

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Fixed resistors for use in electronic equipment –
Part 4: Sectional specification: Power resistors for through hole assembly on
circuit boards (THT) or for assembly on chassis**

**Résistances fixes utilisées dans les équipements électroniques –
Partie 4: Spécification intermédiaire: Résistances de puissance pour
assemblage par trous traversants sur cartes de circuit imprimé (carte THT) ou
pour assemblage sur châssis**



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CONTENTS

FOREWORD.....	8
1 Scope.....	11
2 Normative references	11
3 Terms, definitions, product types, product technologies and product classification.....	12
3.1 Terms and definitions.....	12
3.2 Product types.....	13
3.2.1 General	13
3.2.2 Axial type	13
3.2.3 Radial type	13
3.2.4 Vertical type	14
3.2.5 Tubular types.....	14
3.2.6 Metal housed wire-wound resistors	15
3.2.7 Any other type	15
3.3 Resistor encapsulation and material of termination	15
3.3.1 Conformal lacquer coat.....	15
3.3.2 Silicone cement coating.....	15
3.3.3 Enamel coating.....	16
3.3.4 Ceramic housed resistor	16
3.3.5 Wire termination	16
3.4 Product technologies	16
3.4.1 General	16
3.4.2 Metal film technology.....	17
3.4.3 Metal glaze technology	17
3.4.4 Metal oxide technology	17
3.4.5 Wire-wound technology	17
3.4.6 Metal strip technology.....	18
3.4.7 Any other technology	18
3.5 Product classification	18
4 Preferred characteristics.....	19
4.1 General.....	19
4.2 Preferred types, styles and dimensions.....	19
4.2.1 Axial type	19
4.2.2 Ceramic housed type with axial lead wires.....	22
4.2.3 Ceramic housed type with radial lead wires	24
4.2.4 Radial or vertical ceramic housed type and dimensions	25
4.2.5 Tubular type of power resistors.....	26
4.2.6 Other types.....	27
4.3 Preferred climatic categories.....	28
4.4 Resistance.....	28
4.5 Tolerances on resistance	28
4.6 Rated dissipation P_T	28
4.7 Limiting element voltage U_{\max}	30
4.8 Insulation voltage U_{ins}	30
4.9 Insulation resistance R_{ins}	30
5 Tests and test severities.....	30
5.1 General provisions for tests invoked by this specification.....	30

5.2	Preparation of specimen	31
5.2.1	Drying.....	31
5.2.2	Mounting of power resistors on test boards.....	31
5.2.3	Mounting of power resistors on test racks.....	32
5.2.4	Specification of test boards/ racks for any other type of high-power resistors	34
5.3	Details of applicable tests	34
5.3.1	Resistance	34
5.3.2	Temperature coefficient of resistance	34
5.3.3	Temperature rise	35
5.3.4	Endurance at the rated temperature 70 °C.....	35
5.3.5	Endurance at room temperature	36
5.3.6	Endurance at a maximum temperature: UCT with category dissipation	37
5.3.7	Short-term overload	37
5.3.8	Single-pulse high-voltage overload test	38
5.3.9	Periodic-pulse high-voltage overload test	38
5.3.10	Visual examination	40
5.3.11	Gauging of dimensions	40
5.3.12	Detail dimensions	41
5.3.13	Robustness of the resistor body.....	41
5.3.14	Robustness of terminations	41
5.3.15	Bump.....	42
5.3.16	Shock	42
5.3.17	Vibration.....	42
5.3.18	Rapid change of temperature.....	43
5.3.19	Rapid change of temperature, ≥ 100 cycles	43
5.3.20	Climatic sequence	43
5.3.21	Damp heat, steady state	45
5.3.22	Solderability, with lead-free solder.....	45
5.3.23	Solderability, with SnPb solder	46
5.3.24	Resistance to soldering heat.....	46
5.3.25	Solvent resistance	47
5.3.26	Insulation resistance.....	47
5.3.27	Voltage proof.....	47
5.4	Optional and/or additional tests.....	48
5.4.1	Single-pulse high-voltage overload test	48
5.4.2	Periodic-pulse overload test	48
5.4.3	Electrostatic discharge (ESD).....	49
5.4.4	Robustness of threaded stud or screw terminations	50
5.4.5	Operation at low temperature.....	50
5.4.6	Damp heat, steady state, accelerated	50
5.4.7	Accidental overload test.....	51
5.4.8	Flammability	51
6	Performance requirements.....	52
6.1	General.....	52
6.2	Limits for change of resistance at test.....	52
6.3	Temperature coefficient of resistance	55
6.4	Temperature rise	55
6.5	Visual inspection.....	56

6.5.1	General visual criteria.....	56
6.5.2	Visual criteria after tests.....	56
6.5.3	Visual criteria for the packaging.....	56
6.6	Solderability.....	56
6.7	Insulation resistance.....	57
6.8	Flammability.....	57
6.9	Accidental overload test.....	57
7	Marking, packaging and ordering information.....	57
7.1	Marking of the component.....	57
7.2	Packaging.....	57
7.3	Marking of the packaging.....	58
7.4	Ordering information.....	58
8	Detail specifications.....	58
8.1	General.....	58
8.2	Information to be specified in a detail specification.....	59
8.2.1	Outline drawing or illustration.....	59
8.2.2	Type, style, and dimensions.....	59
8.2.3	Climatic category.....	59
8.2.4	Resistance range.....	59
8.2.5	Tolerances on rated resistance.....	59
8.2.6	Rated dissipation P_{70}	59
8.2.7	Limiting element voltage U_{max}	60
8.2.8	Insulation voltage U_{ins}	60
8.2.9	Insulation resistance R_{ins}	60
8.2.10	Tests and test severities.....	60
8.2.11	Limits of resistance change after testing.....	60
8.2.12	Temperature coefficient of resistance.....	60
8.2.13	Marking.....	60
8.2.14	Ordering information.....	60
8.2.15	Mounting.....	60
8.2.16	Storage.....	61
8.2.17	Transportation.....	61
8.2.18	Additional information.....	61
8.2.19	Quality assessment procedures.....	61
9	Quality assessment procedures.....	61
9.1	General.....	61
9.2	Definitions.....	61
9.2.1	Primary stage of manufacture.....	61
9.2.2	Structurally similar components.....	61
9.2.3	Assessment level EZ.....	62
9.3	Formation of inspection lots.....	62
9.4	Approved component (IECQ AC) procedures.....	63
9.5	Qualification approval (QA) procedures.....	63
9.5.1	General.....	63
9.5.2	Qualification approval.....	63
9.5.3	Quality conformance inspection.....	63
9.6	Capability certification (IECQ AC-C) procedures.....	64
9.7	Technology certification (IECQ-AC-TC) procedures.....	64

9.8	Periodical evaluation of termination platings	64
9.9	Delayed delivery	64
9.10	Certified test records.....	64
9.11	Certificate of conformity (CoC).....	64
Annex A (normative) Symbols and abbreviated terms		75
A.1	Symbols.....	75
A.2	Abbreviated terms.....	78
Annex B (normative) Visual inspection acceptance criteria.....		80
B.1	General.....	80
B.2	Acceptance criteria for a general visual inspection of body of specimens	80
B.3	Acceptance criteria for a general visual inspection of the terminals	80
B.4	Acceptance criteria for a general visual inspection of specimen after test	80
Annex C (normative) Workmanship requirements for the assembly of power resistors.....		81
C.1	General.....	81
C.2	Lead forming.....	81
C.2.1	General	81
C.2.2	Means for support of mounting height	82
C.3	Mounting.....	83
C.3.1	General	83
C.3.2	Lateral mounting.....	84
C.3.3	Upright mounting	85
C.4	Lead trimming	86
Annex D (informative) Zero ohm resistors (jumpers)		88
Annex E (informative) Guide on the application of optional and/or additional tests		89
E.1	General.....	89
E.2	Endurance at room temperature.....	89
E.3	Single-pulse high-voltage overload test.....	90
E.4	Periodic-pulse overload test.....	91
E.5	Operation at low temperature.....	92
E.6	Damp heat, steady state, accelerated	93
E.7	Accidental overload test.....	94
E.8	Flammability test.....	95
E.9	Electrostatic discharge test (ESD).....	96
E.10	Robustness of threaded stud or screw terminations	97
Annex F (informative) Radial formed types from axial styles		99
F.1	General.....	99
F.1.1	Applicability of this annex	99
F.1.2	Denomination of radial formed styles	99
F.1.3	Coated lead wires.....	101
F.1.4	Means for support of mounting height	101
F.1.5	Means for retention.....	102
F.2	Radial formed types for through hole assembly.....	102
F.2.1	Radial formed style with lateral body position	102
F.2.2	Radial formed style with upright body position	104
F.3	Radial formed types for surface-mount assembly	106
F.4	Packaging.....	107
F.4.1	Packaging of resistors formed for through-hole assembly	107
F.4.2	Packaging of resistors formed for surface-mount assembly.....	108

F.5	Quality assessment.....	108
F.5.1	General	108
F.5.2	Quality assessment of formed resistors	108
F.5.3	Forming of finished resistors of assessed quality	109
F.5.4	Special inspection requirements	109
Annex X (informative)	Cross references for the prior revision of this specification	111
Bibliography	114
Figure 1	– Illustrations of typical axial leaded power resistors	13
Figure 2	– Illustrations of typical radial leaded power resistors.....	13
Figure 3	– Illustrations of typical vertical leaded power resistors with punched terminals.....	14
Figure 4	– Illustrations of typical tubular type power resistors	14
Figure 5	– Illustrations of typical metal housed power resistors.....	15
Figure 6	– Shape and dimensions of cylindrical axial leaded resistors.....	19
Figure 7	– Alternative methods for specification of the length of excessive protective coating or welding beads on axial leaded resistors	21
Figure 8	– Lead-wire spacing of axial leaded resistors with bent leads.....	21
Figure 9	– Specification of the lead eccentricity of axial leaded resistors	22
Figure 10	– Shape and dimensions of axial leaded ceramic housed resistors.....	23
Figure 11	– Shape and dimensions of radial type ceramic resistors	24
Figure 12	– Shape and dimensions of radial leaded ceramic resistors.....	25
Figure 13	– Shape and dimensions of tubular resistors	26
Figure 14	– Typical derating curve for MET > UCT.....	29
Figure 15	– Typical derating curve for power wire-wound resistors	29
Figure 16	– Assembly of specimen to the test board	32
Figure 17	– Mounting of axial leaded specimens on a rack, top view.....	33
Figure 18	– Examples of specimen lead fixation devices	34
Figure C.1	– Lead forming dimensions	81
Figure C.2	– Examples of mounting height support	83
Figure C.3	– Clearance between coating and solder	84
Figure C.4	– Lateral mounting.....	84
Figure C.5	– Upright mounting	85
Figure C.6	– Lead protrusion	86
Figure C.7	– Lead end distortion	87
Figure F.1	– Production flow and different scopes of quality assurance.....	100
Figure F.2	– Shape and dimensions of radial formed resistor for lateral body position.....	102
Figure F.3	– Shape and dimensions of radial formed resistor for lateral body position with kinked lead wires	102
Figure F.4	– Shape and dimensions of radial formed resistor for upright body position.....	104
Figure F.5	– Shape and dimensions of radial formed resistor for upright body position and wide spacing	104
Figure F.6	– Shape and dimensions of radial formed resistor for upright body position and wide spacing, with kinked lead wire.....	105
Figure F.7	– Shape and dimensions of radial formed resistor for surface-mount assembly (Z-bend).....	106

Figure F.8 – Land pattern dimensions for surface-mount assembly	107
Table 1 – Examples of preferred styles of cylindrical axial leaded power resistors	20
Table 2 – Examples of preferred styles of axial leaded ceramic housed resistors	23
Table 3 – Examples of preferred styles of radial type ceramic resistors.....	24
Table 4 – Preferred styles of radial or vertical mount ceramic resistors	26
Table 5 – Example of preferred styles of tubular types of power resistors	27
Table 6 – Preferred alternative overload conditions	40
Table 7 – Limits for resistance variations at tests	54
Table 8 – Permitted change of resistance due to the temperature coefficient of resistance	55
Table 9 – Test schedule for the qualification approval of power resistors	65
Table 10 – Test schedule for quality conformance inspection of power resistors	70
Table C.1 – Lead bend radius	82
Table C.2 – Recommended circuit board bore diameters	83
Table C.3 – Clearance of lateral mounted resistors	85
Table E.1 – Implementation of the test endurance at room temperature	90
Table E.2 – Implementation of the single-pulse high-voltage overload test.....	91
Table E.3 – Implementation of the periodic-pulse overload test.....	92
Table E.4 – Implementation of the operation at low temperature test	93
Table E.5 – Implementation of the test damp heat, steady state, accelerated.....	94
Table E.6 – Implementation of the test accidental overload test	95
Table E.7 – Implementation of the test flammability	96
Table E.8 – Implementation of the test Electrostatic discharge (ESD)	97
Table E.9 – Implementation of the test Robustness of threaded stud or screw terminations	98
Table F.1 – Feasible lead-wire spacing of radial formed resistor for lateral body position.....	103
Table F.2 – Feasible lead-wire spacing of radial formed resistor for upright body position.....	106
Table X.1 – Cross reference for references to clauses	112
Table X.2 – Cross reference for references to figures	113
Table X.3 – Cross reference for references to tables	113

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED RESISTORS FOR USE IN ELECTRONIC EQUIPMENT –**Part 4: Sectional specification: Power resistors for through hole assembly on circuit boards (THT) or for assembly on chassis**

FOREWORD

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IEC 60115-4 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment. It is an International Standard.

This third edition cancels and replaces the second edition published in 1982 and Amendment 1:1993. This edition constitutes a technical revision and includes test conditions and requirements for lead-free soldering and assessment procedures meeting the requirements of a "zero defect" approach.

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

- a) the definitions of product technologies and product classification levels of the generic specification, IEC 60115-1:2020, have been adopted;
- b) a basis for the optional specification of the lead eccentricity of axial leaded resistors has been amended in 4.2;

- c) the 'period-pulse high-voltage overload test' of IEC 60115-1:2020, 8.3 has been adopted as default test method in 5.3.9, thereby replacing the legacy test 'periodic-pulse overload test' of IEC 60115-1:2020, 8.4;
- d) the revised solderability test of IEC 60115-1:2020, 11.1 has been adopted in 5.3.22 and 5.3.23;
- e) the combined solvent resistance test of IEC 60115-1:2020, 11.3 has been adopted in 5.3.25;
- f) the 'endurance at room temperature test' of IEC 60115-1:2020, 7.2 has been reworked and adopted in 5.3.5;
- g) the 'single-pulse high-voltage overload test' of IEC 60115-1:2020, 8.2, applied with the pulse shape 10/700 in 5.3.8, is complemented with the optional alternative provided by the pulse shape 1,2/50 in 5.4.1.
- h) climatic tests for 'operation at low temperature' of IEC 60115 1:2020, 10.2, and for 'damp heat, steady state, accelerated' of IEC 60115-1:2020, 10.5, have been adopted as optional tests in 5.4.5. and 5.4.6, respectively;
- i) inclusion of an optional flammability test as 5.4.8;
- j) new guidance is provided in 6.2 on the presentation of stability requirements with their permissible absolute and relative deviations;
- k) acceptance criteria for the visual inspection have been added in 6.5 and in Annex B;
- l) visual inspection for the primary and proximity packaging has been added in 6.5.3 and in 7.2;
- m) the periodical evaluation of termination platings has been added as a new topic of quality assessment in 9.8;
- n) the revised test clause numbering of IEC 60115-1:2020 has been applied;
- o) a new Annex C has been added to summarize workmanship requirements for the assembly of leaded power resistors, e.g. as given in the prior IEC 61192 series of standards;
- p) the informative Annex F on radial formed styles has been amended with details on a formed Z-bend style for surface-mount assembly;
- q) furthermore, the informative Annex X has been added to show the cross-references to the prior edition of this document.

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

Draft	Report on voting
40/2920/CDV	40/2963/RVC

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 parts in the IEC 60115 series, published under the general title *Fixed resistors 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.

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FIXED RESISTORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 4: Sectional specification: Power resistors for through hole assembly on circuit boards (THT) or for assembly on chassis

1 Scope

This part of IEC 60115 relates to resistors having a rated dissipation typically greater than 1 W up to and including 1 000 W for use in electronic equipment. This document is applicable to fixed power resistors with a maximum surface temperature (MET) higher than the preferred upper category temperature (UCT) of 200 °C.

NOTE Heat sink resistors, i.e. resistors which in their operation depend on being mounted on a dedicated heat sink, owing to their special temperature conditions, are covered by a special sectional specification (under consideration at the time of publication).

These resistors are typically described according to types (different geometric shapes) and styles (different dimensions), and product technology.

The resistive element of these resistors is typically

- protected by a conformal lacquer coating, or
- cement coating, or
- vitreous enamel, or
- a ceramic body, or
- any other housing, which is to be described in the relevant specification.

The electrical connection of these resistors is typically achieved by means of

- axial leads for through hole assembly (THT), or
- vertical or radial leads or punched terminals, or
- ferrules or lugs for chassis mount, or
- push on terminals, or
- screw terminals, or
- any other termination, which is to be described in the relevant specification.

In special cases, a heat sink can be applicable but not mandatory.

The object of this document is to define preferred ratings and characteristics and to select from IEC 60115-1 the appropriate quality assessment procedures, tests and measuring methods and to give general performance requirements for this type of resistor.

NOTE SMD resistors are covered by IEC 60115-8, regardless of their dissipation.

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 60062:2016, *Marking codes for resistors and capacitors*

IEC 60063:2015, *Preferred number series for resistors and capacitors*

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

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Basic environmental testing procedures – Part 2-2: Tests – Tests B: Dry heat*

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

IEC 60068-2-20:2021, *Environmental testing – Part 2-20: Tests – Test Ta and Tb: Test methods for solderability and resistance to soldering heat of devices with leads*

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

IEC 60068-2-47, *Environmental testing – Part 2-47: Tests – Mounting of specimens for vibration, impact and similar dynamic tests*

IEC 60115-1:2020, *Fixed resistors for use in electronic equipment – Part 1: Generic specification*

IEC 60115-2:—¹, *Fixed resistors for use in electronic equipment – Part 2: Sectional specification: Low power film resistors with leads for through-hole assembly on circuit boards (THT)*

IEC 60286-1, *Packaging of components for automatic handling – Part 1: Tape packaging of components with axial leads on continuous tapes*

IEC 60286-2, *Packaging of components for automatic handling – Part 2: Tape packaging of components with unidirectional leads on continuous tapes*

IEC 60294:2012, *Measurement of the dimensions of a cylindrical component with axial terminations*

IEC 60301, *Preferred diameters of wire terminations of capacitors and resistors*

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

3 Terms, definitions, product types, product technologies and product classification

3.1 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 60115-1:2020, 3.1, as well as the following, apply.

ISO and IEC maintain terminology 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>

¹ Under development. Stage at the time of publication: IEC TPUB 60115-2:2022.

3.1.1 insulated resistor

resistor that is declared as being insulated by the relevant specification, which in order to support this has a specified insulating voltage and insulation resistance, and which is assessed for these properties with the suitable tests of this specification

[SOURCE: IEC 60115-1:2020, 3.1.7]

3.2 Product types

3.2.1 General

For each type of products there shall be detailed specifications describing the preferred technology and style of the products covered therein.

3.2.2 Axial type

Axial type designates the physical design of a component with leads for PCB mounting by bending and for through hole assembly (THT). The leads shall extend to both sides along the longitudinal axis of the components body. Figure 1 shows illustration of typical axial leaded power resistors.

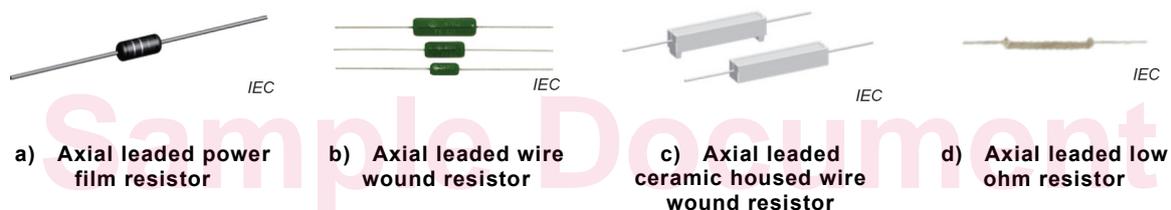


Figure 1 – Illustrations of typical axial leaded power resistors

Axial type resistors can be suitable for forming the leads to a radial assembly style if the leads are long enough; see Annex F.

3.2.3 Radial type

"Radial type" designates the physical design of a component with leads extending to one side along the diagonal axis of the component body for PCB mounting. The leads of power resistors typically originate from inside the component body. Bent versions of axial resistors made by forming of one or both leads can be used. Figure 2 shows illustration of typical radial leaded power resistors.

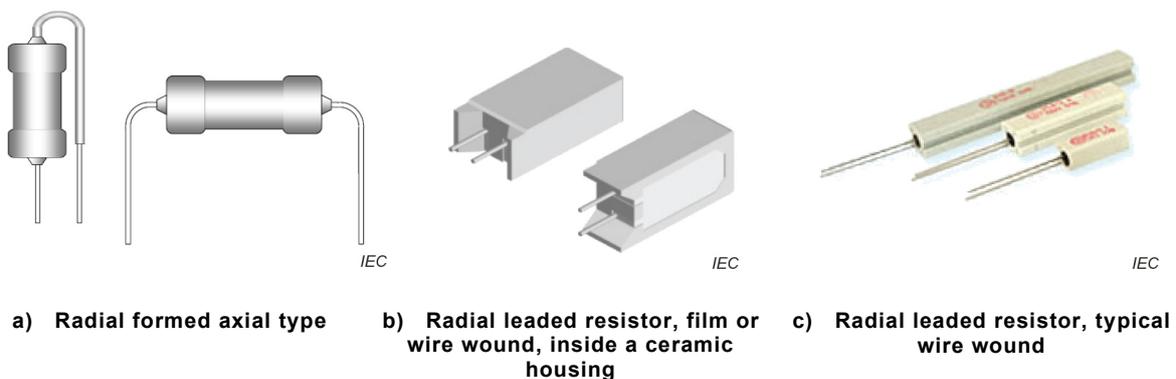


Figure 2 – Illustrations of typical radial leaded power resistors