IEC TR 60086-7

Edition 1.0 2026-10

TECHNICAL REPORT

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

ICS 29.220.10

ISBN 978-2-8327-1341-9

IEC TR 60086-7:2026-10(en)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2026 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD 2
INTRODUCTION 4
1 Scope 5
2 Normative references 5
3 Terms and definitions 5
4 Saline soak test simulating cell ingestion 6
4.1 Cautionary notice 6
4.2 Parameter measurement tolerances 7
4.3 Preparation 7
4.4 Ambient temperature 7
4.5 Test procedure 8
5 Example of execution 9
5.1 Actual operation 9
5.2 Test result 9
5.3 Test summary 9
6 Assessment 10
6.1 Validity of this test 10
6.2 Conclusions and recommendations 10
6.3 Reservations 11
Bibliography 12

Figure 1 – Saline soak test 8
Figure 2 – Discharge capacity distribution 9

Table 1 – Items used in the test 7
Table 2 – Consumed capacity calculation in three companies 10

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

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

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60086-1:2026, IEC 60086-4:2025, ISO/IEC Guide 51:2014 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

– IEC Electropedia: available at https://www.electropedia.org/

– ISO Online browsing platform: available at https://www.iso.org/obp

3.1
cell
basic functional unit, consisting of an assembly of electrodes, electrolyte, container, terminals and usually separators, that is a source of electric energy obtained by direct conversion of chemical energy

[SOURCE: IEC 60050-482:2004 [1], 482-01-01]

3.2
battery
one or more cells electrically connected and fitted in a case, with terminals, markings, protective devices etc., as necessary for use

[SOURCE: IEC 60050-482:2004 [1], 482-01-04, modified – "fitted with devices necessary for use, for example case" replaced by "electrically connected and fitted in a case", addition of "etc., as necessary for use".]

3.3
coin cell
coin battery
lithium button cell
lithium button battery
small round cell or battery where the overall height is less than the diameter, containing non-aqueous electrolyte

Note 1 to entry: The nominal voltage of lithium batteries is typically greater than 2 V. See also the definition of "button cell" in IEC 60086-5 [2].