

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Fixed capacitors for use in electronic equipment –  
Part 26: Sectional specification – Fixed aluminium electrolytic capacitors with  
conductive polymer solid electrolyte**

**Condensateurs fixes utilisés dans les équipements électroniques –  
Partie 26: Spécification intermédiaire – Condensateurs fixes électrolytiques en  
aluminium à électrolyte solide en polymère conducteur**





## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2010 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 Varembé  
CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
Web: [www.iec.ch](http://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](http://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 It also gives information on projects, withdrawn and replaced publications.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](http://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](http://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](http://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](mailto: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](http://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](http://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](http://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](http://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](mailto:csc@iec.ch)

Tél.: +41 22 919 02 11

Fax: +41 22 919 03 00



IEC 60384-26

Edition1.0 2010-08

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Fixed capacitors for use in electronic equipment –  
Part 26: Sectional specification – Fixed aluminium electrolytic capacitors with  
conductive polymer solid electrolyte**

**Condensateurs fixes utilisés dans les équipements électroniques –  
Partie 26: Spécification intermédiaire – Condensateurs fixes électrolytiques en  
aluminium à électrolyte solide en polymère conducteur**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX

ICS 31.060.50

ISBN 978-2-88912-165-6

## CONTENTS

FOREWORD .....	5
1 General .....	7
1.1 Scope .....	7
1.2 Object .....	7
1.3 Normative references .....	7
1.4 Information to be given in a detail specification .....	8
1.4.1 Outline drawings and dimensions .....	8
1.4.2 Mounting .....	8
1.4.3 Rating and characteristics .....	8
1.4.4 Marking .....	9
1.5 Terms and definitions .....	9
1.6 Marking .....	9
1.6.1 General .....	9
1.6.2 Marking on capacitor .....	9
1.6.3 Marking on package .....	9
1.6.4 Additional markings .....	9
2 Preferred rating and characteristics .....	10
2.1 Preferred characteristics .....	10
2.1.1 Preferred climatic categories .....	10
2.2 Preferred values of ratings .....	10
2.2.1 Nominal capacitance ( $C_N$ ) .....	10
2.2.2 Tolerance on nominal capacitance .....	10
2.2.3 Rated voltage ( $U_R$ ) .....	10
2.2.4 Surge voltage .....	10
2.2.5 Rated temperature .....	11
3 Quality assessment procedures .....	11
3.1 Primary stage of manufacture .....	11
3.2 Structurally similar components .....	11
3.3 Declaration of conformity (basic requirements) .....	11
3.4 Test schedule and requirement for initial assessment (mandatory and optional tests) .....	11
3.4.1 Qualification approval on the basis of the fixed sample size procedures sampling .....	11
3.4.2 Tests .....	12
3.5 Quality conformance inspection .....	19
3.5.1 Formation of inspection lots .....	19
3.5.2 The schedule .....	20
3.5.3 Delayed delivery .....	20
3.5.4 Assessment levels .....	20
4 Test and measurement procedures .....	22
4.1 Pre-conditioning (if required) .....	22
4.2 Measuring conditions .....	22
4.3 Visual examination and check of dimensions .....	23
4.3.1 Visual examination .....	23
4.3.2 Requirements .....	23
4.4 Electrical tests .....	23
4.4.1 Leakage current .....	23

4.4.2	Capacitance .....	23
4.4.3	Tangent of loss angle ( $\tan \delta$ ) .....	24
4.4.4	Equivalent series resistance (ESR).....	24
4.5	Robustness of terminations .....	24
4.5.1	Initial measurement .....	24
4.6	Resistance to soldering heat .....	24
4.6.1	Initial measurement .....	24
4.6.2	Test conditions .....	24
4.6.3	Final inspection, measurements and requirements .....	25
4.7	Solderability .....	25
4.7.1	Test conditions .....	25
4.7.2	Final inspection, measurements and requirements .....	25
4.8	Rapid change of temperature .....	25
4.8.1	Initial measurement .....	25
4.8.2	Test conditions .....	25
4.8.3	Final inspection, measurements and requirements .....	25
4.9	Vibration.....	25
4.9.1	Test condition .....	26
4.9.2	Final inspection, measurements and requirements .....	26
4.10	Shock .....	26
4.10.1	Test conditions .....	26
4.10.2	Final inspection, measurements and requirements .....	26
4.11	Bump .....	26
4.11.1	Test conditions .....	26
4.11.2	Final examination, measurements and requirements .....	26
4.12	Climatic sequence .....	27
4.12.1	Initial measurement .....	27
4.12.2	Dry heat .....	27
4.12.3	Damp heat, cyclic, Test Db, first cycle .....	27
4.12.4	Cold .....	27
4.12.5	Damp heat, cyclic, Test Db, remaining cycles .....	27
4.12.6	Recovery .....	27
4.12.7	Final inspection, measurements and requirements .....	27
4.13	Damp heat, steady state.....	27
4.13.1	Initial measurement .....	27
4.13.2	Test conditions .....	27
4.13.3	Final inspection, measurements and requirements .....	27
4.14	Endurance.....	27
4.14.1	Initial measurement .....	28
4.14.2	Test conditions .....	28
4.14.3	Final inspection, measurements and requirements .....	28
4.15	Surge .....	28
4.15.1	Initial measurement .....	28
4.15.2	Test procedure .....	28
4.15.3	Final inspection, measurements and requirements .....	28
4.16	Reverse voltage (if required by the detail specification).....	28
4.16.1	Initial measurement .....	28
4.16.2	Test procedure .....	28
4.16.3	Final inspection, measurements and requirements .....	29

4.17 Component solvent resistance (if required by the detail specification) .....	29
4.17.1 Test conditions .....	29
4.18 Solvent resistance of the marking (if required by the detail specification) .....	29
4.18.1 Test conditions .....	29
4.19 Storage at high temperature .....	29
4.19.1 Initial measurement .....	29
4.19.2 Test conditions .....	29
4.19.3 Final measurements and requirements .....	29
4.20 Characteristics at high and low temperature .....	29
4.20.1 Measurements and requirements .....	30
4.21 Charge and discharge (if required by the detail specification) .....	30
4.21.1 Initial measurement .....	30
4.21.2 Test procedure .....	30
4.21.3 Final inspection, measurements and requirements .....	30
4.22 High surge current (if required by the detail specification) .....	30
4.22.1 Initial measurement .....	30
4.22.2 Final measurements and requirements .....	30
Bibliography.....	31
 Table 1 – Surge voltage .....	10
Table 2 – Fixed sample size test plan for qualification approval, assessment level EZ .....	13
Table 3 – Test schedule for qualification approval.....	14
Table 4 – Test plan for lot-by-lot inspection (Assessment level EZ).....	21
Table 5 – Test plan for periodic inspection (Assessment level EZ) .....	22

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –****Part 26: Sectional specification – Fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte****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 60384-26 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

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

FDIS	Report on voting
40/2052/FDIS	40/2062/RVD

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

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

A list of all parts of the IEC 60384 series can be found, under the general title *Fixed capacitors for use in the electronic equipment*, 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.

**FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –****Part 26: Sectional specification – Fixed aluminium electrolytic capacitors with conductive polymer solid electrolyte****1 General****1.1 Scope**

This part of IEC 60384 is applicable to aluminium electrolytic capacitors with conductive polymer solid electrolyte primarily intended for d.c. applications for use in electronic equipment.

NOTE Aluminium electrolytic capacitors with solid ( $MnO_2$ ) are covered by IEC 60384-4 and IEC 60384-4-2. Surface mount aluminium electrolytic capacitors with conductive polymer solid electrolyte are covered by IEC 60384-25 and IEC 60384-25-1.

**1.2 Object**

The object of this standard is to prescribe preferred ratings and characteristics and to select from IEC 60384-1, the appropriate quality assessment procedures, tests and measuring methods and to give general performance requirements for this type of capacitor. Test severities and requirements prescribed in detail specifications referring to this sectional specification shall be of equal or higher performance level, lower performance levels are not permitted.

**1.3 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 60063:1963, *Preferred number series for resistors and capacitors*

Amendment 1 (1967)

Amendment 2 (1977)

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*<sup>1</sup>

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-20:2008, *Environmental testing – Part 2-20: Tests – Test T – Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60384-1:2008, *Fixed capacitors for use in electronic equipment – Part 1: Generic specification*

IEC 60410:1973, *Sampling plans and procedures for inspection by attributes*

<sup>1</sup> For the tests in the IEC 60068 series of publication, the editions referenced in the applicable test clauses of the generic specification shall be used.