

Developmental Testing of Current Transformers

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Current sensing transformers are widely used to measure electrical current in various applications, including power distribution, motor control, and instrumentation. When developing and testing current sensing transformers, it's important to verify their accuracy, linearity, and performance under different conditions. Here are some common developmental tests and measurements you can perform:

Turns Ratio Test:

Measure the turns ratio of the current sensing transformer to ensure it meets the specified design.

Apply a known AC voltage to the primary winding and measure the resulting AC voltage on the secondary winding.

Calculate the turns ratio as the ratio of secondary voltage to primary voltage.

Linearity Test:

Apply a range of input currents (typically from zero to the maximum rated current) and record the corresponding output voltages.

Plot the relationship between input current and output voltage to check for linearity.

Evaluate the deviation from a linear response and calculate linearity error.

Frequency Response:

Sweep the frequency of the AC current through the current sensing transformer and measure the output voltage.

Determine the frequency range over which the transformer provides accurate measurements.

Ensure the transformer's response remains consistent across the frequency range of interest.

Accuracy and Calibration:

Use a calibrated current source to apply known currents to the transformer.

Measure the output voltage and calculate the accuracy of the current sensing transformer.

Perform calibration as necessary to correct for any deviations from the expected performance.

Phase Shift:

Apply an AC current with a known phase angle to the primary winding and measure the phase angle between the input current and output voltage on the secondary winding.

Verify that the phase shift remains within specified limits.

Temperature Coefficient:

Test the current sensing transformer over a range of temperatures to assess its performance under different thermal conditions.

Measure the change in turns ratio, linearity, and other parameters with temperature variations.

Ensure the transformer maintains accuracy within the specified temperature range.

Saturation Test:

Apply a steadily increasing current to the primary winding and measure the output voltage.

Observe the point at which saturation occurs, where further increases in current no longer result in proportional output voltage increases.

Verify that the transformer can handle the maximum expected current without saturating.

Common-Mode Rejection Ratio (CMRR):

Apply a common-mode current (identical current applied to both primary and secondary windings) and measure the output voltage.

Calculate the CMRR as the ratio of the differential output voltage to the common-mode output voltage.

Frequency Response in the Presence of DC Current:

Apply a DC current superimposed with an AC current to the primary winding and measure the output voltage.

Check how the transformer responds to AC signals in the presence of a DC offset.

Dynamic Response and Transient Testing:

Apply step changes or transient current waveforms to the primary winding and observe the time it takes for the output to stabilize.

Evaluate the rise time, settling time, and overshoot.

Impulse and Surge Testing:

Apply high-energy transients or surge currents to the primary winding to assess the transformer's ability to withstand voltage spikes.

When conducting these tests, use appropriate measurement equipment, such as oscilloscopes, signal generators, and calibrated current sources. Follow safety guidelines and refer to the manufacturer's specifications for the current sensing transformer to ensure you test it under the recommended conditions.

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Revision History

REV	DESCRIPTION	ECO	DATE
A	Initial Release	N/A	08NOV2023