



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	L17L2PB4
Cell Model name	ICP595490C2
Nominal voltage	7.72 V
Electric power capacity	39 Wh

Conducted By: Min Je Woo

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UN38.3 Test Report

- L17L2PB4 (Nom.39Wh, 7.72V) -

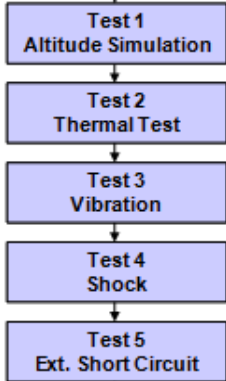
Index

- 1. UN38.3 Test Condition
- 2. General Information
- 3. Test Result
- 4. Sample Image

2017. 07. 06



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℃	<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% 	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 1g) 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℃	<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 (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 = 2460 mA Voltage = 8.8 V	Current = 246 mA
Discharge	CC	Current = 984 mA	Voltage = 6.0 V

2. Cycle Condition

	Mode	Condition	End Condition
Charge	CC / CV	Current = 2460 mA Voltage = 8.8 V	Current = 246 mA
Discharge	CC	Current = 984 mA	Voltage = 6.0 V

3. Test Condition

	Mode	Condition
Test 7. Overcharge	CC / CV	Max. Charge Current = 2706 mA CC/CV 2Imax (5412mA) 17.6 V cut-off 24Hr
Test 8. Forced Discharge	CC	Max. Discharge Current = 4920 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	8.785	155.09	8.778	155.08	99.92	0.006	Pass	8.635	154.99	98.37	0.058	Pass	8.633	154.98	99.98	0.006	Pass	8.629	154.98	99.95	0.000	Pass
2	8.783	155.02	8.776	155.02	99.92	0.000	Pass	8.670	155.01	98.79	0.006	Pass	8.666	155.00	99.95	0.006	Pass	8.644	155.00	99.75	0.000	Pass
3	8.781	155.07	8.778	155.06	99.97	0.006	Pass	8.669	155.00	98.76	0.039	Pass	8.666	154.99	99.97	0.006	Pass	8.625	154.99	99.53	0.000	Pass
4	8.781	155.07	8.777	155.07	99.95	0.000	Pass	8.664	155.01	98.71	0.039	Pass	8.661	155.01	99.97	0.000	Pass	8.635	155.00	99.70	0.006	Pass

B. 50th cycle fully charged state

5	8.781	155.04	8.776	155.04	99.94	0.000	Pass	8.644	155.03	98.50	0.006	Pass	8.639	155.03	99.94	0.000	Pass	8.637	155.02	99.98	0.006	Pass
6	8.777	155.06	8.775	155.05	99.98	0.006	Pass	8.648	155.04	98.55	0.006	Pass	8.635	154.98	99.85	0.039	Pass	8.632	154.98	99.97	0.000	Pass
7	8.782	155.06	8.779	155.06	99.97	0.000	Pass	8.645	155.04	98.47	0.013	Pass	8.633	155.02	99.86	0.013	Pass	8.629	155.02	99.95	0.000	Pass
8	8.785	155.09	8.780	155.09	99.94	0.000	Pass	8.648	155.03	98.50	0.039	Pass	8.633	155.03	99.83	0.000	Pass	8.633	155.02	100.00	0.006	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	8.629	55.31	Pass
2	8.644	55.58	Pass
3	8.625	55.65	Pass
4	8.635	55.87	Pass

B. 50th cycle fully charged state

5	8.637	55.51	Pass
6	8.632	55.20	Pass
7	8.629	55.58	Pass
8	8.633	55.18	Pass

Over Charge (T7)

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

9	8.645	24.53	Pass
10	8.641	25.58	Pass
11	8.644	25.66	Pass
12	8.643	25.94	Pass

Over Charge (T7)

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

13	8.620	26.08	Pass
14	8.627	24.36	Pass
15	8.628	25.97	Pass
16	8.626	25.78	Pass

3-3. T6/T8 Test Result (ICP595490C2)

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

A. 1st cycle 50% charged state

C-1	3.894	21.28	Pass
C-2	3.898	21.45	Pass
C-3	3.901	21.34	Pass
C-4	3.887	21.49	Pass
C-5	3.891	21.38	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	3.119	42.74	Pass
C-7	3.112	42.87	Pass
C-8	3.082	40.83	Pass
C-9	3.112	41.56	Pass
C-10	3.087	41.29	Pass
C-11	3.079	41.32	Pass
C-12	3.110	40.56	Pass
C-13	3.085	43.44	Pass
C-14	3.116	42.94	Pass
C-15	3.110	42.90	Pass

B. 50th cycle fully discharged state

C-16	3.126	42.99	Pass
C-17	3.117	40.38	Pass
C-18	3.126	43.11	Pass
C-19	3.106	41.94	Pass
C-20	3.138	40.67	Pass
C-21	3.122	42.08	Pass
C-22	3.148	41.68	Pass
C-23	3.155	43.03	Pass
C-24	3.148	41.46	Pass
C-25	3.109	40.88	Pass

4. Sample Image

