
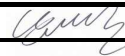



문서번호	QAE-EF02-131216-PKAC14B8K	
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UN Test Report

- AC14B8K(48 Wh, 15.2V) -

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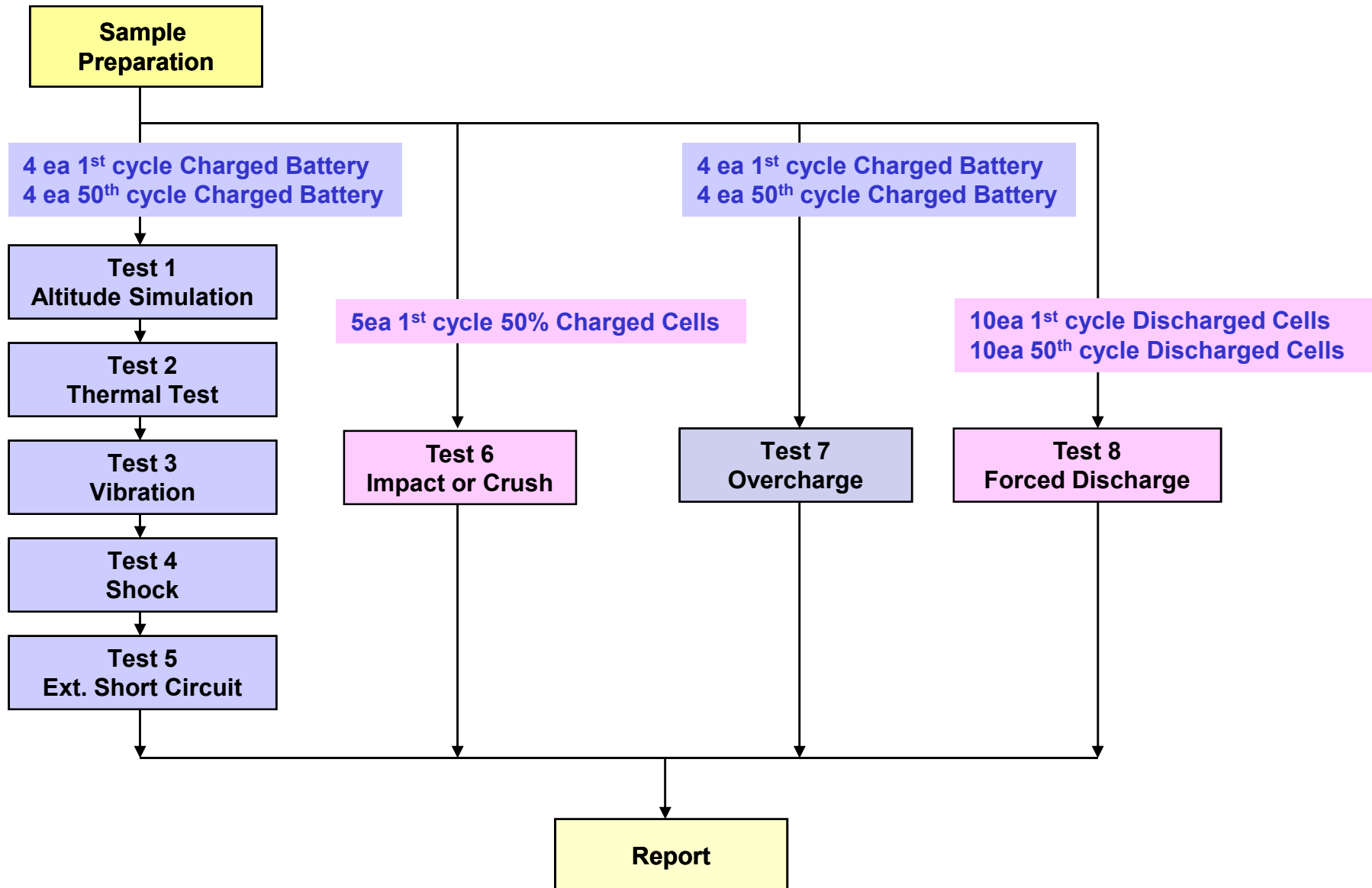
1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- Measuring mass before/ after each test 1) M<1g, less than 0.5% 2) 1g≤M≤75g, less than 0.2% 3) 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 (> 20mm diameter)	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	- No disassembly, no rupture, no fire (after 6 hours) - 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 (after 7 days)
Test 8. Forced Discharge	Discharge at max. discharge current (with 12V DC power supply), Duration time = rated capacity/initial test current	- Appearance picture before/ after test (after 7 days) - Temp. monitoring (max. 170℃)

* 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	17.173	230.914	17.146	230.905	99.84	0.004	Pass	16.923	230.886	98.70	0.008	Pass	16.910	230.872	99.92	0.006	Pass	16.898	230.868	99.93	0.002	Pass
	2	17.160	230.718	17.141	230.705	99.89	0.005	Pass	16.880	230.696	98.48	0.004	Pass	16.872	230.675	99.95	0.009	Pass	16.856	230.673	99.91	0.001	Pass
	3	17.140	230.649	17.114	230.645	99.85	0.002	Pass	16.872	230.643	98.59	0.001	Pass	16.864	230.643	99.95	0.000	Pass	16.848	230.622	99.91	0.009	Pass
	4	17.151	230.584	17.128	230.571	99.87	0.006	Pass	16.876	230.569	98.53	0.001	Pass	16.871	230.557	99.97	0.005	Pass	16.860	230.548	99.94	0.004	Pass
	Ave.	17.156	230.716	17.132	230.707	99.86	0.004	-	16.888	230.699	98.57	0.003	-	16.879	230.687	99.95	0.005	-	16.865	230.678	99.92	0.004	-

B. 50th cycle fully state

Charge	5	17.161	230.115	17.130	230.097	99.82	0.008	Pass	16.903	230.095	98.67	0.001	Pass	16.887	230.081	99.90	0.006	Pass	16.886	230.070	100.00	0.005	Pass
	6	17.168	230.595	17.136	230.574	99.81	0.009	Pass	16.882	230.562	98.51	0.005	Pass	16.869	230.555	99.93	0.003	Pass	16.858	230.544	99.93	0.005	Pass
	7	17.151	230.891	17.129	230.870	99.87	0.009	Pass	16.886	230.842	98.58	0.012	Pass	16.876	230.819	99.94	0.010	Pass	16.875	230.807	100.00	0.005	Pass
	8	17.160	230.514	17.138	230.503	99.87	0.005	Pass	16.917	230.480	98.71	0.010	Pass	16.908	230.473	99.95	0.003	Pass	16.902	230.469	99.97	0.002	Pass
	Ave.	17.160	230.529	17.133	230.511	99.84	0.008	-	16.897	230.495	98.62	0.007	-	16.885	230.482	99.93	0.005	-	16.880	230.472	99.97	0.004	-

Requirement	<ul style="list-style-type: none"> - Measuring mass before/after each test (If M>5g, less than 0.1%) - 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)				
	Pack NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully state

Charge	1	16.898	55.49	Pass
	2	16.856	55.93	Pass
	3	16.848	55.42	Pass
	4	16.860	54.95	Pass
	MAX.	16.898	55.93	-

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

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully state

Charge	9	17.149	24.79	Pass
	10	17.147	24.69	Pass
	11	17.150	23.57	Pass
	12	17.150	23.78	Pass
	MAX.	17.150	24.79	-

Test Condition
- Max. Charge Current : 3090 mA - CC/CV 2Imax(6180mA) 22 V cut-off 24Hr

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

B. 50th cycle fully state

Charge	5	16.886	55.82	Pass
	6	16.858	55.82	Pass
	7	16.875	55.42	Pass
	8	16.902	55.07	Pass
	MAX.	16.902	55.82	-

Requirement
- Temperature < 170 (°C) - No disassembly, no rupture, no fire within 6 hours

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (°C)	Result

B. 50th cycle fully state

Charge	13	17.130	23.73	Pass
	14	17.126	23.97	Pass
	15	17.121	24.13	Pass
	16	17.123	23.76	Pass
	MAX.	17.130	24.13	-

Requirement
- No disassembly, no fire within 7 day

3-3. T6 Test Result (ICP485780A1)

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

A. 1st cycle 50% charged state

Direction

		Initial OCV(V)	Max. Temp (°C)	Result
Flat	1	3.826	24.91	Pass
	2	3.826	27.70	Pass
	3	3.825	25.16	Pass
	4	3.825	26.74	Pass
	5	3.825	26.10	Pass
MAX.		3.826	26.12	-

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

Requirement
- Temperature < 170 (°C)
- No disassembly, no rupture, no fire within 6 hours

Forced Discharge (T8)				
	Pack NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully Discharged state

1	3.225	83.20	Pass
2	3.226	75.45	Pass
3	3.228	73.73	Pass
4	3.228	76.96	Pass
5	3.227	91.81	Pass
6	3.216	92.02	Pass
7	3.217	86.63	Pass
8	3.225	78.06	Pass
9	3.223	89.09	Pass
10	3.224	85.96	Pass
MAX.	3.228	92.02	-

B. 50th cycle fully discharged state

1	3.275	93.37	Pass
2	3.282	79.64	Pass
3	3.283	92.53	Pass
4	3.279	95.42	Pass
5	3.286	94.21	Pass
6	3.275	87.65	Pass
7	3.289	88.64	Pass
8	3.292	91.24	Pass
9	3.284	90.45	Pass
10	3.282	88.94	Pass
MAX.	3.292	95.42	-

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

Requirement
- No disassembly, no fire within 7 days

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(16 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(16 th) special provisions 188	536.0g		Passed

B. Sample Description

Dimensions	31.0 X 14.3 X 3.7cm	Net Weight of Batteries	460g	Battery Type	Rechargeable Li-ion Battery
Gross weight	536.0g	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 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(16 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(16 th) special provisions 188	8166g		Passed

B. Sample Description

Dimensions	35.0 X 27.5 X 25.5cm	Net Weight of Batteries	6900g	Battery Type	Rechargeable Li-ion Battery
Gross weight	8166g	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