"This specification sheet is for the 17-24S 100A model. For other specifications, please contact our sales team to obtain them."

PRODUCT SPECIFICATION

Product model： KL-BL2410Ax

Configure	Parameter	Configure	Parameter
Series Number	17~24S	RS485/CAN/One-Wire Interface	5P
Applicable battery	NMC,LiFePO4,etc	UART Interface	4P
Continuous discharge current	100A	Sampling cable	15P+11P,750 mm wire length
Chip Solution	Integration Solution	Bluetooth communication	Support
Remote Communication Positioning	Optional	Voltage protection function	Over-voltage and under-voltage protection, Secondary over-voltage alarm
Balanced	Full-time Automatic Balance	Current protection function	Over-current protection during charging and discharging, short-circuit protection
Number of temperature sensors	2	Temperature protection function	High and low temperature protection for charging and discharging
Current Integration	Support	Preheating (Insulation) Function	Optional
Display screen	Optional	Pre-discharge (anti-spark) function	Optional
MOS short-circuit protection	Support	Iron Tower Agreement	Support
Charging handshake	Support	Downhill overcharge protection	Optional

In case of any discrepancy between the subsequent description and the configuration table, the above configuration table shall prevail.

Prepare BY	CHECKED BY	APPROVED BY
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Noted：

The images in the specification document represent standard models and may differ slightly from the sample provided.

Catalogue

I. Overview

This specification is applicable to the lithium battery protection board of Chengdu Ban li Zhuo Xing Technology Co., Ltd.

With the widespread application of lithium-ion batteries, battery management systems (BMS) are required to deliver high performance, reliability, and cost-effectiveness. Commonly referred to as the "battery steward," the BMS collects, processes, and stores critical operational data from battery packs in real time, intervenes to protect against abnormal conditions beyond standard operating parameters, and exchanges information with external devices such as the vehicle controller. It addresses key challenges including safety, availability, usability, and service life within lithium-ion battery systems. Its primary functions include enhancing battery utilization efficiency, preventing overcharging and over-discharging, extending battery lifespan, and monitoring the battery's real-time status.

This BMS protection board features an integrated design that combines data acquisition, management, and protection functions into a single unit. When paired with our company's remote communication module, it enables high-precision GPS positioning (compatible with both Beidou and GPS systems), ensuring safe, reliable, efficient, and long-lasting operation of power batteries.

II. Product Functional Features

. It features individual cell voltage monitoring, overall voltage detection, overcharge and over-dis-charge alarms, as well as protection functions.

. It features over-current protection during charging and discharging, short-circuit alarms, and protective functions.

. It features a battery cell, real-time MOS temperature monitoring, alarm, and protection functions.

. It features automatic balancing capability to equalize unevenly charged cells.

. Communication protocols include RS485, CAN, Bluetooth, and One-Wire Communication.

. Current integration function (Coulometer).

. SOC Measurement: Combines current integration with open-circuit voltage algorithm.

. It possesses multiple dormancy and awakening modes.

. The software's remote control feature allows users to conveniently configure battery-related parameters through the platform software.

. Dual real-time positioning via GPS and BeiDou.

. Supports display interface (optional).

2.1 Voltage Detection and Protection Function

It features individual cell voltage and overall voltage detection, along with over-voltage/under-voltage alarms and protection functions.

2.1.1 Monomer Overcharge Protection and Recovery

When the voltage of any cell exceeds the set overcharge protection threshold and remains above it for the specified duration, the system activates overcharge protection, disabling the charging MOS device and preventing battery charging. Once the overcharg protection is triggered, the protection state is lifted when the cell voltage drops below the designated overcharge recovery threshold.

2.1.2 Monomer Over-Discharge Protection and Recovery

When the voltage of any cell falls below the set over-discharge protection threshold and remains below it for the specified duration, the system enters an over-discharge protection state, disabling the discharge MOS device and preventing external discharge. The protection is lifted upon successful recharge.

2.1.3 Secondary Over-voltage Protection and Recovery for Individual Units

When the voltage of any cell exceeds the set value for secondary over-voltage protection and remains above that threshold for the specified duration, the system activates secondary over-voltage protection. The charging MOSFET is turned off, an alarm signal is triggered, and charging to the battery becomes prohibited. This constitutes a hazardous emergency; immediate cessation of battery use is required. The battery should be discharged under controlled conditions without fire hazards, followed by return to the manufacturer for maintenance.

2.1.4 General Overcharge Protection and Recovery

When the total voltage exceeds the preset overcharge protection threshold and remains elevated for the specified duration, the system activates overcharge protection by disabling the charging MOSFET, preventing battery charging. The protection state is lifted once the total voltage drops below the overshoot protection recovery threshold.

2.1.5 Overall Over-Discharge Protection and Recovery

When the total voltage falls below the preset over-discharge protection threshold and remains below it for the specified duration, the system activates over-discharge protection by turning off the discharge MOSFET. The protection state can be lifted by charging the battery pack after the protection is triggered.

2.2 Current Detection and Protection Function

It features charging and discharging capabilities, short-circuit current detection, alarm, and protection functions. The charging current is displayed as negative current, while the discharging current is shown as positive current.

2.2.1 Over-current Protection and Recovery During Charging

When the charging current exceeds the over-current protection threshold and remains elevated for the preset over-current detection delay period, the system activates over-current protection mode. During this state, the charging MOSFET is turned off, preventing battery charging. Upon occurrence of an over-current condition, the system automatically recovers after a configurable delay period. The over-current protection state can also be lifted during discharge.

2.2.2 Discharge Over-current Protection and Recovery

When the discharge current exceeds the over-current protection threshold and remains elevated for the preset over-current detection delay period, the system activates discharge over-current protection, turning off the discharge MOS device and preventing external discharge. Upon occurrence of over-current, the system automatically recovers after a configurable delay period. Charging can also terminate the over-current protection state. The discharge circuit features dual- level over-current protection with varying response speeds for different current levels, ensuring more reliable battery protection.

2.2.3 Short-Circuit Protection Function

When the discharge current exceeds the short-circuit protection current and remains elevated for the duration of the short-circuit detection delay period, the system enters short-circuit protection mode, disabling the discharge MOS device and preventing external discharge. After activation, the system automatically attempts recovery after a delayed period; if three consecutive attempts fail, it locks out and ceases automatic recovery. The short-circuit protection can only be lifted by removing the load.

2.3 Temperature Detection and Protection Function

It features cell monitoring, environmental conditions detection, and MOSFET temperature sensing capabilities, with alarms and protection mechanisms during high/low-temperature charging/discharging operations.

Two cell temperature detection probes are used; the probes are placed near the cells to measure their temperature.

A space temperature detection probe is deployed at an available location within the PACK to measure the ambient temperature inside.

Continuous MOS temperature detection.

Note: NTC is a fragile electronic component. After installation, avoid applying external pressure; damage to the NTC will trigger temperature protection. Battery charging and discharging are strictly prohibited.

2.3.1 High-Temperature Protection and Recovery During Charging and Discharging

During charging or discharging, when the NTC sensor detects that the cell surface temperature exceeds the preset high-temperature protection threshold, the BMS activates high-temperature protection mode, disconnecting the MOS for charging or discharging operations. In this state, the battery pack cannot be charged or discharged. Once the cell surface temperature returns to the high-temperature recovery threshold, the BMS reverts from protection mode and restores conduction of the charging/discharging MOS.

2.3.2 Low-Temperature Protection and Recovery During Charging and Discharging

During charging or discharging, when the NTC sensor detects that the cell surface temperature falls below the preset low-temperature protection threshold, the BMS enters low-temperature protection mode. The MOS for charging or discharging are disconnected, preventing any battery pack operation during this state. Once the cell surface temperature rises to the recovery threshold for low-temperature protection, the BMS exits the protection mode and reactivates the charging/discharging MOS

2.3.3 MOSFET Temperature Alarm, Protection, and Recovery

When the NTC detects that the ambient temperature or MOSFET temperature reaches the alarm threshold, the BMS triggers a temperature alarm signal; the alarm is lifted once the temperature returns to the preset alarm recovery value. Similarly, when the NTC detects that the MOSFET temperature reaches the protection threshold, the BMS enters a temperature protection mode; the protection is lifted once the temperature returns to the preset protection recovery value

2.4 Cell Equilibrium Function

2.4.1 Balance

During charging, when the cell reaches the "equilibrium activation voltage" and the voltage difference exceeds the "equilibrium accuracy," the corresponding channel's equalization is activated. After equalization is enabled, if the cell voltage falls below the "equilibrium activation voltage" or the voltage difference becomes smaller than the "equilibrium accuracy," the corresponding channel's equalization is deactivated.

2.4.2 Full-time Automatic Balance

When charging or at rest, if the cell reaches the "equilibrium activation voltage" and the voltage difference exceeds the "equilibrium accuracy," the corresponding channel's equalization is activated; after equalization is enabled, if the cell voltage falls below the "equilibrium activation voltage" or the voltage difference is less than the "equilibrium accuracy," the corresponding channel's equalization is deactivated.

2.5 Fire Prevention

The system's integrated pre-discharge function effectively suppresses sparking at the connector when connecting vehicles, prevents damage to battery plugs, and extends their service life.

2.6 Communication Function

2.6.1 LTE Communication (optional)

The BMS can communicate via LTE, allowing platform users to view various battery information.

2.6.2 RS485 Communication

This product supports RS485 communication interface functionality and features a display screen.

The BMS can communicate with the host computer via an RS485 interface, allowing the host to view various battery information. The default baud rate is 9600 bps.

2.6.3 One-Line Communication (Optional)

This product supports the One-Line Communication Interface function.

It adopts the international SIF communication protocol, enabling communication with chargers, vehicles, and battery swap cabinets.

2.6.4 CAN Communication (Optional)

This product supports customizable CAN communication interface functionality.

2.6.5 Bluetooth Communication

Users can view the battery's basic information and control its charging/discharging switches via Bluetooth on the Mini Program.

2.7 Hibernation and Wake-up Methods

2.7.1 Standby Mode and Wake-Up

After the protection board detects that the battery has remained stationary for a period of time, it enters standby mode to reduce power consumption; the protection board automatically wakes up and activates when the battery discharges and moves.

2.7.2 Sleep Patterns and Wakefulness

Method 1: When the battery voltage is too low lithium iron phosphate cells <2.1V, ternary batteries <2.5V, the protection board enters sleep mode to prevent complete discharge and battery damage.

Method 2: When prolonged transportation or storage is required, you can manually issue a shutdown command to activate the protection board's sleep mode, conserving battery power.

Wake-up method: Before using the battery, charge it or press the power-on wake-up button to activate the protection board for proper operation.

2.8 Communication Module Function (Optional)

The system is optionally equipped with our company's integrated remote communication and positioning module, which combines GSM wireless communication technology with GPS positioning technology. The terminal features an industrial-grade, highly integrated design, allowing battery charging and discharging to be controlled via either a computer backend or mobile device, in conjunction with the BMS protection board for battery management.

Intelligent discharge control provides real-time monitoring of battery usage, ensures battery safety, optimizes battery lifespan, and facilitates maintenance and management of both batteries and vehicles.

2.8.1 Real-Time Data and Control

Battery anomaly alert; Low battery level notification; Vibration-based anti-theft alarm; Remote control for charging and discharging; Real-time monitoring of battery voltage, battery state of charge (SOC), and charge/discharge cycles; Real-time monitoring of battery temperature and protection board temperature with remote prediction and alarm functions.

2.8.2 Real-Time Positioning

Through GPS satellite positioning, the battery's operational status can be monitored remotely.

2.8.3 Replaying of Historical Running Data

The platform allows users to save driving records for easy playback, enabling them to view the vehicle's route, stops and their durations, current speed, and mileage during playback.

2.8.4 Distance Statistics

You can view daily, weekly, and monthly mileage reports as well as the total mileage for each vehicle, allowing easy management on your mobile device. These data, along with battery charge- discharge cycles, serve as key references for after-sales maintenance.

2.8.5 Electronic Fencing

Provide pricing and control for devices located outside a specified geographic area, restricting their operational coverage.

2.8.6 Over-the-Air Upgrade (OTA)

The protection board and communication module can be remotely upgraded, continuously optimizing system functionality and user experience.

2.9 Battery Heating Function (optional)

An external heating element can be connected to heat or maintain the temperature of the battery, with a maximum continuous heating current support of 3A.

2.9.1 Discharge Preheating

In the absence of voltage drop protection for the battery, heating is activated when low- temperature charging protection occurs and the charger is connected, and deactivated once the protection is lifted.

2.9.2 Keep Warm

In the absence of voltage drop protection, the heating switch is controlled based on the detected battery temperature to maintain the internal battery temperature within a specified range.

2.10 Display Interface (optional)

This intelligent software board utilizes an RS485 interface to display battery status information on the screen, including battery voltage, current, cell voltage, temperature, and other relevant data.

III. Electrical Parameters (Ta = 25℃)

3.1 Basic Functional Parameters

Detailed Project		Specifications			Unit	Other Notes
		Least value	Representative value	Crest value		
Charging current		-	100	-	A	Sustainable operating current
Discharge current		-	100	-	A	
Work Mode Current		-	8.5	-	mA	No remote communication module included
Work Mode Current		-	10	-	mA	Including a remote communication module
Standby mode current		-	-	0.5	mA	
Sleep Mode Current		-	-	120	μA	
Work environment	Working temperature	-20	-	70	℃	Normal operating temperature range
	Working humidity	0%	-	90%	RH	The humidity is below 90%, with no condensation.
Storage Environment	Storage temperature	-40	-	85	℃	Normal storage temperature range
	Storage humidity	0%	-	90%	RH	The humidity is below 90%, with no condensation.
Current Integration	SOC estimation accuracy	<5%				
	Current Measurement	Sampling frequency <250 ms, accuracy 5%				
RS485 Interface		Supports 1 channel				Choose one from three
CAN Interface		Supports 1 channel				
ISDN		Supports 1 channel				
PDA		The Bluetooth-enabled mini-program can rapidly detect and analyze battery health status.				
LTE/GPS positioning		GPS real-time positioning; remote real-time battery information queries				2-in-1
Monomer secondary overcharging detection		Support				
Single-cell voltage detection		Supports detection range of 1.0 V to 5.0 V				
Overall voltage detection		Detection range: 0–100 V				
Battery Type		3.7V ternary lithium, 3.2V lithium iron phosphate				Parameters are configurable
Battery pack assembly method		17-24 string				The number of battery strings is selectable with a minimum support of 17 strings
Equilibrium Function	Balanced activation voltage	Ternary: 3.9V, Iron lithium: 3.2V				Can be configured
	Evenly balance the differential pressure	10mV				Can be configured

	Equalizing current	30~80 mA	
Internal resistance	Internal resistance of the discharge circuit	<4 mΩ	
Default Capacity Set up	Low battery alert	SOC <10% (adjustable); no alarm during charging	
	Nominal capacity	Can be configured	

Note: Prolonged overload operation may damage the protection board and reduce its service life.

3.2 Protection Function Parameters

3.2.1 Voltage Protection Parameters

Voltage Project	Protection	It is recommended to set parameters		Remarks
Monomer Over-charge Protection	Detonate by contact	Trigger voltage	Trigger delay	Can be configured
		Ternary: 4.2 V, Iron lithium: 3.6 V	1.0S	
	Release	Release Condition	Release voltage	
		The cell voltage drops to the recovery point or discharges,and automatically recovers.	Ternary: 4.1 V, Iron lithium: 3.5 V	
Monomer Over-discharge Protection	Detonate by contact	Trigger voltage	Trigger delay	After enabling over-discharge protection, the individual cell voltage should be <2.1 V for lithium iron phosphate. And <2.5 V for ternary batteries. Enter sleep mode
		Ternary: 2.7V, Lithium iron phosphate: 2.7V	1.0S	
	Release	Release Condition	Release voltage	
		Connect to charger	Ternary: 3.1V, Lithium iron phosphate: 2.9V	
Group-wide overcharge protection	Detonate by contact	Trigger voltage	Trigger delay	Can be configured
		Three components: Number of battery strings × 4.2 V Iron lithium: Number of battery strings × 3.6 V	10S	
	Release	Release Condition	Release voltage	
		The total voltage drops to the recovery point or discharges, and automatically recovers.	Three components: Number of battery strings× 4.1 V Iron lithium: Number of battery strings × 3.5V	
Whole-group over-discharge protection	Detonate by contact	Trigger voltage	Trigger delay	Can be configured
		Three components: Number of battery strings × 2.7V Iron lithium: Number of battery strings × 2.7 V	10S	
	Release	Release Condition	Release voltage	

		Connect to charger	Three components: Number of battery strings× 3.1 V Iron lithium: Number of battery strings × 2.9 V	
Secondary overcharge Alarm for the single cell	Detonate by cont act	Trigger voltage	Trigger delay	This condition cannot be set as an extremely dangerous situation, as it will shut down the charging MOS transistor. In such cases, the battery must be discharged and returned to the factory for repair.
		T Ternary: 4.4V, Lithium iron phosphate: 3.8V	10S	

3.2.2 Current Protection Parameters

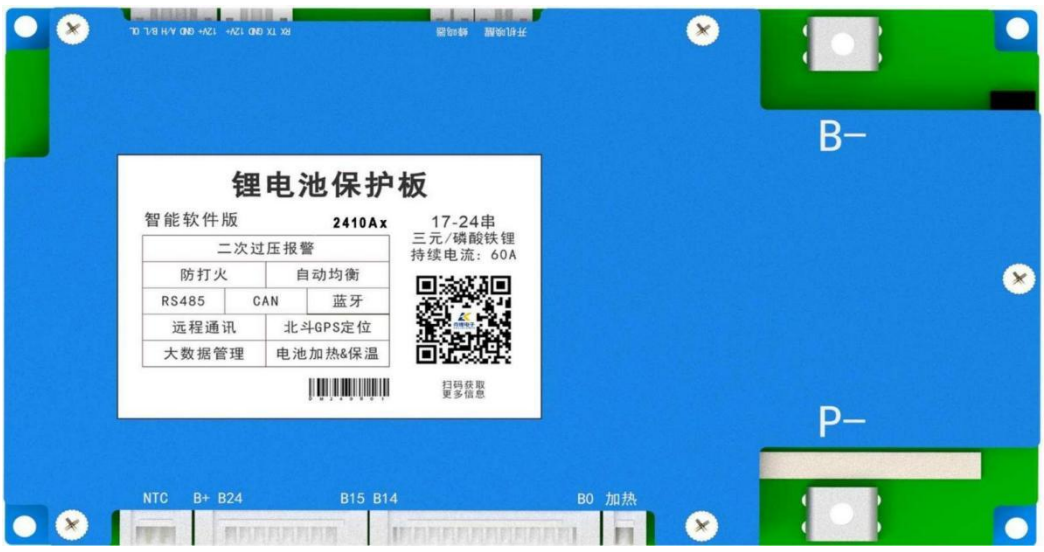
Current Protection Project		It recommended to set parameters		Remarks
		Current value	Trigger delay	
Short-circuit protection	Detonate by contact	1200A	960uS	Cannot be set
	Release	Automatically released after a 64-second delay		Due to the exceptionally high short-circuit current, customers are advised against conducting short-circuit tests to avoid hazards.
Over-current protection during charging	Detonate by contact	>100A	300S	Can be configured
	Release	Automatically released after a 300s delay		Can be configured
Discharge Over-current protection	Detonate by contact	>100A	300S	Can be configured
	Release	Automatically released after a 300s delay		Can be configured

3.2.3 Temperature Protection Parameters

Temperature Protection Project		It is recommended to set parameters	Remarks
Cell temperature protection	Charging low-temperature protection temperature	-5℃	Can be configured
	Thermal protection re-lease temperature for low-temperature char-ging	0℃	Can be configured
	High-temperature protection temperature for charging	65℃	Can be configured
	Heating high-temperature protection release temperature	55℃	Can be configured
	Discharge low-temperature protection temperature	-20℃	Can be configured
	Discharge low-temperature protection release temperature	-15℃	Can be configured
	Discharge high-temperature protection temperature	65℃	Can be configured
	Discharge high-temperature protection release temperature	55℃	Can be configured

MOS Temperature Protection	MOS high temperature protection temperature	80℃	Cannot be set
	MOS High Temperature Protection Release Temperature	75℃	Cannot be set

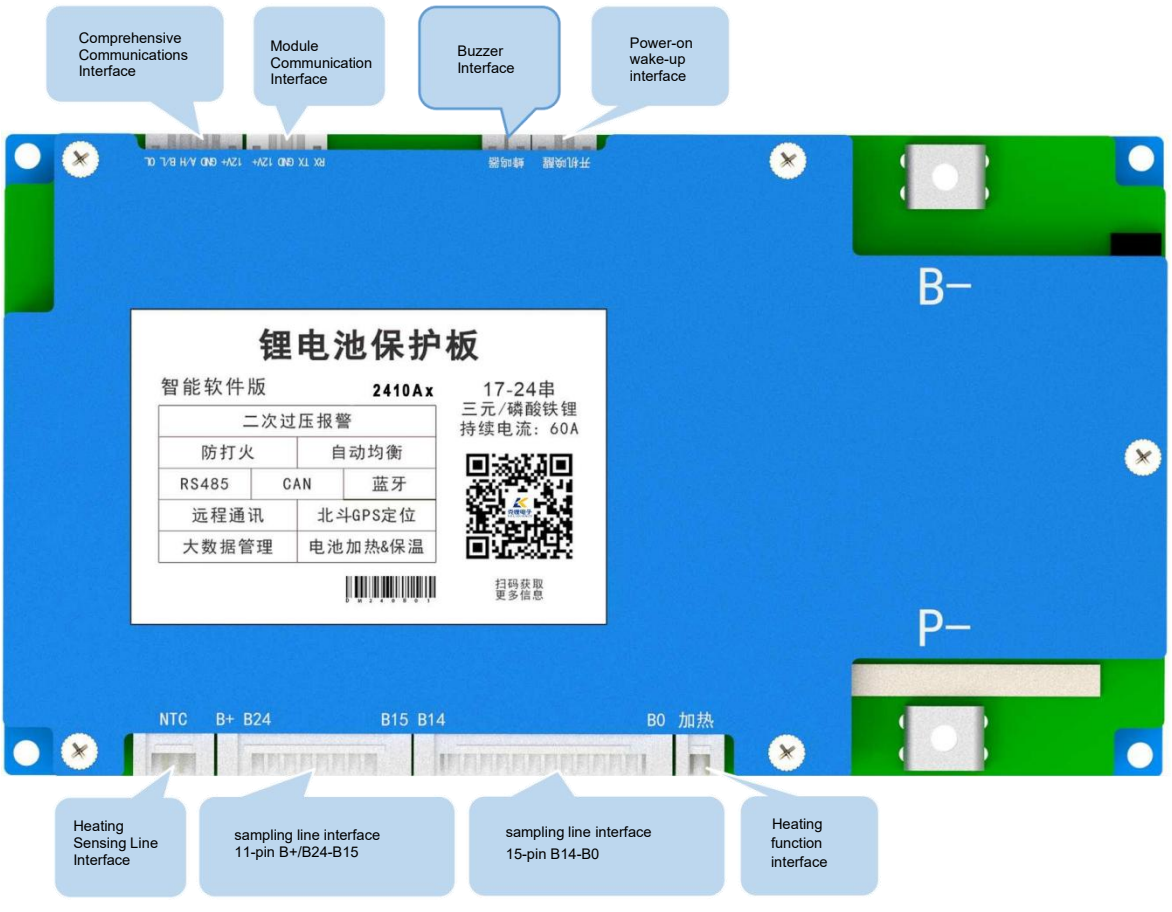
Figure 4: Dimension Diagram of the BMS Protection Board



外形尺寸：144mm*80mm*15.6mm

安装尺寸：138.5mm*74.5mm

V. Distribution of Functional Interfaces and Pin Definitions



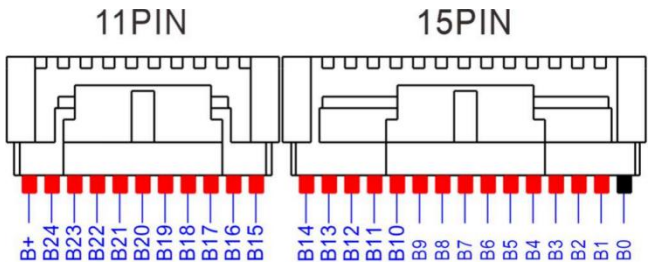
接插件详细型号说明			
接口功能	接口详细型号	接口功能	接口详细型号
综合通讯接口	PH2.0-5P	开机唤醒	PH2.0-3P
模块通讯接口	PH2.0-4P	采样排线	HY2.0-(15P+11P)
温感线 (2路)	HY2.0-4P	加热电源输出	HY2.0-2P
蜂鸣器	PH2.0-2P		

5.1 Power-on Wake-up Interface

Power-on wake-up: This activation switch allows direct power-on when the device is in deep sleep or shutdown mode. [Short-circuit the 2 pins for 2–3 seconds to activate; disconnect after power-on.- A reset- type switch is recommended: Press to turn on, release to turn off.

5.2 Sampling Line Interface

Do not tension the routing cable too tightly during installation to prevent loosening during use; seal the junction between the motherboard socket and the cable with adhesive. [Note: Never solder the cable directly onto the protection board; after completing the connection, do not plug it into the equalizer for calibration.

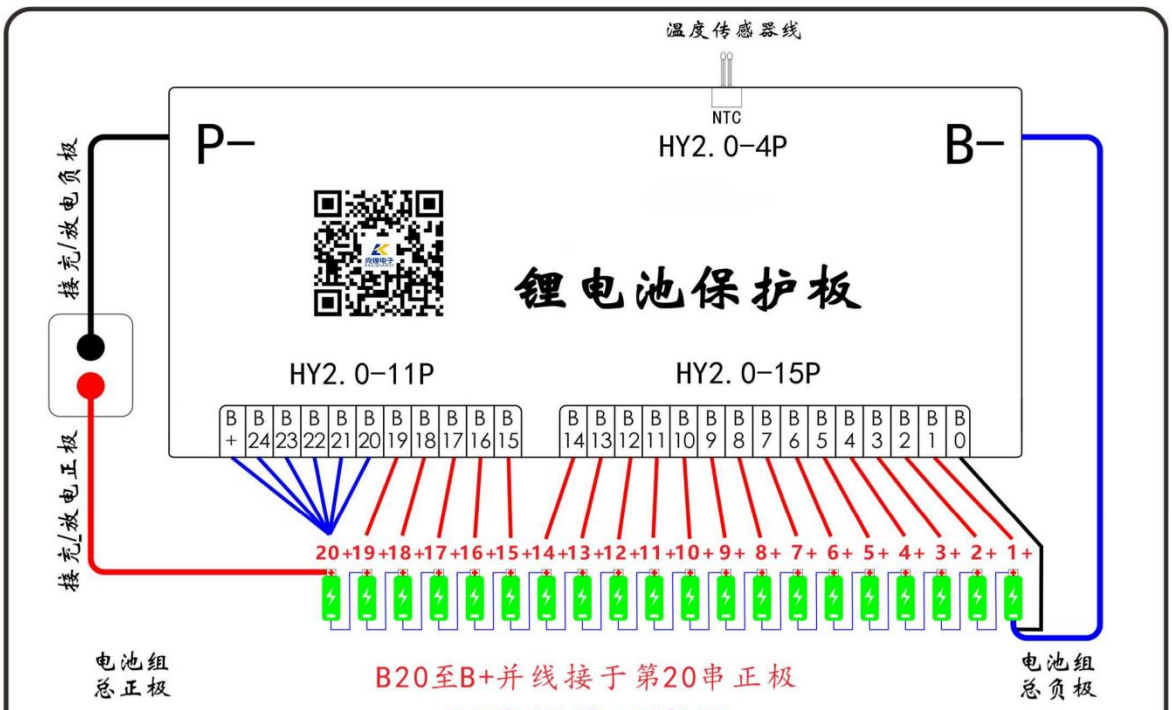


5.3 Sampling Cable Wiring Rules

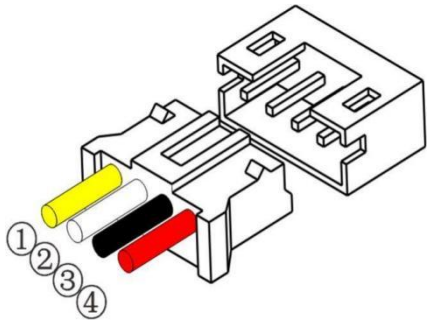
B0 is connected to the negative terminal of the first string, B1 to the positive terminal of the first string, B2 to the positive terminal of the second string, B3 to the positive terminal of the third string, and so on.The remaining sampling wires are connected in parallel to the positive terminal of the last cell string.

Example: [String 17] B17 to B+ are connected in parallel to the positive terminal of String 17; [String 18] B18 to B+ are connected in parallel to the positive terminal of String 18, and so on; [String 24] B24 to B+ are connected in parallel to the positive terminal of String 24.

The following uses 20 battery cells as an example:

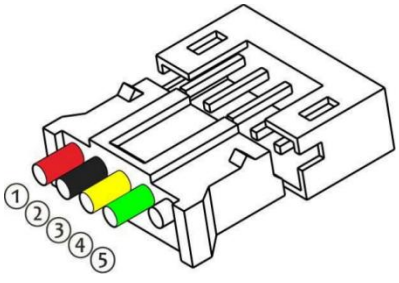


5.4 Module Communication Interface



	Pin	Defined declaration	Wiring color
Terminal mo- del PH2.0-4P	1	TX	Huang
	2	RX	White
	3	GND	Black
	4	12V+	Red

5.5 Comprehensive Communication Interface



	Pin	Defined declaration	Wiring color
Terminal model PH2.0-5P	1	12V+	Red
	2	GND	Black
	3	485A/CH	Huang
	4	485B/CL	Green
	5	OL	Do not answer

VI Wiring and Power-On

6.1 Connection Description

Warning: When connecting the protection board to the cell or removing it from the battery pack, strictly follow the specified connection sequence and procedures. Failure to adhere to these requirements may damage the components of the protection board, rendering it ineffective in protecting the cell and potentially causing severe consequences.

6.2 Steps for Connecting the Protection Board

Preparation:

First, connect the sampling busbar to the battery cell pack and verify that the connections are correct. [Important: Do not plug the busbar onto the protection board and then connect each cell individually.]

a. Connect the negative terminal B-of the battery pack;

b. Connect the negative terminal P-of the output load;

c. The sampling cable connecting the battery pack: (Insert the low-voltage cable [with black wiring] first, then insert the high-voltage cable [with red wiring])

d. Connect to the positive terminal B+ of the battery pack;

e. After installing all connecting cables, insert the charger to activate the protection board and power on the device. Ensure that the total battery voltage matches the output voltage of the protection board.

6.3 Step to Disconnect the Protection Board

a. Unplug the load or charger;

b. Unplug the B+ cable from the positive terminal of the battery pack;

c. Remove the sampling cable from the battery pack; (First remove the high-voltage cable [with red wiring], then remove the low-voltage cable [with black wiring]).

d. Disconnect the P-connected line at the negative terminal of the output load;

e. Unplug the B-connected cable from the negative terminal of the battery pack;

Special Note: During this procedure, special attention must be paid to electrostatic protection. Particular care should be taken to prevent leakage current from production soldering irons.

6.4 Starting Up

6.4.1 Newly Installed Battery Pack

First, connect all wires on the protection board according to the corresponding serial number wiring diagram above and confirm that everything is correct. If the interfaces of the newly installed battery pack protection board are exposed, activate it by powering on the device; when the red indicator light flashes, the protection board is successfully activated.

6.4.2 The Battery Pack Has Been Assembled and Sealed.

When the cell voltage falls below the protection threshold or a shutdown command is issued, causing the BMS protection board to enter shutdown mode, it must be activated through charging (with a charging current>1A) to resume normal operation. Upon successful activation, the protection board's operational status can be verified via the host computer program, mobile app, or desktop platform.

VII. Reference for Selecting the Diameter of Power Cables

Current	Wire marking	Sectional area
15A and below	14AWG	2.0mm^2
20-25A	12AWG	3.4mm^2
30-45A	10AWG	4.3mm^2
50-70A	8AWG	8.3mm^2
80A	7AWG	12mm^2
100-120A	6AWG	16mm^2

Note: The appropriate wire material must be selected based on the actual discharge current; the wire diameter should not be too small, as this may cause excessive temperature rise in the protection board during discharge, thereby compromising its performance.

8. Usage Precautions

. Before installing the protective board, the batteries should be assembled properly: the voltage difference between individual cells must be less than 0.05 V, the internal resistance difference must be below 5 mΩ, and the capacity difference must not exceed 30 mAh.

. When connecting the protection board for the first time, ensure the battery voltage is neither too high nor too low: lithium iron phosphate batteries should operate between 2.8 V and 3.4 V, while polymer batteries should be between 3 V and 4 V. An excessively high battery voltage will trigger the protection mechanism, preventing the board from functioning properly. If the battery is fully charged, reduce its voltage to the required level before connecting the protection board.

. The lead wire corresponding to the protection board B0 serves as the first wiring connection (black conductor, connected to B-). The second wire (white conductor) connects to the positive terminal of the first battery string, followed sequentially by the positive terminals of each subsequent strings until the final B+ string (red conductor, connected to B+). During soldering, the lead wires must never be inserted directly onto the protection board. All connections must be made in the specified sequence; incorrect wiring may damage the protection board or render it non-functional.

- After wiring the cables, do not insert the plug directly. Instead, test the voltage between every two adjacent metal terminals on the back of the plug, ensuring the voltage difference across each battery string is less than 0.05 V.

- For protection boards with more than 15 strings, after connecting the patch cords, ensure that the two patch cord plugs on each board are never inserted incorrectly—this will directly cause the board to burn out. Insert the low-voltage patch cord first, which contains the B-black wire, followed by the high-voltage patch cord containing the B+ red wire.

- After connecting the wires to the protection board, the total battery voltage must equal the output voltage of the protection board to confirm correct wiring; only then can charging and discharging operations be performed.

- During use, ensure that the lead terminals, soldering iron, and solder slag do not come into contact with the components on the circuit board, as this may damage the protection board.

- When welding battery leads, never connect them incorrectly or in reverse. If a connection error is detected, the circuit board may be damaged and must be retested before reuse.

- During assembly, the protective plate should not come into direct contact with the cell surface to avoid damaging the cell. The assembly must be secure and reliable.

- During the assembly of the protective plate and battery pack, do not position the aluminum heat sink close to the cell surface; otherwise, heat will transfer to the cells, compromising battery pack safety.
- After assembling the battery pack and protection board, if no voltage output is detected or charging fails during the initial power-up, verify that the wiring is correct.

- During testing, installation, use, or handling of the protective panel, appropriate anti-static measures must be implemented.

- When conducting charge-discharge tests on battery packs with protective plates installed, do not use a battery aging cabinet to measure the voltage of individual cells; doing so may damage both the protective plates and the batteries.

- This protection board lacks a 0V charging function. If the battery reaches 0V, it will experience severe degradation and eventual damage. To prevent battery failure, users should periodically recharge the battery when not in use for extended periods (for battery packs with capacities exceeding 2Ah stored for over three months). After discharge protection during use, the battery must be recharged within 12 hours to avoid complete discharge due to self-discharge.

- This protection board does not have reverse charging protection functionality. Do not connect the charging input in reverse during use, as this may damage both the protection board and the battery.

- Use a charger that complies with these specifications. Employing a charger with a DC voltage exceeding the charging port's maximum tolerance may damage the protection board; prioritize chargers featuring a trickle current shutdown function (double safety). Note: Chargers lacking this feature are designed for lead-acid batteries and are unsuitable for lithium-ion batteries.

. During use, the product must strictly adhere to the design parameters and operating conditions; values specified in this specification shall not be exceeded. Violation of these specifications may damage the protective board, thereby compromising the battery pack.

. If any abnormal situation occurs during use, stop using immediately and return the device to the manufacturer or have it repaired by a professional technician.

. It is prohibited to connect two or more protective plates in series or parallel.

. This protection board has undergone extensive reliability testing, demonstrating significantly higher reliability than conventional protection boards on the market. However, to minimize the risk of accidents, please use certified battery cells.

. The relationship between battery pack capacity and the continuous discharge current of the protection board:

. Select a protection board with a continuous discharge current matching the recommended battery pack capacity in ampere-hours (e.g., for a 50 Ah battery pack, choose a protection board with a minimum continuous discharge current of 50 A).

Note: Prolonged over-current operation may damage the protection board

IX. Revision Record Form

Edition Revision	Change Content Modified Content	Personnel Responsibility Principle	Date Date	Tab Mark	Remarks Note
V3.5	Initial Version	JVT	2025.04.9		
V3.61	1. Modification of overall dimensions 2. Modification of wiring port type and location 3. Modification of serial number adaptation 4. Modification of sampling cable wiring rules	LY	2025.8.29		