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Marking codes for resistors and capacitors

Codes de marquage des résistances et des condensateurs

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MARKING CODES FOR RESISTORS AND CAPACITORS

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IEC 60062 edition 6.1 contains the sixth edition (2016-07) [documents 40/2465/FDIS and 40/2473/RVD], its corrigendum (2016-12) and its amendment 1 (2019-08) [documents 40/2622/CDV and 40/2661/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60062 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This sixth edition constitutes a technical revision.

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

- introduction of the new code colour pink for the coding of the multiplier 10^{-3} ;
- introduction of new subclauses, 3.2 Prescription of code colours, 3.3 Methods for marking resistance value and tolerance, 3.4 Methods for TCR marking, for improved clarity, the subjects of colour assignment, coding of R value and tolerance, and coding of TCR is dealt with in separate clauses;
- inclusion of illustrations for TCR marking by interrupted colour band;
- inclusion of a new subclause on a fixed length code marking, fixed length code marking of resistance values with up to 3 significant digits, hence a fixed code length of 4 digits, and fixed length code marking of capacitance values with up to 2 significant digits, hence a fixed code length of 3 digits;
- introduction of two new clauses, Clause 6, Coding of properties specific to capacitors and Clause 7, Coding of properties specific to resistors;
- introduction of Annex A, Special three character coding of resistance value with three significant numerals.
- introduction of Annex B, Special two-character code system for capacitors.

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MARKING CODES FOR RESISTORS AND CAPACITORS

1 Scope

This International Standard specifies designation and marking codes for capacitors and resistors.

It provides coding methods for the resistance or capacitance value and its tolerance, including colour coding for resistors.

It provides coding for parameters specific either to capacitors, like e.g. the dielectric material, or to resistors, like e.g. the temperature coefficient of resistance (TCR).

It also provides date code systems suitable for the marking of small components.

2 Normative references

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.

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

IEC 60757, *Code for designation of colours*

ISO 8601, *Data elements and interchange formats – Information interchange – Representation of dates and times*

3 Colour code for fixed resistors

3.1 General rules

Colour code is applied in a sequence of individual solid colour bands.

Wherever possible, the first band shall be the one nearest to the end of the resistor and the bands shall be so placed and spaced that there can be no confusion in reading the coding.

The design width of the band used for marking the tolerance shall be at least 1,5 times the width of the other bands in order to avoid any confusion.

NOTE The design width is not intended to be measured.

Any additional coding shall be so applied as not to confuse the coding for value and tolerance.

Although colour bands are expected to be complete rings around the perimeter of a cylindrical resistor body, incidental interruption of a band shall be permissible if at least two thirds of the band is visible from any radial angle of view.

3.2 Prescription of code colours

The colours black, brown, red, orange, yellow, green, blue, violet, grey and white are used for the coding of the figures 0 through 9 for each significant numeral. Complemented with the

colours silver, gold and pink, they are also used for the coding of the multiplier, the tolerance and the temperature coefficient of resistance (TCR). Table 1 summarizes the colours with all assigned parameters and their respective values.

Table 1 – Code colour prescriptions

Colour		Example	Significant numeral	Multiplier	Tolerance %	TCR 10 ⁻⁶ /K
Code						
None	—		—	—	±20	—
Pink	PK		—	10 ⁻³	—	—
Silver	SR		—	10 ⁻²	±10	—
Gold	GD		—	10 ⁻¹	±5	—
Black	BK		0	1	—	±250
Brown	BN		1	10 ¹	±1	±100
Red	RD		2	10 ²	±2	±50
Orange	OG		3	10 ³	±0,05	±15
Yellow	YE		4	10 ⁴	±0,02	±25
Green	GN		5	10 ⁵	±0,5	±20
Blue	BU		6	10 ⁶	±0,25	±10
Violet	VT		7	10 ⁷	±0,1	±5
Grey	GY		8	10 ⁸	±0,01	±1
White	WH		9	10 ⁹	—	—

NOTE 1 The code letters are as defined in IEC 60757.

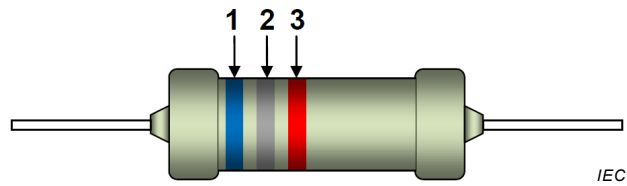
NOTE 2 The colours shown here as example are not intended as normative reference, but are applied for the purpose of consistent illustration only.

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3.3 Methods for marking resistance value and tolerance

3.3.1 Marking of resistance values with two significant numerals

Resistors with a tolerance of ±20 %, whose resistance values are described with two significant numerals, are marked with a three-band colour code, consisting of two bands for the significant numerals, followed by one band for the multiplier. The absence of the fourth band indicates the tolerance of ±20 %. Figure 1 illustrates this with a 6,8 kΩ resistor with a tolerance of ±20 %.



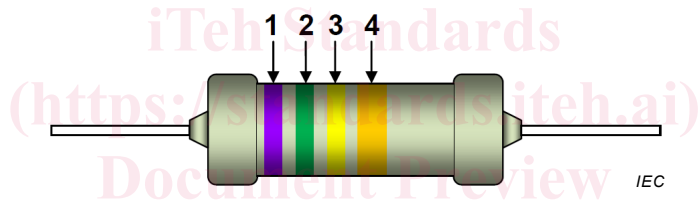
Key:

- 1: 1st band 1st numeral Blue = 6
- 2: 2nd band 2nd numeral Grey = 8
- 3: 3rd band Multiplier Red = $\times 10^2$

Figure 1 – Colour marking of a resistor 6,8 kΩ, tolerance $\pm 20\%$

3.3.2 Marking of resistance values with two significant numerals and tolerance

Resistors with a tolerance tighter than $\pm 20\%$, whose resistance values are described with two significant numerals, are marked with a four-band colour code, consisting of two bands for the significant numerals, followed by one band for the multiplier, followed by the last and wider band showing the tolerance. Figure 2 illustrates this with a 750 kΩ resistor with a tolerance of $\pm 5\%$.



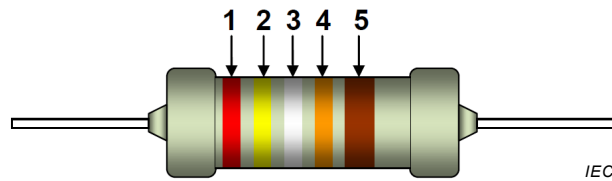
Key:

- 1: 1st band 1st numeral Violet = 7
- 2: 2nd band 2nd numeral Green = 5
- 3: 3rd band Multiplier Yellow = $\times 10^4$
- 4: 4th band Tolerance Gold = $\pm 5\%$

Figure 2 – Colour marking of a resistor 750 kΩ, tolerance $\pm 5\%$

3.3.3 Marking of resistance values with three significant numerals and tolerance

Resistors, whose resistance values are described with three significant numerals, are marked with a five-band colour code, consisting of three bands for the significant numerals, followed by one band for the multiplier, followed by the last and wider band showing the tolerance. Figure 3 illustrates this with a 249 kΩ resistor with a tolerance of $\pm 1\%$.



Key:

1: 1 st band	1 st numeral	Red = 2
2: 2 nd band	2 nd numeral	Yellow = 4
3: 3 rd band	3 rd numeral	White = 9
4: 4 th band	Multiplier	Orange = $\times 10^3$
5: 5 th band	Tolerance	Brown = $\pm 1\%$

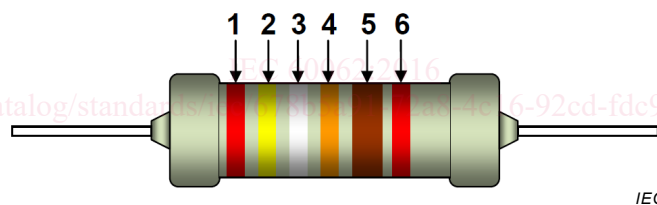
Figure 3 – Colour marking of a resistor 249 k Ω , tolerance $\pm 1\%$

3.4 Methods for TCR marking

Colour-code marking of the temperature coefficient shall only be used in combination with a resistance coding for three significant numerals and is additional to the marking of resistance value and tolerance as prescribed in 3.3.3.

One of the following methods should be used for the indication of temperature coefficients with a code colour as prescribed in Table 1, where the tolerance band is consistently maintained as the single wider band.

a) The TCR is marked by means of a colour band as the sixth band, as shown in Figure 4.



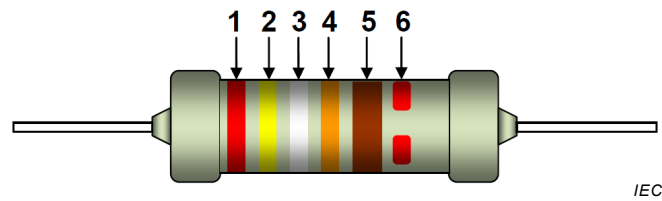
Key:

1: 1 st band	1 st numeral	Red = 2
2: 2 nd band	2 nd numeral	Yellow = 4
3: 3 rd band	3 rd numeral	White = 9
4: 4 th band	Multiplier	Orange = $\times 10^3$
5: 5 th band	Tolerance	Brown = $\pm 1\%$
6: 6 th band	TCR	Red = $\pm 50 \times 10^{-6}/K$

Figure 4 – Colour marking of a resistor with a 6th band for TCR marking

NOTE The prescription of prior revisions of this standard about the sixth band to be the wider band has been changed here as it has been found to be a reason of confusion with component users about the tolerance marking.

b) The TCR is marked by means of an interrupted colour band as the sixth band, as shown in Figure 5.



Key:

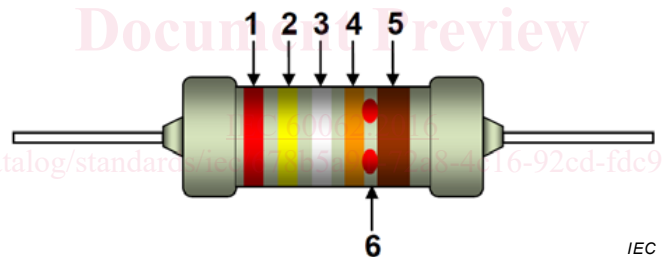
1: 1 st band	1 st numeral	Red = 2
2: 2 nd band	2 nd numeral	Yellow = 4
3: 3 rd band	3 rd numeral	White = 9
4: 4 th band	Multiplier	Orange = $\times 10^3$
5: 5 th band	Tolerance	Brown = $\pm 1\%$
6: 6 th band	TCR	Red = $\pm 50 \times 10^{-6}/K$

Figure 5 – Colour marking of a resistor with an interrupted 6th band for TCR marking

c) Other method of colour marking for TCR.

Other methods of colour marking for TCR may be used if they are clearly described by the documentation and specification of the respective resistor, and if they do not risk confusion with any of the methods given above.

An illustration of a possible similar method is given in Figure 6, adopting the general principles of TCR marking for a situation with insufficient axial length for a dedicated 6th solid or interrupted band.



Key:

1: 1 st band	1 st numeral	Red = 2
2: 2 nd band	2 nd numeral	Yellow = 4
3: 3 rd band	3 rd numeral	White = 9
4: 4 th band	Multiplier	Orange = $\times 10^3$
5: 5 th band	Tolerance	Brown = $\pm 1\%$
6: 6 th dots	TCR	Red = $\pm 50 \times 10^{-6}/K$

Figure 6 – Colour marking of a resistor using an alternative method of inter-band colour dots for TCR marking

4 Letter and numeral code for resistance and capacitance values

4.1 General rules

The value code shall use 3, 4 or 5 characters consisting of 2 figures and a letter, 3 figures and a letter, or 4 figures and a letter, as required.

The code letters replace the decimal point as shown in the respective examples below.