

# Lithium Batteries: 5 Keys for Shippers

Start with these 5 fundamentals to simplify shipping compliance.



**LION**  
TECHNOLOGY INC.®



# Lithium Batteries: 5 Keys for Shippers

Lithium battery regulations are complicated and constantly evolving. For new shippers, the five fundamentals in this guide are where to start to identify relevant regulatory requirements and determine how strictly a shipment will be regulated during transportation.

## What's Inside



Lithium-metal vs. lithium-ion cells and batteries



What is thermal runaway?



Energy density and Watt-hour (Wh) rating



Full regulation and exceptions by mode



Packing cells/batteries alone, in equipment, etc



Modal regulations for highway, rail, air, and vessel



**NEW!** | Stay Ahead of New (or Changing) Regulations

# Key #1: Lithium-Ion or Lithium Metal?

Lithium batteries come in two types—*lithium-metal* and *lithium-ion*. Knowing which you ship will help you to identify information like size and quantity limits you need to know.

Knowing if your cell or battery is lithium-metal or lithium-ion also allows you to focus on the regulatory requirements and variations that apply to *your* type of cell or battery.

Not *all* of the lithium battery rules will apply to any one shipment. Identifying which rules to follow and where to find them are hurdles you can overcome by thinking through the shipping process before trying to navigate the regulations.

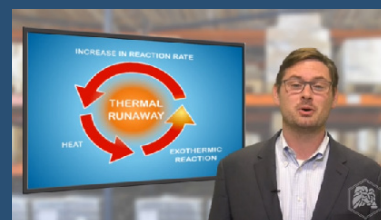
## “Lithium-metal” batteries and cells:

- Are **non-rechargeable**.
- Are also called “**primary**” cells or batteries.
- Have an anode containing **lithium metal or alloys**.
- Often **power small consumer electronics** like calculators, watches, cameras, and others.



## “Lithium-ion” batteries and cells:

- Are **rechargeable**.
- Are also called “**secondary**” cells or batteries
- Have an anode which **contains no lithium metal**.
- Contain **lithium ions** that oscillate between (+) and (-) electrodes, creating energy.



### VIDEO:

[What Makes Lithium Batteries Hazardous?](#)

[WATCH VIDEO >>](#)

## Extreme Heat, Extreme Hazard

When a lithium battery short circuits during transportation due to damage, defect, or exposure to extreme conditions, the incident can quickly escalate into a “thermal runaway event.”

**Thermal runaway** occurs when a chemical reaction in one or more cells increases the temperature inside the battery. As the heat builds, so does the rate of the chemical reaction. This pattern quickly spirals out of control and causes the battery to smoke, ignite, and/or explode.



# Key #2: Full Regulation vs. “Excepted” Shipments

Fully regulated vs. excepted lithium cells and batteries, by mode			
		Status by Mode of Transportation	
TYPE	ENERGY DENSITY	GROUND	AIR, VESSEL
<i>Lithium-metal</i> CELL	≤ 1 g	Excepted	Excepted **
	> 1 g to ≤ 5 g	Excepted *	Fully Regulated
	> 5 g	Fully Regulated	Fully Regulated
<i>Lithium-metal</i> BATTERY	≤ 2 g	Excepted	Excepted **
	> 2 g to ≤ 25 g	Excepted *	Fully Regulated
	> 25 g	Fully Regulated	Fully Regulated
<i>Lithium-ion</i> CELL	≤ 20 Wh	Excepted	Excepted **
	> 20 Wh to ≤ 60 Wh	Excepted *	Fully Regulated
	> 60 Wh	Fully Regulated	Fully Regulated
<i>Lithium-ion</i> BATTERY	≤ 100 Wh	Excepted	Excepted **
	> 100 Wh to ≤ 300 Wh	Excepted *	Fully Regulated
	> 300 Wh	Fully Regulated	Fully Regulated
<p>* Packages must be marked with: <i>“Lithium Batteries - Forbidden for Transport Aboard Aircraft or Vessel”</i></p> <p>** By air, may be shipped as “Excepted” only when packaged in or with equipment.</p>			

The US and international shipping regulations that apply to lithium cells and batteries vary based on *energy density*.

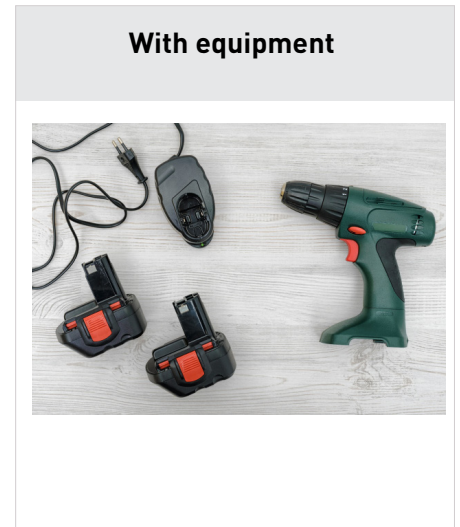
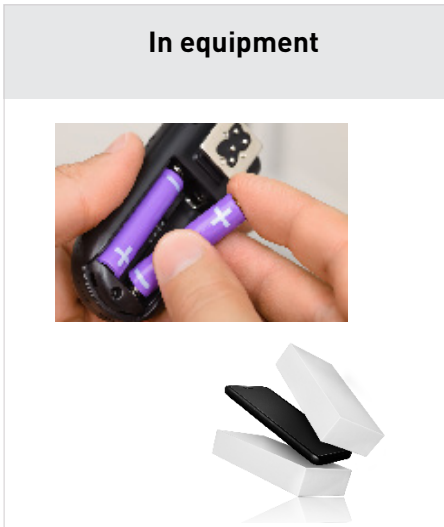
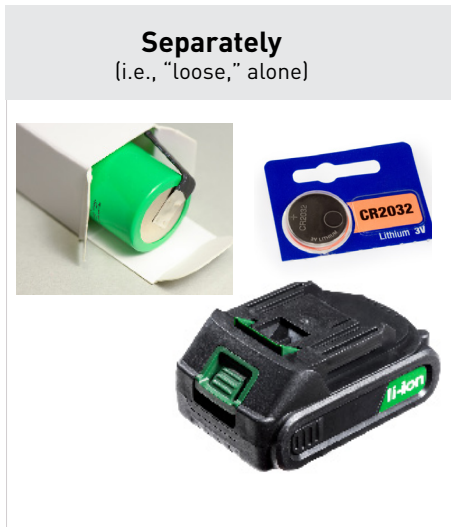
Batteries with a greater energy density are subject to more stringent rules—i.e., “full regulation”—while those with lesser energy density can qualify for exception from certain packaging, labeling, and documentation requirements.

- For *lithium-metal* cells and batteries, energy density is measured in **lithium-metal content** (in grams).
- For *lithium-ion* cells and batteries, energy density is measured in **Watt hour (Wh)** rating.

*The table above shows how the regulatory status for lithium-ion and -metal cells and batteries differs based on the mode of transportation and the energy density of the battery or cell.*

# Key #3: Alone, In Equipment, or With Equipment?

A lithium-ion and/or -metal cell or battery may be packaged for transportation in one of **three (3) arrangements**:



How you ship your lithium battery will help you to determine exactly which rules to follow—whether you're shipping by ground, air, or vessel. Batteries shipped alone are subject to more stringent limits on package size than those shipped in or with equipment, for example. What's more, standalone lithium batteries are prohibited from carriage as cargo on passenger aircraft.

Knowing how you plan to ship will be critical to make informed decisions when weighing your transport options.

# Key #4: Mode of Transportation

Do you plan to move your lithium batteries by highway, rail, aircraft, or cargo ship? Because of the unique hazards they pose in transit, batteries shipped by air or vessel can be subject to more stringent limits and requirements than batteries shipped by ground.

## Where Do I Find the Rules I Need?

Regulations for shipping hazardous materials—including lithium batteries—are largely separated into **three major texts**. You may need to refer to one or all of these books to properly prepare your shipment.

Mode of Transportation		Relevant Regulations...
Ground		<b>US Hazardous Materials Regulations (HMR)</b>  The US Department of Transportation regulations for hazmat shippers are found in 49 CFR, Parts 100–181.
Air		<b>IATA <i>Dangerous Goods Regulations (DGR)</i></b>  A revised edition of the International Air Transport Association (IATA) DGR takes effect every January 1.
Vessel		<b>IMDG Code</b>  An amended edition of the <i>International Maritime Dangerous Goods Code (IMDG Code)</i> is published during every even-numbered year.

# Key #5: Stay Ahead of New (or Changing) Regulations

The 2025 Edition of the IATA *Dangerous Goods Regulations* (DGR) includes new guidance related to lithium ion batteries in air transportation.

IATA recommends that, starting January 1, 2025, shippers of lithium-ion batteries packed in or with equipment (UN 3481), or in vehicles (UN 3556), abide by a limit on state-of-charge in air transportation. In 2026, some of the recommendations will become *mandatory* requirements.

A 30% state-of-charge limit already applies to lithium batteries shipped alone by air (UN 3480).

## Recommended Limits for 2025

For 2025, the IATA *DGR* **recommends** that shipments of the following be offered for transport at a state of charge not exceeding 30% of their rated design capacity:

- UN 3481, lithium ion batteries packed with equipment
- UN 3481, lithium ion batteries contained in equipment \*
- UN 3556, Vehicle, lithium ion battery powered \*

\* An “indicated battery capacity” not exceeding 25% is also acceptable.



## Mandatory Limits Start January 1, 2026

Starting *January 1, 2026*, shipments of the following **must be offered** for transport at a state of charge not exceeding 30% of their rated design capacity:

UN 3481, lithium ion batteries packed with equipment *where the cells/batteries have a Watt-hour rating greater than 2.7 Wh.*

Starting *January 1, 2026*, shipments of the following **must be offered** for transport at a state of charge not exceeding 30% of their rated design capacity or an indicated battery capacity not exceeding 25%:

UN 3556, Vehicle, lithium ion battery powered *where the battery has a Watt-hour rating greater than 100 Wh.*

While the mandatory limits apply to *some* lithium battery shipments only starting in 2026, IATA will continue to recommend that all shipments referenced on this page be offered a state of charge not exceeding 30%.



# LION

TECHNOLOGY INC.®

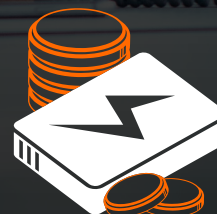
## Ship Lithium Batteries With Confidence

Convenient training for individuals or groups covering what you need to know to ship lithium batteries in compliance with US and international regulations.

[Join a live webinar](#) or [train online at your own pace.](#)

### Shipping Lithium Batteries Training

Provides training for shippers and “hazmat employees” and the current US DOT, IATA *DGR*, and *IMDG Code* regulations for shipping lithium batteries — alone, in equipment, or with equipment by ground, air, or vessel.



### RECOMMENDED COURSES

[Shipping Lithium Batteries Online Course](#)

[Shipping Excepted Lithium Batteries Online Course](#)

ENROLL NOW



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



888-546-6511



[info@lion.com](mailto:info@lion.com)