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CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 6th revised edition 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.

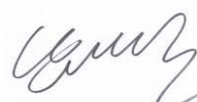
<input type="checkbox"/> Lithium-ion cell <input checked="" type="checkbox"/> Lithium-ion battery <input type="checkbox"/> Lithium-ion single cell battery	
Model name	L17L3PH0
Cell Model name	ICP2690105L1
Nominal voltage	11.55 V
Electric power capacity	48 Wh

Reviewed By: MinJe Woo

Approved By: DaeHo Nam



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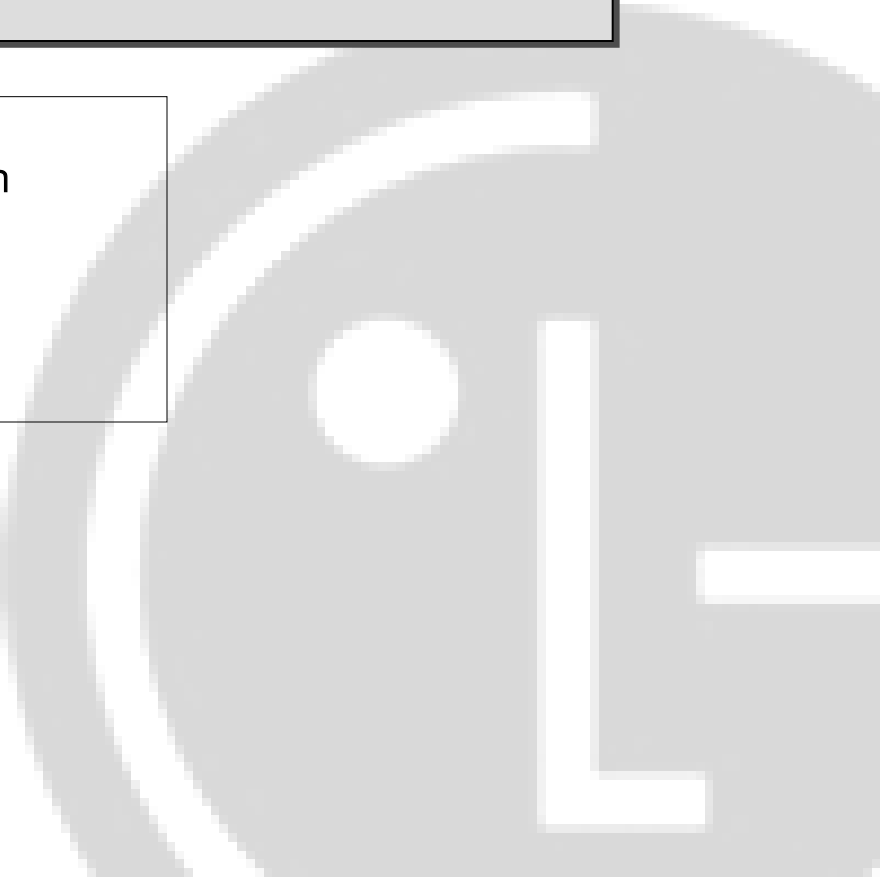
UN38.3 Test Report

- L17L3PH0 (Nom.48Wh, 11.55V) -

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2017. 11. 15



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℃		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℃,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	<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℃ 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℃	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - No disassembly, no fire within 6 hours after the test - Max. Temp ≤ 170℃ 	for cylindrical cells (dia ≥ 18mm)
Test 6. Crush	Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation		for cylindrical cells (dia < 18mm) 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 $Rt = \frac{12V + Vc}{Max\ discharge\ current}$ - Rc-Rw

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	13.175	198.077	13.170	198.073	99.96	0.002	Pass	12.994	198.070	98.66	0.002	Pass	12.991	198.065	99.98	0.003	Pass	12.985	198.057	99.95	0.004	Pass
2	13.179	198.093	13.168	198.090	99.92	0.002	Pass	12.965	198.083	98.46	0.004	Pass	12.962	198.074	99.98	0.005	Pass	12.951	198.068	99.92	0.003	Pass
3	13.181	198.133	13.170	198.125	99.92	0.004	Pass	12.997	198.119	98.69	0.003	Pass	12.989	198.108	99.94	0.006	Pass	12.982	198.104	99.95	0.002	Pass
4	13.188	198.088	13.179	198.087	99.93	0.001	Pass	12.993	198.082	98.59	0.003	Pass	12.988	198.074	99.96	0.004	Pass	12.980	198.071	99.94	0.002	Pass

B. 50th cycle fully charged state

5	13.175	198.088	13.166	198.082	99.93	0.003	Pass	12.976	198.078	98.56	0.002	Pass	12.970	198.074	99.95	0.002	Pass	12.961	198.072	99.93	0.001	Pass
6	13.170	198.093	13.163	198.087	99.95	0.003	Pass	12.995	198.081	98.72	0.003	Pass	12.988	198.074	99.95	0.004	Pass	12.978	198.071	99.92	0.002	Pass
7	13.178	198.097	13.174	198.087	99.97	0.005	Pass	12.952	198.086	98.31	0.001	Pass	12.944	198.080	99.94	0.003	Pass	12.936	198.075	99.94	0.003	Pass
8	13.181	198.128	13.175	198.122	99.95	0.003	Pass	13.008	198.121	98.73	0.001	Pass	13.002	198.118	99.95	0.002	Pass	12.993	198.113	99.93	0.003	Pass

3-2. 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	12.985	56.59	Pass
2	12.951	56.24	Pass
3	12.982	56.20	Pass
4	12.980	56.93	Pass

B. 50th cycle fully charged state

5	12.961	56.50	Pass
6	12.978	56.36	Pass
7	12.936	56.09	Pass
8	12.993	56.81	Pass

Over Charge (T7)

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

9	13.143	25.74	Pass
10	13.142	24.82	Pass
11	13.148	25.53	Pass
12	13.141	25.53	Pass

Over Charge (T7)

NO.	Initial OCV(V)	Max. Temp (°C)	Result
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B. 50th cycle fully charged state

13	13.127	24.44	Pass
14	13.129	25.43	Pass
15	13.121	25.48	Pass
16	13.129	25.80	Pass

3-3. T6/T8 Test Result (P2690A5A1)

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

A. 1st cycle 50% charged state

C-1	3.799	22.68	Pass
C-2	3.800	22.70	Pass
C-3	3.801	22.66	Pass
C-4	3.800	22.63	Pass
C-5	3.800	22.64	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	3.248	65.65	Pass
C-7	3.238	68.23	Pass
C-8	3.224	71.33	Pass
C-9	3.233	62.52	Pass
C-10	3.328	64.49	Pass
C-11	3.328	58.87	Pass
C-12	3.323	64.58	Pass
C-13	3.318	74.67	Pass
C-14	3.313	70.97	Pass
C-15	3.317	78.23	Pass

B. 50th cycle fully discharged state

C-16	3.424	60.79	Pass
C-17	3.430	62.86	Pass
C-18	3.442	66.43	Pass
C-19	3.430	62.24	Pass
C-20	3.444	61.85	Pass
C-21	3.484	67.13	Pass
C-22	3.402	61.80	Pass
C-23	3.435	61.84	Pass
C-24	3.438	59.35	Pass
C-25	3.450	58.53	Pass

4. Sample Image

