

Auto transformer Example 1

Auto transformer features

The primary and secondary windings are connected electrically

The output voltage can be varied using a tap changer (variable output voltage)

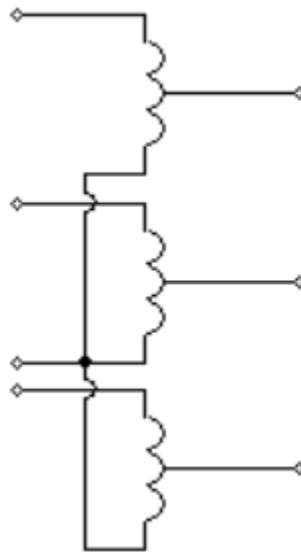
Voltage conversion is similar to two winding transformer

It can be used to start up induction machines because the voltage can be raised using tap changer and increase the voltage from low value to the full supply voltage

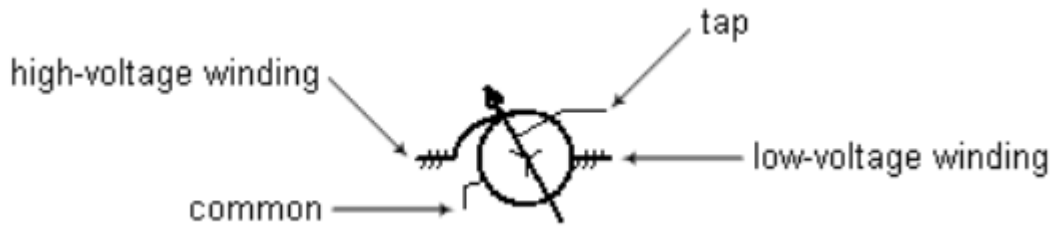
This example shows the 3-phase auto transformer bank comprised of 3 single-phase banks.

Options are provided so that the user may choose between either a magnetizing branch (linear core), or a current injection routine to model magnetizing characteristics. If desired, the magnetizing branch can be eliminated altogether, leaving the transformer in 'ideal' mode, where all that remains is a series leakage reactance.

The following diagram shows a schematic of the connection:



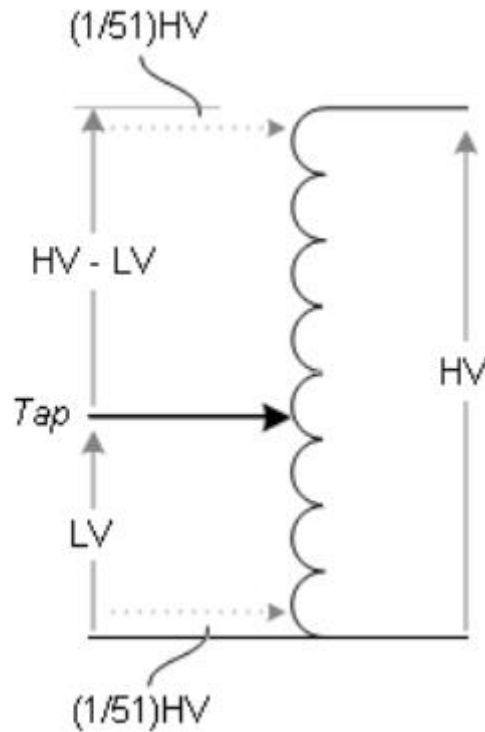
External connections to this component are described as follows:



This component also includes an on-load tap changing capability.

On-Load Tap Changer

The following describes the internal limits of the on-load tap changer in the autotransformer components.



On-Load Tap Changer Internal Limits

The tap value is limited internally so that the (HV-LV) and LV voltage ratios never exceed 50. This translates to tap position limits that maintain the LV-side voltage between:

$$LV \cdot \left(1 + \frac{1}{50}\right) < HV < 51 \cdot LV$$

For example, the tap limits for a **115 [kV] : 230 [kV]** autotransformer would be:

$$\frac{230}{\left(1 + \frac{1}{50}\right)} = 225.49 \text{ kV} \quad \text{and} \quad \frac{230}{51} = 4.51 \text{ kV}$$

This translates to tap input signal limits of:

$$\frac{230/115}{\left(1 + \frac{1}{50}\right)} = 1.961 \text{ pu} \quad \text{and} \quad \frac{230/115}{51} = 0.039 \text{ pu}$$

NOTE: It is important to remember that the tap limits for the autotransformer are not fixed, but dependent on the values of HV and LV. Also, when a change in tap position is mandated, it is not changed until the next winding current zero-crossing.