



CONFIDENTIAL

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## CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 5<sup>th</sup> 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 checked="" type="checkbox"/> Lithium-ion cell <input type="checkbox"/> Lithium-ion battery <input type="checkbox"/> Lithium-ion single cell battery	
Cell Model name	<b>INR18650MH1</b>
Type	<b>Cylindrical</b>
Nominal voltage	<b>3.7 V</b>
Capacity (Min.)	<b>3100 mAh</b>

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# UN38.3 Test Report

## - INR18650MH1 (Min. 3100mAh, 3.7V)-

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2016. 10. 05



# 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℃	<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)               <ol style="list-style-type: none"> <li>1) If <math>M &lt; 1g</math>, less than 0.5%,</li> <li>2) If <math>1g \leq M \leq 75g</math>, less than 0.2%,</li> <li>3) If <math>M &gt; 75g</math>, less than 0.1%</li> </ol> </li> </ul>	T1~T5 : Sequence Tests <pre>           graph TD             T1[Test 1 Altitude Simulation] --&gt; T2[Test 2 Thermal Test]             T2 --&gt; T3[Test 3 Vibration]             T3 --&gt; T4[Test 4 Shock]             T4 --&gt; 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"> <li>- No disassembly, no fire within 6 hours after the test</li> <li>- Max. Temp ≤ 170℃</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. General Information

### 1. Standard charge / discharge Condition

	Mode	Condition	End Condition
Charge	CC / CV	Current = 1550 mA Voltage = 4.2 V	Current = 50 mA
Discharge	CC	Current = 620 mA	Voltage = 2.5 V

### 2. Cycle Condition

	Mode	Condition	End Condition
Charge	CC / CV	Current = 1550 mA Voltage = 4.2 V	Current = 50 mA
Discharge	CC	Current = 620 mA	Voltage = 2.5 V

### 3. Test Condition

	Mode	Condition
Test 8. Forced Discharge	CC	Max. Discharge Current = 10000 mA Duration Time = 18.6 min

# 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	4.170	46.592	4.170	46.592	100.00	0.000	Pass	4.124	46.590	98.90	0.004	Pass	4.123	46.590	99.98	0.000	Pass	4.123	46.590	100.00	0.000	Pass
2	4.170	46.737	4.170	46.737	100.00	0.000	Pass	4.122	46.736	98.85	0.002	Pass	4.122	46.736	100.00	0.000	Pass	4.122	46.736	100.00	0.000	Pass
3	4.170	46.522	4.170	46.522	100.00	0.000	Pass	4.127	46.520	98.97	0.004	Pass	4.126	46.520	99.98	0.000	Pass	4.126	46.520	100.00	0.000	Pass
4	4.171	46.573	4.170	46.573	99.98	0.000	Pass	4.126	46.573	98.94	0.000	Pass	4.126	46.573	100.00	0.000	Pass	4.126	46.573	100.00	0.000	Pass
5	4.170	46.736	4.169	46.736	99.98	0.000	Pass	4.122	46.736	98.87	0.000	Pass	4.122	46.736	100.00	0.000	Pass	4.122	46.736	100.00	0.000	Pass
6	4.171	46.677	4.170	46.677	99.98	0.000	Pass	4.122	46.676	98.85	0.002	Pass	4.122	46.676	100.00	0.000	Pass	4.122	46.676	100.00	0.000	Pass
7	4.170	46.476	4.170	46.476	100.00	0.000	Pass	4.125	46.474	98.92	0.004	Pass	4.124	46.474	99.98	0.000	Pass	4.124	46.474	100.00	0.000	Pass
8	4.170	46.555	4.169	46.555	99.98	0.000	Pass	4.126	46.553	98.97	0.004	Pass	4.124	46.553	99.95	0.000	Pass	4.124	46.553	100.00	0.000	Pass
9	4.171	46.450	4.169	46.450	99.95	0.000	Pass	4.122	46.450	98.87	0.000	Pass	4.122	46.450	100.00	0.000	Pass	4.122	46.450	100.00	0.000	Pass
10	4.170	46.494	4.170	46.494	100.00	0.000	Pass	4.123	46.492	98.87	0.004	Pass	4.123	46.492	100.00	0.000	Pass	4.122	46.492	99.98	0.000	Pass

# 2-2. T5/T6/T8 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	4.123	108.26	Pass
2	4.122	113.08	Pass
3	4.126	100.88	Pass
4	4.126	106.00	Pass
5	4.122	96.38	Pass
6	4.122	115.30	Pass
7	4.124	106.93	Pass
8	4.124	98.91	Pass
9	4.122	103.61	Pass
10	4.122	93.83	Pass

## Impact (T6)

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

11	3.714	114.10	Pass
12	3.719	99.95	Pass
13	3.715	120.17	Pass
14	3.713	118.71	Pass
15	3.716	118.00	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

16	3.255	113.52	Pass
17	3.252	114.24	Pass
18	3.260	118.05	Pass
19	3.261	115.45	Pass
20	3.271	116.73	Pass
21	3.268	116.3	Pass
22	3.221	109.26	Pass
23	3.224	119.31	Pass
24	3.272	107.86	Pass
25	3.271	113.5	Pass

### B. 50th cycle fully discharged state

26	3.376	113.81	Pass
27	3.377	116.56	Pass
28	3.376	117.35	Pass
29	3.374	122.7	Pass
30	3.374	116.86	Pass
31	3.377	116.54	Pass
32	3.377	116.33	Pass
33	3.377	116.27	Pass
34	3.375	121.28	Pass
35	3.378	119.66	Pass

# 3. Sample Image

