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UN Test Report

- ASM P/N 45N1136 (70.798Wh, 11.22V) -

목 차

1. UN Transportation Regulation Test
2. Test Procedure
3. Test Result
4. Sample Image

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 **LG Chem**
Mobile Energy Division

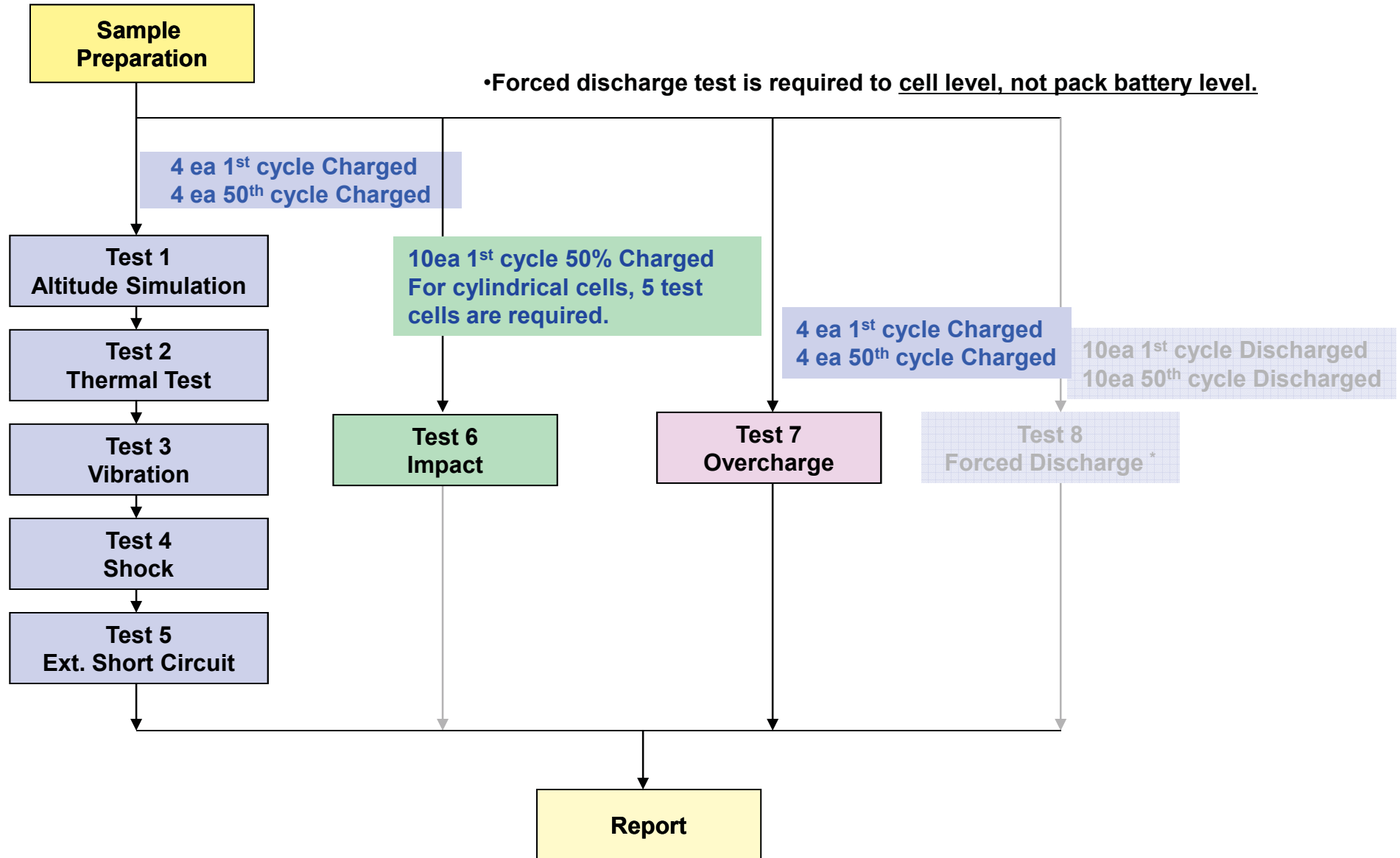
1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure) 11.6kPa for 6hr at 20+/-5℃	<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%) - No leakage, no venting, no disassembly, no rupture, no fire
Test 2. Thermal Test	[75±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℃	<ul style="list-style-type: none"> - No disassembly, no rupture, no fire (after 6 hours) - Temp. monitoring (max. 170℃)
Test 6. Impact	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	
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)	<ul style="list-style-type: none"> - No disassembly, no fire (after 7 days)
Test 8. Forced Discharge	Only for Cell, not battery.	<ul style="list-style-type: none"> - No disassembly, no fire (after 7 days)

* 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)

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	12.934	342.818	12.908	342.802	99.80	0.005	Pass	12.785	342.778	99.05	0.007	Pass	12.769	342.757	99.87	0.006	Pass	12.750	342.750	99.86	0.002	Pass
	2	12.935	343.193	12.919	343.189	99.88	0.001	Pass	12.798	343.169	99.06	0.006	Pass	12.781	343.144	99.87	0.007	Pass	12.762	343.141	99.85	0.001	Pass
	3	12.934	342.959	12.918	342.950	99.88	0.003	Pass	12.799	342.947	99.08	0.001	Pass	12.775	342.937	99.81	0.003	Pass	12.755	342.916	99.85	0.006	Pass
	4	12.933	342.757	12.919	342.748	99.89	0.003	Pass	12.794	342.728	99.03	0.006	Pass	12.772	342.710	99.83	0.005	Pass	12.752	342.697	99.85	0.004	Pass
	Ave.	12.934	342.932	12.916	342.922	99.86	0.003	-	12.794	342.905	99.05	0.005	-	12.774	342.887	99.84	0.005	-	12.755	342.876	99.85	0.003	-

B. 50th cycle fully state

Charge	9	12.922	342.411	12.909	342.396	99.90	0.004	Pass	12.781	342.391	99.01	0.001	Pass	12.757	342.382	99.81	0.002	Pass	12.733	342.369	99.81	0.004	Pass
	10	12.927	343.238	12.910	343.233	99.87	0.001	Pass	12.786	343.219	99.04	0.004	Pass	12.766	343.200	99.85	0.006	Pass	12.743	343.178	99.82	0.006	Pass
	11	12.914	343.256	12.892	343.253	99.83	0.001	Pass	12.770	343.250	99.05	0.001	Pass	12.755	343.242	99.88	0.002	Pass	12.740	343.222	99.88	0.006	Pass
	12	12.911	342.985	12.889	342.964	99.83	0.006	Pass	12.771	342.945	99.09	0.005	Pass	12.750	342.923	99.84	0.007	Pass	12.725	342.918	99.80	0.001	Pass
	Ave.	12.918	342.973	12.900	342.962	99.86	0.003	-	12.777	342.951	99.05	0.003	-	12.757	310.633	99.84	0.004	-	12.735	342.922	99.83	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	12.750	58.06	Pass
	2	12.762	57.59	Pass
	3	12.755	57.13	Pass
	4	12.752	56.22	Pass
	MAX.	12.762	58.06	-

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	17	12.951	26.72	Pass
	18	12.906	26.79	Pass
	19	12.967	25.85	Pass
	20	12.961	25.53	Pass
	MAX.	12.967	26.79	-

Test Condition
- Max. Charge Current : 3900mA - CC/CV 2Imax(7800mA) 22V cut-off 24Hr

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

B. 50th cycle fully state

Charge	9	12.733	56.78	Pass
	10	12.743	57.87	Pass
	11	12.740	57.65	Pass
	12	12.725	57.37	Pass
	MAX.	12.743	57.87	-

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	21	12.854	26.78	Pass
	22	12.947	25.57	Pass
	23	12.927	26.37	Pass
	24	12.868	26.72	Pass
	MAX.	12.947	26.78	-

Requirement
- No disassembly, no fire within 7 day

3-3. T6 Test Result (ICR18650E1)

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

A. 1st cycle 50% charge state

11	3.779	25.01	Pass
12	3.868	31.72	Pass
13	3.779	26.04	Pass
14	3.780	53.88	Pass
15	3.872	123.73	Pass
16	3.780	141.65	Pass
17	3.772	23.96	Pass
18	3.780	64.75	Pass
19	3.780	125.17	Pass
20	3.780	123.57	Pass
MAX.	3.872	141.65	-

Test Condition
- $\Phi=15.8\text{mm}$ bar, 9.1kg mass, $61\pm 2.5\text{cm}$ height

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

4. Sample Image

