

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-190929-B-L19L4PF1	Test 1. Altitude Simulation	Pass
Date of test report	2019.09.29	Test 2. Thermal Test	Pass
Model name	L19L4PF1	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	15.12 V	Test 5. External Short Circuit	Pass
Capacity	70.00Wh	Test 6. Impact or Crush	Pass
Weight	294.04g	Test 7. Overcharge	Pass
Dimensions	320.75mmX112.15mmX6.70mm	Test 8. Forced Discharge	Pass

Approved By: Yuan Xu
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Document Number	QDI-190929-B-L19L4PF1	
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UN38.3 Test Report

– L19L4PF1 (Nom. 70.00Wh, 15.12V) –

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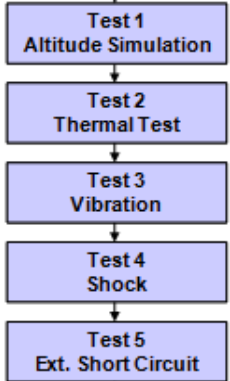
1. UN38.3 Test Condition
2. Test Result
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2019. 09. 29



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°C	- 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°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 $\sqrt{\frac{100850}{\text{Mass(kg)}}}$ 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	- No disassembly, no fire within 6 hours after the test - Max. Temp ≤ 170°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 ≤ 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	17.1348	294.04	17.1316	294.01	99.98	0.010	Pass	16.8456	293.94	98.33	0.024	Pass	16.4928	293.95	97.91	0.000	Pass	16.4904	293.96	99.99	0.000	Pass
2	17.1432	293.32	17.1398	293.31	99.98	0.003	Pass	16.5100	293.23	96.33	0.027	Pass	16.5123	293.25	100.00	0.000	Pass	16.5088	293.25	99.98	0.000	Pass
3	17.1359	293.05	17.1326	293.02	99.98	0.010	Pass	16.5063	292.96	96.34	0.020	Pass	16.5043	292.97	99.99	0.000	Pass	16.4995	292.98	99.97	0.000	Pass
4	17.1338	292.89	17.1308	292.87	99.98	0.007	Pass	16.5067	292.80	96.36	0.024	Pass	16.5084	292.81	100.00	0.000	Pass	16.5043	292.83	99.98	0.000	Pass

B. 25th cycle fully charged state

5	17.2453	292.97	17.2410	292.97	99.98	0.000	Pass	16.5682	292.93	96.10	0.014	Pass	16.5674	292.94	100.00	0.000	Pass	16.5671	292.94	100.00	0.000	Pass
6	17.2470	292.73	17.2431	292.71	99.98	0.007	Pass	16.5420	292.66	95.93	0.017	Pass	16.5455	292.68	100.00	0.000	Pass	16.5416	292.67	99.98	0.003	Pass
7	17.2470	293.23	17.2430	293.23	99.98	0.000	Pass	16.5445	293.18	95.95	0.017	Pass	16.5475	293.18	100.00	0.000	Pass	16.5442	293.19	99.98	0.000	Pass
8	17.2456	292.94	17.2415	292.94	99.98	0.000	Pass	16.5431	292.88	95.95	0.020	Pass	16.5458	292.90	100.00	0.000	Pass	16.5434	292.90	99.99	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	16.4904	58.16	Pass
2	16.5088	58.05	Pass
3	16.4995	56.96	Pass
4	16.5043	57.22	Pass

B. 25th cycle fully charged state

5	16.5671	58.08	Pass
6	16.5416	58.08	Pass
7	16.5442	57.21	Pass
8	16.5434	57.25	Pass

Over Charge (T7)

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

9	16.7716	24.72	Pass
10	16.7795	24.72	Pass
11	16.7786	24.62	Pass
12	16.7748	24.32	Pass

Over Charge (T7)

NO.	Initial OCV(V)	Max. Temp (°C)	Result
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B. 25th cycle fully charged state

13	16.8918	24.48	Pass
14	16.8762	24.21	Pass
15	16.8854	24.38	Pass
16	16.8875	24.15	Pass

2-3. T6/T8 Test Result (P595490B4)

Cell Document Number

QDI-190704-C-P595490B4

Crush (T6)

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

11	3.8220	22.71	Pass
12	3.8231	22.21	Pass
13	3.8646	22.30	Pass
14	3.8228	22.18	Pass
15	3.8231	22.41	Pass

B. 25th cycle 50% charged state

16	3.8274	21.99	Pass
17	3.8298	21.98	Pass
18	3.8263	22.14	Pass
19	3.8275	21.96	Pass
20	3.8372	21.60	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

21	3.3389	79.48	Pass	31	3.2802	78.78	Pass
22	3.3462	92.43	Pass	32	3.2612	94.33	Pass
23	3.3366	86.98	Pass	33	3.2646	84.47	Pass
24	3.3270	53.23	Pass	34	3.2693	93.90	Pass
25	3.3283	87.14	Pass	35	3.3158	81.66	Pass
26	3.3242	96.92	Pass	36	3.2775	97.80	Pass
27	3.3302	90.10	Pass	37	3.2601	91.47	Pass
28	3.3285	96.73	Pass	38	3.2872	77.08	Pass
29	3.3347	78.97	Pass	39	3.2675	87.07	Pass
30	3.3377	104.32	Pass	40	3.2640	91.40	Pass

B. 25th cycle fully discharged state

3. Sample Image

