

# UN38.3 Test Summary


The following product has been evaluated according to the 5th revised edition Amendment 2 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-150824-C-INR18650M26	Test 1. Altitude Simulation	Pass
Date of test report	2015.08.24	Test 2. Thermal Test	Pass
Model name	INR18650M26	Test 3. Vibration	Pass
Type	Cylindrical	Test 4. Shock	Pass
Nominal voltage	3.6 V	Test 5. External Short Circuit	Pass
Capacity	2600 mAh / 9.36 Wh	Test 6. Impact or Crush	Pass
Weight	43.411 g	Test 7. Overcharge	N/A
Dimensions	18.4mm X 65.2mm	Test 8. Forced Discharge	Pass

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# UN38.3 Test Report

## - INR18650M26(Nom. 2600mAh) -

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2015. 08. 24

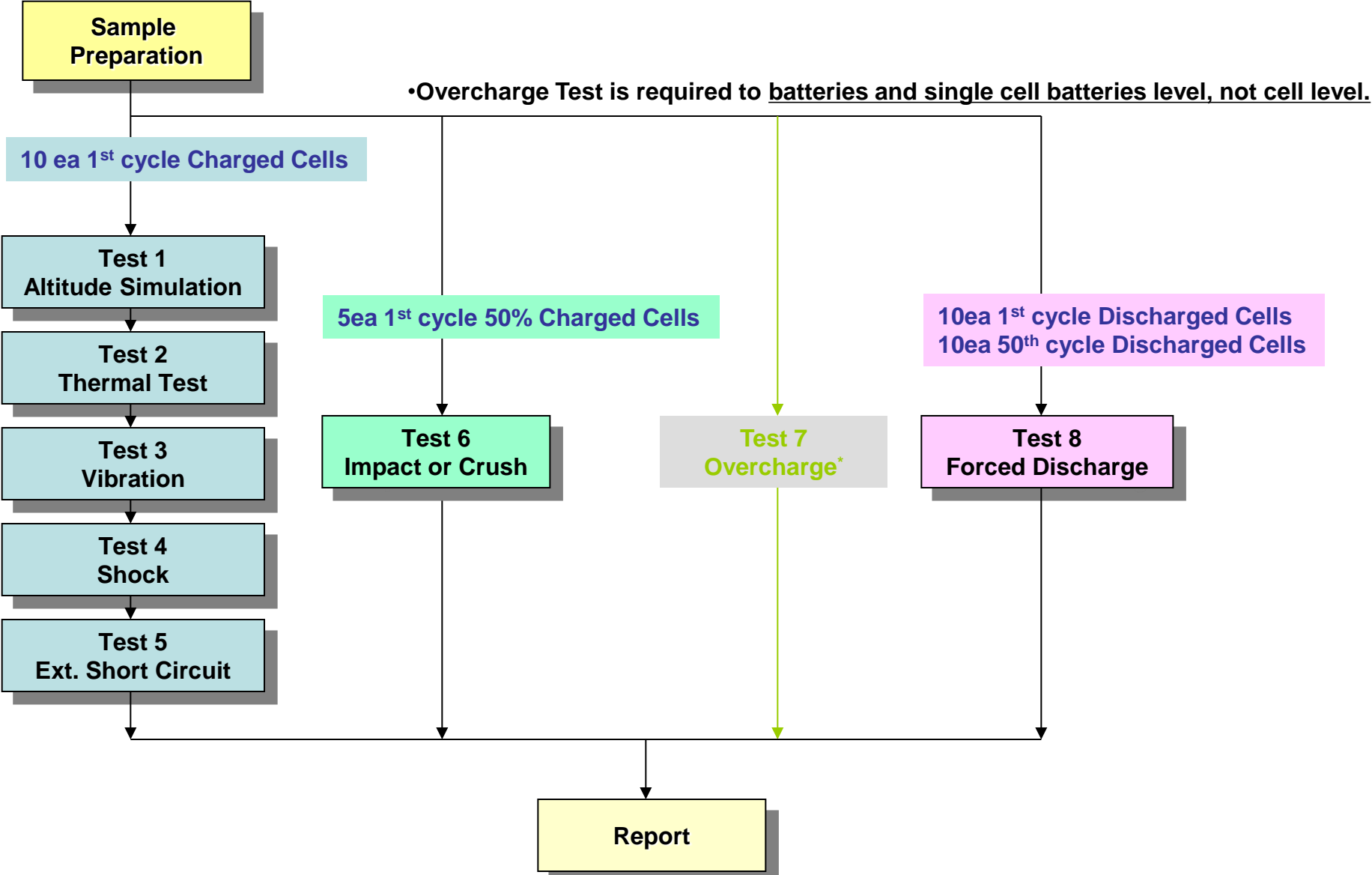
# 1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	<ul style="list-style-type: none"> <li>- Measuring mass before/ after each test (If M&lt;1g, less than 0.5%, If 1g≤M≤75g, less than 0.2%, If M&gt;75g, less than 0.1%)</li> <li>- Measuring voltage before/ after each test (more than 90%)</li> <li>- No leakage, no venting, no disassembly, no rupture, no fire</li> </ul>
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 for cylindrical cells (> 18mm diameter)	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	<ul style="list-style-type: none"> <li>- No disassembly, no fire within 6 hours after the test</li> <li>- Temp. monitoring (max. 170℃)</li> </ul>
Test 6. Crush for cylindrical cells (≤ 18mm diameter) for prismatic, pouch, coin/button cells	Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation	
Test 7. Overcharge	Only for battery, not cell.	- Overcharge Test is required to pack battery level, not cell level.
Test 8. Forced Discharge	Discharge at max. discharge current (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>

\* Tests through T1-T5 shall be conducted in sequence with the same samples.

\* We declare that the above-mentioned test is the result of being checked according to UN Test ( Manual of Test and Criteria ST/SG/AC.10/11/Rev.5/Amd.2)

# 2. Test Procedure



# 3-1. T1-T4 Test Result

Before			Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
NO.	OCV	Mass	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result

## A. 1st cycle fully charged state

1	4.163	43.388	4.162	43.386	99.98	0.005	Pass	4.108	43.383	98.70	0.007	Pass	4.108	43.382	100.00	0.002	Pass	4.108	43.380	100.00	0.005	Pass
2	4.165	43.395	4.165	43.393	100.00	0.005	Pass	4.114	43.389	98.78	0.009	Pass	4.114	43.388	100.00	0.002	Pass	4.113	43.388	99.98	0.000	Pass
3	4.164	43.410	4.163	43.409	99.98	0.002	Pass	4.117	43.405	98.90	0.009	Pass	4.116	43.403	99.98	0.005	Pass	4.116	43.402	100.00	0.002	Pass
4	4.164	43.398	4.164	43.398	100.00	0.000	Pass	4.110	43.396	98.70	0.005	Pass	4.109	43.395	99.98	0.002	Pass	4.108	43.393	99.98	0.005	Pass
5	4.164	43.386	4.164	43.385	100.00	0.002	Pass	4.111	43.381	98.73	0.009	Pass	4.111	43.379	100.00	0.005	Pass	4.110	43.378	99.98	0.002	Pass
6	4.163	43.411	4.163	43.411	100.00	0.000	Pass	4.111	43.407	98.75	0.009	Pass	4.111	43.405	100.00	0.005	Pass	4.111	43.404	100.00	0.002	Pass
7	4.163	43.404	4.163	43.402	100.00	0.005	Pass	4.115	43.398	98.85	0.009	Pass	4.115	43.397	100.00	0.002	Pass	4.115	43.397	100.00	0.000	Pass
8	4.165	43.386	4.164	43.384	99.98	0.005	Pass	4.116	43.380	98.85	0.009	Pass	4.116	43.380	100.00	0.000	Pass	4.116	43.378	100.00	0.005	Pass
9	4.163	43.390	4.163	43.388	100.00	0.005	Pass	4.109	43.386	98.70	0.005	Pass	4.109	43.386	100.00	0.000	Pass	4.109	43.386	100.00	0.000	Pass
10	4.165	43.389	4.165	43.389	100.00	0.000	Pass	4.113	43.387	98.75	0.005	Pass	4.113	43.386	100.00	0.002	Pass	4.113	43.385	100.00	0.002	Pass
<b>Ave.</b>	4.164	43.396	4.164	43.395	99.99	0.003	-	4.112	43.391	98.77	0.008	-	4.112	43.390	100.00	0.003	-	4.112	43.389	99.99	0.002	-

### Requirement

- Measuring mass before/after each test (If  $M > 75g$ , less than 0.1%,  $1g \leq M \leq 75$ , less than 0.2%,  $M < 1g$ , less than 0.5%)
- Measuring voltage before/after each test (more than 90%, only charged samples)
- No leakage, no venting, no disassembly, no rupture, no fire

# 3-2. T5/T6/T8 Test Result

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

## A. 1st cycle fully charged state

1	4.108	101.57	Pass
2	4.113	100.60	Pass
3	4.116	94.05	Pass
4	4.108	95.25	Pass
5	4.110	97.19	Pass
6	4.111	90.24	Pass
7	4.115	98.39	Pass
8	4.116	94.90	Pass
9	4.109	95.92	Pass
10	4.113	100.48	Pass
<b>MAX.</b>	4.116	101.57	-

Test Condition
- 100mΩ ext. short-circuit at 55±2°C

Requirement
- Temperature < 170 (°C) - No disassembly, no rupture, no fire within 6 hours after the test

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

## A. 1st cycle 50% charged state

Flat	11	3.618	103.54	Pass
	12	3.611	97.26	Pass
	13	3.615	99.37	Pass
	14	3.617	100.69	Pass
	15	3.612	103.41	Pass
<b>MAX.</b>	3.618	103.54	-	

Test Condition
- Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height

Requirement
- Temperature ≤ 170 (°C) - No disassembly, no fire within 6 hours after the test

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

## A. 1st cycle fully Discharged state

16	3.027	46.04	Pass
17	3.045	58.3	Pass
18	3.041	52.48	Pass
19	3.012	45.76	Pass
20	3.011	49.43	Pass
21	3.045	45.83	Pass
22	3.025	57.28	Pass
23	3.034	49.79	Pass
24	3.047	59.41	Pass
25	3.013	49.16	Pass
<b>MAX.</b>	3.047	59.41	-

## B. 50th cycle fully discharged state

26	3.104	58.10	Pass
27	3.107	68.85	Pass
28	3.112	63.76	Pass
29	3.118	58.84	Pass
30	3.121	64.11	Pass
31	3.103	61.58	Pass
32	3.100	66.52	Pass
33	3.106	65.60	Pass
34	3.113	55.62	Pass
35	3.102	68.37	Pass
<b>MAX.</b>	3.121	68.85	-

Test Condition
- Discharge at max. discharge current (with 12V DC power supply) : 4650mA Duration time: rated capacity (41min)

Requirement
- No disassembly, no fire within 7 days after the test

# 4. Sample Image



# 4. Sample Image

