

No.SET2021-05560

化学品安全技术说明书

Material Safety Data Sheet (MSDS)

Report

委托单位: 深圳市正浩创新科技股份有限公司
Client unit Ecoflow Inc.,

样品名称: 便携式移动太阳能锂电发电储能设备
Name of sample Portable Power Station Solar Generator

委托单位地址: 深圳市宝安区石岩街道龙腾社区松白公路北侧方正科技工业园厂房 A202
Address Factory Building A202, Founder Technology Industrial Park, North Side of Songbai Highway, Longteng Community, Shiyan Sub-district, Baoan District, Shenzhen City, Guangdong, China



Tested by: *Renee* Checked By: *Aaron* Approved By: *Lu Jian*
Date: Jun 08,2021 Date: Jun 08,2021 Date: Jun 08,2021

中检集团南方测试股份有限公司
CCIC Southern Testing CO.,Ltd.

地 址: 深圳市南山区西丽街道沙河路 43 号电子检测大厦 邮编: 518055

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1 化学品及企业标识 Identification of product and company

样品名称 **Product name:** 便携式移动太阳能锂电发电储能设备 Portable Power Station Solar Generator

型号 **Part No.:** EFD310

制造商/供应商: 深圳市正浩创新科技股份有限公司

Manufacturer/ Producer: Ecoflow Inc.,

地址: 深圳市宝安区石岩街道龙腾社区松白公路北侧方正科技工业园厂房 A202

Address: Factory Building A202, Founder Technology Industrial Park, North Side of Songbai Highway, Longteng Community, Shiyan Sub-district, Baoan District, Shenzhen City, Guangdong, China

邮编 **Post Code:** /

电话 **Telephone:** /

传真 **Fax:** /

电子邮件 **Mail:** /

化学品安全技术说明书号 **MSDS code:** SET2021-05560

2 危险性概述 Hazards identification

紧急情况概述: 可能在火灾爆炸, 释放刺激性气体。

Emergency Overview: May explode in a fire, which could release irritant gas.

侵入途径 Primary routes of entry:

皮肤接触: 正常情况下无已知的重大影响或危害。接触已损坏电池可能引起灼伤。

Skin contact: No known significant effects or critical hazards under normal use. Contact with damaged batteries may cause burns.

眼睛接触: 正常情况下无已知的重大影响或危害。接触已损坏电池可能引起灼伤。

Eye contact: No known significant effects or critical hazards under normal use. Contact with damaged batteries may cause burns.

吸入: 电池泄漏释放蒸汽或气体, 吸入可能导致刺激呼吸道及眼睛。

Inhalation: Inhalation of vapors or fumes released due to heat or a large number of leaking batteries may cause respiratory and eye irritation.

摄入: 产品内物质摄入人体可能会引起口腔、喉咙和肠道烧伤和伤害。

Ingestion: Ingestion of product contents may cause mouth, throat and intestinal burns and damage.

**3成分/组成信息Composition/information on ingredients****Chemical characterization:**

化学成份 Chemical composition	CAS 号 CAS No.	重量百分比 in % by weight
Ternary Materials	182442-95-1	28.4
Graphite	7782-42-5	17.1
Lithium Hexafluorophosphate	21324-40-3	1.3
Ethylene Carbonate	96-49-1	3.4
Diethyl Carbonate	105-58-8	4.7
Dimethyl Carbonate	616-38-6	3.8
Polypropylene	9003-07-0	2
Steel	7439-89-6	31.1
Copper	7440-50-8	5.7
Aluminum	7429-90-5	2.5

缩写Abbreviation:

CAS: 化学文摘服务

CAS: Chemical Abstract Service

EC: 欧盟委员会编号

EC: European Inventory of Existing Commercial chemical Substances

NA = 不适用

NA = Not apply.

4急救措施First aid measures

皮肤接触: 如果电池泄漏, 电池内物质接触到皮肤, 立即脱去污染的衣着, 用大量清水冲洗15分钟以上。仍感觉刺激或疼痛, 立刻就医。

Skin contact: If the battery is leaking and the contained material contacts the skin, remove contaminated clothes quickly and rinse the skin with plenty of water at least 15 minutes. If irritation or pain persists, get medical aid at once.

眼睛接触: 如果电池泄漏, 电池内物质接触到眼睛, 用大量清水或生理盐水冲洗15分钟以上。立刻就医。

Eyes contact: If the battery is leaking and the contained material contacts the eyes, flush the eyes with plenty of water or saline water at least 15 minutes. Get medical aid at once.

吸入: 如果电池泄漏, 迅速脱离现场至空气新鲜处。保持呼吸道通畅。如呼吸困难, 给输氧。就医。

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Inhalation: If the battery is leaking, remove to fresh air immediately. Keep the respiratory tract smooth. Use oxygen if available. Get medical aid.

摄入: 如果电池泄漏, 电池内物质摄入人体, 立即用清水冲洗口腔及周边。立刻就医。

Ingestion: If the battery is leaking and the contained material is ingested, rinse mouth and surrounding area with clear water at once. Get medical aid at once.

5 消防措施 Fire fighting measures

危险特性: 当产品暴露在火中时, 会引起爆炸和释放分解有害物质。

Danger characteristic: Products may burst and release hazardous decomposition products when exposed to a fire situation.

有害燃烧产物: 一氧化碳、二氧化碳、金属氧化物、刺激性烟雾等。

Hazardous combustion products: Carbon monoxide, carbon dioxide, metal oxide, irritate fume, etc.

灭火方法及灭火剂: 消防人员必须佩戴过滤式防毒面具(全面罩)或隔离式呼吸器、穿全身防火防毒服, 在上风向灭火。尽可能将容器从火场移至空旷处。喷水保持火场容器冷却, 直至灭火结束。灭火剂: 雾状水、泡沫、干粉、二氧化碳、砂土。

Fire-Fighting method & media: The staff must equipped with filtermask (full mask) or isolated breathing apparatus. The staff must wear the clothes which can defense the fire and the toxic gas. Put out the fire in the upwind direction. Remove the container to the open space as soon as possible. Sparying water on the containers in the fireplace to keep them cool until finish extinguishment. Media: hazy water, foam, powder, CO₂, sandy clay.

6 泄漏应急处理 Accidental release measures

应急处理:

1. 迅速撤离泄漏污染区人员至安全区, 并进行隔离, 严格限制出入;
2. 提供适当的防护及通风设备;
3. 用一个不产生粉尘的方法打扫处理泄漏物, 尽可能多地收集泄漏处理物于有标签的合适的容器中;
4. 在安全状况下, 选用合适方式阻止或减少泄漏, 如用沙或泥土收齐围堵泄漏物;
5. 尽可能切断泄漏源, 避免流入下水道或其它密闭空间;
6. 如果大量泄漏, 收集回收泄漏物于合适且标示的有盖容器内, 并运往专门废物处理场所处置。

Disposal methods:

1. Rapid evacuation leakage pollution area personnel to safe areas, and isolation, strictly limited access;
2. Provide adequate protection and ventilation equipment;
3. Cleaning the spillage with the method does not produce dust, collect the leakage in a suitable labeled containers much as possible;
4. In a safe condition, choose appropriate ways to prevent or reduce leakage, for example use sand or clay ring-fence leakage, possible cut off leakage source, avoid into sewer or other enclosed spaces;
5. Cut off the source of leakage as much as possible, avoid entering sewers or other confined space;

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6. If a large number of leakage, collect and recycle leakage to suitable and indicative covered container, and shipped to a special waste disposal site disposal.

废弃处理方法: 所有废弃物必须参照联合国, 国家, 地方性法规进行处置。

Waste treatment methods: All waste must be referring to the United Nations, national and local regulations for disposal.

7 操作处置与储存 Handling and storage

操作注意事项: 工作现场应保持通风。远离热源。未使用时密封容器。减少粉尘积聚和产生。避免眼睛接触, 避免呼吸粉尘。空容器会包含此化学品残留, 不要对空容器进行损坏。

Handling: Job site should keep ventilation. Keep away from heat. Sealed container when not using. Reduce dust accumulation and generation. Avoid eye contact. Avoid breathing dust. Empty containers will contain this chemical residue. Don't damage the empty container.

储存注意事项: 储存在一个低温, 干燥, 通风良好的环境。避免阳光直射。储存时远离食物和水源, 吃饭喝水前彻底清洗双手。远离禁忌物, 如强氧化剂, 强酸。远离火种、热源。配备相应品种和数量的消防器材。储区应备有泄漏应急处理设备和合适的收容材料。

Storage: Stored in a low temperature, dry, well ventilated environment. Avoid direct sunlight. Store away from food and water, wash your hands thoroughly before eat bread or drink water. Far from taboo object, such as strong oxidizer, strong acid. Keep away from fire and heating sources. Equipped with corresponding varieties and number of fire equipment. Storage areas should be equipped with leakage emergency treatment equipment and suitable for accept materials.

8 接触控制/个体防护 Exposure controls and personal protection

监测方法: 无数据资料。

Monitoring method: No data available.

工程控制: 密闭操作时注意通风。确保车间蒸汽浓度在现行OSHA的要求下

Engineering controls: Ensure vapor concentration in the workshop under the requirements of existing OSHA.

呼吸系统防护: 空气中浓度超标时, 必须佩戴自吸过滤式防毒面具(半面罩)。紧急事态抢救或撤离时, 应该佩戴空气呼吸器。

Respiratory system safeguard: Exceed the standard concentration in air, must wear self-priming filter type gas mask (half mask), emergency rescue or evacuation, should wear air respirator.

眼睛防护: 如有需要, 戴化学安全防护眼镜。

Eye safeguard: If necessary, wear chemical safety protective glasses.

身体防护: 穿防静电服。

Body safeguard: Wear anti-static clothes.

手防护: 戴手套。

Hand safeguard: Wear glove.

其他防护: 工作现场严禁吸烟。避免长期反复接触电解液。

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Else safeguard: No smoking at job site. Avoid prolonged and repeated contact electrolyte.

9 理化特性 Physical and chemical properties:

9.1 物理化学性质 Physical and chemical properties:

沸点 Boiling Point: 无数据资料 No Data
相对蒸气密度 relative vapour density: 无数据资料 No Data
饱和蒸气压 saturated vapor pressure: 无数据资料 No Data
额定容量 Rated capacity: 40Ah
额定能量 Rate Energy: 2016Wh

10 稳定性和反应活性 Stability and reactivity

稳定性: 常温常压下稳定。
Stability: Stable under ordinary conditions of use and storage.
避免接触的条件: 无数据资料
Avoid contact conditions: No data available
禁配物: 强氧化剂, 强酸
Prohibited content: Strong oxidizer, strong acids
聚合危害: 无数据资料
Aggregate harm: No data available
分解产物: 正常情况下使用, 无有害物质产生。
Decomposition product: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 毒理学资料 Toxicological information

毒理学影响的信息 toxicology influencing information
急性毒性: 无数据资料
Acute toxicity: No known significant effects or critical hazards.
刺激性: 部分成分吸入和皮肤接触可能引起过敏。
Irritation: Part of composition may cause sensitization by Inhalation and skin contact.
慢性毒性: 无已知重大影响或严重危害。
Chronic toxicity: No known significant effects or critical hazards.
致癌性: 无已知重大影响或严重危害。
Carcinogenicity: No known significant effects or critical hazards.
生殖毒性: 无已知重大影响或严重危害。
Reproduction toxicity: No known significant effects or critical hazards.

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如果电池被强制打开或毁坏，立即丢弃。电池内部成分有刺激性或过敏性。
If the cells are opened through misuse or damage, discard immediately. Internal components of cell are irritants and sensitizers.

12生态学资料Ecological information

生态毒性: 无已知重大影响或严重危害。

Ecotoxicity: No known significant effects or critical hazards.

生物降解性: 无已知重大影响或严重危害。

Biological degradability: No known significant effects or critical hazards.

非生物降解性: 无已知重大影响或严重危害。

Non-living things degradability: No known significant effects or critical hazards.

生物富集和生物积累性: 无已知重大影响或严重危害。

Biology gathering and biology accumulate: No known significant effects or critical hazards.

13废弃处置Disposal considerations

废弃处置方法: 所有废弃物必须参照联合国，国家，地方性法规进行处置。参照地方法规，倾倒或丢弃的物质可能作为一种限制性的废弃物。清洗过盛装此物质容器的溶液也要按规定处理。需遵守废弃法，大气污染法，水质污染法进行处置。

Waste disposal methods: All waste must be referring to the United Nations, national and local regulations for disposal, the dumped or discarded material may be regard as a restrictive waste referring to local regulations. Cleaned containers containing this substance were also required treatment. Comply with waste law. Atmospheric Pollution Act and water pollution law for disposal.

14运输信息Transport information

危险货物编号 Number of dangerous goods: 9

UN 编号 UN Number: 3480 , 3481, 3171

运输注意事项:

货物应符合2021年国际航空运输协会危险货物规则（第62版），包装规范PI952, PI965-967第I or IA部分，以及应通过UN38.3测试，并符合2018年国际海运危险货物规则（第39-18版）188条款及230条款。

产品应妥善包装，防止电池短路。运输前应先检查包装容器是否完整、密封。运输过程中要确保容器不泄漏、不倒塌、不坠落、不损坏。防止货物倒塌。严禁与氧化剂、食品等混装混运。运输车船必须彻底清洗、消毒，否则不得装运其它物品。运输过程中防止曝晒，雨淋，高温。中途停留时应远离火种、热源。船运时，配装位置应远离卧室、厨房，并与机舱、电源、火源等部位隔离。公路

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运输时要按规定路线行驶，勿在居民区和人口稠密区停留。禁用木船、水泥船散装运输。

Transport Attentions:

The goods shall be complied with the requirements of 62nd DGR Manual the Packing Instruction 952, 965-967, Section I or IA (2021 edition), including the passing of the UN38.3 test, And also complies with the Special Provision 188 and 230 of IMDG CODE (Amdt.39-18) 2018 Edition.

The batteries should be securely packed and protected against short-circuits. Examine whether the package of the containers are integrate and tighten closed before transport. Take in a cargo of them without falling, dropping, and breakage. Prevent collapse of cargo piles. Don't put the goods together with oxidizer and chief food chemicals. The transport vehicle and ship must be cleaned and sterilized otherwise it is not allowed to assemble articles. During transport, the vehicle should prevent exposure, rain and high temperature. For stopovers, the vehicle should be away from fire and heat sources. When transported by sea, the assemble place should keep away from bedroom and kitchen, and isolated from the engine room, power and fire source. Under the condition of Road Transportation, the driver should drive in accordance with regulated route, don't stop over in the residential area and congested area. Forbid to use wooden, cement for bulk transport.

15法规信息 Regulations

OSHA Hazard communication standard (29 CFR 1910.1200)

Hazardous ___ Non-hazardous

请注意废物处理也应该满足当地法规的要求。

Please note that waste disposal should meet local regulatory requirements.

16其他信息 Other information

上述信息视为正确，但不包含所有的信息，仅作为指引使用。本文件中的信息是基于现有的数据信息，该信息不代表保证此产品的性质。在实际应用过程中，可能出现其他未预料的情况，其相应信息可能需要修改，我方对任何操作或者接触上述产品而引起的损害不负有任何责任。

The above information are correct, but does not contain all of the information and only used as a guide. The information in this document is based on our current knowledge, it apply to this product as for the correct safety tips. The information does not guarantee the properties of this product. Our company is not responsible for any damages caused by the products.

***** 报告结束 END OF REPORT *****

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检测报告

TEST REPORT

委托单位名称

Client Name

深圳市正浩创新科技股份有限公司

Ecoflow Inc.,

产品名称

Name of product

便携式移动太阳能锂电发电储能设备

Portable Power Station Solar Generator

制造厂商

Manufacturer

深圳市正浩创新科技股份有限公司

Ecoflow Inc.,

商标型号

Trade mark & model

EcoFlow/EFD310

检测类别

Test sort

委托试验

Safety Entrust Test



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CCIC Southern Testing CO., Ltd.

检测报告

TEST REPORT

样品名称 Name of sample	便携式移动太阳能锂电发电储能设备 Portable Power Station Solar Generator		商标 Trade mark	EcoFlow	
制造厂商 Manufacturer	深圳市正浩创新科技股份有限公司 Ecoflow Inc.,		型号规格 Model/Type	EFD310 (电池型号: INR18650-2500mAh)	
委托单位 Client	深圳市正浩创新科技股份有限公司 Ecoflow Inc.,		取样方式 Sampling method	Sent by client	
送检日期 Application data	2021/04/20		检测日期 Test Date	2021/04/20-2021/05/16	
样品数量 Quantity of samples	4 个电池组, 30 个电池 4 Batteries,30 Cells		检验环境 Environment condition	20~25℃ 50~75%RH	
标称电压 Nominal voltage (cell/battery)	3.6V/50.4V	充电限制电压 Limited Charge Voltage (cell/ Energy storage power DC Input)	4.2V/100V	额定容量/能量 Rate Capacity/ Energy (cell/battery)	2500mAh 2016Wh/40Ah
标准充电电流 Standard charge Current (cell/ Energy storage power DC Input)	1.25A/7.2A	最大充电电流 Max. Charge Current (cell/Energy storage power DC Input)	2.5A/10A	充电截止电流 End Charge Current (cell)	25mA
放电截止电压 Cut-off Voltage (cell)	3.0V	最大放电电流 MaxDischarge Current (cell/ Energy storage power12V Output)	7.5A/10A	电池数量 Component cells Number	224PCS (14S16P)

检验项目(Test item):

- Test1: 高度模拟 Altitude simulation
- Test2: 温度试验 Thermal Test
- Test3: 振动 Vibration
- Test4: 冲击 Shock
- Test5: 外短路 External short circuit
- Test6: 撞击/挤压 Impact/Crush
- Test7: 过充电 Overcharge
- Test8: 强制放电 Forced discharge

检测依据(Reference documents):

《关于危险货物运输的建议书试验和标准手册》(第六修订版修正 1) 38.3 节: 金属锂电池和锂离子电池组。

《Recommendations on the Transport of Dangerous Goods,Manual of Test and Criteria》(Sixth revised edition Amendment 1) section 38.3:Lithium metal and lithium ion batteries (ST/SG/AC.10/11/Rev.6/Amend.1).

检验概况(Summary):

对电池或电池组进行了 T1 至 T8 项试验, 试验 T1 至 T5 按顺序进行, 使用相同电池或电池组, 试验 T6 和 T8 使用未另外试验过的电池或电池组, 试验 T7 使用原先试验 T1 至 T5 中使用过的未损坏的电池组进行试验。

Each Cell/battery type is subjected to tests 1 to 8,Tests 1 to 5 are conducted in sequence on the same

Cells/batteries, Tests 6 and 8 are conducted using not otherwise tested Cells/batteries, Test 7 using undamaged batteries previously used in Tests 1 to 5.

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

式中：M₁ 是实验前的质量，M₂ 是试验后的质量，如果质量损失不超过表 3.8.3.1 所列的数值，视为“无质量损失”。

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 38.3.2.2, it shall be considered as "no mass loss".

Mass M of cell or battery	Mass loss limit
M < 1g	0.5%
1g ≤ M ≤ 75g	0.2%
M > 75g	0.1%

试验 T1 至 T4 如果电池组无渗漏、无排气、无解体、无破裂和无起火，并且每个试验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% 则认为符合要求。

In test 1 to 4 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 battery after testing is not less than 90% of its voltage immediately prior to this procedure.

备注 (Remark) :

编号 B01#-B02# 是在第一个充放电周期完全充电的电池组。

Batteries of B01#-B02# are fully charged at first cycle.

编号 B03#-B04# 是在 25 个充放电周期后完全充电的电池组。

Batteries of B03#-B04# are fully charged after 25 cycles.

编号 C05#-C09# 是在第一个充放电周期 50% 设计额定容量状态的元件电池。

Component cells of C05#-C09# at 50% of the design rated capacity at first cycle.

编号 C10#-C14# 是在第 25 个充放电周期 50% 设计额定容量状态的元件电池。

Component cells of C10#-C14# at 50% of the design rated capacity after 25 cycles.

编号 C15#-C24# 是在第一个充放电周期完全放电的元件电池。

Component cells of C10#-C19# at first cycle in fully discharged states.

编号 C25#-C34# 是在 50 个充放电周期后完全放电状态的元件电池。

Component cells of C25#-C34# are fully Discharged after 50 cycles.

检验结论 (Test conclusion):

测试样品符合联合国《关于危险货物运输的建议书试验和标准手册》38.3 要求。

The test samples comply with section 38.3 of Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria.

(检测单位盖章 stamp)

检测:
Tested by

许柔丹

审核:
Reviewed by

唐鹏森

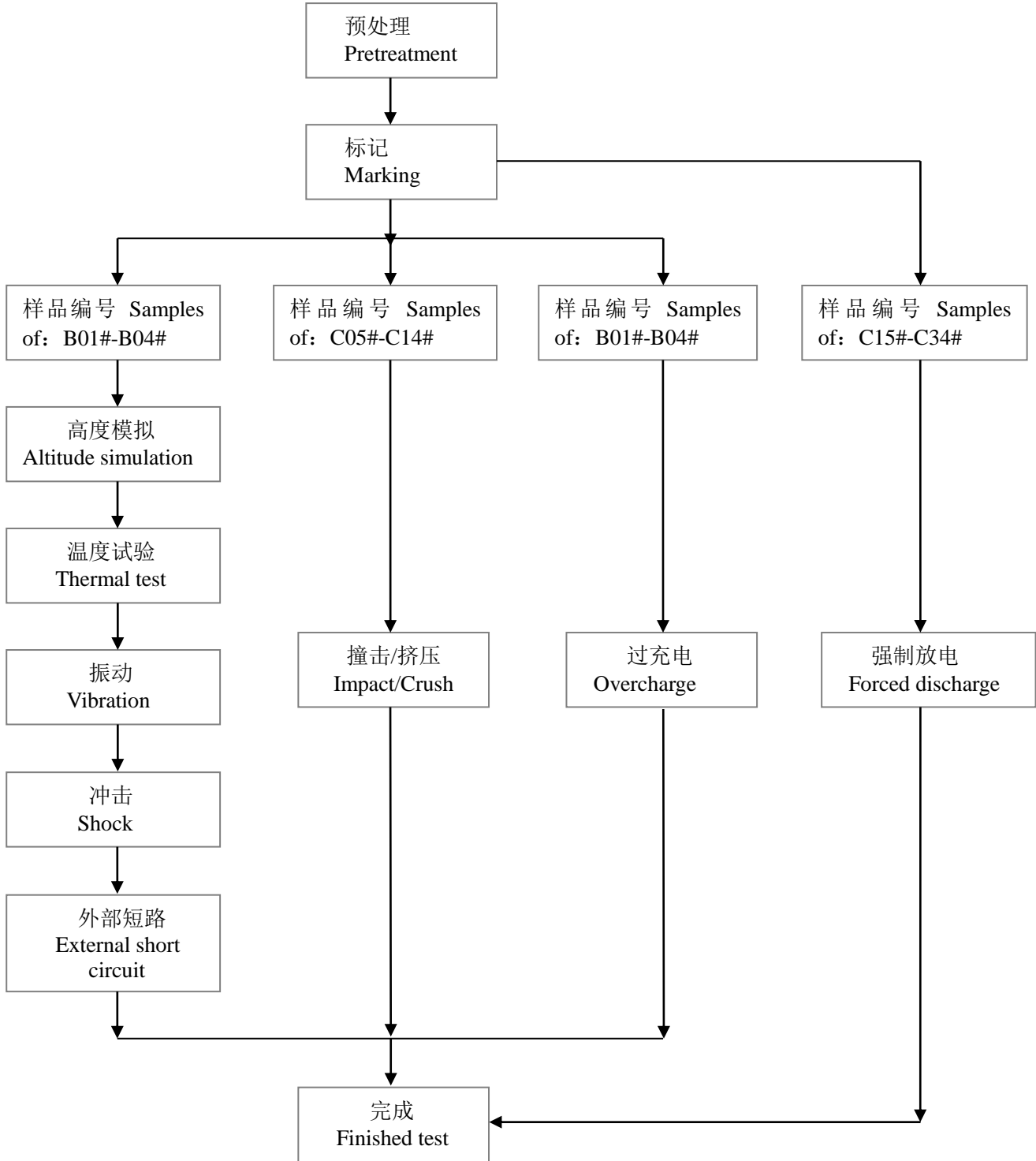
批准:
Approved by

2021 年 06 月 08 日

2021 年 06 月 08 日

2021 年 06 月 08 日

测试流程 Test Procedure



测试结果 Test results:

Test T.1 高度模拟 Altitude simulation

测试方法 Test method:

电池或电池组在压力等于或低于 11.6 千帕和环境温度(20±5℃)下存放至少 6 小时。

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).

要求 Requirement:

电池或电池组如无渗漏、无排气、无解体、无破裂和无燃烧，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%，即符合这一要求。

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.

测试数据如下表 Test Date showed in table below:

样品状态 State of sample	序号 No.	试验前 Pre-test		试验后 After test		质量损失 Mass loss (%)	电压比 Voltage after test/Voltage pre-test(%)	判定 Status
		质量 Mass (kg)	电压 Voltage (V)	质量 Mass (kg)	电压 Voltage (V)			
第一个充放电周期后完全充电 At first cycle in fully charged states	B01#	21.630	20.421	21.630	20.419	0.00	99.99	PASS
	B02#	21.650	20.362	21.650	20.361	0.00	100.00	PASS
25 个充放电周期后，完全充电 After 25 cycles ending in fully charged states	B03#	21.636	20.416	21.636	20.414	0.00	99.99	PASS
	B04#	21.642	20.386	21.642	20.384	0.00	99.99	PASS

备注 Notes:

试验后电池无渗漏、无排气、无解体、无破裂和无燃烧。

After the test,the cells are no leakage,no venting, no disassembly, no rupture and no fire.

Test T.2: 温度试验 Thermal test

测试方法 Test method:

电池或电池组在试验温度等于 $72 \pm 2^\circ\text{C}$ 下存放至少 6 小时，接着在试验温度等于 $-40 \pm 2^\circ\text{C}$ 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。这一程序重复 10 次，接着将所有试验电池在环境温度 ($20 \pm 5^\circ\text{C}$) 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。

Test cells and batteries are to be stored for at least six hours at a test temperature equal to $72 \pm 2^\circ\text{C}$, followed by storage for at least six hours at a test temperature equal to $-40 \pm 2^\circ\text{C}$. 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 ($20 \pm 5^\circ\text{C}$). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

要求 Requirement:

电池或电池组如无渗漏、无排气、无解体、无破裂和无燃烧，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%，即符合这一要求。

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.

测试数据如下表 Test Date showed in table below:

样品状态 State of sample	序号 No.	试验前 Pre-test		试验后 After test		质量损失 Mass loss (%)	电压比 Voltage after test/Voltage pre-test(%)	判定 Status
		质量 Mass (kg)	电压 Voltage (V)	质量 Mass (kg)	电压 Voltage (V)			
第一个充放电周期后完全充电 At first cycle in fully charged states	B01#	21.630	20.419	21.625	20.411	0.02	99.96	PASS
	B02#	21.650	20.361	21.644	20.351	0.03	99.95	PASS
25 个充放电周期后，完全充电 After 25 cycles ending in fully charged states	B03#	21.636	20.414	21.632	20.406	0.02	99.96	PASS
	B04#	21.642	20.384	21.638	20.375	0.02	99.96	PASS

备注 Notes:

试验后电池无渗漏、无排气、无解体、无破裂和无燃烧。

After the test, the cells are no leakage, no venting, no disassembly, no rupture and no fire.

Test T.3: 振动 Vibration

测试方法 Test method:

电池或电池组紧固在振动机平台，但不得造成电池变形，并能准确可靠地传播振动。正弦波形振动，频率在 7 赫兹和 200 赫兹之间摆动再回到 7 赫兹的对数扫频为时 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个方向都重复进行 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，对总质量不超过 12kg 的电池或电池组（电池和小型电池组），和对 12Kg 及更大的电池组（大型电池组）有所不同。

对电池和小型电池组：从 7 赫兹开始，保持 1gn 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 8gn(频率约为 50 赫兹)。将最大加速度保持在 8gn 直到频率增加到 200 赫兹。

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.

要求 Requirement:

样品无渗漏、无排气、无解体、无破裂和无燃烧，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%，电池即符合这一要求。

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 after testing in its perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure.

测试数据如下表 Test Date showed in table below:

样品状态 State of sample	序号 No.	试验前 Pre-test		试验后 After test		质量损失 Mass loss (%)	电压比 Voltage after test/Voltage pre-test(%)	判定 Status
		质量 Mass (kg)	电压 Voltage (V)	质量 Mass (kg)	电压 Voltage (V)			
第一个充放电周期后完全充电 At first cycle in fully charged states	B01#	21.625	20.411	21.625	20.408	0.00	99.99	PASS
	B02#	21.644	20.351	21.644	20.351	0.00	100.00	PASS
25 个充放电周期后，完全充电 After 25 cycles ending in fully charged states	B03#	21.632	20.406	21.632	20.404	0.00	99.99	PASS
	B04#	21.638	20.375	21.638	20.375	0.00	100.00	PASS

备注 Notes:

试验后电池无渗漏、无排气、无解体、无破裂和无燃烧。

After the test,the cells are no leakage,no venting, no disassembly, no rupture and no fire.

Test T.4:冲击 Shock

测试方法 Test method:

电池或电池组用坚硬支架紧固在试验装置上，支架支撑着每个试验电池的所有安装面。

每个电池经受最大加速度 150gn 和脉冲持续时间 6 毫秒的半正弦波冲击。大型电池需经受最大加速度 50gn 和脉冲持续时间 11ms 的半正弦冲击。

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.

每个电池组应受到半正弦冲击峰值加速度取决于电池组的质量。小电池组脉冲时间为 6 毫秒，大电池组脉冲时间为 11 毫秒。下面的公式用于计算适当的最小峰值加速度。

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.

Battery	Minimum peak acceleration	Pulse duration
Small batteries	150 gn or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller	6 ms
Large batteries	50 gn or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller	11 ms

* Mass is expressed in kilograms.

每个电池在三个互相垂直的电池组安装方位的正方向经受三次冲击，接着在反方向经受三次冲击，总共经受 18 次冲击。

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.

要求 Requirement:

样品无渗漏、无排气、无解体、无破裂和无燃烧，并且每个试验电池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%，电池即符合这一要求。

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 cells 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.

测试数据如下表 Test Date showed in table below;

样品状态 State of sample	序号 No.	试验前 Pre-test		试验后 After test		质量损失 Mass loss (%)	电压比 Voltage after test/Voltage pre-test(%)	判定 Status
		质量 Mass (kg)	电压 Voltage (V)	质量 Mass (kg)	电压 Voltage (V)			
第一个充放电周期后完全充电 At first cycle in fully charged states	B01#	21.625	20.408	21.625	20.408	0.00	100.00	PASS
	B02#	21.644	20.351	21.644	20.351	0.00	100.00	PASS
25 个充放电周期后, 完全充电 After 25 cycles ending in fully charged states	B03#	21.632	20.404	21.632	20.404	0.00	100.00	PASS
	B04#	21.638	20.375	21.638	20.375	0.00	100.00	PASS

备注 Notes:

试验后电池无渗漏、无排气、无解体、无破裂和无燃烧。

After the test,the cells are no leakage,no venting, no disassembly, no rupture and no fire.

Test T.5:外部短路 External short circuit

测试方法 Test method:

电池或电池组的应加热一段时间使外壳达到 $57 \pm 4^\circ\text{C}$ 的均匀稳定温度，加热时间应通过评估电池或电池组的尺寸和设计决定。对于无法评估的，小型电池和电池放置时间应至少 6 小时，大型电池和电池组应至少 12 小时。然后电池或电池组在 $57 \pm 4^\circ\text{C}$ 下经受总外阻小于 0.1 欧姆的短路条件。

电池或电池组外壳温度回到 $57 \pm 4^\circ\text{C}$ 后保持短路状态 1 小时以上，对于大型电池，电池温度降低至最高温升值一半时试验结束。

The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of $57 \pm 4^\circ\text{C}$, 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 $57 \pm 4^\circ\text{C}$ 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 $57 \pm 4^\circ\text{C}$, 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.

要求 Requirement:

外壳温度如不超过 170°C ，并且在试验过程后 6 小时内无解体、无破裂、无起火，即符合这一要求。

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 within six hours after test.

测试数据如下表 Test Date showed in table below:

样品状态 State of sample	序号 No.	最高温度 Highest temperature ($^\circ\text{C}$)	短路电阻 Short-circuit resistance ($\text{m}\Omega$)	判定 Status
第一个充放电周期 后完全充电 At first cycle in fully charged states	B01#	55.6	79	PASS
	B02#	55.8	80	PASS
25 个充放电周期 后，完全充电 After 25 cycles ending in fully charged states	B03#	56.3	82	PASS
	B04#	56.0	79	PASS

备注 Notes:

试验后电池 6 小时内无解体、无破裂、无起火。

After the test, the cells are no disassembly, no rupture and no fire within six hours.

Test T.6: 撞击/挤压 Impact/Crush

撞击 Impact

(适用于直径不小于 18mm 的圆柱形电池 applicable to cylindrical cells not less than 18mm in diameter)

测试方法 Test method:

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 $15.8\text{mm} \pm 0.1\text{mm}$, 长度至少 6cm, 或电池最长端的尺度, 取二者之长者, 将一块 $9.1\text{kg} \pm 0.1\text{kg}$ 的重锤从 $61\text{cm} \pm 2.5\text{cm}$ 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 $15.8\text{mm} \pm 0.1\text{mm}$ 完全表面的纵轴垂直、每一试样只经受一次撞击。

The sample cell or component cell is to be placed on a flat smooth surface. A $15.8\text{ mm} \pm 0.1\text{mm}$ 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 $9.1\text{ kg} \pm 0.1\text{ kg}$ mass is to be dropped from a height of $61 \pm 2.5\text{ cm}$ 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 $15.8\text{ mm} \pm 0.1\text{mm}$ diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.

挤压/Crush

(适用于棱柱形、袋装、硬币/纽扣电池和直径小于 18mm 的圆柱形电池 applicable to prismatic, pouch, coin/button cells and cylindrical cells not more than 18 mm in diameter)

注: 此处直径指设计参数(例如, 18650 电池的直径为 18.0 毫米)。

NOTE: Diameter here refers to the design parameter (for example the diameter of 18 650 cells is 18.0 mm).

测试方法 Test method:

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, 直到出现下列的情况之一:

Cells 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) 施加的力量达到 13 千牛 ± 0.78 千牛;
The applied force reaches $13\text{ kN} \pm 0.78\text{ kN}$;
- (b) 电池的电压下降至少 100mV; 或
The voltage of the cell drops by at least 100 mV; or
- (c) 电池变形达原始高度的 50%或以上。
The cell is deformed by 50% or more of its original thickness.

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。

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.

棱柱形或袋装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。

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.

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。

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.

要求 Requirement:

外壳温度如不超过 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，即符合这一要求。Cells or component cell 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 test.

试验数据如下表 Test Date showed in table below:

样品状态 State of sample	测试项目 Test item	序号 No.	判定 Status
一个充放电周期 50% 设计额定容量 状态 At first cycle at 50% of the design rated capacity	撞击 Impact	C05#	PASS
		C06#	PASS
		C07#	PASS
		C08#	PASS
		C09#	PASS
25 个充放电周期 50% 设计额定容量 状态 At 25 cycles at 50% of the design rated capacity		C10#	PASS
		C11#	PASS
		C12#	PASS
		C13#	PASS
		C14#	PASS

备注 Notes:

电池或元件电池在试验过程中和试验后 6 小时内无解体、无破裂、无起火。

Cells or component cell are no disassembly and no fire during the test and within six hours after test.

Test T.7:过充电 Overcharge

测试方法 Test method;

充电电流为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：

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

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

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

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

试验应在环境温度下进行。进行试验的时间应为 24 小时。

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

要求 Requirement;

电池组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。

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

测试数据如下 Test Date showed in table below;

过充电流 Overcharge current: 2×10A=30A	过充电压 Overcharge voltage : 1.2×100V=120V	充电总时间 Total time of charging: 24hours
样品状态 State of sample	序号 No.	判定 Status
第一个充放电周期后完全 充电 At first cycle in fully charged states	B01#	PASS
	B02#	PASS
25 个充放电周期后，完全 充电 After 25 cycles ending in fully charged states	B03#	PASS
	B04#	PASS

备注 Notes:

电池组在试验过程中和试验后 7 天内无解体、无起火。

Batteries are no disassembly and no fire during the test and within seven days after the test.

Test T.8:强制放电 Forced discharge

测试方法 Test method;

电池在环境温度下与 12V 直流电电源串联在起始电流等于制造商给的最大放电电流条件下强制放电
Each cells is forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.

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)。

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).

要求 Requirement;

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。

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

测试数据如下表 Test Date showed in table below;

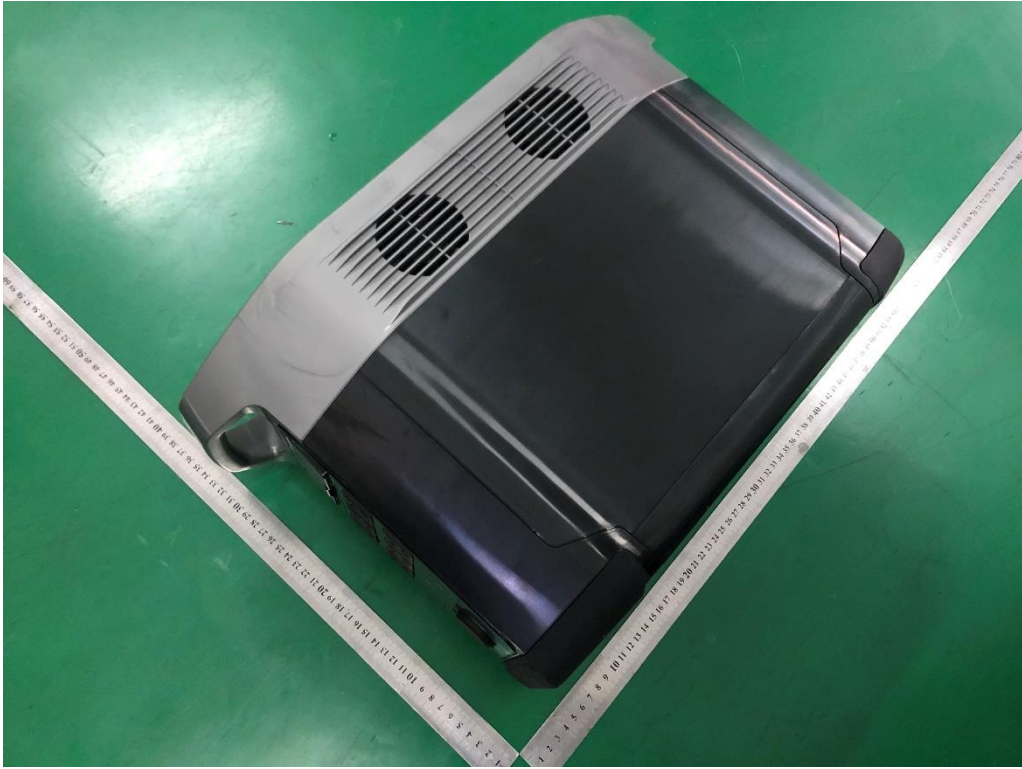
样品状态 State of sample	序号 No.	判定 Status
第一个充放电周期后完全 放电 At first cycle in fully discharged states	C15#	PASS
	C16#	PASS
	C17#	PASS
	C18#	PASS
	C19#	PASS
	C20#	PASS
	C21#	PASS
	C22#	PASS
	C23#	PASS
25 个充放电周期后，完全 放电 After 25 cycles ending in fully discharged states	C24#	PASS
	C25#	PASS
	C26#	PASS
	C27#	PASS
	C28#	PASS
	C29#	PASS
	C30#	PASS
	C31#	PASS
	C32#	PASS
	C33#	PASS
	C34#	PASS

备注 Notes:

试验后充电电池在试验过程中和试验后 7 天内无解体、无起火。

After the test, the recharged cells are no disassembly and no fire during the test and within seven days Ambient.

样品照片 Photo document



图片 Photo 1



图片 Photo 2

样品照片 Photo document



图片 Photo 3



图片 Photo 4

试验仪器设备清单

序号	名称	型号	编号	校准有效期至	本次使用(√)
1	电池充放电测试柜	Ct-3008-5V10A-204	R161000419	2022/04/20	√
2	直流电子负载	HK3312	R1307187	2022/04/21	√
3	直流电阻测试仪	YG2512	R160700400	2021/07/14	√
4	振动台	EV203VT640VCSus b-2	A180703116	2021/06/14	√
5	手持式数字万用表	U1341C	R170800448	2022/01/26	√
6	电子秤	BWS-30-SXR	R1307189	2022/03/11	√
7	冲击试验台	CL-50	R141000242	2021/06/14	√
8	线性高低温试验箱	XSMS4-225C	R160700407	2021/11/27	√
9	数据采集仪(主机)	34972A	R160527001	2022/04/21	√
10	数据采集开关单元	34901A	R160527003	2022/04/21	√
11	重物冲击试验机	XSM-8016	R170500434	2021/07/14	√
12	电池高空低压检测设备	RJD-DY-50	R150300294	2021/07/29	√
13	温控短路试验机	BE-8102S	A180803175	2021/07/14	√
14	电池充放电测试系统	CHROMA 17011	R151000329	2021/07/14	√
15	能源回收式电池模组测试系统	CHROMA 17020	A171102799	2021/10/14	√
16	直流稳压电源	62024P-100-25	A200503591	2022/04/25	√
17	电池包(模组)充放电系统	17040	A200503588	2022/05/25	√

注：以上仪器设备在计量检定周期内。

***** 报告结束 END OF REPORT *****

声明

STATEMENT

1. 报告未加盖“检测专用章”无效。
The test report is invalid without stamp of laboratory.
2. 报告无检测、批准人员签字无效。
The test report is invalid without signature of person(s) testing and authorizing.
3. 报告涂改无效。
The test report is invalid if erased and corrected.
4. 自送样品的检测结论仅对送检样品有效。
Test results of the report is valid to the test samples if sampling by client.
5. “☆”号项目未通过 CNAS 认可。
“☆” item to be outside the scope of authorized by CNAS.
6. “☆”项目未取得资质认定, 检测方法、数据和结果供双方参考。
“☆” item to be outside the scope of CMA, the test method、data and results are available for reference.
7. 未经本实验室书面同意, 不得部分地复制本报告。
The test report shall not be reproduced except in full, without written approval of the laboratory.
8. 如对本报告有异议, 可在收到报告后 15 天内向本单位申诉, 逾期不予受理。
If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

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