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1 Overview

The lithium battery intelligent protection board is a management system tailored for large-capacity series lithium battery packs. It has functions such as voltage acquisition, high current active balance, overcharge, over discharge, over current and over temperature protection, coulomb counter, Bluetooth communication, GPS remote and other functions. Suitable for battery types such as lithium, Li-ion ,Lifepo4, LTO and so on .

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

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

2 main technical parameters

2.1 Main technical indicators

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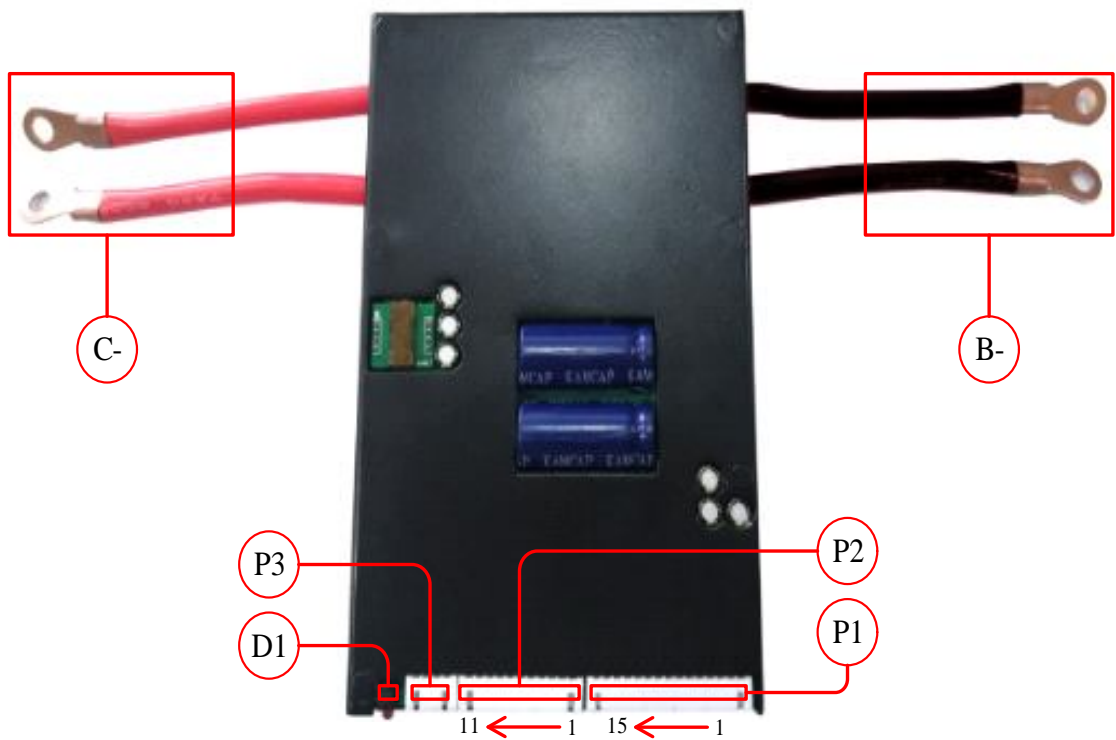
parameters	BD6A20S-10P	B1A24S-15P	B2A24S-15P	B2A24S-20P	JK-BD6A24S10P	JK-BD6A17S6P
Lifepo4 range	16 ~ 20S	16 ~ 24S	16 ~ 24S	16 ~ 24S	16 ~ 24S	14S ~ 17S
Li-ion range	13 ~ 20S	13 ~ 24S	13 ~ 24S	13 ~ 24S	13 ~ 24S	13S ~ 17S
LTO range	20S	20S ~ 24S	20S ~ 24S	20S ~ 24S	20 ~ 24S	NO
Single cell voltage	1 ~ 5 V					
acquisition accuracy	±5 mV	±5 mV	±5 mV	±5 mV	±5 mV	±5 mV
Continuous discharge	100A	150A	150A	200A	100A	60A
Max discharge	200A	300A	300A	350A	200A	120A
Balance mode	active	active	active	active	active	active
Balance current	0.6 A	1 A	2 A	2 A	0.6A	0.6 A
Main circuit conduction	0.8mΩ	0.5mΩ	0.5mΩ	0.3mΩ		0.8mΩ
Overcharge protection voltage	1.2V-4.25V adjustable					
Overcharge release	1.2V-4.25V V adjustable					
Charging overcurrent protection (adjustable)	10 ~ 100 A	10 ~ 150 A	10 ~ 150 A	10 ~ 200 A	10A-100A	1A-60A
Charging overcurrent release time	2 ~ 120S adjustable					
Over discharge protection	1.2V-4.25V adjustable					
Over discharge recovery voltage	1.2V-4.25V adjustable					
Discharge overcurrent protection (adjustable)	10 ~ 100 A	10 ~ 150 A	10 ~ 150 A	10 ~ 200 A	10A-100A	10A-60A
Discharge overcurrent release time	2 ~ 120S adjustable					
Number of temperature tests	3pcs					
Temperature protection	yes					
Short circuit protection	yes					
Coulomb counter	Yes					
Bluetooth function	Support for android / ios iphone					
GPS	GPS Need to contact us custom made					
Other port	RS485/CAN , need to contact us for custom made					
Wring ouput	Common port					

2.2 Environmental conditions

- a) Operating temperature range: -20 °C ~ 70 °C
- b) Power requirements: 40 ~ 100V。
- c) Power consumption: 10mA @ 100V in balanced state, 6mA @ 100V in unbalanced state

3 connector and interface description

3.1 Connector, LED light position description



3.2 Connector, LED definition description

Table 2 for connector definition and LED light definition.。

表 1 Connector definition

connect	Pin	JK-BD6A20S-10P	JK-B1A24S-15P/JK-B2A24S-15P/JK-B2A24S-20P
---------	-----	----------------	---

or		名称	definition	名称	definition
P1	1	B-	Battery pack total +	B-	Battery pack total +
	2	B1	1 th cell +	B1	1 th cell +
	3	B2	2 th cell +	B2	2 th cell +
	4	B3	3 th cell +	B3	3 th cell +
	5	B4	4 th cell +	B4	4 th cell +
	6	B5	5 th cell +	B5	5 th cell +
	7	B6	6 th cell +	B6	6 th cell +
	8	B7	7 th cell +	B7	7 th cell +
	9	B8	8 th cell +	B8	8 th cell +
	10	B9	9 th cell +	B9	9 th cell +
	11	B10	10 th cell +	B10	10 th cell +
	12	B11	11 th cell +	B11	11 th cell +
	13	B12	12 th cell +	B12	12 th cell +
	14	B13	13 th cell +	B13	13 th cell +
	15	B14	14 th cell +	B14	14 th cell +
P2	1	B15	15 th cell +	B15	15 th cell +
	2	B16	16 th cell +	B16	16 th cell +
	3	B17	17 th cell +	B17	17 th cell +
	4	B18	18 th cell +	B18	18 th cell +
	5	B19	19 th cell +	B19	19 th cell +
	6	B20	20 th cell +	B20	20 th cell +
	7	B+	Bms power supply	B21	21 th cell +
	8	-	-	B22	22 th cell +
	9	-	-	B23	23 th cell +
	10	-	-	B24	24 th cell +
	11	-	-	B+	Bms power supply

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connect or	Pin	JK-BD6A20S-10P		JK-B1A24S-15P/JK-B2A24S-15P/JK-B2A24S-20P	
		名称	definition	名称	definition
P3	1	T1A	1st temperature sensor A pin		
	2	T1B	1st temperature sensor B pin		
	3	T2A	2nd temperature sensor A pin		
	4	T2B	2nd temperature sensor B pin		
D1	Bluetooth connection indicator. When the protection board is connected to Bluetooth, the indicator is always on. When disconnected, the indicator blinks.				
C-	Connect external load or charger negative				
B-	Connected to battery negative -				



图 1 Effect picture of protection board

3.3 size

JK-BD6A20S-10Psize is 158.4mm×79.4mm×14.8mm, as this picture shows 。

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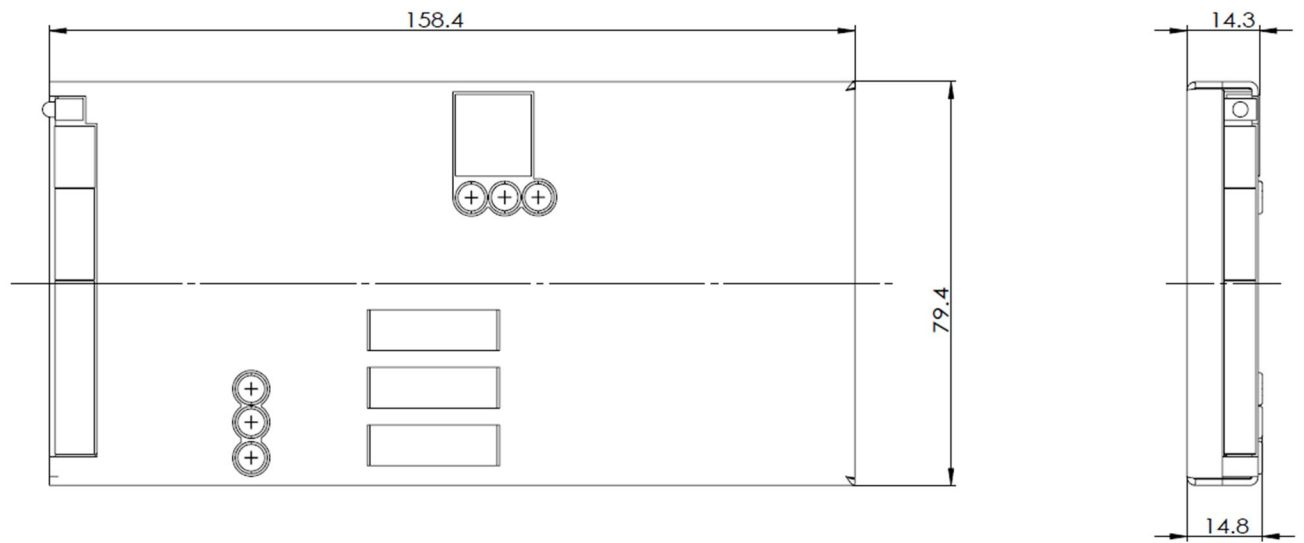


图 2 JK-BD6A20S-10P

JK-B1A24S-15P/JK-B2A24S-15P/JK-B2A24S-20P size 161.4mm×101.4mm× 17.95mm,
as this picture shows 。

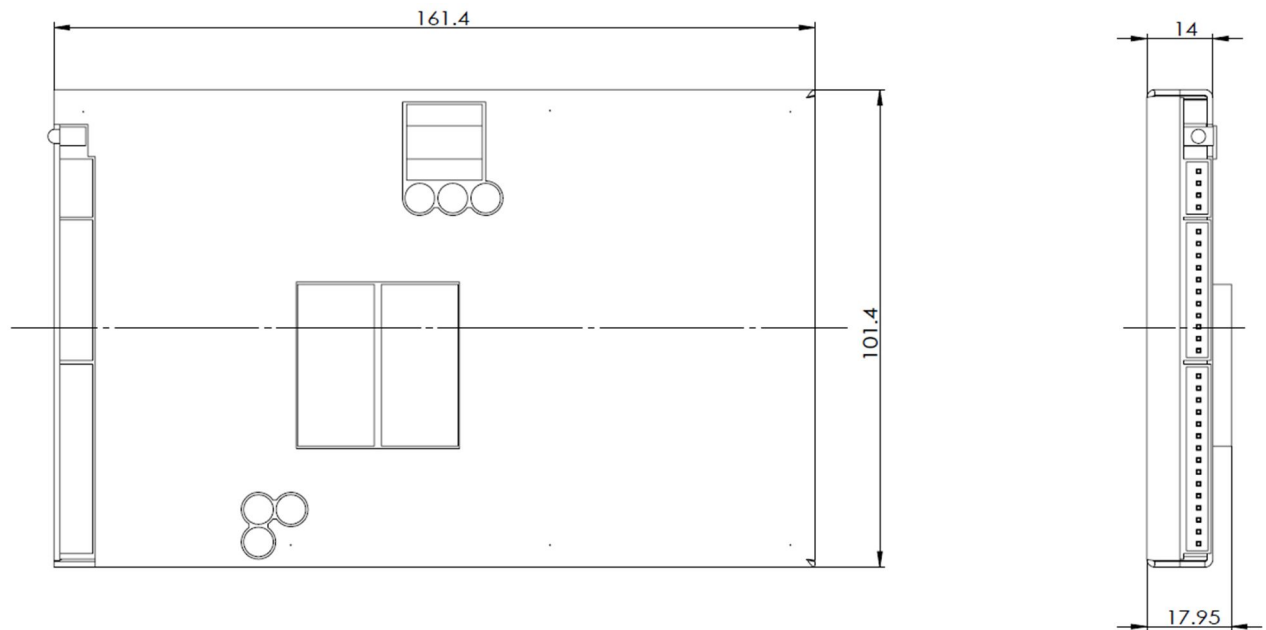


图 3 JK-B1A24S-15P/JK-B2A24S-15P/JK-B2A24S-20P

Weight :

JK-BD6A20S-10P weight around 400g。

JK-B1A24S-15P/JK-B2A24S-15P/JK-B2A24S-20P weight around 550g。

4 installation method and precautions

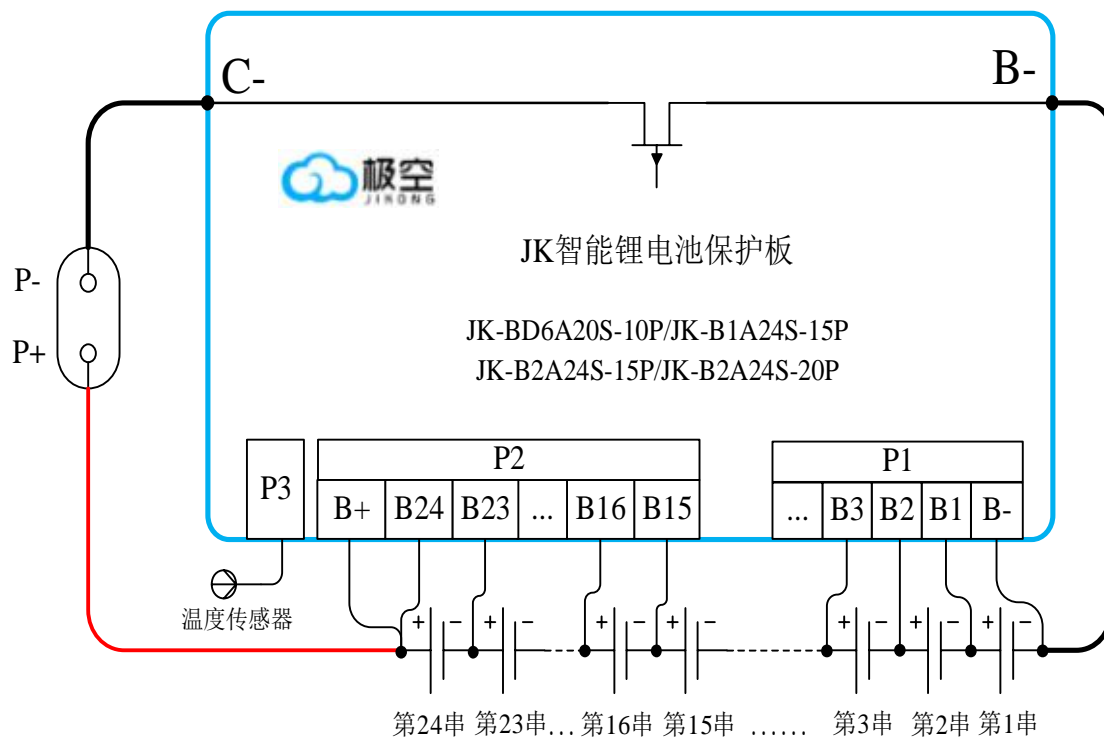
4.1 Unpacking inspection and precautions

- Handle the packaging box, protective plate, etc. gently, and try not to invert it;;
- Before opening the box, pay attention to whether the packaging is intact, if there are no traces of impact, damage, etc.;

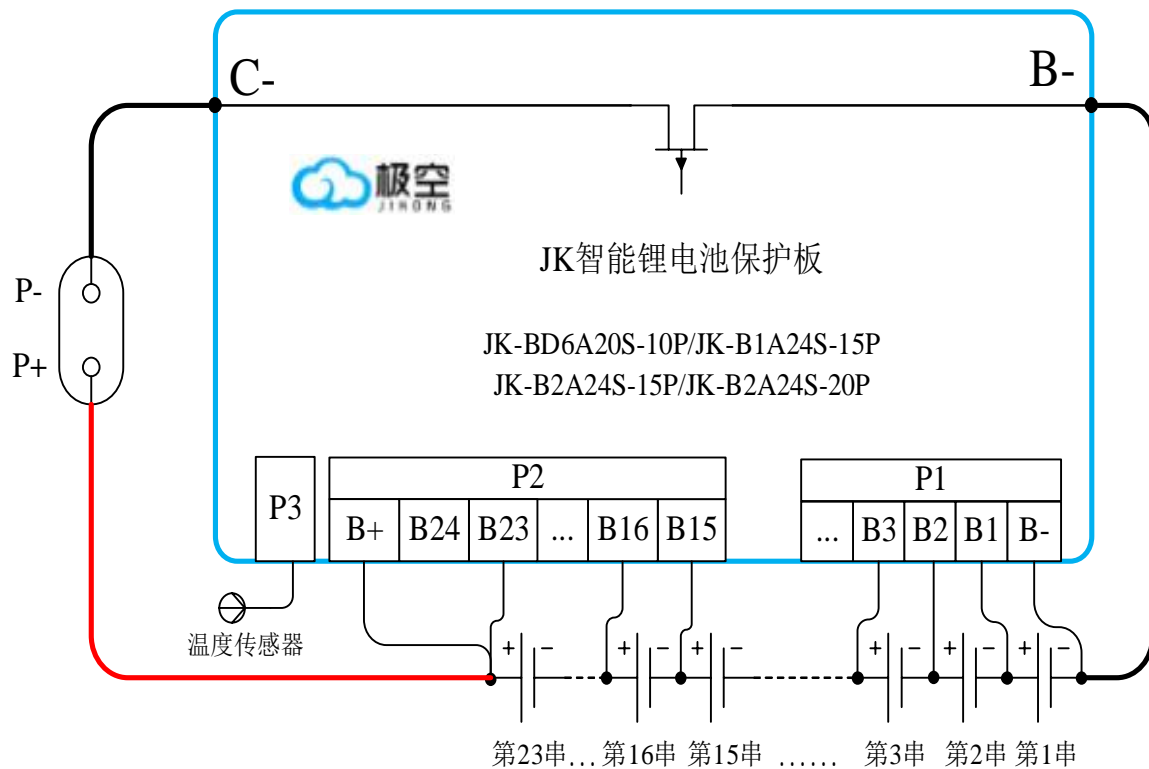
4.2 Wiring

BMS use for 14S to 24S

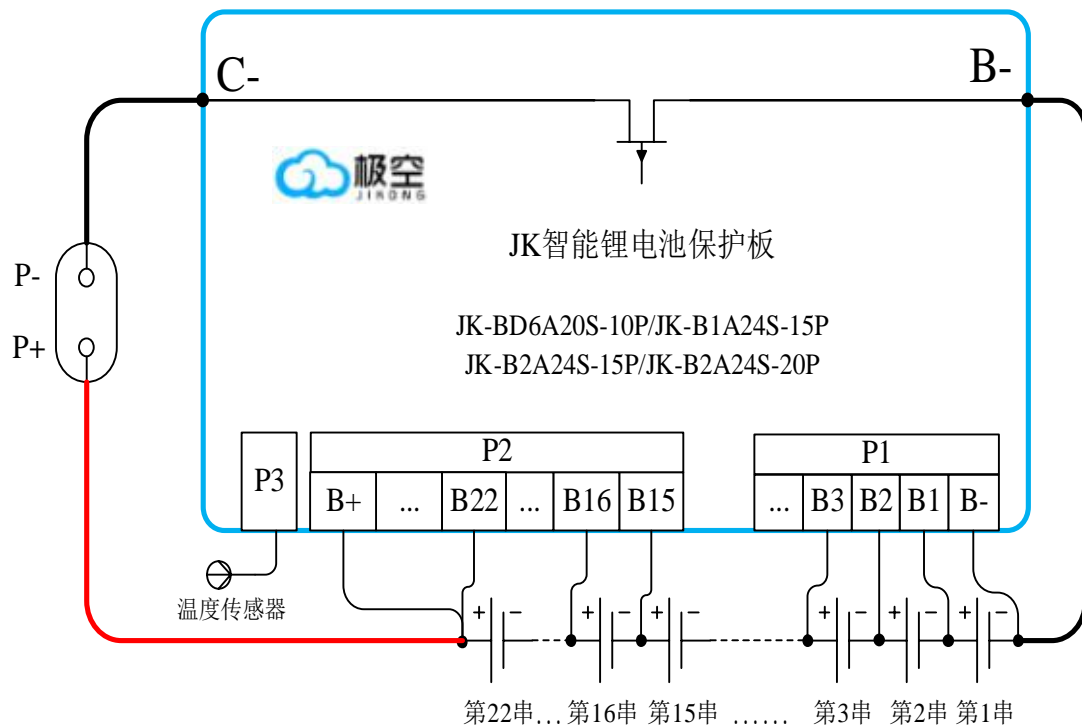
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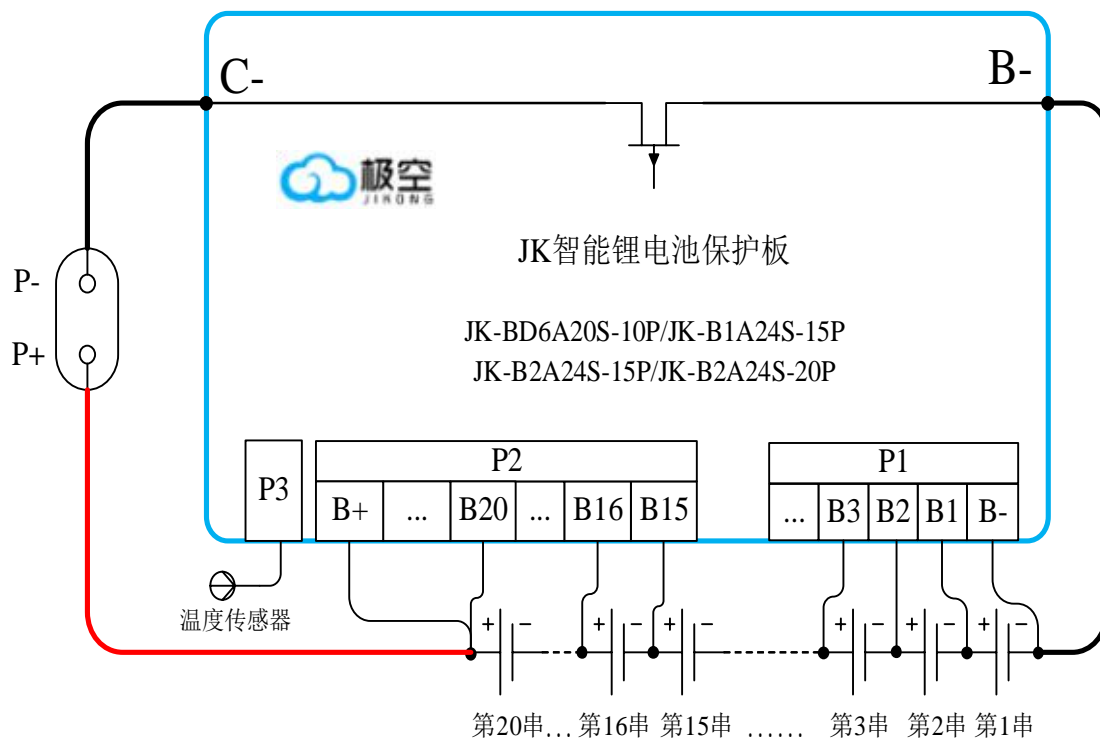
24S wiring



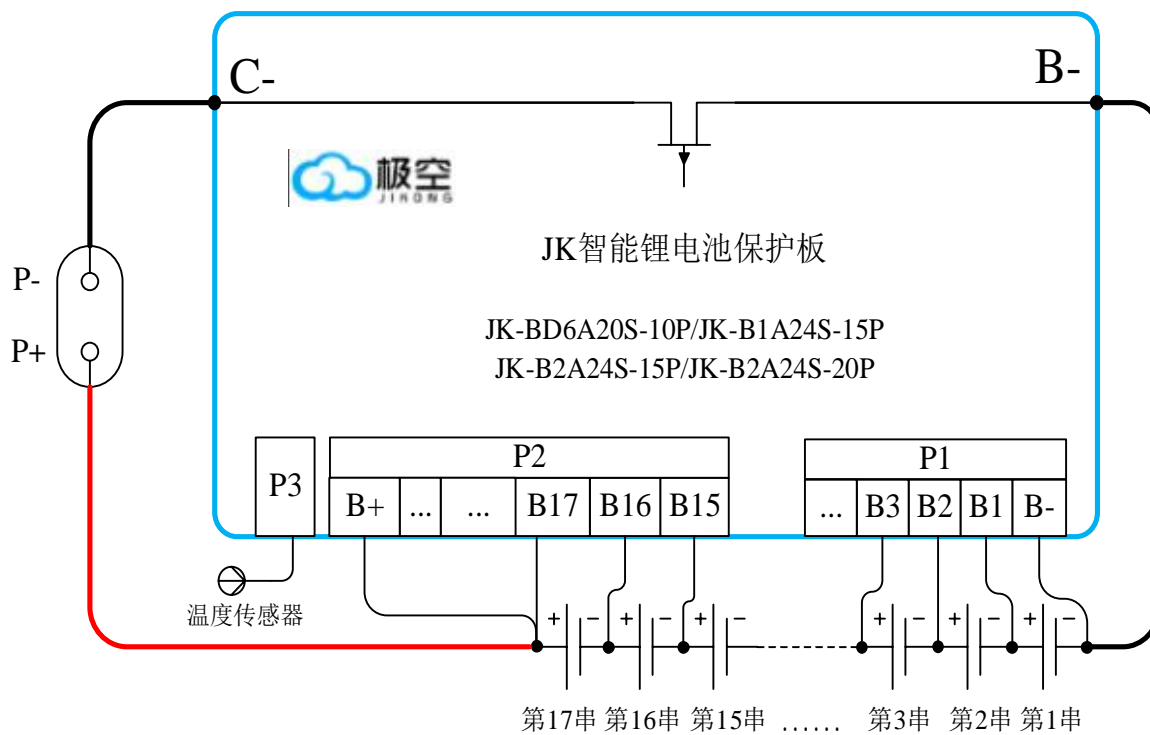
23S wiring



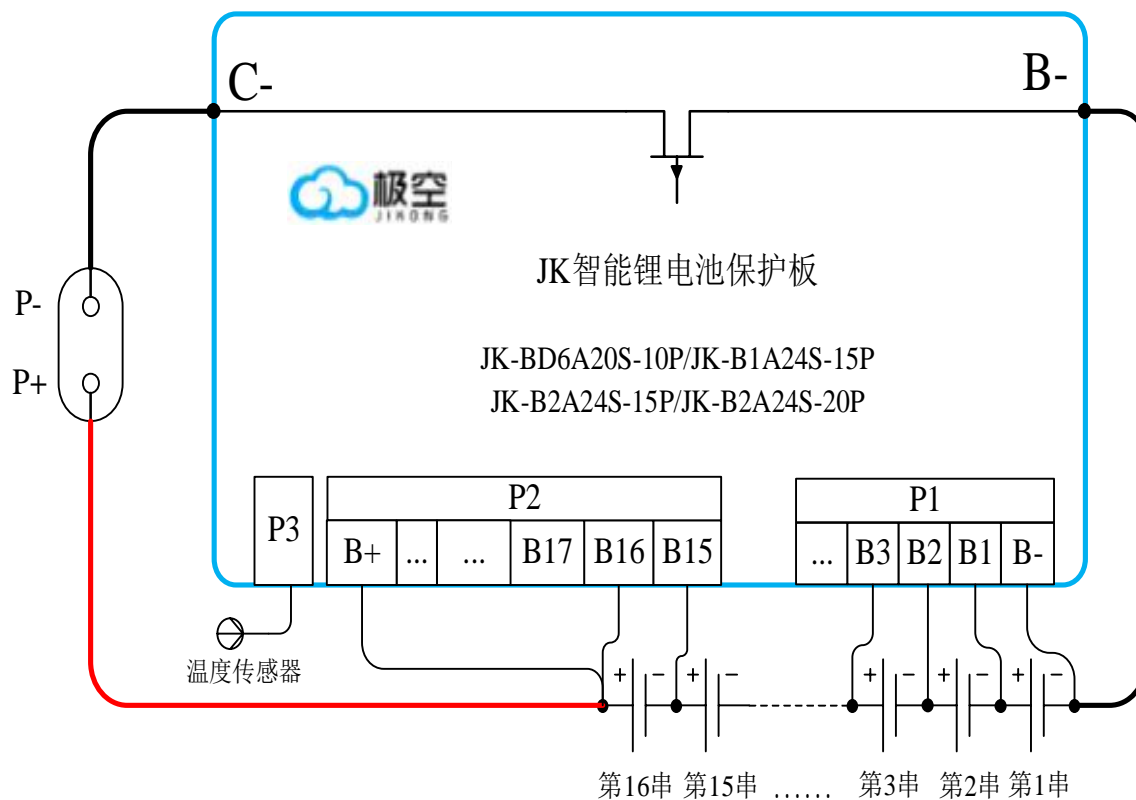
22S wiring



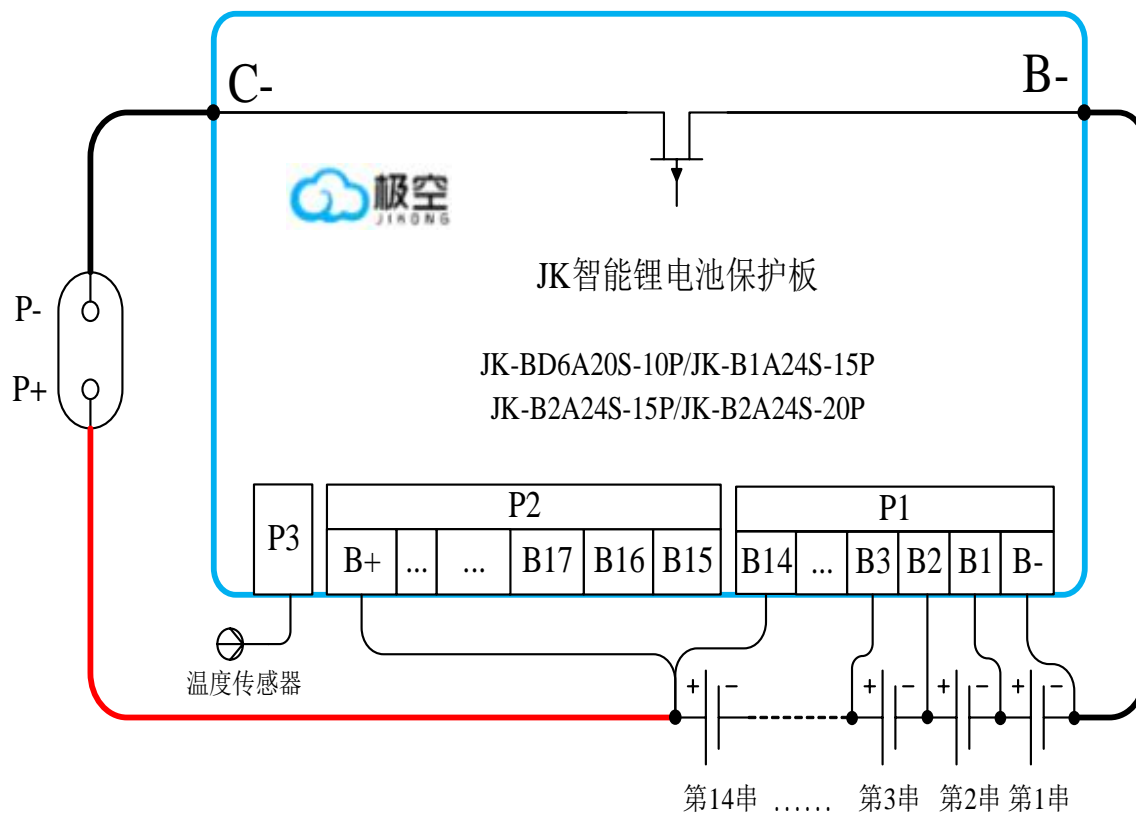
20S wiring



17S wiring



16S wiring



14S wiring

4.3 APP install

Scan this QR to download app 。



5 use and operation

5.1 Preparation and inspection before use

Before turning on the protection board, please confirm whether the balance wire is connected normally and whether "C-" and "B-" are connected correctly. Check whether the protection board is securely fixed to the battery core, and then you can switch on the protection board after confirming that it is correct. Otherwise, it may cause serious consequences such as abnormal operation and even burnout.

5.2 BMS power ON

After confirming that the above operations are correct, you can power on the protection board. The protection board does not have a power-on control switch, and is designed to be in a charging activation mode. That is, after the battery is assembled, a charger needs to be connected to start the protection board.。

5.3 APP operations

5.3.1 Device operations

Connect to Device

First turn on the mobile phone's Bluetooth, and then turn on the APP, as shown in Figure Below.

Click the icon in the upper left corner to scan the device. After the scan is completed, click the name of the device to be connected, such as "JK-B1A24S". The APP will prompt for a password when connecting for the first time. The default password of the device is "1234". The APP will automatically record the password after the device is connected. There is no need to enter the password for the next connection. It will automatically connect after opening the APP. The password input interface is shown in Figure below . .

图 4 设备扫描

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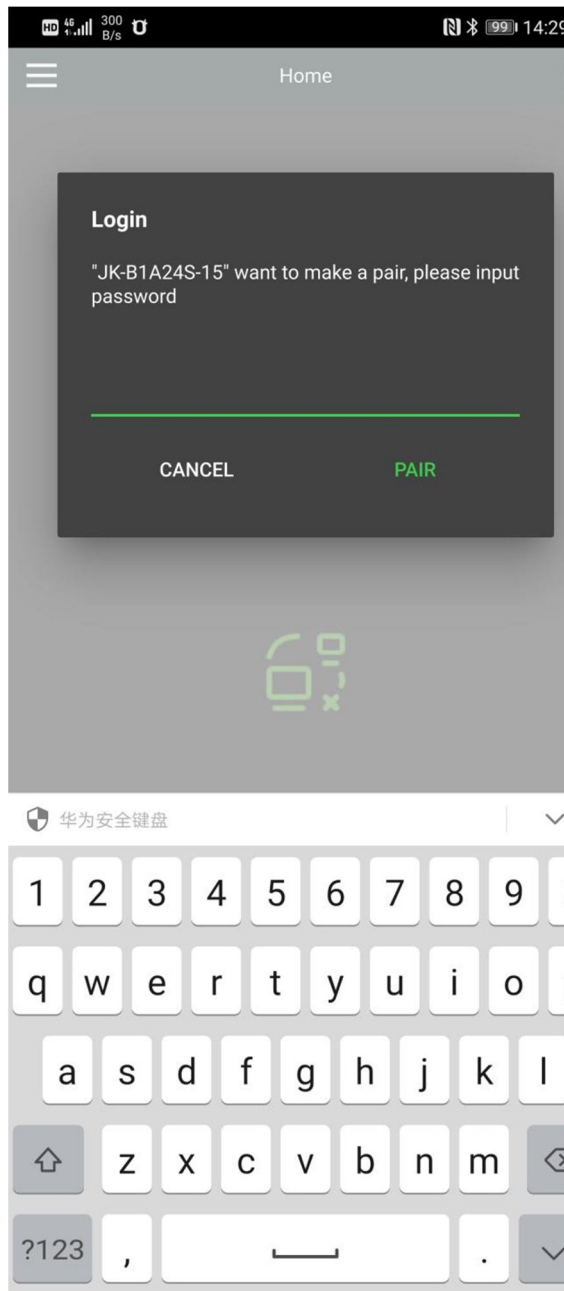


图 5 密码输入

c) change password and name

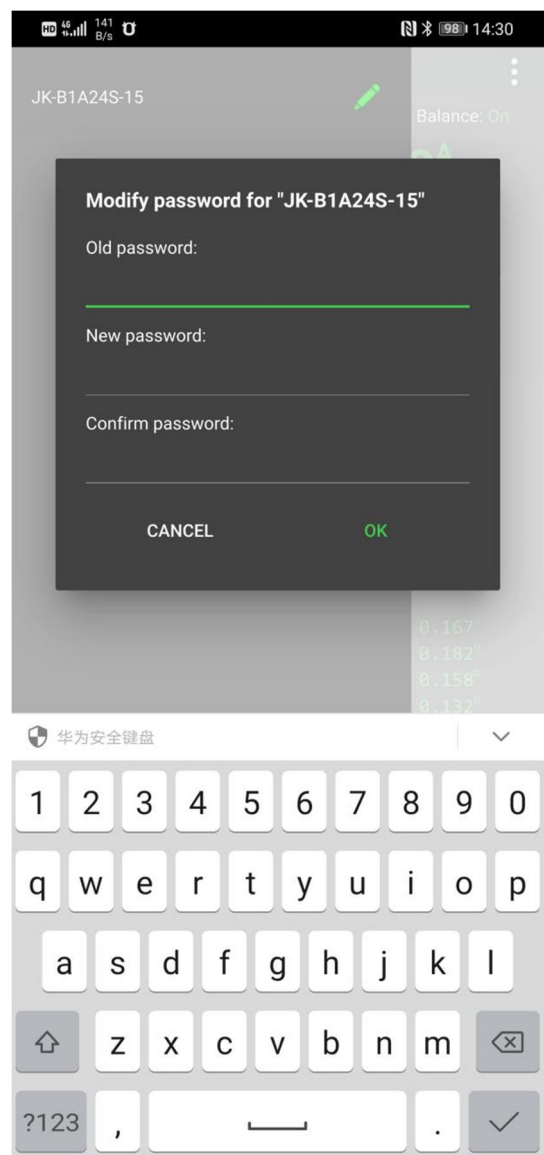
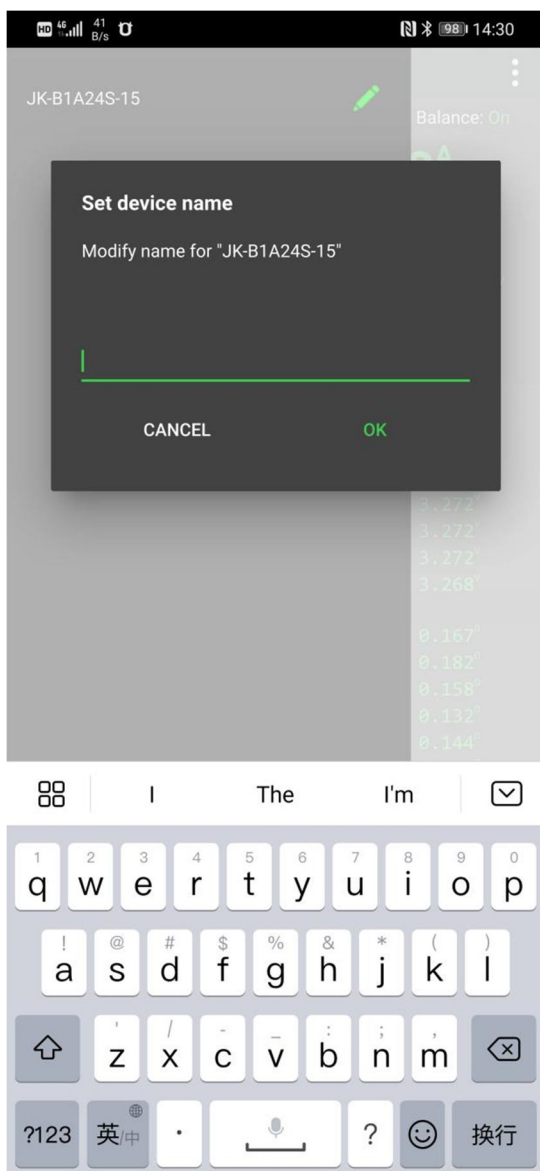
After the device is connected, click the "pen type" icon on the right side of the device list to modify the device name and password.

The interface for modifying the device name is shown in Figure below. Note that the device

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name only supports English or numbers, and does not support Chinese names and Chinese characters.

The password change interface is shown in Figure below . 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 new password entry option. After entering the new password twice, click' OK' to complete the device password modification.



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5.3.2 状态查看

实时状态界面如图 6 所示。

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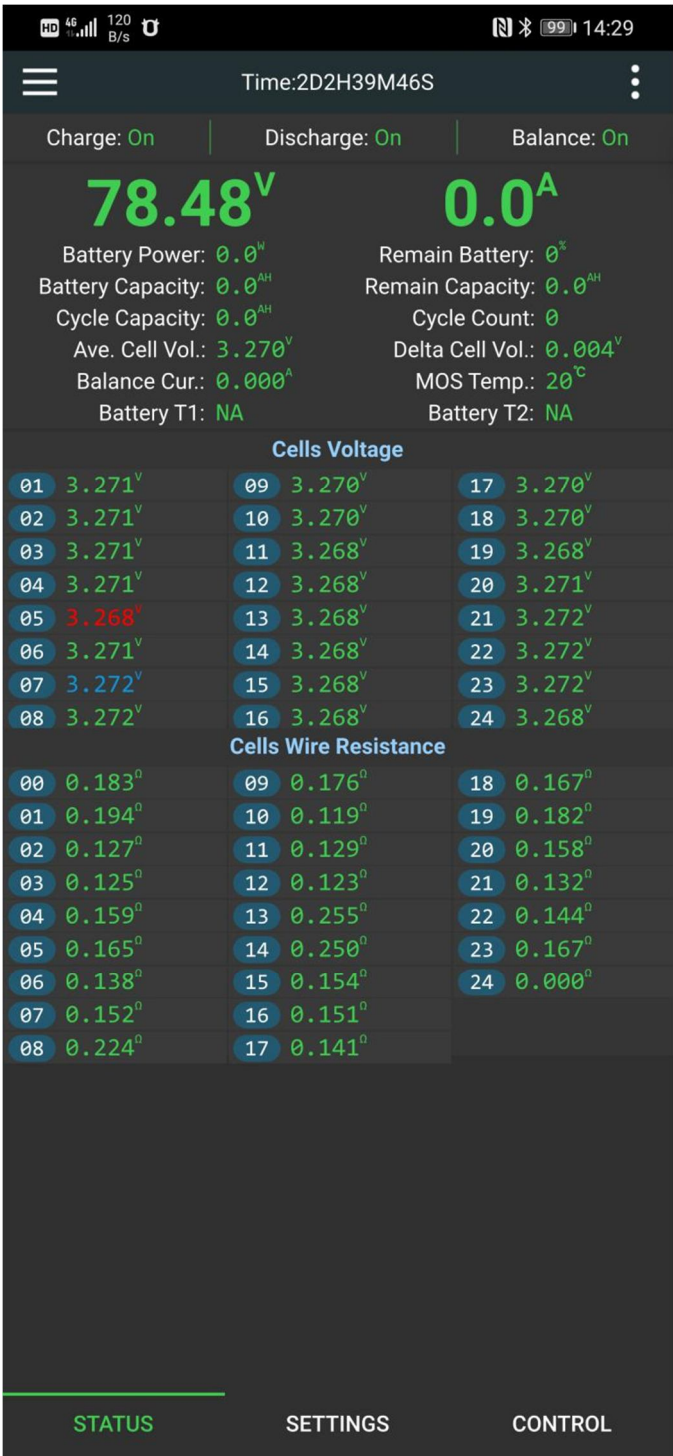


图 6 实时状态显示

The real-time status page is divided into 3 areas.。

The area 1 in the figure is the comprehensive battery information column. The parameters

are explained as follows::

a) operation time

The running time indicates the total running time from the time the protection board is turned on until now.

b) Charge

Indicates the current status of the protection board's charging MOS. When "ON" is displayed, it means that the current protection board charging MOS is turned on, and the battery is allowed to charge; when "OFF" is displayed, it means that the current protection board charging MOS is turned off, and the battery is not allowed to charge.

c) Discharge

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

d) Balance

Indicates the current state of the protection board balance switch. When " On" is displayed, the protection board will automatically balance when the balance starting conditions are met; when " Off" is displayed, it means that the balance is off, and the protection board will not balance the battery.◦

e) Voltage

The voltage area displays the current total voltage of the battery in real time, and the total voltage is the sum of all unit voltages.

f) Current

The current area displays the total current of the current battery in real time. When the battery is charging, the current is positive, and when the battery is discharging, the current is negative.

g) Battery power

Represents the total power of the current battery output or input. Its value is the product of the current battery voltage and the absolute value of the battery current.

h) Remaining power

Represents the percentage of current battery power remaining.

i) Battery Capacity

Represents the actual battery capacity calculated by the current protection board based on the high-precision SOC. The unit is AH. (The value needs to be updated after the battery has completed a full discharge and charge cycle).

j) Remaining Capacity

Remaining capacity indicates the remaining capacity of the current battery, unit: AH.

k) Cycle capacity

The cycle capacity indicates the cumulative discharge capacity of the battery, and the unit is AH.。

l) Cycle times

The number of cycles indicates the number of charge saturation times of the current battery, the unit is: times.

m) Single cell monomer average

Means the average cell voltage of the current battery, unit: V

n) Maximum voltage difference

The maximum voltage difference represents the difference between the highest battery voltage and the lowest battery voltage of the entire battery. The unit is V.

o) Balance current

When the protection board turns on the balance function and reaches the balance condition, it displays the balance current in real time. Unit: A.

When the balance is performed, the status display area of the real-time status, blue represents a discharged battery, and red represents a charged battery. Balanced current negative current indicates that the battery is discharging, and blue flashes at this time, and balanced current positive current indicates that the battery is charging, and red flashes.

The protection board uses active balance technology. The principle of balance is to take power from high-voltage cells, store them on the protection board, and then put them on low-voltage cells.

p) MOS temperature

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

q) Battery temperature 1

When the temperature sensor 1 is not installed, "NA" is displayed. When the temperature sensor is installed, the temperature of the temperature sensor 1 is displayed in real time, and the unit is ° C.

r) Battery temperature 2

When the temperature sensor 2 is not installed, "NA" is displayed. When the temperature sensor is installed, the temperature of the temperature sensor 2 is displayed in real time, and the unit is ° C.

Area 2 in the figure is a single-voltage area. The voltage data of each cell in the battery pack is displayed in real time, where red indicates the lowest voltage cell and blue indicates the highest voltage cell.

Area 3 in the figure is the resistance area of the balanceline. This balanced line resistance is the balanced line resistance obtained by the self-test of the protection board. This value is only an initial calculation. The purpose is to prevent misconnection or poor contact. When the balanced line resistance exceeds a certain value, it is displayed in yellow. Cannot turn on balance.

5.3.3 Parameter setting

a) One click to Lifepo4

b) One click to Li-ion

c) Actual quantity of cells

The number of cells indicates the number of cells in the current battery. Before use, please set this value accurately, otherwise the protection board cannot work normally.◦

d) Battery capacity

e) Trigger the balance voltage difference

Triggered balance voltage difference is the only parameter that controls balance . When the balance switch is on, when the maximum voltage difference of the battery pack exceeds this value, the balance starts, and the balance ends when the voltage difference is lower than this value. For example, the balance trigger voltage difference is set to 0.01V. When the battery pack voltage difference is greater than 0.01V, balance is started, and when the battery pack voltage difference is lower than 0.01V, the balance is ended. (It is recommended that the balance trigger voltage difference of the battery above 50AH is 0.005V, and the balance trigger voltage difference of the battery below 50AH is 0.01V).◦

f) Voltage calibration

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

When there is an error between the total voltage collected by the protection board and the total voltage of the battery, you can use the voltage calibration function to calibrate the protection board. The calibration method is to fill in the total battery voltage that is currently measured, and then click " Small Plane" behind the voltage calibration to complete the calibration.



“Single 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 “cell undervoltage alarm” is generated, and the protection board is turned off to discharge MOS. At this time, the battery cannot Discharge and only charge. When the alarm occurs, only after the voltage of all the cells exceeds the value of “cell voltage recovery”, the protection board releases the “cell undervoltage alarm” and turns on the discharge MOS at the same time.

h) "Single overcharge voltage", "Single overcharge recovery"

"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' is generated, and the protection board turns off the charging MOS, and the battery cannot be charged at this time. Can only be discharged. When the alarm occurs, only after 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 at the same time.

i) Automatic shutdown voltage

The automatic shutdown voltage indicates the minimum 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 closes. This value must be lower than the "cell undervoltage protection".

j) "Maximum charging current", "Charging overcurrent delay", "Charging overcurrent release"

When charging the battery pack, when the current exceeds the "maximum charging current" and the duration exceeds the "charge overcurrent delay" time, the protection board generates a 'charging overcurrent alarm' and turns off the charging MOS at the same time. After the alarm occurs, after the " charge overcurrent release" time elapses, the protection board releases the charge overcurrent alarm and restarts the charging MOS.

Example: Set "Maximum Charging Current" to 10A, "Charge Overcurrent Delay" to 10 seconds, and "Charge Overcurrent Release" to 50 seconds. During the charging process, the charging current exceeds 10A for 10 seconds. The protection board will generate a 'charging overcurrent alarm' and turn off the charging MOS at the same time. 50 seconds after the alarm is generated, the 'charging overcurrent alarm' will be cancelled and the protection board will turn on the charging MOS again.

k) "Maximum discharge current", "Discharge overcurrent delay", "Discharge overcurrent release"

When the battery pack is discharged, when 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 turns off the discharge MOS at the same time. After the alarm occurs, after the " discharge overcurrent release" time elapses, the protection board releases the " discharge overcurrent alarm" and turns on the discharge MOS again.

Example: Set "Maximum Discharge Current" to 100A, "Discharge Overcurrent Delay" to 10 seconds, and "Discharge Overcurrent Release" to 50 seconds. During the discharge process,

the discharge current exceeds 100A for 10 seconds. 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' will be cancelled and the protection board will turn on the discharge MOS again.

l) Short-circuit protection is released

When short-circuit protection occurs, the short-circuit protection is released after the time set by 'Short-circuit protection release'.

m) Maximum balance current

balance current refers to the continuous current of high voltage battery discharge and low voltage battery charge during energy transfer.

The maximum balance current represents the maximum current during the energy transfer process, and the maximum balance current is preferably not more than 0.1C. Such as: 20AH battery does not exceed $20 * 0.1 = 2A$.

n) "Charging over temperature protection", "Charging over temperature recovery"

During the charging process, when the battery temperature exceeds the value of " Charging Over-Temperature Protection" , the protection board generates a " Charging Over-Temperature Protection" warning, and at the same time, the protection board turns off the charging MOS. After the alarm is generated, when the temperature is lower than the "charging overtemperature recovery", the protection board will release the 'charging overtemperature protection' warning and turn on the charging MOS at the same time.

o) "Charging low temperature protection", "Charging low temperature recovery"

During the charging process, when the battery temperature is lower than the value of "Charging Low Temperature Protection", the protection board generates a 'Charging Low Temperature Protection' warning, and at the same time, the protection board turns off the charging MOS. After the alarm is generated, when the temperature is higher than the "charging low temperature recovery", the protection board releases the "charging low temperature protection" warning and turns on the charging MOS at the same time.

p) "MOS over-temperature protection", "MOS over-temperature recovery"

When the MOS temperature exceeds the value of "MOS over-temperature protection", the protection board generates a MOS over-temperature alarm and turns 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 "MOS overtemperature recovery" value, the protection board releases the MOS overtemperature alarm and turns on the charge and discharge MOS at the same time (**MOS overtemperature protection value is 100 ° C and MOS overtemperature recovery value 80 ° C, these two values are factory defaults and cannot be modified**).

note:

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

After any parameter is modified, you need to click the "small plane" behind the parameter to complete the parameter delivery. After the equalizer successfully receives the parameter, it will emit a "drop" sound.

5.3.4 BMS Control

The BMS control page is shown in the figure. The BMS control can be used to switch the charging function, discharging function, and balancefunction of the protection board. It can also turn off the power of the protection board and restore the factory settings.

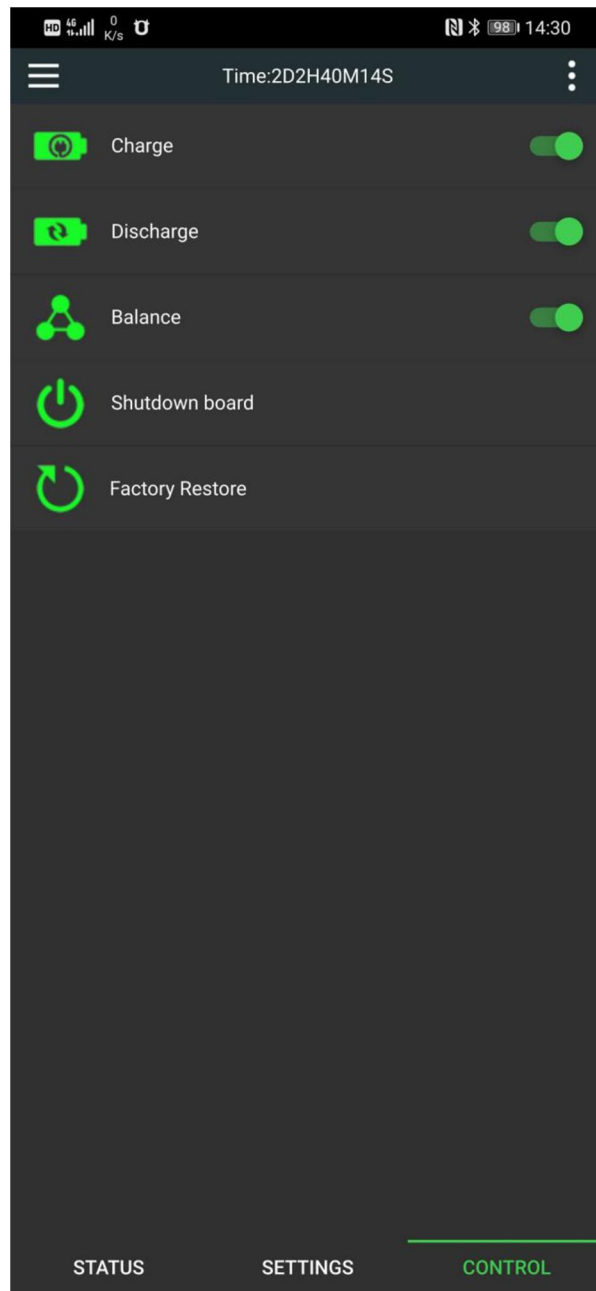


图 8

BMS 控制页面

6 safety protection measures and precautions

The protective plate itself does not have high voltage, which will not cause electric shock to the body.

Please read the instruction manual carefully before use, connect according to the correct wiring diagram of different strings, and connect from the negative pole to the positive pole. After the balanced wire is connected, confirm it with a multimeter again, and insert the protection board after confirmation.

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

7 Transportation and storage

7.1 Transport

The boxed products are not directly affected by rain and snow and are subject to severe collisions and bumps, and can be transported by ordinary transportation means. It is not allowed to be put together with corrosives such as acid and alkali during transportation.

7.2 Storage

The packaged products should be stored in a permanent warehouse. The temperature of the warehouse is 0 °C ~ 35 °C, and the relative humidity is not more than 80%. The warehouse should be free of acid, alkali and corrosive gas, strong mechanical vibration and shock, and strong magnetic field Role.

Lifepo4 and li-ion parameters

序号	parameter	铁锂默认	三元默认	单位
1	Single undervoltage protection	2.500	2.800	V
2	Single-unit undervoltage protection recovery	2.650	3.200	V
3	Single overcharge voltage	3.65	4.25	V
4	Single overcharge protection recovery	3.6	4.2	V
5	Trigger balance voltage difference	0.01	0.01	V
6	Automatic shutdown voltage	2.5	2.799	V
7	Charging overcurrent protection current	25.0	25.0	A
8	Charge overcurrent protection delay	30	30	S
9	Charging overcurrent protection release time	60	60	S

10	Discharge overcurrent protection current	100.0	100.0	A
11	Discharge overcurrent protection delay	30	30	S
12	Discharge overcurrent protection release time	60	60	S
13	Short-circuit protection release time	60	60	S
14	Maximum balance current	1.0	1.0	A
15	Charging over-temperature protection temperature	70	70	°C
16	Charging over temperature recovery temperature	60	60	°C
17	Discharge over-temperature protection temperature	70	70	°C
18	Discharge over-temperature recovery temperature	60	60	°C
19	Charging low temperature protection temperature	-20	-20	°C
20	Charging low temperature recovery temperature	-10	-10	°C
21	MOS over-temperature protection temperature	100	100	°C
22	MOS over-temperature protection restores temperature	80	80	°C
23	Number of cells	24	24	Series
24	Charge switch	OFF	OFF	-
25	Discharge switch	OFF	OFF	-
26	Balance switch	OFF	OFF	-
27	battery capacity	40	40	AH

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