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UN38.3 Test Summary

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.

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Description		List of Test Completed	
Test Report Number	QDI-181015-B-L18L4PF0	Test 1. Altitude Simulation	Pass
Date of test report	2018.10.15	Test 2. Thermal Test	Pass
Model name	L18L4PF0	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	288.65g	Test 7. Overcharge	Pass
Dimensions	202.00mmX112.00mmX6.60mm	Test 8. Forced Discharge	Pass

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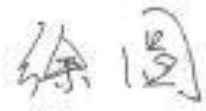

Document Number	QDI-181015-B-L18L4PF0	
Prepared	qianjunli	
Approved	Xuyuan	

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UN38.3 Test Report
- L18L4PF0 (Nom. 70.00Wh, 15.12V) -

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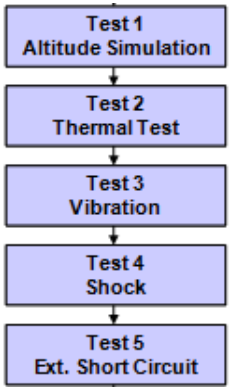
2018. 10. 15

LG Chem

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℃	- 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]x10cycle 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	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	16.8083	288.16	16.8028	288.15	99.97	0.003	Pass	16.4939	288.04	98.16	0.038	Pass	16.4853	288.07	99.95	0.000	Pass	16.4826	288.08	99.98	0.000	Pass
2	16.7909	286.55	16.7852	286.55	99.97	0.000	Pass	16.8948	286.44	100.00	0.038	Pass	16.8885	286.46	99.96	0.000	Pass	16.8837	286.47	99.97	0.000	Pass
3	16.8083	288.24	16.8038	288.25	99.97	0.000	Pass	16.4968	288.12	98.17	0.045	Pass	16.4861	288.15	99.94	0.000	Pass	16.4842	288.16	99.99	0.000	Pass
4	16.8019	287.47	16.7958	287.46	99.96	0.003	Pass	16.4896	287.35	98.18	0.038	Pass	16.4775	287.38	99.93	0.000	Pass	16.4765	287.38	99.99	0.000	Pass
B. 50th cycle fully charged state																						
5	16.8221	288.65	16.8188	288.65	99.98	0.000	Pass	16.5283	288.54	98.27	0.038	Pass	16.5179	288.58	99.94	0.000	Pass	16.5159	288.58	99.99	0.000	Pass
6	16.8169	288.21	16.8142	288.21	99.98	0.000	Pass	16.5248	288.12	98.28	0.031	Pass	16.5143	288.14	99.94	0.000	Pass	16.5127	288.16	99.99	0.000	Pass
7	16.8123	286.42	16.8093	286.43	99.98	0.000	Pass	16.5196	286.33	98.28	0.035	Pass	16.5096	286.36	99.94	0.000	Pass	16.5076	286.37	99.99	0.000	Pass
8	16.8257	288.51	16.8238	288.53	99.99	0.000	Pass	16.5330	288.43	98.27	0.035	Pass	16.5245	288.47	99.95	0.000	Pass	16.5235	288.46	99.99	0.003	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	16.4826	58.35	Pass
2	16.8837	58.15	Pass
3	16.4842	57.60	Pass
4	16.4765	57.30	Pass
B. 50th cycle fully charged state			
5	16.5159	58.44	Pass
6	16.5127	58.16	Pass
7	16.5076	57.95	Pass
8	16.5235	57.23	Pass

Overcharge (T7)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
9	12.5005	24.01	Pass
10	12.5053	24.01	Pass
11	12.5114	23.91	Pass
12	12.5145	23.75	Pass
B. 50th cycle fully charged state			
13	12.5234	23.91	Pass
14	12.5205	23.51	Pass
15	12.5178	23.57	Pass
16	12.5238	23.41	Pass

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

Cell Document Number	QDI-180205-C-P595490B4

Crush (T6)

A. 1st cycle 50% charged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result
C-1	3.827	20.73	Pass
C-2	3.826	20.37	Pass
C-3	3.826	19.75	Pass
C-4	3.826	20.11	Pass
C-5	3.252	20.30	Pass

Forced Discharge (T8)

A. 1st cycle fully discharged state / B. 50th cycle fully discharged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result	NO.	Initial OCV(V)	Max. Temp (℃)	Result
C-6	3.243	82.06	Pass	C-16	3.325	77.94	Pass
C-7	3.240	73.57	Pass	C-17	3.323	80.22	Pass
C-8	3.239	72.69	Pass	C-18	3.334	88.16	Pass
C-9	3.241	79.03	Pass	C-19	3.334	80.73	Pass
C-10	3.241	74.51	Pass	C-20	3.325	76.07	Pass
C-11	3.244	78.94	Pass	C-21	3.330	80.85	Pass
C-12	3.251	76.06	Pass	C-22	3.332	78.83	Pass
C-13	3.243	77.02	Pass	C-23	3.334	75.14	Pass
C-14	3.243	77.20	Pass	C-24	3.330	82.70	Pass
C-15	3.242	68.57	Pass	C-25	3.342	78.34	Pass

3. Sample Image