

STN	Nepremenné kondenzátory na používanie v elektronických zariadeniach Časť 9: Rámcová špecifikácia Nepremenné kondenzátory s keramickým dielektrikom, trieda 2	STN EN IEC 60384-9 35 8291
------------	---	--

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

Táto norma obsahuje anglickú verziu európskej normy.

This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 11/24

Obsahuje: EN IEC 60384-9:2024, IEC 60384-9:2024

Oznámením tejto normy sa od 18.09.2027 ruší

STN EN 60384-9 (35 8291) z októbra 2015

139557

Úrad pre normalizáciu, metrológiu a skúšobníctvo Slovenskej republiky, 2024

Slovenská technická norma a technická normalizačná informácia je chránená zákonom č. 60/2018 Z. z. o technickej normalizácii v znení neskorších predpisov.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN IEC 60384-9

September 2024

ICS 31.060.20

Supersedes EN 60384-9:2015

English Version

**Fixed capacitors for use in electronic equipment - Part 9:
Sectional specification - Fixed capacitors of ceramic dielectric,
Class 2
(IEC 60384-9:2024)**

Condensateurs fixes utilisés dans les équipements
électroniques - Partie 9: Spécification intermédiaire -
Condensateurs fixes à diélectrique en céramique, Classe 2
(IEC 60384-9:2024)

Festkondensatoren zur Verwendung in Geräten der
Elektronik - Teil 9: Rahmenspezifikation - Keramik-
Festkondensatoren, Klasse 2
(IEC 60384-9:2024)

This European Standard was approved by CENELEC on 2024-09-18. 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 60384-9:2024 (E)**European foreword**

The text of document 40/3145/FDIS, future edition 5 of IEC 60384-9, prepared by TC 40 "Capacitors and resistors for electronic equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60384-9:2024.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2025-06-18 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2027-09-18 document have to be withdrawn

This document supersedes EN 60384-9:2015 and all of its amendments and corrigenda (if any).

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

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 60384-9:2024 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 standard indicated:

- | | |
|--------------------|---|
| IEC 60063 | NOTE Approved as EN 60063 |
| IEC 60068-1:2013 | NOTE Approved as EN 60068-1:2014 (not modified) |
| IEC 60384-9-1:2005 | NOTE Approved as EN 60384-9-1:2005 (not modified) |
| IEC 60384-14 | NOTE Approved as EN IEC 60384-14 |
| IEC 60384-22 | NOTE Approved as EN IEC 60384-22 |

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where 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.cencenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60384-1	2021	Fixed capacitors for use in electronic equipment - Part 1: Generic specification	EN IEC 60384-1	2021
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



IEC 60384-9

Edition 5.0 2024-08

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 © 2024 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 Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

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 once a month by email.

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: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

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.

Recherche de publications IEC -**webstore.iec.ch/advsearchform**

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 une fois par mois par email.

Service Clients - webstore.iec.ch/csc

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

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.



IEC 60384-9

Edition 5.0 2024-08

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 978-2-8322-9519-9

**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	6
1 Scope	8
2 Normative references	8
3 Terms and definitions	8
4 Preferred ratings and characteristics	9
4.1 Preferred characteristics	9
4.2 Preferred values of ratings	9
4.2.1 Rated temperature	9
4.2.2 Rated voltage (U_R)	10
4.2.3 Category voltage (U_C)	10
4.2.4 Preferred values of nominal capacitance and associated tolerance values	10
4.2.5 Temperature characteristic of capacitance	10
5 Test and measurement procedures	11
5.1 General	11
5.2 Special preconditioning	11
5.3 Visual examination and check of dimensions	11
5.4 Electrical tests	11
5.4.1 Capacitance	11
5.4.2 Tangent of loss angle ($\tan \delta$)	12
5.4.3 Insulation resistance (R_i)	12
5.4.4 Voltage proof	13
5.5 Temperature characteristic of capacitance (reference temperature 20 °C)	14
5.5.1 Special preconditioning	14
5.5.2 Measuring conditions	14
5.5.3 Requirements	15
5.6 Robustness of terminations	15
5.7 Resistance to soldering heat	15
5.7.1 General	15
5.7.2 Special preconditioning	15
5.7.3 Initial measurement	15
5.7.4 Recovery	16
5.7.5 Final inspection, measurements and requirements	16
5.8 Solderability	16
5.8.1 General	16
5.8.2 Test conditions	16
5.8.3 Final inspection, measurements and requirements	16
5.9 Rapid change of temperature (if required)	16
5.9.1 General	16
5.9.2 Special preconditioning	16
5.9.3 Initial measurement	17
5.9.4 Test conditions	17
5.9.5 Recovery	17
5.10 Vibration	17
5.10.1 General	17
5.10.2 Test conditions	17

5.10.3	Final inspection, measurements and requirements.....	17
5.11	Bump (repetitive shock)	17
5.11.1	General	17
5.11.2	Initial measurements	17
5.11.3	Test conditions	17
5.11.4	Final inspection, measurements and requirements.....	18
5.12	Shock (non-repetitive shock).....	18
5.12.1	General	18
5.12.2	Initial measurements	18
5.12.3	Test conditions	18
5.12.4	Final inspection, measurements and requirements.....	18
5.13	Climatic sequence.....	19
5.13.1	General	19
5.13.2	Special preconditioning.....	19
5.13.3	Initial measurements	19
5.13.4	Dry heat	19
5.13.5	Damp heat, cyclic, Test Db, first cycle	19
5.13.6	Cold.....	19
5.13.7	Low air pressure	19
5.13.8	Damp heat, cyclic, Test Db, remaining cycles	20
5.14	Damp heat, steady state	21
5.14.1	General	21
5.14.2	Special preconditioning.....	21
5.14.3	Initial measurement	21
5.14.4	Test conditions	21
5.14.5	Recovery	22
5.14.6	Final inspection, measurements and requirements.....	22
5.15	Endurance	23
5.15.1	General	23
5.15.2	Special preconditioning.....	23
5.15.3	Initial measurement	23
5.15.4	Test conditions	23
5.15.5	Recovery	23
5.15.6	Final inspection, measurements and requirements.....	23
5.16	Component solvent resistance (if applicable)	24
5.17	Solvent resistance of the marking (if applicable)	24
6	Marking	24
6.1	General.....	24
6.2	Information for marking	24
6.3	Marking on the body	25
6.4	Marking on the packaging	25
6.5	Additional marking	25
7	Information to be given in a detail specification.....	25
7.1	General.....	25
7.2	Outline drawing and dimensions	25
7.3	Mounting.....	26
7.4	Ratings and characteristics	26
7.4.1	General	26
7.4.2	Nominal capacitance range.....	26

7.4.3	Particular characteristics	26
7.4.4	Soldering	26
7.5	Marking.....	26
8	Quality assessment procedures	26
8.1	Primary stage of manufacture	26
8.2	Structurally similar components	26
8.3	Certified test records of released lots.....	26
8.4	Qualification approval	27
8.4.1	General	27
8.4.2	Qualification approval on the basis of the fixed sample size procedure	27
8.4.3	Tests	27
Annex A (normative) Capacitance ageing of fixed capacitors of ceramic dielectric, Class 2		33
A.1	General.....	33
A.2	Law of capacitance ageing.....	33
A.3	Capacitance measurements and capacitance tolerance (see 5.4.1).....	34
A.4	Special preconditioning (see 5.2)	35
Annex B (normative) Temperature characteristics of capacitance of 25 °C		36
Annex C (normative) Quality conformance inspection		38
C.1	Formation of inspection lots	38
C.1.1	Groups A and B inspection	38
C.1.2	Group C inspection	38
C.2	Test schedule	38
C.3	Delayed delivery	38
C.4	Assessment levels	38
C.5	Test schedule for quality conformance inspection	39
Annex X (informative) Comparison of cross-references in relation to IEC 60384-9:2015		44
Bibliography.....		45
Table 1 – Preferred tolerance on nominal capacitance		10
Table 2 – Temperature characteristic of capacitance		11
Table 3 – Measuring conditions		12
Table 4 – Insulation resistance requirements		13
Table 5 – Test voltages.....		14
Table 6 – Details of measuring conditions		15
Table 7 – Maximum capacitance change.....		16
Table 8 – Preferred severities (of non-repetitive shock)		18
Table 9 – Maximum capacitance change.....		19
Table 10 – Number of damp heat cycles		20
Table 11 – Final inspection measurements and requirements		21
Table 12 – Test conditions for damp heat, steady state.....		22
Table 13 – Final inspection, measurements and requirements		22
Table 14 – Endurance test conditions		23
Table 15 – Final inspection, measurements and requirements		24
Table 16 – Sampling plan together with numbers of permissible non-conforming items for qualification approval tests, assessment level EZ		28

Table 17 – Test schedule for qualification approval.....	29
Table B.1 – Temperature characteristics of capacitance	36
Table B.2 – Preferred values of the temperature characteristic of with and without a DC voltage applied	37
Table B.3 – Measuring conditions of temperature characteristic of capacitance for the reference temperature of 25 °C.....	37
Table C.1 – Lot-by-lot inspection	39
Table C.2 – Periodic tests.....	39
Table C.3 – Test schedule for quality conformance inspection (lot by lot).....	40
Table C.4 – Test schedule for quality conformance inspection (periodic test).....	41
Table X.1 – Reference to IEC 60384-9:2015 for clauses/subclauses/annexes.....	44
Table X.2 – Reference to IEC 60384-9 for figure/table	44

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 60384-9 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2015. This edition constitutes a technical revision.

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

- a) The document has been completely restructured to comply with ISO/IEC Directives, Part 2 and to make it more useable; tables, figures and references have been revised accordingly. Annex X contains all cross-references of changes in clause/subclause numbers.
- b) The requirements of reference temperature 25 °C have been added in Table 7, Table 9, Table 11, Table 13 and Table 15.

- c) The table of temperature characteristics of capacitance for the reference temperature 25 °C have been added in Table B.1, Table B.2 and Table B.3.
- d) Annex B has been changed from informative to normative.
- e) Clause C.5 (Test schedule for quality conformance inspection) has been newly added to withdraw the blank detail specification: IEC 60384-9-1.

The text of this International Standard is based on the following documents:

Draft	Report on voting
40/3145/FDIS	40/3162/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 9: Sectional specification – Fixed capacitors of ceramic dielectric, Class 2

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.

The object of this document is to specify preferred ratings and characteristics and to select from IEC 60384-1:2021 the appropriate quality assessment procedures, tests and measuring methods and to give general performance requirements for this type of capacitor. Test severities and requirements specified in detail specifications referring to this document provide specific test severities and requirements of an equal or higher performance level. Further information on the conception of generic, sectional and detail specifications can be found in the Introduction of IEC 60384-1:2021.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60384-1:2021, *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*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN