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# 锂离子电芯规格书

# Specification
# for
# Lithium-ion Rechargeable Cell

电芯型号: 32140FS

Cell Type: 32140FS

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# 规格书修订履历表

| 文件名称 | 32140FS-15000mAh 型锂离子电池规格书 | 文件编号 | CBNJ-PS-AA |
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# Contents 目录

## 1. Preface 前言

This Product Specification describes the technique requirements, test procedures and precaution notes of cylindrical type Lithium-ion Rechargeable cell to be supplied to customer by NANJING CBAK ENERGY TECHNOLOGY COMPANY LIMITED.

本标准规定了由南京中比新能源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 锂离子可充性电芯

2.2. Model (Type) 电芯型号: 32140FS

2.3. Designation 名称:

| 32 | 140 | F | S |
|---|---|---|---|
| ① | ② | ③ | ④ |

①: Indicates the diameter of cell 代表电芯直径

②: Indicates the overall height of cell 代表电芯高度

③: Indicates the property of the cell 代表电池性能

The letter "F" defines LiFePO4 series cathode

"F"代表以 LiFePO4 为正极材料体系

④: Indicates the property of the cell 代表电池性能

The letter "S" defines steel can cell

"S"代表钢壳电池

## 3. Cell Size 电芯尺寸

For details, please refer to Figure A. Remark: contain PET cover

对于电池结构的详细资讯，请参阅图 A。备注：包含热缩套

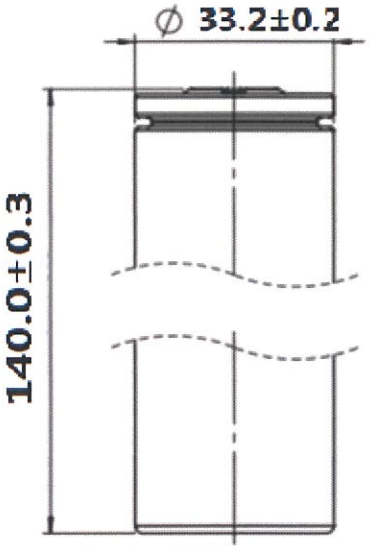


Figure A

## 4. Construction 电芯结构

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

电芯由正极、负极、隔膜、钢壳和盖板组成。

## 5. Specification 标准

Fresh cell, all tests stated in this Specification is Standard Test Conditions.
样品为新电池，无特别要求，此规格书上的产品测试条件均为标准测试条件。

| Item 项目 | | Specification 标准 | | | | | | Remark 备注 |
|---|---|---|---|---|---|---|---|---|
| Typical Capacity<br>典型容量 | | 15000mAh | | | | | | 0.5C discharge capacity |
| Minimum Capacity<br>最小容量 | | 14500mAh | | | | | | |
| Internal Impedance<br>交流内阻 | | 1.0 mΩ≤IR<3.0mΩ | | | | | | By AC 1 kHz |
| Nominal Voltage<br>标称电压 | | 3.20 V | | | | | | |
| Cell Weight<br>电芯重量 | | 300±5.0g | | | | | | contain package<br>包含外包装 |
| Energy Density<br>能量密度 | | 160Wh/kg | | | | | | |
| End-of-charge Voltage<br>充电截止电压 | | 3.6V | | | | | | At CC mode<br>恒流制式 |
| End-of-discharge Voltage<br>放电截止电压 | | 2.0V | | | | | | At CC mode<br>恒流制式 |
| Standard Charging<br>标准充电制式 | | 0.5C CC/CV, cut off 0.05C<br>0.5C 恒流恒压充电至 3.6V，0.05C 截止 | | | | | | 180min |
| Standard Discharging<br>标准放电制式 | | 0.5C CC, cut off 2.0V<br>0.5C 恒流放电至 2.0V 截止 | | | | | | |
| Max Continuous Charge<br>最大持续充电<br>（电芯表面温度 Cell Surface Temperature） | | 0~10℃ | 10~20℃ | 20~45℃ | 45~50℃ | 50~55℃ | 55~60℃ | |
| | | 0.2C | 0.5C | 1C | 0.5C | 0.2C | 0.1C | |
| Max Continuous Discharge<br>最大持续放电 | | 2C | | | | | | |
| Max Pulse Discharge<br>最大脉冲放电 | | 6C (10s) | | | | | | |
| Cycle Life<br>循环性能 | | ≥2000 cycles | | | | | | +0.5C/-0.5C, 25±2℃ |
| Operating Temperature Range<br>操作温度范围 | Charging/Discharging Temperature<br>(Cell Surface Temperature)<br>充放电温度（电芯表面温度） | 0~60℃/-30~60℃ | | | | | | 无论电芯处在何种充放电模式，一旦发现电芯温度超过充放电温度范围即停止充放电 |
| | Storage Temperature<br>存储温度 | -20～45℃ | | | | | | 3month（3 个月） |
| | | -10～25℃ | | | | | | 6month（6 个月） |
| Shelf Life 保质期 | | 1year 1 年 | | | | | | |
| Appearance<br>外观 | | Without break, scratch, distortion, contamination, leakage and so on<br>无破裂、划痕、变形、污迹、电解液泄露等 | | | | | | |

# 6. Test Conditions 测试条件

## 6.1. Standard Test Conditions 标准测试条件

Unless otherwise specified, all tests stated in this Specification are conducted at temp. 25±2℃ and humidity 15-90%RH

若无特别要求，此规格书上的产品测试条件均为温度：25±2℃，湿度：15-90%RH

## 6.2. Standard Charge and Discharge Method 标准充放电制式

The "Standard Charge" means charging the Cell at a constant current of 0.5C until the voltage is 3.6V, then charged at a constant voltage of 3.6V until its current is less than 0.05C.

“标准充电制式”即以恒定电流 0.5C 充电至 3.6V，再以 3.6V 的恒压充电至电流小于 0.05C。

The "Standard Discharge" means discharging the Cell at a constant current of 0.5C until the voltage is 2.0V

“标准放电制式”即以恒定电流 0.5C 放电至 2.0V。

# 7. Electrical Characteristics 电性能

| Test Item<br>测试项目 | Test Method<br>测试方法 | Criteria<br>检验标准 |
|---|---|---|
| 1)<br>High Temperature Performance<br>高温性能 | A cell is charged in accordance with Standard Charge, and stored in an ambient temp. of 60±2℃ for 4hrs, then discharged in accordance with Standard Discharging. After that, fetch out the cell and place it in Standard Test Conditions for 4hrs, then check its appearance.<br>电芯按标准充电制式充电结束后，放入 60±2℃的高温箱中恒温 4h，然后以标准放电制式放电，将电芯取出在标准测试条件下搁置 4h，目测电芯外观。 | 1. Capacity≥95%;<br>2. No distortion, no rupture.<br>1. 放电容量≥95%;<br>2. 电芯外观无变形，无爆裂。 |
| 2)<br>Low Temperature Performance<br>低温性能 | A cell is charged in accordance with Standard Charge, and stored in an ambient temp. of -20±2℃ for 4hrs, then discharged to 1.8V at a constant current of 0.5C. After that, fetch out the cell and place it in Standard Test Conditions for 4hrs, then check its appearance.<br>电芯按标准充电制式充电结束后，将电芯放入-20℃±2℃的低温箱中恒温 4h，然后以 0.5C 电流放电至 1.8V，实验结束后，将电芯取出在标准测试条件下搁置 4h，然后目测电芯外观。 | 1. Capacity≥70%<br>2. No distortion, no rupture<br>1. 放电容量≥70%;<br>2. 电芯外观无变形，无爆裂。 |
| 3)<br>C-Rate Performance<br>倍率性能 | A cell is charged in accordance with Standard Charge, after that stored for 30min, then discharged to cut-off voltage at a constant current of 0.2C, after that, stored 30min; then the cell is charged and discharge as above except that at a discharged constant current of 0.5C; then the cell is charged and discharge as above except that at a discharged constant current of 1C; then the cell is charged and discharge as above except that at a discharged constant current of 2C.<br>电芯按标准充电制式充电结束后搁置 30min，然后以 0.2C 恒流放电，放电结束后搁置 30min；这颗电芯继续进行下一次充放电循环，需以 0.5C 进行恒流放电；继续进行下一次充放电循环，需以 1C 进行恒流放电；进行下一次充放电循环，需以 2C 进行恒流放电。 | 0.5C Capacity/0.2C Capacity ≥95%;<br>1C Capacity/0.2C Capacity ≥93%;<br>2C Capacity/0.2C Capacity ≥90%;<br>0.5C /0.2C 放电容量≥95%;<br>1C /0.2C 放电容量≥93%;<br>2C /0.2C 放电容量≥90%; |

| | | |
|---|---|---|
| 4)<br>Capacity Retention and recovery<br>荷电保持和恢复性能 | A cell is charged in accordance with Standard Charge, and stored in 55±2℃ for 7d, after that stored for 5hrs at room temperature, then discharged in accordance with Standard Discharging. After that, stored 30min the cell is charged in accordance with Standard Charge, after that stored for 30min, then discharged in accordance with Standard Discharging.<br>电芯按标准充电制式充电结束后，将电芯在 55±2℃搁置 7 天，然后在室温下搁置 5 小时，再以标准放电制式放电，放电结束后搁置 30min；然后以标准充电制式充电结束后搁置 30min，再以标准放电制式放电。 | Capacity retention: ≥ 90%<br>Capacity recovery: ≥ 95%<br>容量保持率：≥90%<br>容量恢复率：≥95% |
| | A cell is charged in accordance with Standard Charge, and stored in Standard Test Conditions for 28d, then discharged in accordance with Standard Discharging. After that, stored 30min the cell is charged in accordance with Standard Charge, after that stored for 30min, then discharged in accordance with Standard Discharging.<br>电芯按标准充电制式充电结束后，在标准测试条件下，将电芯搁置 28 天，再以标准放电制式放电，放电结束后搁置 30min；此电芯标准充电制式充电结束后，搁置 30min，然后以标准放电制式放电。 | Capacity retention: ≥90%<br>Capacity recovery: ≥95%<br>容量保持率：≥90%<br>容量恢复率：≥95% |
| 5)<br>Cycle Life<br>循环寿命 | At Temp.:25℃±2℃, a cell is charged at a constant current of 0.5C until the voltage is 3.6V, then charged at a constant voltage of 3.6V until its current is less than 0.05C, after that stored for 30min; then discharged at a constant current of 0.5C until the voltage is 2.0V, after that, stored 30min prior to next charge-discharge cycle. The cell shall be continuously charged and discharged for 2000 times.<br>温度 25℃±2℃，电芯以 0.5C 恒流充电至 3.6V，以 3.6V 恒压充电至电流小于 0.05C，结束后搁置 30min，然后以 0.5C 恒流放电至 2.0V，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 2000 次。 | capacity retention: ≥80%<br>容量保持率：≥80% |

## 8. Safety Characteristics 安全性能

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 Standard Charge, and stored 1hrs 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标准充电制式充电，并搁置 1hrs 后，再进行以下试验。

| Test Item<br>测试项目 | Test Method<br>测试方法 | Criteria<br>检验标准 |
|---|---|---|
| 1)<br>Forced-Discharge Test<br>过放电<br>(GB 38031 8.1.2) | A cell is discharged at a constant current of 1C until the discharge time reaches 90min, then observed the cell for 1h.<br>电芯以 1C 电流放电，直至放电时间到达 90min，观察 1 小时。 | No fire, no explosion.<br>电芯应不起火、不爆炸 |

| | | |
|---|---|---|
| 2)<br>Overcharge Test<br>过充电<br>(GB 38031 8.1.3) | A cell is charged in accordance with Standard Charge, then charged the cell up to 4V or 115%SOC at CC of 1C, then observed the cell for 1h.<br>电芯按标准充电制式充电结束后，对电芯以 1C 恒流充电至 4V 或 115%SOC 后停止充电，观察 1 小时。 | No fire, no explosion.<br>电芯应不起火、不爆炸 |
| 3)<br>Short-circuit Test<br>外部短路测试<br>(GB 38031 8.1.4) | Short circuit the positive terminal and negative terminal of the cell externally for 10min (external line resistance < 5mΩ), then observe for 1h.<br>将电芯正极端子和负极端子经外部短路 10min（外部线路电阻<5mΩ），观察 1 小时。 | No fire, no explosion.<br>电芯应不起火、不爆炸 |
| 4)<br>Heating Test<br>加热测试<br>(GB 38031 8.1.5) | 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, then observed the cell for 1h.<br>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 30min，观察 1 小时。 | No fire,<br>no explosion<br>电芯不起火，<br>不爆炸 |
| 5)<br>Temperature Test<br>温度循环测试<br>(GB 38031 8.1.6) | A cell is charged in accordance with Standard Charge, heated the cell to be in an oven. In 60min, the temperature of the oven is to be dropped to the temperature of -40℃ and remain for 90min at -40℃; In 60min, the temperature of the oven is to be raised to the temperature of 25℃; In 90min, the temperature of the oven is to be dropped to the temperature of 85℃ and remain for 110min at 85℃; In 70min, the temperature of the oven is to be dropped to the temperature of 25℃; Repeat this for 5 cycles, after that observed the cell for 1h, then check cell's appearance.<br>电芯按标准充电制式充电结束后，将电芯放入温控箱内，<br>在 60 分钟内，温控箱温度降至-40℃，并在-40℃温度下保持 90min;<br>在 60 分钟内，温控箱温度升至 25℃;<br>在 90 分钟内，温控箱温度升至 85℃，并在 85℃温度下保持 110min，<br>在 70 分钟内，温控箱温度降至 25℃，<br>重复以上步骤 5 次，观察 1h，目测电芯外观。 | No fire, no explosion.<br>电芯应不起火、不爆炸 |
| 6)<br>Crush Test<br>挤压测试<br>(GB 38031 8.1.7) | A cell is to be placed on the crush surface, the axis is parallel to the crush surface, it is to be crushed between two flat surfaces. The pressure is gradually increased at an extrusion speed of ≤2mm/s until the voltage reaches 0V or the deformation reaches 15% or the squeezing force reaches 100kN or 1000 times the weight of the cell, keep the pressure for 10 minutes, and observe for 1 hour.<br>电芯放在挤压设备的两个挤压面之间，圆柱电芯芯轴平行于挤压平面，以≤2mm/s 的挤压速度，逐渐增加压力至电压达到 0V 或变形量达到 15%或挤压力达到 100kN 或 1000 倍电芯重量，保持压力 10min，观察 1 小时。 | No fire, no explosion.<br>电芯应不起火、不爆炸 |

| | | |
|---|---|---|
| 7)<br>Drop Test<br>跌落测试<br>(GB/T 31485 6.2.5) | A cell is charged in accordance with Standard Charge, then dropped the cell from a height of 1.5m to the concrete ground with positive and negative terminals downward, then observed the cell for 1h.<br>电芯按标准充电制式充电结束后，将电芯样品的正负极端子向下由高度为 1.5m 的位置自由跌落到水泥地面上，观察 1 小时。 | No leakage, no fire, no explosion<br>电芯应不漏液、不起火、不爆炸 |
| 8)<br>Impact Test<br>重物冲击测试<br>(UL 1642 14) | A cell is to be placed on the impact flat. A Φ15.8mm 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.<br>将电芯放在冲击台上，将一个 Φ15.8mm 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<br>电芯不起火，不爆炸 |
| 9)<br>Vibration Test<br>振动测试<br>(UL 1642 16) | A cell is charged in accordance with Standard Charge, 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 1Hz/min between 10 and 55 hertz, and repeat vibration for 90-100min, amplitude: 0.16mm. The cell is to be tested in three mutually perpendicular directions)<br>电芯按标准充电制式充电结束后，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 90-100min，扫频速率为 1Hz/min，位移幅值(单振幅)：0.16mm. | No leakage, no fire, no explosion<br>电芯应不漏液、不起火、不爆炸 |
| 10)<br>Low-pressure Test<br>低气压测试<br>(UL1642 19) | A cell is charged in accordance with Standard Charge, then stored it for 6hrs at an absolute pressure of 11.6kPa, then check cell's appearance.<br>电芯按标准充电制式充电结束后，将电芯放入在绝对压力为 11.6kPa 下搁置 6h，目测电芯外观。 | No leakage, no fire, no explosion<br>电芯应不漏液、不起火、不爆炸 |

## 9. Shipment 出货

The Cell shall be shipped in 20-30% state of charge (SOC) 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 20-30%的充电容量或客户要求出货，电芯出货后充电前的剩余容量取决于储存时间和条件。

## 10. 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, NANJING CBAK ENERGY TECHNOLOGY COMPANY LIMITED won't replace a new cell for free as long as the problem is not due to the failure of NANJING CBAK ENERGY TECHNOLOGY COMPANY LIMITED 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，如果不是南京中比新能源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，南京中比新能源科技有限公司不承诺免费更换。

NANJING CBAK ENERGY TECHNOLOGY COMPANY LIMITED will not be responsible for trouble occurred by handling outside of the precautions in instructions.

南京中比新能源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。

NANJING CBAK ENERGY TECHNOLOGY COMPANY LIMITED will not be responsible for trouble occurred by matching electric circuit, cell pack and charger.

南京中比新能源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。

NANJING CBAK ENERGY TECHNOLOGY COMPANY LIMITED will be exempt from warrantee 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南京中比新能源科技有限公司质量保证的范围之列。

## 11. 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损害或人身伤害，在使用以前，请仔细阅读以下的安全守则：

Note 1. The customer is required to contact NANJING CBAK ENERGY TECHNOLOGY COMPANY LIMITED 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，请先咨询南京中比新能源科技有限公司相关事宜。

Note 2. NANJING CBAK ENERGY TECHNOLOGY COMPANY LIMITED 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，南京中比新能源科技有限公司不承担任何责任。

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

a) Do not throw the Battery cell into fire or heat it.
不要将电芯投入火中或加热。

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。

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

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 touch a leaked cell directly.
不要直接接触泄漏的电芯。

k) Do not use Lithium-ion cell in mixture.
不要将锂离子电芯混合使用。

l) 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。

m) Keep cell away from children.
将电芯放置在远离儿童的地方。

n) 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。

o) Do not give cell impact or fling it.
不要撞击或投掷电芯。

p) Do not put Battery Cell into microwave oven or high pressure container.
不要将电芯放入微波炉或高压容器中。

### 11.2 Cell Operation Instructions 电芯使用说明

11.2.1 Charging 充电

a) When the Battery Cell is charged, the specified charge method and current described in this PS-Document should apply. If charge current exceeds the upper limit of the specified range, characteristics and safety of the Battery Cell could be deteriorated, or it may cause heat, explosion and fire.
应遵守本规格书的充电方式。如果超过电流上限，电池的安全性将不能被保证，会引起发热，爆炸，起火。

b) Charge voltage should not exceed 3.65V.
充电电压不能超过 3.65V。

c) Charge the cell in a temperature range of 0°C to 60°C.
电芯充电温度范围为 0℃～60℃。

d) Use a constant current, constant voltage (CC/CV) lithium-ion (Li+) cell charge controller.
使用恒流恒压锂离子电芯充电器。

11.2.2 Discharging 放电

a) The discharge current should not exceed the designated current described in this PS-Document. If the discharge current exceeds the specified value, discharge capacity could be extremely deteriorated or the Cell could be heated
放电电流不能超过本规格书的规定值，如果电流超过了规定值，电池容量将被破坏或者电池会出现发热情况。

b) For maximum performance, discharge the cell in a temperature range of –30°C to + 60°C.
为了达到较好的性能，电芯的放电温度范围为–30℃～+ 60℃。

11.2.3 Storage Recommendations 储存建议

a) Do not store the Battery Cell together with combustibles.
不要将电池和易燃物一起存放。

b) In case of long period storage (more than 3 months), storage the cell at temperature range of –10 ~ 25°C, low humidity, no corrosive gas atmosphere, and recommend to charge/discharge once every 3 months, and the SOC remains between 25-75%.
如果要长时间存放(超过 3 个月)，电芯应存储在温度范围为-10～25℃，低湿度和不含腐蚀性气体的环境中，建议每隔 3 个月充放电一次，SOC 保持在 25-75%之间。

c) No press on the cell
不要让电芯承受任何压力。

## 2. Consultation 技术咨询

As to the obscurity, contact the following.
Address: No. 5, Cangxi Road, Gaochun District, Nanjing
Tel No.: +86—025—57878020
如有疑问，请按以下方式咨询
厂址：南京市高淳区沧溪路 5 号
电话号码：+86—025—57878020
**http://www.cbak.com.cn**

## 3. Requirement for Safety Assurance 安全保证要求

For the sake of safety, please consult NANJING CBAK ENERGY TECHNOLOGY COMPANY LIMITED for equipment design, lithium-ion cell system protection circuit or high current, fast charging and other special applications.
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，快速充电及其它方面的特殊应用，请先咨询南京中比新能源科技有限公司相关事宜。