

Chapter 1

Introduction



Measuring instruments and relays for the operation of protective and control devices usually are connected to alternating - current power circuits through instrument transformers, if the circuit voltage is higher than a few hundred volts, direct connection between high - voltage circuits and instruments, which would be dangerous to operators and would require expensive and elaborately insulated instrument panels, is thus avoided. Even when the circuit voltage is not dangerously high, instrument transformers are commonly used for measurement of large currents, to avoid bringing heavy lead to the instrument panels.

Instrument transformers are classified as voltage transformers or current transformers according to whether they are used in measurement of potential different or current.

The function of a voltage transformer is to produce a voltage which is applicable to standard instruments, meters, or relays, and which is a representation of the primary voltage in a known and acceptable proportionality and phase relationship.

The voltage transformer is quite similar in design and behavior to power transformer. Its primary winding is connected between lines (Fig 1.1) so that the full line voltage is impressed on it. The voltage transformer may be considered a parallel transformer with its secondary operating under virtual open-circuit conditions. In normal operation the line voltage is nearly constant, voltage transformer

excitation varies only over a restricted range.

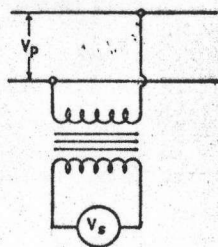


FIG 1-1 VOLTAGE TRANSFORMER CONNECTION

The secondary winding of voltage transformer is usually designed so that in normal operation a voltage between 100 and 120 volts is delivered to the instru-

ment load. Insulation problems are very similar to those in a power transformer of comparable voltage rating, the loading of a voltage transformer is always small sometime only a few volt-amperes, and consists of the voltage circuits of instruments, meters, or relays. Since the power requirements are small, the design is usually controlled by consideration of adequate insulation and good regulation rather than by economies in the use of iron and copper.

The voltage transformer is classified according to:

1. Method of installation
 - 1.1 Indoor
 - 1.2 Outdoor
2. Type of major insulation
 - 2.1 Dry - Type
 - 2.2 Compound - Filled
 - 2.3 Liquid - Immersed
3. Method of cooling
 - 3.1 Dry - Type Self - Cooled
 - 3.2 Oil - Immersed Self - Cooled