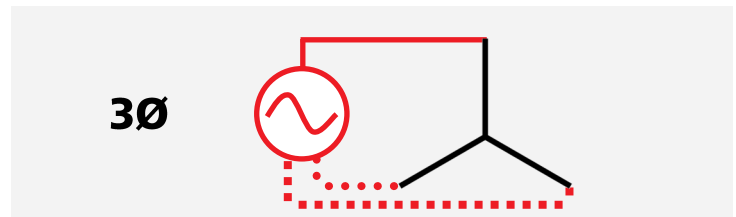
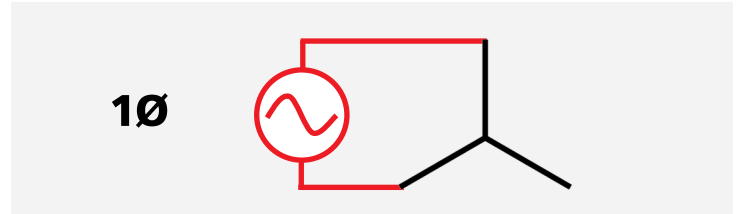


Transformer Turns Ratio

1Ø vs 3Ø Excitation

Transformer turns ratio is measured by applying line frequency AC voltage to one winding of a transformer and measuring the induced voltage on the corresponding winding. Historically, most transformer turns ratiometers excite one phase at a time and switch before making a measurement on other phases. This is referred to as switched 1Ø excitation.

The **TTRU3** is capable of exciting all three phases at the same time - also known as simultaneous 3Ø excitation. But what are the benefits to this method of excitation?



Improved Test Time

With 3Ø excitation, test time is up to 5 times faster compared to switched 1Ø.



Accuracy

All phases are excited, eliminating error due to loading of unexcited phases at lower test voltages.

Example

The transformer tested below has a delta secondary. Using 1Ø excitation at 80V, the unexcited phases of the delta load the transformer. This reduces the voltage on the measured phase, resulting in ratios that exceeded the acceptable limit as defined in the ratio testing standards.

With 3Ø excitation at 80V, all phases are excited. This eliminates loading due to unexcited phases, and brings the measurement within acceptable limits ($\pm 0.5\%$).



Excitation Method	Test V	Primary Tap V	Secondary Tap V	Calculated TTR	ØA		ØB		ØC	
					Actual TTR	% Error	Actual TTR	% Error	Actual TTR	% Error
1Ø	80	127,000	12,850	5.706	5.736	0.53	5.736	0.53	5.743	0.64
3Ø					5.728	0.38	5.727	0.37	5.727	0.37