CAST RESIN INSULATED INSTRUMENT TRANSFORMERS

CURRENT TRANSFORMERS

A Current transformer belongs to the series connected class of electrical apparatus. The system current passes through the primary winding of Current Transformer and sets up a current in its secondary winding. Except for a little deviation, this current is in phase with the primary current and bears a definite ratio with it. The little deviation is expressed in terms of the ratio error and phase error of the Current Transformer. Various international standards on current transformers specify the limits of these errors for various accuracy classes of the Current Transformers, the accuracy class depending upon the duty the current transformer is called upon to perform as also upon the type of instrument / protective device it is supposed to feed.

Selection of Current Transformer :
The following points need to be considered while selecting Current Transformers :-

(a) **Ratio :-**
This is a ratio of the rated primary current and the rated secondary current and is usually specified as Rated primary current / Rated Secondary current.

The rated secondary is determined by the rated current of the apparatus which is to be fed by the Current Transformers. For the range of current transformers, described here we have standardized on a rated secondary current of 5 Amps although Current Transformers with rated secondary current other than 5 Amps are also manufactured

The rated primary current is determined by the
i) Rated system current.
ii) Fault level at the point in the system where the Current Transformer is to be located.

It is immediately apparent that the rated primary current of the Current Transformer should be at least equal to the rated system current, although it is usual to specify about 25% higher rating to cater for increases in the system load (Maximum overload permitted for a current transformer is 20% of its rated currents. When substantial changes in the system load are envisaged it is usual to specify double ratio current transformers, viz 200-100/5 A.

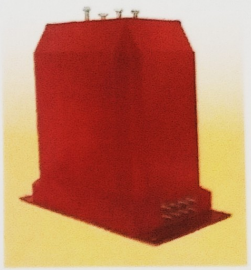
For multi-ratio current Transformer, the various ratios may either be obtained by a suitable tap on the secondary winding or by primary reconnection. If latter is the case, the accuracy of the current transformation is same the regardless of the connected ratio. In the former case, however the accuracy is inferior for the lower ratio.

Fault level at the point in the system where the Current Transformer is to be located plays an important part in the selection of rated primary current as this influences the cross sectional area of the copper conductor to be used for the primary winding. If the fault level is high, it immediately puts a limitation on the total number of ampere turns at which a current transformer can be designed to operate which in turn puts a limit on the accuracy of current transformation it may therefore happen that with a given fault level the required accuracy cannot be obtained for a certain value of the rated primary current . In such a case next higher standard value of the rated current should be examined.

(b) Rated Burden :
Devices like meters relay coils etc. require certain voltage to be developed across them for satisfactory operation. The product of this voltage and the rated current of the device is called the burden of the device which is expressed in 'VA'. The burden imposed by each device is readily available from the makers of the device and the total burden on the Current Transformers due to the connection of number of such devices is merely an addition of the burdens imposed by each device.

(c) Class of Accuracy :
Depending on the permissible ratio and phase errors, current transformers are classified into various classes. Specifying an accuracy class higher than the one required for a particular duty may result in an unduly large and expensive current transformer. The different standard specifications for current transformers suggest suitable accuracy classes for various types of duties.

(d) Accuracy Limit Factor :
Under fault conditions the current through Current Transformer primary will be many times the rated current. A proportionate secondary current will be produced only if the core does not get saturated. An accuracy limit factor specifies the limit of primary current (protect of rated primary current and accuracy limit factor) till which the accuracy of current transformation is within the specified limits. Higher accuracy limit factors, than required, result into an unduly large and uneconomical Current Transformer for protective duty an accuracy limit factor of 10 is



33 kV RCCT

11 kVCTR

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(e) Voltage Class :
This specifies the rated system voltage on which the Current Transformers is to operate. The system ear thing condition, i.e whether the neutral of the system is solidly grounded or otherwise also needs examination as it influences the power frequency voltage test level for the Current Transformers.

Twin and Triple core Current Transformers :
It is usually necessary to have separate current transformers for metering and protective duty. These Current Transformers can be combined into one Current Transformer having two separate secondary windings, one for metering and the other for protection and a common primary winding thereby resulting considerable economy. This may further be extended to include three core Current Transformers.

Current Transformers for Electrically Exposed Installations :
The current transformers described are normally suitable for indoor use. The Impulse voltage withstand test has however been carried out on some of the designs. Which is the specified test level for Current Transformers by I.S.S., B.S.S.

Special Current Transformers.
We shall be pleased to manufacture special Current Transformer to suit the exact individual requirements. In such case the following information may please be furnished to us :-

(a) Ratio of primary to secondary current.
(b) Rated Burden.
Class of Accuracy
(c) Accuracy Limit factor
(d) Frequency.
(e) Voltage class.
(f) Limiting Dimensions
(g) Any special conditions and requirements.

VOLTAGE TRANSFORMERS

General :

A voltage transformer belongs to the shunt connected class of electrical apparatus and is used so that high systems voltages can be conveniently measured by stepping them down to a value suitable for the measuring instruments. For the Voltage Transformer to be useful in this capacity, it is important that the transformation ratio is accurately known and also that the secondary voltage of the Voltage Transformer is in phase with the voltage across its primary. The various standard specifications list the limits of permissible errors (Ratio Error and Phase Displacement) for the various accuracy classes of Voltage Transformers.

Voltage transformers for dual purpose, metering and protection, are also commonly used. An additional secondary winding is provided which is connected in open delta so that, in the event of an earth fault on any of the phases, appropriate voltage is developed across the open delta terminals which is then use to actuate a tripping mechanism. Various classes of accuracy for the protective duty, are also included in the standard specifications.

Single phase Voltage Transformers. We have included Voltage Transformers with only one secondary winding suitable for metering and additional winding (usually termed as the tertiary winding) can however be included; although in such cases, an alternation in the value of the rated burden on the metering winding may be necessary.

SELECTION OF A VOLTAGE TRANSFORMER :

The following points needto be considered while selecting a Voltage Transformers.

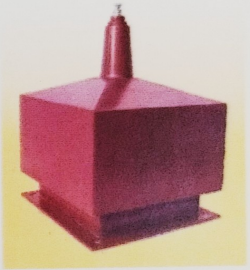
(a) Ratio :
This is the ratio of the rated primary voltage to the rated secondary voltage. The rated primary voltage is selected to be suitable for the system, and is different depending upon whether the Voltage Transformer is connected across lines or between line and earth. Considering the particular case of 11kv. whereas for Voltage Transformer connected across the lines the rated primary voltage will be 11 kv / $\sqrt{3}$. The secondary Voltage also changes depending upon the mode of connection and is either 'Vs' or Vs/$\sqrt{3}$. We have standardized on a value of 110 Volts for VS Although Voltage Transformers with Vs different from 110 Volts are also manufactured.

(b) Rated Burden :
This in fact, is the 'load' expressed in VA, connected across the secondary winding of a Voltage Transformer if a number of meters are connected across the Voltage Transformer the total burden on the Voltage Transformer is merely an addition of the load imposed by each meter. The burden values of the meters are readily available from their manufacturers and it is suggested that an estimate of the total burden be made prior to the placement or orders.

(c) Class of Accuracy :
Depending upon the accuracy of voltage transformation Voltage Transformers are classified into various classes by the standard specification. The choice of an accuracy class of the Voltage Transformers naturally depend upon the duty it is called upon to perform. We as manufacturers of the Voltage Transformers have certain limitations as to the class of accuracy which can be obtained for certain rated burden.

Impulse Voltage Withstand Test :
The Voltage Transformers listed here are normally suitable for electrically non-exposed installations and impulse voltage withstand test is not applicable. The impulse test has, however been successfully carried out on all designs as per I.S Specification.

33 kV VT Both Pole



33 kV VT Single Pole