

# **Trial-Use Guide for Quality Control Testing of External Discharges on Form-Wound Coils, Roëbel Bars, VPI'd Stators and Fully Assembled Stator Windings**

## **Introduction:**

For many years, manufacturers worked to decrease the groundwall insulation thickness of stator coils and bars. This optimization work increases in fact the dielectric stress on the end winding stress grading system.

In the last few years some utilities have seen deterioration of the stress grading – semi-conducting junction of some generators after only two or three years of operation. This deterioration induces surface degradation that may lead in the long run to a phase to ground fault.

Inadequate workmanship for globally VPI'd stators or problems on stators assembled onsite have been observed to cause external discharges in the end-windings. Poorly finished lashes with insufficient gap between bars produces coil to coil or bar to bar discharges. Misalignment between adjacent coils or bars may also reduce the gap distance and generate a dielectric stress larger than the air breakdown field. Sometimes misplaced RTD or air gap monitor leads have been seen to cause PD with high voltage bars or coils. After many years, these conditions, combined with contamination, will degrade end windings and reduce the overall reliability of the system.

The proposed guide presents a method to evaluate the quality of materials and design, factory workmanship and onsite workmanship. Two methods are proposed in this guide. The first one, the blackout test, has been used for many years. The second one, the ultraviolet camera inspection, is more recent and presents several advantages, but each method has pros and cons. The IEEE Std. 1434-2000 Reaff. 2005, Trial-Use Guide to the Measurement of Partial Discharges in Rotating Machinery discusses these two inspection methods. The new guide will be more elaborate and will describe sample preparation, bench tests, test conditions and acceptance criteria in the factory and onsite.

## **Scope:**

This guide applies to ultraviolet camera inspection and blackout testing of form-wound stator winding bars and coils having a mica-based insulation system with thermo-setting polyester and/or epoxy resins used in stators operating in air with a rated line-to-line voltage between 4000 to 22000 V, and a frequency of 50 or 60 Hz.

## **Purpose:**

The purpose of this standard is to define the test parameters for ultraviolet camera inspection and blackout test and the number of specimens to be used for each test. It shall also define the acceptance criteria and the procedure for retesting in the event of a test failure.

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