

INTERNATIONAL STANDARD



**Fixed capacitors for use in electronic equipment –
Part 14: Sectional specification – Fixed capacitors for electromagnetic
interference suppression and connection to the supply mains**

IEC 60384-14:2023

<https://standards.iteh.ai/catalog/standards/sist/d99f3c0d-5e11-4bd7-8a59-af07f9bcd2d0/iec-60384-14-2023>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2023 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
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 It also gives information on projects, replaced and withdrawn publications.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 Products & Services Portal - products.iec.ch

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

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.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

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 60384-14:2023](https://standards.iteh.ai/catalog/standards/sist/d99f3c0d-5e11-4bd7-8a59-af07f9bcd2d0/iec-60384-14-2023)

<https://standards.iteh.ai/catalog/standards/sist/d99f3c0d-5e11-4bd7-8a59-af07f9bcd2d0/iec-60384-14-2023>



IEC 60384-14

Edition 5.0 2023-01
COMMENTED VERSION

INTERNATIONAL STANDARD



**Fixed capacitors for use in electronic equipment –
Part 14: Sectional specification – Fixed capacitors for electromagnetic
interference suppression and connection to the supply mains**

[IEC 60384-14:2023](https://standards.iteh.ai/catalog/standards/sist/d99f3c0d-5e11-4bd7-8a59-af07f9bcd2d0/iec-60384-14-2023)

<https://standards.iteh.ai/catalog/standards/sist/d99f3c0d-5e11-4bd7-8a59-af07f9bcd2d0/iec-60384-14-2023>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 31.060.10

ISBN 978-2-8322-6433-1

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

CONTENTS

FOREWORD.....	8
1 General.....	10
1 Scope.....	10
1.2 Object.....	10
2 Normative references.....	10
3 Terms and definitions and classification.....	11
3.1 Terms and definitions.....	11
3.2 Classifications.....	16
3.2.1 Classification of X capacitors.....	16
3.2.2 Classification of Y capacitors.....	16
4 Preferred ratings and characteristics.....	17
4.1 Preferred climatic categories.....	17
4.2 Preferred values of ratings.....	18
4.2.1 Nominal capacitance (C_N).....	18
4.2.2 Tolerance on nominal capacitance.....	18
4.2.3 Selection of rated voltages (U_R).....	18
4.2.4 Nominal resistance (R_N).....	18
4.2.5 Rated temperature.....	18
4.2.6 Passive flammability.....	18
4.3 Requirements for sleeving, tape, tubing and wire insulation.....	18
5 Test and measurement procedures, and performance requirements.....	19
5.1 General.....	19
5.2 Visual examination and check of dimensions.....	19
5.2.1 General.....	19
5.2.2 Creepage distances and clearances.....	19
5.3 Electrical tests.....	20
5.3.1 Voltage proof.....	20
5.3.2 Capacitance.....	22
5.3.3 Tangent of loss angle.....	22
5.3.4 Resistance (Equivalent Series Resistance (ESR)) (for RC units only).....	22
5.3.5 Insulation resistance.....	23
5.4 Robustness of terminations.....	24
5.5 Resistance to soldering heat.....	24
5.5.1 General.....	24
5.5.2 Test conditions.....	25
5.5.3 Final inspection, measurements, and requirements.....	25
5.6 Solderability.....	25
5.6.1 General.....	25
5.6.2 Test conditions.....	25
5.6.3 Requirements.....	25
5.7 Rapid change of temperature.....	25
5.7.1 General.....	25
5.7.2 Final inspection.....	26
5.8 Vibration.....	26
5.8.1 General.....	26

5.8.2	Test conditions	26
5.8.3	Final inspection	26
5.9	Repetitive shock (bump)	26
5.9.1	General.....	26
5.9.2	Test conditions	26
5.9.3	Final inspection, measurements, and requirements.....	27
5.10	Shock.....	27
5.10.1	General.....	27
5.10.2	Test conditions	27
5.10.3	Final inspection, measurements, and requirements.....	27
5.11	Container sealing	28
5.11.1	General.....	28
5.11.2	Test conditions	28
5.11.3	Requirements.....	28
5.12	Climatic sequence	28
5.12.1	General.....	28
5.12.2	Initial measurements	28
5.12.3	Dry heat.....	28
5.12.4	Damp heat, cyclic, test Db, first cycle.....	28
5.12.5	Cold.....	28
5.12.6	Damp heat, cyclic, test Db, remaining cycles.....	29
5.12.7	Final inspection, measurements, and requirements.....	29
5.13	Damp heat, steady state (DHSS).....	29
5.13.1	General.....	29
5.13.2	Initial measurements	30
5.13.3	Test conditions	30
5.13.4	Final inspection, measurements, and requirements.....	30
5.13.5	Sample size summary for humidity tests.....	31
5.14	Impulse voltage	32
5.14.1	General.....	32
5.14.2	Initial measurements	32
5.14.3	Test conditions.....	32
5.14.4	Requirements.....	33
5.15	Endurance.....	33
5.15.1	General.....	33
5.15.2	Test conditions	33
5.15.3	Sampling.....	34
5.15.4	Initial measurements	34
5.15.5	Endurance for Class X capacitors and RC units containing Class X capacitors	34
5.15.6	Endurance for Class Y capacitors and RC units containing Class Y capacitors	34
5.15.7	Endurance for the lead-through arrangements.....	35
5.15.8	Test conditions – Combined voltage/current tests	35
5.15.9	Final inspection, measurements, and requirements.....	35
5.16	Charge and discharge.....	36
5.16.1	General.....	36
5.16.2	Initial measurements	36

5.16.3	Test conditions	36
5.16.4	Final measurements and requirements	37
5.17	Radiofrequency characteristics	37
5.18	Passive flammability test	38
5.18.1	Testing according to IEC 60384-1	38
5.18.2	Alternative passive flammability test	38
5.19	Active flammability test	39
5.19.1	Test condition	39
5.19.2	Adjustment of U_i	41
5.19.3	Requirements	41
5.20	Component solvent resistance (if applicable)	41
5.21	Solvent resistance of the marking	41
6	Marking	41
6.1	General	41
6.2	Information for marking	41
6.3	Marking of capacitors	42
6.4	Marking of packaging	42
6.5	Additional marking	42
7	Information to be given in a detail specification	42
7.1	General	42
7.2	Outline drawing and dimensions	42
7.3	Mounting	43
7.4	Ratings and characteristics	43
7.4.1	General	43
7.4.2	Nominal capacitance range	43
7.4.3	Nominal resistance range (if applicable)	43
7.4.4	Particular characteristics	43
7.4.4	Marking	43
8	Assessment procedures	43
8.1	Primary stage of manufacture	43
8.2	Structurally similar components	44
8.3	Certified records of released lots	44
8.4	Approval testing	44
8.4.1	Safety tests only qualification approval	44
8.4.2	Qualification approval based on safety and performance testing	44
8.4.3	Qualification approval based on the fixed sample size procedure	44
8.5	Quality conformance inspection	52
8.5.1	General	52
8.5.2	Formation of inspection lots	52
8.5.3	Test schedule for safety tests only approval	53
8.5.4	Delayed delivery	53
8.5.5	Assessment level	53
Annex A (normative) Circuit for the impulse voltage test		55
Annex B (normative) Circuit for the endurance test		57
Annex C (normative) Circuit for the charge and discharge test		58
Annex D (normative) Declaration of design (confidential to the manufacturer and the certification body)		59

Annex E (informative) Pulse test circuits	60
E.1 General	61
E.2 Test circuits	61
E.3 Charging of the capacitor	62
E.4 Discharging of the capacitor	62
E.4.1 Discharging in resistive circuit	62
E.4.2 Discharging in inductive circuit	63
Annex F (normative) Particular requirements for safety test of surface mount capacitors	64
F.1 General	64
F.2 Test and measurement procedures	64
Annex G (informative) Capacitance ageing of fixed capacitors of ceramic dielectric, Class 2	67
G.1 Overview	67
G.2 Law of capacitance ageing	67
G.3 Capacitance measurements and capacitance tolerance	68
G.4 Special preconditioning	68
Annex H (normative) Use of safety approved AC rated capacitors in DC applications	70
H.1 Overview	70
H.2 Background	70
H.3 Additional requirement for use of X- and Y-capacitors in DC applications	70
H.4 Creepage and clearance distances	71
Annex I (normative) Humidity robustness grades for applications, where high stability under high humidity operating conditions is required	72
I.1 Overview	72
I.2 Humidity robustness grades	72
I.2.1 General	72
I.2.2 Grade (I) robustness under humidity	72
I.2.3 Grade (II) robustness under high humidity	72
I.2.4 Grade (III) high robustness under high humidity	72
I.3 Test description	73
I.4 Indication of humidity robustness grades	73
Annex J (normative) Description of creepage/clearance distance measurement for cased and conformal coated capacitors	74
J.1 Measurement of creepage distances and clearance – general	74
J.1.1 General	74
J.1.2 Capacitor styles	74
J.1.3 Capacitor body and terminal insulation	74
J.1.4 Measurement principle	75
J.2 Measurement	76
J.2.1 Creepage distance between terminals	76
J.2.2 Clearance between terminals	77
J.2.3 Clearance in mounted stage	77
J.2.4 Conductors between terminals	79
J.3 Precautions in handling	79
Annex K (normative) Safety and performance tests qualification approval	80
K.1 Overview	80
K.2 Qualification approval	80
K.3 Quality conformance inspection	86
K.3.1 General	86

K.3.2	Groups A and B inspection	86
K.3.3	Group C inspection	86
K.3.4	Test schedule for qualification approval	86
Annex X (informative)	Cross-references to the previous edition of this document	88
Bibliography	92
List of comments	93
Figure 1	– Two-terminal EMI suppression capacitor	12
Figure 2	– RC unit	12
Figure 3	– Lead-through capacitor (coaxial)	12
Figure 4	– Lead-through capacitors	13
Figure 5	– By-pass capacitors	14
Figure 6	– Impulse wave form	33
Figure 7	– Typical circuit for pulse loading of capacitors under AC voltage	40
Figure 8	– Fundamental AC wave with randomly, not synchronized, superimposed high-voltage pulse	40
Figure 9	– Test duration (s) Increased voltage for tests below 2 seconds	52
Figure A.1	– Impulse voltage test circuit	55
Figure B.1	– Endurance test circuit	57
Figure C.1	– Charge and discharge test circuit	58
Figure E.1	– Resistive pulse test circuit	61
Figure E.2	– Inductive pulse test circuit	62
Figure E.3	– Charge waveform for both circuits	62
Figure E.4	– Discharge waveform for resistive circuit	62
Figure E.5	– Discharge waveform for inductive circuit	63
Figure F.1	– Example of test substrate for safety test according to Table F.1	66
Figure J.1	– Example of a cased capacitor	74
Figure J.2	– Example of a conformal coated capacitor	74
Figure J.3	– Cased and conformal coated types	75
Figure J.4	– Description	76
Figure J.5	– Creepage distance – cased style	76
Figure J.6	– Creepage distance – conformal coated style	77
Figure J.7	– Clearance between terminals	77
Figure J.8	– Clearance in mounted stage – cased style	78
Figure J.9	– Clearance – capacitor body larger than lead pitch	78
Figure J.10	– Clearance – capacitor body smaller than lead pitch	78
Table 1	– Classification of Class X capacitors	16
Table 2	– Classification of Class Y capacitors	17
Table 3	– Creepage distances and clearances	20
Table 4	– Voltage proof	21
Table 5	– Insulation resistance – Safety tests only	23
Table 6	– Insulation resistance – Safety and performance tests	24
Table 7	– Resistance to soldering heat – Requirements	25

Table 8 – Shock test preferred severities	27
Table 9 – Climatic sequence – Requirements	29
Table 10 – Damp heat, steady state – Requirements for samples tested without voltage applied	31
Table 11 – Damp heat, steady state – Requirements for samples tested with voltage applied	31
Table 12 – Sample sizes for humidity tests	32
Table 13 – Endurance – Requirements	36
Table 14 – Charge and discharge – Requirements	37
Table 15 – Sampling plan – Tests concerning safety requirements only	46
Table 16 – Test schedule and sampling plan for lot-by-lot tests	47
Table 17 – Test schedule for safety tests only	48
Table 18 – Assessment level	54
Table A.1 – Values of C_X , C_T , R_P , R_S , C_p	56
Table A.2 – Values and tolerances of C_X , t_r , t_d	56
Table F.1 – Test schedule and sampling plan for safety test of surface mount capacitors	65
Table H.1 – Additional test conditions	71
Table I.1 – Requirements	73
Table 4 K.1 – Sampling plan – Safety and performance tests qualification approval – Assessment level DZ	80
Table 5 K.2 – Test schedule and sampling plan for lot-by-lot tests	82
Table 7 K.3 – Test schedule for safety and performance tests qualification approval Assessment level DZ	82
Table 8 K.4 – Assessment level	87
Table X.1 – Reference to IEC 60384-14 for clause/subclause or annex	88
Table X.2 – Reference to IEC 60384-14 for figure/table	91

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED CAPACITORS FOR USE IN ELECTRONIC EQUIPMENT –**Part 14: Sectional specification –
Fixed capacitors for electromagnetic interference
suppression and connection to the supply mains**

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.

This commented version (CMV) of the official standard IEC 60384-14:2023 edition 5.0 allows the user to identify the changes made to the previous IEC 60384-14:2013+AMD1:2016 CSV edition 4.1. Furthermore, comments from IEC TC 40 experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

IEC 60384-14 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 2013 and Amendment 1:2016. This edition constitutes a technical revision.

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

- a) in damp heat steady state test, all capacitor types are tested both with and without rated voltage; the number of test pieces has been increased;
- b) tangent of loss angle is added In Group 0 tests, in safety tests only;
- c) qualification approval based on safety and performance tests has been removed from the main text to a normative annex;
- d) the range of rated voltages is given instead of exact rated voltage values;
- e) normative annex for description of capacitor styles and of creepage/clearance distance measurement has been added;
- f) the importance of mechanical failures (cracks) in component encapsulation as a safety feature is highlighted in handling instructions and requirements after all relevant tests.

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

Draft	Report on voting
40/2985/FDIS	40/3022/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.

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

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.

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,
- replaced by a revised edition, or
- amended.

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 14: Sectional specification – Fixed capacitors for electromagnetic interference suppression and connection to the supply mains

~~1~~ **General**

1 Scope

This part of IEC 60384 applies to capacitors and resistor-capacitor combinations intended to be connected to AC mains or other supply with a nominal voltage not exceeding 1 000 V AC (RMS) ~~or 1 500 V d.c.~~, and with a nominal frequency not exceeding 100 Hz. This document includes also additional specific conditions and requirements for the connection to DC supplies with a rated voltage not exceeding 1 500 V DC. **1**

~~1.2~~ **Object**

The principal object of this part of IEC 60384 is to prescribe preferred ratings and characteristics and to select, from IEC 60384-1, the appropriate quality assessment procedures, tests and measuring methods and to give general performance requirements for this type of capacitor. Test severities and requirements prescribed in detail specifications referring to this sectional specification are of equal or higher performance level; lower performance levels are not permitted.

This document also provides a schedule of safety tests to be used by national testing stations in countries where approval by such stations is required.

The overvoltage categories in combination with the AC mains voltages for the capacitors classified in this document ~~should~~ are to be taken from IEC 60664-1.

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 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

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

~~IEC 60065:2001, *Audio, video and similar electronic apparatus – Safety requirements* –
Amendment 1:2005
Amendment 2:2010~~

IEC 60068-1:1988/2013, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-17, *Basic environmental testing procedures – Part 2-17: Tests – Test Q: Sealing*

IEC 60384-1:2008/2021, *Fixed capacitors for use in electronic equipment – Part 1: Generic specification*

~~IEC 60417, *Graphical symbols for use on equipment*~~

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements, and tests*

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

~~IEC 60940, *Guidance information on the application of capacitors, resistors, inductors and complete filter units for radio interference suppression*~~

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

IEC 61210, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

CISPR 17, *Methods of measurement of the suppression characteristics of passive EMC filtering devices*

ISO 7000, *Graphical symbols for use on equipment* — ~~Index and synopsis~~ (available at <http://www.graphical-symbols.info/equipment>)

3 Terms and definitions and classification

3.1 Terms and definitions

For the purposes of this document, the terms, and definitions of IEC 60384-1, as well as the following, apply.

ISO and IEC maintain terminological 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>

NOTE Some definitions of IEC 60384-1 have been expanded, as is indicated by a note.

3.1.1

AC capacitor

capacitor designed essentially for application with a power-frequency alternating voltage

Note 1 to entry: AC capacitors may be used on DC supplies having the same voltage as the AC RMS rated voltage of the capacitor. For use of capacitors with rated DC voltage greater than the rated AC voltage, see Annex H.

3.1.2

electromagnetic interference suppression capacitor

radio interference suppression capacitor

AC capacitor used for the reduction of electromagnetic interference caused by electrical or electronic apparatus, or other sources

3.1.3
capacitor of Class X
RC unit of Class X

capacitor or RC unit of a type suitable for use in situations where failure of the capacitor or RC unit would not lead to danger of electrical shock but could result in a risk of fire

3.1.4
capacitor of Class Y
RC unit of Class Y

capacitor or RC unit of a type suitable for use in situations where failure of the capacitor could lead to danger of electric shock

3.1.5
two-terminal capacitor

electromagnetic interference suppression capacitor having two terminals

Note 1 to entry: See Figure 1.



Figure 1 – Two-terminal EMI suppression capacitor

3.1.6
series RC unit

functional combination of a resistor in series with a capacitor of Class X or Y

Note 1 to entry: See Figure 2.

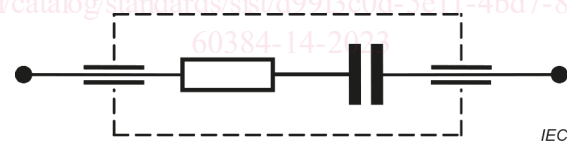


Figure 2 – RC unit

Note 2 to entry: In this document, where the word "capacitor" appears, the words "capacitor or RC unit" should be understood where the context permits.

3.1.7
lead-through capacitor

<coaxial> capacitor with a central current-carrying conductor surrounded by a capacitor element which is symmetrically bonded to the central conductor and to the outer casing to form a coaxial construction

Note 1 to entry: These lead-through capacitors are coaxially mounted (see Figure 3).

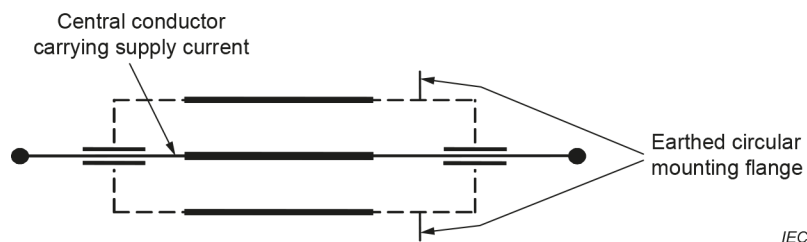


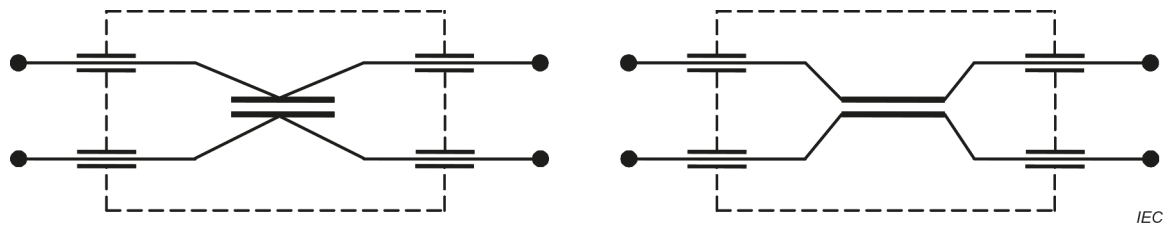
Figure 3 – Lead-through capacitor (coaxial)

3.1.8

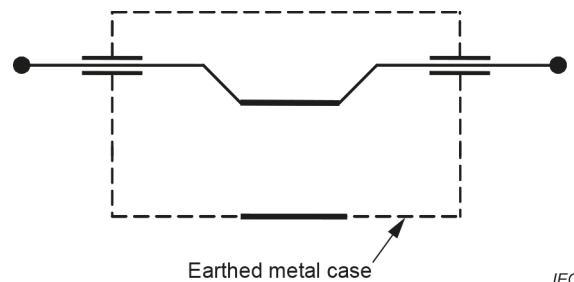
lead-through capacitor

<non-coaxial> capacitor in which the supply currents flow through or across the electrodes

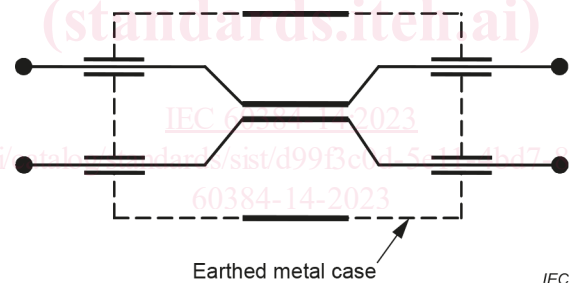
Note 1 to entry: See Figure 4 a), Figure 4 b), Figure 4 c) and Figure 4 d).



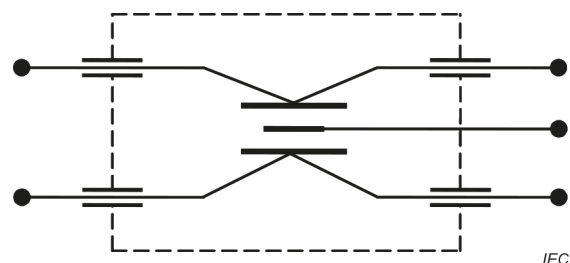
a) Lead-through capacitor for symmetrical use (non-coaxial)



b) Lead-through capacitor for asymmetrical use (non-coaxial)



c) Multiple unit lead-through capacitor (non-coaxial) for symmetrical and asymmetrical use



d) Multiple unit lead-through capacitor

Figure 4 – Lead-through capacitors

3.1.9

by-pass capacitor

capacitor where radiofrequency interference currents are by-passed

Note 1 to entry: There are three common forms: single, delta and T-connected. The single capacitor consists of a capacitor in a metal case with one termination connected to the case as in Figure 5 a); the delta form consists of an X-capacitor and two Y2-capacitors arranged in a delta network as in Figure 5 b); the T-connected form consists of three capacitors C_A , C_B and C_C connected in T as shown in Figure 5 c).