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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-190515-B-L18L3PF2	Test 1. Altitude Simulation	Pass
Date of test report	2019.05.15	Test 2. Thermal Test	Pass
Model name	L18L3PF2	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	11.34 V	Test 5. External Short Circuit	Pass
Capacity	36.00Wh	Test 6. Impact or Crush	Pass
Weight	168.37g	Test 7. Overcharge	Pass
Dimensions	202.25mmX112.20mmX6.7mm	Test 8. Forced Discharge	Pass

Approved By: Yuan Xu
Part Leader
Cyl NPI&CE lab part DQA Team
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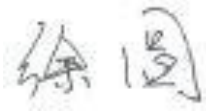

Document Number	QDI-190515-B-LL18L3PF2	
Prepared	qianjunli	
Approved	Xuyuan	

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UN38.3 Test Report
- L18L3PF2 (Nom. 36.00Wh, 11.34V) -

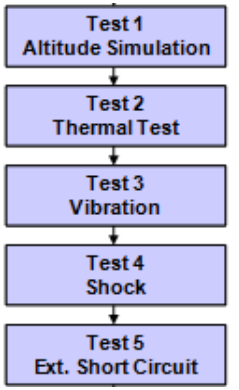
Index

2019. 05. 15

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	12.5846	168.04	12.5812	168.02	99.97	0.012	Pass	12.3070	167.96	97.82	0.036	Pass	12.3021	167.99	99.96	0.000	Pass	12.3011	167.97	99.99	0.012	Pass
2	12.5912	168.28	12.5883	168.26	99.98	0.012	Pass	12.3156	168.21	97.83	0.030	Pass	12.3095	168.20	99.95	0.006	Pass	12.3074	168.22	99.98	0.000	Pass
3	12.5756	168.37	12.5720	168.36	99.97	0.006	Pass	12.2961	168.30	97.81	0.036	Pass	12.2921	168.30	99.97	0.000	Pass	12.2908	168.31	99.99	0.000	Pass
4	12.5887	168.27	12.5857	168.25	99.98	0.012	Pass	12.3122	168.19	97.83	0.036	Pass	12.3078	168.22	99.96	0.000	Pass	12.3070	168.21	99.99	0.006	Pass
B. 25th cycle fully charged state																						
5	12.5783	168.06	12.5737	168.04	99.96	0.012	Pass	12.3057	167.98	97.87	0.036	Pass	12.3021	167.98	99.97	0.000	Pass	12.3004	167.98	99.99	0.000	Pass
6	12.5831	168.26	12.5795	168.24	99.97	0.012	Pass	12.3108	168.17	97.86	0.042	Pass	12.3082	168.20	99.98	0.000	Pass	12.3057	168.18	99.98	0.012	Pass
7	12.5696	168.41	12.5660	168.40	99.97	0.006	Pass	12.2978	168.34	97.87	0.036	Pass	12.2950	168.35	99.98	0.000	Pass	12.2925	168.35	99.98	0.000	Pass
8	12.5864	168.16	12.5830	168.15	99.97	0.006	Pass	12.3134	168.09	97.86	0.036	Pass	12.3129	168.11	100.00	0.000	Pass	12.3078	168.09	99.96	0.012	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	12.3011	58.15	Pass
2	12.3074	58.60	Pass
3	12.2908	58.01	Pass
4	12.3070	57.75	Pass
B. 25th cycle fully charged state			
5	12.3004	58.16	Pass
6	12.3057	58.55	Pass
7	12.2925	58.02	Pass
8	12.3078	57.97	Pass

Over Charge (T7)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
9	12.5869	24.32	Pass
10	12.5758	24.21	Pass
11	12.5822	24.32	Pass
12	12.5789	24.05	Pass

Over Charge (T7)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 25th cycle fully charged state			
13	12.5822	24.21	Pass
14	12.5794	23.61	Pass
15	12.5763	23.77	Pass
16	12.5912	23.61	Pass

2-3. T6/T8 Test Result (P594285A1)

Cell Document Number	QDI-180828-C-P594285A1

Crush (T6)

A. 1st cycle 50% charged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result
11	3.8246	24.34	Pass
12	3.8248	25.36	Pass
13	3.8240	23.96	Pass
14	3.8238	24.08	Pass
15	3.8244	24.17	Pass

Forced Discharge (T8)

A. 1st cycle fully discharged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result
16	3.2873	95.03	Pass
17	3.2909	84.72	Pass
18	3.2872	89.41	Pass
19	3.2842	88.08	Pass
20	3.2933	94.86	Pass
21	3.2858	92.11	Pass
22	3.2876	91.82	Pass
23	3.2858	85.91	Pass
24	3.2854	99.33	Pass
25	3.2863	90.32	Pass

B. 50th cycle fully discharged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result
26	3.3485	83.75	Pass
27	3.3622	105.54	Pass
28	3.3468	113.60	Pass
29	3.3488	90.78	Pass
30	3.3482	94.48	Pass
31	3.3528	106.91	Pass
32	3.3468	87.58	Pass
33	3.3518	88.36	Pass
34	3.3462	85.90	Pass
35	3.3438	90.81	Pass

3. Sample Image