Material Safety Data Sheet

MSDS Report

Applicant:	**ATHENA SPA** *Via delle Albere 13, 36045 Alonte (VI) ITALY*
Description model:	**Lithium Iron Phosphate Battery**
Type Model:	**GK-ATHBL-0003**
Nominal Voltage:	**12.8V**
Rated Capacity:	**2.5Ah, 32Wh**
Weight:	**575.2g**
Size (L×W×T):	**107.5mm*56.5mm*85.5mm**

Referenced Document:
Report No. ST2412302989-2
ISO 11014:2009 Safety data sheet for chemical products

Place: ***Alonte (VI) Italy***
Date: ***April 17th, 2026***

ATHENA SPA
Quality Director
ROBERTO PESAVENTO



SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Lithium Iron Phosphate Battery
Trademark:	GET
Model:	GK-ATHBL-0003
Nominal Voltage:	12.8V
Rated Capacity:	2.5Ah (32Wh)
Manufacture's Name:	Athena S.p.A.
Address:	Via delle Albere, 13, 36045 Alonte VI, Italy
Contact Information:	Roberto Pesavento
Email:	Roberto.Pesavento@athena.eu

SECTION 2: HAZARDS IDENTIFICATION

Classification of Danger	See section 14.
Primary Route(s) of Exposure	Eye, skin contact, ingestion.
Health Hazard	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.

SECTION 3 – COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	Concentration or concentration ranges (%)	CAS Number
LiFePO4	15 -40	15365-14-7
Copper	7-9	7440-50-8
Graphite	15-17	7440-44-0
Ethylene carbonate	10 -31	96-49-1
Dimethyl carbonate	5-16	616-38-6
Ethyl methyl carbonate	1-2	623-53-0
Lithium Hexafluorophosphate	2-3	21324-40-3
Aluminium foil	5-7	7429-90-5
Nickel	2-3	7440-02-0
Other	/	/

Labelling according to EC directives.
No symbol and hazard phrase are required.
Note: CAS number is Chemical Abstract Service Registry Number.
N/A=Not apply.

SECTION 4 – FIRST-AID MEASURES

Eye	Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin	Remove contaminated clothes and rinse skin with plenty of water or shower for 15 minutes. Get medical aid.
Inhalation	Remove from exposure and move to fresh air immediately. Use oxygen if available.
Ingestion	Ingesting damaged batteries, do not induce vomiting or give food or drink. Seek medical attention immediately

SECTION 5 – FIRE-FIGHTING MEASURES

Characteristics of Hazard	Dusts at sufficient concentrations can form explosive mixtures with air. Combustion generates toxic fumes
Hazardous Combustion Products	Carbon dioxide.
Fire-extinguishing Methods and Extinguishing Media	For small fires, use water spray, dry chemical, carbon dioxide or chemical foam.
Attention in Fire-extinguishing	Wear self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Personal Precautions, protective equipment, and emergency procedures	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.
Environmental Precautions	Prevent product from contaminating soil and from entering sewers or waterways.
Methods and materials for Containment	Stop the leak if safe to do so. Contain the spilled liquid with dry sand or earth. Clean up spills immediately.
Methods and materials for cleaning up	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.

SECTION 7 – HANDLING AND STORAGE

Handling	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.
Storage	Store in a cool, dry, well-ventilated area away from incompatible substances. Store locked up. Keep out of the reach of children.
Other Precautions	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.

SECTION 8 – EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls	Use adequate ventilation to keep airborne concentrations low. If used under conditions that generate particulates, the ACGIH TLV-TWA of 3mg/m3 respirable fraction (10mg/m3 total) should be observed.
Personal Protective Equipment	Eye and Face Protection: None required for consumer use. If there is a Hazard of contact: Tight sealing safety goggles. Face protection shield. Skin and Body Protection: None required for consumer use. If there is a Hazard of contact: Wear protective gloves and protective clothing. Respiratory Protection: No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, 柱ventilation and evacuation may be required.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Black almost cuboid
	Odour: If leaking, smells of medical ether.
Change in condition:	
pH	Not applicable as supplied.
Flash Point	Not applicable unless individual components exposed.
Flammability (soil, gas)	Not applicable unless individual components exposed.
	Not applicable unless individual components exposed.
Viscosity	Not applicable unless individual components exposed.
Solubility (other)	Not applicable unless individual components exposed.

SECTION 10 – STABILITY AND REACTIVITY

Chemical Stability	Stable under recommended storage conditions.
Possibility of Hazardous Reactions	None under normal processing.
Conditions to Avoid	Exposure to air or moisture over prolonged periods.
Incompatible materials	Acids, Oxidizing agents, Bases.
Hazardous Decomposition Products	Carbon oxides.

SECTION 11 – TOXICOLOGICAL INFORMATION

Irritation	In the event of exposure to internal contents, vapour fumes may be very irritating to the eyes and skin.
Sensitization	Not Available
Reproductive Toxicity	Not Available
Toxicologically Synergistic Materials	Not Available

SECTION 12 – ECOLOGICAL INFORMATION

General note:	Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
Anticipated behaviour of a chemical product in environment / possible environmental impact / ecotoxicity	Not Available

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Treatment	Recycle or dispose of in accordance with government, state & local regulations.
Attention for Waste Treatment	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.

SECTION 14 – TRANSPORT INFORMATION

UN number	/
Proper shipping name	UN3480: Lithium-ion Batteries (PI 965) UN3481: Lithium-ion Batteries packed with equipment (PI 966) UN3481: Lithium-ion Batteries Contained in equipment (PI 967)
Label(s) / Placard Required	/
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.	
ICAO / IATA:	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、967 Section II of IATA DGR 66th (2025 Edition) for transportation.
IMDG CODE:	The batteries are not restricted to IMDG Code 2024 Edition (Amdt 42-24) according to special provision 188.
DOT:	Other requirements for the US Department of Transportation (DOT) Subchapter C, Hazardous Materials Regulations if shipped in compliance with 49 CFR 173.185
ADR/ ADN:	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 2025.

RID:	Regulations concerning the International Carriage of Dangerous Goods by Rail under Special Provision 188
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.	

SECTION 15 – REGULATORY INFORMATION

- Dangerous Goods Regulations
- Recommendations on the Transport of Dangerous Goods-Model Regulations (23rd revised edition)
- Recommendations on the Transport of Dangerous Goods-Manual of Tests and Criteria
- International Air Transport Association (IATA)
- International Maritime Dangerous Goods (IMDG Code 2024 Edition Amdt 42-24)
- Technical Instructions for the Safe Transport of Dangerous Goods
- Classification and code of dangerous goods (GB 6944-2012)
- OSHA Hazard Communication (29 CFR 1910.1200)
- Toxic Substance Control Act (TSCA)
- Code of Federal Regulations
- In accordance with all Federal, State and local laws

SECTION 16 – ADDITIONAL INFORMATION

MSDS creation date: 2025 Version: 1.0

Sample photo:





To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

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

***** End of Report *****

中国认可
国际互认
检测
TESTING
CNAS L7500

UN38.3检 测 报 告
UN38.3 Test Report

样 品 名 称: 磷酸铁锂电池

Name of Samples: **Lithium Iron Phosphate Battery**

申 请 商 名 称: 阿典那摩托车配件（杭州）有限公司

Applicant's name: **Athena (Hangzhou) Automotive and Industrial Parts Co., Ltd.**

深圳市北航检测有限公司
Shenzhen Beihang Testing Co., Ltd.

TEST REPORT UN38.3(Rev 7+AMD1) Manual of test and criteria, Section 38.3 - Lithium metal and lithium ion Batteries 测试报告—联合国《关于危险货物运输的建议书试验和标准手册》第七版修订一		
Report Number 报告编号	RSZBHST250114126	
Date of issue 签发日期	2025-01-14	
Testing Laboratory 测试实验室	Shenzhen Beihang Testing Co., Ltd. 深圳市北航检测有限公司 Room 202， 2/F， Building F, HaoWei Industrial Park, QingSong West Road, PingShan District, Shenzhen, Guangdong, China 广东省深圳市坪山区青松西路豪威新材料工业园F座202室	
Tested by 检测人 Reviewed by审核人 Approved by 批准人	**Romy** **Justin** **Arvin**	**Seal of BUAA：** **报告单位盖章：**
Applicant's name 委托商名称	Athena (Hangzhou) Automotive and Industrial Parts Co., Ltd. 阿典那摩托车配件（杭州）有限公司	
Applicant's Address 委托商地址	1st floor, Building 15, Zhong Zi Technology Park, No. 260, 6th Street, Bai Yang Community, Economic and Technological Development Zone, Hangzhou 杭州经济技术开发区白杨街道6号大街260号中自科技园15幢1层	
[redacted]		
Test Standard 检测标准	UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS Manual of Tests and Criteria" Seventh revised edition (ST/SG/AC.10/11/Rev 7+AMD1) 联合国《关于危险货物运输的建议书试验和标准手册》第七版修订一 (ST/SG/AC.10/11/Rev 7+AMD1).	
Name of Products 产品名称	Lithium Iron Phosphate Battery 磷酸铁锂电池	
Model/Type 型号	GK-ATHBL-0003	
Ratings 额定参数	12.8V, 2.5Ah,32Wh	

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List of Attachments 附件清单:

Appendix 1: 3 pages of Photo Documentation 附录1：3页照片文件

Summary of testing 测试摘要:

Name of test and test clause 试验名称和条款:

Test items 测试项目	Sample Number 样品编号
T.1: Altitude simulation / 高度模拟	B1# - B8#
T.2: Thermal test / 温度测试	
T.3: Vibration / 振动	
T.4: Shock / 冲击	
T.5: External short circuit / 外接短路	
T.6: Crush / 挤压 or Impact/撞击	C1# - C10#
T.7 Overcharge / 过充电	B9# - B16#
T.8: Forced discharge / 强制放电	C11# - C30#

Sample description 样品说明：

Sample Number 样品编号	State of samples 样品状态
B1# - B8#	The conditions of the batteries of samples No. B1# – B4# are at first cycle, in fully charged states. 样品编号B1# - B4#为第一次循环充放电周期完全充电状态的电池。
	The conditions of the batteries of samples No. B5# – B8# are after 25 th cycles ending, in fully charged states. 样品编号B5# - B8#为25次循环充放电周期后完全充电状态的电池。
C1# - C10#	The conditions of the cells of samples No. C1# - C5# are at first cycle at 50% of the design rated capacity. 样品编号C1# - C5#为第一次循环充放电周期充电至标称容量的50%状态的电芯。
	The conditions of the cells of samples No. C6# – C10# are after 25 th cycles ending at 50% of the design rated capacity. 样品编号C6# - C10#为25次循环充放电周期后充电至标称容量的50%状态的电芯。
B9# - B16#	The conditions of the batteries of samples No. B9# - B12# are at first cycle, in fully charged states. 样品编号B9# - B12#为第一次循环充放电周期后完全充电状态的电池。
	The conditions of the batteries of samples No. B13# - B16# are after 25th cycles ending in fully charged states. 样品编号B13# - B16#为25次循环充放电周期后完全充电状态的电池。
C11# - C30#	The conditions of the cells of samples No. C11# – C20# are at first cycle, in fully discharged states. 样品编号C11# - C20#为第一次循环充放电周期完全放电状态的电芯。
	The conditions of the cells of samples No. C21# – C30# are after 25th cycles ending in fully discharged states. 样品编号C21# – C30# 为25次循环充放电周期后完全放电状态的电芯。

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Test Procedure测试程序:

1. TestsT.1 toT.5 are conducted in sequence on the same battery, Tests 6 and 8 are conducted using not otherwise tested batteries. Test T.7 may be conducted using undamaged batteries previously used in Tests T.1toT.5 for purposes of testing on cycled batteries.
电池必须按顺序在相同的一组电池上进行试验T.1至T.5。试验T.6和T.8应使用未另外试验过的电池。试验T.7可以使用先前在试验T.1至T.5中使用过的未损坏电池进行，以便测试进行在循环过的电池上。

2.Inorder to quantify the mass loss, the following procedure is provided:

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

为了量化质量损失，可用以下公式计算：质量损失$(\%)=(M_1-M_2)/M_1\times 100$
Where M_1 is the mass before the test and M_2 is the mass after the test. When mass loss does not exceed the values in Table below, it is considered as" no mass loss".
式中：M_1是试验前的质量，M_2是试验后的质量。如果质量损失不超过下表所列的数值，应视为“无质量损失”。

Mass M of cell or battery 电芯或电池的质量	Mass loss limit 质量损失限值
M＜1g	0.5%
1g≤M≤75g	0.2%
M＞75g	0.1%

3. In test T.1toT.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%ofits voltage immediately prior to this procedure.
在测试T.1至T.4中，电池须满足无渗漏、无泄气、无解体、无破裂和无起火，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%。

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Possible test case verdicts 测试判定：

- test case does not apply to the test object ..... : N/A
判定不适用于测试对象
- test object does meet the requirement ..... : P (Pass)
测试符合规定
- test object does not meet the requirement ..... : F (Fail)
测试不符合规定

Date of receipt of test item 接收日期 ..... : 2024-12-20

Date (s) of performance of tests 项目执行日期 ..... : 2024-12-21 to 2025-01-10

General remarks 通用注解:

The test results presented in this report relate only to the object tested.

本报告的测试结果仅对送检样品负责。

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.本报告未经本实验室书面批准不得全部复制。

Throughout this report a point is used as the decimal separator.

在整个报告中，一个点被用作小数分隔符。

General product information 通用产品信息:

Product name 产品名称	Lithium Iron Phosphate Cell 磷酸铁锂电芯	Lithium Iron Phosphate Battery 磷酸铁锂电池
Type/model 型号	114383	GK-ATHBL-0003
Nominal voltage 标称电压	3.2V	12.8V
Rated capacity 额定容量	2500mAh	2500mAh
Recommended charging voltage 标称充电电压	3.6V	14.4V
Recommended charging Current 标称充电电流	500mA	500mA
Maximum charging current 最大充电电流	2500mA	2500mA
Maximum discharging current 最大放电电流	25000mA	25000mA
Discharge cut-off voltage 放电截至电压	2.3V	10.0V
Dimensions 尺寸	87.0mm*45.0mm*11.2mm	107.5mm*56.5mm*85.5mm
Weight 重量	约 75.0g	约575.2g
Appearance 外观	--	Black almost cuboid 黑色近长方体
Remark：The batteries consist of 4 cells. 备注：电池由4个电芯组成。		

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UN38.3			
Clause	Requirement + Test	Result - Remark	Verdict
38.3.4.1	**Test T.1: Altitude simulation/高度模拟**		**P**
	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)/将电芯和电池在温度为20±5°C、大气压力不大于11.6kpa的环境中贮存不少于6个小时。		P
	Cells and batteries meet this requirement if there is no mass loss, 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. /电芯和电池符合要求：无质量损失、无漏液、无冒烟、无分解、无破裂以及无着火现象；电芯或电池测试后的开路电压不低于测试前开路电压的90%。此项关于电压方面的要求不适用于完全放电后的电芯和电池。	No leakage, no venting, no disassembly, no rupture and no fire. / 无漏液、无冒烟、无分解、无破裂以及无着火现象。 The data see table 1. / 测试数据见表1。	P
38.3.4.2	**Test T.2: Thermal test/温度试验**		**P**
	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 10times, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20±5°C). /首先将样品放在72±2°C的环境中放置至少6个小时，然后放在- 40±2°C的环境中放置至少6个小时。温度转换的最大间隔时间为30分钟。如此循环10次，最后将样品放在20±5°C的环境中静置24小时。		P
	For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours. /对于大电芯，在高温和低温中放置的时间最少12个小时。		N/A
	Cells and batteries meet this requirement if there is no mass loss, 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. /电芯和电池符合要求：无质量损失、无漏液、无冒烟、无分解、无破裂以及无着火现象；电芯或电池测试后的开路电压不低于测试前开路电压的90%。此项关于电压方面的要求不适用于完全放电后的电芯和电池。	No leakage, no venting, no disassembly, no rupture and no fire. / 无漏液、无冒烟、无分解、无破裂以及无着火现象。 The data see table 1. / 测试数据见表1。	P

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UN38.3			
Clause	Requirement + Test	Result - Remark	Verdict
38.3.4.3	**Test T.3: Vibration/振动**		**P**
	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 7Hz 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. /样品必须牢固地安装在振动台台面上。振动以正弦波形式，以7Hz增加至200Hz，然后减少回到7Hz为一个循环，一个循环持续15分钟。对样品从三个互相垂直的方向上循环12次，共3个小时。其中一个振动方向必须是垂直样品的极性平面。		P
	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). /对于质量不大于12kg的样品(电芯和小电池)和质量超过12kg的电池(大电池)，对数扫频不同。		P
	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. /对于电芯和小电池，对数扫频为：从7Hz开始保持1gn的最大加速度直到频率为18Hz，然后将振幅保持在0.8mm (总偏移1.6mm) 并增加频率直到最大加速度达到8gn (频率约为50Hz)，将最大加速度保持在8gn直到频率增加到200Hz。		P
	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. /对于大电池，对数扫频为：从7Hz开始保持1gn的最大加速度直到频率为18Hz，然后将振幅保持在0.8mm (总偏移1.6mm) 并增加频率直到最大加速度达到2gn (频率约为25Hz)，将最大加速度保持在2gn直到频率增加到200Hz。		N/A

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UN38.3			
Clause	Requirement + Test	Result - Remark	Verdict
	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./电芯和电池符合要求：无质量损失、无漏液、无冒烟、无分解、无破裂以及无着火现象；电芯或电池测试后的开路电压不低于测试前开路电压的90%。此项关于电压方面的要求不适用于完全放电后的电芯和电池。	No leakage, no venting, no disassembly, no rupture and no fire. / 无漏液、无冒烟、无分解、无破裂以及无着火现象。 The data see table 1. / 测试数据见表1。	P
38.3.4.4	**Test T.4: Shock/冲击**		**P**
	Test cells shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test cell. Each cell or battery 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 cell shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks. /以稳固的托架固定住每个样品。对每个电芯样品以峰值为150gn的半正弦的加速度撞击，脉冲持续6ms，另外，大电芯须经受最大加速度50gn和脉冲持续时间11ms的半正弦波冲击，每个样品必须在三个互相垂直的电池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。		N/A
	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. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in the negative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks. The formulas below are provided to calculate the appropriate minimum peak accelerations /每个电池经受冲击峰值加速度取决于电池的质量，小电池的脉冲持续时间为6ms，大电池的脉冲持续时间为11ms，每个样品必须在三个互相垂直的电池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,提供下面的公式来计算合适的最小峰值加速度。		P

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UN38.3			
Clause	Requirement + Test	Result - Remark	Verdict
	<table><tr><th>Battery</th><th>Minimum peak acceleration</th><th>Pulse duration</th></tr><tr><td>Small batteries</td><td>150 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller</td><td>6 ms</td></tr><tr><td>Large batteries</td><td>50 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller</td><td>11 ms</td></tr></table> * Mass is expressed in kilograms.		P
	Cells and batteries meet this requirement if there is no mass loss, 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. / 电芯和电池符合要求：无质量损失、无漏液、无冒烟、无分解、无破裂以及无着火现象；电芯或电池测试后的开路电压不低于测试前开路电压的90%。 此项关于电压方面的要求不适用于完全放电后的电芯和电池。	No leakage, no venting, no disassembly, no rupture and no fire. / 无漏液、无冒烟、无分解、无破裂以及无着火现象。 The data see table 1. / 测试数据见表1。	P
38.3.4.5	**Test T.5: External short circuit/外部短路**		**P**
	The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches 57±4°C and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at 57±4°C. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to57±4°C. /保持测试环境温度稳定在57 ±4°C，以便样品外表温度达到57±4°C，然后将样品正负极用小于0.1欧姆的总电阻回路进行短路，样品的外表温度恢复到57±4°C之后保持短路状态1小时以上。		P
	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./电芯和电池符合要求：在测试过程中以及之后6个小时内，外表温度不超过170°C，并且无分解、无破裂和无着火现象发生。	No disassembly, no rupture and no fire during the test and within six hours after the test./ 在测试过程中以及之后6个小时内，外表温度不超过170° C，并且无分解、无破裂和无着火现象发生。 The data see table 1. / 测试数据见表1。	P

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UN38.3			
Clause	Requirement + Test	Result - Remark	Verdict
38.3.4.6	**Test T.6: Impact / Crush/撞击/挤压**		**P**
	Test procedure – Impact (applicable to cylindrical cells greater than or equal to18 mm in diameter) /撞击(适合于直径大于或等于18mm的圆柱形电芯)		N/A
	The 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, Type316 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. /将样品放在一个平坦的光滑平面上。将一直径为15.8 mm± 0.1mm，长度不小于6cm的316不锈钢棒横过样品中部放置后，将一质量为9.1 kg±0.1 kg的重物从61±2.5 cm的高度落向样品		N/A
	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. /接受撞击的样品，纵轴应与平坦的表面平行并与横放在样品中心的直径15.8 mm±0.1mm弯曲表面的纵轴垂直。每一个样品只接受一次撞击。		N/A
	Test Procedure – Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells not more than 18 mm in diameter). /挤压 (适用于棱柱形、袋状、硬币/纽扣电芯和直径不超过18mm的圆柱形电芯)	Pouch cell/袋状电芯	P
	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. /将样品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1.5cm/s。挤压持续进行，直到出现以下三种情况之一		P
	(a) The applied force reaches 13 kN±0.78 kN; /施加力达到13 kN±0.78 kN		P
	(b) The voltage of the cell drops by at least 100 mV; /样品的电压下降至少100mV		N/A
	(c) The cell is deformed by 50% or more of its original thickness. /电池变形达原始厚度的50%以上。		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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. /棱柱形或袋状电芯应从最宽的一面施压。纽扣/硬币形电芯应从其平坦表面施压。圆柱形应从与纵轴垂直的方向施压。		P
	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./每个样品都是全新样品，并且只经受一次施压。施压结束后样品应静置观察6小时。		P
	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. /电芯满足要求：在测试过程中以及之后6个小时内，外表温度不超过170°C，并且无分解和无着火现象发生。	No disassembly and no fire. /无分解，无着火现象发生。 The data see table 2. / 测试数据见表2。	P
38.3.4.7	**Test T.7: Overcharge/过充电**		**P**
	The charge current shall be twice the manufacturer's recommended maximum continuous charge current. Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours. The minimum voltage of the test shall be as follows: /在室温下，以2倍的制造商宣称的最大持续充电电流对样品充电，测试时间为24小时。测试的最小电压如下：		P
	(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. /如果制造商宣称的充电电压不超过18V，本测试的最小充电电压应是制造商宣称的最大充电电压的两倍或者是22V之中的较小者。		P
	(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. /如果制造商宣称的充电电压超过18V，本测试的最小充电电压应该是制造商宣称的最大充电电压的1.2倍。		N/A
	There is no disassembly and no fire during the test and within seven days after the test. /在测试中和测试完成后7天内，样品无分解和无着火现象。	No disassembly and no fire. /无分解，无着火现象发生。 The data see table 3. /测试数据见表3。	P

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UN38.3			
Clause	Requirement + Test	Result - Remark	Verdict
38.3.4.8	**Test T.8: Forced discharge/强制放电**		**P**
	Each cell shall be 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. /在室温下，将单个电芯连接在12V的直流电源上进行强制放电，此直流电源供给每个电芯初始电流为制造商宣称的最大放电电流。 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). /指定的放电电流通过串联在测试电芯上的合适大小和功率的负载来获得，每个电芯的强制放电时间(小时)为额定容量除以初始电流(安培)。		P
	There is no disassembly and no fire during the test and within seven days after the test./在测试中和测试完成后7天内，样品无分解和无着火现象发生	No disassembly and no fire. /无分解和无着火现象发生。 The data see table 4. / 测试数据见表4	P

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Table 1: T.1~T.5 / 表1. 测试T.1~测试T.5

Sample No.样品编号	Mass prior to test 测试前质量（g）	OCV prior to test 测试前开路电压（V）	Test 1: Altitude simulation 测试 1：高度模拟		Test 2: Thermal test 测试 2：温度试验		Test 3: Vibration 测试 3：振动		Test 4: Shock 测试 4：冲击		Test 5: External Short Circuit 测试 5：外部短路
			Mass loss 质量损失 (%)	Voltage after test/Voltage pre-test, 试验后电压/试验前电压(%)	Mass loss 质量损失 (%)	Voltage after test/Voltage pre-test, 试验后电压/试验前电压(%)	Mass loss 质量损失 (%)	Voltage after test/Voltage pre-test, 试验后电压/试验前电压 (%)	Mass loss 质量损失 (%)	Voltage after test/Voltage pre-test, 试验后电压/试验前电压(%)	Temp. 温度(°C)
B1#	574.784	14.147	0.00	99.98	0.01	99.94	0.01	99.98	0.01	99.98	57.3
B2#	574.966	14.136	0.01	99.97	0.01	99.97	0.01	99.99	0.01	99.99	57.8
B3#	574.845	14.142	0.00	100.00	0.00	99.93	0.00	100.00	0.00	100.00	57.2
B4#	575.198	14.138	0.00	100.00	0.01	99.95	0.00	100.00	0.00	100.00	57.6
B5#	574.644	14.152	0.00	99.99	0.01	99.94	0.01	99.99	0.01	99.98	57.7
B6#	575.099	14.149	0.01	99.98	0.01	99.96	0.01	99.98	0.01	99.98	57.4
B7#	574.912	14.138	0.00	100.00	0.01	99.95	0.00	100.00	0.00	100.00	57.9
B8#	575.068	14.143	0.00	99.98	0.01	99.93	0.00	100.00	0.00	99.99	57.2

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Table 2: Crush or impact/ 表2：挤压或撞击											
Test 6: Crush 测试6：挤压	Sample No. 样品编号	C1#	C2#	C3#	C4#	C5#	C6#	C7#	C8#	C9#	C10#
	OCV prior to test(V) 测试前开路电压	3.347	3.342	3.348	3.346	3.343	3.342	3.336	3.339	3.334	3.342
	Temp. 温度(°C)	24.6	24.8	24.3	24.2	24.7	24.5	24.3	24.6	24.8	24.3

Table 3：Overcharge / 表3：过充电									
Test 7: Overcharge 测试7：过充电	Sample No. 样品编号	B9#	B10#	B11#	B12#	B13#	B14#	B15#	B16#
	OCV prior to test(V) 测试前开路电压	14.155	14.156	14.158	14.147	14.136	14.142	14.147	14.145

Table 4：Forced discharge / 表4：强制放电											
Test 8: Forced discharge 测试8：强制放电	Sample No. 样品编号	C11#	C12#	C13#	C14#	C15#	C16#	C17#	C18#	C19#	C20#
	OCV prior to test(V) 测试前开路电压	2.532	2.526	2.537	2.525	2.528	2.534	2.536	2.527	2.524	2.531
	Sample No. 样品编号	C21#	C22#	C23#	C24#	C25#	C26#	C27#	C28#	C29#	C30#
	OCV prior to test(V) 测试前开路电压	2.516	2.518	2.514	2.513	2.517	2.514	2.512	2.519	2.515	2.513

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Appendix 1 附录1

Photo Documentation 照片文件

Fig. 1 – Front view of Power Bank
表1–电池正面视图



Fig. 2 – Back view of Power Bank
表2–电池反面视图



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Fig. 3 – Front view of Cell
表3 –电芯正面视图

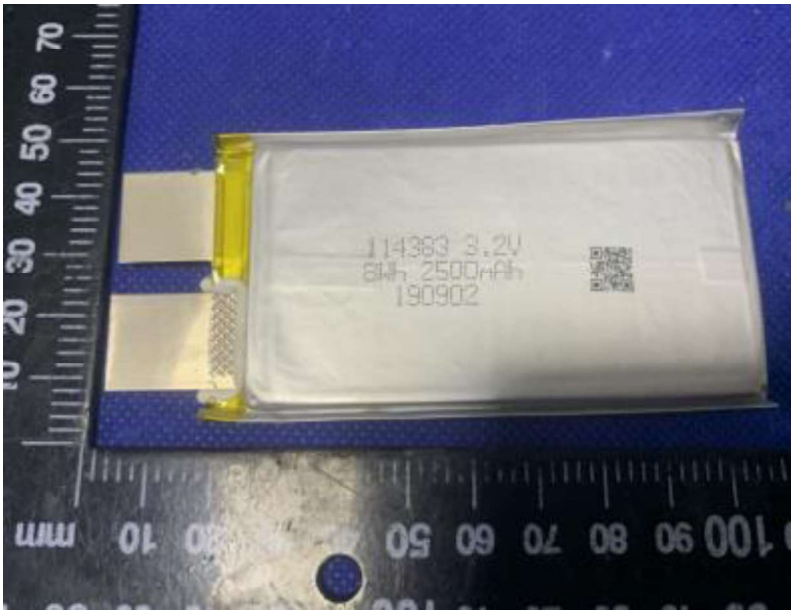
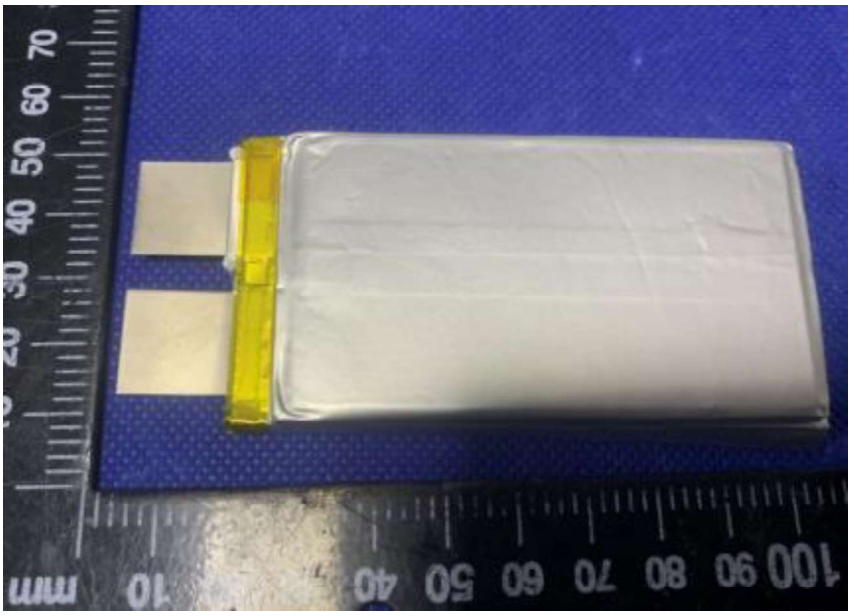


Fig. 4 – Back view of Cell
表4 –电芯反面视图



--End of Test Report---

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