



INSTRUMENT TRANSFORMERS

I. TERMS AND DEFINITIONS

INSTRUMENT TRANSFORMERS

The following definitions deal with general and specific terms used in current transformers and voltage transformers of measurement and / or protection.

A. GENERAL TERMS

Terms	Definitions
Measurement transformer	Transformer for feeding measuring instruments, meters, relays and other similar devices. <i>Note: The term "measurement transformer" includes both current transformers and voltage transformers.</i>
Measurement autotransformer	Measuring transformer in which the windings primary and secondary have a part in common.
Combined transformer	Measuring transformer formed by a current and voltage transformer in the same cover.
Primary winding (of a current transformer)	Winding through which the intensity that will be transformed flows.
Primary winding (of a voltage transformer)	Winding to which is applied the voltage to be transformed.
Secondary winding (of a current transformer)	Winding which feeds the current circuits of measuring instruments, meters, relays and similar devices.
Secondary winding (of a voltage transformer)	Winding that supplies the voltage circuits of measuring instruments, meters, relays and other similar devices.
Secondary circuit	External circuit fed by the secondary winding of a transformer.
Rated primary current (of a current transformer)	Value of the primary current that appears in the designation of the transformer and according to which its operating conditions are determined. <i>Note: The "primary current" is the one that flows through the primary winding of a current transformer.</i>
Rated primary voltage (of a voltage transformer)	Value of the primary voltage that appears in the designation of the transformer and according to which its operating conditions are determined. <i>Note: The "primary voltage" is the one applied to the primary winding of a voltage transformer.</i>
Rated secondary current (of a current transformer)	Value of the secondary current that appears in the designation of the transformer and according to which its operating conditions are determined. <i>Note: "Secondary current" is the current that flows through a secondary winding of a current transformer when the current passes through the primary winding.</i>

Terms	Definitions
Rated secondary voltage (of a voltage transformer)	<p>Value of the secondary voltage that appears in the designation of the transformer and according to which its operating conditions are determined.</p> <p><i>Note: The "secondary voltage" is that which is generated at the terminals of a secondary winding of a voltage transformer when a voltage is applied to the primary winding.</i></p>
Rated transformation ratio of a current transformer	Ratio between the assigned primary current and the assigned secondary current of a current transformer.
Rated transformation ratio of a voltage transformer	Ratio between the assigned primary voltage and the assigned secondary voltage of a voltage transformer.
Current error (ratio error in a current transformer)	Error that introduces a current transformer in the measurement of an intensity and that is derived from the fact that the real transformation ratio is not equal to the assigned transformation ratio.
Voltage error (ratio error in a voltage transformer)	Error that introduces a voltage transformer in the measurement of a voltage and that is derived from the fact that the real transformation ratio is not equal to the assigned transformation ratio.
Phase error	<p>Phase difference between the primary or secondary currents (or voltages), with the sense of the primary and secondary currents (or voltages) selected so that, for a perfect transformer, this difference is zero.</p> <p>The phase error is considered to be positive when the vector of the secondary current (or voltage) is advanced with respect to the vector of the primary current (or voltage).</p> <p><i>Note: This definition is accurate only for sinusoidal currents.</i></p>
Accuracy class	Designation applied to a measurement transformer in which the ratio error and its phase error remain within the specified limits under specified conditions of use.
Precision charge	Charge value at which accuracy specifications are based.
Charge	<p>Impedance of the secondary circuit, expressed in ohms and with indication of the power factor.</p> <p>The charge is usually expressed by the apparent absorbed power (in volt-amperes) with a specified power factor and the current (or voltage) secondary assigned.</p>
Power factor	Relation between active power and apparent power.
Precision burden	Value of the apparent power (in volt-amperes with a specified power factor) that the transformer supplies to the secondary circuit with the secondary current (or voltage) assigned when it is connected to its accuracy charge.

Terms	Definitions
Higher voltage for the material	Highest value of the effective voltage between phases for which the transformer is specified in relation to its insulation.
Assigned insulation level	Combination of voltage values that characterizes the insulation of the transformer in relation to its capacity to withstand dielectric stresses.

B. CURRENT TRANSFORMERS

Terms	Definitions
Current transformer	Measuring transformer in which secondary current is, in normal conditions of use, substantially proportional to the primary current and offset relative thereto an angle close to zero, for a proper sense of the connections.
Current transformer for bushing	Current transformer without primary winding and without its own insulation that can be placed directly on a bushing or an insulated conductor.
Current transformer for passage of bars	Current transformer without a primary winding, but with primary insulation, which can be placed directly on a conductor or a bar.
Current transformer for cables	Current transformer without primary winding and its own primary insulation, which can be placed on an insulated cable.
Split core current transformer	Current transformer without primary winding, and its own primary insulation, where the magnetic circuit can be opened (or otherwise, separated into two parts) and then closed around the insulated conductor that transports the current that will be measured.
Built-in bar current transformer	Current transformer in which the primary winding is formed by a bar or a group of bars in parallel.
Current transformer type bushings	Current transformer constructed such that it can be used as a bushing.
Support-type current transformer	Current transformer arranged in such a way that it acts as a support for the conductor of the primary circuit.
Extended-range current transformer	Current transformer that has a permanently assigned thermal current higher than its assigned primary current (greater than 120%) and for which, in this current, accuracy requirements are indicated. The normal values of the heating currents for the extended range transformers are 120%, 150% and 200% of the assigned primary current.

Terms	Definitions
Residual current	The sum of instantaneous values of the three-line currents, in a three-phase system.
Residual current transformer	Current transformer, or group of three current transformers connected such that only transformed residual current.
Rated short-circuit thermal current	Effective value of the primary current that the transformer has had for 1 s with the secondary winding in short circuit, without prejudice to the detrimental effects.
Rated dynamic current	Peak value of the primary current that the transformer must withstand the primary winding in short circuit, without being damaged electrically or mechanically by the resulting electromagnetic forces.
Rated permanent thermal current (or heating intensity)	Current value that can circulate permanently by the primary winding, with the secondary winding connected to the precision charge, without the heating exceeding the specified values.
Excitement current	Effective value of the current flowing through the secondary winding of a current transformer, when a sinusoidal voltage is applied between the secondary terminals at the assigned frequency, with the primary winding and all other windings with the open circuit.
Safety factor for measuring devices (FS)	Ratio between the primary limit current assigned and the primary current assigned. <i>Note: In case of short circuit in the network in which the primary winding is interleaved, the safety of the devices powered by the transformer is greater the lower the FS.</i>
Composite error	In permanent regime, is the effective value of the difference between: a) the instantaneous values of the primary current, and b) the product of the transformation ratio assigned by the instantaneous values of the secondary current, corresponding the positive directions of the primary and secondary currents that permitted convention for marking terminals.
Rated primary limit current (for measuring devices) (PLC)	Minimum value of primary current for which the composite error of the current transformer for measurement is equal to or greater than 10%, the secondary charge being equal to the precision charge.
Electromotive force secondary limit	Product of the safety factor (FS) for the assigned secondary current and for the vector sum of the precision charge and the impedance of the secondary winding.

C. CURRENT TRANSFORMERS FOR PROTECTION

Terms	Definition
Current transformer for protection	Current transformer designed to supply protection relays.
Precision current limit assigned	Value of the primary current to which the current transformer complies with the specifications for the composite error.
Precision limit factor	Ratio between the primary current and the assigned precision limit and the nominal primary current.

D. INDUCTIVE VOLTAGE TRANSFORMERS

Terms	Definition
Voltage transformer	Measuring transformer in which the secondary voltage, under normal conditions of use, is substantially proportional to the primary voltage and differs in phase from it at an angle that is approximately equal to zero for an appropriate sense of the connections.
Voltage transformer grounded	Single-phase voltage transformer whose function is to have one end of its primary winding directly grounded.
Double function voltage transformer	Voltage transformer with a magnetic core in charge of fulfilling the double function of measurement and protection. It could have one or more secondary windings.
Voltage transformer adapter	Voltage transformer that allows adapting the assigned secondary voltage of the main voltage transformer to the rated voltage of the charge.
Residual voltage	Sum of the instantaneous values of the earth voltages of the three lines in a three-phase system.
Assigned voltage factor	Factor by which it is necessary to multiply the assigned primary voltage in order to determine the maximum voltage for which the transformer must respond to the heating requirements, for a specified time, as well as the corresponding accuracy requirements.

E. INDUCTIVE VOLTAGE TRANSFORMERS FOR PROTECTION

Terms	Definition
Voltage transformer for protection	Voltage transformer designed to power electrical protection relays.

Terms	Definition
Residual voltage winding	Winding of a single-phase voltage transformer, intended, in a set of three single-phase transformers, to the formation of an open triangle for: a) supply a residual voltage in the event of a ground fault; b) dampen the relaxation oscillations (ferroresonances).