



SLOVENSKI STANDARD
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Sectional specification: Fixed low power surface mounting (SMD) resistors

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Rahmenspezifikation: Oberflächenmontierbare Festwiderstände (SMD) kleiner Belastbarkeit

Specification intermédiaire: Résistances fixes à faible dissipation pour montage en surface (CMS)

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**Sectional specification:
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Specification intermédiaire:
Résistances fixes à faible dissipation
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Rahmenspezifikation:
Oberflächenmontierbare
Festwiderstände (SMD) kleiner
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CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC/CECC SC40XB, Resistors.

It is based, wherever possible, on the publications of the International Electrotechnical Commission and in particular on IEC 115, Fixed resistors for use in electronic equipment.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 140400 on 1996-07-02.

This European Standard supersedes CECC 40 400:1989.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-06-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-06-01

Standards referred to in this sectional specification

EN 140000	1993	Generic Specification: Fixed resistors https://standards.iteh.ai/catalog/standards/sist/9cca19f6-9eeb-4995-ad70-9c1297ab429c/sist-en-140400-2002
IEC 62	1992	Marking codes for resistors and capacitors (harmonized as EN 60062:1993)
IEC 68-1	1988	Environmental testing - Part 1: General and guidance (harmonized as EN 60068-1:1994)
IEC 68-2	series	Environmental testing - Part 2: Tests (harmonized as EN 60068-2-x or HD 323.2.x)
IEC 115-2	1982	Fixed resistors for use in electronic equipment Part 2: Sectional specification: Fixed low-power non-wirewound resistors



Contents	Page	
1	Scope	4
2	Preferred characteristics, rating and severities for environmental and overload tests	4
2.1	Characteristics	4
2.1.1	Climatic severities	4
2.1.2	Temperature characteristics and temperature coefficients of resistance	5
2.1.3	Limits for change in resistance	5
2.2	Preferred value ratings	6
2.2.1	Rated resistance	6
2.2.2	Tolerances on rated resistance	6
2.2.3	Rated dissipation (in the mounted state)	7
2.2.4	Limiting element voltage	7
2.2.5	Limits for insulation resistance	7
2.2.6	Insulation voltage (insulated styles only)	8
2.3	Severities for environmental and overload tests	8
2.3.1	Drying	8
2.3.2	Overload (in the mounted condition)	8
2.4	Information to be specified in the detail specification	8
2.4.1	Style and dimensions	9
2.4.2	Rated dissipation	9
2.4.3	Limiting element voltage	9
2.4.4	Insulation voltage (insulated styles only)	9
2.4.5	Resistance range	10
2.4.6	Tolerances on rated resistance	10
2.4.7	Climatic category	10
2.4.8	Limits of resistance change after 1 000 h endurance test	10
2.4.9	Temperature characteristic of resistance	10
2.4.10	Derating curve	10
2.4.11	Marking	10
2.4.12	Ordering information	10
2.4.13	Additional information (not for inspection purposes)	11
3	Inspection	11
3.1	Formation of inspection lots	11
3.1.1	General	11
3.1.2	Lot-by-lot testing	12
3.1.3	Periodic testing	12
3.2	Test methods	12
3.3	Qualification approval	12
3.4	Qualification approval procedures for enhanced assessment of quality	12
3.4.1	General	12
3.4.2	Distribution of values for Qualification Sample	13
3.5	Assessed process average procedures	13
3.6	Delayed delivery	13
Annexes		
A	Fixed sample size Qualification Approval test schedule for fixed low power surface mounting (SMD) resistors	14
B	Letter coding for the designation of the temperature coefficient of fixed resistors	19

1 Scope

This sectional specification prescribes the preferred values for characteristics and ratings and also the inspection requirements for fixed surface mounting resistors of assessed quality. These resistors generally have metallised connecting pads and are intended to be mounted directly on to substrates, for example hybrid integrated circuits or printed boards. It selects from the generic specification, EN 140000, the appropriate methods of test to be used in detail specifications derived from this specification.

Associated with this specification are one or more blank detail specifications each referenced by an EN number. A blank detail specification which has been completed as specified in 2.4 of this specification forms a detail specification. Such detail specifications may be used for the grant of Qualification Approval to a resistor and for the performance of Quality Conformance Inspection in accordance with the CECC System.

2 Preferred characteristics, rating and severities for environmental and overload tests

2.1 Characteristics

The values given in detail specifications shall preferably be selected from the following:

2.1.1 *Climatic severities* (IEC 115-2, subclause 2.1.1)

The resistors covered by this document are classified into climatic categories according to the general rules given in IEC 68-1 annex A.

The standard severities for the cold, dry heat and damp heat, steady state, tests are within the following ranges:

Cold (test A)	- 40 °C to -55 °C
Dry heat (test B)	+ 85 °C to 155 °C
Damp heat, steady state (test C)	4 to 56 days

Values selected within these ranges shall be chosen from those listed in the relevant tests of IEC 68-2.

The severities for the cold and dry heat tests are the lower and upper category temperatures. For some resistors, these temperatures will occur between two of the preferred temperatures given in IEC 68-2. In this case, the nearest preferred temperature within the category temperature range of the resistors shall be chosen for this severity.

NOTE: The climatic performance of the resistor is greatly influenced by the mounting substrate, the mounting method and the final coating.

2.1.2 Temperature characteristics and temperature coefficients of resistance (IEC 115-2, subclause 2.1.2)

The preferred limits of change in resistance for the temperature characteristic of resistance test are given in table 1. Each line in table 1 gives the temperature coefficient and corresponding temperature characteristic for 20 °C to 70 °C and limits of change in resistance for the measurement of temperature characteristic of resistance (4.8 of EN 140000) on the basis of the category temperature ranges for 2.1.1 of this document.

Table 1: Percentage change in resistance

Temp. coeff. $10^{-6} \text{ }^{\circ}\text{C}$	Temp char. 20/70 °C %	Reference temperature/lower category temperature °C			Reference temperature/upper category temperature °C			
		-55/20 °C %	-40/20 °C %	-25/20 °C %	20/85 °C %	20/100 °C %	20/125 °C %	20/155 °C %
± 1000	± 5,0	± 7,5	± 6,0	± 4,5	± 6,5	± 8,0	± 10,5	± 13,5
± 500	± 2,5	± 3,75	± 3,00	± 2,25	± 3,25	± 4,00	± 5,25	± 6,75
± 250	± 1,25	± 1,88	± 1,50	± 1,13	± 1,62	± 2,00	± 2,62	± 3,38
± 100	± 0,50	± 0,75	± 0,60	± 0,45	± 0,65	± 0,80	± 1,05	± 1,35
± 50	± 0,250	± 0,375	± 0,300	± 0,230	± 0,325	± 0,400	± 0,525	± 0,675
± 25	± 0,125	± 0,188	± 0,150	± 0,113	± 0,162	± 0,200	± 0,262	± 0,338
± 15	± 0,075	± 0,133	± 0,090	± 0,068	± 0,098	± 0,120	± 0,158	± 0,203
± 10	± 0,050	± 0,075	± 0,060	± 0,045	± 0,065	± 0,080	± 0,105	± 0,135
± 5	± 0,025	± 0,038	± 0,030	± 0,023	± 0,033	± 0,040	± 0,053	± 0,068

NOTE: Content different to IEC 115-2.

Resistors having an upper category temperature of +85 °C need not be measured between 20 °C and 70 °C.

If measurements are required at additional temperatures, these shall be specified in the detail specification.

2.1.3 Limits for change in resistance (IEC 115-2, subclause 2.1.3)

For preferred combinations of standard limits for change in each of the tests listed in the heading of table 2 are indicated in the lines of the table.

NOTE: The subclause numbers in the heading of table 2 refer to EN 140000.

Table 2: Limits of change in resistance

Stability Class	4.23 Climatic sequence 4.24 Damp heat, steady state 4.25 Endurance at 70 °C 4.25.3 Endurance at upper category temperature	4.13 Overload 4.31 Shear test and substrate bending test 4.19 Rapid change of temperature
5	$\pm (5 \% R + 0,1 \Omega)$	$\pm (1,0 \% R + 0,05 \Omega)$
3	$\pm (3 \% R + 0,1 \Omega)$	$\pm (0,5 \% R + 0,05 \Omega)$
2	$\pm (2 \% R + 0,1 \Omega)$	$\pm (0,5 \% R + 0,05 \Omega)$
1	$\pm (1 \% R + 0,05 \Omega)$	$\pm (0,25 \% R + 0,05 \Omega)$
0,5	$\pm (0,5 \% R + 0,05 \Omega)$	$\pm (0,1 \% R + 0,01 \Omega)$
0,25	$\pm (0,25 \% R + 0,05 \Omega)$	$\pm (0,1 \% R + 0,01 \Omega)$
0,10	$\pm (0,10 \% R + 0,02 \Omega)$	$\pm (0,05 \% R + 0,01 \Omega)$
0,05	$\pm (0,05 \% R + 0,01 \Omega)$	$\pm (0,05 \% R + 0,01 \Omega)$
NOTE: Content different to IEC 115-2.		

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2.2 Preferred value ratings

2.2.1 Rated resistance (IEC 115-2, subclause 2.2.1)

See 2.3.2 of EN 140 000.

2.2.2 Tolerances on rated resistance (IEC 115-2, subclause 2.2.2)

The preferred tolerances on rated resistance are:

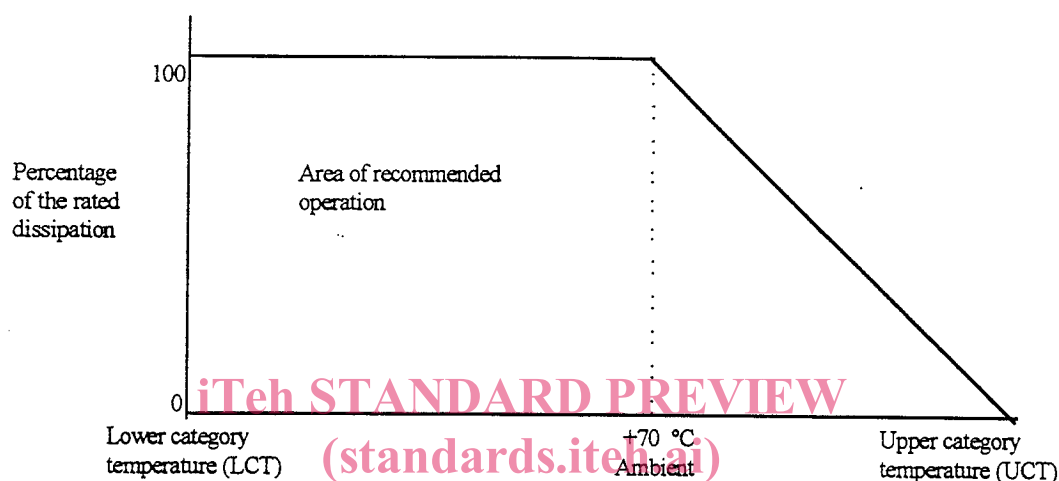
$\pm 10; \pm 5; \pm 2; \pm 1; \pm 0,5; \pm 0,25; \pm 0,1; \pm 0,05; \pm 0,02; \pm 0,01 \%$ or $10 \text{ m}\Omega$.

2.2.3 Rated dissipation (IEC 115-2, subclause 2.2.3) (in the mounted state)

The preferred values of rated dissipation at 70 °C are:

0,031 W; 0,063 W; 0,1 W; 0,125 W; 0,25 W; 0,5 W; 1,0 W; 2,0 W; 2,5 W and 3,0 W.

NOTE: The rated dissipation refers to the resistors as mounted on one of the substrates described in CECC 00802, Issue 2, annex B with the dimensional details given in the detail specification. For resistors not intended for mounting on such a substrate, the detail specification shall fully describe the reference conditions.



A larger area of operation may be given in the detail specification provided it includes all the areas given above.

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The detail specification shall state the maximum dissipation at temperatures other than 70 °C. All break points on the curve shall be verified by test.

2.2.4 Limiting element voltage (IEC 115-2, subclause 2.2.4)

The preferred values of limiting element voltage are:

50 V; 75 V; 100 V; 150 V; 200 V; 250 V and 350 V d.c. or a.c.

2.2.5 Limit for insulation resistance (IEC 115-2, subclause 2.2.5)

The standard limit for insulation resistance shall be 1 G Ω minimum or, after humidity testing 100 M Ω .

For small size resistors where the dimensions of the test jig given in 4.6 of EN 140000 are not adequate, they shall be specified in the detail specification.

2.2.6 *Insulation voltage (insulated styles only)* (IEC 115-2, subclause 2.2.6)

See 2.2.1.7 of EN 140 000.

For small size resistors where the dimensions of the test jig given in 4.6 of EN 140000 are not adequate, they should be specified in the detail specification.

2.3 Severities for environmental and overload tests

Test severities given in detail specifications shall preferably be chosen from the following:

2.3.1 *Drying* (IEC 115-2, subclause 2.3.1)

Procedure I of 4.3 of EN 140 000 shall be used.

2.3.2 *Overload (in the mounted condition)*

Subclause 4.13 of EN 140 000 with the following details:

Applied voltage: 2,5 times the rated voltage or twice the limiting element voltage, whichever is the less.

Duration: The detail specification shall state the load duration. Preferred values 0,5; 1; 2; 5; 10 s. This time shall be fixed in such a way, that the max. temperature is $50\text{ °C} \pm 20\text{ °C}$ above the upper category temperature.

Mounting: As specified for endurance test under 2.2.3.

2.4 Information to be specified in the detail specification

The following information shall be specified in each detail specification and the values quoted shall preferably be selected from those given in the appropriate clause of this document.

NOTE: The information given in 2.4.1 to 2.4.6 may, for convenience be presented in tabular form.

2.4.1 Style and dimensions**Table 3: Preferred styles for cylindrical (RC) and rectangular (RR) resistors**

	Inch	Metric	Length L (mm)	Diameter D (mm)	Width W (mm)	Thickness T (mm)
RC	-	2211	2,1 ± 0,1	1,1 max	-	-
RC	-	3715	3,5 ± 0,2	1,5 max	-	-
RC	-	6123	5,9 ± 0,2	2,3 max	-	-
RR	0402	1005	1,00 ± 0,05	-	0,05 ± 0,05	0,35 ± 0,10
RR	0603	1608	1,60 ± 0,15	-	0,85 ± 0,15	0,45 ± 0,10
RR	0805	2012	2,00 ± 0,3	-	1,25 ± 0,2	0,60 ± 0,15
RR	1206	3216	3,20 ± 0,4	-	1,60 ± 0,2	0,60 ± 0,15
RR	1210	3225	3,20 ± 0,4	-	2,50 ± 0,3	0,60 ± 0,15
RR	2010	5025	5,00 ± 0,4	-	2,50 ± 0,3	0,60 ± 0,15
RR	2512	6332	6,30 ± 0,5	-	3,10 ± 0,4	0,60 ± 0,15
RR	3015	7035	7,0 max	-	3,5 max	3,8 max
RR	5020	12070	12,0 max	-	7,0 max	5,0 max
RR	6030	15070	15,0 max	-	7,0 max	7,0 max
RR	8030	19070	19,0 max	-	7,0 max	7,0 max

NOTE 1: Tolerances shall be stated in the blank detail specification
NOTE 2: For temperature coefficient coding, see annex B

2.4.2 Rated dissipation

See 2.2.3.

2.4.3 Limiting element voltage

See 2.2.4.

2.4.4 Insulation voltage (insulated styles only)

See 2.2.17 of EN 140 000.

For small size resistors where the dimensions of the test jig given in 4.6 of EN 140000 are not adequate, they shall be specified in the detail specification.