



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

Control Number: SLEU-1808001

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: L18M6PD1

Rating: 11.46V , 4.19Ah / 48Wh

Issue date: 2018/08/01

Approved By	Checked By	Prepared By

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Form No. : W11-002-B04

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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.

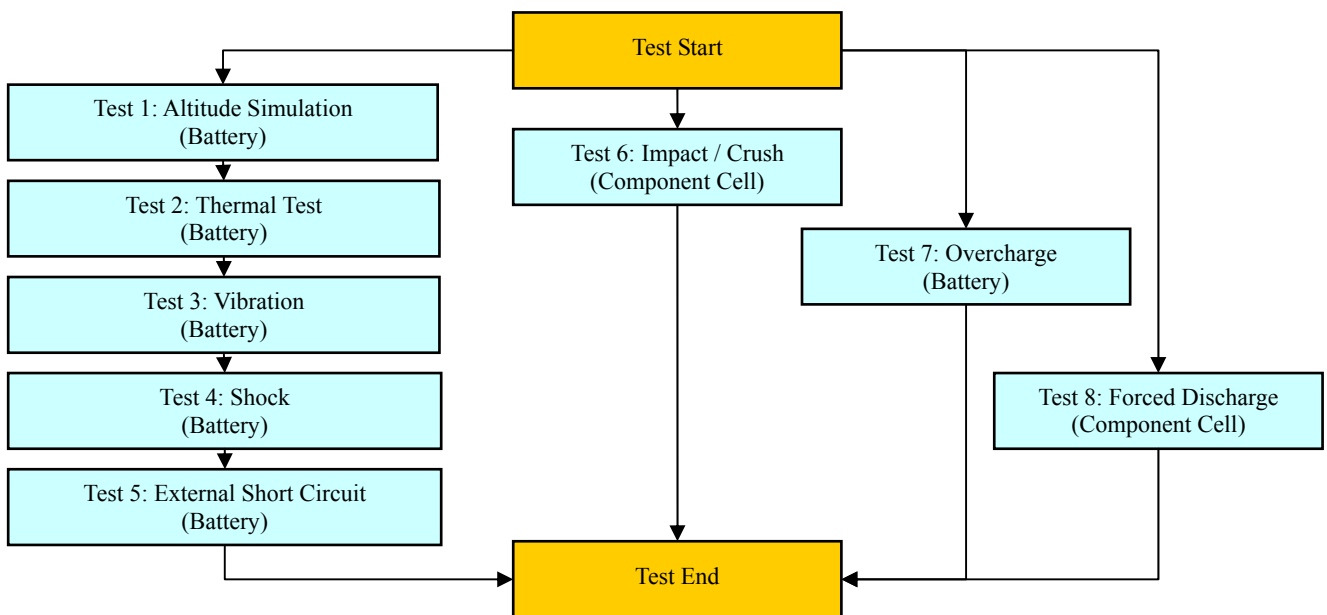
2. Test Quantity :

- 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-1808001

5. Test Equipment :

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Revised Date: 2018-08-01

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	
	ML-494	Electronic Balance	XS1220M-SCS	1-1200 gf	CHUANHUA	2018/7/18	2019/7/18	
V	TD-166	Electronic Balance	PG603-S	1-610 gf	METTLER TOLEDO	2017/9/13	2018/9/13	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2017/9/13	2018/9/13	
V	ML-550	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2017/9/18	2018/9/18	
T.2 Thermal Test								
V	ML-789	Thermal Shock	GTST-080-65-AW	T:-40 to 120℃	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	1-1000 gf	CHUANHUA	2018/7/18	2019/7/18	
V	TD-166	Electronic Balance	PG603-S	1-610 gf	METTLER TOLEDO	2017/9/13	2018/9/13	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2017/9/13	2018/9/13	
V	ML-551	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2017/9/18	2018/9/18	
T.3 Vibration								
V	ML-233	Vibration	KD-9636-EM-300F2K-30N80	F:5~2000Hz G:0.2~20G	King Design	2017/8/29	2018/8/29	
V	ML-257	Multimeter	HP 34401A	note 1	Agilent	2018/3/1	2019/3/1	
	ML-494	Electronic Balance	XS1220M-SCS	1-1000 gf	CHUANHUA	2018/7/18	2019/7/18	
V	TD-166	Electronic Balance	PG603-S	1-610 gf	METTLER TOLEDO	2017/9/13	2018/9/13	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2017/9/13	2018/9/13	
V	ML-552	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2017/9/18	2018/9/18	
T.4 Shock								
V	ML-056	Shock	DP-1200-25	G:10~600G	King Design	2017/8/29	2018/8/29	
V	ML-257	Multimeter	HP 34401A	note 1	Agilent	2018/3/1	2019/3/1	
	ML-494	Electronic Balance	XS1220M-SCS	1-1000 gf	CHUANHUA	2018/7/18	2019/7/18	
V	TD-166	Electronic Balance	PG603-S	1-610 gf	METTLER TOLEDO	2017/9/13	2018/9/13	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2017/9/13	2018/9/13	
V	ML-551	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2017/9/18	2018/9/18	
T.5 External Short Circuit								
V	ML-534	mΩ Hitester	3540	1mΩ ~ 30kΩ	HIOKI	2017/9/18	2018/9/18	
V	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2017/9/13	2018/9/13	
V	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2017/9/13	2018/9/13	
V	ML-521	Oven	9031	30~80 ℃	YEOW LONG	2017/9/13	2018/9/13	
V	ML-549	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2017/9/18	2018/9/18	
T.6 Impact / Crush								
V	ML-339	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	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℃	Yokogawa	2017/9/13	2018/9/13	

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Revised Date: 2018-08-01

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 Logger	313	15~35 ℃; 30~80 %RH	CENTER	2017/9/18	2018/9/18	
	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2017/9/13	2018/9/13	
	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2017/9/13	2018/9/13	
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 Logger	313	15~35 ℃; 30~80 %RH	CENTER	2017/9/18	2018/9/18	
	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2017/9/13	2018/9/13	
	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2017/9/13	2018/9/13	
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-1808001

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

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

Control Number: SLEU-1808001	Customer: Lenovo	Model Name: L18M6PD1	SMP Project Name: SideSwipe
Pack P/N: 931QA115H (A)(B)	Configuration: 3S2P	Test Duration: 2018/07/02~2018/07/31	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
V	01~04	1 Cycle, Fully charged	V	05~08	50 Cycles, Fully charged
V	09~12	1 Cycle, Fully charged	V	13~16	50 Cycles, Fully charged
		25Cycles, Fully charged			25 Cycles, Fully charged
			V	01C~05C	1 Cycle, 50% SOC
			V	06C~15C	1 Cycle, Fully discharged (0% SOC)
			V	16C~25C	50 Cycles, Fully discharged (0% SOC)

T.1 Altitude Simulation

Start time: 2018/07/17 09:00		Ambient temp.: 23.5 °C						Operator: Betty	
Finish time: 2018/07/17 15:20		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	12.938	12.933	12.930	12.934	12.933	12.936	12.931	12.933
	After	12.926	12.922	12.919	12.923	12.922	12.926	12.920	12.923
	Residual OCV %	99.91%	99.91%	99.91%	99.91%	99.91%	99.92%	99.91%	99.92%
Mass (g)	Before	227.439	227.581	227.379	227.689	227.428	227.705	227.351	227.466
	After	227.434	227.581	227.377	227.689	227.428	227.705	227.347	227.465
	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: 2018/07/17 15:40		Ambient temp.: 24.7 °C						Operator: Betty	
Finish time: 2018/07/24 08:50		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	12.926	12.922	12.919	12.923	12.922	12.926	12.920	12.923
	After	12.731	12.730	12.737	12.739	12.732	12.739	12.728	12.733
	Residual OCV %	98.49%	98.51%	98.59%	98.58%	98.53%	98.55%	98.51%	98.53%
Mass (g)	Before	227.434	227.581	227.377	227.689	227.428	227.705	227.347	227.465
	After	227.417	227.559	227.353	227.669	227.407	227.682	227.329	227.441
	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: 2018/07/24 09:10		Ambient temp.: 23.4 °C						Operator: Betty	
Finish time: 2018/07/25 08:50		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	12.731	12.730	12.737	12.739	12.732	12.739	12.728	12.733
	After	12.712	12.712	12.719	12.721	12.713	12.721	12.710	12.715
	Residual OCV %	99.85%	99.86%	99.86%	99.86%	99.85%	99.86%	99.86%	99.86%
Mass (g)	Before	227.417	227.559	227.353	227.669	227.407	227.682	227.329	227.441
	After	227.417	227.559	227.350	227.664	227.407	227.676	227.329	227.438
	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: 2018/07/25 09:10		Ambient temp.: 24.5 °C						Operator: Betty	
Finish time: 2018/07/25 11:20		Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08
OCV (V)	Before	12.712	12.712	12.719	12.721	12.713	12.721	12.710	12.715
	After	12.711	12.711	12.717	12.720	12.712	12.720	12.709	12.713
	Residual OCV %	99.99%	99.99%	99.98%	99.99%	99.99%	99.99%	99.99%	99.98%
Mass (g)	Before	227.417	227.559	227.350	227.664	227.407	227.676	227.329	227.438
	After	227.417	227.559	227.350	227.661	227.407	227.676	227.325	227.438
	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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Control Number: SLEU-1808001

T.5 External Short Circuit

Start time: 2018/07/25 11:40	Ambient temp.: 23.5 °C							Operator: Betty	
Finish time: 2018/07/26 09:10	Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	Sample 06	Sample 07	Sample 08	
OCV (V)	Before	12.711	12.711	12.717	12.720	12.712	12.720	12.709	12.713
	After	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Resistance (<100mΩ)	61.4	55.7	59.8	56.9	60.7	57.3	55.9	58.4	
Max Temp. (< 170°C)	57.9	58.1	57.9	57.7	57.8	57.7	57.7	58.0	
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: 2018/07/19 09:50	Ambient temp.: 23.6 °C				Operator: Betty	
Finish time: 2018/07/19 18:00	Sample 01C	Sample 02C	Sample 03C	Sample 04C	Sample 05C	
Initial OCV (V)	3.782	3.777	3.774	3.783	3.776	
Max Temp. (< 170°C)	23.8	23.6	23.6	23.6	23.7	
Results	P	P	P	P	P	

T.7 Overcharge

Start time: 2018/07/23 09:40	Ambient temp.: 23.5 °C							Operator: Betty	
Finish time: 2018/07/31 10:30	Sample 09	Sample 10	Sample 11	Sample 12	Sample 13	Sample 14	Sample 15	Sample 16	
Initial OCV (V)	12.936	12.930	12.934	12.936	12.931	12.935	12.933	12.929	
Results	P	P	P	P	P	P	P	P	

T.8 Forced Discharge (Component Cell)

Start time: 2018/07/20 09:50	Ambient temp.: 23.7 °C							Operator: Betty	
Finish time: 2018/07/30 09:20	Sample 06C	Sample 07C	Sample 08C	Sample 09C	Sample 10C	Sample 11C	Sample 12C	Sample 13C	
Initial OCV (V)	3.466	3.458	3.463	3.452	3.459	3.468	3.449	3.457	
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)	3.452	3.437	3.441	3.453	3.449	3.453	3.463	3.447	
Results	P	P	P	P	P	P	P	P	
Sample No.	Sample 22C	Sample 23C	Sample 24C	Sample 25C					
Initial OCV (V)	3.462	3.455	3.451	3.459					
Results	P	P	P	P					

7. Test Sample:



Form No. : W11-002-B04

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