

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Fixed capacitors for use in electronic equipment –
Part 1: Generic specification**

**Condensateurs fixes utilisés dans les équipements électroniques –
Partie 1: Spécification générique**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2016 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 20 000 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

65 000 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 20 000 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

65 000 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.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Fixed capacitors for use in electronic equipment –
Part 1: Generic specification**

**Condensateurs fixes utilisés dans les équipements électroniques –
Partie 1: Spécification générique**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 31.060

ISBN 978-2-8322-3153-1

**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.....	9
INTRODUCTION.....	11
1 General.....	13
1.1 Scope.....	13
1.2 Normative references.....	13
2 Technical data.....	15
2.1 Symbols, units and abbreviated terms.....	15
2.1.1 General.....	15
2.1.2 Letter symbols.....	15
2.1.3 Abbreviations.....	16
2.2 Terms and definitions.....	16
2.3 Preferred values and additional technical requirements.....	21
2.3.1 General.....	21
2.3.2 Preferred values of nominal capacitance.....	21
2.3.3 Preferred values of rated voltage.....	21
2.3.4 Rated a.c. load.....	21
2.3.5 Rated pulse load.....	22
2.3.6 Temperature derated voltage.....	22
2.4 Marking.....	23
2.4.1 General.....	23
2.4.2 Coding.....	23
3 Quality assessment procedures.....	23
4 Tests and measurement procedures.....	24
4.1 General.....	25
4.2 Standard atmospheric conditions.....	25
4.2.1 Standard atmospheric conditions for testing.....	25
4.2.2 Recovery conditions.....	25
4.2.3 Referee conditions.....	26
4.2.4 Reference conditions.....	26
4.3 Drying.....	26
4.4 Visual examination and check of dimensions.....	26
4.4.1 Visual examination.....	26
4.4.2 Dimensions (gauging).....	26
4.4.3 Dimensions (detail).....	26
4.5 Insulation resistance.....	27
4.5.1 Preconditioning.....	27
4.5.2 Measuring conditions.....	27
4.5.3 Test points.....	27
4.5.4 Test methods.....	27
4.5.5 Temperature compensation.....	28
4.5.6 Conditions to be prescribed in the relevant specification.....	28
4.6 Voltage proof.....	29
4.6.1 General.....	29
4.6.2 Test circuit (for the test between terminations).....	29
4.6.3 Test.....	30
4.6.4 Requirements.....	32

4.6.5	Conditions to be prescribed in the relevant specification	32
4.7	Capacitance	32
4.7.1	Measuring frequency and measuring voltage	32
4.7.2	Measuring equipment	33
4.7.3	Conditions to be prescribed in the relevant specification	33
4.8	Tangent of loss angle and equivalent series resistance (ESR)	33
4.8.1	Tangent of loss angle	33
4.8.2	Equivalent series resistance (ESR)	33
4.9	Leakage current	34
4.9.1	Preconditioning	34
4.9.2	Test method	34
4.9.3	Power source	34
4.9.4	Measuring accuracy	34
4.9.5	Test circuit	34
4.9.6	Conditions to be prescribed in the relevant specification	34
4.10	Impedance	34
4.11	Self-resonant frequency and inductance	35
4.11.1	Self-resonant frequency (f_r)	35
4.11.2	Inductance	38
4.11.3	Conditions to be prescribed in the relevant specification	38
4.12	Outer foil termination	38
4.13	Robustness of terminations	39
4.13.1	General	39
4.13.2	Test Ua ₁ – Tensile	39
4.13.3	Test Ub – Bending (half of the sample)	40
4.13.4	Test Uc – Torsion (remaining sample)	40
4.13.5	Test Ud – Torque	40
4.13.6	Visual examination	40
4.14	Resistance to soldering heat	41
4.14.1	Preconditioning and initial measurement	41
4.14.2	Test procedure	41
4.14.3	Recovery	41
4.14.4	Final inspection, measurement and requirements	41
4.15	Solderability	41
4.15.1	General	41
4.15.2	Preconditioning	41
4.15.3	Test procedure	42
4.15.4	Final inspection, measurements and requirements	42
4.16	Rapid change of temperature	42
4.16.1	Initial measurement	42
4.16.2	Test procedure	42
4.16.3	Final inspection, measurements and requirements	42
4.17	Vibration	42
4.17.1	Initial measurement	42
4.17.2	Test procedure	43
4.17.3	Electrical test (intermediate measurement)	43
4.17.4	Final inspection, measurements and requirements	43
4.18	Bump (repetitive shock)	43
4.18.1	Initial measurement	43

4.18.2	Test procedure.....	43
4.18.3	Final inspection, measurements and requirements.....	43
4.19	Shock	43
4.19.1	Initial measurement.....	43
4.19.2	Test procedure.....	43
4.19.3	Final inspection, measurements and requirements.....	44
4.20	Container sealing	44
4.21	Climatic sequence.....	44
4.21.1	General	44
4.21.2	Initial measurements	44
4.21.3	Dry heat.....	44
4.21.4	Damp heat, cyclic, Test Db, first cycle	44
4.21.5	Cold.....	44
4.21.6	Low air pressure	45
4.21.7	Damp heat, cyclic, Test Db, remaining cycles	45
4.21.8	Final measurements.....	45
4.22	Damp heat, steady state.....	45
4.22.1	Initial measurement.....	45
4.22.2	Test procedure.....	45
4.22.3	Final inspection, measurements and requirements.....	46
4.23	Endurance	46
4.23.1	Initial measurements	46
4.23.2	Test procedure.....	46
4.23.3	Conditions to be prescribed in the relevant specification	46
4.23.4	Test voltage.....	46
4.23.5	Placement in the test chamber	47
4.23.6	Recovery	47
4.23.7	Final inspection, measurements and requirements.....	47
4.24	Variation of capacitance with temperature.....	48
4.24.1	Static method.....	48
4.24.2	Dynamic method	48
4.24.3	Methods of calculation	49
4.25	Storage.....	50
4.25.1	Storage at high temperature	50
4.25.2	Storage at low temperature	50
4.26	Surge.....	51
4.26.1	Initial measurement.....	51
4.26.2	Test procedure.....	51
4.26.3	Final inspection, measurements and requirements.....	52
4.26.4	Information to be given in the relevant detail specification.....	52
4.27	Charge and discharge tests and inrush current test.....	52
4.27.1	Initial measurement.....	52
4.27.2	Test procedure.....	52
4.27.3	Charge and discharge	53
4.27.4	Inrush current	54
4.27.5	Final inspection, measurements and requirements.....	54
4.28	Pressure relief (for aluminium electrolytic capacitors).....	54
4.28.1	General	54
4.28.2	AC test	54

4.28.3	DC test	54
4.28.4	Pneumatic test	54
4.28.5	Final inspection, measurements and requirements	54
4.29	Characteristics at high and low temperature	54
4.29.1	Test procedure	54
4.29.2	Requirements	55
4.30	Thermal stability test	55
4.31	Component solvent resistance	55
4.31.1	Initial measurements	55
4.31.2	Test procedure	55
4.31.3	Final inspection, measurements and requirements	55
4.32	Solvent resistance of marking	55
4.32.1	Test procedure	55
4.32.2	Final inspection, measurements and requirements	56
4.33	Mounting (for surface mount capacitors only)	56
4.33.1	Substrate	56
4.33.2	Wave soldering	56
4.33.3	Reflow soldering	56
4.34	Shear test	59
4.34.1	Test procedure	59
4.34.2	Final inspection, measurements and requirements	59
4.35	Substrate bending test	59
4.35.1	Test procedure	59
4.35.2	Recovery	60
4.35.3	Final inspection and requirements	60
4.36	Dielectric absorption	60
4.36.1	Test procedure	60
4.36.2	Requirement	61
4.37	Damp heat, steady state, accelerated	61
4.37.1	Initial measurements	61
4.37.2	Test methods	61
4.37.3	Test procedures	61
4.37.4	Final inspection, measurements and requirements	61
4.38	Passive flammability	61
4.38.1	Test procedure	61
4.38.2	Final inspection, measurements and requirements	62
4.39	High surge current test	62
4.39.1	Initial measurements	62
4.39.2	Test procedure	62
4.39.3	Requirements for the charging circuit	63
4.39.4	Nonconforming items	63
4.40	Voltage transient overload (for aluminium electrolytic capacitors with non-solid electrolyte)	63
4.40.1	Initial measurement	63
4.40.2	Test procedure	63
4.40.3	Final inspection, measurements and requirements	65
4.40.4	Conditions to be prescribed in the relevant specification	65
4.41	Whisker growth test	65
4.41.1	General	65

4.41.2	Preparation of specimen.....	66
4.41.3	Initial measurement.....	66
4.41.4	Test procedures	66
4.41.5	Test severities	66
4.41.6	Final inspection, measurements and requirements.....	66
Annex A (informative) Interpretation of sampling plans and procedures as described in IEC 60410 for use within quality assessment systems.....		67
Annex B (informative) Rules for the preparation of detail specifications for capacitors and resistors for electronic equipment for use within quality assessment systems		68
B.1	Drafting.....	68
B.2	Reference standard.....	68
B.3	Circulation	68
Annex C (informative) Layout of the first page of a PCP/CQC specification		69
Annex D (informative) Requirements for capability approval test report		70
D.1	General.....	70
D.2	Requirements.....	70
D.3	Summary of test information (for each CQC).....	70
D.4	Measurement record	70
Annex E (informative) Guide for pulse testing of capacitors.....		71
E.1	Overview.....	71
E.2	Typical capacitor pulse conditions	71
E.3	Effect of inductance on pulse testing	72
Annex F (informative) Guidance for the extension of endurance tests on fixed capacitors.....		74
F.1	Overview.....	74
F.2	Guidelines.....	74
Annex G (normative) Damp heat, steady state with voltage applied, for metallized film capacitors only		75
G.1	Overview.....	75
G.2	Test procedure.....	75
Annex H (normative) Accelerated damp heat, steady state, for multilayer ceramic capacitors only		76
H.1	Mounting of capacitors	76
H.2	Initial measurement.....	76
H.3	Test procedure.....	76
H.4	Recovery	76
H.5	Final inspection, measurements and requirements.....	76
Annex Q (informative) Quality assessment procedures		77
Q.1	General.....	77
Q.1.1	Scope of this annex	77
Q.1.2	Quality assessment definitions	78
Q.1.3	Rework	78
Q.1.4	Alternative test methods.....	79
Q.1.5	Certified test records of released lots	79
Q.1.6	Unchecked parameters	79
Q.1.7	Delayed delivery	79
Q.1.8	Repair	79
Q.1.9	Registration of approvals.....	80
Q.1.10	Manufacture outside the geographical limits	80

Q.2	Qualification approval (QA) procedures	80
Q.2.1	Eligibility for qualification approval.....	80
Q.2.2	Application for qualification approval	80
Q.2.3	Subcontracting.....	80
Q.2.4	Test procedure for the initial product qualification approval	80
Q.2.5	Granting of qualification approval	80
Q.2.6	Maintenance of qualification approval.....	81
Q.2.7	Quality conformance inspection.....	81
Q.3	Capability approval (CA) procedures.....	81
Q.3.1	General	81
Q.3.2	Eligibility for capability approval	81
Q.3.3	Application for capability approval	82
Q.3.4	Subcontracting.....	82
Q.3.5	Description of the capability	82
Q.3.6	Demonstration and verification of capability	82
Q.3.7	Granting of capability approval	82
Q.3.8	Maintenance of capability approval.....	82
Q.3.9	Quality conformance inspection.....	82
Q.4	Technology approval (TA) procedure	83
Q.4.1	General	83
Q.4.2	Eligibility for technology approval	83
Q.4.3	Application of technology approval	83
Q.4.4	Subcontracting.....	83
Q.4.5	Description of technology	83
Q.4.6	Demonstration and verification of the technology	83
Q.4.7	Granting of technology approval.....	84
Q.4.8	Maintenance of technology approval.....	84
Q.4.9	Quality conformance inspection.....	84
Bibliography		85
Figure 1	– Reactive power against frequency	22
Figure 2	– Relation between category temperature range and applied voltage.....	23
Figure 3	– Voltage-proof test circuit.....	30
Figure 4	– Schematic diagram of the impedance measuring circuit.....	35
Figure 5	– Capacitor mounting arrangement	36
Figure 6	– Capacitor mounting arrangement	37
Figure 7	– Typical diagram of an absorption oscillator-wavemeter.....	37
Figure 8	– Schematic diagram of the measuring circuit	38
Figure 9	– Test circuit	39
Figure 10	– Test circuit for electrolytic capacitors	47
Figure 11	– Relay circuit	51
Figure 12	– Thyristor circuit	51
Figure 13	– Voltage waveform across capacitor.....	52
Figure 14	– Voltage and current waveform	53
Figure 15	– Suitable substrate for mechanical tests	58
Figure 16	– Suitable substrate for electrical tests.....	59

Figure 17 – High surge current test	63
Figure 18 – Voltage transient overload test circuit	64
Figure 19 – Voltage waveform	65
Table 1 – Referee conditions	26
Table 2 – Measurement of insulation resistance	27
Table 3 – Measuring points	29
Table 4 – Tensile force	40
Table 5 – Torque	40
Table 6 – Number of cycles	45
Table 7 – Severities and requirements	62

This document is a preview generated by EVS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –**Part 1: Generic specification****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 60384-1 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment

This fifth edition cancels and replaces the fourth edition published in 2008 and constitutes a technical revision, including minor revisions related to tables, figures and references.

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

- INTRODUCTION added;
- 4.41 Whisker growth test added;
- Annex Q completely restructured.

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

FDIS	Report on voting
40/2420/FDIS	40/2444/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.

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

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

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.

INTRODUCTION

The specification system for fixed capacitors for use in electronic equipment is structured in a hierarchical system consisting of the following specification types.

Generic specification

The generic specification covers all subjects mainly common to the family of fixed capacitors for use in electronic equipment, such as terminology, methods of measurement and tests. Where the individual subjects require the prescription conditions or parameters specific to the particular subfamily or type of fixed capacitor, such prescriptions are required to be given by one of the subordinate specifications.

For the scope of fixed capacitors, the numeric reference to the generic specification is IEC 60384-1.

Sectional specification

Sectional specifications cover all subjects additional to those given in the generic specification, which are specific to a defined sub-group of fixed capacitors. These subjects normally are preferred values for dimensions and characteristics, additional test methods and relevant prescriptions for test methods given in the generic specification, prescriptions for sampling and for the preparation of specimen, recommended test severities and preferred acceptance criteria. The sectional specification also outlines the structure and scope of the test schedules which are to be applied in all subordinate detail specifications.

For the scope of fixed capacitors, the numeric references to the sectional specifications reach from IEC 60384-2 for polyester film capacitors to currently IEC 60384-26 for aluminium electrolytic capacitors with conductive polymer solid electrolyte. The variety of sectional specifications may be adapted to the portfolio of different technologies of fixed capacitors.

Detail specification

Detail specifications give directly, or by making reference to other specifications, all information necessary to completely describe a given type and range of fixed capacitors, including prescriptions of all values for dimensions and characteristics. They also give all information required for the quality assessment of the covered type and range of fixed capacitors within a suitable quality assessment system, including prescriptions for all applied test severities and acceptance criteria, and the completed test schedules.

Detail specifications can be either specifications within the IEC system, another specification system linked to IEC, or specified by the manufacturer or user. For the scope of fixed capacitors, the numeric references to detail specifications are for example IEC 60384-3-101, if related to the sectional specification IEC 60384-3 and to the ancillary blank detail specification IEC 60384-3-1.

Blank detail specification

The hierarchical system of specifications is supplemented by one or more blank detail specifications to a sectional specification, which are used to ensure a uniform presentation of detail specifications. The blank detail specifications provide the specification writer with a template on the layout to be adopted and on the information to be given and with guidance for the preparation of detail specifications in line with the requirements of the superior generic or sectional specifications. Blank detail specifications are not considered as relevant specifications since they do not themselves describe any particular component.

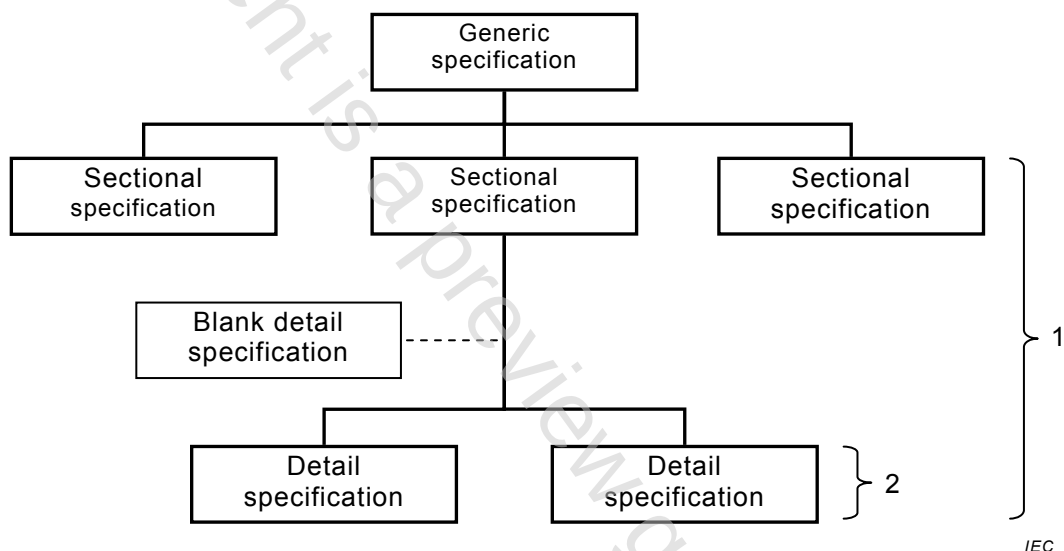
The presence of an established hierarchical specification system with blank detail specifications permits the preparation of detail specifications even outside of the relevant IEC technical committee.

For the scope of fixed capacitors, the numeric references to blank detail specifications are, for example, IEC 60384-3-1, if related to the sectional specification IEC 60384-3.

Relevant specification

In this system the term “relevant specification” addresses subordinate specifications containing specific requirements, where applicable.

Any generic or sectional specification may use abstract and universal references to subordinate specifications of either hierarchical level by use of the expression “relevant specification”.



Key

- 1 Indicates the range of “*Relevant specifications*” to the superior generic specification, where applicable.
- 2 Indicates the range of “*Relevant specifications*” to the superior sectional specification, where applicable.

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 1: Generic specification

1 General

1.1 Scope

This part of IEC 60384 is a generic specification and is applicable to fixed capacitors for use in electronic equipment.

It establishes standard terms, inspection procedures and methods of test for use in sectional and detail specifications of electronic components for quality assessment or any other purpose.

1.2 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 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60050 (all parts), *International Electrotechnical Vocabulary*¹

IEC 60062, *Marking codes for resistors and capacitors*

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

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

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Tests A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Tests B: Dry heat*

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-13:1983, *Environmental testing – Part 2-13: Tests – Test M: Low air pressure*

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

IEC 60068-2-17:1994, *Environmental testing – Part 2-17: Tests – Test Q: Sealing*

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

IEC 60068-2-21:2006, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

¹ www.electropedia.org

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-45:1980, *Environmental testing – Part 2-45: Tests – Test XA and guidance: Immersion in cleaning solvents*
IEC 60068-2-45:1980/AMD1:1993

IEC 60068-2-54:2006, *Environmental testing – Part 2-54: Tests – Test Ta: Solderability testing of electronic components by the wetting balance method*

IEC 60068-2-58:2015, *Environmental testing – Part 2-58: Tests – Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)*

IEC 60068-2-67:1995, *Environmental testing – Part 2-67: Tests – Test Cy: Damp heat, steady state, accelerated test primarily intended for components*

IEC 60068-2-69:2007, *Environmental testing – Part 2-69: Tests – Test Te: Solderability testing of electronic components for surface mounting devices (SMD) by the wetting balance method*

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60068-2-82:2007, *Environmental testing – Part 2-82: Tests – Test XW1: Whisker test methods for electronic and electric components*

IEC 60294, *Measurement of the dimensions of a cylindrical component with axial terminations*

IEC 60617, *Graphical symbols for diagrams*

IEC 60695-11-5:2004, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

IEC 60717, *Method for the determination of the space required by capacitors and resistors with unidirectional terminations*

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

IEC 61249-2-7:2002, *Materials for printed boards and other interconnecting structures – Part 2-7: Reinforced base materials clad and unclad – Epoxide woven E-glass laminated sheet of defined flammability (vertical burning test), copper-clad*

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

ISO 80000-1, *Quantities and units – Part 1: General*