

Insulators and Conductors

Another important element of understanding electricity is knowing what will conduct it and what won't, because all electronic components are based on these basics. To do this we take a quick look at what is meant by the *flow of electric current*.

Atoms and electrons

In simple terms, everything is made up of *atoms* that consist of *protons*, *neutrons*, and *electrons*. The protons have a positive electrical charge and together with the neutrons, which have no charge, make up the nucleus of the atom. Outside of the nucleus are the tiny negatively charged particles we call electrons.

The atoms of different materials all have different numbers of these protons, neutrons, and electrons. A powerful force keeps everything bonded together and balanced, but it is also possible for an atom to “lose” an electron. The atom is now electrically unbalanced and has a positive charge, making it able to attract an electron from another atom.

This movement of electrons is normally random, but if a voltage is applied across the material then the electrons all move in the same direction. This movement is the flow of electric current. Some materials conduct electricity very well, whilst others conduct hardly any or none at all.

Insulators

Materials where the electrons are held tightly to their nucleus so that they exhibit hardly any current flow are called *insulators*. They have a high resistance to the flow of current.

Conductors

Materials that have loosely connected electrons to their nucleus are called *conductors* because these loose electrons are able to easily move from one atom to another through the material. They have a low resistance to the flow of current. Metals are in this category.

The table opposite lists some common insulators and conductors that you will be familiar with.

Insulators	Conductors
Rubber	Copper
PVC	Aluminum
Glass	Mild Steel
Wood	Gold



Copper and gold are excellent conductors, and so are used extensively in electronic circuits. You will often come across gold-plated pins in high-quality connectors.



Wherever there is electricity it is always advisable to work with insulated tools to prevent shorting out connectors or components. It will also minimize the chance of receiving an electric shock if high voltages are present.