版本：2.2

锂电池主动均衡保护板

Lithium battery active balancing protection board

保护板参数设置说明书

Protection Board Parameter Setting Manual

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1. APP 安装(APP installation)

通过扫描下图中的二维码下载手机APP。

Download the mobile app by scanning the QR code in the following image.

图1 手机APP链接二维码

Figure 1 Mobile APP Link QR Code

2. APP 操作说明(APP operation instructions)

2.1. 设备操作(Equipment operation)

2.1.1. 设备连接(Equipment Connection)

首先开启手机蓝牙，然后打开APP后，如图2所示。

First, turn on the Bluetooth on your phone, then open the app as shown in Figure 2.

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后点击设备列表中的设备自动连接，密码输入界面如图3所示。

Click on the icon in the upper left corner to scan the device, wait for the scan to complete, and then click on the name of the device that needs to be connected, such as "JK - B1A24S". When connecting for the first time, the APP will prompt for a password. The default password for the device is "1234". After the device is connected, the APP will automatically record the password. There is no need to enter a password for the next connection. After opening the APP, click on the device in the device list to automatically connect. The password input interface is shown in Figure 3.

图2 设备扫描

Figure 2 Device Scanning

图3 密码输入

Figure 3 Password Input

2.1.2. 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 connecting the device, click on 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 4 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 device name modification interface is shown in Figure 4. Please note that the device name only supports English or numbers, and does not support Chinese names or Chinese characters.

修改密码界面如图 5 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 5. To change the device password, you must first enter the old password of the device. Only when the current password is correct can you enter the option for entering the new password. After entering the new password twice, click "OK" to complete the device password modification.

图 4 名称修改

Figure 4 Name modification

图 5 密码修改

Figure 5 Password modification

2.2. 状态查看(Status View)

实时状态界面如图 6、7 所示。

The real-time status interface is shown in Figure 6、7.

图 6 实时状态显示

Figure 6 Real time status display

图 7 实时状态显示

Figure 7 Real time status display

在实时状态页面分为 3 个区域。

The real-time status page is divided into three areas.

图中 1 区为电池综合信息栏。各参数参数释义如下：

Zone 1 in the figure is the comprehensive battery information column. The definitions of each parameter are as follows:

1)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，单位：秒（S）。

The running time represents the total running time from the first startup of the protection board to the present (unit: S).

2)充电(Charging)

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 switch status of the current protection board charging MOS. When "on" is displayed, it indicates that the current protection board charging MOS is on and the battery is allowed to charge; When "off" is displayed, it indicates that the charging MOS of the current protection board is turned off and the battery is not allowed to charge.

3)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 switch status of the current protection board discharge MOS. When "on" is displayed, it indicates that the current protection board discharge MOS is open and the battery is allowed to discharge; When "off" is displayed, it indicates that the current protection board discharge MOS is turned off and the battery is not allowed to discharge.

4)预充状态（如果支持）(Precharge status (if supported))

表示当前放电预充开关的状态。当显示内容为“开启”时，此时放电预充开关打开，电池通过预充电开关，流经预充电阻，给控制器进行预充电。预充电的时间为参数设置中“放电预充时间”所设置的值。预充结束，保护板会自动打开放电开关。

Indicates the status of the current discharge precharge switch. When the displayed content is On, the discharge precharge switch is on, and the battery precharges the controller through the precharge switch and the precharge resistor. The precharge time is the value set in Discharge Precharge Time in Parameter Settings. After the precharge is complete, the protection board automatically turns on the discharge switch.

5)均衡(Equilibrium)

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

Indicates the on/off state of the current protection board balance switch. When "on" is displayed, the protection board will automatically balance when the balance triggering condition is reached; When "off" is displayed, it indicates that the balance is off and the protection board will not balance the battery.

6)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，单位：V。

Voltage area Displays the total voltage of the current battery in real time. The total voltage is the sum of voltage of all cells (unit: V).

7)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，单位：A。

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 (unit: A).

8)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，单位：W。

Represents the total power output or input of the current battery, which is the product of the absolute value of the current battery voltage and battery current(unit: W).

9)单体平均(Individual average)

表示当前电池的单体平均电压，单位：V。

Indicates the average voltage of the current battery (unit: V).

10)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 battery capacity calculated by the high precision SOC of the current protection board (unit: AH).(This value needs to be updated after the battery has done a complete discharge and charge cycle)

11)最大压差(Maximum pressure difference)

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 pressure difference represents the difference between the highest cell voltage and the lowest cell voltage for the entire battery group (unit: V).

12)剩余容量(Remaining power)

剩余容量表示当前电池的剩余容量，单位：AH。

Remaining capacity Indicates the remaining capacity of the current battery (unit: AH).

a) 13)均衡电流(Balanced 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 enables the balancing function and reaches the balancing condition, the balancing current display area displays the balancing current in real time (unit: A).

当均衡进行时，实时状态的单体电压显示区域，蓝色代表放电的电池，红色代表被充电的电池。均衡电流负电流表示电池在放电，此时蓝色闪烁，均衡电流正电流表示在电池在充电，此时红色闪烁。

When balancing is in progress, the real-time status of the individual voltage display area, where blue represents the discharged battery and red represents the charged battery. The negative current of the balanced current indicates that the battery is discharging, with blue flashing. The positive current of the balanced current indicates that the battery is charging, with red flashing.

保护板采用主动均衡技术，均衡的原理是从高电压的电芯取电，存放到保护板，然后再放给低电压的电芯。

The protection board adopts active balancing technology, and the principle of balancing is to take electricity from high voltage cells, store it in the protection board, and then discharge it to low voltage cells.

14)剩余电量(Residual electricity)

表示当前电池所剩电量的百分比。

Represents the percentage of current battery power left.

15)MOS 温度(功率温度)(MOS temperature (power temperature))

实时显示当前保护板功率 MOS 的温度，单位：℃。

Real time display of the current protection board power MOS temperature(unit: ℃).

16)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：℃。

When temperature sensor 1 is not installed, "NA" is displayed. When temperature sensor 1 is installed, the temperature of temperature sensor 1 is displayed in real time(unit: ℃).

17)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：℃。

When temperature sensor 2 is not installed, "NA" is displayed. When temperature sensor 2 is installed, the temperature of temperature sensor 2 is displayed in real time(unit: ℃).

18)电池温度 3 （如果支持）(Battery temperature 3 (if supported))

在温度传感器 3 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 3 的温度，单位：℃。

When temperature sensor 3 is not installed, "NA" is displayed. When temperature sensor 3 is installed, the temperature of temperature sensor 3 is displayed in real time(unit: ℃).

19)电池温度 4（如果支持）(Battery temperature 4 (if supported))

在温度传感器 4 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 4 的温度，单位：℃。

When temperature sensor is not installed, "NA" is displayed. When temperature sensor 4 is

installed, the temperature of temperature sensor 4 is displayed in real time(unit: ℃).

20)电池温度 5（如果支持）(Battery temperature 5 (if supported))

在温度传感器 5 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 5 的温度，单位：℃。

When temperature sensor 5 is not installed, "NA" is displayed. When temperature sensor 5 is installed, the temperature of temperature sensor 5 is displayed in real time(unit: ℃).

21)循环次数(Number of cycles)

循环次数表示电池放电总容量与实际容量的比值，单位为：次。

The number of cycles indicates the ratio of the total discharge capacity to the actual battery capacity,in units of times.

22)循环容量(Cycle capacity)

循环容量表示电池的累计放电容量，单位：AH。

Cycle capacity represents the cumulative discharge capacity of a battery(unit:AH).

23)电池电压(Battery voltage)

当前电池的总电压，单位：V。

Current total battery voltage(unit:V).

24)C-电压（内部参数）(C-voltage (internal parameters))

充电器输入电压与电池实际电压的差值，单位：V。

The difference between the charger input voltage and the actual battery voltage(unit:V).

25)加热电流(如果支持)(Heating current (if supported))

在保护板支持加热的条件下，当保护板加热打开的时候，实时显示当前的加热电流，单位：A。

Under the condition that the protection board supports heating, when the heating of the protection board is turned on, the current heating current is displayed in real time(unit:A).

26)加热状态(如果支持)(Heating status (if supported))

在保护板支持加热的条件下，实时显示当前保护板加热开关状态，显示内容为“开启”或“关闭”。当开启时，表示此时保护板正在加热。

When the protection board supports heating, the current heating switch status of the protection board is displayed in real time. The displayed content is On or Off. When this parameter is enabled, it indicates that the protection plate is heating.

27)ACC(如果支持)(ACC (if supported))

如果保护板支持 ACC 识别功能，该处显示 ACC 当前的状态，显示内容为“开启”或“关闭”。保护板支持 ACC 识别时，需要 ACC 状态为“开启”的条件下，保护板才能打开放电输出。

If the protection board supports ACC recognition function, the current status of ACC will be displayed here, with the displayed content as "on" or "off". When the protection board supports ACC recognition, the discharge output of the protection board can only be turned on when the ACC status is "on".

28)专用充电器(如果支持)(Dedicated charger (if supported))

如果保护板支持专用充电器识别功能，该处显示当前专用充电器的状态，显示内容为“插入”或“未插入”，此时需要专用充电器状态为“插入”的情况下，才能打开充电。

If the protection board supports the dedicated charger recognition function, the current status of the dedicated charger will be displayed here, with the display indicating "inserted" or "not inserted". In this case, the charging can only be turned on when the dedicated charger status is "inserted".

29)充电器(如果支持)(Charger (if supported))

如果保护板支持充电器识别功能，该处显示当前充电器的状态，显示内容为“插入”或“未插入”，此时需要充电器状态为“插入”的情况下，才能打开充电。

If the protection board supports the charger recognition function, the current status of the charger will be displayed here, with the display indicating "inserted" or "not inserted". In this case, the charging can only be turned on when the charger status is "inserted".

30)SOH 估值(SOH valuation)

表示当前保护板所估算的电池健康状态。

Indicates the estimated battery health status of the current protection board.

31)充电电流修正(内部参数)(Charge current correction (internal parameters))

用作充电电流校准。

Used as charging current calibration.

32)放电电流修正(内部参数)(Discharge current correction)

用作放电电流校准。

Used for discharge current calibration

33)充电压(内部参数)(Charge voltage (internal parameters))

充电电流传感器电压，单位：V。

Charging current Sensor voltage (unit: V).

34)放电压(内部参数)(Discharge voltage (internal parameter))

放电电流传感器电压，单位：V。

Discharge current Sensor voltage (unit: V).

35)应急时间(Emergency time)

在打开应急开关的条件下，这里显示当前还剩下的应急时间。单位：秒(S)。

Under the condition of turning on the emergency switch, the remaining emergency time is displayed here (unit: S).

36)电压修正(内部参数)(Voltage correction (internal parameter))

电池电压修正因子。

Battery voltage correction factor.

37)均衡充 PWM(内部参数)(Equalizing PWM(internal parameter))

控制均衡恒流充电电流。

Control balanced constant current charging current.

38)均衡放 PWM(内部参数)(Equalizing PWM(internal parameter))

控制均衡恒流放电电流。

Control balanced constant discharge current.

39)复位源(内部参数)(Reset source(internal parameter))

表示保护板的复位是由什么引起的。

Indicates what causes the reset of the protection board.

40)MCU 型号(内部参数)(MCU model(internal parameter))

表示保护板处理器的型号。(注意：**0 表示 STM32,1 表示 HK32，2 表示 MM32M0,3 表示 GD32，4 表示 MM32M3,5 表示 WCH32,6 表示 AMP32**)。

Indicates the processor model of the protection board.(Note: 0 is STM32,1 is HK32, 2 is MM32M0,3 is GD32, 4 is MM32M3,5 is WCH32,6 is AMP32)

41)系统节拍(System beat)

表示系统节拍时间，单位：秒（S）。

Indicates the system beat time (unit: S).

42)PVD 触发(内部参数)(PVD trigger (internal parameters))

表示 PVD 触发的时间戳，单位：秒（S）。

Indicates the timestamp triggered by PVD(unit: S).

43)详细日志(Detailed journal)

表示当前保护板记录详细日志的条数。

Indicates the number of detailed logs recorded by the current protection board.

44)进入休眠时间(Hibernation time)

表示保护板进入休眠状态的时间，单位：秒（S）。

Indicates the time when the protection board enters the hibernation state(unit: S).

45)限流模块（如果支持）(Current limiting module (if supported))

如果保护板支持限流模块识别功能，该处显示限流模块当前的状态，显示内容为“开启”或“关闭”。

If the protection board supports the identification function of the current traffic limiting module, the status of the current traffic limiting module is On or Off.

图 7 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。

Region 2 in Figure 7 is the voltage region of a single unit. The voltage data of each cell in the battery pack is displayed in real time, where red indicates the cell with the lowest voltage and blue indicates the cell with the highest voltage.

图 7 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。

Area 3 in Figure 7 is the resistance area of the equalizing line. The balance line resistance is the balance line resistance obtained by the self-test of the protection board. The value is only a preliminary calculation to prevent incorrect connection or poor contact. When the balance line resistance exceeds a certain value, the yellow color is displayed, and the balance cannot be started.

2.3. 参数设置(Parameter settings)

如图 8 所示为参数设置界面。

The parameter setting interface is shown in Figure 8.

图 8 参数设置页面显示

Figure 8 The parameter setting page is displayed

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 permission. Parameter Setting The default password is 123456. You can modify the parameters of the protection board only after entering the correct parameters and setting the password. Parameter Setting The password and 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。

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

1)一键铁锂(One click lithium iron)

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

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

2)一键三元(One click ternary)

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 ternary battery parameters. The default values of ternary lithium parameters are in the appendix.

3)一键钛酸锂(One bond lithium titanate)

点击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。

Click this button to modify all the working parameters of the protection plate to the parameters of the lithium titanate battery. See appendix for the default values of the lithium titanate parameters.

4)单体数量(Number of monomers)

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

The number of cells indicates the number of cells in the current battery. Please set the value accurately before use, otherwise the protection board cannot work normally.

5)电池容量(Battery capacity)

该值为电池的设计容量，单位：AH。

This value is the design capacity of the battery (unit: AH).

6)触发均衡压差(Trigger equilibrium pressure difference)

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

With the equalization switch on, when the maximum pressure difference of the battery string exceeds the value and the current voltage of the cell exceeds the initial voltage of the equalization, the equalization starts and ends when the pressure difference is lower than the value or the voltage of the cell is lower than the initial voltage of the equalization. For example, set the balance trigger pressure difference to 0.01V, when the battery pack pressure difference is greater than 0.01V, the balance begins, and the balance ends when it is lower than 0.01V. (It is recommended that the battery above 50AH set the equalization trigger pressure difference to 0.005V, and the battery below 50AH set the equalization trigger pressure difference to 0.01V).

7)电流传感器量程(Current sensor range)

设置保护板电流传感器的量程，单位：A。

Set the range of the protection plate current sensor (unit: A).

8)电压校准(Voltage calibration)

电压校准功能可以用来校准保护板电压采集的精度。

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

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

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 method of calibration is to fill in the current measured total battery voltage, and then click the "Set" button behind the voltage calibration to complete the calibration.

9)电流校准(Current calibration)

电流校准功能可以用来校准保护板电流采集的精度。

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

按钮，完成校准。

The current calibration function can be used to calibrate the accuracy of the current acquisition of the protection plate.

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 method of calibration is to fill in the currently measured total battery current, and then click the 'Settings' button behind the current calibration to complete the calibration.

10)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 initial voltage is used to control the voltage phase of equalization. Equalization is triggered only when the cell voltage exceeds this value and the maximum battery pack pressure difference exceeds the equalization trigger pressure difference.

11)最大均衡电流(Maximum equilibrium 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*0.1=2A。

12)“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’，同时开启充电开关。

Balanced current represents the continuous current during energy transfer between the discharge of high-voltage batteries and the charging of low-voltage batteries. The maximum equilibrium current represents the maximum current during the energy transfer process, and the maximum equilibrium current should not exceed 0.1C.

For example, a 20AH battery should not exceed 20 * 0.1=2A.

13)“单体欠压保护”、“单体欠压恢复”("Individual undervoltage protection" and "Individual 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。

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

14)推荐充电电压(Recommended charging voltage)

“推荐充电电压”是指 BMS 为了最佳电池性能和安全而建议的充电电压范围或具体数值。这个推荐值是根据电池类型、制造商的建议、BMS 设计的特性以及充电器的特性来确定的。

"Recommended Charge Voltage" means the range or specific value of the charge voltage recommended by BMS for optimal battery performance and safety. This recommendation is based on the type of battery, the manufacturer's recommendations, the characteristics of the BMS design, and the characteristics of the charger.

15)“SOC-100%电压”、“SOC-0%电压”("SOC-100% Voltage", "SOC-0% Voltage")

“SOC-100%电压”是指电芯 SOC 值为 100%时的电压，该值略低于单体过充电压，当电芯电压大于或等于该值时，即认为该电芯为满电状态；“SOC-0%电压”是指电芯 SOC 值为 0%时的电压，该值略高于单体欠压保护电压，当电芯电压小于或等于该值时，即认为该电芯电量为 0。

"Soc-100% voltage" refers to the voltage when the SOC value of the battery cell is 100%, which is slightly lower than the overcharge voltage of the single cell. When the voltage of the battery cell is greater than or equal to this value, the battery cell is considered to be in a fully charged state. "SOC-0% voltage" refers to the voltage when the SOC value of the cell is 0%, the value is slightly higher than the single undervoltage protection voltage, when the cell voltage is less than or equal to the value, that is, the battery quantity of the cell is 0.

16)自动关机电压(Automatic shutdown voltage)

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

Automatic shutdown voltage Indicates the lowest voltage at which the protection board works. When the voltage of the highest cell in the battery pack is lower than this value, the protection board shuts down. The value must be lower than Cell Undervoltage Protection.

17)推荐浮充电压(Floating charge voltage is recommended)

“推荐浮充电压”是指电池在充电完成后，BMS 建议保持的稳定充电电压。这个电压通常稍低于电池的单体过充电压，用于维持电池的充电状态而不过度充电。（注意：该参数在设置时需在 BMS 控制界面打开充电浮动模式）

The "recommended floating charge voltage" refers to the stable charge voltage that the BMS recommends to maintain after the battery is charged. This voltage is usually slightly lower than the single overcharge voltage of the battery, and is used to maintain the charging state of the battery without overcharging. (Note: When setting this parameter, the charging floating mode needs to be opened in the BMS control interface).

18)“智能休眠电压”、“智能休眠时间”("Intelligent Sleep Voltage", "Intelligent sleep Time")

“智能休眠电压”用于确定何时电池应该进入休眠模式，这通常发生在电池长时间未被使用时，为了防止电池耗电和保护其健康状态。当单体最高电池电压降至设定的智能休眠电压以下时，同时，在持续休眠时间内无电流通过，保护板会触发休眠程序，将保护板切换到极低功耗状态，以减少自耗电和其他电池损耗。“智能休眠时间”是指电池进入休眠模式时持续的时间（注意：设置这两个参数时需在 BMS 控制界面打开智能休眠开关）。

"Smart sleep voltage" is used to determine when the battery should go into sleep mode, which usually occurs when the battery has not been used for a long time, in order to prevent the battery from draining and protect its health. When the maximum battery voltage of a single cell drops below the set intelligent sleep voltage, and no current passes through during the continuous sleep time, the protection board will trigger the sleep procedure to switch the protection board to an extremely low power state to reduce self-consumption and other battery losses. Smart Sleep Time indicates the duration when the battery enters sleep mode. (Note: To set these two parameters, you need to turn on the smart sleep switch on the BMS control screen.)

19)“持续充电电流”、“充电过流延时”、“充电过流解除”("Continuous 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。

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。

When charging the battery pack, the current exceeds the "maximum charging current" and the duration exceeds the "charging overcurrent delay" time, the protection board generates a "charging overcurrent alarm" and closes the charging switch. After the alarm is generated, after the time of "charging overcurrent release", the protection board releases the charging overcurrent alarm and re-opens the charging switch.

For example, set Maximum Charge current to 10A, Charge overcurrent delay to 10 seconds, and Charge Overcurrent Release to 50 seconds. When the charging current exceeds 10A for 10

consecutive seconds during the charging process, the protection board will generate a 'charge overcurrent alarm' and turn off the charging switch at the same time. 50 seconds after the alarm is generated, the 'charge overcurrent alarm' will be removed and the protection board will re-open the charging switch.

20)“持续放电电流”、“放电过流延时”、“放电过流解除”("Continuous 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。

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。

When the battery pack is discharged, the current exceeds the "maximum discharge current" and the duration exceeds the "Discharge overcurrent delay" time, the protection board generates a "discharge overcurrent alarm" and shuts down the discharge MOS. After the alarm is generated, after the "discharge overcurrent release" time, the protection board releases the "discharge overcurrent alarm" and re-opens the discharge switch.

For example, set Max Discharge Current to 100A, Discharge overcurrent Delay to 10 seconds, and Discharge Overcurrent Release to 50 seconds. When the discharge current exceeds 100A for 10 consecutive seconds during the discharge process, the protection board will generate a 'discharge overcurrent alarm' and turn off the discharge MOS at the same time. 50 seconds after the alarm is generated, the 'discharge overcurrent alarm' is removed, and the discharge MOS is reopened on the protection board.

21)“充电过温保护”、“充电过温恢复”("Charge overtemperature protection", "Charge overtemperature recovery")

在充电过程中，当任一电池温度超过“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，只有当全部电池温度低于“充电过温恢复”时，保护板才解除‘充电过温保护’警告，同时重新开启充电 MOS。

During the charging process, when the temperature of any battery exceeds the value of "charge overtemperature protection", the protection board generates a "charge overtemperature protection" warning, and the protection board turns off the charging MOS. After the alarm is generated, only when the temperature of all batteries is lower than the "charge overtemperature recovery", the protection board will release the "charge overtemperature protection" warning, and restart the charging MOS.

22)“放电过温保护”、“放电过温恢复”("Discharge overtemperature protection", "Discharge overtemperature recovery")

在放电过程中，当任一电池温度超过“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，只有当全部电池温度低于“放电过温恢复”时，保护板才解除‘放电过温保护’警告，同时重新开启放电开关。

During the discharge process, when the temperature of any battery exceeds the value of Discharge Overtemperature protection, the protection board generates a discharge overtemperature protection warning and turns off the discharge switch. After the alarm is generated, only when the temperature of all the batteries is lower than "discharge overtemperature recovery", the protection board will release the "discharge overtemperature protection" warning, and restart the discharge switch.

23)“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，当任一电池温度低于“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，只有当全部电池温度高于“充电低温恢复”时，保护板才解除‘充电低温保护’警告，同时重新开启充电 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。

During the charging process, when the temperature of any battery is lower than the value of "charge low temperature protection", the protection board generates a "charge low temperature protection" warning, and the protection board turns off the charging MOS. After the alarm is generated, only when the temperature of all the batteries is higher than the "charge low temperature recovery", the protection board will release the "charge low temperature protection" warning, and restart the charging MOS.

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, and after the "charging low temperature protection" is lifted, the heating is turned off.

24)“MOS 过温保护”、“MOS 过温恢复”("MOS Overtemperature Protection", "MOS Overtemperature Recovery")

当 MOS 温度超过“MOS 过温保护”的值以后，保护板产生‘MOS 过温报警’同时关闭充放电 MOS，电池不能充电也不能放电。报警产生以后，MOS 温度低于“MOS 过温恢复”的值以后，保护板解除‘MOS 过温报警’，同时重新开启充放电 MOS（**注意：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**）。

When the MOS temperature exceeds the value of "MOS overtemperature protection", the

protection board generates "MOS overtemperature alarm" and turns off the charging and discharging MOS, and the battery cannot be charged or discharged. After the alarm is generated, when the MOS temperature is lower than the value of "MOS overtemperature recovery", the protection board releases the "MOS overtemperature alarm" and restarts the charge and discharge MOS (note: the MOS overtemperature protection value is 100 ° C, and the MOS overtemperature recovery value is 80 ° C, the two values are the factory default values and cannot be modified).

25)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’，同时关闭相应充放电开关。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。

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’， 同时关闭相应充放电开关，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。（**建议使用出厂默认设置；短路保护设置为‘0’，表示关闭短路保护**）。

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

For example, set Short Circuit Protection Delay to 1000 microseconds and Short Circuit Protection Release to 50 seconds. In the charge and discharge process, the current continuously 1000 microseconds 600A, the protection board will produce a "short circuit protection alarm", while closing the corresponding charge and discharge switch, 50 seconds after the alarm is generated, the "short circuit protection alarm" is removed, and the protection board re-opens the charge and discharge switch. (Factory default Settings are recommended; Short circuit protection is set to '0', which means short circuit protection is turned off)

26)短路保护解除(Short-circuit release)

当短路保护发生以后，经过‘短路保护解除’所设定的时间以后，解除短路保护。

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

27)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, the value is used to control the closing time of the discharge precharge switch, in seconds. After the discharge precharge is finished, the discharge switch is automatically turned on and the discharge starts.

28)“电池报警温度”、“电池报警恢复”("Battery alarm Temperature", "Battery alarm recovery")

当电池温度超过“电池报警温度”，保护板产生‘电池过温报警’，同时保护板关闭充放电开关。报警产生以后，当温度低于“电池报警恢复”时，保护板解除‘电池过温报警’，同时重新开启充放电开关。

When the battery temperature exceeds the "battery alarm temperature", the protection board generates a "battery overtemperature alarm", and the protection board closes the charge and discharge switch. After the alarm is generated, when the temperature is lower than the "battery alarm recovery", the protection board releases the "battery overtemperature alarm" and re-opens the charge and discharge switch.

29)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或者配置保护板 CAN 通信中 CANID 的地址。

Used to configure the device slave address of the protection board or the CANID address in the CAN communication of the protection board.

30)数据存储周期(Data storage cycle)

用来设置保护板存储详细日志的周期（注意：需要在 BMS 控制中打开定时存储数据）。

Used to set the period for the protection board to store detailed logs (note: The periodic data storage needs to be turned on in the BMS control).

31)RCV 保持时间(RCV retention time)

用来设置推荐充电电压的保持时间，单位：小时（H）。

Used to set the holding time of the recommended charging voltage (unit: H).

32)RFV 保持时间(RFV retention time)

用来设置推荐浮充电压的保持时间，单位：小时(H)。

Used to set the holding time of the recommended floating charge voltage(unit: H).

33)应急时间(Emergency time)

用来设置应急开关打开后自动关闭的时间，单位：分钟（Min）。（注意：需要在 BMS 控制中打开应急开关）

It is used to set the time when the emergency switch automatically closes after it is turned on(unit: Min).(Note: emergency switch needs to be turned on in BMS control)

34)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。

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。

In the application of cable switching, this place fills the first 12 digits of the BT code. There are 24 bits of the BT code in the wire converter protocol, and the last 12 bits are the Bluetooth name.

For example, the battery BT code is BT207204012YMLD220815001. The first 12 bits of BT207204012Y are filled with the user's private data, and the last 12 bits of MLD220815001 are filled with the Bluetooth name.

35)“串口 1 协议”、“串口 2 协议”(Serial Port 1 Protocol, Serial Port 2 Protocol)

保护板支持两路串口，用户可根据自身需求在该处切换串口协议。支持的串口协议如表 1 所示。

The protection board supports two serial ports. You can switch the serial port protocol based on your requirements. Table 1 lists the supported serial port protocols.

表 1

极空 BMS RS485 Modbus 通用协议
小牛 U 系列通用协议
铁塔换电柜通用协议 V1.1
沛城 RS485 Modbus V1.3
派能低压储能 RS485 协议 V3.3
古瑞瓦特 RS485 通信协议
日月元逆变器与 RS485 通信协议
铁塔换电柜通用协议 V2.0
硕日 RS485_Modbus_V1.3
极空 BMS 显示器协议 V2.0
串口 1 客制化
串口 2 客制化

36)CAN 协议(CAN protocol)

保护板支持 CAN 通信，用户可根据自身需求在该处切换 CAN 通信协议。支持的 CAN 协议如表 2 所示。

The protection board supports CAN communication, and users CAN switch the CAN

communication protocol according to their own needs. Table 2 lists the supported CAN protocols.

表 2

极空 BMS CAN 接口协议（250K）
德业低压储能 CAN 通信协议 V1.0
派能低压 CAN 通信协议 V1.2
古瑞瓦特低压 CAN 通信协议 REV05
维克多_CAN 通信协议 I_20170717
SEPLOS_CAN 通信协议_V1.0
极空 BMS CAN 接口协议(500K)
英威腾低压版 BMS 通信协议 V1.02
固德威低压 BMS 通信协议
SMA 电池与逆变器通信协议 V1.0
美世乐 PV1800F-系列 CAN 通信协议
鹏城 CAN 通信协议 V01
CAN 总线客制化

37)“显示器报警触发源”、“显示器报警触发值”、“显示器报警恢复值”("Display alarm trigger Source", "Display alarm trigger value", "Display alarm recovery value")

如果保护板连接显示器，“显示器报警触发源”用于设置显示器蜂鸣器报警的触发条件，当满足“显示器报警触发值”时，显示器蜂鸣器将产生报警；当满足“显示器报警恢复值”时，显示器蜂鸣器将停止报警（注意：“显示器报警触发值”与“显示器报警恢复值”在设置时需符合逻辑）。

举例：设定“显示器报警触发源”为“电芯超压”、“显示器报警触发值”为 4000mV、“显示器报警恢复值”为 3900mV。当任一电芯电压超过 4000mV 时，显示器蜂鸣器将产生报警；当所有电芯电压都低于 3900mV 时，显示器蜂鸣器解除报警。

If the protection board is connected to the monitor, the "Monitor alarm trigger source" is used to set the trigger condition of the monitor buzzer alarm. When the "Monitor alarm trigger value" is met, the monitor buzzer will generate an alarm; When the "Monitor alarm recovery value" is met,

the monitor buzzer will stop the alarm (note: "Monitor alarm trigger value" and "monitor alarm recovery value" need to be set logically).

For example, set display alarm trigger Source to Cell overvoltage, Display alarm Trigger Value to 4000mV, and Display Alarm Recovery value to 3900mV. When the voltage of any battery cell exceeds 4000mV, the display buzzer will generate an alarm; When the voltage of all cells is lower than 3900mV, the display buzzer disactivates the alarm.

38)“干节点触发源”、“干节点触发值”、“干节点恢复值”(Dry Node Trigger Source, Dry Node Trigger Value, Dry Node Recovery Value)

“干节电触发源”用于设置保护板干节点报警的触发条件，当满足“干节电触发值”时，保护板将产生报警；当满足“干节电恢复值”时，保护板停止报警。（注意：“干节点触发值”与“干节点恢复值”在设置时需符合逻辑）。

Dry Power saving Trigger Source is used to set the trigger condition for the dry node alarm of the protection board. When the dry power saving trigger value is met, the protection board will generate an alarm. When the "dry power saving recovery value" is met, the protection board stops alarming. (Note: "Dry node trigger Value" and "dry node recovery value" should be set logically.).

显示器、干节点触发源参数说明如表 3 所示。

Table 3 describes the parameters of the monitor and dry node trigger source.

参数说明 Parameter Specification						示例说明 Example description		
编号 No.	触发源 Trigger	触发值单位 TriggerVal Unit	恢复值单位 ReleaseVal Unit	参数范围 Val Range	备注 Note	触发值 TriggerVal	恢复值 ReleaseVal	动作 Action
0	00 - 无触发 00 - OFF	-	-			-	-	-
1	01 - 电量过低 01 - Low SOC	%	%	0~99	触发值<恢复值 TriggerVal<ReleaseVal	25	30	低于25%开启设备，高于30%关闭设备 Turn on devices below 25%, turn off devices above 30%
2	02 - 电池超压 02 - Battery Over Voltage	mV	mV	0~105000	触发值>恢复值 TriggerVal>ReleaseVal	58500	56500	高于58500mV（58.5V）开启设备，低于56500mV(56.5V)关闭设备 Turn on the device above 58500mV (58.5V) and turn off the device below 56500mV (56.5V)
3	03 - 电池欠压 03 - Battery Under Voltage	mV	mV	0~105000	触发值<恢复值 TriggerVal<ReleaseVal	40000	42000	低于40000mV（40V）开启设备，高于42000mV(42V)关闭设备 Turn on device below 40000mV (40V), turn off device above 42000mV (42V)
4	04 - 电芯超压 04 - Battery Cell Over Voltage	mV	mV	0~5000	触发值>恢复值 TriggerVal>ReleaseVal	3620	3580	高于3620mV（3.62V）开启设备，低于3580mV（3.58V）关闭设备 Turn on the device above 3620mV (3.62V) and turn off the device below 3580mV (3.58V)
5	05 - 电芯欠压 05 - Battery Cell Under Voltage	mV	mV	0~5000	触发值<恢复值 TriggerVal<ReleaseVal	3000	3100	低于3000mV(3V)开启设备，高于3100mV（3.1V）关闭设备 Turn on device below 3000mV(3V), turn off device above 3100mV (3.1V)
6	06 - 充电过流 06 - Charge Over Current	mA	mA	0-1000000	触发值>恢复值 TriggerVal>ReleaseVal	110000	98000	高于110000mA（110A）开启设备，低于98000mA（98A）关闭设备 Turn on the device above 110000mA (110A) and turn off the device below 98000mA (98A)
7	07 - 放电过流 07 - Discharge Over Current	mA	mA	0-1000000	触发值>恢复值 TriggerVal>ReleaseVal	110000	98000	高于110000mA（110A）开启设备，低于98000mA（98A）关闭设备 Turn on the device above 110000mA (110A) and turn off the device below 98000mA (98A)
8	08 - 电池超温 08 - Battery over Temperature	℃	℃	-50~150	触发值>恢复值 TriggerVal>ReleaseVal	60	55	高于60℃开启设备，低于55℃关闭设备 Turn on the device above 60℃ and turn off the device below 55℃
9	09 - MOS管超温 09 - MOSFET Over Temperature	℃	℃	-50~150	触发值>恢复值 TriggerVal>ReleaseVal	90	85	高于90℃开启设备，低于85℃关闭设备 Turn on the device above 90℃ and turn off the device below 85℃
10	10 - 系统告警 10 - SysAlarm	-	-	-	-	-	-	-
11	11 - 电池低温 11 - Battery Low Temperature	℃	℃	-50~150	触发值<恢复值 TriggerVal<ReleaseVal	-10	0	低于-10℃开启设备，高于0℃关闭设备 Turn on device below -10℃, turn off device above 0℃

表 3 显示器、干节点触发源参数说明

Table 3 Description of trigger source parameters of display and dry node

39)连接线电阻(Connecting line 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. Single-box batteries are not used. Please consult the supplier for specific usage methods. (Note: The connection line resistance is not materially related to the balanced line resistance on the real-time data page.)

注意：

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

Attention:

Any parameter modification, please refer to the manual, improper parameters may make the protection board can not work properly, and even burn the protection board. After modifying any parameter, you need to click the "Set" button next to the parameter to complete parameter delivery. After successfully receiving the parameter, the protection board will make a "drip" sound.

2.4. BMS 控制(BMS control)

BMS 控制页面如图 9 所示。通过 BMS 控制可以对保护板进行充电功能、放电功能、均衡功能进行开关和恢复出厂设置等。

The BMS control page is shown in Figure 9. Through the BMS control, the protection board can be switched on and off for charging, discharging and balancing functions and restore factory Settings.

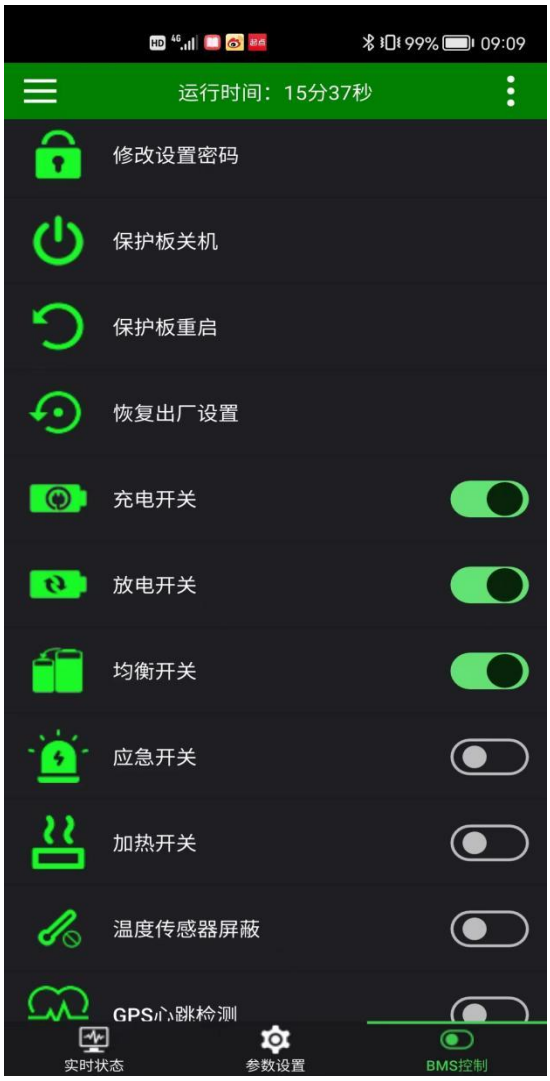

图 9 BMS 控制页面

Figure 9 BMS control page

a)修改设置密码(Change Setting Password)

用来修改参数设置的密码，参数设置密码由最多 12 位数字、英文字母、字符或它们的组合构成。

The password is used to change the parameter setting. The parameter setting password consists of a maximum of 12 digits, letters, characters, or their combination.

b)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 charging switch of the protection plate to open or close.

c)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 turn on or off the discharge switch of the protection board.

d)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 enable or disable the balancing function of the protection board.

e)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，经过一定的时间后自动关闭，该时间由参数设置中配置的“应急时间”决定，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 the charge and discharge, allowing users to use the battery in an emergency. After the emergency switch is turned on, it automatically turns off after a certain period of time, which is determined by the Emergency time configured in the parameter Settings. You do not need to turn off the emergency switch by yourself. (After the emergency switch is turned on, the battery loses any protection function.

f)加热开关 （如果支持）(Heating switch (if supported))

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 board supports heating, when the heating condition is met, the heating can only be turned on when the charger is detected or the heating switch is turned on.

g)温度传感器屏蔽(Temperature sensor shielding)

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（此功能常用于温度传感器由于某种原因损坏的情况）。

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

h)GPS 心跳检测 （如果支持）(GPS Heartbeat Detection (if supported))

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 enabled, the protection board will detect the GPS connection status. When the GPS is disconnected from the protection board for more than 24 hours, the protection board will turn off the charge and discharge switch and generate an alarm of "GPS disconnected" (This function is usually used for GPS anti-disconnection detection).

i)复用端口切换（如果支持）(Multiplexed port switching (if supported))

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 multiplexed port on the protection board. The switching option is RS485 or CAN (the hardware of the protection board needs to support the corresponding function).

j)显示器常亮（如果支持）(Display steady on (if supported))

打开显示器常亮开关，此时显示器背光将保持常亮状态；关闭该开关，显示器背光关闭。若显示器超过 3 秒没有接收到保护板的数据，背光将保持常亮状态。

Turn on the indicator switch to keep the indicator backlight steady on. Turn off the switch to turn off the display backlight. If the monitor does not receive data from the protection board for more than 3 seconds, the backlight will remain on.

k)专用充电器识别 (如果支持)(Dedicated charger identification (if supported))

打开专用充电器识别后，保护板将识别专用充电器的插入状态。

After the dedicated charger identification is turned on, the protection board will recognize the plug-in status of the dedicated charger.

l)智能休眠(Intelligent sleep)

用来控制保护板智能休眠开关的打开或者关闭。

It is used to turn on or off the intelligent sleep switch of the protection board.

m)禁用充电限流(Disable charging current limiting)

打开此开关，在电池并联的情况下，将禁用充电限流功能。

Turn on this switch to disable the charge current limiting function when the batteries are connected in parallel.

n)定时存储数据(Timed stored data)

打开定时存储数据开关，保护板将按照参数设置中“数据存储周期”设定的时间周期性存储详细日志数据。

If the periodic data storage switch is enabled, the protection board stores detailed log data periodically according to the time set in Data Storage Period in Parameter Settings.

o)充电浮动模式(Charge floating mode)

用于控制保护板充电浮动模式的打开或者关闭。打开此开关，当电池充电完成后，保护板会将充电电压调整到相对较低的水平，以避免对电池的过度充电。

It is used to control the opening or closing of the floating charging mode of the protection board. Turn on this switch, and when the battery is charged, the protection board will adjust the charging voltage to a relatively low level to avoid overcharging the battery.

p)按钮触发应急（如果支持）(Button trigger emergency (if supported))

打开按钮触发应急功能，则可通过显示器接口的激活开关来触发应急功能。

Open the button to trigger the emergency function, then the emergency function can be triggered through the activation switch of the display interface.

q)断续报警（如果支持）(Intermittent alarm (if supported))

用于控制各种报警的间断性。当打开此开关后，若触发显示器报警或干节点报警，则报警时间将具有间断性；当关闭此开关，若触发显示器报警或干结点报警，将持续不断地报警。

Used to control the discontinuity of various alarms. When this switch is turned on, if the display alarm or dry node alarm is triggered, the alarm time will be intermittent; When this switch is turned off, if the display alarm or dry junction alarm is triggered, it will continue to alarm.

r)对时(Check the time)

点击“对时”按钮，将自动同步手机的时间。

Click the "Right time" button to automatically synchronize the time of the phone.

3. 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。

Please read the instruction manual carefully before use, and connect the cables from the negative terminal to the positive terminal according to the wiring diagram of the corresponding number of strings. After the balanced wire is connected, use the multimeter again to confirm that it is correct before inserting the protection board.

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 connecting the mobile phone APP to the protection board, change the connection password in time to prevent others from connecting to the protection board.

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

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