

# 电池管理系统

## Battery Active-Balancer

**(JK-B2A25S-60P) / (JK-B5A25S-60P)**

使用维护说明书

Specification and operation manual

## 产品保修条款

# Product warranty clause

产品名称：电池管理系统

**Name** : Battery Active-Balancer

保修期限：壹年

**Warranty period** : One Year

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## 1 概述 Overview

JK-B5A25S-60P 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 8~25 串的电池组，具备电池保护、电压采集和电压均衡功能。

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 5A 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。

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检查单体电池电压、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。

JK-B5A25S-60P Battery Management System is a battery management system tailored for large capacity series lithium battery packs. It is suitable for 8-25 series battery packs and has battery protection, voltage collection and voltage balancing functions.

The balancing function of the system uses the super capacitor as the medium to achieve active energy transfer balancing. The system works with battery protection functions such as overcharge, overdischarge and short-circuit protection, and transfers energy with a balanced current of up to 5A. The balanced current does not depend on the voltage difference of the individual batteries in series in the battery pack. Voltage collection range 1V~5V, accuracy (+3mV). External communication interface can choose RS485 bus, CAN bus, GPS interface or LCD interface. It can be used for all types of batteries on the market, such as lithium iron phosphate, lithium ternary, Titanic acid, lithium lead.

The system is equipped with Bluetooth communication function and mobile APP software. It can check the voltage of single battery, view balance status, modify settings parameters and other operations through Bluetooth connected device system. It can be used in battery PACK of small sightseeing car, surrogate car, forklift, shared car, high power storage, base station backup power, solar power station and other products, as well as in batteries. Balance maintenance, repair

and other occasions.

## 2 主要技术参数 Main technical parameters

### 2.1 主要技术指标 Features

- ◆ 支持 8~25 串电池组;
- ◆ 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;
- ◆ 实时、主动式均衡, 均衡电流 5A, 平衡后电池间压差 $\leq 5\text{mV}$ ;
- ◆ 预留充/放电开关控制接口 (12V), 配置 500A 电流分流器 (75mv);
- ◆ 预留蜂鸣器接口 (12V);
- ◆ 支持 3 个温度探头;
- ◆ 单体电压范围 1V~5V, 精度 $\pm 5\text{mV}$ ;
- ◆ 具备库仑计功能;
- ◆ 适用于大容量的三元、铁锂、钛酸锂等锂电池组;
- ◆ 蓝牙通信功能, 配备 APP, 可实时查看电芯状态;
- ◆ 支持对外接口 RS485、CAN 总线、GPS 接口;
- ◆ 低电压关机功能, 防止电池损坏。
- ◆ support 8 ~ 25 strings of battery pack;
- ◆ overcharge, over discharge voltage protection and overcurrent protection parameters can be set through app, with short-circuit protection function;
- ◆ real time and active equalization, the equalization current is 5a, and the voltage difference between batteries after balancing is  $\leq 5\text{mv}$ ;
- ◆ reserve charge / discharge switch control interface (12V) and configure 500A current shunt (75mV);
- ◆ reserved buzzer interface (12V);
- ◆ support 3 temperature probes;
- ◆ monomer voltage range 1V ~ 5V, accuracy  $\pm 5\text{mv}$ ;
- ◆ coulometer function;
- ◆ suitable for high-capacity ternary, lithium iron, lithium titanate and other lithium batteries;
- ◆ Bluetooth communication function, equipped with app, which can view the battery status in real time;
- ◆ support external interface RS485, can bus and GPS interface;

◆ low voltage shutdown function to prevent battery damage

2.2 使用环境条件

- a) 工作温度范围：-20℃～70℃；
- b) 电源要求：25V~100V，可以使用电池自供电或外部电源供电。
- c) 功耗：保护板最大功耗 1.5W（不包含继电器功耗），关机功耗 20mW。
- a) Operating temperature range: - 20 ℃ ~ 70 ℃；
- b) Power requirements: 25V ~ 100V, which can be powered by battery or external power supply.
- c) 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

3.1 前面板连接器、LED 灯位置描述 connectors and LED

前连接器、带灯开关位置如图 1 所示。

The positions of connectors and LED are shown in figure 1

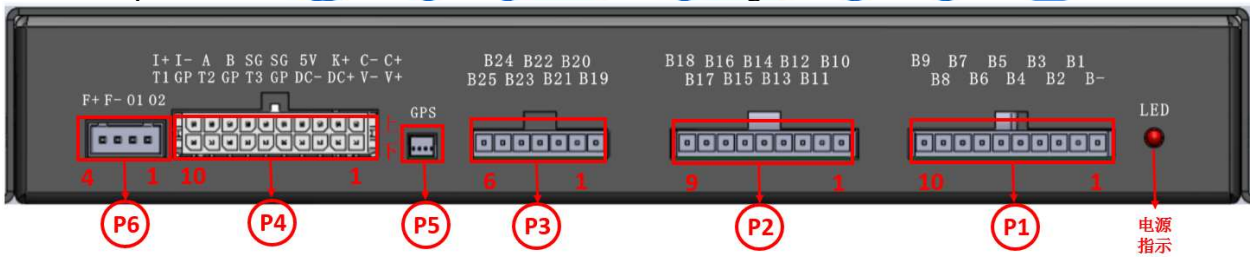


图 1 连接器示意图

3.2 前面板连接器、带灯开关定义描述

前面板连接器定义、带灯开关定义见表 1。

Connector definition and LED definition are shown in table 1.

表 1 连接器定义 connector definitions

连接器	管脚号	名称	定义
P1	1	B-	电池总负极
	2	B1	第 1 串电池正极
	3	B2	第 2 串电池正极
	4	B3	第 3 串电池正极
	5	B4	第 4 串电池正极
	6	B5	第 5 串电池正极
	7	B6	第 6 串电池正极
	8	B7	第 7 串电池正极



	9	B8	第 8 串电池正极
	10	B9	第 9 串电池正极
P2	1	B10	第 10 串电池正极
	2	B11	第 11 串电池正极
	3	B12	第 12 串电池正极
	4	B13	第 13 串电池正极
	5	B14	第 14 串电池正极
	6	B15	第 15 串电池正极
	7	B16	第 16 串电池正极
	8	B17	第 17 串电池正极
	9	B18	第 18 串电池正极
P3	1	B19	第 19 串电池正极
	2	B20	第 20 串电池正极
	3	B21	第 21 串电池正极
	4	B22	第 22 串电池正极
	5	B23	第 23 串电池正极
	6	B24	第 24 串电池正极
	7	B25	第 25 串电池正极
P4	上 1	C+	充电开关正
	上 2	C-	充电开关负
	上 3	K+	开机检测信号（接充电接口正端）
	上 4	5V	预留 5V 电源
	上 5	SG	预留 5V 电源地
	上 6	SG	RS485/CAN 地
	上 7	B	充电器开关检测 B 端/485_B/CAN_L
	上 8	A	充电器开关检测 A 端/485_A/CAN_H
	上 9	I-	分流器负
	上 10	I+	分流器正
	下 1	V+	保护板电源正
	下 2	V-	保护板电源负
	下 3	DC+	放电开关正
	下 4	DC-	放电开关负
	下 5	GP	热传感器地
	下 6	T3	热传感器 3 正
	下 7	GP	热传感器地
	下 8	T2	热传感器 2 正
	下 9	GP	热传感器地
	下 10	T1	热传感器 1 正
P5			GPS 接口
P6	1	O2	12V 蜂鸣器正/预充继电器正端
	2	O1	12V 蜂鸣器负/预充继电器负端
	3	F-	充电器激活开关 A 端
	4	F+	充电器激活开关 B 端
LED 灯		指示灯	电源指示灯
connector	Pin	Name	Description
P1	1	B-	battery negative
	2	B1	The 1st string of battery cathode



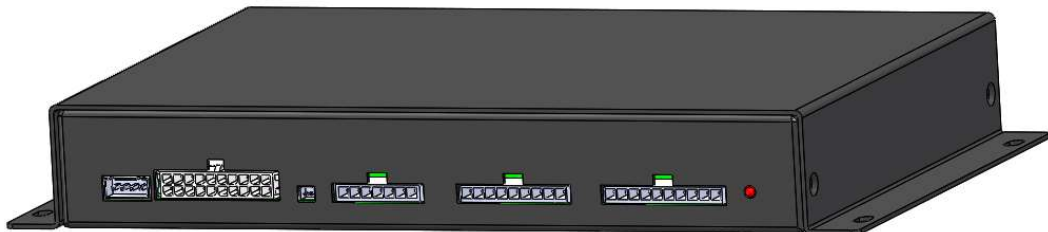
	3	B2	The 2st string of battery cathode
	4	B3	The 3st string of battery cathode
	5	B4	The 4st string of battery cathode
	6	B5	The 5st string of battery cathode
	7	B6	The 6st string of battery cathode
	8	B7	The 7st string of battery cathode
	9	B8	The 8st string of battery cathode
	10	B9	The 9st string of battery cathode
P2	1	B10	The 10st string of battery cathode
	2	B11	The 11st string of battery cathode
	3	B12	The 12st string of battery cathode
	4	B13	The 13st string of battery cathode
	5	B14	The 14st string of battery cathode
	6	B15	The 15st string of battery cathode
	7	B16	The 16st string of battery cathode
	8	B17	The 17st string of battery cathode
	9	B18	The 18st string of battery cathode
P3	1	B19	The 19st string of battery cathode
	2	B20	The 20st string of battery cathode
	3	B21	The 21st string of battery cathode
	4	B22	The 22st string of battery cathode
	5	B23	The 23st string of battery cathode
	6	B24	The 24st string of battery cathode
	7	B25	The 25st string of battery cathode
P4	up 1	C+	Charging switch positive
	up 2	C-	Charge switch negative
	up 3	K+	Startup detection signal (connected to the positive end of charging interface)
	up 4	5V	Reserve 5V power supply
	up 5	SG	Reserve 5V power ground
	up 6	SG	RS485 / can ground
	up 7	B	Charger switch detection terminal B / 485_ B/CAN_ L
	up 8	A	Charger switch detection terminal A / 485_ A/CAN_ H
	up 9	I-	Diverter negative
	up 10	I+	Diverter timing
	Down1	V+	Protection board power supply positive

	Down2	V-	Protection board power supply negative
	Down3	DC+	Discharge switch positive
	Down4	DC-	Discharge switch negative
	Down5	GP	Thermal sensor ground
	Down6	T3	Thermal sensor 3 positive
	Down7	GP	Thermal sensor ground
	Down8	T2	Thermal sensor 2 positive
	Down9	GP	Thermal sensor ground
	Down10	T1	Thermal sensor 1 positive
P5			GPS interface
P6	1	O2	12V buzzer positive / precharge relay positive terminal
	2	O1	12V buzzer negative / precharge relay negative terminal
	3	F-	Charger activation switch a end
	4	F+	Charger activation switch terminal B
LED		LED	Power indicator

### 3.3 产品外型

产品外型如下所示。

The product appearance is shown in Below



JK-B2A25S-60P 效果图-正面 appearance

### 3.4 尺寸 Size

JK-B2A25S-60P 均衡器大小为 234mm×144mm×32mm，外形和安装孔位置尺寸如图 2 所示。

The size of balancer is 234mm×144mm×32mm,and its appearance and size of mounting hole are shown in figure 2

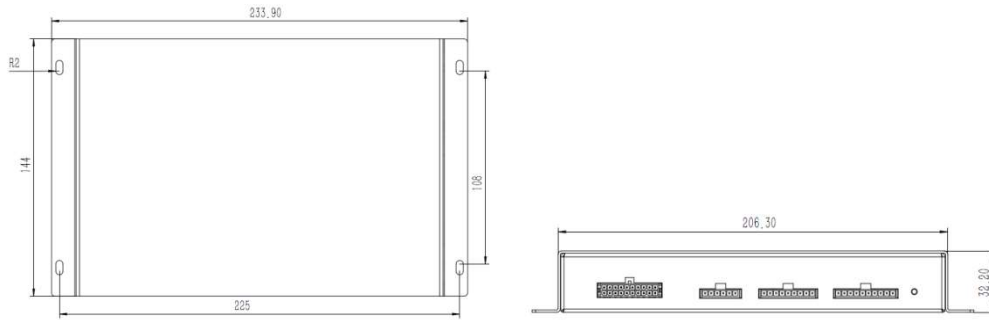


图 2 JK-B2A25S-60P 外形尺寸图 dimension diagram

### 3.5 分流器尺寸 Splitter

分流器使用最大 500A 电流，满量程 75mv 压差。尺寸如图 3 所示。

The shunt uses a maximum of 500A current with a full range of 75mv pressure

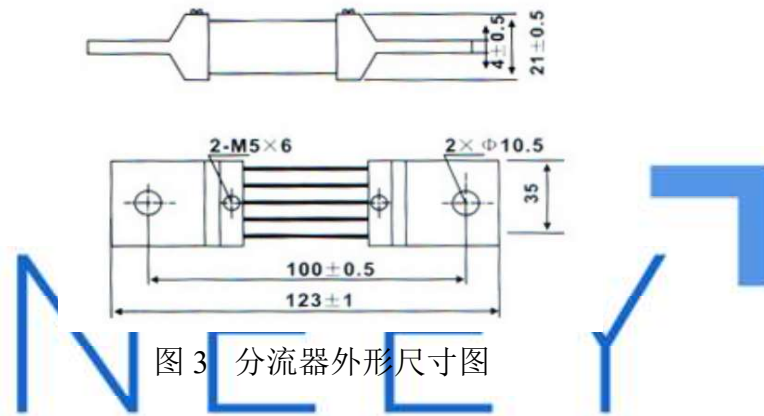


图 3 分流器外形尺寸图

### 3.6 重量 Weight

电池管理系统重量约为 600g。

The balancer weighs about 600g.

## 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

开箱检查及注意事项如下：

- 对包装箱、均衡器等需要轻拿轻放、尽量不要倒置；
- 开箱前注意包装是否完好，如有无撞击痕迹、有无破损等；
- 做好足够的防静电措施，如穿好防静电服、带上防静电手套、带上防静电腕带，并经过充分放电后，打开防静电袋取出均衡器，检查均衡器外观是否完好。

Unpacking inspection and precautions are as follows:

- Handle the packing box and equalizer with care and try not to put them upside down;
- Before unpacking, pay attention to whether the package is intact, such as whether there is impact trace, damage, etc;

- c) Take sufficient anti-static measures, such as wearing anti-static clothes, anti-static gloves and anti-static wrist strap. After full discharge, open the anti-static bag, take out the equalizer and check whether the appearance of the equalizer is intact.

#### 4.2 电池管理系统设备安装 Installation of a single balancer

JK-B2A25S-60P 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 4 所示。

JK-B5A25S-60P Battery Management System is suitable for 8-25 series battery packs. The connection mode of 25 series battery pack system is shown in Figure 4.

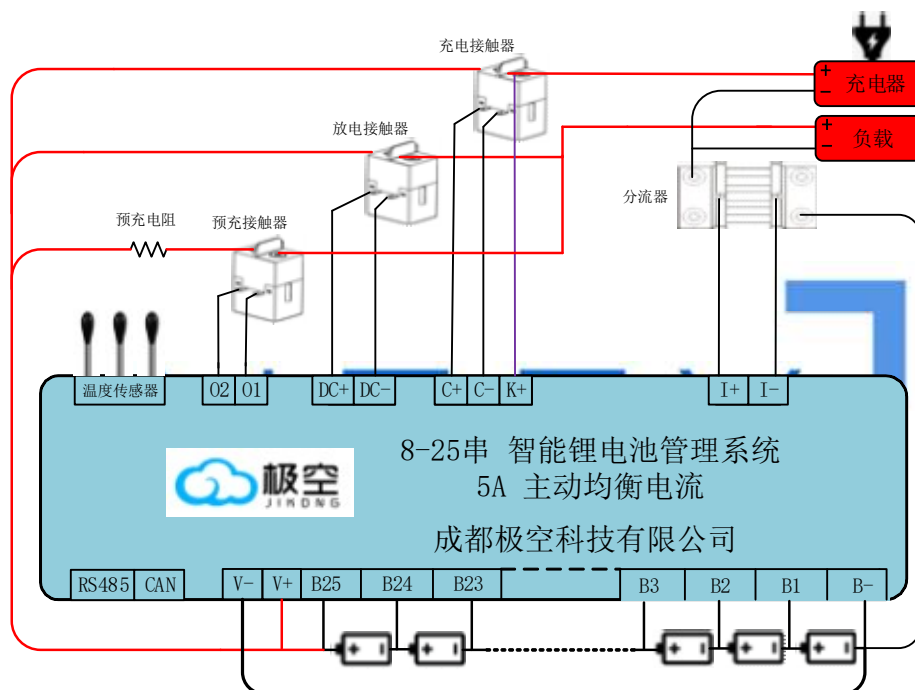


图 4 25 串电池组系统接线方式 Wiring mode of serial battery pack system  
20 串电池组系统接线方式如图 5 所示。

The connection mode of the 20 series battery pack system is shown in Figure 5.

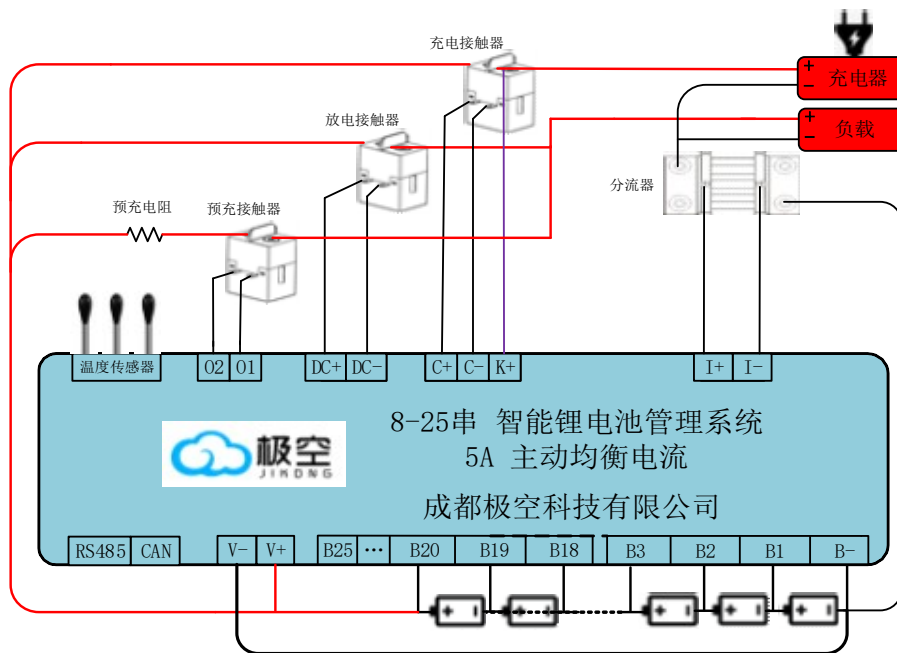


图 5 20 串电池接线图示 The 20 Strial battery wiring diagram is shown  
16 串电池组系统接线方式如图 6 所示。

The connection mode of the 16 series battery pack system is shown in Figure 6.

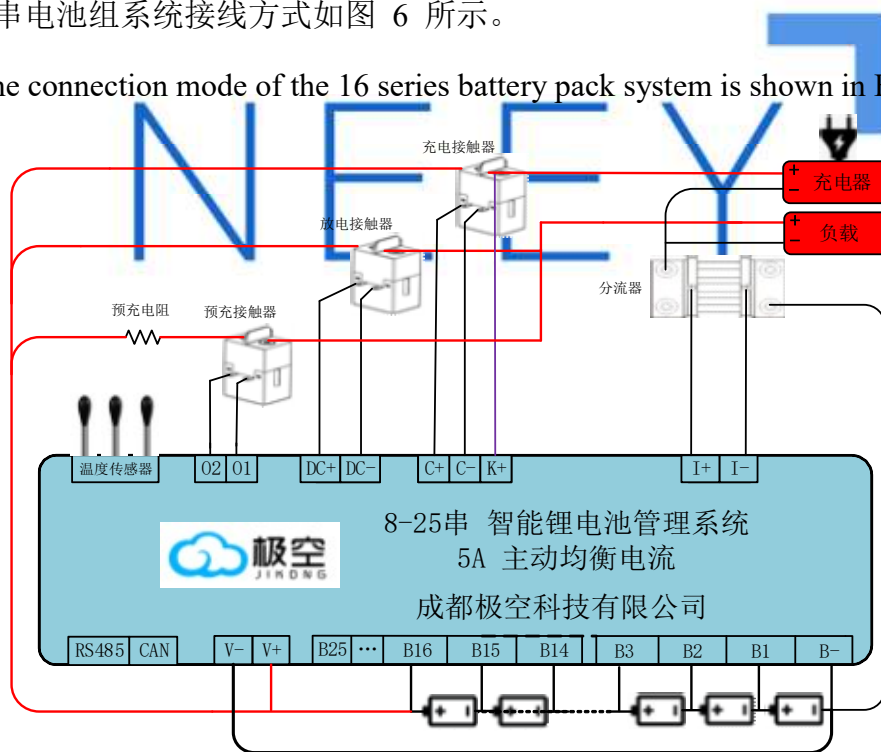


图 6 16 串电池接线图示 16 Strial battery wiring diagram shows

### 4.3 APP 安装 The APP install

通过扫面图 7 所示的二维码可以获取与产品配套的手机 APP（安卓），IOS 手机用户可以直接在苹果商店 App Store 搜索“极空 BMS”下载安装。

By scanning the QR code shown in figure 7, you can get the mobile APP matching the product.



图 7 手机 APP 连接二维码 APP QR Code

## 5 使用与操作 Operation guide

### 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, please make sure again that the cable connection is correct, that the power supply provided to the battery management system is within the required range, that the device is properly placed, that the circuit board is short-circuited, and so on, that the power supply of the battery management system can only be connected after making sure that it is correct, otherwise it may cause serious consequences such as abnormal work or even burning down.

### 5.2 电池管理系统上电工作 Balancer start to work

确认上述操作无误以后，可以给设备上电。JK-B2A25S-60P 型电池管理系统没有上电控制开关，给设备充电接口上电后，此时设备自动开机工作。

The JK-B5A25S-60P battery management system does not have an on-power control switch. When the charging interface of the device is powered on, the device automatically turns on and works.

### 5.3 APP 操作说明 APP operation guide

#### 5.3.1 设备操作 Device operation in APP

##### a) 设备连接

首先开启手机蓝牙，然后打开 APP 后，如图 8 所示。

点击左上角图标扫描设备，第一次连接 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，密码输入界面如错误!未找到引用源。所示。

#### A) Device connection

First turn on Bluetooth on your mobile phone, then turn on APP, as shown in Figure 9.

Click on the icon in the upper left corner to scan the device. The first time you connect to the APP, you will be prompted to enter the password. The default password of the device is "1234". APP will record the password automatically after the device is connected. No password is needed for the next connection. After opening the APP, you will connect automatically. The password input interface is shown in Figure 10.



图 8 设备扫描 Figure 8. Device scan

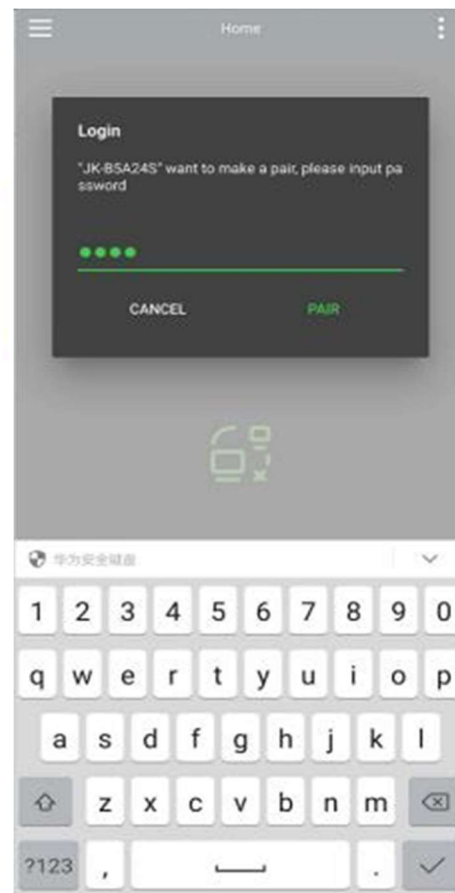


图 9 设备扫描 Figure 9 Enter the password

#### 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 0 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 0 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，选择确认可以完成设备密码修改。

#### B) Modify password and name

You can change the device name and password by clicking the pen Icon to the right of the device list after the device is connected.

Modify the device name interface as shown in Figure 10. Note that the device name only supports English or numbers, not Chinese names and Chinese characters.

The password modification interface is shown in Figure 11. To modify the device password, you must first enter the old password of the device, and only if the current password is correct can you enter the option of entering a new password. After entering the new password twice, select Confirm to complete the device password modification.





图 10 名称修改 Name modification

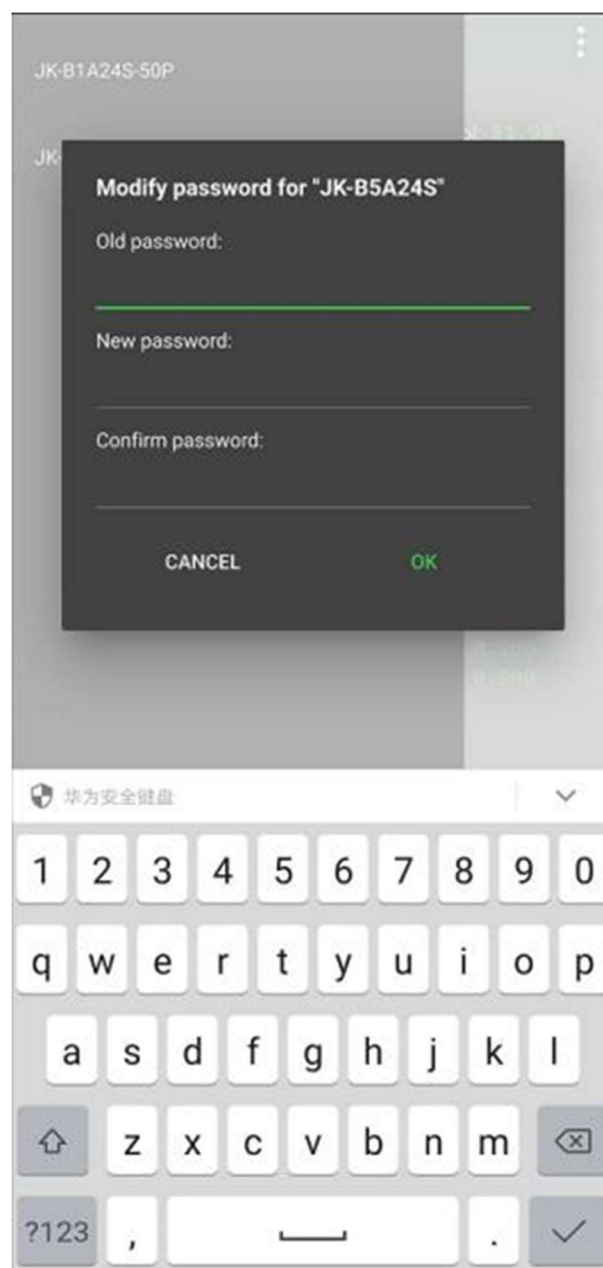


图 11 密码修改 Password modification

5.3.2 状态查看 Status View

实时状态界面如 0 所示。

The real-time status interface is shown in Figure 12.

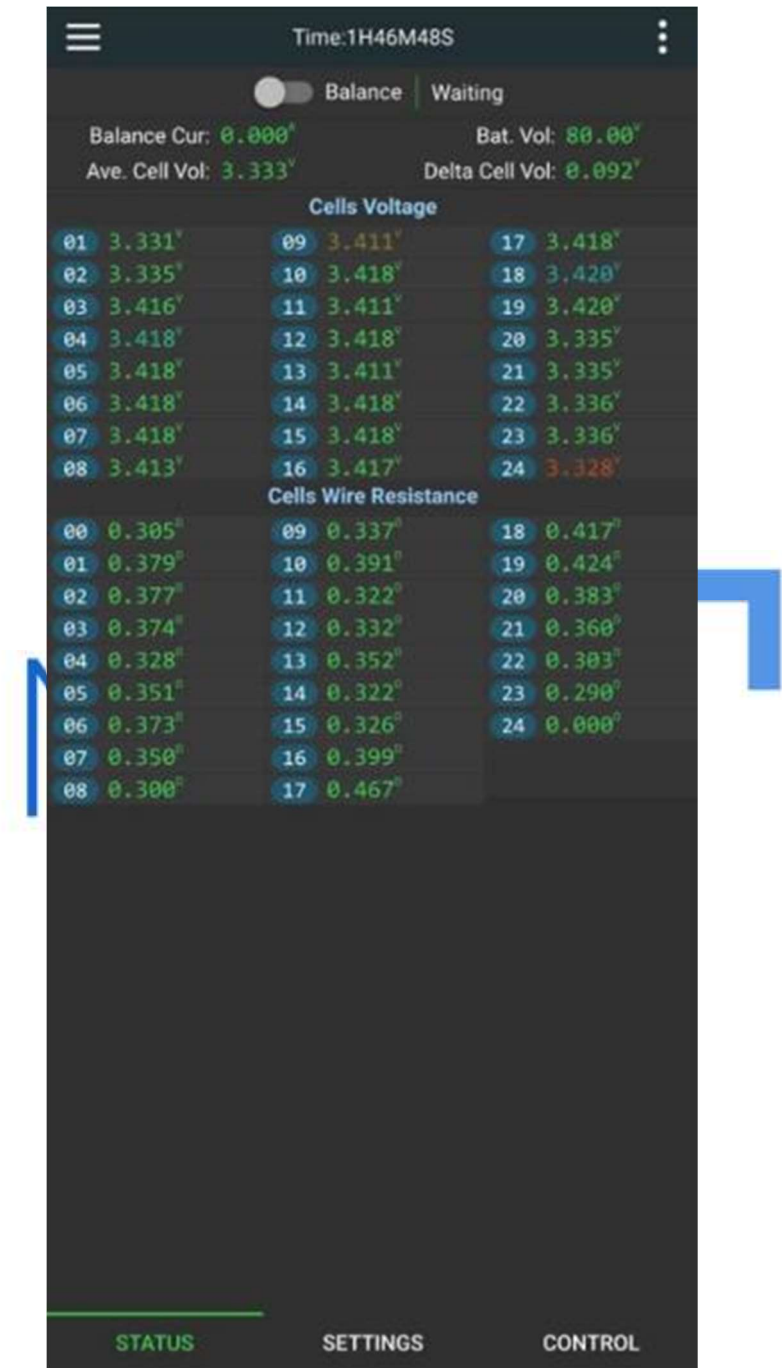


图 12 实时状态显示 Real-time status display

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 information such as switch status, charging current, discharge current, temperature display, protection alarm, individual voltage, total battery voltage, maximum pressure difference, average single voltage, balanced status, balanced current, balanced line resistance, etc.

### 5.3.3 参数设置 Parameter Settings

参数设置页面如 0 所示。

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。

The parameter settings page is shown in Figure 13.

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

#### a) 一键铁锂

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。

#### b) 一键三元

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。

#### c) 单体数量

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。

#### d) 电池容量

该值为电池的设计容量。

#### e) 触发均衡压差

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）。

#### f) 电压校准

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‘小飞机’，完成校准。

#### A) One-touch lithium iron

With this button, all working parameters of the protective panel can be modified to Li-iron battery parameters. The default values of these parameters are listed in the appendix.

#### B) One-touch ternary

With this button, all working parameters of the protective panel can be modified to Li-iron

battery parameters. The default values of these parameters are listed in the appendix.

C) Number of monomers

The number of units indicates the current number of cores in the battery. Please set this value accurately before use, otherwise the protective panel will not work properly.

D) Battery capacity

This value is the designed capacity of the battery.

E) Trigger balance pressure difference

Trigger equalization pressure difference is the only parameter that controls equalization. When the equalization switch is on, when the maximum pressure difference of the battery pack exceeds this value, equalization starts until the pressure difference is lower than this value. For example, set the equalization trigger pressure difference to 0.01V, start equalization when the pressure difference of the battery pack is greater than 0.01V, and end equalization when the pressure difference of the battery pack is lower than 0.01V.(It is recommended to set the balance trigger pressure difference of 0.005V for batteries above 50AH and 0.01V for batteries below 50AH).

F) Voltage calibration

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

When errors are found between the total voltage collected by the protective panel and the total voltage of the battery, you can use the voltage calibration function to calibrate the protective panel. The calibration method is to fill in the current measured total battery voltage, and then click on the "airplane" behind the voltage calibration to complete the calibration.

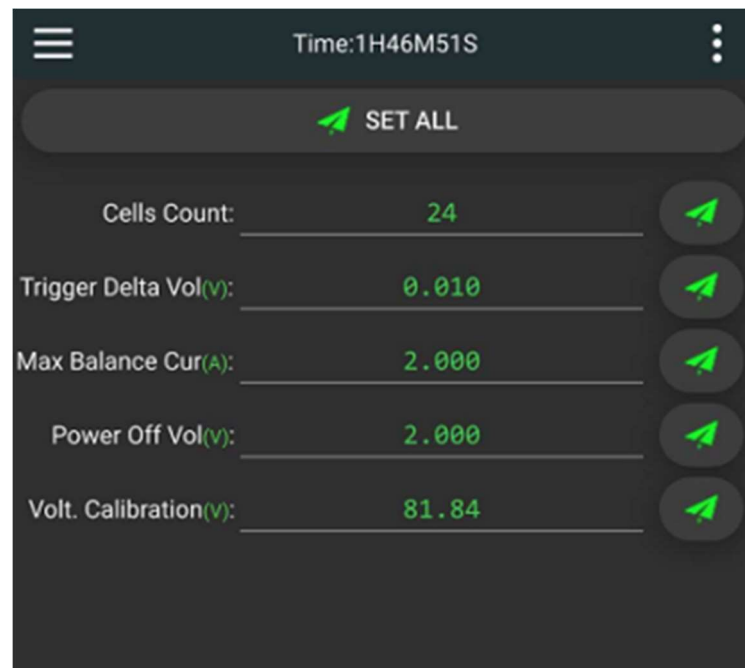


图 13 参数设置

g) “单体欠压保护”、“单体欠压恢复”

“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。

#### **h) “单体过充电压”、“单体过充恢复”**

“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。

#### **i) 自动关机电压**

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”。

#### **j) “最大充电电流”、“充电过流延时”、“充电过流解除”**

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。

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。

#### **k) “最大放电电流”、“放电过流延时”、“放电过流解除”**

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。

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。

#### **l) 短路保护解除**

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。

#### **m) 最大均衡电流**

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  $20 \times 0.1 = 2A$ 。

#### **n) “充电过温保护”、“充电过温恢复”**



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。

**o) “充电低温保护”、“充电低温恢复”**

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。

**p) “MOS 过温保护”、“MOS 过温恢复”**

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 100℃, MOS 过温恢复值为 80℃, 这两个值为出厂默认值, 不能修改)。

**G) "Single undervoltage protection", "Single undervoltage recovery"**

"Single undervoltage protection" refers to the cut-off voltage of the cores. As long as any single voltage in the battery pack is below this value, a "single undervoltage alarm" is generated, and the protective panel closes the discharging MOS. At this time, the batteries cannot discharge and can only be charged. When the alarm is generated, only the values of all single voltage exceed the "single voltage recovery". After the value of "single undervoltage alarm" is released, and the discharge MOS is turned on at the same time.

**H) "Monomer Overcharge Voltage", "Monomer Overcharge Recovery"**

"Monomer Overcharge Voltage" refers to the saturated voltage of the core. As long as any of the individual voltage in the battery pack exceeds this value, 'Monomer Overcharge Alarm' is generated, and the protective panel closes the charging MOS. At this time, the battery cannot be charged and can only be discharged. When the alarm is generated, only the total monomer voltage value is lower than 'Monomer Overcharge Recovery'. After the value of 'single overcharge alarm' is removed, and the charging MOS is turned on at the same time.

**I) Auto shutdown voltage**

The automatic shut-off voltage indicates the minimum voltage at which the protective panel operates. When the voltage of the highest unit in the battery pack is lower than this value, the protective panel shuts down. This value must be lower than "single undervoltage protection".

**J) "Maximum Charging Current", "Charging Overcurrent Delay", "Charging Overcurrent Release"**

When charging the battery pack, the current exceeds the "maximum charging current" and the duration exceeds the "charging overcurrent delay", the protective panel generates the "charging overcurrent alarm" and turns off the charging MOS. After the alarm is generated, after the "charging overcurrent relief" time, the protective panel removes the charging overcurrent alarm and turns on the charging MOS again.

For example, set the "maximum charging current" to 10A, the "charging overcurrent delay" to 10seconds, and the "charging overcurrent relief" to 50seconds. During the charging process, when



the charging current continuously exceeds 10A for 10 seconds, the protective panel will generate a "charging overcurrent alarm", turn off the charging MOS at the same time, remove the "charging overcurrent alarm" 50 seconds after the alarm is generated, and turn on the charging MOS again.

K) "Maximum Discharge Current", "Discharge Overcurrent Delay", "Discharge Overcurrent Release"

When the battery pack is discharged, the current exceeds the "maximum discharge current" and the duration exceeds the "discharge overcurrent delay", the protective panel generates the "discharge overcurrent alarm" and turns off the discharge MOS at the same time. After the alarm is generated, after the "discharge overcurrent relief" time, the protective panel releases the "discharge overcurrent alarm" and turns on the discharge MOS again.

For example, set the "maximum discharge current" to 100A, "discharge overcurrent delay" to 10 seconds and "discharge overcurrent relief" to 50 seconds. During the discharge process, the discharge current exceeds 100A for 10 seconds in a row, the protective panel will produce a "discharge overcurrent alarm", turn off the discharge MOS at the same time, remove the "discharge overcurrent alarm" 50 seconds after the alarm is generated, and turn on the discharge MOS again.

L) Release of short circuit protection

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

M) Maximum balanced current

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

The maximum balanced current represents the maximum current in the energy transfer process, and a maximum balanced current of no more than 0.1C is appropriate. For example, 20AH batteries do not exceed  $20 \times 0.1 = 2A$ .

N) "Charge overtemperature protection", "Charge overtemperature recovery"

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

O) "Charging Low Temperature Protection", "Charging Low Temperature Recovery"

During charging, when the battery temperature is below the value of "Charging Low Temperature Protection", the protective panel generates a warning of "Charging Low Temperature Protection" and the protective panel turns off the charging MOS. After the warning is generated, when the temperature is above "Charging Low Temperature Recovery", the protective panel removes the warning of "Charging Low Temperature Protection" and turns on the charging MOS again.

P) "MOS Over Temperature Protection", "MOS Over Temperature Recovery"

When the MOS temperature exceeds the value of "MOS Over-Temperature Protection", the protective panel generates a "MOS Over-Temperature Alarm" and turns off the charging and discharging MOS at the same time, the battery cannot charge or discharge. After the alarm is

generated, when the MOS temperature is below the value of "MOS Over-Temperature Recovery", the protective panel removes the "MOS Over-Temperature Alarm" and turns on the charging and discharging MOS again. (The MOS overtemperature protection value is 100 C and the MOS overtemperature recovery value is 80 C. These two values are factory defaults and cannot be modified).

**注意:**

任何参数的修改, 请参考说明书, 不恰当的参数可能会使保护板不能正常工作, 甚至烧毁保护板。

任何一项参数修改以后, 均需要点击参数后面的“小飞机”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。

**Be careful:**

Please refer to the instruction manual for any parameter modification, inappropriate parameters may make the protective panel not work properly or even burn it.

After any parameter is modified, click "Small Airplane" after the parameter to finish the parameter. When the equalizer successfully receives the parameter, it will make a "Drop" sound.

### 5.3.4 BMS 控制 Setting

BMS 控制页面如错误!未找到引用源。所示。The BMS control page is shown in Figure 14.



## 6 一般故障分析与排除 General Failure Analysis and Troubleshooting

故障原因与处理见表 2 。 The cause and treatment of the failure are shown in Table 2.

表 2 故障原因与处理 Failure Reason and Handling

序号	故障现象	原因分析	排除方法	备注
1	电源指示灯不亮	设备给供电不正常	检查 P2 连接器上电源管脚是否接入了电源。	
2	APP 提示单体设置数量与设置值不符合	单体设置数量错误或者均衡线连接异常	检查单体设置数量是否与接入电池数量相同。	
3	APP 提示均衡线电阻过大	电池到连接器的线阻过大	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。	
4	电压采集不准	接线错误或者参数设置错误	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。	
5	设备不开机	设备不满足工作条件	检查充电线是否接好	

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。

NUM	Failure Phenomena	Reason Analysis	Exclusion Method	NOTE
1	Power indicator does not light up	The power supply to the device is not normal	Check that the power pin on the P2 connector is connected to the power supply.	
2	The number of APP prompt unit settings does not match the settings	Incorrect number of individual settings or unexpected equalizer connection	Check that the number of individual settings is the same as the number of batteries that are accessed.	
3	APP indicates that equalizer resistance is too high	Excessive battery-to-connector resistance	Check the connection of the battery monomer to the connector for poor contact, otherwise replace the wire.	
4	Voltage Acquisition Accuracy	Wiring error or parameter setting error	Check the connections one by one to eliminate connection errors. Fine tune the voltage collection benchmark until the collection is accurate.	
5	Device is not on	Equipment does not meet working	Check if the charging cable is connected properly	

NUM	Failure Phenomena	Reason Analysis	Exclusion Method	NOTE
		conditions		

As listed above, the general common failures, possible causes and solutions, if the failures have not been eliminated, please contact Chengdu JK Technology Co., Ltd.

## 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。

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，易造成均衡器损坏。如果需要对均衡器操作，请密切关注以下说明：

- 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；
- 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；
- 当在设备上从事焊接工作时，应确信电烙铁头已接地；
- 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。

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

Battery management systems have electrostatic sensitive devices that require anti-static protection. If improperly operated, the equalizer may be damaged. If you need to operate the equalizer, pay close attention to the following instructions:

- Before touching the PCB, the operator must remove the static electricity by himself and take good anti-static measures;
- The equipment does not allow contact with electrical insulation materials - plastic film, insulated tabletop or garments made of man-made fibers;
- When engaged in welding work on the equipment, be sure that the head of the cautery is grounded;
- If non-conductive containers are unavoidable, they must be packed with conductive materials such as conductive foam rubber or regular aluminum foil before placing the PCB.

## 8 运输与贮存 Transport 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 product is not directly affected by rain or snow and is subject to severe bumps and bumps. It can be transported by normal means of transport. Corrosives such as acids and bases are not allowed to be kept together during transport.

## 8.2 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。

Packed products should be stored in permanent warehouses with temperatures ranging from 0 35 and relative humidity not more than 80%. The warehouses should be free from acid and alkali, corrosive gases, strong body vibration and impact, and strong magnetic field.

## 附录 “一键铁锂”、“一键三元”默认参数

Appendix Default Parameters for "One-Bond Lithium Iron", "One-Bond Ternary"

序号	参数	铁锂默认	三元默认	单位
1	单体欠压保护	2.500	2.800	V
2	单体截欠压保护恢复	2.650	3.200	V
3	单体过充电压	3.65	4.2	V
4	单体过充保护恢复	3.6	4.1	V
5	触发均衡压差	0.01	0.01	V
6	自动关机电压	2.5	2.799	V
7	充电过流保护电流	100.0	100.0	A
8	充电过流保护延时	30	30	秒
9	充电过流保护解除时间	60	60	秒
10	放电过流保护电流	400.0	400.0	A
11	放电过流保护延时	30	30	秒
12	放电过流保护解除时间	60	60	秒
13	短路保护解除时间	60	60	秒
14	最大均衡电流	5.0	5.0	A
15	充电过温保护温度	70	70	℃
16	充电过温恢复温度	60	60	℃
17	放电过温保护温度	70	70	℃
18	放电过温恢复温度	60	60	℃
19	充电低温保护温度	-20	-20	℃

20	充电低温恢复温度	-10	-10	℃
21	MOS 过温保护温度	100	100	℃
22	MOS 过温保护恢复温度	80	80	℃
23	单体数量	25	25	串
24	充电开关	关	关	-
25	放电开关	关	关	-
26	均衡开关	关	关	-
27	电池容量	400	400	AH

NUM	Parameter	Lifepo4 Default	Li-ion Default	Unit
1	Single undervoltage protection	2.500	2.800	V
2	Single undervoltage protection	2.650	3.200	V
3	Monomer Overcharge Voltage	3.65	4.2	V
4	Monomer Overcharge Protection	3.6	4.1	V
5	Trigger Balanced Pressure	0.01	0.01	V
6	Auto Shutdown Voltage	2.5	2.799	V
7	Charging Overcurrent Protection	100.0	100.0	A
8	Charging Overcurrent Protection	30	30	S
9	Charging Overcurrent Protection	60	60	S
10	Discharge Overcurrent Protection	400.0	400.0	A
11	Discharge Overcurrent Protection	30	30	S
12	Discharge Overcurrent Protection	60	60	S
13	Release time of short circuit	60	60	秒
14	Maximum Equilibrium Current	5.0	5.0	A
15	Charging Over temperature	70	70	℃
16	Charging Over temperature	60	60	℃
17	Discharge Overtemperature	70	70	℃
18	Discharge Overtemperature	60	60	℃
19	Charging Low Temperature	-20	-20	℃
20	Charging Low Temperature	-10	-10	℃
21	MOS overtemperature protection	100	100	℃
22	MOS Over Temperature Protection	80	80	℃
23	Number of monomers	25	25	Strings
24	Charging switch	off	off	-

25	Discharge switch	off	off	-
26	Equalization switch	off	off	-
27	Battery capacity	400	400	AH

NEEY<sup>7</sup>