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Science & Tech

transformer

electronics

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Also known as: AC transformer, alternating-current transformer

Written and fact-checked by

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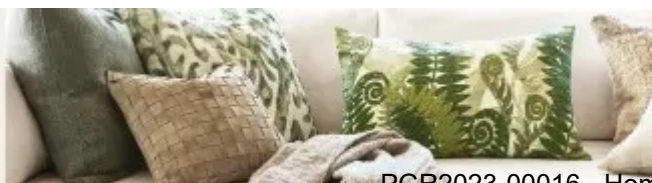
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Transformer, device that transfers electric energy from one alternating-current [circuit](#) to one or more other circuits, either increasing (stepping up) or reducing (stepping down) the [voltage](#). Transformers are employed for widely varying purposes; e.g., to reduce the voltage of conventional power circuits to operate low-voltage devices, such as doorbells and toy electric trains, and to raise the voltage from electric generators so that [electric power](#) can be transmitted over long distances.

Transformers change voltage through [electromagnetic induction](#); i.e., as the magnetic lines of force (flux lines) build up and collapse with the changes in [current](#) passing through the primary [coil](#), current is induced in another coil, called the secondary. The secondary voltage is calculated by multiplying the primary voltage by the ratio of the number of turns in the secondary coil to the number of turns in the primary coil, a quantity called the turns ratio.

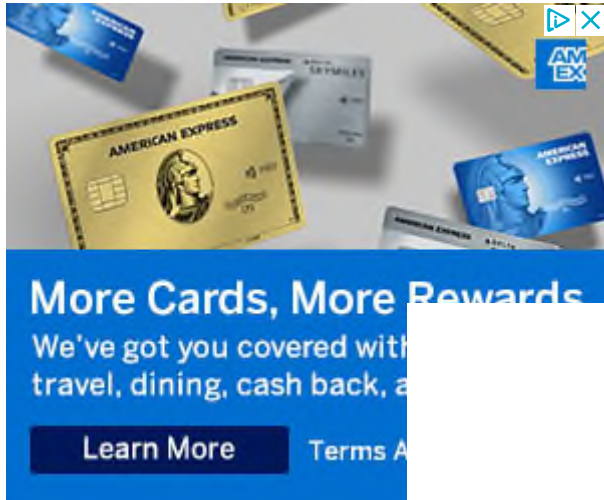


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Air-core transformers are designed to transfer radio-frequency currents—i.e., the currents used for radio transmission;

they consist of two or more coils wound around a solid insulating substance or on an insulating coil form. Iron-core transformers serve [analogous](#) functions in the audio-frequency range.



Impedance-matching transformers are used to match the impedance of a source and that of its load, for most efficient transfer of energy. Isolation transformers are usually employed for reasons of safety to isolate a piece of equipment from the source of power.

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voltage regulator

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Voltage regulator, any electrical or electronic device that maintains the voltage of a power source within acceptable limits. The voltage regulator is needed to keep voltages within the prescribed range that can be tolerated by the electrical equipment using that voltage. Such a device is widely used in [motor vehicles](#) of all types to match the output voltage of the generator to the electrical load and to the charging requirements of the battery. Voltage regulators also are used in electronic equipment in which excessive variations in voltage would be [detrimental](#).

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Related Topics: [electric circuit](#) • [induction regulator](#) • [step regulator](#) • [electric power supply](#)

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In [motor vehicles](#), voltage regulators rapidly switch from one to another of three [circuit](#) states by means of a spring-loaded, double-pole switch. At low speeds, some current from the generator is used to boost the generator's [magnetic field](#), thereby increasing voltage output. At higher speeds, resistance is inserted into the generator-field circuit so that its voltage and current are moderated. At still higher speeds, the circuit is switched off, lowering the magnetic field. The regulator switching rate is usually 50 to 200 times per second.

Electronic voltage regulators utilize solid-state semiconductor devices to smooth out variations in the flow of current. In most cases, they operate as variable resistances; that is, resistance decreases when the electrical load is heavy and increases when the load is lighter.

Voltage regulators perform the same function in large-scale power-distribution systems as they do in motor vehicles and other machines; they minimize variations in voltage in order to protect the equipment using the electricity. In power-distribution systems the regulators are either in the substations or on the feeder lines themselves. Two types of regulators are used: step regulators, in

which switches regulate the current supply, and induction regulators, in which an [induction](#) motor supplies a secondary, continually adjusted voltage to even out current variations in the feeder line.

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