Lithium Ion Battery;
Lithium Polymer Battery PoLiFlex®

1. Identification of the product and company

Product details

Trade name:	Lithium ion battery; lithium polymer battery PoLiFlex®
Voltage:	3,7 V
Electrochemical system:	Lithium ion
Anode (negative):	Graphite based
Cathode (positive):	Lithium metal oxide

Supplier details

Address:	VARTA Microbattery GmbH Daimlerstr. 1 D-73479 Ellwangen/Jagst
Emergency telephone number:	+49-7961-921-211

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 exempt from the requirements of the Hazard Communication Standard, hence this “Safety Information” is provided as a service to our customers.

2. Composition/information on ingredients

Ingredients

Contents	CAS-No.	Hazards	Material
10 – 30 %	7782-42-5	-	Graphite
20 – 50 %	12190-79-3	Harmful	Lithium metal oxide
10 – 20 %		Flammable, Corrosive	Organic electrolyte, consisting of $LiPF_6$ and organic carbonates
2 – 15 %			Copper
2 – 20 %			Aluminium
5 – 10 %			Polymer
0 – 20 %			Stainless steel / nickel

During charge process a lithium graphite intercalation phase is formed, which is flammable (F) and corrosive (C).

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

3. Hazard identification

If the battery is faultless and the measures for handling and storage (chapter 7) are followed there is no hazard. If in case of mistreatment the ingredients are released unintended, a spontaneously flammable gas mixture may occur 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.

4. First aid measures

Measures at accidental release

After inhalation:	Fresh air. Seek for medical assistance.
After skin contact:	Flush affected areas with plenty of water. Dab off with polyethylene glycol 400. Remove contaminated cloth immediately. Seek for medical assistance.
After eye contact:	Flush the eye gently with plenty of water (at least 10 minutes). Seek for medical assistance.
After ingestion:	Drink plenty of water. Avoid vomiting. Seek for medical assistance. No trials for neutralization.

5. Fire-fighting measures

Suitable extinguishing media:	Cold water and dry powder in large amount are applicable for burning lithium batteries. Metal fire extinction powder, rock salt or dry sand are suitable if only a few batteries are involved.
Conditional applicable extinguishing media:	Carbon dioxide (CO_2) is only applicable for incipient fire. Do not use warm or hot water.
Special protection equipment during fire-fighting:	Contamination cloth including breathing apparatus.
Special hazard:	At contact of electrolyte with water hydrofluoric acid may be formed. In this case take care for good ventilation.

6. Accidental release measures

Person related measures:	Wear personal protective equipment adapted to the situation (protection gloves, cloth, 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 get into the earth, canalization or waters.
Treatment for cleaning:	If battery casing is dismantled, small amounts of electrolyte may leak. Pack the battery including ingredients together with lime, sand or rock salt. Then clean with water.

7. Handling and storage

Guideline for safe handling:	Avoid short circuiting the battery. Do not use damaged batteries. More detailed guidelines for the use of this batteries are in document “Handling Precautions and Prohibitions for VARTA PoLiFlex® Batteries“ and “Handling Precautions and Prohibitions Rechargeable Lithium Cylindrical and Prismatic (Li-Ion)“.
Storage:	Storage preferably at room temperature 20°C. Avoid large temperature changes. Do not store close to the heating. Avoid direct sunlight. At higher temperature the storage capability is reduced. Preferred storage at 50% of the nominal capacity (OCV 3,7 – 3,9 V).
Storage of large amounts:	If possible, store the batteries in original packaging (short circuit protection and transport release); A fire alarm is recommended; For automatic fire extinction consider chapter 5 “Fire fighting measures”.
VCI-storage category:	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:	0.02 mg/m^3 (TWA)

*Source: ACGIH Threshold Limit Values for Chemical Substances and Physical Agents, 2002.

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. If accidental release occurs see information in chapter 2.

Swallowing of a battery can be harmful. Call the local Poison Control Centre for advice and follow-up.

12. Ecological information

Lithium batteries do not contain hazardous materials according to European directives 91/157/EEC and 93/86/EEC.

13. Disposal considerations

In the European Union, manufacturing and handling of batteries is regulated on the basis of the COUNCIL DIRECTIVE of 18 March 1991 on batteries and accumulators containing certain dangerous substances (91/157/EEC). According to this directive, lithium batteries are no hazardous material containing batteries and do not have to be marked. Importers and users outside EU should consider the local law and rules.

To avoid short circuit and heating, lithium 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

UN-No.:	3090: Lithium batteries 3091: Lithium batteries in devices or lithium batteries packed with devices
Category:	Cat. 9
Packaging category:	II

Lithium batteries are dangerous goods. In general they are subjected to transport regulations depending on the means of transportation. But all batteries sold by VARTA Microbattery are not subjected to the transport regulations of dangerous goods, because they fulfil the following requirements (Special provisions ADR 188, IATA A45, IMDG 188, DOT / 49 CFR provision 173.185):

- The batteries contain an equivalent amount of not more than 1,5 g lithium per cell respectively 8 g Lithium per battery (the lithium equivalent amount in g is calculated by 0,3 times the nominal capacity in Ah).
- The batteries passed the tests according to 38.3 of the UN handbook of tests and criteria.
- 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.
- The total mass must not exceed 30 kg per pack.

Used lithium batteries have to be handled like fresh ones.

15. Regulatory information

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

International safety standards: IEC 61960 (Part 1 and Part 2).

16. Other information

Note: Date of issue of the transport regulations: ADR 2003, IATA 2004, IMDG 2002, DOT / 49 CFR 2003.

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