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January 2, 2014

CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 5th revised edition Amendment 1 of the UN Manual of Tests and Criteria.

We, LG Chem. Ltd hereby certify that this cell meets the requirements of the regulation for transportation of lithium-ion cells and batteries.

Customer Model Name : **L13L4P61**
Cell Model Name : **ICP288694L1 (2P*2S)**
Type of Cell : **Polymer**
Nominal capacity : **44.4 Wh**
Document No. : **QAE-EF02-140102-PKL13L4P61**

Conducted By: Dae Ho Nam

Handwritten signature of Dae Ho Nam in black ink.

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Test Result

For more information, please refer to Document: QAE-EF02-140102-PKL13L4P61

<input type="checkbox"/> Lithium-ion cell	<input checked="" type="checkbox"/> Lithium-ion battery
Pack Model name	L13L4P61
Cell Model name	ICP288694L1
Nominal voltage	7.4 V
Nominal capacity	44.4 Wh
Lithium equivalent content	1.80 g

No.	Test Item	Criteria	Result	Remark
Test 1	Altitude simulation	- No leakage (If $M < 1g$, less than 0.5%, If $1g \leq M \leq 75g$, less than 0.2%, If $M > 75g$, less than 0.1%), venting, disassembly, rupture and no fire. -Measuring mass before/after each test. -Measuring voltage before/after each test. (more than 90%)	Pass	
Test 2	Thermal test		Pass	
Test 3	Vibration		Pass	
Test 4	Shock		Pass	
Test 5	External Short Circuit	-No disassembly, rupture and fire within six hours of this test. -Max. temperature should not exceed 170°C.	Pass	
Test 6	Crush	-No disassembly and fire within six hours of this test. -Max. temperature should not exceed 170°C.	Pass	
Test 7	Overcharge	-No disassembly and fire within seven days of the test.	Pass	Battery only
Test 8	Forced discharge	-No disassembly and fire within seven days of the test.	Pass	

Tests through T1-T5 shall be conducted in sequence with the same battery.

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/Amendment1)

We certify that this cell is proved to meet the requirements of each applicable test in the UN Manual of Test and Criteria, Part III, sub-section 38.3

Conducted By: Dae Ho Nam



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UN Test Report

- L13L4P61(44.4 Wh, 7.4V) -

목 차

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2014. 01. 02

1. UN Transportation Regulation Test

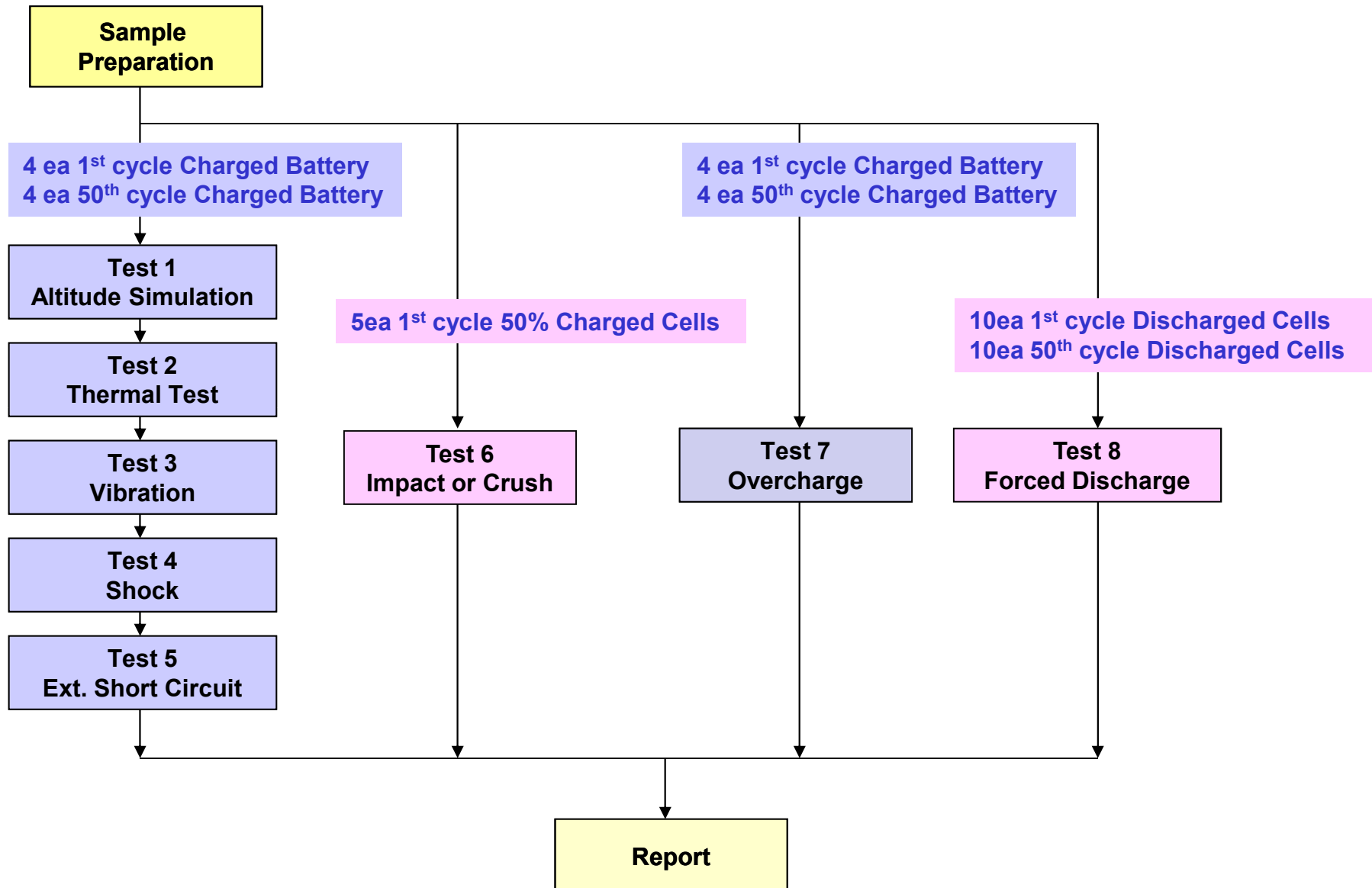
Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	
Test 2. Thermal Test	[72±2℃,6hr ↔ -40±2℃,6hr,interval max. 30min] x 10cycle Storing at 20±5℃ for 24h	- Measuring mass before/ after each test 1) M<1g, less than 0.5% 2) 1g≤M≤75g, less than 0.2% 3) M>75g, less than 0.1%
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	- Measuring voltage before/after each test (more than 90%)
Test 4. Shock	Half sine shock (peak acceleration : 150gn, pulse duration : 6msec) x 6 (±x, y, z) direction x 3 cycle	- No leakage, no venting, no disassembly, no rupture, no fire
Test 5. External Short Circuit	100mΩ ext. short-circuit at 55±2℃ 1hr continue after returning at 55±2℃	- No disassembly, no rupture, no fire (after 6 hours) - Temp. monitoring (max. 170℃)
Test 6. Impact for cylindrical cells (> 20mm diameter)	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	- No disassembly, no rupture, no fire (after 6 hours)
Test 6. Crush for cylindrical cells (≤ 20mm diameter) for prismatic, pouch, coin/button cells	Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation	- Temp. monitoring (max. 170℃)
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 V (min.) = 22V. 2.If charge voltage > 18V, V (min.) = 1.2 x (max. charge voltage)	- No disassembly, no fire (after 7 days)
Test 8. Forced Discharge	Discharge at max. discharge current (with 12V DC power supply), Duration time = rated capacity/initial test current	- Appearance picture before/ after test - No disassembly, no fire (after 7 days) - Temp. monitoring (max. 170℃)

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

* 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.1)

2. Test Procedure



3-1. T1-T4 Test Result

Before				Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
	Pack 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 state

Charge	1	8.342	240.466	8.329	240.460	99.84	0.002	Pass	8.250	240.437	99.05	0.010	Pass	8.236	240.426	99.83	0.005	Pass	8.220	240.414	99.81	0.005	Pass
	2	8.346	240.855	8.334	240.846	99.86	0.004	Pass	8.252	240.829	99.01	0.007	Pass	8.237	240.826	99.82	0.001	Pass	8.228	240.817	99.90	0.004	Pass
	3	8.348	240.208	8.339	240.190	99.90	0.007	Pass	8.262	240.170	99.08	0.008	Pass	8.247	240.147	99.81	0.010	Pass	8.230	240.136	99.80	0.005	Pass
	4	8.349	240.682	8.335	240.659	99.83	0.010	Pass	8.257	240.637	99.07	0.009	Pass	8.247	240.630	99.88	0.003	Pass	8.231	240.626	99.80	0.002	Pass
	Ave.	8.346	240.553	8.334	240.539	99.86	0.006	-	8.255	240.518	99.05	0.009	-	8.242	240.507	99.83	0.005	-	8.227	240.498	99.83	0.004	-

B. 50th cycle fully state

Charge	5	8.340	240.016	8.324	240.001	99.81	0.006	Pass	8.244	239.987	99.04	0.006	Pass	8.229	239.981	99.82	0.003	Pass	8.216	239.962	99.84	0.008	Pass
	6	8.349	240.157	8.333	240.156	99.81	0.000	Pass	8.250	240.135	99.00	0.009	Pass	8.235	240.121	99.82	0.006	Pass	8.224	240.108	99.86	0.005	Pass
	7	8.336	240.788	8.325	240.773	99.87	0.006	Pass	8.242	240.765	99.01	0.003	Pass	8.232	240.743	99.88	0.009	Pass	8.218	240.734	99.82	0.004	Pass
	8	8.339	240.937	8.326	240.934	99.84	0.001	Pass	8.242	240.911	99.00	0.010	Pass	8.228	240.906	99.83	0.002	Pass	8.219	240.881	99.89	0.010	Pass
	Ave.	8.341	240.474	8.327	240.466	99.83	0.004	-	8.245	240.450	99.01	0.007	-	8.231	240.438	99.84	0.005	-	8.219	240.421	99.85	0.007	-

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

A. 1st cycle fully state

Charge	1	8.220	55.82	Pass
	2	8.228	55.57	Pass
	3	8.230	55.74	Pass
	4	8.231	55.97	Pass
	MAX.	8.231	55.97	-

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

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

A. 1st cycle fully state

Charge	9	8.380	25.63	Pass
	10	8.372	25.38	Pass
	11	8.387	25.96	Pass
	12	8.345	25.50	Pass
	MAX.	8.387	25.96	-

Test Condition
- Max. Charge Current : 4200 mA - CC/CV 2Imax(8400mA) 16.8 V cut-off 24Hr

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

B. 50th cycle fully state

Charge	5	8.216	54.29	Pass
	6	8.224	54.30	Pass
	7	8.218	54.46	Pass
	8	8.219	54.17	Pass
	MAX.	8.224	54.46	-

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

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

B. 50th cycle fully state

Charge	13	8.226	25.33	Pass
	14	8.300	25.28	Pass
	15	8.293	25.45	Pass
	16	8.334	25.24	Pass
	MAX.	8.334	25.45	-

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

3-3. T6 Test Result (ICP288694L1)

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

A. 1st cycle 50% charged state (Direction :Flat)

Flat	1	3.759	56.92	Pass
	2	3.761	56.77	Pass
	3	3.761	55.63	Pass
	4	3.761	55.51	Pass
	5	3.759	56.10	Pass
MAX.		3.761	56.92	-

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

A. 1st cycle fully Discharged state

1	3.283	107.76	Pass
2	3.285	86.22	Pass
3	3.282	105.38	Pass
4	3.286	94.52	Pass
5	3.287	81.85	Pass
6	3.284	81.85	Pass
7	3.284	100.36	Pass
8	3.278	100.62	Pass
9	3.283	93.10	Pass
10	3.284	88.07	Pass
MAX.	3.287	107.76	-

B. 50th cycle fully discharged state

1	3.689	91.01	Pass
2	3.689	107.96	Pass
3	3.691	91.72	Pass
4	3.691	81.48	Pass
5	3.690	95.17	Pass
6	3.690	91.73	Pass
7	3.691	103.54	Pass
8	3.690	98.49	Pass
9	3.693	95.26	Pass
10	3.694	107.61	Pass
MAX.	3.694	107.96	-

Test Condition
- Discharge at max. discharge current (with 12V DC power supply) Duration time: rated capacity

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

