产品名称 Product	G11E	文件编号 Specification No.	PBRI-G11E-V1.1-D06-02	版本 Version	A

产品交付规格书

Product Specification

Cylindrical Lithium-ion Cell

圆柱锂离子电池

产品名称 **Product：G11E**

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**

客户接受栏 **Customer Recipient**
公司名称 **Company Name:** 批准 **Approved by:** 日期 **Date:**

2025 年 5 月 May, 2025

惠州亿纬锂能股份有限公司 **EVE Power Co., Ltd**

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客户要求 **Customer's Requirement**

要求客户写出他们的需求信息并提前与 EVE 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，EVE 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 in advanced. If the customer has some special applications or operating conditions different from those described in this document, EVE can design and manufacture the product according to the customer's special requirements.

序号 No.	特殊要求 Special Requirements	标准 Standard
1	中值容量 Average Capacity	32.4Ah @ 25±2°C, 1/3C, 2.8~4.2V
2		
3		
4		
5		
6		
7		
8		

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	2025.05.07	新版发行 First Release	易克炜

目录 Content

术语定义 **Term Define**

术语 Terms	定义 Definition
电池单体 Cell	直接将化学能和电能转化的基本单元装置，包括电极、隔膜、电解质、外壳和端子，并被设计成可充电。 A basic unit device that directly combines chemical and electrical energy, including electrodes, separator, electrolytes, can and terminals, and is designed to be rechargeable.
最小容量 Nominal Capacity	电池在规定试验条件和试验方法下测得的放电容量 The discharge capacity tested with specified test method.
最小能量 Nominal Energy	电池在规定试验条件和试验方法下测得的放电能量 The discharge energy tested with specified test method.
开路电压（OCV） Open circuit voltage	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。 The voltage of the cell measured when unloaded or circuit is connected. The abbreviation is expressed by OCV.
DCR	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。 The ratio of the voltage changes of the cell to the corresponding current change under working conditions, the abbreviation is DCR.
标准充电 Standard Charge	本规格书第 4.5 条所述的充电模式。 The charge mode described in 4.5 of this specification.
标准放电 Standard Discharge	本规格书第 4.6 条所述的放电模式。 The discharge mode described in 4.6 of this specification.
环境温度 Environment temperature	电池所处的周围环境温度。 Surrounding environmental temperature where the cell is located.
电池表面温度 Cell surface temperature	由温度传感器测量的电池大面或侧面中心的温度。 Temperature measure by the temperature sensor installed at the center of cell surface.
新电池状态 Fresh cell	是指电池自产品的制造日期算起 3 个月以内的状态。 It refers to the cell within 3 months from the date of manufacture of the product.
荷电状态（SOC） State of charge	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额定容量的比值，缩写用 SOC 表示。如：若将容量为 560Ah 的状态视为 100%SOC，则容量为 0Ah 时，SOC 为 0%。 Under unloaded conditions, the ratio of the cell capacity state to the rated capacity measured in ampere-hours or watt-hours. The abbreviation is expressed by SOC. For example, if the capacity is 560Ah as 100% SOC, when the capacity is 0 Ah, the SOC is 0%.
循环 Cycle	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。 The cell is charged and discharged in a cycle according to the prescribed charging and discharging standards. The cycle includes short-term normal charging or regenerative charging combination with discharging processes. In the charging process, sometimes there is only normal charging and no re-generative charging. The discharge can be formed by combining some partial discharges.
测量单位 The unit of measurement	电压单位 Voltage：伏特 “V” (Volt) 电流单位 Current：安培 “A” (Ampere) 容量单位 Capacity：安培-小时 “Ah” (Ampere-Hour) 能量单位 Energy：瓦特-小时 “Wh” (Watt-Hour) 电阻单位 Resistance：欧姆 “Ω” (Ohm)，毫欧姆 “mΩ” (Milliohm) 温度单位 Temperature：摄氏度 “℃” (degree Celsius) 长度单位 length：毫米 “mm” (millimeter) 时间单位 Time：秒 “s” (second) 频率单位 Frequency：赫兹 “Hz” (Hertz) 功率单位 Power：瓦特 “W” (Watt)

1. 基本信息 Basic Information

1.1. 使用范围 Scope

本规格书详细描述了 EVE 生产的可充电三元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 NCM cylindrical cell produced by EVE, 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 圆柱锂离子电池 Cylindrical Lithium-ion Cell

1.2.2. 产品名称 Cell Model G11E

2. 电池规格参数 Cell Specification

2.1. 基本性能 Nominal Specification

序号 No.	项目 Item	产品规格 Specification	备注 Remark
2.1.1	最小容量 Minimum Capacity	31.9Ah	25±2°C, 1/3C, 2.8~4.2V
2.1.2	最小能量 Minimum Energy	117.0Wh	25±2°C, 1/3C, 2.8~4.2V
2.1.3	标称电压 Nominal Voltage	3.665V	1/3C
2.1.4	工作电压 Operation Voltage Range	2.8~4.2V	T>0°C
		2.5~4.2V	T≤0°C
2.1.5	标准充电电流 Standard Charge Current	10.63A	25°C, 1/3C
2.1.6	标准放电电流 Standard Discharge Current	10.63A	25°C, 1/3C
2.1.7	最大持续充电电流 Maximum Continuous Charge Current	82.9A	参照 5.1.操作窗口 Refer to 5.1. Operation Window
2.1.8	最大脉冲放电电流 Maximum Pulse Discharge Current	189.5A	25°C, 50%SOC, 10s
2.1.9	初始 ACR Initial ACR	≤1.5mΩ	Shipping SOC, AC, 1kHz
2.1.10	初始 DCR Initial DCR	≤3.0mΩ	25°C, 50%SOC, 2C, 10s

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2.1.11	出货 SOC 状态 Shipping SOC Status	30%SOC		±5%SOC
2.1.12	月自放电率 Monthly Self Discharge	≤3%		25°C, 30%SOC, 90days
2.1.13	电池重量 Cell Weight	423±10g		包含蓝膜 With Insulation Film
2.1.14	电池尺寸 Cell Dimension (含蓝膜) (With Insulation Film)	高度 H Height(H)	97.20±0.30mm	包含极柱 With Terminal
		高度 h Height(h)	95.00±0.20mm	不包含极柱 Without Terminal
		直径 φ Diameter(φ)	46.16±0.15mm	/
		平面度 负极焊接区域 (φ22~φ43) Flatness Negative Welding Area	≤0.20mm	/
		平面度 正极焊接区域 (φ6~φ13) Flatness Positive Welding Area	≤0.10mm	/
2.1.15	工作温度 Operation Temperature	电池表面温度 Cell Surface Temperature 充电：0~55°C（0°C以下需预热，建议温度降低到 50°C再充电） Charge Temperature: 0~55°C（Preheating Required <0°C, Recommended Re-charge Release <50°C） 放电：-35~60°C（建议温度降低到 55°C再放电） Discharge Temperature: -35~60°C（Recommended Re-discharge Release <55°C）		
2.1.16	存储温度 Storage Temperature	1 年 1 year	0~25°C	出货 SOC 状态 Shipping SOC Status
		3 个月 3 months	0~45°C	
		1 个月 1 month	-20~55°C	

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

2.2. 电性能指标 Electrical Specification

序号 No.	项目 Items	产品规格 Specification	测试条件 Test Condition
2.2.1	倍率放电容量 Rate Discharge Capacity	放电容量比值 1C/0.33C ≥97%；3C/1C ≥95% Capacity Ratio 1C/0.33C ≥97%; 3C/1C ≥95%	25°C
2.2.2	低温放电容量 -20°C Discharge Capacity	放电能量比值 -20°C/25°C ≥70% Capacity Ratio -20°C/25°C ≥70%	-20°C/25°C
2.2.3	高温放电容量 45°C Discharge Capacity	放电能量比值 45°C/25°C ≥95% Capacity Ratio 45°C/25°C ≥95%	45°C/25°C
2.2.4	室温荷电保持与容量恢复能力 25°C Capacity retention and recovery capability	容量保持率≥90%、容量恢复率≥95% Capacity Retention Rate ≥90%, Capacity Recovery Rate ≥95%	25°C, 100%SOC, 30days
2.4.5	高温荷电保持与容量恢复能力 45°C High Temperature Capacity retention and recovery capability	容量保持率≥90% Capacity Retention Rate ≥90% 容量恢复率≥95% Capacity Recovery Rate ≥95%	45°C, 100%SOC, 7days
2.2.6	存储 Storage	容量恢复率≥95% Capacity Recovery Rate ≥95%	45°C, 50%SOC, 30days
2.2.7	标准循环 Standard Cycle Life	1000 cycles ≥80%	25°C, 0~100%SOC 0.33C/1C
2.2.8	25min 快充循环 25min FC Cycle Life	1000 cycles ≥80%	35°C, 10~80%SOC FC 4N2F

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. 安全与可靠性 Safety and Reliability Specification

序号 No.	项目 Items	产品规格 Specification	测试条件 Test Condition
2.3.1	过放电 Over Discharge	不起火、不爆炸 No fire, No explosion	GB 38031-2020
2.3.2	过充电 Over Charge	不起火、不爆炸 No fire, No explosion	GB 38031-2020
2.3.3	外部短路 External Short Circuit	不起火、不爆炸 No fire, No explosion	GB 38031-2020
2.3.4	加热 Heating	不起火、不爆炸 No fire, No explosion	GB 38031-2020
2.3.5	温度循环 Temperature Cycling	不起火、不爆炸 No fire, No explosion	GB 38031-2020
2.3.6	挤压 Crush	不起火、不爆炸 No fire, No explosion	GB 38031-2020

2.3.7	振动 Vibration	不开阀、不漏液、不破裂、不起火、不解体、且测试后的电池 OCV 不低于测试前的 90% No leakage, no venting, no disassembly, no rupture and no fire, OCV is not less than 90%	UN 38.3-2019 (新鲜电池 Fresh cell)
2.3.8	机械冲击 Mechanical Shock	不开阀、不漏液、不破裂、不起火、不解体、且测试后的电池 OCV 不低于测试前的 90% No leakage, no venting, no disassembly, no rupture and no fire, OCV is not less than 90%	UN 38.3-2019 (新鲜电池 Fresh cell)

备注：外部短路测试需要带夹具进行测试，进行其他测试或者参考其他标准测试前需与 EVE 确认具体测试流程和注意事项。

Note: External short circuit test needs to be carried out with fixture. Before carrying out other tests or referring to other standard tests, it is necessary to confirm the specific test process and precautions with EVE.

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

2.4. 工况寿命 Scenario Profile Life

序号 No.	项目 Items	产品规格 Specification	测试条件 Test Condition
2.4.1	常温工况循环寿命 RT Normal Cycle Life	1500 cycles ≥80%SOH	10~95%SOC, 25℃, 0.5C/0.5C
2.4.2	高温工况循环寿命 HT Normal Cycle Life	500 cycles ≥80%SOH	10~95%SOC, 45℃, 0.5C/0.5C
2.4.3	日历寿命 45℃ Calendar Life 45℃	容量恢复率≥90% Capacity Recovery ≥95%	95%SOC，45℃存储，1年 100%SOC, 45℃ Storage, 90days

2.5. 电池图纸 Cell Drawing

见附录。 See Appendix.

2.6. 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 should have none of obvious scratches, cracks, rust stains, discoloration, or electrolyte leakage, which may adversely affect commercial value of the cell.

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±5℃，相对湿度 15%~90% RH，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℃。

Unless otherwise specified, the test should be carried out in an environment with a temperature of 25±5℃, a relative humidity of 15%~90% RH, and an atmospheric pressure of 86 kPa to 106 kPa. The ambient temperature mentioned in this specification refers to 25±2℃.

3.2. 测试设备 Measurement 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: ±0.1%

B. 电流测量装置 Current measuring device: ±0.1%

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

D. 尺寸测量装置 Dimension measuring device: ±0.0001mm

E. 重量测量装置 Weight measuring device: ±0.001g

4. 测试方法 Testing Methods

4.1. 测试夹具安装 Testing Fixture Installation

电池进行电性能测试时，接触内阻需小于 0.2mΩ。如无特殊要求，电池进行电性能测试和寿命测试时，需要对电池进行 Bar 片焊接，实现与测试柜之间的电压连接和电流连接。焊接 Bar 片和夹具安装示意图如下。铝夹板（10mm）侧使用导热填充材料（导热系数 3W/m·K），ABS 夹板侧和电木限位板侧均使用隔热填充材料（导热系数<0.05W/m·K）。

When the cell is tested for electrical performance, the contact resistance should less than 0.2mΩ. If there are no special requirements, when the cell is tested for electrical performance and life, it is necessary to weld the Bar sheet of the cell to achieve voltage connection and current connection between the test device. The diagram after welding Bar sheet and fixture installation is as follows. The aluminum fixed plate (10mm) side uses thermal conductive filling material (thermal conductivity 3W/ m·K), while the ABS fixed plate and the limit plate side both use thermal insulation filling material (thermal conductivity < 0.05W/ m·K).

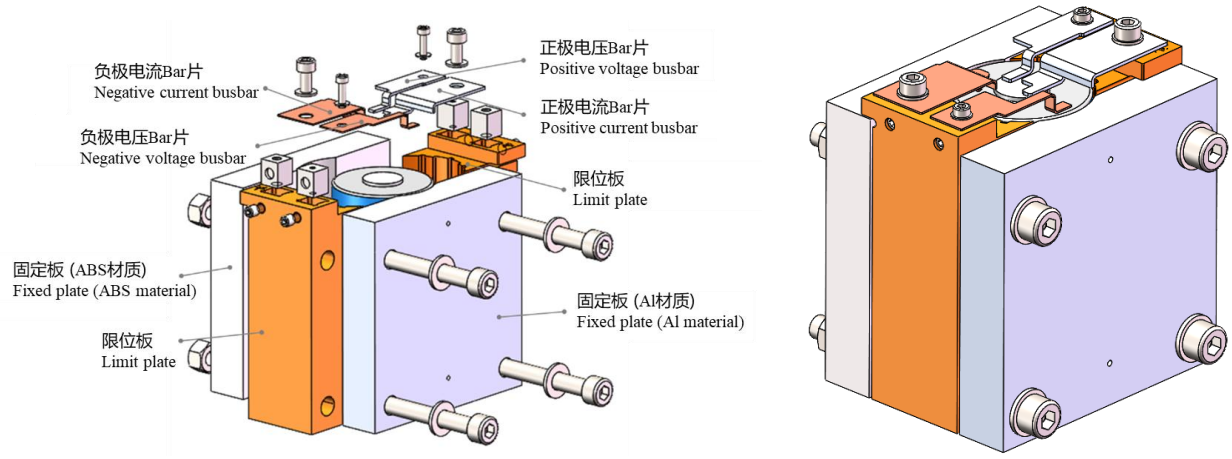


图 1 电池测试夹具示意图 Cell testing fixture diagram

4.2. 电池测试温度采集 Temperature Monitor

如果没有特殊要求，电池测试时将按照如下描述进行温度采集。对电池表面进行温度采集时，建议温度采集点布置在正极端子（温度点 T1）、负极端子（温度点 T2）、圆柱面中间位置（温度点 T3，负极 Bar 片下方的大面

中心），如下图。

If there are no special requirements, the temperature sensor will be pasted during test as below. When collecting temperature on the cell surface, the temperature collection point in the middle of the positive terminal (temperature point T1), negative terminal (temperature point T2), and cylinder surface (temperature point T3, below the positive voltage busbar), as shown in the following figure.

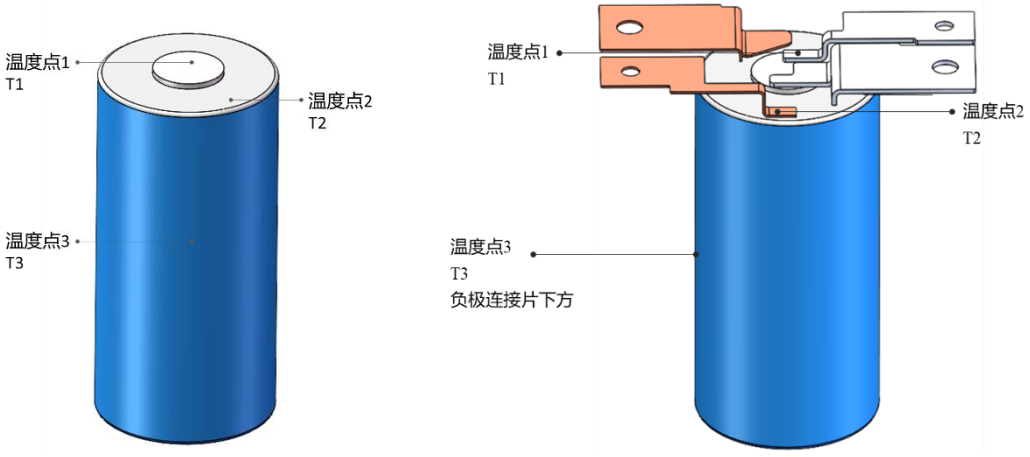


图 2 电池温度采集点示意图 Cell temperature monitoring diagram

4.3. 尺寸 Dimension

试验设备：三坐标（CMM），分辨率 0.0001mm。

试验方法：使用 CMM 设备分别测试电池的直径和高度。

Testing Instrument: Coordinate Measuring Machine (CMM), resolution 0.0001mm.

Testing Method: Use the CMM test device test the diameter and height respectively.

4.3.1. 总高和肩高 Cell Height with or without Terminal

试验设备：三坐标（CMM）。

试验方法：

1、采用 CMM 测量项目，电池需在温度 18℃~22℃，湿度 40%~60%环境下放置 3h。

2、电池卧置在 V 形块上，如下图所示。

3、CMM 采用直径 φ1.00mm 探针，在电池扣边平台面 B 面 φ42.50mm 处，间隔 30°取 12 个点，拟合形成基准平面。

4、在电池 A 面负极焊印区 φ28.00 和 φ37.00mm 处，间隔 45°取 8 个点，拟合肩高平面。

5、在电池 A 面正极端子 φ10.00mm 处，间隔 45°取 8 个点，拟合总高平面。

6、CMM 计算出基准平面与肩高平面距离即为肩高 h。

7、CMM 计算出基准平面与总高平面距离即为总高 H。

Test Equipment: CMM

Test Measurements:

1. Using the CMM measurement program, the cores are placed at 18℃~22℃ and 40%~60% humidity for 3 hours.

2. The core is placed on a V-shaped block.

3. 1.00mm diameter probe is used for CMM, and 12 points are taken at 30° interval on the platform surface of the buckle edge φ42.50mm, and the base plane is formed by fitting.

4. At the negative welding area φ28.00 and φ37.00mm, take 8 points at 45° interval, and fit the cell height wihout terminal plane.

5. At the positive terminal φ10.00mm, take 8 points at 45° interval and fit the cell height with terminal plane.

6. CMM calculates the distance between the base plane and the cell height without terminal plane, which is the cell height h without terminal.

7. CMM calculates the base plane and the cell height with terminal plane, which is the cell height H with terminal.

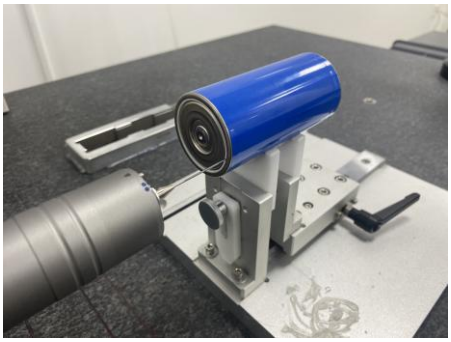


图3 G11E 电池高度测量夹具示意图 Schematic diagram of G11E battery height measuring fixture

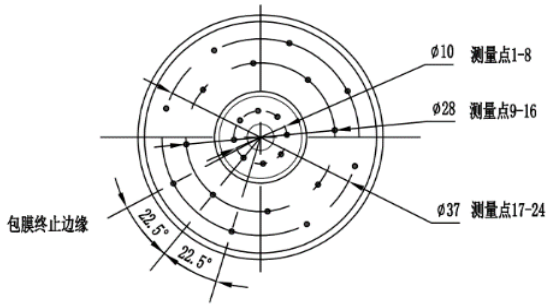


图4 G11E 肩高平面和总高平面取点示意图 Schematic diagram of G11E battery points taking from A side

4.3.2. 直径 Diameter

试验设备：三坐标（CMM）

试验方法：

1、采用 CMM 测量项目，电池需在温度 18℃~22℃，湿度 40%~60%环境下放置 3h。

2、电池平躺放置在 CMM 测量台面上，如下图所示。

3、CMM 采用直径 φ3.00mm 探针，在距 B 面底部 5.00±0.50mm、10.00±0.50mm、15.00±0.50mm、25.00±0.50mm、47.50±0.50mm、70.00±0.50mm、80.00±0.50mm、85.00±0.50mm、90.00±0.50mm 九个位置高度，每个位置分别间隔 30°取点，总共 12 个点，测量位置避开蓝膜重叠区。

4、CMM 计算出九个位置每个位置的直径。

Test Equipment: CMM

Test Measurements:

1. Using the CMM measurement program, the cores are placed at 18°C~22°C and 40%-60% humidity for 3 hours.

2. Cells are placed on the CMM table.

3. CMM uses 3.00mm diameter probe, 5.00±0.50mm, 10.00±0.50mm, 15.00±0.50mm, 25.00±0.50mm, 47.50±0.50mm, 70.00±0.50mm, 80.00±0.50mm, 85.00±0.50mm, 90.00±0.50mm from the bottom, each position is spaced 30° to take 12 points, wrapped cells need to measure the position to avoid the blue film overlap area.

4. CMM calculates the diameter of each of the nine positions.

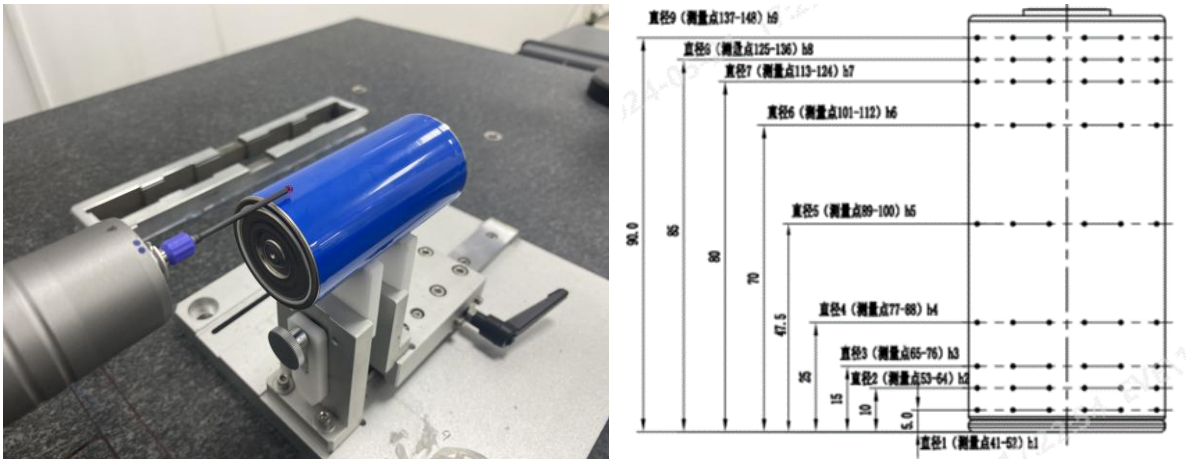


图5 G11E 电池直径测量示意图 Schematic diagram of G11E battery diameter measurement

4.3.3. 平面度 Flatness

1、采用 CMM 测量项目，电池在 18°C~22°C，湿度 40%~60%环境下放置 3 小时；将电池卧置在 V 形块上，如下图所示。

2、CMM 采用直径 φ1.00mm 探针，在负极焊接区域 φ28.00mm & φ37.00mm 处，间隔 45°取点，总共取 8 个点，拟合负极焊印区平面；在正极柱 φ10.00mm 处，间隔 45°取 8 个点，拟合正极焊接区平面。

3、CMM 计算出负极焊接区平面度。

4、CMM 计算出正极焊接区平面度。

1. CMM is used to measure the project, and the battery cell is placed for 3 hours at 18℃~22℃ and 40%~60% humidity; Lay the battery cell on the V-shaped block, as shown in the figure below.

2. At the negative welding area φ28.00 and φ37.00mm, take 8 points at 45° interval, and fit the plane; At the positive terminal φ10.00mm, take 8 points at 45° interval and fit the plane.

3. CMM calculates the flatness of negative welding area.

4. CMM calculates the flatness of positive welding area.

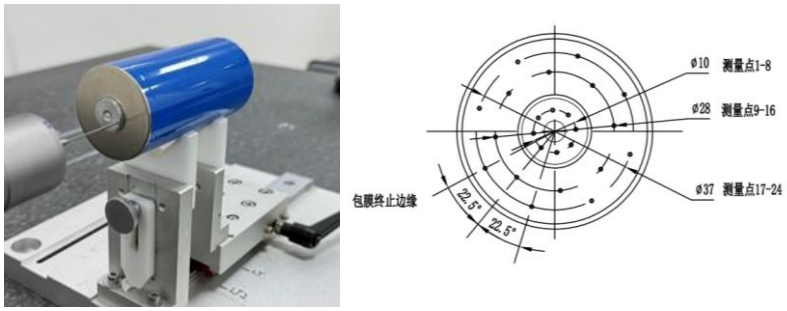


图6 G11E 电池焊接区域平面度测量示意图

Schematic diagram of flatness measurement in welding area of battery core

4.4. 重量 Weight

试验设备：电子秤，精度 0.001g。

试验方法：使用电子秤测量电池的重量。

Test Instrument: Electronic scale, scale has a readability of 0.001g.

Test Method: Use the electronic scale to measure the weight of the cell. Record the weight value.

4.5. 标准充电 Standard Charge

标准充电是在环境温度 25±2℃的条件下，对电池以 1/3C 的电流恒流充电至 4.20V，然后在 4.20V 下转恒压充电，直至充电电流小于等于 0.02C。搁置 30min。1C 对应电流强度为 31.9A。

At 25±2℃, charged with constant current 1/3C to 4.20V, then continue charged with constant voltage until the current reach to 0.02C, rest 30min. 1C corresponds to a current intensity of 31.9A.

4.6. 标准放电 Standard Discharge

标准放电是在环境温度 25±2℃的条件下，电池以 1/3C 的电流恒流放电至 2.8V。搁置 30min。1C 对应电流强度为 31.9A。

At 25±2℃, discharged with constant current 1/3C to 2.8V, rest 30min. 1C corresponds to a current intensity of 31.9A.

4.7. SOC 调节方式 SOC Adjust Method

如果没有特殊要求，SOC 将按照如下方式进行调节。在环境温度 25±2℃的条件下，电池以 1/3C 恒流放电至 2.8V，搁置 30min。按照标准充电方式和标准放电方式重复 3 次。记录三次放电容量的平均值，标记为 C_0。

调节 SOC：按照标准充电方式充满电，以 1/3C 的电流恒流放电至目标电量。

目标电量 =（1-目标 SOC）*C_0，搁置 60min。

If there are no special requirements, the SOC will be adjusted as follows. At 25±2℃, the cell was discharged with 1/3C to 2.8V. Repeat 3 times according to standard charge mode and standard discharge mode. Record the average of the three discharge capacities, recorded as C_0.

Adjust SOC: charging with standard charge mode, discharge with 1/3C to target SOC, rest 60min.

Target SOC = (1- Target SOC) * C_0

4.8. 初始 ACR Initial ACR

在 25±2℃下，将电池用频率为 1kHz 的电压内阻测试仪的正、负极分别接触电池的正、负极，读取电池的交流内阻读数。

At 25±2°C, connect the cell's positive and negative terminals to the voltage internal resistance tester, which operates at a 1kHz frequency.

4.9. 初始容量和能量 Initial Capacity and Energy

在 25±2℃下，电池初始容量和能量测试按照下列方法进行：

电池标准放电后，使用标准充电和标准放电进行 3 次充放电循环，以 3 次放电的均值作为结果，分别计算初始容量 C_0 和初始能量。

The initial discharge capacity and energy are tested according to the follow step.

Cell is discharged with standard discharge, then cycled with standard charge and standard discharge model until 3 cycles, calculate the average of the 3 cycle discharge capacity and energy. The calculated value is recorded as the initial discharge capacity C_0 and energy.

4.10. 初始 DCR Initial DCR

在 25±2℃下，按照 SOC 调节方式将电池调节至 50%SOC，记录搁置末期第 60min 的电压 V_1。2C 恒流放电 30s。记录第 10s 放电末期的电压 V_2。采样间隔为 0.1s。

计算 DCR：DCR = (V_1-V_2)/ 2C mΩ。

At 25±2°C, adjust the cell to 50%SOC, according to the SOC adjust method. Record the voltage as V_1 at the end of 60min rest. Then, discharge the cell with 2C for 30s, record the voltage as V_2 at the end of 10s discharge. The sampling interval was 0.1s during the 30s discharge.

Calculate DCR: DCR = (V_1-V_2) / 2C mΩ.

4.11. 月自放电 Monthly Self Discharge

① 标定 C_0：在环境温度 25±2℃的条件下，电池以 1/3C 恒流放电至 2.8V，搁置 30min。按照标准充电方式和标准放电方式重复 3 次。记录三次放电容量的平均值，标记为 C_0。

② SOC 调节：按照 4.7 章节 SOC 调节方式将电池 SOC 调节至 30%SOC。

③ 储存：在 25±2℃下，搁置 30 天。

④ 容量保持率测试：在 25±2℃下，1/3C 恒流放电至 2.8V，搁置 30min，记录放电容量 C_i（i=1、2、3…，代表第 i 个月）。

⑤ 容量恢复率测试：在 25±2℃下，按照标准充电方式和标准放电方式重复 3 次。记录三次放电容量的平均值，标记为 C_j （j=1、2、3…，代表第 j 个月）。

⑥ 重复步骤②至⑤，一共 3 次。

月自放电计算：$(0.3*C_j- C_i) /C_{(j-1)}$ 为第 i 个月的自放电（计算时 j = i，表示同一个月）

① At 25±2℃, the cell was discharged with 1/3C to 2.8V. Repeat 3 times according to standard charge mode and standard discharge mode. Record the average of the three discharge capacities, recorded as C_0.

② SOC adjust: Adjust SOC to 30%SOC, according to the chapter 4.7.

③ Storage: At 25±2℃, storage 30 days.

④ Capacity Retention test: At 25±2℃, 1/3C discharge to 2.8V, rest 30min, record the discharge capacity as C_i (i=1, 2, 3, …, representing the i th month).

⑤ Capacity Recovery test: At 25±2℃, repeat 3 times according to standard charge mode and standard discharge mode. Record the average of three discharge capacities, record the discharge capacity as C_j (j=1, 2, 3, …, representing the j th month).

⑥ Repeat step ② to step ⑤, the total repeat is 3 times.

Calculate monthly self discharge: $(0.3*C_j- C_i)/C_{(j-1)}$, is the i monthly self discharge (j=i, indicating the same month).

4.12. 倍率放电容量 Rate Discharge Capacity

在 25±2℃下，电池标准放电后，进行标准充电。执行标准放电，记录放电容量 C_1。

标准充电后，1C 放电至 2.8V，搁置 30min，记录放电容量为 C_2。

标准充电后，3C 放电至 2.8V，搁置 30min，记录放电容量为 C_3。

计算倍率放电容量比值：3C/1C= C_3/C_2，1C/0.33C=C_2/C_1

At 25±2℃, cell discharged with standard discharge mode, charged with standard charge mode. Then standard discharged, record the discharge capacity as C_1.

Standard charged the cell, 1C discharge to 2.8V, rest 30min, record the discharge capacity as C_2.

Standard charged the cell, 3C discharge to 2.8V, rest 30min, record the discharge capacity as C_3.

Calculate rate discharge capacity ratio: 3C/1C= C_3/C_2, 1C/0.33C=C_2/C_1

4.13. 低温放电容量 -20℃ Discharge Capacity

在 25±2℃下，电池标准放电后，进行标准充电。

然后使用 1C 放电至 2.8V，搁置 30min，记录放电容量为 C_2。再将电池进行标准充电。

在-20±2℃下，将电池搁置 24h。使用 1C 放电至 2.5V，搁置 30min，记录放电容量为 C_4。

计算低温放电容量比值：C_4/C_2

At 25±2℃, cell discharged with standard discharge mode, charged with standard charge mode.

Then, discharge with 1C to 2.8V, rest 30min, record the discharge capacity as C_2. Charged with standard charged.

At -20±2℃, rest 24h. Then discharge to 2.5V with 1C, rest 30min, record the discharge capacity as C_4.

Calculate -20℃ discharge capacity ratio: C_4/C_2

4.14. 高温放电容量 45℃ Discharge Capacity

在 25±2℃下，电池标准放电后，进行标准充电。

然后使用 1C 放电至 2.8V，搁置 30min，记录放电容量为 C_2。再将电池进行标准充电。

在 45±2℃下，将电池搁置 5h。使用 1C 放电至 2.8V，搁置 30min，记录放电容量为 C_5。

计算高温放电容量比值：C_5/C_2

At 25±2℃, cell discharged with standard discharge mode, charged with standard charge mode.

Then, discharge with 1C to 2.8V, rest 30min, record the discharge capacity as C_2. Charged with standard charged.

At 45±2℃, rest 5h. Then discharge to 2.8V with 1C, rest 30min, record the discharge capacity as C_5.

Calculate 45℃ discharge capacity ratio: C_5/C_2

4.15. 室温荷电保持与容量恢复性能 25℃ Capacity Retention and Recovery Capability

在 25±2℃下，电池标准放电后，进行标准充电。

1C 放电至 2.8V，搁置 30min，记录放电容量为 C_2。再将电池进行标准充电。

在 25±2℃下，将电池搁置 30days。

使用 1C 放电至 2.8V，搁置 30min，记录放电容量为剩余容量 C_6。

使用标准充电和标准放电进行 3 次充放电循环，以 3 次放电的均值作为结果，记录为恢复容量 C_7。

计算容量保持率：C_6/C_2

计算容量恢复率：C_7/C_2

At 25±2℃, cell discharged with standard discharge mode, charged with standard charge mode.

Then, discharge with 1C to 2.8V, rest 30min, record the discharge capacity as C_2. Charged with standard charged.

At 25±2℃, rest 30days. Then discharge to 2.8V with 1C, rest 30min, record the discharge capacity as C_6.

Cycled with standard charge and standard discharge model until 3 cycles, calculate the average of the 3 cycle discharge capacity, recorded as C_7.

Calculate capacity retention: C_6/C_2

Calculate capacity recovery: C_7/C_2

4.16. 高温荷电保持与容量恢复性能 45℃ Capacity Retention and Recovery Capability

在 25±2℃下，电池标准放电后，进行标准充电。

1C 放电至 2.8V，搁置 30min，记录放电容量为 C_2。再将电池进行标准充电。

在 45±2°C 下，将电池搁置 7 days。

使用 1C 放电至 2.8V，搁置 30min，记录放电容量为剩余容量 C_8。

使用标准充电和标准放电进行 3 次充放电循环，以 3 次放电的均值作为结果，记录为恢复容量 C_9。

计算容量保持率：C_8/C_2

计算容量恢复率：C_9/C_2

At 25±2°C, cell discharged with standard discharge mode, charged with standard charge mode.

Then, discharge with 1C to 2.8V, rest 30min, record the discharge capacity as C_2. Charged with standard charged.

At 45±2°C, rest 7 days. Then discharge to 2.8V with 1C, rest 30min, record the discharge capacity as C_8.

Cycled with standard charge and standard discharge model until 3 cycles, calculate the average of the 3 cycle discharge capacity, recorded as C_9.

Calculate capacity retention: C_8/C_2

Calculate capacity recovery: C_9/C_2

4.17. 存储 Storage Performance

在 25±2°C下，电池标准放电后，进行标准充电。

1C 放电至 2.8V，搁置 30min，记录放电容量为 C_2。

按照 SOC 调节方式，将电池 SOC 调节至 50%SOC。

在 45±2°C 下，将电池搁置 30 天。1C 放电至 2.8V，搁置 30min。

使用标准充电和标准放电进行 3 次充放电循环，以 3 次放电的均值作为结果，记录为恢复容量 C_{10}。

计算容量恢复率：C_{10}/C_2

At 25±2°C, cell discharged with standard discharge mode, charged with standard charge mode.

Then, discharge with 1C to 2.8V, rest 30min, record the discharge capacity as C_2.

Adjust the SOC to 50%SOC, according to the SOC adjust method.

At 45±2°C, rest 30 days. Then discharge to 2.8V with 1C, rest 30min.

Cycled with standard charge and standard discharge model until 3 cycles, calculate the average of the 3 cycle discharge capacity, recorded as C_{10}.

Calculate capacity recovery: C_{10}/C_2

4.18. 标准循环 Standard Cycle Life at 25°C

① 初始性能测试：

初始容量：按照初始容量和能量的测试方法（4.9）进行初始容量测试。

初始 DCR：按照初始 DCR 的测试方法（4.10）测试 DCR。

标准放电：在 25±2°C下，电池以 1/3C 恒流放电至 2.8V，搁置 30min。

② 循环：

充电：在 25±2°C下，1/3C 恒流恒压充电至 4.2V，0.02C 截止，搁置 30min。

放电：在 25±2℃下，1C 恒流放电至 2.8V，搁置 30min。

循环：100cycles。

每 100 圈进行初始性能测试，记录容量和 DCR，计算放电容量保持率和 DCR 增长率。

① Initial performance test:

Initial capacity: testing the cell with the initial capacity and energy test method (4.9), obtain the capacity.

Initial DCR: testing the cell with the initial DCR test method (4.10), obtain the DCR.

Standard discharge: At 25±2℃, cell discharged with constant current 1/3C to 2.8V, rest 30min.

② Cycle:

Charge: At 25±2℃, 1/3C constant current charge to 4.20V, 0.02C cut-off, rest 30min.

Discharge: At 25±2℃, 1C constant current discharge to 2.8V, rest 30min.

Cycle: 100cycles.

After every 100cycles, testing the initial performance test, record the capacity and DCR, calculate the capacity retention and DCR increase ratio.

4.19. 4N2F 25min 快充循环 4N2F 25min Fast Charging(FC) Cycle Life at 35°C

① 初始性能测试：

初始容量：按照初始容量和能量的测试方法（4.9）进行初始容量测试

初始 DCR：按照初始 DCR 的测试方法（4.10）测试 DCR。

标准放电：在 25±2℃下，电池以 1/3C 恒流放电至 2.8V，搁置 30min。

② 循环：

普通循环（1）：

充电：在 35±2°C 下，0.1C 恒流恒压充电至 4.2V，0.02C 截止，搁置 30min。放电：在 35±2°C 下，0.1C 恒流恒压放电至 3.199V，0.02C 截止，搁置 30min。

普通循环（2）：

充电：在 35±2°C 下，1/3C 恒流恒压充电至 4.2V，0.02C 截止，搁置 30min。放电：在 35±2°C 下，1/3C 恒流恒压放电至 3.199V，0.02C 截止，搁置 30min。共循环 3 次。

快充循环：

在 35±2°C 下，使用 25min 快充工步充电，SOC 区间为 10%SOC~80%SOC，搁置 30min。

放电：在 35±2°C 下，1/3C 恒流恒压放电至 3.199V，0.02C 截止，搁置 60min。共循环 2 次。

普通循环（1）和普通循环（2）后进行快充循环，定义为 1 次“4N2F 循环”。

每 13 次“4N2F 循环”进行初始性能测试，记录容量和 DCR，计算放电容量保持率和 DCR 增长率。

快充充电电流每 13 次“4N2F 循环”后更新，即随初始容量 C_0 更新。

① Initial performance test:

Initial capacity: testing the cell with the initial capacity and energy test method (4.9), obtain the capacity.

Initial DCR: testing the cell with the initial DCR test method (4.10), obtain the DCR.

Standard Discharge: At 25±2℃, cell discharged with constant current 1/3C to 2.8V, rest 30min.

② Cycle:

N Cycle (1):

i) Charge: At 35±2℃, charge with 0.1C CCCV to 4.2V, cut-off 0.02C, rest 30min.

ii) Discharge: At 35±2℃, discharge with 0.1C CCCV to 3.199V, cut-off 0.02C, rest 30min.

N Cycle (2):

i) Charge: At 35±2℃, charge with 1/3C CCCV to 4.2V, cut-off 0.02C, rest 30min.

ii) Discharge: At 35±2℃, discharge with 1/3C CCCV to 3.199V, cut-off 0.02C, rest 30min.

iii) 3cycles.

F Cycle:

After finished N Cycle, then

i) Charge: At 35±2℃, charge with 25min FC step in Table 1 from 3.199V to 4.170V, rest 30min.

ii) Discharge: At 35±2℃, 1/3C constant current constant voltage discharge to 3.199V, rest 60min.

iii) 2cycles.

Every 1 times N Cycle(1) and 3 times N Cycle (2) combined with 2 times F Cycle defined as 1 “4N2F Cycle”.

After 13 “4N2F Cycle”, testing the initial performance test, record the capacity and DCR, calculate the capacity retention and DCR increase ratio.

The fast charging current is updated every 13 “4N2F Cycle”, which is updated with the initial capacity C_0.

表 1. 25 min 快充策略表

表 1. 25min Fast Charging Strategy Table

Start SOC	End SOC	C Rate (C_0)	Voltage (V)
10%	20%	2.60	3.776
20%	30%	2.60	3.856
30%	40%	2.60	3.944
40%	45%	2.10	3.946
45%	50%	1.80	3.973
50%	55%	1.60	4.005
55%	60%	1.40	4.030
60%	65%	1.30	4.064
65%	70%	1.20	4.111
70%	75%	1.10	4.160
75%	80%	0.88	4.170

4.20. 安全与可靠性 Safety and Reliability Performance

所有测试均参考国家标准 GB38031-2020 和国际标准 UN38.3 标准进行测试。外部短路测试需要使用到的夹具示意图如下所示。

All tests are carried out with reference to the national standard GB38031-2020 and UN38.3 standards. The fixture

diagram for external short-circuit test is shown below.

序号 No.	项目 Items	测试方法 Test Method
1	过放电 Over Discharge	GB 38031-2020
2	过充电 Over Charge	GB 38031-2020
3	外部短路 External Short Circuit	GB 38031-2020
4	加热 Heating	GB 38031-2020
5	温度循环 Temperature Cycling	GB 38031-2020
6	挤压 Crush	GB 38031-2020
7	振动 Vibration	UN 38.3-2019 (新鲜电池 Fresh cell)
8	机械冲击 Mechanical Shock	UN 38.3-2019 (新鲜电池 Fresh cell)

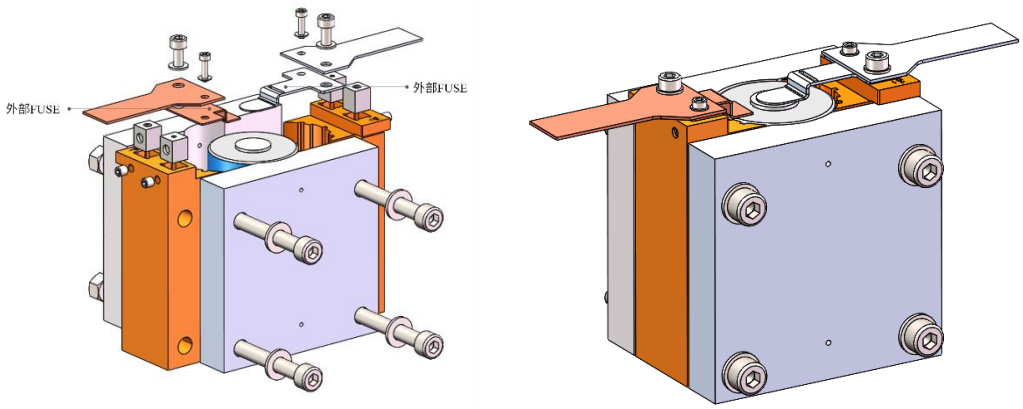


图 7 外部短路测试夹具示示意图 External short circuit test fixture

5. PACK 使用参数建议 Recommended PACK Design Parameters

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

The following is the cell performance data for reference only during the BMS design. The actual use is subject to the usage mode and conditions agreed by both parties.

5.1. 操作窗口 Operation Window

产品名称 Product	G11E	文件编号 Specification No.	PBRI-G11E-V1.1-D06-02	版本 Version	A

软件应用-操作窗口

Software Application – Operation Window

限制 Limits	温度 Temperature (°C)		-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	35	40	45	50	55
电压使用范围 Voltage operation range	充电 Charge		/																	
	脉冲充电电流允许动态电压上限 Maximum allowed dynamic voltage(V) for pulse		4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200
	持续充电电流允许动态电压上限 Maximum allowed dynamic voltage(V) for continuous		4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200	4.200
	开路电压上限 Maximum allowed open circuit voltage(V)		4.181																	
	放电 Discharge		/																	
	脉冲放电电流允许动态电压下限 Minimum allowed dynamic voltage(V) for pulse		2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.800	2.800	2.800	2.800	2.800	2.800	2.800	2.800	2.800	2.800	2.800
	持续放电电流允许最低动态电压下限 Minimum allowed dynamic voltage(V) for continuous		2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.800	2.800	2.800	2.800	2.800	2.800	2.800	2.800	2.800	2.800	2.800
	开路电压下限 Minimum allowed open circuit voltage(V)		3.041																	
电流限制 Current limit (C)	热限制 Thermal		控制放电电流以防止电池内部过热（加速老化），同时考虑电压限制 Valid for discharging current to protect the cell from internal overheating (strong aging), also considering voltage																	
	在 50%SOC 脉冲放电电流限制 Pulse Limit @ 50%SOC	0＜t ≤10s	0.76	1.19	1.71	2.38	3.09	3.75	4.51	4.75	5.04	5.27	5.61	5.94	5.96	5.98	6.00	6.02	6.04	0.02
		0＜t ≤30s	0.54	0.95	1.36	1.95	2.63	3.22	3.85	4.12	4.26	4.40	4.53	4.67	4.69	4.71	4.73	4.75	4.77	0.02
	在 50%SOC 持续放电电流限制 Continuous @ 50%SOC	≤60s	0.20	0.53	0.85	1.10	1.42	1.71	2.11	2.28	2.60	2.93	3.09	3.25	3.27	3.29	3.31	3.33	3.35	0.02
	析锂限制 Plating		控制充电电流以防止电池析锂（加速老化或损坏），同时考虑电压和温度限制 Valid for charging current to protect the cell from lithium plating (strong aging, damaging), also considering voltage & thermal																	
	在 50%SOC 脉冲充电电流限制 Pulse limit @ 50%SOC	0＜t ≤10s	0.27	0.44	0.78	1.08	1.44	1.77	2.13	2.35	2.63	2.76	2.85	3.03	3.05	3.07	3.09	3.11	3.13	0.02
		0＜t ≤30s	0.11	0.16	0.42	0.72	1.03	1.30	1.63	1.81	2.03	2.17	2.38	2.59	2.61	2.63	2.65	2.67	2.69	0.02
	持续充电电流限制 Continuous limit	SOC = 0%	0.02	0.10	0.15	0.20	0.30	0.35	0.56	0.82	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.02
		SOC = 5%	0.02	0.10	0.15	0.20	0.30	0.35	0.56	0.82	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.02
		SOC = 10%	0.02	0.10	0.15	0.20	0.30	0.35	0.56	0.82	1.15	1.50	1.90	2.60	2.60	2.60	2.60	2.60	2.60	0.02
		SOC = 15%	0.02	0.10	0.15	0.20	0.30	0.35	0.56	0.82	1.15	1.50	1.90	2.60	2.60	2.60	2.60	2.60	2.60	0.02
		SOC = 20%	0.02	0.10	0.15	0.20	0.30	0.35	0.56	0.82	1.15	1.50	1.90	2.60	2.60	2.60	2.60	2.60	2.60	0.02
		SOC = 25%	0.01	0.09	0.13	0.19	0.28	0.34	0.53	0.77	1.10	1.47	1.80	2.17	2.32	2.49	2.60	2.60	2.60	0.02
		SOC = 30%	0.01	0.08	0.12	0.18	0.25	0.33	0.43	0.64	0.95	1.29	1.68	1.91	2.03	2.15	2.60	2.60	2.60	0.02
		SOC = 35%	0.01	0.07	0.10	0.17	0.23	0.32	0.38	0.58	0.87	1.19	1.56	1.76	1.87	1.98	2.60	2.60	2.60	0.02
		SOC = 40%	0.01	0.05	0.07	0.15	0.20	0.30	0.34	0.54	0.81	1.10	1.42	1.65	1.75	1.87	2.60	2.60	2.60	0.02
		SOC = 45%	0.01	0.02	0.05	0.13	0.18	0.25	0.32	0.50	0.75	1.01	1.31	1.53	1.63	1.74	1.95	2.10	2.13	0.02
		SOC = 50%	0.01	0.02	0.05	0.11	0.17	0.23	0.30	0.43	0.66	0.91	1.20	1.43	1.52	1.62	1.70	1.80	1.83	0.02
		SOC = 55%	0.01	0.02	0.05	0.09	0.15	0.19	0.24	0.33	0.53	0.75	1.00	1.33	1.41	1.45	1.50	1.60	1.63	0.02
		SOC = 60%	0.01	0.02	0.05	0.07	0.11	0.13	0.18	0.23	0.41	0.60	0.81	1.22	1.29	1.32	1.35	1.40	1.43	0.02
		SOC = 65%	0.01	0.02	0.05	0.06	0.09	0.11	0.14	0.18	0.32	0.50	0.71	1.08	1.13	1.20	1.25	1.30	1.33	0.02
		SOC = 70%	0.01	0.02	0.03	0.05	0.08	0.10	0.12	0.16	0.29	0.44	0.63	0.92	0.97	1.04	1.15	1.20	1.23	0.02
		SOC = 75%	0.01	0.02	0.02	0.05	0.07	0.08	0.11	0.14	0.28	0.43	0.59	0.85	0.91	0.94	1.00	1.10	1.13	0.02
		SOC = 80%	0.01	0.02	0.02	0.05	0.05	0.05	0.10	0.13	0.27	0.42	0.55	0.76	0.80	0.83	0.85	0.88	0.91	0.02
		SOC = 85%	0.01	0.01	0.02	0.03	0.05	0.05	0.08	0.12	0.25	0.35	0.44	0.50	0.50	0.50	0.50	0.50	0.50	0.02
		SOC = 90%	0.01	0.01	0.01	0.02	0.05	0.05	0.06	0.11	0.22	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.02
		SOC = 95%	0.01	0.01	0.01	0.02	0.05	0.05	0.05	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.02
		SOC = 97%	0.01	0.01	0.01	0.02	0.03	0.03	0.03	0.05	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.02
		SOC = 100%	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
备注 Remarks	1）温度监测点参考章节 4.2.电池测试温度采集。 Temperature monitoring points refer to chapter 4.2.																			
	2）电池在 25°C 下以 1C 恒流（直流）放电动态电压值，不受最低允许开路电压或脉冲动态电压限制。 Dynamic Voltage Value, the cell is allowed to be discharged with 1C-DC @25°C, regardless of minimum allowed OCV or dynamic limit.																			
	3）持续充电电流限制是不析锂最大电流，快充策略需单独制定，且电流不得超过持续充电电流。 Continuous limit value is the maximum no plating lithium current, the fast charge strategy needs to be made separately and current less than continuous current.																			
	4）初始倍率 C 以额定容量为基准，并随电池寿命衰减而降低。																			

	The initial multiplication rate C corresponds to the capacity as the rated capacity and decreases with the lifetime.
	5）持续充电电流限制：温度跳转点以电池壳体最低温度，且壳体最高温度不能超过 55°C。 Continuous charging current limit: The temperature threshold shall be based on the lowest cell casing temperature, while the cell casing temperature shall not exceed 55°C.

5.2. 热学性能 Thermal Performance

		数值 Value
卷芯质量 Mass of JR (g)		309
平均热容 Average heat capacity (kJ/kg·K)		0.836
平均热传导率 Average Thermal conductivity (W/m·K)	轴向 Axial	18.35
	径向 Radial	1.24

5.3. PACK 内一致性建议 One Pack Batch Recommend

序号 No.	项目 Items	要求 Requirement	备注 Remark
1	出货电压极差（同一批次） Shipping State OCV Range (Same Batch)	≤5mV	出货态，25℃ Shipping State, 25℃
2	自放电（出货+30 天） OCV Range (Shipping State + 30 Days)	≤14mV	出货态，25℃ Shipping State, 25℃
3	容量极差 Capacity Range	≤5%	出货态，25℃，BOL Shipping State, 25℃, BOL
4	DCR 极差 DCR Range	≤30%	出货态，25℃，BOL Shipping State, 25℃, BOL

6. 电池安全操作限制 Safety Limits

6.1. 电压限制 Voltage Limits

项目 Items	类别 Category	数值 Value	备注 Remark
上限电压 Upper Limit Voltage	一级 Primary-level	＞4.17V	BMS 系统报警 BMS alarm
	二级 Secondary-level	＞4.19V	降低电池充电电流或者功率 Reduce cell charge current or power
	三级 Three-level	＞4.20V	切断电流，强制使电池停止工作 Cut off the current and force the cell to stop working
下限电压 Lower Limit Voltage	一级 Primary-level	＜3.00V (T>0°C) ＜2.70V (T≤0°C)	BMS alarm BMS 系统报警
	二级 Secondary-level	＜2.90 (T>0°C) ＜2.60 (T≤0°C)	降低电池放电电流或者功率 Reduce cell discharge current or power
	三级 Three-level	＜2.80 (T>0°C)	切断电流，强制使电池停止工作 Cut off the current and force the cell to stop working

		＜2.50 (T≤0°C)	

6.2. 温度限制 Temperature Limits

项目 Items	数值 Value	备注 Remark
推荐操作温度范围 Recommended Operating Temperature Range	10°C~45°C	推荐使用电池的温度范围。 Recommended cell usage temperature range.
最高操作温度 Maximum operating temperature	充电 Charge 55°C	如果电池使用温度超过操作温度范围，功率需要降为 0。 If the cell surface temperature exceeds the operating temperature range, the power needs to be reduced to 0.
	放电 Discharge 60°C	
最低操作温度 Minimum operating temperature	-35°C	
最高安全温度 Maximum safety temperature	65°C	如果电池使用温度超过最高安全温度或最低安全温度，将会造成电池不可逆的永久性损坏，用户使用时不得超过安全温度范围。 If the cell surface temperature exceeds the safety temperature range, it will cause irreversible and permanent damage to the cell. The user should not use it exceed the safety temperature range.
最低安全温度 Minimum safety temperature	-40°C	

7. 电池操作说明及注意事项 Cell Operation Instruction and Precautions

7.1. 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湖北亿纬动力有限公司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 80%（25℃）或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，免除湖北亿纬动力有限公司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 Power Co., Ltd. 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 80% 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 Power Co., Ltd. from its responsibility for product quality assurance in accordance with the product sales agreement and this specification.

7.2. 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，则电池需要在干燥、通

风、无腐蚀性气体影响的库房，低 SOC 态下进行存储。推荐的存储条件为：25%~35% SOC，0~25℃，≤60% RH。

电池若在库房长期放置未使用，需定期进行补充电。电池补充电周期参考如下：

After charging the cell, it should be used as soon as possible to avoid loss of available capacity due to self discharge. If storage is required, the cell needs to be stored in a dry, ventilated, and non corrosive gas free warehouse under low SOC conditions. The recommended storage conditions are: 25%~35% SOC, 0~25 ℃, ≤ 60% RH.

If the cell is not used for a long time in the warehouse, it need to be recharged periodically. The recharge cell cycle reference is as follows:

电池补充电周期 Cell Recharge Cycle		
实际存储温度 Actual Storage Temperature	补充电周期 Recharge Periodically	补充电方式 Recharge Method
0≤T≤25℃	6 个月 6 months	标准充放电1次后调整至存储SOC Cycle with standard charge and discharge current, then switch to storage SOC

备注：对电池最后一次实际充放电日期或补电日期需进行记录

Note: Record the date of the last actual charge and discharge or recharge of the cell.

7.3. 运输 Transportation

产品的运输应在 25%~35% SOC 下包装成箱进行。在运输过程中应防止剧烈振动、冲击或挤压、避免日晒雨淋。适用于汽车、火车、轮船、飞机等交通工具运输。

Cell for shipping should be packed in boxes with the SOC of 25%~35%. The severe vibration, impact, extrusion, sun and rain should be prevented during shipping. Applicable methods of transportation include truck, train, ship, airplane, etc.

7.4. 操作说明 Operation Precautions

- 禁止反向充电。正确连接电池的正负极，严禁反向充电。
- 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。
- 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。
- 禁止将电池放在热高温源旁边，如火、加热器等使用和留置。
- 充电时请选用锂离子电池专用充电器。
- 在使用过程中，严禁将电池正负极颠倒。
- 禁止将电池丢于火或给电池加热。
- 禁止用金属直接导通电池正负极。
- 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。
- 不要使用处于极热环境中的电池，如阳光直射或热天的车内。
- 禁止在强静电和强磁场的地方使用。
- 如果电池漏液，电解液溅入到皮肤、眼睛、口、鼻等部位，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。
- 如果电池出现异味、发热、变色、变形或使用、贮存、充电过程中出现任何异常时不得使用。
- It is forbidden to inversely charge. Correctly connect the positive and negative poles of the cell, and reverse charging is strictly prohibited.
- It is forbidden to over-discharge. During the normal use of the cell, in order to prevent over-discharge, the cell should be charged regularly to maintain the voltage above 2.8 V.
- 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.
- It is forbidden to use and leave the cell next to heat and high temperature sources, such as fire, heater, etc.
- Please use a special charger for lithium-ion batteries when charging.
- During usage, it is strictly prohibited to reverse the positive and negative terminals of the cell.
- Do not throw the cell in the fire or heater.
- It is forbidden to use metal to directly connect the positive and negative terminals of the cell to short-circuit.
- It is forbidden to transport or store the cell with metal, such as hairpins, necklaces, etc.
- It is forbidden to knock or throw, step on, or bend the cell.
- It is forbidden to directly solder the cell.
- It is forbidden to directly pierce the cell with nails or other sharp objects.
- It is forbidden to use or place the cell under high temperature (under hot sunlight), such as in a car under direct sunlight or in a hot day.
- It is forbidden to use it in places with strong static electricity and strong magnetic fields.
- If the cell leaks and the electrolyte splashes on the skin, clothes, eyes, mouth, nose, etc., immediately wash the affected area with running water and send to a doctor for treatment immediately, otherwise it will cause serious harm to the human body.
- If the cell emits peculiar smell, heat, discoloration, deformation, or any abnormality during use, storage, or charging, stop using it.

7.5. 免责声明 Disclaimer

如果由于产品需求单位不按本说明书中的规定进行使用，造成社会性影响，并对湖北亿纬动力有限公司的声誉造成影响的，湖北亿纬动力有限公司将会追究产品需求单位的责任。根据对湖北亿纬动力有限公司造成的影响程度，产品需求单位需向湖北亿纬动力有限公司提供赔偿。

If the product demanding party does not use the provisions in this manual, which causes social impact and affects the

reputation of EVE Power Co., Ltd., EVE Power will pursue the responsibility of the product demanding party. According to the degree of impact on EVE Power, the product demand party must provide compensation to EVE Power.

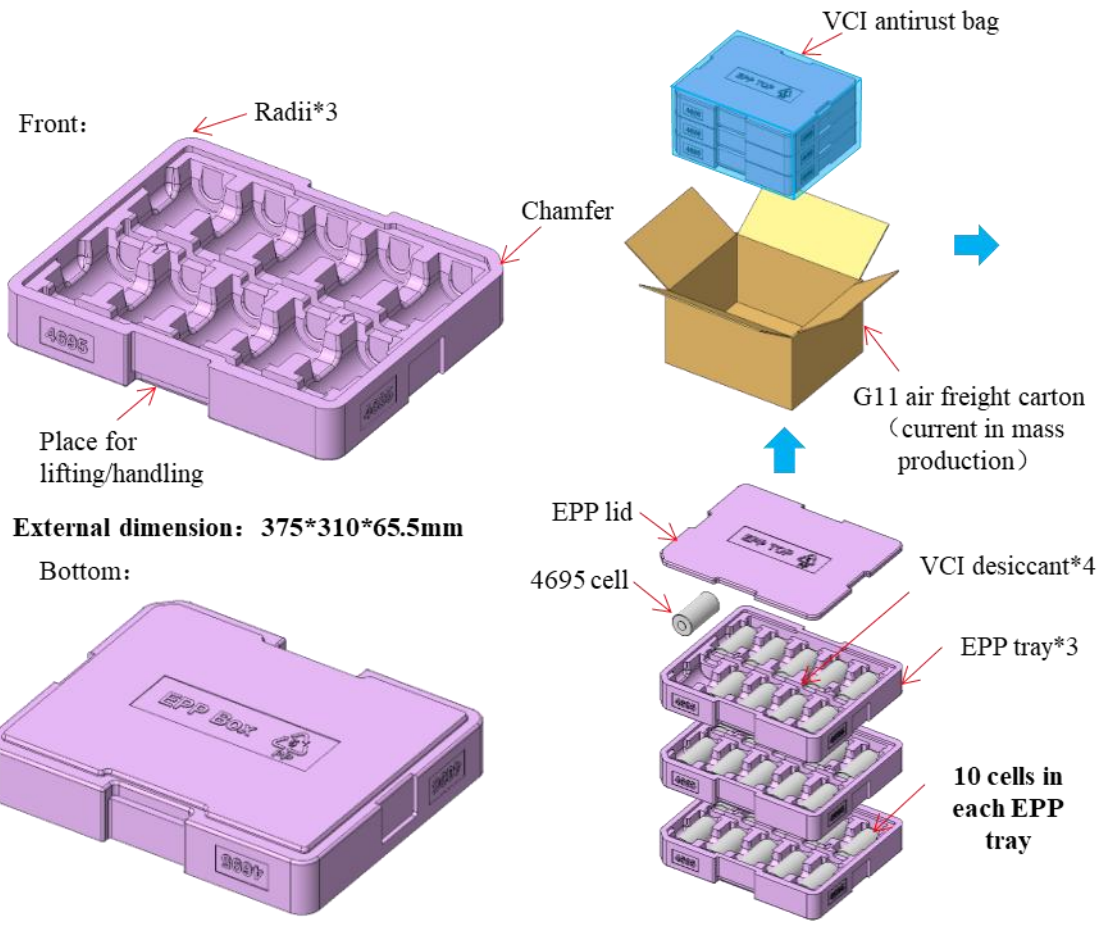
8. 包装 Package Discription

海运包材清单 Package list of ocean

序号 No.	名称 Part name	材料 Material	数量 Quantity
1	电池 Cell	Cylindrical	30pcs / Box
2	EPP 托盘 EPP tray	EPP	3/Box
3	EPP 箱盖 EPP lid	EPP	1/Box
4	干燥剂 VCI desiccant	VCI	4/tray
5	防尘袋 VCI antirust bag	VCI	1/Box

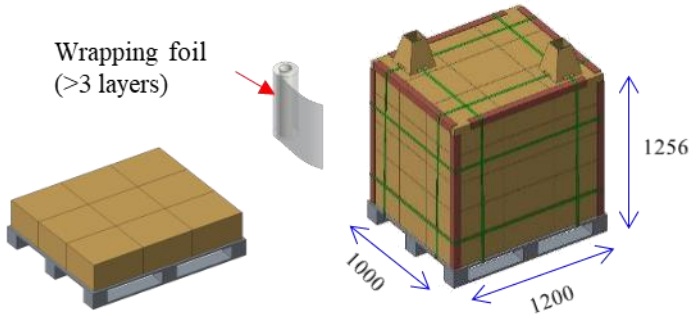
步骤 1 装箱 Step1 Box

海运 Ocean



步骤 2 装栈板 Step2 Pallet

海运 Ocean



9. 其它 Other

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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。

本规格书自双方签字盖章之日起生效，有效期至：___年___月___日。一式两份，具有同等法律效力。

本规格书未尽事宜，由双方另行签订补充协议，补充协议与本规格书具有同等法律效力。非经双方签署书面的文件，本规格书的任何条款不得被修改或者变更。

These specifications shall be governed by the laws of the People's Republic of China, excluding its conflict specifications. 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.

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.

This specification shall come into force upon being signed and sealed by both parties and shall be valid until ___Year Month___Day. In duplicate, both copies shall have the same legal effect.

For matters not covered in this specification, both parties shall separately sign a supplementary agreement which shall have the same legal effect as this specification document. No provision of this specification shall be modified or altered without a written document signed by both parties.

10. 联系方式 Contact Information

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附录 **A** 电池成品尺寸图 **Appendix A: Cell Dimension Diagram**

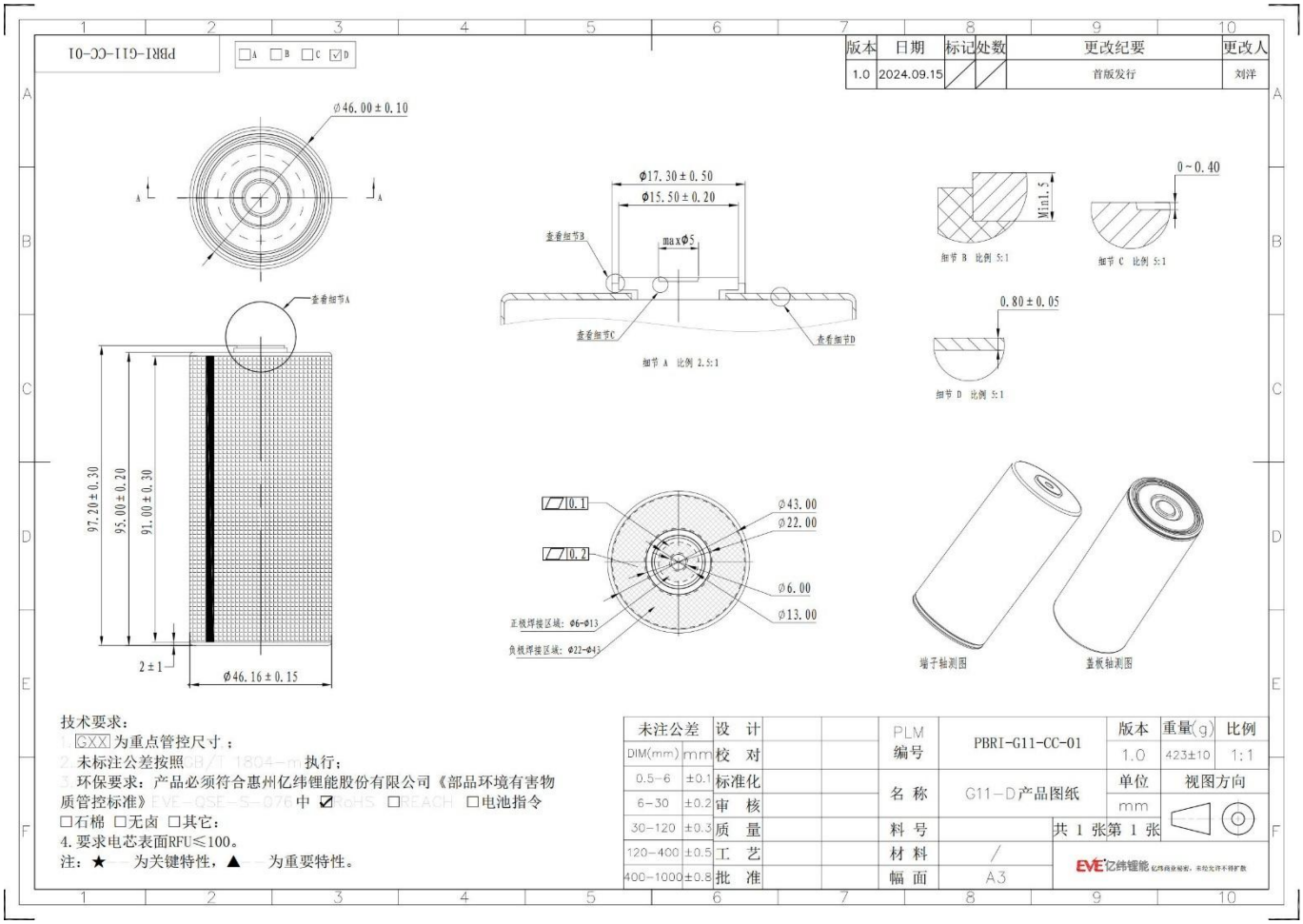

图 8 电池尺寸图 Cell Dimension Diagram