

LG Chem, Ltd.

NO.17, Hengyi Road , Nanjing Economical & Technological Development Zone, Nanjing, China

DQA Team

Tel: 025-8560-3000 , Fax: 025-8328-9793

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## CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 6<sup>th</sup> revised edition 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	<b>L18L3P72</b>
Cell Model name	<b>P468073A1</b>
Nominal voltage	<b>11.55V</b>
Electric power capacity	<b>51.00Wh</b>

Approved By: Xuyuan



Assistant Manager

DQA Team

LG Chem, Ltd.

E-mail: [Xuyuan@lgchem.com](mailto:Xuyuan@lgchem.com)

Document Number	QDI-180824-B-L18L3P72	
Prepared	qianjunli	钱俊丽
Approved	Xuyuan	徐园

# UN38.3 Test Report

– L18L3P72 (Nom. 51.00Wh, 11.55V) –

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2018. 08. 24

# 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°C		T1~T5 : Sequence Tests <pre> graph TD     T1[Test 1 Altitude Simulation] --&gt; T2[Test 2 Thermal Test]     T2 --&gt; T3[Test 3 Vibration]     T3 --&gt; T4[Test 4 Shock]     T4 --&gt; T5[Test 5 Ext. Short Circuit]           </pre>
Test 2. Thermal Test	[72±2°C, 6hr ↔ -40±2°C, 6hr, interval max. 30min] x 10 cycle Storing at 20±5°C 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	<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 M&lt;1g, less than 0.5%,</li> <li>2) If 1g≤M≤75g, less than 0.2%,</li> <li>3) If M&gt;75g, less than 0.1%</li> </ol> </li> </ul>	
Test 4. Shock	Half sine shock 1) Peak acceleration - For cells & single cell batteries : 150gn - For batteries (whichever is smaller) : 150gn or $\sqrt{\frac{100850}{\text{Mass}(kg)}} \text{ gn}$ 2) Pulse duration : 6msec 3) 6 direction (±x, y, z) x 3 cycle		
Test 5. External Short Circuit	1) Samples to be heated to 57±4°C in chamber (Measured on external case) 2) Less than 0.1Ω, ext. short-circuit at 57±4°C 3) 1hr continue after returning to 57±4°C	<ul style="list-style-type: none"> <li>- No disassembly, no rupture, no fire within 6 hours after the test</li> <li>- Max. Temp ≤ 170°C</li> </ul>	
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°C</li> </ul>	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"> <li>- No disassembly, no fire within 7 days after the test</li> </ul>	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"> <li>- No disassembly, no fire within 7 days after the test</li> </ul>	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	OCV	Mass	After OCV(%)	Mass Loss(%)	Result	OCV	Mass	After OCV(%)	Mass Loss(%)	Result	OCV	Mass	After OCV(%)	Mass Loss(%)	Result	OCV	Mass	After OCV(%)	Mass Loss(%)	Result

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

1	12.9186	202.28	12.9042	202.25	99.89	0.015	Pass	12.7132	202.29	98.52	0.000	Pass	12.7115	202.30	99.99	0.000	Pass	12.7105	202.31	99.99	0.000	Pass
2	12.8830	201.99	12.8696	201.96	99.90	0.015	Pass	12.6893	202.01	98.60	0.000	Pass	12.6878	202.01	99.99	0.000	Pass	12.6865	202.01	99.99	0.000	Pass
3	12.8835	201.05	12.8693	201.00	99.89	0.025	Pass	12.6875	201.06	98.59	0.000	Pass	12.6861	201.06	99.99	0.000	Pass	12.6849	201.06	99.99	0.000	Pass
4	12.9410	201.66	12.9258	201.63	99.88	0.015	Pass	12.7282	201.67	98.47	0.000	Pass	12.7253	201.68	99.98	0.000	Pass	12.7248	201.68	100.00	0.000	Pass

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

5	12.9025	202.17	12.8913	202.13	99.91	0.020	Pass	12.7043	202.19	98.55	0.000	Pass	12.7028	202.18	99.99	0.005	Pass	12.7012	202.19	99.99	0.000	Pass
6	12.9035	202.43	12.8774	202.40	99.80	0.015	Pass	12.6958	202.45	98.59	0.000	Pass	12.6943	202.45	99.99	0.000	Pass	12.6929	202.46	99.99	0.000	Pass
7	12.9010	203.07	12.8784	203.04	99.82	0.015	Pass	12.6960	203.09	98.58	0.000	Pass	12.6945	203.10	99.99	0.000	Pass	12.6929	203.09	99.99	0.005	Pass
8	12.9090	202.49	12.8810	202.46	99.78	0.015	Pass	12.6961	202.51	98.56	0.000	Pass	12.6948	202.51	99.99	0.000	Pass	12.6932	202.51	99.99	0.000	Pass

# 2-2. T5/T7 Test Result

## EXT.Short Circuit (T5)

NO.	Initial OCV(V)	Max. Temp (°C)	Result
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### A. 1st cycle fully charged state

1	12.7105	57.85	Pass
2	12.6865	57.30	Pass
3	12.6849	56.41	Pass
4	12.7248	56.01	Pass

### B. 50th cycle fully charged state

5	12.7012	58.20	Pass
6	12.6929	57.96	Pass
7	12.6929	56.78	Pass
8	12.6932	56.47	Pass

## Overcharge (T7)

NO.	Initial OCV(V)	Max. Temp (°C)	Result
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### A. 1st cycle fully charged state

9	12.9062	21.50	Pass
10	12.5893	21.70	Pass
11	12.8573	21.19	Pass
12	12.9670	21.54	Pass

### B. 50th cycle fully charged state

13	12.9683	20.39	Pass
14	12.9118	20.79	Pass
15	12.8978	19.84	Pass
16	12.9117	20.19	Pass

## 2-3. T6/T8 Test Result (P468073A1)

**Crush (T6)**

NO.	Initial OCV(V)	Max. Temp (°C)	Result
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**A. 1st cycle 50% charged state**

C-1	3.8468	21.41	Pass
C-2	3.8458	24.91	Pass
C-3	3.8468	25.40	Pass
C-4	3.8452	25.91	Pass
C-5	3.8450	24.98	Pass

**Forced Discharge (T8)**

NO.	Initial OCV(V)	Max. Temp (°C)	Result	NO.	Initial OCV(V)	Max. Temp (°C)	Result
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**A. 1st cycle fully discharged state**

C-6	3.4259	83.27	Pass	C-16	3.5843	90.56	Pass
C-7	3.4090	83.54	Pass	C-17	3.5940	94.15	Pass
C-8	3.4187	85.99	Pass	C-18	3.5750	99.04	Pass
C-9	3.4148	86.49	Pass	C-19	3.5455	88.28	Pass
C-10	3.4159	92.66	Pass	C-20	3.5470	95.54	Pass
C-11	3.4190	87.37	Pass	C-21	3.5915	98.42	Pass
C-12	3.4250	89.10	Pass	C-22	3.5775	96.77	Pass
C-13	3.4202	66.55	Pass	C-23	3.5735	87.43	Pass
C-14	3.4192	90.48	Pass	C-24	3.5443	93.34	Pass
C-15	3.4166	88.19	Pass	C-25	3.5612	85.76	Pass

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

# 3. Sample Image

