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主动均衡继电器保护板

Active balance relay BMS

JK-B2A25S-RP

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：锂电池智能护板

保修期限：壹年

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1. 概述Overview

JK-B2A25S-RP 电池管理系统是为大容量串联锂电池组量身打造的电池管理系统。该系统适用于 3~25 串的电池组，具备电池保护、电压采集和电压均衡功能。

JK-B2A25S-RP battery management system is a battery management system tailored for large capacity series lithium battery packs. The system is applicable to 3 ~ 25 strings of battery packs and has the functions of battery protection, voltage collection and voltage equalization.

该系统的均衡功能以超级电容为媒介，实现主动式能量转移均衡。系统工作时实现过充、过放保护和短路保护等电池保护功能，并以持续最大 2A 的均衡电流进行能量转移，均衡电流不依赖电池组中串联电池单体的压差。电压采集范围 1 V~5V，精度±3mV。对外通讯接口可选择 RS485 总线、CAN 总线、GPS 接口或者液晶显示接口。可适用于磷酸铁锂、三元锂、钛酸、铅酸锂等市面上的所有电池种类。

The balancing function of the system takes supercapacitor as the medium to realize active energy transfer balancing. When the system works, it realizes battery protection functions such as overcharge protection, over discharge protection and short circuit protection, and transfers energy with a continuous equilibrium current of up to 2A. The equilibrium current does not depend on the pressure difference of the series connected battery cells in the battery pack. The voltage collection range is 1V ~ 5V, and the accuracy is ± 3MV. The external communication interface can be RS485 bus, can bus, GPS interface or LCD interface. It can be applied to all kinds of batteries on the market, such as lithium iron phosphate, ternary lithium, titanate and lithium lead acid.

系统具备蓝牙通信功能，并配套手机 APP 软件。可以通过蓝牙连接设备系统进行查看单体电池电压、查看均衡状态、修改设置参数等操作。可应用于小型观光车、代步车、叉车、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 内，亦可用于电池均衡维修、修复等场合。

The system has Bluetooth communication function and is equipped with mobile app software. You can view the cell voltage, view the equilibrium state, modify the setting parameters and other operations through the Bluetooth connected device system. It can be used in the battery pack of small sightseeing vehicles, scooters, forklifts, shared cars, high-power energy storage, base station backup power supply, solar power stations and other products, and also in the occasions of battery balance maintenance and repair.

2.主要技术参数 Main technical parameters

2.1. 主要技术指标 Main technical indicators

- ◆ 支持3~25串电池组。
- ◆ Support 3 ~ 25 strings of battery packs.
- ◆ 过充、过放电压保护和过流保护参数可通过 APP 设置，具备短路保护功能；
- ◆ Overcharge, over discharge voltage protection and over-current protection parameters can be set through app, with short-circuit protection function;
- ◆ 实时、主动式均衡，均衡电流 2A，平衡后电池间压差 $\leq 5\text{mV}$ ；
- ◆ Real time, active equalization, equalizing current 2a, voltage difference between batteries $\leq 5\text{mv}$ after balance;
- ◆ 支持充电、放电、放电预充继电器控制功能，继电器驱动电压 12V；
- ◆ Support the control function of charging, discharging and discharging precharge relay, and the relay driving voltage is 12V;
- ◆ 支持 3 个温度探头；
- ◆ Support 3 temperature probes;
- ◆ 单体电压范围 1V~4.5V，精度 $\pm 5\text{mV}$ ；
- ◆ Single voltage range: 1V ~ 4.5V, accuracy: $\pm 5\text{mv}$;
- ◆ 具备库仑计功能；
- ◆ With coulometer function;
- ◆ 适用于大容量的三元、铁锂、钛酸锂等锂电池组；
- ◆ Suitable for high-capacity ternary, lithium iron, lithium titanate and other lithium batteries;
- ◆ 蓝牙通信功能，配备 APP，可实时查看电芯状态；
- ◆ Bluetooth communication function, equipped with app, can view the status of the battery in real time;
- ◆ 支持对外接口：GPS 接口、CAN 接口，RS485 需定制；
- ◆ Support external interfaces: GPS interface, can interface, RS485 needs to be customized;

- ◆ 低电压关机功能，防止过放导致电池损坏；
- ◆ Low voltage shutdown function to prevent battery damage caused by excessive discharge;
- ◆ 加热功能，最大支持 5A 加热电流；
- ◆ Heating function, max. 5A heating current;
- ◆ 支持 ACC 点火开关，用于钥匙启动放电；
- ◆ Support ACC ignition switch for key start discharge;
- ◆ 分流器规格设置功能，便于更换不同的分流器。
- ◆ The diverter specification setting function facilitates the replacement of different diverters.

2.2. 使用环境条件 Service environment conditions

- 工作温度范围：-20°C~70°C；
- Operating temperature range: - 20 °C ~ 70 °C;
- 电源要求：16~100V。
- Power requirement: 16 ~ 100V.
- 功耗：保护板最大功耗 1.5W（不包含继电器功耗），关机功耗 20mW。
- Power consumption: the maximum power consumption of the protection board is 1.5W (excluding relay power consumption), and the shutdown power consumption is 20mW.

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

3.1. 前面板连接器、LED 灯位置描述 Front panel connector, LED lamp position description

前连接器、带灯开关位置如图 1 所示。

The positions of front connector and light switch are shown in Fig. 1.

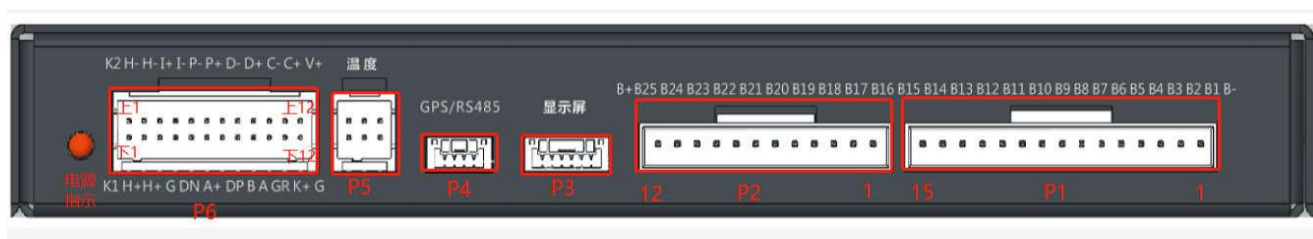


图 1 连接器示意图 Fig. 1 Schematic diagram of connector

3.2. 前面板连接器、带灯开关定义描述 Definition and description of front panel connector and light switch

前面板连接器定义见表1。

See Table 1 for the definition of front panel connector.

表1 连接器定义 Table 1 connector definition

连接器 Connector	管脚号 Pin number	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	B9	第 9 串电池正极 Positive electrode of the 9st string battery
	11	B10	第 10 串电池正极 Positive electrode of the 10st string battery
	12	B11	第 11 串电池正极 Positive electrode of the 11st string battery
	13	B12	第 12 串电池正极 Positive electrode of the 12st string battery
	14	B13	第 13 串电池正极 Positive electrode of the 13st string battery
	15	B14	第 14 串电池正极 Positive electrode of the 14st string battery
P2	1	B15	第 15 串电池正极 Positive electrode of the 15st string battery
	2	B16	第 16 串电池正极 Positive electrode of the 16st string battery
	3	B17	第 17串电池正极 Positive electrode of the 17st string battery
	4	B18	第 18串电池正极 Positive electrode of the 18st string battery
	5	B19	第 19串电池正极 Positive electrode of the 19st string battery
	6	B20	第 20 串电池正极 Positive electrode of the 20st string battery
	7	B21	第 21串电池正极 Positive electrode of the 21st string battery
	8	B22	第 22串电池正极 Positive electrode of the 22st string battery
	9	B23	第 23串电池正极 Positive electrode of the 23st string battery
	10	B24	第 24串电池正极 Positive electrode of the 23st string battery
	11	B25	第 25串电池正极 Positive electrode of the 23st string battery
		12	B+
P3	显示屏接口 Display interface		
P4	GPS接口 GPS interface		
P5	上1	T1	热传感器 1 正

	Upper 1			Thermal sensor 1 (Positive)
	上2 Upper 2	T2		热传感器 2 正 Thermal sensor 2 (Positive)
	上3 Upper 3	T3		热传感器 3 正 Thermal sensor 3 (Positive)
	下1 Lower 1	GP		热传感器1 地 Thermal sensor 1 (Ground)
	下2 Lower 2	GP		热传感器2 地 Thermal sensor 2 (Ground)
	下3 Lower 3	GP		热传感器3 地 Thermal sensor 3 (Ground)
P6	上1 Upper 1	K2	K2	预留管脚 Reserved pin
	上2 Upper 2	H-	Heat-	加热开关负 Heating switch (Negative)
	上3 Upper 3	H-	Heat-	加热开关负 Heating switch (Negative)
	上4 Upper 4	I+	C-sense+	分流器 正 Diverter (Positive)
	上5 Upper 5	I-	C-sense-	分流器 负 Diverter (Negative)
	上6 Upper 6	P-	Pre-chat-	预充开关 负 Precharge switch (Negative)
	上7 Upper 7	P+	Pre-chat+	预充开关 正 Precharge switch (Positive)
	上8 Upper 8	D-	Dis-char-	放电开关 负 Discharge switch (Negative)
	上9 Upper 9	D+	Dis-char+	放电开关 正 Discharge switch (Positive)
	上10 Upper 10	C-	Char-	充电开关 负 Charging switch (Negative)
	上11 Upper 11	C+	Char+	充电开关 正 Charging switch (Positive)
	上12 Upper 12	V+	V+	保护板电源 正 BMS power (Positive)
	下1 Lower 1	K1	K1	预留管脚 Reserved pin
	下2 Lower 2	H+	Heat+	加热开关 正 Heating switch (Positive)
下3 Lower 3	H+	Heat+	加热开关 正 Heating switch (Positive)	

	下4 Lower 4	G	GND	保护板电源 负 BMS power (Negative)
	下5 Lower 5	A-	ACC-	点火开关 负 Ignition switch (Negative)
	下6 Lower 6	A+	ACC+	点火开关 正 Ignition switch (Positive)
	下7 Lower 7	K-	K-	不接 Refuse
	下8 Lower 8	B	B/L	485_B/CAN_L, 默认 CAN_L 485_B/CAN_L. Default can_L
	下9 Lower 9	A	A/H	485_A/CAN_H, 默认 CAN_H 485_A/CAN_H. Default can_H
	下10 Lower 10	GR	GND-TR	RS485/CAN 地 RS485/CAN(Ground)
	下11 Lower 11	K+	K+	充电开关 正 Charging switch (Positive)
	下12 Lower 12	G	GND	保护板电源 负 Protection board power supply (Negative)
LED灯	指示灯 Indicator light		电源指示灯 Power indicator	

3.3. 产品外型 Product appearance

产品外型如图 2 所示。

The product appearance is shown in Figure 2.



图 2 JK-B2A25S-RP 效果图-正面 Figure 2 JK-B2A25S-RP effect drawing - front

3.4. 尺寸 Size

JK-B2A25S-RP 均衡器大小为 188.6mm×94mm×23.5mm，外形和安装孔位置尺寸如图 3 所示。

JK-B2A25S-RP equalizer size is 188.6mm × 94mm × 23.5mm, and the outline and

installation hole position dimensions are shown in Fig. 3.

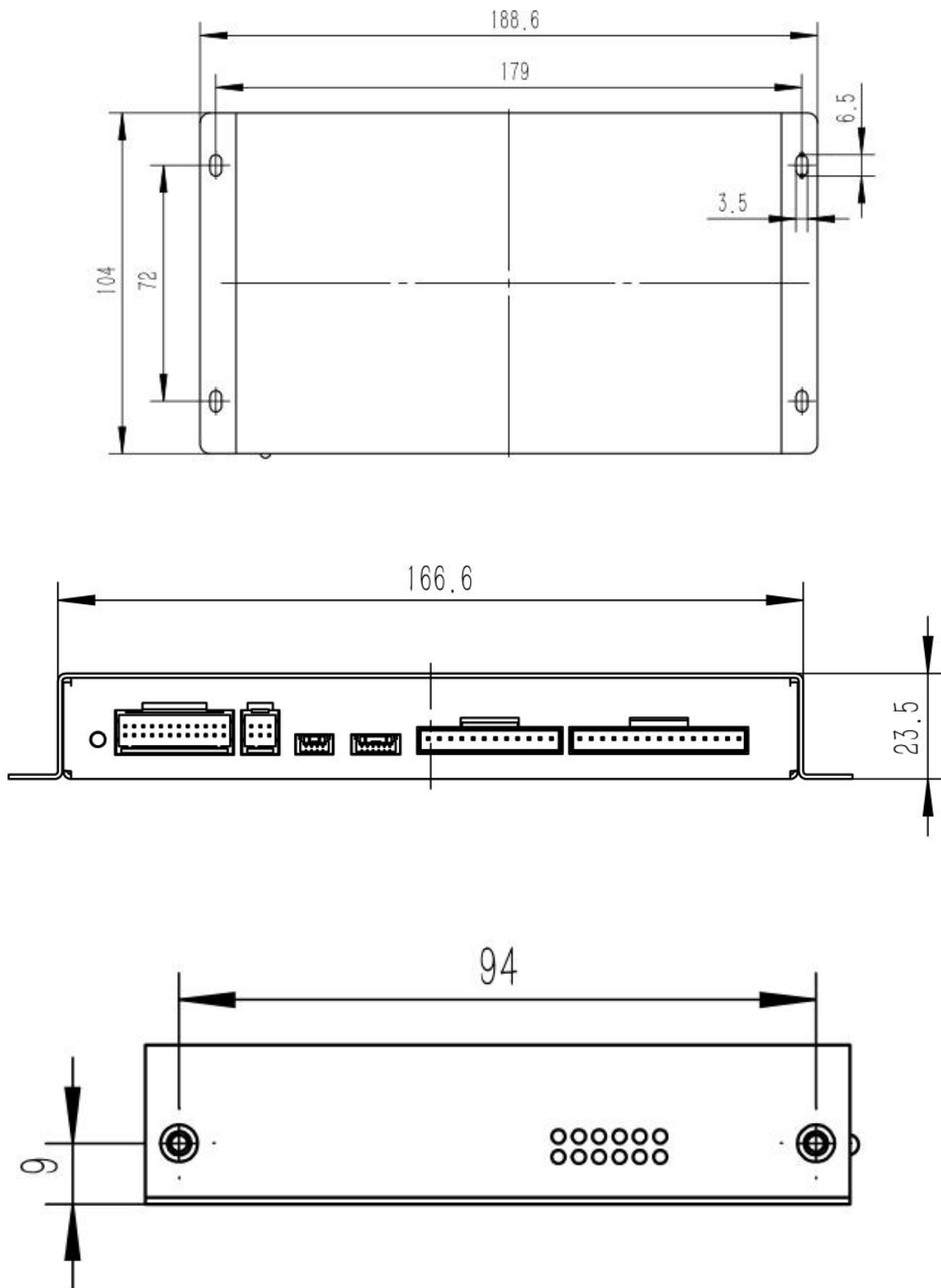


图3 JK-B2A25S-RP 外形尺寸图 Fig. 3 outline dimension of JK-B2A25S-RP

3.5. 分流器尺寸 Diverter size

标配分流器使用最大 500A 电流，满量程 75mv 压差。尺寸如图 4 所示。

The standard shunt uses a maximum current of 500A and a full-scale differential pressure of 75mV. The dimensions are shown in Fig. 4.

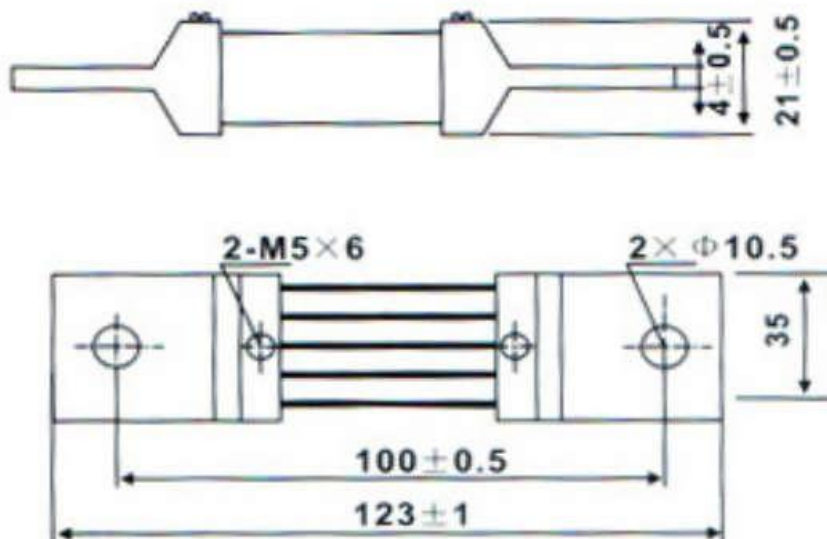


图4 分流器外形尺寸图 Fig. 4 overall dimension of diverter

如需更大电流需求，可选择更大分流器，并通过 APP 设置分流器规格。

If you need a larger current demand, you can select a larger shunt and set the shunt specification through app.

3.6. 重量 Weight

- 电池管理系统重量约为 700g。
- The weight of the battery management system is about 700g.

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. 电池管理系统设备安装 Installation of battery management system equipment

JK-B2A25S-RP 电池管理系统适用于 8-25 串的电池组。25 串电池组系统接线方式如图 5 所示。

Jk-b2a25s-rp battery management system is applicable to 8-25 strings of battery packs. The wiring mode of 25 string battery pack system is shown in Fig. 5.

注意：带 12V 辅助电源的充电器，需将辅助电源正极接到 K+，辅助电源正极接到充电器负极。

Note: for the charger with 12V auxiliary power supply, the positive pole of auxiliary power supply shall be connected to K +, and the positive pole of auxiliary power supply shall be connected to the negative pole of charger.

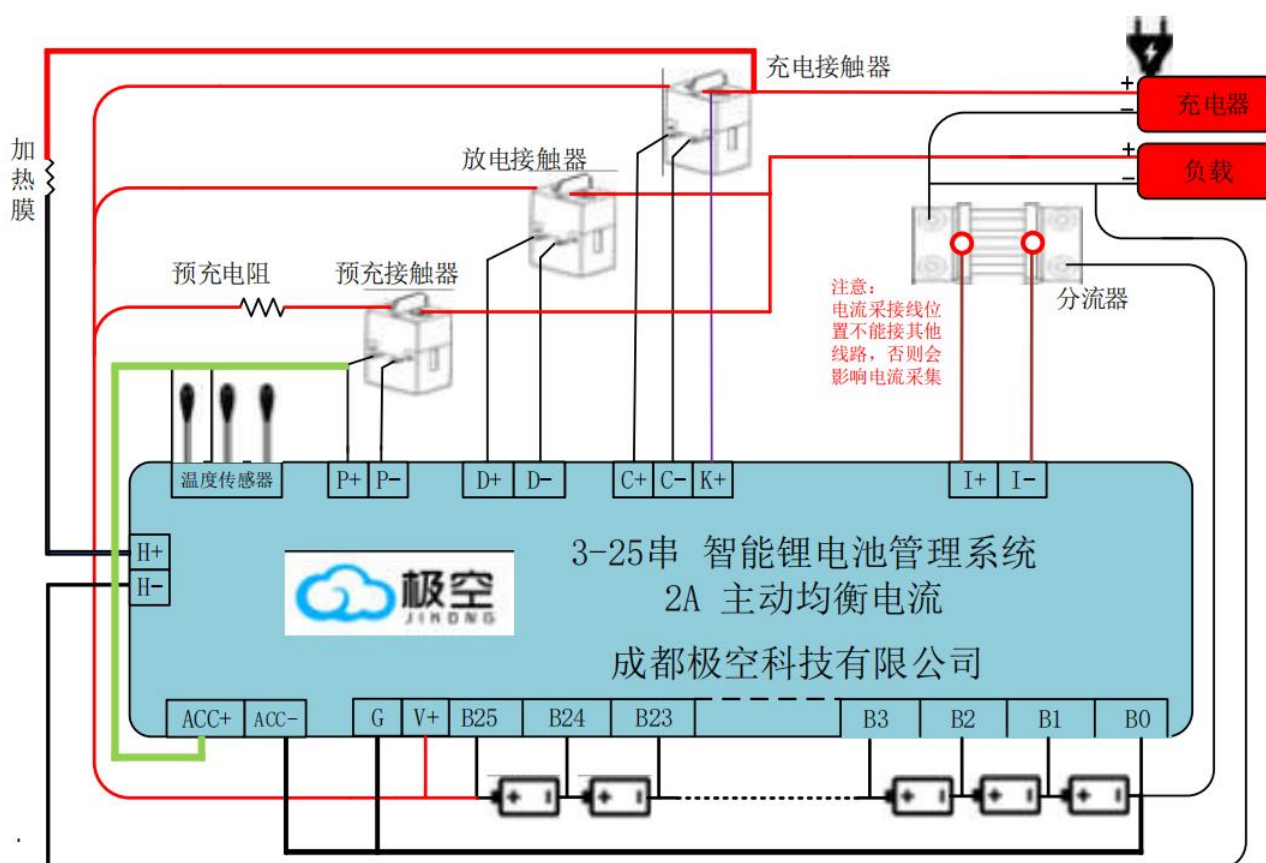


图 5 25 串电池组系统接线方式 Figure 5 wiring mode of 25 string battery pack system

20 串电池组系统接线方式如图 6 所示。

The wiring mode of the 20 string battery pack system is shown in Fig. 6.

注意：带 12V 辅助电源的充电器，需将辅助电源正极接到 K+，辅助电源正极接到充电器负极。

Note: for the charger with 12V auxiliary power supply, the positive pole of auxiliary power supply shall be connected to K +, and the positive pole of auxiliary power supply shall be connected to the negative pole of charger.

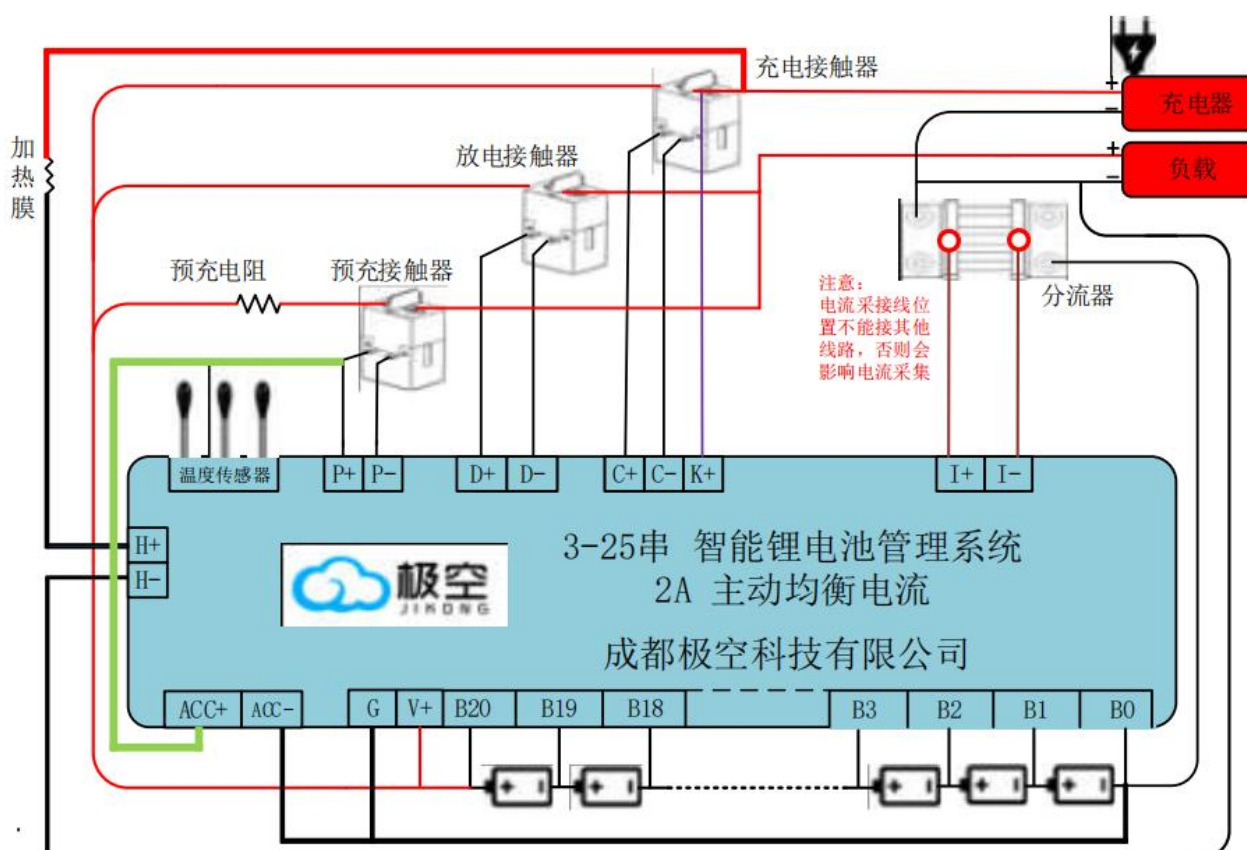


图 6 20串电池接线图示 Figure 6 wiring diagram of 20 string batteries

16 串电池组系统接线方式如图 7 所示。

The wiring mode of the 16 string battery pack system is shown in Fig. 7.

注意：带 12V 辅助电源的充电器，需将辅助电源正极接到 K+，辅助电源正极接到充电器负极。

Note: for the charger with 12V auxiliary power supply, the positive pole of auxiliary power supply shall be connected to K +, and the positive pole of auxiliary

power supply shall be connected to the negative pole of charger.

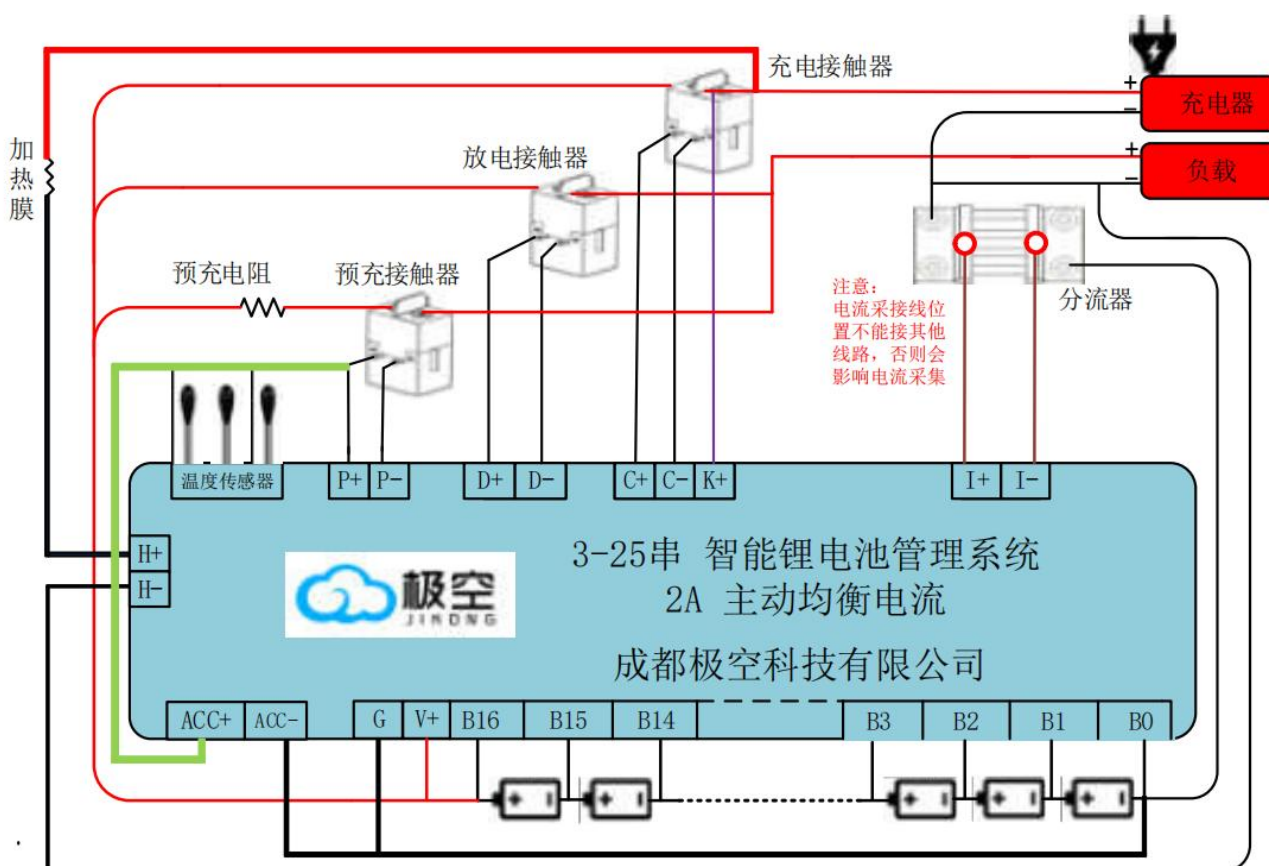


图 7 16串电池接线图示 Figure 7 wiring diagram of 16 string batteries

4.3.APP 安装 APP installation

通过扫描图 8 所示的二维码可以获取与产品配套的手机APP。

By scanning the two-dimensional code shown in Figure 31, you can obtain the mobile phone app matching the product.



图 8 手机APP 链接二维码 Figure 16 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

打开电源使用之前，请再次确认线缆连接是否正确，给电池管理系统提供的电源是否在要求范围之内，检查设备是否已经稳妥的放置，确认电路板有无短路等情况，确认无误后才可以接通电池管理系统电源，否则可能造成工作异常、甚至烧毁等严重后果。

Before turning on the power supply for use, please reconfirm whether the cable connection is correct, whether the power supply provided to the battery management system is within the required range, check whether the equipment has been placed properly, and confirm whether the circuit board is short circuited. Only after confirmation can the power supply of the battery management system be turned on, otherwise serious consequences such as abnormal operation or even burning may be caused.

5.2. 电池管理系统上电工作 Power on of battery management system

确认上述操作无误以后，可以给设备上电。将配套的激活开关插头插到显示屏接口，**按下激活开关开启保护板。**

After confirming that the above operations are correct, the equipment can be powered on. Plug the matching activation switch plug into the display interface, **Press the activation switch to turn on 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9所示。

First, turn on the Bluetooth of the mobile phone, and then turn on the app, as shown in Figure 9.

点击左上角图标扫描设备,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 后点击设备列表中的设备自动连接，密码输入界面如图10所示。

Click the icon in the upper left corner to scan the device. When connecting the device for the first time, the app will prompt you to enter the password. The default password of the device is "1234". After connecting the device, the app will automatically record the password. The next connection does not need to enter the password. After opening the app, click the device in the device list to automatically connect. The password input interface is shown in Figure 10.

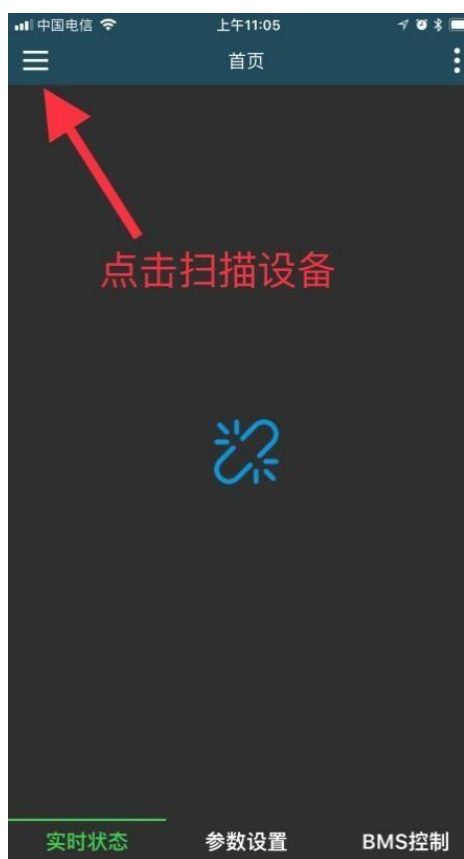


图9 设备扫描 Figure 9 device scanning



图10 密码输入 Figure 10 password input

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11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 11. 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12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 12. 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11 名称修改 Figure 11 name modification



图 12 密码修改 Figure 12 password modification

5.3.2. 状态查看 Status viewing

实时状态界面如13 所示。

The real-time status interface is shown in Figure 13.



图 21 实时状态显示 Figure 21 real time status display

在实时状态页面可以查看开关状态、充电电流、放电电流、温度显示、保护告警、单体电压、电池总电压、最大压差、单体平均电压、均衡状态、均衡电流、均衡线电阻等信息。

On the real-time status page, you can view the switch status, charge current, discharge current, temperature display, protection alarm, cell voltage, total battery voltage, maximum voltage difference, average cell voltage, equilibrium state, equilibrium current, equilibrium line resistance and other information.

5.3.3. 参数设置 Parameter setting



图 14 参数设置页面显示 Figure 14 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.

A) 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.

B) 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.

C) 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.

D) 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.

E) 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.

F) 触发均衡压差 Trigger equalizing 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。

The trigger equalization pressure difference is the only parameter that controls equalization, When the equalizing switch is on, when the maximum differential pressure of the battery pack exceeds this value, equalizing starts until the differential pressure is lower than this value. For example, set the equalization trigger pressure difference to 0.01V, start equalization when the battery pack pressure difference is greater than 0.01V, and end equalization 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).

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。

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 currently measured total battery voltage, and then click the "OK" button behind the voltage calibration to complete the calibration.

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。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.

I) “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.

J) “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.

K) 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".

L) 最大均衡电流 Maximum balance 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。如：20AH 电池不超过 $20 \times 0.1 = 2A$ 。

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

N) “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’，同时关闭充电开关。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，重新开启充电开关。

When charging the battery pack, if the current exceeds the "maximum charging current" and the duration exceeds the "charging overcurrent delay", BMS will generate a "charging overcurrent alarm" and turn off the charging switch. After the alarm is generated, after the time of "charging overcurrent release", BMS releases the charging overcurrent alarm and turns on the charging switch 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’，同时关闭充电开关，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开关。

For example, set "maximum charging current" as 10a, "charging overcurrent delay" as 10s, "charging overcurrent release" as 50s. During charging, if the charging current exceeds 10A for 10 consecutive seconds, BMS will generate a 'charging overcurrent alarm' and turn off the charging switch. 50 seconds after the alarm is generated, BMS will release the 'charging overcurrent alarm' and turn on the charging switch again.

O) “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’，重新开启放电开关。

When discharging the battery pack, if the current exceeds the "maximum discharge current" and the duration exceeds the "discharge overcurrent delay", the BMS will generate a "discharge overcurrent alarm" and turn off the discharge MOS. After the alarm is generated, after the "discharge overcurrent release" time, BMS releases the "discharge overcurrent alarm" and turns on the discharge switch 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。

For example, set "maximum discharge current" as 100A, "discharge overcurrent delay" as 10s, "discharge overcurrent release" as 50s. During the discharge process, if the discharge current exceeds 100A for 10 consecutive seconds, BMS will generate a "discharge overcurrent alarm" and turn off the discharge MOS. 50 seconds after the alarm is generated, the "discharge overcurrent alarm" will be released, and BMS will turn on the discharge MOS again.

P) 短路保护延时 Short circuit protection delay

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 BMS detects that the current exceeds 600A and the duration exceeds the time of "short circuit protection delay", BMS will generate "short circuit alarm" and corresponding charge / discharge switch. After the alarm is generated, after the "short circuit protection is released" time, BMS will release the "short circuit protection alarm" and turn on the charge and discharge switch again.

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. During the charging and discharging process, if the current is 600A for 1000 microseconds continuously, BMS will generate "short circuit protection alarm", and the corresponding charging and discharging switch will be set. 50 seconds after the alarm is generated, the "short circuit protection alarm" will be released, and BMS will turn on the charging and discharging switch again. **(It is recommended to use the factory default setting unnecessarily; if the short-circuit protection is set to '0', it means that the short-circuit protection is turned off.)**

Q) 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".

R) “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 "charging over temperature protection", the BMS will generate a warning of "charging over temperature protection" and turn off the charging MOS. After the alarm is generated, when the temperature is lower than "charging over temperature recovery", BMS will release the warning of "charging over temperature protection" and restart the charging MOS.

S) “放电过温保护”、“放电过温恢复” z) "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 discharge, when the battery temperature exceeds the value of "discharge over temperature protection", BMS will generate a warning of "discharge over temperature protection" and BMS 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 restart the discharge switch.

T) “充电低温保护”、“充电低温恢复” "Low temperature charging protection", "Low temperature charging 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 charging, when the battery temperature is lower than the value of "charging low temperature protection", the BMS will generate a warning of "charging low temperature protection" and turn off the charging MOS. After the alarm is generated, when the temperature is higher than "charging low temperature recovery", the protection board will release the warning of "charging low temperature protection" 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 BMS supports heating, after entering "charging low temperature protection", BMS turns on the heating function to heat the battery. After "charging low temperature protection" is released, the heating is turned off.

U) “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 BMS will generate "MOS overtemperature alarm" and turn off the charge and discharge MOS at the same time. 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 BMS will release the "MOS over temperature alarm" and restart the charging and discharging MOS (**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**).

V) 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.

W) 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 turned on to start the discharge.

X) 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 and power exchange, the first 12 bits of BT code are filled in here. The BT code in the grounding power exchange protocol has 24 bits in total, 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 fill in the user's private data and the last 12 bits MLD220815001 fill in the Bluetooth name.

Y) 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 connection line resistance is used for multi box batteries, and single box batteries are not used. Please consult the supplier for the specific use method (**Note that the connection line resistance has no substantive relationship with the balance line resistance on 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。

For any parameter modification, please refer to the manual. Improper

parameters may make the BMS unable to work normally or even burn the BMS. After any parameter is modified, you need to click the "Set" button behind the parameter to complete the parameter distribution. After the BMS 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 23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 23. Through BMS control, the protection board can be charged, discharged, balanced, switched and emergency switched.



图 23 BMS控制页 Figure 23 BMS control page

Z) 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.

AA) 放电开关 **Discharge switch**

用来控制保护板放电开关打开或者关闭。

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

AB) 均衡开关 **Balance 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 BMS balance function.

AC) 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)。

Regardless of any failure of the battery, opening the emergency switch can turn on charging and discharging, allowing users to use the battery in emergency. After the emergency switch is turned on, it will automatically turn off within 30 minutes without the user turning it off by himself (after the emergency switch is turned on, the battery will lose any protection function, and do not turn on the switch unless necessary).

AD) 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 BMS supports heating, when the heating conditions are met, this heating switch can be turned on only when **the charger is detected or turned on**.

AE) 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 temperature sensor shield switch. At this time, BMS ignores the temperature related alarm (this function is often used when the temperature sensor is damaged for some reason).

AF) 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 BMS will detect the connection status of the GPS. When the GPS is disconnected from the BMS for more than 24 hours, the BMS will turn off the charge / discharge switch and generate an alarm of "GPS disconnected" (this function is usually used for GPS anti disassembly detection).

AG) 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 BMS multiplex port. The switching options are "RS485" or "CAN" (the BMS hardware is required to support the corresponding functions).

6. 一般故障分析与排除 General fault analysis and troubleshooting

故障原因与处理见表 2。

序号 No.	故障现象 Fault phenomenon	原因分析 cause analysis	排除方法 exclusion method	备注 remarks:
1	电源指示灯不亮 Power indicator does not light	设备给供电不正常 Abnormal power supply of equipment	检查 P2 连接器上电源管脚是否接入了电源。 Check whether the power pin of P2 connector is connected to the power supply.	
2	APP 提示单体设置数量与设置值不符合 App prompts that the number of individual settings does not match the set value	单体设置数量错误或者均衡线连接异常 Wrong number of unit settings or abnormal connection of equalizing line	检查单体设置数量是否与接入电池数量相同。 Check whether the number of unit settings is the same as the number of connected batteries.	
3	APP 提示均衡线电阻过大 App prompts that the resistance of equalizing line is too large	电池到连接器的线阻过大 The wire resistance from the battery to the connector is too large	检查电池单体到连接器的连线是否存在接触不良，否则请更换线材。 Check whether the wiring from the battery cell to the connector has poor contact, otherwise, replace the wire.	
4	电压采集不准 'Inaccurate voltage collection	接线错误或者参数设置错误 Wiring error or parameter setting error	逐一检查连线排除连线错误。通过电压采集基准进行微调，直到采集精准。 Check the connection one by one to eliminate the connection error. Fine tune the voltage acquisition reference until the acquisition is accurate.	
5	设备不开机 Device does not start	设备不满足工作条件 The equipment does not meet the working conditions	检查充电线是否接好 Check whether the charging cable is connected properly	

如上所列为一般常见故障，可能的原因和解决方案，如果仍未排除故障，请联系成都极

空科技有限公司解决。

The above are common faults, possible causes and solutions. If the faults are still not eliminated, please contact Chengdu Jikong Technology Co., Ltd. for solutions.

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

电池管理系统本身不存在高压，对身体不会造成电击伤害。

There is no high voltage in the battery management system, which will not cause electric shock injury to the body.

电池管理系统有静电敏感器件，需进行防静电保护。如果操作不当，易造成电池管理系统损坏。如果需要对电池管理系统操作，请仔细关注以下说明：

The battery management system has static sensitive devices and needs to be protected against static electricity. Improper operation will easily damage the battery management system. If you need to operate the battery management system, please pay close attention to the following instructions:

a) 在触摸 PCB 之前，执行操作的人员必须自身放掉静电，做好防静电措施；

Before touching PCB, operators must discharge static electricity and take anti-static measures;

b) 设备不允许与电绝缘材料—塑料薄膜，绝缘桌面或人造纤维做的衣服接触；

The equipment is not allowed to contact with electrically insulating materials - plastic film, insulated desktop or clothes made of artificial fiber;

c) 当在设备上从事焊接工作时，应确保电烙铁头已接地；

When welding on the equipment, ensure that the electric iron head is grounded;

d) 如果不可避免要使用非导电的容器，在放置 PCB 之前必须用导电材料包装，这些材料包括如：导电泡沫橡胶或普通的铝箔。

If it is unavoidable to use non-conductive containers, the PCB must be packed with conductive materials before placement, such as conductive foam rubber or ordinary aluminum foil.

8. 运输与贮存 Transportation and storage

8.1. 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 are not directly affected by rain and snow, and can be transported by normal means of transportation. It is not allowed to put it together with acid, alkali and other corrosive substances during transportation.

8.2. 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 mechanism 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