

# What is an Electromagnetic Coil?

An electromagnetic coil is a fundamental electrical component that converts electrical energy into a magnetic field when current flows through a wound conductor, a principle defined by Ampere's Law. This capability makes coils essential across industries—from everyday electronics to advanced applications like medical imaging and aerospace—where controlled power and precision are critical.

## Structure of an Electromagnetic Coil

Electromagnetic coils are designed with two key components:

- » **Conductor** – a highly conductive wire, often copper, that carries the electrical current.
- » **Core** – usually a ferromagnetic material such as iron, which amplifies the magnetic field.

The conductor is wound helically or spirally around the core, with each loop of wire called a turn.

## Function of an Electromagnetic Coil

The strength of the field depends on two main factors:

1. The amount of current flowing through the wire.
  2. The number of turns in the coil.
- » Single-turn coils generate weaker fields.
  - » Multi-turn coils provide stronger, more efficient fields for the same current.

This flexibility allows engineers to precisely control electromagnetic power, which makes electromagnetic coils extremely versatile in both small-scale and large-scale applications

## Electromagnetic Coil Applications

Electromagnetic coils are indispensable across many industries, powering critical technologies such as:

- » **Aerospace** – propulsion systems, navigation equipment.
- » **Automotive** – speed sensors, tachometers, electric power systems.
- » **Commercial** – RFID and barcode scanners, exercise equipment, electric toothbrushes, wind turbines.
- » **Communications** – power supplies, RF antenna duplexers, noise suppression, RF/microwave switching.
- » **Industrial** – level sensors, control joysticks, automation components.
- » **Laser Technology** – surgical devices, medical therapeutics, laser vision correction, entertainment light shows.
- » **Medical** – imaging equipment (MRI, CT), ECG & EEG monitoring, neurostimulation devices.
- » **Military & Defense** – radar, infrared and ultraviolet sensing, signal jamming, missile defense systems.
- » **Music & Audio** – amplifiers, recording equipment, speaker crossovers, custom guitar pickups with noise cancellation.

From powering advanced defense systems to improving everyday consumer devices, electromagnetic coils play a critical role in modern technology. While they combine efficiency, adaptability, and control, their ability to generate controlled magnetic fields makes them one of the most adaptable components in electronics and engineering today.

## Precise and Reliable Electromagnets at Able Coil & Electronics

Able Coil & Electronics produces a wide range of wire wound electromagnetic products. These products include Custom Coil Assemblies, Fine Wire Assemblies, Self-Supporting Coils, Toroids, High Frequency Transformers, Power & Signal Transformers, Cable and Connector Harnesses, Encapsulated Assemblies and Integrated Electro-mechanical Assemblies.

Our experts work with customers to find the perfect solution for their application, including items that require tight tolerances, challenging geometries, high reliability, and stringent environmental requirements.

**Custom is our standard!** We're ready to be your trusted partner for innovative, high-performance wire-wound solutions. For more information on our services, [contact us](https://www.ablecoil.com) today!



**ABLE COIL**  
& ELECTRONICS

[www.ablecoil.com](https://www.ablecoil.com)