Specification for Lithium-ion Rechargeable Cell

锂离子电芯规格书

Cell Type（电芯型号）: ICR18650/20P

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1. Preface（前言）

This product specification document describes the technical specification, test procedures and precaution notes of prohibition and cautions in handing ICR18650/20P rechargeable lithium-ion cell supplied to customers by HuiZhou EVE Energy Co., LTD.

本产品规格书所描述的技术说明书，测试程序和关于产品的注意事项以及安全使用的说明，都是针对由惠州亿纬锂能股份有限公司通过交易提供给客户的印有 ICR18650/20P 的锂离子二次充电电芯。

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： ICR18650/20P

2.3 Designation 名称：

EVE—— ICR 18 650 ——20P

① ② ③ ④ ⑤⑥

① The letter "EVE" defines Huizhou EVE Energy Co., LTD.
"EVE"代表惠州亿纬锂能股份有限公司

② The letter "ICR" defines cylindrical Li-ion rechargeable cell
" ICR"代表圆柱锂离子二次电芯

③ "18" indicates the diameter of the cell "18"代表电芯直径

④ "650" indicates the height of the cell "650"代表电芯高度

⑤ "20" indicates the project name of the cell "20"代表电芯项目名称

⑥ "P" indicates the power cell "P"代表功率型电芯

3. Cell dimensions（电芯尺寸及结构）

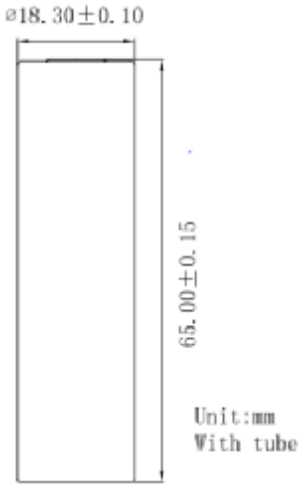

Figure A（图 A）

4. Cell structures（电芯结构）

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

电芯由正极、负极、隔膜、钢壳体和盖帽等组成。

5. Specification （标准）

Item 项目		Specification 标准		Remark 备注
5.1 Nominal capacity 标称容量		2000mAh		0.4A discharge capacity
5.2 Minimum capacity 最小容量		1900mAh		
5.3 AC impedance 交流内阻		≤18mΩ		By AC 1 kHz (After standard charge)
5.4 Nominal voltage 标称电压		3.6V		From 4.2 V to 2.5V
5.5 Cell weight 电芯重量		≤44.0g		
5.6 End-of-charge voltage 充电限制电压		4.2V		
5.7 End-of-charge current 充电截止电流		0.1A		At CV mode
5.8 End-of-discharge voltage 放电截止电压		2.5V		
5.9 Standard charge current 标准充电电流		1A		
5.10 Max. continuous charge current 最大持续充电电流		4A		
5.11 Charging time 充电时间		1）≤180 min 2）≤55 min		1）1A 2）4A
5.12 Standard discharge current 标准放电电流		0.4A		
5.13 Max. continuous discharge current 最大持续放电电流		20A		
5.14 Cycle life 循环性能		300 cycles		RT.
5.15 Operating Temperature range 操作温度范围	Charging temperature 充电温度	0°C～15°C	≤0.4A	
		15°C～25°C	≤1.0A	
		25°C～45°C	≤4.0A	
	Discharging temperature 放电温度	-20°C～75°C		

Item 项目	Specification 标准	Remark 备注
5.16 Storage temperature 存储温度 （Recovery 90% after storage） (存储后容量恢复 90%)	-20°C～60°C	≤1 month ≤1 个月
	-20°C～45°C	≤3 months ≤3 个月
	-20°C～25°C	≤1 year ≤1 年
5.17 Appearance 外观	Without break, distortion, contamination, leakage, etc. 无破裂、变形、污迹、电解液泄漏等	

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 product specification should be conducted at temperature 25°C±2°C and humidity 65%±20% 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：65%±20% RH。

6.2 Standard charge method 标准充电方式

The "Standard Charge" means charging the cell at a constant current of 1A until the voltage is 4.20V, then charging at a constant voltage of 4.20V until its current is less than 0.1A at 25°C±2°C.

“标准充电”即在环境温度为 25℃±2℃ 的条件下，先以恒定电流 1A 充电至 4.20V，再以 4.20V 的恒压充电至电流小于 0.1A。

7. Electrical characteristics （电性能）

Test item 测试项目	Test method 测试方法	Criteria 检验标准				
7.1 Rate discharge performance 倍率放电性能	The cell is charged in accordance with 6.2, and then stored in an ambient temperature of 25°C±2°C for 10min, finally discharged to end of discharge voltage with the various discharge current in the right table. 电芯按 6.2 规定充电后，在环境温度为 25°C±2°C 的条件下搁置 10min，而后按照右表不同电流放电到截止电压。	Discharge condition 放电条件				
		Current 电流	0.4A	2A	15A	20A
		Relative capacity 相对容量	100%	≥90%	≥92%	≥95%

Test item 测试项目	**Test method 测试方法**	**Criteria 检验标准**
7.2 High temperature performance 高温性能	A cell is charged in accordance with 6.2, and stored in an ambient temperature of 55°C±2°C for 5h, then discharged to end of discharge voltage at a constant current of 0.4A. 电芯按 6.2 规定充电结束后，将电芯放入 55°C±2°C 的高温箱中恒温 5h，然后以 0.4A 电流放电至截止电压。	Discharge capacity is no less than 95% nominal capacity 放电容量≥95%标称容量
7.3 Low temperature performance 低温性能	A cell is charged in accordance with 6.2, and stored in an ambient temperature of -20°C±2°C for 5h, then discharged to end of discharge voltage at a constant current of 0.4A. 电芯按 6.2 规定充电结束后，将电芯放入 -20°C±2°C 的低温箱中恒温 5h，然后以 0.4A 电流放电至截止电压。	Discharge capacity is no less than 70% nominal capacity 放电容量≥70%标称容量
7.5 High temperature storage performance 高温存储性能	A cell is charged in accordance with 6.2, and stored in an ambient temperature of 60°C±2°C for 30d, after that, fetch out the cell and place it in the ambient temperature of 25°C±2°C for 5h, then discharged to end of discharge voltage at a constant current of 0.4A. 电芯按 6.2 规定充电结束后，在环境温度为 60°C±2°C 条件下，将电芯存储 30d，然后在 25°C±2°C 下放置 5h，再以 0.4A 电流放电至截止电压。	Capacity retention is no less than 80% nominal capacity Capacity regain is no less than 95% nominal capacity 容量保持率≥80%标称容量 容量恢复率≥95%标称容量
7.6 Cycle life 循环寿命	A cell is charged with 4A, and stored for 10 min, then discharged to 2.5V at a constant current of 20A, after that, stored 30 min prior to next charge/discharge cycle. The cell shall be continuously charged and discharged for 300 times. 电芯按照 4A 充电结束后，搁置 10min，然后以 20A 电流放电至 2.5V，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 300 次。	Capacity retention≥60% 容量保持率≥60%

8. Mechanical characteristic（机械性能）

Test item 测试项目	Test method 测试方法	Criteria 检验标准
8.1 Drop test 跌落测试	A cell is charged in accordance with 6.2, then the cell is dropped three times from a height of 1.0 m onto a concrete floor. The cell is dropped so as to obtain impact in random orientations, after that, the cell shall be put on rest for a minimum of one hour. 充满电的电芯从 1.0m 的高度以随机的方向跌落至水泥地板 3 次，实验后放置至少 1h 后进行外观检查。	No fire, no explosion 电芯不起火、不爆炸
8.2 Vibration test 振动测试	A cell is to be subjected to simple harmonic motion with amplitude of 0.8 mm. The frequency is to be varied at the rate of 1 hertz per minute between 10 and 55 hertz, and return in no less than 90 or more than 100 minutes. The cell is to be tested in three mutually perpendicular directions. 将电芯固定在振动台上，施加单振幅为 0.8mm 的简谐振动，振动频率在 10～55Hz 范围内以 1Hz/min 的速率变化，在 90～100min 内恢复，电池沿 3 个相互垂直的方向振动。	No fire, no explosion, no leakage 电芯不起火、不爆炸、不漏液

9. 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 should be charged in accordance with 6.2, and stored 24h prior for 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 6.2 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
9.1 Impact test 重物冲击	A cell is to be placed on the impact flat. A Φ15.8±0.1 mm bar is to be placed on the center of the cell. A 9.1±0.46 kg weight is to be dropped from a height of 610±25 mm onto the cell. 将电芯放在冲击台上，将一 Φ15.8±0.1 mm 的钢柱置放电池中心，钢柱的纵轴平行于平面，让重量 9.1±0.46 kg 重锤自 610±25 mm 高度自由落下，冲击电芯。	No fire, no explosion 电芯不起火、不爆炸
9.2 Crush test 挤压测试	A cell is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram or similar force mechanism. The flat surfaces are to be brought in contact with the cells and the crushing is to be continued until an applied force of 13±1 kN is reached. Once the maximum force has been obtained it is to be released. 电芯放在挤压设备的两个挤压平面之间，用液压油缸或类似的力挤压，挤压面与电芯接触，逐渐增加压力至 13±1 kN 后停止。	No fire, no explosion 电芯不起火、不爆炸

Test item 测试项目	Test method 测试方法	Criteria 检验标准
9.3 Heating test 热冲击	A cell is to be heated in a gravity convection or circulating air oven with an initial temperature of 20°C±5°C. 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 10 min. The sample shall return to room temperature 20°C±5°C and then be examined. 将电芯放置于 20°C±5°C 的电热鼓风干燥箱中加热，温度以(5°C±2°C) /min 的速率升至 130°C±2°C 并保持 10min，然后将电芯取出，放置在室温 20°C±5°C 条件下进行检查。	No fire, no explosion 电芯不起火、不爆炸
9.4 Overcharge test 过充电	A cell is discharged to end of discharge voltage at CC of 0.4A, and then it is to be subjected to CC/CV power by connecting its positive & negative terminal, then charge the cell up to 8.4V at CC of 8A, until that last 24h. 先将电芯以0.4A放电至截止电压，然后将电芯正负极连接于恒压电源，对电芯以8A充电，直到输出电压不低于8.4V，持续充电24h。	No fire, no explosion 电芯不起火、不爆炸
9.5 Short-circuit test 短路测试	A cell is to be short-circuited by connecting the positive and negative terminals of the cell with copper wire having a resistance load of 80±20mΩ at 20°C±5°C. Monitor its temperature while testing, the cell is to discharge until a fire or explosion is obtained, or until it has reached a completely discharged state of less than 0.2 V and the cell case temperature has returned to 10°C of ambient temperature. 20°C±5°C环境温度下，用铜线将电芯正、负极短路，铜线阻值80±20mΩ。监测电芯温度，电芯放电直至起火或爆炸，或直至电芯完全放电至电压低于0.2V，壳体温度降至环境温度±10°C停止。	No fire, no explosion 电芯不起火、不爆炸
9.6 Low pressure 低气压	Sample cell is to be stored for 6 hours at an absolute pressure of 11.6 kPa and a temperature of 20°C±3°C。 电芯在绝对压力为11.6kPa，温度为20°C±3°C条件下贮存6小时。	No fire, no explosion, no leakage 电芯不起火、不爆炸、不漏液

10. Shipment （运输）

The capacity of shipping cell is less than 30% of charging. During transportation, keep the cell from acutely vibration, impacting, solarization, drenching.

电芯出货荷电量小于 30%，运输过程应防止剧烈振动、冲击、日晒雨淋。

11. Warranty （质量保证）

The warranty period of cell is made according to business contract from shipping date. However, even though the problem occurs within this period, EVE won't replace a new cell for free as long as the problem is not due to the failure of EVE 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，如果非亿纬公司的制程原因而是客户

的误用造成的电芯质量问题，亿纬公司不承诺免费更换。

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

亿纬公司对违反安全守则操作所产生的问题不承担任何责任。

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

亿纬公司对与电路、电池组、充电器不搭配所产生的问题不承担任何责任。

＞ EVE 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亿纬公司质量保证的范围之列。

12. Precautions and safety instructions （安全守则）

Lithium-ion rechargeable cell subject to abusive conditions can cause damage to the cell and 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的损害和人身的伤害。在使用锂离子充电电芯以前，请仔细阅读以下的安全守则：

Note 1. The customer is required to contact EVE 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，请先咨询亿纬公司相关事宜。

Note 2. EVE 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，亿纬公司不承担任何责任。

12.1 Cell precaution 电芯防范措施

a. Do not expose the cell to extreme heat or flame.

不要将电芯暴露在极热或有火星的环境中。

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，或弄湿电芯。

e. Do not reverse the polarity of the cell for any reason.

不要反接电芯的正负极。

f. Do not disassemble or modify the cell.

不要拆卸或修理电芯。

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.

不要使用受损或变形电芯。

i. Do not connect cell to the plug socket.

不要将电芯与插座连接。

j. Do not make direct soldering onto a cell with soldering iron.

不要用烙铁直接焊接电芯。

k. Do not touch a leaked cell directly.

不要直接接触漏液电芯。

l. Do not mix Lithium-ion cell.

不要将锂离子电芯混合使用。

m. Do not leave the cell under the blazing sun.

不要将电芯放置在太阳光直射的地方。

n. Keep cell away from children.

将电芯放置在远离儿童的地方。

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

不要针刺、锤打或踩踏电芯。

p. Do not hit or fling it.

不要撞击或投掷电芯。

12.2 Cell operation instruction 电芯使用说明

12.2.1. Charging 充电

a. The cell shall be charged within a range of specified temperatures in the specification.
电芯应在规格书限定的充电温度范围内充电。

b. For expected performance, charge the cell with "Standard Charge" method. Charging current shall be less than maximum continuous charge current.
为了达到较好的性能，以标准充电方式对电芯进行充电。充电电流不得超过最大持续充电电流。

c. Charging shall be done by voltage less than that specified in the specification.
电芯充电电压不得超过规格书中限定的电压。

d. Charging time is recommended to be installed from safety consideration, which shuts off further charging at time specified in the specification.
从安全角度考虑，建议增加充电时间的设置，超过规格书限定的充电时间，切断充电，防止继续充电。

12.2.2. Discharging 放电

a. The cell shall be discharged within a range of temperatures specified in the specification.
电芯应在规格书限定的放电温度范围内放电。

b. The cell shall be discharged continuously at less than maximum continuous discharge current specified in the specification.
持续放电电流不得超过规格书限定的最大持续放电电流。

c. Discharging shall be done by voltage over than that specified in the specification.
电芯放电电压不得超过规格书中限定的电压。

12.2.3. Storage 储存

a. Storage condition 储存条件

The cell should be stored within a range of temperatures specified in the product specification, low humidity and no corrosive gas atmosphere.
电芯应储存在规格书限定的温度范围内，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, the cell should be stored at voltage range of 3.50V to 3.80V, temperature range of 0°C to 25°C, low humidity, no corrosive gas atmosphere.
如果要长时间存放电芯，存储电压区间为 3.50-3.80V，存储温度范围为 0°C～25°C，低湿度和不含腐蚀性气体的环境。

12.2.4. Sorting recommendations 分档建议

a. Variation of capacity per carton: 40mAh
每卡板电芯容量散差：40mAh

b. Variation of voltage per carton: 15mV
每卡板电芯电压散差：15mV

13. Consultation （技术咨询）

As to the obscurity, contact the following:

Address: HuiZhou EVE Energy Co., Ltd.—EVE Industrial Park on No.36,Huifeng 7th Road, Zhongkai Hi-Tech Zone, Huizhou

Tel No. : 86(0)—752—2606966

Fax No.: 86(0)—752—2606033

Website: Http://www.evebattery.com.cn

如有疑问，请按以下方式咨询：

厂址：惠州亿纬锂能股份有限公司－惠州市仲恺高新区惠风七路 36 号亿纬工业园

电话：86(0)—752—2606966

传真：86(0)—752—2606033

网址：Http://www.evebattery.com.cn

14. 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 EVE 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，请先咨询亿纬公司相关事宜。