

Test Report issued under the responsibility of:



<b>TEST REPORT</b>		
<b>UL 1642:2020</b>		
<b>UL Standard for Safety Lithium Batteries</b>		
<b>Report Number.....:</b>	TCTTJ20210114161ZB-BR03	
<b>Date of issue.....:</b>	March 18, 2021	
<b>Total number of pages.....:</b>	16 pages	
<b>Applicant's name.....:</b>	SHEN ZHEN YONG DA JIA TECHNOLOGY CO., LTD.	
<b>Address.....:</b>	3rd Floor, No.24 Youganyuan Road, Anliang Village, Henggang Town, Longgang District, Shenzhen, Guangdong, China	
<b>Test specification:</b>		
<b>Standard..... :</b>	UL 1642:2020	
<b>Test procedure.....:</b>	N/A	
<b>Non-standard test method.....:</b>	N/A	
<b>Test item description.....:</b>	Lithium-ion Cell	
<b>Trade Mark..... :</b>	N/A	
<b>Manufacturer..... :</b>	SHEN ZHEN YONG DA JIA TECHNOLOGY CO., LTD.	
<b>Model/Type reference.....:</b>	103450	
<b>Ratings..... :</b>	3.7V, 2000mAh, 7.4Wh	
<b>Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):</b>		
<input checked="" type="checkbox"/>	<b>Testing Laboratory:</b>	Shenzhen Tiansu Calibration and Testing Co.,Ltd.
	<b>Testing location/ address.....:</b>	Building 1/4, NO.2, Jinlong Road, Longgang District, Shenzhen, Guangdong, China
	<b>Tested by (name, function, signature).....:</b>	Wang wentao Test Engineer <i>Wang Wen tao</i>
	<b>Approved by (name, function, signature)... :</b>	Nick wang Technology supervisor <i>Nick Wang</i>
<b>List of Attachments (including a total number of pages in each attachment):</b>		
-main report:15 pages		
Appendix 1 (1 page): Product Photos		

<b>Summary of testing:</b>	
<b>Tests performed (name of test and test clause):</b> cl.10 Short-Circuit Test; cl.11 Abnormal Charging Test; cl.13 CrushTest; cl.14 ImpactTest; cl.15 Shock Test; cl.16 Vibration Test; cl.17 Heating Test; cl.18 Temperature Cycling Test; cl.19 Low Pressure (Altitude Simulation) Test; cl.20 Projectile Test.	<b>Testing location:</b> Shenzhen Tiansu Calibration and Testing Co.,Ltd. Building 1/4, NO.2, Jinlong Road, Longgang District, Shenzhen, Guangdong, China
<b>General disclaimer:</b> The test results presented in this report relate only to the object tested.	
Copy of marking plate (representative): <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <p> <b>Lithium-ion Cell 103450</b>  <b>3.7V, 2000mAh, 7.4Wh 1INP10/35/51</b>  <b>SHEN ZHEN YONG DA JIA TECHNOLOGY CO., LTD.</b>  <b>Red wire “+” Black wire “-”</b>  <b>Made in China YYMMDD</b>  <b>Caution: Risk of Fire and Burns</b>  <b>Follow Manufacturer’s Instructions</b> </p> </div>	
Remark: YYMMDD represents the date of manufacture.	

<b>Test item particulars:</b>	
Information about the product needed to establish a correct test program, such as product mobility, type of power connections and similar.	To be defined in final product
Recommend charging method declared by the manufacturer.....	400mA constant current charge to 4.2V, then constant voltage 4.2V charge till charge current declines to 40mA.
Nominal voltage.....	3.7V
Rated capacity.....	2000mAh
Maximum charge voltage.....	4.20V
Specified final voltage .....	2.75V
<b>Possible test case verdicts:</b>	
- test case does not apply to the test object.....	: N/A
- test object does meet the requirement.....	: P (Pass)
- test object does not meet the requirement.....	: F (Fail)
<b>Testing..... :</b>	
<b>Date of receipt of test item.....</b>	: March 05, 2021
<b>Date (s) of performance of tests.....</b>	: March 05, 2021 to March 18, 2021
<b>General remarks:</b>	
<p>"(See Enclosure #)" refers to additional information appended to the report.          "(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
<b>Name and address of factory (ies)..... :</b>	
SHEN ZHEN YONG DA JIA TECHNOLOGY CO., LTD. 3rd Floor, No.24 Youganyuan Road, Anliang Village, Henggang Town, Longgang District, Shenzhen, Guangdong, China	
<b>General product information and other remarks:</b>	
Model no.	103450
Recommend charging voltage	4.2V
Recommend charging current	400mA
Max. charging current	2000mA
Recommend discharging voltage	2.75V
Recommend discharging current	400mA
Max. discharging current	2000mA
Operation Temperature (Charge)	0~45°C

UL 1642			
Clause	Requirement – Test	Result - Remark	Verdict
<b>PERFORMANCE</b>			
<b>5</b>	<b>General</b>		P
<b>5.1</b>	<b>Technician-replaceable Batteries</b>		P
5.1.1	Technician-replaceable lithium cells or batteries are to be tested as described in Sections 10-20. Section 12, Forced-Discharge Test, is applicable only to cells intended to be used in series-connected multicell applications such as battery packs. For multicell installations, also see 5.3.1.		P
5.1.2	When a fire or explosion occurs as a result of the Crush Test, Section 13, or the Impact Test, Section 14, or the cell or battery ruptures to the extent that the aluminum test cage is penetrated during the Projectile Test, Section 20; the use of the technician replaceable cell or battery shall be restricted to applications in which it is not exposed to, or is protected from, any conditions shown to cause a fire or explosion.	No fire or explosion occurs	P
5.1.3	Cells and batteries subjected to the Shock Test, Section 15, Vibration Test, Section 16, Temperature Cycling Test, Section 18, and Low Pressure (Altitude Simulation) Test, Section 19, shall also not leak or vent. For these tests, unacceptable leakage is determined to have occurred when the resulting mass loss exceeds the values shown in Table 5.1, Venting and leakage mass loss criteria.	No leak or vent	P
<b>5.2</b>	<b>User-replaceable Batteries</b>		N/A
5.2.1	User-replaceable lithium cells or batteries are to be tested as described in Sections 10-20. Section 12, Forced Discharge Test, is applicable only to cells intended to be used in multicell applications such as battery packs. In addition to complying with the requirements for a technician replaceable cell or battery as specified in 5.1.1, a user-replaceable cell or battery shall not explode or ignite when subjected to the Crush Test, Section 13, or the Impact Test, Section 14.	Technician-replaceable cell	N/A
5.2.2	Sets of five specimens each are to be used for the Projectile Test, Section 20.3; see Table 6.3. When only one specimen from a set of five does not comply with the requirements, another set of five specimens is to be tested. All specimens from this second set shall comply with the requirements.	Technician-replaceable cell	N/A
<b>5.3</b>	<b>Multi-cell Installation</b>		
5.3.1	A technician-replaceable or user-replaceable cell intended for use in multicell installations or battery packs shall also be tested as described in 10.3 and Section 12. No fire or explosion shall occur as a result of these tests. In addition, batteries subjected to the test described in 10.3 shall meet the requirements as described in 5.1.1 and 5.2.1 for a cell or battery subjected to the Short-Circuit Test, Section 10.	Single cell.	N/A
<b>6</b>	<b>Samples</b>		P
6.1	Fully charged primary cells or batteries and primary cells or batteries that have been conditioned by partial or complete discharge, or both, are to be used for the tests described in Sections 10-20. The number of samples to be used in each test for a primary technician-replaceable cell or battery is shown in Table 6.1. The number of samples to be used in each test for a primary user-replaceable cell or battery is shown in Table 6.3. When a group of cells or batteries of different sizes, but similar chemistries is involved, selected sizes representative of the range are to be tested.	The samples are secondary cells.	N/A

UL 1642			
Clause	Requirement – Test	Result - Remark	Verdict
6.2	Fully charged secondary cells or batteries and secondary cells or batteries that have been conditioned by charge-discharge cycling are to be used for the tests described in Sections 10 — 20. The number of samples to be used in each test for a secondary technician-replaceable cell or battery is shown in Table 6.2. The number of samples to be used in each test for a secondary user-replaceable cell or battery is shown in Table 6.4. When a group of cells or batteries of different sizes, and similar chemistries is involved, selected sizes representative of the range are to be tested.	The samples are secondary technician-replaceable cells. Prepared as required.	P
6.3	Prior to conducting the testing in Section 17, the Lithium-ion Polymer Rechargeable Cell samples shall be pre-conditioned as outlined in 6.4 and 6.5.	Prepared as required.	P
6.4	For the heating test of Section 17, two sets of five Lithium-ion Polymer Rechargeable Cell samples are to be fully discharged (i.e. to the manufacturer's specified end point voltage). The samples are then placed in a test chamber and conditioned for 1 to 4 h (5 samples at the upper temperature limit and 5 samples at the lower temperature limit of the operating region) as outlined in Table 6.3.	Prepared as required.	P
6.5	While still in the test chamber set at the temperature limits, the samples are charged (5 samples at the upper temperature limit and 5 samples at lower temperature limit) at the specified maximum charging current and upper limit charging voltage per Table 6.3, using a constant voltage charging method. Charging is continued until the charge current is reduced to the specified end of charge conditions (i.e. 0.05 times the charge current).	Prepared as required.	P
<b>7</b>	<b>Conditioning of Samples</b>		P
<b>7.1</b>	<b>Discharge</b>		N/A
7.1.1	Primary batteries are to be completely discharged by connecting their terminals through resistors that provide the desired level of discharge within 60 days. Completely discharged is considered to be the state in which the closed-circuit voltage has been reduced to less than 0.2 volts and the short-circuit current to less than 1.0 milliamperes. Batteries are to be discharged at room temperature. Cells with a liquid cathode such as thionyl chloride or sulfur dioxide, shall also be conditioned by one-half discharge	The samples are secondary cells.	N/A
7.1.2	For solid electrolyte and other types of primary lithium batteries that cannot be discharged within 60 days because of the small currents they inherently produce, longer discharge times plus discharge at higher temperatures may be used to obtain the desired level of discharge. The manufacturer's recommended discharge procedures are to be followed so as to obtain the required discharge level in the minimum time.	The samples are secondary cells.	N/A
<b>7.2</b>	<b>Charge-discharge cycling</b>		P
7.2.1	Secondary cells are to be conditioned at 25°C (77°F). Cells are continuously cycled as per the manufacturer's specifications. The specification shall be such that the full rated capacity of the cell is utilized and the number of cycles accumulated shall be at least equal to 25 percent of the advertised cycle life of the cell or cycled continuously for 90 days, whichever is shorter. Cycling is to be done either individually or in groups. Cells are to be recharged prior to testing as indicated in Table 6.2 and Table 6.4.	The samples are cycled at manufacturer's factory before they were sent for test.	P
<b>8</b>	<b>Important test considerations</b>		P

UL 1642			
Clause	Requirement – Test	Result - Remark	Verdict
8.1	Some lithium batteries are capable of exploding when the tests described in Sections 10-20 are conducted. It is important that personnel be protected from the flying fragments, explosive force, sudden release of heat, and noise that results from such explosions. The test area is to be well ventilated to protect personnel from possible harmful fumes or gases.	Prepared the tests as required.	P
8.2	As an additional precaution, the temperatures on the surface of the battery casings shall be monitored during the tests described in Sections 10, 12, 13, and 14. All personnel involved in the testing of lithium batteries are to be instructed never to approach a lithium battery while the surface temperature exceeds 90°C (194°F).	Prepared the tests as required.	P
8.3	For protection, the Projectile Test, Section 20 is to be conducted in a room separate from the observer.	Prepared the tests as required.	P
<b>9</b>	<b>Temperature measurements</b>		P
9.1	Temperatures are to be measured by thermocouples consisting of wires not larger than 24 AWG (0.21 mm <sup>2</sup> ) and not smaller than 30 AWG (0.05 mm <sup>2</sup> ) and a potentiometer-type instrument.	Prepared the tests as required.	P
9.2	The temperature measurements on the batteries are to be made with the measuring junction of the thermocouple held tightly against the metal casing of the battery.	Prepared the tests as required.	P
<b>TESTS FOR TECHNICIAN-REPLACEABLE AND USER-REPLACEABLE BATTERIES</b>			
<b>ELECTRICAL TESTS</b>			
<b>10</b>	<b>Short-Circuit Test</b>		P
10.1	Each test sample battery, in turn, is to be short-circuited by connecting the positive and negative terminals of the battery with a circuit load having a maximum resistance load of 0.1 ohm. The battery is to discharge until a fire or explosion is obtained, or until it has reached a completely discharged state of less than 0.1 volts and the battery case temperature has returned to ±10°C (±18°F) of ambient temperature.	Tested as required. See table 10	P
10.2	Tests are to be conducted at 20 ±5°C (68 ±9°F) and at 55 ±5°C (131 ±9°F). The batteries are to reach equilibrium at 20 ±5°C or 55 ±5°C, as applicable, before the terminals are connected.	Tested as required.	P
10.3	A battery is to be tested individually unless the manufacturer indicates that it is intended for use in series or parallel. For series or parallel use, additional tests on five sets of batteries are to be conducted using the maximum number of batteries to be covered for each configuration.	Tested as required.	P
10.4	When an overcurrent or thermal protective device that has been investigated for the purpose actuates during the test, the test shall be repeated with the battery supply connected to the maximum load that does not cause the protective device to open. A protective device that has not been investigated for the purpose shall be short-circuited.	Only one single lithium-ion cell, no over-current or thermal protective device was integrated into the cell.	N/A
10.5	The samples shall not explode or catch fire. The temperature of the exterior cell or battery casing shall not exceed 150°C (302°F).	The test results meet the requirements.	P
<b>11</b>	<b>Abnormal Charging Test</b>		P
11.1	Primary cells or batteries shall comply with 11.2— 11.7.	Secondary cell	N/A
11.2	Cells or batteries conditioned in accordance with Tables 6.1 or 6.3, as applicable, are to be used for this test. The batteries are to be tested in an ambient temperature of 20 ±5°C (68 ±9°F).		N/A

UL 1642			
Clause	Requirement – Test	Result - Remark	Verdict
11.3	<p>Each test sample battery is to be subjected to a charging current of three times the current I, specified by the manufacturer by connecting it in opposition to a dc-power supply. The specified charging current is to be obtained by connecting a resistor of the specified size and rating in series with the battery. The test charging time is to be calculated using the formula:</p> $t_c = \frac{2.5C}{3(I_c)}$ <p><i>t<sub>c</sub> is the charging time in hour</i>  <i>C is the capacity of the cell/batteiy in ampere-hours, and</i>  <i>I<sub>c</sub> is the maximum charging current, in amperes, specified by the manufacturer.</i>            The minimum charging time is to be 7 hours.</p>		N/A
11.4	<p>When a non-resettable overcurrent or thermal protective device that has been investigated for the purpose operates during the test, the test is to be repeated at a charge current below the level that the protective device operates. When a resettable protective device operates during the test, the protector is allowed to reset to a total of 10 cycles; or until the appropriate charging time has been completed, but not less than 7 hours. A protective device that has not been investigated for the purpose is to be short-circuited. See 2.3.2.</p>		N/A
11.5	The samples shall not explode or catch fire.		N/A
11.6	Secondary cells or batteries shall comply with 11.7— 11.10.	See table 11, tested as required	P
11.7	Cells or batteries conditioned in accordance with Tables 6.2 or 6.4, as applicable, are to be used for this test. The batteries are to be tested in an ambient temperature of 20 ±5°C (68 ±9°F).	Tested as required.	P
11.8	Each test sample battery is to be discharged at a constant current of 0.2c/lhour, to a manufacturer specified discharge endpoint voltage. The cell or battery is then to be charged with a constant maximum specified output voltage and a current limit of three times the maximum charging current, I, specified by the manufacturer. Charging duration is to be 7 hours or the time required to reach the manufacturer's specified end-of-charge condition, whichever is greater.	Tested as required.	P
11.9	<p>The cell/battery is to be tested without the assistance of overcurrent or thermal protective devices, unless such protective devices have been investigated for the purpose. When a non-resettable overcurrent or thermal protective device operates during the test, the test shall be repeated at an overcharging current below the level that the protection device operates. When a resettable protective device operates during the test, the protector is to be allowed to reset to a total of 10 cycles; or until the appropriate charging time has been completed, but not less than 7 hours. A protective device that has not been investigated for the purpose is to be short-circuited. See 2.3.2.</p>	The samples are to be tested without any assistance of over-current or thermal protective devices.	N/A
11.10	The samples shall not explode or catch fire.	No explosion or catch fire during and after the test	P
<b>12</b>	<b>Forced-Discharged Test</b>		N/A
12.1	This test is intended for cells that are to be used in series-connected, multicell applications, such as battery packs.	One single cell	N/A

UL 1642			
Clause	Requirement – Test	Result - Remark	Verdict
12.2	A completely discharged cell is to be force- discharged by connecting it in series with fully charged cells of the same kind. The number of fully charged cells to be connected in series with the discharged cell is to equal the maximum number less one of the cells to be covered for series use. Five cells are to be completely discharged, at room temperature.		N/A
12.3	Once the completely discharged cell is connected in series with the specified number of fully charged cells the resultant battery pack is to be short circuited.		N/A
12.4	The positive and negative terminals of the sample are to be connected with a copper wire with a maximum resistance load of 0.1 ohm. The sample is to discharge until a fire or explosion is obtained, or until it has reached a completely discharged state of less than 0.2 volts and the battery case temperature has returned to $\pm 10^{\circ}\text{C}$ ( $18^{\circ}\text{F}$ ) of ambient temperature.		N/A
12.5	When an overcurrent or thermal protective device that has been investigated for the purpose operates during the test, the test shall be repeated with the battery supply connected to the maximum load that does not cause the protective device to open. A protective device that has not been investigated for the purpose shall be short-circuited.		N/A
12.6	The samples shall not explode or catch fire.		N/A
<b>MECHANICAL TESTS</b>			
<b>13</b>	<b>Crush Test</b>		<b>P</b>
13.1	A battery is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram or similar force mechanism. The flat surfaces are to be brought in contact with the cells and the crushing is to be continued until an applied force of $13 \pm 1$ kN ( $3000 \pm 224$ lbs) is reached. Once the maximum force has been obtained it is to be released.	Tested as required. See table 13	P
13.2	A cylindrical, pouch or prismatic cell is to be crushed with its longitudinal axis parallel to the flat surfaces of the crushing apparatus. A prismatic cell is also to be rotated $90^{\circ}$ around its longitudinal axis so that both the wide and narrow sides will be subjected to the crushing force. Each sample is to be subjected to a crushing force in only one direction. Separate samples are to be used for each test. Exception: For Lithium ion systems, a cylindrical, pouch or prismatic cell is to be crushed with its longitudinal axis parallel to the flat surface of the crushing apparatus. Each sample is to be subjected to a crushing force in only one direction. Test only the wide side of pouch and prismatic cells.	Tested as required. The sample are cylindrical lithium-ion cells.	P
13.3	A coin or button battery is to be crushed with the flat surface of the battery parallel with the flat surfaces of the crushing apparatus.	Not a coin or button battery	P
13.4	The samples shall not explode or catch fire.	No explosion or catch fire during and after the test	P
<b>14</b>	<b>Impact Test</b>		<b>P</b>
14.1	A test sample battery is to be placed on a flat surface. A $15.8 \pm 0.1$ -mm ( $5/8 \pm 0.004$ -in) diameter bar is to be placed across the center of the sample. A $9.1 \pm 0.46$ -kg ( $20 \pm 1$ -lb) weight is to be dropped from a height of $610 \pm 25$ mm ( $24 \pm 1$ in) onto the sample.	Prepared the test as required. See table 14	P



UL 1642			
Clause	Requirement – Test	Result - Remark	Verdict
14.2	A cylindrical, pouch or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8-mm (5/8-in) diameter curved surface lying across the center of the test sample. A prismatic cell is also to be rotated 90° around its longitudinal axis so that both the wide and narrow sides are subjected to the impact. Each sample is to be subjected to only a single impact. Separate samples are to be used for each test. <i>Exception: For Lithium ion systems, a cylindrical, pouch or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8-mm (5/8-in) diameter curved surface lying across the center of the test sample. Each sample is to be subjected to only a single impact. Test only the wide side of pouch and prismatic cells.</i>	Tested as required. The samples are cylindrical lithium-ion cells.	P
14.3	A coin or button battery is to be impacted with the flat surface of the test sample parallel to the flat surface and the 15.8-mm (5/8-in) diameter curved surface lying across its center.	Not a coin or button battery	N/A
14.4	The samples shall not explode or catch fire.	No explosion or catch fire during and after the test	P
<b>15</b>	<b>Shock Test</b>		P
15.1	The cell is to be secured to the testing machine by means of a rigid mount which supports all mounting surfaces of the cell. Each cell shall be subjected to a total of three shocks of equal magnitude. The shocks are to be applied in each of three mutually perpendicular directions unless it has only two axes of symmetry in which case only two directions shall be tested. Each shock is to be applied in a direction normal to the face of the cell. For each shock the cell is to be accelerated in such a manner that during the initial 3 milliseconds the minimum average acceleration is 75 g (where g is the local acceleration due to gravity). The peak acceleration shall be between 125 and 175 g. Cells shall be tested at temperature of 20 ± 5°C (68 ± 9°F).	Prepared the test as required. See table 15	P
15.2	The samples shall not explode or catch fire. In addition, the sample shall not vent or leak as described in 5.1.1.	No explosion or catch fire, the sample not vent or leak	P
<b>16</b>	<b>Vibration Test</b>		P
16.1	A battery is to be subjected to simple harmonic motion with an amplitude of 0.8 mm (0.03 inch) [1.6 mm (0.06 inch) total maximum excursion].	Prepared the test as required. See table 16.	P
16.2	The frequency is to be varied at the rate of 1 hertz per minute between 10 and 55 hertz, and return in not less than 90 nor more than 100 minutes. The battery is to be tested in three mutually perpendicular directions. For a battery that has only two axes of symmetry, the battery is to be tested perpendicular to each axis.	Tested as required.	P
16.3	The samples shall not explode or catch fire. In addition the sample shall not vent or leak as described in 5.1.1.	The test results meet the requirements.	P
<b>ENVIRONMENTAL TESTS</b>			
<b>17</b>	<b>Heating Test</b>		P

UL 1642			
Clause	Requirement – Test	Result - Remark	Verdict
17.1	A battery is to be heated in a gravity convection or circulating air oven with an initial temperature of 20 ±5°C (68±9°F). The temperature of the oven is to be raised at a rate of 5 ±2°C (9±3.6°F) per minute to a temperature of 130 ±2°C (266±3.6°F) and remain for 10 min. The sample shall return to room temperature (20±5°C) and then be examined. For batteries specified for temperatures above 100°C (212°F), the conditioning temperature shall be increased from 130 ±2°C (266±3.6°F), to 30±2°C (86±3.6°F) above the manufacturers maximum specified temperature. For a battery of lithium metal chemistry, the conditioning temperature shall be increased to a maximum of 170 ±2°C (338±3.6°F).	Tested as required. Oven temperature: 130°C.	P
17.2	The samples shall not explode or catch fire.	The test results meet the requirements.	P
<b>18</b>	<b>Temperature Cycling Test</b>		
18.1	The batteries are to be placed in a test chamber and subjected to the following cycles: Raising the chamber-temperature to 70 ±3°C (158±5°F) within 30 minutes and maintaining this temperature for 4 hours. Reducing the chamber temperature to 20 ±3°C (68±5°F) within 30 minutes and maintaining this temperature for 2 hours.Reducing the chamber temperature to minus 40±3°C (minus 40 ±5°F) within 30 minutes and maintaining this temperature for 4 hours.Raising the chamber temperature to 20 ±3°C (68±5°F) within 30 minutes.Repeating the sequence for a further 9 cycles. After the 10th cycle, storing the batteries for a minimum of 24 hours, at a temperature of 20 ±5°C (68 ±9°F) prior to examination.	Tested as required. See table 18	P
18.2	The samples shall not explode or catch fire. In addition, the samples shall not vent or leak as described in 5.1.1.	The test results meet the requirements.	P
<b>19</b>	<b>Low Pressure (Altitude Simulation) Test</b>		
19.1	Sample batteries are to be stored for 6 hours at an absolute pressure of 11.6 kPa (1.68 psi) and a temperature of 20 ± 3°C (68 ± 5°F).	Tested as required. See table 19	P
19.2	The samples shall not explode or catch fire as a result of the Altitude Simulation Test. In addition, the samples shall not vent or leak as described in 5.1.1.	The test results meet the requirements.	P
<b>TESTS FOR USER-REPLACEABLE LITHIUM BATTERIES</b>			
<b>20</b>	<b>Projectile Test</b>		
20.1	When subjected to the test described in 20.2 - 20.5 no part of an exploding cell or battery shall penetrate the wire screen such that some or all of the cell or battery protrudes through the screen.	The test results meet the requirements.	P
20.2	Each test sample cell or battery is to be placed on a screen that covers a 102 mm (4 inch) diameter hole in the center of a platform table. The screen is to be constructed of steel wire mesh having 20 openings per inch (25.4 mm) and a wire diameter of 0.017 inch (0.43 mm).	Prepared the test as required.	P
20.3	The screen is to be mounted 38 mm (1-1/2 inch) above a burner. The fuel and air flow rates are to be set to provide a bright blue flame that causes the supporting screen to glow a bright red.	Prepared the test as required.	P
20.4	An eight-sided covered wire cage, 610 mm (2 feet) across and 305 mm (1 foot) high, made from metal screening is to be placed over the test sample. See Figure 20.1. The metal screening is to be constructed from 0.25 mm (0.010 inch) diameter aluminum wire with 16 — 18 wires per inch (25.4 mm) in each direction.	Tested as required.	P

UL 1642			
Clause	Requirement – Test	Result - Remark	Verdict
20.5	The sample is to be heated and shall remain on the screen until it explodes or the cell or battery has ignited and burned out. It is not required to secure the sample in place unless it is at risk of falling off the screen before the test is completed. When required, the sample shall be secured to the screen with a single wire tied around the sample.	Tested as required.	P

TABLE: Critical components information					
Object / part No.	Manufacturer / trademark	Type / model	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>
-Positive electrode	Anhui new materials Co., Ltd	KD-1M	LiNi <sub>0.5</sub> Co <sub>0.2</sub> Mn <sub>0.3</sub> O <sub>2</sub> , Aluminum foil. etc.	--	--
-Negative electrode	Jiangmen Keheng Industrial Co., Ltd	TE510	Graphite. Copper. Foil. etc.	--	--
-Separator	Shenzhen Haike power supply Co., Ltd	46*14um	PP, PE, 46mm*14um, shut down temp. 130°C	--	--
-Electrolyte	Dongguan Tianfeng Power Material Co., Ltd	TF-009D	LiPF <sub>6</sub> +DEC+EC+PC.etc	--	--

10	TABLE: Short-Circuit Test					P
Fully Charged Cell						
Ambient temperature.....:		24.3°C				
Sample No.	C1#	C2#	C3#	C4#	C5#	
T <sub>max</sub> (°C)	80.3	77.5	81.9	76.7	83.3	
Failure Mode	No	No	No	No	No	
Ambient temperature.....:		53.9°C				
Sample No.	C6#	C7#	C8#	C9#	C10#	
T <sub>max</sub> (°C)	79.2	87.5	83.4	78.8	85.5	
Failure Mode	No	No	No	No	No	
Cycled Cell						
Ambient temperature.....:		24.3°C				
Sample No.	C11#	C12#	C13#	C14#	C15#	
T <sub>max</sub> (°C)	77.1	82.6	84.9	80.9	78.1	
Failure Mode	No	No	No	No	No	
Ambient temperature.....:		53.9°C				
Sample No.	C16#	C17#	C18#	C19#	C20#	
T <sub>max</sub> (°C)	85.2	81.1	79.4	80.5	84.8	
Failure Mode	No	No	No	No	No	
Supplementary information: Tmax was recorded on the centre of the cell surface. No explode or catch fire.						
11	TABLE: Abnormal Charging Test					P
Ambient temperature.....:		23.5°C				
I <sub>d</sub>	0.4A		U <sub>e</sub>	2.75V		
I <sub>c</sub>	2A		U <sub>c</sub>	4.2V		
Fully Charged Cell						
Sample No.	C21#	C22#	C23#	C24#	C25#	
T <sub>max</sub> (°C)	33.1	29.9	35.8	33.8	31.1	
Failure Mode	No	No	No	No	No	
Cycled Cell						
Sample No.	C26#	C27#	C28#	C29#	C30#	
T <sub>max</sub> (°C)	30.8	32.5	35.4	29.8	32.6	
Failure Mode	No	No	No	No	No	
Supplementary information: Tmax was recorded on the centre of the cell surface; <b>Test current is 2A*3=6A.</b> No explode or catch fire.						
13	TABLE: Crush Test					P
Ambient temperature.....:		23.1°C				
Fully Charged Cell						
Sample No.	C31#	C32#	C33#	C34#	C35#	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Crush direction	Wide side	Wide side	Wide side	Wide side	Wide side	
Failure Mode	No	No	No	No	No	

Cycled Cell					
Sample No.	C36#	C37#	C38#	C39#	C40#
Catch fire	No	No	No	No	No
Explode	No	No	No	No	No
Crush direction	Wide side	Wide side	Wide side	Wide side	Wide side
Failure Mode	No	No	No	No	No
Supplementary information:no explosion or catch fire.					
<b>14</b>	<b>TABLE: Impact Test</b>				<b>P</b>
Ambient temperature.....:		22.9°C			
Fully Charged Cell					
Sample No.	C41#	C42#	C43#	C44#	C45#
Catch fire	No	No	No	No	No
Explode	No	No	No	No	No
Impact direction	Wide side	Wide side	Wide side	Wide side	Wide side
Failure Mode	No	No	No	No	No
Cycled Cell					
Sample No.	C46#	C47#	C48#	C49#	C50#
Catch fire	No	No	No	No	No
Explode	No	No	No	No	No
Impact direction	Wide side	Wide side	Wide side	Wide side	Wide side
Failure Mode	No	No	No	No	No
Supplementary information: no explosion or catch fire.					
<b>15</b>	<b>TABLE: Shock Test</b>				<b>P</b>
Ambient temperature.....:		23.5°C			
Fully Charged Cell					
Sample No.	C51#	C52#	C53#	C54#	C55#
Mass before test (g)	33.294	33.018	33.366	33.414	32.714
Mass after test (g)	33.289	33.014	33.362	33.408	32.708
Mass loss ratio (%)	0.02	0.01	0.01	0.02	0.02
Cycled Cell					
Sample No.	C56#	C57#	C58#	C59#	C60#
Mass before test (g)	33.155	32.975	33.596	33.063	33.231
Mass after test (g)	33.148	33.970	33.591	33.057	33.224
Mass loss ratio (%)	0.02	0.02	0.01	0.02	0.02
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%					
<b>16</b>	<b>TABLE: Vibration Test</b>				<b>P</b>
Ambient temperature.....:		24.1°C			
Fully Charged Cell					
Sample No.	C61#	C62#	C63#	C64#	C65#
Mass before test (g)	33.093	33.072	33.125	33.029	33.073
Mass after test (g)	33.087	33.065	33.122	33.025	33.066
Mass loss ratio (%)	0.02	0.02	0.01	0.01	0.02
Cycled Cell					
Sample No.	C66#	C67#	C68#	C69#	C70#

Mass before test (g)	33.048	33.394	32.972	32.988	33.333
Mass after test (g)	33.042	33.388	32.965	32.981	33.325
Mass loss ratio (%)	0.02	0.02	0.02	0.02	0.02
Supplementary information:no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%					
<b>18</b>	<b>TABLE: Temperature Cycling Test</b>				<b>P</b>
Ambient temperature.....:	23.8°C				
Fully Charged Cell					
Sample No.	C91#	C92#	C93#	C94#	C95#
Mass before test (g)	33.380	33.345	33.328	33.414	32.988
Mass after test (g)	33.062	33.331	33.314	33.402	32.972
Mass loss ratio (%)	0.05	0.04	0.04	0.04	0.05
Cycled Cell					
Sample No.	C96#	C97#	C98#	C99#	C100#
Mass before test (g)	33.221	33.108	33.367	33.063	33.094
Mass after test (g)	33.206	33.093	33.355	33.407	33.077
Mass loss ratio (%)	0.05	0.05	0.04	0.05	0.05
Supplementary information:no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%.					
<b>19</b>	<b>TABLE: Low Pressure (Altitude Simulation) Test</b>				<b>P</b>
Ambient temperature.....:	21.9°C				
Fully Charged Cell					
Sample No.	C101#	C102#	C103#	C104#	C105#
Mass before test (g)	33.209	33.122	33.058	33.342	33.107
Mass after test (g)	33.202	33.155	33.051	33.335	33.101
Mass loss ratio (%)	0.02	0.02	0.02	0.02	0.02
Cycled Cell					
Sample No.	C106#	C107#	C108#	C109#	C110#
Mass before test (g)	32.991	33.317	33.291	33.166	33.256
Mass after test (g)	32.987	33.309	33.283	33.158	33.249
Mass loss ratio (%)	0.01	0.02	0.02	0.02	0.02
Supplementary information:no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%					

Photo Documentation:

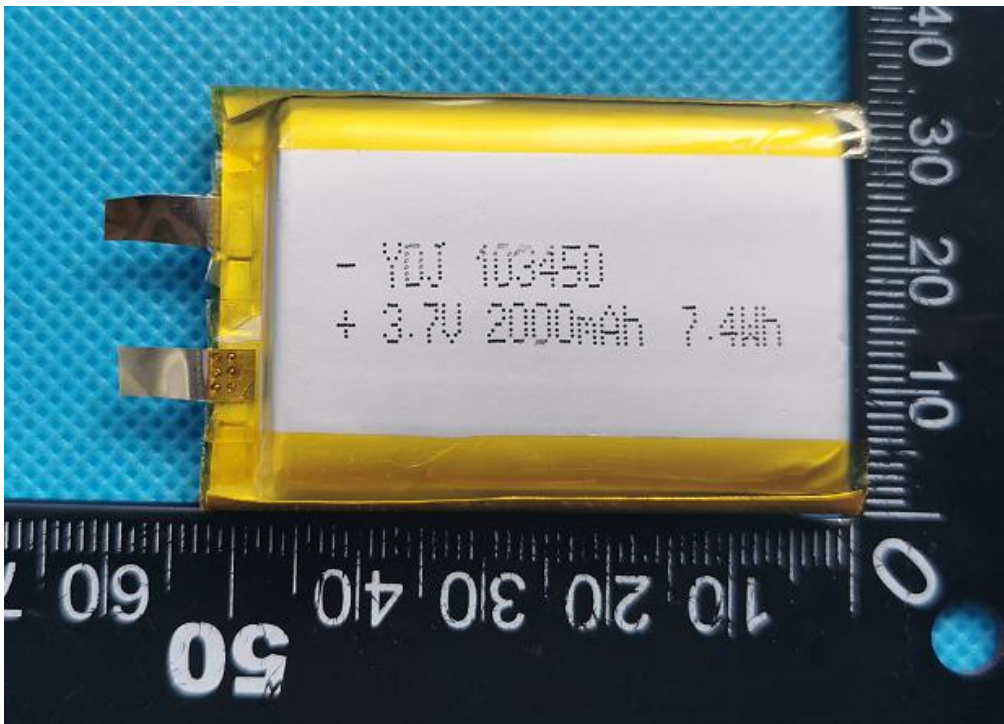


Figure 1 Front view of Cell

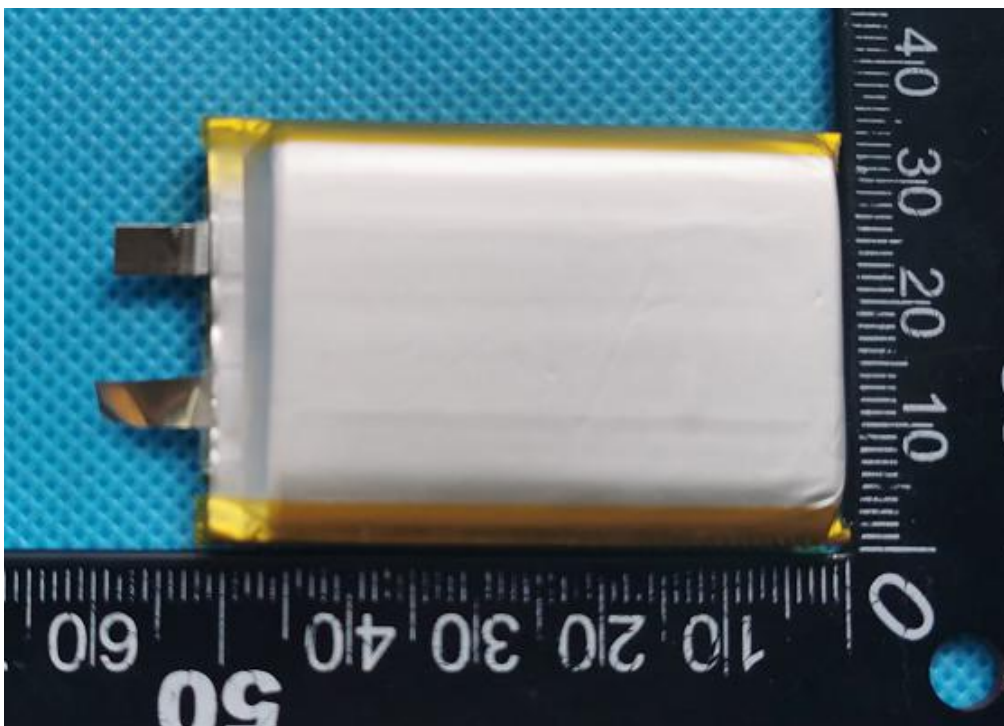


Figure 2 Back view of Cell