Smart BMS with Active-Balancer

JK-BD4AxxS-4P/ JK-BD6AxxS-6P
JK-BD6AxxS-8P/ JK-BD6AxxS-10P
JK-B1AxxS-12P/ JK-B1AxxS-15P
JK-B2AxxS-15P/ JK-B2AxxS-20P

Specification and operation manual

JKBMS Technology Co., Ltd

Acknowledge： Steve_S，Johan Dams，

Product warranty clause

Name： Smart BMS with Active-Balancer

Warranty period： One Year

First of all, thank you for purchasing the Smart BMS with with Active-Balancer from Chengdu Jikong technology co., LTD.

Chengdu Jikong technology co., LTD. Provides quality warranty for the hardware products and accessories sold by our company. The warranty period is as shown above. During the warranty period, the company shall have the right to choose to repair or replace the whole set of products after receiving the notice of the product failure and verification. The whole set of replacement products may be new or close to new.

1. Chengdu jikong technology co., ltd. guarantees that the products are fully tested.
2. Chengdu jikong technology co., LTD does not guarantee that the products can be used without interruption during the product repair process. However, the company shall ensure that faulty products are repaired within a reasonable time.
3. The warranty period starts from the date of product delivery or the date of installation by chengdu jikong technology co., LTD. If the company's products are not installed within

   30 days after the date of shipment due to the user's schedule or delay, the warranty period of the products shall be calculated from the 31st day after the date of shipment.
4. Chengdu jikong technology co., ltd. shall not provide free warranty for any product failure or damage caused by :(a) improper use or improper maintenance;(b) software, accessories, components or other items not provided by chengdu jikong technology co., LTD.;(c) unauthorized removal, modification and misuse;(d) use in excess of the scope specified in the technical specifications of the product;(e) improper transport, handling and storage;(f) failure or damage caused by other non-mass causes (e.g. earthquake, war, traffic accident, etc.).

To the extent permitted by law, the above warranty is the only express warranty and there are no other warranties, whether written or oral. Expressly disclaims any implied warranty or commercial terms.

Copyright statement

1.Overview

Lithium battery smart BMS is a management system tailored for large capacity series lithium battery packs. It has the functions of voltage collection, active balancing of large current, overcharge over-current over-temperature protection, Coulombmeter, Bluetooth communication, GPS remote and so on. It is suitable for lithium iron phosphate, lithium ternary and other battery types.

The BMS relies on our Proprietary technology for Active Balancing. Our high current active balancing technology can ensure maximum battery consistency, improve battery life, delay Battery aging.

The BMS has a companion mobile APP that supports Android V. 7 and above and IOS operating systems. The APP can connect to the BMS via Bluetooth on your mobile phone to check the battery working status and to modify the working parameters of the BMS, control the charging, discharging switches, and so on. The BMS is small in size, simple to operate and full of functions, that can be widely used in battery PACK of small sightseeing cars, walkers, shared cars, high-power storage, base station backup power, solar power stations and other products.。

2.

2.1. Main technical indicators

The main technical indexes BMS are shown in Table 1 and table 2 and table 3

Table 1 Main technical indexes of 4p/6p series BMS

Technical indicators	Model					
	BD4A17S4P	**BD4A20S4P**	**BD4A24S4P**	**BD6A17S6P**	**BD6A20S6P**	**BD6A24S6P**
Li-ion Strings	7～17	7～20	7～24	7～17	7～20	7～24
Lifepo4 Strings	8～17	8～20	8～24	8～17	8～20	8～24
LTO Strings	12~17	12～20	12～24	12~17	12～20	12～24
Balance mode	Active Balance					
Balance Current	0.4A			0.6A		
Internal resistance	2.8 mΩ			1.53 mΩ		
Continuous discharge Current	40A	40A	40A	60A	60A	60A
Continuous Charge Current	40A	40A	40A	60A	60A	60A
Maximum discharge current	60A	60A	60A	100A	100A	100A
Over-current protection(ADJ)	10～40 A	10～40 A	10～40 A	10～60 A	10～60 A	10～60 A
Communication interface	RS485(By Default) / CAN(customization)					
Display interface	YES					
Entry cable	Common Port					
Unit voltage range	1~5V					
Voltage acquisition accuracy	±3mV					
Overcharge protection voltage	1.2～4.35V Adjustable					
Overcharge release voltage	1.2～4.35V Adjustable					
Over-current release time	2～120S Adjustable					
Over discharge protection voltage	1.2～4.35V Adjustable					
Over discharge recovery voltage	1.2～4.35V Adjustable					
Temperatue detection	Three					
Temperature protection	YES					
Short circuit protection	YES					
Coulombmeter	YES					
Bluetooth function	Support Android and IOS					

GPS (optional)	Support (RS485 And GPS One out of two)

Table 2 Main technical indexes of 8p/10p/12P series BMS

Technical indicators	Model					
	BD6A17S8P	**BD6A20S8P**	**BD6A24S8P**	**BD6A20S10P**	**BD6A24S10P**	**B1A17S12P**
Li-ion Strings	7～17	7～20	7～24	7～20	7～24	7～17
Lifepo4 Strings	8～17	8～20	8～24	8～20	8～24	8～17
LTO Strings	12～17	12～20	12～24	12～20	12～24	12～17
Balance mode	Active Balance					
Balance Current	0.6A					1A
Internal resistance	1.2 mΩ			1mΩ		0.65 mΩ
Continuous discharge Current	80A	80A	80A	100A	100A	120A
Continuous Charge Current	80A	80A	80A	100A	100A	120A
Maximum discharge current	150A	150A	150A	200A	200A	250A
Over-current protection(ADJ)	10～80 A	10～80 A	10～80 A	10～ 100A	10～100 A	10～120 A
Communication interface	RS485(By Default) / CAN(customization)					
Display interface	YES					
Entry cable	Common Port					
Unit voltage range	1~5V					
Voltage acquisition accuracy	±3mV					
Overcharge protection voltage	1.2～4.35V Adjustable					
Overcharge release voltage	1.2～4.35V Adjustable					
Over-current release time	2～120S Adjustable					
Over discharge protection voltage	1.2～4.35V Adjustable					
Over discharge recovery voltage	1.2～4.35V Adjustable					
Temperatue detection	Three					
Temperature protection	YES					
Short circuit protection	YES					
Coulombmeter	YES					

Bluetooth function	Support Android and IOS
GPS (optional)	Support (RS485 And GPS One out of two)

Table 3 Main technical indexes of 12P/15p/20P series BMS

Technical indicators	Model					
	B1A20S12P	**B1A20S15P**	**B1A24S15P**	**B2A24S15P**	**B2A20S20P**	**B2A24S20P**
Li-ion Strings	7～20	7～20	7～24	7～24	7～20	7～24
Lifepo4 Strings	8～20	8～20	8～24	8～24	8～20	8～24
LTO Strings	12～20	12～20	12～24	12～24	12～20	12～24
Balance mode	Active Balance					
Balance Current	1A			2A		
Internal resistance	0.65 mΩ			0.47 mΩ		
Continuous discharge Current	120A	150A	150A	150A	200A	200A
Continuous Charge Current	120A	150A	150A	150A	200A	200A
Maximum discharge current	250A	300A	300A	300A	350A	350A
Over-current protection(ADJ)	10～120 A	10～150A	10～150A	10～150A	10～200A	10～200A
Communication interface	RS485(By Default) / CAN(customization)					
Display interface	YES					
Entry cable	Common Port					
Unit voltage range	1~5V					
Voltage acquisition accuracy	±3mV					
Overcharge protection voltage	1.2～4.35V Adjustable					
Overcharge release voltage	1.2～4.35V Adjustable					
Over-current release time	2～120S Adjustable					
Over discharge protection voltage	1.2～4.35V Adjustable					
Over discharge recovery voltage	1.2～4.35V Adjustable					
Temperature detection	Three					
Temperature protection	YES					
Short circuit protection	YES					

Coulombmeter	YES
Bluetooth function	Support Android and IOS
GPS (optional)	Support (RS485 And GPS One out of two)

2.2. Service environmental conditions

Operating temperature range: -40℃～70℃;

Power requirements: 20~100V

Power consumption: balanced state 8mA@100V, Non-Equilibrium State 7mA@100V

3. Connector and interface description

3.1. Connector, LED lamp location identification

The two BMS connectors and the position of the LED lamp are shown in Below.

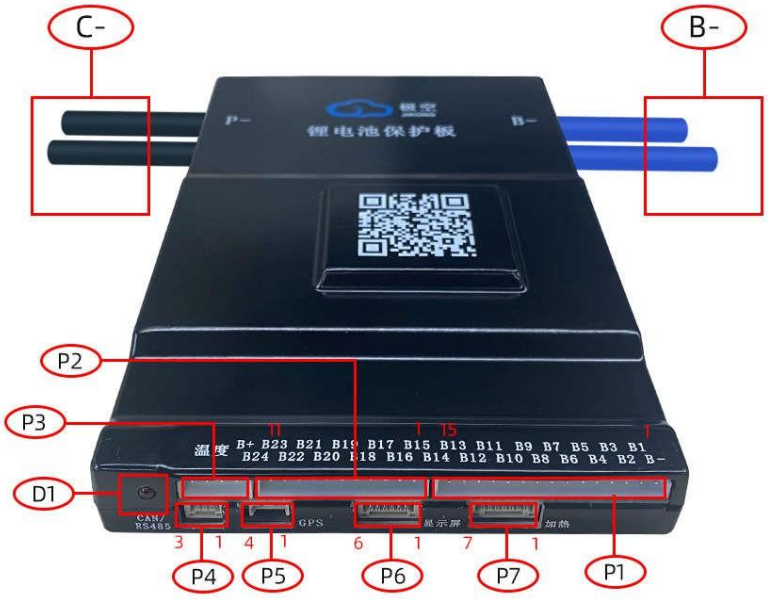


Fig. 1 BD6AxxS-10P/ B1AxxS-15P/B2AxxS-15P/B2AxxS20P Connector schematic

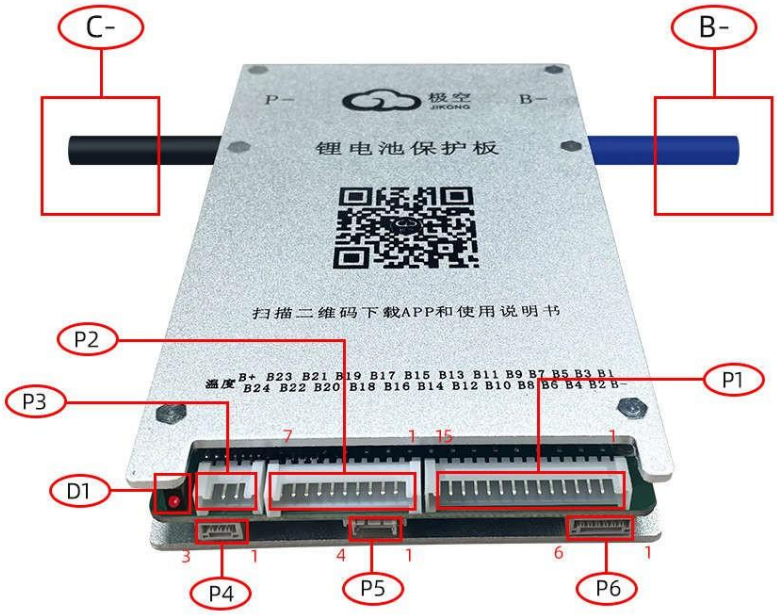
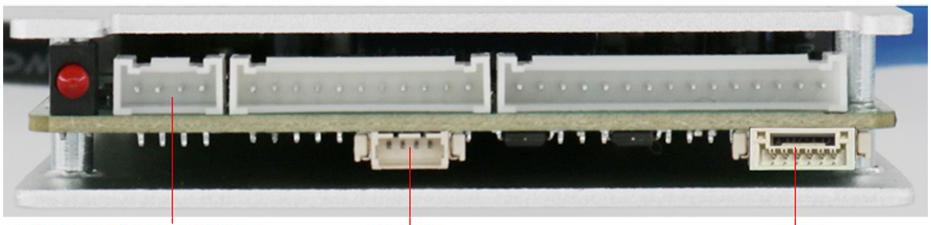
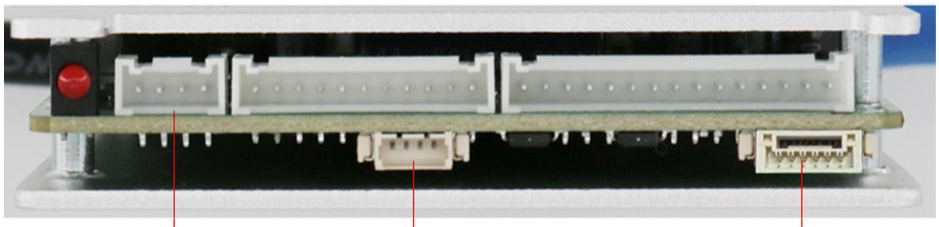


Fig. 2 BD4AXXS-4P/ BD6AxxS-6P/ BD6AxxS8P Connector schematic

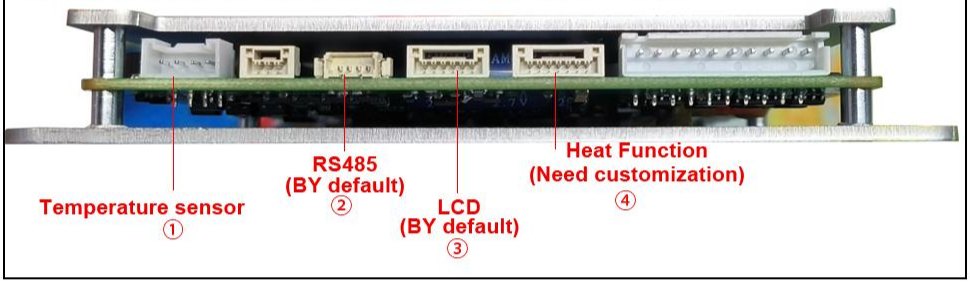
JK-BD4A8S4P
JK-BD4A17S4P/BD4A20S4P/BD4A24S4P



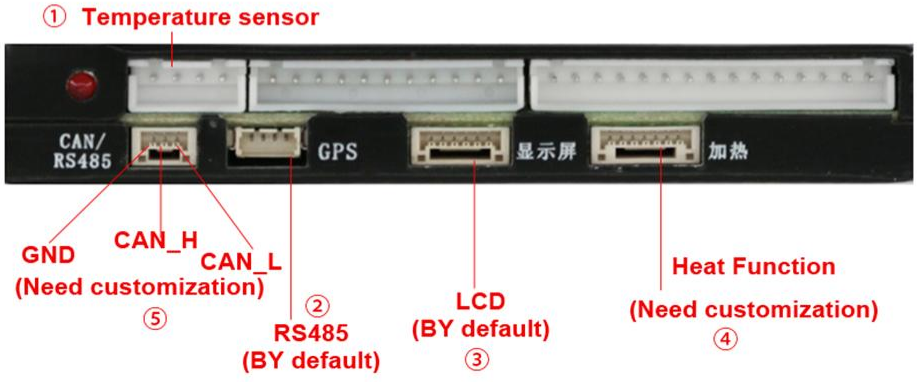
JK-BD6A17S6P/BD6A20S6P/BD6A24S6P
JK-BD6A17S8P/BD6A20S8P/BD6A24S8P

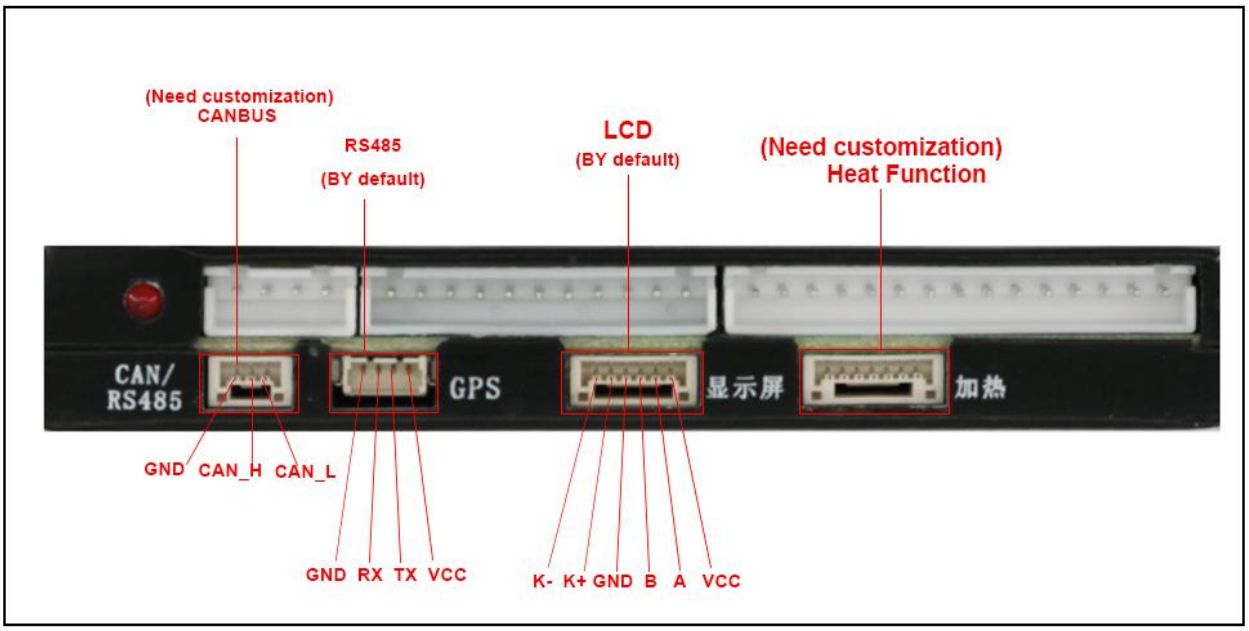


JK-B1A8S10P/B1A8S20P/B2A8S20P



JK-BD6A20S10P/BD6A24S10P/B1A17S12P
JK-B1A20S12P/B1A20S15P/B1A24S15P
JK-B2A24S15P/B2A20S20P/B2A24S20P





①:Temperature sensor

②:RS485 interface(At present, all JK BMS are configured with RS485 function by default)

③:LCD interface(At present, all JK BMS are configured with LCD interface by default)

④:Heat Function interface

(Only a BMS equipped with heating function can use heating interface)
Description of heating function:
Battery temperature is below low temperature charge protection, turn off charging, turn on heating.
Battery temperature is higher than low temperature charge recovery temperature, turn on charging, turn off heating.
Cryogenic charge protection is a parameter that can be set within APP

The heating power depends on the battery voltage and the resistance value of the heating film.
Battery voltage U.
Heating resistance R.
Power equals U*U/R
Heating current I=U/R;
The maximum I (current) of the board design is 3A

MAX heating Power 200W (100W of B2A8S20P)
This condition must be met.

⑤:CANBUS interface (Needs customization)

3.2. Connector, LED Definition

BD6AxxS-6P/BD6AxxS-8P/BD6AxxS-10PB1AxxS-15P/B2AxxS-15P/B2AxxS20P BMS Connector definition, LED light definition see Table 3 Table 4

P1~P4 Interface Definition

Connector	Name	Pin	BD6AxxS-6P/BD6AxxS-8P/BD6AxxS-10P/ B1AxxS-15P/ B2AxxS-15P/B2AxxS20P	
			name	Definition
P1	Balance and collection interface	1	B-	Battery total negative
		2	B1	Series 1 Battery Positive
		3	B2	Series 2 Battery Positive
		4	B3	Series 3 Battery Positive
		5	B4	Series 4 Battery Positive
		6	B5	Series 5 Battery Positive
		7	B6	Series 6 Battery Positive
		8	B7	Series 7 Battery Positive
		9	B8	Series 8 Battery Positive
		10	B9	Series 9 Battery Positive
		11	B10	Series 10 Battery Positive
		12	B11	Series 11 Battery Positive
		13	B12	Series 12 Battery Positive
		14	B13	Series 13 Battery Positive
		15	B14	Series 14 Battery Positive
P2		1	B15	Series 15 Battery Positive
		2	B16	Series 16 Battery Positive
		3	B17	Series 17 Battery Positive
		4	B18	Series 18 Battery Positive
		5	B19	Series 19 Battery Positive

		6	B20	Series 20 Battery Positive
		7	B21	Series 21 Battery Positive
		8	B22	Series 22 Battery Positive
		9	B23	Series 23 Battery Positive
		10	B24	24th Series Battery Positive (Battery Total Positive)
		11	B+	BMS power supply, connect battery
P3	Temperature interface	1	T1A	1st temperature sensor A pin
		2	T1B	1st temperature sensor B pin
		3	T2A	2nd temperature sensor A pin
		4	T2B	2nd temperature sensor B pin
P4	communication interface	1	D_N	CAN_ L/RS485-N signal positive pole (optional function, CAN or RS485 optional)
		2	D_P	CAN_ H/RS485-P signal negative (optional function, CAN or RS485 optional)
		3	GND	GND

P5~P7 Interface Definition

Connector	Name	Pin	BD6AxxS-6P/BD6AxxS-8P/BD6AxxS-10P B1AxxS-15P/B2AxxS-15P/B2AxxS20P	
			Name	Definition
P5	GPS	1	VGPS	Power output, voltage close to b+
		2	TX	UART_TX,3.3V
		3	RX	UART_RX,3.3V
		4	GND	GND
P6	Display interface	1	VCC	Display power output
		2	A	Display RS485 signal positive
		3	B	Display RS485 signal negative
		4	GND	Power negative
		5	K+	Activation signal positive
		6	K-	Activation signal negative
P7	Heating interface (optional function)	1	HT-	Heating negative -- (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		2	HT-	Heating negative -- (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		3	HT-	Heating negative -- (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		4	HT-	Heating negative -- (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		5	HT-	negative -- (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		6	CD+	Charging Indicator Input Positive Pole - (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		7	CD-	Charging Indicator Input Negative -- (BD6AxxxS-6P/BD6AxxS-8P does not have this function)
D1	Bluetooth connection indicator, which is always on when the BMS is connected to Bluetooth, blinks when disconnected.			
P-/C-	Connect external load or charger negative (battery (-) terminal)			
B-	Connect battery negative			

3.3.

JK-BD6AxxS-10P、JK-B1AxxS-15P、JK-B2AxxS-15P、JK-B2AxxS-20P 保护板外型如图 3 所示。

JK-BD6AxxS-10P、JK-B1AxxS-15P、JK-B2AxxS-15P、JK-B2AxxS-20P appearance is shown in Figure 3.

Figure 3. JK-BD6AxxS-10P、JK-B1AxxS-15P、JK-B2AxxS-15P、JK-B2AxxS-20P

JK-BD6AxxS-6P、JK-BD6AxxS-8P appearance is shown in Figure 4.

Figure 4 JK-BD6AxxS-6P、JK-BD6AxxS-8P

3.4. SIZE

BD6AXXS-10P/ B1AXXS-12P/B1AXXS-15P/ B2AXXS-15P/ B2AXXS-20P BMS

Size 162mm × 102mm × 20.4mm, and the overall dimension is shown in Figure 5.

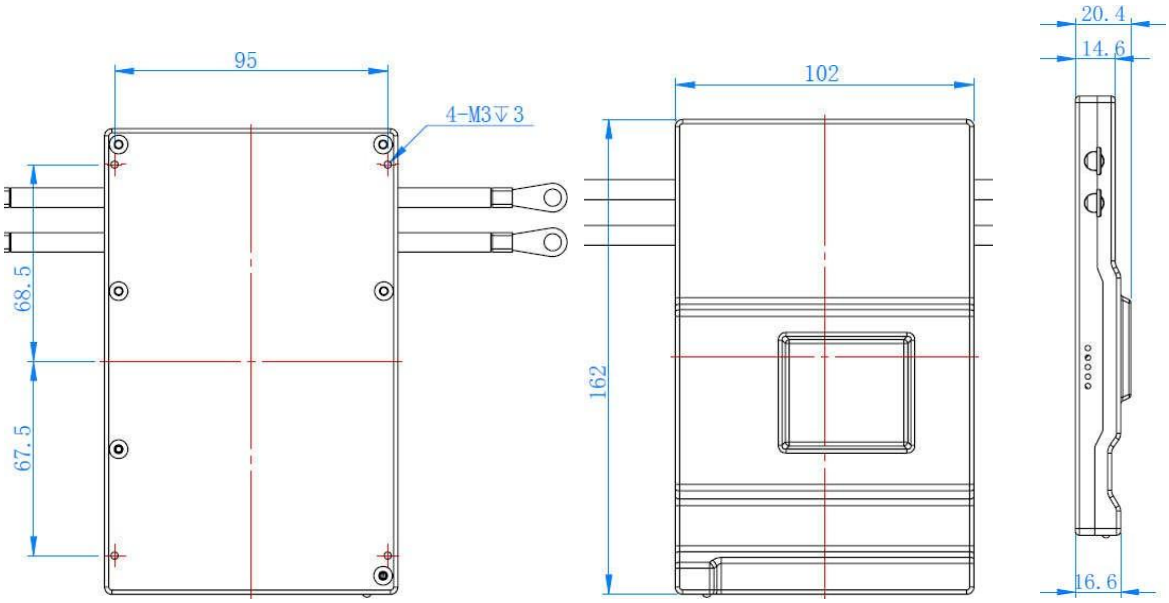


Figure 5

JK-BD6AXXS-6P、JK-BD6AXXS-8P BMS

Size 136mm×83mm× 17.6mm, and the overall dimension is shown in Figure 6.

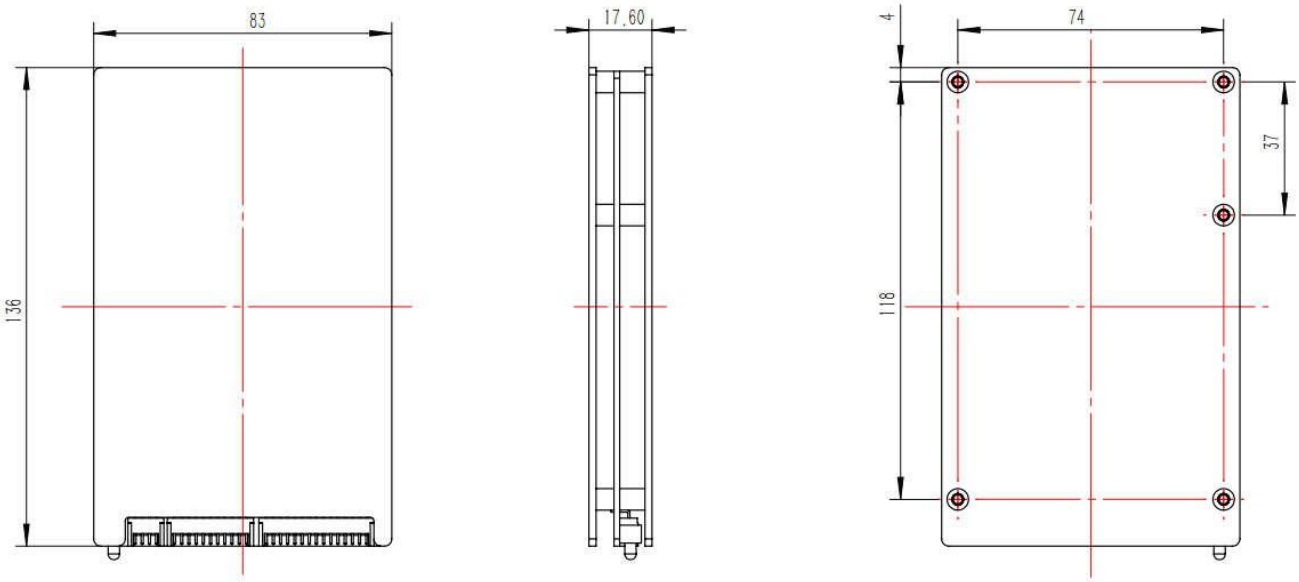


Figure 6

JK-BD4A8S-4P/ BD4A17S-4P/ BD4A20S-4P BMS

Size 110.4mm×73mm×17.6mm, and the overall dimension is shown in Figure 7

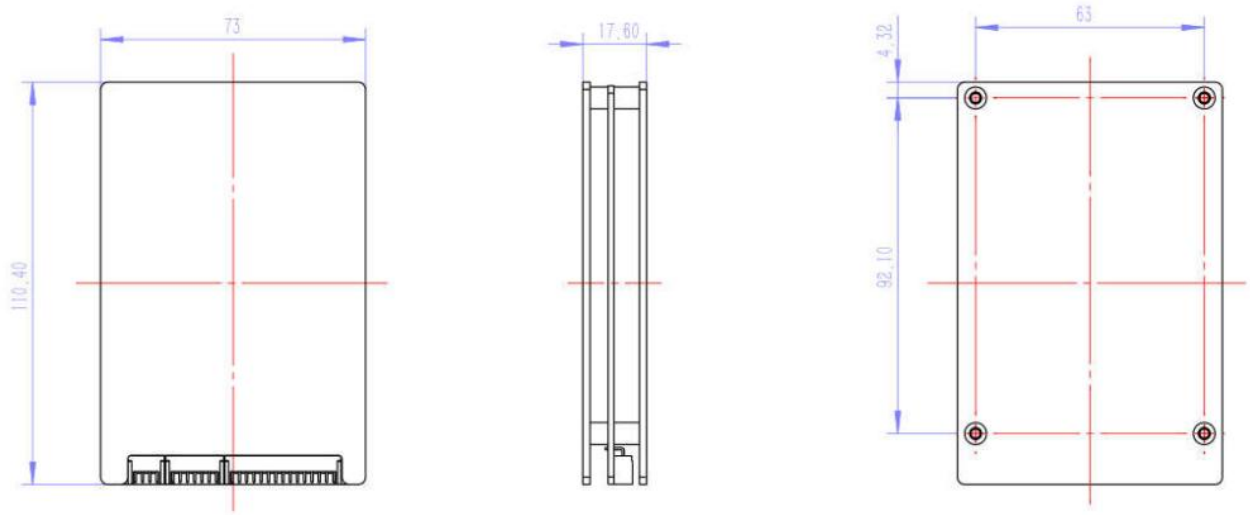


Figure 7

JK-BD4A24S-4P BMS

Size 116mm×83mm×17.6mm, and the overall dimension is shown in Figure 8

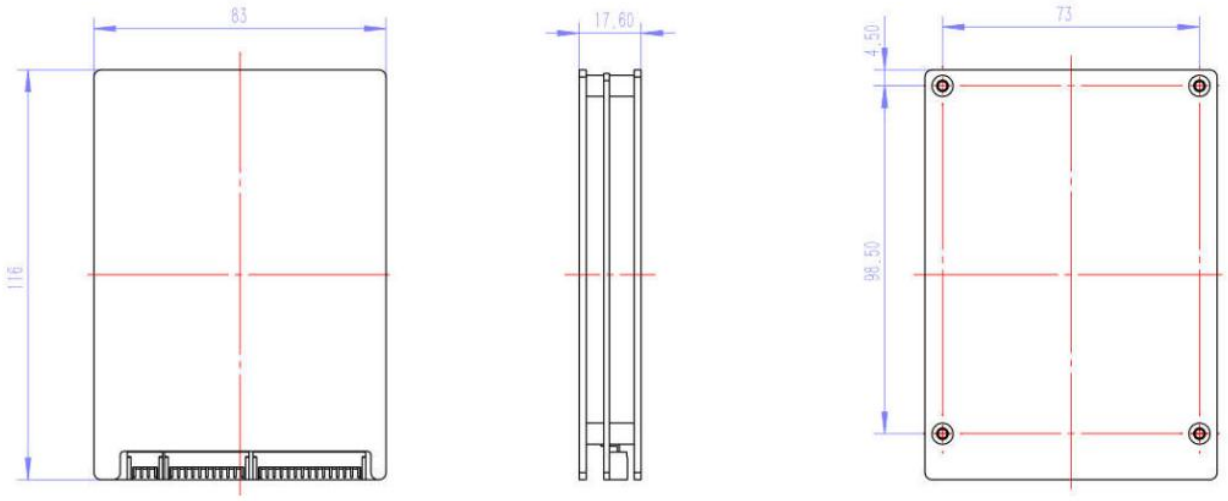


Figure 8

3.5. Weight

The weight of BD4AXXS -4P series BMS is about 257g.

The weight of BD6AXXS -6P and BD6AXXS -8P series BMS is about 387g.

The weight of BD6AXXS -10P and BD6AXXS -12P series BMS is about 530g.

The weight of B1AXXS-15P/B2AXXS-15P/B2AXXS-20P series BMS is about 630g.

4. **Installation method and precautions**

4.1. Out-of-box check and precautions

The following are the out-of-box checks and precautions:

A) The boxes, BMSs, etc. need to be handled gently and lightly, and should not be upside down as much as possible.
B)Before opening the box, pay attention to the integrity of the package,
such as whether there are any impact marks, whether there are any
breakage, etc.

4.2. Line connection

JK-BD6AxxS-10P、BD6AxxS-12P、 B1AxxS-15P、B2AxxS-15P、B2AxxS-20P 保护板

For lithium-ion battery packs with 7-24 series of cells, the connection methods for different number of cells are different. The specific connection methods are shown in the following figure. Attention: Always attach sense/balancing wire to the Positive side of the cells,

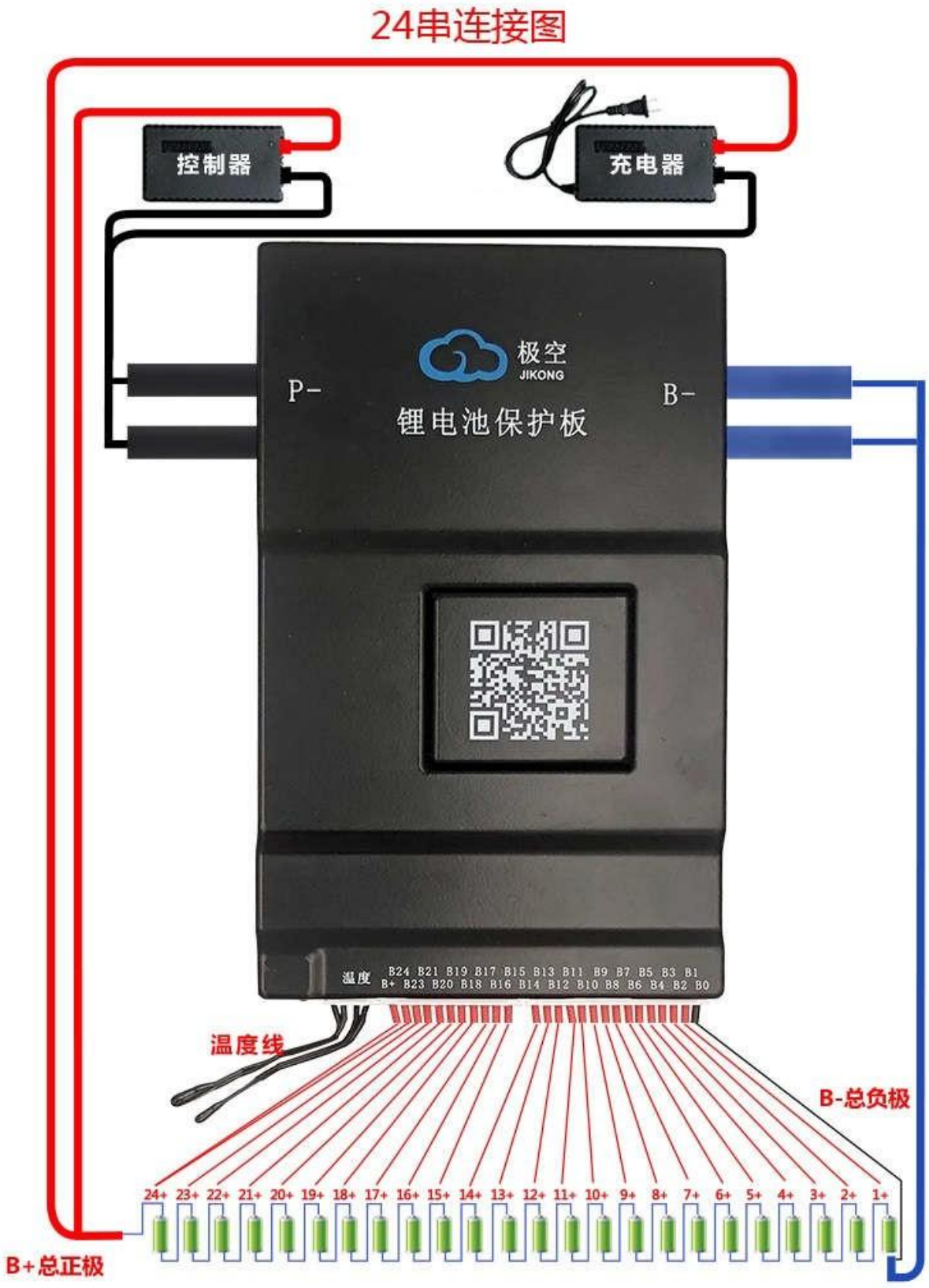


Figure 9 Diagram of 24 series battery connection

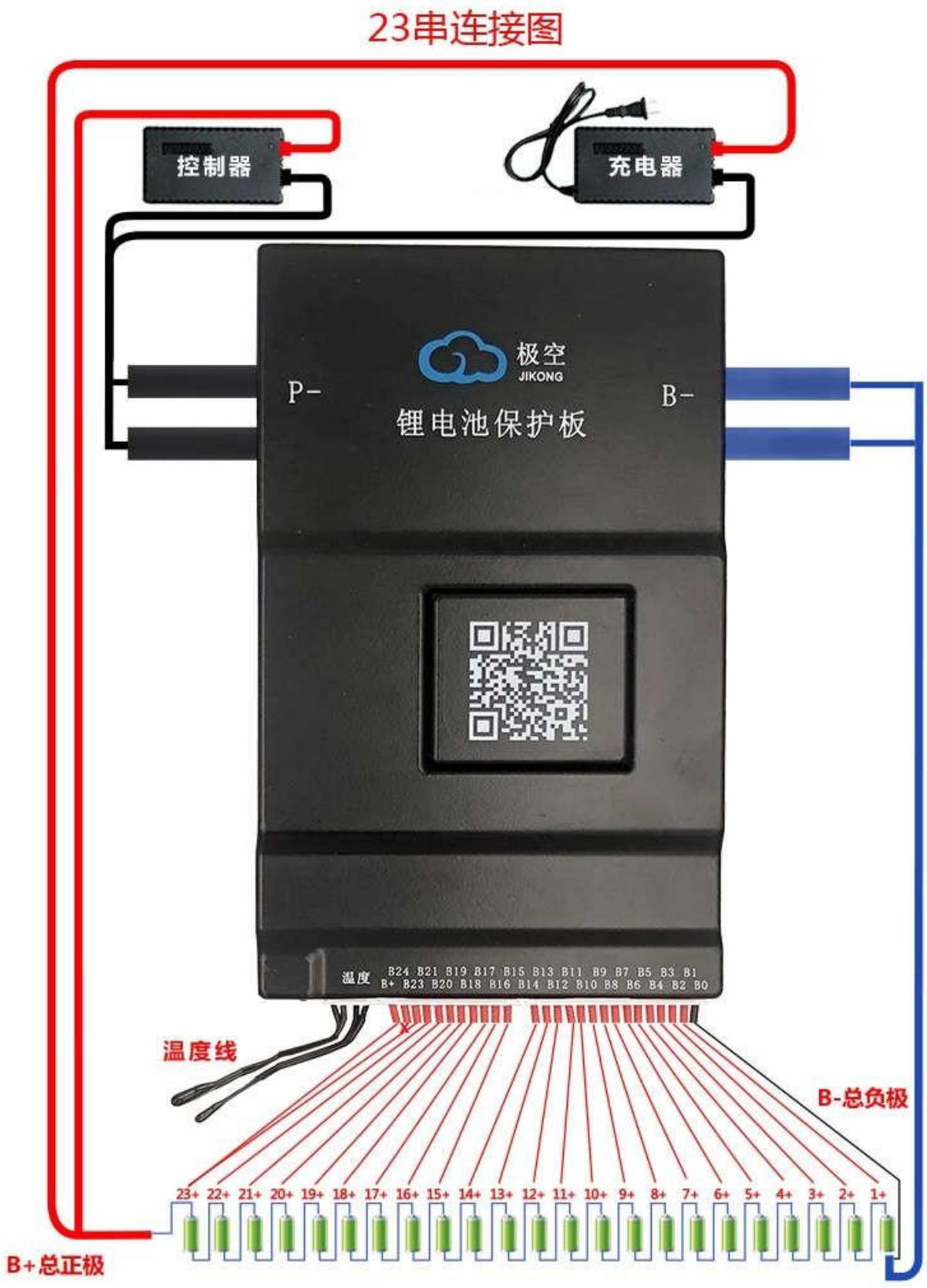


Figure 10 Diagram of 23 series battery connection

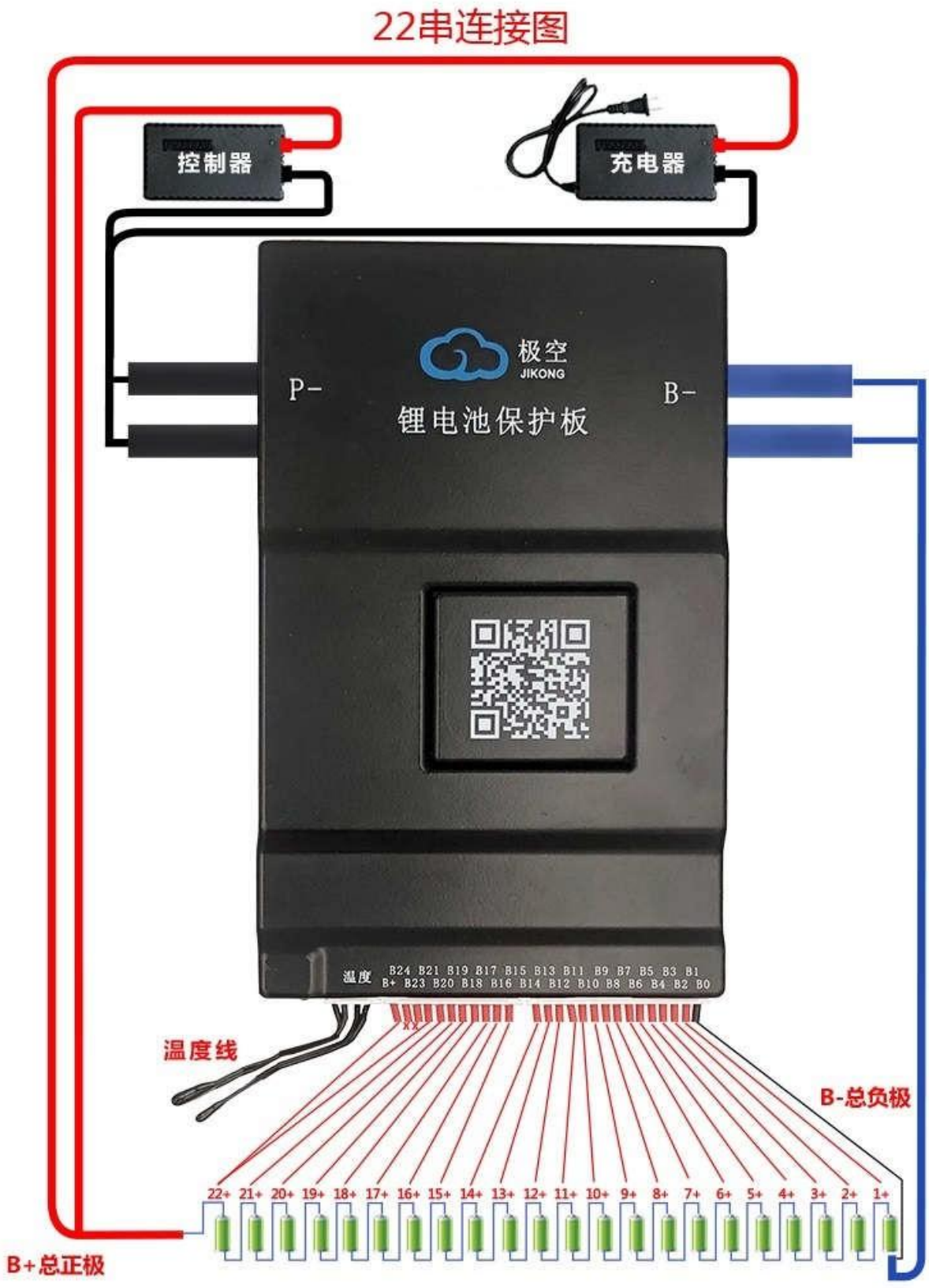


Figure 11 Diagram of 22 series battery connection

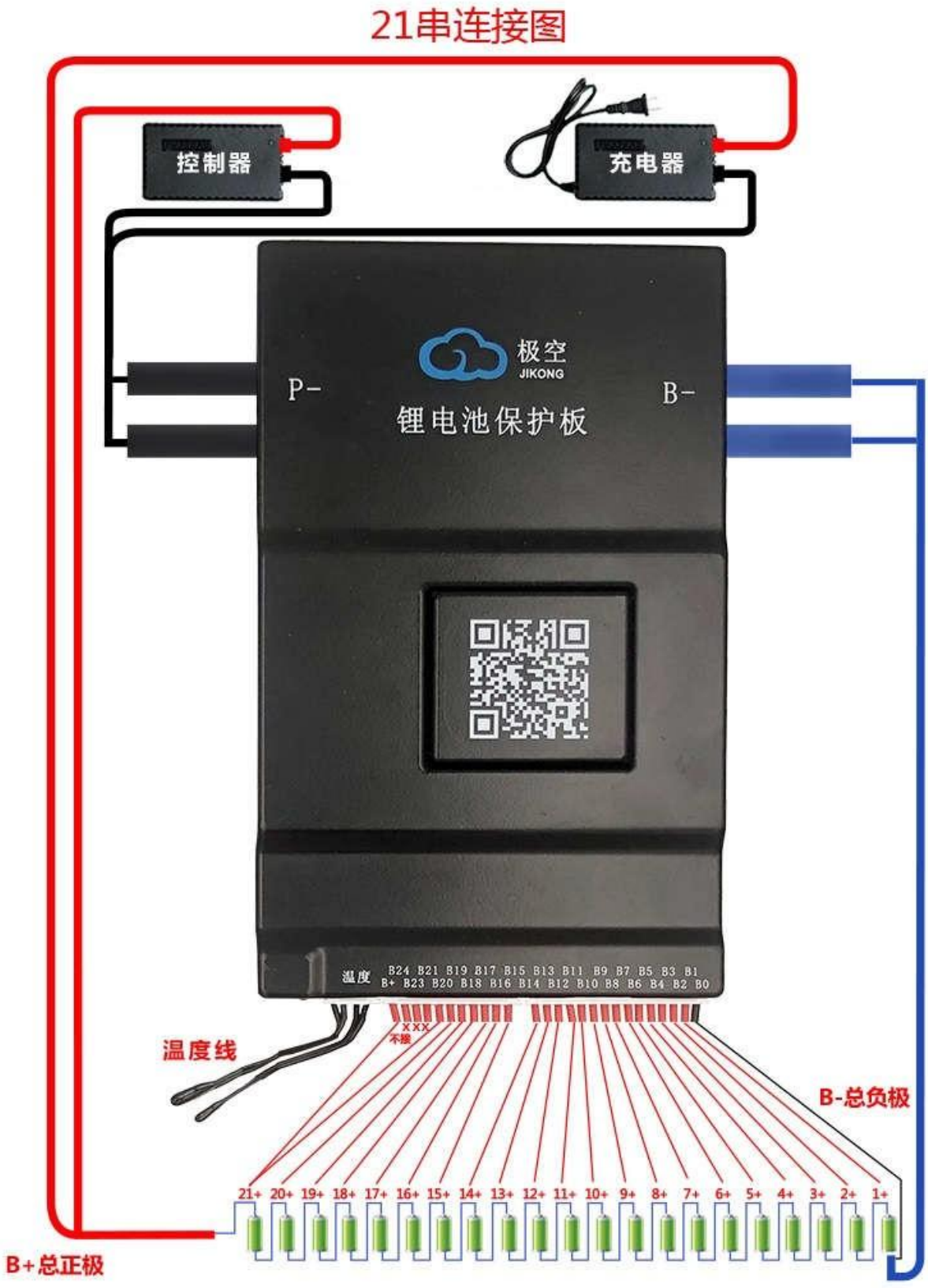


Figure 12 Diagram of 21 series battery connection

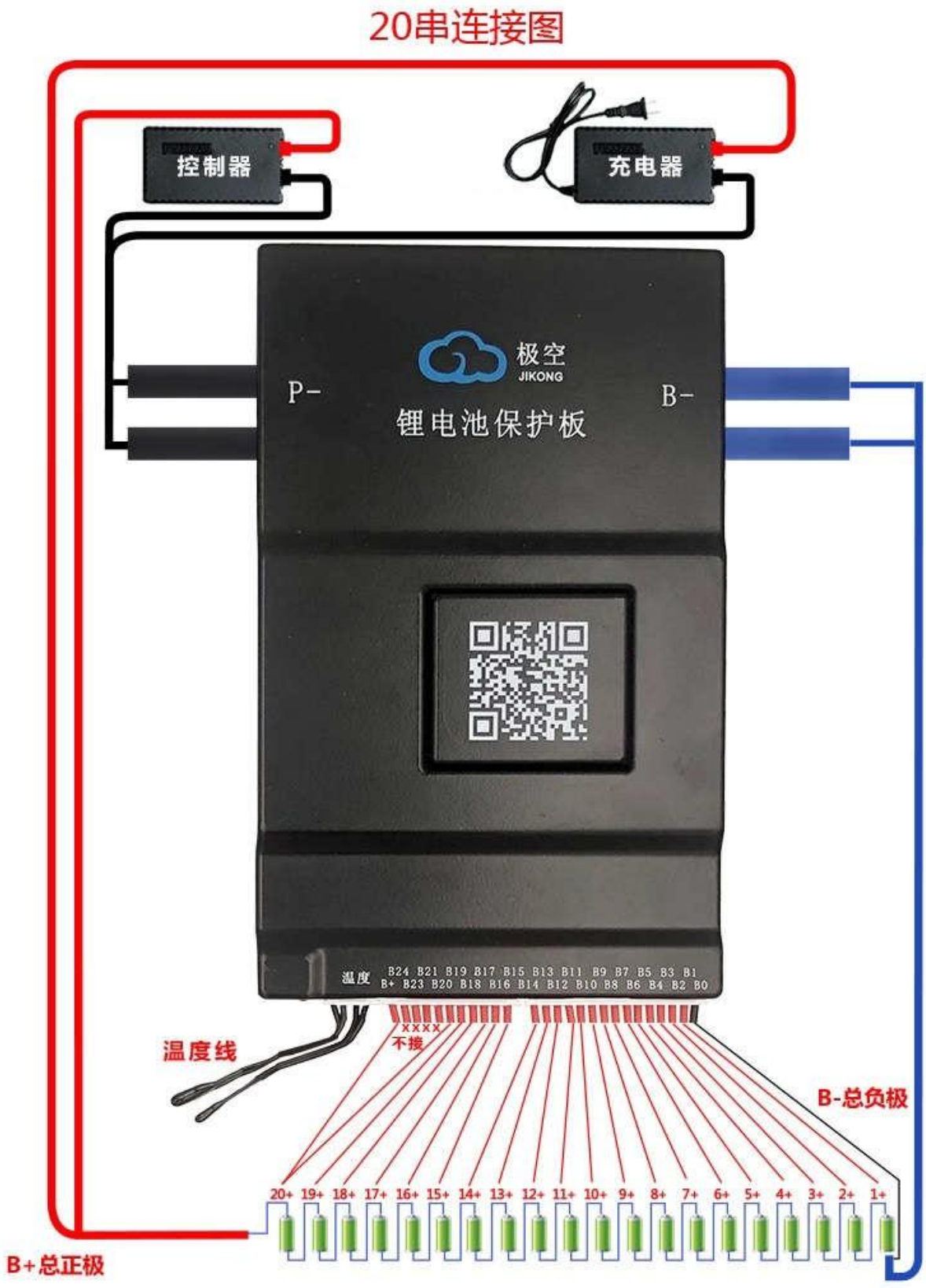


Figure 13 Diagram of 20 series battery connection

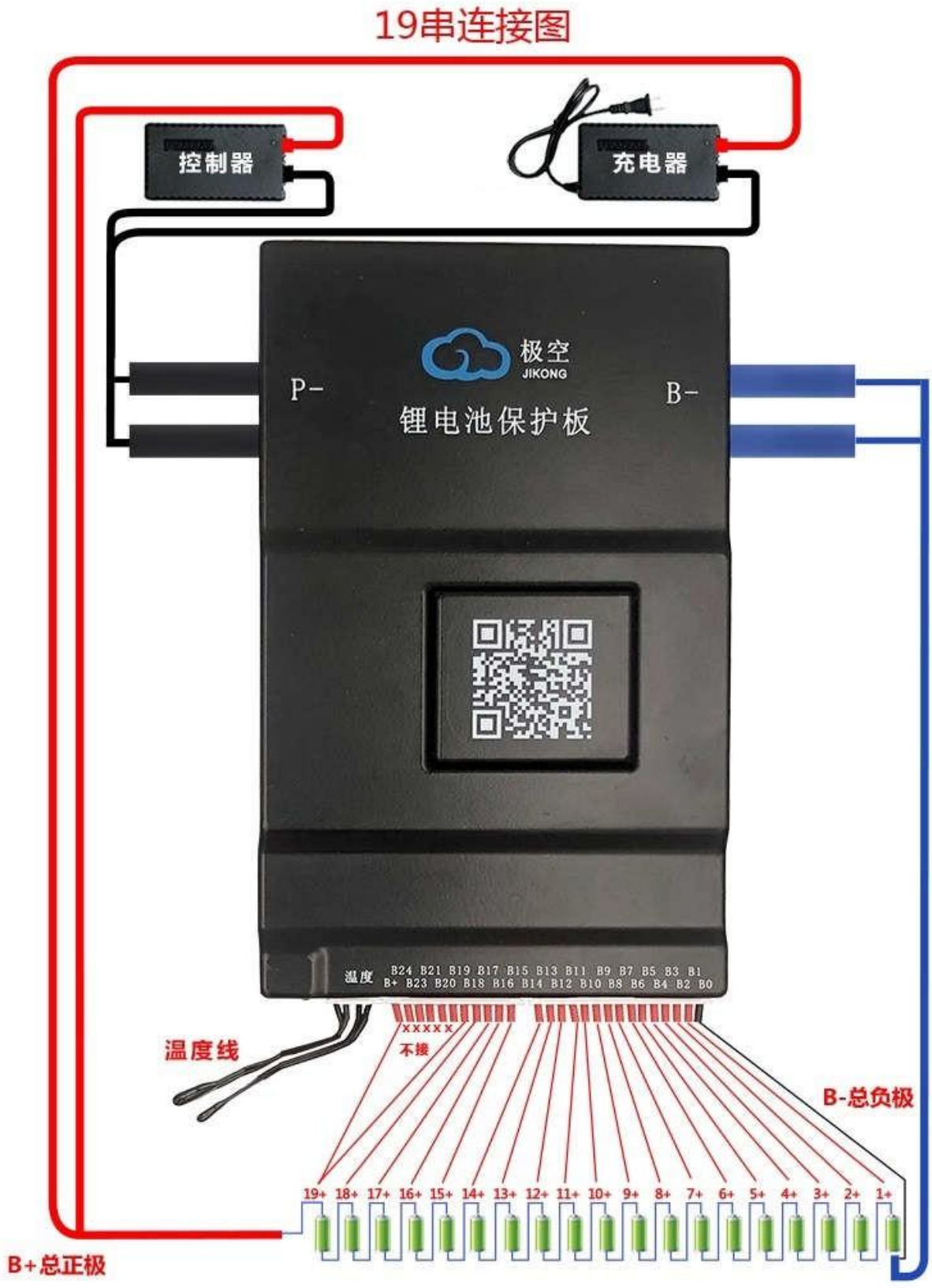


Figure 14 Diagram of 19 series battery connection

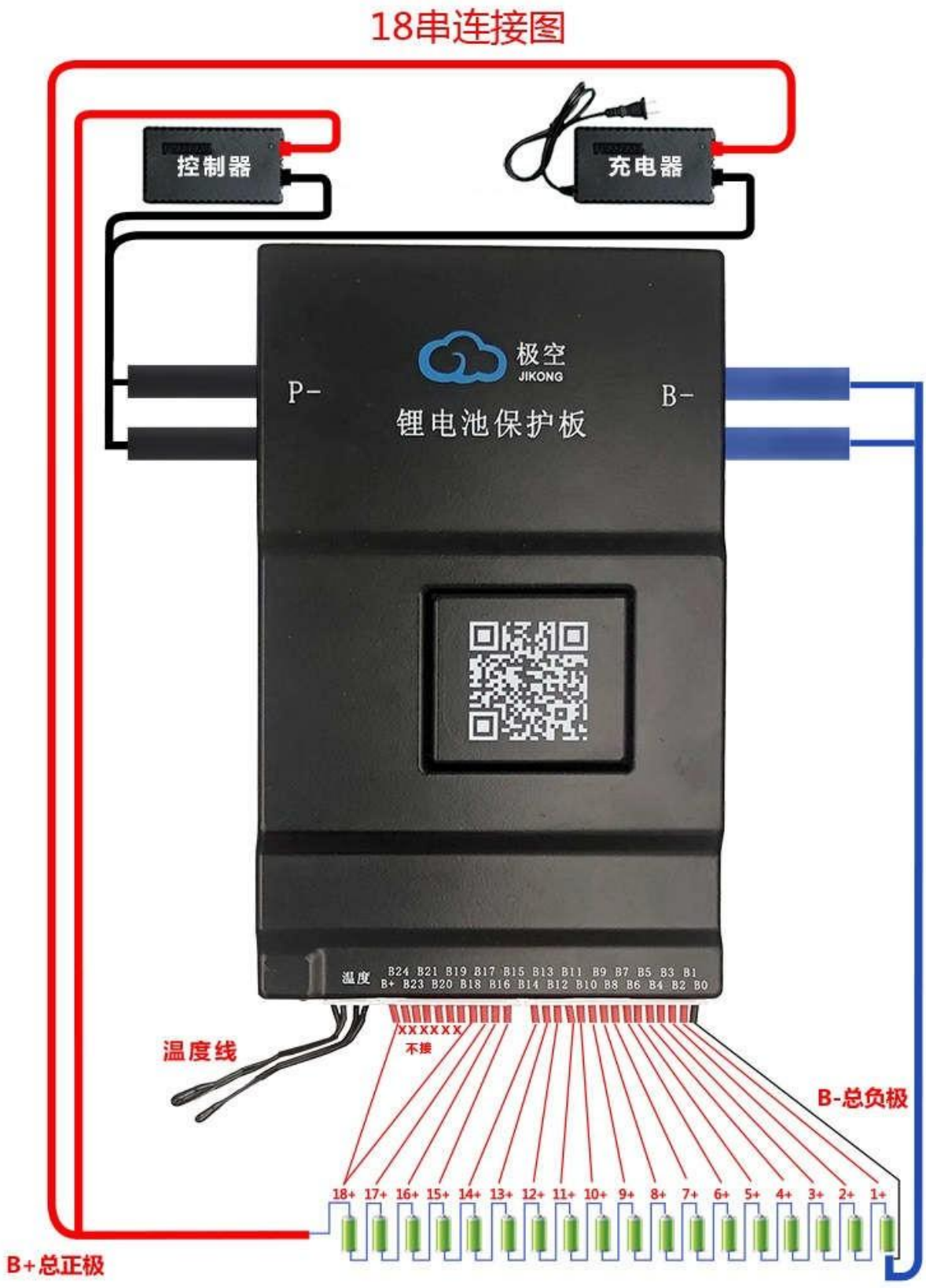


Figure 16 Diagram of 18 series battery connection

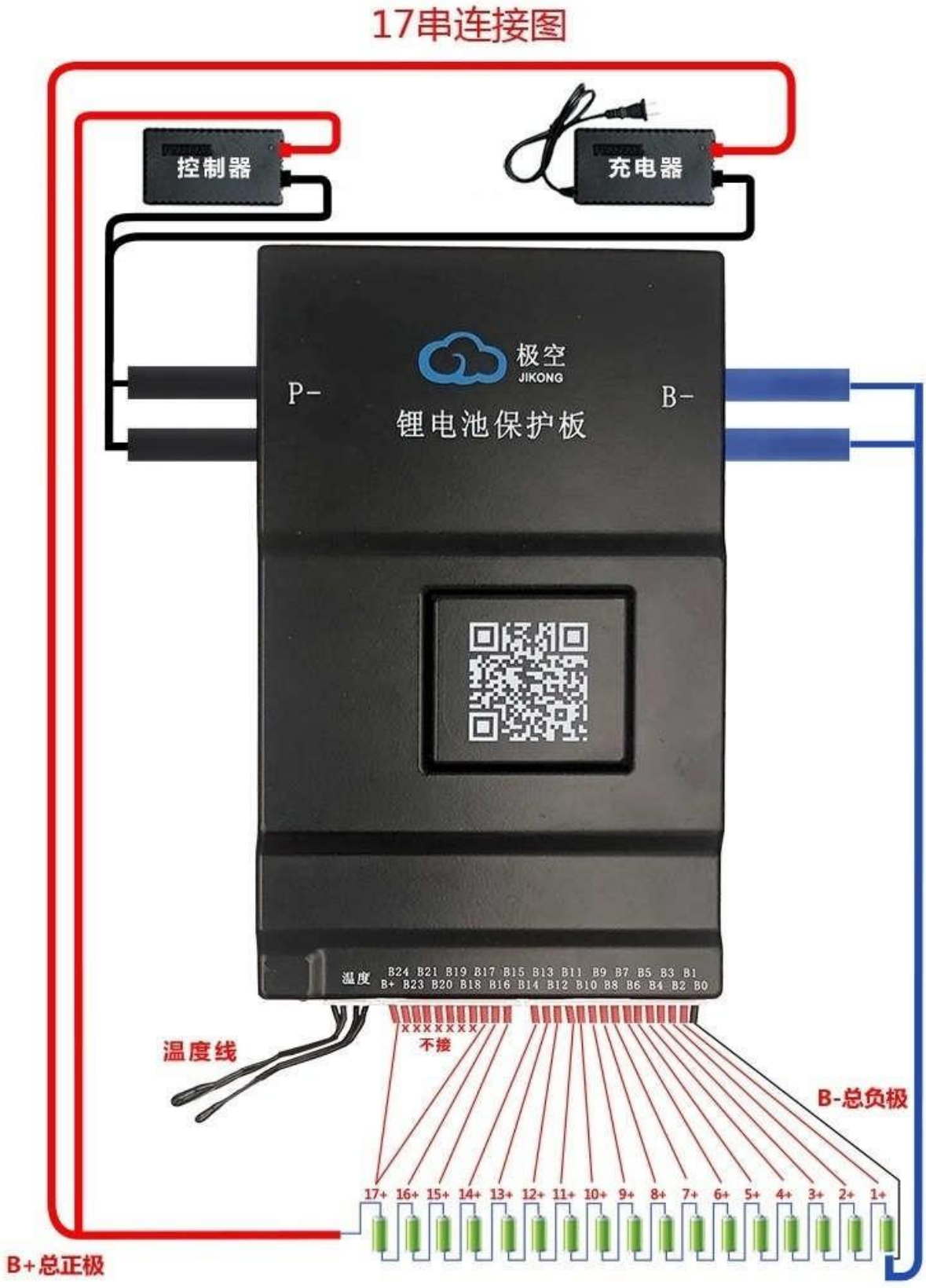


Figure 16 Diagram of 17 series battery connection

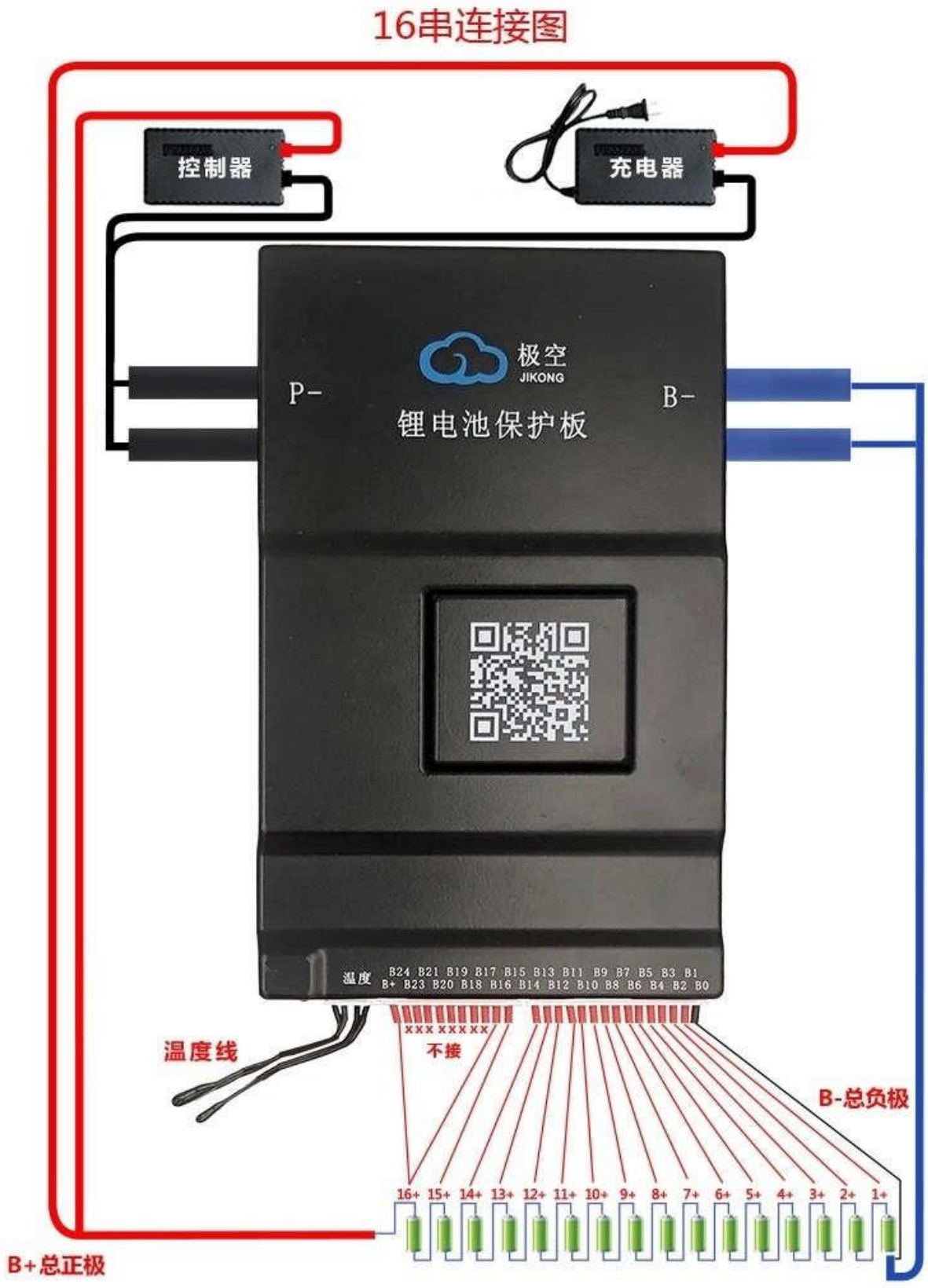


Figure 17 Diagram of 16 series battery connection

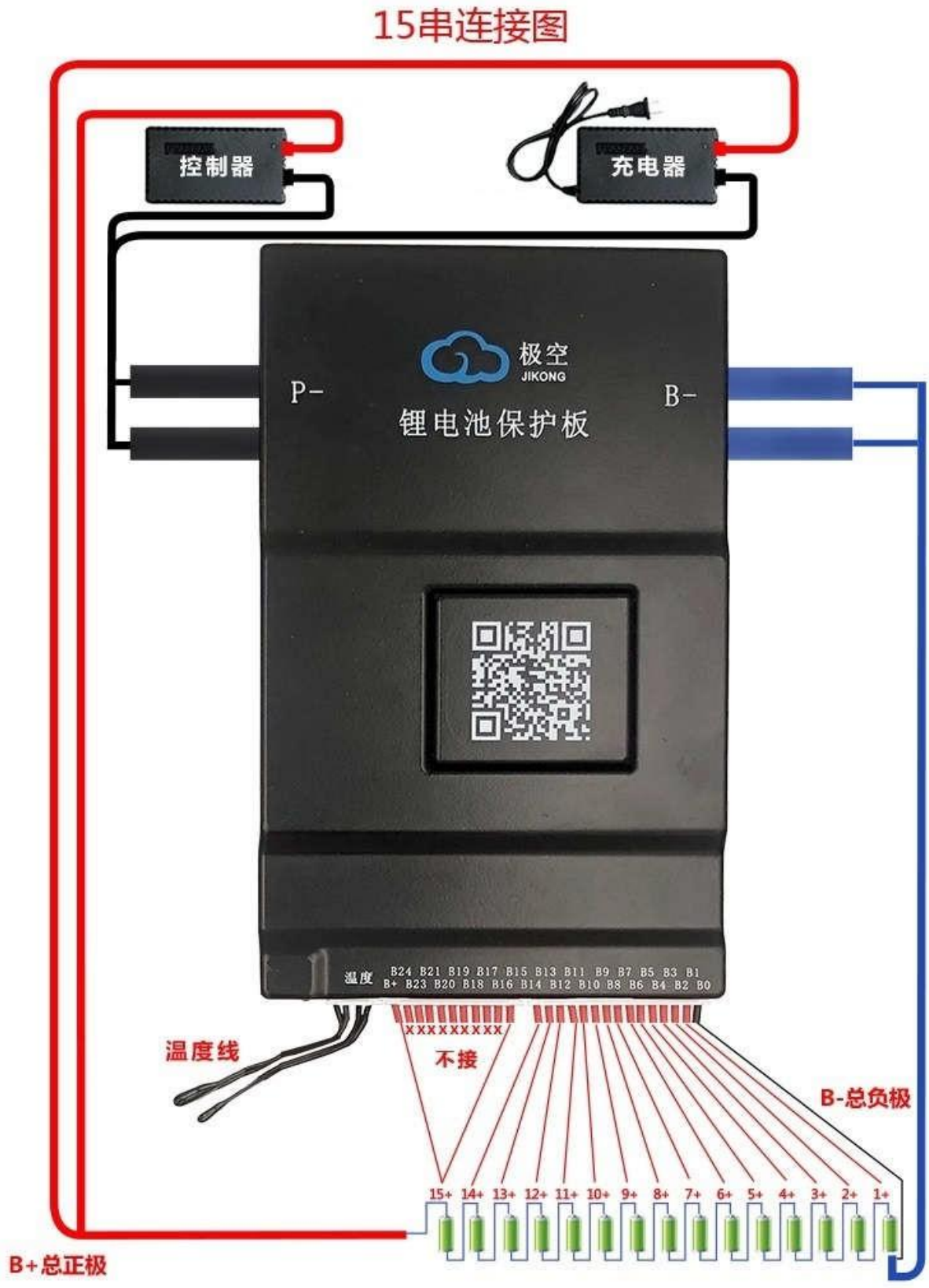


Figure 18 Diagram of 15 series battery connection

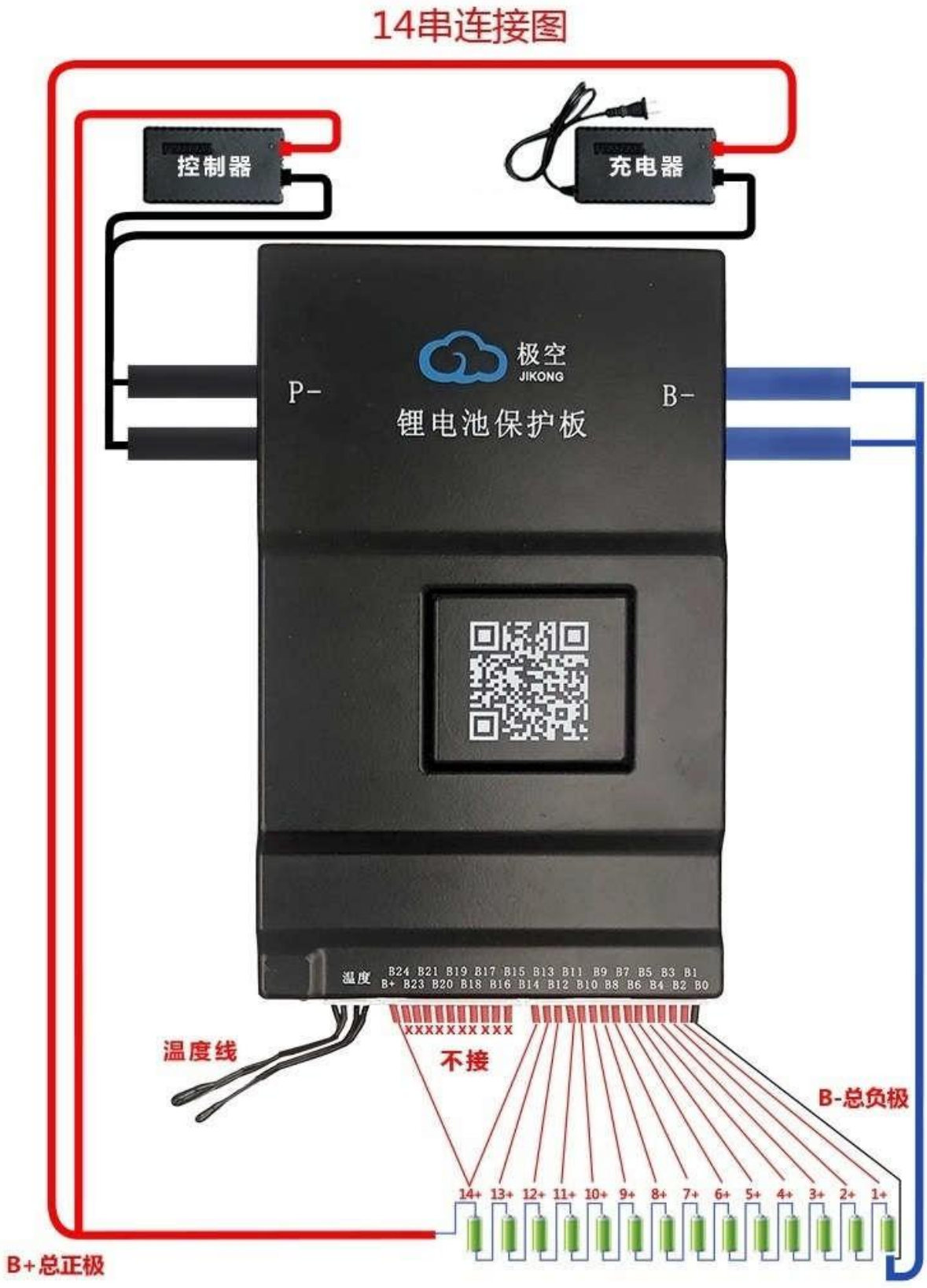


Figure 19 Diagram of 17 series battery connection

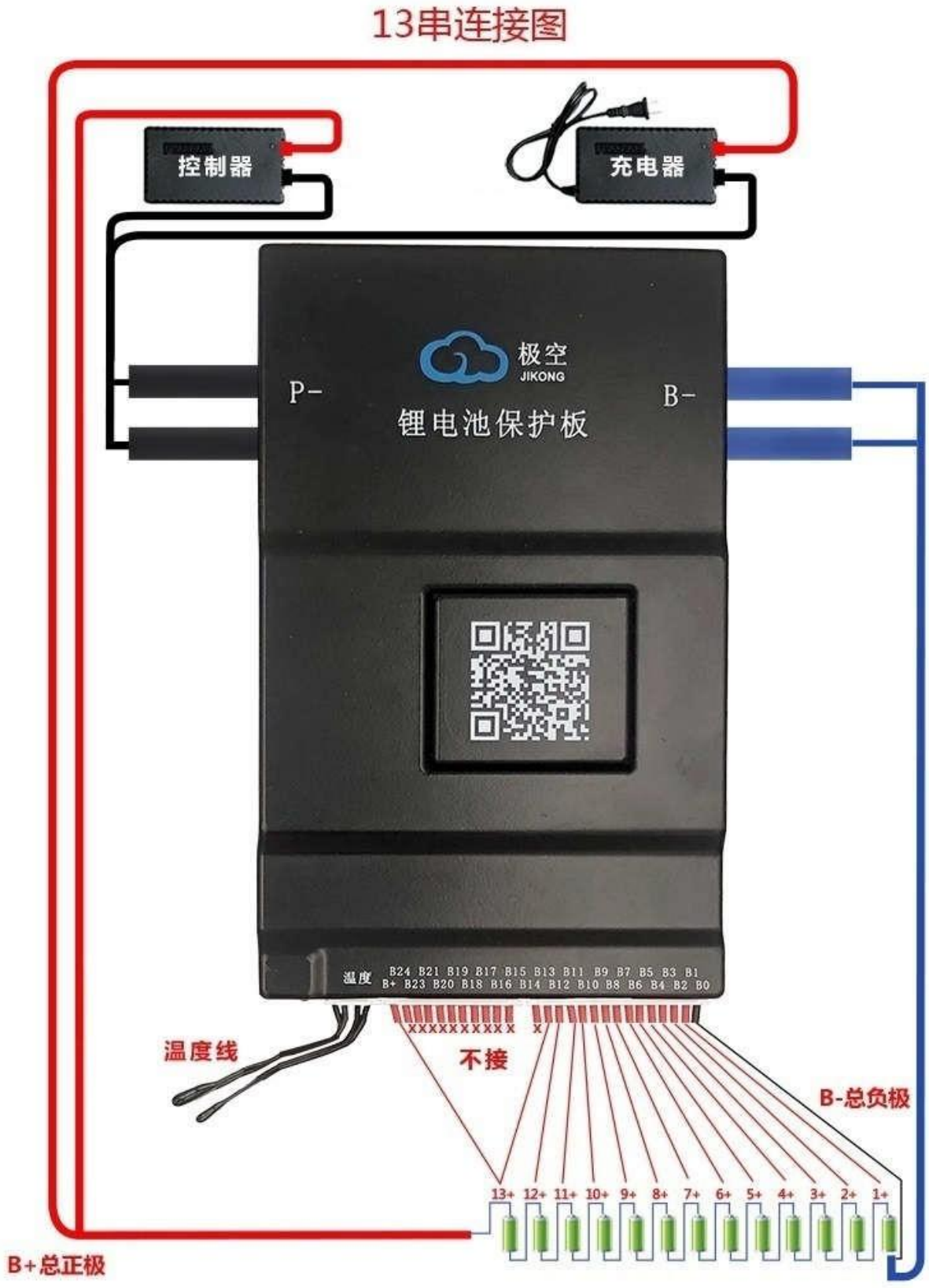


Figure 20 Diagram of 13 series battery connection

The JK-BD6AxxxS-6P, JK-BD6AxxxS-8P BMS' are suitable for lithium battery packs with 7-24 series of cells. The connection methods of the battery packs with different number of cells are different. The specific connection methods are shown in the following figure. Attention: Always attach sense/balancing wire to the Positive side of the cells,

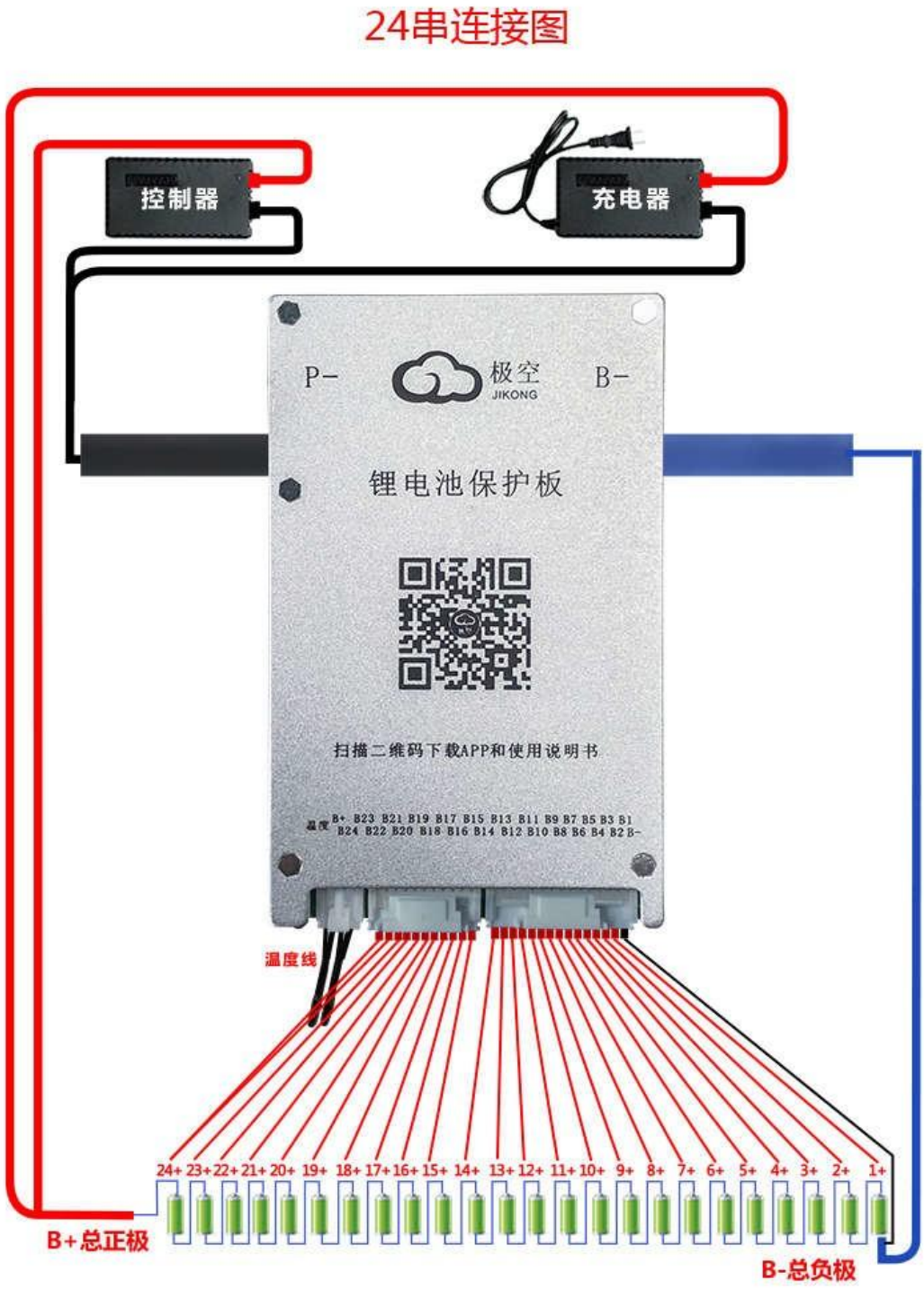


Figure 21 Diagram of 24-series battery connection

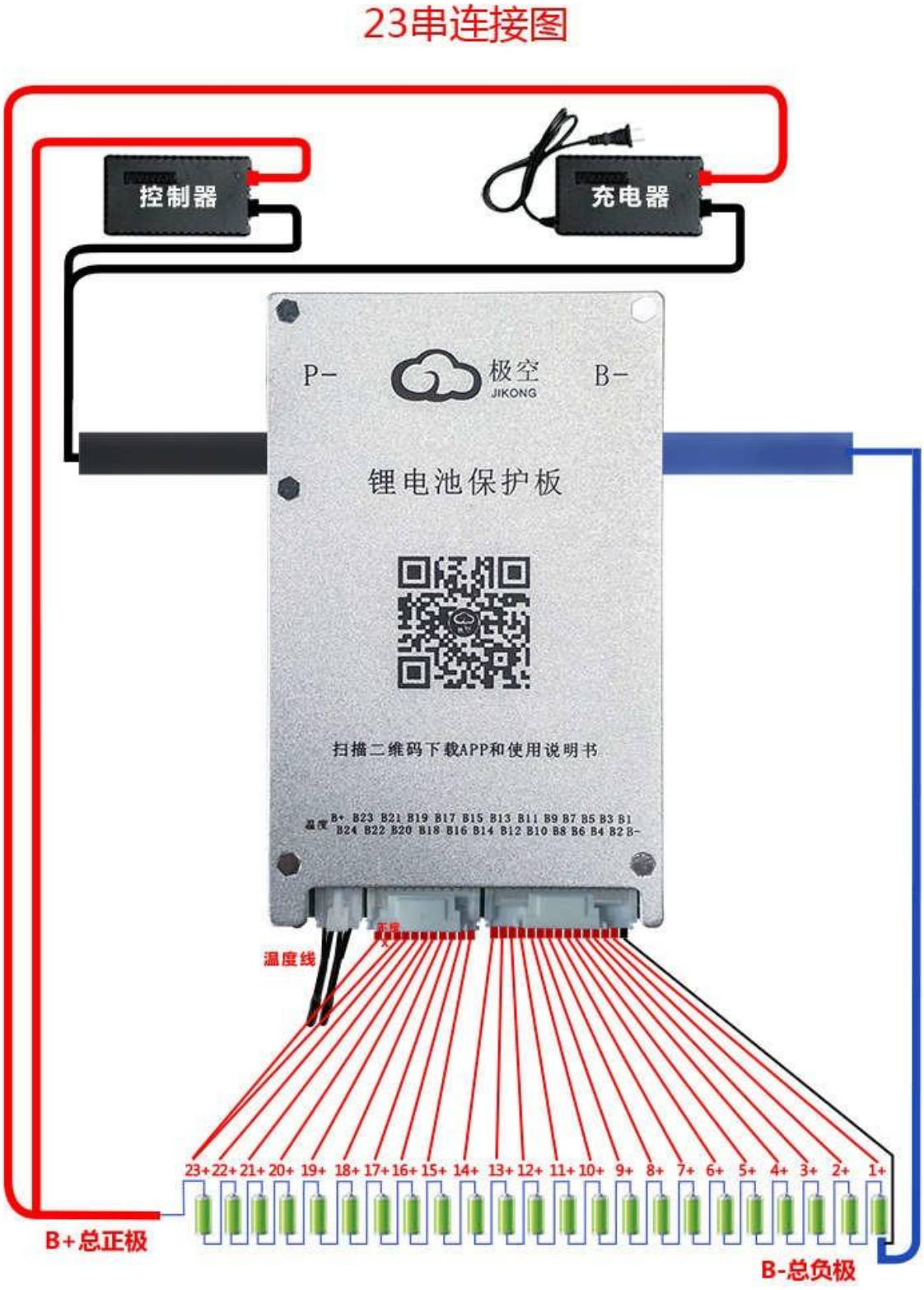


Figure 22 Diagram of 23-series battery connection

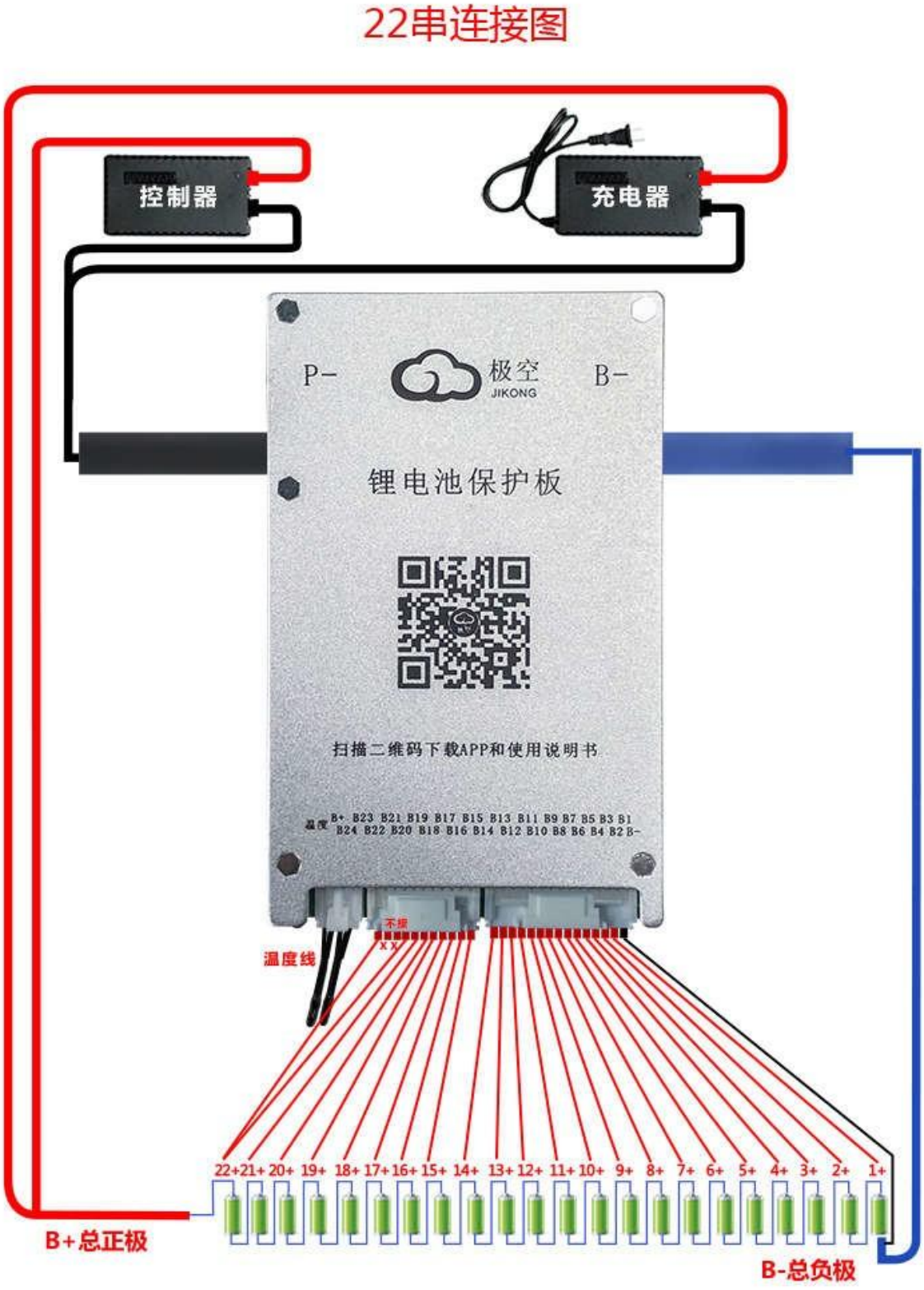


Figure 23 Diagram of 22-series battery connection

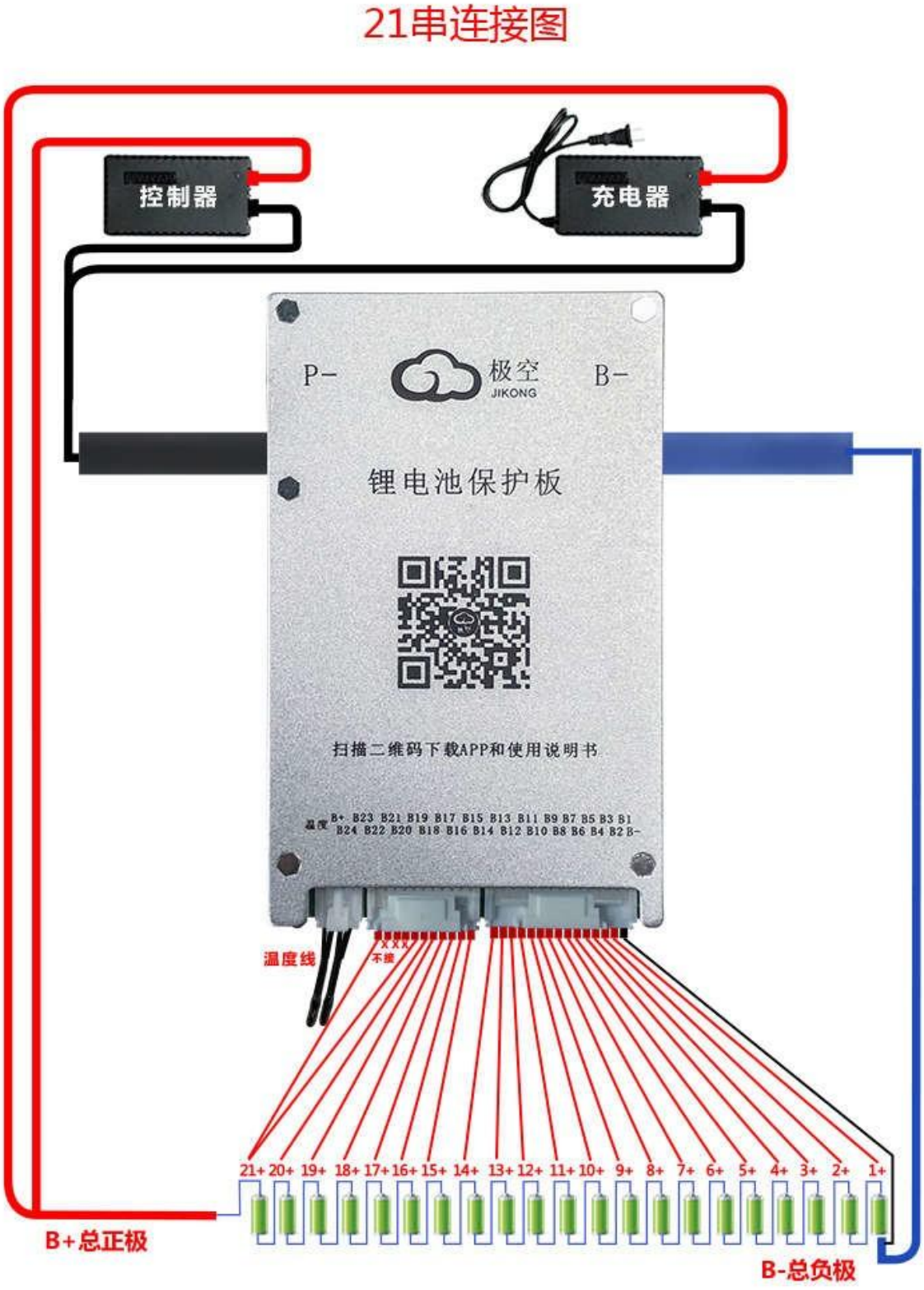


Figure 24 Diagram of 21-series battery connection

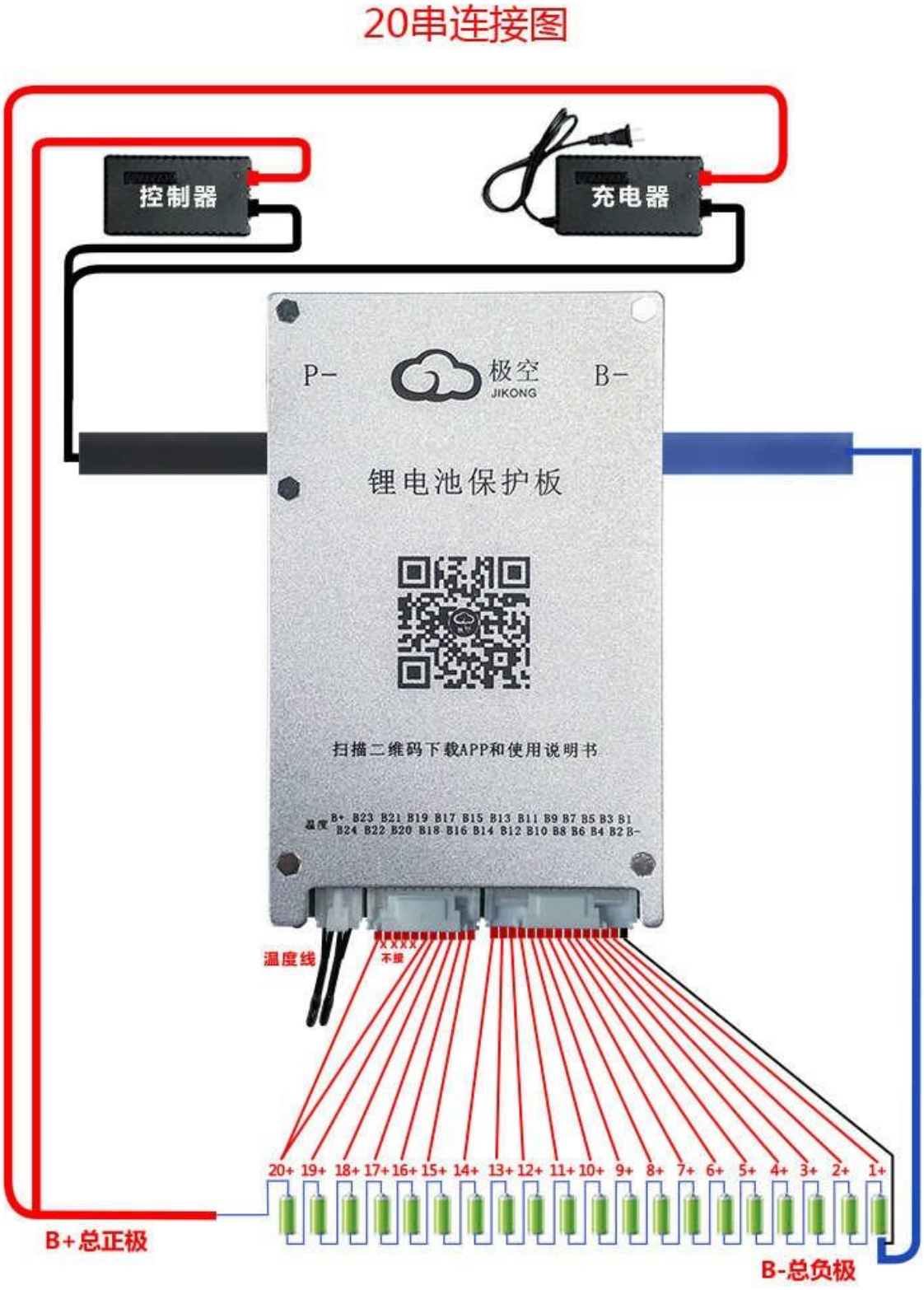


Figure 25 Diagram of 20-series battery connection

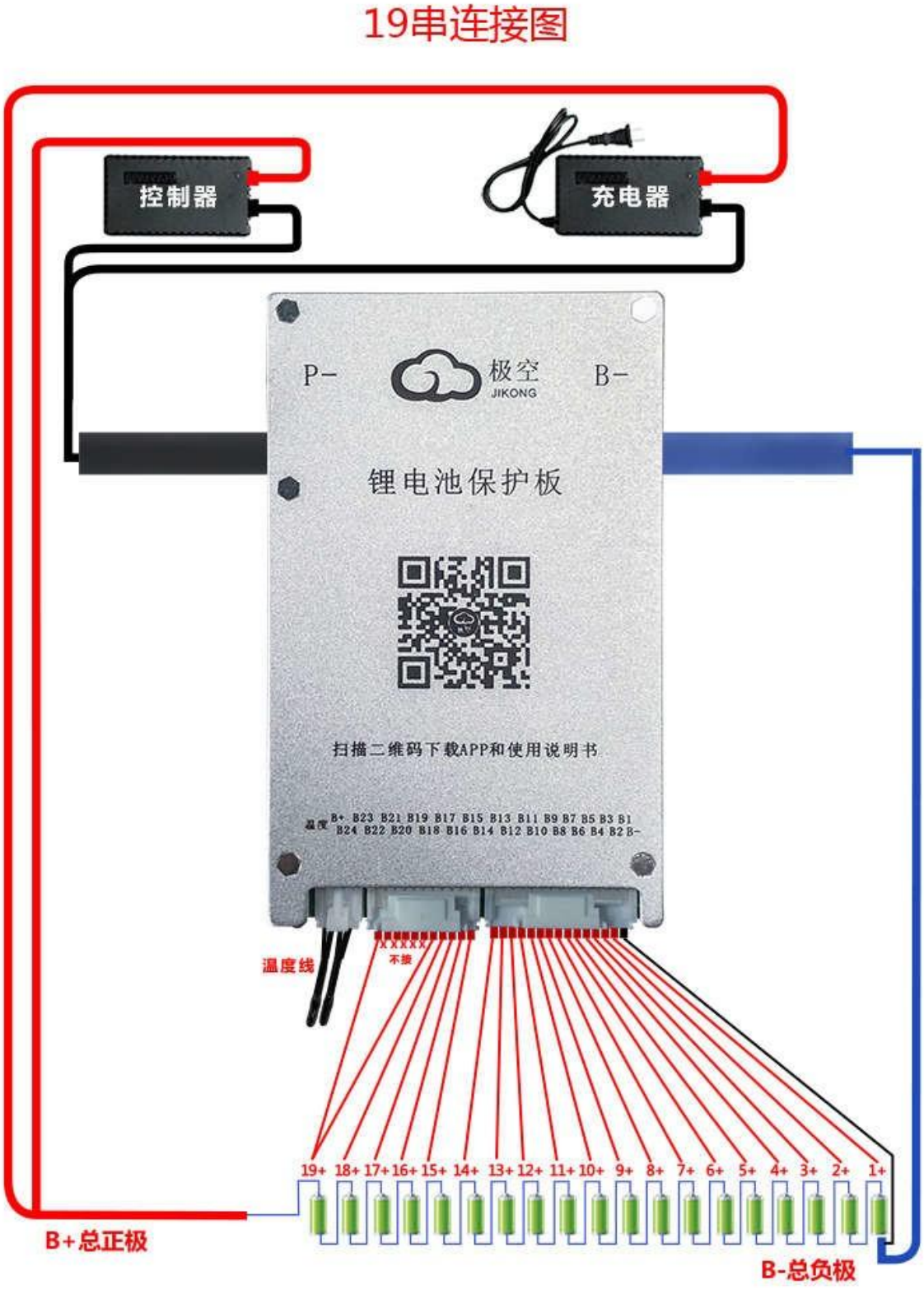


Figure 26 Diagram of 19-series battery connection

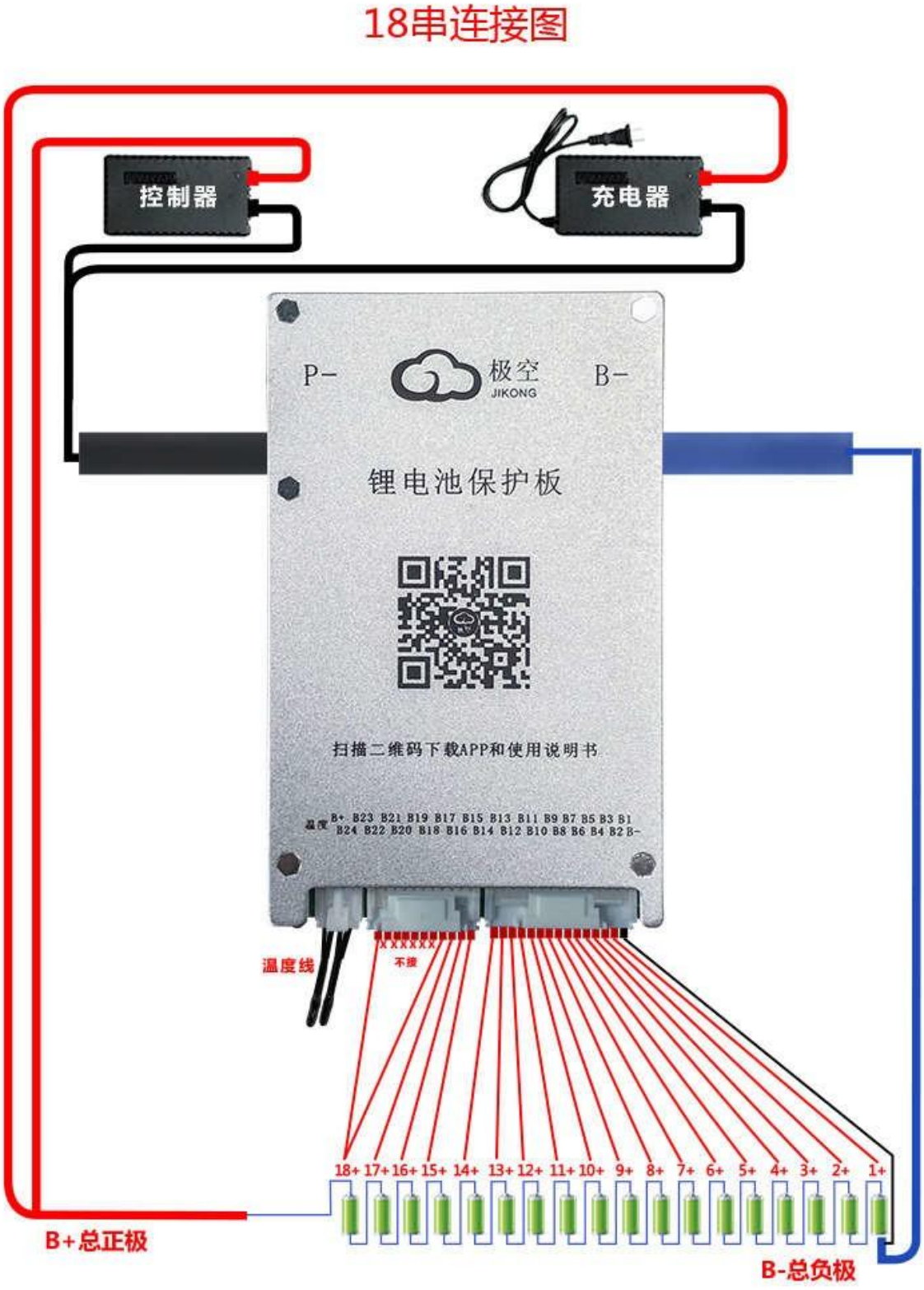


Figure 27 Diagram of -18-series battery connection

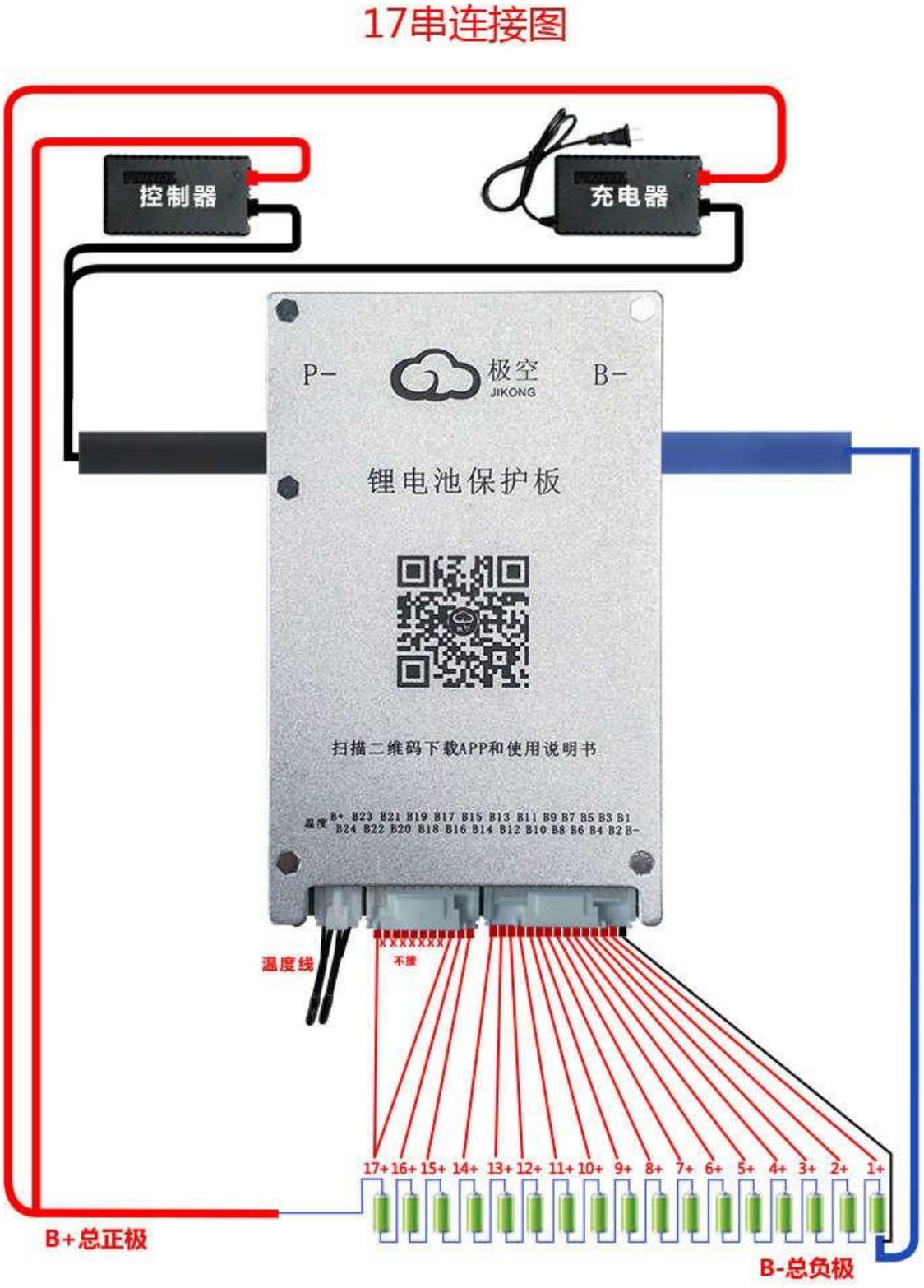


Figure 28 Diagram of 17-series battery connection

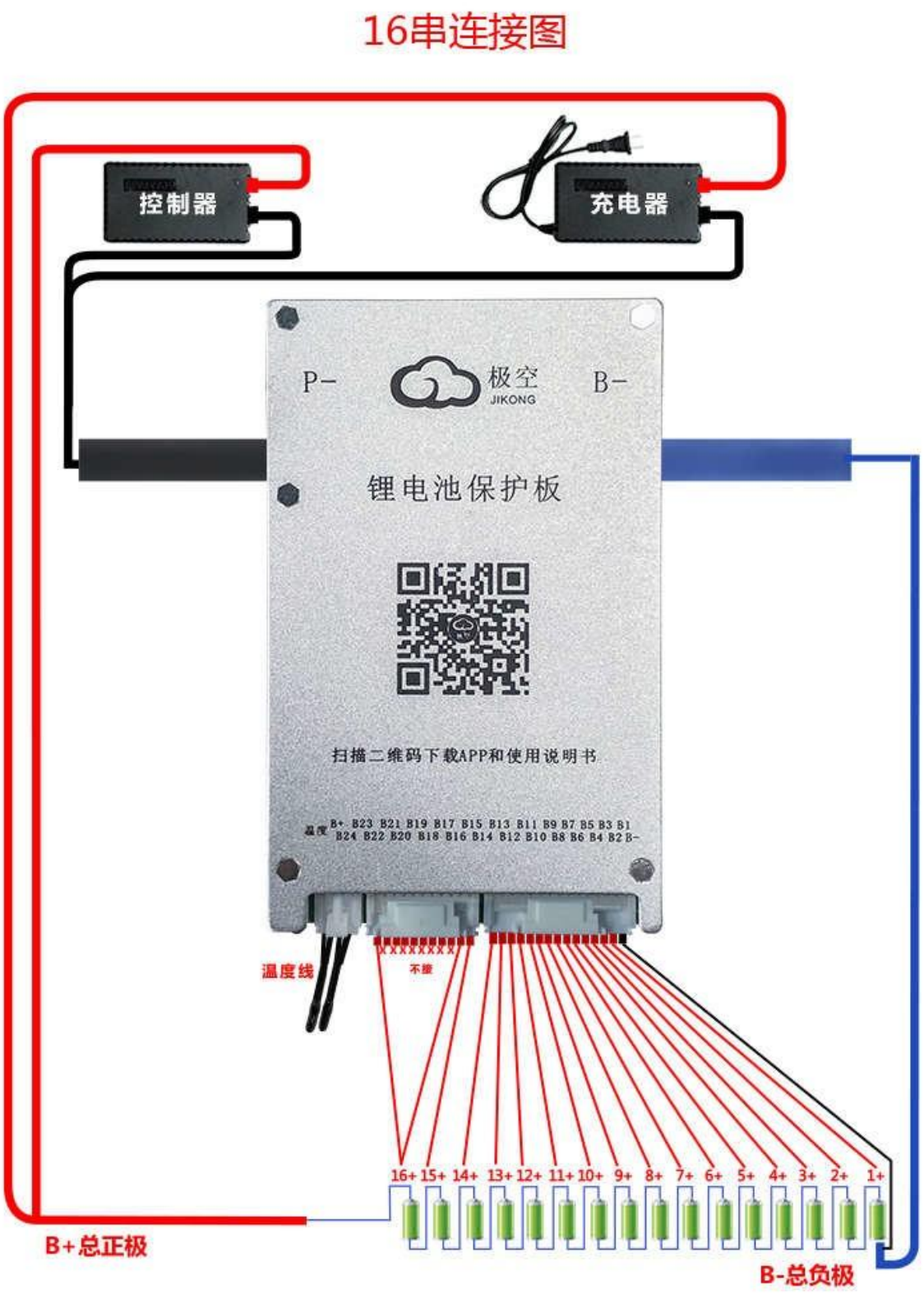


Figure 29 Diagram of 16-series battery connection

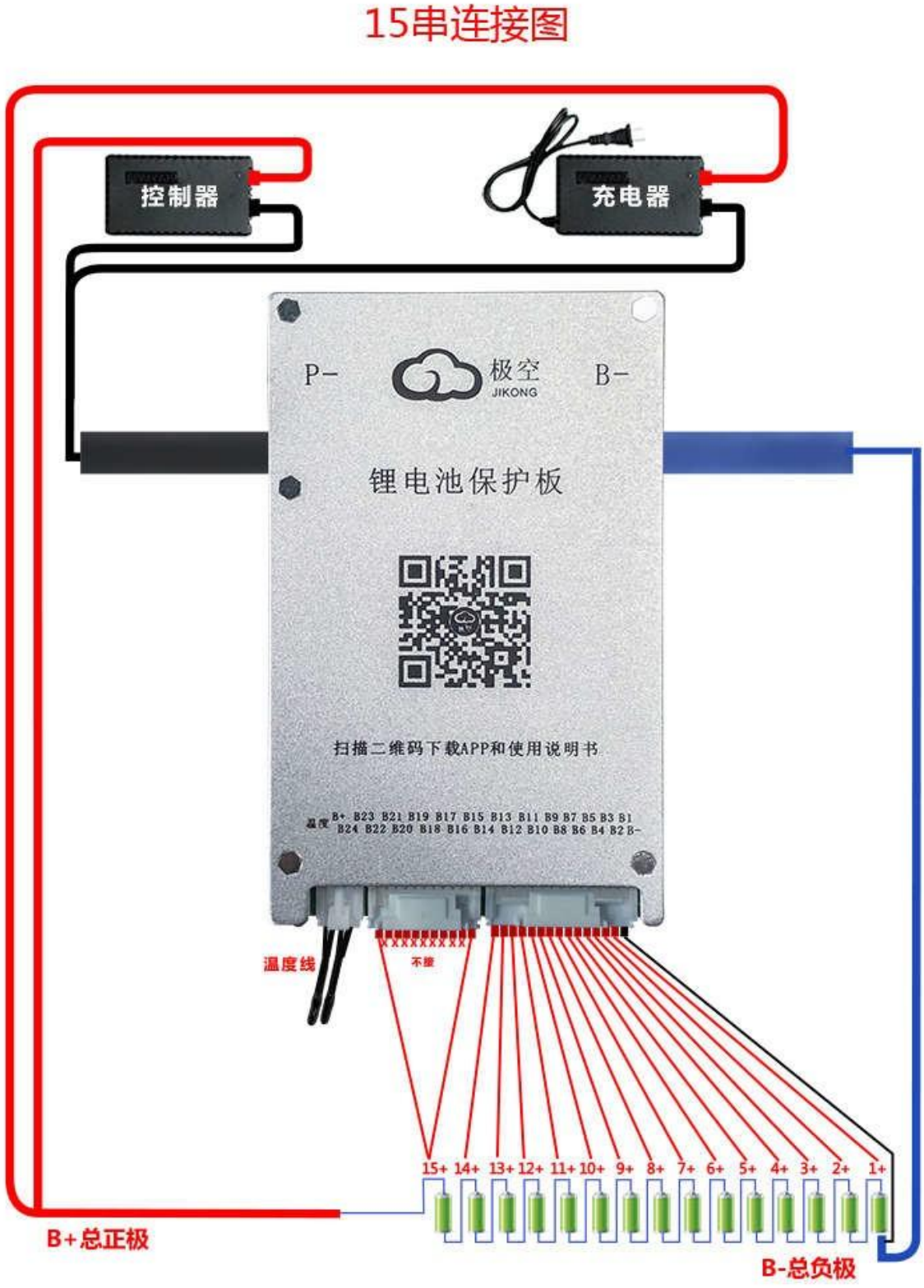


Figure 30 Diagram of 15-series battery connection

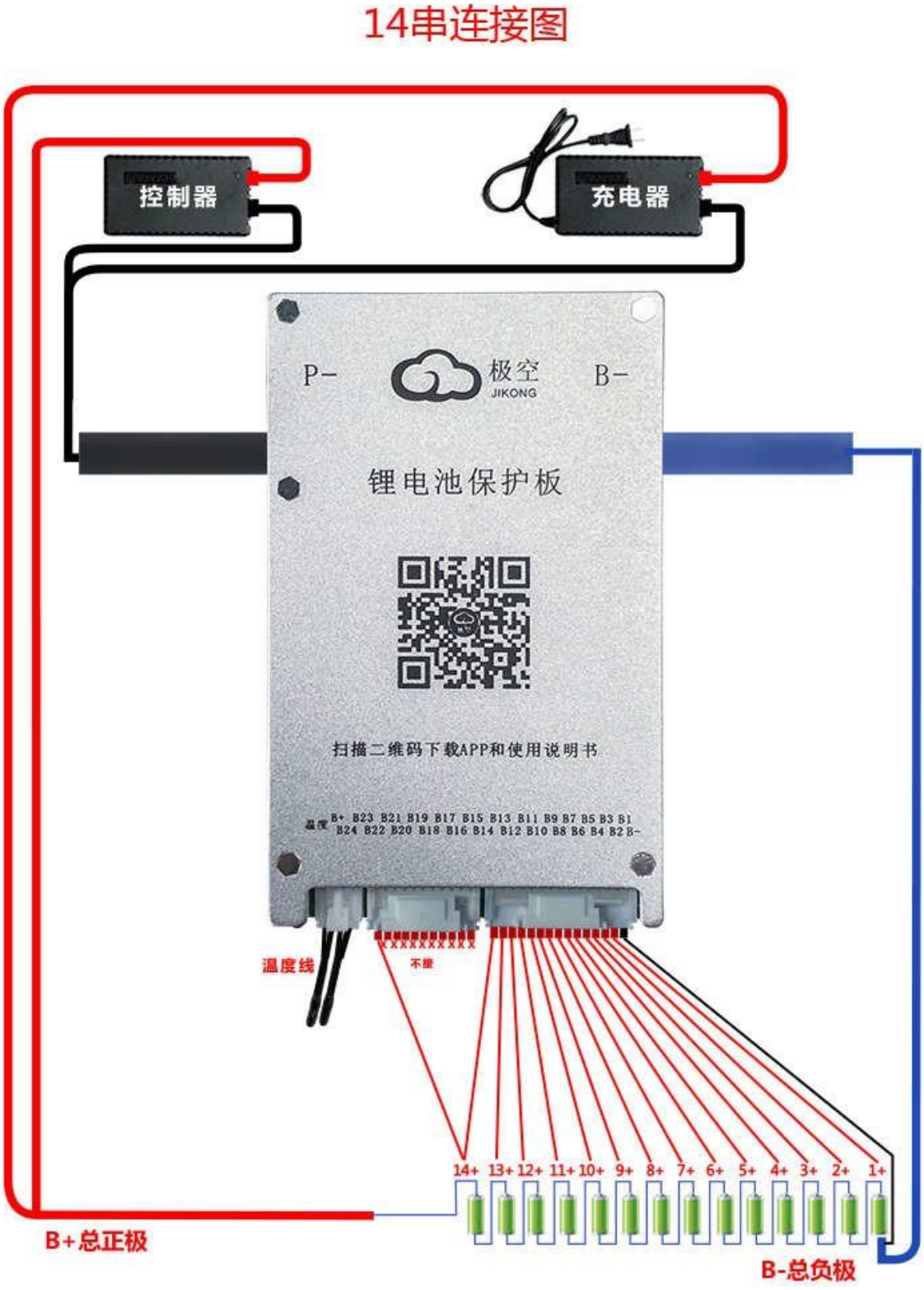


Figure 31 Diagram of 14-Series battery connection

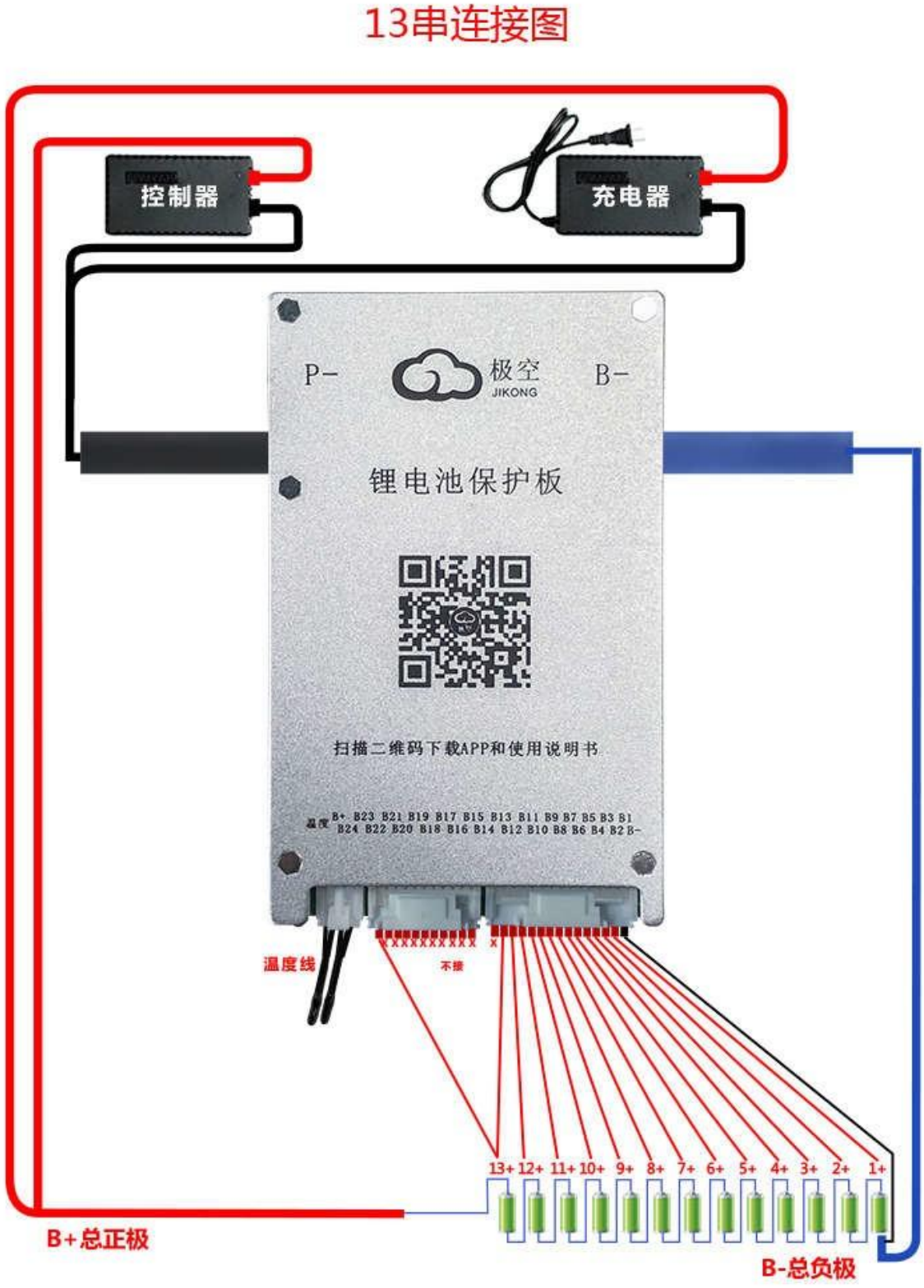


Figure 32 Diagram of 13-series battery connection

4.3. APP Installation

Mobile APP matching the product can be obtained by scanning the QR code shown in Figure 31. Android Version 7 minimum is required for the Android APP.

Figure 33 Mobile APP Link QR Code

5. Use and operation

5.1. Prepare and check before use

Before turning on the BMS, make sure that the sense/balancing lines is connected properly again, "P-/C-" (1st Cell Negative) and "B-" (B- Negative out from the BMS) are connected correctly. Check if the BMS is securely fixed to the Cells, and make sure it is correct before it can be connected to the BMS. Otherwise, it may cause serious consequences such as abnormal operation or even failure.

5.2. BMS works electrically

After confirming that the above conditions are correct, the BMS can be powered up. The BMS has no power-on control switch and is designed for charging activation mode (charger voltage is 5V higher than battery voltage), that is, after the battery is assembled, you need to connect the charger to make the BMS work. You can also activate the BMS using the new LCD screens or Switches that come with the BMS. Another method (without switches or LCD screen) prior to connecting the assembled battery to the system is to Connect the Positive side of the 9 volt (max) to the Negative end of the cells, the B- lead of the BMS. Then connect the Negative side of the 9 volt battery to the C-/P- lead of the BMS for one second or until you hear a Beep. It is very fast)

5.3. App operating instructions

5.3.1. Equipment operation

5.3.1.1. Device connection

First turn on the Bluetooth of the mobile phone, and then turn on the app, the app requires access to location, as shown in Figure 32. Click the icon in the upper left corner to scan the device. After the scanning is completed, click the name of the device to be connected, such as "jk-b1a24s". During the first connection, the app will prompt you to enter a password. The default password of the device is **"1234".** After the device is connected, the app will automatically record the password. The next connection does not need to enter a password. After the app is opened, it will automatically connect. The default BMS Password is "**1234".** The default BMS Password for Internal Configuration is "**123456**". The password input interface is shown in Figure 33.

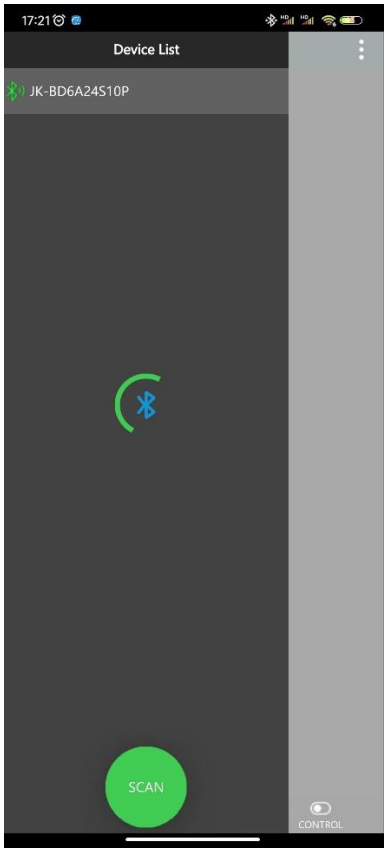


Figure 34 device scanning

Figure 35 Password input

5.3.1.2. Modify password and name

You can change the device name and password by clicking the Pen icon to the right of the device list after the device is connected. Modify the device name interface as shown in Figure 34. Note that the device name only supports English or numbers, not Chinese names and Chinese characters.

Modify the password interface as shown in Figure 35. To change the password of the device, you must first enter the old password of the device, and only if the current password is correct can you enter the option of entering a new password. After entering the new password twice, click OK to complete the device password change.

Figure 36 Name Modification

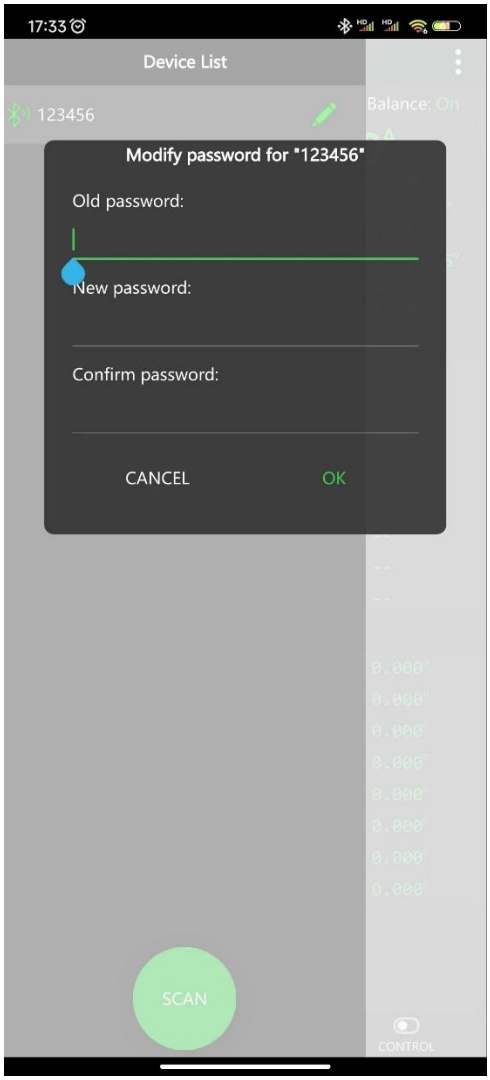
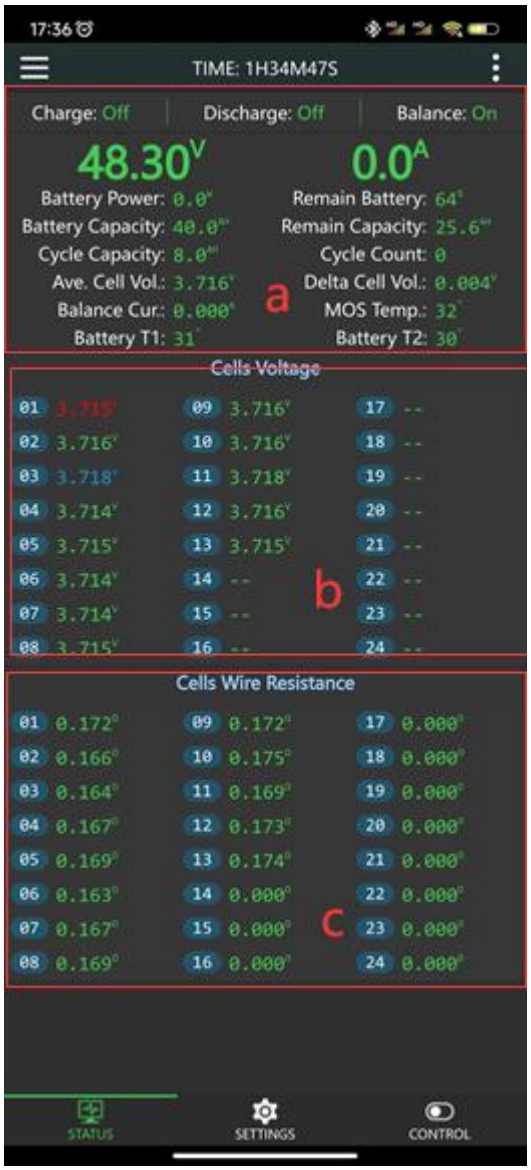


Figure 37 Password modification

5.3.1 Status View

The real-time status interface is shown in 38.



Real-time status display

Zone 1 in the picture is the battery comprehensive information bar. The parameters are defined as follows:

A) RUNTIME

Running time represents the total running time from the first start of the BMS to now.

B) CHARGE

Indicates the current switch state of the BMS charging MOS. When "On" is displayed, it indicates that the current BMS charging MOS is on and the battery is allowed to charge. When "Off" is displayed, it indicates that the current BMS charging MOS is off and the battery is not allowed to charge.

C) DISCHARGE

Indicates the current switch state of the BMS discharge MOS. When "On" is displayed, it indicates that the current BMS discharge MOS is on and the battery is allowed to discharge. When "Off" is displayed, it indicates that the current BMS discharge MOS is off and the battery is not allowed to discharge.

D) Balance

Equilibrium represents the switching state of the current BMS Active Balancing switch. When "On" is displayed, the BMS is automatically balancing when the balance trigger condition is reached; When "Off" is displayed, it means balancing is shutdown, and the BMS will not balance the battery.

E) Voltage

The voltage voltage region shows the total voltage of the current battery in real time. The total voltage is the sum of all the individual currents.

F) Current

The current area shows the total current of the current battery in real time. The current is positive when the battery is charging and negative when the battery is discharging

G) Power

Battery power represents the total power output or input of the current battery, which is the product of the absolute value of the current battery voltage and current.

H) Battery Capacity

Represents the actual battery capacity calculated by the current BMS with high precision SOC in AH. (This value needs the battery to do a full discharge and charge cycle before it can be updated).

I) Remaining capacity

Remaining capacity refers to the remaining capacity of the current battery, unit: ah.

J) cycle capacity

Cycle capacity cycle capacity refers to the cumulative discharge capacity of the battery, in AH units.

k) Number of cycles

The number of cycles indicates the number of charging saturation times of the current battery, unit: times

L) *Monomer average

Indicates the average voltage of the current battery, unit: v.

M) Maximum differential pressure

The maximum voltage difference indicates the difference between the highest cell voltage and the lowest cell voltage of the current whole battery, unit: v.

N) balancing current

When the BMS turns on the Active Balancing function and reaches the Active Balancing condition, the Active Balancing current display area displays the Active Balancing current in real time, unit: A.

When Active Balancing is in progress, the single voltage display area of the real-time state, with blue representing the highest voltage cell and red representing the lowest voltage cell.

Pool. Balanced negative current indicates that the battery is discharging, blue flashes, positive current of balanced current indicates that the battery is charging, and red flashes. The BMS uses active balancing technology. The principle of balancing is to take power from high voltage cells, store them in the BMS, and then release them to low voltage cells.

O) MOS

Real time display of current BMS power MOS temperature, unit: ℃

P) Battery temperature 1

"NA" is displayed when the temperature sensor 1 is not installed, and the temperature of the temperature sensor 1 is displayed in real time when the temperature sensor is installed in units of:. C.

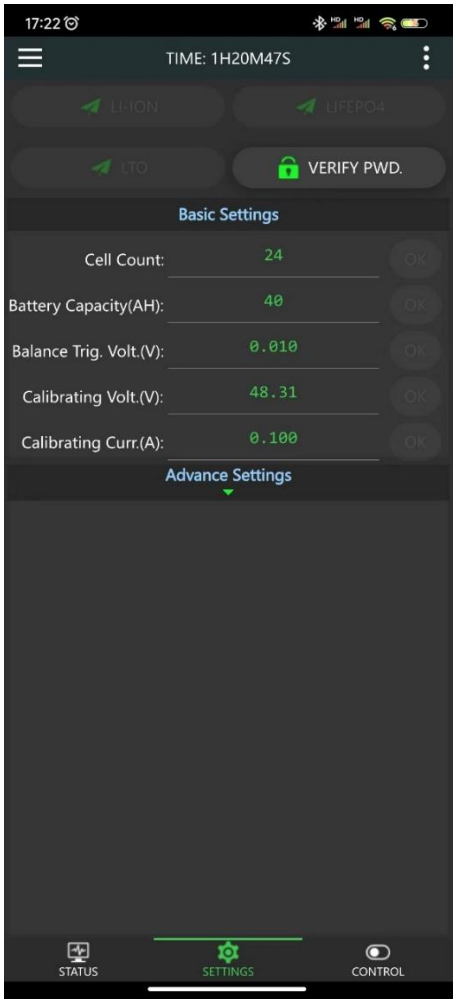
Q) Battery temperature 2

"NA" is displayed when the temperature sensor 2 is not installed, and the temperature of temperature sensor 2 is displayed in real time when the temperature sensor is installed in units of:> C.

Zone 2 in the figure is a single voltage region. Real-time display of voltage data for each individual in the battery pack, where red indicates the lowest voltage monomer and blue indicates the highest voltage monomer.

Zone 3 in the figure is the sense/balancing lines resistance area. The sense/balancing lines resistance is the sense/balancing lines resistance obtained by the BMS self-test. This value is only a preliminary calculation to prevent misconnection or poor contact. When the sense/balancing lines resistance exceeds a certain value, it appears yellow, and Active Balancing cannot be turned on at this time.

5.3.2 Parameter Settings



Parameter Settings Page Display

If you need to modify the working parameters of the protection panel, you must first click the Authorization Settings button and enter the parameter settings password. Set permissions to validate parameters. The parameter setting password factory defaults to **"123456"**. The parameters of the BMS can only be modified after the parameters are entered correctly and the password is set. The parameter setting password and the device Bluetooth connection password are independent of each other.

On the Parameter Settings page, the working parameters of the BMS can be modified, and each parameter is interpreted as follows.

a) One-click Lifepo4

One-click Lifepo4 button can change all working parameters of the BMS to Lifepo4 battery parameters. The default values of Lifepo4 parameters are listed in the appendix. These should be adjusted for your specific battery cell specifications for proper operation.

b) One-click lithium iron

。

One-click lithium iron can modify all the working parameters of the BMS to triple battery parameters. The default values of triple lithium parameters are listed in the appendix. These should be adjusted for your specific battery cell specifications for proper operation.

c) One-click Lithium Titanate

One-click Lithium Titanate, all working parameters of the BMS can be modified to the Lithium Titanate battery parameters. The default values of the Lithium Titanate parameters are listed in the appendix. These should be adjusted for your specific battery cell specifications for proper operation.

d) Number of monomers

Number of units Indicates the number of cells in the current battery. Please set this value accurately before use, otherwise the BMS will not work properly.

e) Battery capacity

Battery capacity This value is the designed capacity of the battery.

f) Trigger Balanced Pressure Differential

When the Active Balancing switch is turned on, and when the maximum voltage difference of the battery pack exceeds this value and the current monomer voltage exceeds the balancing start voltage, Active Balancing starts until the voltage difference is lower than this value or the monomer voltage is lower than the Active Balancing start voltage. For example, set the Active Balancing trigger pressure difference to 0.010V, start Active Balancing when the battery pack pressure difference is greater than 0.010V, and end Active Balancing when it is lower than 0.01V. (It is recommended to set the balance trigger pressure difference of 0.005V for batteries above 50AH and 0.01V for batteries below 50AH).

g) Voltage Calibration

The voltage calibration function can be used to calibrate the accuracy of the BMS voltage collection. When errors are found between the total voltage collected by the BMS and the total voltage of the battery, the BMS can be calibrated using the voltage calibration function. The calibration method is to get the actual voltage from the Battery Terminals with charge / discharge OFF then enter the "actual" total battery voltage and click on the Settings button after the voltage calibration to complete the calibration. Remember to turn charge/discharge back on.

h) Current Calibration

The current calibration function can be used to calibrate the accuracy of current collection from the BMS. When errors are found between the total current collected by the BMS and the actual current of the battery, the current calibration function can be used to calibrate the BMS. The calibration method is to fill in the current measured total battery current and click on the Settings button after the current calibration to complete the calibration.

i) Single Under-voltage Protection, Single Under-voltage Recovery

j)

"Single under-voltage protection" refers to the cut-off voltage of the cells. When any single Cell within the battery pack is lower than this value, a "single under-voltage alarm" is generated, and the

BMS turns off the discharging MOS. At this time, the battery cannot be discharged and can only be charged. When the alarm is generated, only after all the individual voltage values exceed the value of "single voltage recovery", the BMS removes the "single under-voltage alarm" and turns on the discharge MOS.

j) Monomer Overcharge Voltage", "Monomer Overcharge Recovery"

Single Overcharge Voltage refers to the saturated voltage of the battery. As long as any single Cell voltage within the battery pack exceeds this value,'Single Overcharge Alarm' will be generated, and the BMS will turn off the charging MOS. At this time, the battery can not be charged but can only be discharged. When the alarm is generated, only after all the individual voltage values are lower than the "single overcharge recovery" value, the BMS removes the "single overcharge alarm" and turns on the charging MOS at the same time. While not being able to charge, the Active Balancing will transfer the higher voltage cell to a lower voltage cell.

k) Auto Shutdown Voltage

The automatic shut-off voltage indicates the lowest voltage at which the BMS operates. When the lowest cell voltage in the battery pack reaches this value, the BMS shuts down. This value must be lower than "Single under-voltage protection"

l) Maximum Charging Current", "Charging Over-current Delay", "Charging Over-current Release"

When charging the battery pack, the current exceeds the "maximum charging current" and the duration exceeds the "charging Over-current delay", the BMS generates the "charging Over-current alarm" and turns off the charging MOS. After the alarm is generated, after the "charging Over-current relief" time, the BMS relieves the charging Over-current alarm and turns on the charging MOS again.

For example, set the "maximum charging current" to 10A, "charging Over-current delay" to 10 seconds, and "charging Over-current relief" to 50 seconds. When the charging current exceeds 10A continuously for 10 seconds during the charging process, the BMS will generate a 'charging Over-current alarm', turn off the charging MOS at the same time, remove the 'charging Over-current alarm' 50 seconds after the alarm is generated, and turn on the charging MOS again.

m) Maximum Discharge Current", "Discharge Over-current Delay", "Discharge Over-current Release"

When the battery pack is discharged, and the current exceeds the "maximum discharge current" and the duration exceeds the "discharge Over-current delay", the BMS generates a "discharge Over-current alarm" and turns off the discharging MOS. After the alarm is generated, after the time of "discharge Over-current relief", the BMS relieves the "discharge Over-current alarm" and turns on the discharge MOS again.

Examples include setting maximum discharge current to 100A,'discharge Over-current delay to 10 seconds, and discharge Over-current relief' to 50 seconds. When the discharge current exceeds 100A continuously for 10 seconds during the discharge process, the BMS will produce a 'discharge Over-current alarm', turn off the discharge MOS at the same time, remove the 'discharge Over-current alarm' 50 seconds after the alarm is generated, and turn On the discharge MOS again.

n) Short Circuit Protection Release

When the short-circuit protection occurs, the short-circuit protection is removed after the time set by `Release of Short-Circuit Protection'.

o) balancing starting voltage

The balancing starting voltage is used to control the voltage stage of balancing. Balancing will be triggered when the cell voltage exceeds this value and the maximum voltage difference of the battery pack exceeds the balancing trigger voltage difference.

p) Maximum balancing current

The balancing current represents the continuous current of high-voltage battery discharge and low-voltage battery charging during the process of energy transfer. The maximum balancing current refers to the maximum current in the process of energy transfer, and the maximum balancing current should not exceed 0.1C. For example, 20Ah battery shall not exceed 20*0.1=2a.

q) Charging over temperature protection", "charging over temperature recovery"

During charging, when the battery temperature exceeds the value of "Charge Over Temperature Protection", the BMS generates a warning of "Charge Over Temperature Protection", and the BMS turns off the charging MOS. After the alarm is generated, and the temperature falls below "Charge Over Temperature Recovery", the BMS removes the warning of "Charge Over Temperature Protection" and turns on the charging MOS again.

r) “Charging Low Temperature Protection", "Charging Low Temperature Recovery"

During the charging process, when the battery temperature is below the value of "Charging Low Temperature Protection", the BMS generates a warning of "Charging Low Temperature Protection", and the BMS turns off the charging MOS. After the alarm is generated, and the temperature is higher than "Charging Low Temperature Recovery", the BMS removes the "Charging Low Temperature Protection" warning and restarts the charging MOS.

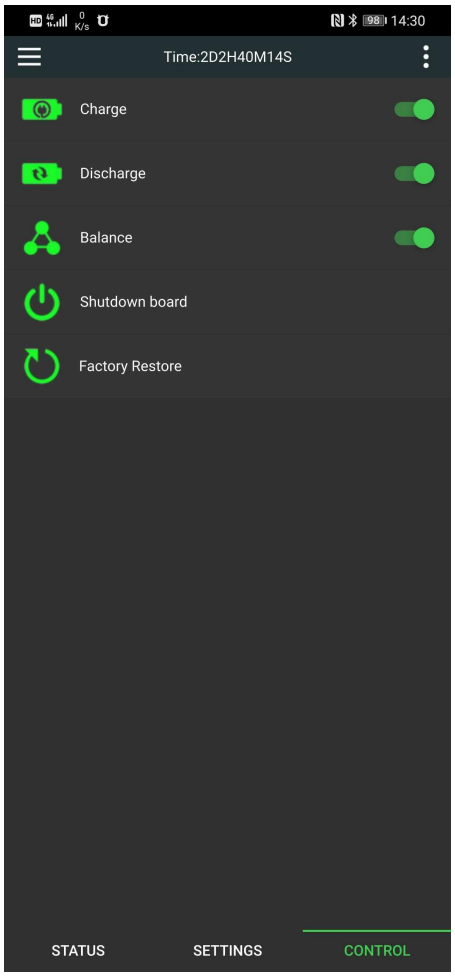
s) “MOS Over Temperature Protection", "MOS Over Temperature Recovery"

When the MOS temperature exceeds the value of "MOS over-temperature protection", the BMS generates a "MOS over-temperature alarm" and turns off the charging and discharging MOS at the same time, so the battery cannot be charged or discharged. After the alarm is generated, and the MOS temperature reaches lower than the value of "MOS Over Temperature Recovery", the BMS will release the "MOS Over Temperature Alarm" and turn on the charging and discharging MOS again (the MOS Over Temperature Protection Value is 75 degrees C and the MOS Over Temperature Recovery Value is 65 degrees C, (these are the factory default values and cannot be modified).

Note: Any parameter modification, please refer to the instruction manual, inappropriate parameters may make the BMS not work properly, or even damage the BMS. After any parameter modification, you need to click on the Settings button after the parameter to complete the parameter issue. When the BMS successfully receives the parameter, it will make a "drop" sound.

5.3.3 BMS control

The BMS control page is shown in Figure 40. The BMS control can switch the charging , discharging, and balancing functions of the BMS and restore the factory settings



BMS control page

6. Safety protection measures and precautions

Please read the operation manual carefully before use, and connecting the wires according to the wiring diagram of the corresponding string number, from the negative pole to the positive pole. After the balancing wire is connected, use a multi-meter again to confirm that it is correct before connecting the BMS.

The default password of the BMS is **"1234"**. After the mobile app is connected to the BMS, please modify the connection password in time to prevent others from connecting.

It is not allowed to refit the power line of the BMS without permission. Refitting the power line without permission will cause uneven Over-current of the BMS and damage the BMS.

7. Transportation and storage

7.1. Transportation

The packed product is not directly affected by rain or snow and is subject to severe bumps. It can be transported by normal means of transport. Corrosives such as acids and bases are not allowed to be kept together during transportation.

7.2. storage

The packed products should be stored in a permanent warehouse with a temperature ranging from 0 35 and a relative humidity not exceeding 80%. The warehouse should be free from acid and alkali, corrosive gases, strong mechanical vibration and impact, and strong magnetic field.

Appendix1 Default Parameters for Lithium-Ion, Lithium Iron Phosphate, Lithium Titanate

NUM	PARA	LI-ION	LIFEPO4	LTO	UNIT
1	Single under-voltage protection	2.9	2.7	1.8	V
2	Single under-voltage protection recovery	3.2	2.9	2.0	V
3	Monomer Overcharge Voltage	4.2	3.6	2.7	V
4	Monomer Overcharge Protection Recovery	4.1	3.5	2.4	V
5	Trigger Balanced Pressure Differential	0.01	0.010	0.01	V
6	Auto Shutdown Voltage	2.8	2.6	1.7	V
7	Charging Over-current Protection Delay	30	30	30	S
8	Charging Over-current Protection Release Time	60	60	60	S
9	Discharge Over-current Protection Delay	30	30	30	S
10	Discharge Over-current Protection Release Time	60	60	60	S
11	Release time of short circuit protection	60	60	60	S
12	Charging Over-Temperature Protection Temperature	60	60	60	℃
13	Charging Over-Temperature Recovery Temperature	55	55	55	℃
14	Discharge Over-Temperature Protection Temperature	60	60	60	℃
15	Discharge Over-Temperature Recovery Temperature	55	55	55	℃
16	Charging Low Temperature Protection Temperature	-20	0	-20	℃
17	Charging Low Temperature Recovery Temperature	-10	5	-10	℃
18	MOS Over-Temperature protection temperature	75	75	75	℃
19	MOS Over Temperature Protection Recovery Temperature	70	70	70	℃

Appendix II key points for parameter setting of the BMS

NUM	parameter	UNIT	MIN	MAX	Li-ion	Lifepo4	NOTE
1	Number of monomers	Strings	2	-	-	-	The maximum value refers to the model of the BMS. The default value is the maximum number of strings supported by the model
2	Battery capacity	AH	5	2000	40	40	
3	Trigger Balance Pressure Differential	V	0.003	1	0.01	0.01	
4	Single under-voltage protection	V	1.2	4.35	2.9	2.6	These parameters must follow the following logical relationship. Otherwise, you will be prompted that the parameter setting fails! Cell overcharge voltage > cell overcharge recovery > cell under-voltage recovery > cell under-voltage > shutdown voltage
5	Single under-voltage recovery	V	1.2	4.35	3.2	3	
6	Single overcharge voltage	V	1.2	4.35	4.2	3.6	
7	Monomer overcharge recovery	V	1.2	4.35	4.1	3.4	
8	Automatic shutdown voltage	V	1.2	4.35	2.8	2.5	
9	Maximum charging current	A	1	-	25	25	The maximum value refers to the model of BMS,
10	Charging Over-current delay	S	2	600	60	60	
11	Charging Over-current release	S	2	600	60	60	
12	Maximum discharge current	A	1	-	-	-	The maximum value refers to the model of the BMS, and the default value is the continuous current supported by the model
13	Discharge Over-current delay	S	2	600	300	300	
14	Discharge Over-current release	S	2	600	60	60	
15	Short circuit protection delay	uS	0	1000000	1500	1500	Set to 0 to turn off short circuit protection
16	Short circuit protection release	S	2	600	60	60	
17	Maximum balancing current	A	0.3	-	-	-	The maximum value refers to the model of the BMS. The default value is the maximum Active Balancing current supported by the model
18	balancing starting voltage	V	1.2	4.25	1.5	1.5	
19	Charging over temperature protection	℃	30	80	70	**55C**	These parameters must follow the following logical relationship, or you will be prompted that the parameter setting fails! Charging over temperature > charging over temperature recovery > charging low temperature recovery > charging low temperature Discharge over temperature > discharge over temperature recovery
20	Charging over temperature recovery	℃	30	80	60	**50~55 C <0.1C**	
21	Discharge over temperature protection	℃	30	80	70	**55C**	
22	Discharge over temperature recovery	℃	30	80	60	**50C**	
23	Charging low temperature protection	℃	-30	20	-20	**0C**	
24	Charging low temperature recovery	℃	-30	20	-10	**0~10C max current 0.2c**	
25	MOS over temperature protection	℃	50	110	90	90	Not modifiable
26	MOS over temperature recovery	℃	50	110	70	70	Not modifiable
27	User private data	character	-	-	-	--	Maximum 13 characters allowed
28	Connecting line resistance	mΩ	0	2000000	0	0	Separate box batteries are used, and single box batteries are generally not used.

Be careful:
1. Factory default Li-ion parameters.
2 It is recommended that users only modify the number of individual strings and the capacity of individual. Then select one-click settings according to the battery type. If other parameters need to be modified, users are strongly advised to read the instructions to understand the meaning of each parameter before modifying them.
3. If you modify according to the above rules and prompt for errors, it is recommended that users update APP.

Noted:
1. For Android 12 and above systems, app needs to be allowed to obtain mobile GPS permission, and it is always allowed.
(this is the setting of Android 12 system. BMS will not always read the user's data.)

2. It is recommended that the customer update the app in time. The app will repair the bug within a week according to the customer's feedback, and it will also be updated according to the design reasons.

FAQ:

Error code

1**. Monomer over discharge alarm**
2. Monomer overcharge alarm
3. Overcurrent alarm
4. MOS over temperature alarm
5. CELL over temperature alarm
6. Short circuit alarm
7. Internal communication abnormal alarm
8. Alarm of excessive equalizing resistance
9. Drop string

Supplemental Appendix

System Calibration for proper BMS operations.

Calibrating the Voltages between your Solar Controller, Inverter/Charger, All-In-One *Must be*

Done.

- This is essential so that everything is reading, sending/receiving the correct Voltages @ the Battery Terminals / DC Bus (for Parallel Banks of Batteries).
- When an SCC or Inverter/Charger etc is charging @ 25.6/51.2 You need to ensure that is WHAT the Batteries See. Otherwise, the differential "will" cause a Mismatch and generate an error (*1), either at the SCC or any Charge Device on the DC Bus (*2).
- The BMS is the MOST Precise @ measuring the Battery & the Cell Voltage States. This applies to a Single Battery or a Bank of Batteries.
- Not All SCC's or Charging Devices have a Compensation/Correction setting within them. Therefore you have to do the "Math" to compensate for that differential. Therefore you "must" take Voltage Measurements @ the SCC, Charger & Battery Terminals/Bus, then make adjustments to match your desired Charge Profile to prevent such incidents.
- A Digital Multimeter / Digital Volt/Ohm Meter with at least 2 Decimal Place voltage displays is Most Highly Recommended to do so. A Single Digit device is TOO INACCURATE for any Lithium Based Battery or cell.

(*1) This can result in Over/Under voltage reading triggering an error. IF over or under it can also create the "Runner Cell" situation where one or more cells within a Battery can run & defeat the Working Voltage Range (3.000-3.400) of the cells, triggering a BMS Fault. This is Very Common with new/fresh installations that are NOT Corrected & Balanced for Voltage.

(*2) Note that ALL DC-Lines will suffer some loss over the length of the wire run. These include every terminal, lug, bolt, switch, and even fuses & breakers collectively. While each individual "item" may not be large (unless there is a Fault), collectively they can add up quite quickly collectively. This is an "accuracy" requirement problem with using Lithium Based tech as opposed to Lead Acid which is more "brute force" and not as accurate due to the very Tight Voltage Curves in comparison to Lead-Acid.

Typical Faults creating large drops, with some basic problem avoidance solutions:

- Loose or dirty connections,
- Poor or weak crimped terminals,
- Overly long wiring, including wires of Different Lengths (+) & (-) should be as close to identical lengths as possible,
- Low-Grade or Incorrect wiring used for the application, load & demands,
- Quality wires (Fine Strand Pure Copper) tinned or not, along with Tinned Terminal lugs is always the best solution,
- All Connections to Lugs etc should be shrink wrapped with quality adhesive bound Shrink Wrap to prevent air/moisture infiltration over time that can cause corrosion & deterioration. Do NOT avoid using long enough shrink wrap.

Final Important Note:

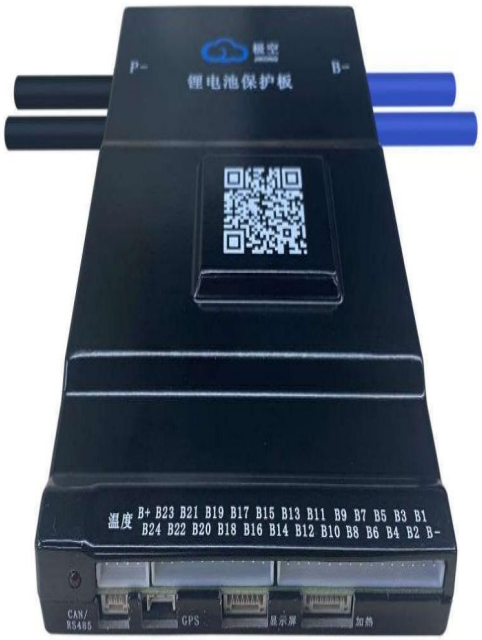
It is extremely important to not that various devices like Solar Charge Controllers, Inverter/Chargers etc all have varying hardware, firmware and user interface software. This makes Calibration & Configuration more demanding for proper operations between all the variety of devices.

Repair instructions

1、Processor exception

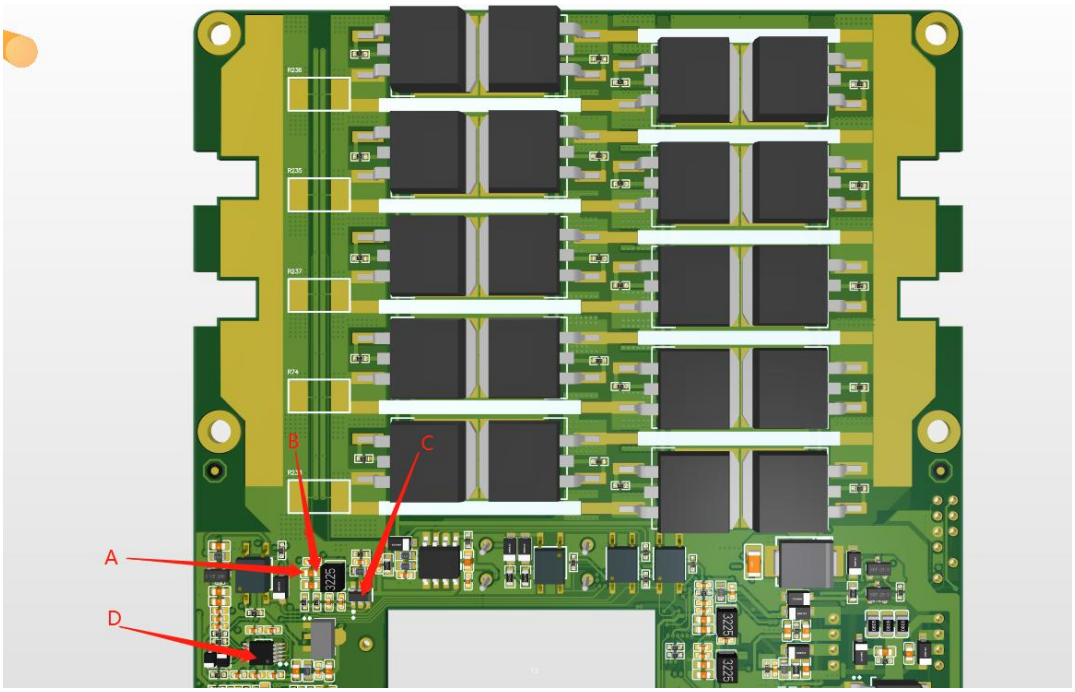
appearance (CPUAUX Anomaly)

Product appearance



Testing repair method：

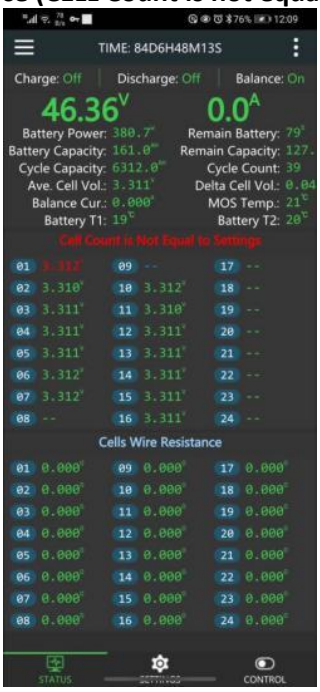
Step 1: Test the resistance between A and B points in the figure when the machine is not turned on. If the resistance is less than 100 Ω, it is necessary to replace chip C, which is RY3820E. After replacing the chip, retest the resistance between A and B in the figure. If the resistance is greater than 100 Ω, restart the machine for test; Confirm whether the functional fault is eliminated. If the fault persists, the second step is required.



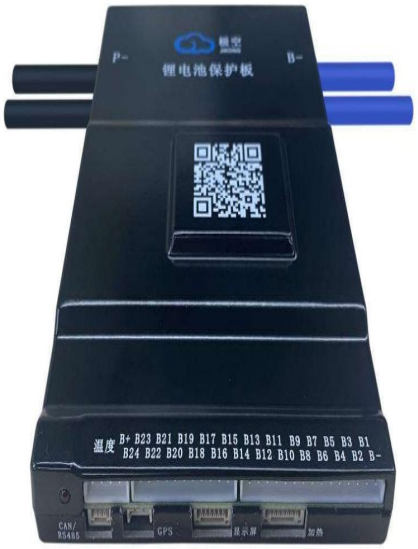
Step 2: After power on, test the voltage between A and B points in the diagram. If the voltage is between 4.5~5.2V, it is necessary to replace chip D, which is MDT10F272. After switching off and replacing the chip, turn on the machine again to test whether the functional fault is eliminated.

2、The number of monomer is inconsistent with the set value

appearance (CELL Count is not equal setting)



product appearance



Tsting repair method：

Step 1: Test the resistance between A and B points in the figure when the machine is not turned on and the battery is not connected. If the resistance value is greater than 2 Ω, replace the resistance between A and B, and the resistance value is 10m Ω; Perform the second step after replacement.

Step 2: When the machine is not turned on and the battery is not connected, adjust the multimeter to the diode test gear (as shown by arrow A1) and perform the following tests:

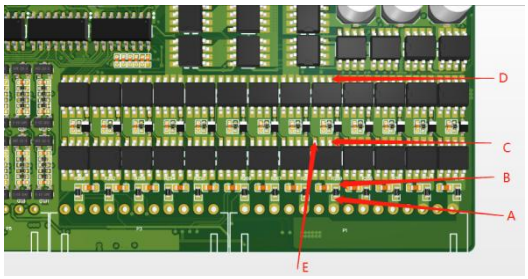
Test point B with the black multimeter and point C with the red multimeter. If the displayed value is within the range of 0.3~0.7, it is qualified.

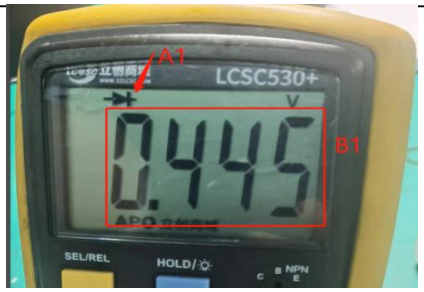
Test point C with the black multimeter and point B with the red multimeter. If it shows that the range is exceeded, it is qualified.

Test point D with the black multimeter and point C with the red multimeter. If the displayed value is within the range of 0.3~0.7, it is qualified.

Test point C with the black multimeter and point D with the red multimeter. If it shows that the range is exceeded, it is qualified.

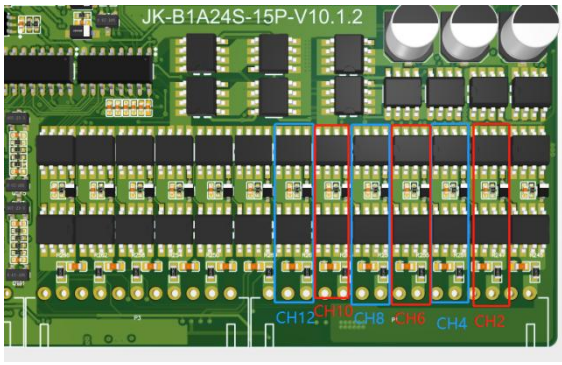
If the test value is not within the range, the corresponding MOS tube is damaged and needs to be replaced (model: HYG180N10LS1S). After the replacement, repeat the second step. After the above values are qualified, the machine can be started for test.



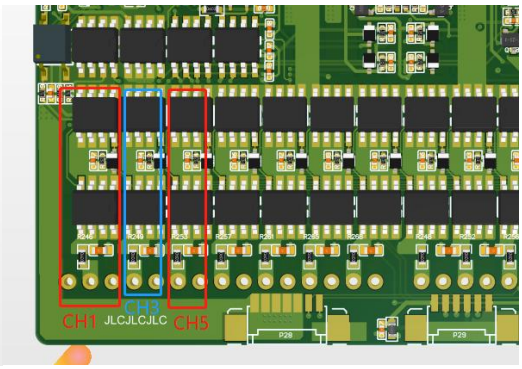


Note: If other channels are damaged, repeat step 1 and step 2 according to the corresponding relationship identified in the figure below, and give priority to the lowest string of exceptions. As shown in the figure, the abnormal channels are 08 and 09, and priority should be given to maintenance of CH8.

PCB Front side



PCB back side



3、Unable to start

Product appearance

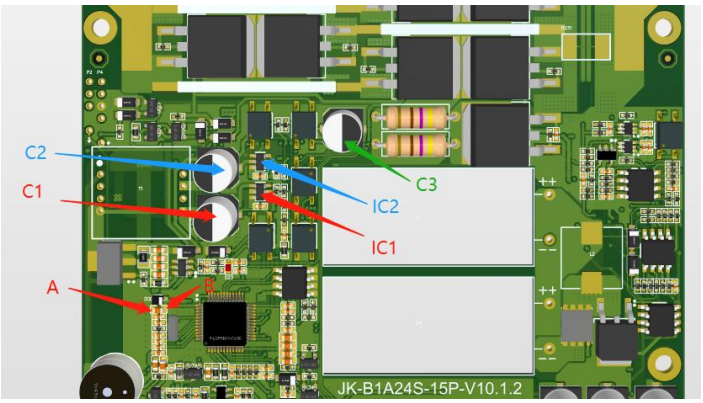
testing repair method：

Step 1: Try to start the machine after replacing the IC1. If the fault is not eliminated after replacement, perform the second step.

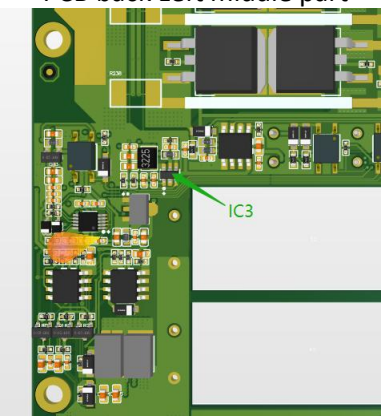
Step 2: Test the resistance between A and B points in the figure when the machine is not turned on and the battery is not connected. Then test the resistance values at both ends of C1, C2 and C3 capacitors. The test results and corresponding processing methods are shown in the following table.

	Testing rusults and handling methods	
	Processing method for ＜ 500 Ω	Processing method for ＞ 500 Ω
C2	Replace IC2 (RY3820E)	do no handle
C3	Replace IC3 (RY3820E)	do no handle

PCB front middle part

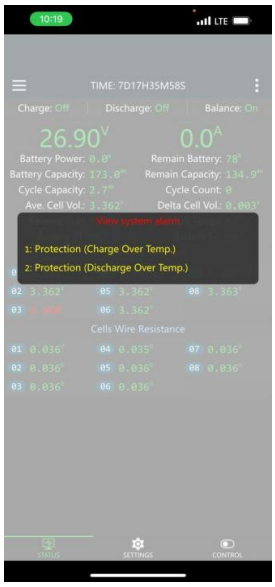


PCB back Left middle part



4、Over temperature protection

Appearance(Charge over Temp)



product appearance

Testing repair method：

Step 1: replace the temperature sensor and test again. If the fault is not found, go to step 2

Step 2: Replace the IC1 shown in the figure below