

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Primary batteries –
Part 1: General

ITeh STANDARD PREVIEW
(standards.iteh.ai)

Piles électriques –
Partie 1: Généralités

<https://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-21149059e98f/iec-60086-1-2015>
[IEC 60086-1:2015](#)



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
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 It also gives information on projects, replaced and withdrawn publications.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.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.



IEC 60086-1

Edition 12.0 2015-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Primary batteries – **STANDARD PREVIEW**
Part 1: General (standards.iteh.ai)

Piles électriques –
Partie 1: Généralités [IEC 60086-1:2015](https://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-21149059e98f/iec-60086-1-2015)

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.220.10

ISBN 978-2-8322-8893-1

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

CONTENTS

FOREWORD	5
INTRODUCTION	7
1 Scope	8
2 Normative references	8
3 Terms and definitions	8
4 Requirements	11
4.1 General	11
4.1.1 Design	11
4.1.2 Battery dimensions	11
4.1.3 Terminals	11
4.1.4 Classification (electrochemical system)	13
4.1.5 Designation	14
4.1.6 Marking	14
4.1.7 Interchangeability: battery voltage	15
4.2 Performance	16
4.2.1 Discharge performance	16
4.2.2 Dimensional stability	16
4.2.3 Leakage	16
4.2.4 Open-circuit voltage limits	16
4.2.5 Service output	16
4.2.6 Safety	16
5 Performance – Testing	17
5.1 General	17
5.2 Discharge testing	17
5.2.1 General	17
5.2.2 Application tests	17
5.2.3 Service output tests	18
5.3 Conformance check to a specified minimum average duration	18
5.4 Calculation method of the specified value of a minimum average duration	19
5.5 OCV testing	19
5.6 Battery dimensions	19
5.7 Leakage and deformation	19
6 Performance – Test conditions	19
6.1 Storage and discharge conditions	19
6.2 Commencement of discharge tests after storage	20
6.3 Discharge test conditions	20
6.3.1 General	20
6.3.2 Compliance	20
6.4 Load resistance	20
6.5 Time periods	20
6.6 Test condition tolerances	21
6.7 Activation of 'P'-system batteries	21
6.8 Measuring equipment	21
6.8.1 Voltage measurement	21
6.8.2 Mechanical measurement	21
7 Sampling and quality assurance	21

8	Battery packaging.....	21
Annex A	(normative) Criteria for the standardization of batteries.....	22
Annex B	(informative) Recommendations for equipment design	23
B.1	Technical liaison	23
B.2	Battery compartment.....	23
B.2.1	General	23
B.2.2	Limiting access by children	24
B.3	Voltage cut-off	24
Annex C	(normative) Designation system (nomenclature)	25
C.1	General.....	25
C.2	Designation system in use up to October 1990.....	25
C.2.1	General	25
C.2.2	Cells	25
C.2.3	Electrochemical system	28
C.2.4	Batteries	28
C.2.5	Modifiers	28
C.2.6	Examples.....	28
C.3	Designation system in use since October 1990	28
C.3.1	General	28
C.3.2	Round batteries	29
C.3.3	Non-round batteries	32
C.3.4	Ambiguity	35
Annex D	(informative) Standard discharge voltage U_S – Definition and method of determination.....	37
D.1	Definition.....	37
D.2	Determination	37
D.2.1	General considerations: the C/R -plot.....	37
D.2.2	Determination of the standard discharge resistor R_S	38
D.2.3	Determination of the standard discharge capacity C_S and standard discharge time t_S	39
D.3	Experimental conditions to be observed and test results	39
Annex E	(informative) Preparation of standard methods of measuring performance (SMMP) of consumer goods.....	41
E.1	General.....	41
E.2	Performance characteristics.....	41
E.3	Criteria for the development of test methods	41
Annex F	(informative) Calculation method for the specified value of minimum average duration	42
Annex G	(normative) Code of practice for packaging, shipment, storage, use and disposal of primary batteries	43
G.1	General.....	43
G.2	Packaging.....	43
G.3	Transport and handling	43
G.4	Storage and stock rotation	43
G.5	Displays at sales points	44
G.6	Selection, use and disposal	44
G.6.1	Purchase	44
G.6.2	Installation.....	44
G.6.3	Use.....	44

G.6.4	Replacement	45
G.6.5	Disposal	45
Bibliography		46
Figure 1	– Ingestion gauge	11
Figure C.1	– Designation system for round batteries: $d_1 < 100$ mm; height $h_1 < 100$ mm	29
Figure C.2	– Diameter code for non-recommended diameters	30
Figure C.3	– Height code for denoting the hundredths of a millimetre of height	31
Figure C.4	– Designation system for round batteries: $d_1 \geq 100$ mm; height $h_1 \geq 100$ mm	32
Figure C.5	– Designation system for non-round batteries, dimensions < 100 mm	33
Figure C.6	– Designation system for non-round batteries, dimensions ≥ 100 mm	34
Figure C.7	– Height code for discrimination per tenth of a millimetre	35
Figure D.1	– Normalized C/R -plot (schematic)	38
Figure D.2	– Standard discharge voltage (schematic)	39
Table 1	– Standardized electrochemical systems	13
Table 2	– Marking requirements	15
Table 3	– Conditions for storage before and during discharge testing	19
Table 4	– Resistive loads for new tests	20
Table 5	– Time periods for new tests	20
Table 6	– Test condition tolerances	21
Table A.1	– Items necessary to standardize	22
Table C.1	– Physical designation and dimensions of round cells and batteries	26
Table C.2	– Physical designation and nominal overall dimensions of flat cells	27
Table C.3	– Physical designation and dimensions of square cells and batteries	27
Table C.4	– Diameter code for recommended diameter	30
Table C.5	– Physical designation and dimensions of round cells and batteries based on Clause C.2	36
Table C.6	– Physical designation and dimensions of non-round batteries based on Clause C.2	36
Table D.1	– Standard discharge voltage by system	40

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRIMARY BATTERIES –**Part 1: General****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) 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.

International Standard IEC 60086-1 has been prepared by IEC technical committee 35: Primary cells and batteries.

This bilingual version (2020-10) corresponds to the monolingual English version, published in 2015-07.

This twelfth edition cancels and replaces the eleventh edition (2011) and constitutes a technical revision.

The major technical changes with respect to the previous edition are:

- the order of the Annexes was changed to the order in which they appear in the document and a caption was added to indicate where the Annex information first appears in the document;
- the humidity conditions for non P-system batteries in Table 3 was modified;

- the standard discharge voltage for the Y and W chemistries was determined to be at 3,5 V and 2,8 V respectively;
- details on capacity measurement were moved from Annex E to Subclause 5.1.
- the coin/button cell and battery definition was clarified in order to better address issues with the swallowing of coin cells.

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

FDIS	Report on voting
35/1346/FDIS	35/1349/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.

The French version of this standard has not been voted upon.

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

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 website 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.

<http://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-21149059e98f/iec-60086-1-2015>
 IEC 60086-1:2015

INTRODUCTION

The technical content of this part of IEC 60086 provides fundamental requirements and information on primary cells and batteries. All batteries within the IEC 60086 series are considered dry cell batteries. In this sense, IEC 60086-1 is the main component of the IEC 60086 series and forms the basis for the subsequent parts. For example, this part includes elementary information on definitions, nomenclature, dimensions and marking. While specific requirements are included, the content of this part tends to explain methodology (how) and justification (why).

Over the years, this part has been changed to improve its content and remains under continual scrutiny to ensure that the publication is kept up to date with the advances in both battery and battery-powered device technologies.

NOTE Safety information is available in IEC 60086-4, IEC 60086-5 and IEC 62281.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

IEC 60086-1:2015

<https://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-21149059e98f/iec-60086-1-2015>

PRIMARY BATTERIES –

Part 1: General

1 Scope

This part of IEC 60086 is intended to standardize primary batteries with respect to dimensions, nomenclature, terminal configurations, markings, test methods, typical performance, safety and environmental aspects.

As a primary battery classification tool, electrochemical systems are also standardized with respect to system letter, electrodes, electrolyte, nominal and maximum open circuit voltage.

NOTE The requirements justifying the inclusion or the ongoing retention of batteries in the IEC 60086 series are given in Annex A.

The object of this part of IEC 60086 is to benefit primary battery users, device designers and battery manufacturers by ensuring that batteries from different manufacturers are interchangeable according to standard form, fit and function. Furthermore, to ensure compliance with the above, this part specifies standard test methods for testing primary cells and batteries.

iTech STANDARD PREVIEW

2 Normative references (standards.iteh.ai)

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60086-2:-1, *Primary batteries – Part 2: Physical and electrical specifications*

IEC 60086-3:2011, *Primary batteries – Part 3: Watch batteries*

IEC 60086-4:2014, *Primary batteries – Part 4: Safety of lithium batteries*

IEC 60086-5:2011, *Primary batteries – Part 5: Safety of batteries with aqueous electrolyte*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

application test

simulation of the actual use of a battery in a specific application

3.2

battery

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

¹ To be published.

[SOURCE:IEC 60050-482:2004, 482-01-04, modified definition]

3.3

button (cell or battery)

small round cell or battery where the overall height is less than the diameter

Note 1 to entry: In English, the term “button (cell or battery)” is only used for non-lithium batteries while the term “coin (cell or battery)” is used for lithium batteries only. In languages other than English, the terms “coin” and “button” are often used interchangeably, regardless of the electrochemical system.

3.4

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, 482-01-01]

3.5

closed-circuit voltage

CCV (abbreviation)

voltage across the terminals of a battery when it is on discharge

[SOURCE:IEC 60050-482:2004, 482-03-28, modified (“voltage between the terminals of a cell or battery” replaced by “voltage across the terminals of a battery”)]

3.6

coin (cell or battery)

see button (cell or battery)

[IEC 60086-1:2015](https://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-21149059e98f/iec-60086-1-2015)

<https://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-21149059e98f/iec-60086-1-2015>

3.7

cylindrical (cell or battery)

round cell or battery in which the overall height is equal to or greater than the diameter

[SOURCE:IEC 60050-482: 2004, 482-02-39, modified (“cell with a cylindrical shape” replaced by “round cell or battery”)]

3.8

discharge (of a primary battery)

operation during which a battery delivers current to an external circuit

3.9

dry (primary) **battery**

primary battery in which the liquid electrolyte is essentially immobilized

[SOURCE:IEC 60050-482:2004, 482-04-14, modified]

3.10

effective internal resistance – DC method

the internal d.c. resistance of any electrochemical cell is defined by the following relation:

$$R_i (\Omega) = \frac{\Delta U (V)}{\Delta i (A)}$$

3.11

end-point voltage

EV (abbreviation)

specified voltage of a battery at which the battery discharge is terminated

[SOURCE:IEC 60050-482:2004, 482-03-30]

3.12

leakage

unplanned escape of electrolyte, gas or other material from a cell or battery

[SOURCE:IEC 60050-482:2004, 482-02-32]

3.13

minimum average duration

MAD (abbreviation)

minimum average time on discharge which is met by a sample of batteries

Note 1 to entry: The discharge test is carried out according to the specified methods or standards and designed to show conformity with the standard applicable to the battery types.

3.14

nominal voltage (of a primary battery)

V_n (symbol)

suitable approximate value of the voltage used to designate or identify a cell, a battery or an electrochemical system

[SOURCE:IEC 60050-482:2004, 482-03-31, modified (addition of "(of a primary battery)" and symbol V_n)]

[IEC 60086-1:2015](https://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-21149059e98f/iec-60086-1-2015)

<https://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-21149059e98f/iec-60086-1-2015>

3.15

open-circuit voltage

OCV (abbreviation)

voltage across the terminals of a cell or battery when it is off discharge

3.16

primary (cell or battery)

cell or battery that is not designed to be electrically recharged

3.17

round (cell or battery)

cell or battery with circular cross section

3.18

service output (of a primary battery)

service life, or capacity, or energy output of a battery under specified conditions of discharge

3.19

service output test

test designed to measure the service output of a battery

Note 1 to entry: A service output test may be prescribed, for example, when

- a) an application test is too complex to replicate;
- b) the duration of an application test would make it impractical for routine testing purposes.

3.20

small battery

cell or battery fitting entirely within the limits of the truncated cylinder as defined in Figure 1

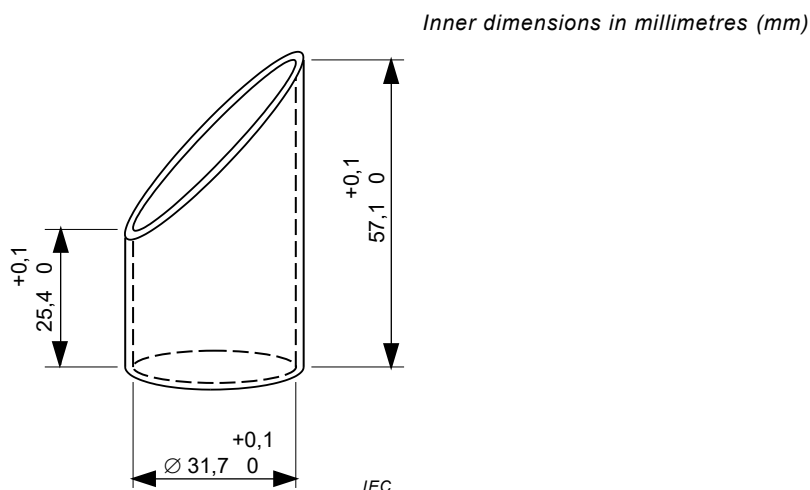


Figure 1 – Ingestion gauge

3.21

storage life

duration under specified conditions at the end of which a battery retains its ability to perform a specified service output

[SOURCE:IEC 60050-482:2004, 482-03-47, modified ("function" replaced by "service output")]

3.22

terminals (of a primary battery)

conductive parts of a battery that provide connection to an external circuit

<https://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-21149059e98f/iec-60086-1-2015>

4 Requirements

4.1 General

4.1.1 Design

Primary batteries are sold mainly in consumer markets. In recent years, they have become more sophisticated in both chemistry and construction, for example both capacity and rate capability have increased to meet the growing demands from new, battery-powered equipment technology.

When designing primary batteries, the aforementioned considerations shall be taken into account. Specifically, their dimensional conformity and stability, their physical and electrical performance and their safe operation under normal use and foreseeable mis-use conditions shall be assured.

Additional information on equipment design can be found in Annex B.

4.1.2 Battery dimensions

The dimensions for individual types of batteries are given in IEC 60086-2 and IEC 60086-3.

4.1.3 Terminals

4.1.3.1 General

Terminals shall be in accordance with Clause 6 of IEC 60086-2:–.

Their physical shape shall be designed in such a way that they ensure that the batteries make and maintain good electrical contact at all times.

They shall be made of materials that provide good electrical conductivity and resistance to corrosion.

4.1.3.2 Contact pressure resistance

Where stated in the battery specification tables or the individual specification sheets in IEC 60086-2, the following applies:

- a force of 10 N applied through a steel ball of 1 mm diameter at the centre of each contact area for a period of 10 s shall not cause any apparent deformation which might prevent satisfactory operation of the battery.

NOTE See also IEC 60086-3 for exceptions.

4.1.3.3 Cap and base

This type of terminal is used for batteries which have their dimensions specified according to Figures 1 to 7 of IEC 60086-2:– and which have the cylindrical side of the battery insulated from the terminals.

4.1.3.4 Cap and case

This type of terminal is used for batteries which have their dimensions specified according to Figures 8, 9, 10, 14, 15 and 16 of IEC 60086-2:– but in which the cylindrical side of the battery forms part of the positive terminal.

4.1.3.5 Screw terminals

[IEC 60086-1:2015](https://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-3d14b85e9856/iec-60086-1-2015)

[https://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-](https://standards.iteh.ai/catalog/standards/sist/b380a0c3-013d-4de5-91d4-3d14b85e9856/iec-60086-1-2015)

This contact consists of a threaded rod in combination with either a metal or insulated metal nut.

4.1.3.6 Flat contacts

These are essentially flat metal surfaces adapted to make electrical contact by suitable contact mechanisms bearing against them.

4.1.3.7 Flat or spiral springs

These contacts comprise flat metal strips or spirally wound wires which are in a form that provides pressure contact.

4.1.3.8 Plug-in-sockets

These are made up of a suitable assembly of metal contacts, mounted in an insulated housing or holding device and adapted to receive corresponding pins of a mating plug.

4.1.3.9 Snap fasteners

4.1.3.9.1 General

These contacts are composed of a combination comprising a stud (non-resilient) for the positive terminal and a socket (resilient) for the negative terminal.

They shall be of suitable metal so as to provide efficient electrical connection when joined to the corresponding parts of an external circuit.

4.1.3.9.2 Snap fastener

This type of terminal consists of a stud for the positive terminal and a socket for the negative terminal. These shall be made from nickel plated steel or other suitable material. They shall be designed to provide a secure physical and electrical connection, when fitted with similar corresponding parts for connection to an electrical circuit.

4.1.3.10 Wire

Wire leads may be single or multi-strand flexible insulated tinned copper. The positive terminal wire covering shall be red and the negative black.

4.1.3.11 Other spring contacts or clips

These contacts are generally used on batteries when the corresponding parts of the external circuit are not precisely known. They shall be of spring brass or of other material having similar properties.

4.1.4 Classification (electrochemical system)

Primary batteries are classified according to their electrochemical system.

Each system, with the exception of the zinc-ammonium chloride, zinc chloride-manganese dioxide system, has been allocated a letter denoting the particular system.

The electrochemical systems that have been standardized up to now are given in Table 1.

Table 1 – Standardized electrochemical systems

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
A	Zinc (Zn)	Ammonium chloride, Zinc chloride	Oxygen (O_2)	1,4	1,55
B	Lithium (Li)	Organic electrolyte	Carbon monofluoride (CF_x)	3,0	3,7
C	Lithium (Li)	Organic electrolyte	Manganese dioxide (MnO_2)	3,0	3,7
E	Lithium (Li)	Non-aqueous inorganic	Thionyl chloride (SOCl_2)	3,6	3,9
F	Lithium (Li)	Organic electrolyte	Iron disulfide (FeS_2)	1,5	1,83
G	Lithium (Li)	Organic electrolyte	Copper (II) oxide (CuO)	1,5	2,3
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_2O)	1,55	1,63
W	Lithium (Li)	Organic electrolyte	Sulphur dioxide (SO_2)	3,0	3,05
Y	Lithium (Li)	Non-aqueous inorganic	Sulfuryl chloride (SO_2Cl_2)	3,9	4,1
Z	Zinc (Zn)	Alkali metal hydroxide	Nickel oxyhydroxide (NiOOH)	1,5	1,78

NOTE 1 The value of the nominal voltage is not verifiable; therefore it is only given as a reference.

NOTE 2 The maximum open-circuit voltage (3.15) is measured as defined in 5.5 and 6.8.1.

NOTE 3 When referring to an electrochemical system, common protocol is to list negative electrode first, followed by positive electrode, i.e. lithium-iron disulfide.