

## **Quantification of energy losses and characterization of connectors' effective contact area by infrared thermography**

Prof. Dr. Pablo Rodrigues Muniz

COELETRO,

Instituto Federal do Espírito Santo – Campus Vitória, Brazil

[pablorm@ifes.edu.br](mailto:pablorm@ifes.edu.br) , +55 27 3331 2260

In building and industrial electrical installations, defective electrical connections dissipate electrical energy as heat at higher intensity than they perform when they are in conformal condition. In this way, such connections are classified as energetically inefficient. Currently, electrical connections are diagnosed as approved or disapproved when inspected by infrared thermography. Dissipated power has not been evaluated, which is an energy efficiency factor of the installation. Thermographic inspections also do not quantitatively estimate the severity level of the electrical connection defect, which could be assessed by its effective contact area.

Through laboratory tests, a method of estimating energy losses and effective contact area in pre-insulated electric terminals for electric cables from (1,5 to 6,0) mm<sup>2</sup>, approximately (15 to 9) AWG, was developed. These cables and terminals gauge are widely used in building installations. Only the temperature raises of the connectors, detected by thermographic inspection, were enough to evaluate them. Low complexity and high confidence level equations that correlate dissipated power, effective contact area, and temperature raise were obtained and validated.

Such equations can be used by maintenance inspectors to decide on corrective maintenance intervention more assertively, since they will have available information concerning to energy conservation and degradation of the connectors, besides temperature rise, preventing the electrical installations from operating under the condition of energy inefficiency or low reliability.

### **Keywords**

Energy loss, calculation, temperature raise, evaluation