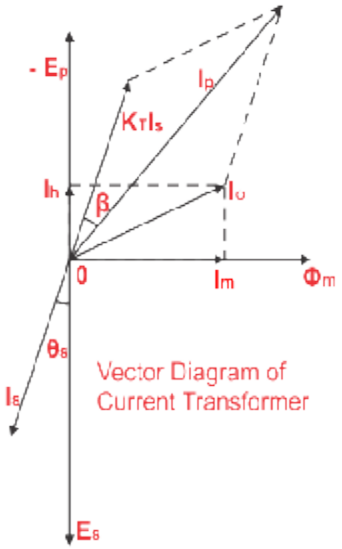
FACULTY OF ENGINEERING & TECHNOLOGY

Dileep Kumar
Assistant Prof. EE Deptt

Error in Current Transformer or CT

In an actual CT, errors with which we are connected can best be considered through a study of phasor diagram for a CT

I_s – Secondary current.
E_s - Secondary induced emf.
I_p - Primary current.
E_p - Primary induced emf.
K_T - Turns ratio = Numbers of secondary turns/number of primary turns.
I_0 - Excitation current.
I_m - Magnetizing component of I_0.
I_w - Core loss component of I_0.
Φ_m - Main flux.



Let us take flux as reference. EMF E_s and E_p lags behind the flux by 90°. The magnitude of the passers E_s and E_p are proportional to secondary and primary turns. The excitation current I_o which is made up of two components I_m and I_w. The secondary current I_0 lags behind the secondary induced emf E_s by an angle Φ_s. The secondary current is now transferred to the primary side by reversing I_s and multiplied by the turns ratio K_T. The total current flows through the primary I_p is then vector sum of $K_T I_s$ and I_0.

The Current Error or Ratio Error in Current Transformer or CT

From above passer diagram it is clear that primary current I_p is not exactly equal to the secondary current multiplied by turns ratio, i.e. $K_T I_s$. This difference is due to the primary current is contributed by the core excitation current. The error in current transformer introduced due to this difference is called current error of CT or some times ratio error in current transformer.

$$\text{Hence, the percentage current error} = \frac{|I_p| - |K_T . I_s|}{I_p} \text{ X } 100\ \%$$

Phase Error or Phase Angle Error in Current Transformer

For a ideal CT the angle between the primary and reversed secondary current vector is zero. But for an actual CT there is always a difference in phase between two due to the fact that primary current has to supply the component of the exiting current. The angle between the above two phases in termed as phase angle error in current transformer or CT. Here in the pharos diagram it is β the phase angle error is usually expressed in minutes.