

Article Safety Data Sheet - Lithium Metal Batteries ¹⁾

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Section I - Product identification

Product Name: **Primary (non-rechargeable) Lithium Battery** Nominal Voltage: 3.0 V

Models: **Coin Type Cells CR Series see Annex I**

Chemical System: **Lithium Manganese Dioxide** ($\text{Li} + \text{MnO}_2 \rightarrow \text{LiMnO}_2$)
Primary **NOT** designated for Recharge

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
Manganese Dioxide (MnO_2)	1313-13-9	12 - 50
Lithium*	7439-93-2	1.1 - 3.3
Propylene Carbonate (PC)	108-32-7	2 - 9
1,2 dimethoxy ethane (DME)	110-71-4	1 - 3.5
Lithium Perchlorate (LiClO_4)	7791-03-9	0.2 - 0.8

* Approximate weight content of lithium in each model can be found in Annex I

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 primary coin cells. 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.

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Section III - Possible Hazards

**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.
DME is classified as a reprotoxic of category 2 in the European Union.
Accordingly, exposure to DME may impair fertility and may cause harm to the unborn child.
DME is also classified as harmful by inhalation.
LiClO₄ is irritating to skin, eyes and mucous membranes.
Lithium can cause thermal and chemical burns upon contact with the skin.
Contact with electrolyte and extruded lithium with skin and eyes should be avoided.

Section IV - First Aid Procedures

None unless internal material exposure.

Skin contact:

Skin contact with contents of an opened battery can cause irritation, flush immediately with copious amounts of water. Remove contaminated clothing. If irritation persists, get medical help

Eye contact:

Contents of an opened battery can cause severe irritation, flush immediately thoroughly with copious amounts of water for at least 15 minutes. Get medical attention immediately.

Inhalation:

Do not inhale leaked material. Provide immediately fresh air, if irritation persists, get medical help.

Section V - Fire Fighting Instructions

<u>Flash point of electrolyte solvents (°C):</u>	DME: -6°C, PC: 123°C Mixture: 20°C
<u>Extinguishing Media:</u>	see Special Fire Fighting Procedure
<u>Flammable Limits:</u>	Not available
<u>Special Fire Fighting Procedure:</u>	In case of fire in an adjacent area, use water. CO ₂ or dry chemical extinguishers if cells are packed in their original containers since the fuel of the fire is basically paper products. For bulk quantities of unpackaged cells use for example LITH-X (Graphite Base). In this case, do not use water. In a small room, remember that the supply of oxygen is quickly consumed in feeding a lithium fire. 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:

The preferred response is to leave the area and allow the batteries to cool and the vapours to dissipate. Avoid skin and eye contact or inhalation of vapours. Collect all released material in a plastic lined metal container and remove spilled liquid with absorbent. Doing this, protect your skin and eyes with gloves and protection glasses. Avoid direct contact with internal components.

Section VII - Handling and Storage

When used correctly, lithium batteries provide 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 charge 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 container 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.

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 their 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 coin cells is made at temperature between +10°C and +25°C, never exceeding +30°C (also according to IEC 60086-4). In this way the maximum shelf-life (i.e. max. retention of cell performances after storage periods) of lithium coin cells 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

<u>Respiratory protection (specify type):</u>	Not necessary under conditions of normal use.
<u>Ventilation:</u>	Not necessary under conditions of normal use.
<u>Protective gloves:</u>	Not necessary under conditions of normal use.
<u>Eye protection:</u>	Not necessary under conditions of normal use.
<u>Other protective clothing or equipment:</u>	Not necessary under conditions of normal use.

Section IX - Physical and Chemical Properties

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

Section X - Stability and Reactivity

Lithium batteries are contained in a stable steel container and are sealed to avoid any chemical release under conditions of normal use.

Conditions to avoid: See Section VII

Section XI - Toxicological Information

Swallowing:

Ingestion of a battery can be harmful. For US call The National Capital Poison Control Center (1-800-222-1222) day or night - for advice and follow-up. For other countries please contact the local Tox Centers.

Section XII - Ecological Information

The chemicals mentioned in Section II are contained in a sealed battery can. 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

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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.

Section XIV - Transportation Information

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

UN-No. UN 3090
 Proper Shipping Name: Lithium metal batteries

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

Method	Technical Guidelines	Packing Instruction and Special Provisions
Air	ICAO TI 2015-2016) or IATA Dangerous Goods Regulations 2015 (56th Edition)	Packing Instruction 968 Section II
Road and Rail Europe	ADR / RID 2015	Special Provision 188
Marine	IMDG Code 2010 (amdm.37)	Special Provision 188
USA	DOT 49 CFR	49 CFR Sections 171.12, 171.24, 171.25

All CR cells and batteries of Renata AG fulfil the conditions pursuant to the requirements for partly regulated transportation.

Summary of Packing Instruction (IATA Dangerous Goods Regulations 56th Edition):

- For all the lithium metal (button) cells, listed in Annex I the lithium content is not more than 0.3 g and for lithium metal batteries the lithium content is not more than 0.3 g.
- Each cell or battery of the type proven meet the requirements of each test in the UN Manual of *Tests and Criteria*, Part III, subsection 38.3 (Edition 5) - (DGR 3.9.2.6).
- Packing, marking, labeling and weight limitations must be observed as per technical guidelines of the respective transport mode.

Note: Lithium metal (button) cells and batteries are forbidden for transportation aboard passenger-carrying aircraft as from 01.01.2015.

Note: Example of Lithium Metal Battery Label see Annex II
 Examples of Lithium Metal Battery transport accompanied Document (Caution Statement) see Annex III
 Example of Cargo Aircraft Only Label see Annex IV
 For information 49 CFR 171.12 / 171.24 / 171.25 see Annex V

GENERAL HANDLING INSTRUCTIONS

Battery cartons should be handled with care. Rough handling may result in batteries being short circuited or damaged. This may cause leakage, explosion, or fire. (Refer also to Section VII) (**Specimen see Annex V**)

GENERAL REMARK

The exemptions from dangerous goods regulations are only applicable with the respect to the delivery form / packaging in which the lithium batteries are dispatched by RENATA SA. Any re-packing or assembly of the cells and batteries is in the responsibility of the customer and makes new safety tests necessary.

Section XV - Regulatory Information

The batteries are in accordance with the directive 2006/66/EC

Section XVI - Other Information

RENATA's lithium batteries are registered by UNDERWRITERS LABORATORIES INC., NORTHBROOK, IL, U.S.A., under file number MH14002.

Further information is given in RENATA Designer's Guide.

For lithium cells and batteries in general, Safety Standard IEC 60086-4 applies, which also contains detailed recommendations for manufacturers of equipment and users.

For further information on RENATA's lithium cells and batteries visit our web site: www.renata.com.

ANNEX I

APPROXIMATE WEIGHT CONTENT OF LITHIUM IN RENATA LITHIUM BATTERIES

Model no.	% Lithium Max	Weight of battery (in g)	Qty Li (Max in mg)
CR1025	1.5 %	0.6	9
CR1216	1.1 %	0.7	8
CR1216 MFR	1.3 %	0.7	9
CR1220	1.4 %	0.8	11
CR1220 MFR	1.6 %	0.8	13
CR1225	1.7 %	0.9	15
CR1616	1.3 %	1.1	15
CR1620	1.8 %	1.2	21
CR1632	2.2 %	1.8	39
CR1632 MFR	2.2 %	1.8	39.5
CR2016	1.4 %	1.7	24
CR2016 MFR	1.5 %	1.7	26
CR2016.MFR	1.3 %	1.8	23
CR2016 alterna	1.1 %	1.8	20
CR2025	2.1 %	2.3	48
CR2025 MFR	2.0 %	2.5	50
CR2025.MFR	1.9 %	2.5	48
CR2025 alterna	2.0 %	2.5	50
CR2032	2.4 %	2.8	67
CR2032 MFR	2.0 %	2.8	56
CR2032.MFR	2.2 %	2.9	65
CR2032 alterna	2.0 %	3.0	60
CR2045	2.2 %	3.7	83
CR2045HT	1.9 %	4.1	79
CR2320	1.6 %	2.7	43
CR2325	1.8 %	3.0	55
CR2430	2.0 %	4.1	80
CR2430 MFR	3.0 %	4.3	129
CR2450HT	2.2 %	6.7	149
CR2450N	2.7 %	5.9	160
CR2450N.MFR	2.6 %	6.2	162
CR2450N-MFR	2.6 %	6.0	156
CR2477N	3.3 %	8.3	270

ANNEX II

CAUTION !

LITHIUM METAL BATTERIES

**DO NOT LOAD OR TRANSPORT
PACKAGE IF DAMAGED**

For more information, call +41 61 319 28 27

For further Information's consult the IATA Dangerous Goods Regulations, 56th Edition (Section 7.4.8).

ANNEX III

CAUTION!

Packages in this shipment contain

Lithium Metal Batteries

UN-No. UN 3090
Proper Shipping Name: Lithium metal batteries

Lithium metal (button) cells and batteries are subject to the following transport rules:

Method	Technical Guidelines	Packing Instruction and Special Provisions
Air	ICAO TI 2015-2016) or IATA Dangerous Goods Regulations 2015 (56th Edition)	Packing Instruction 968 Section II
Road and Rail Europe	ADR / RID 2015	Special Provision 188
Marine	IMDG Code 2010 (amdm.37)	Special Provision 188
USA	DOT 49 CFR	49 CFR Sections 171.12, 171.24, 171.25

Hereby we confirm that our shipment containing Lithium Metal (button) cells and batteries fully complies with all mentioned requirements of the relevant Rules of the above mentioned technical Guidelines

The packages must be handled with care.

A flammability hazard exists if the packages are damaged.

Special procedures must be followed in the event the packages are damaged, including inspection and repacking if necessary.

If the packages are damaged, batteries must be quarantined, inspected and repacked.

Telephone number for additional information:

Phone: +41 61 319 2827

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ANNEX IV



For further Information's consult the IATA Dangerous Goods Regulations, 56th Edition (Section 7.4.2).

(b) *Shipments to or from Mexico.* Unless otherwise excepted, hazardous materials shipments from Mexico to the United States or from the United States to Mexico must conform to all applicable requirements of this subchapter. When a hazardous material that is a material poisonous by inhalation (see §171.8) is transported by highway or rail from Mexico to the United States, or from the United States to Mexico, the following requirements apply:

- (1) The shipping description must include the words "Toxic Inhalation Hazard" or "Poison-Inhalation Hazard" or "Inhalation Hazard", as required in §172.203(m) of this subchapter.
- (2) The material must be packaged in accordance with requirements of this subchapter.
- (3) The package must be marked in accordance with §172.313 of this subchapter.
- (4) Except as provided in paragraph (e)(5) of this section, the package must be labeled or placarded POISON GAS or POISON INHALATION HAZARD, as appropriate, in accordance with subparts E and F of this subchapter.
- (5) A label or placard that conforms to the UN Recommendations (IBR, see §171.7) specifications for a "Division 2.3" or "Division 6.1" label or placard may be substituted for the POISON GAS or POISON INHALATION HAZARD label or placard required by §§172.400(a) and 172.504(e) of this subchapter on a package transported in a closed transport vehicle or freight container. The transport vehicle or freight container must be marked with identification numbers for the material, regardless of the total quantity contained in the transport vehicle or freight container, in the manner specified in §172.313(c) of this subchapter and placarded as required by subpart F of this subchapter.

§ 171.24 Additional requirements for the use of the ICAO Technical Instructions.

(a) A hazardous material that is offered for transportation or transported within the United States by aircraft, and by motor vehicle or rail either before or after being transported by aircraft in accordance with the ICAO Technical Instructions (IBR, see §171.7), as authorized in paragraph (a) of §171.22, must conform to the requirements in §171.22, as applicable, and this section.

(b) Any person who offers for transportation or transports a hazardous material in accordance with the ICAO Technical Instructions must comply with the following additional conditions and requirements:

- (1) All applicable requirements in parts 171 and 175 of this subchapter (also see 14 CFR 121.135, 121.401, 121.433a, 135.323, 135.327 and 135.333);
- (2) The quantity limits prescribed in the ICAO Technical Instructions for transportation by passenger-carrying or cargo aircraft, as applicable;
- (3) The conditions or requirements of a United States variation, when specified in the ICAO Technical Instructions.

(c) *Highway transportation.* For transportation by highway prior to or after transportation by aircraft, a shipment must conform to the applicable requirements of part 177 of this subchapter, and the motor vehicle must be placarded in accordance with subpart F of part 172.

(d) *Conditions and requirements specific to certain materials.* Hazardous materials offered for transportation or transported in accordance with the ICAO Technical Instructions must conform to the following specific conditions and requirements, as applicable:

(1) *Batteries—(i) Nonspillable wet electric storage batteries.* Nonspillable wet electric storage batteries are not subject to the requirements of this subchapter provided—

- (A) The battery meets the conditions specified in Special Provision 67 of the ICAO Technical Instructions;
- (B) The battery, its outer packaging, and any overpack are plainly and durably marked "NONSPILLABLE" or "NONSPILLABLE BATTERY"; and

(C) The batteries or battery assemblies are offered for transportation or transported in a manner that prevents short circuiting or forced discharge, including, but not limited to, protection of exposed terminals.

(ii) *Primary lithium batteries and cells.* Primary lithium batteries and cells are forbidden for transportation aboard passenger-carrying aircraft. Equipment containing or packed with primary lithium batteries or cells are forbidden for transport aboard passenger-carrying aircraft except as provided in §172.102, Special Provision A101 of this subchapter. When transported aboard cargo-only aircraft, packages containing primary lithium batteries and cells transported in accordance with Packing Instructions 968-970 (Section II) of the ICAO Technical Instructions must be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" or "LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT." This marking is not required on packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries or cells that are contained in or packed with equipment.

(iii) *Prototype lithium batteries and cells.* Prototype lithium batteries and cells are forbidden for transport aboard passenger aircraft and must be approved by the Associate Administrator prior to transportation aboard cargo aircraft, in accordance with the requirements of Special Provision A55 in §172.102 of this subchapter.

(2) A package containing Oxygen, compressed, or any of the following oxidizing gases must be packaged as required by Parts 173 and 178 of this subchapter: carbon dioxide and oxygen mixtures, compressed; compressed gas, oxidizing, n.o.s.; liquefied gas, oxidizing, n.o.s.; nitrogen trifluoride; and nitrous oxide.

§ 171.25 Additional requirements for the use of the IMDG Code.

(a) A hazardous material may be offered for transportation or transported to, from or within the United States by vessel, and by motor carrier and rail in accordance with the IMDG Code (IBR, see §171.7), as authorized in §171.22, provided all or part of the movement is by vessel. Such shipments must conform to the requirements in §171.22, as applicable, and this section.

(b) Any person who offers for transportation or transports a hazardous material in accordance with the IMDG Code must conform to the following additional conditions and requirements:

(1) Unless specified otherwise in this subchapter, a shipment must conform to the requirements in part 176 of this subchapter. For transportation by rail or highway prior to or subsequent to transportation by vessel, a shipment must conform to the applicable requirements of parts 174 and 177 respectively, of this subchapter, and the motor vehicle or rail car must be placarded in accordance with subpart F of part 172 of this subchapter. When a hazardous material regulated by this subchapter for transportation by highway is transported by motor vehicle on a public highway or by rail under the provisions of subpart C of part 171, the segregation requirements of Part 7, Chapter 7.2 of the IMDG Code are authorized.

(2) For transportation by vessel, the stowage and segregation requirements in Part 7 of the IMDG Code may be substituted for the stowage and segregation requirements in part 176 of this subchapter.

(3) Packages containing primary lithium batteries and cells that are transported in accordance with Special Provision 188 of the IMDG Code must be marked "PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" or "LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT." This marking is not required on packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries and cells that are contained in or packed with equipment.

(4) Material consigned under UN3166 and UN3171 (e.g., Engines, internal combustion, etc., Vehicles, etc. and Battery-powered equipment) may be prepared in accordance with the IMDG Code or this subchapter.

(c) *Conditions and requirements for bulk packagings* . Except for IBCs and UN portable tanks used for the transportation of liquids or solids, bulk packagings must conform to the requirements of this subchapter. Additionally, the following requirements apply:

(1) UN portable tanks must conform to the requirements in Special Provisions TP37, TP38, TP44 and TP45 when applicable, and any applicable bulk special provisions assigned to the hazardous material in the Hazardous Materials Table in §172.101 of this subchapter;

(2) IMO Type 5 portable tanks must conform to DOT Specification 51 or UN portable tank requirements, unless specifically authorized in this subchapter or approved by the Associate Administrator;

(3) Except as specified in this subpart, for a material poisonous (toxic) by inhalation, the T Codes specified in Column 13 of the Dangerous Goods List in the IMDG Code may be applied to the transportation of those materials in IM, IMO and DOT Specification 51 portable tanks, when these portable tanks are authorized in accordance with the requirements of this subchapter; and

(4) No person may offer an IM or UN portable tank containing liquid hazardous materials of Class 3, PG I or II, or PG III with a flash point less than 100 °F (38 °C); Division 5.1, PG I or II; or Division 6.1, PG I or II, for unloading while it remains on a transport vehicle with the motive power unit attached, unless it conforms to the requirements in §177.834(o) of this subchapter.

(d) *Use of IMDG Code in port areas* . (1) Except for Division 1.1, 1.2, and Class 7 materials, a hazardous material being imported into or exported from the United States or passing through the United States in the course of being shipped between locations outside the United States may be offered and accepted for transportation and transported by motor vehicle within a single port area, including contiguous harbors, when packaged, marked, classed, labeled, stowed and segregated in accordance with the IMDG Code, offered and accepted in accordance with the requirements of subparts C and F of part 172 of this subchapter pertaining to shipping papers and placarding, and otherwise conforms to the applicable requirements of part 176 of this subchapter.

(2) The requirement in §172.201(d) of this subchapter for an emergency telephone number does not apply to shipments made in accordance with the IMDG Code if the hazardous material is not offloaded from the vessel, or is offloaded between ocean vessels at a U.S. port facility without being transported by public highway.