Precious Metals Conductivity Table at Room Temprature

This table presents the electrical resistivity and electrical conductivity of several materials.

Electrical resistivity, represented by the Greek letter ρ (rho), is a measure of how strongly a material opposes the flow of electric current. The lower the resistivity, the more readily the material permits the flow of electric charge.

Electrical conductivity is the reciprocal quantity of resistivity. Conductivity is a measure of how well a material conducts an electric current. Electric conductivity may be represented by the Greek letter σ (sigma), κ (kappa), or γ (gamma).

Table of Resistivity and Conductivity at 20°C

Material	**ρ (Ω•m) at 20 °C Resistivity**	**σ (S/m) at 20 °C Conductivity**
Silver	1.59×10^{-8}	6.30×10^{7}
Copper	1.68×10^{-8}	5.96×10^{7}
Annealed copper	1.72×10^{-8}	5.80×10^{7}
Gold	2.44×10^{-8}	4.10×10^{7}
Aluminum	2.82×10^{-8}	3.5×10^{7}
Calcium	3.36×10^{-8}	2.98×10^{7}
Tungsten	5.60×10^{-8}	1.79×10^{7}
Zinc	5.90×10^{-8}	1.69×10^{7}

Nickel	6.99×10^{-8}	1.43×10^{7}
Lithium	9.28×10^{-8}	1.08×10^{7}
Iron	1.0×10^{-7}	1.00×10^{7}
Platinum	1.06×10^{-7}	9.43×10^{6}
Tin	1.09×10^{-7}	9.17×10^{6}
Carbon steel	(10^{10})	1.43×10^{-7}
Lead	2.2×10^{-7}	4.55×10^{6}
Titanium	4.20×10^{-7}	2.38×10^{6}
Grain oriented electrical steel	4.60×10^{-7}	2.17×10^{6}
Manganin	4.82×10^{-7}	2.07×10^{6}
Constantan	4.9×10^{-7}	2.04×10^{6}
Stainless steel	6.9×10^{-7}	1.45×10^{6}
Mercury	9.8×10^{-7}	1.02×10^{6}
Nichrome	1.10×10^{-6}	9.09×10^{5}
GaAs	5×10^{-7} to 10×10^{-3}	5×10^{-8} to 10^{3}
Carbon (amorphous)	5×10^{-4} to 8×10^{-4}	1.25 to 2×10^{3}
Carbon (graphite)	2.5×10^{-6} to 5.0×10^{-6} //basal plane 3.0×10^{-3} ⊥basal plane	2 to 3×10^{5} //basal plane 3.3×10^{2} ⊥basal plane
Carbon (diamond)	1×10^{12}	$\sim10^{-13}$
Germanium	4.6×10^{-1}	2.17
Sea water	2×10^{-1}	4.8
Drinking water	2×10^{1} to 2×10^{3}	5×10^{-4} to 5×10^{-2}

Silicon	6.40×10^{2}	1.56×10^{-3}
Wood (damp)	1×10^{3} to 4	10^{-4} to 10^{-3}
Deionized water	1.8×10^{5}	5.5×10^{-6}
Glass	10×10^{10} to 10×10^{14}	10^{-11} to 10^{-15}
Hard rubber	1×10^{13}	10^{-14}
Wood (oven dry)	1×10^{14} to 16	10^{-16} to 10^{-14}
Sulfur	1×10^{15}	10^{-16}
Air	1.3×10^{16} to 3.3×10^{16}	3×10^{-15} to 8×10^{-15}
Paraffin wax	1×10^{17}	10^{-18}
Fused quartz	7.5×10^{17}	1.3×10^{-18}
PET	10×10^{20}	10^{-21}
Teflon	10×10^{22} to 10×10^{24}	10^{-25} to 10^{-23}

Factors That Affect Electrical Conductivity

There are three main factors that affect the conductivity or resistivity of a material:

1. **Cross-Sectional Area:** If the cross-section of a material is large, it can allow more current to pass through it. Similarly, a thin cross-section restricts current flow.
2. **Length of the Conductor:** A short conductor allows current to flow at a higher rate than a long conductor. It’s a bit like trying to move a lot of people through a hallway.
3. **Temperature:** Increasing temperature makes particles vibrate or move more. Increasing this movement (increasing temperature) decreases conductivity because the molecules are more likely to get in the way of

current flow. At extremely low temperatures, some materials are superconductors.

Reference:

Ugur, Umran. “Resistivity of steel.” Elert, Glenn (ed), The Physics Factbook, 2006.