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Foreword

(This foreword is not a part of IEEE Std 43-1974, IEEE Recommended Practice for Testing Insulation Resistance of Rotating Machinery.)

Insulation resistance measurement has been recommended and used for more than half a century to evaluate the condition of electric insulation. Whereas individual insulation resistance measurements may be of questionable value, the carefully maintained record of periodic measurements accumulated over months and years of service, is of unquestioned value as a measure of the condition of the electrical insulation. Originally, in 1950, this Recommended Practice was published by the AIEE as a Guide to present the various facets associated with the measurement and understanding of electrical insulation resistance. The Guide was revised in 1961. With this publication as a Recommended Practice, the IEEE is presenting and recommending electrical insulation resistance measurement as an important factor in monitoring the condition of electrical insulation in rotating machinery.

This Recommended Practice was prepared by a working group of the Insulation Subcommittee of the Rotating Machinery Committee of the IEEE Power Engineering Society. Working group personnel were:

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IEEE Recommended Practice for Testing Insulation Resistance of Rotating Machinery

1. Scope

1.1

This document describes the recommended procedure for the measurement of insulation resistance of windings of rotating machines rated 1 hp, 1 kW or greater.

It applies to synchronous machines, induction machines, direct-current machines, and synchronous converters.

It applies to armature windings and field windings.

It does not apply to fractional-horsepower machines.

1.2

This document describes insulation resistance characteristics of rotating-machine windings, the manner in which these characteristics may serve to indicate the condition of the winding, and the testing procedure for obtaining insulation resistance values. It gives the recommended minimum value of insulation resistance of alternating-current and direct-current rotating-machine windings. The Appendix gives maintenance information relative to dry-out procedure.

1.3

Other IEEE publications which include information on insulation resistance measurement are listed in Section 10.

2. Purpose

The purpose of this publication is to:

- 1) Describe and define insulation resistance as applied to the winding of a rotating machine
- 2) Review the factors which affect or change insulation resistance characteristics and recommend uniform test conditions
- 3) Outline and recommend uniform methods for measuring insulation resistance together with precautions for avoiding erroneous results
- 4) Provide a basis for interpreting insulation resistance test results to estimate the suitability of the winding for service or for overpotential test.
- 5) Present equations, based on machine ratings, for the calculation of recommended minimum insulation resistance values for various types of rotating machines.

3. Insulation Resistance—General Theory, Use, Limitations

3.1

Insulation resistance is the term generally used to describe the quotient of the applied direct potential divided by the current at some given time measured from the start of voltage application: thus reference will be found in this recommended practice to 1 min or 10 min insulation resistance.

3.1.1

The current that results from the applied direct potential consists of two parts: that in leakage paths over the surface of the insulation and that within the volume of the insulation. The current within the volume of the insulation may be further subdivided as follows (see IEEE Std 62-1958 , Guide for Making Dielectric Measurements in the Field).

- 1) The capacitance charging current, of comparatively high magnitude and short duration, usually has effectively disappeared by the time the first data are taken, and it does not affect the measurements.
- 2) The absorption current decays at a decreasing rate from a comparatively high initial value to nearly zero. The resistance-time relationship is a power function which may be plotted on log-log graph paper as a straight line. Usually the resistance measured in the first few minutes of a test is largely determined by the absorption current.
- 3) The conduction current, which, with the surface leakage current, is nearly constant. These currents predominate after the absorption current has become insignificant.

3.1.2

After removal of the impressed direct potential and the provision of a suitable discharge circuit, there will be evident a discharge which is of two parts:

- 1) The capacitance discharge current which will decay nearly instantaneously, depending upon the discharge resistance
- 2) The absorption discharge current which will decay from a high initial value to nearly zero, as does the absorption current in Section 3.1.1.