FLIR MR277: Moisture Meter, MSX IR Camera, and Hygrometer

P/N: MR277

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Document identity

Publ. No.: MR277
Commit: 79300
Language:
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Website

http://www.flir.com

Customer support

http://support.flir.com

Disclaimer

Specifications subject to change without further notice. Camera models and accessories subject to regional market considerations. License procedures may apply. Products described herein may be subject to US Export Regulations. Please refer to exportquestions@flir.com with any questions.



General description	
Part number	MR277
Part name	Moisture Meter, MSX IR Camera, and Psychrometer
Description	Building Inspection System with Moisture Psychrometer and MSX IR Camera

Thermal imaging	
Imaging detector	FLIR Lepton microbolometer
Image calibration	Automatic with manual lock scale option
Thermal image resolution (W × H)	160 × 120 (19,200 pixels)
Object temperature range	0 to 100°C (32 to 212°F)
Spectral response	8–14 µm
Field of view (W x H)	55° x 43°
Sensitivity	<70 mK
Image update speed frequency	9 Hz
Thermal image palettes	Iron, Rainbow, Arctic, White-Hot, Black-Hot
Thermal image minimum focus distance	10 cm (4 in)
MSX	Adds visual details to full resolution thermal image
Saved image file format	Radiometric JPEG
Stored image capacity	15,000 images
Internal memory	8 GB
Digital camera	2MP
Digital camera field of view (HFOV)	83° FOV (70.5° HFOV x 56° VFOV)

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#MR277; r. 79300;

Thermal imaging	
Digital camera minimum focus distance	25 cm (9.8 in)
Display type	QVGA (320 × 240 pixels) 2.8 in. color TFT graphical display

Moisture measurement	
Pin moisture range	7–100%
Pin moisture accuracy	±1.5%, 7 to 30% Reference only: 30 to 100%
Pin moisture groups	11 material groups
Pinless moisture range	0 to 100
Pinless moisture accuracy	Relative
Pinless measurement depth	0.75" (19 mm) Max
Measurement resolution	0.1
Response time pinless mode	100 ms
Response time pin mode	750 ms

Environmental measurement	
Relative humidity range	0 to 100%
Relative humidity basic accuracy	±2.5%
Relative humidity detailed accuracy	±4.7%, 0 to 10% ±2.5%, 10 to 90% ±4.7% 90 to 100%
Air temperature range	0 to 50°C (32 to 122°F)
Air temperature accuracy	±0.6°C (±1.1°F)
Dew point	–30 to 50°C (–22 to 122°F)
Dew point basic accuracy	±1.0°C (±1.8°F)
Vapor pressure	0 to 12.0 kPa
Vapor pressure basic accuracy	±0.05 kPa
Mixing ratio range	0 to 80.0 g/kg (0 to 560 GPP)
Mixing ratio basic accuracy	0.25 g/kg (±2 GPP)

General information	
IP rating	IP54
Warranty	https://www.flir.com/testwarranty
Language options	22

Laser	
Type	Visible class 2
Orientation	Single laser pointer to center of thermal image
Power output	Maximum 1.0 mW
Wavelength	650 ±20 nm

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P/N: MR277

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#MR277; r. 79300;

Power system	
Continuous run time	16 hours maximum
Typical usage	4 work weeks
Auto power off	Programmable: off, 1, 5, or 20 minutes
Battery	Rechargeable 3.7 V nominal, 5400 mAh LiPo

Certifications	
Certification standards	EN 61326 (EMC), EN 60825-1 Class 2 (Laser), IEC61010-1
Agency approvals	CE, FCC Class B, RCM

Environmental specifications	
Operating temperature	-20 to +60°C (- 4 to +140°F)
Storage temperature	-20 to +45°C (- 4 to +113°F)
Operating humidity	5% to 95%
Storage humidity	90% relative humidity (no condensation)
Drop test	2 m (6.6 ft)

Meter physical data	
Weight	406 g (14.3 oz)
Size (L × W × H)	16 x 8.5 x 4.4 cm (6.2 × 3.3 × 1.7 in)

Shipping information	
Packaging type	Retail color box
Packaging contents	FLIR MR277, FLIR MR13 Replaceable Temperature and Relative Humidity Sensor, FLIR MR02 Standard Pin Probe, quick start guide, international USB charger, USB cable, and lanyard
Packaging weight	966 g (34 oz)
Packaging dimensions (H × W × L)	55 x 31 x 32 cm (21.6 x 12.3 x 12.4 in)
Master carton quantity	12
EAN-13	0793950374771
UPC-12	793950374771
Country of origin	China

Technical support	
Website	http://support.flir.com

Supplies & accessories:

- MR11; FLIR MR11: Handheld Temperature & Humidity sensor accessory
- MR12; FLIR MR12: Ball probe moisture sensor accessory
- MR01; Replaceable T/RH Probe for MR77
- MR02; Replaceable External Moisture Pin Probe for MR77
- MR05; Impact Pin Moisture Probe
- MR06; Wall Cavity Probe
- MR07; Hammer Probe
- MR08; Hammer and Wall Cavity Probe Combo

P/N: MR277
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#MR277; r. 79300;

- MR09; Baseboard probe
- MR10-2; Protective case for FLIR Moisture Meters
- MR13; Replacement Temperature and Humidity Sensor for MR277

Teledyne FLIR LLC
9 Townsend West, Nashua NH 03063 / Phone: 603.324.7800 / Fax: 603.324.7864

Declaration of Conformity

Flir Model: ***MR277***
Description: ***Moisture Meter***
Date of Issue: ***12-Jul-21***

We, Teledyne FLIR LLC., 9 Townsend West, Nashua, NH 03063 declare that a sample of the product listed above has been tested by a third party for CE marking

EMC Directive: **2014/30/EU**
Report Number: **12829836-E2V1-CE-Report**
Report Date of Issue: **9/27/2019**

Standards:
EN 61326-1:2013
DRAFT EN 301 489-1 v2.2.1:2019-03
DRAFT EN 301 489-17 v3.2.0:2017-03

LVD Directive: **2014/35/EU**
Report Number: **E201687-D1018-1/A0/C0-CB**
Report Date of Issue: **10/9/2019**

Standards:
IEC 61010-1:2010 (Third Edition)

RED Directive: **2014/53/EU**
Report Number: **190600323TWN-001**
Report Date of Issue: **7/17/2019**

Standards:
ETSI EN 300 328 V2.1.1

RoHS Directive: **EU Directive 2015/863/EU (RoHS 3)**

The test reports show that the product fulfills the requirement in the EC Low Voltage Directive, EMC Directive, RED Directive, and RoHS Directive for CE Marking. On this basis, together with the manufacturer's own documented production control, the manufacturer (or his European authorized representative) can in his EC Declaration of Conformity verify compliance with the EC Low Voltage Directive, EMC Directive, RED Directive, and RoHS Directive.

Mark Sultzbach / QA Manager

Taipei, Taiwan July 29, 2021

UK Declaration of Conformity

Product: FLIR MR277

Name and address of the manufacturer: Teledyne FLIR LLC,
9 Townsend West,
Nashua, NH 03063

This declaration of conformity is issued under the sole responsibility of the manufacturer.

The object of the declaration: FLIR MR277.

The object of the declaration described above is in conformity with the relevant statutory requirements applicable to the specific product:

Standards review between UK and EU

UK legislation refr.	UK designated standard*	EU regulation refr.	EU harmonised standard
EMC		**EMC**	
S.I. 2016 No. 1091	EN 61326-1:2013	2014/30/EU	EN 61326-1:2013
S.I. 2016 No. 1091	EN 301 489-1 v2.2.1	2014/53/EU	DRAFT EN 301 489-1 v2.2.1:2019-03
S.I. 2016 No. 1091	EN 301 489-17 v3.2.0	2014/53/EU	DRAFT EN 301 489-17 v3.2.0:2017-03
Radio equipment (RE)		**RED**	
S.I. 2017 No.1206	ETSI EN 300 328 v2.1.1	2014/53/EU	EN 300 328 V2.1.1
LVD Directive		**LVD Directive**	
S.I. 2016 No. 1101	IEC 61010-1 (Ed. 3)	2014/35/EU	EN 61010-1:2010(Ed. 3)
RoHS			
S.I. 2012 No. 3032	EN 50581:2012	2015/65/EU (RoHS)	EN 50581:2012

* https://www.gov.uk/guidance/designated-standards
Designated standards: EMC – consolidated list, version 1, 1 January 2021
Designated standards: radio equipment – consolidated list, version 1, 1 January 2021.
Designated standards: Low voltage equipment – consolidated list, version 1, 1 January 2021
Designated standards: RoHS – consolidated list, version 1, 1 January 2021

FLIR Commercial Systems
Quality Assurance

Hank Tsai

Hank Tsai
Quality Manager

RPC Corporation
17F-5, No. 716, Zhongzheng Rd., Zhonghe District, New Taipei City, Taiwan, R.O.C
TEL: 886 2 8227 8799 FAX: 886 2 8227 8786
http://www.rpc.com.tw

Safety Data Sheet

(Safety Data Sheet LiPO MSDS Transportation, Date of Issue: **1-Jan. 2021)**

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1. Product and Company Identification

[Product]
1.1 Product Name: Lithium-ion Polymer Battery
1.2 System: Rechargeable Lithium-ion Polymer batteries
(IP604480-2P 3.7V 5400mAh, 20.0Wh)
[Comapny]
1.3 Company Name: RPC Corporation
1.4 Company Address: 17F-5, No. 716, Zhongzheng Rd., Zhonghe District, New Taipei City, Taiwan, R.O.C
1.5 Emergency Telephone Number: +886 2 8227 8799

2. Hazards Identification

The batteries herein are defined as “articles” under 29 CFR 1910.1200, and are not subject to OSHA’s requirements for material safety data sheets under its Hazard Communication Standard, 29 CFR 1910.1200. The batteries are not classified as hazardous according to Regulation (EC) No. 1272/2008.
The battery ingredients are contained in a sealed enclosure. Therefore, it is not classified as dangerous or hazardous under normal use. Risk of exposure occurs only if the cell is mechanically, thermally or electrically abused to the point of dismantling the enclosure. If this occurs, exposure to the electrolyte solution within can occur by Inhalation, Ingestion, Eye contact and Skin contact. Damaged or opened cells or batteries may result in rapid heat release, and the release of flammable vapors.

3. Composition Information on Components

Some components are considered to be hazardous.

Component	Percent of Content	CAS No.	Classification & Hazard labeling
Lithium Cobalt Oxide	20-40%	12190-79-3	Eye, Skin, Respiratory irritant
Carbon, as Graphite	10-30%	7782-42-5	Eye, Skin, Respiratory irritant
Aluminum metal	5-15%	7429-90-5	Inert
Copper metal	5-15%	7440-50-8	Inert
Electrolyte	10-25%	21324-40-3	Mixture (flammable, reactive; sensitizer; eye, skin, respiratory irritant.)
Ethylene carbonate		96-49-1	
Dimethyl carbonate		616-38-6	
Ethyl methyl carbonate		623-53-0	
Li-hexafluorophosphate		21324-40-3	

The materials contained in the battery may only become a hazard if the battery or the cell is disintegrated or if the battery is physically or electrically abused.

4. First Aid Measures

In case of contacting the materials from a damaged or ruptured cell or battery:
Eye contact: Washing immediately with plenty of water and soap or for at least 15 minutes. Get medical attention.
Skin Contact: Washing immediately with water and soap.
Inhalation of Vented Gas: Remove to fresh air. Get medical attention.
Ingestion: Get medical attention immediately.

5. Fire Fighting Measures

Extinguishing Media: Dry chemicals (for small fire), large amount of water(for large fire).
Fire-Fighting Procedures:
Use self-contained breathing apparatus and protective clothing.
Unusual Fire and Explosion Hazards:
Toxic gases (HF, PF_6) will be formed if cells or battery are involved in a fire. Cells or battery may flame or leak potentially hazardous organic vapors if exposed to excessive heat, fire or over-voltage conditions. Damaged or opened cells or batteries may result in rapid heat and the release of flammable vapors.

6. Accidental release measures

The material contained within the batteries would only be expelled under abusive conditions.
Using shovel or broom, cover battery or spilled substances with dry sand or vermiculite, place in approved container (after cooling if necessary) and dispose in accordance with local regulations.

7. Handling And Storage

7.1 Do not store batteries in a manner that allows terminals to short circuit.
7.2 Do not place batteries near heating sources, nor exposed to direct sunlight for long periods. Elevated temperatures can result in reduced battery service life.

7.3 Charging Battery

Use only approved chargers and procedures. Improperly charging a cell or battery may cause the cell or battery to flame or damage.

7.4 Battery Disassembly

Never disassemble a battery.
Should a battery unintentionally be crushed, thus releasing its contents, rubber gloves must be used to handle all battery components. Avoid inhalation of any vapors that may be emitted.

7.5 Battery Short Circuit

Do not short-circuit a battery. A short circuit can result in over-heating of the terminals and provide an ignition source.

More than a momentary short circuit will generally reduce the cell or battery service life and can lead to ignition of surrounding materials or materials within the cell or battery if the seal integrity is damaged.
Extended short-circuiting creates high temperature in the cell and at the terminals. Physical contact to high temperatures can cause skin burns. In addition, extended short-circuit may cause the cell or battery to flame.
Avoid reversing cell polarity within a battery assembly. Reversing cell polarity may cause the cell or battery toflame or to emit gases.

7.6 Mixed Batteries and Types

Avoid to use old and new cells or cells of different sizes; different chemistry or types in the same battery assembly.

8. Exposure Controls/Personal Protection

Respiratory protection : N*ot necessary under normal use.* In case of battery rupture, use self-contained full-face respiratory equipment.
Hand protection : *Not necessary under normal use.* Use Viton rubber gloves if handling a leaking or ruptured battery.
Eye protection : *Not necessary under normal use.* Wear safety goggles or glasses with side shields if handling a leaking or ruptured battery**.**
Skin protection : *Not necessary under normal use*. Use rubber apron and protective working in case of handling of a ruptured battery.

9. Physical and Chemical Properties

Appearance :	square shape.
Relative Density :	n/a
Odor :	if leaking, smell like ether.
pH :	not applicable as supplied
Flash Point :	not applicable unless individual components being exposed.
Flammability :	not applicable unless individual components being exposed.
Solubility (water) :	not applicable unless individual components being exposed.
Solubility (other) :	not applicable unless individual components being exposed.

10. Stability and Reactivity

Conditions to avoid : Heat above 70°C or incinerate. Do not deform, mutilate, crush, pierce, disassemble, or Short circuit the battery. Avoid prolonged exposure to humid conditions.
Materials to avoid : N/A.
Hazardous decomposition products : Corrosive/Irritant Hydrogen fluoride (HF) is produced in case of reaction of *lithium hexafluorophosphate(LiPF6)* with water. Combustible vapors and formation of Hydrogen fluoride (HF) and phosphorous oxides during fire.

11. Toxicological Information

The batteries do not contain toxic materials under normal conditions. In case of accidental release of content, refer to Section 2, 3, & 4 above.

12. Ecological Information

When properly used or disposed RPC rechargeable Li-Ion polymer batteries do not present environmental hazard.

13. Disposal Procedures

The batteries contain no toxic metals, only naturally occurring trace elements. To avoid short circuit and heating, the used batteries should not be stored or transported in bulk. It is advisable to consult with local authorities as disposal regulations may vary depending on location.

14. Transportation

The Lithium-ion Polymer cells and batteries are manufactured under Quality Management Program ISO 9001:2015 [assessed by Sira Certification Service (UK); Certificate No. 115010.], meeting the Provisions of 3.9.2.6(e).

This document refers to the Lithium-ion Polymer Cells of not more 20Whtt-hour and Batteries of not more than 100Whtt-hour. Cells or batteries are of the type proven to meet the requirements of each test in the UN Manual of Test and Criteria, Part III, Subsection 38.3. meeting the Provisions of 3.9.2.6(a).

The Lithium-ion cells and batteries are packaged as below:

1. the cells or batteries are designed to preclude a violent rupture upon transport accident [3.9.2.6(b)];

2. the cells or batteries are with individual package to avoid short-circuit [3.9.2.6(c)];

3. the batteries, in case with cells connected in parallel, would be equipped with effective means to prevent dangerous reverse current flow (e.g. diodes, fuses, etc.) [3.9.2.6(d)]

4. the export packing is marked with a Lithium-ion battery handling Label(and/or the Class 9 hazard label), and must be quarantined, inspected and repacked if damaged;

Subject to the Packing List information against individual shipping consignment, they are packaged in compliance with ONE of the followings :

The Section II of Packing Instruction (PI) 967 (under UN3481 Lithium-ion Batteries, contained in equipment) requirement of shipping as “Not Restricted” Dangerous Goods, per INTERNATIONAL CIVIL AVIATION ORGANISATION (ICAO) and the INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA) DGR 62nd edition [2021].

They do not contain any prototype, heavy, recalled and/or defective batteries.

15. Regulation information

15.1 USA

TSCA Status : all ingredients in the battery are listed on the TSCA inventory.

15.2 EC Classification for the Substance/Preparation

The batteries are not classified as hazardous according to Regulation (EC) No. 1272/2008.
Keep out of the reach of children.

16. Other Information

The information contained herein is based on the data available to us and believed to be correct. However, RPC Corporation makes no warranty, expressed or implied. Users should consider the data only as a supplement to other information gathered by them and must make independent determinations of the suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers.

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Safety Data Sheet

(Safety Data Sheet LiPO MSDS-SEA Transportation, Date of Issue: **1-Jan. 2021)**

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1. Product and Company Identification

[Product]
1.1 Product Name: Lithium-ion Polymer Battery
1.2 System: Rechargeable Lithium-ion Polymer batteries
(IP604480-2P 3.7V 5400mAh, 20.0Wh)
[Comapny]
1.3 Company Name: RPC Corporation
1.4 Company Address: 17F-5, No. 716, Zhongzheng Rd., Zhonghe District,
New Taipei City, Taiwan, R.O.C
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Electrolyte	10-25%	21324-40-3	Mixture (flammable, reactive; sensitizer; eye, skin, respiratory irritant.)
Ethylene carbonate		96-49-1	
Dimethyl carbonate		616-38-6	
Ethyl methyl carbonate		623-53-0	
Li-hexafluorophosphate		21324-40-3	

The materials contained in the battery may only become a hazard if the battery or the cell is disintegrated or if the battery is physically or electrically abused.

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Eye contact: Washing immediately with plenty of water and soap or for at least 15 minutes. Get medical attention.
Skin Contact: Washing immediately with water and soap.
Inhalation of Vented Gas: Remove to fresh air. Get medical attention.
Ingestion: Get medical attention immediately.

5. Fire Fighting Measures

Extinguishing Media: Dry chemicals (for small fire), large amount of water(for large fire).
Fire-Fighting Procedures:
Use self-contained breathing apparatus and protective clothing.
Unusual Fire and Explosion Hazards:
Toxic gases (HF, PF_6) will be formed if cells or battery are involved in a fire. Cells or battery may flame or leak potentially hazardous organic vapors if exposed to excessive heat, fire or over-voltage conditions. Damaged or opened cells or batteries may result in rapid heat and the release of flammable vapors.

6. Accidental release measures

The material contained within the batteries would only be expelled under abusive conditions.
Using shovel or broom, cover battery or spilled substances with dry sand or vermiculite, place in approved container (after cooling if necessary) and dispose in accordance with local regulations.

7. Handling And Storage

7.1 Do not store batteries in a manner that allows terminals to short circuit.
7.2 Do not place batteries near heating sources, nor exposed to direct sunlight for long periods. Elevated temperatures can result in reduced battery service life.

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Never disassemble a battery.
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7.6 Mixed Batteries and Types

Avoid to use old and new cells or cells of different sizes; different chemistry or types in the same battery assembly.

8. Exposure Controls/Personal Protection

Respiratory protection : N*ot necessary under normal use.* In case of battery rupture, use self-contained full-face respiratory equipment.
Hand protection : *Not necessary under normal use.* Use Viton rubber gloves if handling a leaking or ruptured battery.
Eye protection : *Not necessary under normal use.* Wear safety goggles or glasses with side shields if handling a leaking or ruptured battery**.**
Skin protection : *Not necessary under normal use*. Use rubber apron and protective working in case of handling of a ruptured battery.

9. Physical and Chemical Properties

Appearance :	square shape.
Relative Density :	n/a
Odor :	if leaking, smell like ether.
pH :	not applicable as supplied
Flash Point :	not applicable unless individual components being exposed.
Flammability :	not applicable unless individual components being exposed.
Solubility (water) :	not applicable unless individual components being exposed.
Solubility (other) :	not applicable unless individual components being exposed.

10. Stability and Reactivity

Conditions to avoid : Heat above 70°C or incinerate. Do not deform, mutilate, crush, pierce, disassemble, or Short circuit the battery. Avoid prolonged exposure to humid conditions.
Materials to avoid : N/A.
Hazardous decomposition products : Corrosive/Irritant Hydrogen fluoride (HF) is produced in case of reaction of *lithium hexafluorophosphate(LiPF6)* with water. Combustible vapors and formation of Hydrogen fluoride (HF) and phosphorous oxides during fire.

11. Toxicological Information

The batteries do not contain toxic materials under normal conditions. In case of accidental release of content, refer to Section 2, 3, & 4 above.

12. Ecological Information

When properly used or disposed RPC rechargeable Li-Ion polymer batteries do not present environmental hazard.

13. Disposal Procedures

The batteries contain no toxic metals, only naturally occurring trace elements. To avoid short circuit and heating, the used batteries should not be stored or transported in bulk. It is advisable to consult with local authorities as disposal regulations may vary depending on location.

14. Transportation

The Lithium-ion Polymer cells and batteries are manufactured under Quality Management Program ISO 9001:2015 [assessed by Sira Certification Service (UK); Certificate No. 115010.], meeting the Provisions of 3.9.2.6(e).

This document refers to the Lithium-ion Polymer Cells of not more 20Whtt-hour and Batteries of not more than 100Whtt-hour. Cells or batteries are of the type proven to meet the requirements of each test in the UN Manual of Test and Criteria, Part III, Subsection 38.3. meeting the Provisions of 3.9.2.6(a).

The Lithium-ion cells and batteries are packaged as below:

1. the cells or batteries are designed to preclude a violent rupture upon transport accident [3.9.2.6(b)];

2. the cells or batteries are with individual package to avoid short-circuit [3.9.2.6(c)];

3. the batteries, in case with cells connected in parallel, would be equipped with effective means to prevent dangerous reverse current flow (e.g. diodes, fuses, etc.) [3.9.2.6(d)]

4. the export packing is marked with a Lithium-ion battery handling Label(and/or the Class 9 hazard label), and must be quarantined, inspected and repacked if damaged;

Subject to the Packing List information against individual shipping consignment, they are packaged in compliance with ONE of the followings :

The requirement of shipping as **"**Not Restricted" Cargo, per INTERNATIONALMARITIME ORGANISATION(IMO)-IMDG Special Provision 188 & 230(under UN3480 Lithium-ion Batteries).

They do not contain any prototype, heavy, recalled and/or defective batteries.

15. Regulation information

15.1 USA

TSCA Status : all ingredients in the battery are listed on the TSCA inventory.

15.2 EC Classification for the Substance/Preparation

The batteries are not classified as hazardous according to Regulation (EC) No. 1272/2008.
Keep out of the reach of children.

16. Other Information

The information contained herein is based on the data available to us and believed to be correct. However, RPC Corporation makes no warranty, expressed or implied. Users should consider the data only as a supplement to other information gathered by them and must make independent determinations of the suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers.

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16. Other Information

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160008222171

中国认可
国际互认
检测
TESTING
CNAS L0095

No.: RZUN2019-1280

检 测 报 告
TEST REPORT

UN38.3

NAME OF SAMPLE: 产品名称：	Li-Polymer Rechargeable Battery 聚合物锂离子电池
CLIENT: 委托单位：	RPC Corporation 聚力電子股份有限公司
CLASSIFICATION OF TEST: 检测类别：	Commission Test 委托测试

威凯检测技术有限公司
Vkan Certification & Testing Co., Ltd.

检 测 报 告
TEST REPORT

Name of samples: Li-Polymer Rechargeable Battery 样品名称:聚合物锂离子电池	Type/Model: 型号规格: IP604480-2P 3,7 V 5400 mAh 20,0Wh
Color: Blue 样品颜色:蓝色	Physical shape: Prismatic 样品形状：棱柱形
Commissioned by: RPC Corporation 委托单位: 聚力電子股份有限公司	Commissioner address:17F-5, No. 716, Zhongzheng Rd., Zhonghe District, New Taipei City, 235 Taiwan 委托单位地址:台灣新北市中和區中正路 716 號 17 樓之 5
Manufacturer: RPC Corporation 生产单位: 聚力電子股份有限公司	Manufacturer address:17F-5, No. 716, Zhongzheng Rd., Zhonghe District, New Taipei City, 235 Taiwan 生产单位地址: 台灣新北市中和區中正路 716 號 17 樓之 5
Factory：Intellect Pioneering Battery Technology Co.,Ltd. 生产厂：佛山市顺德区精锐电池科技有限公司	Factory address: No.30 Xinghua Road East, Xinghua Industrial Park, Ronggui Street, Shunde District , Foshan, Guangdong, P.R. China. 生产厂地址: 广东省佛山市顺德区容桂街道兴华工业区兴华东路 30 号
Classification of test: Commission Test 检测类别: 委托测试	Quantity of sample: 8 battery packs, 30 cells 样品数量: 8 个电池组, 30 个电芯
Tested according to: 测试标准：ST/SG/AC.10/11/Rev.6/Amend.1/Section 38.3	Sample identification: 样品标识序号:b1#~b8#, c1#~c30#
Receiving date: 接样日期：2019-03-05	Means of receiving: Submitted by commissioner 接样方式：委托单位送样
Completing date: 完成日期：2019-03-26	Test item: 8 items 测试项目：8 项

Test conclusion:
检测结论:

The Li-Polymer Rechargeable Batteries submitted by RPC Corporation are tested according to Section 38.3 of the Sixth revised Edition Amendment 1 of the Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.6/Amend.1/Section 38.3). The test items are full items. The test results comply with the relevant requirements of the standard.

由聚力電子股份有限公司送检的聚合物锂离子电池，依据《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 第 38.3 节进行检测，试验为全项目，测试结果符合标准相关要求。

Seal of CVC

CVC 印章

Date of issue:
签发日期:

Title: Manager
批准人职务： 经理

Approved by:	Reviewed by:	Tested by:
批准：	审核：	检测：

Description and illustration of the sample:
样品说明及描述:
The sample's status is good
样品状况良好。

Test item 测试项目	Sample No. 样品编号	State 状态	Remark 备注
T.1~T.5	b1#~b4#	at first cycle, in fully charged states 第一个交替充电放电周期完全充电状态	-
	b5#~b8#	after 25 cycles ending in fully charged states 第 25 个交替充电放电周期完全充电状态	
T.6	c1#~c5#	at first cycle at 50% of the design rated capacity 第一个交替充电放电周期充电到设计额定容量的 50%	-
	c6#~c10#	after 25 cycles ending at 50% of the design rated capacity 第 25 个交替充电放电周期充电到设计额定容量的 50%	
T.7	b1#~b4#	at first cycle, in fully charged states 第一个交替充电放电周期完全充电状态	using undamaged samples previously used in tests T.1 to T.5 使用试验 T.1 至 T.5 未损坏的样品
	b5#~b8#	after 25 cycles ending in fully charged states 第 25 个交替充电放电周期完全充电状态	
T.8	c11#~c20#	at first cycle, in fully discharged states 第一个交替充电放电周期完全放电状态	-
	c21#~c30#	after 25 cycles ending in fully discharged states 第 25 个交替充电放电周期完全放电状态	-

Description of the sampling procedure:
取样程序的说明:

/

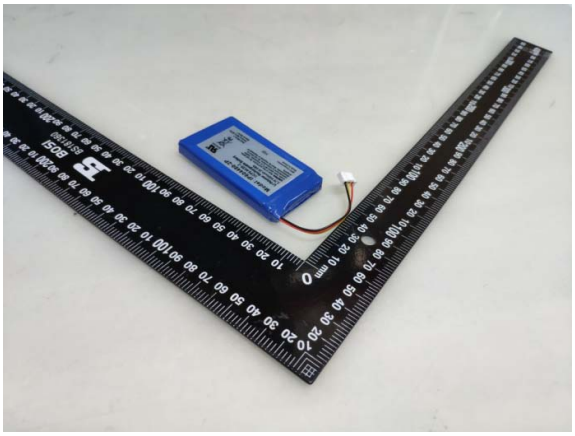
Description of the deviation from the standard, if any:
测试结果不符合标准项的说明:

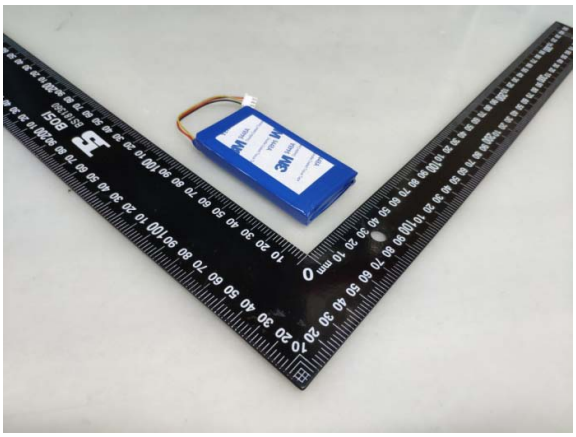
/

Remarks:
备注:
Throughout this report a comma is used as the decimal separator.
本报告中以逗号代替小数点。

Photos of Samples and Labels/样品照片及标识

Battery/电池 （IP604480-2P 3,7 V 5400 mAh 20,0Wh）

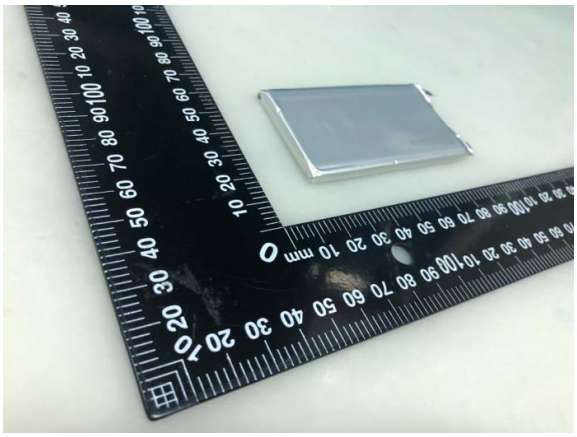


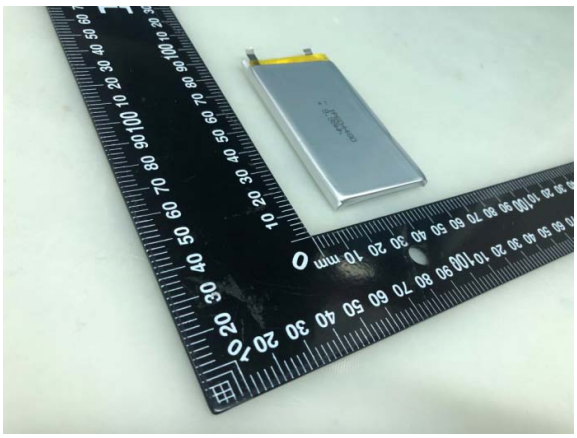


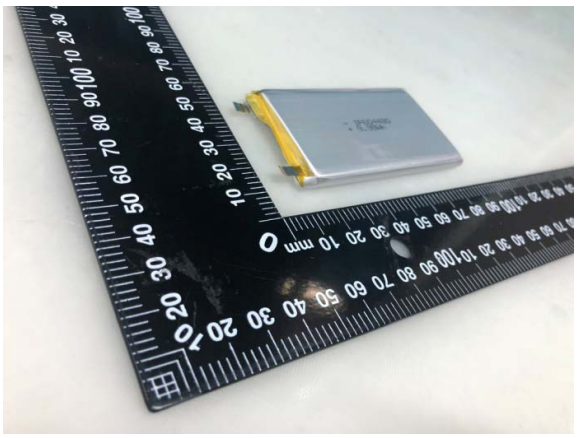


Photos of Samples and Labels/样品照片及标识

Inner Cell/内部电芯（IP604480 3,7 V 2700 mAh 9,99Wh ）







ST/SG/AC.10/11/Rev.6/Amend.1/Section 38.3			
Clause 章节	**Requirements 标准要求**	**Result 测试结果**	**Verdict 判定**
38.3.4	**Procedure/测试步骤**		—
38.3.4.1	**Test 1: Altitude simulation/测试 1：高度模拟**		**P**
	Test cells and batteries shall be stored at a pressure of 11,6kPa or less for at least six hour at ambient temperature (20±5℃)/ 将电芯和电池在温度为 20±5℃，大气压力为不大于 11,6kpa 的环境中贮存不少于 6 个小时		
	Requirement/标准要求： 1 Cells and batteries Mass loss limit:≤ 0,1% /样品质量损失≤0,1% 2 Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states. 样品试验后开路电压应不低于试验前开路电压的 90%,此要求不适用于完全放完电的电池和电芯。 3 No leakage, no venting, no disassembly, no rupture and no fire 样品（电池）应无漏液、无排气、无解体、无破裂以及无着火现象的发生	The samples b1#~b8# : No leakage, no venting, no disassembly, no rupture and no fire/编号为 b1#~b8# 的样品：无漏液、无排气、无解体、无破裂以及无着火现象 The data is shown in Table 1./数据见表 1	
38.3.4.2	**Test 2: Thermal test/测试 2: 热冲击**		**P**
	Test cells and batteries are to be stored for/电池存储条件如下： 1 For small cells and batteries: one temperature cycle: 72±2℃(6h) —-40±2℃(6h) /对于小型电芯和电池：一次温度循环为 72±2℃(6h) —-40±2℃(6h) For large cells and batteries: one temperature cycle: 72±2℃(12h) —-40±2℃(12h) /对于大型电芯和电池：一次温度循环为 72±2℃(12h) —-40±2℃(12h) 2 The maximum time interval between test temperature extremes is 30 minutes/温度转换最大间隔时间为 30min 3 This procedure is to be repeated 10 times/重复 10 次循环 4 after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20±5℃)/循环结束后，电池在 20±5℃的条件下 搁置 24 小时		
	Requirements/标准要求 1 Cells and batteries Mass loss limit:≤ 0,1% /样品质量损失≤0,1% 2 Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states. 样品试验后开路电压应不低于试验前开路电压的 90%,此要求不适用于完全放完电的电池和电芯。 3 No leakage, no venting, no disassembly, no rupture and no fire 样品（电池）应无漏液、无排气、无解体、无破裂以及无着火现象的发生	The samples b1#~b8# : No leakage, no venting, no disassembly, no rupture and no fire/编号为 b1#~b8# 的样品：无漏液、无排气、无解体、无破裂以及无着火现象 The data is shown in Table 1./数据见表 1	

ST/SG/AC.10/11/Rev.6/Amend.1/Section 38.3			
Clause 章节	**Requirements 标准要求**	**Result 测试结果**	**Verdict 判定**
38.3.4.3	**Test 3: Vibration/测试 3: 振动** 1 Cells and batteries are firmly secured to the platform of the vibration machine /电芯和电池牢固地安装在振动台（的台面）上 2 The vibration: a sinusoidal waveform with a logarithmic sweep between 7Hz and 200Hz and back to 7Hz traversed in 15 minutes/振动以正弦波形式，以 7Hz 增加至 200Hz，然后在减少回到 7Hz 为一个循环，一个循环持续 15 分钟的对数前移传送。 3 For cells and small batteries: from 7 Hz a peak acceleration of 1gn is maintained until 18Hz is reached. The amplitude is then maintained at 0.8mm (1.6mm total excursion) and the frequency increased until a peak acceleration of $8g_n$ occurs (approximately 50Hz). A peak acceleration of $8g_n$ is then maintained until the frequency is increased to 200Hz. / 对于电芯和小型电池：从 7Hz开始，以 $1g_n$的峰值加速度保持不变，直到达到 18Hz。然后将振幅保持在 0.8mm（总偏移 1.6mm）并且频率增加直到出现 $8g_n$的峰值加速度（大约 50Hz）。然后保持 $8g_n$的峰值加速度，直到频率增加到 200Hz。 For large batteries: from 7Hz a peak acceleration of $1g_n$ is maintained until 18Hz is reached. The amplitude is then maintained at 0.8mm (1.6mm total excursion) and the frequency increased until a peak acceleration of $2g_n$ occurs (approximately 25Hz). A peak acceleration of $2g_n$ is then maintained until the frequency is increased to 200Hz. / 对于大型电池：从 7Hz开始，以 $1g_n$的峰值加速度保持不变，直到达到 18Hz。然后将振幅保持在 0.8mm（总偏移 1.6mm）并且频率增加直到出现 $2g_n$的峰值加速度（大约 25Hz）。然后保持 $2g_n$的峰值加速度，直到频率增加到 200Hz。 4 This cycle repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting position of the cell. One of the directions of vibration must be perpendicular to the terminal face. /以振动的其中一个方向必须是垂直样品极性，对每个电芯从三个互相垂直的方向上循环 12 次，每个方向 3 个小时，共 9 小时。		**P**
	Requirements/标准要求 1 Cells and batteries Mass loss limit:≤ 0,1% /样品质量损失≤0,1% 2 Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states. 样品试验后开路电压应不低于试验前开路电压的 90％,此要求不适用于完全放完电的电池和电芯。 3 No leakage, no venting, no disassembly, no rupture and no fire 样品（电池）应无漏液、无排气、无解体、无破裂以及无着火现象的发生	The samples b1#~b8#: No leakage, no venting, no disassembly, no rupture and no fire/编号为 b1#~b8# 的样品：无漏液、无排气、无解体、无破裂以及无着火现象 The data is shown in Table 1./数据见表 1	

ST/SG/AC.10/11/Rev.6/Amend.1/Section 38.3			
Clause 章节	**Requirements 标准要求**	**Result 测试结果**	**Verdict 判定**
38.3.4.4	**Test 4: Shock/测试 4: 冲击** 1 Test cells and batteries shall be secured to the testing machine/以稳固的托架固定住每个电芯和电池样品的全部配件表面。 2 Each cell shall be subjected to a half-sine shock of peak acceleration of 150 g_n and pulse duration of 6 milliseconds. Large cells may be subjected to a half-sine shock of peak acceleration of 50 gn and pulse duration of 11 milliseconds. / 对每个电芯以峰值为 150g_n的半正弦的加速度撞击，脉冲持续 6 毫秒，大型电芯须经受最大加速度 50g_n和脉冲持续时间 11 毫秒的半正弦波冲击。 Small batteries shall be subjected to a half-sine shock of peak acceleration of 150 g_n (or Acceleration(g_n)= $\sqrt{\left(\frac{100850}{mass}\right)}$, which is smaller) and pulse duration of 6 milliseconds, large batteries shall be subjected to a half-sine of peak acceleration of 50 g_n (or Acceleration(g_n)= $\sqrt{\left(\frac{30000}{mass}\right)}$, which is smaller) and pulse duration of 11 milliseconds/对每个电池以峰值为 150g_n（或与 $\sqrt{\left(\frac{100850}{mass}\right)}$ 中的较小值）的半正弦的加速度撞击，脉冲持续 6 毫秒，大型电池须经受最大加速度 50g_n（或与 $\sqrt{\left(\frac{30000}{mass}\right)}$ 中的较小值）和脉冲持续时间 11 毫秒的半正弦波冲击。 3 Each cell or battery 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/每个电池或电池组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。		**P**
	Requirements/标准要求： 1 Cells and batteries Mass loss limit:≤ 0,1% /样品质量损失≤0,1% 2 Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states. 样品试验后开路电压应不低于试验前开路电压的 90 %,此要求不适用于完全放完电的电池和电芯。 3 No leakage, no venting, no disassembly, no rupture and no fire 样品（电池）应无漏液、无排气、无解体、无破裂以及无着火现象的发生	The samples b1#~b8# ： Acceleration= 150g_n No leakage, no venting, no disassembly, no rupture and no fire/编号为 b1#~b8# 的样品： 峰值加速度= 150g_n 无漏液、无排气、无解体、无破裂以及无着火现象 The data is shown in Table 1./数据见表 1	

<table>
<tr><th colspan="4">ST/SG/AC.10/11/Rev.6/Amend.1/Section 38.3</th></tr>
<tr><th>Clause
章节</th><th>Requirements
标准要求</th><th>Result
测试结果</th><th>Verdict
判定</th></tr>
<tr><td rowspan="3">38.3.4.5</td><td colspan="2">Test 5: External Short Circuit/测试 5 外接短路</td><td rowspan="3">P</td></tr>
<tr><td colspan="2">1The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches 57±4℃/保持试验环境温度稳定在 57±4℃，以使电芯或电池样品外表温度达到 57±4℃
2 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℃, This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57±4℃, 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. /将样品正负极用小于 0,1Ω 的总电阻回路进行短路，样品的外表温度恢复到 57±4℃之后保持短路状态 1 小时以上；对于大电池，电池温度降低至最高温升值的一半时实验结束。
3 the cell or battery must be observed for a further six hour for the test to be concluded,
/对电芯或电池必须进一步观察 6 个小时才能下结论。</td></tr>
<tr><td>Requirements/标准要求：
During the test and within six hours after test ,the cells or batteries
在测试过程中以及之后 6 个小时内，电芯或电池样品
1. External temperature not exceed 170℃
外表温度不超过 170℃
2. No disassembly, no rupture and no fire.
无解体、无破裂和无着火现象发生。</td><td>The samples b1#~b8# ：
no disassembly, no rupture and no fire/编号为 b1#~b8# 的样品：无解体、无破裂以及无着火现象
The data is shown in Table 1./数据见表 1</td></tr>
</table>

ST/SG/AC.10/11/Rev.6/Amend.1/Section 38.3			
Clause 章节	**Requirements 标准要求**	**Result 测试结果**	**Verdict 判定**
	Test 6: Impact / Crush / 测试 6: 撞击/挤压		**P**
	Impact (applicable to cylindrical cells not less than 18mm in diameter) / 撞击（适用于直径不小于 18 毫米的圆柱形电池）		
	1 This test sample cell or component cell is to be placed on a flat smooth surface/ 将试验样品用的电芯或聚合物电芯放在一个平坦光滑的平面上 2 A 15,8 mm diameter bar is to be placed across the center of the sample, A 9,1kg mass is to be dropped from a height of 61±2,5cm onto the sample./将一直径为 15,8mm 的横木横过电池中部放置后，将一质量为 9,1kg 的物体从 61±2,5cm 的高度落向样品。 3 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./ 接受撞击的试样，纵轴应与平坦的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。每一个试样只经受一次撞击。		**N/A**
	Requirements/标准要求： 1 Cells external temperature not exceed 170℃.电芯或电池的最高表面温度应不超过 170℃ 2 No disassembly, no fire within six hours of this test 试验结束后 6 个小时之内，电芯和聚合物电芯应无解体和无着火现象发生	-	
38.3.4.6	Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18mm in diameter) / 挤压（适用于棱柱形、袋装、硬币/纽扣电池和直径小于 18 毫米的圆柱形电池）		**P**
	1 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) The applied force reaches 13 kN ± 0,78 kN. / 施加的力达到 13 千牛±0,78 千牛 (b) The voltage of the cell drops by at least 100 mV,/电池的电压下降至少 100 毫伏 (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。 2. 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。圆柱形应从与纵轴垂直的方向施压。		
	Requirements/标准要求： 1 Cells external temperature not exceed 170℃.电芯或电池的最高表面温度应不超过 170℃ 2 No disassembly, no fire within six hours of this test 试验结束后 6 个小时之内，电芯和聚合物电芯应无解体和无着火现象发生	The samples c1#~c10#: no disassembly and no fire/ 编号为 c1#~c10#的样品：无解体、无着火现象 The data is shown in Table 2./数据见表 2	

ST/SG/AC.10/11/Rev.6/Amend.1/Section 38.3			
Clause 章节	**Requirements 标准要求**	**Result 测试结果**	**Verdict 判定**
38.3.4.7	**Test 7: Overcharge/测试 7: 过充电**		**P**
	1 The charge current shall be twice the manufacturer's recommended maximum continuous charge current/以 2 倍制造厂推荐的最大持续充电电流对样品充电 2 The minimum voltage of the test shall be as follows/本测试最小电压为:		
	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/ 如果厂家推荐的充电电压不超过 18V，本测试的最小充电电压应是厂家标定最大充电电压的两倍或者是 22V 之中的较小者。 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/ 如果厂家推荐的充电电压超过 18V，本测试的最小充电电压应是厂家标定最大充电电压的 1,2 倍。 3 Tests are to be conducted at ambient temperature 20±5℃, The duration of the test shall be 24 hours/20±5℃的环境温度下，试验持续 24 小时。	The voltage of the test is 8,4V, and the current is 5,2A 测试的电压为 8,4V，电流为 5,2A	
	Requirements/标准要求: No disassembly and no fire within seven days of this test 试验样品在试验中和试验后 7 天内，应无解体和无着火现象发生。	The samples b1#~b8# : For voltage data before test, see table 3. / 试验前电压见表 3 no disassembly, no rupture and no fire/编号为 b1#~b8#的样品：无解体、无着火现象	
38.3.4.8	**Test 8: Forced discharge/测试 8: 强制放电**		**P**
	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, 20±5℃的环境温度下，将单个电芯连接在 12V 的直流电源上进行强制放电，此直流电源提供给每个电芯初始电流为制造厂指定的最大放电电流。		
	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）。		
	Requirements/标准要求: No disassembly and no fire within seven days of this test 试验样品在试验中和试验后 7 天内，应无解体和无着火现象发生。	The samples c11#~c30#: no disassembly and no fire/编号为 c11#~c30#的样品：无解体、无着火现象 The data is shown in Table 3./数据见表 3	

Table1：T1~T5 / 表 1. 试验 1~试验 5

Sample No. 样品号	**Mass prior to test / 试验前质量 (g)**	**OCV prior to test /试验前电压(V)**	**Test 1: Altitude simulation/ 测试 1：高度模拟**		**Test 2: Thermal test/ 测试 2: 热冲击**		**Test 3: Vibration/ 测试 3: 振动**		**Test 4: Shock/ 测试 4: 冲击**		**Test 5: External Short Circuit/测试 5 外接短路**
			Mass loss(%) 质量损失(%)	Change ratio 电压比(%)	Mass loss(%) 质量损失(%)	Change ratio 电压比(%)	Mass loss(%) 质量损失(%)	Change ratio 电压比(%)	Mass loss(%) 质量损失(%)	Change ratio 电压比(%)	Temp. (℃) 温度 (℃)
b1#	94,186	4,182	0,000	100,00	0,023	99,31	0,002	100,00	0,000	99,98	57,4
b2#	93,960	4,177	0,000	100,00	0,023	99,35	0,000	100,00	0,002	100,00	57,7
b3#	93,751	4,181	0,000	100,00	0,023	99,28	0,000	100,00	0,002	100,00	57,3
b4#	94,373	4,182	0,000	100,00	0,021	99,31	0,000	100,00	0,001	100,00	57,5
b5#	93,845	4,184	0,000	100,00	0,023	99,19	0,001	100,00	0,000	100,00	58,2
b6#	93,973	4,179	0,000	100,00	0,022	99,40	0,002	99,98	0,000	100,00	58,0
b7#	93,886	4,181	0,000	100,00	0,000	99,26	0,023	100,00	0,002	100,00	57,4
b8#	94,225	4,182	0,000	100,00	0,022	99,26	0,000	100,00	0,000	100,00	57,7

Table2: Crush /表 2:挤压											
Test 6: Crush/测试 6:挤压	Sample No. 样品号	c1#	c2#	c3#	c4#	c5#	c6#	c7#	c8#	c9#	c10#
	OCV prior to test / 试验前电压（V）	3,822	3,824	3,815	3,831	3,827	3,814	3,822	3,817	3,827	3,824
	Temp. (℃) 温度 (℃)	27,3	27,5	27,3	27,6	27,5	27,7	27,4	27,2	27,5	27,7

Table3：Overcharge Test of batteries/ 表 3 电池过充试验									
Test 7: Overcharge **/测试 7: 过充电**	Sample No. 样品号	b1#	b2#	b3#	b4#	b5#	b6#	b7#	b8#
	OCV prior to test /试验前电压（V）	4,152	4,150	4,150	4,152	4,181	4,179	4,177	4,180

Table 4：Forced discharge / 表 4. 强制放电											
Test 8: Forced discharge **/ 测试 8: 强制放电**	Sample No. 样品号	c11#	c12#	c13#	c14#	c15#	c16#	c17#	c18#	c19#	c20#
	OCV prior to test / 试验前电压(V)	3,203	3,195	3,215	3,224	3,207	3,197	3,199	3,214	3,225	3,217
	Sample No. 样品号	c21#	c22#	c23#	c24#	c25#	c26#	c27#	c28#	c29#	c30#
	OCV prior to test / 试验前电压(V)	3,221	3,215	3,221	3,207	3,211	3,204	3,199	3,193	3,204	3,217

注 意 事 项
Important

1. 报告无检测单位印章无效。
   The test report is invalid without the official stamp of CVC.
2. 未经本试验室书面同意，不得部分地复制本报告。
   Nobody is allowed to photocopy or partly photocopy this test report without written permission of CVC.
3. 本报告无批准人、审核人及检测人签名无效。
   The test report is invalid without the signatures of Ratifier, Reviewer and Testing engineer.
4. 本报告涂改无效。
   The test report is invalid if altered,
5. 对检测报告若有异议，应于收到报告之日起十五天内向检测单位提出。
   Objections to the test report must be submitted to CVC within 15 days,
6. 本报告仅对送检样品负责。
   The test report is valid for the tested samples only.
7. 判定栏中“-”表示“不需要判定”，“P”表示“通过”，“F”表示“不通过”，“N/A”表示“不适用”。
   As for the Verdict, “-” means “no need for judgement”, “P” means “pass”， “F” means “fail” and “N/A” means “not applicable”.

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