Article Safety Data Sheet - Lithium Ion/Polymer Batteries

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Section I - Product identification

Product Name: **Lithium-ion Polymer Battery Pack** Nominal Voltage: 3.7 V
(Rechargeable Single Cell Battery)

Models: **ICP / AHB Series see Annex I (Pouch cell construction)**

Chemical System: Lithium - Graphit - Cobalt oxide

Section II - Hazardous ingredients

IMPORTANT NOTE: The battery should not be opened or exposed to heat because exposure of the following ingredients contained within could be harmful under some circumstances.

Chemical Name	CAS No.	Content % of total weight
LiCoO2	12190-79-3	29.36 - 35.88
Carbon black	1333-86-4	15.26 - 18.66
Aluminium	7429-90-5	13.14 - 16.06
Copper	7440-50-8	7.08 - 8.66
Ethylene carbonate	96-49-1	4.55 - 5.57
Nylon		3.47 - 4.24
Ethyl methyl carbonate	623-53-0	3.45 - 4.21
Diethyl carbonate	105-58-8	3.36 - 4.10
Polyethylene	9002-88-4	3.26 - 3.98
Polypropylene	9003-07-0	2.40 - 2.94
Poly(vinyliden difluoride)	24937-79-9	2.11 - 2.57
Lithium hexafluorophosphate	21324-40-3	1.64 - 2.00
Nickel	7440-02-0	0.54 - 0.66
Polyester		0.13 - 0.15
Polyimide		0.09 - 0.11
Activated Carbon	7440-44-0	0.08 - 0.10
Acrylic		0.05 - 0.07
Oxalic acid	00144-62-7	0.04 - 0.06

1) This Article Safety Data Sheet is provided as a service to our customers.

Based on the definition of the term 'article' in the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR Subpart 1910.1200, there is no requirement for a Material Safety Data Sheet (MSDS) for lithium Ion Polymer Batteries. Notification is not required because these products are 'articles' that do not release a covered toxic chemical under the normal conditions of processing or use.

Disclaimer:

The batteries are exempt articles and are not subject to hazard Communication Standard Requirement. This sheet is provided as technical information only. The information contained in this Product Safety Data Sheet has been established to the best of RENATA SA's knowledge and belief. RENATA SA makes no representation and provides no warranty or guarantee regarding the contents of this Product Safety Data Sheet and excludes its liability, express or implied.

Section III - Possible Hazards

Cells or Batteries may explode when placed in a fire, when exposed to excessive heat, when opened or during inappropriate use; which could release hydrogen fluoride gas and smoke.
Use only suitable extinguishing media.

The chemicals mentioned in Section II are contained in a sealed can.
Risk of exposure occurs only if the battery is mechanically or electrically abused
(see Safety precautions in Section VII).

The most likely risk is acute exposure when a cell vents or opened, can cause irritation when inhaled.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO

Contact with electrolyte with skin and eyes should be avoided.

3.2 Risk and Safety sentences:
(1) – Nature of special risks :
R14 Reacts with water
R21 Harmful in contact with skin
R22 Harmful is swallowed
R41 Risk of serious damage to the eye
R42/43 May cause sensitization by inhalation and skin contact
R43 May cause sensitization by skin contact
(2) – Safety advices :
S2 Keep out of reach from children
S8 Keep away from moisture
S22 Do not breathe dust
S24 Avoid contact with skin
S26 In case of contact with eyes, rinse immediately with plenty of water
and get medical advice / attention
S36 Wear suitable protective clothing
S37 Wear suitable gloves

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3.3 EU-GHS Classification:
Hazard statements:
H302 Harmful if swallowed
H312 Harmful in contact with skin
H315 Causes skin irritation
H318 Causes serious eye damage
H332 Harmful if inhaled
Precautionary statements:
P102 Keep out of reach of children
P223 Keep away from any possible contact with water, because of violent reaction and possible flash fire
P232 Protect from moisture
P260 Do not breathe dust/fume/gas/mist/vapors/spray
P262 Do not get in eyes, on skin, or on clothing
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P280 Wear protective gloves / protective clothing / eye protection / face protection

Section IV - First Aid Procedures

None unless internal material exposure.
Explanation Carcinogenicity: NOT RELEVANT
Skin contact with contents of an opened battery can cause irritation, wash immediately with soap and water. Remove contaminated clothing. If irritation persists, get medical help
Eye contact:
Contents of an opened battery can cause severe irritation, IMMEDIATELY FLUSH THOROUGHLY WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. SEEK MEDICAL ATTENTION.
Ingestion:
CALL MEDICAL PRACTIONER IMMEDIAIELY
Inhalation:
Do not inhale leaked material. PROVIDE IMMEDIATELY FRESH AIR, IF IRRITATION PERSISTS, GET MEDICAL HELP.

Section V - Fire Fighting Instructions

5.1 Fire and explosion hazard:
The battery can leak and/or spout vaporized or decomposed and combustible electrolyte fumes in case of exposure above 70°C resulting from inappropriate use or the environment.
Cells or batteries may flame or leak potentially hazardous organic vapors if exposed to excessive heat or fire. Fire, excessive heat, or over voltage conditions may produce hazardous decomposition products.
Damaged or opened cells or batteries can result in rapid heating and the release of flammable vapors.
Vapors may be heavier than air and may travel along the ground or be moved by ventilation to an ignition source and flash back fire, excessive heat, or over voltage conditions may produce hazardous decomposition products.
During water application, caution is advised as burning pieces of flammable particles may be ejected from the fire.

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5.2 Extinguishing Media:
Suitable CO_2
Dry chemical or Foam extinguishers.
Not to be used: Type D extinguishers.
Special Fire Fighting Procedure: WEAR NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT.
Unusual Fire and Explosion Hazards: NONE SPECIFIED BY MANUFACTURER.

As with any fire, wear self-contained breathing apparatus to avoid inhalation of hazardous decomposition products.

Section VI - Accidental Release

Steps to be taken in case material is released or spilled:

Wear appropriate personal protective equipment.
Isolate hazard area.
Keep unnecessary and unprotected personnel from entering.
Carefully recover spillages with appropriate ladle and/or clothe and transfer to a suitably labelled, sealable container for safe disposal.
Wash the spillage area, neutralize with calcium hydroxide.
Wear suitable personal protection during removal of spillages.
Spontaneous fire and/or explosion can occur when material is released or spilled. Only use appropriate fire extinction equipment.

Section VII - Handling and Storage

When used correctly, Lithium-ion Polymer Battery Pack *(Rechargeable Single cell Battery)* provides a safe and dependable source of power. However, if they are misused or abused, leakage, venting, or in extreme cases explosion and/or fire may result.

Make sure to observe amongst others, following warnings.

Handling:
- Do not insert batteries in reverse. Observe the polarity markings on battery and equipment
- Do not short-circuit batteries
- Do not overcharge batteries
- Do not force discharge batteries
- Do not mix batteries
- Do not overheat batteries by exposure to high temperatures and direct sunlight.
- Do not weld or solder directly to batteries
- Do not dismantle batteries
- Do not deform batteries
- Do not dispose of batteries in fire
- A battery with a damaged pouch should not be exposed to water
- Do not allow children to replace batteries without adult supervision
- Keep batteries out of the reach of children. In case of ingestion of a cell or battery, the person involved should seek medical assistance promptly.
- Equipment intended for use by children should have battery compartments which are tamper-proof
- Do not encapsulate and/or modify batteries
- Exhausted batteries should be immediately removed from equipment and disposed of (see section XIII)
- When discarding batteries with solder tags, insulate the tags by wrapping them with tape, foil, etc.

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Storage:

- Store unused batteries in their original packaging and keep them away from metal objects which may short-circuit them. Storing unpackaged cells together could result in cell shorting and heat build-up.
- Store and display batteries in there original packaging in well ventilated, dry and cool conditions.
- Avoid storing or display batteries in direct sun or in places where they get exposed to rain
- The normal storage of Lithium-ion Polymer Battery Pack is made at temperature between +10°C and +25°C, never exceeding +30°C In this way the maximum shelf-life (i.e. max. retention of cell performances after storage periods) of Lithium-ion Polymer Battery Pack is achieved. Storage temperatures above room temperature will increase the rate of self-discharge, reducing the available capacity of the cell. Humidity above 95% R.H. and below 40% R.H. should also be avoided for sustained periods, as these extremes are detrimental to batteries. Storing the cells at low temperature is also suggested, but attention must be paid when transferring the cells to warmer environments, because of the possibility of having water condensing on to the cells (risk of short-circuits).
- Do not stack battery cartons on top of each other exceeding a specified height. The height is clearly dependent on the strength of the packaging. As for general rule this height should not exceed 1.5 m for cardboard packages or 3 m for wooden cases. The above recommendations are equally valid for storage conditions during prolonged transit. Thus, batteries should be stored away from ship engines and not left for long periods in unventilated metal box cars (containers) during summer.

Section VIII - Exposure Controls / Personal Protection

Respiratory protection (specify type):	Not necessary under conditions of normal use (see section VI)
Ventilation:	Not necessary under conditions of normal use (see section VI)
Protective gloves:	Not necessary under conditions of normal use (see section VI)
Eye protection:	Not necessary under conditions of normal use (see section VI)
Other protective clothing or equipment:	Not necessary under conditions of normal use (see section VI)

Section IX - Physical and Chemical Properties

The chemicals mentioned in Section II are contained in a sealed pouch.
Under conditions of normal use, the chemicals will not be released.

Section X - Stability and Reactivity

Lithium-ion Polymer Battery Pack *(Rechargeable Single cell Battery)* are stable, no chemical release under conditions of normal use.

Conditions to avoid: See Sections VII & VIII

Section XI - Toxicological Information

In case electrolyte is spilled and exposed to air, HF could be released.
May include hydrogen fluoride and carbon oxides gas.
May cause skin and eye Irritation when contacted.

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Section XII - Ecological Information

The chemicals mentioned in Section II are contained in a sealed pouch.
Under conditions of normal use, the chemicals will not be released.
It does not pose a physical or health risk to users, see section XIII for disposal.

Section XIII - Disposal Considerations

Waste disposal method:

a) **Be sure to comply with your federal, state and local regulation disposal of used batteries.**

Dispose in accordance with appropriate national and international regulations, below some references**.**

European Community: according to Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE), Annex II, batteries have to be removed from any separately collected WEEE. The removed batteries have to be treated according to the Battery directive 2006/66/EC

US: Lithium batteries are neither specifically listed nor exempted from the Federal Environmental Protection Agency (US EPA) hazardous waste regulations. The only material of possible concern due to its reactivity is lithium metal. However, button cells contain so little lithium that they can be disposed off in the normal municipal waste stream.

Use a professional disposal firm for disposal of mass quantities of undischarged lithium batteries.

b) Open cells should be treated as hazardous waste

DO NOT INCINERATE or subject battery cells to temperatures in excess of 212°F (100°C). Such treatment can cause cell rupture.

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Section XIV - Transportation Information

Lithium Ion Batteries are classified as Class 9 Dangerous Goods in the United Nations Recommendation. In case of transport, compliance with all the relevant UN regulations is required. Our battery and its shipping package complies with the requirement of UN Manual of Test and Criteria, (see below section 2.).

Provisions for the international transportation (pursuant to ICAO-TI/IATA-DGR, IMDG Code, ADR, RID, DOT):

UN-No. UN 3480
Proper Shipping Name: Lithium Ion Batteries (including lithium polymer batteries)

Lithium Ion cells and batteries are subject to the following transport rules:

Method	Technical Guidelines	Packing Instruction and Special Provisions
Air	ICAO TI 2017-2018 or IATA Dangerous Goods Regulations 2018 (59th Edition)	***Packing Instruction 965 Section II*** Only applies for shipments, were the total net weight of the batteries does not exceed 2.5 kg and the shipment does not exceed one package (handling unit) ***Packing Instruction 965, Section IB*** applies for shipments, were the total net weight of the batteries does exceed 2.5 kg
Road and Rail Europe	ADR / RID 2017	Special Provision 188
Marine	IMDG Code 2015 (amdt 37)	Special Provision 188
USA	DOT 49 CFR	49 CFR Sections 171.12, 171.24, 171.25

All listed in Annex I, Renata Lithium Ion cells and batteries fulfil the conditions pursuant to the requirements for partly regulated transportation of the relevant Rules and Regulations according to the above mentioned technical Guidelines.

Summary of Transport Packing Instructions and Special Provisions of above mentioned Technical Guidelines:

1. For all lithium ion and lithium polymer cells, listed in Annex I, the Watt-hour rating is not more than 2.7Wh.
   Excepting Articles: ICP543759 (Watt-hour rating is 4.9 Wh) and ICP606168 (Watt-hour rating is 10.4 Wh).

2. For all the lithium ion cells or batteries, listed in Annex I, we hereby confirm, that the cells are fully and successfully tested to meet the requirements of each test in the UN Manual of Tests and Criteria, Part III, subsection 38.3 (Edition 5) – (IATA DGR 3.9.2.6).
   The cells are also safe for transport when build-in equipment (IATA - PI 967) or packed with equipment (IATA - PI 966) shipped under UN 3481.
   Important: assembly of the cells and batteries is in the responsibility of the customer and may makes new safety tests related to devices necessary.

3. Packing, marking, labelling and weight limitations must be observed as per technical guidelines of the respective transport mode.

4. We hereby declare, that for all airfreight shipments the state of charge of the cells and batteries does not exceed a Rate of 30%.

5. For shipments by Airfreight under Section IB, a dangerous goods declaration (DGD) will align the shipment as per IATA dangerous goods regulations. For shipments by Airfreight under Section II, only a caution statement will align the shipment, see Annex III.

Note I: Lithium ion cells and batteries are forbidden for transportation aboard passenger-carrying aircraft.

Note II: Example of Lithium ion polymer Battery Mark Label, see Annex II
Example of Cargo Aircraft Only Label, see Annex III
Example of Dangerous Goods Class 9 Label, see Annex IV

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Section XV - Regulatory Information

See ACGIH exposure limits Information as noted in Section III.
US: This MSDS meets/exceeds OSHA requirements
International: this MSDS conforms to European Union (UN), the International Standards Organisation (ISO) and the International Labor Organization (ILO) and as documental in ANSI (American National Standards Institute) Standard Z400.1-1993.

Section XVI - Other Information

Compliance: In accordance with the RoHS Directive 2002/95/EC, and its amendment directives

Test Method: With reference to IEC 62321, Ed.1 111/54/CDV
Procedures for the Determination of Levels of Regulated Substances in Electrotechnical Products.
(1) Determination of Cadmium by ICP-AES.
(2) Determination of Lead by ICP-AES
(3) Determination of Mercury by ICP-AES
(4) Determination of Hexavalent Chromium for non-metallic samples by UVA/is Spectrometry
(5) Determination of PBB and PBDE by GC'MS

Test Item (s):	Methode (Refer to)	Result No.1	MDL
Cadmium- Cd	(1)	n.d	2
Lead (Pb)	(2)	n.d	2
Mercury (Hg)	(3)	n.d	2
Hexavalent Chromium CR(VI) by alkaline extraction	(4)	n.d	2
Sum of PBBs	(5)	n.d	
Monobromobiphenyl		n.d	5
Dibromobiphenyl		n.d	5
Tribromobiphenyl		n.d	5
Tetrabromobyphenyl		n.d	5
Pentabromobiphenyl		n.d	5
Hexabromobiphenyl		n.d	5
Heptabromobiphenyl		n.d	5
Octabromobiphenyl		n.d	5
Nonabromobiphenyl		n.d	5
Decabromobiphenyl		n.d	5
Sum of PBDEs (Mono to Nona) (Note 4)		n.d	-
Moniobromobiphenyl ether		n.d	5
Dibromobiphenyl ether		n.d	5
Tribromobiphenyl ether		n.d	5
Tetrabiphenyl ether		n.d	5
Pentabromobiphenyl ether		n.d	5

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Hexabromobiphenyl ether		n.d	5
Heptabromobiphenyl ether		n.d	5
Octabiphenyl ether		n.d	5
Nonabiphenyl ether		n.d	5
Decabromobiphenyl ehter		n.d	5
Sum of PBDEs (Mono to Deca)		n.d	-

References:

Chemical substances Information: Japan Advanced Information center of Safety and Health
International Chemical Safety Cards (ICSCs): International Occupational Safety and Health Information Centre (CIS)
2002 TLVs and BELs: American Conference of Governmental Industrial Hygienists (ACGIH)
The United Nations Economic Commission for Europe (UNECE)
MSDS of raw materials prepared by the manufactures

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ANNEX I

MODELS OVERVIEW

Model no.	Approx. Weight of battery [g]	Nominal Capacity [mAh]	Nominal Voltage [V]	Wh
ICP241019	1.2	24	3.7	0.0888
ICP341018	1.5	35	3.7	0.1295
ICP331319	2.0	50	3.7	0.185
AHB701218	2.5	75	3.7	0.2775
ICP501022	2.6	80	3.7	0.296
ICP641414	2,7	95	3.7	0.3515
ICP591519	3.1	110	3.7	0.407
ICP631519	2.9	115	3.7	0.4255
ICP501421	3.1	115	3.7	0.4255
ICP651321	3.3	120	3.7	0.444
AHB331242	3.5	125	3.7	0.4625
ICP401230	3.5	130	3.7	0.481
ICP501230	3.3	135	3.7	0.4995
ICP581323	3.7	145	3.7	0.5365
ICP581323PJ-01	3.7	145	3.7	0.5365
ICP402025	4	155	3.7	0.5735
ICP591524	3.7	160	3.7	0.592
ICP641620	3.9	165	3.7	0.6105
ICP631524	3.9	170	3.7	0.629
ICP501233	4.2	175	3.7	0.6475
ICP402035	4.8	195	3.7	0.7215
ICP591530	4.8	220	3.7	0.814
ICP482323PS	5.1	220	3.7	0.814
ICP502030	5.6	230	3.7	0.851
ICP631530	5	235	3.7	0.8695
ICP621333	5.5	240	3.7	0.888
ICP521630	5,4	250	3.7	0.925
ICP552030	6.3	300	3.7	1.11
ICP422339	7.3	340	3.7	1.258
ICP602823	7.3	350	3.7	1.295
ICP402050	8.8	420	3.7	1.554
ICP582930	9.1	450	3.7	1.665
ICP303450	10.8	510	3.7	1.887
ICP622540	11	600	3.7	2.22
ICP543759	26	1320	3.7	4.884
ICP606168	70	2800	3.7	10.36

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ANNEX II

Lithium Battery Mark Labels

Labels valid **until 31.12.2018:**

or

Label valid **as from 01.01.2017:**

Note: Renata uses all mentioned forms of the Lithium Battery Mark Labels until 31.12.2018.

For further Information's consult the IATA Dangerous Goods Regulations, 59th Edition (Section 7.4.8).

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ANNEX III

For further Information's consult the IATA Dangerous Goods Regulations, 59th Edition (Section 7.4.2).

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ANNEX V

Class 9 – Miscellaneous Dangerous Goods Label

For Air Transport (IATA), Label is valid **until 31.12.2018:**

For Air Transport (IATA), Label is valid **uas from 01.01.2017:**

Note: Renata uses both mentioned forms of the Class 9 Labels until 31.12.2018.

For further Information's consult the IATA Dangerous Goods Regulations, 59th Edition (Section 7.3.18.1 – Figure 7.3.W and 7.3.18.2 – Figure 7.3X).

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