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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>L14L4P72</b>     |
| Cell Model name  | <b>ICP3549100L1</b> |
| Nominal voltage  | <b>7.6 V</b>        |
| Electric power capacity  | <b>40 Wh</b>        |

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|          |                            |   |
|----------|----------------------------|---|
| 문서번호     | QAE-EF02-150520-PKL14L4P72 |   |
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SolutionPartner

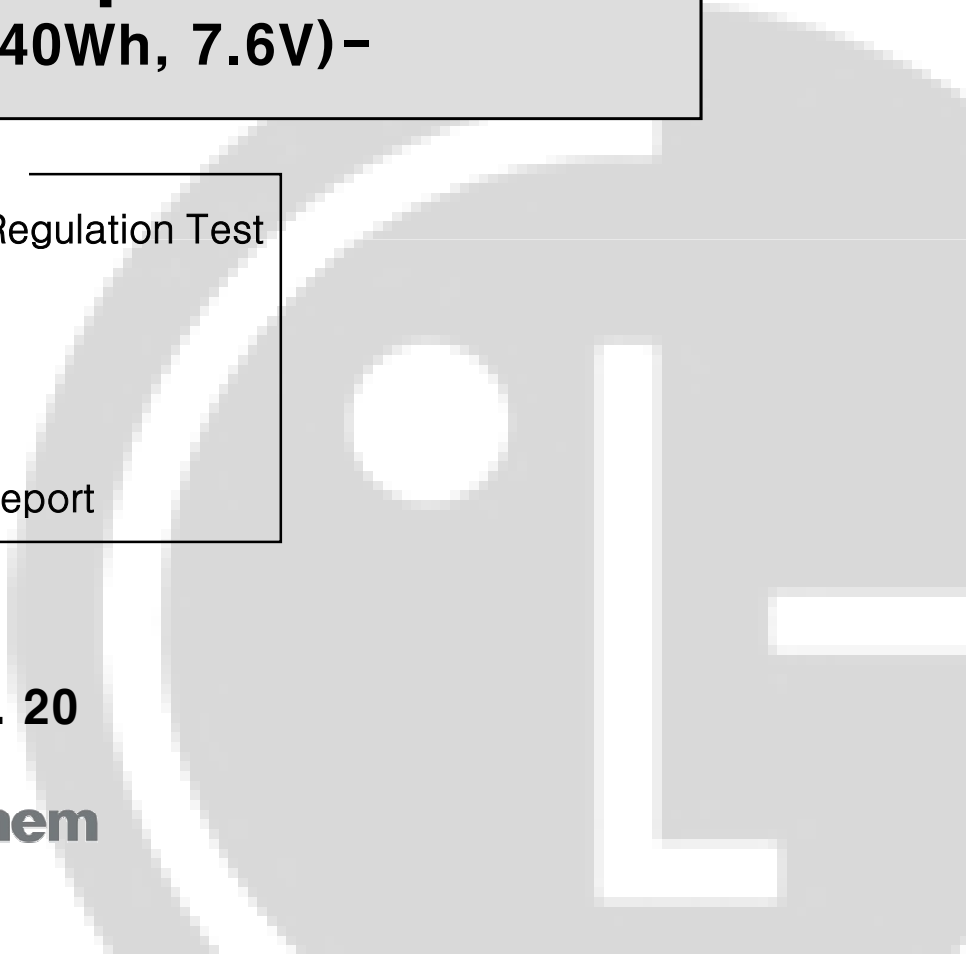
# UN Test Report

## -L14L4P72(Nom. 40Wh, 7.6V)-

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  2. Test Procedure
  3. Test Result
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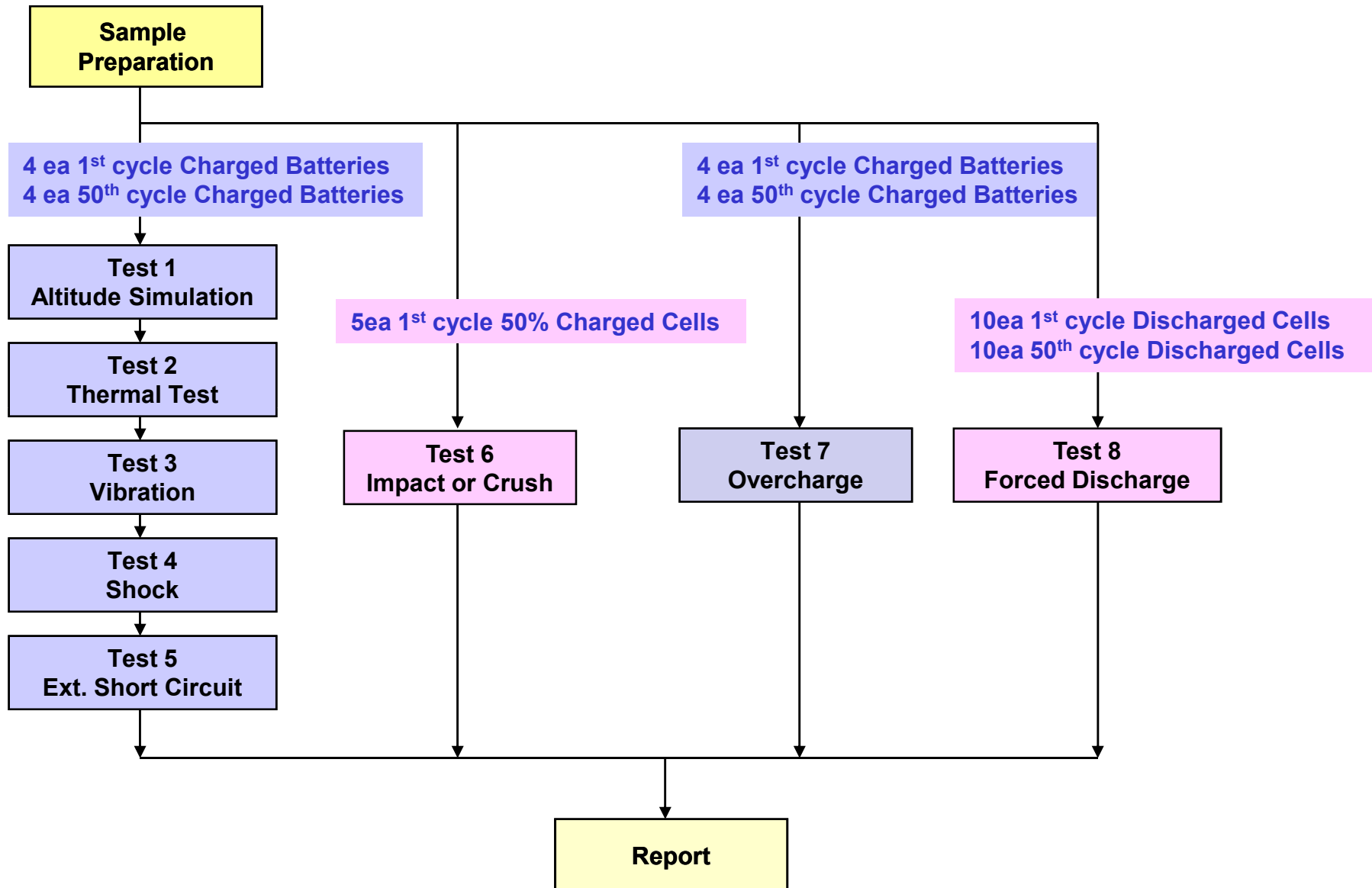
# 1. UN Transportation Regulation Test

| Test  | Condition   | Requirements  |
|---|---|---|
| Test 1. Altitude Simulation   | Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃   | - Measuring mass before/ after each test<br>(If $M < 1g$ , less than 0.5%, If $1g \leq M \leq 75g$ , less than 0.2%, If $M > 75g$ , less than 0.1%)<br>- Measuring voltage before/ after each test (more than 90%)<br>- No leakage, no venting, no disassembly, no rupture, no fire |
| 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 1gn) 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) 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 for cylindrical cells (> 18mm diameter)  | Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height   | - No disassembly, no fire within 6 hours after the test<br>- Temp. monitoring (max. 170℃)   |
| Test 6. Crush for cylindrical cells (≤ 18mm diameter) for prismatic, pouch, coin/button cells | Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation  |   |
| Test 7. Overcharge  | Current = Manufacturer's recommended max. continuous charge current X 2 Voltage<br>1.If charge voltage ≤ 18V,<br>V (min.) = 2 x (max. charge voltage) or V (min.) = 22V.<br>2.If charge voltage > 18V, V (min.) = 1.2 x (max. charge voltage) | - No disassembly, no fire within 7 days after the test  |
| Test 8. Forced Discharge  | Discharge at max. discharge current (with 12V DC power supply),<br>Duration time = rated capacity/initial test current  |   |

\* Tests through T1-T5 shall be conducted in sequence with the same samples.

\* We declare that the above-mentioned test is the result of being checked according to UN Test ( Manual of Test and Criteria ST/SG/AC.10/11/Rev.5/Amd.2)

## 2. Test Procedure



# 3-1. T1-T4 Test Result

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

## A. 1st cycle fully charged state

|        |      |       |        |       |        |       |       |      |       |        |       |       |      |       |        |       |       |      |       |        |       |       |      |
|--------|------|-------|--------|-------|--------|-------|-------|------|-------|--------|-------|-------|------|-------|--------|-------|-------|------|-------|--------|-------|-------|------|
| Charge | 1    | 8.674 | 180.14 | 8.664 | 180.13 | 99.88 | 0.006 | Pass | 8.569 | 180.13 | 98.90 | 0.000 | Pass | 8.471 | 180.12 | 98.86 | 0.006 | Pass | 8.466 | 180.11 | 99.94 | 0.006 | Pass |
|        | 2    | 8.631 | 180.95 | 8.621 | 180.95 | 99.88 | 0.000 | Pass | 8.530 | 180.94 | 98.94 | 0.006 | Pass | 8.435 | 180.93 | 98.89 | 0.006 | Pass | 8.429 | 180.92 | 99.93 | 0.006 | Pass |
|        | 3    | 8.635 | 180.03 | 8.622 | 180.02 | 99.85 | 0.006 | Pass | 8.533 | 180.02 | 98.97 | 0.000 | Pass | 8.438 | 180.00 | 98.89 | 0.011 | Pass | 8.432 | 179.99 | 99.93 | 0.006 | Pass |
|        | 4    | 8.633 | 180.80 | 8.622 | 180.79 | 99.87 | 0.006 | Pass | 8.535 | 180.78 | 98.99 | 0.006 | Pass | 8.440 | 180.78 | 98.89 | 0.000 | Pass | 8.435 | 180.78 | 99.94 | 0.000 | Pass |
|        | Ave. | 8.643 | 180.48 | 8.632 | 180.47 | 99.87 | 0.004 | -    | 8.542 | 180.47 | 98.95 | 0.003 | -    | 8.446 | 180.46 | 98.88 | 0.006 | -    | 8.441 | 180.45 | 99.93 | 0.004 | -    |

## B. 50th cycle fully charged state

|        |      |       |        |       |        |       |       |      |       |        |       |       |      |       |        |       |       |      |       |        |       |       |      |
|--------|------|-------|--------|-------|--------|-------|-------|------|-------|--------|-------|-------|------|-------|--------|-------|-------|------|-------|--------|-------|-------|------|
| Charge | 5    | 8.654 | 180.19 | 8.643 | 180.18 | 99.87 | 0.006 | Pass | 8.551 | 180.17 | 98.94 | 0.006 | Pass | 8.450 | 180.16 | 98.82 | 0.006 | Pass | 8.447 | 180.15 | 99.96 | 0.006 | Pass |
|        | 6    | 8.667 | 180.31 | 8.657 | 180.29 | 99.88 | 0.011 | Pass | 8.563 | 180.28 | 98.91 | 0.006 | Pass | 8.468 | 180.28 | 98.89 | 0.000 | Pass | 8.463 | 180.27 | 99.94 | 0.006 | Pass |
|        | 7    | 8.665 | 180.19 | 8.653 | 180.17 | 99.86 | 0.011 | Pass | 8.559 | 180.17 | 98.91 | 0.000 | Pass | 8.456 | 180.15 | 98.80 | 0.011 | Pass | 8.451 | 180.14 | 99.94 | 0.006 | Pass |
|        | 8    | 8.668 | 180.42 | 8.658 | 180.41 | 99.88 | 0.006 | Pass | 8.570 | 180.40 | 98.98 | 0.006 | Pass | 8.468 | 180.37 | 98.81 | 0.017 | Pass | 8.465 | 180.37 | 99.96 | 0.000 | Pass |
|        | Ave. | 8.664 | 180.28 | 8.653 | 180.26 | 99.88 | 0.008 | -    | 8.561 | 180.26 | 98.94 | 0.004 | -    | 8.461 | 180.24 | 98.83 | 0.008 | -    | 8.457 | 180.23 | 99.95 | 0.004 | -    |

### Requirement

- Measuring mass before/after each test (If  $M > 75g$ , less than 0.1%,  $1g \leq M \leq 75$ , less than 0.2%,  $M < 1g$ , less than 0.5%)
- Measuring voltage before/after each test (more than 90%, only charged samples)
- No leakage, no venting, no disassembly, no rupture, no fire

# 3-2. T5/T7 Test Result

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

## A. 1st cycle fully charged state

|        |      |       |       |      |
|--------|------|-------|-------|------|
| Charge | 1    | 8.466 | 54.31 | Pass |
|        | 2    | 8.429 | 55.07 | Pass |
|        | 3    | 8.432 | 54.90 | Pass |
|        | 4    | 8.435 | 55.06 | Pass |
|        | MAX. | 8.466 | 55.07 | -    |

| Test Condition                       |
|--------------------------------------|
| - 100mΩ ext. short-circuit at 55±2°C |

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

## A. 1st cycle fully charged state

|        |      |       |       |      |
|--------|------|-------|-------|------|
| Charge | 9    | 8.643 | 23.46 | Pass |
|        | 10   | 8.648 | 24.90 | Pass |
|        | 11   | 8.641 | 24.94 | Pass |
|        | 12   | 8.641 | 24.72 | Pass |
|        | MAX. | 8.648 | 24.94 | -    |

| Test Condition   |
|--|
| - Max. Charge Current : 2670mA<br>- CC/CV 2Imax(5340mA) 17.4V cut-off 24Hr |

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

## B. 50th cycle fully charged state

|        |      |       |       |      |
|--------|------|-------|-------|------|
| Charge | 5    | 8.447 | 55.18 | Pass |
|        | 6    | 8.463 | 53.94 | Pass |
|        | 7    | 8.451 | 53.89 | Pass |
|        | 8    | 8.465 | 55.50 | Pass |
|        | MAX. | 8.465 | 55.50 | -    |

| Requirement   |
|---|
| - Temperature ≤ 170 (°C)<br>- No disassembly, no rupture, no fire within 6 hours after the test |

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

## B. 50th cycle fully charged state

|        |      |       |       |      |
|--------|------|-------|-------|------|
| Charge | 13   | 8.629 | 23.73 | Pass |
|        | 14   | 8.629 | 24.26 | Pass |
|        | 15   | 8.629 | 24.24 | Pass |
|        | 16   | 8.626 | 24.99 | Pass |
|        | MAX. | 8.629 | 24.99 | -    |

| Requirement   |
|---|
| - No disassembly, no fire within 7 day after the test |

# 3-3. T6/T8 Test Result (ICP3549100L1)

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

## A. 1st cycle 50% charged state

|             |     |       |       |      |
|-------------|-----|-------|-------|------|
| Flat        | C-1 | 3.823 | 24.92 | Pass |
|             | C-2 | 3.823 | 25.42 | Pass |
|             | C-3 | 3.823 | 25.35 | Pass |
|             | C-4 | 3.824 | 24.83 | Pass |
|             | C-5 | 3.826 | 24.96 | Pass |
| <b>MAX.</b> |     | 3.826 | 25.42 | -    |

| Test Condition   |
|--|
| - Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation |

| Requirement   |
|---|
| - Temperature ≤ 170 (°C)                                |
| - No disassembly, no fire within 6 hours after the test |

| Forced Discharge (T8) |                |                |        |
|-----------------------|----------------|----------------|--------|
| NO.                   | Initial OCV(V) | Max. Temp (°C) | Result |

## A. 1st cycle fully discharged state

|             |       |       |      |
|-------------|-------|-------|------|
| C-6         | 3.053 | 86.59 | Pass |
| C-7         | 3.038 | 83.68 | Pass |
| C-8         | 3.038 | 89.21 | Pass |
| C-9         | 3.038 | 84.26 | Pass |
| C-10        | 3.047 | 81.84 | Pass |
| C-11        | 3.036 | 81.92 | Pass |
| C-12        | 3.051 | 82.82 | Pass |
| C-13        | 3.041 | 80.61 | Pass |
| C-14        | 3.034 | 78.86 | Pass |
| C-15        | 3.051 | 85.18 | Pass |
| <b>MAX.</b> | 3.053 | 89.21 | -    |

## B. 50th cycle fully discharged state

|             |       |       |      |
|-------------|-------|-------|------|
| C-16        | 3.053 | 83.36 | Pass |
| C-17        | 3.081 | 76.83 | Pass |
| C-18        | 3.058 | 88.14 | Pass |
| C-19        | 3.055 | 85.62 | Pass |
| C-20        | 3.056 | 79.33 | Pass |
| C-21        | 3.070 | 83.09 | Pass |
| C-22        | 3.050 | 79.37 | Pass |
| C-23        | 3.050 | 84.62 | Pass |
| C-24        | 3.083 | 82.55 | Pass |
| C-25        | 3.058 | 89.13 | Pass |
| <b>MAX.</b> | 3.083 | 89.13 | -    |

| Test Condition   |
|--|
| - Discharge at max. discharge current (with 12V DC power supply) : 2290mA<br>Duration time: rated capacity (60.0min) |

| Requirement  |
|--|
| - No disassembly, no fire within 7 days after the test |

# 4. Sample Image

