



SLOVENSKI STANDARD

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Fixed resistors for use in electronic equipment - Part 1: Generic specification (IEC 60115-1:1999)

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

Festwiderstände zur Verwendung in Geräten der Elektronik -- Teil 1:
Fachgrundspezifikation

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

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31.040.10 Fiksni upor Fixed resistors

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EUROPEAN STANDARD

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Fixed resistors for use in electronic equipment
Part 1: Generic specification
(IEC 60115-1:1999, modified)

Résistances fixes utilisées dans les
équipements électroniques
Partie 1: Spécification générique
(CEI 60115-1:1999, modifiée)

Festwiderstände zur Verwendung in
Geräten der Elektronik
Teil 1: Fachgrundspezifikation
(IEC 60115-1:1999, modifiziert)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of the International Standard IEC 60115-1:1999, prepared by IEC TC 40, Capacitors and resistors for electronic equipment, together with the common modifications prepared by the Technical Committee CENELEC TC 40XB, Resistors, was submitted to the Unique Acceptance procedure and was approved by CENELEC as EN 60115-1 on 2001-03-01.

This European Standard supersedes EN 140000:1993.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2002-04-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2004-04-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A, B, D, ZB and ZC are normative and annexes C and ZA are informative.

Annexes ZA, ZB and ZC have been added by CENELEC.

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Endorsement notice
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The text of the International Standard IEC 60115-1:1999 was approved by CENELEC as a European Standard with agreed common modifications.

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Cross reference list for clause numbers of EN 140000 and IEC 60115-1

The following cross reference list has been established to indicate the relation between the corresponding clauses in EN 140000 and IEC 60115-1. Technical deviations are indicated by "Y" in the third column. The clause numbers of common modifications for the harmonized EN 60115-1 refer to IEC 60115-1:1999. Related clause numbers for new clauses are indicated in column four.

Clause number		Modification	
EN 140000:1993	IEC 60115-1:1999	Yes/No	New clauses
	1	N	
1	1.1	N	
2.1	1.2	Y	
2	2	N	
2.2/2.2.1	2.1	N	
---	2.2	N	
2.2.2	2.2.1	N	
2.2.3	2.2.2	N	
2.2.4	2.2.3	N	
2.2.5	2.2.4	N	
2.2.6	2.2.5	N	
2.2.7	2.2.6	N	
2.2.8	2.2.7	N	
2.2.9	2.2.8	N	
2.2.10	2.2.9	N	
2.2.11	2.2.10	N	
2.2.12	2.2.11	N	
2.2.13	2.2.12	N	
2.2.13 Note	2.2.13	N	
	2.2.19	Y	
---	2.2.21	N	
2.2.21	2.2.22	N	
2.2.22	2.2.23	N	
2.2.23	2.2.24	N	
---	2.2.25	N	
2.2.24		Y	2.2.27
		Y	2.2.28
		Y	2.2.29

Clause number		Modification	
EN 140000:1993	IEC 60115-1:1999	Yes/No	New clauses
		Y	2.2.30
		Y	2.2.31
		Y	2.2.32
		Y	2.2.33
2.4.2	2.5	N	
		Y	2.6
		Y	2.7
3	3	Y	
4.5.3		Y	4.5.3
	4.10	Y	
4.14.2	4.14.2	Y	
4.14.4	4.14.4	Y	
4.14.6	4.14.6	Y	
4.17	4.17	Y	
	4.17.2	Y	
---	4.17.5	Y	
4.18	4.18.2 a, b, c	N	
4.19.2	4.19.2	Y	
4.25.4.2,3	4.25.4.2	N	
4.25.4.5	4.25.4.3	N	
4.25.4.6, 7, 8, 9	4.25.4.4	N	
4.25.4.10	4.25.4.5	N	
---	4.31	N	
4.31	4.32	Y	
---	4.32.2	Y	
4.31	4.33	N	
4.32		Y	4.34
4.33		Y	4.35
4.34		Y	4.36
		Y	4.37
		Y	4.38
		Y	4.39
		Y	4.40

Clause number		Modification	
EN 140000:1993	IEC 60115-1:1999	Yes/No	New clauses
---	Annex A	Y	
Annex E	Annex B	Y	
4.28.3.1 Diagram	Annex C	N	
---	Annex D	N	
Annex A	---	Y	Annex ZA
---	---	Y	Annex ZB
Annex B	---		
Annex C	---		
Annex D	---		

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FIXED RESISTORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 1: Generic specification

1 General

1.1 Scope

This part of IEC 60115 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 normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60115. For dated references, subsequent amendments to, or revisions of any of these publications do not apply. However, parties to agreements based on this part of IEC 60115 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

NOTE In the case of IEC 60068 standards, use the referenced edition.

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

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

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

IEC 60060-2:1994, *High-voltage test techniques – Part 2: Measuring systems*

IEC 60062:1992, *Marking codes for resistors and capacitors*
Amendment 1 (1995)

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 60068-2-3:1969, *Environmental testing – Part 2: Tests – Test Ca: Damp heat, steady state*
Amendment 1 (1984)

- IEC 60068-2-6:1995, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*
- 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 60068-2-21:1983, *Environmental testing – Part 2: Tests – Test U: Robustness of terminations and integral mounting devices*
Amendment 2 (1991)
Amendment 3 (1992)
- 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 60068-2-30:1980, *Environmental testing – Part 2: Tests – Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle)*
Amendment 1 (1985)
- IEC 60068-2-45:1980, *Environmental testing – Part 2: Tests – Test XA and guidance: Immersion in cleaning solvents*
Amendment 1 (1993)
- IEC 60068-2-58:1989, *Environmental testing – Part 2: Tests – Test Td: Solderability, resistance to dissolution of metallization and to soldering heat of Surface Mounting Devices (SMD)*
<https://standards.iteh.ai/catalog/standards/sist/1304817c-729a-4099-a19e-02961b1b4acc/sist-en-60115-1-2002>
- IEC 60195:1965, *Method of measurement of current noise generated in fixed resistors*
- IEC 60249-2-4:1987, *Base materials for printed circuits – Part 2: Specifications – Specification No. 4: Epoxide woven glass fabric copper-clad laminated sheet, general purpose grade*
- 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 QC 001002-3:1998, *IEC Quality Assessment System for Electronic Components (IECQ) – Rules of procedure – Part 3: Approval procedures*
- IEC QC 001003:1998, *IEC Quality Assessment System for Electronic Components (IECQ) – Guidance documents*
- IEC QC 001005:1998, *Register of firms, products and services approved under the IECQ system, including ISO 9000*
- ISO 1000:1992, *SI units and recommendations for the use of their multiples and of certain other units*
- CECC 00 114-2:1994, *RP 14: Quality assessment procedures – Part 2: Qualification approval of electronic components*


CECC 00114-3:1999, *RP 14: Quality assessment procedures – Part 3: Capability approval of an electronic component manufacturing activity*

EN 60068-2-67:1996, *Environmental testing - Part 2: Tests - Test Cy: Damp heat, steady state, accelerated test primarily intended for components (IEC 60068-2-67:1995)*

EN 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test (IEC 61000-4-2:1995)*

EN 61760-1:1998, *Surface mounting technology - Part 1: Standard method for the specification of surface mounting components (SMDs) (IEC 61760-1:1998)*

EN 100014:1991, *CECC Assessed Process Average Procedure (APA)*

EN 100114-6:1996, *Technology approval of electronic component manufacturers* 

2 Technical data

2.1 Units and symbols

For the purposes of this part of IEC 60115, the following definitions apply. In addition, units, graphical symbols, letter symbols and terminology shall, whenever possible, be taken from the following publications:

- IEC 60027; <https://standards.iteh.ai/catalog/standards/sist/1304817c-729a-4099-a19e-02961b1b4ac6/sist-en-60115-1-2002>
- IEC 60050;
- ISO 1000.

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

2.2 Definitions

For the purposes of this part of IEC 60115, the following definitions apply.

2.2.1 type

group of components having similar design features, the similarity of whose manufacturing techniques enables them to be grouped together either for qualification approval or for quality conformance inspection; they are generally covered by a single detail specification

NOTE 1 Components described in several detail specifications, may, in some cases, be considered as belonging to the same type and may therefore be grouped for quality assessment purposes.

NOTE 2 Mounting accessories are ignored, provided they have no significant effect on the test results.

NOTE 3 Ratings cover the combination of

- electrical ratings,
- sizes,
- environmental category.

The limits of the range of ratings are to be given in the detail specification.

2.2.2**style**

subdivision of a type, generally based on dimensional factors; a style may include several variants, generally of a mechanical order

2.2.3**grade**

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

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.

The figures to be added after the term "grade" should be arabic numerals

2.2.4**family** (of electronic components)

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

2.2.5**subfamily** (of electronic components)

group of components within a family manufactured by similar technological methods

2.2.6**rated resistance**

resistance value for which the resistor has been designed, and which is generally indicated on the resistor

2.2.7**critical resistance**

resistance value at which the rated voltage is equal to the limiting element voltage (see 2.2.15 and 2.2.16)

NOTE 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.

2.2.8**category temperature range**

range of ambient temperatures for which the resistor has been designed to operate continuously, defined by the temperature limits of its appropriate category

2.2.9**upper category temperature**

the maximum ambient temperature for which a resistor has been designed to operate continuously at that portion of the rated dissipation which is indicated in the category dissipation

2.2.10**lower category temperature**

minimum ambient temperature at which a resistor has been designed to operate continuously

2.2.11**maximum surface temperature**

maximum temperature permitted on the surface for any resistor of that type when operated continuously at rated dissipation at an ambient temperature of 70 °C

2.2.12**rated temperature**

maximum ambient temperature at which the rated dissipation may be applied continuously under the conditions of the endurance test prescribed for this temperature. It has a value of 70 °C, unless otherwise prescribed in the relevant sectional specification

2.2.13**rated dissipation**

maximum allowable dissipation at an ambient temperature of 70 °C under the conditions of the endurance test at 70 °C and for which the permitted change in resistance for this endurance test is not exceeded

2.2.14**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 The category dissipation may be zero.

2.2.15**rated voltage (U_N or U_R)**

d.c. or a.c. r.m.s. voltage calculated from the square root of the product of the rated resistance and the rated dissipation

NOTE At high values of resistance, the rated voltage may not be applicable because of the size and the construction of the resistor (see 2.2.16).

2.2.16**limiting element voltage**

maximum d.c. or a.c. r.m.s. voltage that may be continuously applied to the terminations of a resistor (generally dependent upon size and manufacturing technology of the resistor).

Where the term "a.c. r.m.s. voltage" is used in this standard, the peak voltage shall not exceed 1,42 times the r.m.s. value

NOTE This voltage can only be applied to resistors when the resistance value is equal to or higher than the critical resistance value.

2.2.17**insulation voltage** (applicable only to insulated resistors)

the maximum peak voltage which may be applied under continuous operating conditions between the resistor terminations and any conducting mounting surface

2.2.18**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

2.2.19**insulation resistance**

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

2.2.20**variation of resistance with temperature**

variation of resistance with temperature which can be expressed either as a temperature characteristic or as a temperature coefficient as defined below