



**WORKING PAPER**

**DANGEROUS GOODS PANEL (DGP)**

**TWENTY-FIFTH MEETING**

**Montréal, 19 to 30 October 2015**

**Agenda Item 5: Development of a comprehensive strategy to mitigate risks associated with the transport of lithium batteries including development of performance-based packaging standards and efforts to facilitate compliance**

**SECTION II OF PACKING INSTRUCTIONS 965 AND 968 FOR UN 3090 AND UN 3480**

(Presented by B. Carrara)

**SUMMARY**

This paper proposes to exclude the provisions of Section II of Packing Instruction 965 for **Lithium ion batteries** (UN 3480) and Packing Instruction 968 for **Lithium metal batteries** (UN 3090) based on the reports of the International Multidisciplinary Lithium Battery Transport Coordination Meetings.

**Action by the DGP:** The DGP is invited to consider the exclusion of Section II for Packing Instruction 965 and Packing Instruction 968 as presented in the appendix of this working paper.

**1. INTRODUCTION**

1.1 The Second Dangerous Goods Panel (DGP) Working Group on Lithium Batteries (DGP-WG/LB/2) (Montréal 7 to 11 April 2014), which continued discussions begun at the Twenty-Fourth Meeting of the DGP (DGP/24, Montréal, 28 October to 8 November 2013) on mitigating risks posed by lithium metal batteries, agreed that lithium metal batteries should be banned from passenger aircraft considering their unacceptable risk for air transport.

1.2 Recent tests presented at the Third International Multidisciplinary Lithium Battery Transport Coordination Meeting have shown that, despite not being as dangerous as lithium metal batteries, lithium ion batteries just can be carried in a safe manner in very low quantities inside a cargo compartment.

1.3 Considering that Section II of Packing Instructions 965 and 968 only permits a small quantity of cells or batteries to be carried in the same package (except for lithium ion batteries not exceeding 2.7 Wh and lithium metal batteries not exceeding 0.3 g of lithium, for which there is a weight limit not a limit in numbers) and taking into consideration that this allowance exceeds the safe limits established by the tests for the number of lithium batteries in a single cargo compartment of an aircraft commonly used in air transport, there is no reason for maintaining the provisions of Section II in the Technical Instructions.

1.4 In addition to that, at some DGP meetings there were comments raised that the provisions of Section II have become so complicated that shippers and operators cannot follow updates to regulations, especially for Packing Instructions 965 and 968, which have Section IB.

## 2. **ACTION BY THE DGP**

2.1 The DGP is invited to consider removing Section II for Packing Instruction 965 and Packing Instruction 968 as presented in the appendix of this working paper.

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APPENDIX

PROPOSED AMENDMENT TO PART 4 OF THE TECHNICAL INSTRUCTIONS

Part 4

PACKING INSTRUCTIONS

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Chapter 11

CLASS 9 — MISCELLANEOUS DANGEROUS GOODS

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Packing Instruction 965

Passenger and cargo aircraft 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; **and**
- 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.

IA. SECTION IA

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

1A.1 General requirements

Part 4;1 requirements must be met.

Table 965-IA

UN number and proper shipping name	Net quantity per package	
	Passenger	Cargo

UN 3480	<b>Lithium ion batteries</b>	5 kg	35 kg
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**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**

<i>Boxes</i>	<i>Drums</i>	<i>Jerricans</i>
Aluminium (4B)	Aluminium (1B2)	Aluminium (3B2)
Fibreboard (4G)	Fibre (1G)	Plastics (3H2)
Natural wood (4C1, 4C2)	Other metal (1N2)	Steel (3A2)
Other metal (4N)	Plastics (1H2)	
Plastics (4H1, 4H2)	Plywood (1D)	
Plywood (4D)	Steel (1A2)	
Reconstituted wood (4F)		
Steel (4A)		

**IB. SECTION IB**

Quantities of lithium ion cells or batteries ~~of this section that exceed the allowance permitted in Section II, Table 965-  
H~~ 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;

**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 965-IB**

<i>Contents</i>	<i>Net quantity per package</i>	
	<i>Passenger</i>	<i>Cargo</i>
Lithium ion cells and batteries	10 kg	10 kg

## 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.
- 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

## II. ~~SECTION II~~

~~With the exception of Part 1;2.3 (General — Transport of dangerous goods by post), 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 c) 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.~~

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## Packing Instruction 965

### 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 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>
4	2	3	4
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.

### 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).
- 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 PI965" 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.

### 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".

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**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; **and**
- 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.

**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 <b>Lithium metal batteries</b>	Forbidden	35 kg

## Packing Instruction 968

### 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)

### IB. SECTION IB

Quantities of lithium metal cells or batteries of this section ~~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**

**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**

Contents	Net quantity per package	
	Passenger	Cargo
Lithium metal cells and batteries	Forbidden	2.5 kg

**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**

<i>Boxes</i>	<i>Drums</i>	<i>Jerricans</i>
Strong outer packagings		

**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.~~

**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).~~

**Packing Instruction 968**

**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>
1	2	3	4
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.

**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 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) ≠ 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.
- + Consignments of lithium metal batteries prepared in accordance with the provisions of Section II must not be consolidated with other shipments of dangerous goods or non-dangerous goods 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.

**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 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".

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**Part 5****SHIPPER'S RESPONSIBILITIES****Chapter 3****LABELLING**

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**3.5 LABEL SPECIFICATIONS****3.5.1 Class hazard label specifications**

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**3.5.2.2 Lithium battery handling label**

Packages containing lithium batteries that meet the requirements of Section II of Packing Instructions ~~965 to 970~~**966, 967, 969 and 970** must bear a "Lithium battery" handling label shown in Figure 5-32, as required by the applicable packing instruction. The label must be a minimum dimension of 120 mm wide × 110 mm high except labels of 105 mm wide × 74 mm high may be used on packages containing lithium batteries where the packages are of dimensions such that they can only bear smaller labels. When the reduced size label is used, the label features must be in approximate proportion to those shown on the full-size label (Figure 5-32). The label must show "Lithium metal batteries" or "Lithium ion batteries", as applicable, and a telephone number for additional information. Where the package contains both types of batteries, the label must show "Lithium metal and lithium ion batteries". Packages containing lithium batteries that meet the requirements of Section IB of Packing Instructions 965 and 968 must bear both a "Lithium battery" handling label shown in Figure 5-32 and a Class 9 hazard label (Figure 5-24).

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**Part 7****OPERATOR'S RESPONSIBILITIES**

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**Chapter 4****PROVISION OF INFORMATION**

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**4.1 INFORMATION TO THE PILOT-IN-COMMAND**

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**Table 7-9. Dangerous goods not required to appear in the information to the pilot-in-command**

<i>UN Number</i>	<i>Item</i>	<i>Reference</i>
n/a	Dangerous goods packed in excepted quantities	3;5.1.1
UN 2807	<b>Magnetized material</b>	Packing Instruction 953
UN 2908	<b>Radioactive material, excepted package — empty packaging</b>	1;6.1.5.1 a)
UN 2909	<b>Radioactive material, excepted package — articles manufactured from natural uranium or depleted uranium or natural thorium</b>	1;6.1.5.1 a)
UN 2910	<b>Radioactive material, excepted package — limited quantity of material</b>	1;6.1.5.1 a)
UN 2911	<b>Radioactive material, excepted package — instruments or articles</b>	1;6.1.5.1 a)

<i>UN Number</i>	<i>Item</i>	<i>Reference</i>
UN 3090	<del>Lithium metal batteries</del> (including lithium alloy batteries) when meeting the requirements of Packing Instruction 968, Section II	<del>Packing Instruction 968, Section II</del>
UN 3091	<b>Lithium metal batteries contained in equipment</b> (including lithium alloy batteries) when meeting the requirements of Packing Instruction 970, Section II	Packing Instruction 970, Section II
UN 3091	<b>Lithium metal batteries packed with equipment</b> (including lithium alloy batteries) when meeting the requirements of Packing Instruction 969, Section II	Packing Instruction 969, Section II
UN 3245	<b>Genetically modified micro-organisms</b>	Packing Instruction 959
UN 3245	<b>Genetically modified organisms</b>	Packing Instruction 959
UN 3373	<b>Biological substance, Category B</b>	Packing Instruction 650, sub-paragraph 11
UN 3480	<del>Lithium ion batteries</del> (including lithium ion polymer batteries) when meeting the requirements of Packing Instruction 965, Section II	<del>Packing Instruction 965, Section II</del>
UN 3481	<b>Lithium ion batteries contained in equipment</b> (including lithium ion polymer batteries) when meeting the requirements of Packing Instruction 967, Section II	Packing Instruction 967, Section II
UN 3481	<b>Lithium ion batteries packed with equipment</b> (including lithium ion polymer batteries) when meeting the requirements of Packing Instruction 966, Section II	Packing Instruction 966, Section II

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