

## Measurement of the ac resistance of small cross section power cables

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The ampacity of power cables are strongly correlated with the AC resistance of the core conductor. AC resistance is the key factor that determines the Joule heat power when an alternative current is going through the cable. So it is very important to measure the AC resistance of the core conductor of power cables.

An electronic method for the measurement of AC resistance has been developed in this paper. We connect the core conductor to an accurate current source and then measure the potential difference of the two points "a" and "b" on the surface of the conductor.

The system schematic diagram is shown in Fig.1.

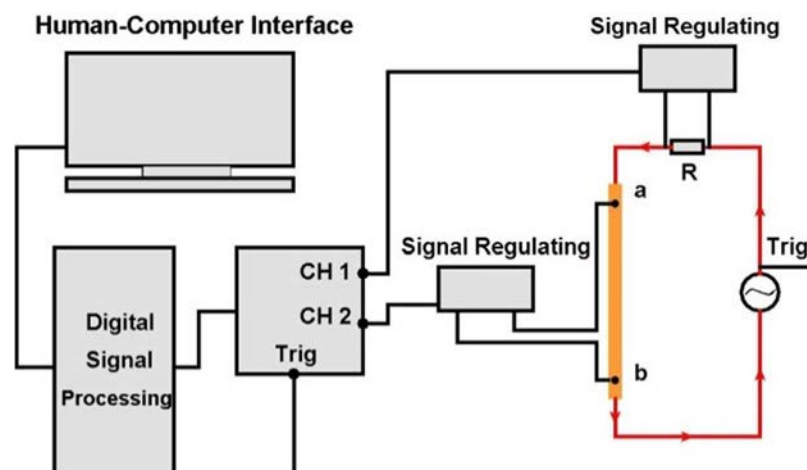


Fig. 1.:Schematic Diagram

The current in the circuit is very small so that the temperature of the conductor will not be changed obviously during the measurement. The main function of the system is to measure the amplitude of the voltage between point "a" and point "b" and the phase difference between the voltage and the current. This is done in the "Digital Signal Processing" unit.

To find out the precision of the measurement, we measure the AC resistance of a standard  $100\mu\Omega$  DC resistor. Since the shape and the material of the resistor are known, we can calculate its AC resistance. Measurement result of the AC resistance of this resistor agrees with the theoretical calculation. The maximum error is in the range of 0.2%.The AC resistance of some small cross section power cable conductors has also been measured. They agree with the IEC theoretical calculation as shown in the following:

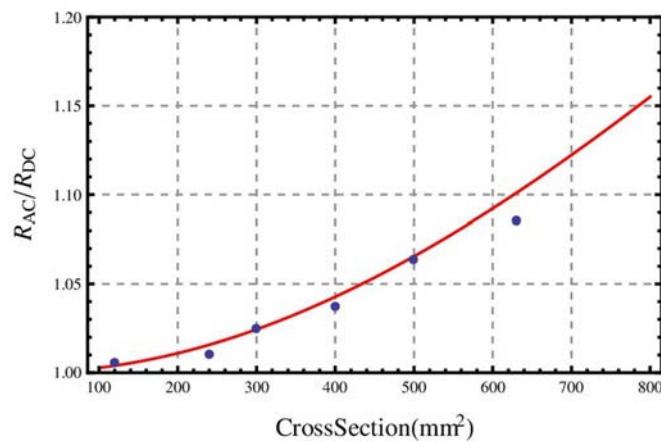


Fig. 2: Measurement Results of  $R_{AC}/R_{DC}$  vs. Theoretical Curve

Difference between the IEC calculation of  $R_{AC}/R_{DC}$  and our measurement is in the range of 0.5% except for the 630 mm<sup>2</sup> cable conductor.