



# SLOVENSKI STANDARD

## SIST EN 60115-1:2023

01-maj-2023

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### Fiksni upori za elektronsko opremo - 1. del: Splošna specifikacija (IEC 60115-1:2020, spremenjen)

Fixed resistors for use in electronic equipment - Part 1: Generic specification (IEC 60115-1:2020 (MOD))

Festwiderstände zur Verwendung in Geräten der Elektronik - Teil 1: Fachgrundspezifikation (IEC 60115-1:2020 (MOD))

Résistances fixes utilisées dans les équipements électroniques - Partie 1: Spécification générique (IEC 60115-1:2020 (MOD))

Ta slovenski standard je istoveten z: **EN 60115-1:2023**

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#### ICS:

31.040.10      Fiksni upor      Fixed resistors

**SIST EN 60115-1:2023**      **en**



EUROPEAN STANDARD

**EN 60115-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2023

ICS 31.040.10

Supersedes EN 60115-1:2011;  
EN 60115-1:2011/A11:2015

English Version

**Fixed resistors for use in electronic equipment - Part 1: Generic specification  
(IEC 60115-1:2020, modified)**Résistances fixes utilisées dans les équipements  
électroniques - Partie 1: Spécification générique  
(IEC 60115-1:2020, modifiée)Festwiderstände zur Verwendung in elektronischen Geräten  
- Teil 1: Fachgrundspezifikation  
(IEC 60115-1:2020, modifiziert)

This European Standard was approved by CENELEC on 2023-02-13. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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[SIST EN 60115-1:2023](https://standards.iteh.ai/catalog/standards/sist/4b65dd59-7816-47f8-bc3d-173d7911f310/sist-en-60115-1-2023)

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## European foreword

This document (EN 60115-1:2023) consists of the text of IEC 60115-1:2020 prepared by IEC/TC 40, "Capacitors and resistors for electronic equipment", together with the common modifications prepared by the 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) 2024-02-13
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2026-02-13

This document supersedes EN 60115-1:2011 + EN 60115-1:2011/A11:2015.

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

- a) this edition employs a new document structure, where the tests of prior Clause 4 are given in Clauses 6 to 12 now, with an informative Annex ZX providing cross-references for references to the prior revision of this standard;
- b) the terms and definitions have been revised and amended, supplemented by a new section on resistor technologies and a new section on product classification levels;
- c) a new Subclause 4.7 on recommendations for permissible substitutions has been added;
- d) the provisions for packaging, storage and transportation in Subclauses 4.8, 4.9 and 4.10 have been completely revised;
- e) a new Subclause 5.3 on default tolerances for the most common test parameters has been added;
- f) the generic method of measuring resistance, now Subclause 5.6, has been separated from the test for compliance with a prescribed resistance value in 6.1, as a revision of the prior 4.5;
- g) the test for the temperature coefficient of resistance of Subclause 6.2 is a revision of the prior test 4.8, variation of resistance with temperature, where the special concessions for resistors below 10  $\Omega$  have been waived;
- h) the single-pulse high-voltage overload test of Subclause 8.2 (prior 4.27) has been completely revised;
- i) the periodic-pulse high-voltage overload test of Subclause 8.3 (prior 4.28) has been revised and a corrected table of severities provided;
- j) the period-pulse overload test of Subclause 8.4 (prior 4.39) has been deprecated and streamlined to only offer the severity historically applied in subordinate specifications;
- k) the Subclauses 9.1 on visual inspection, 9.2 on the gauging of dimensions, and 9.3 on the assessment of detail dimensions (all parts of prior 4.4) have been completely revised;
- l) the tests for robustness of terminations (prior 4.16) have been revised and separated into tests for the robustness of solderable terminations, Subclause 9.5, and tests for the robustness of threaded stud or screw terminations, Subclause 9.6;

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- m) the bump test of Subclause 9.9 (prior 4.20) and the shock test of Subclause 9.10 (prior 4.21) have been revised to reflect the merged relevant test standard EN 60068-2-29;
- n) the accelerated damp heat, steady-state test of Subclause 10.5 (prior 4.37) has been amended with an option for a reduced number of bias voltages;
- o) the corrosion test of Subclause 10.6 has been completely revised in order to employ the better suitable test method of EN 60068-2-52 instead of the prior used EN 60068-2-11;
- p) the whisker growth test of 10.7 has been revised to reflect the changes of the new revision of the test methods of EN IEC 60068-2-82;
- q) the test methods for solderability of Subclause 11.1 (prior 4.17) and for resistance to soldering heat of Subclause 11.2 (prior 4.18) have been completely revised to incorporate the necessary option for the variety of lead-bearing and lead-free solder alloys and respective process conditions;
- r) the solvent resistance test of 11.3 combines the prior tests 4.29, component solvent resistance, and 4.30, solvent resistance of marking, in one test;
- s) the accidental overload test of Subclause 12.3 (prior 4.26) has been completely revised.

Preceding documents on the subject covered by this specification have been:

- EN 60115-1:2001 + EN 60115-1:2001/A1:2001 + EN 60115-1:2001/A11:2007
- EN 140000:1993-12
- CECC 40 000:1973-00, 1979-00.

Clauses, subclauses, annexes, notes, tables and figures which are additional to those in IEC 60115-1:2020 are prefixed "Z".

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

## 1 Modification to the Introduction

Add the following new paragraph after the existing first paragraph:

“The explanation given in this introduction uses IEC documents as examples. Anyhow, the same principles apply in unison to respective documents with EN or EN IEC prefix.”

## 2 Modification to Clause 1

Replace the first paragraph with the following:

“This part of EN 60115 is a generic specification and is applicable to fixed resistors for use in electronic equipment.”

## 3 Modification to Clause 2

3.1 Modify the normative reference to IECQ 03-1:2018 as follows:

IECQ 03-1:2020, *IEC Quality Assessment System for Electronic Components (IECQ System) – Rules of procedure – Part 1: General Requirements for all IECQ Schemes*

3.2 Add the following two entries:

IECQ 03-3:2018, *IEC Quality Assessment System for Electronic Components (IECQ System) – Rules of Procedure – Part 3: IECQ Approved Component Products, Related Materials and Assemblies Scheme*

IECQ 03-3-1:2018, *IEC Quality Assessment System for Electronic Components (IECQ System) – Rules of Procedure – Part 3-1: IECQ Approved Component Products, Related Materials and Assemblies Scheme, IECQ Approved Component – Technology Certification (IECQ AC-TC)*

## 4 Modification to Clause 5

In 5.1, replace the 4th paragraph with the following:

“The performance requirements prescribed by any relevant specification are absolute limits. The policy on uncertainty of measurements and inset limits, as given in IECQ 03-1:2020, Annex C, shall be applied.”

## 5 Modification to Clause 9

Replace the 1st paragraph in 9.2.2.1, as well as the 1st paragraph in 9.3.2.1, with the following:

“The limiting dimensions are generally prescribed as absolute limits. The policy on inset limits in accordance with IECQ 03-1:2020, Annex C, shall be applied to the preparation of gauges or other representations of the required acceptance windows.”

## 6 Modification to Annex B

Replace Annex B with the following:

“

## Annex B (normative)

### Rules for the preparation of detail specifications for resistors and capacitors for electronic equipment for use within the IECQ system

**B.1** The drafting of a complete detail specification, in line with the CEN/CENELEC Internal Regulations, shall begin only when all the following conditions have been met:

- a) the generic specification has been approved;
- b) the sectional specification, if appropriate, has been circulated for approval according to the relevant system rules (e.g. FDIS, or unanimously approved CDV, at IEC);
- c) the associated blank detail specification has been circulated for approval according to the relevant system rules (e.g. FDIS, or unanimously approved CDV, at IEC);

**B.2** Detail specifications shall use the standard or preferred values, ratings and characteristics, and severities for environmental tests, etc. which are given in the appropriate generic or sectional specifications.

An exception to this rule may only be granted for a specified detail specification, if agreed by the technical committee.

**B.3** The detail specification should not be circulated for approval according to the relevant system rules (e.g. FDIS, or unanimously approved CDV, at IEC) until the sectional and blank detail specifications have been approved for publication.”

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## 7 Modification to Annex C

Replace Annex C with the following:

“

### Annex C (informative)

#### Example of a certified test record

Component manufacturer	Veriohm Ltd.
Place of manufacture	Amper Lane 8, Voltville
Detail specification and issue	EN 140401-808:2021
Description of component	Fixed low power film surface mount (SMD) resistors, Rectangular
Current three months period	2021-01-01 – 2021-03-31

This Certified Test Record is a completed and accurate record of the tests carried out in accordance with the specified procedures.

Manufacturer

Designated Management Representative (T. Rustworthy)

IECQ Certification Body

Supervising Inspector (S. Crutiny)

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## EN 60115-1:2023 (E)

TEST REPORT THIN FILM RESISTORS				Detail Specification: EN 140401-808:2021			
-Style(s): RR1005M (abc0402) - RR1608M (abc0603) - RR2012M (abc0805) - RR3216M (abc1206)				Date: 2021-03-31			
Resistance range: 0.22Ω to 10MΩ; 0.0Ω		Resistance tolerance(s): 0.1% to 5%		TCR(s): 10, 15, 25 and 50 · 10 <sup>-6</sup> /K			
1. RESULTS OF QUALIFICATION AND QUALITY CONFORMANCE TESTS							
Group <sup>1)</sup>	Test <sup>1)</sup>	Clause <sup>2)</sup>	Req. <sup>1)</sup>	Test results			
				Quarter: I/21		Period: I/88 - I/21	
				pcs tested	failures	pcs tested	failures
A1	Resistance value	6.1 [4.5]	E	400	0	350.223	1
A2	Visual examination	9.1 [4.4.1]	A	0	0	63.260	0
	Marking	9.1 [4.4.1]	B	140.459	0	2.500.533	5
	Dimensions (gauging)	9.2 [4.4.2]	D	0	0	2.840	0
B1	Insulation resistance	12.1 [4.6]	D	0	0	631	0
	Voltage proof	12.2 [4.7]	F	40	0	2.395	0
	Short time overload	8.1 [4.13]	D	50	0	177.370	1
B2	Solderability	11.1 [4.17]	G	1.135	0	3.422.323	57
C1	Substrate bending test	9.8 [4.33]	D	0	0	8.700	8
	Shear test	9.7 [4.32]	C	0	0	3.480	1
	Rapid change of temperature	10.1 [4.19]	D	0	0	3.740	0
	Climatic sequence	10.3 [4.23]	D	0	0	6.850	0
C2	Endurance at 70 °C - 1000 h	7.1 [4.25.1]	D	0	0	6.409	2
	Extended endurance - 8000 h	7.1.8 [4.25.1.8]	D	0	0	2.120	0
C3	Resistance to soldering heat	11.2 [4.18]	D	830	0	315.762	44
	Flammability	12.4 [4.35]	D	0	0	125	0
D1	Variation of resistance with temperature	6.2 [4.8]	H	28.022	0	383.252	20
D2	Damp heat, steady state	10.4 [4.24]	D	0	0	1.480	1
D3	Dimensions (detail)	9.3 [4.4.3]	D	40	0	1.645	0
	Endurance at UCT	7.3 [4.25.3]	D	0	0	480	0
	Temperature rise	6.7 [4.14]	D	0	0	50	0
E	Electrostatic discharge	8.5 [4.38]	D	0	0	1.060	1
	Component solvent resistance	11.3 [4.29]	C	0	0	26.342	0
	Solvent resistance of marking	11.3 [4.30]	B, C	0	0	1.307	0
	Vibration	9.11 [4.22]	D	0	0	0	0
	Periodic pulse overload	8.4 [4.39]	D	0	0	0	0
F	Rapid change of temperature	10.1 [4.19]	D	0	0	910	0
G	Single pulse high voltage overload	8.2 [4.27]	D	0	0	1.220	0

1) According to detail specification(s)

2) Clause numbers relate to EN 60115-1:2021, complemented with clause numbers related to EN 60115-1:2011 in square brackets [..].

## Requirements :

A : Condition, workmanship and finish shall be satisfactory

B : Marking shall be legible

C : No visible damage or reduced usability

D : Parameter / resistance change as specified in the detail specification

E : Rated tolerance of resistance not to be exceeded at 20 °C

F : No break down or flashover

G : Good tinning (≥ 95 %) with wetting of the terminations

H : TCR between -55 °C and 20 °C and TCR between 20 °C and 125 °C less than rated TCR

## Remarks:

none

## 8 Modification to Annex Q

8.1 Modify the indication of Annex Q from informative to normative, as follows:

### “Annex Q (normative)

#### Quality assessment procedures”

8.2 In Q.1.4, replace the 1st paragraph as follows:

“Rework is the rectification of a processing error, prior to the release of the component, by means not differing from those used in the current process, or by an explicitly permitted rework process.”

8.3 In Q.1.9, replace the 1st paragraph as follows:

“Repair is the making good of an approved component which has been damaged or has become defective after its release, and is not permitted under the Rules of Procedure.”

8.4 In Q.1.11, replace the paragraph as follows:

“An organisation may be covered by one certification for more than one location (site) (see IECQ 03-1:2020, Clause 5 and Annex D, and IECQ 03-3:2018, Clause 5).”

8.5 In Q.2.1, replace the 1st paragraph as follows:

“An IECQ Approved Component certification may be granted to a manufacturer meeting the requirements given in IECQ 03-1:2020, 9.2 and in IECQ 03-3:2018, Clause 8.”

8.6 In Q.3.5, replace the paragraph as follows:

“QA shall be granted by the Certification Body (CB) when all requirements have been met (see IECQ 03-1:2020, 9.7).”

8.7 In Q.4.2, replace the 1st paragraph as follows:

“An IECQ Approved Component – Capability Certification may be granted to a manufacturer meeting the requirements given in IECQ 03-1:2020, 9.2 and in IECQ 03-3:2018, D.8.”

8.8 In Q.4.9, replace the 1st paragraph as follows:

“Quality conformance inspections shall be executed according to the provisions of IECQ 03-3:2018, 8.13.3 and to the respective descriptions of the CM.”

8.9 In Q.5.2, replace the 1st paragraph as follows:

“An IECQ AC-TC may be granted to a manufacturer meeting the requirements given in IECQ 03-1:2018, 9.2 and in IECQ 03-3:2018, Clause 8.”

## 9 Modification to Annex R

Modify the indication of Annex R from informative to normative, as follows:

### “Annex R (normative)

#### Failure rate level evaluation, determination and qualification”

In R.1.2, replace the 2nd dash item with the following:

“

**EN 60115-1:2023 (E)**

— IECQ Qualification Approval (QA), according to IECQ 03-3:2018, Annex C”;

**10 Modification to Annex X**

*Replace the contents of Annex X with the following:*

“This annex, providing cross references for references to IEC 60115-1:2008, has been deleted from this document. In lieu thereof, see Annex ZX, which is providing cross references for references to EN 60115-1:2011 and EN 60115-1:2011/A11:2015.”

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## 11 Addition of Annex ZA

Add the following new Annex ZA:

“

### Annex ZA (normative)

#### Normative references to international publications with their corresponding European publications

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.

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](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60027	series	Letters symbols to be used in electrical technology	-	-
IEC 60050	series	International electrotechnical vocabulary	-	-
IEC 60062	-	Marking codes for resistors and capacitors	EN 60062	-
IEC 60063	-	Preferred number series for resistors and capacitors	EN 60063	-
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 - Test B: Dry heat	EN 60068-2-2	-
IEC 60068-2-6	-	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	-
IEC 60068-2-13	-	Environmental testing - Part 2-13: Tests - Test M: Low air pressure	EN 60068-2-13	-
IEC 60068-2-14	-	Environmental testing - Part 2-14: Tests - Test N: Change of temperature	EN 60068-2-14	-
IEC 60068-2-20	2008	Environmental testing - Part 2-20: Tests - Test T: Test methods for solderability and resistance to soldering heat of devices with leads	EN 60068-2-20	2008
IEC 60068-2-21	2006	Environmental testing - Part 2-21: Tests - Test U: Robustness of terminations and integral mounting devices	EN 60068-2-21	2006
IEC 60068-2-27	2008	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	2009
IEC 60068-2-30	-	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)	EN 60068-2-30	-

## EN 60115-1:2023 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-45 + AMD 1	1980 1993	Basic environmental testing procedures - Part 2-45: Tests - Test XA and guidance: Immersion in cleaning solvents	EN 60068-2-45 + A1	1992 1993
IEC 60068-2-47	-	Environmental testing - Part 2-47: Test - Mounting of specimens for vibration, impact and similar dynamic tests	EN 60068-2-47	-
IEC 60068-2-52	-	Environmental testing - Part 2-52: Test - Test Kb: Salt mist, cyclic (sodium chloride solution)	EN IEC 60068-2-52	-
IEC 60068-2-58	-	Environmental testing - Part 2-58: Tests - Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)	EN 60068-2-58	-
IEC 60068-2-67	-	Environmental testing - Part 2-67: Tests - Test Cy: Damp heat, steady-state, accelerated test primarily intended for components	EN 60068-2-67	-
IEC 60068-2-78	-	Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady-state	EN 60068-2-78	-
IEC 60068-2-82	2019	Environmental testing - Part 2-82: Tests - Test Xw1: Whisker test methods for components and parts used in electronic assemblies	EN IEC 60068-2-82	2019
IEC 60195	2016	Method of measurement of current noise generated in fixed resistors	EN 60195	2016
IEC 60286	series	Packaging of components for automatic handling	EN 60286	series
IEC 60294	-	Measurement of the dimensions of a cylindrical component with axial terminations	EN 60294	-
IEC 60440	2012	Method of measurement of nonlinearity in resistors	EN 60440	2012
IEC 60617-DB	-	Graphical symbols for diagrams	-	-
IEC 60695-11-5	-	Fire hazard testing - Part 11-5: Test flames - Needle-flame test method - Apparatus, confirmatory test arrangement and guidance	EN 60695-11-5	-
IEC 61191	series	Printed board assemblies	EN IEC 61191	series
IEC 61193-2	-	Quality assessment systems - Part 2: Selection and use of sampling plans for inspection of electronic components and packages	EN 61193-2	-
IEC 61340-3-1	-	Electrostatics - Part 3-1: Methods for simulation of electrostatic effects - Human body model (HBM) electrostatic discharge test waveforms	EN 61340-3-1	-
IEC 61760-1	-	Surface mounting technology - Part 1: Standard method for the specification of surface mounting components (SMDs)	EN IEC 61760-1	-
IEC 61760-2	-	Surface mounting technology - Part 2: Transportation and storage conditions of surface mounting devices (SMD) - Application guide	EN 61760-2	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62090	-	Product package labels for electronic components using bar code and two-dimensional symbologies	-	-
IEC 62812	2019	Low resistance measurements - Methods and guidance	EN IEC 62812	2019
IEC 80000	series	Quantities and units	EN 80000	series
IECQ 03-1	2020	IEC Quality Assessment System for Electronic Components (IECQ System) – Rules of procedure – Part 1: General Requirements for all IECQ Schemes	-	-
ISO 80000	series	Quantities and units	EN ISO 80000	series
IECQ 03-3	2018	IEC Quality Assessment System for Electronic Components (IECQ System) – Rules of Procedure – Part 3: IECQ Approved Component Products, Related Materials and Assemblies Scheme	-	-
IECQ 03-3-1	2018	IEC Quality Assessment System for Electronic Components (IECQ System) – Rules of Procedure – Part 3–1: IECQ Approved Component Products, Related Materials and Assemblies Scheme, IECQ Approved Component – Technology Certification (IECQ AC-TC)	-	-

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