

Article Safety Data Sheet - Lithium Batteries ¹⁾Edition date: January 7th, 2011Version: 2011-01-07

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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	17 - 48
Lithium*	7439-93-2	1.1 - 3.3
Propylene Carbonate (PC)	108-32-7	3 - 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 believed to be slightly to moderately toxic, PC moderately toxic.
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

Flash point of electrolyte solvents (°C):

DME: -6°C, PC: 123°C **Mixture: 20°C**

Extinguishing Media:

see Special Fire Fighting Procedure

Flammable Limits:

Not available

Special Fire Fighting Procedure:

In case of fire in an adjacent area, use water. CO₂ 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
- 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 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

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

Lithium cells and batteries are subject to:

Area	Method	Organization	Special Provision
International	Air	IATA, ICAO	Packing Instruction 968 - Section II
Europe	Road and Rail	ADR / RID	SP188
International	Marine	IMDG	SP188
U.S.A	Rail, Road, Marine	DOT	DOT 49 CFR Section 173.185

Their regulations are based on the UN Recommendations. Each special provision provides specifications on exceptions and packaging for lithium batteries shipping. All CR batteries of Renata AG meet all special provisions.

Summary of Packing Instruction (IATA Dangerous Goods Regulations 52nd Edition):

The minimum requirements necessary to transport as partly regulated goods are as follows;

- 1) For a lithium metal or lithium alloy cell, the lithium content is not more than 1g. For a lithium metal or lithium alloy battery, the aggregate lithium content is not more than 2g.
- 2) Each cell or battery is of the type proven to meet the requirement of each test in the UN Manual of Tests and Criteria, Part III, subsection 38.3.
- 3) Each consignment must be accompanied with a certification that the goods meet the conditions for transportation as "partly regulated" (**Specimen See Annex IV**).
- 4) Each package must be displayed a battery handling label (**Specimen See Annex II**).
- 5) Each package must be capable of withstanding a 1.2 m drop test.

However, if they meet the following requirements of Special Provision 188 of the UN Model Regulations, Packing Instruction 968 IATA/ICAO, Special Provision 310 of the IMDG Code, Special Provision 188 of the ADR and RID (Road and Rail Europe), they are not subject to other provisions of the above mentioned regulations:

- (a) For a lithium metal or lithium alloy cell, the lithium content is not more than 1 g
- (b) For a lithium metal or lithium alloy battery the aggregate lithium content is not more than 2 g
- (c) Each cell or battery is of the type proved to meet the requirements of each test in the *Manual of Tests and Criteria*, Part III, sub-section 38.3;
- (d) Cells and batteries, except when installed in equipment, shall be packed in inner packagings that completely enclose the cell or battery. Cells and batteries shall be protected so as to prevent short circuits. This includes protection against contact with conductive materials within the same packagings that could lead to short circuit. The inner packagings shall be packed in strong outer packagings which conform to provisions of 4.1.1.1, 4.1.1.2 and 4.1.1.5.
- (e) Cells and batteries when installed in equipment shall be protected from damage and short circuit, and the equipment shall be equipped with an effective means of preventing accidental activation. When Lithium Batteries are installed in equipment, the equipment shall be packed in strong outer packagings constructed of suitable material of adequate strength and design in relation to the packaging's capacity and its intended use unless the battery is afforded equivalent by protection by the equipment in which it is contained.
- (f) Except for packages containing no more than four cells installed in equipment or no more that two batteries installed in equipment, each package shall be marked with the following (**see annex II**):

- (i) an indication that the package contains "Lithium Metal Batteries"
- (ii) an indication that the package shall be handled with care and that a flammability hazard exists in the package is damaged.
- (iii) an indication that special procedures shall be followed in the event the package is damaged, include inspection and repacking if necessary and
- (iv) a telephone number for additional information
- (g) Each consignment of one or more packages marked in accordance with paragraph (f) shall be accompanied with a document including the following (**see annex V**):
 - (i) an indication that the package contains "Lithium Metal Batteries"
 - (ii) an indication that the package shall be handled with care and that a flammability hazard exists in the package is damaged.
 - (iii) an indication that special procedures shall be followed in the event the package is damaged, include inspection and repacking if necessary and
 - (iv) a telephone number for additional information
- (h) Except when Lithium Batteries are installed in equipment, each package shall be capable of withstanding a 1.2 m drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents so as to allow battery (or cell to cell) contact and without release of contents, and;
- (i) Except when batteries are installed in or packed with equipment, packages shall not exceed 30 kg gross mass.

As used above and elsewhere in these Regulations, "lithium content" means the mass of lithium in the anode of a lithium metal or lithium alloy cell, except in the case of a lithium-ion cell the "equivalent lithium content" in grams is calculated to be 0.3 times the rated capacity in ampere-hours.

RENATA's lithium cells and batteries do meet the above mentioned provisions.
They can be described as "Partly Regulated" in the transport documents.

XIV.II Provisions for shipments by air into, out of, or within the U.S. (pursuant to 49 CFR)

In addition to the provisions mentioned under XIV.I for shipments into, out of, or within the US the following provisions of the 49 CFR apply:

Pursuant to Special Provision A 100 of the 49 CFR primary (non-rechargeable) lithium cells and batteries are forbidden for transport on passenger carrying aircraft. To avoid these cells and batteries being loaded on board of passenger carrying aircrafts, packages must be marked pursuant to § 173.185 (b)(5) (**Specimen see Annex III**), even if the packaging are shipped via highway, rail or vessel. RENATA's primary lithium cells and batteries do meet the provisions of § 173.185 (b).

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 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	2.1 %	1.8	38
CR2016	1.4 %	1.7	24
CR2016 MFR	1.5 %	1.7	26
CR2016 alterna	1.1 %	1.8	20
CR2025	2.1 %	2.3	48
CR2025 MFR	2.0 %	2.5	50
CR2025 alterna	2.0 %	2.5	50
CR2032	2.4 %	2.8	67
CR2032 MFR	2.0 %	2.8	56
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	2.0 %	6.7	136
CR2450N	2.7 %	5.9	160
CR2477N	3.3 %	8.3	270

ANNEX II



ANNEX III

Primary Lithium Batteries
Forbidden for transport
aboard passenger aircraft

This label is required for shipments containing one or more cells/batteries into, out of, or within the U.S. via highway, rail, vessel or cargo-only aircraft. The label must be in contrasting colour and the letters must be 6 mm (0.25 in) in height for packages weighting not more than 30 kg.

ANNEX IV

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batteries

Regulatory References: SP 188 UN Model Regulations, 188 ADR/RID, 310 IMDG Code, ICAO/IATA Packing Instruction 968 Section II (Lithium Metal Batteries) and ICAO/IATA Packing Instruction 965 Section II (Lithium Ion Batteries)

SHIPPER'S CERTIFICATION for Lithium Metal Batteries and Lithium Ion Batteries

Hereby we declare that the cells and batteries contained in this shipment qualify in accordance with above provisions for transportation "partly regulated"

DÉCLARATION DE L'EXPÉDITEUR pour piles au Lithium Metal et Lithium Ion

Par la présente, nous certifions que les piles contenues dans cet envoi sont conformes aux conditions de transport exigées pour la mention "partiellement réglementés".

ERKLÄRUNG DES VERSENDERS für Lithium Metall Batterien und Lithium Ionen Batterien

Wir bestätigen hiermit, dass die Batterien und Zellen in dieser Sendung entsprechend oben genannten Bestimmungen als "teilweise eingeschränkt" transportiert werden können

For emergency information call RENATA SA at +41 61 319 28 27
referring to the below Packing List No.

This certification is on every packing list for shipments containing Lithium Metal and Lithium Ion Batteries.

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ANNEX V

CAUTION

The packages in this consignment consist of

Lithium Metal Batteries

Shipment must be handled with care

Flammable if damaged

If the package is damaged it must be
quarantined, inspected and repacked

For further information contact:

Phone: +41 61 319 28 27

(24 hrs / 7 days per week)

ANNEX VI

OVERPACK