

Subsea transponders



KONGSBERG

Battery safety data sheet

Identification

The battery packs for Kongsberg Maritime's subsea transponders are manufactured according to high standards and strict specifications to offer best possible performance and maximum operational safety.

Subsea transponders are used to provide communication between the various modules that comprise an underwater positioning and navigation system and for underwater data links.

Many transponders are equipped with a lithium battery pack.

- **Manufacturer:** Kongsberg Maritime AS
- **Address:** Strandpromenaden 50, 3191 Horten, Norway
- **Telephone:** +47 33 03 24 07 (24 hrs)
- **Website:** <http://www.km.kongsberg.com>
- **E-mail:** km.support.hpr@kongsberg.com

Hazards identification

The battery pack for the transponder is a solid, manufactured article. Exposure to hazardous ingredients is not expected with normal use. The battery pack is not provided with any hazards identification.

In normal use, the battery pack is placed inside the sealed transponder.

Water ingress into the transponder can cause dangerous situations.

Short-circuits, overheating, mechanical damage and exposure to water can start chemical reactions and high currents inside the transponder lithium battery. This can generate noxious gases and/or danger of explosions. The chemical reactions will continue without additional supply of oxygen, as the battery cells contain the necessary ingredients for maintaining the chemical reactions.

- If the cells that are used in the battery pack exceed the critical temperature of 180°C, they may explode.
- In the event of external fire, the temperature inside the transponder can easily reach the critical limit of 180°C.
- In the event of water ingress:
 - The battery temperature will increase. This is caused by the high internal currents. The temperature can easily reach the critical limit of 180°C.
 - An electrolytic process will produce hydrogen. Together with oxygen, hydrogen can create oxyhydrogen gas inside the transponder. This gas is explosive.
 - Chemical reactions in the battery pack will cause increased pressure inside the transponder. The transponder can explode if this pressure is high enough.
- In the event of an explosion, one or both end caps will blow out. The transponder will become fragmented. This can cause serious damage to personnel and/or equipment.

- Some transponders have a relief valve to prevent overpressure. Noxious gases will then leak out of the transponder until the chemical reactions have stopped.

Products generated by the chemical reactions during an emergency may however clog this pressure release valve.

Composition

The lithium battery used in the transponder consists of *Lithium Metal* cells.

A transponder lithium battery pack consists of several individual cells that are electrical connected, both in series and parallel.

The various transponder battery packs have different number of cells, output voltages and power capacity. All transponder batteries include protection against short circuits (circuit breakers) and reverse current (diodes).

The cells used within the battery pack are manufactured by one of the following companies:

- Tadiran TL-2300
- Sonnenschein SL-780
- Saft LS 33600
- Saft LSH 20
- Sonnenschein SL-760

The lithium metal cells have the following chemical formula:

Lithium Thionyl Chloride - Li/SOCl₂

- **Negative electrode:** Lithium metal (Li)
- **Positive electrode:** Carbon
- **Electrolyte:** Solution of lithium tetrachloroaluminate (LiAlCl₄) in thionyl chloride

cNODE and WBAT batteries			
Part	Battery	Weight-(kg)	Lithium(g)
319554	L14.4 (48) Maxi	5.9	183
347563	L14.4 (24) Midi	3.0	92

Exd batteries			
Part	Battery	Weight-(kg)	Lithium(g)
355324	L14.4 (48) Maxi Exd	5.9	183

Other lithium batteries			
Part	Battery	Weight-(kg)	Lithium(g)
325902	L14.4 (48)	5.9	183
290-089501	L10/36 (15/20)	4.3	175
290-101665	L10/36 (18/30)	5.6	240
290-103053	L10/36 (15/40)	6.6	235
290-103179	L10/36 (15/40)	6.6	235
290-089505	L10/36 (36/60)	11.7	480
290-102726	L10/40 (3/11)	1.7	70
290-210845	L10/40 (3/11)	1.7	70
290-089010	L10/21 (6/12)	2.2	90
290-082380	L10/21 (6/48)	6.7	270
290-089592	L10/50 (12/42)	6.5	228
290-222071	L10/50 (27/28)	6.6	247
290-083530	L50/10/24	10	438
290-219492	L24 (98)	11	490
290-062447	L50	4.3	175
290-080718	L80	6.8	280

In case of hazardous events, the noxious gases are:

- Thionyl chloride (SOCl₂)
- Sulphur dioxide (SO₂)
- Hydrogen sulphide (H₂S)
- Hydrogen chloride (HCl)
- Chlorine (Cl₂)

First aid measures

All personnel that have been exposed to noxious gases must immediately seek medical help.

The battery will release toxic fumes if burned or exposed to fire. If subjected to gas from a burning sensor or battery, remove source of contamination or move victim to fresh air. Obtain medical advice.

- **Inhalation:** The chemicals are lung irritant. Remove yourself from exposure, rest, and keep warm.
- **Skin contact:** The chemicals are skin irritant. Wash off skin thoroughly with water. Remove contaminated clothing and wash it before reuse.
- **Eye contact:** The chemicals are eye irritant. Irrigate thoroughly with water for at least 15 minutes.
- **Ingestion:** Exposure to the chemicals may cause tissue damage to throat and gastro/respiratory tract if swallowed. Wash out mouth thoroughly with water and give plenty of water to drink. Seek medical advice.

Fire fighting measures

The transponder in which the battery pack is used is designed to withstand damage to the internal battery. Nonflammable materials are used. In case of fire, move the transponder away from the fire if you can do it without risk.

Extreme mechanical abuse to the transponder may result in ruptured seal, and expose the battery.

- 1 If possible, move the battery and/or the transponder away from the fire.
- 2 Cool it down using copious amounts of cold water.
 - a Immerse the battery and/or the transponder in the sea for minimum 24 hours.
 - b If this method is impossible, it can be cooled down with a fire hose.

Cooling down the battery with copious amount of cold water is the only way to reduce or stop the internal chemical reactions, or to limit the fire/explosions to as few battery cells as possible. The chemical reactions/fire will continue without additional supply of oxygen, so extinguisher like Lith-X will not work properly.

Applying water directly onto a battery may develop hydrogen gas, due to the possible electrolysis if the battery terminals are exposed to water. Mixed with air, this gas is very inflammable/explosive. However, if the water cooling takes place out on deck or in a storeroom with good ventilation, there will never be enough hydrogen gas to exceed the lower explosive limit of hydrogen in air (about 4%).

Note

In case of an external fire, always remove transponder units and lithium batteries.

Accidental release measures

During normal operation, accidental release measures are not applicable. Extreme mechanical abuse to the transponder in which the battery is used may however result in ruptured seal and exposure.

- 1 As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions.
- 2 Keep unauthorized personnel away.
- 3 Stay upwind, and keep out of low areas.
- 4 Ventilate closed areas before entering.
- 5 Wear adequate personal protective equipment.
- 6 Prevent material from contaminating soil and from entering sewers or waterways.
- 7 Stop the leak if safe to do so.
- 8 Contain the spilled liquid with dry sand or earth, and clean up spills immediately.
- 9 Absorb spilled material with an inert absorbent (dry sand or earth). Scoop contaminated absorbent into an acceptable waste container. Collect all contaminated absorbent and dispose of according to relevant regulations.
- 10 Scrub the area with detergent and water; collect all contaminated wash water for proper disposal.

Handling and storage

Correct storage and handling is required to avoid damage and reduce the battery lifetime.

- 1 Do not open, disassemble, crush or burn the battery.
- 2 Do not expose the battery to water, sea water or other high conductivity liquids.

- 3 Avoid mechanical or electrical abuse.
- 4 Do not expose the battery to temperatures outside the range of -40°C to 80°C.
- 5 Store the battery in a dry location.
Recommended relative air humidity is 40 to 70%.
To minimize any adverse effects on battery performance it is recommended that it is kept at room temperature (25°C +/- 5°C). Elevated temperatures can result in shortened life.
- 6 Do not store the battery in direct sunlight.
- 7 Keep the battery out of reach of children.

A suitable storage room is properly ventilated, it has sturdy racks with dedicated cradles for the batteries, and it must allow for easy removal of batteries in case of fire. The room must be designated and clearly identified as a storage area, and entrance should be restricted. The room must not be used as a general rest or work area.

Note

The storage room must have a sprinkler system or a fire station. A suitable fire hose (with water) must be placed outside or in the proximity of the room.

Exposure control and personal protection

Airborne exposures to hazardous substances are not expected when the battery is used for its intended purpose. No protection (respirator, skin and/or eye) are then required. If the battery is damaged, and you are exposed to the chemicals inside it, proper personal protection is required.

In the event of fire or physical damage to the battery, observe the mandatory rules for personal protection.

- **Fire or explosion:** Use self-contained breathing apparatus.
- **Exposure to noxious gas:** Use a full face mask with minimum BE-filter, and protective equipment of rubber or plastic.

Physical and chemical properties

The battery is solid with a firm and hard appearance. No chemicals are exposed during normal use and transportation.

The Subsea transponders battery pack is provided as a solid and sealed unit. The battery pack can not be opened to reveal the individual cells.

Stability and reactivity

During normal operational conditions, the battery is stable. No specific handling requirements apply.

In normal use, the battery pack is placed inside the sealed transponder. Water ingress into the transponder can cause dangerous situations.

Short-circuits, overheating, mechanical damage and exposure to water can start chemical reactions and high currents inside the transponder lithium battery. This can generate noxious gases and/or danger of explosions. The chemical reactions will continue without additional supply of oxygen, as the battery cells contain the necessary ingredients for maintaining the chemical reactions.

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- 6 Do not store the battery in direct sunlight.
- 7 Keep the battery out of reach of children.

Toxicological information

Acute oral, dermal and inhalation toxicity data are not available for this battery. Risk of irritation occurs only if the battery is abused to the point of breaking the container and opening it to reveal the individual cells.

In the event of exposure to internal contents, corrosive fumes with pungent odor will be very irritating to skin, eyes and mucous membranes. Overexposure can cause symptoms of non-fibrotic lung injury and membrane irritation.

- **Inhalation:** The chemicals are lung irritant. Remove yourself from exposure, rest, and keep warm.
- **Skin contact:** The chemicals are skin irritant. Wash off skin thoroughly with water. Remove contaminated clothing and wash it before reuse.
- **Eye contact:** The chemicals are eye irritant. Irrigate thoroughly with water for at least 15 minutes.
- **Ingestion:** Exposure to the chemicals may cause tissue damage to throat and gastro/respiratory tract if swallowed. Wash out mouth thoroughly with water and give plenty of water to drink. Seek medical advice.

Note

Eczema, skin allergies, lung injuries, asthma and other respiratory disorders may occur.

Ecological information

The battery is not biodegradable.

Provided that the battery pack is disposed of according to local regulations and/or law, it will not have any environmental impact.

Disposal considerations

The battery pack must be disposed of in accordance with local, state and federal laws and regulations for batteries.

A lithium thionyl chloride battery does not contain any heavy metals, and is therefore not regarded as special waste (contains only biodegradable parts).

A used transponder lithium battery often contains a significant amount of residual energy. It is the danger of explosion that presents a problem when disposing a battery. Used batteries must therefore be handled with the same care as new ones.

Note

For safe disposal, contact the nearest local company that has been approved to collect and dispose of lithium batteries.

Transport information

All transponders with a lithium battery and separate transponder lithium batteries must be shipped in accordance with the prevailing national regulations.

Observe the following regulations:

- **Lithium battery:** UN no. 3090, Class 9 Miscellaneous (Lithium batteries)
- **Transport:**
 - **Aircraft:** IATA DGR
 - **Sea:** IMDG Code
 - **Railway:** RID
 - **Road:** ADR

Original shipping boxes must be used for all transport.

Only new separate transponder lithium batteries can be transported by air.

Air transport of all transponders with new lithium battery, and new separate transponder lithium batteries, is only permitted on board cargo aircraft. The goods must be clearly labelled: CARGO AIRCRAFT ONLY.

Note

During transport a lithium battery must always be disconnected from the electronics.

Emergency procedures

Follow these procedures for transponders with lithium batteries with unknown or failing status. Always read these procedures before handling any lithium batteries.

Recovering a failing transponder

Always read the emergency procedures before handling lithium batteries.

Prerequisites

Handle a failing transponder as a possible water ingress.

Procedure

- 1 Evacuate all unnecessary people.
- 2 Recover the transponder with great caution using a crane. No people should be near the transponder when it is lifted up on deck.
- 3 Place the transponder in a safe place out on deck, shielded from people and vital equipment.
- 4 Fasten the transponder in a crane, ready to lower it into the sea again.
- 5 Control the transponder for minimum two hours. Check for damages that could involve a water leakage and check the housing

temperature for a possible temperature increase in the lithium battery.

- 6 For batteries with normal temperature: Take out the battery, see the emergency procedure for opening a transponder with a possible defect battery.
- 7 For batteries with increasing temperature: See the emergency procedure for handling a heated or self-heated transponder.

Handling a heated or self-heated transponder

Always read the emergency procedures before handling lithium batteries.

Procedure

- 1 Evacuate all unnecessary people.
- 2 Fasten the transponder to a rope and immerse in the sea for 24 hours or permanent. If this method is impossible, the transponder can be cooled with copious amounts of cold water using a fire hose.
- 3 Recover the transponder and control the temperature.
- 4 Repeat this until the temperature is low and stable.
- 5 Take out the battery, see the emergency procedure for opening a transponder with a possible defect battery.

Handling a transponder with an open relief valve

Always read the emergency procedures before handling lithium batteries.

Procedure

- 1 Evacuate all unnecessary people.
- 2 Use a full face mask with minimum BE-filter and protective equipment of rubber or plastic.
- 3 Fasten the transponder to a rope and immerse in the sea for 24 hours or permanent. If this method is impossible, the transponder can be cooled with copious amounts of cold water using a fire hose.
- 4 Repeat this until no gases come out the relief valve and the temperature is low and stable.
- 5 Take out the battery, see the emergency procedure for opening a transponder with a possible defect battery.
- 6 Wash out the chemical reaction products with water.

Opening a transponder with defect/possibly defect battery

Always read the emergency procedures before handling lithium batteries.

Procedure

- 1 Open the transponder in a safe place out on deck, shielded from people and vital equipment.
- 2 Use a full face mask with minimum BE-filter and protective equipment of rubber or plastic.

WARNING

Do not stand in front of the transducer or the bottom end cap when opening the transponder.

- 3 If there has been water ingress and the battery is still warm, disconnect the battery from the transponder electronics and study the procedure for handling a heated or warm separate battery.
- 4 Wash out the residues from the chemical reaction with water.

Handling heated or warm batteries

Always read the emergency procedures before handling lithium batteries.

Procedure

- 1 Evacuate all unnecessary people.
- 2 Fasten the battery to a rope and immerse it in the sea for 24 hours or permanent. If this is not possible, the battery can be cooled down with copious amounts of cold water using a fire hose.
- 3 Wash out the residues from the chemical reaction with water.

Handling transponders and separate transponder batteries in case of an external fire

Always read the emergency procedures before handling lithium batteries.

Procedure

- 1 Remove transponders with lithium batteries and separate transponder lithium batteries in case of an external fire if possible.
- 2 Cool down transponders and separate transponder batteries with copious amounts of cold water.
- 3 Cooling down the batteries with copious amount of cold water is the only way to reduce/stop the internal chemical reactions, or to limit the fire/explosions to as few battery cells as possible. The chemical reactions/fire will continue without additional supply of oxygen, so extinguishers like Lith-X will not work properly.