

Conductor resistance measurement by axial current injection

Major improvement in cable measurement of aluminium, enamelled or waterproofing conductors

INTRODUCTION

The measurement of the linear resistance of electrical conductors has always been challenging. The achievement of reliable results depends mainly on the conductor cross-section and the contact resistance between the different wires (current distribution). The problem is even worse when using conductors such as aluminium because of the quasi instantaneous oxidation of the wires that significantly increases the contact resistance.

RADIAL CURRENT INJECTION

The standards recommend measuring the voltage over a length of 1 meter. To obtain a relatively homogeneous current distribution in the conductor, the injection points were moved away from the voltage knives, sometimes by several meters. This solution has disadvantages both in terms of the handling of samples and in the high waste costs.

Since long time ago AESA Cortailod has introduced a hydraulic jaw system for large section conductors. A very high pressure is applied on the current injection jaws to reduce the contact resistance, and this coupled with a tensile force to improve the current distribution over the entire length of the sample. This solution improves the reliability of the measurement while limiting the need for long sample length.

AXIAL CURRENT INJECTION

After several years of research, AESA has developed a new method for current injection. Rather than injecting it transversely/radially, current is injected axially. In this way, all conductors are in direct contact with the current source, thus minimizing the contact resistance effect between wires. As a result, the accuracy and reliability of the measurement is significantly enhanced.

AESA has filed a patent to protect this method.



INSULATED CONDUCTORS

To reduce the skin effect, conductors with large cross-sections are often insulated. Usually, sectors are separated by insulating material or enamelled wires are used. Radial current injection does not allow this type of conductor to be properly measured. The same applies to waterproofing conductors (e.g. aquablock). Therefore, the axial injection opens up new possibilities for these types of conductors.

BENEFITS

- Mastery of raw material costs through better control of uncertainties.
- Reduction of waste by using shorter samples.
- Possibility to measure conductors of large cross-section even insulated conductors.

CONCLUSION

The new patented method of measuring the linear resistance of electrical conductors by axial current injection provides manufacturers with an important advance in the measurement of metal conductors. It pushes back the limits of traditional methods while providing a significant improvement in measurement reliability.

*Jean-Luc Allemann, Vice President, AESA Cortailod
Boris Dardel, R&D Senior Manager, AESA Cortailod*

AN1907A