



IEEE Standard Test Procedure for Polyphase Induction Motors Having Liquid in the Magnetic Gap

STANDARDS

IEEE Power and Energy Society

Developed by the
Electric Machinery Committee

IEEE Std 252™-2022
(Revision of IEEE Std 252-1995)



IEEE Standard Test Procedure for Polyphase Induction Motors Having Liquid in the Magnetic Gap

Developed by the

Electric Machinery Committee
of the
IEEE Power and Energy Society

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IEEE SA Standards Board

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Abstract: Instructions for conducting and reporting the generally applicable and acceptable tests to determine the performance characteristics of polyphase induction motors having liquid in the magnetic gap are given. Constants in several equations and forms apply to three-phase motors only and require modifications for applications to motors having another number of phases. It is not intended that the procedures cover all possible tests or tests of a research nature. The procedures shall not be interpreted as requiring the making of any or all tests described herein in any given transaction.

Keywords: IEEE 252™, liquid in the magnetic gap, polyphase induction motor, test procedures, three-phase motor

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Yao Duan, *Chair*
Haran Karmaker, *Vice Chair*

Kevin Alewine

Lizhi Qu

Zhiwei Zhang

The following members of the individual Standards Association balloting group voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

Blake Bailey
Derek Brown
Gustavo Brunello
Koti Reddy Butukuri
Paul Cardinal
Yao Duan
Donald Dunn
Carl Fredericks
Paul Gaberson
Tyler Gaerke

Shubhanker Garg
Jalal Gohari
J Travis Griffith
Werner Hoelzl
Haran Karmaker
John Kay
Tanuj Khandelwal
Mario Lanaro
William Lockley
Lorraine Padden

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Lizhi Qu
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Nikunj Shah
Ashfak Shaikh
David Tepen
James Timperley
John Vergis
John Yagielski

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Andrew Myles
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Annette D. Reilly
Robby Robson
Jon Walter Rosdahl

Mark Siira
Dorothy V. Stanley
Lei Wang
F. Keith Waters
Karl Weber
Sha Wei
Philip B. Winston
Daidi Zhong

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Introduction

This introduction is not part of IEEE Std 252-2022, IEEE Standard for Test Procedure for Polyphase Induction Motors Having Liquid in the Magnetic Gap.

In recent years, induction motors have found increasing usage in applications where the rotor operates in a liquid environment. Frequent applications include driving pumps in primary coolant loops in nuclear reactors, in boiler forced circulating systems, and in deep well pumping. From the viewpoint of testing and test procedures, motors designed for these applications differ from conventional motors principally in having additional losses due to circulating currents in the metallic barriers in the air gap, in having higher friction loss, and in reduced accessibility to the windings and rotating parts. Because of these differences and the increasing usage of such motors, the Motor Subcommittee of the Electrical Machinery Committee undertook the preparation of this test procedure, which was derived from IEEE Std 112™, IEEE Standard Test Procedure for Polyphase Induction Motors and Generators.⁶

⁶ Information on normative references can be found in Clause 2.

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IEEE Standard for Test Procedure for Polyphase Induction Motors Having Liquid in the Magnetic Gap

1. Overview

1.1 Scope

~~This test procedure covers~~ Instructions for conducting and reporting the more generally applicable and acceptable tests to determine the performance characteristics of polyphase induction motors having liquid in the magnetic gap are described in this standard. ~~Constants in several equations and forms apply to three phase motors only and require modification for application to motors having another number of phases. It is not intended that the procedure cover all possible tests or tests of a research nature. The procedure shall not be interpreted as requiring the making of any or all of the tests described herein in any given transaction.~~

~~Test report forms are provided with this standard. For the convenience of the user, they are organized into a normative annex.~~

1.2 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).^{7,8}

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

⁷ The use of the word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

⁸ The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is only used in statements of fact.

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

~~This standard shall be used in conjunction with the following references:~~

IEEE Std 4TM ~~1995~~, IEEE Standard Techniques for High-Voltage Testing^{9,10} ~~(ANSI)~~.[‡]

IEEE Std 43TM-1974 (Reaff 1991), IEEE Recommended Practice for Testing Insulation Resistance of Rotating Machinery ~~(ANSI)~~.

IEEE Std 85TM-1973 (Reaff 1986), IEEE Standard Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery (ANSI).¹¹

IEEE Std 112TM ~~1991~~, IEEE Standard Test Procedure for Polyphase Induction Motors and Generators ~~(ANSI)~~.

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¹¹ IEEE Std 85-1973 has been withdrawn; copies can be obtained from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, NJ 08855-1331, USA.

IEEE Std 118TM-1978 (Reaff 1992), IEEE Standard Test Code for Resistance Measurements (ANSI).¹²

IEEE Std 119TM-1974, IEEE Recommended Practice for General Principles of Temperature Measurement as Applied to Electrical Apparatus.^{13 2}

~~IEEE Std 120-1989, IEEE Master Test Guide for Electrical Measurements in Power Circuits (ANSI).~~

3. General

3.1 Kinds of tests

These motors are normally given either a routine test or a complete test.

3.1.1 Routine test

The routine test includes measurement of speed, power input, and current input at no load, rated voltage and frequency; power input and current input with locked rotor; and⁷ winding resistance, insulation resistance, and dielectric test. The locked rotor test may also be performed with single-phase power applied to the motor. Form 1 ([see Figure A.1](#)) may be used for reporting such data.

3.1.2 Complete test

The complete test includes a routine test plus additional tests necessary to determine efficiency, power factor, starting torque, breakdown torque, rated-load slip, and rated-load temperature rise.

¹² IEEE Std 118-1978 has been withdrawn; copies can be obtained from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, NJ 08855-1331, USA.

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