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新世電子(常熟)有限公司
新普科技(重慶)有限公司
兆普電子(上海)有限公司

Control Number: SLEU-1401005

Lithium-ion Battery UN38.3 Test Report

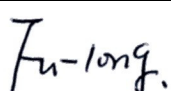
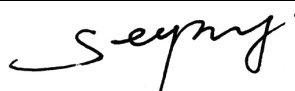
Recommendations on the TRANSPORT OF DANGEROUS GOODS

(Manual of Tests and Criteria, Fifth revised edition, Amend 1)

Customer: Lenovo

Model: L14M6AA0

Rating: 10.8V , 47.5Wh / 4400mAh

Approved By	Checked By	Prepared By
		

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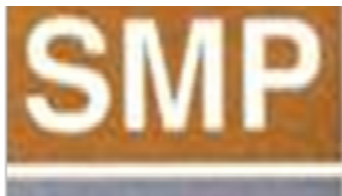
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1. Purpose of the Test :

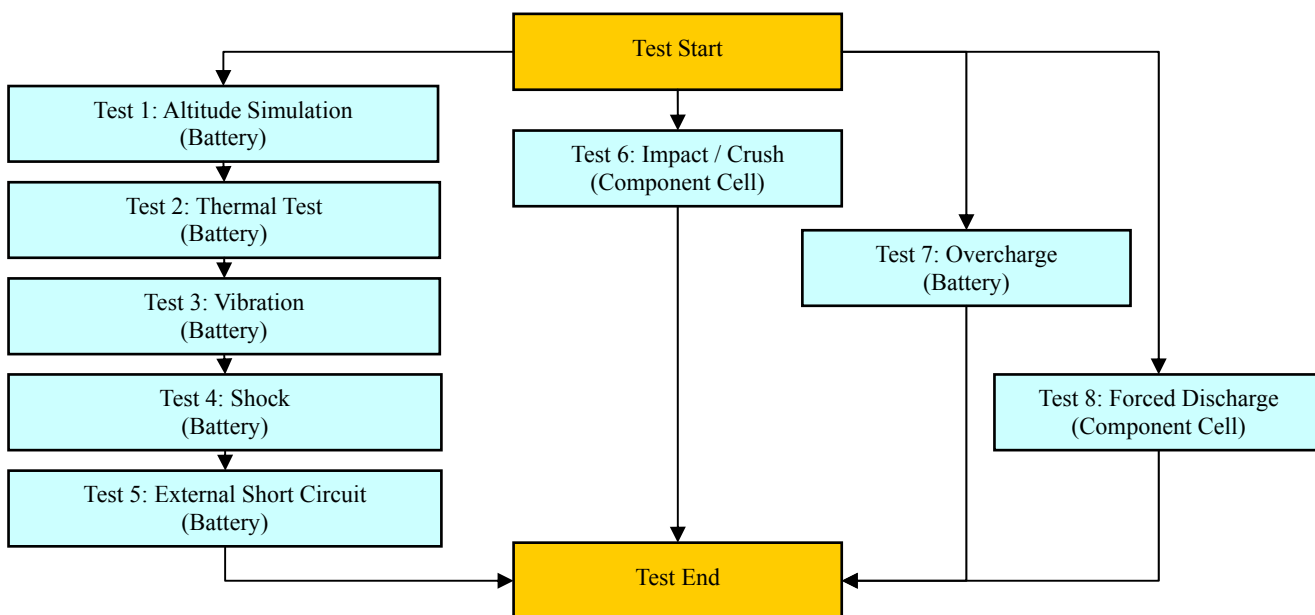
To test each cell/battery is of the type proved to meet the requirements in UNITED NATIONS, Recommendations on the TRANSPORT OF DANGEROUS GOODS, Manual of Tests and Criteria, Fifth revised edition, Amend 1, Section 38.3.

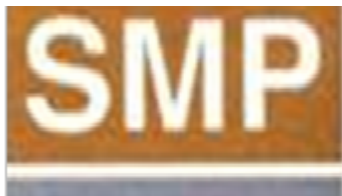
2. Test Quantity :

- 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, Fifth revised edition, Amend 1, Section 38.3.
- 3.2 Test flow shall be followed as below.





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Control Number: SLEU-1401005

4. Test Result :

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

4.1.1 All batteries could meet the requirement, mass loss was less than 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.

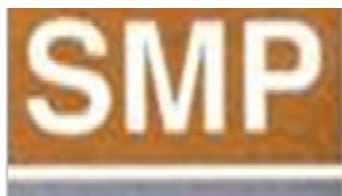
4.4 T.7 Test result: **Passed**

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-1401005

5. Test Equipment :

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Revised Date: 2014-01-31

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	
V	ML-764	Learning	715C	0~18V 0~8A	SMP	2013/3/28	2014/3/28	
	ML-510	Learning	L750R	0~60V 0~60A	SMP	2013/3/28	2014/3/28	
	ML-512	Learning	L750A	0~60V 0~60A	SMP	2013/3/28	2014/3/28	
	ML-519	Learning	L750R	0~60V 0~60A	SMP	2013/3/28	2014/3/28	
	ML-520	Learning	L750R	0~60V 0~60A	SMP	2013/3/28	2014/3/28	
	ML-838	Learning	PCP535	1.5V~5.5V 0~2.5A	SMP	2013/9/30	2014/9/30	
	ML-840	Learning	PCP535	1.5V~5.5V 0~2.5A	SMP	2014/1/14	2015/1/14	
	ML-841	Learning	PCP535	1.5V~5.5V 0~2.5A	SMP	2014/1/15	2015/1/15	
T.1 Altitude Simulation								
	ML-308	Altitude		Kpa:30~90	HSIN JIANG	2013/8/15	2014/8/15	
V	ML-522	Altitude	SVT-120	Kpa:30~90	HSIN JIANG	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	1-1200 gf	CHUANHUA	2013/8/15	2014/8/15	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2013/10/4	2014/10/4	
V	ML-550	Data logger	313	15~35 °C; 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°C	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	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2013/10/4	2014/10/4	
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	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2013/10/4	2014/10/4	
V	ML-552	Data logger	313	15~35 °C; 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	
	ML-523	Electronic Balance	MTW-30K	30*0.005Kg		2013/10/4	2014/10/4	
V	ML-551	Data logger	313	15~35 °C; 30~80 %RH	CENTER	2013/10/16	2014/10/16	
T.5 External Short Circuit								
V	ML-534	mΩ Hitester	3540	1mΩ ~ 30kΩ	HIOKI	2013/10/18	2014/10/18	
V	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2013/10/14	2014/10/14	
V	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2013/10/14	2014/10/14	
V	ML-521	Oven	9031	30~80 °C	YEOU LONG	2013/10/14	2014/10/14	
T.6 Impact (Component cell) / Crush								
V	ML-339	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2013/6/5	2014/6/5	
	ML-076	Impact Tester			JYI SHENG	2014/1/10	2015/1/10	
V	ML-553	Crush Tester	BCT-01		Simplo	2013/10/14	2014/10/14	
	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2013/10/14	2014/10/14	

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Control Number: SLEU-1401005

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Revised Date: 2014-01-31

Test Instruments Reference List								
Used	Instrument ID	Instrument Name	Type	Range Used	Manufacturer	Calibration Date_Last	Calibration Date_Next	Remarks
	T.7 Overcharge							
V	ML-481	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-482	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-483	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-484	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-485	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-486	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-487	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-488	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-489	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-490	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-550	Data logger	313	15~35 °C; 30~80 %RH	CENTER	2013/10/16	2014/10/16	
V	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2013/10/14	2014/10/14	
V	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2013/10/14	2014/10/14	
	T.8 Forced Discharge							
V	ML-132	Electronic Load	3311C	60V,55A, 300W	Prodigit	2013/3/7	2014/3/7	
V	ML-133	Electronic Load	3311C	60V,55A, 300W	Prodigit	2013/3/7	2014/3/7	
V	ML-136	Electronic Load	3311C	60V,55A, 300W	Prodigit	2013/3/7	2014/3/7	
V	ML-192	Electronic Load	3311C	60V,55A, 300W	Prodigit	2013/3/7	2014/3/7	
V	ML-269	Electronic Load	3311C	60V,55A, 300W	Prodigit	2013/3/7	2014/3/7	
V	ML-532	DC Electronic Load	33511-01	120V, 240A, 3600W	Prodigit	2013/8/15	2014/8/15	
V	ML-481	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-482	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-483	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-484	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-485	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-486	Programmable DC Source	DS10014	1-100Vdc, 0.3-14.4A	MOTECH	2013/6/5	2014/6/5	
V	ML-487	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-488	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-489	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-490	Programmable DC Source	DS6024	1-60 Vdc, 0.3-24A	MOTECH	2013/6/5	2014/6/5	
V	ML-550	Data logger	313	15~35 °C; 30~80 %RH	CENTER	2013/10/16	2014/10/16	
V	ML-459	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2013/10/14	2014/10/14	
V	ML-460	Data Acquisition	MX100-E-1D	1-100 Vdc, -50 to 150°C	Yokogawa	2013/10/14	2014/10/14	
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-1401005

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

Control No.: SLEU-1401005

UN 38.3 Test Datasheet

Customer: Lenovo

Model name: L14M6AA0 3S2P

Test Duration: 2014/01/09~2014/01/31

Reviewer: Esmond

Test Sample Identification:

Battery						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 Cycle, Fully charged	V	01C ~ 05C	1 Cycle, 50% charged
V	09 ~ 12	1 Cycle, Fully charged	V	13 ~ 16	50 Cycle, Fully charged	V	06C ~ 15C	1 Cycle, 0% charged
		25Cycle, Fully charged			25Cycle, Fully charged	V	16C ~ 25C	50 Cycle, 0% charged

T.1 Altitude Simulation

Ambient temp.: 21.6 °C

Operator: Stephy

Sample No.: 01					Sample No.: 02						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	277.3	277.3	Mass loss %	0.00%	P	Mass (g)	276.7	276.7	Mass loss %	0.00%	P
OCV (V)	12.54	12.54	Residual OCV %	100.00%		OCV (V)	12.53	12.53	Residual OCV %	100.00%	
Sample No.: 03					Sample No.: 04						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	276.8	276.7	Mass loss %	0.04%	P	Mass (g)	277.4	277.4	Mass loss %	0.00%	P
OCV (V)	12.53	12.52	Residual OCV %	99.92%		OCV (V)	12.53	12.52	Residual OCV %	99.92%	
Sample No.: 05					Sample No.: 06						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	276.8	276.8	Mass loss %	0.00%	P	Mass (g)	277.3	277.2	Mass loss %	0.04%	P
OCV (V)	12.53	12.52	Residual OCV %	99.92%		OCV (V)	12.54	12.53	Residual OCV %	99.92%	
Sample No.: 07					Sample No.: 08						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	277.1	277.0	Mass loss %	0.04%	P	Mass (g)	277.2	277.2	Mass loss %	0.00%	P
OCV (V)	12.54	12.53	Residual OCV %	99.92%		OCV (V)	12.54	12.54	Residual OCV %	100.00%	

T.2 Thermal Test

Ambient temp.: 21.5 °C

Operator: Stephy

Sample No.: 01					Sample No.: 02						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	277.3	277.2	Mass loss %	0.04%	P	Mass (g)	276.7	276.6	Mass loss %	0.04%	P
OCV (V)	12.54	12.36	Residual OCV %	98.56%		OCV (V)	12.53	12.36	Residual OCV %	98.64%	
Sample No.: 03					Sample No.: 04						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	276.7	276.6	Mass loss %	0.04%	P	Mass (g)	277.4	277.3	Mass loss %	0.04%	P
OCV (V)	12.52	12.37	Residual OCV %	98.80%		OCV (V)	12.52	12.35	Residual OCV %	98.64%	
Sample No.: 05					Sample No.: 06						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	276.8	276.8	Mass loss %	0.00%	P	Mass (g)	277.2	277.2	Mass loss %	0.00%	P
OCV (V)	12.52	12.36	Residual OCV %	98.72%		OCV (V)	12.53	12.35	Residual OCV %	98.56%	
Sample No.: 07					Sample No.: 08						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	277.0	277.0	Mass loss %	0.00%	P	Mass (g)	277.2	277.2	Mass loss %	0.00%	P
OCV (V)	12.53	12.37	Residual OCV %	98.72%		OCV (V)	12.54	12.39	Residual OCV %	98.80%	

T.3 Vibration

Ambient temp.: 21.3 °C

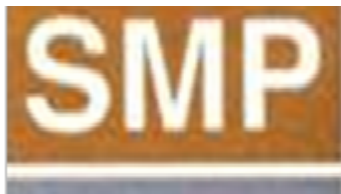
Operator: Stephy

Sample No.: 01					Sample No.: 02						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	277.2	277.2	Mass loss %	0.00%		Mass (g)	276.6	276.6	Mass loss %	0.00%	
OCV (V)	12.36	12.35	Residual OCV %	99.92%		OCV (V)	12.36	12.35	Residual OCV %	99.92%	
Sample No.: 03					Sample No.: 04						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	276.6	276.6	Mass loss %	0.00%		Mass (g)	277.3	277.3	Mass loss %	0.00%	
OCV (V)	12.37	12.37	Residual OCV %	100.00%		OCV (V)	12.35	12.34	Residual OCV %	99.92%	
Sample No.: 05					Sample No.: 06						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	276.8	276.8	Mass loss %	0.00%		Mass (g)	277.2	277.2	Mass loss %	0.00%	
OCV (V)	12.36	12.35	Residual OCV %	99.92%		OCV (V)	12.35	12.35	Residual OCV %	100.00%	
Sample No.: 07					Sample No.: 08						
	Before	After	Variation		Results		Before	After	Variation		Results
Mass (g)	277.0	277.0	Mass loss %	0.00%		Mass (g)	277.2	277.2	Mass loss %	0.00%	
OCV (V)	12.37	12.37	Residual OCV %	100.00%		OCV (V)	12.39	12.38	Residual OCV %	99.92%	

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Control Number: SLEU-1401005

T.4 Shock

Ambient temp.: 21.2 °C

Operator: Stephy

Sample No.: 01					Sample No.: 02				
Before	After	Variation		Results	Before	After	Variation		Results
Mass (g)	277.2	277.2	Mass loss %	0.00%	Mass (g)	276.6	276.6	Mass loss %	0.00%
OCV (V)	12.35	12.35	Residual OCV %	100.00%	OCV (V)	12.35	12.35	Residual OCV %	100.00%
Sample No.: 03					Sample No.: 04				
Before	After	Variation		Results	Before	After	Variation		Results
Mass (g)	276.6	276.6	Mass loss %	0.00%	Mass (g)	277.3	277.3	Mass loss %	0.00%
OCV (V)	12.37	12.37	Residual OCV %	100.00%	OCV (V)	12.34	12.34	Residual OCV %	100.00%
Sample No.: 05					Sample No.: 06				
Before	After	Variation		Results	Before	After	Variation		Results
Mass (g)	276.8	276.8	Mass loss %	0.00%	Mass (g)	277.2	277.2	Mass loss %	0.00%
OCV (V)	12.35	12.35	Residual OCV %	100.00%	OCV (V)	12.35	12.35	Residual OCV %	100.00%
Sample No.: 07					Sample No.: 08				
Before	After	Variation		Results	Before	After	Variation		Results
Mass (g)	277.0	277.0	Mass loss %	0.00%	Mass (g)	277.2	277.2	Mass loss %	0.00%
OCV (V)	12.37	12.37	Residual OCV %	100.00%	OCV (V)	12.38	12.38	Residual OCV %	100.00%

T.5 External Short Circuit

Ambient temp.: 20.7 °C

Operator: Stephy

	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)	54.9		51.6		54.2		58.6		52.7		53.1		57.6		54.3	
OCV before test/ after short circuit(V)	12.35	0.00	12.35	0.00	12.37	0.00	12.34	0.00	12.35	0.00	12.35	0.00	12.37	0.00	12.38	0.00
Max Temp. (< 170°C)	55.3		55.3		55.6		55.4		55.4		55.4		55.2		55.3	
Results	P		P		P		P		P		P		P		P	

T.6 Impact / Crush (Component Cell)

Ambient temp.: 20.4 °C

Operator: Stephy

☐ Impact-Cylindrical cells greater than 20mm in diameter

☒ Crush- Prismatic, pouch, coin/button cells and cylindrical cells not more than 20mm in diameter

	Sample No.: 01C	Sample No.: 02C	Sample No.: 03C	Sample No.: 04C	Sample No.: 05C
OCV before test(V)	3.59	3.59	3.59	3.58	3.58
Max Temp. (< 170°C)	22.3	21.8	22.6	21.7	21.9
Results	P	P	P	P	P

T.7 Overcharge

Ambient temp.: 20.4 °C

Operator: Stephy

	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)	12.54	12.54	12.54	12.53	12.54	12.55	12.54	12.53
Results	P	P	P	P	P	P	P	P

T.8 Forced Discharge (Component Cell)

Ambient temp.: 20.3 °C

Operator: Stephy

	Sample No.: 06C	Sample No.: 07C	Sample No.: 08C	Sample No.: 09C	Sample No.: 10C
OCV before test(V)	2.98	3.02	3.04	3.01	2.98
Results	P	P	P	P	P
	Sample No.: 11C	Sample No.: 12C	Sample No.: 13C	Sample No.: 14C	Sample No.: 15C
OCV before test(V)	3.02	3.03	2.96	3.02	3.02
Results	P	P	P	P	P
	Sample No.: 16C	Sample No.: 17C	Sample No.: 18C	Sample No.: 19C	Sample No.: 20C
OCV before test(V)	3.03	3.02	2.99	2.99	3.02
Results	P	P	P	P	P
	Sample No.: 21C	Sample No.: 22C	Sample No.: 23C	Sample No.: 24C	Sample No.: 25C
OCV before test(V)	2.97	3.04	3.03	2.99	3.01
Results	P	P	P	P	P

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Control Number: SLEU-1401005

7. Equipment for Test:

Pretest



T.1 Altitude Simulation



T.2 Thermal Test



T.5 External Short Circuit



T.4 Shock



T.3 Vibration



T.6 Impact / Crush



T.8 Forced Discharge



T.7 Overcharge

