



NSAI
Standards

Irish Standard
I.S. EN 60384-9:2015

Fixed capacitors for use in electronic
equipment - Part 9: Sectional specification:
Fixed capacitors of ceramic dielectric, Class
2

I.S. EN 60384-9:2015

Incorporating amendments/corrigenda/National Annexes issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

This document is based on:

EN 60384-9:2015

Published:

2015-05-15

This document was published under the authority of the NSAI and comes into effect on:

2015-06-02

ICS number:

31.060.20

NOTE: If blank see CEN/CENELEC cover page

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

EUROPEAN STANDARD

EN 60384-9

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2015

ICS 31.060.20

Supersedes EN 60384-9:2005

English Version

**Fixed capacitors for use in electronic equipment - Part 9:
Sectional specification: Fixed capacitors of ceramic dielectric,
Class 2
(IEC 60384-9:2015)**

Condensateurs fixes utilisés dans les équipements
électroniques - Partie 9: Spécification intermédiaire:
Condensateurs fixes à diélectrique en céramique, Classe 2
(IEC 60384-9:2015)

Festkondensatoren zur Verwendung in Geräten der
Elektronik - Teil 9: Rahmenspezifikation - Keramik-
Festkondensatoren, Klasse 2
(IEC 60384-9:2015)

This European Standard was approved by CENELEC on 2015-04-14. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Foreword

The text of document 40/2339/FDIS, future edition 4 of IEC 60384-9, prepared by IEC TC 40, "Capacitors and resistors for electronic equipment" was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60384-9:2015.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-01-14
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-04-14

This document supersedes EN 60384-9:2005.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 60384-9:2015 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60384-14	NOTE	Harmonized as EN 60384-14.
IEC 60384-22	NOTE	Harmonized as EN 60384-22.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60063	1963	Preferred number series for resistors and capacitors	-	-
+A1	1967		-	-
+A2	1977		-	-
IEC 60068-1	2013	Environmental testing -- Part 1: General and guidance	EN 60068-1	2014
IEC 60384-1	2008	Fixed capacitors for use in electronic equipment -- Part 1: Generic specification	EN 60384-1	2009
IEC 61193-2	2007	Quality assessment systems -- Part 2: Selection and use of sampling plans for inspection of electronic components and packages	EN 61193-2	2007
ISO 3	1973	Preferred numbers; Series of preferred numbers	-	-

This page is intentionally left blank



IEC 60384-9

Edition 4.0 2015-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Fixed capacitors for use in electronic equipment –
Part 9: Sectional specification: Fixed capacitors of ceramic dielectric, Class 2**

**Condensateurs fixes utilisés dans les équipements électroniques –
Partie 9: Spécification intermédiaire: Condensateurs fixes à diélectrique en
céramique, Classe 2**





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
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

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

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

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

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

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

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

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

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

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

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

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

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



IEC 60384-9

Edition 4.0 2015-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Fixed capacitors for use in electronic equipment –
Part 9: Sectional specification: Fixed capacitors of ceramic dielectric, Class 2**

**Condensateurs fixes utilisés dans les équipements électroniques –
Partie 9: Spécification intermédiaire: Condensateurs fixes à diélectrique en
céramique, Classe 2**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 31.060.20

ISBN 978-2-8322-2284-3

**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 Marking on the body	10
1.6.3 Marking of the packaging	10
1.6.4 Additional marking	10
2 Preferred ratings and characteristics	10
2.1 Preferred characteristics	10
2.2 Preferred values of ratings	10
2.2.1 Rated temperature	10
2.2.2 Rated voltage (U_R)	10
2.2.3 Category voltage (U_C)	11
2.2.4 Preferred values of nominal capacitance and associated tolerance values	11
2.2.5 Temperature characteristic of capacitance	11
3 Quality assessment procedures	12
3.1 Primary stage of manufacture	12
3.2 Structurally similar components	12
3.3 Certified test records of released lots	12
3.4 Qualification approval	12
3.4.1 General	12
3.4.2 Qualification approval on the basis of the fixed sample size procedure	12
3.4.3 Tests	13
3.5 Quality conformance inspection	18
3.5.1 Formation of inspection lots	18
3.5.2 Test schedule	19
3.5.3 Delayed delivery	19
3.5.4 Assessment levels	19
4 Test and measurement procedures	20
4.1 General	20
4.2 Special preconditioning	20
4.3 Visual examination and check of dimensions	20
4.4 Electrical tests	20
4.4.1 Capacitance	20
4.4.2 Tangent of loss angle ($\tan \delta$)	21

4.4.3	Insulation resistance (R_i)	21
4.4.4	Voltage proof	22
4.5	Temperature characteristic of capacitance	23
4.5.1	Special preconditioning	23
4.5.2	Measuring conditions	23
4.5.3	Requirements	23
4.6	Robustness of terminations	23
4.7	Resistance to soldering heat	23
4.7.1	General	23
4.7.2	Special preconditioning	24
4.7.3	Initial measurement	24
4.7.4	Recovery	24
4.7.5	Final inspection, measurements and requirements	24
4.8	Solderability	24
4.8.1	General	24
4.8.2	Test conditions	24
4.8.3	Final inspection, measurements and requirements	24
4.9	Rapid change of temperature (if required)	24
4.9.1	General	24
4.9.2	Special preconditioning	24
4.9.3	Initial measurement	25
4.9.4	Test conditions	25
4.9.5	Recovery	25
4.10	Vibration	25
4.10.1	General	25
4.10.2	Test conditions	25
4.10.3	Final inspection, measurements and requirements	25
4.11	Bump (repetitive shock)	25
4.11.1	General	25
4.11.2	Initial measurements	25
4.11.3	Test conditions	25
4.11.4	Final inspection, measurements and requirements	26
4.12	Shock (non-repetitive shock)	26
4.12.1	General	26
4.12.2	Initial measurements	26
4.12.3	Test conditions	26
4.12.4	Final inspection, measurements and requirements	26
4.13	Climatic sequence	27
4.13.1	General	27
4.13.2	Special preconditioning	27
4.13.3	Initial measurements	27
4.13.4	Dry heat	27
4.13.5	Damp heat, cyclic, Test Db, first cycle	27
4.13.6	Cold	27
4.13.7	Low air pressure	27
4.13.8	Damp heat, cyclic, Test Db, remaining cycles	28
4.14	Damp heat, steady state	28
4.14.1	General	28
4.14.2	Special preconditioning	28

4.14.3	Initial measurement	29
4.14.4	Test conditions	29
4.14.5	Recovery	29
4.14.6	Final inspection, measurements and requirements.....	29
4.15	Endurance	30
4.15.1	General	30
4.15.2	Special preconditioning.....	30
4.15.3	Initial measurement	30
4.15.4	Test conditions	30
4.15.5	Recovery	30
4.15.6	Final inspection, measurements and requirements.....	30
4.16	Component solvent resistance (if applicable)	31
4.17	Solvent resistance of the marking (if applicable)	31
Annex A (informative) Capacitance ageing of fixed capacitors of ceramic dielectric, Class 2		32
A.1	General.....	32
A.2	Law of capacitance ageing.....	32
A.3	Capacitance measurements and capacitance tolerance (see 4.4.1).....	33
A.4	Special preconditioning (see 4.2).....	33
Bibliography.....		35
Table 1 – Preferred tolerance on nominal capacitance		11
Table 2 – Preferred values of temperature characteristics.....		11
Table 3 – Sampling plan together with numbers of permissible non-conforming items for qualification approval tests, assessment level EZ		14
Table 4 – Test schedule for qualification approval		15
Table 5 – Lot-by-lot inspection		19
Table 6 – Periodic tests		20
Table 7 – Measuring conditions		21
Table 8 – Insulation resistance requirements		22
Table 9 – Test voltages.....		22
Table 10 – Details of measuring conditions		23
Table 11 – Maximum capacitance change.....		24
Table 12 – Preferred severities (of non-repetitive shock)		26
Table 13 – Maximum capacitance change.....		27
Table 14 – Number of damp heat cycles		28
Table 15 – Final inspection measurements and requirements		28
Table 16 – Test conditions for damp heat, steady state.....		29
Table 17 – Final inspection, measurements and requirements		29
Table 18 – Endurance test conditions		30
Table 19 – Final inspection, measurements and requirements		30

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –**Part 9: Sectional specification:
Fixed capacitors of ceramic dielectric, Class 2**

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 60384-9 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This fourth edition cancels and replaces the third edition published in 2005. This fourth edition is a result of maintenance activities related to the previous edition. All changes that have been agreed upon can be categorized as minor revisions.

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

FDIS	Report on voting
40/2339/FDIS	40/2364/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 in the IEC 60384 series, published 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 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 9: Sectional specification: Fixed capacitors of ceramic dielectric, Class 2

1 General

1.1 Scope

This part of IEC 60384 is applicable to fixed capacitors of ceramic dielectric with a defined temperature coefficient (dielectric Class 2), intended for use in electronic equipment, including leadless capacitors but excluding fixed surface mount multilayer capacitors of ceramic dielectric, which are covered by IEC 60384-22 (Class 2).

Capacitors for electromagnetic interference suppression are not included, but are covered by IEC 60384-14.

1.2 Object

The object of this standard is to prescribe preferred ratings and characteristics and to select from IEC 60384-1:2008 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 60063:1963, *Preferred number series for resistors and capacitors*
IEC 60063:1963/AMD1:1967
IEC 60063:1963/AMD2:1977

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 3:1973, *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 relevant blank detail specification.

Detail specifications shall not specify requirements inferior to those of the generic, sectional or blank detail specification. When more severe requirements are included, they shall be

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-