

UN38.3 Test Summary

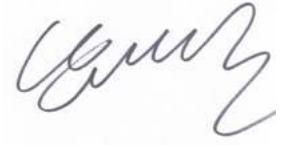
The following product has been evaluated according to the 5th revised edition Amendment 2 of the UN Manual of Tests and Criteria.
We, LG Chem, Ltd., hereby certify that this battery meets the requirements of the regulation for transportation of lithium-ion cells, batteries and single cell batteries.

Manufacturer's contact information	LG Chem, Ltd. Address : 128 Yeoui-Daero, Yeongdeungpo-gu, SEOUL, 150-721, REPUBLIC OF KOREA Telephone : +82-10-7742-5427 E-mail : kkammy@lgchem.com Website : www.lgchem.com			
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-160114-B-M48189P3B CMA (RESU10)	UN 38.3 Tests	Test 1. Altitude Simulation	Pass
Date of test report	2016. 01. 14		Test 2. Thermal Test	Pass
Item / Cell Type	Lithium ion Battery / Pouch		Test 3. Vibration	Pass
Model name	M48189P3B CMA (RESU10)		Test 4. Shock	Pass
Nominal voltage	7.4 V		Test 5. External Short Circuit	Pass
Capacity / Energy	189.0 Ah / 1.4 kWh		Test 6. Impact or Crush	Pass
Weight	Max 76.0 kg		Test 7. Overcharge	N/A
Dimensions	452(L)*483(W)*227(H) mm		Test 8. Forced Discharge	Pass

Reviewed By: MinJe Woo
Professional
Global Standard Certification Team
LG Chem, Ltd.
E-mail: Milkis@lgchem.com



Approved By: DaeHo Nam
Team Leader
Global Standard Certification Team
LG Chem, Ltd.
E-mail: kkammy@lgchem.com





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E-Mail: info@unidomo.de | Tel.: 04621 - 30 60 89 0 | www.unidomo.de



LG Chem, Ltd.
128, Yeoui-daero, Yeongdeungpo-gu, Seoul, Korea
Global Standard Certification Team
Tel: 82-42-870-6195, Fax: 82-42-863-0182

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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.

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☐ Lithium-ion cell ☒ Lithium-ion battery ☐ Lithium-ion single cell battery	
Model name	M48189P3B CMA (RESU10)
Cell Model name	JH3
Nominal voltage	7.4 V
Electric power capacity	1.4 kWh

Reviewed By: MinJe Woo

Professional
Global Standard Certification Team
LG Chem, Ltd.
E-mail: milkis@lgchem.com

Approved By: DaeHo Nam

Team Leader
Global Standard Certification Team
LG Chem, Ltd.
E-mail: kkammy@lgchem.com

Document Number	QDI-160114-B-M48189P3B CMA	
Prepared	MyeongHun Choi	<i>Choi</i>
Reviewed	MinJe Woo	<i>[Signature]</i>
Approved	DaeHo Nam	<i>[Signature]</i>

UN38.3 Test Report

- M48189P3B CMA (RESU10)

(Nom. 1.4 kWh, 7.4V) -

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2016. 01. 14

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 <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℃	- 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	8.353	7.700	8.353	7.700	100.00	0.000	Pass	8.313	7.700	99.52	0.000	Pass	8.310	7.700	99.96	0.000	Pass	8.310	7.700	100.00	0.000	Pass
2	8.355	7.680	8.355	7.680	100.00	0.000	Pass	8.310	7.680	99.46	0.000	Pass	8.310	7.680	100.00	0.000	Pass	8.310	7.680	100.00	0.000	Pass
3	8.356	7.690	8.356	7.690	100.00	0.000	Pass	8.310	7.690	99.45	0.000	Pass	8.310	7.690	100.00	0.000	Pass	8.310	7.690	100.00	0.000	Pass
4	8.353	7.690	8.353	7.690	100.00	0.000	Pass	8.320	7.690	99.60	0.000	Pass	8.310	7.690	99.88	0.000	Pass	8.310	7.690	100.00	0.000	Pass

B. 50th cycle fully charged state

5	8.366	7.700	8.366	7.700	100.00	0.000	Pass	8.320	7.700	99.45	0.000	Pass	8.320	7.700	100.00	0.000	Pass	8.320	7.700	100.00	0.000	Pass
6	8.351	7.680	8.351	7.680	100.00	0.000	Pass	8.310	7.680	99.51	0.000	Pass	8.310	7.680	100.00	0.000	Pass	8.310	7.680	100.00	0.000	Pass
7	8.352	7.670	8.352	7.670	100.00	0.000	Pass	8.310	7.670	99.50	0.000	Pass	8.310	7.670	100.00	0.000	Pass	8.310	7.670	100.00	0.000	Pass
8	8.352	7.690	8.352	7.690	100.00	0.000	Pass	8.310	7.690	99.50	0.000	Pass	8.310	7.690	100.00	0.000	Pass	8.310	7.690	100.00	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	8.310	54.66	Pass
2	8.310	54.23	Pass
3	8.310	54.38	Pass
4	8.310	54.22	Pass

B. 50th cycle fully charged state

5	8.320	54.09	Pass
6	8.310	55.51	Pass
7	8.310	54.66	Pass
8	8.310	55.95	Pass

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

Impact (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





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