



ROOFER

路华能源科技（保山）有限公司

ROOFER ENERGY TECHNOLOGY (BAOSHAN) CO., LTD

# 锂离子电芯规格书

## Specification

for

## Lithium-ion Rechargeable Cell

电芯型号: INR18650-2000A (带PTC)

Cell Type: INR18650-2000A (带PTC)

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## 1. Preface 前言

This Product Specification describes the technique requirements, test procedure and precaution notes of prismatic type Lithium-ion Rechargeable cell to be supplied to customer by Roof Energy Technology (BAOSHAN) CO., LTD

本标准规定了由路华能源科技（保山）有限公司生产的锂离子电芯的技术要求，测试方法及注意事项。

## 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: INR18650-2000A

## 3. Specification 标准

Item 项目	Specification 标准	Remark 备注
3.1 Normal Capacity 标称容量	2000mAh	0.5C, 2.75V cut-off
3.2 Minimum Capacity 最小容量	1950mAh	0.5C, 2.75V cut-off
3.3 Internal Impedanc 内阻	≤50mΩ	AC (含PTC)
3.4 Nominal Voltage 额定电压	3.7V	From 4.20V to 2.75V
3.5 Charging Current (Std.) 充电电流(标准)	0.2C	400mA 0~ 45°C
3.6 Discharge Current (Std.) 放电电流(标准)	0.2C	400mA -20~ 60°C
3.7 Conventional charge and discharge current 常规充放电电流	0.5C	1000mA 20±5° C
3.7 Charging Current (Max.) 充电电流(最大)	不建议充电	≤0°C
	0.3C	600mA 0~ 10°C
	0.5C	1000mA 10~25°C
	1.0C	2000mA 25~45°C
3.9 Discharge Current (Max.) 持续放电电流(最大)	2.0C	4000mA -20~ 60°C

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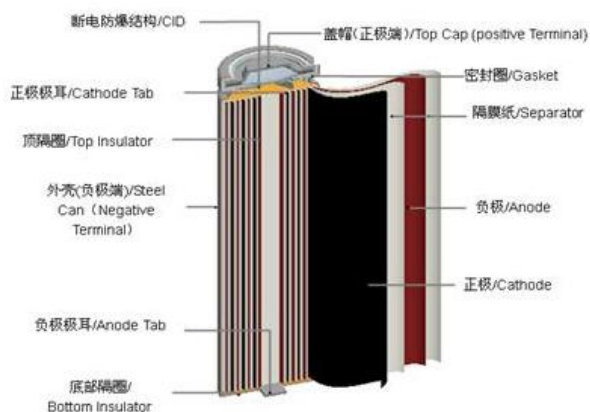
3.10 Maximum Instantaneous Discharge Current (Max.) 瞬间放电电流(最大)	3.0C	6000mA -20~ 60°C
3.11 Limited charging Voltage 充电限制电压	4.20V	
3.12 End-of-charge Current 充电终止电流	0.02C	40mA At CV mode
3.13 Discharge Cut-off Voltage 放电截止电压	2.75V	
3.14 0.5C discharge capacity (Std) 0.5C放电容量	≥97%	0.2C充/0.5C放
3.15 1.0C discharge capacity 1.0C放电容量	≥95%	0.2C充/1.0C放
3.16 Operating Temperature 工作温度	Charge: 0 to 45°C Discharge: -20 to 60°C	
3.17 Weight 重量	Approx. 44.6g	
3.18 Storage Temperature 贮存温度	7 day: -20~60°C 3month: -20~40°C 1year: -20~25°C	

## 4. Dimensions 尺寸

For details, please refer to annex A.

对于图形结构的详细资讯，请参阅附件A。

## 5. Construction 电芯结构



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

电芯由正极，负极，隔膜，壳体和盖板组成。

## 6. Cell bar and explanation 电芯喷码及说明



尺寸型号	标称电压	能量	电芯批号
INR18650-2000A	3.7V	7.4Wh	XXXX

## 7. Test Conditions 测试条件

### 7.1 Standard Test Conditions 标准测试条件

Unless otherwise specified, all tests stated in this Product Specification are conducted at temperature  $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$  and humidity  $60\%\pm 25\%$  RH.

若无特别要求，此规格书上的产品测试条件均为温度： $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ ，湿度： $60\%\pm 25\%$  RH。

### 7.2 Standard Charge Method 标准充电制式

The "Standard Charge" means charging the Cell at a constant current of  $0.2\text{C}$  until the voltage is  $4.20\text{V}$ , then charged at a constant voltage of  $4.20\text{V}$  until its current is  $0.02\text{C}$ .

“标准充电”即在环境温度为 $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ 的条件下，先以恒定电流 $0.2\text{C}$ 充电至 $4.20\text{V}$ ，再以 $4.20\text{V}$ 的恒压充电至电流为 $0.02\text{C}$ 。

### 7.3 Quick Charge Method 快速充电制式

The "Quick Charge" means charging the Cell at a constant current of  $0.5\text{C}$  until the voltage is  $4.20\text{V}$ , then charged at a constant voltage of  $4.20\text{V}$  until its current is  $0.02\text{C}$ .

“快速充电”即在环境温度为 $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ 的条件下，先以恒定电流 $0.5\text{C}$ 充电至 $4.20\text{V}$ ，再以 $4.20\text{V}$ 的恒压充电至电流为 $0.02\text{C}$ 。

## 8. Electrical Characteristics 电性能



Test Item 测试项目	Test Method 测试方法	Criteria 检验标准
8.1 High Temperature Performance 高温性能	A cell is charged in accordance with 7.2 and stored in an ambient temperature of $60^{\circ}\text{C}\pm 2^{\circ}\text{C}$ for 4h, then discharged to cut-off voltage at a constant current of 0.2C. 电芯按7.2规定充电结束后，将电芯放入 $60^{\circ}\text{C}\pm 2^{\circ}\text{C}$ 的高温箱中恒温4h，然后以0.2C电流放电至终止电压。	Retention: 95% 容量保持率：95%；
8.2 Low Temperature Performance 低温性能	A cell is charged in accordance with 7.2, and stored in an ambient temperature of $-20^{\circ}\text{C}\pm 2^{\circ}\text{C}$ for 4h, then discharged to cut-off voltage at a constant current of 0.2C. 电芯按7.2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4h，然后以0.2C电流放电至终止电压。	Retention: 60% 容量保持率：60%；
8.3 Charge (Capacity) Retention 荷电保持能力	A cell is charged in accordance with 7.2, and stored in an ambient temperature of $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ for 30d, then discharged to cut-off voltage at a constant current of 0.2 C. 电芯按7.2规定充电结束后，在环境温度为 $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ 条件下，将电芯搁置30天，再以0.2 C电流放电至终止电压；	Retention: 85% 容量保持率：85%；
	A cell is charged in accordance with 7.2 and stored in an ambient temperature of $60^{\circ}\text{C}\pm 2^{\circ}\text{C}$ for 7d, then discharged to cut-off voltage at a constant current of 0.2 C. 电芯按7.2规定充电结束后，在环境温度为 $60^{\circ}\text{C}\pm 2^{\circ}\text{C}$ 条件下，将电芯搁置7天，再以0.2 C电流放电至终止电压；	Retention: 85% 容量保持率：85%；
	The cell is cycled for 3 times using 0.2 C. The maximum discharge capacity is tested. 0.2 C循环3次，测试放电容量（3周循环的最大放电容量）	Retention: 95% 容量恢复率：95%；
8.4 Cycle Life 循环寿命	at temperature $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ , the Cell at a constant current of 0.5C until the voltage is 4.20V, and stored for 10min, then discharged to cut-off voltage, after that, stored 10min prior to next charge-discharge cycle. The cell shall be continuously charged and discharged for 300 times. 在环境温度为 $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ 条件下，电芯0.5C充电至4.2V，而后搁置10min，然后以0.5 C电流放电至终止电压，放电结束后，搁置10min，再进行下一次充放电循环，连续进行充放电循环300次。	capacity retention $\geq 80\%$ 容量保持率 $\geq 80\%$

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## 9. Environment Characteristic 环境性能

Test Item 测试项目	Test Method 测试方法	Criteria 检验标准
9.1 Vibration Test 振动测试	After standard charging, fixed the cell to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz and 55Hz, the excursion of the vibration is 1.52mm. The cell shall be vibrated for 90 minutes per axis of x, y axes. 将充满电的电池以振幅 0.76mm（双振幅为 1.52mm）的正弦振动，振动频率范围为 10Hz~55Hz，频率变化速率 1Hz/min。沿 X、Y、Z 三个方向振动，每个方向振动 90mins±5mins。	no remarkable Damage, no smoking, no explosion 电池外观无明显损伤、不泄漏、不冒烟、不爆炸
9.2 Drop test 自由跌落	After the cell was charged according to 7.2, the cell samples were dropped from a height of 1m onto the concrete slab, and the two end faces were dropped once and the cylinder face was dropped twice, a total of four drop tests were carried out. 电芯按7.2规定充电结束后，将电芯样品由高度为1m的位置自由跌落混凝土板上，两个端面各跌落一次圆柱面跌落两次，共计进行四次跌落试验。	no fire, no explosion 电芯不起火，不爆炸

## 10. Safety Test 安全测试

All below tests are carried out on the equipments with forced ventilation and explosion-proof device. Before test, all cells are charged in accordance with 7.2, and stored 24h 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7.2规定充电，并搁置24h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
10.1 Heating Test 热冲击	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°C±2°C per minute to a temperature of 130°C±2°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°C±2°C/min的速率由室温升至130°C±2°C并保持30min。	no fire, no explosion 电芯不起火，不爆炸



<p>10.2 overcharge test (3C/10V) 过充电</p>	<p>A cell is to be subjected to CC/CV power by connecting its positive &amp; negative terminal, then set the current as 3C<sub>5</sub>A, the voltage as 10V, after that, Charge the cell up to 10V at CC of 3 C<sub>5</sub>A and The current is close to 0A, when the cell temperature drops to about 20% below the peak value, the experiment is finished .</p> <p>将电芯正负极连接于恒压电源，调节电流至3 C<sub>5</sub>A，电压为10 V，然后对电芯以3 C<sub>5</sub>A充电，直到电压为10V，电流接近0A，当电芯温度下降到比峰值低约20%时，结束实验。</p>	<p>no fire, no explosion 电芯不起火，不爆炸</p>
<p>10.3 Short-circuit test 短路测试</p>	<p>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 80±20 mΩ .Monitor its temperature while testing, the cell is to be discharged until the cell case temperature has returned to be 20% less than peak temperature.</p> <p>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80±20 mΩ)，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20%时，结束实验。</p>	<p>no fire, no explosion, Cell surface temperature is less than 150 °C 电芯不起火，不爆炸，电芯表面温度小于150°C</p>

### 11. Shipment 出货

The Cell shall be shipped in voltage range of 3.85 ~ 3.95 V or in accordance with customers' requirement. The remaining capacity before charging shall be changed depending on the storage time and conditions. Attach package flow chart.

单体电芯按3.85~3.95V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。附出货包装流程图。



NO.	Item 项目	Description 描述	Remark 备注
1	Packing style 包装方式	Carton&Box&Cutter Card 外箱+纸盒+刀卡	
2	Outside of the box size 包装箱外尺寸	420mm*225mm*165mm	
3	Weight 重量	≤18.6Kg	
4	Carton Sealing style 封箱方式	Scotch tape 透明封箱胶带	

### 12. 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, ROOFER won't replace a new cell for free as long as the problem is not due to the failure of ROOFER manufacturing process or is due to customer's abuse or misuse.

自出货之日起电芯的保质期依合同而定。但是，在此期限内，如果非路华公司的制程原因而是客户的误用造成的电芯质量问题，路华公司不承诺免费更换。

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

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路华公司对违反安全守则操作所产生的问题不承担任何责任。

- > ROOFER will not be responsible for trouble occurred by matching electric circuit, cell pack and charger.  
路华公司对与电路，电池组，充电器搭配使用所产生的问题不承担任何责任。
- > ROOFER will be exempt from warranty 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路华公司质量保证的范围之列。
- > This product is mainly used in mobile power supply (single or multiple parallel power supply).  
本产品主要应用于移动电源（单只或多只并联）。

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

In order to prevent improper use of the core, it may cause short-circuit, leakage of liquid, overheating and explosion of the core, please read the following safety rules carefully:

为防止电芯使用不当，可能引起电芯短路、漏液、过热、爆炸，请仔细阅读以下的安全守则：

Note 1. The customer is required to contact ROOFER 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，请先咨询路华公司相关事宜。

Note 2. ROOFER 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,路华公司不承担任何责任。

#### 13.1 Standard cell Precaution 电芯防范措施

- a. Do not expose the core to extreme heat(direct sunlight) or to a Martian environment.  
不要将电芯暴露在极热（阳光直射）或有火星的环境中。
- b. Do not short-circuit the core, overcharge(monomer core exceeds 4.2 V) or overcharge(monomer voltage is less than 2.75 V).  
不要将电芯短路，过充（单体电芯超过4.2V）或过放（单体电压低于2.75V）。
- c. Do not make the core bear heavy mechanical impact, do not acupuncture, hammer or trample on the core.  
不要使电芯承受过重的机械冲击，不要针刺，锤打或践踏电芯。
- 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 positive and negative poles of the core. The reverse use or assembly of the positive and negative poles may cause rapid short circuits and safety risks.  
不要颠倒电芯的正负极，正负极反向使用或组装，可能会引起急速短路、有安全风险。
- f. Do not disassemble or modify the cell.  
不要拆卸或修整电芯。
- h. 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。
- i. 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。
- j. Do not connect cell to the plug socket or car-cigarette-plug.  
不要将电芯与插座连接。
- k. Do not make the direct soldering onto a cell.



不要直接焊接电芯。

l. Do not touch a leaked cell directly.

不要直接接触泄漏的电芯。

m. Do not mix lithium ion cores of different models or specifications and different manufacturers.

不要将不同型号或规格、不同厂家的锂离子电芯混合使用。

n. Ensure that the core is completely insulated in use and assembly, and that there is no hidden danger of short circuit.

保证电芯在使用、组装时完全绝缘，不得存在短路的隐患。

o. Never charge or discharge current(temperature) in excess of specifications.

不得在超过规格书要求的电流（温度）充放电及使用。

### 13.2 cell Operation Instruction 电芯使用说明

#### 13.2.1. Charging 充电

a. Charge the cell in a temperature range of 0°C to + 45°C.

电芯充电温度范围为0°C~45°C

b. Charge the cell at a constant current of 0.2C until 4.20V is attained. Charge rates greater than 0.5C are NOT recommended. (C : Rated Capacity of cell)

以0.2C的电流恒流充电至4.20V,超过0.5C的电流建议不要使用（C：标称容量）

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

使用恒压恒流锂离子电芯充电器

\* Do not continue to charge cell over specified time.

不要超过标准时间持续充电

#### 13.2.2. Discharging 放电

a. Recommended cut-off voltage to 2.75V. Recommended max discharge rate is 2C at constant current.

建议放电终止电压为2.75V，建议最大恒流放电电流为 2C

b. For maximum performance, discharge the cell in a temperature range of -20°C to + 60°C.

为了达到较好的性能，电芯的放电温度范围为-20°C ~ 60°C

#### 13.2.3. Storage Recommendations 储存建议

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

• Storage the cell at temperature of -20~25°C, low humidity and no corrosive gas atmosphere.

电芯应储存在温度范围为-20 ~ 25°C，低湿度和不含腐蚀性气体的环境中。

• No press on the cell

不要让电芯承担任何压力

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 -20 ~ 25°C, low humidity, no corrosive gas atmosphere.

如果要长时间存放(超过3个月)，电芯应存储在温度范围为-20~25°C，低湿度和不含腐蚀性气体的环境中。

• No more than 50 % charge storage is optimal.

不超过50%带电量储存为最佳。

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•It is recommended that shallow charge be placed in shallow water for half a year.

建议半年内浅充浅放、检测一次。

• No press on the cell

不要让电芯承受任何压力

#### 14. Consultation 技术咨询

As to the obscurity, contact the following:

Roof Energy Technology (Baoshan) Co.,Ltd.

Tel No: 0875-8889999

Fax No: 0875-8885555

Address: Luhua Industrial Park Baoshan Industry and Trade Zone

Longyang District Baoshan, Yunnan, 678000 CHINA

如有疑问，请按以下方式咨询：

路华能源科技（保山）有限公司

电话:0875-8889999

传真: 0875-8885555

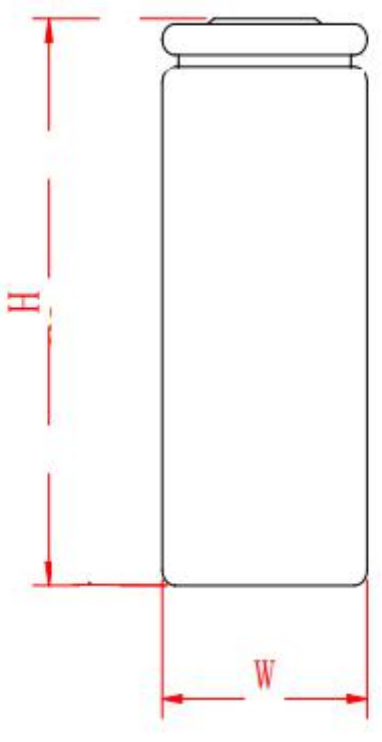
厂址：中国云南省保山市隆阳区保山工贸园路华工业园678000

#### 15. 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 cell with Roof in advance. And consult about the high rate current, rapid charge and special application in the same way.

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，请先咨询路华公司相关事宜。



标题	INR18650-2000A电芯尺寸图		
			
NO	项目	描述	规格
1	H	电芯高度（含热塑套管）	65.10±0.15 mm
2	W	直径（含热塑套管）	18.35±0.15 mm