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CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 5^{th} 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.

☐ Lithium-ion cell ☑ Lithium-ion battery ☐ Lithium-ion single cell batte				
Model name	L14L4A01 ICR18650S3			
Cell Model name				
Nominal voltage	14.4 V			
Electric power capacity	32 Wh			

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UN Test Report

- L14L4A01 (Nom.32Wh, 14.4V)-

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2014. 11. 20



1. UN Transportation Regulation Test

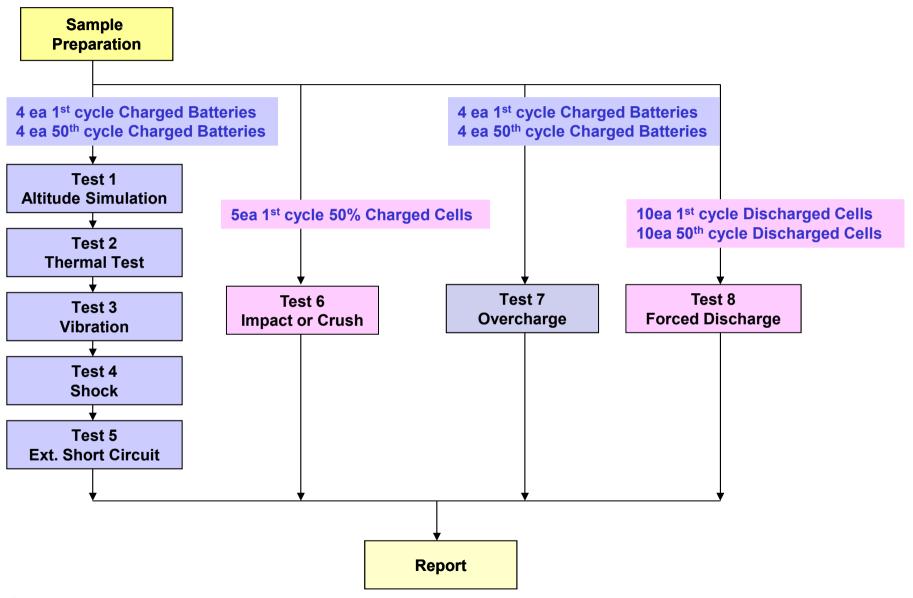
Test	Condition	Requirements	
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- Measuring mass before/	
Test 2. Thermal Test	[72±2℃,6hr ↔ -40±2℃,6hr,interval max. 30min] x 10cycle Storing at 20±5℃ for 24h	after each test (If M<1g, less than 0.5%, If 1g≤M≤75g, less than 0.2%, If	
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	M>75g, less than 0.1%) - 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 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	- No disassembly,	
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 fire within 6 hours after the test - 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 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		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(%)		Result	ocv		Residual OCV(%)		Result
A. 1st cycle fully state																							
	1	16.777	203.189	16.747	203.169	99.82	0.010	Pass	16.512	203.166	98.60	0.001	Pass	16.321	203.158	98.84	0.004	Pass	16.030	203.152	98.22	0.003	Pass
	2	16.748	203.805	16.722	203.803	99.84	0.001	Pass	16.473	203.800	98.51	0.001	Pass	16.287	203.783	98.87	0.008	Pass	16.006	203.775	98.27	0.004	Pass
Charge	3	16.747	203.241	16.718	203.222	99.83	0.009	Pass	16.470	203.207	98.52	0.007	Pass	16.278	203.206	98.83	0.000	Pass	15.999	203.199	98.29	0.003	Pass
	4	16.737	203.488	16.709	203.484	99.83	0.002	Pass	16.466	203.482	98.55	0.001	Pass	16.271	203.458	98.82	0.012	Pass	15.994	203.441	98.30	0.008	Pass
	Ave.	16.752	203.431	16.724	203.420	99.83	0.006	-	16.480	203.414	98.54	0.003	-	16.289	203.401	98.84	0.006	-	16.007	203.392	98.27	0.005	-
B. <u>50th cy</u>	cle full	y state																1					ı
	5	16.767	203.268	16.748	203.266	99.89	0.001	Pass	16.510	203.253	98.58	0.006	Pass	16.325	203.246	98.88	0.003	Pass	16.039	203.232	98.25	0.007	Pass
	6	16.750	203.550	16.729	203.542	99.87	0.004	Pass	16.491	203.528	98.58	0.007	Pass	16.309	203.519	98.90	0.004	Pass	16.025	203.510	98.26	0.004	Pass
Charge	7	16.767	203.425	16.744	203.403	99.86	0.011	Pass	16.507	203.392	98.58	0.005	Pass	16.309	203.383	98.80	0.004	Pass	16.030	203.372	98.29	0.005	Pass
	8	16.758	203.240	16.726	203.229	99.81	0.005	Pass	16.479	203.226	98.52	0.001	Pass	16.287	203.213	98.83	0.006	Pass	16.008	203.194	98.29	0.009	Pass
	Ave.	16.761	203.371	16.737	203.360	99.86	0.005	-	16.497	203.350	98.57	0.005	-	16.308	203.340	98.85	0.005	-	16.026	203.327	98.27	0.007	-

Requirement

- 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



3-2. T5/T7 Test Result

	EXT.Short Circuit (T5)							
	NO.	Initial OCV(V)	Max. Temp (℃)	Result				
A. 1st cyc	A. 1st cycle fully state							
	1	16.030	56.34	Pass				
	2	16.006	55.51	Pass				
Charge	3	15.999	56.62	Pass				
	4	15.994	55.06	Pass				
	MAX.	16.030	56.62	-				

		OCV(V)	(0)					
B. <u>50th cy</u>	B. 50th cycle fully state							
	5	16.039	55.72	Pass				
	6	16.025	55.96	Pass				
Charge	7	16.030	56.11	Pass				
	8	16.008	55.06	Pass				
	MAX.	16.039	56.11	-				

EXT.Short Circuit (T5)

Max. Temp

Result

Test Condition

- 100mΩ ext. short-circuit at 55± 2°C

Over Charge (T7)							
	NO.	Initial OCV(V)	Max. Temp (℃)	Result			
A. 1st cycle fully state							
	9	16.746	24.23	Pass			
	10	16.745	24.95	Pass			
Charge	11	16.748	24.88	Pass			
	12	16.749	23.51	Pass			
	MAX.	16.749	24.95	-			

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 state							
	13	16.723	24.12	Pass			
	14	16.721	23.67	Pass			
Charge	15	16.722	23.53	Pass			
	16	16.728	24.62	Pass			
,	MAX.	16.728	24.62	-			

Test Condition

- Max. Charge Current: 1075mA
- CC/CV 2Imax(2150mA) 22V cut-off 24Hr

Requirement

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



3-3. T6/T8 Test Result (ICR18650S3)

	Crush (T6)								
Direction NO.		Initial Max. Temp OCV(V) (℃)		Result					
A. 1st cycl	A. 1st cycle 50% charged state (Direction :Flat)								
	C-1	3.647	17.86	Pass					
	C-2	3.647	18.66	Pass					
Flat	C-3	3.647	19.22	Pass					
	C-4	3.647	19.82	Pass					
	C-5	3.647	19.49	Pass					
MAX	<.	3.647	19.49	•					

Test Condition					
- Crushing rate :1.5cm/s, until 13kN±0.78kN or 100m\					
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 (℃)	Result						
A. 1st cycle fu	A. 1st cycle fully Discharged state								
C-6	3.435	95.86	Pass						
C-7	3.435	91.43	Pass						
C-8	3.436	104.99	Pass						
C-9	3.436	98.50	Pass						
C-10	3.436	93.10	Pass						
C-11	3.437	99.91	Pass						
C-12	3.437	97.06	Pass						
C-13	3.435	97.02	Pass						
C-14	3.436	103.25	Pass						
C-15	3.435	99.42	Pass						
MAX.	3.437	104.99	-						
B. 50th cycle f	ully discharged	state_							
C-16	3.435	94.44	Pass						
C-17	3.436	93.95	Pass						
C-18	3.436	98.90	Pass						
C-19	3.435	102.69	Pass						
C-20	3.436	95.74	Pass						
C-21	3.436	95.66	Pass						
C-22	3.436	93.42	Pass						
C-23	3.437	98.34	Pass						
C-24	3.437	96.99	Pass						

Test Condition

100.33

102.69

Pass

- Discharge at max. discharge current (with 12V DC power supply): 4300mA Duration time: rated capacity (31min)

3.436

3.437

C-25

MAX.

Requirement

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



4. Sample Image







