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CNAS L3503

UN38.3 Test Report
UN38.3测试报告

Report No. 报告号	:	**1811C50113012702**
Client Name 委托单位	:	**Shenzhen OLiPower Energy & Automation Technology Co., Ltd.** 深圳市欧力普能源与自动化技术有限公司
Client Address 单位地址	:	**1001, Block A, Building 2, SEZ Construstion Wisdom Park, No. 380 Guangming Avenue, Tangwei Community, Fenghuang Street, Guangming District, Shenzhen City, Guangdong Province** 广东省深圳市光明区凤凰街道塘尾社区光明大道380号尚智科技园2栋A座1001
Product Name 产品名称	:	**Battery Energy Storage System** 电池储能系统
Report Date 报告日期	:	**2025-06-10**

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	Battery Energy Storage System 电池储能系统		Sample Model: 样品型号	OLP-EC-PV650_P500_E1205-AO01	
Manufacturer: 制造商	Shenzhen OLiPower Energy & Automation Technology Co., Ltd. 深圳市欧力普能源与自动化技术有限公司				
Address of manufacturer: 制造商地址	1001, Block A, Building 2, SEZ Construstion Wisdom Park, No. 380 Guangming Avenue, Tangwei Community, Fenghuang Street, Guangming District, Shenzhen City, Guangdong Province 广东省深圳市光明区凤凰街道塘尾社区光明大道 380 号尚智科技园 2 栋 A 座 1001				
Factory: 工厂	Dongguan Olipower New Energy Co., Ltd. 东莞欧力普新能源有限公司				
Address of factory: 工厂地址	No. 2 Qianmei Road, Dongkeng Town, Dongguan City, Guangdong Province, PRC. 广东省东莞市东坑镇东坑谦梅路 2 号				
Battery Nominal Voltage: 电池标称电压	768V	Rated Capacity: 额定容量	1570Ah/ 1.2MWh	Trademark: 商标	OLiPower
Standard Charge Current: 标准充电电流	722A	Maximum Charge Current: 最大充电电流	195A*5	Charge Limited Voltage: 充电限制电压	876V
Standard Discharge Current: 标准放电电流	722A	Maximum Discharge Current: 最大放电电流	195A*5	Discharge Cut-off Voltage: 放电终止电压	672V
Battery cluster Number: 内含电池簇个数	5PCS, (1S 5P)	Battery cluster Model: 内部电池簇型号	OLP-EB-V768_E241-AO01	Battery cluster Rated Capacity: 电池簇额定容量	314Ah
Battery module Number: 内含模组个数	75PCS, (15S 5P)	Battery module Model: 内部模组型号	HP 51016	Battery module Rated Capacity: 模组额定容量	314Ah
Cells Number: 内含电芯个数	1200PCS, (240S 5P)	Cell Model: 电芯型号	RBA4F1	Cell Rated Capacity: 电芯额定容量	314Ah
Date of Sample Received: 样品接收日期	2025-05-20				
Date of Test: 检测日期	2025-05-20~ 2025-06-05				

Written by 编制 李小媚 Checked by 审核 Approved by 批准 朱洁

	Battery Energy Storage System 电池储能系统	Battery cluster 电池簇	Battery module 电池模组	Cell 电芯
Name 名称	Battery Energy Storage System 电池储能系统	OLP Air Cooled Integrated Energy Cabinet OLP 风冷一体能源柜	Energy Storage Li-ion Battery 储能锂离子电池	Lithium iron phosphate battery cell 磷酸铁锂电芯
Model 型号	OLP-EC-PV650_P500_E1205-AO01	OLP-EB-V768_E241-AO01	HP 51016	RBA4F1
Nominal voltage 标称电压	768V	768V	51.2V	3.2V
Rated capacity 额定容量	1570Ah	314Ah	314Ah	314Ah
Limited charge voltage 充电限制电压	876V	876V	58.4V	3.65V
Cut-off voltage 放电终止电压	672V	672V	40V	2.0V
Standard charge current 标准充电电流	722A	157A	157A	157A
Standard discharge current 标准放电电流	722A	157A	157A	157A
Max continuous charge current 最大持续充电电流	195A*5	195A	195A	195A
Max continuous discharge current 最大持续放电电流	195A*5	195A	195A	195A

Note 注意:

Due to the customer's declaration, the Battery cluster inside the Sample are not connected to each other. This test only tests the Battery cluster.

由于客户声明，样品内部的电池簇之间相互不连接、不导通，本次测试仅测试到电池簇。

2. REFERENCE METHOD 参考方法

UN "Manual of Tests and Criteria" Eighth revised edition ST/SG/AC.10/11/Rev.8/Subsection 38.3
联合国《试验和标准手册》第八修订版 38.3 节

3. EQUIPMENT LIST 设备清单

Name of equipment /Model
设备名称
Battery Charge And Discharge System
电池充放电系统
Altitude Simulation Testing Machine
模拟高空低压试验箱
High Fast Temperature&Humidity Chamber
快速温变箱
Vibration Testing Machine
振动试验机
Shock Testing Machine
机械冲击台
Short Circuit Testing Machine
短路试验机
Battery Internal resistance
电池内阻测试仪
Battery Extrusion Testing Machine
电池挤压试验机
Multimeter
万用表
Electronic Balance
电子秤
Data Acquisition/Swith Unit
温升记录仪

4. ENVIRONMENTAL CONDITIONS OF THE TEST 环境条件

Temperature: (20±5) °C	R.H.: (25~75) %RH
温度	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
T1 Altitude simulation 高度模拟	B1~B4	ST/SG/AC.10/11/Rev.8	经测试，该样品符合联合国《试验和标准手册》第八修订版 38.3 节标准要求 The sample has passed the items of UN "Manual of Tests and Criteria" Eighth revised edition ST/SG/AC.10/11/Rev.8/Subsection 38.3
T2 Thermal test 热测试			
T3 Vibration 振动			
T4 Shock 冲击			
T5 External short circuit 外部短路			
T6 Crush 挤压	C1~C5, C6~C10		
T7 Overcharge 过度充电	B5~B8		
T8 Forced discharge 强制放电	C11~C20, C21~C30		
(g) Overcharge protection 过充电保护	BMS01		
(g) Short-circuit protection 短路保护	BMS01		
(g) Over-discharge protection 过放电保护	BMS01		

说明 Notes：

B1~B2, B5~B6	为第一个充放电周期完全充电状态的电池组 Batteries at first cycle in fully charged states
B3~B4, B7~B8	为 25 个充放电周期后完全充电状态的电池组 Batteries after 25 cycles ending in fully charged states
C1~C5	为第一个充放电周期后 50%设计额定容量状态的电池 Cells at first cycle at 50% of the design rated capacity
C6~C10	为 25 个充放电周期后 50%设计额定容量状态的电池 Cells after 25 cycle at 50% of the design rated capacity
C11~C20	为第一个充放电周期后完全放电状态的电池 Cells at first cycle in fully discharged states
C21~C30	为 25 个充放电周期后完全放电状态的电池 Cells after 25 cycles ending in fully discharged states
BMS01	为由已通过所有适用试验的上述锂电池组以电路连接而成的电池簇 Battery cluster that have passed all applicable tests are electrically connected to form a battery

Shenzhen OLiPower Energy & Automation Technology Co., Ltd. is the OLP Air Cooled Integrated Energy Cabinet. Battery Energy Storage System (Model: OLP-EC-PV650_P500_E1205-AO01) consists of 5pcs OLP Air-Cooled Integrated Energy Cabinets cabinets (Model: OLP-EB-V768_E241-AO01), OLP Air Cooled Integrated Energy Cabinet consists of 15pcs Energy Storage Li-ion Battery (Model: HP51016), Energy Storage Li-ion Battery are tested according to Section 38.3 of The Eighth Edition of the United Nations Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.8/Subsection 38.3). The internal battery pack that makes up the sample has been verified in 1811C50113012701, meet the standard

(ST/SG/AC.10/11/Rev.8/Subsection 38.3). Internal battery pack T1-T8 test data reference report 1811C50113012701 in this report.

由深圳市欧力普能源与自动化技术有限公司送检的样品 OLP 风冷一体能源柜 OLP-EB-V768_E241-AO01（5 个 OLP 风冷一体能源柜组成电池储能系统 OLP-EC-PV650_P500_E1205-AO01），由 15 个储能锂离子电池 HP 51016 组成，依据联合国《试验和标准手册》（第 8 版）38.3 节进行检测，组成该样品的内部电池组在 1811C50113012701 中已经过验证，满足联合国《试验和标准手册》（第 8 版）38.3 节的相关要求。本报告中内部电池组 T1-T8 测试数据引用报告 1811C50113012701。

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”.

小型电池或电池组应按顺序进行试验 T.1 至 T.5。试验 T.6 和 T.8 应使用未另外试验过的电池或电池组。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组进行，以便测试经过充放电的电池组。

质量损失的量化数值可用下式计算：

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

式中 M_1 是试验前的质量，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 电池或电池组质量 M	Mass loss limit 质量损失限值
M<1g	0.5%
1g≤M≤75g	0.2%
M>75g	0.1%

Test 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 ± 5°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.

试验 T.1 高度模拟

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

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

Test T.2 Thermal test

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

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.

试验 T.2 温度试验

试验电池和电池组应先在试验温度等于 72±2°C 的条件下存放至少 6 小时，接着再在试验温度等于-40±2°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±5°C）下存放 24 小时。对于大型电池和电池组，暴露于极端试验温度的时间至少应为 12 小时。

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

Test 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 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 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.

试验 T.3 振动

电池和电池组紧固于振动机平台，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 千克的电池和电池组（电池和小型电池组），和对 12 千克及更大的电池组（大型电池组）应有所不同。

对电池和小型电池组：从 7 赫兹开始，保持 1 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。

对大型电池组：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。

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

Test 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 小型电池组	150 g_n or result of formula 150 g_n 或公式计算 Acceleration 加速度(g_n)= $\sqrt{\left(\frac{100850}{\text{mass 质量}*}\right)}$ whichever is smaller 取数值较少者	6 ms 6 毫秒
Large batteries 大型电池组	50 g_n or result of formula 50 g_n 或公式计算 Acceleration 加速度(g_n)= $\sqrt{\left(\frac{30000}{\text{mass 质量}*}\right)}$ whichever is smaller 取数值较少者	11 ms 11 毫秒

* Mass is expressed in kilograms 质量单位为千克

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.

试验 T.4 冲击

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

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

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

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

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

Test T.5 External short circuit

The cell or battery to be tested shall be 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.

试验 T.5 外部短路

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

这一短路条件应在电池或电池组外壳温度回到 57±4°C 后继续至少 1 小时，或在大型电池组的情况下外壳温度降幅达试验中所观察的最高温升幅的二分之一并保持低于该数值。

短路和降温阶段应至少相当于环境温度。

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

Test T.6 Impact / Crush

Test procedure - Impact (applicable to cylindrical cells not less than 18 mm in diameter)

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

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

Test procedure - Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less 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 kN ± 0.78 kN;

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

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

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

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

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

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.

试验 T.6 撞击/挤压

试验程序—撞击（适用于直径不小于 18 毫米的圆柱形电池）

试样电池或原件电池放在平坦光滑的表面上，一根 316 型不锈钢棒横放在试样中心，钢棒直径 15.8 毫米 ±0.1 毫米，长度至少 6 厘米，或电池最长端的尺寸，取二者之长者。将一块 9.1 千克 ±0.1 千克的重锤从 61 ± 2.5 厘米高处跌落到钢棒和试样交叉处，使用一个几乎没有摩擦的、对落体重锤阻力最小的垂直轨道或管道加以控制。垂直轨道或管道用于引导落锤沿水平支撑表面呈 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 毫米 ±0.1 毫米弯曲表面的纵轴垂直。每一试样只经受一次撞击。

试验程序—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）

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

（a） 施加的力量达到 13 千牛顿 ± 0.78 千牛顿；

（b） 电池的电压下降至少 100 毫伏；或

（c） 电池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，或电池变形至少达原厚度的 50%，即可解除压力。

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

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

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

Test 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.

试验 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。

可充电电池组在试验过程中和试验后 7 天内无解体，无起火，即符合本项要求。

Test 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.

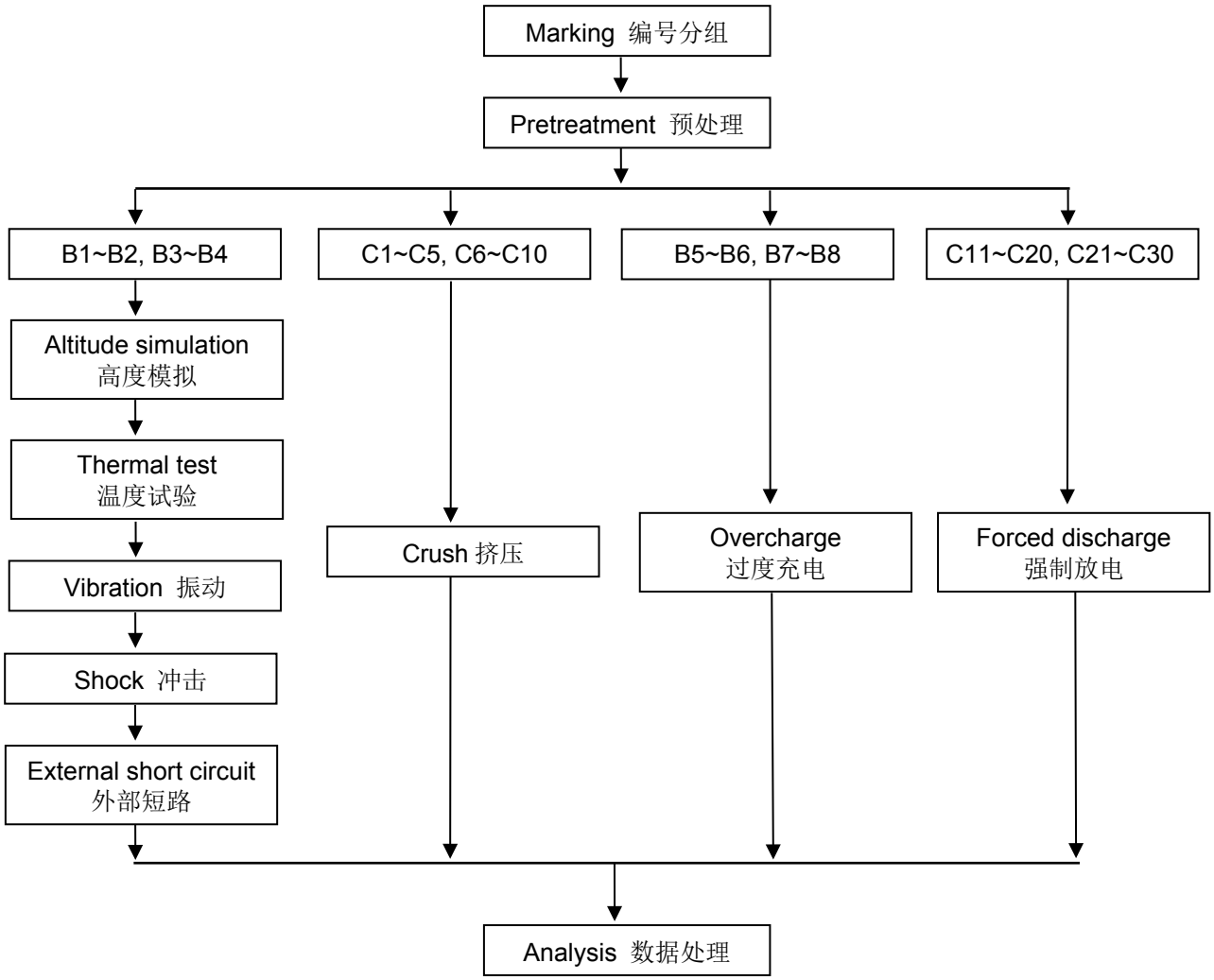
试验 T.8 强制放电

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

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

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

7. TEST PROCEDURE 测试程序



8. DATA 测试数据

T.1 Altitude simulation 高度模拟

Sample No. 样品编号	Pre-test 测试前		After test 测试后		Mass loss 质量亏损 (%)	Residual OCV 剩余电压 (%)	Results 结果
	Mass 质量	Voltage 电压	Mass 质量	Voltage 电压			
B1	111.500kg	54.06V	111.491kg	53.98V	0.01	99.85	Pass 通过
B2	111.199kg	53.91V	111.195kg	53.79V	0.00	99.78	Pass 通过
B3	111.390kg	54.01V	111.382kg	53.96V	0.01	99.91	Pass 通过
B4	111.058kg	54.03V	111.057kg	54.01V	0.00	99.96	Pass 通过
Requirements 要求: After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. The open circuit voltage of each test cell or battery after testing is not less than 90 % of its voltage immediately prior to this procedure.测试后，样品无渗漏、无排气、无解体、无破裂和无起火。并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%。							

T.2 Thermal test 热测试

Sample No. 样品编号	Pre-test 测试前		After test 测试后		Mass loss 质量亏损 (%)	Residual OCV 剩余电压 (%)	Results 结果
	Mass 质量	Voltage 电压	Mass 质量	Voltage 电压			
B1	111.491kg	53.98V	111.490kg	52.98V	0.00	98.15	Pass 通过
B2	111.195kg	53.79V	111.185kg	52.72V	0.01	98.01	Pass 通过
B3	111.382kg	53.96V	111.374kg	52.70V	0.01	97.66	Pass 通过
B4	111.057kg	54.01V	111.051kg	52.60V	0.01	97.39	Pass 通过
Requirements 要求: After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. The open circuit voltage of each test cell or battery after testing is not less than 90 % of its voltage immediately prior to this procedure.测试后，样品无渗漏、无排气、无解体、无破裂和无起火。并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%。							

T.3 Vibration 振动

Sample No. 样品编号	Pre-test 测试前		After test 测试后		Mass loss 质量亏损 (%)	Residual OCV 剩余电压 (%)	Results 结果
	Mass 质量	Voltage 电压	Mass 质量	Voltage 电压			
B1	111.490kg	52.98V	111.481kg	52.98V	0.01	100.00	Pass 通过
B2	111.185kg	52.72V	111.180kg	52.63V	0.00	99.83	Pass 通过
B3	111.374kg	52.70V	111.365kg	52.66V	0.01	99.92	Pass 通过
B4	111.051kg	52.60V	111.050kg	52.47V	0.00	99.75	Pass 通过
Requirements 要求: After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. The open circuit voltage of each test cell or battery after testing is not less than 90 % of its voltage immediately prior to this procedure.测试后，样品无渗漏、无排气、无解体、无破裂和无起火。并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%。							

T.4 Shock 冲击

Sample No. 样品编号	Pre-test 测试前		After test 测试后		Mass loss 质量亏损 (%)	Residual OCV 剩余电压 (%)	Results 结果
	Mass 质量	Voltage 电压	Mass 质量	Voltage 电压			
B1	111.481kg	52.98V	111.476kg	52.80V	0.00	99.66	Pass 通过
B2	111.180kg	52.63V	111.177kg	52.39V	0.00	99.54	Pass 通过
B3	111.365kg	52.66V	111.364kg	52.54V	0.00	99.77	Pass 通过
B4	111.050kg	52.47V	111.044kg	52.22V	0.01	99.52	Pass 通过
Requirements 要求: After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. The open circuit voltage of each test cell or battery after testing is not less than 90 % of its voltage immediately prior to this procedure.测试后，样品无渗漏、无排气、无解体、无破裂和无起火。并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%。							

T.5 External short circuit 外部短路

Sample No. 样品编号	Max. surface temperature (°C) 表面最高温度	Results 结果
B1	57.6	Pass 通过
B2	57.7	Pass 通过
B3	57.2	Pass 通过
B4	58.6	Pass 通过
Requirements 要求: Test sample exteral temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire during the test and within six hours after the test. 测试样品表面温度不超过 170°C，测试中与测试后 6 小时内无解体、无破裂、无起火。		

T.6 Crush 挤压

Sample No. 样品编号	Max. surface temperature (°C) 表面最高温度	Results 结果
C1	23.6	Pass 通过
C2	23.6	Pass 通过
C3	23.5	Pass 通过
C4	24.0	Pass 通过
C5	23.2	Pass 通过
C6	23.3	Pass 通过
C7	23.6	Pass 通过
C8	24.4	Pass 通过
C9	24.7	Pass 通过
C10	24.2	Pass 通过
Requirements 要求: Test sample exteral temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire during the test and within six hours after the test. 测试样品表面温度不超过 170°C，测试中与测试后 6 小时内无解体、无破裂、无起火。		

T.7 Overcharge 过度充电

Sample No. 样品编号	Results 结果
B5	Pass 通过
B6	Pass 通过
B7	Pass 通过
B8	Pass 通过
Requirements 要求: There is no disassembly and no fire during the test and within seven days after the test.样品在测试中和测试后 7 天内无解体、无起火。	

T.8 Forced discharge 强制放电

Sample No. 样品编号	Results 结果
C11	Pass 通过
C12	Pass 通过
C13	Pass 通过
C14	Pass 通过
C15	Pass 通过
C16	Pass 通过
C17	Pass 通过
C18	Pass 通过
C19	Pass 通过
C20	Pass 通过
C21	Pass 通过
C22	Pass 通过
C23	Pass 通过
C24	Pass 通过
C25	Pass 通过
C26	Pass 通过
C27	Pass 通过
C28	Pass 通过
C29	Pass 通过
C30	Pass 通过
Requirements 要求: There is no disassembly and no fire during the test and within seven days after the test.样品在测试中和测试后 7 天内无解体、无起火。	

(g) Protection verification 保护验证

保护验证 1	Overcharge protection/过充电保护				合格
38.3.3（g）过充电保护 Overcharge protection	测试步骤/ Procedure 按照制造商规定的充电方法，验证过度充电保护功能。 Verify overcharge protection according to the manufacturer's charging method. 标准要求/Requirements BMS 过充保护功能按照制造商的设计规格动作。 BMS overcharge protection function activated follows the design specifications of the manufacturer.				
样品编号 Sample No.	试验前电压(V) Voltage before Test	充电电流(A) Charging current(A)	最大充电电压(V) Max. Charging voltage(V)		测试结果 Results
BMS01#	787.0	157	830.9		O
其他补充：Supplements ： 1.测试结果"O"代表判定该电池包无起火、无爆炸，BMS 动作。 Test result "O" decides that the Battery Pack no fire, no explosion, BMS action. 2.测试电流根据电池组的过充电保护功能的设计确定。 The test current is determined according to the design of the overcharge protection function of the battery pack.					
保护验证 2	Short-circuit protection/短路保护				合格
38.3.3（g）短路保护 Short-circuit protection	测试步骤/Procedure 按照制造商规定的充电方法充满电，使电池组经受总外电阻小于 0.1Ω 的短路条件，验证短路保护功能。 Fully charged according to the charging method specified by the manufacturer. The battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm. Verify short circuit protection. 标准要求/Requirements BMS 短路保护功能按照制造商的设计规格动作。 BMS short-circuit protection function activated follows the design specifications of the manufacturer.				
样品编号 Sample No.	试验前电压(V) Voltage before Test	试验后电压(V) Voltage after Test	回路总电阻（mΩ） Total circuit Resistance	最高温度（°C） Maximum Temperature °C	测试结果 Results
BMS01#	790.3	0	44	23.9	O
其他补充：Supplements ： 1.测试结果"O"代表判定该电池包无起火、无爆炸，BMS 动作。 Test result "O" decides that the Battery Pack no fire, no explosion, BMS action. 2.测试结束后，除电池组内短路保护功能正常动作外，无其他异常。 After the test is complete, the short-circuit protection function in the battery string takes effect, no other exceptions were generated.					
保护验证 3	Over-discharge protection/过放电保护				合格
38.3.3（g）过放电保护 Over-discharge protection	测试步骤/Procedure 按照制造商规定的放电方法，验证过度放电保护功能。 Verify over-discharge protection according to the manufacturer's charging method. 标准要求/Requirements BMS 过放电保护功能按照制造商的设计规格动作。 BMS over-discharge protection function activated follows the design specifications of the manufacturer.				
样品编号 Sample No.	试验前电压(V) Voltage before Test	放电电流(A) Discharging current(A)	最小电压(V) Min. Voltage(V)		测试结果 Results
BMS01#	789.9	157	690.4		O
其他补充：Supplements ： 1.测试结果"O"代表判定该电池包无起火、无爆炸，BMS 动作。 Test result "O" decides that the Battery Pack no fire, no explosion, BMS action. 2.测试电流根据电池组的过放电保护功能的设计确定。 The test current is determined according to the design of the overdischarge protection function of the battery pack.					

9. PHOTOS OF THE SAMPLE 样品照片

Storage System 储能系统

Photo 1 图片 1

Photo 2 图片 2

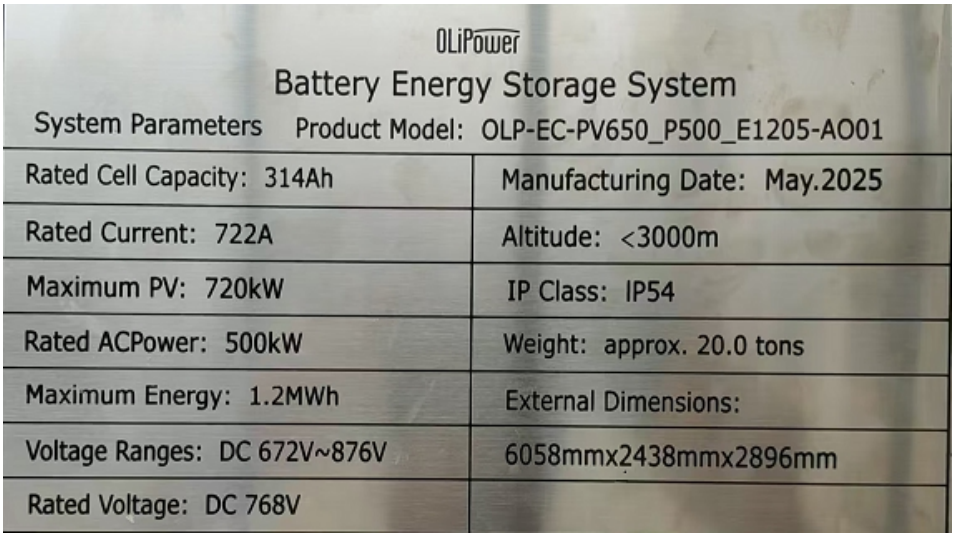


Photo 3 图片 3

Photo 4 photo of the Battery cluster inside the Sample are not connected to each other.
图片 4 样品内电池簇相互不连接

Battery cluster inside 内部电池簇

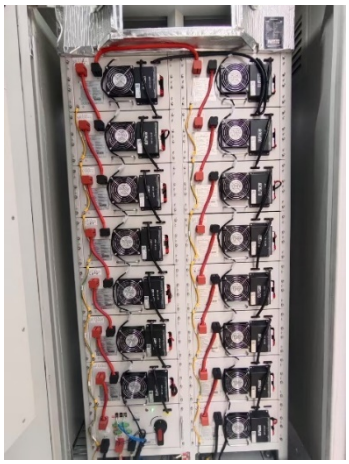


Photo 5 图片 5

Photo 6 图片 6

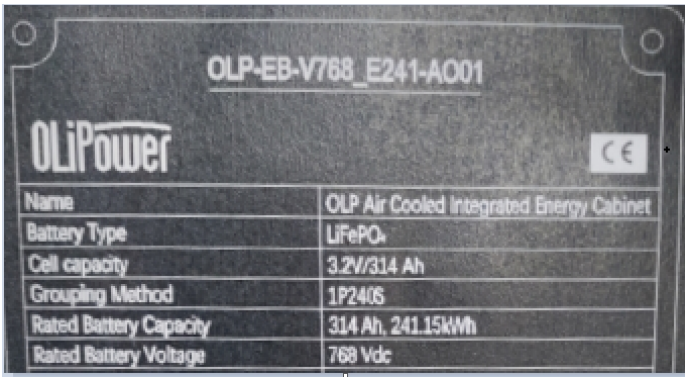


Photo 7 图片 7

Battery module inside 内部电池模组

Photo 8 图片 8

Photo 9 图片 9

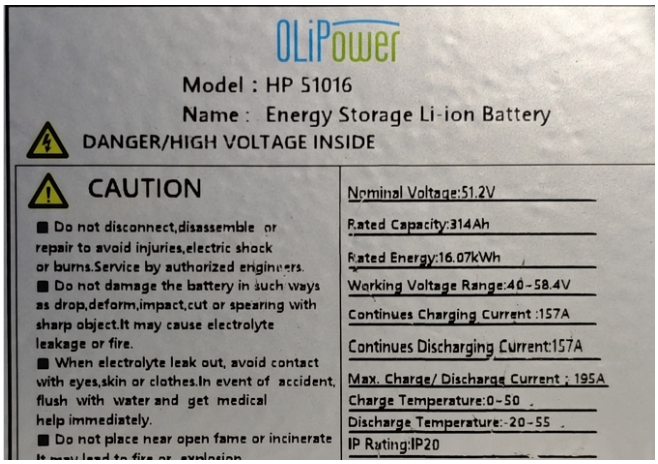


Photo 10 图片 10

Cell 电芯

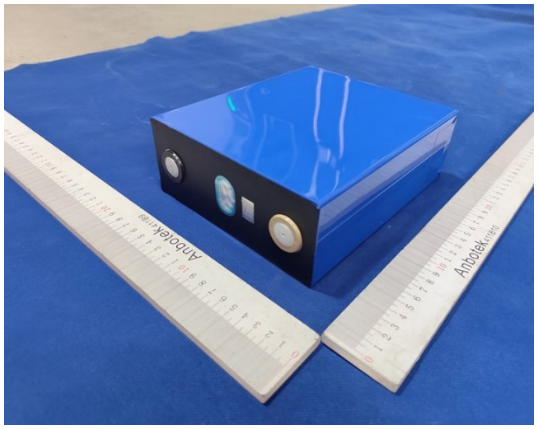


Photo 11 图片 11

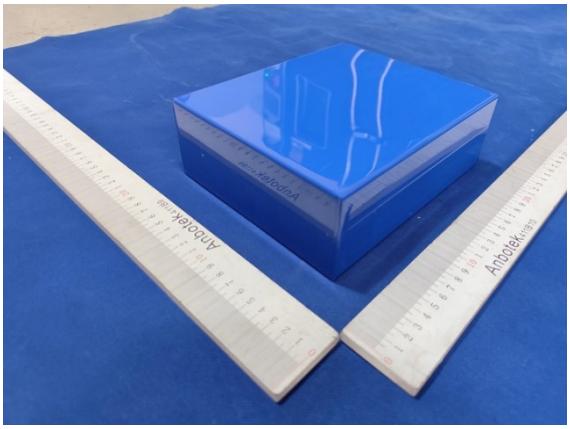


Photo 12 图片 12

DECLARATION

声明

1. Test place Lab: Shenzhen Anbotek Compliance Laboratory Limited

   Address: Zone South, 1/F., Building 2, Hengchangrong High-Tech Industrial Park, Huangtian, Hangcheng 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航城街道黄田恒昌荣高新产业工业园第2栋第1层南区

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-- End of report --

-- 报告结束 --