

Windings and taps

The wire or conductor which constitutes the coil is called the **winding**. The hole in the centre of the coil is called the **core** area or magnetic axis. Each loop of wire is called a **turn**. In windings in which the turns touch, the wire must be insulated with a coating of nonconductive insulation such as plastic or enamel to prevent the current from passing between the wire turns. The winding is often wrapped around a coil form made of plastic or other material to hold it in place. The ends of the wire are brought out and attached to an external circuit. Windings may have additional electrical connections along their length; these are called **taps**. A winding which has a single tap in the centre of its length is called **centre-tapped**.

Coils can have more than one winding, insulated electrically from each other. When there are two or more windings around a common magnetic axis, the windings are said to be **inductively coupled** or **magnetically coupled**. A time-varying current through one winding will create a time-varying magnetic field which passes through the other winding, which will induce a time-varying voltage in the other windings. This is called a transformer.

Magnetic core

Many electromagnetic coils have a magnetic core, a piece of ferromagnetic material like iron in the centre to increase the magnetic field. The current through the coil magnetizes the iron, and the field of the magnetized material adds to the field produced by the wire. This is called a **ferromagnetic-core** or **iron-core coil**. A ferromagnetic core can increase the magnetic field of a coil by hundreds or thousands of times over what it would be without the core. A **ferrite core coil** is a variety of coil with a core made of ferrite, a ferromagnetic ceramic compound. Ferrite coils have lower losses at high frequencies.

A coil without a ferromagnetic core is called an **air-core coil**. This includes coils wound on plastic or other nonmagnetic forms, as well as coils which actually have empty air space inside their windings.

Type of Transformers

A transformer is a device with two or more magnetically coupled windings (or sections of a single winding). A time varying current in one coil (called the primary winding) generates a magnetic field which induces a voltage in the other coil (called the secondary winding). A few types:

- **Power & Distribution transformer** - A transformer in an electric power grid which transforms the high voltage from the electric power line to the lower voltage used by utility customers.
- **Autotransformer** - a transformer with only one winding. Different portions of the winding, accessed with taps, act as primary and secondary windings of the transformer.
- **Toroidal transformer** - the core is in the shape of a toroid. This is a commonly used shape as it decreases the leakage flux, resulting in less electromagnetic interference.
- **Induction coil or trembler coil** - an early transformer which uses a vibrating interrupter mechanism to break the primary current so it can operate off of DC current.

- **Ignition coil** - an induction coil used in internal combustion engines to create a pulse of high voltage to fire the spark plug which initiates the fuel burning.
- **Balun**- a transformer which matches a balanced transmission line to an unbalanced one.
- **Bifilar coil** - a coil wound with two parallel, closely spaced strands. If AC currents are passed through it in the same direction, the magnetic fluxes will add, but if equal currents in opposite directions pass through the windings the opposite fluxes will cancel, resulting in zero flux in the core. So no voltage will be induced in a third winding on the core. These are used in instruments and in devices like Ground Fault Interrupters. They are also used in low inductance wire wound resistors for use at RF frequencies.
- **Audio transformer** - A transformer used with audio signals. They are used for impedance matching.
- **Hybrid coil** - a specialized audio transformer with 3 windings used in telephony circuits to convert between two-wire and four-wire circuits.