

Getac

Battery UN38.3 Test Report

Model: Caltech

(7.4V==4200mAh/31.08Wh)

PN: 541386790003

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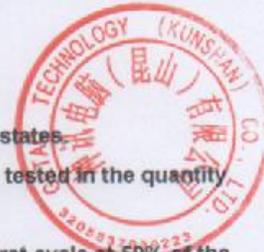
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NO	TEST ITEM	TEST TIME	RESULT
1	Altitude simulation	2015/6/4	PASS
2	Thermal test	2015/6/5~2015/6/11	PASS
3	Vibration	2015/6/12~2015/6/13	PASS
4	Shock	2015/6/15	PASS
5	External short circuit	2015/6/16	PASS
6	Crush	2015/6/11~2015/6/15	PASS
7	Overcharge	2015/6/4~2015/6/12	PASS
8	Forced discharge	2015/6/8~2015/6/15	PASS

Note: UN manual of tests and Criteria section 5th 38.3 Test (ST/SG/AC.10/11/Rev.5/Amend.1)

When a cell or battery type is to be tested under this sub-section, the number and condition of cells and batteries of each type to be tested are as follows:

- (a) When testing rechargeable cells and batteries under tests T.1 to T.5, the following shall be tested in the quantity indicated:
- (i) ten cells at first cycle, in fully charged states;
 - (ii) four small batteries at first cycle, in fully charged states;
 - (iii) four small batteries after fifty cycles ending in fully charged states.
- (b) When testing rechargeable cells under test T.6, the following shall be tested in the quantity indicated:
- (i) for component cells of rechargeable batteries, five cells at first cycle at 50% of the design rated capacity.
- (c) When testing rechargeable batteries or rechargeable single cell batteries under test T.7, the following shall be tested in the quantity indicated:
- (i) four small batteries at first cycle, in fully charged states;
 - (ii) four small batteries after fifty cycles ending in fully charge states.
- Batteries not equipped with overcharge protection that are designed for use only in a battery assembly, which affords such protection, are not subject to the requirements of this test.
- (d) When testing rechargeable component cells under test T.8, the following shall be tested in the quantity indicated:
- (i) ten rechargeable component cells, at first cycle in fully discharged states;
 - (ii) ten rechargeable component cells after fifty cycles ending in fully discharge states.



Remark:

Rechargeable single cell batteries:

Sample #1~#10 ten single cell batteries, at first cycle, in fully charge states;

Sample #11~#14 four single cell batteries, at first cycle, in fully charge states;

Sample #15~#18 four single cell batteries, after fifty cycles ending in fully charge states;

Component Cell #1~#5 five cells, at first cycle, at 50% of design rate capacity;

Component Cell #6~#15 ten cells, at first cycle, in fully discharged states;

Component Cell #16~#25 ten cells, after fifty cycles ending in fully discharge states.

Rechargeable batteries:

Sample #1~#4 four batteries, at first cycle, in fully charge states;

Sample #5~#8 four batteries, after fifty cycles ending in fully charge states;

Sample #9~#12 four batteries, at first cycle, in fully charge states;

Sample #13~#16 four batteries, after fifty cycles ending in fully charge states;

Component Cell #1~#5 five cells, at first cycle, at 50% of design rate capacity;

Component Cell #6~#15 ten cells, at first cycle, in fully discharged states;

Component Cell #16~#25 ten cells, after fifty cycles ending in fully discharge states.



1. Altitude simulation

1. Test Equipment:

BE-DY-27/1170001, KEITHLEY2700/0280002, KDB-1200/0040026

2. Purpose:

This test simulates air transport under low-pressure condition.

3. Test Conditions:

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

4. Requirement:

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. The requirement relating to voltage is not applicable to test battery at fully discharged states.

5. Test table:

Sample	Before test		After test		Mass Loss/%	Residual OCV/%	Other Event
	Voltage (V)	Weight(g)	Voltage (V)	Weight(g)			
#1	8.324	168.55	8.323	168.53	0.01	99.99	OK
#2	8.328	168.41	8.327	168.38	0.02	99.99	OK
#3	8.334	167.97	8.332	167.96	0.01	99.98	OK
#4	8.353	168.14	8.351	168.12	0.01	99.98	OK
#5	8.331	167.31	8.329	167.29	0.01	99.98	OK
#6	8.338	167.89	8.336	167.86	0.02	99.98	OK
#7	8.333	168.99	8.331	168.97	0.01	99.98	OK
#8	8.324	168.48	8.322	168.46	0.01	99.98	OK

Note: OK- No Leakage, No Venting, No Disassembly, No rupture & No Fire;

NG- Leakage, Venting, Disassembly, rupture & Fire

6. Test result: PASS

2. Thermal test

1. Test Equipment:

TSK-E4C-150+RAMP/0130001, KEITHLEY2700/0280002, KDB-1200/0040026

2. Purpose:

This test assesses battery seal integrity and internal electrical connections. The test is conducted using rapid and extreme temperature change.

3. Test Conditions:



Test 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 batteries are to be stored for 24 hours at ambient temperature (20 ± 5 °C.).

4. Requirement:

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. The requirement relating to voltage is not applicable to test battery at fully discharged states.

5. Test table:

Sample	Before test		After test		Mass Loss/%	Residual OCV/%	Other Event
	Voltage (V)	Weight(g)	Voltage (V)	Weight(g)			
#1	8.323	168.53	8.236	168.53	0.00	98.95	OK
#2	8.327	168.38	8.252	168.38	0.00	99.10	OK
#3	8.332	167.96	8.253	167.95	0.01	99.05	OK
#4	8.351	168.12	8.256	168.10	0.01	98.86	OK
#5	8.329	167.29	8.250	167.29	0.00	99.05	OK
#6	8.336	167.86	8.251	167.86	0.00	98.98	OK
#7	8.331	168.97	8.241	168.97	0.00	98.92	OK
#8	8.322	168.46	8.242	168.46	0.00	99.04	OK

Note: OK- No Leakage, No Venting, No Disassembly, No rupture & No Fire;

NG- Leakage, Venting, Disassembly, rupture & Fire.

6. Test result: PASS



3. Vibration

1. Test Equipment:

EM-1000F2K-50N250/0910001, KEITHLEY2700/0280002, KDB-1200/0040026

2. Purpose:

This test simulates vibration during transport.

3. Test Conditions:

Batteries are firmly secured to the platform of the vibration machine without distorting the cell such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with algorithmic 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

163/58/50001/0910001

positions of the cell. One of the directions of vibration must be perpendicular to the terminal face. The logarithmic frequency sweep shall differ for batteries with a gross mass of not more than 12 kg (small batteries), small batteries: from 7 Hz 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 8 gn occurs (approximately 50 Hz). A peak acceleration of 8 gn is maintained until the frequency is increased to 200 Hz.

4. Requirement:

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 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 battery at fully discharged states.

5. Test table:

Sample	Before test		After test		Mass Loss/%	Residual OCV/%	Other Event
	Voltage (V)	Weight(g)	Voltage (V)	Weight(g)			
#1	8.236	168.53	8.232	168.53	0.00	99.95	OK
#2	8.252	168.38	8.248	168.36	0.01	99.95	OK
#3	8.253	167.95	8.249	167.95	0.00	99.95	OK
#4	8.256	168.10	8.251	168.10	0.00	99.94	OK
#5	8.250	167.29	8.246	167.28	0.01	99.95	OK
#6	8.251	167.86	8.246	167.86	0.00	99.94	OK
#7	8.241	168.97	8.237	168.94	0.02	99.95	OK
#8	8.242	168.46	8.238	168.44	0.01	99.95	OK

Note: OK- No Leakage, No Venting, No Disassembly, No rupture & No Fire;
 NG- Leakage, Venting, Disassembly, rupture & Fire.

6. Test result: PASS



4. Shock

1. Test Equipment:

ASQ-700/0900001, KEITHLEY2700/0280002, KDB-1200/0040026

2. Purpose:

This test simulates possible impacts during transport.

3. Test Conditions:

Test the 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 battery shall be subjected to a half-sine

shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Each 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 battery for a total of 18 shocks.

4. Requirement:

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. The requirement relating to voltage is not applicable to test battery at fully discharged states.

5. Test table:

Sample	Before test		After test		Mass Loss/%	Residual OCV/%	Other Event
	Voltage (V)	Weight(g)	Voltage (V)	Weight(g)			
#1	8.232	168.53	8.230	168.53	0.00	99.98	OK
#2	8.248	168.36	8.246	168.36	0.00	99.98	OK
#3	8.249	167.95	8.247	167.95	0.00	99.98	OK
#4	8.251	168.10	8.249	168.10	0.00	99.98	OK
#5	8.246	167.28	8.244	167.28	0.00	99.98	OK
#6	8.246	167.86	8.244	167.86	0.00	99.98	OK
#7	8.237	168.94	8.235	168.94	0.00	99.98	OK
#8	8.238	168.44	8.236	168.44	0.00	99.98	OK

Note: OK- No Leakage, No Venting, No Disassembly, No rupture & No Fire;
 NG- Leakage, Venting, Disassembly, rupture & Fire.

6. Test result: PASS

5. External short circuit

1. Test Equipment:

MHU-225Q/0120004, KEITHLEY2700+7700/0280003

2. Purpose:

This test simulates an external short circuit.

3. Test Conditions:

The battery to be tested shall be temperature stabilized so that its external case temperature reaches 55 ± 2 °C and then the battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at 55 ± 2 °C. This short circuit condition is continued for at least one hour after battery external case temperature has returned to 55 ± 2 °C.

4. Requirement:

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.



5. Test table:

Sample	Max. External Temperature(°C)	Other Event
#1	54.5	OK
#2	54.5	OK
#3	54.4	OK
#4	54.6	OK
#5	54.3	OK
#6	54.4	OK
#7	54.5	OK
#8	54.6	OK

Note: OK- No Disassembly, No rupture & No Fire; NG- Disassembly, rupture & Fire.

6. Test result: PASS

6. Crush

1. Test Equipment:

BE-6048/1180001, KEITHLEY2700+7700/0280003

2. Purpose

These tests simulate mechanical abuse from an impact or crush that may result in an internal short circuit.

3. Test Conditions:

Test procedure- Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells not more than 20 mm in diameter)

A 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 $13 \text{ kN} \pm 0.78 \text{ kN}$;

Example: The force shall be applied by a hydraulic ram with a 32 mm diameter piston until a pressure of 17 MPa is reached on the hydraulic ram.

(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 100mV 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 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 component cells that have not previously been subjected to other tests.

4. Requirement:

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.

5. Test table:

Sample (Cell)	Max. External Temperature (°C)	Other Event
#1	26.1	OK
#2	25.8	OK
#3	26.4	OK
#4	26.0	OK
#5	26.6	OK

Note: OK- No Disassembly, No rupture & No Fire; NG- Disassembly, rupture & Fire.

6. Test result: PASS

7. Overcharge

1. Test Equipment:

ITECH IT6952A 60V/25A/600W/0020243-0020250

2. Purpose

This test evaluates the ability of a rechargeable battery to withstand an overcharge condition.

3. Test Conditions:

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.

4. Requirement:

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

5. Test table:

Sample	Other Event
#9	OK
#10	OK
#11	OK
#12	OK
#13	OK
#14	OK
#15	OK
#16	OK

Note: OK- No Disassembly & No Fire; NG- Disassembly & Fire.

6. Test result: PASS

8. Forced discharge

1. Test Equipment:

ITECH IT6952A 60V/25A/600W/0020243~0020250
 Chroma 63103/0230171/0230172/0230175/0230176
 Chroma 63102/0230173/0230174/0230177/0230178

2. Purpose

This test evaluates the ability of a rechargeable cell to withstand a forced discharge condition.

3. Test Conditions:

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)

4. Requirement:

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



5. Test table:

Sample (Cell)	Other Event
#6	OK
#7	OK
#8	OK
#9	OK
#10	OK
#11	OK
#12	OK
#13	OK
#14	OK
#15	OK
#16	OK
#17	OK
#18	OK
#19	OK
#20	OK
#21	OK
#22	OK
#23	OK
#24	OK
#25	OK



Note: OK- No Disassembly & No Fire; NG- Disassembly & Fire.

6. Test result: PASS

