IEC 60115-1

Edition 4.0 2008-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Résistances fixes utilisées dans les équipements électroniques – Partie 1: Spécification générique

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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.
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International Standard IEC 60115-1 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment

This fourth edition cancels and replaces the third edition issued in 1999 and Amendment 1 (2001). It constitutes a technical revision.

This standard cancels and replaces IEC 61045-1 (1991), IEC 61045-2 (1991) and IEC 61045-2-1 (1991).

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

a) implementation of Annex Q which replaces Clause 3;
b) addition of new tests procedures in 4.34 through 4.38;
c) removal of the property "temperature characteristics" from 4.8;

d) introduction of a new system of test severities for the shear test in 4.32;

e) introduction of new bias voltages for the damp heat steady-state test in 4.24;

f) furthermore, this fourth edition cancels and replaces the third edition published in 1999 and constitutes minor revisions related to tables, figures and references.

This bilingual version (2013-07) corresponds to the monolingual English version, published in 2008-07.

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

FDIS	Report on voting
40/1907/FDIS	40/1922/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.

The French version of this standard has not been voted upon.

A list of all parts of the IEC 60115 series, under the general title *Fixed resistors for use in electronic equipment*, can be found on the IEC website.

All sectional specifications mentioned above do have one or more blank detail specifications being a supplementary document, containing requirements for style, layout and minimum content of detail specifications.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

FIXED RESISTORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 1: Generic specification

1 General

1.1 Scope

This part of IEC 60115 is a generic specification and is applicable to fixed resistors 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 referenced documents are indispensable for the application 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 60027 (all parts), *Letter symbols to be used in electrical technology*

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

IEC 60060-1:1989, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60062:2004, *Marking codes for resistors and capacitors*

IEC 60063:1963, *Preferred number series for resistors and capacitors*
Amendment 1(1967)
Amendment 2(1977)

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*
Amendment 1(1992)

IEC 60068-2-1:1990, *Environmental testing – Part 2: Tests – Tests A: Cold*
Amendment 1(1993)
Amendment 2(1994)

IEC 60068-2-2:1974, *Environmental testing – Part 2: Tests – Tests B: Dry heat*
Amendment 1(1993)
Amendment 2(1994)

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

IEC 60068-2-11:1981, *Environmental testing – Part 2: Tests – Test Ka: Salt mist*

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

IEC 60068-2-14:1984, *Environmental testing – Part 2: Tests – Test N: Change of temperature*
Amendment 1(1986)

IEC 60068-2-20:1979, *Environmental testing – Part 2: Tests – Test T: Soldering* Amendment 2(1987)

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

IEC 60068-2-27:1987, *Environmental testing – Part 2: Tests – Test Ea and guidance: Shock*

IEC 60068-2-29:1987, *Environmental testing – Part 2: Tests – Test Eb and guidance: Bump*

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

IEC 60068-2-45:1980, *Environmental testing – Part 2: Tests – Test XA and guidance: Immersion in cleaning solvents*
Amendment 1(1993)

IE 60068-2-54: 2006, *Environmental testing – Part 2.54: Tests – Test Ta: Solderability testing of electronic components by the wetting balance method*

IEC 60068-2-58:2005, *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 60068-2-78:2001, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60195:1965, *Method of measurement of current noise generated in fixed resistors*

IEC 60286, *Packaging of components for automatic handling*

IEC 60294:1969, *Measurement of the dimensions of a cylindrical component having two axial terminations*

IEC 60410:1973, *Sampling plans and procedures for inspection by attributes*

IEC 60440:1973, *Method of measurement of non-linearity in resistors*

IEC 60617:2007, *Graphical symbols for diagrams*

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 61193-2:2007,*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*

IEC 61249-2-22: 2005, *Materials for printed boards and other interconnecting structures – Part 2-22: Reinforced base materials clad and unclad – Modified non-halogenated epoxide woven E-glass laminated sheets of defined flammability (vertical burning test), copper-clad*

IEC 61249-2-35, *Materials for printed boards and other interconnecting structures – Part 2-35: Reinforced base materials clad and unclad – Modified epoxide woven E-glass laminated sheets of defined flammability (vertical burning test), copper-clad for lead-free assembly*[1]

IEC 61340-3-1:2006, *Electrostatics – Part 3-1: Methods for simulation of electrostatic effects – Human body model (HBM) electrostatic discharge test waveforms*

ÌEC 61760-1:2006, *Surface mounting technology – Part 1: Standard method for the specification of surface mounting components (SMDs)*

IEC QC 001002-3:2005, *IEC Quality Assessment System for Electronic Components (IECQ) – Rules of procedure – Part 3: Approval procedures*

ISO 1000:1992, *SI units and recommendations for the use of their multiples and of certain other units*

2 Technical data

2.1 Units and symbols

Units, graphical symbols and letter symbols should, whenever possible, be taken from the following publications:

– IEC 60027;
– IEC 60050;
– IEC 60617;
– ISO 1000.

When further items are required they shall be derived in accordance with the principles of the publications listed above.

2.2 Terms and definitions

For the purposes of this document, the following terms and definitions apply, in alphabetical order:

2.2.1
category dissipation
fraction of the rated dissipation exactly defined in the detail specification, applicable at the upper category temperature, taking account of the derating curve prescribed in the detail specification

NOTE 1 For resistors the category dissipation is zero, where the upper category temperature is the maximum element temperature.

NOTE 2 Related terminology: rated dissipation, upper category temperature, derating curve

2.2.2
category temperature range
range of ambient temperatures for which the resistor has been designed to operate continuously; this is given by the lower and upper category temperature

[1] To be published.

NOTE Related terminology: lower category temperature, upper category temperature

2.2.3
critical resistance
resistance value at which the rated voltage is equal to the limiting element voltage (see 2.2.18 and 2.2.11)

NOTE 1 At an ambient temperature of 70 °C, the maximum voltage which may be applied across the terminations of a resistor is either the calculated rated voltage, if the resistance is less than the critical resistance, or the limiting element voltage, if the resistance is equal to or greater than the critical resistance. At temperatures other than 70 °C, it is important that account be taken of the derating curve and of the limiting element voltage in the calculation of any voltage to be applied.

NOTE 2 Related terminology: Rated voltage, limiting element voltage

2.2.4
derating curve
curve which shows the maximum allowable dissipation at ambient temperatures between the upper and lower category temperature

NOTE 1 In the range between lower category temperature and rated temperature it shows the rated dissipation, and between rated temperature and maximum element temperature it shows a linear slope down to zero dissipation at the maximum element temperature. The slope depends on the thermal properties of the resistor, i.e. its capability to abduct the dissipation to the environment.

NOTE 2 Related terminology: rated dissipation, rated temperature, maximum element temperature

2.2.5
family (of electronic components)
group of components which predominantly displays a particular physical attribute and/or fulfils a defined function

NOTE Related terminology: subfamily

2.2.6
grade
term indicating additional general characteristics concerning the intended application, for example, long-life applications

NOTE 1 The term "grade" may be used only in combination with one or more words (for example, long-life grade) and not with a single letter or number.

NOTE 2 Related terminology: stability class

2.2.7
heat-sink resistor
resistor type designed for mounting on a separate heat-sink

NOTE Related terminology: insulated resistor

2.2.8
insulated resistor
resistor which fulfils the voltage proof and insulation resistance test requirements and the damp-heat, steady-state test with a polarizing voltage applied when mounted on a metal plate

NOTE Related terminology: heat-sink resistor

2.2.9
insulation resistance
resistance of the encapsulation of the insulated resistor measured between the resistor terminations connected together and any conducting mounting surface

NOTE Related terminology: insulated resistor