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Interested committees:

Title: BS EN IEC 60940 Guidance information on the application of capacitors; resistors; inductors and complete filter units for electromagnetic interference suppression

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

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- iii) requires additional national guidance or information

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



40/3174/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 60940 ED3

DATE OF CIRCULATION:

2024-08-30

CLOSING DATE FOR COMMENTS:

2024-10-25

SUPERSEDES DOCUMENTS:

40/2815/RR

IEC TC 40 : CAPACITORS AND RESISTORS FOR ELECTRONIC EQUIPMENT

SECRETARIAT:

Netherlands

SECRETARY:

Mr Ronald Drenthen

OF INTEREST TO THE FOLLOWING COMMITTEES:

TC 9, SC 22H, TC 23, SC 23B, SC 23E, SC 23J, SC 23K, SC 34C, SC 34D, TC 56, TC 61, SC 62A, SC 62D, TC 65, TC 72, TC 78, TC 96, TC 105, TC 108, TC 116

HORIZONTAL FUNCTION(S):

ASPECTS CONCERNED:

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Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

Application of capacitors, resistors, inductors and complete filter units for electromagnetic interference suppression - General rules and safety requirements

NOTE FROM TC/SC OFFICERS:

TC40 WG40 decided a complete revision of title, scope and content compared to ED2. The CD is still incomplete at certain places. Experts from other TCs as users of the standards covered by that document are invited to contribute to that revision. A 2nd CD then will be prepared based on those inputs.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**APPLICATION OF CAPACITORS, RESISTORS, INDUCTORS AND
COMPLETE FILTER UNITS FOR ELECTROMAGNETIC INTERFERENCE
SUPPRESSION -****General rules and safety requirements**

FOREWORD

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- IEC 60940 has been prepared by IEC technical committee **40: Capacitors and resistors for electronic equipment**. It is an International Standard.

This **3rd** edition cancels and replaces the **2nd** edition published in **2015**. This edition constitutes a structural and technical revision.

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

- a) New title to change the document from "guidance" into "general rules and safety requirements;
- b) New content added (Clauses 5 to 10);
- c) The previous edition is partly contained in Clause 4.

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

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

138
139 Full information on the voting for its approval can be found in the report on voting indicated in
140 the above table.

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

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

146 The committee has decided that the contents of this document will remain unchanged until the
147 stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to
148 the specific document. At this date, the document will be

- 149 • reconfirmed,
- 150 • withdrawn,
- 151 • replaced by a revised edition, or
- 152 • amended.

153
154

APPLICATION OF CAPACITORS, RESISTORS, INDUCTORS AND COMPLETE FILTER UNITS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION - General rules and safety requirements

1 Scope

This document establishes general rules and safety requirements on the application of capacitors, resistors, inductors, and complete filter units for electromagnetic interference suppression which will be connected to an AC mains or other supply (DC or AC) with a nominal voltage not exceeding 1 000 V AC, with a nominal frequency not exceeding 400 Hz, or 1 500 V DC.

It should facilitate drafters of product safety standards and other stakeholders such as designers, manufacturers, service providers, policy makers and regulators to consider safety aspects for the intended use and the reasonably foreseeable misuse of these components in its products and systems and apply risk reduction measures to achieve a tolerable risk level.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC Guide 51, IEC Guide 104, IEC Guide 116 , IEC 60664-1:2020 and 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>

3.1 Voltage terms

3.1.1

overvoltage category

numeral defining a **transient overvoltage** condition

Note 1 to entry: Overvoltage categories I, II, III and IV are used, see IEC 60664-1:2020, 4.3.2.

[SOURCE: IEC 426-04-48]

3.1.2

transient overvoltage

short duration **overvoltage** of a few milliseconds or less, oscillatory or non-oscillatory, usually highly damped

[SOURCE: IEC 60664-1:2020, 3.1.13]

3.2 Safety terms

3.2.1

fault protection

protection against electric shock under single fault conditions

[SOURCE: IEC 61140:2016, 3.1.2]

3.2.2**single fault condition**

condition in which one means for protection against electric shock is defective or one fault is present which could cause a hazard

[SOURCE: IEC 61140:2016, 3.1.4]

Note 1 to entry: If a single fault condition results in one or more other fault conditions, all are considered as one single fault condition.

4 Electromagnetic and Radio frequency interference suppression (EMI/RFI)

4.1 General

Electromagnetic interference (EMI) is any electromagnetic disturbance which causes an undesirable response, malfunctioning or degradation in the performance of electrical equipment. Radio frequency interference (RFI) is any electrical energy within the frequency range dedicated to radio frequency transmission.

The lower frequency range up to 30 MHz is often analysed by means of voltage or current measurements. The measured spectra are called “conducted interference” at certain points in a circuit. The higher frequency range up to many GHz is often analysed by means of field measurements like electric field E, magnetic field H or radiated power. The measured spectra are called “radiated interference” as they are measured with special antennas for each field type and frequency range instead of a voltage or current probe. Radiated interference is always analysed in a defined distance to the device under test.

Electrical machines and apparatus may generate EMI which is fed back into its power supply mains. This electromagnetic interference may be picked up by apparatus connected to the same power system up to a certain distance from the machine or apparatus. EMI-filters limit this interference to certain levels which do not make any harm.

Differential-mode interference occurs symmetrical between lines of different polarity. Common-mode interference occurs with reference to ground. These two types of interference have different sources and different propagation paths and need different counter measures.

EMI can be suppressed by providing a low impedance path for interference currents providing a short path back to its source by means of EMI-capacitors according to IEC 60384-14. This can be combined with a high impedance element in series to prevent interference from taking this way. Such a high impedance can be a choke according to IEC 60938 series. Using the principle of current compensation makes so-called Common-Mode chokes very effective against Common-Mode interference.

Besides filtering with capacitors and chokes, shielding with metal enclosures can be very effective against interference.

4.2 Limits of interference

In Europe and many other countries, mandatory limits are set for both emission of interference and immunity against interference by EMC standards. The compatibility levels are defined for different applications and apparatus in the CISPR standards or other product standards for different environments like household or industrial surroundings.

Some sensitive electrical equipment requires an interference-free power-supply to a greater extent than that guaranteed by the common compatibility levels. In these cases, additional measures should be taken at a place in the power supply system close to the place where the apparatus is connected. When the apparatus is shielded or placed in a shielded room, interference suppression will generally be applied at each point where the power supply system enters the shielded enclosure.