产品说明书

Product Manual

高压级联锂电池均衡保护板

High Voltage Cascaded Lithium Battery BMS Manual

适用高压级联BMS产品（继电器电流控制）

Applicable to high-voltage cascaded BMS products (relay current control)

目录

一、产品概述（Product Overview）

本公司主要产品是各类智能BMS，产品线包括适用于3-24串各类锂电池的高端均衡保护板、适用于汽车及特种车辆启动的强起板、适用于大电流场景（300A及以上）的继电器保护板、适用于高压高串数储能场景的级联保护板（继电器模块）。

Our company specializes in intelligent Battery Management Systems (BMS), offering a comprehensive product portfolio. This includes high-performance balancing protection boards for 3-24-cell lithium battery strings, high-current starting protection boards for automotive and specialized vehicles, relay protection boards for high-current applications (300A+), and cascade protection boards (relay modules) designed for high-voltage, high-cell-count energy storage systems.

同时，公司为适配不同场景，所有保护板均带双485通讯接口（支持显示屏可选、上位机通信、专用充电器）；可选CAN通信（与整车控制器/仪表等定制交互）；支持GPS/GPRS远程通信（实现平台对接和远程收费系统）。

To accommodate diverse scenarios, all protection boards feature dual 485 communication interfaces (supporting optional display modules, host computer communication, and dedicated chargers), optional CAN communication (for customized interaction with vehicle controllers/instrument clusters), and GPS/GPRS remote communication (enabling platform integration and remote billing systems).

（二）产品核心卖点(Core Selling Points of the Product)

2.1、超高串数The number of ultra-high voltage series connections

级联BMS，设有一个主控机(Main Controller,5-16S)，可搭配从控机(Slave Controller,5-16S)，一个主机最多可支持8-16个从控机，即可适配于48V-1024V的高压储能站、电车外置备用电池等使用。

The cascaded battery management system (BMS) features a main controller (5-16S) that can be paired with slave controllers (5-16S), supporting up to 8-16 slave units per host. This configuration is ideal for high-voltage energy storage stations (48V-1024V) and external backup batteries for electric vehicles.

2.2、超强休眠模式super hibernation mode

本BMS已配置强休眠模式，如检测到电芯已经低于放电时效电压，将自动进入强休眠模式，运行功耗将降为0，可有效避免电芯因BMS自身运行出现亏电损坏。

This battery management system (BMS) is equipped with a deep sleep mode. When the cell voltage falls below the discharge threshold, it automatically enters deep sleep mode, reducing power consumption to zero. This effectively prevents battery damage caused by the BMS's own operation.

2.3、支持CAN通讯Supports CAN communication

BMS除常规的485通讯外，支持CAN通讯，具有丰富的扩展通讯性能。

In addition to standard 485 communication, the BMS supports CAN communication and offers extensive communication expansion capabilities.

2.4、可选配加热功能Heating function is optional

BMS预留弱电加热功能模块，通过温控感应电池环境温度，启动外部加热板，从而确保BMS在低温环境下正常工作。客户可依据需求定制该功能；

The BMS features a built-in low-voltage heating module that detects ambient temperature and activates an external heating plate, ensuring stable operation in cold environments. This function can be customized to meet specific requirements.

（三）产品选择指引Product Selection Guide

3.1、电芯类型确定Determination of cell type

电池类型确认：钛酸锂电池标称电压是2.4V，满电电压是2.8V；

磷酸铁锂的标称电压是3.2V，满电电压为3.7V；

三元锂电池标称电压是3.7V，满电电压是4.2V;

Battery type verification: The nominal voltage of lithium titanate batteries is 2.4V with a full charge voltage of 2.8V; lithium iron phosphate batteries have a nominal voltage of 3.2V and a full charge voltage of 3.7V; ternary lithium batteries feature a nominal voltage of 3.7V and a full charge voltage of 4.2V.

3.2、电池串数确认：Battery string confirmation

电池总电压范围（电压向下兼容），一般需求总电压或者电池总电压 / 电池标称≈电池串联数量=需求BMS串数； The battery's total voltage range (with backward compatibility) is determined by the following relationship: the total voltage or the ratio of the battery's total voltage to its nominal voltage equals the number of series-connected batteries, which corresponds to the required number of BMS series.

3.3、电流确认：Current confirmation

3.3.1 功率确认法：正常工作功率/电池总电压=正常工作电流*1.2=持续电流（建议预留一定冗余量）；Power confirmation method: Normal operating power divided by the total battery voltage equals the normal operating current multiplied by 1.2, yielding the continuous current (it is recommended to reserve a certain amount of redundancy).

3.3.2、电池组容量确认法：建议电池组容量多少安时，就选用持续放电电流为多少安的保护板。

Battery pack capacity verification method: Select a protection board with a continuous discharge current matching the recommended battery pack capacity in ampere-hours.

（例如：50AH的电 池组要选择持续放电电流至少为50A的保护板）。

For example, a 50AH battery pack requires a protection board with a continuous discharge current of at least 50A.

注：长时间的超电流工作，会损坏保护板的。

Note: Prolonged overcurrent operation may damage the protection board.

二、使用注意事项Usage Notes

（一）安装前注意事项Pre-installation Notes

1.1、安装保护板之前，电池一定要匹配好，每节电池电压相差低于0.05V，内阻相差低于5mΩ，容量相差低于30mAh。Before installing the protective board, ensure the batteries are properly matched: voltage difference per cell below 0.05V, internal resistance difference below 5mΩ, and capacity difference below 30mAh.

1.2、初次连接保护板，电池电压不要太高也不要太低，铁锂电池在2.8到3.4V之间，聚合物 电池在3V到4V之间。 When connecting the protection board for the first time, ensure the battery voltage is neither too high nor too low. Lithium iron phosphate batteries typically operate between 2.8V and 3.4V, while polymer batteries range from 3V to 4V.

1.3、电池电压太高会触发保护，导致保护板无法正常工作。如果电池已经充满，请放低至要求电压后再连接保护板。The battery voltage is too high, triggering the protection and causing the protection board to fail. If the battery is fully charged, lower it to the required voltage before connecting the protection board.

（二）电压采集线接线注意事项Precautions for wiring voltage acquisition lines

2.1、保护板B-对应的那条排线为接线的第一条排线，第2根线也是B-线，从第三号针开始连接第1串电池正极，后面依次连接每一串电池的正极，直到最后一串B+（接B16+）。The wire corresponding to the B-protection board serves as the first connection wire. The second wire is also designated as B-. Starting from the third pin, connect the positive terminals of the first battery string, then sequentially connect the positive terminals of each subsequent battery string until the final B+ string (connected to B16+).

焊排线时排线切不可插在保护板上面去焊接。接线一定要按照顺序去接，排线接错，可能会导致保护板烧坏和无法正常工作。Never insert the wire harness into the protective panel for welding. Always

connect the wires in the correct sequence, as incorrect wiring may cause the protective panel to burn out or malfunction.

2.2、排线接好后，插头不要直接插入，要测试插头背面每2个相邻金属端子间的电压，注意确认每串电池电压相差要低于0.05V。After wiring, avoid direct insertion of the plug. Instead, test the voltage between every two adjacent metal terminals on the back of the plug, ensuring the voltage difference between each battery string is less than 0.05V.

2.3、保护板接好线之后，电池总电压与保护板输出电压相等，才代表接线正确，此时才可以进行充放电使用。After the protective board is properly wired, the battery's total voltage must equal the output voltage of the board to confirm the wiring is correct. Only then can the device be charged and discharged.

2.4、使用中注意引线头、电烙铁、锡渣等不要碰到电路板上的元器件，否则易损坏保护板。When using, avoid letting the lead end, soldering iron, or solder residue touch the components on the circuit board, as this may damage the protective board.

（三）外部接线注意事项（特别注意）External Wiring Notes (Special Note)

3.1、应在所有插头都不插在板子上的时候，接好相关线束。Connect all relevant wiring harnesses when no plugs are plugged into the board.

3.2、确认接线无误后，在开关KEY断开情况下，依次插入BMS主控接线及分控接线。After confirming the wiring is correct, sequentially connect the BMS main control and sub-control wiring while keeping the KEY switch disconnected.

接线顺序为：The wiring sequence is

（1）主控机：依次插入MC-1\MC-2\MC-3\MC-4\MC-5\MC-6接口；

Main control unit: sequentially connect the MC-1/MC-2/MC-3/MC-4/MC-5/MC-6 interfaces;

（2）分控机：依次插入SC-1\SC-2\SC-3接口；The controller is inserted into the SC-1/SC-2/SC-3 interface in sequence.

3.3、连接上位机软件或者蓝牙APP查看或者修改参数；Connect to the host computer software or Bluetooth app to view or modify parameters.

注意：pay attention

（1）、禁止开关闭合情况下插拔接插件，否则带电插拔会引起板子故障或者失效；Do not insert or remove connectors when the switch is closed, as live insertion or removal may cause board failure or malfunction.

（2）、务必确认线束定义和实际必须符合预期，否则会造成板子失效。Ensure the harness definition and actual configuration meet the expected specifications, otherwise the board may fail.

（四）安装连接说明注意事项Installation and connection instructions

4.1、警告warning

把保护板连接至电芯，或从电池组拆下保护板时，必须遵守以下连接顺序与规定。如果不按要求的顺序作业，会损坏保护板的元器件，从而导致保护板不能保护电芯，造成严重的后果。When connecting the protection board to the cell or removing it from the battery pack, you must follow the specified connection sequence. Failure to follow the required sequence may damage the protection board's components, rendering it ineffective and causing serious consequences.

4.2、连接保护板的步骤The steps to connect the protective board

1）焊接电池组的负极B-；Weld the battery pack's negative terminal B-;

2）焊接输出负载的负极P-；The welding output load is negative electrode P-;

3）连接电池组的采样排线；The sampling busbar connecting the battery pack;

4）所有连接线安装好，保护板开机，确认电池总电压与保护板输出电压相等；After all connection cables are installed, power on the protection board and verify that the battery's total voltage matches its output voltage.

4.3、断开保护板的步骤 Steps to disconnect the protection board

1）断开负载或者充电器； Disconnect the load or charger;

2）拔下电池组的采样排线； Disconnect the battery pack's sampling busbar;

3）断开输出负载负极的P-连接线；Disconnect the P-wire from the negative output load terminal;

4）断开电池组负极的B－连接线； Disconnect the B-connector from the battery pack's negative terminal;

特别说明：在此环节中要注意静电的防护，特别要注意生产用的烙铁漏电问题。

Special note: During this process, special attention must be paid to electrostatic protection, particularly to potential leakage issues in production-grade soldering irons.

（五）使用中注意事项Precautions during use

5.1、在测试、安装、使用、接触该保护板时，需做好相应的防静电措施。When testing, installing, using, or handling the protective panel, appropriate anti-static measures must be taken.

5.2、在对装好保护板的电池组进行充放电测试时，请不要使用电池老化柜对电池组各节电池电压进行测量，否则有可能损坏保护板和电池。When performing charge-discharge tests on battery packs with protective panels installed, do not use the battery aging cabinet to measure individual cell voltages, as this may damage both the protective panels and the batteries.

5.3、本保护板没有0V充电功能，电池一旦出现0V的情况下，电池将严重退化直至损坏，为了不损坏电池，用户在长期（电池组容量大于2AH，储存超过3个月）不使用时请定期充电补充电量，在使用过程中放电保护后，须在12小时内及时充电，防止电池因自耗电而放电至0V。This protection board lacks 0V charging capability. If the battery reaches 0V, it will degrade severely and eventually

fail. To prevent battery damage, users should recharge the battery periodically when not in use for extended periods (battery pack capacity>2AH, storage over 3 months). After discharge protection during use, recharge the battery within 12 hours to prevent self-discharge to 0V.

5.4、本保护板未配置反充电保护功能，使用时不可将充电输入反接，否则可能损坏保护板和电池。This protection board lacks reverse charging protection. Do not reverse the charging input during use, as this may damage both the board and the battery.

5.5、请使用符合本规格书规定的充电器，如使用高于充电口最高可承受的直流电压的充电器，易造成保护板损坏，充电器应优先选择具备充电电流末端涓流关闭功能的产品（双保险）。Use chargers compliant with this specification. Employing chargers exceeding the charging port's maximum DC voltage may damage the protection board. Prioritize chargers with trickle-cutoff functionality at the charging current terminal (double protection).

特别说明：注意不具备涓流关闭功能的充电器是为铅酸电池设计的，不适合锂电池使用。Important note: Note that chargers without trickle shut-off function are designed for lead-acid batteries and are not suitable for lithium batteries.

5.6、产品使用过程中一定要遵循设计参数及使用条件，不得超过本规格书中的值；如违反规格书，易损坏保护板，进而损坏电池组。During product operation, all design parameters and usage conditions must be strictly observed, and no values exceeding those specified in this specification shall be exceeded. Violation of these specifications may cause the protective board to be damaged, potentially leading to battery pack failure.

5.7、使用过程中如出现异常情况，请立即停止使用，送回原厂或请专业维修人员进行维修。If any abnormal situation occurs during use, stop immediately and return to the original manufacturer or have it repaired by a professional technician.

本保护板已经做了大量的可靠性试验，可靠性远远高于市面上的一般保护板，为尽可能地减少事故的发生，请使用合格的电芯。This protection board has undergone extensive reliability testing, demonstrating significantly higher reliability than standard market products. To minimize potential incidents, we recommend using certified battery cells.

三、产品功能综述 Product Function Overview

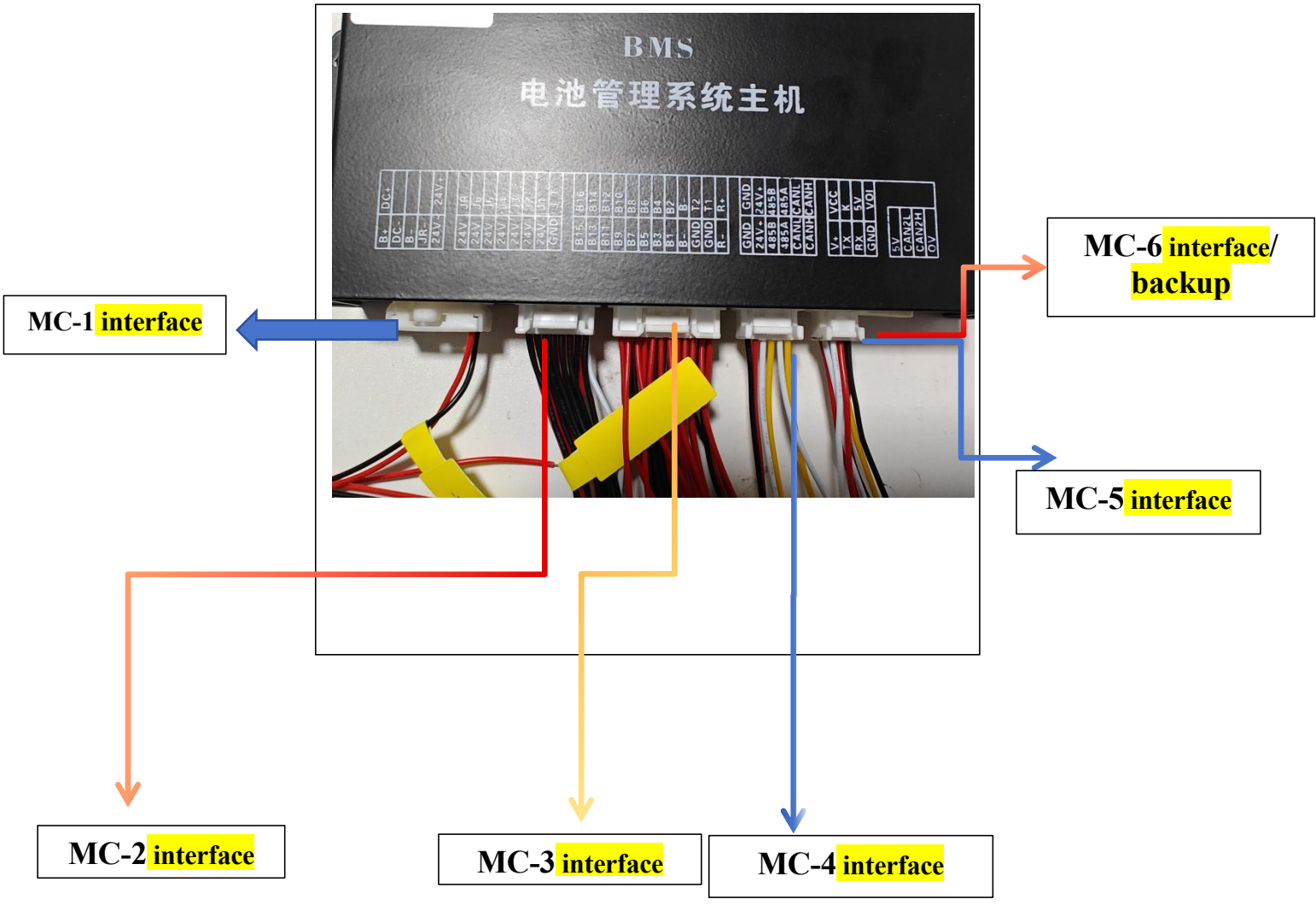
（一）产品接口说明及定义功能特性Product interface specifications and defined functional features

接口简述Brief Introduction to the Interface

配件名称 Accessory name	使用/接线说明Usage and Wiring Instructions
主控机（Main Controller）	
MC-1接线	外接12V直流电源External 12V DC power supply
MC-2接线	继电器温控、充电、放电、预充、二次保护继电器及弱电加热信号线Relays for temperature control, charging, discharging, pre-charging, secondary protection, and low-voltage heating signal lines
MC-3接线	分流器、电芯温度、电池电压采集线Splitter, cell temperature, and battery voltage acquisition lines
MC-4接线	主控及分控CAN通讯、上位机（485A/B)、分控供电接线Main control and sub-control CAN communication, host computer (485A/B), and sub-control power supply wiring
MC-5接线	UART接线、显示屏、蜂鸣器、外置弱电开关接线UART wiring, display, buzzer, and external low-voltage switch wiring
MC-6接线	对外CAN通讯接线External CAN communication wiring
从控机(Slave Controller）	
SC-1接线	电芯温度、电池电压采集线Collection lines for cell temperature and battery voltage
SC-2接线	CAN通讯、上位机（485A/B)、分控供电接线CAN communication, host computer (485A/B), and distributed power supply wiring
SC-3接线	备用-CAN通讯、上位机（485A/B)、分控供电接线Backup CAN communication, host computer (485A/B), and distributed power supply wiring

（二）主控机：MC-1\MC-2\MC-3\MC-4\MC-5\MC-6接口Main Control Unit:

Interface of MC-1, MC-2, MC-3, MC-4, MC-5, and MC-6

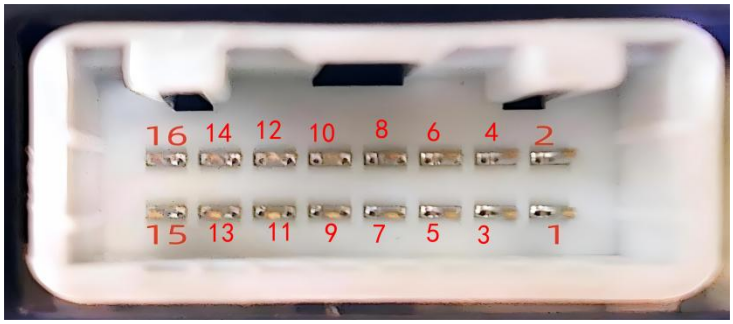


各接口定义Definitions of each interface

（1）MC-1接口:主控接外置12V电源使用。MC-1 interface: The main controller is powered by an external 12V power supply.

MC-1 interface		
序号NO.	主机面板标识 Host panel identifier	外部接线 external wiring
1	24V-	供电12V-
2	24V+	供电12V+
3	JR-	/
4		/
5	B-	/
6	DC-	/
7	B+	/
8	DC+	/

（2）MC-2接口：外置充放电继电器、温度、加热功能接线MC-2 Interface: External Charging and Discharging Relay, Temperature and Heating Function Wiring



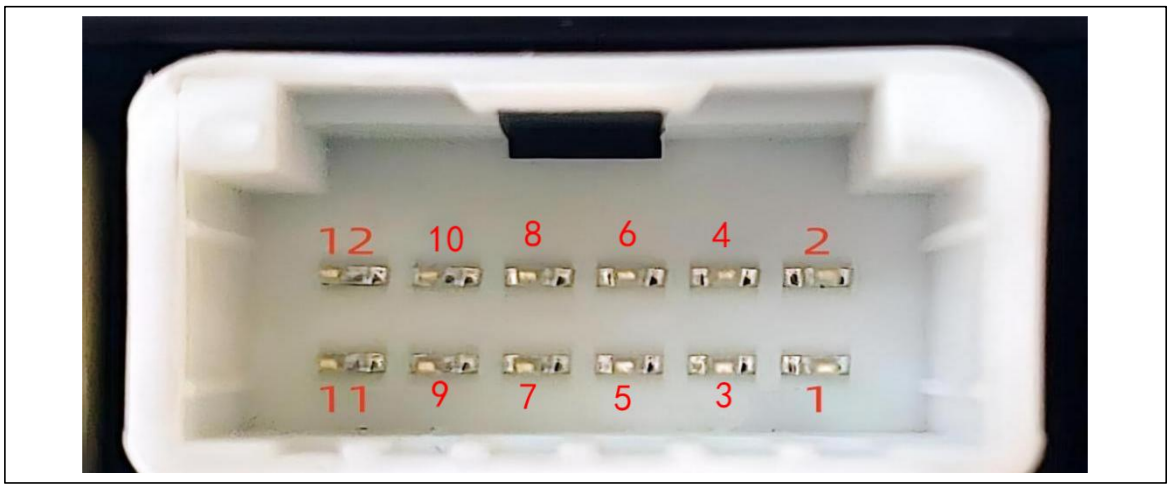
MC-2 interface			
序号NO.	主机面板标识 Host panel identifier	外部接线 external wiring	备注说明 Notes
1	GND	继电器温控Relay temperature control	不区分正负极No distinction between positive /negative
2	J_T	继电器温控Relay temperature control	
3	24V	继电器放电+Relay discharge +	依据继电器正负极确认 Based on the confirmation of the positive and negative poles of the relay
4	J1	继电器放电-Relay discharge -	
5	24V	继电器预充+Relay precharge +	
6	J2	继电器预充-Relay precharge -	
7	24V	继电器充电+Relay charging +	
8	J3	继电器充电-Relay charging -	
9	24V	二次保护 + Secondary protection +	
10	J4	二次保护 -Secondary protection -	
11	24V		
12	J5		
13	24V		
14	J6		
15	24V	加热heat	Customizable heating function
16	JR	加热heat	

（3）MC-3接口：分流器、电芯温度、电压采集线接口MC-2 Interface: External Charging and Discharging Relay, Temperature and Heating Function Wiring

MC-3 interface			
序号NO.	主机面板标识 Host panel identifier	外部接线 external wiring	备注说明 Notes
1	R-	分流器输入diverger input	不区分正负极 No distinction between positive and negative electrodes
2	R+	分流器输出divergent output	
3	GND	温度1temperature 1	
4	T1	温度1temperature 1	
5	GND	温度2temperature 2	
6	T2	温度2temperature 2	
7	B-	分流器输入diverger input	Parallel to Pin 1
8	B-	电池总负极B-	/
9	B1	第1节电芯正极+B1+	/
10	B2	第2节电芯正极+B2+	/
11	B3	第3节电芯正极+B3+	/
12	B4	第4节电芯正极+B4+	/
13	B5	第5节电芯正极+B5+	/
14	B6	第6节电芯正极+B6+	/
15	B7	第7节电芯正极+B7+	/
16	B8	第8节电芯正极+B8+	/
17	B9	第9节电芯正极+B9+	/
18	B10	第10节电芯正极+B10+	/
19	B11	第11节电芯正极+B11+	/
20	B12	第12节电芯正极+B12+	/
21	B13	第13节电芯正极+B13+	/
22	B14	第14节电芯正极+B14+	/

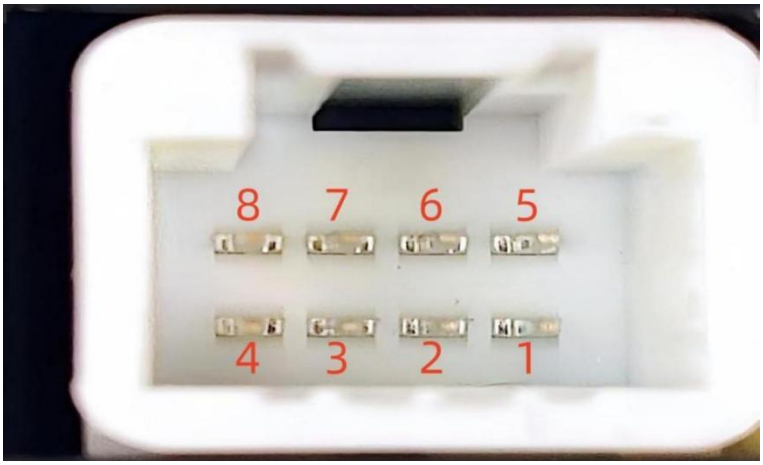
23	B15	第15节电芯正极+B15+	/
24	B16	第16节电芯正极+B16+	/

（4）MC-4接口：内部CAN通讯、RS485、分控供电接口interface: internal CAN communication, RS485, and distributed power supply interface



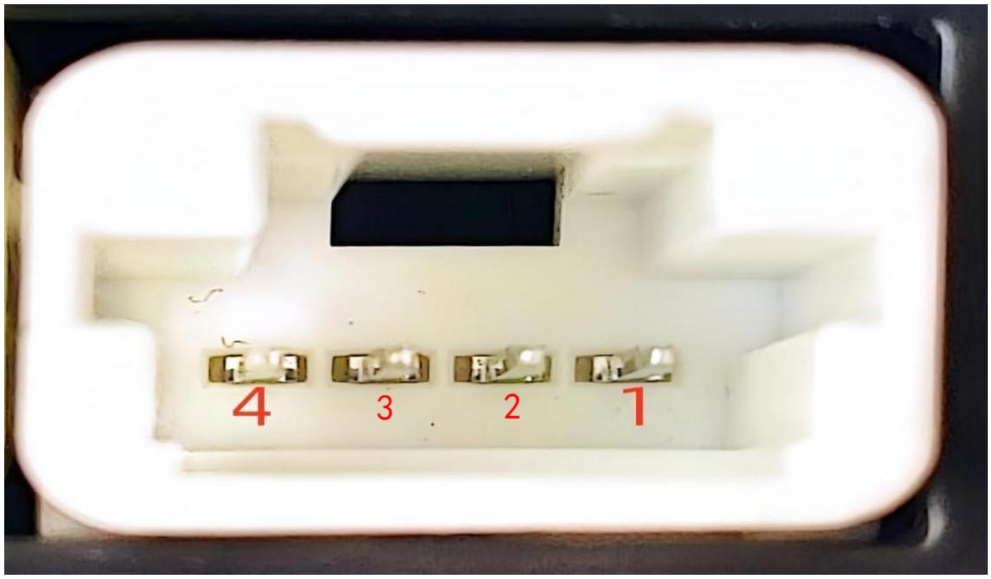
MC-4 **interface**			
序号NO.	主机面板标识 Host panel identifier	外部接线 external wiring	备注说明 Notes
1	CANH	接分机CAN高	任一即可 Either one will do
2	CANH	接分机CAN高	
3	CANL	接分机CAN低	
4	CANL	接分机CAN低	
5	485A	备用reserve	可依据需求，定制为上位机接口Can be customized as a host computer interface based on requirements
6	485A	备用reserve	
7	485B	备用reserve	
8	485B	备用reserve	
9	24V+	12V-24V主控供电正极 Power supply positive	任选一组可为分控机供电 Select any group to power the sub-controller
10	24V+	12V-24V主控供电正极 Power supply positive	
11	GND	12V-24V主控供电负极 Power supply negative	
12	GND	12V-24V主控供电负极 Power supply negative	

（5）MC-5 接口：UART 通讯、蜂鸣器、弱电开关接口 Interface: UART Communication, Beezer, and Low Voltage Switch Interface



MC-5 interface			
序号NO.	主机面板标识 Host panel identifier	外部接线 external wiring	备注说明 Notes
1	GND	TTL地TTL the earth	可依据需求，定制为LED屏或断码屏等It can be customized as LED screens or custom code displays based on requirements.
2	RX	TTL RX	
3	TX	TTL TX	
4	V+	往外部供电external power supply	
5	VIO	蜂鸣器 -buzzer -	No distinction between positive and negative electrodes
6	5V	蜂鸣器 +buzzer -	
7	K	弱电开关Switch	Can be customized as an external switch
8	VCC	弱电开关Switch	

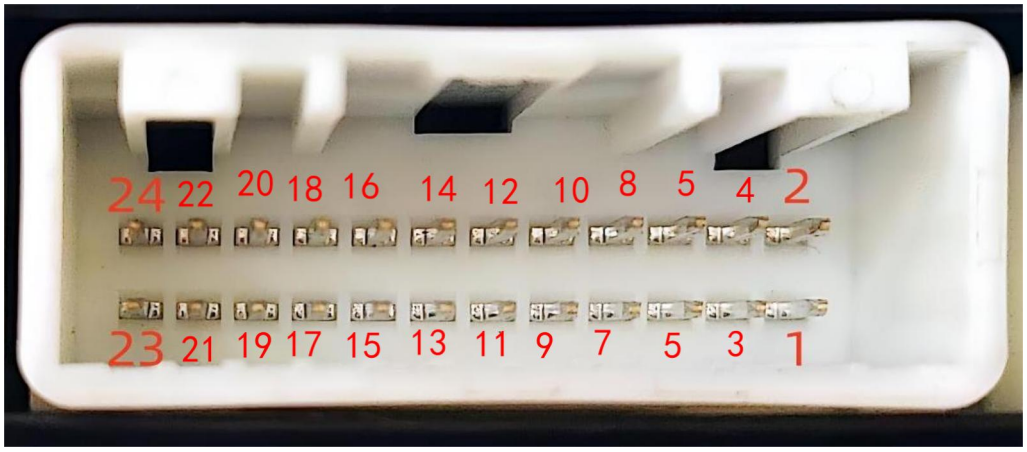
（6）MC-6接口：外部CAN通讯接口-备用External CAN Communication Interface (Backup)



MC-6 interface			
序号NO.	主机面板标识 Host panel identifier	外部接线 external wiring	备注说明 Notes
1	0V	外部供电 -External power supply-	可依据需求，定制为外部通讯接口You can customize it as an external communication interface based on your needs.
2	CAN2H	CAN高	
3	CAN2L	CAN低	
4	5V	外部5V供电 +External 5V power supply +	

（三）分控机subcontrol unit：SC-1\SC-2\SC-3\SC-4接口interface

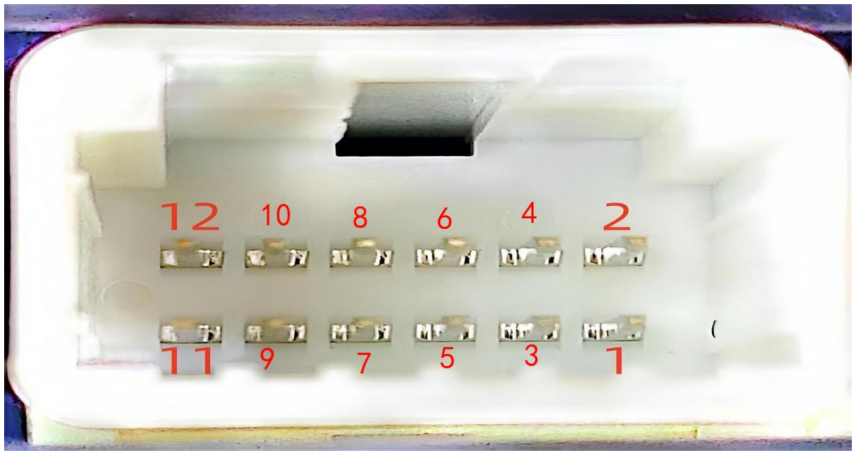
（1）SC-1接口:电芯温度、电芯电压采集线接口 for cell temperature and voltage acquisition



SC-1 Interface			
序号NO.	主机面板标识 Host panel identifier	外部接线 external wiring	备注说明 Notes
1	GND	温度1temperature 1	一般设置2路温度监测 Two-channel temperature monitoring is generally set up.
2	T0	温度1temperature 1	
3	GND	温度2temperature 2	
4	T1	温度2temperature 2	
5	GND	温度3temperature 3	
6	T2	温度3temperature 3	
7	B-	分机电池总负极B-	分控机电池总负极The total negative electrode of the battery in the control unit
8	B1-	分机电池总负极B-	
9	B1+	第1节电芯正极+B1+	/
10	B2+	第2节电芯正极+B2+	/
11	B3+	第3节电芯正极+B3+	/
12	B4+	第4节电芯正极+B4+	/
13	B5+	第5节电芯正极+B5+	/
14	B6+	第6节电芯正极+B6+	/
15	B7+	第7节电芯正极+B7+	/
16	B8+	第8节电芯正极+B8+	/
17	B9+	第9节电芯正极+B9+	/
18	B10+	第10节电芯正极+B10+	/
19	B11+	第11节电芯正极+B11+	/
20	B12+	第12节电芯正极+B12+	/

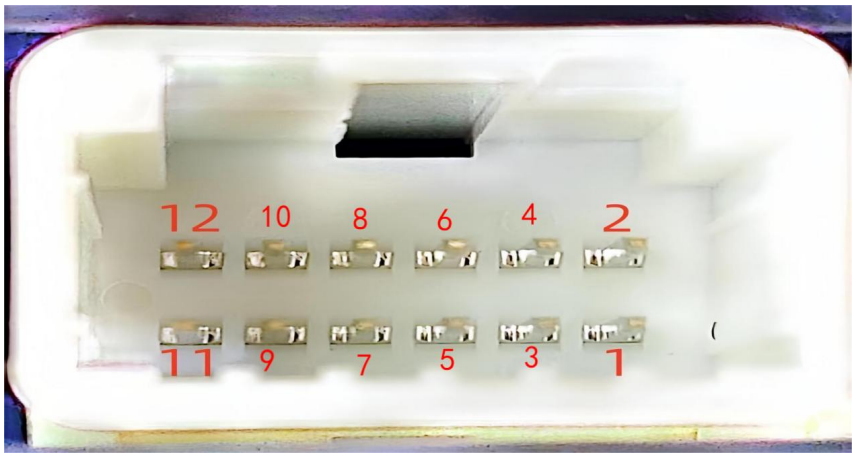
21	B13+	第13节电芯正极+B13+	/
22	B14+	第14节电芯正极+B14+	/
23	B15+	第15节电芯正极+B15+	/
24	B16+	第16节电芯正极+B16+	/

（2）SC-2接口:内部CAN通讯、下一级分控机供电、外接RS485接口Enables internal CAN communication, powers the next-level sub-controller, and supports external RS485 interface



SC-2 interface			
序号NO.	主机面板标识 Host panel identifier	外部接线 external wiring	备注说明 Notes
1	CANH	接分机CAN高	
2	CANH	接分机CAN高	
3	CANL	接分机CAN低	
4	CANL	接分机CAN低	
5	485A	备用reserve	
6	485A	备用reserve	
7	485B	备用reserve	
8	485B	备用reserve	
9	24V+	12V-24V主控供电正极 Power supply positive	
10	24V+	12V-24V主控供电正极 Power supply positive	
11	GND	12V-24V主控供电负极 Power supply negative	
12	GND	12V-24V主控供电负极 Power supply negative	

（3）SC-3接口:备用通讯接口



SC-3 interface			
序号NO.	主机面板标识 Host panel identifier	外部接线 external wiring	备注说明 Notes
1	CANH	接上级CAN高	任一即可 Either one will do
2	CANH	接上级CAN高	
3	CANL	接上级CAN低	任一即可 Either one will do
4	CANL	接上级CAN低	
5	485A	备用reserve	可依据需求，定制为上位机接口 Can be customized as a host computer interface based on requirements
6	485A	备用reserve	
7	485B	备用reserve	
8	485B	备用reserve	
9	24V+	12V-24V分控供电power supply	任选一组可为分控机供电Select any group to power the sub-controller
10	24V+	12V-24V分控供电power supply	
11	24V-	12V-24V分控供电power supply	
12	24V-	12V-24V分控供电power supply	

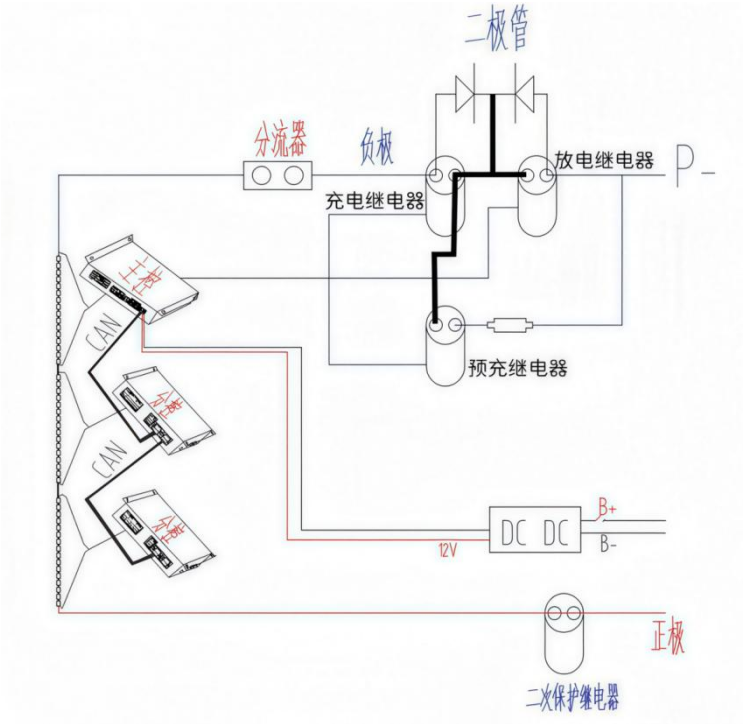
（三）接线说明Wiring Instructions

1、级联BMS外部接线说明Description of the external wiring for the cascaded BMS

根据不同的实际应用场景，BMS的电控部分有不同的接法，具体使用之前务必和技术对接好，否则滥用或破坏板子或者电池组，甚至造成安全性事件的发生。Depending on specific application scenarios, the BMS's electronic control system may require different wiring configurations. Always consult technical experts before implementation to prevent misuse or damage to circuit boards and battery packs, which could lead to safety incidents.

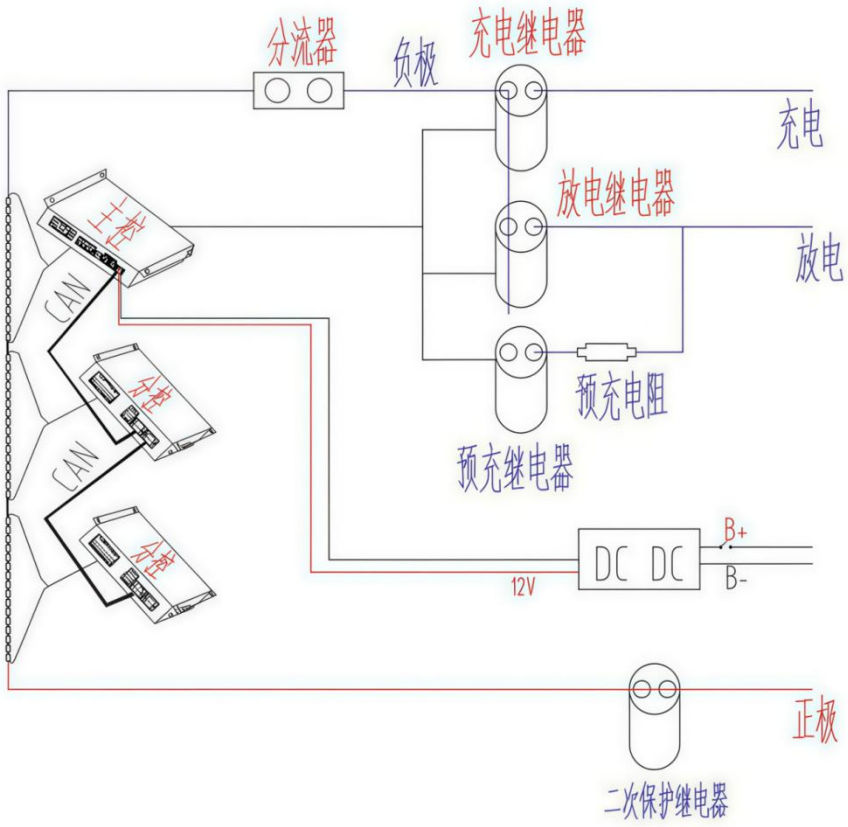
1.1、同口接法（同一个继电器充放电）Same-port connection method (using the same relay for charging and discharging)

同口接法为充放继电器都串在一条正极线上，通常适用于储能或者特殊需要电池输入只有一个正极负极的情况下：The common connection method involves series-connection of charging and discharging relays on a single positive terminal, typically used in energy storage systems or when batteries require only one positive and negative terminal for input.



1.2、分口接法（区分充电、放电继电器）Split-port connection method (distinguishing charging and discharging relays)

分口接法为充电和放电继电器各自控制一个正极输出，通常适用于车用电池，但是充电口不能用于放电，不能从放电口充电。The split-port method is used for charging and discharging relays to control a positive output respectively, which is usually applied to the vehicle battery, but the charging port cannot be used for discharging, and the discharging port cannot be used for charging.



2、BMS电压采集线接法How to connect the voltage acquisition line of BMS

2.1、特别说明

(1)无论是主控机还是分控机，电池必须大于5串，否则无法正常工作。Both the main control unit and sub-control units require at least 5 battery strings; otherwise, they will fail to operate properly.

(2)继电器需选择12V线圈电压版本。The relay must be selected with a 12V coil voltage version.

2.2、不同电池串数采集线接线说明——不区分主控机分控机 Instructions for connecting collection lines of different battery series numbers-without distinguishing between main control units and sub-control units

（1）16/15串电池series battery

MC1/SC-1 interface				
针号 pin order	16串电池16S		15串电池15S	
	面板标识Panel Identification	电池接线处 Battery wiring	面板标识Panel Identification	电池接线处 Battery wiring
7	B-	电池总负极B-	B-	电池总负极B-
8	B1-		B1-	
9	B1+	B1+	B1+	B1+
10	B2+	B2+	B2+	B2+
11	B3+	B3+	B3+	B3+
12	B4+	B4+	B4+	B4+
13	B5+	B5+	B5+	B5+
14	B6+	B6+	B6+	B6+
15	B7+	B7+	B7+	B7+
16	B8+	B8+	B8+	B8+
17	B9+	B9+	B9+	B9+
18	B10+	B10+	B10+	B10+
19	B11+	B11+	B11+	B11+
20	B12+	B12+	B12+	B12+
21	B13+	B13+	B13+	B13+
22	B14+	B14+	B14+	B14+
23	B15+	B15+	B15+	B15+
24	B16+	B16+	B16+	

（2）14/13串电池接法battery connection method

MC1/SC-1 interface				
插针序号 Pin order	14串电池14S		13串电池13S	
	面板标识 Panel Identification	电池接线处 Battery wiring	面板标识Panel Identification	电池接线处 Battery wiring
7	B-	电池总负极B-	B-	电池总负极B-
8	B1-		B1-	
9	B1+	B1+	B1+	B1+
10	B2+	B2+	B2+	B2+
11	B3+	B3+	B3+	B3+
12	B4+	B4+	B4+	B4+
13	B5+	B5+	B5+	B5+
14	B6+	B6+	B6+	B6+
15	B7+	B7+	B7+	B7+
16	B8+	B8+	B8+	B8+
17	B9+	B9+	B9+	B9+
18	B10+	B10+	B10+	B10+
19	B11+	B11+	B11+	B11+
20	B12+	B12+	B12+	B12+
21	B13+	B13+	B13+	B13+
22	B14+	B14+	B14+	不接No Connectinon
23	B15+	不接No Connectinon	B15+	
24	B16+	B14+	B16+	B13+

（3）12/11串电池接法battery connection method

插针序号 Pin order	12串电池12S		11串电池11S	
	面板标识Panel Identification	电池接线处 Battery wiring	面板标识Panel Identification	电池接线处 Battery wiring
7	B-	电池总负极B-	B-	B1+
8	B1-		B1-	
9	B1+	B1+	B1+	B2+
10	B2+	B2+	B2+	B3+
11	B3+	B3+	B3+	B4+
12	B4+	B4+	B4+	B5+
13	B5+	B5+	B5+	B6+
14	B6+	B6+	B6+	B7+
15	B7+	B7+	B7+	B8+
16	B8+	B8+	B8+	B9+
17	B9+	B9+	B9+	B10+
18	B10+	B10+	B10+	B1+
19	B11+	B11+	B11+	B11+
20	B12+	B12+	B12+	不接No Connectinon
21	B13+	不接No Connectinon	B13+	
22	B14+		B14+	
23	B15+		B15+	
24	B16+	B12+	B16+	B11+

（4）10/9串电池接法battery connection method

MC1/SC-1 interface				
插针序号 Pin order	10串电池10S		9串电池9S	
	面板标识Panel Identification	电池接线处 Battery wiring	面板标识Panel Identification	电池接线处 Battery wiring
7	B-	电池总负极B-	B-	电池总负极B-
8	B1-		B1-	
9	B1+	B1+	B1+	B1+
10	B2+	B2+	B2+	B2+
11	B3+	B3+	B3+	B3+
12	B4+	B4+	B4+	B4+
13	B5+	B5+	B5+	B5+
14	B6+	B6+	B6+	B6+
15	B7+	B7+	B7+	B7+
16	B8+	B8+	B8+	B8+
17	B9+	B9+	B9+	B9+
18	B10+	B10+	B10+	不接No Connectinon
19	B11+	不接No Connectinon	B11+	
20	B12+		B12+	
21	B13+		B13+	
22	B14+		B14+	
23	B15+		B15+	
24	B16+	B10+	B16+	B9+

（5）8/7串电池接法battery connection method

MC1/SC-1 interface				
插针序号 Pin order	10串电池10S		9串电池9S	
	面板标识Panel Identification	电池接线处 Battery wiring	面板标识Panel Identification	电池接线处 Battery wiring
7	B-	电池总负极B-	B-	电池总负极B-
8	B1-		B1-	
9	B1+	B1+	B1+	B1+
10	B2+	B2+	B2+	B2+
11	B3+	B3+	B3+	B3+
12	B4+	B4+	B4+	B4+
13	B5+	B5+	B5+	B5+
14	B6+	B6+	B6+	B6+
15	B7+	B7+	B7+	B7+
16	B8+	B8+	B8+	不接No Connectinon
17	B9+	不接No Connectinon	B9+	
18	B10+		B10+	
19	B11+		B11+	
20	B12+		B12+	
21	B13+		B13+	
22	B14+		B14+	
23	B15+		B15+	
24	B16+	B8+	B16+	B7+

（4）6/5串电池接法battery connection method

MC1/SC-1 interface				
插针序号 Pin order	6串电池6S		5串电池5S	
	面板标识Panel Identification	电池接线处 Battery wiring	面板标识Panel Identification	电池接线处 Battery wiring
7	B-	电池总负极B-	B-	电池总负极B-
8	B1-		B1-	
9	B1+	B1+	B1+	B1+
10	B2+	B2+	B2+	B2+
11	B3+	B3+	B3+	B3+
12	B4+	B4+	B4+	B4+
13	B5+	B5+	B5+	B5+
14	B6+	B6+	B6+	不接
15	B7+	不接	B7+	不接
16	B8+	不接	B8+	不接
17	B9+	不接	B9+	不接
18	B10+	不接	B10+	不接
19	B11+	不接	B11+	不接
20	B12+	不接	B12+	不接
21	B13+	不接	B13+	不接
22	B14+	不接	B14+	不接
23	B15+	不接	B15+	不接
24	B16+	B6+	B16+	B5+

（四）功能说明Function Description

3.1、基本功能说明Description of Basic Functions

功能指标项目items		出厂默认数值 default settings	备注remarks
电压保护说明Voltage Protection Instructions			
过充保护 overcharge protection	过充保护电压 overcharge protection voltage	三元4.25V/铁锂3.65V/钛锂2.8VTernary 4.25V / Lithium iron phosphate 3.65V / Lithium titanate 2.8V	2.8～4.5V
	过充保护延时时间 Overcharge protection delay time	1.0S，可设置	软件控制 ，可设置Software control, configurable
	过充保护解除电压 Overcharge protection release voltage	三元4.15V/铁锂3.5V/钛锂2.7VTernary 4.15V / Lithium iron phosphate 3.5V / Lithium titanate 2.7V	3.0～4.5V
	过充保护解除 Overcharge protection is disabled	单体电压下降到恢复点，自动恢复The voltage of the single unit drops to the recovery point and automatically recovers	
过放保护 over discharge protection	过放保护电压over discharge protection voltage	三元2.75V/铁锂2.3V/钛锂1.6VTernary 2.75V / Lithium iron phosphate 2.3V / Lithium titanate 1.6V	可设置，过放保护后，单体电压低于放电失效保压值后进入低功耗模式；It can be set that

功能指标项目items		出厂默认数值 default settings	备注remarks
	过放保护延时时间 Overcharge protection delay time	1.0S，可设置configurable	after over-discharge protection, the voltage of the cell will enter low power mode when the voltage is lower than the discharge failure pressure.
	过放保护解除电压 over discharge protection release voltage	三元3.0V/铁锂2.9V/钛锂1.8V;NMC-3.0V/2.9V LiFePO4 / 1.8V LiTiO2	
	过放保护恢复方式 Overcharge protection recovery method	接入充电器connect to charger	
总体过充保护overcharge protection	总体过充保护电压 overall overcharge protection voltage	串数*过充保护电压charge series*overcharge protection voltage	软件控制，可设置Software control, configurable
	总体过充保护延时时间 Overall overcharge protection delay time	1.0S，可设置configurable	软件控制，可设置Software control, configurable
总体过充保护解除 Overall overcharge protection Released	总体过充保护解除电压 Total Overcharge Protection Release Voltage	串数*过充保护解除电压erial number * Overcharge protection release voltage	软件控制，可设置configurable
	总体过充保护解除 Overall overcharge	总体电压下降到恢复点，自动恢复The total voltage drops to the recovery point and automatically recovers	

功能指标项目items		出厂默认数值 default settings		备注remarks
	protection is lifted.			
总体过放保护 Overall over-discharge protection	总体过放保护电压 overall over discharge protection voltage	串数*单体过放保护电压 Number of series * Over-discharge protection voltage for monomers		可设置，过放保护后，单体电压低于放电失效保护电压值后进入低功耗模式；After the over-discharge protection, the voltage of the cell is lower than the discharge failure protection voltage, and the low power mode is entered.
	总体过放保护延时时间 Overall over-discharge protection delay time	1.0S，可设置configurable		
总体过放保护解除 Overall over-discharge protection released.	总体过放保护解除电压 over discharge protection release voltage	串数*过放保护解除电压 Series number * Over-discharge protection release voltage		
	充电解除 Release charge	接入充电器connect to charger		
电流保护说明Current Protection Instructions				
放电过流保护 overcurrent protection	电流值current value	持续时间 duration	恢复延时 recovery delay	备注remarks
	100-900A	5S	5S	**依据继电器电流规格设置 Setting up according to the current specifications of the**

功能指标项目items		出厂默认数值 default settings		备注remarks
				relay
放电过流保护解除 Discharge overcurrent protection released..	自动解除，延时后自动恢复；Auto-unlock, auto-recover after delay			
充电过流保护 overcurrent protection	电流值current value	持续时间 duration	恢复延时 recovery delay	备注remarks
过流保护 overcurrent protection	100A-900A	120S	10S	**依据继电器电流规格设置电流大小及时间长短Setting the current size and duration based on the relay current specifications**
峰值过流保护 peak overcurrent protection	**依据继电器电流规格设置Setting up according to the current specifications of the relay**			
放电过流保护解除	自动解除，延时后自动恢复；Auto-unlock, auto-recover after delay			

功能指标项目items		出厂默认数值 default settings	备注remarks
Discharge overcurrent protection released			
短路保护说明Short-circuit protection instructions			
短路保护延时时间 Short-circuit protection delay time	200/600/800		μS
短路保护解除方式short circuit protection release mode	断开负载；鉴于短路电流上千安，避免危险不建议客户做短路测试；Disconnect the load. Given the short-circuit current exceeding 1,000A, customers are advised against performing short-circuit tests to avoid hazards.		
温度保护说明Temperature Protection Instructions			
继电器高温保护 Relay high-temperature protection	MOS 高温保护温度 MOS high temperature protection temperature	**依据继电器电流规格设置 Setting up according to the current specifications of the relay**	在软件/设置/温度设置模块/进行设置和调整软 Go to Software> Settings> Temperature Settings to adjust the settings.
	MOS 高温保护解除温度 MOS high temperature protection		

功能指标项目items		出厂默认数值 default settings	备注remarks
	release temperature		
电芯温度保护 Cell temperature protection	充电低温保护温度 Charging low-temperature protection	-39 °C，可设置configurable	
	充电低温保护解除温度 Thermal protection release temperature for charging	-35°C，可设置configurable	
	充电高温保护温度 Charging high-temperature protection	65°C，可设置configurable	
	充电高温保护解除温度 Thermal protection release temperature for charging	55°C，可设置configurable	
	放电低温保护 Discharge low-temperature protection	-39°C，可设置configurable	
	放电低温保护解除温	-35°C，可设置configurable	

功能指标项目items		出厂默认数值 default settings	备注remarks
	度 Thermal protection release temperature for charging		
	放电高温保护温度 Discharge high-temperature protection	65°C，可设置configurable	
	放电高温保护解除温度 Discharge high-temperature protection	55°C，可设置configurable	
均衡功能说明Equilibrium Function Description			
均衡功能 equilibrium function	均衡开启电压balanced turn-on voltage	三元3.9V/铁锂 3.3V，可设置 Ternary 3.9V / Lithium iron phosphate 3.3V, configurable	在软件/设置/均衡设置模块/进行设置和调整软 Go to Software> Settings> Equalization Settings to adjust the software settings.
	均衡开启压差balanced differential pressure opening	50mV，可设置configurable	
	均衡电流 equalizing current	30~80 mA	
内阻说明	放电回路内阻internal	<40 m Ω	

功能指标项目items		出厂默认数值 default settings	备注remarks
internal resistance explanation	resistance of discharge circuit		
其他功能说明Other features			
低电量警告 Low battery warning	SOC＜ 10% ，可设置 ，充电时不告警 SOC <10% (adjustable), no alarm during charging	可通过软件设置Set via software	
满容量设置 Full capacity setting	依据真实电池容量设置 Set according to the actual battery capacity	可通过软件设置Set via software	

3.2、其余功能说明Description of other functions

3.2.1、均衡Balance:

（1）均衡开关：开启和关闭的情况下，任意一串超过启控电压、充电自动开启均衡直到设置压差电压停止均 衡，均衡温度到了和电池掉线会停止均衡。Balancing switch: When either the on or off state exceeds the activation voltage, the charging process automatically initiates balancing until the preset voltage difference stops. The balancing process terminates when the temperature reaches the specified threshold or the battery disconnects.

（2）均衡开启：任意一串超过均衡启控电压，超过设置压差电压，开启均衡、 自动均衡到启控电压和设置压 差电压，停止均衡，有电流和电池掉线。Balanced activation: When any string exceeds the preset voltage thresholds (either the balanced activation voltage or the set voltage difference), the system initiates balanced mode. It automatically adjusts to the specified voltage levels until the thresholds are met, then terminates the process. During this phase, current flow and battery disconnection may occur.

3.2.2、电流校正：Current Correction

放电情况下，用仪表读取正确电流、APP和上位机，输入实际电流值单位是mA，直接按校正按 键校正，再到主页看看显示的是输入电流就可以了。During discharge, use the instrument to measure the correct current. Enter the actual current value (in mA) into the APP and host computer, then press the correction button to adjust. Finally, check the main interface to verify the displayed input current.

3.2.3、剩余电量校正：Remaining Power Correction

先把电池组实际容量填到容量设置里面去，设置好充放电保护电压，再把电池充电/放电到BMS保护，SOC就可以校正好。First, input the battery pack's actual capacity into the capacity settings, then configure the charge/discharge protection voltage. After charging or discharging the battery to the BMS protection level, the SOC will be accurately calibrated.

3.2.4、实际容量校正：Actual Capacity Correction

先把电池充满到保护电压（最高电压不能低于充电恢复电压），再把电放完（放电到设定的保护电压）实际APP里边校准容量就会出来了。First, charge the battery to the protection voltage (the maximum voltage must not fall below the charging recovery voltage), then discharge it to the preset protection voltage. The actual calibrated capacity will then be displayed in the app.

3.2.5、低功耗及唤醒Low Power Consumption and Wake-up

①休眠模式：BMS检测到电芯电压已经低于放电失效保护电压时，BMS会进入休眠状态，防止电量耗尽损坏电池。Sleep mode: When the BMS detects that the cell voltage falls below the discharge failure protection threshold, it enters sleep mode to prevent battery damage from complete discharge.

②开启BMS：通过接通充电器或者选择485隔离口5V激活；Activate BMS: Connect the charger or select the 5V power supply on the 485 interface to enable it.

3.2.6、显示屏功能Display Screen Functions

本智能软件板使用RS485接口来支持屏幕显示电池组状态，电池电压、电流、单体电压、温度等相关信息。This smart software board uses the RS485 interface to display battery pack status, including voltage, current, cell voltage, and temperature.

3.2.7、通讯说明 Communication Instructions

本产品支持RS485通信接口功能，可支持显示屏功能。

可以通过RS485接口与上位机进行通讯，从而在上位机端查看电池的各种信息。

默认波BMS特率为19600lbp。This product supports RS485 communication interface and display functions.

The device can communicate with the host computer via RS485 interface, allowing the host to monitor various battery parameters.

The default BMS rate is 19600 lbp.

3.3、通讯功能说明Description of Communication Functions

（1）支持定制CAN通讯：用于与整车控制器/电机控制器/仪表/充电机（支持客户自定义）；Customizable CAN communication support: Compatible with vehicle controllers, motor controllers, instrument clusters, and chargers (with customer-defined configurations);

①RS485—通讯（左侧）：自带隔离，接专用充电器，支持RS485通讯，2500V隔离。波特率标准9600（接上位机/显示屏/外部通信）。RS485—1 communication (left side): Built-in isolation, compatible with dedicated chargers, supports RS485 communication with 2500V isolation. Standard baud rate is 9600 (for connection to host computer, display, or external communication).

②RS485—通讯（右侧）：RS485通讯，波特率标准9600（带12V供电/接GPS/显示屏）；RS485—communication (right side): RS485 communication with a baud rate of 9600 (powered by 12V, compatible with GPS and display);

（2）外接GPS/GPRS远程通讯：可以连接平台、公众号，实现远程收费系统。External GPS/GPRS remote communication: Enables platform and official account connectivity for remote billing system.

（3）蜂鸣器接口：可开启蜂鸣器；如遇电池设置错误，或触发保护状态，则会长鸣；正常状态下启动蜂鸣器，则以固定频率短鸣，以提示位置；Beezer interface: The buzzer can be activated. If the battery setting is incorrect or a protection state is triggered, it will sound continuously. Under normal conditions, the buzzer will sound at a fixed frequency to indicate the location.

（4）预留加热模块接口：可外加锂电池加热片，确保低温环境下的锂电池正常使用；Heating module interface reserved: Allows external lithium battery heating elements to ensure proper operation of lithium batteries in low-temperature environments.

（5）预留弱电管理模块接口：可以外置手动关闭放电MOS；Integrated low-voltage management module interface: Enables external manual shutdown of discharge MOS;

（五）电气参数Electrical parameters

额定规格参数（适用于全部型号BMS）Rated specifications (applicable to all BMS models)

详细项目Detailed items		规格specifications			单位unit	其他说明Other notes
		最小值Min	典型值Typical	最大值Max		
可持续工作电流 sustainable operating current		40	-	300	A	与BMS持续电流一致 Consistent with BMS continuous current
低功耗模式电流 low power mode current		-	-	<100	μA	休眠模式下In hibernation mode
工作自耗电电流 Current of the work's own power consumption		-	20	-	mA	整机待机状态下The entire system is in standby mode.
工作环境 work environment	工作温度 working temperature	-20	-	+70	℃	正常工作温度范围 Normal operating temperature range
	工作湿度 working humidity	0%	-	90%	RH	湿度低于90%，无凝结 Humidity below 90% with no condensation
存储环境 Storage environment	存储温度 storage temperature	- 40	-	+85	℃	正常存储温度范围 Normal storage temperature range
	存储湿度 storage humidity	0%	-	90%	RH	湿度低于90%，无凝结 Humidity below 90% with no condensation
SOC估算精度 SOC estimation accuracy		<5%				
电流检测current detection		采样频率<250mS，精度5%Sampling frequency <250 mS, accuracy 5%			900A以内Up to 900A	

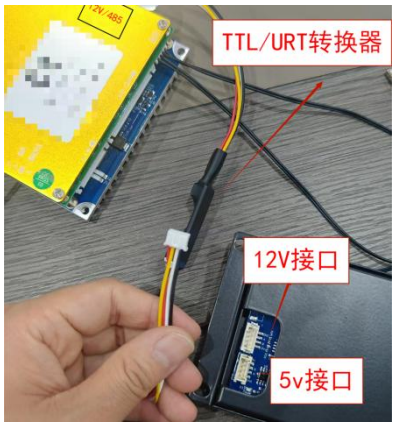
RS485接口RS485 interface	左右双侧路485口485 ports on both the left and right sides	
蓝牙/GPRS/GPS定位Bluetooth/GPRS/GPS positioning	蓝牙专用APP可快速检测分析电池健康状况；Bluetooth-enabled apps can quickly assess battery health.	GPS实时定位；远程实时查询电池相关信息；GPS real-time location; remote real-time battery information query;
单位电压掉线检测unit voltage dropout detection	支持support	
单体电压检测monomer voltage detection	支持，检测范围1.0V～4.35VSupport, detection range 1.0V～4.35V	
总电压检测total voltage detection	检测范围0-120VDetection range: 0-120V	参数可设置 电池串数由BMS型号及APP设置确定 Parameters are configurable The battery string number is determined by the BMS model and APP settings.
电池类型Battery type	三元锂/磷酸铁锂/钛酸锂电池Lithium ternary / Lithium iron phosphate / Lithium titanate batteries	
电池组组合方式Battery pack combination method	单控大于5串，最高支持128/256串Single control with more than 5 strings, supports up to 128/256 strings	

四、产品配件清单Product Accessories List

（一）通讯接线类Communication wiring categories

配件名称 Accessory name	使用/接线说明Usage and Wiring Instructions
主控机（Main Controller）	
MC-1接线	外接12V直流电源External 12V DC power supply
MC-2接线	继电器温控、充电、放电、预充、二次保护继电器及弱电加热信号线Relays for temperature control, charging, discharging, pre-charging, secondary protection, and low-voltage heating signal lines
MC-3接线	分流器、电芯温度、电池电压采集线Splitter, cell temperature, and battery voltage acquisition lines
MC-4接线	主控及分控CAN通讯、上位机（485A/B)、分控供电接线Main control and sub-control CAN communication, host computer (485A/B), and sub-control power supply wiring
MC-5接线	UART接线、显示屏、蜂鸣器、外置弱电开关接线UART wiring, display, buzzer, and external low-voltage switch wiring
MC-6接线	对外CAN通讯接线External CAN communication wiring
从控机(Slave Controller）	
SC-1接线	电芯温度、电池电压采集线Collection lines for cell temperature and battery voltage
SC-2接线	CAN通讯、上位机（485A/B)、分控供电接线CAN communication, host computer (485A/B), and distributed power supply wiring
SC-3接线	备用-CAN通讯、上位机（485A/B)、分控供电接线Backup CAN communication, host computer (485A/B), and distributed power supply wiring

（二）搭配附件类Accessories and Attachments

序号 NO.	名称name	图片picture	说明marks
1	4.3寸液晶屏 4.3-inch LCD screen		4.3寸液晶屏显示电压、电流及剩余电量，可展示详细数据；4.3-inch LCD screen Display voltage, current, and remaining battery power with detailed data.
2	TTL/URT转换器 TTL/URT converter		**必须使用TTL/URT转换器（双头黑白红黄四线），接入BMS的12V/485接口A TTL/URT converter (a four-wire dual-ended device with black, white, red, and yellow outputs) must be used to connect to the BMS's 12V/485 interface.**