

# UN38.3 Test Summary

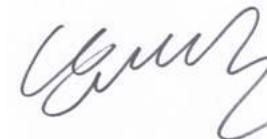
The following product has been evaluated according to the 5th revised edition Amendment 2 of the UN Manual of Tests and Criteria.  
We, LG Chem, Ltd., hereby certify that this battery meets the requirements of the regulation for transportation of lithium-ion cells, batteries and single cell batteries.


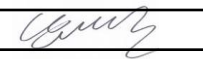

Manufacture's contact information	LG Chem, Ltd. 128 Yeoui-Daero, Yeongdeungpo-gu, SEOUL, 150-721, REPUBLIC OF KOREA Telephone : +86-10-7742-5427      E-mail : kkammy@lgchem.com      Website : <a href="http://www.lgchem.com">www.lgchem.com</a>		
Test Laboratory information	LG Chem, Ltd. / RESEARCH PARK 188 Munjiro, Yuseong-gu, Daejeon, 305-738, REPUBLIC OF KOREA Telephone : +82-10-3099-3724      E-mail : juhongpark@lgchem.com      Website : <a href="http://www.lgchem.com">www.lgchem.com</a>		
	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 : <a href="http://www.lgchem.com">www.lgchem.com</a>		
Description		List of Test Completed	
Test Report Number	QAE-EF02-151126-B-L15L4PC0	Test 1. Altitude Simulation	Pass
Date of test report	2015.11.26	Test 2. Thermal Test	Pass
Model name	L15L4PC0	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	7.6 V	Test 5. External Short Circuit	Pass
Capacity	46.0 Wh	Test 6. Impact or Crush	Pass
Weight	209.0 g	Test 7. Overcharge	Pass
Dimensions	246.60mm X 92.00mm X 6.95mm	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	QAE-EF02-151126-B-L15L4PC0	
Prepared	남익현	
	장승현	
Reviewed	남대호	
	박광민	
Approved	김병수	

# UN38.3 Test Report

## - L15L4PC0 (Nom.46Wh, 7.6V)-

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2015. 11. 26

# 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"> <li>- After OCV (%) ≥ 90%</li> <li>- No leakage, no venting, no disassembly, no rupture, no fire</li> <li>- Mass loss limit (leakage)                             <ul style="list-style-type: none"> <li>1) If M&lt;1g, less than 0.5%,</li> <li>2) If 1g≤M≤75g, less than 0.2%,</li> <li>3) If M&gt;75g, less than 0.1%)</li> </ul> </li> </ul>	<p>T1~T5 : Sequence Tests</p> <pre> graph TD     T1[Test 1 Altitude Simulation] --&gt; T2[Test 2 Thermal Test]     T2 --&gt; T3[Test 3 Vibration]     T3 --&gt; T4[Test 4 Shock]     T4 --&gt; 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"> <li>- No disassembly, no fire within 6 hours after the test</li> <li>- Max. Temp ≤ 170℃</li> </ul>	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"> <li>- No disassembly, no fire within 7 days after the test</li> </ul>	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"> <li>- No disassembly, no fire within 7 days after the test</li> </ul>	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	8.653	208.88	8.653	208.88	100.00	0.000	Pass	8.544	208.87	98.74	0.005	Pass	8.543	208.84	99.99	0.014	Pass	8.542	208.83	99.99	0.005	Pass
2	8.653	208.39	8.653	208.39	100.00	0.000	Pass	8.547	208.38	98.77	0.005	Pass	8.544	208.37	99.96	0.005	Pass	8.541	208.37	99.96	0.000	Pass
3	8.654	208.30	8.652	208.29	99.98	0.005	Pass	8.540	208.27	98.71	0.010	Pass	8.538	208.25	99.98	0.010	Pass	8.536	208.25	99.98	0.000	Pass
4	8.653	208.75	8.652	208.75	99.99	0.000	Pass	8.550	208.75	98.82	0.000	Pass	8.550	208.74	100.00	0.005	Pass	8.547	208.74	99.96	0.000	Pass

## B. 50th cycle fully charged state

5	8.651	208.50	8.648	208.50	99.97	0.000	Pass	8.541	208.48	98.76	0.010	Pass	8.540	208.46	99.99	0.010	Pass	8.538	208.45	99.98	0.005	Pass
6	8.652	208.32	8.649	208.32	99.97	0.000	Pass	8.533	208.31	98.66	0.005	Pass	8.531	208.29	99.98	0.010	Pass	8.528	208.29	99.96	0.000	Pass
7	8.648	208.71	8.645	208.71	99.97	0.000	Pass	8.544	208.71	98.83	0.000	Pass	8.541	208.70	99.96	0.005	Pass	8.538	208.70	99.96	0.000	Pass
8	8.649	208.65	8.646	208.65	99.97	0.000	Pass	8.546	208.63	98.84	0.010	Pass	8.544	208.62	99.98	0.005	Pass	8.544	208.62	100.00	0.000	Pass

# 2-2. T5/T7 Test Result

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

**A. 1st cycle fully charged state**

1	8.542	55.04	Pass
2	8.541	55.21	Pass
3	8.536	54.63	Pass
4	8.547	56.29	Pass

**B. 50th cycle fully charged state**

5	8.538	56.00	Pass
6	8.528	55.10	Pass
7	8.538	55.19	Pass
8	8.544	55.76	Pass

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

**A. 1st cycle fully charged state**

9	8.650	25.83	Pass
10	8.645	24.73	Pass
11	8.643	25.10	Pass
12	8.646	24.56	Pass

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

**B. 50th cycle fully charged state**

13	8.621	26.04	Pass
14	8.629	26.15	Pass
15	8.627	25.73	Pass
16	8.621	25.37	Pass

# 2-3. T6/T8 Test Result (ICP596766L1)

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

**A. 1st cycle 50% charged state**

C-1	3.843	22.71	Pass
C-2	3.851	22.74	Pass
C-3	3.848	23.03	Pass
C-4	3.848	23.39	Pass
C-5	3.746	23.49	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	3.056	46.41	Pass
C-7	3.027	48.90	Pass
C-8	3.035	46.80	Pass
C-9	3.046	49.04	Pass
C-10	3.031	47.18	Pass
C-11	3.046	49.27	Pass
C-12	3.050	48.11	Pass
C-13	3.061	48.30	Pass
C-14	3.055	46.83	Pass
C-15	3.053	47.64	Pass

**B. 50th cycle fully discharged state**

C-16	3.076	45.57	Pass
C-17	3.061	45.37	Pass
C-18	3.114	45.35	Pass
C-19	3.051	46.11	Pass
C-20	3.068	44.59	Pass
C-21	3.075	45.62	Pass
C-22	3.049	46.28	Pass
C-23	3.054	44.44	Pass
C-24	3.085	44.66	Pass
C-25	3.123	44.64	Pass

# 2-3. T6/T8 Test Result (ICP345578L1)

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

## A. 1st cycle 50% charged state

C-1	3.856	22.57	Pass
C-2	3.857	22.44	Pass
C-3	3.856	22.42	Pass
C-4	3.857	22.47	Pass
C-5	3.856	22.48	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	3.112	46.32	Pass
C-7	3.110	45.74	Pass
C-8	3.109	44.21	Pass
C-9	3.115	47.13	Pass
C-10	3.109	48.21	Pass
C-11	3.116	47.56	Pass
C-12	3.108	47.46	Pass
C-13	3.114	47.20	Pass
C-14	3.110	48.49	Pass
C-15	3.114	47.32	Pass

## B. 50th cycle fully discharged state

C-16	3.221	44.84	Pass
C-17	3.222	44.26	Pass
C-18	3.218	43.21	Pass
C-19	3.220	44.56	Pass
C-20	3.217	45.26	Pass
C-21	3.225	45.52	Pass
C-22	3.219	46.79	Pass
C-23	3.220	44.52	Pass
C-24	3.222	44.82	Pass
C-25	3.216	42.69	Pass

# 3. Sample Image

