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CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 5th 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	L14L4P24
Cell Model name	ICP4554116L1
Nominal voltage	7.6 V
Electric power capacity	66 Wh


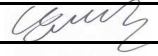

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문서번호	QAE-EF02-150313-PKL14L4P24	
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UN Test Report

- L14L4P24(Nom.66Wh, 7.6V)-

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2015. 03. 13



1. UN Transportation Regulation Test

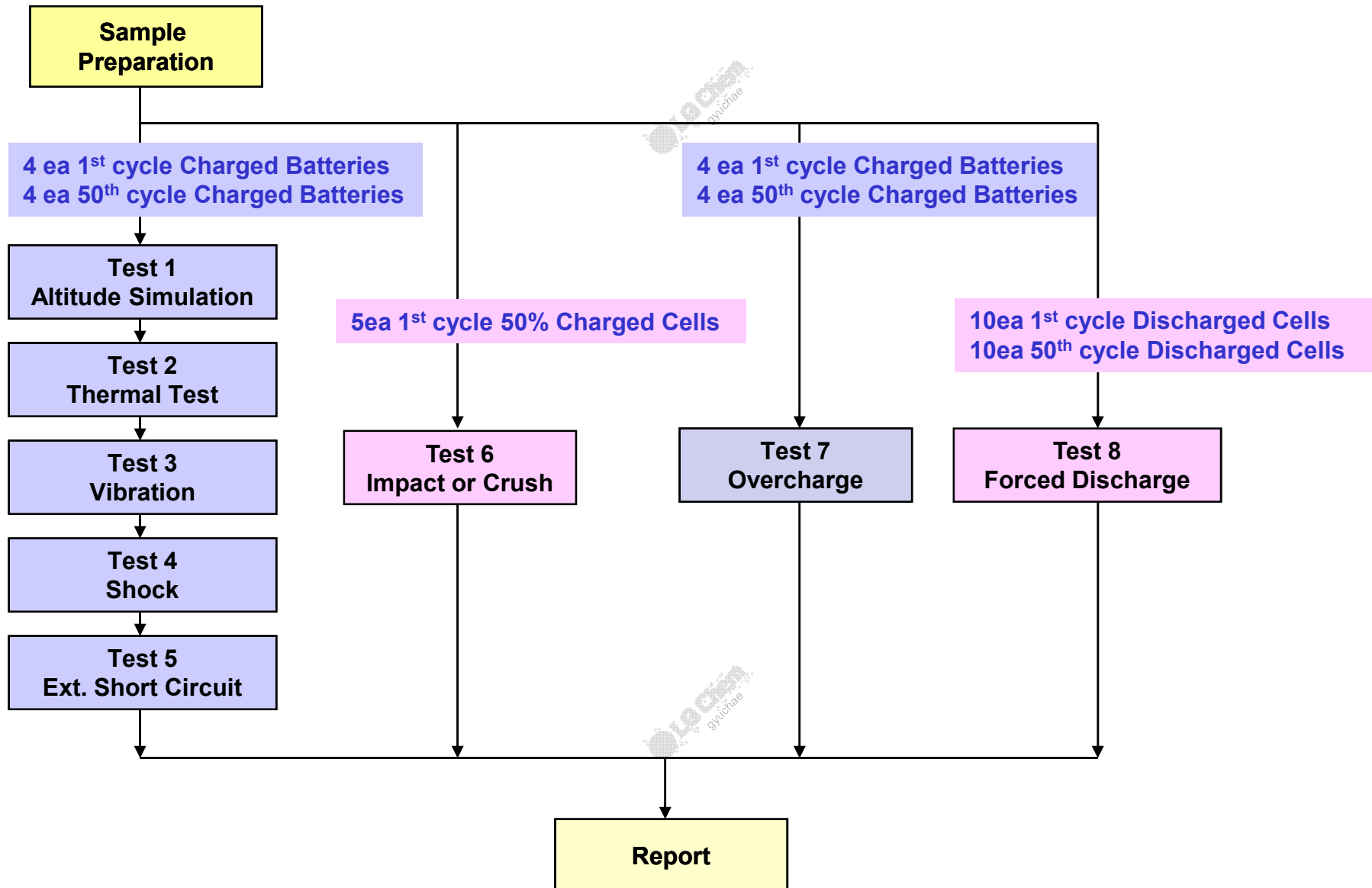
Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure) 11.6kPa for 6hr at 20+/-5℃	- Measuring mass before/ after each test (If M<1g, less than 0.5%, If 1g≤M≤75g, less than 0.2%, If M>75g, less than 0.1%) - Measuring voltage before/ after each test (more than 90%) - No leakage, no venting, no disassembly, no rupture, no fire
Test 2. Thermal Test	[72±2℃, 6hr ↔ -40±2℃, 6hr, interval max. 30min] x 10cycle Storing at 20±5℃ 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	
Test 4. Shock	Half sine shock (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℃ 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 - 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 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 within 7 days after the test
Test 8. Forced Discharge	Discharge at max. discharge current (with 12V DC power supply), 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	8.672	289.70	8.671	289.69	99.99	0.003	Pass	8.571	289.66	98.85	0.010	Pass	8.568	289.65	99.96	0.003	Pass	8.566	289.63	99.98	0.007	Pass
	2	8.652	289.04	8.651	289.03	99.99	0.003	Pass	8.537	289.01	98.68	0.007	Pass	8.533	289.00	99.95	0.003	Pass	8.531	289.00	99.98	0.000	Pass
	3	8.657	289.32	8.651	289.30	99.93	0.007	Pass	8.542	289.28	98.74	0.007	Pass	8.541	289.27	99.99	0.003	Pass	8.538	289.25	99.96	0.007	Pass
	4	8.659	289.95	8.650	289.92	99.90	0.010	Pass	8.530	289.90	98.61	0.007	Pass	8.528	289.88	99.98	0.007	Pass	8.527	289.87	99.99	0.003	Pass
	Ave.	8.660	289.50	8.656	289.49	99.95	0.006	-	8.545	289.46	98.72	0.008	-	8.543	289.45	99.97	0.004	-	8.541	289.44	99.98	0.004	-

B. 50th cycle fully charged state

Charge	5	8.653	289.15	8.652	289.15	99.99	0.000	Pass	8.512	289.14	98.38	0.003	Pass	8.507	289.12	99.94	0.007	Pass	8.500	289.11	99.92	0.003	Pass
	6	8.669	289.56	8.666	289.55	99.97	0.003	Pass	8.569	289.55	98.88	0.000	Pass	8.560	289.54	99.89	0.003	Pass	8.558	289.52	99.98	0.007	Pass
	7	8.651	289.13	8.650	289.13	99.99	0.000	Pass	8.510	289.12	98.38	0.003	Pass	8.509	289.10	99.99	0.007	Pass	8.490	289.10	99.78	0.000	Pass
	8	8.667	289.02	8.662	289.02	99.94	0.000	Pass	8.520	289.00	98.36	0.007	Pass	8.512	288.99	99.91	0.003	Pass	8.502	288.98	99.88	0.003	Pass
	Ave.	8.660	289.22	8.658	289.21	99.97	0.001	-	8.528	289.20	98.50	0.003	-	8.522	289.19	99.93	0.005	-	8.513	289.18	99.89	0.003	-

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	8.566	56.32	Pass
	2	8.531	55.09	Pass
	3	8.538	55.57	Pass
	4	8.527	55.32	Pass
	MAX.	8.566	56.32	-

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	8.646	24.30	Pass
	10	8.640	24.11	Pass
	11	8.649	24.06	Pass
	12	8.649	25.12	Pass
	MAX.	8.649	25.12	-

Test Condition
- Max. Charge Current : 4400mA - CC/CV 2Imax(8800mA) 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	8.500	56.29	Pass
	6	8.558	54.74	Pass
	7	8.490	55.45	Pass
	8	8.502	56.27	Pass
	MAX.	8.558	56.29	-

Requirement
- Temperature ≤ 170 (°C) - 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	8.624	24.42	Pass
	14	8.620	24.85	Pass
	15	8.621	23.48	Pass
	16	8.622	23.80	Pass
	MAX.	8.624	24.85	-

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



3-3. T6/T8 Test Result (ICP4554116L1)

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

A. 1st cycle 50% charged state

Flat	C-1	3.859	23.25	Pass
	C-2	3.856	23.36	Pass
	C-3	3.858	23.15	Pass
	C-4	3.853	23.29	Pass
	C-5	3.855	23.18	Pass
MAX.		3.859	23.36	-

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	3.015	48.22	Pass
C-7	3.011	48.23	Pass
C-8	3.010	47.56	Pass
C-9	3.014	47.13	Pass
C-10	3.011	48.52	Pass
C-11	3.011	47.25	Pass
C-12	3.009	47.89	Pass
C-13	3.011	47.44	Pass
C-14	3.010	48.09	Pass
C-15	3.015	47.96	Pass
MAX.	3.015	48.52	-

B. 50th cycle fully discharged state

C-16	3.117	45.95	Pass
C-17	3.124	46.69	Pass
C-18	3.124	46.21	Pass
C-19	3.120	45.98	Pass
C-20	3.117	45.11	Pass
C-21	3.120	45.52	Pass
C-22	3.119	46.03	Pass
C-23	3.120	46.59	Pass
C-24	3.120	44.52	Pass
C-25	3.118	44.67	Pass
MAX.	3.120	46.69	-

Test Condition
- Discharge at max. discharge current (with 12V DC power supply) : 4310mA Duration time: rated capacity (60min)

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



