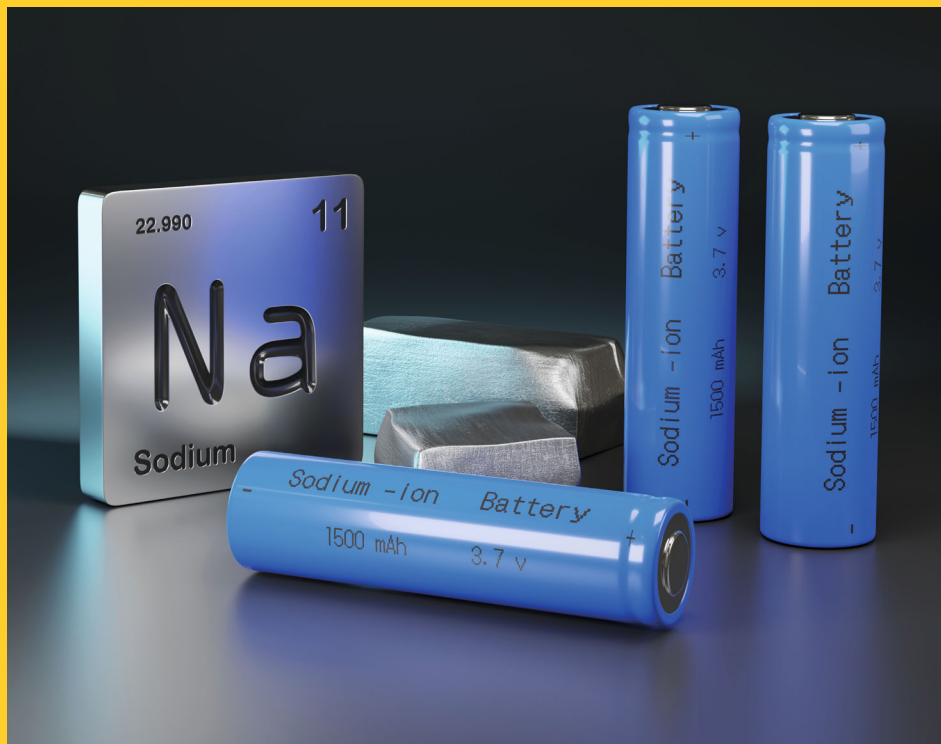


Transport of Sodium Ion Batteries: A Multi Modal Guide



How to find the **applicable UN number** for Sodium Ion Batteries?

How to find the **applicable provision** for the transport?

Mode of Transport:

- ADR/RID/ADN
- IMDG Code
- IATA DGR

Sodium ion batteries have become a new energy storage system. But sodium-ion batteries are also categorised as dangerous goods. As a result their transport is subject to dangerous goods regulations.

This guide is intended to help you to find your way through the jungle of legal requirements for the various modes of transport.

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Transport of Sodium Ion Batteries: A Multi Modal Guide



Prof. Dr. Norbert Müller

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Imprint

<p>Publishing Company Verlag Heinrich Vogel TECVIA GmbH Aschauer Straße 30 81549 München</p> <p>1st Edition 2024 Status: 11/2023 Art. Nr 33359 ISBN: 978-3-574-60592-5</p>	<p>Author Prof. Dr. Norbert Müller</p> <p>Product Management/Layout Dagmar Kunzmann Markus Tröger</p> <p>Print Print24 GmbH Friedrich-List-Str. 3 01445 Radebeul</p>	<p>Front page foto jroballo - stock.adobe.com</p> <p>This work, including all parts of it, is protected by copyright. Any utilization outside the narrow limits of copyright law without the consent of the publisher is unauthorised and liable to</p>	<p>prosecution. This applies in particular to reproductions, translations, microfilming and storage and processing in electronic systems. The work has been compiled with the utmost care. However, a legal guarantee for the correctness of the individual details cannot be accepted. Liability for the content of Internet links is excluded,</p>	<p>despite careful checking of the content, excluded. The respective site operator is solely responsible for the content of the pages. For reasons of readability, the masculine form is used in the following (e.g. vehicle driver) is used in the following. However, all personal statements always apply equally to men and women.</p>
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Introduction

Sodium ion batteries have become a new energy storage system. They need to be transported

- stand alone
- contained in equipment and vehicles
- packed with equipment and vehicles
- contained in and packed with equipment and vehicles.

Sodium ion batteries are dangerous goods without any exemption. As a result their transport is subject to dangerous goods regulations.

This guide will help you to find a path through the jungle of dangerous goods regulations to identify the correct applicable provision for the corresponding transportation case.

Recommendation: check first the flow chart “How to find the applicable UN number” of this guide to identify the applicable regulation for the resp. mode of transport.

Companies which

- pack and/or mark and/or label packages and/or over-packages
- load
- consign
- transport
- unload

sodium ion batteries, stand-alone and/or contained in equipment and/or packed with equipment have to take care that their respective employees, including the drivers, have completed an appropriate training. In Air transport the training (and examination) is regulated by the CBTA.

In countries, which are contract parties of the ADR, RID and/or ADN, companies which

- pack and/or mark and/or label packages and/or over-packages
- load
- consign
- transport
- unload

sodium ion batteries, stand alone and/or contained in equipment and/or packed with equipment have to appoint a Dangerous Goods Safety Adviser (DGSA) if the weight of the load on a cargo transport unit (road vehicle, rail wagon, container) is more than 333 kg of such batteries. Except for sodium ion batteries which are critically damaged or defective according to Special Provision 376 of ADR/RID/ADN: In this case a DGSA has to be appointed independent of the weight of the load.

The Guide reflects the provisions as from 1st of January 2025, as published in November 2023.

Prof. Dr. Norbert Müller

How to find the applicable UN number?










How to find the applicable UN number sodium ion cell or battery		
stand alone		UN 3551
equipment, not containing other dangerous goods	cell/battery is contained in equipment	UN 3552
	cell/battery is packed with equipment (equipment does not contain cell/battery)	
	cell/battery is contained in equipment and is packed with equipment	
vehicle	battery is contained in vehicle	UN 3558 *)
	battery is packed with vehicle (vehicle does not contain battery)	UN 3552
	battery is contained in vehicle and is packed with vehicle	UN 3558 *) & UN 3552
contained in article, article is containing other dangerous goods		UN 2990, UN 3072, UN 3479, UN 3537-3548
*) if vehicle is powered by both, flammable liquid / gas & sodium ion battery ("hybrid"): UN number = 3166.		

UN 3551, UN 3552 and UN 3558: Overview over **Special Provisions** and **Packing Instructions**


















UN	Class	Label	Special Provisions			Packing Instructions	
			ADR / RID / ADN	IMDG Code	IATA DGR	ADR / RID / ADN / IMDG Code	IATA DGR
3551	9	9A	188	188	<i>P1974</i>	P903	<i>P1974</i> + PI974 ICAO-TI
			230	230	-	P908	-
			310	310	A88	P909	-
			348	348	<i>P1974</i>	P910	PI910 ICAO-TI
			376	376	A154	P911	-
			377	377	A183	LP903	PI974 ICAO-TI
			<i>400</i>	<i>400</i>	-	LP904	-
			<i>401</i>	<i>401</i>	<i>A228</i>	LP905	PI910 ICAO-TI
			636	-	-	LP906	-
			677	-	-	-	-
			-	-	A99	-	-
			-	-	A164	-	-
			-	-	[A201] not finalised	-	-
			3552	9	9A	188	188
230	230	-				P908	-
310	310	A88				P909	-
348	348	<i>P1977 P1978</i>				P910	PI910 ICAO-TI
360	360	A185				P911	-
376	376	A154				LP903	PI974 ICAO-TI
377	377	-				LP904	-
<i>400</i>	<i>400</i>	-				LP905	PI910 ICAO-TI
<i>401</i>	<i>401</i>	<i>A228</i>				LP906	-
670	-	-				-	-
677	-	-				-	-
-	-	A48				-	-
-	-	A99				-	-
-	-	A164				-	-
3558	9	9A	388	388	A214	<i>P912</i>	PI952
			<i>404</i>	<i>404</i>	<i>A231</i>	-	-
			666 (e)	<i>405</i>	A87	-	-
			667	-	-	-	-
			669	-	-	-	-
			-	-	A118	-	-
			-	-	A120	-	-
			-	-	A154	-	-
			-	-	A164	-	-
			-	-	-	-	-

(Restriction valid from 2025 highlighted in red)









Mode of Transport – ADR/RID/ADN

ADR / RID / ADN								
UN 3551 SODIUM ION BATTERIES								
(1a)	Special Provision (1b)	Test Summary? (2)	Package			Container		Transport document (5)
			Packaging (3a)	Marking (3b)	Labeling (3c)	Marking (4a)	Placarding (4b)	
188	≤ 20 Wh per cell, ≤ 100 Wh per battery	Yes SP188 (c)	SP188 (d), (g), (h)		-	-	-	-
-	> 20 Wh per cell, > 100 Wh per battery	Yes 2.2.9.1.7.2 (g)	P903 (1), (2) LP903	UN 3551		-		UN 3551 SODIUM ION BATTERIES, 9, (E)
310	pre-production prototypes or production runs ≤ 100 cells or batteries	No	P910 (1), (3) LP905 (1)	UN 3551		-		UN 3551 SODIUM ION BATTERIES, 9, (E), CARRIAGE IN ACCORDANCE WITH SPECIAL PROVISION 310
376	damaged / defective, non critical	No	P908 LP904	UN 3551 DAMAGED / DEFECTIVE SODIUM ION BATTERIES		-		UN 3551 SODIUM ION BATTERIES, 9, (E), CARRIAGE IN ACCORDANCE WITH SPECIAL PROVISION 376
376 677	damaged / defective, critical	No	P911 LP906	UN 3551 DAMAGED / DEFECTIVE SODIUM ION BATTERIES		-		UN 3551 SODIUM ION BATTERIES, 9, (E), CARRIAGE IN ACCORDANCE WITH SPECIAL PROVISION 376, TRANSPORT CATEGORY 0

Mode of Transport – IMDG Code

IMDG Code								
UN 3551 SODIUM ION BATTERIES								
Special Provision		Test Summary?	Package			Container		Transport document
(1a)	(1b)	(2)	Packaging (3a)	Marking (3b)	Labeling (3c)	Marking (4a)	Placarding (4b)	
(5)								
188	≤ 20 Wh per cell, ≤ 100 Wh per battery	Yes SP188.3	SP188.4, .7, .8		-	-	-	- (unless required by carrier)
-	> 20 Wh per cell, > 100 Wh per battery	Yes 2.9.5.6	P903 (1), (2) LP903	UN 3551 SODIUM ION BATTERIES		 if > 4 tons	 9	UN 3551 SODIUM ION BATTERIES, 9
310	pre-production prototypes or production runs ≤ 100 cells or batteries	No	P910 (1), (3) LP905 (1)	UN 3551 SODIUM ION BATTERIES		 if > 4 tons	 9	UN 3551 SODIUM ION BATTERIES, 9, TRANSPORT IN ACCORDANCE WITH SPECIAL PROVISION 310
376	damaged / defective, non critical	No	P908 LP904	UN 3551 DAMAGED / DEFECTIVE SODIUM ION BATTERIES		 if > 4 tons	 9	UN 3551 SODIUM ION BATTERIES, 9, TRANSPORT IN ACCORDANCE WITH SPECIAL PROVISION 376
	damaged / defective, critical	No	P911 LP906	UN 3551 DAMAGED / DEFECTIVE SODIUM ION BATTERIES		 if > 4 tons	 9	UN 3551 SODIUM ION BATTERIES, 9, TRANSPORT IN ACCORDANCE WITH SPECIAL PROVISION 376
188	waste ≤ 20 Wh per cell, ≤ 100 Wh per battery	Yes SP188.3	SP188.4, .7, .8		-	-	-	- (unless required by carrier) Waste codes: - EU: 160605 or 200134 - Basel: B1090
377	waste	No	P909 (1), (2), (4)	UN 3551 SODIUM ION BATTERIES FOR RECYCLING		 if > 4 tons	 9	UN 3551 WASTE SODIUM ION BATTERIES, 9, TRANSPORT IN ACCORDANCE WITH SPECIAL PROVISION 377 Waste codes: - EU: 160605 or 200134 - Basel: B1090

Mode of Transport – IATA DGR

IATA DGR						
UN 3551 SODIUM ION BATTERIES						
Special Provision		Test Summary?	Package			Transport document (Shipper's Declaration)
(1a)	(1b)		Packaging	Marking	Labeling	
(1a)	(1b)	(2)	(3a)	(3b)	(3c)	(4)
-	≤ 30 % SoC ≤ 35 kg net mass per package	Yes 3.9.2.6.1.2 (f)	PI976	UN 3551 SODIUM ION BATTERIES 		UN 3551 SODIUM ION BATTERIES, 9, PI 976
A99	≤ 30 % SoC > 35 kg net mass per package	Yes 3.9.2.6.1.2 (f)	PI974 (1) of ICAO TI	UN 3551 SODIUM ION BATTERIES 		UN 3551 SODIUM ION BATTERIES, 9, PI 974, SP A99
A88	pre-production prototypes or production runs ≤ 100 cells or batteries ≤ 30 % SoC	No	PI910 (1) of ICAO TI	UN 3551 SODIUM ION BATTERIES 		UN 3551 SODIUM ION BATTERIES, 9, PI 910, SP A88
A154	damaged / defective, non critical	Forbidden				
	damaged / defective, critical	Forbidden				
A183	waste ≤ 30 % SoC	Yes 3.9.2.6.1.2 (f)	PI976	UN 3551 SODIUM ION BATTERIES 		UN 3551 WASTE SODIUM ION BATTERIES, 9, PI 976 Waste codes: - EU: 160605 or 200134 - Basel: B1090

(numbering of test summary assumed by the author)

Appendix 3: Restrictions of IATA Airlines

Airlines in alphabetical order		UN 3551		UN 3552				UN 3558
		PI965		with PI966		in PI967		PI952
		IA	IB	I	II	I	II	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(14)
Aerolineas Argentinas	AR				A		A	
Aeromexico	AM							
AeroUnion	6R	shipper must be registered						if self balancing with additional provisions only
Air Atlanta Europe	CT							CAO
Air Atlanta Icelandic	CC							CAO
Air Baltic	BT							
Air Bridge Cargo	RO	with approval only		with approval only	A	with approval only	A	
Air Canada	AC				A		A	
Air Canada Rouge	RV				A		A	
Air China	CA							
Air Europa	UX							
Air Europa Express	X5							
Air France	AF			≤ 1,6 m				
Air Hong Kong	LD							
Air Mauritius	MK							
Air New Zealand	NZ	if not for refurbishment only						
Air Serbia	JU							
Air Transat	TS							
All Nippon Airways	NH	confirmation SoC ≤ 30 %						
			packing certificate					
American Airlines	AA	prohibitions of mixed packaging						
Asiana Airlines	OZ	with approval only	confirmation SoC ≤ 30 %					
Atran	V8	with approval only	A	with approval only	A	with approval only	A	
Austrian Airlines	OS			CAO		CAO		CAO
Avianca Costa Rica	LR							self balancing CAO