



CONFIDENTIAL

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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	AP16L8J
Cell Model name	P359190D1
Nominal voltage	7.50V
Electric power capacity	36.50Wh

Approved By: Xuyuan

Assistant Manager

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UN38.3 Test Report

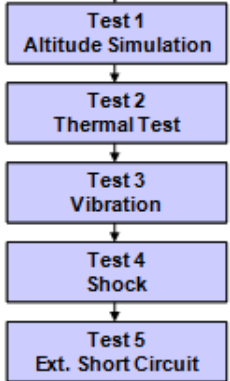
– AP16L8J (Nom. 36.50Wh, 7.50V) –

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2018. 10. 17

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°C	<ul style="list-style-type: none"> - After OCV (%) $\geq 90\%$ - 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 
Test 2. Thermal Test	[72±2°C, 6hr ↔ -40±2°C, 6hr, interval max. 30min] x 10 cycle Storing at 20±5°C 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 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°C in chamber (Measured on external case) 2) Less than 0.1Ω, ext. short-circuit at 57±4°C 3) 1hr continue after returning to 57±4°C		
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 $\leq 170^\circ C$ 	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 $\leq 18V$, 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)

2-1. T1-T4 Test Result

Before			Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
NO.	OCV	Mass	OCV	Mass	After OCV(%)	Mass Loss(%)	Result	OCV	Mass	After OCV(%)	Mass Loss(%)	Result	OCV	Mass	After OCV(%)	Mass Loss(%)	Result	OCV	Mass	After OCV(%)	Mass Loss(%)	Result

A. 1st cycle fully charged state

1	8.6132	151.53	8.6100	151.51	99.96	0.013	Pass	8.4466	151.46	98.10	0.033	Pass	8.4458	151.47	99.99	0.000	Pass	8.4405	151.49	99.94	0.000	Pass
2	8.6109	151.60	8.6076	151.57	99.96	0.020	Pass	8.4463	151.53	98.13	0.026	Pass	8.4455	151.54	99.99	0.000	Pass	8.4402	151.56	99.94	0.000	Pass
3	8.6110	151.71	8.6075	151.69	99.96	0.013	Pass	8.4457	151.64	98.12	0.033	Pass	8.4449	151.64	99.99	0.000	Pass	8.4398	151.66	99.94	0.000	Pass
4	8.6137	151.69	8.6103	151.67	99.96	0.013	Pass	8.4472	151.62	98.11	0.033	Pass	8.4463	151.64	99.99	0.000	Pass	8.4412	151.65	99.94	0.000	Pass

B. 50th cycle fully charged state

5	8.6151	151.71	8.6125	151.67	99.97	0.026	Pass	8.4523	151.63	98.14	0.026	Pass	8.4513	151.63	99.99	0.000	Pass	8.4461	151.66	99.94	0.000	Pass
6	8.6162	151.39	8.6137	151.38	99.97	0.007	Pass	8.4522	151.32	98.13	0.040	Pass	8.4514	151.32	99.99	0.000	Pass	8.4460	151.34	99.94	0.000	Pass
7	8.6169	151.47	8.6143	151.44	99.97	0.020	Pass	8.4528	151.39	98.13	0.033	Pass	8.4520	151.41	99.99	0.000	Pass	8.4466	151.41	99.94	0.000	Pass
8	8.6203	151.53	8.6177	151.51	99.97	0.013	Pass	8.4565	151.46	98.13	0.033	Pass	8.4557	151.47	99.99	0.000	Pass	8.4504	151.49	99.94	0.000	Pass

2-2. 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	8.4405	58.60	Pass
2	8.4402	58.26	Pass
3	8.4398	57.66	Pass
4	8.4412	57.27	Pass

B. 50th cycle fully charged state

5	8.4461	58.47	Pass
6	8.4460	58.52	Pass
7	8.4466	57.67	Pass
8	8.4504	57.11	Pass

Overcharge (T7)

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

9	8.5875	29.05	Pass
10	8.5906	98.04	Pass
11	8.5927	97.03	Pass
12	8.5902	69.61	Pass

B. 50th cycle fully charged state

13	8.6037	52.92	Pass
14	8.5954	46.37	Pass
15	8.5996	74.11	Pass
16	8.6013	22.60	Pass

2-3. T6/T8 Test Result (P359190D1)

Crush (T6)

NO.	Initial OCV(V)	Max. Temp (°C)	Result
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A. 1st cycle 50% charged state

C-1	3.7922	22.57	Pass
C-2	3.7930	23.56	Pass
C-3	3.7948	21.19	Pass
C-4	3.7933	21.46	Pass
C-5	3.7936	22.13	Pass

Forced Discharge (T8)

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

C-6	3.2017	71.78	Pass	C-16	3.2918	69.15	Pass
C-7	3.2029	69.58	Pass	C-17	3.2786	68.06	Pass
C-8	3.2027	79.40	Pass	C-18	3.2873	74.69	Pass
C-9	3.2032	79.52	Pass	C-19	3.2932	63.42	Pass
C-10	3.2098	77.25	Pass	C-20	3.2988	70.32	Pass
C-11	3.2041	74.56	Pass	C-21	3.2974	65.01	Pass
C-12	3.2060	76.33	Pass	C-22	3.2890	68.95	Pass
C-13	3.2049	67.73	Pass	C-23	3.2988	69.07	Pass
C-14	3.2008	66.94	Pass	C-24	3.2844	68.32	Pass
C-15	3.2009	70.41	Pass	C-25	3.2820	69.43	Pass

B. 50th cycle fully discharged state

3. Sample Image

