LITHIUM BATTERIES

Packing and Handling Guideline

IATA DGR 62nd edition

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Disclaimer

Please note that the information contained in this Guide is purely illustrative and does not replace the study of the Dangerous Goods Regulations to perform any tasks related to the preparation of shipments containing Lithium Batteries. DHL will not be held responsible for any inaccuracy, error or omission, regardless of cause.

Overview

Lithium batteries are a staple of everyday life – you can find them in almost all household appliances and in plenty of equipment at work. Their uses range from supplying energy to mobile phones to powering electric vehicles.

During the last couple of years the transport regulations for lithium batteries have undergone significant changes and it is the aim of this guide to summarize the current regulations.

The adequate preparation for transport for lithium batteries is described in Packing Instructions which are divided into three parts: General, Section I and Section II. General explains requirements which are valid for all lithium batteries; Section I refers to fully regulated Lithium Batteries and Cells and Section 2 refers to partly exempt Lithium Batteries or Cells.

The current IATA Lithium Battery Guidance Document is available at www.iata.org/en/programs/cargo/dgr/lithium-batteries/.

Regulations

ICAO / IATA Regulations

Adequate Instruction for Shipping Section II Lithium Batteries

Section II of the lithium battery packing instructions, PI 965–PI 970, include a requirement that "Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities". The definition of "adequate instruction" is explained in Chapter 1.6 of the IATA DGR. At a minimum, an employer should consider the following as being adequate instruction:

- Classification of lithium batteries being shipped.
- Documentation of procedures applied to lithium batteries being shipped.
- Written work instructions or other documentation, including automated controls.
- Review and understanding of documented procedures as applicable to the job function.
- Instruction records including date(s) for all employees.
- Refresher instructions provided at a minimum every two years or as the documented instructions are revised or regulations are changed.
- Reverse logistics, including transport mode and applicable prohibitions.

General Packing Requirements

Packaging Quality (IATA DGR 5.0.2.4)

Dangerous goods must be packed in good quality packagings which must be strong enough to withstand the shocks and loadings normally encountered in transport, including removal from a pallet, unit load device or overpack for subsequent manual or mechanical handling. Packages must be constructed and closed as to prevent any loss of contents when prepared for transport which might be caused under normal conditions of transport, by vibration or by changes in temperature, humidity or pressure (resulting from altitude, for example). Packages (including inner packagings and receptacles) must be closed in accordance with the information provided by the manufacturer. No dangerous residue must adhere to the outside of packages during transport. These provisions apply, as appropriate, to new, reconditioned or remanufactured packagings.

Manufacturers and subsequent distributors of packagings must provide information regarding procedures to be followed (including closure instructions for inner packagings and receptacles), a description of the types and dimensions of closures (including required gaskets) and any other components needed to ensure that packages as presented for transport are capable of passing the

applicable performance tests of Subsections 6.3 to 6.6 and the pressure differential requirements of 5.0.2.9, as applicable.

Note:
The nature of transport dictates that many packages are likely to be moved between different modes of transport with attendant increases in handling, e.g. from vehicles into warehouses and then onto aircraft. Additionally, packages consigned on a pallet may be removed from that pallet to assist handling and loading which may be carried out manually. To avoid damage and leakage from packages during transport, shippers should take this into account in selecting an appropriate packaging or in making the decision about the suitability of an already packaged item. In this respect, it is recommended that single steel or aluminium packagings (1A1, 1A2, 1B1, 1B2, 3A1, 3A2, 3B1, 3B2) when transported in narrow-bodied aircraft and not otherwise protected by, for example, placement in a unit load device, be provided additional protection against abrasive effects experienced in loading the aircraft through overpacking, palletisation or another means protecting the bottom head and chime. Also small single packagings, with a capacity of 2 L or less, should be overpacked to facilitate handling and to permit adequate securing of the dangerous goods aboard the aircraft.

Direct Contact of Packaging (IATA DGR 5.0.2.6.1)
Parts of packagings which are in direct contact with dangerous goods:

a) must not be affected or significantly weakened by those dangerous goods;
b) must not cause a dangerous effect, e.g. catalysing a reaction or reacting with the dangerous goods; and
c) must not allow permeation of the dangerous goods that could constitute a danger under normal conditions of transport.

Where necessary, they must be provided with a suitable inner coating or treatment. Shippers must also ensure that any absorbent materials and the materials of intermediate packagings for liquids do not react dangerously with the liquid.

Cushioning Material (IATA DGR 5.0.2.12.1)
Inner packagings must be packed, secured or cushioned in an outer packaging in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents into the outer packaging. Inner packagings containing liquids must be packaged with their closures upward and placed within outer packagings consistent with the orientation markings prescribed in 7.2.4.4 of these Regulations. Inner packagings that are liable to break or be punctured easily, such as those made of glass, porcelain or stoneware or of certain plastic material, etc., must be

secured in the outer packagings with suitable cushioning material. Any leakage of contents must not substantially impair the protective properties of the cushioning material or of the outer packaging.

Note:
The "inners" of "combination packagings" are always termed "inner packagings" not "inner receptacles". A glass bottle is an example of such an "inner packaging". The "inners" of "composite packagings" are normally termed "inner receptacles". For example, the "inner" of a 6HA1 composite packaging (plastic material) is such an "inner receptacle" since it is normally not designed to perform a containment function without its "outer packaging" and is not therefore an "inner packaging".

General Provisions on Lithium Batteries (IATA DGR 3.9.2.6)

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.

f) Lithium batteries, containing both primary lithium metal cells and rechargeable lithium ion cells, that are not designed to be externally charged (see Special Provision A213) must meet the following conditions:
    1. the rechargeable lithium ion cells can only be charged from the primary lithium metal cells;
    2. overcharge of the rechargeable lithium ion cells is precluded by design;
    3. the battery has been tested as a lithium primary battery;
    4. component cells of the battery must be of a type proved to meet the respective testing requirements of the UN Manual of Tests and Criteria, Part III, sub-section 38.3.

g) Manufacturers and subsequent distributors of cells or batteries manufactured after 30 June 2003 must make available the test summary as specified in the UN Manual of Tests and Criteria, Part III, sub-section 38.3, paragraph 38.3.5.

Provisions for lithium batteries carried by passengers or crew (IATA DGR Table 2.3.A)

Lithium Batteries can be carried by passengers and crew member staff, in an aircraft, under the below conditions:

The pilot-in-command must be informed of the location				
Permitted in or as carry-on baggage				
Permitted in or as checked baggage				
The approval of the operator is required				
Batteries, spare/loose, including lithium batteries, non-spillable batteries, nickel-metal hydride batteries and dry batteries (see 2.3.5.8) for portable electronic devices must be carried in carry-on baggage only. Articles which have the primary purpose as a power source, e.g. power banks are considered as spare batteries. These batteries must be individually protected to prevent short circuits. Lithium metal batteries: the lithium metal content must not exceed 2 g (see 2.3.5.8.4). Lithium ion batteries: the Watt-hour rating must not exceed 100 Wh (see 2.3.5.8.4). Each person is limited to a maximum of 20 spare batteries. *The operator may approve the carriage of more than 20 batteries. Non-spillable batteries: must be 12 V or less and 100 Wh or less. Each person is limited to a maximum of 2 spare batteries (see 2.3.5.8.5)	NO*	NO	YES	NO
e-cigarettes (including e-cigars, e-pipes, other personal vaporizers) containing batteries, must be individually protected to prevent accidental activation. (see 2.3.5.8.2)	NO	NO	YES	NO
Lithium Batteries: Portable electronic devices (PED) containing lithium metal or lithium ion cells or batteries, including medical devices such as portable oxygen concentrators (POC) and consumer electronics such as cameras, mobile phones, laptops and tablets (see 2.3.5.8). For lithium metal batteries the lithium metal content must not exceed 2 g and for lithium ion batteries the Watt-hour rating must	NO*	YES	YES	NO

The pilot-in-command must be informed of the location **Permitted in or as carry-on baggage** **Permitted in or as checked baggage** **The approval of the operator is required**				
not exceed 100 Wh. Devices in checked baggage must be completely switched off and must be protected from damage. Each person is limited to a maximum of 15 PED. *The operator may approve the carriage of more than 15 PED.				
Lithium battery-powered electronic devices. Lithium ion batteries for portable (including medical) electronic devices, a Wh rating exceeding 100 Wh but not exceeding 160 Wh. For portable medical electronic devices only, lithium metal batteries with a lithium metal content exceeding 2 g but not exceeding 8 g. Devices in checked baggage must be completely switched off and must be protected from damage.	YES	YES	YES	NO
Lithium Batteries: spare/loose, including power banks with a Watt-hour rating exceeding 100 Wh but not exceeding 160 Wh for consumer electronic devices and PMED or with a lithium metal content exceeding 2 g but not exceeding 8 g for PMED only. Maximum of two spare batteries in carry-on baggage only. These batteries must be individually protected to prevent short circuits.	YES	NO	YES	NO
Mobility Aids: Battery-powered wheelchairs or other similar mobility devices with **lithium ion batteries** where the battery is specifically designed to be removed, the battery must be carried in the cabin (see 2.3.2.4.3(b)2. for details)	YES	NO	YES	YES

IATA DGR Packing Instruction 965

This instruction applies to lithium ion or lithium polymer cells and batteries (UN 3480) on Cargo Aircraft Only.

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

- Section IA applies to lithium ion cells with a Watt-hour rating in excess of 20 Wh and lithium ion batteries with a Watt-hour rating in excess of 100 Wh, or to quantities of lithium ion 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 ion cells with a Watt-hour rating not exceeding 20 Wh and lithium ion batteries with a Watt-hour rating not exceeding 100 Wh packed in quantities that exceed the allowance permitted in Section II, Table 965-II; and
- Section II applies to lithium ion cells with a Watt-hour rating not exceeding 20 Wh and lithium ion batteries with a Watt-hour rating not exceeding 100 Wh packed in quantities not exceeding the allowance permitted in Section II, Table 965-II.A single cell battery as defined in Part III, sub-section 38.3.2.3 of the UN Manual of Tests and Criteria is considered a “cell” and must be transported according to the requirements for “cells” for the purpose of this packing instruction.

General requirements

The following requirements apply to all lithium ion or lithium polymer cells and batteries:

a) cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport;
b) 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;
c) 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 ion cells with a Watt-hour rating in excess of 20 Wh and lithium ion batteries with a Watt-hour rating in excess of 100 Wh 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:

a) meet the provisions of 3.9.2.6.1;
b) meet the General Requirements, above; and
c) lithium ion cells and batteries must be offered for transport at a state of charge (SoC) not exceeding 30% of their rated capacity. Cells and/or batteries at a SoC of greater than 30% may only be shipped with the approval of the State of Origin and the State of the Operator under the written conditions established by those authorities (see Special Provision A331).

Note:
Guidance and methodology for determining the rated capacity can be found in Section 38.3.2.3 of the UN Manual of Tests and Criteria.

- 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.
- Cells and batteries must not be packed in the same outer packaging with dangerous goods classified in Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).
- 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 authority of the State of origin. A copy of the document of approval must accompany the consignment.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.
- Packages containing cells or batteries must not be placed in an overpack with packages containing dangerous goods classified in Class 1 other than Division 1.4S, Division 2.1, Class 3, Division 4.1 or Division 5.1.

Table 965-IA

UN Number	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
UN3480 Lithium ion batteries	Forbidden	35kg

Outer Packagings

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

Section IB

Lithium ion 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:

a) for lithium ion cells, the Watt-hour rating is not more than 20 Wh;
b) for lithium ion batteries, the Watt-hour rating is not more than 100 Wh. The Watt-hour rating must be marked on the outside of the battery case except for those batteries manufactured before 1 January 2009; and
c) lithium ion cells and batteries must be offered for transport at a state of charge (SoC) not exceeding 30% of their rated capacity. Cells and/or batteries at a SoC of greater than 30% may only be shipped with the approval of the State of Origin and the State of the Operator under the written conditions established by those authorities, (see Special Provision A331).

Note:
Guidance and methodology for determining the rated capacity can be found in Section 38.3.2.3 of the UN Manual of Tests and Criteria.

Section IB requirements apply to cells and batteries packed in quantities that exceed the allowance permitted in Section II, Table 965-II shown below.
Quantities of lithium ion 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.

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.

Cells and batteries must not be packed in the same outer packaging with dangerous goods classified in Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).

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

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

Packages containing cells or batteries must not be placed in an overpack with packages containing dangerous goods classified in Class 1 other than Division 1.4S, Division 2.1, Class 3, Division 4.1 or Division 5.1.

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.

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

Table 965-IB

	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
Lithium ion cells and batteries	Forbidden	10 kg

Outer Packagings

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

Section II

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

a) restrictions on dangerous goods in consolidations (1.3.3.2.3 and 1.3.3.2.6);
b) provision of adequate instruction (1.6)
c) dangerous goods in passenger and crew baggage (Subsection 2.3). Only those lithium ion batteries as specifically permitted may be carried in carry-on baggage;
d) dangerous goods in air mail (Subsection 2.4);
e) use of unit load device (5.0.1.3)
f) marking of packages (7.1.5.5);
g) loading of cargo aircraft (9.3.4)
h) 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:

a) for cells, the Watt-hour rating is not more than 20 Wh; and
b) for batteries, Watt-hour rating is not more than 100 Wh. The Watt-hour rating must be marked on the outside of the battery case except those manufactured before 1 January 2009;
c) lithium ion cells and batteries must be offered for transport at a state of charge (SoC) not exceeding 30% of their rated capacity.

Note:
Guidance and methodology for determining the rated capacity can be found in Section 38.3.2.3 of the UN Manual of Tests and Criteria.

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 packaging must be placed in a strong rigid outer packaging of one of the packaging types shown below.
Each package must be capable of withstanding a 1.2 m drop test in any orientation without:

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

A Shipper's Declaration for Dangerous Goods is not required.
A shipper is not permitted to offer for transport more than one (1) package prepared according to this section in any single consignment.

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

The words “Lithium ion batteries in compliance with Section II of PI 965” and “Cargo Aircraft Only” or “CAO” must be included on the air waybill, when an air waybill is used. Where packages of Section II lithium batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different lithium battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable lithium battery type(s), packing instruction numbers and “CAO”. The information should be shown in the “Nature and Quantity of Goods” box of the air waybill.

Packages and overpacks of lithium ion batteries prepared in accordance with the provisions of Section II must be offered to the operator separately from cargo which is not subject to these Instructions and must not be loaded into a unit load device before being offered to the operator.

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

Overpacks–Section II

No more than one (1) package complying with the requirements of Section II may be placed in an overpack. The overpack may also contain packages of dangerous goods, other than dangerous goods classified in Class 1 other than Division 1.4S, Division 2.1, Class 3, Division 4.1 and Division 5.1, or goods not subject to these Regulations provided that the packages do not contain substances which might react dangerously with each other. An overpack must be marked with the word “Overpack” in lettering at least 12 mm high and durably and legibly marked with the mark shown in Figure 7.1.C and the Cargo Aircraft Only label (Figure 7.4.B), unless the marks and label representative of those on the package inside the overpack are visible.

Note:

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

Table 965-II

Contents	Lithium ion cells and/or batteries with a Watt-hour rating of 2.7 Wh or less	Lithium ion cells with a Watt-hour rating of more than 2.7 Wh but not more than 20 Wh	Lithium ion batteries with a Watt-hour rating of more than 2.7 Wh but not more than 100 Wh
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 965-II must not be combined in the same package.

Outer Packagings

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

IATA DGR Packing Instruction 966

This instruction applies to lithium ion or lithium polymer cells and batteries packed with equipment (UN 3481) on passenger and Cargo Aircraft Only.

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

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

- Section I applies where the equipment is packed with lithium ion cells with a Watt-hour rating in excess of 20 Wh or lithium ion batteries with a Watt-hour rating in excess of 100 Wh, which must be assigned to Class 9 and are subject to all of the applicable requirements of these Regulations; and
- Section II applies where the equipment is packed with lithium ion cells with a Watt-hour rating not exceeding 20 Wh or lithium ion batteries with a Watt-hour rating not exceeding 100 Wh.

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

General requirements

The following requirements apply to all lithium ion or lithium polymer cells and batteries:

a) cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport;
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 ion cells with a Watt-hour rating in excess of 20 Wh and lithium ion batteries with a Watt-hour rating in excess of 100 Wh 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:

a) meet the provisions of 3.9.2.6.1; and
b) meet the General Requirements, above.

The number of cells or batteries in each package must not exceed the number required for the equipment's operation, plus two spare sets. A “set” of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.

Cells and/or batteries must:

- be completely enclosed in inner packagings then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance standards; or
- be completely enclosed in inner packagings 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. Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

Table 966-I

UN Number	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
UN3481 Lithium Ion batteries packed with equipment	5 kg	35 kg

Outer Packagings

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

Section II

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

a) provision of adequate instruction (1.6);
b) dangerous goods in passenger and crew baggage (Subsection 2.3). Only those lithium ion batteries as specifically permitted may be carried in carry-on baggage;

c) dangerous goods in air mail (Subsection 2.4);
d) marking of packages (7.1.5.5);
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:

a) for cells, the Watt-hour rating is not more than 20 Wh; and
b) for batteries, Watt-hour rating is not more than 100 Wh. The Watt-hour rating must be marked on the outside of the battery case except those manufactured before 1 January 2009;

Cells and batteries must be packed in strong outer packaging that conforms to 5.0.2.4, 5.0.2.6.1 and 5.0.2.12.1. Cells and/or batteries must:

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

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

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

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

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

Each package must be durably and legibly marked with the mark shown in Figure 7.1.C. as required by 7.1.5.5.The package must be of such size that there is adequate space to affix the mark on one side of the package without the mark being folded.

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

The words “Lithium ion batteries in compliance with Section II of PI 966” must be included on the air waybill, when an air waybill is used. Where packages of Section II lithium batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different lithium battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable lithium battery type(s), packing instruction numbers and “CAO”, when applicable. The information should be shown in the “Nature and Quantity of Goods” box of the air waybill.

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

- the shipper must ensure that all applicable parts of both packing instructions are met. The total weight of lithium batteries contained in any package must not exceed 5 kg;
- the words “lithium ion batteries, in compliance with Section II of PI 966” must be placed on the air waybill, when an air waybill is used

Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible. Information on adequate instruction can be found in subsection 1.6.

Overpacks–Section II

Individual packages each complying with the requirements of Section II may be placed in an overpack. The overpack may also contain packages of dangerous goods or goods not subject to these Regulations provided that the packages do not contain substances which might react dangerously with each other. An overpack must be marked with the word “Overpack” in lettering at least 12 mm high and durably and legibly marked with the mark shown in Figure 7.1.C, unless the marks representative of those on the package(s) inside the overpack are visible.

Table 966-II

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

Outer Packagings

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

IATA DGR Packing Instruction 967

This instruction applies to lithium ion or lithium polymer cells and batteries contained in equipment (UN 3481) on passenger and Cargo Aircraft Only.
For the purposes of this packing instruction "equipment" means the device or apparatus for which the lithium cells or batteries will provide electrical power for its operation. The general requirements apply to all lithium ion cells and batteries packed with equipment prepared for transport according to this packing instruction:

- Section I applies where the equipment is packed with lithium ion cells with a Watt-hour rating in excess of 20 Wh or lithium ion batteries with a Watt-hour rating in excess of 100 Wh, which must be assigned to Class 9 and are subject to all of the applicable requirements of these Regulations; and
- Section II applies where the equipment is packed with lithium ion cells with a Watt-hour rating not exceeding 20 Wh or lithium ion batteries with a Watt-hour rating not exceeding 100 Wh.

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

General requirements

The following requirements apply to all lithium ion or lithium polymer cells and batteries:

a) cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport;
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 containing 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;

Section I

These requirements apply to lithium ion cells with a Watt-hour rating in excess of 20 Wh and lithium ion batteries with a Watt-hour rating in excess of 100 Wh that have been determined to meet the criteria for assignment to Class 9. Each cell or battery must:

a) meet the provisions of 3.9.2.6.1; and
b) meet the General Requirements, above.

The equipment must be packed in strong rigid 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 equipment containing the cells or batteries must be secured against movement within the outer packaging and be packed so as to prevent accidental activation.

Where multiple pieces of equipment are packed in the same outer packaging, the equipment must be packed and protected against contact with other equipment so as to prevent damage.

Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

Table 967-I

UN Number	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
UN3481 Lithium Ion batteries contained in equipment	5 kg	35 kg

Outer Packagings – Strong outer packagings, such as:

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

Section II

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

a) provision of adequate instruction (1.6);
b) dangerous goods in passenger and crew baggage (Subsection 2.3). Only those lithium ion batteries as specifically permitted may be carried in carry-on and checked baggage;
c) dangerous goods in air mail (Subsection 2.4);
d) marking of packages (7.1.5.5);
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 provision of 3.9.2.6 (a) and (e), the General Requirements of this packing instruction and:

a) for cells, the Watt-hour rating is not more than 20 Wh; and
b) for batteries, Watt-hour rating is not more than 100 Wh. The Watt-hour rating must be marked on the outside of the battery case except those manufactured before 1 January 2009.

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.

The equipment must be packed in strong rigid 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 or battery is afforded equivalent protection by the equipment in which it is contained.

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

Where multiple pieces of equipment are packed in the same outer packaging, the equipment must be packed and protected against contact with other equipment so as to prevent damage.
Each package must be durably and legibly marked with the mark shown in 7.1.C as required by 7.1.5.5. The package must be of such size that there is adequate space to affix the mark on one side of the package without the mark being folded.

This requirement does not apply to:

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

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

Where a consignment includes packages bearing the lithium battery mark, the words "Lithium ion batteries in compliance with Section II of PI 967" must be included on the air waybill, when an air waybill is used. Where packages of Section II lithium batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different lithium battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable lithium battery type(s), packing instruction numbers and "CAO", when applicable. 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 the functions for which they are responsible. Information on adequate instruction can be found in subsection 1.6.

Overpacks – Section II

Individual packages each complying with the requirements of Section II may be placed in an overpack. The overpack may also contain packages of dangerous goods or goods not subject to these Regulations provided that the packages do not contain substances which might react dangerously with each other. An overpack must be marked with the word "Overpack" in lettering at least 12 mm high and durably and legibly marked with the mark shown in Figure 7.1.C, unless the marks representative of those on the package(s) inside the overpack are visible, or the packages are not required to bear the lithium battery mark.

Table 967-II

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

Outer Packagings

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

IATA DGR Packing Instruction 968

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

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

General Requirements

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

a) cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport;
b) 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;
c) 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 an aggregate lithium 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:

a) meet the provisions of 3.9.2.6.1; and
b) meet the General Requirements, above.

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.

Cells and batteries must not be packed in the same outer packaging with dangerous goods classified in Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).

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.

Packages containing cells or batteries must not be placed in an overpack with packages containing dangerous goods classified in Class 1 other than Division 1.4S, Division 2.1, Class 3, Division 4.1 or Division 5.1.

Table 968-IA

	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
Lithium metal cells and batteries	Forbidden	35 kg

Outer Packagings

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

Section 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:

a) for a lithium metal cell, the lithium content is not more than 1 g; and
b) 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. 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.

Cells and batteries must not be packed in the same outer packaging with dangerous goods classified in Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).

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

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

Packages containing cells or batteries must not be placed in an overpack with packages containing dangerous goods classified in Class 1 other than Division 1.4S, Division 2.1, Class 3, Division 4.1 or Division 5.1.

Each package must be durably and legibly marked with the mark shown in Figure 7.1.C in addition to the Class 9—Lithium Battery hazard label (Figure 7.3.X) 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							
Desc.	Steel	Alumin-ium	Plywood	Fibre	Plastic	Other metal	Steel	Alumin-ium	Plastic	Steel	Alumin-ium	Wood	Plywood	Reconstituted 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) restrictions on dangerous goods in consolidations (1.3.3.2.3 and 1.3.3.2.6);
b) provision of adequate instruction (1.6);
c) 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;
d) dangerous goods in air mail (Subsection 2.4);
e) use of unit load devices (5.0.1.3);
f) marking of packages (7.1.5.5);
g) loading of cargo aircraft (9.3.4)
h) 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 3.9.2.6.1(a), (e), (f) if applicable and (g), the General Requirements of this packing instruction and:

a) for cells, the lithium content is not more than 1 g;
b) 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.

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

Each package must be durably and legibly marked with the lithium battery mark, Figure 7.1.C, as required by 7.1.5.5 and the Cargo Aircraft Only label (Figure 7.4.B). The package must be of such size that there is adequate space to affix the mark on one side of the package without the mark being folded. When the package dimensions are adequate, the Cargo Aircraft Only label must be located on the same surface of the package near the lithium battery mark.

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

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

The words “Lithium metal batteries in compliance with Section II of PI 968” and “Cargo Aircraft Only” or “CAO” must be included on the air waybill, when an air waybill is used. Where packages of Section II lithium batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different lithium battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable lithium battery type(s), packing instruction numbers and “CAO”, when applicable. The information should be shown in the “Nature and Quantity of Goods” box of the air waybill.
Packages and overpacks containing lithium batteries prepared in accordance with this section must be offered to the operator separately from the goods in the consolidation that are not subject to these Regulations. Packages and overpacks in consolidations must not be loaded into a unit load device before being offered to the operator.

Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible. Information on adequate instruction can be found in subsection 1.6.

Overpacks–Section II

Not more than one (1) package complying with the requirements of Section II may be placed in an overpack. The overpack may also contain packages of dangerous goods, other than dangerous goods classified in Class 1 other than Division 1.4S, Division 2.1, Class 3, Division 4.1 and Division 5.1, or goods not subject to these Regulations provided that the packages do not contain substances which might react dangerously with each other. An overpack must be marked with the word "Overpack" in lettering at least 12 mm high and durably and legibly marked with the mark shown in Figure 7.1.C and the Cargo Aircraft Only label (Figure 7.4.B), unless the mark and label representative of those on the package inside the overpack are visible.

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

Table 968-II

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

Cells and or batteries specified in columns 2, 3 and 4 of Table 965-II must not be combined in the same package.

Outer Packagings

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

IATA DGR Packing Instruction 969

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

For the purposes of this packing instruction "equipment" means the device or apparatus for which the lithium cells or batteries will provide electrical power for its operation. The general requirements apply to all lithium metal batteries packed with equipment prepared for transport according to this packing instruction:

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

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

General Requirements

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

a) cells or batteries identified as being damaged or defective in accordance with Special Provision A154 are forbidden for transport;
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 an aggregate lithium 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:

a) meet the provisions of 3.9.2.6.1; and
b) meet the General Requirements, above.

The number of cells or batteries in each package must not exceed the number required for the equipment's operation, plus two spare sets. A “set” of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment. Cells and/or batteries must:

- be completely enclosed in inner packagings then placed in an outer packaging. The completed package for the cells or batteries must meet the Packing Group II performance standards; or
- be completely enclosed in inner packagings then placed with equipment in a package that meets the Packing Group II performance standards.

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

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

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

Table 969-I

	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
Lithium metal cells and batteries	5kg	35kg

Outer Packagings

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

Section II

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

a) provision of adequate instruction (1.6);
b) 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;
c) dangerous goods in air mail (Subsection 2.4);
d) marking of packages (7.1.5.5);
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 provision of 3.9.2.6 (a) and (e), the General Requirements of this packing instruction; and:

a) for cells, the lithium content is not more than 1 g;
b) 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. Cells and batteries must:

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

The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
The number of cells or batteries in each package must not exceed the number required for the equipment's operation plus two spare sets. A “set” of cells or batteries is the number of individual cells or batteries that are required to power each piece of equipment.
Each package of cells or batteries, or the completed package must be capable of withstanding a 1.2 m drop test in any orientation without:

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

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

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. Where packages of Section II lithium batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different lithium battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable lithium battery type(s), packing instruction numbers and “CAO”, when applicable. The information should be shown in the “Nature and Quantity of Goods” box of the air waybill.

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

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

Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with the functions for which they are responsible. Information on adequate instruction can be found in subsection 1.6.

Overpacks – Section II

Individual packages each complying with the requirements of Section II may be placed in an overpack. The overpack may also contain packages of dangerous goods or goods not subject to these Regulations provided that the packages do not contain substances which might react dangerously with each other. An overpack must be marked with the word “Overpack” in lettering at least 12 mm high and durably and legibly marked with the mark shown in Figure 7.1.C, unless the marks representative of those on the package(s) inside the overpack are visible.

Table 969-II

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

Outer Packagings

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

IATA DGR Packing Instruction 970

This instruction applies to lithium metal or lithium alloy cells and batteries contained in equipment (UN 3091) on passenger and Cargo Aircraft Only.
For the purposes of this packing instruction "equipment" means the device or apparatus for which the lithium cells or batteries will provide electrical power for its operation.
The general requirements apply to all lithium metal batteries packed with equipment prepared for transport according to this packing instruction:

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

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

General Requirements

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

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

Section I

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

Each cell or battery must:

a) meet the provisions of 3.9.2.6.1; and
b) meet the General Requirements, above.

The equipment must be packed in strong rigid 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 equipment containing the cells or batteries must be secured against movement within the outer packaging and be packed so as to prevent accidental activation.

Where multiple pieces of equipment are packed in the same outer packaging, the equipment must be packed and protected against contact with other equipment so as to prevent damage.

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

	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
Lithium metal cells and batteries	5kg	35kg

Outer Packagings – Strong outer packagings, such as:

Type	Drums						Jerricans			Boxes							
Desc.	Steel	Alumin-ium	Plywood	Fibre	Plastic	Other metal	Steel	Alumin-ium	Plastic	Steel	Alumin-ium	Wood	Plywood	Reconstituted 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) provision of adequate instruction (1.6);
b) 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;
c) dangerous goods in air mail (Subsection 2.4);
d) marking of packages (7.1.5.5);
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:

a) for cells, the lithium content is not more than 1 g;
b) 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.

The equipment must be packed in strong rigid 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 or battery is afforded equivalent protection by the equipment in which it is contained.

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

Where multiple pieces of equipment are packed in the same outer packaging, the equipment must be packed and protected against contact with other equipment so as to prevent damage.

Each package must be durably and legibly marked with the mark shown in Figure 7.1.C. The package must be of such size that there is adequate space to affix the mark on one side of the package without the mark being folded. This requirement does not apply to:

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

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

Where a consignment includes packages bearing the lithium battery mark, the words “Lithium metal batteries in compliance with Section II of PI 970” must be included on the air

waybill, when an air waybill is used. Where packages of Section II lithium batteries from multiple packing instructions are included on one air waybill, the compliance statement for the different lithium battery types and/or packing instructions may be combined into a single statement provided that the statement identifies the applicable lithium battery type(s), packing instruction numbers and “CAO”, when applicable. 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 the functions for which they are responsible. Information on adequate instruction can be found in subsection 1.6.

Overpacks – Section II

Individual packages each complying with the requirements of Section II may be placed in an overpack. The overpack may also contain packages of dangerous goods or goods not subject to these Regulations provided that the packages do not contain substances which might react dangerously with each other. An overpack must be marked with the word “Overpack” in lettering at least 12 mm high and durably and legibly marked with the mark shown in Figure 7.1.C, unless the marks representative of those on the package(s) inside the overpack are visible, or the packages are not required to bear the lithium battery mark.

TABLE 970-II

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

Outer Packagings:

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

ADR

ADR stands for “Accord relatif au transport international des marchandises dangereuses par route” or in English “Agreement concerning the international Carriage of Dangerous Goods by Road”.

For road transport the ADR Special Provision 188 must be followed.
If the limits mentioned in the Special provision 188 are exceeded the shipment is not accepted in Time Definite International or Day Definite DHL Network. This restriction is limited to shipments sent to or from an ADR member state.

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;

Note:
When lithium batteries in conformity with 2.2.9.1.7 (f) are carried in accordance with this special provision, the total lithium content of all lithium metal cells contained in the battery shall not exceed 1.5g and the total capacity of all lithium ion cells contained in the battery shall not exceed 10 Wh (see special provision 387)

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;

Note:
When lithium batteries in conformity with 2.2.9.1.7 (f) are carried in accordance with this special provision, the total lithium content of all lithium metal cells contained in the battery shall not exceed 1.5g and the total capacity of all lithium ion cells contained in the battery shall not exceed 10 Wh (see special provision 387)

c) Each cell or battery meets the provisions of 2.2.9.1.7 (a),(e),(f) if applicable and (g);

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 material

within the same packaging that could lead to a short circuit. The inner packagings shall be packed in strong outer packagings which conform to the provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.5;

e) Cells and batteries when installed in equipment shall be protected from damage and short circuit, and the equipment shall be equipped with an effective means of preventing accidental activation. This requirement does not apply to devices which are intentionally active in carriage (radio frequency identification (RFID) transmitters, watches, sensors, etc.) and which are not capable of generating a dangerous evolution of heat. When batteries are installed in equipment, the equipment shall be packed in strong outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained;

f) Each package shall be marked with the appropriate lithium battery mark, as illustrated in 5.2.1.9;

This requirement does not apply to:

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

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

Note:

Packages containing lithium batteries packed in conformity with the provisions of Part 4, Chapter 11, packing instructions 965 or 968, Section IB of the ICAO Technical Instructions that bear the mark as shown in 5.2.1.9 (lithium battery mark) and the label shown in 5.2.2.2.2, model No. 9A shall be deemed to meet the provisions of this special provision.

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

h) Except when cells or 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. As used in this special provision “equipment” means apparatus for which the lithium cells or batteries will provide electrical power for its operation.

Separate entries exist for lithium metal batteries and lithium ion batteries to facilitate the carriage of these batteries for specific modes of carriage and to enable the application of different emergency response actions.

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

Use of overpacks (5.1.2.)

Unless marks and labels required in Chapter 5.2, except 5.2.1.3 to 5.2.1.6, 5.2.1.7.2 to 5.2.1.7.8 and 5.2.1.10, representative of all dangerous goods in the overpack are visible, the overpack shall be:

- marked with the word “OVERPACK”. The lettering of the “OVERPACK” mark shall be at least 12 mm high. The mark shall be in the official language of the country of origin and also, if that language is not English, French or German, in English, French or German, unless agreements, if any, concluded between the countries concerned in the transport operation provide otherwise; and
- labelled and marked with the UN number and other marks, as required for packages in Chapter 5.2 except 5.2.1.3 to 5.2.1.6, 5.2.1.7.2 to 5.2.1.7.8 and 5.2.1.10, for each item of the dangerous goods contained in the overpack. Each applicable mark or label only needs to applied once.

Orientation arrows illustrated in 5.2.1.10 shall be displayed on two opposite sides of overpacks containing packages which shall be marked in accordance with 5.2.2.10.1, unless the marks remains visible.

Each package of dangerous goods contained in the overpack shall comply with all applicable provisions of ADR. The intended function of each package shall not be impaired by the overpack.

Each package bearing package orientation marks as described in 5.2.1.10. and which is overpacked or placed in a large packaging shall be oriented in accordance with such marks.

The prohibitions on mixed loading also apply to these overpacks.

The complete ADR provisions are available at:
www.unece.org/trans/danger/publi/adr/adr_e.html.

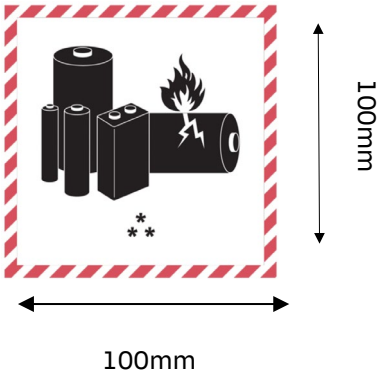
Marking and Labeling

The following marks and labels are used for lithium batteries shipments:

Lithium Battery Mark

Applicability:
Section II of PI965 - PI970 and Section IB of PI965 and PI968

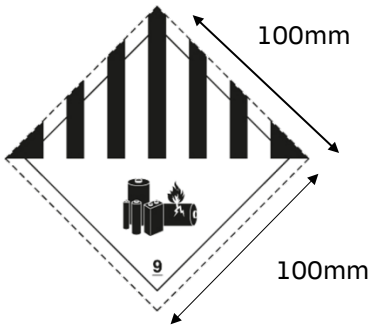
Minimum dimensions:
100 mm wide × 100 mm high. If the size of the package so requires, the dimensions may be reduced to not less than 100 mm wide × 70 mm high.



Class 9 – Lithium Batteries Label

Applicability:
Section IA and IB off PI965 and PI968 and Section I of PI966, PI967, PI969 and PI970

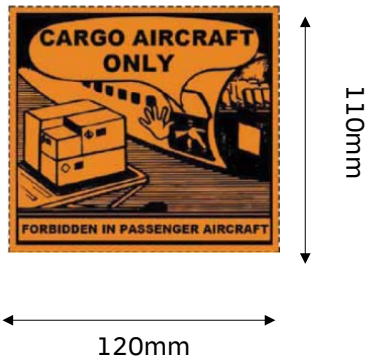
Minimum dimensions:
100 mm × 100 mm



Cargo Aircraft Only Label

Applicability:
Mandatory for Section IA, IB and II off PI965 and PI968

Minimum dimensions:
120 mm × 110 mm

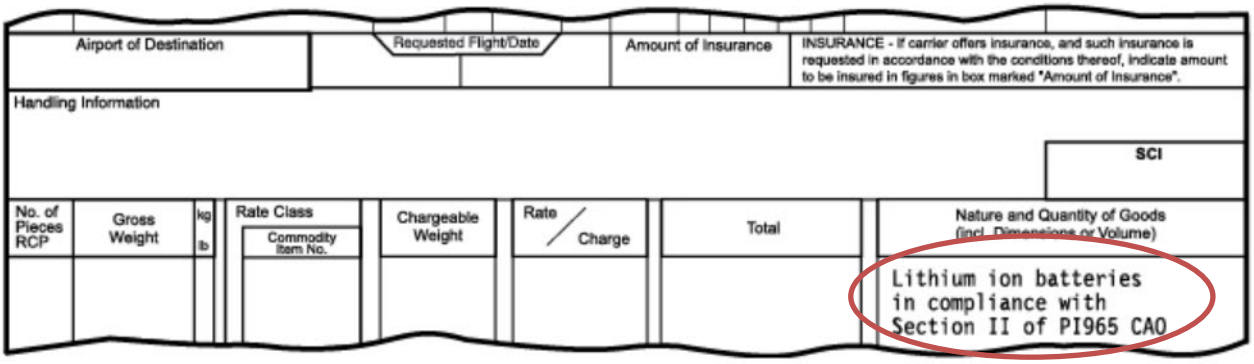


Documentation

Air waybill – Section II

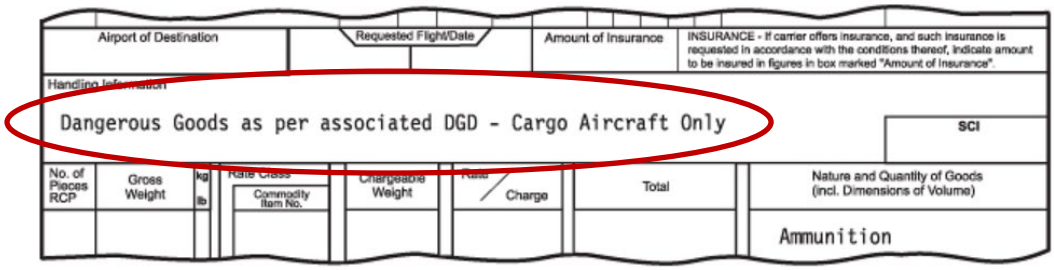
The following statement must be shown in the "Nature and Quantity of Goods" box of the air waybill:

- "Lithium ion batteries in compliance with Section II of PI ***" where "***" must be replaced with PI965, PI966, PI967 OR
- "Lithium metal batteries in compliance with Section II of PI ***" where "***" must be replaced with PI969, PI970
- "Cargo Aircraft Only" or "CAO" must be added mandatory for lithium batteries in compliance with Section II of PI965 and PI968



Air waybill – Sections I, IA, IB

The following statement must be shown in the "Handling Information" box of the air waybill, "Dangerous Goods as per associated Shipper's Declaration" or "Dangerous Goods as per attached DGD", and "Cargo Aircraft Only" or "CAO" if applicable.



Shipper's Declaration for Dangerous Goods

A Shipper's Declaration for Dangerous Goods is only required for shipments with Sections I, IA or IB.

Shipper Herbert Mey Gruselstr. 111 52249 Dueren Germany	**Air Waybill No:** 123 4567 8763 **Page** 1 of 1 Pages Shippers reference nbr. (optional)
Consignee Guido Schreck Avenue Bilmont 36 98724 Paris France	
Two completed and signed copies of this Declaration must be handed to the operator	

TRANSPORT DETAILS			WARNING
This shipment is within the limitations prescribed for (delete non-applicable)		**Airport of Departure** CGN	Failure to comply in all respects with the applicable Dangerous Goods Regulation may be in breach of the applicable law, subject to legal penalties.
xxxxxxxxxx xxxxxxxxxx xxxxxxxxxx	CARGO AIRCRAFT ONLY	**Airport of Destination** CDG	Shipment type: (delete non-applicable) NON-RADIOACTIVE / xxxxxxxxxxxxxxxxx

NATURE AND QUANTITY OF DANGEROUS GOODS

Dangerous Goods Identification				Quantity and type of packing	Packing Inst.	Authorization
UN or ID no	Proper Shipping Name.	Class or Division (Sub-risk)	Packing Group			
UN 3840	Lithium Ion Batteries	9		1 fibreboard box x 3 kg 2 plywood boxes x 4kg 5 plastic boxes x 2,3kg	965 IB	

Additional Handling Information
Emergency contact: .....

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. I declare that all of the applicable Air Transport requirements have been met.	Name of Signatory John Doe Date 07.01.2021 Signature John Doe

Shipper Herbert Mey Gruselstr. 111 52249 Dueren Germany	Air Waybill No: 123 4567 8763 Page 1 of 1 Pages Shippers reference nbr. (optional)
Consignee Guido Schreck Avenue Bilmont 36 9874 Paris France	
Two completed and signed copies of this Declaration must be handed to the operator	

TRANSPORT DETAILS

This shipment is within the limitations prescribed for (delete non-applicable)		Airport of Departure CGN
xxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxxxxxx	CARGO AIRCRAFT ONLY	Airport of Destination CDG

WARNING

Failure to comply in all respects with the applicable Dangerous Goods Regulation may be in breach of the applicable law, subject to legal penalties.

Shipment type: (delete non-applicable)

NON-RADIOACTIVE	xxxxxxxxxxxxxxxxx

NATURE AND QUANTITY OF DANGEROUS GOODS

Dangerous Goods Identification				Quantity and type of packing	Packing Inst.	Authorization
UN or ID no	Proper Shipping Name.	Class or Division (Sub-risk)	Packing Group			
UN 3840	Lithium Ion Batteries	9		1 fibreboard box x 3 kg 3 plastic boxes x 4kg 2 plywood boxes x 2.3kg Overpack used #678 Total quantity 19,6kg	965 IB	
UN 3480	Lithium Ion Batteries	9		3 plastic boxes x 4kg Overpack used x 3 #123, #234,#345 Total quantity per overpack 12kg	965	IB

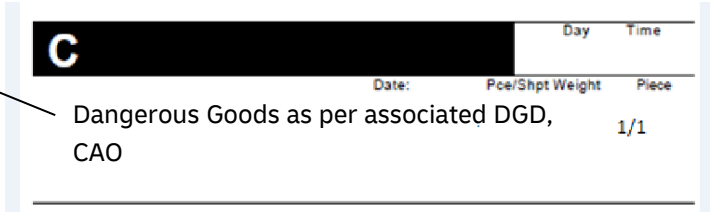
Additional Handling Information
Emergency contact: .....

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. I declare that all of the applicable Air Transport requirements have been met.	Name of Signatory John Doe Date 07.01.2021 Signature John Doe

Examples of prepared packages

Lithium Ion Batteries Section II PI965 package:

Lithium Ion Batteries Section IB PI965 package:



Lithium Batteries Section II PI967 / PI970 package:

Applicable for Batteries / cells with not more than:

- For PI967 - 20 Wh per cell or 100 Wh per battery
- For PI970 – 1 g per cell or 2 g per battery (lithium metal content

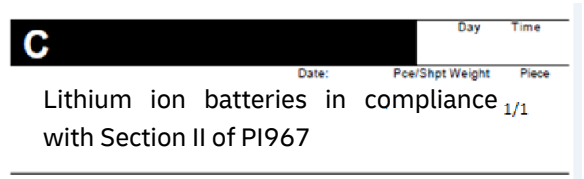
Not more than 2 batteries or 4 cells

Not more than 2 packages per consignment (waybill)

More than 2 batteries or 4 cells

More than 2 packages per consignment (waybill)

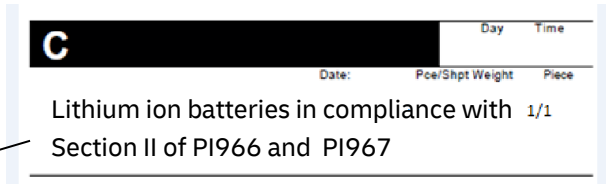
When the Lithium Battery Mark is required, the package must have:



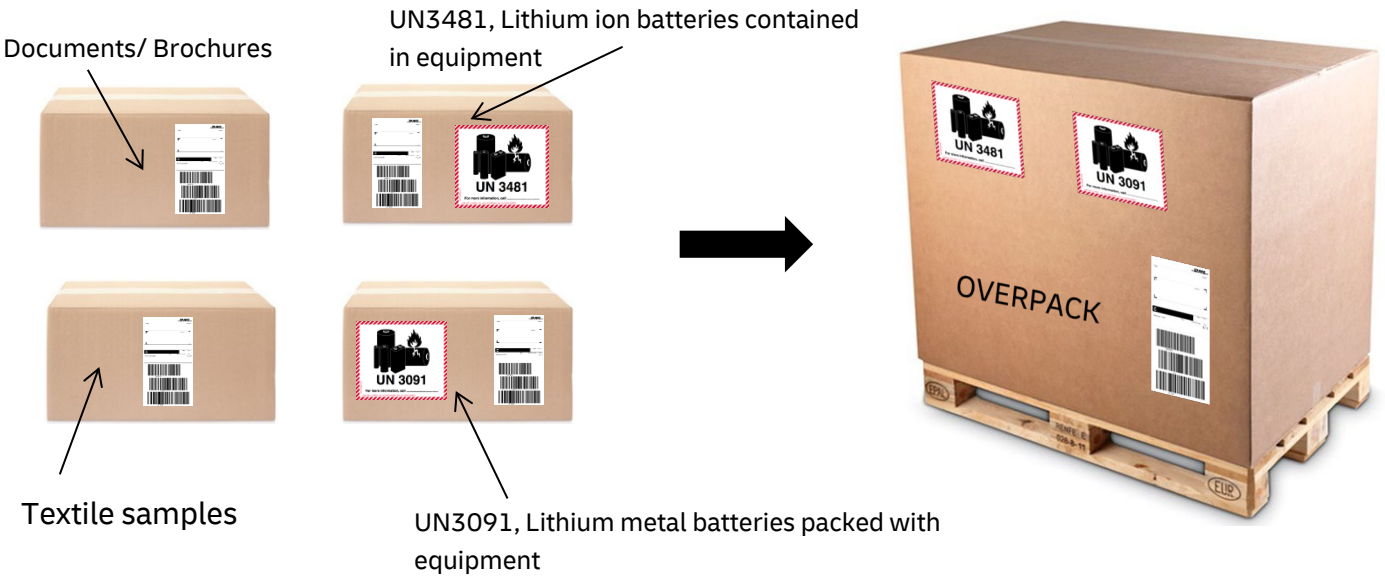
Lithium Batteries package prepared for road only transport:
All packages containing lithium batteries shipped under Special Provision 188 must be marked accordingly:

Applicable UN number and a phone number for additional information

Lithium Batteries package containing a combination of lithium ion batteries contained in equipment and lithium ion batteries packed with equipment (package and air waybill)



Lithium Batteries overpack:



Handling

Whenever packages containing lithium batteries fulfilling the exemption of part 1 of the applicable packing instructions are to be prepared for transport, it must be ensured that only staff trained and advised in accordance to this “Packing and Handling Procedure” will take over the required duties to prepare the shipment for transport.

Each single battery must be packed in inner packaging avoiding any short circuits during transport. Before the package gets closed it must be ensured that sufficient cushioning material is used to avoid any movement within the package during transport.

Only outer packages withstanding a 1.2 m drop test must be used.

Damaged or leaking batteries are forbidden to ship. If you recognize damaged package containing lithium batteries in accordance to this instruction you must repack the contents in accordance to this procedure. Ensure that the contents are undamaged and properly packed in inner packaging as required by the packing instruction.

In the unlikely event that a lithium battery catches fire leave it burning. Don’t use the common fire extinguisher – it might make things worse. Follow the responder procedure in place. Separate – if possible – the fuming or burning battery from other flammable material such as packaging material etc.