

## The Resistor Color Code

Resistor values are normally shown using colored bands. Each color represents a number as shown in the table. Most resistors show 4 bands:

- The **first band** gives the **first digit**.
- The **second band** gives the **second digit**.
- The **third band** indicates the **number of zeros**.
- *The **fourth band** is used to show the tolerance (precision) of the resistor. In particular:*

**silver**  $\pm 10\%$ , **gold**  $\pm 5\%$ , **red**  $\pm 2\%$ , **brown**  $\pm 1\%$ .

**Example:**



This resistor has the following bands:

red ( $\rightarrow 2$ ),  
violet ( $\rightarrow 7$ ),  
yellow ( $\rightarrow 4$  zeros)  
gold ( $\rightarrow 5\%$ )

So its value is  $270000 \Omega = 270 \text{ k}\Omega$  (5%).

Metal-film precision resistors use a four-digit code printed on the resistor body, rather than the ordinary color-banding scheme. The first three digits denote a value, and the last digit is the “number of zeros” multiplier (note that the color bands work the same way, but with only three digits altogether) . For example, 1693 denotes a 169k resistor, and 1000 denotes a 100  $\Omega$  resistor. Many capacitors types use this same printed number scheme.

### Color code for small value resistors (less than 10 $\Omega$ ).

The standard color code cannot show values of less than 10 $\Omega$ . To show these small values two special colors are used for the **third band**: **gold** which means  $\times 0.1$  and **silver** which means  $\times 0.01$ . The first and second bands represent the digits as normal. For example:

**red, violet, gold** bands represent  $27 \times 0.1 = 2.7 \Omega$

**green, blue, silver** bands represent  $56 \times 0.01 = 0.56 \Omega$

### Tolerance of resistors (fourth band of color code).

The tolerance of a resistor is shown by the **fourth band** of the color code. Tolerance is the **precision** of the resistor and it is given as a percentage. For example a 390 $\Omega$  resistor with a tolerance of  $\pm 10\%$  will have a value within 10% of 390 $\Omega$ , between  $390 - 39 = 351\Omega$  and  $390 + 39 = 429\Omega$  (39 is 10% of 390). If no fourth band is shown the tolerance is  $\pm 20\%$ .

A special color code is used for the fourth band tolerance:

**silver**  $\pm 10\%$ , **gold**  $\pm 5\%$ , **red**  $\pm 2\%$ , **brown**  $\pm 1\%$ .

Colour	Number
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Grey	8
White	9

A summary of the colored bands meaning is reported below.

