

UN38.3 Test Summary

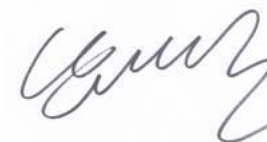
The following product has been evaluated according to the 5th revised edition Amendment 2 of the UN Manual of Tests and Criteria.
We, LG Chem, Ltd., hereby certify that this battery meets the requirements of the regulation for transportation of lithium-ion cells, batteries and single cell batteries.

| 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





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

If any of pages is not legible or has not been received, please notify our office for re-transmission

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.

| | |
|--|-------------------------------|
| <input type="checkbox"/> Lithium-ion cell <input checked="" type="checkbox"/> Lithium-ion battery <input type="checkbox"/> 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

Approved By: DaeHo Nam

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

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) -

목 차

1. UN38.3 Test Condition
2. Test Result
3. Sample Image

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℃ | <ul style="list-style-type: none"> - After OCV (%) ≥ 90% - No leakage, no venting, no disassembly, no rupture, no fire - Mass loss limit (leakage) <ol style="list-style-type: none"> 1) If $M < 1g$, less than 0.5%, 2) If $1g \leq M \leq 75g$, less than 0.2%, 3) If $M > 75g$, less than 0.1% | <p>T1~T5 : Sequence Tests</p> <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℃ | | |
| Test 6. Impact | Φ=15.8±0.1mm bar, 9.1±0.1kg mass, 61±2.5cm height | <ul style="list-style-type: none"> - 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) | <ul style="list-style-type: none"> - 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 | <ul style="list-style-type: none"> - 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

