

Report No.: 18270BC10173605

# MSDS REPORT

Client Name : EcoFlow Inc.

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

Product Name : Portable Power Station

Date : Aug. 17, 2021

**Shenzhen Anbotek Compliance Laboratory Limited**

## MATERIAL SAFETY DATA SHEET

### 1. Chemical Product and Company Identification

Sample name: Portable Power Station

Sample model: EFD500

Rating: Battery Nominal Voltage: 48V  
AC Input/entrée: 100-120V~15A 220-240V~12.5A 50Hz/60Hz  
X-Stream Charge Input/entrée: 120V 1800W Max, 240V 3000W Max  
Solar/Solaire/DC Input/entrée: 11-150V=12A 1200W Max  
Total Output/entrée: 4260W  
12V Output/sortie: 12.6V=30A/10A/3A 504W Max  
AC Output/sortie(×5): 120V~ 50Hz/60Hz 3600W(Surge 7200W) total  
USB-A Output/sortie(×2): 5V=2.4A 12W Max per port  
USB-A Fast Charge Output/rapide sortie(×2): 5V=2.4A 9V=2A 12V=1.5A 18W Max per port  
USB-C Output/sortie(×2): 5/9/12/15/20V=5A 100W Max per port  
Rated Capacity: 3600Wh  
Weight: 43.7kg

Manufacturer: EcoFlow Inc.

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

Factory: EcoFlow Inc.

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

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Written by:

*Sunny Li*

Approved by:

*Jelly Zhang*

Report No.: 18270BC10173605

Page 3 of 9

E-mail: /

Date of received: Jul. 13, 2021

Date of report: Jul. 14, 2021


Written by: *Sunny Li*

Approved by: *Jelly Yang*

**Shenzhen Anbotek Compliance Laboratory Limited**

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Code: AB-BAT-66-b

 Hotline  
400-003-0500  
www.anbotek.com



## 2. Composition/Information on Ingredients

Chemical Name	Percent of Content	CAS No.
Lithium iron phosphate (LiFePO <sub>4</sub> )	25%~30%	15365-14-7
Graphite (C)	8%~12%	7782-42-5
LiPF <sub>6</sub>	15%~22%	21324-40-3
Aluminum(AL)	5%~8%	7429-90-5
Copper(Cu)	10%~15%	7440-50-8
High molecular polymer	3%~5%	-
Nickel (Ni)	0.5%~1%	7440-02-0
Iron (Fe)	22%~30%	7439-89-6

## 3. Hazards Summarizing

**Danger sort:** N/A

**Routes of entry:**

1. Eyes and Skin—When leaking, the electrolyte solution contained in the battery irritates to ocular tissues and the skin.
2. Inhalation—Respiratory (and eye) irritation may occur if fumes are released due heat or an abundance of leaking batteries.
3. Ingestion—The ingestion of the battery can be harmful. Content of open battery can cause serious chemical burns of mouth, esophagus and gastrointestinal tract.

**Health harm:**

Exposure to leaking electrolyte from ruptured or leaking battery can cause:

1. Inhalation—Burns and irritation of the respiratory system, coughing, wheezing, and shortness of breath.
2. Eyes—Redness, tearing, burns. The electrolyte is corrosive to all ocular tissues.
3. Skin—The electrolyte is corrosive and causes skin irritation and burns.
4. Ingestion—The electrolyte solution causes tissue damage to throat and gastrointestinal track.

**Environment harm:** Not necessary under conditions of normal use.

**Explosion danger:** The battery may be explosive at high temperature (above 150°C) or exposing to the fire.



#### 4. First Aid Measures

**Skin contact:** Not anticipated. If the battery is leaking and the contained material contacts the skin, flush with copious amounts of clear water for at least 15 minutes.

**Eye contact:** Not anticipated. If the battery is leaking and the contained material contacts eyes, flush with copious amounts of clear water for at least 15 minutes. Get medical attention at once.

**Inhalation:** Not anticipated. If the battery is leaking, remove to fresh air. If irritation persists, consult a physician.

**Ingestion:** Not anticipated. If the battery is leaking and the contained material is ingested, rinse mouth and surrounding area with clear water at once. Consult a physician immediately for treatment.

#### 5. Fire Fighting Measures

**Unusual Fire and Explosion Hazards:** Battery may explode or leak potentially hazardous vapors subject to: exposed to excessive heat (above the maximum rated temperature as specified by the manufacturer) or fire, over-charged, short circuit, punctured and crushed.

**Hazardous Combustion Products:** Fire, excessive heat, or over voltage conditions may produce hazardous decomposition products. Damaged batteries can result in rapid heating and the release of flammable vapors.

**Extinguishing Media:** Dry chemical type extinguishers are the most effective means to extinguish a battery fire. A CO<sub>2</sub> extinguisher will also work effectively.

**Fire Fighting Procedures:** Use a positive pressure self-contained breathing apparatus if batteries are involved in a fire. Full protective clothing is necessary. During water application, caution is advised as burning pieces of flammable particles may be ejected from the fire.

#### 6. Accidental Release Measures

The material contained within the battery would only be released under abusive conditions. In the event of battery rupture and leakage, collect all the released materials that are not hot or burning in an appropriate waste disposal container while wearing proper protective clothing and ventilate the area. Placed in approved container and disposed according to the local regulations.

#### 7. Handling and Storage

##### Handling:

1. Batteries are designed to be recharged. However, improperly charging a battery may

Code: AB-BAT-66-b



cause the battery to flame. When charging the battery, use dedicated chargers and follow the specified conditions.

2. Never disassemble or modify a battery.
3. Do not immerse, throw, and wet a battery in water.
4. Should a battery unintentionally be crushed, thus releasing its contents, rubber gloves must be used to handle all battery components. Avoid the inhalation of any vapors that may be emitted.
5. Short circuit causes heating. In addition, short circuit reduces the life of the battery and can lead to ignition of surrounding materials. Physical contact with to short-circuited battery can cause skin burn.
6. Avoid reversing the battery polarity, which can cause the battery to be damaged or flame.
7. In the event of skin or eye exposure to the electrolyte, refer to Section 4, First Aid Measures.

**Storage:**

1. Batteries should be separated from other materials and stored in a noncombustible, well ventilated, sprinkler-protected structure with sufficient clearance between walls and battery stacks. Do not place batteries near heating equipment, nor expose to direct sunlight for long periods.
2. Do not store batteries above 35°C or below -20°C. Store batteries in a cool (about 20°C±5°C) in a long time, dry and ventilated area that is subject to little temperature change. Elevated temperatures can result in reduced battery cycle life. Battery exposure to temperatures in excess of 60°C will result in the battery venting flammable liquid and gases.
3. Keep batteries in original package until use and do not jumble them.

**8. Exposure Controls/Personal Protection**

**Engineering Controls:** Keep away from heat and open flame.

**Ventilation:** Not necessary under conditions of normal use. In case of abuse, use adequate mechanical ventilation (local exhaust) for the battery that vent gas or fumes.

**Respiratory Protection:** Not necessary under conditions of normal use. If battery is burning, leave the area immediately. During fire fighting fireman should use self-contained breathing, full-face respiratory equipment. Fires may be fought but only from safe fire fighting distance, evacuate all persons from the area of fire immediately.

**Eye Protection:** Not necessary under conditions of normal use. Use safety glasses with side shields if handling a leaking or ruptured battery.



**Body Protection:** Not necessary under conditions of normal use. Use rubber apron and protective working in case of handling a leaking of ruptured battery.

**Protective Gloves:** Not necessary under conditions of normal use. Use chemical resistant rubber gloves if handling a leaking or ruptured battery.

**Others:** Use good chemical hygiene practice. Wash hands thoroughly after cleaning-up a battery spill caused by leaking battery. No eating, drinking, or smoking in battery storage area.

## 9. Physical and Chemical Properties

<b>State:</b>	Solid
<b>Odor:</b>	N/A
<b>pH:</b>	N/A
<b>Vapor pressure:</b>	N/A
<b>Vapor density:</b>	N/A
<b>Boiling point:</b>	N/A
<b>Solubility in water:</b>	Insoluble
<b>Specific gravity:</b>	N/A
<b>Density:</b>	N/A

## 10. Stability and Reactivity

**Stability:** Stable

**Conditions to Avoid:** Do not heat, throw into fire, disassemble, short circuit, immerse in water or overcharge, etc.

**Incompatibility:** None during normal operation. Avoid exposure heat, open flame and corrosives.

**Hazardous Polymerization:** Will not occur.

**Hazardous Decomposition Products:** The battery may release irritative gas once the electrolyte leakage.

## 11. Toxicological Information

The battery does not elicit toxicological properties during routine handling and use. If the battery is opened through misuse or damage, discard immediately. Internal components of cell are irritant and sensitization.

**Irritancy:** The electrolytes contained in this battery can irritate eyes with any contact. Prolonged contact with the skin or mucous membranes may cause irritation.

**Sensitization:** No information is available.

**Teratogenicity:** No information is available.



**Carcinogenicity:** No information is available.

**Mutagenicity:** No information is available.

**Reproductive toxicity:** No information is available.

## 12. Ecological Information

1. When properly used and disposed, the battery does not present environmental hazard.
2. The battery does not contain mercury, cadmium, or lead.
3. Do not let internal components enter marine environment. Avoid releasing to water ways, wastewater or ground water.

## 13. Disposal Considerations

1. Disposal of the battery should be performed by permitted, professional disposal firms knowledgeable in Federal, State or Local requirements of hazardous waste treatment and hazardous waste transportation.
2. The battery should be completely discharged prior to disposal and/or the terminals taped or capped to prevent short circuit. When completely discharged it is not considered hazardous.
3. The battery contains recyclable materials. Recycling options available in your local area should be considered when disposing of this product, through licensed waste Carrier.

## 14. Transport Information

According to PACKING INSTRUCTION 965 of IATA DGR 62nd Edition for transportation, the special provision 230 of IMDG (inc Amdt 39-18). 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 should be cleaned and sterilized before transport. 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.



**(a) UN number**

3480

**(b) UN Proper shipping name**

LITHIUM ION BATTERIES (including lithium ion polymer batteries)

**(c) Packing Instruction (if applicable)**

965 IA

**(d) Marine pollutant (Yes/No)**

No

**(e) Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code)**

No information available.

**(f) Special precautions**

No information available.

**15. Regulatory Information**

The transport of rechargeable lithium-ion batteries regulated by the united nations as detailed in the “model Regulations on the transport of dangerous Goods Ref. ST/SG/AC.10/1 Revision 21 2019”.

Defined by UN in the “Recommendations on the transport of Dangerous Goods Chapter 38.3 Manual of Tests and Criteria Ref. ST/SG/AC.10/11 Rev.7 2019”. The Lithium-ion Cells and the battery Packs may or may not be assigned to the UN No. 3480 Class-9 that is restricted for transport.

**16. Other Information**

Prepared Department: EcoFlow Inc.

-- End of report --



Report No.: 18270BC10173601

报告编号

# Lithium Battery UN38.3 Test Report

## 锂电池 UN38.3 测试报告

**Client Name** : EcoFlow Inc.  
**委托单位** : 深圳市正浩创新科技股份有限公司

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

**Product Name** : Portable Power Station  
**产品名称** : 移动储能站

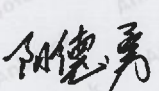
**Date** : Aug. 13, 2021  
**日期** : 2021 年 08 月 13 日

**Shenzhen Anbotek Compliance Laboratory Limited**  
**深圳安博检测股份有限公司**





## 1. SAMPLE DESCRIPTION 样品描述:

Sample Name: 样品名称	Portable Power Station 移动储能站		Sample Model: 样品型号	EFD500	
Manufacturer: 制造商	EcoFlow Inc. 深圳市正浩创新科技股份有限公司				
Address of manufacturer: 制造商地址	Factory Building A202, Founder Technology Industrial Park, North side of Songbai Highway, Longteng Community, Shiyan Sub-district, Baoan District Shenzhen City, Guangdong, China 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				
Factory: 工厂	EcoFlow Inc. 深圳市正浩创新科技股份有限公司				
Address of factory: 工厂地址	Factory Building A202, Founder Technology Industrial Park, North side of Songbai Highway, Longteng Community, Shiyan Sub-district, Baoan District Shenzhen City, Guangdong, China 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				
Battery Nominal Voltage: 电池标称电压	48V	Rated Capacity: 额定容量	3600Wh	Trademark: 商标	EcoFlow
Charge Current: 充电电流	12A(DC:1 1-150V)	Maximum Continuous Charge Current: 最大持续充电电流	12A(DC:11- 150V)	End Charge Current: 充电截止电流	4A
Cut-off Voltage: 终止电压	4.75V(5V)	Maximum Continuous Discharge Current: 最大持续放电电流	5A(USB-C:5V)	Limited Charge Voltage: 充电限制电压	53.25V
Cells Number: 内含电芯个数	15	Cell Model: 电芯型号	GSP27135206 F-80Ah	Cell Rated Capacity: 电芯额定容量	80Ah
Date of Sample Received: 样品接收日期	Jul. 02, 2021 2021 年 07 月 02 日				
Date of Test: 检测日期	Jul. 02, 2021 to Jul. 14, 2021 2021 年 07 月 02 日 至 2021 年 07 月 14 日				
Tested by:  检测 Checked by:  审核 Approved by:  批准					

Report No.: 18270BC10173601

报告编号

Page 3 of 16

第 3 页 共 16 页

## 2. REFERENCE METHOD 参考方法

United Nations Recommendations On The Transport Of Dangerous Goods, Manual Of Tests And Criteria (ST/SG/AC.10/11/Rev.7)

《联合国关于危险货物运输的建议书—试验和标准手册》 (ST/SG/AC.10/11/Rev.7)

## 3. EQUIPMENT LIST 设备清单

Name of equipment /Model 设备名称/型号	Serial No. 编号	Due Date 校准有效期
Low Pressure Test Machine 模拟高空低压试验箱 BE-DY-125	SE-132	2022-03-11
High Fast Temperature&Humidity Chamber 快速温变箱 ZJ-KSWB1506	SE-1488	2022-07-11
Vibration Machine 振动台 DC-2200-26	SE-1199	2021-12-17
Shock Machine 机械冲击台 HSKT-10	SE-440	2022-03-11
High Temperature Short Circuit Test Chamber 高温短路试验箱 KY-CS50	SE-4071	2022-05-18
Crush Testing Machine 挤压试验机 BE-6045	SE-135	2022-03-11
Power Battery Detection System 动力电池检测系统 CE-7002-100V200A	SE-4087	2022-07-11
DC Power Supply 直流电源 QJ3020E	SE-1532	2021-11-01
DC Power Supply 直流电源 QJ3020E	SE-1562	2021-12-08
DC Power Supply 直流电源 QJ3020E	SE-1563	2021-12-08
DC Power Supply 直流电源 QJ3020E	SE-1564	2021-11-01
DC Power Supply 直流电源 QJ3020E	SE-1565	2021-12-08
Electronic loading 电子负载 JT6111	SE-1561	2021-12-08
TRUE RMS multimeter 台式万用表 MS8040	SE-2010	2022-05-18



Report No.: 18270BC10173601

报告编号

Page 4 of 16

第 4 页 共 16 页

Electronic Platform Scale

电子台秤

SE-1452

2021-12-08

TCS-300

Temperature rise recorder

温升记录仪

SE-004

2022-03-11

34970A



Report No.: 18270BC10173601

报告编号

Page 5 of 16

第 5 页 共 16 页

## 4. ENVIRONMENTAL CONDITIONS OF THE TEST 环境条件

Temperature: (20±5) °C

温度

R.H.: (25~75) %RH

相对湿度

## 5. TEST ITEM AND CONCLUSION 测试项目及结论

ITEM 测试项目	SAMPLE NUMBER 样品编号	STANDARD 执行标准	CONCLUSION 结论
Altitude simulation 高度模拟	B1~B2, B3~B4	ST/SG/AC.10/11/Rev. 7	PASS 通过
Thermal test 热测试			PASS 通过
Vibration 振动			PASS 通过
Shock 冲击			PASS 通过
External short circuit 外部短路			PASS 通过
Crush 挤压	C1~C5, C6~C10		PASS 通过
Overcharge 过度充电	B5~B6, B7~B8		PASS 通过
Forced discharge 强制放电	C11~C20, C21~C30		PASS 通过

## Notes 说明:

B1~B2: Batteries at first cycle in fully charged states;

为第 1 个充放电周期完全充电状态的电池;

B3~B4: Batteries after 25 cycles ending in fully charged states;

为第 25 个充放电周期后完全充电状态的电池;

B5~B6: Batteries at first cycle in fully charged states;

为第 1 个充放电周期完全充电状态的电池;

B7~B8: Batteries after 25 cycles ending in fully charged states;

为第 25 个充放电周期后完全充电状态的电池;

C1~C5: Cells at first cycle at 50% of the design rated capacity;

为第 1 个充放电周期 50%设计额定容量状态的电芯;

C6~C10: Cells at 25 cycle at 50% of the design rated capacity;

为第 25 个充放电周期 50%设计额定容量状态的电芯;

C11~C20: Cells at first cycle in fully discharged states;

为第 1 个充放电周期完全放电状态的电芯;

C21~C30: Cells after 25 cycles ending in fully discharged states.

为第 25 个充放电周期后完全放电状态的电芯。



## 6. TEST METHOD 测试方法

Tests T.1 to T.5 shall be conducted in sequence on the same cell or battery. Tests T.6 and T.8 shall be conducted using not otherwise tested cells or batteries. Test T.7 may be conducted using undamaged batteries previously used in tests T.1 to T.5 for purposes of testing on cycled batteries. In order to quantify the mass loss, the following procedure is provided:

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

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

小型电芯或电池必须按顺序进行试验 T.1 至 T.5。试验 T.6 和 T.8 应使用未另外试验过的电芯或电池。试验 T.7 可以使用原先在试验 T.1 至 T.5 中使用过的未损坏电池进行，以便测试交替充电放电过的电池。

质量损失依照下式计算：

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

式中  $M_1$  是实验前的质量， $M_2$  是试验后的质量。如质量损失不超过下表所列数值，即视为“无质量损失”。

Mass M of cell or battery 电芯或电池质量 M	Mass loss limit 质量损失限值
$M < 1\text{g}$	0.5%
$1\text{g} \leq M \leq 75\text{g}$	0.2%
$M > 75\text{g}$	0.1%

### T.1 Altitude simulation

Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature ( $20 \pm 5^\circ\text{C}$ ).

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.

#### T.1 高度模拟

试验电芯和电池应在压力等于或低于 11.6 千帕和环境温度为( $20^\circ\pm 5^\circ\text{C}$ ) 下存放至少 6 小时。

要求电芯和电池无渗漏、无排气、无解体、无破裂、无起火，并且每个试验电芯或电池在试验后的开路电压不小于其在进行这一实验前电压的 90%。有关电压的要求不适用于完全放电状态的试验电芯和电池。

### T.2 Thermal test

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.

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.

#### T.2 热测试

试验电芯和电池应先在试验温度等于  $72\pm 2^\circ\text{C}$  的条件下存放至少 6 小时，接着再在试验温度等于  $-40\pm 2^\circ\text{C}$  的条件下存放至少 6 小时。两个极端试验温度之间的最大时间间隔为 30 分钟。此程序重复进行，完成 10 次，接着将所有试验电芯和电池在环境温度 ( $20\pm 5^\circ\text{C}$ ) 下存放 24 小时。对于大型电芯和电池，暴露于极端试验温度的时间至少应为 12 小时。

要求电芯和电池无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电芯或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%。有关电压的要求不适用于完全放电状态的试验电芯和电池。

### T.3 Vibration

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  $g_n$  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  $g_n$  occurs (approximately 50 Hz). A peak acceleration of 8  $g_n$  is then maintained until the frequency is increased to 200 Hz.

For large batteries: from 7 Hz to a peak acceleration of 1  $g_n$  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  $g_n$  occurs (approximately 25 Hz). A peak acceleration of 2  $g_n$  is then maintained until the frequency is increased to 200 Hz.

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.

### T.3 振动

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

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

对电芯和小型电池：从 7 赫兹开始，保持 1  $g_n$  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（总位移 1.6 毫米），并增加频率直到最大加速度达到 8  $g_n$ （频率约为 50 赫兹）。将最大加速度保持在 8  $g_n$  直到频率增加到 200 赫兹。

对大型电池：从 7 赫兹开始，保持 1  $g_n$  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（总行程 1.6 毫米）并增加频率直到最大加速度达到 2  $g_n$ （频率约为 25 赫兹）。将最大加速度保持在 2  $g_n$  直到频率增加到 200 赫兹。

要求电芯和电池无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电芯或电池在第三个垂直安装方位上的试验后立即测得的开路电压不小于在进行这一试验前电压的 90%。有关电压的要求不适用于完全放电状态的试验电芯和电池。

### T.4 Shock

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  $g_n$  and pulse duration of 6 milliseconds. Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50  $g_n$  and pulse duration of 11 milliseconds.

Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of the battery. The pulse duration shall be 6 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations.



Battery 电池	Minimum peak acceleration 最小峰值加速度	Pulse duration 脉冲持续时间
Small batteries 小型电池	150 g <sub>n</sub> or result of formula Acceleration(g <sub>n</sub> )= $\sqrt{\left(\frac{100850}{\text{mass}^*}\right)}$ whichever is smaller	6 ms
Large batteries 大型电池	50 g <sub>n</sub> or result of formula Acceleration(g <sub>n</sub> )= $\sqrt{\left(\frac{30000}{\text{mass}^*}\right)}$ whichever is smaller	11 ms

\* Mass is expressed in kilograms.

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.

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.

#### T.4 冲击

试验电芯和电池用坚固支架紧固在试验机上，支架支撑着每个试验电池的所有安装面。

每个电芯须经受最大加速度 150 g<sub>n</sub> 和脉冲持续时间 6 毫秒的半正弦波冲击。不过，大型电芯须经受最大加速度 50 g<sub>n</sub> 和脉冲持续时间 11 毫秒的半正弦波冲击。

每个电芯须经受半正弦波冲击的峰值加速度取决于电池的质量。对小型电池的脉冲持续时间为 6 毫秒，对大型电池的脉冲持续时间为 11 毫秒。上面的公式用于计算合适的最低限度最大加速度。

每个电芯或电池须在三个相互垂直的电芯或电池安装方位的正极方向经受三次冲击，接着在负极方向经受三次冲击，总共经受 18 次冲击。

要求电芯和电池无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电芯或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%。有关电压的要求不适用于完全放电状态的试验电芯和电池。

#### T.5 External short circuit

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

This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57±4°C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.

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

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.

#### T.5 外部短路

对于待试电芯或电池，应加温一段必要的时间，使从外壳测量的温度达到均匀的稳定温度 57±4°C，这段时间的长短取决于电芯或电池的大小和设计，对于这个持续时间应加以评估和记录。如无法进行这种评估，则小型电芯或电池的暴露时间应至少持续 6 小时，大型电芯或电池的暴露时间应至少持续 12 小时。然后，电芯或电池在 57±4°C 下经受总外电阻小于 0.1 欧姆的短路条件。

这一短路条件应在电芯或电池外壳温度回到  $57\pm 4^{\circ}\text{C}$  后持续至少 1 小时，或在大电池的情况下外壳温度降幅达试验中所观察的最高升温幅的二分之一并保持低于此温度值。

短路和降温阶段应至少相当于环境温度。

要求电芯和电池外壳温度不超过  $170^{\circ}\text{C}$ ，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。

#### T.6 Impact / Crush

Impact (applicable to cylindrical cells greater than 18 mm in diameter)

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

Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells not more than 18 mm in diameter)

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

(a) The applied force reaches  $13 \pm 0.78\text{ kN}$ ;

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

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

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

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

Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6 h. The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.

Cells and component cells meet this requirement if their external temperature does not exceed  $170^{\circ}\text{C}$  and there is no disassembly and no fire during the test and within six hours after this test.

#### T.6 撞击/挤压

撞击（适用于直径不小于 18 毫米的圆柱形电芯）

试样电芯或组成电芯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  $15.8 \pm 0.1$  毫米，长度至少 6 厘米，或电芯最长端的尺度，取二者之长者。将一块  $9.1 \pm 0.1$  千克的重锤从  $61 \pm 2.5$  厘米高处跌落到钢棒和试样交叉处，使用一个几乎没有摩擦的、对落体重锤阻力最小的垂直轨道或管道加以控制。垂直轨道或管道用于引导落锤沿水平支撑表面呈 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  $15.8 \pm 0.1$  毫米弯曲表面的纵轴垂直。每一试样只经受一次撞击。

挤压（棱柱形、袋装、硬币/纽扣电芯和直径小于 18 毫米的圆柱形电芯）

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

(a) 施加的力量达到  $13 \pm 0.78$  千牛顿；

(b) 电芯的电压下降至少 100 毫伏；或

(c) 电芯变形达到原始厚度的 50%或以上。

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



棱柱形或袋装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。圆柱形电芯应从与纵轴垂直的方向施压。

每个试样电芯或组成电芯只做一次挤压试验。试样应继续观察 6 小时。试验应使用之间未做过其他试验的电芯或组成电芯进行。

要求电芯或组成电芯外壳温度不超过 170°C，并且在试验过程中及试验后 6 小时内无解体，无起火。

#### T.7 Overcharge

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

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

(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.

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

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

#### T.7 过度充电

充电电流必须是制造商建议的最大持续充电电流的两倍。试验的最小电压如下：

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

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

试验应在环境温度下进行，进行试验的时间应为 24 小时。

要求可充电电池在试验过程中和试验后 7 天内无解体，无起火。

#### T.8 Forced discharge

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.

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).

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

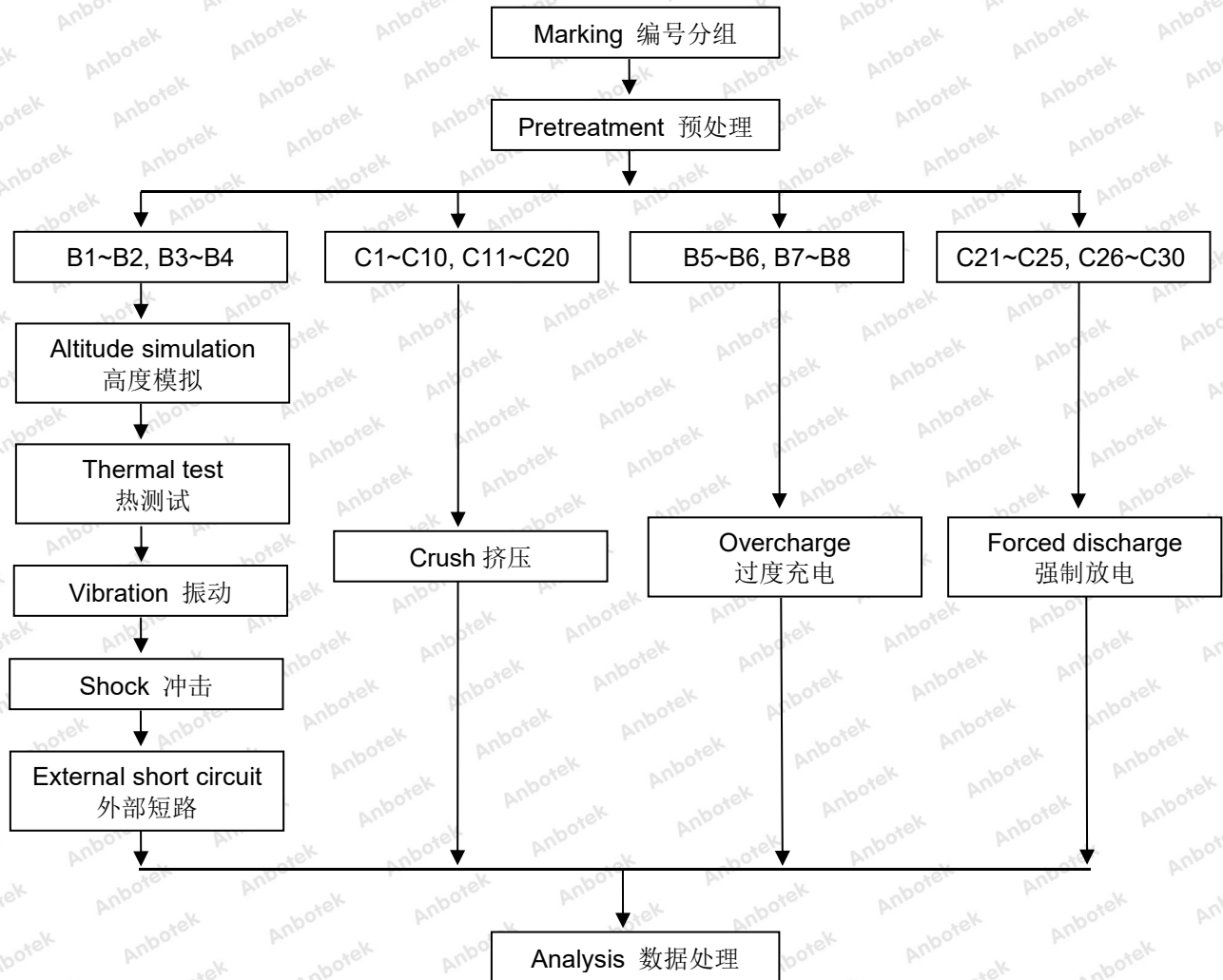
#### T.8 强制放电

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

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

要求原电芯或可充电电芯在试验过程中和试验后 7 天内无解体，无起火。

## 7. TEST PROCEDURE 测试程序





## 8. DATA 测试数据

## T.1 Altitude simulation 高度模拟

No. 编号	Pre-test 测试前		After test 测试后		Mass loss 质量亏损 (%)	Voltage loss 电压亏损 (%)	Whether leakage, venting, disassembly, rupture, fire (Y/N) 有无渗漏, 排气, 解 体, 破裂和起火 (是 /否)
	Mass 质量 千克(kg)	Voltage 电压 伏(V)	Mass 质量 千克(kg)	Voltage 电压 伏(V)			
B1	43.79	5.131	43.79	5.131	0.00	0.00	N
B2	43.77	5.164	43.77	5.163	0.00	0.02	N
B3	43.77	5.143	43.77	5.143	0.00	0.00	N
B4	43.78	5.139	43.78	5.139	0.00	0.00	N

## T.2 Thermal test 热测试

No. 编号	Pre-test 测试前		After test 测试后		Mass loss 质量亏损 (%)	Voltage Loss 电压亏损 (%)	Whether leakage, venting, disassembly, rupture, fire (Y/N) 有无渗漏, 排气, 解 体, 破裂和起火 (是 /否)
	Mass 质量 千克(kg)	Voltage 电压 伏(V)	Mass 质量 千克(kg)	Voltage 电压 伏(V)			
B1	43.79	5.131	43.79	5.122	0.00	0.18	N
B2	43.77	5.163	43.77	5.152	0.00	0.21	N
B3	43.77	5.143	43.77	5.133	0.00	0.19	N
B4	43.78	5.139	43.78	5.128	0.00	0.21	N

## T.3 Vibration 振动

No. 编号	Pre-test 测试前		After test 测试后		Mass loss 质量亏损 (%)	Voltage Loss 电压亏损 (%)	Whether leakage, venting, disassembly, rupture, fire (Y/N) 有无渗漏, 排气, 解 体, 破裂和起火 (是 /否)
	Mass 质量 千克(kg)	Voltage 电压 伏(V)	Mass 质量 千克(kg)	Voltage 电压 伏(V)			
B1	43.79	5.122	43.79	5.122	0.00	0.00	N
B2	43.77	5.152	43.77	5.151	0.00	0.02	N
B3	43.77	5.133	43.77	5.133	0.00	0.00	N
B4	43.78	5.128	43.78	5.128	0.00	0.00	N

## T.4 Shock 冲击

Peak acceleration: 26.2 g<sub>n</sub>, Pulse duration: 11 ms峰值加速度: 26.2 g<sub>n</sub>, 脉冲时间: 11 ms

No. 编号	Pre-test 测试前		After test 测试后		Mass loss 质量亏损 (%)	Voltage Loss 电压亏损 (%)	Whether leakage, venting, disassembly, rupture, fire (Y/N) 有无渗漏, 排气, 解体, 破裂和起火 (是/否)
	Mass 质量 千克(kg)	Voltage 电压 伏(V)	Mass 质量 千克(kg)	Voltage 电压 伏(V)			
B1	43.79	5.122	43.79	5.122	0.00	0.00	N
B2	43.77	5.151	43.77	5.151	0.00	0.00	N
B3	43.77	5.133	43.77	5.133	0.00	0.00	N
B4	43.78	5.128	43.78	5.127	0.00	0.02	N

## T.5 External short circuit 外部短路

No. 编号	Peak temperature (°C) 最高温度	Whether disassembly, rupture, fire (Y/N) 有无解体, 破裂, 起火 (是/否)
B1	56.7	N
B2	57.1	N
B3	56.9	N
B4	56.8	N

## T.6 Crush 挤压

No. 编号	Peak temperature (°C) 最高温度	Whether disassembly, fire (Y/N) 有无解体, 起火 (是/否)
C1	26.1	N
C2	26.3	N
C3	26.7	N
C4	26.1	N
C5	26.5	N
C6	26.2	N
C7	26.4	N
C8	26.4	N
C9	26.1	N
C10	26.3	N

## T.7 Overcharge 过度充电

No. 编号	Whether disassembly, fire (Y/N) 有无解体, 起火 (是/否)
B5	N
B6	N
B7	N
B8	N



## T.8 Forced discharge 强制放电

No. 编号	Whether disassembly, fire (Y/N) 有无解体, 起火 (是/否)
C11	N
C12	N
C13	N
C14	N
C15	N
C16	N
C17	N
C18	N
C19	N
C20	N
C21	N
C22	N
C23	N
C24	N
C25	N
C26	N
C27	N
C28	N
C29	N
C30	N

## 9. PHOTOS OF THE SAMPLE 样品照片

### Battery 电池



#### EcoFlow DELTA Pro

Model/Modèle: EFD500

Capacity/Capacité: 3600Wh 48V

Discharge Temperature/Température d'utilisation: 14 to 113°F

Charge Temperature/Température de recharge: 32 to 113°F

AC Input/entrée: 100-120V- 15A 220-240V- 12.5A 50Hz/60Hz

X-Stream Charge Input/entrée: 120V 1800W Max, 240V 3000W Max

Solar/Solaire/DC Input/entrée: 11-150V=12A 1200W Max

Total Output/entrée: 4260W

12V Output/sortie: 12.6V=30A/10A/3A 504W Max

AC Output/sortie(x5): 120V- 50Hz/60Hz 3600W(Surge 7200W) total

USB-A Output/sortie(x2): 5V=2.4A 12W Max per port

USB-A Fast Charge Output/rapide sortie(x2): 5V=2.4A 9V=2A 12V=1.5A 18W Max per port

USB-C Output/sortie(x2): 5/9/12/15/20V=5A 100W Max per port

### Cell 电芯





**DECLARATION****声明**

1. United Nations Recommendations On The Transport Of Dangerous Goods, Manual Of Tests And Criteria(ST/SG/AC.10/11/Rev.7).  
《联合国关于危险货物运输的建议书—试验和标准手册》(ST/SG/AC.10/11/Rev.7)
2. Test place Lab: Shenzhen Anbotek Compliance Laboratory Limited  
Address: East of 4/F., Building A, Hourui No.3 Industrial Zone, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China  
测试实验室: 深圳安博检测股份有限公司  
地址: 广东省深圳市宝安区西乡街道后瑞第三工业区A栋4楼东
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-- End of report --

-- 报告结束 --

