



IEC 60086-4

Edition 5.0 2019-04  
REDLINE VERSION

# INTERNATIONAL STANDARD



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**Primary batteries –  
Part 4: Safety of lithium batteries**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**IEC 60086-4**  
Edition 5.0 2019-04

**PRIMARY BATTERIES –**

**Part 4: Safety of lithium batteries**

**INTERPRETATION SHEET 1**

This interpretation sheet has been prepared by IEC technical committee 35: Primary cells and batteries.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
35/1445/DISH	35/1448/RVDISH

Full information on the voting for the approval of this interpretation sheet can be found in the report on voting indicated in the above table.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

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**Question 1**

In looking at IEC 60086-4 Edition 5.0 2019-04, I thought it was difficult to understand all of the marking requirements for swallowable batteries as well as the purpose of those requirements. Could you provide a detailed explanation?

**Answer 1**

The following list of statements reflects the intention of Table 9 and presents an interpretation of certain parts of Clause 9, and Annex F:

- a) Table 9 is intended to summarize requirements that are found in the text, namely in 7.2 a), 9.1 and 9.2, and in Annex F.

- b) The structure of table 9 is similar to the list in 9.1 (items "a" to "f") and 9.2 (items "a" thru "b").
- c) From item a) in 9.2 it is not clear what exactly is required to appear on the packaging and what on the battery: the safety sign alone (Table D.1 item E, or Figure F.1) or the complete product safety label (Figure 9).

The purpose of measures to prevent accidental ingestion of batteries is to eliminate the opportunity for children to get stuck batteries in the oesophagus.

The battery that requires measures to prevent accidental ingestion is a swallowable battery size which fits within the limits of the ingestion gauge and is applied to direct sale in consumer-replaceable applications in which children have opportunity to contact swallowable batteries.

There is no description requiring the marking of Caution for ingestion on battery/cell with a diameter of 20 mm or more in the text. However, due to the consideration of measures to prevent accidental ingestion, it was determined that the marking of Caution for ingestion on a battery/cell with a diameter of 20 mm or more is needed and its requirement is shown in Table 9. Therefore, a pictogram must be engraved as a substitute of Caution for ingestion due to a battery/cell with a diameter of 20 mm or more having no space to display the marking.

The type of "caution for ingestion" that is required on the immediate packaging of swallowable batteries is one of the safety signs as shown in Figure F.1. Where there is enough space on the packaging, additional information per Figure 9 (the safety label or only its text) can be printed on the packaging or accompanying safety information about battery handling.

Table 1 of this Interpretation Sheet summarizes the requirements for marking of lithium button cells.

**Table 1 – Marking requirements for swallowable batteries**

Diameter	Requirement(s)
$d < 16 \text{ mm}$	Cautionary advice in the form of the words KEEP OUT OF REACH OF CHILDREN or the safety symbol E of Table D.1 on the immediate packaging.
$16 \text{ mm} \leq d < 20 \text{ mm}$	Child resistant packaging and cautionary advice in the form of the words KEEP OUT OF REACH OF CHILDREN or the safety symbol E of Table D.1 on the immediate packaging.
$d \geq 20 \text{ mm}$	Child resistant packaging, cautionary advice in the form of the words KEEP OUT OF REACH OF CHILDREN or the safety symbol E of Table D.1 on the immediate packaging, and the safety symbol E of Table D.1 on the positive side of the battery.
NOTE If applicable, the cautionary advice in the form of words should appear in one or more languages as appropriate for the market on which the cells and batteries are placed.	

**Question 2**

From 9.2 and in particular 9.2 a), it is not clear which kind of batteries are intended for direct sale in consumer-replaceable applications?

**Answer 2**

The kind of batteries that are included are those with general packaging such as blister packs sold in stores and on the internet, batteries packed with equipment and batteries which are contained in equipment and can be replaced by the consumer.

**Question 3**

Annex F is marked as "Informative", however "requirements" is stated in the title of Table 9. When referring to Table 9, do we have to consider Annex F as "normative" ?

**Answer 3**

Annex F contains supplementary material, the main text in the body of the standard takes priority over it. Therefore, even if Annex F is informative, the content listed in Table 9 has to be considered as requirements.

**Question 4**

In E.3.2 b), it is difficult to understand the test method of the torsion test. It is not clear how to twist "three times in both directions".

**Answer 4**

Following is an explanation how and how many times to twist the packaging and in which order to proceed.

① First time – Hold the packaging with the fingers of one hand on each of its shorter sides from the state of 0 degrees (neutral state without torsion). Twist it diagonally with a torsion angle of 45° in opposite directions as shown in Figure E.2.

② Second time – Twist it diagonally 90° (45° back + 45° opposite direction) in opposite directions to the direction twisted at the first time

③ Third time – Return to neutral state without torsion (45° back)

④ Movements ①, ② and ③ are counted as 1 time (1 reciprocation) and are repeated 25 times (25 reciprocations).

Figure 1 of this Interpretation Sheet shows the movements of the torsion test. The red and blue lines represent the left and right edge of the packaging. The triangles and circles were added to keep track of the orientation during movements.

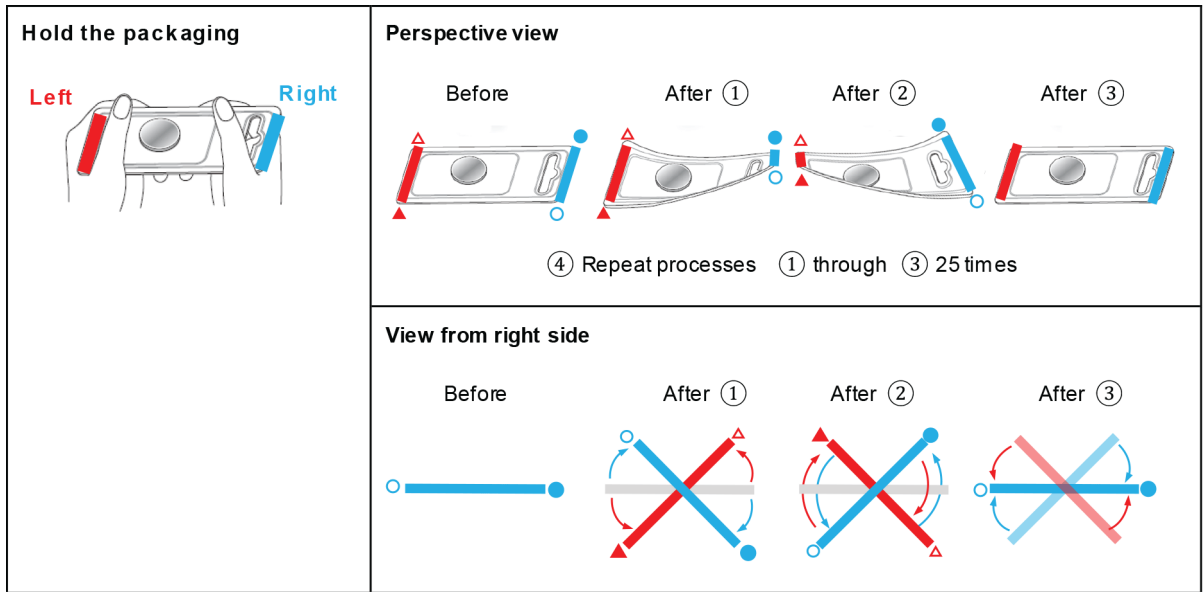


Figure 1 – Torsion test

**Question 5**

From 9.2 b), Table 9, and Annex E, it is not clear what the transition period is for the requirement of "Child resistant package" ?

**Answer 5**

The transition period is the same as Marking and packaging requirements, namely 2 years from the publication date of the fifth edition of IEC 60086-4.

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**PRIMARY BATTERIES –****Part 4: Safety of lithium batteries****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.
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- 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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

**This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

International Standard IEC 60086-4 has been prepared by technical committee 35: Primary cells and batteries.

This fifth edition cancels and replaces the fourth edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Revised criteria for an explosion;
- b) Addition of test parameters for the overdischarge test of battery types FR14505 and FR10G445;
- c) Addition of a new subclause 5.1 Validity of Testing;
- d) revised pictogram E in Table D.1;
- e) Addition of Annex E with requirements for child resistant packaging of coin cells;
- f) Addition of Annex F with recommendations on the use of the KEEP OUT OF REACH OF CHILDREN safety sign.

The text of this standard is based on the following documents:

FDIS	Report on voting
35/1420/FDIS	35/1423/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

NOTE The following print types are used:

- instructions/warnings for consumers: *in italic type*.

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of the corrigendum of October 2019 and Interpretation sheet of May 2020 have been included in this copy. The contents of the corrigendum of April 2020 apply to the French version only.

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## INTRODUCTION

The concept of safety is closely related to safeguarding the integrity of people and property. This document specifies tests and requirements for lithium batteries and has been prepared in accordance with ISO/IEC guidelines, taking into account all relevant national and international standards which apply.

Lithium batteries are different from conventional primary batteries using aqueous electrolyte in that they contain flammable materials.

Consequently, it is important to carefully consider safety during design, production, distribution, use, and disposal of lithium batteries. Based on such special characteristics, lithium batteries for consumer applications were initially small in size and had low power output. There were also lithium batteries with high power output which were used for special industrial and military applications and were characterized as being “technician replaceable”. The first edition of this document was drafted to accommodate this situation.

However, from around the end of the 1980s, lithium batteries with high power output started to be widely used in the consumer replacement market, mainly as a power source in camera applications. Since the demand for such lithium batteries with high power output significantly increased, various manufacturers started to produce these types of lithium batteries. As a consequence of this situation, the safety aspects for lithium batteries with high power output were included in the second edition of this document.

Primary lithium batteries both for consumer and industrial applications are well-established safe and reliable products in the market, which is at least partly due to the existence of safety standards such as this document and, for transport, IEC 62281. The fourth edition of this document therefore reflects only minor changes which became necessary in order to keep it harmonized with IEC 62281 and to continuously improve the user information about safety related matters.

Guidelines addressing safety issues during the design of lithium batteries are provided in Annex A. Annex B provides guidelines addressing safety issues during the design of equipment where lithium batteries are installed. Both Annex A and B reflect experience with lithium batteries used in camera applications and are based on [23]<sup>1</sup>.

Safety is freedom from unacceptable risk. There can be no absolute safety: some risk will remain. Therefore a product, process or service can only be relatively safe. Safety is achieved by reducing risk to a tolerable level determined by the search for an optimal balance between the ideal of absolute safety and the demands to be met by a product, process or service, and factors such as benefit to the user, suitability for purpose, cost effectiveness, and conventions of the society concerned.

As safety will pose different problems, it is impossible to provide a set of precise provisions and recommendations that will apply in every case. However, this document, when followed on a judicious “use when applicable” basis, will provide reasonably consistent standards for safety.

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<sup>1</sup> Numbers in square brackets refer to the bibliography.

## PRIMARY BATTERIES –

### Part 4: Safety of lithium batteries

#### 1 Scope

This part of IEC 60086 specifies tests and requirements for primary lithium batteries to ensure their safe operation under intended use and reasonably foreseeable misuse.

NOTE Primary lithium batteries that are standardized in IEC 60086-2 are expected to meet all applicable requirements herein. It is understood that consideration of this part of IEC 60086 might also be given to measuring and/or ensuring the safety of non-standardized primary lithium batteries. In either case, no claim or warranty is made that compliance or non-compliance with this standard will fulfil or not fulfil any of the user's particular purposes or needs.

#### 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:~~2014~~, *Primary batteries – Part 1: General*

IEC 60086-2, *Primary batteries – Part 2: Physical and electrical specifications*

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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**Primary batteries –  
Part 4: Safety of lithium batteries**

**Piles électriques –  
Partie 4: Sécurité des piles au lithium**

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**IEC 60086-4**  
Edition 5.0 2019-04

**PRIMARY BATTERIES –**

**Part 4: Safety of lithium batteries**

**INTERPRETATION SHEET 1**

This interpretation sheet has been prepared by IEC technical committee 35: Primary cells and batteries.

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**Question 1**

In looking at IEC 60086-4 Edition 5.0 2019-04, I thought it was difficult to understand all of the marking requirements for swallowable batteries as well as the purpose of those requirements. Could you provide a detailed explanation?

**Answer 1**

The following list of statements reflects the intention of Table 9 and presents an interpretation of certain parts of Clause 9, and Annex F:

- a) Table 9 is intended to summarize requirements that are found in the text, namely in 7.2 a), 9.1 and 9.2, and in Annex F.

- b) The structure of table 9 is similar to the list in 9.1 (items "a" to "f") and 9.2 (items "a" thru "b").
- c) From item a) in 9.2 it is not clear what exactly is required to appear on the packaging and what on the battery: the safety sign alone (Table D.1 item E, or Figure F.1) or the complete product safety label (Figure 9).

The purpose of measures to prevent accidental ingestion of batteries is to eliminate the opportunity for children to get stuck batteries in the oesophagus.

The battery that requires measures to prevent accidental ingestion is a swallowable battery size which fits within the limits of the ingestion gauge and is applied to direct sale in consumer-replaceable applications in which children have opportunity to contact swallowable batteries.

There is no description requiring the marking of Caution for ingestion on battery/cell with a diameter of 20 mm or more in the text. However, due to the consideration of measures to prevent accidental ingestion, it was determined that the marking of Caution for ingestion on a battery/cell with a diameter of 20 mm or more is needed and its requirement is shown in Table 9. Therefore, a pictogram must be engraved as a substitute of Caution for ingestion due to a battery/cell with a diameter of 20 mm or more having no space to display the marking.

The type of "caution for ingestion" that is required on the immediate packaging of swallowable batteries is one of the safety signs as shown in Figure F.1. Where there is enough space on the packaging, additional information per Figure 9 (the safety label or only its text) can be printed on the packaging or accompanying safety information about battery handling.

Table 1 of this Interpretation Sheet summarizes the requirements for marking of lithium button cells.

**Table 1 – Marking requirements for swallowable batteries**

Diameter	Requirement(s)
$d < 16 \text{ mm}$	Cautionary advice in the form of the words KEEP OUT OF REACH OF CHILDREN or the safety symbol E of Table D.1 on the immediate packaging.
$16 \text{ mm} \leq d < 20 \text{ mm}$	Child resistant packaging and cautionary advice in the form of the words KEEP OUT OF REACH OF CHILDREN or the safety symbol E of Table D.1 on the immediate packaging.
$d \geq 20 \text{ mm}$	Child resistant packaging, cautionary advice in the form of the words KEEP OUT OF REACH OF CHILDREN or the safety symbol E of Table D.1 on the immediate packaging, and the safety symbol E of Table D.1 on the positive side of the battery.
NOTE If applicable, the cautionary advice in the form of words should appear in one or more languages as appropriate for the market on which the cells and batteries are placed.	

**Question 2**

From 9.2 and in particular 9.2 a), it is not clear which kind of batteries are intended for direct sale in consumer-replaceable applications?

**Answer 2**

The kind of batteries that are included are those with general packaging such as blister packs sold in stores and on the internet, batteries packed with equipment and batteries which are contained in equipment and can be replaced by the consumer.

**Question 3**

Annex F is marked as "Informative", however "requirements" is stated in the title of Table 9. When referring to Table 9, do we have to consider Annex F as "normative" ?

**Answer 3**

Annex F contains supplementary material, the main text in the body of the standard takes priority over it. Therefore, even if Annex F is informative, the content listed in Table 9 has to be considered as requirements.

**Question 4**

In E.3.2 b), it is difficult to understand the test method of the torsion test. It is not clear how to twist "three times in both directions".

**Answer 4**

Following is an explanation how and how many times to twist the packaging and in which order to proceed.

① First time – Hold the packaging with the fingers of one hand on each of its shorter sides from the state of 0 degrees (neutral state without torsion). Twist it diagonally with a torsion angle of 45° in opposite directions as shown in Figure E.2.

② Second time – Twist it diagonally 90° (45° back + 45° opposite direction) in opposite directions to the direction twisted at the first time

③ Third time – Return to neutral state without torsion (45° back)

④ Movements ①, ② and ③ are counted as 1 time (1 reciprocation) and are repeated 25 times (25 reciprocations).

Figure 1 of this Interpretation Sheet shows the movements of the torsion test. The red and blue lines represent the left and right edge of the packaging. The triangles and circles were added to keep track of the orientation during movements.



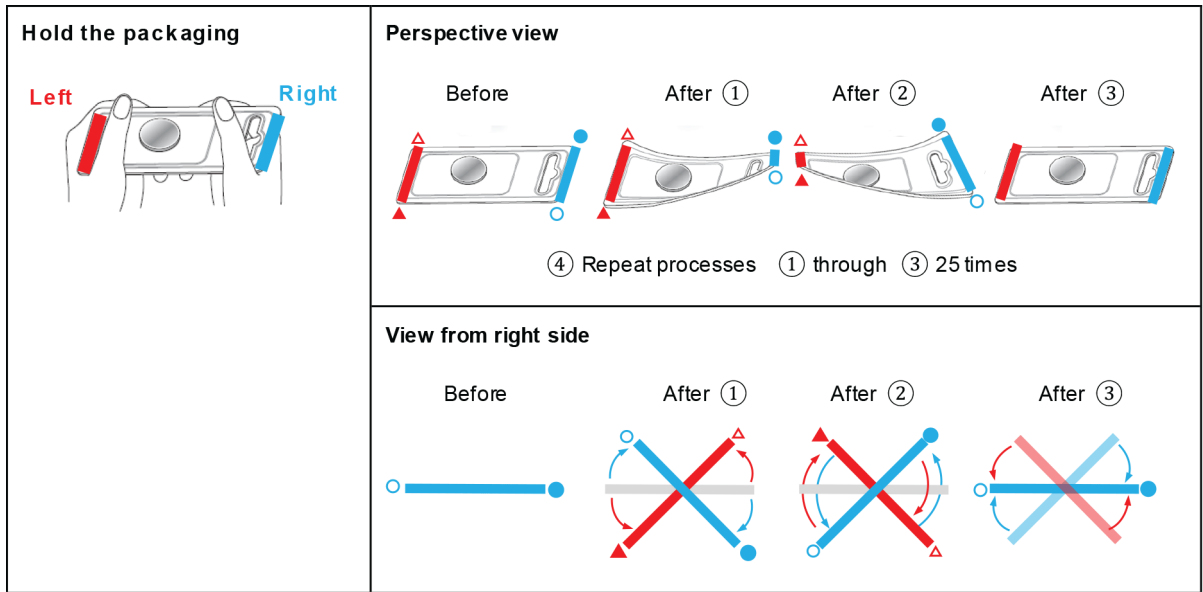


Figure 1 – Torsion test

**Question 5**

From 9.2 b), Table 9, and Annex E, it is not clear what the transition period is for the requirement of "Child resistant package" ?

**Answer 5**

The transition period is the same as Marking and packaging requirements, namely 2 years from the publication date of the fifth edition of IEC 60086-4.

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**PRIMARY BATTERIES –****Part 4: Safety of lithium batteries****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.
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International Standard IEC 60086-4 has been prepared by technical committee 35: Primary cells and batteries.

This fifth edition cancels and replaces the fourth edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Revised criteria for an explosion;
- b) Addition of test parameters for the overdischarge test of battery types FR14505 and FR10G445;
- c) Addition of a new subclause 5.1 Validity of Testing;
- d) revised pictogram E in Table D.1;
- e) Addition of Annex E with requirements for child resistant packaging of coin cells;

- f) Addition of Annex F with recommendations on the use of the KEEP OUT OF REACH OF CHILDREN safety sign.

The text of this standard is based on the following documents:

FDIS	Report on voting
35/1420/FDIS	35/1423/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

NOTE The following print types are used:

- instructions/warnings for consumers: *in italic type*.

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of the corrigendum of October 2019 and the Interpretation sheet of May 2020 have been included in this copy. The contents of the corrigendum of April 2020 apply to the French version only.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

The concept of safety is closely related to safeguarding the integrity of people and property. This document specifies tests and requirements for lithium batteries and has been prepared in accordance with ISO/IEC guidelines, taking into account all relevant national and international standards which apply.

Lithium batteries are different from conventional primary batteries using aqueous electrolyte in that they contain flammable materials.

Consequently, it is important to carefully consider safety during design, production, distribution, use, and disposal of lithium batteries. Based on such special characteristics, lithium batteries for consumer applications were initially small in size and had low power output. There were also lithium batteries with high power output which were used for special industrial and military applications and were characterized as being “technician replaceable”. The first edition of this document was drafted to accommodate this situation.

However, from around the end of the 1980s, lithium batteries with high power output started to be widely used in the consumer replacement market, mainly as a power source in camera applications. Since the demand for such lithium batteries with high power output significantly increased, various manufacturers started to produce these types of lithium batteries. As a consequence of this situation, the safety aspects for lithium batteries with high power output were included in the second edition of this document.

Primary lithium batteries both for consumer and industrial applications are well-established safe and reliable products in the market, which is at least partly due to the existence of safety standards such as this document and, for transport, IEC 62281. The fourth edition of this document therefore reflects only minor changes which became necessary in order to keep it harmonized with IEC 62281 and to continuously improve the user information about safety related matters.

Guidelines addressing safety issues during the design of lithium batteries are provided in Annex A. Annex B provides guidelines addressing safety issues during the design of equipment where lithium batteries are installed. Both Annex A and B reflect experience with lithium batteries used in camera applications and are based on [23]<sup>1</sup>.

Safety is freedom from unacceptable risk. There can be no absolute safety: some risk will remain. Therefore a product, process or service can only be relatively safe. Safety is achieved by reducing risk to a tolerable level determined by the search for an optimal balance between the ideal of absolute safety and the demands to be met by a product, process or service, and factors such as benefit to the user, suitability for purpose, cost effectiveness, and conventions of the society concerned.

As safety will pose different problems, it is impossible to provide a set of precise provisions and recommendations that will apply in every case. However, this document, when followed on a judicious “use when applicable” basis, will provide reasonably consistent standards for safety.

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<sup>1</sup> Numbers in square brackets refer to the bibliography.

## **PRIMARY BATTERIES –**

### **Part 4: Safety of lithium batteries**

#### **1 Scope**

This part of IEC 60086 specifies tests and requirements for primary lithium batteries to ensure their safe operation under intended use and reasonably foreseeable misuse.

NOTE Primary lithium batteries that are standardized in IEC 60086-2 are expected to meet all applicable requirements herein. It is understood that consideration of this part of IEC 60086 might also be given to measuring and/or ensuring the safety of non-standardized primary lithium batteries. In either case, no claim or warranty is made that compliance or non-compliance with this standard will fulfil or not fulfil any of the user's particular purposes or needs.

#### **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, *Primary batteries – Part 1: General*

IEC 60086-2, *Primary batteries – Part 2: Physical and electrical specifications*



COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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**IEC 60086-4**  
Edition 5.0 2019-04

**PILES ÉLECTRIQUES –**

**Partie 4: Sécurité des piles au lithium**

**FEUILLE D'INTERPRÉTATION 1**

Cette feuille d'interprétation a été établie par le comité d'études 35 de l'IEC: Piles.

Le texte de cette feuille d'interprétation est issu des documents suivants:

DISH	Rapport de vote
35/1445/DISH	35/1448/RVDISH

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette feuille d'interprétation.

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**Question 1**

En examinant l'IEC 60086-4 Édition 5.0 2019-04, j'ai pensé qu'il était difficile de comprendre toutes les exigences de marquage pour les piles susceptibles d'être ingérées, ainsi que le but de ces exigences. Pouvez-vous fournir des explications détaillées?

**Réponse 1**

La liste d'énoncés suivante reflète l'objet du Tableau 9 et présente une interprétation de certaines parties de l'Article 9 et de l'Annexe F:

- a) Le Tableau 9 vise à résumer les exigences contenues dans le texte, à savoir en 7.2 a), 9.1 et 9.2, et à l'Annexe F.
- b) La structure du tableau 9 est similaire à celle de la liste figurant en 9.1 (points "a" à "f") et en 9.2 (points "a" à "b").
- c) Le point a) du 9.2 ne permet pas de savoir exactement ce qui doit figurer sur l'emballage et sur la pile : le signe de sécurité seul (Tableau D.1, point E, ou Figure F.1) ou l'étiquette de sécurité complète du produit (Figure 9).

L'objet des mesures visant à prévenir l'ingestion accidentelle de piles est d'éliminer la possibilité pour les enfants de se retrouver avec des piles coincées dans l'œsophage.

La pile exigeant des mesures pour prévenir l'ingestion accidentelle est une pile susceptible d'être ingérée, dont la taille correspond aux limites du gabarit d'ingestion et qui est appliquée à la vente directe dans des applications remplaçables par le consommateur, dans lesquelles les enfants ont la possibilité d'accéder aux piles avec risque d'ingestion.

Il ne figure pas, dans le texte, de description exigeant le marquage de Mise en garde contre l'ingestion sur la pile ou l'élément de diamètre minimal de 20 mm. Toutefois, compte tenu de l'examen des mesures visant à prévenir l'ingestion accidentelle, il a été déterminé que le marquage de "Mise en garde contre l'ingestion sur une pile ou un élément de diamètre minimal de 20 mm est nécessaire et l'exigence correspondante figure dans le Tableau 9. Par conséquent, un pictogramme doit être gravé en remplacement de la Mise en garde contre l'ingestion due à une pile ou un élément de diamètre minimal de 20 mm, qui ne dispose pas d'espace suffisant pour apposer le marquage.

Le type de "Mise en garde contre l'ingestion" qui doit figurer sur l'emballage immédiat des piles risquant d'être ingérées constitue l'un des signes de sécurité, comme le l'indique la Figure F.1. Si l'emballage dispose de suffisamment d'espace, des informations supplémentaires selon la Figure 9 (l'étiquette de sécurité ou seulement son texte) peuvent être imprimées sur l'emballage ou les informations de sécurité connexes portant sur la manipulation des piles.

Le Tableau 1 de la présente Feuille d'Interprétation résume les exigences relatives au marquage des piles boutons au lithium.

**Tableau 1 – Exigences de marquage relatives aux piles susceptibles d'être ingérées**

Diamètre	Exigence(s)
d < 16 mm	Consigne de prudence formulée par la mention TENIR HORS DE PORTÉE DES ENFANTS ou le symbole de sécurité E du Tableau D.1 sur l'emballage immédiat.
16 mm ≤ d < 20 mm	Emballage à l'épreuve des enfants et consigne de prudence formulée par la mention TENIR HORS DE PORTÉE DES ENFANTS ou le symbole de sécurité E du Tableau D.1 sur l'emballage immédiat.
d ≥ 20 mm	Emballage à l'épreuve des enfants, consigne de prudence formulée par la mention TENIR HORS DE PORTÉE DES ENFANTS ou le symbole de sécurité E du Tableau D.1 sur l'emballage immédiat, et le symbole de sécurité E du Tableau D.1 sur le côté positif de la pile.
NOTE Le cas échéant, il convient que la consigne de prudence sous forme rédigée apparaisse dans une ou plusieurs langues selon le marché sur lequel sont commercialisées les piles et batteries.	

**Question 2**

Au point 9.2 et en particulier au point 9.2 a), il n'est pas aisé de saisir clairement quels types de piles sont destinés à la vente directe dans des applications de remplacement par les consommateurs?

**Réponse 2**

Les piles dont il est question sont celles comportant un emballage ordinaire, tel que les blisters, en vente dans les magasins et sur Internet, les piles contenues dans l'emballage de l'équipement correspondant et les piles intégrées dans l'équipement et qui peuvent être remplacées par le consommateur.

**Question 3**

L'Annexe F est indiquée comme étant "Informatif"; toutefois, la mention "exigences" figure dans le titre du Tableau 9. S'agissant du Tableau 9, faut-il considérer l'Annexe F comme étant "normative"?

**Réponse 3**

L'annexe F contient des éléments supplémentaires; le texte principal figurant dans le corps de la norme prévaut sur ceux-ci. Par conséquent, même si l'Annexe F est informative, le contenu figurant dans le Tableau 9 doit être considéré comme étant des exigences.

**Question 4**

Dans l'E.3.2 b), la méthode d'essai de torsion est difficilement compréhensible. La méthode consistant à tordre l'emballage "trois fois dans les deux sens" n'est pas claire.

**Réponse 4**

Les instructions ci-après précisent la méthode et le nombre de torsions de l'emballage et dans quel l'ordre procéder.

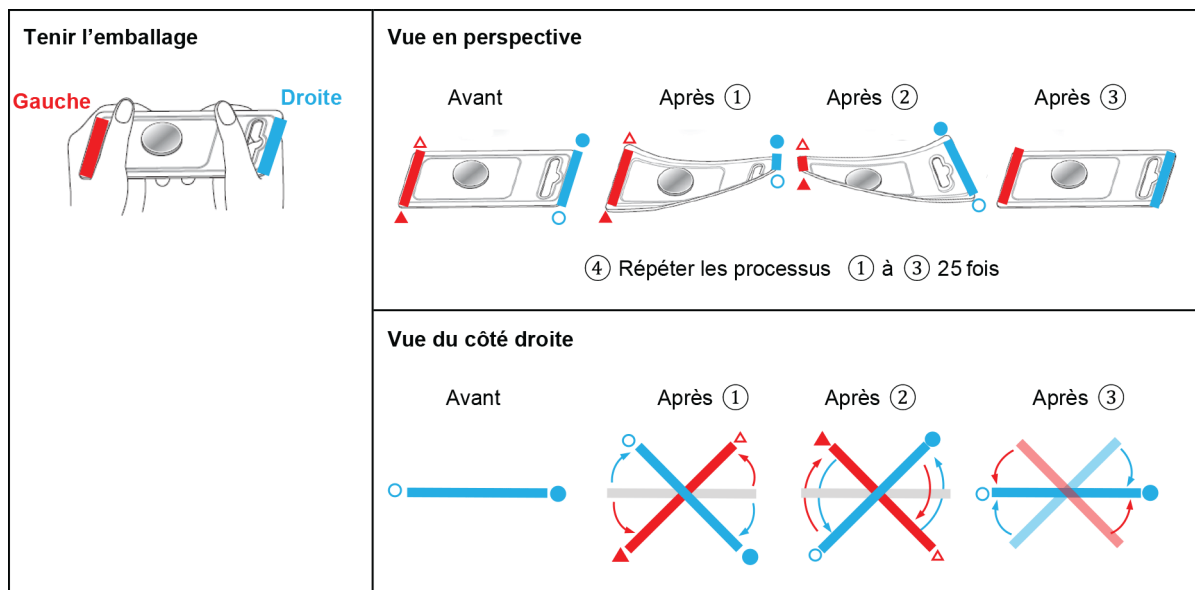
① Première fois – Tenir l'emballage avec les doigts d'une main sur chaque côté court en partant de l'état de 0 degré (état neutre sans torsion). Tordre l'emballage suivant sa diagonale en appliquant un angle de torsion de 45° dans les sens opposés, comme cela est représenté à la Figure E.2.

② Deuxième fois – Tordre l'emballage suivant sa diagonale en appliquant un angle de 90° (45° vers l'arrière + 45° dans le sens opposé) dans des directions opposées à celle de la première torsion

③ Troisième fois - Retour à l'état neutre sans torsion (45° vers l'arrière)

④ Les mouvements ①, ② et ③ sont comptés comme 1 fois (1 réciprocity) et sont répétés 25 fois (25 réciprocitys).

La Figure 1 de la présente feuille d'Interprétation représente les mouvements de l'essai de torsion. Les lignes rouges et bleues représentent le bord gauche et le bord droite de l'emballage. Les triangles et les cercles ont été ajoutés pour repérer l'orientation pendant les mouvements.



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**Figure 1 – Essai de torsion**

**Question 5**

D'après le 9.2 b), le Tableau 9 et l'annexe E, il n'est pas facile de déterminer quelle est la période de transition concernant l'exigence portant sur les "emballages à l'épreuve des enfants" ?

**Réponse 5**

La durée de transition est la même que pour les exigences portant sur le marquage et l'emballage, à savoir 2 ans à compter de la date de publication de la cinquième édition de l'IEC 60086-4.

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# COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

## PILES ÉLECTRIQUES –

### Partie 4: Sécurité des piles au lithium

#### AVANT-PROPOS

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- 9) L'attention est attirée sur le fait que certains des éléments de la présente publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et averti de leur existence.

La Norme internationale IEC 60086-4 a été établie par le comité d'études 35 de l'IEC: Piles.

Cette cinquième édition annule et remplace la quatrième édition parue en 2014 dont elle constitue une révision technique.

La présente édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) Mise à jour des critères pour une explosion;
- b) Ajout de paramètres pour l'essai de décharge excessive des piles des types FR14505 et FR10G445;
- c) Ajout d'un nouveau paragraphe 5.1 Validité des essais;
- d) mise à jour du pictogramme E dans le Tableau D.1;



- e) Ajout de l'Annexe E avec des exigences relatives aux emballages à l'épreuve des enfants d'éléments de type bouton;
- f) Ajout de l'Annexe F avec des recommandations sur l'utilisation du signal de sécurité TENIR HORS DE PORTEE DES ENFANTS.

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
35/1420/FDIS	35/1423/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Cette publication a été rédigée selon les Directives ISO/IEC, Partie 2.

NOTE Les caractères d'imprimerie suivants sont utilisés:

- instructions/avertissements pour les consommateurs: *en caractères italiques*.

Une liste de toutes les parties de la série IEC 60086, publiées sous le titre général *Piles électriques*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "<http://webstore.iec.ch>" dans les données relatives à la publication recherchée. A cette date, la publication sera

- reconduite,
- supprimée,
- remplacée par une édition révisée, ou
- amendée.

Le contenu des corrigenda d'octobre 2019 et avril 2020 et la feuille d'interprétation de mai 2020 a été pris en considération dans cet exemplaire.

**IMPORTANT – Le logo "colour inside" qui se trouve sur la page de couverture de cette publication indique qu'elle contient des couleurs qui sont considérées comme utiles à une bonne compréhension de son contenu. Les utilisateurs devraient, par conséquent, imprimer cette publication en utilisant une imprimante couleur.**

## INTRODUCTION

La notion de sécurité est étroitement liée à la sauvegarde de l'intégrité des personnes et des biens. Le présent document spécifie les essais et les exigences pour les piles au lithium et elle a été établie conformément aux lignes directrices ISO/IEC, en prenant en compte toutes les normes nationales et internationales qui s'appliquent.

Les piles au lithium sont différentes des piles électriques conventionnelles utilisant un électrolyte aqueux dans la mesure où elles contiennent des matériaux inflammables.

Par conséquent, il est important de bien prendre en compte la sécurité aux étapes que sont la conception, la production, la distribution, l'utilisation et la mise au rebut des piles au lithium. Compte tenu de leurs caractéristiques spécifiques, les piles au lithium pour les applications grand public étaient à l'origine de petite taille et de faible puissance. Il existait également des piles au lithium de forte puissance qui étaient utilisées pour des applications industrielles et militaires particulières dont l'une des particularités était d'être "remplaçables par un technicien". La première édition du présent document avait été rédigée pour prendre en compte cette situation.

Cependant, depuis la fin des années 1980 environ, des piles au lithium de forte puissance ont commencé à être largement utilisées sur le marché de remplacement grand public, principalement en tant que source d'énergie dans les appareils de prise de vues. La demande pour de telles piles au lithium de forte puissance ayant augmenté de manière significative, différents fabricants ont commencé à en produire. Par conséquent, les aspects de sécurité relatifs aux piles au lithium de forte puissance ont été inclus dans la seconde édition du présent document.

Les piles au lithium, tant pour les applications grand public que pour les applications industrielles, sont des produits du marché dont la sûreté et la fiabilité sont bien établies, cela étant dû, au moins en partie, à l'existence de normes de sécurité telles que le présent document et, pour le transport, de l'IEC 62281. La quatrième édition du présent document ne reflète donc que les modifications mineures qui étaient devenues nécessaires pour qu'elle reste harmonisée avec l'IEC 62281 et pour continuer à améliorer les informations destinées à l'utilisateur touchant les questions de sécurité.

Les lignes directrices relatives aux questions de sécurité au moment de la conception des piles au lithium sont données dans l'Annexe A. L'Annexe B donne des lignes directrices relatives aux questions de sécurité au moment de la conception des matériels dans lesquels sont installées des piles au lithium. Les deux Annexes A et B reflètent l'expérience acquise avec les piles au lithium utilisées dans les applications pour les appareils de prise de vues et sont fondées sur le document de référence [22]<sup>1</sup>.

La sécurité est l'absence de risques inacceptables. La sécurité absolue ne peut pas exister: il subsiste toujours un risque. De ce fait, un produit, un procédé ou un service ne peut être sûr que de manière relative. La sécurité est obtenue en réduisant le risque à un niveau tolérable déterminé par la recherche d'un équilibre optimal entre l'idéal de sécurité absolue et les exigences auxquelles doit répondre un produit, un procédé ou un service, et des facteurs tels que le bénéfice pour l'utilisateur, l'adéquation à l'usage prévu, la rentabilité et les conventions de la société concernée.

Dans la mesure où la sécurité pose différents problèmes, il est impossible d'établir une liste de dispositions et de recommandations précises qui s'appliquent dans tous les cas. Cependant, s'il est suivi de manière judicieuse en fonction de son applicabilité, le présent document constitue une référence raisonnable et cohérente en matière de sécurité.

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<sup>1</sup> Les chiffres entre crochets se réfèrent à la Bibliographie.

## PILES ÉLECTRIQUES –

### Partie 4: Sécurité des piles au lithium

#### 1 Domaine d'application

La présente partie de l'IEC 60086 spécifie les essais et les exigences pour les piles électriques au lithium afin d'assurer leur fonctionnement en toute sécurité dans les conditions d'utilisation prévue et en cas de mauvais usage raisonnablement prévisible.

NOTE Les piles électriques au lithium qui sont normalisées dans l'IEC 60086-2 sont prévues pour satisfaire à toutes les exigences applicables ci-dessous. Il est entendu que la présente partie de l'IEC 60086 pourrait également être prise en compte pour mesurer les piles électriques au lithium non normalisées et/ou s'assurer qu'elles sont sûres. Dans les deux cas, il n'existe aucune déclaration ou garantie que la conformité ou la non-conformité à la présente norme répondra ou ne répondra pas aux objectifs ou aux besoins particuliers de l'utilisateur.

#### 2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60086-1, *Piles électriques – Partie 1: Généralités*

IEC 60086-2, *Piles électriques – Partie 2: Spécifications physiques et électriques*