BSI Standards Publication

Fixed resistors for use in electronic equipment

Part 2-10: Blank detail specification: Low-power film resistors with leads for through-hole assembly on circuit boards (THT), for general electronic equipment, classification level G

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National foreword

This British Standard is the UK implementation of IEC 60115-2-10:2023. It supersedes BS 9940-01.01:1983, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee W/-, Consumer Products and Services Sector Policy and Strategy Committee.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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INTERNATIONAL STANDARD

Fixed resistors for use in electronic equipment – Part 2-10: Blank detail specification: Low-power film resistors with leads for through-hole assembly on circuit boards (THT), for general electronic equipment, classification level G

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CONTENTS

FOREWORD 5
0 Introduction to the template provided by this blank detail specification 7
0.1 Scope of this blank detail specification 7
0.2 Function of this blank detail specification 7
0.3 Identification of the detail specification and the resistor 8
1 Scope 10
2 Normative references 10
3 Terms and definitions 11
4 Characteristics and ratings 11
4.1 General 11
4.2 Dimensions 11
4.3 Ratings 14
4.4 Resistance range and tolerance on resistance 15
5 Tests and test severities 16
5.1 General 16
5.2 Resistance 16
5.3 Temperature coefficient of resistance 17
5.4 Temperature rise 17
5.5 Endurance at the rated temperature 70 °C 17
5.6 Endurance at a maximum temperature: UCT 17
5.7 Short-term overload 17
5.8 Electrostatic discharge (ESD) test 18
5.9 Visual examination 18
5.10 Gauging of dimensions 18
5.11 Detail dimensions 18
5.12 Robustness of terminations 19
5.13 Vibration 19
5.14 Rapid change of temperature 19
5.15 Climatic sequence 19
5.16 Damp heat, steady state 19
5.17 Solderability, with lead-free solder 20
5.18 Solderability, with SnPb solder 20
5.19 Resistance to soldering heat 20
5.20 Solvent resistance 21
5.21 Insulation resistance 21
5.22 Voltage proof 21
5.23 Flammability 21
6 Performance requirements 21
6.1 General 21
6.2 Limits for change of resistance at tests 22
6.3 Temperature coefficient of resistance 22
6.4 Temperature rise 23
6.5 Visual examination 23
6.5.1 General visual criteria 23
6.5.2 Visual criteria after tests 24
6.5.3 Visual criteria for packaging 24

AVA Documents
Document Sharing Hub

6.6 Solderability ... 24
6.7 Insulation resistance ... 24
6.8 Flammability ... 25
7 Marking, packaging and ordering information ... 25
7.1 Marking of the component ... 25
7.2 Packaging ... 25
7.3 Marking of the packaging ... 25
7.4 Ordering information ... 25
8 Additional information ... 26
8.1 General ... 26
8.2 Storage and transportation ... 26
8.3 Substrate for assembly ... 26
8.4 Soldering process ... 26
8.5 Use of cleaning agents or solvents ... 26
8.6 Coating or potting after assembly ... 27
9 Quality assessment procedures ... 27
9.1 General ... 27
9.1.1 100 % test ... 27
9.1.2 Certificate of conformity (CoC) ... 27
9.1.3 Certified test records of released lots ... 28
9.2 Qualification approval ... 28
9.3 Maintenance of a qualification approval ... 28
9.3.1 Quality conformance inspection ... 28
9.3.2 Non-conforming specimen ... 28
Annex A (normative) Symbols and abbreviated terms ... 37
A.1 Symbols ... 37
A.2 Abbreviated terms ... 39
Annex B (normative) Reference for visual examination ... 40
Annex C (normative) Zero Ohm resistors (jumpers) ... 41
C.1 General ... 41
C.2 Characteristics and ratings ... 41
C.3 Tests and test severities ... 42
C.4 Performance requirements ... 42
C.5 Marking, packaging and ordering information ... 42
C.6 Additional information ... 42
C.7 Quality assessment procedures ... 42
C.7.1 Test schedule for qualification approval ... 42
C.7.2 Test schedule for quality conformance inspection ... 43
Annex X (informative) Cross-references to the prior revision of this specification ... 44
Bibliography ... 45

Figure 1 – Outline and dimensions ... 12
Figure 2 – Lead eccentricity of the wire terminations ... 13
Figure 3 – Length of excessive coating on the wire terminations ... 13
Figure 4 – Derating curve ... 15

Table 1 – Styles and dimensions ... 14

AVA Documents
Document Sharing Hub

Full document details: BS IEC 60115-2-10:2023

Table 2 – Climatic categories 14
Table 3 – Ratings 14
Table 4 – Temperature coefficients, tolerances and resistance ranges for climatic category … / … / … 16
Table 5 – Short-term overload duration 18
Table 6 – ESD test voltages 18
Table 7 – Additional cycles of the damp heat, cyclic test 19
Table 8 – Damp heat, steady state test duration 20
Table 9 – Limits for change of resistance at tests 22
Table 10 – Permitted change of resistance due to the variation of temperature 23
Table 11 – Test schedule for the qualification approval 29
Table 12 – Test schedule for quality conformance inspection 33
Table C.1 – Climatic category 41
Table C.2 – Ratings for 0 Ω resistors 41
Table X.1 – Cross-references to clauses of the prior edition 44

Documents
Document Sharing Hub
Full document details: BS IEC 60115-2-10:2023

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED RESISTORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 2-10: Blank detail specification: Low-power film resistors with leads for through-hole assembly on circuit boards (THT), for general electronic equipment, classification level G

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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8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 60115-2-10 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment. It is an International Standard.

This first edition cancels and replaces IEC 60115-2-1:1982. This edition constitutes a technical revision.

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

a) it employs the product classification based on application requirements as defined in the generic specification IEC 60115-1:2020;
b) it permits the specification of additional dimensional requirements concerning the eccentricity of termination wires and the coating extending onto wires;
c) it provides for a tabulated presentation of resistance ranges in relationship to the temperature coefficient and the tolerance;

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d) it supports solderability testing for both traditional lead-bearing soldering and up-to-date lead-free soldering, as required;

e) it introduces a test for the specimens' robustness to electrostatic discharge;

f) it introduces a test for the specimens' resistance to solvents;

g) it introduces a test for the flammability of the specimens;

h) it employs consistent stability requirements grouped in stability classes;

i) it supports the provision of detailed visual acceptance criteria;

j) it includes the requirement for a visual examination of the primary and proximity packaging;

k) it provides the correlated test schedules for a qualification approval and for subsequent quality conformance inspections side by side;

l) it employs quality assessment procedures which meet the requirements of a zero-defect approach, which evades the use of historic AQL levels and the permission of non-conforming specimens in test groups;

m) it provides for the inclusion of specific visual acceptance criteria, to be applied in addition to those given in Annex B of the sectional specification IEC 60115-2:2023;

n) it provides for the optional coverage of 0 Ω resistors (jumpers) within the scope of the drafted detail specification;

o) furthermore, it employs a new document structure, for which a transition guidance is provided in Annex X.

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

Draft	Report on voting
40/2944/CDV	40/3002/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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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0 Introduction to the template provided by this blank detail specification

COMMENT This introduction is not intended to be copied into the drafted detail specification. Therefore, it is positioned in front of the conventional document structure and clause numbering range. It nevertheless contains normative requirements to the drafted detail specification.

0.1 Scope of this blank detail specification

This part of IEC 60115-2 is applicable to the drafting of detail specifications for low-power film resistors with leads, classified to level G, based on the definition of the product classification levels in IEC 60115-1:2020, 3.4.

Another part of IEC 60115-2 provides a separate blank detail specification for the drafting of detail specifications for low-power film resistors with leads, classified to level P and to level R.

Yet other parts of IEC 60115-2 may be issued to provide blank detail specifications for the drafting of detail specifications for low-power film resistors with leads, of other technologies or of other classification levels.

0.2 Function of this blank detail specification

A blank detail specification is a supplementary document to the sectional specification and contains requirements for style, layout and minimum contents of detail specifications. Detail specifications not complying with these requirements shall not be accepted as being in accordance with IEC specifications nor shall they be described as such.

Detail specifications complying with the requirements of this blank detail specification are a legitimate basis for the quality assessment of leaded fixed low-power film resistors under an adequate quality assessment system, e.g. the IEC Quality Assessment System for Electronic Components (IECQ System), whereas the plain blank detail specification is not a suitable basis.

The detail specification should contain a table of contents prior the first page of the actual specification.

In the preparation of the detail specification, the content of IEC 60115-2:2023, 8.2 shall be taken into account. The detail specification should be written by using the preferred values given in IEC 60115-2.

Units, graphical symbols and letter symbols shall, whenever possible, be taken from those specified in the following standards:

– IEC 60027-1, *Letter symbols to be used in electrical technology – Part 1: General*
– IEC 60617, *Graphical symbols for diagrams*
– IEC 80000 (all parts), *Quantities and units*
– ISO 80000 (all parts), *Quantities and units*

This blank detail specification uses for its purpose two different kinds of notes:

– NOTE For notes which give additional information intended to assist the understanding or use of the resulting document and therefore shall be copied as NOTE into the drafted detail specification. As outlined in the ISO/IEC directives, these notes shall not contain any requirement, instruction, recommendation or permission.

– COMMENT For editorial notes which are intended to aid and direct the specification writer and therefore shall not be copied into the drafted detail specification. In order to accomplish their function, editorial notes require the use of instructions, recommendations and permissions addressed to the writer of the detail specification.

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0.3 Identification of the detail specification and the resistor

The first page of the detail specification should have a layout starting with a title block as recommended on the following page.

The numbers in square brackets are editorial references, which are not intended to be copied into the drafted detail specification, and which correspond to the following information on the contents which shall be inserted in the indicated fields.

[1] The name of the standardisation organisation under whose authority the detail specification is published and, if applicable, the organization from whom the detail specification is available.

[2] The number allocated to the detail specification by the IEC or by the responsible standardisation organisation, together with the date of issue and issue number, as applicable. Further reference details required by the responsible standardisation organisation or quality assessment system may be given here, including an established mark of conformity, as applicable.

[3] The number and issue date and number, as applicable, of the relevant generic specification, sectional specification and blank detail specification, where the referenced issues shall be the most recent issues of the respective specifications.

[4] The title of the detail specification, providing a short description of the type of resistors.

This entry should support the discrimination between similar specifications and should be suitable for an entry in a register of approvals or in a catalogue of standards. It may duplicate information given in fields [6] and [7] and in the textual scope in Clause 1.

[5] An outline drawing or illustration of the products. This entry should aid the easy recognition of the specified resistors and, if possible, support the discrimination between similar specifications. It may duplicate information given in Figure 1.

[6] Information on the typical construction of the resistors (where applicable), information of the specified resistors being insulated or non-insulated (see IEC 60115-1:2020, 3.1.7), and information on compatibility with a specific soldering process (if applicable, see 8.4). This entry may duplicate information given in the textual scope in Clause 1.

[7] The classification level of the resistors covered by this detail specification, the level of quality assessment (Assessment level EZ), and the general level of stability requirements at performance tests (Stability class).

This information may duplicate information given in the textual scope in Clause 1.

[8] Optional field for table notes.

[9] Statement(s) about the availability of information on components qualified to this detail specification, if applied within a full quality assessment system.

Example for the use within the IECQ system:

Information about components qualified to this detail specification is available in the approvals section of the website http://www.iecq.org.

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Specification available from: [1]	**IEC 60115-2-10xx:20yy** [2]
Electronic components of assessed quality in accordance with: Generic specification: IEC 60115-1:2020 [3] Sectional specification: IEC 60115-2:2023 Blank detail specification: IEC 60115-2-10:2023	
FIXED RESISTORS FOR USE IN ELECTRONIC EQUIPMENT – **Part 2-10xx: Detail specification –** **Low-power film resistors with leads for through-hole assembly on circuit boards (THT), for general electronic equipment, classification level G,** [4]	
[5]	Technology … [6] Insulated / Non-insulated
	Product classification level G Assessment level EZ [7] Stability classes …
[8]	

COMMENT The remainder of this page is intentionally left empty in order to start Clause 1 on top of the next page.

Information about components qualified to this detail specification is available ….. [9]

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FIXED RESISTORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 2-10: Blank detail specification: Low-power film resistors with leads for through-hole assembly on circuit boards (THT), for general electronic equipment, classification level G

1 Scope

COMMENT The text of this clause may repeat information already given in some fields of the above title block. Essential information on the special type of components covered by the drafted detail specification may be added, preferably at the place marked with "...".

This detail specification specifies the characteristics and ratings of low-power film resistors with leads for use in electronic equipment, which are typically assembled in through-hole technology (THT) on circuit boards.

...

The resistors covered herein are classified to level G, as defined in IEC 60115-1:2020, 3.4 for general electronic equipment, typically operated under benign or moderate environmental conditions, where the major requirement is function. Examples for level G include consumer products and telecommunication user terminals.

This detail specification is based upon the blank detail specification IEC 60115-2-10:2023.

This detail specification establishes test schedules and performance requirements permitting the quality assessment of the resistors covered herein according to the quality assessment procedures specified by IEC 60115-1:2020, Annex Q.

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, *Marking codes for resistors and capacitors*

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

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

IEC 60115-2:2023, Fi*xed 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 60115-2-10:2023, *Fixed resistors for use in electronic equipment – Part 2-10: Blank detail specification –Low-power film resistors with leads for through-hole assembly on circuit boards (THT), for general electronic equipment, classification level G*

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

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

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

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

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

…

COMMENT 1 The above list of normative references provides an example and needs to be adapted to the actual requirements of the drafted detail specification, indicated by the space marked with "…", which however does not preclude from sorting in proper numerical order.

COMMENT 2 According to the ISO/IEC directives, dated references are required when reference is made to a specific part of the referenced standard and generally should be applied only in such cases.

COMMENT 3 It is recommended to update any dated references to the most recent revision of the referenced standard when drafting a detail specification. This involves updating of the dated normative references within the text of the drafted detail specification.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60115-1 and in IEC 60115-2, as well as the following, apply.

…

COMMENT Any terms and their respective definitions specifically required for the scope of the drafted detail specification may be inserted in the space marked with "…", using the specified numbering and format. Otherwise, the above statement should be reduced to "For the purposes of this document, the terms and definitions given in IEC 60115-1 and in IEC 60115-2 apply." if no further terms or definitions are required in the drafted detail specification.

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

4 Characteristics and ratings

4.1 General

Various parameters of this component are precisely defined in this specification. Unspecified parameters can vary from one component to another.

4.2 Dimensions

The shape and dimensions of the resistors covered by this specification are shown in Figure 1, with the specific styles and their respective dimensions given in Table 1. Other shapes are permissible within the given dimensions.

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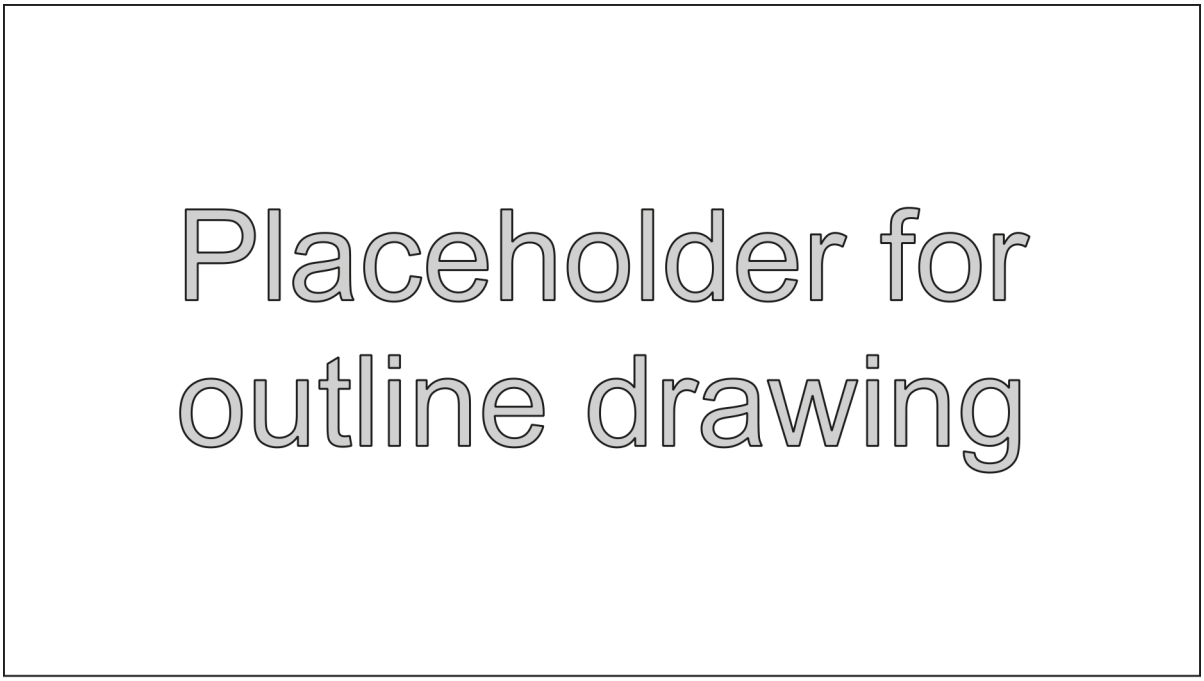

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Figure 1 – Outline and dimensions

COMMENT 1 See IEC 60115-2:2023, 8.2.1.

COMMENT 2 The details shown in Figure 1 may repeat information already given in some fields of the title block above. Figure 1 in particular needs to define all dimensions intended to be verified by measurements, which generally includes those dimensions to be specified in Table 1.

Table 1 – Styles and dimensions

Style		Dimensions					Mass[f]
Metric	X[a]	D[b] mm	L[c] mm	d[d] mm	Y	l_{min}[e] mm	m mg

[a] Historical style code, for information only.

[b] The body diameter of the resistor D shall be gauged as specified in IEC 60294 (see IEC 60115-2:2023, 5.3.11).

[c] The body length of the resistor L shall be gauged and measured in accordance with IEC 60294 (see IEC 60115-2:2023, 5.3.11 and 5.3.12).

[d] Nominal diameter of the lead wires d, with permissible tolerances in accordance with IEC 60301.

[e] The minimum lead length l_{min} for products in tape packaging in accordance with IEC 60286-1 applies to the length of the free sections of lead wire between the resistor body and each tape. For untaped resistors, it applies to the length of each lead wire.

[f] For information only.

COMMENT 3 See IEC 60115-2:2023, 8.2.2.

COMMENT 4 The metric style designation is the normative designation used in all other places throughout this detail specification, see IEC 60115-2:2023, 4.2.1. Column X is an optional column for additional style information, e.g. for traditional alphabetic designations, which generally need to be marked with a respective footnote, e.g. "Historical style code, for information only".

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COMMENT 5 The dimensions for body diameter D, body length L, lead wire diameter d and minimum free lead length l_{min} are given as examples based on the requirements for axial leaded resistors with cylindrical bodies and need to correspond to the dimensions identified in Figure 1. The choice of specified dimensions needs to be adapted to the actual requirements of the drafted detail specification and the shape of products covered therein. The dimensions may be given in the format of nominal values plus tolerance, or by stating permissible minimum and maximum values. Columns for additional dimensions may be inserted as required.

COMMENT 6 Column Y represents one or more optional column(s) for the specification of an additional dimension, e.g. the permissible lead eccentricity and/or the permissible length of excessive coating on the leads, as required.

COMMENT 7 The specified minimum lead length should take account of the variety of inside tape spacing specified as dimension B by IEC 60286-1, plus the permissible window for the lateral resistor body location, given there as dimension K.

COMMENT 8 The component mass is not intended to be verified by an inspection procedure. It should be given as the maximum mass of a single component and should be marked with a respective footnote as "For information only".

The wire terminations of the resistor shall emerge concentrically from the end faces of the resistor body; see IEC 60115-2:2023, 4.2.4 with IEC 60115-2:2023, Figure 6. The real eccentricity e, as shown in below Figure 2, shall not exceed the limit given in Table 1. For gauging of the lead eccentricity, the effective eccentricity e' should be used; see IEC 60115-2:2023, 4.2.4.

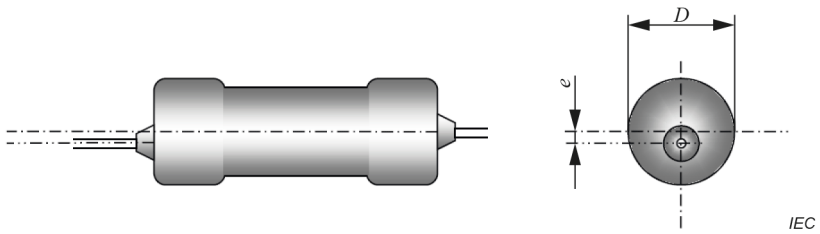

Figure 2 – Lead eccentricity of the wire terminations

COMMENT 9 The above paragraph and figure are optional and given as an example for the specification of a permissible lead eccentricity. If this specification is used in the drafted detail specification, a suitable method for gauging and/or measuring of the lead eccentricity needs to be described, e.g. in the respective subclauses of Clause 5. Alternatively, the deletion of this paragraph and figure will result in the need to update the numbering of subsequent figures accordingly.

The resistor shall be properly coated in order to provide a suitable protection against mechanical, electrical and climatic influences, e.g. by means of a conformal lacquer coating. It is typical for such coating to also cover the end faces of the resistor body, which can lead for some amount of excessive coating to spread onto the leads; see IEC 60115-2:2023, 4.2.2 with IEC 60115-2:2023, Figure 4. The length of excessive coating c, as shown in below Figure 3, shall not exceed the limit given in Table 1.

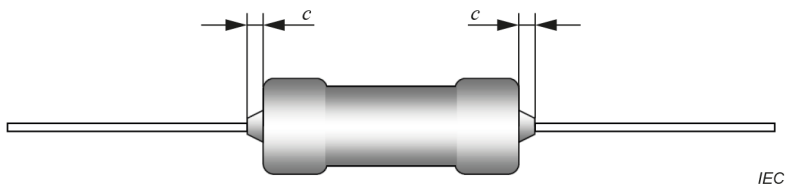

Figure 3 – Length of excessive coating on the wire terminations

COMMENT 10 The above paragraph and figure are optional and given as an example for the specification of a permissible length of excessive coating on the wire terminations. If this specification is used in the drafted detail specification, a suitable method for gauging and/or measuring of the length of excessive coating needs to be described, e.g. in the respective subclauses of Clause 5. Alternatively, the deletion of this paragraph and figure will result in the need to update the numbering of subsequent figures accordingly.

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