
Lithium Ion Battery (Series: LIC..., LIP...)

1. Identification of the product and of the company undertaking

Product details

| | |
|-------------------------|---|
| Trade name: | Lithium ion battery |
| Voltage: | 3.7 V (or multiples of this in case of multi-cell configurations) |
| Electrochemical system: | Lithium ion |
| Anode (negative): | Graphite based |
| Cathode (positive): | Lithium cobalt oxide |

Supplier details

| | |
|-----------------------------|--|
| Address: | VARTA Microbattery GmbH Daimlerstr. 1 D-73479 Ellwangen/Jagst Germany |
| Emergency telephone number: | +49 7961 921 110 (VAC) |

Legal Remark (U.S.A.)

Material Safety Data Sheets (MSDS) are a sub-requirement of the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR Subpart 1910.1200. This Hazard Communication Standard does not apply to various subcategories including anything defined by OSHA as an "article". OSHA has defined "article" as a manufactured item other than a fluid or particle; (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities, e.g. minute or trace amounts of a hazardous chemical, and does not pose a physical hazard or health risk to employees.

Because all of our batteries are defined as "articles", they are exempted from the requirements of the Hazard Communication Standard.

Legal remark (EU)

These batteries are no "substances" or "preparations" according to Regulation (EC) No 1907/2006 EC. Instead they have to be regarded as "articles", no substances are intended to be released during handling. Therefore there is no obligation to supply a MSDS according to Regulation (EC) 1907/2006, Article 31.

General remark

This "Safety Information" is provided as a service to our customers. The details presented are in accordance with our present knowledge and experiences. They are no contractual assurances of product attributes.

2. Hazards identification

The battery is sealed hermetically. Thus, the ingredients have no hazard potential, except the battery is violated or dismantled.

If in case of mistreatment the ingredients are released, a spontaneously flammable gas mixture may be released under certain circumstances (measures according to chapter 4 to 6).

Attention: If batteries are treated wrong the danger of burns or bursts occurs. Batteries must not be heated above 100°C or incinerated. The battery contents must not get in contact with water. If the negative electrode gets in contact with water or humidity hydrogen gas is formed, which may inflame spontaneously.

3. Composition/information on ingredients

Ingredients

| Contents | CAS No. | Hazard Symbols | R Phrases | Material |
|-----------|------------|----------------|--------------------|---|
| 10 - 30 % | 7782-42-5 | - | - | Graphite |
| 20 - 50 % | 12190-79-3 | Xn | R22 - 43 | Lithium cobalt oxide |
| 10 - 20 % | | C | R10 - 34 - 40 - 43 | Organic electrolyte, consisting of LiPF ₆ and organic carbonates |

Full text of Classification and R-phrases: see section 16.

Heavy Metals

| Contents | CAS No. | Material |
|-------------|-----------|---|
| < 1 mg/kg | 7440-43-9 | Cadmium |
| < 10 mg/kg | 7439-92-1 | Lead |
| < 0,1 mg/kg | 7439-97-6 | Mercury (none intentionally introduced, see Chapter 12) |

Other Ingredients

| Contents | CAS No. | Material |
|-----------|-----------|-----------------|
| 2 - 10 % | 7440-50-8 | Copper |
| 2 - 10 % | 7429-90-5 | Aluminium |
| 50 - 80 % | 7440-02-0 | Stainless steel |
| 2 - 10 % | | Polymer |

During charge process a lithium graphite intercalation phase is formed, which is highly flammable (F) and corrosive (C), but not released under the circumstances of normal usage.

4. First-aid measures

Measures at accidental release

| | |
|---------------------|---|
| After inhalation: | Fresh air. Seek for medical assistance. |
| After skin contact: | Remove solid particles immediately. Flush affected areas with plenty of water (at least 15 min.). Remove contaminated cloth immediately. Seek for medical assistance. |
| After eye contact: | Flush the eye gently with plenty of water (at least 15 min.). Seek for medical assistance. |
| After ingestion: | Drink plenty of water. Avoid vomiting. Seek for medical assistance. No trials for neutralization. |

5. Fire-fighting measures

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| Suitable extinguishing media: | Dry powder is applicable for burning lithium ion batteries. Metal fire extinction powder, rock salt or dry sand are suitable if only a few batteries are involved. |
| Extinguishing media with limited suitability: | Carbon dioxide (CO ₂) is only applicable for incipient fire. Do not use water. |
| Special protection equipment during fire-fighting: | Contamination cloth including breathing apparatus. |

| | |
|-----------------|--|
| Special hazard: | Cells may explode and release metal parts. At contact of electrolyte with water traces of hydrofluoric acid may be formed. In this case avoid contact and take care for good ventilation. At contact of charged anode material with water extremely flammable hydrogen gas is generated. |
| Attention: | Do not let used extinguishing media penetrate into surface water or ground water. If necessary, thicken water or foam with suitable solids. Dispose off properly. |

6. Accidental release measures

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|----------------------------------|---|
| Person related measures: | Wear personal protective equipment adapted to the situation (protection gloves, face protection, breathing protection). |
| Environment protection measures: | Bind released ingredients with powder (rock salt, sand). Dispose off according to the local law and rules. Avoid leached substances to penetrate into the earth, canalization or water. |
| Treatment for cleaning: | If battery casing is dismantled, small amounts of electrolyte may leak. Package the battery tightly including ingredients together with lime, sand or rock salt. Then clean with water. |

7. Handling and storage

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|------------------------------|---|
| Guideline for safe handling: | Always follow the warning information on the batteries and in the manuals of devices. Only use the recommended battery types. Keep batteries away from children. For devices to be used by children, the battery casing should be protected against unauthorized access. Unpacked batteries shall not lie about in bulk. In case of battery change always replace all batteries by new ones of identical type and brand. Do not swallow batteries. Do not throw batteries into water. Do not throw batteries into fire. Avoid deep discharge. Do not short-circuit batteries Use recommended charging time and current. |
| Storage: | Storage preferably at room temperature (approx. 20°C). Avoid large temperature changes. Do not store close to heating devices. Avoid direct sunlight. At higher temperature the electrical performance may be reduced. Preferred storage at 50% of the nominal capacity (OCV 3.7 – 3.9V or multiples of this in case of serial multi-cell configurations). |
| Storage of large amounts: | Storage of unpacked batteries can cause short circuit and heat generation. If possible, store the batteries in original packaging (because of short circuit protection and exemptions according to transport regulations). A fire alarm is recommended. |
| VCI storage category: | For automatic fire extinction consider chapter 5 "Fire fighting measures". It is recommended to consider the "VCI Guideline for the mixed storage of chemicals" and to handle lithium ion batteries according to storage category 11 ("combustible solids"). |

8. Exposure controls/personal protection

Under normal conditions (during charge and discharge) release of ingredients does not occur.

In the event of release of ingredients, the following TLVs have to be considered (U.S.A.):

| Material | TLV* |
|-----------------------|-------------------------------|
| Cobalt and compounds: | 0.1 mg/m ³ (TWA) |
| Graphite: | C 5.0 mg/m ³ (TWA) |

*Source: OSHA CFR 29 1910.1000 Table Z-1, 2 or 3 3-01-2007.

9. Physical and chemical properties

Not applicable if closed.

10. Stability and reactivity

Dangerous reactions: When heated above 100°C the risk of rupture occurs.

11. Toxicological information

Under normal conditions (during charge and discharge) release of ingredients does not occur. In case of accidental release see information in chapter 2, 3, 4.

12. Ecological information

Lithium ion batteries do not contain heavy metals as defined by the European directives 2006/66/EC Article 21.

Mercury has not been "intentionally introduced (as distinguished from mercury that may be incidentally present in other materials)" in the sense of the U.S.A. "Mercury-Containing and Rechargeable Battery Management Act" (May 13 1996).

The Regulation on Mercury Content Limitation for Batteries promulgated on 1997-12-31 by the China authorities including the State Administration of Light Industry and the State Environmental Protection Administration defines 'low mercury' as 'mercury content by weight in battery as less than 0.025%', and 'mercury free' as 'mercury content by weight in battery as less than 0.0001%'. And therefore: Varta lithium ion batteries belong to the category of mercury-free battery (mercury content lower than 0.0001%).

13. Disposal considerations

USA: Lithium ion batteries are classified by the federal government as non-hazardous waste and are safe for disposal in the normal municipal waste stream. These batteries, however, do contain recyclable materials and are accepted for recycling by the Rechargeable Battery Recycling Corporation's (RPBC) Battery Recycling Program. Please go to the RPRC website at www.rbr.org for additional information.

In the European Union, manufacturing, handling and disposal of batteries is regulated on the basis of the DIRECTIVE 2006/66/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC. Customers find detailed information on disposal in their specific countries using the web site of the European Portable Batteries Association (http://www.epbaeurope.net/legislation_national.html).

Importers and users outside EU should consider the local law and rules.

In order to avoid short circuit and heating, used lithium ion batteries should never be stored or transported in bulk. Proper measures against short circuit are:

- Storage of batteries in original packaging
- Coverage of the terminals
- Embedding in dry sand

14. Transport information

General considerations

Lithium ion batteries manufactured by VARTA Microbattery are considered to be UN 3480 Lithium Ion Batteries, and are tested according to 38.3 of the "UN Manual of Tests and Criteria" for compliance with the requirements of special provisions ADR 188, IMDG 188, DOT / 49 CFR § 173.102, and the requirements of IATA DGR packing instruction 965 Section II. Positive test results required for not restricted transportation are stated in dedicated "Declarations of Conformity". In addition, the following conditions for not restricted transportation are fulfilled for these products in original VARTA packaging:

- The batteries have not more than 20 Watt-hours per cell / not more than 100 Watt-hours per battery.
- The batteries are isolated in the packaging to avoid short circuits.
- The packs are marked with a warning notice, that clearly states that the pack contains lithium batteries and must be quarantined, inspected and repacked if damaged.
- For air transport, the total mass does not exceed 10 kg per pack; for other transports 30 kg are allowed.

15. Regulatory information

Marking consideration:

European Union: According to Directive 2006/66/EC, the batteries have to be marked with the crossed wheel bin symbol.

Lithium ion batteries, which contain electronic modules (e.g. PCM) and which are subjected to the EMC directive 93/97/EEC, must be CE approved and must wear the CE marking.

According to Dangerous Goods Regulations (see 14.) battery packs have to be marked with the Watt-hour rating.

International safety standards:

The basis cells are approved according to UL 1642

Water hazard class:

(according to German Federal Water Management Act)
non-water pollution according to VwVwS Appendix 1
(No. 1443 and 766)

16. Other information

Full text of Classification and R-phrases referred to under sections 2 and 3

| | | |
|-----------------------|----|---|
| Classification | Xn | Harmful |
| | F | Highly flammable |
| | C | Corrosive |
| R Phrases | 10 | Flammable |
| | 22 | Harmful if swallowed |
| | 34 | Causes burns |
| | 40 | Limited evidence of a carcinogenic effect |
| | 43 | May cause sensitization by skin contact. |

Note: Date of issue of the transport regulations: ADR 2011, RID 2011, IATA 2011, IMDG 2010, DOT / 49 CFR 2011.

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