Bonrex Technology Co., LTD

Cylindrical LiFePO4 Battery Specification

Model:	**IFR18650**
Capacity:	**2000mAh**
Type:	**LiFePO4**

Prepared	Checked	Approved

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修订记录 Revision History

版本Version	日期Date	修改者 Originator	变更内容Description
A.0	2024.4.03	严硕	初版发行

1.基本信息（General Information）

1.1 适用范围（Scope）

本规格书适用于深圳市鹏荟科技有限公司生产的锂离子电池。

This specification shall be applied to Lithium ion rechargeable battery supplied by BONREX(Shandong) Energy Technology Co., Ltd.

1.2 产品类型（Product Classification）

圆柱型锂离子电池（Cylindrical Battery）

1.3 产品名称（Model Name）

IFR18650-2000

1.4 定义（Definitions）

倍率（“C”）：满电电池 1 小时放电至终止电压所用的电流大小（mA）。

Rate（“C”）：The current required to discharge a fully charged battery to termination voltage in 1 hour.

2. 标准规格（Nominal Specification）

2.1 标称容量（Nominal Capacity）	2000mAh（0.2C，2.0V 放电) 2000mAh（0.2C，2.0V discharge）
2.2 最小容量（Minimum Capacity）	1950mAh（0.2C，2.0V 放电) 1950mAh（0.2C，2.0V discharge）
2.3 充电截止电压（End-of Charge Voltage）	3.65V±0.05V
2.4 标称电压（Nominal Voltage）	3.2V@0.2C
2.5 标准充电（Standard Charge@25±2℃）	方法：恒流恒压 Method：CC-CV
	充电电压：3.65V Charging Voltage：3.65V
	充电电流：0.5C（1000mA） Charging Current：0.5C（1000mA）
	截止电流：20mA Cut-off Current：20mA
2.6 最大充电电流（Maximum Charge Current）	1.0C(2000mA)
2.7 充电时间（Charging Time）	标准充电：＜3.5h Standard Charge：＜3.5h

2.8 标准放电（Standard Discharge@25±2℃）	方法：恒流 Method：CC	
	放电终止电压：2.0V Discharge Cut-off Voltage：2.0V	
	放电电流：0.2C（400mA） Discharging Current：0.2C（400mA）	
2.9 最大放电电流（Maximum Discharge Current） 非循环（Not for cycle）	3.0C（6000mA），可用于持续放电 3.0C（6000mA），for continuous discharge	
2.10 重量（Weight）	42.0±2.0 g	
2.11 使用温度（Operating Temperature） (电芯表面温度 Cell surface temperature)	充电 Charge：0~15℃	≤0.2C（400mA）
	充电Charge：15~45℃	≤1C（2000mA）
	放电Discharge：-20~60℃	

2.12 保存温度（Storage Temperature）	1 个月（1 month）：-20~45℃ 3 个月（3 months）：-20~35℃ 12 个月（1 year）：-20~25℃

3.外观及尺寸（Appearance and Dimension）

3.1 外观（Appearance）

不得有严重的划伤、生锈、变色或者漏液等可能会造成电池外观不良的现象。

There shall be no such as deep scratch, rust, discoloration or leakage, which may adversely affect the commercial value of the cell.

3.2 尺寸（Dimension）

直径（Diameter）： 18.40±0.20mm； 高度（Height）： 65.0±0.3mm.

4.性能规格（Performance Specification）

4.1测试条件（Testing Conditions）

4.1.1 测试设备（Test equipment）

（1）游标卡尺：精度为 0.01mm

The slide caliper should have 0.01 mm scale.

（2）内阻测试仪：在 1kHz 交流条件下进行内阻测试，精度不低于0.1mΩ/0.5mV

The Internal resistance testing system with AC 1kHz should have an accuracy ofthe grade 0.1mΩ and 0.5mV or higher.

4.1.2 除特殊要求外，所有测试均在标准温度25℃±2℃和标准湿度65%RH±20%RH 的条件下进行。测试使用电 池为交货一周内的新电池。

Unless otherwise specified, all tests stated in this specification are conducted at temperature 25±2℃ and humidity under 65%RH±20%RH.

4.2充电方式（Charge Mode）

标准充电：25±2℃下，0.5C（1000mA）恒流充电至3.65V，再以3.65V恒压充电至电流衰减为20mA。

"Standard Charge" means charging the cell with charge current of 0.5C (1000mA) and constant voltage 3.65Vat 25±2℃, 20mA cut-off.

快速充电：25±2℃下，1C 恒流充电至 3.65V，再以3.65V 恒压充电至电流降至20mAh。

"Rapid Charge" means charging the cell with charge current of 1C and constant voltage 3.65V at 25±2℃， 20mA cut-off.

4.3放电方式（Discharge Mode）

标准放电：25±2℃下，0.2C 恒流放电至2.0V。

"Standard Discharge" means discharging the cell with discharge current of 0.2C at 25±2℃， 2.0V cut-off.

4.4交流内阻（Ac Internal Resistance）

25℃±2℃下，在 1kHz 交流条件下进行内阻测试，精度0.1mΩ/1mV，出货带电态电池内阻≤25mΩ。

Initial internal resistance（measuredat AC 1kHz at shipping SOC）≤ 25mΩ.

4.5 温度特性（Temperature Dependence of Discharge Capacity）

25±2℃下按照“标准充电”充满电，在测试温度下搁置4h 后，按照下表中的放电方式放电，记录不同温度下电池放电容量，并计算与25℃放电容量百分比，满足下表要求。

Charge the battery fully at 25±2℃ according to the "standard charge", after sitting at the test temperature for 4 hours, discharge the battery according to the discharge mode listed in the following table. Record the discharge capacity of the battery at different temperatures and calculate the percentage to the discharge capacity at 25±2℃.

测试温度 Temperature	-10℃	0℃	25℃	60℃
放电倍率 Discharging rate	**0.2C（400mA）**	**0.5C（1000mA）**	**0.2C（400mA）**	**0.5C（1000mA）**
容量百分比 Capacity ratio	≥55%	≥60%	100%	≥95%

4.6 倍率放电性能（Rate Discharge Performance）

25±2℃下按照“标准充电”充满电，分别按照以下放电方式进行放电，记录电池放电容量，并计算与电池 0.2C 放 电容量百分比，满足下表要求。

Charge the battery fully at 25±2℃ according to the "standard charge",discharge the battery in the following way, record the discharge capacity and calculate the percentage to the 0.2C capacity of the battery.

放电倍率discharge rate	**0.5C（1000mA）**	**1.0C（2000mA）**	**2.0C（4000mA）**	**3.0C（6000mA）**
容量百分比Capacity ratio	≥95%	≥92%	≥88%	≥85%

4.7 存储性能（Storaging Performance）

4.7.1 常温存储（Room temperature storage）

测试条件	循环测试流程	标准
温度：25±2℃ 存储时间：28 天 25±2℃,28days	1 、常温下标准充电，标准方式放电，记为初始容量； Standard charge and discharge ， recorded as Initial capacity	剩余 容量/初始容量≥90%； Residual capacity/ Initial capacity≥90%
	2、常温下标准充电后，置于 25℃±2℃环境下存储 28 天； Standard charge and then storage at 25℃±2℃ for 28days	
	3、标准方式放电，记为剩余容量； Standard discharge, recorded as Residual capacity	恢复 容量/初始容量≥95%； Recovery capacity/ Initial capacity≥95%
	4 、标准方式充电，标准方式放电，记为恢复容量； Standard charge and discharge ， recorded as Recovery capacity	

4.7.2 高温存储（High temperature storage）

测试条件	循环测试流程	标准
温度：60±2℃ 存储时间：7 天 60±2℃,7days	1、常温下标准充电，标准方式放电，记为初始容量； Standard charge and discharge ， recorded as Initial capacity	剩余容量/初始容量≥90%； Residual capacity/ Initial capacity≥90% 恢复容量/初始容量≥95%； Recovery capacity/ Initial capacity≥95%
	2、常温下标准充电后，置于 60℃±2℃环境下存储 7 天； Standard charge and then storage at 60℃±2℃ for 7 days	
	3、按照标准方式放电，记为剩余容量； Standard discharge, recorded as Residual capacity	
	4、按照标准方式充电，标准方式放电，记为恢复容量； Standard charge and discharge ， recorded as Recovery capacity	

4.8 循环寿命（Cycle Lifes）

测试环境	循环测试流程	循环次数	标准
温度：25±2℃	1、标准充电（0.5C）后搁置 10 分 钟 Standard charge（0.5C）， and then rest 10min； 2 、1C 放电至 2.5V 后搁置 10 分钟 1C discharge to 2.5V ， and then rest 10min；	1000 次	放电容量/初始容量≥70%； *初始容量为前 3 次放电容量平均值 The ratio of the 1000th discharge capacity and the initial capacity ≥70% *The initial capacity is the mean value of first three cycles capacity.

备注：经常在高温（≥35℃）及高倍率或高电压情况下充放电，会造成电池循环寿命缩短；经常在高温 （≥60℃）下充放电，可能存在安全隐患。

Note: Frequently be charged and discharged at high temperature (≥35℃) and high rate or high voltage will shorten the cycle life of the battery; Frequently be charged and discharged at high temperature (≥60℃), which may cause potential safety problems.

4.9安全特性（Safety Performance）

项目 Item	测试条件 Test Condition	规格 Specification
4.9.1 过放电 Over discharge Test	标准充电后，1C 放电2.5 小时。 The cell shall be standard charged, and discharged at 1C for 2.5 hours.	不起火，不爆炸，不漏液 No fire ， No explode，No leakage
4.9.2 过充电 Overcharge Test	标准充电后，设置 1C（2000mA）， 10V 连续恒流充电 2.5 小时。 After standard charged, the cell shall be charged for 2.5hours using 10V, 1C（2000mA）.	不起火，不爆炸 No fire ， No explode
4.9.3 外部短路测试 External Short- Circuiting Test	标准充电后电池正负极间接 80±20mΩ 以下内阻电线短路 1 小时 以上。 The battery shall be standard charged. The plus and minus terminals of the battery shall be short circuited with a wire having 80±20mΩ or less resistance, and left for 1 hour.	不起火，不爆炸 No fire ， No explode
4.9.4 跌 落 测 试 Drop Test	标准充电后，电池从 100cm 高处落下到水泥地面上，X、Y、Z 面各落下一次。 The cellshall be standard charged and then dropped onto concrete from the height of 100cm in 3 directions X, Y, and Z once at each direction.	不起火，不爆炸 No fire ， No explode

4.9.5 加热测试 Heating Test	将充满电的电池放在重力对流或循环空气的烘箱中进行加热，烘箱的温度以每分 5±2°C 的速率上升到 130±2°C 后保温 30 分钟。 The charged cells are heated in a gravity convection or circulating air oven.The temperature of the oven is to be raisedata rate of 5±2°C per minute. The oven is to remain for 30 minutes at 130±2°C before the test is discontinued.	不起火，不爆炸 No fire ， No explode
4.9.6 挤压实验 Crush test	将电池放在两个平面之间，使用直径 32mm 的圆柱体施加压力，压强持续增加到 17.2MPa，压力达到 13kN 后释放压力。 The force for the crushing is to be applied by a hydraulic ram with a 1.25 inch (32mm) diameter piston. The crushing is to be continued until a pressure reading of 17.2MPa is reached on the hydraulic ram, applied force of 13kN.	不起火,不爆炸 No fire, nor explosion

5.电池焊接部位（Welding Allowable Part on a cell）

电池侧壁不可焊接，仅可在头部、底部进行焊接。
Welding is not allowed on cell side and wall, only be allowed on the top and end of the cell.

6.出货前电池充电态 （Charge State of Battery Before Shipment）

出货电池处于10%充电状态，由于电池存在自耗，运送到客户端的电池无法完全保证10%荷电量。运输过程应防止剧烈振动、冲击、日晒雨淋。

The batteries delivered to the client are in a state of 10% SOC. Due to self-discharging, the cells delivered to the client cannot fully guarantee 10% SOC. During transportation, violent vibration, impact, sun and rain should be prevented.

7.包装（Package）

电池包装每盒装 100 只电池，每箱装4 盒，共400 只电池。
Packing: 100 cells to a carton, 4 cartons to a big box, 400 cells in total.

8.保证（Warranty）

电池的保质期从出货之日算起为1年。如果证明电池的缺陷是在制造过程中形成的而不是由于用户滥用及错误使 用造成，本公司负责退换电池。

The period of warranty is one year from the date of shipment. Guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customers abuse and misuse.

9. 锂离子二次电池的使用操作禁止及注意事项

Handling Precaution and Prohibitions of Lithium Ion Rechargeable Cells and Batteries

9.1 充电（Charging）

9.1.1 电芯应该使用恒流-恒压充电的方式进行充电，单体电芯的充电电压不能超过 3.65V，充电电压高于 3.65V 会导致电芯循环寿命缩短。

The cell should be charged using constant current - constant voltage charging, The charging voltage of a single cell should not exceed 3.65V, Charging voltage higher than 3.65V will shorten the cycle life of the cell.

9.1.2 充电器应该配备一个完整的充电检测装置。充电检测装置能够通过计时器、电流检测以及开路电压检测， 检测到电池充满电的状态。当充电时间、电流或电压其中之一检测到电池充满电后，应该完全切断充电电路，避 免产生涓流充电。

The charger shall be equipped with a complete charging detection device. The charging detection device detects when the battery is fully charged through a timer, current detection, and open circuit voltage detection. When one of the charging time, current, or voltage detects that the battery is fully charged, the charging circuit should be completely cutoffto avoid generating trickle charging.

9.1.3 电芯充电应在温度为0℃~45℃下按规定电流进行，当电芯温度超出此范围时，应静置到电池温度达到以上 范围后再行充电。The battery shall be charged at the specified current with the temperature between 0~45℃. When the battery temperature exceeds this range, it shall be placed for a while until the battery temperature reaches the above range before charging.

9.1.4 为确保电池寿命，推荐使用标准充电方法或小电流充电，减少快充。

In order to ensure the life of battery, it is recommended to use standard charging method or low current to reduce fast charging.

9.1.5 不要对电池反向充电。

Don't charge the battery reversely.

9.2 放电（Discharging）

9.2.1 电芯放电终止电压需高于2.0V；

The end-offvoltage should be above 2.0V.

9.2.2 电芯放电温度范围为-20℃~60℃， 按规定电流进行，放电过程中，如果电芯表面温度超过60℃， 须终止放 电。

The discharge temperature range is -20℃~60℃, according to the specified current during the discharge process, discharge must be terminated when the temperature exceeds 60℃ during discharging process.

9.3 储存（Storaging）

电芯应在干燥无腐蚀性气体的环境下储存，不要让电芯承受任何压力，且不能有冷凝液体附在电芯表面，长期存 储的最佳温度为-20℃~25℃, 电芯长期存储建议荷电态25%~35%，并且使用前需要进行电压检测。

The cell should be stored in a dry non-corrosive gas environment, do not let the battery under any pressure, and there is no condensation liquid attached to the surface of the cell. The best long-term storage temperature is -20℃~25℃, and the cell shall be in 25%~35%SOC state, and the voltage should be test before use.

9.4 保护电路（Protective Circuit）

9.4.1 出于安全的原因和为了不缩短循环寿命，模组内单体池最大电压应该低于3.65V（包含公差）。

For safety reasons and cycle life, the maximum cell voltage within each module should be below 3.65V (including tolerances).

9.4.2 过放电保护：如果单体电芯电压达到2.0V，我们建议过放电保护应该切断放电电流，电路的消耗电流要尽 量小。

Over discharge protection: if the single cell voltage reaches 2.0V, we suggest that over discharge protection should cut off the discharge current, the consumption current of the circuit should be as small as possible.

9.4.3 过电流保护：如果单体电池放电电流超过 3C，过电流保护应该切断放电电流电路。

Overcurrent protection: if the cell discharge exceeds about 3C, the overcurrent protection should cut off the discharge circuit.

9.4.4 外短路保护：电池模组要有防止外部短路功能。

External short circuit protection: The battery module should have the function to prevent external short circuit.

9.4.5 为了避免长期存储出现过放电模式，电池包保护线路的消耗电流应该设置的尽量小。长期未使用时，要定 期检查电池剩余电量状态，要确保电池组内单体电芯不能过放。

To avoid overdischarge in long-term storage, the consumption current of the battery pack protection line should be set as small as possible. If the battery is not used for along time, periodically check the remaining battery power and ensure that the single battery cannot be overdischarged state.

9.5 防止环境误用（Environmental Misusage）

9.5.1 请勿将电池靠近火源或热源。
Don't throw the battery into the fire.

9.5.2 不要将电池沾湿，或将其浸泡或投进水或海水中。
Don't immerse, throw, wet the battery in water / seawater.

9.6 警告（Warning）

9.6.1 不要将新旧电池混用或组装。

Don't use or assemble old and new batteries together.

9.6.2 若在规定时间内充电仍未完成，要停止电池充电。

Stop charging the battery if charging isn't completed within the specified time.

9.6.3 在使用、充电或储存过程中，若发现电池发热异常、变色、变形或其他反常情况，请停止使用电池。

Stop using the battery if the battery becomes abnormally hot, discoloration, deformation, or abnormal conditions is detected during use, charge, or storage.

9.6.4 若电池漏液或产生臭味，请将其立刻远离火源。

Keep away from fire immediately when leakage or foul odors are detected.

9.6.5 如果液体粘到皮肤或衣服上，立即用清水冲洗。若液体进入到眼睛，不要揉擦，用清水冲洗并马上就医。 If liquid leaks onto your skin or cloths, wash well with freshwater immediately. If liquid leaking from the battery gets into your eyes, don't rub your eyes and wash them with clean water and goto see a doctor immediately.

9.6.6 若电池端子脏污，请用干布擦拭后再使用电池。

If the terminals of the battery become dirty, wipe with a dry cloth before using the battery.

9.7 注意（Caution）

9.7.1 防止电气误用（Electrical misusage） 充
电电流必须控制在电池规格书规定值内。

Charge current must be controlled by specified value in Cell specification.

放电电流必须控制在电池规格书指定范围内。Discharge current must be controlled by specified value in Cell's specification.

在使用电池前，请务必阅读用户手册和处理防范措施。

Before using the battery, be sure to read the user's manual and precaution of it's handling. 废弃电池前，用绝缘胶带缠住电池终端。

Cover terminals with insulating tape before proper disposal.

电池在充电、使用和储存时，请将其远离带有静电的物体材料。

While the battery is charged, used and stored, keep it away from object materials with static electric chargers.

9.7.2 有关电池组在用电器具或充电器中的位置设计

Design of positioning the battery pack in application and charger

为了防止由高温引起的电池性能恶化，电池应放置在远离使用和充电过程中的发热区域。

To prevent the deterioration of the battery performance caused by heat, battery shall be positioned away from the area where heat is generated in the application and the charger.

9.8 其他（Others）

9.8.1 不要把电池储存在装有钥匙、项链、发夹、硬币、金属物体的口袋中，或与螺丝包在一起，避免金属导体短 路电池正负极。

Don't store the battery in a pocket or a bag together with metallic objects such as keys, necklaces, hairpins, coins, or screws， to avoid short circuit (+) and (-) terminals.

9.8.2 不要用烙铁等对电池进行局部加热。

Don't heat partial area of the battery with heated objects such as soldering iron.

9.8.3 不要用重物捶打电池。

Don't hit with heavy objects such as a hammer, weight.

9.8.4 不要踩踏电池，或将其扔或掉在硬地板上，以避免机械冲击。

Don't step on the battery and throw or drop the battery on the hard floor to avoid mechanical shock.

9.8.5 不要对电池包括保护电路进行拆卸或改装。

Don't disassemble the battery or modify the battery design including electric circuit.

9.8.6 不要把电池放进微波炉、烘干机或高压容器中。

Don't put the battery into a microwave oven, dryer or high-pressure container.

9.8.7 不要与其他制造商生产的电池、不同类型或不同规格的电池(如干电池、镍氢电池或镍镉电池) 一同使用或 组合。

Don't use or assemble the battery with other makers' batteries, different types and/or models of batteries such as dry batteries, nickel-metal hydride batteries, or nickel-cadmium batteries.

9.9 免责声明（Disclaimer）

对以下情况深圳市鹏荟科技有限公司不承担相应责任：

BONREX shall not assume corresponding responsibilities under the following circumstances:

9.9.1 对因违反规格书内注意事项及操作所产生的问题及造成的任何损失不承担责任；

The company shall not be liable for any loss or problems caused by violation of the notes and operations in the specification;

9.9.2 对因电路、电池包、电动车和充电器的设计及搭配所造成的任何问题不承担责任；

No liability for any problems caused by the design and collocation of circuits, battery packs, electric vehicles and chargers;

9.9.3 不接受因不正确的组装过程造成的异常电池；

Do not accept abnormal batteries caused by improper assembly process;

9.9.4 对于因不可抗力（如雷电，暴风雨，洪水，火灾，地震等）造成的任何问题不承担责任。

No liability for any problems caused by force majeure (such as lightning, storm, flood, fire, earthquake, etc.).

9.9.5 为了规范电池使用，使每一位客户和鹏荟的权利、义务、责任得到明确。在使用电池之前，请仔细阅读并 透彻理解规格书内容。

In order to standardize the use of batteries, the rights, obligations and responsibilities of each customer and BONREX are clearly defined. Please read and understand the specifications carefully before using the battery.

9.9.6 如果您选择使用本款电池，您的使用行为将被视为对本声明全部内容的认可。

为了安全起见，如有设备设计、锂离子电芯系统保护电路或大电流，快速充电和其它方面的特殊应用,请先咨询鹏荟公司相关事宜。

If you choose to use this battery, your use will be deemed to endorse the entire content of this statement.

For safety reasons, please consult BONREX for packs design, lithium ion cell system protection circuit or high current, fast charging and other special applications.

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BONREX reserves the right to modify, update and final interpretation of this statement.