

# BMS Manual

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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。The lithium battery intelligent protection board is a management system tailored for large-capacity series lithium battery packs. It has the functions of voltage acquisition, high current active balance, overcharge, over-discharge, over-current and over-temperature protection, coulomb counter, Bluetooth communication, GPS remote and other functions. It can be applied to lithium iron phosphate, ternary lithium and other battery types.

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。The protection board relies on the energy transfer active equalization technology with independent intellectual property rights, which can achieve a maximum continuous equalization current of 2A. The high-current active equalization technology can ensure the consistency of the battery to the greatest extent, improve the battery cruising range, and delay the aging of the battery.

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。The protection board has a matching mobile APP, which supports Android and IOS operating systems. The APP can connect to the protection board through the mobile phone Bluetooth to check the working status of the battery, modify various working parameters of the protection board, control the charge and discharge switch, and so on. The protection board is small in size, simple in operation and full in function, and can be widely used in battery packs for small sightseeing cars, scooters, shared cars, high-power energy storage, base station backup power, solar power plants and other products.

## 2 主要技术参数 Main technical parameters

### 2.1 主要技术指标

保护板的主要技术指标如表 3 所示。

表 1 保护板主要技术指标

技术指标	产品型号						
	BD6A17S6P	BD6A20S6P	BD6A20S10P	BD6A24S10P	B1A24S15P	B2A24S15P	B2A24S20P
三元串数 li-ion	12~17	12~20	12~20	12~24	12~24	12~24	12~24
铁锂串数 LFP	12~17	12~20	12~20	12~24	12~24	12~24	12~24
钛酸串数 LTO	17	17~20	17~20	17~24	17~24	17~24	17~24

## JK 锂电池智能保护板使用维护说明书

均衡方式 Equalization	Active balance 主动均衡	Active balance 主动均衡	Active balance 主动均衡	Active balanc 主动均衡	Active balance 主动均衡	Active balance 主动均衡	Active balance 主动均衡
主动均衡电流 Active equalizing current	0.6 A	0.6 A	0.6 A	0.6 A	1 A	2 A	2 A
主回路内阻 Internal resistance of main loop	1.3 mΩ	1.3 mΩ	0.8mΩ	0.8mΩ	0.5mΩ	0.5mΩ	0.3mΩ
持续放电电流 Continuous discharge current	60A	60A	100A	100A	150A	150A	200A
最大放电电流 maximum discharge current	100A	100A	200A	200A	300A	300A	350A
过流保护(可调) Overcurrent protection	10~60 A	10~60 A	10~100 A	10~100 A	10~150 A	10~150 A	10~200 A
其他接口(定制)Other Interfaces (custom)	RS485	RS485	RS485	RS485	RS485/CAN	RS485/CAN	RS485/CAN
出线方式 wiring method	同口 same port						
单体电压范围 Cell voltage range	1~5 V						
电压采集精度 Voltage acquisition accuracy	±5 mV						
过充保护电压 Over-charged	1.2~4.35 V 可调 adjustable						
过充解除电压 Overcharge release voltage	1.2~4.35 V 可调 adjustable						
过流解除时间 Overcurrent release time	2~120S 可调 adjustable						
过放保护电压 Over discharge protection voltage	1.2~4.35 V 可调 adjustable						
过放恢复电压 Over discharge recovery voltage	1.2~4.35 V 可调 adjustable						
温度检测数量 Number of temperature detections	3 个						
温度保护 temperature protection	有 yes						
短路保护 short-circuit	有 yes						
库仑计 coulombmeter	有 yes						
蓝牙功能 bluetooth function	支持安卓、苹果 supports Android and ISO						
GPS(选配)Optional	支持(RS485 和 GPS 二选一) Support (RS485 or GPS)						

## 2.2 使用环境条件 Environmental Conditions

- 工作温度范围 Operating temperature range:  $-20^{\circ}\text{C} \sim 70^{\circ}\text{C}$ ;
- 电源要求 power requirement: 24~100V。
- 功耗 power dissipation: 均衡状态 state of equalisation  $10\text{mA}@100\text{V}$ , 非均衡状态 Disequilibrium state  $6\text{mA}@100\text{V}$ 。

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

### 3.1 连接器、LED 灯位置描述 osition of connectors and LED lights

两类保护板连接器、LED 灯位置如图 1 和图 2 所示所示。The two types of protection plate connectors and LED lamp positions are shown in Figure 1 and Figure 2.

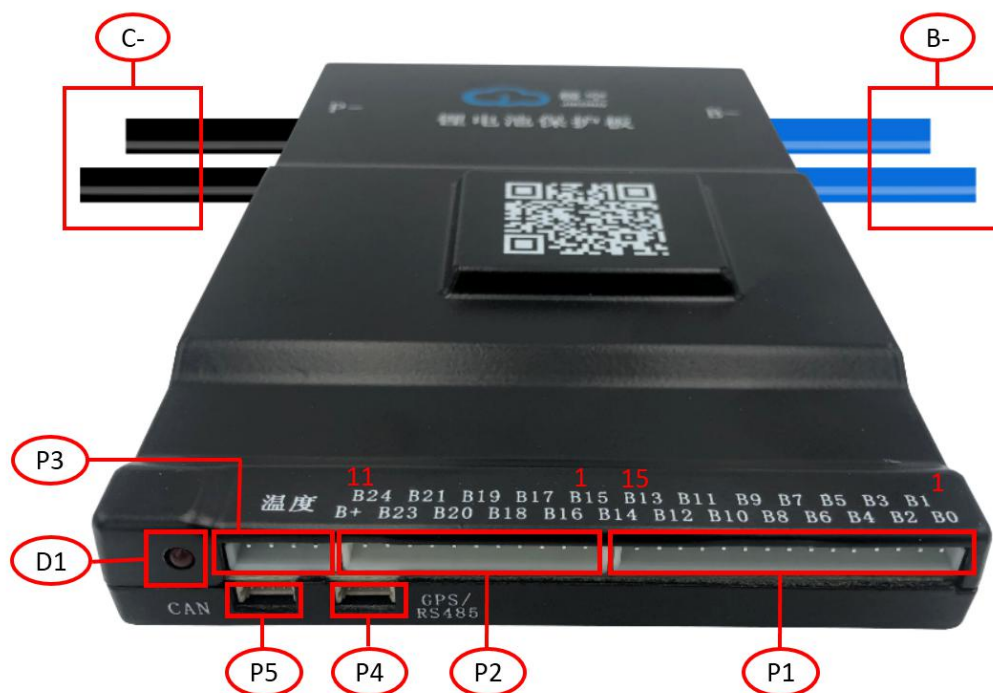


图 1 BD6A20S10P/B2A24S10P/ B1A24S15P/B2A24S15P/B2A24S20P 连接器示意图

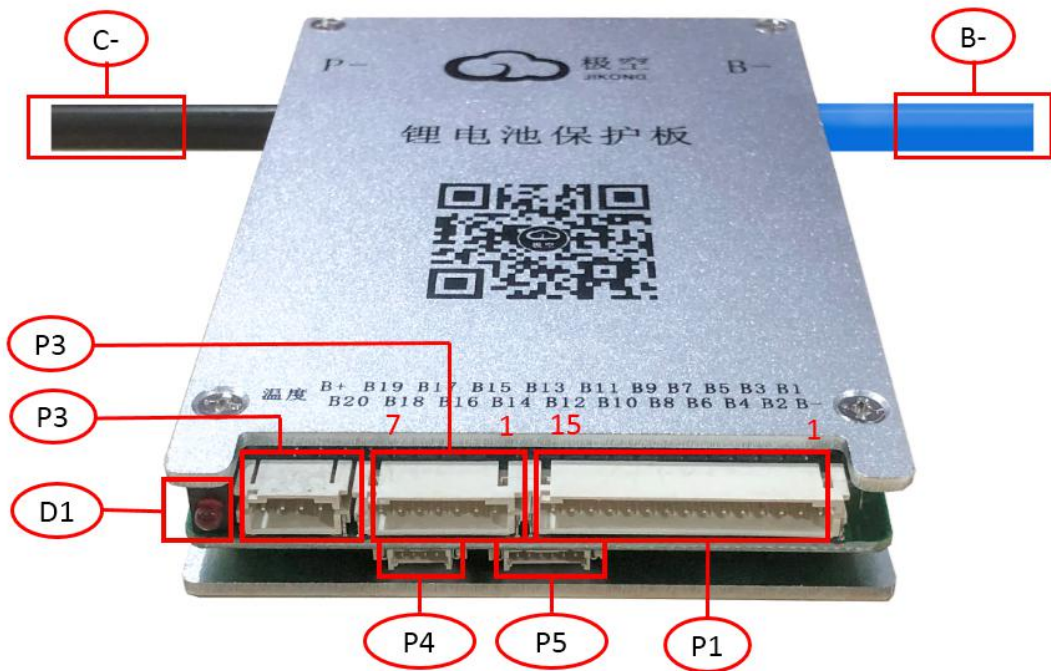


图 2 BD6A17S6P/BD6A20S6P 连接器示意图

### 3.2 连接器、LED 定义描述 Connector and LED definition Description

BD6A20S10P、B2A24S10P、B1A24S15P、B2A24S15P、B2A24S20P 保护板连接器定义、LED 灯定义见表 2。

BD6A20S10P, B2A24S10P, B1A24S15P, B2A24S15P, B2A24S20P Protection plate connector and LED lamp are defined in Table 2.

表 2 连接器定义 Connector definitions Table 2.

连接器 connector	管脚号 pin number	JK-BD6A20S10P		JK-B1A24S15P/JK-B2A24S15P /JK-B2A24S20P/JK-BD6A24S10P	
		名称	定义 definition	名称	定义 definition
P1	1	B-	电池总负极 Total negative electrode of battery	B-	电池总负极 Total negative electrode of battery
	2	B1	第 1 串电池正极 1 series battery positive	B1	第 1 串电池正极 1 series battery positive
	3	B2	第 2 串电池正极 2nd series battery positive	B2	第 2 串电池正极 2nd series battery positive
	4	B3	第 3 串电池正极 3rd series battery positive	B3	第 3 串电池正极 3rd series battery positive
	5	B4	第 4 串电池正极 4 <sup>th</sup> series battery positive	B4	第 4 串电池正极 4 <sup>th</sup> series battery positive
	6	B5	第 5 串电池正极 5th series battery positive	B5	第 5 串电池正极 5th series battery positive
	7	B6	第 6 串电池正极 6th series battery positive	B6	第 6 串电池正极 6th series battery positive
	8	B7	第 7 串电池正极 7th series battery positive	B7	第 7 串电池正极 7th series battery positive
	9	B8	第 8 串电池正极 8th series battery positive	B8	第 8 串电池正极 8th series battery positive
	10	B9	第 9 串电池正极 9th series battery positive	B9	第 9 串电池正极 9th series battery positive
	11	B10	第 10 串电池正极 10th series battery positive	B10	第 10 串电池正极 10th series battery positive
	12	B11	第 11 串电池正极 11th series battery positive	B11	第 11 串电池正极 11th series battery positive
	13	B12	第 12 串电池正极 12th series battery positive	B12	第 12 串电池正极 12th series battery positive
	14	B13	第 13 串电池正极 13th series battery positive	B13	第 13 串电池正极 13th series battery positive
	15	B14	第 14 串电池正极 14th series battery positive	B14	第 14 串电池正极 14th series battery positive
P2	1	B15	第 15 串电池正极 15th series battery positive	B15	第 15 串电池正极 15th series battery positive
	2	B16	第 16 串电池正极 16th series battery positive	B16	第 16 串电池正极 16th series battery positive
	3	B17	第 17 串电池正极 17th series battery positive	B17	第 17 串电池正极 17th series battery positive
	4	B18	第 18 串电池正极 18th series battery positive	B18	第 18 串电池正极 18th series battery positive
	5	B19	第 19 串电池正极 19th series battery positive	B19	第 19 串电池正极 19th series battery positive
	6	B20	第 20 串电池正极 20th series battery positive	B20	第 20 串电池正极 20th series battery positive

连接器 connector	管脚号 pin number	JK-BD6A20S10P		JK-B1A24S15P/JK-B2A24S15P /JK-B2A24S20P/JK-BD6A24S10P	
		名称	定义 definition	名称	定义 definition
	7	-	-	B21	第 21 串电池正极 21 <sup>st</sup> series battery positive
	8	-	-	B22	第 22 串电池正极 22 <sup>nd</sup> series battery positive
	9	-	-	B23	第 23 串电池正极 23 <sup>rd</sup> series battery positive
	10	-	-	B24	第 24 串电池正极 24 <sup>th</sup> series battery positive
	11	B+	保护板电源 Power supply for protection board	B+	保护板电源 Power supply for protection board
P3	1	T1A	第 1 个温度传感器 A 管脚 The first temperature sensor A pin		
	2	T1B	第 1 个温度传感器 B 管脚 The first temperature sensor B pin		
	3	T2A	第 2 个温度传感器 A 管脚 Second temperature sensor A pin		
	4	T2B	第 2 个温度传感器 B 管脚 Second temperature sensor B pin		
P4	外置 GPS 接口或者外置 RS485 转换器接口 External GPS interface or external RS485 converter interface				
P5	外置 CAN 转换器接口 External CAN converter interface				
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: when bluetooth is connected to the protection board, the indicator is steady on, and when disconnected, the indicator blinks.				
C-	接外部负载或者充电器负极 Connect to external load or negative charger				
B-	接电芯负极 Connect to the negative core				

JK-BD6A17S6P、JK-BD6A20S6P 保护板连接器定义、LED 灯定义见表 3。

表 3 连接器定义 Table 3 Connector definitions

连接器	管脚号	JK-BD6A17S6P		JK-BD6A20S6P	
		名称	定义	名称	定义
P1	1	B-	电池总负极	B-	电池总负极
	2	B1	第 1 串电池正极	B1	第 1 串电池正极
	3	B2	第 2 串电池正极	B2	第 2 串电池正极
	4	B3	第 3 串电池正极	B3	第 3 串电池正极
	5	B4	第 4 串电池正极	B4	第 4 串电池正极
	6	B5	第 5 串电池正极	B5	第 5 串电池正极
	7	B6	第 6 串电池正极	B6	第 6 串电池正极
	8	B7	第 7 串电池正极	B7	第 7 串电池正极
	9	B8	第 8 串电池正极	B8	第 8 串电池正极
	10	B9	第 9 串电池正极	B9	第 9 串电池正极
	11	B10	第 10 串电池正极	B10	第 10 串电池正极



连接器	管脚号	JK-BD6A17S6P		JK-BD6A20S6P	
		名称	定义	名称	定义
	12	B11	第 11 串电池正极	B11	第 11 串电池正极
	13	B12	第 12 串电池正极	B12	第 12 串电池正极
	14	B13	第 13 串电池正极	B13	第 13 串电池正极
	15	B14	第 14 串电池正极	B14	第 14 串电池正极
P2	1	B15	第 15 串电池正极	B15	第 15 串电池正极
	2	B16	第 16 串电池正极	B16	第 16 串电池正极
	3	B17	第 17 串电池正极	B17	第 17 串电池正极
	4	-	-	B18	第 18 串电池正极
	5	-	-	B19	第 19 串电池正极
	6	-	-	B20	第 20 串电池正极
	7	B+	保护板电源	B+	保护板电源
P3	1	T1A	第 1 个温度传感器 A 管脚		
	2	T1B	第 1 个温度传感器 B 管脚		
	3	T2A	第 2 个温度传感器 A 管脚		
	4	T2B	第 2 个温度传感器 B 管脚		
P4	外置 GPS 接口或者外置 RS485 转换器接口				
P5	外置蓝牙模块接口				
D1	电源指示灯，当保护板上电后，指示灯常亮。				
C-	接外部负载或者充电器负极				
B-	接电芯负极				

### 3.3 产品外型 Product appearance

BD6A20S10P、B2A24S10P、B1A24S15P、B2A24S15P、B2A24S20P 保护板外型如图 3 所示。The appearance of the protective plate is shown in Figure 3.

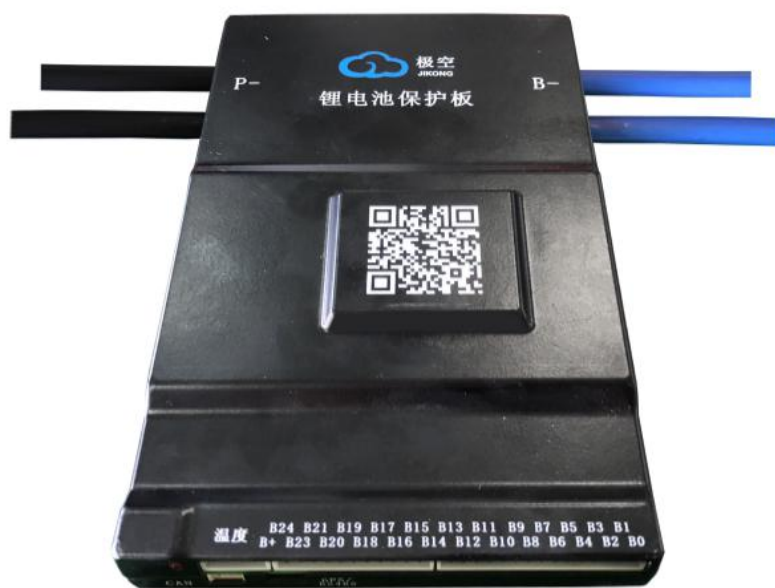


图 3 BD6A20S10P/B2A24S10P/ B1A24S15P/B2A24S15P/B2A24S20P 效果图

JK-BD6A17S6P、JK-BD6A20S6P 保护板外型如图 4 所示。



图 4 JK-BD6A17S6P/JK-BD6A20S6P 效果图

### 3.4 尺寸 Size

JK-BD6A20S10P、JK-B2A24S10P、JK-B1A24S15P、JK-B2A24S15P、JK-B2A24S20P 保护板大小为 162mm×102mm×20.4mm，外形尺寸如图 5 所示。The external dimensions are shown in Figure 5

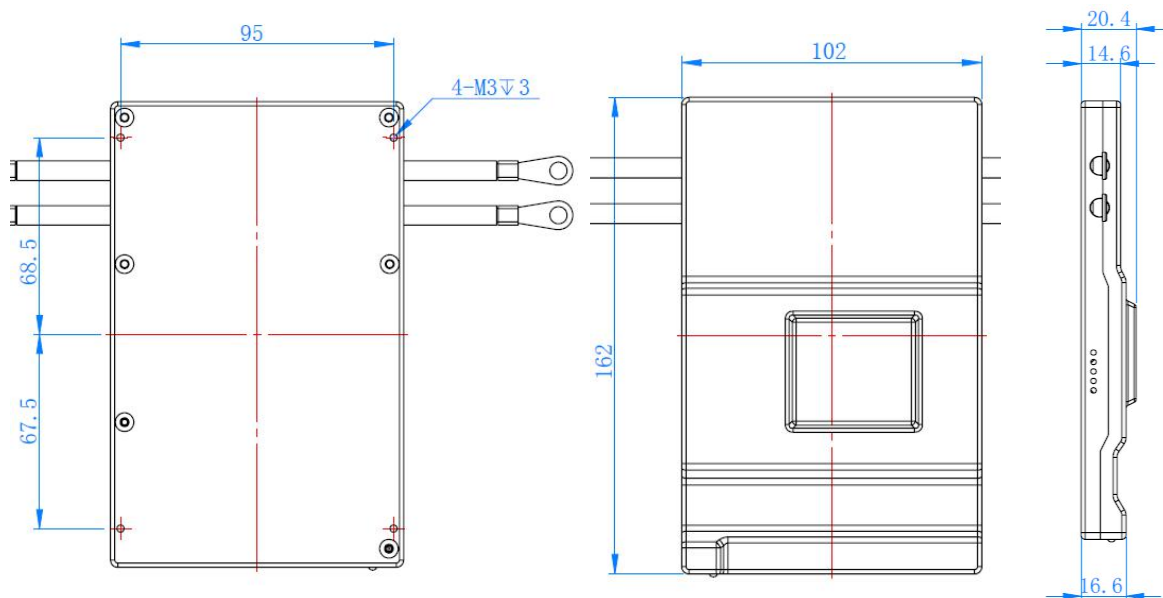


图 5 BD6A20S10P/B2A24S10P/ B1A24S15P/B2A24S15P/B2A24S20P 外形尺寸图

JK-BD6A17S6P、JK-BD6A20S6P 保护板大小为 115mm×78mm×17.6mm，外形尺寸如图 6 所示。

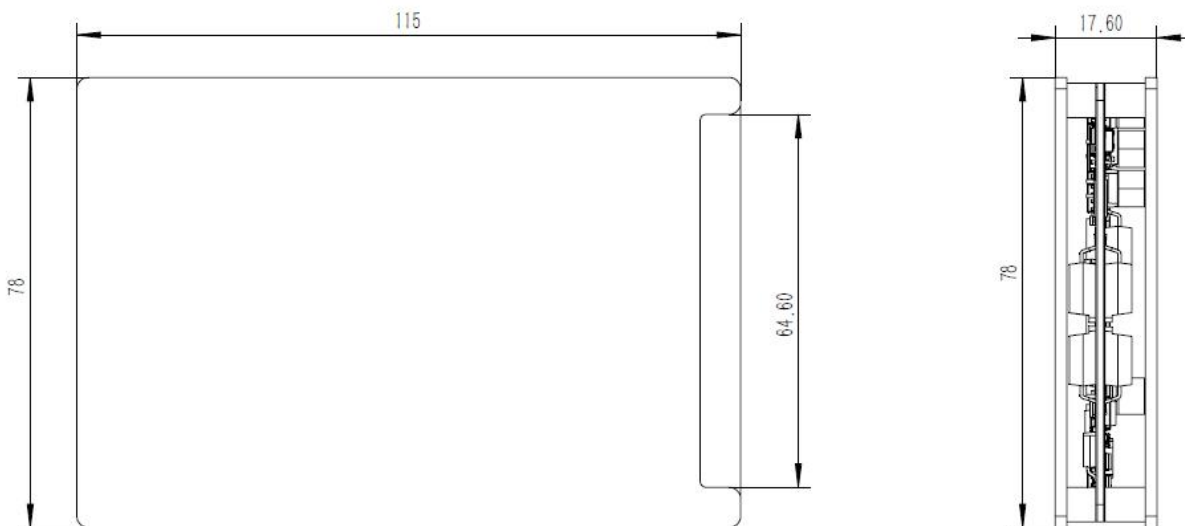


图 6 JK-BD6A17S6P/JK-BD6A20S6P 外形尺寸图

### 3.5 重量 weight

JK-BD6A17S6P/JK-BD6A20S6P 保护板重量 weight 约为 210g。

BD6A20S10P/B2A24S10P/B1A24S15P/B2A24S15P/B2A24S20P 重量 weight 约为 370g。

## 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 Unpacking inspection and precautions

开箱检查及注意事项如下：Unpacking inspection and precautions are as follows:

- 对包装箱、保护板等需要轻拿轻放、尽量不要倒置；Handle the packing boxes and protective plates gently and try not to turn them upside down;
- 开箱前注意包装是否完好，如有无撞击痕迹、有无破损等；Before unpacking, pay attention to whether the package is intact, such as there is no impact mark, there is no damage, etc.

### 4.2 接线图 the wiring diagram

JK-BD6A20S10P、JK-B2A24S10P、JK-B1A24S15P、JK-B2A24S15P、JK-B2A24S20P 保护板适用于 13-24 串电芯的锂电池组，不同电芯数量的电池组接线方法不同。

对于 24 串电芯串联的电池组，安装接线方法如图 7 所示。

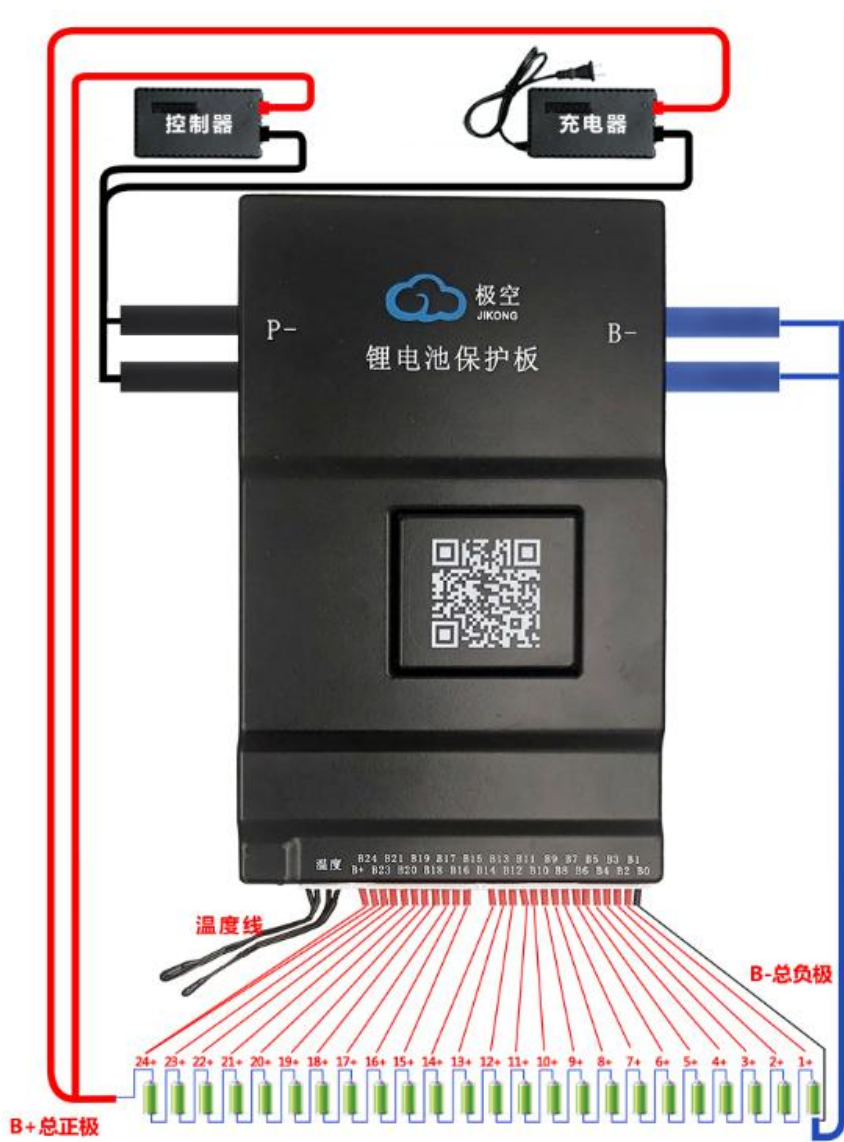


图 7 24 串电池接线图示 Figure 7 24-series battery wiring diagram  
对于 23 串电芯串联的电池组，安装接线方法如图 8 所示。

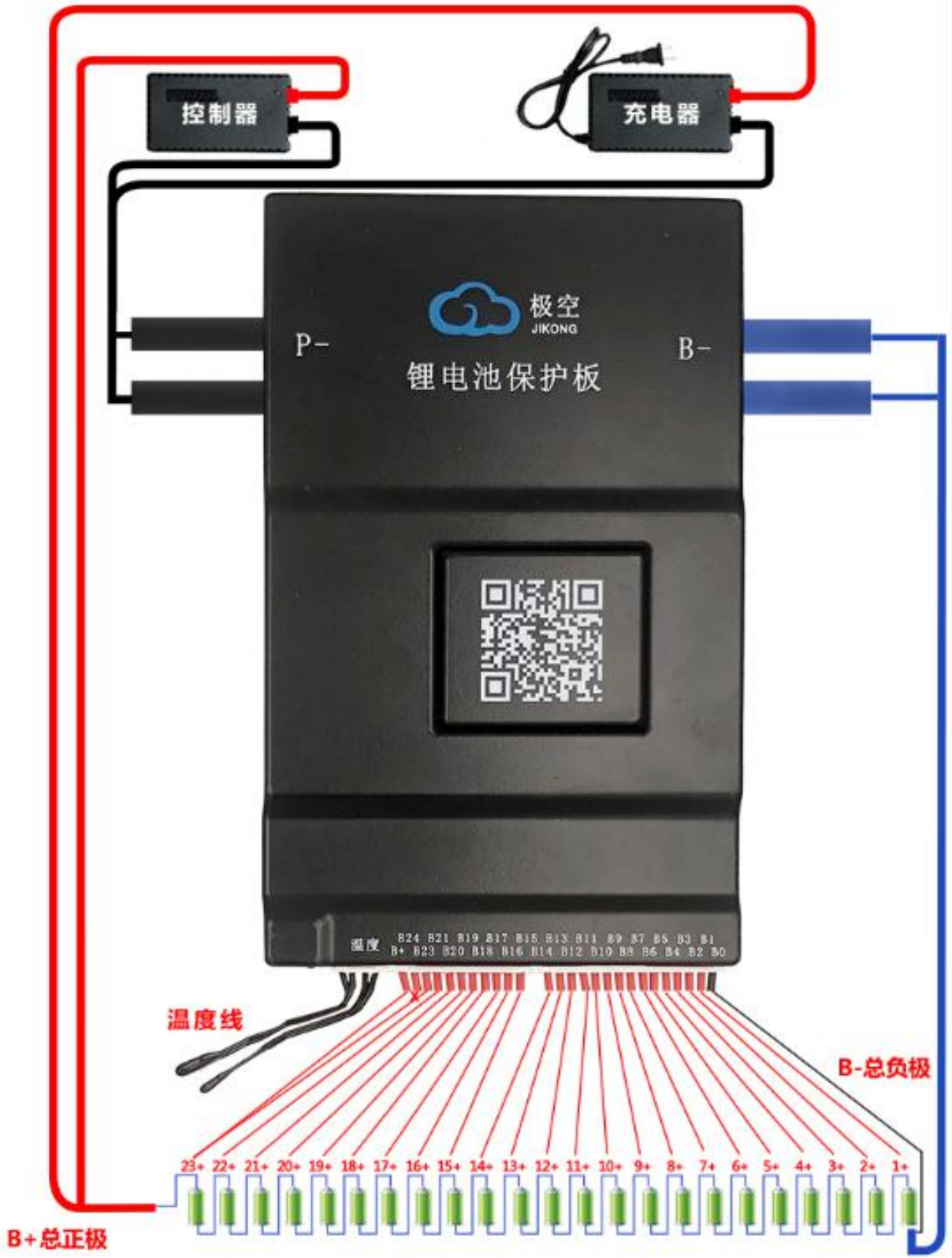


图 8 23 串电池接线图示 23-series battery wiring diagram

对于 22 串电芯串联的电池组，安装接线方法如图 9 所示。

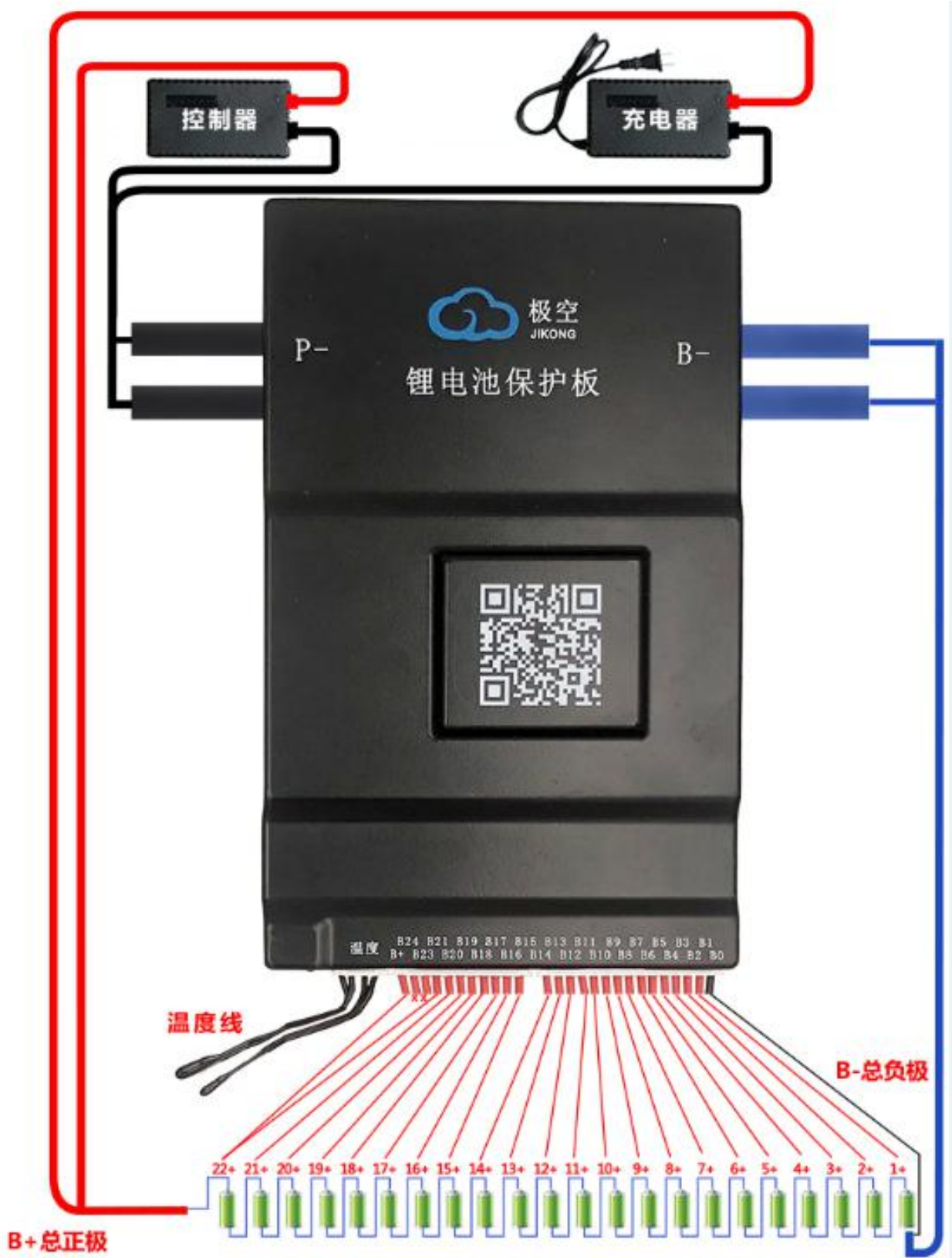


图 9 22 串电池接线图示 22-series battery wiring diagram

对于 21 串电芯串联的电池组，安装接线方法如图 10 所示。

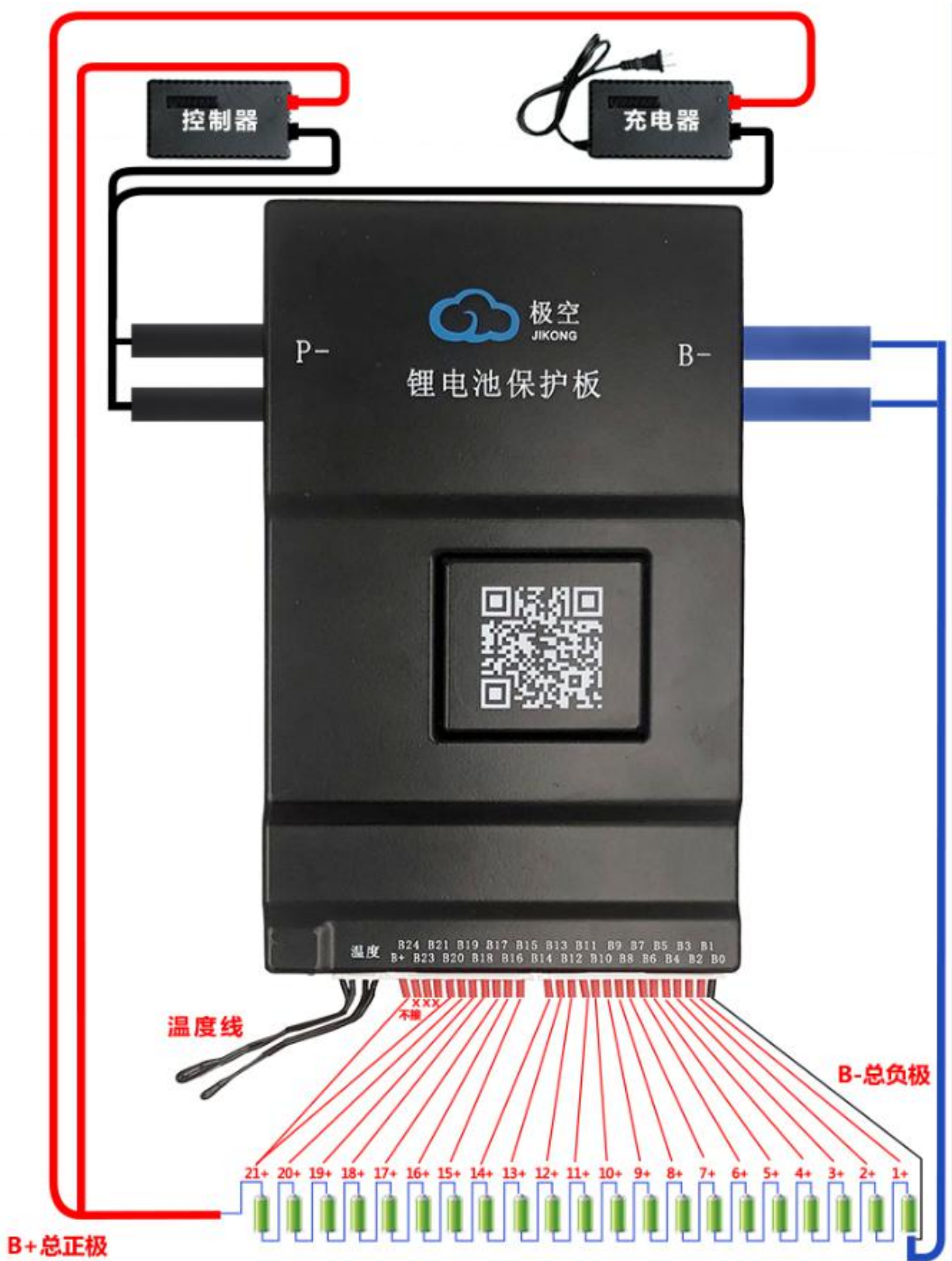


图 10 21 串电池接线图示 21-series battery wiring diagram

对于 20 串电芯串联的电池组，安装接线方法如图 11 所示。

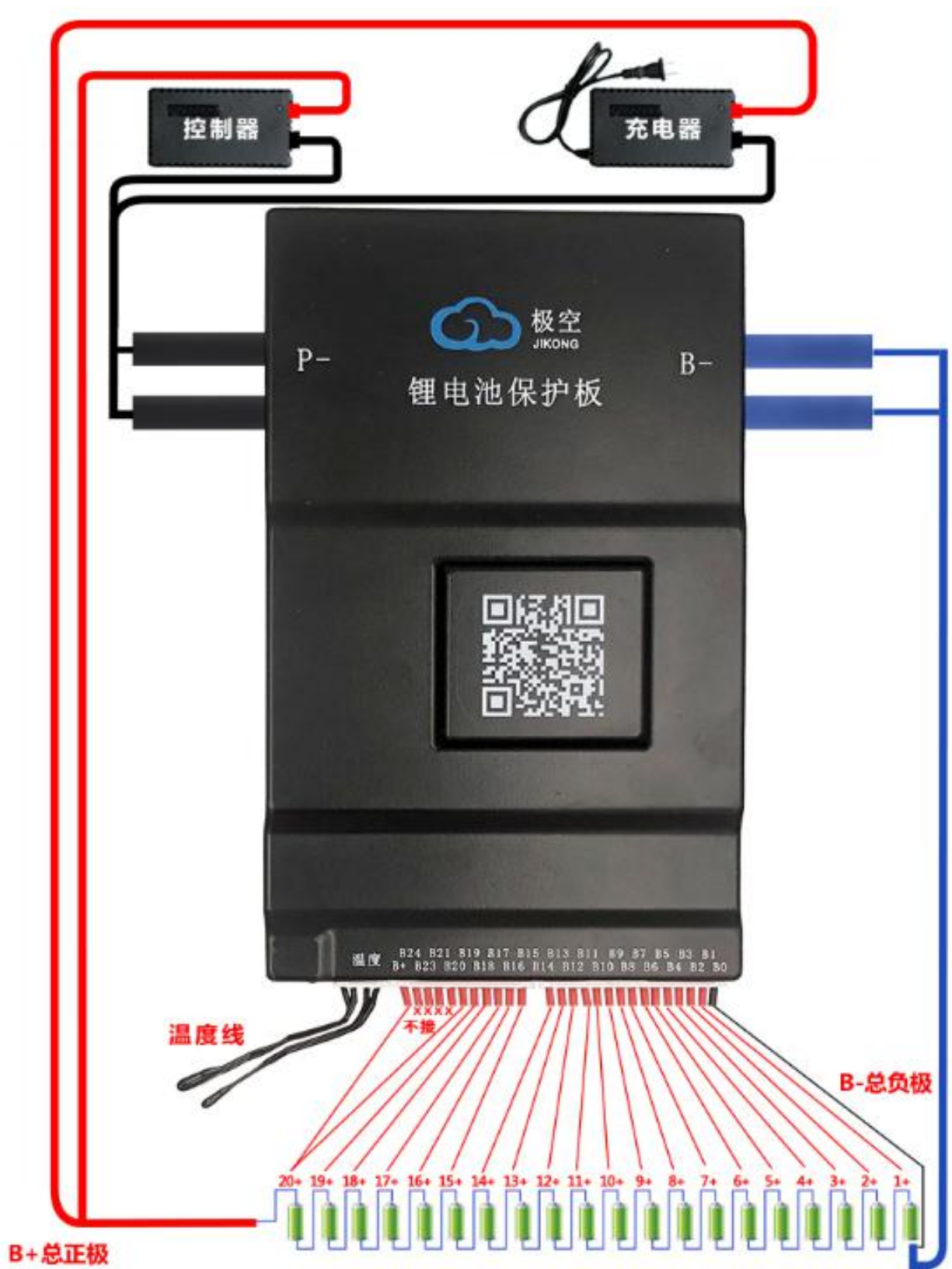




图 11 20 串电池接线图示 20-series battery wiring diagram

对于 19 串电芯串联的电池组，安装接线方法如图 12 所示。

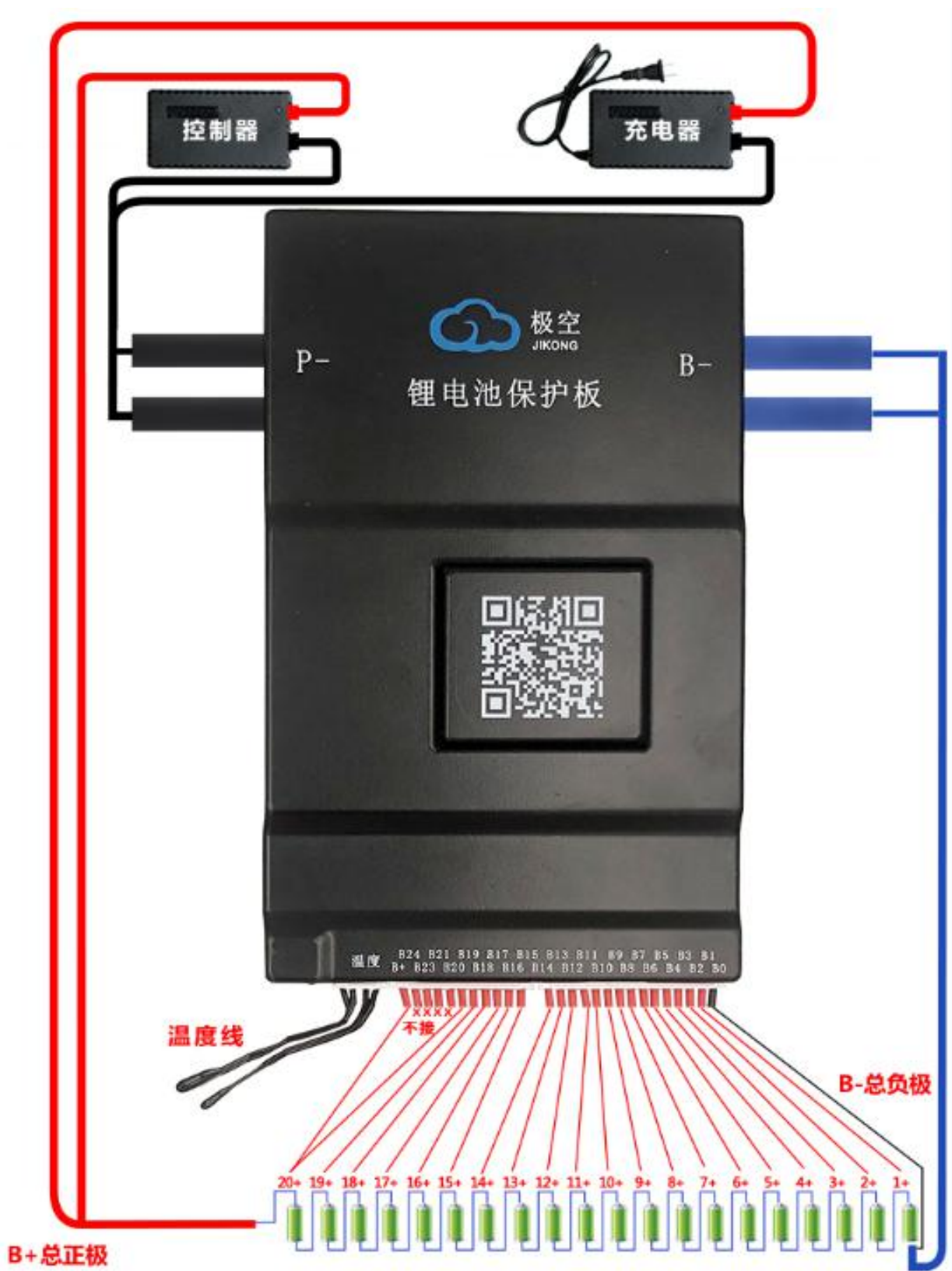


图 12 19 串电池接线图示 19-series battery wiring diagram

对于 18 串电芯串联的电池组，安装接线方法如图 13 所示。

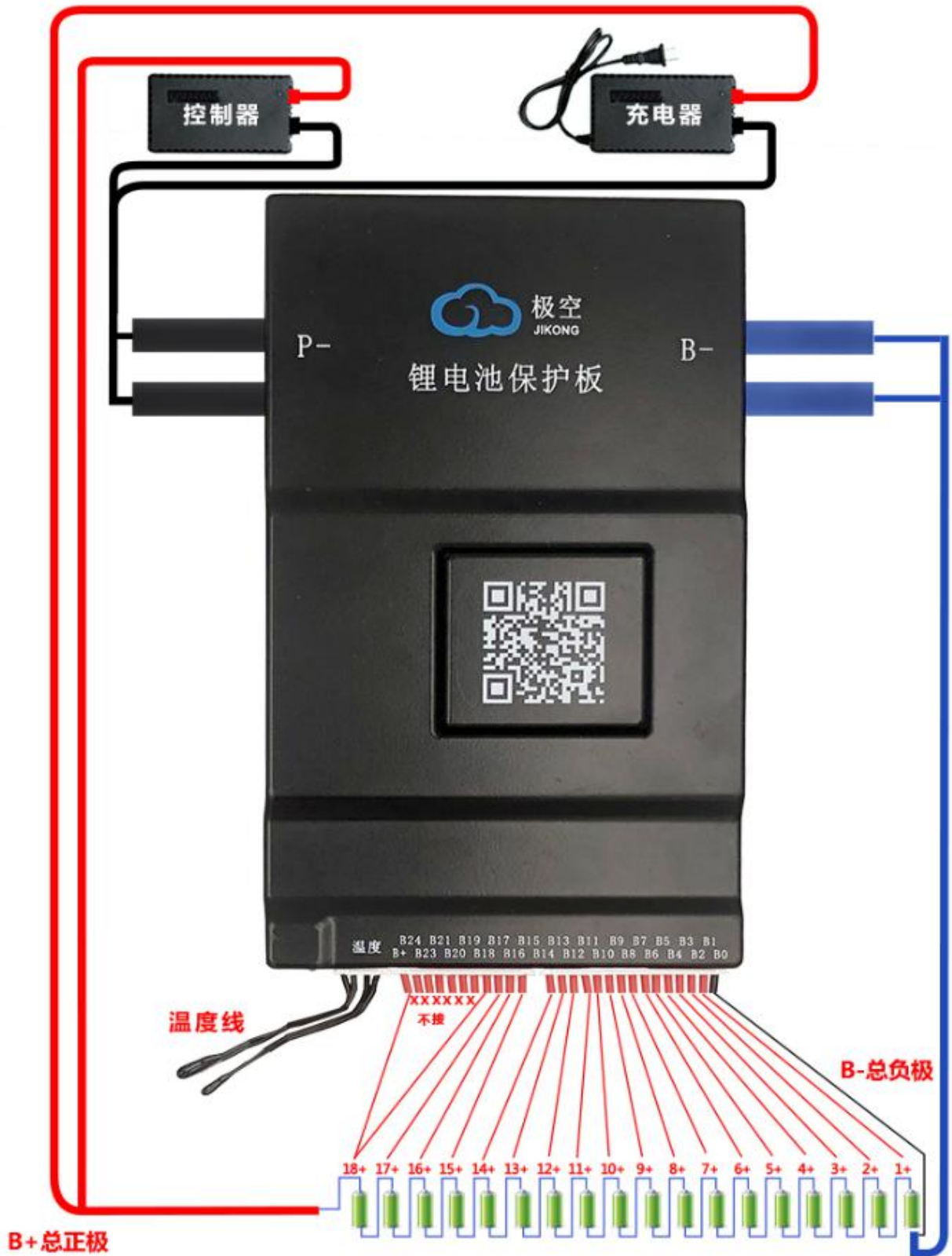


图 13 18 串电池接线图示 18-series battery wiring diagram

对于 17 串电芯串联的电池组，安装接线方法如图 14 所示。

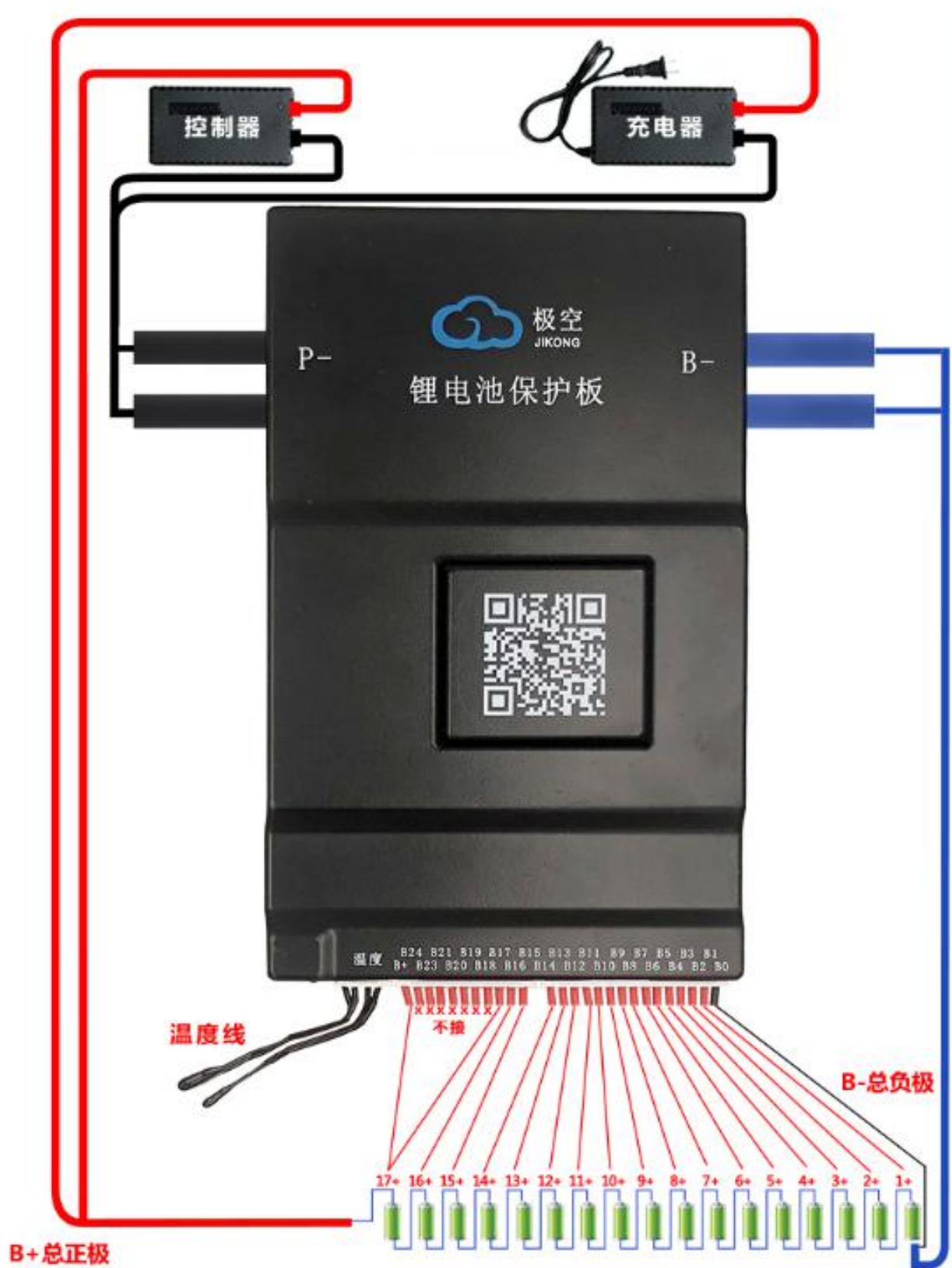


图 14 17 串电池接线图示 17-series battery wiring diagram

对于 16 串电芯串联的电池组，安装接线方法如图 15 所示。

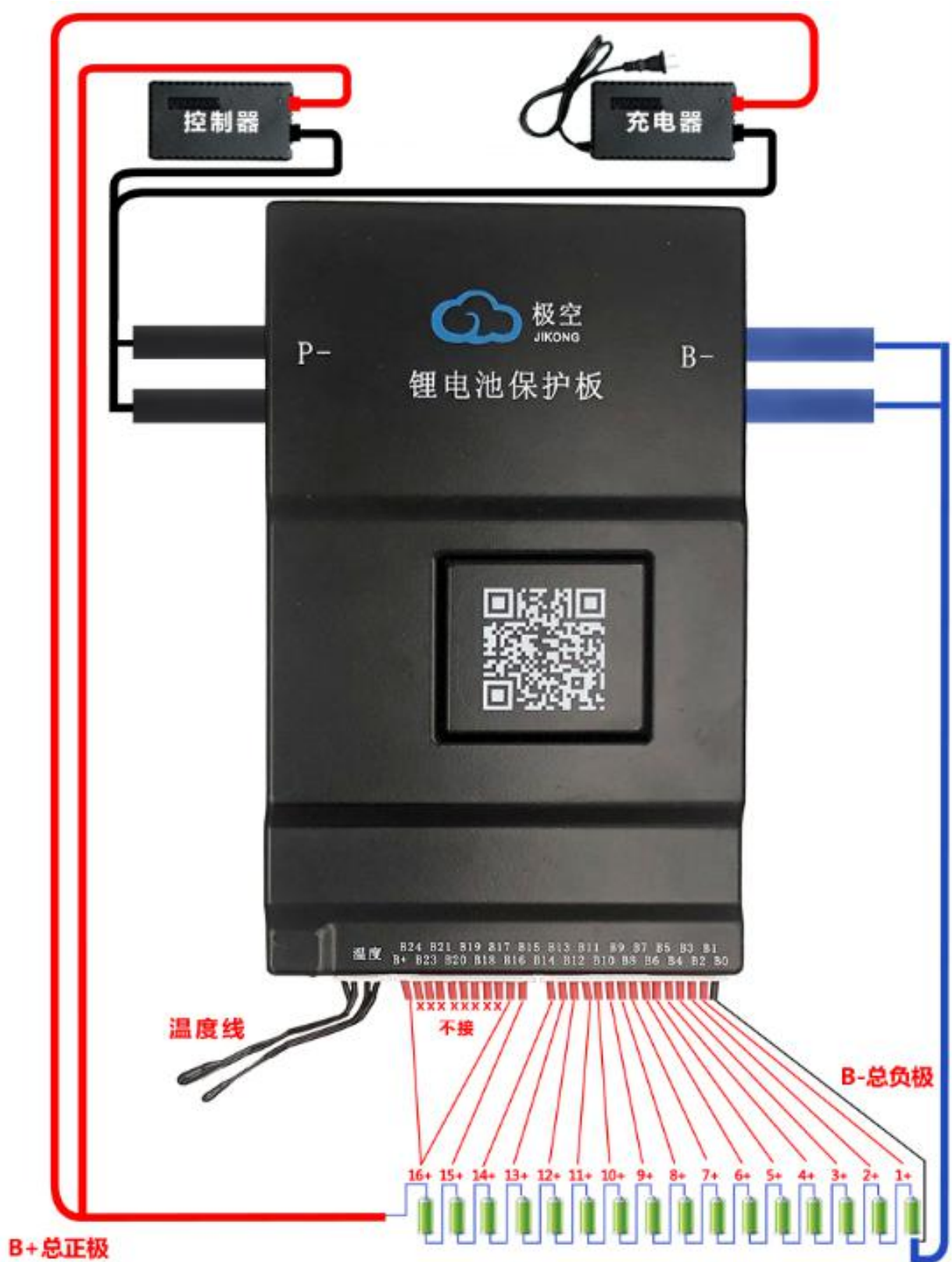


图 15 16 串电池接线图示 16-series battery wiring diagram

对于 15 串电芯串联的电池组，安装接线方法如图 16 所示。

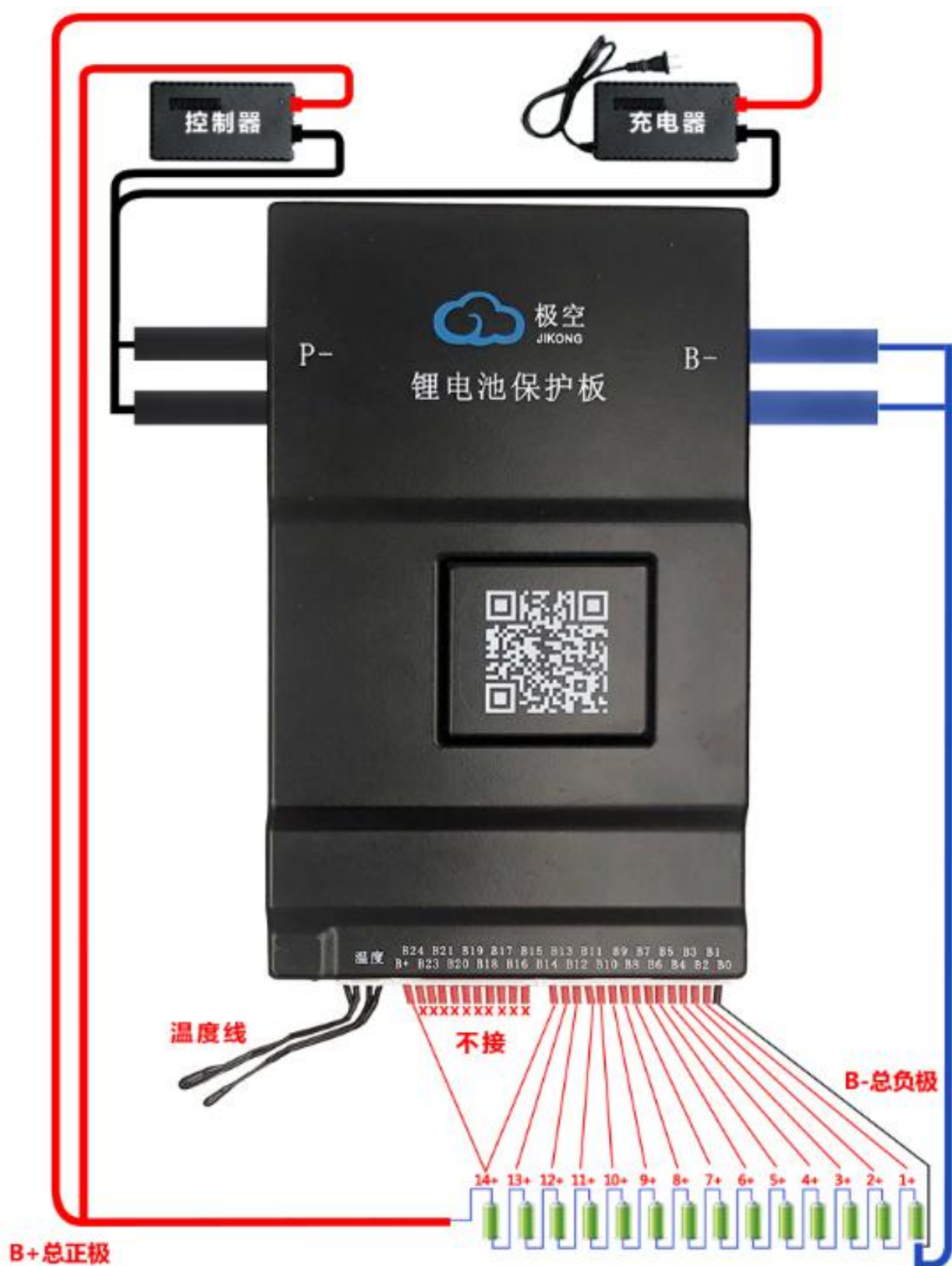


图 16 15 串电池接线图示 15-series battery wiring diagram

对于 14 串电芯串联的电池组，安装接线方法如图 17 所示。

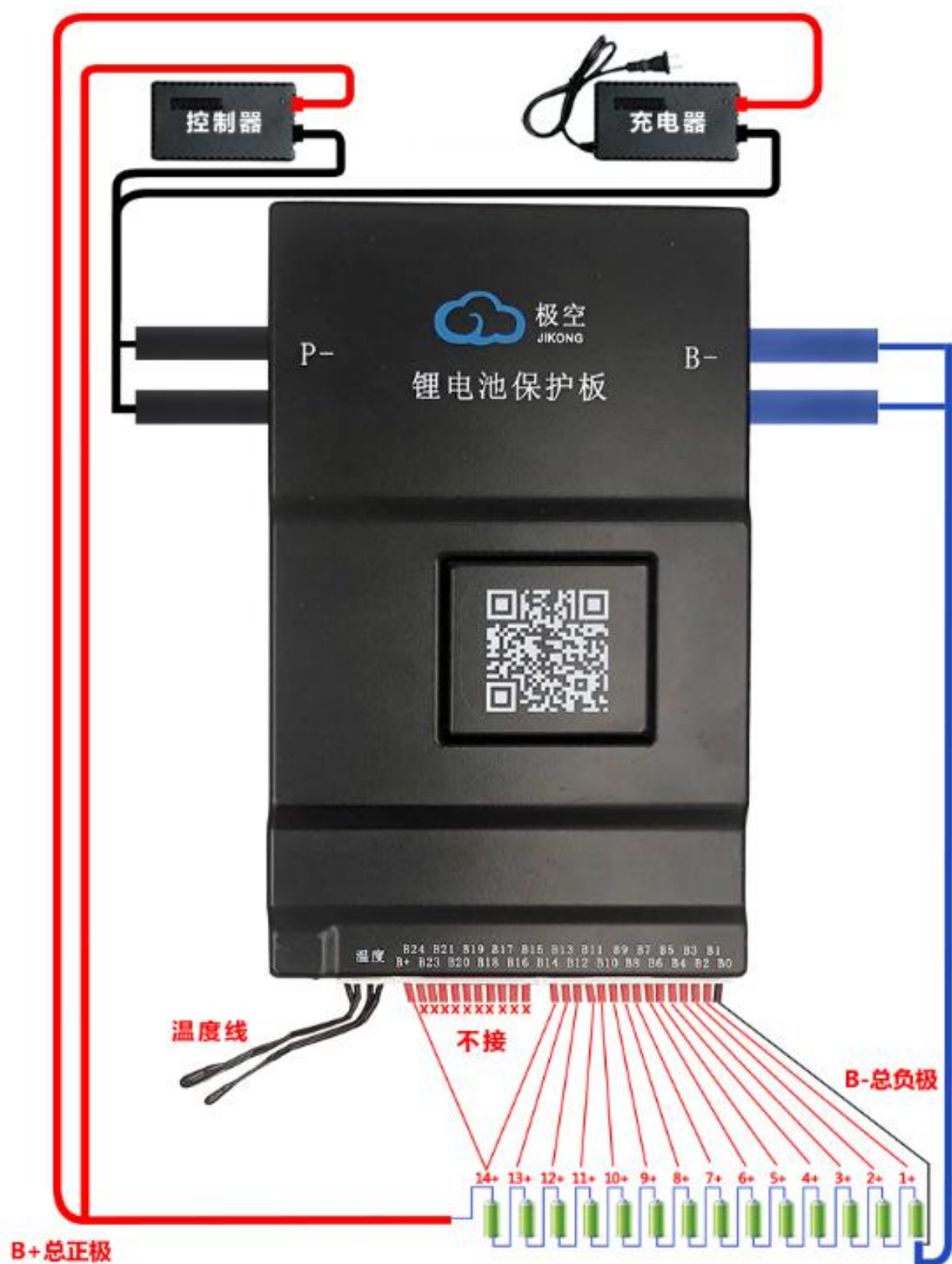


图 17 14 串电池接线图示 14-series battery wiring diagram

对于 13 串电芯串联的电池组，安装接线方法如图 18 所示。

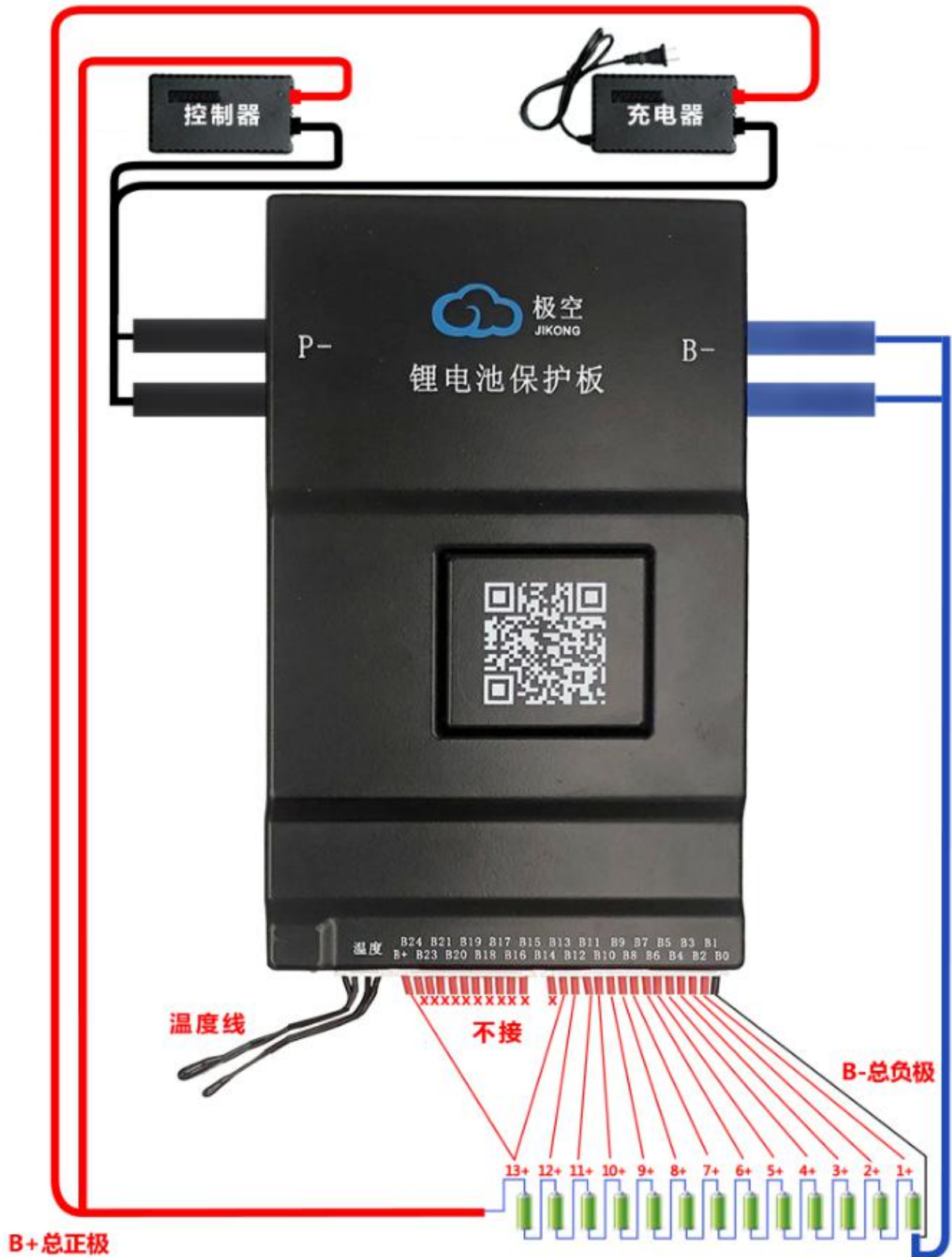


图 18 13 串电池接线图示 13-series battery wiring diagram



JK-BD6A20S6P、JK-BD6A17S6P 保护板适用于 13-20 串电芯的锂电池组，不同电芯数量的电池组接线方法不同。

对于 20 串电芯串联的电池组，安装接线方法如图 19 所示。

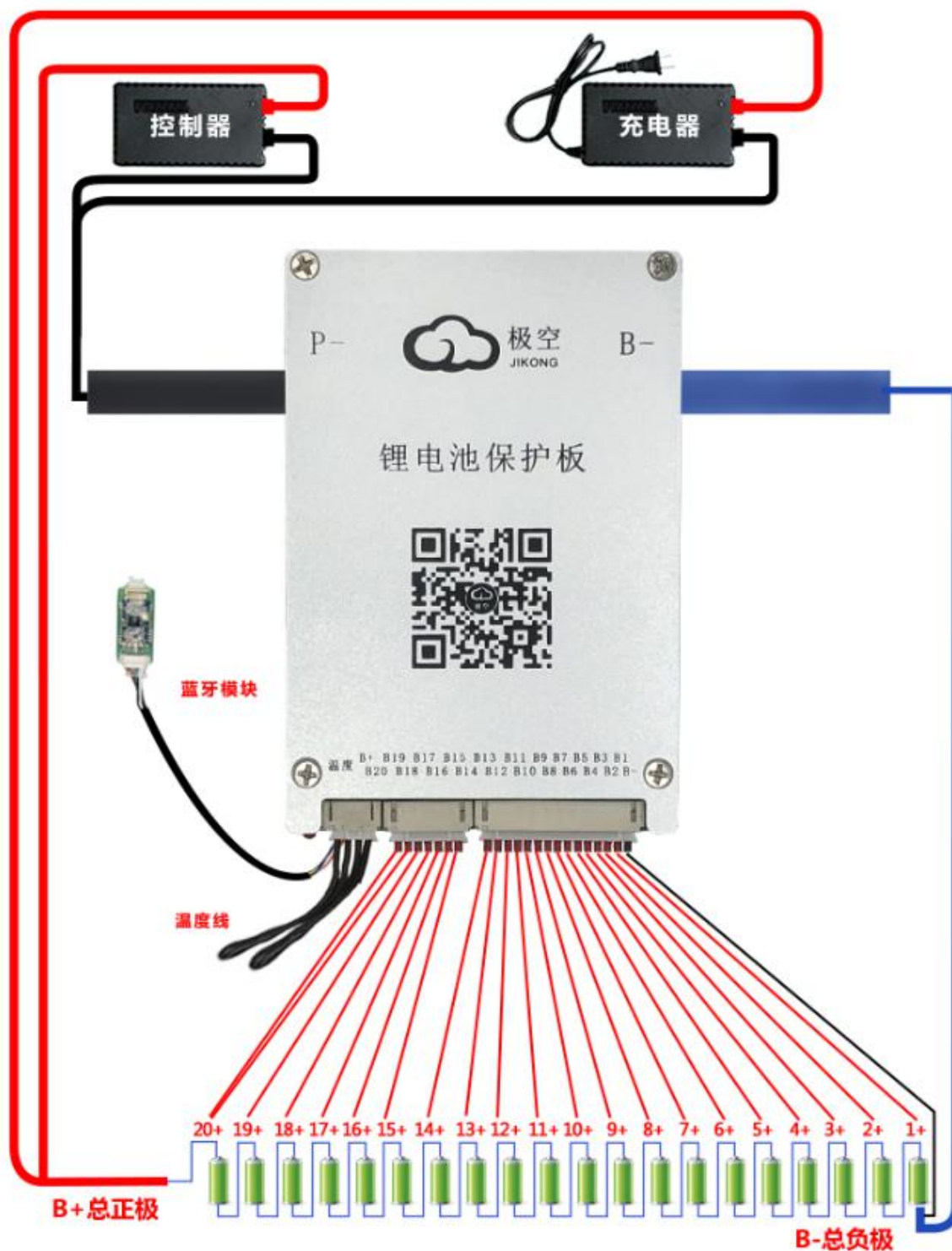


图 19 20 串电池接线图示 Figure 19. Wiring diagram of 20 battery strings

对于 19 串电芯串联的电池组，安装接线方法如图 20 所示。

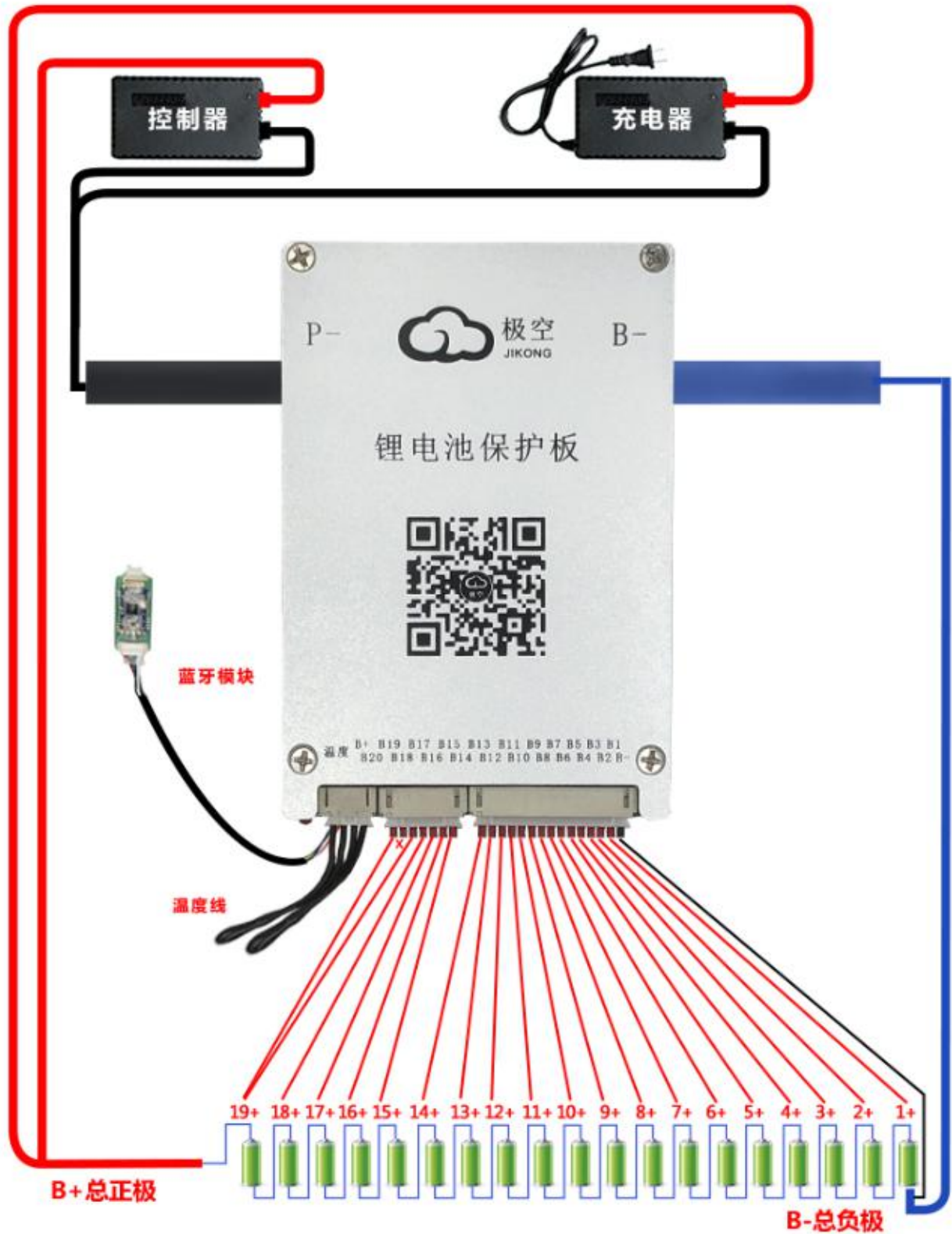


图 20 19 串电池接线图示 Wiring diagram of 19 battery strings

对于 18 串电芯串联的电池组，安装接线方法如图 21 所示。

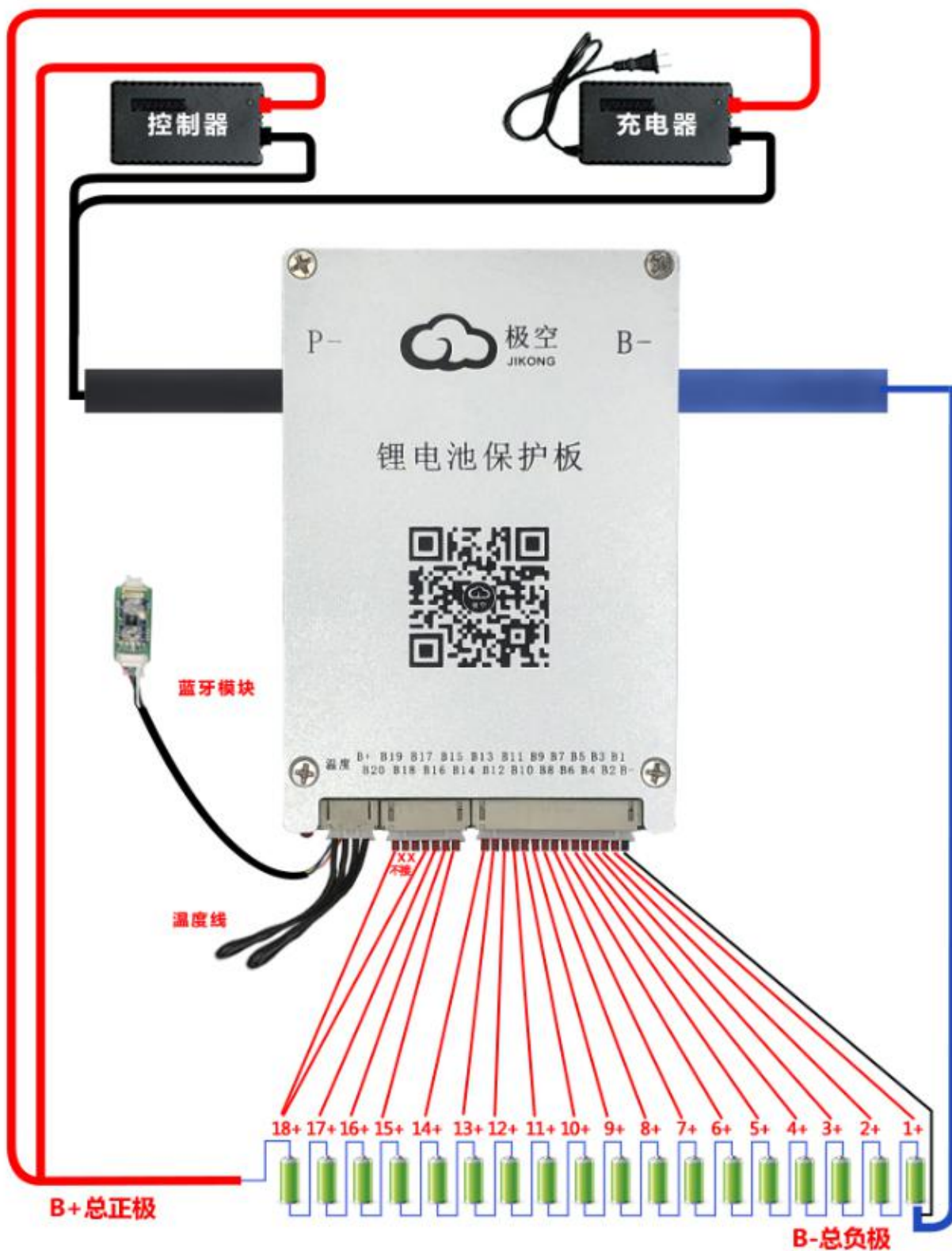


图 21 18 串电池接线图示 Cable connection of 18 battery strings  
对于 17 串电芯串联的电池组，安装接线方法如图 22 所示。

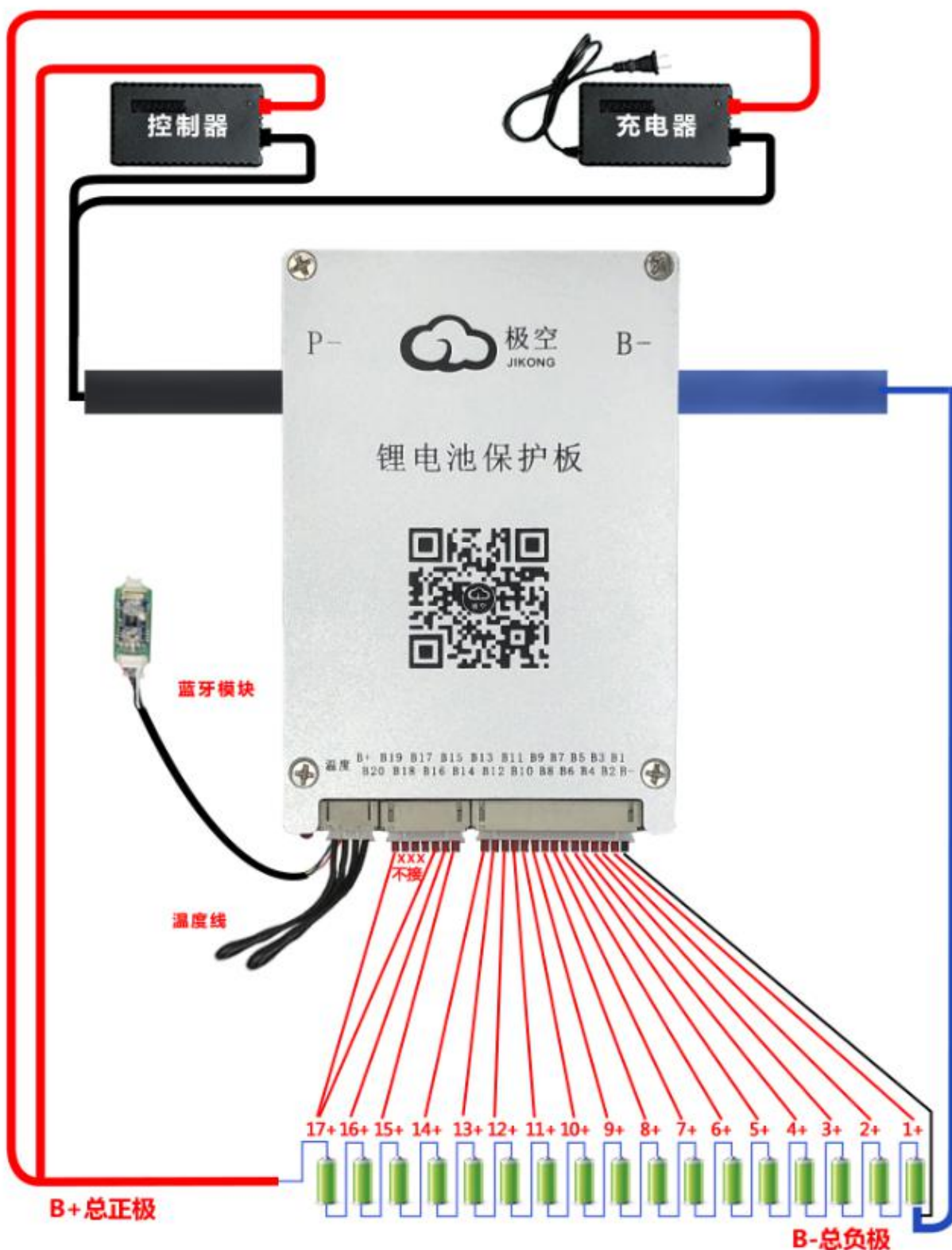


图 22 17 串电池接线图示 Wiring diagram of 17 battery strings  
对于 16 串电芯串联的电池组，安装接线方法如图 23 所示。

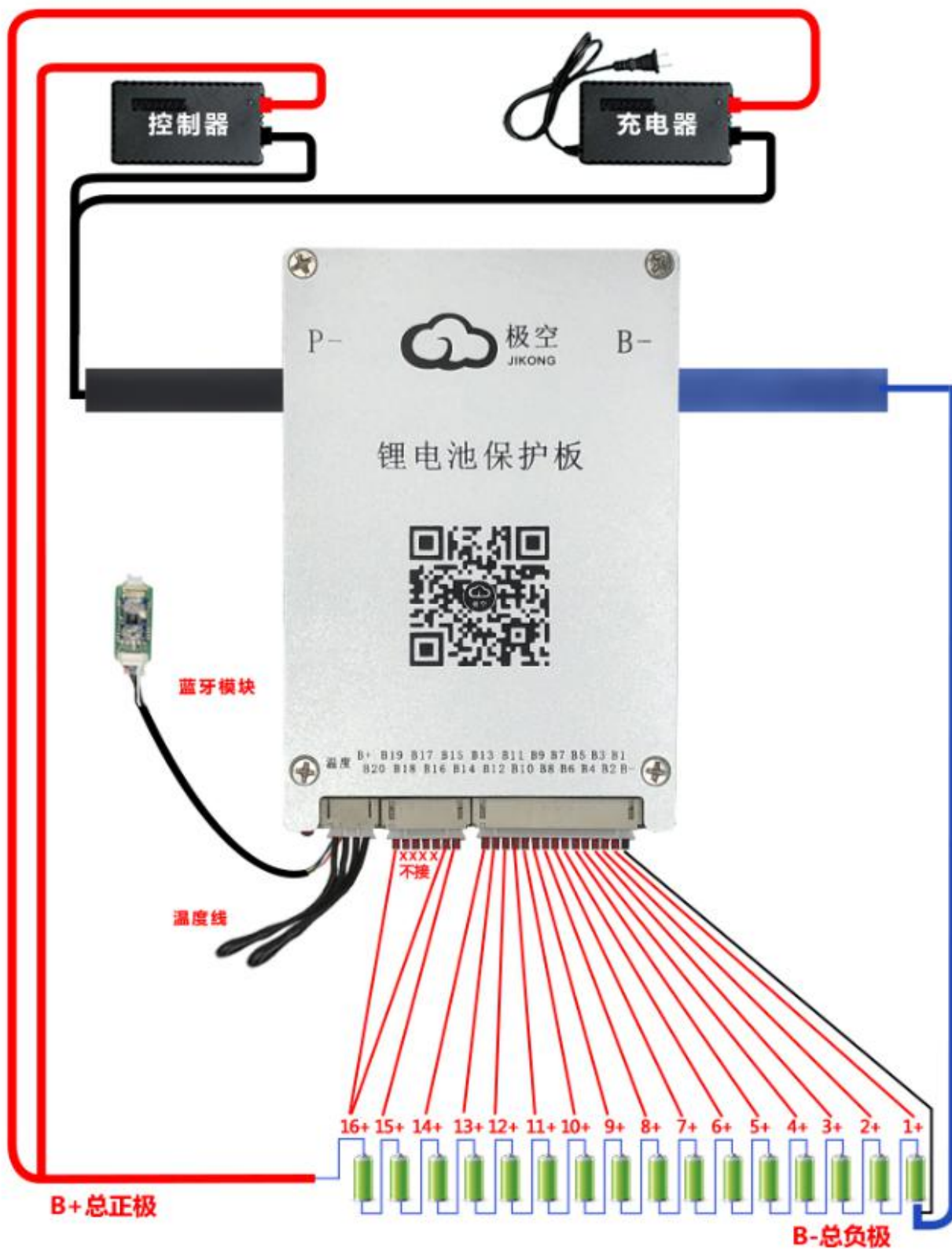


图 23 16 串电池接线图示 Wiring diagram of 16 battery strings  
对于 15 串电芯串联的电池组，安装接线方法如图 24 所示。

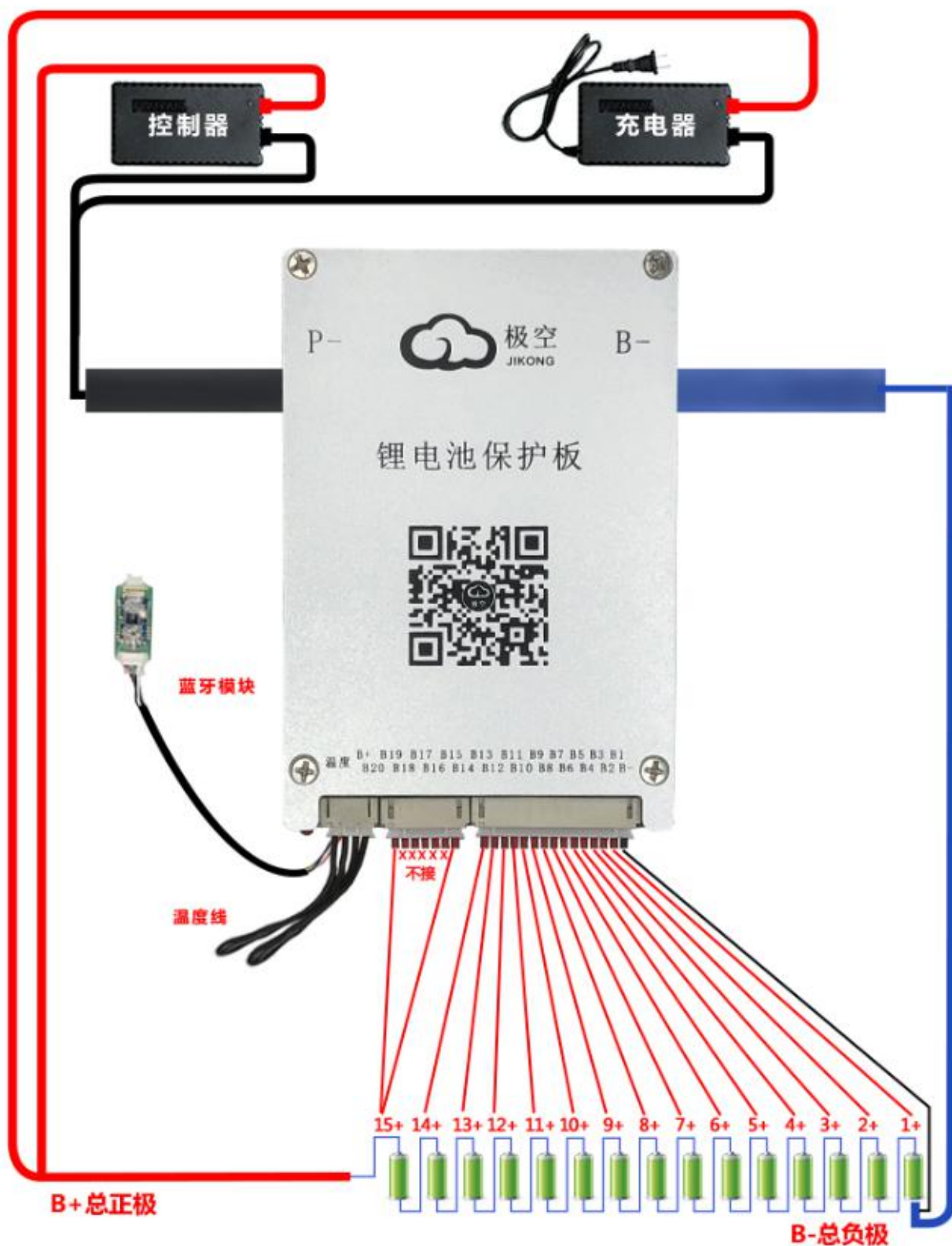


图 24 15 串电池接线图示 Wiring diagram of 15 battery strings

对于 14 串电芯串联的电池组，安装接线方法如图 25 所示。

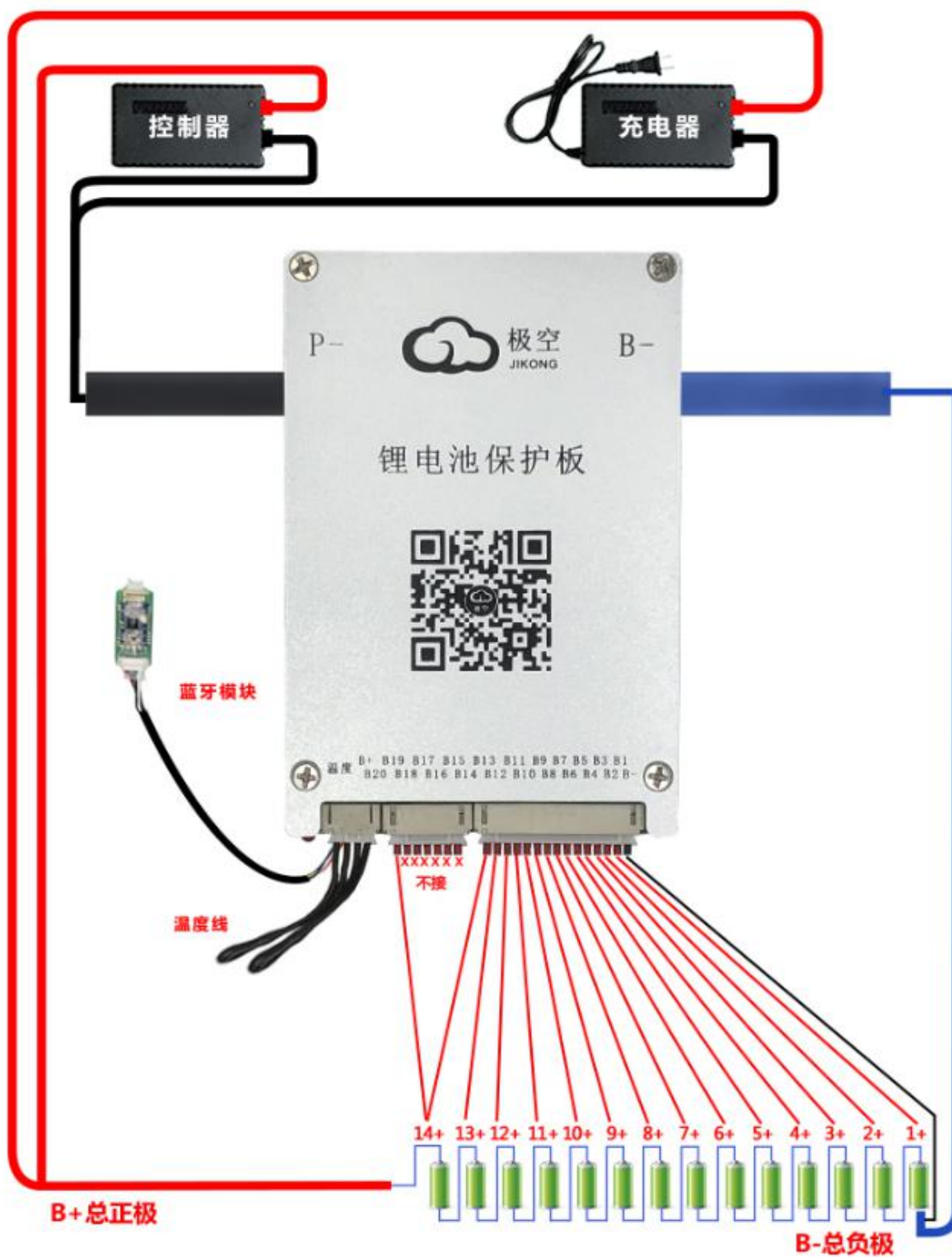


图 25 14 串电池接线图示 Wiring diagram of 14 battery strings

对于 13 串电芯串联的电池组，安装接线方法如图 26 所示。

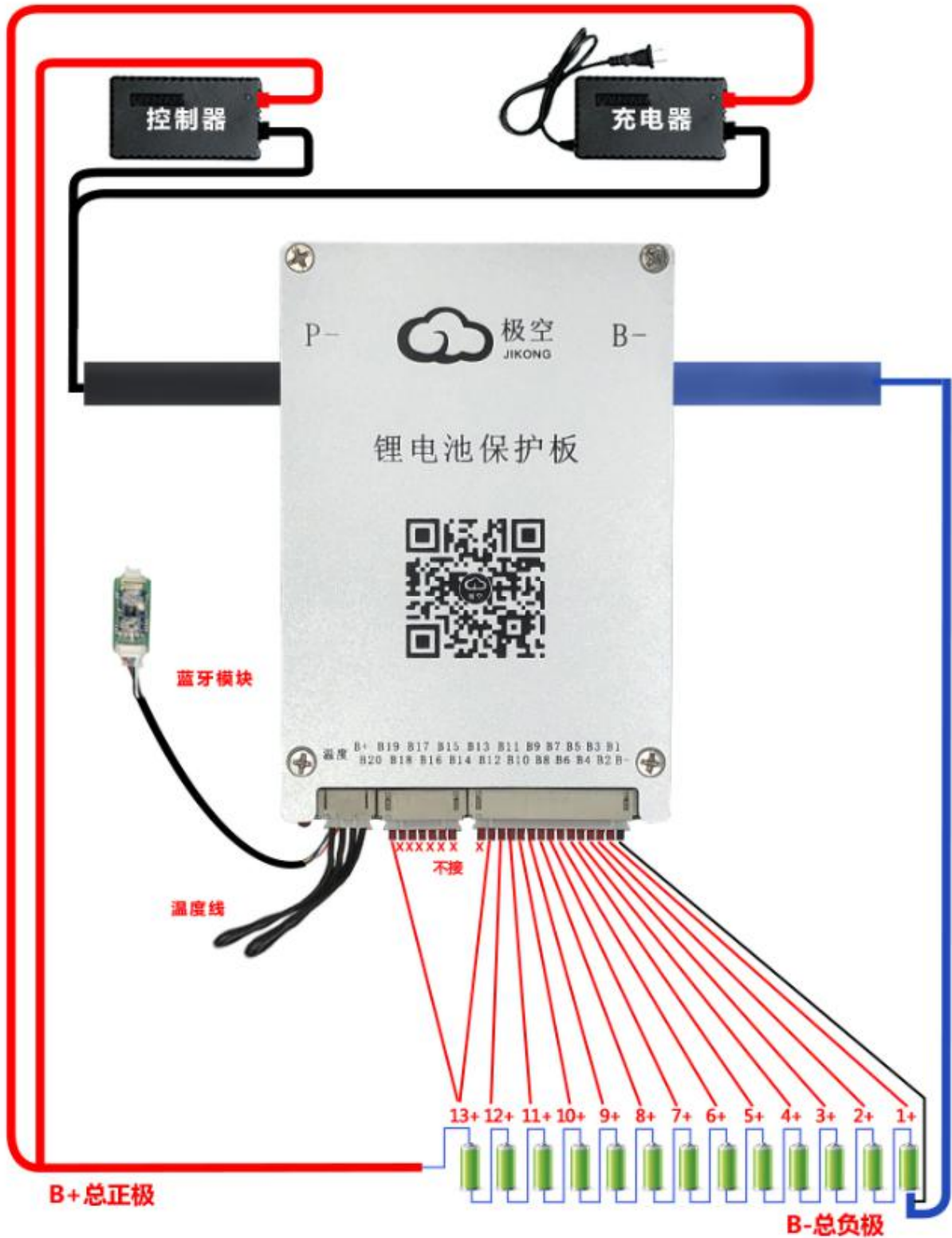


图 26 13 串电池接线图示 wiring diagram of 13 battery strings

### 4.3 APP 安装

通过扫描图 27 所示的二维码可以获取与产品配套的手机 APP。





- 手机 APP 链接二维码

Figure 27 Mobile APP link to qr code

•

图 27

## 5 使用与操作

### 5.1 使用前的准备和检查

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 protection board, please confirm again whether the balance line is connected properly, and whether "C-" and "B-" are connected correctly. Check whether the protection board has been securely fixed to the battery cell, and only after confirming that it is correct can you power on the protection board, otherwise it may cause serious consequences such as abnormal work or even burning.

### 5.2 保护板上电工作

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(满足条件：充电器电压比电池电压高 5V)**模式，即电池组装完成以后需要接上充电器让保护板开机工作。

After confirming that the above operations are correct, you can power on the protection board. The protection board does not have a power-on control switch, and is designed to be

activated by charging (conditions are met: the charger voltage is 5V higher than the battery voltage), that is, after the battery is assembled, the charger needs to be connected to make the protection board work.

### 5.3 APP 操作说明

#### 5.3.1 设备操作

##### a) 设备连接

首先开启手机蓝牙，然后打开 APP 后，如图 28 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 29 所示。

First turn on the mobile phone Bluetooth, and then open the APP, as shown in Figure 28.

Click the icon in the upper left corner to scan the device. After the scan is completed, click the name of the device to be connected, such as "JK-B1A24S". When connecting for the first time, the APP will prompt 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 time you connect, you do not need to enter a password. After opening the APP, it will automatically connect. .



图 28 设备扫描



图 29 密码输入

### b) 修改密码和名称

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 30 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。

修改密码界面如图 31 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。

After the device is connected, click the "pen" icon on the right side of the device list to modify the device name and password.

The interface for modifying the device name is shown in Figure 30. Note that the device name only supports English or numbers, and does not support Chinese names and Chinese characters.

The interface for modifying the password is shown in Figure 31. To modify the device password, you must first enter the old password of the device. Only when the current password is

correct can you enter the new password input option. After entering the new password twice, click 'OK' to complete the device password modification.



图 30 名称修改



图 31 密码修改

### 5.3.2 状态查看 Viewing status

实时状态界面如图 32 所示。The real-time status interface is shown in Figure 32.



图 32 实时状态显示

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: Area 1 in the figure is the battery comprehensive information bar. The meanings of the parameters are as follows:

**a) 运行时间 Running time**

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 Indicates the total running time since the protection board was started for the first time.

**b) 充电 charging**

表示当前保护板充电 MOS 的开启状态。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。It Indicates the status of MOS on the current protection plate charging. When "On" is displayed, the MOS of the current protection plate charging is on and the battery is allowed to charge. When "Off" is displayed, the MOS is off and the battery is not allowed to charge.

#### c) 放电 **discharging**

表示当前保护板放电 MOS 的开启状态。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。It indicates the status of the MOS on the protection board. If "On" is displayed, the MOS of the current protection board is on and the battery can discharge. If Off is displayed, the MOS of the current protection board is off, and the battery cannot discharge.

#### d) 均衡 **balancing**

表示当前保护板均衡开关的开启状态。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。Indicates the status of the balance switch of the protection board. When "On" is displayed, the protection board automatically balances when the balancing trigger condition is reached. If Off is displayed, battery balancing is disabled and the protection board does not balance batteries.

#### 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压之和。The voltage area displays the total voltage of the current battery in real time. The total voltage is the sum of all individual voltages.

#### 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。When the battery is charging, the current is positive, and when the battery is discharging, the current is negative.

#### g) 电池功率 **battery 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。Indicates the total power output or input of the current battery, and its value is the product of the current battery voltage and the absolute value of the battery current.

#### h) 剩余电量 **Remaining battery**

表示当前电池所剩电量的百分比。Indicates the current percentage of battery power remaining.

#### i) 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）。**Displays the actual battery capacity calculated by the current protection board through high-precision SOC, the unit is: AH. (This value requires the battery to do a full discharge and charge cycle before updating).**

**j) 剩余容量 The remaining capacity**

剩余容量表示当前电池的剩余容量，单位：AH。Remaining capacity indicates the remaining capacity of the current battery, unit: AH.

**k) 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 represents the cumulative discharge capacity of the battery, unit: AH.

**l) 循环次数 l) 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 times the current battery is fully charged, in units of times.

**m) 单体平均 m) monomer average**

表示当前电池的单体平均电压，单位：V。

**n) 最大压差 n) 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 in the current entire battery group, unit: V.

**o) 均衡电流 o) Balance current**

当保护板开启均衡功能，且达到均衡条件时，实时显示均衡电流，单位：A。When the equalization function is enabled on the protection board and the equalization condition is reached, the equalization current will be displayed in real time, unit: A.

当均衡进行时，实时状态的状态显示区域，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。When equalization is in progress, the status display area of the real-time status, blue represents the discharged battery, and red represents the charged battery. Negative balance current means that the battery is discharging and flashes blue at this time, and positive balance current means that the battery is charging, and red flashes at this time.

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，存放于保护板，然后再放给低电压的电芯。The protection board adopts active equalization technology. The principle of equalization is to take electricity from the high-voltage cells, store it in the protection board, and then put it on the low-voltage cells.

**p) MOS 温度 p)MOS temperature**

实时显示当前保护板功率 MOS 的温度，单位：℃。Displays the current temperature of the power MOS of the protection board in real time, unit: °C.

**q) 电池温度 1q) 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：°C。If the temperature sensor 1 is not installed, "NA" will be displayed. If the temperature sensor is installed, the temperature of the temperature sensor 1 will be displayed in real time, unit: °C.

#### **r) 电池温度 2 r) 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：°C。If the temperature sensor 2 is not installed, "NA" will be displayed, and if the temperature sensor is installed, the temperature of the temperature sensor 2 will be displayed in real time, unit: °C.

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。Area 2 in the figure is the cell voltage area. Displays the voltage data of each cell in the battery pack in real time, where red represents the cell with the lowest voltage, and blue represents the cell with the highest voltage.

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。Area 3 in the figure is the balanced line resistance area. The balance line resistance is the balance line resistance obtained by the self-check of the protection board. This value is only a rough calculation. The purpose is to prevent wrong wiring or poor contact. When the balance line resistance exceeds a certain value, it will be displayed in yellow. At this time Balance cannot be turned on.

### **5.3.3 参数设置 5.3.3 Parameter setting**

参数设置页面如图 33 所示。The parameter setting page is shown in Figure 33.





图 33 参数设置页面显示

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。You can modify the working parameters of the protection board on the parameter setting page. The definitions of each parameter are as follows:

**a) 一键铁锂 One-bond lifepo4**

功能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，参数默认值见附录。

Function, This button can change all operating parameters of the protection plate to LFP battery parameters. See the appendix for default parameters.

**b) 一键三元 One-bond Li-ion**

功能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，参数默认值见附录。

Function, This button can change all operating parameters of the protection plate to Li-ion battery parameters. See the appendix for default parameters.

**c) 一键钛酸锂 One-bond LTO**

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，参数默认值见附录。

Function, This button can change all operating parameters of the protection plate to LTO battery parameters. See the appendix for default parameters.

**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。The number of cells indicates the number of cells in the current battery. Set this value correctly before using the battery. Otherwise, the protection board cannot work properly.

**e) 电池容量 Battery capacity**

该值为电池的设计容量。This value is the designed capacity of the battery.

**f) 触发均衡压差 Trigger equalization differential pressure**

触发均衡压差是唯一的控制均衡的参数，在均衡开关打开的情况下，当电池组最大压差超过该值时，均衡开始，直到压差低于该值时均衡结束。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）。

**Triggering the balance differential pressure is the only parameter that controls the balance.** When the balance switch is turned on, when the maximum differential pressure of the battery pack exceeds this value, the balance starts, and the balance ends when the differential pressure falls below this value. For example, set the balance trigger voltage difference to 0.01V, start the balance when the battery pack voltage difference is greater than 0.01V, and end the balance when it is lower than 0.01V. **(It is recommended that batteries above 50AH should set the equalization trigger voltage difference to 0.005V, and batteries below 50AH should set the trigger equalization voltage difference to 0.01V).**

**g) 电压校准 Voltage calibration**

电压校准功能可以用来校准均衡器电压采集的精度。

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’，完成校准。

The voltage calibration function can be used to calibrate the accuracy of the equalizer

voltage acquisition.

When it is found that there is an error between the total voltage collected by the protection board and the total voltage of the battery, the voltage calibration function can be used to calibrate the protection board. The calibration method is to fill in the current measured total battery voltage, and then click 'Settings' behind the voltage calibration to complete the calibration.

**h) “单体欠压保护”、“单体欠压恢复” "Single undervoltage protection", "Single undervoltage 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。"Cell under-voltage protection" refers to the cut-off voltage of the cell. As long as the voltage of any cell in the battery pack is lower than this value, a 'cell under-voltage alarm' will be generated, and the protection board will turn off the discharge MOS. At this time, the battery cannot Discharge, only charge. After the alarm is generated, only after the voltage value of all cells exceeds the value of "cell voltage recovery", the protection board releases the "cell undervoltage alarm" and turns on the discharge MOS at the same time.

**i) “单体过充电压”、“单体过充恢复” "Single overcharge voltage", "Single 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 saturation voltage of the battery cell. As long as the voltage of any single cell in the battery pack exceeds this value, a 'single overcharge alarm' will be generated, and the protection board will turn off the charging MOS. At this time, the battery cannot be charged. , only discharge. When the alarm occurs, only after the voltage value of all cells is lower than the value of "cell overcharge recovery", the protection board releases the "cell overcharge alarm" and turns on the charging MOS at the same time.

**j) 自动关机电压 Automatic 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”。Automatic shutdown voltage Indicates the lowest operating voltage of the protection board. When the voltage of the highest battery string is lower than this value, the protection board shuts down. The value must be lower than Monomer undervoltage protection.

**k) “最大充电电流”、“充电过流延时”、“充电过流解除” "Maximum charging current", "charging overcurrent delay", "Charging overcurrent 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, if the current exceeds the "maximum charge current" and the duration exceeds the "charge overcurrent delay" time, the protection plate will generate "charge overcurrent alarm" and turn off the charging MOS. After the alarm is generated, after the time of "charging overcurrent release", the protection plate will release the charging overcurrent alarm and restart the charging MOS.

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 Maximum charge current to 10A, Charge overcurrent Delay to 10 seconds, and Charge overcurrent Release to 50 seconds. When the charging current exceeds 10A for 10 consecutive seconds during the charging process, the protection plate will generate "charging overcurrent alarm" and turn off the charging MOS at the same time. After the alarm is generated, the "charging overcurrent alarm" will be removed and the charging MOS will be turned on again at the same time.

**l) “最大放电电流”、“放电过流延时”、“放电过流解除”** "Maximum discharge current", "discharge overcurrent delay", "Discharge overcurrent 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 discharging the battery pack, if the current exceeds the Maximum discharge current and the duration exceeds the discharge overcurrent delay time, the protection board generates the discharge overcurrent alarm and turns off the MOS. After the alarm is generated, after the time of "discharge overcurrent release", the protection plate will release the "discharge overcurrent alarm" and restart the discharge MOS.

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。For example, set maximum discharge current to 100A, discharge overcurrent delay to 10 seconds, and discharge overcurrent disconnection to 50 seconds. When the discharge current exceeds 100A for 10 consecutive seconds in the discharge process, the protection plate will generate "discharge overcurrent alarm" and turn off the DISCHARGE MOS at the same time. After the alarm is generated, the "discharge overcurrent alarm" will be removed and the protection plate will restart the discharge MOS at the same time.

**m) 短路保护解除** Short circuit protection removed

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, after the time set by the "short circuit protection release", the short circuit protection is removed.

**n) 最大均衡电流** Maximum balanced 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。

Equalization current represents the continuous current of high voltage battery discharge and low voltage battery charge during energy transfer.

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。如: 20AH 电池不超过  $20 \times 0.1 = 2A$ 。The maximum equalization current indicates the maximum current in the process of energy transfer, and the maximum equalization current should not exceed  $0.1c$ . For example: 20 ah battery does not exceed  $20 \times 0.1 = 2A$ .

**o) “充电过温保护”、“充电过温恢复” "Charging overtemperature protection", "Charging overtemperature 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 the charging process, when the battery temperature exceeds the value of "charging over-temperature protection", the protection board generates a "charging over-temperature protection" warning, and at the same time, the protection board turns off the charging MOS. After the alarm is generated, when the temperature is lower than "charging over-temperature recovery", the protection board releases the "charging over-temperature protection" warning, and at the same time re-opens the charging MOS.

**p) “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 lower than the value of "charging low temperature protection", the protection board generates a "charging low temperature protection" warning, and the protection board turns off the charging MOS at the same time. After the alarm is generated, when the temperature is higher than "charging low temperature recovery", the protection board releases the "charging low temperature protection" warning, and at the same time re-opens the charging MOS.

**q) “MOS 过温保护”、“MOS 过温恢复” "MOS overtemperature protection", "MOS overtemperature 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  $75^{\circ}C$ , MOS 过温恢复值为  $65^{\circ}C$ , 这两个值为出厂默认值, 不能修改)。When the MOS temperature exceeds the value of "MOS overtemperature protection", the protection plate will generate "MOS overtemperature alarm" and turn off the charge and discharge MOS, and the battery can neither charge nor discharge. After the alarm is generated, when the MOS temperature is lower than the value of "MOS overtemperature recovery", the protection board releases the "MOS

overtemperature alarm" and restarts the charging and discharging MOS (the MOS overtemperature protection value is 75 ° C, and the MOS overtemperature recovery value is 65 ° C, which are the factory default values and cannot be modified).

**Attention 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。**For any parameter modification, please refer to the instruction manual. Improper parameters may make the protection board not work normally, or even burn the protection board.**

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，均衡器成功接收到参数以后，会发出“滴”的响声。**After any parameter is modified, you need to click the "Set" button behind the parameter to complete the parameter delivery. After the equalizer successfully receives the parameter, it will make a "beep" sound.**

#### **5.3.4 BMS 控制 BMS Control**

BMS 控制页面如图 34 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操作。The BMS control page is shown in Figure 34. Through BMS control, the protection board can be switched on and off for charging, discharging, and equalization functions, and restore factory settings.



图 34 BMS 控制页面

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

保护板本身不存在高压，对身体不会造成电击伤害。

使用之前请仔细阅读使用说明书，按照正确的不同串数的接线图接线，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。There is no high voltage on the protective plate itself, and it will not cause electric shock damage to the body.

Before use, please read the instruction manual carefully, connect according to the correct wiring diagram of different numbers of strings, connect from the negative pole to the positive pole, after the equalization line is connected, confirm with a multimeter again, and then insert the protection board after confirmation.

**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。It is not allowed to modify the power line of the protection board without permission. Modifying the power line without permission will cause uneven overcurrent of the protection board and burn the protection board.**

## 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。After packing, the products are not affected by rain or snow or violent collision, and can be transported by the usual means of transportation. It is not allowed to be put together with acid, alkali and other corrosive substances 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℃，相对湿度不大于 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。Packaged products should be stored in a permanent warehouse, the temperature of the warehouse is 0℃ ~ 35℃, the relative humidity is not more than 80%, the warehouse should be free of acid and alkali and corrosive gases, no strong mechanism vibration and impact, no strong magnetic field.



附录 “一键铁锂”、“一键三元”、“一键钛酸锂”默认参数 Appendix Default Parameters of "One-Key Iron Lithium", "One-Key Ternary", "One-Key Lithium Titanate"

序号	参数 Parameter	三元默认 Li-ion default	铁锂默认 LFP Default	钛酸锂默认 LTO Default	单位
1	单体欠压保护 Cell undervoltage protection	2.9	2.6	1.8	V
2	单体截欠压保护恢复 Single unit undervoltage protection recovery	3.2	3.0	2.0	V
3	单体过充电压 Cell overcharge voltage	4.2	3.6	2.7	V
4	单体过充保护恢复 Cell overcharge protection recovery	4.1	3.4	2.4	V
5	触发均衡压差 Trigger equalization differential pressure	0.01	0.01	0.01	V
6	自动关机电压 Automatic shutdown voltage	2.8	2.5	1.7	V
7	充电过流保护延时 Charge overcurrent protection delay	30	30	30	秒
8	充电过流保护解除时间 Charging overcurrent protection release time	60	60	60	秒
9	放电过流保护延时 Discharge overcurrent protection delay time	30	30	30	秒
10	放电过流保护解除时间 Discharge overcurrent protection release time	60	60	60	秒

11	短路保护解除时间 Short circuit protection release time	60	60	60	秒
12	充电过温保护温度 Charging over temperature protection temperature	60	60	60	°C
13	充电过温恢复温度 Overheating recovery temperature	55	55	55	°C
14	放电过温保护温度 Discharge over temperature protection	60	60	60	°C
15	放电过温恢复温度 Discharge over-temperature recovery	55	55	55	°C
16	充电低温保护温度 Charging low temperature protection temperature	-20	-20	-20	°C
17	充电低温恢复温度 Charging low temperature recovery temperature	-10	-10	-10	°C
18	MOS 过温保护温度 MOS over temperature protection temperature	75	75	75	°C
19	MOS 过温保护恢复温度 MOS over temperature protection recovery temperature	70	70	70	°C