

문서번호	QAE-EF02-100823-PKAS10D81	
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“ 창의와 자율, 25<sup>+1</sup> ”

# UN Test Report

## - AS10D81 (Nom. 48Wh, 10.8V) -

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2010. 8. 23

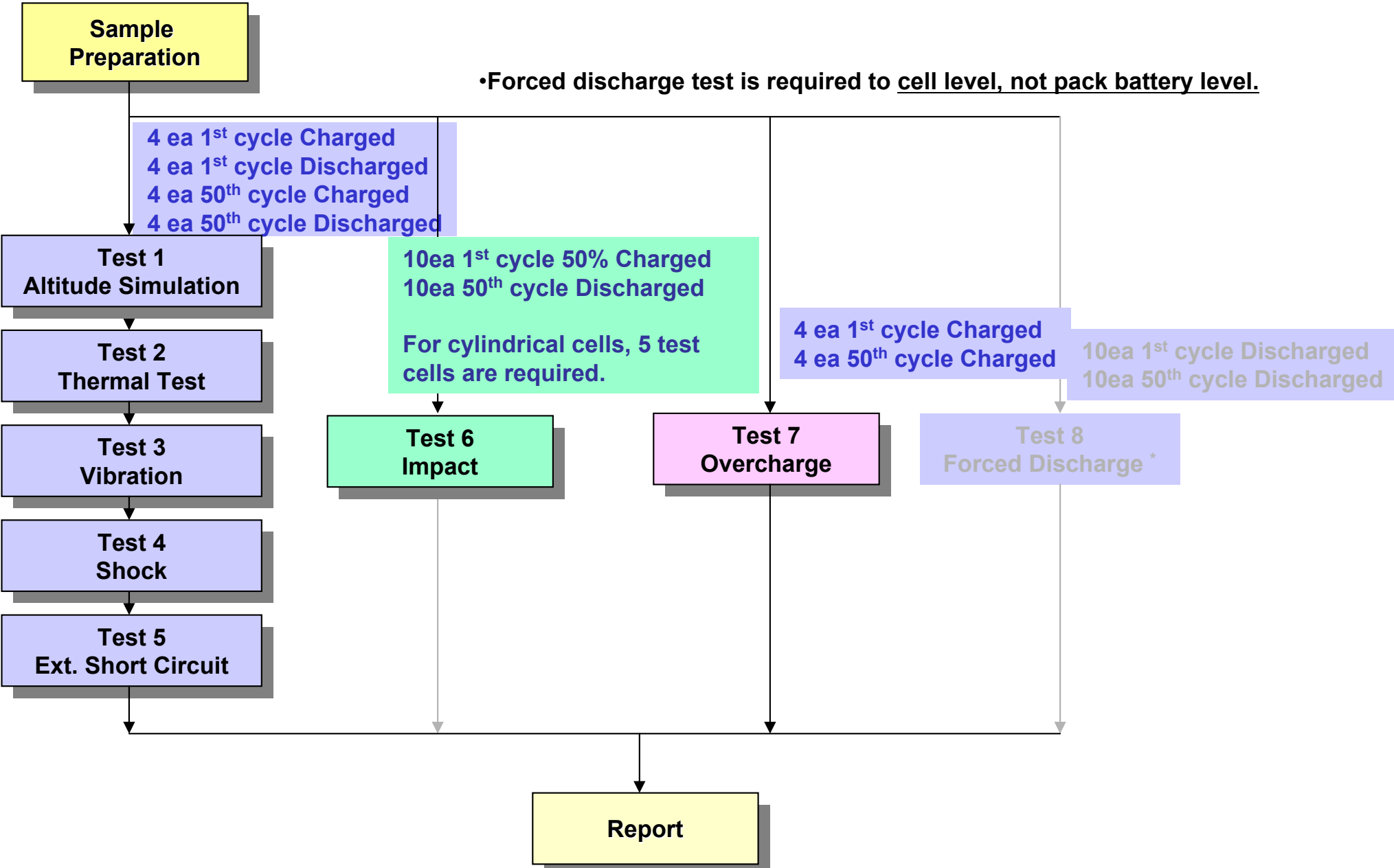
# 1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	<ul style="list-style-type: none"> <li>- Measuring mass before/ after each test (If M&gt;5g, less than 0.1%)</li> <li>- Measuring voltage before/ after each test (more than 90%)</li> <li>- No leakage, no venting, no disassembly, no rupture, no fire</li> </ul>
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"> <li>- No disassembly, no rupture, no fire (after 6 hours)</li> <li>- Temp. monitoring (max. 170℃)</li> </ul>
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"> <li>- No disassembly, no fire (after 7 days)</li> </ul>
Test 8. Forced Discharge	Only for Cell, not battery.	<ul style="list-style-type: none"> <li>- No disassembly, no fire (after 7 days)</li> </ul>

\* 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.10/27/Add.2)

# 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	11.954	341.20	11.949	341.20	99.98	0.008	Pass	11.905	342.60	99.75	0.016	Pass	11.914	342.58	99.47	0.008	Pass	11.901	342.58	99.92	0.000	Pass
	2	11.982	341.30	11.913	341.30	99.98	0.008	Pass	11.991	342.23	99.87	0.021	Pass	11.900	342.22	99.47	0.004	Pass	11.989	342.20	99.94	0.008	Pass
	3	11.979	341.25	11.906	341.25	99.99	0.008	Pass	11.985	342.17	99.88	0.025	Pass	11.903	342.15	99.53	0.008	Pass	11.995	342.14	99.95	0.004	Pass
	4	11.956	342.10	11.923	342.10	99.99	0.017	Pass	11.900	342.01	99.87	0.021	Pass	11.909	342.01	99.47	0.000	Pass	11.901	342.01	99.95	0.000	Pass
	Ave.	11.925	342.33	11.923	342.30	99.99	0.010	-	11.995	342.25	99.84	0.021	-	11.907	342.24	99.49	0.005	-	11.997	342.23	99.94	0.003	-
Dis charge	5	10.115	342.55	-	342.54	-	0.004	Pass	-	342.53	-	0.004	Pass	-	342.53	-	0.000	Pass	-	342.52	-	0.004	Pass
	6	10.050	341.55	-	342.55	-	0.000	Pass	-	342.52	-	0.012	Pass	-	342.51	-	0.004	Pass	-	342.50	-	0.004	Pass
	7	10.053	342.77	-	342.75	-	0.008	Pass	-	342.72	-	0.012	Pass	-	342.71	-	0.004	Pass	-	342.71	-	0.000	Pass
	8	10.034	342.03	-	342.03	-	0.000	Pass	-	342.01	-	0.008	Pass	-	342.97	-	0.017	Pass	-	342.97	-	0.000	Pass
	Ave.	10.063	342.48	-	342.47	-	0.003	-	-	342.45	-	0.009	-	-	342.43	-	0.019	-	-	342.43	-	0.002	-

## B. 50th cycle fully state

Charge	9	11.986	342.48	11.984	342.47	99.99	0.004	Pass	11.951	342.44	99.81	0.012	Pass	11.950	342.41	99.41	0.012	Pass	11.948	342.40	99.99	0.004	Pass
	10	11.907	342.24	11.904	342.23	99.98	0.004	Pass	11.971	342.19	99.81	0.017	Pass	11.965	342.19	99.39	0.000	Pass	11.964	342.19	99.99	0.000	Pass
	11	11.904	341.64	11.900	342.62	99.98	0.008	Pass	11.979	342.58	99.88	0.016	Pass	11.972	342.57	99.38	0.004	Pass	11.938	342.56	99.80	0.004	Pass
	12	11.904	341.44	11.901	342.41	99.98	0.012	Pass	11.969	342.37	99.82	0.017	Pass	11.965	342.37	99.40	0.000	Pass	11.963	342.37	99.99	0.000	Pass
	Ave.	11.900	341.45	11.997	342.43	99.98	0.007	-	11.968	342.40	99.83	0.015	-	11.963	342.39	99.39	0.004	-	11.953	342.38	99.94	0.002	-
Dis charge	13	10.056	342.73	-	342.73	-	0.000	Pass	-	342.71	-	0.008	Pass	-	342.70	-	0.004	Pass	-	342.70	-	0.000	Pass
	14	10.056	342.03	-	342.03	-	0.000	Pass	-	342.00	-	0.012	Pass	-	342.00	-	0.000	Pass	-	342.00	-	0.000	Pass
	15	10.047	342.00	-	342.00	-	0.000	Pass	-	342.96	-	0.017	Pass	-	342.95	-	0.004	Pass	-	342.93	-	0.008	Pass
	16	10.037	342.22	-	342.22	-	0.000	Pass	-	342.18	-	0.017	Pass	-	342.18	-	0.000	Pass	-	342.18	-	0.000	Pass
	Ave.	10.049	342.25	-	342.25	-	0.000	-	-	342.21	-	0.013	-	-	342.21	-	0.002	-	-	342.20	-	0.002	-

### 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	11.935	55.18	Pass
	2	11.956	54.98	Pass
	3	11.998	54.78	Pass
	4	11.905	55.49	Pass
	MAX.	11.905	55.49	-
Dis charge	5	9.923	55.45	Pass
	6	9.936	54.87	Pass
	7	9.928	55.68	Pass
	8	9.989	55.72	Pass
	MAX.	9.923	55.72	-

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	11.972	24.75	Pass
	18	11.981	24.57	Pass
	19	11.979	24.67	Pass
	20	11.985	24.56	Pass
	MAX.	11.985	24.75	-

Test Condition
- Max. Charge Current : 4000mA - CC/CV 2Imax(8000mA) 22V cut-off 24Hr

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

## B. 50th cycle fully state

Charge	9	11.948	55.54	Pass
	10	11.964	54.64	Pass
	11	11.938	54.73	Pass
	12	11.963	55.65	Pass
	MAX.	11.964	55.65	-
Dis charge	13	9.988	55.55	Pass
	14	9.986	54.91	Pass
	15	9.983	55.63	Pass
	16	9.954	55.46	Pass
	MAX.	9.988	55.63	-

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	11.991	24.76	Pass
	22	11.981	24.64	Pass
	23	11.971	24.51	Pass
	24	11.979	24.76	Pass
	MAX.	11.991	24.76	-

Requirement
- No disassembly, no fire within 7 day

# 3-3. T6 Test Result (ICR18650S3)

Impact (T6)			
Pack NO.	Initial OCV(V)	Max. Temp (°C)	Result
<b>A. 1st cycle 50% charge state</b>			
21	3.677	25.53	Pass
22	3.676	25.51	Pass
23	3.678	24.71	Pass
24	3.675	25.28	Pass
25	3.679	24.61	Pass
MAX.	3.679	25.53	-
<b>B. 50th cycle fully discharge state</b>			
26	3.458	25.24	Pass
27	3.459	25.57	Pass
28	3.458	24.95	Pass
29	3.459	25.13	Pass
30	3.461	24.72	Pass
MAX.	3.461	25.57	-
<b>Test Condition</b>			
- $\phi=15.8$ mm bar, 9.1kg mass, $61 \pm 2.5$ cm height			
<b>Requirement</b>			
- Temperature < 170 (°C) - No disassembly, no rupture, no fire within 6 hours			

# 4. Sample Image

