TRIATHLON®
INTELLIGENT BATTERIES

Material/Product Safety Data Sheet (MSDS / PSDS)

Lithium-Ion Batteries/TC

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1. PRODUCT AND COMPANY IDENTIFICATION

Product details:

The *Triathlon® Lithium-Ion battery system*, TC series for traction applications essentially consists of lithium nickel manganese cobalt oxide cells ($LiNiMnCoO_2$ or NMC), a control unit to protect the battery and a powder coated steel case.

Manufacturer details:

Triathlon Batterien GmbH
Siemensstraße 1
D-08371 Glauchau
Tel: 03763 (0) 77 85-0
Fax: 03763 (0) 77 85-110
Email: info@triathlon-batterien.de
Internet: www.triathlon-batterien.de

2. HAZARDS IDENTIFICATION

If the battery is intact and the operating instructions are followed there is no hazard.

The energy storage of the *Triathlon® Lithium-Ion battery system* consists of prismatic NMC cells, which are UN38.3 tested. The cells consist of a laser-welded metal case and various safety features. The battery is contained in a steel case. A battery management and control system (BMS) integrated in the control unit monitors the individual cells and the battery and protects them against critical circumstances.

The battery system is actively protected against overload, short circuit, deep discharge and over-charging. Nonetheless, the battery system may only be used properly and according to the operating instructions.

If external influences such as use of undue force, fire, flooding, etc. cause an abnormal situation to occur, the following information must be noted and followed:

The cells contain substances which can be flammable if they come into contact with oxygen or water. The substances can escape if the cells are exposed to high pressure, an external fire or are damaged mechanically through force. However, the quantity of these substances is so small that caution is advised only in the immediate vicinity of the battery.

3. COMPOSITION OF INGREDIENTS

Each cell consists of a hermetically sealed, laser-welded metal case with a safety valve. The cell contains a number of chemicals and materials, which can constitute a hazard if released.

Ingredients	EC No.	CAS No.	Name	Content approx. %	GHS Classification
Active material – positive electrode	480-390-0	182442-95-1	Lithium nickel cobalt Manganese oxide	20 - 40	H373; H412
	-	113066-89-0	Lithium nickel cobalt Aluminium oxide	0 - 40	H350i; H330; H317; H372; H410
	-	12057-17-9	Lithium manganese oxide	0 - 40	H372
	215-609-9	1333-86-4	Carbon black	< 5	-
Active material – negative electrode	231-955-3	7782-42-5	Graphite	0 - 25	-
	231-153-3	7440-44-0	Carbon	0 - 25	-
Electrolytes	202-510-0	96-49-1	Ethylene carbonate (EC)	10 - 25	H318
	210-478-4	616-38-6	Dimethyl carbonate (DMC)		H225
	433-480-9	623-53-0	Ethyl methyl carbonate (EMC)		H226
	244-334-7	21324-40-3	Lithium hexafluorophosphate	< 5	H314; H302; H312; H332
Binder	Polymer	24937-79-9	Polyvinylidene fluoride (PVdF)	< 5	-
Plastic parts	Polymer	9002-88-4	Polyethylene (PE)	< 10	-
	Polymer	68608-59-3	Polypropylene (PP)	< 10	-
Metal parts	231-072-3	7429-90-5	Al	< 15	-
	231-159-6	7440-50-8	Cu		-

4. FIRST-AID MEASURES

This information is only relevant if the battery is destroyed and direct contact is made with the ingredients.

If ingredients (dust, liquid) of the battery cells are released the following must be noted and followed:

After inhalation	leave the room immediately, get fresh air and **consult a doctor.**
Following contact with eyes	rinse eyes under running water for several minutes, **consult a doctor.**
Following skin contact	clothing must be removed and the skin cleaned thoroughly with paper or cloth towel, and then the skin must be washed with plenty of water and soap.
After swallowing	drink plenty of milk/water immediately and induce vomiting, **consult a doctor.**
Following burns	treat appropriately and **consult a doctor.**

If a person has eye or breathing difficulties following the event, they must consult a doctor and show the doctor this data sheet.

5. FIREFIGHTING MEASURES

In general	The undamaged battery or cell is not flammable. The organic electrolyte it contains or escaping gases can be ignited by external sources.
Firefighting area	Take the battery outside or to a well ventilated room and keep people away. The pressure valve can burst at temperatures above 120°C, which can cause flammable gases to escape.
Extinguishing medium	Lithium battery fires can generally be fought with water. Use of large quantities of water results in optimum cooling of the battery. Extinguishing additives can increase heat transfer. If these extinguishing attempts do not achieve the desired success, or if water cannot be located or used, sand or metal fire extinguishing powder can be used as an alternative. As with any fire, the fire gases produced cause health damage if inhaled. Therefore, ensure adequate ventilation. Fires in the area surrounding the batteries are to be fought with conventional extinguishers. A battery fire cannot be considered separately from the surrounding fire.

6. ACCIDENTAL RELEASE MEASURES

In general	in case of fire evacuate personnel from the affected area, do not breathe in fumes, do not touch any of the spilled or leaked material with your bare hands. Use/wear protective equipment.
On land	place spilled or leaked material in appropriate containers and notify the authorities.
In water	if possible remove the spilled or leaked material from the water and notify the authorities.

7. HANDLING AND STORAGE

Handling	No special protective clothing required. The *Triathlon® Lithium-Ion battery system* may not be opened, destroyed or set on fire.
Storage	Store in a dry, cool and well-ventilated place. The *Triathlon® Lithium-Ion battery system* has a low discharge rate of approx. 3 % per month at a temperature of 23°C. We recommend that the *Triathlon® Lithium-Ion battery system* be recharged every 3 months. Higher ambient temperatures increase this effect and accelerate the natural aging process of the battery. Recommended storage temperature 0°C - 40°C.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

No exposure if handled properly.

Personal protective equipment if a failure/accident occurs

Protection for:

Breathing system	Wear a breathing mask in case of fire
Eyes	Wear safety glasses/goggles
Hands	Wear gloves in case of leakage
Miscellaneous	Use/wear protective clothing, safety footwear

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Steel case with degree of protection IP 54 and battery connector
Odor	not applicable
pH	not applicable
Pressure	not applicable
Leakproof	not applicable
Flammability	not applicable
Solubility in water	not applicable
Specific density	not applicable
Boiling point	not applicable

10. STABILITY AND REACTIVITY

Reactivity	none, under normal operating conditions
Incompatibilities	none, under normal operating conditions
Hazardous by-products	none, under normal operating conditions
Caution in case of failure/accident	Lithium hexafluorophosphate can react with water or steam at high temperature to form hydrogen fluoride (hydrofluoric acid) HF. Risk of bursting at temperatures > 120°C.

11. TOXICOLOGICAL INFORMATION

This product does not have any toxicological properties in its normal, intended use.

Warning	Skin and eye irritation and breathing problems can occur if the battery is destroyed and cell material is released (see Section 4).

12. ECOLOGICAL INFORMATION

If the *Triathlon® Lithium-Ion battery system* is used and disposed of as intended it does not constitute any hazard to the environment. The *Triathlon® Lithium-Ion battery system* can be recycled.

13. DISPOSAL CONSIDERATIONS

Notes on safe and environmentally-friendly recovery (recycling).

Burning/Incineration	Do not burn battery or expose it to temperatures > 120°C. This can cause the pressure valve to burst and flammable gases to escape.
Recycling	Only in consultation with the manufacturer and by authorized recycling firms.

14. TRANSPORT INFORMATION (US DOT 49 CFR 172.101)

The following must be observed when transporting the battery:

Transport on land:

UN number	ADR/RID Class	Packing group	Dangerous goods class	Classification code
3480	9	II		M4

Sea freight:

UN number	IMDG code	Packing group	Dangerous goods class	EmS
3480	9	II		F-A, S-I

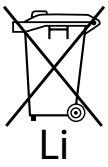
Air freight:

UN number	ICAO/IATA-DGR	Packing group	Dangerous goods class	
3480	9	II		

15. REGULATORY INFORMATION

Identification

The *Triathlon® Lithium-Ion battery system* is labelled with the symbol of a crossed out garbage bin with the ISO return/recycling symbol next to it. The battery manufacturer is responsible for attaching the labelling. In addition there are other important markings on the battery nameplate.

	The *Triathlon® Lithium-Ion battery system* must not be thrown away with household or industrial waste.
	The *Triathlon® Lithium-Ion battery system* can be returned to your service partner or supplier for disposal or handed over to an approved and certified recycling company.

	The *Triathlon® Lithium-Ion battery system* must not be dismantled or modified. With standard product type, do not work in potentially explosive areas. Do not throw the battery into fire or cause a short-circuit. Use the corresponding charger only for charging. If these regulations are not followed, escaping liquid or gas, a fire hazard or excessive heat generation can occur.
	The terminals of the *Triathlon® Lithium-Ion battery system* can be live! There is a short-circuit risk.
	Please read and follow the operating instructions. Work on the *Triathlon® Lithium-Ion battery system* may only be carried out by your local service partner or supplier. These instructions should be kept near the battery and always be accessible to the user in case of questions in the place of use.

16. OTHER INFORMATION EU

The above information is based on current knowledge and does not constitute an assurance of specific properties. The possessor of the product is responsible for complying with existing laws and legal regulations.

The data for the ingredients has been taken solely from current versions of our suppliers' safety data sheets.

Explanation of the GHS codes in Section 3 (composition/details of the ingredients)

H225 Highly flammable liquid and vapor
H226 Flammable liquid and vapor
H302 Harmful if swallowed
H312 Harmful in contact with skin
H314 Causes severe skin burns and eye damage
H317 May cause an allergic skin reaction
H318 Causes serious eye damage
H330 Fatal if inhaled
H332 Harmful if inhaled
H350i May cause cancer if inhaled
H372 Causes damage to organs through prolonged or repeated exposure
H373 May cause damage to organs through prolonged or repeated exposure
H410 Very toxic to aquatic life with long-lasting effects
H412 Harmful to aquatic life with long-lasting effects

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Triathlon Battery Solutions, Inc.
631 Southwestern Blvd., Suite 140
Coppell, TX 75019
Tel: +1 469.301.2128
E-Mail: info@triathlon-batteries.com
Internet: www.triathlon-batteries.com