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检测
TESTING
CNAS L5868

UN38.3

UN38.3 test report

Report No.: MTi20101902-1B1

Date of issue: Nov. 09, 2020

Sample Name :	Lithium Metal Cylindrical Cell
Model :	ULCR2
Client :	Dantona Industries, Inc.
Address :	3051 Burns Ave. Wantagh, NY 11793

Shenzhen Microtest Co., Ltd.

http://www.mtitest.com

(Tel):(86-755)88850135 (Fax): (86-755) 88850136 (Web): http://www.mtitest.com (E-mail): mti@51mti.com
(Add): 101, No. 7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao 'an District, Shenzhen, Guangdong, China.

ST/SG/AC.10/11 Rev.6/Amend.1
AMENDMENTS TO THE SIXTH REVISED EDITION OF THE RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS, MANUAL OF TEST AND CRITERIA

Sample Name.....:	Lithium Metal Cylindrical Cell
Trade Mark.....:	N/A
Sample Model.....:	ULCR2
Manufacturer.....:	Dantona Industries, Inc.
Address.....:	3051 Burns Ave., Wantagh, NY 11793
Testing Laboratory.....:	Shenzhen Microtest Co., Ltd.
Manufacturer.....:	101, No. 7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China.
Received Date.....:	2020-10-24
Tested Date.....:	2020-10-24-2020-10-06

Test method and criterion：
Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.6, 38.3/Amend. 1)

Test result: Pass

Tested by (signature):	Checked by (signature):	Approved by (signature):
Henry chen	Jun Zeng	Tom Xue

Ⅰ、Sample Information

Sample Model	ULCR2	Rated Capacity/Energy	800mAh, 2.4Wh
Nominal Voltage	3.0V	Battery Shape	Cylindrical
Standard Discharge Current	1mA	Maximum Discharge Current	800mA
Cell Number	1PCS	Cell Model	ULCR2

Ⅱ、Conclusion

Standard	Item	Sample number	Verdict
ST/SG/AC.10/11/Rev.6/Amend.1 Section 38.3 (UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria)	Altitude simulation	C1-C10,C11-C20	PASS
	Thermal test		PASS
	Vibration		PASS
	Shock		PASS
	External short circuit		PASS
	Impact/~~Crush~~	C21-C25, C26-C30	PASS
	~~Overcharge~~	--	N/A
	Forced discharge	C31-C40	PASS

Possible test case Verdicts:	
Test case does not apply to the test object.....:	N/A
Test item does meet the requirement.....:	P(ass)
Test item does not meet the requirement.....:	F(ail)

Ⅲ、Test Method and Data

Tests T.1 to T.5 shall be conducted in sequence on the same cell or battery. Tests T.6 andT.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.

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 than90% 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.

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

$$mass\ loss = (M_1 - M_2)/M_1 \times 100\%$$

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

Mass M of cell or battery	Mass lost limite
M＜1g	0.5%
1g≤M≤75g	0.2%

Test T.1: Altitude simulation

(1) Test procedure

Test cells and batteries shall be stored at a pressure of 11.6kPa or less for at least six hours at ambient temperature (20±5)°C.

(2) Requirement

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.

Test T.2: Thermal test

(1) Test procedure

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.

(2) Requirement

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.

Test T.3: Vibration

(1) Test procedure

1 Cells and batteries are firmly secured to the platform of the vibration machine /

2 The vibration :a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes

3 the logarithmic frequency sweep is as follows: from 7Hz a peak acceleration of 1gn is maintained until 18 Hz is reached, The amplitude is then maintained at 0.8mm (1.6mm total excursion) and the frequency increased until a peak acceleration of $8g_n$ occurs (approximately 50Hz), A peak acceleration of 8 g_n is then maintained until the frequency is increased to 200Hz

4 This cycle repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting position of the cell

(2) Requirement

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.

Test T.4: Shock

(1) Test procedure

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 or battery shall be subjected to a halfsine shock of peak acceleration of 150gn and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks. However, large cells and large batteries shall be subjected to a half-sine shock of peak acceleration of 50gn and pulse duration of 11 milliseconds. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in the negative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.

(2) Requirement

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.

Test T.5: External short circuit

(1) Test procedure

The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches (57±4)°C and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at (57±4)°C. 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.

(2) Requirement

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.

Test T.6: Impact /Crush (applicable to cylindrical cells not less than 18.0mm in diameter) / Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18.0mm in diameter)

(1) Test procedure Impact

The sample cell or component cell is to be placed on a flat smooth surface. A (15.8±0.1)mm diameter, at least 6cm 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±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±0.1)mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.

(2) Test procedure

A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5cm/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±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.

(3) Requirement

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.

Test T.8: Forced discharge

(1) Test procedure

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).

(2) Requirement

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

IV. Test data

Test T1: Altitude simulation

Data

No	Pre-tes		After test		Mass loss (%)	Voltage after test/Voltage pre-test(%)Mass(g)	Verdict Voltage (V)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
C1	9.566	3.42	9.566	3.41	0.000	99.71	PASS
C2	9.521	3.42	9.521	3.42	0.000	100.00	PASS
C3	9.644	3.42	9.644	3.42	0.000	100.00	PASS
C4	9.615	3.41	9.615	3.41	0.000	100.00	PASS
C5	9.490	3.43	9.490	3.42	0.000	99.71	PASS
C6	9.547	3.42	9.546	3.42	0.010	100.00	PASS
C7	9.771	3.40	9.771	3.40	0.000	100.00	PASS
C8	9.597	3.40	9.597	3.40	0.000	100.00	PASS
C9	9.638	3.43	9.638	3.43	0.000	100.00	PASS
C10	9.698	3.42	9.697	3.42	0.010	100.00	PASS
C11	9.651	3.42	9.651	3.42	0.000	100.00	PASS
C12	9.650	3.41	9.650	3.41	0.000	100.00	PASS
C13	9.556	3.42	9.555	3.42	0.010	100.00	PASS
C14	9.461	3.40	9.461	3.40	0.000	100.00	PASS
C15	9.665	3.42	9.665	3.41	0.000	99.71	PASS
C16	9.661	3.42	9.661	3.42	0.000	100.00	PASS
C17	9.656	3.41	9.655	3.41	0.010	100.00	PASS
C18	9.412	3.42	9.412	3.41	0.000	99.71	PASS
C19	9.676	3.42	9.676	3.42	0.000	100.00	PASS
C20	9.642	3.41	9.642	3.41	0.000	100.00	PASS

#：No leakage, No venting, No disassembly No rupture and no fire

The conditions of the cells of sample No. C1# to C10# are in undischarged state;

The conditions of the cells of sample No. C11# to C20# are in full discharged state;

Test T.2: Thermal test

Data

No	Pre-tes		After test		Mass loss (%)	Voltage after test/Voltage pre-test(%)Mass(g)	Verdict Voltage (V)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
C1	9.566	3.41	9.565	3.41	0.010	100.00	PASS
C2	9.521	3.42	9.520	3.42	0.011	100.00	PASS
C3	9.644	3.42	9.643	3.42	0.010	100.00	PASS
C4	9.615	3.41	9.615	3.41	0.000	100.00	PASS
C5	9.490	3.42	9.489	3.40	0.011	99.42	PASS
C6	9.546	3.42	9.545	3.41	0.010	99.71	PASS
C7	9.771	3.40	9.770	3.39	0.010	99.71	PASS
C8	9.597	3.40	9.596	3.40	0.010	100.00	PASS
C9	9.638	3.43	9.638	3.42	0.000	99.71	PASS
C10	9.697	3.42	9.697	3.41	0.000	99.71	PASS
C11	9.697	3.42	9.697	3.41	0.000	99.71	PASS
C12	9.651	3.42	9.651	3.42	0.000	100.00	PASS
C13	9.650	3.41	9.649	3.40	0.010	99.71	PASS
C14	9.555	3.42	9.554	3.41	0.000	99.71	PASS
C15	9.461	3.40	9.461	3.40	0.000	100.00	PASS
C16	9.665	3.41	9.663	3.41	0.021	100.00	PASS
C17	9.661	3.42	9.660	3.42	0.010	100.00	PASS
C18	9.655	3.41	9.654	3.40	0.010	99.71	PASS
C19	9.412	3.41	9.412	3.41	0.000	100.00	PASS
C20	9.676	3.42	9.676	3.41	0.000	99.71	PASS

#：No leakage, No venting, No disassembly No rupture and no fire

The conditions of the cells of sample No. C1# to C10# are in undischarged state;

The conditions of the cells of sample No. C11# to C20# are in full discharged state;

Test T.3: Vibration

Data

No	Pre-tes		After test		Mass loss (%)	Voltage after test/Voltage pre-test(%)Mass(g)	Verdict Voltage (V)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
C1	9.565	3.41	9.564	3.41	0.010	100.00	PASS
C2	9.520	3.42	9.520	3.42	0.000	100.00	PASS
C3	9.643	3.42	9.643	3.42	0.000	100.00	PASS
C4	9.615	3.41	9.615	3.41	0.000	100.00	PASS
C5	9.489	3.40	9.488	3.40	0.011	100.00	PASS
C6	9.545	3.41	9.545	3.41	0.000	100.00	PASS
C7	9.770	3.39	9.770	3.38	0.000	99.71	PASS
C8	9.596	3.40	9.595	3.39	0.010	99.71	PASS
C9	9.638	3.42	9.638	3.42	0.000	100.00	PASS
C10	9.697	3.41	9.697	3.41	0.000	100.00	PASS
C11	9.697	3.41	9.697	3.40	0.000	99.71	PASS
C12	9.651	3.42	9.650	3.41	0.010	99.71	PASS
C13	9.649	3.40	9.649	3.40	0.000	100.00	PASS
C14	9.554	3.41	9.554	3.41	0.000	100.00	PASS
C15	9.461	3.40	9.460	3.40	0.011	100.00	PASS
C16	9.663	3.41	9.662	3.41	0.010	100.00	PASS
C17	9.660	3.42	9.660	3.41	0.000	99.71	PASS
C18	9.654	3.40	9.653	3.40	0.010	100.00	PASS
C19	9.412	3.41	9.412	3.41	0.000	100.00	PASS
C20	9.676	3.41	9.676	3.41	0.000	100.00	PASS

#：No leakage, No venting, No disassembly No rupture and no fire

The conditions of the cells of sample No. C1# to C10# are in undischarged state;

The conditions of the cells of sample No. C11# to C20# are in full discharged state;

Test T4: Shock

Data

No	Pre-tes		After test		Mass loss (%)	Voltage after test/Voltage pre-test(%)Mass(g)	Verdict Voltage (V)
	Mass (g)	Voltage (V)	Mass (g)	Voltage (V)			
C1	9.564	3.41	9.563	3.41	0.010	100.00	PASS
C2	9.520	3.42	9.520	3.42	0.000	100.00	PASS
C3	9.643	3.42	9.642	3.41	0.010	99.71	PASS
C4	9.615	3.41	9.615	3.41	0.000	100.00	PASS
C5	9.488	3.40	9.487	3.40	0.011	100.00	PASS
C6	9.545	3.41	9.544	3.40	0.010	99.71	PASS
C7	9.770	3.38	9.770	3.38	0.000	100.00	PASS
C8	9.595	3.39	9.595	3.38	0.000	99.71	PASS
C9	9.638	3.42	9.637	3.42	0.010	100.00	PASS
C10	9.697	3.41	9.697	3.41	0.000	100.00	PASS
C11	9.697	3.40	9.697	3.40	0.000	100.00	PASS
C12	9.650	3.41	9.650	3.41	0.000	100.00	PASS
C13	9.649	3.40	9.649	3.40	0.000	100.00	PASS
C14	9.554	3.41	9.553	3.4	0.010	99.71	PASS
C15	9.460	3.40	9.460	3.40	0.000	100.00	PASS
C16	9.662	3.41	9.662	3.40	0.000	99.71	PASS
C17	9.660	3.41	9.660	3.41	0.000	100.00	PASS
C18	9.653	3.40	9.652	3.40	0.010	100.00	PASS
C19	9.412	3.41	9.412	3.41	0.000	100.00	PASS
C20	9.676	3.41	9.676	3.41	0.000	100.00	PASS

#：No leakage, No venting, No disassembly No rupture and no fire

The conditions of the cells of sample No. C1# to C10# are in undischarged state;

The conditions of the cells of sample No. C11# to C20# are in full discharged state;

Test T.5: External short circuit

Data

No.	Peak temperature(°C)	Status
C1	60.7	PASS
C2	59.7	PASS
C3	62.8	PASS
C4	61.5	PASS
C5	62.6	PASS
C6	60.8	PASS
C7	59.5	PASS
C8	61.3	PASS
C9	62.4	PASS
C10	60.7	PASS
C11	60.2	PASS
C12	59.6	PASS
C13	58.5	PASS
C14	58.3	PASS
C15	59.8	PASS
C16	57.9	PASS
C17	58.3	PASS
C18	60.7	PASS
C19	60.6	PASS
C20	59.5	PASS

#：No leakage, No venting, No disassembly No rupture and no fire

The conditions of the cells of sample No. C1# to C10# are in undischarged state;

The conditions of the cells of sample No. C11# to C20# are in full discharged state;

Test T.6: Impact /Crush

Data

No	Peak temperature(°C)	Status
C21	28.9	PASS
C22	29.7	PASS
C23	30.2	PASS
C24	28.7	PASS
C25	29.2	PASS
C26	29.5	PASS
C27	31.9	PASS
C28	30.6	PASS
C29	29.7	PASS
C30	28.8	PASS

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

No disassembly, No fire during, External temperature does not exceed 170°C

The conditions of the cells of sample No.C21# to C25# are in undischarged state;

The conditions of the cells of sample No.C26# to C30# are in full discharged state;

Test T.8: Forced discharge (for cell)

Data

No	Verdict
C31	PASS
C32	PASS
C33	PASS
C34	PASS
C35	PASS
C36	PASS
C37	PASS
C38	PASS
C39	PASS
C40	PASS

No disassembly No fire during

The conditions of the cells of sample No.C31# to C40# are in full discharged state;

Photos of The Sample

Photo 1

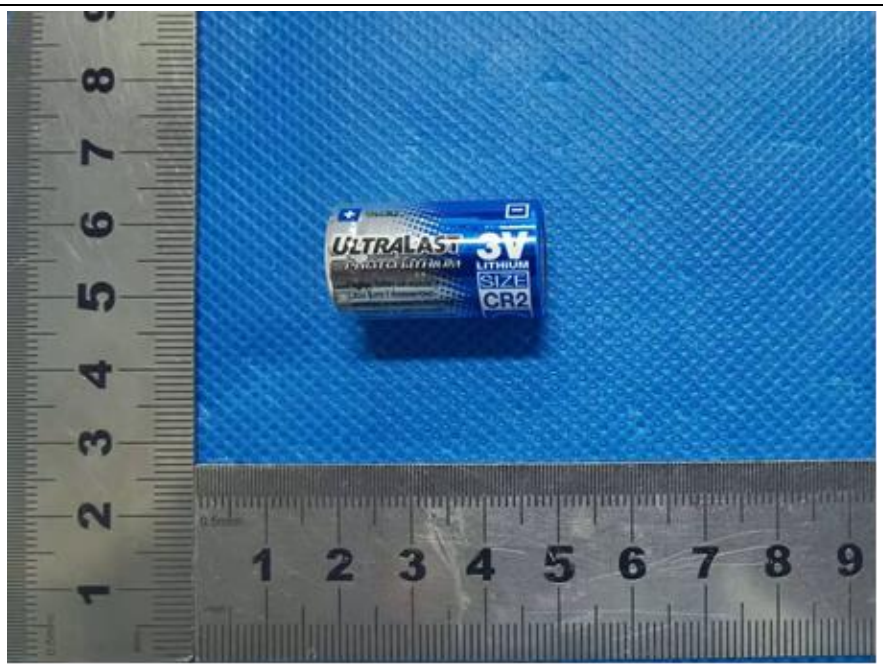

Photo 2

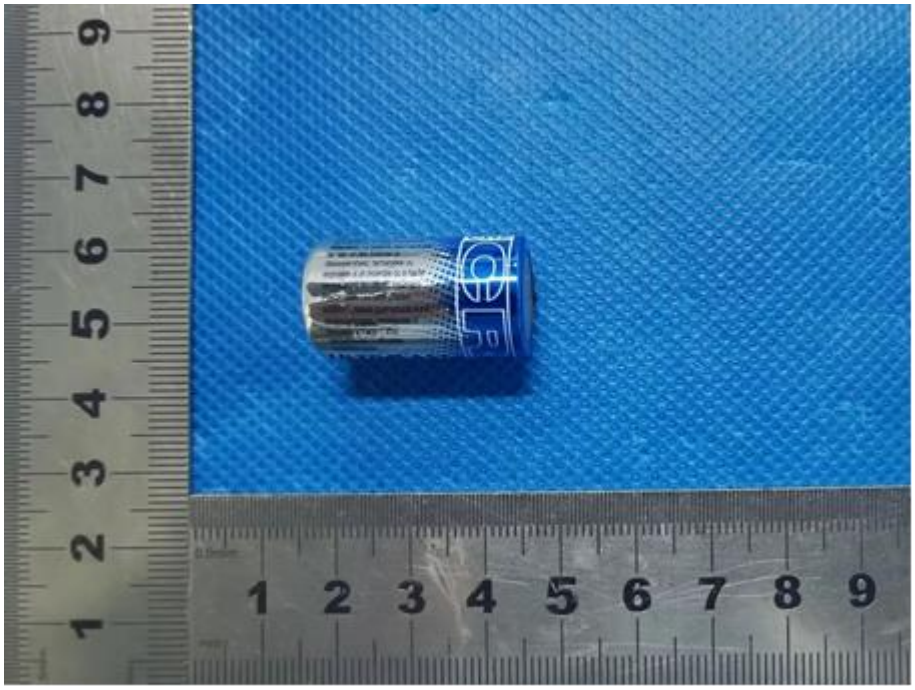

Photo 3

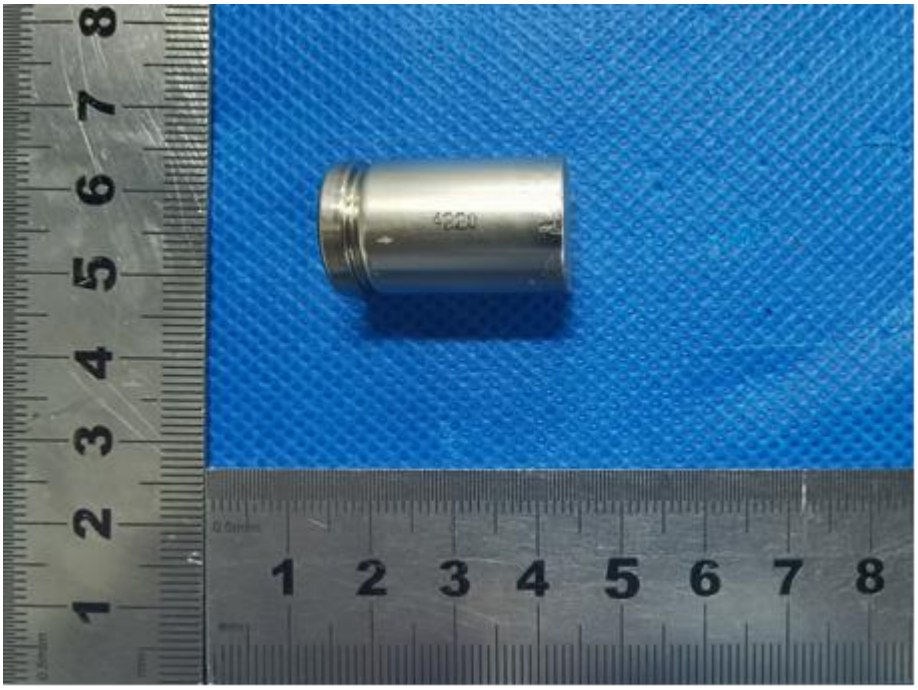

Photo 4

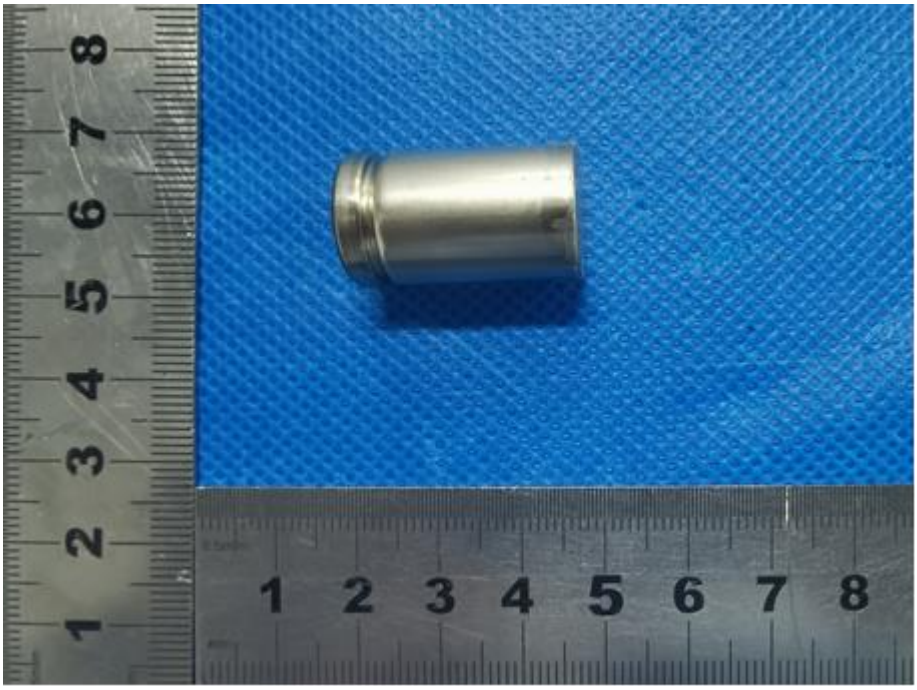

Photo 5

Main Test Equipment

No	Code	**Instrument Name**
1	MTi-B001	Low Pressure Chamber
2	MTi-B002	High-Low Temperature Chamber
3	MTi-B006	Hydraulic Shock Tester
4	MTi-B007	Electro-dynamic Vibration Test System
5	MTi-B010	Drop Tester
6	MTi-B013	Oven
7	MTi-B021	Electronic Balance
8	MTi-B024	10V/10A Battery Charger System
9	MTi-B026	25V/10A Battery Charger System
10	MTi-B029	Temperature Recorder
11	MTi-B031	DC Source
12	MTi-B032	DC Source
13	MTi-B033	DC Electronic load
14	MTi-B044	Temperature Recorder
15	MTi-B049	Multimeter
16	MTi-B052	Crush Tester
17	MTi-B053	Impact Tester
Remark:The above equipment are within the calibration cycle.		

Important Notice

1. The test report is invalid without the official stamp of the lab.

2. The test report is invalid without the signature of ratifier, reviewer

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3. Nobody is allowed to photocopy or partly photocopy this report without written permission of the lab.

4. The test report is invalid if illegal transfer,altered or tampering in any media form.

5. If any test method is deviation from the designated test method, must be commented in the test data sheet.

6. Objections to the test report must be submitted to lab within 15 days.

7. The test report is valid for the tested sample only.

****** End of Report ******