



Short Circuit

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Short Circuit Calculations – Infinite Bus Method

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Have you wondered is there a simpler way to calculate short circuit currents without a computer program? A very simplified method known by many as the “infinite bus” calculation method is a good way to approximate short circuit calculations.

Three-phase transformers contain some valuable data on their nameplate such as the kVA rating, primary and secondary voltage, and percent impedance. With this minimal data, you can calculate the worst case short circuit current through a transformer. The calculation will provide the three-phase rms symmetrical short circuit current on the secondary bus of the transformer.



This process only has two simple calculation steps:

Step 1 – Calculate the secondary full load current rating of the transformer:

$$FLA_{\text{secondary}} = (kVA_{\text{3phase}}) / kV_{L-L} \times \text{Sqrt}(3)$$

Step 2 – Calculate the short circuit current on the transformer secondary bus:

$$SCA_{\text{secondary}} = x (FLA_{\text{secondary}} \times 100) / \% Z$$

Here is an example of the calculation:

The existing transformer is rated 1500 kVA with a secondary voltage of 480Y/277V and an impedance of 5.75%.

Step 1 – Calculate the secondary full load current rating of the transformer:

$$FLA_{\text{secondary}} = 1500 \text{ kVA} / 0.48 \text{ kV}_{L-L} \times \text{Sqrt}(3)$$

$$FLA_{\text{secondary}} = 1804 \text{ Amps}$$

Step 2 – Calculate the short circuit current on the transformer secondary bus.

$$SCA_{\text{secondary}} = 1804 \text{ Amps} \times 100 / 5.75\%$$

$$SCA_{\text{secondary}} = 31,374 \text{ Amps}$$

All of the variables listed above are:

FLA _{secondary}	=	Secondary Full Load Amps
kV _{L-L}	=	Secondary Voltage in kV
kVA _{3phase}	=	Transformer Three Phase kVA
Sqrt(3)	=	Square Root of Three (1.73)
% Z	=	Percent Impedance of Transformer
SCA _{secondary}	=	Short Circuit Amps at Secondary Bus

A few words of caution: The impedance of a transformer must be the actual nameplate and not an assumed value. Impedances of transformers that have not yet been built or tested can vary by + / - 7.5% of the specified impedance. The above calculation does not include something called motor contribution that is discussed in another article and also the calculation does not include any reduction in current due to the source or conductor impedance.

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