



CONFIDENTIAL

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CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 5th revised edition Amendment2 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 and 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	L17L2PF1
Cell Model name	P595490A4
Nominal voltage	7.56 V
Electric power capacity	30 Wh

Conducted By: Min Je Woo

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UN38.3 Test Report

- L17L2PF0 (Nom.30Wh, 7.56V) -

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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

2. General Information

1. Standard charge / discharge Condition

	Mode	Condition	End Condition
Charge	CC / CV	Current = 3968 mA Voltage = 7.56 V	Current = 196 mA
Discharge	CC	Current = 785 mA	Voltage = 6.0 V

2. Cycle Condition

	Mode	Condition	End Condition
Charge	CC / CV	Current = 3968 mA Voltage = 7.56 V	Current = 196 mA
Discharge	CC	Current = 785 mA	Voltage = 6.0 V

3. Test Condition

	Mode	Condition
Test 7. Overcharge	CC / CV	Max. Charge Current = 4708 mA CC/CV 2Imax (9416mA) 17.4 V cut-off 24Hr
Test 8. Forced Discharge	CC	Max. Discharge Current = 8000 mA Duration Time = 29.7 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	8.686	136.72	8.680	136.71	99.93	0.007	Pass	8.586	136.71	98.92	0.000	Pass	8.585	136.71	99.99	0.000	Pass	8.577	136.71	99.91	0.000	Pass
2	8.686	136.71	8.678	136.70	99.91	0.007	Pass	8.585	136.70	98.93	0.000	Pass	8.578	136.70	99.92	0.000	Pass	8.574	136.70	99.95	0.000	Pass
3	8.687	136.72	8.680	136.72	99.92	0.000	Pass	8.593	136.72	99.00	0.000	Pass	8.588	136.71	99.94	0.007	Pass	8.587	136.71	99.99	0.000	Pass
4	8.670	136.70	8.663	136.70	99.92	0.000	Pass	8.569	136.69	98.91	0.007	Pass	8.562	136.69	99.92	0.000	Pass	8.557	136.69	99.94	0.000	Pass

B. 50th cycle fully charged state

5	8.690	136.74	8.686	136.74	99.95	0.000	Pass	8.596	136.74	98.96	0.000	Pass	8.593	136.74	99.97	0.000	Pass	8.592	136.74	99.99	0.000	Pass
6	8.690	136.71	8.685	136.71	99.94	0.000	Pass	8.590	136.70	98.91	0.007	Pass	8.588	136.70	99.98	0.000	Pass	8.586	136.70	99.98	0.000	Pass
7	8.679	136.73	8.678	136.73	99.99	0.000	Pass	8.588	136.73	98.96	0.000	Pass	8.585	136.72	99.97	0.007	Pass	8.577	136.72	99.91	0.000	Pass
8	8.681	136.74	8.678	136.74	99.97	0.000	Pass	8.586	136.74	98.94	0.000	Pass	8.585	136.74	99.99	0.000	Pass	8.578	136.73	99.92	0.007	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	8.577	56.42	Pass
2	8.574	56.66	Pass
3	8.587	56.38	Pass
4	8.557	56.58	Pass

B. 50th cycle fully charged state

5	8.592	56.87	Pass
6	8.588	56.15	Pass
7	8.577	56.42	Pass
8	8.578	56.32	Pass

Over Charge (T7)

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

9	8.692	24.69	Pass
10	8.695	24.72	Pass
11	8.691	24.32	Pass
12	8.693	24.34	Pass

Over Charge (T7)

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

13	8.687	24.29	Pass
14	8.691	24.23	Pass
15	8.684	24.37	Pass
16	8.691	24.24	Pass

3-3. T6/T8 Test Result (P595490A4)

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

A. 1st cycle 50% charged state

C-1	3.828	22.89	Pass
C-2	3.828	22.88	Pass
C-3	3.828	22.84	Pass
C-4	3.828	22.85	Pass
C-5	3.829	22.83	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	2.994	56.00	Pass
C-7	3.031	53.62	Pass
C-8	3.028	56.40	Pass
C-9	2.994	55.34	Pass
C-10	2.990	55.47	Pass
C-11	3.000	54.47	Pass
C-12	2.987	57.32	Pass
C-13	3.015	55.50	Pass
C-14	2.938	49.76	Pass
C-15	2.944	48.16	Pass

B. 50th cycle fully discharged state

C-16	3.270	51.33	Pass
C-17	3.266	54.33	Pass
C-18	3.252	55.62	Pass
C-19	3.253	55.40	Pass
C-20	3.288	55.51	Pass
C-21	3.252	56.10	Pass
C-22	3.281	56.91	Pass
C-23	3.282	56.12	Pass
C-24	3.295	55.44	Pass
C-25	3.299	56.63	Pass

4. Sample Image

