ENERGY VERY ENDURE 亿纬锂能

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锂离子电芯规格书

Specification
for
Lithium-ion Rechargeable Cell

电芯型号：LFP18650P

Cell Type:　LFP18650P

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Contents 目录

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 HuiZhou EVE Energy Co., LTD.
本标准规定了由惠州亿纬锂能股份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: LFP18650P

2.3 Designation名称:

EVE——— LFP 18 650 ——— P

① ② ③ ④ ⑤

①：Indicates the manufacturing plant 代表厂家名称

The letter "EVE" difines Huizhou EVE Energy Co., LTD.

"EVE"代表惠州亿纬锂能股份有限公司

②：Indicates the property of the cell代表电池性能

The letter "LFP" difines LiFePO4 series cathode

"LFP"代表以磷酸铁锂为正极材料体系

③：Indicates the diameter of cell代表电芯直径

18=18mm

④：Indicates the overall height of cell代表电芯高度

650=65mm

⑤ ：Indicates the performance of cell代表电池性能

The letter "P" difines high power cell

"P"代表高功率

3. Cell Size 电芯尺寸

For details,please refer to Figure A.
对于图形结构的详细资讯,请参阅图A.

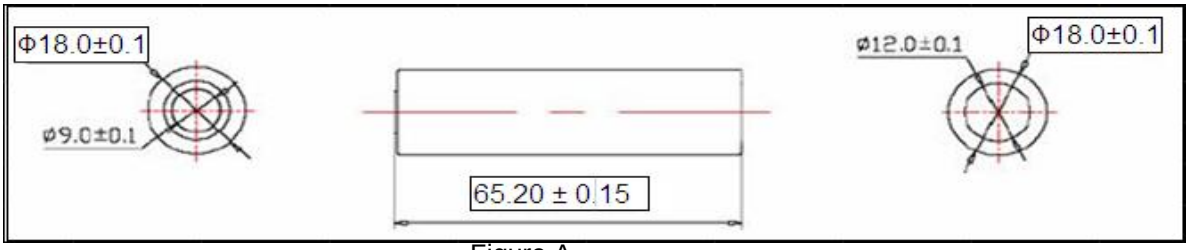

Figure A

4. Construction 电芯结构

A cell is made of cathode,anode,seperator,steel can and header.
电芯由正极,负极,隔膜,钢壳体和顶盖组成.

5. Specification 标准

Item 项目		Specification 标准	Remark 备注
5.1 Nominal Capacity 典型容量		1130mAh	0.5C_5A Rate discharge capacity
5.2 Mininum Capacity 最小容量		1100mAh	
5.3 Internal Impedance 交流内阻		≤13mΩ	By AC 1 kHZ
5.4 Nominal Voltage 标称电压		3.2V	From 3.65 V to 2.00V
5.5 Cell Weight 电芯重量		40±1g	
5.6 End-of-charge Voltage 充电截止电压		3.65V±0.05V	
5.7 End-of-charge Current 充电截止电流		0.01C_5A	At CV mode
5.8 End-of-discharge Voltage 放电截止电压		2.00 V	
5.9 Charging Time 充电时间		8.0hours	0.2C_5rate
5.10 Charge Method 充电方式	Standard charge method 标准充电方式	1C_5mA to 3.65V CC/CV	120min
	Max quick charge method 快速充电方式	5C_5mA to 3.65V CC/CV	30min
5.11 Max Continuous Discharge current 最大连续放电电流		30C_5A	
5.12 Specific Power 额定功率		>3.52WhW	
5.13 Cycle Life 循环性能		over 4000 cycles≥60%	5C_5A Continual Discharge (100% DOD)
5.15 Operating Temperature Range 操作温度范围	Charging Temperature 充电温度	0～45℃	Ambient temperature.Cell skin temperature must be <65℃.
	Discharging Temperature 放电温度	-10～45℃	Ambient temperature.Cell skin temperature not exceed 80℃
	Storage Temperature 存储温度	-10～45℃	Recommended temperature range for long term storage is 0 ~ 25°
5.16 Shelf Life 保质期		1year	Typical value from ship state
5.17 Appearance 外观		Without break, scratch, distortion, contamination, leakage and so on 无破裂、划痕、变形、污渍、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 Product Specification are conducted at temperature 25℃±2℃ 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 标准充电制式

The "Standard Charge" means charging the Cell at a constant current of $1C_5A$ until the voltage is 3.65V, then charged at a constant voltage of 3.65V until its current is less than $0.01C_5A$.

“标准充电”即在环境温度为25℃±2℃的条件下,先以恒定电流$1C_5A$充电至3.65V,再以3.65V的恒压充电至电流小于$0.01C_5A$.

6.3 Quick Charge Method 快速充电制式

The "Quick Charge" means charging the Cell at a constant current of $5C_5A$ until the voltage is 3.65V, then charged at a constant voltage of 3.65V until its current is less than$0.02C_5A$.

“快速充电”即在环境温度为25℃±2℃的条件下,先以恒定电流$5C_5A$充电至3.65V,再以3.65V的恒压充电至电流小于$0.02C_5A$.

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 Discharge Performance ($0.5C_5A$) $0.5C_5A$ 放电性能	A cell is charged in accordance with 6.2 , and then stored in an ambient temperature of 25℃±2℃ for 10min, finally discharged to cut-off voltage at a constant current of $0.5C_5A$. 电芯按6.2规定充电后，在环境温度为25℃±2℃的条件下搁置10min,而后以$0.5C_5A$电流放电到终止电压.	the discharge capacity is not less than mininum capacity. 放电容量不低于最小容量.
7.2 Discharge Performance ($10C_5A$) $10C_5A$ 放电性能	A cell is charged in accordance with 6.2 , and then stored in an ambient temperature of 25℃±2℃ for 10min, finally discharged to cut-off voltage at a constant current of $10C_5A$ 电芯按6.2规定充电后在环境温度为25℃±2℃的条件下搁置10min,而后以$10C_5A$电流放电到终止电压.	the discharge capacity is ≥90% nominal capacity. 放电容量≥90%标称容量.
7.3 High Temperature Performance 高温性能	A cell is charged in accordance with 6.2 ,and stored in an ambient temperature of 55℃±2℃ for 5h,then discharged to cut-off voltage at a constant current of $1.0C_5A$. After that,fetch out the cell and place it in the ambient temperature of 25℃±2℃ for 2h, then check its appearance. 电芯按6.2规定充电结束后,将电芯放入55℃±2℃的高温箱中恒温5h,然后以$1C_5A$电流放电至终止电压,实验结束后,将电芯取出在环境温度为25℃±2℃的条件下搁置2h,然后目测电芯外观.	1.the discharge capacity is not less than 95% nominal capacity; 2.no distortion,no rupture. 1.放电容量不低于标称容量的95%; 2.电芯外观无变形,无爆裂.

7.4 Low Temperature Performance 低温性能	A cell is charged in accordance with 6.2 ,and stored in an ambient temperature of -10℃±2℃ for 6h,then discharged to cut-off voltage at a constant current of 0.2C_5A. After that,fetch out the cell and place it in the ambient temperature of 25℃±2℃ for 2h, then check its appearance. 电芯按6.2规定充电结束后,将电芯放入-10℃±2℃的低温箱中恒温6h,然后以0.2C_5A电流放电至终止电压,实验结束后,将电芯取出在环境温度为25℃±2℃的条件下搁置2h,然后目测电芯外观.	1.the discharge capacity is not less than 50% nominal capacity; 2.no distortion,no rupture. 1.放电容量不低于标称容量的50%; 2.电芯外观无变形,无爆裂.
7.5 Charge(Capacity) Retention and Regain 荷电保持与恢复能力	A cell is charged in accordance with 6.2 ,and stored in an ambient temperature of 55℃±2℃ for 7d,After that,fetch out the cell and place it in the ambient temperature of 25℃±2℃ for 5h.then discharged to cut-off voltage at a constant current of 1C_5A. 电芯按6.2规定充电结束后,在环境温度为55℃±2℃条件下,将电芯搁置7天,然后在25℃±2℃下放置5h,再以1C_5A电流放电至终止电压.	Retention:≥90%C_5Ah Regain:≥95%C5Ah 容量保持率:90%C_5Ah 容量恢复率:95%C5Ah
7.6 Cycle Life 循环寿命	A cell is charged in accordance with 6.3,and stored for 10min,then discharged to cut-off voltage at a constant current of 5C5A,after that, stored 10 min prior to next chargedischarge cycle.The cell shall be continuously charged and discharged for 4000 times. 电芯按6.3规定充电,而后搁置10min,然后以5C5A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	capacity retention≥60% 容量保持率≥60%
7.7 30C5A Rate Discharge 30C_5A倍率 放电性能	A cell is charged in accordance with 6.2 , and then stored in an ambient temperature of 25℃±2℃ for 10min, finally discharged to cut-off voltage at a constant current of 30C_5A. 电芯按6.2规定充电后在环境温度为25℃±2℃的条件下搁置10min,而后以30C_5A电流放电到终止电压.	the discharge capacity is not less than 90% nominal capacity; discharge median voltage≥2.4V 放电容量不低于标称容量的90%.放电中值电压≥

8. Environment Characteristic 环境性能

Test Item 测试项目	Test Method 测试方法	Criteria 检验标准
8.1 Constant Temperature and Humidity 恒定湿热性能	A cell is charged in accordance with 6.2 or 6.3,and 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 prior to being discharged to cut-off voltage at a constant current of 1C_5A. 电芯按6.2或6.3规定充电结束后,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_5A电流放电至终止电压.	1.no distorsion,no rust,no fume,no explosion; 2.the discharging time is not less than 36min. 1.电芯外观应无变形,锈蚀,冒烟或爆炸; 2.放电时间应不低于36min.

8.2 Vibration Test 振动测试	A cell is charged in accordance with 6.2 or 6.3,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 herts,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 电芯按6.2或6.3的规定充电结束后,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30min，扫频速率为1oct/min: 振动频率：10Hz～30Hz 位移幅值(单振幅)：0.38mm; 振动频率：30Hz～55Hz 位移幅值(单振幅)：0.19mm.	1.no scratch,no leakage, no fume,no explosion; 2.the voltage is min3.2V. 1.电芯外观应无明显损伤，漏液，冒烟或爆炸; 2.单体电芯电压不低于3.2V.
8.3 Shock Test 碰撞测试	A cell is tested in accordance with 8.2,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:acceleration of impulse peak value:100m/s2,shock frequency:40~80times/min, impulse lasting time:16min,shock times:1000±10 电芯按8.2的规定试验结束后,将电池分别按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: 脉冲峰值加速度:100m/s2,每min碰撞次数:40～80, 脉冲持续时间:16ms,碰撞次数：1000±10.	1.no scratch,no leakage, no fume,no explosion; 2.the voltage is min3.2V. 1.电芯外观应无明显损伤，漏液，冒烟或爆炸; 2.单体电芯电压不低于3.2V.
8.4 Drop Test 自由跌落	A cell is charged in accordance with 6.2,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 $1C_5A$,then repeat charge & discharge at a current of $1C_5A$ until the discharge time is not less than 51min,the cycle times should be not more than 3. 电芯按6.2的规定试验结束后,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$1C_5A$电流放电至终止电压,然后以$1C_5A$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.	no leakage,no fume,no explosion. 电芯应不漏液，冒烟或爆炸

9. Safety Test 安全测试

All below tests are carried out on the equipments with foreced ventilation and explosion-proof device.Before test all cells are charged in accordance with 6.2 or 6.3, 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6.2或6.3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 Φ15.8mm 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. 将电芯放在冲击台上,将一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 电芯不起火,不爆炸
9.2 Crush Test 挤压测试	A cell is to be 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 电芯放在挤压设备的两个挤压表面之间，圆柱电芯轴平行于挤压平面，逐渐增加压力至13 kN，保持压力1min.	no fire,no explosion 电芯不起火,不爆炸
9.3 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℃±2℃ per minute to a temperature of 130℃±2℃ 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℃±2℃/min的速率由室温升至130℃±2℃并保持30min.	no fire,no explosion 电芯不起火,不爆炸
9.4 Overcharge Test （3C/10V) 过充电	A cell is discharged to cut-off voltage at CC of 0.2C_5A.then it is to be subjected to CC/CV power by connecting its positive & negative terminal, then set the current as 3C_5A,the voltage as 10V,after that,Charge the cell up to 10V at CC of 3C_5A ,until that last 7h at the voltage of 10V or the voltage is no more increased. 先将电池以0.2C_5A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_5A,电压为10V,然后对电芯以3C_5A充电,直到输出电压不低于10V,持续充电7h或电压不再增大..	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 maximum resistance load of 50mΩ.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. 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.	1.no fire,no explosion 2.Max.temp.< 150℃ 1.电芯不起火,不爆炸 2.最高温度<150℃
9.6 Nail penetration Test 针刺测试	A cell is to be penetrated completely the center of the largest side at the speed of 20-40mm per second by a Φ3.0mm stainless steel nail . 将接有热电偶的电芯置于通风橱中,用 Φ3.0mm的不锈钢针以 20-40mm/s的速度刺透电芯最大表面的中心位置.	no fire,no explosion 电芯不起火,不爆炸

10. Shipment 出货

The Cell shall be shipped in voltage range of 3.20 ~ 3.40 V 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3.20～3.40V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.

11. 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, 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,充电器搭配使用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 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:

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 Standard 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.
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 use for other equipment.
不要将电芯用于其它设备.
n. Do not use Lithium-ion cell in mixture.
不要将锂离子电芯混合使用.
o. 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.
p. Keep cell away from children.
将电芯放置在远离儿童的地方.
q. 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.
r. Do not give cell impact 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. Charge the cell in a temperature range of 0°C to + 45°C.
电芯充电温度范围为0℃～45℃.

b. Charge the cell at a constant current of 0.5C until 3.65V is attained. Charge rates greater than 5C are NOT recommended. (C : Rated Capacity of cell)
以0.5C的电流恒流充电至3.65V.超过5C的电流建议不要使用（C：标称容量）

c. Maintain charge voltage at 3.65V for 4.0 hours (recommended for maximum capacity).
恒压3.65V充电4小时（最大容量）.

* 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.

12.2.2. Discharging 放电

a. Recommended cut-off voltage to 2.0V. Recommended max continuous discharge current is30C_5A
建议放电终止电压为2.0V,建议最大持续恒流放电电流为30C_5A .

b. For maximum performance, discharge the cell in a temperature range of -10°C to + 45°C.
为了达到较好的性能,电芯的放电温度范围为－10℃ ～ + 45℃.

12.2.3. Storage Recommendations 储存建议

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

• Storage the cell at temperature of –10 ~ 45°C, low humidity and no corrosive gas atmosphere.
电芯应储存在温度范围为－10 ～45℃,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 0 ~ 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0～25℃,低湿度和不含腐蚀性气体的环境中.

• No press on the cell
不要让电芯承受任何压力.

13. Consultation 技术咨询

As to the obscurity, contact the following.

HuiZhou EVE Energy Co., Ltd.
EVE Industrial Park on No.36,Huifeng 7th Road,Zhongkai Hi-Tech Zone,Huizhou
Tel No.: 86—755—3270571
Fax No.: 86—752—2606033
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亿纬工业园

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.