

BATTERY LITHIUM-ION INFORMATION SHEET

ARTS –Energy Part

Issue H on March 30th, 2018

1. Identification of the Company	
Batteries production sites	ARTS Energy 10 rue Ampère - Zone Industrielle 16440 Nersac FRANCE Tel. No. +33 (0)5 45 90 35 50 Fax No. +33 (0)5 45 90 37 65
Emergency contacts	ARTS Energy local dealer

2. Composition & Information on Ingredients					
Each cell consists of a hermetically sealed metallic container containing a number of chemicals and materials of construction of which the following could potentially be hazardous upon release.					
Ingredient	Content (%)	CAS No.	CHIP Classification		
Aluminum Foil	2-10	7429-90-5			
Metal Oxide (proprietary)	20-50				
Electrolyte (proprietary)	10-20				
Polyvinylidene Fluoride (PVDF)	<5	24937-79-9			
Carbon (C _n)	10 to 30%	7440-44-0			NONE KNOWN
Copper Foil	2-10	7440-50-8			NONE KNOWN
Stainless steel, Nickel and inert materials	Reminder	N/A			NONE KNOWN
Amount varies depending on cell size					

3. Hazards Identification

Emergency Overview

May explode in a fire, which could release hydrogen fluoride gas.

Use extinguishing media suitable for materials burning in fire.

Primary routes of entry

Skin contact : NO

Skin absorption : NO

Eye contact : NO

Inhalation : NO

Ingestion : NO

Symptoms of exposure

Skin contact

No effect under routine handling and use.

Skin absorption

No effect under routine handling and use.

Eye contact

No effect under routine handling and use.

Inhalation

No effect under routine handling and use.

Reported as carcinogen

Not applicable

Risk of exposure only in case of abuse (mechanical, thermal, electrical) which leads to the activation of safety valves and/or the rupture of the battery container. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow, depending upon the circumstances.

4. First Aid Measures

THE CELL OR BATTERY ITSELF	
Inhalation	Not a health hazard.
Skin contact	Not a health hazard.
Eye contact	Not a health hazard.
Ingestion	If the product is swallowed, obtain medical attention immediately.
IF EXPOSURE TO INTERNAL MATERIALS	
Inhalation	Leave area immediately and seek medical attention.
Skin contact	Wash area thoroughly with soap and water and seek medical attention.
Eye contact	Rinse eyes with water for 15 minutes and seek medical attention.
Ingestion	Drink milk/water and induce vomiting; seek medical attention.
Further treatment	All cases of eye contamination, persistent skin irritation and casualties who have swallowed this substance or been affected by breathing its vapours should be seen by a Doctor.

5. Firefighting Measures

Cell is not flammable. Combustion products include, but are not limited to hydrogen fluoride, carbon monoxide and carbon dioxide.

Extinguishing Media

Use extinguishing media suitable for the materials that are burning.

Use water or CO₂ on burning Li-ion cells or batteries

Special Firefighting Instructions

If possible, remove cell(s) from firefighting area. If heated above 160°C, cell(s) may explode/vent.

Firefighting Equipment

Use NIOSH/MSHA approved full-face self-contained breathing apparatus (SCBA) with full protective gear.

6. Accidental Release Measures

On Land

Place material into suitable containers and call local fire/police department.

In Water

If possible, remove from water and call local fire/police department.

7. Handling and Storage

Handling	No special protective clothing required for handling individual intact cells Do not crush, pierce, short (+) and (-) battery terminals with conductive (i.e. metal) goods. Do not directly heat or solder. Do not throw into fire. Do not mix batteries of different types and brands. Do not mix new and used batteries. Keep batteries in non-conductive (i.e. plastic) trays.
Storage	Store in a cool (preferably below 30°C) and ventilated area, away from moisture, sources of heat, open flames, food and drink. Keep adequate clearance between walls and batteries. Temperature above 70°C may result in battery leakage and rupture. Since short circuit can cause burn, leakage and rupture hazard, keep batteries in original packaging until use and do not jumble them.
Other	Follow Manufacturers recommendations regarding maximum recommended currents and operating temperature range. Applying pressure on deforming the battery may lead to disassembly followed by eye, skin and throat irritation.

8. Exposure Controls & Personal Protection

Occupational exposure standard	Compound: LiCoO ₂ 0.1 mg/m ³ max. (OSHA) EC, EA, DMC N/A LiPF ₆ N/A	
	Respiratory protection	In all fire situations, use self-contained breathing apparatus.
	Hand & Feet protection	In the event of leakage wear gloves. Steel toed shoes recommended for large container handling.
	Eye protection	Safety glasses are recommended during damaged batteries handling.
	Other	In the event of leakage, wear chemical apron.

9. Physical and Chemical Properties

Appearance	Cylindrical or Prismatic Pack, with or without external wires and connector – casings can be added for specific applications
Odour	N/A
pH	Not Applicable
Flash point	Not applicable unless individual components exposed
Flammability	Not applicable unless individual components exposed
Relative density	Not applicable unless individual components exposed
Solubility (water)	Not applicable unless individual components exposed
Solubility (other)	Not applicable unless individual components exposed

10. Stability and Reactivity	
Product is stable under conditions described in Section 7.	
Conditions to avoid	Heat above 100°C or incinerate. Deform. Mutilate. Crush. Pierce. Disassemble Short circuit. Expose over a long period to humid conditions.
Materials to avoid	
Hazardous decomposition Products	None during normal operating conditions. If cells are opened, hydrogen fluoride and carbon monoxide may be released.

11. Toxicological Information	
Signs & symptoms	None, unless battery ruptures. In the event of exposure to internal contents, corrosive fumes will be very irritating to skin, eyes and mucous membranes. Overexposure can cause symptoms of non-fibrotic lung injury and membrane irritation. Organic Electrolyte : Acute toxicity : LD50 oral – Rat 2,000mg/kg or more
Inhalation	Lung irritant.
Skin contact	Skin irritant
Eye contact	Eye irritant.
Ingestion	Tissue damage to throat and gastro-respiratory tract if swallowed.
Medical conditions generally aggravated by exposure	In the event of exposure to internal contents, eczema, skin allergies, lung injuries, asthma and other respiratory disorders may occur.
12. Ecological Information	
Mammalian effects	None known if used/disposed of correctly.
Eco-toxicity	None known if used/disposed of correctly.
Bioaccumulation potential	Some materials within the cell are bio accumulative. Under normal conditions, these materials are contained and pose no risk to persons or the surrounding environment.
Environmental fate	None known if used/disposed of correctly.
13. Disposal Considerations	
Do not incinerate, or subject cells to temperatures in excess of 70°C. Such abuse can result in loss of seal, leakage, and/or cell explosion. California regulated debris RCRA Waste Code : Non-regulated Dispose of according to all federal, state, and local regulations.	

14. Transport Information	
Restrictions & Label for conveyance	The requirements of the UN manual of Test and Criteria, Part III, sub-section 38.3 are fulfilled by ARTS Energy Li-Ion batteries. Whatever the transportation mode, batteries or cells must be protected to prevent short circuits and must be packed in an inner packaging which completely encloses the battery. A strong outer packaging is mandatory. A specific training and instructions has to be done for any person taking care of the shipment preparation (to be checked according to the safety level with DGR IATA and other government organization of your country) NOTE: All these date are indicative – please refer to your own safety advisor for any information.
TRANSPORTATION OF “NEW BATTERIES » AIR TRANSPORTATION (DGR IATA) CARGO AIRCRAFTS ONLY (CAO) charge ≤30%  Damaged batteries Air Transportation is not allowed	If Part is a Li-ion cell (≤2.7Wh and not exceeding 2,5 kg net per package, or 2,7<Wh≤20 and not exceeding 8 cells per package) : - Transport by air is possible with state of charge ≤30% - maximum weight 2,5kg net if ≤2.7Wh/cell - 8 cells maximum if 2,7<Wh≤20/cell - Packed in accordance with ICAO/IATA Packing instruction PI965 Section II. - Not more than 1 package in any single consignment A ‘Lithium batteries marking’ (7.1.C or 7.4.H until 31/12/2018) label should be affixed to the package. A ‘Cargo Aircraft only’ label should be affixed to the package The words “Lithium Ion batteries in compliance with section II of PI965” and “Cargo Aircraft Only” must be included in “nature and qty of goods” box of the air waybill DGD is not required ((Dangerous Goods Declaration) If Part is a Li-ion cell (≤2.7Wh and exceeding 2,5 kg net per package, or 2,7<Wh≤20 and more than 8 cells per package) : - Transport by air is possible with state of charge ≤30% - maximum weight 10kg net - Packed in accordance with ICAO/IATA Packing instruction PI965 Section IB. DGD is required (Dangerous Goods Declaration) mentioning UN3480/Lithium ion batteries/9/- packing description /PI965-1B + Emergency contact A ‘Class 9-A (IATA label ref 7.3.X)’ label should be affixed to the package. A ‘Lithium batteries marking’ (7.1.C or 7.4.H until 31/12/2018) label should be affixed to the package. Emergency contact should be visible. A ‘Cargo Aircraft only’ label should be affixed to the package If Part is a Li-ion battery pack (Wh ≤2,7, not exceeding 2,5kg net per package - or - 2,7<Wh≤100, battery packed in qties not exceeding 2 batteries per package) : - Transport by air is possible - with state of charge ≤30% - maximum weight 2,5kg net if ≤2.7Wh/battery - 2 batteries maximum if 2,7<Wh≤100/battery - Packed in accordance with ICAO/IATA Packing instruction PI965 Section II - Not more than one package in any single consignment. - Not require approved packaging but should withstand 1,2m drop test. A ‘Lithium batteries marking’ (7.1.C or 7.4.H until 31/12/2018) label should be affixed to the package. A ‘Cargo Aircraft only’ label should be affixed to the package The words “Lithium Ion batteries in compliance with section II of PI965” and “Cargo Aircraft Only” must be included in “nature and qty of goods” box of the air waybill DGD is not required ((Dangerous Goods Declaration)

TRANSPORTATION OF “NEW BATTERIES » SEA TRANSPORTATION (IMDG CODE)	If Part is a Li-ion battery pack (Wh ≤2,7, exceeding 2,5kg net per package - or – 2,7<Wh≤100, battery packed in qties exceeding 2 batteries per package) : - Transport by air is possible - with state of charge ≤30% - maximum weight 10kg net - Packed in accordance with ICAO/IATA Packing instruction PI965 Section IB - Not require approved packaging but should withstand 1,2m drop test. DGD is required (Dangerous Goods Declaration) mentioning UN3480/Lithium ion batteries/9/ packing description /PI965-1B + emergency contact A ‘Class 9- A (IATA label ref 7.3.X)’ label should be affixed to the package (mentioning UN3480). A ‘Lithium batteries marking’ (7.1.C or 7.4.H until 31/12/2018) label should be affixed to the package. Emergency contact should be visible. A ‘Cargo Aircraft only’ label should be affixed to the package
	If Part is a Li-ion battery pack (Wh exceeding 100Wh) : - Transport by air is possible - with state of charge ≤30% - maximum weight 35kg net - Packed in accordance with ICAO/IATA Packing instruction PI965 Section IA - Complete package must be approved packing group II. DGD is required (Dangerous Goods Declaration) mentioning UN3480/Lithium ion batteries/9/ packing description /PI965-1B + emergency contact A ‘Class 9-A (IATA label ref 7.3.X)’ label should be affixed to the package (mentioning UN3480) A ‘Cargo Aircraft only’ label should be affixed to the package.
	If Part is a Li-ion cell (≤20Wh) : - Transport by sea is possible - No state of charge requirement - maximum weight 30kg gross - Packed in accordance with IMDG Packing instruction SP188. - Not require approved packaging but should withstand 1,2m drop test. A ‘Lithium battery mark - 5.2.1.9 ’ label should be affixed to the package (UN3480 + information phone number) No DGD and safety document required.
	If Part is a Li-ion battery pack (≤100Wh) : - Transport by sea is possible - No state of charge requirement - maximum weight 30kg gross - Packed in accordance with IMDG Packing instruction SP188. - Not require approved packaging but should withstand 1,2m drop test. A ‘Lithium battery mark - 5.2.1.9 ’ label should be affixed to the package (UN3480 + information phone number) No DGD and safety document required.
	If Part is a Li-ion battery pack (>100Wh) : - Transport by sea is possible - No state of charge requirement - No maximum weight limit - Packed in accordance with IMDG Packing instruction P903. - Complete package must be approved packing group II. A ‘Class 9- A (IATA label ref 7.3.X)’ label should be affixed to the package (mentioning UN3480 Lithium Battery) Multimodal document required (with UN3480, Lithium batteries, 9, FS: F-A,S-I,(E) – gross weight, shipper, destination, phone number)

TRANSPORTATION OF "NEW BATTERIES » ROAD TRANSPORTATION (ADR)	ROAD TRANSPORTATION (ADR): If Part is a Li-ion cell ($\leq 20\text{Wh}$) : - Transport by road is possible - No state of charge requirement - maximum weight 30kg gross - Packed in accordance with ADR Packing instruction SP188. - Not require approved packaging but should withstand 1,2m drop test. A 'Lithium battery mark - 5.2.1.9' label should be affixed to the package with UN3480 and phone number If Part is a Li-ion battery pack ($\leq 100\text{Wh}$) : - Transport by road is possible - No state of charge requirement - maximum weight 30kg gross - Packed in accordance with ADR Packing instruction SP188. - Not require approved packaging but should withstand 1,2m drop test. A 'Lithium battery mark - 5.2.1.9' label should be affixed to the package with UN3480 and phone number If Part is a Li-ion battery pack ($> 100\text{Wh}$) : - Transport by road is possible - No state of charge requirement - For shipments < 333kg gross weight – for > 333 kg, please consult us - Packed in accordance with ADR Packing instruction P903. - Complete package must be approved packing group II. - Transportation category : 2 - Tunnel code : (E) A 'Class 9- A (IATA label ref 7.3.X)' label should be affixed to the package (mentioning UN3480) ADR declaration required with UN3480, Lithium Ion Battery, 9, (E) + gross weight + shipper + destination
TRANSPORTATION OF "LITHIUM BATTERIES FOR DISPOSAL OR RECYCLING" For any LITHIUM BATTERIES FOR DISPOSAL OR RECYCLING road or sea transportation, please contact us to set up the best packaging to fulfil the legal requirements	ROAD TRANSPORTATION (ADR): - Permitted according to P909 - Approved packaging group II - pallet weight limit : 333 kg – for > 333 kg, please consult us - Cells or batteries must be protected against short circuit. - Each inner packaging shall be surrounded by sufficient non-combustible / nonconductive material. - Package Transportation category : 2 - Tunnel code : (E) Package shall be marked "lithium ion batteries for disposal" or "lithium ion batteries for recycling". A 'Class 9- A (IATA label ref 7.3.X)' label should be affixed to the package (mentioning UN3480) ADR declaration required with UN3480, Batteries for disposal, Lithium battery, 9, (E) A 2kg extinguisher is required into the lorry cabin. ADR declaration exemption possible as per SP636: - Products go directly from collecting point to treatment facility - Batteries < 100 Wh - Or Cells < 20 Wh - Or Cells or batteries < 500 g SEA TRANSPORTATION (IMDG): - Permitted according to P909 - Approved packaging group II - Cells or batteries must be protected against short circuit. - Each inner packaging shall be surrounded by sufficient non-combustible and nonconductive material. Package shall be marked "lithium ion batteries for disposal" or "lithium ion batteries for recycling". A 'Class 9- A (IATA label ref 7.3.X)' label should be affixed to the package (mentioning UN3480)

	DG declaration required AIR TRANSPORTATION (IATA) : Forbidden ! Unless approved by the appropriate national authority of the state of origin and the state of the operator
TRANSPORTATION OF "DAMAGED LITHIUM BATTERIES" For any Damaged batteries road or sea transportation, please contact us to set up the best packaging to fulfil the legal requirements	Damaged lithium batteries means in particular: - Batteries identified by the manufacturer as being defective for safety reasons; - Batteries with damaged or considerably deformed cases; - Leaking or venting batteries; or - Batteries with faults that cannot be diagnosed prior to carriage to a place of analysis ROAD TRANSPORTATION (ADR): - Permitted according to SP376 and packing instructions P908 - pallet weight limit : 333 kg – for >333 kg, please consult us - Package shall be marked "Damaged/defective lithium ion batteries". - All batteries which present a risk of rapid disassembly, dangerous reaction, flame production, heat evolution shall not be carried except specific conditions specified by competent authority. - Cells or batteries must be protected against short circuit. - Approved packaging group II - Each inner packaging shall be surrounded by sufficient non-combustible material. - Outer packaging weight limit : No A 'Class 9- A (IATA label ref 7.3.X)' label should be affixed to the package (mentioning UN3480) ADR declaration required with UN3480, batteries for disposal, Lithium batteries, 9, (E), gross weight + shipper + destination A 2kg extinguisher is required into the lorry cabin. SEA TRANSPORTATION (IMDG): - Permitted according to SP376 and packing instructions P908 - Approved packaging group II - Each inner packaging shall be surrounded by sufficient non-combustible and nonconductive material. - Package shall be marked "UN3480 + Damaged/defective lithium ion batteries". - All batteries which present a risk of rapid disassembly, dangerous reaction, flame production, heat evolution shall not be carried except specific conditions specified by competent authority. - Cells or batteries must be protected against short circuit. - Outer packaging weight limit : No A 'Class 9- A (IATA label ref 7.3.X)' label should be affixed to the package (mentioning UN3480 Lithium ion Battery) Multimodal declaration required with UN3480, lithium batteries, 9, FS : F-A, S-I, (E) + emergency phone number + shipper + destination AIR TRANSPORTATION (IATA): Forbidden ! Note Damaged lithium batteries means in particular: - Batteries identified by the manufacturer as being defective for safety reasons; - Batteries with damaged or considerably deformed cases; - Leaking or venting batteries; or - Batteries with faults that cannot be diagnosed prior to carriage to a place of analysis

« prototype » Less than 100 products Not tested for section 38.3 in UN Manuel of tests and criteria	ROAD TRANSPORTATION (ADR): - Less than 100 products. - Cells or batteries must be protected against short circuit. - Approved packaging group II and packing instructions P910 and SP310 - Each inner packaging shall be surrounded by sufficient non-combustible material. - Outer packaging weight limit : No A 'Class 9- A (IATA label ref 7.3.X)' label should be affixed to the package (mentioning UN3480) ADR declaration required SEA TRANSPORTATION (IMDG): - Less than 100 products. - Cells or batteries must be protected against short circuit. - Approved packaging group II and packing instructions P910 and SP310 - Each inner packaging shall be surrounded by sufficient non-combustible material. - Outer packaging weight limit : No A 'Class 9- A (IATA label ref 7.3.X)' label should be affixed to the package (mentioning UN3480 Lithium ion battery) DG declaration required AIR TRANSPORTATION (IATA): Normally Forbidden ! But concessions possible under national Civil Aviation authority and SP A88 - For any prototype batteries air transportation, please contact us to set up the best packaging to fulfil the legal requirements.
Applicable UN numbers	UN 3480 (Lithium ion batteries). UN 3481 (Lithium ion batteries contained in equipment or Lithium ion batteries packed with equipment).
Shipping name	Lithium ion Batteries
EmS No.	F-A, S-I
Marine pollutant	No
ONU Class	Class 9

15. Regulatory Information	
OSHA hazard communication standard (29 CFR 1910.1200)	
Risk phrases	Non-hazardous.
UK regulatory references	Classified under CHIP

16. Other information
This information has been compiled from sources considered to be dependable and is, to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty (either expressed or implied) or guarantee is made to the accuracy, reliability or completeness of the information contained herein. This information relates to the specific materials designated and may not be valid for such material used in combination with any other materials or in any process. It is the user's responsibility to satisfy himself as to the suitability and completeness of this information for his particular use. ARTS Energy does not accept liability for any loss or damage that may occur, whether direct, indirect, incidental or consequential, from the use of this information. ARTS Energy does not offer warranty against patent infringement.