

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Primary batteries –
Part 2: Physical and electrical specifications**

**Piles électriques –
Partie 2: Spécifications physiques et électriques**

Withdrawn



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2011 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us.

Email: csc@iec.ch

Tel.: +41 22 919 02 11

Fax: +41 22 919 03 00

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

- Catalogue des publications de la CEI: www.iec.ch/searchpub/cur_fut-f.htm

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,...). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: www.iec.ch/online_news/justpub

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:

Email: csc@iec.ch

Tél.: +41 22 919 02 11

Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Primary batteries –
Part 2: Physical and electrical specifications**

**Piles électriques –
Partie 2: Spécifications physiques et électriques**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

XA

ICS 29.220.10

ISBN 978-2-88912-360-5

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms, definitions, symbols and abbreviations.....	7
3.1 Terms and definitions	7
3.2 Symbols and abbreviations.....	8
4 Battery dimensions, symbols	9
5 Constitution of the battery specification tables.....	9
6 Physical and electrical specifications.....	11
6.1 Category 1 batteries.....	11
6.1.1 Category 1 – Physical and electrical specifications.....	11
6.2 Category 2 batteries.....	18
6.2.1 Category 2 – Physical and electrical specifications.....	18
6.3 Category 3 batteries.....	20
6.3.1 Category 3 – Physical and electrical specifications.....	20
6.4 Category 4 batteries.....	21
6.4.1 Category 4 – Physical and electrical specifications.....	21
6.5 Category 5 batteries.....	30
6.5.1 Category 5 – Physical and electrical specifications.....	30
6.6 Category 6 batteries.....	34
6.6.1 Category 6 – Physical and electrical specifications.....	34
Annex A (informative) Tabulation of batteries by application	48
Annex B (informative) Cross-reference index	54
Annex C (informative) Index.....	57
Annex D (informative) Common designation	58
Bibliography.....	59
Figure 1 – Category 1 dimensional drawings.....	11
Figure 2 – Category 2 dimensional drawing	18
Figure 3 – Category 3 dimensional drawings.....	20
Figure 4 – Category 4 dimensional drawing	21
Figure 5 – Gauge drawing for P system batteries.....	24
Figure 6 – Airhole placement diagram.....	25
Figure 7 – Dimensional drawings: R40	30
Figure 8 – Dimensional drawing: 4LR44, 2CR13252, 4SR44.....	32
Figure 9 – Dimensional drawings: 3R12P, 3R12S, 3LR12	34
Figure 10 – Dimensional drawings: 4LR61	36
Figure 11 – Dimensional drawings: CR-P2.....	37
Figure 12 – Dimensional drawings: 2CR5	38
Figure 13 – Dimensional drawings: 2EP3863	39
Figure 14 – Dimensional drawings: 4R25X, 4LR25X	40
Figure 15 – Dimensional drawings: 4R25Y.....	41

Figure 16 – Dimensional drawings: 4R25-2, 4LR25-2	42
Figure 17 – Dimensional drawings: 6AS4	43
Figure 18 – Dimensional drawings: 6AS6	44
Figure 19 – Dimensional drawings: 6F22, 6LR61, 6LP3146	45
Figure 20 – Dimensional drawings: 6F100	47
Table A.1 – Road warning lamp	48
Table A.2 – Industrial equipment	48
Table A.3 – Electric fence controller	48
Table A.4 – Radio	49
Table A.5 – Radio/Clock	49
Table A.6 – Electronic equipment	49
Table A.7 – Pager	49
Table A.8 – Hearing aid	50
Table A.9 – Photo	50
Table A.10 – Portable lighting	50
Table A.11 – Smoke detector	51
Table A.12 – Toy (motor)	51
Table A.13 – Remote control	51
Table A.14 – Digital audio	51
Table A.15 – Photo flash	52
Table A.16 – Laser pointer	52
Table A.17 – Portable stereo	52
Table A.18 – CD/Electronic games	52
Table A.19 – Digital still camera	52
Table A.20 – Automatic camera	52
Table A.21 – Tape recorder	53
Table B.1 – Category 1 batteries	54
Table B.2 – Category 2 batteries	54
Table B.3 – Category 3 batteries	54
Table B.4 – Category 4 batteries	55
Table B.5 – Category 5 batteries	56
Table B.6 – Category 6 batteries	56
Table C.1 – Index	57
Table D.1 – Index	58

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRIMARY BATTERIES –

Part 2: Physical and electrical specifications

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. 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 twelfth edition cancels and replaces the eleventh edition (2006) and constitutes a technical revision.

Significant changes from the previous edition are the deletion of eight battery types from this standard, the addition of an air hole placement diagram and deletion of the resistive hearing aid tests for the P-system (zinc air) hearing aid batteries, standardization of a new form of alkaline (L-system) 9 volt battery (6LP3146), addition of a common designation reference as Annex D and general adjustment of application tests and their minimum average duration values to reflect changes in battery usage.

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

CDV	Report on voting
35/1271/CDV	35/1275/RVC

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

Withdrawn

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.

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 is available in IEC 60086-4, IEC 60086-5 and IEC 62281.

Withdrawn

PRIMARY BATTERIES –

Part 2: Physical and electrical specifications

1 Scope

This part of IEC 60086 is applicable to primary batteries based on standardized electro-chemical systems.

It specifies

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

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60086-1:2011, *Primary batteries – Part 1: General*

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

3 Terms, definitions, symbols and abbreviations

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

3.1 Terms and definitions

3.1.1 application test

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

3.1.2 closed-circuit voltage

CCV (abbreviation)

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

[IEC 60050- 482:2004, 482-03-28, modified]

3.1.3 end-point voltage

EV (abbreviation)

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

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

3.1.4

minimum average duration

MAD (abbreviation)

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 or standards and designed to show conformity with the standard applicable to the battery types.

3.1.5

nominal voltage (of a primary battery)

V_n (symbol)

suitable approximate value of the voltage used to designate or identify a cell, a battery or an electrochemical system

[IEC 60050-482:2004, 482-03-31, modified]

3.1.6

open-circuit voltage

OCV (abbreviation)

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

[IEC 60050-482:2004, 482-03-32, modified]

3.1.7

primary (cell or battery)

cell or battery that is not designed to be electrically recharged

3.1.8

round (cell or battery)

cell or battery with circular cross section

3.1.9

service output (of a primary battery)

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

3.1.10

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.

3.1.11

storage life

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

[IEC 60050-482:2004, 482-03-47, modified]

3.1.12

terminals (of a primary battery)

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

3.2 Symbols and abbreviations

EV end-point voltage

MAD	minimum average duration
OCV	open-circuit voltage (off-load voltage)
R	load resistance
V_n	nominal voltage of a primary battery

4 Battery dimensions, symbols

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

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

Recesses are permitted in the negative flat contact surface defined by dimensions d_6 and d_7 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:

$$\begin{aligned}d_6 &> d_3 \\d_2 &> d_7 \\h_3 &> h_4\end{aligned}$$

5 Constitution of the battery specification tables

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

5.2 In each category, batteries having the same shape but belonging to a different electrochemical system are grouped together and shown in succession.

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

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

5.5 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.

5.6 When a drawing represents only one type of battery, the dimensions of the relevant battery may be directly shown on the drawing.

5.7 Batteries are categorized into the following groups:

- a) Category 1: Round batteries according to Figure 1
R1, R03, R6P, R6S, R14P, R14S, R20P, R20S
LR8D425, LR1, LR03, LR6, LR14, LR20
- 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, SR54, SR42, SR43, SR44
CR1025, CR1216, CR1220, CR1616, CR2012, CR1620, CR2016, CR2025, CR2320,
CR2032, CR2330, CR2430, CR2354, CR3032, CR2450
BR1225, BR2016, BR2320, BR2325, BR3032
- e) Category 5: Other round batteries – Miscellaneous
R40
4LR44
2CR13252
4SR44
- f) Category 6: Non-round batteries – Miscellaneous
3R12P, 3R12S, 3LR12
4LR61
CR-P2
2CR5
2EP3863
4R25X, 4LR25X
4R25Y
4R25-2, 4LR25-2
6AS4
6AS6
6F22, 6LR61, 6LP3146
6F100

5.8 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 Annexes A, B and C for ease of locating battery sizes.

6 Physical and electrical specifications

6.1 Category 1 batteries

6.1.1 Category 1 – Physical and electrical specifications

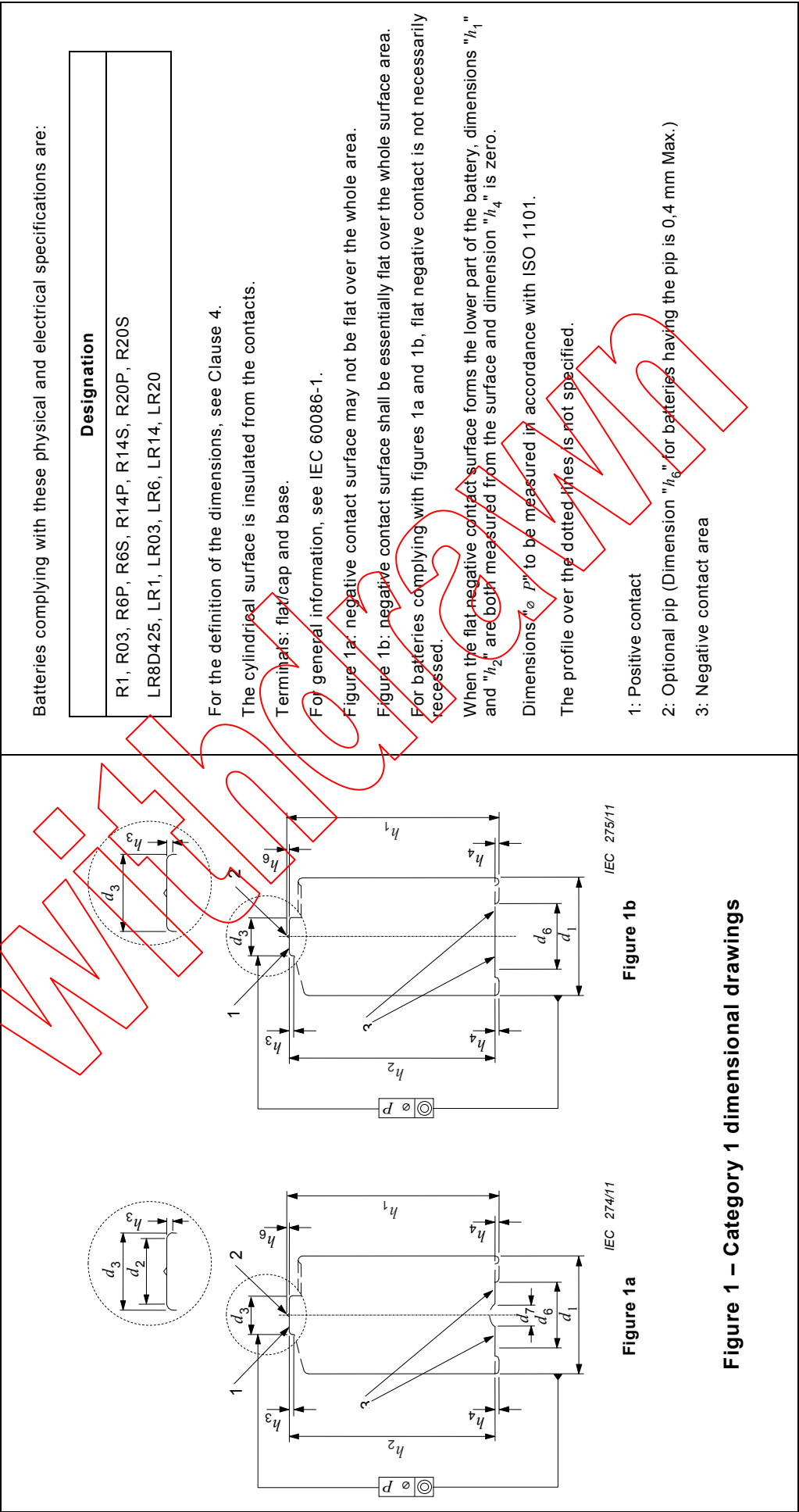


Figure 1 – Category 1 dimensional drawings

6.1.1.1 Category 1 – Specifications: R1, R03, R6P, R6S

Electro-chemical system letter	Designation	V_n V	OCV max. V	Dimensions mm										Discharge conditions			MAD ^a (initial)	Applications
				h_1 max.	h_2 min.	h_3 min.	h_4 max.	d_1		d_3 max.	d_6 min.	ϕP max.	R Ω	Daily period	EV V			
								max.	min.									
No letter (see NOTE)	R1	1,5	1,73	30,2	29,1	0,5	0,2	12,0	10,9	4,0	5,0	0,5	300	12 h	0,9	76 h	Hearing aid	
	R03	1,5	1,73	44,5	43,3	0,8	0,5	10,5	9,5	3,8	4,3	0,4	5,1	5 min	0,9	30 min	Portable lighting	
													5,1	b	0,9	50 min	Portable lighting	
													10	1 h	0,9	1,5 h	Digital audio	
													75	4 h	0,9	20 h	Radio/Clock	
	R6P (high power)	1,5	1,73	50,5	49,2	1,0	0,5	14,5	13,5	5,5	7,0	0,5	24	15 s per min 8 h per day	1,0	4 h	Remote control	
													43	4 h	0,9	27 h	Radio/Clock	
													3,9	1 h	0,8	65 min	Motor/toy	
													10	1 h	0,9	4 h	Tape recorder	
	R6S (standard)	1,5	1,73	50,5	49,2	1,0	0,5	14,5	13,5	5,5	7,0	0,5	1,8	c	0,9	60 pulses	Pulse test	
43													4 h	0,9	22 h	Radio/Clock		
NOTE Delayed discharge performance after 12 months is 80 % of MAD.																		
^a Standard conditions (see IEC 60086-1, Table 5, 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.																		

^a Standard conditions (see IEC 60086-1, Table 5, 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.

6.1.1.2 Category 1 – Specifications: R14P, R14S

Electro-chemical system letter	Designation	I_n V	OCV max. V	Dimensions mm								Discharge conditions			MAD ^a (initial)	Applications		
				h_1 max.	h_2 min.	h_3 min.	h_4 max.	d_1		d_3 max.	d_6 min.	ϕ	P max.	R Ω			Daily period	EV V
								max.	min.									
No letter (see NOTE)	R14P (high power)	1,5	1,73	50,0	48,6	1,5	0,9	26,2	24,9	7,5	13,0	1,0	3,9	b	0,9	270 min	Portable lighting	
								20	4 h	0,9	28 h	Radio						
								3,9	1 h	0,8	4 h	Toy						
	R14S (standard)	1,5	1,73	50,0	48,6	1,5	0,9	26,2	24,9	7,5	13,0	1,0	3,9	b	0,9	120 min	Portable lighting	
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 5, Initial discharge test).																		
b 4 min beginning at hourly intervals for 8 h per day.																		

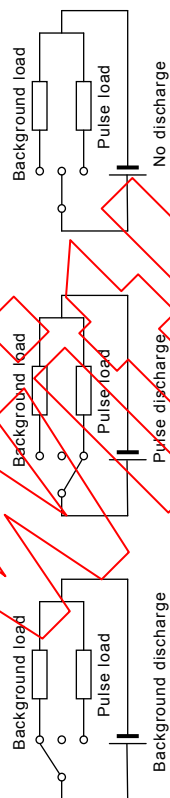
6.1.1.3 Category 1 – Specifications: R20P, R20S, LR8D425, LR1

Electro-chemical system letter	Designation	V_n V	OCV max. V	Dimensions mm										Discharge conditions			MAD ^a (initial)	Applications			
				h_1		h_2	h_3	h_4	d_1		d_3	d_6	ϕ P	R Ω	Daily period	EV V					
				max.	min.	min.	min.	max.	max.	min.	max.	min.	max.								
No letter (see NOTE 1)	R20P (high power)	1,5	1,73	61,5	59,5	1,5	1,0	34,2	32,3	9,5	18,0	1,0	2,2	b	0,9	320 min	Portable lighting				
L (see NOTE 2)	R20S (standard)	1,5	1,73	61,5	59,5	1,5	1,0	34,2	32,3	9,5	18,0	1,0	2,2	1 h	0,8	2 h	Toy				
L (see NOTE 2)	LR8D425	1,5	1,68	42,5	41,5	0,7	0,1	8,3	7,7	3,8	2,3	0,1	75	1 h	1,1	22 h	Laser pointer				
L (see NOTE 2)	LR1	1,5	1,68	30,2	29,1	0,5	0,2	12,0	10,9	4,0	5,0	0,5	300	12 h	0,9	130 h	Hearing aid				
NOTE 1 Delayed discharge performance after 12 months is 80 % of MAD. NOTE 2 Delayed discharge performance after 12 months is 90 % of MAD.																					

6.1.1.3 (continued)

- a Standard conditions (see IEC 60086-1, Table 5, Initial discharge test).
- b 4 min beginning at hourly intervals for 8 h per day.
- c This battery does not fulfill the requirement $d_6 > d_3$ due to constructional constraints.
- d The pulse load alone shall be applied across the battery. It is not added in series or parallel to the background load. See example.

EXAMPLE



6.1.1.4 Category 1 – Specifications: LR03, LR6, LR14, LR20

Electro-chemical system letter	Designation	V_n V	OCV max. V	Dimensions mm								Discharge conditions			MAD ^a (initial)	Applications	
				h_1 max.	h_2 min.	h_3 min.	h_4 max.	d_1		d_3 max.	d_6 min.	ϕP max.	R Ω	Daily period			EV V
								max.	min.								
L (see NOTE)	LR03	1,5	1,68	44,5	43,5	0,8	0,5	10,5	9,8	3,8	4,3	0,25	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	
												5,1	1 h	0,8	2 h	Toy	
												75	4 h	0,9	44 h	Radio/Clock	
												Current drain 600 mA	c	0,9	170 pulses	Photo flash	
												Current drain 100 mA	1 h	0,9	7 h	Digital audio	
	LR6	1,5	1,68										43	4 h	0,9	60 h	Radio/Clock
												3,9	1 h	0,8	5 h	Motor/toy	
												Current drain 100 mA	1 h	0,9	15 h	Digital audio	
												Current drain 250 mA	1 h	0,9	5 h	CD/ Electronic games	
												Current drain 1 000 mA	c	0,9	220 pulses	Photo flash	
												Power drains 1 500 mW 650 mW 0 mW	5 min ^d 55 min	1,05	40 pulses	Digital still camera	
	LR14	1,5	1,68										24	15 s per min 8 h per day	1,0	33 h	Remote control
												3,3	4 min per h 8 h per day	0,9	190 min	Portable lighting	
												3,9	b	0,9	800 min	Portable lighting	
												Current drain 400 mA	2 h	0,9	8 h	Portable stereo	
												20	4 h	0,9	80 h	Radio	
												3,9	1 h	0,8	14 h	Toy	

6.1.1.4 (continued)

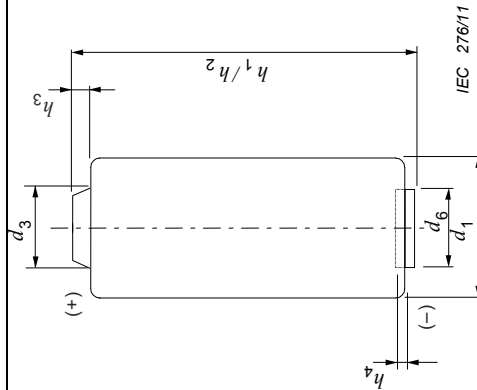
Electro-chemical system letter	Designation	V_n V	OCV max. V	Dimensions mm								Discharge conditions			MAD ^a (initial)	Applications			
				h_1 max.	h_2 min.	h_3 min.	h_4 max.	d_1		d_3 max.	d_6 min.	ϕP		R Ω			Daily period	EV V	
								max.	min.			max.	max.						
L (see NOTE)	LR20	1,5	1,68	61,5	59,5	1,5	1,0	34,2	32,3	9,5	18,0	1,0	Current drain 600 mA			2 h	0,9	11 h	Portable stereo
													10	4 h	0,9				
													2,2	1 h	0,8				
													1,5	4 min per 15 min 8 h per day	0,9				
NOTE Delayed discharge performance after 12 months is 90 % of MAD.																			
a Standard conditions (see IEC 60086-1, Table 5, 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.																			

6.2 Category 2 batteries

6.2.1 Category 2 – Physical and electrical specifications

6.2.1.1 Category 2 – Specifications: CR14250, CR15H270, CR17345, CR17450, BR17335

														For the definition of the dimensions, see Clause 4. The cylindrical surface is insulated from the contacts. Terminals: flat/cap and base. For general information, see IEC 60086-1.									
Electro-chemical system letter		Designation	V _n V	OCV max. V	Dimensions mm						Discharge conditions			MAD ^a (initial)	Applications								
					h ₁ /h ₂		h ₃		h ₄		d ₁		d ₃			d ₆	R kΩ	Daily period	EV V				
C (see NOTE)	CR14250	3,0	3,7	25,0	23,5	0,4	-	-	14,5	13,5	8,0	5,0	3	24 h	2,0	750 h	Service output test						
	CR15H270	3,0	3,7	27,0 ^b	26,0 ^b	0,6	0,4	0,05	15,6	15,0	7,0	8,5	0,2	24 h	2,0	48 h	Service output test						
	CR17345	3,0	3,7	34,5	33,5	1,0	0,9	0,5	17,0	16,0	9,6	11,0	Current drain 900 mA	3 s on 27 s off 24 h/d	1,55	840 pulses	Photo						
	CR17450	3,0	3,7	45,0	43,5	0,4	-	-	17,0	16,0	8,0	5,0	1	24 h	2,0	710 h	Service output test						



For the definition of the dimensions, see Clause 4.
The cylindrical surface is insulated from the contacts.
Terminals: flat/cap and base.
For general information, see IEC 60086-1.

Figure 2 – Category 2 dimensional drawing

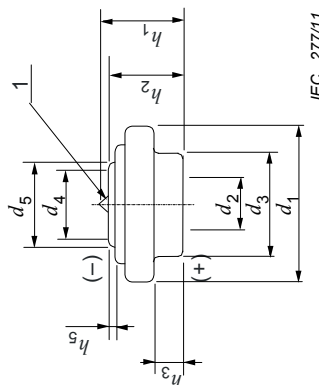
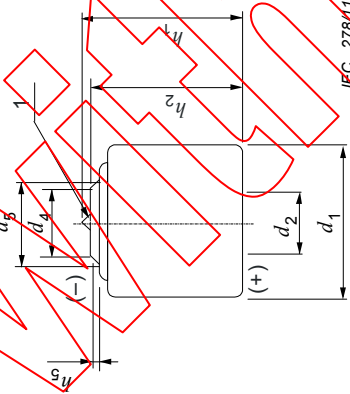
6.2.1.1 (continued)

Electro-chemical system letter	Designation	OCV max. V	Dimensions mm										Discharge conditions			MAD ^a (initial)	Applications
			h_1/h_2		h_3 min.	h_4		d_1		d_3		d_6 min.	R kΩ	Daily period	EV V		
			max.	min.		max.	min.	max.	min.	max.	min.						
B (see NOTE)	BR17335	3,0	33,5	32,0	0,1	-	-	17,0	16,0	8,0	5,0	-	1	24 h	1,8	380 h	Service output test
NOTE Delayed discharge performance after 12 months is 98 % of MAD.																	
a Standard conditions (see IEC 60086-1, Table 5, Initial discharge test).																	
b The h_1/h_2 dimensions shall be measured on the label overlap.																	

6.3 Category 3 batteries

6.3.1 Category 3 – Physical and electrical specifications

6.3.1.1 Category 3 – Specifications: LR9, LR53, CR11108

 IEC 277/11		 IEC 278/11		For the definition of the dimensions, see Clause 4. The cylindrical surface is connected to the positive terminal. Terminals: flat/cap and case. For general information, see IEC 60086-1. No part of the battery shall project beyond the positive contact area. Marking: 4.1.6.2 of IEC 60086-1 is applicable.													
Figure 3a		Figure 3b		Figure 3 – Category 3 dimensional drawings													
Electro-chemical system letter	Designation	OCV max. V	Dimensions mm										MAD ^a (initial)	Applications			
			h_1 max.	h_2 min.	h_3 min.	h_5 min.	d_1 max.	d_1 min.	d_2 min.	d_3 max.	d_4 min.	d_5 max.			R Ω	Daily period	EV V
L (see NOTE 1)	LR9	1,5	6,2	5,6	2,0	0,2	16,0	15,2	10,0	13,5	10,0	12,5	390	24 h	0,9	48 h	Service output test
	LR53	1,5	6,1	5,4	2,1	0,2	23,2	22,6	18,7	20,9	15,3	21,0	470	24 h	0,9	50 h	Service output test
C (see NOTE 2)	CR11108	3,0	10,8	10,4	-	0,2	11,6	11,4	9,0	-	3,0	9,0	15 000	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 5, Initial discharge test).																	

6.4 Category 4 batteries

6.4.1 Category 4 – Physical and electrical specifications

Figure 4 – Category 4 dimensional drawing

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

Designation
PR70, PR41, PR48, PR44 LR41, LR55, LR54, LR43, LR44 SR62, SR63, SR65, SR64, SR60, SR67, SR66, SR58, SR68, SR59, SR69, SR41, SR57, SR55, SR48, SR54, SR42, SR43, SR44 CR1025, CR1216, CR1220, CR1616, CR2012, CR1620, CR2016, CR2025, CR2320, CR2032, CR2330, CR2430, CR2354, CR3032, CR2450 BR1225, BR2016, BR2320, BR2325, BR3032

For the definition of the dimensions, see Clause 4.

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 4.1.3.2 of IEC 60086-1.

For general information see IEC 60086-1.

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.

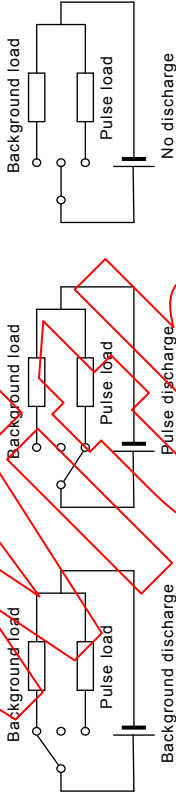
6.4.1.1 Category 4 – Specifications: PR70, PR41, PR48, PR44

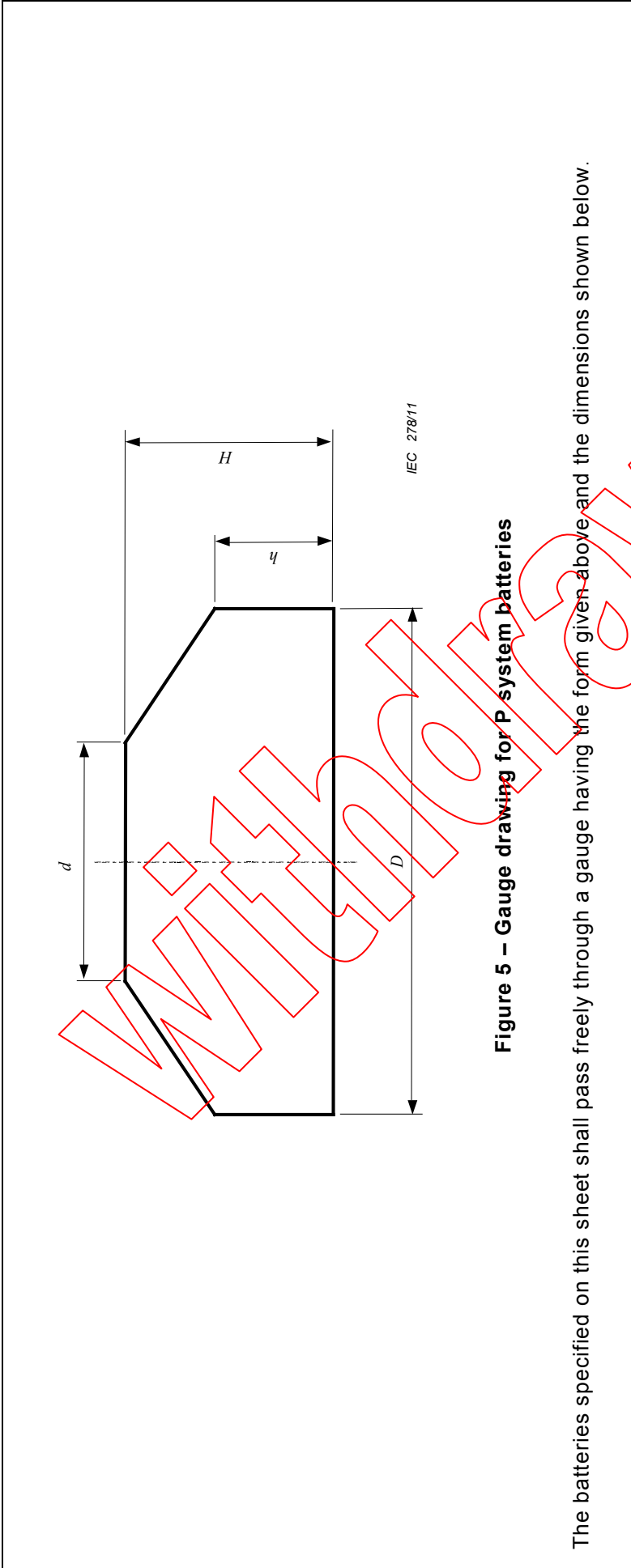
Electro-chemical system letter	Designation	V_n V	OCV max. V	Dimensions mm						Discharge conditions			MAD ^a (initial)	Applications
				h_1/h_2		d_1		d_2	d_4					
				max.	min.	max.	min.	min.	min.	Current drain	Daily period	EV V		
P (see NOTE)	PR70 b, c	1,4	1,59	3,60	3,30	5,80	5,65	-		Background: 0,7 mA Pulse: 3mA	d, e	1,05	85 h	Hearing aid standard
										Background: 1 mA Pulse: 5 mA	d, e	1,05	50 h	Hearing aid high drain
	PR41 b, c	1,4	1,59	3,60	3,30	7,90	7,70	3,80	3,00	Background: 1,2 mA Pulse: 5 mA	d, e	1,05	95 h	Hearing aid standard
										Background: 2 mA Pulse: 10 mA	d, e	1,05	55 h	Hearing aid high drain
	PR48 b, c	1,4	1,59	5,40	5,05	7,90	7,70	3,80	3,00	Background: 2 mA Pulse: 6mA	d, e	1,05	82h	Hearing aid standard
										Background: 3 mA Pulse: 12 mA	d, e	1,05	55 h	Hearing aid high drain
	PR44 b, c	1,4	1,59	5,40	5,05	11,60	11,30	3,80	3,80	Background: 5 mA Pulse: 15 mA	d, e	1,05	69 h	Hearing aid standard
										Background: 8 mA Pulse: 24 mA	d, e	1,05	45 h	Hearing aid high drain
NOTE Delayed discharge performance after 12 months is 95 % of MAD.														

6.4.1.1 (continued)

- a Standard conditions (see IEC 60086-1, Table 5, 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 not added in series or parallel to the background load. See example.
- e Six repeated cycles of the heavier load for 100 ms, followed by the lighter load for 119 min, 59 s, 900 ms, then off for 12 h.

EXAMPLE





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

6.4.1.1 (continued)

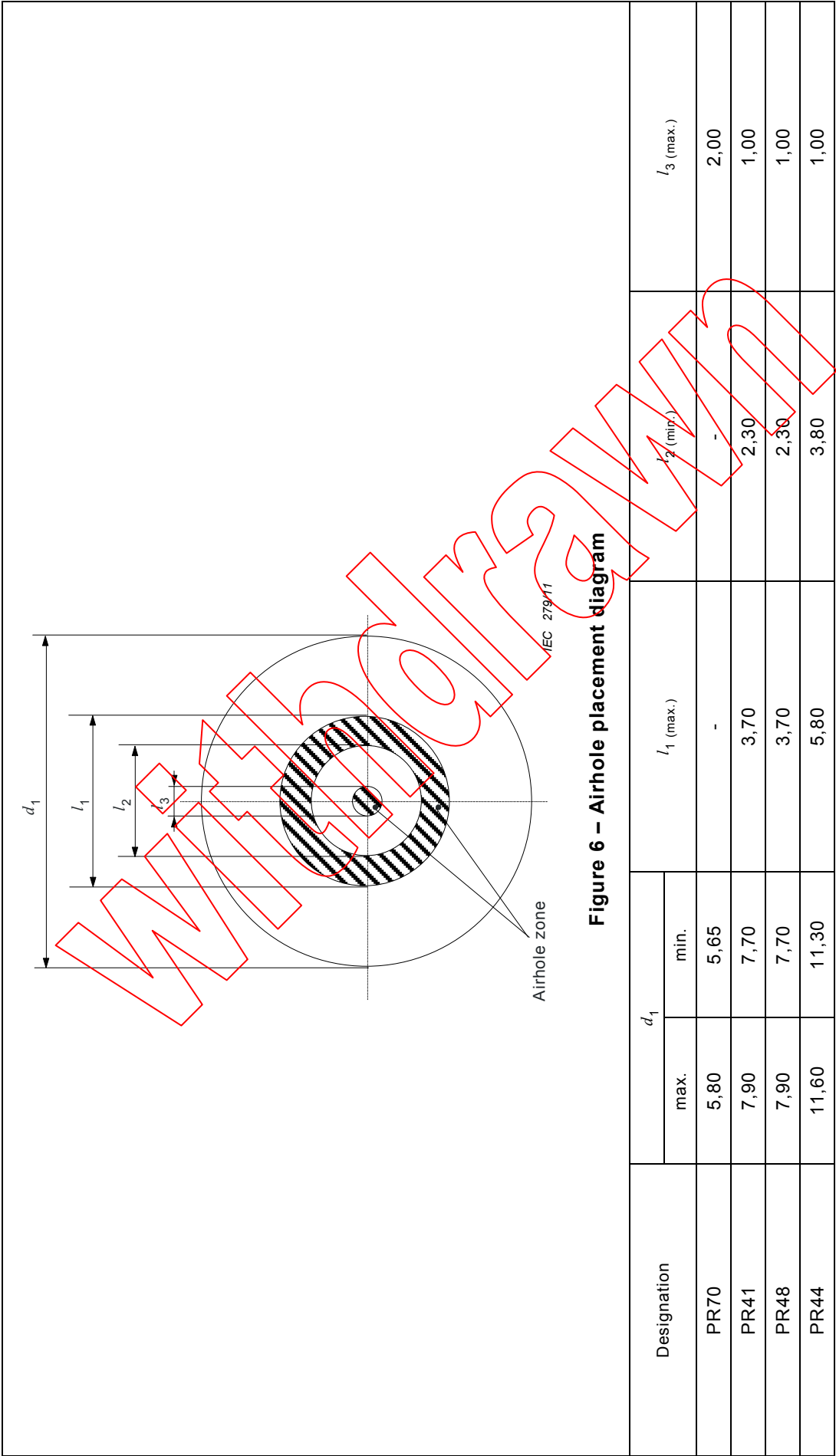


Figure 6 – Airhole placement diagram

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

Electro-chemical system letter	Designation	V_n V	OCV max. V	Dimensions mm						Discharge conditions			MAD ^a (initial)	Applications
				h_1/h_2		d_1		d_2 min.	d_4 min.	R kΩ	Daily period	EV V		
L (see NOTE)	LR41	1,5	1,68	3,6	3,3	7,9	7,55	3,8	3,0	22	24 h	1,2	300 h	Service output test
	LR55	1,5	1,68	2,1	1,85	11,6	11,25	3,8	3,8	22	24 h	1,2	275 h	Service output test
	LR54	1,5	1,68	3,05	2,75	11,6	11,25	3,8	3,8	15	24 h	1,2	350 h	Service output test
	LR43	1,5	1,68	4,2	3,8	11,6	11,25	3,8	3,8	10	24 h	1,2	359 h	Service output test
	LR44	1,5	1,68	5,4	5,0	11,6	11,25	3,8	3,8	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, 6.1, Table 5, Initial discharge test)														

6.4.1.3 Category 4 – Specifications: SR62, SR63, SR65, SR64, SR60, SR67, SR66, SR58, SR68, SR59, SR69, SR41, SR57, SR55, SR48, SR54, SR42, SR43, SR44

Electro-chemical system letter	Designation	V_n V	OCV max. V	Dimensions mm						Discharge conditions				MAD ^a (Initial)	Applications
				h_1/h_2		d_1		d_2	d_4	R kΩ	Daily period	EV V			
S (see NOTE)	SR62	1,55	1,63	max. 1,65	min. 1,45	max. 5,8	min. 5,55	min. 3,8	min. 2,5	82	24 h	1,2	390 h	Service output test	
	SR63	1,55	1,63	2,15	1,9	5,8	5,55	3,8	2,5	68	24 h	1,2	560 h	Service output test	
	SR65	1,55	1,63	1,65	1,45	6,8	6,6	–	3,0	100	24 h	1,2	810 h	Service output test	
	SR64	1,55	1,63	2,7	2,4	5,8	5,55	3,8	2,5	56	24 h	1,2	540 h	Service output test	
	SR60	1,55	1,63	2,15	1,9	6,8	6,5	3,8	3,0	68	24 h	1,2	685 h	Service output test	
	SR67	1,55	1,63	1,65	1,45	7,9	7,65	–	3,0	68	24 h	1,2	820 h	Service output test	
	SR66	1,55	1,63	2,6	2,4	6,8	6,6	–	3,0	47	24 h	1,2	680 h	Service output test	
	SR58	1,55	1,63	2,1	1,85	7,9	7,55	3,8	3,0	47	24 h	1,2	518 h	Service output test	
	SR68	1,55	1,63	1,65	1,45	9,5	9,25	–	3,8	47	24 h	1,2	680 h	Service output test	

6.4.1.3 (continued)

Electro-chemical system letter	Designation	V _n V	OCV max. V	Dimensions mm				Discharge conditions				MAD ^a (initial)	Applications	
				h ₁ /h ₂		d ₁		d ₂ min.	d ₄ min.	R kΩ	Daily period			EV V
				max.	min.	max.	min.							
S (see NOTE)	SR59	1,55	1,63	2,6	2,3	7,9	7,55	3,8	3,0	33	24 h	1,2	Service output test	
	SR69	1,55	1,63	2,1	1,85	9,5	9,25	—	3,8	33	24 h	1,2	Service output test	
	SR41	1,55	1,63	3,6	3,3	7,9	7,55	3,8	3,0	22	24 h	1,2	Service output test	
	SR57	1,55	1,63	2,7	2,4	9,5	9,15	3,8	3,8	22	24 h	1,2	Service output test	
	SR55	1,55	1,63	2,1	1,85	11,6	11,25	3,8	3,8	22	24 h	1,2	Service output test	
	SR48	1,55	1,63	5,4	5,0	7,9	7,55	3,8	3,0	1,5	12 h	0,9	Hearing aid	
	SR54	1,55	1,63	3,05	2,75	11,6	11,25	3,8	3,8	15	24 h	1,2	Service output test	
	SR42	1,55	1,63	3,6	3,3	11,6	11,25	3,8	3,8	15	24 h	1,2	Service output test	
	SR43	1,55	1,63	4,2	3,8	11,6	11,25	3,8	3,8	10	24 h	1,2	Service output test	
	SR44	1,55	1,63	5,4	5,0	11,6	11,25	3,8	3,8	6,8	24 h	1,2	Service output test	
										Background: 5,6 Pulse: 0,039		b, d	0,9	c

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

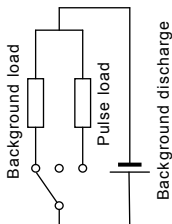
a Standard conditions (see IEC 60086-1, Table 5, Initial discharge test).

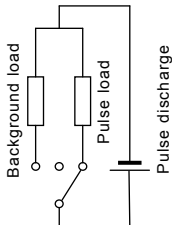
b 24 h per day, plus 39 Ω for 1 s every 6 s, for 5 min per day.

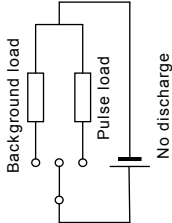
c Accelerated application test for automatic cameras.

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







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

Electro-chemical system letter	Designation	V_n V	OCV max. V	Dimensions mm						Discharge conditions			MAD ^a (initial)	Applications
				h_1/h_2		d_1		d_2	d_4	R kΩ	Daily period	EV V		
				max.	min.	max.	min.	min.	min.					
C (see NOTE)	CR1025	3,0	3,7	2,5	7,2	10,0	9,7	-	3,0	68	24 h	2,0	630 h	Service output test
	CR1216	3,0	3,7	1,6	1,4	12,5	12,2	-	4,0	62	24 h	2,0	480 h	Service output test
	CR1220	3,0	3,7	2,0	1,8	12,5	12,2	-	4,0	62	24 h	2,0	700 h	Service output test
	CR1616	3,0	3,7	1,6	1,4	16,0	15,7	-	5,0	30	24 h	2,0	480 h	Service output test
	CR2012	3,0	3,7	1,2	1,0	20,0	19,7	-	8,0	30	24 h	2,0	530 h	Service output test
	CR1620	3,0	3,7	2,0	1,8	16,0	15,7	-	5,0	47	24 h	2,0	900 h	Service output test
	CR2016	3,0	3,7	1,6	1,4	20,0	19,7	-	8,0	30	24 h	2,0	675 h	Service output test
	CR2025	3,0	3,7	2,5	2,2	20,0	19,7	-	8,0	15	24 h	2,0	540 h	Service output test
	CR2320	3,0	3,7	2,0	1,8	23,0	22,6	-	8,0	15	24 h	2,0	590 h	Service output test
	CR2032	3,0	3,7	3,2	2,9	20,0	19,7	-	8,0	15	24 h	2,0	920 h	Service output test
	CR2330	3,0	3,7	3,0	2,7	23,0	22,6	-	8,0	15	24 h	2,0	1 320 h	Service output test
	CR2430	3,0	3,7	3,0	2,7	24,5	24,2	-	8,0	15	24 h	2,0	1 300 h	Service output test
	CR2354	3,0	3,7	5,4	5,1	23,0	22,6	-	8,0	7,5	24h	2,0	1 260 h	Service output test
CR3032	3,0	3,7	3,2	2,9	30,0	29,6	-	8,0	7,5	24 h	2,0	1 250 h	Service output test	
CR2450	3,0	3,7	5,0	4,6	24,5	24,2	-	8,0	7,5	24 h	2,0	1 200 h	Service output test	
NOTE Delayed discharge performance after 12 months is 98 % of MAD.														
a Standard conditions (see IEC 60086-1, Table 5, Initial discharge test).														

6.4.1.5 Category 4 – Specifications: BR1225, BR2016, BR2320, BR2325, BR3032

Electro-chemical system letter	Designation	V_n V	OCV max. V	Dimensions mm						Discharge conditions			MAD ^a (initial)	Applications
				h_1/h_2		d_1		d_2 min.	d_4 min.	R kΩ	Daily period	EV V		
B (see NOTE)	BR1225	3,0	3,7	2,5	2,2	12,5	12,2	-	4,0	30	24 h	2,0	395 h	Service output test
	BR2016	3,0	3,7	1,6	1,4	20,0	19,7	-	8,0	30	24 h	2,0	636 h	Service output test
	BR2320	3,0	3,7	2,0	1,8	23,0	22,6	-	8,0	15	24 h	2,0	468 h	Service output test
	BR2325	3,0	3,7	2,5	2,2	23,0	22,6	-	8,0	15	24 h	2,0	696 h	Service output test
	BR3032	3,0	3,7	3,2	2,9	30,0	29,6	-	8,0	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 (see IEC 60086-1, Table 5, Initial discharge test)														

6.5 Category 5 batteries

6.5.1 Category 5 – Physical and electrical specifications

6.5.1.1 Category 5 – Specifications: R40

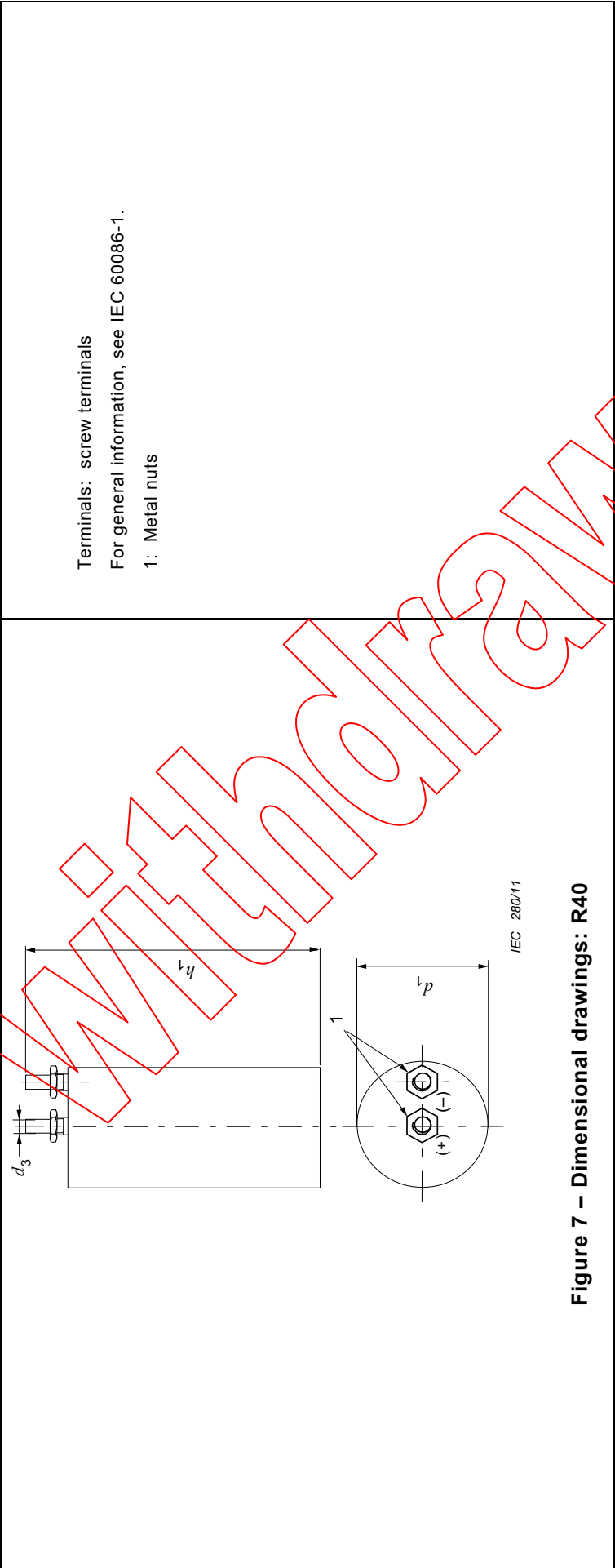


Figure 7 – Dimensional drawings: R40

6.5.1.1 (continued)

Electro-chemical system letter	Designation	V_n V	OCV max. V	Dimensions mm			Discharge conditions				MAD ^a (initial)	Applications
				h_1 max.	d_1 max.	d_3 max.	R Ω	Daily period	EV V			
No letter (see NOTE)	R40	1,5	1,73	172	67	4,2	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 controller	
NOTE 1 Delayed discharge performance after 12 months is 80 % of MAD.												
a Standard conditions (see IEC 60086-1, Table 5, 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.												

6.5.1.2 Category 5 – Specifications: 4LR44, 2CR13252, 4SR44

Figure 8 – Dimensional drawing: 4LR44, 2CR13252, 4SR44

Electro-chemical system letter	Designation	I_n V	OCV max. V	Dimensions mm										Discharge conditions			MAD ^a (initial)	Applications
				h ₁	h ₂	h ₃	h ₄	h ₅	d ₁	d ₂	d ₃	d ₄	R	Daily period	EV			
L (see NOTE 1)	4LR44	6,0	6,72	max. 25,2	min. 23,9	max. 0,7	min. 0,40	max. 0,05	max. 13	min. 12	max. 5,0	min. 5,0	Backgroud: 27 Pulse: 0,160	27	24 h	3,6	310 h	c
	2CR13252	6,0	7,4	max. 25,2	min. 23,9	max. 0,7	min. 0,40	max. 0,05	max. 13	min. 12	max. 5,0	min. 5,0	0,1	d	3,6	950 pulses	Service output test	
C (see NOTE 2)	4SR44	6,2	6,52	max. 25,2	min. 23,9	max. 0,7	min. 0,40	max. 0,05	max. 13	min. 12	max. 5,0	min. 5,0	Backgroud: 27 Pulse: 0,160	27	24 h	3,6	620 h	Service output test
													0,1	d	3,6	1 000 pulses	Pulse test	

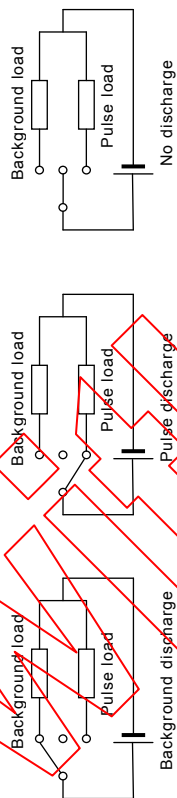
NOTE 1 Delayed discharge performance after 12 months is 90 % of MAD.

NOTE 2 Delayed discharge performance after 12 months is 98 % of MAD.

6.5.1.2 (continued)

- a Standard conditions (see IEC 60086-1, Table 5, Initial discharge test).
- b 24 h per day, plus 160 Ω for 1 s every 6 s for 5 min per day.
- c Accelerated application test for automatic cameras.
- d 24 h per day, 2 s on, 1 s off.
- e 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.

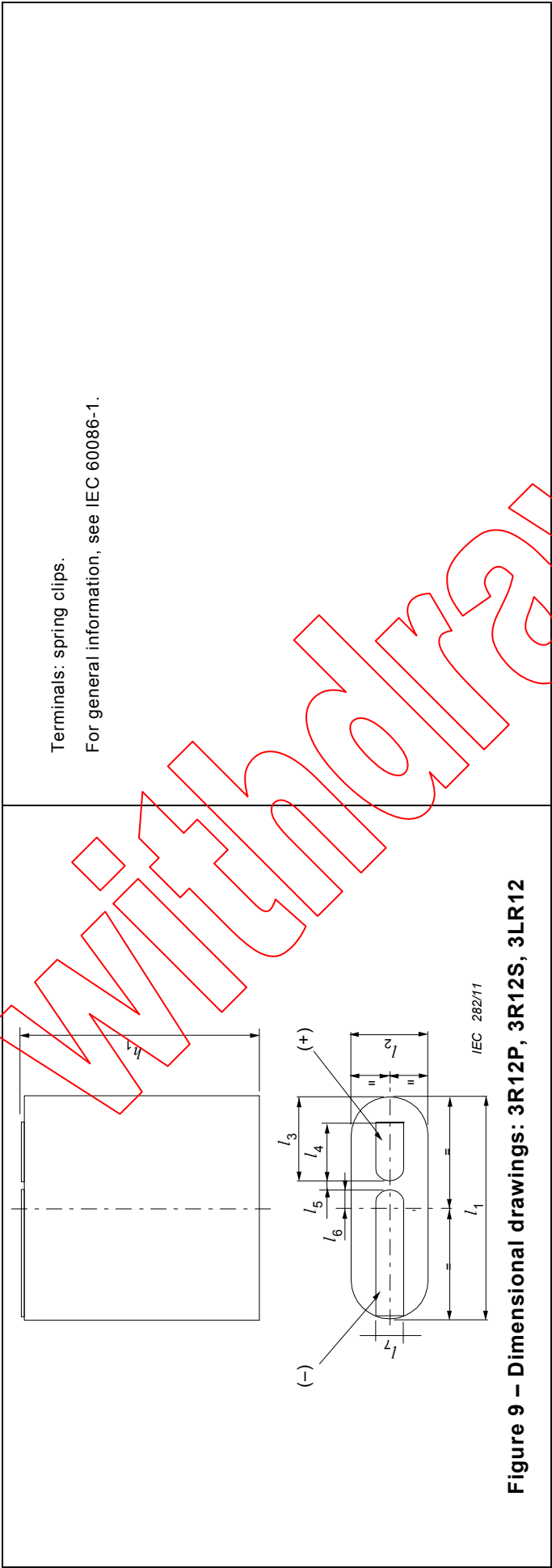
EXAMPLE



6.6 Category 6 batteries

6.6.1 Category 6 – Physical and electrical specifications

6.6.1.1 Category 6 – Specifications: 3R12P, 3R12S, 3LR12



6.6.1.1 (continued)

Electro-chemical system letter	Designation	I _n V	OCV max. V	Dimensions mm												Discharge conditions			MAD ^a (initial)	Applications	
																R Ω	Daily period	EV V			
				h ₁ max. min.	l ₁ max. min.	l ₂ max. min.	l ₃ max. min.	l ₄ max. min.	l ₅ max. min.	l ₆ max. min.	l ₇ max. min.										
No letter (see NOTE 1)	3R12P (high power)	4,5	5,19	67,0 63,0	62,0 60,0	22,0 20,0	-	23,0	-	16,0	-	1,0	-	3,0	7,0	6,0	20	1 h	2,7	5,5 h	Portable lighting
	3R12S (standard)	4,5	5,19	67,0 63,0	62,0 60,0	22,0 20,0	-	23,0	-	16,0	-	1,0	-	3,0	7,0	6,0	220	4 h	2,7	96 h	Radio
L (see NOTE 2)	3LR12	4,5	5,04	67,0 63,0	62,0 60,0	22,0 20,0	- -	23,0	-	16,0	-	1,0	-	3,0	7,0	6,0	20	1 h	2,7	12 h	Portable lighting
																	220	4 h	2,7	96 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 5, Initial discharge test).																					