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## CERTIFICATE OF COMPLIANCE

The following product has been evaluated according to the 5<sup>th</sup> 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	<b>AC14A8L</b>
Cell Model name	<b>ICP666180A1</b>
Nominal voltage	<b>11.4 V</b>
Electric power capacity	<b>52.5 Wh</b>

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**Solution**Partner

# UN Test Report

## - AC14A8L(Nom.52.5Wh, 11.4V) -

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2014. 05. 16



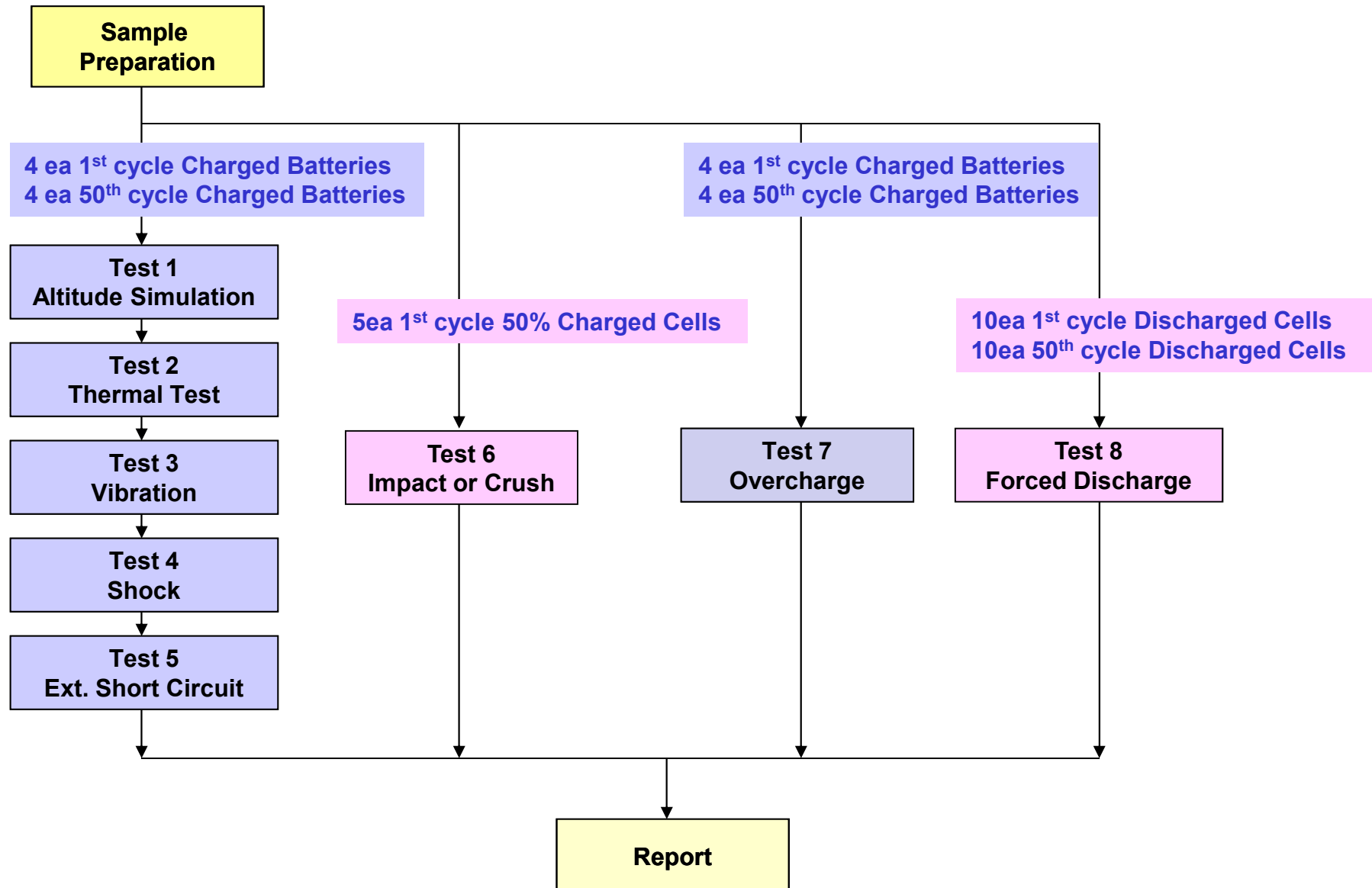
# 1. UN Transportation Regulation Test

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 $1g \leq M \leq 75g$ , 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 10 cycle 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℃	- 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, 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 state

Charge	1	12.847	245.228	12.833	245.214	99.89	0.005	Pass	12.712	245.195	99.06	0.008	Pass	12.690	245.172	99.82	0.009	Pass	12.672	245.153	99.86	0.008	Pass
	2	12.844	245.166	12.830	245.143	99.89	0.009	Pass	12.710	245.128	99.06	0.006	Pass	12.696	245.111	99.90	0.007	Pass	12.681	245.091	99.88	0.008	Pass
	3	12.840	245.258	12.824	245.240	99.87	0.007	Pass	12.698	245.237	99.02	0.001	Pass	12.679	245.216	99.85	0.009	Pass	12.664	245.201	99.88	0.006	Pass
	4	12.843	245.827	12.826	245.805	99.87	0.009	Pass	12.709	245.788	99.09	0.007	Pass	12.690	245.765	99.85	0.009	Pass	12.670	245.751	99.84	0.006	Pass
	Ave.	12.844	245.370	12.828	245.351	99.88	0.008	-	12.707	245.337	99.06	0.005	-	12.689	245.316	99.86	0.009	-	12.672	245.299	99.86	0.007	-

## B. 50th cycle fully state

Charge	5	12.848	245.847	12.830	245.832	99.86	0.006	Pass	12.709	245.814	99.06	0.007	Pass	12.689	245.792	99.84	0.009	Pass	12.665	245.790	99.82	0.000	Pass
	6	12.839	245.176	12.825	245.173	99.89	0.001	Pass	12.699	245.153	99.01	0.008	Pass	12.682	245.136	99.87	0.007	Pass	12.668	245.116	99.89	0.008	Pass
	7	12.849	245.070	12.824	245.050	99.81	0.008	Pass	12.700	245.029	99.03	0.009	Pass	12.684	245.023	99.87	0.002	Pass	12.665	245.006	99.85	0.007	Pass
	8	12.837	245.926	12.822	245.907	99.89	0.008	Pass	12.703	245.882	99.07	0.010	Pass	12.678	245.873	99.80	0.004	Pass	12.664	245.862	99.89	0.004	Pass
	Ave.	12.843	245.505	12.825	245.490	99.86	0.006	-	12.703	245.470	99.04	0.008	-	12.683	310.633	99.85	0.006	-	12.665	245.444	99.86	0.005	-

### 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 state

Charge	1	12.672	55.82	Pass
	2	12.681	55.32	Pass
	3	12.664	55.52	Pass
	4	12.670	55.86	Pass
	MAX.	12.662	55.86	-

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 state

Charge	9	12.840	25.51	Pass
	10	12.873	25.28	Pass
	11	12.812	25.88	Pass
	12	12.852	25.81	Pass
	MAX.	12.873	25.88	-

Test Condition				
- Max. Charge Current : 4400mA - CC/CV 2Imax(8800mA) 22V cut-off 24Hr				

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

### B. 50th cycle fully state

Charge	5	12.665	54.63	Pass
	6	12.668	54.84	Pass
	7	12.665	54.97	Pass
	8	12.664	54.70	Pass
	MAX.	12.665	54.97	-

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

Charge	13	12.732	25.13	Pass
	14	12.851	25.50	Pass
	15	12.846	25.08	Pass
	16	12.892	25.07	Pass
	MAX.	12.892	25.50	-

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

# 3-3. T6/T8 Test Result (ICP666180A1)

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

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

Flat	C-1	3.813	23.65	Pass
	C-2	3.812	26.89	Pass
	C-3	3.812	26.46	Pass
	C-4	3.815	26.58	Pass
	C-5	3.813	23.42	Pass
MAX.		3.815	26.89	-

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	3.724	59.24	Pass
C-7	3.699	61.94	Pass
C-8	3.854	64.76	Pass
C-9	3.840	61.25	Pass
C-10	3.668	59.73	Pass
C-11	3.574	61.89	Pass
C-12	3.514	59.27	Pass
C-13	3.699	61.28	Pass
C-14	3.853	61.25	Pass
C-15	3.852	59.24	Pass
MAX.	3.854	64.76	-

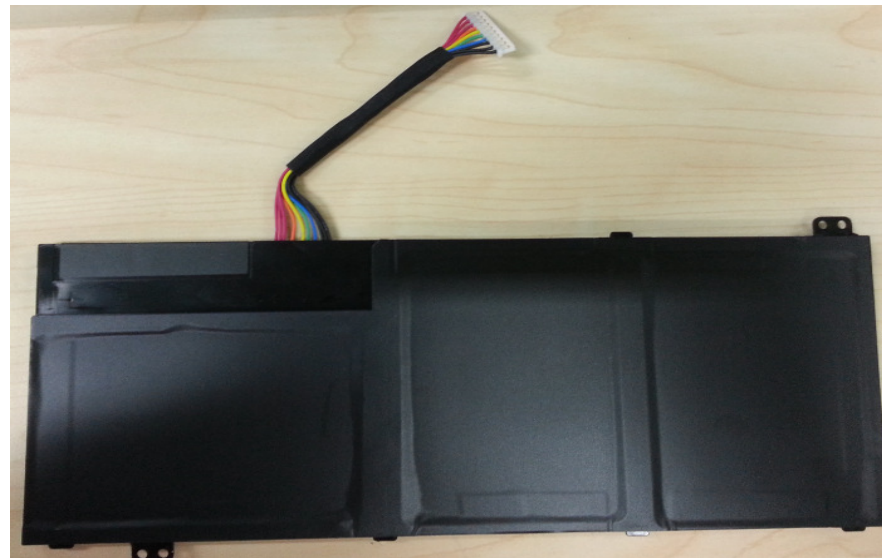
## B. 50th cycle fully discharged state

C-16	3.854	62.32	Pass
C-17	3.840	64.32	Pass
C-18	3.668	59.98	Pass
C-19	3.574	61.99	Pass
C-20	3.514	61.32	Pass
C-21	3.840	61.25	Pass
C-22	3.824	59.34	Pass
C-23	3.820	62.35	Pass
C-24	3.814	61.21	Pass
C-25	3.722	61.23	Pass
MAX.	3.854	64.32	-

Test Condition	
- Discharge at max. discharge current (with 12V DC power supply) : 6697mA Duration time: rated capacity (40.0min )	

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

## 4. Sample Image





# 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 <sup>th</sup> ) 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 <sup>th</sup> ) special provisions 188	566g		Passed

## B. Sample Description

Dimensions	25.0X 14.2 X 3.7cm	Net Weight of Batteries	504g	Battery Type	Rechargeable Li-ion Battery
Gross weight	566g	Battery number	2Pcs/Carton	** Description	Covered by air bag

## 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 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 <sup>th</sup> ) 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 <sup>th</sup> ) special provisions 188	8.7kg		Passed

## B. Sample Description

Dimensions	40.0X 26.0 X 26.0cm	Net Weight of Batteries	7.5kg	Battery Type	Rechargeable Li-ion Battery
Gross weight	8.7kg	Battery number	30Pcs/Carton	** Description	Covered by air bag

## 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