Product Service Bulletin
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Ask the experts

Q: Can a 100:5 rated current transformer be converted to 50:5 ratio?

A: Yes .US Motors has standardized on variable ratio CTs because of the flexibility they offer. The 100:5 ratio rated CTs with 10 turns subtracted from the secondary is equivalent to 50:5 ratio rated CTs.The use of Variable Ratio current transformers benefits the customer by giving him the flexibility to use a different ratio if he chooses. The standardization on Variable Ratio CTs simplifies installation because the size, shape, and configuration remain the same.

DIFFERENTIAL PROTECTION OF ELECTRIC MOTORS

By: Howard E. Barr

A current transformer (CT) is a device used to measure alternating current in a conductor without contacting the conductor. The device measures the intensity of the alternating magnetic field that surrounds a conductor carrying alternating current. Since this magnetic field is proportional to the current in the conductor, the CT is designed to produce an output which is proportional to the conductor current.

The winding is looped around the core in a continuous coil. Usually only the secondary winding is installed on the core, but sometimes a separate primary winding may be wound on the core.

Conductor size is determined from the rated current values.

A current transformer is usually specified by a current ratio which is the ratio of the primary to secondary currents. For example, a 100:5 CT has a 100:5 (or 20:1) ratio of primary to secondary current, and the secondary winding is rated at 5 amperes. Primary current greater than 100 amperes may overload and burn out the secondary winding.

The primary winding is usually

made by passing the conductor whose current is being measured through the center hole (or window) of the donut. Changes in the rating of

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variable ratio current transformers can be accomplished by means of external turns added to or subtracted from the secondary winding to generate output current of approximately 5 amperes. The output current is proportional to the ampere-turns of the secondary winding.

The donut-type CT measures the net total of the currents in all the conductors that pass through the window of the CT. Thus, if a conductor is passed through a CT and then back through in the opposite direction, the net current as seen by the CT is zero, and there will be no secondary current, regardless of the level of the current in the primary conductors.

Should part of the current be drained off from the conductor between the points where it leaves the CT and then re-enters the CT, then the CT would sense the difference between the two current levels, and an output will be generated in the secondary current.

It is important to note that differential protection does not prevent faults from occurring. The differential protection is intended to open circuit breakers before the fault current reaches a damaging energy content. The differential protection does protect against both phase-to-phase and phase-to-ground faults.

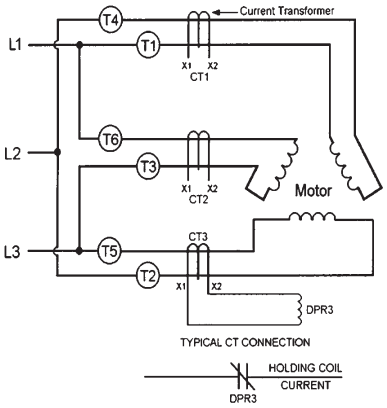
When differential protection is applied to a 3-phase motor, it is necessary to bring out both leads of each phase. The winding connection is the same as for a wye start-delta run motor, although the motor may be designed to run on either the wye or the delta connection.

The 3-CT method allows the current transformers to be self-balancing, that is, in normal operation the output of each CT is zero. This allows use of low cost non-precision current transformers. The CT's used for the 3-CT method are usually 100:5 or 50:5 ratio for maximum sensitivity in detecting fault current.

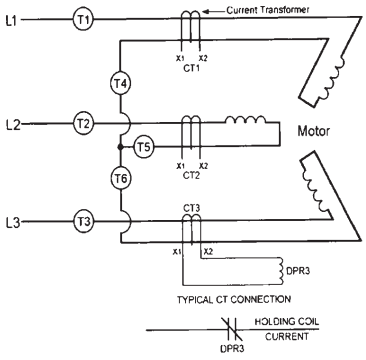
Relays are available that will react to 0.25-0.50 amperes of current, so using a 50:5 ratio CT could result in detecting fault current as low as 2.5-5.0 amperes. Probably more typical is protection that reacts at 20-50 amperes of fault current.

Matching the relay to the CT is important for short response time to shut off the power before the fault current climbs to damaging values and to assure that the CT output has the capacity to operate the relay.

Typical CT Connections



Delta Connected, Single Winding



Wye Connected, Single Winding