

1、概述 (Overview)

在锂电池的使用场景中，低温场景是必不可少的，但在低温环境下电池的性能衰减较大。主要表现为以下几个方面：

In the use of lithium batteries, low temperature scenes are essential, but the performance of batteries will be greatly degraded in low temperature environments. This is mainly manifested in the following aspects:

- 减低容量：锂离子电池在低温环境下的容量会减低，因为低温会导致电池内部化学反应速率变慢，降低了电池的能量输出。

Reduced capacity: The capacity of lithium-ion batteries will decrease in low temperature environments because low temperatures will slow down the chemical reaction rate inside the battery, reducing the battery's energy output.

- 减低功率：低温环境下，电池内部电导率降低，电池内部电阻增加，电池输出功率减小，导致车辆加速性能变差。

Reduce power: In low temperature environment, the internal conductivity of the battery decreases, the internal resistance of the battery increases, and the battery output power decreases, resulting in poor vehicle acceleration performance.

- 延长充电时间：低温会导致电池内部化学反应速率变慢，电池内部电阻增加，导致充电时间延长，加速了电池的老化。

Prolong charging time: Low temperature will slow down the chemical reaction rate inside the battery, increase the internal resistance of the battery, and prolong the charging time, accelerating the aging of the battery.

- 降低寿命：长时间在低温环境下使用，会导致电池内部结构发生改变，例如电极材料的脱落和钝化等，导致电池寿命缩短。

为此，电池加热功能应运而生，电池加热功能可有效改善低温对锂电池性能衰减。

Reduced lifespan: Long-term use in low-temperature environments will cause changes in the internal structure of the battery, such as the shedding and passivation of electrode materials, which will shorten the battery life. For this reason, the battery heating function came into being, which can effectively improve the performance degradation of lithium batteries caused by low temperatures.

2、功能特性 (Features)

- 本功能是通过检测电池温度，结合充电低温保护/恢复温度以及充电器状态实现电池加热控制功能。

This function realizes the battery heating control function by detecting the battery temperature, combining the charging low temperature protection/recovery temperature and the charger status.

- 最大加热电流：3A (Maximum heating current: 3A)
- 推荐电流：2.5A@标准电池电压
Recommended current: 2.5A@standard battery voltage
- 最高加热电压：100V (Maximum heating voltage: 100V)

3、控制逻辑 (Control Logic)

加热开启条件，在满足条件 1 的同时满足条件 2 或条件 3 即可开启充电加热功能。

Heating start-up conditions: When condition 1 is met and condition 2 or condition 3 is met at the same time, the charging heating function can be turned on.

- 条件 1，电池温度低于充电低温保护温度；

Condition 1: The battery temperature is lower than the charging low temperature protection temperature;

- 条件 2，通过 APP 开启加热，不检测充电器状态，达到低温条件就加热，会消耗电池电量；

Condition 2: Turn on the heating through the APP without detecting the charger status. When the temperature reaches a low temperature, heating will be started, which will consume battery power.

- 条件 3，检测到充电器插入。该功能和保护板硬件、充电器相关，因此下单前请先确认好技术状态。

Condition 3: Detect that the charger is plugged in. This function is related to the protection board hardware and the charger, so please confirm the technical status before placing an order.

4、加热膜选择 (Heating film selection)

- 第一步，明确最大电池总压，如 20 串铁锂最高总压为 $20 \times 3.6 = 72V$ ，24 串铁锂最高总压为 $24 \times 3.6 = 86.4V$ 。

The first step is to determine the maximum total voltage of the battery. For example, the maximum total voltage of 20 lithium iron batteries is $20 \times 3.6 = 72V$, and the maximum total voltage of 24 lithium iron batteries is $24 \times 3.6 = 86.4V$.

- 第二步，确定加热膜电阻值，电阻值 = 最大总压 ÷ 3A，如： $72V \div 3A = 24\Omega$ ，结合市场上的加热膜规格选择接近的阻值。加热膜规格为 72V/24Ω/216W。

The second step is to determine the resistance value of the heating film. Resistance value = maximum total voltage ÷ 3A, such as: $72V \div 3A = 24\Omega$. Combined with the specifications of the heating film on the market, choose a resistance value close to it. The specifications of the heating film are 72V/24Ω/216W.

5、加热接口定义与线缆图片 (Heating interface definition and cable pictures)

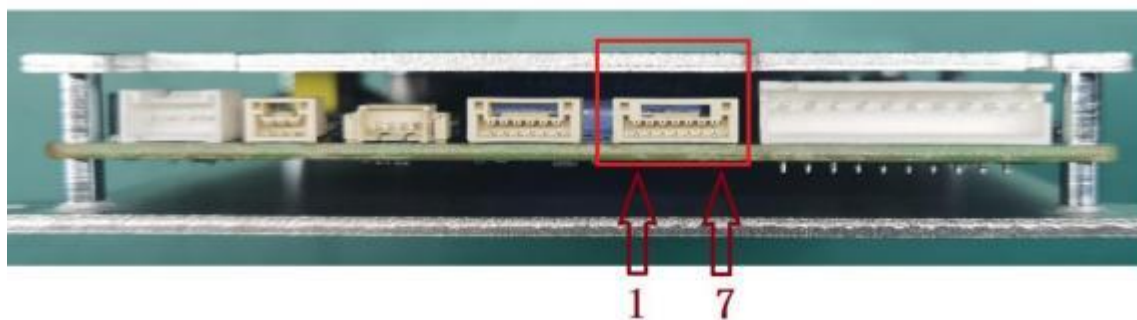
5.1 接口定义表 (Interface definition table)

加热接口 (选配功能)	管脚 Pins	信号 Signal	描述 describe	接线描述 Wiring Description
Heating interface (optional function)	1~5	HT-	加热负极 Heating the cathode	接加热膜任意一端，加热膜另一端接总正 Connect one end of the heating film to the positive
	6	CD+	充电指示输入正极 Charging indication input positive	需搭配带 12V 辅助电源的充电器使用，分别接辅助电源正极和负极，无辅助电源则不接 It needs to be used with a charger with a 12V auxiliary power supply. Connect the positive and negative poles of the auxiliary power supply respectively. If there is no auxiliary power supply, do not connect
	7	CD-	充电指示输入负极 Charging indication input negative pole	

5.2 接口标识图 (Interface identification diagram)

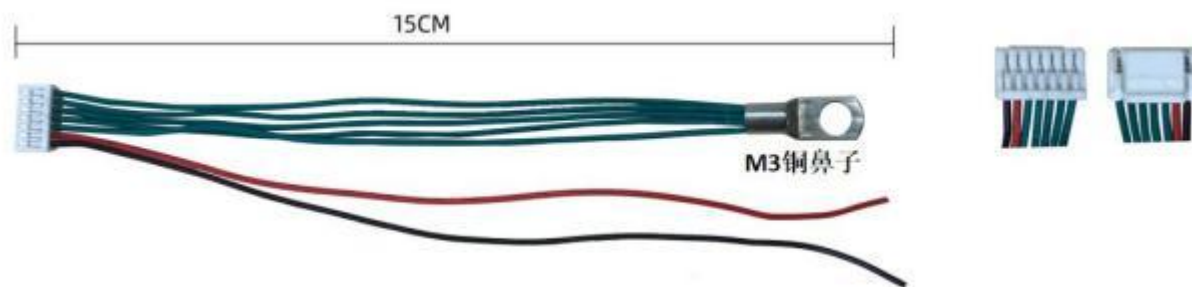
下图是各型号保护板接口外形图

The following figure shows the appearance of the protection board interface of each model



6、线缆与接线图 (Cables and Wiring Diagrams)

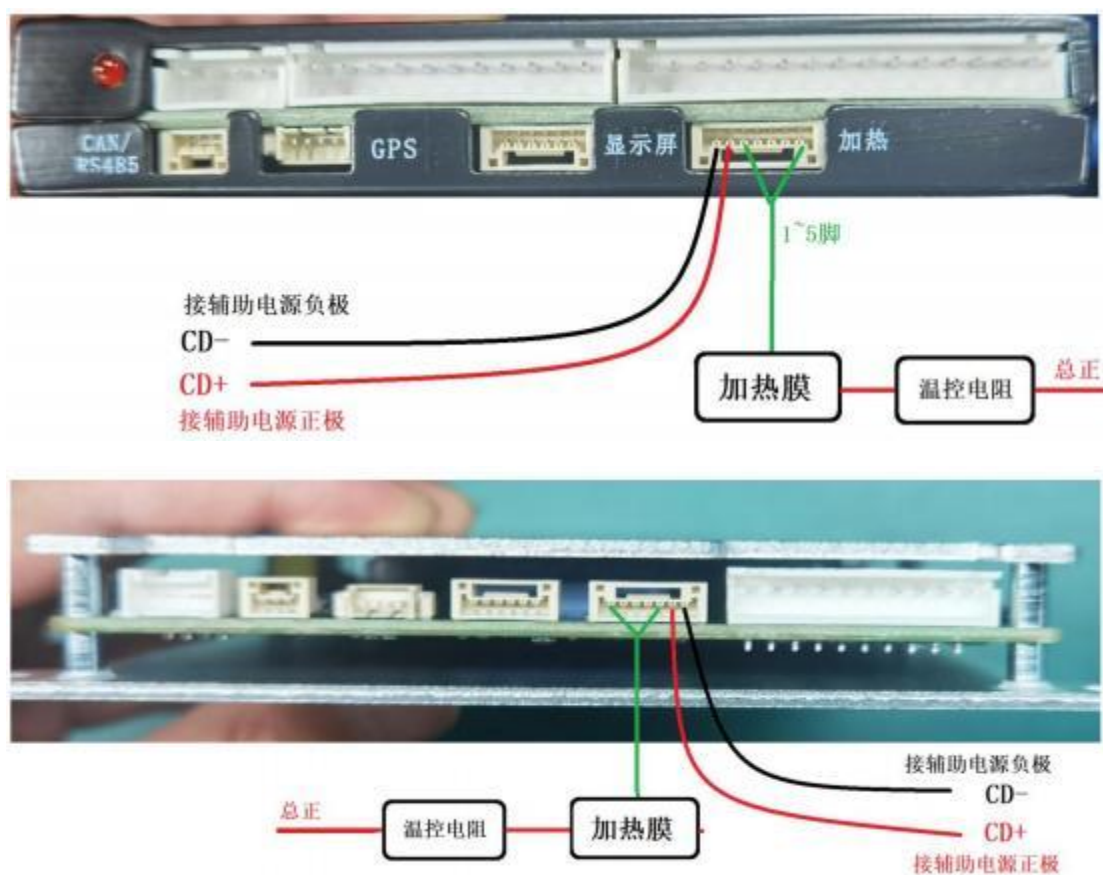
6.1 线缆图片 (Cable pictures)



6.2 接线图 (Wiring Diagram)

为了防止保护板加热开关电路损耗导致电池过温引发**安全风险**。**建议在加热回路中串联温控开关**作为二级保护，确保万无一失。建议选择 45~65℃常闭温控开关，当温度超过标称温度后，开关会自动断开，防止继续加热。

In order to prevent the protection board heating switch circuit loss from causing battery overheating and causing safety risks, it is recommended to connect a temperature control switch in series in the heating circuit as a secondary protection to ensure foolproofness. It is recommended to choose a 45~65℃ normally closed temperature control switch. When the temperature exceeds the nominal temperature, the switch will automatically disconnect to prevent further heating.



5.4. 安装方法 (Installation method)

开箱检查及注意事项如下：

对包装箱、保护板等需要轻拿轻放、尽量不要倒置；开箱前注意包装是否完好，如有无撞击痕迹、有无破损等；

JK-BxxA 8S xx P系列保护板适用于3-8串的的锂电池组，不同电芯数量的电池组接线方法不同，具体接线方式如下图所示。

Unpacking inspection and precautions are as follows:

The packing box and protection board should be handled gently and not upside down. Before unpacking, pay attention

to whether the package is intact, such as whether there are impact marks, whether there is damage, etc.;

JK-BxxA 8S xx P series protection board is suitable for 3-8 series of lithium battery pack, different cell number of battery

pack wiring methods are different, the specific wiring method is shown in the following figure.

