

Interactive Guide to Shipping Lithium Batteries

About this document:

This document provides awareness of the International Civil Aviation Organization's (ICAO) 2023-2024 Edition of the Technical Instructions (Doc 9284) requirements for lithium batteries.

This document does not replace any regulation and is not considered training.

The carrier can be more restrictive than the regulation.

Always check the full regulations and carrier requirements before shipping.

Updated: January 2023

Produced by AOC and ASH.2022-ASH-017

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Summary of Changes for 2023-2024

- Revision to the lithium battery mark. A telephone number is no longer required on the lithium battery mark. Lithium battery marks with a phone number may continue to be applied until December 31, 2026.
- Packing Instructions 965 and 968 – removal of Section II
- Packing Instructions 966 and 969 – clarification on protection against short circuits
- Packing Instructions 966, 967, 969, 970 – requirement to ensure packages in overpacks are secure and the intended function of each package is not impaired by the overpack
- Packing Instructions 967, 970 – requirement to ensure that multiple pieces of equipment packed into the same outer packaging are packed so as to prevent damage due to contact between the pieces of equipment.

Battery Types

STEP 1 – What Type Of Battery/Cell Are You Shipping?



Lithium Ion/Polymer
Batteries or Cells
(rechargeable)



Lithium Metal
Batteries or Cells
(non-rechargeable)

STEP 2 – How Are You Shipping Them? Lithium Ion:

Batteries / Cells
Packed With
Equipment
(separately in the
same package)

Batteries / Cells
Only



Batteries / Cells
Contained in Equipment



STEP 2 – How Are You Shipping Them? Lithium Metal:

Batteries / Cells
Packed With
Equipment
(separately in the
same package)

Batteries / Cells
Only



Batteries / Cells
Contained in Equipment





STEP 3 – What Is The Capacity (Watt Hour* (Wh) Rating) Of Your Lithium Ion Battery/Cell?

30% Rule

All Lithium Ion batteries must be shipped at a state of charge (SoC) not exceeding 30% of their rated design capacity



**For information on how to calculate the Wh rating, click on the information button in the top right corner of the page.*

Cells $\leq 20\text{Wh}$
and Batteries
 $\leq 100\text{Wh}$

Cells $> 20\text{Wh}$
and Batteries
 $> 100\text{Wh}$

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





STEP 3 –How Much Lithium Does Your Lithium Metal Battery/Cell Contain?

Cells $\leq 1\text{g}$ and
Batteries $\leq 2\text{g}$

Cells $> 1\text{g}$ and
Batteries $> 2\text{g}$





STEP 3 – What Is The Capacity (Watt Hour* Rating) Of Your Lithium Ion Battery/Cell?

Cells \leq 20 Wh or
Batteries \leq 100 Wh

Cells $>$ 20 Wh or
Batteries $>$ 100 Wh





STEP 3 – What Is The Capacity (Watt Hour* Rating) Of Your Lithium Ion Battery/Cell?

Cells \leq 20 Wh or
Batteries \leq 100 Wh

Cells $>$ 20 Wh or
Batteries $>$ 100 Wh





STEP 3 – How Much Lithium Does Your Lithium Metal Battery/Cell Contain?

Cells \leq 1 g or
Batteries \leq 2 g

Cells $>$ 1 g or
Batteries $>$ 2 g





STEP 3 – How Much Lithium Does Your Lithium Metal Battery/Cell Contain?

Cells \leq 1 g or
Batteries \leq 2 g

Cells $>$ 1 g or
Batteries $>$ 2 g





STEP 4 – Lithium Metal: How Many Cells Does Your Package Contain In Total?

\leq 8 Cells

$>$ 8 Cells





STEP 4 – How Many Lithium Metal Batteries Does Your Package Contain In Total?

≤ 2 Batteries

> 2 Batteries





STEP 4 – How Many Lithium Metal Batteries Does Your Package Contain In Total?

≤ 4 Cells
or
 ≤ 2 Batteries

> 4 Cells
or
 > 2 Batteries

Only Button Cell
Batteries Installed in
Equipment (including
circuit boards)





STEP 4 – How Many Lithium Ion Batteries Does Your Package Contain In Total?

≤ 4 Cells
or
 ≤ 2 Batteries

> 4 Cells
or
 > 2 Batteries





Step 5 – Lithium Ion: How Many Packages Are In The Consignment?

≤ 2 Packages

> 2 Packages





STEP 5 – Lithium Metal: How Many Packages Are In The Consignment?

≤ 2 Packages

> 2 Packages





Packing Instruction (PI) 965, Section 1A

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3480, Lithium ion batteries	>20 Wh	NA	>100 Wh	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) <u>Forbidden</u> 35kg (CAO)	YES	Class 9 + CAO Label	Y (PGII)	SOC ≤30%

[Click Here to See additional requirements restricting the packing, overpacking and loading of lithium batteries with substances and articles of certain classes and divisions.](#)



See completed Package

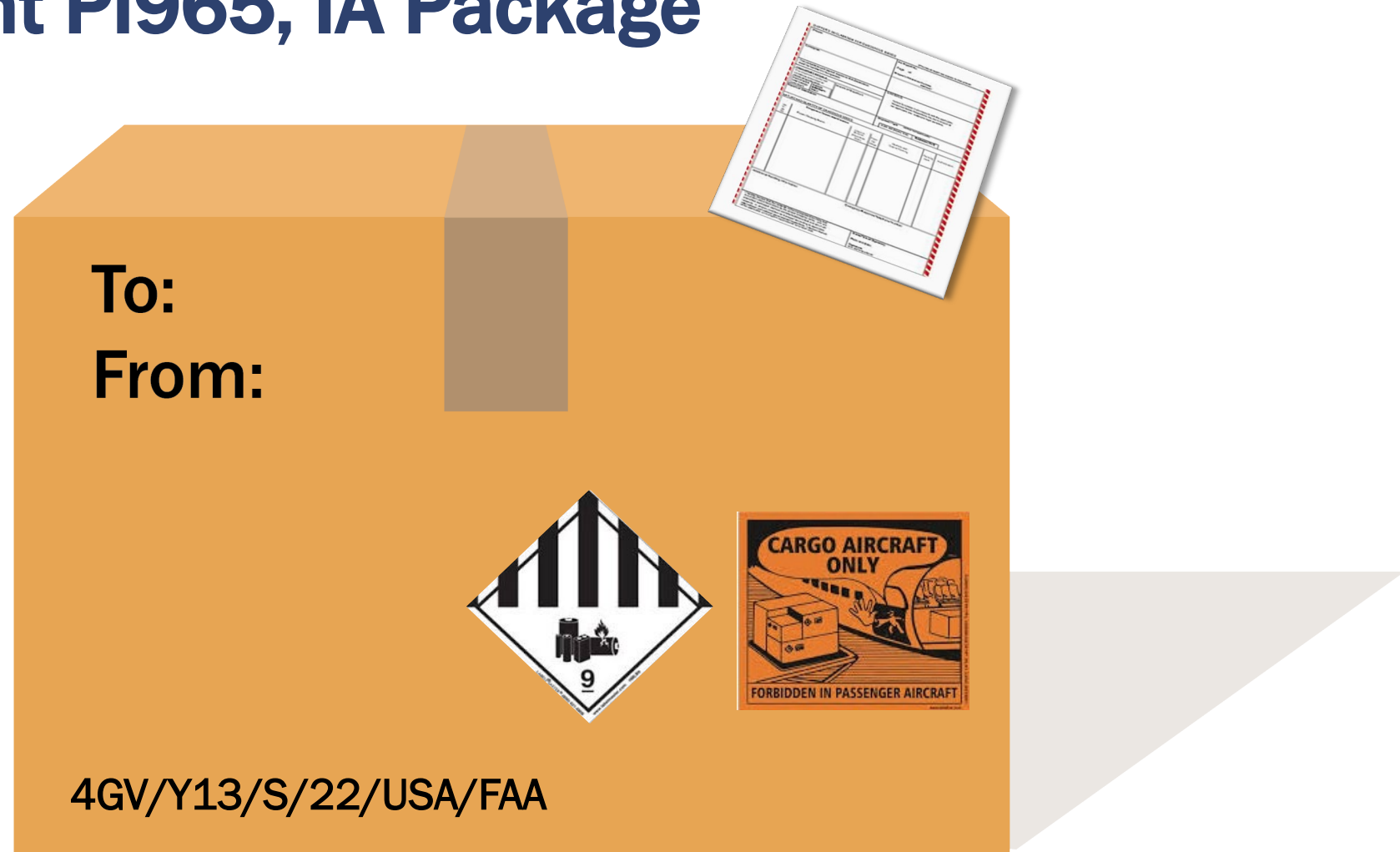


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Compliant PI965, IA Package



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Packing Instruction (PI) 965, Section 1B

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3480, Lithium ion batteries	≤20 Wh	NA	≤100 Wh	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) <u>Forbidden</u> 10kg (CAO)	YES	Class 9 + CAO Label + Lithium Battery Mark	No UN Spec. 1.2 m drop test 3 m stack test	PI # needs "IB" on Dec. SOC ≤30%

[Click Here to See additional requirements restricting the packing, overpacking and loading of lithium batteries with substances and articles of certain classes and divisions.](#)



See completed Package

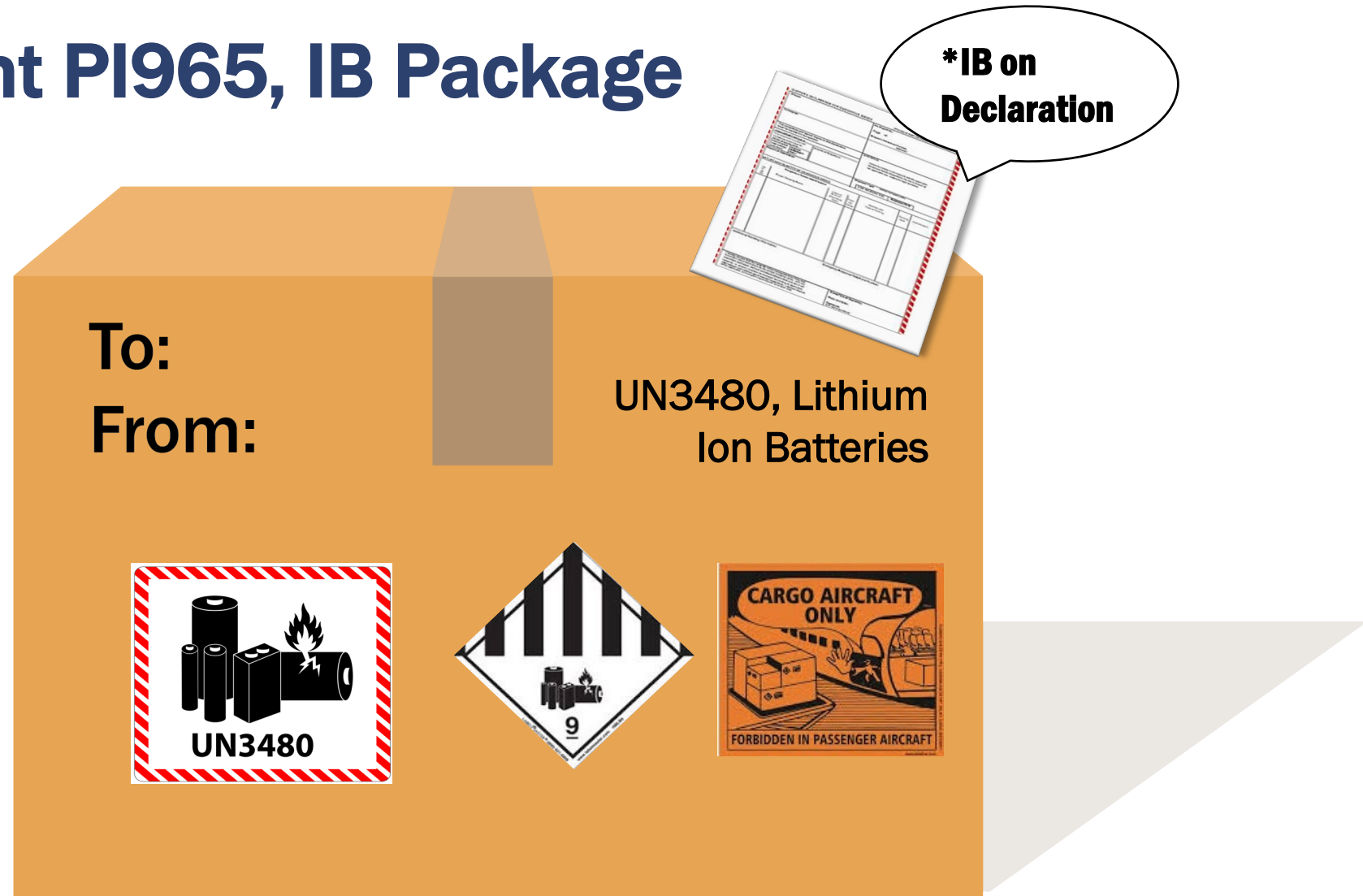


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Compliant PI965, IB Package



A telephone number is no longer required on the lithium battery mark. Lithium battery marks with a phone number may continue to be applied until December 31, 2026.



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Packing Instruction (PI) 966, Section I

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3481, Lithium ion batteries packed with equipment	>20 Wh	Minimum to power equip + 2 spare sets	>100 Wh	Minimum to power equip + 2 spare sets

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX) 35kg (CAO)	YES	Class 9 + CAO* (if >5kg)	Y (PGII)	



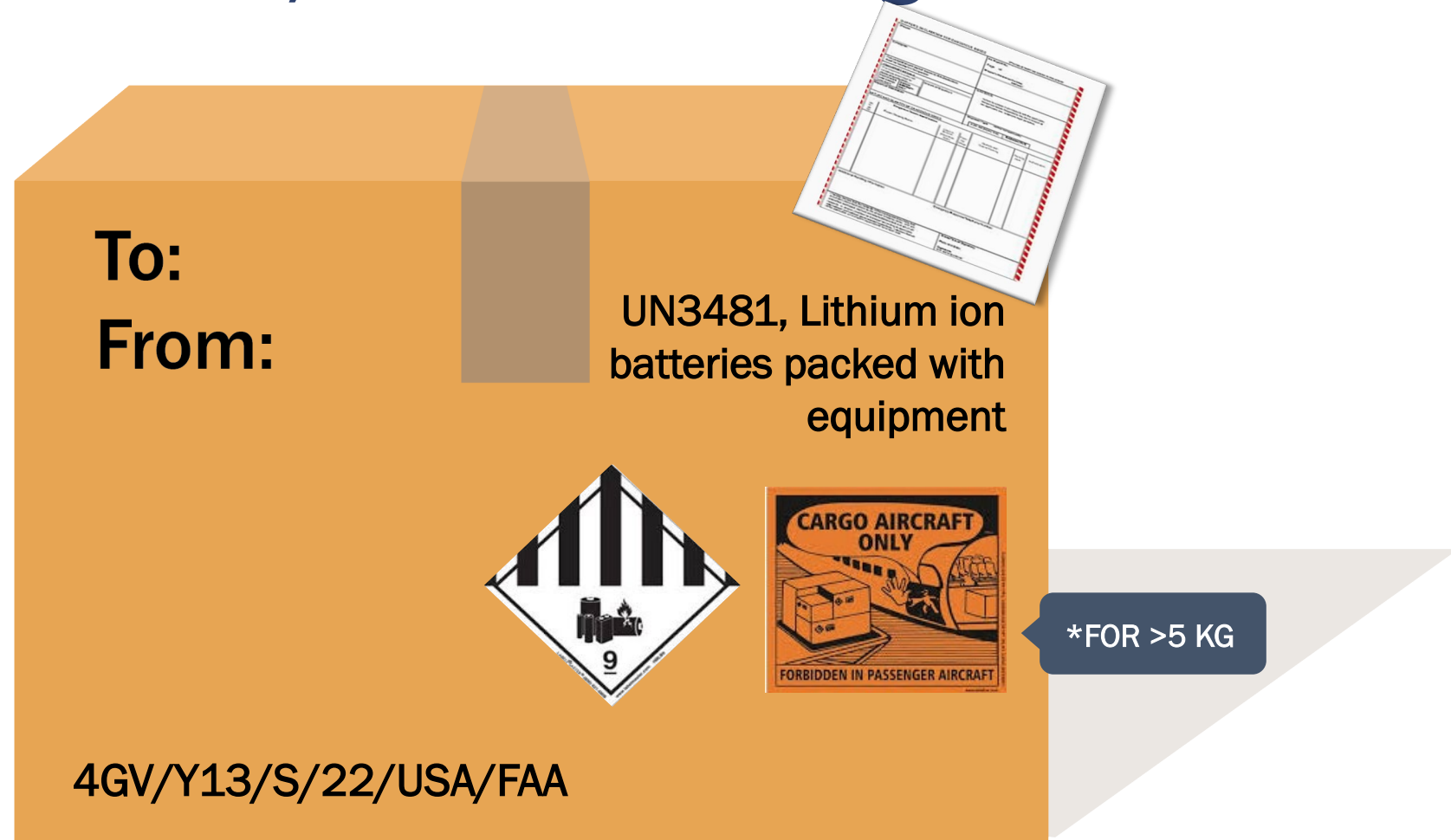
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Compliant PI966, Section I Package





Packing Instruction (PI) 966, Section II

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3481, Lithium ion batteries packed with equipment	≤20 Wh	Minimum to power equip + 2 spare sets	≤100 Wh	Minimum to power equip + 2 spare sets

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5 kg (PAX) & (CAO)	No Shippers Dec. “Lithium ion batteries in compliance with Section II of PI966” on AWB.	Lithium Battery Mark	No UN Spec. 1.2 m drop test	N/A



See completed Package

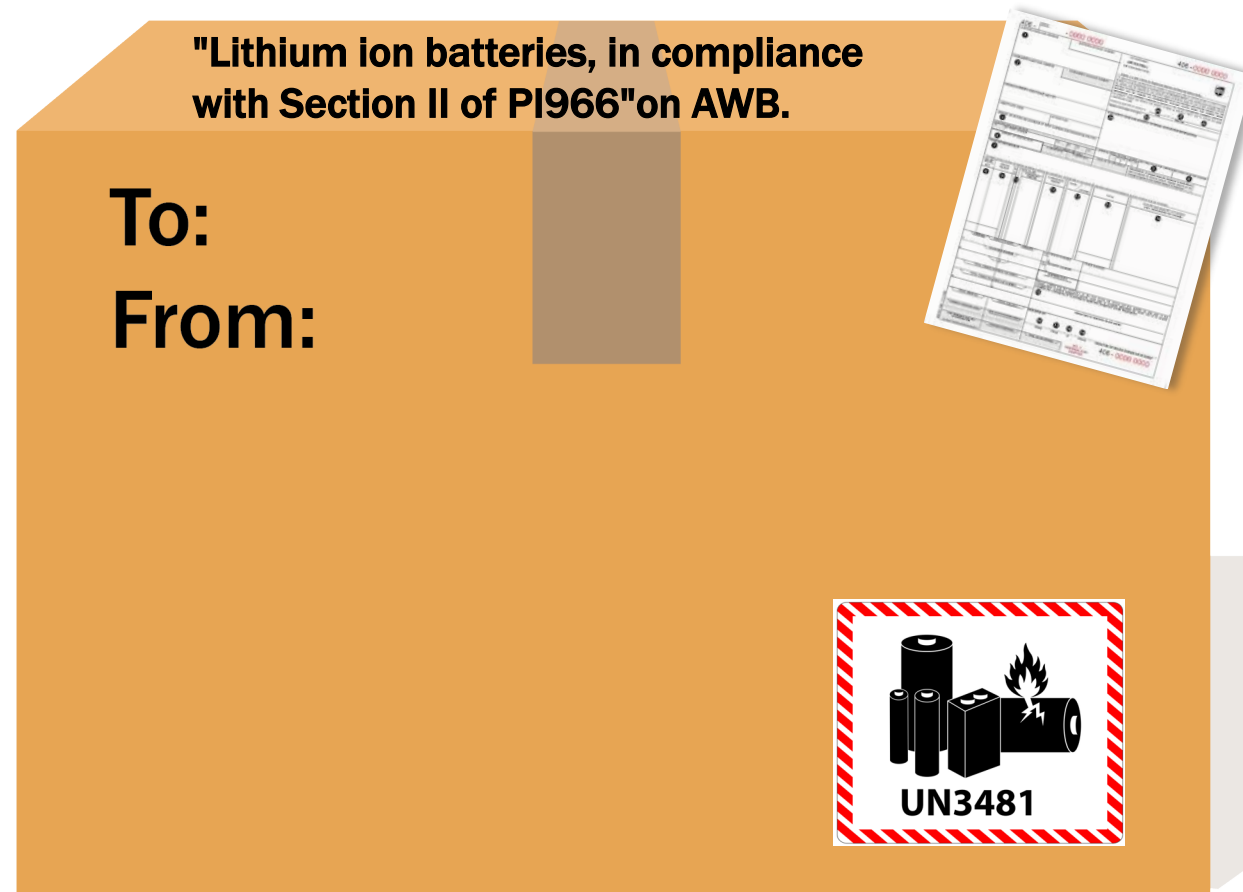


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Compliant PI966, Section II Package



NOTE: Where a package contains a combination of lithium batteries contained in equipment and lithium batteries packed with equipment that meet the limits for lithium cells or batteries of Section II, the following additional requirements apply: the shipper must ensure that all applicable parts of both packing instructions are met. The total mass of lithium batteries contained in any package may not exceed 5 kg. 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.

A telephone number is no longer required on the lithium battery mark. Lithium battery marks with a phone number may continue to be applied until December 31, 2026.



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Packing Instruction (PI) 967, Section I

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3481, Lithium ion batteries contained in equipment	>20 Wh	NA	>100 Wh	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX) 35kg (CAO)	YES	Class 9 + CAO Label* (if>5kg)	No UN Spec. Suitable material of adequate strength and design. Strong rigid outer packaging.	Packed to prevent accidental activation and damage due to eqpt. contact



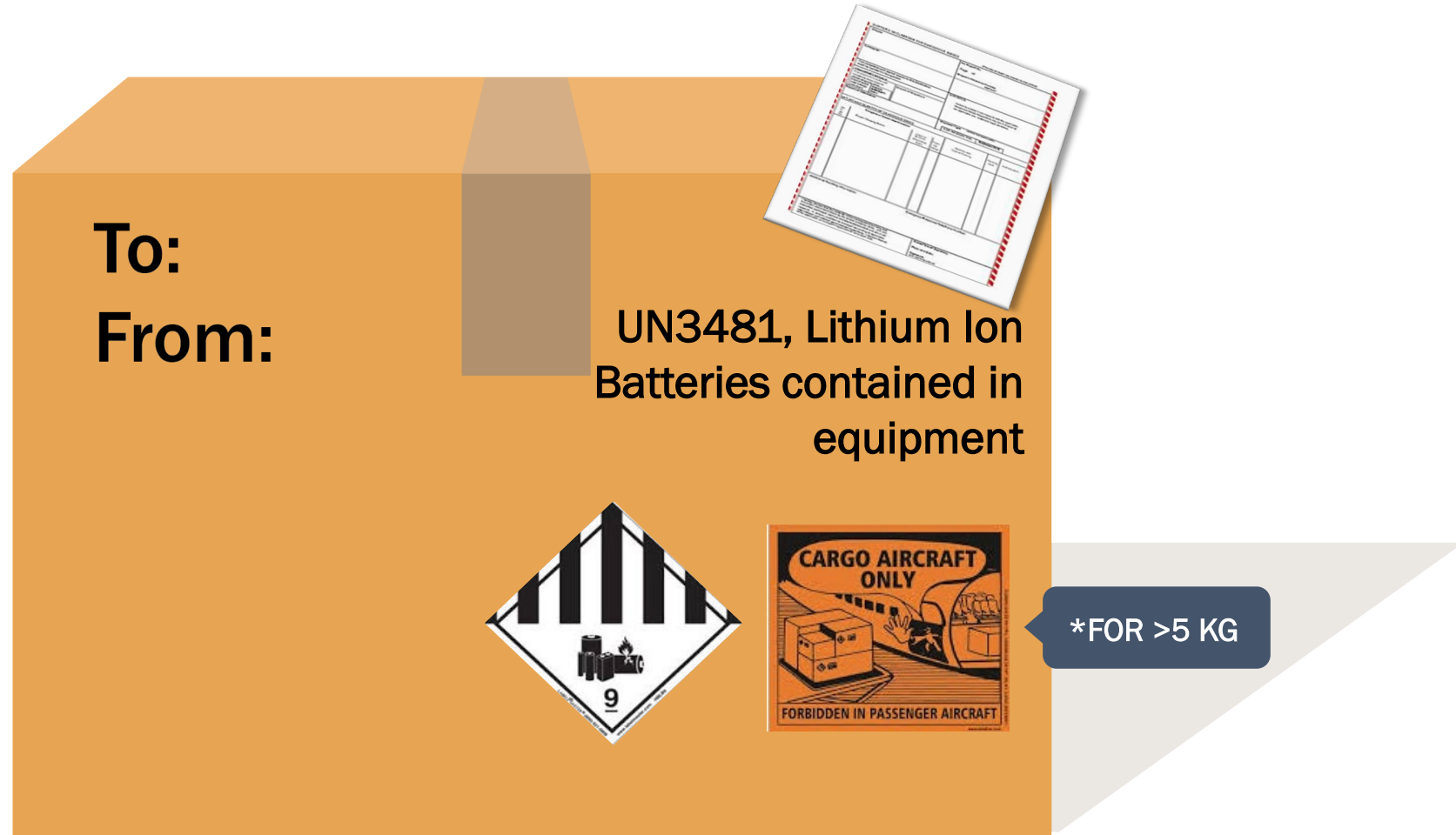
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Compliant PI967, Section I Package





Packing Instruction (PI) 967, Section II

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3481, Lithium ion batteries contained in equipment	≤20 Wh	NA	≤100 Wh	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5 kg (PAX) & (CAO)	No Shippers Dec. "Lithium ion batteries in compliance with Section II of PI967" on AWB.	Lithium Battery Mark	No UN Spec. Suitable material of adequate strength and design. Strong rigid outer packaging.	See PI 967 for RFID tags. Packed to prevent accidental activation and damage due to eqpt. contact



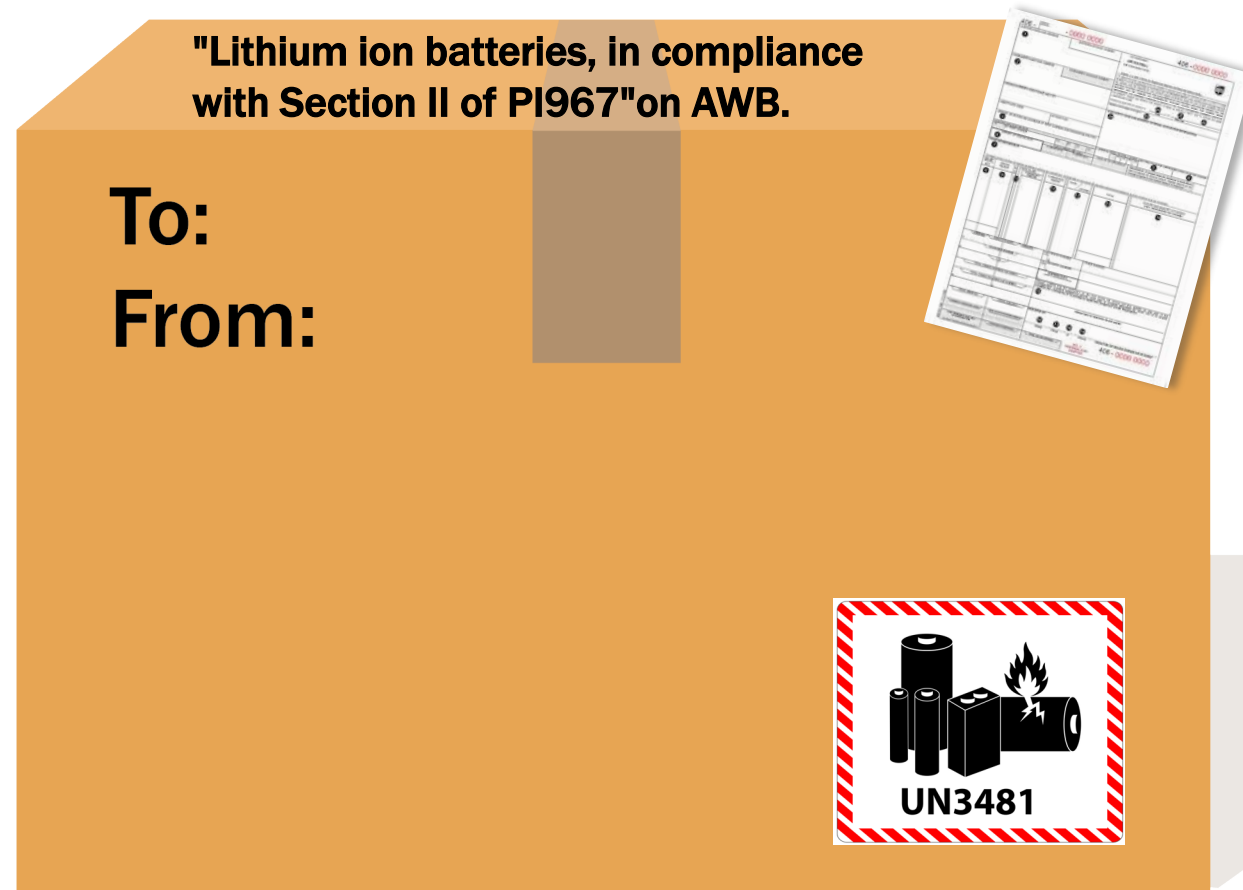
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Compliant PI967, Section II Package



NOTE: the requirement to apply lithium battery mark does not apply to:

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

A telephone number is no longer required on the lithium battery mark. Lithium battery marks with a phone number may continue to be applied until December 31, 2026.



Packing Instruction (PI) 968, Section IA

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3090, Lithium metal batteries	>1g lithium content	NA	>2g lithium content	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) Forbidden 35kg (CAO)	YES	Class 9 + CAO Label	Y (PGII)	

[Click Here to See additional requirements restricting the packing, overpacking and loading of lithium batteries with substances and articles of certain classes and divisions.2019 Packing Restrictions](#)



See completed Package

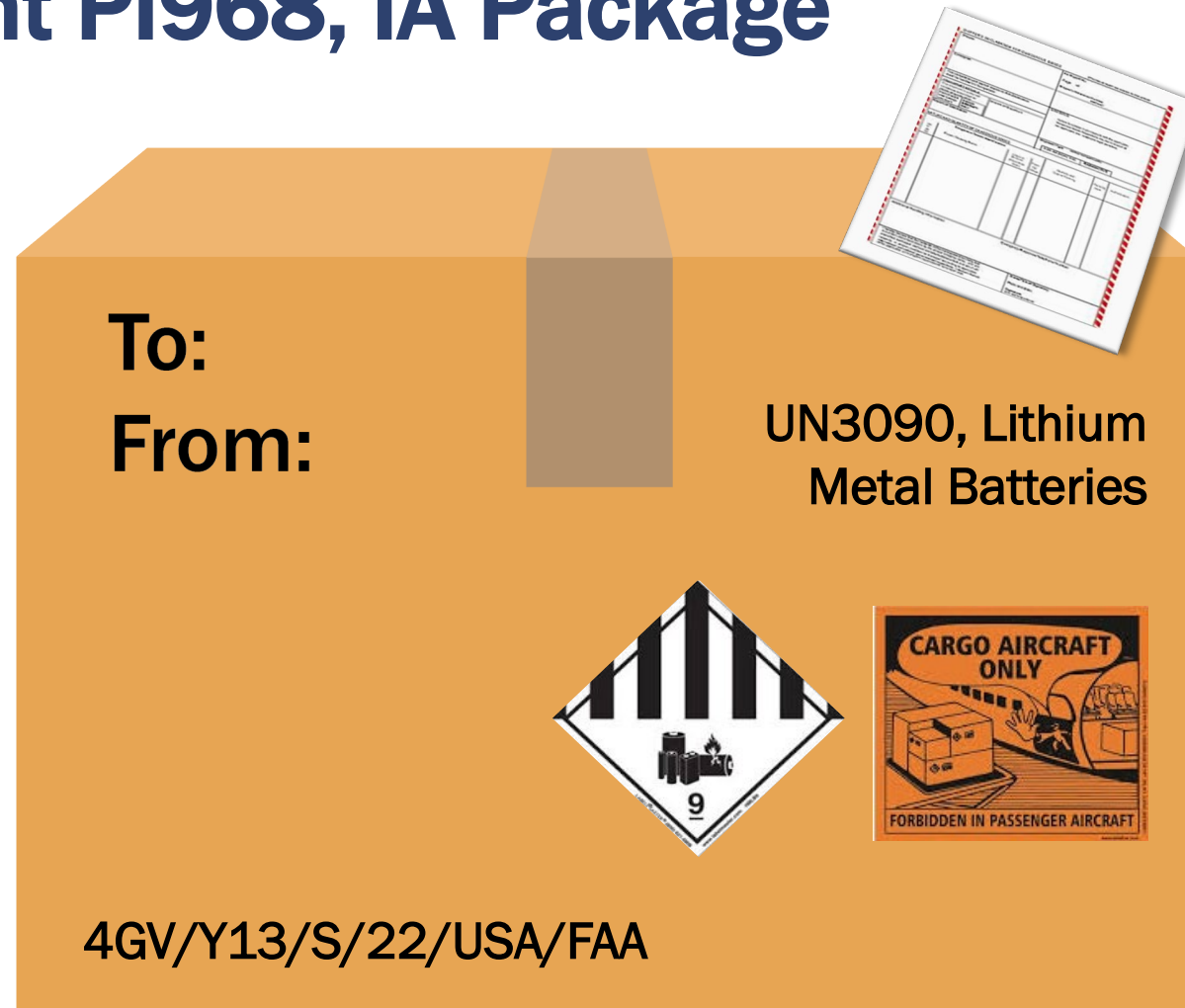


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Packing Instruction (PI) 968, Section IB

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3090, Lithium metal batteries	≤1g lithium content	NA	≤2g lithium content	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) Forbidden 2.5kg (CAO)	YES	Lithium Battery Mark + Class 9 + CAO Label	No UN Spec. 1.2 m drop test 3 m stack test	“IB” required on DGD

[Click Here to See additional requirements restricting the packing, overpacking and loading of lithium batteries with substances and articles of certain classes and divisions.](#)



See completed Package

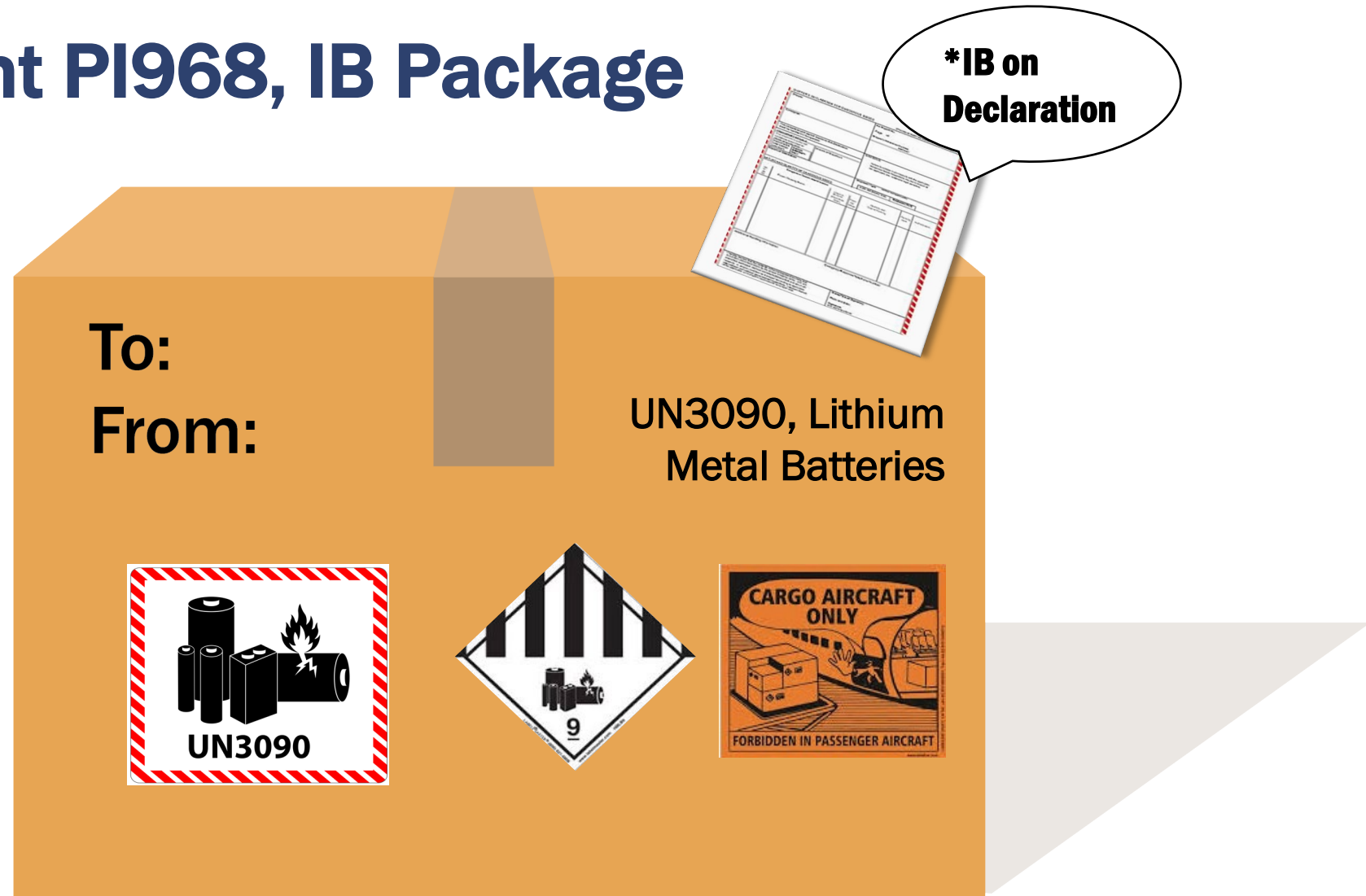


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Compliant PI968, IB Package



A telephone number is no longer required on the lithium battery mark. Lithium battery marks with a phone number may continue to be applied until December 31, 2026.



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Packing Instruction (PI) 969, Section I

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3091, Lithium Metal Batteries Packed With Equipment	>1g lithium content	Minimum to power equip + 2 spare sets	>2g lithium content	Minimum to power equip + 2 spare sets
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX) 35kg (CAO)	YES	Class 9 + CAO Label* (if>5kg)	Y (PGII) Packed to prevent accidental activation.	PAX - packed in intermediate /outer rigid metal packaging surrounded by non-conductive /combustible cushioning then inside an outer packaging.



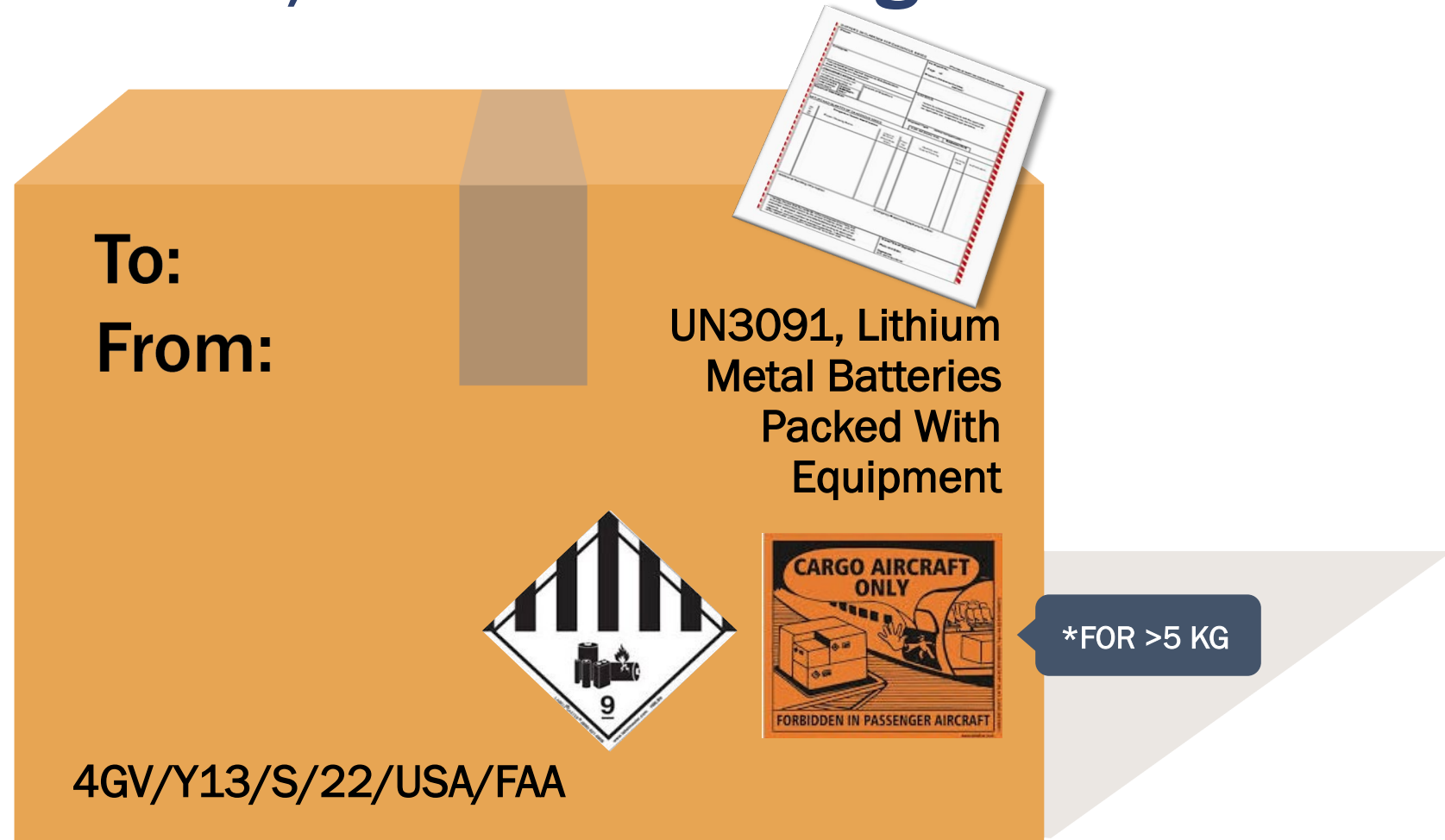
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Compliant PI969, Section I Package





Packing Instruction (PI) 969, Section II

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3091, Lithium Metal Batteries Packed With Equipment	≤1g lithium content	Minimum to power equip + 2 spare sets	≤2g lithium content	Minimum to power equip + 2 spare sets

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX & CAO)	No Shippers Dec. "Lithium metal batteries, in compliance with Section II of PI969" on AWB.	Lithium Battery Mark	No UN Spec. Packed to prevent accidental activation. 1.2 m drop test.	NA



See completed Package

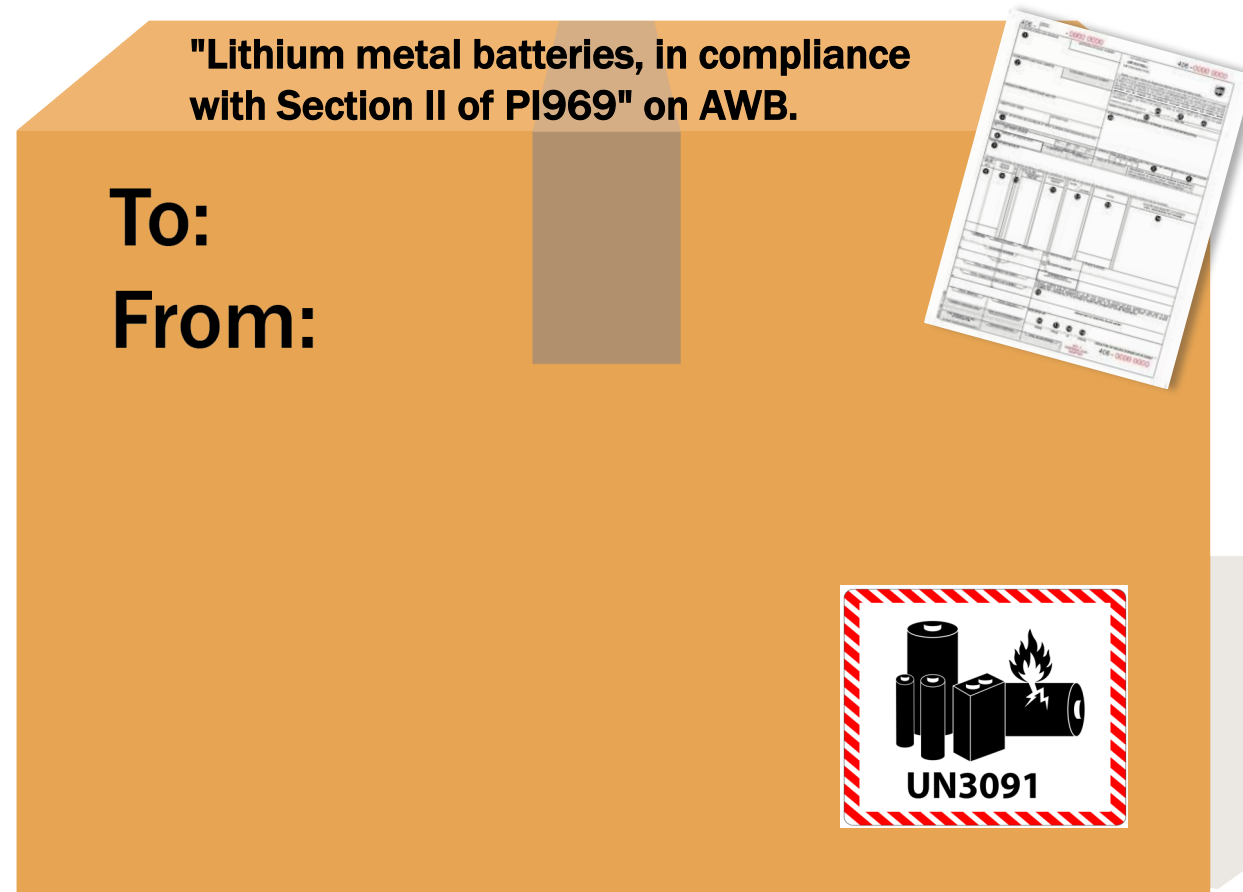


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Compliant PI969, Section II Package



NOTE: Where a package contains a combination of lithium batteries contained in equipment and lithium batteries packed with equipment that meet the limits for lithium cells or batteries of Section II, the following additional requirements apply: the shipper must ensure that all applicable parts of both packing instructions are met. The total mass of lithium batteries contained in any package may not exceed 5 kg. 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.

A telephone number is no longer required on the lithium battery mark. Lithium battery marks with a phone number may continue to be applied until December 31, 2026.



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Packing Instruction (PI) 970, Section I

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3091, Lithium Metal Batteries Contained In Equipment	>1g lithium content	NA	>2g lithium content	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX) 35kg (CAO)	YES	Class 9 + CAO Label* (if >5kg)	No UN spec. Suitable material of adequate strength and design. Strong rigid outer packaging.	Packed to prevent accidental activation and damage due to eqpt. contact



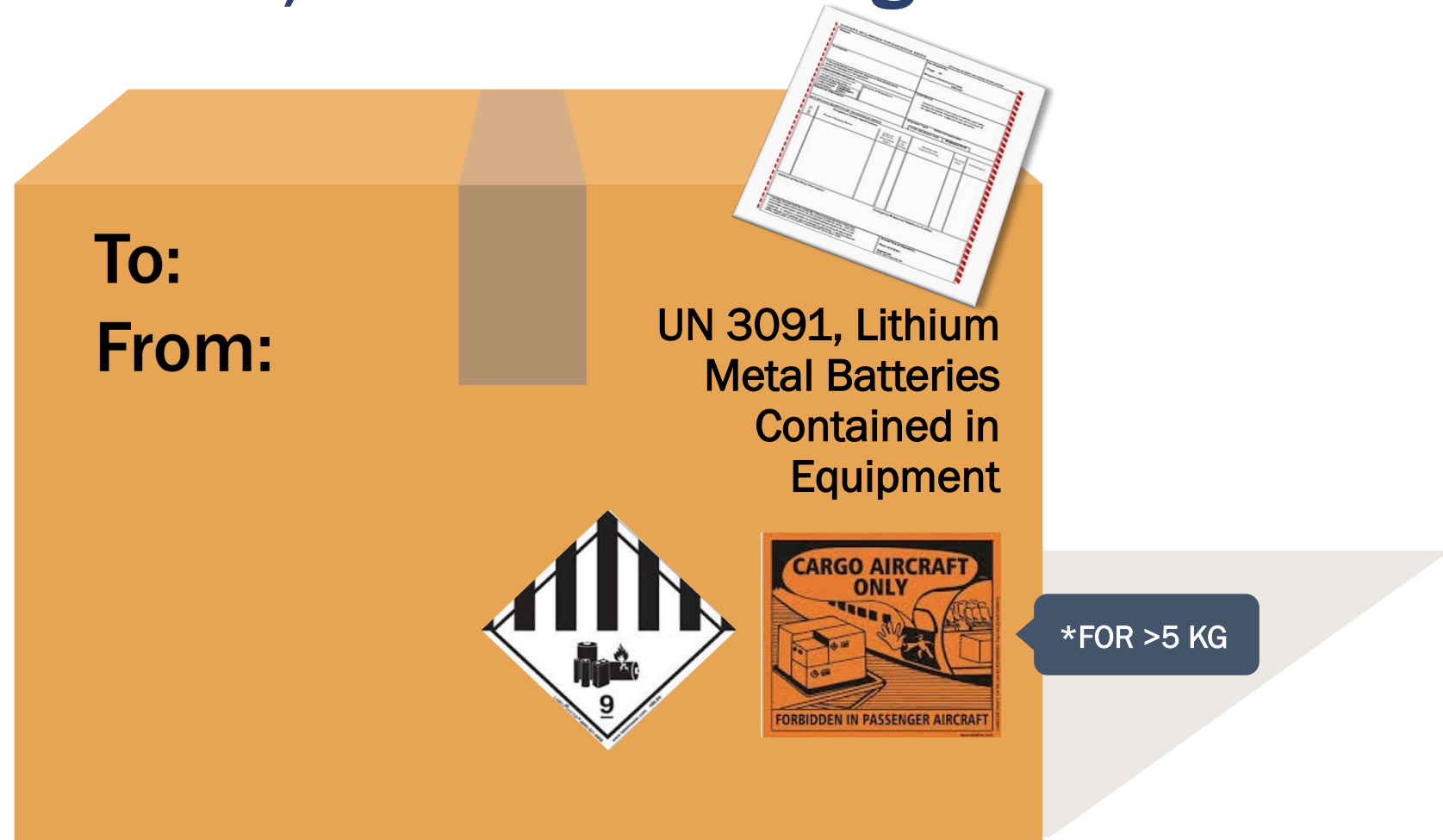
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Compliant PI970, Section I Package





Packing Instruction (PI) 970, Section II

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3091, Lithium Metal Batteries Contained In Equipment	≤1g lithium content	NA	≤2g lithium content	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX & CAO)	No Shippers Dec. "Lithium metal batteries, in compliance with Section II of PI970" on AWB.	Lithium Battery Marking	No UN Spec. Suitable material of adequate strength and design. Strong rigid outer packaging.	See PI 970 for RFID tags. Packed to prevent accidental activation and damage due to eqpt. contact



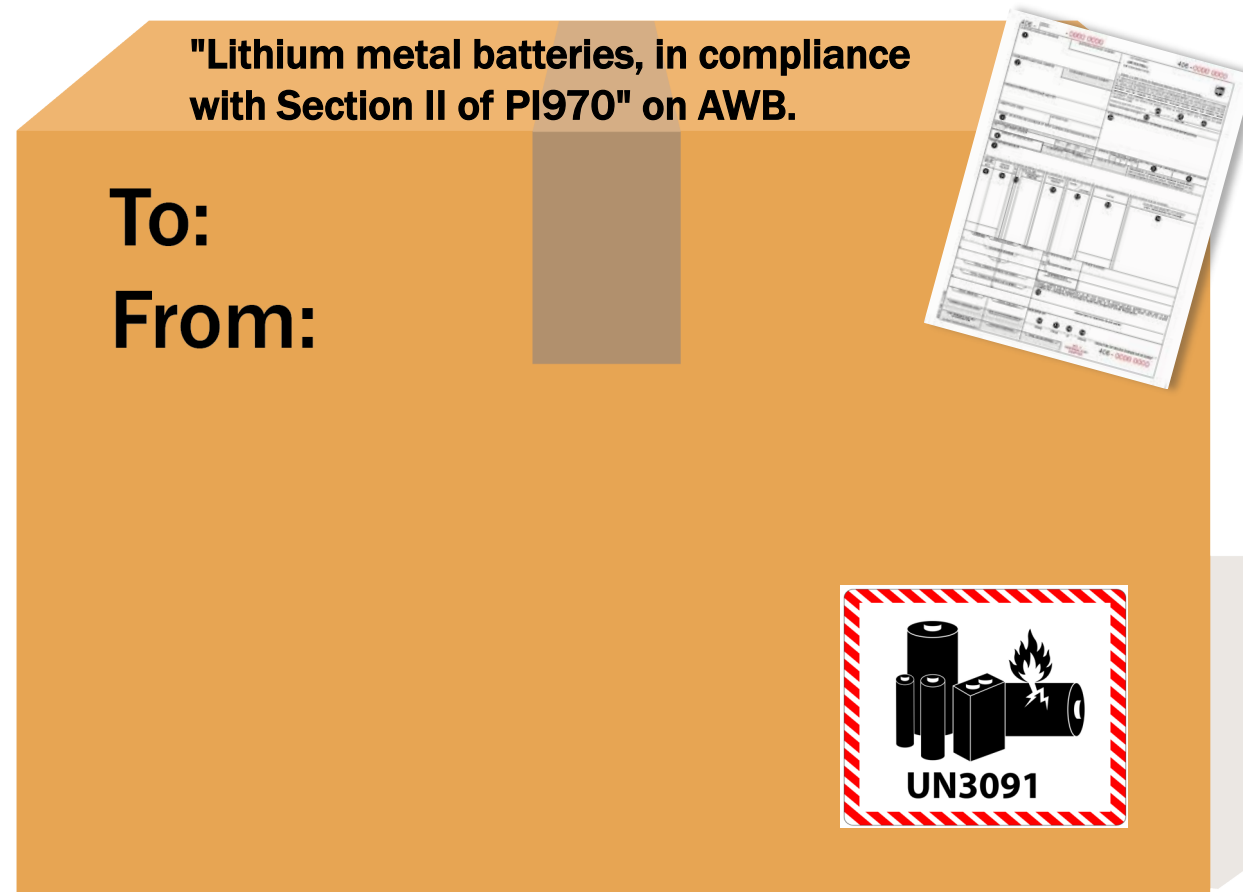
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Compliant PI970, Section II Package



NOTE: the requirement to apply lithium battery mark does not apply to:

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

A telephone number is no longer required on the lithium battery mark. Lithium battery marks with a phone number may continue to be applied until December 31, 2026.



How to Determine the Watt-hour (Wh) Rating

If the Watt-hour rating isn't clearly marked on your battery case, and the information isn't included on a battery specification or Safety Data Sheet, you can simply determine the battery's Wh-rating by multiplying the battery's voltage (V) and capacity in ampere-hours (Ah).

$$\text{Ah} \times \text{V} = \text{Wh}$$

Some battery cases list mAh.

To convert mAh to Ah, divide by 1000

E.G., $1030 \text{ (mAh)} / 1000 = 1.030 \text{ Ah}$

$1.030 \text{ Ah} \times 7.4 \text{ V} = \sim 7.7 \text{ Wh}$

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



Packing Restrictions

PI965 & PI968 Section IA & IB (Outer Packages)

UN 3090, lithium metal batteries prepared in accordance with Section IA or Section IB of PI 968 and UN 3480, lithium ion batteries prepared in accordance with Section IA or Section IB of PI 965 must not be packed in the same outer packaging with dangerous goods classified in Class 1 (explosives) other than Division 1.4S, Division 2.1 (flammable gases), Class 3 (flammable liquids), Division 4.1 (flammable solids) or Division 5.1 (oxidizers).

PI965 & PI968 Section IA, IB, and II (Overpacks)

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





Packing Instruction (PI) 967, Section II

UN #, Proper Shipping Name	Watt-hr Rating (Cells)	Allowable # of Cells Per Package	Watt-hr Rating (Batteries)	Allowable # of Batteries Per Package
UN3481, Lithium ion batteries contained in equipment	≤20 Wh	NA	≤100 Wh	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5 kg (PAX) & (CAO)	N/A when lithium battery marking not applied.	NA	No UN Spec. Suitable material of adequate strength and design. Strong rigid outer packaging.	See PI 967 for RFID tags. Packed to prevent accidental activation and damage due to eqpt. contact



See completed Package



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Compliant PI967, Section II Package



NOTE: the requirement to apply lithium battery mark does not apply to:

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



Packing Instruction (PI) 970, Section II

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
UN 3091, Lithium Metal Batteries Contained In Equipment	≤1g lithium content	NA	≤2g lithium content	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX & CAO)	N/A when lithium battery marking not applied.	NA	No UN Spec. Suitable material of adequate strength and design. Strong rigid outer packaging.	See PI 970 for RFID tags. Packed to prevent accidental activation and damage due to eqpt. contact



See completed Package



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Compliant PI970, Section II Package



NOTE: the requirement to apply lithium battery mark does not apply to:

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