

**Fixed resistors for use in electronic equipment - Part 2:
Sectional specification: Leaded fixed low power film
resistors**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 60115-2:2015 sisaldab Euroopa standardi EN 60115-2:2015 ingliskeelset teksti.	This Estonian standard EVS-EN 60115-2:2015 consists of the English text of the European standard EN 60115-2:2015.
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English Version

**Fixed resistors for use in electronic equipment - Part 2:
Sectional specification: Lead fixed low power film resistors
(IEC 60115-2:2014 , modified)**

Résistances fixes utilisées dans les équipements
électroniques - Partie 2: Spécification intermédiaire:
Résistances fixes à broches à couches, à faible dissipation
(IEC 60115-2:2014 , modifiée)

Festwiderstände zur Verwendung in Geräten der Elektronik
- Teil 2: Rahmenspezifikation - Verbleite niedrig belastbare
Schichtwiderstände
(IEC 60115-2:2014 , modifiziert)

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

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Foreword

This document (EN 60115-2:2015) has been prepared by CLC/TC 40XB “Resistors”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-12-15
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2017-12-15

This document supersedes EN 140100:2008.

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 60115-2:2014 are prefixed “Z”.

1 Modification to Clause 2

After the 1st paragraph, **add** the following note:

NOTE The readers of this European Standard are advised of the corresponding European documents listed in the normative Annex ZA, which take precedence over the International Standards listed in this clause. The precedence also applies to all normative references made within this document.

2 Modification to 3.1

At the end, **add** the following:

3.1.Z1

nominal resistance

R_n

resistance value for which the resistor has been designed, and which is generally used for denomination of the resistor

Note 1 to entry: The definition of nominal resistance, R_n , is identical to the definition of rated resistance, R_r , in EN 60115-1:2011. Therefore nominal resistance, R_n , may be applied wherever rated resistance, R_r , is required, e.g. in a quality assessment scheme.

3 Modifications to 3.3

At the beginning of the 2nd paragraph, **replace** “Two general end product levels” by “Three general end product levels”.

After the 5th paragraph (Examples for Level P ...), **add** the following:

NOTE Z1 Product classification level P adopts and succeeds the former Version A.

Replace the 6th paragraph (Level P is the suitable basis ...) by

Level R – High-performance and high-reliability electronic equipment, where the requirement for established reliability and for an approved failure rate level applies in addition to the criteria of Level P.

Examples for Level R include military & defence equipment, avionics and aerospace applications.

NOTE Z2 Product classification level R adopts and succeeds the former Version E.

Replace the 7th paragraph (Each level shall be used ...) by

Each level shall be used in individual detail specifications, except for Level P and Level R, which may be used in combined detail specifications.

4 Modification to 4.6

Replace the 4th paragraph by

The upper category temperature (UCT), which is used for test procedures, shall be the same as the maximum element temperature (MET).

5 Modification to 5.2.10

Replace the last paragraph by

This test is mandatory only for resistors categorized as Level P or as Level R.

6 Modification to 5.2.12.5

Replace the 2nd entry for air pressure (1 kPa ...) by

$$p_{\text{amb}} = 1 \text{ kPa, for resistors categorized as Level P or as Level R.}$$

7 Modification to 5.2.14

Replace the last paragraph by

The extended endurance of this test is mandatory only for resistors categorized as Level P or as Level R.

8 Modification to 5.2.17

Replace the last paragraph by

This test is mandatory only for resistors categorized as Level P or as Level R.

9 Modification to 5.2.18

Replace the entry for the solvent temperature by

$$\vartheta_{\text{bath}} = (50_{-5}^0) ^\circ\text{C}$$

10 Modification to 5.2.19

Replace the entry for solvent temperature by

$$\vartheta_{\text{bath}} = (50_{-5}^0) ^\circ\text{C}$$

11 Modifications to 5.2.21

Replace the 2nd list entry for positive discharges ($n_{\text{pos}} = 3 \dots$) by

$$n_{\text{pos}} = 3 \text{ for resistors categorized as Level P or as Level R}$$

Replace the 2nd list entry for negative discharges ($n_{\text{neg}} = 3 \dots$) by

$$n_{\text{neg}} = 3 \text{ for resistors categorized as Level P or as Level R}$$

12 Modification to 5.2.22

Replace the last paragraph by

This test is mandatory only for resistors categorized as Level P or as Level R.

13 Modification to 6.2

Replace Footnote ^a in Table 3 by

^a Test is mandatory only for resistors categorized as Level P or as Level R.

14 Modification to 6.5

Replace the explanation for MET by

MET is the maximum element temperature, MET = UCT.

15 Modifications to 9.4

Replace the 1st paragraph by

9.4.Z1 General

The procedures for Qualification Approval testing are given in EN 60115-1:2011, Clause Q.2, with the test procedures described in EN 60115-1:2011, Q.2.4.

Replace the last paragraph by

9.4.Z2 Granting the approval for products classified to Level G or to Level P

The qualification approval for classification level G or P shall be granted after successful completion of 1 000 h of the test endurance at 70 °C and all other tests of Table 5.

9.4.Z3 Granting the approval for products classified to Level R

The qualification approval for classification level R, failure rate level E5 shall be granted after successful completion of 1 000 h of the test Endurance at 70 °C and all other tests of Table 5.

Thereafter, the qualification approval for classification level R, failure rate level E6 shall be granted after successful completion of 8 000 h of the test Endurance at 70 °C.

The qualification approval for classification level R shall be withdrawn if the 8 000 h test is not completed successfully.

16 Modification to 9.5

Replace the 1st sentence of the 1st paragraph by

The schedule for the lot-by-lot and periodic tests for Quality Conformance Inspection of resistors categorized as level G, P or R are given in Table 6.

17 Modification to 9.6

Replace the 1st paragraph by

This sectional specification does not support the capability approval as described in EN 60115-1:2011, Q.3.

18 Modification to 9.7

Replace the 1st paragraph by

The provisions of EN 60115-1:2011, Q.4 shall apply, and the test schedules of Table 5 and Table 6 shall be used.

19 Modification to 9.8

Replace the 1st paragraph by

The provisions of EN 60115-1:2011, Q.1.7 shall apply, except that the inspection level shall be reduced to S-2.

20 Modification to 9.9

Replace the 1st paragraph by

Certified test records according to EN 60115-1:2011, Q.1.5 can be supplied, if agreed upon between the manufacturer and the customer.

21 Modifications to Table 5

In Group 7, Test 4.25.1.8, **replace** the bracketed term of the entry in the 1st column by

(applicable only to resistors categorized as Level P or as Level R)

In Group 12, Test 4.39, **replace** the bracketed term of the entry in the 1st column by

(applicable only to resistors categorized as Level P or as Level R)

In Group 13, Test 4.19, **replace** the bracketed term of the entry in the 1st column by

(applicable only to resistors categorized as Level P or as Level R)

In Group 14, Test 4.27, **replace** the bracketed term of the entry in the 1st column by

(applicable only to resistors categorized as Level P or as Level R)

22 Modifications to Table 6

In Group C2, Test 4.25.1.8, **replace** the bracketed term of the entry in the 1st column by

(applicable only to resistors categorized as Level P or as Level R)

In Group F, Test 4.19, **replace** the bracketed term of the entry in the 1st column by

(applicable only to resistors categorized as Level P or as Level R)

In Group G, Test 4.27, **replace** the bracketed term of the entry in the 1st column by

(applicable only to resistors categorized as Level P or as Level R)

23 Modifications to Clause D.1

In the list of letter symbol explanations, **add** the new entry after the entry for R_n :

R_r	Rated resistance, $R_r = R_n$	Ω
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In the list of letter symbol explanations, **replace** the respective entries for temperature T to $\Delta T_{\max}$ by

ϑ	Temperature, e.g. as an atmospheric condition for testing (also written as T)	$^{\circ}\text{C}$
ϑ_A	Low temperature of a change of temperature test (also written as T_A)	$^{\circ}\text{C}$
ϑ_B	High temperature of a change of temperature test (also written as T_B)	$^{\circ}\text{C}$
ϑ_{amb}	Ambient temperature (also written as T_{amb})	$^{\circ}\text{C}$
ϑ_{bath}	Bath temperature, e.g. in solvent resistance or solder bath tests (also written as T_{bath})	$^{\circ}\text{C}$
ϑ_{max}	Maximum temperature, maximum element temperature (also written as T_{max})	$^{\circ}\text{C}$
ϑ_r	Rated temperature (also written as T_r)	$^{\circ}\text{C}$
ϑ_{sup}	Upper temperature, e.g. in a respective temperature sequence (also written as T_{sup})	$^{\circ}\text{C}$
$\Delta\vartheta$	Temperature rise (also written as ΔT)	K
$\Delta\vartheta_{\text{max}}$	Maximum permissible temperature rise (also written as ΔT_{max})	K

24 Modifications to Annex X

Delete Annex X (Cross reference for references to the prior revision of this standard).

25 New Annex ZA

Add the new normative Annex ZA (see attached Annex ZA) on correspondences for normative references.

26 New Annex ZX

Add the new informative Annex ZX (see attached Annex ZX) providing cross references for references to the predecessor of this specification.

27 Modifications to the Bibliography

Replace the Bibliography by the Bibliography providing references to European Standards (see attached Bibliography).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60062	2004	Marking codes for resistors and capacitors	EN 60062 + corrigendum Jan.	2005 2007
IEC 60068-1	2013	Environmental testing - Part 1: General and guidance	EN 60068-1	2014
IEC 60068-2-1	-	Environmental testing - Part 2-1: Tests - Test A: Cold	EN 60068-2-1	-
IEC 60068-2-2	-	Environmental testing - Part 2-2: Tests - Tests B: Dry heat	EN 60068-2-2	-
IEC 60068-2-6	2007	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	2008
IEC 60068-2-20	2008	Environmental testing - Part 2-20: Tests – Test T – Test methods for solderability and resistance to soldering heat of leaded devices	EN 60068-2-20	2008
IEC 60115-1 (mod.)	2008	Fixed resistors for use in electronic equipment - Part 1: Generic specification	EN 60115-1	2011
IEC 60286-1	-	Packaging of components for automatic handling - Part 1: Tape packaging of components with axial leads on continuous tapes	EN 60286-1	-
IEC 60294	2012	Measurement of the dimensions of a cylindrical component having two axial terminations	EN 60294	2012
IEC 60301	-	Preferred diameters of wire terminations of capacitors and resistors	EN 60301	-
IEC 61193-2	2007	Quality assessment systems – Part 2: Selection and use of sampling plans for inspection of electronic components and packages	EN 61193-2	2007
IEC 61760-1	2006	Surface mounting technology – Part 1: Standard method for the specification of surface mounting components (SMDs)	EN 61760-1	2006

Annex ZX (informative)

Cross reference for references to the predecessor of this specification

This sectional specification is presented in a new structure compared to the preceding document. The following table provides a cross reference for all references to specific elements of the predecessor of this Sectional Specification.

EN 140100:2003 Clause/Subclause	EN 60115-2:2015 Clause/Subclause	Notes
1	—	The subject is covered by Clauses 1 and 8.
1.1	1	—
1.2	8	—
2	—	The subject is covered by Clauses 4, 5 and 6.
2.1	—	The subject is covered by Clauses 4 and 6.
2.1.1	4.1	The prior Table 1 is succeeded by Table 1.
2.1.2	4.2	The prior Table 2 is succeeded by Table 4.
2.1.3	6.4	—
2.1.4	6.2	The prior Tables 3a and 3b are succeeded by Tables 3a and 3b, respectively.
2.2	4	—
2.2.1	4.4	—
2.2.2	4.5	—
2.2.3	4.6	—
2.2.4	4.7	—
2.2.5	4.9	—
2.2.6	4.8	—
2.2.7	—	The subject is left to the ruling of the detail specification.
2.3	5.2	—
2.3.1	5.2.13	—
2.3.2	5.2.11	—
2.3.3	5.2.12.5	—
2.3.4	5.2.9 5.2.10	—
2.3.5	5.2.7	—
2.3.6	5.2.8	—
2.3.7	5.2.4	—
2.3.8	5.2.17	—