

INTERNATIONAL STANDARD

IEC 60086-2

2000

AMENDMENT 2
2004-02

Amendment 2

Primary batteries –

**Part 2:
Physical and electrical specifications**

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Международная Электротехническая Комиссия

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FOREWORD

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

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

FDIS	Report on voting
35/1199/FDIS	35/1203/RVD

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

The committee has decided that the contents of the base publication and its amendments will remain unchanged until 2005. At this date, the publication will be

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- withdrawn;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

This amendment replaces the data corresponding to addition of CR15H270, Figure 5 – Gauge, and deletion of BR17345 and PR43, and also the data corresponding to R1, LR6, LR14 and LR20.

Replace pages 9, 11, 12, 13, 14, 15, 16, 17, 20, 21, 24 and 28 by the following new pages carrying the same numbers.

Insert after page 21, the new page 21bis.

Replace pages 45, 47, 48 and 50 by the following new pages carrying the same numbers.

Global replacement

Replace all footnote “a” references in the remaining unchanged tables from

“a Standard conditions.”

with

“a Standard conditions (see IEC 60086-1, 6.1, Table 4, Initial discharge test).”

- b) Category 2: Round batteries
CR14250, CR15H270, CR17345, CR17450
BR17335
- c) Category 3: Round batteries according to figure 2 and figure 3
LR9, LR53
CR11108
- d) Category 4: Round batteries according to figure 4
PR70, PR41, PR48, 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 Specification tables and sheets

NOTE See annex C for ease of locating battery sizes.

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	∅		∅P	R Ω	Daily period			
			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	30 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
	R6C (high capacity)	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	25 h	Radio
												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
	R6P (high power)	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	27 h	Radio
												3,9	1 h	0,8	60 min	Motor/toy
												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
	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 (see IEC 60086-1, 6.1, Table 4, Initial discharge test).

^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		ØP	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/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 (see IEC 60086-1, 6.1 Table 4, Initial discharge test).

^b 4 min beginning at hourly intervals for 8 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.					
(see note 1)	R20P (high power)	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	320 min	Portable lighting (1)
												3,9	1 h	0,9	13 h	Tape recorders
												10	4 h	0,9	35 h	Transistor radios
												2,2	1 h	0,8	6 h	Toys
												1,5	4 min per 15 min 8 h per day	0,9	137 min	Portable lighting (2)
	R20S (standard)	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	100 min	Portable lighting (1)
												3,9	1 h	0,9	4 h	Tape recorders
												10	4 h	0,9	18 h	Transistor radios
												2,2	1 h	0,8	2 h	Toys
												1,5	4 min per 15 min 8 h per day	0,9	32 min	Portable lighting (2)
2R10	3,0	74,6	71,5	9,0	0,8	6,8	1,0	21,8	20,0	6,8	5 min	1,8	85 min	Portable lighting		
L (see note 2)	LR8D425	1,5	42,5	41,5	2,3 ^c	0,1	3,8	0,7	8,3	7,7	0,1	5,1	5 min	0,9	90 min	Lighting
												75	1 h	1,1	22 h	Laser pointer
												75	1 h	0,9	27 h	Service output test
	LR1	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	130 h	Hearing aids
												5,1	5 min	0,9	94 min	Portable lighting
												3 000	d	0,9	888 h	Paging test

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

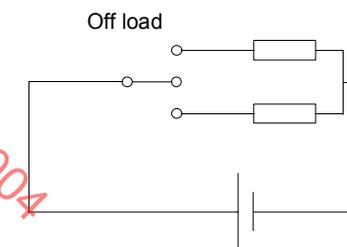
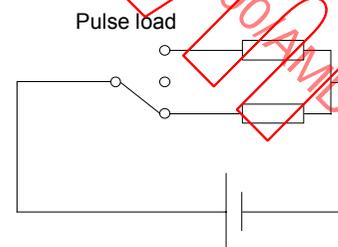
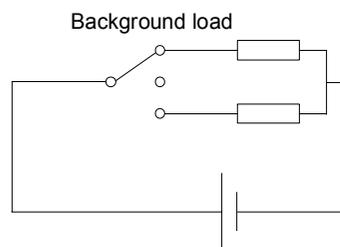
NOTE 2 Delayed discharge performance after 12 months is 90 % of MAD.

^a Standard conditions (see IEC 60086-1, 6.1, Table 4, Initial discharge test).

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

^c This battery does not fulfill 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. See example.



Example

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.		
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) 250 mA	1 h	0,9	4,5 h	CD/MD/ Electronic game
												(current drain) 1 000 mA	c	0,9	200 pulses	Photo flash
	LR14	1,5	50,0	48,6	13,0	0,9	7,5	1,5	26,2	24,9	1,0	24	15 s per min 8 h per day	1,0	31 h	Remote control
												3,9	b	0,9	770 min	Portable lighting
												(current drain) 400 mA	2 h	0,9	8 h	Portable stereo
	LR20	1,5	61,5	59,5	18,0	1,0	9,5	1,5	34,2	32,3	1,0	20	4 h	0,9	77 h	Radio
												3,9	1 h	0,8	12 h	Toy
												2,2	b	0,9	810 min	Portable lighting (1)
												(current drain) 600 mA	2 h	0,9	11 h	Portable stereo
												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 (see IEC 60086-1, 6.1, Table 4, Initial discharge test).

^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	∅		∅P	R	Daily period			EV V
			Max.	Min.	Min.	Max.	Max.	Min.	Max.	Min.	Max.	Ω				
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 (see IEC 60086-1, 6.1 Table 4, Initial discharge test).																
^b Marking: subclause 4.1.6.2 of IEC 60086-1 is applicable.																

PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 2 BATTERIES

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

Designation	OCV Max.
	V
CR14250, CR15H270, CR17345, CR17450, BR17335	3,7 3,7

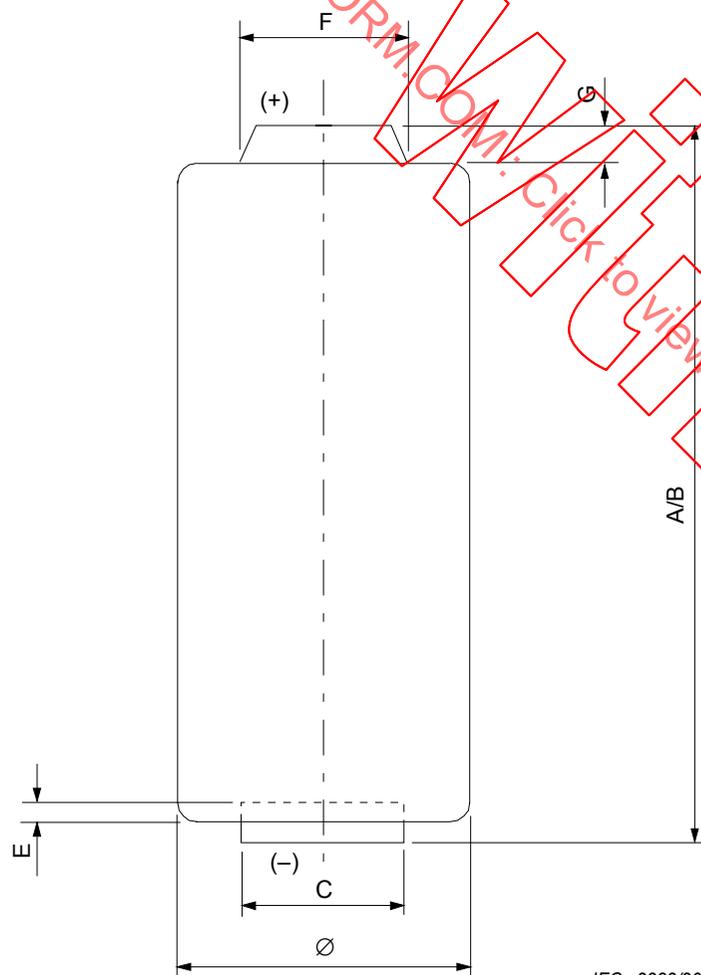
For the definition of the dimensions, see clause 5.

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.



IEC 2382/2000

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 note 1)	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
	CR15H270	3	27,0 ^b	26,0 ^b	8,5	0,4	0,05	7,0	0,6	15,6	15,0	0,2	24 h	2,0	48 h	Service output test
												(Current drain) 900 mA	3 s on 27 s off 24 h/d	1,55	840 pulses	Photo
	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	
^a Standard conditions (see IEC 60086-1, 6.1 Table 4, Initial discharge test). ^b The A dimensions shall be measured on the label overlap.																
B (see note 2)	BR17335	3	33,5	32,0	5,0			8,0	0,1	17,0	16,0					
NOTE 1 Delayed discharge performance after 12 months is 98 % of MAD.																
NOTE 2 Delayed discharge performance after 12 months is 98 % of MAD.																

PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 4 BATTERIES

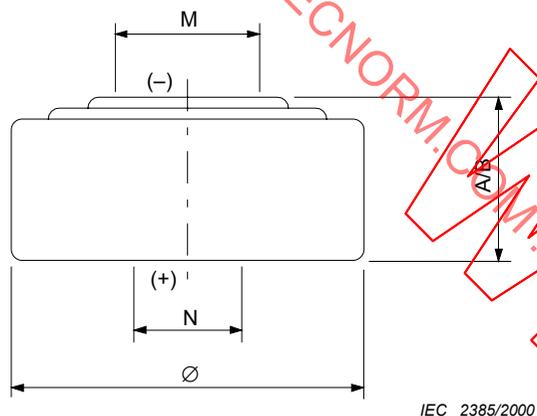


Figure 4

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

Designation	OCV Max. V
PR70, PR41, PR48, 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

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.

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.

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	∅		R	Daily period	EV		
			Max.	Min.	Min.	Min.	Max.	Min.	kΩ		V		
P (see note)	PR70 ^{b, c}	1,4	3,6	3,3	3	3,8	5,8	5,55	3	12 h	0,9	90 h	Hearing aids
									Background: 3 Pulse: 0,510	12 h 1 s on/3 s off for 12 h ^d	1,0	45 h	High power service output test
	PR41 ^{b, c}	1,4	3,6	3,3	3	3,8	7,9	7,55	1,5	12 h	0,9	100 h	Hearing aids
									Background: 1,5 Pulse: 0,160	12 h 1 s on/3 s off for 12 h ^d	1,0	25 h	High power service output test
	PR48 ^{b, c}	1,4	5,4	5,0	3	3,8	7,9	7,55	1,5	12 h	0,9	195 h	Hearing aids
Background: 1,5 Pulse: 0,110									12 h 1 s on/3 s off for 12 h ^d	1,0	30 h	High power service output test	
PR44 ^{b, c}	1,4	5,4	5,0	3,8	3,8	11,6	11,25	0,620	12 h	0,9	195 h	Hearing aids	
								Background: 0,620 Pulse: 0,043	12 h 1 s on/3 s off for 12 h ^d	1,0	38 h	High power service output test	

NOTE Delayed discharge performance after 12 months is 95 % of MAD.

^a Standard conditions (see IEC 690086-1, 6.1 Table 4, Initial discharge test).
^b A period of at least 10 min shall elapse between activation and commencement of electrical measurement.
^c Equipment designers' attention is drawn to the importance of making positive electrical contact on the side of the battery so that air access is not impeded for "P" system batteries.
^d The pulse load alone shall be applied across the battery. It is the effective load. It is not added in series or parallel to the background load. See example.

Example

Background load

Pulse load

Off load

PHYSICAL AND ELECTRICAL SPECIFICATIONS

CATEGORY 4 BATTERIES

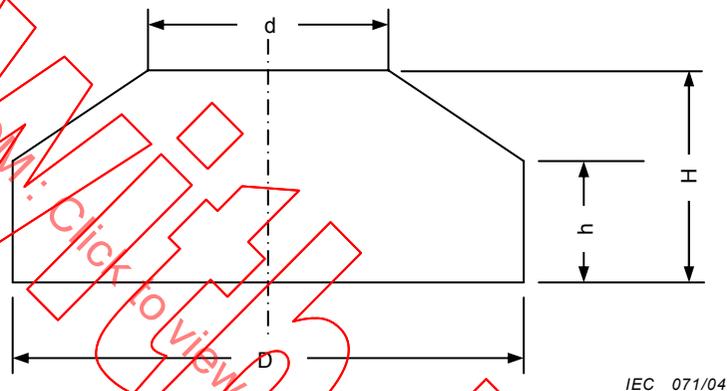


Figure 5 – Gauge

The batteries specified on this sheet shall pass freely through a gauge having the form given above and the dimensions shown below.

Electro-chemical system	Designation	Vn V	Gauge dimensions mm							
			D		d		H		h	
			Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
P	PR70	1,4	5,814	5,805	4,652	4,643	3,612	3,604	3,031	3,023
	PR41	1,4	7,914	7,905	6,314	6,305	3,612	3,604	2,808	2,802
	PR48	1,4	7,914	7,905	6,314	6,305	5,412	5,404	4,612	4,604
	PR44	1,4	11,617	11,606	9,614	9,605	5,412	5,404	4,412	4,404

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 (see IEC 60086-1, 6.1, Table 4, Initial discharge test).
^b 24 h per day, plus 39 Ω for 1 s every 6 s, for 5 min per day. See example.
^c Accelerated application test for automatic cameras.

Example

Background load

Pulse load

Off load

PHYSICAL AND ELECTRICAL SPECIFICATIONS			CATEGORY 5 BATTERIES				
<p style="text-align: center;">IEC 2387/2000</p>			Designation		OCV Max.		
					V		
		4LR44		6,60			
		2CR13252		7,4			
		4SR44		6,52			
<p>Dimensions in millimetres.</p> <p>The cylindrical surface is insulated from the contacts.</p> <p>Terminals: flat.</p> <p style="text-align: center;">for terminal details, see 4.1.3.5 of IEC 60086-1.</p> <p>For general information see IEC 60086-1.</p>							
Electro-chemical system	Designation	Vn V	Discharge conditions			MAD ^a (initial)	Applications
			R kΩ	Daily period	EV V		
L (see note 1)	4LR44	6,0	27	^b	3,6	310 h	^c
			27	24 h	3,6	420 h	Service output test
			0,1	^d	3,6	950 pulses	Pulse test
C (see note 2)	2CR13252	6	30	24 h	4,0	620 h	Service output test
S (see note 1)	4SR44	6,2	27	^b	3,6	570 h	^c
			27	24 h	3,6	620 h	Service output test
			0,1	^d	3,6	1 000 pulses	Pulse test
NOTE 1 Delayed discharge performance after 12 months is 90 % of MAD.							
NOTE 2 Delayed discharge performance after 12 months is 98 % of MAD.							
^a Standard conditions (see IEC 60086-1, 6.1, Table 4, Initial discharge test).							
^b 24 h per day, plus 160 Ω for 1 s every 6 s for 5 min per day. See example.							
^c Accelerated application test for automatic cameras.							
^d 24 h per day, 2 s on, 1 s off.							
Example							

Table A.8 – Photo

Designation	Nominal voltage V
CR15H270	3,0
CR17345	3,0
BR-P2	6,0
CR-P2	6,0
2CR5	6,0

Table A.9 – Portable lighting

Designation	Nominal voltage V
LR8D425	1,5
R1	1,5
LR1	1,5
R03	1,5
LR03	1,5
R14C	1,5
R14P	1,5
R14S	1,5
LR14	1,5
R20C	1,5
R20P	1,5
R20S	1,5
LR20	1,5
2R10	3,0
3R12C	4,5
3R12P	4,5
3R12S	4,5
3LR12	4,5
4R25X	6,0
4LR25X	6,0
4R25Y	6,0
4R25-2	6,0
4LR25-2	6,0

Table A.10 – Smoke detector

Designation	Nominal voltage V
6F22	9,0
6LR61	9,0