

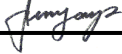


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# UN Test Report

## - L13L4P21(34Wh, 7.4V)-

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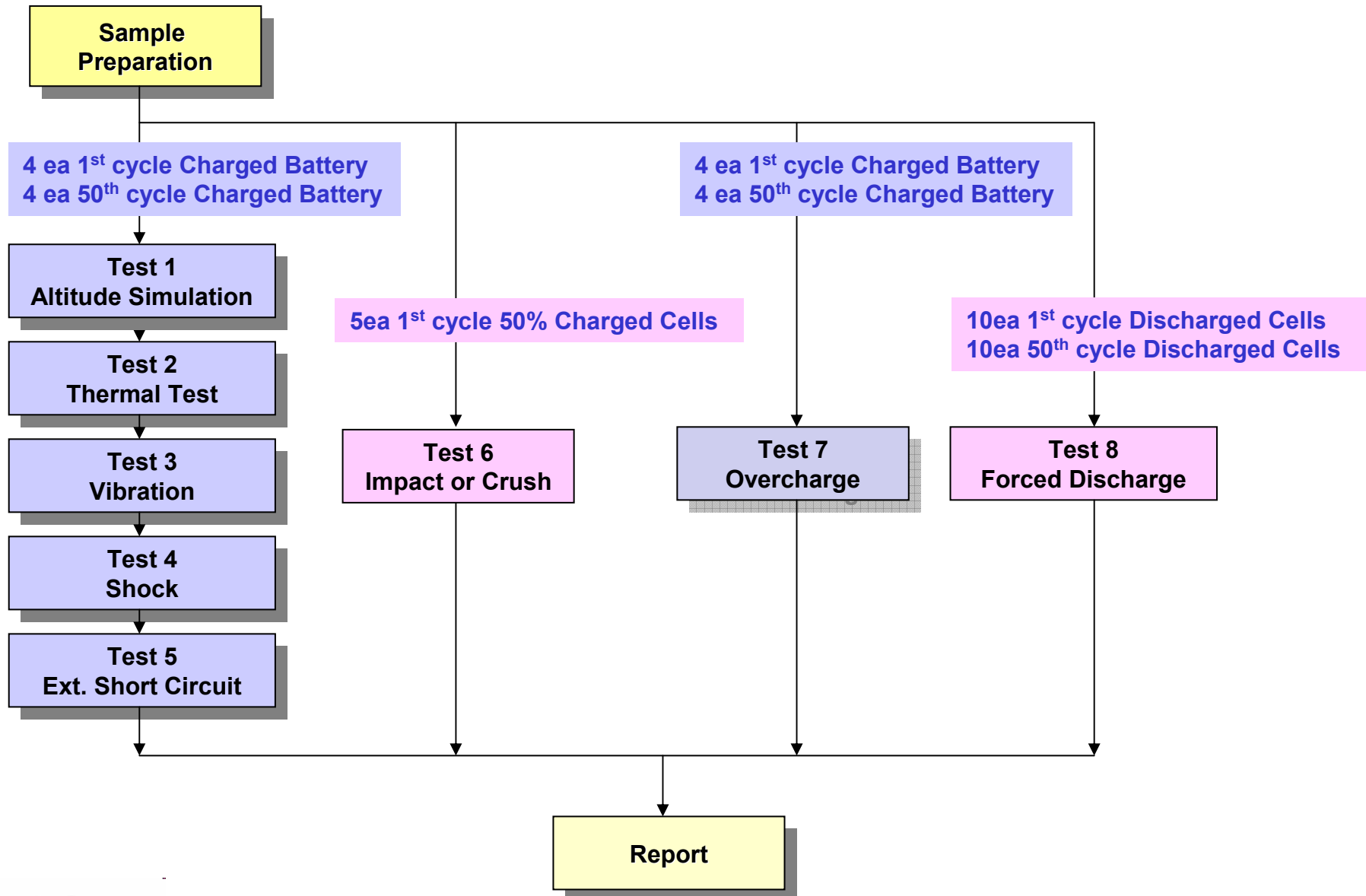
# 1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5 ℃	
Test 2. Thermal Test	[75±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	8.342	204.428	8.328	204.418	99.82	0.005	Pass	8.247	204.414	99.03	0.002	Pass	8.231	204.404	99.81	0.005	Pass	8.217	204.396	99.82	0.004	Pass
	2	8.345	204.979	8.330	204.956	99.83	0.011	Pass	8.249	204.948	99.02	0.004	Pass	8.232	204.942	99.80	0.003	Pass	8.224	204.918	99.90	0.012	Pass
	3	8.350	204.130	8.335	204.119	99.82	0.005	Pass	8.254	204.118	99.02	0.001	Pass	8.243	204.113	99.87	0.002	Pass	8.231	204.099	99.85	0.007	Pass
	4	8.344	204.812	8.332	204.806	99.86	0.003	Pass	8.252	204.800	99.05	0.003	Pass	8.239	204.791	99.84	0.004	Pass	8.226	204.791	99.84	0.000	Pass
	Ave.	8.345	204.587	8.331	204.575	99.83	0.006	-	8.250	204.570	99.03	0.003	-	8.236	204.562	99.83	0.004	-	8.224	204.551	99.85	0.006	-

## B. 50th cycle fully state

Charge	5	8.332	204.945	8.318	204.926	99.83	0.009	Pass	8.240	204.903	99.06	0.012	Pass	8.228	204.889	99.86	0.006	Pass	8.215	204.878	99.83	0.005	Pass
	6	8.332	204.789	8.322	204.780	99.88	0.005	Pass	8.241	204.756	99.02	0.011	Pass	8.229	204.749	99.86	0.003	Pass	8.220	204.741	99.89	0.004	Pass
	7	8.328	204.039	8.318	204.025	99.88	0.007	Pass	8.241	204.017	99.08	0.004	Pass	8.226	204.000	99.82	0.008	Pass	8.216	203.992	99.88	0.004	Pass
	8	8.345	204.366	8.329	204.342	99.80	0.012	Pass	8.246	204.342	99.00	0.000	Pass	8.234	204.334	99.86	0.004	Pass	8.225	204.328	99.88	0.003	Pass
	Ave.	8.334	204.535	8.322	204.518	99.85	0.008	-	8.242	204.504	99.04	0.007	-	8.229	310.633	99.85	0.005	-	8.219	204.485	99.87	0.004	-

### 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	8.217	55.35	Pass
	2	8.224	55.63	Pass
	3	8.231	55.57	Pass
	4	8.226	55.95	Pass
	MAX.	8.231	55.95	-

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	8.354	25.29	Pass
	10	8.349	25.83	Pass
	11	8.328	25.13	Pass
	12	8.314	25.27	Pass
	MAX.	8.354	25.83	-

Test Condition
- Max. Charge Current : 3000mA - CC/CV 2Imax(6000mA) 16.8V cut-off 24Hr

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

## B. 50th cycle fully state

Charge	5	8.215	54.28	Pass
	6	8.220	54.58	Pass
	7	8.216	54.51	Pass
	8	8.225	54.25	Pass
	MAX.	8.225	54.58	-

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	8.364	25.80	Pass
	14	8.358	25.30	Pass
	15	8.387	25.80	Pass
	16	8.323	25.05	Pass
	MAX.	8.387	25.80	-

Requirement
- No disassembly, no fire within 7 day

# 3-3. T6 Test Result (ICP505070L1)

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

## A. 1st cycle 50% charged state

### Direction

Flat	1	3.817	26.45	Pass
	2	3.818	27.27	Pass
	3	3.819	29.51	Pass
	4	3.819	26.74	Pass
	5	3.816	28.67	Pass
MAX.		4.169	28.67	-

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

# 4. Sample Image

