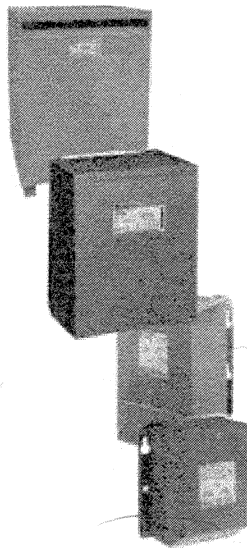


Application Tips

Reverse Feed - Dry Type Transformer



Occasionally, someone has an urgent need for a non-stock step-up transformer. The natural inclination is to grab an in-stock step-down unit and to operate it in reverse. Except for small (less than 3 KVA models, which have compensated windings to provide rated voltage at rated load), if permitted by local codes, then it is generally OK to reverse feed a transformer but there are several precautions that should be considered. To illustrate, let's assume that a standard 9T23B3874 step-down transformer rated 75 KVA/3-phase/60 HZ with a 480 VAC Delta Primary with (6) 2-1/2% FC2A4BN voltage taps and a 208Y/120 VAC Secondary is to be operated step-up; that is, 208 VAC input to 480 VAC output.

The installer may discover that the primary protector, having been properly selected and applied per Article 450 of the National Electrical Code, nevertheless, trips or blows when he attempts to energize the reverse operated transformer. This phenomenon can occur because the low impedance winding (the 208Y/120 VAC one that was intended by design to be the secondary winding) now serves as the primary and the value of the magnetizing inrush current (Mag-I) is actually much greater than expected. The Mag-I experienced when energizing transformers is similar to the inrush current associated with motor starting. The primary and secondary full load amps of the subject transformer are 90 Amps @ 480 VAC and 208 Amps @ 208 VAC respectively. When connected step-down and energized at 480 VAC, the maximum peak inrush current is approximately 990 Amps or 11 times the rated 90 Amp primary winding full load current. But when connected step-up and energized at 208 VAC, the maximum peak inrush can reach 7700 Amps or 37 times the rated 208 Amp Secondary winding full load current.

Normally, the taps on the primary can be used to compensate for instances where the voltage of the source is not the same as the rated voltage of the transformer. When the normal secondary is energized to serve as the primary, there are no adjustment taps. So if the voltage of

the source is higher than the rated voltage of the transformer's normal secondary, it will be over-excited resulting in higher than rated core loss and exciting current. This is generally not a serious concern unless the over-voltage exceeds 5%.

When the secondary (WYE) of a DELTA-WYE transformer is energized, instead of the primary (DELTA), the neutral should not be connected to ground or to the enclosure. An unbalanced source might circulate current in the transformer DELTA and cause over-heating. Also the impedance to ground of the transformer might be lower than the system ground impedance and excessive current to ground might over-heat the transformer. Unbalanced conditions could cause a voltage to ground to appear on the enclosure if it was connected to the neutral.

Small transformers, rated less than 3 KVA, are compensated for voltage regulation to ensure that they will provide rated voltage at rated load. This means that the output voltage will be 5 to 10% lower than rated if they are reverse connected.

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