

# United Nations Transport of Dangerous Goods Test Criteria and Test Report

This Section presents the procedures to be followed for the classification of Lithium metal and Lithium Ion Cells and secondary battery packs.

Report Number:	201706071
Date of issue:	2017-06-07
Total number of pages	11
Test specification:	
Standard	UN38.3/ST/SG/AC.10/11/Rev.6 (Sixed Revised Edition)
Test procedure:	T1 T2 T3 T4 T5 and T7
Non-standard test method	
	N/A
Test Report Form No	UNDOT38.3-6
Test Report Form(s) Originator:	Inspired Energy LLC
Master TRF:	Dated 2016-06
Lab Manager:	Mike Thompson
Approval:	Mithanpson
Lab Technician:	Thomas Rush
Anneous	Shine gla
Approval:	V
Test item description:	Rechargeable Lithium Ion Battery
Manufacturer:	Inspired Energy LLC 25440 NW 8 <sup>th</sup> Place Newberry, FL 32669-2539 United States
Model/Type reference:	NL2024HD222
Ratings:	14.4V, 6.7A, 97Wh

Summary of testing:	
Tests performed (name of test and test clause):	Testing location:
<ul> <li>38.3.4.1. Test T.1 - Altitude Simulation</li> <li>38.3.4.2. Test T.2 - Thermal Test</li> <li>38.3.4.3. Test T.3 - Vibration</li> <li>38.3.4.4. Test T.4 - Shock</li> <li>38.3.4.5. Test T.5 - External Short Circuit</li> <li>38.3.4.7. Test T.7 - Overcharge</li> </ul> The following tests were performed at the cell level: <ul> <li>38.3.4.6. Test T.6 - Impact</li> </ul>	Inspired Energy LLC 25440 NW 8th Place Newberry, FL 32669-2539 United States ***** BASED OF EXISTING TEST DATA NL2024HD22 UN DOT TEST REPORT DATED June 13, 2011*******
38.3.4.8. Test T.8 – Forced Discharge	

Battery Parameters	
Recommend charging method declared by the manufacturer	CC/CV
Maximum Discharge current	8A
Specified final voltage:	11.0 V
Chemistry:	🗌 nickel systems 🛛 🖾 lithium systems
Recommend of charging limit for lithium system	
Upper limit charging voltage	16.8V
Maximum charging current	4A
Charging temperature upper limit	45°C
Charging temperature lower limit	0°C
Possible test case verdicts:	
- test case does not apply to the test object:	N/A
- test object does meet the requirement:	P (Pass)
- test object does not meet the requirement:	F (Fail)

38.3.4	Procedure						-	
		nust be condu	icted in seque	ence on the				
	same cell o							
		Test 8 should l ested cells or b		l using not			N/A	
		be conducted		aded				
		eviously used i						
	of testing or	n cycled batter	ies.					
38.3.4.1		titude Simulati	on					
38.3.4.1.1	Purpose						-	
	conditions	nulates air trar	nsport under l	ow-pressure			-	
38.3.4.1.2	Test Proced							
	Stored at a		<u>,</u>		15.00kPa			
		s (>/= 6 Hours	)		8 Hours			
38.3.4.1.3	Requirement							
		Cells and batteries meet this requirement if there is no leakage, no venting no leakage, no venting, no disassembly, no rupture and						
		and if the oper			no fire. Batter			
		attery after te			is not less that			
		e immediately				diately prior to		
		The requirement relating to voltage is not applicable this procedure.						
	to test cells and batteries at fully discharged states.							
			A of Test Ba		0.01/1			
Group	No.	M1 (Defense the	M2	Mass Loss	OCV1	OCV2	Final	
•		(Before the	(After the	(.2% Limit)	(Before the	(After the		
		Test) 656 g	Test) 656 g	0%	Test) 16.58 VDC	Test) 16.57 VDC	(> 90%	
	1	-	-					
1 Cycle Batteries	2	656 g	656 g	0%	16.57 VDC	16.56 VDC	99.9%	
	3	652 g	652 g	0%	16.60 VDC	16.58 VDC	99.9%	
	4	654 g	654 g	0%	16.58 VDC	16.56 VDC	99.9%	
	5	638 g	638 g	0%	16.60 VDC	16.59 VDC	99.9%	
50 Cycle	6	644 g	644 g	0%	16.58 VDC	16.57 VDC	99.9%	
Batteries	7	642 g	642 g	0%	16.61 VDC	16.60 VDC	99.9%	
	8	638 g	638 g	0%	16.60 VDC	16.58 VDC	99.9%	
Remarks:								
Mass Loss the test)	(%)= M1-M2	/M1 *100% (\	Where M1 is	the mass befo	ore the test an	d M2 is the ma	ass after	
	(%)_ <u></u>	)CV2*100% (V	Mhoro OCV1	is before the	test and $OCV$	2 is after the te	et)	
	(70)- 000 170						51)	
Final Concl	lusion							
Lithium Ior	n Secondary	Battery Asse	mbly passed	l altitude simu	llation test.			
Test End D	ate: April 19	, 2011 at 1520	)				Р	
		, _011 at 1020						
							1	

leakage, no ver d no fire and if t t cell or battery ts voltage imme e requirement re est cells and ba	trical co rapid an e and St me inter est cells mbient t ad batter test tem at 12 hou s meet th nting, no the open after tes	and batteries tored Hours and batteries temperature ries, the dura perature ext urs.	the test is temperature s are stored (20°C +/- ation of remes	72°C +/- 2°C f -40°C +/-2°C f Between test extremes is 3 Repeated 10 <100Wh Sma	for > 6 Hours temperature 0 minutes. Times	- - - - - N/A			
d internal elect nducted using anges. st Procedure st Temperature e maximum tir st Cycles er which all te 24 hours at ar 2) large cells an posure to the t puld be at leas quirement ls and batteries leakage, no ver a no fire and if t t cell or battery ts voltage imme e requirement me a requirement me a requirement me a st cells and batteries a Mas	trical co rapid an e and St me inter est cells mbient t ad batter test tem at 12 hou s meet th nting, no the open after tes	and batteries tored Hours and batteries temperature ries, the dura perature ext urs.	the test is temperature s are stored (20°C +/- ation of remes	-40°C +/-2°C f Between test extremes is 3 Repeated 10 <100Wh Sma	for > 6 Hours temperature 0 minutes. Times	-			
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anges. at Procedure at Temperature e maximum tir at Cycles er which all te 24 hours at ar 20 ar large cells an bosure to the t bould be at leas quirement Is and batteries leakage, no ver a no fire and if t t cell or battery ts voltage imme e requirement re est cells and ba Mas	e and St me inter est cells mbient t nd batter test tem at 12 hou s meet th nting, no the open after tes	tored Hours rval and batterie temperature ries, the dura perature ext urs.	s are stored (20°C +/- ation of remes	-40°C +/-2°C f Between test extremes is 3 Repeated 10 <100Wh Sma	for > 6 Hours temperature 0 minutes. Times	-			
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24 hours at ar bosure to the to bosure to the to bould be at leas quirement ls and batteries leakage, no ver d no fire and if t t cell or battery ts voltage imme e requirement re est cells and battery Mas	mbient t nd batter test tem st 12 hou s meet th nting, no the open	temperature ries, the dura perature ext urs. nis requireme disassembly	(20°C +/- ation of remes		II Battery	- N/A			
arge cells an bosure to the t bould be at leas quirement ls and batteries leakage, no ver d no fire and if t t cell or battery ts voltage imme e requirement re est cells and ba Mas	test tem st 12 hou s meet th nting, no the open after tes	perature ext urs. his requireme disassembly	remes		II Battery	N/A			
posure to the to build be at leas quirement Is and batteries leakage, no ver I no fire and if t t cell or battery ts voltage imme e requirement re est cells and ba Mas	test tem st 12 hou s meet th nting, no the open after tes	perature ext urs. his requireme disassembly	remes						
Is and batteries leakage, no ver l no fire and if t t cell or battery ts voltage imme e requirement re est cells and ba Mas	nting, no the open after tes	disassembly		NI- I 1					
leakage, no ver d no fire and if t t cell or battery ts voltage imme e requirement re est cells and ba	nting, no the open after tes	disassembly		Nie les l		-			
I no fire and if t t cell or battery ts voltage imme e requirement re est cells and ba	the open after tes		/ no runture	Cells and batteries meet this requirement if there is No leakage No venting, no					
t cell or battery ts voltage imme requirement re est cells and ba Mas	after tes	circuit voltag	no leakage, no venting, no disassembly, no rupture disassembly, no rupture,						
ts voltage imme e requirement re est cells and ba Mas		and no fire and if the open circuit voltage of each and							
e requirement re est cells and ba Mas	culatory	test cell or battery after testing is not less than 90% voltage.							
est cells and ba Mas									
	ss M of	Test Battery			OCV (V)				
M1		M2	Mass Loss	OCV1	OCV2	Final			
•		(After the	(.2% Limit)	(Before the	(After the	OCV			
Test)		Test)	0%	Test) 16.57 VDC	Test) 16.49 VDC	(> 90%) P			
	•	656 g	- · · ·						
2 65	56 g	656 g	0%	16.56 VDC	16.31 VDC	Р			
3 65	52 g	652 g	0%	16.58 VDC	16.32 VDC	Р			
4 65	54 g	654 g	0%	16.56 VDC	16.30 VDC	Р			
5 63	38 g	638 g	0%	16.59 VDC	16.32 VDC	Р			
6 64	44 g	644 g	0%			Р			
7 64	12 0	642 g	0%			Р			
	42 Y		0%	16 58 \/DC	16 22 \/DC	Р			
2 3 4 5 6	6 6 6 6 6 6	656 g 656 g 652 g 654 g 638 g 644 g 642 g	656 g         656 g           652 g         652 g           654 g         654 g           638 g         638 g           644 g         644 g           642 g         642 g	656 g         656 g         0%           652 g         652 g         0%           654 g         654 g         0%           638 g         638 g         0%           644 g         644 g         0%           642 g         642 g         0%	656 g         656 g         0%         16.56 VDC           652 g         652 g         0%         16.58 VDC           654 g         654 g         0%         16.58 VDC           638 g         638 g         0%         16.59 VDC           644 g         644 g         0%         16.57 VDC           642 g         642 g         0%         16.60 VDC	656 g         656 g         0%         16.56 VDC         16.31 VDC           652 g         652 g         0%         16.58 VDC         16.32 VDC           654 g         654 g         0%         16.56 VDC         16.30 VDC           638 g         638 g         0%         16.57 VDC         16.32 VDC           644 g         644 g         0%         16.57 VDC         16.32 VDC			

Test End Date: May 25, 2017 Conducted by Timco Engineering TR: 899UT11

38.3.4.3	Test T.3: V	ibration					-
38.3.4.3.1	Purpose						-
38.3.4.3.2	This test si transportat Test Proce		tion during				-
30.3.4.3.Z							-
	platform of distorting t faithfully tr	Batteries are fi f the vibration the cells in sub cansmit the vi	n machine w ch a manner bration.	ithout as to			-
		on shall be a	sinusoidal w	/aveform			-
	with a loga Duration				15 Minutes		_
	Frequency	/ Range		7Hz200Hz	z7Hz	_	
			0.8mm		-		
	Test cycle				12 Times for a	total 3 hours.	-
38.3.4.3.3	Requireme	nt				-	
and no fire and if the ope		o disassembly, no rupture n circuit voltage of each sting is not less than 90% prior to this procedure. to voltage is not		venting, no disassembly, no rupture and no fire.		-	
			Test Battery			OCV (V)	
Group	No.	M1 (Before the Test)	M2 (After the Test)	Mass Loss (.2% Limit)	OCV1 (Before the Test)	OCV2 (After the Test)	Final OCV (> 90%)
	1	656 g	656 g	0%	16.49 VDC	16.42 VDC	P
1 Cycle	2	656 g	656 g	0%	16.31 VDC	16.24 VDC	Р
Batteries	3	652 g	652 g	0%	16.32 VDC	16.26 VDC	Р
	4	654 g	654 g	0%	16.30 VDC	16.24 VDC	Р
	5	638 g	638 g	0%	16.32 VDC	16.26 VDC	Р
50 Cycle	6	644 g	644 g	0%	16.32 VDC	16.26 VDC	Р
Batteries	7	642 g	642 g	0%	16.33 VDC	16.27 VDC	Р
Batteries	8	638 g	638 g	0%	16.32 VDC	16.26 VDC	Р

the test)

Final OCV (%)= OCV1/OCV2\*100% (Where OCV1 is before the test and OCV2 is after the test)

Final Conclusion:

Lithium Ion Secondary Battery Assembly passed vibration test.

Test End Date: May 25, 2017 Conducted by Timco Engineering TR: 899UT11

This test simulates possible impacts during transportation.       Impact the set of the set	38.3.4.4.1 38.3.4.4.2	This test s transporta Test Proce Test cells a test machi will suppo battery. A Half-Sin Pulse dura The positiv Each cell c shocks in t three shoc	tion. dure and batteries s ne by means o rt all mounting e shock of pean ation ve direction for or battery shal	shall be secu of a rigid mo g surfaces o k acceleratio	ured to the bunt which f each test	150g		-	
Iransportation.       -         38.3.4.4.2       Test Procedure       -         Test cells and batteries shall be secured to the test machine by means of a rigid mount which will support all mounting surfaces of each test battery.       -         A Half-Sine shock of peak acceleration       150g       -         Pulse duration       6ms       -         The positive direction followed       3 Times       -         Each cell or battery shall be subjected to three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery shall be subjected to three mutually perpendicular mounting positions of the cell or battery atter testing is not less sembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90%, of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cell and batteries is not less than 90%, of 16.42 VDC       Final OCV (V)         Group       Mass M of Test Battery (g)       OCV (V)       OCV (V)         Group       Mass M of Test Battery (g)       OCV (V)       Final U)         1       656 g       65 g       0%       16.24 VDC       16.24 VDC         1       656 g       65 g       0%       16.24 VDC       16.24 VDC       P         1       656 g       65 g       0%       16.24 VDC       16.26 VDC       P	38.3.4.4.2	transporta Test Proce Test cells a test machi will suppo battery. A Half-Sin Pulse dura The positiv Each cell c shocks in t three shoc	tion. dure and batteries s ne by means o rt all mounting e shock of pean ation ve direction for or battery shal	shall be secu of a rigid mo g surfaces o k acceleratio	ured to the bunt which f each test	150g		-	
38.3.4.4.2       Test Procedure       -         Test cells and batteries shall be secured to the test machine by means of a rigid mount which will support all mounting surfaces of each test battery.       -         A Half-Sine shock of peak acceleration       150g       -         Pulse duration       6ms       -         Each cell or battery shall be subjected to three shocks in the negative direction of three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.       -         Test cycle       6 Cycles of 3 Shocks (18)       -         Test cycle       6 Cycles of 3 Shocks (18)       -         Requirement       -       -         Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery for to to tis procedure. The requirement relating to voltage is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not less than 90% of its voltage tates.       OCV 1         1       656 g       656 g       0%       16.42 VDC       16.24 VDC         1       656 g       656 g       0%       16.24 VDC       P         1       656 g       656 g       0%       16.24 VDC       P         1       656 g       656 g       0%       16.24 VDC	38.3.4.4.2	Test Proce Test cells a test machi will suppo battery. A Half-Sin Pulse dura The positiv Each cell c shocks in t three shoc	edure and batteries s ne by means o rt all mounting e shock of pea ation ve direction fo or battery shal	of a rigid mo g surfaces o ik acceleratio	ount which f each test	150g		-	
test machine by means of a rigid mount which will support all mounting surfaces of each test altery.       Image: Surface of each test         A Half-Sine shock of peak acceleration       150g       -         Pulse duration       6ms       -         The positive direction followed       3 Times       -         Each cell or battery shall be subjected to three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.       6 Cycles of 3 Shocks (18)       -         Test cycle       6 Cycles of 3 Shocks (18)       -         Zeals and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.       OCV / W       Final         Group       Mass M of Test Battery (g)       OCV (V)       OCV (V)       Final         1 056 g       656 g       0%       16.42 VDC       16.40 VDC       P         1 056 g       656 g       0%       16.24 VDC       16.24 VDC       P         1 056 g       656 g       0%       16.24 VDC       16.24 VDC       P         1 056 g       656 g       0%       16.24 VDC       16.26 VDC       P		test machi will suppo battery. A Half-Sin Pulse dura The positiv Each cell c shocks in t three shoc	ne by means of rt all mounting e shock of pea ation ve direction fo or battery shal	of a rigid mo g surfaces o ik acceleratio	ount which f each test	150g		-	
Pulse duration       6ms       -         The positive direction followed       3 Times       -         Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.       -         Test cycle       6 Cycles of 3 Shocks (18)       -         38.3.4.4.3       Requirement       -         Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery strete testing is not leas than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.       OCV (V)         Group       M1       M2       Mass Loss       OCV (V)         I Cycle Batteries       6 65 g       0%       16.42 VDC       16.40 VDC       P         1 Cycle Batteries       3 652 g       0%       16.24 VDC       16.24 VDC       P       2       656 g       656 g       0%       16.24 VDC       16.26 VDC       P         5 0 Cycle Batteries       6 634 g       0%       16.26 VDC       16.26 VDC       P       P         6 6 644 g       644 g       0%       16.26 VDC       16.26 VDC       P       P       8		Pulse dura The positiv Each cell c shocks in t three shoc	ation ve direction fo or battery shal		est machine by means of a rigid mount which vill support all mounting surfaces of each test pattery. A Half-Sine shock of peak acceleration				
The positive direction followed       3 Times       -         Each cell or battery shall be subjected to three shocks in the positive direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.       -         Test cycle       6 Cycles of 3 Shocks (18)       -         38.3.4.4.3       Requirement       -         Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not leas than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.       OCV (V)         Group       M1       M2       Mass Loss       OCV1       OCV2       Final         1 656 g       656 g       0%       16.42 VDC       16.24 VDC       P       P         5 638 g       638 g       0%       16.26 VDC       16.26 VDC       P         5 638 g       638 g       0%       16.26 VDC       16.26 VDC       P         5 638 g       638 g       0%       16.26 VDC       16.26 VDC       P         5 638 g       638 g       0%       16.26 VDC       16.26 VDC       P         8 discharged states.       7       642 g       0%       16.26 VDC       16.26 VDC		The positiv Each cell c shocks in t three shoc	ve direction fo or battery shal						
Each cell or battery shall be subjected to three shocks in the positive direction of lowed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks. <ul> <li>Test cycle</li> <li>Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not leas than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.             <li>OCV (V)</li> <li>Group</li> <li>Mass M of Test Battery (g)</li> <li>OCV (V)</li> <li>Group</li> <li>Mass M of Test Battery (g)</li> <li>OCV (V)</li> <li>Group</li> <li>M1</li> <li>M2</li> <li>M383 M of Test Battery (g)</li> <li>OCV (V)</li> <li>Group</li> <li>M1</li> <li>M2</li> <li>M383 M of Test Battery (g)</li> <li>OCV (V)</li> <li>Group</li> <li>A56 g</li> <li>656 g</li> <li>656 g</li> <li>0%</li> <li>16.26 VDC</li> <li>16.24 VDC</li> <li>16.24 VDC</li> <li>16.26 VDC</li></li></ul>		Each cell c shocks in t three shoc	or battery shal			6ms		-	
shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.Test cycle6 Cycles of 3 Shocks (18)Test cycle6 Cycles of 3 Shocks (18)Test cycle6 Cycles of 3 Shocks (18)There is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.OCV 1 (QCV1 (QCV2OCV (V)GroupM1M2 (Before the Test)Mass Loss (After the Test)OCV1 (2% Limit)OCV1 (Before the Test)OCV2 (After the Test)Final (QCV (> 90%1656 g656 g0% (After the Test)16.24 VDC16.24 VDCP2656 g656 g0% (After the Test)16.26 VDCP1656 g656 g0% (After the Test)16.26 VDCP2653 g653 g0% (After the Test)16.26 VDC16.26 VDCP3652 g656 g0% (After the Test)16.26 VDC16.26 VDCP5638 g638 g0% (After the Test)16.26 VDC16.26 VDCP3652 g642 g0%16.26 VDC16.26 VDCP <t< td=""><td></td><td>shocks in t three shoc</td><td></td><td>llowed</td><td></td><td>3 Times</td><td></td><td>-</td></t<>		shocks in t three shoc		llowed		3 Times		-	
38.3.4.4.3       Requirement       -         Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.       There is no leakage, no venting, no disassembly, no rupture and no fire.       -         Group       M1       M2       Mass Loss       OCV1       OCV (V)         Group       M1       M2       Mass Loss       OCV1       OCV2       Final         1       656 g       656 g       0%       16.42 VDC       16.40 VDC       P         1       656 g       656 g       0%       16.24 VDC       16.24 VDC       P         1       656 g       656 g       0%       16.24 VDC       16.26 VDC       P         1       656 g       656 g       0%       16.26 VDC       P       P         2       656 g       656 g       0%       16.24 VDC       P       P         5       638 g       638 g       0%       16.26 VDC       P       P         50 Cycle       6       644 g       644 g       0%       16.26 VDC       P       P		shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.						-	
Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fullyThere is no leakage, no venting, no disassembly, no rupture and no fire.GroupM1M2Mass Loss (.2% Limit)OCV1 (Before the Test)OCV2Final OCVGroupM1M2 (Before the Test)Mass Loss (.2% Limit)OCV1 (Before the Test)OCV2Final OCV (<90%								-	
no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.venting, no disassembly, no rupture and no fire.GroupM1M2Mass Loss (After the Test)OCV (V)GroupM1M2Mass Loss (After the Test)OCV1OCV2I 056 g656 g0%16.42 VDC16.40 VDCP1 056 g656 g0%16.24 VDC16.24 VDCP1 056 g652 g0%16.24 VDC16.24 VDCP2 055 g652 g0%16.26 VDCPP3 052 g652 g0%16.26 VDCPP5 0 Cycle6644 g644 g0%16.26 VDCP50 Cycle6644 g644 g0%16.27 VDCP8 0 38 g638 g0%16.26 VDC16.25 VDCP8 0 638 g638 g0%16.26 VDC16.25 VDCP8 0 638 g638 g0%16.26 VDC16.25 VDCP8 0 638 g638 g0%16.26 VDC16.25 VDCP9 0 0 16.27 VDC16.27 VDC16.25 VDCPP9 0 0 16.26 VDC16.26 VDC16.25 VDCPP9 0 0 16.26 VDC16.26 VDC16.25 VDCPP9 0 0 0 16.26 VDC16.26 VDC16.25 VDC <t< td=""><td>38.3.4.4.3</td><td>Requireme</td><td>ent</td><td></td><td></td><td></td><td>-</td></t<>	38.3.4.4.3	Requireme	ent				-		
Mass M of Test Battery (g)         OCV (V)           Group         M1         M2         Mass Loss         OCV1         OCV2         Final           No.         (Before the Test)         (After the Test)         (.2% Limit)         (Before the Test)         (After the Test)         OCV1         OCV2         (Final OCV         OCV           1         656 g         656 g         0%         16.42 VDC         16.40 VDC         P           2         656 g         656 g         0%         16.24 VDC         16.24 VDC         P           3         652 g         652 g         0%         16.26 VDC         16.26 VDC         P           4         654 g         654 g         0%         16.26 VDC         16.26 VDC         P           5         638 g         638 g         0%         16.26 VDC         16.26 VDC         P           50 Cycle         6         644 g         644 g         0%         16.26 VDC         16.26 VDC         P           8         638 g         638 g         0%         16.26 VDC         16.27 VDC         P           8         638 g         638 g         0%         16.26 VDC         16.25 VDC         P           8 <t< td=""><td></td><td colspan="4">no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully</td><td>venting, no di</td><td>sassembly, no</td><td>-</td></t<>		no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully				venting, no di	sassembly, no	-	
No.         (Before the Test)         (After the Test)         (.2% Limit)         (Before the Test)         (After the Test)         OCV (> 90%)           1         656 g         656 g         0%         16.42 VDC         16.40 VDC         P           2         656 g         656 g         0%         16.24 VDC         16.40 VDC         P           3         652 g         652 g         0%         16.24 VDC         16.24 VDC         P           4         654 g         654 g         0%         16.24 VDC         16.24 VDC         P           5         638 g         652 g         0%         16.26 VDC         16.26 VDC         P           50 Cycle         6         644 g         644 g         0%         16.26 VDC         16.26 VDC         P           50 Cycle         6         644 g         644 g         0%         16.26 VDC         16.26 VDC         P           50 Cycle         7         642 g         642 g         0%         16.26 VDC         16.27 VDC         P           8         638 g         638 g         0%         16.26 VDC         16.25 VDC         P           8         638 g         638 g         0%         16.26 VDC         16.2			Mass M of						
$\frac{1}{1} + \frac{1}{1} + \frac{1}$	Group	No.	(Before the	(After the		(Before the	(After the		
I Cycle       I <thi< th="">       I       <thi< th="">       I       <thi< th=""> <thi< th=""></thi<></thi<></thi<></thi<>		1	656 g	656 g	0%	16.42 VDC	16.40 VDC	Р	
Batteries         3         652 g         652 g         0%         16.26 VDC         16.26 VDC         P           4         654 g         654 g         0%         16.24 VDC         16.24 VDC         P           50 Cycle         5         638 g         638 g         0%         16.26 VDC         16.26 VDC         P           6         644 g         644 g         0%         16.26 VDC         16.26 VDC         P           50 Cycle         6         644 g         644 g         0%         16.26 VDC         16.26 VDC         P           8         638 g         642 g         0%         16.27 VDC         16.27 VDC         P           8         638 g         638 g         0%         16.26 VDC         16.25 VDC         P           8         638 g         638 g         0%         16.26 VDC         16.25 VDC         P           Remarks:         Mass Loss (%)= M1-M2/M1 *100% (Where M1 is the mass before the test and M2 is the mass after the test)         Final OCV (%)= OCV1/OCV2*100% (Where OCV1 is before the test and OCV2 is after the test)	1 Cycle	2	656 g	656 g	0%	16.24 VDC	16.24 VDC	Р	
4         664 g         664 g         664 g         638 g         0%         16.26 VDC         16.26 VDC         P           50 Cycle         6         644 g         644 g         0%         16.26 VDC         16.26 VDC         P           Batteries         7         642 g         642 g         0%         16.27 VDC         16.27 VDC         P           8         638 g         638 g         0%         16.26 VDC         16.25 VDC         P           Remarks:         8         638 g         638 g         0%         16.26 VDC         16.25 VDC         P           Remarks:         Mass Loss (%)= M1-M2/M1 *100% (Where M1 is the mass before the test and M2 is the mass after the test)         Final OCV (%)= OCV1/OCV2*100% (Where OCV1 is before the test and OCV2 is after the test)		3	652 g	652 g	0%	16.26 VDC	16.26 VDC	Р	
50 Cycle         6         644 g         644 g         0%         16.26 VDC         16.26 VDC         P           50 Cycle         6         644 g         644 g         0%         16.26 VDC         16.26 VDC         P           8         638 g         638 g         0%         16.27 VDC         16.27 VDC         P           8         638 g         638 g         0%         16.26 VDC         16.25 VDC         P           Remarks:           Mass Loss (%)= M1-M2/M1 *100% (Where M1 is the mass before the test and M2 is the mass after the test)           Final OCV (%)= OCV1/OCV2*100% (Where OCV1 is before the test and OCV2 is after the test)		4	654 g	654 g	0%	16.24 VDC	16.24 VDC	Р	
S0 Cycle         0         0 + y		5	638 g	638 g	0%	16.26 VDC	16.26 VDC	Р	
Batteries         7         642 g         642 g         0%         16.27 VDC         16.27 VDC         P           8         638 g         638 g         0%         16.26 VDC         16.25 VDC         P           Remarks:           Mass Loss (%)= M1-M2/M1 *100% (Where M1 is the mass before the test and M2 is the mass after the test)           Final OCV (%)= OCV1/OCV2*100% (Where OCV1 is before the test and OCV2 is after the test)	50 Cycle	6	644 g	644 g	0%	16.26 VDC	16.26 VDC	Р	
Remarks: Mass Loss (%)= M1-M2/M1 *100% (Where M1 is the mass before the test and M2 is the mass after the test) Final OCV (%)= OCV1/OCV2*100% (Where OCV1 is before the test and OCV2 is after the test)		7	642 g	642 g	0%	16.27 VDC	16.27 VDC	Р	
Mass Loss (%)= M1-M2/M1 *100% (Where M1 is the mass before the test and M2 is the mass after the test) Final OCV (%)= OCV1/OCV2*100% (Where OCV1 is before the test and OCV2 is after the test)		8	638 g	638 g	0%	16.26 VDC	16.25 VDC	Р	
	Mass Loss ( the test)								
	Final Conclu								
	l ithium lon							Р	

Lithium Ion Secondary Battery Assembly passed shock test.

Test End Date: May 25, 2017 Conducted by Timco Engineering TR: 899UT11

38.3.4.5	Test T.5: E	xternal Short Circuit			-		
38.3.4.5.1	Purpose				-		
	This test s	imulates an external shor	t circuit.		-		
38.3.4.5.2	Test Proce	edure			-		
	temperatu	r Battery to be tested shal re stabilized so that its ex re reaches 55°C +/-2°C.			-		
	Short Circ	uit condition with a total e of less than 0.10hm.	external		-		
	The cell or	battery must be observed hours for the test to be co			-		
	This short circuit condition is continued for at least one hour after the cell or battery external temperature has returned to 55°C +/- 2°C.						
38.3.4.5.3		Requirement					
	Cells and batteries meet this requirement if their external temperature does not exceed 170°C and there is no disassembly, no rupture and no fire during the test and within six hours after the test.				-		
Group	No.	External Highest Temperature	Criteria:		Result		
	1	51°C	Cells exter	Р			
1 Cycle	2	50°C	exceed 170	Р			
Batteries	3	50°C	during the	disassembly, no rupture and no fire during the test and within six hours			
	4	51°C	after this te	est.	Р		
	5	50°C	-		Р		
50 Cycle	6	50°C	-		Р		
Batteries	7	49°C	-		Р		
	8	49°C	-		Р		
Remarks: Ambient te	mperature	24°C					
Final Concl Lithium Ior		y Battery Assembly passed	d external sh	ort circuit test.	Р		
Test End D	ate: May 31	, 2011 at 1100					

38.3.4.6	Test T.6: Impact		N/A
38.3.4.6.1	Purpose		N/A
	These test simulate mechanical abuse from impact.		N/A
38.3.4.6.2	Test Procedure – Impact		N/A
	The sample cell or component cell is to be placed on a flat smooth surface. A 15.8mm diameter bar is to be placed across the centre of the sample. A 9.1 kg Mass is to be dropped from the height of 61+/-2.5cm from the sample.		N/A
	A cylindrical or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8mm diameter curved surface lying across the centre of the test sample. A prismatic cell is also to be rotated 90 degrees around its longitudinal axis so that both the wide and narrow sides will be subjected to the impact. Each sample is to be subjected to only a single impact. Separate samples are to be used for each impact.		N/A
	A coin or button cell is to be impacted with the flat surface of the sample parallel to the flat surface and the 15.8mm diameter curved surface laying across the centre.		N/A
38.3.4.6.3	Requirement		N/A
	Cells and component cells meet this requirement if their requirement if their external temperature does not exceed 170°C and there is no disassembly and no fire within six hours of this test.		N/A
	Cell Manufacture:	Confidential	-
	Cell Model	Confidential	-
	Test Date	January 9, 2009	-
	Test Results:	Passed	Р

38.3.4.7	Test 7: Ove	rcharge			-	
38.3.4.7.1	Purpose				-	
		aluates the ability of a r vithstand an overcharge			-	
38.3.4.7.2	Test Proced	dure			-	
	The minim	um voltage of the test:			-	
	The minim	um voltage of the test			-	
	Charge at current that is twice the manufacturers recommended maximum continuous charge current. The minimum voltage shall be the lesser of two times the maximum charge voltage of the battery or 22V. Tests are to be conducted at ambient temperature and test duration shall be 24 hours.					
38.3.4.7.3	Requirement					
	there is no	ble batteries meet this re disassembly and no fire thin seven days after the	during the	There is no disassembly and no fire during the test and within seven days after the test.	-	
Group	No.	Disassembly or Fire within seven days.	Criteria:		Result	
	1	No	There is no	Р		
1 Cycle	2	No		during the test and within seven days after the test.		
Batteries	3	No				
	4	No			Р	
	5	No			Р	
50 Cycle	6	No			Р	
Batteries	7	No			Р	
	8	No			Р	
Remarks: Ambient te	mperature 2	4°C				
Final Concl Lithium Ior		Battery Assembly passe	ed external sh	ort circuit test.	Р	
7- Day Hold	d Ends: June	e 10, 2011 at 12:35				

38.3.4.8	Test T.8: Forced Discharge		N/A
38.3.4.8.1	Purpose		N/A
	This test evaluates the ability of a primary or a rechargeable cell to withstand a forced discharge condition.		N/A
38.3.4.8.2	Test Procedure – Forced Discharge		N/A
	Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V DC power supply at an initial current equal to the maximum discharge current specified by the manufacturer.		N/A
	The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to the rated capacity divided by the initial test current (in ampere)		N/A
38.3.4.8.3	Requirement		N/A
	Primary or rechargeable cells meet this requirement if there is no disassembly and no fire within seven days of the test.		N/A
	Cell Manufacture:	Confidential	-
	Cell Model	Confidential	-
	Test Date	January 9, 2009	-
	Test Results:	Passed	Р

Page **10** of **11** 



# Declaration of Conformance

#### PRODUCT: Smart Rechargeable Secondary Battery

Inspired Energy Part Number: NL2024HD22

#### **SECTION I - MANUFACTURER INFORMATION**

Inspired Energy, LLC. 25440 NW 8<sup>th</sup> Place, Newberry FL 32669, USA

Telephone: +1 352 472 4855 Date Prepared: June 7<sup>th</sup>, 2017

### SECTION II - CONFORMANCE INFORMATION

The listed products have been tested in accordance with the UN document ST/SG/AC.10/11/Rev.6: *"Amendments to the Sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Tests & Criteria"* and found to comply with the stated criteria.

Test #	Description	Date Tested	Test result
T1	Altitude Simulation	April 19, 2011	PASSED
T2	Thermal Cycling	May 25, 2011	PASSED
T3	Vibration	May 25, 2011	PASSED
T4	Shock	May 25, 2011	PASSED
T5	Short Circuit	June 1, 2011	PASSED
T6	Impact (Cell-Level test)	January 9, 2009	PASSED
T7	Overcharge	June 10, 2011	PASSED
T8	Forced Discharge (Cell-level test)	January 9, 2009	PASSED

Signed:

hmoz all

Thomas J. Rush Product Compliance Engineer Inspired Energy LLC.

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