

Master 2008

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Current measurement using shunt resistances for Electronic Trip Unit MCCB (Molded Case Circuit Breakers) for the Replacement of current transformers

*ABSTRACT - Masterthesis*

The thesis demonstrates the use of shunt resistances for the current measurement for miniature circuit breakers. Presently available circuit breakers make use of current transformers but since there are a lot of limitations and inaccuracy in measurements so they are not a good solution, and hence there is a need of a more reliable and accurate system. These conditions are satisfied by the shunt resistances. Siemens has two different frame sizes which divide the current ranges: 630A and 250A frame. The shunt resistances are characterized according to the accuracy requirements for both the frame sizes.

Isolation of 9.8kV on board is created by using opto-couplers. Gain switching concept is implemented using window comparator. Calculations for the most critical conditions are discussed.

The voltage appearing across the shunt resistance is the input signal which is analog having a frequency of 50Hz, is first conditioned and amplified and then converted into a digital signal. The number of samples taken for one complete input sinusoidal wave are 64. Thus the frequency of sampling is 3.2 kHz. This digital signal is sent to the microcontroller where the Root Mean Square (RMS) value is calculated and displayed on screen.

The simulation results are obtained for the first design and compared with the real system. The results produced from the first design suggest that the analog-to-digital converter stage must have very high noise immunity. In the second design, these issues were resolved and the desired accuracy was achieved. Only few deviations were observed since the current source has a lot of spikes and noise signal. This issue is resolved by drawing the trend line linear approximation for both the input supplied current and the output displayed current. The difference is implemented in the microcontroller program and the desired results were achieved.