

# INTERNATIONAL STANDARD



**Fixed capacitors for use in electronic equipment –  
Part 8: Sectional specification – Fixed capacitors of ceramic dielectric, Class 1**

(<https://standards.iteh.ai>)

Document Preview

[IEC 60384-8:2024](https://standards.iteh.ai/catalog/standards/iec/d5eccc17-7320-4da8-87a8-0ebe22bf7998/iec-60384-8-2024)

<https://standards.iteh.ai/catalog/standards/iec/d5eccc17-7320-4da8-87a8-0ebe22bf7998/iec-60384-8-2024>



**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.

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

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

**IEC publications search - [webstore.iec.ch/advsearchform](http://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 It also gives information on projects, replaced and withdrawn publications.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](http://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](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: [sales@iec.ch](mailto:sales@iec.ch).

**IEC Products & Services Portal - [products.iec.ch](http://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](http://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.

International  
Standards  
Document Preview  
[standards.iteh.ai](http://standards.iteh.ai)

[IEC 60384-8:2024](https://standards.iteh.ai/catalog/standards/iec/d5eccc17-7320-4da8-87a8-0e8e22bf7998/iec-60384-8-2024)

<https://standards.iteh.ai/catalog/standards/iec/d5eccc17-7320-4da8-87a8-0e8e22bf7998/iec-60384-8-2024>



IEC 60384-8

Edition 5.0 2024-08  
REDLINE VERSION

# INTERNATIONAL STANDARD



Fixed capacitors for use in electronic equipment –  
Part 8: Sectional specification – Fixed capacitors of ceramic dielectric, Class 1

(<https://standards.iteh.ai>)  
Document Preview

[IEC 60384-8:2024](https://standards.iteh.ai/catalog/standards/iec/d5eccc17-7320-4da8-87a8-0ebe22bf7998/iec-60384-8-2024)

<https://standards.iteh.ai/catalog/standards/iec/d5eccc17-7320-4da8-87a8-0ebe22bf7998/iec-60384-8-2024>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

ICS 31.060.20

ISBN 978-2-8322-9574-8

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	6
<del>1 General.....</del>	<del>8</del>
1 Scope.....	8
2 Normative references .....	8
3 Terms and definitions .....	9
4 Preferred ratings and characteristics .....	9
4.1 Preferred characteristics .....	9
4.2 Preferred values of ratings.....	10
4.2.1 Rated temperature.....	10
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 coefficient ( $\alpha$ ).....	10
5 Test and measurement procedures.....	16
5.1 General.....	16
5.2 Visual examination and check of dimensions .....	16
5.3 Electrical tests .....	16
5.3.1 Capacitance .....	16
5.3.2 Tangent of loss angle ( $\tan \delta$ ) .....	16
5.3.3 Insulation resistance ( $R_i$ ) .....	17
5.3.4 Voltage proof.....	17
5.4 Temperature coefficient ( $\alpha$ ) and temperature cyclic drift of capacitance .....	18
5.4.1 General .....	18
5.4.2 Preliminary drying.....	18
5.4.3 Measuring conditions.....	18
5.4.4 Requirements .....	18
5.5 Robustness of terminations.....	19
5.6 Resistance to soldering heat.....	19
5.6.1 General .....	19
5.6.2 Initial measurement .....	19
5.6.3 Test conditions .....	19
5.6.4 Final inspection, measurements and requirements.....	19
5.7 Solderability.....	19
5.7.1 General .....	19
5.7.2 Test conditions .....	20
5.7.3 Final inspection, measurements and requirements.....	20
5.8 Rapid change of temperature (if required).....	20
5.8.1 General .....	20
5.8.2 Initial measurement .....	20
5.8.3 Test conditions .....	20
5.8.4 Recovery .....	20
5.9 Vibration .....	20
5.9.1 General .....	20
5.9.2 Test conditions .....	20
5.9.3 Final inspection, measurements and requirements.....	20

5.10	Bump (repetitive shock) .....	21
5.10.1	General .....	21
5.10.2	Initial measurements .....	21
5.10.3	Test conditions .....	21
5.10.4	Final inspection, measurements and requirements.....	21
5.11	Shock (non-repetitive shock).....	21
5.11.1	General .....	21
5.11.2	Initial measurements .....	21
5.11.3	Test conditions .....	21
5.11.4	Final inspection, measurements and requirements.....	22
5.12	Climatic sequence.....	22
5.12.1	General .....	22
5.12.2	Initial measurements .....	22
5.12.3	Dry heat .....	22
5.12.4	Damp heat, cyclic, Test Db, first cycle .....	22
5.12.5	Cold.....	22
5.12.6	Low air pressure .....	23
5.12.7	Damp heat, cyclic, Test Db, remaining cycles .....	23
5.13	Damp heat, steady state .....	24
5.13.1	General .....	24
5.13.2	Initial measurement .....	24
5.13.3	Test conditions .....	24
5.13.4	Recovery .....	25
5.13.5	Final inspection, measurements and requirements.....	25
5.14	Endurance .....	25
5.14.1	General .....	25
5.14.2	Initial measurement .....	25
5.14.3	Test conditions .....	25
5.14.4	Recovery .....	26
5.14.5	Final inspection, measurements and requirements.....	26
5.15	Component solvent resistance (if required) .....	26
5.16	Solvent resistance of the marking (if required) .....	26
6	Marking .....	27
6.1	General.....	27
6.2	Information for marking .....	27
6.3	Marking for code of temperature coefficient .....	27
6.4	Marking on the body .....	27
6.5	Marking of the packaging .....	27
6.6	Additional marking .....	27
7	Information to be given in a detail specification.....	27
7.1	General.....	27
7.2	Outline drawing and dimensions .....	28
7.3	Mounting.....	28
7.4	Ratings and characteristics .....	28
7.4.1	General .....	28
7.4.2	Nominal capacitance range.....	28
7.4.3	Particular characteristics .....	28
7.4.4	Soldering.....	29
7.5	Marking.....	29

8	Quality assessment procedures .....	29
8.1	Primary stage of manufacture .....	29
8.2	Structurally similar components .....	29
8.3	Certified test records of released lots .....	29
8.4	Qualification approval .....	29
8.4.1	General .....	29
8.4.2	Qualification approval on the basis of the fixed sample size procedure .....	29
8.4.3	Tests .....	30
	Annex A (normative/informative) Figures with limits of variation of capacitance with temperature for certain temperature coefficients and classes .....	40
	Annex B (normative) Combination of temperature coefficients and tolerances for the reference temperature of 25 °C .....	48
	Annex C (normative) Quality conformance inspection .....	49
C.1	Formation of inspection lots .....	49
C.1.1	Groups A and B inspection .....	49
C.1.2	Group C inspection .....	49
C.2	Test schedule .....	49
C.3	Delayed delivery .....	49
C.4	Assessment levels .....	49
C.5	Test schedule for quality conformance inspection .....	50
	Annex X (informative) Comparison of cross-references in relation to IEC 60384-8:2015 .....	56
	Bibliography .....	57
	Figure A.1 – $\alpha$ : +100 ( $10^{-6}/K$ ) .....	40
	Figure A.2 – $\alpha$ : 0 ( $10^{-6}/K$ ) .....	41
	Figure A.3 – $\alpha$ : -33 ( $10^{-6}/K$ ) .....	41
	Figure A.4 – $\alpha$ : -75 ( $10^{-6}/K$ ) .....	42
	Figure A.5 – $\alpha$ : -150 ( $10^{-6}/K$ ) .....	42
	Figure A.6 – $\alpha$ : -220 ( $10^{-6}/K$ ) .....	43
	Figure A.7 – $\alpha$ : -330 ( $10^{-6}/K$ ) .....	43
	Figure A.8 – $\alpha$ : -470 ( $10^{-6}/K$ ) .....	44
	Figure A.9 – $\alpha$ : -750 ( $10^{-6}/K$ ) .....	44
	Figure A.10 – $\alpha$ : -1 000 ( $10^{-6}/K$ ) .....	45
	Figure A.11 – $\alpha$ : -1 500 ( $10^{-6}/K$ ) .....	45
	Figure A.12 – $\alpha$ : -2 200 ( $10^{-6}/K$ ) .....	46
	Figure A.13 – $\alpha$ : -3 300 ( $10^{-6}/K$ ) .....	46
	Figure A.14 – $\alpha$ : -4 700 ( $10^{-6}/K$ ) .....	47
	Figure A.15 – $\alpha$ : -5 600 ( $10^{-6}/K$ ) .....	47
	Table 1 – Preferred tolerances on nominal capacitance .....	10
	Table 2 – Nominal temperature coefficient and tolerance for reference temperature 20 °C .....	11
	Table 3 – Combination of temperature coefficient and tolerance .....	13

Table 4 – Tangent of loss angle .....	17
Table 5 – Insulation resistance requirements .....	17
Table 6 – Test voltages for single layer ceramic capacitors .....	18
Table 7 – Test voltages for leaded multilayer ceramic capacitors .....	18
Table 8 – Temperature cyclic drift limits .....	19
Table 9 – Requirements .....	19
Table 10 – Preferred severities (of non-repetitive shock) .....	22
Table 11 – Maximum capacitance change .....	22
Table 12 – Number of damp heat cycles .....	23
Table 13 – Final inspection, measurements and requirements .....	24
Table 14 – Test conditions for damp heat, steady state .....	24
Table 15 – Final inspection, measurements and requirements .....	25
Table 16 – Endurance test conditions .....	26
Table 17 – Final inspection, measurements and requirements .....	26
Table 18 – Sampling plan together with numbers of permissible non-conforming items for qualification approval tests, assessment level EZ .....	31
Table 19 – Test schedule for qualification approval .....	32
Table B.1 – Combination of temperature coefficients and tolerances for the reference temperature of 25 °C .....	48
Table C.1 – Lot-by-lot inspection .....	50
Table C.2 – Periodic tests .....	50
Table C.3 – Test schedule for quality conformance inspection (lot by lot) .....	51
Table C.4 – Test schedule for quality conformance inspection (Periodic test) .....	52
Table X.1 – Comparison of cross-references between this document and the previous edition of IEC 60384-8 for clauses/subclauses/annexes .....	56
Table X.2 – Reference to IEC 60384-8 for figure/table .....	56

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –****Part 8: Sectional specification –  
Fixed capacitors of ceramic dielectric, Class 1**

## 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.

**This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60384-8:2015. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**



IEC 60384-8 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 terms have been replaced by the letter symbols in Table 3.
- c) Code of temperature coefficient and tolerance of C0G, U2J have been added in Table 4, Table 6, Table 8, Table 9, Table 11, Table 13, Table 16 and Annex B.
- 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 60384-8-1.

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

Draft	Report on voting
40/3144/FDIS	40/3161/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

**IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

# FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

## Part 8: Sectional specification – Fixed capacitors of ceramic dielectric, Class 1

### ~~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 1), intended for use in electronic equipment, including leadless capacitors but excluding fixed surface mount multilayer capacitors of ceramic dielectric, which are covered by IEC 60384-21 (Class 1).

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

#### ~~1.2~~ **Object**

The object of this document is to ~~prescribe~~ specify preferred ratings and characteristics and to select from IEC 60384-1:20082021, 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~~ specified in detail specifications referring to ~~this sectional specification shall be of equal or higher performance level because lower performance levels are not permitted~~ 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.

[IEC 60384-8:2024](https://standards.iteh.ai/catalog/standards/iec/d5eccc17-7320-4da8-87a8-0ebe22bf7998/iec-60384-8-2024)

<https://standards.iteh.ai/catalog/standards/iec/d5eccc17-7320-4da8-87a8-0ebe22bf7998/iec-60384-8-2024>

## **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 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 60384-1:20082021, *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~~

### 3 Terms and definitions

For the purposes of this document, the ~~applicable~~ terms and definitions given in IEC 60384-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

#### 3.1

##### ~~fixed capacitors~~, capacitor of ceramic dielectric, Class 1

capacitor specially designed and suited for resonant circuit application where low losses and high stability of capacitance are essential or where a precisely defined temperature coefficient is required, for example for compensating temperature effects in the circuit

Note 1 to entry: The ceramic dielectric is defined by its nominal temperature coefficient ( $\alpha$ ).

#### 3.2

##### subclass

~~for a given nominal temperature coefficient ; it is defined by the tolerance on the temperature coefficient (see Table 2)~~ <Class 1> tolerance on the temperature coefficient for a given nominal temperature coefficient (see Table 2)

Note 1 to entry: The nominal temperature coefficient value and its tolerance refer to the temperature interval of +20 °C or +25 °C to +85 °C but because in practice TC curves are not strictly linear, it is necessary to define limiting capacitance deviations ( $\Delta C/C$ ) for other temperatures (see Table 3 and Annex B). The same information is expressed in graphical form in Figure A.1 to Figure A.15.

Figure A.1 to Figure A.15 enable the user to form an estimate of the value and tolerance of  $1/C \times (dC/dT)_T$ , the incremental temperature coefficient at a given temperature  $T$ , though this quantity is not required specifically to be measured in the test.

#### 3.3

##### rated voltage

$U_R$

maximum DC voltage that ~~may~~ can be applied continuously to the terminations of a capacitor at the rated temperature

Note 1 to entry: Maximum DC voltage is the sum of the DC voltage and peak AC voltage or peak pulse voltage applied to the capacitor.

~~[SOURCE: IEC 60384-1:2008, 2.2.25, modified (addition of "the terminations of")]~~

### 4 Preferred ratings and characteristics

#### 4.1 Preferred characteristics

Preferred climatic categories only shall be given in the preferred characteristics.

The capacitors covered by this document are classified into climatic categories in accordance with the general rules given in IEC 60068-1:2013, Annex A.

For reference temperature of 20 °C or 25 °C, the lower and upper category temperatures and the duration of the damp heat, steady state test shall be chosen from the following:

- lower category temperature: –55 °C, –40 °C, –25 °C and –10 °C
- upper category temperature: +70 °C, +85 °C, +100 °C and +125 °C

- duration of the damp heat, steady state test (40 °C, 93 % RH): 4 days, 10 days, 21 days and 56 days

The severities for the cold and dry heat tests are the lower and upper category temperatures, respectively.

## 4.2 Preferred values of ratings

### 4.2.1 Rated temperature

For capacitors covered by this document, the rated temperature is equal to the upper category temperature.

### 4.2.2 Rated voltage ( $U_R$ )

The preferred values of rated voltage are: (25, 40, 63, 100, 160, 250, 400, 630, 1 000, 1 600, 2 500, 4 000 and 6 300) V. These values conform to the basic series of preferred values R5 given in ISO 3. If other values are needed, they shall be chosen from the R10 series.

The sum of the DC voltage and the peak AC voltage applied to the capacitor ~~should~~ shall not exceed the rated voltage. ~~The value of the peak alternating voltage should not exceed the value determined by the permissible reactive power.~~

### 4.2.3 Category voltage ( $U_C$ )

Since the rated temperature is defined as the upper category temperature, the category voltage is equal to the rated voltage, as defined in IEC 60384-1:2008/2021, 3.5.

### 4.2.4 Preferred values of nominal capacitance and associated tolerance values

#### 4.2.4.1 Preferred values of ~~rated~~ nominal capacitance

Nominal capacitance values ~~shall~~ should be taken from the E6, E12 and E24 series given in IEC 60063 ~~preferably~~.

#### 4.2.4.2 Preferred tolerances on nominal capacitance

Table 1 denotes the preferred values of tolerance on nominal capacitance.

Table 1 – Preferred tolerances on nominal capacitance

Preferred series	$C_N \geq 10$ pF		$C_N < 10$ pF	
	Tolerances	Letter code	Tolerances	Letter code
E 6	±20 %	M	±2 pF	G
E 12	±10 %	K	±1 pF	F
	±5 %	J	±0,5 pF	D
E 24	±2 %	G	±0,25 pF	C
	±1 %	F	±0,1 pF	B

### 4.2.5 Temperature coefficient ( $\alpha$ )

#### 4.2.5.1 Nominal temperature coefficient and tolerance

Table 2 shows the ~~preferred~~ nominal temperature coefficients for the reference temperature 20 °C and the associated tolerances, expressed in parts per million per Kelvin ( $10^{-6}/K$ ), and the

corresponding subclasses and codes. Annex B contains the most used temperature coefficients for the reference temperature 25 °C.

The detail specification shall specify for each temperature coefficient the minimum value of capacitance for which the given tolerance of temperature coefficient may be verified, considering the accuracy of the methods of capacitance measurement specified.

For values of capacitance lower than these minimum values:

- The detail specification shall specify a multiplying factor for the tolerance on  $\alpha$ , as well as the permissible changes of capacitance at the lower and upper category temperature;
- Special methods of measurement ~~may~~ can be necessary and, if required, shall be stated in the detail specification.

**Table 2 – Nominal temperature coefficient and tolerance  
for reference temperature 20 °C**

Nominal temperature coefficient ( $\alpha$ ) 10 <sup>-6</sup> /K	Tolerance on temperature coefficient 10 <sup>-6</sup> /K	Subclass	Letter code		Colour code for temperature coefficient
			$\alpha$	Tolerance	
+100	±15	1A	A	F	Red +and Violet
	±30	1B		G	
0	±15	1A	C	F	Black
	±30	1B		G	
	±60	1F		H	
-33	±15	1A	H	F	Brown
	±30	1B		G	
-75	±15	1A	L	F	Red
	±30	1B		G	
-150	±15	1A	P	F	Orange
	±30	1B		G	
	±60	1F		H	
-220	±15	1A	R	F	Yellow
	±30	1B		G	
	±60	1F		H	
-330	±30	1A	S	G	Green
	±60	1B		H	
-470	±30	1A	T	G	Blue
	±60	1B		H	
-750	±60	1A	U	H	Violet
	±120	1B		J	
	±250	1F		K	
-1 000	±60	1A	Q	H	Red and Yellow
	±120	1B		J	
	±250	1F		K	
-1 500	±250	1F	V	K	Orange and Orange
-2 200	±500	1F	K	L	Yellow and Orange
-3 300	±500	1F	D	L	Green and Orange
-4 700	±1 000	1F	E	M	Blue and Orange

-5 600	±1 000	1F	F	M	Black and Orange
$+140 \geq \alpha \geq -1\ 000$	<sup>a</sup>	1C	SL	-	Grey
$+250 \geq \alpha \geq -1\ 750$	<sup>a</sup>	1D	UM	-	White

**NOTE 1**— Preferred temperature coefficient values ( $\alpha$ ) are underlined.

**NOTE 2**—  $\alpha$  values  $+33 \times 10^{-6}/K$  and  $-47 \times 10^{-6}/K$  are also obtained on request.

**NOTE 3**— The nominal temperature coefficients and their tolerances are defined using the capacitance change between the temperatures 20 °C and 85 °C.

**NOTE 4**— A capacitor with a temperature coefficient of  $0 \times 10^{-6}/K$  and a tolerance on temperature coefficient of  $\pm 30 \times 10^{-6}/K$  is designated as a CG capacitor (subclass 1B).

<sup>a</sup> Those temperature coefficient values are not subject to inspection, since no limits for relative capacitance variation are specified in Table 3.

#### 4.2.5.2 ~~Limits of~~ Permissible relative variation of capacitance

Table 3 shows for each combination of temperature coefficient and tolerance the permissible relative variation of capacitance expressed in parts per thousand at both the upper and lower category temperatures. Temperature coefficients and tolerances are expressed in parts per million per Kelvin ( $10^{-6}/K$ ). In the case of reference temperature 25 °C, see Table B.1 for an explanation of the permissible relative variation of capacitance.

Figure A.1 to Figure A.15 show the limits of variation of capacitance with temperature for the temperature coefficients and subclasses listed in Table 3.

(<https://standards.iteh.ai>)  
Document Preview

IEC 60384-8:2024

<https://standards.iteh.ai/catalog/standards/iec/d5ecce17-7320-4da8-87a8-0ebe22bf7998/iec-60384-8-2024>