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锂电池智能保护板

Lithium battery active equalization protection board

JK-B2A8S-20P/JK-B1A8S-20P

使用维护说明书

Operation and maintenance instructions

成都极空科技有限公司

Chengdu Jikong Technology Co., Ltd

产品保修条款

产品名称：锂电池智能

保护板保修期限：壹年

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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。

The lithium battery intelligent protection board is a management system tailored for high-capacity series lithium battery packs. It has the functions of voltage collection, large current active equalization, overcharge and discharge overcurrent temperature protection, coulometer, Bluetooth communication, GPS remote, etc. 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 0.4A 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。

Based on the energy transfer active balancing technology with independent intellectual property rights, the protection board can achieve a maximum continuous equalizing current of 0.4A. High current active balancing technology can ensure battery consistency, improve battery life and delay battery aging to the maximum extent.

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 supporting mobile phone app and supports Android and IOS operating systems. The app can be connected to the protection board through the Bluetooth of the mobile phone to view the working status of the battery, modify various working parameters of the protection board, control the charge and discharge switch, etc. The protection panel is small in size, simple in operation and full in function. It can be widely used in the battery pack of small sightseeing cars, scooters, shared cars, high-power energy storage, backup power supply of base stations, solar power stations and other products.

2. 主要技术参数 Main technical parameters

2.1. 主要技术指标 Main technical indicators

JK-B2A8S20P保护板的主要技术指标如表 1 所示。

The main technical indexes of JK-B2A8S20P protection board are shown in Table 1.

表1 保护板主要技术指标Table 1 main technical indicators

技术指标 Technical indicators	产品型号Product model:	
	B1A8S-20P	B2A8S-20P
三元串数 Number of NCM strings	3~8	
铁锂串数 Number of LFP strings	4~8	
钛酸串数 Number of LTO strings	7~8	
均衡方式 Equilibrium mode	主动均衡 Active equalization	
均衡电流 Equalizing current	1 A	2 A
主回路内阻 Internal resistance of main circuit	0.5 mΩ	
持续放电电流 Continuous discharge current	200A	
最大放电电流 Maximum discharge current	350A	
过流保护(可调) Overcurrent protection (adjustable)	10~200 A	
RS485通信接口 RS485 communication interface	支持, 需选配 (CAN/RS485只能二选一) Support, optional (can / RS485 can only be one of two)	
CAN通信接口 Can communication interface	支持, 需选配 (CAN/RS485只能二选一) Support, optional (can / RS485 can only be one of two)	
显示屏接口 Display interface	有 have	
出线方式 Entry cable	同口 Tongkou	
单体电压范围 Single voltage range	1~5V	

GPS(选配) GPS (optional)	支持 (RS485 和GPS 二选一) Support (one of RS485 and GPS)
加热功能 Heating function	支持定制 Support customization
电压采集精度 Voltage acquisition accuracy	±5 mV
过充保护电压 Overcharge protection voltage	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 Temperature detection quantity	3 个
温度保护 Temperature protection	有 have
短路保护 Short circuit protection	有 have
库仑计 SOC	有 have
蓝牙功能 Bluetooth function	支持安卓、苹果 Support Android and IOS

2.2. 使用环境条件 Service environment conditions

- 工作温度范围: -40°C~70°C;
- Operating temperature range: - 40 °C ~ 70 °C;
- 电源要求: 20~100V。
- Power requirement: 20 ~ 100V.
- 功耗: 均衡状态 10mA@100V, 非均衡状态 6mA@100V。
- Power consumption: balanced state 10mA@100V , unbalanced state 6mA@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 and LED lamp position identification

连接器、LED 灯位置如图 1 所示。The position of connector and LED lamp is shown in

Figure 1.

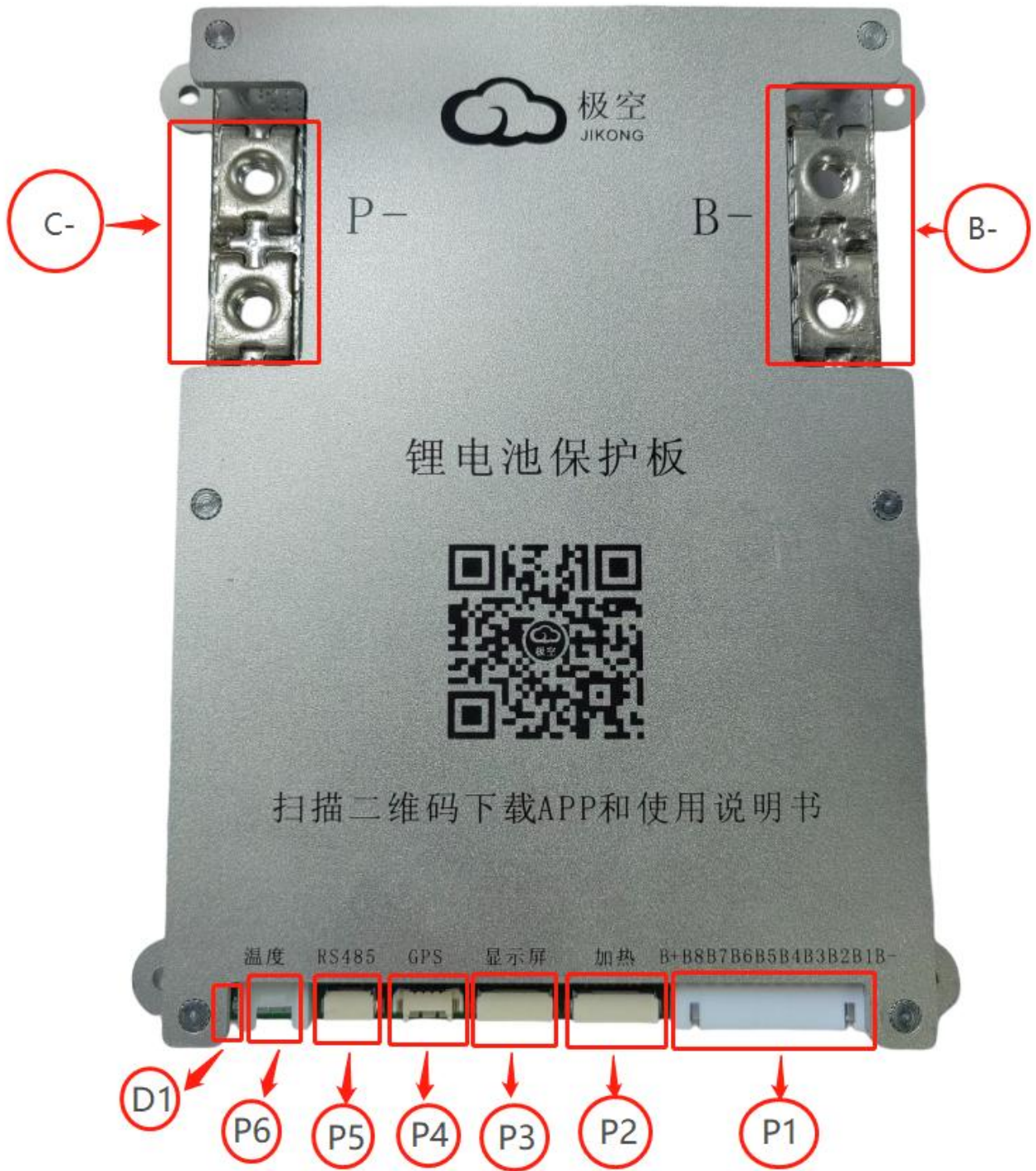


图 1 B2A8S20P 连接器示意图

Figure 1 Schematic diagram of b2a8s20p connector

3.2 连接器、LED 定义描述 Definition of connector and led

BxA8S20P 保护板连接器定义、LED 灯定义见表 2。

See Table 2 for definitions of BxA8S20P protection board connector and LED lamp.

表2 连接器定义 Table 2 connector definition

连接器 Connector	管脚号 Pin number	JK-B2A8S20P	
		名称 Name	定义 Definition
P1	1	B-	电池总负极 Total negative electrode of battery
	2	B1	第 1 串电池正极 Positive electrode of the 1st string battery
	3	B2	第 2 串电池正极 Positive electrode of the 2st string battery
	4	B3	第 3 串电池正极 Positive electrode of the 3st string battery
	5	B4	第 4 串电池正极 Positive electrode of the 4st string battery
	6	B5	第 5 串电池正极 Positive electrode of the 5st string battery
	7	B6	第 6 串电池正极 Positive electrode of the 6st string battery
	8	B7	第 7 串电池正极 Positive electrode of the 7st string battery
	9	B8	第 8 串电池正极 Positive electrode of the 8st string battery
	10	B+	保护板电源,接电池总正 Power supply of protection board, connected to battery positive
P2	加热接口 Heating interface		
P3	液晶显示屏接口 LCD interface		
P4	外置 GPS 接口 External GPS interface		
P5	RS485/CAN接口(二选一) RS485 / can interface (one out of two)		
P6	1	T1A	第 1 个温度传感器 A 管脚 Pin A of the first temperature sensor
	2	T1B	第 1 个温度传感器B 管脚 Pin B of the first temperature sensor
	3	T2A	第 2 个温度传感器 A 管脚 Pin A of the second temperature sensor
	4	T2B	第 2 个温度传感器B 管脚 Pin B of the second temperature sensor
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: the indicator is always on when the Bluetooth is connected to the protection board, and flashes when the Bluetooth is disconnected.		
C-	接外部负载或者充电器负极 Connected to external load or charger negative pole		
B-	接电池负极 Connected to battery negative electrode		

3.3 产品外型 Product appearance

BxA8S20P 保护板外型如图2所示。

The appearance of BxA8S20P protection board is shown in Figure 2.



图2 JK- BxA8S20P/ 效果图 Figure 2 JK - BxA8S20P / effect diagram

3.4 尺寸 Size

JK-BxA8S20P 保护板大小为 153mm×126mm×17.6mm，外形尺寸如图 3所示。

The size of JK-BxA8S20P protection plate is 153mm × 126mm × 17.6mm, and the overall dimensions are shown in Fig. 3.

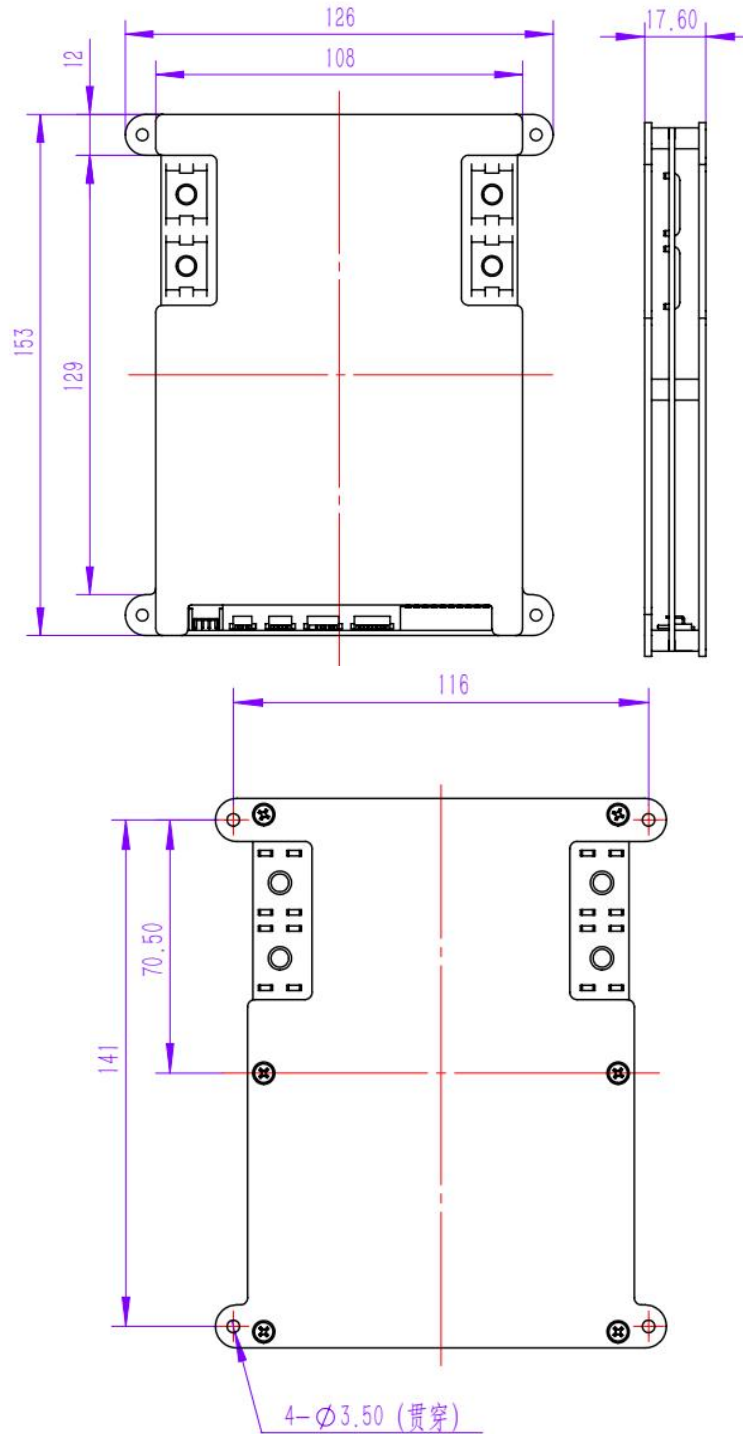


图 3 BxA8S20P 外形尺寸图 Fig. 3 outline dimensions of BxA8S20P

3.5 重量 Weight

JK-BxA8S20P 保护板重量约为 349g。

The weight of JK-BxA8S20P protective plate is about 349g.

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:

a) 对包装箱、保护板等需要轻拿轻放、尽量不要倒置；

a) The packaging box and protective plate shall be handled with care and shall not be inverted as far 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 unpacking, pay attention to whether the package is in good condition, such as whether there are impact marks and damages;

4.2 接线图 Wiring diagram

JK-B2A8S20P 保护板适用于 8 串电芯的锂电池组，安装接线方法如图 4 所示。

Jk-b2a8s20p protection board is applicable to the lithium battery pack with 8 strings of cells. The installation and wiring method is shown in Fig. 4.

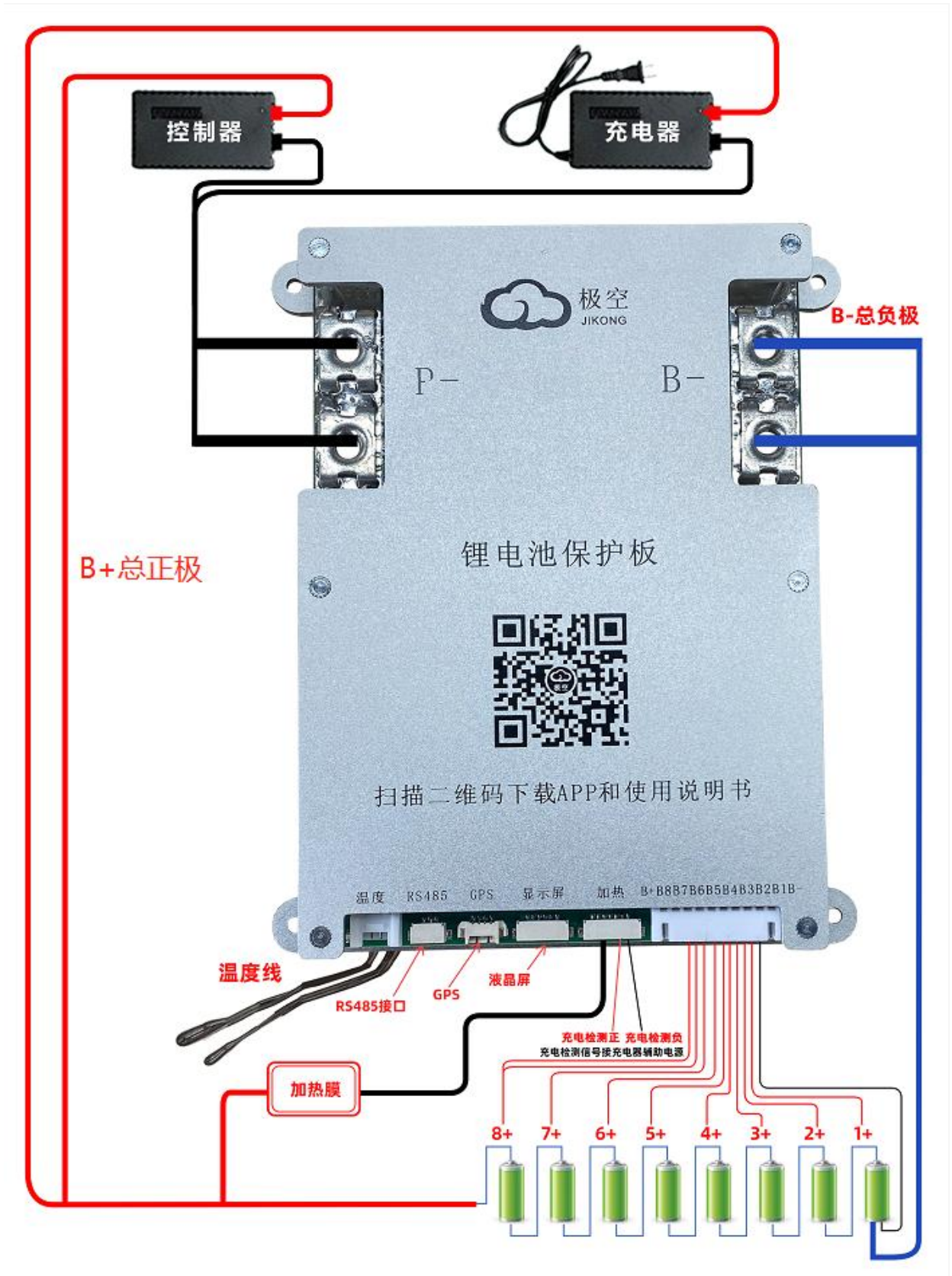


图 4 8串电池接线图示 Figure 4 wiring diagram of 8-string battery

4.3 APP 安装 APP installation

通过扫描图 5 所示的二维码可以获取与产品配套的手机APP。

By scanning the QR code shown in Fig. 5, the mobile phone APP matching the product can be obtained.



图 5 手机APP 链接二维码 Figure 5 mobile APP link QR code

5. 使用与操作 Use and operation

5.1. 使用前的准备和检查 Preparation and inspection 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 starting the protection board, please confirm whether the equalizing line is connected normally again and whether "C -" and "B -" are connected correctly. Check whether the protection board has been firmly fixed with the electric core. Only after confirmation can the protection board be powered on. Otherwise, it may cause serious consequences such as abnormal operation or even burning.

5.2. 保护板上电工作 Power on protection board

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 2V)**，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 operation is correct, power on the protection board. The protection board has no power on control switch and is designed as **charging activation mode (the charger voltage is 2V higher than the battery voltage)**, that is, after the battery is assembled, the charger needs to be connected to start the protection board.

5.3. APP 操作说明 APP operating instructions

5.3.1. 设备操作 Equipment operation

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 6所示。

First, turn on the Bluetooth of the mobile phone, and then turn on the app, as shown in Figure 6.

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 7所示。

lick the icon in the upper left corner to scan the equipment. After the scanning is completed, **click the name of the equipment to be connected**, such as "JK - B1A24S". During the first connection, the app will prompt for the 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 require the password. After the app is opened, the password will be automatically connected. The password input interface is shown in Figure 7.



图6 设备扫描 Figure 6 device scanning



图7 密码输入 Figure 7 device scanning

5.3.1.2. 修改密码和名称 **Change 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。

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

修改设备名称界面如图 8 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。

The interface for modifying the equipment name is shown in Figure 8. Note that the equipment name only supports English or numbers, and does not support Chinese names and Chinese characters.

修改密码界面如图 9 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。

The password modification interface is shown in Figure 9. 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. After entering the new password twice, click "OK" to complete the modification of the device password.



图8 名称修改 Figure 8 name modification



图9 密码修改 Figure 9 password modification

5.3.2. 状态查看 Status viewing

实时状态界面如10 所示。

The real-time status interface is shown in Figure 15.



图 10 实时状态显示 Figure 10 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：

Area 1 in the figure is the battery comprehensive information column. The definition of each parameter is as follows:

a) 运行时间 Run time

运行时间表示从保护板第一次开机至今的运行总时间。

The running time indicates the total running time since the first startup of the protection

board.

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 switching state of the protection board charging MOS. When "on" is displayed, it indicates that the charging MOS of the current protection board is on and the battery is allowed to be charged; When "off" is displayed, it means that the current protection board charging MOS is off and the battery is not allowed to be charged.

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 switching state of the protection board discharge MOS. When "on" is displayed, it indicates that the current protection board discharge MOS is on and the battery is allowed to discharge; When "off" is displayed, it means that the current protection board discharge MOS is off and the battery is not allowed to discharge.

d) 均衡 balanced

表示当前保护板均衡开关的开关状态。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 switching state of the current equalizing switch of the protection board. When "on" is displayed, the protection board will automatically equalize when the equalization trigger condition is reached; When "off" is displayed, it means that equalization is off and the protection board will not equalize 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 cell 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。

The current area displays the total current of the current battery in real time. When the battery is charged, the current is positive, and when the battery is discharged, 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。

Represents 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 power

表示当前电池所剩电量的百分比。

Represents the percentage of power left in the current battery.

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）。

Indicates the actual capacity of the battery calculated by the current protection board through the high-precision SOC, unit: AH. **(this value needs to be updated after a complete discharge and charge cycle of the battery).**

j) 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.

k) 循环容量 Circulation capacity

循环容量表示电池的累计放电容量，单位：AH。

Cycle capacity refers to the cumulative discharge capacity of the battery, unit: AH.

l) 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 times of current battery charging saturation, and the unit is: times.

m) 单体平均 Monomer average

表示当前电池的单体平均电压，单位：V。

Represents the average cell voltage of the current battery, unit: v.

n) 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 whole battery, unit: V.

o) 均衡电流 Equalizing 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 protection board turns on the equalization function and reaches the equalization condition, the equalization current display area displays the equalization 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。

When the equalization is performed, the cell voltage display area in the real-time state, blue represents the discharged battery, and red represents the charged battery. The negative current of equalizing current indicates that the battery is discharging, and the blue blinks at this time. The positive current of equalizing current indicates that the battery is charging, and the red blinks 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 power from high-voltage cells, store it in the protection board, and then put it into low-voltage cells.

p) MOS

实时显示当前保护板功率MOS 的温度，单位：°C。

Real time display of current protection board power MOS temperature, unit: °C.

q) 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：°C。

"Na" is displayed when the temperature sensor 1 is not installed. When the temperature sensor 1 is installed, the temperature of the temperature sensor 1 is displayed in real time, unit: °C.

r) 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：°C。

"Na" is displayed when the temperature sensor 2 is not installed. When the temperature sensor 2 is installed, the temperature of the temperature sensor 2 is 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。

Zone 2 in the figure is the single voltage region. The voltage data of each cell in the battery pack is displayed 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，该值只是初略的计算，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 area of equalizing line resistance. The resistance of the equalizing line is the resistance of the equalizing line obtained by the self inspection of the protection board. This value is only a preliminary calculation. The purpose is to prevent wrong connection or poor contact. When the resistance of the equalizing line exceeds a certain value, it will be displayed in yellow. At this time, equalizing cannot be started.

5.3.3. 参数设置 Parameter setting



图 11 参数设置页面显示 Figure 11 display of parameter setting page

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 board, you must first click the "**authorization setting**" button and enter the parameter setting password to verify the

parameter setting authority. The parameter setting password is "123456" by default. Only after the parameter setting password is correctly entered can the parameters of the protection board be modified. 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。

The working parameters of the protection board can be modified on the parameter setting page. The definitions of the parameters are as follows.

s) 一键铁锂 One key LFP

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。

Click this button to modify all working parameters of the protection board to LFP battery parameters. See the appendix for the default values of LFP parameters.

t) 一键三元 One key NCM

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。

Click this button to modify all working parameters of the protection board to NCM battery parameters. See the appendix for the default values of NCM parameters.

u) 一键钛酸锂 One key 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，钛酸锂参数默认值见附录。

Function this button can modify all working parameters of the protection board to LTO battery parameters. See the appendix for the default values of LTO parameters.

v) 单体数量 Monomer quantity

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 of the current battery. Please set this value accurately before use, otherwise the protection board will not work properly.

w) 电池容量 Battery capacity

该值为电池的设计容量。

This value is the design capacity of the battery.

x) 触发均衡压差 Trigger equalizing differential pressure

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。

When the equalization switch is turned on, when the maximum voltage difference of the battery pack exceeds this value and the current cell voltage exceeds **equalization start voltage**, equalization starts until the voltage difference is lower than this value or the cell voltage is lower than the equalization start voltage. For example, set the equalizing trigger voltage difference to 0.01V, start equalizing when the voltage difference of the battery pack is greater than 0.01V, and end equalizing when it is lower than 0.01V.

（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）。

(it is recommended to set the equalizing trigger pressure difference to 0.005v for batteries above 50ah and 0.01V for batteries below 50ah).

y) 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。

The voltage calibration function can be used to calibrate the accuracy of the protection board voltage acquisition.

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。

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 the "set" button behind the voltage calibration to complete the calibration.

z) 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。The current calibration function can be used to calibrate the accuracy of the current collection of the protection board.

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。

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

aa) “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. At the same time, the protection board closes the charging MOS. At this time, the battery cannot be charged and can only be discharged. After the alarm is generated, only when the voltage value of all the cells is lower than the value of "cell overcharge recovery", the protection board releases the "cell overcharge alarm" and turns on the charging MOS.

ab) “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 undervoltage protection" refers to the cut-off voltage of the battery cell. As long as the voltage of any cell in the battery pack is lower than this value, a "cell undervoltage alarm" will be generated. At the same time, the protection board will turn off the discharge MOS. At this time, the battery cannot be discharged and can only be charged. After the alarm is generated, only when all the individual voltage values exceed the value of "individual voltage recovery", the protection board releases the "individual undervoltage alarm" and turns on the discharge MOS.

ac) 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”。

The automatic shutdown voltage indicates the lowest voltage of the protection board. When the voltage of the highest cell in the battery pack is lower than this value, the protection board is closed. This value must be lower than "single undervoltage protection".

ad) 均衡起始电压 Balanced 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 equalization start voltage is used to control the voltage stage of equalization. Only when the cell voltage exceeds this value and the maximum voltage difference of the battery pack exceeds **balance trigger voltage difference**, equalization will be triggered.

ae) 最大均衡电流 Maximum equalizing 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。

The equalizing current represents the continuous current of the high-voltage battery discharging and the low-voltage battery charging in the process of energy transfer. The maximum equalizing current refers to the maximum current in the energy transfer process, and the maximum equalizing current should not exceed 0.1C.

如：20AH 电池不超过 $20 \times 0.1 = 2A$ 。

For example, 20Ah battery shall not exceed $20 * 0.1 = 2A$.

af) “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, the current exceeds the "maximum charging current" and the duration exceeds the time of "charging overcurrent delay", the protection board generates "charging overcurrent alarm" and turns off the charging MOS. After the alarm is generated, after the time of "charging overcurrent release", the protection board releases the charging overcurrent alarm and reopens 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 the "maximum charging current" as 10a, the "charging overcurrent delay" as 10s, and the "charging overcurrent release" as 50s. In the charging process, if the charging current exceeds 10A for 10 seconds, the protection board will generate a "charging overcurrent alarm" and turn off the charging MOS. After 50 seconds, the "charging overcurrent alarm" will be released and the protection board will turn on the charging MOS again.

ag) “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 the battery pack is discharged, the current exceeds the "maximum discharge current" and the duration exceeds the time of "discharge overcurrent delay", the protection board generates a "discharge overcurrent alarm" and turns off the discharge MOS. After the alarm is generated, after the time of "discharge overcurrent release", the protection board releases the "discharge overcurrent alarm" and reopens 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 the "maximum discharge current" as 100A, the "discharge overcurrent delay" as 10s, and the "discharge overcurrent release" as 50s. During the discharge process, if the discharge current exceeds 100A for 10 consecutive seconds, the protection board will generate a "discharge overcurrent alarm" and turn off the discharge MOS. After 50 seconds after the alarm is generated, the "discharge overcurrent alarm" will be released and the protection board will turn on the discharge MOS again.

ah) 短路保护延时 Release of short circuit protection

当保护板检测到电流超过 600A 且持续时间超过“短路保护延时”的时间，保护板产生‘短路报警’，同时相应充放电开关。报警产生以后，经过“短路保护解除”的时间后，保护板解除‘短路保护报警’，重新开启充放电开关。

When the protection board detects that the current exceeds 600A and the duration exceeds the "short-circuit protection delay", the protection board generates a "short-circuit alarm" and the corresponding charge / discharge switch. After the alarm is generated, after the "short-circuit protection release" time, the protection board releases the "short-circuit protection alarm" and reopens the charge / discharge switch.

举例：设定“短路保护延时”为 1000 微秒、“短路保护解除”为 50 秒。在充放电过程中电流连续 1000 微秒 600A，保护板将产生‘短路保护报警’，同时相应充放电开关，报警产生后 50 秒，解除‘短路保护报警’，同时保护板重新开启充放电开关。（**建议非必要使用出厂默认设置；短路保护设置为‘0’，表示关闭短路保护**）。

For example, set "short circuit protection delay" to 1000 microseconds and "short circuit protection release" to 50 seconds. In the process of charging and discharging, the current is 600A for 1000 microseconds continuously, and the protection board will generate a "short circuit protection alarm", and the corresponding charge and discharge switch will release the "short circuit protection alarm" 50 seconds after the alarm is generated. At the same time, the protection board will restart the charge and discharge switch. **(it is not necessary to use the factory default setting; the short-circuit protection is set to '0', which means that the short-circuit protection is turned off.)**

ai) 短路保护解除 Release of short circuit protection

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。

After the short-circuit protection occurs, the short-circuit protection is released after the time set by "short-circuit protection release".

aj) “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。

In the process of charging, when the battery temperature exceeds the value of "charging over temperature protection", the protection board generates a warning of "charging over temperature protection", and the protection board closes the charging MOS. After the alarm is generated, when the temperature is lower than "charging over temperature recovery", the protection board will release the warning of "charging over temperature protection" and restart the charging MOS.

ak) “放电过温保护”、“放电过温恢复” "Discharge over temperature protection", "discharge over temperature recovery"

在放电过程中，电池温度超过“放电过温保护”的值时，保护板产生‘放电过温保护’警告，同时保护板关闭放电开关。报警产生以后，当温度低于“放电过温恢复”时，保护板解除‘放电过温保护’警告，同时重新开启放电开关。

During the discharge process, when the battery temperature exceeds the value of "discharge over temperature protection", the protection board will generate "discharge over temperature protection" warning, and at the same time, the protection board will close the discharge switch. After the alarm is generated, when the temperature is lower than "discharge over temperature recovery", the protection board will release the warning of "discharge over temperature protection" and turn on the discharge switch again.

al) “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 warning of "charging low temperature protection", and the protection board closes the charging MOS. After the alarm is generated, when the temperature is higher than "charging low temperature recovery", the protection board will release the "charging low temperature protection" warning and restart the charging MOS.

在保护板支持加热的条件下，进入“充电低温保护”以后，保护板打开加热功能给电池加热，‘充电低温保护’解除以后，加热关闭。

Under the condition that the protection plate supports heating, after entering the "charging low temperature protection", the protection plate turns on the heating function to heat the battery. After the "charging low temperature protection" is released, the heating is turned off.

am) “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°C)

MOS 过温恢复值为 65°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 board will generate "MOS overtemperature alarm" and turn off the charging and discharging MOS. The battery cannot be charged or discharged. After the alarm is generated, after the MOS temperature is lower than the value of "MOS over temperature recovery", the protection board releases the "MOS over temperature alarm" and starts the charging and discharging MOS again (**The MOS over temperature protection value is 75 °C, and the MOS over temperature recovery value is 65 °C. These two values are factory default values and cannot be modified**).

an) 设备地址（如果支持） Device address (if supported)

用来配置保护板的设备从地址。

The device slave address used to configure the protection board.

ao) 放电预充时间（如果支持） Discharge precharge time (if supported)

当保护板支持放电预充功能，该值用来控制放电预充开关的闭合时间，单位：秒。放电预充结束以后，自动打开放电开关，开始放电。

When the protection board supports the discharge precharge function, this value is used to control the closing time of the discharge precharge switch, unit: s. After the discharge precharge is completed, the discharge switch is automatically opened to start the discharge.

ap) 用户私有数据(用户数据) User private data (user data)

在铁搭换电的应用中，该处填入BT码的前12位。铁搭换电协议中BT码共计24位，后12位是蓝牙名称。

In the application of grounding power exchange, the first 12 bits of BT code shall be filled here. There are 24 bits of BT code in the tietie power exchange protocol, and the last 12 bits are the Bluetooth name.

举例，电池BT码为BT207204012YMLD220815001；则前12位BT207204012Y填入用户私有数据，后12位MLD220815001填入蓝牙名称。

For example, the battery BT code is bt207204012ymld220815001; The first 12 bits bt207204012y are filled with the user's private data, and the last 12 bits mld220815001 are filled with the Bluetooth name.

aq) 连接线电阻 Connecting wire resistance

连接线电阻用于多箱体电池，单箱体电池不使用，具体使用方法请咨询供货商 (**注意连接线电阻与实时数据页面的均衡线电阻没有实质性的关联**)。

The connecting line resistance is used for multi box batteries, but not for single box batteries. Please consult the supplier for the specific use method (**Note that the connecting line resistance has no substantive relationship with the equalizing line resistance of the real-time data page**).

注意：Be careful:

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。

Please refer to the manual for any parameter modification. Improper parameters may cause the protection board to fail to work normally or even burn the protection board. After any parameter is modified, you need to click the "set" button behind the parameter to complete the parameter distribution. After the protection board successfully receives the parameter, it will make a "drip" sound.

5.3.4. BMS 控制 BMS control

BMS 控制页面如图 12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应急开关等

The BMS control page is shown in Figure 12. Through BMS control, the protection board can be charged, discharged, balanced, switched and emergency switched



图 12 BMS控制页 Figure 12 BMS control page

ar) 充电开关 Charging switch

用来控制保护板充电开关打开或者关闭。

It is used to control the opening or closing of the charging switch of the protection board.

as) 放电开关 Discharge switch

用来控制保护板放电开关打开或者关闭。

Used to control the opening or closing of the discharge switch of the protection board.

at) 均衡开关 Equalizing switch

用来控制保护板均衡功能打开或者关闭。

It is used to control the opening or closing of the equalizing function of the protection board.

au) 应急开关 Emergency switch

无论电池出现任何故障，打开应急开关都可以打开充放电，允许用户应急使用电池。应急开关打开后，30分钟自动关闭，无需用户自行关闭(打开应急开关以后，电池失去任何保护功能，非必要请勿打开此开关)。

No matter what happens to the battery, opening the emergency switch can turn on the charging and discharging, allowing the user to use the battery in an emergency. After the emergency switch is turned on, it will automatically turn off within 30 minutes without the user turning it off (**after the emergency switch is turned on, the battery will lose any protection function. Do not turn on this switch unless necessary**).

av) 加热开关 Heating switch

保护板支持加热的条件下，在满足加热的条件时，只有**检测到充电器**或者**打开**此加热开关加热才能打开。

Under the condition that the protection plate supports heating, when the heating conditions are met, the heating can be turned on only when the charger is detected or the heating switch is turned on.

aw) 温度传感器屏蔽 Temperature sensor shield

打开温度传感器屏蔽开关，此时保护板忽略跟温度相关的报警(此功能常用与温度传感器由于某种原因损坏的情况)。

Turn on the shield switch of the temperature sensor. At this time, the protection board ignores the alarm related to the temperature (this function is often used when the temperature sensor is damaged for some reason).

ax) GPS心跳检测 GPS heartbeat detection

打开GPS心跳检测功能以后，保护板会检测GPS的连接状态，当GPS断开与保护板连接超过24小时以后，保护板关闭充放电开关，同时产生“GPS断开连接”的报警(该功能通常

用于GPS防拆检测)。

After the GPS heartbeat detection function is turned on, the protection board will detect the connection status of GPS. When the GPS is disconnected from the protection board for more than 24 hours, the protection board will close the charge / discharge switch and generate an alarm of "GPS disconnected" (this function is usually used for GPS anti disassembly detection).

ay) 复用端口切换 Multiplexing port switching

该功能可以切换保护板复用端口的输出功能，切换选项为“RS485”或者“CAN” (需要保护板硬件支持相应的功能)。

This function can switch the output function of the multiplexing port of the protection board. The switching option is "RS485" or "can" (the corresponding function needs to be supported by the protection board hardware).

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。

Before use, please carefully read the operating instructions, and connect the wires according to the wiring diagram of the corresponding string number, from the negative electrode to the positive electrode. After the equalizing wire is connected, use a multimeter to confirm again, and then insert the protection board after confirmation.

保护板默认密码为“1234”，默认授权密码为“123456”，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。

The default password of the protection board is "1234", and the default authorization password is "123456". After the mobile app is connected to the protection board, please modify the connection password in time to prevent it from being connected by others.

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 authorization. Unauthorized modification of the power line 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 Transport

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 products will not be directly affected by rain and snow, and can be transported by

ordinary means of transportation. It is not allowed to be put together with corrosive substances such as acid and alkali during transportation.

7.2. 贮存 Keep in 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°C~35°C，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 packaged products shall be stored in a permanent warehouse with a temperature of 0 °C ~ 35 °C and a relative humidity of no more than 80%. The warehouse shall be free of acid, alkali and corrosive gases, strong mechanical vibration and impact, and strong magnetic field.

附录“一键铁锂”、“一键三元”、“一键钛酸锂”默认参数

Appendix "one bond iron lithium", "one bond ternary", "one bond lithium titanate" default parameters

序号 No.	参数 Parameter	三元 NCM	铁锂 LFP	钛酸锂 LTO	单位 Company
1	单体欠压保护 Single undervoltage protection	2.9	2.6	1.8	V
2	单体截欠压保护恢复 Recovery of single block undervoltage protection	3.2	3.0	2.0	V
3	单体过充电压 Single overcharge voltage	4.2	3.6	2.7	V
4	单体过充保护恢复 Recovery of single overcharge protection	4.1	3.4	2.4	V
5	触发均衡压差 Trigger balance 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 Charging overcurrent protection delay	30	30	30	秒(S)
8	充电过流保护解除时间 Release time of charging overcurrent protection	60	60	60	秒(S)
9	放电过流保护延时 Discharge overcurrent protection delay	30	30	30	秒(S)
10	放电过流保护解除时间 Discharge overcurrent protection release time	60	60	60	秒(S)
11	短路保护解除时间 Release time of short circuit protection	60	60	60	秒(S)
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 Charging over temperature recovery temperature	55	55	55	°C
14	放电过温保护温度 Discharge over temperature protection temperature	60	60	60	°C
15	放电过温恢复温度 Discharge over temperature recovery temperature	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 Recovery temperature of MOS over temperature protection	70	70	70	°C