



ICAO | UNITING AVIATION

ICAO Training on Lithium Batteries

September, 2016

Abu Dhabi



Overview

- Classification of Dangerous Goods
- Dangerous Goods List: Lithium Batteries
- Dangerous Goods Special Provisions: Lithium Batteries
- Lithium Battery Packing Instructions



Overview

- Dangerous Goods Transport Documentation
- Dangerous Goods Markings
- Dangerous Goods Labels
- Passenger Exceptions for Lithium Batteries



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CLASSIFICATION OF DANGEROUS GOODS



Classification of Dangerous Goods

- Technical Instructions, Part 2, Chapter 9
 - Lithium battery classification is in 2;9.3



9.3 LITHIUM BATTERIES

9.3.1 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 Nos. 3090, 3091, 3480 or 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 Instructions.
- + Cell and battery types only meeting the requirements of the UN *Manual of Tests and Criteria*, Revision 3, are no longer valid.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 must be of a type proved to meet the testing requirements of the UN 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 a series of cells connected in parallel is equipped with effective means as necessary to prevent dangerous reverse current flow (e.g. diodes, fuses, etc.);



Classification of Dangerous Goods

- Quality Management Programme requirements for the lithium cell and battery manufacturer
- Part 2, 2;9.3.1 e)



- e) **cells and batteries must be manufactured under a quality management programme** 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 in accordance with Part III, subsection 38.3 of the UN *Manual of Tests and Criteria*;
 - 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.



Classification of Dangerous Goods

- 2;9.3.1 a) states that “each cell and battery is of a type proved to meet the requirements of each test of the UN *Manual of Tests and Criteria*, Part III, Section 38.3;”
- Section 38.3 covers the classification testing criteria for lithium batteries.



UN Manual of Test and Criteria (MoTC)

– UN MoTC, Revision 6

[http://www.unece.org/fileadmin/DAM/trans/danger/publi/manual/Rev.6/1520832_E_ST_SG_AC.10_11_Rev6_WEB -
With corrections from Corr.1.pdf](http://www.unece.org/fileadmin/DAM/trans/danger/publi/manual/Rev.6/1520832_E_ST_SG_AC.10_11_Rev6_WEB_-With_corrections_from_Corr.1.pdf)



UN Manual of Test and Criteria (MoTC)

- Sections to Review in the UN MoTC, Section 38.3, Rev. 5, Amendments 1 & 2:
 - 38.3.1 Purpose
 - 38.3.2.1, 38.3.2.2 Scope
 - 38.3.2.3 Definition of cell and battery
 - 38.3.3 (a)-(f)
 - 38.3.4 Brief overview of Procedures and T.1-T.8 testing titles



DANGEROUS GOODS LIST: LITHIUM BATTERIES





Dangerous Goods List: Lithium Batteries

- Technical Instructions, Part 3, Table 3-1
- Six (6) Proper Shipping Name (PSN) listings for lithium batteries in Table 3-1



Name	UN No.	Class or division	Subsidiary risk	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only		
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package	
1	2	3	4	5	6	7	8	9	10	11	12	13	
# Lithium ion batteries (including lithium ion polymer batteries)	3480	9		Miscellaneous	US 3	A88 A99 A154 A164 A183 A201			E0	FORBIDDEN	See 965		
# Lithium ion batteries contained in equipment (including lithium ion polymer batteries)	3481	9		Miscellaneous	US 3	A48 A99 A154 A164 A181 A185			E0	967	5 kg	967	35 kg
# Lithium ion batteries packed with equipment (including lithium ion polymer batteries)	3481	9		Miscellaneous	US 3	A88 A99 A154 A164 A181 A185			E0	966	5 kg	966	35 kg



Name	UN No.	Class or division	Subsidiary risk	Labels	State variations	Special provisions	UN packing group	Excepted quantity	Passenger and cargo aircraft		Cargo aircraft only	
									Packing instruction	Max. net quantity per package	Packing instruction	Max. net quantity per package
1	2	3	4	5	6	7	8	9	10	11	12	13
# Lithium metal batteries (including lithium alloy batteries) †	3090	9		Miscellaneous	US 2 US 3	A88 A99 A154 A164 A183 A201		E0	FORBIDDEN		See	968
# Lithium metal batteries contained in equipment (including lithium alloy batteries) †	3091	9		Miscellaneous	US 2 US 3	A48 A99 A154 A164 A181 A185		E0	970	5 kg	970	35 kg
# Lithium metal batteries packed with equipment (including lithium alloy batteries) †	3091	9		Miscellaneous	US 2 US 3	A99 A154 A164 A181 A185		E0	969	5 kg	969	35 kg



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DANGEROUS GOODS SPECIAL PROVISIONS: LITHIUM BATTERIES



Dangerous Goods Special Provisions: Lithium Batteries

- Technical Instructions, Part 3, Table 3-2
- Special Provisions (SP) listed against the Lithium Battery Proper Shipping Names in Table 3-1



Special Provisions

- A48 Packaging tests are not considered necessary.
- A88 Prototype or low production (i.e., annual production runs consisting of not more than 100 lithium batteries or cells) lithium batteries or cells 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), 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 Part 6 of these Instructions. 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.



Special Provisions

- A99 Irrespective of the quantity limits for cargo aircraft specified in column 13 of Table 3-1, and in Section I of Packing Instructions 965, 966, 967, 968, 969 and 970, a lithium battery or battery assembly (i.e. UN 3090 or UN 3480), including when packed with equipment or contained in equipment (i.e. 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.
- 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).
- 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.
- 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 metal batteries and lithium ion 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.



Special Provisions

- 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.
- A185 (360) Vehicles only powered by lithium metal batteries or lithium ion batteries must be consigned under the entry UN 3171 **Battery-powered vehicle**.

SUPPLEMENT:

- A201 States concerned may grant an exemption from the prohibition to transport lithium metal or lithium ion batteries on passenger aircraft in accordance with Part 1;1.1.3. Authorities issuing exemptions in accordance with this special provision must provide a copy to the Chief of the Cargo Safety Section within three months via email at CSS@icao.int, via facsimile at +1 514-954-6077 or via post to the following address:

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

Note. – Guidance for the processing of exemptions from the prohibition to transport lithium batteries may be found in Part S-1;4 of the Supplement to the Technical Instructions.



LITHIUM BATTERY PACKING INSTRUCTIONS



Lithium Battery Packing Instructions

- Technical Instructions, Part 4, Chapter 11
- 4;11 contains 6 packing instructions on Lithium Batteries (PI-965, 966, 967, 968, 969, & 970)



Lithium Battery Packing Instructions

- Packing Instruction 965 – Lithium ion batteries



Packing Instruction 965

Cargo aircraft only for UN 3480

1. Introduction

This entry applies to lithium ion or lithium polymer batteries. This packing instruction is structured as follows:

- 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, which must be assigned to Class 9 and are subject to all of the applicable requirements of these Instructions;
- 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.

2. Lithium batteries forbidden from transport

The following applies to all lithium ion cells and batteries in this packing instruction:

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).

Waste lithium batteries and lithium 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.



Packing Instruction 965

Cargo aircraft only for UN 3480

IA.1 General requirements

- Part 4;1 requirements must be met.
- Lithium ion cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity. Cells and/or batteries at a state of charge greater than 30 per cent of their rated capacity 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.

Note.— Guidance and methodology for determining the rated capacity can be found in sub-section 38.3.2.3 of the UN Manual of Tests and Criteria.

Table 965-IA

UN number and proper shipping name	Net quantity per package	
	Passenger	Cargo
UN 3480 Lithium ion batteries	Forbidden	35 kg



State of Charge

Rated capacity means the capacity, in ampere-hours or milliampere-hours, of a cell or battery as measured by subjecting it to a load, temperature and voltage cut-off point specified by the manufacturer.

NOTE: *The following IEC standards provide guidance and methodology for determining the rated capacity:*

(1) *IEC 61960 (First Edition 2003-12) : Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications;*

(2) *IEC 62133 (First Edition 2002-10): Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications;*

(3) *IEC 62660-1 (First Edition 2011-01): Secondary lithium-ion cells for the propulsion of electric road vehicles – Part 1: Performance testing.*



Packing Instruction 965

Cargo aircraft only for UN 3480

IA.2 Additional requirements

- Lithium ion cells and batteries must be protected against short circuits.
- Lithium ion 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 requirements.
- Lithium ion batteries with a mass 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 Part 6 of these Instructions, 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.

IA.3 Outer packagings

Boxes

Aluminium (4B)
Fibreboard (4G)
Natural wood (4C1, 4C2)
Other metal (4N)
Plastics (4H1, 4H2)
Plywood (4D)
Reconstituted wood (4F)
Steel (4A)

Drums

Aluminium (1B2)
Fibre (1G)
Other metal (1N2)
Plastics (1H2)
Plywood (1D)
Steel (1A2)

Jerricans

Aluminium (3B2)
Plastics (3H2)
Steel (3A2)



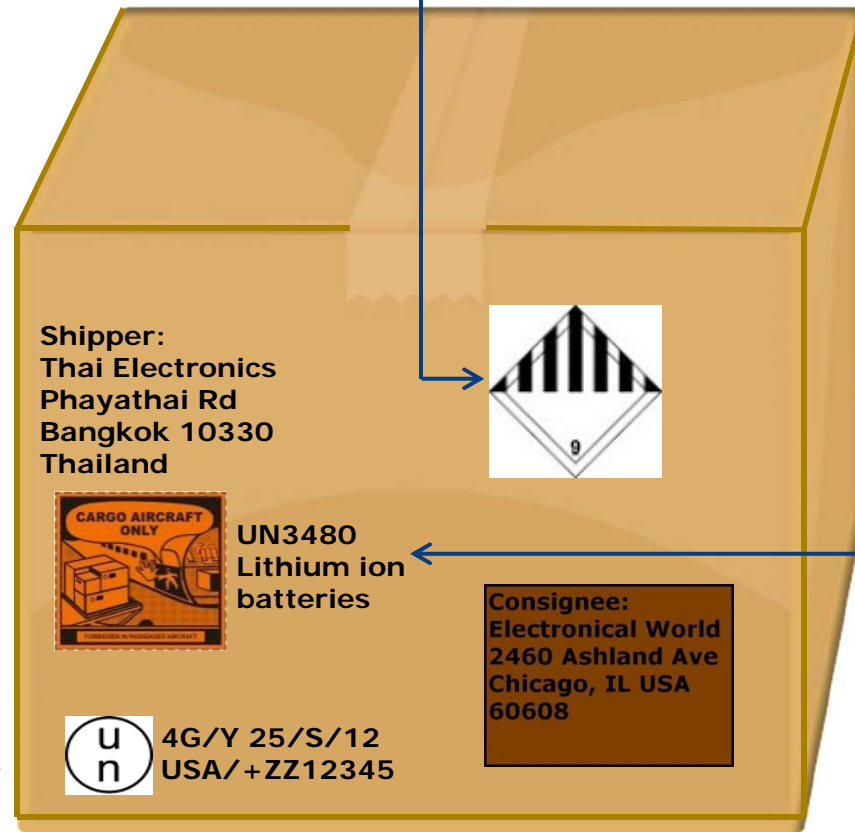
Lithium Ion Batteries: Section IA

Hazard Label

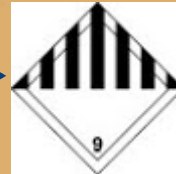
PACKAGE LIMITS

Passenger = **FORBIDDEN**

CAO = 35kg



Shipper:
Thai Electronics
Phayathai Rd
Bangkok 10330
Thailand



UN3480
Lithium ion
batteries

Consignee:
Electronical World
2460 Ashland Ave
Chicago, IL USA
60608



4G/Y 25/S/12
USA/+ZZ12345

UN Package
Specification
Number →

Proper Shipping
Name &
UN Number



Packing Instruction 965

Cargo aircraft only for UN 3480

IB. SECTION IB

Quantities of lithium ion cells or batteries that exceed the allowance permitted in Section II, Table 965-II are subject to all of the applicable provisions of these Instructions (including the requirements in paragraph 2 of this packing instruction and of this section) except for the the provisions of Part 6.

Lithium ion cells or batteries shipped in accordance with the provisions of Section IB must be described on a dangerous goods transport document as set in Part 5;4. The packing instruction number "965" required by 5;4.1.5.8.1 a) must be supplemented with "IB". All other applicable provisions of Part 5;4 apply.

Lithium ion cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for lithium ion cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;
- 2) 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;



Packing Instruction 965

Cargo aircraft only for UN 3480

IB.1 General requirements

- Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).
- Lithium ion cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity. Cells and/or batteries at a state of charge greater than 30 per cent of their rated capacity 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.

Note.— Guidance and methodology for determining the rated capacity can be found in sub-section 38.3.2.3 of the UN Manual of Tests and Criteria.

Table 965-IB

≠	Contents	Net quantity per package	
		Passenger	Cargo
≠	Lithium ion cells and batteries	Forbidden	10 kg



Packing Instruction 965

Cargo aircraft only for UN 3480

Packing Instruction 965

IB.2 Additional requirements

- Cells and batteries must be packed in inner packagings that completely enclose the cell or battery then placed in a strong outer packaging.
- 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.
- 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 labelled with a lithium battery handling label (Figure 5-32) in addition to the Class 9 hazard label (Figure 5-24) and the cargo aircraft only label (Figure 5-26).
- Each consignment must be accompanied with a document with an indication that:
 - the package contains lithium ion 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.

+ *Note.— This information may be provided on the dangerous goods transport document.*

IB.3 Outer packagings

Boxes

Drums

Jerricans

Strong outer packagings



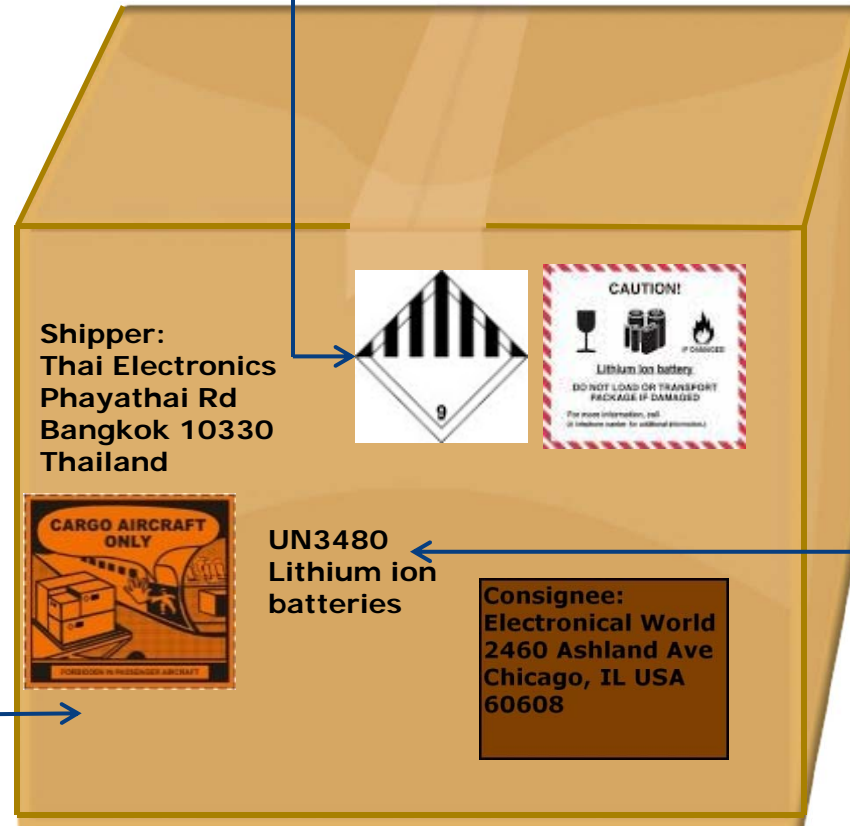
Lithium Ion Batteries: Section IB

Hazard and Handling Labels

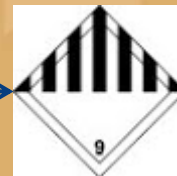
PACKAGE LIMITS

Passenger = **FORBIDDEN**

CAO = 10kg



Shipper:
Thai Electronics
Phayathai Rd
Bangkok 10330
Thailand



UN3480
Lithium ion
batteries

Consignee:
Electrical World
2460 Ashland Ave
Chicago, IL USA
60608

Proper Shipping
Name &
UN Number

Strong Outer
Packaging



Packing Instruction 965

Cargo aircraft only for UN 3480

II. SECTION II

With the exception of Part 1;2.3 (General — Transport of dangerous goods by post) , 5;1.1 g), 5.1.1 j) (Shipper's responsibilities — General requirements), 7;2.1 (Operator's responsibilities — Loading restrictions on the flight deck and for passenger aircraft), 7;2.4.1 (Operator's responsibilities — Loading of cargo aircraft), 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents), 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew) and paragraph 2 of this packing instruction, lithium ion cells and batteries offered for transport are not subject to other additional requirements of these Instructions if they meet the requirements of this section.

≠ Lithium ion cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for lithium ion cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;
- 2) 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.

>

II.1 General requirements

- Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).
- Lithium ion cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity.

Note.— Guidance and methodology for determining the rated capacity can be found in sub-section 38.3.2.3 of the UN Manual of Tests and Criteria.



Packing Instruction 965

Cargo aircraft only for UN 3480

Table 965-II

<i>Contents</i>	<i>Lithium ion cells and/or batteries with a Watt-hour rating not more than 2.7 Wh</i>	<i>Lithium ion cells with a Watt-hour rating more than 2.7 Wh, but not more than 20 Wh</i>	<i>Lithium ion batteries with a Watt-hour rating more than 2.7 Wh, but not more than 100 Wh</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Maximum number of cells / batteries per package	No limit	8 cells	2 batteries
Maximum net quantity (mass) per package	2.5 kg	n/a	n/a

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



Packing Instruction 965

Cargo aircraft only for UN 3480

II.2 Additional requirements

- Cells and batteries must be packed in inner packagings that completely enclose the cell or battery then placed in a strong outer packaging.
- 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.
- 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 labelled with a lithium battery handling label (Figure 5-32) and the cargo aircraft only label (Figure 5-26).
 - the cargo aircraft only label must be located on the same surface of the package near the lithium battery handling label, if the package dimensions are adequate.
- Each consignment must be accompanied with a document with an indication that:
 - the package contains lithium ion 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 is not permitted to offer for transport more than one package prepared according to this section in any single consignment.
- The words “lithium ion batteries, in compliance with Section II of PI965 — cargo aircraft only” or “lithium ion batteries, in compliance with Section II of PI965 — CAO” must be placed on the air waybill, when an air waybill is used.
- 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.



Packing Instruction 965

Cargo aircraft only for UN 3480

II.3 Outer packagings

Boxes

Drums

Jerricans

Strong outer packagings

II.4 Overpacks

Not more than one package prepared in accordance with this section may be placed into an overpack. When the package is placed in an overpack, the lithium battery handling label (Figure 5-32) and the cargo aircraft only label (Figure 5-26) required by this packing instruction must either be clearly visible or the label must be affixed on the outside of the overpack and the overpack must be marked with the word "Overpack".

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.



Packing Instruction 965

What Section Does my Shipment Fall Under?

Type of Lithium Ion Cell or Battery	Cells/Batteries under 2.7 Wh	Cells with a Watt-hour rating over 2.7 Wh, but less than 20 Wh	Batteries over 2.7 Wh, But not more than 100 Wh
Max number per pkg	No limit	8 cells	2 batteries
Max net quantity (mass) per pkg	2.5 kg	n/a	n/a

The limits specified in each column must not be combined in the same package.



Packing Instruction 965

What Section Does my Shipment Fall Under?

	Cells	Batteries
Section IA	> 20 Wh (5 kg PAX) (35 kg Cargo)	> 100 Wh (5 kg PAX) (35 kg Cargo)
Section IB	< 20 Wh and < 10 kg but Above Section II Limits	< 100 Wh and < 10 kg but Above Section II Limits
Section II	< 20 Wh and within limits	< 100 Wh, and within limits



Packing Instruction 965 -- SECTION IB

What's the Difference with IA?

Qty Limit	Passenger Aircraft	Cargo Aircraft
Section IA <i>Net Qty/Package</i>	5 kg	35 kg
Section IB <i>Package Qty</i>	10 kg G	10 kg

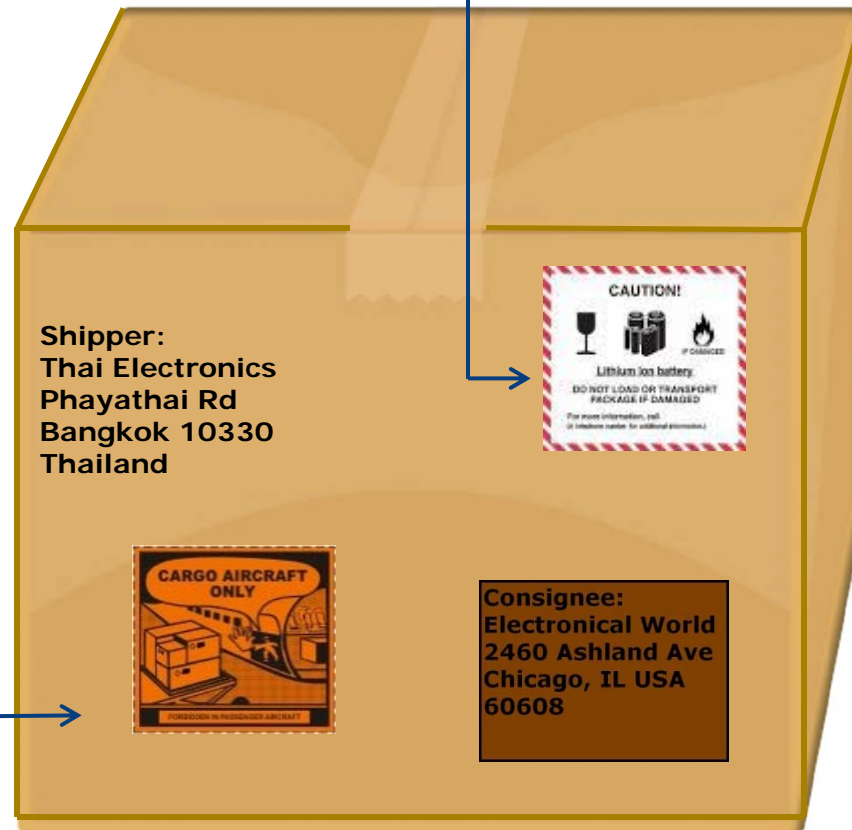
And...

- No specification packaging for IB
- Require a Lithium Battery handling label in addition to a Class 9 label for IB



Lithium Ion Batteries: Section II

Handling Label



PACKAGE LIMITS

Button cells = 2.5kg
or
8 cells
or
2 Batteries

Strong Outer Packaging



Lithium Battery Packing Instructions

- Packing Instruction 966 – Lithium ion batteries, packed with equipment



Packing Instruction 966

Passenger and cargo aircraft for UN 3481 (packed with equipment) only

1. Introduction

This entry applies to lithium ion or lithium polymer batteries packed with equipment.

Section I of this packing instruction applies to lithium ion and lithium polymer cells and batteries that are assigned to Class 9. Certain lithium ion and lithium polymer cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

2. Lithium batteries forbidden from transport

The following applies to all lithium ion cells and batteries in this packing instruction:

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).



Packing Instruction 966

Passenger and cargo aircraft for UN 3481 (packed with equipment) only

I. SECTION I

Each cell or battery must meet all the provisions of 2;9.3.

I.1 General requirements

Part 4;1 requirements must be met.

<i>UN number and proper shipping name</i>	<i>Package quantity (Section I)</i>	
	<i>Passenger</i>	<i>Cargo</i>
UN 3481 Lithium ion batteries packed with equipment	5 kg of lithium ion cells or batteries	35 kg of lithium ion cells or batteries



Packing Instruction 966

Passenger and cargo aircraft for UN 3481 (packed with equipment) only

I.2 Additional requirements

- Lithium ion cells and batteries must be protected against short circuits.
- Lithium ion 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 requirements; or
 - be placed in inner packagings that completely enclose the cell or battery, then placed with equipment in a packaging that meets the Packing Group II performance requirements.
- 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 operation, plus two spares.
- For the purpose of this packing instruction, "equipment" means apparatus requiring the lithium ion batteries with which it is packed for its operation.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

I.3 Outer packagings

Boxes

Aluminium (4B)
Fibreboard (4G)
Natural wood (4C1, 4C2)
Other metal (4N)
Plastics (4H1, 4H2)
Plywood (4D)
Reconstituted wood (4F)
Steel (4A)

Drums

Aluminium (1B2)
Fibre (1G)
Other metal (1N2)
Plastics (1H2)
Plywood (1D)
Steel (1A2)

Jerricans

Aluminium (3B2)
Plastics (3H2)
Steel (3A2)



Packing Instruction 966

Passenger and cargo aircraft for UN 3481 (packed with equipment) only

II. SECTION II

With the exception of Part 1;2.3 (Transport of dangerous goods by post), 7;4.4 (Reporting of dangerous goods accidents and incidents), 8;1.1 (Dangerous goods carried by passengers or crew) and paragraph 2 of this packing instruction, lithium ion cells and batteries packed with equipment offered for transport are not subject to other additional requirements of these Instructions if they meet the requirements of this section.

Lithium ion cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for lithium ion cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;
- 2) 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.



Packing Instruction 966

Passenger and cargo aircraft for UN 3481 (packed with equipment) only

II.1 General requirements

Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

<i>Contents</i>	<i>Package quantity (Section II)</i>	
	<i>Passenger</i>	<i>Cargo</i>
Net quantity of lithium ion cells or batteries per package	5 kg	5 kg



Packing Instruction 966

Passenger and cargo aircraft for UN 3481 (packed with equipment) only

II.2 Additional requirements

- Lithium ion 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 the equipment in a strong outer packaging.
- 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.
- 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 operation, plus two spares.
- Each package of cells or batteries, or the completed package, must be capable of withstanding a 1.2 m drop test in any orientation without:
 - damage to cells or batteries contained therein;
 - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
 - release of contents.
- Each package must be labelled with a lithium battery handling label (Figure 5-32).
- Each consignment must be accompanied with a document with an indication that:
 - the package contains lithium ion 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.
- The words "lithium ion batteries, in compliance with Section II of PI966" must be placed on the air waybill, when an air waybill is used.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.



Packing Instruction 966

Passenger and cargo aircraft for UN 3481 (packed with equipment) only

II.3 Outer packagings

Boxes

Drums

Jerricans

Strong outer packagings

II.4 Overpacks

When packages are placed in an overpack, the lithium battery handling label required by this packing instruction must either be clearly visible or the label must be affixed on the outside of the overpack and the overpack must be marked with the word "Overpack".



Lithium Battery Packing Instructions

- Packing Instruction 967 – Lithium ion batteries, contained in equipment



Packing Instruction 967

Passenger and cargo aircraft for UN 3481 (contained in equipment) only

1. Introduction

This entry applies to lithium ion or lithium polymer batteries contained in equipment.

Section I of this packing instruction applies to lithium ion and lithium polymer cells and batteries that are assigned to Class 9. Certain lithium ion and lithium polymer cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

2. Lithium batteries forbidden from transport

The following applies to all lithium ion cells and batteries in this packing instruction:

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).



Packing Instruction 967

Passenger and cargo aircraft for UN 3481 (contained in equipment) only

I. SECTION I

Each cell or battery must meet all the provisions of 2;9.3.

I.1 General requirements

Equipment must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

<i>UN number and proper shipping name</i>	<i>Package quantity (Section I)</i>	
	<i>Passenger</i>	<i>Cargo</i>
UN 3481 Lithium ion batteries contained in equipment	5 kg of lithium ion cells or batteries	35 kg of lithium ion cells or batteries



Packing Instruction 967

Passenger and cargo aircraft for UN 3481 (contained in equipment) only

1.2 Additional requirements

- The equipment must be secured against movement within the outer packaging and be packed so as to prevent accidental operation during air transport.
- 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.
- Batteries manufactured after 31 December 2011 must be marked with the Watt-hour rating on the outside case.

1.3 Outer packagings

Boxes

Drums

Jerricans

Strong outer packagings



Packing Instruction 967

Passenger and cargo aircraft for UN 3481 (contained in equipment) only

II. SECTION II

With the exception of Part 1;2.3 (Transport of dangerous goods by post), 7;4.4 (Reporting of dangerous goods accidents and incidents), 8;1.1 (Dangerous goods carried by passengers or crew) and paragraph 2 of this packing instruction, lithium ion cells and batteries contained in equipment offered for transport are not subject to other additional requirements of these Instructions if they meet the requirements of this section.

Lithium ion cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for lithium ion cells, the Watt-hour rating (see the Glossary of Terms in Attachment 2) is not more than 20 Wh;
- 2) 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.

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.



Packing Instruction 967

Passenger and cargo aircraft for UN 3481 (contained in equipment) only

II.1 General requirements

Equipment must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

<i>Contents</i>	<i>Package quantity (Section II)</i>	
	<i>Passenger</i>	<i>Cargo</i>
Net quantity of lithium ion cells or batteries per package	5 kg	5 kg



Packing Instruction 967

Passenger and cargo aircraft for UN 3481 (contained in equipment) only

II.2 Additional requirements

- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- Cells and batteries must be protected so as to prevent short circuits.
- 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.
- 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 5-32) (except button cell batteries installed in equipment (including circuit boards)).
- Each consignment with packages bearing the lithium battery handling label must be accompanied with a document with an indication that:
 - the package contains lithium ion 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.
- Where a consignment includes packages bearing the lithium battery handling label, the words "lithium ion batteries, in compliance with Section II of PI967" must be placed on the air waybill, when an air waybill is used.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.



Packing Instruction 967

Passenger and cargo aircraft for UN 3481 (contained in equipment) only

II.3 Outer packagings

Boxes

Drums

Jerricans

Strong outer packagings

II.4 Overpacks

When packages are placed in an overpack, the lithium battery handling label required by this packing instruction must either be clearly visible or the label must be affixed on the outside of the overpack and the overpack must be marked with the word "Overpack".



Lithium Battery Packing Instructions

- Packing Instruction 968 – Lithium metal batteries



Packing Instruction 968

Cargo aircraft only for UN 3090

1. Introduction

This entry applies to lithium metal or lithium alloy batteries. This packing instruction is structured as follows:

- 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 Instructions;
- 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.

2. Lithium batteries forbidden from transport

The following applies to all lithium metal cells and batteries in this packing instruction:

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).

Waste lithium batteries and lithium 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.



Packing Instruction 968

Cargo aircraft only for UN 3090

IA. SECTION IA

Each cell or battery must meet all the provisions of 2;9.3.

IA.1 General requirements

Part 4;1 requirements must be met.

Table 968-IA

	<i>UN number and proper shipping name</i>	<i>Net quantity per package</i>	
		<i>Passenger</i>	<i>Cargo</i>
≠	UN 3090 Lithium metal batteries	Forbidden	35 kg



Packing Instruction 968

Cargo aircraft only for UN 3090

IA.2 Additional requirements

- Lithium metal cells and batteries must be protected against short circuits.
- Lithium metal 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 requirements.
- Lithium metal batteries with a mass 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 Part 6 of these Instructions, if approved by the appropriate authority of the State of Origin. A copy of the document of approval must accompany the consignment.

IA.3 Outer packagings

Boxes

Aluminium (4B)
Fibreboard (4G)
Natural wood (4C1, 4C2)
Other metal (4N)
Plastics (4H1, 4H2)
Plywood (4D)
Reconstituted wood (4F)
Steel (4A)

Drums

Aluminium (1B2)
Fibre (1G)
Other metal (1N2)
Plastics (1H2)
Plywood (1D)
Steel (1A2)

Jerricans

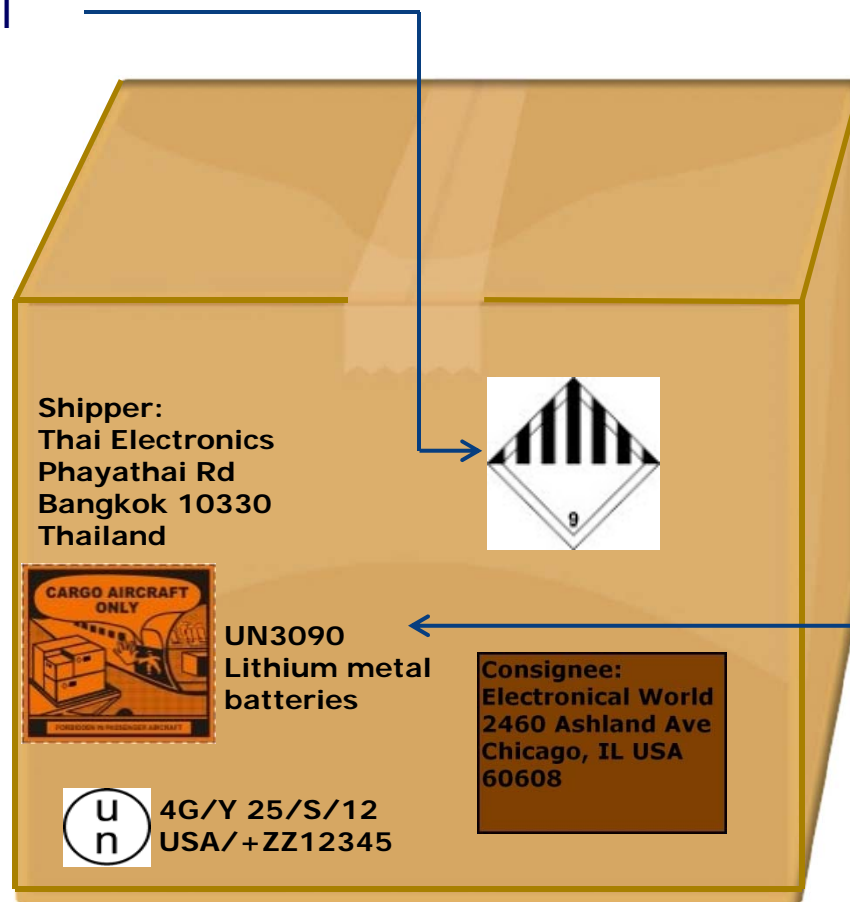
Aluminium (3B2)
Plastics (3H2)
Steel (3A2)



Lithium Metal Batteries: Section IA

Hazard Label

UN Package Specification Number →



PACKAGE LIMITS

Passenger =
Forbidden
CAO = 35kg

Proper Shipping Name & UN Number



Packing Instruction 968

Cargo aircraft only for UN 3090

IB. SECTION IB

Quantities of lithium metal cells or batteries that exceed the allowance permitted in Section II, Table 968-II, are subject to all of the applicable provisions of these Instructions (including the requirements in paragraph 2 of this packing instruction and of this section) except for the provisions of Part 6.

Lithium metal cells or batteries shipped in accordance with the provisions of Section IB must be described on a dangerous goods transport document as set in Part 5;4. The packing instruction number "968" required by 5;4.1.5.8.1 a) must be supplemented with "IB". All other applicable provisions of Part 5;4 apply.

Lithium metal or lithium alloy cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

- 1) for lithium metal cells, the lithium content is not more than 1 g;
- 2) for lithium metal or lithium alloy batteries, the aggregate lithium content is not more than 2 g.



Packing Instruction 968

Cargo aircraft only for UN 3090

IB.1 General requirements

Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

Table 968-IB

	<i>Contents</i>	<i>Net quantity per package</i>	
		<i>Passenger</i>	<i>Cargo</i>
≠ ≠	Lithium metal cells and batteries	Forbidden	2.5 kg



Packing Instruction 968

Cargo aircraft only for UN 3090

IB.2 Additional requirements

- Cells and batteries must be packed in inner packagings that completely enclose the cell or battery then placed in a strong outer packaging.
- 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.
- 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 labelled with a lithium battery handling label (Figure 5-32) in addition to the Class 9 hazard label and the cargo aircraft only label (Figure 5-26).
- 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.

Note.— This information may be provided on the dangerous goods transport document.

IB.3 Outer packagings

Boxes

Drums

Jerricans

Strong outer packagings

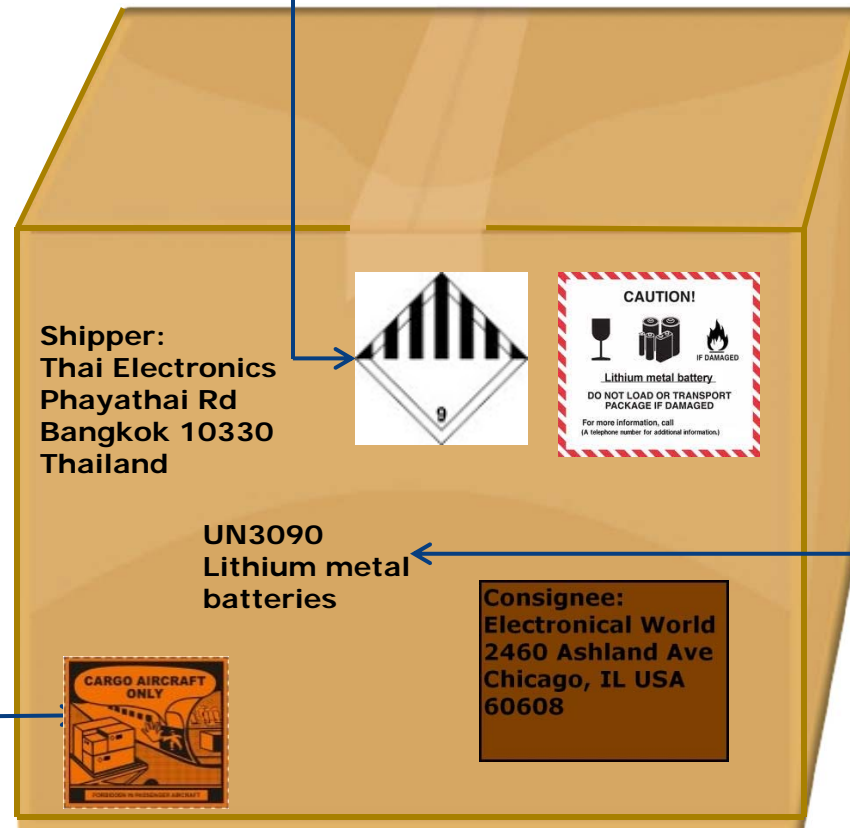


Lithium Metal Batteries: Section IB

Hazard and Handling Labels

PACKAGE LIMITS

Passenger =
Forbidden
CAO = 2.5kg



Shipper:
Thai Electronics
Phayathai Rd
Bangkok 10330
Thailand

UN3090
Lithium metal
batteries

Consignee:
Electronical World
2460 Ashland Ave
Chicago, IL USA
60608

Proper Shipping
Name &
UN Number

Strong Outer
Packaging



Packing Instruction 968

Cargo aircraft only for UN 3090

II. SECTION II

With the exception of Part 1;2.3 (General — Transport of dangerous goods by post), 5;1.1 g), 5;1.1 j) (Shipper's responsibilities — General requirements), 7;2.1 (Operator's responsibilities — Loading restrictions on the flight deck and for passenger aircraft), 7;2.4.1 (Operator's responsibilities — Loading of cargo aircraft), 7;4.4 (Operator's responsibilities — Reporting of dangerous goods accidents and incidents), 8;1.1 (Provisions concerning passengers and crew — Dangerous goods carried by passengers or crew) and paragraph 2 of this packing instruction, lithium metal or lithium alloy cells and batteries offered for transport are not subject to other additional requirements of these Instructions if they meet the requirements of this section.

Lithium metal or lithium alloy cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

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



Packing Instruction 968

Cargo aircraft only for UN 3090

II.1 General requirements

Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

Table 968-II

<i>Contents</i>	<i>Lithium metal cells and/or batteries with a lithium content not more than 0.3 g</i>	<i>Lithium metal cells with a lithium content more than 0.3 g but not more than 1 g</i>	<i>Lithium metal batteries with a lithium content more than 0.3 g but not more than 2 g</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Maximum number of cells / batteries per package	No limit	8 cells	2 batteries
Maximum net quantity (mass) per package	2.5 kg	n/a	n/a

The limits specified in columns 2, 3 and 4 of Table 968-II must not be combined in the same package.



Packing Instruction 968

Cargo aircraft only for UN 3090

1.2 Additional requirements

- Cells and batteries must be packed in inner packagings that completely enclose the cell or battery, then placed in a strong outer packaging.
- 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.
- 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 labelled with a lithium battery handling label (Figure 5-32) and the cargo aircraft only label (Figure 5-26).
 - the cargo aircraft only label must be located on the same surface of the package near the lithium battery handling label, if the package dimensions are adequate.
- 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.
- A shipper is not permitted to offer for transport more than one package prepared according to this section in any single consignment.
- The words "lithium metal batteries, in compliance with Section II of PI968 — cargo aircraft only" or "lithium metal batteries, in compliance with Section II of PI968 — CAO" must be placed on the air waybill, when an air waybill is used.
- Packages and overpacks of lithium metal 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.



Packing Instruction 968

Cargo aircraft only for UN 3090

1.3 Outer packagings

Boxes

Drums

Jerricans

Strong outer packagings

1.4 Overpacks

Not more than one package prepared in accordance with this section may be placed into an overpack. When the package is placed in an overpack, the lithium battery handling label and the cargo aircraft only label (Figure 5-26) required by this packing instruction must either be clearly visible or the labels must be affixed on the outside of the overpack and the overpack must be marked with the word "Overpack".

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.



Packing Instruction 968

What Section Does my Shipment Fall Under?

	Cells	Batteries
Section IA	> 1 g (2.5 kg PAX) (35 kg Cargo)	> 2 g (2.5 kg PAX) (35 kg Cargo)
Section IB	< 1 g lithium and <2.5 kg/package but Above Section II Limits	< 2 g lithium and <2.5 kg/package but Above Section II Limits
Section II	< 1 g, and within limits	< 2 g, and within limits



Packing Instruction 968

What Section Does my Shipment Fall Under?

First see if the package is within Section II

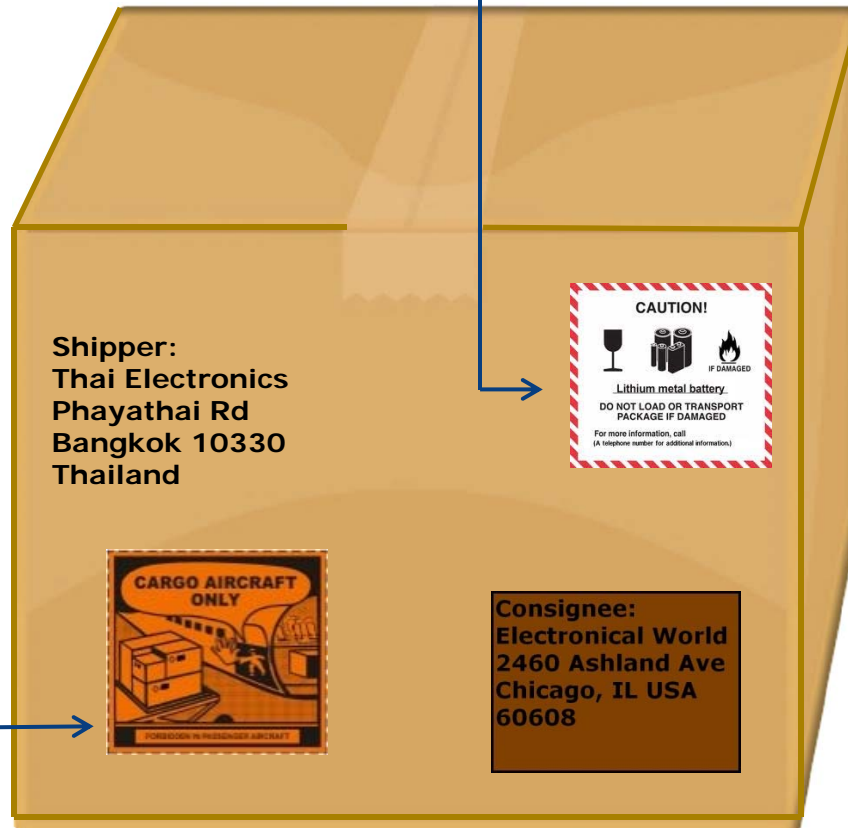
Type of Lithium Metal Cell or Battery	Cells/Batteries under 0.3 g	Cells with a lithium content over 0.3 g but less than 1 g	Batteries with a lithium content over 0.3 g but less than 2 g
Max number per pkg	No limit	8 cells	2 batteries
Max net quantity (mass) per pkg	2.5 kg	n/a	n/a

The limits specified in each column must not be combined in the same package.



Lithium Metal Batteries: Section II

Handling Label



PACKAGE LIMITS

Button cells = 2.5kg
or
8 cells
or
2 Batteries

Strong Outer
Packaging



Lithium Battery Packing Instructions

- Packing Instruction 969 – Lithium metal batteries, packed with equipment



Packing Instruction 969

Passenger and cargo aircraft for UN 3091 (packed with equipment) only

1. Introduction

This entry applies to lithium metal or lithium alloy batteries packed with equipment.

Section I of this packing instruction applies to lithium metal and lithium alloy cells and batteries that are assigned to Class 9. Certain lithium metal and lithium alloy cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

2. Lithium batteries forbidden from transport

The following applies to all lithium metal cells and batteries in this packing instruction:

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).



Packing Instruction 969

Passenger and cargo aircraft for UN 3091 (packed with equipment) only

I. SECTION I

Each cell or battery must meet all the provisions of 2;9.3.

I.1 General requirements

Part 4;1 requirements must be met.

<i>UN number and proper shipping name</i>	<i>Package quantity (Section I)</i>	
	<i>Passenger</i>	<i>Cargo</i>
UN 3091 Lithium metal batteries packed with equipment	5 kg of lithium metal cells or batteries	35 kg of lithium metal cells or batteries



Packing Instruction 969

Passenger and cargo aircraft for UN 3091 (packed with equipment) only

1.2 Additional requirements

- Lithium metal cells and batteries must be protected against short circuits.
- Lithium metal 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 requirements; or
 - be placed in inner packagings that completely enclose the cell or battery, then placed with equipment in a packaging that meets the Packing Group II performance requirements.
- 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 operation, plus two spares.
- For the purpose of this packing instruction, "equipment" means apparatus requiring the lithium batteries with which it is packed for its operation.
- For lithium metal cells and batteries prepared for transport on passenger aircraft as Class 9:
 - cells and batteries offered for transport on passenger aircraft must be packed in intermediate or outer rigid metal packaging surrounded by cushioning material that is non-combustible and non-conductive and placed inside an outer packaging.



Packing Instruction 969

Passenger and cargo aircraft for UN 3091 (packed with equipment) only

I.3 Outer packagings

Boxes

Aluminium (4B)
Fibreboard (4G)
Natural wood (4C1, 4C2)
Other metal (4N)
Plastics (4H1, 4H2)
Plywood (4D)
Reconstituted wood (4F)
Steel (4A)

Drums

Aluminium (1B2)
Fibre (1G)
Other metal (1N2)
Plastics (1H2)
Plywood (1D)
Steel (1A2)

Jerricans

Aluminium (3B2)
Plastics (3H2)
Steel (3A2)



Packing Instruction 969

Passenger and cargo aircraft for UN 3091 (packed with equipment) only

II. SECTION II

With the exception of Part 1;2.3 (Transport of dangerous goods by post), 7;4.4 (Reporting of dangerous goods accidents and incidents), 8;1.1 (Dangerous goods carried by passengers or crew) and paragraph 2 of this packing instruction, lithium metal cells and batteries packed with equipment offered for transport are not subject to other additional requirements of these Instructions if they meet the requirements of this section.

Lithium metal cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

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

II.1 General requirements

Cells and batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

<i>Contents</i>	<i>Package quantity (Section II)</i>	
	<i>Passenger</i>	<i>Cargo</i>
Net quantity of lithium metal cells or batteries per package	5 kg	5 kg



Packing Instruction 969

Passenger and cargo aircraft for UN 3091 (packed with equipment) only

II.2 Additional requirements

- Lithium metal cells or 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 the equipment in a strong outer packaging.
- 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.
- 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 operation, plus two spares.
- Each package of cells or batteries, or the completed package, must be capable of withstanding a 1.2 m drop test in any orientation without:
 - damage to cells or batteries contained therein;
 - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
 - release of contents.
- Each package must be labelled with a lithium battery handling label (Figure 5-32).
- 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.
- The words "lithium metal batteries, in compliance with Section II of PI969" must be placed on the air waybill, when an air waybill is used.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.



Packing Instruction 969

Passenger and cargo aircraft for UN 3091 (packed with equipment) only

II.3 Outer packagings

Boxes

Drums

Jerricans

Strong outer packagings

II.4 Overpacks

When packages are placed in an overpack, the lithium battery handling label required by this packing instruction must either be clearly visible or the label must be affixed on the outside of the overpack and the overpack must be marked with the word "Overpack".



Lithium Battery Packing Instructions

- Packing Instruction 970 – Lithium metal batteries, contained in equipment



Packing Instruction 970

Passenger and cargo aircraft for UN 3091 (contained in equipment) only

1. Introduction

This entry applies to lithium metal or lithium alloy batteries contained in equipment.

Section I of this packing instruction applies to lithium metal and lithium alloy cells and batteries that are assigned to Class 9. Certain lithium metal and lithium alloy cells and batteries offered for transport and meeting the requirements of Section II of this packing instruction, subject to paragraph 2 below, are not subject to other additional requirements of these Instructions.

2. Lithium batteries forbidden from transport

The following applies to all lithium metal cells and batteries in this packing instruction:

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).



Packing Instruction 970

Passenger and cargo aircraft for UN 3091 (contained in equipment) only

I. SECTION I

Each cell or battery must meet all the provisions of 2;9.3.

I.1 General requirements

Equipment must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

<i>UN number and proper shipping name</i>	<i>Package quantity (Section I)</i>	
	<i>Passenger</i>	<i>Cargo</i>
UN 3091 Lithium metal batteries contained in equipment	5 kg of lithium metal cells or batteries	35 kg of lithium metal cells or batteries



Packing Instruction 970

Passenger and cargo aircraft for UN 3091 (contained in equipment) only

1.2 Additional requirements

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

1.3 Outer packagings

Boxes

Drums

Jerricans

Strong outer packagings



Packing Instruction 970

Passenger and cargo aircraft for UN 3091 (contained in equipment) only

II. SECTION II

With the exception of Part 1;2.3 (Transport of dangerous goods by post), 7;4.4 (Reporting of dangerous goods accidents and incidents), 8;1.1 (Dangerous goods carried by passengers or crew) and paragraph 2 of this packing instruction, lithium metal cells and batteries contained in equipment offered for transport are not subject to other additional requirements of these Instructions if they meet the requirements of this section.

Lithium metal cells and batteries may be offered for transport provided that each cell and battery meets the provisions of 2;9.3.1 a) and e) and the following:

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



Packing Instruction 970

Passenger and cargo aircraft for UN 3091 (contained in equipment) only

II.1 General requirements

Equipment containing batteries must be packed in strong outer packagings that conform to Part 4;1.1.1, 1.1.3.1 and 1.1.10 (except 1.1.10.1).

<i>Contents</i>	<i>Package quantity (Section II)</i>	
	<i>Passenger</i>	<i>Cargo</i>
Net quantity of lithium metal cells or batteries per package	5 kg	5 kg



Packing Instruction 970

Passenger and cargo aircraft for UN 3091 (contained in equipment) only

II.2 Additional requirements

- The equipment must be secured against movement within the outer packaging and must be equipped with an effective means of preventing accidental activation.
- Cells and batteries must be protected so as to prevent short circuits.
- 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.
- 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 5-32) (except button cell batteries installed in equipment (including circuit boards)).
- 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.
- Where a consignment includes packages bearing the lithium battery handling label, the words "lithium ion batteries, in compliance with Section II of PI970" must be placed on the air waybill, when an air waybill is used.
- Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.



Packing Instruction 970

Passenger and cargo aircraft for UN 3091 (contained in equipment) only

II.3 Outer packagings

Boxes

Drums

Jerricans

Strong outer packagings

II.4 Overpacks

When packages are placed in an overpack, the lithium battery handling label required by this packing instruction must either be clearly visible or the label must be affixed on the outside of the overpack and the overpack must be marked with the word "Overpack".



UK CAA Video on Lithium Batteries

Lithium batteries: Guidance for cargo and ramp personnel (8m38s)

<https://www.youtube.com/watch?v=puhtU0npSW0>



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DANGEROUS GOODS TRANSPORT DOCUMENTATION



Dangerous Goods Transport Document

- Technical Instructions, Part 5, Chapter 4 includes the requirements
- The red and white striped border is not a regulatory requirement, but has been adopted by the industry as a standard



Dangerous Goods Transport Document

- The following Lithium Battery packages need a DG Transport Document:
 - Section IA (PI-965 & 968)
 - Section IB (PI-965 & 968)
 - Section I (PI-966, 967, 969, & 970)

Proper Shipping Name	UN #	Class	Packing Instruction
Lithium ion batteries	UN3480	9	965
Lithium ion batteries contained in equipment	UN3481	9	966
Lithium ion batteries packed with equipment	UN3481	9	967

Proper Shipping Name	UN #	Class	Packing Instruction
Lithium metal batteries	UN3090	9	968
Lithium metal batteries contained in equipment	UN3091	9	969
Lithium metal batteries packed with equipment	UN3091	9	970



Dangerous Goods Transport Document

SHIPPER'S DECLARATION FOR DANGEROUS GOODS

Shipper Thai Electronics Phayathai Rd Bangkok 10330 Thailand		Air Waybill No. Page 1 of 1 Pages Shipper's Reference Number <i>(optional)</i>				
Consignee Electronical World 2480 Ashland Ave. Chicago, IL USA 60608		<i>For optional use for Company logo name and address</i>				
<i>Two completed and signed copies of this Declaration must be handed to the operator.</i>		WARNING Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties.				
TRANSPORT DETAILS						
This shipment is within the limitations prescribed for: <i>(delete non-applicable)</i>		Airport of Departure: Bangkok				
<input checked="" type="checkbox"/> PASSENGER AND CARGO AIRCRAFT <input type="checkbox"/> CARGO AIRCRAFT		Airport of Destination: Chicago				
		Shipment type: <i>(delete non-applicable)</i> <input checked="" type="checkbox"/> NON-RADIOACTIVE <input type="checkbox"/> RADIOACTIVE				
NATURE AND QUANTITY OF DANGEROUS GOODS						
Dangerous Goods Identification						
UN or ID No.	Proper Shipping Name	Class (or Division) (Subsidiary Risk)	Pack- ing: Group	Quantity and type of packing	Packing Inst.	Authorization
UN3480	Lithium ion batteries	9		1 - 4G (Fiberboard) Box	065	
Additional Handling Information Emergency Telephone Number: +66 2 0000000						
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/Title of Signatory Punyaa Mookjai, Transport Specialist Place and Date Bangkok, Thailand, July 15, 2015 Signature <i>(see warning above)</i> Punyaa Mookjai		



SHIPPER'S DECLARATION FOR DANGEROUS GOODS

Shipper Thai Electronics Phayathai Rd Bangkok 10330 Thailand		Air Waybill No. Page 1 of 1 Pages Shipper's Reference Number <i>(optional)</i>	
Consignee Electronical World 2460 Ashland Ave. Chicago, IL USA 60608		<i>For optional use for Company logo name and address</i>	
<i>Two completed and signed copies of this Declaration must be handed to the operator.</i>			
TRANSPORT DETAILS			
This shipment is within the limitations prescribed for: <i>(delete non-applicable)</i>		Airport of Departure: Bangkok	
<input checked="" type="checkbox"/> PASSENGER AND CARGO AIRCRAFT		<input checked="" type="checkbox"/> CARGO AIRCRAFT ONLY	
Airport of Destination:		Chicago	
WARNING Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties.			
Shipment type: <i>(delete non-applicable)</i> <input checked="" type="checkbox"/> NON-RADIOACTIVE <input checked="" type="checkbox"/> RADIOACTIVE			



Dangerous Goods Transport Document

NATURE AND QUANTITY OF DANGEROUS GOODS						
Dangerous Goods Identification						
UN or ID No.	Proper Shipping Name	Class or Division (Subsidiary Risk)	Pack-ing Group	Quantity and type of packing	Packing Inst.	Authorization
UN3480	Lithium ion batteries	9		1 - Fiberboard Box x 4kg	965	



Dangerous Goods Transport Document

Additional Handling Information

Emergency Telephone Number: +66 2 9999999

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/Title of Signatory
Punyaa Mookjai, Transport Specialist

Place and Date
Bangkok, Thailand, July 15, 2015

Signature **Punyaa Mookjai**
(see warning above)



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UNITING AVIATION

DANGEROUS GOODS MARKINGS



Dangerous Goods Markings

- Technical Instructions, Part 5, Chapter 2
- The following Lithium Battery packages need a DG Proper Shipping Name and UN Number marks:
 - Section IA (PI-965 & 968)
 - Section IB (PI-965 & 968)
 - Section I (PI-966, 967, 969, & 970)

Proper Shipping Name	UN #	Class	Packing Instruction
Lithium ion batteries	UN3480	9	965
Lithium ion batteries contained in equipment	UN3481	9	966
Lithium ion batteries packed with equipment	UN3481	9	967

Proper Shipping Name	UN #	Class	Packing Instruction
Lithium metal batteries	UN3090	9	968
Lithium metal batteries contained in equipment	UN3091	9	969
Lithium metal batteries packed with equipment	UN3091	9	970

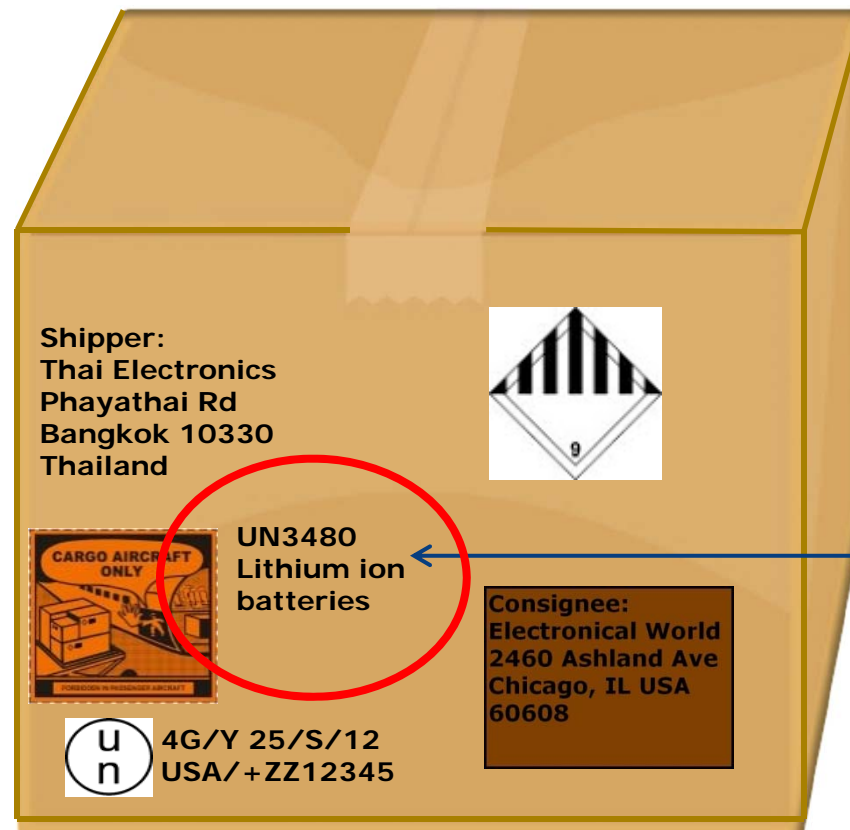


Lithium Ion Batteries: Section IA

PACKAGE LIMITS

Passenger = **FORBIDDEN**

CAO = 35kg



Proper Shipping
Name &
UN Number



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UNITING AVIATION

DANGEROUS GOODS LABELS



Dangerous Goods Labels

- Technical Instructions, Part 5, Chapter 3
- The following labels may need to be utilized on a Lithium Battery package:
 - Class 9 Label
 - Cargo Aircraft Only (CAO) Label
 - Lithium Battery Handling Label
 - Reduced sized Lithium Battery Handling Label



Dangerous Goods Labels

- The following Lithium Battery packages need a DG Class 9 Label:
 - Section IA (PI-965 & 968)
 - Section IB (PI-965 & 968)
 - Section I (PI-966, 967, 969, & 970)

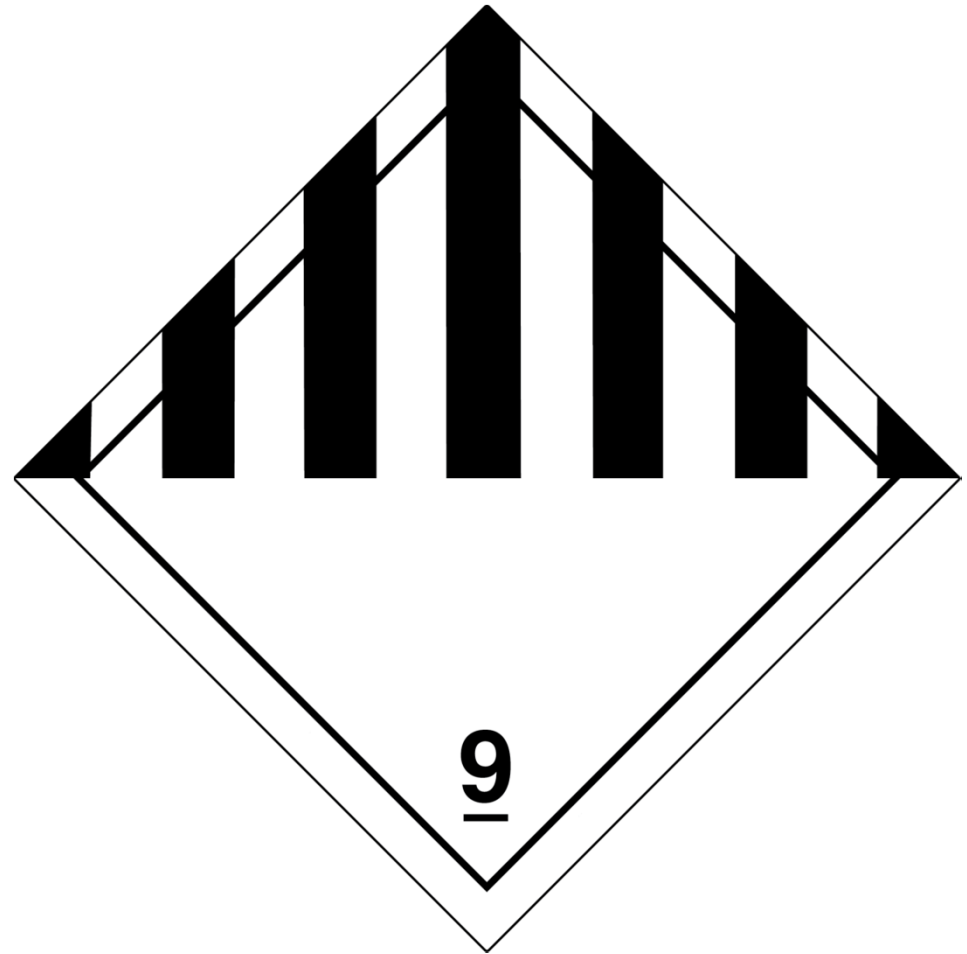
Proper Shipping Name	UN #	Class	Packing Instruction
Lithium ion batteries	UN3480	9	965
Lithium ion batteries contained in equipment	UN3481	9	966
Lithium ion batteries packed with equipment	UN3481	9	967

Proper Shipping Name	UN #	Class	Packing Instruction
Lithium metal batteries	UN3090	9	968
Lithium metal batteries contained in equipment	UN3091	9	969
Lithium metal batteries packed with equipment	UN3091	9	970



Dangerous Goods Labels

Class 9 Label





Dangerous Goods Labels

- The following Lithium Battery packages need a DG Cargo Aircraft Only Label:
 - PI-965, Section IA , Section IB, & Section II;
 - PI-968, Section IA, Section IB, & Section II;
 - PI-966, 967, 969, & 970, Section I: with a net weight of Lithium Batteries more than 5 kg

Proper Shipping Name	UN #	Class	Packing Instruction
Lithium ion batteries	UN3480	9	965
Lithium ion batteries contained in equipment	UN3481	9	966
Lithium ion batteries packed with equipment	UN3481	9	967

Proper Shipping Name	UN #	Class	Packing Instruction
Lithium metal batteries	UN3090	9	968
Lithium metal batteries contained in equipment	UN3091	9	969
Lithium metal batteries packed with equipment	UN3091	9	970



Dangerous Goods Labels

Cargo Aircraft Only
(CAO) Label





Dangerous Goods Labels

- The following Lithium Battery packages need a Lithium Battery Handling Label:
 - Section IB (PI-965 & 968)
 - Section II (PI-965, 966, 967, 968, 969, & 970)

Proper Shipping Name	UN #	Class	Packing Instruction
Lithium ion batteries	UN3480	9	965
Lithium ion batteries contained in equipment	UN3481	9	966
Lithium ion batteries packed with equipment	UN3481	9	967

Proper Shipping Name	UN #	Class	Packing Instruction
Lithium metal batteries	UN3090	9	968
Lithium metal batteries contained in equipment	UN3091	9	969
Lithium metal batteries packed with equipment	UN3091	9	970



Dangerous Goods Labels

Lithium Battery Handling Label





Dangerous Goods Labels

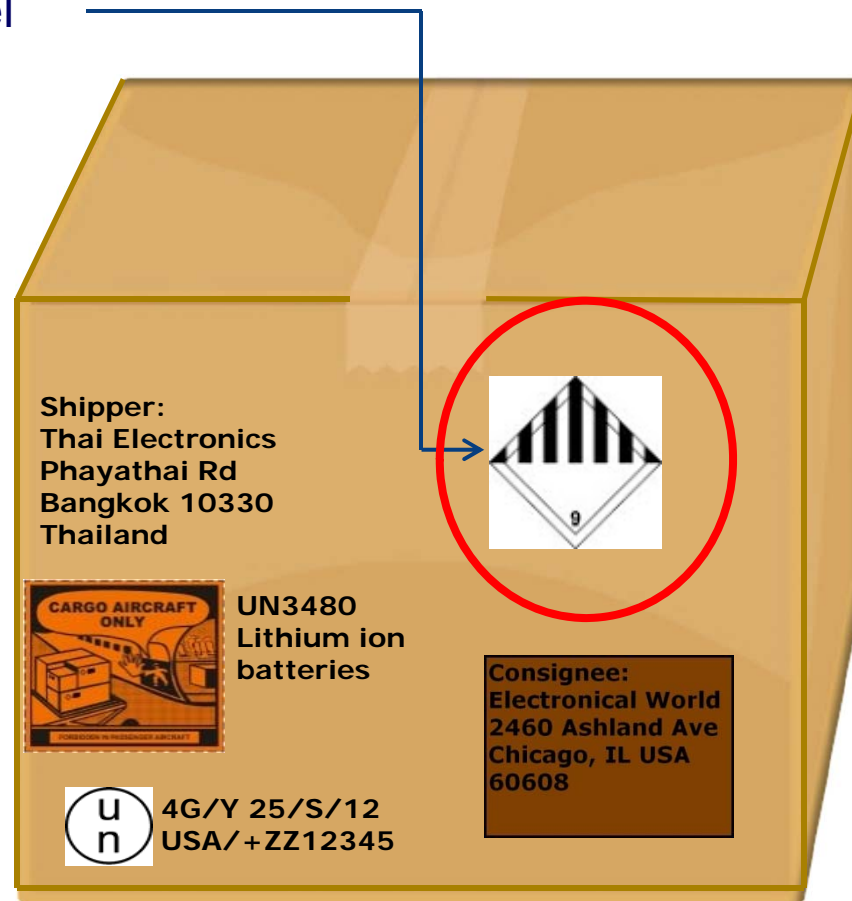
Reduced sized Lithium Battery Handling Label





Lithium Ion Batteries: Section IA

Hazard Label



PACKAGE LIMITS

Passenger = **FORBIDDEN**

CAO = 35kg



Dangerous Goods Labels

- In December 2014, the Final UN DG meeting for the 19th Model Regulations was held
- A new Class 9 label for lithium batteries was approved
- It includes a picture in the lower half of the label



Dangerous Goods Labels

- New Class 9
Lithium Battery
Label to take effect
no later than 31
December 2019





Dangerous Goods Labels

- The Final UN DG Meeting also approved a new lithium battery handling mark was approved. It now will be required on all modes of transportation, not just air.
- UN number(s) would be required on the handling mark. Now you will be able to tell the difference between metals and ions, as well as bulk shipments and contained in/packed with















Dangerous Goods Labels

- New Lithium Battery Handling Mark to take effect no later than 31 December 2019





Labelling and Marking (new requirements)

Section IA	Section IB	Section II
<p>Lithium ion batteries UN 3480</p> <p>From: Mr. Smith ABC Company 123 Maple Street New York, New York</p> <p>To: Ms. Jones XYZ Company 567 Maplethorp Road London, England MJ24 8BB</p> <p>UN •4G/Y/25/S/06/GB/XXX</p>  	<p>Lithium ion batteries UN 3480</p> <p>To: Ms. Jones XYZ Company 567 Maplethorp Road London, England MJ24 8BB</p> <p>From: Mr. Smith ABC Company 123 Maple Street New York, New York 10171</p>   	<p>To: Ms. Jones XYZ Company 567 Maplethorp Road London, England MJ24 8BB</p> <p>From: Mr. Smith ABC Company 123 Maple Street New York, New York 10171</p>  
<p>Lithium metal batteries UN 3090</p> <p>From: Mr. Smith ABC Company 123 Maple Street New York, New York</p> <p>To: Ms. Jones XYZ Company 567 Maplethorp Road London, England MJ24 8BB</p> <p>UN •4G/Y/25/S/06/GB/XXX</p>  	<p>Lithium metal batteries UN 3090</p> <p>To: Ms. Jones XYZ Company 567 Maplethorp Road London, England MJ24 8BB</p> <p>From: Mr. Smith ABC Company 123 Maple Street New York, New York 10171</p>   	<p>To: Ms. Jones XYZ Company 567 Maplethorp Road London, England MJ24 8BB</p> <p>From: Mr. Smith ABC Company 123 Maple Street New York, New York 10171</p>  



PASSENGER EXCEPTIONS FOR LITHIUM BATTERIES



Passenger Exceptions for Lithium Batteries

- Technical Instructions, Part 8, Table 8-1
 - Mobility Aids
 - Portable Medical Electronic Devices
 - Battery Powered Portable Electronic Smoking Devices
 - Portable Electronic Devices
 - Security-type Equipment



QUESTIONS?