

Guidelines For Shipping, Handling, Storage & Recycling of Your Inspired Energy Lithium Ion Battery



Shipping

Shipping regulations are categorized based on:

1. The destination (Domestic US or International)
2. The materials used in the cell construction
3. The product type: Individual cell or assembled battery pack
4. The energy-rating of the cell or battery pack
5. The level of testing that has been undertaken

There are many different categories, each with differing regulations, so it is important to know which category applies when shipping your Inspired Energy battery packs.

- 💡 All commercially available Inspired Energy, Li Ion battery packs have been tested and comply with the UN Manual of Tests and Criteria part III subsection 38.3 (ST/SG/AC.10/11/Rev.5) - more commonly known as UN 38.3. A copy of the compliance certificate may be downloaded from the product pages on our website.
- 💡 All Inspired Energy standard Li Ion battery packs are between 2.7Watt hours and 100Watt hours.
- 💡 All Inspired Energy standard Li Ion battery packs contain less than 8g of equivalent Lithium.
- 💡 Inspired Energy does not sell Lithium metal products of any type.
- 💡 Inspired Energy does not sell individual cells of any type.

Lithium Ion	Cells	< 2.7Wh	Tested to UN 38.3	✘	Inspired Energy does not sell these products
			Untested	✘	
	2.7 to 20Wh	Tested to UN 38.3	✘		
		Untested	✘		
	Battery packs	< 2.7Wh	Tested to UN 38.3	✘	
			Untested	✘	
2.7 to 100Wh		Tested to UN 38.3	✔	All commercially available Inspired Energy Li Ion battery packs are in this category	
		Untested	✘		
> 100Wh	Tested to UN 38.3	✘			
	Untested	✘			
Lithium Metal	Cells	<3g of Li Metal	Tested to UN 38.3	✘	Inspired Energy does not sell these products
			Untested	✘	
		0.3 to 1g of Li Metal	Tested to UN 38.3	✘	
			Untested	✘	
	Battery packs	0.3 to 2g of Li Metal	Tested to UN 38.3	✘	
			Untested	✘	

Inspired Energy standard Li Ion batteries can be shipped nationally and internationally, however there are very specific requirements regarding packaging & documentation.

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IATA Packing Instructions:

These packing instructions pertain to International air transport, they have been adopted by the major courier services for transportation by all modes, and have become the de-facto standard for international shipping by ground or air. The US DOT is meeting early in 2013 to decide whether to formally adopt these regulations for domestic shipments also. We recommend that domestic US customers prepare for this to occur.

- Lithium Ion batteries shipping internationally from Inspired Energy are packaged in accordance with the IATA Packing Instruction **965**. If you re-ship our products **on their own**, the same procedure must be followed.
- If you ship Inspired Energy batteries internationally **with** your device, you must follow IATA P.I. **966**.
- If you ship Inspired Energy batteries internationally **installed in** your device you must follow IATA P.I. **967**.

To avoid confusion when reviewing IATA packaging instructions, we recommend that you also review the IATA Guidance Document on Transportation of Lithium Batteries.

If you need to demonstrate that your battery is between 2.7Wh and 100wh, please refer to the product page at www.inspiredenergy.com - The watt-hour rating is listed in the specification summary. Alternatively, it can be calculated as follows:

$$\text{Rated battery capacity (Ah)} \times \text{nominal battery voltage (V)} = \text{Energy in Watt-hours (Wh)}$$

If you need to demonstrate that your Inspired Energy battery has been tested to UN38.3, A copy of the compliance certificate may be downloaded from the product pages on our website.

Transportation Regulations for Lithium Ion Batteries

The international regulations covering the transport of rechargeable lithium ion batteries are the:

- UN Recommendations on the Transport of Dangerous Goods Model Regulations
- UN Recommendations on the Transport of Dangerous Goods Manual of Tests and Criteria
- IMDG (International Maritime Dangerous Goods) Code.
- ICAO (International Civil Aviation Organization) Technical Instructions
- IATA (International Air Transport Association) Dangerous Goods Regulations

These shipping regulations apply to everyone shipping a lithium ion battery: cell manufacturers, battery assemblers, distributors, OEMs, retail establishments & end users. Fines have been established for non-conformance.

No provision is made to adjust the shipping requirements based on state of charge. A fully discharged battery has exactly the same shipping requirements as a fully charged battery. All Inspired Energy products follow the industry recommendation of shipping between 30 & 50% state of charge. This maximizes the warehousing or holding period whilst minimizing the amount of stored energy being transported.

Commercial Air travel with Inspired Energy Li ion battery packs

Inspired Energy Li Ion battery packs may not be packed in your checked luggage. They must be carried with you in your carry-on bag. Inspired Energy has dust caps available which may be used to provide isolation of the battery terminals during transport if required. For current regulations & advice on how many batteries you may travel with, we recommend you consult

<http://safetravel.dot.gov>

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When preparing to ship your Inspired Energy Li Ion battery pack, these questions will guide you:

Q1) Are you shipping domestically within the USA or Internationally?

Q2) What do you wish to ship: batteries only? batteries with equipment? or batteries in equipment?

Q3) How many batteries do you wish to ship in the same box?

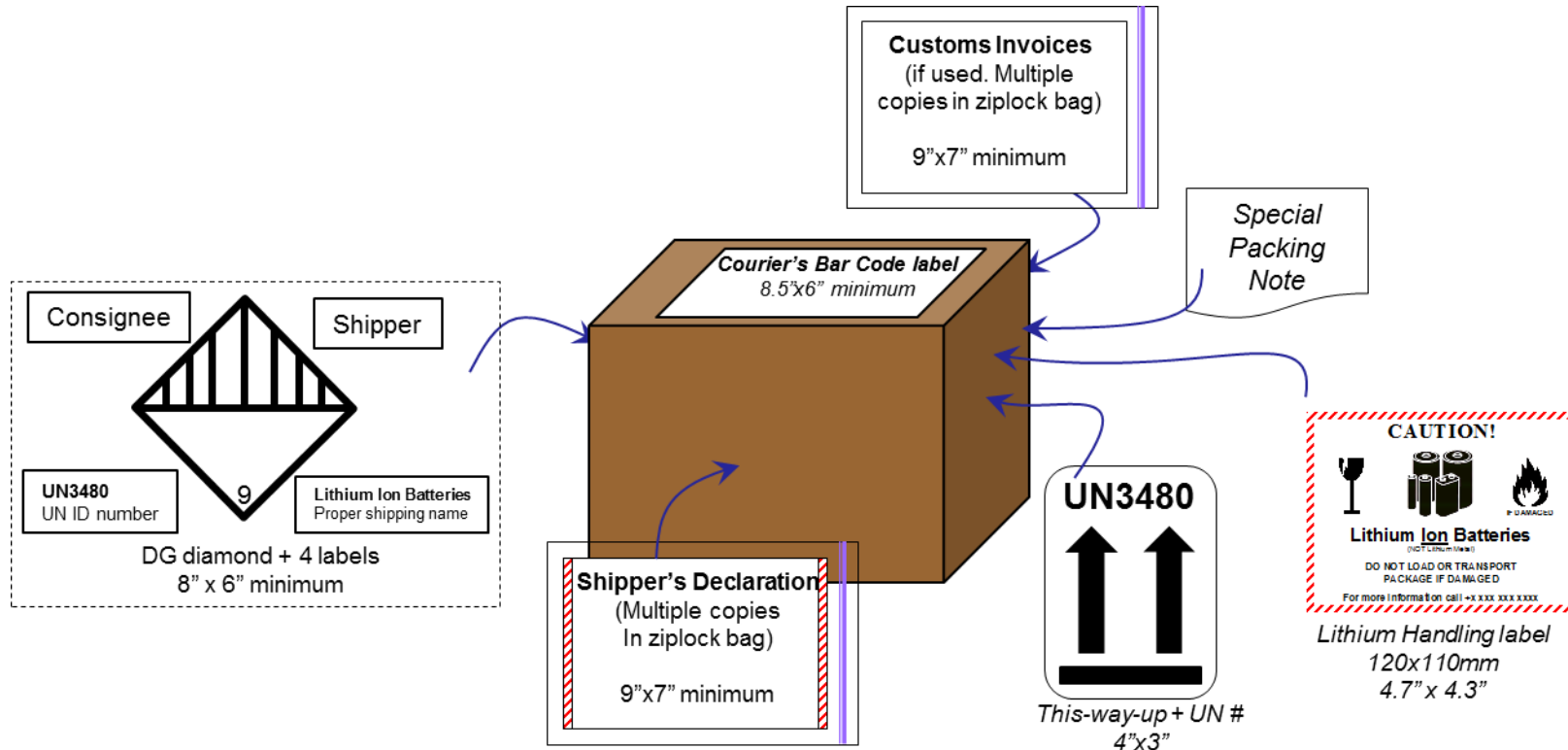
Use the following table to determine the appropriate packing & regulations & personnel certification that will apply to your shipment.

IATA PI#	Qty / Weight	Class	Packaging	Documents, Labels & Package Identification	Cert.	
Inspired Energy Li Ion Batteries shipped on their own IATA Packing Instruction <u>965</u>	3 or more batteries per box up to 10kg / 22lb box weight	Regulated Class 9 DG Lithium Ion Batteries; Section IB	Batteries to be in inner packaging completely enclosing the battery, then placed in a strong outer packaging.	Packing note indicating: Package contains Li Ion batteries, Handle with care, Flammability hazard exists if damaged, special procedures to be followed if damaged, a phone # for further info.	Shipper to be IATA DG certified (i)	
			Batteries to be protected to prevent short circuits, including protection against conductive packaging materials	Lithium Handling label		
			Box must pass a 1.2M drop test in any orientation without damage to, shifting of, or release of the contents.	Class 9 DG Diamond		
	2 batteries max per box. No weight limit	UN3480 Excepted Lithium Ion Batteries; Section II	Batteries to be in inner packaging completely enclosing the battery, then placed in a strong outer packaging.	Shipper's declaration for DG (on red-fringed paper)		Shipper to be "adequately trained" (ii)
			Box must pass a 1.2M drop test in any orientation without damage to, shifting of, or release of the contents.	UN Identification Number UN3480		
			Batteries to be protected to prevent short circuits, including protection against conductive packaging materials	Proper Shipping Name: Lithium Ion Batteries		
Inspired Energy Li Ion Batteries shipped WITH equipment IATA PI <u>966</u>	Up to 5kg of Li ion batteries per box Max. Quantity = the minimum needed to power the device + 2 spares	UN3481 Excepted Lithium Ion Batteries; Section II	Batteries to be in inner packaging completely enclosing the battery, then placed in a strong outer packaging.	Packing note indicating: Package contains Li Ion batteries, Handle with care, Flammability hazard exists if damaged, special procedures to be followed if damaged, a phone # for further info.	Shipper to be "adequately trained" (iii)	
			Box must pass a 1.2M drop test in any orientation without damage to, shifting of, or release of contents.	Lithium Handling label		
			The equipment must be secured against movement & prevented from accidental activation	"Lithium Ion Batteries, in compliance with Section II of PI966" to be written on the airwaybill if used		
Inspired Energy Li Ion Batteries shipped IN equipment IATA PI <u>967</u>	3 or more batteries up to 5kg per box	UN3481 Excepted Lithium Ion Batteries; Section II	Equipment to be packed in strong outer packaging constructed of suitable material of adequate strength & design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained.	Lithium Handling label	Shipper to be "adequately trained" (iv)	
				Packing note indicating: Package contains Li Ion batteries, Handle with care, Flammability hazard exists if damaged, special procedures to be followed if damaged, a phone # for further info.		
	2 batteries max up to 5kg / box			"Lithium Ion Batteries, in compliance with Section II of PI967" to be written on the airwaybill if used	Shipper to be adequately trained (v)	
				None required.		

The documentation & labeling required for (i) through (v) are shown on the following pages.

Don't forget to check for any Operator Variations that FedEx, UPS DHL et al may also implement which are over & above the IATA requirements shown below. You'll find them in a separate section of the IATA Dangerous Goods Handbook.

(i) Boxes containing 3 or more Inspired Energy battery packs only



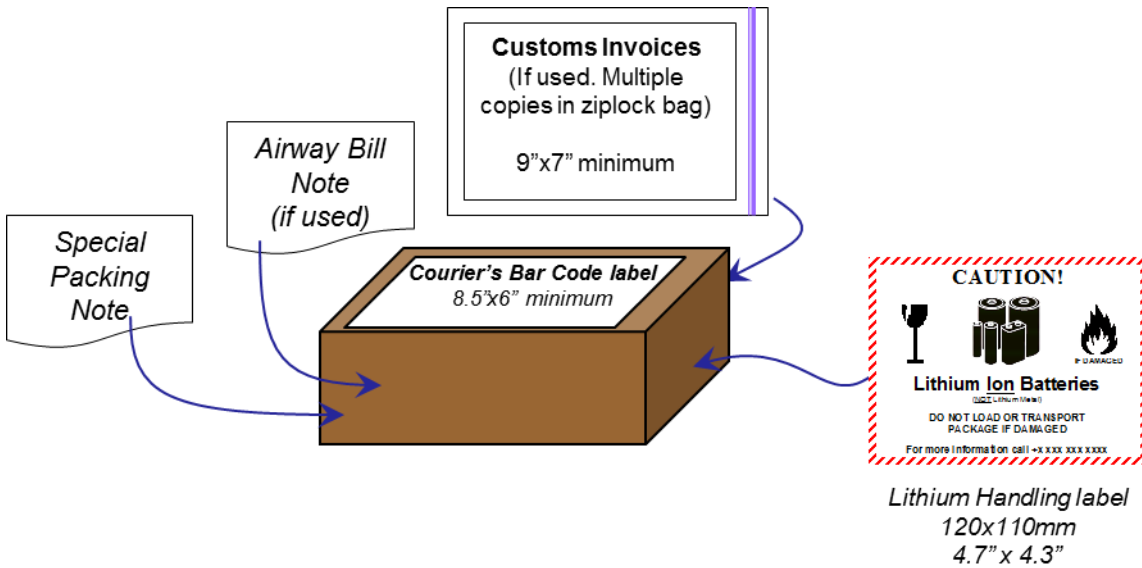
Minimum box size to fit all the paperwork = 9" long x 8" wide x 7" tall

UN3480. IATA Packing Instruction 965 Section IB; Regulated Class 9 Dangerous Goods, Lithium Ion Batteries

The shipper must be IATA dangerous goods certified.

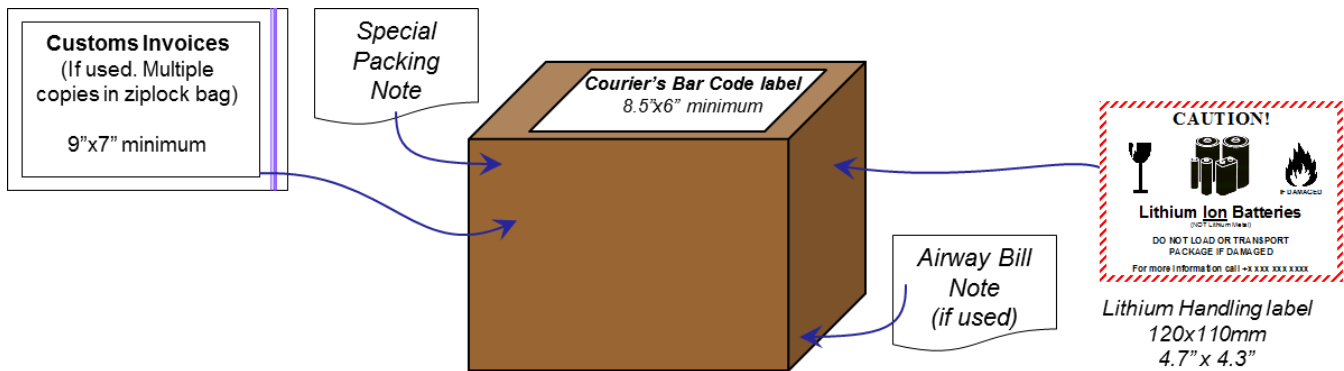
- ⚡ Bulk packaged battery packs shipped internationally from Inspired Energy will be shipped like this.
- ⚡ Note the distinction between “regulated” and “FULLY regulated” products:
- ⚡ Shipments of 3 or more Inspired Energy Li ion battery packs in the same box are shipped as regulated class 9 dangerous goods under section IB.
- ⚡ The only Inspired Energy products shipped as fully regulated class 9 dangerous goods under section IA, are new, untested battery packs en-route to the test facility to undergo testing.
- ⚡ If your shipper allows it (See Operator Variations) you may replace the Shipper’s declaration with an alternate document. (Most shippers do not allow this)
- ⚡ If you intend to re-use the packaging in which you received the battery packs, then you must replace our Lithium Handling label with your own, and you must assess the packaging to ensure that it remains in sufficiently good condition to be re-used. **The shipper must be IATA dangerous goods certified.**

(ii) Boxes containing 1 or 2 Inspired Energy battery packs only



UN3480. IATA Packing Instruction 965 Section II; Excepted Lithium Ion Batteries
The shipper must be adequately trained

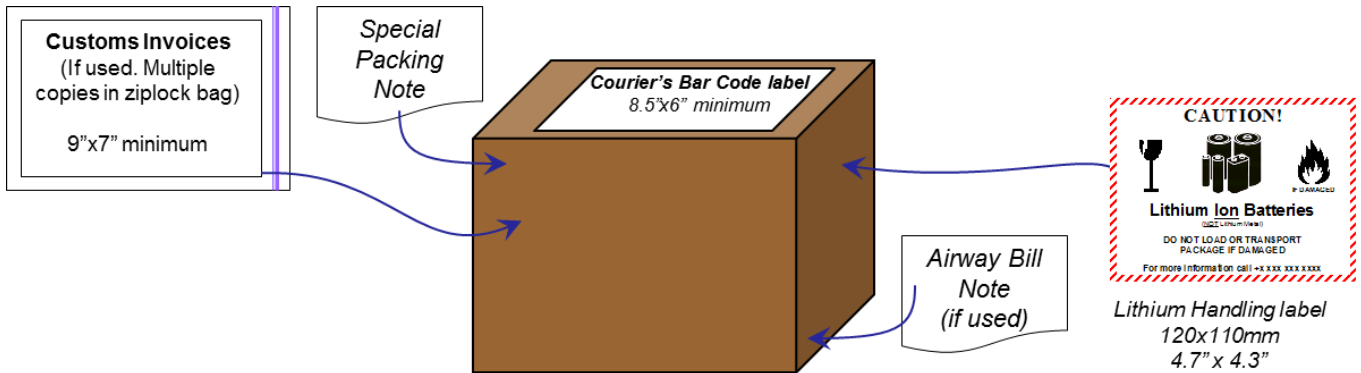
(iii) Boxes containing up to 5kg of Inspired Energy battery packs packaged with equipment



Maximum Quantity of batteries = Minimum number required to operate the device + 2 spares

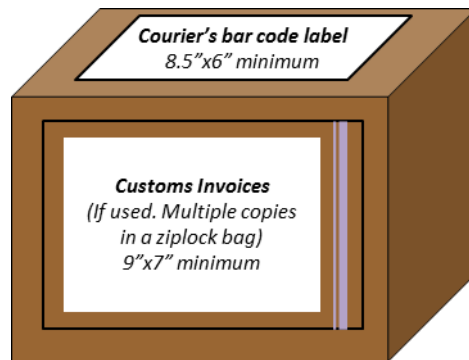
UN3481. IATA Packing Instruction 966 Section II; Excepted Lithium Ion Batteries
The shipper must be adequately trained

(iv) Boxes containing 3 or more Inspired Energy battery packs packaged IN equipment



UN3481. IATA Packing Instruction 967 Section II; Excepted Lithium Ion Batteries
The shipper must be adequately trained

(v) Boxes containing 1 or 2 Inspired Energy battery packs packaged IN equipment



UN3481. IATA Packing Instruction 967 Section II; Excepted Lithium Ion Batteries
The shipper must be adequately trained

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U.S. Domestic Postal Service Regulations for Lithium Ion Battery Packs (349.222)		
Energy Rating	Testing Requirements	Special Packaging / Markings
<=100Wh ✓ Inspired Energy std. batteries are in this category	Batteries must be tested to UN38.3 ✓ Inspired Energy std. batteries are in this category	<ul style="list-style-type: none"> • The package may not contain more than 3 batteries. • Batteries must be sealed, separated & cushioned and packed in strong enough packages to prevent short circuit, crushing or exposure of contents during normal mail handling. • Batteries properly installed in the device they operate must be protected from damage and short circuit, and the device must be protected against accidental activation or crushing of the contents. • Packages must have complete delivery & return addresses. • The outside of the package must be marked on the address side “Package Contains Lithium-ion Batteries (no lithium metal).” ✓ Inspired Energy Batteries with, or in equipment may mail by air or surface. ✓ Inspired Energy batteries on their own may be mailed by surface only.

- Damaged or recalled batteries and batteries exceeding 100Wh may not be mailed.
- We do not recommend using the US postal service for international shipments.

The UN 38.3 Transportation Tests:

The UN 38.3 Tests are summarized at the end of this document. They must be performed once for each battery of a given design, and must be completed prior to shipment. Although the lithium ion CELL may have passed the UN 38.3 tests, this does not bestow certification for a battery pack which must be separately tested. A new battery must be re-tested if it differs from a previously tested type by:

- A change of more than 0.1 g or 20% by mass, whichever is greater, to the cathode, to the anode, or to the electrolyte; or
 - A change that would materially affect the test results,
- Untested batteries must be shipped as UN 3480, Class 9, Fully Regulated, Dangerous Goods.

Additional Resources:

<http://safetravel.dot.gov>
www.iata.org
www.chemtrec.com

www.phmsa.dot.gov
www.fmcsa.dot.gov
pe.usps.com

Recommended Reading:

IATA Lithium Battery Guidance Document. Transport of Lithium Metal and Lithium Ion batteries Revised for the 2013 regulations. Dated 04/10/2012 (or subsequent revisions)
 IATA Dangerous Goods Regulations 54th Edition Effective January 1 2013
 Both are available from www.iata.org

Lithium Ion Handling Labels:

Search for "Lithium Ion handling labels" on the internet. Labels can be purchased with blank spaces to identify the contents as Lithium Ion, & for your phone number to be added. You cannot re-use our Li Ion handling labels because your phone number must be used when you ship the products onwards.

Finding a Carrier:

In order to ship Inspired Energy Lithium Ion batteries and to receive ex-works shipments from Inspired Energy you will need a freight account with a shipper who is able to carry class 9 dangerous goods. . When making your decision Be sure to check the operator variances in the IATA handbook or contact them for their requirements as some carriers require more stringent documentation than the IATA regulations.

Dangerous Goods Certification:

Inspired Energy shipping personnel are certified to the requirements of IATA Dangerous Goods regulations 54th ed 2013. If you ship more than 2 Inspired Energy Lithium Ion battery packs in a package on their own, your shipping personnel must be similarly certified. One resource for this is:

www.compliancetrainingonline.com

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Storage

Inspired Energy Lithium Ion battery packs can be stored from -20°C to +60°C at up to 80% relative humidity. However they are best stored below 21°C in a cool, dry, well-ventilated facility free from corrosive gas or vapor.

Storage at elevated temperatures (Above 45°C) will degrade battery performance and reduce battery life. Storage at low temperatures may affect initial battery performance.

Extended storage may require a calibration cycle or a few regular operating cycles to restore full accuracy to the fuel gauge.

Handling

- Avoid shorting the battery
- Avoid exposing the battery to excessive shock or vibration
- Do not use modified chargers
- Do not use a battery that has been damaged in any way
- Do not immerse the battery in water
- Do not expose the battery to fire
- Do not dispose of the battery in fire
- Do not disassemble or deform the battery
- Keep the battery out of the reach of children
- Always charge in accordance with the manufacturer's instructions, using specified chargers only

Recycling

Inspired Energy is a member of the Rechargeable Battery Recycling Corporation & all applicable products bear the RBRC symbol which includes the phone number to call to find your closest recycling location. All Inspired Energy Lithium Ion batteries contain recyclable materials and are accepted for recycling by all the RBRC locations throughout North America. We encourage the use of recycling facilities for our products. For more information on recycling:

In North America contact the Rechargeable Battery Recycling Corporation (RBRC) at:

www.call2recycle.org or phone 1-877-2-RECYCLE (1-877-273-2925)

In Europe contact the European Portable Battery Association (EPBA).

www.epbaeurope.net

This document pertains to rechargeable Lithium Ion Batteries manufactured and marketed by Inspired Energy ONLY. The requirements & regulations are different for rechargeable lithium ion cells, rechargeable lithium metal cells & batteries, & for non-rechargeable lithium cells & batteries.

While every attempt is made to ensure accuracy and timeliness, the information provided herein is for guidance only. No representation, claim or guarantee is made by Inspired Energy for accuracy, completeness, applicability, currency or compliance to regulations which are subject to change.

Inspired Energy shall not be liable for any inclusions, omissions, errors or outdated information.

This document does not constitute, and should not be considered as legal advice.

In all cases we recommend that you fully research the topic and seek appropriate advice from regulatory authorities to ensure your compliance with all applicable regulations.

UN38.3 Transportation Test Procedure

UN T-Tests			
Test Title	Procedure	Test Sample Size	Pass Requirement
T1: Altitude Simulation	Store @ $\leq 11.6\text{kPa}$ or less for $\geq 6\text{hrs}$ @ $20 \pm 5^\circ\text{C}$	4 batteries, cycle 1 fully charged	No mass loss, leakage, venting, rupture, disassembly, or fire & OCV after test $\geq 90\%$ OCV before test
		4 batteries, cycle 50 fully charged	
T2: Thermal Shock (follows T1)	Store for $\geq 6\text{hrs}$ @ $75 \pm 2^\circ\text{C}$, Store for $\geq 6\text{hrs}$ @ $-40 \pm 2^\circ\text{C}$. Interval between extremes $\leq 30\text{mins}$. Repeat 10 times.	Same 8 batteries from T1	As above
T3: Vibration (follows T2)	Sinusoidal vibration, logarithmic sweep of 7Hz-200Hz-7Hz in 15minutes. Repeat 12 times in each of 3 perpendicular axes	Same 8 batteries from T2	As above
T4: Shock (follows T3)	$\frac{1}{2}$ Sine shock, peak acceleration of 150G for 6ms. 3 shocks in positive direction & 3 in negative direction in 3 perpendicular axes: A total of 18	Same 8 batteries from T3	As above
T5: Short Circuit (follows T4)	Stabilize the battery @ $55 \pm 2^\circ\text{C}$. Short circuit it with $< 0.1\Omega$ for $\geq 1\text{hr}$ or until 1hr after the battery case has returned to $55 \pm 2^\circ\text{C}$.	Same 8 batteries from T4	External temp $\leq 170^\circ\text{C}$, no disassembly, no rupture, no fire within 6hrs of test.
T6: Impact Cell level test - done by Cell mfr.	15.8mm Φ bar placed on the cell & 9.1kg mass dropped onto bar from a height of $61 \pm 2.5\text{cm}$ As above. Test repeated on two axes	5 Cylindrical cells, cycle 1, 50% charged	External temp $\leq 170^\circ\text{C}$, no disassembly, no rupture, no fire within 6hrs of test.
		10 Prismatic cells, cycle 1, 50% charged	
T7: Overcharge Can follow T5 if undamaged	Charge @ $20^\circ\text{C} \pm 5^\circ\text{C}$ @ twice the manufacturers recommended charge current.	4 new or undamaged batteries from T5, cycle 1 fully charged	No disassembly & no fire within 7 days of the test
		4 new or undamaged batteries from T5, cycle 50 fully charged	
T8: Forced Discharge Cell level test - done by Cell mfr	@ $20^\circ\text{C} \pm 5^\circ\text{C}$, connect each cell in series with a 12V DC power supply at an initial current equal to the manufacturers max rated discharge current for a time equal to the rated capacity divided by the initial test current.	Ten cells, Cycle 1, fully discharged Ten cells cycle 50 fully discharged	No Disassembly & No Fire within 7 days of the test