

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

---

**Fixed capacitors for use in electronic equipment –  
Part 25: Sectional specification – Fixed aluminium electrolytic surface mount  
capacitors with conductive polymer solid electrolyte**

**Condensateurs fixes utilisés dans les équipements électroniques –  
Partie 25: Spécification intermédiaire – Condensateurs fixes électrolytiques en  
aluminium pour montage en surface à électrolyte solide en polymère conducteur**



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 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 l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[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.

#### IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

#### IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

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 It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

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

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

---

### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) 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 IEC

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

#### Catalogue IEC - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

#### Recherche de publications IEC - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Glossaire IEC - [std.iec.ch/glossary](http://std.iec.ch/glossary)

Plus de 60 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

---

**Fixed capacitors for use in electronic equipment –  
Part 25: Sectional specification – Fixed aluminium electrolytic surface mount  
capacitors with conductive polymer solid electrolyte**

**Condensateurs fixes utilisés dans les équipements électroniques –  
Partie 25: Spécification intermédiaire – Condensateurs fixes électrolytiques en  
aluminium pour montage en surface à électrolyte solide en polymère conducteur**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 31.060.40; 31.060.50

ISBN 978-2-8322-2790-9

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## 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 .....	7
1.4.1 General .....	7
1.4.2 Outline drawing and dimensions .....	8
1.4.3 Mounting .....	8
1.4.4 Ratings and characteristics.....	8
1.4.5 Marking .....	9
1.5 Terms and definitions.....	9
1.6 Marking.....	9
1.6.1 General .....	9
1.6.2 Information for marking.....	9
1.6.3 Marking on capacitors.....	9
1.6.4 Marking on packaging.....	9
2 Preferred ratings and characteristics .....	9
2.1 Preferred characteristics .....	9
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 Category voltage ( $U_C$ ) .....	10
2.2.5 Surge voltage ( $U_{RS}$ ).....	10
2.2.6 Rated temperature.....	10
3 Quality assessment procedures .....	11
3.1 Primary stage of manufacture .....	11
3.2 Structurally similar components .....	11
3.3 Certified test records of released lots.....	11
3.4 Qualification approval procedures .....	11
3.4.1 General .....	11
3.4.2 Qualification approval on the basis of the fixed sample size procedure .....	11
3.4.3 Tests .....	12
3.5 Quality conformance inspections.....	19
3.5.1 Formation of inspection lots .....	19
3.5.2 Test schedule .....	20
3.5.3 Delayed delivery.....	20
3.5.4 Assessment levels .....	20
4 Test and measurement procedures.....	21
4.1 Preliminary drying.....	21
4.2 Measuring conditions .....	21
4.3 Mounting.....	21
4.3.1 General .....	21
4.3.2 Initial inspections.....	21
4.3.3 Test conditions .....	21

4.3.4	Final inspections and requirements.....	21
4.4	Visual examination and check of dimensions .....	21
4.4.1	General .....	21
4.4.2	Visual examination and check of dimensions .....	22
4.4.3	Requirements .....	22
4.5	Electrical tests .....	22
4.5.1	Leakage current.....	22
4.5.2	Capacitance .....	22
4.5.3	Tangent of loss angle ( $\tan \delta$ ) .....	23
4.5.4	Equivalent series resistance (if required) .....	23
4.5.5	Impedance (if required).....	23
4.6	Resistance to soldering heat.....	24
4.6.1	General .....	24
4.6.2	Initial inspections.....	24
4.6.3	Test conditions .....	24
4.6.4	Recovery .....	24
4.6.5	Final inspections and requirements.....	24
4.7	Solderability.....	24
4.7.1	General .....	24
4.7.2	Final inspections and requirements.....	24
4.8	Shear test (if required) .....	24
4.9	Substrate bending test (if required) .....	24
4.9.1	General .....	24
4.9.2	Initial inspections.....	24
4.9.3	Test conditions .....	25
4.9.4	Final inspections and requirements.....	25
4.10	Rapid change of temperature .....	25
4.10.1	General .....	25
4.10.2	Initial inspections.....	25
4.10.3	Test conditions .....	25
4.10.4	Recovery .....	25
4.10.5	Final inspections and requirements.....	25
4.11	Climatic sequence.....	25
4.11.1	General .....	25
4.11.2	Initial inspections.....	25
4.11.3	Dry heat .....	25
4.11.4	Damp heat, cyclic, Test Db, first cycle .....	25
4.11.5	Cold.....	26
4.11.6	Damp heat, cyclic, Test Db, remaining cycles .....	26
4.11.7	Recovery .....	26
4.11.8	Final inspections and requirements.....	26
4.12	Damp heat, steady state .....	26
4.12.1	General .....	26
4.12.2	Initial inspections.....	26
4.12.3	Test conditions .....	26
4.12.4	Recovery .....	26
4.12.5	Final inspections and requirements.....	26
4.13	Characteristics at high and low temperature.....	26
4.13.1	General .....	26

4.13.2	Inspections and requirements .....	27
4.14	Surge voltage .....	27
4.14.1	General .....	27
4.14.2	Initial inspections .....	27
4.14.3	Test conditions .....	27
4.14.4	Recovery .....	27
4.14.5	Final inspections and requirements.....	27
4.15	Endurance .....	27
4.15.1	General .....	27
4.15.2	Initial inspections.....	27
4.15.3	Test conditions .....	27
4.15.4	Recovery .....	28
4.15.5	Final inspections and requirements.....	28
4.16	Storage at high temperature.....	28
4.16.1	General .....	28
4.16.2	Initial inspections.....	28
4.16.3	Test conditions .....	28
4.16.4	Recovery .....	28
4.16.5	Final inspections and requirements.....	28
4.17	Charge and discharge (if required).....	28
4.17.1	General .....	28
4.17.2	Initial inspections.....	28
4.17.3	Test conditions .....	28
4.17.4	Final inspections and requirements.....	29
4.18	Component solvent resistance (if required) .....	29
4.19	Solvent resistance of marking (if required) .....	29
4.20	High surge current (if required) .....	29
4.20.1	General .....	29
4.20.2	Final inspections and requirements.....	29
Bibliography.....		30
Table 1 – Surge voltages .....		10
Table 2 – Sampling plan for qualification approval, assessment level EZ .....		13
Table 3 – Test schedule for qualification approval (1 of 6) .....		14
Table 4 – Lot-by-lot inspection .....		20
Table 5 – Periodic inspection .....		21

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –****Part 25: Sectional specification – Fixed aluminium electrolytic surface mount 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 60384-25 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This second edition cancels and replaces the first edition published in 2006 and constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Revision of the structure in accordance with ISO/IEC Directives, Part 2:2011 (sixth edition) to the extent practicable, and harmonization between other similar kinds of documents.
- b) In addition, Clause 4 and all the tables have been reviewed in order to prevent duplications and contradictions.

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

FDIS	Report on voting
40/2383/FDIS	40/2396/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.

The list of all parts of the IEC 60384 series, under the general title *Fixed capacitors for use in electronic equipment*, 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 website 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 25: Sectional specification – Fixed aluminium electrolytic surface mount capacitors with conductive polymer solid electrolyte

#### 1 General

##### 1.1 Scope

This part of IEC 60384 applies to fixed aluminium electrolytic surface mount capacitors with conductive polymer solid electrolyte, primarily intended for d.c. applications for use in electronic equipment.

Fixed aluminium electrolytic surface mount capacitors with solid ( $\text{MnO}_2$ ) are not included but are covered by IEC 60384-18.

These capacitors are primarily intended for use in electronic equipment to be mounted directly on substrates for hybrid circuits or to printed boards.

Capacitors for special-purpose applications may need additional requirements.

##### 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, because lower performance levels are not permitted.

##### 1.3 Normative references

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

IEC 60063, *Preferred number series for resistors and capacitors*

IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

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

IEC 61193-2:2007, *Quality assessment systems – Part 2: Selection and use of sampling plans for inspection of electronic components and packages*

ISO 3, *Preferred numbers – Series of preferred numbers*

##### 1.4 Information to be given in a detail specification

###### 1.4.1 General

Detail specifications shall be derived from the blank detail specification.