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UN38.3 Test Summary

The following product has been evaluated according to the 6th revised edition Amendment 1 of the UN Manual of Tests and Criteria.
We, LG Chem, ltd., hereby certify that this battery meets the requirements of the regulation for transportation of lithium-ion cells, batteries and single cell batteries.

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Description		List of Test Completed	
Test Report Number	QDI-190327-SB-EB-BN972ABU L	Test 1. Altitude Simulation	Pass
Date of test report	2019.03.27	Test 2. Thermal Test	Pass
Model name	EB-BN972ABU L	Test 3. Vibration	Pass
Type	Pouch (Lithium ion battery)	Test 4. Shock	Pass
Nominal voltage	3.85 V	Test 5. External Short Circuit	Pass
Capacity	16.56Wh	Test 6. Impact or Crush	Pass
Weight	59.264g	Test 7. Overcharge	Pass
Dimensions	78.50mmX58.84mmX5.38mm	Test 8. Forced Discharge	Pass

Approved By: Yuan Xu
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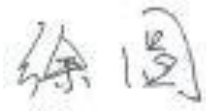

Document Number	QDI-190327-SB-EB-BN972ABU L	
Prepared	qianjunli	
Approved	Xuyuan	

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UN38.3 Test Report
- EB-BN972ABU L (Nom. 16.56Wh, 3.85V) -

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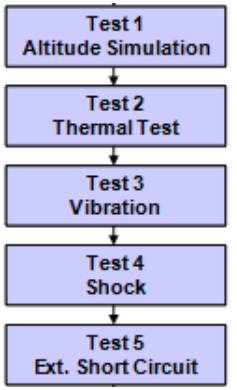
2019. 03. 27

LG Chem

1. UN38.3 Test Condition

Test item	Test Condition	Requirements	Etc.
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- After OCV (%) ≥ 90% - No leakage, no venting, no disassembly, no rupture, no fire - Mass loss limit (leakage) 1) If M<1g, less than 0.5%, 2) If 1g≤M≤75g, less than 0.2%, 3) If M>75g, less than 0.1%)	T1~T5 : Sequence Tests 
Test 2. Thermal Test	[72±2℃,6hr↔-40±2℃,6hr, interval max. 30min]x10cycle Storing at 20±5℃ for 24h		
Test 3. Vibration	[7Hz↔200Hz↔7Hz, in 15min] x 12 times x 3 direction 1) sinusoidal waveform with a logarithmic sweep 2) 7Hz 18Hz (maintaining 1gn) app. 50Hz (until 8gn) 200Hz (maintaining 8gn), 1.6mm total excursion		
Test 4. Shock	Half sine shock 1) Peak acceleration - For cells & single cell batteries : 150gn - For batteries (whichever is smaller) : 150gn or ⁻⁻⁻ gn 2) Pulse duration : 6msec 3) 6 direction (±x, y, z) x 3 cycle		
Test 5. External Short Circuit	1) Samples to be heated to 57±4℃ in chamber (Measured on external case) 2) Less than 0.1Ω, ext. short-circuit at 57±4℃ 3) 1hr continue after returning to 57±4℃	- No disassembly, no rupture, no fire within 6 hours after the test - Max. Temp ≤ 170℃	
Test 6. Impact	Φ=15.8±0.1mm bar, 9.1±0.1kg mass, 61±2.5cm height	- No disassembly, no fire within 6 hours after the test - Max. Temp ≤ 170℃	for cylindrical cells (not less than 18mm diameter)
Test 6. Crush	Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation		for cylindrical cells (less than 18mm diameter) for prismatic, pouch, coin/button cells
Test 7. Overcharge	Current = Manufacturer's recommended max. continuous charge current X 2 Voltage 1.If charge voltage ≤ 18V, V (min.) = 2 x (max. charge voltage) or 22V. 2.If charge voltage > 18V, V (min.) = 1.2 x (max. charge voltage)	- No disassembly, no fire within 7 days after the test	Only for Single Cell Battery / Battery
Test 8. Forced Discharge	Discharge at max. discharge current (connecting in series with 12V DC power supply), Duration time = rated capacity/initial test current	- No disassembly, no fire within 7 days after the test	Resistance of Electric Loader 1/Ω = (max. discharge current) / (12 + Initial OCV)

2-1. T1-T4 Test Result

Before			Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
NO.	OCV	Mass (g)	After OCV (V)	Mass (g)	After OCV(%)	Mass Loss(%)	Result	After OCV (V)	Mass (g)	After OCV(%)	Mass Loss(%)	Result	After OCV (V)	Mass (g)	After OCV(%)	Mass Loss(%)	Result	After OCV (V)	Mass (g)	After OCV(%)	Mass Loss(%)	Result
A. 1st cycle fully charged state																						
1	4.3452	59.339	4.3389	59.335	99.86	0.007	Pass	4.2519	59.328	97.99	0.012	Pass	4.2519	59.328	100.00	0.000	Pass	4.2519	59.329	100.00	0.000	Pass
2	4.3409	59.239	4.3349	59.235	99.86	0.007	Pass	4.2507	59.229	98.06	0.010	Pass	4.2504	59.227	99.99	0.003	Pass	4.2505	59.228	100.00	0.000	Pass
3	4.3390	59.252	4.3336	59.249	99.88	0.005	Pass	4.2507	59.244	98.09	0.008	Pass	4.2505	59.241	100.00	0.005	Pass	4.2506	59.243	100.00	0.000	Pass
4	4.3433	59.143	4.3372	59.140	99.86	0.005	Pass	4.2524	59.134	98.04	0.010	Pass	4.2522	59.133	100.00	0.002	Pass	4.2522	59.134	100.00	0.000	Pass
5	4.3406	59.286	4.3346	59.284	99.86	0.003	Pass	4.2508	59.277	98.07	0.012	Pass	4.2507	59.276	100.00	0.002	Pass	4.2507	59.278	100.00	0.000	Pass
B. 25th cycle fully charged state																						
6	4.3483	59.381	4.3455	59.377	99.94	0.007	Pass	4.2646	59.372	98.14	0.008	Pass	4.2644	59.370	100.00	0.003	Pass	4.2645	59.371	100.00	0.000	Pass
7	4.3472	59.294	4.3444	59.290	99.94	0.007	Pass	4.2636	59.285	98.14	0.008	Pass	4.2634	59.284	100.00	0.002	Pass	4.2635	59.285	100.00	0.000	Pass
8	4.3461	59.238	4.3434	59.234	99.94	0.007	Pass	4.2631	59.229	98.15	0.008	Pass	4.2628	59.227	99.99	0.003	Pass	4.2630	59.228	100.00	0.000	Pass
9	4.3460	59.217	4.3433	59.213	99.94	0.007	Pass	4.2628	59.208	98.15	0.008	Pass	4.2626	59.206	100.00	0.003	Pass	4.2627	59.207	100.00	0.000	Pass
10	4.3470	59.250	4.3444	59.247	99.94	0.005	Pass	4.2631	59.241	98.13	0.010	Pass	4.2629	59.239	100.00	0.003	Pass	4.2629	59.241	100.00	0.000	Pass

2-2. T5/T7 Test Result

EXT.Short Circuit (T5)

NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
1	4.2519	57.47	Pass
2	4.2505	57.51	Pass
3	4.2506	55.18	Pass
4	4.2522	56.69	Pass
5	4.2507	56.91	Pass
B. 25th cycle fully charged state			
6	4.2645	58.52	Pass
7	4.2635	58.67	Pass
8	4.2630	56.71	Pass
9	4.2627	58.08	Pass
10	4.2629	58.05	Pass

Over Charge (T7)

NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
11	4.3332	23.81	Pass
12	4.3299	23.61	Pass
13	4.3272	23.61	Pass
14	4.3317	23.35	Pass

Over Charge (T7)

NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 25th cycle fully charged state			
15	4.3414	23.51	Pass
16	4.3413	23.11	Pass
17	4.3406	23.17	Pass
18	4.3306	22.90	Pass

2-3. T6/T8 Test Result (P545978A1)

Cell Document Number	QDI-190327-C-P545978A1

Crush (T6)

NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle 50% charged state			
C-1	3.8433	21.36	Pass
C-2	3.8446	21.03	Pass
C-3	3.8444	21.23	Pass
C-4	3.8437	20.82	Pass
C-5	3.8440	20.77	Pass
B. 25st cycle 50% charged state			
C-6	3.8663	20.76	Pass
C-7	3.8672	20.77	Pass
C-8	3.8642	20.87	Pass
C-9	3.8672	20.85	Pass
C-10	3.8654	20.84	Pass

Forced Discharge (T8)

NO.	Initial OCV(V)	Max. Temp (℃)	Result	NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully discharged state				**B. 25th cycle fully discharged state**			
C-6	3.4261	60.07	Pass	C-16	3.4534	70.47	Pass
C-7	3.4217	63.05	Pass	C-17	3.4608	63.02	Pass
C-8	3.4271	59.81	Pass	C-18	3.4453	70.46	Pass
C-9	3.4239	75.34	Pass	C-19	3.4483	79.50	Pass
C-10	3.4270	65.00	Pass	C-20	3.4343	37.38	Pass
C-11	3.4272	59.90	Pass	C-21	3.4457	43.65	Pass
C-12	3.4231	61.91	Pass	C-22	3.4552	42.29	Pass
C-13	3.4254	84.05	Pass	C-23	3.4463	52.91	Pass
C-14	3.4206	66.87	Pass	C-24	3.4286	36.65	Pass
C-15	3.4243	61.83	Pass	C-25	3.4320	45.15	Pass

3. Sample Image