

# 锂离子电芯规格书

## Specification for Lithium-ion Rechargeable Cell

电芯型号: FREY36130290-100PF

Cell Type :FREY36130290-100PF)

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### 1. Preface 前言

This Product Specification describes the technique requirements, test procedures and precaution notes of Lithium-ion Rechargeable cell to be supplied to customer by Jiangsu FREY Battery Technology Co., Ltd.

本标准规定了由江苏福瑞士电池科技有限公司生产的锂离子电芯的技术要求、测试方法和注意事项。

### 2. Description 说明

2.1 Product 产品: Lithium-ion Rechargeable cell 锂离子可充电电芯

2.2 Model (Type) 电芯型号: FREY36130290-100PF

2.3 Designation 名称:

36	130	290 -	100	P	F
①	②	③	④	⑤	⑥

①: Indicates the Thickness of cell 代表电芯厚度 T

T 36=36mm, 尺寸公差±1mm

②: Indicates the overall Width of cell 代表电芯宽度 W

W 130=130mm, 尺寸公差±1mm

③: Typical battery height 代表电芯高度 H

H 290=290mm, 尺寸公差±2mm

④: 60 Indicates the capacity of cell

代表电池容量 100Ah

⑤: Indicates the performance of cell 代表电池性能

The letter "P" defines high power cell

"P"代表功率型

⑥: The letter "F" defines LiFePO<sub>4</sub> series cathode

"F"代表以 LiFePO<sub>4</sub> 为正极材料的电芯

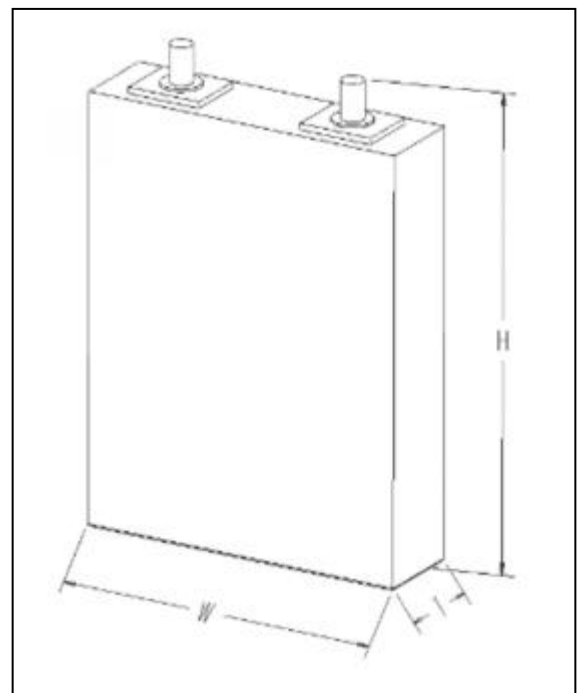


图 A

### 3. Cell Size 电芯尺寸

For details, please refer to Figure A. Remark: contain package (PVC heat-shrinkable).

对于电池结构的详细资讯, 请参阅图 A。备注: 包含外包装 (本司默认为 PVC 热缩套管)

### 4. construction 电芯结构

A cell is made of cathode, anode, separator, aluminum shell and caps.

电芯由正极、负极、隔膜、铝壳体和盖板组成。

### 5.Specification 标准

Item 项目	Specification 标准	Remark 备注	
5.0 Typical Capacity 典型容量	102Ah	温度: Temperature:23±2℃ 放电倍率: 0.3C discharge capacity	
5.1 Minimum Capacity 最小容量	100Ah		
5.2 Internal Impedance 交流内阻	≤1mΩ	By AC 1 KHZ	
5.3 Nominal Voltage 标称电压	3.2V		
5.4 Cell Weight 电芯重量	≤3kg	contain package 包含外包装	
5.5 End-of-charge Voltage 充电截止电压	3.65V	At CC mode	
5.6 End-of-discharge Voltage 放电截止电压	2.2V		
5.7 Charge Method 标准充电方式	0.5C CC/CV		
5.8 Max Pulse Discharge current 最大瞬间放电电流	500A	Pulse Current width: 5C Under 5 Seconds 电流脉冲宽度: 5C 5S 以内	
5.9 Max Continuous Discharge current 最大持续放电电流	200A	Continuous Discharge current: Under 2C 持续电流: 2C 以内	
5.10 Max Pulse charge current 最大瞬间充电电流	100A	Pulse Current width: 2c Under 10Seconds 电流脉冲宽度: 2c 10S 以内	
5.11 Standard charge current 标准充电电流	50A	0.5C	
5.12 Cycle Life 循环性能	≥2500 cycles	50A Continual Charge&Discharge (100% DOD) Rest Capacity over 80%	
5.13 Operating Temperature Range 操作温度范围	Charging Temperature 充电温度	0~50℃	Recommended temperature range for long term storage is 0~+50℃
	Discharging Temperature 放电温度	-20~50℃	Recommended temperature range for long term storage is -20~+50℃
	Storage Temperature 存储温度	-10~45℃	Recommended temperature range for long term storage is -10~+45℃
5.14 Shelf Life 储藏寿命	3year	Typical value from ship state	
5.15 Appearance 外观	Without break, scratch, distortion, contamination, leakage and so on 无破裂、划痕、变形、污迹、电解液泄露等		

### 6. Test Conditions 测试条件

6.1 Unless otherwise specified, all tests stated in this Product Specification are conducted at temperature  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and Humidity  $<75\% \text{ RH}$ .

若无特别要求，此规格书上的产品测试条件均为温度： $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ，湿度： $<75\% \text{ RH}$ 。

### 6.2 Standard Charge Method 标准充电方式

The "Standard Charge" means in an ambient temperature of  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , charging the Cell at a constant current of 0.5C until the voltage is 3.65V, then charged at a constant voltage of 3.65V until current is less than 0.05C.

“标准充电”即在环境温度为  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$  的条件下，先以恒定电流 0.5C 充电至 3.65V 再以 3.65V 充电至电流小于 0.05C。

### 7. Electrical characteristics 电性能

Test Item 测试项目	Test Method 测试方法	Criteria 检验标准
7.1 High Temperature Performance 高温性能	A cell is charged in accordance with 6.2, and stored in an ambient temperature of $50^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 4hrs, then discharged to cut-off voltage at a constant current of 0.5C. After that, fetch out the cell and place it in the ambient temperature of $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 4hrs, then check its appearance. 电芯按 6.2 规定充电结束后，将电芯放入 $50^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 的高温箱中恒温 4h，然后以 0.5C 电流放电至终止电压，实验结束后，将电芯取出在环境温度为 $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 的条件下搁置 4hrs，然后目测电芯外观。	1. Capacity retention: $\geq 90\%$ ; 2. No distortion, no rupture. 1. 容量保持率: $\geq 90\%$ ; 2. 电芯外观无变形，无爆裂。
7.2 Low Temperature Performance 低温性能	A cell is charged in accordance with 6.2, and stored in an ambient temperature of $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 20hrs, then discharged to cut-off voltage :2.0V at a constant current of 0.5C . After that, fetch out the cell and place it in the ambient temperature of $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 4hrs, then check its appearance. 电芯按 6.2 规定充电结束后，将电芯放入 $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 的低温箱中恒温 20hrs，然后以 0.5C 电流放电至终止电压 2.0v，实验结束后，将电芯取出在环境温度为 $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 的条件下搁置 4hrs，然后目测电芯外观。	1. Discharge Capacity Percentage Ratio : $\geq 65\%$ ; 2. No distortion, no rupture 1. 放电容量为额定容量的百分率: $\geq 65\%$ ; 2. 电芯外观无变形, 无爆裂。
7.3 Room Temperature Powerful Discharge Performance 室温倍率放电性能	A cell is charged in accordance with 6.2, and stored in an ambient temperature of $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 20hrs, then discharged to cut-off voltage :2.2V at a constant current of 3C . After that, fetch out the cell and place it in the ambient temperature of $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 4hrs, then check its appearance. 电芯按 6.2 规定充电结束后，将电芯放入 $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 的常温箱中恒温 20hrs，然后以 3C 电流放电至终止电压 2.2V，实验结束后，将电芯取出在环境温度为 $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 的条件下搁置 4hrs，然后目测电芯外观。	1. Discharge Capacity Percentage Ratio : $\geq 95\%$ ; 2. No distortion, no rupture 1. 放电容量: $\geq 95\%$ ; 2. 电芯外观无变形, 无爆裂。
7.4 Cycle Life 循环寿命 ( $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ )	A cell is charged to end-of-charge voltage at a current of 0.5C, and then charged at a constant voltage of 3.65V until the charge current is less than 0.05C, after that stored for 30min; Discharged to cut-off voltage at a constant current of 0.5C, after that, stored 30min prior to next charge-discharge cycle. The cell shall be continuously charged and discharged for 2500 times. 电芯按 0.5C CC/CV3.65V 充电后搁置 30min，然后以 0.5C 电流放电至终止电压，放电结束后搁置 30min，再进行下一次充放电循环，连续进行充放电循环 2500 次。	capacity retention: $\geq 80\%$ 容量保持率: $\geq 80\%$

### 8. Environmental Characteristics 环境性能

Test Item 测试项目	Test Method 测试方法	Criteria 检验标准
8.1 Constant Temperature and Humidity 恒定湿热性能	<p>A cell is charged in accordance with 6.2, and stored in an ambient temperature of <math>40 \pm 2</math> °C (90 ~ 95%RH) for 48hrs, then placed in room temperature for 2hrs. After that, check its appearance prior to being discharged to cut-off voltage at a constant current of 0.5C.</p> <p>电芯按 6.2 规定充电结束后, 将电芯放入 <math>40 \pm 2</math> °C (90~95%RH) 的恒温恒湿箱中搁置 48hrs 后, 将电芯取出在室温下搁置 2hrs, 目测电芯外观, 再以 0.5C 电流放电至终止电压</p>	<p>1.No distortion ,no, rust no fume, no explosion;</p> <p>2.Capacity retention: <math>\geq 80\%</math></p> <p>1.电芯外观应无变形, 锈蚀, 冒烟或爆炸;</p> <p>2.容量保持率: <math>\geq 80\%</math></p>
8.2 Temperature Test 温度冲击	<p>A cell is charged in accordance with 6.2, then heated the cell to be in a oven. then the temperature of the oven is to be raised to the temperature of <math>70</math> °C <math>\pm 3</math> °C and remain for 4h at that temperature, then the temperature of the oven is to be dropped to the temperature of <math>20</math> °C <math>\pm 3</math> °C and remain for 4h at that temperature, then the temperature of the oven is to be dropped to the temperature of <math>-40</math> °C <math>\pm 3</math> °C and remain for 4hrs at that temperature, repeat this for another 9 cycles, after that put the cell in room temperature for at least 24hrs, then check cell's appearance.</p> <p>电芯按 6.2 的规定充电结束后, 将电芯放入温控箱内, 在 30 分钟内, 环境温度升至 <math>70 \pm 3</math> °C, 并在此温度下保持 4hrs, 在 30 分钟内, 环境温度降至 <math>20 \pm 3</math> °C, 并在此温度下保持 4hrs, 在 30 分钟内, 环境温度降至 <math>-40 \pm 3</math> °C, 并在此温度下保持 4hrs, 重复以上步骤 9 次, 将电池保持在室温环境下 24hrs, 目测电芯外观。</p>	<p>No leakage, no fire, no explosion, no vent</p> <p>电芯应不漏液、不着火、不爆炸、不裂开</p>
8.3 Low-pressure Test 低压测试	<p>A cell is charged in accordance with 6.2, then stored it for 6hrs at a vacuum of <math>-0.90</math> mPa, after that put the cell in room temperature for 6hrs, then check cell's appearance.</p> <p>电芯按 6.2 的规定充电结束后, 将电芯放入真空度为 <math>-0.90</math> mPa 下搁置 6hrs, 将电芯取出在室温下搁置 6hrs, 目测电芯外观。</p>	<p>No leakage, no fire, no explosion, no vent</p> <p>电芯应不漏液、不着火、不爆炸、不裂开</p>
8.4 Vibration Test 振动测试	<p>A cell is charged in accordance with 6.2, then installed onto the vibration desk with clamps. Equipment parameters of frequency and amplitude are as follows(the frequency is to be varied at the rate of 1oct/min between 10 and 55 Hz, and repeat vibration for 30min.The cell is to be tested in three mutually perpendicular directions): frequency:10Hz~30Hz amplitude: 0.38mm frequency:30Hz~55Hz amplitude: 0.19mm</p> <p>电芯按 6.2 的规定充电结束后, 将电芯用夹具安装在振动台的台面上, 按下面的振动频率和对应的振幅调整好实验设备。X、Y、Z 三个方向每个方向上从 10~55Hz 循环扫频振动 30min, 扫频速率为 1oct/min:</p> <p>振动频率: 10Hz~30Hz 位移幅值(单振幅): 0.38mm;</p> <p>振动频率: 30Hz~55Hz 位移幅值(单振幅): 0.19mm</p>	<p>1.No scratch, no fire, no explosion, no vent;</p> <p>2.The voltage is not less than 3.35V.</p> <p>1.电芯外观应无明显损伤、不漏液、不着火、不爆炸、不裂开;</p> <p>2.单体电芯电压不低于 3.35V。</p>



### 9. Safety Test 安全测试

All below tests are carried out on the equipment with forced ventilation and explosion-proof device. Before test, all cells are charged in accordance with 6.2, and stored 24hrs prior to testing.

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 6.2 规定充电，并搁置 24hrs 后，再进行以下试验。

Test Item 测试项目	Test Method 测试方法	Criteria 检验标准
9.1 55°C Short-circuit Test 高温(55°C)短路测试	A oven is to be raised to the temperature of 55°C and remain for 10min at that temperature. A cell is to be placed into the oven and remain for 30min~40min. Then the Cell is to be short-circuited by connecting the positive and negative terminals of the cell with copper wire having a maximum resistance load of 50mΩ. Monitor its temperature while testing, the cell is to be discharged until the cell case temperature has returned to be 10°C less than peak temperature. 将高温试验箱加热到 55°C，保持 10min。将接有热电偶的电芯置于高温箱中，电芯在高温箱中保持 30min~45min。用铜线短路其正负极(外部线路总电阻不大于 5 毫欧)。同时检测电芯温度变化，当电芯温度下降到比峰值低约 10°C 时，结束实验	1.No fire, no explosion 2.Max.temp.< 150°C 1.电芯不起火，不爆炸 2.最高温度<150°C
9.2 Overcharge Test (3C/5V) 过充电	A cell is discharged to cut-off voltage at CC of 0.5C. then it is to be subjected to CC/CV power by connecting its positive & negative terminal, then set the current as 3C, the voltage as 5V, after that, Charge the cell up to 5V at CC of 3C, until that last 7h at the voltage of 5V or the voltage is no more increased. 先将电池以 0.5C 放电至终止电压，然后将电芯正负极连接于恒压电源，调节电流至 3C，电压为 5V，然后对电芯以 3C 充电，直到输出电压不低于 5V，持续充电 7h 或电压不再增大。	No fire, no explosion 电芯不起火，不爆炸
9.3 Forced-Discharge Test 过放电	A cell is discharged to cut-off voltage 0V at a constant current of 1C. 以 1C 电流放电，直至电池电压为 0V。	No fire, no explosion, 电芯不起火，不爆炸
9.4 Crush Test 挤压测试	A cell is to be placed on the crush flat, the axis is parallel to the crush flat, it is to be crushed between two flat surfaces. Crushing force is approximately 13 KN and hold for 1 min. 电芯放在挤压设备的两个挤压表面之间，垂直于电芯极板方向施压，逐渐增加压力至 13 KN，保持压力 1min。	No fire, no explosion 电芯不起火，不爆炸
9.5 Impact Test 重物冲击	A cell is to be placed on the impact flat. A $\Phi 15.8$ mm bar is to be placed on the center of the cell. A 9.1kg weight is to be dropped from a height of 610mm onto the cell, the distortion is allowed. 将电芯放在冲击台上，将 $\Phi 15.8$ mm 的钢柱置放电池中心，钢柱的纵轴平行于平面，让重量 9.1kg 重锤自 610mm 高度自由落下，冲击电芯，电芯允许发生变形。	No fire, no explosion 电芯不起火，不爆炸
9.6 Heating Test 热冲击(130°C)	A cell is to be heated in a circulating air oven. The temperature of the oven is to be raised at a rate of $5^{\circ}\text{C} \pm 2^{\circ}\text{C}$ per minute to a temperature of $130^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and remain for 30min at that temperature before the test is discontinued. 将电芯放在电热鼓风干燥箱中，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。	No fire, no explosion 电芯不起火，不爆炸

### 10. Shipment 出货

The Cell shall be shipped in voltage range of 3.2 ~ 3.4V or in accordance with customers' requirement.

The remaining capacity before charging shall be changed depending on the storage time and conditions.

单体电芯按 3.2-3.4V 的充电电压或客户要求出货，电芯出货后充电前的剩余容量取决于储存时条件。

### 11. Warranty 质量保证

The Warranty period of cell is made according to business contract, However, even though the problem occurs within this period, Jiangsu FREY Battery Technology Co., LTD. won't replace a new cell for free as long as the problem is not due to the failure of Jiangsu FREY Battery Technology Co., LTD. manufacturing process or is due to customer's abuse or misuse.

自出货之日起，电芯的保质期限依合同而定。但是，在此期限内，如果非江苏福瑞士电池科技有限公司的制程原因而是客户的误用造成的电芯质量问题江苏福瑞士电池科技有限公司不承诺免费更换。

Jiangsu FREY Battery Co., LTD. will not be responsible for trouble occurred by handling outside of the precautions in instructions.

江苏福瑞士电池科技有限公司对违反安全守则操作所产生的问题不承担任何责任。

Jiangsu FREY Battery Technology Co., LTD. will not be responsible for trouble occurred by matching electric circuit, cell pack and charger.

江苏福瑞士电池科技有限公司对与电路、电池组、充电器搭配使用所产生的问题不承担任何责任。

Jiangsu FREY Battery Technology Co., LTD. will be exempt from warrant any defect cells during assembling after acceptance.

出货后客户在电芯组装过程中产生的不良电芯不在江苏福瑞士电池科技有限公司质量保证的范围之列。

### 12. Precautions and Safety Instructions 安全守则

Lithium-Ion rechargeable batteries subject to abusive conditions can cause damage to the cell and/or personal injury.

Please read

and observe the standard cell precautions below before using utilization.

滥用锂离子充电电芯可能会造成电芯的损害或人身的伤害，在使用锂离子充电电芯以前，请仔细阅读以下的安全守则：

Note 1. The customer is required to contact Jiangsu FREY Battery Technology Co., LTD. in advance, if and when the

customer needs other applications or operating conditions than those described in this document.

注释 1、如果客户需要将电芯在该文件之外的条件下操作或应用，请先咨询江苏福瑞士电池科技有限公司相关事宜。

Note 2. Jiangsu FREY Battery Technology Co., LTD. will take no responsibility for any accident when the cell is used under other

conditions than those described in this Document.

注释 2、在该文件说明的条件之外使用该电芯而产生的事故，江苏福瑞士电池科技有限公司不承担任何责任。

#### 12.1 Standard cell Precautions 电芯防范措施

a. 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。

b. Do not short circuit, over-charge or over-discharge the cell.

不要将电芯短路，过充或过放。



- c. Do not subject the cell to strong mechanical shocks.  
不要使电芯承受过重的机械冲击。
- d. 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。
- f. Do not disassemble or modify the cell.  
不要拆卸或修整电芯。
- g. 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。
- h. 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。
- i. Do not connect cell to the plug socket or car-cigarette-plug.  
不要将电芯与插座连接。
- j. Do not make the direct soldering onto a cell.  
不要直接焊接电芯。
- k. Do not touch a leaked cell directly.  
不要直接接触泄漏的电芯。
- l. Do not use for other equipment.  
不要将电芯用于其它设备。
- m. Do not use Lithium-ion cell in mixture.  
不要将锂离子电芯混合使用。
- n. 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。
- o. Keep cell away from children.  
将电芯放置在远离儿童的地方。
- p. 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。
- q. Do not give cell impact or fling it.  
不要撞击或投掷电芯。

## 12.2 Cell Operation Instructions 电芯使用说明

### 12.2.1 Charging 充电

- a. Charge the cell in a temperature range of 0°C to +50°C.  
电芯充电温度范围为 0°C~50°C。
- b. Charge the cell at a constant current of 0.5C until 3.65V, and then at a constant voltage of 3.65V until 0.05C.

Charge rates greater than 1C are NOT recommended. (C : Rated Capacity of cell)

以 0.5C 电流恒流充电至 3.65V，然后以 3.65V 的电压恒压充电至电流为 0.05C，超过 1C 的电流建议不要使用  
(C: 标称容量)

### 12.2.2 Discharging 放电

- a. Recommended cut-off voltage to 2.2V. Recommended max continuous discharge current is 2C.  
建议放电终止电压为 2.2V，建议最大持续恒流放电电流为 2C
- b. For maximum performance, discharge the cell in a temperature range of -20°C to +50°C.  
为了达到较好的性能，电芯的放电温度范围为 -20°C~+50°C。

### 12.2.3 Storage Recommendations 储存建议

In case of long period storage (more than 3 months), storage the cell at temperature range of  $-10 \sim +45^{\circ}\text{C}$ , low humidity, no corrosive gas atmosphere, No press on the cell; And more than 3 months need to put a charge according to the standard charge and discharge process

如果要长时间存放(超过 3 个月), 电芯应存储在温度范围为  $-10 \sim 45^{\circ}\text{C}$ , 低湿度和不含腐蚀性气体的环境中。不要让电芯承受任何压力; 并且超过三个月需要按照标准充放电流程充放一次

### **13. Consultation** 技术咨询

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