

UN38.3 Test Summary

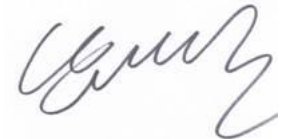
The following product has been evaluated according to the 5th revised edition Amendment 2 of the UN Manual of Tests and Criteria.
We, LG Chem, Ltd., hereby certify that this battery meets the requirements of the regulation for transportation of lithium-ion cells, batteries and single cell batteries.




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Description		List of Test Completed	
Test Report Number	QAE-EF02-150520-PKL14L4P72	Test 1. Altitude Simulation	Pass
Date of test report	2015.05.20	Test 2. Thermal Test	Pass
Model name	L14L4P72	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	7.6 V	Test 5. External Short Circuit	Pass
Capacity	40.0 Wh	Test 6. Impact or Crush	Pass
Weight	180.0 g	Test 7. Overcharge	Pass
Dimensions	223.80mm X 104.00mm X 4.00mm	Test 8. Forced Discharge	Pass

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UN Test Report

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

목 차

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2015. 05. 20

1. UN Transportation Regulation Test

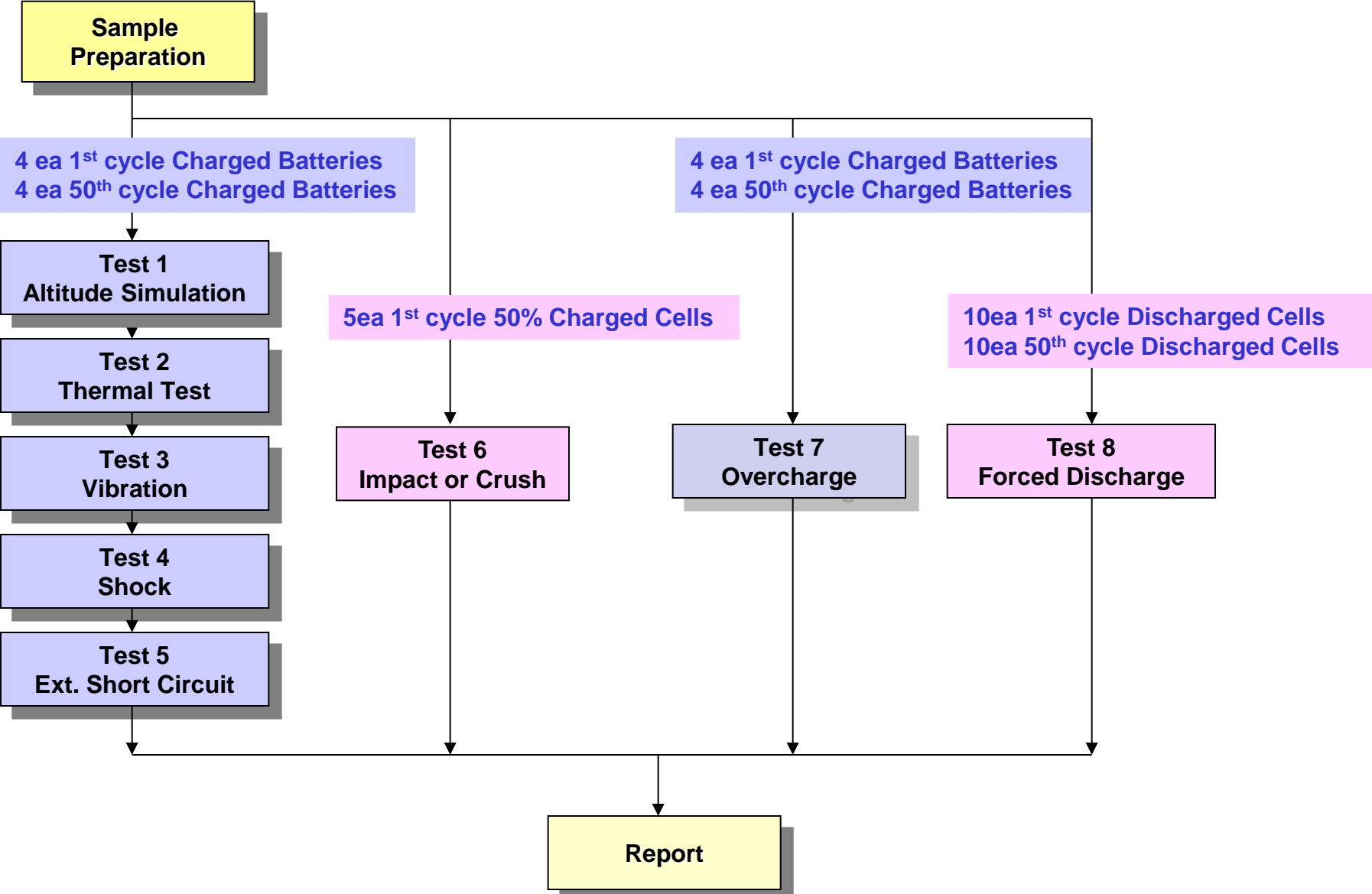
Rev.5 / Amd.2

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 $1g \leq M \leq 75g$, 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	- No disassembly, no rupture, no fire within 6 hours after the test - Temp. monitoring (max. 170℃)
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℃	- No disassembly, no fire within 6 hours after the test - Temp. monitoring (max. 170℃)
Test 6. Impact for cylindrical cells (> 18mm diameter)	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	
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	- No disassembly, no fire within 7 days after the test
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)	
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	8.674	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	<ul style="list-style-type: none"> - Measuring mass before/after each test (If M>75g, less than 0.1%, 1g≤M≤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
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3-2. 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

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
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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
 - CC/CV 2Imax(5340mA) 17.4V cut-off 24Hr

EXT.Short Circuit (T5)

	NO.	Initial OCV(V)	Max. Temp (°C)	Result
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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)
 - No disassembly, no rupture, no fire within 6 hours after the test

Over Charge (T7)

	NO.	Initial OCV(V)	Max. Temp (°C)	Result
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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
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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
MAX.		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
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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
MAX.	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
MAX.	3.083	89.13	-

Test Condition

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

Requirement

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

Appendix 1. 1.2m Drop Test Report

A. Test Result

No	Name of Test Items	Standard requirement or The Clause Number of Standard	Test Result		Conclusion
1	1.2m Drop Test	* UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS" Model Regulations(18 th) special provisions 188	Face	The package is not cracked, the contents are not damaged and not shifted.	Passed
			Edge	The package is not cracked, the contents are not damaged and not shifted.	
			Angle	The package is not cracked, the contents are not damaged and not shifted.	
2	Gross Weight Measure	* UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS" Model Regulations(18 th) special provisions 188	425g		Passed

B. Sample Description

Dimensions	24.6 x 13.8 x 3.6cm	Net Weight of Batteries	360g	Battery Type	Rechargeable Li-ion Battery
Gross weight	425g	Battery number	2pcs/Carton	** Description	Carton box

C. Image After Test



* Recommendations on the transport of dangerous goods as below
Each package of cells or batteries, or the completed package must be capable of withstanding a 1.2 m drop test in any orientation without:

- 1) damage to cells or batteries contained therein
- 2) shifting of the contents so as to allow battery to battery (or cell to cell) contact
- 3) release of contents.

** Description: Description about the protection of short-circuit

Appendix 2. 1.2m Drop Test Report

A. Test Result

No	Name of Test Items	Standard requirement or The Clause Number of Standard	Test Result		Conclusion
1	1.2m Drop Test	* UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS" Model Regulations(18 th) special provisions 188	Face	The package is not cracked, the contents are not damaged and not shifted.	Passed
			Edge	The package is not cracked, the contents are not damaged and not shifted.	
			Angle	The package is not cracked, the contents are not damaged and not shifted.	
2	Gross Weight Measure	* UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS" Model Regulations(18 th) special provisions 188	7166g		Passed

B. Sample Description

Dimensions	300 x 270 x 320mm	Net Weight of Batteries	5760g	Battery Type	Rechargeable Li-Polymer Battery
Gross weight	7166g	Battery number	32Pcs/Carton	** Description	Carton box

C. Image After Test



* Recommendations on the transport of dangerous goods as below
Each package of cells or batteries, or the completed package must be capable of withstanding a 1.2 m drop test in any orientation without:

- 1) damage to cells or batteries contained therein
- 2) shifting of the contents so as to allow battery to battery (or cell to cell) contact
- 3) release of contents.

** Description: Description about the protection of short-circuit