# Specification

## for

## Cylindrical-lithium-ion Cell

电池型号/ Battery Type: ICR18650 -1500mAh

目录/ Contents

## 1. 前言/ Preface

This product specification describes the technique requirements, test procedure and precaution notes of cylindrical type Lithium-ion Rechargeable cell.

## 2. 说明/ Description

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

2.2 电芯型号/ Model (Type): ICR18650

2.3 名称/ Designation: I CR ——— 18 650 P

① ② ③ ④

2.3.1: ① 代表电池性能/ Indicates the performance of cell

"ICR"代表以三元材料为正极材料体系的锂离子可充电电池。

The letters "ICR" define Lithium-ion Rechargeable cell of $LiCo_xNi_yMn_{(1-x-y)}O_2$ series cathode.

2.3.2: ② 代表电芯直径/ Indicates the diameter of cell

18 = 18 mm

2.3.3: ③ 代表电芯高度/ Indicates the overall height of cell

650 = 65 mm

2.3.4: ④ 代表电池性能/ Indicates the performance of cell

"P" 代表高功率

The letter "P" defines high power/ rate cell

## 3. 电芯尺寸/ Cell Size

对于图形结构的详细资讯，请参阅图A.

For details, please refer to Figure A.

| Item | Description | Dimensions |
|---|---|---|
| H | Height（Bare Cell） | 66.0 mm max |
| D | Diameter（ Bare Cell） | 18.5 mm max |

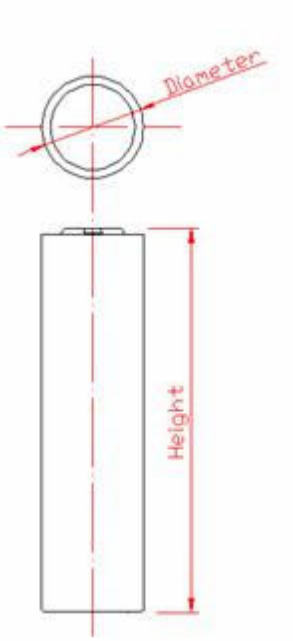

Figure A

## 4. 电芯结构/ Cell Construction

电芯由正极,负极,隔膜,壳体和盖板组成.

A cell is made of cathode, anode, separator, can and cap.

## 5. 标准/ Specification

| 项目/ Item | | 标准/ Specification | | 备注/ Remark |
|---|---|---|---|---|
| 5.1 典型容量/ Typical capacity | | 1500mAh | | 0.2C rate discharge capacity |
| 5.2 最小容量/ Minimum capacity | | 1425mAh | | |
| 5.3 交流内阻/ Internal impedance | | ≤20mΩ | | By 1kHz AC |
| 5.4 标称电压/ Nominal voltage | | 3.7V | | |
| 5.5 电芯重量/ Cell weight | | 42g±2g | | |
| 5.8 标准放电方法 Standard discharge conditions（1C） | 恒 流 / Constant current | 1500 mA | | |
| | 截止电压 End-of-charge voltage | 2.75V | | |
| 5.6 标准充电方式 Standard charge method | 恒 流 / Constant current | 750mA | | |
| | 充电电压 Charge voltage | 4.2V±0.05V | | |
| | 截止电流 Cut-off current | 30 mA | | |
| 5.7 快速充电方式 Fast charge method | 恒 流 / Constant current | 3000mA | | |
| | 充电电压 Charge voltage | 4.2V±0.05V | | |
| | 截止电流 Cut-off current | 30 mA | | |
| 5.9 最大持续放电电流 Max continuous discharge current | | 22.5A | | |
| 5.10 脉冲放电电流 Pulse discharge at 10 Sec | | 35A | | |
| 5.11 循环寿命 Cycle life | | over 300 cycles | | 10C continual discharge ( 100% DOD) |
| 5.12 操作温度 Operating temperature | 充电温度 Charging ambient temperature | 0～45℃ 电池充电的环境温度 | | Cell skin temperature should not exceed 65℃. |
| | 放电温度 Discharging ambient temperature | -20～70℃ 电池放电的表面温度 | | Cell skin temperature should not exceed 80℃ |
| | 存储温度 Storage temperature | 1 year | 0～30℃ | Note:If the cell is kept as ex-factory status (50 % of charge) |
| | | 3 months | -20～35℃ | |
| | | 1 month | -20～45℃ | |
| 5.13 外观/ Appearance | | 无破裂、划痕、变形、污迹、电解液泄露等 Without break, scratch, | | |

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| | distortion, contamination, leakage. | |

## 6. 测试条件/ Test conditions

6.1 标准测试条件/ Standard test conditions

若无特别要求，此规格书上的产品测试条件均为温度：23±2℃，湿度：65%±20% RH.

Unless otherwise specified, all tests stated in this Product Specification are conducted at temperature 23±2℃ and humidity 65 ± 10 %RH.

## 7.电性能/ Electrical Characteristics

| 测试项目/ **Test Item** | 测试方法/ **Test Method** | 检验标准/ **Criteria** |
|---|---|---|
| 7.1 1C 放电性能<br>Discharge performance (1C) | 电芯按5.6规定充电后，在环境温度为23℃±2℃的条件下搁置0.5h，而后以1C电流放电到2.75V.<br>A cell is charged using standard charge method (spec. 5.6), stored at 23℃±2℃ for 0.5h, and then 1C constant current discharged to 2.75V. | 放电时间不低于57min.<br>the discharging time is not less than 1h. |
| 7.2 10C 放电性能<br>Discharge performance (10C) | 电芯按5.6规定充电后，在环境温度为23℃±2℃的条件下搁置0.5h，而后以10C电流放电到2.75V.<br>A cell is charged using standard charge method (spec. 5.6), stored at 23℃±2℃ for 0.5h, and then 10C constant current discharged to 2.75V. | 放电时间不低于5min.<br>the discharging time is not less than 5min. |
| 7.3高温性能<br>High temperature performance | 电芯按5.6规定充电后，将电芯放入55℃±2℃的高温箱中恒温2h，然后以1.0C电流放电至2.75V,实验结束后,将电芯取出在环境温度为20℃±5℃的条件下搁置2h，然后目测电芯外观<br>A cell is charged using standard charge method (spec. 5.6), stored at 55℃±2℃ for 2h, then 1C constant current discharged to 2.75V. After that, fetch out the cell and place it in the ambient temperature of 20℃±5℃ for 2h, then check its appearance. | 1.放电时间不低51min;<br>2.电芯外观无变形,无爆裂.<br>1. the discharging time is not less than 51min;<br>2. no distortion, no rupture. |
| 7.4低温性能<br>Low temperature performance | 电芯按5.6规定充电后，将电芯放入-20℃±2℃的低温箱中恒温16～24h,然后以0.2C电流放电至2.75V,实验结束后,将电芯取出在环境温度为20℃±5℃的条件下搁置2h,然后目测电芯外观.<br>A cell is charged using standard charge method (spec. 5.6), stored at -20℃±2℃for 16h～24h,then discharged to 2.75V at a constant current of 0.2C.After that, fetch out the cell and place it in the ambient temperature of 20℃±5℃ for 2h, then check its appearance. | 1.放电时间不低于3h;<br>2.电芯外观无变形,无爆裂.<br>1.the discharging time is not less than 3h;<br>2.no distortion, no rupture |
| 7.5荷电保持能力<br>Charge(Capacity) retention | 电芯按5.6规定充电后,在环境温度为23℃±2℃条件下,将电芯搁置28天,再以0.2C电流放电至2.75V.<br>A cell is charged using standard charge method (spec. 5.6), and stored at 20℃±5℃ for 28days, then discharged to 2.75V at a | 容量保持率:85%<br>Capacity retention:85%Ch |

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| | constant current of 0.2C. | |
| 7.6循环寿命<br>Cycle life | 电芯按5.6规定充电后,搁置0.5～1h,然后以10C电流放电至终止电压,放电结束后,搁置0.5～1h,再进行下一次充放电循环,连续进行充放电循环300次.<br>A cell is charged using standard charge method (spec. 5.6),and stored for 0.5h～1h,then discharged to cut-off voltage, after that, stored 0.5h～1h prior to next charge-discharge cycle. The cell shall be continuously charged and discharged for 300 times. | 容量保持率≥80%<br>Capacity retention≥80% |

**8. Environment Characteristics/ 环境性能**

| 测试项目/ **Test item** | 测试方法/ **Test method** | 检验标准/ **Criteria** |
|---|---|---|
| 8.1恒定湿热性能<br>Constant temperature and humidity | 电芯按5.6规定充电后,将电芯放入40±2℃(90～95%RH)的恒温恒湿箱中搁置48h后，将电芯取出在室温下搁置2h,目测电芯外观,再以1C电流放电至终止电压.<br>A cell is charged using standard charge method (spec. 5.6),and stored at 40℃±2℃(90 ～ 95%RH) for 48h, then placed in room temperature for 2h. After that, check its appearance prior to being discharged to cut-off voltage at a constant current of 1C. | 1.电芯外观应无变形,锈蚀,冒烟或爆炸;<br>2.放电时间应不低于36min.<br>1. No distortion, no rust, no fume, no explosion;<br>2. The discharging time is not less than 36min. |
| 8.2振动测试<br>Vibration test | 电芯按5.6规定充电后,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:<br>振动频率：10Hz～30Hz 位移幅值(单振幅)：0.38mm;<br>振动频率：30Hz～55Hz 位移幅值(单振幅)：0.19mm.<br>A cell is charged using standard charge method (spec. 5.6), 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 | 1.电芯外观应无明显损伤，漏液，冒烟或爆炸；<br>2. 单体电芯电压不低于3.6V.<br>1. No scratch, no leakage, no fume, no explosion;<br>2. The min voltage is 3.6V. |
| 8.3碰撞测试<br>Shock test | 电芯按5.6规定充电后,将电芯分别按X,Y,Z三个互相垂直轴通过夹具固定在振动台面上,按下述要求调好加速度,脉冲持续时间进行碰撞实验:<br>脉冲峰值加速度:100m/s2,每min碰撞次数:40～80,<br>脉冲持续时间:16ms,碰撞次数：1000±10.<br>A cell is charged using standard charge method (spec. 5.6),then secured to the testing machine by means of rigid mount which supports all mounting surfaces of the cell. Each cell shall be subjected to a total of three shocks of equal magnitude. The shocks are to be applied in each of three mutually perpendicular directions. The acceleration and impulse time are as follows:<br>acceleration of impulse peak value:100m/s2,shock frequency:40~80times/min,<br>impulse lasting time:16min,shock times:1000±10 | 1.电芯外观应无明显损伤，漏液，冒烟或爆炸；<br>2. 单体电芯电压不低于3.6V.<br>1. No scratch, no leakage, no fume, no explosion;<br>2. The min voltage is 3.6V. |

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|---|---|---|
| 8.4自由跌落<br>Drop test | 电芯按5.6规定充电后,将电芯样品由高度为1000mm的位置自由跌落到置于水泥地面上的18-20mm厚的木板上，从X,Y,Z正负方向(六个方向)每个方向自由跌落1次.自由跌落结束后,将电芯以1C电流放电至终止电压,然后以1C的电流进行充放电循环,直至放电时间不低于51min,即可终止充放电循环,充放电循环次数应不多于3次.<br>A cell is charged using standard charge method (spec. 5.6), then dropped from a height of 1000mm to a wooden board(18-20mm thick) which is placed on the concrete ground. Cells shall be dropped in each of three mutually perpendicular directions. Total drop times are 6.After that, the cell is discharged to cut-off voltage at CC of 1C, then repeat charge & discharge at a current of 1C until the discharge time is not less than 51min, the cycle times should be not more than 3. | 电芯应不漏液、不冒烟、不爆炸<br>No leakage, no fume, no explosion. |

## 9. 安全测试/ Safety test

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按5.6规定充电后,并搁置24h后,再进行以下试验.

All below tests are carried out on the equipments with forced ventilation and explosion-proof device. Before test all cells are charged using standard charge method (spec. 5.6), and stored 24h prior to testing.

| 测试项目/ **Test Item** | 测试方法/ **Test Method** | 检验标准/ **Criteria** |
|---|---|---|
| 9.1热冲击<br>Heating test | 将电芯放在电热鼓风干燥箱中,温度以5℃±2℃/min的速率由室温升至130℃±2℃并保持10min.<br>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℃±2℃ per minute to a temperature of 130℃±2℃ and remain for 30min at that temperature before the test is discontinued. | 电芯不起火,不爆炸<br>No fire, no explosion |
| 9.2（3C/10V)过充电<br>Overcharge test | 先将电池以0.2C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10V,然后对电芯3C充电,直到输出电压不低于10V,持续充电7h或电压不再增大.<br>A cell is discharged to cut-off voltage at CC of 1C.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 10V, after that, Charge the cell up to 10V at CC of 3C, until that last 7h at the voltage of 10V or the voltage is no more increased. | 电芯不起火,不爆炸<br>No fire, no explosion |
| 9.3 短路测试<br>Short-circuit test | 将接有热电偶的电芯置于通风橱中,用铜线短路其正负极(线路总电阻不大于50毫欧),实验过程中监视电芯温度变化,当电芯温度下降到比峰值低约10℃时,结束实验.<br>A 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 50m.Monitor its temperature while testing, the cell is to be discharged until the cell case temperature has returned to be 10℃ less then peak temperature. | 1.电芯不起火,不爆炸<br>1. No fire, no explosion |

## 10.出货/ Shipment

单体电芯按3.70～3.90V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间和条件.

The Cell shall be shipped in voltage range of 3.70 ~ 3.90 V or in accordance with customers' requirement. The remaining capacity before charging shall be changed depending on the storage time and conditions.

**11. 质量保证/ Warranty**

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,如果非公司的制程原因而是客户的误用造成的电芯质量问题,不承诺免费更换.

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

公司对违反安全守则操作所产生的问题不承担任何责任.

＞ LPW will not be responsible for trouble occurred by handling outside of the precautions in instructions.

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.

＞ LPW will not be responsible for trouble occurred by matching electric circuit, cell pack and charger.

出货后客户在电芯组装过程中产生的不良电芯不在质量保证的范围之列.

＞ LPW will be exempt from warrantee any defect cells during assembling after acceptance.

**12. 安全守则/ Precautions and safety instructions**

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:

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.

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,请先咨询相关事宜.

Note1. The customer is required to contact AKY advance, if and when the customer needs other applications or operating 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, 不承担任何责任.

Note2. LPW will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.

**12.1.0** 电芯防范措施/ **Standard cell Precaution**

12.1.1 不要将电芯暴露在极热或有火星的环境中.
Do not expose the cell to extreme heat or flame.

12.1.2 不要将电芯短路,过充或过放.
Do not short circuit, over-charge or over-discharge the cell.

12.1.3 不要使电芯承受过重的机械冲击.
Do not subject the cell to strong mechanical shocks.

12.1.4 不要将电芯浸入海水或水中,或者使其吸湿.
Do not immerse the cell in water or sea water, or get it wet.

12.1.5 不要颠倒电芯的正负极.
Do not reverse the polarity of the cell for any reason.

12.1.6 不要拆卸或修整电芯.
Do not disassemble or modify the cell.

12.1.7 不要和项链,硬币或发夹等金属物品放置在一起.
Do not handle or store with metallic like necklaces, coins or hairpins, etc.

12.1.8 不要使电芯受到明显的损害或变形.
Do not use the cell with conspicuous damage or deformation.

12.1.9 不要将电芯与插座连接.
Do not connect cell to the plug socket or car-cigarette-plug.

12.1.10 不要直接焊接电芯.
Do not make the direct soldering onto a cell.

12.1.11 不要直接接触泄漏的电芯.
Do not touch a leaked cell directly.

12.1.12 不要将电芯用于其它设备.
Do not use for other equipment.

12.1.13 不要将锂离子电芯混合使用.

Do not use Lithium-ion cell in mixture.

12.1.14 不要将电芯放置在太阳光直射的地方.

Do not use or leave the cell under the blazing sun (or in heated car by sunshine).

12.1.15 将电芯放置在远离儿童的地方.

Keep cell away from children.

12.1.16 不要针刺,锤打或践踏电芯.

Do not drive a nail into the cell, strike it by hammer or tread it.

12.1.17 不要撞击或投掷电芯.

Do not give cell impact or fling it.

**12.2** 电芯使用说明/ **Cell operation instruction**

12.2.1 充电/ Charging

使用恒压恒流锂离子电芯充电器.

* Use a constant current, constant voltage (CC/CV) lithium-ion (Li+) cell charge controller.

12.2.2 储存建议/ Storage recommendations

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

- 电芯应储存在温度范围为0 ～45℃,低湿度和不含腐蚀性气体的环境中.
  Storage the cell at 0 ~ 45°C, low humidity and no corrosive gas atmosphere.
- 不要让电芯承担任何压力.
  No press on the cell

**13. 安全保证要求/ Requirement for safety assurance**

为了安全起见,如有设备设计,锂离子电芯系统保护电路或高电流,快速充电和其它方面的特殊应用,请先咨询相关事宜.

For the sake of safety assurance, please discuss the equipment design, its system and protection circuit of Lithium-ion cell with AKY in advance. And consult about the high rate current, rapid charge and special application in the same way.