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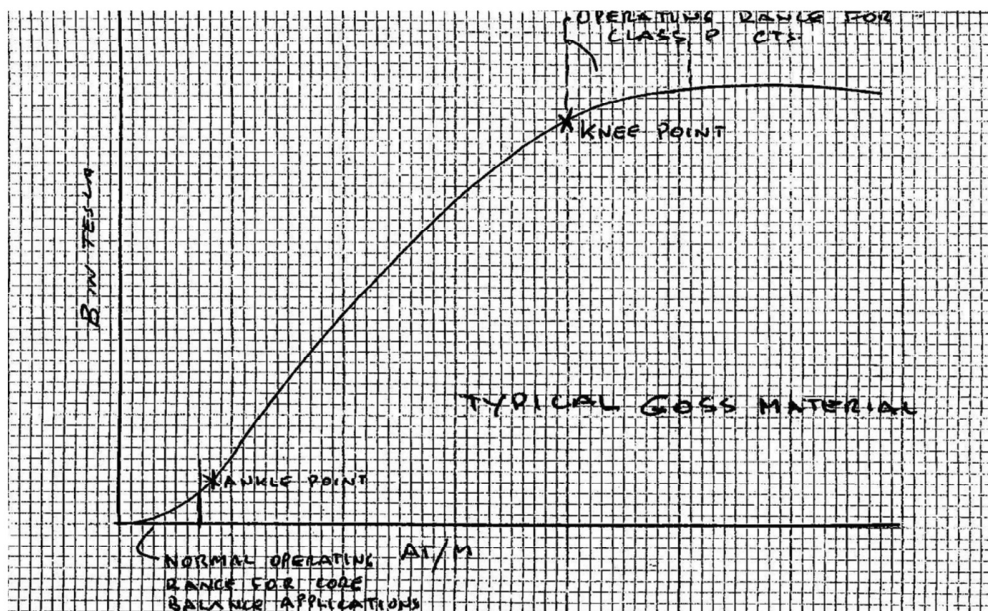
## CURRENT TRANSFORMER SELECTION FOR CORE BALANCE APPLICATION

A common practice by some specifiers is to specify classes in accordance with class P protection CTs to AS:60044 or IEC:60044.

This method of specifying will not necessarily provide a Current Transformer that will operate satisfactorily for the reasons outlined below.

Let us consider typical excitation curves for either GOSS material and Mumetal.

With a class P Current Transformer the required class is normally specified with an accuracy limit factor of 10 or 20 this is shown in the typical GOSS curve below.



As you can see the performance specified is at 10 or 20 times rated current, this does not ensure that the Current Transformer will generate sufficient output to operate a typical core balance protection primary sensitivity of typical 250mA or 500mA. This is due to the fact that typical GOSS material has magnetizing characteristics that are not linear but in fact rise up slowly to what is termed the ankle point of the curve.

It is for this reason that it is very important it evaluate and specify the Current Transformer performance at the required operating level i.e.

The Voltage Output from the Current Transformer must be higher than:



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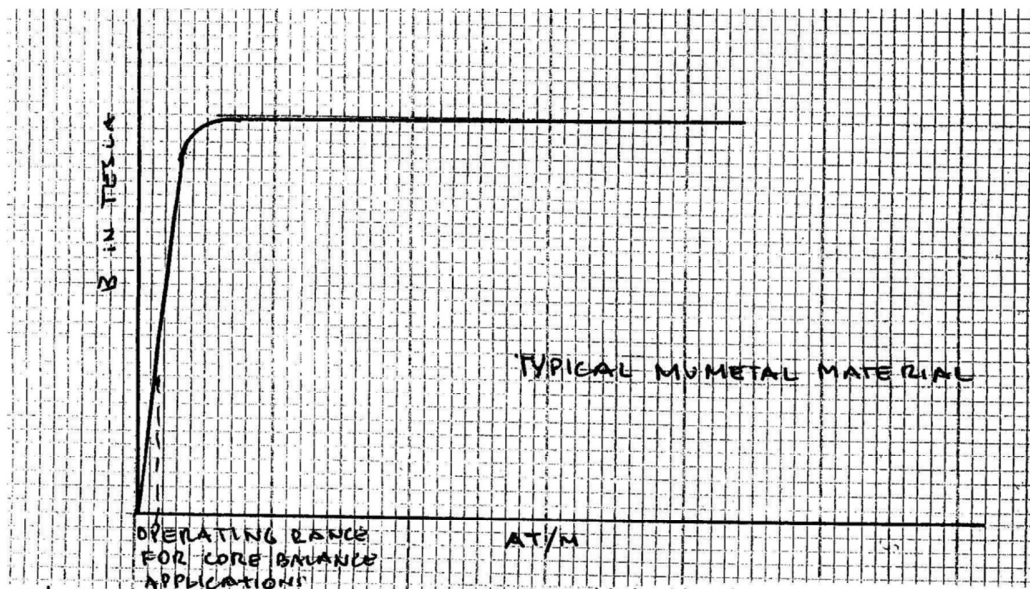


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Operating Current x (Rct + Relay burden + R of interconnecting leads and this must be achieved at an excitation current = to 10% of relay settings) this is to minimize error to no more than 10%.

As can be seen from GOSS typical curve the resultant flux at very low values of excitation current is very small resulting in very large core size; the alternative is to use either a combined GOSS/Mumetal core in the case of very low primary sensitivity (125mA) a full Mumetal Core.

The use of Mumetal is required as this material has considerably higher induction than GOSS at very low excitation currents. See curves below



Traditionally Stemar has always taken the approach of insisting in obtaining a relay to measure actual impedance values and note rely on the relay manufacturer published burdens since on a number of occasions we have established that the burden values specified were not consistent with actual values measured.

The other very important consideration in core balance applications is the location of the core balance toroid.

If mounted within switchgear the performance of the toroid is affected by the fluxes generated by adjacent current carrying conductors; this can be the cause of undesirable tripping of the protection system; it is for this reason that where core balance toroids are mounted close to large current carrying conductors they should incorporate special windings and sheildings (see stemar published article)



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In summary to obtain proper performance at the most economical solution for core balance protection the following should be addressed:

1. Determine level of primary sensitivity required (This will determine the ratio of the Current Transformer)
2. Determine relay settings and calculate  $V_k$  required at the operating level
3. Determine  $I_e$  – Excitation current value at which minimum  $V_k$  is required
4. Determine where toroid is installed and if special shielding is required.

OR

Specify 1 and 3 above and allow the Current Transformer manufacturer to determine the value or  $R_{ct}$  and the most economical selection of core material.

Stemar utilizing on line computer programs can provide practical instant recommendations on the selection of appropriate Current Transformer characteristics.



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