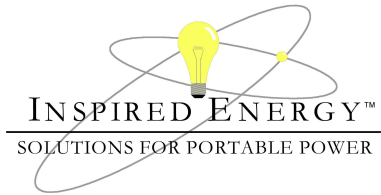


# Guidelines For Shipping, Handling, Storage & Disposal of Your Inspired Energy Lithium Ion Battery



## Shipping

All Inspired Energy, Li Ion battery packs have been tested in accordance with the UN Manual of tests and Criteria part III subsection 38.3 (ST/SG/AC.10/11/Rev.3) - more commonly known as the UN T- tests; and have been found to comply with the stated criteria. As a result they can be shipped unrestricted internationally by any means. A copy of the compliance certificate may be downloaded from the product pages on our website.



Inspired Energy Lithium Ion batteries are packaged in accordance with the UN requirements for packaging Lithium-Ion batteries. When re-shipping the same guidelines must be followed.

If packed in boxes containing up to 12 battery packs, the box is required to have strong outer packaging with physical separation of the individual batteries to prevent short circuits.

If packed in boxes containing more than 12 battery packs, the packaging must additionally be capable of surviving a 1.2m drop without the contents shorting, and must weigh less than 10kg/22lb.

In addition the contents must be identified as being Lithium Ion batteries (Not Lithium) and the box

accompanied by a document identifying the contents as being Lithium Ion batteries (Usually the packing slip). An example of the label used by Inspired Energy is shown above.

We do not recommend that Li Ion batteries be installed into your device prior to shipping.

You may encounter misunderstanding amongst shipping companies who are not familiar with the differences between Lithium, Lithium-metal and Lithium-Ion batteries, & may need to assist them by explaining the difference.

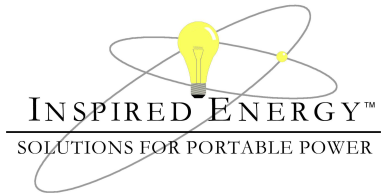
“Small” Lithium-Ion batteries are not regulated (i.e. they have no transportation restrictions) as long as they meet these 3 criteria:

- 1) Each individual Li-ion battery pack contains less than 100Wh (Watt-hours) of energy.
- 2) The battery has been tested to the UN/DOT transportation tests (commonly known as the UN T-Tests).
- 3) They are packaged as detailed above

To find out how much energy is in your Inspired Energy battery, please refer to the appropriate product page at [www.inspiredenergy.com](http://www.inspiredenergy.com) - you'll find the watt-hour rating listed in the specification summary. In addition every Inspired Energy Lithium Ion battery has the watt hour rating embossed into the plastic case adjacent to the connector. This conforms to the requirements for marking the Wh rating on the battery pack.

To avoid confusion when reviewing IATA packaging instructions, we recommend that you also review the IATA Guidance Document on Transportation of Lithium Batteries as this is necessary to establish the hazardous goods shipping exemption for our <100Wh Lithium Ion batteries.

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



## 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) may degrade battery performance and reduce battery life. Storage at low temperatures may affect initial battery performance.

## Handling

- Avoid shorting the battery
- Avoid exposing the battery to excessive shock or vibration
- Do not use modified chargers
- Do not use any battery that has been damaged in any way
- Do not immerse the battery in water
- Do not expose to, or 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

## Disposal

All Inspired Energy Lithium Ion batteries are classified by the US federal government as non-hazardous waste and are safe for disposal in the normal municipal waste stream.

These batteries, however, do contain recyclable materials and are accepted for recycling by a number of regional battery recycling programs. (Charges may apply for these services.)

In North America contact the Rechargeable Battery Recycling Corporation (RBRC) at [www.rbrc.org](http://www.rbrc.org)

In Europe contact the European Portable Battery Association. (EPBA) [www.epbaeurope.org](http://www.epbaeurope.org)

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## Transportation Regulations for Lithium Ion Batteries

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

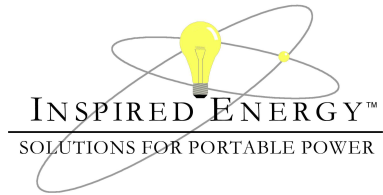
- UN Recommendations on the Transport of Dangerous Goods Model Regulations
- UN Manual of Tests and Criteria 4th Revised Ed. (2003) (Often called the "UN T-Tests")
- IMDG (International Maritime Dangerous Goods) Code.
- ICAO (International Civil Aviation Organization) Technical Instructions
- IATA (International Air Transport Association) Dangerous Goods Regulations

The **domestic US regulations** covering transportation & packaging of lithium ion batteries are contained in Part 49 of the Code of Federal Regulations, (49 CFR Sections 100-185) of the U.S. Hazardous Materials Regulations (HMR). Sections 173.185, 172.101 & 172.102 issued by the Office of Hazardous Materials Safety

Although the domestic regulations are based on the international UN Recommendations there are differences.

These shipping regulations apply to everyone shipping a lithium ion battery: cell manufacturers, battery assemblers, distributors, OEMs, retail establishments & end users - no exceptions. Fines have been established for non-conformance.

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



All lithium ion batteries are classified for transportation domestically & internationally by the amount of “Equivalent Lithium” or the amount of energy that they contain.

The equivalent lithium content for lithium ion cells and batteries is calculated as follows:

$$0.3 \times \text{rated cell capacity (Ah)} \times \text{number of cells in the battery} = \text{“Equivalent Lithium” (g)}$$

The amount of energy in a battery is calculated as follows:

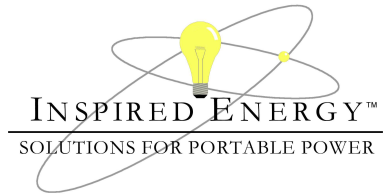
$$\text{Rated battery capacity (Ah)} \times \text{battery voltage (V)} = \text{Energy in Watt-hours (Wh)}$$

There is no provision made in any of the regulations covering rechargeable lithium ion batteries to adjust the shipping requirements based on the state of charge of the product being shipped. A fully discharged battery has exactly the same shipping requirements as a fully charged battery.

Domestic US Transportation Regulations for Lithium Ion Battery Packs		
Equivalent Lithium Content / Energy	Shipping Classification / Testing Requirements	Special Packaging / Markings
Small Lithium Ion Batteries: <=8.0 grams or less than 100Wh	Batteries that pass UN Tests are classified as not regulated & can be shipped as regular non-hazardous cargo.	Packages containing more than 12 batteries must meet packaging, marking, and documentation requirements.
Medium Lithium Ion Batteries 8 - 25 grams	Batteries must pass UN T-Tests. From Oct 1, 2008 Batteries must be shipped as Class 9 hazardous materials unless transported by motor vehicle or rail car. <i>See note below</i>	Requires Class 9 markings, label, special packaging, and documentation unless transported by motor vehicle or rail car under Special Provision 189
Large Lithium Ion Batteries >25 grams	Batteries must pass UN T1-T8 Tests and be shipped as a Class 9 hazardous material.	Requires Class 9 markings, label, special packaging, and documentation

ICAO Technical Instructions for Commercial Airline Carry-on & Checked Baggage		
Equivalent Li Content	Carry-On	Checked Baggage
<=8.0 g or less than 100Wh	Batteries within a portable electronic device + spare batteries allowed (qty unspecified)	Batteries within a portable electronic device allowed. Spare batteries prohibited
8 - 25g	Batteries within a portable electronic device + up to 2 spare batteries allowed	prohibited
> 25g	prohibited	prohibited
<i>Note: spare batteries must be individually protected so as to prevent short circuits and placed in carry-on baggage only. It is recommended to carry-on &amp; not to check portable electronic devices &amp; batteries.</i>		

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



U.S. Postal Service Regulations for Lithium Ion Battery Packs		
Equivalent Lithium Content	Shipping Classification / Testing Requirements	Special Packaging / Markings
<=8.0 grams	May be mailed by surface or air. / Batteries must pass UN T-Tests. Batteries.	<ul style="list-style-type: none"> <li>The package may not contain more than 3 batteries.</li> <li>Batteries must be sealed, separated &amp; cushioned to prevent short circuit.</li> <li>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.</li> <li>Packages must have complete delivery &amp; return addresses. The outside of the package must be marked on the address side "Package Contains Lithium-ion Batteries (no lithium metal)."</li> <li>Damaged or Recalled batteries may not be mailed</li> </ul>
>8 grams	May not be Mailed	

International Transportation Regulations for Lithium Ion Battery Packs		
Energy	Shipping Classification / Testing Requirements	Special Packaging/Markings
<100Wh	Cells and batteries must pass UN T-Tests to enable them to be shipped as non hazardous goods.	Packages containing more than 12 batteries must meet packaging, marking, and documentation requirements.
>100Wh	Cells and batteries must pass UN T-Tests and be shipped as UN3480 hazardous materials	Requires UN3480 markings, label, special packaging, and documentation

## The UN T-Tests:

The UN T1-T8 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 T-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,

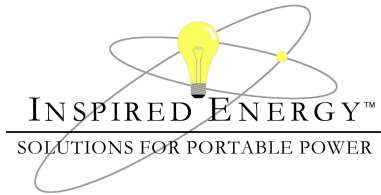
Batteries shipped to a testing facility may be shipped only by highway and must be shipped as UN 3480 hazardous materials.

## T-Test Deadlines:

- The T-Test requirements are currently in effect for all international shipments.
- The U.S. DOT lithium battery final rule of August 9<sup>th</sup> 2007 extended the testing deadline: lithium ion batteries with no more than 8 grams of equivalent lithium content do not require testing until October 1<sup>st</sup> 2009. Note - this only applies to domestic shipping - international regulations do NOT allow this extended deadline.

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[www.inspiredenergy.com](http://www.inspiredenergy.com)

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



- In addition, the IMDG Code exempts batteries that were manufactured before January 1<sup>st</sup> 2003 from T-testing until December 31<sup>st</sup> 2013 only if they are shipped by sea under the IMDG Code.

## Marking, Packing, and Shipping Requirements for Non-Hazardous Lithium ion Batteries

Packages containing more than lithium ion batteries must:

1. Be marked to indicate that they contain lithium ion batteries and that special procedures should be followed in the event that the package is damaged.
2. Be accompanied with a document indicating that packages contain lithium batteries and that special procedures should be followed in the event a package is damaged;
3. Be capable of withstanding a 1.2 meter (3.9 ft.) drop test in any orientation without damage to batteries contained in the package, without shifting of the contents that would allow short circuiting and without release of the contents
4. Not exceed 10 kg (22 lbs.)

## Hazardous Goods Shipping

**(Note: Inspired Energy does not manufacture any batteries which require hazardous goods shipping.)**

- Any lithium ion batteries that do not qualify for an exemption under the definitions above must be shipped as hazardous goods under the hazardous goods code UN 3480.
- If the batteries must be shipped as hazardous materials, then any equipment containing them must also be shipped as hazardous materials.
- Anyone packing or shipping hazardous goods must complete a hazardous materials training course which must be renewed every three years in the U.S. and every two years under the international regulations.

## Additional Resources:

<http://hazmat.dot.gov>

[http://safetravel.dot.gov/whats\\_new\\_batteries.html](http://safetravel.dot.gov/whats_new_batteries.html)

[www.iata.org/whatwedo/cargo/dangerous\\_goods/index.htm](http://www.iata.org/whatwedo/cargo/dangerous_goods/index.htm)

[www.chemtrec.com](http://www.chemtrec.com)

[www.phmsa.dot.gov](http://www.phmsa.dot.gov)

[www.fmcsa.dot.gov/safety-security/hazmat/complyhmregs.htm](http://www.fmcsa.dot.gov/safety-security/hazmat/complyhmregs.htm)

*This document pertains to rechargeable Lithium Ion Batteries ONLY. The requirements & regulations are different for rechargeable lithium ion cells, rechargeable lithium metal cells & batteries, & 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.*

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

UN T-Tests		
Test Title	Procedure	Pass Requirement
T1: Altitude Simulation	Store @ $\leq 11.6$ kPa or less for $\geq 6$ hrs @ $20 \pm 5^\circ\text{C}$	4 batteries, cycle 1 fully charged
		4 batteries, cycle 50 fully charged
T2: Thermal Shock (follows test 1)	Store for $\geq 6$ hrs @ $75 \pm 2^\circ\text{C}$ , Store for $\geq 6$ hrs @ $-40 \pm 2^\circ\text{C}$ . Interval between extremes $\leq 30$ mins. Repeat 10 times.	4 batteries, cycle 1 fully discharged
		4 batteries, cycle 50 fully discharged
T3: Vibration (follows test 2)	Sinusoidal vibration, logarithmic sweep of 7Hz-200Hz-7Hz in 15minutes. Repeat 12 times in each of 3 perpendicular axes	Same 8 fully charged batteries
		Same 8 fully discharged batteries
T4: Shock (follows test 3)	Half Sine shock of peak acceleration of 150G duration 6ms. 3 shocks in positive direction & 3 shocks in negative direction in each of 3 perpendicular axes: A total of 18	Same 8 fully charged batteries
		Same 8 fully discharged batteries
T5: Short Circuit (follows test 4)	Stabilize the battery at $55 \pm 2^\circ\text{C}$ . Short circuit the battery with $< 0.1\Omega$ for $\geq 1$ hr or until 1hr after the battery case has returned to $55 \pm 2^\circ\text{C}$ . Observe for 6hrs.	Same 8 fully charged batteries
		Same 8 fully discharged batteries
T6: Impact Cell level test - done by Cell mfr. Not required if cell already has approval	15.8mm dia bar placed on the cell & 9.1kg mass dropped onto bar from a height of $61 \pm 2.5$ cm  15.8mm dia bar placed on the cell & 9.1kg mass dropped onto bar from a height of $61 \pm 2.5$ cm. Test repeated on two axes	Cylindrical cells used in batteries: 5 cells, cycle 1, 50% charged plus 5 cells, cycle 50, fully discharged.
		Prismatic cells used in batteries: 10 cells, cycle 1, 50% charged plus 10 cells, cycle 50, fully discharged.
T7: Overcharge Can follow test 5 if undamaged	Charge @ $20^\circ\text{C} \pm 5^\circ\text{C}$ @ twice the manufacturers recommended charge current.	4 new or undamaged batteries from 1-5, cycle 1 fully charged
		4 new or undamaged batteries from 1-5, cycle 50 fully charged
T8: Forced Discharge Cell level test - done by Cell mfr. Not required if cell already has approval	@ $20^\circ\text{C} \pm 5^\circ\text{C}$ , 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

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