

## 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 (Example see Appendix B, last page).
- The gross mass does not exceed 30 kg per package (2.5 kg for air transport).
- The packaging shall be strong and capable of withstanding a 1.2 m drop test.
- For more conditions see special provision 188 (ADR/RID/IMDG-Code) and section II of Packing Instructions 968-970 (IATA DGR).
- Special conditions apply to air transport of lithium cells batteries with more than 0.3 g but less than 1 g / 2 g lithium content (see PI 968, section IB).

## 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.

Size/Type	Model	Exempted	Lithium content	UN Tests passed	UN Number	
BEL	SL-340	SL-740 SL-840 Yes1)	0.13 g	YES	3090/91	
1/6D	SL-386	SL-786 SL-886 Yes1) 2)	0.5 g	YES	3090/91	
1/10D	SL-389	SL-789 SL-889 Yes1)	0.3 g	YES	3090/91	
1/2AA	SL-350	SL-550 SL-750 SL-850 Yes1) 2)	0.35 g	YES	3090/91	
2/3AA	SL-361	SL-561 SL-761 SL-861 Yes1) 2)	0.5 g	YES	3090/91	
AA	SL-360 SL-460 SL-560	SL-760 SL-860 Yes1) 2)	0.65 g	YES	3090/91	
C	SL-770	SL-2770 SL-2870 No	2.5 g	YES	3090/91	
D	SL-780	SL-2780 SL-2880 No	5 g	YES	3090/91	
DD	SL-790	SL-2790 No	10 g	YES	3090/91	
Hybrid Layer Capacitors	HLC-1020 (3.7 V and 3.9 V)		Yes1)	0.01 g	YES	3090/91
	HLC-1520 (3.7 V)		Yes1)	0.02 g	YES	3090/91
	HLC 1520 (3.9 V)		Yes1)	0.04 g	YES	3090/91
	HLC-1550 (3.7 V)		Yes1)	0.07 g	YES	3090/91
	HLC-1550 (3.9 V)		Yes1)	0.13 g	YES	3090/91
TLM batteries	TLM-1520HP		Yes1)	0.04 g	YES	3090/91
	TLM-1530HP		Yes1)	0.08 g	YES	3090/91
	TLM-1550HP		Yes1)	0.18 g	YES	3090/91
	TLM-1520HE		Yes1)	0.11 g	YES	3090/91
	TLM-1530HE		Yes1)	0.20 g	YES	3090/91
	TLM-1550HE		Yes1) 2)	0.44 g	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 mass per package	<b>Forbidden</b> (as of 01.01.2015)	35 kg	according to packaging approval	according to packaging approval
	Packing group		N/A	N/A	N/A
	Packing instruction		968	P 903	P 903
	Marking		Class 9 label Handling Label "Cargo Aircraft only" Lithium battery handling label	Class 9 label	Class 9 label
<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	N/A	N/A	N/A	N/A
	Packing instruction	970 / 969	970 / 969	903	903
	Marking	Class 9 label	Class 9 label Handling Label For Cargo Aircraft Only	Class 9 label	Class 9 label
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 2015.

The applicable documents are:

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

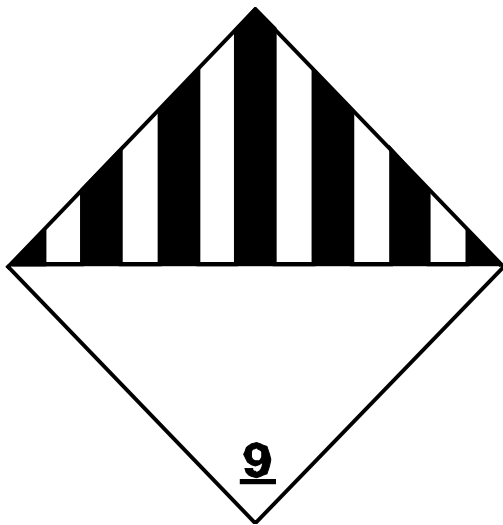
IATA DGR: International Air Transport Association, Dangerous Goods Regulations,

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.



Class 9 hazard label,  
reduced size,  
black on white



Handling Label  
"Cargo Aircraft Only",  
reduced size,  
black on orange



Lithium battery handling label  
reduced size,  
black on white,  
red boarder with diagonal  
hatchings

*\* delete as appropriate*

**ADR 2015**  
**Transport Regulations for Road and Rail Transport**  
**Overview**

UN 3090	LITHIUM METAL BATTERIES				see ADR chapter
UN 3091	LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT or LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT				
Class	9	Miscellaneous	x	x	2.2
Classification code	M4	Lithium batteries	x	x	2.2.9.1.2
Classification		Quality Management program	x	x	2.2.9.1.7
Packing group			x	x	2.1.1.3
Labels	9	Class 9 Hazard label	x	x	5.2.2
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	
	636	Used batteries etc.	x	x	
Limited quantities	LQ0	No	x	x	3.4.6
Excepted Quantity	E0	No	x	x	3.5.1.2
Packing instructions	P903	Lithium batteries	x	x	4.1.4
	P908	Used lithium batteries	x	x	4.1.4
	P909	Used cells and batteries for disposal	x	x	4.1.4
	LP903	Large packaging for single battery	x	x	4.1.4
	LP904	Large packaging for single damaged or defect battery	x	x	4.1.4
Transport category	2	Exemptions under 333 kg	x	x	1.1.3.6
Tunnel restriction 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

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.

**Note:** *The entry UN 3171 Battery-powered vehicle or UN 3171 Battery-powered equipment only applies to vehicles powered by wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries and equipment powered by wet batteries or sodium batteries transported with these batteries installed.*

*For the purpose of this UN number, vehicles are self-propelled apparatus designed to carry one or more persons or goods. Examples of such vehicles are electrically-powered cars, motorcycles, scooters, three- and four-wheeled vehicles or motorcycles, e-bikes, wheel-chairs, lawn tractors, boats and aircraft.*

*Examples of equipment are lawnmotors, cleaning machines or model boats and model aircraft. Equipment powered by lithium metal batteries or lithium ion batteries shall be consigned under the entries UN 3091 LITHIUM METAL BATTERIES CONTAINED IN*

*EQUIPMENT or UN 3091 LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT or UN 3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT or UN 3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT, as appropriate,*

*Hybrid electric vehicles powered by both an internal combustion engine and wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries, transported with the battery(ies) installed shall be classified under the entries UN 3166 vehicle, flammable gas powered or UN 3166 vehicle, flammable liquid powered, as appropriate, Vehicles which contain a fuel cell shall be classified under the entries UN 3166 vehicle, fuel cell, flammable gas powered or UN 3166 vehicle, fuel cell, flammable liquid powered, as appropriate.*

### 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) Except for packages containing button cell batteries installed in equipment (including circuit boards), or no more than four cells installed in equipment or no more than two batteries installed in equipment, each package shall be marked with the following:
  - (i) an indication that the package contains "lithium metal" or "lithium ion" cells or batteries, as appropriate;
  - (ii) an indication that the package shall be handled with care and that a flammability hazard exists if the package is damaged;
  - (iii) an indication that special procedures shall be followed in the event the package is damaged, to include inspection and repacking if necessary; and
  - (iv) a telephone number for additional information;
- (g) Each consignment of one or more packages marked in accordance with paragraph (f) shall be accompanied with a document including the following:
  - (i) an indication that the package contains "lithium metal" or "lithium ion" cells or batteries, as appropriate;
  - (ii) an indication that the package shall be handled with care and that a flammability hazard exists if the package is damaged;
  - (iii) an indication that special procedures shall be followed in the event the package is damaged, to include inspection and repacking if necessary; and
  - (iv) a telephone number for additional information;
- (h) 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
- (i) 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.

### 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 sub-section 38.3 of the *Manual of Tests and Criteria* 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, if:

- (a) the cells and batteries are carried in an outer packaging that is a metal, plastics or plywood drum or a metal, plastics or wooden box and that meets the criteria for packing group I; and
- (b) each cell and battery is individually packed in an inner packaging inside an outer packaging and is surrounded by cushioning material that is non-combustible, and non-conductive.

### 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 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 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.

### Special Provision 636

- (a) Cells contained in equipment shall not be capable of being discharged during carriage to the extent that the open circuit voltage falls below 2 volts or two thirds of the voltage of the undischarged cell, whichever is the lower.
- (b) Up to the intermediate processing facility, lithium cells and batteries with a gross mass of not more than 500 g each or 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, whether or not contained in equipment, collected and handed over for carriage for disposal or recycling, together with or

without other non-lithium cells or batteries are not subject to the other provisions of ADR including special provision 376 and paragraph 2.2.9.1.7, if they meet the following conditions:

- (i) The provisions of packing instruction P909 of 4.1.4.1 apply except for the additional requirements 1 and 2;
  
- (ii) A quality assurance system is in place to ensure that the total amount of lithium cells or batteries per transport unit does not exceed 333 kg;  
***NOTE:** The total quantity of lithium cells and batteries in the mix may be assessed by means of a statistical method included in the quality assurance system. A copy of the quality assurance records shall be made available to the competent authority upon request.*
  
- (iii) Packages are marked "LITHIUM BATTERIES FOR DISPOSAL" or "LITHIUM BATTERIES FOR RECYCLING" as appropriate.

**Special Provision 656**

(Deleted)

**Special Provision 661**

(Deleted)

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 <b>4.1.1</b> and <b>4.1.3</b> are met:		
<p>(1) For 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>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> <ul style="list-style-type: none"><li>(a) Strong outer packagings;</li><li>(b) Protective enclosures (e.g. in fully enclosed or wooden slatted crates); or</li><li>(c) Pallets or other handling devices.</li></ul> <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>		
<p><b>Additional requirement:</b> Cells or batteries shall be protected against short circuit.</p>		

<b>P903a</b>	<b>PACKING INSTRUCTION</b>	<b>P903a</b>
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(Deleted)

<b>P903b</b>	<b>PACKING INSTRUCTION</b>	<b>P903b</b>
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(Deleted)

<b>P908</b>	<b>PACKING INSTRUCTION</b>	<b>P908</b>
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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.

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:

- Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G)
- Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2)
- Jerricans (3A2, 3B2, 3H2)

Packagings shall conform to the packing group II performance level.

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.
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.
3. Sealed packagings shall be fitted with a venting device when appropriate.
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.
5. Non combustibility shall be assessed according to a standard recognized in the country where the packaging is designed or manufactured.

For leaking cells or batteries, sufficient inert absorbent material shall be added to the inner or outer packaging to absorb any release of electrolyte.

A cell or battery with a net mass of more than 30 kg shall be limited to one cell or battery per outer packaging.

**Additional requirement:**

Cells or batteries shall be protected against short circuit.

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> <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 carriage (e.g. by using a non-combustible and non-conductive cushioning material or through the use of a tightly closed plastics bag).</li> </ol>		

LP903	PACKING INSTRUCTION	LP903
This instruction applies to UN Nos. 3090, 3091, 3480 and 3481.		
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: Rigid large packagings conforming to the packing group II performance level, made of: steel (50A); aluminium (50B); metal other than steel or aluminium (50N); rigid plastics (50H); natural wood (50C); plywood (50D); reconstituted wood (50F); rigid fibreboard (50G). 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.		
<b>Additional requirement:</b> Batteries shall be protected against short circuit.		

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.		
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 For batteries and equipment containing batteries, large packagings made of: steel (50A) aluminium (50B) metal other than steel or aluminium (50N) rigid plastics (50H) plywood (50D) Packagings shall conform to the packing group II performance level.		
<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>		
For leaking batteries, sufficient inert absorbent material shall be added to the inner or outer packaging to absorb any release of electrolyte.		
<b>Additional requirement:</b> Batteries shall be protected against short circuit.		

## Transport Regulations Aircraft

### IATA DGR 2015

### 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	Miscellaneous	x	x	x	7.3.18	
Exempted Quantity	E0	No	x	x	x	2.7	
Limited Quantity	-	Forbidden	x	x	x	2.7	
Max. Net mass	2.5 kg	see also packing instructions	<sup>1)</sup>	<sup>1)</sup>	x	5.9	
Cargo aircraft	Max. Net mass	35 kg	see also packing instructions	<sup>1)</sup>	<sup>1)</sup>	x	5.9
	Handling label	Yes	Cargo Aircraft Only	x	x	x	7.4.2
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 vehicle	x	x			
	A201	Special Exemptions			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.

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**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.*



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**IATA Special Provision A48**

Packaging tests are not considered necessary.

**IATA Special Provision A88**

Prototype or low production (i.e. annual production runs consisting of no more than 100 lithium cells or batteries) 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 following requirements are met:

- (a) except as provided in paragraph (c), the cells or batteries must be transported in an outer packaging that is a metal, plastic or plywood drum or a metal, plastic or wooden box and that meets the criteria for Packing Group I packagings;
- (b) except as provided in paragraph (c), each cell or battery must be individually packed in an inner packaging inside an outer packaging and surrounded by cushioning material that is non-combustible, and non-conductive. Cells or batteries must be protected against short-circuiting;
- (c) lithium batteries with a mass of 12 kg or greater and having a strong, impact resistant outer casing, or assemblies of such batteries, may be packed in strong outer packagings or protective enclosures not subject to the requirements of Section 6 of these Regulations. The batteries or battery assemblies must be protected against short circuiting; and
- (d) a copy of the document of approval showing the quantity limitations must accompany the consignment.

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 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, 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.

**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**

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 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 University Street; Montreal, Quebec; CANADA H3C 5H7

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**PACKING INSTRUCTION 968**

STATE VARIATIONS: USG-02/03

OPERATOR VARIATIONS: 4C-08, 4M-08, 5X-02/07, AM-09,BA-01, BI-03, BR-18, C8-04, CV-04, CX-07, CZ-08, D0-03, DL-06, EY-04, FX-07, GF-14, HX-06, IB-01, JJ-08, KA-07, KK-10, L7-08, LA-16, LD-07, LP-08, LU-08, LX-06, M3-08, M7-08, OZ-10, PZ-08, QY-03/05, RS-06, SQ-07, UC-08, UX-07, WY-07, XL-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.

**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:

1. meet the provisions of 3.9.2.6; and
2. 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;
- lithium 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 <b>Lithium metal batteries</b>	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:

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**PACKING INSTRUCTION 968 (continued)**

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 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 consignment must be accompanied with a document with an indication that:

- the package contains lithium metal cells or batteries;
- the package must be handled with care and that a flammability hazard exists if the package is damaged;
- special procedures must be followed in the event the package is damaged, to include inspection and repacking if necessary; and
- a telephone number for additional information.

Each package must be labelled with a lithium battery handling label (Figure 7.4.H) in addition to the Class 9 hazard label (Figure 7.3.W) and the Cargo Aircraft Only label (Figure 7.4.B.).

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
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**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 (1.3.3.3 and 1.3.3.6);
- (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) 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;

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**PACKING INSTRUCTION 968** *(continued)*

- shifting of the contents so as to allow battery to battery (or cell to cell) contact;
- release of contents.

Each consignment must be accompanied with a document with an indication that:

- the package contains lithium metal cells or batteries;
- the package must be handled with care and that a flammability hazard exists if the package is damaged;
- special procedures must be followed in the event the package is damaged, to include inspection and repacking if necessary; and
- a telephone number for additional information.

Each package must be labelled with a lithium battery handling label (Figure 7.4.H) and the Cargo Aircraft Only label (Figure 7.4.B). 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 handling label;

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

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.

Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.

**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 there are no packages enclosing different substances which might react dangerously with each other. An overpack must be marked with the word "Overpack" and labelled with the lithium battery label (Figure 7.4.H) and the Cargo Aircraft Only label (Figure 7.4.B), unless the label(s) on the package(s) inside the overpack are visible.

**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
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**PACKING INSTRUCTION 969**

STATE VARIATIONS: USG-02/03

OPERATOR VARIATIONS: 4C-08, 4M-08, 5X-07, AC-06, AM-09, AR-11, AU-11, BR18/19, C8-04, CV-04, CZ-08, D0-03, EY-04, GF-14, HX-06, JJ-08, KQ-09, L7-08, LA-16, LP-08, LU-08, LX-06, M3-08, M7-08, OZ-10, PZ-08, QK-06, QR-04, QY-03/05, RS-06, RV-06, SQ-07, TZ-06, UC-08, WN-01, WY-07, XL-07, XW-06

**Introduction**

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

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.

**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);

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**PACKING INSTRUCTION 969 (continued)**

- (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;
- for the purpose of this packing instruction, "equipment" means apparatus requiring the lithium batteries with which it is packed for its operation.

**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	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 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.

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**PACKING INSTRUCTION 969** (continued)**Additional Requirements–Section II**

Cells and batteries must:

- be placed in inner packagings that completely enclose the cell or battery then placed in a strong outer packaging; or
- be placed in inner packagings that completely enclose the cell or battery, then placed with equipment in a strong 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 consignment must be accompanied with a document with an indication that:

- the package contains lithium metal cells or batteries;
- the package must be handled with care and that a flammability hazard exists if the package is damaged;
- special procedures must be followed in the event the package is damaged, to include inspection and repacking if necessary; and
- a telephone number for additional information.

Each package must be labelled with a lithium battery handling label (Figure 7.4.H);

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

The words "Lithium metal batteries in compliance with Section II of PI 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.

Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.

**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 there are no packages enclosing different substances which might react dangerously with each other. An overpack must be marked with the word "Overpack" and labelled with the lithium battery label (Figure 7.4.H), unless the label(s) 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	
<b>OUTER PACKAGINGS</b>			
Type	Drums	Jerricans	Boxes

**PACKING INSTRUCTION 970**

STATE VARIATIONS: USG-02/03

OPERATOR VARIATIONS: 4C-08, 4M-08, 5X-07, AC-06, AM-09, AR-11, AU-11, BR-18/19, C8-04, CV-04, CX-08, CZ-08, D0-03, EY-04, GF-14, HX-06, JJ-08, KA-08, KQ-09, L7-08, LA-16, LD-07, LU-08, LX-06, M3-08, M7-07, OZ-10, PZ-08, QK-06, QR-04, QY-03/05, RS-06, RV-06, SQ-07, TZ-06, UC-08, UX-07, WN-01, WY-07, XL-08, XW-06

**Introduction**

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

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.

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**PACKING INSTRUCTION 970 (continued)**

**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 Lithium metal batteries contained in equipment	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 containing more than four cells or more than two batteries installed in equipment must be labelled with a lithium battery handling label (Figure 7.4.H), except for button cell batteries installed in equipment (including circuit boards);

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**PACKING INSTRUCTION 970** *(continued)*

Each consignment with packages bearing the lithium battery handling label must be accompanied with a document with an indication that:

- the package contains lithium metal cells or batteries;
- the package must be handled with care and that a flammability hazard exists if the package is damaged;
- special procedures must be followed in the event the package is damaged, to include inspection and repacking if necessary; and
- a telephone number for additional information.

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

Where a consignment includes packages bearing the lithium battery handling label, the words "Lithium metal batteries in compliance with Section II of PI 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.

**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 there are no packages enclosing different substances which might react dangerously with each other. An overpack must be marked with the word "Overpack" and labelled with the lithium battery label (Figure 7.4.H), unless the label(s) on the package(s) inside the overpack are visible, or a label is not required.

**TABLE 970-II**

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

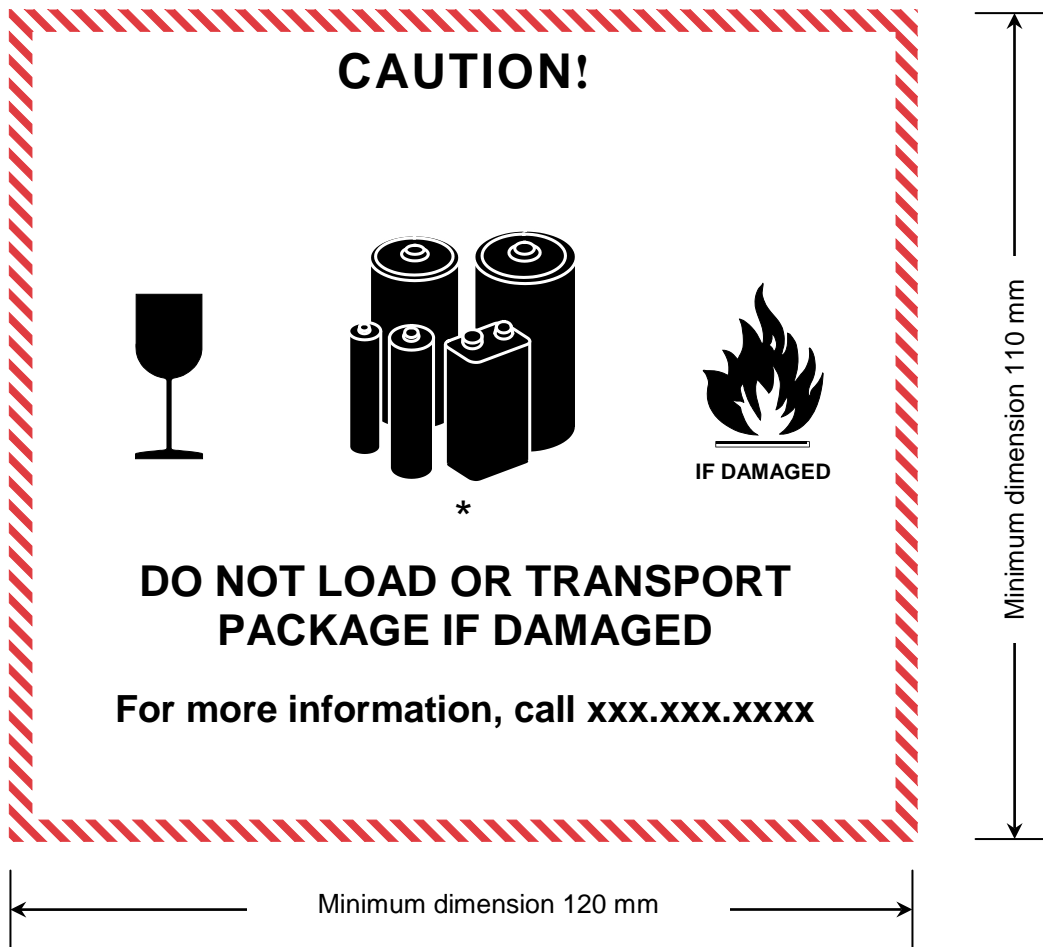
**OUTER PACKAGINGS**

Type	Drums	Jerricans	Boxes



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Figure 7.4.H  
Lithium Battery Label



\* Place for “Lithium ion battery” and/or “Lithium metal battery”, as applicable

Name: Lithium Battery Label  
Cargo IMP Code: RLI, RLM, ELI or ELM as applicable  
Where the packages are of dimensions such that they can only bear smaller labels the label dimensions may be 105 mm wide x 74 mm high  
Colour: The border of the label must have red diagonal hatchings. Text and symbols black on a contrasting background.

**IMDG Code 2015**  
**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
Subsidiary	---		x	x	
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		
	377	Lithium batteries for disposal or recycling	x	x	
Limited Quantities	0	no	x	x	
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
	LP903	Large packaging for single battery	x	x	4.1.4.3
	LP904	Large packaging for single damaged or defective battery	x	x	4.1.4.3
EmS <sup>1)</sup>	F-A	Fire Schedule Alfa	x	x	5.4.3.2
	S-I	Spillage Schedule India (flammable solids, repacking possible)	x	x	7.3
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				

<sup>1)</sup> See "The EmS Guide-Emergency Response procedures for Ships Carrying Dangerous Goods", including Emergency Schedules".

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#### 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 .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.

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### Special Provision 188

Lithium 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 Except for packages containing button cell batteries installed in equipment (including circuit boards), or no more than four cell installed in equipment or no more than two batteries installed in equipment, each package shall be marked with the following:
  - (i) an indication that the package contains "lithium metal" or "lithium ion" cells or batteries; as appropriate;
  - (ii) as indication that the package shall be handled with care and that a flammability hazard exists if the package is damaged;
  - (iii) an indication that special procedures shall be followed in the event the package is damaged, to include inspection and repacking if necessary; and
  - (iv) a telephone number for additional information.
- .7 Each consignment of one or more packages marked in accordance with paragraph .6 shall be accompanied with a document including the following:
  - (i) an indication that the package contains "lithium metal" or "lithium ion" cells or batteries, as appropriate;
  - (ii) an indication that the package shall be handled with care and that a flammability hazard exists if the package is damaged;
  - (iii) an indication that special procedures shall be followed in the event the package is damaged, to include inspection and repacking if necessary; and
  - (iv) a telephone number of additional information.

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- .8 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
- .9 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.

### **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 Chapter 38.3 of the UN Manual of Tests and Criteria 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 transported for testing if:

- .1 the cell and batteries are transported in an outer packaging that is a metal, plastics or plywood drum or a metal, plastics or wooden box and that meets the criteria for packing group I packagings; and
- .2 each cell and battery is individually packed in an inner packaging inside an outer packaging and is surrounded by cushioning material that is non-combustible, and non-conductive.

**Note:** For damage or defective lithium batteries and cells see SP 376

### **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.

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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 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.

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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, in protective enclosures (e.g., in fully enclosed or wooden slatted crates); or</p>		
<p>(b) 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. When active, these devices shall meet defined standards for electromagnetic radiation to ensure that the operation of the device does not interfere with aircraft systems.</p>		
<p>Additional requirement: Cells or batteries shall be protected against short circuit.</p>		

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P908	PACKING INSTRUCTION	P908
<p>This instruction applies to UN Nos. 3090, 3091, 3480 and 3481.</p>		
<p>The following packagings are authorized for damaged or defective lithium ion cells and batteries and lithium metal cells and batteries including those contained in equipment, 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)</p>		
<p>Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2)</p>		
<p>Jerricans (3A2, 3B2, 3H2)</p>		
<p>Packagings shall conform to the packing group II performance level.</p>		
<p>1. Each 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.</p>		
<p>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.</p>		
<p>3. Sealed packagings shall be fitted with a venting device when appropriate.</p>		
<p>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.</p>		
<p>5. Non combustibility shall be assessed according to a standard recognized in the country where the packaging is designed or manufactured.</p>		
<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></p>		
<p>Cells or batteries shall be protected against short circuit.</p>		



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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> <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 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> <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:</p> <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> <p>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).</p>		

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LP903	PACKING INSTRUCTION	LP903
<p>This instruction applies to UN Nos. 3090, 3091, 3480 and 3481</p>		
<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: 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>		

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LP904	PACKING INSTRUCTION	LP904
This instruction applies to UN Nos. 3090, 3091, 3480 and 3481		
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		
For batteries and equipment containing batteries: steel (50A) aluminium (50B) metal other than steel or aluminium (50N) rigid plastics (50H) plywood (50D)		
Packagings shall conform to the packing group II performance level.		
<ol style="list-style-type: none"><li>1. Each 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 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 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>		
For leaking batteries, sufficient inert absorbent material shall be added to the inner or outer packaging to absorb any release of electrolyte.		
<b>Additional requirements:</b> Batteries shall be protected against short circuit.		

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

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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)	