

## Technical Notice

### Transport Regulations for Lithium Metal Batteries

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## 1. Exemptions

Lithium metal batteries are dangerous goods, UN No. 3090. Therefore they are generally subject to transport regulations, depending on the transport mode. However, most Tadiran Lithium Batteries listed in the product data catalogue are exempted from the regulations if the following conditions are given:

- The batteries have not more than 2 g lithium content, each cell not more than 1 g lithium content (Table 1).
- The batteries have passed the UN tests (Table 1).
- The batteries shall be packed in inner packagings that completely enclose them. They shall be protected so as to prevent short circuits.
- The package and the shipping documents are marked with a notice indicating that it contains lithium batteries and shall – if damaged – be quarantined, inspected and repacked (see “Lithium Battery Mark”).
- The gross mass does not exceed 30 kg per package (ADR / RID /IMDG-Code).
- The net mass does not exceed 2,5 kg per package (IATA DGR).
- Lithium metal cells / batteries as aircraft cargo with more than 0,3 g but less than 1g / 2 g lithium content is restricted (please refer to packaging instruction 968 part IB and II).
- The „Cargo Aircraft Only“ handling label and the “Lithium Battery Mark” (IB und II) together with Class 9A hazard label must be attached on the package (IATA DGR).
- The packaging shall be strong and capable of withstanding a 1.2 m drop test.
- For more requirements see special provision 188 (ADR/RID/IMDG-Code) and section II of packing instructions 968 - 970 (IATA DGR).

## 2. Classification of lithium metal batteries

Table 1 shows Tadiran's Lithium Metal Batteries and which of them are exempted from the dangerous goods regulations and which are not. The regulations for not exempted batteries are summarized in table 2.

System	Size	Typ				Exempted <sup>1</sup>	Lithium content [g]	UN Test passed	UN Number	
Lithium thionylchloride (LTC)	1/10C		TLH-2450	TL-2450		Yes	0,18	Yes	3090/91	
	1/10D			SL-786	SL-886	Yes	0,3	Yes	3090/91	
	1/6D			SL-789	SL-889	Yes <sup>2)</sup>	0,5	Yes	3090/91	
	1/2AA	SL-350	SL-550	SL-750	SL-850	Yes <sup>2)</sup>	0,35	Yes	3090/91	
	2/3AA	SL-361	SL-561	SL-761	SL-861	Yes <sup>2)</sup>	0,5	Yes	3090/91	
	AA	SL-360	SL-560	SL-760	SL-860	Yes <sup>2)</sup>	0,65	Yes	3090/91	
	C			SL-2770	SL-2870	No	2,5	Yes	3090/91	
	D			SL-2780	SL2880	No	5	Yes	3090/91	
	DD			SL-2790		No	10	Yes	3090/91	
Hybrid Layer Capacitors (HLC)	AAA	HLC-1020 (3,7 V und 3,9 V)				Yes	0,01	Yes	3090/91	
	1/2AA	HLC-1520 (3,7 V)				Yes	0,02	Yes	3090/91	
	2/3AA	HLC-1530 (3,7 V)				Yes	0,02	Yes	3090/91	
	AA	HLC-1550 (3,7 V)				Yes	0,05	Yes	3090/91	
	1/2AA	HLC-1520 (3,9 V)				Yes	0,03	Yes	3090/91	
	2/3AA	HLC-1530 (3,9 V)				Yes	0,05	Yes	3090/91	
	AA	HLC-1550 (3,9 V)				Yes	0,10	Yes	3090/91	
Tadiran Lithium metal oxide (TLM)	1/2AA	TLM-1520HP				Yes	0,04	Yes	3090/91	
	2/3AA	TLM-1530HP				Yes	0,08	Yes	3090/91	
	AA	TLM-1550HP				Yes	0,18	Yes	3090/91	
		AA	TLM-1550UHP				Yes	0,16	Yes	3090/91
	1/2AA	TLM-1520HE				Yes	0,11	Yes	3090/91	
	2/3AA	TLM-1530HE				Yes	0,20	Yes	3090/91	
		AA	TLM-1550HE				Yes <sup>2)</sup>	0,44	Yes	3090/91

1) if conditions mentioned in the text are fulfilled  
2) see also IATA DGR under UN 3090 / PI 968 / Table 968-II

**Table 1**

Classification of Tadiran's Lithium Metal Batteries

### 3. UN tests

Table 1 also shows the status of UN-tests for Tadiran's Lithium Metal Batteries according to the UN Manual of Tests and Criteria, part III, sub-section 38.3. Regarding Tadiran Lithium Batteries not listed in table 1, please apply to Tadiran Batteries for a confirmation.

### 4. Overview dangerous goods by transport mode

Transport regulations for lithium metal batteries					
UN-No. and class	Limitations and instructions	Passenger aircraft IATA DGR	Cargo aircraft IATA DGR	Road/Railway transport ADR/RID	Sea transport IMDG Code
<b>Lithium metal batteries</b>					
UN 3090 Class 9	Maximum net mass per package	<b>Forbidden</b> (as of 2015)	35 kg	according to packaging approval	
	Packing group		See LTN-065-70 page 9		
	Packing instruction		968	P 903	
	Marking		Class 9A hazard label for lithium batteries and handling label "Cargo Aircraft Only"	Class 9A hazard label for lithium batteries	
<b>Lithium metal batteries contained in equipment / packed with equipment</b>					
UN 3091 Class 9	Max. Qty. of batteries per piece of equipment	5 kg / -	35 kg / -		
	Max. Qty. of batteries per package, excluding equipment	- / 5 kg	- / 35 kg		
	Packing group	not assigned			
	Packing instruction	970 / 969	970 / 969	903 a, b	903
	Marking	Class 9A hazard label for lithium batteries	Class 9A hazard label for lithium batteries and Handling Label "Cargo Aircraft Only"	Class 9A hazard label for lithium batteries	
Further instructions		see packing instructions		see special provision 230	

**Table 2**

Transport regulations for lithium metal cells / batteries: more than 1 g / 2 g lithium content (refer to Table 1)

It is necessary to refer to the listed regulations and instructions for detailed information. They are revised on a regular basis. The tables are based on the revisions effective in January 2017.

The applicable documents are:

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road,

IATA DGR: International Air Transport Association, Dangerous Goods Regulations,

ICAO: International Civil Aviation Organization, Technical Instructions for the Safe Transport of Dangerous Goods by Air,

IMDG Code: International Maritime Dangerous Goods Code,

RID: International Statutory Order on the Conveyance of Dangerous Goods by Rail,

UN: United Nations Recommendations on the Transport of Dangerous Goods.

### 5. Shipping of defect cells

Tadiran must be contacted prior to the shipping of defect cells in order to agree on the procedure.



Handling Label Cargo Aircraft Only,

*reduced size,  
black on orange (Pantone color No. 151U)*

Cargo IMP Code: CAO  
Minimum dimensions 120 x 110 mm



Lithium Battery Mark,

*reduced size,  
black on white,  
red boarder with diagonal hatchings*

\*Place for UN number(s)  
\*\* Place for a telephone number for  
additional information

Minimum dimensions 120 x 110 mm

## ADR 2017 Transport Regulations for Road and Rail Transport

### Overview

UN 3090	LITHIUM-METALL-BATTERIES				See ADR chapter
UN 3091	LITHIUM-METALL-BATTERIES CONTAINED IN EQUIPMENT or LITHIUM-METALL-BATTERIES PACKED WITH EQUIPMENT				
Class	9	Miscellaneous	x	x	2.9
Packing group					2.0.1.3
Special provisions	188	Excepted if ...	x	x	3.3
	230	Class 9 if...	x	x	
	310	Prototypes		x	
	360	Battery powered vehicles	x		
	376	Damaged or defective lithium batteries	x	x	
	377	Lithium batteries for disposal or recycling			
Limited quantities	0	No	x	x	
Excepted quantity	E0	No	x	x	3.5
Packing instructions	P903	Lithium batteries	x	x	4.1.4.1
	P908	Defect batteries	x	x	
	P909	Batteries for disposal	x	x	
	LP903	Large packaging for single battery	x	x	
	LP904	Large packaging for single damaged or defect battery	x	x	
EmS	F-A	Fire schedule Alfa	x	x	LTN-065-72
	S-I	Spillage schedule India	x	x	LTN-065-72
Stowage	Category A		x	x	7.1; 7.2
	SW19		x	x	LTN-065-72
Transport category	2	Exemption under 333 kg	x	X	1.1.3.6
Tunnel code	E	Forbidden in tunnels of category E	X	X	8.6

**1.6.1.29**

Lithium cells and batteries manufactured according to a type meeting the requirements of sub-section 38.3 of the Manual of Tests and Criteria, Revision 3, Amendment 1 or any subsequent revision and amendment applicable at the date of the type testing may continue to be carried, unless otherwise provided in ADR.

Lithium cells and batteries manufactured before 1 July 2003 meeting the requirements of the Manual of Tests and Criteria, Revision 3, may continue to be carried if all other applicable requirements are fulfilled.

**2.2.9.1.7**

Lithium batteries shall meet the following requirements, except when otherwise provided for in ADR (e.g. for prototype batteries and small production runs under special provision 310 or damaged batteries under special provision 376).

Cells and batteries, cells and batteries contained in equipment, or cells and batteries packed with equipment, containing lithium in any form shall be assigned to UN Nos. 3090, 3091, 3480 or 3481 as appropriate. They may be carried under these entries if they meet the following provisions:

- (a) Each cell or battery is of the type proved to meet the requirements of each test of the Manual of Tests and Criteria, Part III, sub-section 38.3;  
**Note:** *Batteries shall be of a type proved to meet the testing requirements of the Manual of Tests and Criteria, part III, sub-section 38.3, irrespective of whether the cells of which they are composed are of a tested type.*
- (b) Each cell and battery incorporates a safety venting device or is designed to preclude a violent rupture under normal conditions of carriage;
- (c) Each cell and battery is equipped with an effective means of preventing external short circuits;
- (d) Each battery containing cells or series of cells connected in parallel is equipped with effective means as necessary to prevent dangerous reverse current flow (e.g., diodes, fuses, etc.);
- (e) Cells and batteries shall be manufactured under a quality management programme that includes:
  - (i) A description of the organizational structure and responsibilities of personnel with regard to design and product quality;
  - (ii) The relevant inspection and test, quality control, quality assurance, and process operation instructions that will be used;
  - (iii) Process controls that should include relevant activities to prevent and detect internal short circuit failure during manufacture of cells;
  - (iv) Quality records, such as inspection reports, test data, calibration data and certificates. Test data shall be kept and made available to the competent authority upon request;
  - (v) Management reviews to ensure the effective operation of the quality management programme;
  - (vi) A process for control of documents and their revision;
  - (vii) A means for control of cells or batteries that are not conforming to the type tested as mentioned in (a) above;
  - (viii) Training programmes and qualification procedure for relevant personnel; and
  - (ix) Procedure to ensure that there is no damage to the final product.

**Note:** *In house quality management programmes may be accepted. Third party certification is not required, but the procedures listed in (i) to (ix) above shall be properly recorded and traceable. A copy of the quality management programme shall be made available to the competent authority upon request.*

Lithium batteries are not subject to the provisions of ADR if they meet the requirements of special provision 188 of Chapter 3.3.

**Special Provision 188**

Cells and batteries offered for carriage are not subject to other provisions of ADR if they meet the following:

- (a) For a lithium metal or lithium alloy cell, the lithium content is not more than 1 g, and for a lithium ion cell, the Watt-hour rating is not more than 20 Wh;
- (b) For a lithium metal or lithium alloy battery the aggregate lithium content is not more than 2 g, and for a lithium ion battery, the Watt-hour rating is not more than 100 Wh. Lithium ion batteries subject to this provision shall be marked with the Watt-hour rating on the outside case, except those manufactured before 1 January 2009;
- (c) Each cell or battery meets the provisions of 2.2.9.1.7 (a) and (e);
- (d) 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 conductive materials 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;
- (e) 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 carriage (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;
- (f) Each package shall be marked with the appropriate lithium battery mark, as illustrated in 5.2.1.9;  
This requirements does not apply to
  - (i) Packages containing only button cell batteries installed in equipment (including circuit boards); and
  - (ii) Packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment-
- (g) Except when 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
- (h) Except when batteries are installed in or packed with equipment, packages shall not exceed 30 kg gross mass.

As used above and elsewhere in ADR, "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 carriage of these batteries for specific modes of carriage and to enable the application of different emergency response actions.

A single cell battery as defined in Part III, sub-section 38.3.2.3 of the Manual of Test and Criteria is considered a "cell" and shall be carried according to the requirements for "cells" for the purpose of this special provision.

**Special Provision 230**

Lithium cells and batteries may be carried under this entry if they meet the provisions of 2.2.9.1.7.

**Special Provision 310**

The testing requirements in the Manual of Tests and Criteria, part III sub-section 38.3 do not apply to production runs, consisting of not more than 100 cells and batteries, or to pre-production prototypes of cells and batteries when these prototypes are carried for testing when packaged in accordance with packing instruction P910 of 4.1.4.1.

The transport document shall include the following statement: "Carriage in accordance with special provision 310".

Damaged or defective cells, batteries, or cells and batteries contained in equipment shall be carried in accordance with special provision 376 and packaged in accordance with packing instructions P908 of 4.1.4.1. or LP904 of 4.1.4.3, as applicable.

Cells, batteries or cells and batteries contained in equipment carried for disposal or recycling may be packaged in accordance with special provision 377 and packing instruction P909 of 4.1.4.1.

### Special Provision 360

Vehicles only powered by lithium metal batteries or lithium ion batteries shall be classified under the entry UN 3171 battery-powered vehicle.

### Special Provision 376

Lithium ion cells or batteries and lithium metal 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 carriage; or
- Cells or batteries that have sustained physical or mechanical damage.

**NOTE:** *In assessing a battery as damaged or defective, the type of battery and its previous use and misuse shall be taken into account.*

Cells and batteries shall be carried according to the provisions applicable to UN No. 3090, UN No. 3091, UN No. 3480 and No. UN 3481, except special provision 230 and as otherwise stated in this special provision.

Packages shall be marked "DAMAGED/DEFECTIVE LITHIUM-ION BATTERIES" or "DAMAGED/DEFECTIVE LITHIUM METAL BATTERIES", as applicable.

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 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 carriage shall not be carried except under conditions approved by the competent authority of any ADR Contracting Party who may also recognize an approval granted by the competent authority of a country which is not an ADR Contracting Party provided that this approval has been granted in accordance with the procedures applicable according to RID, ADR, ADN, the IMDG Code or the ICAO Technical Instructions. In this case the cells and batteries are assigned to transport category 0.

### Special Provision 377

Lithium ion and lithium metal cells and batteries and equipment containing such cells and batteries carried for disposal or recycling, either packed together with or packed without non-lithium 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 2.2.9.1.7 (a) to (e).

Packages shall be marked "LITHIUM BATTERIES FOR DISPOSAL" or "LITHIUM BATTERIES FOR RECYCLING".

Identified damaged or defective batteries shall be carried in accordance with special provision 376 and packaged in accordance with P908 of 4.1.4.1 or LP904 of 4.1.4.3, as applicable.



P903	PACKING INSTRUCTION	P903
This instruction applies to UN Nos. 3090, 3091, 3480 and 3481.		
The following packagings are authorized provided the general provisions of 4.1.1 and 4.1.3 are met:		
<p>(1) For cells and batteries:</p> <p style="padding-left: 40px;">Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);</p> <p style="padding-left: 40px;">Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);</p> <p style="padding-left: 40px;">Jerricans (3A2, 3B2, 3H2).</p> <p>Cells or batteries shall be packed in packagings so that the cells or batteries are protected against damage that may be caused by the movement or placement of the cells or batteries within the packaging.</p> <p>Packagings shall conform to the packing group II performance level.</p> <p>(2) In addition for cells or batteries with a gross mass of 12 kg or more employing a strong, impact resistant outer casing, and assemblies of such cells or batteries:</p> <p style="padding-left: 40px;">(a) Strong outer packagings;</p> <p style="padding-left: 40px;">(b) Protective enclosures (e.g. in fully enclosed or wooden slatted crates); or</p> <p style="padding-left: 40px;">(c) Pallets or other handling devices.</p> <p>Cells or batteries shall be secured to prevent inadvertent movement, and the terminals shall not support the weight of other superimposed elements.</p> <p>Packagings need not meet the requirements of 4.1.1.3.</p> <p>(3) For cells or batteries packed with equipment:</p> <p>Packagings conforming to the requirements in paragraph (1) of this packing instruction, then placed with the equipment in an outer packaging; or</p> <p>Packagings that completely enclose the cells or batteries, then placed with equipment in a packaging conforming to the requirements in paragraph (1) of this packing instruction.</p> <p>The equipment shall be secured against movement within the outer packaging.</p> <p>For the purpose of this packing instruction, "equipment" means apparatus requiring the lithium metal or lithium ion cells or batteries with which it is packed for its operation.</p> <p>(4) For cells or batteries contained in equipment:</p> <p>Strong outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use. They shall be constructed in such a manner as to prevent accidental operation during carriage. Packagings need not meet the requirements of 4.1.1.3.</p> <p>Large equipment can be offered for carriage unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.</p> <p>Devices such as radio frequency identification (RFID) tags, watches and temperature loggers, which are not capable of generating a dangerous evolution of heat, may be carried when intentionally active in strong outer packagings.</p>		
<b>Additional requirement:</b>		
Cells or batteries shall be protected against short circuit.		

P908	PACKING INSTRUCTION	P908
<p>This instruction applies to damaged or defective lithium ion cells and batteries and damaged or defective lithium, defective metal cells and batteries, including those contained in equipment, of UN Nos. 3090, 3091, 3480 and 3481.</p>		
<p>The following packagings are authorized provided the general provisions of 4.1.1 and 4.1.3 are met:  For cells and batteries and equipment containing cells and batteries:</p> <ul style="list-style-type: none"> <li>Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G)</li> <li>Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2)</li> <li>Jerricans (3A2, 3B2, 3H2)</li> </ul> <p>Packagings shall conform to the packing group II performance level.</p> <ol style="list-style-type: none"> <li>1. Each damaged or defective cell or battery or equipment containing such cells or batteries shall be individually packed in inner packaging and placed inside an outer packaging. The inner packaging or outer packaging shall be leak-proof to prevent the potential release of electrolyte.</li> <li>2. Each inner packaging shall be surrounded by sufficient non-combustible and non-conductive thermal insulation material to protect against a dangerous evolution of heat.</li> <li>3. Sealed packagings shall be fitted with a venting device when appropriate.</li> <li>4. Appropriate measures shall be taken to minimize the effects of vibrations and shocks, prevent movement of the cells or batteries within the package that may lead to further damage and a dangerous condition during carriage. Cushioning material that is non-combustible and non-conductive may also be used to meet this requirement.</li> <li>5. Non combustibility shall be assessed according to a standard recognized in the country where the packaging is designed or manufactured.</li> </ol> <p>For leaking cells or batteries, sufficient inert absorbent material shall be added to the inner or outer packaging to absorb any release of electrolyte.</p> <p>A cell or battery with a net mass of more than 30 kg shall be limited to one cell or battery per outer packaging.</p>		
<p><b>Additional requirement:</b>  Cells or batteries shall be protected against short circuit.</p>		

P909	PACKING INSTRUCTION	P909
<p>This instruction applies to UN Nos. 3090, 3091, 3480 and 3481 carried for disposal or recycling, either packed together with or packed without non-lithium batteries.</p>		
<p>(1) Cells and batteries shall be packed in accordance with the following:</p> <p>(a) The following packagings are authorized, provided that the general provisions of 4.1.1 and 4.1.3, are met:            Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);            Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H2); and            Jerricans (3A2, 3B2, 3H2).</p> <p>(b) Packagings shall conform to the packing group II performance level.</p> <p>(c) Metal packagings shall be fitted with a non-conductive lining material (e.g. plastics) of adequate strength for the intended use.</p> <p>(2) However, lithium ion cells with a Watt-hour rating of not more than 20 Wh, lithium ion batteries with a Watt-hour rating of not more than 100 Wh, lithium metal cells with a lithium content of not more than 1 g and lithium metal batteries with an aggregate lithium content of not more than 2 g may be packed in accordance with the following:</p> <p>(a) In strong outer packaging up to 30 kg gross mass meeting the general provisions of 4.1.1, except 4.1.1.3, and 4.1.3.</p> <p>(b) Metal packagings shall be fitted with a non-conductive lining material (e.g. plastics) of adequate strength for the intended use.</p> <p>(3) For cells or batteries contained in equipment, strong outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use, may be used. Packagings need not meet the requirements of 4.1.1.3. Large equipment may be offered for carriage unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.</p> <p>(4) In addition, for cells or batteries with a gross mass of 12 kg or more employing a strong, impact resistant outer casing, strong outer packagings constructed of suitable material and of adequate strength and design in relation to the packaging's capacity and its intended use, may be used. Packagings need not meet the requirements of 4.1.1.3.</p>		
<p><b>Additional requirements:</b></p> <p>1. Cells and batteries shall be designed or packed to prevent short circuits and the dangerous evolution of heat.</p> <p>2. Protection against short circuits and the dangerous evolution of heat includes, but is not limited to:            -individual protection of the battery terminals,            -inner packaging to prevent contact between cells and batteries,            -batteries with recessed terminals designed to protect against short circuits, or            -the use of a non-conductive and non-combustible cushioning material to fill empty space between the cells or batteries in the packaging.</p> <p>3. Cells and batteries shall be secured within the outer packaging to prevent excessive movement during carriage            (e.g. by using a non-combustible and non-conductive cushioning material or through the use of a tightly closed plastics bag).</p>		

LP903	PACKING INSTRUCTION	LP903
This instruction applies to UN Nos. 3090, 3091, 3480 and 3481.		
<p>The following large packagings are authorized for a single battery, including for a battery contained in equipment, provided that the general provisions of <b>4.1.1</b> and <b>4.1.3</b> are met:</p> <p>Rigid large packagings conforming to the packing group II performance level, made of:</p> <ul style="list-style-type: none"> <li>steel (50A);</li> <li>aluminium (50B);</li> <li>metal other than steel or aluminium (50N);</li> <li>rigid plastics (50H);</li> <li>natural wood (50C);</li> <li>plywood (50D);</li> <li>reconstituted wood (50F);</li> <li>rigid fibreboard (50G).</li> </ul> <p>The battery shall be packed so that the battery is protected against damage that may be caused by its movement or placement within the large packaging.</p>		
<p><b>Additional requirement:</b></p> <p>Batteries shall be protected against short circuit.</p>		

LP904	PACKING INSTRUCTION	LP904
This instruction applies to single damaged or defective batteries of UN Nos. 3090, 3091, 3480 and 3481, including those contained in equipment.		
<p>The following large packagings are authorized for a single damaged or defective battery and for a single damaged or defective battery contained in equipment, provided the general provisions of 4.1.1 and 4.1.3 are met</p> <p>For batteries and equipment containing batteries, large packagings made of:</p> <ul style="list-style-type: none"> <li>steel (50A)</li> <li>aluminium (50B)</li> <li>metal other than steel or aluminium (50N)</li> <li>rigid plastics (50H)</li> <li>plywood (50D)</li> </ul> <p>Packagings shall conform to the packing group II performance level.</p> <ol style="list-style-type: none"> <li>1. Each damaged or defective battery or equipment containing such a battery shall be individually packed in an inner packaging and placed inside an outer packaging. The inner packaging or outer packaging shall be leakproof to prevent the potential release of electrolyte.</li> <li>2. Each inner packaging shall be surrounded by sufficient non-combustible and non-conductive thermal insulation material to protect against a dangerous evolution of heat.</li> <li>3. Sealed packagings shall be fitted with a venting device when appropriate.</li> <li>4. Appropriate measures shall be taken to minimize the effects of vibrations and shocks, prevent movement of the battery within the package that may lead to further damage and a dangerous condition during carriage. Cushioning material that is non-combustible and non-conductive may also be used to meet this requirement.</li> <li>5. Non combustibility shall be assessed according to a standard recognized in the country where the packaging is designed or manufactured.</li> </ol> <p>For leaking batteries, sufficient inert absorbent material shall be added to the inner or outer packaging to absorb any release of electrolyte.</p>		
<p><b>Additional requirement:</b></p> <p>Batteries shall be protected against short circuit.</p>		

## Transport Regulations Aircraft

### IATA DGR 2017

### Overview

UN 3090	LITHIUM METAL BATTERIES					see Chapter
UN 3091	LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT or LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT					
Class	9	Miscellaneous dangerous goods	x	x	x	3.9
Sub risk	-					
Classification			x	x	x	3.9.2.6
Packing Group						3.0.3
Packing instructions	968	Lithium batteries			x	5.9
	970	Lithium batteries contained in equipment		x		5.9
	969	Lithium batteries packed with equipment	x			5.9
Hazard label	9	Lithium batteries	x	x	x	7.3.18.2
Exempted Quantity	E0	No	x	x	x	2.7
Limited Quantity	-	Forbidden	x	x	x	
Max. Net mass	2.5 kg	See also packing instructions	<sup>1)</sup>	<sup>1)</sup>	x	
Cargo aircraft	Max. Net mass	35 kg	See also packing instructions	<sup>1)</sup>	<sup>1)</sup>	x
	Handling label	Yes	Cargo Aircraft Only	x	x	x
Special Provisions	A48	Packaging tests		x		4.4
	A88	Prototypes			x	
	A99	Over 35 kg	x	x	x	
	A154	Defective batteries	x	x	x	
	A164	Heat development	x	x	x	
	A181	Various combinations	x	x		
	A182	Equipment containing ONLY lithium batteries...	<sup>4)</sup>	<sup>4)</sup>		
	A183	No waste batteries			x	
	A185	Battery powered vehicles	x	x		
	A201	Special Exemptions			x	
A206	Transition period	x	x	x		
ERG <sup>2)</sup> Code	9FZ		x	x	x	ICAO <sup>3)</sup>

<sup>1)</sup> see applicable packing instruction

<sup>2)</sup> Emergency Response Drill Code

<sup>3)</sup> Doc 9481-AN/928

<sup>34)</sup> must be classified as either UN 3091 or UN 3481.

### 3.9.2.6 Lithium Batteries

Cells and batteries, cells and batteries contained in equipment, or cells and batteries packed with equipment, containing lithium in any form must be assigned to UN 3090, UN 3091, UN 3480 or UN 3481, as appropriate. They may be transported under these entries if they meet the following provisions:

- (a) each cell or battery is of the type proved to meet the requirements of each test of the UN *Manual of Tests and Criteria*, Part III, subsection 38.3.

Cells and batteries manufactured according to a type meeting the requirements of subsection 38.3 of the UN *Manual of Tests and Criteria*, Revision 3, Amendment 1 or any subsequent revision and amendment applicable at the date of the type testing may continue to be transported, unless otherwise provided in these Regulations.

Cell and battery types only meeting the requirements of the UN *Manual of Tests and Criteria*, Revision 3, are no longer valid. However, cells and batteries manufactured in conformity with such types before 1 July 2003 may continue to be transported if all other applicable requirements are fulfilled.

**Note:**

*Batteries, including those which have been refurbished or otherwise altered, must be of a type proved to meet the testing requirements of the Manual of Tests and Criteria, Part III, subsection 38.3, irrespective of whether the cells of which they are composed are of a tested type.*

- (b) each cell and battery incorporates a safety venting device or is designed to preclude a violent rupture under conditions normally incident to transport;
- (c) each cell and battery is equipped with an effective means of preventing external short circuits;
- (d) each battery containing cells or series of cells connected in parallel is equipped with effective means as necessary to prevent dangerous reverse current flow (e.g., diodes, fuses, etc.);
- (e) cells and batteries must be manufactured under a quality management program that includes:
1. a description of the organizational structure and responsibilities of personnel with regard to design and product quality;
  2. the relevant inspection and test, quality control, quality assurance, and process operation instructions that will be used;
  3. process controls that should include relevant activities to prevent and detect internal short circuit failure during manufacture of cells;
  4. quality records, such as inspection reports, test data, calibration data and certificates. Test data must be kept and made available to the appropriate national authority upon request;
  5. management reviews to ensure the effective operation of the quality management programme;
  6. a process for control of documents and their revision;
  7. a means for control of cells or batteries that are not conforming to the type tested as mentioned in (a) above;
  8. training programmes and qualification procedures for relevant personnel; and
  9. procedures to ensure that there is no damage to the final product.

**Note:**

*In house quality management programmes may be accepted. Third party certification is not required, but the procedures listed in 1. to 9. above must be properly recorded and traceable. A copy of the quality management programme must be made available to the appropriate national authority upon request.*

#### IATA Special Provision A48

Packaging tests are not considered necessary.

#### IATA Special Provision A88

Pre-production prototypes of lithium batteries or cells, when these prototypes are transported for testing, or low production runs, (i.e. annual production runs consisting of no more than 100 lithium cells and batteries) of lithium cells or batteries that have not been tested to the requirements in subsection 38.3 of the UN *Manual of Tests and Criteria* may be transported aboard cargo aircraft, if approved by the appropriate authority of the State of origin and the requirements in Packing Instruction 910 of the Supplement to the Technical Instructions are met.

A copy of the document of approval must accompany the consignment. Transport in accordance with this special provision must be noted on the Shipper's Declaration.

Irrespective of the limit specified in Column L of Table 4.2, the battery or battery assembly as prepared for transport may have a mass exceeding 35 kg.

#### IATA Special Provision A99

Irrespective of the per package quantity limit for cargo aircraft specified in Column L of the List of Dangerous Goods (Subsection 4.2) and in Section I of Packing Instructions 965, 966, 967, 968, 969 or 970, a lithium battery or battery assembly (UN 3090 or UN 3480), including when packed with, or contained in equipment (UN 3091 or UN 3481) that meets the other requirements of Section I of the applicable packing instruction may have a mass exceeding 35 kg, if approved by the appropriate authority of the State of origin. A copy of the document of approval must accompany the consignment.

**IATA Special Provision A154**

Lithium batteries identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

**IATA Special Provision A164**

Any electrical battery or battery powered device, equipment or vehicle having the potential of a dangerous evolution of heat must be prepared for transport so as to prevent:

- (a) a short circuit (e.g. in the case of batteries by the effective insulation of exposed terminals; or in the case of equipment, by disconnection of the battery and protection of exposed terminals); and
- (b) unintentional activation.

**IATA Special Provision A181**

When a package contains a combination of lithium batteries contained in equipment and lithium batteries packed with equipment, the following requirements apply:

- (a) the shipper must ensure that all applicable parts of both packing instructions are met. The total weight of lithium batteries contained in any package must not exceed the limits for passenger aircraft or cargo aircraft, as applicable;
- (b) the package must be marked **UN 3091 Lithium metal batteries packed with equipment, or UN 3481 Lithium ion batteries packed with equipment** as appropriate. If a package contains both lithium ion batteries and lithium metal batteries packed with and contained in equipment, the package must be marked as required for both battery types. However, button cell batteries installed in equipment (including circuit boards) need not be considered.
- (c) the Shipper's Declaration must indicate **UN 3091 Lithium metal batteries packed with equipment or UN 3481 Lithium ion batteries packed with equipment**, as appropriate. If a package contains both lithium metal batteries and lithium ion batteries packed with and contained in equipment, then the dangerous goods transport document must indicate both **UN 3091 Lithium metal batteries packed with equipment** and **UN 3481 Lithium ion batteries packed with equipment**.

**IATA Special Provision A182**

Equipment containing only lithium batteries must be classified as either UN 3091 or UN 3481

**IATA Special Provision A183**

Waste batteries and batteries being shipped for recycling or disposal are forbidden from air transport unless approved by the appropriate national authority of the State of Origin and the State of the Operator.

**IATA Special Provision A185**

(360) Vehicles only powered by lithium metal batteries or lithium ion batteries must be consigned under the entry UN 3171, **Battery-powered vehicles**.

**IATA Special Provision A201**

States concerned may grant an exemption from the prohibition to transport lithium metal or lithium ion batteries as cargo on passenger aircraft in accordance with 1.2.6 Authorities issuing exemptions in accordance with this special provision must provide a copy to the Chief of the Cargo Safety Section within three months of issuance via email at: [CSS@icao.int](mailto:CSS@icao.int), via facsimile at +1 514-954-6077 or via post to the following address:

Chief, Cargo Safety Section; International Civil Aviation Organisation; 999 Robert Bourassa Boulevard; Montreal, Quebec; CANADA H3C 5H7

**IATA Special Provision A206**

(384) The hazard label must conform to that shown in Figure 7.3.X The Class 9 hazard label shown in Figure 7.3.W may continue to be used until 31 December 2018.

## PACKING INSTRUCTION 968

STATE VARIATIONS: USG-03

OPERATOR VARIATIONS: 3V-01/02, 4C-08, 4M-08, 5X-03/07/08, AF-05, AM-09, BI-03, BI-03, BR-18, BZ-10, C8-04, CA-13, CI-09, CV-04, CX-07, CZ-08, D0-03, D5-03, EK-02, ES-03, EY-04, FX-05, GF-14, GK-05, GS-03, HX-06, JJ-08, KA-07, KK-10, KQ-09, KZ-04, L7-08, LA-16, LD-07, LH-08, LP-08, LU-08, LX-06, M3-08, M7-08, NH-07/08/09, OZ-10, P3-02, PZ-08, QF-05, QR-07, QY-03/05, RS-06, RU-02, SQ-07, SV-14, TK-01, UC-08, UH-10, WY-07, XL-08, XQ-08

### Introduction

This instruction applies to lithium metal or lithium alloy cells and batteries (UN 3090) on Cargo Aircraft Only.

The general requirements apply to all lithium metal batteries prepared for transport according to this packing instruction:

- Section IA applies to lithium metal cells with a lithium metal content in excess of 1 g and lithium metal batteries with a lithium metal content in excess of 2 g, or to quantities of lithium metal cells or batteries in excess of those permitted in Section IB of this packing instruction which must be assigned to Class 9 and are subject to all of the applicable requirements of these Regulations;
- Section IB applies to lithium metal cells with a lithium metal content not exceeding 1 g and lithium metal batteries with a lithium metal content not exceeding 2 g packed in quantities that exceed the allowance permitted in Section II, Table 968-II; and
- Section II applies to lithium metal cells with a lithium metal content not exceeding 1 g and lithium metal batteries with a lithium metal content not exceeding 2 g packed in quantities not exceeding the allowance permitted in Section II, Table 968-II.

A single cell battery as defined in Part III, of subsection 38.3.2.3 of the UN *Manual of Tests and Criteria*, is considered a "cell" and must be transported according to the requirements for "cells" for the purpose of this packing instruction.

### General Requirements

The following requirements apply to all lithium metal or lithium alloy cells and batteries:

- cells and batteries identified by the manufacture as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons);
- waste lithium batteries and lithium batteries being shipped for recycling or disposal are prohibited from air transport unless approved by the appropriate national authority of the State of origin and the State of the operator;
- cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to a short circuit.

### Section IA

These requirements apply to lithium metal cells with a lithium metal content in excess of 1 g and lithium metal batteries with a lithium metal content in excess of 2 g that have been determined to meet the criteria for assignment to Class 9.

The General Packing Requirements of 5.0.2 must be met.

Each cell or battery must:

- meet the provisions of 3.9.2.6; and
- meet the General Requirements, above;

### Additional Requirements – Section IA

- Cells and batteries must be placed in inner packagings that completely enclose the cell or battery then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance standards;
- batteries with a weight of 12 kg or greater and having a strong, impact-resistant outer casing, or assemblies of such batteries, may be transported when packed in strong outer packagings or protective enclosures (e.g. in fully enclosed or wooden slatted crates) not subject to the requirements of Section 6 of these Regulations, if approved by the appropriate national authority of the State of origin. A copy of the document of approval must accompany the consignment.

**TABLE 968-IA**

UN number	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
UN 3090 Lithium metal batteries	Forbidden	35 kg

### OUTER PACKAGINGS

Type	Drums						Jerricans			Boxes							
Desc.	Steel	Alumi- nium	Ply- wood	Fibre	Plastic	Other metal	Steel	Alumi- nium	Plastic	Steel	Alumi- nium	Wood	Ply- wood	Recon- stituted wood	Fibre- board	Plastic	Other metal
Spec.	1A2	1B2	1D	1G	1H2	1N2	3A2	3B2	3H2	4A	4B	4C1 4C2	4D	4F	4G	4H2	4N



**Section IB**

Lithium metal or lithium alloy cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 3.9.2.6(a) and (e), and they meet all of the following:

1. for a lithium metal cell, the lithium content is not more than 1 g; and
2. for a lithium metal or lithium alloy battery, the aggregate lithium content is not more than 2 g

Section IB requirements apply to cells and batteries packed in quantities that exceed the allowance permitted in Section II, Table 968-II.

Quantities of lithium metal cells or batteries prepared in accordance with this section are subject to all of the applicable provisions of these Regulations (including the General Requirements of this packing instruction), except for the provisions of Section 6.

Cells or batteries shipped under the provisions of Section IB must be described on a Shipper's Declaration as set out in Section 8, and the air waybill, when used, must contain the applicable information required by 8.2.1 and 8.2.2.

Cells and batteries must be packed in strong outer packagings that conform to 5.0.2.4, 5.0.2.6.1 and 5.0.2.12.1.

**Additional Requirements-Section IB**

Cells and batteries must be packed in inner packagings that completely enclose the cell or battery. To provide protection from damage or compression to the batteries, the inner packagings must be placed in a strong rigid outer packaging of one of the packaging types shown below.

Each package must be capable of withstanding a 1.2 m drop test in any orientation without:

- damage to cells or batteries contained therein;
- shifting of the content so as to allow battery to battery (or cell to cell) contact;
- release of contents.
- 

Each package must be durable and legibly marked with the mark shown in Figure 7.1C in addition to the Class 9 Lithium Battery hazard label (and 7.3.X) and the Cargo Aircraft Only label (Figure 7.4.B).

Note:

*The provisions for the lithium battery handling label, Figure 7.4.H and 7.2.4. 7 may continue to be used until 31 December 2018. In addition, the Class 9 label shown in Figure 7.3. W may continue to be used on packages containing lithium batteries prepared in accordance with Section IB until 31 December 2018.*

Each package must be marked in accordance with the requirements of 7.1.4.1 (a) and (b) and in addition the net weight when required by 7.1.4.1(c) must be marked on the package.

**TABLE 968-IB**

	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
Lithium metal cells and batteries	Forbidden	2.5 kg

**OUTER PACKAGINGS**

Type	Drums						Jerricans			Boxes							
	Steel	Alumi- nium	Ply- wood	Fibre	Plastic	Other metal	Steel	Alumi- nium	Plastic	Steel	Alumi- nium	Wood	Ply- wood	Recon- stituted wood	Fibre- board	Plastic	Other metal
Desc.																	

**Section II**

Lithium metal or lithium alloy cells and batteries meeting the requirements in this section are not subject to other additional requirements of these Regulations except for:

- (a) restrictions on dangerous goods in consolidations (1.3.3.2.3 and 1.3.3.2.6);
- (b) dangerous goods in passenger and crew baggage (Subsections 2.3.). Only those lithium metal batteries as specifically permitted may be carried in carry-on baggage;
- (c) dangerous goods in air mail (Subsection 2.4);
- (d) use of unit load devices (5.0.1.3);
- (e) loading of cargo aircraft (9.3.4)
- (f) reporting of dangerous goods accidents, incidents and other occurrences (9.6.1 and 9.6.2).

Cells and batteries offered for transport must meet the provisions of 3.9.2.6(a) and (e), the General Requirements of this packing instruction and:

1. for cells, the lithium content is not more than 1 g; and
2. for batteries, the aggregate lithium content is not more than 2 g;

Cells and batteries must be packed in strong outer packagings that conform to 5.0.2.4, 5.0.2.6.1 and 5.0.2.12.1.

**Additional Requirements–Section II**

Cells and batteries must be packed in inner packagings that completely enclose the cell or battery. To provide protection from damage or compression to the batteries, the inner packagings must be placed in a strong rigid outer packaging of one of the packaging types shown below.

Each package must be capable of withstanding a 1.2 m drop test in any orientation without:

- damage to cells or batteries contained therein;
- shifting of the contents so as to allow battery to battery (or cell to cell) contact;
- release of contents.

Each package must be durable and legibly marked with the mark shown in Figure 7.1C and the Cargo Aircraft Only label (Figure 7.4.B). The package must be of such a size that there is adequate space to affix the mark on one side of the package without the mark being folded. When the package dimensions are adequate, the Cargo Aircraft Only label must be located on the same surface of the package near the lithium battery mark.

*Note:*

*The provisions for the lithium battery handling label, Figure 7.4.H and 7.2.4. 7, may continue to be used until 31 December 2018.*

A Shipper's Declaration for Dangerous Goods is not required.

A shipper is not permitted to offer for transport more than one (1) package prepared according to this section in any single consignment.

The words "Lithium metal batteries in compliance with Section II of PI 968" and "Cargo Aircraft Only " or "CAO" must be included on the air waybill, when an air waybill is used. The information should be shown in the "Nature and Quantity of Goods" box of the air waybill.

Packages and overpacks containing lithium batteries prepared in accordance with this section must be offered to the operator separately from goods in the consolidation that are not subject to these Regulations. Packages and overpacks in consolidations must not be loaded into a unit load device before being offered to the operator.

Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities. Information on adequate instruction can be found in subsection 1.6.

**Overpack–Section II**

Not more than one (1) package complying with the requirements of Section II may be placed in an overpack. The overpack may also contain packages of dangerous goods or goods not subject to these Regulations provided that the packages do not contain substances which might react dangerously with each other. An overpack must be marked with the word "Overpack" and durably and legibly marked with the mark shown in Figure 7.1C and the Cargo Aircraft Only label (Figure 7.4.B), unless the mark and label representative of those on the package inside the overpack are visible.

*Note:*

For the purpose of Section II, an overpack is an enclosure used by a single shipper that contains no more than one package prepared in accordance with this section. For shipments prepared in accordance with Section IA and/or IB, this limit of one package of Section II batteries per overpack still applies.

**TABLE 968-II**

Contents	Lithium metal cells and/or batteries with a lithium content of 0.3 g or less	Lithium metal cells with a lithium content of more than 0.3 g but not more than 1 g	Lithium metal batteries with a lithium content of more than 0.3 g but not more than 2 g
1	2	3	4
Maximum number of cells/batteries per package	No limit	8 cells	2 Batteries
Maximum net quantity (weight) per package	2.5 kg	N/A	N/A

Cells and/or batteries specified in columns 2, 3 and 4 of Table 968-II must not be combined in the same package.

**OUTER PACKAGINGS**

Type	Drums						Jerricans			Boxes							
	Steel	Aluminium	Plywood	Fibre	Plastic	Other metal	Steel	Aluminium	Plastic	Steel	Aluminium	Wood	Plywood	Reconstituted wood	Fibre-board	Plastic	Other metal
Desc.																	

## PACKING INSTRUCTION 969

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STATE VARIATIONS: USG-03

OPERATOR VARIATIONS: 2K-02, 3K-06, 4C-08, 4M-08, 5X-07, AC-06, AF-05, AI-08, AM-09, AR-11, AU-11, BM-01, BR-18/19, BT-01, BZ-10, CB-04, CV-04, CZ-08, 00-03, 05-03, ES-03, EY-04, FX-05, G3-07, GF-14, GS-03, HA-06, HX-06, JJ-08, JU-13, KQ-09, L7-08, LA-09/16, LH-08, LP-08, LU-08, LX-06, M3-08, M7-08, MK-16, OM-15, OZ-10, P3-02, PZ-08, QK-06, QR-04, QY-03/05, RS-06, RU-02, RV-06, SQ-07, TG-08, TZ-06, UC-08, VN-12, WN-01, WY-07, XG-08, XL-08, XQ-08

### Introduction

This instruction applies to lithium metal or lithium alloy cells and batteries packed with equipment (UN 3091) on passenger and Cargo Aircraft Only.

For the purposes of this packing instruction "equipment" means the device or apparatus for which the lithium cells or batteries will provide electrical power for its operation.

The general requirements apply to all lithium metal batteries packed with equipment prepared for transport according to this packing instruction:

- Section I applies where equipment is packed with lithium metal cells with a lithium metal content in excess of 1 g or lithium metal batteries with a lithium metal content in excess of 2 g which must be assigned to Class 9 and are subject to all of the applicable requirements of these Regulations; and
- Section II applies where equipment is packed with lithium metal cells with a lithium metal content not exceeding 1 g or lithium metal batteries with a lithium metal content not exceeding 2 g.

A single cell battery as defined in Part III, of subsection 38.3.2.3 of the UN *Manual of Tests and Criteria*, is considered a "cell" and must be transported according to the requirements for "cells" for the purpose of this packing instruction.

### General Requirements

The following requirements apply to all lithium metal or lithium alloy cells and batteries:

- (a) cells and batteries identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons);
- (b) cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to a short circuit.

### Section I

These requirements apply to lithium metal cells with a lithium metal content in excess of 1 g and lithium metal batteries with a lithium metal content in excess of 2 g that been determined to meet the criteria for assignment to Class 9.

The General Packing Requirements of 5.0.2 must be met.

Each cell or battery must:

1. meet the provision of 3.9.2.6; and
2. meet the General Requirements, above;

### Additional Requirements—Section I

The number of cells or batteries in each package must not exceed the appropriate number for the equipment's operation, plus two spares.

- cells or batteries must:
  - be placed in inner packagings that completely enclose the cell or battery then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance standards; or
  - be placed in inner packagings that completely enclose the cell or battery, then placed with equipment in a package that meets the Packing Group II performance standards.
- the equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation;

### Lithium metal and lithium alloy cells and batteries prepared for transport on Passenger Aircraft as Class 9:

- must be packed in either a rigid metal intermediate or a metal outer packaging;
- cells and batteries must be surrounded by cushioning material that is non-combustible and non-conductive and being placed in either the metal intermediate or metal outer packaging;
- when the package does not meet the above requirements, the package(s) must bear the "Cargo Aircraft Only" label and the Shipper's Declaration must indicate "Cargo Aircraft Only".

**TABLE 969-I**

UN number	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
UN 3091 <b>Lithium metal batteries packed with equipment</b>	5 kg	35 kg

**OUTER PACKAGINGS**

Type	Drums						Jerricans			Boxes							
Desc.	Steel	Aluminium	Ply-wood	Fibre	Plastic	Other metal	Steel	Aluminium	Plastic	Steel	Aluminium	Wood	Ply-wood	Reconstituted wood	Fibre-board	Plastic	Other metal
Spec.	1A2	1B2	1D	1G	1H2	1N2	3A2	3B2	3H2	4A	4B	4C1 4C2	4D	4F	4G	4H2	4N

**Section II**

Lithium metal or lithium alloy cells and batteries meeting the requirements in this section are not subject to other additional requirements of these Regulations except for:

- (a) dangerous goods in passenger and crew baggage (Subsection 2.3). Only those lithium metal batteries as specifically permitted may be carried in carry-on baggage;
- (b) dangerous goods in air mail (Subsection 2.4);
- (c) reporting of dangerous goods accidents, incidents and other occurrences (9.6.1 and 9.6.2).

Cells and batteries offered for transport must meet the provisions of 3.9.2.6(a) and (e), the General Requirements of this packing instruction; and:

1. for cells, the lithium content is not more than 1g; and
2. for batteries, the aggregate lithium content is not more than 2 g;

Cells and batteries must be packed in strong outer packagings, that conform to 5.0.2.4, 5.0.2.6.1 and 5.0.2.12.1.

**Additional Requirements–Section II**

Cells and batteries must:

- be completely enclosed in inner packagings then placed in a strong rigid outer packaging; or
- be completely enclosed in inner packagings then placed with equipment in a strong rigid outer packaging.

The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.

The number of batteries in each package must not exceed the appropriate number for the equipment's operation plus two spares.

Each package of cells or batteries, or the completed package must be capable of withstanding a 1.2 m drop test in any orientation without:

- damage to cells or batteries contained therein;
- shifting of the contents so as to allow battery to battery (or cell to cell) contact;
- release of contents.

Each package must be durably and legibly marked with the mark shown in Figure 7.1 .C. The package must be of such size that there is adequate space to affix the mark on one side of the package without the mark being folded.

**Note:**

*The provisions for the lithium battery handling label, Figure 7.4.H and 7.2.4.7 may continue to be used until 31 December 2018*

A Shipper's Declaration for Dangerous Goods is not required.

The words "Lithium metal batteries in compliance with Section II of P1 969" must be included on the air waybill, when an air waybill is used. The information should be shown in the "Nature and Quantity of Goods" box of the air waybill.

Where a package contains a combination of lithium batteries contained in equipment and lithium batteries packed with equipment that meet the limits for lithium cells or batteries of Section II, the following additional requirements apply:

- the shipper must ensure that all applicable parts of both packing instructions are met. The total weight of lithium batteries contained in any package must not exceed 5 kg;
- the words "lithium metal batteries, in compliance with Section II of P1 969 must be placed on the air waybill, when an air waybill is used.

Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities, Information on adequate instruction can be found in subsection 1.6.

**Overpacks–Section II**

Individual packages each complying with the requirements of Section II may be placed in an overpack. The overpack may also contain packages of dangerous goods or goods not subject to these Regulations provided that the packages do not contain substances which might react dangerously with each other. An overpack must be marked with the word “Overpack” and durably and legibly marked with the mark shown in Figure 7.1.C, unless the marks representative of those on the package(s) inside the overpack are visible.

**TABLE 969-II**

	Passenger aircraft	Cargo Aircraft Only
Net quantity of lithium metal cells or batteries per package	5 kg	5 kg

**OUTER PACKAGINGS**

Type	Drums						Jerricans			Boxes							
Desc.	Steel	Aluminium	Ply-wood	Fibre	Plastic	Other metal	Steel	Aluminium	Plastic	Steel	Aluminium	Wood	Ply-wood	Reconstituted wood	Fibre-board	Plastic	Other metal

## PACKING INSTRUCTION 970

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STATE VARIATIONS: USG-03

OPERATOR VARIATIONS: K-02, 3K-06, 4C-08, 4M-08, 5X-07, AC-06, AF-05, AI-08, AM-09, AR-11, AU-11, BM-01, BR-18/19, BT-01, BZ-10, C8-04, CV-04, CX-08, CZ-08, 00-03, 05-03, ES-03, EY-04, FX-05, G3-07, GF-14, GS-03, HA-06, HX-06, JJ-08, JU-13, KA-08, KK-11, KQ-09, L7-08, LA-09/16, LD-08, LH-08, LP-08, LU-08, LX-06, M3-08, M7-08, MK-16, OM-15, OZ-10, PZ-08, QK-06, QR-04, QY-03/05, RS-06, RU-02, RV-06, SQ-07, TG-08, TZ-06, UC-08, UH-11, VN-12, WN-01, WY-07, XG-08, XL-08, XQ-08

### Introduction

This instruction applies to lithium metal or lithium alloy cells and batteries contained in equipment (UN 3091) on passenger and Cargo Aircraft Only.

For the purposes of this packing instruction "equipment" means the device or apparatus for which the lithium cells or batteries will provide electrical power for its operation.

The general requirements apply to all lithium metal and lithium alloy cells and batteries contained in equipment prepared for transport according to this packing instruction:

- Section I applies where equipment contains lithium metal cells with a lithium metal content in excess of 1 g or lithium metal batteries with a lithium metal content in excess of 2 g which must be assigned to Class 9 and are subject to all of the applicable requirements of these Regulations; and
- Section II applies where equipment contains lithium metal cells with a lithium metal content not exceeding 1 g or lithium metal batteries with a lithium metal content not exceeding 2 g.

A single cell battery as defined in Part III, of subsection 38.3.2.3 of the UN *Manual of Tests and Criteria*, is considered a "cell" and must be transported according to the requirements for "cells" for the purpose of this packing instruction.

### General requirements

The following requirements apply to all lithium metal or lithium alloy cells and batteries:

- (a) cells and batteries identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons);
- (b) cells and batteries must be protected so as to prevent short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to a short circuit;
- (c) equipment must be equipped with an effective means of preventing accidental activation;
- (d) equipment containing cells or batteries must be packed in strong outer packagings that conform to 5.0.2.4, 5.0.2.6.1 and 5.0.2.12.1.
- (e) the equipment containing the cells or batteries must be secured against movement within the outer packaging and be packed so as to prevent accidental operation during air transport.

### Section I

These requirements apply to lithium metal cells with a lithium metal content in excess of 1 g and lithium metal batteries with a lithium metal content in excess of 2 g that have been determined to meet the criteria for assignment to Class 9.

Each cell or battery must:

1. meet the provisions of 3.9.2.6; and
2. meet the General Requirements, above;

### Additional Requirements—Section I

- the equipment must 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;
- the quantity of lithium metal contained in any piece of equipment must not exceed 12 g per cell and 500 g per battery.

**TABLE 970-I**

UN number	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
UN 3091 <b>Lithium metal batteries contained in equipment</b>	5 kg	35 kg

**OUTER PACKAGINGS—Strong outer packagins, such as:**

Type	Drums						Jerricans			Boxes							
Desc.	Steel	Alumi-nium	Ply-wood	Fibre	Plastic	Other metal	Steel	Alumi-nium	Plastic	Steel	Alumi-nium	Wood	Ply-wood	Recon-stituted wood	Fibre-board	Plastic	Other metal

**Section II**

Lithium metal or lithium alloy cells and batteries meeting the requirements in this section are not subject to other additional requirements of these Regulations except for:

- (a) dangerous goods in passenger and crew baggage (Subsection 2.3). Only those lithium metal batteries as specifically permitted may be carried in carry-on and checked baggage;
- (b) dangerous goods in air mail (Subsection 2.4);
- (c) reporting of dangerous goods accidents, incidents and other occurrences (9.6.1 and 9.6.2).

Cells and batteries offered for transport must meet the provisions of 3.9.2.6(a) and (e), the General Requirements of this packing instruction and:

1. for cells, the lithium content is not more than 1 g;
2. for batteries, the aggregate lithium content is not more than 2 g;

Devices such as radio frequency identification (RFID) tags, watches and temperature loggers, which are not capable of generating a dangerous evolution of heat, may be transported when intentionally active. When active, these devices must meet defined standards for electromagnetic radiation to ensure that the operation of the device does not interfere with aircraft systems. The devices must not be capable of emitting disturbing signals (such as buzzing alarms, strobe lights, etc.) during transport.

**Additional Requirements—Section II**

The equipment must 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 cell of battery is afforded equivalent protection by the equipment in which it is contained.

Each package must be durably and legibly marked with the mark shown in Figure 7.1.C. The package must be of such size that there is adequate space to affix the mark on one side of the package without the mark being folded.

This requirement does not apply to:

- packages containing only button cell batteries installed in equipment (including circuit boards);
- consignments of two packages or less where each package contains no more than four cells or two batteries installed in equipment.

**Note:**

*The provisions for the lithium battery handling label, Figure 7.4.H and 7.2.4.7 may continue to be used until 31 December 2018.*

A Shipper's Declaration for Dangerous Goods is not required.

Where a consignment includes packages bearing the lithium battery mark, the words "Lithium metal batteries in compliance with Section II of P1 970" must be included on the air waybill, when an air waybill is used. The information should be shown in the "Nature and Quantity of Goods" box of the air waybill.

Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities, Information on adequate instruction can be found in subsection 1.6.

**Overpacks—Section II**

Individual packages each complying with the requirements of Section II may be placed in an overpack. The overpack may also contain packages of dangerous goods or goods not subject to these Regulations provided that the packages do not contain substances which might react dangerously with each other. An overpack must be marked with the word "Overpack" and durably and legibly marked with the mark shown in Figure 7.1.C, unless the marks representative of those on the package(s) inside the overpack are visible.

**TABLE 970-II**

	Passenger aircraft	Cargo Aircraft Only
Net quantity of lithium metal cells or batteries per package	5 kg	5 kg

**OUTER PACKAGINGS—Strong outer packagins, such as:**

Type	Drums						Jerricans			Boxes							
Desc.	Steel	Alumi-nium	Ply-wood	Fibre	Plastic	Other metal	Steel	Alumi-nium	Plastic	Steel	Alumi-nium	Wood	Ply-wood	Recon-stituted wood	Fibre-board	Plastic	Other metal



Figure 7.3.X:

Class 9A hazard label for lithium batteries.

*reduced size,  
black on white*

Cargo IMP Code: RLI, RLM  
Minimum dimensions 100 x 100 mm



Figure 7.4.B:

Handling Label Cargo Aircraft Only,

*reduced size,  
black on orange (Pantone color No. 151U)*

Cargo IMP Code: CAO  
Minimum dimensions 120 x 110 mm

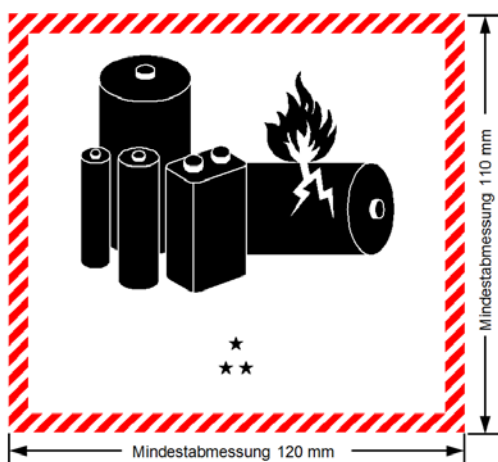


Figure 7.1.C:

Lithium Battery Mark,

*reduced size,  
black on white,  
red boarder with diagonal hatchings*

\*Place for UN number(s)

\*\* Place for a telephone number for  
additional information

Minimum dimensions 120 x 110 mm



## IMDG Code 2017 Transport Regulations for Sea Transport Overview

UN 3090	LITHIUM METALL BATTERIES			see chapter	
UN 3091	LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT or LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT				
Class	9	Miscellaneous dangerous substances and articles	x	x	2.9
Classification		Quality Management Program	x	x	2.9.4
Packing group					2.0.1.3
Special provisions	188	Exempted if...	x	x	3.3
	230	Class 9 if...	x	x	
	310	Prototypes		x	
	360	Battery powered vehicles	x		
	376	Damaged or defective lithium batteries	x	x	
	377	Lithium batteries for disposal or recycling	x	x	
	384	Label 9A	x	X	
Limited Quantities	0	no	x	x	3.4
Excepted quantities	E0	no	x	x	3.5
Packing Instructions	P903	Lithium batteries	x	x	4.1.4.1
	P908	Damaged or defective lithium batteries	x	x	4.1.4.1
	P909	Lithium batteries for disposal or recycling	x	x	4.1.4.1
	P910	Prototypes and small series			
	LP903	Large packaging for single battery	x	x	4.1.4.3
	LP904	LP for single damaged/defective batt	x	x	4.1.4.3
EmS <sup>1)</sup>	F-A	Fire Schedule Alfa	x	x	
	S-I	Spillage Schedule India (flammable solids, repacking possible)	x	x	
Storage and segregation	Category A SW 19	On deck or under deck	x	x	7.1, 7.2
Properties and observations	Electrical batteries containing lithium or lithium alloy encased in a rigid metallic body. Lithium batteries may also be shipped in, or packed with, equipment. Electrical lithium batteries may cause fire due to an explosive rupture of the body caused by improper construction or reaction with contaminants				

#### 2.9.4 Lithium batteries

Cells and batteries, cells and batteries contained in equipment, or cells and batteries packed with equipment, containing lithium in any form shall be assigned to UN Nos. 3090, 3091, 3480 or 3481 as appropriate. They may be transported under these entries if they meet the following provisions:

.1 Each cell or battery is of the type proved to meet the requirements of each test of the *Manual Tests and Criteria* Part III, sub section 38.3. Cells and batteries manufactured according to a type meeting the requirements of subsection 38.3 of the Manual of Tests and Criteria, Revision 3, Amendment 1 or any subsequent revision and amendment applicable at the date of the type testing may continue to be transported, unless otherwise provided in this Code.

Cell and battery types only meeting the requirements of the Manual of Tests and Criteria, Revision 3, are no longer valid. However, cells and batteries manufactured in conformity with such types before 1 July 2003 may continue to be transported if all other applicable requirements are fulfilled;

**Note:** Batteries shall be of a type proved to meet the testing requirements of the *Manual of Tests and Criteria*, part III, sub-section 38.3, irrespective of whether the cells of which they are composed are of a tested type.

- .2 Each cell and battery incorporates a safety venting device or is designed to preclude a violent rupture under conditions normally incident to transport;
- .3 Each cell and battery is equipped with an effective means of preventing external short circuits;
- .4 Each battery containing cells or series of cells connected in parallel is equipped with effective means as necessary to prevent dangerous reverse current flow (e.g., diodes, fuses, etc.);
- .5 Cells and batteries shall be manufactured under a quality management programme that includes:
  - (i) a description of the organizational structure and responsibilities of personnel with regard to design and product quality;
  - (ii) the relevant inspection and test, quality control, quality assurance, and process operation instructions that will be used;
  - (iii) process controls that should include relevant activities to prevent and detect internal short circuit failure during manufacture of cells;
  - (iv) quality records, such as inspection reports, test data, calibration data and certificates. Test data shall be kept and made available to the competent authority upon request;
  - (v) management reviews to ensure the effective operation of the quality management programme;
  - (vi) a process for control of documents and their revision;
  - (vii) a means for control of cells of batteries that are not conforming to the type tested as mentioned in .2.9.4.1 above;
  - (viii) training programmes and qualification procedures for relevant personnel; and
  - (ix) procedures to ensure that there is no damage to the final product.

**Note:** In-house quality management programmes may be accepted. Third party certification is not required, but the procedures listed in (i) to (ix) above shall be properly recorded and traceable. A copy of the quality management programme shall be made available to the competent authority upon request.

### **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 cell, the watt-hour rating is not more than 20 W h;
- .2 For a lithium metal or lithium alloy battery, the aggregate lithium content is not more than 2 g, and for a lithium-ion battery, the watt-hour rating is not more than 100 W h.  
Lithium-ion batteries subject to this provision shall be marked with the watt-hour rating on the outside case, except those manufactured before 1 January 2009;
- .3 Each cell or battery meets the provisions of 2.9.4.1 and 2.9.4.5;
- .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 conductive materials 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 battery mark, as illustrated in 5.2.1.10:

Note: The provision concerning marking in special provision 188 of amendment 37-14 of the Code may continue to be applied until 31 December 2018.

This requirement does not apply to:

- (i) package containing only button cell batteries installed in equipment (including circuit boards); and
  - (ii) Packages containing no more than four cells or two batteries installed in equipment, where there are not more than two packages in the consignment;
- .7 Except when batteries are installed in equipment, each package shall be capable of withstanding a 1.2 m drop test in any orientation without damage to cell 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 batteries are installed in or packed with equipment, packages shall not exceed 30 kg gross mass.

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 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 “cell” for the purpose of this special provision.

### **Special Provision 230**

Lithium cells and batteries may be transported under this entry if they meet the provisions of 2.9.4.

### **Special Provision 310**

The testing requirements in the Manual of Testing and Criteria, part III, subsection 38.3 do not apply to production runs, consisting of not more than 100 cells and batteries, or to pre-production prototypes of cells batteries when these prototypes are transported for testing when packaged in accordance with packing instruction P910 of 4.1.4.1.

This transport documents shall include the following statement: “Transport in accordance with special provision 310”.

Damaged or defective cells, batteries, or cells and batteries contained in equipment shall be transported in accordance with special provision 376 and packaged in accordance with packing instructions P908 of 4.1.4.1 or LP904 of 4.1.4.3, as applicable.

Cells, batteries or cells and batteries contained in equipment transported for disposal or recycling may be packaged in accordance with special provision 377 and packing instruction P909 of 4.1.4.1.

### **Special Provision 360**

Vehicles only powered by lithium metal batteries or lithium ion batteries shall be consigned under the entry UN 3171 BATTERY POWERED VEHICLE.

### **Special Provision 376**

Lithium ion cells or batteries and lithium metal 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 carriage; or
- Cells or batteries that have sustained physical or mechanical damage.

***NOTE:** In assessing a battery as damaged or defective, the type of battery and its previous use and misuse shall be taken into account.*

Cells and batteries shall be carried according to the provisions applicable to UN No. 3090, UN No. 3091, UN No. 3480 and No. UN 3481, except special provision 230 and as otherwise stated in this special provision.

Packages shall be marked "DAMAGED/DEFECTIVE LITHIUM ION BATTERIES" or "DAMAGED/DEFECTIVE LITHIUM METAL BATTERIES", as applicable.

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 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 carriage shall not be carried except under conditions specified by the competent authority.

**Special Provision 377**

Lithium ion and lithium metal cells and batteries and equipment containing such cells and batteries carried for disposal or recycling, either packed together with or packed without non-lithium

batteries, may be packaged in accordance with packing instruction P909 of 4.1.4.1.

These cells and batteries are not subject to section 2.9.4.

Packages shall be marked "LITHIUM BATTERIES FOR DISPOSAL" or "LITHIUM BATTERIES FOR RECYCLING".

Identified damaged or defective batteries shall be transported in accordance with special provision 376 and packaged in accordance with P908 of 4.1.4.1 or LP904 of 4.1.4.3, as applicable.

**Special Provision 384**

The label to be used in Model No. 9A, see 5.2.2.2.2.

**Note:** The class 9 label (Model No.9) may continue to be used until 31 December 2018.

P 903	PACKING INSTRUCTION	P 903
<p>This instruction applies to UN Nos. 3090, 3091, 3480 and 3481.</p>		
<p>The following packagings are authorized provided that the general provisions of 4.1.1 and 4.1.3 are met:</p>		
<p>(1) For cells and batteries: Drums (1A2, 1B 2, 1N2, 1H2, 1D, 1G); Boxes (4A, 4B, 4N 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2); Jerricans (3A2, 3B2, 3H2).</p>		
<p>Cells or batteries shall be packed in packagings so that the cells or batteries are protected against damage that may be caused by the movement or placement of the cells or batteries within the packaging.</p>		
<p>Packagings shall conform to the packing group II performance level.</p>		
<p>(2) In addition for cells or batteries with a gross mass of 12 kg or more employing a strong, impact resistant outer casing, and assemblies of such cells or batteries:</p>		
<p>(a) Strong outer packagings, (b) Protective enclosures (e.g. fully enclosed or wooden slatted crates): or (c) Pallets or other handling devices.</p>		
<p>Cells or batteries shall be secured to prevent inadvertent movement, and the terminals shall nor support the weight of other superimposed elements.</p>		
<p>Packagings need not meet the requirements of 4.1.1.3.</p>		
<p>(3) For cells or batteries packed with equipment:</p>		
<p>Packagings conforming to the requirements in paragraph (1) of this packing instruction, then placed with the equipment in an outer packaging; or</p>		
<p>Packagings that completely enclose the cells or batteries, then placed with equipment in a packaging conforming to the requirements in paragraph (1) of this instruction.</p>		
<p>The equipment shall be secured against movement within the outer packaging.</p>		
<p>For the purpose of this packaging instruction, “equipment” means apparatus requiring the lithium metal or lithium ion cells or batteries with which it is packed for its operation.</p>		
<p>(4) For cells or batteries contained in equipment:</p>		
<p>Strong outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use. They shall be constructed in such a manner as to prevent accidental operation during transport.</p>		
<p>Packagings need not meet the requirements of 4.1.1.3.</p>		
<p>Large equipment can be offered for transport unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.</p>		
<p>Devices such as radio frequency identification (RFID) tags, watches and temperature loggers, which are not capable of generation a dangerous evolution of heat, may be transported when intentionally active in strong outer packagings.</p>		
<p>Additional requirement: Cells or batteries shall be protected against short circuit.</p>		

P908	PACKING INSTRUCTION	P908
<p>This instruction applies to damaged or defective lithium ion cells and batteries and damaged or defective lithium metal cells and batteries, including those contained in equipment, of UN Nos. 3090, 3091, 3480 and 3481.</p>		
<p>The following packagings are authorized provided the general provisions of 4.1.1 and 4.1.3 are met:</p>		
<p>For cells and batteries and equipment containing cells and batteries:</p>		
<p>Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G) Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2) Jerricans (3A2, 3B2, 3H2)</p>		
<p>Packagings shall conform to the packing group II performance level.</p>		
<ol style="list-style-type: none"><li>1. each damaged or defective cell or battery or equipment containing such cells or Batteries shall be individually packed in inner packaging and placed inside of an outer packaging. The inner packaging or outer packaging shall be leak-proof to prevent the potential Release of electrolyte.</li><li>2. Each inner packaging shall be surrounded by sufficient non-combustible and non-conductive thermal insulation material to protect against a dangerous evolution of heat.</li><li>3. Sealed packagings shall be fitted with a venting device when appropriate.</li><li>4. Appropriate measures shall be taken to minimize the effects of vibrations and shocks, prevent movement of the cells or batteries within the package that may lead to further damage and a dangerous condition during transport. Cushioning material that is non-combustible and non-conductive may also be used to meet this requirement.</li><li>5. Non combustibility shall be assessed according to a standard recognized in the country where the packaging is designed or manufactured.</li></ol>		
<p>For leaking cells or batteries, sufficient inert absorbent material shall be added to the inner or outer packaging to absorb any release of electrolyte.</p>		
<p>A cell or battery with a net mass of more than 30 kg shall be limited to one cell or battery per outer packaging.</p>		
<p><b>Additional requirements:</b> Cells or batteries shall be protected against short circuit.</p>		

P909	PACKING INSTRUCTION	P909
<p>This instruction applies to UN Nos. 3090, 3091, 3480 and 3481 transported for disposal or recycling, either packed together with or packed without non-lithium batteries:</p>		
<p>(1) Cells and batteries shall be packed in accordance with the following:</p> <ul style="list-style-type: none"><li>(a) The following packagings are authorized, provided that the general provisions of 4.1.1 and 4.1.3, are met: Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G); Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H2); and Jerricans (3A2, 3B2, 3H2).</li><li>(b) Packagings shall conform to the packing group II performance level.</li><li>(c) Metal packagings shall be fitted with a non-conductive lining material (e.g. plastics) of adequate strength for the intended use.</li></ul> <p>(2) However, lithium ion cells with a Watt-hour rating of not more than 20 Wh, lithium ion batteries with a Watt-hour rating of not more than 100 Wh, lithium metal cells with a lithium content of not more than 1 g and lithium metal batteries with an aggregate lithium content of not more than 2 g may be packed in accordance with the following:</p> <ul style="list-style-type: none"><li>(a) In strong outer packaging up to 30 kg gross mass meeting the general provisions of 4.1.1, except 4.1.1.3, and 4.1.3.</li><li>(b) Metal packagings shall be fitted with a non-conductive lining material (e.g. plastics) of adequate strength for the intended use.</li></ul> <p>(3) For cells or batteries contained in equipment, strong outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use, may be used. Packagings need not meet the requirements of 4.1.1.3. Large equipment may be offered for transport unpackaged or on pallets when the cells or batteries are afforded equivalent protection by the equipment in which they are contained.</p> <p>(4) In addition, for cells or batteries with a gross mass of 12 kg or more employing a strong, impact resistant outer casing, strong outer packagings constructed of suitable material and of adequate strength and design in relation to the packagings capacity and its intended use, may be used. Packagings need not meet the requirements of 4.1.1.3.</p>		
<p><b>Additional requirements:</b></p> <ol style="list-style-type: none"><li>1. Cells and batteries shall be designed or packed to prevent short circuits and the dangerous evolution of heat.</li><li>2. Protection against short circuits and the dangerous evolution of heat includes, but is not limited to:<ul style="list-style-type: none"><li>-individual protection of the battery terminals,</li><li>-inner packaging to prevent contact between cells and batteries,</li><li>-batteries with recessed terminals designed to protect against short circuits, or</li><li>-the use of a non-conductive and non-combustible cushioning material to fill empty space between the cells or batteries in the packaging.</li></ul></li><li>3. Cells and batteries shall be secured within the outer packaging to prevent excessive movement during transport (e.g. by using a non-combustible and non-conductive cushioning material or through the use of a tightly closed plastics bag).</li></ol>		



P910	PACKING INSTRUCTION	P910
<p>This instruction applies to UN Nos. 3090, 3091, 3480 and 3481 production runs consisting of not more than 100 cells and batteries and to pre-production prototypes of cells and batteries when these prototypes are transported for testing.</p>		
<p>The following packaging are authorized provided that the general provisions of 4.1.1 and 4.1.3 are met:</p>		
<p>(1) For Cells and batteries; including when packed with equipment: Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G); Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H2); Jerricans (3A2, 3B2, 3H2).</p>		
<p>Packagings shall conform to the packing group II performance level and shall meet the following requirements:</p>		
<p>(a) Batteries and cells, including equipment, of different sizes, shapes of masses shall be packaged in an outer the gross mass for which the design type has been tested;</p> <p>(b) each cell or battery shall be individually packed in an inner packaging and placed inside an outer packaging;</p> <p>(c) each inner packaging shall be completely surrounded by sufficient non-combustible and non-conductive thermal insulation material to protect against a dangerous evolution of heat;</p> <p>(d) Appropriate measures shall be taken to minimize the effects of vibration and shocks and prevent movement of the cells or batteries within the package that may lead to damage and a dangerous condition during transport. Cushioning material that is non-combustible and non-conductive may be used to meet this requirement;</p> <p>(e) Non-combustibility shall be assessed according to a standard recognized in the country where the packaging is designed or manufactured;</p> <p>(f) A cell or battery with a net mass of more than 30 kg shall be limited to one cell or battery per outer packaging.</p>		
<p>(2) For cells and batteries contained in equipment: Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G); Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H2); Jerricans (3A2, 3B2, 3H2).</p>		
<p>Packagings shall conform to the packing group II performance level and shall meet the following requirements:</p>		
<p>(a) Equipment to different sizes, shapes or masses shall be packaged in an outer packaging of a tested design type listed above provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested.</p> <p>(b) the equipment shall be constructed or packaged in such a manner as to prevent accidental operation during transport;</p> <p>(c) Appropriate measures shall be taken to minimize the effects of vibration and shocks and prevent movement of the equipment within the package that may lead to damage and a dangerous condition during transport. When cushioning material is used to meet this requirement it shall be a none combustible and non-conductive; and</p> <p>(d) Non-combustibility shall be assessed according to a standard recognized in the country where the packaging the designed or manufactured</p>		

- (3) The equipment in the batteries may be transported unpackaged under conditions specified by the competent authority. Additional conditions that may be considered in the approval process include, but are not limited to:
- (a) The equipment or the battery shall be strong enough to withstand the shocks and loadings normally encountered during transport, including transshipment between cargo transport units and between cargo transport units and warehouses as well as any removal from a pallet for subsequent manual or mechanical handling; and
  - (b) The equipment or the battery shall be fixed in cradles or crates or other handling devices in such a way that it will not become loose during normal conditions of transport.

**Additional requirements:**

The cells and batteries shall be protected against short circuit; Protection against short circuits includes, but is not limited to,

- Individual protection of the battery terminals,
- Inner packaging to prevent contact between cells and batteries,
- Batteries with recessed terminals designed to protect against short circuits or
- The use of a non-conductive and non-combustible cushioning material to fill empty space between the cells or batteries in the packaging

<b>LP903</b>	<b>PACKING INSTRUCTION</b>	<b>LP903</b>
This instruction applies to UN Nos. 3090, 3091, 3480 and 3481		
<p>The following large packagings are authorized for a single battery, including for a battery contained in equipment, provided that the general provisions of <b>4.1.1</b> and <b>4.1.3</b> are met:</p> <p>Rigid large packagings conforming to the packing group II performance level, made of:</p> <ul style="list-style-type: none"> <li>steel (50A);</li> <li>aluminium (50B);</li> <li>metal other than steel or aluminium (50N);</li> <li>rigid plastics (50H);</li> <li>natural wood (50C);</li> <li>plywood (50D);</li> <li>reconstituted wood (50F);</li> <li>rigid fibreboard (50G).</li> </ul> <p>The battery shall be packed so that the battery is protected against damage that may be caused by its movement or placement within the large packaging.</p>		
<p><b>Additional requirement:</b>                      Batteries shall be protected against short circuit.</p>		

<b>LP904</b>	<b>PACKING INSTRUCTION</b>	<b>LP904</b>
	<p>This instruction applies to single damaged or defective batteries for UN 3090, 3091,3480 and 3481,including those contained in equipment.</p> <p>The following large packagings are authorized for a single damaged or defective battery and for a single damaged or defective battery contained in equipment, provided the general provisions of 4.1.1 and 4.1.3 are met</p> <p>For batteries and equipment containing batteries:</p> <ul style="list-style-type: none"> <li>steel (50A)</li> <li>aluminium (50B)</li> <li>metal other than steel or aluminium (50N)</li> <li>rigid plastics (50H)</li> <li>plywood (50D)</li> </ul> <p>Packagings shall conform to the packing group II performance level.</p> <ol style="list-style-type: none"> <li>1. Each damaged or defective cell or battery or equipment containing such battery shall be individually packed in an inner packaging and placed inside of an outer packaging. The inner packaging or outer packaging shall be leakproof to prevent the potential release of electrolyte.</li> <li>2. Each inner packaging shall be surrounded by sufficient non-combustible and non-conductive thermal insulation material to protect against a dangerous evolution of heat.</li> <li>3. Sealed packagings shall be fitted with a venting device when appropriate.</li> <li>4. Appropriate measures shall be taken to minimize the effects of vibrations and shocks, prevent movement of the battery within the package that may lead to further damage and a dangerous condition during transport. Cushioning material that is non-combustible and non-conductive may also be used to meet this requirement.</li> <li>5. Non combustibility shall be assessed according to a standard recognized in the country where the packaging is designed or manufactured.</li> </ol> <p>For leaking batteries, sufficient inert absorbent material shall be added to the inner or outer packaging to absorb any release of electrolyte.</p>	
	<p><b>Additional requirements:</b></p> <p>Batteries shall be protected against short circuit.</p>	

<b>Stowage Code</b>	<b>Description</b>
SW19	For batteries transported in accordance with special provisions 376 or 377, category C, unless transported on a short international voyage.

From: **IMDG - Code Supplement – The EmS Guide**

**F-A: Fire Schedule Alfa  
General Fire Schedule**

General comments		In a fire, exposed cargoes may explode or their containment may rupture. Fight fire from a protected position from as far away as possible.
	Packages	Create water spray from as many hoses as possible.
Cargo on fire on deck	Cargo Transport Units	
Cargo on fire under deck		Stop ventilation and close hatches. Use cargo space fixed fire-extinguishing system. If this is not available, create water spray using copious quantities of water.
Cargo exposed to fire		If practicable, remove or jettison packages which are likely to be involved in fire. Otherwise, keep cool using water.

**S-I: Spillage schedule India  
Flammable solids (Repacking possible)**

General comments		Wear suitable protective clothing and self-contained breathing apparatus. Avoid all sources of ignition (e.g., naked lights, unprotected light bulbs, electric hand tools, friction). Wear non-sparking footwear. Stop leak if practicable.
Spillage on deck	Packages (small spillage)	Collect spillage and repack if practicable. Otherwise, wash overboard with copious quantities of water. Keep clear of effluent.
	Cargo Transport Units (large spillage)	
Spillage under deck	Packages (small spillage)	Collect spillage and repack if practicable.
	Cargo Transport Units (large spillage)	