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# UN Test Report

## - EQ40(Min.14Wh, 3.8V) -

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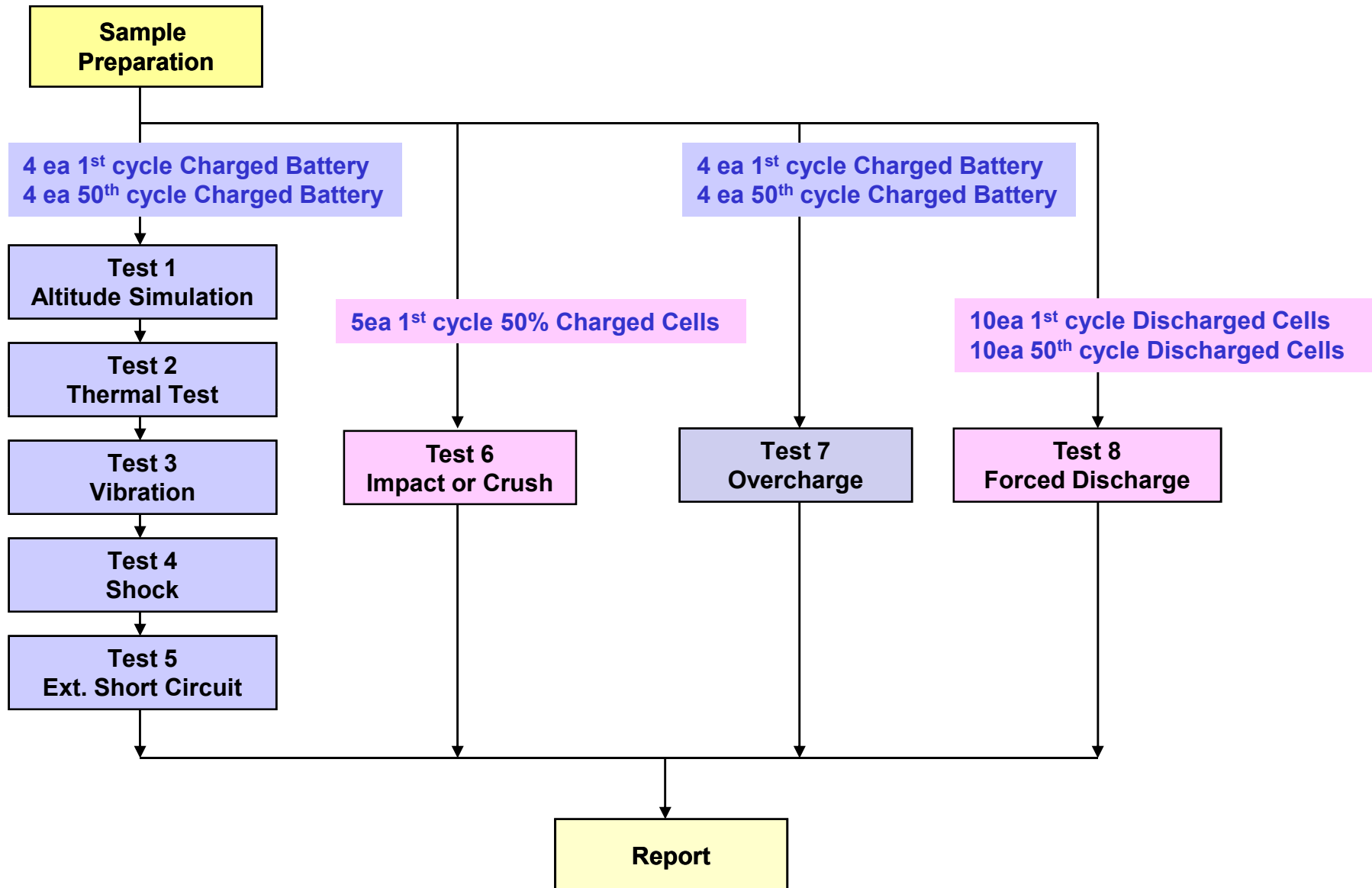
# 1. UN Transportation Regulation Test

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 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℃	
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)					
	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	37.747	4.321	37.746	99.98	0.003	Pass	4.261	37.746	98.61	0.000	Pass	4.260	37.745	99.98	0.003	Pass	4.259	37.745	99.98	0.000	Pass
	2	4.323	37.845	4.322	37.844	99.98	0.003	Pass	4.259	37.844	98.54	0.000	Pass	4.258	37.844	99.98	0.000	Pass	4.257	37.844	99.98	0.000	Pass
	3	4.323	37.834	4.321	37.834	99.95	0.000	Pass	4.261	37.833	98.61	0.003	Pass	4.260	37.833	99.98	0.000	Pass	4.258	37.832	99.95	0.003	Pass
	4	4.322	37.822	4.321	37.821	99.98	0.003	Pass	4.262	37.821	98.63	0.000	Pass	4.261	37.820	99.98	0.003	Pass	4.260	37.820	99.98	0.000	Pass
	Ave.	4.323	37.812	4.321	37.811	99.97	0.002	-	4.261	37.811	98.60	0.001	-	4.260	37.811	99.98	0.001	-	4.259	37.810	99.97	0.001	-

## B. 50th cycle fully state

Charge	5	4.314	37.834	4.313	37.834	99.98	0.000	Pass	4.254	37.833	98.63	0.003	Pass	4.253	37.833	99.98	0.000	Pass	4.251	37.833	99.95	0.000	Pass
	6	4.315	37.793	4.314	37.792	99.98	0.003	Pass	4.252	37.791	98.56	0.003	Pass	4.251	37.790	99.98	0.003	Pass	4.250	37.789	99.98	0.003	Pass
	7	4.313	37.846	4.312	37.845	99.98	0.003	Pass	4.251	37.845	98.59	0.000	Pass	4.249	37.844	99.95	0.003	Pass	4.248	37.844	99.98	0.000	Pass
	8	4.313	37.813	4.311	37.813	99.95	0.000	Pass	4.253	37.812	98.65	0.003	Pass	4.252	37.812	99.98	0.000	Pass	4.250	37.812	99.95	0.000	Pass
	Ave.	4.314	37.822	4.313	37.821	99.97	0.001	-	4.253	37.820	98.61	0.002	-	4.251	37.820	99.97	0.001	-	4.250	37.820	99.96	0.001	-

<b>Requirement</b>	<ul style="list-style-type: none"> <li>- Measuring mass before/after each test (If <math>M &gt; 75g</math>, less than 0.1%, <math>1g \leq M \leq 75</math>, less than 0.2%, <math>M &lt; 1g</math>, less than 0.5%)</li> <li>- Measuring voltage before/after each test (more than 90%, only charged samples)</li> <li>- No leakage, no venting, no disassembly, no rupture, no fire</li> </ul>
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# 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	4.259	53.47	Pass
	2	4.257	54.89	Pass
	3	4.258	55.71	Pass
	4	4.260	55.66	Pass
	MAX.	4.260	55.71	-

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	4.324	23.16	Pass
	10	4.324	22.17	Pass
	11	4.323	21.98	Pass
	12	4.322	23.74	Pass
	MAX.	4.324	23.74	-

Test Condition
- Max. Charge Current : 3800mA - CC/CV 2Imax(7600mA) 8.7V cut-off 24Hr

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

## B. 50th cycle fully state

Charge	5	4.251	55.67	Pass
	6	4.250	54.81	Pass
	7	4.248	54.97	Pass
	8	4.250	56.01	Pass
	MAX.	4.251	56.01	-

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	4.315	22.67	Pass
	14	4.315	23.54	Pass
	15	4.317	23.41	Pass
	16	4.316	21.87	Pass
	MAX.	4.317	23.54	-

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

# 3-3. T6 Test Result (ICP4462104L1)

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

## A. 1st cycle 50% charged state

Flat	1	3.855	32.74	Pass
	2	3.854	29.96	Pass
	3	3.855	29.40	Pass
	4	3.855	30.12	Pass
	5	3.856	31.22	Pass
MAX.		3.856	32.74	-

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

1	3.274	82.45	Pass	
2	3.276	83.59	Pass	
3	3.284	84.21	Pass	
4	3.265	80.25	Pass	
5	3.278	78.09	Pass	
6	3.289	80.65	Pass	
7	3.272	82.24	Pass	
8	3.273	79.76	Pass	
9	3.289	82.99	Pass	
10	3.278	80.28	Pass	
MAX.		3.289	82.41	-

## B. 50th cycle fully discharged state

1	3.346	83.24	Pass	
2	3.344	79.91	Pass	
3	3.352	82.10	Pass	
4	3.348	80.09	Pass	
5	3.348	78.52	Pass	
6	3.358	79.43	Pass	
7	3.342	86.57	Pass	
8	3.359	82.54	Pass	
9	3.351	83.11	Pass	
10	3.345	83.03	Pass	
MAX.		3.359	86.57	-

Test Condition
- Discharge at max. discharge current : 3800mA (with 12V DC power supply), Duration time: rated capacity (60.0min)

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

## 4. Sample Image

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