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UN Test Report

- EL40(Min.7.1Wh, 3.8V)-

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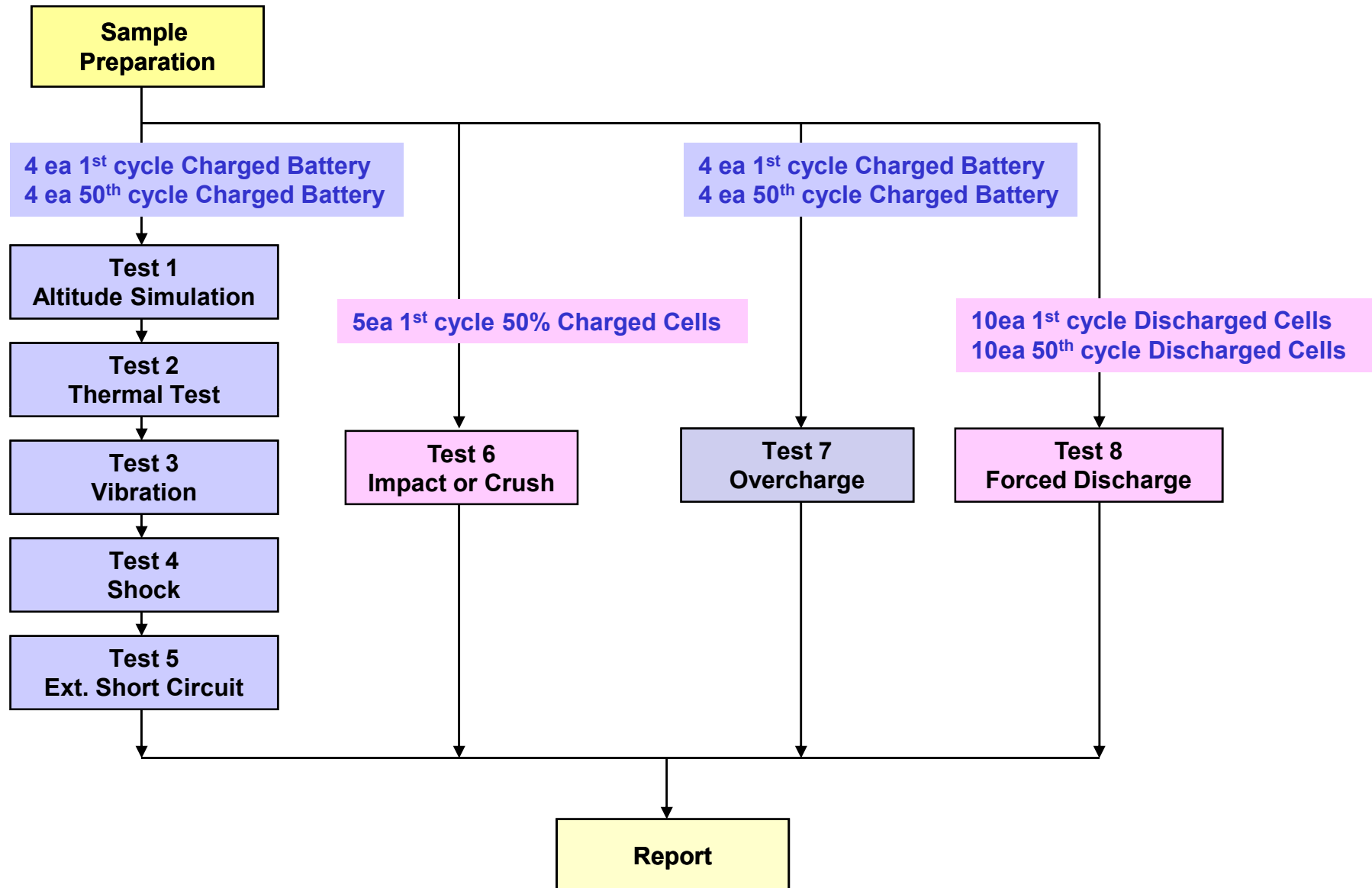
1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- Measuring mass before/ after each test (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	
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	4.322	32.279	4.319	32.278	99.93	0.003	Pass	4.259	32.278	98.61	0.000	Pass	4.258	32.277	99.98	0.003	Pass	4.256	32.277	99.95	0.000	Pass
	2	4.322	32.311	4.320	32.311	99.95	0.000	Pass	4.259	32.310	98.59	0.003	Pass	4.257	32.309	99.95	0.003	Pass	4.255	32.308	99.95	0.003	Pass
	3	4.321	32.299	4.318	32.298	99.93	0.003	Pass	4.256	32.298	98.56	0.000	Pass	4.255	32.297	99.98	0.003	Pass	4.253	32.296	99.95	0.003	Pass
	4	4.322	32.316	4.318	32.316	99.91	0.000	Pass	4.255	32.315	98.54	0.003	Pass	4.253	32.315	99.95	0.000	Pass	4.251	32.315	99.95	0.000	Pass
	Ave.	4.322	32.301	4.319	32.301	99.93	0.002	-	4.257	32.300	98.58	0.002	-	4.256	32.300	99.96	0.002	-	4.254	32.299	99.95	0.002	-

B. 50th cycle fully state

Charge	5	4.313	32.277	4.311	32.276	99.95	0.003	Pass	4.265	32.276	98.93	0.000	Pass	4.263	32.275	99.95	0.003	Pass	4.262	32.274	99.98	0.003	Pass
	6	4.314	32.289	4.311	32.288	99.93	0.003	Pass	4.261	32.287	98.84	0.003	Pass	4.259	32.286	99.95	0.003	Pass	4.257	32.286	99.95	0.000	Pass
	7	4.313	32.309	4.312	32.308	99.98	0.003	Pass	4.258	32.308	98.75	0.000	Pass	4.255	32.307	99.93	0.003	Pass	4.253	32.306	99.95	0.003	Pass
	8	4.312	32.298	4.31	32.298	99.95	0.000	Pass	4.254	32.298	98.70	0.000	Pass	4.251	32.298	99.93	0.000	Pass	4.249	32.297	99.95	0.003	Pass
	Ave.	4.313	32.293	4.311	32.293	99.95	0.002	-	4.260	32.292	98.81	0.001	-	4.257	32.292	99.94	0.002	-	4.255	32.291	99.96	0.002	-

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

A. 1st cycle fully state

Charge	1	4.256	55.78	Pass
	2	4.255	55.49	Pass
	3	4.253	54.45	Pass
	4	4.251	54.88	Pass
	MAX.	4.256	55.88	-

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	4.323	21.67	Pass
	10	4.322	21.54	Pass
	11	4.321	22.68	Pass
	12	4.323	21.46	Pass
	MAX.	4.323	22.68	-

Test Condition	
- Max. Charge Current : 1920mA - CC/CV 2Imax(3840mA) 8.7V cut-off 24Hr	

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

B. 50th cycle fully state

Charge	5	4.262	55.76	Pass
	6	4.257	55.29	Pass
	7	4.253	55.68	Pass
	8	4.249	56.21	Pass
	MAX.	4.262	56.21	-

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

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

B. 50th cycle fully state

Charge	13	4.318	23.01	Pass
	14	4.316	22.98	Pass
	15	4.317	21.12	Pass
	16	4.317	21.04	Pass
	MAX.	4.318	23.01	-

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

3-3. T6/T8 Test Result (ICP394973L1)

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

A. 1st cycle 50% charged state

Direction

Flat	1	3.647	23.50	Pass
	2	3.647	23.45	Pass
	3	3.648	24.10	Pass
	4	3.647	24.08	Pass
	5	3.648	24.10	Pass
MAX.		3.678	24.10	-

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

A. 1st cycle fully Discharged state

1	3.316	83.11	Pass
2	3.321	82.92	Pass
3	3.319	79.88	Pass
4	3.317	80.27	Pass
5	3.324	79.33	Pass
6	3.319	83.05	Pass
7	3.318	81.22	Pass
8	3.321	78.65	Pass
9	3.317	78.25	Pass
10	3.315	79.14	Pass
MAX.		3.324	83.11

B. 50th cycle fully discharged state

1	3.453	85.97	Pass
2	3.451	87.99	Pass
3	3.461	88.61	Pass
4	3.448	89.91	Pass
5	3.453	85.31	Pass
6	3.453	90.03	Pass
7	3.450	86.59	Pass
8	3.499	87.86	Pass
9	3.487	88.56	Pass
10	3.455	89.53	Pass
MAX.		3.487	90.03

Test Condition

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

Requirement

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

4. Sample Image



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