문서번호	QAE-EF02-140129-PKAP14A8M	
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UN Test Report
- AP14A8M(22Wh, 3.80V) -

목 차

2014. 01. 29

LG Chem

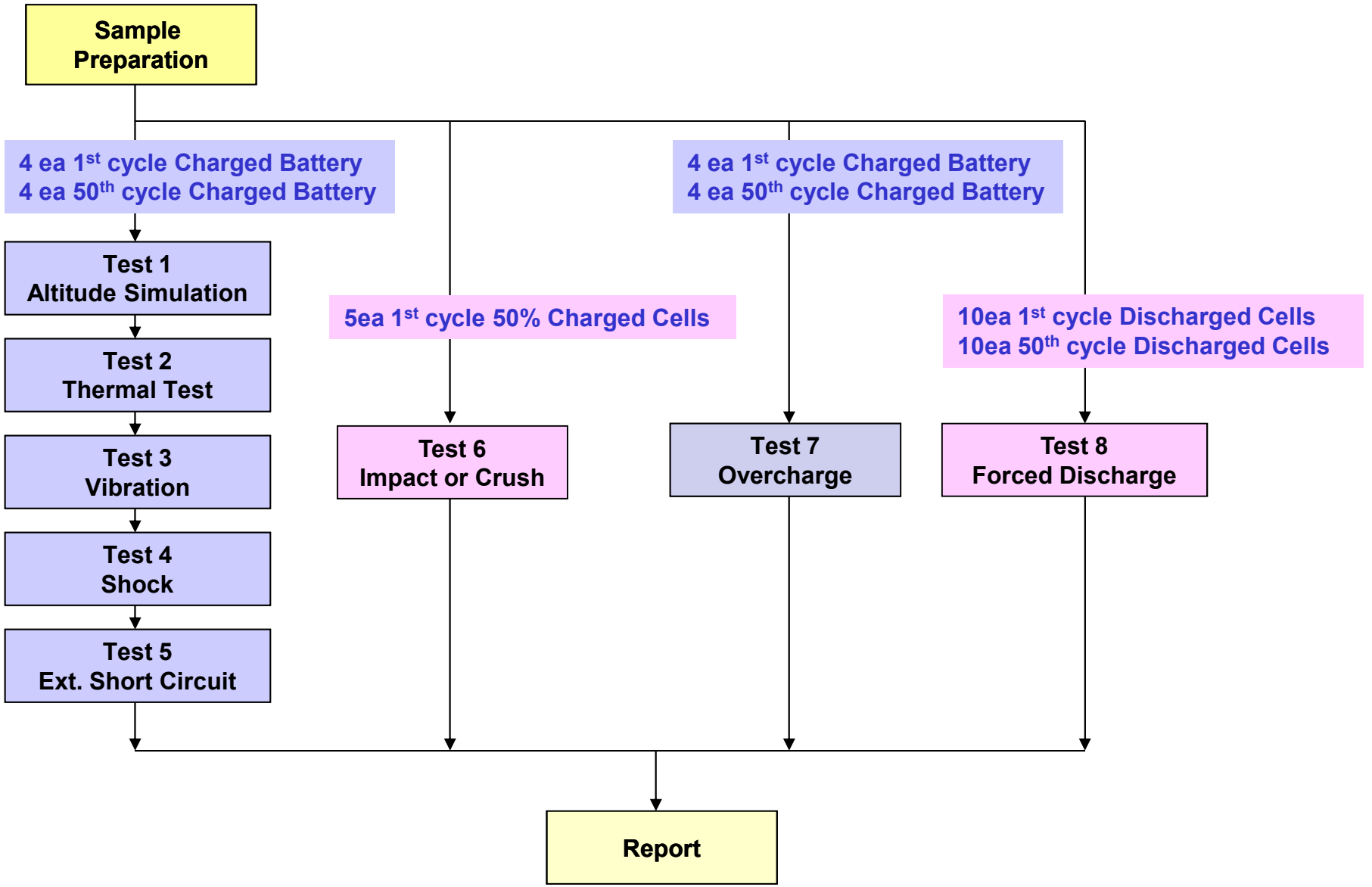
1. UN Transportation Regulation Test

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℃	- No disassembly, no rupture, no fire within 6 hours after the test - 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 fire within 6 hours after the test - Temp. monitoring (max. 170℃)
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	
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 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**	4.328	103.231	4.327	103.223	99.98	0.008	**Pass**	4.280	103.216	98.91	0.007	**Pass**	4.278	103.209	99.95	0.007	**Pass**	4.276	103.205	99.95	0.004	**Pass**
	2	4.331	103.180	4.325	103.175	99.86	0.005	**Pass**	4.281	103.169	98.98	0.006	**Pass**	4.279	103.166	99.95	0.003	**Pass**	4.276	103.165	99.93	0.001	**Pass**
	3	4.323	103.212	4.318	103.208	99.88	0.004	**Pass**	4.273	103.207	98.96	0.001	**Pass**	4.272	103.201	99.98	0.006	**Pass**	4.270	103.197	99.95	0.004	**Pass**
	4	4.321	103.219	4.318	103.212	99.93	0.007	**Pass**	4.274	103.210	98.98	0.002	**Pass**	4.271	103.209	99.93	0.001	**Pass**	4.269	103.201	99.95	0.008	**Pass**
	Ave.	4.326	103.211	4.322	103.205	99.91	0.006	-	4.277	103.201	98.96	0.004	-	4.275	103.196	99.95	0.004	-	4.273	103.192	99.95	0.004	-
B. 50th cycle fully state																							
Charge	**5**	4.311	103.198	4.309	103.197	99.95	0.001	**Pass**	4.264	103.191	98.96	0.006	**Pass**	4.262	103.190	99.95	0.001	**Pass**	4.261	103.189	99.98	0.001	**Pass**
	6	4.319	103.149	4.318	103.142	99.98	0.007	**Pass**	4.274	103.137	98.98	0.005	**Pass**	4.272	103.132	99.95	0.005	**Pass**	4.271	103.124	99.98	0.008	**Pass**
	7	4.315	103.173	4.313	103.169	99.95	0.004	**Pass**	4.269	103.165	98.98	0.004	**Pass**	4.267	103.157	99.95	0.008	**Pass**	4.265	103.151	99.95	0.006	**Pass**
	8	4.313	103.182	4.311	103.177	99.95	0.005	**Pass**	4.266	103.169	98.96	0.008	**Pass**	4.264	103.162	99.95	0.007	**Pass**	4.263	103.157	99.98	0.005	**Pass**
	Ave.	4.315	103.176	4.313	103.171	99.96	0.004	-	4.268	103.166	98.97	0.006	-	4.266	103.160	99.95	0.005	-	4.265	103.155	99.97	0.005	-

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)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully state				
Charge	1	4.276	55.49	Pass
	2	4.276	55.93	Pass
	3	4.270	55.42	Pass
	4	4.269	54.95	Pass
	MAX.	4.276	55.93	-

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

EXT.Short Circuit (T5)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 50th cycle fully state				
Charge	5	4.261	55.82	Pass
	6	4.271	55.82	Pass
	7	4.265	55.42	Pass
	8	4.263	55.07	Pass
	MAX.	4.271	55.82	-

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

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully state				
Charge	9	4.261	24.93	Pass
	10	4.271	24.93	Pass
	11	4.265	25.61	Pass
	12	4.263	24.68	Pass
	MAX.	4.271	25.61	-

Test Condition
- Max. Charge Current : 3990mA - CC/CV 2Imax(7980mA) 8.7 V cut-off 24Hr

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 50th cycle fully state				
Charge	13	4.256	25.08	Pass
	14	4.264	25.47	Pass
	15	4.264	25.02	Pass
	16	4.261	25.24	Pass
	MAX.	4.264	25.47	-

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

3-3. T6 Test Result (ICP3657101L1)

Crush (T6)				
Direction	NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle 50% charged state				
Flat	1	3.827	26.41	Pass
	2	3.841	26.12	Pass
	3	3.831	25.92	Pass
	4	3.836	26.09	Pass
	5	3.834	25.72	Pass
MAX.		3.841	26.41	-

Test Condition
- Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation

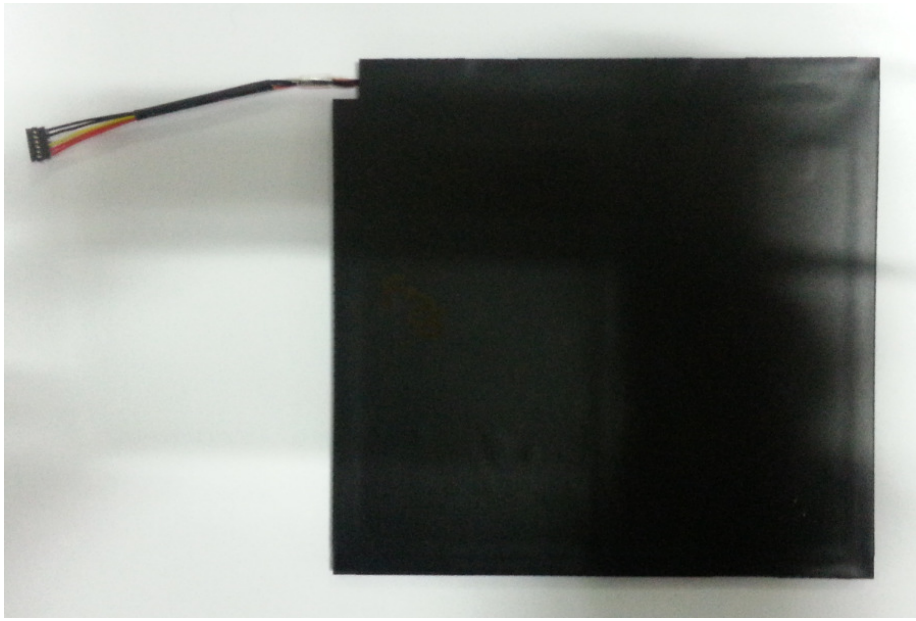
Requirement
- Temperature ≤ 170 (℃)
- No disassembly, no fire within 6 hours after the test

Forced Discharge (T8)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully Discharged state			
1	3.298	57.76	Pass
2	3.293	69.56	Pass
3	3.287	58.64	Pass
4	3.291	70.98	Pass
5	3.303	62.79	Pass
6	3.297	64.05	Pass
7	3.300	73.09	Pass
8	3.298	62.64	Pass
9	3.296	64.22	Pass
10	3.300	69.84	Pass
MAX.	3.303	73.09	-
B. 50th cycle fully discharged state			
1	3.537	76.15	Pass
2	3.546	68.15	Pass
3	3.543	64.41	Pass
4	3.533	61.78	Pass
5	3.527	63.87	Pass
6	3.535	65.06	Pass
7	3.542	67.75	Pass
8	3.544	70.65	Pass
9	3.545	66.92	Pass
10	3.551	66.49	Pass
MAX.	3.551	76.15	-

Test Condition
- Discharge at max. discharge current (with 12V DC power supply) : 2850mA Duration time: rated capacity (60.0min)

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(16th) 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(16th) special provisions 188	278.3g		Passed

B. Sample Description

Dimensions	24.5×14×3.6cm	**Net Weight of Batteries**	206.4g	**Battery Type**	Rechargeable Li-Polymer Battery
Gross weight	278.3g	**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(16th) 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(16th) special provisions 188	4.91Kg		Passed

B. Sample Description

Dimensions	27 x 29.5 x 32.5cm	**Net Weight of Batteries**	3.32Kg	**Battery Type**	Rechargeable Li-Polymer Battery
Gross weight	4.91Kg	**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

Appendix 3. 1.2m Drop Test Report

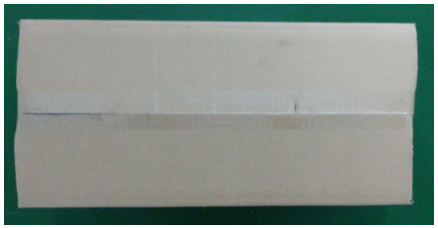
A. Test Result

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(16th) 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(16th) special provisions 188	4.31Kg		**Passed**

B. Sample Description

Dimensions	26.9 x 16.2 x 13.5cm	**Net Weight of Batteries**	3.09Kg	**Battery Type**	Rechargeable Li-Polymer Battery
Gross weight	4.31Kg	**Battery number**	30Pcs/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