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-160513-B-R4863P3S	UN 38.3 Tests	Test 1. Altitude Simulation	Pass
Date of test report	2016. 05. 13		Test 2. Thermal Test	Pass
Item / Cell Type	Lithium ion Battery / Pouch		Test 3. Vibration	Pass
Model name	R4863P3S		Test 4. Shock	Pass
Nominal voltage	51.8 V		Test 5. External Short Circuit	Pass
Capacity / Energy	63.0 Ah / 3.3 kWh		Test 6. Impact or Crush	Pass
Weight	Max. 33.0 kg		Test 7. Overcharge	Pass
Dimensions	401(L)*452(W)*120(H) mm		Test 8. Forced Discharge	Pass

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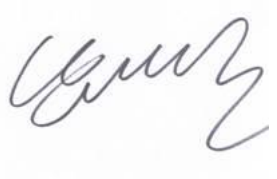

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CERTIFICATE OF COMPLIANCE

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.

☐ Lithium-ion cell ☑ Lithium-ion battery ☐ Lithium-ion single cell battery	
Model name	**R4863P3S**
Cell Model name	**JH3**
Nominal voltage	**51.8 V**
Electric power capacity	**3.3 kWh**

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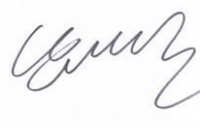

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UN38.3 Test Report
- R4863P3S (Nom. 3.3kWh, 51.8V) -

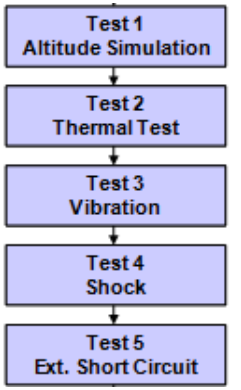
목 차

2016. 05. 13

LG Chem

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℃	- 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℃,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℃	- No disassembly, no rupture, no fire within 6 hours after the test - Max. Temp ≤ 170℃	
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℃	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	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	- No disassembly, no fire within 7 days after the test	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 (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	58.320	30.280	58.190	30.280	99.78	0.000	**Pass**	58.050	30.280	99.76	0.000	**Pass**	58.030	30.280	99.97	0.000	**Pass**	57.930	30.280	99.83	0.000	**Pass**
2	58.370	30.300	58.240	30.300	99.78	0.000	**Pass**	58.120	30.300	99.79	0.000	**Pass**	58.090	30.300	99.95	0.000	**Pass**	58.070	30.300	99.97	0.000	**Pass**
B. 25th cycle fully charged state																						
3	58.370	30.260	58.250	30.260	99.79	0.000	**Pass**	58.120	30.260	99.78	0.000	**Pass**	58.090	30.260	99.95	0.000	**Pass**	58.060	30.260	99.95	0.000	**Pass**
4	58.370	30.280	58.250	30.280	99.79	0.000	**Pass**	58.110	30.280	99.76	0.000	**Pass**	58.100	30.280	99.98	0.000	**Pass**	58.080	30.280	99.97	0.000	**Pass**

2-2. T5/T7 Test Result

EXT.Short Circuit (T5)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
1	57.930	55.90	Pass
2	58.070	55.80	Pass
B. 25th cycle fully charged state			
3	58.060	55.60	Pass
4	58.080	56.80	Pass

Over Charge (T7)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
5	58.559	20.20	Pass
6	58.586	20.10	Pass

Over Charge (T7)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 25th cycle fully charged state			
7	58.588	19.30	Pass
8	58.578	20.40	Pass

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

Crush (T6)

A. 1st cycle 50% charged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result
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)

A. 1st cycle fully discharged state / B. 50th cycle fully discharged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result	NO.	Initial OCV(V)	Max. Temp (℃)	Result
C-6	3.362	58.40	Pass	C-16	3.196	64.30	Pass
C-7	3.368	61.20	Pass	C-17	3.342	63.50	Pass
C-8	3.204	57.70	Pass	C-18	3.367	61.90	Pass
C-9	3.392	59.60	Pass	C-19	3.342	67.40	Pass
C-10	3.385	61.60	Pass	C-20	3.162	67.60	Pass
C-11	3.373	61.70	Pass	C-21	3.352	66.20	Pass
C-12	3.269	60.00	Pass	C-22	3.354	60.40	Pass
C-13	3.390	57.70	Pass	C-23	3.371	61.10	Pass
C-14	3.381	62.10	Pass	C-24	3.163	60.30	Pass
C-15	3.389	60.60	Pass	C-25	3.356	65.90	Pass

3. Sample Image