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Difference between Voltage Transformer and Transformer

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A B S T R A C T
In this article, voltage transformers are discussed about their working principles and the difference between them and ordinary transformers.

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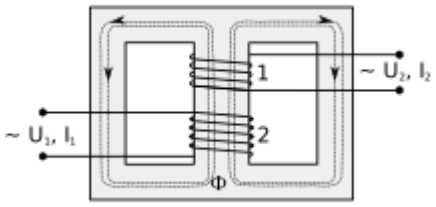
INTRODUCTION: A transformer (Latin: transformo — to change) is an electrostatic device that converts low voltage to high voltage and high voltage to low voltage (without changing the frequency). In technology - a device designed to change energy or some important property of objects (for example, current, voltage, etc.). It is divided into electric transformer, hydrotransformer, phototransformer, OUCH (ultra high frequency) transformer and others. An electrical transformer is designed to change (step up or step down) alternating current voltage. His work is based on the phenomenon of electromagnetic induction. It consists of one primary coil, one or several secondary coils, and a ferromagnetic core (magnetic conductor) of mostly closed type.

All coils are wound on a ferromagnetic core and are inductively coupled to each other. The primary winding ends (transformer input) are connected to the alternating current voltage source, and the secondary winding (or windings) ends (transformer output) are connected to consumers. P. N. Yablochkov used the electric transformer for the first time in 1876 in the electric lighting network. M. O. Dolivo Dobrovolsky created a three-phase electric transformer in 1890. Later, other scientists and inventors worked on improving the transformer, increasing its power and efficiency, improving insulation, compacting, and others.

The most common type of electrical transformer is power transformers. They are installed on power transmission lines (EUL). Such transformers increase the current voltage produced by generators of power plants from 10-15 kV to 220-750 kV. The coils of the transformers are made of copper, and the magnetic conductors are made of cold-rolled electrotechnical steel. There are dry and oil types of electric transformer. A dry transformer is air cooled without oil. The magnetic conductor and coils of the oil transformer are placed in a tank filled with mineral oil. Oil acts as an insulator and coolant.

In addition to power transformers, there are also transformers such as measuring transformer, voltage transformer, current transformer, pulse transformer, radio frequency transformer.

A complex designed to increase or decrease voltage in the alternating current network and distribute electricity to consumers is called a substation. It will have a power transformer, distribution devices, automatic control and protection device, additional facilities. Some high-power step-down transformer substations use powerful, laboratory and household compact autotransformers.



Basic operating principles

The operation of the transformer is based on two main principles:

1. A time-varying electric current creates a time-varying magnetic field (electromagnetism).

2. The change in the magnetic flux passing through the winding creates an EMF (electromagnetic force) in the winding.

One of the windings, called the primary winding, is energized from an external source. The alternating magnetizing current passing through the primary winding creates an alternating magnetic flux in the magnetic circuit. As a result of electromagnetic induction, the alternating magnetic flux in the magnetic circuit in all windings, including the primary, creates an induction EMF (electromagnetic force) proportional to the first derivative of the magnetic flux, the sinusoidal flux shifts in the opposite direction by 90 °. relative to the magnetic flux. Some transformers operating at high or very high frequencies may not have a magnetic circuit. The voltage pattern in the secondary winding is related to the voltage pattern in the primary winding in a more complicated way. Due to this complexity, it was possible to create a series of special transformers that serve as current amplifiers, frequency multipliers, signal generators, etc. In the case of the classic AC transformer proposed by P. Yablochkov, it converts the sinusoid of the input voltage into the same sinusoidal voltage at the output of the second winding. Many electrical appliances and tools require different voltages. Even the same electrical device requires different current voltages. For example, a radio receiver requires only a few volts to heat a lamp, and several hundred volts to operate its amplifier. However, we often have only one network with a certain voltage at our disposal. Therefore, it is necessary to change the alternating current. The simultaneous change of current strength with alternating current voltage at the same frequency is called alternating current transformation. A device that transforms alternating current is called a transformer. The operation of the transformer is based on the phenomenon of electromagnetic induction.

The working principle of the voltage transformer is the same as the general transformer and differs only in terms of structure, materials used, capabilities and error range. First, the voltage transformer: A voltage transformer is a voltage converter that converts a high voltage to a low voltage to reflect the change of a high voltage value to a low voltage value. Therefore, voltage measurement can be done directly through a voltage transformer through a general electric meter.

1. Voltage transformer electrical converter, also known as instrument transformer;

2. The power of the voltage transformer is very small, usually only tens of hundreds of volts;

3. The voltage on the primary side of the voltage transformer is the grid voltage that is not affected by the secondary load and in most cases its load is constant;

4. The secondary side load is mainly the instrument and the relay coil. Their impedance is very large, and the current through it is very small. If the secondary load is increased indefinitely, the secondary voltage will decrease, resulting in an increased measurement error.

5. Using a voltage transformer to measure voltage indirectly, it can accurately reflect the value of the high voltage side to ensure measurement accuracy;

6. Regardless of the high voltage of the primary voltage of the voltage transformer, its secondary voltage is usually 100V, which standardizes the measuring device and the relay voltage coil in production. In addition, it ensures the safety of the measurement and relay protection work of instruments, and also solves the difficulties in the isolation and production process of high-voltage measurement;

7. Voltage transformers are commonly used in circuits such as power distribution metering and relay protection. Second, transformer: A transformer is a device that converts alternating voltage, current, and impedance. When an alternating current is passed through the primary coil, an alternating magnetic flux is produced in the iron core (or magnetic core), which is the voltage (or current) in the secondary coil. Load a large current to change the voltage level.

Conclusion: The main difference between the transformers we have considered and the voltage transformers is that we can give 7 general conclusions.

1. Classification of various transformers into several categories according to cooling methods, moisture-proof methods, core structure, power phase, use, etc.;

2. The power of the transformer is from small to large, from tens of volts to tens of megavolts amperes;

3. The primary side voltage of the transformer is greatly affected by the secondary load, when the secondary load is large, the system voltage is affected;

4. The secondary side load of the transformer is a variety of electrical equipment, flowing through a large, strong load carrying capacity;

5. Regardless of the primary side voltage of the transformer, the secondary voltage can be stepped up or down as needed;

6. The shape and size of the transformer varies greatly depending on the capacity;

7. Transformers are often used in various situations.

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