

**How to Read Colour Codes on Resistors**

Resistors are rather small and come in many different values of resistance.

If the manufacturer were to print the value of the resistor on the side of the resistor, it would be too small to read.

Thus a clever way was devised to tell the value of a resistor.

The resistors are all color coded.

All the resistors we use have 3 or 4 color bands on them.

Every color is different number.

The **first** colour band indicates the first number of the resistor value.



The **second** colour band indicates the second number of the resistor value.



The **third** colour band indicates the number of zeroes that follow the first two numbers--the **multiplier** band.

$\times 10^1$

If there is a **fourth** colour band it indicates the **TOLERANCE**—the acceptable percentage you are allowed to be “off” of the accepted resistance.

$\times 10$   
 $1 \emptyset$

$\pm \%$  5% or 10% or 20%  
Au Ag  $\emptyset$

blue — red — brown — silver  
6 2  $\times 10^1 \Omega \pm 10\%$

$$620 \Omega \pm 10\%$$

$$\frac{10 \Omega}{100 \Omega} = \frac{x}{620 \Omega}$$

$$x = \frac{10 \Omega \times 620 \Omega}{100 \Omega}$$

$$620 \Omega - 62 \Omega$$

$$= 62 \Omega$$

$$620 \Omega + 62 \Omega$$

$$\boxed{558 \Omega - 682 \Omega}$$

Color	Digit	Multiplier	Tolerance (%)
Black	0	$10^0$ (1)	
Brown	1	$10^1$	1
Red	2	$10^2$	2
Orange	3	$10^3$	
Yellow	4	$10^4$	
Green	5	$10^5$	0.5
Blue	6	$10^6$	0.25
Violet	7	$10^7$	0.1
Grey	8	$10^8$	
White	9	$10^9$	
Gold		$10^{-1}$	5
Silver		$10^{-2}$	10
(none)			20

**Example:**

A resistor has the following banding pattern—Red—Green—Red—Silver.

What is the value of the resistor and its acceptable range?

$$\begin{aligned}
 & 25 \times 10^2 \Omega \pm 10\% \\
 & 2.5 \times 10^3 \Omega \pm 10\% \\
 & 2500 \Omega \pm 10\% \\
 & -250 \quad +250 \\
 & 2250 \Omega - 2750 \Omega
 \end{aligned}
 \left. \vphantom{\begin{aligned} & 25 \times 10^2 \Omega \pm 10\% \\ & 2.5 \times 10^3 \Omega \pm 10\% \\ & 2500 \Omega \pm 10\% \\ & -250 \quad +250 \\ & 2250 \Omega - 2750 \Omega \end{aligned}} \right\} \text{show me the math}$$