UN38.3 Test Report

Recommendations on the TRANSPORT OF DANGEROUS GOODS

(Manual of Tests and Criteria, Fifth revised edition)

Customer : Lenovo
Model : L13M4P02
Rating : 7.4V, 7400mAh / 54Wh

Approved By	Checked By	Prepared By
	Fu-long.	

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1. Purpose of the Test：

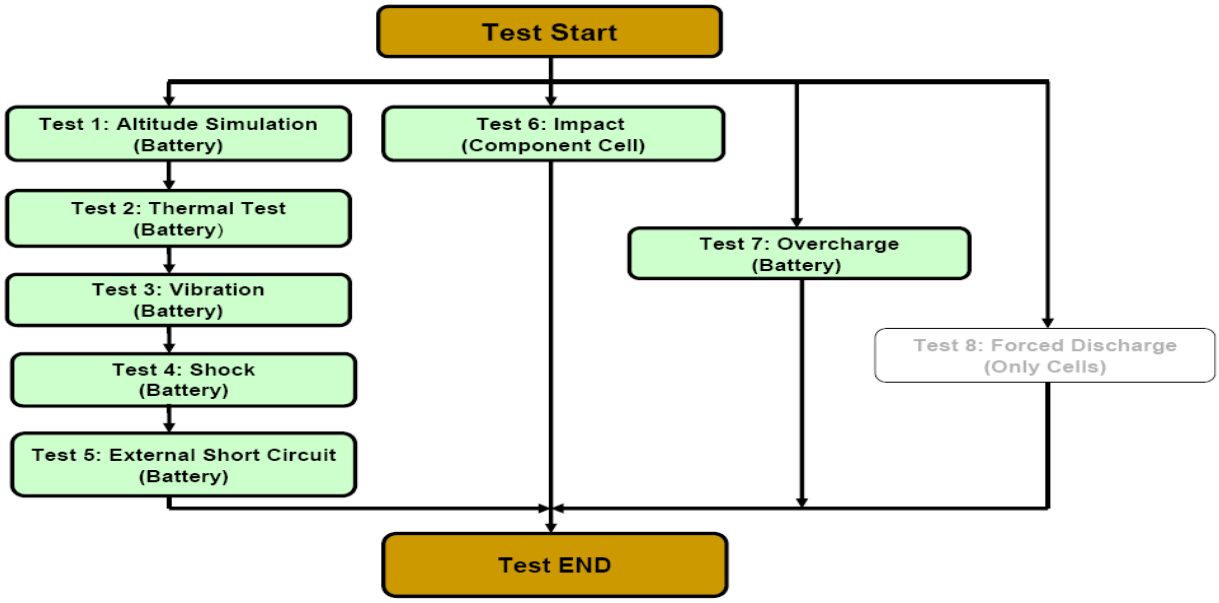
To test each cell/battery is of the type proved to meet the requirements in the Recommendations on the TRANSPORT OF DANGEROUS GOODS, Manual of Tests and Criteria, Fifth revised edition.

2. Test Quantity：

2.1 Four batteries, at first cycle, in fully charged states. (for T.1~T.5 test)
2.2 Four batteries, after fifty cycles ending in fully charged states. (for T.1~T.5 test)
2.3 Ten component cells, at first cycle at 50% of the design rated capacity. (for T.6 test)
2.4 Four batteries, at first cycle, in fully charged states. (for T.7 test)
2.5 Four batteries, after fifty cycles ending in fully charged states. (for T.7 test)

3. Test Procedure：

3.1 All detail related test procedure shall be follow TRANSPORT OF DANGEROUS GOODS, Manual of Tests and Criteria, Fifth revised edition.
3.2 Test flow shall be follow below statement.



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4. Test Result：

4.1 T.1 ~T.4 Test results: **Pass**

4.1.1 All batteries could meet the requirement, mass loss less than 0.1% and voltage drop less than 10% after the test.

4.1.2 No leakage, no venting, no disassembly, no rupture and no fire.

4.2 T.5 Test results: **Pass**

4.2.1 All batteries could meet the requirement, external temperature did not exceed 170℃.

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 results: **Pass**

4.3.1 All component cells could meet the requirement, external temperature did not exceed 170℃.

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: **Pass**

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

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5. Test Equipment：

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Revised date: 2013-11-15
Date:2013-11-15
Project No.: SLEU-1311003

Test Instruments Reference List

Used	Instrument ID	Instrument Name	Type	Range Used	Manufacturer	Calibration Date_Last	Calibration Date_Next	Remarks
	Pretest							
V	ML-761	Learning	715C	0~18V 0~8A	SMP	2013/3/28	2014/3/28	
V	ML-762	Learning	715C	0~18V 0~8A	SMP	2013/3/22	2014/3/22	
V	ML-763	Learning	715C	0~18V 0~8A	SMP	2013/3/22	2014/3/22	
	T.1 Altitude Simulation							
V	ML-522	Altitude		Kpa:30~90	新匠	2013/8/15	2014/8/15	
V	ML-257	Multimeter	HP 34401A	Note 1	Agilent	2013/3/8	2014/3/8	
V	ML-494	Electronic Balance	XS1220M-SCS	1-1000 gf	CHUANHUA	2013/8/15	2014/8/15	
V	ML-550	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2013/10/16	2014/10/16	
	T.2 Thermal Test							
V	ML-789	Thermal Shock	GTST-080-65-AW	T:-40 to 120℃	GF	2013/2/18	2014/2/18	
V	ML-257	Multimeter	HP 34401A	Note 1	Agilent	2013/3/8	2014/3/8	
V	ML-494	Electronic Balance	XS1220M-SCS	1-1000 gf	CHUANHUA	2013/8/15	2014/8/15	
	T.3 Vibration							
V	ML-233	Vibration	KD-9636-EM-300F2K-30N80	F:5~2000Hz G:0.2~20G	King Design	2013/9/27	2014/9/27	
V	ML-257	Multimeter	HP 34401A	Note 1	Agilent	2013/3/8	2014/3/8	
V	ML-494	Electronic Balance	XS1220M-SCS	1-1000 gf	CHUANHUA	2013/8/15	2014/8/15	
V	ML-552	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2013/10/16	2014/10/16	
	T.4 Shock							
V	ML-056	Shock	DP-1200-25	G:10~600G	King Design	2013/9/27	2014/9/27	
V	ML-257	Multimeter	HP 34401A	Note 1	Agilent	2013/3/8	2014/3/8	
V	ML-494	Electronic Balance	XS1220M-SCS	1-1000 gf	CHUANHUA	2013/8/15	2014/8/15	
V	ML-551	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2013/10/16	2014/10/16	
	T.5 External Short Circuit							
V	ML-534	mΩ Hitester	3540	1mΩ ~ 30kΩ	YEOW LONG	2013/10/18	2014/10/18	
V	ML-339	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2013/6/5	2014/6/5	
V	ML-521	Chamber	WIT IPC-1000(3F)	-20 to 150℃	WIT	2013/10/14	2014/10/14	
	T.6 Impact (Component cell)							
V	ML-340	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150℃	Yokogawa	2013/3/21	2014/3/21	
V	ML-076	Impact Tester			JYI SHENG	2013/1/15	2014/1/15	
	T.7 Overcharge							
V	ML-481	Power Supply	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-482	Power Supply	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-483	Power Supply	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-484	Power Supply	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-485	Power Supply	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-486	Power Supply	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-487	Power Supply	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-488	Power Supply	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-489	Power Supply	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-490	Power Supply	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-549	Data Logger	313	15~35 ℃; 30~80 %RH	CENTER	2013/10/16	2014/10/16	

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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6. T.1~T.7 Detail Reports:

Control No.: SLEU-1311003

UN 38.3 Test Datasheet

Customer: Lenovo Model name: L13M4P02 2S2P Test duration: 2013/10/18~2013/11/15 Reviewer: Esmond

Test Sample Identification:

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 Cycle, Fully charged			25Cycle, Fully charged
V	09~12	1 Cycle, Fully charged	V	13~16	50 Cycle, Fully charged			25Cycle, Fully charged
V	01C~10C	1 Cycle, 50% charged			1 Cycle, 50% charged			

T.1 Altitude Simulation Start time: 10 / 28 / 09 : 03 Finish time: 10 / 28 / 15 : 25 Ambient temp.: 24.0 ℃ Operator: Stephy Reviewer: Esmond

Sample No.: 01	Before	After	Variation		Results	Sample No.: 05	Before	After	Variation		Results
Mass (g)	283.6	283.6	Mass loss %	0.00%	P	Mass (g)	283.5	283.5	Mass loss %	0.00%	P
OCV (V)	8.36	8.36	Remained OCV%	100.00%		OCV (V)	8.35	8.34	Remained OCV%	99.88%	
Sample No.: 02	**Before**	**After**	**Variation**		**Results**	**Sample No.: 06**	**Before**	**After**	**Variation**		**Results**
Mass (g)	283.6	283.6	Mass loss %	0.00%	P	Mass (g)	283.7	283.7	Mass loss %	0.00%	P
OCV (V)	8.37	8.37	Remained OCV%	100.00%		OCV (V)	8.36	8.36	Remained OCV%	100.00%	
Sample No.: 03	**Before**	**After**	**Variation**		**Results**	**Sample No.: 07**	**Before**	**After**	**Variation**		**Results**
Mass (g)	283.7	283.6	Mass loss %	0.04%	P	Mass (g)	283.6	283.6	Mass loss %	0.00%	P
OCV (V)	8.36	8.36	Remained OCV%	100.00%		OCV (V)	8.36	8.36	Remained OCV%	100.00%	
Sample No.: 04	**Before**	**After**	**Variation**		**Results**	**Sample No.: 08**	**Before**	**After**	**Variation**		**Results**
Mass (g)	283.6	283.6	Mass loss %	0.00%	P	Mass (g)	283.6	283.6	Mass loss %	0.00%	P
OCV (V)	8.36	8.36	Remained OCV%	100.00%		OCV (V)	8.37	8.37	Remained OCV%	100.00%	

T.2 Thermal Test Start time: 10 / 28 / 15 : 58 Finish time: 11 / 04 / 16 : 31 Ambient temp.: 23.8 ℃ Operator: Stephy Reviewer: Esmond

Sample No.: 01	Before	After	Variation		Results	Sample No.: 05	Before	After	Variation		Results
Mass (g)	283.6	283.5	Mass loss %	0.04%	P	Mass (g)	283.5	283.5	Mass loss %	0.00%	P
OCV (V)	8.36	8.26	Remained OCV%	98.80%		OCV (V)	8.34	8.21	Remained OCV%	98.44%	
Sample No.: 02	**Before**	**After**	**Variation**		**Results**	**Sample No.: 06**	**Before**	**After**	**Variation**		**Results**
Mass (g)	283.6	283.6	Mass loss %	0.00%	P	Mass (g)	283.7	283.7	Mass loss %	0.00%	P
OCV (V)	8.37	8.27	Remained OCV%	98.81%		OCV (V)	8.36	8.23	Remained OCV%	98.44%	
Sample No.: 03	**Before**	**After**	**Variation**		**Results**	**Sample No.: 07**	**Before**	**After**	**Variation**		**Results**
Mass (g)	283.6	283.6	Mass loss %	0.00%	P	Mass (g)	283.6	283.5	Mass loss %	0.04%	P
OCV (V)	8.36	8.25	Remained OCV%	98.68%		OCV (V)	8.36	8.26	Remained OCV%	98.80%	
Sample No.: 04	**Before**	**After**	**Variation**		**Results**	**Sample No.: 08**	**Before**	**After**	**Variation**		**Results**
Mass (g)	283.6	283.6	Mass loss %	0.00%	P	Mass (g)	283.6	283.6	Mass loss %	0.00%	P
OCV (V)	8.36	8.26	Remained OCV%	98.80%		OCV (V)	8.37	8.26	Remained OCV%	98.69%	

T.3 Vibration Start time: 11 / 04 / 17 : 18 Finish time: 11 / 06 / 14 : 57 Ambient temp.: 23.0 ℃ Operator: Stephy Reviewer: Esmond

Sample No.: 01	Before	After	Variation		Results	Sample No.: 05	Before	After	Variation		Results
Mass (g)	283.5	283.5	Mass loss %	0.00%	P	Mass (g)	283.5	283.5	Mass loss %	0.00%	P
OCV (V)	8.26	8.26	Remained OCV%	100.00%		OCV (V)	8.21	8.21	Remained OCV%	100.00%	
Sample No.: 02	**Before**	**After**	**Variation**		**Results**	**Sample No.: 06**	**Before**	**After**	**Variation**		**Results**
Mass (g)	283.6	283.6	Mass loss %	0.00%	P	Mass (g)	283.7	283.7	Mass loss %	0.00%	P
OCV (V)	8.27	8.27	Remained OCV%	100.00%		OCV (V)	8.23	8.23	Remained OCV%	100.00%	
Sample No.: 03	**Before**	**After**	**Variation**		**Results**	**Sample No.: 07**	**Before**	**After**	**Variation**		**Results**
Mass (g)	283.6	283.6	Mass loss %	0.00%	P	Mass (g)	283.5	283.5	Mass loss %	0.00%	P
OCV (V)	8.25	8.25	Remained OCV%	100.00%		OCV (V)	8.26	8.26	Remained OCV%	100.00%	
Sample No.: 04	**Before**	**After**	**Variation**		**Results**	**Sample No.: 08**	**Before**	**After**	**Variation**		**Results**
Mass (g)	283.6	283.6	Mass loss %	0.00%	P	Mass (g)	283.6	283.6	Mass loss %	0.00%	P
OCV (V)	8.26	8.25	Remained OCV%	99.88%		OCV (V)	8.26	8.26	Remained OCV%	100.00%	

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T.4 Shock

Start time: 11 / 06 / 15 : 36
Finish time: 11 / 07 / 10 : 34
Ambient temp.: 24.4 ℃ Operator: Stephy Reviewer: Esmond

Sample No.: 01	Before	After	Variation		Results
Mass (g)	283.5	283.5	Mass loss %	0.00%	P
OCV (V)	8.26	8.26	Remained OCV%	100.00%	

Sample No.: 02	Before	After	Variation		Results
Mass (g)	283.6	283.6	Mass loss %	0.00%	P
OCV (V)	8.27	8.27	Remained OCV%	100.00%	

Sample No.: 03	Before	After	Variation		Results
Mass (g)	283.6	283.6	Mass loss %	0.00%	P
OCV (V)	8.25	8.25	Remained OCV%	100.00%	

Sample No.: 04	Before	After	Variation		Results
Mass (g)	283.6	283.6	Mass loss %	0.00%	P
OCV (V)	8.25	8.25	Remained OCV%	100.00%	

Sample No.: 05	Before	After	Variation		Results
Mass (g)	283.5	283.5	Mass loss %	0.00%	P
OCV (V)	8.21	8.21	Remained OCV%	100.00%	

Sample No.: 06	Before	After	Variation		Results
Mass (g)	283.7	283.7	Mass loss %	0.00%	P
OCV (V)	8.23	8.23	Remained OCV%	100.00%	

Sample No.: 07	Before	After	Variation		Results
Mass (g)	283.5	283.5	Mass loss %	0.00%	P
OCV (V)	8.26	8.26	Remained OCV%	100.00%	

Sample No.: 08	Before	After	Variation		Results
Mass (g)	283.6	283.6	Mass loss %	0.00%	P
OCV (V)	8.26	8.26	Remained OCV%	100.00%	

T.5 External Short Circuit

Start time: 11 / 07 / 11 : 13
Finish time: 11 / 14 / 11 : 25
Ambient temp.: 23.6 ℃ Operator: Stephy Reviewer: Esmond

	Sample No.: 01		Sample No.: 02		Sample No.: 03		Sample No.: 04		Sample No.: 05		Sample No.: 06		Sample No.: 07		Sample No.: 08	
Resistance (<100mΩ)	54.6		56.4		55.9		58.1		52.3		57.6		57.1		52.4	
OCV before test/ after short circuit(V)	8.26	0.00	8.27	0.00	8.25	0.00	8.25	0.01	8.21	0.00	8.23	0.00	8.26	0.00	8.26	0.00
Max Temp. (< 170℃)	55.8		55.5		55.6		55.4		55.6		55.1		55.2		55.4	
Results	P		P		P		P		P		P		P		P	

T.6 Impact (Component cell)

Start time: 10 / 28 / 10 : 14
Finish time: 10 / 29 / 10 : 41
Ambient temp.: 23.7 ℃ Operator: Stephy Reviewer: Esmond

	Sample No.: 01C	Sample No.: 02C	Sample No.: 03C	Sample No.: 04C	Sample No.: 05C
OCV before test(V)	3.68	3.68	3.68	3.69	3.68
Max Temp. (< 170℃)	94.5	92.0	90.7	93.3	95.1
Results	P	P	P	P	P
	Sample No.: 06C	Sample No.: 07C	Sample No.: 08C	Sample No.: 09C	Sample No.: 10C
OCV before test(V)	3.68	3.68	3.68	3.69	3.67
Max Temp. (< 170℃)	91.7	92.7	94.6	91.4	97.3
Results	P	P	P	P	P

T.7 Overcharge

Start time: 10 / 30 / 11 : 16
Finish time: 11 / 15 / 16 : 32
Ambient temp.: 23.9 ℃ Operator: Stephy Reviewer: Esmond

	Sample No.: 09	Sample No.: 10	Sample No.: 11	Sample No.: 12	Sample No.: 13	Sample No.: 14	Sample No.: 15	Sample No.: 16
OCV before test(V)	8.36	8.37	8.36	8.35	8.35	8.36	8.36	8.36
Results	P	P	P	P	P	P	P	P

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