

# INTERNATIONAL STANDARD



**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**

IEC 60115-4:2022

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IEC Secretariat  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

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## 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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://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:—<sup>1</sup>, *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>

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<sup>1</sup> 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]

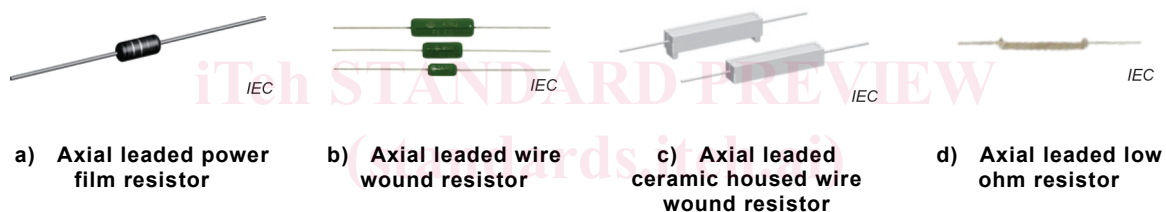
## 3.2 Product types

### 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.



IEC 60115-4:2022  
<https://standards.itec.org/standards/iec-60115-4-2022>  
 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.

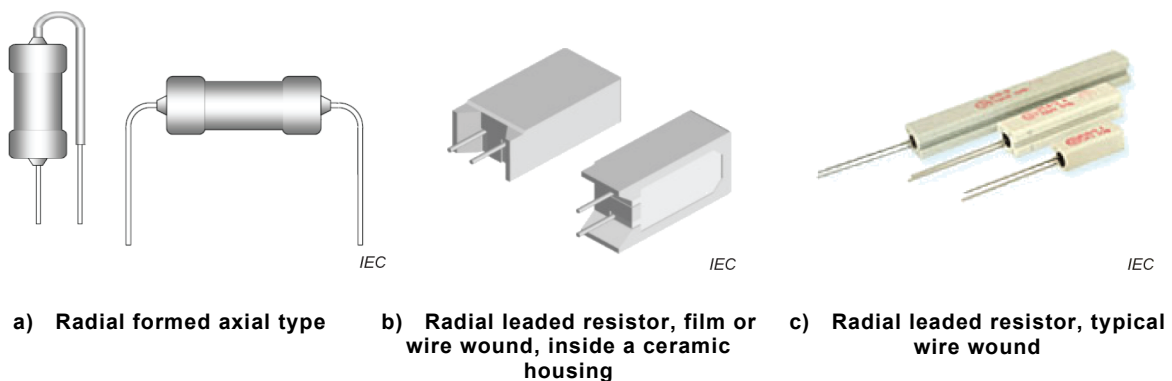


Figure 2 – Illustrations of typical radial leaded power resistors