



新普科技股份有限公司
 新世電子(常熟)有限公司
 新普科技(重慶)有限公司
 華普電子(常熟)有限公司

Control Number: SLEU-1809009

Lithium-ion Battery UN38.3 Test Report

Recommendations on the TRANSPORT OF DANGEROUS GOODS

(Manual of Tests and Criteria, Sixth revised edition)

Customer: Lenovo

Model: L18M4PF5

Rating: 15.2V, Typical Capacity 4610mAh/ 70Wh

Rated Capacity 4480mAh/ 68Wh

Issue date: 2018/09/25

Approved By	Checked By	Prepared By

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Form No. : W11-002-B04

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Page 1 of 7

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1. Purpose of the Test :

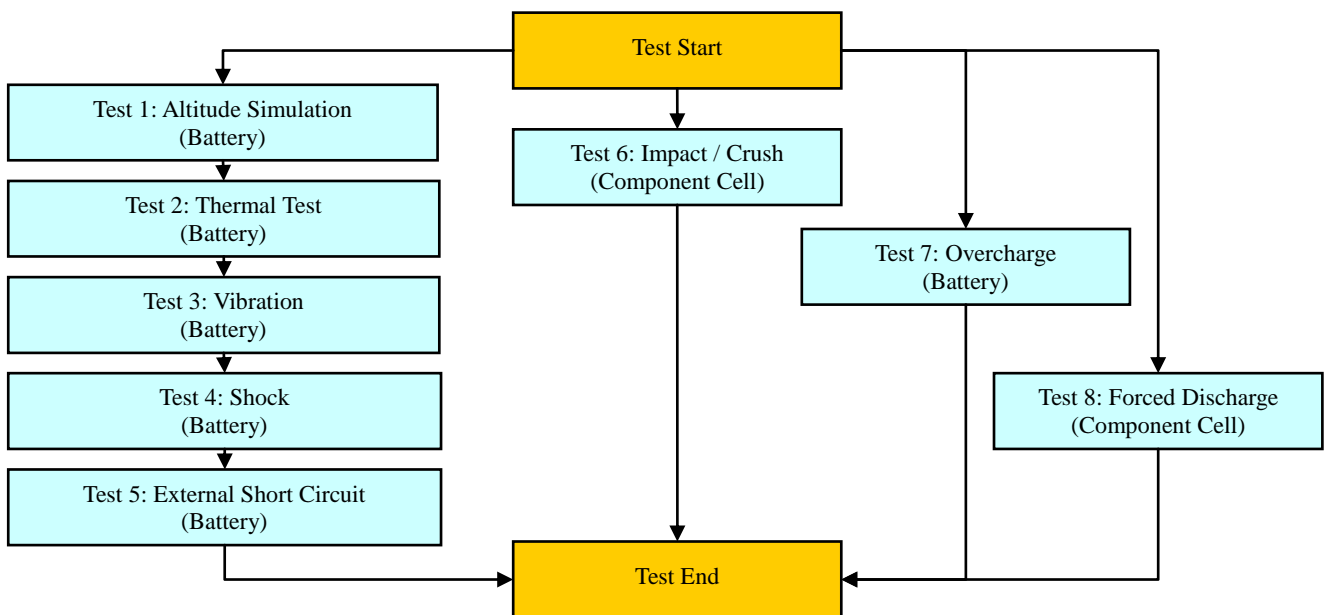
To test each cell/battery is of the type proved to meet the requirements in United Nations Recommendations on the TRANSPORT OF DANGEROUS GOODS, Manual of Tests and Criteria, Sixth revised edition, Section 38.3.

2. Test Quantity :

- 2.1 Four batteries, at first cycle, in fully charged states. (For T.1~T.5)
- 2.2 Four batteries, after 50 cycles ending in fully charged states. (For T.1~T.5)
- 2.3 Five component cells, at first cycle at 50% of the design rated capacity. (For T.6)
- 2.4 Four batteries, at first cycle, in fully charged states. (For T.7)
- 2.5 Four batteries, after 50 cycles ending in fully charged states. (For T.7)
- 2.6 Ten component cells, at first cycle in fully discharge states. (For T.8)
- 2.7 Ten component cells, after 50 cycles ending in fully discharged states. (For T.8)

3. Test Procedure :

- 3.1 All detailed test procedures must be based on United Nations Recommendations on the TRANSPORT OF DANGEROUS GOODS, Manual of Tests and Criteria, Sixth revised edition, Section 38.3.
- 3.2 Test flow shall be followed as below.





4. Test Result :

4.1 T.1 ~T.4 Test result: **Passed**

- 4.1.1 All batteries could meet the requirement of Table 38.3.1 Mass loss limit ($M < 1g$: 0.5% ; $1g \leq M \leq 75g$: 0.2% ; $M > 75g$: 0.1%) and residual OCV not less than 90% after the test.
- 4.1.2 No leakage, no venting, no disassembly, no rupture and no fire.

4.2 T.5 Test result: **Passed**

- 4.2.1 All batteries could meet the requirement, external temperature did not exceed 170°C .
- 4.2.2 All batteries were no disassembly, no rupture and no fire during the test and within six hours after the test.

4.3 T.6 Test result: **Passed**

- 4.3.1 All component cells could meet the requirement, external temperature did not exceed 170°C .
- 4.3.2 All component cells were no disassembly and no fire during the test and within six hours after the test.

4.4 T.7 Test result: **Passed**

- 4.4.1 All batteries could meet no disassembly and no fire during the test and within seven days after the test.

4.5 T.8 Test result: **Passed**

- 4.5.1 All component cells could meet the requirement, no disassembly and no fire during the test and within seven days after the test.

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



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Control Number: SLEU-1809009

5. Test Equipment :

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Revised Date: 2018-09-25

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	2018/2/26	2019/2/26	
V	ML-762	Learning	715C	0~18V 0~8A	SMP	2018/1/3	2019/1/3	
V	ML-763	Learning	715C	0~18V 0~8A	SMP	2018/2/26	2019/2/26	
V	ML-764	Learning	715C	0~18V 0~8A	SMP	2018/1/3	2019/1/3	
	ML-925	Learning	750C8	0~60V 0~30A	SMP	2018/1/3	2019/1/3	
T.1 Altitude Simulation								
V	ML-522	Altitude	SVT-120	Kpa:30~90	HSIN JIANG	2018/7/18	2019/7/18	
V	ML-257	Multimeter	HP 34401A	Note 1	Agilent	2018/3/1	2019/3/1	
V	ML-494	Electronic Balance	XS1220M-SCS	1-1220 gf	CHUANHUA	2018/7/18	2019/7/18	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2018/9/12	2019/9/12	
V	ML-550	Data Logger	313	15~35 °C; 30~80 %RH	CENTER	2018/9/18	2019/9/18	
T.2 Thermal Test								
V	ML-789	Thermal Shock	GTST-080-65-AW	T:40 to 120°C	GF	2018/1/3	2019/1/3	
V	ML-257	Multimeter	HP 34401A	note 1	Agilent	2018/3/1	2019/3/1	
	ML-494	Electronic Balance	XS1220M-SCS	1-1220 gf	CHUANHUA	2018/7/18	2019/7/18	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2018/9/12	2019/9/12	
V	ML-551	Data Logger	313	15~35 °C; 30~80 %RH	CENTER	2018/9/18	2019/9/18	
T.3 Vibration								
V	ML-233	Vibration	KD-9636-EM-300F2K-30N80	F:5~2000Hz G:0.2~20G	King Design	2018/8/24	2019/8/24	
V	ML-257	Multimeter	HP 34401A	note 1	Agilent	2018/3/1	2019/3/1	
	ML-494	Electronic Balance	XS1220M-SCS	1-1220 gf	CHUANHUA	2018/7/18	2019/7/18	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2018/9/12	2019/9/12	
V	ML-552	Data Logger	313	15~35 °C; 30~80 %RH	CENTER	2018/9/18	2019/9/18	
T.4 Shock								
V	ML-056	Shock	DP-1200-25	G:10~600G	King Design	2018/8/24	2019/8/24	
V	ML-257	Multimeter	HP 34401A	note 1	Agilent	2018/3/1	2019/3/1	
	ML-494	Electronic Balance	XS1220M-SCS	1-1220 gf	CHUANHUA	2018/7/18	2019/7/18	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2018/9/12	2019/9/12	
V	ML-551	Data Logger	313	15~35 °C; 30~80 %RH	CENTER	2018/9/18	2019/9/18	
T.5 External Short Circuit								
V	ML-534	mΩ Hitester	3540	1mΩ ~ 30kΩ	HIOKI	2018/9/18	2019/9/18	
V	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2018/9/12	2019/9/12	
V	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2018/9/12	2019/9/12	
V	ML-521	Oven	9031	30~80 °C	YEOW LONG	2018/9/12	2019/9/12	
V	ML-549	Data Logger	313	15~35 °C; 30~80 %RH	CENTER	2018/9/18	2019/9/18	
T.6 Impact / Crush								
V	ML-339	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2018/5/17	2019/5/17	
	ML-076	Impact Tester			JYI SHENG	2018/1/3	2019/1/3	
	ML-553	Crush Tester	BCT-01		Simplo	2018/5/16	2019/5/16	
V	ML-866	Crush Tester	M0654		JYI SHENG	2018/4/9	2019/4/9	
	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2018/9/12	2019/9/12	

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Revised Date: 2018-09-25

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	2018/5/17	2019/5/17	
	ML-483	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2018/5/17	2019/5/17	
	ML-484	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2018/5/17	2019/5/17	
	ML-486	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2018/5/17	2019/5/17	
	ML-487	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2018/5/17	2019/5/17	
V	ML-549	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2018/9/12	2019/9/12	
	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2018/9/12	2019/9/12	
V	ML-918	Overcharge & Forced discharge tester	T901	3~30 Vdc, Charge: 0.05~20A Discharge: 0.02~10A	SMP	2018/5/17	2019/5/17	
T.8 Forced Discharge								
	ML-132	Electronic Load	3311C	60V,55A, 300W	Prodigit	2018/3/1	2019/3/1	
	ML-133	Electronic Load	3311C	60V,55A, 300W	Prodigit	2018/3/1	2019/3/1	
	ML-136	Electronic Load	3311C	60V,55A, 300W	Prodigit	2018/3/1	2019/3/1	
	ML-192	Electronic Load	3311C	60V,55A, 300W	Prodigit	2018/3/1	2019/3/1	
	ML-269	Electronic Load	3311C	60V,55A, 300W	Prodigit	2018/3/1	2019/3/1	
	ML-532	DC Electronic Load	33511-01	120V, 240A, 3600W	Prodigit	2018/7/18	2019/7/18	
	ML-482	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2018/5/17	2019/5/17	
	ML-483	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2018/5/17	2019/5/17	
	ML-484	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2018/5/17	2019/5/17	
	ML-486	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2018/5/17	2019/5/17	
	ML-487	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2018/5/17	2019/5/17	
V	ML-549	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2018/9/12	2019/9/12	
	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2018/9/12	2019/9/12	
V	ML-918	Overcharge & Forced discharge tester	T901	3~30 Vdc, Charge: 0.05~20A Discharge: 0.02~10A	SMP	2018/5/17	2019/5/17	
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.								

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Control Number: SLEU-1809009

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

UN 38.3 Test Datasheet UN38.3/ST/SG/AC.10/11/Rev.6

Control Number: SLEU-1809009	Customer: Lenovo	Model Name: L18M4PF5	SMP Project Name: S540-4T
Pack P/N: 928QA263H (A)(B)	Configuration: 4S1P	Test Duration: 2018/08/15~2018/09/21	Reviewer: Esmond

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	50 Cycles, Fully charged	V	01C-05C	1 Cycle, 50% SOC
V	09-12	1 Cycle, Fully charged	V	13-16	50 Cycles, Fully charged	V	06C-15C	1 Cycle, Fully discharged (0% SOC)
		25Cycles, Fully charged			25 Cycles, Fully charged	V	16C-25C	50 Cycles, Fully discharged (0% SOC)

T.1 Altitude Simulation

Start time: 2018/09/07 09:10		Ambient temp.: 23.8 °C						Operator: Mia	
Finish time: 2018/09/07 16:30		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	16.874	16.867	16.877	16.868	16.861	16.872	16.859	16.865
	After	16.868	16.865	16.875	16.862	16.858	16.867	16.855	16.862
	Residual OCV %	99.96%	99.99%	99.99%	99.96%	99.98%	99.97%	99.98%	99.98%
Mass (g)	Before	287.153	287.310	287.228	287.192	287.281	287.265	287.174	287.293
	After	287.151	287.308	287.228	287.190	287.276	287.262	287.174	287.292
	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: 2018/09/10 09:30		Ambient temp.: 23.8 °C						Operator: Mia	
Finish time: 2018/09/17 09:00		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	16.846	16.842	16.847	16.838	16.835	16.845	16.829	16.838
	After	16.646	16.660	16.642	16.665	16.639	16.651	16.651	16.653
	Residual OCV %	98.81%	98.92%	98.78%	98.97%	98.84%	98.85%	98.94%	98.90%
Mass (g)	Before	287.151	287.308	287.228	287.190	287.276	287.262	287.174	287.292
	After	287.142	287.294	287.210	287.167	287.265	287.252	287.152	287.277
	Mass loss %	0.00%	0.00%	0.01%	0.01%	0.00%	0.00%	0.01%	0.01%
Results		P	P	P	P	P	P	P	P

T.3 Vibration

Start time: 2018/09/17 09:20		Ambient temp.: 24.0 °C						Operator: Mia	
Finish time: 2018/09/18 07:50		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	16.646	16.660	16.642	16.665	16.639	16.651	16.651	16.653
	After	16.638	16.649	16.629	16.659	16.630	16.640	16.645	16.638
	Residual OCV %	99.95%	99.93%	99.92%	99.96%	99.95%	99.93%	99.96%	99.91%
Mass (g)	Before	287.142	287.294	287.210	287.167	287.265	287.252	287.152	287.277
	After	287.141	287.290	287.210	287.165	287.264	287.250	287.148	287.277
	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: 2018/09/18 15:20		Ambient temp.: 23.7 °C						Operator: Mia	
Finish time: 2018/09/18 18:00		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	16.630	16.644	16.626	16.653	16.626	16.637	16.640	16.632
	After	16.625	16.643	16.624	16.649	16.620	16.632	16.637	16.626
	Residual OCV %	99.97%	99.99%	99.99%	99.98%	99.96%	99.97%	99.98%	99.96%
Mass (g)	Before	287.141	287.290	287.210	287.165	287.264	287.250	287.148	287.277
	After	287.140	287.288	287.210	287.165	287.260	287.248	287.147	287.273
	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

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T.5 External Short Circuit

Start time: 2018/09/18 18:20		Ambient temp.: 23.8 °C						Operator: Mia	
Finish time: 2018/09/19 09:40		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	16.625	16.643	16.624	16.649	16.620	16.632	16.637	16.626
	After	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Resistance (<100mΩ)		57.4	58.2	58.5	59.1	59.7	58.9	60.3	60.7
Max Temp. (< 170°C)		57.8	57.3	57.9	57.6	57.5	57.7	57.4	57.7
Results		P	P	P	P	P	P	P	P

T.6 Impact / Crush (Component Cell)

UN38.3/ST/SG/AC.10/11/Rev.6

- 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: 2018/09/10 09:50		Ambient temp.: 23.7 °C				Operator: Mia	
Finish time: 2018/09/11 09:10		Sample 01C	Sample 02C	Sample 03C	Sample 04C	Sample 05C	
Initial OCV (V)		3.754	3.751	3.742	3.747	3.756	
Max Temp. (< 170°C)		23.8	24.0	23.7	23.6	23.6	
Results		P	P	P	P	P	

T.7 Overcharge

Start time: 2018/09/10 09:30		Ambient temp.: 23.9 °C						Operator: Mia	
Finish time: 2018/09/18 13:20		Sample 09	Sample 10	Sample 11	Sample 12	Sample 13	Sample 14	Sample 15	Sample 16
Initial OCV (V)		16.878	16.865	16.876	16.871	16.859	16.876	16.856	16.869
Results		P	P	P	P	P	P	P	P

T.8 Forced Discharge (Component Cell)

Start time: 2018/09/13 09:20		Ambient temp.: 23.8 °C								Operator: Mia	
Finish time: 2018/09/21 10:30		Sample 06C	Sample 07C	Sample 08C	Sample 09C	Sample 10C	Sample 11C	Sample 12C	Sample 13C		
Initial OCV (V)		3.473	3.451	3.465	3.442	3.436	3.461	3.478	3.465		
Results		P	P	P	P	P	P	P	P		
Sample No.		Sample 14C	Sample 15C	Sample 16C	Sample 17C	Sample 18C	Sample 19C	Sample 20C	Sample 21C		
Initial OCV (V)		3.448	3.482	3.488	3.457	3.438	3.468	3.421	3.438		
Results		P	P	P	P	P	P	P	P		
Sample No.		Sample 22C	Sample 23C	Sample 24C	Sample 25C						
Initial OCV (V)		3.427	3.429	3.484	3.473						
Results		P	P	P	P						

7. Test Sample:



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