

UN38.3 Test Summary

The following product has been evaluated according to the 5th revised edition Amendment 2 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-160928-B-L16L6PC1	Test 1. Altitude Simulation	Pass
Date of test report	2016.09.28	Test 2. Thermal Test	Pass
Model name	L16L6PC1	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	11.58 V	Test 5. External Short Circuit	Pass
Capacity	72.0 Wh	Test 6. Impact or Crush	Pass
Weight	284.0 g	Test 7. Overcharge	Pass
Dimensions	244.94mm X 89.94mm X 8.90mm	Test 8. Forced Discharge	Pass

Reviewed By: Joohong Park
 IT & New Application Part Leader
 Global Standard Certification Team
 LG Chem, Ltd.
 E-mail: juhongpark@lgchem.com



Approved By: DaeHo Nam
 Team Leader
 Global Standard Certification Team
 LG Chem, Ltd.
 E-mail: kkammy@lgchem.com



문서번호	QDI-160928-B-L16L6PC1	
Prepared	남익현	
Reviewed	우민제	
Approved	남대호	

UN38.3 Test Report

- L16L6PC1 (Nom.72Wh, 11.58V)-

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2016. 09. 28

1. UN38.3 Test Condition

Rev.5 / Amd.2

Test item	Test Condition	Requirements	Etc.
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	<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 $1g \leq M \leq 75g$, less than 0.2%, 3) If $M > 75g$, less than 0.1% 	<p>T1~T5 : Sequence Tests</p> <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℃,6hr ↔ -40±2℃,6hr, interval max. 30min] x 10cycle 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 (peak acceleration : 150gn, pulse duration : 6msec) x 6 (±x, y, z), direction x 3 cycle		
Test 5. External Short Circuit	100mΩ ext. short-circuit at 55±2℃ 1hr continue after returning at 55±2℃		
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℃ 	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. General Information

1. Standard charge / discharge Condition

	Mode	Condition	End Condition
Charge	CC / CV	Current = 4298 mA Voltage = 13.2 V	Current = 362 mA
Discharge	CC	Current = 1250 mA	Voltage = 9.6 V

2. Cycle Condition

	Mode	Condition	End Condition
Charge	CC / CV	Current = 4298 mA Voltage = 13.2 V	Current = 362 mA
Discharge	CC	Current = 1250 mA	Voltage = 9.6 V

3. Test Condition

	Mode	Condition
Test 7. Overcharge	CC / CV	Max. Charge Current = 4298 mA CC/CV 2Imax (8.596A) 22V cut-off 24Hr
Test 8. Forced Discharge	CC	Max. Discharge Current = 3070 mA Duration Time = 60 min

3-1. 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	13.183	283.75	13.180	283.73	99.98	0.007	Pass	13.044	283.72	98.97	0.004	Pass	13.039	283.71	99.96	0.004	Pass	13.038	283.70	99.99	0.004	Pass
2	13.157	283.29	13.146	283.28	99.92	0.004	Pass	13.011	283.27	98.97	0.004	Pass	13.004	283.26	99.95	0.004	Pass	12.994	283.25	99.92	0.004	Pass
3	13.158	283.00	13.150	282.99	99.94	0.004	Pass	13.012	282.97	98.95	0.007	Pass	13.007	282.96	99.96	0.004	Pass	13.006	282.95	99.99	0.004	Pass
4	13.143	283.26	13.135	283.24	99.94	0.007	Pass	12.997	283.23	98.95	0.004	Pass	12.992	283.21	99.96	0.007	Pass	12.981	283.19	99.92	0.007	Pass

B. 50th cycle fully charged state

5	13.164	283.58	13.156	283.57	99.94	0.007	Pass	12.978	283.55	98.65	0.007	Pass	12.972	283.54	99.95	0.004	Pass	12.968	283.52	99.97	0.007	Pass
6	13.160	282.97	13.149	282.96	99.92	0.006	Pass	12.981	282.94	98.72	0.007	Pass	12.977	282.93	99.97	0.004	Pass	12.971	282.91	99.95	0.007	Pass
7	13.156	283.38	13.152	283.37	99.97	0.006	Pass	12.961	283.35	98.55	0.007	Pass	12.952	283.33	99.93	0.007	Pass	12.947	283.32	99.96	0.004	Pass
8	13.163	283.03	13.150	283.02	99.90	0.015	Pass	12.981	283.01	98.71	0.004	Pass	12.978	282.99	99.98	0.007	Pass	12.976	282.98	99.98	0.004	Pass

3-2. T5/T7 Test Result

EXT.Short Circuit (T5)			
NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully charged state

1	13.038	55.11	Pass
2	12.994	55.26	Pass
3	13.006	55.95	Pass
4	12.981	56.04	Pass

B. 50th cycle fully charged state

5	12.968	55.93	Pass
6	12.971	56.13	Pass
7	12.947	56.35	Pass
8	12.976	55.02	Pass

Over Charge (T7)			
NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully charged state

9	13.140	24.54	Pass
10	13.145	23.83	Pass
11	13.144	24.67	Pass
12	13.145	23.98	Pass

Over Charge (T7)			
NO.	Initial OCV(V)	Max. Temp (°C)	Result

B. 50th cycle fully charged state

13	13.128	24.90	Pass
14	13.129	23.31	Pass
15	13.126	23.58	Pass
16	13.123	23.64	Pass

3-3. T6/T8 Test Result (P4043B0A1)

Crush (T6)			
NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle 50% charged state

C-1	3.849	23.13	Pass
C-2	3.866	23.24	Pass
C-3	3.874	23.12	Pass
C-4	3.867	23.21	Pass
C-5	3.846	23.10	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

C-6	3.012	46.88	Pass
C-7	3.016	45.91	Pass
C-8	3.021	44.73	Pass
C-9	3.019	47.16	Pass
C-10	3.051	48.71	Pass
C-11	3.048	47.87	Pass
C-12	3.042	47.58	Pass
C-13	3.035	47.96	Pass
C-14	3.048	46.81	Pass
C-15	3.017	47.55	Pass

B. 50th cycle fully discharged state

C-16	3.115	44.86	Pass
C-17	3.192	45.29	Pass
C-18	3.152	44.54	Pass
C-19	3.142	44.63	Pass
C-20	3.186	45.71	Pass
C-21	3.122	45.85	Pass
C-22	3.216	46.82	Pass
C-23	3.208	45.44	Pass
C-24	3.195	44.96	Pass
C-25	3.186	46.87	Pass

4. Sample Image

