

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 6th 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	L18L3PF4
Cell Model name	P595490B4
Nominal voltage	11.34V
Electric power capacity	52.50Wh

Approved By: Xuyuan



Assistant Manager

DQA Team

LG Chem, Ltd.

E-mail: Xuyuan@lgchem.com

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Prepared	qianjunli	钱俊丽
Approved	Xuyuan	徐园

UN38.3 Test Report

– L18L3PF4 (Nom. 52.50Wh, 11.34V) –

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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°C		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°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"> - 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≤M≤75g, less than 0.2%, 3) If M>75g, less than 0.1% 	
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"> - No disassembly, no rupture, no fire within 6 hours after the test - Max. Temp ≤ 170°C 	
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°C 	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	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	12.5035	217.57	12.4967	217.57	99.95	0.000	Pass	12.2653	217.48	98.15	0.041	Pass	12.2601	217.49	99.96	0.000	Pass	12.2574	217.49	99.98	0.000	Pass
2	12.4913	217.61	12.4874	217.60	99.97	0.005	Pass	12.2569	217.52	98.15	0.037	Pass	12.2506	217.53	99.95	0.000	Pass	12.2473	217.53	99.97	0.000	Pass
3	12.5024	217.61	12.4975	217.60	99.96	0.005	Pass	12.2652	217.51	98.14	0.041	Pass	12.2583	217.52	99.94	0.000	Pass	12.2563	217.53	99.98	0.000	Pass
4	12.5013	217.17	12.4948	217.16	99.95	0.005	Pass	12.2656	217.08	98.17	0.037	Pass	12.2588	217.09	99.94	0.000	Pass	12.2561	217.10	99.98	0.000	Pass

B. 50th cycle fully charged state

5	12.5173	217.94	12.5148	217.96	99.98	0.000	Pass	12.2931	217.87	98.23	0.041	Pass	12.2869	217.89	99.95	0.000	Pass	12.2843	217.89	99.98	0.000	Pass
6	12.5183	219.08	12.5227	219.03	100.00	0.023	Pass	12.3022	219.01	98.24	0.009	Pass	12.2957	219.02	99.95	0.000	Pass	12.2935	219.03	99.98	0.000	Pass
7	12.5184	217.64	12.5161	217.66	99.98	0.000	Pass	12.2936	217.58	98.22	0.037	Pass	12.2879	217.58	99.95	0.000	Pass	12.2854	217.59	99.98	0.000	Pass
8	12.5213	217.29	12.5179	217.31	99.97	0.000	Pass	12.2942	217.23	98.21	0.037	Pass	12.2903	217.24	99.97	0.000	Pass	12.2871	217.25	99.97	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	12.2574	58.27	Pass
2	12.2473	58.06	Pass
3	12.2563	58.00	Pass
4	12.2561	57.62	Pass

B. 50th cycle fully charged state

5	12.2843	58.27	Pass
6	12.2935	58.08	Pass
7	12.2854	57.64	Pass
8	12.2871	57.56	Pass

Overcharge (T7)

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

9	12.5005	23.91	Pass
10	12.5053	23.91	Pass
11	12.5114	23.81	Pass
12	12.5145	23.65	Pass

B. 50th cycle fully charged state

13	12.5234	23.71	Pass
14	12.5205	23.41	Pass
15	12.5178	23.57	Pass
16	12.5238	23.41	Pass

2-3. T6/T8 Test Result (P595490B4)

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

A. 1st cycle 50% charged state

C-1	3.827	20.73	Pass
C-2	3.826	20.37	Pass
C-3	3.826	19.75	Pass
C-4	3.826	20.11	Pass
C-5	3.252	20.30	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	3.243	82.06	Pass
C-7	3.240	73.57	Pass
C-8	3.239	72.69	Pass
C-9	3.241	79.03	Pass
C-10	3.241	74.51	Pass
C-11	3.244	78.94	Pass
C-12	3.251	76.06	Pass
C-13	3.243	77.02	Pass
C-14	3.243	77.20	Pass
C-15	3.242	68.57	Pass

B. 50th cycle fully discharged state

C-16	3.325	77.94	Pass
C-17	3.323	80.22	Pass
C-18	3.334	88.16	Pass
C-19	3.334	80.73	Pass
C-20	3.325	76.07	Pass
C-21	3.330	80.85	Pass
C-22	3.332	78.83	Pass
C-23	3.334	75.14	Pass
C-24	3.330	82.70	Pass
C-25	3.342	78.34	Pass

3. Sample Image

