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(Revision of IEEE Std 95-1977)

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IEEE Recommended Practice for Insulation Testing of AC Electric Machinery (2300 V and Above) With High Direct Voltage

IEEE Power Engineering Society

Sponsored by the
Electric Machinery Committee

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Abstract: This recommended practice provides information on the use of high direct voltage for proof tests and/or periodic diagnostic tests on the groundwall insulation of stator (armature) windings in ac electric machines.
Keywords: electric machine windings, electrical insulation, high direct voltage

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Introduction

[This introduction is not part of IEEE Std 95-2002, IEEE Recommended Practice for Insulation Testing of AC Electric Machinery (2300 V and Above) With High Direct Voltage.]

Traditionally, the insulation of rotating machines has been tested for dielectric strength with alternating voltage. In 1952, attention was directed to testing with direct voltage. Since then, high direct voltage has been widely used. Many reports of procedure and results are found in the IEEE Transactions with expressions of widely differing opinion.

In 1957, the Insulation Subcommittee of the IEEE Rotating Machinery Committee appointed a working group to review the existing literature and to prepare a guide for the conduct and interpretation of high direct-voltage insulation tests. It was found that many methods of making the tests have been used and that there was no uniform opinion of their relative merits.

In 1971, the Insulation Subcommittee of the IEEE Rotating Machinery Committee appointed a working group to revise the existing guide to a recommended practice.

In 1996, the Materials Subcommittee of the IEEE Electric Machinery Committee appointed a working group to revise the existing recommended practice. The document has been updated in a number of respects and typical test results using the ramped voltage test method have been included.

At present there is wide usage of high direct voltage for insulation testing, but there are still areas of disagreement regarding the utility of such tests. In this recommended practice every effort has been made to state facts and to indicate what is not certain. This document gives the present opinion and evaluation of high direct-voltage insulation testing of a large number of investigators with experience in a wide area of test activities.

Many of those who have used the methods described in this recommended practice have found them to be satisfactory and a valuable addition to other test procedures. It is hoped that the use of this recommended practice will achieve more uniform results and a fuller understanding and appreciation for the benefits of the high direct-voltage dielectric test.

A general discussion of test procedures, a comparison between alternating and direct-voltage testing, and requirements for high voltage power supplies may be found in Annex A of this recommended practice. For background information on overvoltage testing, see Clause 8 of IEEE Std 56-1977 and see IEEE P62.2/D23.[a]

Participants

This document was originally developed by a working group of the Insulation Subcommittee of the IEEE Rotating Machinery Committee. The members of this working group were:

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[a]Information on references can be found in Clause 2.

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WARNING

Due to high voltage used, dielectric tests should be conducted only by experienced personnel, and adequate safety precautions should be taken to avoid injury to personnel and damage to property.

IEEE Recommended Practice for Insulation Testing of AC Electric Machinery (2300 V and Above) With High Direct Voltage

1. Overview

1.1 Scope

This recommended practice provides uniform methods for testing insulation with high direct voltage. It applies to stator (armature) windings of ac electric machines rated 2300 V or higher. It covers acceptance testing of new equipment in the factory or in the field after installation, and routine maintenance testing of machines that have been in service.

1.2 Purpose

The purpose of this recommended practice is to:

a) Provide uniform procedures for performing high direct-voltage acceptance tests and routine maintenance tests on the main ground insulation of windings of ac electric machines.
b) Provide guidance in analyzing the variations in measured current versus applied voltage so that the condition of the insulation can be more effectively assessed.
c) Compare direct voltage testing with alternating voltage testing.

1.3 Application and limitations

Testing of machine insulation may be conducted in the factory, in the field during installation, as a condition of acceptance, to verify the efficacy of repairs or maintenance, after a system disturbance or extended outage, and/or on a routine basis during the lifetime of the machine.

High direct-voltage acceptance tests are generally performed to provide some assurance that the winding insulation has a minimum level of electrical strength. Because the inherent electrical strength of sound insulation is well above the usual proof test value, failure during an acceptance test at an appropriate voltage indicates the insulation is unsuitable for service.