IEC 60086-3

Edition 4.0 2016-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Primary batteries –
Part 3: Watch batteries

Piles électriques –
Partie 3: Piles pour montres

IEC 60086-3:2016-05(en-fr)

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CONTENTS

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PRIMARY BATTERIES –

Part 3: Watch 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 60086-3 has been prepared by IEC technical committee 35: Primary cells and batteries, and ISO technical committee 114: Horology.

This fourth edition cancels and replaces the third edition published in 2011. This edition constitutes a technical revision.

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

a) A harmonization of the cell sizes and service output tests with IEC 60086-2;
b) Clarifications of Clauses 6: Sampling and Quality Assurance, 7: Test methods, and 8: Visual examination and acceptance condition;
c) Harmonization of temperature and humidity conditions with IEC 60086-1.

This publication is published as a double logo standard.

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

FDIS	Report on voting
35/1359/FDIS	35/1362/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.

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

The committee has decided that the contents of this 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.

INTRODUCTION

This part of IEC 60086 provides specific requirements and information for primary watch batteries. This part of IEC 60086 was prepared through joint work between the IEC and ISO to benefit primary battery users, watch designers and battery manufacturers by ensuring the best compatibility between batteries and watches.

This part of IEC 60086 will remain under continual scrutiny to ensure that the publication is kept up to date with the advances in both battery and watch technologies.

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

PRIMARY BATTERIES –

Part 3: Watch batteries

1 Scope

This part of IEC 60086 specifies dimensions, designation, methods of tests and requirements for primary batteries for watches. In several cases, a menu of test methods is given. When presenting battery electrical characteristics and/or performance data, the manufacturer specifies which test method was used.

2 Normative references

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 60086-1:2015, *Primary batteries – Part 1: General*

IEC 60086-2:2015, *Primary batteries – Part 2: Physical and electrical specifications*

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

IEC 60086-5:-[1], *Primary batteries – Part 5: Safety of batteries with aqueous electrolyte*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60086-1 as well as the following terms and definitions apply.

3.1
capacitive reactance
part of the internal resistance, that leads to a voltage drop during the first seconds under load

3.2
capacity
electric charge (quantity of electricity) which a cell or battery can deliver under specified discharge conditions

Note 1 to entry: The SI unit for electric charge is the coulomb (1 C = 1 As) but, in practice, capacity is usually expressed in ampere hours (Ah).

3.3
fresh battery
undischarged battery 60 days maximum after date of manufacture

[1] To be published.

3.4
ohmic drop
part of the internal resistance that leads to a voltage drop immediately after switching the load on

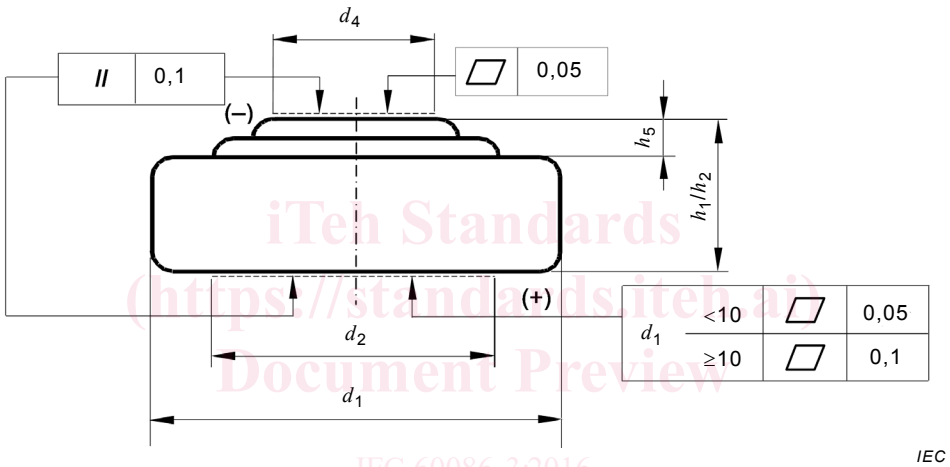
4 Physical requirements

4.1 Battery dimensions, symbols and size codes

Dimensions and tolerances of batteries for watches shall be in accordance with Figure 1, Table 1 and Table 2. The dimensions of the batteries shall be tested in accordance with 7.1.

The symbols used to denote the various dimensions in Figure 1 are in accordance with IEC 60086-2:2015, Clause 4.

Dimensions in millimetres



Key

h_1 maximum overall height of the battery

h_2 minimum distance between the flats of the positive and negative contacts

h_5 minimum projection of the flat negative contact

d_1 maximum and minimum diameter of the battery

d_2 minimum diameter of the flat positive contact

d_4 minimum diameter of the flat negative contact

NOTE This numbering follows the harmonization in the IEC 60086 series.

Figure 1 – Dimensional drawing

Table 1 – Dimensions and size codes

Dimensions in millimetres

Diameter			d_4	Height h_1/h_2														
				Code[a]														
Code[a]	d_1	Tole-rance		10	12	14	16	20	21	25	26	27	30	31	32	36	42	54
				Tolerance														
				0 –0,10	0 –0,15	0 –0,15	0 –0,18	0 –0,20	0 –0,20	0 –0,20	0 –0,20	0 –0,20	0 –0,25	0 –0,25	0 –0,25	0 –0,25	0 –0,25	0 –0,25
4	4,8	0 –0,15					1,65		2,15									
5	5,8	0 –0,15	2,6	1,05	1,25	1,45	1,65		2,15			2,70						
6	6,8	0 –0,15	3,0	1,05	1,25	1,45	1,65		2,15		2,60							
7	7,9	0 –0,15	3,5	1,05	1,25	1,45	1,65		2,10		2,60			3,10		3,60		5,40
9	9,5	0 –0,15	4,5	1,05	1,25	1,45	1,65	2,05	2,10			2,70				3,60		
10	10,0	0 –0,30	3,0							2,50								
11	11,6	0 –0,20	6,0	1,05	1,25	1,45	1,65	2,05	2,10		2,60		3,05			3,60	4,20	5,40
12	12,5	0 –0,25	4,0		1,20		1,60	2,00		2,50								

NOTE Open boxes in the above matrix are not necessarily available for standardisation due to the concept of overlapping tolerances.

[a] See Annex A.

Table 2 – Dimensions and size codes

Dimensions in millimetres

Diameter			d_4	Height h_1/h_2					
				Code[a]					
Code[a]	d_1	Tolerance		12	16	20	25	30	32
				Tolerances					
				0 –0,20	0 –0,20	0 –0,25	0 –0,30	0 –0,30	0 –0,30
16	16	0 –0,25	5,00	1,20	1,60	2,00	2,50		3,20
20	20	0 –0,25	8,00	1,20	1,60	2,00	2,50		3,20
23	23	0 –0,30	8,00	1,20	1,60	2,00	2,50	3,00	
24	24,5	0 –0,30	8,00	1,20	1,60			3,00	

NOTE Open boxes in the above matrix are not necessarily available for standardisation due to the concept of overlapping tolerances.

[a] See Annex A.

4.2 Terminals

Negative contact (–): the negative contact (dimension d_4) shall be in accordance with Tables 1 and 2. This is not applied to those batteries with a two-step negative contact.

Positive contact (+): the cylindrical surface is connected to the positive terminal. Positive contact should be made to the side of the battery but may be made to the base.

4.3 Projection of the negative terminal (h_5)

The dimension h_5 shall be as follows:

$h_5 \geq 0{,}02$ for $h_1/h_2 \leq 1{,}65$

$h_5 \geq 0{,}06$ for $1{,}65 < h_1/h_2 < 2{,}5$

$h_5 \geq 0{,}08$ for $h_1/h_2 \geq 2{,}5$

The negative contact should be the highest point of the battery.

4.4 Shape of negative terminal

The space requirements shall be contained within an angle of 45° (see Figure 2).

The minimum values of l_1, for different heights of h_1/h_2, are given in Table 3.

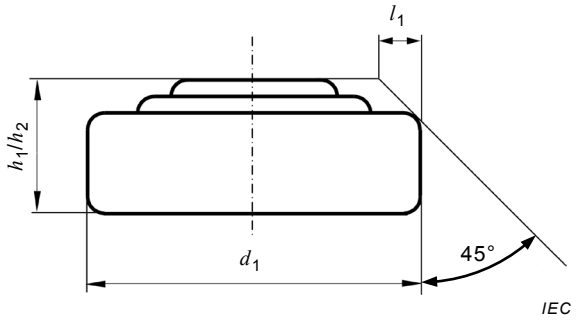


Figure 2 – Shape of negative terminal

Table 3 – Minimum values of l_1

Dimensions in millimetres

h_1/h_2	$l_{1\ min}$
$1 < h_1/h_2 \leq 1{,}90$	0,20
$1{,}90 < h_1/h_2 \leq 3{,}10$	0,35
$3{,}60 \leq h_1/h_2 \leq 4{,}20$	0,70
$5{,}40 \leq h_1/h_2$	0,90

4.5 Mechanical resistance to pressure

A force F (N), as specified in Table 4, applied for 10 s through a steel ball of 1 mm diameter, at the centre of each contact area, shall not cause any deformation prejudicial to the proper functioning of the battery, i.e. after this test, the battery shall pass the tests specified in Clause 7.

Table 4 – Applied force F by battery dimensions

Battery dimensions		Force
d_1 mm	h_1/h_2 mm	F N
<7,9	<3,0	5
	≥3,0	10
≥7,9	<3,0	10
	≥3,0	10

4.6 Deformation

The dimensions of batteries shall conform with the relevant specified dimensions at all times including discharge to the defined end-point voltage.

NOTE 1 A battery height increase up to 0,25 mm can occur, if discharged below this voltage.

NOTE 2 A battery height decrease can occur in B and C systems as discharge continues.

4.7 Leakage

Undischarged batteries and, if required, batteries tested according to 7.2.6 shall be examined as stated in 7.3. The acceptable number of defects shall be agreed between the manufacturer and the purchaser.

4.8 Marking

4.8.1 General

The designation and the polarity shall be marked on the battery. Battery marking should not impede electrical contact. All other markings may be given on the packing instead of on the battery:

a) designation according to normative Annex A, or common;

b) expiration of a recommended usage period or year and month or week of manufacture;

The year and month or week of manufacture may be in code. The code is composed by the last digit of the year and by a number indicating the month. October, November and December should be represented by the letters O, Y and Z respectively.

EXAMPLE

41: January 2014;

4Y: November 2014.

c) polarity of the positive (+) terminal;

d) nominal voltage;

e) name or trade mark of the supplier;

f) cautionary advice;

g) caution for ingestion of batteries shall be given. Refer to IEC 60086-4:2014 (7.2 a) and 9.2) and IEC 60086-5:-[1] (7.1 l) and 9.2) for details.

NOTE Examples of the common designations can be found in Annex D of IEC 60086-2:2015.

4.8.2 Disposal

Marking of batteries with respect to the method of disposal shall be in accordance with local legal requirements.

5 Electrical requirements

5.1 Electrochemical system, nominal voltage, end-point voltage and open-circuit voltage

The requirements concerning the electrochemical system, the nominal voltage, the end-point voltage and the open-circuit voltage are given in Table 5.

Table 5 – Standardised electrochemical systems

Letter	Negative electrode	Electrolyte	Positive electrode	Nominal voltage (V_n) V	End-point voltage (EV) V	Open-circuit voltage (U_{OC} or OCV) V	
						Max.	Min.
B	Lithium (Li)	Organic electrolyte	Carbon monofluoride $(CF)_x$	3,0	2,0	3,70	3,00
C	Lithium (Li)	Organic electrolyte	Manganese dioxide (MnO_2)	3,0	2,0	3,70	3,00
L	Zinc (Zn)	Alkali metal hydroxide	Manganese dioxide (MnO_2)	1,5	1,0	1,68	1,50
S	Zinc (Zn)	Alkali metal hydroxide	Silver oxide (Ag_2O)	1,55	1,2	1,63	1,57