SPECIFICATION
规 格 书

Cylindrical Rechargeable Lithium Iron Phosphate Cell
圆柱可充电磷酸铁锂电池

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1. Preface 序言

This product specification covers the requirements for the following sealed cylindrical rechargeable Lithium Iron Phosphate cell type manufactured and delivered by **JYH Technology Co., Ltd.**
该文件标准包含了下述由**江门市锦业华科技有限公司**制造和交付的圆柱可充电磷酸铁锂电池的性能要求。

LFP26650-3000 cell 电池

2. Description and Model 描述和型号

2.1	Description 描述	Cylindrical rechargeable Lithium Iron Phosphate cell 圆柱可充电磷酸铁锂电池
2.2	Model 型号	LFP26650-3000

3. Ratings 额定参数

3.1	Nominal Voltage 标称电压		3.2V
3.2	Nominal Capacity 标称容量		3000mAh
3.3	Typical Capacity 典型容量		3000mAh after standard charge and standard discharge 3000mAh 标准充电和放电条件
3.4	Standard Charge 标准充电		Constant current at 1500mA charge to 3.65V, then constant voltage at 3.65V charge till current decline to ≤ 30mA 1500mA 恒流充电至 3.65V，转恒压 3.65V 充电至充电电流 ≤ 30mA
3.5	Fast Charge 快速充电		Constant current at 3000mA charge to 3.65V, then constant voltage at 3.65V charge till current decline to ≤ 30mA 3000mA 恒流充电至 3.65V，转恒压 3.65V 充电至充电电流 ≤ 30mA
3.6	Standard Discharge 标准放电		600mA to 2.0V. 600mA 放电至 2.0V
3.7	Fast Discharge 快速放电		3000mA to 2.0V. 3000mA 放电至 2.0V
3.8	Maximum Continuous Charge Current 最大连续充电电流		3000mA
3.9	Maximum Continuous Discharge Current 最大连续放电电流		9000mA
3.10	Operating Temperature 操作温度	Charge 充电	0℃ to 45℃
		Discharge 放电	-20℃ to 60℃
3.11	Storage Temperature 储存温度	< 1 year 小于 1 年	-20℃ to 25℃
		< 3 months 小于 3 个月	-20℃ to 40℃
		< 30days 小于 30 天	-20℃ to 50℃
3.12	Dimensions 尺寸	Diameter 直径	$26.5^{+0}_{-0.7}$ mm
		Height 高度	$65.5^{+0}_{-1.5}$ mm
3.13	Typical Weight 典型重量		78g

4. Electrical Performance 电气性能

Unless otherwise stated, tests should be conducted under the following conditions:
除非另作说明，测试应该在下列条件下进行：

Time frame 时间期限	Within one month after delivery 交货后的一个月内
Ambient temperature 环境温度	20℃ ± 5℃
Relative Humidity 相对湿度	65% ± 20%

4.1 Standard Capacity 标准容量

Standard capacity is measured with a discharge current of 0.2C and a discharge final voltage of 2.0V within 1-4 hours after the standard charge and rest for 10mins. Up to three cycles are permitted for this test.
标准容量是指电池在标准充电后，搁置 10 分钟，然后以 0.2C 电流放电至 2.0V 终止电压的放电容量。允许连续测试 3 次，任意一次达到要求即可停止测试。

Criteria: Discharge capacity ≥ 2850mAh
标准：放电容量 ≥ 2850mAh

4.2 Open Circuit Voltage 开路电压

The open circuit voltage is measured within 4 days after standard charge.
在标准充电后 4 天内测量电池的开路电压。

Criteria: Open circuit voltage ≥ 3.25V
标准：开路电压 ≥ 3.25V

4.3 Initial Internal Impedance 初始内阻

The initial internal impedance is measured at the frequency of 1kHz within 1-4 hours after standard charge.
在标准充电后 1-4 小时，以 1kHz 的频率测量初始内阻。

Criteria: Initial internal impedance ≤ 40mOhm
标准：初始内阻 ≤ 40mOhm

4.4 Fast Discharge Capacity 快速放电容量

After the standard charge, the cell is stored for 10mins. The capacity is measured with a discharge current of 1C to a discharge final voltage of 2.0V.
电池在标准充电后，搁置 10 分钟，然后以 1C 电流放电至 2.0V 终止电压来测量快速放电容量。

Criteria: Discharge capacity ≥ 90% of nominal capacity
标准：快速放电容量 ≥ 标称容量的 90%

4.5 Charge Retention 荷电保持能力

Charge retention is measured with a discharge current of 0.2C and a discharge final voltage of 2.0V after standard charge and storage time of 28 days.
电池在标准充电后，存放 28 天，然后以 0.2C 电流放电到 2.0V 终止电压来测量荷电保持能力。

Criteria: Discharge capacity ≥ 85% of nominal capacity
标准：放电容量 ≥ 标称容量的 85%

4.6 Charge Recovery 充电恢复能力

After charge retention test, the cell shall be done standard charge within 24 hours and stored for 1-4h. Charge recovery is measured with a discharge current of 0.2C and a discharge final voltage of 2.0V.
在完成荷电保持能力测试后 24 小时内对电池进行标准充电，搁置 1-4 小时， 然后以 0.2C 电流放电到 2.0V 终止电压来测量充电恢复能力。

Criteria: Discharge capacity ≥ 90% of nominal capacity
标准：放电容量 ≥ 标称容量的 90%

4.7 Cycle Life 循环寿命

The cell shall be done standard charge, and stored for 10mins, then discharged at a constant current of 0.5C to a final voltage of 2.0V, after that, stored 10mins prior to next charge/discharge cycle. The cell shall be continuously charged and discharged for 1000 times.
电池进行标准充电后搁置 10min，然后以 0.5C 电流放电至 2.0V 终止电压，之后搁置 10 分钟，再进行下一次充放电循环。连续进行 1000 次充放电循环。

Criteria: Discharge capacity at the 1000th cycle ≥ 80% of nominal capacity
标准：第 1000 次的放电容量 ≥ 标称容量的 80%

5. Environmental Performance 环境性能

5.1 Discharge Capacity at High Temperature 高温放电容量

After the standard charge, the cell is stored at an ambient temperature of 55℃ ± 2℃ for not less than 16h and not more than 24h. The capacity is measured with a discharge current of 0.2C and a discharge final voltage of 2.0V.
电池在标准充电后，在 55℃ ± 2℃的环境中存放 16-24 小时，然后以 0.2C 电流放电到 2.0V 终止电压来测量高温放电容量。

Criteria: Discharge capacity ≥ 95% of nominal capacity
标准：高温放电容量 ≥标称容量的 95%

5.2 Discharge Capacity at Low Temperature 低温放电容量

After the standard charge, the cell is stored at an ambient temperature of -10℃ ± 2℃ for not less than 16h and not more than 24h. The discharge capacity is measured with a discharge current of 0.2C and a discharge final voltage of 2.0V.
电池在标准充电后，在-10℃ ± 2℃的环境中存放 16-24 小时, 然后以 0.2C 电流放电到 2.0V 终止电压来测量低温放电容量。

Criteria: Discharge capacity ≥ 60% of nominal capacity
标准：低温放电容量 ≥ 标称容量的 60%

5.3 Constant Temperature and Humidity 恒定湿热

After the standard charge, the cell is stored in an ambient temperature of 40℃ ± 2℃ (90-95%RH) for 48h, then placed in room temperature for 2h. After that, check its appearance, the discharge capacity is measured with a discharge current of 0.2C and a discharge final voltage of 2.0V.
电池在标准充电后，放入 40℃ ± 2℃ (90-95%RH)的恒温恒湿箱中搁置 48 小时后，取出电池在室温下搁置 2 小时，目测电池外观，再以 0.2C 电流放电至 2.0V 终止电压来测量放电容量。

Criteria: No explosion, no fire, no leakage. Discharging capacity ≥ 60% of nominal capacity.
标准：电池应无爆炸、起火、漏液，放电容量 ≥ 标称容量的 60%。

6 Mechanical Performance 机械性能

6.1 Vibration Test 振动测试

After standard charge, the cell is 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 55Hz, and repeat vibration for 30min.The battery is to be tested in three mutually perpendicular directions):
电池在标准充电后，将电池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以 10-55Hz 循环扫频振动 30 分钟，扫频速率为 1oct/min；

Frequency: 10-30Hz, amplitude: 0.38mm
振动频率：10-30Hz ，位移幅值(单振幅)：0.38mm；

Frequency: 30-55Hz, amplitude: 0.19mm
振动频率：30-55Hz，位移幅值(单振幅)：0.19mm。

Criteria: No scratch, no leakage, no fume, no explosion. Voltage ≥ 3.2V.
标准：电池应无损伤、漏液、冒烟或爆炸，电池电压 ≥ 3.2V。

6.2 Drop Test 跌落测试

After standard charge, the cell is dropped from a height of 1m to a concrete surface. Each cell is to be dropped once in the positive and negative directions of three mutually perpendicular mounting positions for a total of 6 times, then rest for 1 hrs.
电池进行标准充电后，将电芯从 1.0mm 高度自由落体跌落到水泥地板上，电芯的正负极方向分别跌落三次，共计 6 次，跌落后搁置 1 小时。

Criteria: No leakage, no fume, no explosion
标准：电池应无漏液、冒烟或爆炸

7 Safety Performance 安全性能

7.1 Overcharge 过充

At standard testing condition, the cell is charged with constant current 3C to voltage 4.6V, then charged with constant voltage of 4.6V till current decline to 0.005C. Charge time is no less than 8hrs.
在标准测试环境下，用 3C 电流充电至 4.6V, 然后恒压 4.6V 充电至电流下降到 0.005C，充电时间不少于 8 小时。

Criteria: No fire, no explosion.
标准：电池应不起火、不爆炸

7.2 Over-discharge 过放

At standard testing condition, the cell is discharged at 0.2C current to final voltage of 2.0V, then connect 30Ω load to discharge for 24 hours.
在标准测试环境下，电池以 0.2C 电流放电至 2.0V 终止电压，再连接 30Ω 负载放电 24 小时。

Criteria: No leakage, no fume, no fire
标准：电池应无漏液、冒烟或起火

7.3 Crush 挤压

At standard testing condition, the cell is charged by standard charge, then 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
在标准测试环境下，电池进行标准充电后，放在挤压设备的两个挤压面之间，电池轴向平行于挤压平面，逐渐增加压力至13 kN，保持压力1分钟。

Criteria: No fire, no explosion.
标准：电池应不起火、不爆炸

7.4 Short-circuit 短路

At standard testing condition, the cell is charged by standard charge, then connect the positive and negative terminals of the cell with a circuit load having a resistance load of 80±20mΩ. The temperature of the battery case is to be recorded during the test. Stop the test until the cell surface temperature lower 10℃ than the temperature max.
在标准测试环境下，电池进行标准充电后，将电池正负极连接80±20mΩ的电阻，直至电芯表面温度低于最高温度10℃停止。

Criteria: No fire, no explosion
标准：电池应不起火、不爆炸

7.5 Heating 加热

At standard testing condition, the cell is charged at standard charge, put the cells in the oven, the temperature of the oven is to be raised at 5℃ ± 2℃ per minute to a temperature of 130℃ ± 2℃ and remain for 10 minutes.
在标准测试环境下，标准充电后，将电芯放在烘箱中，烘箱以5℃ ± 2℃/分钟升温至130℃ ± 2℃，并在该温度下维持10分钟

Criteria: No fire, no explosion
标准：电池应不起火、不爆炸

8 Appearance 外观

The cell shall be free from deformation, cracks, scratches, rusts and leakage。
电池应无变形、破裂、划痕、生锈和泻漏现象。

9 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.
电池出厂时电压范围为 3.2-3.4V 或按照客户要求，电池出货时的剩余容量取决于储存时间和条件。

10Warranty 保质期

As long as the cell is treated in accordance with this product specification, from date of delivery, one year limited warranty against workmanship and material defects is given.
依照本产品规格书要求进行操作，自出厂之日起，对于由加工制造和材料造成的缺陷产品给予一年的保质期。

Precautions and Safety Instructions 安全守则

The batteries subject to abusive conditions can cause damage to the battery and/or personal injury. Please read and observe the standard battery precautions below before using utilization.
滥用电池可能会造成电池损坏或人身伤害，在使用电池以前，请仔细阅读以下内容。

Note 1：The customer is required to contact JYH in advance, if and when the customer needs other applications or operating conditions than those described in this document.
特别说明 1：如果客户需要将电池在该文件之外的条件下操作或应用，请向锦业华公司咨询。

Note 2：JYH will take no responsibility for any accident when the battery is used under other conditions than those described in this document.
特别说明 2：在该文件说明的条件之外使用该电池而产生的事故，锦业华公司不承担任何责任。

1. Precaution 预防措施

a) Do not expose the battery to extreme heat or flame.
不要将电池暴露在极热或有火星的环境中。

b) Do not short circuit, over-charge or over-discharge the battery.
不要将电池短路、过充或过放。

c) Do not subject the battery to strong mechanical shocks.
不要使电池承受过重的机械冲击。

d) Do not immerse the battery in water or sea water, or get it wet..
不要将电池浸入海水或水中，或者令其吸湿。

e) Do not reverse the polarity of the battery for any reason.
不要颠倒电池的正负极。

f) Do not disassemble or modify the battery.
不要拆卸或修理电池。

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 battery with conspicuous damage or deformation.
不要使电池受到明显的损坏或变形。

i) Do not connect battery to the plug socket or car-cigarette-plug.
不要将电池与插座或汽车点烟口连接。

j) Do not make the direct soldering onto a battery.
不要直接在电池上焊锡。

k) Do not touch a leaked battery directly.
不要直接接触泄漏的电池。

l) Do not use for other equipment.
不要将电池用于其它设备。

m) Do not use Lithium-ion battery in mixture.
不要将锂离子电池混合使用。

n) Do not use or leave the battery under the blazing sun (or in heated car by sunshine).
不要将电池放置在太阳光直射的地方（或阳光暴晒的汽车内）。

o) Keep battery away from children.
将电池放置在远离儿童的地方。

p) Do not drive a nail into the battery, strike it by hammer or tread it.
不要针刺、锤打或踩踏电池。

q) Do not give battery impact or fling it.
不要撞击或投掷电池。

2. Battery Operation Instruction 电池使用说明

2.1. Charging 充电

a) Charge the battery in a temperature range of 0℃ to + 45℃.
电池充电温度范围为 0℃ ～ +45℃。

b) Charge the battery at the specified current until 3.65V is attained. Charge rates greater than 1C are NOT recommended.
按要求的电流将电池充电至 3.65V，建议不要使用超过 1C 的电流。

c) Maintain charge voltage at 3.65V for 2.0 hours (recommended for maximum capacity).
恒压 3.65V 充电 2 小时（建议为得到最大容量测试时使用）。

d) Use a constant current, constant voltage (CC/CV) lithium-ion battery charge controller.
使用恒流恒压锂离子电池充电器。

e) Do not continue to charge battery over specified time.
不要超过标准时间持续充电。

2.2. Discharging 放电

a) Recommended discharge final voltage is 2.0V. Recommended max continuous discharge current is 3C.
建议放电终止电压为 2.0V，建议最大持续放电电流为 3C。

b) For maximum performance, discharge the battery in a temperature range of -20℃ to +45℃.
为了达到较好的性能，电池的放电温度范围为-20℃ ～ +45℃。

2.3. Storage Recommendations 储存建议

a) Storage Temperature and Humidity 储存温度和湿度

Storage the cell at temperature of -20℃ to +35℃, low humidity and no corrosive gas atmosphere.
电池应储存在温度范围为-20℃ ～ +35℃，低湿度和不含腐蚀性气体的环境中。

b) Long Period Storage 长期存放

In case of long period storage (more than 3 months), storage the cell at temperature range of -10℃ to +25℃, low humidity, no corrosive gas atmosphere.
如需长期存放(超过 3 个月)，电池应存储在温度为-10℃ ～ +25℃，低湿度和不含腐蚀性气体的环境中。

c) No press on the cell.
不要让电池承受任何压力。

Requirement for Safety Assurance 安全保证要求

For the sake of safety assurance, please discuss the equipment design, its system and protection circuit of Lithium-ion battery with JYH in advance. And consult about the high rate current, rapid charge and special application in the same way.
为了安全起见，请事先与锦业华公司讨论用电器设计方案、锂离子电池的体系及保护电路等。对高倍率放电、快速充电和其它特殊应用，也须向锦业华公司咨询。