문서번호	QAE-EF02-130102-PKL12L4A02	
Prepared	김홍일	
	남익현	
	장승현	
Reviewed	남대호	
	이재승	
Approved	정준용	

SolutionPartner

UN Test Report
- L12L4A02(32Wh, 14.4V)-

목 차

2013. 1. 2.

LG Chem
Mobile Energy Division

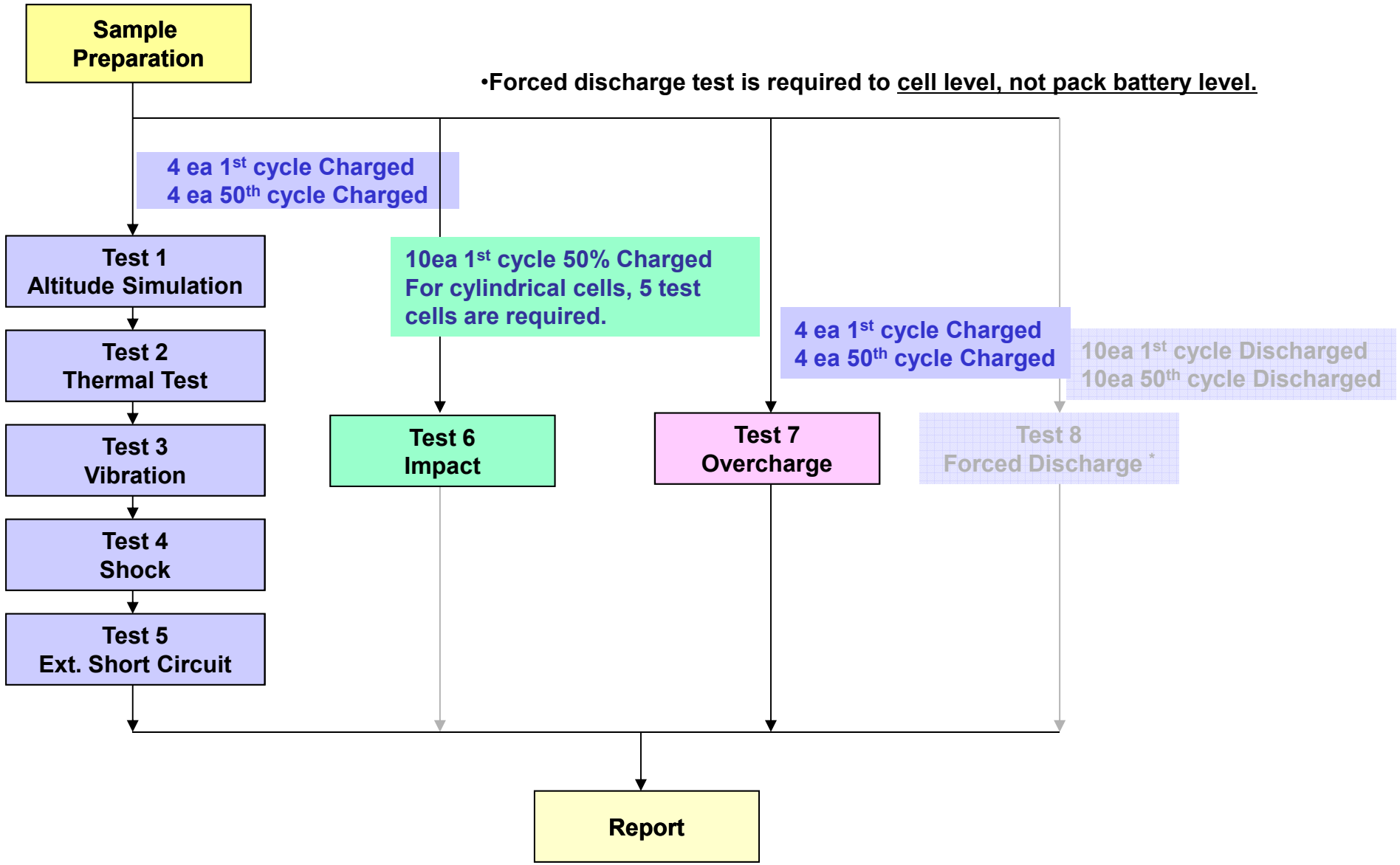
1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- 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℃	- 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)	- No disassembly, no fire (after 7 days)
Test 8. Forced Discharge	Only for Cell, not battery.	- 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**	16.611	205.344	16.610	205.341	99.99	0.001	**Pass**	16.430	205.339	98.92	0.001	**Pass**	16.421	205.335	99.95	0.002	**Pass**	16.418	205.331	99.98	0.002	**Pass**
	2	16.612	205.348	16.611	205.342	99.99	0.003	**Pass**	16.421	205.340	98.86	0.001	**Pass**	16.421	205.339	100.00	0.000	**Pass**	16.415	205.335	99.96	0.002	**Pass**
	3	16.621	205.355	16.619	205.351	99.99	0.002	**Pass**	16.428	205.342	98.85	0.004	**Pass**	16.420	205.339	99.95	0.001	**Pass**	16.413	205.337	99.96	0.001	**Pass**
	4	16.610	205.352	16.607	205.350	99.98	0.001	**Pass**	16.412	205.342	98.83	0.004	**Pass**	16.410	205.339	99.99	0.001	**Pass**	16.410	205.336	100.00	0.001	**Pass**
	Ave.	16.614	205.350	16.612	205.346	99.99	0.002	-	16.423	205.341	98.86	0.003	-	16.418	205.338	99.97	0.001	-	16.414	205.335	99.98	0.002	-
B. 50th cycle fully state																							
Charge	**9**	16.572	205.112	16.569	205.109	99.98	0.001	**Pass**	16.380	205.105	98.86	0.002	**Pass**	16.365	205.092	99.91	0.006	**Pass**	16.340	205.082	99.85	0.005	**Pass**
	10	16.570	205.144	16.567	205.139	99.98	0.002	**Pass**	16.391	205.133	98.94	0.003	**Pass**	16.385	205.129	99.96	0.002	**Pass**	16.370	205.125	99.91	0.002	**Pass**
	11	16.573	205.149	16.571	205.144	99.99	0.002	**Pass**	16.378	205.142	98.84	0.001	**Pass**	16.359	205.140	99.88	0.001	**Pass**	16.353	205.132	99.96	0.004	**Pass**
	12	16.572	205.145	16.570	205.141	99.99	0.002	**Pass**	16.375	205.132	98.82	0.004	**Pass**	16.358	205.129	99.90	0.001	**Pass**	16.352	205.121	99.96	0.004	**Pass**
	Ave.	16.572	205.138	16.569	205.133	99.98	0.002	-	16.381	205.128	98.86	0.003	-	16.367	310.633	99.91	0.003	-	16.354	205.115	99.92	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 (℃)	Result
A. 1st cycle fully state				
Charge	1	16.418	55.21	Pass
	2	16.415	55.39	Pass
	3	16.413	55.82	Pass
	4	16.410	55.79	Pass
	MAX.	16.418	55.82	-

EXT.Short Circuit (T5)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 50th cycle fully state				
Charge	9	16.340	54.68	Pass
	10	16.370	57.32	Pass
	11	16.353	54.63	Pass
	12	16.352	55.32	Pass
	MAX.	16.370	57.32	-

Test Condition
- 100mΩ ext. short-circuit at 55±2℃

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

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully state				
Charge	17	16.609	25.32	Pass
	18	16.611	24.99	Pass
	19	16.613	25.32	Pass
	20	16.632	25.12	Pass
	MAX.	16.632	25.32	-

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
B. 50th cycle fully state				
Charge	21	16.572	25.89	Pass
	22	16.570	25.99	Pass
	23	16.610	26.53	Pass
	24	16.590	26.03	Pass
	MAX.	16.610	26.53	-

Test Condition
- Max. Charge Current : 2080 mA - CC/CV 2Imax(4160mA) 22V cut-off 24Hr

Requirement
- No disassembly, no fire within 7 day

3-3. T6 Test Result (ICR18650S3)

Impact (T6)			
Pack NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle 50% charge state			
C-1	3.677	25.53	**Pass**
C-2	3.676	25.51	**Pass**
C-3	3.678	24.71	**Pass**
C-4	3.675	25.28	**Pass**
C-5	3.679	24.61	**Pass**
MAX.	3.679	25.53	-
B. 50th cycle fully discharge state			
C-6	3.458	25.24	**Pass**
C-7	3.459	25.57	**Pass**
C-8	3.458	24.95	**Pass**
C-9	3.459	25.13	**Pass**
C-10	3.461	24.72	**Pass**
MAX.	3.461	25.57	-
Test Condition			
- Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height			
Requirement			
- Temperature < 170 (℃) - No disassembly, no rupture, no fire within 6 hours			

4. Sample Image