



**SLOVENSKI STANDARD**  
**SIST EN 140401-801:2003**  
**01-oktober-2003**

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**Detail Specification: Fixed low power non wire-wound surface mount (SMD) resistors - Rectangular - Stability classes 0,1; 0,25; 0,5; 1**

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Bauartspezifikation: Oberflächenmontierbare nichtdrachtgewickelte Festwiderstnde (SMD) niedriger Belastbarkeit - Rechteckig - Stabilittsklassen 0,1; 0,25; 0,5; 1

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Spfication particulire: Rsistances fixes non bobines faible dissipation pour montage en surface (CMS) - Rectangulaires - Catgories de stabilit 0,1; 0,25; 0,5; 1

[SIST EN 140401-801:2003](https://standards.iteh.ai/catalog/standards/sist/2bd87209-83ef-4f0c-9b7d-a437cc71663/sist-en-140401-801-2003)

**Ta slovenski standard je istoveten z: EN 140401-801:2002**

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**ICS:**

31.040.10      Fiksni upor      Fixed resistors

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EUROPEAN STANDARD

**EN 140401-801**

NORME EUROPÉENNE

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May 2002

ICS 31.040.10

Supersedes CECC 40 401-801:1998

English version

**Detail Specification:  
Fixed low power non wire-wound surface mount (SMD) resistors -  
Rectangular -  
Stability classes 0,1; 0,25; 0,5; 1**

Spécification particulière:  
Résistances fixes non bobinées  
à faible dissipation pour montage  
en surface (CMS) -  
Rectangulaires -  
Catégories de stabilité 0,1; 0,25; 0,5; 1

Bauartspezifikation:  
Oberflächenmontierbare nichtdracht-  
gewickelte Festwiderstände (SMD)  
niedriger Belastbarkeit -  
Rechteckig -  
Stabilitätsklassen 0,1; 0,25; 0,5; 1

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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 40XB, Resistors.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 140401-801 on 2001-12-01.

This European Standard supersedes CECC 40 401-801:1998.

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) 2003-03-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2004-12-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.


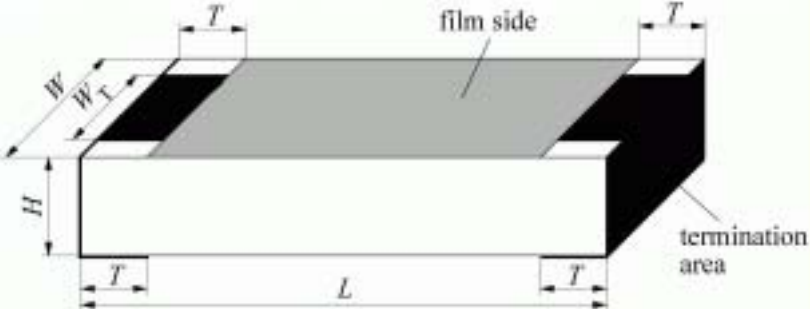
In this standard, annexes A and C are normative and annex B is informative.

This specification is part of four documents describing fixed resistors for surface mount technology as follows:

|               |   |
|---------------|---|
| EN 60115-1    | Fixed resistors for use in electronic equipment – Part 1: Generic Specification<br>(IEC 60115-1, mod.)  |
| EN 140400     | Sectional Specification: Fixed low power surface mount (SMD) resistors  |
| EN 140401     | Blank Detail Specification: Fixed low power non wire-wound surface mount (SMD) resistors  |
| EN 140401-801 | Detail specification: Fixed low power non wire-wound surface mount (SMD) resistors -<br>Chip, rectangular - Stability classes 0,1; 0,25; 0,5; 1 |

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|   |   |
|---|---|
| Specification available from<br>CENELEC Central Secretariat, 35, Rue de Stassart, B-Brussels,<br>or from the National Committees members of CENELEC | <b>EN 140401-801</b>   |
| Electronic components of assessed quality<br>in accordance with:<br>EN 60115-1:2001<br>EN 140400:200X<br>EN 140401:2002                             | <b>Issue 2</b><br>May 2002  |
|    | Fixed low power non wire-wound chip<br>resistors with rectangular base without leads<br>for surface mounting.<br>Style: RR<br><br>Ceramic substrate with protected, insulated,<br>resistance film and solder terminations,<br>typically thin film |
| Other shapes are permitted within the given dimensions.<br><br><b>Figure 1 - Outline and dimensions</b> (see Table 1)                               | Assessment level EZ <sup>a</sup><br>Version A: with 100 %-test<br>Version E: with failure rate level<br>and 100 %-test<br><br>Stability classes 0,1; 0,25; 0,5 and 1  |

<sup>a</sup> For explanations on assessment level EZ see 2.1.1.

## 1 Characteristics and ratings

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

### 1.1 Dimensions and ratings

<https://standards.iteh.ai/catalog/standards/sist/2bd87209-83ef-4f0c-9b7d-a447f6370303>  
 SIST EN 140401-801:2003  
 Table 1 Style and dimensions

| Style    |         | Length <i>L</i><br>mm |      | Width <i>W</i><br>mm |      | Height <i>H</i><br>mm |      | Termination <i>T</i><br>mm |      | Weight <sup>a</sup><br>mg |
|----------|---------|-----------------------|------|----------------------|------|-----------------------|------|----------------------------|------|---------------------------|
| metric   | inch    | min.                  | max. | min.                 | max. | min.                  | max. | min.                       | max. | max.                      |
| RR 1005M | RR 0402 | 0,95                  | 1,10 | 0,45                 | 0,60 | 0,25                  | 0,40 | 0,05/0,1 <sup>b</sup>      | 0,35 | 0,8                       |
| RR 1608M | RR 0603 | 1,50                  | 1,70 | 0,75                 | 0,95 | 0,35                  | 0,55 | 0,10                       | 0,50 | 2,1                       |
| RR 2012M | RR 0805 | 1,85                  | 2,15 | 1,10                 | 1,40 | 0,35                  | 0,65 | 0,15                       | 0,60 | 6,0                       |
| RR 3216M | RR 1206 | 2,90                  | 3,35 | 1,45                 | 1,75 | 0,35                  | 0,65 | 0,25                       | 0,75 | 10,0                      |

<sup>a</sup> For information only.

<sup>b</sup> First figure indicates the termination width on the film side, second figure on the reverse side.

Termination:  $W_T \geq 0,75 \cdot W$   
 Thickness: 0,005 to 0,05 mm

**Table 2a – Ratings for stability classes 1; 0,5; 0,25**

| Style    | Stability class | Rated dissipation<br><i>P</i> <sub>70</sub><br>mW | Limiting element voltage<br>d.c. or a.c. (r.m.s) <i>U</i> <sub>max</sub><br>V | Insulation voltage<br>d.c. or a.c. (peak) <i>U</i> <sub>ins</sub><br>V |            |
|----------|-----------------|---|---|--|------------|
|          |                 |   |   | 1 min  | continuous |
| RR 1005M | 1; 0,5; 0,25    | 63  | 50  | 75   | 75         |
| RR 1608M | 1; 0,5; 0,25    | 100   | 75  | 100  | 75         |
| RR 2012M | 1; 0,5; 0,25    | 125   | 150   | 200  | 75         |
| RR 3216M | 1; 0,5; 0,25    | 250   | 200   | 300  | 75         |

Information about manufacturers who have components qualified to this detail specification is available in the current CECC 00 200: Register of Approvals

**Table 2b – Ratings for stability class 0,1**

| Style    | Stability class | Rated dissipation $P_{70}$<br>mW | Limiting element voltage<br>d.c. or a.c. (r.m.s) $U_{max}$<br>V | Insulation voltage<br>d.c. or a.c. (peak) $U_{ins}$<br>V |            |
|----------|-----------------|----------------------------------|---|--|------------|
|          |                 |                                  |   | 1 min  | continuous |
| RR 1005M | 0,1             | 16                               | 12,5  | 75   | 75         |
| RR 1608M | 0,1             | 32                               | 25  | 100  | 75         |
| RR 2012M | 0,1             | 50                               | 35  | 200  | 75         |
| RR 3216M | 0,1             | 100                              | 50  | 300  | 75         |

**Table 2c – Ratings for 0  $\Omega$  resistors**

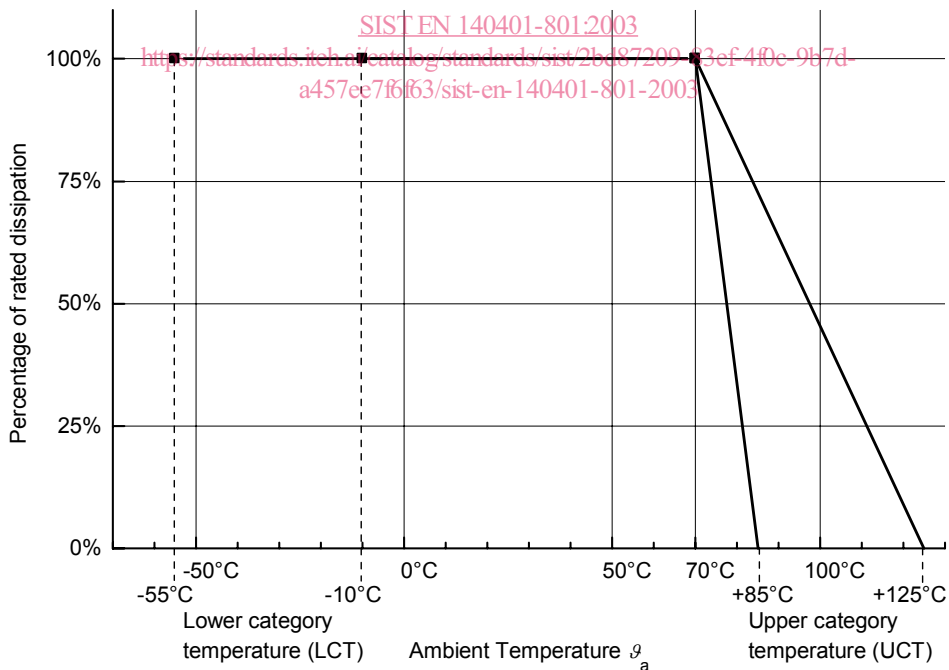
| Style    | Maximum current<br>$I_{max}$<br>A | Maximum resistance value <sup>a</sup><br>$R_{max}$<br>m $\Omega$ | Insulation voltage<br>d.c. or a.c. (peak) $U_{ins}$<br>V |            |
|----------|-----------------------------------|--|--|------------|
|          |                                   |  | 1 min  | continuous |
| RR 1005M | 0,63                              | 20   | 75   | 75         |
| RR 1608M | 1                                 | 20   | 100  | 75         |
| RR 2012M | 1,5                               | 20   | 200  | 75         |
| RR 3216M | 2,0                               | 20   | 300  | 75         |

<sup>a</sup> The resistance value shall be measured on the film side.

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**1.2 Derating curve**

Resistors covered by this specification are derated according to the following diagram:



**Figure 2 – Derating curve**

For the category temperatures of stability classes refer to Table 6.

### 1.3 Resistance range and tolerance on rated resistance

#### Version A:

The following combinations of temperature coefficient, tolerance on rated resistance shall be used for qualification approval according to 2.2.1 and quality conformance inspection according to 2.3. Resistance values of E-series according to IEC 60063 shall be used.

The qualification of resistance values below or beyond the specified resistance values is permitted, if they fulfil the requirements of the closest stability class ( e.g. RR 1608M 1 % >1 M $\Omega$  shall fulfil the requirements of stability class 1).

**Table 3a – Resistance range, tolerance on rated resistance for version A**

| Style   | Tolerance on rated resistance |                   | Temperature coefficient<br>ppm/K | Resistance range                 | Stability class |
|---|-------------------------------|-------------------|----------------------------------|----------------------------------|-----------------|
|   | %                             | Code <sup>a</sup> |                                  |                                  |                 |
| RR 1005M  | ± 1                           | F                 | ± 50; ± 25                       | 10 $\Omega$ to 33,2 k $\Omega$   | 0,5             |
|   |                               |                   |                                  | >33,2 k $\Omega$ to 1 M $\Omega$ | 1               |
|   | ± 0,5                         | D                 | ± 50; ± 25                       | 10 $\Omega$ to 33,2 k $\Omega$   | 0,5             |
|   |                               |                   |                                  | >33,2 k $\Omega$ to 1 M $\Omega$ | 1               |
|   | ± 0,25                        | C                 | ± 25; ± 15; ± 10                 | 43 $\Omega$ to 33,2 k $\Omega$   | 0,25            |
|   |                               |                   |                                  | 100 $\Omega$ to 10 k $\Omega$    | 0,1             |
|   | ± 0,1                         | B                 | ± 25; ± 15; ± 10                 | 100 $\Omega$ to 33,2 k $\Omega$  | 0,25            |
|   |                               |                   |                                  | 100 $\Omega$ to 10 k $\Omega$    | 0,1             |
| RR 1608M  | ± 1                           | F                 | ± 50; ± 25                       | 1 $\Omega$ to <10 $\Omega$       | 1               |
|   |                               |                   |                                  | 10 $\Omega$ to 100 k $\Omega$    | 0,5             |
|   |                               |                   |                                  | >100 k $\Omega$ to 1 M $\Omega$  | 1               |
|   | ± 0,5                         | D                 | ± 50; ± 25                       | 10 $\Omega$ to 100 k $\Omega$    | 0,5             |
|   |                               |                   |                                  | >100 k $\Omega$ to 1 M $\Omega$  | 1               |
|   | ± 0,25                        | C                 | ± 25; ± 15; ± 10                 | 43 $\Omega$ to 100 k $\Omega$    | 0,25            |
|   |                               |                   |                                  | 100 $\Omega$ to 10 k $\Omega$    | 0,1             |
|   | ± 0,1                         | B                 | ± 25; ± 15; ± 10                 | 100 $\Omega$ to 100 k $\Omega$   | 0,25            |
| 100 $\Omega$ to 10 k $\Omega$                               |                               |                   |                                  | 0,1                              |                 |
| RR 2012M  | ± 1                           | F                 | ± 50; ± 25                       | 1 $\Omega$ to <10 $\Omega$       | 1               |
|   |                               |                   |                                  | 10 $\Omega$ to 221 k $\Omega$    | 0,5             |
|   |                               |                   |                                  | >221 k $\Omega$ to 1 M $\Omega$  | 1               |
|   | ± 0,5                         | D                 | ± 50; ± 25                       | 10 $\Omega$ to 221 k $\Omega$    | 0,5             |
|   |                               |                   |                                  | >221 k $\Omega$ to 1 M $\Omega$  | 1               |
|   | ± 0,25                        | C                 | ± 25; ± 15; ± 10                 | 43 $\Omega$ to 221 k $\Omega$    | 0,25            |
|   |                               |                   |                                  | 100 $\Omega$ to 47,5 k $\Omega$  | 0,1             |
|   | ± 0,1                         | B                 | ± 25; ± 15; ± 10                 | 100 $\Omega$ to 100 k $\Omega$   | 0,25            |
| 100 $\Omega$ to 47,5 k $\Omega$                             |                               |                   |                                  | 0,1                              |                 |
| RR 3216M  | ± 1                           | F                 | ± 50; ± 25                       | 1 $\Omega$ to <10 $\Omega$       | 1               |
|   |                               |                   |                                  | 10 $\Omega$ to 332 k $\Omega$    | 0,5             |
|   |                               |                   |                                  | >332 k $\Omega$ to 1 M $\Omega$  | 1               |
|   | ± 0,5                         | D                 | ± 50; ± 25                       | 1 $\Omega$ to <10 $\Omega$       | 1               |
|   |                               |                   |                                  | 10 $\Omega$ to 332 k $\Omega$    | 0,5             |
|   |                               |                   |                                  | >332 k $\Omega$ to 1 M $\Omega$  | 1               |
|   | ± 0,25                        | C                 | ± 25; ± 15; ± 10                 | 43 $\Omega$ to 332 k $\Omega$    | 0,25            |
|   |                               |                   |                                  | 43 $\Omega$ to 332 k $\Omega$    | 0,1             |
| ± 0,1   | B                             | ± 25; ± 15; ± 10  | 43 $\Omega$ to 332 k $\Omega$    | 0,25                             |                 |
|   |                               |                   | 43 $\Omega$ to 332 k $\Omega$    | 0,1                              |                 |
| 0 $\Omega$ -resistors according to Table 2c for all styles. |                               |                   |                                  |                                  |                 |
| <sup>a</sup> Code letters according to EN 60062.            |                               |                   |                                  |                                  |                 |



**Version E:**

The following combinations of temperature coefficient, tolerance on rated resistance and E-series according to IEC 60063 shall be used for qualification approval according to 2.2.2 and quality conformance inspection according to 2.3 and are permitted only:

**Table 3b – Resistance range, tolerance on rated resistance for version E**

| Style  | Tolerance on rated resistance |                   | Temperature coefficient<br>ppm/K | Resistance range | Stability class | E series |
|--|-------------------------------|-------------------|----------------------------------|------------------|-----------------|----------|
|  | %                             | Code <sup>a</sup> |                                  |                  |                 |          |
| RR 1005M   | ± 1                           | F                 | ± 50                             | 10 Ω to 33,2 kΩ  | 0,5             | E96      |
|  |                               |                   |                                  | >33,2 kΩ to 1 MΩ | 1               |          |
|  | ± 0,1                         | B                 | ± 15                             | 100 Ω to 33,2 kΩ | 0,25            | E192     |
| RR 1608M   | ± 1                           | F                 | ± 50                             | 1 Ω to <10 Ω     | 1               | E96      |
|  |                               |                   |                                  | 10 Ω to 100 kΩ   | 0,5             |          |
|  |                               |                   |                                  | >100 kΩ to 1 MΩ  | 1               |          |
|  | ± 0,1                         | B                 | ± 15                             | 100 Ω to 47,5 kΩ | 0,25            | E192     |
| RR 2012M   | ± 1                           | F                 | ± 50                             | 1 Ω to <10 Ω     | 1               | E96      |
|  |                               |                   |                                  | 10 Ω to 221 kΩ   | 0,5             |          |
|  |                               |                   |                                  | >221 kΩ to 1 MΩ  | 1               |          |
|  | ± 0,1                         | B                 | ± 15                             | 100 Ω to 100 kΩ  | 0,25            | E192     |
| RR 3216M   | ± 1                           | F                 | ± 50                             | 1 Ω to <10 Ω     | 1               | E96      |
|  |                               |                   |                                  | 10 Ω to 332 kΩ   | 0,5             |          |
|  |                               |                   |                                  | >332 kΩ to 1 MΩ  | 1               |          |
|  | ± 0,1                         | B                 | ± 15                             | 43 Ω to 332 kΩ   | 0,25            | E192     |
| 0 Ω-resistors according to Table 2c for all styles |                               |                   |                                  |                  |                 |          |
| <sup>a</sup> Code letters according to EN 60062.   |                               |                   |                                  |                  |                 |          |

**1.4 Variation of resistance with temperature and temperature rise**

**Table 4 – Temperature coefficients and percentage change of resistance (acc. to EN 140400, Table 2)**

| Temperature coefficient                                   |                   | Limit of resistance change $\Delta R/R$ |                                    |                                    |                                    |                                   |
|---|-------------------|---|------------------------------------|------------------------------------|------------------------------------|-----------------------------------|
|   |                   | %                                       |                                    |                                    |                                    |                                   |
| ppm/K   | Code <sup>a</sup> | Stability classes 1; 0,5; 0,25          |                                    |                                    | Stability classes 0,1              |                                   |
|   |                   | Temp. charact.<br>20 °C / 70 °C         | LCT / Ref. temp.<br>-55 °C / 20 °C | Ref. temp. / UCT<br>20 °C / 125 °C | LCT / Ref. temp.<br>-10 °C / 20 °C | Ref. temp. / UCT<br>20 °C / 85 °C |
| ± 50  | C                 | ± 0,250                                 | ± 0,375                            | ± 0,525                            | –                                  | –                                 |
| ± 25  | D                 | ± 0,125                                 | ± 0,188                            | ± 0,263                            | ± 0,075                            | ± 0,163                           |
| ± 15  | E                 | ± 0,075                                 | ± 0,113                            | ± 0,158                            | ± 0,045                            | ± 0,098                           |
| ± 10  | F                 | ± 0,050                                 | ± 0,075                            | ± 0,105                            | ± 0,030                            | ± 0,065                           |
| <sup>a</sup> Code letter according to EN 140400, Table 2. |                   |   |                                    |                                    |                                    |                                   |

Table 5 – Limit of temperature rise

| Stability class | Limit of temperature rise at rated dissipation |
|-----------------|--|
| 1; 0,5; 0,25    | $T_r \leq 55 \text{ K}$                        |
| 0,1             | $T_r \leq 15 \text{ K}$                        |

The thermal resistance is calculated to  $R_{th} = T_r / P_{70}$ .

### 1.5 Climatic categories

Table 6 – Climatic categories

| Stability class | Climatic category<br>LCT / UCT / Duration |
|-----------------|---|
| 1; 0,5; 0,25    | 55 / 125 / 56                             |
| 0,1             | 10 / 085 / 56                             |

### 1.6 Limits for change of resistance at tests

Table 7 – Limits for change of resistance at tests

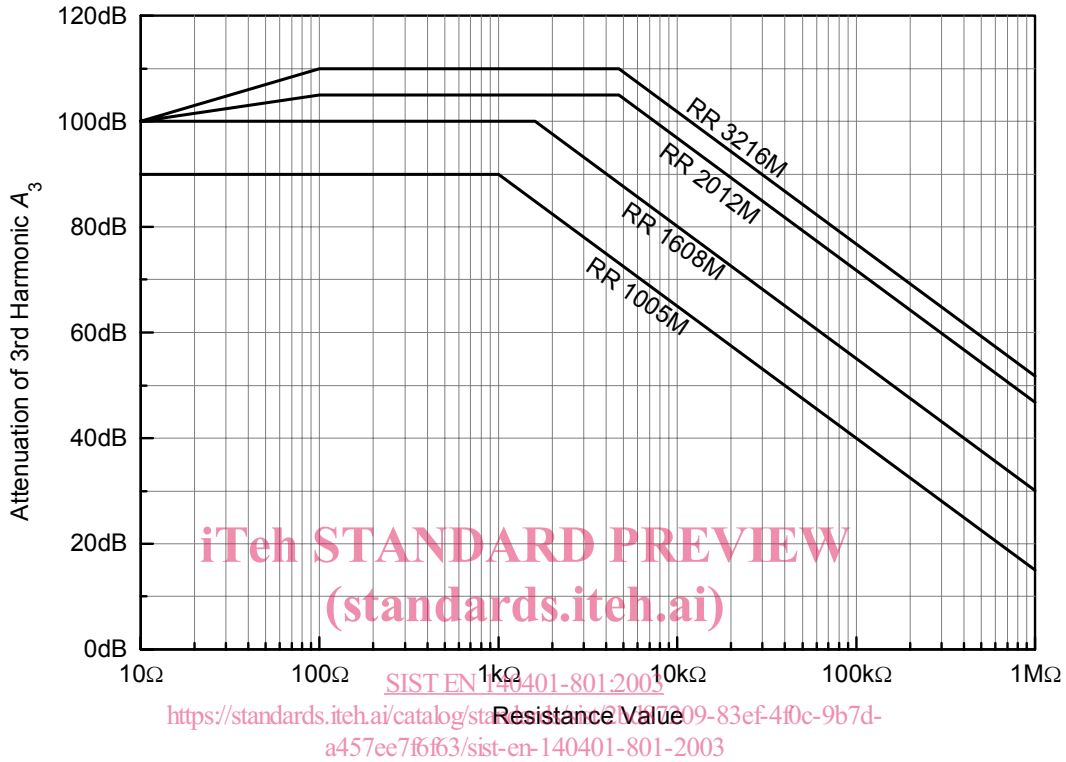
| Stability class | Limit of resistance change $\Delta R/R$   |   |                                 |  |
|-----------------|---|---|---------------------------------|--|
|                 | EN 60115-1,<br>4.23 Climatic sequence<br>4.24 Damp heat, steady state<br>4.25.3 Endurance at upper category temperature | EN 60115-1,<br>4.25.1 Endurance at 70 °C<br><br><a href="https://standards.iteh.ai/catalog/standards/sist/2bd87209-83ef-4f0c-9b7d-a457ee7f6f63/sist-en-140401-801-2003">SIST EN 140401-801:2003</a> |                                 | EN 60115-1,<br>4.13 Overload<br>4.18 Resistance to soldering heat<br>4.19 Rapid change of temperature<br>4.22 Vibration<br>4.33 Substrate bending test |
|                 |   | 1 000 h   | Extended, 8 000 h               |  |
| 1               | $\pm (1 \% R + 0,05 \Omega)$  | $\pm (0,5 \% R + 0,05 \Omega)^a$  | $\pm (1 \% R + 0,05 \Omega)$    | $\pm (0,25 \% R + 0,05 \Omega)$  |
| 0,5             | $\pm (0,5 \% R + 0,05 \Omega)$  | $\pm (0,25 \% R + 0,05 \Omega)^a$   | $\pm (0,5 \% R + 0,05 \Omega)$  | $\pm (0,1 \% R + 0,01 \Omega)$   |
| 0,25            | $\pm (0,25 \% R + 0,05 \Omega)$   | $\pm (0,25 \% R + 0,05 \Omega)$   | $\pm (0,5 \% R + 0,05 \Omega)$  | $\pm (0,05 \% R + 0,01 \Omega)$  |
| 0,1             | $\pm (0,1 \% R + 0,02 \Omega)$  | $\pm (0,1 \% R + 0,02 \Omega)$  | $\pm (0,25 \% R + 0,02 \Omega)$ | $\pm (0,05 \% R + 0,01 \Omega)$  |

<sup>a</sup> Tightening of the general definition of stability classes against the requirements of EN 140400, 2.1.4.

**1.7 Non-linear properties**

(for resistance values  $\geq 10 \Omega$ )

If measurement of non-linearity according to 2.1.1 is required the measured values shall be above the limits given in the diagram below. The resistors shall be tested according to IEC 60440 where the test voltage shall be the rated voltage.



**Figure 3 – Limits of non-linearity in resistors**

**1.8 Marking, packaging and ordering designation**

**1.8.1 Component**

Surface mount resistors are generally not marked on the body. However, if some marking is applied to the body, the resistor shall be marked with the rated resistance according to EN 60062, clause 3 or with the code letter according to Table 8 and as many of the remaining items listed in 2.4.1 of EN 60115-1 (only version A).

For version E the component shall be marked according to EN 60062, clause 3 or with the code letter according to Table 8. The marking of the style RR 1005M and RR 1608M is not required.

**Table 8 – Letter coding**

| Resistance range of the series E 96 | Code letter  |
|-------------------------------------|--------------|
| 1 $\Omega$ to 9,76 $\Omega$         | 1R00 to 9R76 |
| 10 $\Omega$ to 97,6 $\Omega$        | 10R0 to 97R6 |
| 100 $\Omega$ to 976 $\Omega$        | 1000 to 9760 |
| 1 k $\Omega$ to 9,76 k $\Omega$     | 1001 to 9761 |
| 10 k $\Omega$ to 97,6 k $\Omega$    | 1002 to 9762 |
| 100 k $\Omega$ to 976 k $\Omega$    | 1003 to 9763 |
| 1 M $\Omega$ to 9,76 M $\Omega$     | 1004 to 9764 |