

Interactive Guide to Shipping Lithium Batteries

About this document:

This document provides awareness of the International Civil Aviation Organization's (ICAO) 2019-2020 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

Last Updated: March 2019

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SAFETY
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faa.gov/go/safecargo





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



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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



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

Cells and Batteries $\leq 2.7\text{Wh}$

Cells $>2.7\text{Wh}$ and $\leq 20\text{Wh}$

Batteries $> 2.7\text{Wh}$ and $\leq 100\text{Wh}$

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



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



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

**Cells and Batteries
 $\leq .3$ g**

**Cells $> .3$
g /
 ≤ 1 g**

**Batteries
 $> .3$ g /
 ≤ 2 g**

**Cells > 1 g
/ Batteries
 > 2 g**



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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**



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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**



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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**



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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**



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

\leq 8 Cells

$>$ 8 Cells



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Step 4 – Lithium Ion: How Many Cells Does Your Package Contain In Total?

\leq 8 Cells

$>$ 8 Cells



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

\leq 2 Batteries

$>$ 2 Batteries



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

\leq 2 Batteries

$>$ 2 Batteries



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

**≤ 4 Cells
or
 ≤ 2 Batteries**

**> 4 Cells
or
 > 2 Batteries**



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

**\leq 4 Cells
or
 \leq 2 Batteries**

**$>$ 4 Cells
or
 $>$ 2 Batteries**



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

≤ 2 Packages

> 2 Packages



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

≤ 2 Packages

> 2 Packages



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Packing Instruction 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	9 + CAO Label	Y (PGII)	SOC ≤30%

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



See completed Package

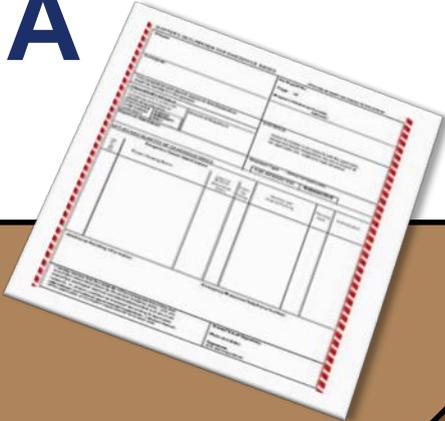


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Compliant PI965, IA Package



To:

**UN3480, Lithium
Ion Batteries**

From:



4GV/Y13/S/08/USA/FAA



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Packing Instruction 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	>2.7 Wh and ≤20 Wh	NA	>2.7 Wh and ≤100 Wh	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) <u>Forbidden</u> 10kg (CAO)	Y	Class 9 + CAO Label + Lithium Battery Mark	1.2 m drop test	PI # needs "IB" on Dec. SOC ≤30%

[Click Here to See additional 2019 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



*IB on Declaration

To:

UN3480, Lithium Ion Batteries

From:



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PI 965, Section II

* ≤1 package per consignment

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	NA	NA	>2.7 Wh and ≤100 Wh	Forbidden (PAX) ≤2 Batteries (CAO)
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
NA	Lithium ion batteries, in compliance with Section II of PI965 – CAO on AWB (if used).	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	SOC ≤30% ≤One Package Per Overpack



See completed Package



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PI 965, Section II



*** ≤ 1 package per consignment**

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	>2.7 Wh and ≤ 20 Wh	<u>Forbidden</u> (PAX) ≤ 8 cells (CAO)	NA	NA
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
NA	Lithium ion batteries in compliance with Section II of PI965-CAO" on AWB.	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	SOC $\leq 30\%$ \leq One Package Per Overpack



See completed Package



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PI 965, Section II

* ≤1 package per consignment

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	≤2.7 Wh	NA	≤2.7 Wh	NA
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
Forbidden (PAX) 2.5kg (CAO)	Lithium ion batteries in compliance with Section II of PI965-CAO" on AWB.	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	SOC ≤30% ≤One Package Per Overpack



See completed Package



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Compliant PI965, Section II Package

"Lithium ion batteries, in compliance with Section II of PI965-CAO" on AWB.

To:

From:



*Section II cells and batteries must not be packed in the same outer packaging with other dangerous goods. *Click here to [See additional overpack restrictions.](#)



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Packing Instruction 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)	Y	9 + CAO *(if >5kg)	Y (PGII)	



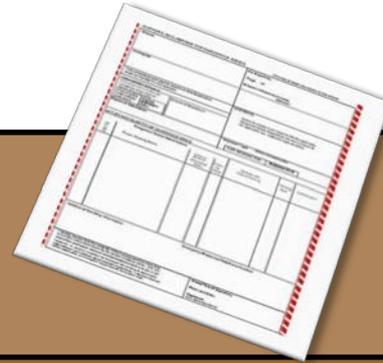
See completed Package



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Compliant PI966, Section I Package



To: UN3481, Lithium ion
batteries packed with
equipment

From:



***FOR >5 KG**

4GV/Y13/S/08/USA/FAA



See completed
Package



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Packing Instruction 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)	Lithium ion batteries in compliance with Section II of PI966 on AWB.	Lithium Battery Mark	1.2 m drop test	NA



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Compliant PI966, Section II Package

"Lithium ion batteries, in compliance with Section II of PI966" on AWB.

To:

From:



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Packing Instruction 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)	Y	9 + CAO Label *(if>5kg)	Suitable material of adequate strength and design.	Packed to prevent accidental activation.



See completed Package



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Compliant PI967, Section I Package



To:

UN3481, Lithium ion
batteries contained in
equipment

From:



***FOR >5 KG**



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Packing Instruction 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)	Lithium ion batteries in compliance with Section II of PI967 on AWB.	Lithium Battery Mark	Suitable material of adequate strength and design.	See PI 967 for RFID tags. Packed to prevent accidental activation.



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Compliant PI967, Section II Package

"Lithium ion batteries, in compliance with Section II of PI967" on AWB.

To:

From:



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Packing Instruction 968, Section IA

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
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)	Y	9 + CAO Label	Y (PGII)	

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



See completed Package

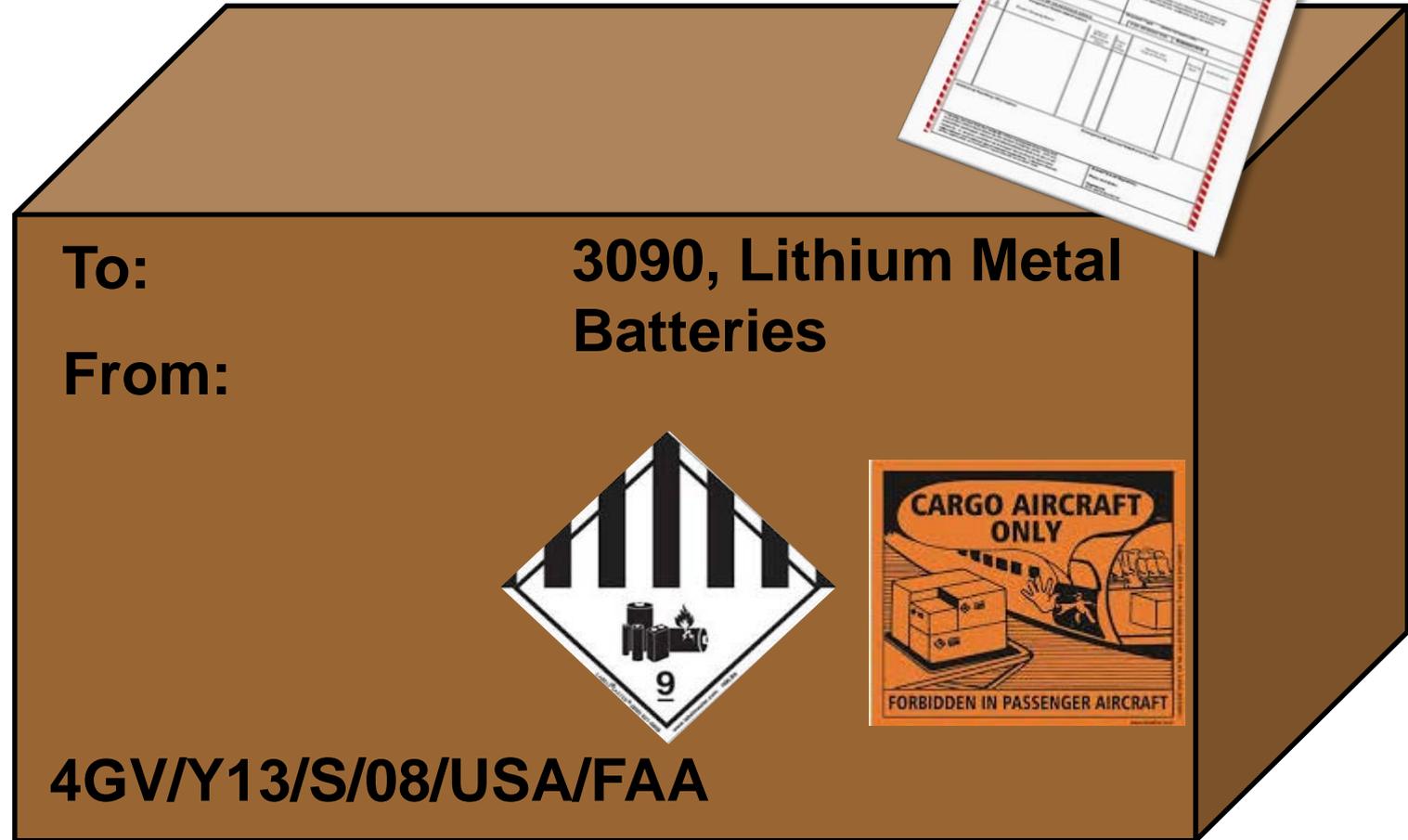


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Compliant PI968, IA Package



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Packing Instruction 968, Section IB

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
3090, Lithium metal batteries	>0.3g and ≤1g lithium content	NA	>0.3g and ≤2g lithium content	NA
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) Forbidden 2.5kg (CAO)	Y	Lithium Battery Mark + 9 + CAO Label	1.2 m drop test	"IB" required on DGD

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



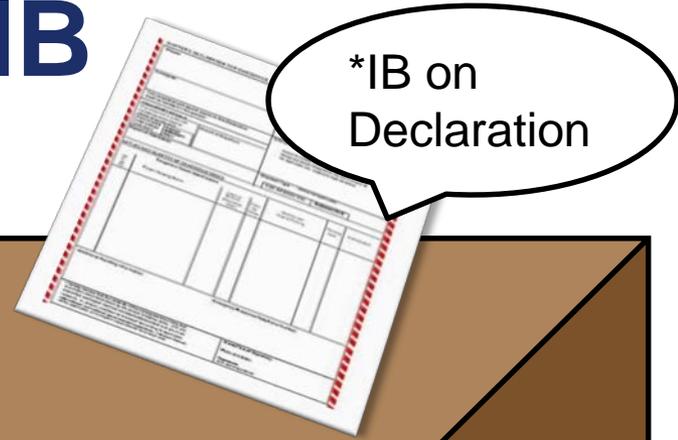
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Compliant PI968, IB Package



To: 3090, Lithium Metal Batteries

From:



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Packing Instruction 968, Section II

*≤1 Package Per Consignment

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
3090, Lithium Metal Batteries	NA	NA	>.3g and <u>≤</u> 2g lithium content	<u>Forbidden (PAX)</u> <u>≤</u> 2 batteries (CAO)
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
NA	Lithium metal batteries, in compliance with Section II of PI968-CAO on AWB.	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	No consolidations allowed. <u>≤</u> One Package Per Overpack



See completed Package



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Packing Instruction 968, Section II

*≤1 Package Per Consignment

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
3090, Lithium Metal Batteries	>0.3g and <u>≤</u> 1g lithium content	Forbidden (PAX) <u>≤</u> 8 cells (CAO)	NA	NA
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
NA	Lithium metal batteries, in compliance with Section II of PI968- CAO on AWB.	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	No consolidations allowed. <u>≤</u> One Package Per Overpack



See completed Package



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Packing Instruction 968, Section II

*≤1 Package Per Consignment

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
3090, Lithium Metal Batteries	<u>≤</u> 0.3g lithium content	NA	<u>≤</u> 0.3g lithium content	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
(PAX) <u>Forbidden</u> 2.5kg (CAO)	Lithium metal batteries, in compliance with Section II of PI968-CAO on AWB.	Lithium Battery Mark + CAO Label + Overpack Mark (if applicable)	1.2 m drop test	No consolidations allowed. <u>≤</u> One Package Per Overpack



See completed Package



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Compliant PI968, Section II Package

"Lithium metal batteries, in compliance with Section II of PI968-CAO" on AWB.

To:

From:



*Section II cells and batteries must not be packed in the same outer packaging with other dangerous goods. *Click here to [See additional overpack restrictions.](#)



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Packing Instruction 969, Section I

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
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)	Y	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.



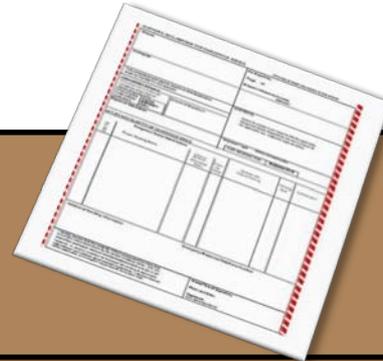
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Compliant PI969, Section I Package



To: 3091, Lithium Metal
Batteries Packed With
Equipment

From:



***FOR >5 KG**

4GV/Y13/S/08/USA/FAA



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Packing Instruction 969, Section II

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
3091, Lithium Metal Batteries Packed With Equipment	>0.3g and ≤1g lithium content	Minimum to power equip + 2 spare sets	>0.3g and ≤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)	Lithium metal batteries, in compliance with Section II of PI969 on AWB.	Lithium Battery Mark	Packed to prevent accidental activation & 1.2 m drop test.	NA



See completed Package



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Compliant PI969, Section II Package

"Lithium metal batteries, in compliance with Section II of PI969" on AWB.

To:

From:



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Packing Instruction 970, Section I

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
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)	Y	9 + CAO Label *(if >5kg)	Suitable material of adequate strength and design.	Packed to prevent accidental activation.



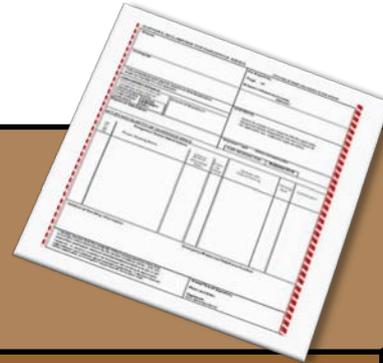
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Compliant PI970, Section I Package



To: 3091, Lithium Metal
Batteries Contained In
Equipment

From:



***FOR >5 KG**



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Packing Instruction 970, Section II

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
3091, Lithium Metal Batteries Contained In Equipment	>0.3g and ≤1g lithium content	NA	>0.3g and ≤2g lithium content	NA

Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX & CAO)	Lithium metal batteries, in compliance with Section II of PI970 on AWB.	Lithium Battery Mark	Suitable material of adequate strength and design.	See PI 970 for RFID tags. Packed to prevent accidental activation.



See completed Package



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Compliant PI970, Section II Package

"Lithium metal batteries, in compliance with Section II of PI970" on AWB.

To:

From:



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How to Determine the 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 batteries voltage (V) and capacity in ampere-hours (Ah).

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

Some battery cases list mAh.

To convert mAh to Ah, divide by 1000

E.G., $1020 \text{ (mAh)}/1000 = 1.020 \text{ Ah}$

$1.020 \text{ Ah} \times 7.2 \text{ V} = \sim 7.4 \text{ Wh}$



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2019 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.



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Packing Instruction 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)	NA	NA	Suitable material of adequate strength and design.	See PI 967 for RFID tags. Packed to prevent accidental activation.



See completed Package

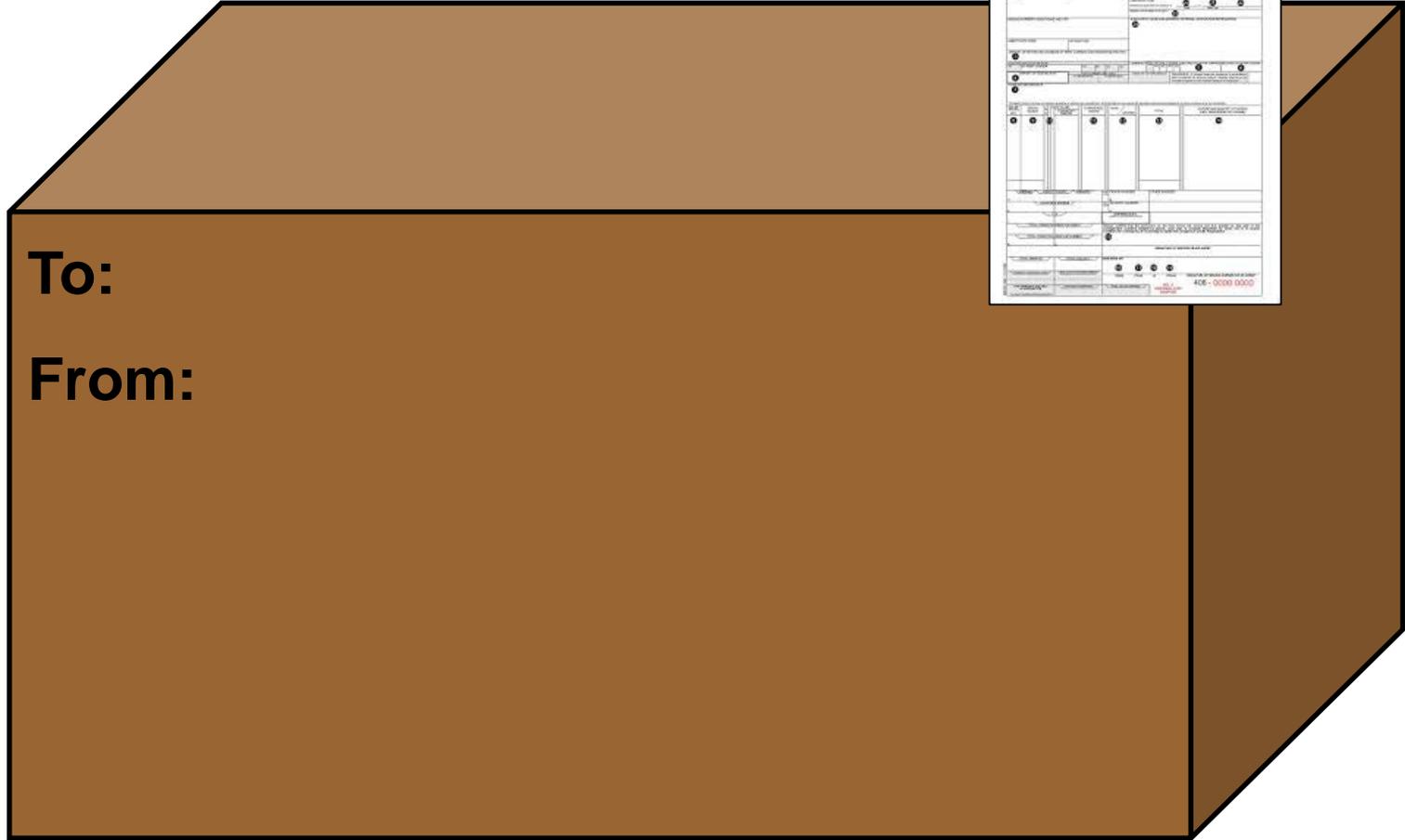


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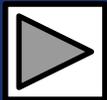


Compliant PI967, Section II Package



To:

From:



See completed Package



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Packing Instruction 970, Section II

UN #, Proper Shipping Name	Lithium Content (Cells)	Allowable # of Cells Per Package	Lithium Content (Batteries)	Allowable # of Batteries Per Package
3091, Lithium Metal Batteries Contained In Equipment	>0.3g and ≤1g lithium content	NA	>0.3g and ≤2g lithium content	NA
Allowable Net Mass Per Package	Shippers Dec?	Labels/ Markings	UN Spec Required?	Additional?
5kg (PAX & CAO)	NA	NA	Suitable material of adequate strength and design.	See PI 970 for RFID tags. Packed to prevent accidental activation.



See completed Package



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Compliant PI970, Section II Package

To:

From:



See completed Package



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