

UN38.3 Test Summary

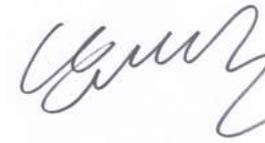
The following product has been evaluated according to the 6th revised edition Amendment 1 of the UN Manual of Tests and Criteria.
We, LG Chem, Ltd., hereby certify that this battery meets the requirements of the regulation for transportation of lithium-ion cells, batteries and single cell batteries.

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Test Laboratory information	LG Chem, Ltd. / RESEARCH PARK Address : 188 Munjiro, Yuseong-gu, Daejeon, 305-738, REPUBLIC OF KOREA Telephone : +82-10-4808-7362 E-mail : milkis@lgchem.com Website : www.lgchem.com			
Description		List of Test Completed		
Test Report Number	QDI-191226-B-R15563P3SDLT	UN 38.3 Tests	Test 1. Altitude Simulation	Pass
Date of test report	2019. 12. 26		Test 2. Thermal Test	Pass
Item / Cell Type	Lithium ion Battery / Pouch		Test 3. Vibration	Pass
Model name	R15563P3SDLT		Test 4. Shock	Pass
Nominal voltage	155.4 V		Test 5. External Short Circuit	Pass
Capacity / Energy	63.0 Ah / 9.8 kWh		Test 6. Impact or Crush	Pass
Weight	Max 103 kg		Test 7. Overcharge	Pass
Dimensions	744(L)*907(W)*205.7(H) mm		Test 8. Forced Discharge	Pass

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CERTIFICATE OF COMPLIANCE

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.

<input type="checkbox"/> Lithium-ion cell <input checked="" type="checkbox"/> Lithium-ion battery <input type="checkbox"/> Lithium-ion single cell battery	
Model name	R15563P3SDLT
Cell Model name	JH3
Nominal voltage	155.4 V
Electric power capacity	9.8 kWh

Reviewed By: MinJe Woo

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UN38.3 Test Report

- R15563P3SDLT (63Ah, 155.4V)

Index

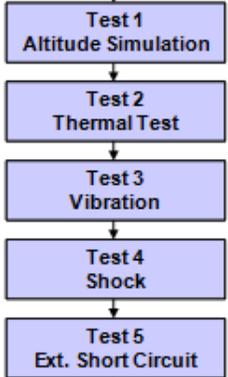
1. UN38.3 Test Condition
2. General Information
3. Test Result
4. Sample Image

2019. 12. 26



1. UN38.3 Test Condition

Rev.6-Amd.1

Test item	Test Condition	Requirements	Etc.
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20±5°C	- 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°C, 12hr ↔ -40±2°C, 12hr, interval max. 30min] x 10cycle , 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 2gn) 200Hz (maintaining 2gn), 1.6mm total excursion		
Test 4. Shock	Half sine shock 1) Peak acceleration - For batteries (whichever is smaller): 50gn or $\sqrt{\frac{30000}{\text{Mass(kg)}}}$ gn 2) Pulse duration : 11 msec 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 or "has decreased by half of the maximum temperature increase observed during the test and remains below that value" If this assessment is not feasible, the exposure time shall be at least 12hours		
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°C	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	Batteries not equipped with overcharge protection that are designed for use only in a battery assembly, which affords such protection, are not subject to the requirements of this test
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 $1/\Omega = (\text{max. discharge current}) / (12 + \text{Initial OCV})$

- Tests through T1-T5 shall be conducted in sequence with the same battery.
- Large battery means a lithium metal battery or lithium ion battery with a gross mass of more than 12 kg.

2-1. T1-T4 Test Result

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

A. 1st cycle fully charged state

1	174.732	101.990	174.704	101.980	99.98	0.010	Pass	173.500	101.890	99.31	0.088	Pass	173.454	101.880	99.97	0.010	Pass	173.444	101.870	99.99	0.010	Pass
2	174.678	102.450	174.677	102.450	100.00	0.000	Pass	173.429	102.380	99.29	0.068	Pass	173.387	102.300	99.98	0.078	Pass	173.376	102.230	99.99	0.068	Pass

B. 25th cycle fully charged state

3	175.352	102.840	175.348	102.840	100.00	0.000	Pass	173.988	102.750	99.22	0.088	Pass	173.977	102.710	99.99	0.039	Pass	173.963	102.690	99.99	0.019	Pass
4	175.365	102.160	175.218	102.150	99.92	0.010	Pass	174.018	102.080	99.32	0.069	Pass	173.591	102.060	99.75	0.020	Pass	173.563	102.060	99.98	0.000	Pass

2-2. T5/T7 Test Result

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

A. 1st cycle fully charged state

1	173.444	56.85	Pass
2	173.376	56.80	Pass

B. 25th cycle fully charged state

3	173.963	56.40	Pass
4	173.563	56.90	Pass

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

A. 1st cycle fully charged state

5	174.692	25.40	Pass
6	174.994	24.90	Pass

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

B. 25th cycle fully charged state

7	175.371	23.80	Pass
8	175.354	23.70	Pass

2-3. T6/T8 Test Result (JH3)

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

A. 1st cycle 50% charged state

C-1	3.718	23.54	Pass
C-2	3.720	23.96	Pass
C-3	3.721	24.05	Pass
C-4	3.720	25.08	Pass
C-5	3.719	23.28	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	3.362	58.40	Pass
C-7	3.368	61.20	Pass
C-8	3.204	57.70	Pass
C-9	3.392	59.60	Pass
C-10	3.385	61.60	Pass
C-11	3.373	61.70	Pass
C-12	3.269	60.00	Pass
C-13	3.390	57.70	Pass
C-14	3.381	62.10	Pass
C-15	3.389	60.60	Pass

B. 50th cycle fully discharged state

C-16	3.196	64.30	Pass
C-17	3.342	63.50	Pass
C-18	3.367	61.90	Pass
C-19	3.342	67.40	Pass
C-20	3.162	67.60	Pass
C-21	3.352	66.20	Pass
C-22	3.354	60.40	Pass
C-23	3.371	61.10	Pass
C-24	3.163	60.30	Pass
C-25	3.356	65.90	Pass

3. Sample Image

