MSDS Report

MSDS 报告

Applicant's name **委托方名称**	Huaibei Qianlibird New Energy Technology Co., LTD 淮北市千锂鸟新能源科技有限公司
Applicant's Address **委托方地址**	Innovation and Entrepreneurship Service Center, No.3 Taobo Road, Lieshan Economic Development Zone, Lieshan District, Huaibei City, Anhui Province 安徽省淮北市烈山区烈山经济开发区陶博路 3 号双创服务中心 419 室
Name of Sample **样品名称**	Rechargeable Cylinder Lithium-ion Cell 可充电圆柱锂离子电芯
Model **型号**	INR18650
Nominal Voltage **标称电压**	3.7V
Rated Capacity **额定容量**	1800mAh, 6.66Wh
Weight **重量**	44.4g
Size 尺寸 **(D×H)**	(18.5×65.0)mm
Prepared By **编制单位**	Shenzhen TCT Testing Technology Co., Ltd. 深圳市通测检测技术有限公司 2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China 广东省深圳市宝安区福海街道桥头社区稔山工业区振昌胶粘制品厂 2101、2201
Report No. **报告编号**	TCT221220M099-1

Written by 编写: April He 何娟 **Approved by 批准:** Evan Chen 陈琪

Inspected by 审核: Amy Zeng 曾 **Effective Date 生效日期:** 2023. 02. 07

Material Safety Data Sheet 化学品安全技术说明书

Section 1- Chemical Product & Company Identification
第一部分 化学品及企业标识

Name of Sample *样品名称*	Rechargeable Cylinder Lithium-ion Cell 可充电圆柱锂离子电芯
Manufacturer's name *制造商名称*	Huaibei Qianlibird New Energy Technology Co., LTD 淮北市千锂鸟新能源科技有限公司
Manufacturer's Address *制造商地址*	Innovation and Entrepreneurship Service Center, No.3 Taobo Road, Lieshan Economic Development Zone, Lieshan District, Huaibei City, Anhui Province 安徽省淮北市烈山区烈山经济开发区陶博路 3 号双创服务中心 419 室
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Section 2- Hazards Identification
第二部分 危险性概述

Classification of Danger *危险性类别*	See section 14. 见第十四部分。
Primary Route(s) of Exposure *浸入途径*	Eye, skin contact, ingestion. 眼睛，皮肤接触，摄入。
Health Hazard *健康危害*	The batteries are not hazardous when used according to the instructions of manufacturer under normal conditions. In case of abuse, there's Hazard of rupture, fire, heat, leakage of internal components, which could cause casualty loss. Abuses including but not limited to the following cases: charged for long time, short circuited, put into fire, whacked with hard object, punctured with acute object, crushed, and broken. 正常条件下根据制造商的说明使用电池不会产生危害。使用不当的情况下，有破裂、起火、发烫、内部成分泄漏的危险，并可能造成意外损失。使用不当的行为包括但不限于下列情况：长时间充电、短路、投入火中、硬物撞击、尖物刺破、破碎，和破裂。

Section 3- Composition/Information on Ingredients
第三部分 成分/组成信息

Chemical Name *化学名称*	*Concentration or concentration ranges (%)* *浓度或浓度范围(%)*	*CAS Number* *CAS 号(化学文摘索引登记号)*
Lithium Cobalt Oxide 钴酸锂	15-40	12190-79-3
Graphite 石墨	10-30	7782-42-5
Phosphate(1-), hexafluoro-, lithium 六氟磷酸锂	10-30	21324-40-3
Copper 铜	7-13	7440-50-8
Aluminum foil 铝箔	5-10	7429-90-5
Nickel 镍	1-5	7440-02-0

Labeling according to EC directives.
标签根据 EC 指令。
No symbol and Hazard phrase are required.
不需要象形符号和危险短语。
Note: CAS number is Chemical Abstract Service Registry Number.
注意: CAS 号是化学文摘服务注册号码。
N/A=Not apply.
N / A =不适用。

Section 4- First Aid Measures
第四部分 急救措施

Eye *眼睛*	Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid. 万一接触，立即用大量的清水冲洗至少 15 分钟，翻起上下眼睑，直到化学的残留物消失为止，迅速就医。
Skin *皮肤*	Remove contaminated clothes and rinse skin with plenty of water or shower for 15 minutes. Get medical aid. 万一接触，用大量水冲洗至少 15 分钟，同时除去污染的衣物和鞋子，迅速就医。
Inhalation *吸入*	Remove from exposure and move to fresh air immediately. Use oxygen if available. 立即从暴露处移至空气清新处，如果呼吸困难给予输氧，立即就医。
Ingestion *食入*	Ingesting damaged batteries, do not induce vomiting or give food or drink. Seek medical attention immediately. 食入损坏的电池，不要催吐且不要再吃下食物或喝饮料，立刻就医。

Section 5- Fire Fighting Measures
第五部分 消防措施

Characteristics of Hazard *危险特性*	Dusts at sufficient concentrations can form explosive mixtures with air. Combustion generates toxic fumes. 高密度粉尘遇空气会形成爆炸性混合物。燃烧生成有毒烟雾。
Hazardous Combustion Products *燃烧产生的危险物品*	Carbon dioxide. 二氧化碳。
Fire-extinguishing Methods and Extinguishing Media *灭火方法及灭火剂*	For small fires, use water spray, dry chemical, carbon dioxide or chemical foam. 对于小型火险，可使用水枪，干冰（也就是液态二氧化碳）或化学泡沫。
Attention in Fire-extinguishing *灭火注意事项*	Wear self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. 因为压强关系，要穿戴可呼吸式全身防护装备，MSHA/NIOSH（经认证或等效的），以及佩戴全套防护装置。

Section 6- Accidental Release Measures
第六部分 泄露应急处理

Personal Precautions, protective equipment, and emergency procedures *个人预防措施、防护装备和应急程序*	In case of rupture. Attention! Corrosive material. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Use personal protective equipment as required. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Refer to protective measures listed in Sections 7 and 8. 万一破裂。注意！腐蚀性物质。避免接触皮肤，眼睛或衣服。确保空气流通。根据需要使用个人防护装备。将人员撤离到安全区域。让人们远离溢出/泄漏处和处于逆风。参考第七部分和第八部分中列出的防护措施。
Environmental Precautions *环境保护措施*	Prevent product from contaminating soil and from entering sewers or waterways. 防止产品污染土壤和进入下水道或水道。
Methods and materials for Containment *方法和材料控制*	Stop the leak if safe to do so. Contain the spilled liquid with dry sand or earth. Clean up spills immediately. 出于安全，阻止泄漏，可以用干砂或泥土来遏制液体溢出，立即清理溢出物。
Methods and materials for cleaning up *清理的方法和材料*	Absorb spilled material with an inert absorbent (dry sand or earth). Scoop contaminated absorbent into an acceptable waste container. Collect all contaminated absorbent and dispose of according to directions in Section 13. Scrub the area with detergent and water; collect all contaminated wash water for proper disposal.

	用惰性吸收剂(干砂或泥土)吸收溢出的材料。污染物转移到可接受的废物容器中。收集所有受污染的吸收剂，按照第十三部分的说明进行处理。用洗涤剂和水清洁污染区域，收集所有受污染的洗涤水，妥善处理。

Section 7- Handling and Storage
第七部分 操作处置与储存

Handling *操作*	The battery may explode or cause burns, if disassembled, crushed or exposed to fire or high temperatures. Do not short or install with incorrect polarity. 拆解、挤压、直接放入火中或高温条件下，电池可能发生爆炸和燃烧。禁止短路或将电池正负极错误的安装在设备中。
Storage *储存*	Store in a cool, dry, well-ventilated area away from incompatible substances. Store locked up. Keep out of the reach of children. 储藏于阴凉，干燥，通风处，远离接触会发生反应的材料。存储锁定。放在儿童无法接触的地方。
Other Precautions *其他要注意的防范措施*	In case of rupture. Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes or clothing. Use personal protection equipment. 万一破裂。按照良好的工业卫生和安全规范进行操作。避免接触皮肤，眼睛或衣服。使用个人防护设备。

Section 8 - Exposure Controls/Personal Protection
第八部分 接触控制和个体防护

Engineering Controls *工程控制*	Use adequate ventilation to keep airborne concentrations low. If used under conditions that generate particulates, the ACGIH TLV-TWA of 3mg/m^3 respirable fraction (10mg/m^3 total) should be observed. 保证空气流通使空气密度保持在低水平。如果在会生成微粒的情况下使用，应仔细观察 3mg/m^3 ACGIH TLV-TWA 3 的吸入量（总量为 10mg/m^3）。
Personal Protective Equipment *个人防护设备*	Eye and Face Protection: None required for consumer use. If there is a Hazard of contact: Tight sealing safety goggles. Face protection shield. 眼睛和脸部保护：消费者无需使用。如果有接触危险：密封安全护目镜。面部防护罩。 Skin and Body Protection: None required for consumer use. If there is a Hazard of contact: Wear protective gloves and protective clothing. 皮肤和身体防护：消费者无需使用。如果有接触危险：穿戴防护手套和防护服。 Respiratory Protection: No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced,

	ventilation and evacuation may be required. 呼吸系统防护：正常使用条件下不需要防护设备。如果超过暴露限值或发生刺激，可能需要通风和疏散。

Section 9- Physical and Chemical Properties
第九部分 理化特性

Physical State *物理状态*	Appearance: Cylindrical 外形：圆柱形
	Color: Purple 颜色：紫色
	Odour: If leaking, smells of medical ether. 气味：泄漏时，医用乙醚的气味。
Change in condition: *变化的条件:*	
pH 酸碱度	Not applicable as supplied. 不适用。
Flash Point 闪点	Not applicable unless individual components exposed. 除非单个的组件暴露，否则不适用。
Flammability 易燃度	Not applicable unless individual components exposed. 除非单个的组件暴露，否则不适用。
Relative density: 相对密度	Not applicable unless individual components exposed. 除非单个的组件暴露，否则不适用。
Solubility (water) 溶解性（水溶性）	Not applicable unless individual components exposed. 除非单个的组件暴露，否则不适用。
Solubility (other) 溶解性（其他）	Not applicable unless individual components exposed. 除非单个的组件暴露，否则不适用。

Section 10 – Stability and Reactivity
第十部分 稳定性和反应性

Chemical Stability *化学稳定性*	Stable under recommended storage conditions. 在推荐的储存条件下可以保持稳定。
Possibility of Hazardous Reactions *危险反应的可能性*	None under normal processing. 正常处理下没有。
Conditions to Avoid *应避免的条件*	Exposure to air or moisture over prolonged periods. 暴露在空气中或长时间受潮。
Incompatible materials *不相容材料*	Acids, Oxidizing agents, Bases. 酸，氧化剂，碱。
Hazardous Decomposition Products *有危害分解物*	Carbon oxides. 二氧化碳。

Section 11 – Toxicological Information
第十一部分 毒理学信息

Irritation *刺激*	In the event of exposure to internal contents, vapour fumes may be very irritating to the eyes and skin. 内部物质暴露的情况下，蒸汽烟雾可能对眼睛和皮肤的刺激性。
Sensitization *致敏*	Not Available. 不适用。
Reproductive Toxicity *再生毒性*	Not Available. 不适用。
Toxicologically Synergistic Materials *协同材料毒理学*	Not Available. 不适用。

Section 12-Ecological Information
第十二部分 生态学信息

General note: *通用信息：*	Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system. 不允许未稀释或大量的产品接触地下水、水道或污水处理系统。
Anticipated behavior of a chemical product in environment/possible environmental impact/ ecotoxicity *化学产品在环境/可能的环境预期的行为的一种生态毒性*	Not Available. 不适用。

Section 13 – Disposal Considerations
第十三部分 废弃处置

Waste Treatment ***废弃处置方法***	Recycle or dispose of in accordance with government, state & local regulations. 建议遵照国家和地方法规处置或再利用。
Attention for Waste Treatment *废弃注意事项*	Deserted batteries shouldn't be treated as ordinary trash. Shouldn't be thrown into fire or placed in high temperature. Shouldn't be dissected, pierced, crushed or treated similarly. Best disposal method is recycling. 废电池不能被当作普通垃圾。不能扔进火中或置于高温下。不能解体，刺穿，破碎或类似的处理。最好的处理办法是回收利用。

Section 14 – Transport Information
第十四部分 运输信息

UN number *联合国货物编号（UN 编号）*	3480 & 3481
Proper shipping name *运输专用名称*	Lithium ion batteries (limited to a maximum of 30% SoC) or; 锂离子电池(荷电状态不得超过其额定容量的 30%)或； Lithium ion batteries packed with equipment (including lithium ion polymer batteries) or; 与设备一起包装的锂离子电池(包括锂离子聚合物电池)或； Lithium ion batteries contained in equipments (including lithium ion polymer batteries). 包含在设备中的锂离子电池(包括锂离子聚合物电池)。
Label(s) / Placard Required *标签/标牌要求*	Miscellaneous Lithium batt 杂项锂电池
Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises. *无论是对内还是对外的运输或运输方式，用户都需要注意或遵守的特殊预防措施。*	
ICAO / IATA: 国际民间航空组织/国际航空运输协会：	Can be shipped by air in accordance with International Civil Aviation Organization (ICAO), TI or International Air Transport Association (IATA), DGR Packing Instructions (PI) 965 Section IB, PI 966 Section II and PI 967 Section II appropriate of IATA DGR 64th (2023 Edition) for transportation. 货物可根据民用航空组织（ICAO），TI 或国际航空运输协会（IATA），DGR 64th（2023 版）包装说明(PI)965 Section IB，PI 966 Section II 和 PI 967 Section II 相关规定进行空运。
IMDG CODE: 国际海运危险货物规则：	The batteries are not restricted to IMDG Code 2020 Edition (Amdt 40-20) according to special provision 188. 根据特殊规定 188，该电池不受 IMDG Code 2020 版（Amdt 40-20）限制。
DOT: 美国运输部：	Other requirements for the US Department of Transportation (DOT) Subchapter C, Hazardous Materials Regulations if shipped in compliance with 49 CFR 173.185. 美国运输部（DOT）有害物质规则 C 分章中的其他规定，运输符合要求 49 CFR 173.185。
ADR/ ADN: 欧洲国际陆运危险货物协定/关于内陆水道国际运输危险货物的欧洲协定：	The batteries are not subject to the provisions of United Nations Economic Commission for Europe (UNECE) ADR/ADN if they meet the requirements of special provision 188 of Chapter 3.3. Applicable as from 1 January 2023. 自 2023 年 1 月 1 日起适用于联合国欧洲经济委员会（UNECE）ADR / ADN，如果电池符合第 3.3 章第 188 条的特殊要求，则电池不受限制。
In addition, to be permitted in transport each lithium cell and battery types must have passed the applicable tests set out in Subsection 38.3 of the UN Manual of Tests and Criteria. 此外，每个锂电芯和电池类型都必须通过联合国《关于危险货物运输的建议书 试验和标准手册》第 38.3 节规定的适用测试。	

Section 15 – Regulatory Information
第十五部分 法规信息

Dangerous Goods Regulations

《危险物品规则》

Recommendations on the Transport of Dangerous Goods-Model Regulations (22nd revised edition)

联合国《关于危险货物运输的建议书 规章范本》（22nd 修订版）

Recommendations on the Transport of Dangerous Goods-Manual of Tests and Criteria

联合国《关于危险货物运输的建议书 试验和标准手册》

International Air Transport Association (IATA)

《国际航空运输协会》（IATA）

International Maritime Dangerous Goods (IMDG Code 2020 Edition Amdt 40-20)

《国际海运危险货物规则》（IMDG Code 2020 版 Amdt 40-20）

Technical Instructions for the Safe Transport of Dangerous Goods

《危险货物安全运输技术指南》

Classification and code of dangerous goods (GB 6944-2012)

《危险货物分类和品名编号》- GB 6944-2012

2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

2012《职业安全与健康标准》危险通信标准（29 CFR 1910.1200）

Toxic Substance Control Act (TSCA)

《有毒物质控制法》（TSCA）

Code of Federal Regulations

《联邦条例》

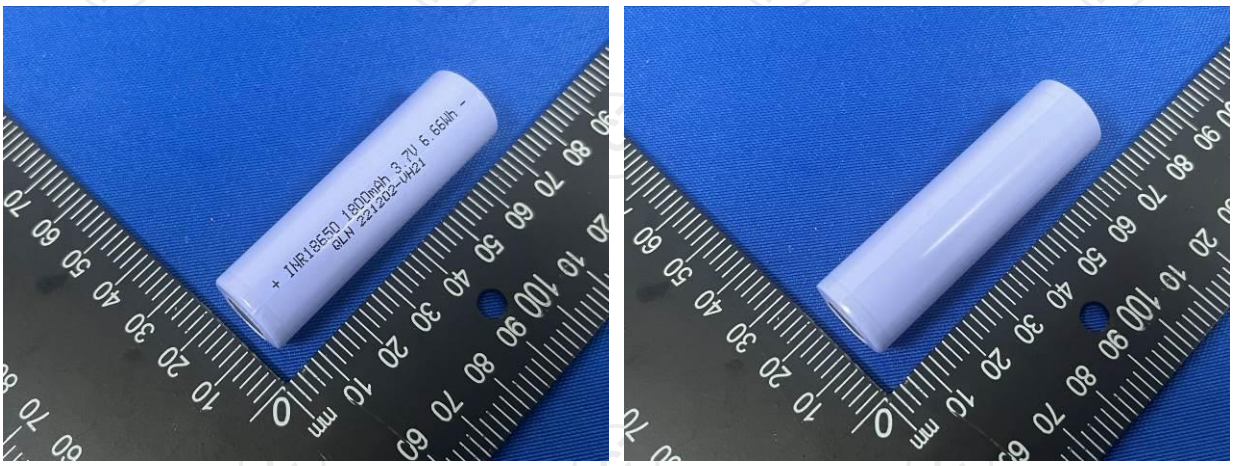
In accordance with all Federal, State and local laws

符合所有联邦、州和地方法律

Section 16 – Additional Information
第十六部分 其他信息

MSDS creation date: 2023 Version: 1.0

Sample photo 样品照片:



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The data/information contained herein has been reviewed and approved for general release on the basis that this document contains no export controlled information.

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********End of report********

********报告结束********

集团微信订阅号 集团微信服务号

Pony Testing International Group

报告编号 Report ID: MRIKW7FG2784157U4 Page 1 of 2

锂电池或锂电池组 UN38.3 试验概要
Lithium Cell or Battery UN38.3 Test Summary

单位信息 Company information:

委托单位 Applicant		淮北市千锂鸟新能源科技有限公司 Huaibei Qianlibird New Energy Technology Co., LTD
生产商 Manufacturer	名称 Name	淮北市千鲤鸟新能源科技有限公司 Huaibei Qianlibird New Energy Technology Co., LTD
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	邮箱 E-mail	2316838439@qq.com
	网址 Website	https://shop24256c132d7n9.1688.com/
测试单位 Test Lab.	名称 Name	深圳市通测检测技术有限公司 Shenzhen TCT Testing Technology Co., Ltd.
	地址 Address	广东省深圳市宝安区福海街道桥头社区稔山工业区振昌胶粘制品厂 2101、2201 2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
	电话 Tel.	86-755-27673339
	邮箱 E-mail	tom@tct-lab.com
	网址 Website	http://www.tct-lab.com

样品信息 Sample information:

样品名称 Sample name	可充电圆柱锂离子电芯 Rechargeable Cylinder Lithium-ion Cell	样品型号 Sample model	INR18650
原始测试型号 Original tested type	/	产品参数 Sample parameter	3.7V 1800mAh
样品质量 Sample mass	44.40g	额定瓦时 Watt-hour rating	6.66Wh
电池或电池组类型 cell or battery type	锂离子电池芯 Lithium ion cell	物理形状 Physical description	紫色圆柱形 Purple Cylindrical
原 UN38.3 报告编号 Original UN38.3 report No.	/	测试报告日期 Test report date	/
UN38.3 报告编号 UN38.3 Report No.	TCT221220B099	报告日期 Report date	2023-01-03

No.: MRIKW7FG2784157U4
Code: ORdO16

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PONY 谱尼测试
Pony Testing International Group

声 明
Statement

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Pony Testing International Group

报告编号 Report ID: MRIKW7FG2784157U4

测试方法 Test method:

《试验和标准手册》 第七修订版修正 1 第III部分 38.3 章节 Manual of Tests and Criteria (ST/SG/AC.10/11/Rev.7/Amend.1 Part III sub-section 38.3)

测试项目及结论 Test item & conclusion:

测试项目 Test item	结论 Conclusion	测试项目 Test item	结论 Conclusion
T1：高度模拟 Altitude Simulation	通过 Pass	T5：外部短路 External short circuit	通过 Pass
T2：温度试验 Thermal test	通过 Pass	T6：撞击 Impact	通过 Pass
T3：振动 Vibration	通过 Pass	T7：过度充电 Overcharge	不适用 Not applicable
T4：冲击 Shock	通过 Pass	T8：强制放电 Forced discharge	通过 Pass
38.3.3（f）	不适用 Not Applicable	38.3.3（g）	不适用 Not Applicable
样品图片 Sample Picture			
测试结论 Test Conclusion	测试样品符合《试验和标准手册》第七修订版修正 1 第III部分 38.3 章节要求。 The tested samples meet the requirements of test items of the Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7/Amend.1 Part III sub-section 38.3).		
备注 Remark	/		
签名 Signature	郑春梅 技术主管 Technical Director	签发日期 Issue date	2023-02-16

UN38.3 Test Report

UN38.3 检测报告

Applicant's name 委托方名称	Huaibei Qianlibird New Energy Technology Co., LTD 淮北市千锂鸟新能源科技有限公司
Applicant's Address 委托方地址	Innovation and Entrepreneurship Service Center, No.3 Taobo Road, Lieshan Economic Development Zone, Lieshan District, Huaibei City, Anhui Province 安徽省淮北市烈山区烈山经济开发区陶博路 3 号双创服务中心 419 室
Name of Sample 样品名称	Rechargeable Cylinder Lithium-ion Cell 可充电圆柱锂离子电芯
Model 型号	INR18650
Testing Laboratory 测试实验室	Shenzhen TCT Testing Technology Co., Ltd. 深圳市通测检测技术有限公司 2101 & 2201, Zhenchang Factory, Renshan Industrial Zone, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China 广东省深圳市宝安区福海街道桥头社区稔山工业区振昌胶粘制品厂 2101、2201
Report No. 报告编号	TCT221220B099
Date of Issue 签发日期	2023. 01. 03
Test Conclusion 测试结论: **The test results are qualified. 测试结果为合格。**	

Tested by主检人: April He 何娟 **Approved by批准人:** Evan Chen 陈祖铭

Inspected by 审核人: Amy Zeng 曾令 **Seal of TCT 报告单位（盖章）:** TCT TESTING TECHNOLOGY CO., LTD. SHENZHEN TCT

Hotline: 400-6611-140 Tel: 86-755-27673339 E-mail: tom@tct-lab.com http://www.tct-lab.com

Ⅰ、Sample Description 样品描述

Name of Sample 样品名称	Rechargeable Cylinder Lithium-ion Cell 可充电圆柱锂离子电芯		**Model 型号**	INR18650	
Manufacturer's name 制造商名称	Huaibei Qianlibird New Energy Technology Co., LTD 淮北市千锂鸟新能源科技有限公司				
Manufacturer's Address 制造商地址	Innovation and Entrepreneurship Service Center, No.3 Taobo Road, Lieshan Economic Development Zone, Lieshan District, Huaibei City, Anhui Province 安徽省淮北市烈山区烈山经济开发区陶博路 3 号双创服务中心 419 室				
Manufacturer's Contact Telephone 制造商联系电话	+86-561-5218111	**E-mail 邮箱**	2316838439@qq.com	**Web 网址**	https://shop24256c132d7n9.1688.com/
Trade Mark 商标	----	**Shape 形状**	Cylindrical 圆柱形	**Size 尺寸 (D×H)**	(18.5×65.0)mm
Nominal Voltage 标称电压	3.7V	**Rated Capacity 额定容量**	1800mAh 6.66Wh	**Charge Voltage 充电电压**	4.2V
Nominal Charge Current 标称充电电流	360mA	**Maximum Charge Current 最大充电电流**	1800mA	**End of Charge Current 结束充电电流**	18mA
Discharge Cut-off Voltage 放电截止电压	3.0V	**Nominal Discharge Current 标称放电电流**	360mA	**Maximum Discharge Current 最大放电电流**	1800mA
Cell Model 电池型号	----	**Cell Nominal Voltage 电池标称电压**	----	**Cell Rated Capacity 电池额定容量**	----
Cells Number 电池数量	----	**Sample Receiving Date 样品接收日期**	2022. 12. 05	**Testing Date 测试日期**	2022. 12. 20 — 2023. 01. 03

Ⅱ、Test Standard 检测标准

UN "Manual of Tests and Criteria" ST/SG/AC.10/11/Rev.7/Amend.1/Subsection 38.3.

联合国《试验和标准手册》（第七修订版修正 1）38.3 节。

Ⅲ、Test Item 测试项目

T.1. ☒Altitude simulation 高度模拟
T.2. ☒Thermal test 温度试验
T.3. ☒Vibration 振动
T.4. ☒Shock 冲击
T.5. ☒External short circuit 外部短路
T.6. ☒Impact / ☐Crush 撞击/挤压
T.7. ☐Overcharge 过度充电
T.8. ☒Forced discharge 强制放电

Ⅳ、Test Method and Requirement 测试方法和要求

T.1. Altitude simulation 高度模拟

Purpose 目的

This test simulates air transport under low-pressure conditions.

本试验模拟在低压条件下的空运。

Test procedure 测试程序

Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature (20 ± 5 °C).

试验电池和电池组应在压力等于或低于 11.6 千帕和环境温度 (20 ± 5 °C) 下存放至少 6 小时。

Requirement 要求

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

如果无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%，电池和电池组即符合这一要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。

T.2. Thermal test 温度试验

Purpose 目的

This test assesses cell and battery seal integrity and internal electrical connections. The test is conducted using rapid and extreme temperature changes.

本试验评估电池和电池组的密封完善性和内部电连接。试验利用迅速和极端的温度变化进行。

Test procedure 测试程序

Test Cells and batteries are to be stored for at least six hours at a test temperature equal to 72 ± 2 °C, followed by storage for at least six hours at a test temperature equal to – 40 ± 2 °C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20 ± 5 °C). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

试验电池和电池组应先在试验温度等于 72 ± 2 ℃的条件下存放至少 6 小时，接着再在试验温度等于 - 40 ± 2 ℃的条件下存放至少 6 小时。两个极端试验温度之间的最大时间间隔为 30 分钟。此程序重复进行，共完成 10 次，接着将所有试验电池和电池组在环境温度 (20 ± 5 ℃)下存放 24 小时。对于大型电池和电池组，暴露于极端试验温度的时间至少应为 12 小时。

Requirement 要求

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

如果无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%，电池和电池组即符合这一要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。

T.3. Vibration 振动

Purpose 目的

This test simulates vibration during transport.

本试验模拟运输过程中的振动。

Test procedure 测试程序

Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep shall differ for cells and batteries with a gross mass of not more than 12 kg (cells and small batteries), and for batteries with a gross mass of more than 12 kg (large batteries).

For cells and small batteries: from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs (approximately 50 Hz). A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz.

For large batteries: from 7 Hz to a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 2 gn occurs (approximately 25 Hz). A peak acceleration of 2 gn is then maintained until the frequency is increased to 200 Hz.

电池和电池组紧固于振动机平台，但紧固程度不能造成电池变形以致不能准确传递振动。振动应是正弦波形，对数频率扫描从 7 赫兹到 200 赫兹，再回到 7 赫兹，跨度为 15 分钟。这一振动过程须对三个互相垂直的电池安装方位的每一方向重复进行 12 次，总共为时 3 小时。其中一个振动方向必须与端面垂直。

作对数式频率扫描，对总质量不足 12 千克的电池和电池组(电池和小型电池组)，和对 12 千克及更大的电池组(大型电池组)应有所不同。

对电池和小型电池组：从 7 赫兹开始，保持 1 gn 的最大加速度，直到频率达到 18 赫兹。然后将振幅保持在 0.8 毫米(总偏移 1.6 毫米)，并增加频率直到最大加速度达到 8 gn(频率约为 50 赫兹)。将最大加速度保持在 8 gn 直到频率增加到 200 赫兹。

对大型电池组：从 7 赫兹开始，保持 1 gn 的最大加速度，直到频率达到 18 赫兹。然后将振幅保持在 0.8 毫米(总偏移 1.6 毫米)，并增加频率直到最大加速度达到 2 gn(频率约为 25 赫兹)。将最大加速度保持在 2 gn 直到频率增加到 200 赫兹。

Requirement 要求

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire during the test and after the test and if the open circuit voltage of each test cell or battery directly after testing in its third perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

如果试验中和试验后无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池或电池组在第三个垂直安装方位上的试验后立即测得的开路电压不小于在进行这一试验前电压的 90%，电池和电池组即符合本项要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。

T.4. Shock 冲击

Purpose 目的

This test assesses the robustness of cells and batteries against cumulative shocks.

本试验评估电池和电池组对累积冲击效应的耐受程度。

Test procedure 测试程序

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery.

Each cell shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50 gn and pulse duration of 11 milliseconds.

Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of the

battery. The pulse duration shall be 6 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations.

Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

试验电池和电池组用坚固支架紧固在试验机上，支架支撑着每个试验电池组的所有安装面。

每个电池须经受最大加速度 150 gn 和脉冲持续时间 6 毫秒的半正弦波冲击。不过，大型电池须经受最大加速度 50 gn 和脉冲持续时间 11 毫秒的半正弦波冲击。

每个电池须经受的正弦波冲击的最大加速度取决于电池组的质量。小型电池组的脉冲持续时间 6 毫秒，大型电池组的脉冲持续时间 11 毫秒。以下公式用于计算合适的最低限度最大加速度。

每个电池或电池组须在三个互相垂直的电池或电池组安装方位的正极方向经受三次冲击，接着在负极方向经受三次冲击，总共经受 18 次冲击。

The formulas below are provided to calculate the appropriate minimum peak accelerations.
以下公式用于计算合适的最低限度最大加速度。

Battery 电池组	Minimum peak acceleration 最低限度最大加速度	Pulse duration 脉冲持续时间
Small batteries 小型电池组	150 g_n or result of formula $\text{Acceleration}(g_n) = \sqrt{\left(\frac{100850}{\text{mass}^*}\right)}$ whichever is smaller	6 ms
Large batteries 大型电池组	50 g_n or result of formula $\text{Acceleration}(g_n) = \sqrt{\left(\frac{30000}{\text{mass}^*}\right)}$ whichever is smaller	11 ms

* Mass is expressed in kilograms.

*质量用千克表示

Requirement 要求

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

如果无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%，电池和电池组即符合这一要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。

T.5. External short circuit 外部短路

Purpose 目的

This test simulates an external short circuit.

本试验模拟外部短路。

Test procedure 测试程序

The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57 ± 4 °C, measured on the external case. This period of time depends on the size and design of the cell or battery and should be assessed and documented. If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries. Then the cell or battery at 57 ± 4 °C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.

This short circuit condition is continued for at least one hour after the cell or battery external case

temperature has returned to 57 ± 4 °C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.

The short circuit and cooling down phases shall be conducted at least at ambient temperature.

对于待试电池或电池组，应加温一段必要的时间，使从外壳测量的温度达到均匀的稳定温度 57 ± 4 °C。这段时间的长短取决于电池或电池组的大小和设计，对于这个持续时间应加以评估和记录。如无法进行这种评估，则小型电池和小型电池组的暴露时间应至少 6 小时，大型电池和大型电池组的暴露时间应至少 12 小时。然后，电池或电池组应在 57 ± 4 °C条件下经受总外电阻小于 0.1 欧姆的短路条件。这一短路条件应在电池或电池组外壳温度回到 57 ± 4 °C后继续至少 1 小时，或在大型电池组的情况下外壳温度降幅达试验中所观察的的最高温升幅的二分之一并保持低于该数值。

短路和降温阶段的温度应至少相当于环境温度。

Requirement 要求

Cells and batteries meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire during the test and within six hours after the test.

如果外壳温度不超过 170℃，并且在试验过程中及试验后 6 小时内无解体、无破裂，无起火，电池和电池组即符合本项要求。

T.6. Impact / Crush 撞击/挤压

Purpose 目的

These tests simulate mechanical abuse from an impact or crush that may result in an internal short circuit.

本节的试验模拟撞击或挤压等可能造成内部短路的机械性破坏。

Test procedure – Impact (applicable to cylindrical cells not less than 18.0 mm in diameter)

测试程序 –撞击（适用于直径不小于 18.0 毫米的圆柱形电池）

The test sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm ± 0.1mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample. A 9.1 kg ± 0.1 kg mass is to be dropped from a height of 61 ± 2.5 cm at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or Channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface.

The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm ± 0.1mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.

试样电池或元件电池放在平坦光滑的表面上。一根 316 型不锈钢棒横放在试样中心，钢棒直径 15.8 毫米±0.1 毫米，长度至少 6 厘米，或电池最长端的尺寸，取二者之长者。将一块 9.1 千克±0.1 千克的重锤从 61 ± 2.5 厘米高处跌落到钢棒和试样交叉处，使用一个几乎没有摩擦的、对落体重锤阻力最小的垂直轨道或管道加以控制。垂直轨道或管道用于引导落锤沿与水平支撑表面呈 90 度落下。

接受撞击的试样，纵轴应与平坦表面平行并与横放在试样中心的直径 15.8 ± 0.1 毫米弯曲表面的纵轴垂直。每一试样只经受一次撞击。

Test procedure – Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18.0 mm in diameter)

测试程序 – 挤压（适用于棱柱形、袋状、硬币/纽扣电池和直径小于 18.0 毫米的圆柱形电池）

A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.

(a) The applied force reaches 13 kN ± 0.78 kN;

(b) The voltage of the cell drops by at least 100 mV; or

(c) The cell is deformed by 50% or more of its original thickness.

Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.

A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis.

Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed

for a further 6 h. The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.

将电池或元件电池放在两个平面之间挤压，挤压力度逐渐加大，在第一个接触点上的速度大约为 1.5 厘米/秒。挤压持续进行，直到出现以下三种情况之一：

(a)施加的力量达到 13 千牛顿 ± 0.78 千牛顿；

(b)电池的电压下降至少 100 毫伏；或

(c)电池形变达原始厚度的 50%或以上。

一旦达到最大压力、电压下降 100 毫伏或更多，或电池变形至少达原厚度的 50%，即可解除压力。

棱柱形或袋状电池应从最宽的一面施压。纽扣/硬币形电池应从其平坦表面施压。圆柱形电池应从与纵轴垂直的方向施压。

每个试样电池或元件电池只做一次挤压试验。试样应继续观察 6 小时。试验应使用之前未做过其他试验的电池或元件电池进行。

Requirement 要求

Cells and component cells meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly and no fire during the test and within six hours after this test.

如果外壳温度不超过 170 ℃，并且在试验过程中及试验后 6 小时内无解体、无破裂，无起火，电池和电池组即符合本项要求。

T.7. Overcharge 过度充电

Purpose 目的

This test evaluates the ability of a rechargeable battery or a single cell rechargeable battery to withstand an overcharge condition.

本试验评估可再充电电池组或可再充电单一电池电池组承受过度充电状况的能力。

Test procedure 测试程序

The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:

(a) When the manufacturer's recommended charge voltage is not more than 18 V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22 V.

(b) When the manufacturer's recommended charge voltage is more than 18 V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.

Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.

充电电流必须是制造商建议的最大持续充电电流的两倍。试验的最小电压如下：

(a)制造商建议的充电电压不大于 18 伏时，试验的最小电压应是电池组最大充电电压的两倍或 22 伏两者中的较小者。

(b)制造商建议的充电电压大于 18 伏时，试验的最小电压应是最大充电电压的 1.2 倍。

试验应在环境温度下进行。进行试验的时间应为 24 小时。

Requirement 要求

Rechargeable batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

充电电池组在试验过程中和试验后 7 天内无解体、无起火，即符合本项要求。

T.8. Forced discharge 强制放电

Purpose 目的

This test evaluates the ability of a primary or a rechargeable cell to withstand a forced discharge condition.

本试验评估原电池或充电电池承受强制放电状况的能力。

Test procedure 测试程序

Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12 V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.

The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).

每个电池应在环境温度下与 12 伏直流电源串联在起始电流等于制造商给定的最大放电电流的条件下强制放电。

将适当大小和额定值的电阻负荷与试验电池串联，计算得出给定的放电电流。对每个电池进行强制放电，放电时间(小时)应等于其额定容量除以初始试验电流(安培)。

Requirement 要求

Primary or rechargeable cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

原电池或充电电池如在试验过程中和试验后 7 天内无解体，无起火，即符合本项要求。

Ⅴ、General terms and definitions 一般术语与定义

Table 38.3.1: Mass loss limit

表 38.3.1: 质量损失限值

Mass M of cell or battery 电池或电池组质量 M	Mass loss limit 质量损失限值
M ＜ 1 g	0.5%
1 g ≤ M ≤75 g	0.2%
M ＞ 75 g	0.1%

In order to quantify the mass loss, the following procedure is provided:

$$\text{Mass loss (\%)} = (M_1 - M_2)/M_1 \times 100$$

质量损失的量化值，可用以下公式计算：

$$\text{质量损失(\%)} = (M_1 - M_2)/M_1 \times 100$$

Where M1 is the mass before the test and M2 is the mass after the test. When mass loss does not exceed the values in Table 38.3.1, it shall be considered as "no mass loss".

式中：M1 是试验前的质量，M2 是试验后的质量。如果质量损失不超过表 38.3.1 所列的数值，应视为“无质量损失”。

Leakage means the visible escape of electrolyte or other material from a cell or battery or the loss of material (except battery casing, handling devices or labels) from a cell or battery such that the loss of mass exceeds the values in Table 38.3.1.

渗漏是指可以看到的电解液或者其他物质从电池或电池组中漏出，或电池或电池组中的物质损失（不包括电池外壳、搬运装置、或标签），质量损失超过表 38.3.1 所列的数值。

Venting means the release of excessive internal pressure from a cell or battery in a manner intended by design to preclude rupture or disassembly.

排气是指按设计方式释放电池或电池组内部过高的压力，防止其破裂或解体。

Disassembly means a vent or rupture where solid matter from any part of a cell or battery penetrates a wire mesh screen (annealed aluminium wire with a diameter of 0.25 mm and grid density of 6 to 7 wires per cm) placed 25 cm away from the cell or battery.

解体是指排气或破裂使电池或电池组任何部分的固体物质穿过放在离电池或电池 25 cm 处的丝网筛（直径 0.25 mm 的软铝丝，网格密度每厘米 6 至 7 条铝丝）。

Rupture means the mechanical failure of a cell container or battery case induced by an internal or external cause, resulting in exposure or spillage but not ejection of solid materials.

破裂是指内部或外部原因引起的电池容器或电池组外壳机械损坏，造成内装物暴露或溢出，但无固体喷射。

Fire means that flames are emitted from the test cell or battery.

起火是指试验电池或电池组有火焰冒出。

Ⅵ、Main Test Apparatus 主要测试仪器

Serial No. 设备编号	Name of Equipment 设备名称	Model 型号	Calibration Date /Due Date 校准日期/到期日
TC-B01	Low Altitude Simulation Tester 低压高空模拟试验箱	GX-3020-Z	2022. 02. 25 2023. 02. 24
TC-B04	Vertical Shock Test Instrument 垂直冲击试验台	SY10-2	2022. 02. 25 2023. 02. 24
TC-B05	Vibration test instrument 振动试验台	ES-3-150	2022. 02. 25 2023. 02. 24
TC-B07	Battery Test System 电池测试系统	CTS 20V/10A	2022. 02. 25 2023. 02. 24
TC-B11	Crush Test Instrument 温控型电池挤压试验机	BE-6045T	2022. 02. 25 2023. 02. 24
TC-B13	Battery Short Circuit Tester 电池短路试验机	GX-6055-B	2022. 02. 25 2023. 02. 24
TC-B14	Electronic Balance 电子天平	PTT-A+300	2022. 02. 25 2023. 02. 24
TC-B15	Data Collector 数据采集器	34970A	2022. 07. 04 2023. 07. 03
TC-B18	DC POWER 直流源	PSW 80-27	2022. 02. 25 2023. 02. 24
TC-B21	Battery Impact Tester 电池冲击试验机	BE-5066	2022. 02. 25 2023. 02. 24
TC-B25	Digital Multimeter 数字万用表	15B	2022. 07. 04 2023. 07. 03
TC-B30	Programmable high & low temperature test chamber 可程式高低温试验机	GX-3000-150	2022. 07. 04 2023. 07. 03

Ⅶ、Test Data 测试数据

T.1. Altitude simulation 高度模拟

Test sample status 测试样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Change ratio 电压比(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
first cycle, fully charged state 首次循环满电状态	1#	43.584	4.19	43.582	4.18	0.00	99.8	Pass 合格
	2#	43.817	4.17	43.817	4.17	0.00	100.0	Pass 合格
	3#	43.607	4.18	43.607	4.18	0.00	100.0	Pass 合格
	4#	43.590	4.17	43.590	4.17	0.00	100.0	Pass 合格
	5#	44.195	4.17	44.191	4.17	0.01	100.0	Pass 合格
25th cycle, fully charged state 25 次循环满电状态	6#	44.248	4.19	44.248	4.19	0.00	100.0	Pass 合格
	7#	43.493	4.18	43.493	4.17	0.00	99.8	Pass 合格
	8#	44.216	4.19	44.216	4.19	0.00	100.0	Pass 合格
	9#	44.364	4.17	44.364	4.17	0.00	100.0	Pass 合格
	10#	43.930	4.17	43.930	4.17	0.00	100.0	Pass 合格

Notes 注释: Ambient temperature 环境温度: 24.3 °C。

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %. 测试后，样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。

T.2. Thermal test 温度试验

Test sample status 测试样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Change ratio 电压比(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
first cycle, fully charged state 首次循环满电状态	1#	43.582	4.18	43.578	4.13	0.01	98.8	Pass 合格
	2#	43.817	4.17	43.812	4.12	0.01	98.8	Pass 合格
	3#	43.607	4.18	43.600	4.13	0.02	98.8	Pass 合格
	4#	43.590	4.17	43.585	4.12	0.01	98.8	Pass 合格
	5#	44.191	4.17	44.179	4.12	0.03	98.8	Pass 合格
25th cycle, fully charged state 25 次循环满电状态	6#	44.248	4.19	44.243	4.14	0.01	98.8	Pass 合格
	7#	43.493	4.17	43.486	4.12	0.02	98.8	Pass 合格
	8#	44.216	4.19	44.211	4.13	0.01	98.6	Pass 合格
	9#	44.364	4.17	44.358	4.12	0.01	98.8	Pass 合格
	10#	43.930	4.17	43.923	4.12	0.02	98.8	Pass 合格

Notes 注释: Ambient temperature 环境温度: 24.0 °C。

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %. 测试后，样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。

T.3. Vibration 振动

Test sample status 测试样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Change ratio 电压比(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
first cycle, fully charged state 首次循环满电状态	1#	43.578	4.13	43.571	4.13	0.02	100.0	Pass 合格
	2#	43.812	4.12	43.812	4.12	0.00	100.0	Pass 合格
	3#	43.600	4.13	43.600	4.12	0.00	99.8	Pass 合格
	4#	43.585	4.12	43.585	4.12	0.00	100.0	Pass 合格
	5#	44.179	4.12	44.175	4.12	0.01	100.0	Pass 合格
25th cycle, fully charged state 25 次循环满电状态	6#	44.243	4.14	44.243	4.13	0.00	99.8	Pass 合格
	7#	43.486	4.12	43.486	4.11	0.00	99.8	Pass 合格
	8#	44.211	4.13	44.211	4.13	0.00	100.0	Pass 合格
	9#	44.358	4.12	44.358	4.12	0.00	100.0	Pass 合格
	10#	43.923	4.12	43.923	4.12	0.00	100.0	Pass 合格

Notes 注释: Ambient temperature 环境温度: 23.9 °C。

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %. 测试后，样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。

T.4. Shock 冲击

Test sample status 测试样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Change ratio 电压比(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
first cycle, fully charged state 首次循环满电状态	1#	43.571	4.13	43.571	4.13	0.00	100.0	Pass 合格
	2#	43.812	4.12	43.812	4.11	0.00	99.8	Pass 合格
	3#	43.600	4.12	43.596	4.12	0.01	100.0	Pass 合格
	4#	43.585	4.12	43.585	4.12	0.00	100.0	Pass 合格
	5#	44.175	4.12	44.175	4.11	0.00	99.8	Pass 合格
25th cycle, fully charged state 25 次循环满电状态	6#	44.243	4.13	44.240	4.13	0.01	100.0	Pass 合格
	7#	43.486	4.11	43.483	4.11	0.01	100.0	Pass 合格
	8#	44.211	4.13	44.211	4.13	0.00	100.0	Pass 合格
	9#	44.358	4.12	44.358	4.12	0.00	100.0	Pass 合格
	10#	43.923	4.12	43.923	4.12	0.00	100.0	Pass 合格

Notes 注释: Ambient temperature 环境温度: 23.5 °C。

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %. 测试后，样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。

T.5. External short circuit 外部短路

Test sample status 测试样品状态	No. 编号	Maximum external temperature (°C) 表面最高温度(°C)	Status 结果
first cycle, fully charged state 首次循环满电状态	1#	95.6	Pass 合格
	2#	92.3	Pass 合格
	3#	93.8	Pass 合格
	4#	96.9	Pass 合格
	5#	95.8	Pass 合格
25th cycle, fully charged state 25 次循环满电状态	6#	91.3	Pass 合格
	7#	92.8	Pass 合格
	8#	93.7	Pass 合格
	9#	92.0	Pass 合格
	10#	93.9	Pass 合格

Notes 注释: Ambient temperature 环境温度: 23.7 °C。

Test sample external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire during the test and within six hours after the test.

测试样品表面温度不超过 170 °C，测试中与测试后 6 小时内无解体、无破裂、无起火。

T.6. Impact 撞击

Test sample status 测试样品状态	No. 编号	Maximum external temperature (°C) 表面最高温度(°C)	Status 结果
first cycle, 50% charged state 首次循环 50%充电状态	11#	96.8	Pass 合格
	12#	93.7	Pass 合格
	13#	92.5	Pass 合格
	14#	95.6	Pass 合格
	15#	96.6	Pass 合格
25th cycle, 50% charged state 25 次循环 50%充电状态	16#	93.7	Pass 合格
	17#	93.5	Pass 合格
	18#	92.8	Pass 合格
	19#	96.0	Pass 合格
	20#	91.6	Pass 合格

Notes 注释: Ambient temperature 环境温度: 24.3 °C。

Test sample external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire during the test and within six hours after the test.

测试样品表面温度不超过 170 °C，测试中与测试后 6 小时内无解体、无破裂、无起火。

T.7. Overcharge 过度充电

Not applicable 不适用

T.8. Forced discharge 强制放电

Test sample status 测试样品状态	No. 编号	Status 结果
first cycle, fully discharged state 首次循环完全放电状态	21#	Pass 合格
	22#	Pass 合格
	23#	Pass 合格
	24#	Pass 合格
	25#	Pass 合格
	26#	Pass 合格
	27#	Pass 合格
	28#	Pass 合格
	29#	Pass 合格
	30#	Pass 合格
25th cycle, fully discharged state 25 次循环完全放电状态	31#	Pass 合格
	32#	Pass 合格
	33#	Pass 合格
	34#	Pass 合格
	35#	Pass 合格
	36#	Pass 合格
	37#	Pass 合格
	38#	Pass 合格
	39#	Pass 合格
	40#	Pass 合格

Notes 注释: Ambient temperature 环境温度: 24.0 °C。

There is no disassembly and no fire during the test and within seven days after the test.

样品在测试中和测试后 7 天内无解体、无起火。

Ⅷ、Conclusion 结论

No. 序号	Name of test items 测试项目名称	Cause number of standard 标准条款号	Test Result 检查结果	Conclusion 结论	Remark 备注
1	Altitude simulation 高空模拟	38.3 Test T.1 38.3 试验 T.1	See Appendix T.1. Altitude simulation 见附表 T.1. 高度模拟	Pass 合格	/
2	Thermal test 温度试验	38.3 Test T.2 38.3 试验 T.2	See Appendix T.2. Thermal test 见附表 T.2.温度试验	Pass 合格	/
3	Vibration 振动	38.3 Test T.3 38.3 试验 T.3	See Appendix T.3. Vibration 见附表 T.3.振动	Pass 合格	/
4	Shock 冲击	38.3 Test T.4 38.3 试验 T.4	See Appendix T.4. Shock 见附表 T.4.冲击	Pass 合格	/
5	External short circuit 外部短路	38.3 Test T.5 38.3 试验 T.5	See Appendix T.5. External short circuit 见附表 T.5.外部短路	Pass 合格	/
6	Impact 撞击	38.3 Test T.6 38.3 试验 T.6	See Appendix T.6. Impact 见附表 T.6.撞击	Pass 合格	/
7	/	/	/	/	/
8	Forced discharge 强制放电	38.3 Test T.8 38.3 试验 T.8	See Appendix T.8. Forced discharge 见附表 T.8.强制放电	Pass 合格	/

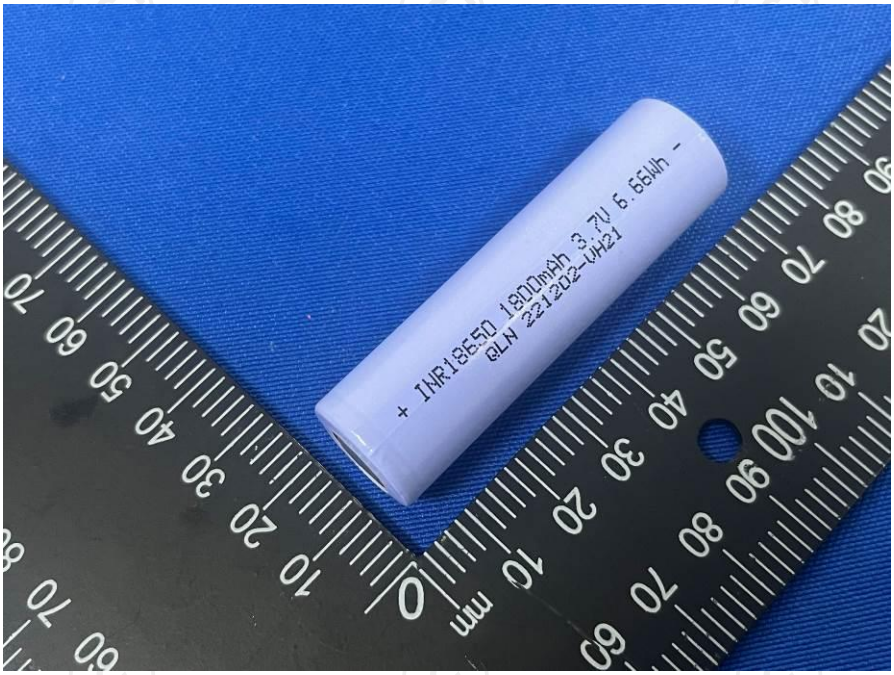
According to the standard:

依据标准:

UN "Manual of Tests and Criteria" ST/SG/AC.10/11/Rev.7/Amend.1/Subsection 38.3.

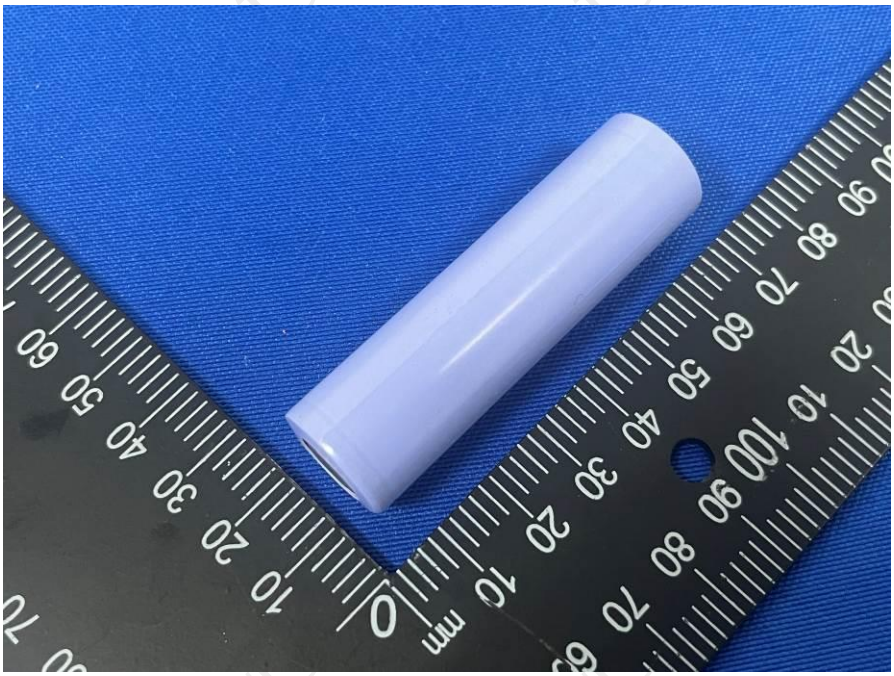
联合国《试验和标准手册》（第七修订版修正 1）38.3 节。

Ⅸ、Picture of the sample 样品图片



Picture 1. Cell view

图片 1. 电池视图



Picture 2. Cell view

图片 2. 电池视图

********End of Report 报告结束********

Important Notice

注意事项

1. 1. The test report is invalid without the official stamp of TCT.
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6. The test report is valid for the tested samples only.
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7. The Chinese contents in this report are only for reference.
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