



CONFIDENTIAL

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## CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 5<sup>th</sup> revised edition Amendment2 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 and 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   | <b>L17L3P53</b>    |
| Cell Model name  | <b>ICP595490L1</b> |
| Nominal voltage  | <b>11.10 V</b>     |
| Electric power capacity  | <b>45 Wh</b>       |

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|                 |                       |                    |
|-----------------|-----------------------|--------------------|
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# UN38.3 Test Report

## - L17L3P53 (Nom.45Wh, 11.10V) -

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# 1. UN38.3 Test Condition

| 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"> <li>- After OCV (%) ≥ 90%</li> <li>- No leakage, no venting, no disassembly, no rupture, no fire</li> <li>- Mass loss limit (leakage)               <ol style="list-style-type: none"> <li>1) If <math>M &lt; 1g</math>, less than 0.5%,</li> <li>2) If <math>1g \leq M \leq 75g</math>, less than 0.2%,</li> <li>3) If <math>M &gt; 75g</math>, less than 0.1%</li> </ol> </li> </ul> | T1~T5 : Sequence Tests<br><pre>           graph TD             T1[Test 1<br/>Altitude Simulation] --&gt; T2[Test 2<br/>Thermal Test]             T2 --&gt; T3[Test 3<br/>Vibration]             T3 --&gt; T4[Test 4<br/>Shock]             T4 --&gt; T5[Test 5<br/>Ext. Short Circuit]           </pre> |
| Test 2. Thermal Test           | [72±2℃,6hr ↔ -40±2℃,6hr, interval max. 30min] x 10cycle<br>Storing at 20±5℃ for 24h  |   |   |
| Test 3. Vibration              | [7Hz↔200Hz↔7Hz, in 15min] x 12 times x 3 direction<br>1) sinusoidal waveform with a logarithmic sweep<br>2) 7Hz 18Hz (maintaining 1g) app. 50Hz (until 8gn)<br>200Hz (maintaining 8gn), 1.6mm total excursion                            |   |   |
| Test 4. Shock                  | Half sine shock<br>(peak acceleration : 150gn, pulse duration : 6msec)<br>x 6 (±x, y, z), direction x 3 cycle  |   |   |
| Test 5. External Short Circuit | 100mΩ ext. short-circuit at 55±2℃<br>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"> <li>- No disassembly, no fire within 6 hours after the test</li> <li>- Max. Temp ≤ 170℃</li> </ul>   | for cylindrical cells<br>(not less than 18mm diameter)  |
| Test 6. Crush                  | Crushing rate :1.5cm/s, until 13kN±0.78kN<br>or 100mV drop or 50% deformation  |   | for cylindrical cells<br>(less than 18mm diameter)<br>for prismatic, pouch,<br>coin/button cells  |
| Test 7. Overcharge             | Current = Manufacturer's recommended max. continuous charge current<br>X 2 Voltage<br>1.If charge voltage ≤ 18V,<br>V (min.) = 2 x (max. charge voltage) or 22V.<br>2.If charge voltage > 18V,<br>V (min.) = 1.2 x (max. charge voltage) | <ul style="list-style-type: none"> <li>- No disassembly, no fire within 7 days after the test</li> </ul>  | Only for<br>Single Cell Battery / Battery   |
| Test 8. Forced Discharge       | Discharge at max. discharge current<br>(connecting in series with 12V DC power supply),<br>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>  | Resistance of Electric Loader<br>1/Ω = (max. discharge current)<br>/ (12 + Initial OCV)   |

## 2. General Information

### 1. Standard charge / discharge Condition

|           | Mode    | Condition                              | End Condition    |
|-----------|---------|--|------------------|
| Charge    | CC / CV | Current = 3945 mA<br>Voltage = 12.60 V | Current = 198 mA |
| Discharge | CC      | Current = 789 mA                       | Voltage = 9.0 V  |

### 2. Cycle Condition

|           | Mode    | Condition                              | End Condition    |
|-----------|---------|--|------------------|
| Charge    | CC / CV | Current = 3945 mA<br>Voltage = 12.60 V | Current = 198 mA |
| Discharge | CC      | Current = 789 mA                       | Voltage = 9.0 V  |

### 3. Test Condition

|                          | Mode    | Condition   |
|--------------------------|---------|---|
| Test 7. Overcharge       | CC / CV | Max. Charge Current = 4340 mA<br>CC/CV 2Imax (8680mA) 22 V cut-off 24Hr |
| Test 8. Forced Discharge | CC      | Max. Discharge Current = 3945 mA<br>Duration Time = 60 min              |

# 3-1. T1-T4 Test Result

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

**A. 1st cycle fully charged state**

|   |        |        |        |        |       |       |      |        |        |       |       |      |        |        |       |       |      |        |        |       |       |      |
|---|--------|--------|--------|--------|-------|-------|------|--------|--------|-------|-------|------|--------|--------|-------|-------|------|--------|--------|-------|-------|------|
| 1 | 12.587 | 215.71 | 12.586 | 215.70 | 99.99 | 0.005 | Pass | 12.581 | 215.69 | 99.96 | 0.005 | Pass | 12.576 | 215.68 | 99.96 | 0.005 | Pass | 12.568 | 215.67 | 99.94 | 0.005 | Pass |
| 2 | 12.548 | 215.70 | 12.545 | 215.70 | 99.98 | 0.000 | Pass | 12.536 | 215.68 | 99.93 | 0.009 | Pass | 12.527 | 215.67 | 99.93 | 0.005 | Pass | 12.516 | 215.67 | 99.91 | 0.000 | Pass |
| 3 | 12.543 | 215.69 | 12.542 | 215.69 | 99.99 | 0.000 | Pass | 12.537 | 215.67 | 99.96 | 0.009 | Pass | 12.528 | 215.67 | 99.93 | 0.000 | Pass | 12.525 | 215.66 | 99.98 | 0.005 | Pass |
| 4 | 12.553 | 215.68 | 12.551 | 215.67 | 99.98 | 0.005 | Pass | 12.547 | 215.67 | 99.97 | 0.000 | Pass | 12.544 | 215.66 | 99.98 | 0.005 | Pass | 12.539 | 215.65 | 99.96 | 0.005 | Pass |

**B. 50th cycle fully charged state**

|   |        |        |        |        |       |       |      |        |        |       |       |      |        |        |       |       |      |        |        |       |       |      |
|---|--------|--------|--------|--------|-------|-------|------|--------|--------|-------|-------|------|--------|--------|-------|-------|------|--------|--------|-------|-------|------|
| 5 | v      | 215.67 | 12.545 | 215.67 | 99.93 | 0.000 | Pass | 12.542 | 215.66 | 99.98 | 0.005 | Pass | 12.539 | 215.66 | 99.98 | 0.000 | Pass | 12.529 | 215.65 | 99.92 | 0.005 | Pass |
| 6 | 12.559 | 215.72 | 12.556 | 215.71 | 99.98 | 0.005 | Pass | 12.549 | 215.71 | 99.94 | 0.000 | Pass | 12.541 | 215.70 | 99.94 | 0.005 | Pass | 12.539 | 215.69 | 99.98 | 0.005 | Pass |
| 7 | 12.570 | 215.69 | 12.565 | 215.67 | 99.96 | 0.009 | Pass | 12.560 | 215.67 | 99.96 | 0.000 | Pass | 12.554 | 215.66 | 99.95 | 0.005 | Pass | 12.546 | 215.66 | 99.94 | 0.000 | Pass |
| 8 | 12.561 | 215.67 | 12.556 | 215.66 | 99.96 | 0.005 | Pass | 12.547 | 215.66 | 99.93 | 0.000 | Pass | 12.538 | 215.65 | 99.93 | 0.005 | Pass | 12.528 | 215.64 | 99.92 | 0.005 | Pass |

# 3-2. T5/T7 Test Result

## EXT.Short Circuit (T5)

| NO. | Initial OCV(V) | Max. Temp (°C) | Result |
|-----|----------------|----------------|--------|
|-----|----------------|----------------|--------|

### A. 1st cycle fully charged state

|   |        |       |      |
|---|--------|-------|------|
| 1 | 12.568 | 56.32 | Pass |
| 2 | 12.516 | 55.09 | Pass |
| 3 | 12.525 | 55.57 | Pass |
| 4 | 12.539 | 55.32 | Pass |

### B. 50th cycle fully charged state

|   |        |       |      |
|---|--------|-------|------|
| 5 | 12.529 | 56.29 | Pass |
| 6 | 12.539 | 54.74 | Pass |
| 7 | 12.546 | 55.45 | Pass |
| 8 | 12.528 | 56.27 | Pass |

## Over Charge (T7)

| NO. | Initial OCV(V) | Max. Temp (°C) | Result |
|-----|----------------|----------------|--------|
|-----|----------------|----------------|--------|

### A. 1st cycle fully charged state

|    |        |       |      |
|----|--------|-------|------|
| 9  | 12.447 | 24.13 | Pass |
| 10 | 12.443 | 24.88 | Pass |
| 11 | 12.447 | 25.00 | Pass |
| 12 | 12.435 | 24.07 | Pass |

## Over Charge (T7)

| NO. | Initial OCV(V) | Max. Temp (°C) | Result |
|-----|----------------|----------------|--------|
|-----|----------------|----------------|--------|

### B. 50th cycle fully charged state

|    |        |       |      |
|----|--------|-------|------|
| 13 | 12.427 | 24.01 | Pass |
| 14 | 12.429 | 24.66 | Pass |
| 15 | 12.429 | 24.89 | Pass |
| 16 | 12.428 | 24.35 | Pass |

# 3-3. T6/T8 Test Result (ICP595490L1)

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

**A. 1st cycle 50% charged state**

|     |       |       |      |
|-----|-------|-------|------|
| C-1 | 3.733 | 24.25 | Pass |
| C-2 | 3.723 | 23.95 | Pass |
| C-3 | 3.724 | 23.69 | Pass |
| C-4 | 3.733 | 23.45 | Pass |
| C-5 | 3.727 | 23.47 | 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  | 3.396 | 80.41 | Pass |
| C-7  | 3.395 | 81.99 | Pass |
| C-8  | 3.399 | 86.40 | Pass |
| C-9  | 3.401 | 79.60 | Pass |
| C-10 | 3.397 | 90.31 | Pass |
| C-11 | 3.380 | 81.89 | Pass |
| C-12 | 3.399 | 84.08 | Pass |
| C-13 | 3.398 | 81.53 | Pass |
| C-14 | 3.398 | 82.76 | Pass |
| C-15 | 3.400 | 73.80 | Pass |

**B. 50th cycle fully discharged state**

|      |       |       |      |
|------|-------|-------|------|
| C-16 | 3.780 | 88.63 | Pass |
| C-17 | 3.588 | 78.32 | Pass |
| C-18 | 3.542 | 99.41 | Pass |
| C-19 | 3.591 | 76.73 | Pass |
| C-20 | 3.605 | 88.63 | Pass |
| C-21 | 3.616 | 81.87 | Pass |
| C-22 | 3.572 | 86.43 | Pass |
| C-23 | 3.581 | 88.18 | Pass |
| C-24 | 3.612 | 88.15 | Pass |
| C-25 | 3.578 | 85.56 | Pass |

# 4. Sample Image

