规格承认书 Specification Approval Sheet

客户名称 Customer Name				
客户型号 Customer Model				
客户料号 Customer Part Number				
产品型号 Product Model	VKPGA-16S200A-LC10A-F0			
版本 Version	V2.2			
日期 Date	2026-08-24			
产品清单 Product List	序号 S/N	名称 Name	型号 Model	数量 Qty.
	1	16S200A 分体保护板（CAN 并机） Split protection board	VKPGA-16S200A-LC10A-F0	1pc.
	2	弱电开关线 Low-voltage switch wire	2.54mm 间距 单头 XP HOUSing 26AWG 另一头浸锡长度 3mm 线长 50cm（**XC070**）	1pc.
	3	动力连接线（B+） Power Connection Cable (B+)	动力连接线 B+电池端 标准长度 30cm（XC102） Power Connection Cable for B+ Battery End, Standard Length 30cm	1pc.
	4	温度采集线 Temperature acquisition wire	温度采集线(水滴状) 标准长度 65cm (XC001) Temperature acquisition wire (in the shape of a water drop) with standard length of 65cm	1pc.
	5	电压采集线 BC0~8 Voltage acquisition wire BC0~8	电压采集线 0-8 标准长度 85cm (**XC002**) Voltage acquisition wire 0-8 with standard length of 85cm	1pc.
	6	电压采集线 BC9~16 Voltage acquisition wire BC9~16	电压采集线 9-16 标准长度 85cm（**XC003**） Voltage acquisition wire 9-16 with standard length of 85cm	1pc.
	7	CAN 并机分体板 VKCA2 Split Board VKCA2	VKCA2_V1R2（**FTB040**）	1pc.
	8	端子板连接线 Terminal block cable	IDC2.54 扁平灰色带扣排线 2*10=20PIN FC20P 500mm 长 IDC2.54 gray flat ribbon cable with lock, 2*10=20PIN, FC20P, 500mm length (**XC250**)	1pc.
	9	LED 灯连接线(50cm) LED Light Cable (50cm)	单排 2.0MM 间距 6pPin 双头同向，定制长度 50cm**(XC017)** Single-row, 2.0mm pitch, 6-pin, double-headed (same direction), customized length 50cm	1pc.

供应商承认 Supplier Confirm		客户确认 Customer Confirmation	
制定 Prepared by		审查 Reviewed by	
核准 Approved by		核准 Approved by	

注意（Notice）：

1. 客户进行批量生产前，需在规格书中签字回传，并说明详细功能，我司才会安排批量生产。Before the customer proceeds with mass production, they are required to sign and return the specification and explain the detailed functions, after which our company will arrange mass production.

2. 贵司收到样品并确认后，请及时签字回传。若 7 天内未签字回传且无问题反馈，我司将默认样品测试合格。规格书中的图片为通用机型示意图，可能与送样样机存在差异。After your company receives the sample and confirms it, please sign and return it in a timely manner. If there is no signed return or problem feedback within 7 days, our company will deem the sample test as qualified by default. The pictures in the specification are diagrams of general models and may differ from the sample machine sent.

产品功能配置表 Product Function Configuration Table

	序号 S/N	功能 Function	定义描述 Definition Description	备注 Remarks	客户选择 Customer Selection
标配功能	1	存储 Storage	数据记录>1 万条 Data recording > 10,000 pieces		
	2	充电限流 Charging current limiting	10A（定义：电流＞180A 开启）默认不使能 10A (Definition: Activated when current >180A); default disabled		
	3	反接保护 Reverse connection protection	标配 Standard configuration		
	4	弱电开关 Low-voltage switch	标配（提供线材和接口，开关客户自行配置） Standard configuration (Wire and interface are provided, and the switch is configured by the customer)		
	5	蜂鸣器 Buzzer	标配 Standard configuration		
	6	LED 灯 LED light	6 个 LED 灯（定义：1 个 ALM；1 个 RUN；4 个 SOC 指示） 6 LED lights (Definition: 1 ALM; 1 RUN; 4 SOC indicators)		
	7	复位按键 Reset button	1 个复位按键（定义：长按 4S BMS 复位） 1 reset button (Definition: Long press for 4S to reset the BMS)		
	8	RTC 时间 RTC time	标配 Standard configuration		
	9	USB 通讯 USB communication	USB TYPE B 方口（定义：上位机接口和软件升级接口） USB TYPE B square port (Definition: Host computer interface and software upgrade interface)		
	10	RS485	标配（定义：逆变器通讯口）Standard configuration (Definition: Inverter communication port)		
	11	CAN-1	标配（定义：逆变器通讯口）Standard configuration (Definition: Inverter communication port)		
	12	CAN-2	标配（定义：电池包并机口）Standard configuration (Definition: Battery pack parallel port)		
	13	预充功能 Pre-charging function	标配 Standard configuration		
	14	唤醒功能 Wake-up function	标配（定义：实现充电唤醒）Standard configuration (Definition: Achieve charging wake-up)		
	1	显示屏 Display screen	各尺寸触摸功能LCD显示屏 Touchscreen LCD displays (various sizes)		
	2	干接点 Dry contact	双路（定义：干接点 1 常开，故障保护时闭合；干接点 2 常开，低电量告警闭合） Dual ways (Definition: Dry contact 1 is normally open and closes during fault protection; dry contact 2 is normally open and closes for low battery alarm)		

选配功能	3	支持低串电芯 Support low-series battery cells	支持 8~15 串电芯电池包 Support battery packs with 8 to 15-series battery cells	需定制软硬件 Customized hardware and software are required	
	4	加热功能 Heating function	提供电池供电加热膜接口，控制开启关闭 Provide an interface for the battery-powered heating film and control the on and off	需定制软硬件 Customized hardware and software are required	
	5	二次保护 Secondary protection	提供电池供电继电器接口，实现二次保护功能 Provide an interface for the battery-powered relay to achieve the secondary protection function	需定制软硬件 Customized hardware and software are required	
	6	WIFI 模块 WIFI module	提供 WIFI 功能和云平台功能 Provide WIFI function and cloud platform function	需定制软硬件 Customized hardware and software are required	
	7	防盗窃模块 Anti-theft module	防盗窃功能，配合云平台实现远程提醒 Anti-theft function, and achieve remote reminder in cooperation with the cloud platform	需定制软硬件 Customized hardware and software are required	
客户新增需求 Customer's new requirements：					
客户签字确认 Customer's signature：					

文件更改摘要 Document Change Summary

日期 Date	版本号 Version No.	修订说明 Revision Instruction	制定人 Prepared by	核准人 Approved by
2023/10/31	V1. 1	第一版 First Edition.	韦莉莉 Wei Lili	
2023/11/15	V1. 2	配件清单升级 Upgraded the accessory list.	韦莉莉 Wei Lili	
2024/01/08	V1. 3	更新并机接口定义 Updated the definition of the Parallel connection.	邓伟雄 Wei Lili	
2024/06/07	V1. 4	更新逆变器协议支持列表和 CAN 并机操作说明 Updated the inverter protocol support list.	邓伟雄 Deng Weixiong	
2024/11/07	V1. 5	更新逆变器协议支持列表和 CAN 并机操作说明 Updated the inverter protocol support list.	邓伟雄 Deng Weixiong	
2024/12/12	V1. 6	更新逆变器通讯接口定义，新增 CAN 并机总线的末端电阻自动切换功能 Update the definition of the inverter communication interface and add the automatic switching function of the terminal resistor for the CAN parallel bus.	邓伟雄 Deng Weixiong	
2025/07/03	V1. 6. 1	更新页眉 LOGO 及排版格式，内容无实质性修改 The header logo and typesetting format have been updated, with no substantive changes to the content.	罗漫 Luo Man	
2026/05/12	V2. 0	更新电芯温度保护参数、更新逆变器协议 Update cell temperature protection parameters、Update inverter protocol	罗漫 Luo Man	
2026/06/08	V2. 1	更新电芯过温保护参数 Update the cell over-temperature protection (OTP) parameters	罗漫 Luo Man	
2026/08/24	V2. 2	修改和增加参数定制，增加闪灯定义 Modify and add parameter customization, add flash- lamp definitions	罗漫 Luo Man	

目录 Table of Contents

一、简介 Introduction

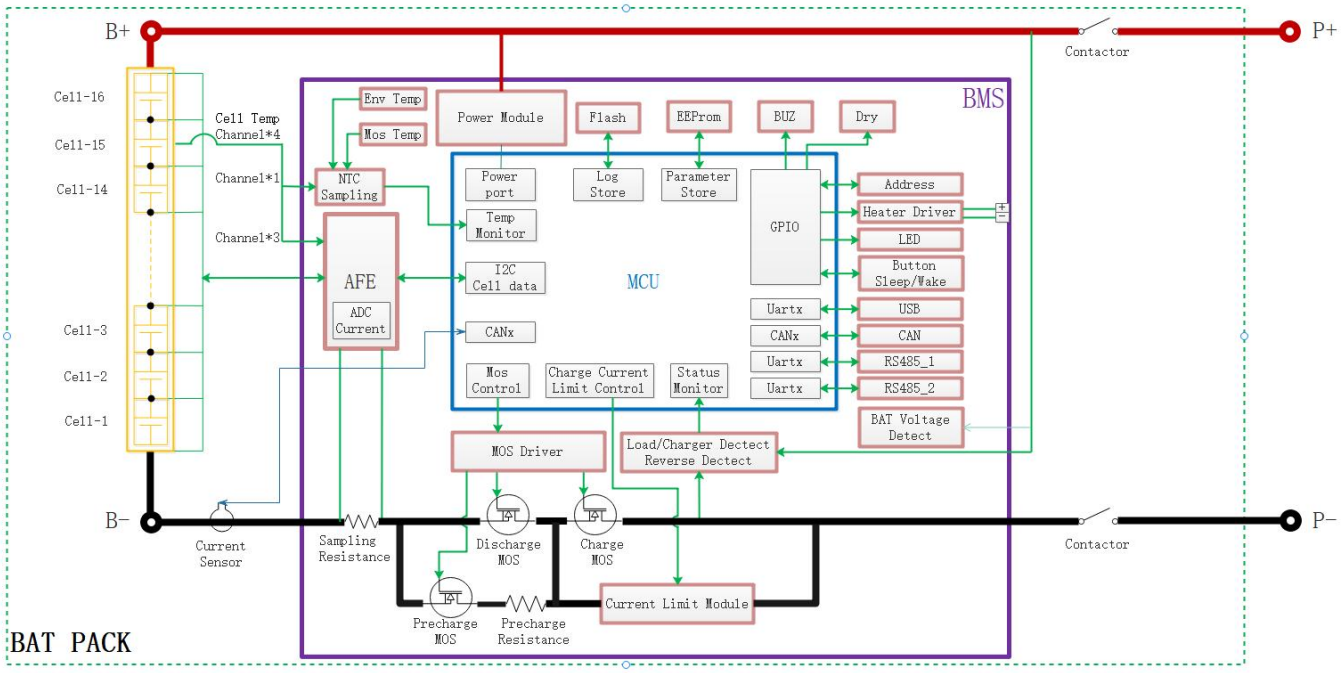
随着铁锂电池在通信行业的广泛应用，对电池管理系统也提出了高性能、高可靠性及高性价比等要求。本产品是专门针对家庭/后备电池设计的 BMS，采用集成化的设计，将采集、管理、通信等功能集成于一体，可广泛应用在室内室外。

With the wide application of lithium iron phosphate batteries in the communication industry, requirements for high performance, high reliability, and high cost-effectiveness are put forward for the battery management system. This product is a BMS specially designed for household/backup batteries. It adopts an integrated design, integrating functions such as acquisition, management, and communication, and can be widely applied indoors and outdoors.

二、功能特性 Functional Characteristics

- 高集成模拟前端
- Highly integrated analog front-end
- 隔离电源电路
- Isolated power supply circuit
- 集成串口IC
- Integrated serial port IC
- 高电压精度（≤10mV）
- High voltage accuracy (≤10mV)
- 高电流精度（≤2%@FS）
- High current accuracy (≤2%@FS)
- 4路电池温度检测（≤2℃）
- 4-way temperature detection (≤2℃)
- SOC 估算功能
- SOC estimation function
- SOH 估算功能
- SOH estimation function
- 短路保护功能
- Short-circuit protection function
- 并机数据透传，通过主机可访问任意从机
- Data passthrough for parallel operation: The host can access any slave unit.
- 可调过流保护
- Adjustable overcurrent protection
- 具有多种休眠及唤醒方式
- Multiple hibernation/wake-up modes
- 低功耗
- Low power consumption
- RS485/CAN 通信
- RS485/CAN communication
- 参数可调设置
- Configurable parameters
- 数据刷新时间间隔（周期）≤2秒
- Data refresh interval (cycle) ≤ 2 seconds
- LED 状态指示功能
- LED status indication function
- 具有充电均衡功能
- Charging equalization function
- SOC 精度(≤5%@50%容量量程以上)
- SOC accuracy (≤5%@50% capacity range)
- OTA 可通过主机批量或指定地址升级从机
- OTA (Over-The-Air): The host unit supports batch upgrading of slave units or targeted upgrading of slave units by specified addresses.

三、功能示意框图 Functional Schematic Block Diagram



四、环境要求 Environmental Requirements

项目 Item	参数 Parameter	单位 Unit
工作温度 Operating temperature	－20～75	℃
储存温度 Storage temperature	－20～75	℃
工作湿度 Operating humidity	≤85	%RH
储存湿度 Storage humidity	≤95	%RH
温度测量 Temperature measurement	-40～125	℃
大气压力 Atmospheric pressure	70~106	kPa

表4-1 环境要求 Table 4-1 Environmental Requirements

五、电气特性 Electrical Characteristics

5. 1. 基本参数设置 Basic Parameter Settings

注：以下参数除特殊注明以外，均为 25℃环境温度下测试。BMS 对单体电池电压测量范围 0～5V，总电压测量范围范围 0～60V。充放电温升均不应超过 75℃

Note: The following parameters are tested at an ambient temperature of 25℃, unless otherwise specified. The voltage measurement range of a single cell by the BMS is 0-5V, and the total voltage measurement range is 0-60V. The temperature rise during charging and discharging should not exceed 75℃.

序号 S/N	指标项目 Index Items		出厂默认参数 Factory Default Parameters	是否可设 Whether Adjustable	备注 Remarks
1	单体过充保护 Single cell over-charge protection	单体过充告警电压 Single cell overcharge alarm voltage	3550±10mV	可设 Yes	
		单体过充保护电压 Single cell overcharge protection voltage	3650mV	可设 Yes	
		单体过充保护延时 Single cell overcharge protection delay	1000mS	可设 Yes	
	单体过充保护解除 Single cell over-charge protection releas	单体过充告警解除电压 Single cell overcharge alarm release voltage	3450±10mV	可设 Yes	
		单体过充保护解除电压 Single cell overcharge protection release voltage	3450±10mV	可设 Yes	
		放电解除Discharge release	放电电流 > 10A Discharging current >10A		
2	单体过放保护 Single cell over-discharge protection	单体过放告警电压 Single cell over-discharge alarm voltage	2700±10mV	可设 Yes	
		单体过放保护电压 Single cell over-discharge protection voltage	2600±10mV	可设 Yes	
		单体过放保护延时 Single cell over-discharge protection delay	2000mS	可设 Yes	
	单体过放保护解除 Single cell over-discharge protection release	单体过放告警解除电压 Single cell over-discharge alarm release voltage	2800±10mV	可设 Yes	
		单体过放保护解除电压 Single cell over-discharge protection release voltage	2800±10mV	可设 Yes	
		有充电时解除Release when charging	接入充电器可激活 Activated when the charger is connected		
3	总体过充保护 Overall overcharge protection	总体过充告警电压 Overall overcharge alarm voltage	56.00V	可设 Yes	
		总体过充保护电压 Overall overcharge protection voltage	57.60V	可设 Yes	
		总体过充保护延时 Overall overcharge protection delay	1000mS	可设 Yes	

	总体过充保护解除 Overall overcharge protection release	总体过充告警解除电压Overall overcharge alarm release voltage	54.40V	可设 Yes	
		总体过充保护解除电压Overall overcharge protection release voltage	54.40V	可设 Yes	
4	总体过放保护 Overall over-discharge protection	总体过放告警电压Overall over-discharge alarm voltage	44.00V	可设 Yes	
		总体过放保护电压 Overall over-discharge protection voltage	42.40V	可设 Yes	
		总体过放保护延时Overall over-discharge protection delay	2000mS	可设 Yes	
	总体过放保护解除Overall over-discharge protection release	总体过放告警解除电压 Overall over-discharge alarm release voltage	45.60V	可设 Yes	
		总体过放保护解除电压 Overall over-discharge protection release voltage	45.60V	可设 Yes	
		有充电时解除Release when charging	接入充电器可激活 Activated when the charger is connected		
5	充电过流保护 Charging overcurrent protection	充电过流告警电流 Charging overcurrent alarm current	205A±1A	可设 Yes	充电过流连续触发超过锁定次数阈值后，将锁定该状态，不再自动解除（放电仍可解除）When charge overcurrent protection is triggered continuously beyond the lockout count threshold, the protection state will be latched and cannot be auto-reset. (Discharge overcurrent protection remains resettable.)
		充电过流保护电流Charging overcurrent protection current	210A±1A	可设 Yes	
		充电过流保护延时 Charging overcurrent protection delay	2000mS	可设 Yes	
		充电过流保护自动锁定次数Charging overcurrent protection lock count	6	可设 Yes	
	充电过流保护解除Charging overcurrent protection release	充电过流保护超时恢复Charging overcurrent protection timeout release	30000mS	可设 Yes	充电电流小于锁定恢复阈值，且维持时间超过锁定恢复延时，会清零保护次数。When the charge current drops below the lockout recovery threshold and this condition persists for longer than the lockout recovery delay, the protection trigger count will be cleared to zero.
		充电过流保护锁定恢复电流 Charging overcurrent protection lock release current	195A±1A	可设 Yes	
		充电过流保护锁定恢复延时 Charging overcurrent protection lock release delay	300000mS	可设 Yes	
		放电解除 Cleared by discharging	放电电流 > 2A Discharging current >2A		
6	放电过流1保护 Discharging overcurrent 1 protection	放电过流告警电流 Discharging overcurrent alarm current	205±1A	可设 Yes	放电过流连续触发超过锁定次数阈值后，将锁定该状态，不再自动解除（充电仍可解除）When discharge overcurrent protection is triggered continuously beyond the lockout count threshold, the protection state will be latched and cannot be auto-reset. (Charge overcurrent protection remains resettable.)
		放电过流1保护电流 Discharging overcurrent 1 protection current	215±1A	可设 Yes	
		放电过流1保护延时 Discharging overcurrent 1 protection delay	1000mS	可设 Yes	
		放电过流保护1自动锁定次数 Discharging overcurrent 1 protection lock count	3	可设 Yes	

	放电过流 1 保护解除 Discharging overcurrent 1 protection release	放电过流告警恢复电流Discharging overcurrent alarm release current	200±1A	可设 Yes	放电电流小于锁定恢复阈值，且维持时间超过锁定恢复延时，会清零锁定次数。When the discharge current drops below the lockout recovery threshold and this condition persists for longer than the lockout recovery delay, the lockout count will be cleared to zero.
		放电过流保护1超时恢复 Discharging overcurrent 1 protection timeout release	50000mS	可设 Yes	
		放电过流保1护锁定恢复电流 Discharging overcurrent 1 protection lock release current	200A±1A	可设 Yes	
		放电过流1保护锁定恢复延时 Discharging overcurrent 1 protection lock release delay	300000mS	可设 Yes	
		充电解除Cleared by charging	充电电流 > 2A Charging current > 2A		
7	放电过流2保护 Discharging overcurrent 2 protection	放电过流2保护电流Discharging overcurrent 2 protection current	225A±1A	可设 Yes	放电过流连续触发超过锁定次数阈值后，将锁定该状态，不再自动解除（充电仍可解除）When discharge overcurrent protection is triggered continuously beyond the lockout count threshold, the protection state will be latched and cannot be auto-reset. (Charge overcurrent protection remains resettable.)
		放电过流2保护延时Discharging overcurrent 2 protection delay	1000mS	可设 Yes	
		放电过流保护2自动锁定次数 Discharging overcurrent 2 protection lock count	3	可设 Yes	
	放电过流 2 保护解除 Discharging overcurrent 2 protection release	流保护2超时恢复 Discharging overcurrent 2 protection timeout release	120000mS	可设 Yes	放电电流小于锁定恢复阈值，且维持时间超过锁定恢复延时，会清零锁定次数。When the discharge current drops below the lockout recovery threshold and this condition persists for longer than the lockout recovery delay, the lockout count will be cleared to zero.
		放电过流保2护锁定恢复电流 Discharging overcurrent 2 protection lock release current	190A±1A	可设 Yes	
		放电过流2保护锁定恢复延时 Discharging overcurrent 2 protection lock release delay	600000mS	可设 Yes	
		充电解除 Cleared by charging	充电电流 > 2A Charging current > 2A		
8	反接保护 Reverse connection protection	上电开机后检测到反接保护信号，关闭充放电MOS At power-on, reverse protection triggered, turned off charge/discharge MOS			无法自动解除，必须重启Cannot be automatically cleared; a system restart is required
9	短路保护 Short-circuit protection	短路保护挡位（短路保护每档500A，有效值0~9，大于9关闭短路保护） Short-circuit Protection Level(500A per step; effective value range: 0–9; short-circuit protection is disabled when the value exceeds 9)	0	可设 Yes	短路保护后锁定计数加1，连续触发超过锁定次数后不再自动解除（重启才解除）The lockout count increments by 1 after each short-circuit protection trigger. Once continuous triggers exceed the lockout count, the protection will not auto-reset — it can only be cleared by a system restart.
		短路保护延时 Short-circuit Protection Delay	1mS	可设 Yes	
		短路保护锁定次数 Short-circuit Protection Lockout Count	5	可设 Yes	
	短路保护解除 Short-circuit protection release	短路保护超时恢复 Short-circuit Protection Timeout Recovery	60000mS	可设 Yes	短路保护自动解除后，在锁定恢复延时期间内未再次触发短路保护，会清零锁定次数。短路保护后关机或重启后，在
		短路保护锁定恢复延时 Short-circuit Protection Lockout Recovery Delay	300000mS	可设 Yes	

		短路保护上电恢复延时Short-circuit Protection Power-on Recovery Delay	2min	不可设 No	“上电恢复延时”时间后才开充放电MOS。 After the short-circuit protection is auto-reset, the lockout count will be cleared to zero if no further short-circuit fault occurs during the lockout recovery delay period.After shutdown or restart due to short-circuit protection, the charge/discharge MOSFETs will not be enabled until the power-on recovery delay period elapses.
10	MOS 温度保护 MOS temperature protection	MOS 低温告警温度MOS low temperature alarm temperature	-20℃	可设 Yes	低温报警恢复 = 低温报警 + 5℃。 过温报警恢复 = 过温报警 - 5℃ Low alarm recovery threshold = Low alarm threshold + 5℃ High alarm recovery threshold = High alarm threshold - 5℃
		MOS 低温保护温度MOS low temperature protection temperature	-30℃	可设 Yes	
		MOS 低温保护解除温度 MOS low temperature protection release temperature	-15℃	可设 Yes	
		MOS 高温告警温度MOS high temperature alarm temperature	90℃	可设 Yes	
		MOS 高温保护温度 MOS high temperature protection temperature	115℃	可设 Yes	
		MOS 高温保护解除温度 MOS high temperature protection release temperature	50℃	可设 Yes	
11	电芯温度保护 Cell temperature protection	充电低温告警温度 Charging low temperature alarm temperature	5℃	可设 Yes	
		充电低温告警解除温度 Charging low temperature alarm release temperature	10℃	可设 Yes	
		充电低温保护温度 Charging low temperature protection temperature	0℃	可设 Yes	
		充电低温保护解除温度 Charging low temperature protection release temperature	5℃	可设 Yes	
		充电高温告警温度Charging high temperature alarm temperature	55℃	可设 Yes	
		充电高温告警解除温度Charging high temperature alarm release temperature	50℃	可设 Yes	
		充电高温保护温度Charging high temperature protection temperature	65℃	可设 Yes	
		充电高温保护解除温度Charging high temperature protection release temperature	50℃	可设 Yes	
		放电低温告警温度Discharging low temperature alarm temperature	-10℃	可设 Yes	
		放电低温告警解除温度Discharging low temperature alarm release temperature	-5℃	可设 Yes	
		放电低温保护温度Discharging low	-20℃	可设	

		temperature protection temperature		Yes	
		放电低温保护解除温度Discharging low temperature protection release temperature	-10℃	可设 Yes	
		放电高温告警温度Discharging high temperature alarm temperature	55℃	可设 Yes	
		放电高温告警解除温度Discharging high temperature alarm release temperature	50℃	可设 Yes	
		放电高温保护温度Discharging high temperature protection temperature	65℃	可设 Yes	
		放电高温保护解除温度Discharging high temperature protection release temperature	50℃	可设 Yes	
12	环境温度告警 Ambient temperature alarm	环境低温告警温度Ambient low temperature alarm temperature	-10℃	可设 Yes	低温报警恢复 = 低温报警 + 5℃。 过温报警恢复 = 过温报警 - 5℃ Low alarm recovery threshold = Low alarm threshold + 5℃ High alarm recovery threshold = High alarm threshold - 5℃
		环境低温保护温度Ambient low temperature protection temperature	-20℃	可设 Yes	
		环境低温保护解除温度 Ambient low temperature protection release temperature	-10℃	可设 Yes	
		环境高温告警温度Ambient high temperature alarm temperature	60℃	可设 Yes	
		环境高温保护温度Ambient high temperature protection temperature	70℃	可设 Yes	
		环境高温保护解除温度 Ambient high temperature protection release temperature	50℃	可设 Yes	
13	消耗电流 Consumption current	工作时自耗电电流 Self-consumption current during operation	≤15mA		
		低功耗模式电流 Low power consumption mode current	≤1mA		
14	休眠功能 Low voltage shut-down	休眠电压 Shut-down single cell voltage	2600mV	可设 Yes	
		延迟时间 Shut-down delay time	10min	可设 Yes	
15	电芯失效保护Cell failure protection	压差报警 Voltage Difference Alarm	500mV	可设 Yes	压差保护恢复 = 压差保护 - 200mV Protection recovery threshold = Protection threshold - 200mV
		压差报警恢复 Voltage Difference Alarm Recovery	300mV	可设 Yes	
		压差保护 Differential voltageprotection	800mV	可设 Yes	
16	充电限流Charge Current-Limiting	限流启动电流 Current-Limiting Start Current	180A	可设 Yes	开始充电的前3秒内，高于此阈值会触发限流 Within the first 3 seconds after charging initiation, current limiting will be triggered if the value exceeds this threshold.
17	满充判断 Full charge judgment	充电截止电压 Charging cut-off voltage	56.0V	可设 Yes	充电电压和电流同时满足条件持续5分钟，达到满充状态The battery reaches the fully charged state when both charge voltage and charge current meet the required conditions continuously for 5 minutes.
		充电截止电流 Charging cut-off current	1A	可设 Yes	

18	均衡功能 Cell voltage balancing	均衡开启电压 Balancing Activation Voltage	3400mV	可设 Yes	单体间压差大于1V时，不开均衡Balancing will not be activated when the voltage difference between individual cells exceeds 1 V.
		均衡开启压差 Balancing On Differential Voltage	50mV	可设 Yes	
		均衡停止压差 Balancing Off Differential Voltage	20mV	可设 Yes	
		均衡电芯高温禁止温度 High Temperature Inhibit Threshold for Cell Balancing	55℃	可设 Yes	
		均衡电芯低温禁止温度 Low Temperature Inhibit Threshold for Cell Balancing	-10℃	可设 Yes	

表5-1 参数配置Table 5-1 Parameter Configuration

5.2. LED 指示说明 LED Indication Instructions

闪灯方式定义 Definition of flashing mode

备注：可通过上位机使能或禁止 LED 指示灯告警，出厂默认为使能的。

Note: The LED indicator light alarm can be enabled or disabled through the Host computer, and it is enabled by default when leaving the factory.

运行方式 Operation mode	亮(秒) On (seconds)	灭(秒) Off (seconds)
闪1 Flash 1	0.5	3.5
闪2 Flash 2	0.5	0.5
闪3 Flash 3	0.5	1.5

表5-2 闪灯模式 Table 5-2 Flashing Mode

5.2.1. 4个SOC指示灯 SOC indicator lights

各个状态下的闪灯方式定义Definition of the flashing mode in various states:

状态 Status	正常/告警/保护 Normal/Alarm/Protection	运行灯 Operation Light	告警灯 Alarm Light	电量灯 SOC Lights						备注 Remarks
				25%	50%	75%	100%	—	—	
关机 Shutdown	休眠 Hibernation	灭 Off	灭 Off	灭 Off	灭 Off	灭 Off	灭 Off			
待机 Standby	正常 Normal	闪1 Flash 1	灭 Off	依据电量指示 According to the power indication						待机状态 On standby
	告警 Alarm	闪1 Flash 1	闪3 Flash 3							所有告警和保护 All alarms and protections （不包括过充告警和保护） (Excluding overcharge alarm and protection)
	升级 OTA	闪2 Flash 2	闪3 Flash 3							IAP模式升级时运行灯闪2
失效 Failure	电芯故障 Cell failure	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	灭 Off	灭 Off	灭 Off	灭 Off	灭 Off	停止充放电 Stop charging and discharging
	充放电MOS故障 Charging and discharging MOS failure	闪2 Flash 2	闪2 Flash 2	灭 Off	闪2 Flash 2	灭 Off	灭 Off	灭 Off	灭 Off	停止充放电 Stop charging and discharging
	AFE故障 AFE failure	闪2 Flash 2	闪2 Flash 2	灭 Off	灭 Off	闪2 Flash 2	灭 Off	灭 Off	灭 Off	停止充放电 Stop charging and discharging
	电流采样电阻故障 Current sampling resistor failure	闪2 Flash 2	闪2 Flash 2	灭 Off	灭 Off	灭 Off	闪2 Flash 2	灭 Off	灭 Off	停止充放电 Stop charging and discharging

	电压故障 Voltage failure	闪2 Flash 2	闪2 Flash 2	灭 Off	灭 Off	灭 Off	灭 Off	闪2 Flash 2	灭 Off	停止充放电 Stop charging and discharging
	反接故障 Reverse connection failure	闪2 Flash 2	闪2 Flash 2	灭 Off	灭 Off	灭 Off	灭 Off	灭 Off	闪2 Flash 2	停止充放电 Stop charging and discharging
	短路 Short circuit	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	停止充放电 Stop charging and discharging
保护 Protection	防盗 Anti-Theft	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	闪2 Flash 2	停止充放电 Stop charging and discharging
	总体过充 Overall over-charge	常亮 On	常亮 On	常亮 On	常亮 On	常亮 On	常亮 On	常亮 On	常亮 On	停止充电 Stop charging
	单体过充 Single cell over-charge	常亮 On	灭 Off	常亮 On	常亮 On	常亮 On	常亮 On	常亮 On	常亮 On	停止充电 Stop charging
	充电高|低温 Charge high or low temperature	灭 Off	常亮 On	闪2 Flash 2	闪2 Flash 2	灭 Off	灭 Off	灭 Off	灭 Off	停止充电 Stop charging
	充电过流 Charge over-current	灭 Off	常亮 On	灭 Off	灭 Off	闪2 Flash 2	闪2 Flash 2	灭 Off	灭 Off	停止充电 Stop charging
	总体过放 Overall over-discharge	闪1 Flash 1	常亮 On	灭 Off	灭 Off	灭 Off	灭 Off	灭 Off	灭 Off	停止放电 Stop charging
	单体过放 Single cell over-discharge	闪1 Flash 1	灭 Off	灭 Off	灭 Off	灭 Off	灭 Off	灭 Off	灭 Off	停止放电 Stop charging
	放电高|低温 Discharge high or low temperature	常亮 On	灭 Off	闪2 Flash 2	闪2 Flash 2	灭 Off	灭 Off	灭 Off	灭 Off	停止放电 Stop charging
	放电过流 Discharge over-current	常亮 On	灭 Off	灭 Off	灭 Off	闪2 Flash 2	闪2 Flash 2	灭 Off	灭 Off	停止放电 Stop charging

表 5-3 4S0C 闪灯含义 Table 5-3 Meaning of Flashing

状态Status	充电Charging				放电Discharging			
容量指示灯 Capacity indicator light	LED1	LED2	LED3	LED4	LED1	LED2	LED3	LED4
0%~25%	闪2 Flash 2	灭 Off	灭 Off	灭 Off	常亮 Normally on	灭 Off	灭 Off	灭 Off
25%~50%	常亮 Normally on	闪2 Flash 2	灭 Off	灭 Off	常亮 Normally on	常亮 Normally on	灭 Off	灭 Off
50%~75%	常亮 Normally on	常亮 Normally on	闪2 Flash 2	灭 Off	常亮 Normally on	常亮 Normally on	常亮 Normally on	灭 Off
75%~100%	常亮 Normally on	常亮 Normally on	常亮 Normally on	闪2 Flash 2	常亮 Normally on	常亮 Normally on	常亮 Normally on	常亮 Normally on
——								
运行灯 Operation Light	常亮Normally on				闪3 Flash 3			

表5-4 4S0C容量表现方式 Table 5-4 Capacity Representation Method

5. 3. 蜂鸣器动作说明 Buzzer Action Instructions

(1) 开机上电，蜂鸣器长鸣一声；**When powering on, the buzzer emits a long beep;**

(2) 关机休眠，蜂鸣器短鸣一声；**When shutting down and hibernating, the buzzer emits a short beep;**

(3) 短路保护时，蜂鸣器每隔 2S 鸣叫一声，短路保护 3 次锁定后，蜂鸣器不再鸣叫；蜂鸣器功能可通过上位机使能或禁止，出厂默认是禁止的；

In case of short-circuit protection, the buzzer beeps every 2 seconds. After the short-circuit protection is

locked for 3 times, the buzzer stops beeping; The buzzer function can be enabled or disabled through the Host computer, and it is disabled by default when leaving the factory;

(4) 蜂鸣器功能禁止时，在保护板告警和保护时（短路和反接保护除外），蜂鸣器不工作；

When the buzzer function is disabled, the buzzer does not work when the protection board gives an alarm and protection (excluding short-circuit and reverse connection protection);

5.4. 弱电开关说明 Low-voltage switch Instructions

(1) 当弱电开关常闭状态，BMS 保护板正常工作。When the low-voltage switch is in the normally closed state, the BMS protection board works normally.

(2) 当弱电开关常开状态，BMS 保护板关机。When the low-voltage switch is in the normally open state, the BMS protection board shuts down.

5.5. 休眠及唤醒 Hibernation and Wake-up

5.5.1. 休眠 Hibernation

为了降低整个系统的功耗，系统具有休眠功能，当满足以下条件时，系统将进入休眠模式：

To reduce the power consumption of the entire system, the system has a hibernation function. When the following conditions are met, the system will enter the hibernation mode:

(1) 单体过放保护 5 分钟仍未解除（可设置）。

The single cell overdischarge protection has not been released within 5 minutes (can be set).

(2) 待机状态持续时间达到 24 小时（无通讯、无充放电、无充电机接入，可设置）。

The standby state lasts for 24 hours (no communication, no charging or discharging, no charger connected, can be set)

5.5.2. 唤醒 Wake-up

结合实际情况，为了方便使用，系统提供了多种不同的唤醒方式：

Combined with the actual situation, for the convenience of use, the system provides multiple different wake-up methods:

(1) 充电唤醒：接入充电器，充电机电压大于 36V；

Charging wake-up: Connect the charger, and the charger voltage is greater than 36V;

(2) 自动唤醒：自动唤醒使能，且配置时间大于 0，非按键手动关机或者低电量关机；

Automatic wake-up: The automatic wake-up is enabled, and the configured time is greater than 0, and it is not manually shut down by the button or shut down due to low battery;

5.6. 充电限流功能 Charging Current Limiting Function

(1) 保护板具有充电限流功能，充电限流为 10±1A，用户可通过上位机设置限流启动条件和限流功能的开启和关闭。

The protection board has a charging current limiting function, and the charging current limiting is 10±1A. The user can set the current limiting activation condition and the on/off of the current limiting function through the Host computer.

(2) 充电限流默认启动条件为充电电流大于 180A(可设置)，进入限流模式后，充电电流小于 2A，或者 10 分钟后自动退出限流模式。

The default activation condition for charging current limiting is that the charging current is greater than 180A (can be set). After entering the current limiting mode, it will automatically exit the current limiting mode when the charging current is less than 2A or after 10 minutes.

5.7. 加热或散热功能（预留）Heating or Cooling Function (Reserved)

(1) 保护板预留充放电加热控制功能（默认不提供），BMS 实时监控电芯温度，当电芯温度最小值低于加热开启温度时，保护板启动加热功能，当所有电芯温度达到加热关闭温度时，加热功能关闭；

The protection board reserves the charging and discharging heating control function (not provided by default). The BMS monitors the cell temperature in real time. When the minimum value of the cell temperature is lower than the heating activation temperature, the protection board activates the heating function. When the temperature of all cells reaches the heating shutdown temperature, the heating function is turned off.

(2) 保护板预留充放电散热控制功能（默认不提供），BMS 实时监控电芯温度，当电芯温度最高值大于散热开启温度时，保护板启动散热功能，当所有电芯温度达到散热关闭温度时，散热功能关闭；

The protection board reserves the charging and discharging cooling control function (not provided by default). The BMS monitors the cell temperature in real time. When the maximum value of the cell temperature is greater than the cooling activation temperature, the protection board activates the cooling function. When the temperature of all cells reaches the cooling shutdown temperature, the cooling function is turned off.

(3) 加热功能最大输出电流为 3A，即 48V 时最大负载能力为 150W；

The maximum output current of the heating function is 3A, that is, the maximum load capacity at 48V is 150W.

(4) 加热与散热功能共用一个控制输出脚，同时只能提供其中一种功能（默认是加热），可以通过用户特性配置该控制脚的功能。**The heating and cooling functions share a control output pin, and only one of the functions can be provided at the same time (heating is provided by default), and the function of this control pin can be configured according to user characteristics.**

六、通信说明 Communication Instructions

6.1. USB 通信 USB Communication

USB 接口采用 TYPE B 端口，BMS 可以通过该接口与上位机进行通讯，从而在上位机端监控电池的各种信息，包括电池电压、电流、温度、状态、SOC、SOH 及电池生产信息等，默认波特率为 115200bps。

The USB interface adopts the TYPE B port. The BMS can communicate with the Host computer through this interface, so as to monitor various information of the battery at the Host computer end, including battery voltage, current, temperature, status, SOC, SOH and battery production information, etc. The default baud rate is 115200bps.

6.2. RS485 通信 RS485 Communication

具有 1 路 RS485 接口，为单端 RJ45 网络端口，主要用于电池组与逆变器间的数据交互，默认波特率为 9600bps。

It has 1 RS485 interface, which is a single-ended RJ45 network port and is mainly used for data interaction between the battery pack and the inverter. The default baud rate is 9600bps.

6.3. CAN 通信 CAN Communication

具有 2 路 CAN 通信接口 **It has 2 CAN communication interfaces:**

6.3.1. CAN-1 为单端 RJ45 网络端口，主要用于电池组与逆变器间的数据交互，默认波特率为 500K；

CAN-1 is a single-ended RJ45 network port, which is mainly used for data interaction between the battery pack and the inverter. The default baud rate is 500K;

6.3.2. CAN-2 为双端 RJ45 网络端口，用于电池组的级联并机之间的数据交互，目前并机接口最多可支持 32 组电池进行并机操作。

CAN-2 is a double-ended RJ45 network port, which is used for data interaction between cascaded parallel battery packs. Currently, the parallel connection interface can support up to 32 groups of batteries for parallel connection operation.

七、电磁兼容性 Electromagnetic Compatibility

7.1. 静电放电抗扰性 Electrostatic Discharge Immunity

满足 GB/T 17626.2-2018 等级 4 的要求，接触 8kV，空气 15kV；试验后能正常工作。

It meets the requirements of Grade 4 in GB/T 17626.2-2018, with a contact voltage of 8kV and an air voltage of 15kV; It can work normally after the test.

7.2. 传导骚扰限值 Conducted Emission Limits

满足传导骚扰限值应符合表 7-1 的要求（引自 GB 9254-2008 中第 5.1 条中表 1）；试验后能正常工作。

It meets the requirements of the conducted emission limits as specified in Table 7-1 (quoted from Table 1 in Article 5.1 of GB9254-2008); It can work normally after the test.

频率范围 / MHz Frequency Range / MHz	限值 Limit / dB(μV)	
	准峰值 Quasi-peak Value	平均值 Average Value
0.15~0.50	79	66
0.50~30	73	60

表 7-1 传导骚扰限值 Table 7-1 Conducted Emission Limits

7.3. 辐射骚扰限值 Radiated Emission Limits

满足辐射骚扰限值应符合表 7-2 的要求（引自 GB 9254-2008 中第 6.1 条中表 5）；试验后能正常工作。

It meets the requirements of the radiated emission limits as specified in Table 7-2 (quoted from Table 5 in Article 6.1 of GB9254-2008); It can work normally after the test.

频率范围 / MHz Frequency Range / MHz	准峰值限值 / dB(μV / m) Quasi-peak Value Limit / dB(μV/m)
30~230	40
230~1000	47

表 7-2 辐射骚扰限值 Table 7-2 Radiated Emission Limits

7.4. 浪涌（冲击）抗扰性 Surge (Impact) Immunity

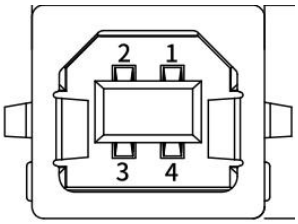
通信端口和电源端口应采用相应的隔离措施， 通信端口线对线应满足 GB/T 17626.5-2019 等级 2（开路试验电压 0.5kV） 的要求，线对地应满足 GB/T 17626.5-2019 等级 2（开路试验电压 1kV） 的要求；电源端口线对线应满足 GB/T 17626.5-2019 等级 4（开路试验电压 2kV） 的要求，线对地应满足 GB/T 17626.5-2019 等级 4（开路试验电压 4kV）的要求。

Corresponding isolation measures should be adopted for the communication port and the power port. The line-to-line of the communication port should meet the requirements of Grade 2 in GB/T 17626.5-2019 (open-circuit test voltage of 0.5kV), and the line-to-ground should meet the requirements of Grade 2 in GB/T 17626.5-2019 (open-circuit test voltage of 1kV); The line-to-line of the power port should meet the requirements of Grade 4 in GB/T 17626.5-2019 (open-circuit test voltage of 2kV), and the line-to-ground should meet the requirements of Grade 4 in GB/T 17626.5-2019 (open-circuit test voltage of 4kV).

八、接口定义 Interface Definition

8.1. 通信接口图示 Communication Interface Diagram

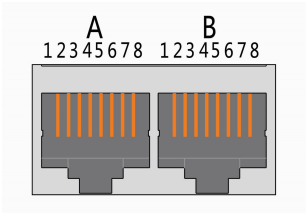
8.1.1. USB 通讯端口定义（接上位机）Definition of USB communication port (connected to the Host computer)



接口 Interface	定义说明 Definition Description	
X7 通讯端口定义 Definition of the communication port	PIN 1	VBUS
	PIN 2	D-
	PIN 3	D+
	PIN 4	GND

表 8-1 USB 端口定义 Table 8-1 Definition of the USB Port

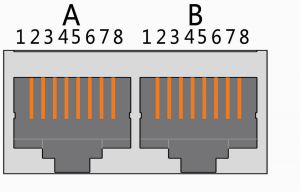
8.1.2. CAN-2 通讯接口定义 Definition of the CAN-2 Communication Interface



接口 Interface	定义说明 Definition Description			定义说明 Definition Description		
X2 通讯端口定义 Definition of the communication port	A部分 Part A CAN-2并机 Parallel connection of CAN-2 OUT接口 OUT interface	PIN 1	CAN2-L	B部分 Part B CAN-2并机 Parallel connection of CAN-2 IN接口 IN interface	PIN 1	CAN2-L
		PIN 2	CAN2-H		PIN 2	CAN2-H
		PIN 3	NC(空 empty)		PIN 3	NC(空 empty)
		PIN 4	NC(空 empty)		PIN 4	NC(空 empty)
		PIN 5	自动编址 OUT-P Automatic addressing OUT-P		PIN 5	自动编址 IN-P Automatic addressing IN-P
		PIN 6	自动编址 OUT-N Automatic addressing OUT-N		PIN 6	自动编址 IN-N Automatic addressing IN-N
		PIN 7	NC(空 empty)		PIN 7	NC(空 empty)
		PIN 8	NC(空 empty)		PIN 8	NC(空 empty)

表 8-2 CAN-2 端口定义 Table 8-3 Definition of the CAN-2 Port

8.1.3. RS485 & CAN-1 通讯接口定义 Definition of the RS485&CAN-1 Communication Interface



接口 Interface	定义说明 Definition Description			定义说明 Definition Description		
X1 通讯端口定义 Definition of the communication port	A部分 Part A CAN-1接口 CAN-1 interface	PIN 1	NC(空 empty)	B部分 Part B RS485接口 RS485 interface	PIN 1	RS485-B
		PIN 2	NC(空 empty)		PIN 2	RS485-A
		PIN 3	CGND		PIN 3	RS485-GND
		PIN 4	CAN1-H		PIN 4	NC(空 empty)
		PIN 5	CAN1-L		PIN 5	NC(空 empty)
		PIN 6	CGND		PIN 6	RS485-GND
		PIN 7	NC(空 empty)		PIN 7	RS485-A
		PIN 8	NC(空 empty)		PIN 8	RS485-B

8.2. 电气接口定义 Definition of Electrical Interfaces

接口 Interface	定义说明 Definition Description	
B+	BMS 供电端子，接电池组 B+（总正） BMS power supply terminal, connected to B+ (total positive) of the battery pack	
B-	接电池组 B-（总负） Connected to the negative terminal (total negative) of the battery pack B	
P-	接充电器或者负载的负端（P-） Connected to the negative terminal (P-) of the charger or load	
CN1(1#) 电芯电压检测接口：**1** **Cell voltage detection interface: 1**	**接口 Interface**	**定义 Definition**
	CN1-1	B0（黑色线）B0 (black wire)
	CN1-2	B1+
	CN1-3	B2+
	CN1-4	B3+
	CN1-5	B4+
	CN1-6	B5+
	CN1-7	B6+
	CN1-8	B7+
	CN1-9	B8+
CN2(2#) 电芯电压检测接口：**2** **Cell voltage detection interface: 2**	**接口 Interface**	**定义 Definition**
	CN2-1	B9-（黑色线）B9- (black wire)
	CN2-2	B9+
	CN2-3	B10+
	CN2-4	B11+
	CN2-5	B12+
	CN2-6	B13+
	CN2-7	B14+
	CN2-8	B15+
	CN2-9	B16+
	CN2-10	NC(悬空)
CN3 电芯温度检测接口 Cell Cell temperature detection interface	**接口 Interface**	**定义 Definition**
	CN3-1	NTC1+
	CN3-2	NTC1-
	CN3-3	NTC2+
	CN3-4	NTC2-
	CN3-5	NTC3+
	CN3-6	NTC3-
	CN3-7	NTC4+
	CN3-8	NTC4-
X5 电加热插座（预留） Electrical heating socket (Reserved)	**接口 Interface**	**定义 Definition**
	X5-1	HEAT（加热控制正端） HEAT (Positive terminal of heating control)
	X5-2	P-(加热控制负端) P- (Negative terminal of heating control)

表 8-3 采样线端口定义 Table 8-5 Definition of the Sampling Wire Port

8.3. 安装连接说明 Installation and Connection Instructions

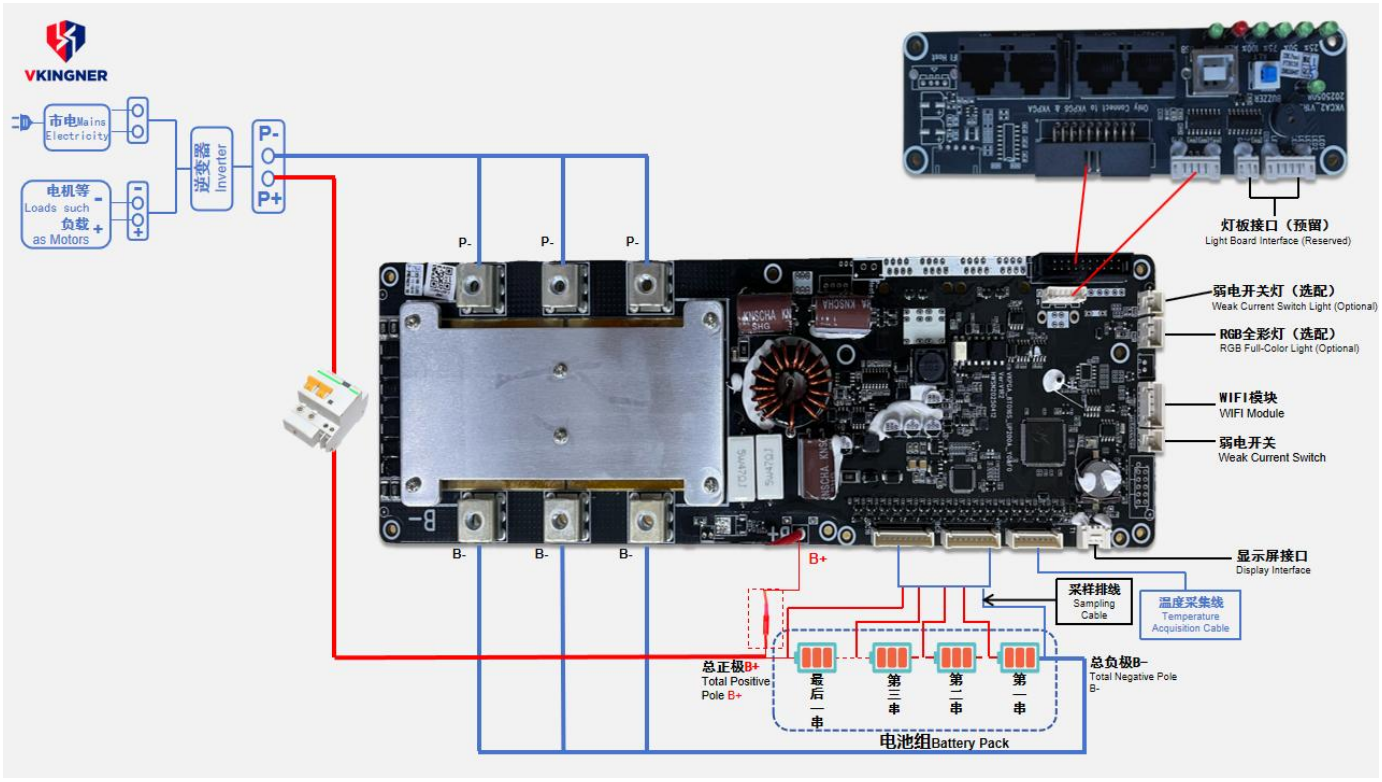
8.3.1. 保护板安装和拆除 Installation and removal of the protection board

保护板上电有严格的顺序要求，先焊接 B-、P-，B+、P+，依次由低到高的顺序插接电池采样线连接器，上电后需要充电或按键激活。所有连接线安装好后才能加负载或充电器。

There are strict sequential requirements for powering on the protection board. First, weld B-, P-, B+, and P+. Then, insert the battery sampling wire connectors in ascending order. After powering on, it needs to be charged or activated by pressing a button. Load or charger can be added only after all connection wires are installed.

拆除时，先拔掉充电器或负载，依次由高到低的顺序拆卸电池采样线连接器，最后拆卸 B+、P+、B-、P-。PACK 组装安装示意图如下：

When removing, first unplug the charger or load, then remove the battery sampling wire connectors in descending order, and finally remove B+, P+, B-, and P-.The PACK Assembly Installation Schematic is shown below:



8.3.2. 并机接线安装 Installation of parallel connection wiring

电池包并机接线示意图如下图 8-1 所示

The wiring schematic diagram for parallel connection of battery packs is as shown in Figure 8-1：

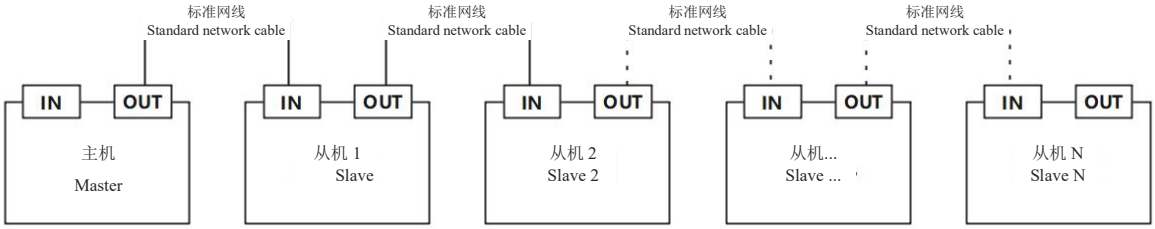


图 8-1 并机接线示意图 Fig. 8-1 Schematic Diagram of Parallel Connection Wiring

CAN 总线为了提高通讯的稳定性，需要在主机的输入和最后一级从机的输出端口接终端电阻（根据现场接线的实际 CAN 总线阻抗而定，典型值为：120Ω）。从 V1R5 版本开始的硬件新增了自动控制末端电阻通断的功能，并机时主机可以根据从机数量自动计算需要接入的末端电阻数量，并控制指定从机的末端电阻的接入或断开。

In order to improve the communication stability of the CAN bus, a terminal resistor needs to be connected to the

input of the master and the output port of the last-level slave (determined according to the actual CAN bus impedance of the on-site wiring, with a typical value of 120Ω). Starting from the hardware of the V1R5 version, the function of automatically controlling the on/off of the terminal resistor is newly added. When making parallel connections, the master can automatically calculate the number of terminal resistors to be connected according to the number of slaves, and control the connection or disconnection of the terminal resistors of the specified slaves.

并机接线完毕后，建议所有的设备一同上电开机。如果不能同时开机，则应先开启主机，然后按级联顺序依次开启所有从机（上电顺序会影响从机地址绑定的连续性，所以尽量按级联顺序靠近主机的从机先上电），现在默认的最大从机数量上限为 32。

After the parallel connection wiring is completed, it is recommended to power on all devices. If the devices cannot be powered on simultaneously, the master should be turned on first, and then all the slaves should be turned on one by one in the cascading order (the power-on sequence will affect the continuity of the slave address binding, so it is advisable to power on the slaves closest to the master in the cascading order first). Currently, the default maximum number of slaves is 32.

九、协议支持 Protocol Support

如第 6 章所述，本保护板的 RS485 和 CAN 通信端口可支持多种逆变器协议，具体协议详见下表；

As described in Chapter 6, the RS485 and CAN communication ports of this protection board can support multiple inverter protocols, and the specific protocols are shown in the following table;

如有新协议需求，可联系公司技术人员定制。If there are new protocol requirements, you can contact the company's technicians for customization.

协议 Protocol	缩写 Abbreviation	中文名 Chinese Name	RS485 可用 RS485 Available	版本 Version	CAN 可用 CAN Available	版本 Version
NONE	“NONE”		是Yes	0.0	是Yes	0.0
VKING	“VKIN”	问鼎	是Yes	1.0	是Yes	1.0，2.0
VOLTRONIC	“VLTC”	日月元	是Yes	1.0		
GROWATT	“GRWT”	古瑞瓦特	是Yes	2.01	是Yes	1.5，1.04
SOLAX	“SOLX”	艾罗	是Yes	1.2	是Yes	1.2
LTW	“LTW”	力通威				
PACE	“PACE”	沛城	是Yes	1.3		
MUST	“MUST”	美世乐	是Yes	1.1	是Yes	1.0
SRNE	“SRNE”	硕日	是Yes	1.0		
SMK	“SMK”		是Yes			
AFORE	“AFOR”	艾伏	是Yes	1.0	是Yes	2.1
GOODWE	“GDWE”	固德威			是Yes	1.5，5.2
SOFAR	“SOFA”	首航			是Yes	1.0
LUXPOWER	“LXPR”	鹏城			是Yes	1.0，7.0
VICTRON	“VICT”				是Yes	1.0
PYLON	“PYLN”	派能	是Yes	1.0	是Yes	1.2，2.0
SOROTEC	“SRTC”	索瑞德			是Yes	1.0
SMA	“SMA”				是Yes	1.0
GINLONG	“GNLG”	锦浪			是Yes	1.0，1.05
DONNERGY	“DONN”	大能			是Yes	1.0
SOLARFAM	“SLFM”					1.0
IMEON	“IMON”				是Yes	2.0
SCHNEIDER	“SHDR”	施耐德			是Yes	1.0，3.0
GENIXGREEN	“GENI”		是 Yes(VKING)	1.0	是Yes	1.0
INHENERGY	“INHE”	银河耐吉			是Yes	
BITTA	“BITA”	比瓦特	是Yes	1.1		
STONE	“STON”	石头	是Yes	2.1		1.2
SENERGY	“SENR”	盛能杰			是Yes	2.0
SUNWAYS	“SNWY”	尚唯斯			是Yes	1.0
STUDER	“STDR”				是Yes	
EVEPER	“EPVR”	汇能精电	是Yes	1.5		1.2
INVT	“INVT”	英威腾			是Yes	1.18
KSTAR	“KSTR”	科士达	是Yes	5.0	是Yes	
SUNFLY	"SNFL"	昇辉	是Yes	1.2		1.0，3.0
DEYE	"DEYE"	德业			是Yes	1.6
ALTENERGY	"AEPS"	昱能			是Yes	1.0
SUNGROW	"SNGR"	阳光电源			是Yes	0.0
FELICITY	"FLCT"	菲利斯	是Yes	1.0		
VERTIV	"VETI"	维谛	是Yes	1.0		
SKYWORTH	"SKWT"	创维			是Yes (GOODWE)	1.5，5.2
SINEXCEL	"SECL"	盛弘电气			是Yes	1.0

十、实物图与尺寸图 Physical Diagram and Dimension Diagram

10.1. 主控板标配图 Standard Diagram of Main Control Board

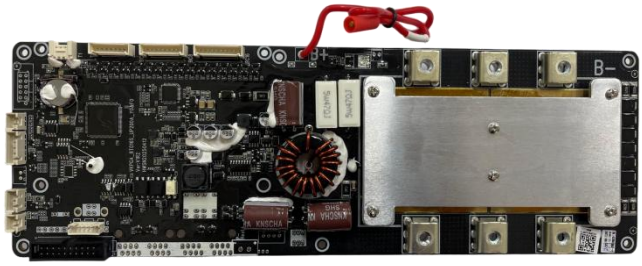


图 10-1 主板标配实物图-正面 Fig. 10-1 Physical Diagram of the Standard Configuration of the Main Board - Front

图 10-2 主板标配实物图-反面 Fig. 10-2 Physical Diagram of the Standard Configuration of the Main Board - Back

10.2. 主板尺寸图 Dimension of Main Board

尺寸 Dimension：300(L)*100(W) （单位 Unit：mm）

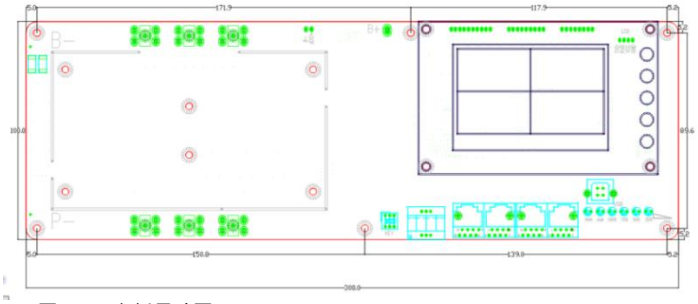


图 10-3 主板尺寸图 Fig. 10-3 Dimension Diagram of the Main Board

10.3. 端子板标配图 Standard Diagram of Terminal Board

图 10-4 端子板标配实物图-正面 Fig. 10-4 Physical Diagram of the Standard Terminal Board - Front

10.4. 端子板尺寸图 Terminal Block Dimensions

尺寸 Dimension：135(L)*40(W) （单位 Unit：mm）

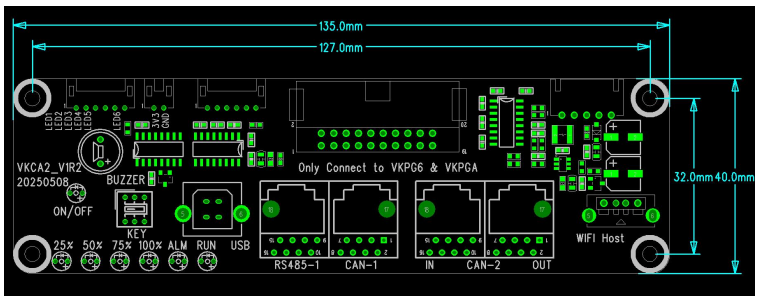


图 10-6 分体端子板尺寸图 Fig. 10-6 Dimension Diagram of the Split Board Board

十一、使用注意事项 Precautions for Use

- 焊接电池引线时，一定不可有错接或反接。如果确实已接错，这块电路板可能已损坏，需要重新测试合格后才可使用。When welding the battery lead wires, there must be no wrong connection or reverse connection. If it is indeed wrongly connected, this circuit board may be damaged and can only be used after being retested and passing the test.
- 装配时保护板不要直接接触到电芯表面，以免损坏电芯。正确的装配步骤为，先接电池组 B-线，再接上温度采样线，显示屏连接线，然后将电池电压采样线，从低到高，按顺序依次接上，最后接上电池组 B+线。拆除 BMS 时，请按照相反的顺序操作。During assembly, the protection board should not directly contact the surface of the battery cells to avoid damaging the cells. The correct assembly steps are to first connect the B- wire of the battery pack, then connect the temperature sampling wire and the display connection wire, then connect the battery voltage sampling wire in ascending order, and finally connect the B+ wire of the battery pack. When removing the BMS, please operate in the reverse order.
- 使用中注意引线头、烙铁、焊锡等不要碰到电路板上的元器件，否则有可能损坏本电路板。

During use, pay attention that the lead wire heads, soldering irons, solder, etc. should not touch the components on the circuit board, otherwise this circuit board may be damaged.

使用过程要注意防静电、防潮、防水等。Pay attention to preventing static electricity, moisture, water, etc. during use.

- 使用过程中请遵循设计参数及使用条件，不得超过本规格书中的值，否则有可能损坏保护板。

During use, please follow the design parameters and usage conditions, and do not exceed the values specified in this manual, otherwise the protection board may be damaged.

- 将电池组和保护板组合好以后，初次上电如发现无电压输出或充不进电，请检查接线是否正确。

After assembling the battery pack and the protection board, if there is no voltage output or the battery cannot be charged during the initial power-on, please check whether the wiring is correct.

- 部分线缆，螺丝，螺母等配件需要客户行采购，以下列表供参考：

Some accessories such as cables, screws, and nuts need to be purchased by the customer. The following list is for reference.

序号 S/N	名称 Name	状态 Status	备注 Remarks
1	上位机通讯线（打印机通讯线） Communication cable for the Host computer (Printer communication cable)	需要客户自行采购 To be purchased by the customer	
2	RS485-1 通信接线 RS485-1 communication wiring	需要客户自行采购 To be purchased by the customer	
3	CAN-1 通信接线 CAN-1 communication wiring	需要客户自行采购 To be purchased by the customer	
4	CAN-2 通信接线 CAN-2 communication wiring	需要客户自行采购 To be purchased by the customer	标准网线 Standard network cable
5	干接点通信接线 Dry contact communication wiring	需要客户自行采购 To be purchased by the customer	
6	主板固定螺丝，螺母 Set screws and nuts for the main board	需要客户自行采购 To be purchased by the customer	
7	B-,P-节点固定螺丝，螺母 Set screws and nuts for the B- and P- nodes	需要客户自行采购 To be purchased by the customer	
8	上位机通讯线（打印机通讯线） Host Computer Communication Cable (Printer Communication Cable)	需要客户自行采购 To be purchased by the customer	

表 11-1 客户自行采购配件说明 Appendix 11-1 Instructions for Accessories Purchased by the Customer

附录 Appendixes

附表 1：选配件清单 Appendix: 1 List of Optional Accessories

序号 S/N	名称 Name	型号 Model	备注 Remarks
1	显示屏 Display screen	各尺寸触摸功能LCD显示屏 Touchscreen LCD displays (various sizes)	需定制软硬件 Customized hardware and software are required
2	WIFI模块 WIFI module	提供WIFI功能和云平台功能 Provide WIFI function and cloud platform function	
3	加热功能 Heating function	提供电池供电加热膜接口，控制开启关闭 Provide an interface for the battery-powered heating film and control the on and off	需定制软硬件 Customized hardware and software are required
4	二次保护 Secondary protection	提供电池供电继电器接口，实现二次保护功能 Provide an interface for the battery-powered relay to achieve the secondary protection function	需定制软硬件 Customized hardware and software are required
5	支持低串电芯 Support low-series battery cells	支持8~15串电芯电池包 Support battery packs with 8 to 15-series battery cells	需定制软硬件 Customized hardware and software are required
6	防盗窃模块 Anti-theft module	防盗窃功能，配合云平台实现远程提醒 Anti-theft function, and achieve remote reminder in cooperation with the cloud platform	需定制软硬件 Customized hardware and software are required

附表 1 选配件清单 Appendix 1 List of Optional Accessories