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UN38.3 Test Summary

The following product has been evaluated according to the 6th revised edition Amendment 1 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.

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Description		List of Test Completed	
Test Report Number	QDI-190319-B-L18L4PE0	Test 1. Altitude Simulation	Pass
Date of test report	2019.03.19	Test 2. Thermal Test	Pass
Model name	L18L4PE0	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	7.74 V	Test 5. External Short Circuit	Pass
Capacity	51.00Wh	Test 6. Impact or Crush	Pass
Weight	Max 194.84g	Test 7. Overcharge	Pass
Dimensions	Max243.25mmX86.15mmX4.8mm	Test 8. Forced Discharge	Pass

Approved By: Yuan Xu
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UN38.3 Test Report
- L18L4PE0 (Nom. 51.00Wh, 7.74V) -

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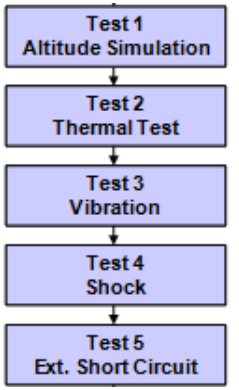
2019. 03. 19

LG Chem

1. UN38.3 Test Condition

Rev.6 Amendment 1

Test item	Test Condition	Requirements	Etc.
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- After OCV (%) ≥ 90% - No leakage, no venting, no disassembly, no rupture, no fire - Mass loss limit (leakage) 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%)	T1~T5 : Sequence Tests 
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 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℃	- 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	- 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)	- 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	- 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 (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	8.8023	194.40	8.7982	194.40	99.95	0.000	Pass	8.5823	194.33	97.55	0.036	Pass	8.5800	194.33	99.97	0.000	Pass	8.5778	194.34	99.97	0.000	Pass
2	8.7987	194.50	8.7944	194.49	99.95	0.005	Pass	8.5813	194.42	97.58	0.036	Pass	8.5793	194.42	99.98	0.000	Pass	8.5772	194.43	99.98	0.000	Pass
3	8.8016	194.55	8.7974	194.54	99.95	0.005	Pass	8.5840	194.47	97.57	0.036	Pass	8.5820	194.48	99.98	0.000	Pass	8.5798	194.49	99.97	0.000	Pass
4	8.8037	194.73	8.7994	194.73	99.95	0.000	Pass	8.5810	194.66	97.52	0.036	Pass	8.5790	194.66	99.98	0.000	Pass	8.5769	194.67	99.98	0.000	Pass
B. 25th cycle fully charged state																						
5	8.8197	194.60	8.8168	194.60	99.97	0.000	Pass	8.6130	194.53	97.69	0.036	Pass	8.6107	194.53	99.97	0.000	Pass	8.6087	194.54	99.98	0.000	Pass
6	8.8174	194.84	8.8145	194.84	99.97	0.000	Pass	8.6126	194.78	97.71	0.031	Pass	8.6106	194.77	99.98	0.005	Pass	8.6084	194.79	99.97	0.000	Pass
7	8.8236	194.62	8.8206	194.61	99.97	0.005	Pass	8.6158	194.55	97.68	0.031	Pass	8.6136	194.55	99.97	0.000	Pass	8.6114	194.56	99.97	0.000	Pass
8	8.8166	194.36	8.8136	194.36	99.97	0.000	Pass	8.6137	194.30	97.73	0.031	Pass	8.6116	194.29	99.98	0.005	Pass	8.6094	194.31	99.97	0.000	Pass

2-2. T5/T7 Test Result

EXT.Short Circuit (T5)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
1	8.5778	58.19	Pass
2	8.5772	57.54	Pass
3	8.5798	56.79	Pass
4	8.5769	57.40	Pass
B. 25th cycle fully charged state			
5	8.6087	58.22	Pass
6	8.6084	57.64	Pass
7	8.6114	57.50	Pass
8	8.6094	56.91	Pass

Over Charge (T7)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
9	8.8010	23.41	Pass
10	8.7979	23.05	Pass
11	8.7980	23.11	Pass
12	8.7982	23.01	Pass

Over Charge (T7)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 25th cycle fully charged state			
13	8.8188	22.87	Pass
14	8.7580	22.70	Pass
15	8.8151	22.66	Pass
16	8.8139	22.44	Pass

2-3. T6/T8 Test Result (P4241B0A1)

Cell Document Number	QDI-190319-C-P4241B0A1

Crush (T6)

A. 1st cycle 50% charged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result
C-1	3.8691	19.56	Pass
C-2	3.8684	20.39	Pass
C-3	3.8701	19.67	Pass
C-4	3.8711	19.59	Pass
C-5	3.8693	19.37	Pass

B. 25st cycle 50% charged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result
C-6	3.8885	18.50	Pass
C-7	3.8908	18.47	Pass
C-8	3.8876	18.62	Pass
C-9	3.8884	18.52	Pass
C-10	3.8891	18.64	Pass

Forced Discharge (T8)

A. 1st cycle fully discharged state / **B. 25th cycle fully discharged state**

NO.	Initial OCV(V)	Max. Temp (℃)	Result	NO.	Initial OCV(V)	Max. Temp (℃)	Result
C-6	3.4862	101.16	Pass	C-16	3.5322	76.94	Pass
C-7	3.4750	78.70	Pass	C-17	3.5335	86.59	Pass
C-8	3.4911	80.00	Pass	C-18	3.5180	83.94	Pass
C-9	3.4863	85.32	Pass	C-19	3.5364	82.45	Pass
C-10	3.4879	92.70	Pass	C-20	3.5401	85.54	Pass
C-11	3.4700	103.50	Pass	C-21	3.5308	86.24	Pass
C-12	3.4805	87.16	Pass	C-22	3.5272	88.58	Pass
C-13	3.4815	92.41	Pass	C-23	3.4869	80.61	Pass
C-14	3.4823	79.62	Pass	C-24	3.5348	86.15	Pass
C-15	3.4845	94.53	Pass	C-25	3.5356	97.70	Pass

3. Sample Image