




문서번호	QAE-EF02-131114-PKL13L4P01	
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UN Test Report

- L13L4P01(48Wh, 7.4V) -

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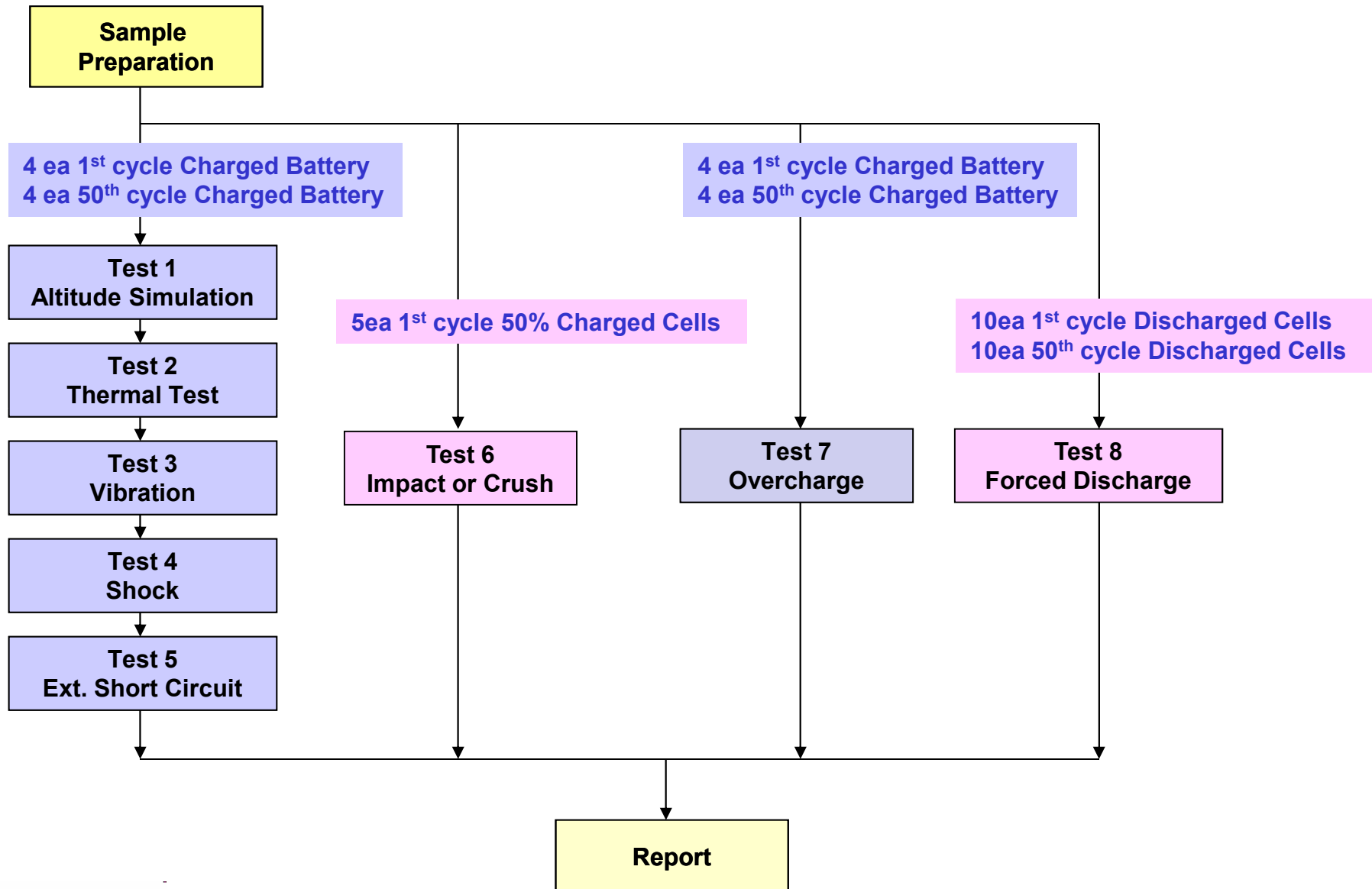
1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5 ℃	
Test 2. Thermal Test	[72±2 ℃,6hr ↔ -40 ± 2 ℃,6hr,interval max. 30min] x 10cycle Storing at 20±5 ℃ for 24h	- Measuring mass before/ after each test (If M>5g, less than 0.1%)
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	- Measuring voltage before/ after each test (more than 90%) - No leakage, no venting, no disassembly, no rupture, no fire
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 (after 6 hours) - 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 rupture, no fire (after 6 hours)
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	- Temp. monitoring (max. 170 ℃)
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	8.376	264.22	8.367	264.20	99.89	0.007	Pass	8.286	264.18	99.03	0.007	Pass	8.284	264.16	99.98	0.006	Pass	8.281	264.15	99.96	0.006	Pass
	2	8.347	264.47	8.330	264.45	99.80	0.006	Pass	8.254	264.45	99.08	0.000	Pass	8.250	264.43	99.96	0.006	Pass	8.246	264.42	99.95	0.004	Pass
	3	8.341	264.18	8.331	264.16	99.88	0.006	Pass	8.250	264.15	99.03	0.003	Pass	8.249	264.14	99.99	0.007	Pass	8.245	264.12	99.96	0.007	Pass
	4	8.347	264.68	8.335	264.68	99.85	0.001	Pass	8.256	264.66	99.06	0.008	Pass	8.251	264.65	99.94	0.005	Pass	8.247	264.62	99.94	0.009	Pass
	Ave.	8.353	264.39	8.341	264.37	99.86	0.005	-	8.261	264.36	99.05	0.005	-	8.259	264.35	99.97	0.006	-	8.255	264.33	99.95	0.006	-

B. 50th cycle fully state

Charge	5	8.369	264.07	8.354	264.05	99.82	0.006	Pass	8.275	264.03	99.06	0.008	Pass	8.273	264.02	99.97	0.005	Pass	8.270	264.00	99.96	0.009	Pass
	6	8.359	264.60	8.343	264.59	99.81	0.006	Pass	8.260	264.58	99.02	0.004	Pass	8.256	264.55	99.95	0.008	Pass	8.252	264.55	99.95	0.001	Pass
	7	8.357	264.72	8.346	264.71	99.87	0.006	Pass	8.265	264.71	99.03	0.000	Pass	8.263	264.69	99.98	0.006	Pass	8.261	264.69	99.97	0.000	Pass
	8	8.359	264.13	8.347	264.11	99.85	0.008	Pass	8.265	264.10	99.01	0.002	Pass	8.264	264.10	99.99	0.002	Pass	8.260	264.09	99.95	0.001	Pass
	Ave.	8.361	264.38	8.347	264.36	99.84	0.006	-	8.266	264.35	99.03	0.004	-	8.264	310.63	99.97	0.005	-	8.261	264.33	99.96	0.003	-

Requirement

- 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

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	8.281	56.37	Pass
	2	8.246	55.96	Pass
	3	8.245	55.34	Pass
	4	8.247	54.80	Pass
	MAX.	8.049	56.37	-

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	8.347	24.20	Pass
	10	8.341	25.03	Pass
	11	8.346	24.16	Pass
	12	8.348	24.99	Pass
	MAX.	8.348	25.03	-

Test Condition
- Max. Charge Current : 6486 mA - CC/CV 2Imax(12972mA) 16.8 V cut-off 24Hr

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

B. 50th cycle fully state

Charge	5	8.270	56.06	Pass
	6	8.252	54.89	Pass
	7	8.261	55.23	Pass
	8	8.260	55.03	Pass
	MAX.	8.042	56.06	-

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	8.324	23.93	Pass
	14	8.328	24.73	Pass
	15	8.327	24.24	Pass
	16	8.326	23.64	Pass
	MAX.	8.328	24.73	-

Requirement
- No disassembly, no fire within 7 day

3-3. T6 Test Result (ICP3852120L1)

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

A. 1st cycle 50% charged state

Direction

	1	3.808	23.00	Pass
Flat	2	3.809	22.99	Pass
	3	3.806	22.96	Pass
	4	3.808	22.98	Pass
	5	3.807	22.98	Pass
	MAX.	3.809	23.00	-

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	3.231	39.78	Pass
2	3.217	40.35	Pass
3	3.221	42.17	Pass
4	3.231	40.55	Pass
5	3.295	41.51	Pass
6	3.246	41.59	Pass
7	3.251	38.73	Pass
8	3.232	39.42	Pass
9	3.215	39.50	Pass
10	3.306	41.46	Pass
MAX.	3.306	42.17	-

B. 50th cycle fully discharged state

1	3.379	40.51	Pass
2	3.384	46.65	Pass
3	3.381	46.54	Pass
4	3.381	42.53	Pass
5	3.381	41.41	Pass
6	3.375	46.64	Pass
7	3.375	43.59	Pass
8	3.382	44.95	Pass
9	3.378	46.46	Pass
10	3.382	40.84	Pass
MAX.	3.384	46.65	-

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

