

Shipping Lithium Ion Batteries for Cordless Power Tools and Electric Garden Equipment: Implementation of Dangerous Goods Transport Regulations - Edition 2018

Transport of lithium ion batteries is in the scope of Dangerous Goods Transport Regulations. Therefore many specific requirements have to be respected for their transport. The safe carriage of dangerous goods is important to shippers and transport companies and not least for every party involved in the chain of lithium ion battery transport.

The following notes, based on recommendations of EPTA and ZVEI, have been produced to provide initial practical guidance to the regulations for the carriage of lithium ion batteries especially for cordless power tools and gardening equipment.

These provisions must be fulfilled by the shipper for every commercial shipment of lithium ion batteries.

Especially the energy content and diverse conditions classify which dangerous goods regulations must be taken into account for the transport of lithium ion batteries. Due to exemption regulations, simplified requirements apply for instance to lithium ion batteries with an energy content up to maximum 100 Wh. Whereas lithium ion batteries with an energy content

of more than 100 Wh are always to be treated as fully regulated Class 9 Dangerous Goods.

This guidance refers to the commercial transport by

- road/rail (ADR/RID)
- sea freight (IMDG Code)
- air freight (IATA)

Lithium ion batteries are classified as follows:

- UN3480 Lithium ion batteries
- UN3481 Lithium ion batteries contained in equipment
- UN3481 Lithium ion batteries packed with equipment

In individual cases, a dangerous goods expert should be consulted.

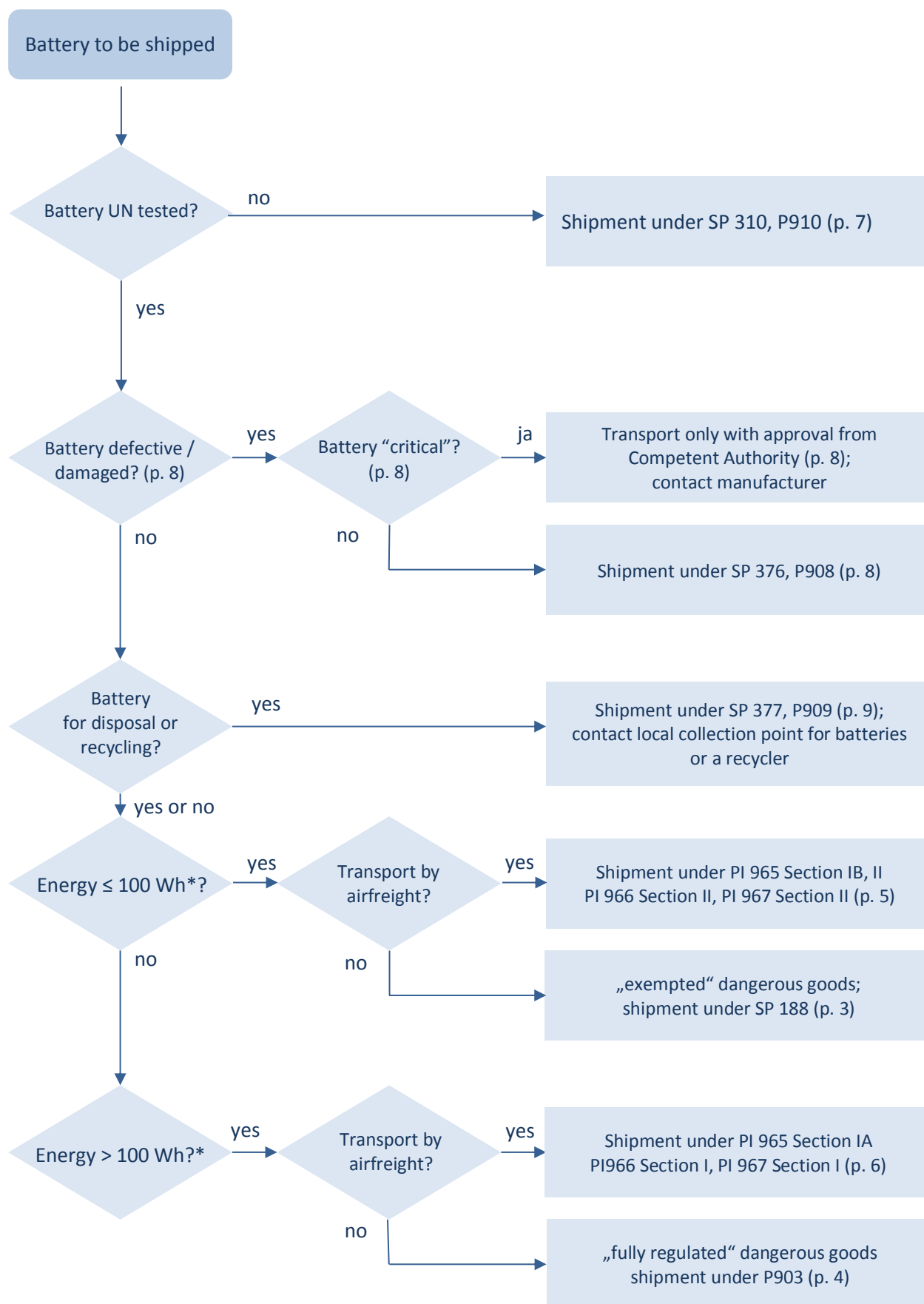
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They can, at their discretion, make decisions differing from this guideline. Therefore, despite the greatest possible care during the revision and composition, no liability can be assumed for the content and the completeness of this document.

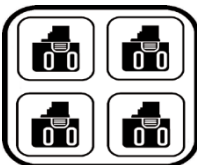
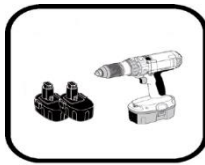



Legend

ADR	Accord européen relatif au transport international des marchandises Dangereuses par Route, (European Agreement concerning the International Carriage of Dangerous Goods by Road)
RID	Règlement concernant le transport International ferroviaire de marchandises Dangereuses (Regulations concerning the International Carriage of Dangerous Goods by Rail)
IMDG Code	International Maritime Code for Dangerous Goods
IATA	International Air Transport Association
PI	Packing Instruction
SP	Special Provision
n/a	not applicable

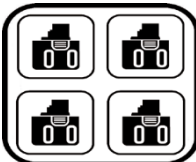




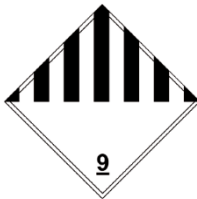
Flow chart to determine the appropriate Packing Instruction













*Energy [Wh] = Capacity [Ah] x Voltage [V] (see name plate)

Transportation Mode	Road/Rail (ADR/RID), Sea Freight (IMDG Code)		
	≤ 100 Wh (per battery)		
	Batteries (without equipment) 	Batteries packed with equipment (at least one battery which is not attached to tool) 	Batteries contained in equipment (contained/plugged-in in tool) 
Packing Instructions	ADR/RID SP188, IMDG Code SP188		
Max. Quantity	n/a		
Weight Limit	30 kg gross weight per package	n/a	
Packaging	Batteries must be placed in inner packagings that completely enclose the battery, batteries must be protected so as to prevent short circuits. Strong outer packaging, e.g. fibreboard box (drop test passed: content shall not be damaged or shifted)		strong outer packaging protection against unintentional activation short circuit protection
Marking ¹	<div>Lithium battery mark  UN 3480 Tel. _____</div>	<div>Lithium battery mark  UN 3481 Tel. _____</div>	not applicable if no more than two batteries are installed and if there are no more than two packages in the consignment
Sea Freight Container-Marking	none		
Transport Document	n/a		n/a
Miscellaneous	Personnel shall be trained commensurate with responsibilities		

¹ NOTE: There is a transition period until 2018-12-31. During this period, the old marking can continue to be used (see our 2016 guidance document)

Transportation Mode	Road/Rail (ADR/RID), Sea Freight (IMDG Code)		
	> 100 Wh (per battery)		
	Batteries (without equipment) 	Batteries packed with equipment (at least one battery which is not attached to tool) 	Batteries contained in equipment (contained/plugged-in in tool) 
Packing Instructions	P903, LP903		
Max. Quantity	333 kg per transport unit (truck incl. trailer) for exemptions according to ADR 1.1.3.6		
Weight Limit	n/a		
Packaging	Batteries must be placed in inner packagings that completely enclose the battery, batteries must be protected to prevent short circuits. Batteries must be secured against movement within the outer packaging. UN approved packaging (Packing Group II: e.g. UN/4G/Y30/...)		strong outer packaging protection against unintentional activation short circuit protection
Marking ²	Hazard label № 9A (10x10 cm) ADR: UN 3480  IMDG Code: UN 3480 LITHIUM ION BATTERIES	Hazard label № 9A (10x10 cm) ADR: UN 3481  IMDG Code: UN 3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT or UN 3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT	
Sea Freight Container-Marking	CONTAINER-PLACARDS (min. 25x25 cm) 		
Transport Document	UN 3480, LITHIUM ION BATTERIES, 9, (E) Number of packages and packaging type (e.g. 1 Fibreboard box) Battery weight (e.g. xx kg), Shipper & consignee's address Sea freight (IMDG Code): (language English) IMO-DANGEROUS GOODS DECLARATION (SOLAS 74, KAP. VII, REG 5, MARPOL 73/79, ANNEX III REG. 4 OF IMDG-CODE)	UN 3481, LITHIUM ION BATTERIES PACKED WITH EQUIPMENT, 9, (E) Number of packages and packaging type (e.g. 1 Fibreboard box) Battery weight (e.g. xx kg) Shipper & consignee's address Sea freight (IMDG Code): (language English) IMO-DANGEROUS GOODS DECLARATION (SOLAS 74, KAP. VII, REG 5, MARPOL 73/79, ANNEX III REG. 4 OF IMDG-CODE)	UN 3481, LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT, 9, (E) Number of packages and packaging type (e.g. 1 Fibreboard box) Battery weight (e.g. xx kg) Shipper & consignee's address Sea freight (IMDG Code): (language English) IMO-DANGEROUS GOODS DECLARATION (SOLAS 74, KAP. VII, REG 5, MARPOL 73/79, ANNEX III REG. 4 OF IMDG-CODE)
Miscellaneous	Personnel shall be trained commensurate with responsibilities		

² NOTE: There is a transition period until 2018-12-31. During this period, the old marking can continue to be used (see our 2016 guidance document)

Transportation Mode	Airfreight (IATA)			
	≤ 100 Wh (per battery)			
	Batteries (without equipment) 		Batteries packed with equipment (at least one battery which is not attached to tool) 	Batteries contained in equipment (contained/plugged-in in tool) 
Packing Instructions	IATA PI 965 Section IB	IATA PI 965 Section II	IATA PI 966 Section II	IATA PI 967 Section II
Max. Quantity	none (more than 2 batteries per package)	2 batteries per package, 1 package per consignment 1 package per overpack	As required for operation, plus 2 for replacement	n/a
Weight Limit	PAX: forbidden CAO:10 kg net battery weight per package	PAX: forbidden CAO: n/a	PAX/CAO: 5 kg net battery weight per package	
Packaging	Batteries must be placed in inner packaging that completely encloses the battery, batteries must be protected to prevent short circuits (only for batteries or batteries packed with equipment) Batteries must be secured against movement within the outer packaging Equipment containing batteries must be secured and packed to prevent unintended operation during transport Strong outer packaging (fibreboard box)			
Marking ³	UN 3480, Lithium ion batteries, battery weight (e.g. net qty xx kg) Shipper's/Consignee's address  	 	 	Up to 2 batteries per package: no battery handling label required More than 2 batteries per package: battery handling label required 
Transport Document	Shipper's Declaration for Dangerous Goods: UN 3480 Lithium ion batteries, 9, // __ Fibreboard box(es) x __ kg // 965 // IB, see Example 1 , delete the "PASSENGER AND CARGO AIRCRAFT" box	n/a	n/a	n/a
Information on the Air Waybill (AWB)	In the "Handling Information" box: "Dangerous Goods as per Shipper's Declaration CAO"	In the "Nature and Quantity of Goods" box: "Lithium ion batteries in compliance with section II of PI 965 CAO", see Example 2	In the "Nature and Quantity of Goods" box: „Lithium ion batteries in compliance with section II of PI 966"	Only if more than 2 batteries per package, in the "Nature and Quantity of Goods" box: „Lithium ion batteries in compliance with section II of PI 967"
Miscellaneous	Official IATA-Training by authorized trainer required, If not available, please contact IATA authorized expert		Batteries <2.7 Wh: Max. Quantity 2.5 kg	
			Adequate instruction commensurate with responsibilities	
	State of charge (SoC) must not exceed 30%			
Special Provisions: A88, A99, A154, A164, A181, A183, A185, A201, A206, A331				

Example 1 Shipper's Declaration Lithium Batteries PI 965 Section IB

Shipper's Declaration Completion

NATURE AND QUANTITY OF DANGEROUS GOODS						
UN or ID No.	Proper Shipping Name	Class or Division (Subsidiary Risk)	Packing Group	Quantity and type of packing	Packing Inst.	Authorisation
UN 3480	Lithium ion batteries	II	N	1 Fibreboard box x 3,5 kg G	965	IB








The appropriate method of describing a lithium ion battery in accordance with Section IB

Example 2 Air Waybill Lithium Batteries PI 965 Section II

Consignment Containing Lithium Batteries Packed According to Section II of PI 965—970

Airport of Destination		Requested Flight/Date		Amount of Insurance		INSURANCE: If carrier offers insurance, and such insurance is requested in accordance with the conditions thereof, indicate amount to be insured in figure in box marked "Amount of Insurance".	
Handling Information							
SCI							
No. of Pieces (Gross Weight)	Gross Weight	Net Weight	Rate Class	Chargeable Weight	Rate / Charge	Total	Nature and Quantity of Goods (incl. Dimensions of Volume)
							Lithium ion batteries in compliance with Section II of PI 965 CAO

³ NOTE: There is a transition period until 2018-12-31. During this period, the old marking can continue to be used (see our 2016 guidance document)


Transportation Mode	Airfreight (IATA)		
	> 100 Wh (per battery)		
	Batteries (without equipment) 	Batteries packed with equipment (at least one battery which is not attached to tool) 	Batteries contained in equipment (contained/plugged-in in tool) 
Packing Instruction	IATA PI 965 Section IA	IATA PI 966 Section I	IATA PI 967 Section I
Max. Quantity	n/a	As required for operation, plus 2 for replacement	n/a
Weight Limit	PAX: forbidden CAO: 35 kg net battery weight per package	PAX: 5 kg net battery weight per package CAO: 35 kg net battery weight per package	
Packaging	Batteries must be placed in inner packagings that completely enclose the battery, batteries must be protected to prevent short circuits UN approved packaging (Packing Group II: e.g. UN 4G/Y30/...)	Batteries must be placed in inner packagings that completely enclose the battery, batteries must be protected so as to prevent short circuits UN approved packaging (Packing Group II: e.g. UN 4G/Y30/...)	Equipment containing batteries must be secured and packed to prevent accidental operation during transport Batteries must be protected so as to prevent short circuits. This includes protection against contact with conductive materials within the same packaging. Strong outer packaging (e.g. cardboard box) UN approved packaging not required (SP A48)
Marking ⁴	<i>UN 3480, Lithium ion batteries Net weight (NET QTY)</i> <i>Shipper's/Consignee's address</i>  	<i>UN 3481, Lithium ion batteries packed with equipment Net weight (NET QTY)</i> <i>Shipper's/Consignee's address</i> 	<i>UN 3481, Lithium ion batteries contained in equipment Net weight (NET QTY)</i> <i>Shipper's/Consignee's address</i> 
Transport Document	Shipper's Declaration for Dangerous Goods: UN 3480 Lithium ion batteries, 9 // 965, delete the "PASSENGER AND CARGO AIRCRAFT" box	Shipper's Declaration for Dangerous Goods: UN 3481 Lithium ion batteries packed with equipment, 9 // 966	Shipper's Declaration for Dangerous Goods: UN 3481 Lithium ion batteries contained in equipment, 9 // 967
Information on the Air Waybill (AWB)	In the "Handling Information" box: "Dangerous Goods as per Shipper's Declaration CAO" When a shipment contains both dangerous goods and non-dangerous goods, the number of packages containing dangerous goods shall be added in the "Handling Information" box.		
Miscellaneous	Official IATA-Training required. If not available, please contact IATA authorized expert.		
	State of charge (SoC) must not exceed 30%		
	Special Provisions: A88, A99, A154, A164, A181, A183, A185, A201, A206, A331		

Example 3 Air Waybill containing 5 packages with lithium batteries packed with or contained in equipment (power tools) together with 20 packages with non-dangerous goods (such as conventional, corded power tools).

For a Shipment Containing Dangerous Goods and Non-Dangerous Goods


Airport of Destination		Requested Flight/Date		Amount of Insurance		INSURANCE – If carrier offers insurance, and such insurance is required in accordance with the conditions thereof, indicate amount to be insured in figures or in words "Amount of Insurance".	
Handling Information							
5 Packages Dangerous Goods as per attached Shipper's Declaration							
SCI							
No. of Pieces BCT	Gross Weight	kg	Rate Class Commodity Item No.	Chargeable Weight	Rate Charge	Total	Nature and Quantity of Goods (incl. Dimensions or Volume)
25							Power tools

⁴ NOTE: There is a transition period until 2018-12-31. During this period, the old marking can continue to be used (see our 2016 guidance document)

Transportation Mode	Prototypes Road/Rail/Sea Freight	Prototypes Airfreight
	Prototypes: Lithium batteries without testing according to UN Test 38.3; Lithium batteries; Lithium batteries packed with or contained in equipment Only for transport of <ul style="list-style-type: none"> • small production series of max. 100 batteries (IATA: annual production) • prototypes for testing reasons only 	
Special Provision, Packing Instruction	ADR/RID/IMDG Code: SP 310, P910	IATA SP A88, P910: Approval required from the Competent Authority of the state of origin Note: to/across/via USA additional approval required from US Authority (DOT)
Max. Quantity	See above	as defined in approval
Weight Limit	n/a	as defined in approval
Packaging	UN approved packaging: e.g. fibreboard box (Packing Group II: e.g. UN 4G/Y30/...) <ul style="list-style-type: none"> • Each battery shall be individually packed in an inner packaging, e.g. in a plastic bag • Non-combustible, non-conductive thermal insulation material, e.g. Vermiculite • Must be secured against movement within the outer packaging 	as defined in approval
Marking	ADR/RID: UN 3480 IMDG Code: UN 3480 LITHIUM ION BATTERIES (100 x 100 mm) 	as defined in approval
Transport Document	Shipper's & consignee's address UN 3480 LITHIUM ION BATTERIES, 9, (E) Number of packages and packaging type (e.g. 1 fibreboard box) Battery weight (e.g. xx kg) "CARRIAGE IN ACCORDANCE WITH SPECIAL PROVISION 310" IMDG Code: IMO-DANGEROUS GOODS DECLARATION (SOLAS 74, KAP. VII, REG 5, MARPOL 73/79, ANNEX III REG. 4 OF IMDG-CODE	as defined in approval
Miscellaneous	Personnel shall be trained commensurate with responsibilities	as defined in approval




Thermal insulation material, e.g. Vermiculite

Transportation Mode	Damaged or Defective Batteries Road/Rail/Sea	
Special Provision, Packing Instruction	SP 376, P908	
Criteria for "Damaged or Defective"	<p>"Non-critical" (no possible danger during transport)</p> <p>Batteries such that they do not conform to the tested type according to the applicable provisions of the UN Manual of Tests and Criteria, 38.3</p> <p>This includes</p> <ul style="list-style-type: none"> • Batteries identified as being defective for safety reasons; • Batteries that have leaked or vented; • Batteries that cannot be diagnosed prior to carriage; or • Batteries that have sustained physical or mechanical damage <p>The following provisions (below) apply to batteries <u>not</u> liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours.</p>	<p>"critical" (possible danger during transport)</p> <p>Batteries liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours</p> <p>Note: In order to assess the type of battery, its previous use and misuse shall be taken into account</p> <p>Transport only with approval from the Competent Authority (in Germany: Federal Institute for Materials Research and Testing (BAM); detailed requirements as stated in the approval.</p>
Max. Quantity	n/a	
Weight Limit	A battery with a net mass of more than 30 kg shall be limited to one battery per outer packaging	
Packaging	<ul style="list-style-type: none"> • Each damaged or defective battery or equipment containing such batteries must be packed separately in leak proof inner packaging to prevent release of electrolyte • UN approved packaging required for all battery types (Packing Group II), e.g. fibreboard box • Must be secured against movement within the package • Sealed packagings shall be fitted with a venting device • Must be packed with non-combustible and non-conductive thermal insulation material, material class A1 or A2 (non-combustible, e.g. rockwool, glass wool, foamglass, Vermiculite) • Absorbing material to absorb leaking electrolyte from leaking batteries • Batteries shall be protected against short circuit 	as stated in the approval
Marking	<p>UN 3480 DAMAGED / DEFECTIVE LITHIUM ION BATTERIES UN 3481 DAMAGED / DEFECTIVE LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT</p>  <p>Packages shall be marked "DAMAGED LITHIUM-ION BATTERIES"</p>	as stated in the approval
Transport Document	<p>Shipper's & consignee's address</p> <p>UN 3480 LITHIUM ION BATTERIES, 9, (E) Number of packages and packaging type (e.g. 1 Aluminium box) Battery weight (e.g. xx kg)</p>	as stated in the approval
Miscellaneous	Personnel shall be trained commensurate with responsibilities	

Air Transport of damaged or defective batteries

Batteries, that have been identified as defective for safety reasons by the manufacturer, 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) (IATA DGR SP A154).

Transportation Mode	Batteries for Disposal & Recycling Road/Rail/Sea	
	≤ 100 Wh (per battery)	> 100 Wh (per battery)
Special Provision, Packing Instruction	SP 377 P909	
Max. Quantity	n/a	
Weight Limit	30 kg gross weight per package	n/a
Packaging	<p>For batteries >100 Wh UN-approved packaging required (Packing Group II)</p> <p>For batteries ≤ 100 Wh and for batteries contained in equipment, UN-approved packaging is not required. Strong outer packagings constructed of suitable material, and of adequate strength and design in relation to the packaging capacity and its intended use.</p> <p>Batteries shall be packed to prevent short circuits and dangerous evolution of heat</p> <p>Protection against short-circuits and dangerous evolution of heat.</p> <p>This can be achieved by:</p> <ul style="list-style-type: none"> • individual protection of the battery terminal • inner packaging to prevent contact between batteries • batteries with recessed terminals designed to protect against short-circuits or • the use of non-conductive and non-combustible cushioning material to fill empty space between the batteries in the package <p>Batteries shall be secured within the outer packaging to prevent excessive movement during carriage (e.g. by using a non-conductive and non-combustible cushioning material or through the use of a tightly closed plastic bag)</p>	
Marking	<p>UN 3480</p> <p>"LITHIUM BATTERIES FOR DISPOSAL"</p> <p>or</p> <p>"LITHIUM BATTERIES FOR RECYCLING"</p> 	
Transport Document	<p>Shipper's & consignee's address</p> <p>UN 3480, WASTE LITHIUM ION BATTERIES, 9, (E)</p> <p>Number of packages and packaging type (e.g. 1 Fibreboard box (4G))</p> <p>Battery weight (e.g. xx kg)</p>	
Miscellaneous	Personnel shall be trained commensurate with responsibilities	

Damaged / defective batteries

Batteries identified as being damaged or defective shall be carried in accordance with SP 376, see page 8.

Air transport of waste batteries

Waste batteries and batteries being shipped for recycling or disposal are prohibited from air transport unless approved by the appropriate national authority of the State of Origin and the State of the Operator (IATA DGR SP A183).

Batteries for Disposal & Recycling

Alternatively, lithium batteries for disposal and recycling can also be carried (like unused lithium batteries) under ADR SP 230 and SP 188, as appropriate, or – up to the intermediate processing facility – under ADR SP 636 b).

Further Information:**Dangerous Goods Safety Advisor (DGSA)**

Each undertaking, the activities of which include the carriage, or the related packing, loading or unloading, of dangerous goods by road shall appoint one or more safety advisers for the carriage of dangerous goods.

These requirements do not apply to undertakings the activities of which concern quantities in each transport unit smaller than those referred to in ADR 1.1.3.6 (see below).

(ADR 1.8.3)

UN-Test 38.3 as Precondition for Transport

Only those batteries that fulfill the requirements of "UN Manual of Tests and Criteria, chapter 38.3" are allowed for transportation. If there should arise any doubts or questions, the manufacturer should be contacted.

For transport of prototypes (without UN test 38.3) and defective batteries, specific instructions have to be applied, see pages 7 and 8.

(ADR 2.2.9.1.7.(a), SP 230, SP 188)

Quality Management Programme

Batteries shall be manufactured under a quality management programme that includes:

- (i) A description of the organizational structure and responsibilities of personnel with regard to design and product quality;
- (ii) The relevant inspection and test, quality control, quality assurance, and process operation instructions that will be used;
- (iii) Process controls that should include relevant activities to prevent and detect internal short circuit failure during manufacture of cells;
- (iv) Quality records, such as inspection reports, test data, calibration data and certificates. Test data shall be kept and made available to the competent authority upon request;
- (v) Management reviews to ensure the effective operation of the quality management programme;
- (vi) A process for control of documents and their revision;
- (vii) A means for control of cells or batteries that are not conforming to the type tested as mentioned in (a) above;
- (viii) Training programmes and qualification procedure for relevant personnel; and

- (ix) 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 (i) to (ix) above shall be properly recorded and traceable. A copy of the quality management programme shall be made available to the competent authority upon request.

(ADR 2.2.9.1.7.(e), SP 230, SP 188)

What should be considered by customers for return shipments?

The consigner, carrier and – if applicable – also a third party on whose behalf the consigner is acting are responsible for the proper shipment.

As a matter of principle, for returns or reshipment the same rules apply like mentioned above. If possible, the original packaging should be used for transport. If the original packaging the marking or even the necessary transport documents are not available for the shipper, they must be provided by the manufacturer or supplier or forwarder to the shipper or the carrier prior transportation.

Disposal and Recycling

See page 9

Exemptions from Dangerous Goods Transport Regulations (ADR)

The provisions of ADR do not apply to companies carrying goods as ancillary process to their main business activity (e.g. deliveries or returns from building sites or demonstration purposes) ("Craftsman Regulation" ADR 1.1.3.1c).

ADR rules do not apply to private individuals where the batteries are packaged for retail sale and if the transport is intended for their personal use (ADR 1.1.3.1a).

Exemptions related to quantities carried per transport unit

For lithium ion batteries or devices with lithium ion batteries >100 Wh a weight limit of 333 kg (battery weight) applies in connection with reduced requirements on transport devices (lorry equipment, driver's qualification) (ADR 1.1.3.6).

Cargo securing

Where applicable, cargo shall be secured by suitable means (ADR 7.5.7).

Cells and single cell batteries

This document refers only to batteries comprising two or more cells. Different exemption limits exist for cells and single cell batteries.



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Annex

Class 9 hazard

Miscellaneous dangerous substances and articles (ADR 5.2.2.2.2)

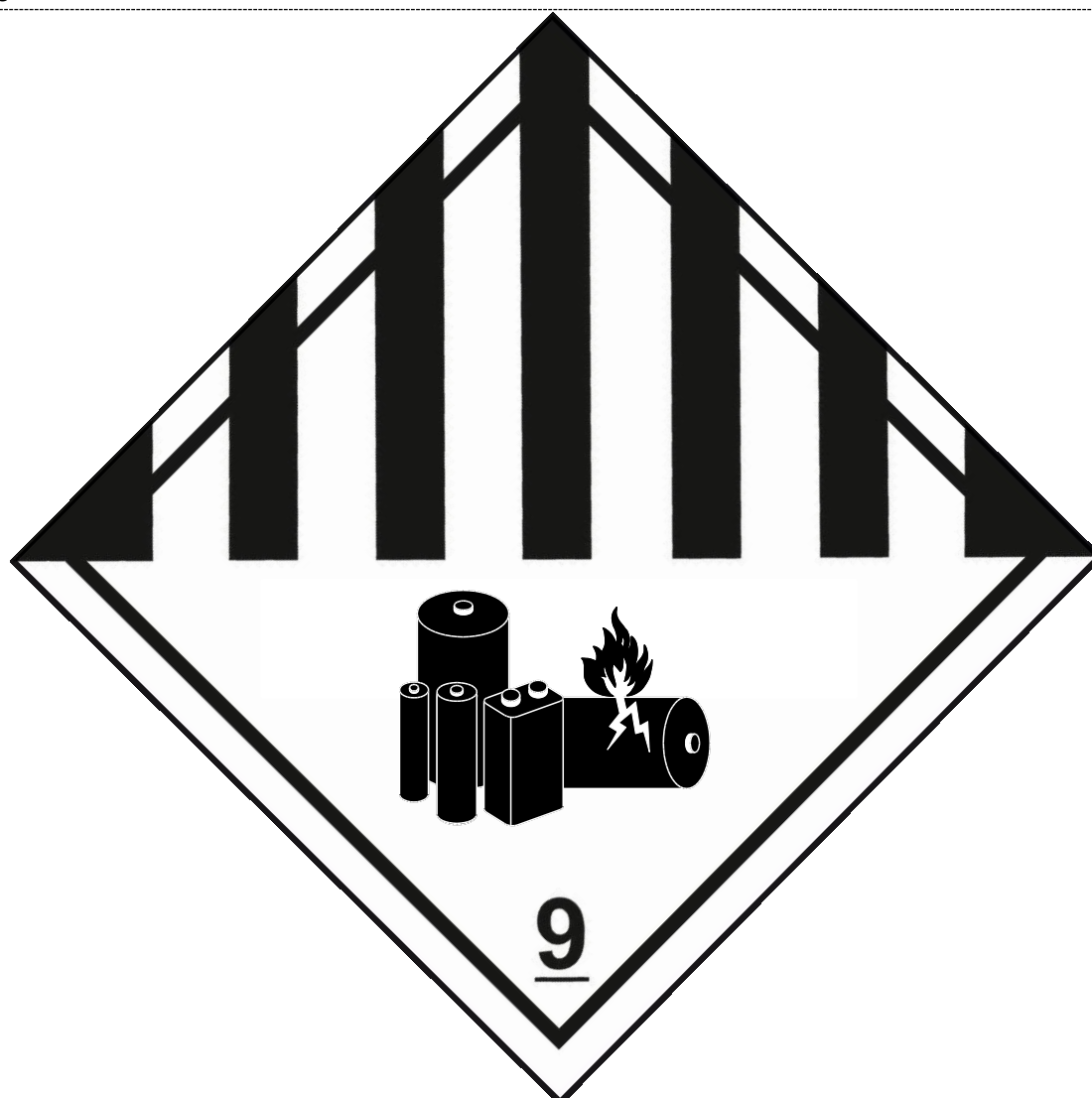
Label № 9A

Full-scale template

UN 3480

Lithium Ion Batteries
(without equipment)

please cut here



UN 3480

Class 9 hazard**Miscellaneous dangerous substances and articles (ADR 5.2.2.2.2)****Label № 9A**

Full-scale template

UN 3481**Lithium Ion Batteries
packed with equipment or
contained in equipment***please cut here***UN 3481**

Lithium Battery Label

(ADR 5.2.1.9.2, IATA DGR 7.1.5.5, Fig. 7.1.C)

Full-scale template

UN 3480

Lithium Ion Batteries

(without equipment)

- cut out outside the red hatching
- insert telephone number



Lithium Battery Label

(ADR 5.2.1.9.2, IATA DGR 7.1.5.5, Fig. 7.1.C)

Full-scale template

UN 3481

Lithium Ion Batteries

packed with or contained in equipment

- cut out outside the red hatching
- insert telephone number

