Rechargeable Li-ion Battery UN38.3 Test Report

Recommendations on the TRANSPORT OF DANGEROUS GOODS

(Manual of Tests and Criteria, Seventh revised edition)

Customer: ACER
Model: AP21A7T
Rating/ Mass: 15.4V, TYP 5845mAh/ 90Wh,
Rated 5675mAh/ 87.39Wh/ 384(g)
Version of Test Report: 01
Issue date: 2021/09/07

Approved By	Checked By	Prepared By
Project Manager	Authorized Signatory	Test Engineer
Steve Sin	Cosmos Huang	Jay Lin

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Email：Test_Lab@simplo.com.tw Website：http://www.simplo.com.tw/

1. Purpose of the Test：

To test each cell/battery is of the type proved to meet the requirements in United Nations Recommendations on the TRANSPORT OF DANGEROUS GOODS, Manual of Tests and Criteria, Seventh revised edition, Section 38.3.

2. Test Result：

Test results of the UN Recommendations on the Transport of Dangerous Goods

No.	Test Item	Test results
T.1	Altitude simulation	PASS
T.2	Thermal test	PASS
T.3	Vibration test	PASS
T.4	Shock test	PASS
T.5	External short circuit	PASS
T.6	Impact, Crush test	PASS
T.7	Overcharge	PASS
T.8	Forced discharge	PASS

3.Test Lab: Email：Test_Lab@simplo.com.tw Website：http://www.simplo.com.tw/

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	SIMPLO (CHONGQING) Laboratory. ADD : No.2 Zongbao Avenue, Shapingba District, ChongQing, China TEL: +86-23-61718899 FAX: +86-23-61210488

4. Product manufacturer : Email：Test_Lab@simplo.com.twWebsite：http://www.simplo.com.tw/

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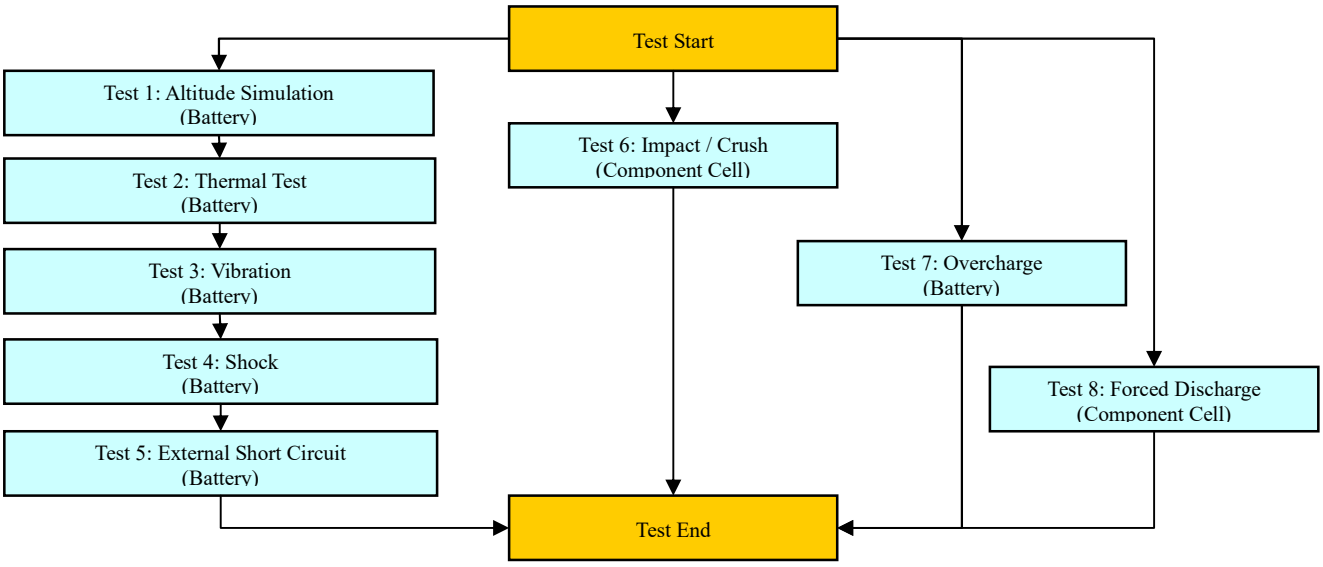
5. Test Quantity：

5.1 Four batteries, at first cycle, in fully charged states. (For T.1~T.5)
5.2 Four batteries, after 25 cycles ending in fully charged states. (For T.1~T.5)
5.3 Five component cells, at first cycle at 50% of the design rated capacity. (For T.6)
5.4 Five component cells, after 25 cycles at 50% of the design rated capacity. (For T.6)
5.5 Four batteries, at first cycle, in fully charged states. (For T.7)
5.6 Four batteries, after 25 cycles ending in fully charged states. (For T.7)
5.7 Ten component cells, at first cycle in fully discharge states. (For T.8)
5.8 Ten component cells, after 25 cycles ending in fully discharged states. (For T.8)

6. Test Procedure：

6.1 All detailed test procedures must be based on United Nations Recommendations on the TRANSPORT OF DANGEROUS GOODS, Manual of Tests and Criteria, Seventh revised edition, Section 38.3.

6.2 Test flow shall be followed as below.



Conclusion: The samples had passed the test items of UN38.3.

7. Comment：

Version	Modify content	Issue date
01	First publish	2021/09/07

8. Test Equipment：

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Revised Date: 2021-09-07

Test Instruments Reference List

Used	Instrument ID	Instrument Name	Type	Range of use	Manufacturer	Calibration Date_Last	Calibration Date_Next	Remarks
	Pretest							
V	ML-761	Learning	715C	0~18V 0~8A	SMP	2021/2/4	2022/3/4	
V	ML-762	Learning	715C	0~18V 0~8A	SMP	2021/1/4	2022/2/4	
V	ML-763	Learning	715C	0~18V 0~8A	SMP	2021/2/4	2022/3/4	
V	ML-764	Learning	715C	0~18V 0~8A	SMP	2021/1/4	2022/2/4	
	ML-925	Learning	750C8	0~60V 0~30A	SMP	2021/1/4	2022/2/4	
	T.1 Altitude Simulation							
V	ML-522	Altitude	SVT-120	kPa:30~90	HSIN JIANG	2021/6/11	2022/7/11	
V	ML-257	Multimeter	34401A	Note 1	Agilent	2021/2/4	2022/3/4	
V	ML-955	Electronic Balance	UX1020H	1-1220 gf	SHIMADZU	2021/1/4	2022/2/4	
	ML-1035	Electronic Balance	JWI-700W	30*0.005kg	JADEVER	2021/6/11	2022/7/11	
V	ML-550	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2021/7/28	2022/8/28	
V	ML-964	Barometric Air Pressure	MP55	750 to 1100 mbar	KIMO	2021/6/10	2022/7/10	
	T.2 Thermal Test							
V	ML-789	Thermal Shock	GTST-080-65-AW	T:-40 to 100℃	GF	2021/1/4	2022/2/4	
V	ML-257	Multimeter	34401A	note 1	Agilent	2021/2/4	2022/3/4	
V	ML-955	Electronic Balance	UX1020H	1-1220 gf	SHIMADZU	2021/1/4	2022/2/4	
	ML-1035	Electronic Balance	JWI-700W	30*0.005kg	JADEVER	2021/6/11	2022/7/11	
V	ML-551	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2021/7/28	2022/8/28	
	T.3 Vibration							
V	ML-233	Vibration	KD-9636-EM-300F2K-30N80	F:5~2000Hz G:0.2~20G	King Design	2021/7/29	2022/7/29	
V	ML-257	Multimeter	34401A	note 1	Agilent	2021/2/4	2022/3/4	
V	ML-955	Electronic Balance	UX1020H	1-1220 gf	SHIMADZU	2021/1/4	2022/2/4	
	ML-1035	Electronic Balance	JWI-700W	30*0.005kg	JADEVER	2021/6/11	2022/7/11	
V	ML-552	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2021/7/28	2022/8/28	
	T.4 Shock							
V	ML-056	Shock	DP-1200-25	G:10~600G	King Design	2021/7/29	2022/7/29	
V	ML-257	Multimeter	34401A	note 1	Agilent	2021/2/4	2022/3/4	
V	ML-955	Electronic Balance	UX1020H	1-1220 gf	SHIMADZU	2021/1/4	2022/2/4	
	ML-1035	Electronic Balance	JWI-700W	30*0.005kg	JADEVER	2021/6/11	2022/7/11	
V	ML-551	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2021/7/28	2022/8/28	
	T.5 External Short Circuit							
V	ML-894	Battery Hitester	BT3562	1mΩ ~ 30kΩ	HIOKI	2021/5/6	2022/6/6	
V	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 200℃	Yokogawa	2021/7/23	2022/8/23	
V	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 200℃	Yokogawa	2021/7/23	2022/8/23	
V	ML-521	Oven	9031	30~80 ℃	YEOW LONG	2021/8/4	2022/9/4	
V	ML-550	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2021/7/28	2022/8/28	
	T.6 Impact / Crush							
V	ML-458	Data Acquisition	XL122-D	1-100 Vdc, -50 to 150℃	Yokogawa	2021/5/11	2022/6/11	
	ML-1016	Impact Tester			King Design	2021/3/29	2022/4/29	
	ML-553	Crush Tester	BCT-01		Simplo	2021/4/7	2022/5/7	
V	ML-866	Crush Tester	M0654		JYI SHENG	2021/4/7	2022/5/7	
	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 200℃	Yokogawa	2021/7/23	2022/8/23	

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Revised Date: 2021-09-07

Test Instruments Reference List

Used	Instrument ID	Instrument Name	Type	Range of use	Manufacturer	Calibration Date_Last	Calibration Date_Next	Remarks
	T.7 Overcharge							
	ML-482	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2021/5/5	2022/6/5	
	ML-484	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2021/5/5	2022/6/5	
	ML-486	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2021/5/5	2022/6/5	
	ML-487	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2021/5/5	2022/6/5	
V	ML-550	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2021/7/28	2022/8/28	
	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 200℃	Yokogawa	2021/7/23	2022/8/23	
	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 200℃	Yokogawa	2021/7/23	2022/8/23	
V	ML-918	Overcharge & Forced discharge tester	T901	3~30 Vdc, Charge: 0.05~20A Discharge: 0.02~10A	SMP	2021/5/5	2022/6/5	
	T.8 Forced Discharge							
	ML-132	Electronic Load	3311C	60V,60A, 300W	Prodigit	2021/2/3	2022/3/3	
	ML-133	Electronic Load	3311C	60V,60A, 300W	Prodigit	2021/2/3	2022/3/3	
	ML-136	Electronic Load	3311C	60V,60A, 300W	Prodigit	2021/2/3	2022/3/3	
	ML-192	Electronic Load	3311C	60V,60A, 300W	Prodigit	2021/2/3	2022/3/3	
	ML-269	Electronic Load	3311C	60V,60A, 300W	Prodigit	2021/2/3	2022/3/3	
	ML-532	DC Electronic Load	33511-01	120V, 240A, 3600W	Prodigit	2021/6/11	2022/7/11	
	ML-482	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2021/5/5	2022/6/5	
	ML-484	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2021/5/5	2022/6/5	
	ML-486	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2021/5/5	2022/6/5	
	ML-487	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2021/5/5	2022/6/5	
V	ML-550	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2021/7/28	2022/8/28	
	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 200℃	Yokogawa	2021/7/23	2022/8/23	
	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 200℃	Yokogawa	2021/7/23	2022/8/23	
V	ML-918	Overcharge & Forced discharge tester	T901	3~30 Vdc, Charge: 0.05~20A Discharge: 0.02~10A	SMP	2021/5/5	2022/6/5	

Note 1: DC Voltage: 0.1-1000V; AC Voltage: 0.5-700V at 60Hz, 1kHz; Resistance: 10Ω-10MΩ; DC Current: 0.1mA-3A; AC Current: 0.01-3A at 60Hz, 0.01-1A, at 1kHz.

9. T.1~T.8 Detail Reports:

UN 38.3 Test Datasheet

UN38.3/ST/SG/AC.10/11/Rev.7

Control Number: SACU-2109001	Customer: ACER	Model Name: AP21A7T	SMP Project Name: AP21A7T
Pack P/N: 934QA023H (B)	Configuration: 4S1P	Test Duration: 2021/08/16~2021/09/06	Reviewer: Esmond
Cell Vendor: ATL	Cell Model: 4263D3	Cell P/N: 110-2385HB	N/A

Test Sample Identification: ☐ Large Battery ■ Small Battery ☐ Single-cell Battery

Battery Pack						Component Cell		
Used	Sample No.	Sample State	Used	Sample No.	Sample State	Used	Sample No.	Sample State
V	01~04	1 Cycle, Fully charged	V	05~08	25 Cycles, Fully charged	V	01C~05C	1 Cycle, 50% SOC
V	09~12	1 Cycle, Fully charged	V	13~16	25 Cycles, Fully charged	V	06C~10C	25 Cycles, 50% SOC
						V	11C~20C	1 Cycle, Fully discharged (0% SOC)
						V	21C~30C	25 Cycles, Fully discharged (0% SOC)

T.1 Altitude Simulation

Start time: 2021/08/26 08:46						Ambient temp.: 23.4 ℃	Operator: Jay		
Finish time: 2021/08/26 15:57		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	16.996	17.011	17.008	16.993	17.025	17.033	17.017	17.036
	After	16.981	16.997	16.995	16.983	17.010	17.021	17.004	17.026
	Residual OCV %	99.91%	99.92%	99.92%	99.94%	99.91%	99.93%	99.92%	99.94%
Mass (g)	Before	383.389	383.378	383.374	383.380	383.385	383.340	383.377	383.381
	After	383.380	383.368	383.366	383.368	383.372	383.330	383.368	383.370
	Mass loss %	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Results		P	P	P	P	P	P	P	P

T.2 Thermal Test

Start time: 2021/08/26 16:20						Ambient temp.: 23.8 ℃	Operator: Jay		
Finish time: 2021/09/02 09:04		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	16.981	16.997	16.995	16.983	17.010	17.021	17.004	17.026
	After	16.799	16.811	16.816	16.798	16.830	16.837	16.822	16.841
	Residual OCV %	98.93%	98.91%	98.95%	98.91%	98.94%	98.92%	98.93%	98.91%
Mass (g)	Before	383.380	383.368	383.366	383.368	383.372	383.330	383.368	383.370
	After	383.355	383.346	383.342	383.345	383.347	383.306	383.342	383.346
	Mass loss %	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Results		P	P	P	P	P	P	P	P

T.3 Vibration

Start time: 2021/09/02 09:25						Ambient temp.: 23.6 ℃	Operator: Jay		
Finish time: 2021/09/03 09:20		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	16.799	16.811	16.816	16.798	16.830	16.837	16.822	16.841
	After	16.786	16.798	16.801	16.786	16.815	16.827	16.810	16.832
	Residual OCV %	99.92%	99.92%	99.91%	99.93%	99.91%	99.94%	99.93%	99.95%
Mass (g)	Before	383.355	383.346	383.342	383.345	383.347	383.306	383.342	383.346
	After	383.348	383.340	383.335	383.339	383.342	383.299	383.336	383.339
	Mass loss %	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Results		P	P	P	P	P	P	P	P

T.4 Shock

Start time: 2021/09/03 09:42						Ambient temp.: 23.8 ℃	Operator: Jay		
Finish time: 2021/09/03 15:10		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	16.786	16.798	16.801	16.786	16.815	16.827	16.810	16.832
	After	16.777	16.787	16.791	16.773	16.802	16.816	16.802	16.818
	Residual OCV %	99.95%	99.93%	99.94%	99.92%	99.92%	99.93%	99.95%	99.92%
Mass (g)	Before	383.348	383.340	383.335	383.339	383.342	383.299	383.336	383.339
	After	383.343	383.337	383.333	383.335	383.341	383.296	383.332	383.337
	Mass loss %	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Results		P	P	P	P	P	P	P	P

T.5 External Short Circuit

Start time: 2021/09/06 09:13						Ambient temp.: 24.3 ℃		Operator: Jay	
Finish time: 2021/09/06 18:30		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	16.758	16.769	16.773	16.756	16.784	16.800	16.784	16.801
	After	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Resistance (<100mΩ)		58.4	57.1	59.6	60.5	58.7	57.9	60.1	60.7
Max Temp. (< 170℃)		57.5	57.8	57.3	57.2	57.4	57.5	57.7	57.6
Results		P	P	P	P	P	P	P	P

T.6 Impact / Crush (Component Cell)

UN38.3/ST/SG/AC.10/11/Rev.7

☐ Impact - Cylindrical cells not less than 18.0 mm in diameter

■ Crush - Prismatic, pouch, coin/button cells and cylindrical cells less than 18.0 mm in diameter

Start time: 2021/08/27 10:45			Ambient temp.: 24.0 ℃		Operator: Jay
Finish time: 2021/08/27 15:50	Sample 01C	Sample 02C	Sample 03C	Sample 04C	Sample 05C
Initial OCV (V)	3.804	3.808	3.813	3.817	3.815
Max Temp. (< 170℃)	24.4	24.5	24.5	24.2	24.0
Results	P	P	P	P	P
Sample No.	Sample 06C	Sample 07C	Sample 08C	Sample 09C	Sample 10C
Initial OCV (V)	3.810	3.805	3.814	3.806	3.803
Max Temp. (< 170℃)	24.1	24.3	23.9	24.1	23.9
Results	P	P	P	P	P

T.7 Overcharge

Start time: 2021/08/26 10:40					Ambient temp.: 23.9 ℃		Operator: Jay	
Finish time: 2021/09/03 12:00	Sample 09	Sample 10	Sample 11	Sample 12	Sample 13	Sample 14	Sample 15	Sample 16
Initial OCV (V)	16.996	17.009	17.011	16.993	17.025	17.033	17.021	17.036
Results	P	P	P	P	P	P	P	P

T.8 Forced Discharge (Component Cell)

Start time: 2021/08/27 08:53					Ambient temp.: 23.7 ℃		Operator: Jay	
Finish time: 2021/09/06 08:52	Sample 11C	Sample 12C	Sample 13C	Sample 14C	Sample 15C	Sample 16C	Sample 17C	Sample 18C
Initial OCV (V)	3.440	3.463	3.457	3.451	3.433	3.468	3.445	3.442
Results	P	P	P	P	P	P	P	P
Sample No.	Sample 19C	Sample 20C	Sample 21C	Sample 22C	Sample 23C	Sample 24C	Sample 25C	Sample 26C
Initial OCV (V)	3.467	3.454	3.449	3.460	3.439	3.434	3.466	3.458
Results	P	P	P	P	P	P	P	P
Sample No.	Sample 27C	Sample 28C	Sample 29C	Sample 30C				
Initial OCV (V)	3.430	3.447	3.450	3.443				
Results	P	P	P	P				

9. Test Sample: