



THE EUROPEAN PORTABLE BATTERY ASSOCIATION

EPBA Safety Guidelines

Used correctly, domestic batteries are a safe and dependable source of portable power. Problems can occur if they are misused or abused – resulting in leakage or, in extreme cases, fire or explosion.

This document presents some simple guidelines addressed to the consumer for safe battery use designed to eliminate any such problems.

It also includes more technical product information which is relevant for the medical sector

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Information may be changed or updated without notice

Consumer Relevant

Battery Ingestion

Like all batteries, button cells and other small batteries perform a valuable function by supplying power to a broad range of portable products. Accidental ingestion of these batteries while rare, may lead to serious health consequences including death. Children with batteries lodged in the esophagus (food pipe) may experience severe, even permanent injury, requiring multiple surgical procedures and long term use of feeding and breathing tubes. Battery manufacturers are concerned about these events and committed to actions aimed at reducing their occurrence.

Specifically, battery manufacturers are

- Supporting the National Capital Poison Center in Washington DC, thereby helping conduct research, engage in education and outreach, and maintain a “Battery Hotline” for emergency assistance.
- Placing warning notices on packaging of ingestible size batteries (i.e. AA and smaller).
- Participating in the standards development process for battery-powered electronics and toys, with focus on making access to batteries harder for children, such as ensuring they are protected by screw-in plate.
- Working through International Electro-technical Commission, and other standard setting organizations to continuously improve battery construction and safety.

While most button cells are small enough to pass through the body without causing harm, button cells that are 20 mm and larger in diameter pose a specific risk particularly to children of becoming stuck in the esophagus. These larger button cells belong to the family of lithium batteries which are used in many devices such as toys, games, toy cell phones, remote controls, calculators, lights and book lights, lighted magnets, kitchen and bathroom scales, door openers/keys, talking books, musical greeting cards, dog collars, flashing pins, alarms, monitors, and key-chains. Device manufacturers have a responsibility to make the battery compartment child resistant for example screwed closed or opened only with a tool. Consumers too can help reduce the risk of ingestion by:

- Storing all small batteries out of sight and reach of young children.
- Making certain the battery compartment of any household product is securely closed and child-resistant (for example screwed shut), and/or the product is stored out of the reach of young children.
- Avoid storing small batteries in pillboxes or setting them out with medications. Their shape and size make them easily mistaken for medication.
- When changing a battery, never hold batteries in the mouth.

Battery ingestion is not pervasive, but it occurs in all age groups. The battery industry is committed to continuously monitoring the situation and implement additional measures within their control that will further help minimize this hazard.

Batteries placed in the nose, ear or other body orifices are also medical emergencies as severe tissue damage may result.

Medical Assistance

In the event of battery ingestion seek immediate medical attention at a hospital emergency room. Batteries lodged in the esophagus may cause severe damage in just 2 hours, so prompt removal is critical. Do not rely on symptoms as lodged batteries may be asymptomatic initially.

Further information is available by following the links below to national poison centres or at www.poison.org/battery.

WHO International Programme on Chemical Safety (IPCS) directory of poison centres: European Region

<http://www.who.int/ipcs/poisons/centre/directory/euro/en/>

§ Austria	§ Kazakhstan
§ Belarus	§ Latvia
§ Belgium	§ Lithuania
§ Bulgaria	§ Netherlands
§ Croatia	§ Norway
§ Czech Republic	§ Poland
§ Denmark	§ Portugal
§ Finland	§ Romania
§ France	§ Russian Federation
§ Georgia	§ Slovakia
§ Germany	§ Slovenia
§ Greece	§ Spain
§ Hungary	§ Sweden
§ Iceland	§ Switzerland
§ Ireland	§ Turkey
§ Israel	§ United Kingdom
§ Italy	

Medical Professional Relevant

Product Information:

Standardised Battery Electrochemical Systems (IEC EN 60086-1)

The following table contains information on commonly available battery chemistries in AA and smaller sizes.

Designation Letter	Negative Electrode	Electrolyte	Positive Electrode	Nominal Voltage V	Maximum Open Circuit Voltage V
No letter	Zinc (Zn)	Ammonium chloride, Zinc chloride	Manganese dioxide (MnO ₂)	1.5	1.73
C	Lithium (Li)	Organic electrolyte	Manganese dioxide (MnO ₂)	3.0	3.7
F	Lithium (Li)	Organic electrolyte	Iron disulfide (FeS ₂)	1.5	1.83
H	Mischmetal	Alkali metal hydroxide	Nickel hydroxide compound	1.2	N/A
L	Zinc (Zn)	Alkali metal hydroxide	Manganese dioxide (MnO ₂)	1.5	1.68
P	Zinc (Zn)	Alkali metal hydroxide	Oxygen (O ₂)	1.4	1.59
S	Zinc (Zn)	Alkali metal hydroxide	Silver oxide (Ag ₂ O)	1.55	1.63
Z	Zinc (Zn)	Alkali metal hydroxide	Nickel oxyhydroxide (NiOOH)	1.5	1.78

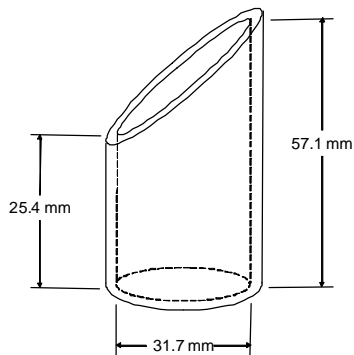
Typical Battery Ingredients

Designation Letter - Chemistry	Ingredients
No letter – Zinc carbon	Acetylene Black 3-7%; Ammonium Chloride 0-10%; Manganese Dioxide 15-31%; Zinc 7-42%; Zinc Chloride 2-10%
C – Lithium manganese dioxide – button cells	Manganese Dioxide 65-75%; Propylene Carbonate 10-15%; Lithium 5-10%; Graphite, synthetic 5-10%; 1,2-Dimethoxyethane 1-10%; Lithium Perchlorate <1.5%
C – Lithium manganese dioxide – cylindrical cells	Manganese Dioxide 15-45%; 1,2-Dimethoxyethane 5-10%; Propylene Carbonate 1-10%; Lithium 1-5%; Lithium Trifluoromethane Sulfonate 0-5%; Carbon Black 0-5%; Ethylene Carbonate 0-5%; Graphite 0-5%
F – Lithium iron disulfide	Carbon Black 0-4%; 1,2 Dimethoxyethane 2-4%; 1,3 Dioxolane 5-9% ; Graphite 0-4% ; Iron Disulfide 24-35%; Lithium or Lithium Alloy 6.7%; Lithium Iodide 0.3-3%
H – Nickel metal hydride	Aluminum <2%; Cobalt 2.5-6.0%; Lithium Hydroxide 0-4%; Mischmetal including: Lanthanum, Cerium, Neodymium, Praseodymium <13%; Nickel 30-50%; Potassium Hydroxide <7%; Sodium Hydroxide 0-4%; Zinc <3%
L – Alkaline manganese – button cells	

	Manganese Dioxide 25-30%; Potassium Hydroxide (35 %) 10-15%; Zinc 8-10%; Graphite (natural or synthetic) 2-3%; Mercury <1 %
L – Alkaline manganese – cylindrical cells	Manganese Dioxide 35-40%; Zinc 10-25%; Potassium Hydroxide (35 %) 5-10%; Graphite (natural or synthetic) 1-5 %
P – Zinc air	Zinc 30-50%; Potassium Hydroxide (35 %) 8-13%; Mercury <1.5%; Manganese Dioxide 0.5%
S – Silver oxide	Silver Oxide 27-40%; Zinc 7-11%; Potassium Hydroxide (35 %) 0-10%; Sodium Hydroxide 0-10%; Manganese Dioxide 0-3%; Mercury <1%
Z – Nickel metal hydroxide	Manganese Dioxide 20-30%; Nickel Oxyhydroxide 20-30%; Zinc 10-20 %; Water 5-15%; Potassium Hydroxide (35 %) 5-10%; Graphite (natural or synthetic) 2.5-4.5%

International Standards (IEC EN 60086-4, IEC EN 60086-5)

International safety standards use the following figure of a truncated cylinder to help define small batteries and identify those that are of concern for possible ingestion.



Batteries having dimensions within this cylinder are of concern and need special caution statements warning of the dangers of ingestion in the case of small children and to seek medical attention if ingestion occurs.

Standards also provide guidance to designers of devices using small batteries: "Battery compartments should be designed such that the battery compartment closure is mechanically retained or secured in such a way as to prevent access by children".

For any question please contact:

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