

# 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-190308-B-AP18E8M	Test 1. Altitude Simulation	Pass
Date of test report	2019.03.08	Test 2. Thermal Test	Pass
Model name	AP18E8M	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	15.40 V	Test 5. External Short Circuit	Pass
Capacity	57.48Wh	Test 6. Impact or Crush	Pass
Weight	Max 229.08g	Test 7. Overcharge	Pass
Dimensions	Max 209mmX79.5mmX8.2mm	Test 8. Forced Discharge	Pass

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# UN38.3 Test Report

– AP18E8M (Nom. 57.48Wh, 15.40V) –

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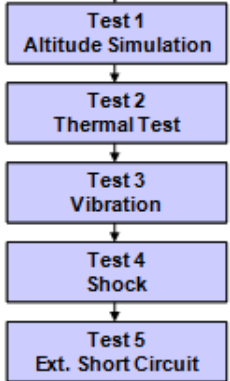
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2019. 03. 08



# 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	<ul style="list-style-type: none"> <li>- After OCV (%) ≥ 90%</li> <li>- No leakage, no venting, no disassembly, no rupture, no fire</li> <li>- Mass loss limit (leakage)               <ul style="list-style-type: none"> <li>1) If M &lt; 1g, less than 0.5%,</li> <li>2) If 1g ≤ M ≤ 75g, less than 0.2%,</li> <li>3) If M &gt; 75g, less than 0.1%</li> </ul> </li> </ul>	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	<ul style="list-style-type: none"> <li>- No disassembly, no fire within 6 hours after the test</li> <li>- Max. Temp ≤ 170°C</li> </ul>	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)	<ul style="list-style-type: none"> <li>- No disassembly, no fire within 7 days after the test</li> </ul>	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"> <li>- No disassembly, no fire within 7 days after the test</li> </ul>	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	17.4202	229.08	17.4172	229.07	99.98	0.004	Pass	17.1116	229.01	98.25	0.026	Pass	17.1091	229.01	99.99	0.000	Pass	17.1096	229.03	100.00	0.000	Pass
2	17.4180	228.80	17.4148	228.79	99.98	0.004	Pass	17.1067	228.73	98.23	0.026	Pass	17.1041	228.73	99.98	0.000	Pass	17.1055	228.74	100.00	0.000	Pass
3	17.4256	228.68	17.4224	228.67	99.98	0.004	Pass	17.1110	228.61	98.21	0.026	Pass	17.1082	228.62	99.98	0.000	Pass	17.1098	228.63	100.00	0.000	Pass
4	17.4239	228.54	17.4208	228.53	99.98	0.004	Pass	17.1100	228.48	98.22	0.022	Pass	17.1073	228.48	99.98	0.000	Pass	17.1091	228.49	100.00	0.000	Pass

## B. 25th cycle fully charged state

5	17.4632	228.60	17.4598	228.59	99.98	0.004	Pass	17.1391	228.54	98.16	0.022	Pass	17.1364	228.54	99.98	0.000	Pass	17.1382	228.56	100.00	0.000	Pass
6	17.4604	229.00	17.4569	228.99	99.98	0.004	Pass	17.1415	228.94	98.19	0.022	Pass	17.1389	228.94	99.98	0.000	Pass	17.1406	228.96	100.00	0.000	Pass
7	17.4593	228.81	17.4557	228.80	99.98	0.004	Pass	17.1421	228.75	98.20	0.022	Pass	17.1395	228.75	99.98	0.000	Pass	17.1408	228.76	100.00	0.000	Pass
8	17.4659	228.37	17.4622	228.36	99.98	0.004	Pass	17.1452	228.32	98.18	0.018	Pass	17.1425	228.31	99.98	0.004	Pass	17.1429	228.33	100.00	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	17.1096	58.51	Pass
2	17.1055	57.97	Pass
3	17.1098	57.15	Pass
4	17.1091	56.96	Pass

#### B. 25th cycle fully charged state

5	17.1382	58.81	Pass
6	17.1406	58.10	Pass
7	17.1408	57.94	Pass
8	17.1429	57.17	Pass

### Over Charge (T7)

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

9	17.4409	24.52	Pass
10	17.4374	24.42	Pass
11	17.4329	24.52	Pass
12	17.4371	24.05	Pass

### Over Charge (T7)

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

13	17.4732	24.32	Pass
14	17.4720	23.81	Pass
15	17.4766	23.98	Pass
16	17.4724	23.41	Pass

## 2-3. T6/T8 Test Result (P367088A1)

Cell Document Number	QDI-190225-C-P367088A1
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Crush (T6)			
NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle 50% charged state

C-1	3.8465	21.69	Pass
C-2	3.8465	21.62	Pass
C-3	3.8462	21.58	Pass
C-4	3.8463	21.75	Pass
C-5	3.8478	21.68	Pass

B. 25st cycle 50% charged state

C-6	3.8496	21.65	Pass
C-7	3.8484	21.67	Pass
C-8	3.8487	23.79	Pass
C-9	3.8486	21.39	Pass
C-10	3.8456	21.41	Pass

Forced Discharge (T8)							
NO.	Initial OCV(V)	Max. Temp (°C)	Result	NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully discharged state

C-6	3.3946	37.69	Pass	C-16	3.4291	40.40	Pass
C-7	3.3965	37.44	Pass	C-17	3.4284	37.84	Pass
C-8	3.3961	38.74	Pass	C-18	3.4300	38.98	Pass
C-9	3.3868	32.48	Pass	C-19	3.4305	39.32	Pass
C-10	3.3778	36.66	Pass	C-20	3.4309	38.51	Pass
C-11	3.3924	36.57	Pass	C-21	3.4256	42.67	Pass
C-12	3.3888	40.34	Pass	C-22	3.4274	40.65	Pass
C-13	3.3901	36.25	Pass	C-23	3.4302	39.26	Pass
C-14	3.3847	68.21	Pass	C-24	3.4303	67.82	Pass
C-15	3.3832	63.61	Pass	C-25	3.4299	59.52	Pass

B. 25th cycle fully discharged state

### 3. Sample Image

