

Specification Approval Sheet(Cell)**产品规格确认书（电芯）****受控 07**Model: IFpP40130220-100型号: IFpP40130220-100

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PRODUCT SPECIFICATION

DOC NO.: IFpP40130220-100

SHEET : 3 OF 23

ECN NO.: Q/KAGG722C-2020

1 Scope

This document describes the Product Specification of the Lithium-ion rechargeable battery cell supplied by JiangSu Highstar Battery Manufacturing Co.,LTD.

适用范围

本规格说明书描述了江苏海四达电源股份有限公司生产的可充电锂离子电芯的产品性能指标。

2 Model: IFpP40130220-100

型号: IFpP40130220-100

3 Specification

规格

No.	Items (项目)	Specifications (规格)
1	Charge voltage 充电电压	3.65V
2	Nominal voltage 标称电压	3.2V
3	Rated Capacity (discharge at 0.5C to voltage of 2.5V at 23°C ±5°C) 额定容量	100Ah
4	Rated Charge-discharge Energy 额定充放电能量(discharge at constant power (150W) to voltage of 2.5V at 23°C±5°C)	300Wh
5	Standard Charge-discharge Power 标准充放电功率	150W
6	Max. Charge Power 允许连续最大充电功率	300W
7	Max. Discharge Power 允许最大放电功率	Under the conditions of 25° C ± 2 ° C, Discharging at 600W for 30s at 100% SOC 在25°C±2° C条件下, 100%SOC状态下, 600W放电 30s。
8	Discharge cut-off voltage 放电截止电压	2.5V
9	Operating temperature humidity % 温度、湿度	Relative 工作
		Charging : 0°C-45°C, 65%±20%RH 充电: 0°C-45°C, 65%±20%RH discharging : -20°C-60°C, 65%±20%RH 放电: -20°C-60°C, 65%±20%RH
10	Recommended Storage temperature 推荐存储温度	15°C-35°C
11	Cell Weight 电芯重量	Approx. 2.25kg
12	Impedance 内阻	≤0.6mΩ
13	Cell dimension 电芯尺寸(包胶)	厚度 thick : 40.2mm ±0.3mm 宽度 Width : 130.2mm±0.5mm 长度 Length : 220.0mm±1.0mm

4 Battery Cell Performance Criteria and Test Conditions

电芯性能标准以及测试条件

4.1 Standard environmental test conditions

标准测试环境

Unless otherwise specified, all tests stated in this Product Specification are conducted at below condition:

Temperature : 23°C±5 °C

Relative Humidity : 65%±20%

除非特别说明, 本标准书中所有测试均在以下环境条件下进行:

温度: 23°C±5°C

湿度: 65%±20%

4.2 Electrical characteristics

电气性能

No.	Items (项目)	Test Method and Condition (测试方法和条	Criteria (标准)
1	Initial Charging method 初始化充电	Rest for 5 hours under the conditions of 25° C ± 5 ° C, 150W constant power discharge to 2.5V; then rest for 30min, 150W constant charge to 3.65V; rest for 30min. 在25°C±5 °C的条件下静置5h, 150W恒功率放电至2.5V,搁置30min, 150W恒功率充电至3.65V,搁置30min。	Charge Power =150W
2	Initial Disharging method 初始化放电	Rest for 5 hours under the conditions of 25° C ± 5 ° C, 150W constant power charge to 3.65V; then rest for 30min, 150W constant discharge to 2.5V; rest for 30min. 在25°C±5 °C的条件下静置5h, 150W恒功率充电至3.65V,搁置30min, 150W恒功率放电至2.5V,搁置30min。	Discharge Power =150W
3	Initial Impedance 初始内阻	Internal resistance measured at AC 1KHz within 1 hour after standard charge 将电池按标准充电方法充电后, 在1h内测量其AC 1KHz下的交流阻抗。	≤0.6mΩ
4	Cell Voltage 电池电压	Battery state upon shipment 出货状态	≥3.0V
5	CC-CV Charging method 恒流 恒压充电方法	Under the conditions of 25° C ± 5 ° C, 0.5C Constant current charge to 3.65V, then Constant voltage 3.65V charge till charge current decline to ≤0.05C. 在25°C±5 °C的条件下, 0.5C恒流充电至3.65V,转为3.65V恒压充电, 直至充电电流小于0.05C.	Charge Current=50A

6	Initial charge-discharge Energy 初始充放电能量	<p>(1)After initial discharge, the cell shall be charged at a constant power of 150W to the cutoff charge voltage 3.65V, rest for 30 minutes. 初始化放电后, 电池以150W恒功率充电至截止电压3.65V, 休息30分钟。</p> <p>(2)The cell shall be discharged at a constant power of 150W to the cutoff discharge voltage 2.5V, rest for 30 minutes. 电池以150W恒功率放电至截止电压2.5V, 休息30分钟。</p> <p>(3) Repeat step (1)-(2) three times,record the average value of charge-discharge energy. 重复步骤(1)-(2)三次, 记录三次充放电能量的平均值。</p>	<p align="center">≥300Wh Energy Efficiency ≥ 93% 能效 ≥93%</p>
7	High Temperature Charge-discharge Performance 高温充放电性能	<p>(1)After initial discharge, the cell shall be stanced for 5h at the temperature of (45±2) °C, then the cell shall be charged at a constant power of 150W to cutoff charge voltage 3.65V at the temperature of (45±2) °C, rest for 30min; 初始化放电, 在(45±2) °C下搁置 5 h; 在(45±2) °C下, 电池以150W恒功率充电至终止电压3.65V, 静置30min;</p> <p>(2)The cell shall be discharged at a constant power of 150W to cutoff discharge voltage 2.5V under the temperature of (45±2) °C, rest for 30min; 在(45±2) °C下, 电池以150W恒功率放电至终止电压2.5V, 静置30min;</p>	<p align="center">Charge-discharge Energy ≥99% Initial Charge- discharge Energy Efficiency ≥ 90% 充放电能量 ≥99% 初始充放电能量 能效 ≥90%</p>
7	Low Temperature Charge-discharge Performance 低温充放电性能	<p>(1)After initial discharge, the cell shall be stanced for 5h at the temperature of (5±2) °C, then the cell shall be charged at a constant power of 150W to cutoff charge voltage 3.65V at the temperature of (5±2) °C, rest for 30min; 初始化放电, 在(5±2) °C下搁置 5 h; 在(5±2) °C下, 电池以150W恒功率充电至终止电压3.65V, 静置30min;</p> <p>(2)The cell shall be discharged at a constant power of 150W to cutoff discharge voltage 2.5V under the temperature of (5±2) °C, rest for 30min; 在(5±2) °C下, 电池以150W恒功率放电至终止电压2.5V, 静置30min;</p>	<p align="center">Charge Energy ≥80% Initial Charge Energy Discharge Energy ≥ 75% Initial Discharge Energy Efficiency ≥ 75% 充电能量 ≥80%初始充 电能量 放电能量 ≥75%初始放 电能量 能效 ≥75%</p>

<p align="center">8</p>	<p align="center">Energy Retention and Recovery at Room Temperature 常温能量保持与能量恢复能力</p>	<p>After initial charge, the cell shall be stored at the temperature of 25 °C ± 5 °C for 28 days. Discharge at the constant power of 150W to 2.5V at the room temperature. This discharge energy is energy retention. The cell shall be charged at Charge the constant power of 150W to 3.65V at the room temperature, then rest for 30min; This charge energy is charge energy recovery. Discharge at the constant power of 150W to 2.5V. This discharge energy is discharge energy recovery. 电池初始化充电；在（25±5）°C下储存28d；在室温下，电池以150W恒功率放电至放电终止电压2.5V，静置30min；此步放电能量为能量保持；然后电池以150W恒功率充电至充电终止电压3.65V，静置30min；此步充电能量为充电恢复能量；电池以150W恒功率放电至放电终止电压2.5V。此步放电能量为放电恢复能量。</p>	<p>Energy Retention ≥ 90% Initial Discharge Energy 能量保持 ≥ 90% 初始放电能量 Charge-discharge Energy Recovery ≥ 92% Initial Charge-discharge Energy 充放电能量恢复 ≥ 92% 初始充放电能量</p>
<p align="center">9</p>	<p align="center">Energy Retention and Recovery at High Temperature 高温能量保持与能量恢复能力</p>	<p>After initial charge, the cell shall be stored at the temperature of 45 °C ± 2 °C for 7 days; Then rest for 5h at the temperature of 25 °C ± 2 °C. Discharge at the constant power of 150W to 2.5V at the room temperature. This discharge energy is energy retention. The cell shall be charged at Charge the constant power of 150W to 3.65V at the room temperature, then rest for 30min; This charge energy is charge energy recovery. Discharge at the constant power of 150W to 2.5V. This discharge energy is discharge energy recovery. 电池初始化充电；在（45±2）°C下储存7d,然后在25 °C ± 2 °C下静置5h；在室温下，电池以150W恒功率放电至放电终止电压2.5V，静置30min；此步放电能量为能量保持；然后电池以150W恒功率充电至充电终止电压3.65V，静置30min；此步充电能量为充电恢复能量；电池以150W恒功率放电至放电终止电压2.5V。此步放电能量为放电恢复能量。</p>	<p>Energy Retention ≥ 90% Initial Discharge Energy 能量保持 ≥ 90% 初始放电能量 Charge-discharge Energy Recovery ≥ 92% Initial Charge-discharge Energy 充放电能量恢复 ≥ 92% 初始充放电能量</p>

10	<p align="center">Storage Performance 存储性能</p>	<p>After initial charge, energy discharged at a constant power of 150W reaches to 50% initial discharge energy; The cell shall be stored for 28 days at the temperature of (45±2)°C; Then rest for 5h, charged at a constant power of 150W to cutoff charge voltage 3.65V; Rest for 30min, discharged at a constant power of 150W to cutoff discharge voltage 2.5V at the room temperature. 电池初始化充电; 在室温下电池以150W恒功率放电至放电能量达到该电池初始放电能量的50%; 在(45±2)°C下储存28d后, 电池在(25±2)°C下静置5h; 在室温下, 电池150W恒功率放电至放电终止电压2.5V, 静置30min; 在室温下, 电池以150W恒功率充电至充电终止电压3.65V, 静置30min; 在室温下, 电池以150W恒功率放电至放电终止电压2.5V.</p>	<p align="center">Charge-discharge Energy Recovery ≥90% Initial Charge-discharge Energy 充放电能量恢复 ≥90% 初始充放电能量</p>
11	<p align="center">Cycle life 循环性能</p>	<p>Charge: The cell shall be charged at Charge the constant power of 150W to 3.65V. rest for 30mins. Discharge: 150W discharge to 2.5V, one cycle is finished, then rest for 30mins. Then repeat above steps,when capacity is less than 80% of initial capacity,the battery life is over. 测试条件: 充电: 电池以150W恒功率充电至充电终止电压3.65V, 搁置30mins 放电: 电池以150W恒功率放电至放电终止电压2.5V。重复上述步骤。当放电容量小于80%标称容量, 寿命终止。</p>	<p align="center">≥5000 cycles</p>
12	<p align="center">Rate Charge-discharge Performance 倍率充放电性能</p>	<p>1)After initial discharge, the cell shall be charge at constant power(150W) to cutoff charge voltage 3.65V, then rest for 30min; 2)The cell shall be discharge at constant power(150W) to cutoff discharge voltage 2.5V, then rest for 30min; 3)The cell shall be charge at constant power(300W) to cutoff charge voltage 3.65V, then rest for 30min;; 4)The cell shall be charge at constant power(150W) to cutoff charge voltage 3.65V, then rest for 30min;; 5)The cell shall be discharge at constant power(300W) to cutoff discharge voltage 2.5V, then rest for 30min; 6)The cell shall be discharge at constant power(150W) to cutoff discharge voltage 2.5V, then rest for 30min; 7)The cell shall be charge at constant power(600W) to cutoff charge voltage 3.65V, then rest for 30min</p>	<p align="center">1) Charge Energy at constant power (300W) ≥95% of Charge Energy at constant power (150W); 2) Discharge Energy at constant power (300W) ≥95% of Discharge Energy at constant power (150W);</p>

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Rate Charge-discharge Performance
倍率充放电性能

8)The cell shall be charge at constant power(150W) to cutoff charge voltage 3.65V, then rest for 30min;
9)The cell shall be discharge at constant power(600W) to cutoff discharge voltage 2.5V, then rest for 30min;
10)The cell shall be discharge at constant power(150W) to cutoff discharge voltage 2.5V, then rest for 30min;
11)The cell shall be charge at constant power(300W) to cutoff charge voltage 3.65V, then rest for 30min;;
12)The cell shall be discharge at constant power(300W) to cutoff discharge voltage 2.5V, then rest for 30min;;
13)The cell shall be discharge at constant power(150W) to cutoff discharge voltage 2.5V, then rest for 30min;
14)The cell shall be charge at constant power(600W) to cutoff charge voltage 3.65V, then rest for 30min;
15)The cell shall be discharge at constant power(600W) to cutoff discharge voltage 2.5V, then rest for 30min;1);电池初始化放电; 以150W恒功率充电至终止电压3.65V, 静置30min;
2)以150W恒功率放电至终止电压2.5V, 静置30min;
3)以300W恒功率充电至终止电压3.65V, 静置30min;
4)以150W恒功率充电至终止电压3.65V, 静置30min;
5)以300W恒功率放电至终止电压2.5V, 静置30min;
6)以150W恒功率放电至终止电压2.5V, 静置30min
7)以600W恒功率充电至终止电压3.65V, 静置30min;
8)以150W恒功率充电至终止电压3.65V, 静置30min;
9);以600W恒功率放电至终止电压2.5V, 静置30min;
10)以150W恒功率放电至终止电压2.5V, 静置30min;
11);以300W恒功率充电至终止电压3.65V, 静置30min;
12)以300W恒功率放电至终止电压2.5V, 静置30min;
13);以150W恒功率放电至终止电压2.5V, 静置30min;
14)以600W恒功率充电至终止电压3.65V, 静置30min;
15);以600W恒功率放电至终止电压2.5V, 静置30min;

- 3) Charge Energy at constant power (600W) $\geq 90\%$ of Charge Energy at constant power (150W);
- 4) Discharge Energy at constant power (600W) $\geq 90\%$ of Discharge Energy at constant power (150W);
- 5) Energy Efficiency at constant power (150W) $\geq 90\%$
- 6) Energy Efficiency at constant power (300W) $\geq 86\%$
- 7) Energy Efficiency at constant power (600W) $\geq 80\%$
- 1)300W恒功率充电能量相对于150W充电能量的能量保持率不小于95%;
- 2) 300W恒功率放电能量相对于150W放电能量的能量保持率不小于95%
- 3) 600W恒功率充电能量相对于150W充电能量的能量保持率不小于90%;
- 4) 600W恒功率放电能量相对于150W放电能量的能量保持率不小于90%
- 5) 下能量效率不小于90%;
- 6) 300W充放下能量效率不小于86%;
- 7) 600W充放下能量效率不小于80%。

4.3 Safety Performance

安全性能测试

4.3.1 Battery Cell Safety Performance

电芯安全性能测试

No.	Items (项目)		Test Method and Condition (测试方法和条件)	Criteria (标)
1	Overcharge 过充试验		Full-charge cell shall be charged at constant current of 1C to 5.5V, or suspend the test after one hour. 满电态电池单体以恒流方式充电至电池单体充电电压的1.5倍(5.5V)或时间达到1h停止充电	No Fire, No Explosion 不爆炸、不起火
2	Overfall 过放试验	Cell 单体	Discharged cell shall be discharged at constant current of 1C to -3.65V, or suspend the test after 90min. 放电态电池1C恒流恒压放电至-3.65V或者时间达到90min停止测试。	No Fire, No Explosion 不爆炸、不起火
		Battery 电池组	One fully discharged cell is connected in series with four fully charged cells forming the battery pack. The battery pack is to be short circuited with a resistance load of 80±20 mΩ, until it has reached a completely discharged state of less than 0.2 V and the battery case temperature has returned to ±10°C of ambient temperature. 5串电池组 (4支满电态, 1支放电态), 用内阻80mΩ±20mΩ对正负极进行短路至放电态电池电压达到到0.2V或者表面温度变化在±10°C之内, 测试结束。	
3	Short-Circuit Test 短路试验	Cell 单体	Fully charge cell shall be stored in an ambient temperature of 55 °C ± 5 °C for 4h. While still in an ambient temperature of 55 °C ± 5 °C, the cell is short-circuited with a total external resistance of 80 mΩ ± 20 mΩ. The cell remains on test for 24 h or until the surface temperature declines by 20 % of the maximum temperature rise, whichever is the sooner. 在55°C±5°C搁置4h后, 在此温度下将电池正负极进行外部短路, 短路电阻80mΩ±20mΩ, 短路24h或者表面温度下降最高温升的20%, 测试结束。	No Fire, No Explosion 不爆炸、不起火
		Battery 电池组	A fully charged battery is then short-circuited with a total external resistance of 80 mΩ ± 20 mΩ in the room temperature. The battery remains on test for 24 h or until the case temperature of battery declines by 20% of the maximum temperature rise, whichever is the sooner. 电池组在20°C±5°C温度下将正负极进行外部短路, 短路电阻80mΩ±20mΩ, 短路24h或者表面温度下降了最高温升的20%, 测试结束。	

No.	Items (项目)	Test Method and Condition (测试方法和条件)	Criteria (标
4	Continuous charging at constant voltage 恒压充电	Fully charged cells shall be charged using CC(constant current)-CV(constant voltage) to 4V for 7 days. 单体电池以0.5C恒流恒压充电至3.65V, 充电时间7天后测试结束;	No Fire, No Explosion, No leakage 不起火、不爆炸、不漏液
5	Crush test 挤压试验	The cells' wide and narrow surface shall be crushed at speed of (5±1)mm/s and the crushing is to be continued until an applied force of 13±0.78kN. Once the maximum force has been obtained it is to be kept for 10min. 以(5±1)mm/s挤压方形电池的宽边及窄边, 当挤压力达到(13±0.78)kN时停止挤压, 保持10min, 观察1h.	No Fire, No Explosion, No leakage 不起火、不爆炸、不漏液
6	Vibration test 振动	Cells, fully charged, shall be firmly secured to the platform of the vibration machine. Test batteries shall be subjected to sinusoidal vibration according to Table 1. This cycle shall be repeated 12 times for a total of approximately 3 h for each of three mutually perpendicular mounting positions. One of the directions shall be perpendicular to the terminal face. 对数扫频振动应是在正弦波形, 频率在7Hz~200Hz摆动再回到7赫兹的对数扫频耗时15分钟min。这一振动过程须对三个互相垂直的电池安装方位的每一个方向都重复进行12次, 总共耗时3h。其中一个振动方向必须与端面垂直。	No leakage, No venting, No disassembly, No rupture and No fire during the test and after the test and if the open circuit voltage of each test cell after testing in its perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure. 无重量损失、无泄漏、无泄气、无解体、无破裂和无起火, 并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的90%

No.	Items (项目)	Test Method and Condition (测试方法和条件)	Criteria (标
7	<p align="center">Mechanical shock 机械冲击</p>	<p align="center">Cells, fully charged, shall be subjected to three shocks in each direction of three mutually perpendicular mounting positions of the battery for a total of 18 shocks. For each shock, the parameters given in Table 2 shall be applied. 每个电池和电池组须经受最大加速度150gn和脉冲持续时间6毫秒的半正弦波冲击。每个电池须在三个互相垂直的电池安装方位的正方向经受三次冲击，接着在反方向经受三次冲击，总共经受18次冲击。</p>	<p align="center">No leakage, No venting, No disassembly, No rupture and No fire during the test and after the test and if the open circuit voltage of each test cell after testing in its perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure. 无重量损失、无泄漏、无泄气、无解体、无破裂和无起火，并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的90%</p>
8	<p align="center">Impact Test 重物冲击</p>	<p>A cell is to be placed on a flat surface. A 15.8 ±0.1 mm diameter bar is to be placed across the center of the sample. A 9.1 ±0.46 kg weight is to be dropped from a height of 610 ±25 mm onto the sample (wide and narrow planes both shall be tested). 使用长度不小于60mm，直径为15.8mm±0.1mm的316不锈钢棒搁置在电芯上，用9.1kg的重锤从610mm±25mm高度跌落。 (要求宽面及窄面都测试)</p>	<p align="center">No Fire, No Explosion 不起火、不爆炸</p>

No.	Items (项目)	Test Method and Condition (测试方法和条件)	Criteria (标
9	火烧试验	<p>Each cell is to be placed on a screen that covers a 102-mm (4-in) diameter hole in the center of a platform table. The screen is to be constructed of steel wire mesh having 20 openings per inch (25.4 mm) and a wire diameter of 0.017 in (0.43 mm). An eight-sided covered wire cage, 610-mm (2-ft) across and 305-mm (1-ft) high, made from metalscreening is to be placed over the test sample. The metal screening is to be constructed from 0.25-mm (0.010-in) diameter aluminum wire with 16 – 18 wires per inch (25.4 mm) in each direction. The cell is to be heated and shall remain on the screen until it explodes or the cell or battery has ignited and burned out.</p> <p>试验装置为：平面桌中间为直径合适的孔，盖板由钢丝直径0.017英寸（0.43mm）、每英寸20孔的钢丝网构成，周围安置一个每对边长2英尺宽（610mm）、1英尺高（305mm）共8面的丝网屏风，盖板之上的金属网由直径0.010英寸（0.25mm）金属丝按每英寸16-18丝构成。电池充满电后，将其放在金属网上，盖住平面桌中间的孔，然后进行加热直至电池爆炸或被摧毁。</p>	<p>No part of an exploding cell shall penetrate the wire screen such that some or all of the cell protrudes through the screen. 电池没有任何部分穿透网屏</p>
10	Temperature Cycling Test 温度循环	<p>Fully charged cells are to be stored for at least 12 h at a test temperature equal to $75\pm 2^{\circ}\text{C}$, followed by storage for at least 12 h at a test temperature equal to $-40\pm 2^{\circ}\text{C}$. Time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 h at ambient temperature ($20 \pm 5^{\circ}\text{C}$).</p> <p>$72\pm 2^{\circ}\text{C}$下存放12h, 间隔30min; $-40\pm 2^{\circ}\text{C}$下存放12h, 间隔30min; 重复9次, 试验电池在环境温度 ($23\pm 2^{\circ}\text{C}$) 下存放24小时;</p>	<p>No leakage, No venting, No disassembly, No rupture and No fire during the test and after the test and if the open circuit voltage of each test cell after testing in its perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure. 无重量损失、无泄漏、无泄气、无解体、无破裂和无起火, 并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的90%</p>

No.	Items (项目)	Test Method and Condition (测试方法和条件)	Criteria (标
11	Thermal abuse 热滥用	Each fully charged cell is placed in a gravity or circulating air-convection oven, in an ambient temperature of $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, for 1 h. The oven temperature is raised at a rate of $5\text{ }^{\circ}\text{C}/\text{min} \pm 2\text{ }^{\circ}\text{C}/\text{min}$ to a temperature of $130\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$. The cell remains at this temperature for 30 min before the test is terminated. 满电态电池放在烘箱中进行加热, 烘箱的温度以 $5\text{ }^{\circ}\text{C}/\text{min} \pm 2\text{ }^{\circ}\text{C}/\text{min}$ 的速率上升到 $130\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ 后保温30min;	No Fire, No Explosion 不起火、不爆炸
12	Free Fall 自由跌落	Each full-charged cell is dropped three times from a height of 1,0 m onto a flat concrete floor or metal floor. After the test, the cell shall be put on rest for a minimum of 1 h and then a visual inspection shall be performed. 满电态电池从1m高度随机跌落3次至水泥地或金属地面, 测试结束后, 至少搁置1h, 并进行目视观察。	No Fire, No Explosion 不起火、不爆炸
13	Low Pressure Test 低气压	The cells are to be stored for 6 hours at an absolute pressure of 11.6 kPa and a temperature of $20 \pm 3\text{ }^{\circ}\text{C}$. 满电态电池放置于真空箱室, 抽真空至11.6kPa, 在 $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ 的环境温度下保持360min。	No leakage, No venting, No disassembly, No rupture and No fire during the test and after the test and if the open circuit voltage of each test cell after testing in its perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure. 无重量损失、无泄漏、无泄气、无解体、无破裂和无起火, 并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的90%

4.4 Visual inspection

外观检测

There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of the cell.

不允许有任何影响电芯性能的外观缺陷，诸如裂纹、裂缝、泄漏等。

5. Storage and Others

贮存及其它事项

5.1. Storage

The best storage temperature: 15°C-35°C.

贮存

最佳贮存温度：15°C-35°C

5.2. Others

Any matters that this specification does not specify should be confirmed by the customer and HIGHSTAR.

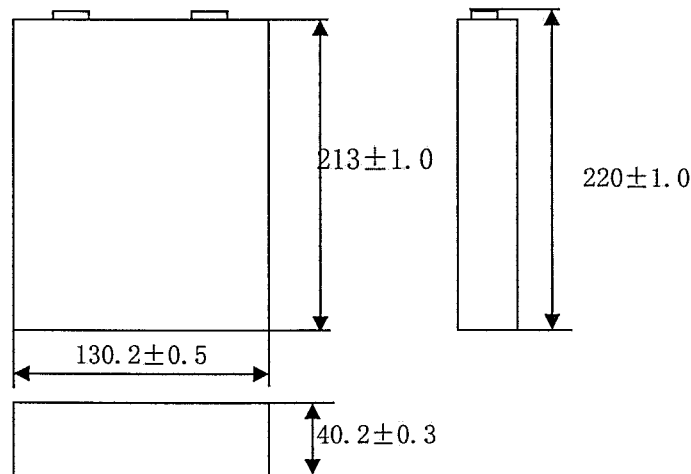
其他事项

任何本说明书中未提及的事项，须经双方协商确定

6. Battery Cell Drawing (all unit in mm, not in scale)

电芯尺寸图（包胶）

单位：mm

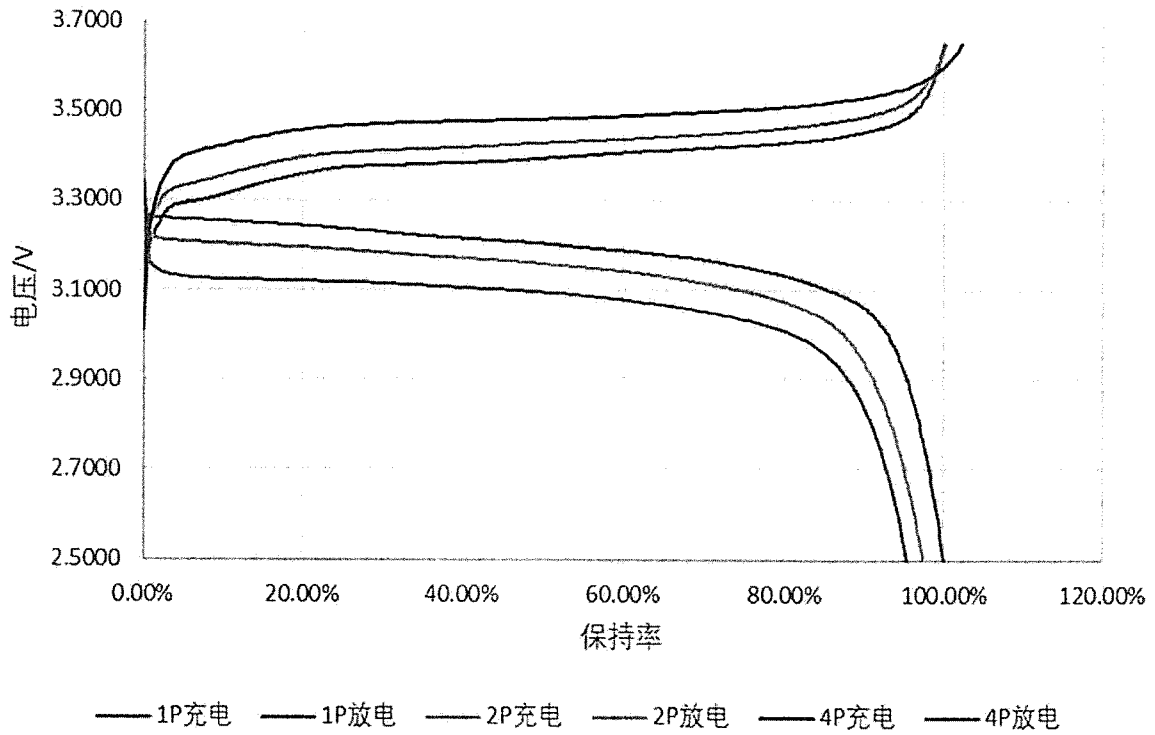


M6*1.0内螺纹，扭矩 $\leq 8\text{N} \cdot \text{m}$ ，正极极柱为铝极柱，负极极柱为紫铜镀镍极柱。

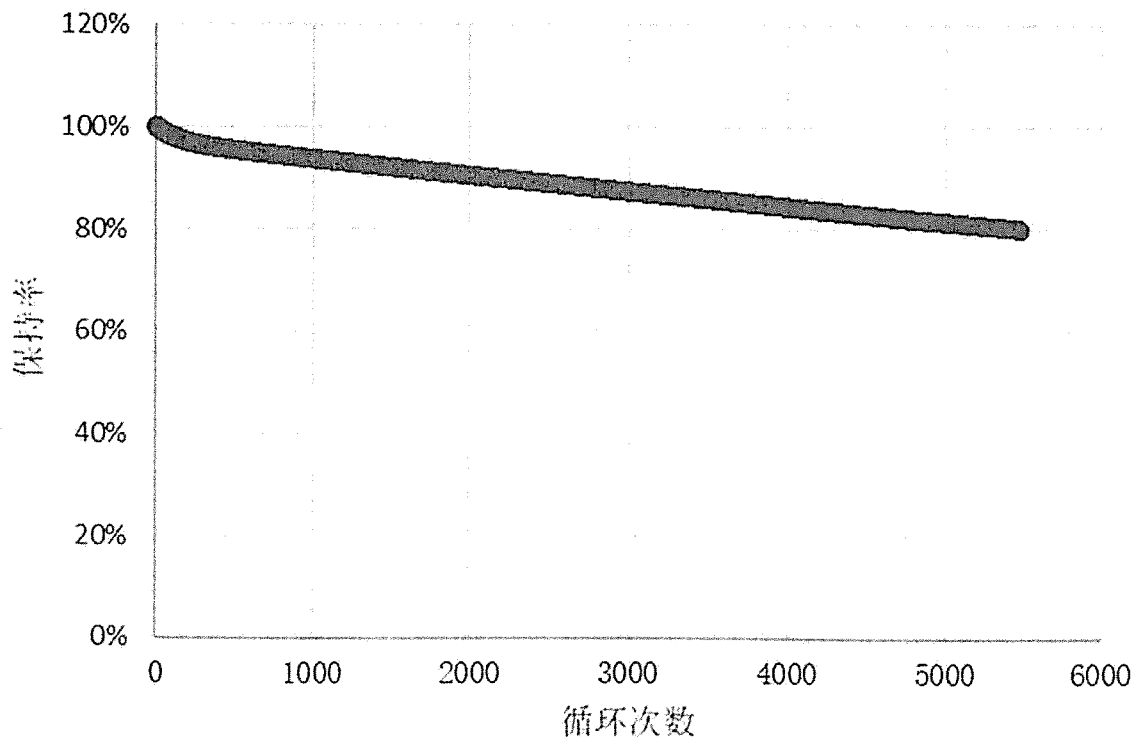
7. Appendix (For Reference Only)

附件 (仅供参考)

倍率充放电性能



循环





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8 Limited Warranty and Liabilities

有限保证和责任

8.1 Limited Warranty 有限保证

The cells shall comply with this specification within 12 months from the manufacture date as stipulated on cell marking ("Warranty Period"). In the Warranty Period, HIGHSTAR will replace cells which fail to conform to this specification at no cost to Customer.

自电芯标识显示的制造日期之日起12月内（“保证期限”），电芯应符合本规格书的规定。在此保证期限内，海四达免费为客户更换不符合本规格书规定的电芯。

8.2 Warranty and Waiver 保证责任免除

Under the following conditions, HIGHSTAR will not take any responsibility incurred in any losses resulting from the use of cells:

在以下条件下，海四达对客户因使用电芯而引起的任何损失不承担赔偿责任：

a. The cells are misused, abused or are used in any manner deviated or in breach of conditions as set out in this specification.

误用、滥用电芯或违反本规格书的规定使用电芯；

b. The cells are rendered to be nonconforming to this specification for reasons caused by parties other than HIGHSTAR or by circumstances beyond the control of HIGHSTAR.

非海四达原因导致的或海四达不能控制的原因导致的电芯不符合本规格书的规定。

9.3 Limited Warranty 有限保证

Customer is recommended to follow this specification to use. Or Customer can use an alternative operation method mutually agreed by Customer and HIGHSTAR. Using a operation method neither according to the specification nor agreed by HIGHSTAR in written will cause voiding of Limited Warranty.

推荐客户完全按照此产品规格书上所描述的要求进行操作，或采用经过客户与海四达双方确认的其他条件。如果客户采用的操作方法既没有按照此规格书的要求，也没有经海四达同意，将导致产品质量保证不适用于此保质期限

Warning Statement

WARNING

BATTERIES ARE POTENTIALLY DANGEROUS AND PROPER PRECAUTIONS MUST BE OBSERVED IN HANDLING AND MAINTENANCE.

RUNNING TESTS ON THE BATTERIES IMPROPERLY MAY RESULT IN SEVERE PERSONAL BODY INJURY OR PROPERTY DAMAGES.

WORK ON BATTERIES MUST BE PERFORMED ONLY WITH PROPER TOOLS AND PROTECTIVE EQUIPMENT MUST BE USED.

BATTERY MAINTENANCE MUST BE CARRIED OUT BY PERSONNEL KNOWLEDGEABLE OF BATTERIES AND TRAINED IN THE SAFETY PRECAUTIONS INVOLVED.

FAILURE TO OBSERVE THE ABOVE MAY CAUSE VARIOUS HAZARDS.

9 Appendix**Handling Precautions and Guideline For Lithium-Ion
Rechargeable Batteries****锂离子充电电芯操作指示及注意事项****Statement (1):**

Customers are requested to contact HIGHSTAR in advance, if and when the customer needs other applications or operating conditions than those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.

声明一:

客户若需要将电芯用于超出文件规定以外的设备，或在文件规定以外的使用条件下使用电芯，应事先联系海四达，因为需要进行特定的实验测试以核实电芯在该使用条件下的性能及安全性

Statement (2):

HIGHSTAR will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.

声明二:

对于在超出文件规定以外的条件下使用电芯而造成的任何意外事故，海四达概不负责。

Statement (3):

HIGHSTAR will inform, in a written form, customers of improvement(s) regarding proper usage and handling of cells, if it is deemed necessary.

声明三:

如有必要，海四达会以书面形式告知客户有关正确操作使用电芯的改进措施。

Statement (4):

During designation of host device or battery pack, it's better for customers to get HIGHSTAR involve to review the battery installation and safety protection scheme. This is very helpful to safety of battery application.

声明四:

客户在产品的设计过程中，最好邀请海四达共同完成电池安装及电池安全保护装置部分的设计，这对电池的安全使用会很有帮助。

9.1 Charging**充电****9.1.1 Charging Power**

Charge power should be less than the maximum value specified in the Product Specification. Charging with higher power than recommended value may cause damage to cells' electrical, mechanical, and safety performance and could lead to heat generation or leakage. If you have special needs, please contact with the company.

充电功率:

充电功率不得超过本标准书中规定的最大充电功率。使用高于推荐值功率充电将可能引起电芯的充放电性能、机械性能和安全性能的问题，并可能会导致发热或泄漏。如有特殊需要，请与公司联系沟通。

9.1.2 Charge Voltage

Batteries shall be charged shall be done by voltage less than that specified in the Product Specification (3.65V/cell). Charging beyond 3.65V, which is the absolute maximum voltage, must be strictly prohibited. The charger and protection circuit of battery pack shall be designed to comply with this condition. It is very dangerous that charging with higher voltage than the maximum value and may cause damage to the cell electrical, mechanical safety performance and could lead to heat generation or leakage

充电电压:

充电电压不得超过本标准书中规定的额定电压（3.65V/电芯）。3.65V为充电电压最高极限，充电器和电池保护电路的设计应满足此条件。电芯电压高于额定电压值时，将可能引起电芯的充放电性能、机械性能和安全性能的问题，可能会导致发热或泄漏。

9.1.3 Charge Temperature:

Batteries shall be charged at 0°C-45°C environment temperature specified in the Product Specification. In case of environment temperature is lower than 10°C, batteries shall be charged with a little current (no larger than 0.2C). If the environment temperature is lower than 0°C, charge shall be prohibited.

充电温度:

电芯必须在0°C-45°C的环境温度范围内才能进行正常充电。环境温度低于10°C时，须以小电流（不大于0.2C）充电；当环境温度低于0°C时，应禁止充电。

9.1.4 Prohibition of Reverse Charge:

Reverse charging is prohibited. Cells shall be connected correctly. The polarity has to be confirmed before wiring. In case of the cell is connected improperly, the cell cannot be charged. the reverse charging may cause damage to the cell which may lead to degradation of cell performance and damage the cell safety, and could cause heat generation or leakage.

禁止反向充电:

正确连接电池的正负极，严禁反向充电。若电池正负极接反，应保证无法对电芯进行充电。反向充电会降低电芯的充放电性能、安全性，并会导致发热、泄漏。

9.2 Discharge

放电

9.2.1 Discharge Power:

The cell shall be discharged at less than the maximum discharge current specified in the Product Specification. High discharging current may reduce the discharge capacity significantly or cause over-heat.

放电功率:

放电功率不得超过本标准书规定的最大放电功率，大功率放电会导致电芯容量剧减并导致过热。

9.2.2 Discharge Temperature:

Cells shall be discharged at -20°C-60°C environment temperature specified in the Product Specification

放电温度:

电芯必须在 -20°C-60°C 的环境温度范围内进行放电。

9.2.3 Over-discharge:

It should be noted that cells would be at an over-discharged status due to self-discharge characteristics in case they were not used for a long time. In order to prevent over-discharging, cells shall be charged periodically to maintain the voltage between 3.2V and 3.4V. Over-discharging may cause the loss of cell performance, characteristics , or battery functions.

过放电:

需注意的是, 在电芯长期未使用期间, 它可能会因其自放电特性而处于某种过放电状态。为防止过放电的发生, 电芯应定期充电, 将其电压维持在3.2V至3.4V之间。过放电会导致电芯性能、电池功能的丧失。

9.3 Notice for Designing Battery Pack 电池结构设计注意事项**9.3.1 Pack Design 外壳设计**

Battery pack should have sufficient strength to make sure the cell(s) inside is protected from mechanical shock.

电池外壳应有足够的机械强度以保证其内部电芯免受机械损伤, 材质为阻燃性材料。

9.3.2 Cell Fixing**电芯的安装**

9.3.2.1 No cell movement in the battery pack should be allowed.

电芯不得在壳内活动。

9.3.2.2 Prevention of short circuit in a battery pack or host device.

防止电芯在电池包装或主机内产生短路。

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection. The battery pack or host device shall be structured with no any potential short circuit, which may cause generation of smoke or firing.

引线与电芯之间要有足够的绝缘层以保证绝对安全。电池壳内不得有任何短路发生隐患, 以防止冒烟或着火。

9.4 Storage**贮存**

The cell shall be stored at the environmental condition of -20°C- 45°C and 65%±20% RH.

The voltage for a long time storage shall be 3.2V-3.4V range.

If the cell has to be storied for a long time (Over 3 months), the environmental condition should be:

Temperature: 15°C-35°C

Humidity: 65%±20%RH

电芯储存温度必须在 -20°C~ 45°C 的范围内。

长期存储电池 (超过3个月) 须置于温度为15°C-35°C、湿度为65%±20%RH的环境中。长期贮存电压为3.2V~3.4V。保质期内每隔3个月对电池电压低于3.2V的电池用10A~50A电流进行补充电, 至电压达到3.4V。

9.5 User's Guideline for Safety Handling:**用户安全操作信息:**

9.5.1 The following information, or equivalent statements, shall be made available to the user through one or more of the following means, as appropriate: printed on the label for the battery, printed on the label for host device, printed in the owner's manual, or posted in a help file or Internet website:

下列信息或类似的申明必须通过一种或多种适当的途径让用户知晓, 可选择的途径包括: 电池标签、主机标签、用户手册、储存于帮助文档或互联网:

9.5.1.1 Do not disassemble or open, crush, bend or deform, puncture, or shred;

请勿拆解或打开、挤压、弯折、变形、刺穿、敲碎;



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9.5.1.2 Do not modify or remanufacture, attempt to insert foreign objects into the battery, immerse or expose to water or other liquids, or expose to fire, explosion, or other hazard.

请勿修改或改装，不要试图将外物插入电池，不要浸入或暴露在水或其它液体中，远离火源、爆炸物和其他危险；

9.5.1.3 Only use the battery for the system for which it was specified.

只能使用本系统规定的电池；

9.5.1.4 Only use the battery with a charging system that has been qualified with the system per standard. Use of an unqualified battery or charger may present a risk of fire, explosion, leakage, or other hazard.

只能使用通过标准认证具有充电管理系统的电池，使用未经认证的电池或充电器可能存在起火、爆炸、或其它危险；

9.5.1.5 Do not short circuit a battery or allow metallic or conductive objects to contact the battery terminals

请勿使电池短路，也不要让金属或其它导体接触电池接电端子；

9.5.1.6 Replace the battery only with another battery that has been qualified with the system per standard. Use of an unqualified battery may present a risk of fire, explosion, leakage, or other hazard.

更换电池时只能使用通过标准认证的电池，使用未经认证的电池可能存在起火、爆炸、或其它危险；

9.5.1.7 Don't keep a battery at rest for a long time (over 6 months). Safety accident may happen when recharging a battery which has a rest for a long time.

避免电池长时间放置不用，长期放置不用的电池重新充电时可能会发生安全问题。

9.5.1.8 Promptly dispose of used batteries in accordance with local regulations.

按当地法规迅速处理报废电池；

9.5.1.9 Battery usage by children should be supervised.

儿童使用电池应受到监督；

9.5.1.10 Avoid dropping the phone or battery. If the phone or battery is dropped, especially on a hard surface, and the user suspects damage, take it to a service center for inspection.

不要跌落主机或电池，如果主机或电池不慎跌落（尤其在硬表面上），用户怀疑电池损坏，则应找服务中心检查；

9.5.1.11 Improper battery use may result in a fire, explosion, or other hazard.

不正确使用电池可能发生燃烧、爆炸或其它危险。

9.5.1.12 In the event of a battery leak, do not allow the liquid to come in contact with the skin or eyes. If contact has been made, wash the affected area with large amounts of water and seek medical advice.

如果电池发生漏液，不要让电池接触皮肤和眼睛，如果接触不幸发生，则用大量的水冲洗接触部位或寻求医生帮助；

9.5.1.13 Seek medical advice immediately if a battery has been swallowed.

如果电池被吞食了，立即就医；

9.5.1.14 Communicate the appropriate steps to be taken if a hazard occurs.

告知用户如果危险发生，应采取什么步骤。

9.5.2 The following indications, notifications, and dialog/messages, at the system level, or an equivalent statement, may be displayed along with recommended actions as appropriate:

下列指示、通告、语句/信息或类似的申明应通过适当途径让用户知悉：

9.5.2.1 Abnormal battery temperature alert.

不正常的电池温度警示；

9.5.2.2 Abnormal host device and/or battery dc input voltage alert.

不正常的主机或电池的直流输入电压警示；

9.5.2.3 Abnormal current draw alert.

不正常的电流警示；

9.5.2.4 Battery communication fail/time-out alert.

电池通讯失败或超时警示；

9.5.2.5 Incompatible battery alert.

不相容电池警示；

9.5.2.6 Alert for other malfunctions that may lead to hazards.

可能导致危险的其它故障警示。

9.6 Cycle Life

循环寿命

Cycle life refers to the cycle life of the test method under the test conditions specified above.

循环寿命是指上述规定的测试条件下用该测试方法的循环寿命。

9.7 Others:

其它事项：

9.7.1 Prohibition of Disassembly

严禁拆卸电芯

9.7.1.1 Never disassemble cells. The disassembling may generate internal short circuit in the cell, which may cause firing or other problems.

在任何情况下不得拆卸电芯。拆卸电芯可能会导致内部短路，进而引起着火及其它问题。

9.7.1.2 Electrolyte is harmful. In case the electrolyte come into contact with the skin, or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.

电解液有害。万一有电解液泄漏而接触到皮肤、眼睛或身体其它部位，应立即用清水冲洗电解液并就医。

9.7.2 Never incinerate nor dispose the cells in fire. These may cause firing of the cells, which is very dangerous and is prohibited.

在任何情况下，不得燃烧电芯或将电芯投入火中，否则会引起电芯燃烧，这是非常危险的，应绝对禁止。

9.7.3 The cells shall never be soaked with liquids such as water, seawater, drinks such as soft drinks, juices, coffee or others.

不得将电芯浸泡液体，如淡水、海水、饮料（果汁、咖啡等）。

9.7.4 The battery replacement shall be done only by either cells supplier or device supplier and never be done by the user.

更换电芯应由电芯供应商或设备供应商完成，用户不得自行更换。

9.7.5 Prohibition of use of damaged cells

禁止使用已损坏的电芯

The cells might be damaged during shipping by shock. If any abnormal features of the cells are found such as deformation of the cell package, smelling of an electrolyte, an electrolyte leakage and others, the cells shall never be used any more. The Cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing.

电芯在运输过程中可能因撞击等原因而损坏，若发现电芯有任何异常特征，如外壳破损，闻到电解液气味，电解液泄漏等，该电芯不得使用。有电解液泄漏或闻到异常味道的电池应远离火源以避免着火。

9.7.6 Curve Graph

曲线图

The curve graph above is for reference only

本规格书中的曲线图仅供参考。

9.7.7 Other

其它

The manufacturer reserves the right to change and revise the design and product specification Approval Sheet without prior notice;

制造商保留在没有预先通知的情况下改变和修正设计及产品规格确认书的权力；



**PRODUCT
SPECIFICATION**

DOC NO.: IFpP40130220-100
SHEET : 23 OF 23
ECN NO.: Q/KAGG722C-2020

Customer Inquiry
产品规格需求

Model: IFpP40130220-100

The customer is requested to write down your information and contact HIGHSTAR in advance, if and when the customer needs applications or operating conditions other than those described in this document. HIGHSTAR could design and build such products according to your special request.
我司也可以根据客户的特殊要求而设计、制造符合要求的产品，如果贵公司有本规格书描述之外的性能要求，请您写在下面并回签给我司：

	Special Request	Criteria
	要求	规格
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Company Name: _____

Signature: _____

Date: _____