

## DRAFT KENYA STANDARD

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### Primary batteries — Specification Part 2: Physical and electrical specifications

PUBLIC REVIEW DRAFT, NOVEMBER 2010

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KENYA BUREAU OF STANDARDS (KEBS)

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Chloride Exide  
Associated Battery Manufactures  
Kenya Police  
Standard Chartered Bank  
Kenya Pipeline Company  
Ministry of Information and Communications  
Eveready East Africa Ltd.  
Kenya Bureau of Standards - Secretariat

## **REVISION OF KENYA STANDARDS**

In order to keep abreast of progress in industry, Kenya standards shall be regularly reviewed. Suggestions for improvement to published standards, addressed to the Managing Director, Kenya Bureau of Standards, are welcome.

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## Foreword

This Kenya Standard has been prepared by the Extra-Low Voltage Equipment Technical Committee under the guidance of the Electrical Industry Standards Committee and is in accordance with the procedures of the Bureau.

This is the third revision of KS 184 and in this revision the committee has retained the structure of IEC 60086 by covering the standard in 5 parts in separate documents, this part being Part 1, as follows:

KS04-184: Kenya Standard Specification for 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

This Part 2 has been aligned with IEC 60086-2 Edition 10.1. Where any text differs from the IEC text, this is indicated by a vertical line in the right hand margin. Acknowledgement is hereby made for the use of this International Standard in this standard.

For the purpose of this Kenya Standard, the source text should be/has been modified as follows:

- (a) The words “this Kenya Standard” should replace “this International Standard” whenever they appear.
- (b) A full point (.) has been used in place of a comma (,) when referring to a decimal marker.
- (c) References to international standards should be replaced by references to the following equivalent Kenya Standards:

Reference to International Standard		Kenya Standard	
No.	Title	No.	Title
IEC 60050(481):1996	International Electrotechnical Vocabulary – Chapter 481: Primary cells and batteries	-	-
IEC 60086-1:2000,	Primary batteries – Part 1: General	KS04-184-1	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	-	-

## **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 Committee 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 has been removed from IEC 60086-1, and is now available in IEC 60086-4 and IEC 60086-5.

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## Primary batteries — Specification

### 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 documents referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050-482:2004, *International Electrotechnical Vocabulary – Chapter 482: Primary and secondary cells and batteries*

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

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

#### 3 Definitions

For the purposes of this document, the definitions of IEC 60050-482 and IEC 60086-1 (some of which are repeated below for convenience) and the following definitions apply.

##### 3.1. application test

simulation the actual use of a battery in a specific application

##### 3.2. end-point voltage EV

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

[IEV 482-03-30:2004, modified]

##### 3.3. minimum average duration MAD

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<sub>n</sub>

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

[IEV 482-03-31:2004, modified]

### 3.5.

#### **on-load voltage**

closed-circuit voltage

#### **CCV**

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

[IEV 482-03-28:2004, modified]

### 3.6.

#### **open-circuit voltage**

off-load voltage

#### **OCV**

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

[IEV 482-03-32:2004, modified]

### 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

[IEV 482-01-02:2004, modified]

### 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

[IEV 482-03-47:2004, modified]

### 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<sub>n</sub>**: 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
- φ: maximum and minimum diameters of the battery
- φP: 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 electrochemical 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 into 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 in the drawing.
- 6.7 Batteries are categorized into the following groups:
  - a) Category 1: Round batteries according to Figure 1  
R1, R03, R6P, R6S, R14P, R14S,  
R20P, R20S, 2R10, LR8D425, LR1,  
LR03, LR6, LR14, LR20  
CR 12A604
  - b) Category 2: Round batteries according to Figure 2  
CR14250, CR15H270, CR17345, CR17450, BR17335

- c) Category 3: Round batteries according to 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 Figure 1, 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.

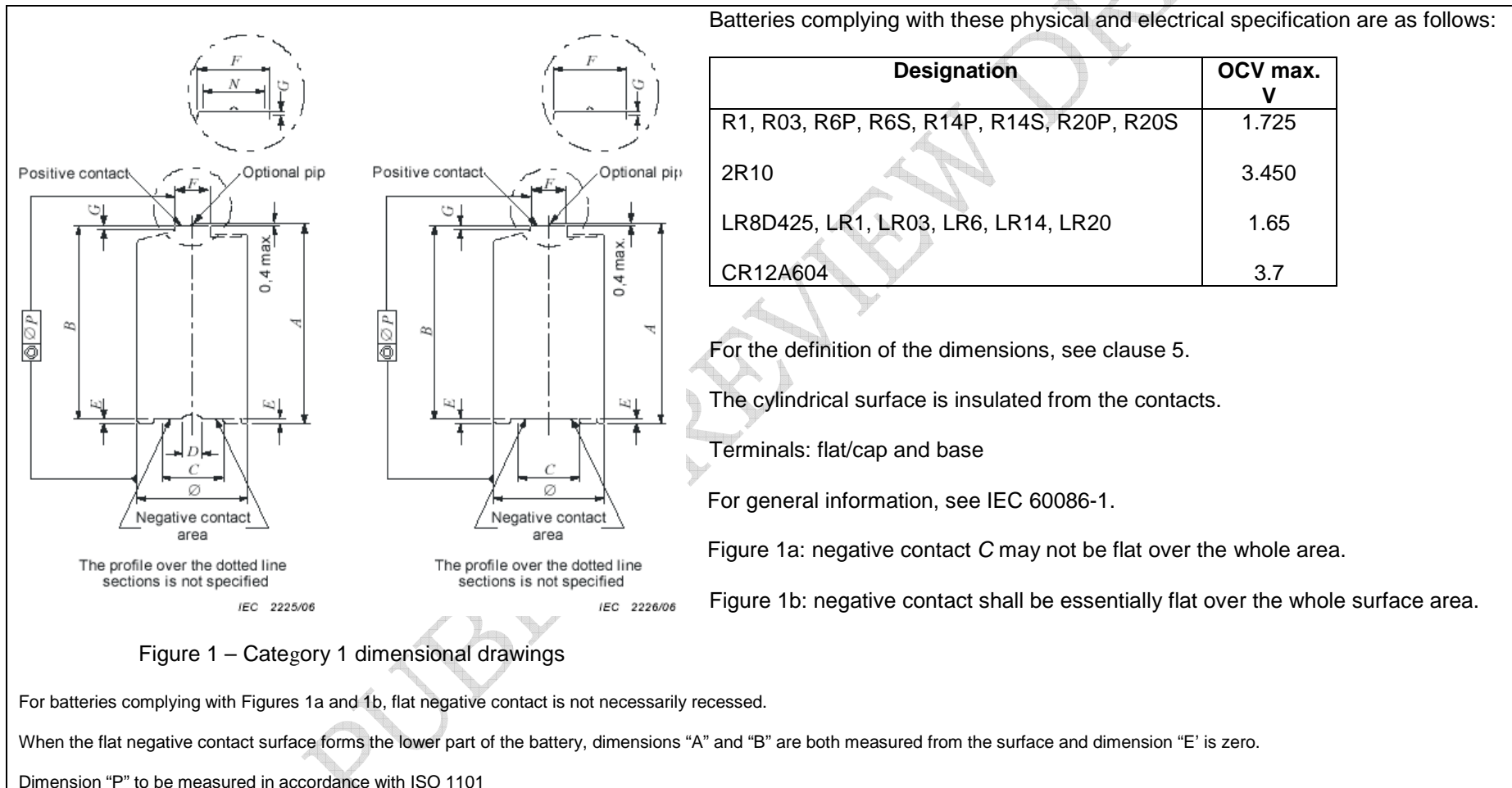
In each case the drawings show the shape of the relevant batteries. Dimensions for each battery are shown in the tables.

NOTE See annex C for ease of locating battery sizes.

## 7 Physical and electrical specifications

### 7.1 Category 1 batteries

#### 7.1.1 Category 1 – Physical and electrical specifications



## 7.1.2 Category 1 – Specifications: R1, R03, R6P, R6S

Electro-chemical system letter	Designation	Vn V	Dimensions mm									Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A	B	C	E	F	G	φ	φp	R Ω	Daily period	EV V			
			Max.	Min.	Min.	Max.	Max.	Min.	Max.	min.	Max.					
No letter (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	1.5 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
	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	4.0 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	60 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, 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.

7.1.3 Category 1 –Specifications: R14P, R14S

Electro-chemical system letter	Designation	Vn V	Dimensions mm									Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A	B	C	E	F	G	φ		φP	R Ω	Daily period	EV V		
			Max.	Min.	Min.	Max.	Max.	Min.	Max.	min.	Max.					
No letter (see note)	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	270 min	Portable lighting
												6.8	1 h	0.9	9 h	Tape recorder
												20	4 h	0.9	27 h	Radio
												3.9	1 h	0.8	3 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 h	Tape recorder
												20	4 h	0.9	15 h	Radio
												3.9	1 h	0.8	1.5 h	Toy

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

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

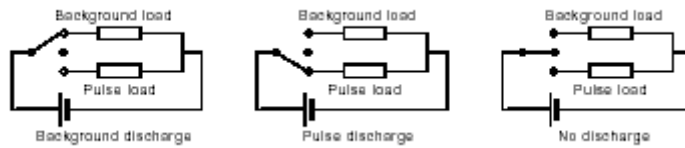
b 4 min beginning at hourly intervals for 8 h per day.

### 7.1.4 Category 1 – Specifications: R20P, R20S, 2R10, LR8D425, LR1

Electro-chemical system letter	Designation	Vn V	Dimensions mm									Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A	B	C	E	F	G	φ	φP	R Ω	Daily period	EV V			
			Max.	Min.	Min.	Max.	Max.	Min.	Max.	min.	Max.					
No letter (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	11 h	Tape recorder
												10	4 h	0.9	32 h	Radio
												2.2	1 h	0.8	5 h	Toy
												1.5	4 min per 15 min 8 h per day	0.9	135 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 recorder
												10	4 h	0.9	18 h	Radio
												2.2	1 h	0.8	2 h	Toy
												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 <sup>c</sup>	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
												Background: 3 000 <sup>d</sup> Pulse:10	24 h 5 s per h	0.9	888 min	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, Table 4, Initial discharge test).
- 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 the pulse load of  $10 \Omega$  alone shall be applied across the battery. It is the effective load. It is not added in series or parallel to the  $3\,000 \Omega$  background load. See example.

Example



### 7.1.5 Category 1 – Specifications: LR03, LR6, LR14, LR20

Electro-chemical system letter	Designation	Vn V	Dimensions mm									Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A	B	C	E	F	G	φ	φp	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 1000 mA	c	0.9	200 pulses	Photo flash
												Power drains 1500 mW 650 mW 0 mW	5 min <sup>d</sup> 55 min	1.05	40 pulses	Digital still camera
												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
												Current drain 400 mA	2 h	0.9	8 h	Portable stereo
												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)
	LR20	1.5	61.5	59.5	18.0	1.0	9.5	1.5	34.2	32.3	1.0	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, 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.   |
| d | Repeat 10 times 1 500 mW for 2 s and 650 mW for 28 s followed by 0 mW for 55 min. Repeat to 1.05 V |

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### 7.1.6 Category 1 – Specifications: CR12A604

Electro-chemical system letter	Designation	Vn V	Dimensions mm									Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A	B	C	E	F	G	$\phi$		$\phi p$	R $\Omega$	Daily period	EV V		
			Max.	Min.	Min.	Max.	Max.	Min.	Max.	min.	Max.					
C (see note)	CR12A604 <sup>b</sup>	3.0	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, Table 4, Initial discharge test).																
b Marking: 4.1.6.2 of IEC 60086-1 is applicable.																

## 7.2 Category 2 batteries

### 7.2.1 Category 2 – Physical and electrical specifications

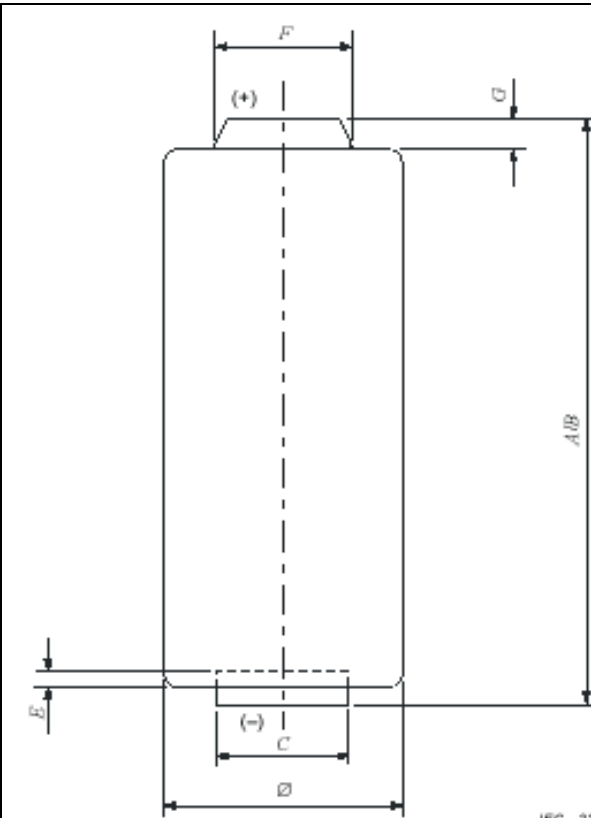


Figure 2 – Category 2 dimensional drawing

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

Designation	OCV max. V
CR14250, CR15H270, CR17345, CR17450	3.7
BR17335	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 general information, see IEC 60086-1.

## 7.2.2 Category 2 – Specifications: CR14250, CR15H270, CR17345, CR17450, BR17335

Electro-chemical system letter	Designation	Vn V	Dimensions mm									Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A	B	C	E		F	G	φ		R kΩ	Daily period	EV V		
			Max.	Min.	Min.	Max.	Max.	Max.	Min.	Max.	Min.					
C (see note)	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	3.0	27.0 <sup>b</sup>	26.0 <sup>b</sup>	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 24 h/d	1.55	1400 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	
B (see note)	BR17335	3	33.5	32.0	5.0	-	-	8.0	0.1	17.0	16.0	-	-	-	-	-

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

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

b The A dimensions shall be measured on the label overlap.

### 7.3 Category 3 batteries

#### 7.3.1 Category 3 – Physical and electrical specifications

IEC 2228/06

IEC 2229/06

**Figure 3a**                      **Figure 3b**

**Figure 3 – Category 3 dimensional drawings**

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
CR 11108	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

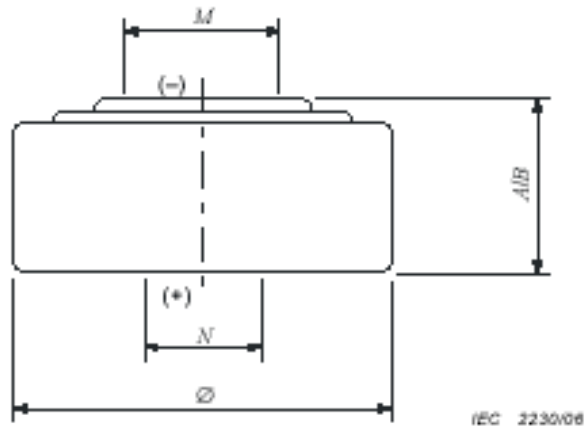
For general information, see IEC 60086-1.

### 7.3.2 Category 3 – Specifications: LR9, LR53, CR11108

Electro-chemical system letter	Designation	Vn V	Dimensions mm										Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A	B	F	G	K	L	M	N	φ		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
C (see note 2)	CR11108	3.0	10.8	10.4	-	-	0.2	9.0	3.0	9.0	11.6	11.4	15000	24 h	2.0	620 h	Service output 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, Table 4, Initial discharge test).																	

## 7.4 Category 3 batteries

### 7.4.1 Category 4 – Physical and electrical specifications



**Figure 4 – Category 4 dimensional drawing**

Any difference between 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 specification 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

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

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.

### 7.4.2 Category 4 – Specifications: PR70, PR41, PR48, PR44

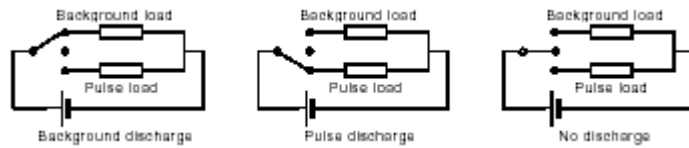
Electro-chemical system letter	Designation	Vn V	Dimensions mm						Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A/B		M	N	φ		R kΩ	Daily period	EV V		
			Max.	Min.	Min.	Min.	Min.	Max.					
P (see note)	PR70 <sup>b, c</sup>	1.4	3.6	3.3	-	-	5.8	5.55	3	12 h	0.9	90 h	Hearing aids
									Background: 3 Pulse: 0.510	12 h 1 s on/3 s off for 12 h <sup>d</sup>	1.0	45 h	High power service output test
									Current drain Background: 0.7 mA Pulse: 3 mA	e	1.05	85 h	Hearing aid standard
									Current drain Background: 1 mA Pulse: 5 mA	e	1.05	50 h	Hearing aid high drain
	PR41 <sup>b, c</sup>	1.4	3.6	3.3	3.0	3.8	7.9	7.55	1.5	12 h	0.9	100 h	Hearing aid
									Background: 1.5 Pulse: 0.160	12 h 1 s on/3 s off for 12 h <sup>d</sup>	1.0	25 h	High power service output test
									Current drain Background: 1.2 mA Pulse: 5 mA	e	1.05	95 h	Hearing aid standard
									Current drain Background: 2 mA Pulse: 10 mA		1.05	55 h	Hearing aid high drain
	PR48 <sup>b, c</sup>	1.4	5.4	5.0	3.0	3.8	7.9	7.55	1.5	12 h	0.9	195 h	Hearing aid
									Background: 1.5 Pulse: 0.110	12 h 1 s on/3 s off for 12 h <sup>d</sup>	1.0	30 h	High power service output test
									Current drain Background: 2 mA Pulse: 6 mA	e	1.05	82 h	Hearing aid standard
									Current drain Background: 3 mA Pulse: 12 mA	e	1.05	55 h	Hearing aid high drain
	PR44 <sup>b, c</sup>	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 <sup>d</sup>	1.0	38 h	High power service output test
									Current drain Background: 5 mA Pulse: 15 mA	e	1.05	69 h	Hearing aid standard
									Current drain Background: 8 mA Pulse: 24 mA	e	1.05	45 h	Hearing aid high drain

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



- a Standard conditions( see IEC 60086-1, 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
- e 12 h per day repeated cycle of the heavier load for 100 ms, plus the lighter load for 119 min, 59 s, 900 ms.

EXAMPLE



7.4.2 (continued)

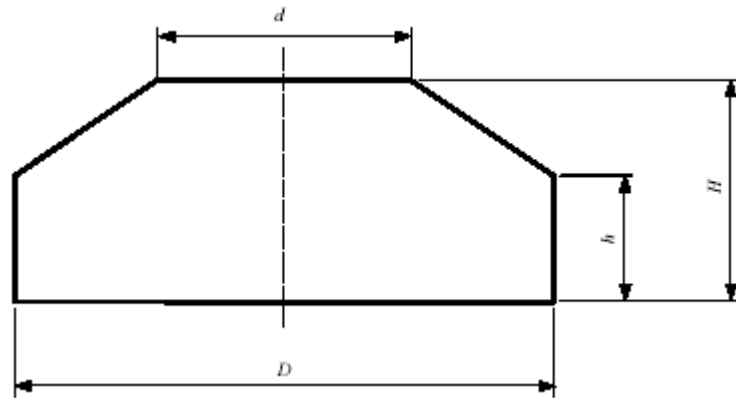


Figure 5 – Gauge for Category 4 batteries

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 letter	Designation	Vn V	Gauge dimensions mm							
			D		d		H		h	
			Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
P (see note)	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	4.612	4.404

7.4.3 Category 4 – Specifications: LR41, LR55, LR54, LR43, LR44

Electro-chemical system letter	Designation	Vn V	Dimensions mm						Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A/B		M	N	φ		R kΩ	Daily period	EV V		
			Max.	Min.	Min.	Min.	Min.	Max.					
L (see note)	LR41	1.5	3.6	3.3	3.0	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 (see IEC 60086-1, Table 4, Initial discharge test).													

#### 7.4.4 Category 4 – Specifications: SR62, SR63, SR65, SR64, SR60, SR67, SR66, SR58, SR68, SR59, SR69, SR41, SR57, SR55, SR48

Electro-chemical system letter	Designation	Vn V	Dimensions mm						Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A/B		M	N	φ		R kΩ	Daily period	EV V		
			Max.	Min.	Min.	Min.	Min.	Max.					
S (see note)	SR62	1.55	1.65	1.45	2.5	3.8	5.8	5.55	82	24 h	1.2	390 h	Service output test
	SR63	1.55	2.15	1.9	2.5	3.8	5.8	5.55	68	24 h	1.2	560 h	Service output test
	SR65	1.55	1.65	1.45	3.0	-	6.8	6.6	100	24 h	1.2	810 h	Service output test
	SR64	1.55	2.7	2.4	2.5	3.8	5.8	5.55	56	24 h	1.2	-	Service output test
	SR60	1.55	2.15	1.9	3.0	3.8	6.8	6.5	68	24 h	1.2	685 h	Service output test
	SR67	1.55	1.65	1.45	3.0	-	7.9	7.65	68	24 h	1.2	820 h	Service output test
	SR66	1.55	2.6	2.4	3.0	-	6.8	6.6	47	24 h	1.2	680 h	Service output test
	SR58	1.55	2.1	1.85	3.0	3.8	7.9	7.55	47	24 h	1.2	518 h	Service output test
	SR68	1.55	1.65	1.45	3.8	-	9.5	9.25	47	24 h	1.2	680 h	Service output test
	SR59	1.55	2.6	2.3	3.0	3.8	7.9	7.55	33	24 h	1.2	530 h	Service output test
	SR69	1.55	2.1	1.85	3.8	-	9.5	9.25	33	24 h	1.2	663 h	Service output test
	SR41	1.55	3.6	3.3	3.0	3.8	7.9	7.55	22	24 h	1.2	450 h	Service output test
	SR57	1.55	2.7	2.4	3.8	3.8	9.5	9.15	22	24 h	1.2	500 h	Service output test
	SR55	1.55	2.1	1.85	3.8	3.8	11.6	11.25	22	24 h	1.2	450 h	Service output test
SR48	1.55	5.4	5.0	3.0	3.8	7.9	7.55	15	12 h	0.9	40 h	Hearing aid	
								15	24 h	1.2	580 h	Service output test	

NOTE Delayed discharge performance after 12 months is 90 % of MAD  
a Standard conditions (see IEC 60086-1, Table 4, Initial discharge test).

7.4.5 Category 4 – Specifications: SR56, SR54,, SR42, SR43, SR44

Electro-chemical system letter	Designation	Vn V	Dimensions mm						Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A/B		M	N	φ		R kΩ	Daily period	EV V		
			Max.	Min.	Min.	Min.	Min.	Max.					
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
									Background 5.6 Pulse: 0.039	b	0.9	450 h	c

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

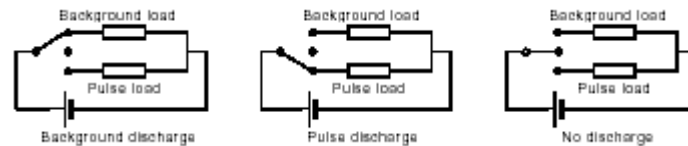
a Standard conditions(see IEC 60086-1, Table 4, Initial discharge test).

b 24 h per day, plus 39 Ω for 1 s every 6 s for 5 min per day.

c Accelerated application test for automatic cameras.

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



**7.4.6 Category 4 – Specifications: CR1025, CR1216, CR1220, CR1616, CR2012, CR1620, CR2016, CR2025, CR2320, CR2032, CR2330, CR2430, CR2354, CR3032, CR2450**

Electro-chemical system letter	Designation	Vn V	Dimensions mm						Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A/B		M	N	φ		R kΩ	Daily period	EV V		
			Max.	Min.	Min.	Min.	Max.	Min.					
C (see note)	CR1025	3.0	2.5	2.2	3.0	-	10.0	9.7	68	24 h	2.0	630 h	Service output test
	CR1216	3.0	1.6	1.4	4.0	-	12.5	12.2	62	24 h	2.0	480 h	Service output test
	CR1220	3.0	2.0	1.8	4.0	-	12.5	12.2	62	24 h	2.0	700 h	Service output test
	CR1616	3.0	1.6	1.4	5.0	-	16.0	15.7	30	24 h	2.0	480 h	Service output test
	CR2012	3.0	1.2	1.0	8.0	-	20.0	19.7	30	24 h	2.0	530 h	Service output test
	CR1620	3.0	2.0	1.8	5.0	-	16.0	15.7	47	24 h	2.0	900 h	Service output test
	CR2016	3.0	1.6	1.4	8.0	-	20.0	19.7	30	24 h	2.0	675 h	Service output test
	CR2025	3.0	2.5	2.2	8.0	-	20.0	19.7	15	24 h	2.0	540 h	Service output test
	CR2320	3.0	2.0	1.8	8.0	-	23.0	22.6	15	24 h	2.0	590 h	Service output test
	CR2032	3.0	3.2	2.9	8.0	-	20.0	19.7	15	24 h	2.0	920 h	Service output test
	CR2330	3.0	3.0	2.7	8.0	-	23.0	22.6	15	24 h	2.0	1320 h	Service output test
	CR2430	3.0	3.0	2.7	8.0	-	24.5	24.2	15	24 h	2.0	1300 h	Service output test
	CR2354	3.0	5.4	5.1	8.0	-	23.0	22.6	7.5	24 h	2.0	1260 h	Service output test
	CR3032	3.0	3.2	2.9	8.0	-	30.0	29.6	7.5	24 h	2.0	1250 h	Service output test
CR2450	3.0	5.0	4.6	8.0	-	24.5	24.2	7.5	24 h	2.0	1200 h	Service output test	

NOTE Delayed discharge performance after 12 months is 98 % of MAD  
a Standard conditions (see IEC 60086-1, Table 4, Initial discharge test).

7.4.7 Category 4 – Specifications: BR1225, BR2016, BR2020, BR2320, BR2325, BR3032

Electro-chemical system letter	Designation	Vn V	Dimensions mm						Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			A/B		M	N	φ		R kΩ	Daily period	EV V		
			Max.	Min.	Min.	Min.	Min.	Max.					
B (see note)	BR1225	3.0	2.5	2.2	4.0	-	12.5	12.2	30	24 h	2.0	395 h	Service output test
	BR2016	3.0	1.6	1.4	8.0	-	20.0	19.7	30	24 h	2.0	636 h	Service output test
	BR2020	3.0	2.0	1.8	8.0	-	20.0	19.7	15	24 h	2.0	490 h	Service output test
	BR2320	3.0	2.0	1.8	8.0	-	23.0	22.6	15	24 h	2.0	468 h	Service output test
	BR2325	3.0	2.5	2.2	8.0	-	23.0	22.6	15	24 h	2.0	696 h	Service output test
	BR3032	3.0	3.2	2.9	8.0	-	30.0	29.6	7.5	24 h	2.0	1310 h	Service output test
NOTE Delayed discharge performance after 12 months is 98 % of MAD													
<sup>a</sup> Standard conditions (see IEC 60086-1, Table 4, Initial discharge test).													





## 7.5 category 5 batteries

### 7.5.1 Category 5 – Physical and electrical specifications

#### 7.5.1.1 Category 5 – Specification: R40

<p style="text-align: center;">IEC 2386/2000</p>	<b>Designation</b>	<b>OCV max.</b> V
	R40	1.725
<p>Dimensions in millimeters.</p> <p>Terminals: Screw terminals.</p> <p>For general information see IEC 60086-1.</p>		

**Figure 6 – Dimensional drawing: R40**

Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
No letter (See note)	R40	1.5	6.8	b	0.93	200 days	Industrial equipment (1)
			2.7	c	0.85	60 h	Industrial equipment (2)
			10	24 h	0.85	280 h	Industrial equipment (3)
			51	24 h	0.9	80 days	Electric fence controllers

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

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

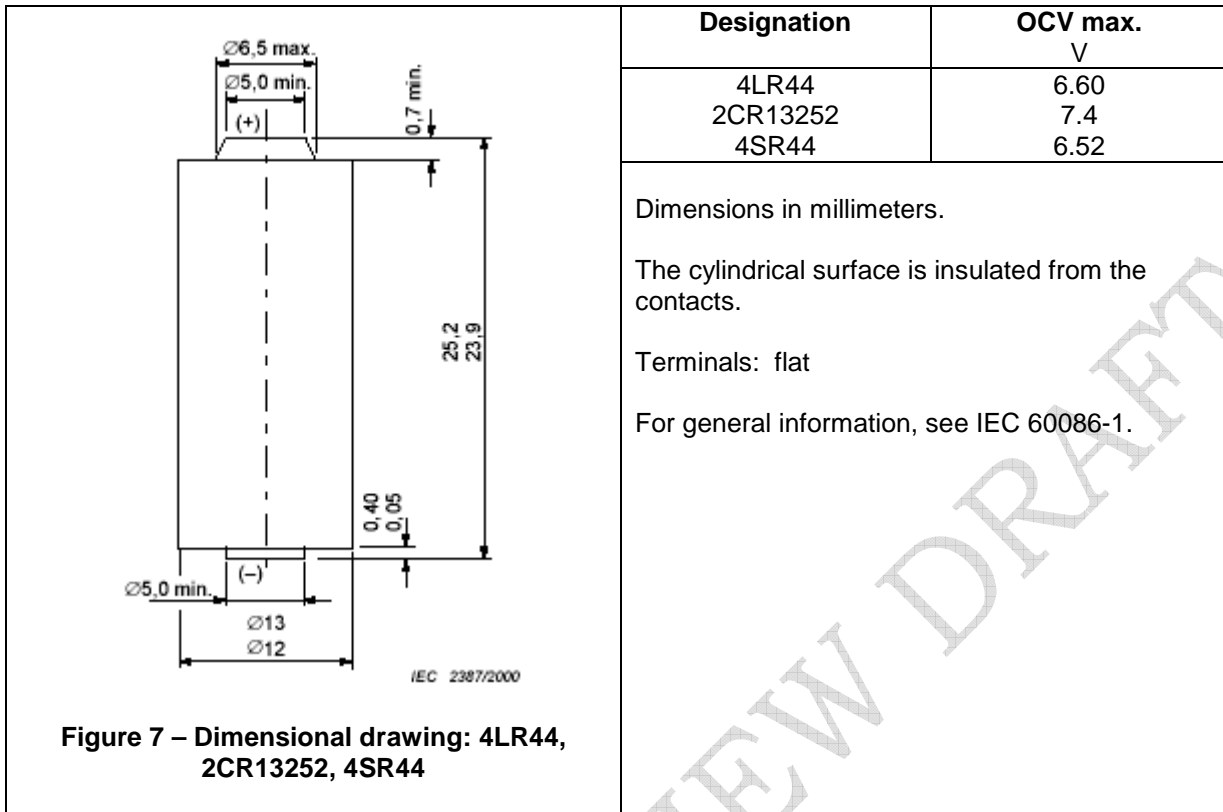
b Ten periods of 4 min each beginning at hourly intervals during six days per week.

On the seventh day, five periods beginning at 2 h intervals.

c 1 h on, 6 h off, 1 h on, 16 h off

**KS 184-2: 2010**  
**IEC 60086-2:2006**

**7.5.1.2 Category 5 – Specifications: 4LR44, 2CR13252, 4SR44**



Designation	OCV max. V
4LR44	6.60
2CR13252	7.4
4SR44	6.52

Dimensions in millimeters.

The cylindrical surface is insulated from the contacts.

Terminals: flat

For general information, see IEC 60086-1.

Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (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	Background <sup>b</sup> :27 Pulse: 0.160	b	3.6	570 h	c
			27	24 h	3.6	620 h	Service output test
			0.1	d	3.6	1000 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

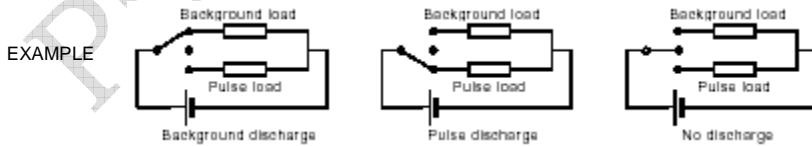
<sup>a</sup> Standard conditions (see IEC 60086-1, Table 4, Initial discharge test).

<sup>b</sup> 24 h per day, plus 160 Ω for 1 s every 6 s for 5 min per day.

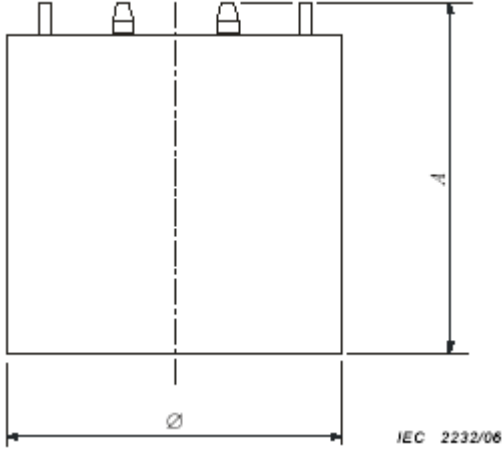
<sup>c</sup> Accelerated application test for automatic cameras.

<sup>d</sup> 24 h per day, 2 s on, 1 s off.

<sup>e</sup> 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.



### 7.5.1.3 Category 5 – Specifications:5AR40

	<b>Designation</b>	<b>OCV max. V</b>
	5AR40	7.75
<p>Dimensions in millimeters.</p> <p>Terminals: Screw terminals</p> <p>Terminals located on top surface.</p> <p>Maximum terminal stud diameter: 4.2 mm.</p> <p>For general information, see IEC 60086-1.</p>		

**Figure 8 – Dimensional drawing: 5AR40**

Dimension	Max.
A	190.0
Ø	184.0

Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
A (see note)	5AR40 <sup>b</sup>	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 (see IEC 60086-1, Table 4, Initial discharge test).

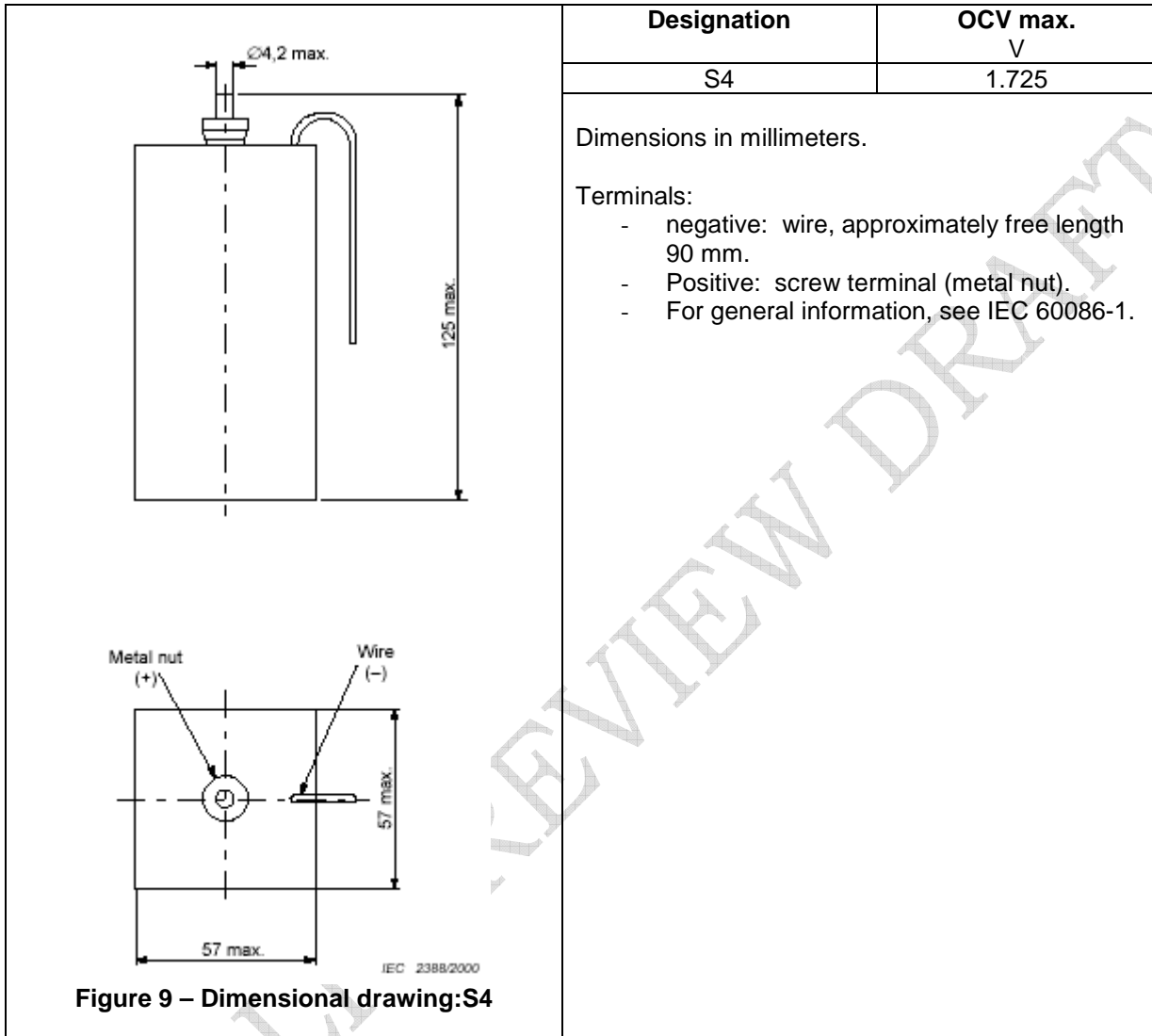
b Equipment designers' attention is drawn to the importance of ensuring that air access is not impeded for "A" system batteries.

**KS 184-2: 2010**  
**IEC 60086-2:2006**

**7.6 Category 6 batteries**

**7.6.1 category 6 – Physical and electrical specifications**

**7.6.1.1 Category 6 – Specifications:S4**



Designation	OCV max. V
S4	1.725

Dimensions in millimeters.

Terminals:

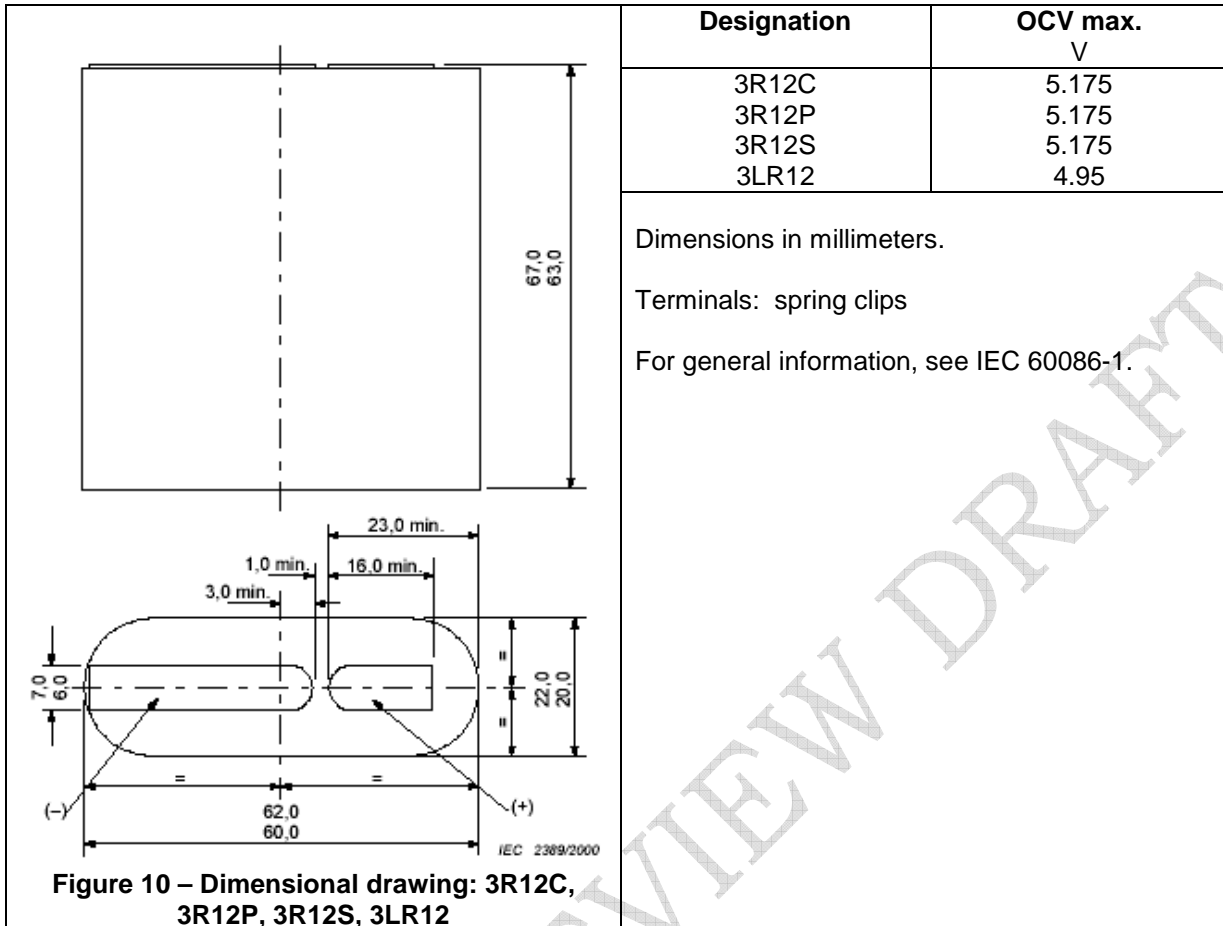
- negative: wire, approximately free length 90 mm.
- Positive: screw terminal (metal nut).
- For general information, see IEC 60086-1.

Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
No letter (see note)	S4	1.5	20	24 h	0.85	500 h	Industrial equipment

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

<sup>a</sup> Standard conditions (see IEC 60086-1, Table 4, Initial discharge test).

7.6.1.2 Category 6 – Specifications: 3R12C, 3R12P, 3R12S, 3LR12



Designation	OCV max. V
3R12C	5.175
3R12P	5.175
3R12S	5.175
3LR12	4.95

Dimensions in millimeters.  
 Terminals: spring clips  
 For general information, see IEC 60086-1.

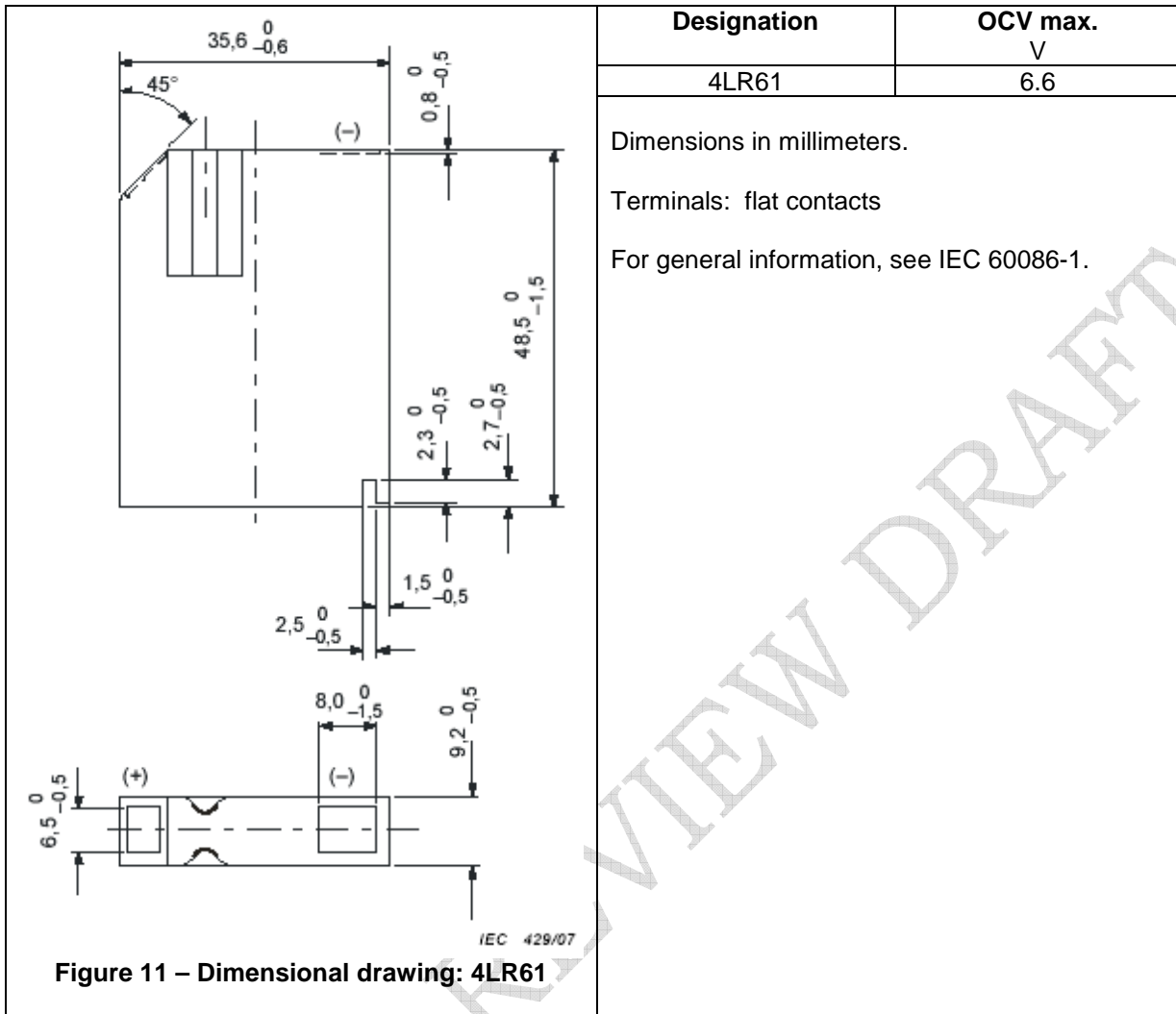
Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
No letter (see note 1)	3R12C (high capacity)	4.5	20	1 h	2.7	4.5 h	Portable lighting
			220	4 h	2.7	96 h	radio
	3R12P (high power)	4.5	20	1 h	2.7	5.5 h	Portable lighting
			220	4 h	2.7	96 h	radio
3R12S (standard)	4.5	20	1 h	2.7	3.5 h	Portable lighting	
		220	4 h	2.7	96 h	radio	
L (see note 2)	3LR12	4.5	20	1 h	2.7	12	Portable lighting
			220	4 h	2.7	300 h	radio

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, Table 4, Initial discharge test).

7.6.1.3 Category 6 – Specificatins: 4LR61



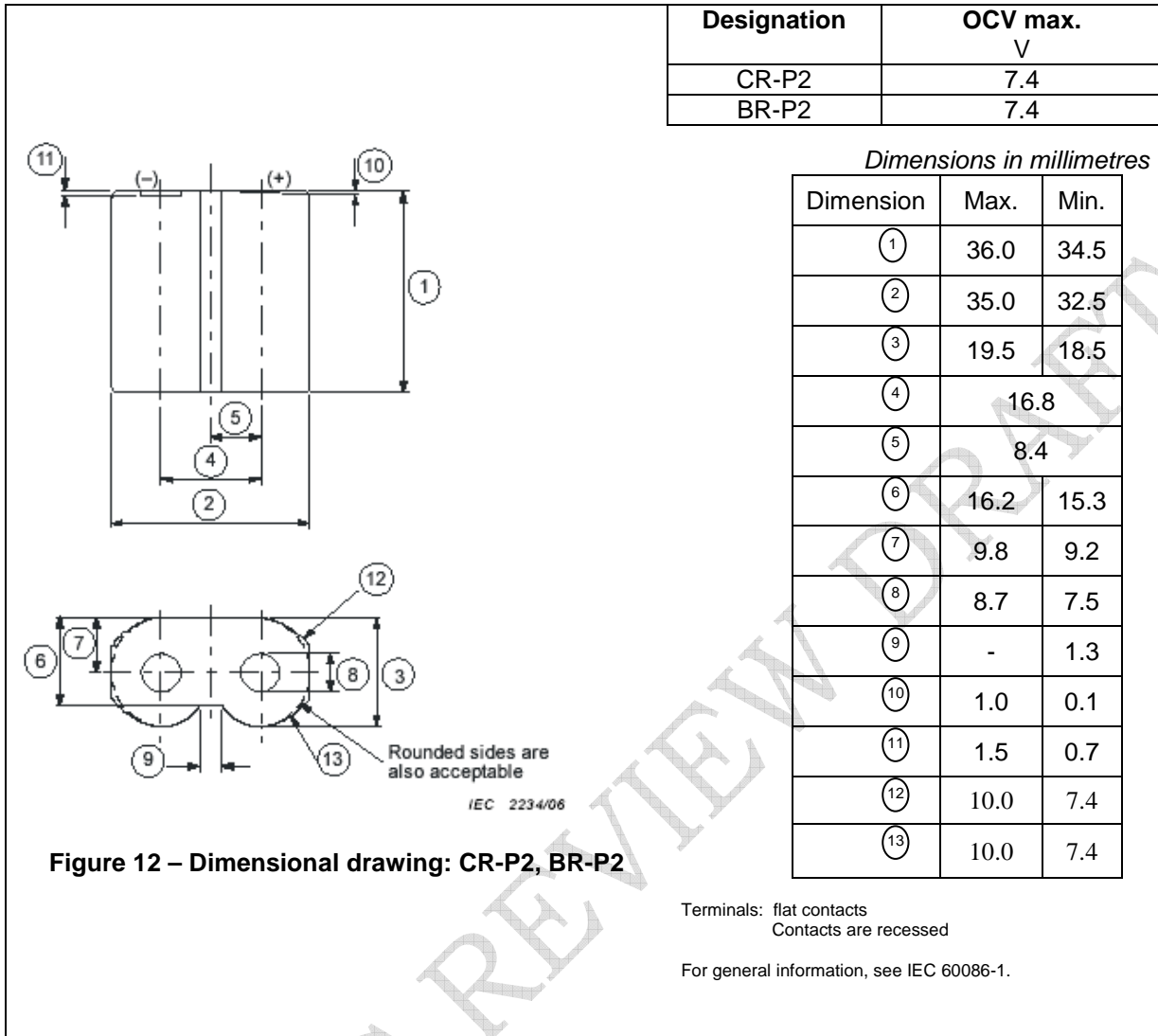
Designation	OCV max. V
4LR61	6.6

Dimensions in millimeters.  
Terminals: flat contacts  
For general information, see IEC 60086-1.

Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (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 (see IEC 60086-2, Table 4, Initial discharge test).

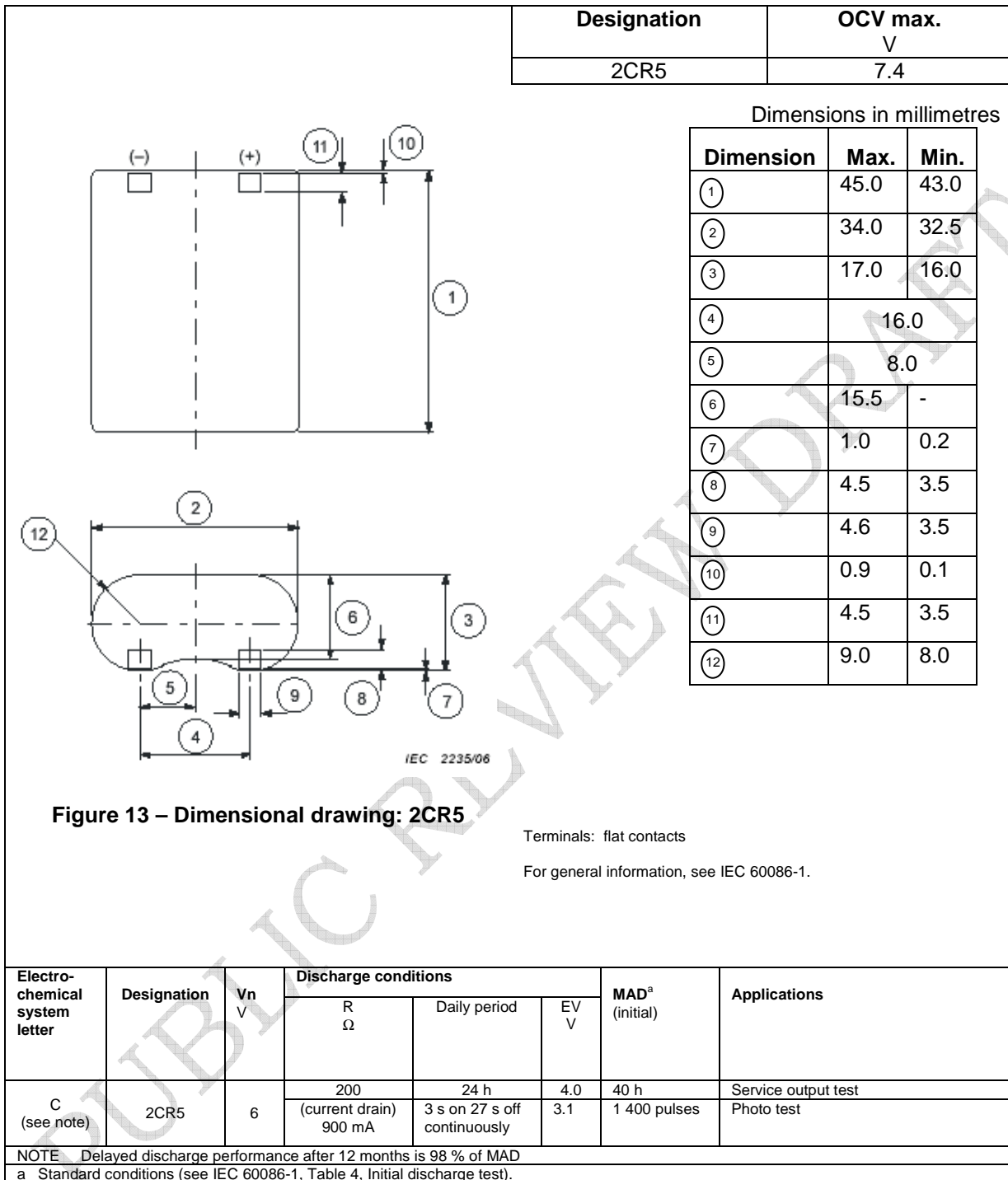
### 7.6.1.4 Category 6 – Specifications: CR-P2, BR-P2



Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
C (see note)	CR-P2	6.0	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	6.0	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 (see IEC 60086-1, Table 4, Initial discharge test).

7.6.1.5 Category 6 – Specifications: 2CR5



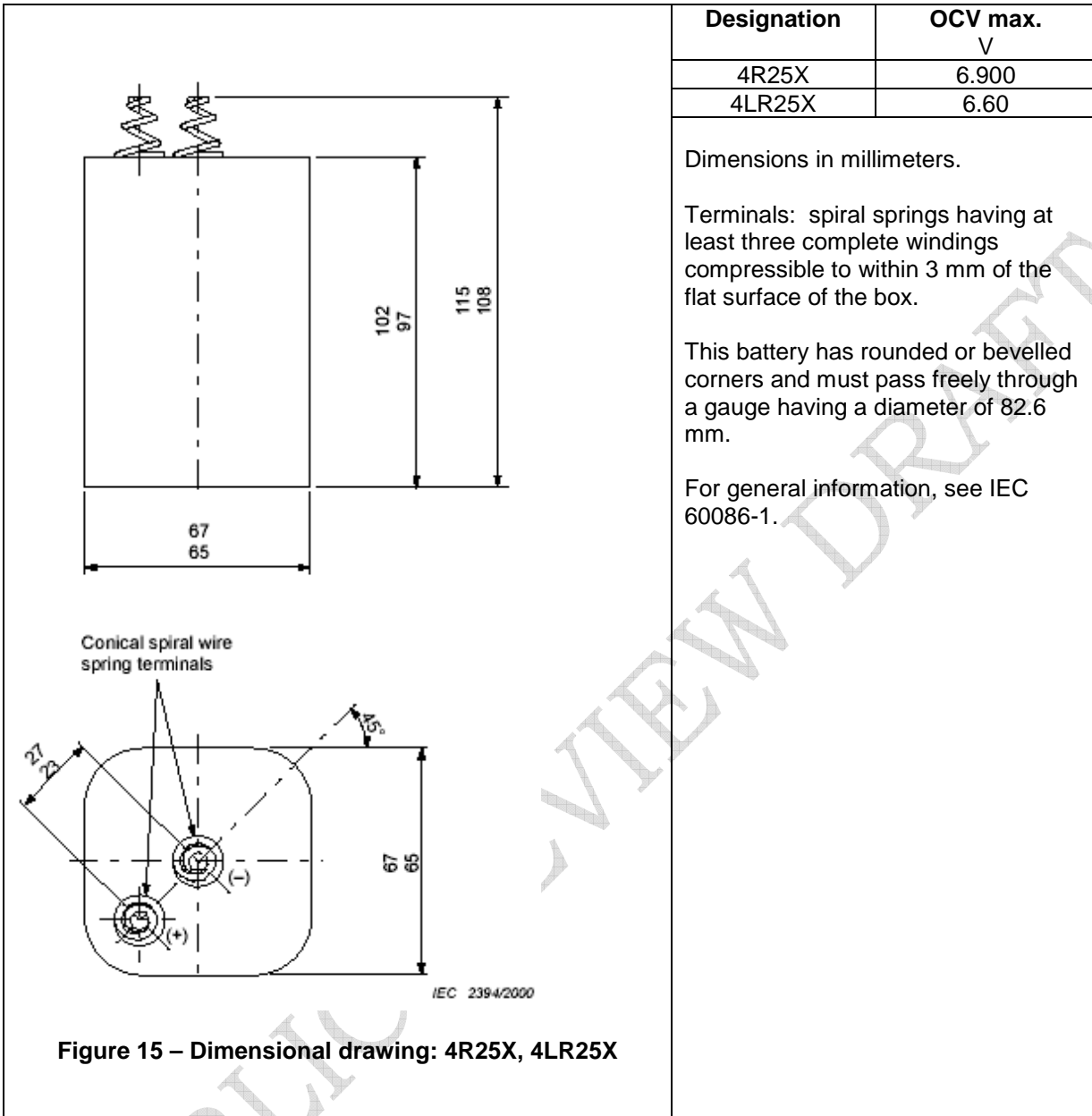


**7.6.1.6 Category 6 – Specifications: 2EP3863**

<p>Fastener: * Loops * Hooks: mushrooms 75-85/cm<sup>2</sup></p> <p style="text-align: right;">IEC 2393/2000</p>		<table border="1"> <tr> <th>Designation</th> <th>OCV max. V</th> </tr> <tr> <td>2EP3863</td> <td>7.8</td> </tr> </table>	Designation	OCV max. V	2EP3863	7.8														
		Designation	OCV max. V																	
2EP3863	7.8																			
<p>Dimensions in millimeters.</p> <p>Terminals: Two flexible wires with connector Positive terminal: red Negative terminal: black</p> <p>For general information, see IEC 60086-1.</p>																				
<p><b>Figure 14 – Dimensional drawing: 2EP3863</b></p> <p>Connector with four receptacles</p> <ol style="list-style-type: none"> <li>1 Negative terminal</li> <li>2 blank</li> <li>3 polarizing key</li> <li>4 positive terminal</li> </ol> <p>Features: dual-metal contact.</p> <p>Gold plating over nickel.</p> <p>Mating data:</p> <ul style="list-style-type: none"> <li>- 2.54 mm distance.</li> <li>- 0.64 mm square or round pins.</li> <li>- 5.84 mm nominal pin length.</li> </ul>																				
<table border="1"> <thead> <tr> <th rowspan="2">Electro-chemical system letter</th> <th rowspan="2">Designation</th> <th rowspan="2">Vn V</th> <th colspan="3">Discharge conditions</th> <th rowspan="2">MAD<sup>a</sup> (initial)</th> <th rowspan="2">Applications</th> </tr> <tr> <th>R Ω</th> <th>Daily period</th> <th>EV V</th> </tr> </thead> <tbody> <tr> <td>E</td> <td>2EP3863</td> <td>6</td> <td>3.3</td> <td>24 h</td> <td>3</td> <td>650 h</td> <td>Service output test</td> </tr> </tbody> </table>	Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications	R Ω	Daily period	EV V	E	2EP3863	6	3.3	24 h	3	650 h	Service output test	
Electro-chemical system letter				Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications										
	R Ω	Daily period	EV V																	
E	2EP3863	6	3.3	24 h	3	650 h	Service output test													
<p><sup>a</sup> Standard conditions (see IEC 60086-1, Table 4, Initial discharge test).</p>																				

**KS 184-2: 2010**  
**IEC 60086-2:2006**

**7.1.6.7 Category 6 – Specifications: 4R25X, 4LR25X**



**Figure 15 – Dimensional drawing: 4R25X, 4LR25X**

Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
No letter (See note 1)	4R25X	6.0	8.2	30 min	3.6	350 min	Portable lighting 1
			9.1	b	3.6	270 min	Portable lighting 2
			110	12 h	3.6	155 h	Road warning lamp
L (see note 2)	4LR25X	6.0	8.2	30 min	3.6	900 min	Portable lighting 1
			9.1	b	3.6	1 020 min	Portable lighting 2
			110	12 h	3.6	310 h	Road warning lamp

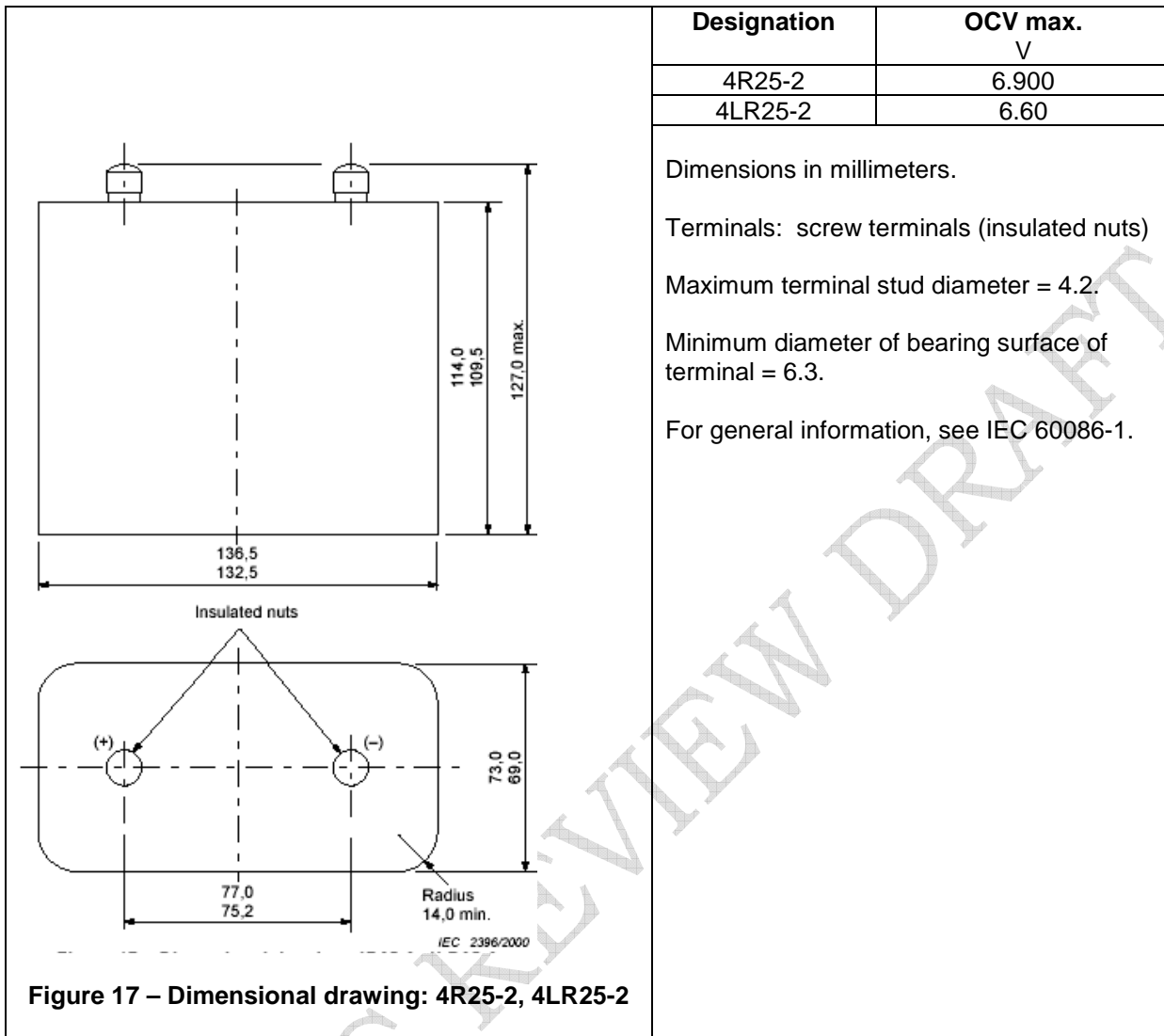
NOTE 1 Delayed discharge performance after 12 months is 80 % of MAD.  
NOTE 2 Delayed discharge performance after 12 months is 90 % of MAD.  
a Standard conditions (see IEC 60086-1, Table 4, Initial discharge test).  
b 30 min beginning at hourly intervals for 8 h per day.

### 7.6.1.8 Category 6 – Specifications: 4R25Y

		Designation	OCV max.				
		4R25Y	V				
			6.900				
		<p>Dimensions in millimeters.</p> <p>Terminals: screw terminals (insulated or metallic nuts)</p> <p>The maximum terminal stud diameter is 3.5.</p> <p>The battery has bevelled or rounded corners and must pass freely through a gauge having a diameter of 82.6 mm.</p> <p>For general information, see IEC 60086-1.</p>					
<b>Figure 16 – Dimensional drawing: 4R25Y</b>							
Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
No letter (See note)	4R25Y	6.0	8.2	30 min	3.6	350 min	Portable lighting 1
			9.1	b	3.6	270 min	Portable lighting 2
			110	12 h	3.6	155 h	Road warning lamps
NOTE 1 Delayed discharge performance after 12 months is 80 % of MAD.							
a Standard conditions (see IEC 60086-1, Table 4, Initial discharge test).							
b 30 min beginning at hourly intervals for 8 h per day.							

**KS 184-2: 2010**  
**IEC 60086-2:2006**

**7.6.1.9 Category 6 – Specifications: 4R25-2, 4LR25-2**



**Figure 17 – Dimensional drawing: 4R25-2, 4LR25-2**

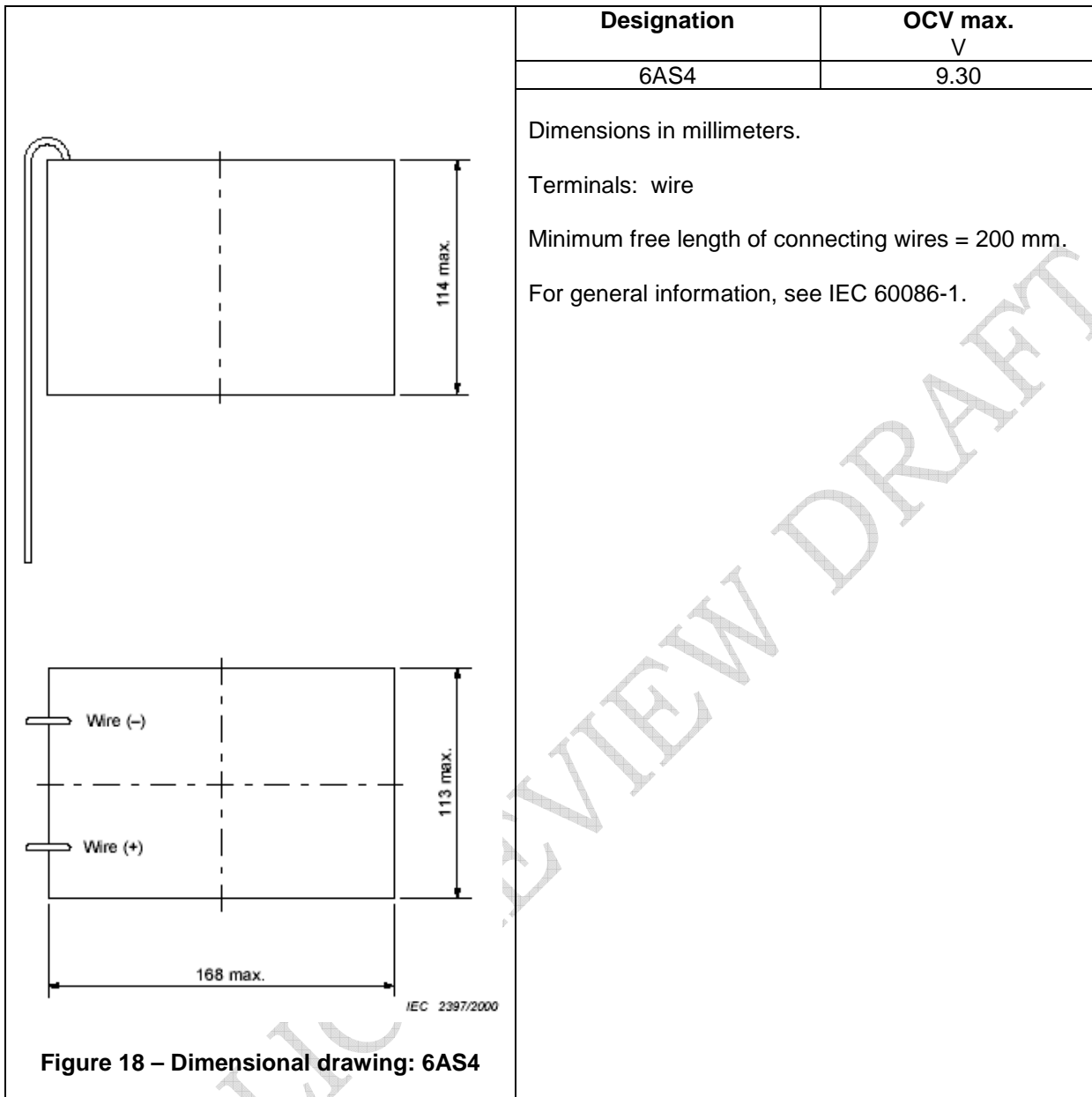
Designation	OCV max. V
4R25-2	6.900
4LR25-2	6.60

Dimensions in millimeters.  
 Terminals: screw terminals (insulated nuts)  
 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 letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
No letter (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 lamp
L (see note 2)	4LR25-2	6.0	8.2	30 min	3.6	1800 min	Portable lighting 1
			9.1	b	3.6	2040 min	Portable lighting 2
			110	12 h	3.6	620 h	Road warning lamp

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, Table 4, Initial discharge test).  
 b 30 min beginning at hourly intervals for 8 h per day.

7.6.1.10 Category 6 – Specifications: 6AS4



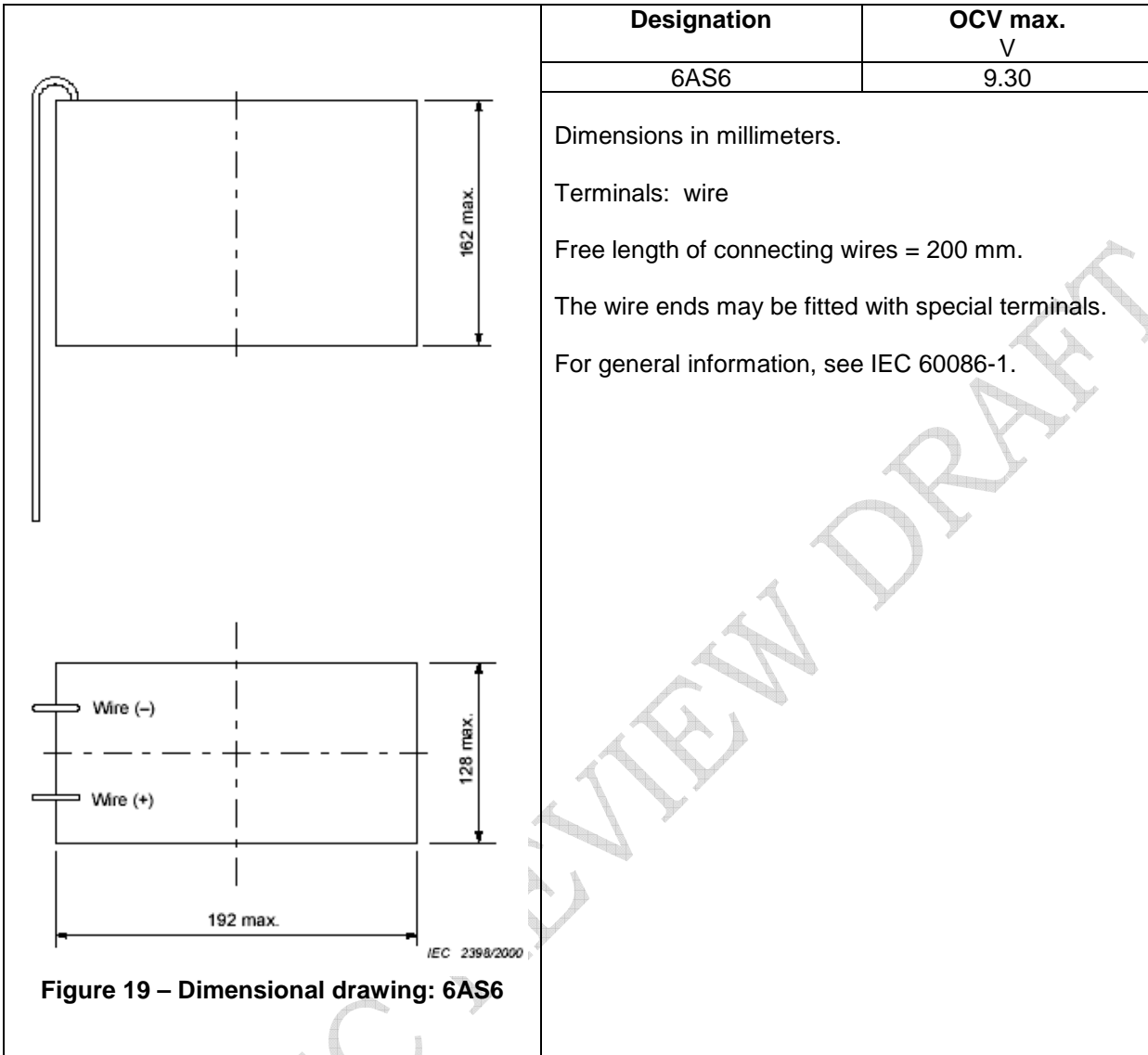
Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
A (see note)	6AS4 <sup>b</sup>	8.4	300	24 h	5.4	80 days	Electric fence controller

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

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

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

7.6.1.11 Category 6 – Specifications: 6AS6



Designation	OCV max. V
6AS6	9.30

Dimensions in millimeters.

Terminals: wire

Free length of connecting wires = 200 mm.

The wire ends may be fitted with special terminals.

For general information, see IEC 60086-1.

Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
A (see note)	6AS6 <sup>b</sup>	8.4	300	24 h	5.4	120 days	Electric fence controller

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

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

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

7.6.1.12 Category 6 – Specifications: 6F22, 6LR61

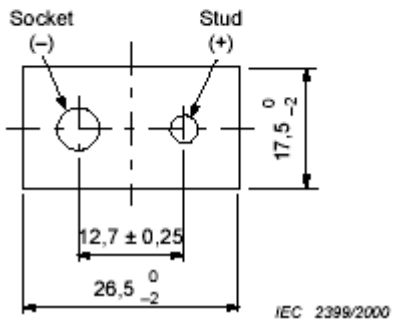
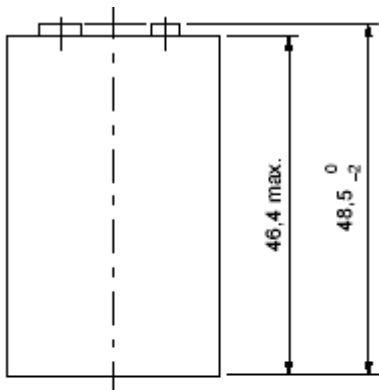


Figure 20 – Dimensional drawing: 6F22, 6LR61

Designation

OCV max.  
V

6F22

10.350

6LR61

9.90

Dimensions in millimeters.

Terminals: miniature snap fasteners.

For general information, see IEC 60086-1.

Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
No letter (See note 1)	6F22	9.0	620	2 h	5.4	24 h	Radio
			Background: 100 000 <sup>b</sup> Pulse 620	24 1 s per h	7.5	14 days	Smoke detector <sup>c</sup>
			270	1 h	5.4	7 h	Toys
L See note 2	6LR61	9.0	620	2 h	5.4	33 h	Radio
			Background: 100 000 <sup>b</sup> Pulse 620	24 1 s per h	7.5	28 days	Smoke detector <sup>c</sup>
			270	1 h	5.4	12 h	Toys

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

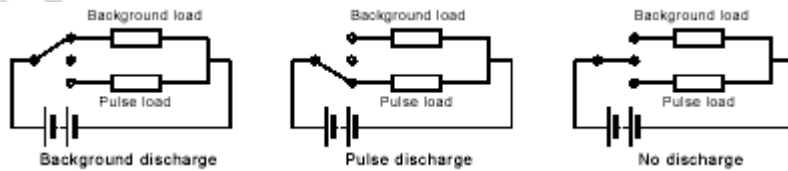
NOTE 2 Delayed discharge performance after 12 months is 90 % of MAD.

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

b Smoke detector test. See example below.

c This is an accelerated test.

Example



NOTE The pulse load of 620 Ω alone should be applied across the battery. It is the effective load. It is not added in series or parallel to the 10 000 Ω background load.

**KS 184-2: 2010**  
**IEC 60086-2:2006**

**7.6.1.13 Category 6 – Specifications: 6F100**

		<b>Designation</b>	<b>OCV max.</b> V				
		6F100	10.350				
<p>Dimensions in millimeters.</p> <p>Terminals: standard snap fasteners.</p> <p>For general information, see IEC 60086-1.</p>							
<b>Figure 21 – Dimensional drawing: 6F100</b>							
Electro-chemical system letter	Designation	Vn V	Discharge conditions			MAD <sup>a</sup> (initial)	Applications
			R Ω	Daily period	EV V		
No letter (See note)	6F100	9.0	240	4 h	5.4	126 h	Transistor radio
NOTE Delayed discharge performance after 12 months is 80 % of MAD.							
a Standard conditions (see IEC 60086-1, Table 4, Initial discharge test).							



## Annex A (informative)

### Tabulation of batteries by application

Each of the following tables lists all the batteries for which there is a discharge test given in this specification for that application.

Within each table the batteries are listed in ascending order of nominal voltage and, within each nominal voltage, in ascending order of volume.

**Table A.1 – Road warning lamp**

Designation	Nominal voltage V
4R25X	6.0
4LR25X	6.0
4R25Y	6.0
4R25-2	6.0
4LR25-2	6.0

**Table A.2 – Industrial equipment**

Designation	Nominal voltage V
S4	1.5
R40	1.5

**Table A.3 – Electric fence controller**

Designation	Nominal voltage V
R40	1.5
5AR40	7.0
6AS4	8.4
6AS6	8.4

**Table A.4 –Radio**

<b>Designation</b>	<b>Nominal voltage V</b>
R03	1.5
LR03	1.5
R6P	1.5
R6S	1.5
LR6	1.5
R14P	1.5
R14S	1.5
LR14	1.5
R20P	1.5
R20S	1.5
LR20	1.5
3R12C	4.5
3R12P	4.5
3R12S	4.5
3LR12	4.5
6F22	9.0
6LR61	9.0
6F100	9.0

**Table A.5 – Electronic equipment**

<b>Designation</b>	<b>Nomination voltage V</b>
CR15H270	3.0
4LR61	6.0

**Table A.6 – Paging test**

<b>Designation</b>	<b>Nominal voltage V</b>
LR1	1.5

**Table A.7 – Hearing aid**

<b>Designation</b>	<b>Nominal voltage V</b>
R1	1.5
LR1	1.5
PR41	1.4
PR44	1.4
PR48	1.4
PR70	1.4
SR48	1.55

**Table A.8 – Photo**

<b>Designation</b>	<b>Nominal voltage V</b>
CR15H270	3.0
CR17345	3.0
BR-P2	6.0
CR-P2	6.0
2CR5	6.0

**Table A.9 – Portable lighting**

<b>Designation</b>	<b>Nominal voltage V</b>
LR8D425	1.5
R1	1.5
LR1	1.5
R03	1.5
LR03	1.5
R14P	1.5
R14S	1.5
LR14	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**

<b>Designation</b>	<b>Nominal voltage</b>
6F22	9.0
6LR61	9.0

**Table A.11 – Toy (motor)**

<b>Designation</b>	<b>Nominal voltage V</b>
R6P	1.5
LR6	1.5
R14P	1.5
R14S	1.5
LR14	1.5
R20P	1.5
R20S	1.5
LR20	1.5
6F22	9.0
6LR61	9.0

**Table A.12 –Automatic camera**

<b>Designation</b>	<b>Nominal voltage V</b>
SR44	1.55
4LR44	6.0
4SR44	6.2

**Table A.13 – Tape recorder (personal cassette player)**

<b>Designation</b>	<b>Nominal voltage V</b>
R03	1.5
LR03	1.5
R6P	1.5
LR6	1.5
R14P	1.5
R14S	1.5
LR14	1.5
R20P	1.5
R20S	1.5
LR20	1.5

**Annex B**  
(informative)

**Cross-reference index**

Batteries having the same physical dimensions may belong to a different electrochemical system.

In order to allow physically interchangeable batteries from different electrochemical systems to be compared in terms of electrical performance, a cross-reference is given below.

Batteries are ranked per category and in each category by chemistry and by shape/size.

Batteries are always ranked by voltage and in each voltage by volume.

**Table B.1 – Category 1 batteries**

<b>Round batteries according to figures 1a and 1b</b>	
Ranking by electrochemical system	Ranking by shape/volume
R1, R03, R6P, R6S, R14P, R14S, R20P, R20S, 2R10	LR8D425
LR8D425, LR1, LR03, LR6, LR14, LR20	R1, LR1
CR12A604	R03, LR03
	R6P, R6S, LR6
	R14P, R14S, LR14
	R20P, R20S, LR20
	CR12A604
	2R10

**Table B.2 – Category 2 batteries**

<b>Round batteries according to Figure 2</b>	
Ranking by electrochemical system	Ranking shape/volume
CR14250, CR15H270, CR17345, CR17450 BR17335	CR14250 CR15H270 BR17335 CR17345 CR17450

**Table B.3 – Category 3 batteries**

<b>Round batteries according to Figure 3</b>		
Ranking by electrochemical system	Ranking by shape/volume	
LR9, LR53 CR11108	CR11108 LR9 LR53	(Figure 3a) (Figure 3a) (Figure 3b)

**Table B.4 – Category 4 batteries**

<b>Round batteries according to figure 4</b>	
<b>Ranking by electrochemical system</b>	<b>Ranking by shape/volume</b>
PR70, PR41, PR48, PR43, PR44	SR62
LR41, LR55, LR54, LR43, LR44	SR63
SR62, SR63, SR65, SR64, SR60, SR67, SR66, SR58, SR68, SR59, SR69, SR41, SR57, SR55, SR48, SR56, SR54, SR42, SR43, SR44	SR65
CR1025, CR1216, CR1220, CR1616, CR2012, CR1620, CR2016, CR2025, CR2320, CR2032, CR2330, CR2430, CR2354, CR3032, CR2450	SR64
BR1225, BR2016, BR2020, BR2320, BR2325, BR3032	SR60
	SR67
	SR66
	PR70
	SR58
	SR68
	SR59
	SR69
	PR41, LR41, SR41
	SR57
	CR1025
	CR1216
	LR55, SR55
	CR1220
	PR48, SR48
	SR56
	BR1225
	CR1616
	LR54, SR54
	CR2012
	SR42
	CR1620
	PR43, SR43
	CR2016, BR2016
	PR44, LR44, SR44
	BR2020
	CR2025
	CR2320, BR2320
	CR2032
	BR2325
	CR2330, CR2430
	CR2354
	CR3032, BR3032
	CR2450

**Table B.5 – Category 5 batteries**

<b>Other round batteries – Miscellaneous</b>	
Ranking by electrochemical system	Ranking by shape/volume
R40 4LR44 2CR13252 4SR44 5AR40	4LR44, 2CR13252, 4SR44 R40 5AR40

**Table B.6 – Category 6 batteries**

<b>Non-round batteries – Miscellaneous</b>	
Ranking by electrochemical system	Ranking by shape/volume
S4, 3R12C, 3R12P, 3R12S, 4R25X, 4R25Y, 4R25-2, 6F22	4LR61
6F100	6F22, 6LR61
	CR-P2, BR-P2
	2CR5
3LR12, 4LR61, 4LR25X, 4LR25-2, 6LR61	2EP3863
	3R12C, 3R12P, 3R12S, 3LR12
6AS4, 6AS6	6F100
CR-P2, 2CR5	S4
	4R25X, 4LR25X
BR-P2	4R25Y
	4R25-2, 4LR25-2
	6AS4
2EP3863	6AS6

**Annex C**  
(informative)

**Index**

This index provides for the relation between a particular battery and its physical dimensions and application/service output test requirements.

In this index the batteries are ranked by increasing number of the numerical part after the alphabetical part of the designation. In the case where two batteries have the same numerical part, they are ranked alphabetically according to the alphabetical part of the designation. In the case where two batteries having these two rules still do not allow a clear ranking, further distinction is made by the increasing number of the numerical part before the alphabetical part of the designation.

**Table C.1 – Index**

Battery	Page	Battery	Page	Battery	Page
LR1		LR41		6F100	
R1		PR41		CR15H270	
BR-P2		SR41		LR8D425	
CR-P2		SR42		CR12A604	
LR03		LR43		CR1025	
R03		SR43		CR1216	
6AS4		LR44		CR1220	
S4		4LR44		BR1225	
2CR5		PR44		CR1616	
6AS6		SR44		CR1620	
LR6		4SR44		CR2012	
R6P		PR48		BR2016	
R6S		SR48		CR2016	
LR9		LR53		BR2020	
2R10		LR54		CR2025	
3LR12		SR54		CR2032	
3R12C		LR55		BR2320	
3R12P		SR55		CR2320	
3R12S		SR56		BR2325	
LR14		SR57		CR2330	
R14P		SR58		CR2354	
R14S		SR59		CR2430	
LR20		SR60		CR2450	
R20P		4LR61		BR3032	
R20S		6LR61		CR3032	
6F22		SR62		2EP3863	
4LR25X		SR63		CR11108	
4LR25-2		SR64		2CR13252	
4R25X		SR65		CR14250	
4R25Y		SR66		BR17335	
4R25-2		SR67		CR17345	
54R40		SR68		CR17450	
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