

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Condensateurs fixes utilisés dans les équipements électroniques –
Partie 14: Spécification intermédiaire – Condensateurs fixes d'antiparasitage
et raccordement à l'alimentation



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COMMISSION

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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**

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International Standard IEC 60384-14 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This fourth edition cancels and replaces the third edition published in 2005. It constitutes a technical revision. All changes that have been agreed upon can be categorized as minor revisions.

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

FDIS	Report on voting
40/2199/FDIS	40/2232/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, published 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 web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

The contents of the corrigendum of April 2016 have been included in this copy.

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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

1.1 Scope

This part of IEC 60384 applies to capacitors and resistor-capacitor combinations which will be connected to an a.c. mains or other supply with nominal voltage not exceeding 1 000 V a.c. (r.m.s.) or 1 000 V d.c. and with a nominal frequency not exceeding 100 Hz.

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 will be of equal or higher performance level; lower performance levels are not permitted.

This standard 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 a.c. mains voltages for the capacitors classified in this standard should be taken from IEC 60664-1.

1.3 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

IEC 60384-1:2008, *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, *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*

1.4 Information to be given in a detail specification

Detail specifications shall be derived from the relevant blank detail specification.

Detail specifications shall not specify requirements inferior to those of the generic, sectional or blank detail specification. When more severe requirements are included, they shall be listed in 1.9 of the detail specification, and indicated in the test schedules, for example, by an asterisk.

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The following information shall be given in each detail specification and the values quoted shall preferably be selected from the appropriate clause of this sectional specification.

NOTE The information given in 1.4.1 may, for convenience, be presented in tabular form.

1.4.1 Outline drawing and dimensions

There shall be an illustration of the capacitor as an aid to easy recognition and for comparison of the capacitor with others. Dimensions and their associated tolerances, which affect interchangeability and mounting, shall be given in the detail specification. All dimensions shall preferably be stated in millimetres; however, when the original dimensions are given in inches, the converted metric dimensions in millimetres shall be added.

Normally, the numerical values shall be given for the length, width and height of the body and the wire spacing, or for cylindrical types, the body diameter and the length and diameter of the terminations. When necessary, for example when a number of capacitance values/voltage ranges are covered by a detail specification, their dimensions and their associated tolerances shall be placed in a table below the drawing.

When the configuration is other than that described above, the detail specification shall state such dimensional information as will adequately describe the capacitor. When the capacitor is not designed for use on printed boards, this shall be clearly stated in the detail specification.

1.4.2 Mounting

The detail specification shall specify the method of mounting to be applied for normal use and for the application of the vibration, bump or shock tests. The capacitors shall be mounted by their normal means. The design of the capacitor may be such that special mounting fixtures

are required in its use. In this case, the detail specification shall describe the mounting fixtures and they shall be used in the application of the vibration, bump or shock tests.

If recommendations for mounting for "normal" use are made, they should be included in the detail specification under "1.8 Additional information (Not for inspection purposes)". If recommendations are included, a warning can be given that the full vibration, bump and shock performance may not be available if mounting methods other than those specified in 1.1 of the detail specification are used.

1.4.3 Ratings and characteristics

The ratings and characteristics shall be in accordance with the relevant clauses of this specification, together with the following.

1.4.3.1 Nominal capacitance range

The preferred range of capacitance values should follow 2.2.1 of this standard.

When products approved to the detail specification have different ranges, the following statement should be added: "The range of values available in each voltage range is given in the register of approvals, available for example on the website www.iecq.org".

1.4.3.2 Nominal resistance range (if applicable)

The preferred range of resistance values should follow 2.2.4 of this standard

1.4.3.3 Particular characteristics

Additional characteristics may be listed, when they are considered necessary to specify the component adequately for design and application purposes.

1.4.4 Marking

The detail specification shall specify the content of the marking on the capacitor and on the package. See also 1.6 of this standard.

1.5 Terms and definitions

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

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

1.5.1

a.c. capacitor

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

Note 1 to entry: a.c. capacitors may be used on d.c. supplies having the same voltage as the a.c. r.m.s. rated voltage of the capacitor.

1.5.2

electromagnetic interference suppression capacitor

radio interference suppression capacitor

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

1.5.3**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

1.5.4**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

1.5.5**two-terminal capacitor**

electromagnetic interference suppression capacitor having two terminals

SEE: Figure 1.

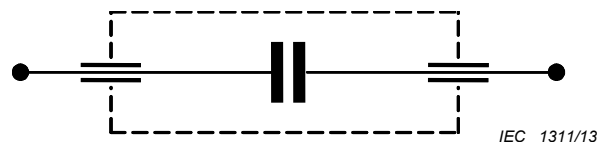


Figure 1 – Two-terminal EMI suppression capacitor

1.5.6**series RC unit**

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

[IEC 60384-14:2013](https://standards.iteh.ai/catalog/standards/sist/5bfl411b-7a68-4399-876b-b0fd2d6f5ac8/iec-60384-14-2013)

SEE: Figure 2.

<https://standards.iteh.ai/catalog/standards/sist/5bfl411b-7a68-4399-876b-b0fd2d6f5ac8/iec-60384-14-2013>

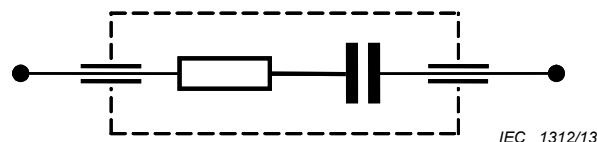


Figure 2 – RC unit

Note 1 to entry: In this standard, where the word "capacitor" appears, the words "capacitor or RC unit" should be understood where the context permits.

1.5.7**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; it is coaxially mounted

SEE: Figure 3.

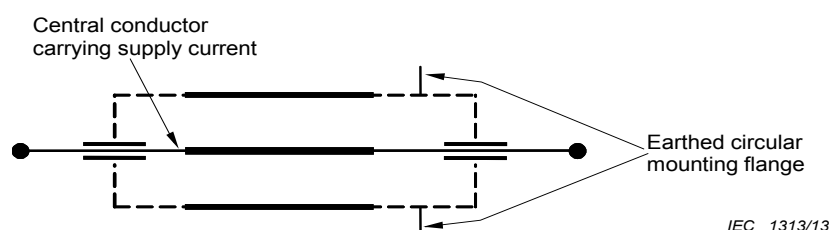


Figure 3 – Lead-through capacitor (coaxial)

1.5.8

lead-through capacitor, <non-coaxial>

capacitor in which the supply currents flow through or across the electrodes

SEE: Figures 4a, 4b, 4c and 4d.

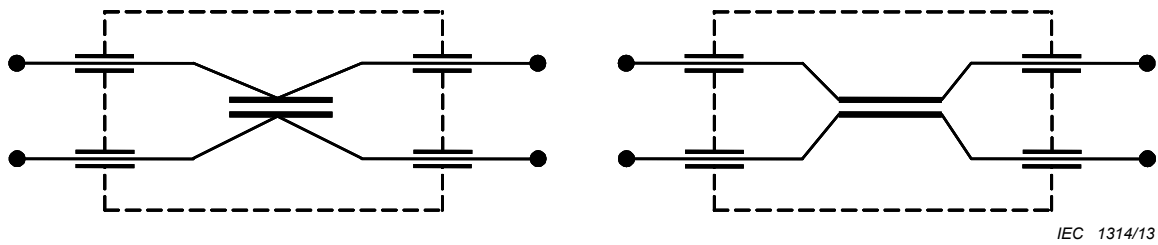


Figure 4a – Lead-through capacitor for symmetrical use (non-coaxial)

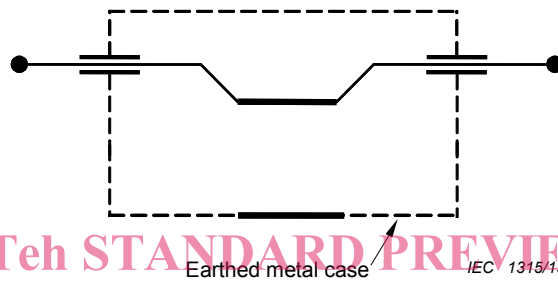


Figure 4b – Lead-through capacitor for asymmetrical use (non-coaxial)

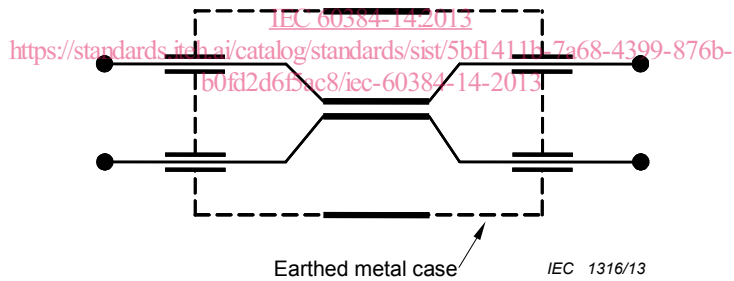


Figure 4c – Multiple unit lead-through capacitor (non-coaxial) for symmetrical and asymmetrical use

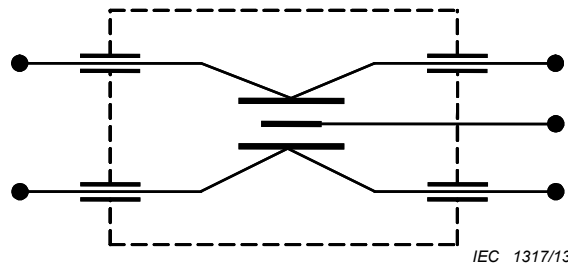


Figure 4d – Multiple unit lead-through capacitor

Figure 4 – Lead-through capacitors

1.5.9

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 5a; the delta form consists of an X-capacitor and two Y2-capacitors arranged in a delta network as in Figure 5b; the T-connected form consists of three capacitors C_A , C_B and C_C connected in T as shown in Figure 5c.

The delta and T-connected forms are electrically equivalent (star-delta transformation). In the T-connected form the X-capacitor is the result of the series connection of $C_B - C_C$ and the Y-capacitors are the results of the series connections of $C_A - C_B$ and $C_A - C_C$.

When T-connected capacitors are submitted to tests, and it is stated that voltages shall be applied across the X-capacitors, such voltages shall be applied between the line and neutral terminations. Similarly, when it is stated that voltages shall be applied across the Y-capacitors, such voltages shall be applied between the line and neutral terminations connected together and the earth termination.

SEE: Figures 5a, 5b and 5c.

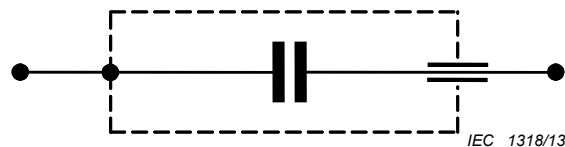


Figure 5a – Single by-pass capacitor

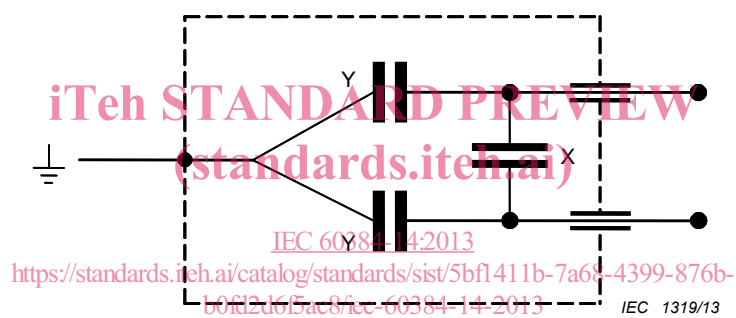


Figure 5b – Delta by-pass capacitor (in metallic housing)

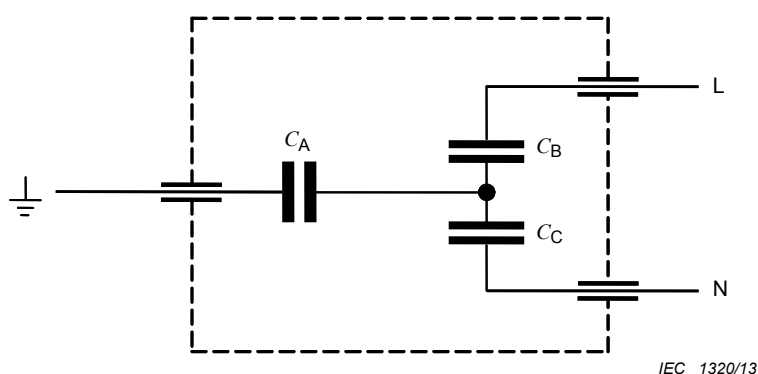


Figure 5c – Example of a T-connected by-pass capacitor (in non-metallic housing)

NOTE For capacitors with non-metallic housings, the earth connection is brought out as a separate termination as is shown in Figure 5c.

Figure 5 – By-pass capacitors