

电池管理系统 **Smart BMS with Active-Balancer**

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

使用维护说明书

Specification and operation manual

成都极空科技有限公司
Chengdu Jikong Technology Co., Ltd

产品保修条款

Product warranty clause

产品名称：电池管理系统

Name : Smart BMS with Active-Balancer

保修期限：壹年

Warranty period : One Year

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1. 概述 Overview

锂电池智能保护板是为大容量串联锂电池组量身打造的管理系统，具备电压采集、大电流主动均衡、过充过放过流过温保护、库仑计、蓝牙通信、GPS 远程等功能。可适用于磷酸铁锂、三元锂等电池种类。

保护板依托具备自主知识产权的能量转移式主动均衡技术，可以实现最大持续 2A 的均衡电流。大电流主动均衡技术可以最大程度的保证电池一致性、提高电池续航里程、延缓电池衰老。

保护板有配套的手机 APP，支持 Android 和 IOS 操作系统。APP 可以通过手机蓝牙连接到保护板以查看电池工作状态、修改保护板的各项工作参数、控制充放电开关等等。保护板体积小、操作简单、功能全，可广泛应用于小型观光车、代步车、共享汽车、大功率储能、基站备用电源、太阳能电站等产品的电池 PACK。

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. 主要技术参数

2.1. 主要技术指标 Main technical indicators

6P/8P/10P/15P 系列保护板的主要技术指标如表 1 、表 2 所示。

The main technical indexes of 6p/8p/10p/15p series BMS' are shown in Table 1 and table 2.

表1 6P/8P 系列保护板主要技术指标

Table 1 Main technical indexes of 6p/8p series BMS

技术指标 Technical indicators	产品型号/Model					
	BD6A17S6P	BD6A20S6P	BD6A24S6P	BD6A17S8P	BD6A20S8P	BD6A24S8P
三元串数/Li-ion Strings	7~17	7~20	7~24	7~17	7~20	7~24
铁锂串数/Lifepo4 Strings	8~17	8~20	8~24	8~17	8~20	8~24
钛酸串数/LTO Strings	12~17	12~20	12~24	12~17	12~20	12~24
均衡方式/Balance mode	主动均衡/Active Balance					
均衡电流/Balance Current	0.6A					
主回路内阻/Internal resistance	1.53 mΩ			1.2 mΩ		
持续放电电流 Continuous discharge Current	60A	60A	60A	80A	80A	80A
持续充电电流 Continuous Charge Current	60A	60A	60A	80A	80A	80A
最大放电电流 Maximum discharge current	100A	100A	100A	150A	150A	150A
过流保护(可调) Over-current protection(ADJ)	10~60 A	10~60 A	10~60 A	10~80 A	10~80 A	10~80 A
通信接口(定制) Communication interface	RS485(By Default) / CAN(customization)					
显示屏接口 Display interface	有/YES (Except of BD4A17S4P)					
出线方式 Entry cable	同口/Common Port					
单体电压范围 Unit voltage range	1~5V					
电压采集精度 Voltage acquisition accuracy	±3mV					
过充保护电压 Overcharge protection voltage	1.2~4.35V 可调/1.2~4.35V Adjustable					
过充解除电压 Overcharge release voltage	1.2~4.35V 可调/1.2~4.35V Adjustable					
过流解除时间 Over-current release time	2~120S 可调/2~120S Adjustable					

过放保护电压 Over discharge protection voltage	1.2~4.35V 可调/1.2~4.35V Adjustable
过放恢复电压 Over discharge recovery voltage	1.2~4.35V 可调/1.2~4.35V Adjustable
温度检测数量 Temperature detection quantity	3 个/Three
温度保护 Temperature protection	有/YES
短路保护 Short circuit protection	有/YES
库仑计 Coulombmeter	有/YES
蓝牙功能 Bluetooth function	支持安卓、苹果/ Support Android and IOS
GPS(选配) GPS (optional)	支持（RS48 和 GPS 二选一） / Support (RS485 And GPS One out of two)

表2 10P/15P 系列保护板主要技术指标

Table 2 Main technical indexes of 10p/15p series BMS

技术指标 Technical indicators	产品型号					
	BD6A20S10P	BD6A24S10P	B1A20S15P	B1A24S15P	B2A24S15P	B2A24S20P
三元串数/Li-ion Strings	7~20	7~24	7~20	7~24	7~24	7~24
铁锂串数/Lifepo4 Strings	8~20	8~24	8~20	8~24	8~24	8~24
钛酸串数/LTO Strings	14	14~20	14~20	14~24	14~24	14~24
均衡方式/Balance mode	主动均衡/Active Balance					
均衡电流/Balance Current	0.6A		1A		2A	
主回路内阻/Internal resistance	1 mΩ		0.65 mΩ		0.47 mΩ	
持续放电电流 Continuous discharge Current	100A		150A			200A
持续充电电流 Continuous Charge Current	100A		150A			200A
最大放电电流 Maximum discharge current	200A		300A			350A
过流保护(可调) Over-current protection(ADJ)	10~100A		10~150A			10~200A
通信接口(定制) Communication interface	RS485(By Default) / CAN(customization)					
显示屏接口 Display interface	有/YES（Except of BD4A17S4P）					
出线方式 Entry cable	同口/Common Port					
单体电压范围 Unit voltage range	1~5V					
电压采集精度 Voltage acquisition accuracy	±3mV					
过充保护电压 Overcharge protection voltage	1.2~4.35V 可调/1.2~4.35V Adjustable					
过充解除电压 Overcharge release voltage	1.2~4.35V 可调/1.2~4.35V Adjustable					
过流解除时间 Over-current release time	2~120S 可调/2~120S Adjustable					
过放保护电压 Over discharge protection	1.2~4.35V 可调/1.2~4.35V Adjustable					
过放恢复电压 Over discharge recovery voltage	1.2~4.35V 可调/1.2~4.35V Adjustable					
温度检测数量 Temperature detection quantity	3 个/Three					

温度保护 Temperature protection	有/YES
短路保护 Short circuit protection	有/YES
库仑计 Coulombmeter	有/YES
蓝牙功能 Bluetooth function	支持安卓、苹果/ Support Android and IOS
GPS(选配) GPS (optional)	支持（RS48 和 GPS 二选一）/ Support (RS485 And GPS One out of two)

2.2. 使用环境条件/ Service environmental conditions

工作温度范围：-30℃～70℃；

Operating temperature range: -30℃～70℃;

电源要求：20~100V。

Power requirements: 20~100V

功耗：均衡状态 8mA@100V，非均衡状态 7mA@100V。

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

3. 连接器及接口描述/Connector and interface description

3.1. 连接器、LED 灯位置标识/ Connector, LED lamp location identification

两款保护板连接器、LED 灯位置如图 1 和图 2 所示所示。

The two BMS connectors and the position of the LED lamp are shown in Fig. 1 and Fig. 2.

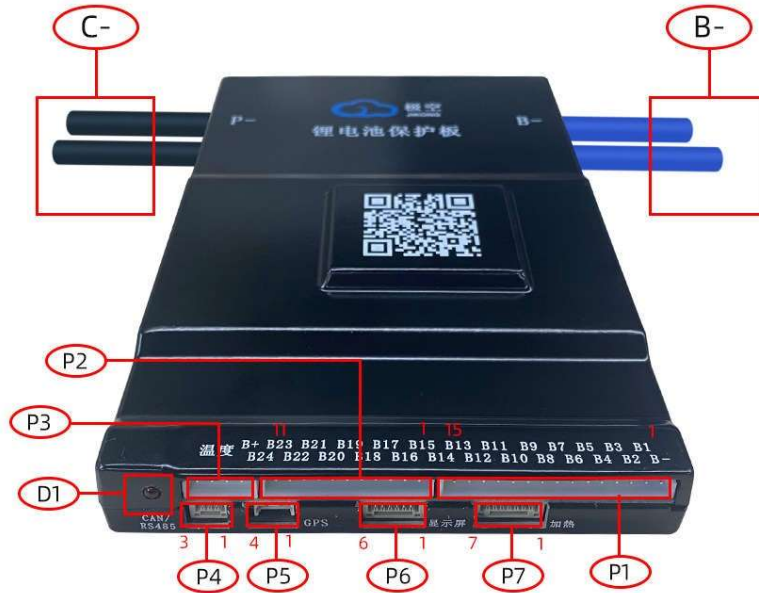


图 1 BD6AxxS-10P/ B1AxxS-15P/B2AxxS-15P/B2AxxS20P 连接器示意图

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

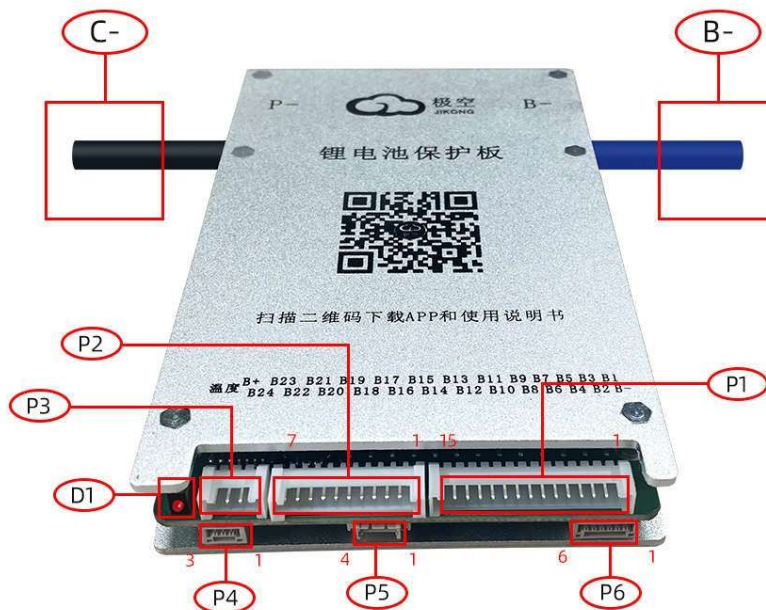
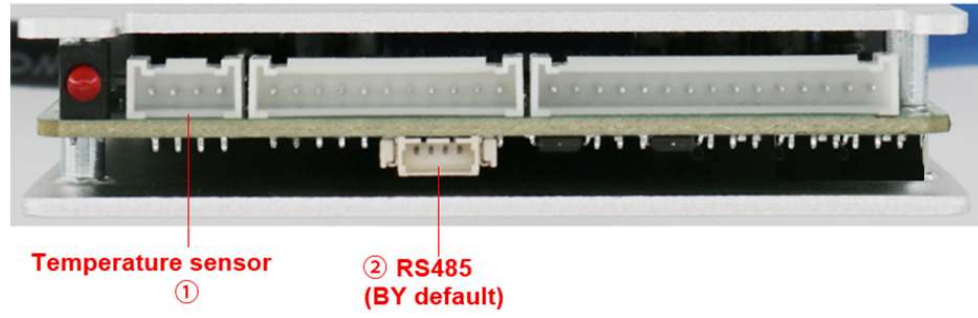


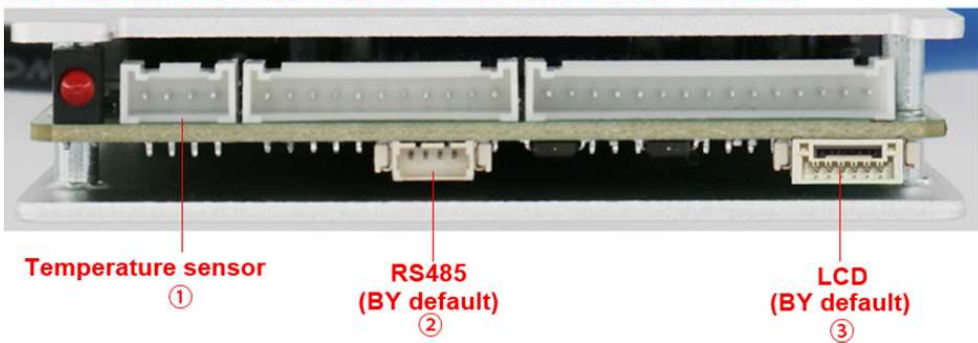
图 2 BD6AxxS-6P/ BD6AxxS8P 连接器示意图

Fig. 2 BD6AxxS-6P/ BD6AxxS8P Connector schematic

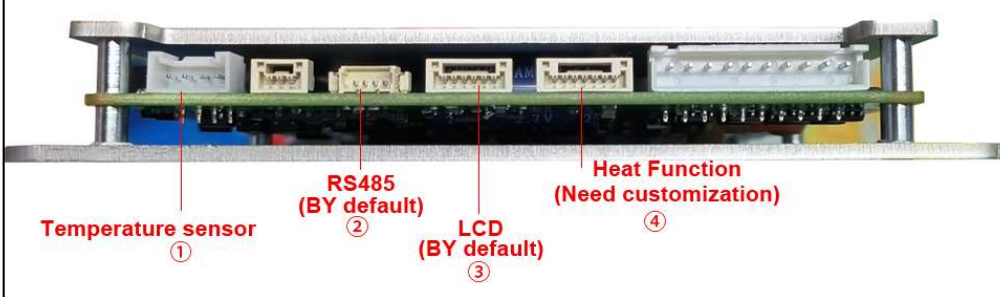
JK-BD4A17S4P



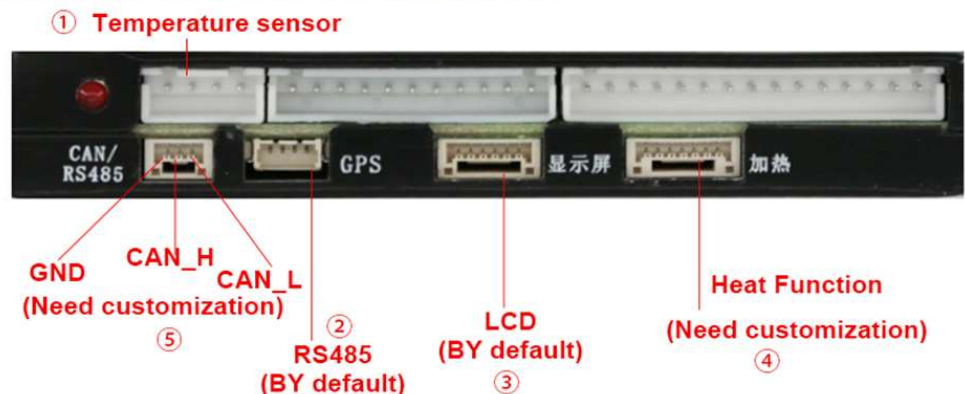
JK-BD6A17S6P/BD6A20S6P/BD6A24S6P JK-BD6A17S8P/BD6A20S8P/BD6A24S8P

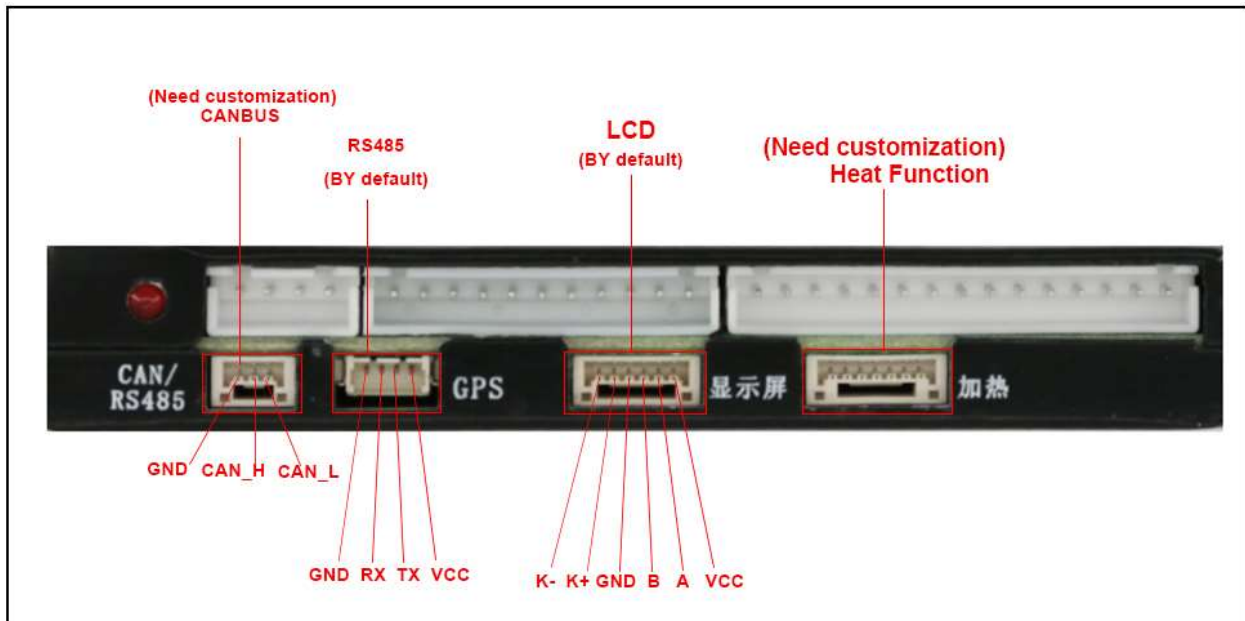


JK-B1A8S20P/JK-B2A8S20P



JK-BD6A20S10P/BD6A24S10P JK-B1A20S15P/B1A24S15P JK-B2A24S15P/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^2/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. 连接器、LED 定义/ Connector, LED Definition

BD6AxxS-6P/BD6AxxS-8P/BD6AxxS-10PB1AxxS-15P/B2AxxS-15P/B2AxxS20P 保护板连接器定义、

LED 灯定义见表3 表 4。

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

表3 P1~P4 接口定义/ P1~P4 Interface Definition

连接器/ Connector	接口名称 /Name	管脚号 /Pin	BD6AxxS-6P/BD6AxxS-8P/BD6AxxS-10P/ B1AxxS-15P/ B2AxxS-15P/B2AxxS20P	
			名称/name	定义/ Definition
P1	均衡与采集 接口/ Balance and collection interface	1	B-	电池总负极/ Battery total negative
		2	B1	第 1 串电池正极/Series 1 Battery Positive
		3	B2	第 2 串电池正极/Series 2 Battery Positive
		4	B3	第 3 串电池正极/Series 3 Battery Positive
		5	B4	第 4 串电池正极/Series 4 Battery Positive
		6	B5	第 5 串电池正极/Series 5 Battery Positive
		7	B6	第 6 串电池正极/Series 6 Battery Positive
		8	B7	第 7 串电池正极/Series 7 Battery Positive
		9	B8	第 8 串电池正极/Series 8 Battery Positive
		10	B9	第 9 串电池正极/Series 9 Battery Positive
		11	B10	第 10 串电池正极/Series 10 Battery Positive
		12	B11	第 11 串电池正极/Series 11 Battery Positive
		13	B12	第 12 串电池正极/Series 12 Battery Positive
		14	B13	第 13 串电池正极/Series 13 Battery Positive
		15	B14	第 14 串电池正极/Series 14 Battery Positive
		1	B15	第 15 串电池正极/Series 15 Battery Positive
		2	B16	第 16 串电池正极/Series 16 Battery Positive
		3	B17	第 17 串电池正极/Series 17 Battery Positive

P2		4	B18	第 18 串电池正极/Series 18 Battery Positive
		5	B19	第 19 串电池正极/Series 19 Battery Positive
		6	B20	第 20 串电池正极/Series 20 Battery Positive
		7	B21	第 21 串电池正极/Series 21 Battery Positive
		8	B22	第 22 串电池正极/Series 22 Battery Positive
		9	B23	第 23 串电池正极/Series 23 Battery Positive
		10	B24	第 24 串电池正极（电池总正）/24th Series Battery Positive (Battery Total Positive)
		11	B+	保护板电源,接电池总正/BMS power supply, connect battery
P3	温度接口 /Temperature interface	1	T1A	第 1 个温度传感器 A 管脚/1st temperature sensor A pin
		2	T1B	第 1 个温度传感器 B 管脚/1st temperature sensor B pin
		3	T2A	第 2 个温度传感器 A 管脚/2nd temperature sensor A pin
		4	T2B	第 2 个温度传感器 B 管脚/2nd temperature sensor B pin
P4	通讯接 口 /commu nication interfac e	1	D_N	CAN_L/RS485-N 信号正极（选配功能，可选择 CAN 或 RS485）/CAN_L/RS485-N signal positive pole (optional function, CAN or RS485 optional)
		2	D_P	CAN_H/RS485-P 信号负极（选配功能，可选择 CAN 或 RS485）/CAN_H/RS485-P signal negative (optional function, CAN or RS485 optional)
		3	GND	信号地/GND

表4 P5~P7 接口定义/ Table 4 P5~P7 Interface Definition

连接器/ Connector	接口名称 /Name	管脚 号/Pin	BD6AxxS-6P/BD6AxxS-8P/BD6AxxS-10P B1AxxS-15P/B2AxxS-15P/B2AxxS20P	
			名称/Name	定义/ Definition
P5	GPS 接口 /GPS	1	VGPS	电源输出，电压与 B+接近/Power output, voltage close to b+
		2	TX	UART_TX,3.3V
		3	RX	UART_RX,3.3V
		4	GND	电源/信号地
P6	显示接口 / Display interface	1	VCC	显示屏电源输出/Display power output
		2	A	显示屏 RS485 信号正极/Display RS485 signal positive
		3	B	显示屏 RS485 信号负极/Display RS485 signal negative
		4	GND	电源负极/Power negative
		5	K+	激活信号正极/ Activation signal positive
		6	K-	激活信号负极/Activation signal negative
P7	加热接口 (选配功 能) / Heating interface (optional function)	1	HT-	加热负极——(BD6AxxS-6P/BD6AxxS-8P 无此功能) Heating negative -- (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		2	HT-	加热负极——(BD6AxxS-6P/BD6AxxS-8P 无此功能) Heating negative -- (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		3	HT-	加热负极——(BD6AxxS-6P/BD6AxxS-8P 无此功能)/ Heating negative -- (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		4	HT-	加热负极——(BD6AxxS-6P/BD6AxxS-8P 无此功能) Heating negative -- (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		5	HT-	加热负极——(BD6AxxS-6P/BD6AxxS-8P 无此功能)/ Heating negative -- (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		6	CD+	充电指示输入正极——(BD6AxxS-6P/BD6AxxS-8P 无此功能) Charging Indicator Input Positive Pole - (BD6AxxxS-6P/BD6AxxxS-8P does not have this function)
		7	CD-	充电指示输入负极——(BD6AxxS-6P/BD6AxxS-8P 无此功能) Charging Indicator Input Negative -- (BD6AxxxS-6P/BD6AxxS-8P does not have this function)
D1	蓝牙连接指示灯，当蓝牙连接上保护板时指示灯常亮，断开连接时指示灯闪烁。/Bluetooth connection indicator, which is always on when the BMS is connected to Bluetooth, blinks when disconnected.			
P-/C-	接外部负载或者充电器负极/Connect external load or charger negative (battery (-) terminal)			
B-	接电池负极/Connect battery negative			

3.3. 产品外型

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.



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

JK-BD6AxxS-6P、JK-BD6AxxS-8P 保护板外型如图 4 所示。
JK-BD6AxxS-6P、JK-BD6AxxS-8P appearance is shown in Figure 4.



图 4 JK-BD6AxxS-6P、JK-BD6AxxS-8P
Figure 4 JK-BD6AxxS-6P、JK-BD6AxxS-8P

3.4. 尺寸/SIZE

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

尺寸为 162mm×102mm×20.4mm，外形尺寸如图 5 所示。

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

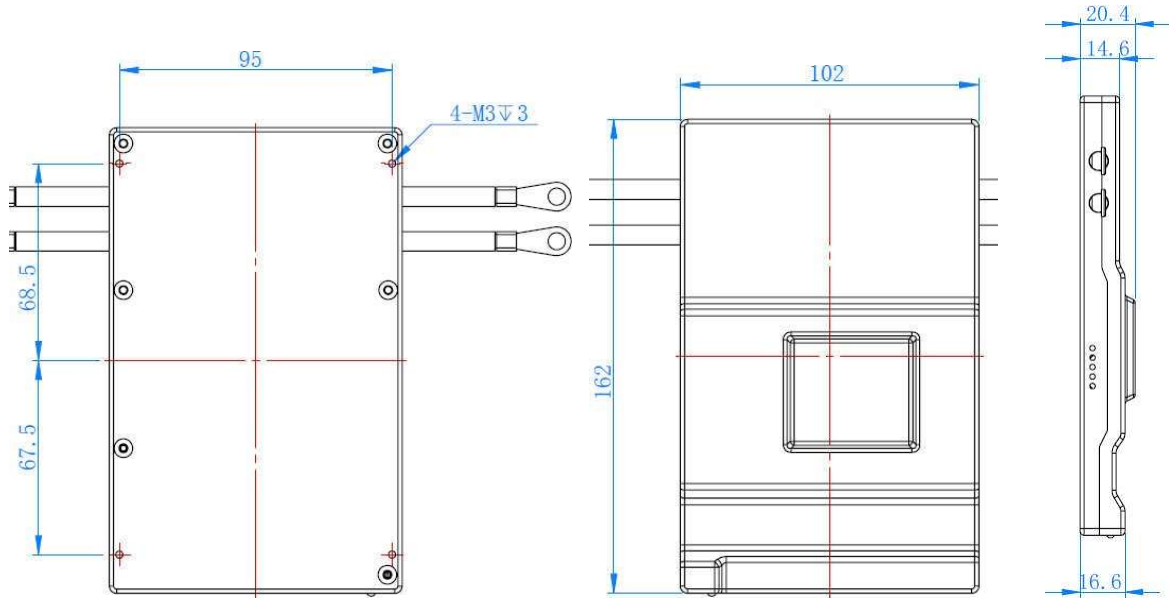


图 5 / Figure 5 BD6A20S10P/B2A24S10P/
B1A24S15P/B2A24S15P/B2A24S20P

JK-BD6AXXS-6P、JK-BD6AXXS-8P BMS

尺寸为 136mm×83mm× 17.6mm，外形尺寸 如图 6 所示。

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

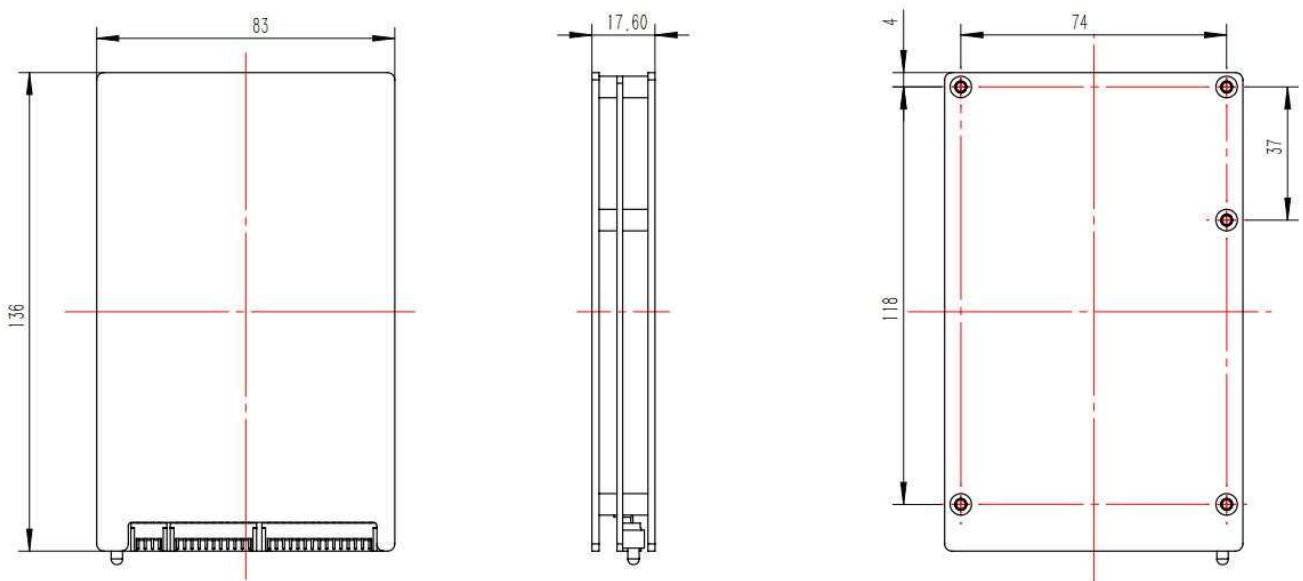


图 6// Figure 6 JJK-BD6AXXS-6P/JK-BD6AXXS-8P

3.5. 重量/Weight

JK-BD6AXXS-6P、JK-BD6AXXS-8P 系列保护板重量约为 257g。

the weight of jk-bd6axxs-6p and jk-bd6axxs-8p series BMS is about 257g.

JK-BD6AXXS-10P 系列保护板重量约为 360g。

the weight of jk-bd6axxs-10p series BMS is about 360g.

JK-B1AXXS-15P/JK-B2AXXS-15P/JK-B2AXXS-20P 系列 保护板重量约为 430g。

the weight of JK-B1AXXS-15P/JK-B2AXXS-15P/JK-B2AXXS-20P series BMS is about 360g.

4. 安装方法及注意事项/ Installation method and precautions

4.1. 开箱检查及注意事项/ Out-of-box check and precautions

开箱检查及注意事项如下/ The following are the out-of-box checks and precautions:

a) 对包装箱、保护板等需要轻拿轻放、尽量不要倒置；

A) The boxes, BMSs, etc. need to be handled gently and lightly, and should not be upside down as much as possible.

b) 开箱前注意包装是否完好，如有无撞击痕迹、有无破损等；

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. 线路连接/Line connection

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

适用于7-24串电芯的锂电池组，不同电芯数量的电池组接线方法不同，具体接线方式如下图所示。

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,

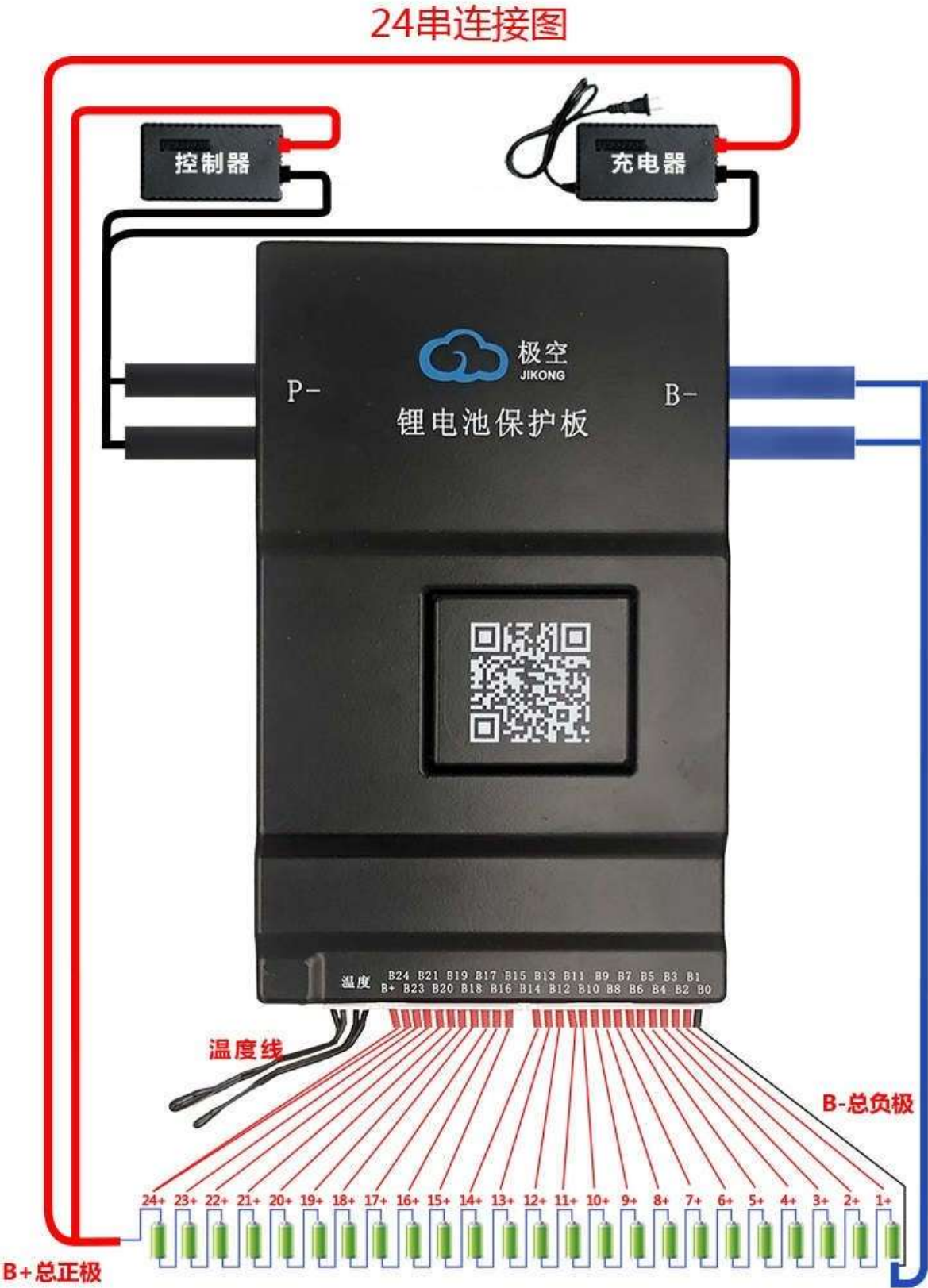


图 7 24 串电池接线图示
Figure 7 Diagram of 24 series battery connection

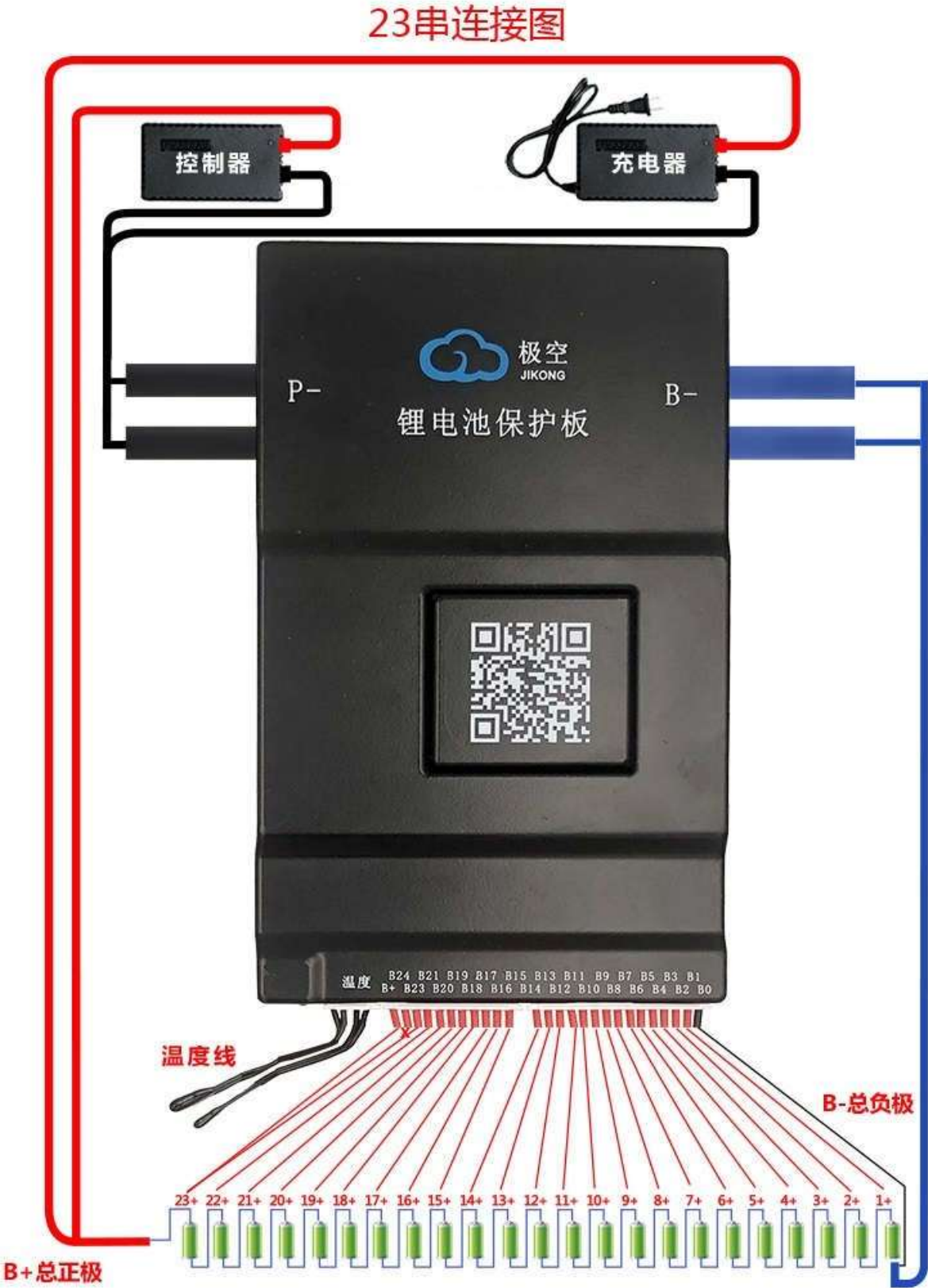


图 8 23 串电池接线图示
Figure 8 Diagram of 23 series battery connection

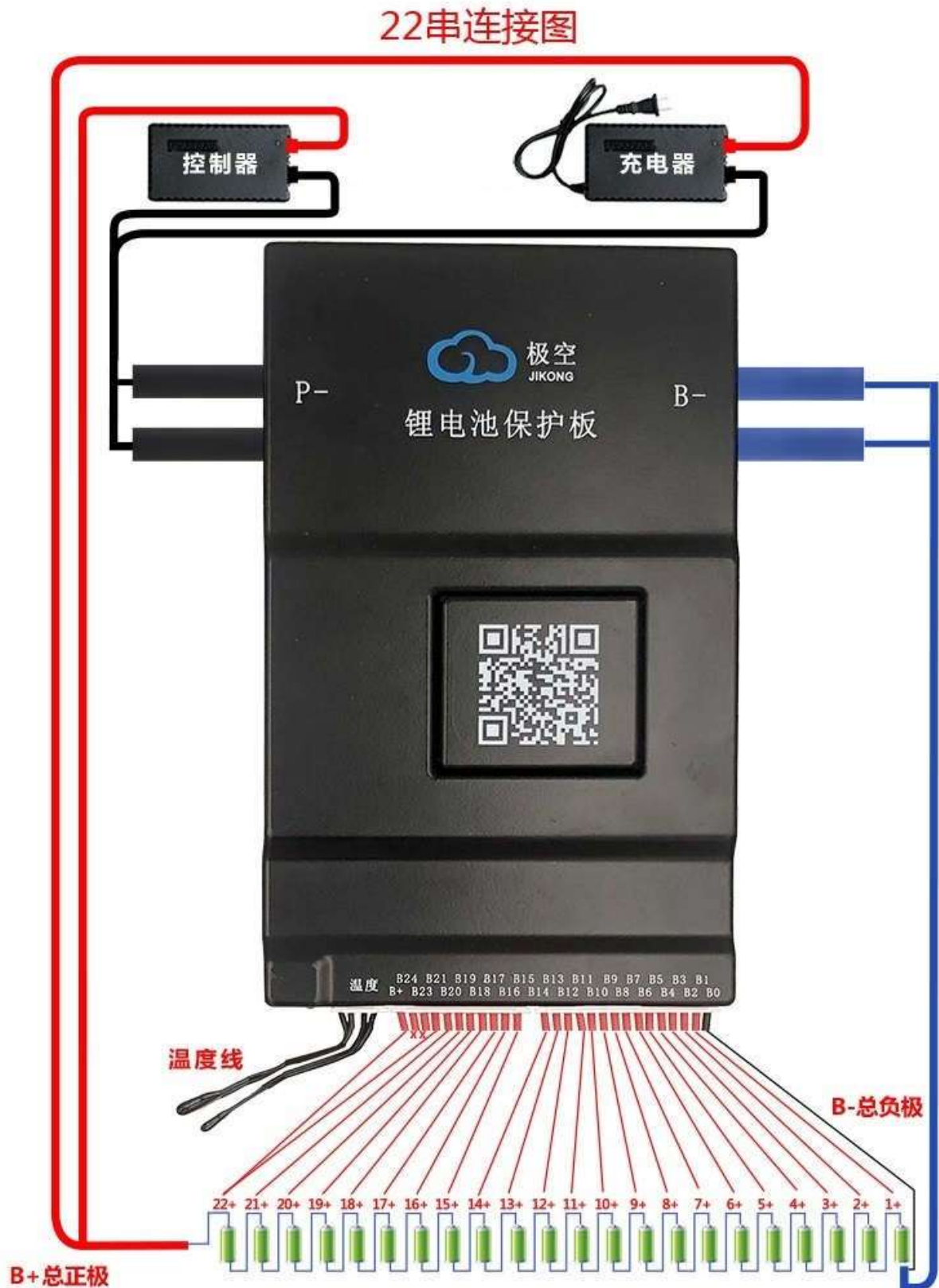


图 9 22 串电池接线图示
Figure 9 Diagram of 22 series battery connection

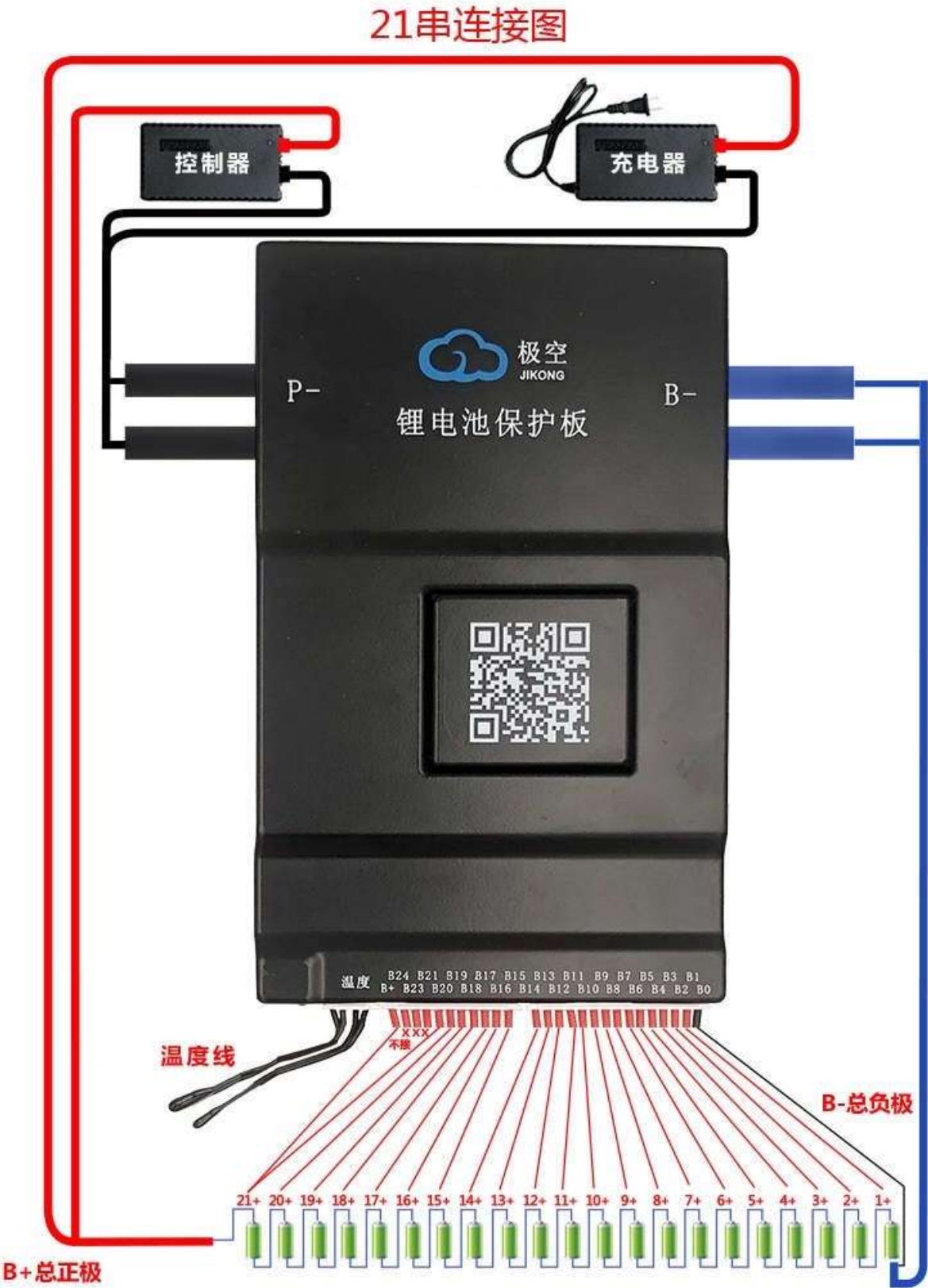


图 10 21 串电池接线图示
Figure 10 Diagram of 21 series battery connection

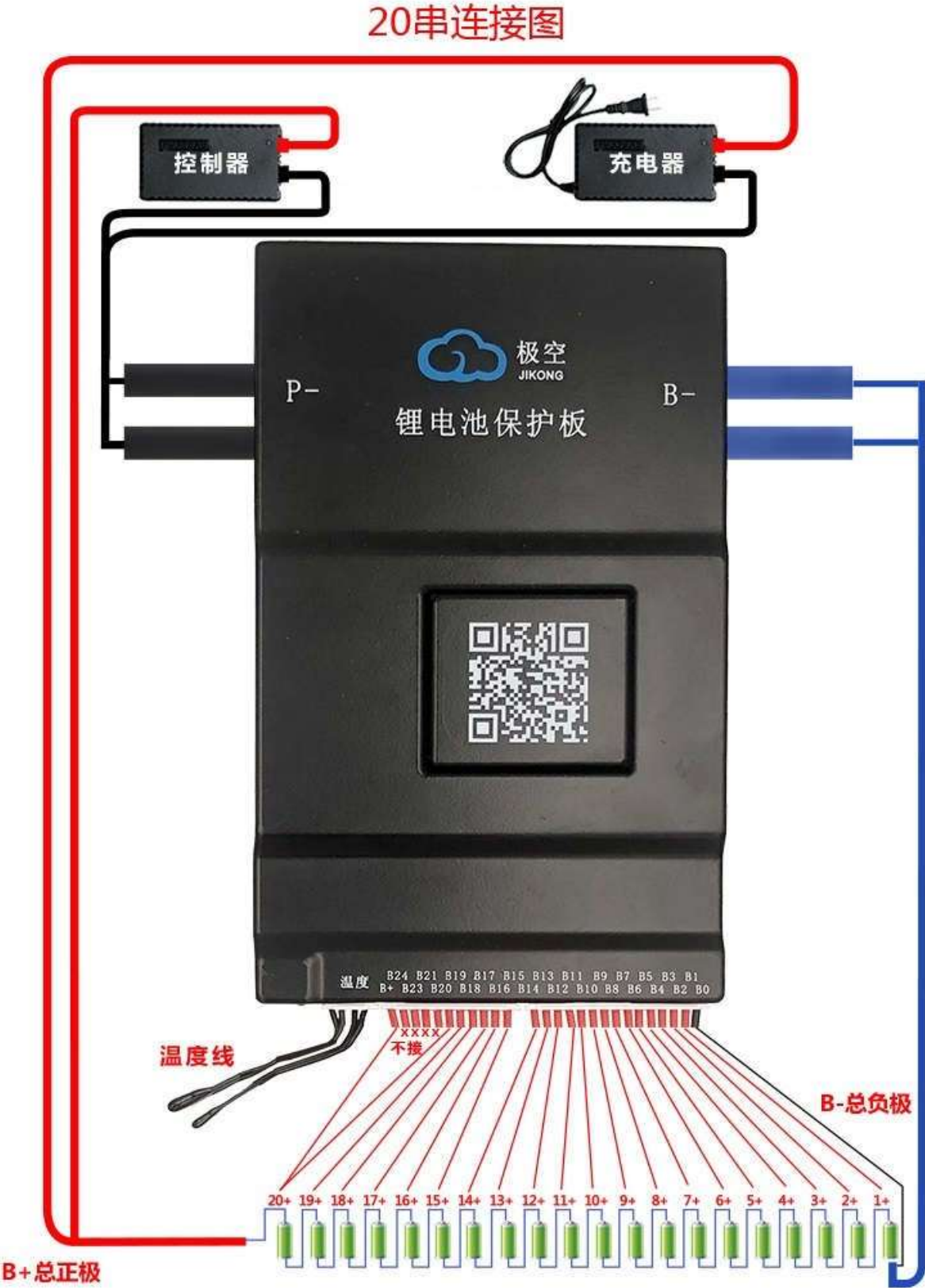


图 11 20 串电池接线图示
Figure 11 Diagram of 20 series battery connection

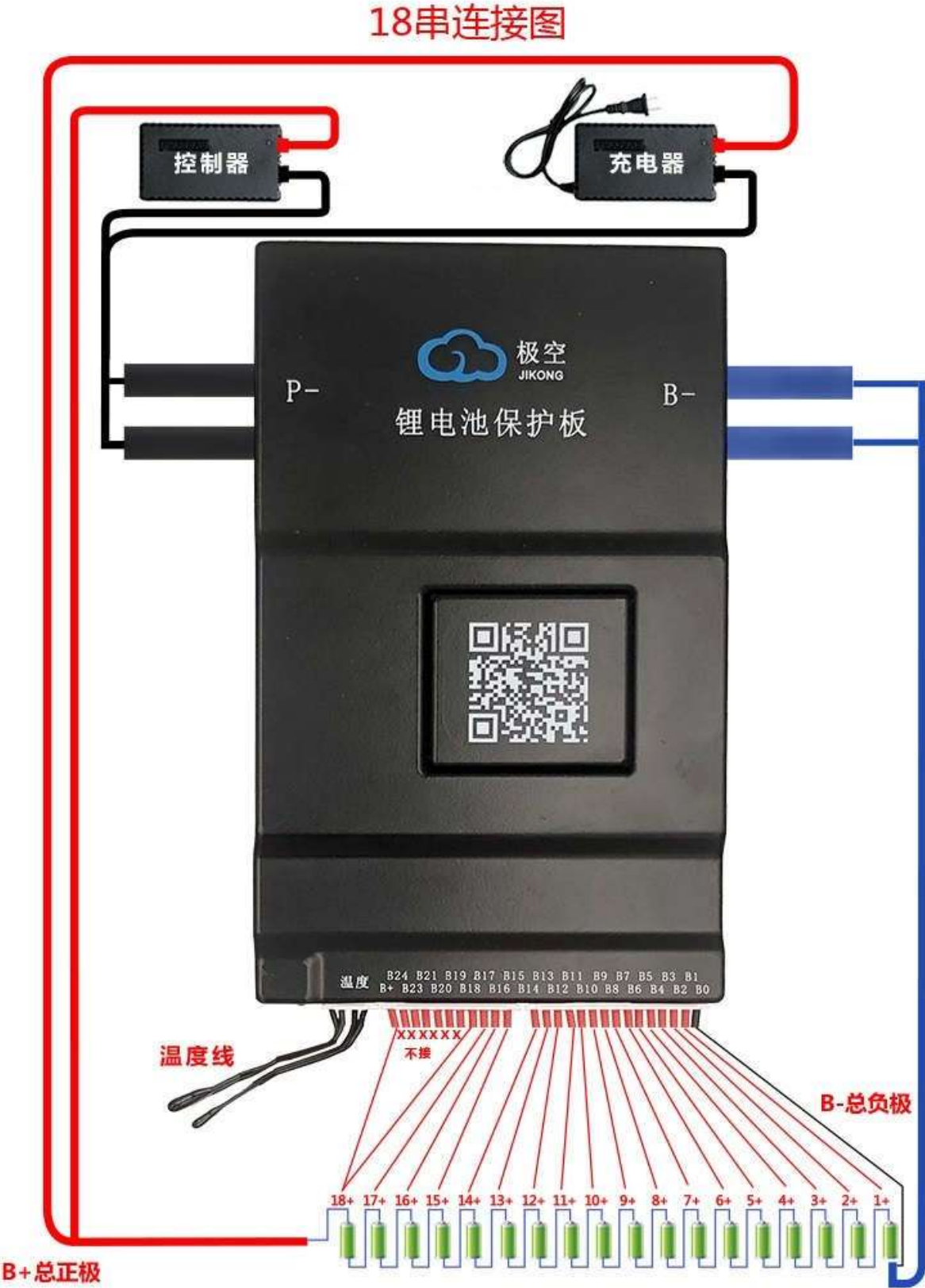


图 13 18 串电池接线图示
Figure 13 Diagram of 18 series battery connection



图 14 17 串电池接线图示
Figure 14 Diagram of 17 series battery connection

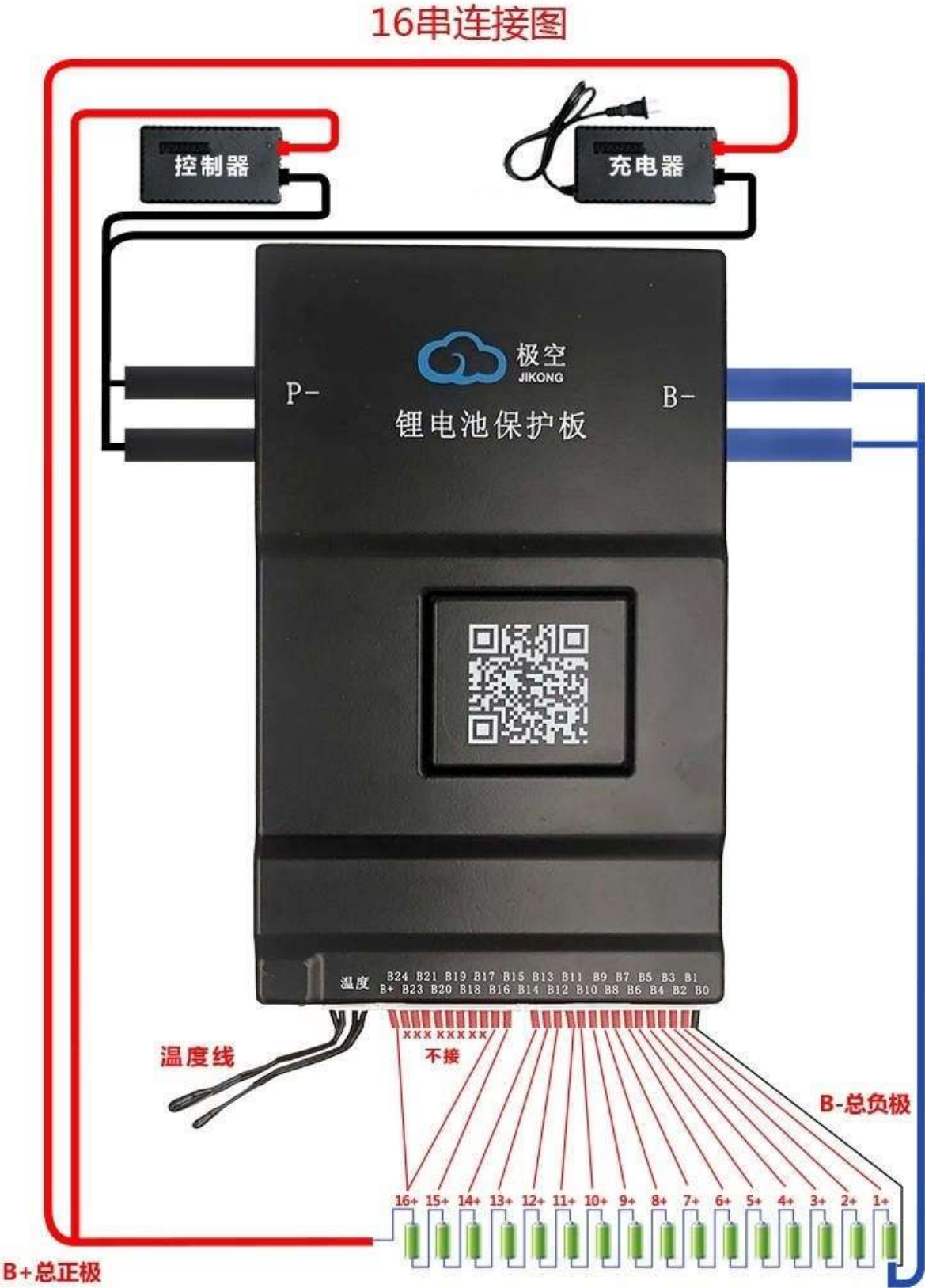


图 15 16 串电池接线图示
Figure 16 Diagram of 16 series battery connection

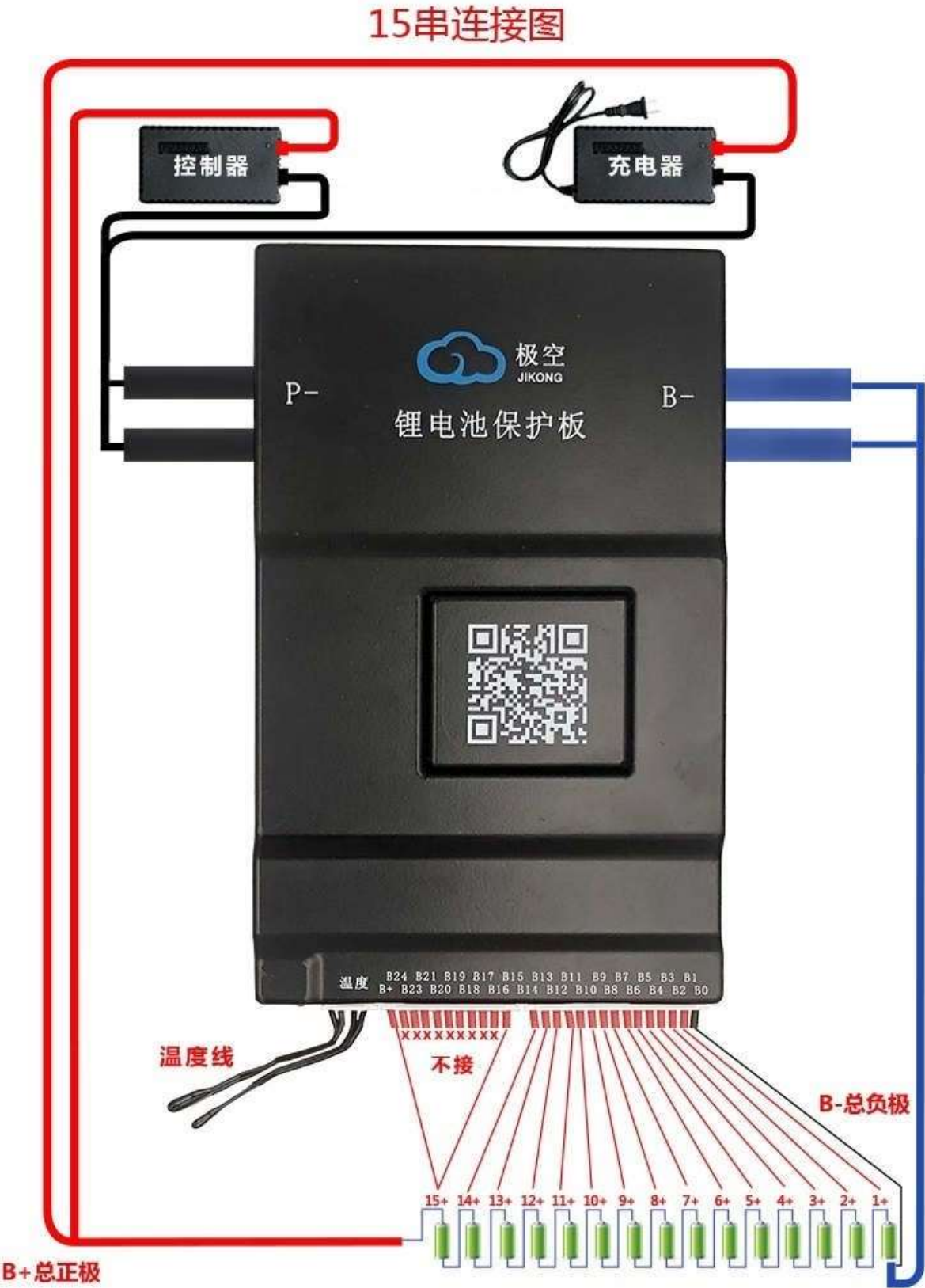


图 16 15 串电池接线图示
Figure 16 Diagram of 15 series battery connection

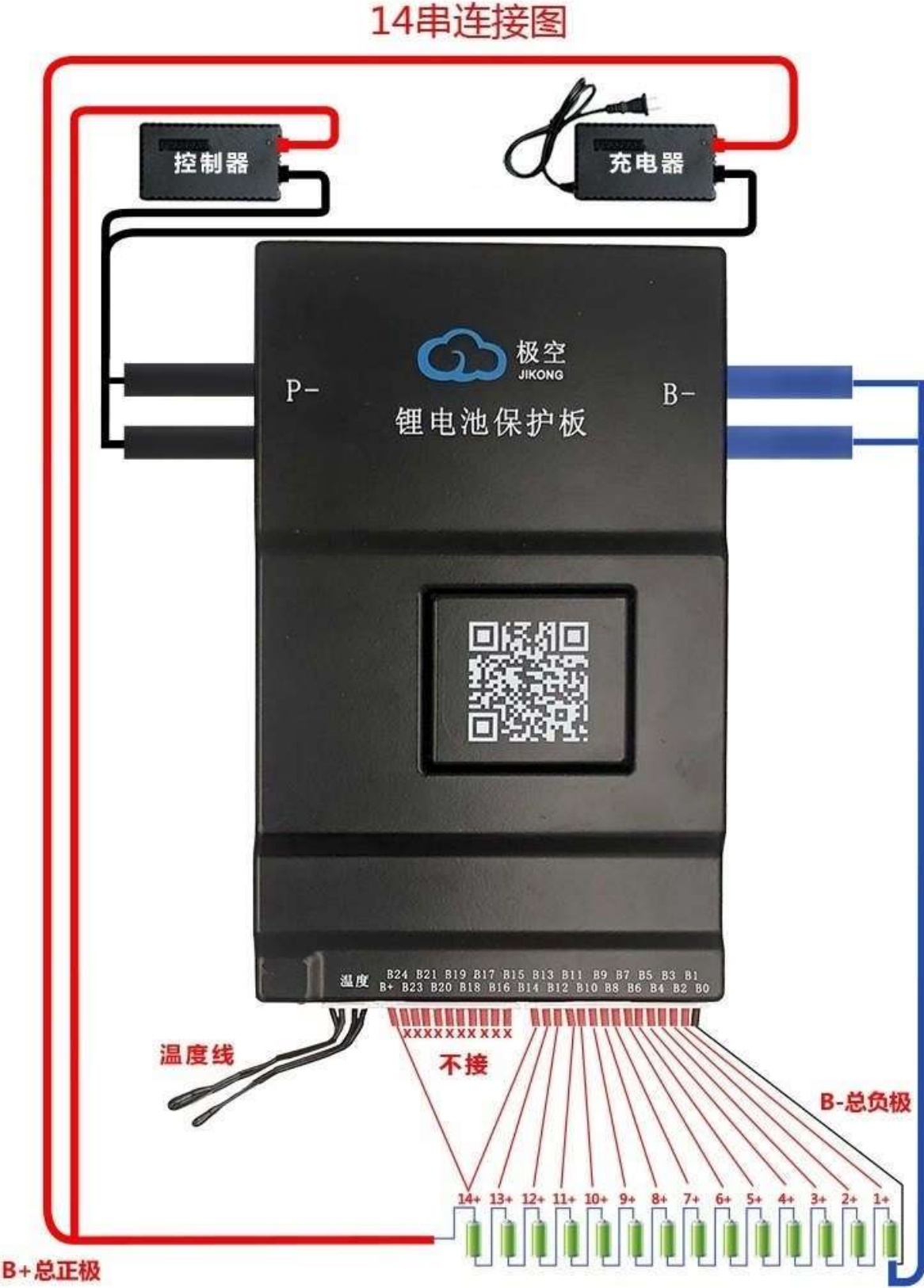


图 17 14 串电池接线图示
Figure 14 Diagram of 17 series battery connection

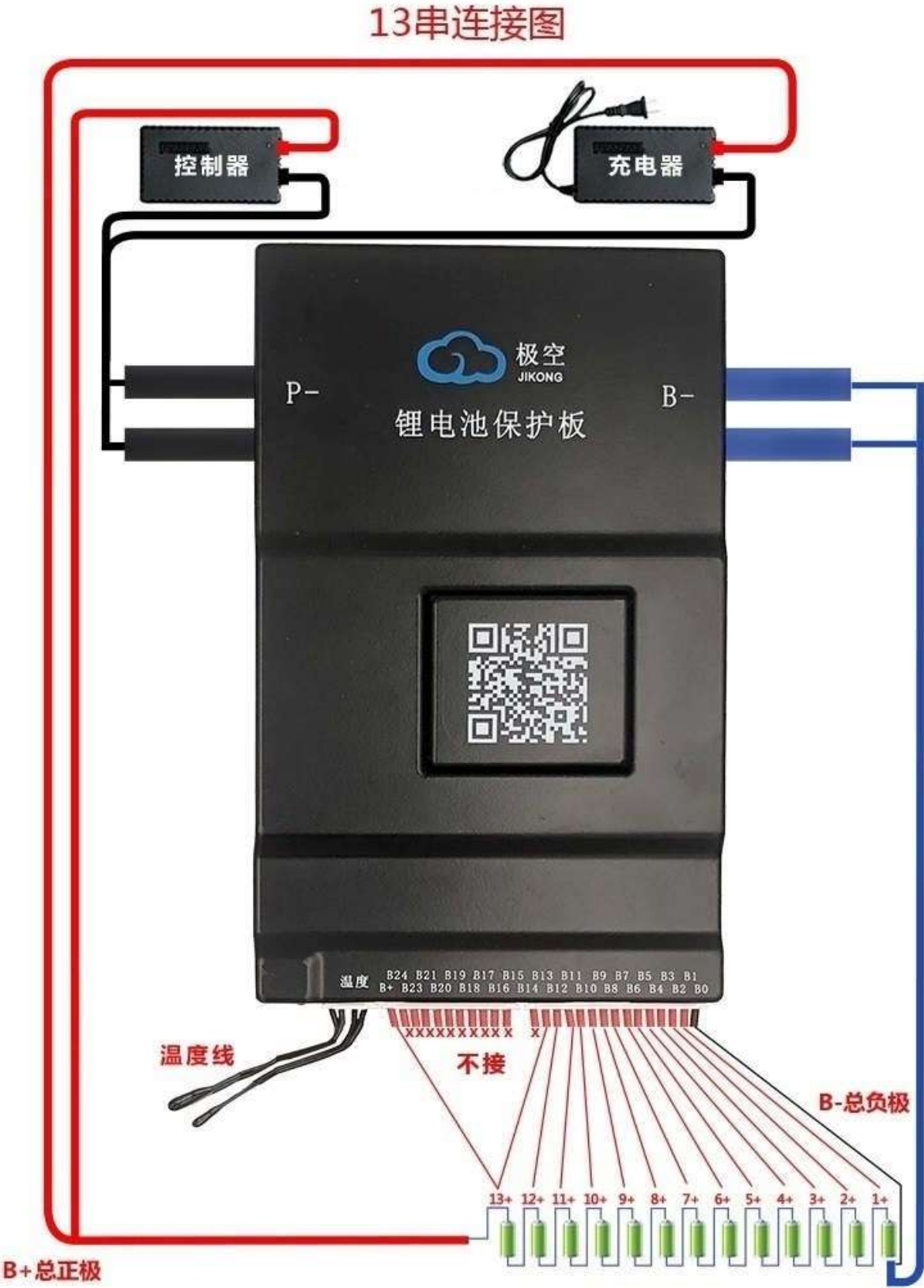


图 18 13 串电池接线图示
Figure 18 Diagram of 13 series battery connection

JK-BD6AxxS-6P、JK-BD6AxxS-8P 保护板适用于7-24 串电芯的锂电池组，不同电芯,数量的电池组接线方法不同，具体接线方式如下图所示。

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,

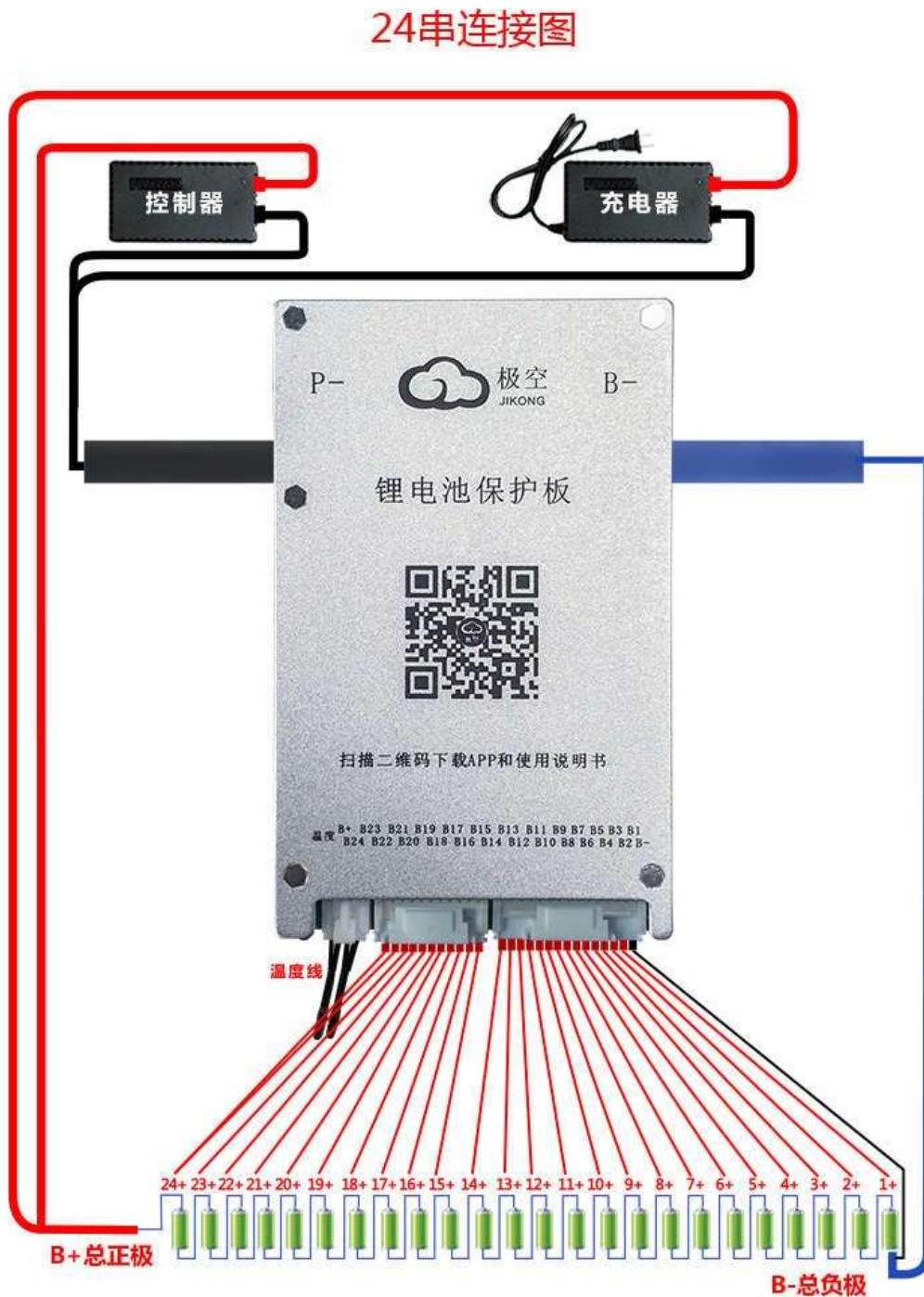


图 19 24 串电池接线图示

Figure 19 Diagram of 24-series battery connection

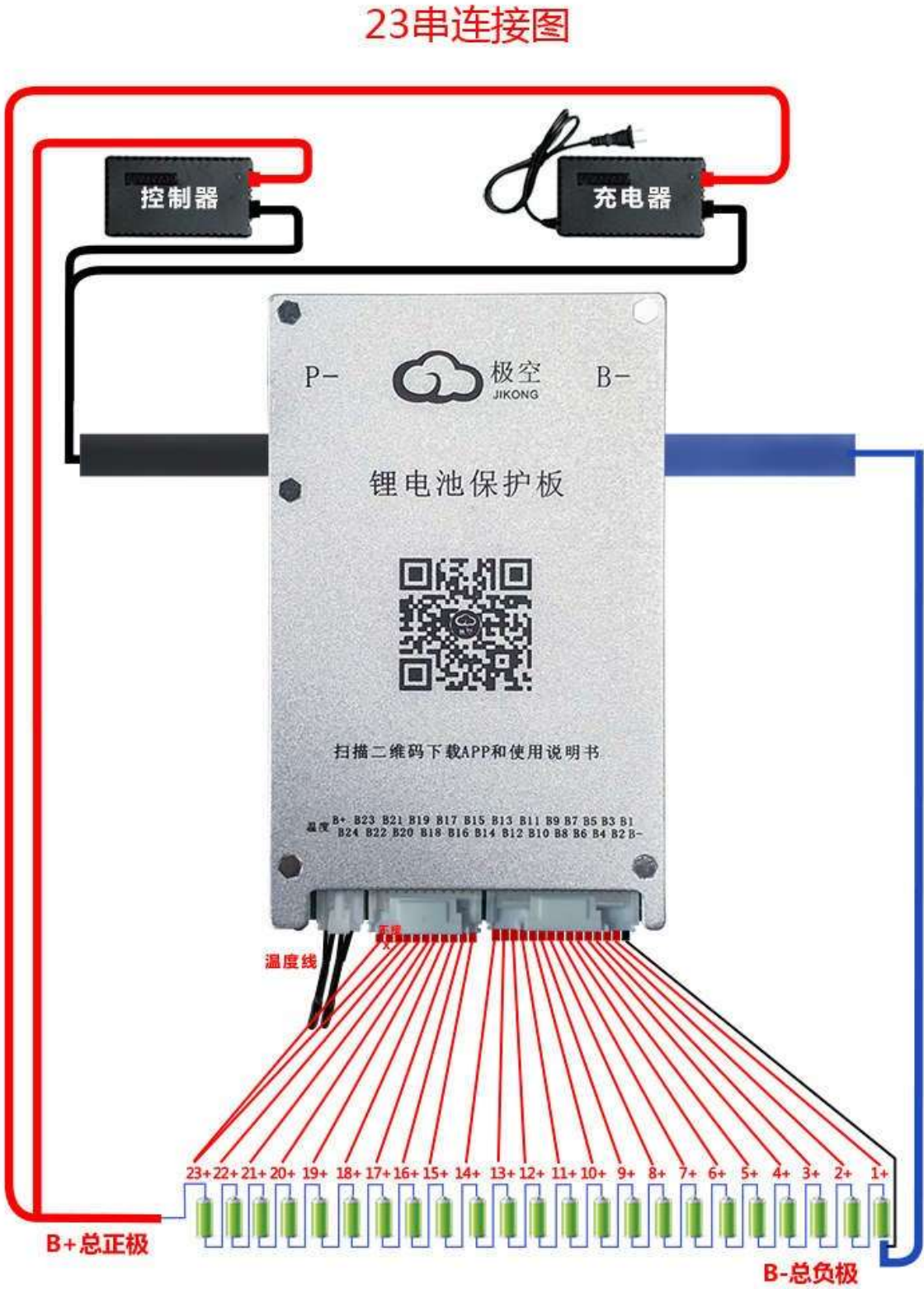


图 20 23 串电池接线图示

Figure 20 Diagram of 23-series battery connection

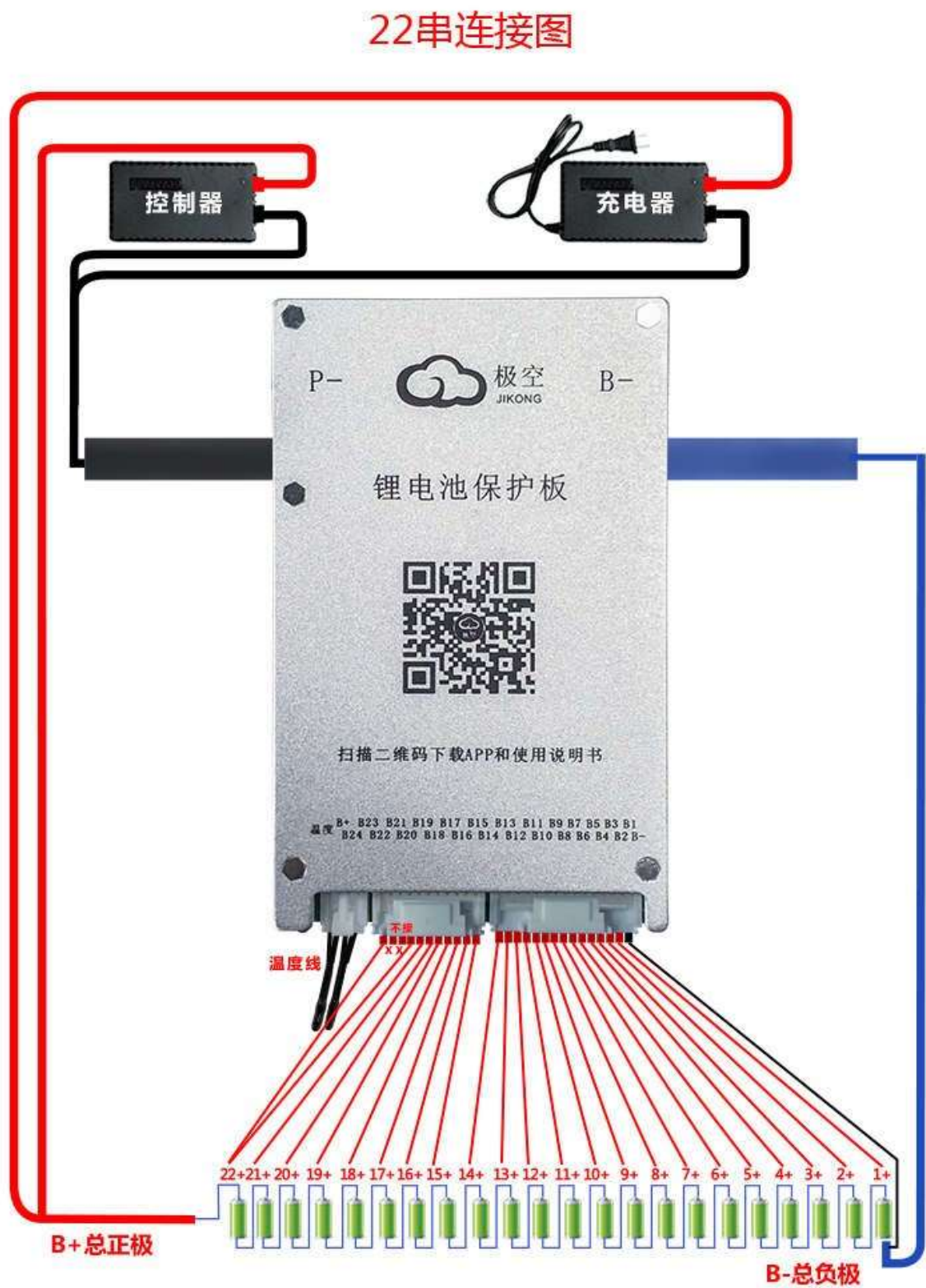


图 21 22 串电池接线图示

Figure 21 Diagram of 22-series battery connection

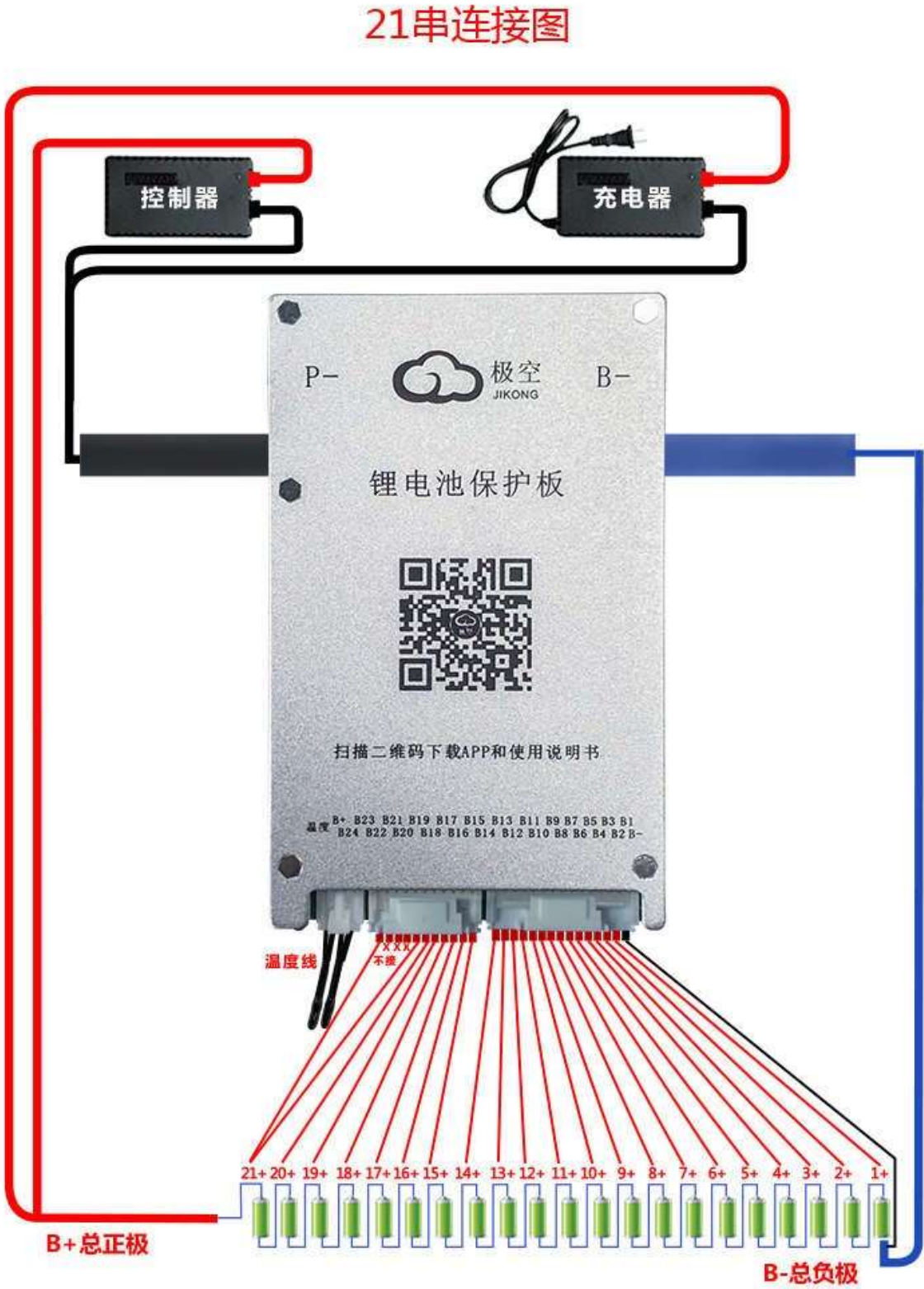


Figure 22 图 22 21 串电池接线图示
Diagram of 21-series battery connection

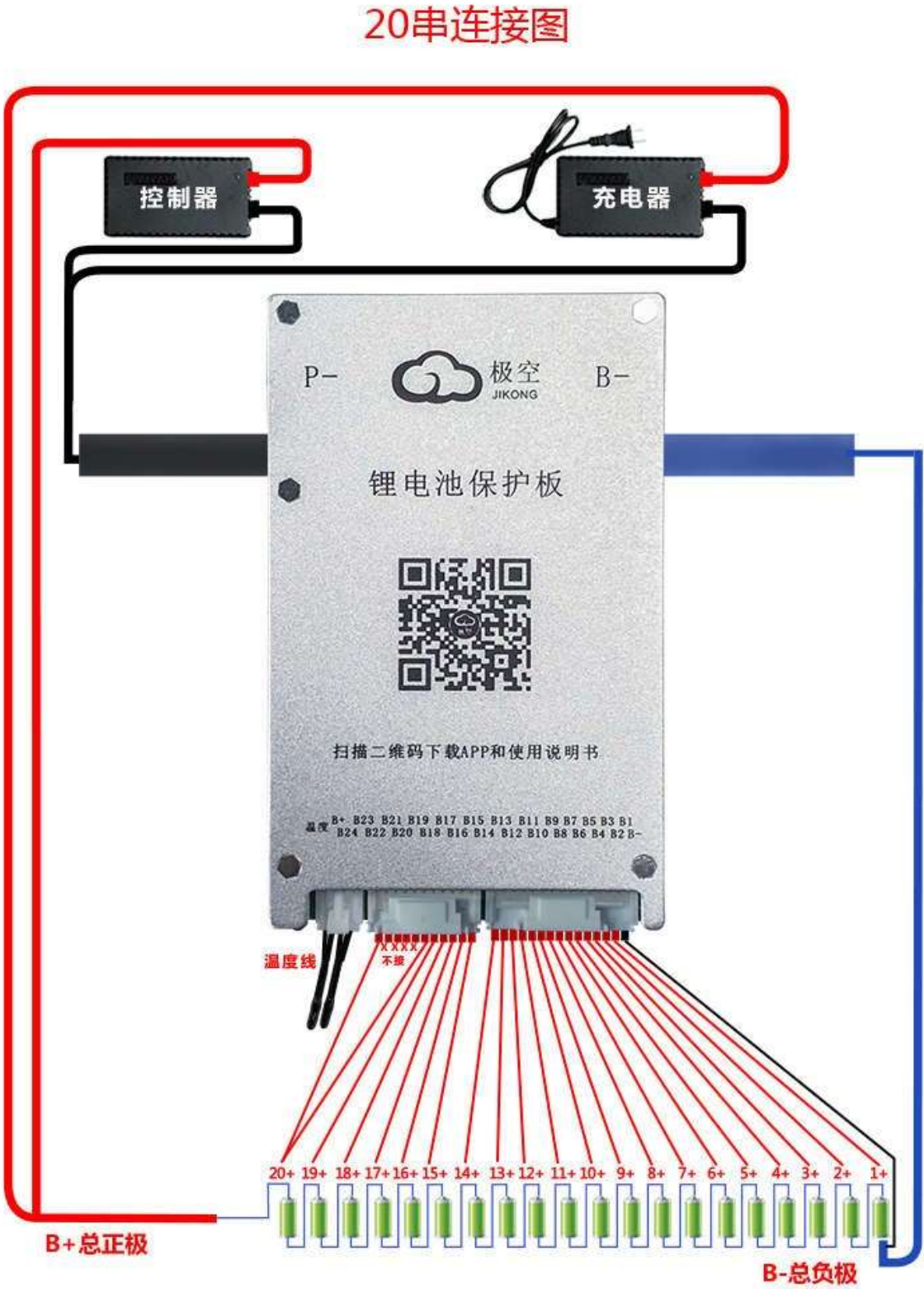


Figure 23 图 23 20 串电池接线图示
Diagram of 20-series battery connection

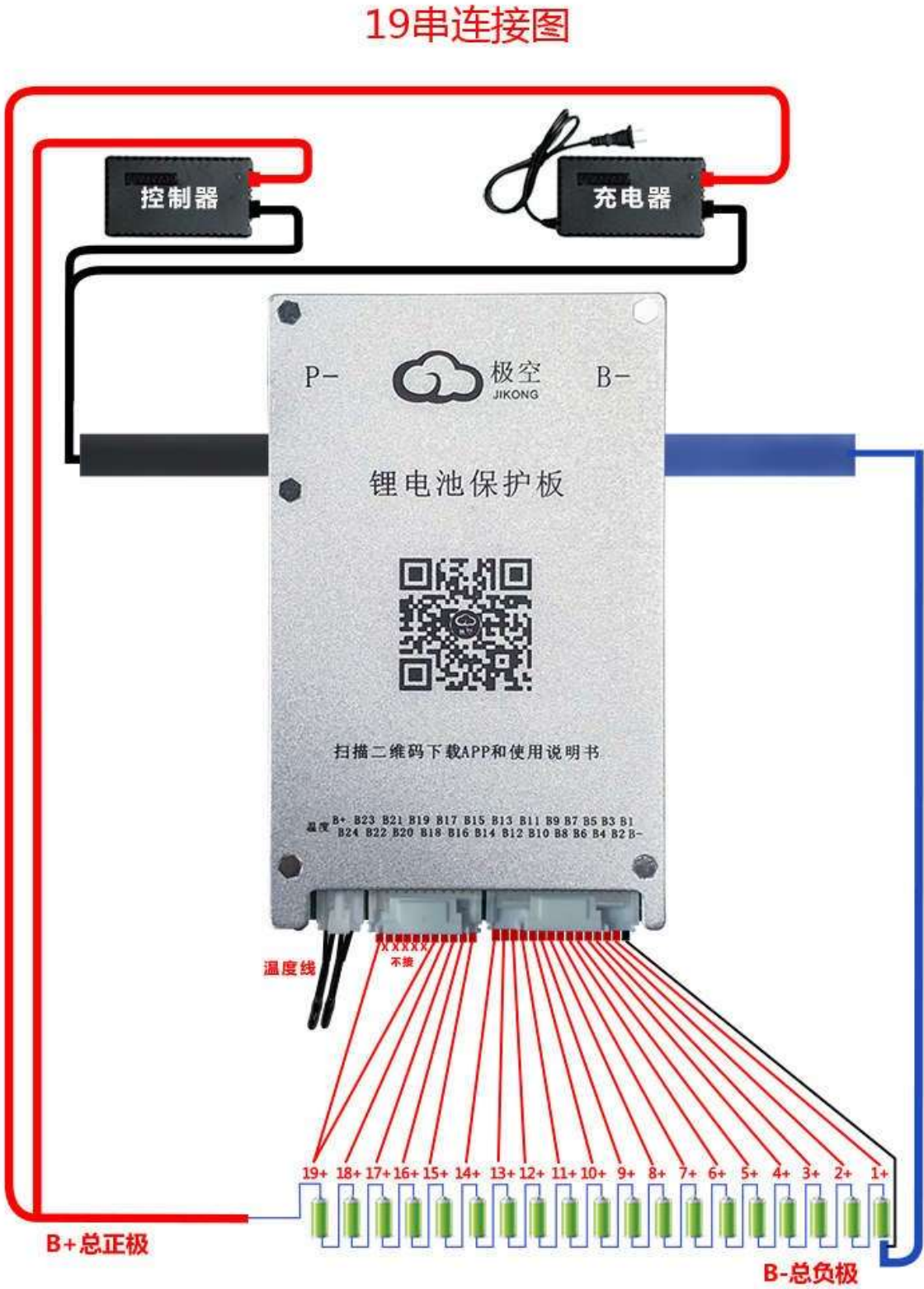


Figure 14 图 24 19 串电池接线图示
Diagram of 19-series battery connection

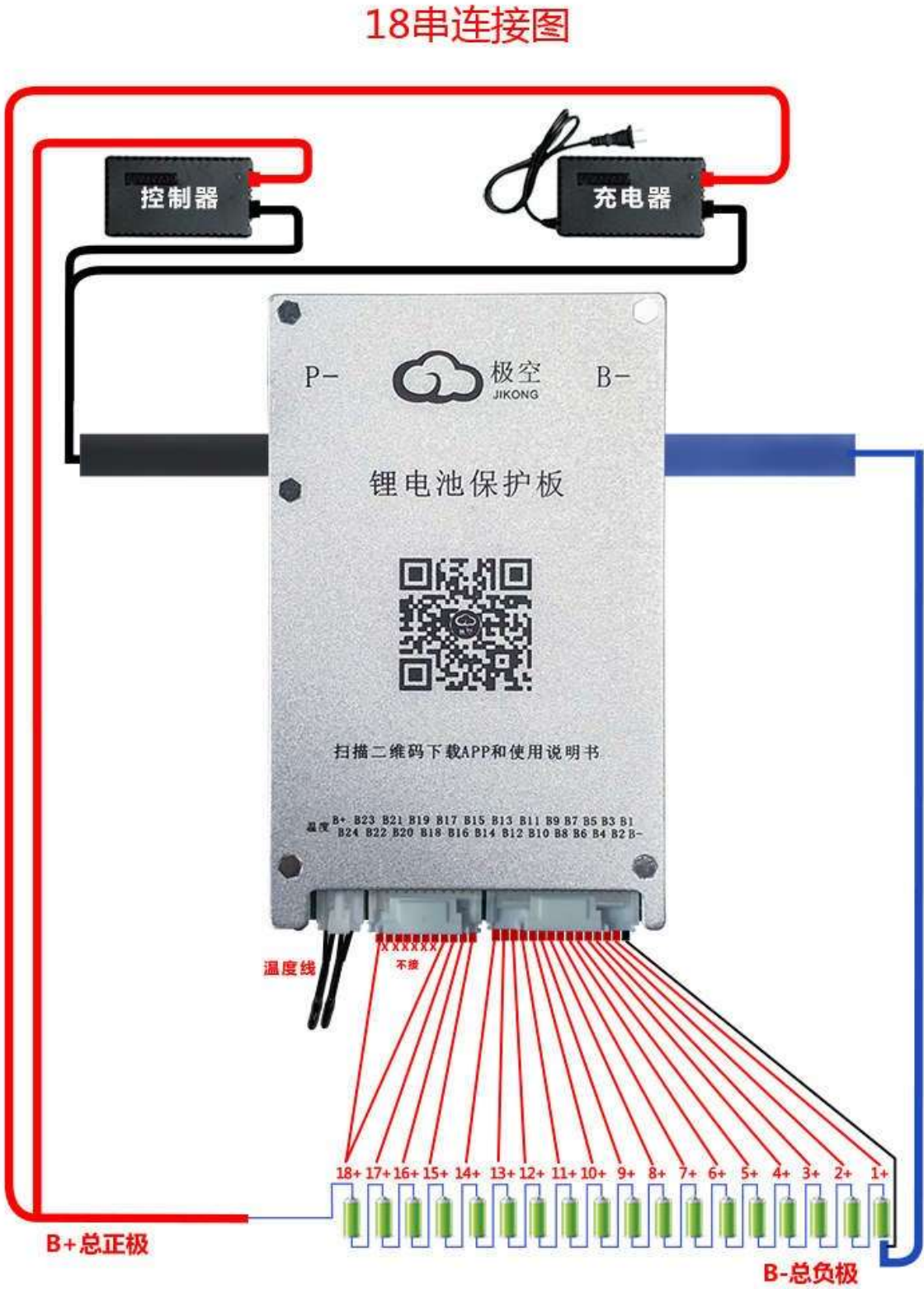


图 25 18 串电池接线图示
Figure 25 Diagram of -18-series battery connection

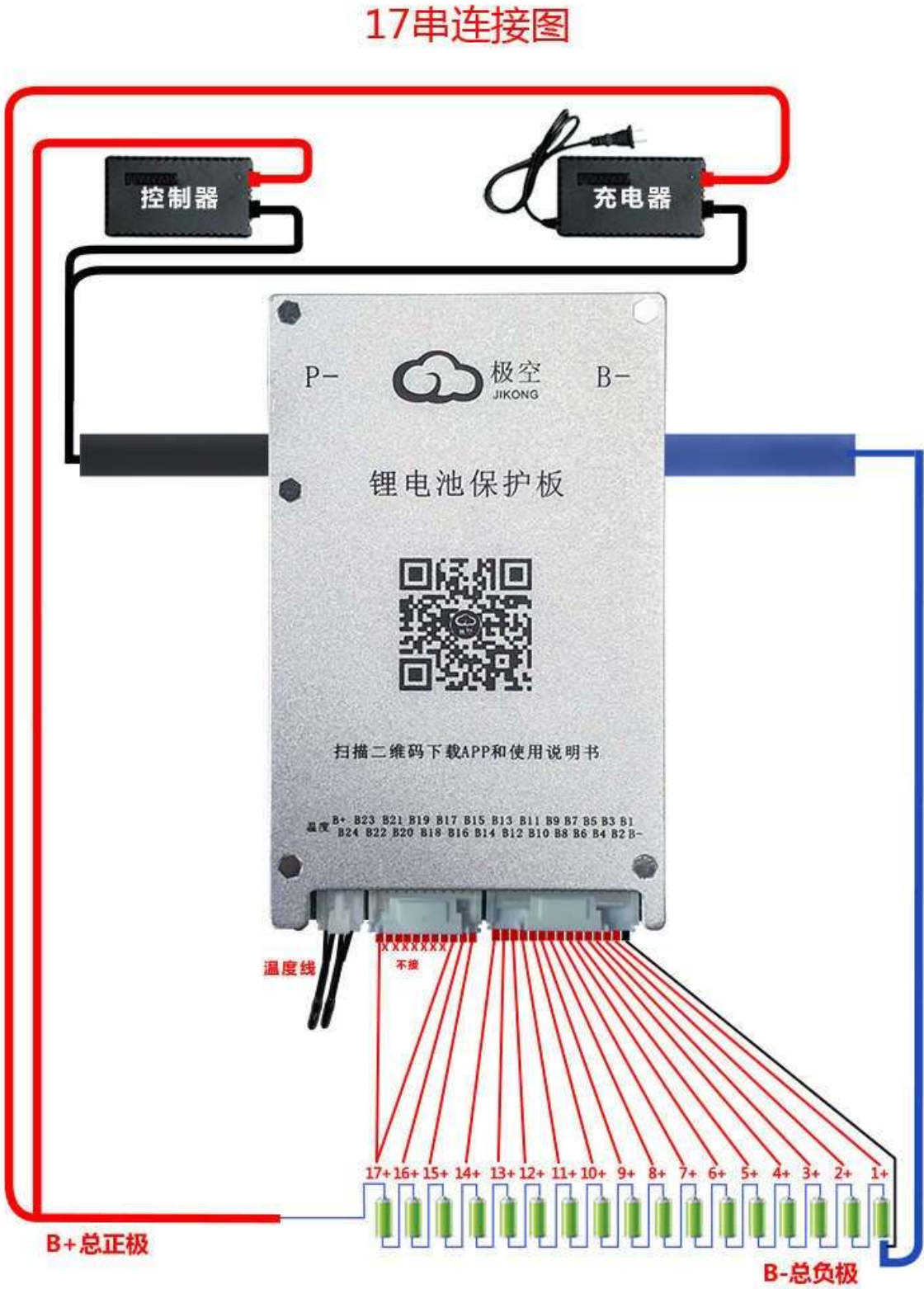


图 26 17 串电池接线图示
Figure 26 Diagram of 17-series battery connection

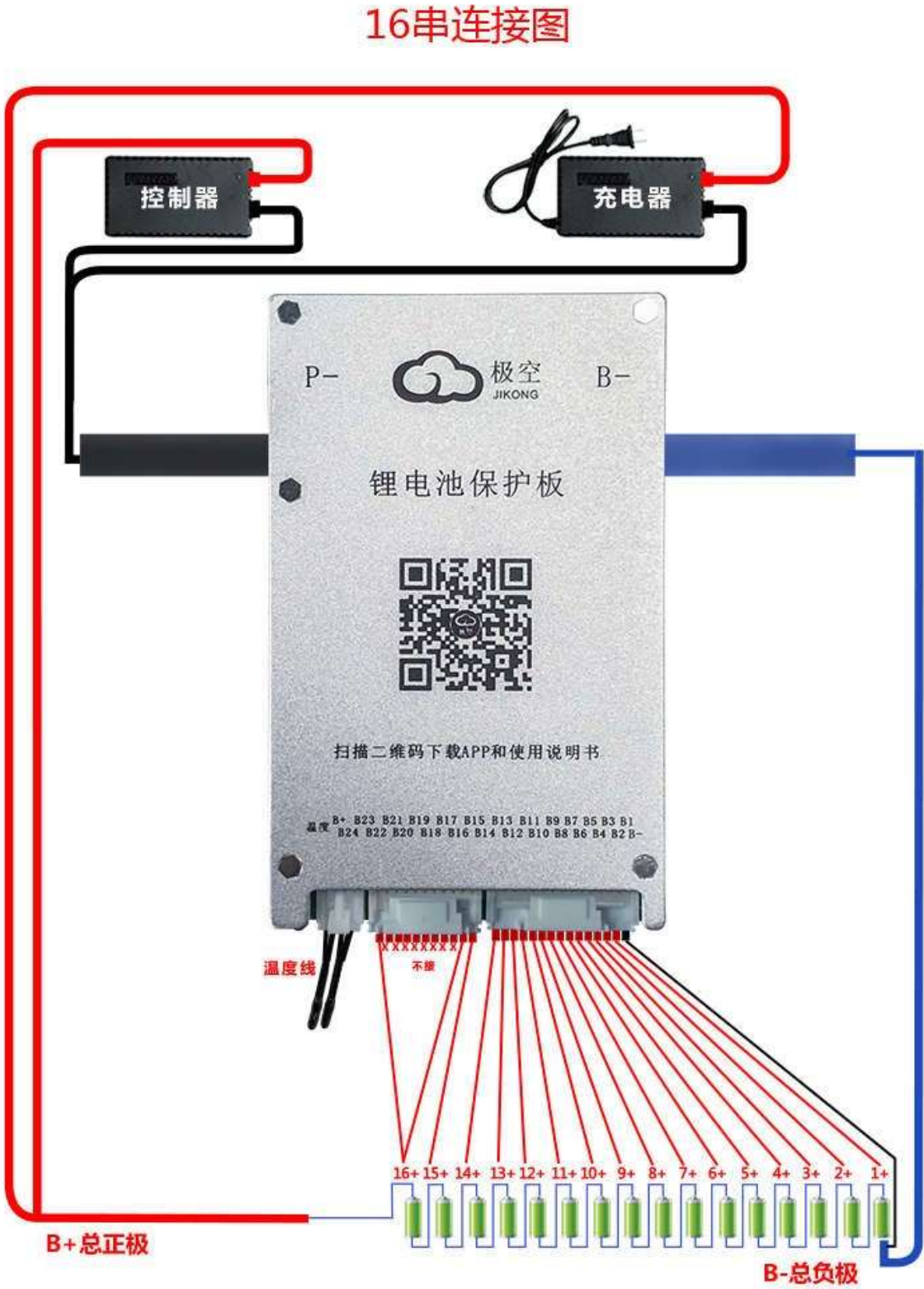


Figure 27 图 27 16 串电池接线图示
Diagram of 16-series battery connection

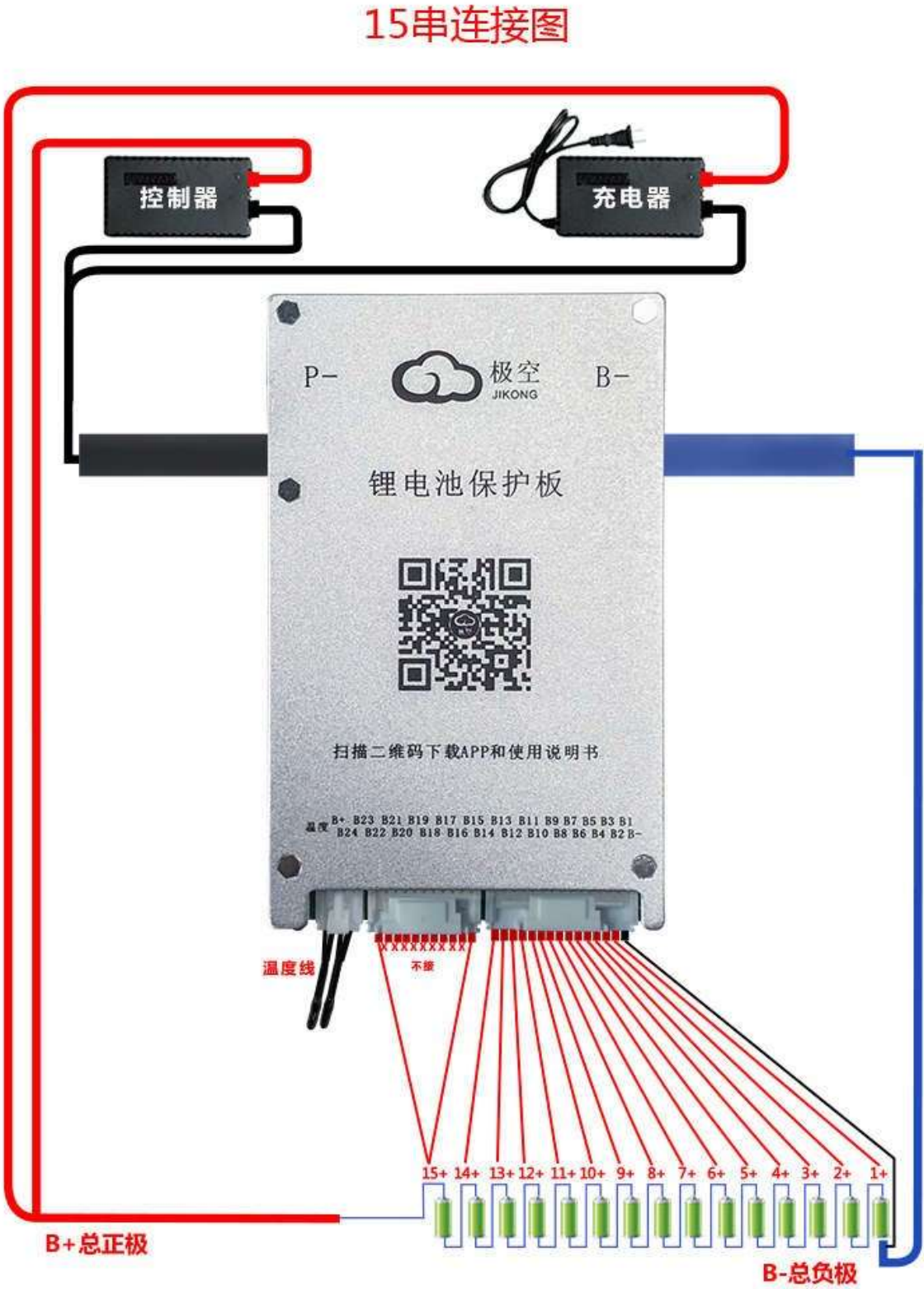


图 28 15 串电池接线图示
Figure 28 Diagram of 15-series battery connection

4.3. APP 安装/ APP Installation

通过扫描图31所示的二维码可以获取与产品配套的手机 APP。

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.



图 31 手机 APP 链接二维码/ Figure 31 Mobile APP Link QR Code

Download link-IOS : Search (JIKONG BMS) in the APP STORE

Download link-Andriod : <https://www.pgyer.com/Cfq3>

Instructions: <https://github.com/NEEY-electronic/JK/tree/JK-BMS>

BMS protocol to connect to other devices: <https://github.com/syssi/esphome-jk-bms>

VenusOS driver: <https://github.com/Louisvdw/dbus-serialbattery>

5.使用与操作/ Use and operation

5.1. 使用前的准备和检查/ Prepare and check before use

在保护板开机之前，请再次确认均衡线连接是否正常，”C-”与”B-”是否连接正确。检查保护板是否已经稳妥的与电芯固定，确认无误后才可以接通给保护板上电，否则可能造成工作异常、甚至烧毁等严重后果。

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. 保护板上电工作/ BMS works electrically

确认上述操作无误以后，可以给保护板上电。保护板没有上电控制开关，设计为**充电激活 模式**（充电器电压比电池电压高 **5V**），即电池组装完成以后需要接上充电器让保护板开机工作。也可以使用 BMS 附带的开关激活 BMS。

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 操作说明/ App operating instructions

5.3.1. 设备操作/ Equipment operation

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.

5.3.1.1. 设备连接/ Device connection

首先开启手机蓝牙，然后打开 APP 后，如图 32 所示。点击左上角图标扫描设备，等待扫描完成以后，点击需要连接的设备名称，如“JK-B1A24S”。第一次连接时APP会提示输入密码，设备的默认密码为“1234”，设备连接后APP会自动记录密码，下次连接无需输入密码，开启APP后自动连接，密码输入界面如图 33 所示。

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.

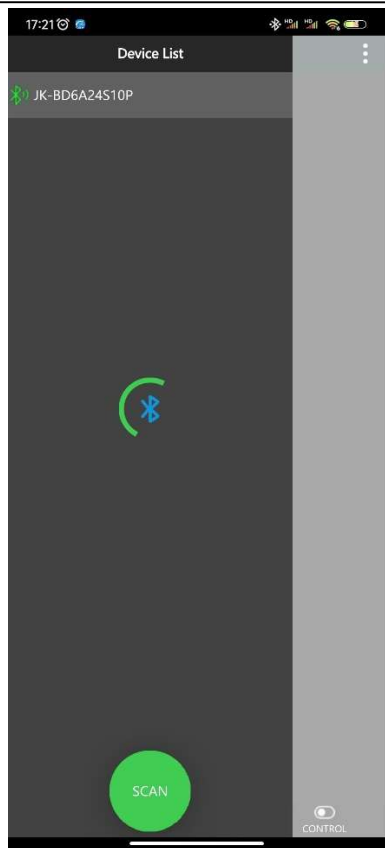


图32 设备扫描

Figure 32 device scanning

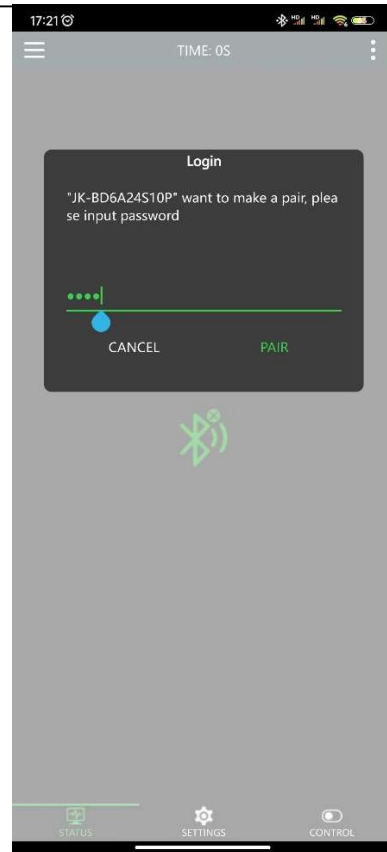


图33 密码输入

Figure 33 Password input

5.3.1.2. 修改密码和名称/Modify password and name

设备连接上后点击设备列表右侧的“笔型”图标可修改设备名称和密码。修改设备名称界面如图 34

所示，注意，设备名称仅支持英文或者数字，不支持中文名称和汉字

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.

修改密码界面如图 35 所示。要修改设备密码必须先输入设备的旧密码，只有在当前密码正确的前提下，才能进入到新密码输入的选项。输入两次新密码后，点击‘确定’可以完成设备密码修改。

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.

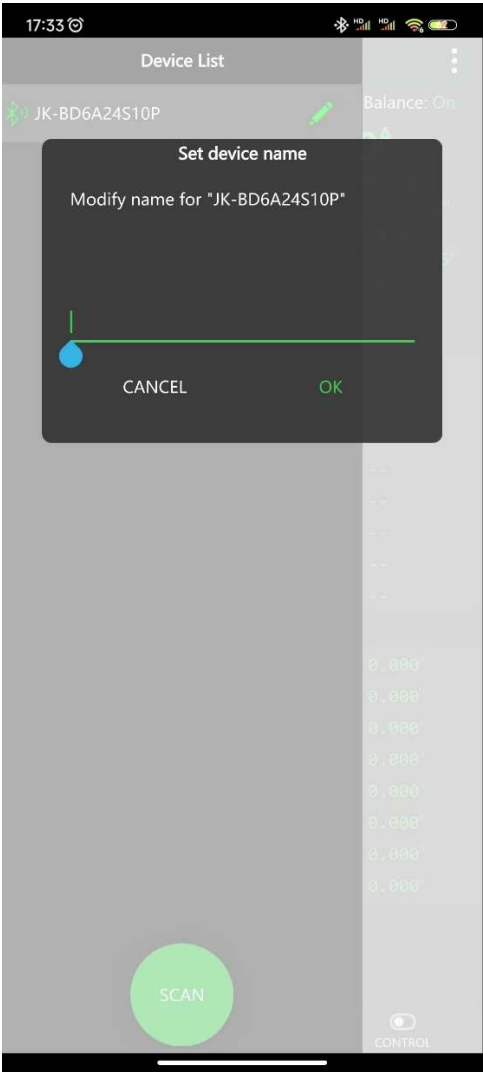


图34 名称修改
Figure 34 Name Modification

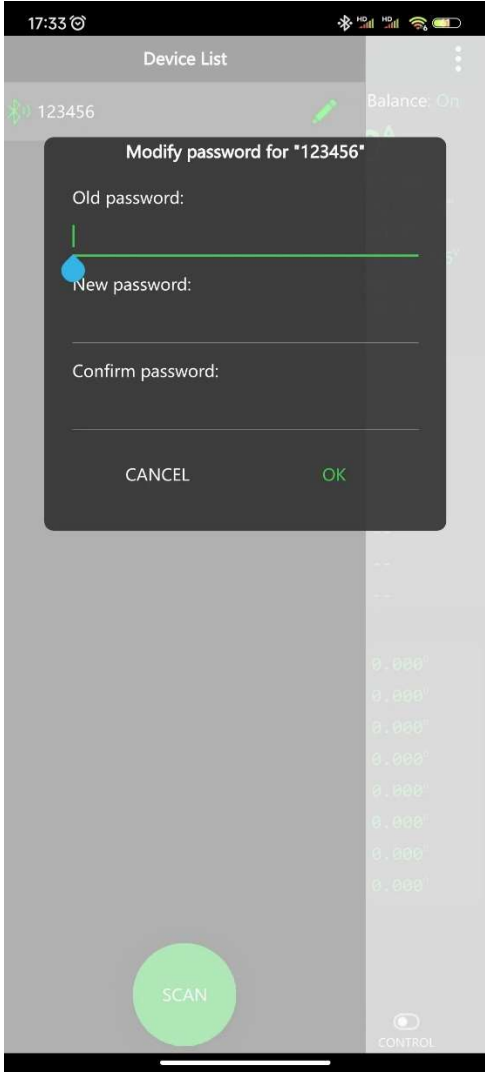


图 35 密码修改
Figure 35 Password modification

5.3.1 状态查看/ Status View

实时状态界面如 36 所示。 / The real-time status interface is shown in 36.

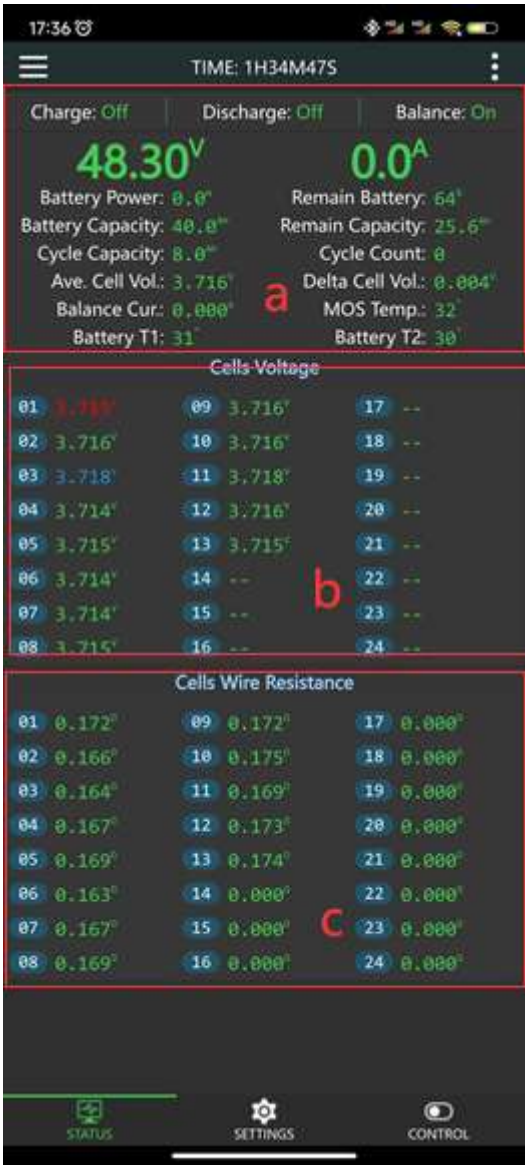


图 36 实时状态显示/ Real-time status display

在实时状态页面分为 3 个区域/The real-time status page is divided into three areas.
图中 1 区为电池综合信息栏。各参数参数释义如下：

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

A) 运行时间 / Runtime

运行时间表示从保护板第一次开机至今的运行总时间。
Running time represents the total running time from the first start of the BMS to now.

B) 充电/CHARGE

表示当前保护板充电 MOS 的开关状态。显示“开启”时，表示当前保护板充电MOS 打开， 电池允

许充电；显示“关闭”时，表示当前保护板充电MOS 关闭，电池不允许充电。

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) 放电/DISCHARGE

表示当前保护板放电 MOS 的开关状态。显示“开启”时，表示当前保护板放电 MOS 打开，电池允许放电；显示“关闭”时，表示当前保护板放电 MOS 关闭，电池不允许放电。

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) 均衡/Balance

表示当前保护板均衡开关的开关态。显示“开启”时，当达到均衡触发条件以后，保护板自动均衡；显示“关闭”时，表示均衡关闭，保护板不会对电池进行均衡。

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) 电压/Voltage

电压区域实时显示当前电池的总电压，总电压是所有单体电之和。

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) 电流/Current

电流区域实时显示当前电池的总电流。当电池充电时，电流为正，当电池放电时，电流为负。

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) 电池功率/Power

表示当前电池输出或者输入的总功率，其值是当前电池电压和电池电流绝对值之积。

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) 电池容量/Battery Capacity

表示当前保护板通过高精度SOC所计算得到的电池实际容量，单位为：AH。（该值需要电池做一个完整的放电和充电循环后才更新）。

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) 剩余容量/ Remaining capacity

剩余容量表示当前电池的剩余容量，单位 AH

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

J) 循环容量 /cycle capacity

循环容量表示电池的累计放电容量，单位：AH。

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

k) 循环次数/Number of cycles

循环次数表示当前电池的充电饱和次数，单位为：次

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

L) 单体平均 /*Monomer average

表示当前电池的单体平均电压，单位：V。

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

M) 最大压差/ Maximum differential pressure

最大压差表示当前整组电池，最高电芯电压和最低电芯电压的差值，单位：V。

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) 均衡电流 / balancing current

当保护板开启均衡功能，且达到均衡条件时，均衡电流显示区域实时显示均衡电流，

单位：A。

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.

当均衡进行时，实时状态的单体电压显示区域，蓝色代表放电的电池，红色代表被充电的电池。均衡电流负电流表示电池在放电，此时蓝色闪烁，均衡电流正电流表示在电池在充电，此时红色闪烁。保护板采用主动均衡技术，均衡的原理是从高电压的电芯取电，存放到保护板，然后再放给 低电压的电芯。

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

实时显示当前保护板功率 MOS 的温度，单位：℃。

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

P) 电池温度 1/ Battery temperature 1

在温度传感器1 没有安装的情况下显示“NA”，在温度传感器安装的情况下，实时显示温度传感器 1 的温度，单位：℃。

"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: ℃.

Q) 电池温度 2/ Battery temperature 2

在温度传感器2 没有安装的情况下显示“NA”，在温度传感器安装的情况下，实时显示温度传感器 2 的温度，单位：℃。

"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: ℃.

图中2区为单体电压区域。实时显示电池包中每个单体的电压数据，其中红色表示最低电压的单体，蓝色表示最高电压的单体。

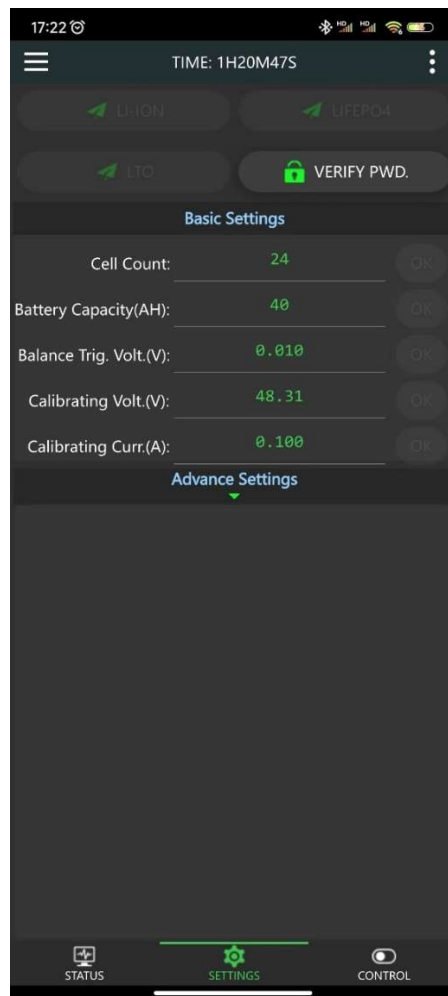
Zone 2 in the figure is a single voltage region. Real-time display of voltage data for each individual

in the battery pack, where red indicates the lowest voltage monomer and blue indicates the highest voltage monomer.

图中3区为均衡线电阻区域。该均衡线电阻为保护板自检得到的均衡线电阻，该值只是粗略的计算，目的是为了防止接错线，或者接触不良，当均衡线电阻超过一定值以后，显示为黄色，此时不能开启均衡。

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 参数设置/ Parameter Settings



Parameter Settings Page Display

如果需要修改保护板的工作参数，必须先点击“授权设置”按钮，输入参数设置密码，以验证参数设置权限。参数设置密码出厂默认为“123456”。只有正确输入参数设置密码以后才能修改保护板的参数。参数设置密码和设备蓝牙连接密码是相互独立的。

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.

在参数设置页面可对保护板的各项工作参数进行修改，各个参数的释义如下。

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

a) 一键铁锂/ One-click Lifepo4

点击该按钮可以将保护板的所有工作参数修改为铁锂电池参数，铁锂参数默认值见附录。

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) 一键三元/ One-click lithium iron

点击该按钮可以将保护板的所有工作参数修改为三元电池参数，三元锂参数默认值见附录。

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) 一键钛酸锂/ One-click Lithium Titanate

功能该按钮可以将保护板的所有工作参数修改为钛酸锂电池参数，钛酸锂参数默认值见附录。

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) 单体数量/ Number of monomers

单体数量表示当前电池的电芯数量，在使用之前，请准确的设定该值，否则保护板不能正常工作。

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) 电池容量 / Battery capacity

该值为电池的设计容量。

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

f) 触发均衡压差/ Trigger Balanced Pressure Differential

在均衡开关打开的情况下，当电池组最大压差超过该值，且当前单体电压超过均衡起始电压，均衡开始，直到压差低于该值或单体电压低于均衡起始电压时均衡结束。比如设定均衡触发压差为 0.01V，当电池组压差大于 0.01V 时开始均衡，低于 0.01V 时结束均衡。（建议 50AH 以上的电池设定均衡触发压差为 0.005V，50AH 以下的电池设定触发均衡压差为 0.01V）。

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) 电压校准/ Voltage Calibration

电压校准功能可以用来校准保护板电压采集的精度。当发现保护板采集的总电压和电池的总电压有误差的时候，可以使用电压校准功能来校准保护板。校准的方法是填入当前测量到的电池总电压，然后点击电压校准后面的‘设置’按钮，完成校准。

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) 电流校准 / Current Calibration

电流校准功能可以用来校准保护板电流采集的精度。当发现保护板采集的总电流和电池的实际电流有误差的时候，可以使用电流校准功能来校准保护板。校准的方法是填入当前测量到的电池总电流，然后点击电流校准后面的‘设置’按钮，完成校准。

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)“单体欠压保护”、“单体欠压恢复” /

Single Under-voltage Protection, Single Under-voltage Recovery

“单体欠压保护”是指电芯的截止电压，只要电池组中任一单体电压低于该值时，产生‘单体欠压报警’，同时保护板关闭放电MOS，此时电池不能放电，只能充电。当报警产生以后，只有全部单体电压值超过“单体电压恢复”的值以后，保护板解除‘单体欠压报警’，同时开启放电 MOS。

"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)“单体过充电压”、“单体过充恢复”

Monomer Overcharge Voltage", "Monomer Overcharge Recovery"

“单体过充电压”是指电芯的饱和电压，只要电池组中任一单体电压超过该值时，产生‘单体过充报警’，同时保护板关闭充电 MOS，此时电池不能充电，只能放电。当报警产生以后，只有全部单体电压值低于“单体过充恢复”的值以后，保护板解除‘单体过充报警’，同时开启充电 MOS。

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) 自动关机电压 / Auto Shutdown Voltage

自动关机电压表示保护板工作的最低电压，当电池组中最高单体的电压低于该值时，保护板关闭。该值必须低于“单体欠压保护”。

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) “最大充电电流”、“充电过流延时”、“充电过流解除” / "

**Maximum Charging Current", "Charging Over-current Delay",
"Charging Over-current Release"**

当给电池包充电时，电流超过“最大充电电流”且持续时间超过“充电过流延时”的时间，保护板产生‘充电过流报警’，同时关闭充电 MOS。报警产生以后，经过“充电过流解除”的时间后，保护板解除充电过流报警，重新开启充电 MOS。

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.

举例：设定“最大充电电流”为 10A、“充电过流延时”为 10 秒、“充电过流解除”为 50 秒。在充电过程中充电电流连续 10 秒超过 10A，保护板将产生‘充电过流报警’，同时关闭充电 MOS，报警产生后 50 秒，解除充电过流报警，同时保护板重新开启充电 MOS。

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) “最大放电电流”、“放电过流延时”、“放电过流解除” / "

**Maximum Discharge Current", "Discharge Over-current
Delay", "Discharge Over-current Release"**

当给电池包放电时，电流超过“最大放电电流”且持续时间超过“放电过流延时”的时间，保护板产生‘放电过流报警’，同时关闭放电 MOS。报警产生以后，经过“放电过流解除”的时间后，保护板解除‘放电过流报警’，重新开启放电 MOS。

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.

举例：设定“最大放电电流”为 100A、“放电过流延时”为 10 秒、“放电过流解除”为 50 秒。在放电过程中放电电流连续 10 秒超过 100A，保护板将产生‘放电过流报警’，同时关闭放电 MOS，报警产生后 50 秒，解除‘放电过流报警’，同时保护板重新开启放电 MOS。

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) 短路保护解除 / Short Circuit Protection Release

当短路保护发生以后，经过‘短路保护解除’所设定的时间以后，解除短路保护。

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

o) 均衡起始电压 / balancing starting voltage

均衡起始电压用来控制均衡的电压阶段，只有当单体电压超过该值，且电池组最大压差超过均衡触发压差，均衡才会被触发。

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) 最大均衡电流/ Maximum balancing current

均衡电流表示在能量转移的过程中高电压电池放电和低电压电池充电的持续电流。最大均衡 电流表示能量转移过程中的最大电流，最大均衡电流以不超过 0.1C 为宜。例如：20AH 电池不超过 $20 \times 0.1 = 2A$ 。

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 $20 \times 0.1 = 2a$.

q) “充电过温保护”、“充电过温恢复”

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

在充电过程中，电池温度超过“充电过温保护”的值时，保护板产生‘充电过温保护’警告，同时保护板关

闭充电 MOS。报警产生以后，当温度低于“充电过温恢复”时，保护板解除‘充电过温保护’警告，同时重新开启充电 MOS。

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) “充电低温保护”、“充电低温恢复”

"Charging Low Temperature Protection", "Charging Low Temperature Recovery"

在充电过程中，电池温度低于“充电低温保护”的值时，保护板产生‘充电低温保护’警告，同时保护板关闭充电 MOS。报警产生以后，当温度高于“充电低温恢复”时，保护板解除‘充电低温保护’警告，同时重新开启充电 MOS。

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 过温保护”、“MOS 过温恢复”

"MOS Over Temperature Protection", "MOS Over Temperature Recovery"

当 MOS 温度超过“MOS 过温保护”的值以后，保护板产生‘MOS 过温报警’同时关闭充放电 MOS，电池不能充电也不能放电。报警产生以后，MOS 温度低于“MOS 过温恢复”的值以后，保护板解除‘MOS 过温报警’，同时重新开启充放电 MOS（MOS 过温保护值为 75℃，MOS 过温恢复值为 65℃，这两个值为出厂默认值，不能修改）。

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)).

注意： 任何参数的修改，请参考说明书，不恰当的参数可能会使保护板不能正常工作，甚至烧毁保护板，任何一项参数修改以后，均需要点击参数后面的“设置”按钮完成参数下发，保护板成功接收到参数以后，会发出“滴”的响声。

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 控制/ BMS control

BMS 控制页面如图 38 所示。通过BMS 控制可以对保护板进行充电功能、放电功能、均衡功 能进行开关和恢复出厂设置等

The BMS control page is shown in Figure 38. The BMS control can switch the charging , discharging, and balancing functions of the BMS and restore the factory settings

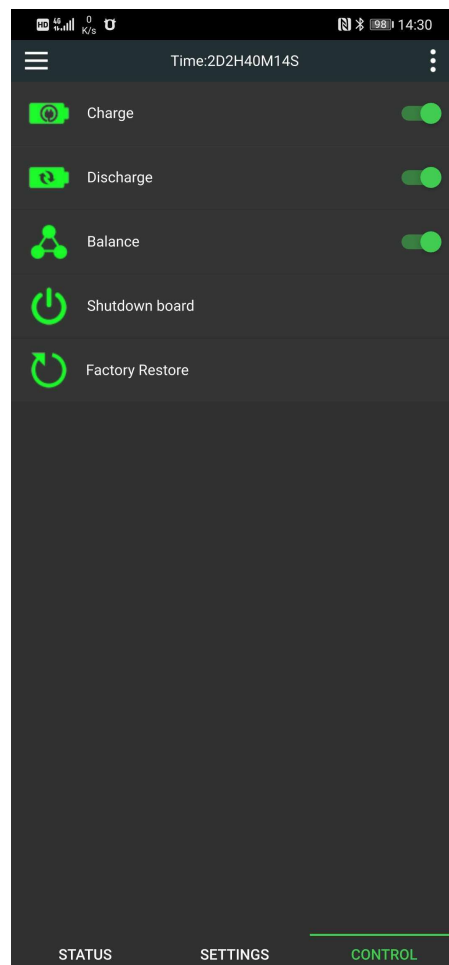


图 38 BMS 控制页/ BMS control page

6.安全保护措施及注意事项/ Safety protection measures and precautions

使用之前请仔细阅读使用说明书，按照对应串数的接线图接线，从负极向正极接，均衡线接好以后要再次用万用表确认，确认无误才能插入保护板。

保护板默认密码为“1234”，手机 APP 连接保护板后，请及时修改连接密码，防止被他人连接。

不允许私自改装保护板的功率线，私自改装功率线会造成保护板过流不均匀而烧毁保护板

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. 运输与贮存/ Transportation and storage

7.1. 运输/ Transportation

装箱后的产品不受雨雪直接影响和剧烈碰撞颠簸下，可用通常的运输工具运输。在运输过程中不允许与酸碱等腐蚀物放在一起。

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. 贮存/ storage

包装好的产品应放置在永久性的库房内贮存，库房温度为 0℃~35℃，相对湿度不超过 80%，库房内应无酸碱及腐蚀性气体、无强烈机构振动和冲击、无强磁场的作用。

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.

序号 NUM	参数 PARA	三元默认 LI-ION	铁锂默认 LIFEPO4	钛酸锂默认 LTO	单位 UNIT
1	单体欠压保护 Single under-voltage protection	2.9	2.7	1.8	V
2	单体截欠压保护恢复 Single under-voltage protection recovery	3.2	2.9	2.0	V
3	单体过充电压 Monomer Overcharge Voltage	4.2	3.6	2.7	V
4	单体过充保护恢复 Monomer Overcharge Protection Recovery	4.1	3.5	2.4	V
5	触发均衡压差 Trigger Balanced Pressure Differential	0.01	0.010	0.01	V
6	自动关机电压 Auto Shutdown Voltage	2.8	2.6	1.7	V
7	充电过流保护延时 Charging Over-current Protection Delay	30	30	30	秒
8	充电过流保护解除时间 Charging Over-current Protection Release Time	60	60	60	秒
9	放电过流保护延时 Discharge Over-current Protection Delay	30	30	30	秒
10	放电过流保护解除时间 Discharge Over-current Protection Release Time	60	60	60	秒
11	短路保护解除时间 Release time of short circuit protection	60	60	60	秒
12	充电过温保护温度 Charging Over-Temperature Protection Temperature	60	60	60	℃
13	充电过温恢复温度 Charging Over-Temperature Recovery Temperature	55	55	55	℃
14	放电过温保护温度 Discharge Over-Temperature Protection	60	60	60	℃
15	放电过温恢复温度 Discharge Over-Temperature Recovery Temperature	55	55	55	℃
16	充电低温保护温度 Charging Low Temperature Protection Temperature	-20	0	-20	℃
17	充电低温恢复温度 Charging Low Temperature Recovery Temperature	-10	5	-10	℃
18	MOS 过温保护温度 MOS Over-Temperature protection temperature	75	75	75	℃
19	MOS 过温保护恢复温度 MOS Over Temperature Protection Recovery	70	70	70	℃

附录 1“一键铁锂”、“一键三元”、“一键钛酸锂”默认参数

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

附录二 保护板参数设置要点

Appendix II key points for parameter setting of the BMS

序号 NUM	参数 parameter	单位 UNIT	最小值 MIN	最大值 MAX	三元默 认值 Li-ion	铁锂默 认值 Lifepo4	备注 NOTE
1	单体数量 Number of monomers	串 Strings	2	-	-	-	最大值参考保护板型号，默认为该型号支持的最大串数/ The maximum value refers to the model of the BMS. The default value is the maximum number of strings supported by the model
2	电池容量/Battery capacity	AH	5	2000	40	40	
3	触发均衡压差/Trigger Balance Pressure Differential	V	0.003	1	0.01	0.01	
4	单体欠压保护/Single under- voltage protection	V	1.2	4.35	2.9	2.6	这些参数必须遵循如下逻辑关系，否则提示 参数设置失败! 单体过充电压>单体过充恢复>单体欠压恢 复>单体欠压>关机电压 These parameters must follow the following logical relationship. Otherwise, you will be prompted that the parameter setting fails!
5	单体欠压恢复/Single under- voltage recovery	V	1.2	4.35	3.2	3	
6	单体过充电压/Single overcharge voltage	V	1.2	4.35	4.2	3.6	
7	单体过充恢复/Monomer overcharge recovery	V	1.2	4.35	4.1	3.4	
8	自动关机电压/Automatic shutdown voltage	V	1.2	4.35	2.8	2.5	Cell overcharge voltage > cell overcharge recovery > cell under-voltage recovery > cell under-voltage > shutdown voltage
9	最大充电电流/ Maximum charging current	A	1	-	25	25	最大值参考保护板型号， The maximum value refers to the model of BMS,
10	充电过流延时/Charging Over- current delay	S	2	600	60	60	
11	充电过流解除/Charging Over- current release	S	2	600	60	60	
12	最大放电电流/Maximum discharge current	A	1	-	-	-	最大值参考保护板型号，默认为该型号支持 的持续电流 The maximum value refers to the model of the BMS, and the default value is the continuous current supported by the model
13	放电过流延时/Discharge Over-current delay	S	2	600	300	300	
14	放电过流解除/Discharge Over-current release	S	2	600	60	60	
15	短路保护延时/Short circuit protection delay	uS	0	1000000	1500	1500	设置为 0 表示关闭短路保护 Set to 0 to turn off short circuit protection
16	短路保护解除/Short circuit protection release	S	2	600	60	60	
17	最大均衡电流/Maximum balancing current	A	0.3	-	-	-	最大值参考保护板型号，默认为该型号支持 的最大均衡电流 The maximum value refers to the model of the BMS. The default value is the maximum Active Balancing current supported by the model
18	均衡起始电压/ balancing starting voltage	V	1.2	4.25	1.5	1.5	
19	充电过温保护/Charging over temperature protection	℃	30	80	70	55C	这些参数必须遵循如下逻辑关系，否则提示 参数设置失败!!! 充电过温>充电过温恢复>充电低温恢复>充 电低温 放电过温>放电过温恢复 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	充电过温恢复/Charging over temperature recovery	℃	30	80	60	50~55C <0.1C	
21	放电过温保护/Discharge over temperature protection	℃	30	80	70	55C	
22	放电过温恢复/Discharge over temperature recovery	℃	30	80	60	50C	
23	充电低温保护/Charging low temperature protection	℃	-30	20	-20	0C	
24	充电低温恢复/Charging low temperature recovery	℃	-30	20	-10	0~10C max current 0.2c	
25	Mos 过温保护/MOS over	℃	50	110	90	90	不可修改

	temperature protection						Not modifiable
26	MOS 过温恢复/MOS over temperature recovery	°C	50	110	70	70	不可修改 Not modifiable
27	用户私有数据/User private data	字符 character	-	-	-	--	最大允许填写 13 个字符 Maximum 13 characters allowed
28	连接线电阻/Connecting line resistance	mΩ	0	2000000	0	0	分箱体电池使用，单箱体电池一般不用。 Separate box batteries are used, and single box batteries are generally not used.

注意:

1. 出厂默认三元参数。
- 2 建议用户仅修改单体串数，单体容量。随后根据电池类型选择一键设置即可，如果需要修改其他参数强烈建议用户先阅读使用说明书，弄懂每个参数的含义，再修改。
3. 如果按照上述规则修改, 提示出错, 建议用户更新 **APP**。

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.

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 device.