

1553™

IEEE Trial-Use Standard for Voltage-Endurance Testing of Form-Wound Coils and Bars for Hydrogenerators

IEEE Power Engineering Society

Sponsored by the
Electric Machinery Committee



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Abstract: The test parameters and acceptance criteria for voltage-endurance testing of form-wound bars and coils for use in large hydrogenerators are covered in this standard.

Keywords: electrical insulation, form-wound bars, form-wound coils, hydrogenerators, voltage-endurance testing

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Introduction

(This introduction is not part of IEEE Std 1553-2002, IEEE Trial-Use Standard for Voltage-Endurance Testing of Form-Wound Coils and Bars for Hydrogenerators.)

Since the 1950s, various manufacturers and users have developed procedures that evaluated the ability of the electrical insulation of form-wound stator coils and bars to withstand electrical stress and high temperature operation [B1, B4, B11, and B12]. The test was referred to as a *voltage-endurance test*. The original purpose was to find those designs and manufacturing processes that could perform well under the test with combined electrical and thermal stresses. Over the years, some utilities started to apply the test to full-size coils, and bars and to use the results to either qualify a design from a vendor or as a quality control tool [B1, B2, B8, B10, and B11].

In 1989 the IEEE issued IEEE Std 1043TM-1989, IEEE Recommended Practice for Voltage-Endurance Testing of Form-Wound Bars and Coils. This document defined the procedure for performing such tests on full-size bars and coils. The document was successful in that most organizations that performed such testing adopted the procedure, making the testing procedures more uniform. Consequently, the test results from different organizations could be realistically compared. Several utilities required the test to be performed on four or more coil legs per winding.

In 1996 the IEEE Standards Board approved a revision to IEEE Std 1043-1989. Most of the recent revisions to the 1989 document were to make the test procedure less ambiguous and to ensure that important aspects that can cause variations in results were more rigorously specified. Revisions also occurred in how the temperatures, voltage, and times-to-failure are to be recorded.

During the revision of IEEE Std 1043-1989, it became apparent that there was a desire that in addition to the “recommended practice” there be a “standard”—that is, with the test voltages, temperatures, and time-to-failures specified. The purpose of this standard is to define test and acceptance criteria for voltage-endurance testing of form-wound bars and coils used in hydrogenerators.

The voltage-endurance test by definition is an accelerated aging test in which elevated voltages are used. Establishing a standard with test temperatures, voltages, and acceptable test times will prevent the unnecessary increase in these parameters, which has happened in the past. Escalating the test parameters may result in failure mechanisms that are unlikely to occur in service, thus rendering the voltage-endurance test a poor indicator of winding quality. On the other hand, by making the test a standard, the test would become more widely specified and related to the industry’s experience.

Participants

At the time this standard was approved, the Materials Subcommittee P1553 Working Group had the following membership:

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