



# T60 Overexcitation Protection

**GE Publication No. GET-8434**

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## DESCRIPTION

The T60 Transformer Management Relay provides overexcitation protection, also known as Volts-per-Hertz protection, to protect transformers during potentially damaging over-voltage and underfrequency disturbances.

The transformer core flux is directly proportional to the voltage and inversely proportional to the frequency. The measured V/Hz ratio is therefore an excitation indication. When the allowable V/Hz ratio is exceeded, the magnetic core saturates.

During saturation, excessive core flux increases the inter-lamination voltages, causing iron damage (burning, pitting). At this high level, the normal magnetic path cannot accommodate the increased flux, which flows in leakage paths not designed (not laminated) to carry it, causing heat damage.

Under normal system operation conditions, generator voltage regulators and other control devices on the power system maintain the voltage within the transformer continuous ratings. However, this does not occur during the following abnormal conditions:

1. An islanded power system that causes a voltage rise during a sudden load loss. Disturbances can cause prolonged overvoltage if the system control measures are ineffective.
2. A generator voltage regulator "runaway" condition can expose the GSU (generator step-up unit) and the auxiliary transformer to high voltages. Although this is primarily an off-line occurrence, it can occur with the generator and the GSU connected to the power system.

## SETTINGS

The T60 V/Hz element has the flexibility to specify specific voltage inputs. The source (SRC) can be configured for phase voltage only, phase and auxiliary voltages, or auxiliary voltage only.

When the source is configured for phase voltage, the V/Hz element uses the voltage from channel A and the measured frequency. If the V/Hz element is configured for auxil-

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ary voltage, the source should **only** be configured for auxiliary voltage. The setting for the phase voltage in the source should be "None".

For almost all transformers, damage occurs at an overexcitation (volts-per-hertz) level of 1.25 pu.