

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.

Manufacture's contact information	LG Chem, Ltd. 128 Yeoui-Daero, Yeongdeungpo-gu, SEOUL, 150-721, REPUBLIC OF KOREA Telephone : +86-10-7742-5427 E-mail : kkammy@lgchem.com Website : www.lgchem.com		
Test Laboratory information	LG Chem, Ltd. / RESEARCH PARK 188 Munjiro, Yuseong-gu, Daejeon, 305-738, REPUBLIC OF KOREA Telephone : +82-10-3099-3724 E-mail : juhongpark@lgchem.com Website : www.lgchem.com		
	LG Chem (Nanjing) I&E Materials Co., Ltd NO.17 Hengyi Road, Nanjing Economic & Technological Development Zone, Nanjing, Jiangsu, China Telephone : +86-025-85603000-8288 E-mail : xuyuannj@lgchem.com Website : www.lgchem.com		
Description		List of Test Completed	
Test Report Number	QDI-190927-SB-EB-BG980ABY L	Test 1. Altitude Simulation	Pass
Date of test report	2019.09.27	Test 2. Thermal Test	Pass
Model name	EB-BG980ABY L	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	3.86 V	Test 5. External Short Circuit	Pass
Capacity	15.44Wh	Test 6. Impact or Crush	Pass
Weight	54.272g	Test 7. Overcharge	Pass
Dimensions	70.70mmX59.80mmX5.33mm	Test 8. Forced Discharge	Pass

Approved By: Yuan Xu
Part Leader
Cyl NPI&CE lab part DQA Team
LG Chem, Ltd.
E-mail: xuyuannj@lgchem.com



Document Number	QDI-190927-SB-EB-BG980ABY L	
Prepared	qianjunli	钱俊丽
Approved	Xuyuan	徐园

UN38.3 Test Report

– EB-BG980ABY L (Nom. 15.44Wh, 3.86V) –

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2019. 09. 27

1. UN38.3 Test Condition

Rev.6 Amendment 1

Test item	Test Condition	Requirements	Etc.
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5°C		T1~T5 : Sequence Tests <pre> graph TD T1[Test 1 Altitude Simulation] --> T2[Test 2 Thermal Test] T2 --> T3[Test 3 Vibration] T3 --> T4[Test 4 Shock] T4 --> T5[Test 5 Ext. Short Circuit] </pre>
Test 2. Thermal Test	[72±2°C,6hr ↔ -40±2°C,6hr, interval max. 30min] x 10cycle Storing at 20±5°C 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	<ul style="list-style-type: none"> - After OCV (%) ≥ 90% - No leakage, no venting, no disassembly, no rupture, no fire - Mass loss limit (leakage) <ol style="list-style-type: none"> 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% 	
Test 4. Shock	Half sine shock 1) Peak acceleration - For cells & single cell batteries : 150gn - For batteries (whichever is smaller) : 150gn or $\sqrt{\frac{100850}{Mass(kg)}} gn$ 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°C in chamber (Measured on external case) 2) Less than 0.1Ω, ext. short-circuit at 57±4°C 3) 1hr continue after returning to 57±4°C	<ul style="list-style-type: none"> - No disassembly, no rupture, no fire within 6 hours after the test - Max. Temp ≤ 170°C 	
Test 6. Impact	Φ=15.8±0.1mm bar, 9.1±0.1kg mass, 61±2.5cm height	<ul style="list-style-type: none"> - No disassembly, no fire within 6 hours after the test - Max. Temp ≤ 170°C 	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)	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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	4.3552	54.100	4.3535	54.100	99.96	0.000	Pass	4.2767	54.088	98.24	0.022	Pass	4.2766	54.089	100.00	0.000	Pass	4.2763	54.091	99.99	0.000	Pass
2	4.3498	54.221	4.3484	54.219	99.97	0.004	Pass	4.2725	54.206	98.25	0.024	Pass	4.2724	54.208	100.00	0.000	Pass	4.2722	54.208	100.00	0.000	Pass
3	4.3506	54.272	4.3491	54.272	99.97	0.000	Pass	4.2728	54.262	98.25	0.018	Pass	4.2728	54.259	100.00	0.006	Pass	4.2726	54.261	100.00	0.000	Pass
4	4.3512	54.173	4.3501	54.172	99.97	0.002	Pass	4.2734	54.161	98.24	0.020	Pass	4.2733	54.161	100.00	0.000	Pass	4.2730	54.161	99.99	0.000	Pass
5	4.3540	53.965	4.3523	53.963	99.96	0.004	Pass	4.2752	53.953	98.23	0.019	Pass	4.2752	53.951	100.00	0.004	Pass	4.2749	53.951	99.99	0.000	Pass

B. 25th cycle fully charged state

6	4.3681	54.065	4.3671	54.064	99.98	0.002	Pass	4.2948	54.054	98.34	0.018	Pass	4.2948	54.052	100.00	0.004	Pass	4.2946	54.054	100.00	0.000	Pass
7	4.3536	54.196	4.3526	54.196	99.98	0.000	Pass	4.2833	54.186	98.41	0.018	Pass	4.2832	54.185	100.00	0.002	Pass	4.2830	54.187	100.00	0.000	Pass
8	4.3660	54.188	4.3648	54.188	99.97	0.000	Pass	4.2916	54.177	98.32	0.020	Pass	4.2917	54.175	100.00	0.004	Pass	4.2915	54.176	100.00	0.000	Pass
9	4.3646	53.954	4.3633	53.951	99.97	0.006	Pass	4.2904	53.943	98.33	0.015	Pass	4.2904	53.941	100.00	0.004	Pass	4.2901	53.943	99.99	0.000	Pass
10	4.3682	54.272	4.3672	54.269	99.98	0.006	Pass	4.2937	54.262	98.32	0.013	Pass	4.2938	54.259	100.00	0.006	Pass	4.2935	54.264	99.99	0.000	Pass

2-2. T5/T7 Test Result

EXT.Short Circuit (T5)

NO.	Initial OCV(V)	Max. Temp (°C)	Result
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A. 1st cycle fully charged state

1	4.2763	58.27	Pass
2	4.2722	58.32	Pass
3	4.2726	57.83	Pass
4	4.2730	57.67	Pass
5	4.2749	57.18	Pass

B. 25th cycle fully charged state

6	4.2946	58.23	Pass
7	4.2830	58.27	Pass
8	4.2915	57.77	Pass
9	4.2901	57.63	Pass
10	4.2935	57.18	Pass

Over Charge (T7)

NO.	Initial OCV(V)	Max. Temp (°C)	Result
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A. 1st cycle fully charged state

11	4.3433	24.62	Pass
12	4.3002	24.35	Pass
13	4.3439	24.52	Pass
14	4.3436	24.21	Pass

Over Charge (T7)

NO.	Initial OCV(V)	Max. Temp (°C)	Result
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B. 25th cycle fully charged state

15	4.3620	24.38	Pass
16	4.3617	24.11	Pass
17	4.3616	24.28	Pass
18	4.3468	24.05	Pass

2-3. T6/T8 Test Result (P536070A1)

Cell Document Number	QDI-190919-C-P536070A1
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Crush (T6)			
NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle 50% charged state

C-1	3.8603	22.93	Pass
C-2	3.8603	23.75	Pass
C-3	3.8602	23.88	Pass
C-4	3.8585	24.16	Pass
C-5	3.8606	22.13	Pass

B. 25st cycle 50% charged state

C-6	3.8859	21.60	Pass
C-7	3.8823	23.19	Pass
C-8	3.8835	24.13	Pass
C-9	3.8795	23.94	Pass
C-10	3.8846	24.12	Pass

Forced Discharge (T8)							
NO.	Initial OCV(V)	Max. Temp (°C)	Result	NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully discharged state B. 25th cycle fully discharged state

C-6	3.4577	56.40	Pass	C-16	3.4649	65.47	Pass
C-7	3.4530	62.24	Pass	C-17	3.4656	62.52	Pass
C-8	3.4098	65.88	Pass	C-18	3.4558	63.25	Pass
C-9	3.4587	58.55	Pass	C-19	3.4685	63.66	Pass
C-10	3.4564	64.55	Pass	C-20	3.4694	64.39	Pass
C-11	3.4568	60.88	Pass	C-21	3.4656	62.26	Pass
C-12	3.4576	65.17	Pass	C-22	3.4677	65.45	Pass
C-13	3.4581	62.66	Pass	C-23	3.4681	64.93	Pass
C-14	3.4576	62.76	Pass	C-24	3.4652	66.05	Pass
C-15	3.4593	63.27	Pass	C-25	3.4732	66.23	Pass

3. Sample Image

