UN38.3 Test Summary

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Description		List of Test Completed	
Cell/Battery Type	Rechargeable Lithium Ion battery pack	Revised edition	Revision 7 Amendment 1
Physical Description	Prismatic shape(pouch case)	Test 1. Altitude Simulation	Pass
Test Report Number	QDI-230613-B-AP23A8L	Test 2. Thermal Test	Pass
Date of test report	2023.06.13	Test 3. Vibration	Pass
Model name	AP23A8L	Test 4. Shock	Pass
Nominal voltage (V)	11.28	Test 5. External Short Circuit	Pass
Capacity (mAh / Wh)	4574 / 51.60	Test 6. Crush	Pass
Mean Mass (g)	212.55	Test 7. Overcharge	Pass
Reference to assembled battery testing requirements	Not applicable	Test 8. Forced Discharge	Pass

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LG Energy Solution

Report number	QDI-230613-B-AP23A8L	
Prepared by	Jie Ma	马杰
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UN38.3 Test Report

- AP23A8L (11.28V, 4574mAh/51.60Wh) -

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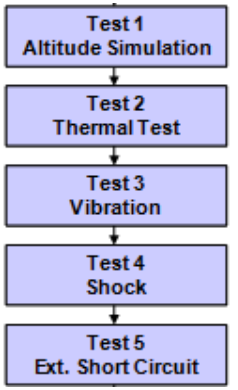
2023. 06. 13

1. UN38.3 Test Condition

Rev.7 Amd1

Test item	Test Condition	Requirements	Etc.
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- After OCV (%) ≥ 90% - No leakage, no venting, no disassembly, no rupture, no fire - Mass loss limit (leakage) 1) If M<1g, less than 0.5%, 2) If 1g≤M≤75g, less than 0.2%, 3) If M>75g, less than 0.1%)	T1~T5 : Sequence Tests 
Test 2. Thermal Test	[72±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 1) Peak acceleration - For cells & single cell batteries : 150gn - For batteries (whichever is smaller) : 150gn or $\sqrt{\frac{100850}{Mass(kg)}}$ gn 2) Pulse duration : 6msec 3) 6 direction (±x, y, z) x 3 cycle		
Test 5. External Short Circuit	1) Samples to be heated to 57±4℃ in chamber (Measured on external case) 2) Less than 0.1Ω, ext. short-circuit at 57±4℃ 3) 1hr continue after returning to 57±4℃	- No disassembly, no rupture, no fire within 6 hours after the test - Max. Temp ≤ 170℃	
Test 6. Impact	Φ=15.8±0.1mm bar, 9.1±0.1kg mass, 61±2.5cm height	- No disassembly, no fire within 6 hours after the test - Max. Temp ≤ 170℃	for cylindrical cells (dia ≥ 18mm)
Test 6. Crush	Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation		for cylindrical cells (dia < 18mm) for prismatic, pouch, coin/button cells
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 22V. 2.If charge voltage > 18V, V (min.) = 1.2 x (max. charge voltage)	- No disassembly, no fire within 7 days after the test	Only for Single Cell Battery / Battery
Test 8. Forced Discharge	Discharge at max. discharge current (connecting in series with 12V DC power supply), Duration time = rated capacity/initial test current	- No disassembly, no fire within 7 days after the test	Resistance of Electric Loader $Rt = \frac{12V + Vc}{Max\ discharge\ current}$ - Rc-Rw

2-1. Test Result (T1-T4)

Before			T1. Altitude Simulation					T2. Thermal					T3. Vibration					T4. Shock				
NO.	OCV(V)	Mass(g)	After OCV(V)	Mass(g)	After OCV(%)	Mass Loss(%)	Result	After OCV(V)	Mass(g)	After OCV(%)	Mass Loss(%)	Result	After OCV(V)	Mass(g)	After OCV(%)	Mass Loss(%)	Result	After OCV(V)	Mass(g)	After OCV(%)	Mass Loss(%)	Result
A. 1st cycle fully charged state																						
1	12.6322	212.32	12.6246	212.29	99.94	0.014	Pass	12.2603	212.24	97.11	0.024	Pass	12.2653	212.23	100.00	0.005	Pass	12.2590	212.24	99.95	0.000	Pass
2	12.6321	212.17	12.6238	212.15	99.93	0.009	Pass	12.2591	212.08	97.11	0.033	Pass	12.2643	212.08	100.00	0.000	Pass	12.2561	212.09	99.93	0.000	Pass
3	12.6314	212.39	12.6237	212.38	99.94	0.005	Pass	12.2567	212.32	97.09	0.028	Pass	12.2623	212.32	100.00	0.000	Pass	12.2536	212.32	99.93	0.000	Pass
4	12.6372	212.69	12.6298	212.66	99.94	0.014	Pass	12.2618	212.60	97.09	0.028	Pass	12.2673	212.60	100.00	0.000	Pass	12.2582	212.61	99.93	0.000	Pass
B. 25th cycle fully charged state																						
5	12.6611	212.81	12.6508	212.79	99.92	0.009	Pass	12.2697	212.72	96.99	0.033	Pass	12.2752	212.72	100.00	0.000	Pass	12.2650	212.73	99.92	0.000	Pass
6	12.6583	212.59	12.6492	212.55	99.93	0.019	Pass	12.2703	212.50	97.00	0.024	Pass	12.2759	212.51	100.00	0.000	Pass	12.2641	212.52	99.90	0.000	Pass
7	12.6703	212.72	12.6610	212.68	99.93	0.019	Pass	12.2732	212.63	96.94	0.024	Pass	12.2787	212.64	100.00	0.000	Pass	12.2661	212.65	99.90	0.000	Pass
8	12.6707	212.74	12.6632	212.72	99.94	0.009	Pass	12.2781	212.67	96.96	0.024	Pass	12.2818	212.67	100.00	0.000	Pass	12.2702	212.68	99.91	0.000	Pass

2-2. Test Result (T5/T7)

T5. External Short Circuit			
NO.	Initial OCV(V)	Max. Temp(℃)	Result
A. 1st cycle fully charged state			
1	12.2590	57.83	**Pass**
2	12.2561	58.04	**Pass**
3	12.2536	57.07	**Pass**
4	12.2582	57.17	**Pass**
B. 25th cycle fully charged state			
5	12.2650	57.95	**Pass**
6	12.2641	58.12	**Pass**
7	12.2661	57.04	**Pass**
8	12.2702	57.37	**Pass**

T7. Overcharge			
NO.	Initial OCV(V)	Max. Temp(℃)	Result
A. 1st cycle fully charged state			
9	12.6328	24.72	**Pass**
10	12.6298	24.55	**Pass**
11	12.6261	24.62	**Pass**
12	12.6263	24.32	**Pass**
B. 25th cycle fully charged state			
13	12.6669	24.48	**Pass**
14	12.6597	24.32	**Pass**
15	12.6657	24.48	**Pass**
16	12.6613	24.25	**Pass**

2-3. Test Result (T6/T8) – P498170C1

T6. Crush			
NO.	Initial OCV(V)	Max. Temp(℃)	Result
A. 1st cycle 50% charged state			
C-1	3.7632	23.68	**Pass**
C-2	3.7621	21.72	**Pass**
C-3	3.7621	21.62	**Pass**
C-4	3.7597	21.63	**Pass**
C-5	3.7555	21.62	**Pass**
B. 25th cycle 50% charged state			
C-6	3.7705	21.74	**Pass**
C-7	3.7687	21.90	**Pass**
C-8	3.7651	21.91	**Pass**
C-9	3.7681	21.99	**Pass**
C-10	3.7661	22.13	**Pass**

T8. Forced Discharge							
NO.	Initial OCV(V)	Max. Temp(℃)	Result	NO.	Initial OCV(V)	Max. Temp(℃)	Result
A. 1st cycle fully discharged state				**B. 25th cycle fully discharged state**			
C-11	3.4604	63.02	**Pass**	**C-21**	3.4651	49.96	**Pass**
C-12	3.4603	66.48	**Pass**	**C-22**	3.4670	62.25	**Pass**
C-13	3.4612	53.56	**Pass**	**C-23**	3.4645	54.48	**Pass**
C-14	3.4615	54.64	**Pass**	**C-24**	3.4661	49.97	**Pass**
C-15	3.4511	51.54	**Pass**	**C-25**	3.4665	58.86	**Pass**
C-16	3.4617	61.65	**Pass**	**C-26**	3.4648	63.02	**Pass**
C-17	3.4613	60.75	**Pass**	**C-27**	3.5375	66.48	**Pass**
C-18	3.4611	51.45	**Pass**	**C-28**	3.4636	53.56	**Pass**
C-19	3.4624	63.32	**Pass**	**C-29**	3.4651	54.64	**Pass**
C-20	3.4611	65.62	**Pass**	**C-30**	3.4672	51.54	**Pass**

3. Sample Image