

INTERNATIONAL STANDARD

COMMENTED VERSION

**Primary batteries -
Part 2-2: Physical and electrical specifications of lithium batteries**

Sample Document

get full document from standards.iteh.ai



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 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 It also gives information on projects, replaced and withdrawn publications.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.

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.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	6
4 Battery dimensions – Symbols.....	8
5 Dimensional stability.....	8
6 Validity of testing.....	8
7 Constitution of the battery specification tables.....	9
8 Physical and electrical specifications.....	10
8.1 Category 1 batteries	10
8.1.1 General	10
8.1.2 Category 1 – Void.....	11
8.1.3 Category 1 – Specification: FR10G445	11
8.1.4 Category 1 – Specification: FR14505.....	12
8.2 Category 2 batteries – Specifications: CR14250, CR15H270, CR17345, CR17450, BR17335	13
8.3 Category 3 battery – Specification: CR11108	14
8.4 Category 4 batteries	15
8.4.1 General	15
8.4.2 Category 4 – Specifications: CR1025, CR1216, CR1220, CR1225, CR1616, CR2012, CR1620, CR2016, CR2412, CR1632, CR2025, CR2320, CR2032, CR2330, CR2430, CR2354, CR3032, CR2450, CR2477, BR1225, BR2016, BR2320, BR2325, BR3032	15
8.5 Category 5 battery – Specification: 2CR13252	18
8.6 Category 6 batteries	19
8.6.1 Category 6 – Specification: CR-P2.....	19
8.6.2 Category 6 – Specification: 2CR5	20
Annex A (informative) Tabulation of batteries by application	22
Annex B (informative) Cross-reference index	24
Annex C (informative) Index reference to subclause	26
Bibliography.....	27
List of comments.....	28
Figure 1 – Dimensional drawing: Category 1	10
Figure 2 – Dimensional drawing: FR10G445	11
Figure 3 – Dimensional drawing: FR14505.....	12
Figure 4 – Dimensional drawing: CR14250, CR15H270, CR17345, CR17450, BR17335	13
Figure 5 – Dimensional drawing: CR11108	14
Figure 6 – Dimensional drawing: Category 4.....	15
Figure 7 – Dimensional drawing: CR1025, CR1216, CR1220, CR1225, CR1616, CR2012, CR1620, CR2016, CR2412, CR1632, CR2025, CR2320, CR2032, CR2330, CR2430, CR2354, CR3032, CR2450, CR2477, BR1225, BR2016, BR2320, BR2325, BR3032	16
Figure 8 – Dimensional drawing: 2CR13252	18

Figure 9 – Dimensional drawing: CR-P2.....	19
Figure 10 – Dimensional drawing: 2CR5	20
Table 1 – Voltage and application test requirements for FR10G445	11
Table 2 – Voltage and application test requirements for FR14505.....	12
Table 3 – Voltage and application test requirements for CR14250, CR15H270, CR17345, CR17450 and BR17335.....	13
Table 4 – Voltage and application test requirements for CR11108	14
Table 5 – Voltage and application test requirements for CR1025, CR1216, CR1220, CR1225, CR1616, CR2012, CR1620, CR2016, CR2412, CR1632, CR2025, CR2320, CR2032, CR2330, CR2430, CR2354, CR3032, CR2450, CR2477, BR1225, BR2016, BR2320, BR2325 and BR3032.....	17
Table 6 – Voltage and application test requirements for 2CR13252.....	18
Table 7 – Voltage and application test requirements for CR-P2.....	20
Table 8 – Voltage and application test requirements for 2CR5	21
Table A.1 – Digital audio.....	22
Table A.2 – Digital still camera	22
Table A.3 – Electronic key	22
Table A.4 – High intensity lighting.....	22
Table A.5 – Photo	22
Table A.6 – Portable lighting (LED).....	23
Table A.7 – Radio/clock/remote control.....	23
Table A.8 – Toy (motor)	23
Table B.1 – Category 1 batteries.....	24
Table B.2 – Category 2 batteries.....	24
Table B.3 – Category 4 batteries.....	25
Table B.4 – Category 6 batteries.....	25
Table C.1 – Index	26

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Primary batteries -
Part 2-2: Physical and electrical specifications 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.
- 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.

This commented version (CMV) of the official standard IEC 60086-2-2:2026 edition 1.0 provides the user with comments from IEC TC 35 experts explaining the reasons for the most relevant changes made to IEC 60086-2:2021. These changes are listed in the Foreword.

Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note containing the comment.

This publication contains both the CMV and the official standard. The full list of comments is available at the end of the CMV.

IEC 60086-2-2 has been prepared by IEC technical committee 35: Primary cells and batteries. It is an International Standard.

This first edition cancels and replaces the fourteenth edition of IEC 60086-2 published in 2021. This edition constitutes a technical revision.

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

- a) the physical and electrical specifications of IEC 60086-2:2021 were divided into two new standards based on their electrolyte types. IEC 60086-2-1 provides specifications for standardized primary batteries containing aqueous electrolyte. IEC 60086-2-2 covers specifications for standardized lithium-based primary batteries; **1**
- b) maximum open circuit voltage of FR10G445 and FR14505 was changed from 1,83 to 1,90 V; **2**
- c) load of digital audio test for FR10G445 was changed from 50 mA to 75 mA and MAD was modified;
- d) portable lighting test was added for FR10G445; **3**
- e) motor/toy and radio /clock /remote control test was added for FR14505; **4**
- f) in Clause 3, terms were reordered according to their functions: basic terms, electrochemical systems, electrical characteristics and specifications; **5**
- g) Annex D for common designation of IEC 60086-2:2021 was moved to IEC 60086-1:2026, as Annex H; **6**
- h) Annex E for Compliance checklist of IEC 60086-2:2021 was removed and merged into Annex J of IEC 60086-1:2026. **7**

The text of this International Standard is based on the following documents:

Draft	Report on voting
35/1592/FDIS	35/1598/RVD

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 International Standard 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, 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

The technical content of this part of IEC 60086 provides physical dimensions, discharge test conditions and discharge performance requirements. IEC 60086-2-1 and IEC 60086-2-2 complement the general information and requirements of IEC 60086-1. Safety information of IEC 60086-2-2 is available in IEC 60086-4 and IEC 62281.

This document was prepared to benefit primary battery users, device designers and battery manufacturers by furnishing the specifics of form, fit and function for individual standardized primary cells and batteries. Over the years, this document has been changed to improve its contents and might again be revised in due course in the light of comments made by national committees and experts on the basis of practical experience and changing technology.

Sample Document

get full document from standards.iteh.ai

1 Scope

This part of IEC 60086 is applicable to primary batteries which are based on standardised lithium (non-aqueous) electrochemical systems.

It specifies

- the physical dimensions,
- the discharge test conditions and discharge performance requirements.

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*

ISO 1101, *Geometrical product specifications (GPS) - Geometrical tolerancing - Tolerances of form, orientation, location and run-out*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60086-1:2026 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

primary cell

primary battery

cell or battery that is not designed to be electrically recharged

3.2

round cell

round battery

cell or battery with circular cross section

3.3

button cell

button battery

small round cell or battery where the overall height is less than the diameter, containing aqueous electrolyte

Note 1 to entry: For the specifications, refer to IEC 60086-2-1.

3.4

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.

3.5

nominal voltage

U_n

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 U_n]

3.6

open-circuit voltage

OCV

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

3.7

end-point voltage

EV

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

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

3.8

minimum average duration

MAD

acceptable minimum average time on discharge, which is met by testing a sample of batteries according to specified methods, to be deemed compliant

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.

3.9

application test

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

3.10

service output

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

3.11

service output test

test designed to measure the service output of a battery

Note 1 to entry: A service output test can 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.

3.12**terminal**

conductive parts of a battery providing connection to an external circuit

[SOURCE: IEC 60050-482:2004, 482-02-22, modified – “conductive part of a device, electric circuit or electric network, provided” replaced by “conductive parts of a battery providing” and “device, electric circuit or electric network to one or more external conductor” replaced by “an external circuit”]

4 Battery dimensions – Symbols

The symbols used to denote the various dimensions are as follows:

- h_1 maximum overall height of the battery;
- h_2 minimum distance between the flats of the positive and negative contacts;
- h_3 minimum projection of the flat positive contact;
- h_4 maximum recess of the negative flat contact surface;
- h_5 minimum projection of the flat negative contact;
- d_1 maximum and minimum diameters of the battery;
- d_2 minimum diameter of the flat positive contact;
- d_3 maximum diameter of the positive contact within the specified projection height;
- d_4 minimum diameter of the flat negative contact;
- d_5 maximum diameter of the negative contact within the specified projection height;
- d_6 minimum outer diameter of the negative flat contact surface;
- d_7 maximum inner diameter of the negative flat contact surface;
- $\emptyset P$ concentricity of the positive contact.

5 Dimensional stability

Refer to IEC 60086-1 for dimensional stability.

6 Validity of testing

Portable primary batteries shall be subjected to the tests, as required in the IEC 60086 series. Testing remains valid until a design change or requirement revision has been made. Retesting is required when:

- a) a battery specification changes by more than 0,1 g or 20 % mass, whichever is greater, for the cathode, anode or electrolyte;
- b) a battery specification changes that would lead to a failure of any of the tests;
- c) there is an addition of new tests or requirements; or
- d) there is a requirement change that would lead to a failure on any of the tests.

7 Constitution of the battery specification tables

- Batteries are categorized into several groups according to their shapes.
- In each category, batteries having the same shape but belonging to a different electrochemical system are grouped together and shown in succession.
- Batteries are always listed in ascending order of nominal voltage and, within each nominal voltage, in ascending order of volume.
- One common shape drawing of these batteries which fall in the same group is exhibited.
- Designation, nominal voltage, dimensions, discharge conditions, minimum average duration and application for these batteries which fall into the same group are summarized in one table.
- When a drawing represents only one type of battery, the dimensions of the relevant battery may be directly shown on the drawing.
- Batteries are categorized into the following groups:
 - Category 1: Round batteries according to Figure 1
FR10G445, FR14505
 - Category 2: Round batteries according to Figure 4
CR14250, CR15H270, CR17345, CR17450, BR17335
 - Category 3: Round battery according to Figure 5
CR11108
 - Category 4: Round batteries according to Figure 6
CR1025, CR1216, CR1220, CR1225, CR1616, CR1632, CR2012, CR1620, CR2016, CR2025, CR2320, CR2032, CR2330, CR2412, CR2430, CR2477, CR2354, CR3032, CR2450, BR1225, BR2016, BR2320, BR2325, BR3032
 - Category 5: Other round battery – Miscellaneous
2CR13252
 - Category 6: Non-round batteries – Miscellaneous
CR-P2
2CR5
- The specification drawings show the shape of the relevant batteries. Dimensions for each battery are shown in Figure 1 to Figure 10.

NOTE 1 See Annex A, Annex B and Annex C for ease of locating battery sizes.

NOTE 2 For batteries with aqueous electrolyte, see IEC 60086-2-1: Physical and electrical specifications of batteries with aqueous electrolyte.

8 Physical and electrical specifications

8.1 Category 1 batteries

8.1.1 General

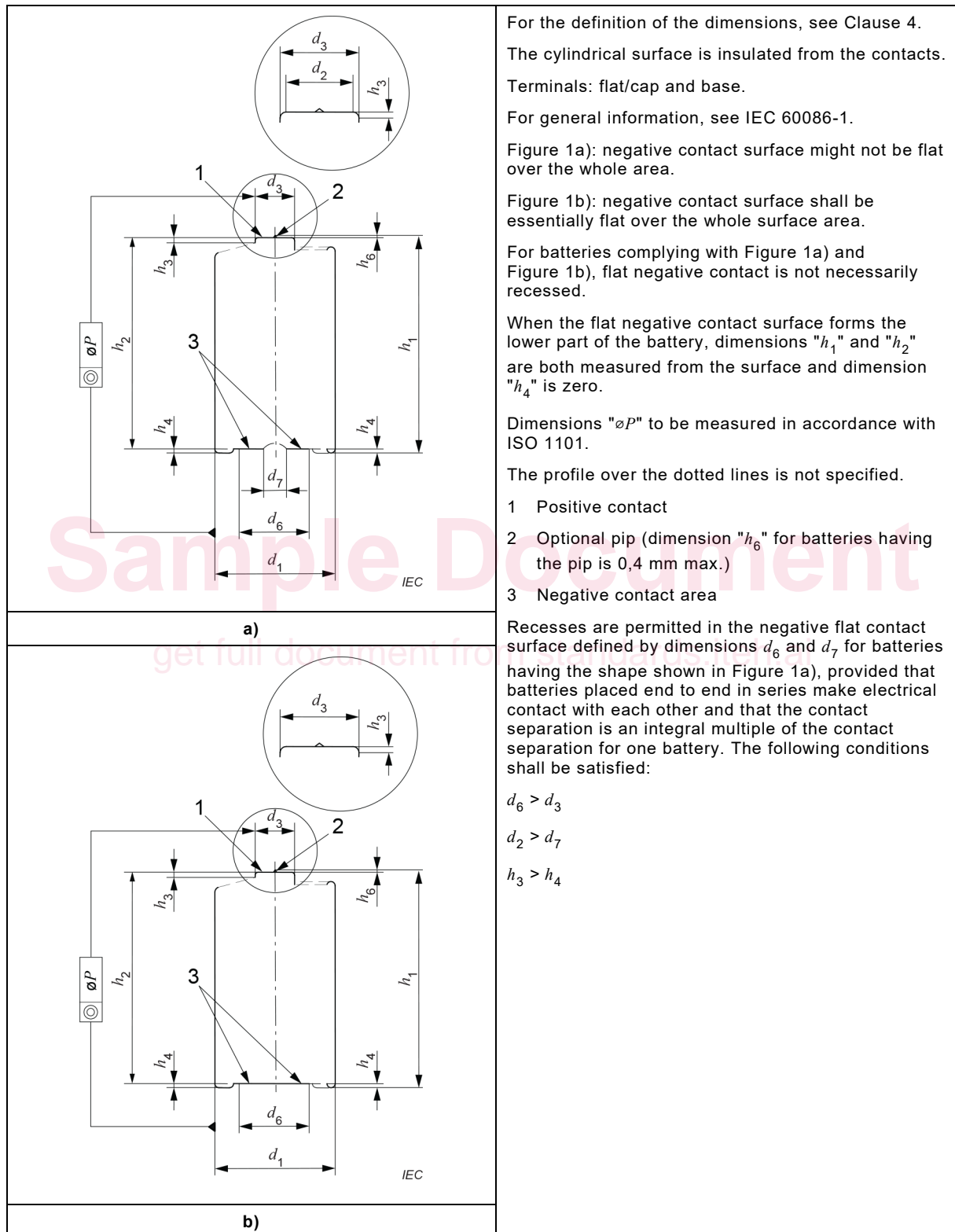


Figure 1 – Dimensional drawing: Category 1

8.1.2 Category 1 – Void

8.1.3 Category 1 – Specification: FR10G445

Figure 2 shows the dimensional drawing and Table 1 shows the voltage and application test requirements for FR10G445.

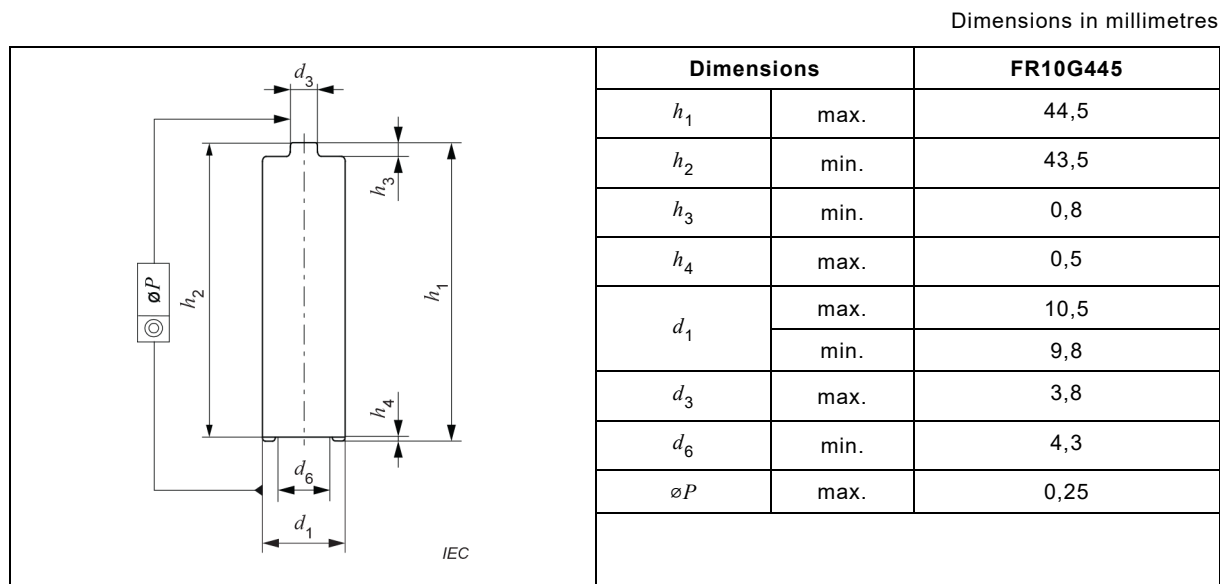


Figure 2 – Dimensional drawing: FR10G445

Table 1 – Voltage and application test requirements for FR10G445

Electrochemical system letter				F
IEC designation				FR10G445
Common designation				AAA, FR03
U_n (V)				1,5
OCV max. (V)				1,90
Delayed discharge performance after 12 months (% of MAD)				95
Applications	Load	Daily Period	EV (V)	MAD ^a (Initial)
Digital still camera	1 200 mW 650 mW	^b	1,05	100 pulses
High intensity lighting	400 mW	4 min on, 11 min off for 8 h per day	1,0	140 min
Portable lighting ^c	5,1 Ω	4 min on, 56 min off for 8 h per day	0,9	170 min
Digital audio ^c	75 mA	1 h on, 11 hr off for 24 h	0,9	11 h
^a Standard conditions (see IEC 60086-1: 2026, Table 3, Initial discharge test).				
^b Repeat 10 times per hour: 1 200 mW for 2 s, then 650 mW for 28 s, then 0 mW for 55 min.				
^c Test conditions shall be kept identical for battery designations FR10G445, and LR03, TR03, R03 in IEC 60086-2-1 (see also I.6.1 and Table I.2 in IEC 60086-1:2026)				

8.1.4 Category 1 – Specification: FR14505

Figure 3 shows the dimensional drawing and Table 2 shows the voltage and application test requirements for FR14505.

Dimensions in millimetres

Dimensions		FR14505
h_1	max.	50,5
h_2	min.	49,5
h_3	min.	1,0
h_4	max.	0,5
d_1	max.	14,5
	min.	13,7
d_3	max.	5,5
d_6	min.	7,0
$\varnothing P$	max.	0,25

Figure 3 – Dimensional drawing: FR14505

Table 2 – Voltage and application test requirements for FR14505

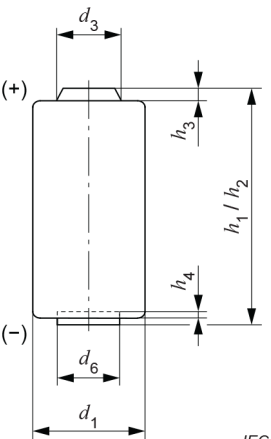
Electrochemical system letter				F
IEC designation				FR14505
Common designation				AA, FR6
U_n (V)				1,5
OCV max. (V)				1,90
Delayed discharge performance after 12 months (% of MAD)				95
Applications	Load	Daily Period	EV (V)	MAD ^a (initial)
High drain application	1 500 mW 650 mW	^b	1,05	370 pulses
High intensity lighting	1 000 mW	4 min on, 11 min off for 8 h per day	1,0	120 min
Motor/toy ^c	3,9 Ω	1 h	0,8	5,5 h
Radio /clock /remote control ^c	50 mA	1 h on, 7 h off for 24 h per day	1,0	34 h
^a Standard conditions (see IEC 60086-1:2026, Table 3, Initial discharge test).				
^b Repeat 10 times per hour: 1 500 mW for 2 s, then 650 mW for 28 s, then 0 mW for 55 min.				
^c Test conditions shall be kept identical for battery designations FR14505, and LR6, TR6, R6P, R6S, in IEC 60086-2-1 (see also I.6.1 and Table I.2 in IEC 60086-1:2026)				

8.2 Category 2 batteries – Specifications: CR14250, CR15H270, CR17345, CR17450, BR17335

Figure 4 shows the dimensional drawing and Table 3 shows the voltage and application test requirements for CR14250, CR15H270, CR17345, CR17450 and BR17335.

Dimensions in millimetres

Dimensions		CR14250	CR15H270	CR17345	CR17450	BR17335
h_1 / h_2	max.	25,0	27,0 ^a	34,5	45,0	33,5
	min.	23,5	26,0 ^a	33,5	43,5	32,0
h_3	min.	0,4	0,6	1,0	0,4	0,1
h_4	max.	-	0,4	0,9	-	-
	min.	-	0,05	0,5	-	-
d_1	max.	14,5	15,6	17,0	17,0	17,0
	min.	13,5	15,0	16,0	16,0	16,0
d_3	max.	8,0	7,0	9,6	8,0	8,0
d_6	min.	5,0	8,5	11,0	5,0	5,0



For the definition of the dimensions, see Clause 4.
The cylindrical surface is insulated from the contacts.
Terminals: flat/cap and base.
For general information, see IEC 60086-1.
^a The h_1/h_2 dimensions shall be measured on the label overlap.

Figure 4 – Dimensional drawing: CR14250, CR15H270, CR17345, CR17450, BR17335

Table 3 – Voltage and application test requirements for CR14250, CR15H270, CR17345, CR17450 and BR17335

Electrochemical system letter				C				B
IEC designation				CR14250	CR15H270	CR17345	CR17450	BR17335
Common designation				CR-1/2AA	CR2	123, CR123A	CR-A	BR-2/3A
U_n (V)				3,0	3,0	3,0	3,0	3,0
OCV max. (V)				3,7	3,7	3,7	3,7	3,7
Delayed discharge performance after 12 months (% of MAD)				98	98	98	98	98
Applications	Load	Daily Period	EV (V)	MAD ^a (initial)				
Photo	Current drain 900 mA	3 s on, 27 s off for 24 h per day	1,55	No test	840 pulses	1 400 pulses	No test	No test
High intensity lighting	750 mA	Repeated cycles of 4 min on, 11 min off for 1 h; then 3 h off	1,8	No test	No test	80 min	No test	No test
Service output test	0,1 kΩ	24 h	2,0	No test	22 h	40 h	No test	No test
Service output test	1 kΩ	24 h	1,8	No test	No test	No test	No test	380 h
Service output test	1 kΩ	24 h	2,0	No test	No test	No test	710 h	No test
Service output test	3 kΩ	24 h	2,0	750 h	No test	No test	No test	No test

^a Standard conditions (see IEC 60086-1:2026, Table 3, Initial discharge test).