection accuracy	$\leq \pm 2\%$			

- With single cell voltage, battery pack overall voltage detection, over charge, over discharge alarm and protection function, short circuit protection function. The static voltage sampling accuracy can reach 10 mV at room temperature.
- With charge and discharge current detection, charge and discharge over current alarm and protection function. The charging current is positive, the discharge current is negative, and the current sampling accuracy is attainable at room temperature  $\leq 2\%$ .
- With cell, environment, MOS temperature detection, cell high and low temperature alarm and protection function, MOS high temperature alarm and protection function, environment high and low temperature alarm function. The temperature sampling accuracy can reach  $3^{\circ}\text{C}$  at room temperature.



- With the active balance function, the maximum balance current is 2A.
- Cell capacity estimation function. The full charge capacity, current capacity and design capacity can be set by the upper machine, and the capacity can be automatically updated after a complete charge and discharge cycle.
- SOC static calibration function to reduce the SOC calculation error by comparing the SOC.
- The control function of the PC software yes the protection parameters of overcharge, over discharge, over temperature and under temperature through the PC software.
- RS485 communication interface, using isolated communication; available package for software upgrade.
- CAN communication interface, isolated communication, support CAN2.0B; available package for software upgrade.
- Support automatic forced reset function, which can effectively avoid the BMS down or stuck.
- The pre-charging function can effectively avoid from the impact on BMS with high starting current of the load.
- Functional diagram





## 3. Electrical characteristics

3.1 Basic parameter setting (Note: the following parameters are tested at 25°C environment temperature unless indicated)

Serial#	Indicator project		Factory default parameters	Settable or not	Remarks
1	Single cell overcharge protection	Voltage	4250 mV	yes	
		Protection delay time	1.0S	yes	
	Single cell overcharge protection release	Voltage	4150 mV	yes	
		Discharge to release	The Discharge current is > 1A or the voltage is below the release voltage		
2	Single cell over discharge protection	Voltage	2800 mV	yes	
		Protection delay time	1.0S	yes	
	Single cell over discharge protection release	Voltage	3000 mV	yes	
		Charge to release	It can be activated when charging and recovered higher than release voltage		
3	Battery Pack overcharge protection	Voltage	85000 m V	yes	
		Protection delay time	1.0S	yes	
	Battery Pack overcharge protection release	Voltage	83000 m V	yes	
		Discharge to release	Discharge current is > 1A or the voltage is below the release voltage		
4	Battery Pack over discharge protection	Voltage	56000 m V	yes	
		Protection delay time	1.0S	yes	
	Battery Pack over discharge protection release	Voltage	60000 m V	yes	
		Charge to release	It can be activated when charging and recovered higher than release voltage		
5	Charging over-current protection	Nominal current	300 A		



		Charge over current protection current	330 A	yes	
		Charging over current protection delay time	1.0S	yes	
	Charging over-current protection release	Automatic release	Automatic release after 10S		
		Discharge to release	Discharge current > 1A		
6	Discharge over current 1 protection	Nominal current	300 A		
		Current	350 A	yes	
		Protection delay time	10.0S	yes	
	Discharge over current 1 protection release	Automatic release	Automatic release after 10S		
		Charge to release	Charge current is > 1A		
7	Discharge over-current protection 2	Current	400 A	yes	



	Discharging over-current protection 2 release	Protection delay time	1280mS	yes	
		Automatic release	Automatic release after 10S		
		Charging to release	Charge current is > 1A		
8	Short-circuit protection	Protection current	800 A		
		Protection delay time	400μ S		
		Protection release	Charge to release		
			When the load is removed		
9	MOS high-temperature protection	MOS over-temperature protection temperature	100°C	yes	
		MOS protection release temperature	70°C	yes	
10	Battery temperature protection	Charging low-temperature protection temperature	0°C	yes	
		Charging low-temperature protection release temperature	5°C	yes	
		Charging high-temperature protection temperature	60°C	yes	
		Charging high-temperature protection release temperature	55°C	yes	
		Discharging low-temperature protection temperature	-15°C	yes	
		Discharging low-temperature protection release temperature	-10°C	yes	
		Discharging high-temperature protection temperature	65°C	yes	
		Discharging high-temperature protection release temperature	55°C	yes	
11	Heating function	Charger to heat	Heating current is ≤10A		



		Heating start temperature	0°C	yes	
		Heating close temperature	5°C	yes	
12	SOC	Accuracy	5%~8%	After assembly, a cycle of charge and discharge is required to meet the accuracy requirement	
13	Consumption of current	Self-consuming current at operation	≤15 mA		
		Low-power consumption mode current	≤150μ A		
14	Balance function	Balance starting voltage	4000 mV		
		Start of voltage difference	50mV		
		Balance current	Maximum 2,000 mA		
15	Communication mode	<input checked="" type="checkbox"/> UART <input checked="" type="checkbox"/> RS485 <input checked="" type="checkbox"/> CAN <input checked="" type="checkbox"/> Bluetooth <input checked="" type="checkbox"/> 4G <input checked="" type="checkbox"/> LCD <input type="checkbox"/> SOC indicator	15	Communication mode	<input checked="" type="checkbox"/> UART <input checked="" type="checkbox"/> RS485 <input checked="" type="checkbox"/> CAN <input checked="" type="checkbox"/> Bluetooth <input checked="" type="checkbox"/> 4G <input checked="" type="checkbox"/> LCD <input type="checkbox"/> SOC indicator
16	Weak switch	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no	16	Weak switch	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no



## 3.2 LED instructions

The BMS is equipped with an LED indicator light, normal is slow flash, and abnormal is fast flash.

## 3.3 Switch description

The BMS is equipped with external switch interface, which is passive switch interface and can not be connected to any power supply.

The switch function can be customized to locking type or reset type according to customer needs, and the default is lock type switch.

When the switch is on, the protection plate works normally. When the switch is off, the protection plate is in sleep mode. At the same time, the battery has no output and cannot be charged.

## 3.4 Sleep and Wake UP

### ● 3.4.1 Sleep

The BMS will go to sleep mode under any of the following conditions:

- 1) After the battery cell or total voltage is over-discharged, if it cannot be restored or enters the charging state within 30 seconds, the BMS will enter the sleep mode.
- 2) After the BMS switch is disconnected, the BMS will enter the sleep mode.
- 3) The battery is in a standby state, no charging, no discharge, no communication for 30 minutes, the BMS will enter the sleep mode.

In sleep mode, no discharge, no charge, no Bluetooth communication.

### ● 3.4.2 Wake-up

In any of the following conditions, BMS will wake up and enter the working state.

- 1) BMS switches from off to on.
- 2) When the BMS switch is on, and it is plugged to the charger (note that the charger voltage must be 1V higher than the battery voltage to wake up).

(Special note: the over discharge of lithium battery will significantly reduce the battery life, please pay attention to charge the battery in time. If the battery is not in use for a long time, please charge and maintain the battery regularly.)





## 4 Communication instructions

### 4.1 CAN communication

The communication protocol can be customized, using the default J1939 communication protocol format.

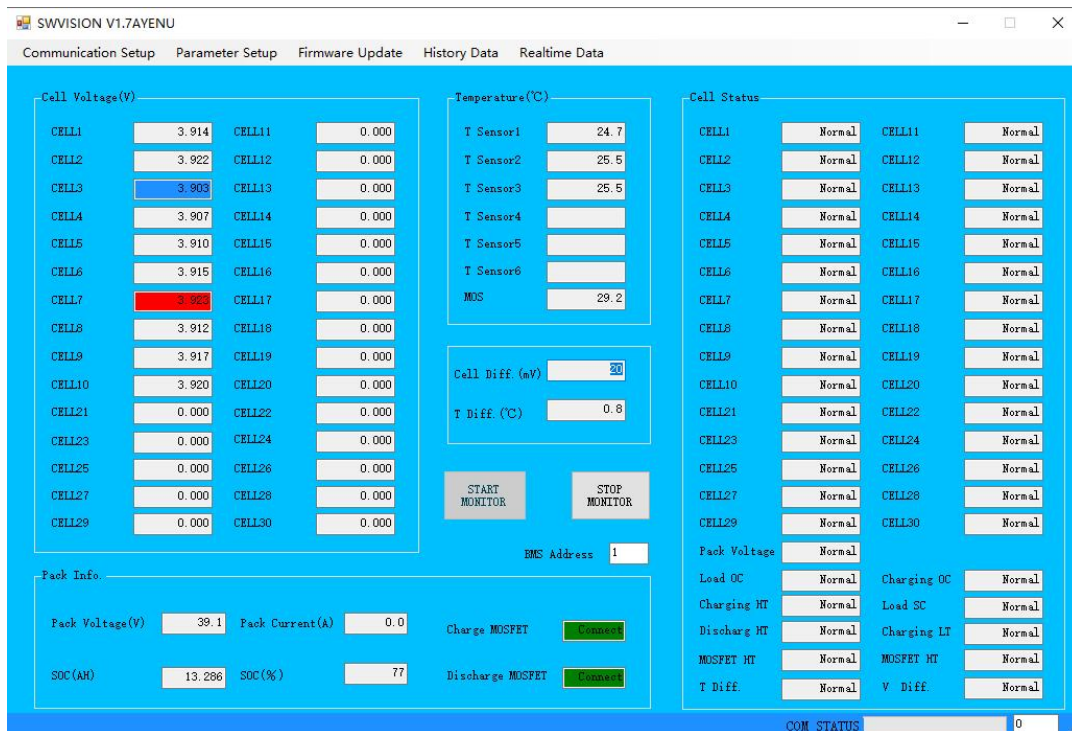
### 4.2 RS485 communication

The communication protocol can be customized by the default standard Modbus \_ RTU protocol.

### 4.3 PC software Description

The functions of the host computer SWVISION V1.7AYENU are mainly divided into five parts: data monitoring, parameter setting, parameter reading, historical alarm and BMS upgrade.

- Analyze the data information sent by each module, and then display the voltage, temperature, configuration value, etc.
- Configure information to each module through the host computer.
- Calibration of production parameters.
- BMS upgrade.





## 5 Dimension and interface definition

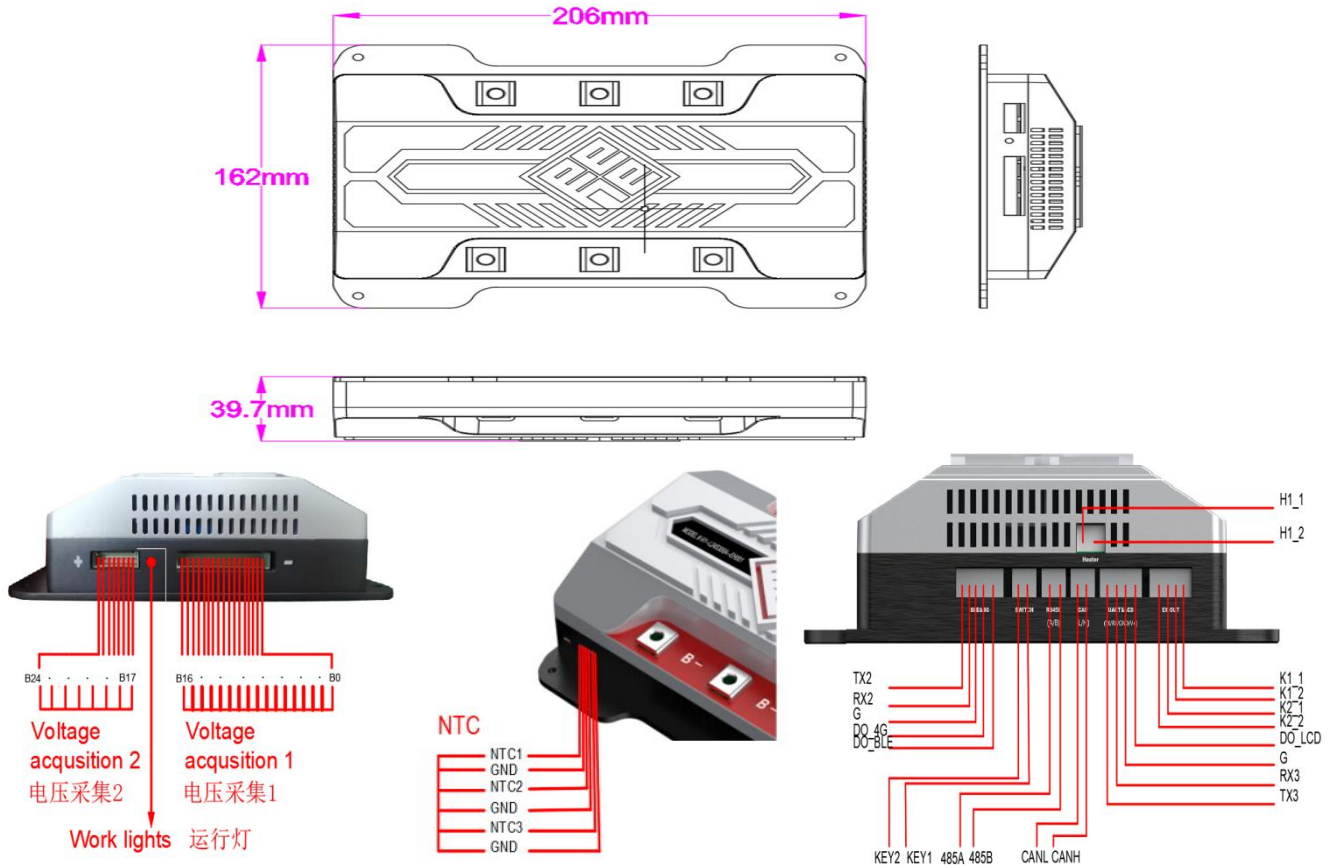


Figure 1 Overall dimensions and interface definition diagram

### 5.1 Acquisition terminal 1 (16 string)

HY2.0-17P

Pin17	BC16	The 16th string cell positive
Pin16	BC15	The 15th string cell positive
Pin15	BC14	The 14th string cell positive
Pin14	BC13	The 13th string cell positive
Pin13	BC12	The 12th string cell positive
Pin12	BC11	The 11th string cell positive
Pin11	BC10	The 10th string cell electrode
Pin10	B C9	The 9th string cell positive
Pin9	B C8	The 8th string cell positive
Pin8	B C7	The 7th string cell positive
Pin7	BC6	The 6th string cell positive
Pin6	BC5	The 5th string cell positive
Pin5	BC4	The 4th string cell positive
Pin4	BC3	The 3rd string cell positive
Pin3	BC2	The 2nd string cell positive
Pin2	BC1	The 1st string cell positive
Pin1	BC0	The 1st string cell negative



## 5.2 Acquisition terminal 2 (8 strings)

### HY2.0-8P

Pin24	B C20	The 20th string cell positive
Pin23	NC	Null (shorted inside terminal)
Pin22	NC	Null (shorted inside terminal)
Pin21	NC	Null (shorted inside terminal)
Pin20	NC	Null (shorted inside terminal)
Pin19	BC19	The 19th string cell positive
Pin18	BC18	The 18th string cell positive
Pin17	BC17	The 17th string cell positive

## 5.3 The NTC terminal

### MH1.25-6 P

Pin1	NTC1	Thermal resistor 1
Pin2	NTCG	Thermal resistor 1
Pin3	NTC2	Thermal resistor 2
Pin4	NTCG	Thermal resistor 2
Pin5	NTC3	Thermal resistor 3
Pin6	NTCG	Thermal resistor 3

## 5.4 Bluetooth or 4G terminals

### PH2.0-5 P

Pin1	BLEP	Bluetooth power positive
Pin2	4GP	The 4G module power supply positive
Pin3	GND	Negative ground
Pin4	RX2IN	The UART 2 receiving foot
Pin5	TX2OUT	The UART 2 sending foot

## 5.5 Switch terminal

### PH2.0-2P

Pin1	SW1	Switch 1
Pin2	SW2	Switch 2

When SW 1 and SW 2 feet are shorted connected, the switch is on, otherwise the switch is off. The switch pins are not allowed to connect to the power supply.



## 5.6 RS485 communication terminal

### PH2.0-2P

Pin1	485B	RS485 positive
Pin2	485A	RS485 negative

## 5.7 CAN communication terminals

### PH2.0-2 P

Pin1	CANH	CANH
Pin2	CANL	CANL

## 5.8 LCD display terminal

### PH2.0-4 P

Pin1	LCDP	LCD display power supply (3.3V 20mA)
Pin2	GND	Negative ground
Pin3	RX3IN	The UART 3 receiving terminal
Pin4	TX3OUT	The UART 3 sending terminal

## 5.9 Extended output terminal

### PH2.0-4 P

Pin1	K1_1	Relay 1 contact
Pin2	K1_2	Relay 1 contact
Pin3	K2_1	Relay 2 contact
Pin4	K2_1	Relay 2 contact

The extension terminal is the output contact for a small relay with customized functional output for customer request.

## 5.10 Heater negative terminal

### HC-5557-2AW

This BMS can realize the preheating function of the battery pack. When the battery pack temperature is low, insert the charger to preheat the battery pack. After preheating, the battery can charge or discharge. The positive of the heating film is connected to the positive of the charger, and the negative of the heating film is connected to this terminal.



## 6 Product and wiring diagram

Note: The matching wires are all 500mm, the position marked in the drawing is for reference only, and the actual position is subjected to the product.

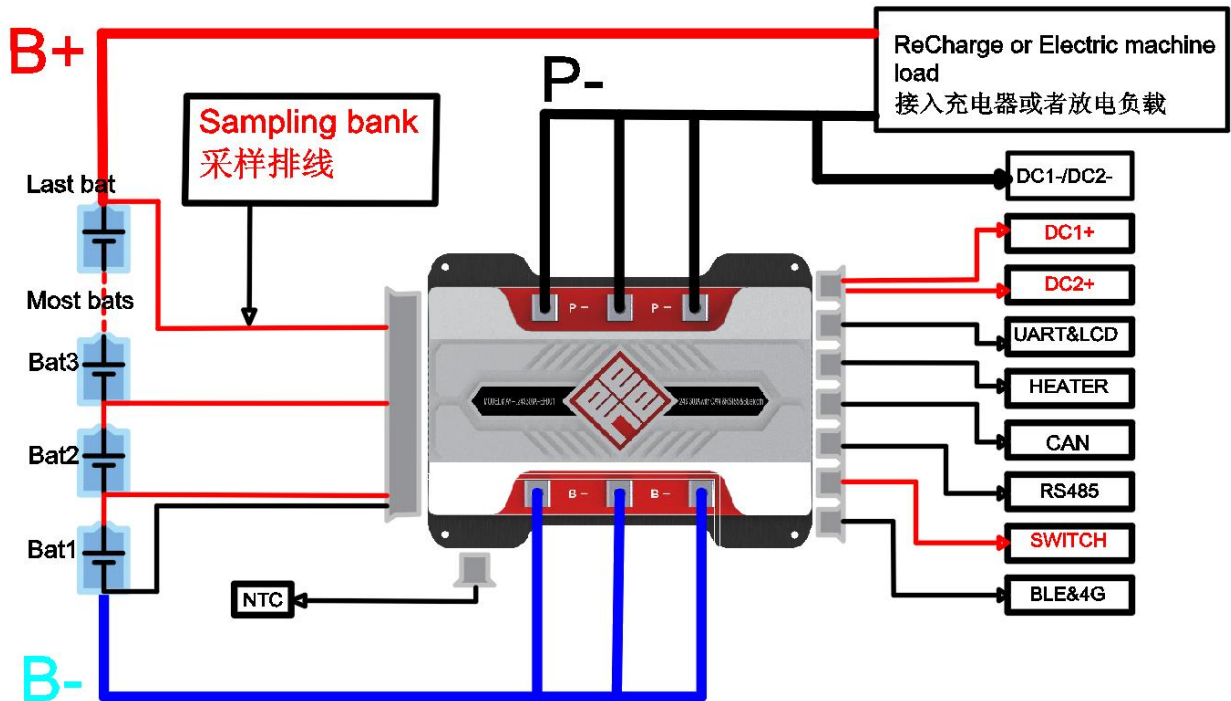


Figure 3 Wiring diagram

Note: When the actual battery pack is less than 24 strings, the acquisition wires will be jumper at the factory, and the user only needs to connect according to the line order.

B-, C- configure multiple power cables, and be sure to connect all the wiring, otherwise it will affect the current sampling accuracy of the BMS and affect the normal use of the BMS.

- First connect the B-line of the protection board (thick blue line) to the total negative pole of the battery pack
- The cable starts from the thin black wire connected to B-, the second wire is connected to the positive electrode of the first string of batteries, and the positive electrode of each string of batteries is connected in turn; then insert the cable into the protection board.
- After the line is completed, measure whether the voltages of battery B+ and B- are the same as those of P+ and P-. The same means that the protection board is working normally; otherwise, please re-operate according to the Above.
- When removing the protection board, first unplug the cable (if there are two cables, first pull out the high-voltage cable, then pull out the low-voltage cable), and then disconnect the power cable B-.



## 7 Precautions for use

- When welding the battery leads, there must be no error or reverse connection. If the connection is wrong, the BMS may be damaged. And the BMS must be re-tested before use.
- When assembling, the BMS not directly contact the surface of the cell, in case of damaging the cell. The assembly should be firm and reliable.
- Make sure that the leads, soldering iron do not touch the components on BMS, it may damage the BMS.
- The battery should be use in anti-static, moisture-proof, waterproof. etc conditions.
- Please follow the design parameters and use conditions during the use process, and shall not exceed the value in this specification. Otherwise the BMS may be damaged.
- After assembling the BMS to the battery pack, if there is no voltage output or no charging for the initial use, please check if the wiring is correct