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CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 5th revised edition Amendment2 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 and batteries and single cell batteries.

<input type="checkbox"/> Lithium-ion cell <input type="checkbox"/> Lithium-ion battery <input checked="" type="checkbox"/> Lithium-ion single cell battery	
Model name	HZ40
Cell Model name	ICP435978L1
Nominal voltage	3.80 V
Electric power capacity	11.4 Wh

Conducted By: Min Je Woo

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문서번호	QDI-160905-SB-HZ40	
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UN38.3 Test Report

- HZ40(Min. 11.4Wh, 3.80V) -

목 차

1. UN38.3 Test Condition
2. General Information
3. Test Result
4. Sample Image

2016. 09. 05

1. UN38.3 Test Condition

Rev.5 / Amd.2

Test item	Test Condition	Requirements	Etc.
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	<ul style="list-style-type: none"> - After OCV (%) ≥ 90% - No leakage, no venting, no disassembly, no rupture, no fire - Mass loss limit (leakage) <ol style="list-style-type: none"> 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%) 	<p>T1~T5 : Sequence Tests</p> <pre> graph TD T1[Test 1 Altitude Simulation] --> T2[Test 2 Thermal Test] T2 --> T3[Test 3 Vibration] T3 --> T4[Test 4 Shock] T4 --> T5[Test 5 Ext. Short Circuit] </pre>
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 (peak acceleration : 150gn, pulse duration : 6msec) x 6 (±x, y, z), direction x 3 cycle		
Test 5. External Short Circuit	100mΩ ext. short-circuit at 55±2℃ 1hr continue after returning at 55±2℃		
Test 6. Impact	Φ=15.8±0.1mm bar, 9.1±0.1kg mass, 61±2.5cm height	<ul style="list-style-type: none"> - 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)	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - No disassembly, no fire within 7 days after the test 	Resistance of Electric Loader 1/Ω = (max. discharge current) / (12 + Initial OCV)

2. General Information

1. Standard charge / discharge Condition

	Mode	Condition	End Condition
Charge	CC / CV	Current = 3000 mA Voltage = 4.2 V	Current = 200 mA
Discharge	CC	Current = 582 mA	Voltage = 3.0 V

2. Cycle Condition

	Mode	Condition	End Condition
Charge	CC / CV	Current = 3000 mA Voltage = 4.2 V	Current = 200 mA
Discharge	CC	Current = 582 mA	Voltage = 3.0 V

3. Test Condition

	Mode	Condition
Test 7. Overcharge	CC / CV	Max. Charge Current = 2820 mA CC/CV 2I _{max} (5640mA) 8.8 V cut-off 24Hr
Test 8. Forced Discharge	CC	Max. Discharge Current = 2842 mA Duration Time = 62 min

3-1. 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	4.368	43.563	4.367	43.561	99.98	0.005	Pass	4.316	43.561	98.83	0.000	Pass	4.314	43.561	99.95	0.000	Pass	4.311	43.561	99.93	0.000	Pass
2	4.367	43.457	4.366	43.456	99.98	0.002	Pass	4.315	43.455	98.83	0.002	Pass	4.313	43.454	99.95	0.002	Pass	4.312	43.453	99.98	0.002	Pass
3	4.367	43.563	4.366	43.563	99.98	0.000	Pass	4.315	43.561	98.83	0.005	Pass	4.314	43.561	99.98	0.000	Pass	4.312	43.559	99.95	0.005	Pass
4	4.366	43.367	4.365	43.366	99.98	0.002	Pass	4.316	43.363	98.88	0.007	Pass	4.315	43.361	99.98	0.005	Pass	4.313	43.359	99.95	0.005	Pass
5	4.368	43.552	4.367	43.552	99.98	0.000	Pass	4.316	43.551	98.83	0.002	Pass	4.314	43.550	99.95	0.002	Pass	4.312	43.550	99.95	0.000	Pass
6	4.367	43.545	4.366	43.543	99.98	0.005	Pass	4.314	43.543	98.81	0.000	Pass	4.312	43.541	99.95	0.005	Pass	4.310	43.540	99.95	0.002	Pass
7	4.365	43.469	4.364	43.468	99.98	0.002	Pass	4.315	43.467	98.88	0.002	Pass	4.313	43.466	99.95	0.002	Pass	4.312	43.465	99.98	0.002	Pass
8	4.365	43.483	4.363	43.483	99.95	0.000	Pass	4.315	43.481	98.90	0.005	Pass	4.314	43.481	99.98	0.000	Pass	4.312	43.481	99.95	0.000	Pass
9	4.366	43.395	4.365	43.394	99.98	0.002	Pass	4.316	43.394	98.88	0.000	Pass	4.313	43.392	99.93	0.005	Pass	4.311	43.391	99.95	0.002	Pass
10	4.365	43.547	4.364	43.546	99.98	0.002	Pass	4.313	43.545	98.83	0.002	Pass	4.312	43.544	99.98	0.002	Pass	4.310	43.541	99.95	0.007	Pass

3-2. T5/T7 Test Result

EXT.Short Circuit (T5)			
NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully charged state

1	4.311	54.17	Pass
2	4.312	55.20	Pass
3	4.312	55.56	Pass
4	4.313	54.89	Pass
5	4.312	56.37	Pass
6	4.310	54.86	Pass
7	4.312	54.32	Pass
8	4.312	54.49	Pass
9	4.311	55.07	Pass
10	4.310	54.36	Pass

Over Charge (T7)			
NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully charged state

11	4.365	24.12	Pass
12	4.364	23.65	Pass
13	4.365	24.29	Pass
14	4.366	23.34	Pass

Over Charge (T7)			
NO.	Initial OCV(V)	Max. Temp (°C)	Result

B. 50th cycle fully charged state

15	4.364	24.25	Pass
16	4.363	24.36	Pass
17	4.362	23.78	Pass
18	4.363	23.61	Pass

3-3. T6/T8 Test Result (ICP435978L1)

Crush (T6)			
NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle 50% charged state

C-1	3.823	22.55	Pass
C-2	3.822	23.05	Pass
C-3	3.820	23.08	Pass
C-4	3.820	22.80	Pass
C-5	3.820	22.96	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	3.111	41.20	Pass
C-7	3.119	40.74	Pass
C-8	3.112	40.40	Pass
C-9	3.112	46.77	Pass
C-10	3.110	40.83	Pass
C-11	3.116	43.95	Pass
C-12	3.117	42.70	Pass
C-13	3.120	46.92	Pass
C-14	3.120	43.74	Pass
C-15	3.111	45.16	Pass

B. 50th cycle fully discharged state

C-16	3.119	39.71	Pass
C-17	3.118	45.47	Pass
C-18	3.125	40.31	Pass
C-19	3.119	43.81	Pass
C-20	3.119	41.79	Pass
C-21	3.126	38.45	Pass
C-22	3.126	34.57	Pass
C-23	3.123	34.96	Pass
C-24	3.130	47.02	Pass
C-25	3.117	33.67	Pass

4. Sample Image



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