

CINS Guidelines for Shipping Lithium-ion Cells in Containers



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Introduction

This document provides shipping companies, operators and carriers with safety standard guidance for the transportation of lithium-ion cells, classified under UN Nos. 3480 and 3481, in Cargo Transport Units (CTUs). It focuses on the specific risks associated with shipping lithium-ion cells, which differ from lithium-ion batteries due to differences in structure and configuration. As components of batteries, lithium-ion cells present a higher risk during transportation than new, non-waste lithium-ion batteries.

Quality control procedures during manufacturing are essential to identify and reject cells in poor condition, thereby reducing the risks posed by defective or substandard cells.

Relation to SAR 101

This document complements the SAR 101 guidelines published by CINS.

- It provides practical guidance for shipping lithium-ion cells packed in CTUs, whether declared as dangerous goods or shipped under the exemptions of Special Provision (SP)188.
- SAR 101 focuses on the technical and chemical properties of lithium-ion batteries and cells.

Definitions

The following definitions, sourced from the *Manual of Tests and Criteria*¹, are provided for clarity:

1. **Cell:** A single encased electrochemical unit (one positive and one negative electrode) that exhibits a voltage differential across its two terminals and may contain protective devices.
2. **Lithium-ion cell:** A rechargeable electrochemical cell in which both the positive and negative electrodes are intercalation compounds. Lithium exists in an ionic or quasi-atomic form within the electrode material. Lithium polymer cells using lithium-ion chemistry are regulated as lithium-ion cells or batteries.
3. **Large cell:** A cell with a gross mass of more than 500 g.
4. **Button cell or battery:** A small round cell or battery where the overall height is less than the diameter.

1. The Manual of Tests and Criteria contains criteria, test methods and procedures to be used for classification of dangerous goods according to the provisions of the "United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations", as well as of chemicals presenting physical hazards according to the "Globally Harmonized System of Classification and Labelling of Chemicals" (GHS). It gives descriptions of the test methods and procedures considered to be the most useful for providing classifiers with the necessary information to arrive at a proper classification. It also supplements national or international regulations, which are derived from the Model Regulations or the GHS.

1. Cargo Issues

1.1 Description of Lithium-Ion Cells and Associated Risks

Lithium-ion cells are the primary elements of a battery and can exist in various forms. Commonly used in portable electronics and electric vehicles, their defining characteristic is the ability to accumulate, store, and release electrical energy through the movement of lithium ions between a positive and a negative electrode.

Lithium-ion cells must be handled with care, as they pose several risks if damaged, improperly charged, or exposed to extreme conditions. Proper safety features and handling protocols are critical to mitigating these risks.

1.2 Hazardous Properties of Lithium-Ion Cells

Lithium-ion cells are classed as dangerous goods because of several hazardous properties listed below. Strict adherence to safety standards during handling and transport are required.

1. **Fire Hazard:** Flammable electrolytes can ignite if damaged or overheated, triggering thermal runaway reactions that lead to fires or explosions.
2. **Chemical Reactivity:** Reactive materials may explode or catch fire if punctured or short-circuited.
3. **Toxic Emissions:** Fires release harmful gases such as hydrogen fluoride (HF), which are toxic and corrosive.
4. **Explosion Risk:** Internal pressure buildup can cause rupture or explosive vapor clouds.
5. **Electrical Hazard:** Short circuits or mishandling can lead to burns, sparks, or fires.
6. **Environmental Risk:** Improper disposal can contaminate soil and water, causing environmental harm.

1.3 Key Risks During Transportation

The below factors increase the risks involved in lithium-ion cell carriage.

- Packing not consigned in compliance with the IMDG Code.
- Packing into containers other than in accordance with the CTU Code.
- High temperature inside container (s) during transport

1.4 United Nations Dangerous Goods Regulations²

Lithium ion cells in IMDG/ Dangerous Goods Regulations can be declared as follows:

Proper Shipping Name	Hazard Class	UN Number
LITHIUM-ION BATTERIES (including Lithium-Ion Polymer Batteries)	9	3480
LITHIUM-ION BATTERIES CONTAINED IN EQUIPMENT or LITHIUM-ION BATTERIES PACKED WITH EQUIPMENT (including Lithium-Ion Polymer Batteries contains in equipment)	9	3481

It is important to note that lithium-ion cell shipments can be exempted from the IMDG Code³ requirements if they comply with the provisions set out in special provision 'SP188'⁴.

2. The United Nations Recommendations on the Transport of Dangerous Goods (the 'Model Regulations', colloquially known as the 'Orange Book') set out the necessary provisions that allow uniform development of national and international regulations to facilitate safe transport by all modes. For the transport of dangerous goods in packaged by sea, the Model Regulations are incorporated into the International Maritime Dangerous Goods (IMDG Code).

3. This document uses as reference Amendment 42-24 of the IMDG Code, which entered transitional effect from 1 January 2025, meaning that stakeholders may start using the revised provisions, and will be mandatorily in force from 1 January 2026 to 31 December 2027.

4. For reference, the full text of SP188 is included in Appendix A.

1.5 Packaging

Packaging must meet the IMDG Code requirements as specified in the individual packing instructions and is determined according to the condition of the cell. Cells must be protected against short-circuit:

- P903/LP903 – New cells that have passed UN38.3 testing
- P908/LP904 – Damaged or defective cells
- P909 – Cells for disposal or recycling
- P910/LP905 – Production runs consisting of not more than 100 cells, or pre-production prototype cells transported for testing
- P911/LP906 – liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours under normal conditions of transport.

Cells exempted under SP188 are not required to follow the above packing instructions and require each cell to be individually packed in inner packagings. These must be protected against short-circuit and placed in strong rigid outer packagings.

1.6 Marking and labelling

Lithium-ion cells must be correctly labelled and marked according to the IMDG Code provisions. Packages must display the label model 9A as shown below, unless exempted by SP188:



For those shipments exempted by SP188, every package must show the lithium and sodium ion battery as per 5.2.1.10 and illustrated by the example below:



2. Preparation for transport

2.1 Booking Process Under SP188

As a minimum, during the booking process under this Special Provision, shippers should inform the shipping company about the presence of Lithium-ion Cells in the container.

When lithium-ion cells are shipped under the exemptions provided by SP188, the following measures are strongly recommended:

1. The box operator should notify the vessel operator of the presence of CTUs containing lithium-ion cells shipped under this exemption.
2. The box operator and the vessel operator should establish dedicated agreements for the shipment of lithium-ion cells under this exemption and the load-list should highlight containers with lithium-ion cells

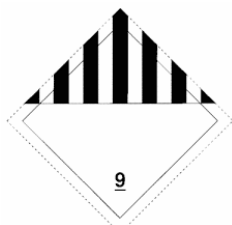
2.2 Packing the CTU

We do not recommend co-loading lithium-ion cells with other Dangerous Goods, except lithium-ion batteries. To ensure adequate packing is carried out and there is no mixed loading, Shippers must pack and stuff in accordance with IMDG code/CTU code and shipping lines should conduct random checks to ensure compliance. To assist firefighting and to mitigate risks, it is recommended that cargo stuffing should keep to:

- a minimum 30cm gap between the top of cargo and the container ceiling.
- a minimum 30cm gap between the cargo and the container doors
- ensuring that the packaging is not in direct contact with the container walls

2.3 Placarding

When lithium-ion cells are transported, the CTU must display class 9 placards as shown below:



This placard is not required for cells shipped under SP188.

2.4 Inspection

It is recommended that shipping lines randomly inspect the contents to check compliance with the IMDG code and CTU code.

When undertaking a tailgate inspection, the following criteria are recommended:

1. Review of Dangerous Goods Declaration (DGD) for compliance with the IMDG Code.
2. Inspection of CTU for structural serviceability.
3. Inspection of CSC plate to ensure validity.
4. Thermal image/camera use where available to spot temperature anomalies.
5. Inspection of cargo to confirm it is as declared on the DGD. Note that packages of cells or batteries that meet SP188 shall be marked with the appropriate lithium battery mark, however no DGD is required for the cargo meeting SP188.
 - a. If shipped under SP188, request the UN38.3 test summary.
 - b. If shipped under SP188, a sample package may need to be opened, or equipment opened, to verify compliance with SP188, .4. .5 and .7.

6. Inspection of packaging's for leaks or damage.
7. Inspection of packaging's and UN Packing Codes to confirm they are approved for the cargo as per the IMDG Code Packing Instructions.
8. Inspection of package marks and labels for compliance.
9. If other cargo is in the container, check any segregation requirements.
10. Inspect that the packages are suitably stowed, secured, blocked and braced as per the IMDG and CTU Code.
11. Inspect placards and marks are properly affixed to the container as required by IMDG.
12. Ensure doors are closed and replacement seal is installed, and number is recorded.
13. Stuffing should be in accordance with these CINS Guidelines

Vanning inspections can be performed to ensure batteries are packaged according to the appropriate packing instruction, for example P909; specifically, requirements regarding protection against short circuit and the dangerous evolution of heat are followed.

In light of the 'know your shipper' initiative, it may be beneficial for surveyors to assist shipping lines and shippers/ customers in this process by requesting training records and ISO 9001 accreditation from shippers (before undertaking visits). During these visits, surveyors can ensure that shippers fully understand and comply with the relevant regulations, particularly SP188. This proactive approach would help shippers meet the regulatory requirements for transporting batteries without the need for declaration, ensuring compliance and minimizing potential risks.

Additionally, a short training presentation on battery regulations, with a focus on proper packing and SP188, could be offered at warehouses to further educate shippers and ensure they are fully equipped to handle these requirements.

2.5 Shipment of used Lithium-ion Cells, (including, but not limited to, defective, damaged, or those shipped for disposal or recycling)

For shipments of cells identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the Manual of Tests and Criteria shall comply with the requirements of SP376

For shipments of cells and equipment containing cells transported for disposal or recycling see SP377,

The full text of these special provisions are provided in Appendix A.

Once packed into a container, this guidance document recommends that vanning inspections be performed to ensure cells are packaged according to the appropriate packing instruction.

For damaged and defective cells this guidance document recommends that the following assessment is carried out to evaluate the cells by sampling method during the stuffing operation. It needs to be conducted by an independent survey company:

- All cells must be individually sealed in plastic. This document recommends using, in all cases, combination packaging - whatever the condition of the cell or its final use.
- Presence of means to prevent cells from movement
- Marking and documentation in accordance with SP376 or 377
- Packaging in accordance with the relevant Packing Instructions.
- The packaging must be evenly distributed within the container, with a minimum of 30cm void space to the roof
- Packaging should not be within 50 cm of the container doors and should not be in contact with the container walls. The Survey Report should include photographs proving that the stuffing is in accordance with the above elements, and the contents of some packaging and the container ID.

3. Ship loading considerations

3.1 Stowage

Stowage requirement as per IMDG CODE Stowage Category A.

ON DECK OR UNDER DECK

If the shipment is being transported according to SP376 or SP377 applicable to damaged or defective cells or those being transported for disposal or recycling, stowage is as per IMDG CODE Stowage Category C.

ON DECK ONLY

However, this guidance document strongly recommends that in all instances stowage on deck only is preferred.

Further to the above, shipments should be stowed away from sources of heat; and - in all cases - protected from direct sunlight.

We strongly recommend to stow lithium-ion cells at minimum 2x40' bay aft and forward the accommodations (including machinery space for vessels with 2 islands).

Block stowage of lithium-ion cells containers could be considered depending on the firefighting equipment available on board. A risk assessment should be performed by the company in this case.

Appendix A

(a) Special Provision 188

Cells and batteries offered for transport are not subject to other provisions of this Code if they meet the following:

.1 For a lithium metal or lithium alloy cell, the lithium content is not more than 1 g, and for a lithium-ion or sodium-ion cell, the watt-hour rating is not more than 20 Wh;

.2 For a lithium metal or lithium alloy battery, the aggregate lithium content is not more than 2 g, and for a lithium-ion or sodium-ion battery, the watt-hour rating is not more than 100 Wh. Lithium-ion and sodium-ion batteries subject to this provision shall be marked with the watt-hour rating on the outside case, except lithium-ion batteries manufactured before 1 January 2009;

.3 Each lithium cell or battery meets the provisions of 2.9.4.1, 2.9.4.5, 2.9.4.6 if applicable and 2.9.4.7 or for sodium-ion cells or batteries, the provisions of 2.9.5.1, 2.9.5.5 and 2.9.5.6 shall apply;

.4 Cells and batteries, except when installed in equipment, shall be packed in inner packagings that completely enclose the cell or battery. Cells and batteries shall be protected so as to prevent short circuits. This includes protection against contact with electrically conductive material within the same packaging that could lead to a short circuit. The inner packagings shall be packed in strong outer packagings which conform to the provisions of 4.1.1.1, 4.1.1.2, and 4.1.1.5;

.5 Cells and batteries when installed in equipment shall be protected from damage and short circuit, and the equipment shall be equipped with an effective means of preventing accidental activation. This requirement does not apply to devices which are intentionally active in transport (radio frequency identification (RFID) transmitters, watches, sensors, etc.) and which are not capable of generating a dangerous evolution of heat. When batteries are installed in equipment, the equipment shall be packed in strong outer packagings constructed of suitable material of adequate strength and 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;

.6 Each package shall be marked with the appropriate lithium or sodium ion battery mark, as illustrated in 5.2.1.10;

Note: Packages containing lithium batteries packed in conformity with the provisions of part 4, chapter 11, packing instructions 965 or 968, Section IB of the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air that bear the mark as shown in 5.2.1.10 (lithium battery mark) and the label shown in 5.2.2.2.2, Model No. 9A shall be deemed to meet the provisions of this special provision. This requirement does not apply to:

- .1 packages containing only button cell batteries installed in equipment (including circuit boards); and
- .2 packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment.

When packages are placed in an overpack, the lithium battery mark shall either be clearly visible or be reproduced on the outside of the overpack and the overpack shall be marked with the word "OVERPACK". The lettering of the "OVERPACK" mark shall be at least 12 mm high;

.7 Except when cells or batteries are installed in equipment, each package shall be capable of withstanding a 1.2 m drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents so as to allow battery to battery (or cell to cell) contact and without release of contents; and

.8 Except when cells or batteries are installed in or packed with equipment, packages shall not exceed 30 kg gross mass. Equipment within this special provision means apparatus for which the cells or batteries will provide electrical power for its operation

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As used above and elsewhere in this Code, “lithium content” means the mass of lithium in the anode of a lithium metal or lithium alloy cell. Separate entries exist for lithium metal batteries and lithium-ion batteries to facilitate the transport of these batteries for specific modes of transport and to enable the application of different emergency response actions.

A single cell battery as defined in part III, subsection 38.3.2.3 of the Manual of Tests and Criteria is considered a “cell” and shall be transported according to the requirements for “cells” for the purpose of this special provision.

(b) Special Provision 376

Lithium metal, lithium-ion or sodium-ion cells or batteries identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the Manual of Tests and Criteria shall comply with the requirements of this special provision.

For the purposes of this special provision, these may include, but are not limited to:

- Cells or batteries identified as being defective for safety reasons;
- Cells or batteries that have leaked or vented;
- Cells or batteries that cannot be diagnosed prior to transport; or
- Cells or batteries that have sustained physical or mechanical damage.

Note: In assessing a cell or battery as damaged or defective, an assessment or evaluation shall be performed based on safety criteria from the cell, battery or product manufacturer or by a technical expert with knowledge of the cell's or battery's safety features. An assessment or evaluation may include, but is not limited to, the following criteria:

- .1 acute hazard, such as gas, fire or electrolyte leaking;
- .2 the use or misuse of the cell or battery;
- .3 signs of physical damage, such as deformation to cell or battery casing, or colours on the casing;
- .4 external and internal short circuit protection, such as voltage or isolation measures;
- .5 the condition of the cell or battery safety features; or
- .6 damage to any internal safety components, such as the battery management system.

Cells and batteries shall be transported according to the provisions applicable to UN 3090, UN 3091, UN 3480, UN 3481, UN 3551 and UN 3552, as appropriate, except special provision 230 and as otherwise stated in this special provision.

Cells and batteries shall be packed in accordance with packing instructions P908 of 4.1.4.1 or LP904 of 4.1.4.3, as applicable.

Cells and batteries identified as damaged or defective and liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours under normal conditions of transport shall be packed and transported in accordance with packing instruction P911 of 4.1.4.1 or LP906 of 4.1.4.3, as applicable. Alternative packing and/or transport conditions may be authorized by the competent authority.

Packages shall be marked “DAMAGED/DEFECTIVE” in addition to the proper shipping name, as stated in 5.2.1. The transport document shall include the following statement “Transport in accordance with special provision 376”.

If applicable, a copy of the competent authority approval shall accompany the transport.

(c) Special Provision 377

Lithium metal, lithium-ion and sodium-ion cells and batteries and equipment containing such cells and batteries transported for disposal or recycling, either packed together with or packed without non-lithium or non-sodium ion batteries, may be packaged in accordance with packing instruction P909 of 4.1.4.1.

These cells and batteries are not subject to the requirements of section 2.9.4 or 2.9.5.

Packages shall be marked “LITHIUM BATTERIES FOR DISPOSAL”, “LITHIUM BATTERIES FOR RECYCLING”, or SODIUM ION BATTERIES FOR RECYCLING”, as appropriate.

Identified damaged or defective batteries shall be transported in accordance with special provision 376.

The transport document shall include the following statement: “Transport in accordance with special provision 377”.



CINS – Cargo Incident Notification System

CINS is a shipping line initiative, launched in September 2011, to improve safety in the supply chain, reduce the number of cargo incidents on-board ships and on land, and highlight the risks caused by certain cargoes and/or packing failures. Membership of CINS comprises container shipping lines, the Members of the International Group of P&I Clubs and the TT Club, together with technical experts specialising in safe containerised cargo transport.

CINS provides analysis of operational information on cargo and container incidents which lead to injury or loss of life, loss or serious damage of assets, environmental concerns. Data relating to any cargo incident on-board a ship is uploaded to the CINS database. The data includes information on cargo type, nature, packaging, weight; journey (load and discharge ports); type of incident and root cause.



International Group of P&I Clubs

The principal underwriting associations which comprise the International Group, between them provide liability cover (protection and indemnity) for approximately 90% of the world's ocean-going tonnage. Each Group Club is an independent, non-profit making mutual insurance association, providing cover for its shipowner and charterer members against third party liabilities relating to the use and operation of ships. Each Club is controlled by its members through a board of directors, or committee, elected from the membership. Clubs cover a wide range of liabilities, including loss of life and personal injury to crew, passengers and others on board, cargo loss and damage, pollution by oil and other hazardous substances, wreck removal, collision and damage to property.



TT Club

TT Club is the established market-leading independent provider of mutual insurance and related risk management services to the international transport and logistics industry. TT Club's primary objective is to help make the industry safer and more secure. Founded in 1968, the Club has more than 1200 Members, spanning container owners and operators, ports and terminals, and logistics companies, working across maritime, road, rail and air. TT Club is renowned for its high-quality service, in-depth industry knowledge and enduring Member loyalty. It retains more than 95% of its Members with a third of its entire membership having chosen to insure with the Club for 20 years or more. TT Club has been actively involved in CINS since its foundation.



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