# IEC TR 60086-7

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# TECHNICAL REPORT

**Primary batteries -**
**Part 7: Coin/lithium button cell saline soak test simulating cell ingestion**

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IEC TR 60086-7 has been prepared by IEC technical committee 35: Primary cells and batteries. It is a Technical Report.

The text of this Technical Report is based on the following documents:

| Draft | Report on voting |
|---|---|
| 35/1597/DTR | 35/1605/RVDTR |

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 60086 series, published under the general title *Primary batteries*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,

– withdrawn, or

– revised.

# INTRODUCTION

Incidental ingestion of coin cells by infants has long been a social problem.

Coin cells are used in various household devices due to their size and convenience. In recent years, in particular, the spread of compact devices has increased the opportunities for infants to come into contact with coin cells in the home. The size and shape of coin cells are attractive to young children, encouraging ingestion incidents.

Coin cells easily become lodged in the oesophagus due to their size and shape. When a coin cell enters the body, a current flow via the body fluid occurs and a discharge reaction takes place. This discharge causes electrolysis of body fluids and generates hydroxide ions. The amount of hydroxide ions is proportional to the consumed capacity. As the concentration of hydroxide ions increases, the body fluid becomes a strong alkaline solution. This can lead to chemical burns, perforation of soft tissue, and, in severe cases, can cause death.

According to data from the US National Capital Poison Center, the percentage of serious consequences (moderate, serious, or fatal) among mishaps responded to by cell medical institutions has been on the rise since 2015. In addition, lithium coin cells with a diameter of 20 mm are easily jammed in the oesophagus, and of the 71 fatalities that have occurred in the past, the CR2032 type has been the most common. The survey results from 1977 to 2022 are available at https://www.poison.org/battery/fatalcases.

As one of the efforts to reduce incidents involving incidental ingestion of coin cells, the development of technology to suppress the effects of incidental ingestion on the human body is an issue for the future. However, at present, there is no method to quantitatively evaluate the degree of effect on the living body, and thus the development of such technology has not progressed.

In light of this situation, this test attempts to estimate the damage to a living body by measuring the consumption and discharge capacity of a coin cell in physiological saline solution, simulating the phenomenon that occurs in a living body.

This document is primarily intended to be used by

– battery manufacturers;
– equipment manufacturers;
– designers;
– standard writers;
– consumer organizations;

This document may also be of assistance to

– medical professionals;
– educational authorities;
– users;
– regulatory authorities.

## 1 Scope

This part of IEC 60086, which is a technical report, provides a procedure to indirectly assess coin cells for their potential to cause internal injury if ingested.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60086-1:2026, *Primary batteries - Part 1: General*

IEC 60086-4:2025, *Primary batteries - Part 4: Safety of lithium batteries*

ISO/IEC Guide 51:2014, *Safety aspects — Guidelines for their inclusion in standards*

# Bibliography

[1] IEC 60050-482:2004, *International Electrotechnical Vocabulary (IEV) - Part 482: Primary and secondary cells and batteries*

[2] IEC 60086-5, *Primary batteries - Part 5: Safety of batteries with aqueous electrolyte*

[3] ISO/IEC Guide 51:2014, *Safety aspects — Guidelines for their inclusion in standards*

[4] IEC 60086-2-2:2026, *Primary batteries - Part 2-2: Physical and electrical specifications of lithium batteries*

[5] Juran’s Quality Control Handbook, 4th Edition

[6] Ohashi S, Kanamori D, Kaji S, et al. (October 16, 2024) Histopathological Analysis of Esophageal Damage Caused by Coin-Shaped Lithium Batteries in Living Piglets. Cureus 16(10): e71598. doi:10.7759/cureus.71598. https://www.cureus.com/articles/296278-histopathological-analysis-of-esophageal-damage-caused-by-coin-shaped-lithium-batteries-in-living-piglets#!/