

INTERNATIONAL STANDARD

IEC
60086-2

Edition 10.1

2001-10

Edition 10: 2000 consolidated with amendment 1:2001

Primary batteries –

Part 2: Physical and electrical specifications

Piles électriques –

*Partie 2:
Spécifications physiques et électriques*



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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRIMARY BATTERIES –

Part 2: Physical and electrical specifications

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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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- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
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- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

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

This consolidated version of IEC 60086-2 is based on the tenth edition (2000) [documents 35/1136/FDIS and 35/1147/RVD], and its amendment 1 (2001) [documents 35/1157/FDIS and 35/1163/RVD].

It bears the edition number 10.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annexes A, B and C are for information only.

IEC 60086 consists of the following parts under the general title: *Primary batteries*

- Part 1: General
- Part 2: Physical and electrical specifications
- Part 3: Watch batteries
- Part 4: Safety of lithium batteries
- Part 5: Safety of batteries with aqueous electrolyte

The committee has decided that the contents of the base publication and its amendment will remain unchanged until 2002. At this date, the publication will be

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

A bilingual version of this standard may be issued at a later date.

INTRODUCTION

The technical content of this part of IEC 60086 provides physical dimensions, discharge test conditions and discharge performance requirements. IEC 60086-2 complements the general information and requirements of IEC 60086-1 through provision of specification sheets for primary cells and batteries.

This part 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 part has been changed to improve its contents and may 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. This current revision is the result of a reformatting initiative, as well as some content changes, aimed at making this part more user-friendly, less ambiguous, and, from a cross-reference basis, fully harmonized with other parts of IEC 60086.

NOTE Safety information as been removed from IEC 60086-1, and is now available in IEC 60086-4 and IEC 60086-5.

PRIMARY BATTERIES –

Part 2: Physical and electrical specifications

1 Scope

This part of IEC 60086 is applicable to primary batteries based on standardized electrochemical systems.

It specifies – the physical dimensions
– the discharge test conditions and discharge performance requirements.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60086. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60086 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 600050(481):1996, *International Electrotechnical Vocabulary – Chapter 481: Primary cells and batteries*

IEC 60086-1:2000, *Primary batteries – Part 1: General*

ISO 1101:1983, *Technical drawings – Geometrical tolerancing – Tolerancing of form, orientation, location and run out – Generalities, definitions, symbols, indication on drawings*

3 Definitions

For the purpose of this International Standard, the definitions of IEC 60050(481), as well as the following definitions, apply.

3.1 application test

test which simulates the actual use of a battery in a specific application, for example, "portable lighting", "tape recorder" or "transistor radio" test

3.2 end-point voltage (EV)

specified closed circuit voltage at which a service output test is terminated

3.3 minimum average duration (MAD)

that minimum average time on discharge which shall be met by a sample of batteries

NOTE The discharge test is carried out according to the specified methods and designed to show conformity with the standard applicable to the battery types

3.4**nominal voltage of a primary battery (V_n)**

suitable approximate value of voltage used to identify the voltage of a primary battery

3.5**on-load voltage****(closed-circuit voltage) (CCV)**

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

3.6**open-circuit voltage (OCV)****(off-load voltage)**

voltage across the terminals of a battery when no external current is flowing

3.7**primary battery**

one or more primary cells, including case, terminals and marking

3.8**primary cell**

source of electrical energy obtained by the direct conversion of chemical energy, that is not designed to be charged by any other electrical source

3.9**service output (of a primary battery)**

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

3.10**service output test**

test designed to measure the service output of a battery

NOTE 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

3.11**storage life**

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

3.12**terminals (of a primary battery)**

conductive parts provided for the connection of a battery to external conductors

4 Symbols and abbreviations

4.1 EV: end-point voltage

4.2 MAD: minimum average duration

4.3 OCV: open-circuit voltage (off-load voltage)

4.4 R: load resistance

4.5 V_n : nominal voltage of a battery

5 Battery dimensions

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

- A: maximum overall height of the battery
- B: minimum distance between the flats of the positive and negative contacts
- C: minimum outer diameter of the negative flat contact surface
- D: maximum inner diameter of the negative flat contact surface
- E: maximum recess of the negative flat contact surface
- F: maximum diameter of the positive contact within the specified projection height
- G: minimum projection of the flat positive contact
- K: minimum projection of the flat negative contact
- L: maximum diameter of the negative contact within the specified projection height
- M: minimum diameter of the flat negative contact
- N: minimum diameter of the flat positive contact
- ∅: maximum and minimum diameters of the battery
- ∅ P: concentricity of the positive contact

Recesses are permitted in the negative flat contact surface defined by dimensions C and D for batteries having the shape shown in figure 1a, provided that batteries placed end to end in series make electrical contact with each other and that the contact separation is an integral multiple of the contact separation for one battery. The following conditions must be satisfied:

$$\begin{aligned} C &> F \\ N &> D \\ G &> E \end{aligned}$$

6 Constitution of the battery specification tables

6.1 Batteries are categorized into several groups according to their shapes.

6.2 In each category, batteries having the same shape but belonging to a different electro-chemical system are grouped together and shown in succession.

6.3 Batteries are always listed in ascending order of nominal voltage and, within each nominal voltage, in ascending order of volume.

6.4 One common shape drawing of these batteries which fall in the same group is exhibited.

6.5 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.

6.6 When a drawing represents only one type of battery, the dimensions of the relevant battery are directly shown on the drawing.

6.7 Batteries are categorized into the following groups:

a) Category 1: Round batteries according to figures 1a and 1b

R1, R03, R6C, R6P, R6S, R14C, R14P, R14S, R20C, R20P, R20S, 2R10

LR8D425, LR1, LR03, LR6, LR14, LR20

CR 12A604

- b) Category 2: Round batteries
CR14250, CR17345, CR17450
BR17335, BR17345
- c) Category 3: Round batteries according to figure 2 and figure 3
LR9, LR53
CR 11108
- d) Category 4: Round batteries according to figure 4
PR70, PR41, PR48, PR43, PR44
LR41, LR55, LR54, LR43, LR44
SR62, SR63, SR65, SR64, SR60, SR67, SR66, SR58, SR68, SR59, SR69, SR41, SR57,
SR55, SR48, SR56, SR54, SR42, SR43, SR44
CR1025, CR1216, CR1220, CR1616, CR2012, CR1620, CR2016, CR2025, CR2320,
CR2032, CR2330, CR2430, CR2354, CR3032, CR2450
BR1225, BR2016, BR2020, BR2320, BR2325, BR3032
- e) Category 5: Other round batteries – Miscellaneous
R40
4LR44
2CR13252
4SR44
5AR40
- f) Category 6: Non-round batteries – Miscellaneous
S4
3R12C, 3R12P, 3R12S, 3LR12
4LR61
BR-P2, CR-P2
2CR5
2EP3863
4R25X, 4LR25X
4R25Y
4R25-2, 4LR25-2
6AS4
6AS6
6F22, 6LR61
6F100

6.8 Drawings of round batteries which correspond to figures 1a and 1b, figure 2, figure 3 and figure 4 are prepared by reduction or enlargement of the relevant original drawings. The other drawings are prepared by reduction or enlargement of conventional specification drawings.

In each case the drawings show the shape of the relevant batteries. Dimensions for each battery are shown in the tables.

7 Battery specification tables and sheets

NOTE See annex C for ease of locating battery sizes.

PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 1 BATTERIES

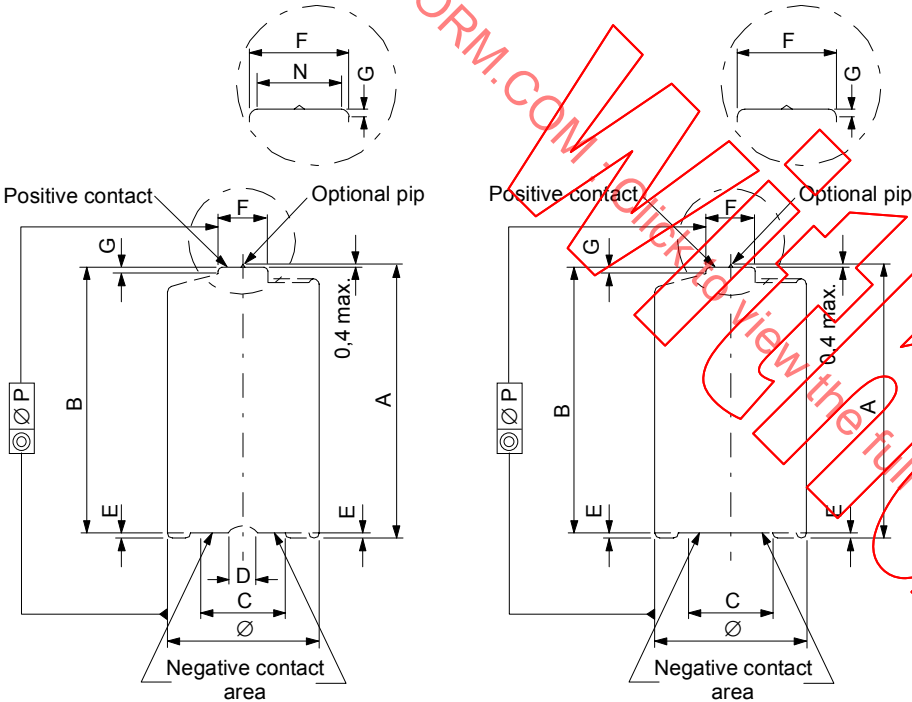


Figure 1a

Figure 1b

For batteries complying with figures 1a and 1b, flat negative contact is not necessarily recessed.

When the flat negative contact surface forms the lower part of the battery, dimensions "A" and "B" are both measured from the surface and dimension "E" is zero.

Dimensions "P" to be measured in accordance with ISO 1101.

Batteries complying with these physical and electrical specifications are:

Designation	OCV Max. V
R1, R03, R6C, R6P, R6S, R14C, R14P, R14S R20C, R20P, R20S	1,725
2R10	3,450
LR8D425, LR1, LR03, LR6, LR14, LR20	1,65
CR12A604	3,7

For the definition of the dimensions, see clause 5.

The cylindrical surface is insulated from the contacts.

Terminals: flat/cap and base.

for terminal details, see respectively 4.1.3.5 and 4.1.3.2 of IEC 60086-1.

For general information, see IEC 60086-1.

Figure 1a: negative contact C may not be flat over the whole area.

Figure 1b: negative contact shall be essentially flat over the whole surface area.

PHYSICAL AND ELECTRICAL SPECIFICATIONS											CATEGORY 1 BATTERIES					
Electro-chemical system	Designation	Vn V	Dimensions mm									Discharge conditions			MAD ^a (initial)	Applications
			A	B	C	E	F	G	Ø		ØP	R Ω	Daily period	EV V		
			Max.	Min.	Min.	Max.	Max.	Min.	Max.	Min.	Max.					
(see note)	R1	1,5	30,2	29,1	5,0	0,2	4,0	0,5	12,0	10,9	0,5	300	12 h	0,9	76 h	Hearing aids
												5,1	5 min	0,9	57 min	Portable lighting
	R03	1,5	44,5	43,3	4,3	0,5	3,8	0,8	10,5	9,5	0,4	5,1	b	0,9	45 min	Portable lighting
												10	1 h	0,9	1,4 h	Personal cassette player and tape recorder
												75	4 h	0,9	20 h	Radio
												24	15 s per min 8 h per day	1,0	4 h	Remote control
												3,6	c	0,9	120 pulses	Pulse test
												43	4 h	0,9	25 h	Radio
	R6C (high capacity)	1,5	50,5	49,2	7,0	0,5	5,5	1,0	14,5	13,5	0,5	3,9	1 h	0,8	47 min	Motor/toy
												10	1 h	0,9	3,5 h	Personal cassette player and tape recorder
												24	15 s per min 8 h per day	1,0	10,9 h	Remote control
												1,8	c	0,9	46 pulses	Pulse test
												43	4 h	0,9	27 h	Radio
												3,9	1 h	0,8	60 min	Motor/toy
	R6P (high power)	1,5	50,5	49,2	7,0	0,5	5,5	1,0	14,5	13,5	0,5	10	1 h	0,9	4,1 h	Personal cassette player and tape recorder
												24	15 s per min 8 h per day	1,0	11 h	Remote control
												1,8	c	0,9	75 pulses	Pulse test
												43	4 h	0,9	22 h	Radio
R6S (standard)	1,5	50,5	49,2	7,0	0,5	5,5	1,0	14,5	13,5	0,5	43	4 h	0,9	22 h	Radio	

NOTE Delayed discharge performance after 12 months is 80 % of MAD.

^a Standard conditions.

^b 4 min beginning at hourly intervals for 8 h per day.

^c 15 s on, 45 s off for 24 h per day.

PHYSICAL AND ELECTRICAL SPECIFICATIONS											CATEGORY 1 BATTERIES					
Electro-chemical system	Designation	Vn V	Dimensions mm								Discharge conditions			MAD ^a (initial)	Applications	
			A	B	C	E	F	G	Ø		R Ω	Daily period	EV V			
			Max.	Min.	Min.	Max.	Max.	Min.	Max.	Min.						Max.
(see note)	R14C (high capacity)	1,5	50,0	48,6	13,0	0,9	7,5	1,5	26,2	24,9	1,0	3,9	b	0,9	250 min	Portable lighting
												6,8	1 h	0,9	7 h	Tape recorders
												20	4 h	0,9	25 h	Radio
												3,9	1 h	0,8	2,5 h	Toy
	R14P (high power)	1,5	50,0	48,6	13,0	0,9	7,5	1,5	26,2	24,9	1,0	3,9	b	0,9	300 min	Portable lighting
												6,8	1 h	0,9	9 h	Tape recorders
												20	4 h	0,9	30 h	Radio
												3,9	1 h	0,8	4,8 h	Toy
	R14S (standard)	1,5	50,0	48,6	13,0	0,9	7,5	1,5	26,2	24,9	1,0	3,9	b	0,9	120 min	Portable lighting
												6,8	1 h	0,9	3,0 h	Tape recorders
												20	4 h	0,9	15 h	Radio
												3,9	1 h	0,8	1,5 h	Toy
	R20C (high capacity)	1,5	61,5	59,5	18,0	1,0	9,5	1,5	34,2	32,3	1,0	2,2	b	0,9	300 min	Portable lighting (1)
												3,9	1 h	0,9	9 h	Tape recorders
												10	4 h	0,9	30 h	Radio
												2,2	1 h	0,8	4 h	Toy
												1,5	4 min per 15 min 8 h per day	0,9	130 min	Portable lighting (2)
NOTE Delayed discharge performance after 12 months is 80 % of MAD.																
^a Standard conditions.																
^b 4 min beginning at hourly intervals for 8 h per day.																

^a	Standard conditions.
^b	4 min beginning at hourly intervals for 8 h per day.
^c	This battery does not fulfil the requirement $C > F$ due to constructional constraints.
^d	24 h per day, plus 10 Ω for 5 s at hourly intervals for 24 h per day.

PHYSICAL AND ELECTRICAL SPECIFICATIONS											CATEGORY 1 BATTERIES					
Electro-chemical system	Designation	Vn V	Dimensions mm									Discharge conditions			MAD ^a (initial)	Applications
			A	B	C	E	F	G	Ø		ØP	R	Daily period	EV V		
			Max.	Min.	Min.	Max.	Max.	Min.	Max.	Min.	Max.	Ω				
L (see note)	LR03	1,5	44,5	43,3	4,3	0,5	3,8	0,8	10,5	9,5	0,4	5,1	b	0,9	130 min	Portable lighting
												24	15 s per min 8 h per day	1,0	14,5 h	Remote control
												10	1 h	0,9	5 h	Personal cassette player and tape recorder
												75	4 h	0,9	44 h	Radio
												(current drain) 600 mA	c	0,9	140 pulses	Photo flash
	LR6	1,5	50,5	49,2	7,0	0,5	5,5	1,0	14,5	13,5	0,5	43	4 h	0,9	60 h	Radio
												3,9	1 h	0,8	4 h	Motor/toy
												10	1 h	0,9	11,5 h	Personal cassette player and tape recorder
												(current drain) 1 000 mA	c	0,9	200 pulses	Photo flash
												24	15 s per min 8 h per day	1,0	31 h	Remote control
	LR14	1,5	50,0	48,6	13,0	0,9	7,5	1,5	26,2	24,9	1,0	3,9	b	0,9	770 min	Portable lighting
												6,8	1 h	0,9	23 h	Tape recorders
												20	4 h	0,9	77 h	Radio
												3,9	1 h	0,8	12 h	Toy
	LR20	1,5	61,5	59,5	18,0	1,0	9,5	1,5	34,2	32,3	1,0	2,2	b	0,9	810 min	Portable lighting (1)
												3,9	1 h	0,9	25 h	Tape recorders
												10	4 h	0,9	81 h	Radio
												2,2	1 h	0,8	15 h	Toy
												1,5	4 min per 15 min 8 h per day	0,9	450 min	Portable lighting (2)

NOTE

Delayed discharge performance after 12 months is 90 % of MAD.

a

Standard conditions.

b

4 min beginning at hourly intervals for 8 h per day.

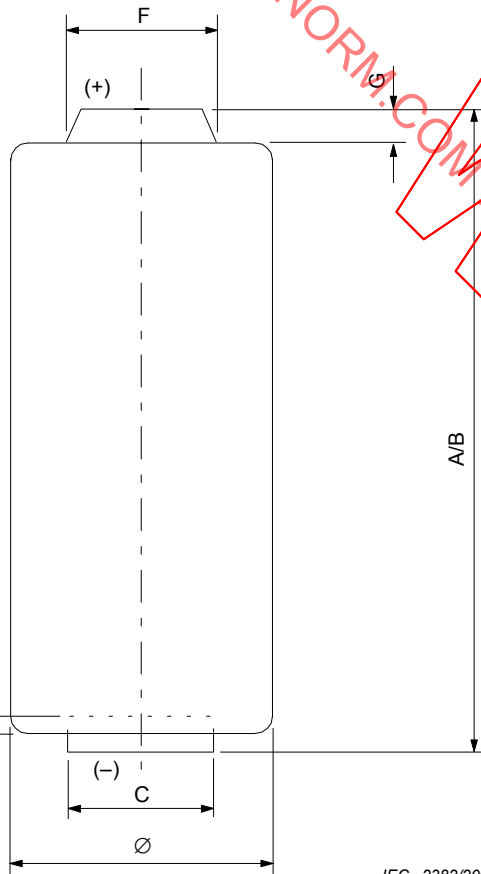
c

10 s on, 50 s off for 1 h per day.

PHYSICAL AND ELECTRICAL SPECIFICATIONS											CATEGORY 1 BATTERIES					
Electro-chemical system	Designation	Vn V	Dimensions mm									Discharge conditions			MAD ^a (initial)	Applications
			A	B	C	E	F	G	Ø		ØP	R Ω	Daily period	EV V		
			Max.	Min.	Min.	Max.	Max.	Min.	Max.	Min.	Max.					
C (see note)	CR12A604 ^b	3	60,4	58,0	4,8	–	4,5	0,3	12,0	10,7		2 000	24 h	2,0	840 h	Service output test
NOTE Delayed discharge performance after 12 months is 98 % of MAD.																
^a Standard conditions																
^b Marking: subclause 4.1.6.2 of IEC 60086-1 is applicable.																

PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 2 BATTERIES



IEC 2382/2000

Batteries complying with these physical and electrical specifications are as follows:

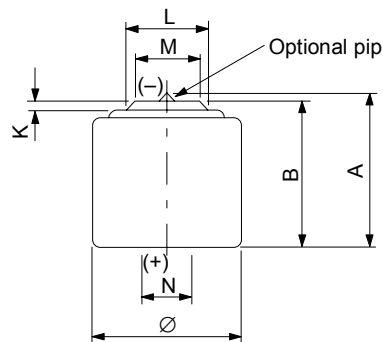
Designation	OCV Max. V
CR14250, CR17345, CR17450	3,7
BR17335, BR17345	3,7

For the definition of the dimensions, see clause 5.
The cylindrical surface is insulated from the contacts.
Terminals: flat/cap and base.
for terminal details, see respectively 4.1.3.5 and 4.1.3.2 of IEC 60086-1.
For general information, see IEC 60086-1.

PHYSICAL AND ELECTRICAL SPECIFICATIONS											CATEGORY 2 BATTERIES					
Electro-chemical system	Designation	Vn V	Dimensions mm								Discharge conditions			MAD ^a (initial)	Applications	
			A/B		C	E		F	G	Ø		R kΩ	Daily period			EV V
			Max.	Min.	Min.	Max.	Min.	Max.	Min.	Max.	Min.					
C (see note1)	CR14250	3	25,0	23,5	5,0			8,0	0,4	14,5	13,5	3	24 h	2,0	750 h	Service output test
	CR17345	3	34,5	33,5	11,0	0,9	0,5	9,6	1,0	17,0	16,0	0,1	24 h	2,0	40 h	Service output test
												(Current drain) 900 mA	3 s on 27 s off 24h/d	1,55	1 400 pulses	Photo
	CR17450	3	45,0	43,5	5,0			8,0	0,4	17,0	16,0	1	24 h	2,0	710 h	Service output test
NOTE 1 Delayed discharge performance after 12 months is 98 % of MAD.																
B (see note 2)	BR17335	3	33,5	32,0	5,0			8,0	0,1	17,0	16,0					
	BR17345	3	34,5	33,5	11,0	0,9	0,5	9,6	1,0	17,0	16,0	0,1	24 h	2,0	40 h	Service output test
												(Current drain) 900 mA	3 s on 27 s off 24h/d	1,55	1 200 pulses	Photo
NOTE 2 Delayed discharge performance after 12 months is 98 % of MAD.																
^a Standard conditions.																

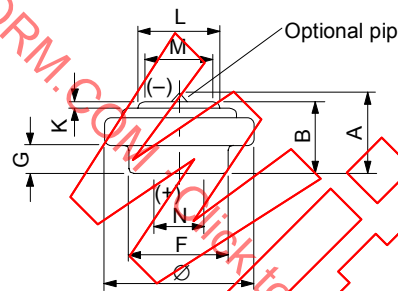
PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 3 BATTERIES



IEC 2383/2000

Figure 2



IEC 2384/2000

Figure 3

No part of the battery shall project beyond the positive contact area.
Marking: 4.1.6.2 of IEC 60086-1 is applicable.

Batteries complying with these physical and electrical specifications are as follows:

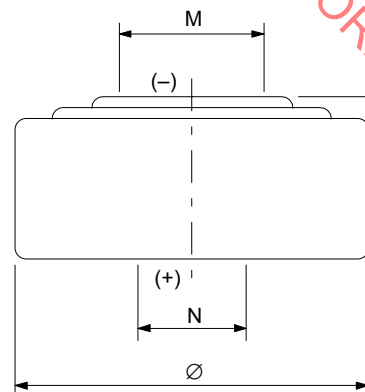
Designation	OCV Max. V
LR9, LR53	1,65
CR11108	3,7

For the definition of the dimensions, see clause 5.
The cylindrical surface is connected to the positive terminal.
Terminals: flat/cap and case.
for terminal details, see respectively 4.1.3.5 and 4.1.3.3 of IEC 60086-1.
For general information, see IEC 60086-1.

PHYSICAL AND ELECTRICAL SPECIFICATIONS													CATEGORY 3 BATTERIES				
Electro-chemical system	Designation	Vn V	Dimensions mm										Discharge conditions			MAD ^a (initial)	Applications
			A	B	F	G	K	L	M	N	Ø		R Ω	Daily period	EV V		
			Max.	Min.	Max.	Min.	Min.	Max.	Min.	Min.	Max.	Min.					
L (see note 1)	LR9	1,5	6,2	5,6	13,5	2,0	0,2	12,5	10,0	10,0	16,0	15,2	390	24 h	0,9	48 h	Service output test
	LR53	1,5	6,1	5,4	20,9	2,1	0,2	21,0	15,3	18,7	23,2	22,6	470	24 h	0,9	50 h	Service output test
NOTE 1 Delayed discharge performance after 12 months is 90 % of MAD.																	
C (see note 2)	CR11108	3	10,8	10,4	–	–	9,2	9,0	3,0	9,0	11,6	11,4	15000	24 h	2,0	620 h	Service output test
NOTE 2 Delayed discharge performance after 12 months is 98 % of MAD.																	
^a Standard conditions.																	

PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 4 BATTERIES



IEC 2385/2000

Figure 4

Any difference between the height of the battery and the distance between the contacts shall not exceed 0,1 mm.

No part of the battery shall project beyond the positive contact.

Marking: 4.1.6.2 of IEC 60086-1 is applicable.

Batteries complying with these physical and electrical specifications are as follows:

Designation	OCV Max. V
PR70, PR41, PR48, PR43, PR44	1,68
LR41, LR55, LR54, LR43, LR44	1,65
SR62, SR63, SR65, SR64, SR60, SR67, SR66, SR58, SR68, SR59, SR69, SR41, SR57, SR55, SR48, SR56, SR54, SR42, SR43, SR44	1,63
CR1025, CR1216, CR1220, CR1616, CR2012, CR1620, CR2016, CR2025, CR2320, CR2032, CR2330, CR2430, CR2354, CR3032, CR2450	3,7
BR1225, BR2016, BR2020, BR2320, BR2325, BR3032	3,7

For the definition of the dimensions, see clause 5.

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.

Terminals: flat/cap and case.

for terminal details, see respectively 4.1.3.5 and 4.1.3.3 of IEC 60086-1.

The flat negative contact shall project.

Contact pressure resistance, see 4.1.3.1 of IEC 60086-1.

For general information see IEC 60086-1.

0,620	g	1,0	38 h	High power
-------	---	-----	------	------------

Requirement.

of the battery so that air access is not impeded for "P" s

PHYSICAL AND ELECTRICAL SPECIFICATIONS									CATEGORY 4 BATTERIES				
Electro-chemical system	Designation	Vn V	Dimensions mm						Discharge conditions			MAD ^a (initial)	Applications
			A/B		M	N	Ø		R kΩ	Daily period	EV V		
			Max	Min	Min.	Min.	Max.	Min.					
L (see note)	LR41	1,5	3,6	3,3	3	3,8	7,9	7,55	22	24 h	1,2	300 h	Service output test
	LR55	1,5	2,1	1,85	3,8	3,8	11,6	11,25	22	24 h	1,2	275 h	Service output test
	LR54	1,5	3,05	2,75	3,8	3,8	11,6	11,25	15	24 h	1,2	350 h	Service output test
	LR43	1,5	4,2	3,8	3,8	3,8	11,6	11,25	10	24 h	1,2	359 h	Service output test
	LR44	1,5	5,4	5,0	3,8	3,8	11,6	11,25	6,8	24 h	1,2	340 h	Service output test
NOTE Delayed discharge performance after 12 months is 90 % of MAD.													
^a Standard conditions.													

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PHYSICAL AND ELECTRICAL SPECIFICATIONS									CATEGORY 4 BATTERIES				
Electro-chemical system	Designation	Vn V	Dimensions mm						Discharge conditions			MAD ^a (initial)	Applications
			A/B		M	N	Ø		R kΩ	Daily period	EV V		
			Max.	Min.	Min.	Min.	Max.	Min.					
S (see note)	SR56	1,55	2,6	2,3	3,8	3,8	11,6	11,25	15	24 h	1,2	490 h	Service output test
	SR54	1,55	3,05	2,75	3,8	3,8	11,6	11,25	15	24 h	1,2	580 h	Service output test
	SR42	1,55	3,6	3,3	3,8	3,8	11,6	11,25	15	24 h	1,2	670 h	Service output test
	SR43	1,55	4,2	3,8	3,8	3,8	11,6	11,25	10	24 h	1,2	620 h	Service output test
	SR44	1,55	5,4	5,0	3,8	3,8	11,6	11,25	6,8	24 h	1,2	620 h	Service output test
									5,6	^b	0,9	450 h	^c
NOTE Delayed discharge performance after 12 months is 90 % of MAD.													
^a Standard conditions. ^b 24 h per day, plus 39 Ω for 1 s every 6 s, for 5 min per day. ^c Accelerated application test for automatic cameras.													

PHYSICAL AND ELECTRICAL SPECIFICATIONS									CATEGORY 4 BATTERIES				
Electro-chemical system	Designation	Vn V	Dimensions mm						Discharge conditions			MAD ^a (initial)	Applications
			A/B		M	N	Ø		R kΩ	Daily period	EV V		
			Max.	Min.	Min.	Min.	Max.	Min.					
B (see note)	BR1225	3	2,5	2,2	4,0	—	12,5	12,2	30	24 h	2,0	395 h	Service output test
	BR2016	3	1,6	1,4	8,0	—	20,0	19,7	30	24 h	2,0	636 h	Service output test
	BR2020	3	2,0	1,8	8,0	—	20,0	19,7	15	24 h	2,0	490 h	Service output test
	BR2320	3	2,0	1,8	8,0	—	23,0	22,6	15	24 h	2,0	468 h	Service output test
	BR2325	3	2,5	2,2	8,0	—	23,0	22,6	15	24 h	2,0	696 h	Service output test
	BR3032	3	3,2	2,9	8,0	—	30,0	29,6	7,5	24 h	2,0	1 310 h	Service output test
NOTE Delayed discharge performance after 12 months is 98 % of MAD.													
^a Standard conditions.													

PHYSICAL AND ELECTRICAL SPECIFICATIONS						CATEGORY 5 BATTERIES	
Ø4,2 max. 172 max. Metal nuts (+) (-) Ø67 max. IEC 2386/2000						Designation	OCV Max. V
						R40	1,725
						Terminals: Screw terminals which comply with 4.1.3.4 of IEC 60086-1. For general information see IEC 60086-1. Dimensions in millimetres.	
Electro-chemical system	Designation	Vn V	Discharge conditions			MAD^a (initial)	Applications
See note	R40	1,5	R Ω	Daily period	EV V		
			6,8	^b	0,93	200 days	Industrial equipment ^c
			2,7	^d	0,85	60 h	Industrial equipment ^c
			10	24 h	0,85	280 h	Industrial equipment
			51	24 h	0,9	80 days	Electric fence controllers
NOTE Delayed discharge performance after 12 months is 80 % of MAD.							
^a Standard conditions.							
^b Ten periods of 4 min each beginning at hourly intervals during six days per week. On the seventh day, five periods beginning at 2 h intervals.							
^c The battery must comply with both tests.							
^d 1 h on, 6 h off, 1 h on, 16 h off.							

[illegible]

PHYSICAL AND ELECTRICAL SPECIFICATIONS				CATEGORY 5 BATTERIES			
				Designation		OCV Max.	
						V	
				5AR40		7,75	
				Dimensions in millimetres. Terminals: Screw terminals. for terminal details, see 4.1.3.4 of IEC 60086-1. Terminals located on top surface. Maximum terminal stud diameter: 4,2 mm. For general information, see IEC 60086-1.			
Dimension	Max.						
Overall height	190,0						
Diameter	184,0						
Electro-chemical system	Designation	Vn V	Discharge conditions			MAD ^a (initial)	Applications
			R Ω	Daily period	EV V		
A (see note)	5AR40 ^b	7,0	240	24 h	4,5	120 days	Electric fence controllers
NOTE Delayed discharge performance after 12 months is 80 % of MAD.							
^a Standard conditions.							
^b Equipment designers' attention is drawn to the importance of ensuring that air access is not impeded for "A" system batteries.							

[illegible]

[illegible]

PHYSICAL AND ELECTRICAL SPECIFICATIONS					CATEGORY 6 BATTERIES		
Technical drawing of the 4LR61 battery showing dimensions in millimeters. The drawing includes a top view and a side view. Key dimensions are: overall length 48.5, width 17, terminal spacing 9.8, terminal width 2.5, and a 45-degree angle for the terminal. The side view shows a 4.3mm radius and a height of 1.8. The drawing is labeled IEC 2390/2000.					Designation	OCV Max. V	
					4LR61	6,60	
Dimensions in millimetres. Terminals: flat contacts. for terminal details, see 4.1.3.5 of IEC 60086-1. For general information, see IEC 60086-1.							
Electro-chemical system	Designation	Vn V	Discharge conditions			MAD ^a (initial)	Applications
			R kΩ	Daily period	EV V		
L (see note)	4LR61	6,0	0,33	24 h	3,6	24 h	Electronic equipment
			6,8	24 h	3,6	700 h	Service output test
NOTE Delayed discharge performance after 12 months is 90 % of MAD.							
^a Standard conditions.							

PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 6 BATTERIES

Designation

OCV Max.

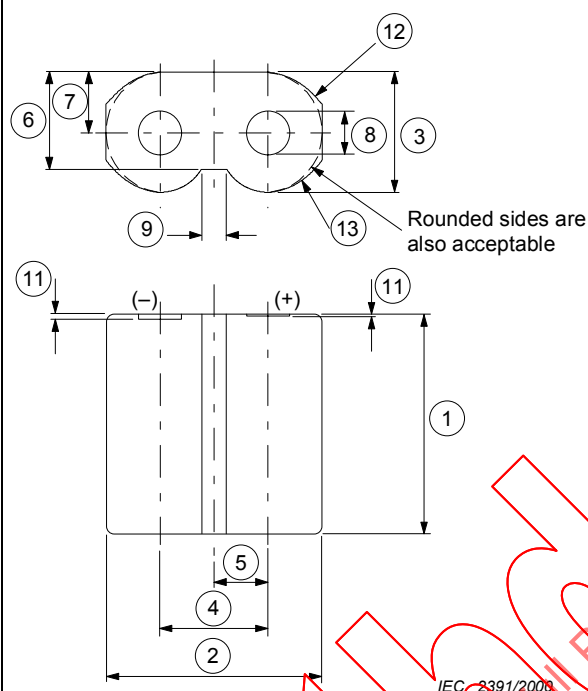
V

CR-P2

7,4

BR-P2

7,4



Dimensions in millimetres

Dimension	Max.	Min.
①	36,0	34,5
②	35,0	32,5
③	19,5	18,5
④	16,8	
⑤	8,4	
⑥	16,2	15,3
⑦	9,8	9,2
⑧	8,7	7,5
⑨		1,3
⑩	1,0	0,1
⑪	1,5	0,7
⑫	10,0	7,4
⑬	10,0	7,4

Terminals: flat contacts.

for terminal details, see 4.1.3.5
of IEC 60086-1.

contacts are recessed.

For general information, see IEC 60086-1.

Electro-chemical system	Designation	Vn V	Discharge conditions			MAD ^a (initial)	Applications
			R Ω	Daily period	EV V		
C (see note)	CR-P2	6	200	24 h	4,0	40 h	Service output test
			(Current drain) 900 mA	3 s on, 27 s off continuously	3,1	1 400 pulses	Photo test
B (see note)	BR-P2	6	200	24 h	4,0	40 h	Service output test
			(Current drain) 900 mA	3 s on, 27 s off continuously	3,1	1 000 pulses	Photo test

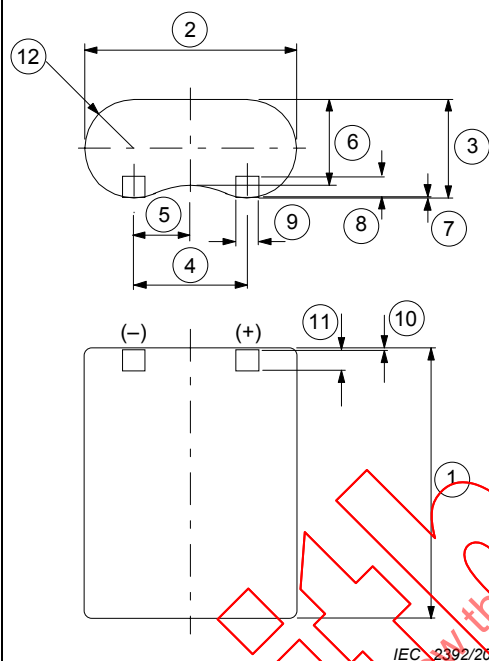
NOTE Delayed discharge performance after 12 months is 98 % of MAD.

^a Standard conditions.

PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 6 BATTERIES

Designation	OCV Max. V
2CR5	7,4



Dimensions in millimetres

Dimension	Max.	Min.
①	45,0	43,0
②	34,0	32,5
③	17,0	16,0
④	16,0	
⑤	8,0	
⑥	15,5	
⑦	1,0	0,2
⑧	4,5	3,5
⑨	4,6	3,5
⑩	0,9	0,1
⑪	4,5	3,5
⑫	9,0	8,0

Terminals: flat contacts.

for terminal details, see 4.1.3.5 of
IEC 60086-1.

For general information, see IEC 60086-1.

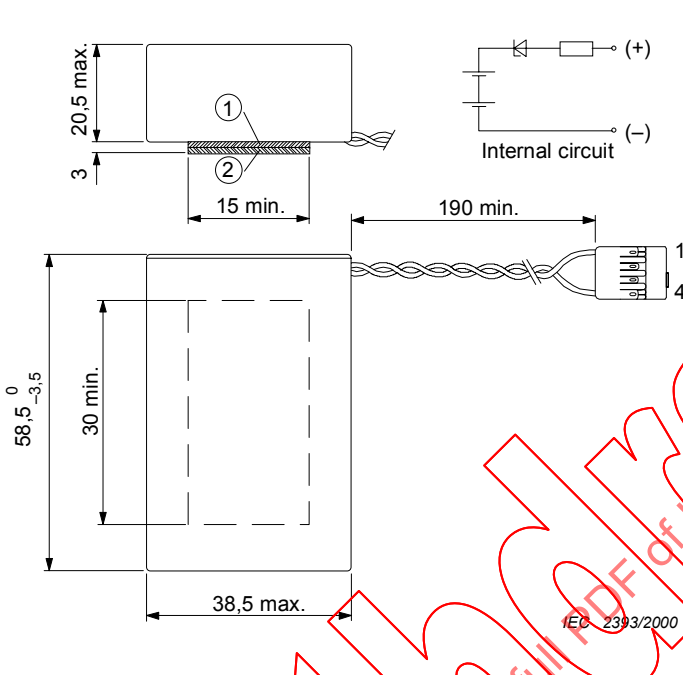
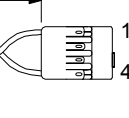
Electro-chemical system	Designation	Vn V	Discharge conditions			MAD ^a (initial)	Applications
			R Ω	Daily period	EV V		
C (see note)	2CR5	6	200	24 h	4,0	40 h	Service output test
			(Current drain) 900 mA	3 s on 27 s off continuously	3,1	1 400 pulses	Photo test

NOTE Delayed discharge performance after 12 months is 98 % of MAD.

^a Standard conditions.

PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 6 BATTERIES

Fastener: ① Loops ② Hooks: mushrooms 75-85/cm²  20,5 max. 3 15 min. 190 min. 58,5⁰_{-3,5} 30 min. 38,5 max. IEC 2393/2000 Internal circuit (+) (-)			Designation		OCV Max. V		
			2EP3863		7,8		
Connector with four receptacles: 1 negative terminal 2 blank 3 polarizing key 4 positive terminal Features: dual-metal contact Gold plating over nickel. Mating data: – 2,54 mm distance. – 0,64 mm square or round pins. – 5,84 mm nominal pin length.			Dimensions in millimetres. Terminals: Two flexible wires with connector. Positive terminal: red. Negative terminal: black. For general information, see IEC 60086-1.				
							
Electro-chemical system	Designation	Vn V	Discharge conditions			MAD ^a	Applications
			R kΩ	Daily period	EV V		
E	2EP3863	6	3,3	24 h	3	650 h	Service output test

^a Standard conditions.

[illegible]

[illegible]

PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 6 BATTERIES

The figure consists of two parts: a main battery outline and a detailed view of the terminals.

Main Battery Outline:

- Overall width: 136,5 mm (top) / 132,5 mm (bottom)
- Overall height: 114,0 mm (left side), 109,5 mm (right side), 127,0 max. (total height including terminals)
- Terminals are located at the top center.

Detailed View of Terminals:

- Shows two circular terminals labeled (+) and (-).
- Terminal diameter: 77,0 mm (outer), 75,2 mm (inner).
- Radius: 14,0 min.
- Distance between terminal centers: 73,0 mm (vertical), 69,0 mm (horizontal).
- Label "Insulated nuts" points to the terminals.
- Reference: IEC 2396/2000

Designation and OCV Max. V Table:

Designation	OCV Max. V
4R25-2	6,900
4LR25-2	6,60

Dimensions in millimetres.

Terminals: screw terminals (insulated nuts).

for terminal details, see 4.1.3.4 of IEC 60086-1.

Maximum terminal stud diameter = 4,2.

Minimum diameter of bearing surface of terminal = 6,3.

For general information, see IEC 60086-1.

Electro-chemical system	Designation	Vn V	Discharge conditions			MAD ^a (initial)	Applications
			R Ω	Daily period	EV V		
See note 1	4R25-2	6,0	8,2	30 min	3,6	900 min	Portable lighting 1
			9,1	b	3,6	696 min	Portable lighting 2
			110	12 h	3,6	200 h	Road warning lamps
L (see note 2)	4LR25-2	6,0	8,2	30 min	3,6	1 800 min	Portable lighting 1
			9,1	b	3,6	2 040 min	Portable lighting 2
			110	12 h	3,6	620 h	Road warning lamps

NOTE 1 Delayed discharge performance after 12 months is 80 % of MAD.

NOTE 2 Delayed discharge performance after 12 months is 90 % of MAD.

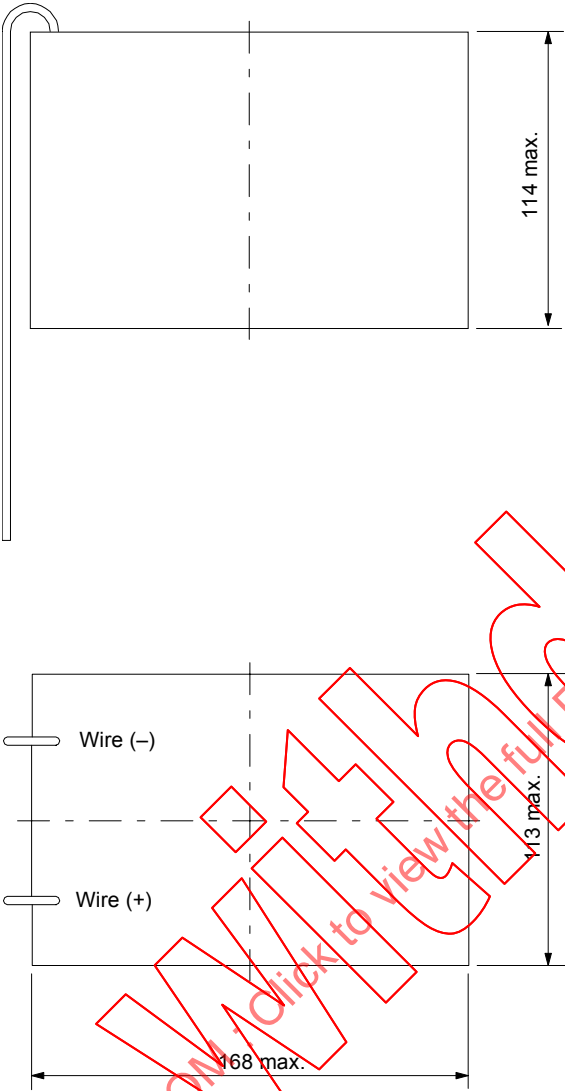
^a Standard conditions.

^b 30 min beginning at hourly intervals for 8 h per day.

PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 6 BATTERIES

Designation		OCV Max.	
		V	
6AS4		9,30	



Dimensions in millimetres.

Terminals: wire.

for terminal details, see 4.1.3.9 of IEC 60086-1.

Minimum free length of connecting wires = 200 mm.

For general information, see IEC 60086-1.

IEC 2397/2000

Electro-chemical system	Designation	Vn V	Discharge conditions			MAD ^a (initial)	Applications
			R Ω	Daily period	EV V		
A (see note)	6AS4 ^b	8,4	300	24 h	5,4	80 days	Electric fence controllers

NOTE Delayed discharge performance after 12 months is 80 % of MAD.

^a Standard conditions.

^b Equipment designers' attention is drawn to the importance of ensuring that air access is not impeded for "A" system batteries.

Dimensions in millimetres.

Terminals: wire.

for terminal details, see 4.1.3.9 of IEC 60086-1.

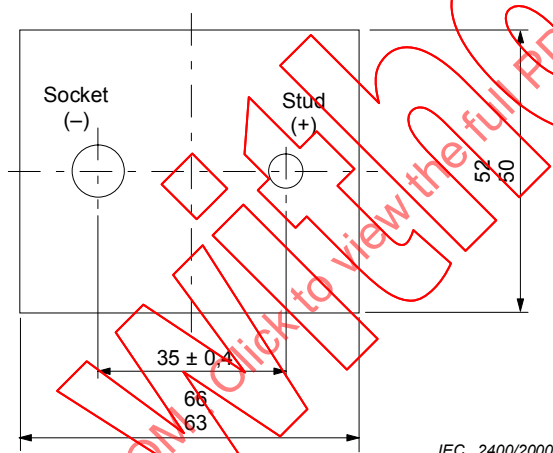
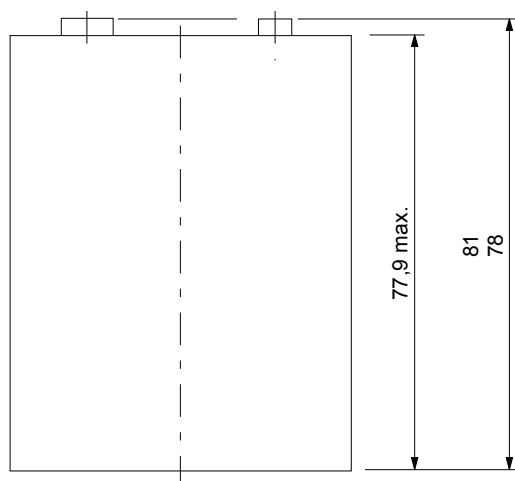
Free length of connecting wires is approximately 200 mm.

The wire ends may be fitted with special terminals.

For general information, see IEC 60086-1.

PHYSICAL AND ELECTRICAL SPECIFICATIONS			CATEGORY 6 BATTERIES				
 Socket (-) Stud (+) 12,7 ± 0,25 26,5⁰₋₂ 17,5⁰₋₂ 46,4 max. 48,5⁰₋₂ IEC 2399/2000			Designation		OCV Max. V		
			6F22		10,350		
			6LR61		9,90		
			Dimensions in millimetres.				
			Terminals: miniature snap fasteners: for terminal details, see 4.1.3.8 of IEC 60086-1.				
			For general information, see IEC 60086-1.				
Electro-chemical system	Designation	Vn V	Discharge conditions			MAD ^a (initial)	Applications
			R Ω	Daily period	EV V		
See note 1	6F22	9,0	620	2 h	5,4	24 h	Radio
			43 k ^b 620	24 1 s per h	7,5	14 days	Smoke detector ^c
			270	1 h	5,4	7 h	Toy
L (see note 2)	6LR61	9,0	620	2 h	5,4	33 h	Radio
			43 k ^b 620	24 1 s per h	7,5	28 days	Smoke detector ^c
			270	1 h	5,4	12 h	Toy
NOTE 1 Delayed discharge performance after 12 months is 80 % of MAD.							
NOTE 2 Delayed discharge performance after 12 months is 90 % of MAD.							
^a Standard conditions. ^b The pulse load of 620 Ω <u>alone</u> shall be applied across the battery for 1 s per h. It is the <i>effective load</i>. It is <u>not</u> added in series or parallel to the 43 kΩ background load. See example below. ^c This is an accelerated test.							
Example (smoke detector test)				Example (smoke detector test)			
 Background load				 Pulse load			

PHYSICAL AND ELECTRICAL SPECIFICATIONS



Designation

OCV Max.

V

6F100

10,350

Dimensions in millimetres.

Terminals: standard snap fasteners.

for terminal details, see 4.1.3.8 of IEC 60086-1.

For general information, see IEC 60086-1.

Electro-chemical system

Designation

V_n
V

Discharge conditions

R
Ω

Daily
period

EV
V

MAD^a
(initial)

Applications

See note

6F100

9,0

240

4 h

5,4

126 h

Transistor radios

NOTE Delayed discharge performance after 12 months is 80 % of MAD.

^a Standard conditions.