中国认可
国际互认
检测
TESTING
CNAS L9856

UN38.3 测试报告
UN38.3 Test Report

样品名称及型号	锂离子电池系统 00366
Sample name &Model	Li-ion Battery System 00366
委托单位	横店集团东磁股份有限公司
Consignor	Hengdian Group DMEGC Magnetics Co.,LTD.

深圳诚测检测技术有限公司
Shenzhen CCJC Technology Co., Ltd

样品名称 Sample Name	锂离子电池系统 Li-ion Battery System		样品型号 Sample Model	00366	
委托单位 Consignor	横店集团东磁股份有限公司 Hengdian Group DMEGC Magnetics Co.,LTD.				
制造商 Manufacturer	横店集团东磁股份有限公司 Hengdian Group DMEGC Magnetics Co.,LTD.				
生产厂 Factory	横店集团东磁股份有限公司 Hengdian Group DMEGC Magnetics Co.,LTD.				
标称电压 Normal Voltage	24V	额定容量 Rated Capacity	12Ah 288Wh	充电限制电压 Limited Charge Voltage	29.4V
充电电流 Charge Current	2400mA	最大连续充电电流 Max Continuous Charge Current	5000mA	充电截止电流 End Charge Current	240mA
终止电压 Cut-off Voltage	21V	最大放电电流 Max Discharge Current	15000mA	电芯额定容量 Cell Rated Capacity	3180mAh
内含电芯个数 Cells Number	28pcs	电芯型号 Cell Model	NCR18650BD	商标 Trademark	/
测试方法和判定标准 Test method and criterion	联合国《试验和标准手册》（第 7 版 修订 1）38.3 节 UN "Manual of Tests and Criteria" ST/SG/AC.10/11/Rev.7/Amend.1/Subsection 38.3				
样品接收日期 Accepted date	2024-02-27		测试起讫日期 Test date	2024-02-27~ 2024-03-21	
测试项目 Test items	高度模拟、温度试验、振动、冲击、外部短路、撞击、过度充电、强制放电。 Altitude simulation, Thermal test, Vibration, Shock, External short circuit, Impact, Overcharge, Forced discharge.				
测试结论 Conclusion	经测试，样品符合联合国《试验和标准手册》（第 7 版修订 1）38.3 节 标准要求。 The sample has passed the test items of UN "Manual of Tests and Criteria" ST/SG/AC.10/11/Rev.7/Amend.1/Subsection 38.3. 签发日期(Issue date)：2024-03-21				

编制 Compiler:	谭涵	审核 Checker:	钟庭生	批准 Approver:	

样品说明及描述：
Description and illustration of the sample:

Test items	Sample Number
T.1: 高度模拟/Altitude simulation	B01 – B08
T.2: 温度测试/ Thermal test	
T.3: 振动/ Vibration	
T.4: 冲击/ Shock	
T.5: 外短路/External short circuit	
T.6: 挤压/ Crush or 撞击/Impact	C01 – C10
T.7 过充电/ Overcharge	B09 – B16
T.8: 强制放电/ Forced discharge	C11 – C30

样品状况良好。
The sample's status is good.

样品编号 B01~B04 为第一次循环充放电周期完全充电状态的电池组。
The conditions of the batteries of samples No. B01 to B04 are at first cycle, in fully charged states.

样品编号 B05~B08 为二十五次循环充放电周期后完全充电状态的电池组。
The conditions of the batteries of samples No. B05 to B08 are after 25 cycles ending in fully charged states.

样品编号 C01~C05 为第一次循环充放电周期充电至标称容量的 50%状态的电池。
The conditions of the cells of samples No. C01 to C05 are at first cycle at 50% of the design rated capacity.

样品编号 C06~C10 为第二十五次循环充放电周期充电至标称容量的 50%状态的电池。
The conditions of the cells of samples No. C06 to C10 are at 25 cycles at 50% of the design rated capacity.

样品编号 B09~B12 为第一次循环充放电周期完全充电状态的电池组。
The conditions of the batteries of samples No. B09 to B12 are at first cycle, in fully charged states.

样品编号 B13~B16 为二十五次循环充放电周期后完全充电状态的电池组。
The conditions of the batteries of samples No. B13 to B16 are after 25 cycles ending in fully charged states.

样品编号 C11~C20 为第一次循环充放电周期完全放电状态的电池。
The conditions of the cells of samples No. C11 to C20 are at first cycle, in fully discharged states.

样品编号 C21~ C30 为二十五次循环充放电周期后完全放电状态的电池。
The conditions of the cells of samples No. C21 to C30 are after 25 cycles ending in fully discharged states.

测试步骤：

Test Procedure:

1. 每一种类型的电池均应进行 T.1 至 T.8 项试验。电池必须按顺序在相同的一组电池上进行试验 T.1 至 T.5。试验 T.6 和 T.8 应使用未另外试验过的电池。试验 T.7 可以使用先前在试验 T.1 至 T.5 中使用过的未损坏电池进行，以便测试进行在循环过的电池上。

Each battery type is subjected to tests T.1 to T.8. Tests T.1 to T.5 are conducted in sequence on the same battery. Tests 6 and 8 are conducted using not otherwise tested batteries. Test T.7 may be conducted using undamaged batteries previously used in Tests T.1 to T.5 for purposes of testing on cycled batteries.

2. 为了量化质量损失，可用以下公式计算：质量损失(%)=(M_1-M_2)/M_1×100

In order to quantify the mass loss, the following procedure is provided:

Mass loss(%)=(M_1-M_2)/M_1×100

式中：M_1 是试验前的质量，M_2 是试验后的质量。如果质量损失不超过下表所列的数值，应视为“无质量损失”。

Where M_1 is the mass before the test and M_2 is the mass after the test. When mass loss does not exceed the values in Table below, it is considered as "no mass loss".

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

3. 在测试 T.1 至 T.4 中，电池须满足无渗漏、无泄气、无解体、无破裂和无起火，并且每个试验电池在试验后的开路电压不小于其在进行这一试验前电压的 90%。

In test T.1 to T.4, batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test battery after testing is not less than 90% of its voltage immediately prior to this procedure.

4. 备注 Remark：

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

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict
38.3.4.1	**Test T.1: 高度模拟/Altitude simulation**		**P**
	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℃）下存放至少 6 小时。/Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature (20±5°C)		P
	电池和电池组无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池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%。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。/Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.	无渗漏、无排气、无解体、无破裂和无起火现象。 No leakage, no venting, no disassembly, no rupture and no fire. 测试数据见表 1。 The data see table 1.	P
38.3.4.2	**Test T.2: 温度试验/Thermal test**		**P**
	试验电池和电池组应先在试验温度等于 72℃±2℃的条件下存放至少 6 小时，接着再在试验温度等于-40℃±2℃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，共完成 10 次，接着将所有试验电池和电池组在环境温度（20℃±5℃）下存放 24 小时。/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 10 times, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20 ±5°C).		P
	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。/For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.		N/A
	电池和电池组无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池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%。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。/Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.	无渗漏、无排气、无解体、无破裂和无起火现象。 No leakage, no venting, no disassembly, no rupture and no fire. 测试数据见表 2。 The data see table 2.	P

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict
38.3.4.3	**Test T.3: 振动/Vibration**		**P**
	电池和电池组紧固于振动机平台，但不得造成电池变形，并能准确可靠地传播振动。振动应是正弦波形，对数扫描频率在 7Hz 和 200Hz 之间，再回到 7Hz，跨度为 15 分钟。这一振动过程须对三个互相垂直的电池安装方位的每一方向重复进行 12 次，总共为时 3 小时。其中一个振动方向必须与端面垂直。/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.		P
	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）有所不同。 /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).		P
	对电池和小型电池组：从 7Hz 开始，保持 $1g_n$ 的最大加速度，直到频率达到 18Hz。然后将振幅保持在 0.8 毫米（总偏移 1.6 毫米），并增加频率直到最大加速度达到 $8g_n$（频率约为 50Hz）。将最大加速度保持在 $8g_n$ 直到频率增加到 200 Hz。 /For cells and small batteries: from 7 Hz a peak acceleration of $1g_n$ 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 $8g_n$ occurs (approximately 50 Hz). A peak acceleration of $8g_n$ is then maintained until the frequency is increased to 200 Hz.		P
	对大型电池组：从 7Hz 开始，保持 $1g_n$ 的最大加速度，直到频率达到 18Hz。然后将振幅保持在 0.8 毫米（总偏移 1.6 毫米），并增加频率直到最大加速度达到 $2g_n$（频率约为 25Hz）。将最大加速度保持在 $2g_n$ 直到频率增加到 200Hz。 /For large batteries: from 7 Hz to a peak acceleration of $1g_n$ 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 $2g_n$ occurs (approximately 25 Hz). A peak acceleration of $2g_n$ is then maintained until the frequency is increased to 200 Hz.		N/A

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict
	电池和电池组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池和电池组。/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.	无渗漏、无排气、无解体、无破裂和无起火现象。 No leakage, no venting, no disassembly, no rupture and no fire. 测试数据见表 3。 The data see table 3.	P
38.3.4.4	**Test T.4: 冲击/Shock**		**P**
	试验电池和电池组用坚硬支架紧固在试验装置上，支架支撑着每个试验电池组的所有安装面。/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.		P
	每个电池必须经受最大加速度 150g_n 和脉冲持续时间 6 毫秒的半正弦波冲击。针对大型电池必须经受最大加速度 50g_n 和脉冲持续时间 11 毫秒的半正弦波冲击。/Each cell shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50 gn and pulse duration of 11 milliseconds		N/A
	每个电池组应根据电池组的质量而受到峰值加速度的半正弦冲击。对于小型电池组的脉冲持续时间应为 6 毫秒，对于大型电池组的脉冲持续时间应为 11 毫秒。下面的公式用于计算适当的最小峰值加速度。/Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of battery. The pulse duration shall be 6 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations. **Battery** / **Minimum peak acceleration** / **Pulse duration** Small batteries: 150 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller; 6 ms Large batteries: 50 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller; 11 ms * Mass is expressed in kilograms.		P

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict
	每个电池或电池组须在三个互相垂直的安装方位的正方向经受三次冲击，接着在反方向经受三次冲击，总共经受 18 次冲击。/ Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.		P
	电池和电池组无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池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%。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。/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.	无渗漏、无排气、无解体、无破裂和无起火现象。 No leakage, no venting, no disassembly, no rupture and no fire. / 测试数据见表 4。 The data see table 4.	P
38.3.4.5	**Test T.5: 外部短路/External short circuit**		**P**
	待测试的电池或电池组应加热一段时间，以使其外表面温度达到均匀稳定的 57±4℃的温度。加热时间取决于电池或电池组的大小和设计，并应进行评估和记录。如果这种评估是不可行的，对于小型电池和小型电池组至少在 57±4℃的环境下存放 6 小时，对于大型电池和大型电池组至少在 57±4℃的环境下存放 12 小时。然后，电池或电池组在 57±4℃的环境中，应接受一个外部总电阻小于 0.1 欧姆的短路条件。/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.		P
	这一短路条件应在电池或电池组外壳温度回到 57±4℃后继续短路 1 小时，或对于大型电池组其外壳温度已下降了一半的最大温升，并保持低于该值。短路和冷却过程至少在环境温度中进行。/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.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	电池和电池组外壳温度不超过 170℃，并且在试验过程中及试验后 6 小时内无解体，无破裂，无起火。/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.	在测试过程中以及之后 6 个小时内，外表温度不超 170°C，并且无解体，无破裂，无起火现象发生。 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. 测试数据见表 5。 The data see table 5.	P
38.3.4.6	**Test T.6: 撞击/挤压/Impact / Crush**		**P**
	撞击(适合于直径大于或等于 18mm 的圆柱形电芯)/Test procedure – Impact (applicable to cylindrical cells greater than or equal to 18 mm in diameter)	直径等于 18mm 的圆柱形电芯/Cylindrical cells equal to 18 mm in diameter	P
	试样电池或元件电池放在平坦光滑的表面上，一根 316 型不锈钢棒横放在试样中心，钢棒直径 15.8 毫米 ± 0.1 毫米，长度至少 6 厘米，或电池最长端的尺度，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与水平支撑表面呈 90 度落下。/The sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm±0.1mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, 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.		P
	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 ±0.1 毫米弯曲表面的纵轴垂直。每一试样只经受一次撞击。/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.		P
	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）/Test Procedure – Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18 mm in diameter).	直径等于 18mm 的圆柱形电芯/Cylindrical cells equal to 18 mm in diameter	N/A

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict
	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 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.		N/A
	(a) 施加力达到 13kN±0.78kN The applied force reaches 13kN±0.78kN		N/A
	(b) 样品的电压下降至少 100mV The voltage of the cell drops by at least 100 mV		N/A
	(c) 电池变形达原始厚度的 50%以 上。 The cell is deformed by 50% or more of its original thickness.		N/A
	棱柱形或袋装电池应从最宽的一面施压。纽扣/硬币形电池应从其平坦表面施压。圆柱形电池应从与纵轴垂直的方向施压。/A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis.		N/A
	每个试样电池或元件电池只做一次挤压试验。试样应继续观察 6 小时。试验应使用之前未做过其他试验的电池或元件电池进行。/Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6 h. The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.		N/A
	电芯满足要求：在测试过程中以及之后 6 个小时内，外表温度不超过 170°C，并且无解体和无起火现象发生。/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.	无解体，无起火现象发生。 No disassembly and no fire. 测试数据见表 6。 The data see table 6.	P
38.3.4.7	**Test T.7: 过充电/Overcharge**		**P**
	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：/The charge current shall be twice the manufacturer's recommended maximum continuous charge current. Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours. The minimum voltage of the test shall be as follows:		P

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict
	(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组最大充电电压的两倍或 22 伏两者中的较小者/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.		N/A
	(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。/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.	测试电压为 35.28V, 电流为 10A. The voltage of the test is 35.28V, and the current is 10A.	P
	充电电池组在试验过程中和试验后 7 天内无解体，无起火。/Rechargeable batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.	无解体，无起火现象发生。 No disassembly and no fire. 测试数据见表 7。 The data see table 7.	P
38.3.4.8	**Test T.8: 强制放电/Forced discharge**		**P**
	每个电池应在环境温度下与 12 伏直流电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。/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.		P
	将适当大小和额定值的电阻负荷与试验电池串联，计算得出给定的放电电流。对每个电池进行强制放电，放电时间（小时）应等于其额定容量除以初始试验电流（安培）。/The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).		P
	原电池或充电电池在试验过程中和试验后 7 天内无解体，无起火/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.	无解体，无起火现象发生。 No disassembly and no fire. 测试数据见表 8。 The data see table 8.	P

表 1 Table 1	高度模拟 Altitude simulation						
样品编号 Sample No	测试前 Before		测试后 After		质量损失 Mass loss (%)	电压损失 Voltage loss (%)	测试结果 Test result
	电池质量 m_1 (g)	开路电压 V_1 (V)	电池质量 m_2 (g)	开路电压 V_2 (V)			
B01	1915.94	29.26	1915.87	29.22	0.004	0.14	P
B02	1914.97	29.26	1914.92	29.23	0.003	0.10	P
B03	1915.62	29.26	1915.57	29.22	0.003	0.14	P
B04	1916.55	29.25	1916.50	29.22	0.003	0.10	P
B05	1916.42	29.27	1916.35	29.24	0.004	0.10	P
B06	1915.28	29.26	1915.21	29.23	0.004	0.10	P
B07	1915.68	29.25	1915.62	29.22	0.003	0.10	P
B08	1916.24	29.27	1916.18	29.23	0.003	0.14	P

表 2 Table 2	温度试验 Thermal test						
样品编号 Sample No	测试前 Before		测试后 After		质量损失 Mass loss (%)	电压损失 Voltage loss (%)	测试结果 Test result
	电池质量 m_1 (g)	开路电压 V_1 (V)	电池质量 m_2 (g)	开路电压 V_2 (V)			
B01	1915.87	29.22	1915.54	28.96	0.017	0.89	P
B02	1914.92	29.23	1914.61	28.96	0.016	0.92	P
B03	1915.57	29.22	1915.12	28.97	0.023	0.86	P
B04	1916.50	29.22	1916.21	28.94	0.015	0.96	P
B05	1916.35	29.24	1916.04	28.97	0.016	0.92	P
B06	1915.21	29.23	1914.81	28.96	0.021	0.92	P
B07	1915.62	29.22	1915.13	28.97	0.026	0.86	P
B08	1916.18	29.23	1915.79	28.98	0.020	0.86	P

表 3 Table 3	振动 Vibration						
样品编号 Sample No	测试前 Before		测试后 After		质量损失 Mass loss (%)	电压损失 Voltage loss (%)	测试结果 Test result
	电池质量 m_1 (g)	开路电压 V_1 (V)	电池质量 m_2 (g)	开路电压 V_2 (V)			
B01	1915.54	28.96	1915.52	28.95	0.001	0.03	P
B02	1914.61	28.96	1914.61	28.96	0.000	0.00	P
B03	1915.12	28.97	1915.12	28.97	0.000	0.00	P
B04	1916.21	28.94	1916.20	28.94	0.001	0.00	P
B05	1916.04	28.97	1916.04	28.97	0.000	0.00	P
B06	1914.81	28.96	1914.81	28.95	0.000	0.03	P
B07	1915.13	28.97	1915.12	28.97	0.001	0.00	P
B08	1915.79	28.98	1915.79	28.98	0.000	0.00	P

表 4 Table 4	冲击 Shock						
样品编号 Sample No	测试前 Before		测试后 After		质量损失 Mass loss (%)	电压损失 Voltage loss (%)	测试结果 Test result
	电池质量 m_1 (g)	开路电压 V_1 (V)	电池质量 m_2 (g)	开路电压 V_2 (V)			
B01	1915.52	28.95	1915.51	28.95	0.001	0.00	P
B02	1914.61	28.96	1914.61	28.95	0.000	0.03	P
B03	1915.12	28.97	1915.12	28.96	0.000	0.03	P
B04	1916.20	28.94	1916.19	28.94	0.001	0.00	P
B05	1916.04	28.97	1916.04	28.97	0.000	0.00	P
B06	1914.81	28.95	1914.81	28.95	0.000	0.00	P
B07	1915.12	28.97	1915.11	28.97	0.001	0.00	P
B08	1915.79	28.98	1915.79	28.98	0.000	0.00	P

表5 Table 5	外部短路 External short circuit							
样品编号 Sample No	B01	B02	B03	B04	B05	B06	B07	B08
温度 (°C) Temp (°C)	58.4	57.9	58.2	58.1	58.1	58.3	57.8	57.9

表 6 Table 6	撞击 Impact									
样品编号 Sample No	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10
试验前电压(V) OCV prior to test	3.68	3.69	3.70	3.70	3.69	3.68	3.70	3.70	3.68	3.69
温度 (°C) Temp (°C)	111.2	115.4	118.7	113.1	114.5	109.6	107.8	109.6	108.5	110.2

表 7 Table 7	电池过充试验 Overcharge Test of batteries							
样品编号 Sample No	B09	B10	B11	B12	B13	B14	B15	B16
试验前电压(V) OCV prior to test	29.25	29.26	29.25	29.25	29.26	29.21	29.25	29.26

表 8 Table 8	强制放电 Forced discharge									
样品编号 Sample No	C11	C12	C13	C14	C15	C16	C17	C18	00377	C20
试验前电压(V) OCV prior to test	3.05	3.04	3.04	3.07	3.04	3.05	3.04	3.06	3.05	3.05
样品编号 Sample No	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30
试验前电压(V) OCV prior to test	3.04	3.06	3.04	3.07	3.05	3.07	3.05	3.04	3.03	3.06

样品图片
Sample photos

Fig. 1 – Front view of Battery

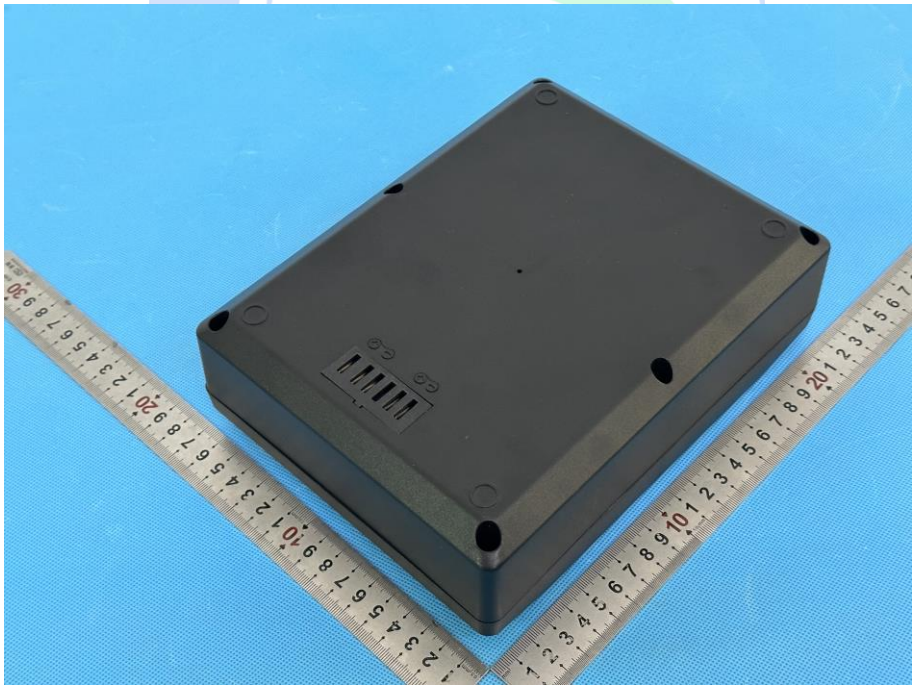

Fig.2 – Back view of Battery

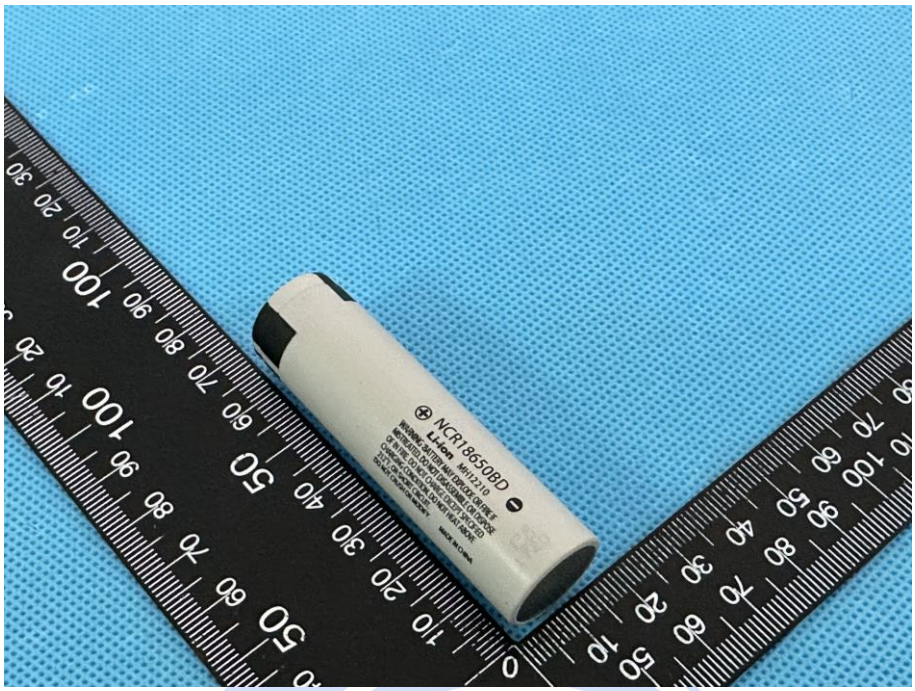

Fig. 3 – Front view of Cell

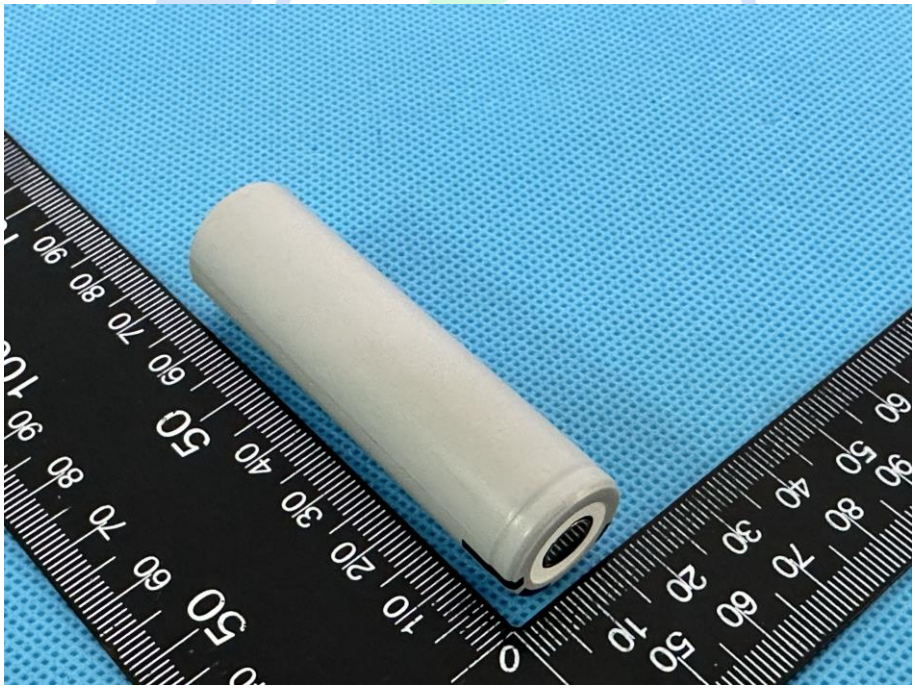

Fig.4 – Back view of Cell

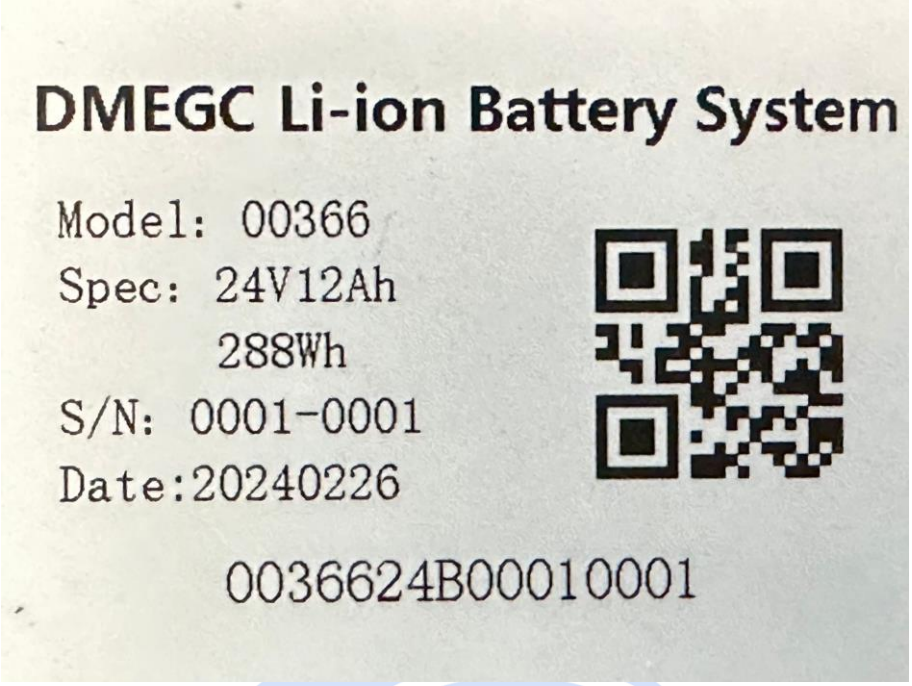

Fig.5 – Label view of Battery

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--End of test report--