



-EVE Power CO., LTD Confidential Proprietary-

Model 型号	IFR40135	Spec No. 规格书编号	PBRI-C40-V2-D06-01	Version NO. 版本	A
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# SPECIFICATION OF PRODUCT

## 产品交付规格书

型号 (Model) : IFR40135

Designed 设计制作	Designer Checked 产品设计审核	QC Checked 品质审核	Sales Checked 销售审核	Approved 批准
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<b>Customer Signature</b> 客户接收栏
公司名称 (Company name) :
批 准 (Approved by) :
日 期 (Signature Date) :

2023 年 07 月

EVE Power CO., LTD  
湖北亿纬动力有限公司



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**客户要求 (Customer Request)**

NO. 序号	Special Requirements 特殊要求	Specification 标准
1		
2		
3		
4		
5		

客户代码 (Customer Code) : \_\_\_\_\_

签 字 (Signature) : \_\_\_\_\_

日 期 (Date) : \_\_\_\_\_



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## Revision History

## 变更履历

Revision NO. 版本	Date 日期	Description 更改内容	Author 确认人
A	2023.07.18	First Edition 新版发行	王乐

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**术语定义 (Definition of Terms)**

Terms 术语	Definition 定义
Product 产品	"Product" in this specification refers to 20 Ah rechargeable cylindrical lithium ion battery produced by EVE Power Co., Ltd. 本规格书中的“产品”是指湖北亿纬动力有限公司生产的 20Ah 可充电圆柱锂离子电池。
customer 客户	Refers to the buyer in the product sales contract of EVE Power Co., Ltd. 指《湖北亿纬动力有限公司产品销售合同》中的买方。
Environment Temperature 环境温度	The ambient temperature where the cell is located. 电芯所处的周围环境温度
Cell temperature 电池温度	The temperature measured by temperature sensor installed at the center of cell surface 由接入电池表面中心的温度传感器测试的电池温度
Rate 倍率 (C)	The ratio of the charge/discharge current to the rated capacity value. For example, the battery capacity is 20Ah, when the charging or discharging current is 20A, the charging or discharging rate is 1C. 充/放电电流与电池的额定容量值的比率。例如，电池容量为 20Ah，当充电或放电电流为 20A 时，则充电或放电倍率为 1C。
State of charge 荷电状态 (SOC)	Under no-load conditions, the ratio of the battery capacity state to the rated capacity measured in Ah or Wh. For example, if the capacity is 20Ah as 100% SOC, when the capacity is 0Ah, the SOC is 0%. 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。如：若将容量为 20Ah 的状态视为 100%SOC，则容量为 0Ah 时，SOC 为 0%。
Standard charging 标准充电	The charging mode described in Article 3.3 of this specification. 本规格书第 3.3 条所述的充电模式。
Standard discharging 标准放电	The discharging mode described in Article 3.4 of this specification. 本规格书第 3.4 条所述的放电模式。
AC resistance 交流内阻 (ACR)	Inject 1kHz sine wave current into the positive and negative poles of the cell, and the internal resistance obtained, which abbreviated as ACR. 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；
DC Resistance 直流电阻 (DCR)	The ratio of the voltage changes of the battery to the corresponding current change under working conditions. 工作条件下电池的电压变化与相应的电流变化之比。
Pulse Current 脉冲电流	The current or voltage pulses that appear periodically are called pulse currents. The pulse currents appear either in the same direction or in alternating positive and negative directions. .以周期重复出现的电流或者电压脉冲称为脉冲电流，脉冲电流或是以同一方向出现，或者是以正负交替变换方向出现。

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**测量单位 (Unit of measurement)**

No. 序号	Unit 单位	Abbreviation 简写	Type of units 单位类型
1	毫伏特(Millivolt)	mV	电压单位 Voltage
2	毫安培(Mill ampere)	mA	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	毫欧姆(Milliohm)	mΩ	电阻单位 Resistance
6	摄氏度(Degree Celsius)	°C	温度单位 Temperature
7	毫米(Millimeter)	mm	长度单位 Length
8	秒(second)	s	时间单位 Time
9	秒(Minute)	min	时间单位 Time
10	小时(Hour)	h	时间单位 Time
11	赫兹(Hertz)	Hz	频率单位 Frequency

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## 1. 基本信息 (Basic Information)

### 1.1. 适用范围 (Scope)

This product specification has been prepared to specify the cylindrical rechargeable lithium-ion cell to be supplied to customer by EVE Power Co., Ltd.

本产品规格书适用于由湖北亿纬动力有限公司生产的圆柱锂离子电池。

### 1.2. 产品类型 (Description)

Cylindrical Lithium-ion Rechargeable cell.

圆柱锂离子可充电电芯。

### 1.3. 产品型号 (Model Name)

EVE—I F R 40 135

①      ②③    ④⑤⑥

- ① The letter "EVE" defines EVE Power Co., LTD.

"EVE"代表湖北亿纬动力有限公司。

- ② The letter "I" defines Lithium-ion cell.

"I"代表锂离子电池。

- ③ The letter "F" defines LFP.

"F"代表磷酸铁锂。

- ④ The letter "R" defines Rotundity.

"R"代表圆柱形。

- ⑤ The letter "40" defines the diameter of the cell.

"40"代表电芯直径为 40 mm。

- ⑥ The letter "135" defines the height of the cell.

"135"代表电芯高度为 135 mm



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## 2. 电池规格参数 (Specification Parameters)

### 2.1. 电池基本参数 (Basic Parameters)

Item 项目	Specification 标准		Remarks 备注
0.33C Capacity@3650-2500mV 0.33C容量@3650~2500mV	≥20000	mAh	0.33C discharge 0.33C放电
1C Capacity@3650~2500mV 1C 容量@3650~2500mV	≥19500	mAh	1C discharge 1C放电
AC-IR 交流内阻	≤1.9	mΩ	AC 1 kHz@25°C 30%SOC
DC-IR 直流内阻	≤6	mΩ	2C放电30s@25°C 30%SOC
End-of-charge Voltage 充电限制电压	3650	mV	/
End-of-charge Current 充电截止电流	1000	mA	0.05C
End-of-discharge Voltage 放电截止电压	T>0°C@2500 T≤0°C@2000	mV	/
Nominal Voltage 额定电压	3220	mV	0.33C
	3200	mV	0.5C
	3130	mV	1C
Standard Charging current 标准充电电流	10000	mA	0.5C
Fast charge 快速充电电流	20000	mA	Max 80%SOC
Standard Discharge current 标准放电电流	10000	mA	0.5C
Max Discharge current 最大放电电流	60000	mA	3C pulse 30s

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Operating Temperature Range 工作温度范围	Charging Temp. 充电温度	0~55°C	Refer to chapter 4.3.1.1 参考章节 4.3.1.1		
	Discharging Temp. 放电温度	-20~60°C	Refer to chapter 4.3.2.1 参考章节 4.3.2.1		
	Storage Humidity 存储湿度	≤70% RH	/		
Monthly self-discharge rate 月自放电率	≤3.0	%/month	/		

## 2.2. 产品规格 (Product Specification)

### 2.2.1. 尺寸、重量指标 (Dimension and Weight)

NO. 序号	Item 项目	Specification 标准	Test Method Chapter 测试方法章节
1	Cell Dimension 电芯尺寸	Diameter: $\Phi 40.5 \pm 0.3$ mm (coated) 直径: $\Phi 40.5 \pm 0.3$ mm (包膜)	3.5.1.
		Height : $135.0 \pm 0.5$ mm (pole contained) 总高: $135.0 \pm 0.5$ mm (含极柱)	3.5.1
		Shoulder Height : $130.4 \pm 0.3$ mm (pole not contained) 肩高: $130.4 \pm 0.3$ mm (不含极柱)	3.5.1.
2	Cell Weight 重量	366±6g	3.5.2.

### 2.2.2. 电性能指标 (Electrical Performance)

NO. 序号	Test Item 测试项目	Specification 标准	Test Method Chapter 测试方法章节
1	Capacity 容量	0.33C discharge 0.33C 放电	≥20000mAh
2		1C discharge 1C 放电	≥19500mAh
3	Temperature Dependence of Discharge Capacity (1.0C discharge) 不同温度放电性	-20°C Retention Ratio -20°C容量保持率	≥70%
4		-10°C Retention Ratio -10°C容量保持率	≥80%
5		0°C Retention Ratio 0°C容量保持率	≥85%

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6	能 (1.0C 放电)	25°C Retention Ratio 25°C容量保持率	100%	3.5.4.2..	
7		45°C Retention Ratio 45°C容量保持率	≥95%	3.5.4.2.	
8		60°C Retention Ratio 60°C容量保持率	≥95%	3.5.4.2..	
9	100% SOC Temperature Charge Retention and Regain 100% SOC 荷电保 持与恢复能力	28d, 25°C	Retention Ratio≥95% Recovery Ratio≥97% 容量保持率≥95%, 容 量恢复率≥97%	3.5.4.3.	
10		28d, 45°C	Retention Ratio≥90% Recovery Ratio≥92% 容量保持率≥90%, 容 量恢复率 92%	3.5.4.3.	
11	Cycle Life 循环寿命	25°C 100%DOD Cycle Life 25°C 100%DOD 循环寿命	After 4000 cycles, Capacity retention≥80% Initial capacity 4000 周后容量保持 率≥80%	3.5.4.4.	
12		45°C 100%DOD Cycle Life 45°C 100%DOD 循环寿命	After 1500 cycles, Capacity retention≥70% Initial capacity 1500 周后容量保持 率≥70%初始容量	3.5.4.5	

### 2.2.3. 安全性能指标 (Safety Performance)

NO. 序号	Test Item 测试项目	Specification 标准	Test Method Chapter 测试方法章节
1	Over-charge Test 过充电测试	No explosion, no fire 不爆炸、不起火	3.5.5.1.
2	Over-discharge Test 过放电测试	No explosion, no fire, no leakage 不爆炸、不起火、不漏液	3.5.5.2.
3	Short-circuit Test 短路测试	No explosion, no fire 不爆炸、不起火	3.5.5.3.

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4	Drop Test 跌落测试	No explosion, no fire 不爆炸、不起火		3.5.5.4.	
5	Crush Test 挤压测试	No explosion, no fire 不爆炸、不起火		3.5.5.5.	
6	Heating Test 加热测试	No explosion, no fire 不爆炸、不起火		3.5.5.6.	
7	Low Pressure Test 低气压	No explosion, no fire, no leakage 不爆炸、不起火、不漏液		3.5.5.7.	

### 2.3. 电池图纸 (Outline Dimensions)

See the attachment (Fig. A).

见附录图 A。

### 2.4. 外观 (Appearance)

There shall be no such defects as rust, discoloration, leakage which may adversely affect commercial value of the cell.

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。

## 3. 试验条件 (Standard Test Condition)

### 3.1. 环境条件 (Environment Condition)

Unless otherwise specified, all tests stated in this Product Specification should be conducted at temperature  $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$  and humidity  $65\%\pm 20\%$  RH.

若无特别要求，此规格书上的产品测试条件均为温度： $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ ；湿度： $65\%\pm 20\%$  RH。

### 3.2. 测量设备 (Measuring Equipment)

The accuracy of measuring instruments and meters should meet the following requirements:

测量仪器、仪表准确度应满足以下要求：

- (1) 电压测量装置 (Volt measuring Equipment) :  $\pm 0.1\%$ ;
- (2) 电流测量装置 (Amp measuring Equipment) :  $\pm 0.1\%$ ;
- (3) 温度测量装置 (Temp measuring Equipment) :  $\pm 0.5^{\circ}\text{C}$ ;
- (4) 尺寸测量装置 (Dimension measuring Equipment) :  $\pm 0.01\text{mm}$ ;
- (5) 重量测量装置 (Weight measuring Equipment) :  $\pm 0.1\text{g}$ 。

### 3.3. 标准充电方式 (Standard Charge Method)

The "Standard Charge" means charging the cell at a constant current of 0.5C until the voltage is 3650mV, then charge at a constant voltage of 3650mV until its current is less than 0.05C. For test purpose, charging shall be performed at  $25 \pm 2^{\circ}\text{C}$ . Unless otherwise specified, it indicates "Standard Charge".

“标准充电”即在环境温度为  $25 \pm 2^{\circ}\text{C}$  的条件下，先以恒定电流 0.5C 充电至 3650mV，再以 3650mV 的恒压

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充电至电流小于 0.05C。若无特别说明，此规格书充电方式表示“标准充电”。

#### 3.4. 标准放电方式 (Standard Discharge Method)

The "Standard Discharge" means discharging the cell at a constant current of 0.5C until the voltage is 2500mV. For test purpose, discharging shall be performed at  $25 \pm 2^\circ\text{C}$ . Unless otherwise specified, it indicates "Standard Discharge"

“标准放电”即在环境温度为  $25 \pm 2^\circ\text{C}$  的条件下，以恒定电流 0.5C 放电到 2500mV。若无特别说明，此规格书充电方式表示“标准放电”。

#### 3.5. 测试方法 (Test Method)

##### 3.5.1. 尺寸 (Dimension)

Use a caliper to measure the diameter and height of the cell.

使用卡尺测量电芯直径和高度。

##### 3.5.2. 重量 (Weight)

Use an electronic scale to measure the weight of the battery.

使用电子秤测量电池的重量。

##### 3.5.3. 内阻 (Internal Resistance)

ACR: At  $25 \pm 2^\circ\text{C}$ , when the SOC is 30 % at ambient temperature, test the cell with a frequency of AC 1kHz.

DCR: At  $25 \pm 2^\circ\text{C}$ , the cell is discharged to 2000mV with a current of 0.5C. Rest for 30 min, and charge with constant current of 0.5C for 36 min (adjust the SOC to 30 %). Then rest for 30 min, and record the voltage  $V_1$  mV at the end of the period. Put a 30 s discharge pulse current of 2 C and record the voltage  $V_2$  mV at the end of the pulse, and calculate the  $\text{DCR} = (V_1 - V_2) / 40$  (m $\Omega$ ).

ACR: 在环境温度  $25 \pm 2^\circ\text{C}$  的条件下，30%SOC 的电芯采用 1kHz 的频率进行测试。

DCR: 在环境温度  $25 \pm 2^\circ\text{C}$  的条件下，电芯以 0.5C 放电至 2000mV，搁置 30min 后使用 0.5C 的电流充电 36min (调整 SOC 至 30%)，搁置 30min，记录搁置末期电压  $V_1$ ，用 2C 的电流放电 30s，记录放电末端电压  $V_2$ ，计算  $\text{DCR} = (V_1 - V_2) / 40$  (m $\Omega$ )。

##### 3.5.4. 电性能 (Electrical Characteristics)

###### 3.5.4.1. 放电容量 (Discharge Capacity)

0.33C discharge capacity: At  $25 \pm 2^\circ\text{C}$ , the cell is charged to 3650mV with constant current of 0.5 C, then charge at constant voltage of 3650mV until decreases to 0.05 C, and rest for 30 minutes; Discharge at a constant current of 0.33 C to a cutoff of 2500mV and record the discharge capacity.

1C discharge capacity: At  $25 \pm 2^\circ\text{C}$ , the cell is charged to 3650mV with constant current of 0.5 C, then charge at constant voltage of 3650mV until decreases to 0.05 C, and rest for 30 minutes; Cycle 5 times and record the average discharge capacity of the last three times.

0.33C 放电容量：在环境温度  $25 \pm 2^\circ\text{C}$ ，0.5 C 恒流恒压充电至 3650mV，0.05 C 截止，搁置 30 min；0.33 C 恒

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流放电至 2500mV 截止，记录放电容量。

1C 放电容量：在环境温度  $25 \pm 2^\circ\text{C}$ ，0.5 C 恒流恒压充电至 3650mV，0.05 C 截止，搁置 30 min；1 C 恒流放电至 2500mV 截止，搁置 30 min；循环 5 次，记录后三次放电容量均值。

#### 3.5.4.2. 不同温度放电性能 (Temperature Dependence of Discharge Capacity)

Capacity calibration: At  $25 \pm 2^\circ\text{C}$ , the cell is charged to 3650mV with constant current of 0.5 C, then charge at constant voltage of 3650mV until decreases to 0.05 C, and rest for 30 minutes; Discharge at a constant current of 1 C to a cutoff of 2500mV and record the discharge capacity. Then, the cell is fully charged according to the standard charging method at  $25 \pm 2^\circ\text{C}$ .

Low temperature discharge: Rest at  $-20/-10/0 \pm 2^\circ\text{C}$  for 12 hours, and then discharge at 1C to 2000mV at  $-20/-10/0 \pm 2^\circ\text{C}$ . Record the discharge capacity, and the capacity retention = the specific temperature discharge capacity/calibration capacity.

High temperature discharge: Rest at  $45/60 \pm 2^\circ\text{C}$  for 6 hours, then discharge at 1C at  $45/60 \pm 2^\circ\text{C}$  to 2500mV, record the discharge capacity, and the capacity retention =the specific temperature discharge capacity/calibration capacity.

容量标定：在环境温度  $25 \pm 2^\circ\text{C}$  下对电池进行 1C 放电至 2500mV 进行容量标定，记录标定容量。然后在  $25 \pm 2^\circ\text{C}$  使用标准充电方式对电芯充满电。

低温放电：在  $-20/-10/0 \pm 2^\circ\text{C}$  下搁置 12h，再在此温度下 1C 放电至 2000mV，记录放电容量，容量保持率=放电容量/标定容量。

高温放电：在  $45/60 \pm 2^\circ\text{C}$  下搁置 6h，再在此温度下 1C 放电至 2500mV，记录放电容量，容量保持率=放电容量/标定容量。

#### 3.5.4.3. 100% SOC 荷电保持与恢复能力 (100% SOC Temperature Charge Retention and Regain)

Capacity calibration is carried out according to standard charging and discharging method, recording the discharge capacity  $C_0$ ; Then, the cell is fully charged according to the standard charging method. After that, rest the cell at  $25 \pm 2^\circ\text{C}$  /  $45^\circ\text{C} \pm 2^\circ\text{C}$  /  $60^\circ\text{C} \pm 2^\circ\text{C}$  for 28D, and discharge it to 2500mV with constant current of 0.5 C under the environment of  $25^\circ\text{C} \pm 2^\circ\text{C}$ . The discharge capacity is recorded as discharge retention capacity. Then, cycling three times according to the standard charging and discharging method (record the third time as the discharge recovery capacity). Capacity retention rate=discharge retention capacity/calibration capacity  $\times 100\%$ , capacity recovery rate =discharge recovery capacity/calibration capacity  $\times 100\%$ .

电池先按照标准充放电方式进行标定容量测试，而后电池按照标准充放电充满电，在环境温度  $25 \pm 2^\circ\text{C}$  /  $45^\circ\text{C} \pm 2^\circ\text{C}$  /  $60^\circ\text{C} \pm 2^\circ\text{C}$  的条件下搁置 28 天，然后在环境温度  $25 \pm 2^\circ\text{C}$  的条件下按照标准放电制度放电至 2500mV（记录放电保持容量），搁置 30 min，然后按照标准充放电制度循环三次（记录第三次为放电恢复容量）。容量保持率=放电保持容量/标定容量 $\times 100\%$ ，容量恢复率=放电恢复容量/标定容量 $\times 100\%$ 。

#### 3.5.4.4. $25^\circ\text{C}$ 100% DOD 循环寿命 ( $25^\circ\text{C}$ 100%DOD Cycle Life)

At ambient temperature of  $25 \pm 2^\circ\text{C}$ , Charge the cell to 3650mV with constant current of 0.5 C, then switching to

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constant voltage charging to 0.05 C to cut off, and rest for 30 min. Discharge to 2500mV with constant current of 0.5 C and rest for 30 min. Repeat charge and discharge and cycle 4000times.

在环境温度  $25 \pm 2^\circ\text{C}$  的条件下, 以 0.5 C 恒流充电至 3650mV, 再恒压充电至电流 0.05 C 截止; 搁置 30 min, 然后以 0.5 C 放电至 2500mV, 放电结束后搁置 30 min 后进行下一个循环, 直至循环 4000 次。

#### 3.5.4.5. 45°C 100% DOD 循环寿命 (45°C 100%DOD Cycle Life)

At ambient temperature of  $45^\circ\text{C} \pm 2^\circ\text{C}$ , Charge the cell to 3650mV with constant current of 0.5 C, then switching to constant voltage charging to 0.05 C to cut off, and rest for 30 min. Discharge to 2500mV with constant current of 0.5 C and rest for 30 min. Repeat charge and discharge and cycle 1500times.

在环境温度  $45^\circ\text{C} \pm 2^\circ\text{C}$  的条件下, 以 0.5 C 恒流充电至 3650mV, 再恒压充电至电流 0.05 C 截止; 搁置 30 min, 然后以 0.5 C 放电至 2500mV, 放电结束后搁置 30 min 后进行下一个循环, 直至循环 1500 次。

#### 3.5.5. 安全性能 (Safety Test)

All below tests are carried out on the equipment with forced ventilation and explosion-proof device. Before test, all cells should be charged in accordance with 3.3.

下述试验应在有强制排风条件及防爆措施的装置内进行, 在试验前所有的电芯都按 3.3 规定标准充电方式充电后再进行以下试验。

##### 3.5.5.1. 过充电测试 (Over-charge Test)

At ambient temperature of  $25 \pm 2^\circ\text{C}$ , after the cell is charged to 1.5 times the termination voltage, or 1 charging time reaching 1.0h, stop charging. Observe for 1 h.

测试环境温度  $25 \pm 2^\circ\text{C}$ , 以 1 C 电流恒流充电至电池电压达到 1.5 倍充电终止电压或充电 1h 后停止充电。完成以上试验步骤后, 在试验环境温度下观察 1 h。

##### 3.5.5.2. 过放电 (Over-discharge Test)

At ambient temperature of  $25 \pm 2^\circ\text{C}$ , the cell is discharged with constant current of 1 C for 90 min. Observe for 1 h.

测试环境温度  $25 \pm 2^\circ\text{C}$ , 以 1 C 电流恒流放电 90 min; 完成以上试验步骤后, 在试验环境温度下观察 1 h。

##### 3.5.5.3. 短路测试 (Short-circuit Test)

At ambient temperature of  $25 \pm 2^\circ\text{C}$ , the anode and cathode terminals of the cell are short-circuited externally for 10 min, and the resistance of the external circuit should be less than  $5\text{m}\Omega$ . Observe for 1 h.

测试环境温度  $25 \pm 2^\circ\text{C}$ , 将电池正负极经外部短路 10 min, 外部线路电阻应小于  $5\text{m}\Omega$ 。完成以上试验步骤后, 在试验环境温度下观察 1 h。

##### 3.5.5.4. 跌落测试 (Drop Test)

At ambient temperature of  $25 \pm 2^\circ\text{C}$ , drop the cathode and anode terminal of the cell down freely from the height of 1.5m to the cement ground once.

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测试环境温度  $25 \pm 2^{\circ}\text{C}$ ，将电芯的正极或者负极端子朝下从 1.5m 高度处自由跌落到水泥地面上 1 次。完成以上试验步骤后，在试验环境温度下观察 1 h。

#### 3.5.5.5. 挤压测试 (Crush Test)

At ambient temperature of  $25 \pm 2^{\circ}\text{C}$ , A cell is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram or similar force mechanism:

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

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

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

d) Extrusion degree: stop extruding after the voltage reaches 0V or the deformation reaches 15 % or the extruding force reaches 100kN or 1000 times the weight of the test object;

e) Keep it for 10 min. Observe for 1h.

测试环境温度  $25 \pm 2^{\circ}\text{C}$ ，将电芯置于挤压设备的两个挤压平面之间，用液压油缸或类似的力挤压按照下列条件进行试验：

a) 挤压板: 半径 75 mm 半圆柱体，长度超过电池尺寸；

b) 挤压方向：垂直于蓄电池极板方向施压；

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 100 kN 或 1000 倍试验对象重量后停止挤压；

e) 保持 10min，观察 1h。

#### 3.5.5.6. 加热测试 (Heating Test)

At ambient temperature of  $25 \pm 2^{\circ}\text{C}$ , a cell is to be heated in a gravity convection or circulating air oven. The temperature of the oven is to be raised at a rate of  $5^{\circ}\text{C} \pm 2^{\circ}\text{C}/\text{min}$  to a temperature of  $130^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and remain for 30 min and observed 1h.

测试环境温度  $25 \pm 2^{\circ}\text{C}$ ，将电芯放在电热鼓风干燥箱中加热，温度以  $5^{\circ}\text{C} \pm 2^{\circ}\text{C} / \text{min}$  的速率由室温升至  $130^{\circ}\text{C} \pm 2^{\circ}\text{C}$  并保持 30min。完成以上试验步骤后，在试验环境温度下观察 1 h。

#### 3.5.5.7. 低气压 (Low Pressure Test)

At ambient temperature of  $25 \pm 2^{\circ}\text{C}$ , the cell was placed in a low pressure box, the pressure in the test box was adjusted to 11.6kPa, the temperature was room temperature, then standing and observed for 1h.

电芯放入低气压箱中，调节试验箱中气压为 11.6kPa，温度为室温，静置 6h，观察 1h。

测试环境温度  $25 \pm 2^{\circ}\text{C}$ ，将电池放入 11.6kPa 的真空箱中搁置 6h，完成以上试验步骤后，在试验环境温度下观察 1 h。



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#### 4. 电池操作说明及注意事项 (Cell Operation Instruction and Precautions)

##### 4.1. 运输 (Transportation)

The capacity of delivery cell is approximately at 30% of charging. It is not specified more than 30% capacity remain at customer, because of self-discharge. During transportation, keep the cell from acutely vibration, impacting, solarization, drenching.

出货电芯为 30%SOC 状态，由于电芯存在自耗，运送到客户端的电芯无法完全保证 30%荷电量。运输过程应防止剧烈振动、冲击、日晒雨淋。

##### 4.2. 储存建议 (Storage Recommendations)

###### 4.2.1. 短期存放 (Short Period Storage)

- \* Storage the cell at temperature of 0°C ~ 45°C (less than 3 months) , low humidity and no corrosive gas atmosphere.

电芯短期存放（不超过 3 个月）应储存在 0°C~45°C 温度范围，低湿度和不含腐蚀性气体的环境中。

- \* No press on the cell  
不要让电芯承受任何压力。

###### 4.2.2. 长期存放 (Long Period Storage)

- \* In case of long period storage (more than 3 months), storage the cell at temperature range of 0°C ~ 25°C, low humidity, no corrosive gas atmosphere.

电芯长期存放（超过 3 个月）应存储在 0°C~25°C 温度范围，低湿度和不含腐蚀性气体的环境中。

- \* No press on the cell.  
不要让电芯承受任何压力。

##### 4.3. 操作说明 (Operation Instruction)

###### 4.3.1. 充电 (Charging)

- \* Charge the cell in an ambient temperature range of 0°C to 55°C.  
电芯充电环境温度范围为 0°C~55°C。
- \* Charge the cell at a constant current of 10000mA until 3650mV is attained. Charge rates greater than 20000mA are not recommended.

建议以 10000mA 的电流恒流充电至 3650mV，超过 20000mA 的电流建议不要使用。

###### 4.3.1.1. 温度梯度充电方案 (Temperature gradient charging scheme)

Charge Current 充电 电流	SOC	Temperature Gradient 温度梯度						
		0~5°C	5~10°C	10~15°C	15~25°C	25~45°C	45~50°C	50~55°C
	100%	0.05C	0.05C	0.05C	0.05C	0.05C	0.05C	0.05C

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	98%	0.1C	0.1C	0.1C	0.1C	0.1C	0.1C	0.1C
	90%	0.1C	0.1C	0.4C	0.5C	0.5C	0.5C	0.2C
	80%	0.2C	0.2C	0.4C	0.5C	0.8C	0.5C	0.2C
	70%	0.2C	0.2C	0.6C	0.8C	1.0C	0.5C	0.2C
	60%	0.2C	0.4C	0.6C	0.8C	1.0C	0.5C	0.2C
	50%	0.2C	0.4C	0.8C	0.8C	1.0C	0.5C	0.2C
	40%	0.2C	0.5C	0.8C	0.8C	1.0C	0.5C	0.2C
	30%	0.2C	0.5C	0.8C	0.8C	1.0C	0.5C	0.2C
	20%	0.2C	0.5C	0.8C	0.8C	1.0C	0.5C	0.2C
	10%	0.2C	0.5C	0.8C	0.8C	1.0C	0.5C	0.2C
	0%	0.2C	0.5C	0.8C	0.8C	1.0C	0.5C	0.2C

#### 4.3.2. 放电 (Discharging)

\* Recommended cut-off voltage to 2500mV for temperature above 0°C and 2000mV for temperature below 0°C. Discharge rates greater than 60000mA are not recommended.

建议温度在 0°C 以上的放电终止电压为 2500mV，0°C 以下的放电终止电压为 2000mV，超过 60000mA 的电流建议不要使用。

\* For maximum performance, discharge the cell in an ambient temperature range of -20°C to 60°C. 为了达到较好的性能，电芯的放电环境温度范围为 -20°C~60°C。

##### 4.3.2.1. 温度梯度放电方案 (Temperature gradient discharging scheme)

Discharge Current 放电 电流	SOC	Temperature Gradient 温度梯度							
		-20~(-10)°C	-10~0°C	0~10°C	10~20°C	20~45°C	45~50°C	50~55°C	55~60°C
		100%	0.5C	0.8C	1.5C	1.5C	1.5C	0.8C	0.5C
98%	0.5C	0.8C	1.5C	1.5C	1.5C	0.8C	0.5C	0.2C	
90%	0.5C	0.8C	1.5C	1.5C	1.5C	0.8C	0.5C	0.2C	
80%	0.5C	0.8C	1.5C	1.5C	1.5C	0.8C	0.5C	0.2C	
70%	0.5C	0.8C	1.5C	1.5C	1.5C	0.8C	0.5C	0.2C	
60%	0.5C	0.8C	1.5C	1.5C	1.5C	0.8C	0.5C	0.2C	
50%	0.5C	0.8C	1.2C	1.2C	1.5C	0.8C	0.5C	0.2C	
40%	0.5C	0.6C	1C	1C	1.5C	0.8C	0.5C	0.2C	
30%	0.4C	0.6C	0.8C	1C	1.5C	0.8C	0.5C	0.2C	
20%	0.25C	0.5C	0.8C	0.8C	1.2C	0.8C	0.5C	0.2C	

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	10%	0.25C	0.5C	0.5C	0.5C	1.0C	0.5C	0.5C	0.1C
	5%	0.1C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.1C

4.3.3. 温度限制 (Temperature Limits)

Item 项目	Value 数值	Remarks 备注
Recommended Operating Temperature Range 推荐操作温度范围	10°C ~ 35°C	Recommended Operating Temperature Range 推荐使用电池的温度范围。
Maximum operating temperature 最高操作温度	60°C	If the cell temperature exceeds the maximum operating temperature, the power needs to be reduced to 0. 如果电池使用温度超过最高操作温度，功率需要降为 0。
Minimum operating temperature 最低操作温度	-20°C	If the cell temperature exceeds the minimum operating temperature, the power needs to be reduced to 0. 如果电池使用温度超过最低操作温度，功率需要降为 0。
Maximum Safe temperature 最高安全温度	60°C	If the cell temperature exceeds the maximum safe temperature, it will cause irreversible and permanent damage to the cell, and the user should not use it higher than the maximum safe temperature. 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，用户使用不得高于最高安全温度。
Minimum safe temperature 最低安全温度	-20°C	If the cell temperature exceeds the minimum safe temperature, it will cause irreversible and permanent damage to the cell, and the user should not lower the minimum safe temperature when using it. 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，用户使用不得低于最低安全温度。

Remarks 备注:

a) Avoid charging the cell at low temperatures (including but not limited to standard charge, quick charge, emergency charge and regenerative charge) prohibited by this specification, otherwise unexpected capacity reduction may occur. The battery management system should be controlled according to minimum charging and regenerative charging temperatures. Charging at temperatures lower than specified in this specification is prohibited, otherwise, EVE will not bear all relevant responsibilities such as quality assurance liability and loss compensation caused thereby.

a) 电池避免在本技术协议禁止的低温条件下充电（包括但不限于标准充电，快充，紧急情况充电和再生充电等），否则可能出现意外的容量降低现象。电池管理系统应依照最小的充电和再生充电温度进行控制。禁止在低于本技术协议规定的温度条件下充电，否则，乙方不承担质量保证责任及由此引起的损失赔偿等一切相关责任。

b) The heat dissipation of battery should be fully considered in the design of cell pack; EVE is not responsible for the quality assurance caused by overheating due to the heat dissipation design of cell pack.

b) 电池包设计中应充分考虑电芯的散热问题，由于电池包散热设计问题导致的电芯或电池过热损坏，乙方

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不承担质量保证责任。

#### 4.3.4. 电芯防范措施 (Standard Cell Precaution)

- \* Do not expose the cell to extreme heat or flame.  
不要将电芯暴露在极热或有火星的环境中。
- \* Do not short circuit, over-charge or over-discharge the cell.  
不要将电芯短路, 过充或过放。
- \* Do not subject the cell to strong mechanical shocks.  
不要使电芯承受过重的机械冲击。
- \* Do not immerse the cell in water or sea water, or get it wet.  
不要将电芯浸入海水或水中, 或者使其吸湿。
- \* Do not reverse the polarity of the cell for any reason.  
不要颠倒电芯的正负极。
- \* Do not disassemble or modify the cell.  
不要拆卸或修整电芯。
- \* Do not handle or store with metallic like necklaces, coins or hairpins, etc.  
不要和项链, 硬币或发夹等金属物品放置在一起。
- \* Do not use the cell with conspicuous damage or deformation.  
不要使电芯受到明显的损害或变形。
- \* Do not connect cell to the plug socket or car-cigarette-plug.  
不要将电芯与插座连接。
- \* Do not make the direct soldering onto a cell.  
不要直接焊接电芯。
- \* Do not touch a leaked cell directly.  
不要直接接触泄漏的电芯。
- \* Do not use for other equipment.  
不要将电芯用于其它设备。
- \* Do not use Lithium-ion cell in mixture.  
不要将锂离子电芯混合使用。
- \* Do not use or leave the cell under the blazing sun (or in heated car by sunshine).  
不要将电芯放置在太阳光直射的地方。
- \* Keep cell away from children.  
将电芯放置在远离儿童的地方。
- \* Do not drive a nail into the cell, strike it by hammer or tread it.  
不要针刺、锤打或践踏电芯。
- \* Do not give cell impact or fling it.  
不要撞击或投掷电芯。

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#### 4.4.其他 (Others)

For the sake of safety assurance, if there are equipment design, lithium ion cell system protection circuit, fast charging and other special application, please consult EVE first. Any matters not mentioned in this specification must be negotiated and determined by both parties.

为了安全起见, 如有设备设计, 锂离子电池系统保护电路或高电流, 快速充电和其它方面的特殊应用, 请先咨询亿纬公司相关事宜。任何本规格书中未提及的事项, 须经过双方协商确定。

This specification is written in both Chinese and English. In case of any conflict between the English version and the Chinese version, the Chinese version shall prevail.

本规格书由中英两种语言书写, 当英文版本和中文版本发生冲突时, 以中文版本为主。

### 5. 免责声明 (Disclaimer)

If the product demand unit or user does not use the product in accordance with the provisions of this manual, EVE will no longer bear all relevant responsibilities 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 acts, EVE reserves the right to investigate the legal liability of the product demand unit.

如果由于产品需求单位和使用者的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发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 将保留追究产品需求单位法律责任权利。

### 6. 联系方式 (Consultation)

As to the obscurity, contact the following:

Address: No.68 Jingnan Avenue, Duodao District, High-tech Zone, Jingmen, Hubei Province, China

Email: sales@evebattery.com

Website: <http://www.evepower.com>

如有疑问, 请按以下方式咨询:

地址: 中国·湖北省荆门市高新区·掇刀区荆南大道 68 号, 湖北亿纬动力有限公司

联系邮箱: sales@evebattery.com

网 址: <http://www.evepower.com>

Model 型号	IFR40135	Spec. NO 规格书编号	PBRI-C40-V2-D06-01	Version NO. 版本	A
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附图一：IFR40135 图纸 (Attachment I: IFR40135 drawing)

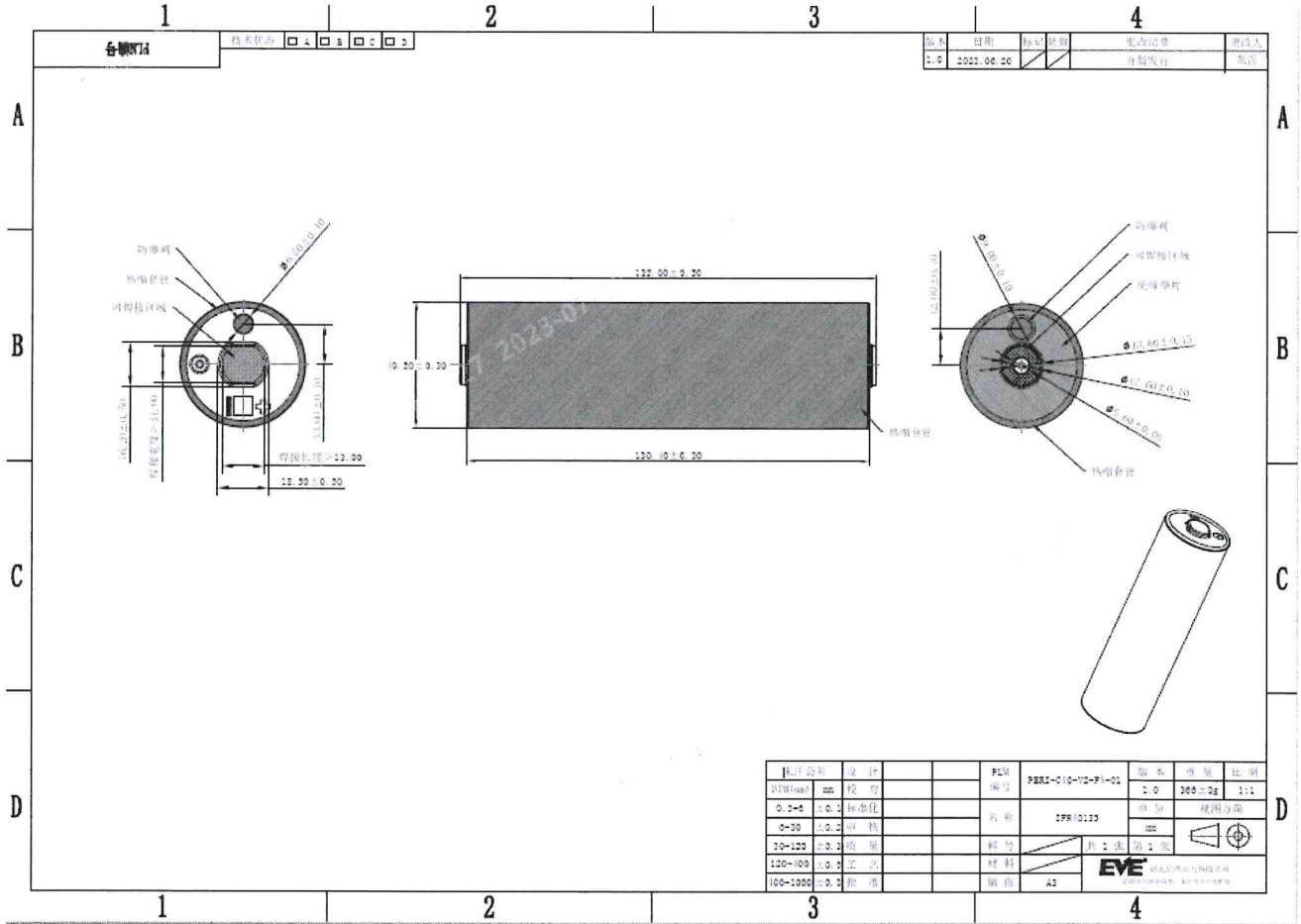


Figure A (图 A)

附图二：IFR40135 包装 (Attachment I: IFR40135 Packing)

Each box contains 45 PCS cell, as shown in figure B.

每箱 45pcs 电芯，如图 B 所示。

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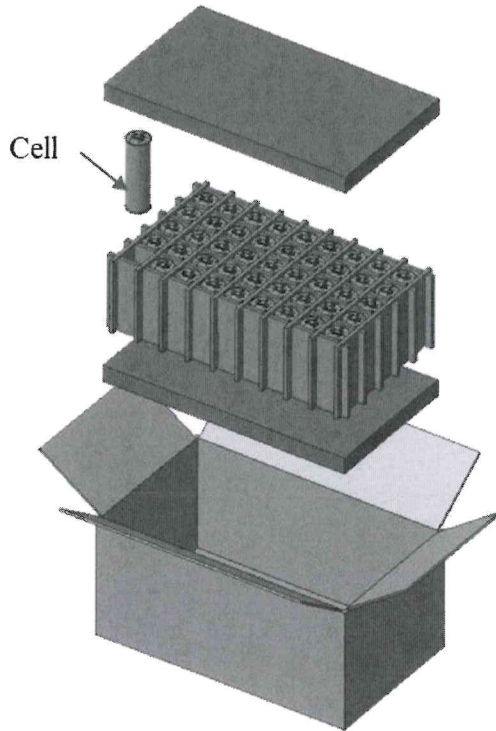


Figure B (图 B)

Each card board has 40 boxes, divided into 5 layers, as shown in figure C.

每卡板 40 个箱子，分 5 层，如图 C 所示。

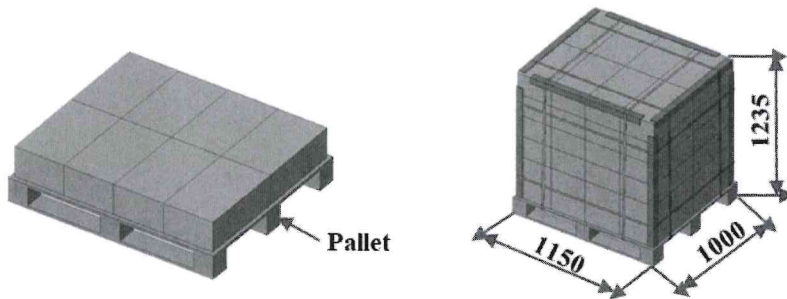


Figure C (图 C)