产品名称 Product	LF334	文件编号 Specification No.	JMRI-LF334-D06-01	版本 Version	A

产品交付规格书

Product Specification

方形锂离子电池

Prismatic Lithium-ion Cell

产品名称 ：LF334

Product：LF334

编制 Drafted by	产品设计审核 Product Design Checked by	品质审核 Quality Checked by	销售审核 Sales Checked by	批准 Approved by
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客户接受栏 Customer Recipient
公司名称 Company Name: 批准 Approved by: 日期 Date:

2025 年 9 月　　Sep., 2025

湖北亿纬动力有限公司　EVE Power Co., Ltd

产品名称 Product	LF334	文件编号 Specification No.	JMRI-LF334-D06-01	版本 Version	A

客户要求 Customer's Requirement

要求客户写出他们的需求信息并提前与亿纬动力沟通。如果客户有一些特别的应用或者操作条件不同于此文件中所描述的，亿纬动力可以根据客户的特别要求进行产品的设计和生产。

Customers are requested to write out their requirement information and communicate with EVE Power Co., Ltd. in advance. If the customer has some special applications or operating conditions different from those described in this document, EVE Power Co., Ltd. can design and manufacture the product according to the customer's special requirements.

序号 No.	特殊要求 Special Requirements	标准 Standards
1		
2		
3		
4		
5		

客 户 代 码：_____ 签字：_____ 日期：_____
Customer Code Sign Date

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变更履历 Change History

版本 Version	日期 Date	内容描述 Description	编制 Draft by
A	2025.09.26	新版发行 First Release	曾庆旺 QingWang Zeng

目录 Content

术语定义 Term Define

产　　品：本规格书中的“产品”是指湖北亿纬动力有限公司（以下简称 EVE）生产的 LF334 可充电方形锂离子电池。

Product: Refers to the LF334 rechargeable lithium-ion cell with prismatic manufactured by EVE Power Co., Ltd. (hereinafter referred to as EVE) in this specification.

客　　户：指与 EVE 签署产品销售合同中的买方。

Customer: Refers to the buyer in the product sales contract signed with EVE.

环境温度：电池所处的周围环境温度。

Environment temperature: The ambient temperature where the cell is located.

电池温度：由接入电池表面中心的温度传感器测量的电池表面的温度，温度传感器和测量线路的选择由 EVE 和客户共同商定。

Cell temperature: The temperature measured by temperature sensor installed at the center of cell surface. The selection of temperature sensor and measuring line shall be jointly agreed by EVE and the customer.

新鲜电池：指电池自产品生产完成日期算起 28 天以内的状态。

Fresh cell: Refers to cell within 28 days after production.

充电倍率：充电电流与电池管理系统监测的电池的容量值的比率。例如：电池容量为 334 Ah，充电电流为 167 A 时，则充电倍率为 0.5C；当电池容量衰减为 300 Ah，充电电流为 150 A 时，则充电倍率为 0.5C.

Charging Rate: The ratio of the charging current to the capacity which measured by the battery management system. For example, if the cell capacity is 334 Ah and the charging current is 167 A, the charging rate is 0.5C. If the cell capacity drops to 300 Ah and the charging current is 150 A, the charging rate is 0.5C.

荷电状态：在无负载的情况下，以安培小时或者以瓦特小时为单位计量的电池容量状态与标称容量的比值，缩写用 SOC 表示。例如：若将容量为 334 Ah 的状态视为 100% SOC，若容量为 0 Ah 时，SOC 为 0%.

State of charge: Under unloaded conditions, the ratio of the cell capacity state to the nominal capacity measured in ampere-hour or watt- hour. The abbreviation is expressed by SOC. For example, if the capacity at 334 Ah considered as 100% SOC, the capacity at 0 Ah, considered as 0% SOC.

健康状态：电池实际容量与标称容量的比值，缩写用 SOH 表示。例如：电池容量 334Ah 为 100% SOH，容量衰减为 267.2 Ah 时，SOH 为 80%.

State of health: The ratio of actual cell capacity to nominal capacity, the abbreviation is expressed by SOH. For example, if the cell capacity at 334 Ah considered as 100% SOH, the cell capacity decays to 267.2 Ah, considered as 80% SOH.

循　　环：电池按规定的充放标准充放一次为一个循环。循环包括短时的正常充电或者再生充电和放电过程的组合，在充电过程中有时只有正常充电而无再生充电的情况。放电可以由一些部分放电组合在一起形成。

Cycle: The cell shall be charged and discharged once according to the specified charging and discharging standards as a

cycle. The cycle includes short-term normal charging or a combination of regenerative charging and discharging processes. In the charging process, sometimes there is only normal charging and no regenerative charging. The discharge can be formed by combining some partial discharges.

标准充电：本规格书第 3.8 条所述的充电模式。

Standard charge: The charging mode described in 3.8 of this specification.

标准放电：本规格书第 3.9 条所述的放电模式。

Standard discharge: The discharging mode described in 3.9 of this specification.

开路电压：没有接入任何负载和电路时测得的电池的电压，缩写用 OCV 表示。

Open circuit voltage: The voltage of the cell measured when unloaded or circuit is disconnected. The abbreviation is expressed by OCV.

交流内阻：给电池正负极注入 1kHz 的正弦波电流，测试所得到的内阻值，缩写用 ACR 表示，测试方法如本规格书第 3.6 条所述。

AC resistance: Apply 1kHz sine wave current between the positive and negative poles of the cell, and the internal resistance obtained, which abbreviated as ACR. The test method is as described in section 3.6 of this specification.

直流内阻：工作条件下电池的电压变化与相应的电流变化之比，缩写用 DCR 表示，测试方法如本规格书第 3.6 条所述。

DC resistance: The ratio of the voltage changes to the corresponding current change under working conditions, and the abbreviation is DCR. The test method is as described in section 3.6 of this specification.

模　　组：锂离子电池经串并联方式组合，加装单体电池监控与管理装置后形成的电池与 pack 的中间产品。

Module: The intermediate product between single cell and pack, which is formed by lithium-ion cells in series and parallel after installing cell monitors and management devices.

脉冲电流：以周期重复出现的电流为脉冲电流，脉冲电流或是以同一方向出现，或是以正、负交替变换方向出现。

Pulse current: The currents that appear periodically are called pulse currents. The pulse currents appear either in the same direction or in alternating positive and negative directions.

压 缩 力：模组组装时，电池可承受压缩力的安全边界。

Compression force: When the module is assembled, the cell can withstand the force perpendicular to the cell stacking direction.

膨 胀 力：在使用过程中，因极片厚度变化、产气等因素导致电池膨胀产生的膨胀力。

Swelling force: In the process of use, the expansion force due to the change of the thickness of electrodes, gas production and other factors lead to the expansion of battery cell.

测量单位：见下表

Units of measurement： Refer to following table

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表 1 测量单位

Table 1 Units of measurement

序号 No.	单位 Units	简写 Abbreviation	单位类型 Type of units
1	伏特 Volt	V	电压单位 Voltage
2	安培 Ampere	A	电流单位 Current
3	安培-小时 Ampere-Hour	Ah	容量单位 Capacity
4	瓦特-小时 Watt-Hour	Wh	能量单位 Energy
5	欧姆 Ohm	Ω	电阻单位 Resistance
6	毫欧姆 Milliohm	mΩ	电阻单位 Resistance
7	摄氏度 Degree Celsius	℃	温度单位 Temperature
8	毫米 Millimeter	mm	长度单位 Length
9	秒 Second	s	时间单位 Time
10	赫兹 Hertz	Hz	频率单位 Frequency
11	牛顿 Newton	N	力单位 Force
12	千克力 Kilogram-Force	kgf	力单位 Force

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1 基本信息 Fundamental Information

1.1 适用范围 Scope

本规格书详细描述了 EVE 生产的可充电磷酸铁锂动力电池的产品性能指标以及产品使用条件及风险警示。

This document describes in detail the product performance specification of the rechargeable LFP cylindrical cell produced by EVE Power Co., Ltd., as well as the product use conditions and risk warnings.

1.2 产品类型 Cell Classification and Model

1.2.1 产品类型 Cell Classification 方形锂离子电池 Prismatic Lithium-ion Cell

1.2.2 产品名称 Cell Model LF334

2 电池规格参数 Cell Specification

2.1 基本性能 Nominal Specification

表 2 基本规格参数

Table 2 Nominal specifications and parameters

序号 No.	项目 Items	规格 Specification	备注 Notes
2.1.1	标称容量 Nominal Capacity	≥334.0 Ah	新鲜电池 Fresh battery 按照 3.8 和 3.9 标准充放电模式测试 Follow the standard charging and discharging modes described in 3.8 and 3.9
2.1.2	标称能量 Nominal Energy	≥1075.48Wh	
2.1.3	标称电压 Nominal Voltage	3.22 V	0.33C 放电，25℃ ± 2℃，2.5 V ~ 3.65 V 0.33C discharge, 25℃ ± 2℃, 2.5 V ~ 3.65 V
2.1.4	充电终止电压 (U_{max}) End-off-charge Voltage	3.65 V	/
2.1.5	放电终止电压 (U_{min}) End-off-discharge Voltage	2.5 V (T > 0℃) 2.0 V (T ≤ 0℃)	/
2.1.6	标准充电电流 Standard Charging Current	0%~80%SOC 1C 80%SOC-3.5V 0.8C 3.5V-3.6V 0.5C 3.6V-3.65V 0.1C	25℃ ± 2℃
2.1.7	最大瞬间充电电流 Maximum Instantaneous Charging Current	2C	30 s, ≤ 80% SOC, 25℃ ± 2℃
2.1.8	标准放电电流 Standard Discharging Current	167 A	25℃ ± 2℃，0.5C

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2.1.9	最大瞬间放电电流 Maximum Instantaneous Discharging Current		3C	30 s, ≥ 30% SOC, 25℃ ± 2℃
2.1.10	初始内阻 Initial IR		0.18mΩ ± 0.05 mΩ	AC, 1 kHz, 19% ~ 23% SOC 新鲜电池 Fresh cell
2.1.11	直流内阻 Direct Current Resistance (DCR)		≤ 1.2 mΩ	25℃, 50% SOC, 1C, 10 s 新鲜电池 Fresh cell
2.1.12	重量 Weight		5520 g ± 166 g	/
2.1.13	尺寸 Dimension (含蓝膜 With Insulation Film)	高度 1 (H1) Terminal Height	207.0 mm ± 0.5 mm	含极柱 With Terminal
		高度 2 (H2) Can-top Height	204.2 mm ± 0.5 mm	不包含极柱 Without Terminal
		宽度 (L) Length	174.0 mm ± 1.0 mm	/
		厚度 (T) Thickness	71.7 mm ± 0.8 mm	（300 kgf ± 20 kgf 压缩力，出货 SOC） (300 kgf ± 20 kgf compression force, Delivery SOC)
		极柱中心距 (D) Center Distance between Poles	123.0 mm ± 0.3 mm	/
2.1.14	工作温度 Operation Temperature	充电温度 Charge Temperature	-10℃~65℃	/
		放电温度 Discharge Temperature	-35℃~65℃	/
2.1.15	存储温度 Storage Temperature	3 个月内 3 months	0℃ ~ 35℃	出货 SOC 状态 Delivery SOC
		1 个月内 1 month	-20℃ ~ 45℃	
2.1.16	EOL 膨胀力 Swelling force at EOL		≤ 40000 N	80% SOH

备注：电池性能测试选用新鲜电池状态进行。Note: Testing the cell using the fresh cell.

2.2 电性能参数 Electrical Performance Parameters

表 3 电性能参数表

Table 3 Electrical performance parameters

产品名称 Product	LF334	文件编号 Specification No.	JMRI-LF334-D06-01	版本 Version	A

序号 No.	项目 Items	规格 Specifications			测试方法 Testing Methods
2.2.1	倍率放电性能 Rate Discharge Performance	项目 Items / 倍率 Rate	放电容量 Discharging Capacity	容量保持率 Capacity Retention	/
		1C	C_0	100%	3.10
		0.5C	C_1	$C_1/C_0 \geq 98\%$	3.11
2.2.2	高/低温放电性能 High/Low Temperature Discharge Performance	项目 Items / 温度 Temp.	放电容量 Discharging Capacity	容量保持率 Capacity Retention	3.12
		-20℃	C_2	$C_2/C_0 \geq 75\%$	
		0℃	C_3	$C_3/C_0 \geq 85\%$	
		25℃	C_0	100%	
		45℃	C_4	$C_4/C_0 \geq 97\%$	
		55℃	C_5	$C_5/C_0 \geq 97\%$	
2.2.3	荷电保持与恢复（100%SOC） The Capacity Retention and Recovery	项目 Items / 温度 Temp.	容量保持率 Capacity Retention	容量恢复率 Capacity Recovery	3.13
		25℃ & 28days	≥ 96%	≥ 97%	
		45℃ & 28days	≥ 93%	≥ 95%	
		55℃ & 7days	≥ 95%	≥ 96%	
2.2.4	存储性能（50%SOC） Storage	项目 Items / 温度 Temp.	容量恢复率 Capacity Recovery		3.14
		25℃ & 28days	≥ 98%		
		45℃ & 28days	≥ 97%		
2.2.5	循环寿命 Cycle Life	25℃循环 25℃ Cycle	4000 cycles, 80% SOH, 25℃		3.15
		45℃循环 45℃ Cycle	2000 cycles, 80% SOH, 45℃		

备注：电池性能测试选用新鲜电池状态进行。Note: Testing the cell using the fresh cell.

2.3 安全性能参数 Safety Performance Parameters

表 4 安全性能参数

Table 4 Safety performance parameters

产品名称 Product	LF334	文件编号 Specification No.	JMRI-LF334-D06-01	版本 Version	A

序号 No.	项目 Items	规格 Specifications	测试方法 Testing Methods
2.3.1	过放电 Over-discharge	不起火、不爆炸 No fire, No explosion	3.17.1
2.3.2	过充电 Over-charge	不起火、不爆炸 No fire, No explosion	3.17.2
2.3.3	外部短路 External Short-circuit	不起火、不爆炸 No fire, No explosion	3.17.3
2.3.4	加热 Heating	不起火、不爆炸 No fire, No explosion	3.17.4
2.3.5	温度循环 Temperature Cycling	不起火、不爆炸 No fire, No explosion	3.17.5
2.3.6	挤压 Crush Test	不起火、不爆炸 No fire, No explosion	3.17.6

备注：客户在进行电性能、安全性能测试或者参考其他标准测试前需与 EVE 确认具体测试流程与注意事项。

Remark：Customer need to confirm the specific test method and precautions with EVE before performing electrical performance, safety performance tests and other test standards beyond this Sample Specifications.

2.4 电池图纸 Cell Drawing

见附录 1。See Appendix1.

2.5 外观 Appearance

电池应无明显擦伤、裂痕、锈渍、变色或电解液泄漏这类对电池商用价值有影响的缺陷。

The cell shall not have any defects that may affect their commercial values, including obvious scratches, cracks, rust stains, discoloration, or electrolyte leakage.

3 试验条件 Testing Conditions

3.1 环境条件 Environmental Conditions

除另有规定外，试验应在温度为 25℃ ± 2℃，相对湿度 10% ~ 90%，大气压力为 86 kPa ~ 106 kPa 的环境中进行。本规格书所提到的室温，是指 25℃ ± 2℃。

短期电性能测试全过程需在试验工装条件下进行，试验工装（参考 GB31486-2024 附录 A）

Unless otherwise specified, the test should be carried out in an environmental temperature of 25℃ ± 2℃, relative humidity of 10% ~ 90%, and atmospheric pressure of 86 kPa to 106 kPa. The room temperature mentioned in this specification refers to 25℃ ± 2℃.

The entire process of short-term electrical performance testing needs to be conducted under the conditions of the

testing fixture (refer to Appendix A of GB31486-2024).

3.2 测量设备 Measuring Instrument

试验装置应符合下列要求：The accuracy of measuring device should meet the following requirements:

A. 电压测量装置 Voltage measuring device: ± 0.05 %FS；

B. 电流测量装置 Current measuring device: ± 0.05 %FS；

C. 温度测量装置 Temperature measuring device: ± 1℃；

D. 尺寸测量装置 Dimension measuring device: ± 0.01 mm；

E. 重量测量装置 Weight measuring device: ± 0.1 g。

备注：测试过程中，均需记录电压、电流、环境温度和电池温度，电池温度采集点建议布置在极柱和大面（或侧面）中心处。

Note: During the testing process, voltage, current, ambient temperature, and cell temperature must be recorded. It is recommended to collect the cell temperature at the terminal and the center of large surface (or side).

3.3 测试夹具准备和安装 Test Clamp Preparation and Installation

3.3.1 普通钢夹具 Ordinary Steel Clamp

单体电池需采用钢夹板（厚度：12~20 mm）固定，夹板需要覆盖住电池大面，夹板之间采用 6 个 M8 螺栓固定，夹板各个面需要有绝缘膜，夹具工装如下图所示：

The single cell shall be clamped with steel splints (thickness: 12~20 mm). The splints need to cover the large surfaces of the cell and be fixed with 6 M8 bolts. All sides of the splints need to be covered with insulating film. Clamp as shown below:

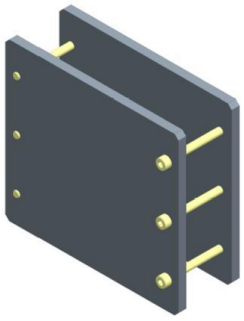

图 1 夹具示意图

Fig. 1 Diagram of cell clamp

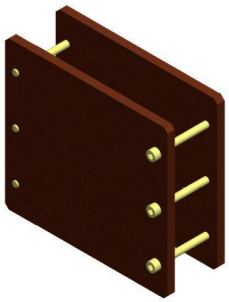

图 2 电池夹具包绝缘膜图

Fig. 2 Diagram of the clamp covered with insulation film

将包覆有蓝膜（材质：PET，厚度 0.1 mm）和顶部贴片（材质：PC，厚度 0.3 mm）的电池（15% ~ 40%SOC）准备好后，置于夹具中间，使用 6 个 M8 螺栓固定钢夹具保证电池受夹具初始预紧力为 300 kgf ± 20 kgf，需采用千分尺测量带夹板电池的厚度（上、中、下），厚度差异需控制小于等于 0.3 mm。

Place the cell (15% ~ 40%SOC) which is covered with blue film (material: PET, thickness: 0.1mm) and top film

(material: PC, thickness: 0.3 mm) in the middle of the splint, fix the steel fixture with 6 M8 bolts to ensure that the initial preload of the cell on the fixture is 300 kgf ± 20 kgf. Then use a micrometer to measure the thickness of the cell (at upper, middle and lower) with splints, and the thickness tolerance shall be controlled within 0.3 mm.

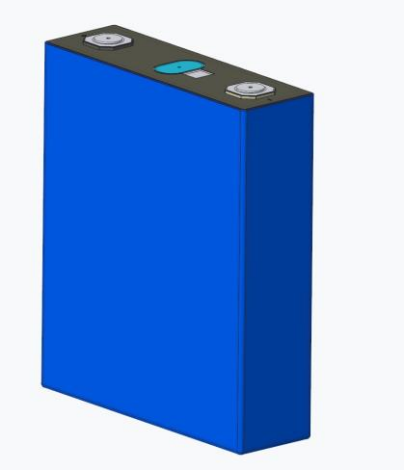

图 3 电池包膜示意图
Fig. 3 Diagram of cell filming

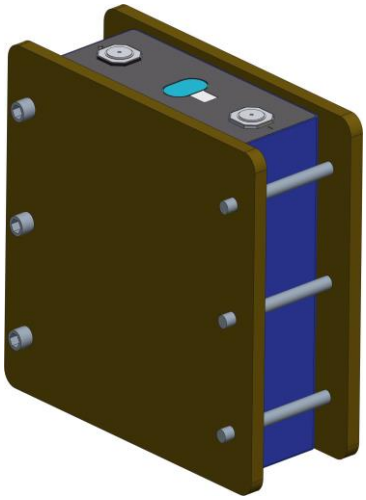

图 4 电池带夹具示意图
Fig. 4 Diagram of cell with clamp

3.3.2 循环测试夹具 Cycle Testing Fixture

将包覆有蓝膜（材质：PET，厚度 0.1 mm）和顶部贴片（材质：PC，厚度 0.3 mm）的电池（15%~40%SOC）准备好后，在电池的两个大面各粘贴一层缓冲材质（例：XPP 材料，对充放电过程中电池的膨胀起到缓冲作用，XPP 尺寸设计参考示例表 5，XPP 材料覆盖整个电芯大面，见示意图 5），置于膨胀力夹具中间，调节膨胀力夹具预紧装置，使间隙达到电池厚度 3%；上夹板后，用千分尺测量带夹板电池的厚度（上、中、下），厚度差异需控制≤0.3 mm，图示见附录 2。

After preparing the battery (15%~40% SOC) wrapped with a blue film (material: PET, thickness: 0.1 mm) and a top patch (material: PC, thickness: 0.3 mm), attach a layer of cushioning material (e.g., XPP material, which buffers the expansion of the battery during charging and discharging; the XPP dimensions should be designed with reference to Example Table 5, covering the entire large surface of the cell as shown in Figure 5) to each of the two large surfaces of the battery. Place the battery in the center of the expansion force fixture, adjust the preload device of the fixture to achieve a gap of 3% of the battery thickness, and then secure the upper clamping plate. Use a micrometer to measure the thickness of the battery with the clamping plate (top, middle, and bottom), ensuring the thickness variation is controlled to ≤0.3 mm. Refer to Appendix 2 for the illustration.

表 5 XPP 尺寸参数表
Table 5 XPP size parameters

XPP 尺寸 XPP specifications		
电池型号	缓冲材质	XPP 压缩前尺寸（长*宽*厚）/mm

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Battery type	Cushioning material	XPP dimensions before compression (L×W×T)
LF334	XPP	191*161*1.3

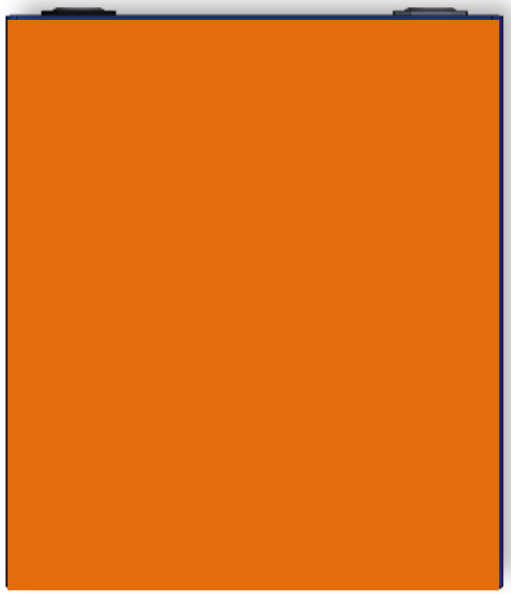

图 5 XPP 粘贴示意图
Fig. 5 XPP Pad Mounting Illustration

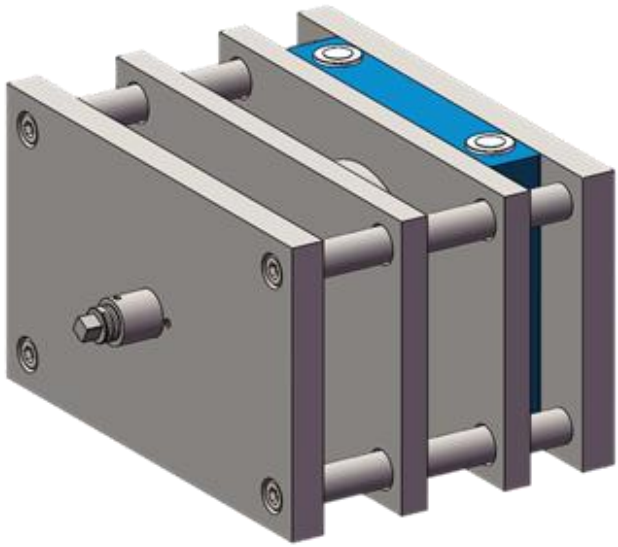

图 6 电池循环夹具图
Fig. 6 Battery Cycling Fixture Schematic

3.4 尺寸 Dimensions

试验设备：自动包膜机。

试验方法：使用自动包膜机测试电池长度、宽度和高度，施加 300 kgf ± 20 kgf 的压力。

电池厚度随着 SOC 增加会有所增加，随着使用时间增加会有所增加，此处厚度指出货时电池的厚度。

Test instrument： Automatic wrapping machine.

Test method: Use the wrapping machine to measure the length, width and height of the cell. And apply a 300 kgf ± 20 kgf force on it.

The thickness of the cell will increase as the SOC increases as well as with the using time. The thickness here indicates the thickness of the cell at the time of delivery.

3.5 重量 Weight

试验设备：电子秤。

试验方法：使用电子秤测量电池的重量。

Test instrument: electronic scale.

Test method: measure the weight of the cell by electronic scale.

3.6 内阻 Internal Resistance

a. 交流内阻（ACR）：在室温条件下，出货 SOC 电池采用 1 kHz 正弦波电流进行测试。

b. 直流内阻（DCR）：对电池按照 3.10 的方法进行容量标定，电池按 3.8 标准充电方法进行充电，然后以 0.5C 恒流放电 60min（调整 SOC 为 50%），搁置 1 h，记录搁置末期电压 V_1，用 1C 恒流放电 10 s，记录放电末期电压 V_2，计算 DCR，DCR= $(V_1 - V_2) \times 1000 / 334$ (mΩ)。

a. ACR: test the cell at delivery SOC with 1kHz sine wave current at room temperature.

b. DCR: Capacity calibration is carried out according to 3.10. The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃. Rest for 30 min, and discharge with constant current of 0.5C for 60 min afterwards (adjust the SOC to 50%). Then rest for 1 h, and record the voltage V_1 at the end of the period. Put a 10 s discharge pulse current of 1C and record the voltage V_2 at the end of the pulse, and calculate the DCR., DCR= $(V_1 - V_2) \times 1000 / 334.0$ (mΩ).

3.7 预处理 Pretreatment

正式测试开始前，电池需要先进行预处理循环，以确保试验对象的性能处于激活和稳定的状态。其步骤如下：

a. 电池按照 3.8 标准充电模式充电；

b. 电池按 3.9 照标准放电模式放电；

c. 重复 a~b 不超过 5 次；

如果电池连续两次的放电容量变化不高于标称容量的 3%，则认为电池完成了预处理，预处理循环可以中止。

Before the formal test, pretreat the cell to ensure it is activated and stable. The steps are as follows:

a. Charge the cell according to the standard 3.8 charging mode;

b. Discharge the cell according to the standard 3.9 discharging mode;

c. Repeat a~b no more than 5 times;

If the discharge capacity of the cell changes no more than 3% of the nominal capacity for two consecutive times, it is considered that the cell has completed the pretreatment, and the pretreatment cycle can be terminated.

3.8 标准充电 Standard Charge

在环境温度 25℃ ± 2℃的条件下，对电池按步骤 a~d 行阶段充电，搁置 30 min。

a. 1C 恒流充电至 80%SOC；

b. 0.8C 恒流充电至 3.5V；

c. 0.5C 恒流充电至 3.6V；

d. 0.1C 恒流充电至 3.65V。

At ambient temperature of 25℃ ± 2℃, the cell is charged with the step of a~d, and rest the cell for 30 min.

a. With 1C constant current charging to 80%SOC;

b. 0.8C constant current charging to 3.5V;

c. 0.5C constant current charging to 3.6V;

d. 0.1C constant current charging to 3.65V.

3.9 标准放电 Standard Discharge

在环境温度 25℃ ± 2℃的条件下，电池以 0.5C 电流恒流放电，放电至电压达到 2.5 V 截止，搁置 30 min。

Discharge the cell to 2.5 V with constant current of 0.5C at ambient temperature of 25℃ ± 2℃, and rest for 30 min.

3.10 1C 容量标定 1C Capacity Calibration

在环境温度 25℃ ± 2℃的条件下，电池按 3.8 标准充电方法进行充电，然后 1C 放电至 2.5 V，搁置 30 min。按照以上充放电方式重复 5 次，最后 3 次的平均放电容量即为 1C 放电容量，记录放电容量为标定容量 C_0。

Charge the cell to 3.65 V with constant current of 1C at ambient temperature of 25℃ ± 2℃ (constant temperature without air convection). The battery is charged according to the 3.8 standard charging method. After that, discharge the cell to 2.5 V with constant current of 1C, lastly rest for 30 min. Repeat the above steps 5 times, and the average discharge capacity of the last 3 times is the 1C discharge capacity, which is recorded as C_0.

3.11 倍率放电性能 Rate Discharge Performance

对电池按照 3.10 的方法进行容量标定。在环境温度 25℃ ± 2℃的条件下，电池按 3.8 标准充电方法进行充电，用 0.5C 电流恒流放电至 2.5 V，记录放电容量 C_1，$C_1 / C_0 \times 100\%$即为 0.5C 容量保持率。

Capacity calibration is carried out according to 3.10. The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃, and discharge it to 2.5 V with constant current of 0.5C. Discharge capacity is recorded as C_1, and $C_1 / C_0 \times 100\%$ is the capacity retention rate at 0.5C.

3.12 高/低温放电性能 High/Low Temperature Discharge Performance

3.12.1 -20℃容量保持率 -20℃ Capacity Retention Rate

对电池按照 3.10 的方法进行容量标定。在环境温度 25℃ ± 2℃的条件下，电池按 3.8 标准充电方法进行充电，然后在-20℃ ± 2℃的环境下搁置 24 h，在-20℃ ± 2℃的环境下用 1C 电流恒流放电至 2.0 V，记录放电容量 C_2，$C_2 / C_0 \times 100\%$即为-20℃容量保持率。

Capacity calibration is carried out according to 3.10. The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃. After that, rest the cell at -20℃ ± 2℃ for 24 h, and discharge it to 2.0 V with constant current of 1C under the environment of -20℃ ± 2℃. Discharge capacity is recorded as C_2, and $C_2 / C_0 \times 100\%$ is the capacity retention rate at -20℃.

3.12.2 0℃容量保持率 0℃ Capacity Retention Rate

对电池按照 3.10 的方法进行容量标定。在环境温度 25℃ ± 2℃的条件下，电池按 3.8 标准充电方法进行充电，然后在 0℃ ± 2℃的环境下搁置 24 h，在 0℃ ± 2℃的环境下用 1C 电流恒流放电至 2.0 V，记录放电容量 C_3，C_3 / C_0

× 100%即为 0℃容量保持率。

Capacity calibration is carried out according to 3.10. The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃. After that, rest the cell at 0℃ ± 2℃ for 24 h, and discharge it to 2.0 V with constant current of 1C under the environment of 0℃ ± 2℃. Discharge capacity is recorded as C_3, and $C_3 / C_0 \times 100\%$ is the capacity retention rate at 0℃.

3.12.3 45℃容量保持率 45℃ Capacity Retention Rate

对电池按照 3.10 的方法进行容量标定。在环境温度 25℃ ± 2℃的条件下，电池按 3.8 标准充电方法进行充电，然后在 45℃ ± 2℃的环境下搁置 5 h，在 45℃ ± 2℃的环境下用 1C 电流恒流放电至 2.5 V，记录放电容量 C_4，$C_4 / C_0 \times 100\%$即为 45℃容量保持率。

Capacity calibration is carried out according to 3.10. The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃. After that, rest the cell at 45℃ ± 2℃ for 5 h, and discharge it to 2.5 V with constant current of 1C under the environment of 45℃ ± 2℃. Discharge capacity is recorded as C_4, and $C_4 / C_0 \times 100\%$ is the capacity retention rate at 45℃.

3.12.4 55℃容量保持率 55℃ Capacity Retention Rate

对电池按照 3.10 的方法进行容量标定。在环境温度 25℃ ± 2℃的条件下，电池按 3.8 标准充电方法进行充电，然后在 55℃ ± 2℃ 的环境下搁置 5 h，在 55℃ ± 2℃的环境下用 1C 电流恒流放电至 2.5 V，记录放电容量 C_5，$C_5 / C_0 \times 100\%$即为 55℃容量保持率。

Capacity calibration is carried out according to 3.10. The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃. After that, rest the cell at 55℃ ± 2℃ for 5 h, and discharge it to 2.5 V with constant current of 1C under the environment of 55℃ ± 2℃. Discharge capacity is recorded as C_5, and $C_5 / C_0 \times 100\%$ is the capacity retention rate at 55℃.

3.13 荷电保持与恢复 The Capacity Retention and Recovery

3.13.1 25℃荷电保持与恢复 25℃ Capacity Retention and Recovery

对电池按照 3.10 的方法进行容量标定。电池按 3.8 标准充电方法进行充电，然后在环境温度 25℃ ± 2℃的条件下搁置 28 天，之后在环境温度 25℃ ± 2℃的条件下按照 1C 放电至 2.5 V（记录放电容量 C_6），搁置 30 min，再按 3.8 标准充电方法进行充电，用 1C 放电至 2.5 V（记录放电容量 C_7）。容量保持率=$C_6 / C_0 \times 100\%$，容量恢复率=$C_7 / C_0 \times 100\%$。

Capacity calibration is carried out according 3.10. The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃, and rest for 28 days afterwards at ambient temperature of 25℃ ± 2℃. Discharge the cell to 2.5 V with constant current of 1C at ambient temperature of 25℃ ± 2℃ (record the discharge capacity as C_6), and rest for 30 min. Then The battery is charged according to the 3.8 standard charging method at

ambient temperature of 25℃ ± 2℃, and discharge to 2.5 V with constant current of 1C (record the discharge capacity C_7). Capacity retention rate=C_6 / C_0 × 100 %, capacity recovery rate=C_7 / C_0 × 100 %.

3.13.2 45℃荷电保持与恢复 45℃ Capacity Retention and Recovery

对电池按照 3.10 的方法进行容量标定。电池按 3.8 标准充电方法进行充电，然后在环境温度 45℃ ± 2℃的条件下搁置 28 天，之后在环境温度 25℃ ± 2℃的条件下搁置 5 h，随后按照 1C 放电至 2.5 V（记录放电容量 C_8），搁置 30 min，再按 3.8 标准充电方法进行充电，用 1C 放电至 2.5 V（记录放电容量 C_9）。容量保持率=C_8 / C_0 × 100 %，容量恢复率=C_9 / C_0 × 100 %。

Capacity calibration is carried out according 3.10. The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃, and rest for 28 days afterwards at ambient temperature of 45℃ ± 2℃. Rest for 5h at ambient temperature of 25℃ ± 2℃, and then discharge the cell to 2.5 V with constant current of 1C (record the discharge capacity C_8). After rest for 30 min, the battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃, and discharge to 2.5 V with constant current of 1C (record the discharge capacity C_9). Capacity retention rate= C_8 / C_0 × 100 %, capacity recovery rate= C_9 / C_0 × 100 %.

3.13.3 55℃荷电保持与恢复 55℃ Capacity Retention and Recovery

对电池按照 3.10 的方法进行容量标定。电池按 3.8 标准充电方法进行充电，然后在环境温度 55℃ ± 2℃的条件下搁置 7 天，之后在环境温度 25℃ ± 2℃的条件下搁置 5 h，随后按照 1C 放电至 2.5 V（记录放电容量 C_{10}），搁置 30 min，再按 3.8 标准充电方法进行充电，用 1C 放电至 2.5 V（记录放电容量 C_{11}）。容量保持率= C_{10} / C_0 × 100 %，容量恢复率= C_{11} / C_0 × 100 %。

Capacity calibration is carried out according 3.10. The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃, and rest for 7 days at ambient temperature of 55℃ ± 2℃. Rest for 5h at ambient temperature of 25℃ ± 2℃, and discharge the cell to 2.5 V with constant current of 1C (record the discharge capacity C_{10}). After rest for 30 min, the battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃, and then discharge to 2.5 V with constant current of 1C (record the discharge capacity C_{11}). Capacity retention rate=C_{10} / C_0 × 100 %, capacity recovery rate=C_{11} / C_0 × 100 %.

3.14 存储性能 Storage

3.14.1 25℃存储 25℃ Storage

对电池按照 3.10 的方法进行容量标定。电池按 3.8 标准充电方法进行充电，用 1C 放电 30 min，然后在环境温度 25℃ ± 2℃的条件下搁置 28 天，之后在环境温度 25℃ ± 2℃的条件下按照 1C 放电至 2.5 V，搁置 30 min，再按 3.8 标准充电方法进行充电，用 1C 放电至 2.5 V（记录放电容量 C_{12}）。容量恢复率=C_{12} / C_0 × 100%。

Capacity calibration is carried out according 3.10. The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃. Then discharge cell to 2.5 V with constant current of 1C. Rest for 28 days

at ambient temperature of 25℃ ± 2℃. Discharge the cell to 2.5 V with constant current of 1C at ambient temperature of 25℃ ± 2℃, and rest for 30 min. Then The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃, and discharge to 2.5V with constant current of 1C (record the discharge capacity C_{12}). Capacity recovery rate=C_{12} / C_0 × 100%.

3.14.2 45℃存储 45℃ Storage

对电池按照 3.10 的方法进行容量标定。电池按 3.8 标准充电方法进行充电，用 1C 放电 30 min，然后在环境温度 45℃ ± 2℃的条件下搁置 28 天，之后在环境温度 25℃ ± 2℃的条件下搁置 5 h，按照 1C 放电至 2.5 V，搁置 30 min，然后按 3.8 标准充电方法进行充电，用 1C 放电至 2.5 V（记录放电容量 C_{13}）。容量恢复率=C_{13} / C_0 × 100%。

Capacity calibration is carried out according 3.10. The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃. Then discharge cell to 2.5 V with constant current of 1C. Rest for 28 days at ambient temperature of 45℃ ± 2℃. Rest for 5h at ambient temperature of 25℃ ± 2℃, and discharge the cell to 2.5 V with constant current of 1C. Rest for 30 min, the battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃, and then discharge to 2.5 V with constant current of 1C (record the discharge capacity C_{13}). Capacity recovery rate= C_{13} / C_0 × 100%.

3.15 循环寿命 Cycle Life

测试前按照 3.3.2 进行夹具准备和安装。

循环前初始容量测试：对电池按照 3.10 的方法进行容量测试，记录初始容量 C_0 。

Before the test, prepare and install the clamp according to 3.3.2.

Initial capacity test before cycling: test the cell capacity according to (3.10). and record the initial capacity as C_0.

3.15.1 25℃ 阶梯充电循环工步 Steps of 25℃ Staged Charging Cycle:

a. 环境温度 25℃ ± 2℃；
b. 1C 恒流充电至 80% C_0；
c. 0.8C 恒流充电至 3.5 V；
d. 0.5C 恒流充电至 3.6 V；
e. 0.1C 恒流充电至 3.65 V；
f. 在开路状态静置 30 min，以 1C 恒流放电至 2.5 V，搁置 30 min；
g. 重复 b 到 f 步骤，循环容量保持率每衰减 5%时，此时 1C 电流值调整为 1C × (1 − 5% × n) ，n=1，2，3，4，…；确保每衰减 5%的充电时长保持一致，具体步骤见阶梯充电循环对应充放电电流表；
h. 按步骤 b ~ g 循环 4000 次。

循环后容量测试：在 25℃ ± 2℃的环境温度下对电池以 0.5C 电流恒流放电至 2.5 V，搁置 30 min，然后按 3.8 标准充电方法进行充电，最后 0.5C 放电至 2.5 V，记录放电容量 C_{14}，容量保持率=C_{14} / 334 × 100%。

a. Ambient temperature at 25℃ ± 2℃;

b. With 1C constant current charging capacity as 80% C_0;

c. 0.8C constant current charging to 3.5 V;

d. 0.5C constant current charging to 3.6 V;

e. 0.1C constant current charging to 3.65 V;

f. Rest for 30 min in an open circuit state, discharge to 2.5 V with constant current of 1C, and rest for 30 min;

g. Repeat steps from b to f. When the cycle capacity retention rate decreases by 5%, the current value of 1C is adjusted to 1C × (1 – 5% × n), n=1, 2, 3, 4, ...; ensure the charging time remains the same every 5% decay, and the specific steps are shown in the corresponding charging and discharging ammeter of the staged charging cycle;

h. 4000 cycles according to steps b ~ g.

Capacity test after cycle: discharge the cell to 2.5 V with constant current of 0.5C at ambient temperature of 25℃ ± 2℃. Rest for 30 min, the battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃, and discharging to 2.5 V with constant current of 0.5C, and record the discharge capacity C_{14}. The capacity retention rate = C_{14} / 334 × 100%.

3.15.2 45 °C 阶梯充电循环工步 Steps of 45 °C Staged Charging Cycle:

a. 环境温度45℃ ± 2℃；

b. 1C 恒流充电至 80% C_0；

c. 0.8C 恒流充电至 3.5V；

d. 0.5C 恒流充电至 3.6V；

e. 0.1C 恒流充电至 3.65V；

f. 在开路状态静置30 min，以1C恒流放电至2.5 V，搁置30 min；

g. 重复b到g步骤，循环容量保持率每衰减5%时，此时1C电流值调整为1C × (1 – 5% × n) ，n=1，2，3，4，…；确保每衰减5%的充电时长保持一致，具体步骤见阶梯充电循环对应充放电电流表；

h. 按步骤 b ~ h 循环 2000 次。

循环后容量测试：在 25℃ ± 2℃的环境温度下对电池以 0.5C 电流恒流放电至 2.5 V，搁置 30 min，然后按 3.8 标准充电方法进行充电，最后 0.5C 放电至 2.5 V，记录放电容量 C_{15}，容量保持率=C_{15} / 334 × 100%。

a. Ambient temperature at 45℃ ± 2℃;

b. With 1C constant current charging capacity as 80% C_0;

c. 0.8C constant current charging to 3.5 V;

d. 0.5C constant current charging to 3.6 V;

e. 0.1C constant current charging to 3.65 V;

f. Rest for 30 min in an open circuit state, discharge to 2.5 V with constant current of 1C, and rest for 30 min;

g. Repeat steps from b to f. When the cycle capacity retention rate decreases by 5%, the current value of 1C is

adjusted to 1C × (1 – 5% × n), n=1, 2, 3, 4, ...; ensure the charging time remains the same every 5% decay, and the specific steps are shown in the corresponding charging and discharging ammeter of the staged charging cycle;

h. 4000 cycles according to steps b ~ g.

Capacity test after cycle: discharge the cell to 2.5 V with constant current of 0.5C at ambient temperature of 25℃ ± 2℃. Rest for 30 min, the battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃, then discharging to 2.5 V with constant current of 0.5C, and record the discharge capacity C_{15}. The capacity retention rate = C_{15} / 334 × 100%.

阶梯充电循环对应充电电流表:

Corresponding Charging Current Table for Staged Charging Cycle:

表 6 阶梯充电循环对应充电电流表

Table 6 Corresponding charging current meter for stepped charging cycle

Items 项目	Current/Capacity 电流/容量	Current capacity / calibrated capacity × 100% (SOH) 当前容量 / 标定容量 × 100%（SOH）			
		> 95%	[95% ~ 90%)	[90% ~ 85%)	[85% ~ 80%)
Charging Current (A) 充电电流（A）	1C	334.0	317.3	300.6	283.9
	0.8C	267.2	253.8	240.8	227.1
	0.5C	167.0	158.7	150.3	142.0
	0.1C	33.4	1637	30.1	28.4
Discharging Current (A) 放电电流（A）	1C	334.0	334.0	334.0	334.0
1C constant Current Charge to 80% C_0; 1C 恒流充电至容量 80% C_0		80% C_0	76% C_0	72% C_0	68% C_0

备注：循环容量保持率每衰减 5%，此时充电电流 1C / 0.8C / 0.5C / 0.1C 电流值调整为 1C / 0.8C / 0.5C / 0.1C × (1 – 5% × n)，n=0，1，2，3，4，…；按阶梯充电对应充放电电流表设置电流。

Notes: When the cycle capacity retention rate decreases by 5%, the charging current 1C / 0.8C / 0.5C / 0.1C current value is adjusted to 1C / 0.8C / 0.5C / 0.1C × (1 – 5% × n) at this time, n=0, 1, 2, 3, 4, …; set the current according to the charging and discharging ammeter corresponding to the stepped charging.

3.16 安全性能 Safety Performance

3.16.1 过放电 Over-discharge

在环境温度 22℃ ± 5℃条件下，电池按 3.9 标准放电方法进行放电。在安全试验环境温度 22℃ ± 5℃下电池以 1C 恒流放电 30 min。观察 1 h。（参考 GB 38031-2025 电动汽车用动力蓄电池安全要求）

The battery is charged according to the 3.9 standard discharging method at ambient temperature of 22℃ ± 5℃. Discharge the cell with constant current of 1C for 30 min at 22℃ ± 5℃ of safety test. Observe for 1 h. (Refer to GB 38031-2025 electric vehicles traction cell safety requirements)

3.16.2 过充电 Over-charge

在环境温度 22℃ ± 5℃条件下，电池按 3.8 标准充电方法进行充电，然后按照 3.3.1 的方法安装测试夹具。在安全试验环境温度 22℃ ± 5℃下电池以不小于 1 / 3C 恒流充电至终止电压的 1.1 倍或 115% SOC 后，停止充电。观察 1 h。（参考 GB 38031-2025 电动汽车用动力蓄电池安全要求）

The battery is charged according to the 3.8 standard charging method at ambient temperature of 22℃ ± 5℃, then installing the test clamp according to 3.3.1. After charge the cell to 1.1 times of the termination voltage, or 115% SOC with constant current of not less than 1 / 3C at the safety test ambient temperature of 22℃ ± 5℃, stop charging. Observe for 1 h. (Refer to GB 38031-2025 electric vehicles traction cell safety requirements)

3.16.3 外部短路 External Short-circuit

在环境温度 22℃ ± 5℃条件下，电池按 3.8 标准充电方法进行充电。在安全试验环境温度 22℃ ± 5℃下将电池正、负极经外部短路 10 min，外部线路电阻值应小于 5 mΩ。观察 1 h。（参考 GB 38031-2025 电动汽车用动力蓄电池安全要求）

The battery is charged according to the 3.8 standard charging method at ambient temperature of 22℃ ± 5℃. The positive and negative terminals of the cell are short-circuited externally for 10 min under the safety test ambient temperature of 22℃ ± 5℃, and the resistance of the external circuit should be less than 5 mΩ. Observe for 1 h. (Refer to GB 38031-2025 electric vehicles traction cell safety requirements)

3.16.4 加热 Heating (130℃)

在环境温度 22℃ ± 5℃条件下，电池按 3.8 标准充电方法进行充电，将电池放入温度箱，温度箱按照 5 ℃/min 的速率由室温升至 130℃，并保持此温度 30 min 后停止加热。观察 1 h。（参考 GB 38031-2025 电动汽车用动力蓄电池安全要求）

The battery is charged according to the 3.8 standard charging method at ambient temperature of 22℃ ± 5℃. Put the cell into the temperature chamber, and the temperature chamber will rise from room temperature to 130℃ at a rate of 5 ℃/min, and keep this temperature for 30 min before stop heating. Observe for 1 h. (Refer to GB 38031-2020 electric vehicles traction cell safety requirements)

3.16.5 温度循环 Temperature Cycling

在环境温度 22℃ ± 5℃条件下，电池按 3.8 标准充电方法进行充电，将电池放入温度箱中，温度箱按照下表进行调节，循环次数 5 次。（参考 GB 38031-2020 电动汽车用动力蓄电池安全要求）

The battery is charged according to the 3.8 standard charging method at ambient temperature of 25℃ ± 2℃. Put the

cell into the temperature chamber, and adjust the temperature chamber according to the following table and figure, and cycle for 5 times. (Refer to GB 38031-2020 electric vehicles traction cell safety requirements)

表 7 温度循环对应参数

Table 7 Temperature cycle corresponding parameter table

温度（℃） Temperature	时间增量（min） Time Increment	累计时间（min） Time Accumulation	温度变化率（℃/min） Temperature Change Rate
25	0	0	0
-40	60	60	13/12
-40	90	150	0
25	60	210	13/12
85	90	300	2/3
85	110	410	0
25	70	480	6/7

3.16.6 挤压 Crush

在环境温度 22℃ ± 5℃的条件下，电池按 3.8 标准充电方法进行充电，在安全试验环境温度 25℃ ± 2℃下按照如下条件进行试验：

a) 挤压方向：垂直于电池单体极板方向施压，或与电池单体在整车布局上最容易受到挤压的方向相同；

b) 挤压板形式：半径 75 mm 的半圆柱体，半圆柱体的长度（L）大于被挤压电池单体的尺寸；

c) 挤压速度：不大于 2 mm/s；

d) 挤压程度：电压达到 0 V 或变形量达到 15%或挤压力达到 100000 N 或 1000 倍试验对象质量后停止挤压；

e) 保持当前位置 10 min 后，在试验环境温度下观察 1 h。（参考 GB 38031-2025 电动汽车用动力蓄电池安全要求）

The battery is charged according to the 3.8 standard charging method at ambient temperature of 22℃ ± 5℃. Test under the following conditions at a safety test environment temperature of 22℃ ± 5℃:

a) Crushing direction: apply pressure perpendicular to the direction of the cell plate, or the same direction that the cell is most susceptible to be crushed in the layout of the whole vehicle;

b) The form of the crushing plate: a semi-cylinder with a radius of 75 mm, the length (L) of the semi-cylinder is greater than the size of the cell being crushed (refer to the figure below);

c) Crushing speed: not more than 2 mm/s;

d) Crushing degree: stop crushing after the voltage reaches 0 V or the deformation reaches 15% or the crushing force reaches 100000 N or 1000 times the weight of the test object;

e) Maintain the current position for 10 minutes, then observe for 1 hour at the test environment temperature. (Refer

to GB 38031-2025 electric vehicles traction cell safety requirements)

4 电池使用说明 Cell Application Instructions

4.1 焊接参数建议 Welding Parameters Recommendation

表 8 焊接参数表

Table 8 Parameters Table

项目 Items		规格 Specifications	备注 Notes
铝巴焊接参数 Welding Parameter of Al Busbar	激光焊接熔深 Laser Welding Depth	≤ 2.0 mm	/
	极柱承受最大压力 Max Pressure Force on Poles	700 N	极柱承受最大垂直力，不发生变形 Max force in longitudinal direction, no deformation.
	极柱承受最大扭矩 Max Torque Force on Poles	6 N·m	极柱承受最大扭曲，不松动 Max torsion, non-loosen.
	极柱承受最大温度 Max Temperature Force on Poles	130℃	极柱承受最大温度，塑胶垫不发生变形 The maximum temperature that the pole bears before the plastic pad deforms.

4.2 充放电参数 Charge and Discharge Parameters

以下数据为 LF334 电池参考性能数据，供 BMS 设计时参考，实际使用以双方约定的使用方式和条件为准。

The following data is the reference performance data of LF334 Cell during BMS design. Actual use is subject to the using mode and conditions agreed by both parties.

4.2.1 充电模式 Charging Mode

表 9 充电模式参数表

Table 9 Charging mode parameter table

参数 Parameters	产品规格 Product Specifications	备注 Notes
标准充电电流 Standard Charging Current	0%~80%SOC 1C 80%SOC-3.5V 0.8C 3.5V-3.6V 0.5C 3.6V-3.65V 0.1C	25℃ ± 2℃
最大持续充电电流 Maximum Continuous Charging Current	1C	
标准充电截止电压	单体电池 ≤ 3.65 V	

产品名称 Product	LF334	文件编号 Specification No.	JMRI-LF334-D06-01	版本 Version	A

Standard Charging Cut-off Voltage	Single cell ≤ 3.65 V	
标准充电模式 Standard Charging Mode	参考 3.8 节 Refer to section 3.8	
标准充电温度 Standard Charging Temperature	25℃ ± 2℃	
绝对充电温度（电池温度） Absolute Charging Temperature (Cell Temperature)	-10℃ ~ 65℃	无论电池处于何种充电模式，电池温度一旦超出绝对充电温度范围，即停止充电 No matter what charging mode the cell is in, once the cell temperature exceeds the absolute charging temperature range, stop charging.
绝对充电电压 Absolute Charging Voltage	最大 3.65 V Max 3.65 V	无论电池处于何种充电模式，电池电压一旦超出绝对充电电压，即停止充电 No matter what charging mode the cell is in, once the cell voltage exceeds the absolute charging voltage, stop charging.

4.2.2 其他充电模式 Other Charging Modes

4.2.2.1 持续充电模式 Continuous Charging Modes

表 10 持续充电模式 / C-电池级别（单位：C-Rate）

Table 10 Continuous charging modes / C-cell level (unit: C-Rate)

T/SOC	0%	5%	10%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	99%	100%
-10℃	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-5℃	0.20	0.20	0.20	0.10	0.10	0.10	0.06	0.06	0.06	0.06	0.04	0.02	0.01	0.01	0.01
0℃	0.50	0.50	0.50	0.30	0.30	0.20	0.20	0.20	0.12	0.12	0.10	0.10	0.07	0.02	0.01
5℃	0.70	0.70	0.70	0.70	0.50	0.40	0.40	0.40	0.20	0.20	0.12	0.12	0.10	0.03	0.01
10℃	0.80	0.80	0.80	0.80	0.80	0.60	0.60	0.60	0.40	0.40	0.30	0.30	0.20	0.05	0.01
15℃	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.80	0.60	0.60	0.40	0.40	0.30	0.08	0.05
20℃	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.90	0.80	0.80	0.60	0.40	0.09	0.05
25℃	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.80	0.50	0.33	0.10
30℃	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.80	0.50	0.33	0.10
35℃	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.80	0.50	0.33	0.10
40℃	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.80	0.50	0.33	0.10
45℃	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.80	0.50	0.33	0.10
50℃	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.80	0.50	0.33	0.10
55℃	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.64	0.64	0.50	0.20	0.10
60℃	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.22	0.22	0.22	0.10	0.05
65℃	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

4.2.2.2 脉冲回馈模式 Pulse Feedback Modes

表 11 30 s 脉冲回馈倍率 / C-电池级别（单位：C-Rate）

Table 11 30 s pulse feedback rate / C-cell level (unit: C-Rate)

产品名称 Product	LF334	文件编号 Specification No.	JMRI-LF334-D06-01	版本 Version	A

T\SOC	0%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	100%
-10℃	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-5℃	0.40	0.40	0.40	0.40	0.30	0.30	0.30	0.20	0.20	0.20	0.10	0.10	0.00
0℃	0.60	0.60	0.50	0.50	0.40	0.40	0.40	0.40	0.30	0.30	0.20	0.20	0.00
10℃	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.40	0.25	0.00
20℃	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	0.80	0.40	0.00
25℃	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.60	0.80	0.00
30℃	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.60	0.80	0.00
35℃	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.60	0.80	0.00
45℃	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.60	0.80	0.00
50℃	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.60	0.80	0.00
55℃	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.20	0.80	0.00
60℃	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.00
65℃	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

注：为确保全生命周期的使用安全并最大限度延长电池使用寿命，充电功率（倍率）必须要根据电池的 SOH（容量衰减）来进行调整。BMS 应确保具有该功能，并对实际的充电功率（和允许充电功率限制）做监测，并在必要的时候触发故障和保护功能。

Note: In order to ensure the safe use during the whole life cycle and maximize the service life of the cell, the charging power (rate) must be adjusted according to the SOH (capacity attenuation) of the cell. It should be ensured that the BMS has this function to monitor the actual charging power (and allowable charging power limit), and trigger fault and protection functions when necessary.

4.2.3 放电模式 Discharge Mode

表 12 放电模式参数表

Table 12 Discharge mode parameter table

参数 Parameters	产品规格 Product Specifications	备注 Notes
标准放电电流 Standard Discharge Current	0.5C	25℃ ± 2℃
最大持续放电电流 Maximum Continuous Discharge Current	1C	
放电截止电压 Discharge Cut-off Voltage	2.5 V	温度 T > 0℃ Temperature T > 0℃
	2.0 V	温度 T ≤ 0℃ Temperature T ≤ 0℃
标准放电模式 Standard Discharge Mode	参考 3.9 节 Refer to Section of 3.9	

产品名称 Product	LF334	文件编号 Specification No.	JMRI-LF334-D06-01	版本 Version	A

标准放电温度 Standard Discharge Temperature	25℃ ± 2℃	
绝对放电温度（电池温度） Absolute Discharge Temperature (Cell Temperature)	-35℃ ~ 65℃	无论电池处于何种放电模式，电池温度一旦超出绝对放电温度范围，即停止放电 No matter what discharge mode the cell is in, once the cell temperature exceeds the absolute discharge temperature range, stop discharging.
绝对放电电压 Absolute Discharge Voltage	最小 2.5 V（T > 0℃） 最小 2.0 V（T ≤ 0℃） Min 2.5 V (T > 0℃) Min 2.0 V (T ≤ 0℃)	无论电池处于何种放电模式，电池电压一旦小于绝对放电电压，即停止放电 No matter what kind of discharge mode the cell is in, once the cell voltage is less than the absolute discharge voltage, stop discharging.

4.2.4 其他放电模式 Other Discharging Modes

4.2.4.1 持续放电模式 Continuous Discharging Modes

表 13 持续放电倍率 / C-电池级别（单位：C-Rate）

Table 13 Continuous discharge rate / C-cell level (unit: C-Rate)

T / SOC	0%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	100%
-36℃	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-35℃	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
-30℃	0.00	0.03	0.06	0.12	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
-20℃	0.00	0.06	0.12	0.25	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
-10℃	0.00	0.19	0.38	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
0℃	0.00	0.28	0.56	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25℃	0.00	0.38	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
60℃	0.00	0.38	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
65℃	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

4.2.4.2 脉冲放电模式 Pulsing Discharging Modes

表 14 30 s 脉冲放电倍率 / C-电池级别（单位：C-Rate）

Table 14 30 s pulse discharge rate / C-cell level (unit: C-Rate)

T\SOC	0%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	100%
-36℃	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-35℃	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
-30℃	0.00	0.03	0.06	0.12	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
-20℃	0.00	0.06	0.12	0.25	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
-10℃	0.00	0.19	0.38	0.62	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
-5℃	0.00	0.25	0.50	1.00	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12

0℃	0.00	0.28	0.56	1.06	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18
5℃	0.00	0.31	0.62	1.12	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
10℃	0.00	0.33	0.66	1.22	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43
15℃	0.00	0.34	0.68	1.32	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63
20℃	0.00	0.36	0.72	1.41	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82
25℃	0.00	0.38	0.75	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
45℃	0.00	0.38	0.75	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
60℃	0.00	0.38	0.75	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
65℃	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

4.3 安全限制 Safety Limits

4.3.1 应用条件 Application Conditions

客户应当确保严格遵守以下与电池相关的应用条件：

a) 客户应配置电池管理和监控系统，严密监控、管理与保护每个电池，并建立电池管理档案，保存完整的电池运转的监测数据，用做问题追溯及产品质量责任划分的参考。**不具备完整的电池系统使用期限内的监测数据的，EVE 不承担产品质量保证责任。**

b) 电池包设计中应充分考虑电池的防水、防尘问题，电池包必须满足国家有关标准规定的防水、防尘等级。**由于防水、防尘问题而导致的电池或电池包的损坏（如腐蚀、生锈、等），EVE 不承担质量保证责任。**

c) **禁止不同型号电池在同一电池系统（或整车）中混用，否则，EVE 不承担质量保证责任。**

Customer shall ensure strict compliance with the following cell application conditions:

a) Customer shall configure a battery management and monitoring system to strictly monitor, manage and protect each cell. And a battery management archive shall be established to keep all monitoring data of the cells, so as to be a reference for problems tracing and product quality responsibility division. **EVE is not responsible for product quality assurance if no complete monitoring data of the battery system during its service life is provided.**

b) The waterproof and dustproof problems of the cell shall be fully considered in the design of the pack, and the pack must meet the waterproof and dustproof grade stipulated by relevant national standards. **EVE is not responsible for the damage (such as corrosion, rust, etc.) of the cell caused by waterproof and dustproof problems.**

c) **It is forbidden to mix different types of cells in the same battery system (or vehicle), otherwise, EVE will not be responsible for the quality assurance.**

4.3.2 电压限制 Voltage Limits

表 15 安全限制电压参数

Table 15 Safety limit voltage parameters

项目 Items	类别 Categories	参数 Parameters	保护动作 Protective Actions

产品名称 Product	LF334	文件编号 Specification No.	JMRI-LF334-D06-01	版本 Version	A

充电电压 Charging Voltage	充电终止 Charging Ends	3.65 V	当电池电压达到 3.65 V 时终止充电。 When the cell voltage reaches 3.65 V, stop charging.
	第一级过充电保护 First Over-Charging Protection	3.80 V	当电池电压达到 3.8 V 时终止充电。 When the cell voltage reaches 3.8 V, stop charging.
	第二级过充电保护 Second Over-Charging Protection	3.85 V	当电池电压达到 3.85 V 时终止充电，并锁定电池管理系统，直至技术人员解决问题。 When the cell voltage reaches 3.85 V, stop charging and lock the battery management system until the technician solves the problem.
放电电压 Discharging Voltage	放电终止 Discharging Ends	最小 2.50 V Min 2.50 V	温度 T > 0℃，当电池电压达到 2.5 V，终止放电。 Temperature T > 0℃. When the cell voltage reaches 2.5 V, stop discharging.
		最小 2.00 V Min 2.00 V	温度 T ≤ 0℃，当电池电压达到 2.0 V，终止放电。 Temperature T ≤ 0℃. When the cell voltage reaches 2.0 V, stop discharging.
	第一级过放电保护 First Over-Discharging Protection	最小 2.00 V Min 2.00 V	温度 T > 0℃，当电池电压达到 2.0 V，将电流降到最小。 Temperature T > 0℃. When the cell voltage reaches 2.0 V, reduce the current to the minimum.
		最小 1.90 V Min 1.90 V	温度 T ≤ 0℃，当电池电压达到 1.9 V，将电流降到最小。 Temperature T ≤ 0℃. When the cell voltage reaches 1.9 V, reduce the current to the minimum.
	第二级过放电保护 Second Over-Discharging Protection	最小 1.85 V Min 1.85 V	温度 T > 0℃，当电池电压低于 1.85 V 时，锁定电池管理系统，直至技术人员解决问题。 Temperature T > 0℃. When the cell voltage is lower than 1.85 V, stop charging and lock the battery management system until the technician solves the problem.
		最小 1.75 V Min 1.75 V	温度 T ≤ 0℃，当电池电压低于 1.75 V 时，锁定电池管理系统，直至技术人员解决问题。 Temperature T ≤ 0℃. When the cell voltage is lower than 1.75 V, stop charging and lock the battery management system until the technician solves the problem.
BMS 保护 BMS protection	短路保护 Short Circuit protection	不允许短路 Short circuit is not allowed	发生短路时，由过流器断开电池。 When a short circuit occurs, the cell is disconnected by the over-current device.

	充电时间过长保护 Long Charging Time Protection	充电时间在 8 小时内 Charging time within 8 h	充电时间长于8小时，则终止充电。 If the charging time is longer than 8 h, the charging will be terminated.

备注 Notes:

a) 电池充电超过终止电压时，需依据相应的保护动作采取措施，对于超出保护电压带来的电池质量问题，EVE 不承担任何责任。

b) 当电池放电电压到达终止电压时，需尽快充电，防止电池进入过放状态。因电池过放导致的电池质量问题，EVE 不承担任何保证责任。

a) If the cell charging voltage exceeds the cut-off voltage, corresponding protective actions need to be taken. EVE shall not be responsible for any cell quality issues caused by exceeding the protection voltage.

b) If the cell discharging voltage reaches the cut-off voltage, it is necessary to charge as soon as possible to prevent the cell from being over-discharged. EVE shall not be responsible for any cell quality issues caused by over-discharge.

4.3.3 温度限制 Temperature Limits

表 16 安全限制温度参数

Table 16 Safety limit temperature parameters

项目 Items	参数 Parameters	备注 Notes
推荐操作温度范围 Recommended Operating Temperature Range	10℃ ~ 35℃	推荐使用电池的温度范围。 Recommend cell usage temperature range.
最高操作温度 Maximum Operating Temperature	65℃	如果电池使用温度超过最高操作温度，功率需要降为 0。 If the cell temperature exceeds the maximum operating temperature, the power needs to be reduced to 0.
最低操作温度 Minimum Operating Temperature	-35°C	如果电池使用温度超过最低操作温度，功率需要降为 0。 If the cell temperature exceeds the minimum operating temperature, the power needs to be reduced to 0.
最高安全温度 Maximum Safe Temperature	65℃	如果电池使用温度超过最高安全温度，将会造成电池不可逆的永久性损坏，用户使用时不得高于最高安全温度。 If the cell temperature exceeds the maximum safe temperature, irreversible and permanent damage will be caused. The user should not use it under environments

		higher than the maximum safe temperature.
最低安全温度 Minimum Safe Temperature	-35℃	如果电池使用温度超过最低安全温度，将会造成电池不可逆的永久性损坏，用户使用时不得低于最低安全温度。 If the cell temperature exceeds the minimum safe temperature, irreversible and permanent damage will be caused. The user should not use it under environments lower than the minimum safe temperature.

备注 Notes:

a) 电池禁止在低温下（-10℃以下）充电及在规定的最低安全温度下放电，否则 EVE 不承担任何电池质量保证责任。

b) 电池包的散热设计会影响电池性能，因电池包散热设计问题导致的电池质量问题，EVE 不承担任何责任。

a) Prohibit charging the cell at low temperature (below -10℃) and the minimum safety temperature specified by this specification, otherwise EVE will not be responsible for any quality assurance liability.

b) The heat dissipation design of battery may effect cell electrical performance, EVE will not be responsible for any assurance liability regarding cell quality issues caused by the heat dissipation design.

4.4 模组设计参数建议 Parameters Recommendation for Module Design

4.4.1 电池方向 Cell Directions

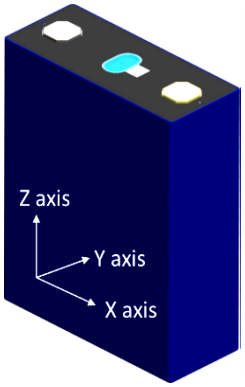

图 7 LF334 电池方向示意图
Fig.7 Diagram of LF334 Cell direction

4.4.2 电池压缩力 Cell Compression Force

电池在模组成组时，为了使电池更好的排列固定，对电池施加一个垂直厚度方向的压缩力，压缩力过大，电池内部可能收到损伤，甚至漏液。电池压缩力测试条件如下：

When forming modules, a compression force in the direction of vertical thickness is applied to the cells in order to make them better arranged and fixed. If the compression force is too large, the cells may be damaged or even leak. Cell compression force test conditions are as follows:

-压缩面积 Compression area: 174.0 mm × 204.2 mm (L × H2)

-压缩速度 Compression speed: 0.02 mm/s

-压缩方向 Compression direction: Y 方向 Y direction

-电池 SOC Cell SOC: 15%~40%

表 17 电池压缩力限制参数

Table 17 Cell compression force limit parameters

现象 Observation	压缩力 Compression Force
推荐压缩力 Recommend Compression Force	＜7000 N
瞬时最大压缩力 Instantaneous Maximum Compression Force	10000 N

电池承受的压缩力不能超过 10000 N，否则电池可能会受到损害。

The compression force of the cell shall be no larger than 10000 N, otherwise the cell may be damaged.

4.4.3 电池膨胀力 Cell Swelling force

在使用过程中，因极片厚度变化、产气等因素导致电池膨胀产生的膨胀力；电池的膨胀力随着电池容量的衰减而增加，电池 BOL 和 EOL（80%SOH）膨胀力如下表：

In the process of use, the expansion force due to the change of the thickness of electrodes, gas production and other factors lead to the expansion of battery cell, and the force increases with the attenuation of the cell capacity. The cell swelling force at BOL and EOL (70%SOH) is shown below:

表 18 电池膨胀力参数

Table 18 Cell Swelling force parameters

膨胀力 Swelling force	BOL	/
	EOL（80%SOH）	≤ 40000 N
	EOL（70%SOH）	≤ 45000 N

客户在设计模组时，应充分考虑电池膨胀力的影响。产品在使用过程中会产生膨胀力，电芯在 20mm 钢板测试条件下衰减至 80%时膨胀力约为 40000N，客户在产品设计过程中需要考虑结构强度可靠性，建议电芯成组预

留 3%的膨胀空间。

Customer shall fully consider the influence of the cell swelling force When designing the module. The product generates expansion force during use, and the expansion force is about 40000 N When the cell capacity attenuates to 80% under the test conditions of 20mm steel plate. Customers shall consider the reliability of structural strength in the product design process, and it is suggested to reserve 3% expansion space While grouping the cells.

4.4.4 推荐温度采集点 Recommend Temperature Collection Points

对电池表面进行温度采集时，建议温度采集点布置在极柱或刻码处。

The recommended temperature collection points are the poles or code when collecting temperature of the cell surface.

4.5 热力学参数 Thermodynamic Parameters

测试方法：Test method:

参考标准：GB/T 10295-2008、ASTM E1269-2011

Reference standards: GB/T 10295-2008、ASTM E1269-2011

表 19 电池导热系数参数

Table 19 Cell thermal conductivity parameter

<table>
<tr><td rowspan="3">导热系数均值
Mean Thermal Conductivity</td><td colspan="2">导热系数 W/(m·K)
Thermal Conductivity W/(m·K)</td></tr>
<tr><td>X/Z 方向
X/Z Direction</td><td>Y 方向
Y Direction</td></tr>
<tr><td>12 ~ 18 W/(m·K)</td><td>1 ~ 3 W/(m·K)</td></tr>
<tr><td rowspan="2">热容均值
Mean Heat Capacity</td><td colspan="2">热容 kJ/(kg·K)
Heat Capacity kJ/(kg·K)</td></tr>
<tr><td colspan="2">0.9~1.2 kJ/(kg·K)</td></tr>
</table>

5 注意事项 Precautions

5.1 产品寿命终止管理 Product End-life Management

电池使用期限是有限的，客户应建立有效的跟踪系统监测并记录每个使用期限内电池的内阻和容量。内阻及容量的测量方法和计算方法需要客户和 EVE 共同讨论和双方同意。当使用中电池的内阻超过这个电池最初内阻的 150%或容量小于标称容量的 70%（25℃）或达到与客户达成一致的电池寿命末期，应停止使用电池。**违反该**

项要求，免除 EVE 依据产品销售协议以及本规格书所应承担的产品质量保证责任。

The cell life is limited. Customers should establish an effective tracking system to monitor and record the internal resistance and capacity of each cell during its life. The measurement method and calculation method of internal resistance and capacity need to be discussed and agreed between the customer and EVE. When the internal resistance of the cell in use exceeds 150% of the initial internal resistance of the cell or the capacity is less than 70% of the nominal capacity（25℃）or the end of cell life which both customer and EVE agree on is coming, the cell should not to be operated. **Violation of this requirement will exempt EVE from its responsibility for product quality assurance in accordance with the product sales agreement and this specification.**

5.2 长期存储 Long-term Storage

电池进行充电后，需尽快使用，以免因自放电而造成可用容量损失。若需要存储，应将 SOC 调整为 15% ~ 40% SOC。推荐的存储条件为：0℃ ~ 35℃，相对湿度≤ 60%。

After charging, the cell should be used as soon as possible to avoid loss of usable capacity due to self-discharge. If long-term storage is required, adjust the cell SOC to 15% ~ 40%. The recommended storage conditions are: 0℃ ~ 35℃, relative humidity ≤ 60%.

电池单体贮存时，荷电态（SOC，容量状态）应保持在 15% ~ 40%，长期贮存（三个月以上）时为防止电池性能差异，应每 3 个月进行一次标准充放电循环至存储 SOC；建议收到货后储存时间不超过半年，避免存储超期造成的质量问题。

The state of charge (SOC, capacity state) of the cell should be kept at 15% ~ 40% during storage. In order to prevent the performance differences after long-term storage (more than three months), perform a standard charge-discharge cycle every 3 months, then switch to storage SOC. It is recommended that the storage time after receiving the cells should not exceed half a year to avoid quality problems due to storage overdue.

5.3 运输及装卸要求 Transportation and Handling Requirements

- 在运输过程中不允许和易燃、易爆、易腐蚀的物品同车装运，大包装运输过程中禁止堆叠；产品不允许经受雨、雪或液体物质的淋袭与机械损伤；
- 产品装卸时，须采用升降车或专用工具对产品进行上下车；要轻取轻放，不得扔掷、挤压，造成电池损坏或对人身的意外伤害，严禁与酸碱等腐蚀物品放在一起。
- It is not allowed to ship with inflammable, explosive and corrosive articles in the same vehicle during transportation, and stacking is prohibited during large package transportation; The product shall not be exposed to rain, snow and other liquid substances without any protection, or suffer mechanical damage;
- While handling, lift trucks or special tools shall be used to load and unload products; Handle with care, do not throw or squeeze, which may cause cell damage or personal injury. It is strictly prohibited to put cells together with corrosive substances such as acid and alkali.

5.4 操作说明 Operation Precautions

- 严禁将电池浸入水中，保存不用时，应放置于阴凉干燥的环境中。
- 禁止电池过充，否则，可能引起电池过热和火灾事故的发生。在电池安装和使用中，硬件和软件需实行多重过充失效安全保护。最低保护要求见本规格书 4.3 条。
- 应对电池持续充电时长进行合理限制。充电时间过长电池可能会出现过热现象，进而引起热失控和火灾。在模组设计时需考虑此类 BMS 管理失效情况。
- 电池非正常终止充电时，为避免未知原因对电池性能及安全的影响，需明确根本原因并彻底解决后再使用。
- 禁止过放电。在电池正常使用过程中，为防止过放电，电池应定期充电，将电压维持在 2.8 V 以上。
- 禁止在高温下使用或放置电池，否则可能会引起电池过热或功能失效、寿命减短。
- 在任何正常的使用情况下，电池温度不能超过 65℃，如果电池温度超过 65℃，电池管理系统需关闭电池，停止电池运行。
- 充电时请选用锂离子电池专用充电器。
- 在使用过程中，严格按照标示和说明连接电池正负极，禁止反向充电。
- 禁止用金属直接连接电池正负极短路，否则强电流和高温可能导致人身伤害或者火灾。
- 禁止将电池与金属，如发夹、项链等一起运输或贮存。
- 禁止敲击或抛掷、踩踏和弯折电池等。
- 禁止直接焊接电池。
- 禁止用钉子或其它利器刺穿电池。
- 尽力保护电池，使其免受机械震动、碰撞及压力冲击，否则电池内部可能短路，产生高温和火灾。
- 禁止在强静电和强磁场的地方使用，否则易破坏电池安全保护装置，带来安全隐患。
- 客户应将电池安全地固定在固体平面上，并将电源线安全地束缚在合适的位置，以避免摩擦而引起电弧和火花。
- 电池极柱朝上放置使用，请勿平放或倒置。
- 严禁用塑料封装电池或用塑料进行电气连接。不正确的电气连接方式可能会造成电池使用过程中发生过热现象。
- 如果电池漏液，电解液溅到皮肤或衣服上，应立即用流动的水清洗受影响区域，如果电池发生泄露，电解液进入眼睛、口、鼻等人体开放部位，应立即用大量清水冲洗，并马上送医治疗，否则会对人体造成严重伤害。禁止任何人或动物吞食电池的任何部位或电池所含物质。
- 如果电池发出异味、发热、变色、变形或使用、贮存、充电过程中出现任何异常，立即将电池从装置或充电器中移离并停用。
- 未经 EVE 书面同意，禁止私自拆解产品。
- It is strictly forbidden to immerse the cell in water. When it is not in use, it should be placed in a cool and dry environment.

- Do not over-charge the cell. Otherwise, cell overheating and fire may occur. During cell installation and use, hardware and software must be protected against multiple over-charge failures. See 4.3 of this specification for the minimum requirements of protection.
- It's necessary to set a reasonable charging time limit, otherwise, the cell may overheat, resulting in thermal runaway or fire. BMS management failure of this kind shall be considered during module design.
- If improper charge termination occurs, the root reasons shall be found and resolved before reuse to avoid negative effects on electrical and safety performances.
- It is forbidden to over-discharge. During the normal use of the cell, charge the cell regularly to keep the voltage above 2.8 V, so as to avoid over-discharge.
- It is forbidden to use or place the cell at a high temperature environment. Otherwise, cell overheat, function failure or life shorten may occur.
- The temperature of the cell shall not exceed 65℃ in any normal use, otherwise the BMS must shut down the cell and stop cell operation.
- Please use a special charger for lithium-ion batteries when charging.
- During use, please connect the positive and the negative of the cell strictly according to the labels and instructions, and reverse charging is forbidden.
- It is forbidden to use metal to directly connect the positive and the negative of the cell to short-circuit. Otherwise, strong current and high temperature may cause personal injury or fire.
- It is forbidden to transport or store the cell with metal, such as hairpins, necklaces, etc.
- It is forbidden to knock, throw, step on or bend the cell.
- It is forbidden to directly weld the cell.
- It is forbidden to directly pierce the battery with nails or other sharp objects.
- Try to protect the cell from mechanical shock, collision and pressure impact. Otherwise, the cell may be short-circuited internally, resulting in high temperature and fire.
- It is forbidden to use it in places with strong static electricity and strong magnetic fields; otherwise cell safety protection devices may be damaged and cause safety hazards.
- Customer shall securely fix the cell to a solid surface and bind the power cord in a proper place to avoid arcing and sparks caused by friction.
- The battery poles should be placed upward during use; do not place it flat or upside down.
- It is forbidden to use plastic for cell encapsulation and electrical connection. Improper electrical connection may cause overheat during cell use.
- If the cell leaks and the electrolyte spills onto the skin or clothes, immediately wash the affected area with running water. If the cell leaks and the electrolyte enters the eyes, mouth, nose and other open parts of the human body, immediately wash with plenty of water and seek medical treatment immediately, otherwise serious injuries

will be caused to the human body. No person or animal is allowed to swallow any part of the cell or any substance contained in the cell.

- If the cell emits peculiar smell, heat, discoloration, deformation, or any abnormality during use, storage, or charging, immediately remove the cell from the device or charger and stop using it.
- It is prohibited to disassemble the product without the written consent of EVE.

5.5 保密协议 Confidentiality Agreement

客户应对合作内容高度保密，未经 EVE 许可，不得向第三方透露规格书的任何内容，否则，将依照相关法律追究责任。

The customer shall keep the cooperation content highly confidential. Without the permission of EVE, the customer shall not disclose any content of the technical agreement to a third party. Otherwise, the customer will be held responsible according to relevant laws.

5.6 风险警告 Risk Warning

5.6.1 警示声明 Warning Declaration

Warning 警告

The cell has potential hazards, and take proper precautions when operating and maintaining the cell!

The cell must be operated with proper tools and protective equipment.

Cell maintenance must be performed by professional with cell expertise and safety training.

Failure to comply with these warnings could result in multiple disasters.

电池存在潜在的危险，在操作和维护时必须采取适当的防护措施！

必须使用正确的工具和防护装备操作电池。

电池的维护必须由具有电池专业知识并经过安全培训的人士执行。

不遵守上述警告可能造成多种灾难。

5.6.2 危险类型 Types of Dangerous

客户知悉在电池使用和操作过程中存在以下潜在的危险：

a) 存在受到电击或者电弧伤害的风险。

b) 解液或其他化学品危害的风险。

为防止发生意外短路，造成电弧、爆炸或热失控，需选择合适的操作方法及防护装备。

Customer must be aware of the following potential hazards in the use and operation of cells:

a) There is a risk from electric shocks or electric arcs during operation.

b) There is a risk from the electrolyte or other chemicals.

Proper operation methods and protective equipment shall be selected to avoid short circuit, explosion or thermal runaway.

5.7 免责声明 Disclaimer

如果由于产品需求单位或使用者不按本说明书中的规定进行使用，EVE 不再承担产品质量保证责任及由此引起的损失赔偿等一切相关责任。因前述行为，对 EVE 的声誉造成负面影响的，EVE 保留追究产品需求单位法律责任权利。

If the product demand party or user does not use the product in accordance with the provisions of this specification, EVE will no longer take any relevant responsibility such as product quality assurance liability and loss compensation caused thereby. In case of any negative impact on EVE's reputation due to the above-mentioned actions, EVE reserves the right to investigate the legal liability of the product demand party.

6 其他 Others

6.1 EVE 的权利和义务 Rights and Obligations of EVE

- EVE 按照与客户签订的协议中的检验标准进行检验，提供产品应符合协议中各项参数要求。
- EVE 向客户提供双方确认的、稳定可靠的产品。
- EVE 有义务为其产品提供优质的服务，服务标准按 EVE 所承诺的标准服务。
- 在客户对系统产品的使用及维护过程中遇到问题或故障时，EVE 进行及时的技术支持及服务。
- EVE shall inspect according to the inspection standards in the protocol signed with the customer, and the products provided shall meet the requirements of various parameters in the protocol.
- EVE shall provide customer with stable and reliable products confirmed by both parties.
- EVE is obliged to provide high-quality services for its products, and the service standards shall be in accordance with the standards promised by EVE.
- EVE shall provide timely technical support and service in case of any problem or failure during the use and maintenance of system products by customer.

6.2 客户的权利和义务 Rights and Obligations of Customer

- 客户应严格按照 EVE 提供的技术资料进行生产，严格执行 EVE 所提供的技术资料中的电池防范措施、安全限制和电池操作说明。
- 客户有义务保证 EVE 产品的安全，应采取相应的防火、防水等措施。
- 客户有义务对 EVE 的产品做出公平、公正详细的使用记录及产品运转的监测数据，用作于产品质量责任划分的参考，不具备完整的电池系统使用期限内的监测数据的，EVE 不承担产品质量保证责任。
- 客户有义务在 EVE 产品运作异常时，通知 EVE 人员，了解实际情况。
- 客户在产品制造过程中，因违反安全守则操作、在本规格书说明条件之外使用及产品与电路等搭配（非

产品自身质量缺陷）所产生的问题或事故，其责任与 EVE 无关，应由客户承担相应的责任。

- Customer must conduct production in strict accordance with the technical data provided by EVE, and strictly implement the cell prevention measures, safety limits and cell operation instructions in the technical data provided by EVE.
- Customer has the obligation to ensure the safety of products by EVE and shall take corresponding fire prevention, waterproof and other measures.
- Customer has the obligation to make fair and detailed use records and monitoring data of product operation for EVE's products, which can be used as a reference for the division of product quality responsibilities. If there is no complete monitoring data within the service life of the battery system, EVE shall not be responsible for product quality assurance.
- Customer has the obligation to notify EVE's personnel to and be informed of the actual situation when products of EVE operate abnormally.
- In the process of product manufacturing, customer shall take all corresponding responsibilities for the problems or accidents caused by the operation in violation of the safety rules or the use beyond the conditions specified in this technical agreement and the combination of the product and the circuit (not the quality defects of the product itself).

备注：因本规格书或者履行过程引发的争议应由双方友好协商解决，协商不成，任何一方均可向湖北亿纬动力有限公司所在地人民法院提起诉讼。

Remarks: Any dispute arising from this specification document or the performance process shall be settled by both sides through friendly negotiation. If no agreement can be reached through negotiation, either side may file a lawsuit with the people's court where EVE Power Co., Ltd. is located.

6.3 语言冲突条款 Language Conflict Clause

本规格书为中英互译版本，如中文与英文约定内容有歧义，以中文内容为准。

This specification is a Chinese English translation version. In case of any ambiguity between the Chinese and English agreed terms, the Chinese content shall prevail.

7 联系方式 Contact Information

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Address：EVE Power Co., Ltd., No .68 Jingnan Avenue, Duodao District, Jingmen High-tech Zone, Jingmen City, Hubei Province.

附录 1：LF334 电池图纸　Appendix 1: Cell Drawing of LF334

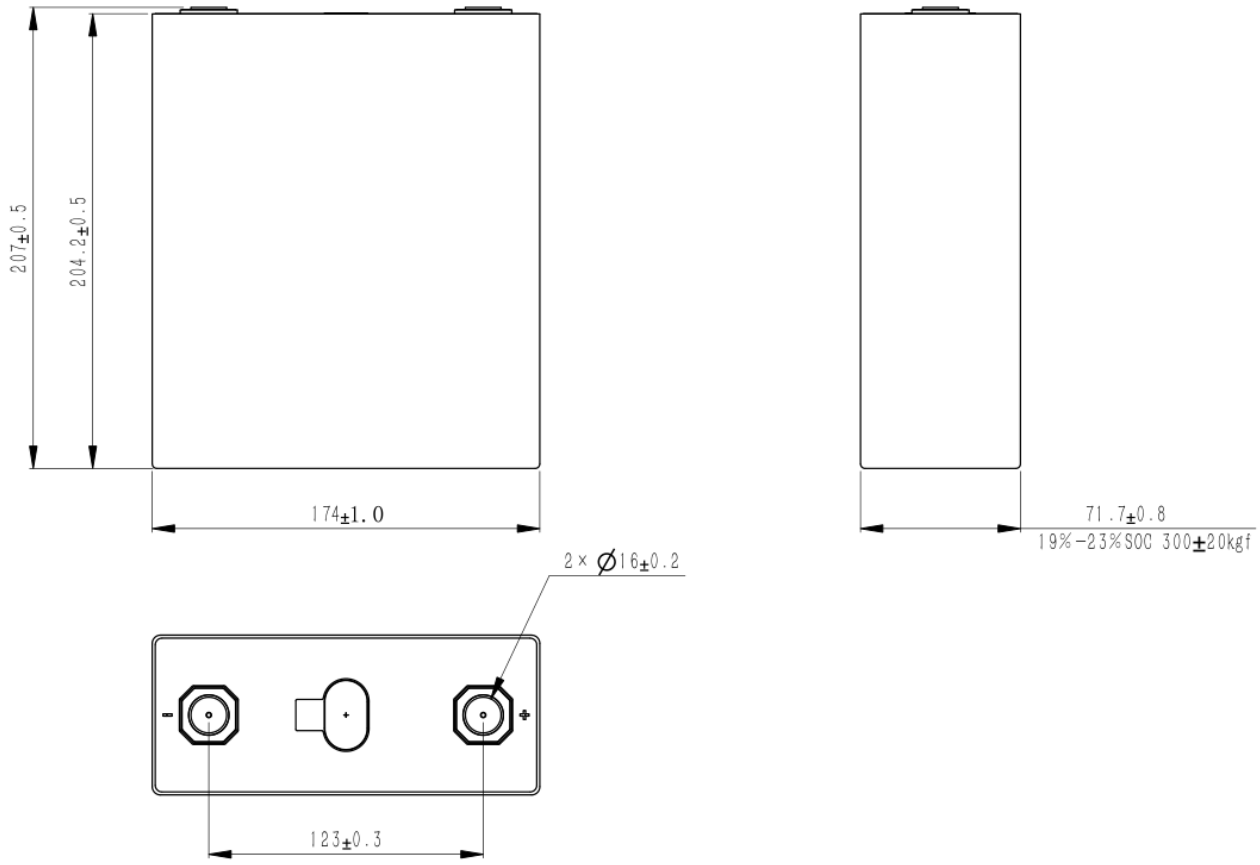
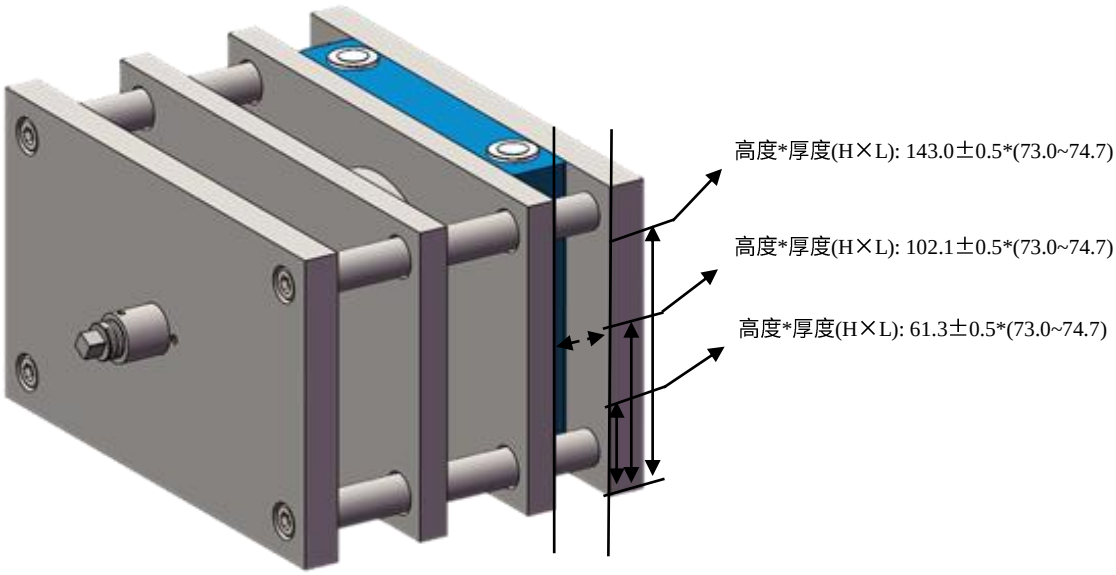


图 8 电池尺寸及外观图

Fig.8 Diagram of Cell Size and Appearance

附录 2：LF334 电池带夹板厚度测量图示　Appendix 2: LF334 Battery with Clamping Plate



备注：夹具两侧带夹板电池厚度测量方法一致

Note: Same thickness measurement method applies to the battery with clamping plates on fixture's both sides

图 9 间隙测量位置示意图

Fig.9 Measurement Position Schematic Diagram