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**MARKING CODES FOR RESISTORS
AND CAPACITORS****FOREWORD**

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

This fifth edition cancels and replaces the fourth edition published in 1992 and its amendment 1 (1995) and constitutes a technical revision.

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

- a) completion of the existing code systems for
 - resistors with a three-character code system and a four-character code system;
 - temperature coefficient of resistance with a letter code system;
 - data code system for capacitors and resistors with the 10-year cycle code (two-character code), the 20-year cycle code (four-digit code), the 10-year cycle code (four-digit code), and a one-character code – four-year cycle.
- b) extension with a code letter system for the dielectric material of plastic film and paper capacitors.

The text of this standard is based on the following documents:

FDIS	Report on voting
40/1465/FDIS	40/1486/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under <http://webstore.iec.ch> in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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MARKING CODES FOR RESISTORS AND CAPACITORS

1 Scope

This International Standard specifies marking codes for resistors and capacitors and indexes for the dielectric material and the electrodes of plastic film and paper capacitors.

The code specified in Clause 3 gives a colour coding for fixed resistors.

It is intended for use with the values of the E6 to E192 series as specified in IEC 60063.

The code specified in Clause 4 gives a system for marking resistance and capacitance values by means of letters and digits.

The code specified in Clause 5 gives a system for marking the tolerance on resistance and capacitance values by means of a letter.

The code specified in Clause 6 gives systems for marking the date codes on capacitors and resistors by means of letters and digits.

The code (index) specified in Clause 7 gives a coding system for the dielectric material.

2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 60063:1963, *Preferred number series of resistors and capacitors*

ISO 1043-1:2001, *Plastics – Symbols and abbreviated terms – Part 1: Basic polymers and their special characteristics*

ISO 8601:2000, *Data elements and interchange formats – Information interchange – Representation of dates and times*

3 Colour code for fixed resistors

3.1 The colour code for indicating resistance values to two and three significant figures, tolerances and, if needed, the indication of the temperature coefficient of fixed resistors shall be as given in 3.2, 3.3 and 3.4.

3.2 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.

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

3.4 Colour code marking for fixed resistors

Table 1 – Values corresponding to colours

Colour	Significant figures	Multiplier	Tolerance	Temperature coefficient 10 ⁻⁶ /K
Silver	-	10 ⁻²	±10 %	-
Gold	-	10 ⁻¹	±5 %	-
Black	0	1	-	±250
Brown	1	10	±1 %	±100
Red	2	10 ²	±2 %	±50
Orange	3	10 ³	±0,05 %	±15
Yellow	4	10 ⁴	-	±25
Green	5	10 ⁵	±0,5 %	±20
Blue	6	10 ⁶	±0,25 %	±10
Violet	7	10 ⁷	±0,1 %	±5
Grey	8	10 ⁸	-	±1
White	9	10 ⁹	-	-
None	-	-	±20 %	-

For the indication of temperature coefficients according to the code as described above one of the following methods shall be used:

- a colour band as the sixth and wider band;
- an interrupted colour band as the sixth band;
- a helix.

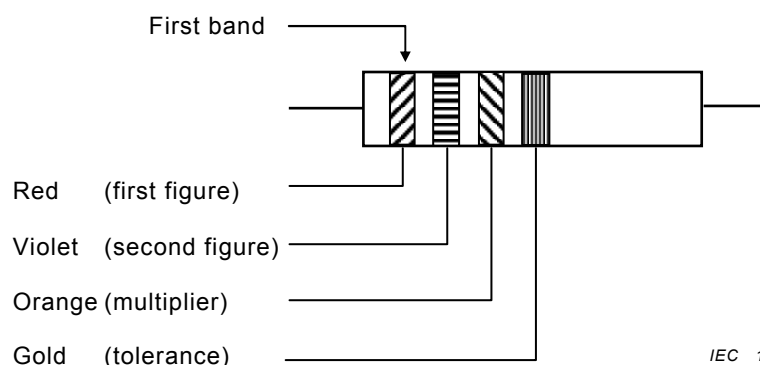
For cylindrical types, the helix shall be superimposed on the full length of the existing bands of colour code indicating the resistance value and tolerance, with the helix covering not less than 270° of the circumference.

For other types, similar methods of colour coding should be used as described in the detail specification.

Colour-code marking of the temperature coefficient shall only be used in combination with three significant figures.

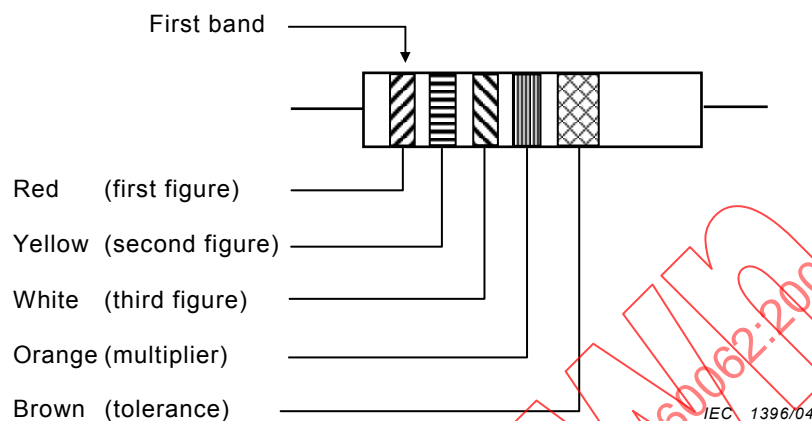
3.4.1 Example of colour-code marking for resistance values with two significant figures

Resistor of 27 000 Ω with a tolerance of ±5 %.



3.4.2 Example of colour-code marking for resistance values with three significant figures

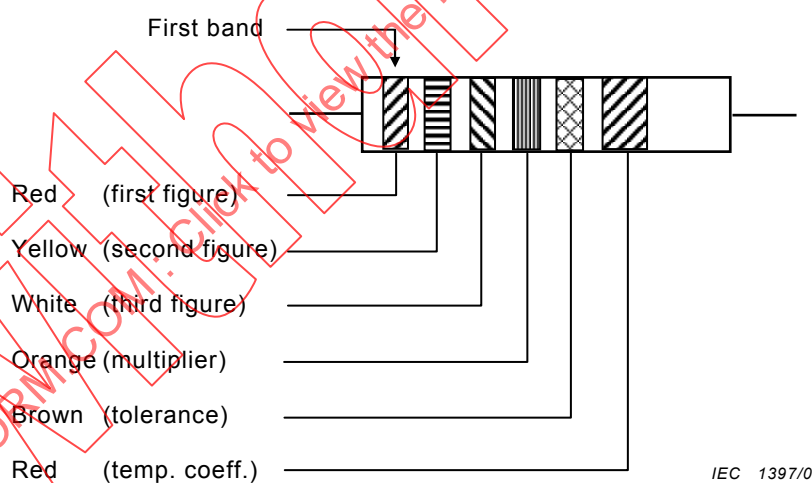
Resistor of 249 000 Ω with a tolerance of $\pm 1\%$.



NOTE In order to avoid any confusion, the last band shall be 1,5 to 2 times wider than the other bands.

3.4.3 Example of colour-code marking for resistance values with three significant figures and temperature coefficient

Resistor of 249 000 Ω with a tolerance of $\pm 1\%$ and a temperature coefficient of $\pm 50 \times 10^{-6}/K$.



NOTE In order to avoid any confusion, the last band should be 1,5 to 2 times wider than the other bands.

4 Letter and digit code for resistance and capacitance values

4.1 General rules

4.1.1 The 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.

4.1.2 The code letters replace the decimal point as shown in the examples in Tables 2 and 3.

4.1.3 Any additional code letter or digit shall appear after the tolerance letter specified in Clause 5 and shall be so applied as not to confuse the coding for value and tolerance.

4.2 Resistors

4.2.1 The RKMG code system

The letters R, K, M, G and T are used as multipliers for 1, 10^3 , 10^6 , 10^9 and 10^{12} , respectively, of the resistance value expressed in ohms.

Table 2a – Examples of code marking for resistance values – max. 3 significant digits

Resistance values	Coded marking	Resistance values	Coded marking
0,1 Ω	R10	1 $M\Omega$	1M0
0,15 Ω	R15	1,5 $M\Omega$	1M5
0,332 Ω	R332	3,32 $M\Omega$	3M32
0,590 Ω	R59	5,90 $M\Omega$	5M9
1 Ω	1R0	10 $M\Omega$	10M
1,5 Ω	1R5	15 $M\Omega$	15M
3,32 Ω	3R32	33,2 $M\Omega$	33M2
5,90 Ω	5R9	59,0 $M\Omega$	59M
10 Ω	10R	100 $M\Omega$	100M
15 Ω	15R	150 $M\Omega$	150M
33,2 Ω	33R2	332 $M\Omega$	332M
59,0 Ω	59R	590 $M\Omega$	590M
100 Ω	100R	1 $G\Omega$	1G0
150 Ω	150R	1,5 $G\Omega$	1G5
332 Ω	332R	3,32 $G\Omega$	3G32
590 Ω	590R	5,90 $G\Omega$	5G9
1 $k\Omega$	1K0	10 $G\Omega$	10G
1,5 $k\Omega$	1K5	15 $G\Omega$	15G
3,32 $k\Omega$	3K32	33,2 $G\Omega$	33G2
5,90 $k\Omega$	5K9	59,0 $G\Omega$	59G
10 $k\Omega$	10K	100 $G\Omega$	100G
15 $k\Omega$	15K	150 $G\Omega$	150G
33,2 $k\Omega$	33K2	332 $G\Omega$	332G
59,0 $k\Omega$	59K	590 $G\Omega$	590G
100 $k\Omega$	100K	1 $T\Omega$	1T0
150 $k\Omega$	150K	1,5 $T\Omega$	1T5
332 $k\Omega$	332K	3,32 $T\Omega$	3T32
590 $k\Omega$	590K	5,90 $T\Omega$	5T9
		10 $T\Omega$	10T

NOTE Resistance values expressed by four significant digits should in this code system have code markings as in the examples shown below.

Table 2b – Examples of code marking for resistance values – 4 significant digits

Value	Coded marking
59,04 Ω	59R04
590,4 Ω	590R4
5,904 $k\Omega$	5K904
59,04 $k\Omega$	59K04 etc.

4.2.2 The three-character code system

The resistance value expressed in ohms is identified by a three-character code as in the examples shown below.

Table 3 – Examples of code marking in the three-character code system

Resistance values	Coded marking	Resistance values	Coded marking
0,1 Ω	R10	10 Ω	100
0,47 Ω	R47	15 Ω	150
1,0 Ω	1R0	100 Ω	101
1,5 Ω	1R5	150 Ω	151
2,0 Ω	2R0	1,0 k Ω	102
4,7 Ω	4R7	1,5 k Ω	152
		100 k Ω	104
		150 k Ω	154
		1 M Ω	105

4.2.3 The four-character code system

The resistance value expressed in ohms is identified by a four-character code as in the examples shown below.

Table 4 – Examples of code marking in the four-character code system

Resistance values	Coded marking
0,1 Ω to 0,976 Ω	R100 to R976
1 Ω to 9,76 Ω	1R00 to 9R76
10 Ω to 97,6 Ω	10R0 to 97R6
100 Ω to 976 Ω	1000 to 9760
1 k Ω to 9,76 k Ω	1001 to 9761
10 k Ω to 97,6 k Ω	1002 to 9762

4.3 Capacitors

The letters p, n, μ , m and F are used as multipliers for 10^{-12} , 10^{-9} , 10^{-6} , 10^{-3} and 1, respectively, of the capacitance value expressed in farads.

Table 5a – Examples of code marking for capacitance values – max. 3 significant digits

Capacitance values	Coded marking	Capacitance values	Coded marking
0,1 pF	p10	100 nF	100n
0,15 pF	p15	150 nF	150n
0,332 pF	p332	332 nF	332n
0,590 pF	p59	590 nF	590n
1 pF	1p0	1 μ F	1 μ 0
1,5 pF	1p5	1,5 μ F	1 μ 5
3,32 pF	3p32	3,32 μ F	3 μ 32
5,90 pF	5p9	5,90 μ F	5 μ 9
10 pF	10p	10 μ F	10 μ
15 pF	15p	15 μ F	15 μ
33,2 pF	33p2	33,2 μ F	33 μ 2
59,0 pF	59p	59,0 μ F	59 μ
100 pF	100p	100 μ F	100 μ
150 pF	150p	150 μ F	150 μ
332 pF	332p	332 μ F	332 μ
590 pF	590p	590 μ F	590 μ
1 nF	1n0	1 mF	1m0
1,5 nF	1n5	1,5 mF	1m5
3,32 nF	3n32	3,32 mF	3m32
5,90 nF	5n9	5,90 mF	5m9
10 nF	10n	10 mF	10m
15 nF	15n	15 mF	15m
33,2 nF	33n2	33,2 mF	33m2
59,0 nF	59n	59,0 mF	59m

NOTE Capacitance values expressed by four significant digits should have code markings as in the examples shown below.

Table 5b – Examples of code marking for capacitance values – 4 significant digits

Value	Coded marking
68,01 pF	68p01
680,1 pF	680p1
6,801 nF	6n801
68,01 nF	68n01 etc.

5 Letter code for tolerance and temperature coefficient on resistance and capacitance values

Code letters shall be placed after the resistance and capacitance values.

5.1 Symmetrical tolerances in per cent

The following letters shall be used for indicating the tolerance on resistance and capacitance values.

Table 6 – Letter code for symmetrical tolerances (per cent)

Tolerance %	Code letter
$\pm 0,005$	E
$\pm 0,01$	L
$\pm 0,02$	P
$\pm 0,05$	W
$\pm 0,1$	B
$\pm 0,25$	C
$\pm 0,5$	D
± 1	F
± 2	G
± 3	H
± 5	J
± 10	K
± 20	M
± 30	N

5.2 Asymmetrical tolerances in per cent

For asymmetrical tolerances on capacitance values, the following letters shall be used.

Table 7 – Letter code for asymmetrical tolerances (per cent)

Tolerance %	Code letter
–10 +30	Q
–10 +50	T
–20 +50	S
–20 +80	Z

5.3 Symmetrical tolerances expressed in fixed values

For tolerances on capacitance values below 10 pF, the following letters shall be used.

Table 8 – Letter code for symmetrical tolerances (fixed values)

Tolerance pF	Code letter
$\pm 0,1$	B
$\pm 0,25$	C
$\pm 0,5$	D
± 1	F
± 2	G

5.4 Other tolerances

For tolerances for which no code letter has been laid down, the letter A shall be used.

The letter A indicates that the tolerance is to be identified in other documents.

5.5 Temperature coefficient of resistance

The following letters shall be used for indicating the temperature coefficient of resistance values.

For temperature coefficients for which no code letter has been laid down, the letter Z shall be used. The letter Z indicates that the temperature coefficient of resistance is to be identified in other documents.

Table 9 – Letter code for temperature coefficient of resistance (TCR)

TCR $10^{-6}/K$	Code letter
*	Z
±2 500	Y
±1 500	X
±1 000	W
±500	V
±250	U
±150	T
±100	S
±50	R
±25	Q
±15	P
±10	N
±5	M
±2	L
±1	K
±0,5	J
±0,2	H
±0,1	G
* Refer to the product specification for information on the temperature coefficient.	

6 Date code system for capacitors and resistors

6.1 Two-character code (year/month)

Where the marking of the year and month of manufacture is required, one of the following systems shall be used.