



**System Configuration/系统结构: 3~6 Modules + 1 BMS Box +1Base**

<b>Prepared by</b>	<b>Approved by</b>	<b>Approved by</b>	<b>Approved by</b>
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<b>Customer Confirmation</b>	<b>Authorized Signatory</b>		<b>Date</b>
	<b>Signature</b>		
	<b>Company Name Of Customer:</b>		
	<b>Company Stamp Of Customer:</b>		

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## 1 System/系统

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### 1.1 Applicable Scope /适用范围

The purpose of this product specification (“Document”) is to specify the specifications of the rechargeable lithium battery system(System or Product) to be supplied by to Customer based on customer requirements . The product is composed of BMS Box with system, modules with system and base with system. For the avoidance of doubt, the specifications specified herein only apply to “customer” product.

本规格书(下称“本文件”或“本规格书”)描述了依据客户需求定制的锂离子可充电电池组系统(“产品”或“电池”)的产品技术指标。产品包含三部分，模组、BMS Box 与底座，为避免疑问，本规格书仅适用于“customer”产品。

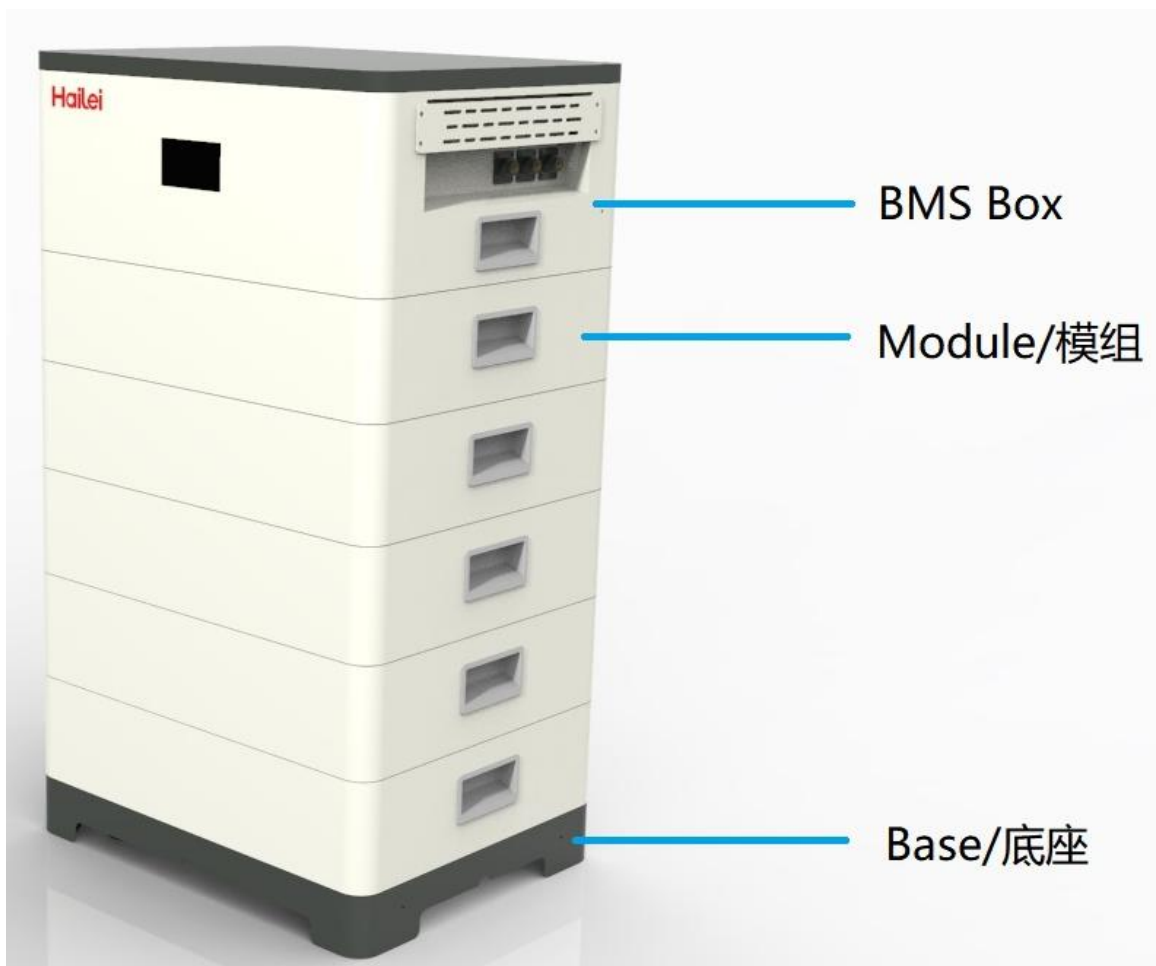
### 1.2 Standard Environmental Test Conditions /标准环境测试条件

Unless otherwise specified, all tests stated in this Document are conducted at below conditions/ 除非特别指定，本规格书的测试遵循如下条件：

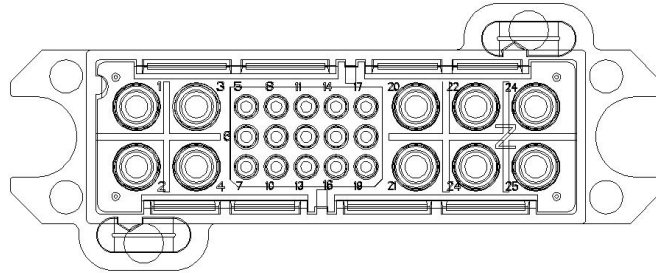
- Temperature/温度:  $25 \pm 3^{\circ}\text{C}$  (“Temperature Condition”/温度条件)
- Humidity/湿度: 5% -95% RH (“Humidity Condition”/湿度条件)

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### 1.3 System Appearance/ Component 系统外观与组成

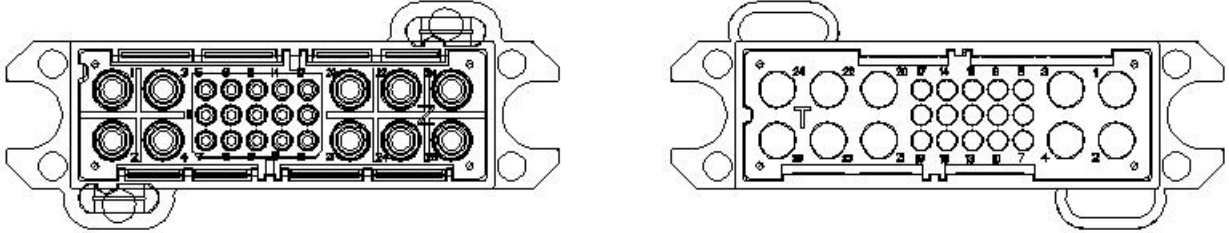


## BMS BOX Input connector



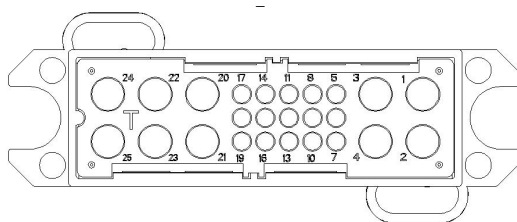
Pin No.	BMS BOX Output connector
1	B+
2	B+
3	NC
4	NC
5	CAN1_L
6	PWR_EN
7	POWER+
8	POWER+
9	CAN_H
10	ADDR_DO
11	GND
12	GND
13	NC
14	NC
15	NC
16	NC
17	NC
18	NC
19	NC
20	-
21	-
22	PE
23	NC
24	NC
25	NC

## Module Output connector and Module Input connector



Pin No.	BMS BOX Output connector	BMS BOX Input connector
1	B-	B+
2	B-	B+
3	NC	NC
4	NC	NC
5	CAN1_L	CAN1_L
6	PWR_EN	PWR_EN
7	POWER+	POWER+
8	POWER+	POWER+
9	CAN_H	CAN_H
10	ADDR_DO	ADDR_DI
11	GND	GND
12	GND	GND
13	NC	NC
14	NC	NC
15	NC	NC
16	NC	NC
17	NC	NC
18	NC	NC
19	NC	NC
20	-	-
21	-	-
22	PE	PE
23	NC	NC
24	NC	NC
25	NC	NC

Base connector



Pin No.	BMS BOX Output connector
1	-
2	-
3	NC
4	NC
5	NC
6	NC
7	NC
8	NC
9	NC
10	NC
11	NC
12	NC
13	NC
14	NC
15	NC
16	NC
17	NC
18	NC
19	NC
20	-
21	-
22	PE
23	NC
24	NC
25	NC

#### 1.4 Detailed Specifications/详细规格

The specifications listed in this Section 4 shall be the detailed specifications for the Product/ 列在第 4 部分的规格作为产品的详细规格。

##### 1.4.1 Basic Parameters/基本参数规格

No./ 序号	Items/ 项目	Specifications/ 参数规格
1	Total Capacity/总容量	50Ah
2	Usable capacity /可用容量	48Ah
3	Max. Charge current/最大充电电流(@25℃)	25A

4	Peak discharge current/峰值放电电流(@25°C,5S) <sup>6</sup>	50A
5	*RoomTemperature Calendar Life(25°C±2°C)/ * 常温日历寿命(25°C±2°C)	≧ 10 years
6	*RoomTemperature Cycle Life(25°C±2°C)/ *常温循环寿命(25°C±2°C)	6000 cycles/80%EOL
7	Operating ambient temperature/使用环境温度	-10°C~50°C
8	Optimal operating temperature/最佳工作温度	15°C~30°C
9	RTE	≥95% <sup>1</sup>
10	Operating ambient humidity/使用环境湿度	5%~95%RH
11	Self-discharge rate of Module/自放电率	≤3.5%/month/@25°C
12	Module Series connection/Module 串联功能	3S~6S
13	Cooling/冷却方式	Natural cooling/自然冷却
14	Altitude/海拔高度	≤2000m
15	Communication port (between parallel battery systems)通 信接口(电池系统间并联通信)	CAN
16	Communication between EMS and battery system/EMS 与 电池系统通信方式	CAN
17	Regulation compliance/产品准入标准	TUV
18	UN Transportation Test Standard 运输安全标准	UN38.3
19	Ingress Protection rate/IP 等级	IP55(After stacked)
20	Environment protection standard/环保要求	RoHS , REACH

<sup>1</sup> Measure method: 0.2C (C=total capacity, 0.2C=10.0A, constant current) charge to 3.65V as cell (max), 2A charge to 3.65V as cell (max) or SOC=100%, then 0.2C discharge to 2.8V as cell cut -off. Cycle for 3 times/测量方法: 先用 0.2C (C 总容量, 0.2C=10.0A) 恒流充电至电芯最大电压3.65V 跳转, 再 2A 恒流充电至电芯最大电压 3.65V 或 SOC=100%截止充电, 然后用 0.2C 放电至 2.8V 截止放电。循环3 次。

RTE: Round-trip efficiency (RTE) – the ratio of discharge energy removed to regen energy returned during the profiles/放电量与利用电量的比值为循环效率。

SOC: State of Charge (SOC) – the available capacity in a battery expressed as a percentage of rated capacity./电池可用容量占额定容量的百分数。

### 1.4.2 Electric Parameters/电气参数规格

Parameter/参数	Specifications/参数规格			
	3S	4S	5S	6S
Module quantity 数量				
Total capacity/总容量	50Ah			
Usable capacity /可用容量	48Ah			
Total energy 总电量 (kWh)	7.68	10.24	12.80	15.36
Size尺寸 (W*D*H) mm	550*430*699.5	550*430*831.0	550*430*962.5	550*430*1094.0
Weight重量 (kg)	115.0	145.0	175.0	205.0
Nominal voltage 标称电压 (V)	153.6	204.8	256.0	307.2
Output voltage range 输出电压范围 (V)	134.4~172.8	179.2~230.4	224.0~288.0	268.8~345.6

## 2 Module/模组

### 2.1 Part Number/料号: -

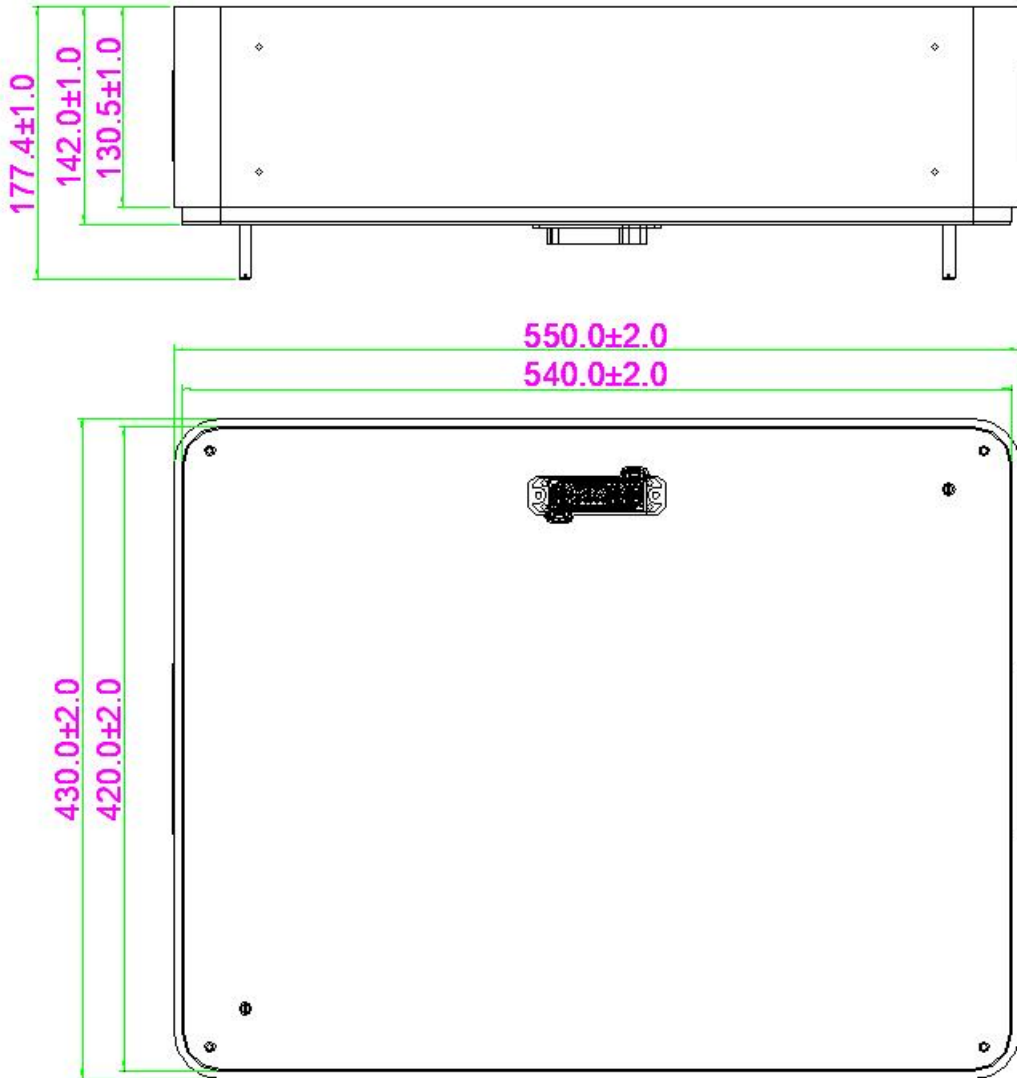
### 2.2 Detailed Specifications/详细规格

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No./序号	Items/项目	Specifications/参数
1	*Total Capacity/ Energy标称容量/能量	50Ah/2.56kWh
3	*Nominal Voltage/标称电压	51.2V
4	Output Voltage Range /输出电压范围	44.8V~57.6V
5	Module Safety Certification/ 模组安规认证	TUV
6	Cell Safety Certification/电芯安规认证	IEC62619、UL1973
7	UN Transportation Test Standard/ UN运输测试标准	UN38.3
8	Ingress Protection/防护等级	IP55(in stacked up state)
9	Dimensions/尺寸	W550.0*D430.0*H142.0 mm (For tolerance, see section 2.3/公差参考2.3)
10	Altitude/海拔高度	≤2000m
12	Weight/重量	30kg (for reference/仅供参考)
14	Connection/电芯串并数量	16S1P
15	Installation/安装方式	Stackable installation/堆叠安装
16	Shipment Capacity/出货容量	<50% SOC

17	Storage conditions/存储条件	$20^{\circ}\text{C}\sim 45^{\circ}\text{C}$ One month $0^{\circ}\text{C}\sim 35^{\circ}\text{C}$ Six months Humidity : 5%-95%RH/湿度: 5%-95%RH Within 12 month after each charge/每次充电后12个月内
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2.3 Module Appearance/模组外观



1) Unit: mm

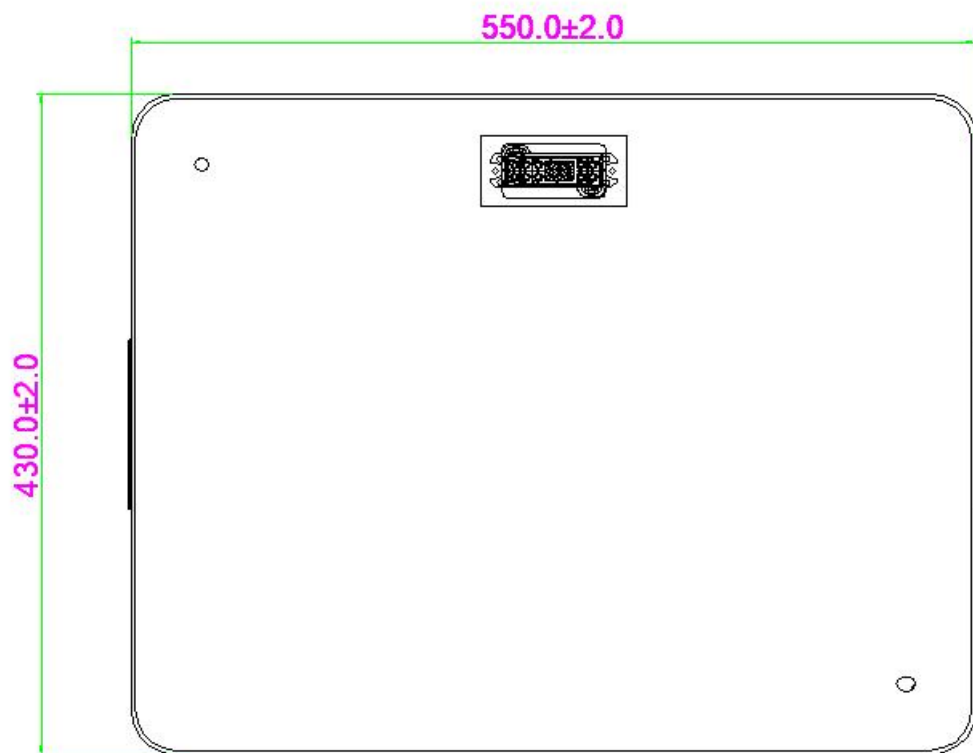
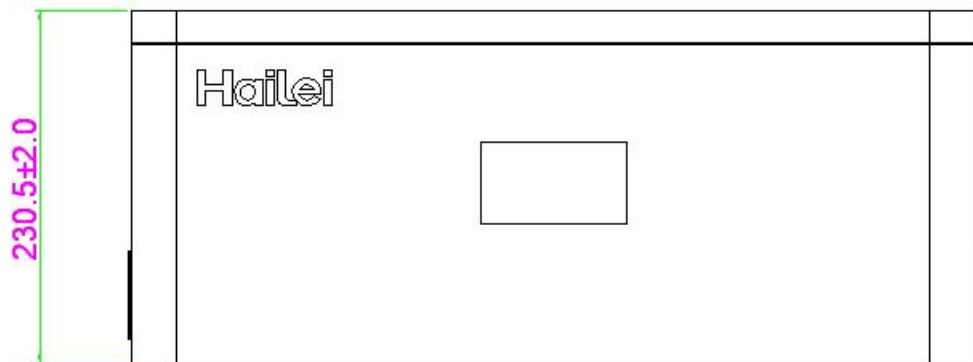


### 3 BMS Box

#### 3.1 Part Number/料号: /

#### 3.2 Detailed Specifications /详细规格

No./序号	Items/ 项目	Specifications/参数
1	Max. Operating Voltage Range/ 最大工作电压范围	134.4V~345.6V
2	Max. Output Current/ 最大输出电流(@25°C)	50A
4	Optimal operating temperature/最佳工作温度	15°C~30°C
5	Environment temperature range/使用环境温度	- 10°C~50°C
6	Communication Port between BMS Box and Module/ 通讯接口(BMS BOX与模组通信)	CAN
7	Communication Port between BMS Box and EMS /通 信接口(BMS Box 与 EMS)	CAN
8	Dimensions/尺寸	W550*D430*H230.5 mm (For tolerance, see section 3.3/公差参考3.3)
9	Weight/ 重量	16kg (for reference/仅供参考)
10	Ingress Protection/防护等级	IP55(in stacked up state)



Unit: mm

## 4 Base/底座

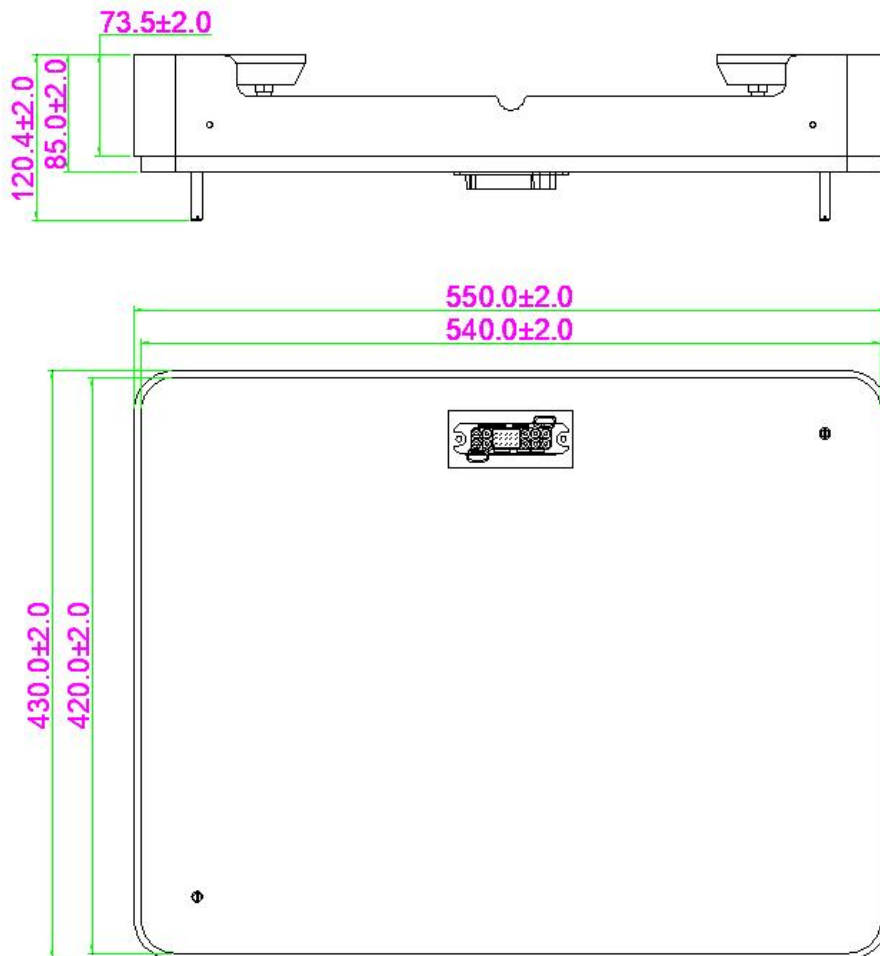
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### 4.1 Part Number/料号: /

### 4.2 Detailed Specifications/详细规格

No./序号	Items/项目	Specifications/参数
1	Dimensions/尺寸	W550*D430*H85 mm ( For tolerance, see section 4.3/公差参考4.3)
2	Weight/重量	6kg (for reference/仅供参考)
3	Installation method/安装方式	Stackable installation/堆叠安装

### 4.3 Base Appearance/底座外观



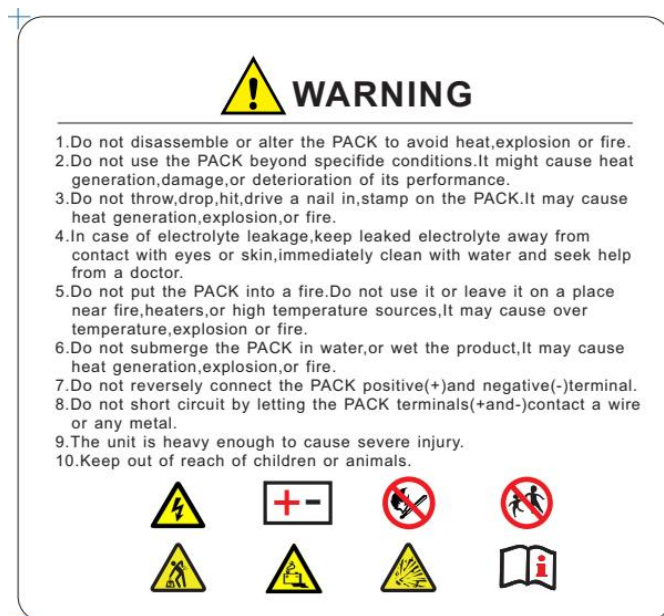
Unit: mm

## 5 Warranty period/保质期

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The warranty period provided by Hailei as well as the conditions and exceptions to the limited warranty shall be prescribed in a separate limited warranty document mutually agreed and signed by the Parties and such limited warranty document shall take precedence over this Document with regard to the subject matter. 海雷提供的产品质保期、质保条件以及排除质保的情形，应依照双方所另行签订的质保协议书所约定内容执行，该质保协议书有关质保内容并应优先适用于本文件。

### 5.1 Labeling/ 丝印图纸 铭牌/Nameplate



Warning Label

### 5.2 System Protection strategy/保护策略

序号 No.	告警 项目 Alarm Item	条件判断 Condition Judgement	确认时间 Confirmati on Time (mS)	切断时间 Disconn ect Time (mS)	告警回 差 Alarm Differen ce	告警消 除确认 时间 (mS)	报警 等级 Alarm level	报警动作 Alarm Reaction
1	单体电 压过高 Cell voltage high	Cell Voltage > 3.6V	1000	\	50 mV	100	Level 1	限制充电功率 0%，放电功率 100% Limit charging power to 0%, discharge power to 100%
		Cell Voltage > 3.65V	1000	100	100 mV	100	Level 2	限制充电功率 0%，放电功率 0%，并切断总 正继电器 Limit charging power to 0%, discharge power to 0%, and cut off the main positive relay
		Cell Voltage > 3.7V	100	100	\	下电清 除	Level 3	限制充电功率 0%，放电功率 0%，并切断继 电器、断开脱扣

								器Limit charging power to 0%, discharge power to 0%, and cut off relays and release devices
2	单体电压过低 Cell voltage low	Cell Voltage < 2.85V 2.65	1000	\	100mV	100	Level 1	限制充电功率100%，放电功率0%Limit charging power to 100%，discharge power to 0%
		Cell Voltage < 2.8V	1000	100	150mV	100	Level 2	限制充电功率0%，放电功率0%，并切断总正继电器Limit charging power to 0%，discharge power to 0%，and cut off the main positive relay
		Cell Voltage < 2.2V	100	100	\	Relay disconnection 下电清除	Level 3	限制充电功率0%，放电功率0%，并切断继电器、断开脱扣器Limit charging power to 0%，discharge power to 0%，and cut off relays and release devices
3	单体压差过大 Cell voltage difference over range	Cell Voltage Difference > 0.8V	100	\	0.3V	100	Level 3	限制充电功率0%，放电功率0%，并切断总正继电器Limit charging power to 0%，discharge power to 0%，and cut off the main positive relay
4	总压过高Pack voltage high	PACK Voltage > 56.8V*模组	1000	\	0.8V*Module模组	100	Level 1	限制充电功率0%，放电功率100%Limit charging power to 0%，discharge power to 100%
		PACK Voltage > 57.6V*模组	1000	100	1.6V*Module模组	100	Level 2	限制充电功率0%，放电功率0%，并切断总正继电器Limit charging power to 0%，discharge power to 0%，and cut off the main positive relay
		PACK Voltage > 58.64V*模组	1000	100	2.4V*Module模组	100	Level 3	限制充电功率0%，放电功率0%，并切断继电器、断开脱扣

								器Limit charging power to 0%, discharge power to 0%, and cut off relays and release devices
5	总压过低Pack voltage low	PACK Voltage < 46.4V*模组	1000	\	2.3V*Module模组	100	Level 1	限制充电功率100%，放电功率0%Limit charging power to 100%，discharge power to 0%
		PACK Voltage < 45.6V*模组	1000	100	4.8V*Module模组	100	Level 2	限制充电功率0%，放电功率0%，并切断总正继电器Limit charging power to 0%，discharge power to 0%，and cut off the main positive relay
		PACK Voltage < 44.8V*模组	1000	100	7.2V*Module模组	100	Level 3	限制充电功率0%，放电功率0%，并切断继电器、断开脱扣器Limit charging power to 0%，discharge power to 0%，and cut off relays and release devices
6	电池放电温度过高 Battery discharge temperature high	Cell Temperature > 50°C	100	\	2.5°C	100	Level 1	限制充电功率100%，放电功率0%
		Cell Temperature > 55°C	100	100	5°C	100	Level 2	限制充电功率0%，放电功率0%，并切断总正继电器Limit charging power to 0%，discharge power to 0%，and cut off the main positive relay
		Cell Temperature > 58°C	100	100	5°C	100	Level 3	限制充电功率0%，放电功率0%，并切断继电器、断开脱扣器Limit charging power to 0%，discharge power to 0%，and cut off relays and release devices
7	电池充电温度过高 Battery	Cell Temperature > 53°C	100	\	1.5°C	100	Level 1	限制充电功率0%，放电功率100%Limit charging power to 0%，discharge

	charge temperature high							power to 100%
		Cell Temperature > 55°C	100	100	3°C	100	Level 2	限制充电功率0%，放电功率0%，并切断总正继电器Limit charging power to 0%, discharge power to 0%, and cut off the main positive relay
		Cell Temperature > 58°C	100	100	3°C	100	Level 3	限制充电功率0%，放电功率0%，并切断继电器、断开脱扣器Limit charging power to 0%, discharge power to 0%, and cut off relays and release devices
8	电池放电温度过低 Battery discharge temperature low	Cell Temperature < -18°C	100	\	2.5°C	100	Level 2	限制充电功率100%，放电功率0%Limit charging power to 100%, discharge power to 0%
		Cell Temperature < -20°C	100	100	5°C	100	Level 3	限制充电功率0%，放电功率0%，断开总正继电器Limit charging power to 0%, discharge power to 0%, disconnect the main positive relay
	电池充电温度过低 Battery charge temperature low	Cell Temperature < 2°C	100	\	1.5°C	100	Level 2	限制充电功率0%，放电功率100%Limit charging power to 0%, discharge power to 100%
		Cell Temperature < 0°C	100	100	3°C	100	Level 3	限制充电功率0%，放电功率0%，断开总正继电器Limit charging power to 0%, discharge power to 0%, disconnect the main positive relay
9	单体温差过大 Cell temperature	Delta Cell Temperature > 15°C	100	\	5°C	100	Level 1	限制充电功率0%，放电功率0%Limit charging power

	Current difference over range							to 0%, discharge power to 0%
10	充电电流过高 Charge current high	Current >MAP*1.25	600000	\	1A	60000	Level 1	限制充电功率100%，放电功率100% Limit charging power to 100%, discharge power to 100%
		Current >MAP*1.5	1000	100	1A	60000	Level 2	限制充电功率0%，放电功率0%，并切断总正继电器 Limit charging power to 0%, discharge power to 0%, and cut off the main positive relay
		Current > 1C (与MAP不符)	100	100	\	Relay disconnect 下电清除	Level 3	限制充电功率0%，放电功率0%，并切断继电器、断开脱扣器 Limit charging power to 0%, discharge power to 0%, and cut off relays and release devices
11	放电电流过高 Discharge current high	Current >MAP*1.15	600000	\	1A	60000	Level 1	限制充电功率100%，放电功率100% Limit charging power to 100%, discharge power to 100%
		Current >MAP*1.25	1500	100	1A	60000	Level 2	限制充电功率0%，放电功率0%，并切断总正继电器 Limit charging power to 0%, discharge power to 0%, and cut off the main positive relay
		Current > 1.5C (与MAP不符)	100	100	\	Relay disconnect 下电清除	Level 3	限制充电功率0%，放电功率0%，并切断继电器、断开脱扣器 Limit charging power to 0%, discharge power to 0%, and cut off relays and release devices
12	绝缘故障 Insulation	Current leakage漏电流 6.7ma	100	100	\	Relay disconnect 下电清除	Level 1	限制充电功率0%，放电功率0%，并切断总



	n fault					除		正继电器Limit charging power to 0%, discharge power to 0%, and cut off the main positive relay
		Current leakage漏电流 10ma	100	100	\	Relay disconnect下电清除	Level 2	
13	通信故障 Communication error	BMS和PCS间的通信丢失Com lst between BMS and PCS	100	100	\	100	Level 3	
14	总正继电器故障Main positive replay fault	Relay adhesion继电器粘粘	100	100	\	Relay disconnect下电清除	Level3	
15	预充失败 Precharge failure	继电器内外侧电压压差>总压*80%Voltage difference between the inner and outer sides of the relay>total voltage * 80%	\	5000	\	Relay disconnect下电清除	Level3	
16	高压互锁故障 HV inter-lock fault	Open circuit, short power supply, short ground 开路、短电源、短地	100	100	\	Relay disconnect下电清除	Level 3	限制充电功率0%，放电功率0%，并切断总正继电器Limit charging power to 0%, discharge power to 0%, and cut off the main positive relay
17	单体电压故障 Cell voltage fault	The sampling line is disconnected and the voltage exceeds the reasonable range 采样线断线、电压超合理范围	100	100	\	Relay disconnect下电清除	Level 3	
18	单体温度故障 Cell temperature fault	Sample line disconnection, sample line short to ground, sample line short to power, temperature exceeding reasonable range采样线断线、采样线短地、采样线短电源、温度超合理范围	100	100	\	Relay disconnect下电清除	Level 3	
19	电流传感器故障 Current sensor fault	Diverter disconnection, HALL channel 1 disconnection, channel 2 disconnection, sensor temperature abnormality, zero current abnormality, current collection exceeding reasonable range分流器断线、HALL通道1断线、通道2断线、传感器温度异常、零点电流异常、电流采集超合理范围	100	100	\	Relay disconnect下电清除	Level 3	限制充电功率0%，放电功率0%Limit charging power to 0%, discharge power to 0%
20	电池系统故障 Battery system fault	BMS fault ,Internal fault BMS故障、内部故障	100	100	\	Relay disconnect下电清除	Level 3	限制充电功率100%，放电功率100%Limit charging power to 100%, discharge power to 100%