IEEE STANDARDS ASSOCIATION

IEEE Standard Test Procedure for Single-Phase Induction Motors

IEEE Industry Applications Society

Sponsored by the
Electric Machines Committee

IEEE
3 Park Avenue
New York, NY 10016-5997
USA

23 December 2010

IEEE Std 114™-2010
(Revision of
IEEE Std 114-2001)

IEEE Std 114™-2010
(Revision of
IEEE Std 114-2001)

IEEE Standard Test Procedure for Single-Phase Induction Motors

Sponsor

Electric Machines Committee
of the
IEEE Industry Applications Society

Approved 30 September 2010

IEEE-SA Standards Board

Abstract: Instructions for conducting and reporting the more generally applicable and acceptable test to determine the performance characteristics of single-phase induction motors are covered in this standard.
Keywords: efficiency, IEEE 114, motor test procedure, single-phase induction motors, speed-torque characteristic

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

PDF: ISBN 978-0-7381-6478-6 STD97027
Print: ISBN 978-0-7381-6443-4 STDPD97027

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. While the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any of the information or the soundness of any judgments contained in its standards.

Use of an IEEE Standard is wholly voluntary. The IEEE disclaims liability for any personal injury, property or other damage, of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, or reliance upon this, or any other IEEE Standard document.

The IEEE does not warrant or represent the accuracy or content of the material contained herein, and expressly disclaims any express or implied warranty, including any implied warranty of merchantability or fitness for a specific purpose, or that the use of the material contained herein is free from patent infringement. IEEE Standards documents are supplied "**AS IS**."

The existence of an IEEE Standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE Standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard. Every IEEE Standard is subjected to review at least every five years for revision or reaffirmation, or every ten years for stabilization. When a document is more than five years old and has not been reaffirmed, or more than ten years old and has not been stabilized, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE Standard.

In publishing and making this document available, the IEEE is not suggesting or rendering professional or other services for, or on behalf of, any person or entity. Nor is the IEEE undertaking to perform any duty owed by any other person or entity to another. Any person utilizing this, and any other IEEE Standards document, should rely upon his or her independent judgment in the exercise of reasonable care in any given circumstances or, as appropriate, seek the advice of a competent professional in determining the appropriateness of a given IEEE standard.

Interpretations: Occasionally questions may arise regarding the meaning of portions of standards as they relate to specific applications. When the need for interpretations is brought to the attention of IEEE, the Institute will initiate action to prepare appropriate responses. Since IEEE Standards represent a consensus of concerned interests, it is important to ensure that any interpretation has also received the concurrence of a balance of interests. For this reason, IEEE and the members of its societies and Standards Coordinating Committees are not able to provide an instant response to interpretation requests except in those cases where the matter has previously received formal consideration. A statement, written or oral, that is not processed in accordance with the IEEE-SA Standards Board Operations Manual shall not be considered the official position of IEEE or any of its committees and shall not be considered to be, nor be relied upon as, a formal interpretation of the IEEE. At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position, explanation, or interpretation of the IEEE.

Comments for revision of IEEE Standards are welcome from any interested party, regardless of membership affiliation with IEEE. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Recommendations to change the status of a stabilized standard should include a rationale as to why a revision or withdrawal is required. Comments and recommendations on standards, and requests for interpretations should be addressed to:

Secretary, IEEE-SA Standards Board
445 Hoes Lane
Piscataway, NJ 08854
USA

Introduction

This introduction is not part of IEEE Std 114-2010, IEEE Standard Test Procedure for Single-Phase Induction Motors.

This introduction provides some background on the rationale used to develop this standard and is meant to aid in the understanding and usage of this document.

This standard describes laboratory tests conducted to evaluate the performance of certain single-phase induction motors. It is intended for the following:

— Individuals or organizations that use electric motors and purchase electric motors from manufacturers.
— Individuals or organizations that acquire electric motors for resale to other individuals or organizations.
— Individuals or organizations that influence how electric motors are purchased from manufacturers.
— Manufacturers interested in providing high-quality electric motors to the consumer.

This standard is designed to help organizations and individuals:

— Incorporate quality considerations during the design, evaluation, selection, and acceptance of single-phase induction motors for operational use.
— Determine how single-phase induction motors should be evaluated, tested, and accepted for delivery to end users.

This standard is intended to satisfy the following objectives:

a) Promote consistency among electric motor manufacturers in the performance evaluation of single-phase induction motors.
b) Provide useful practices for evaluating performance during the design of electric motors.
c) Provide useful practices for evaluating and qualifying manufacturer capabilities to meet user requirements.
d) Provide useful practices for evaluating and qualifying manufactured electric motors.
e) Assist individuals or organizations judging the quality of single-phase induction motors delivered to end users.

Notice to users

Laws and regulations

Users of these documents should consult all applicable laws and regulations. Compliance with the provisions of this standard does not imply compliance to any applicable regulatory requirements. Implementers of the standard are responsible for observing or referring to the applicable regulatory requirements. IEEE does not, by the publication of its standards, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

This document is copyrighted by the IEEE. It is made available for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-

regulation, standardization, and the promotion of engineering practices and methods. By making this document available for use and adoption by public authorities and private users, the IEEE does not waive any rights in copyright to this document.

Updating of IEEE documents

Users of IEEE standards should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of amendments, corrigenda, or errata. An official IEEE document at any point in time consists of the current edition of the document together with any amendments, corrigenda, or errata then in effect. In order to determine whether a given document is the current edition and whether it has been amended through the issuance of amendments, corrigenda, or errata, visit the IEEE Standards Association web site at http://ieeexplore.ieee.org/xpl/standards.jsp, or contact the IEEE at the address listed previously.

For more information about the IEEE Standards Association or the IEEE standards development process, visit the IEEE-SA web site at http://standards.ieee.org.

Errata

Errata, if any, for this and all other standards can be accessed at the following URL: http://standards.ieee.org/reading/ieee/updates/errata/index.html. Users are encouraged to check this URL for errata periodically.

Interpretations

Current interpretations can be accessed at the following URL: http://standards.ieee.org/reading/ieee/interp/index.html.

Patents

Attention is called to the possibility that implementation of this standard may require use of subject matter covered by patent rights. By publication of this standard, no position is taken with respect to the existence or validity of any patent rights in connection therewith. The IEEE is not responsible for identifying Essential Patent Claims for which a license may be required, for conducting inquiries into the legal validity or scope of Patents Claims or determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory. Users of this standard are expressly advised that determination of the validity of any patent rights and the risk of infringement of such rights, is entirely their own responsibility. Further information may be obtained from the IEEE Standards Association.

Participants

At the time this standard was submitted to the IEEE-SA Standards Board for approval, the Motors Working Group had the following membership:

Emmanuel B. Agamloh, *Chair*

Joseph E. Adams	David Eisenbraun	Charles Landy
Austin H. Bonnett	Dale Friesen	Ernesto Jorge Wiedenbrug
	Jim Kinninger	

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

William J. Ackerman	Chad Kiger	Robert Robinson
Emmanuel Agamloh	Jim Kulchisky	Bartien Sayogo
Satish Aggarwal	G Luri	Jeffrey Sexton
Davide Todaro Boscolo	William McBride	James Smith
Manjinder Gill	Bansi Patel	Jerry Sm
Randall Groves	Christopher Petrola	John Wang
Iqbal Husain	Ulrich Pohl	Ernesto Jorge Wiedenbrug

When the IEEE-SA Standards Board approved this standard on 30 September 2010, it had the following membership:

Robert M. Gro, Chair
Richard H. Hulett, *Vice Chair*
Steve M. Mills, *Past Chair*
Judith Gorman, *Secretary*

Karen Bartleson	Richard H. Hulett	Ronald C. Petersen
Victor Berman	Young Kyun Kim	Thomas Prevost
Ted Burse	Joseph L. Koepfinger*	Jon Walter Rosdahl
Clint Chaplin	John Kulick	Sam Sciacca
Andy Drozd	David J. Law	Mike Seavey
Alexander Gelman	Hung Ling	Curtis Siller
Jim Hughes	Oleg Logvinov	Don Wright
	Ted Olsen	

*Member Emeritus

Also included are the following nonvoting IEEE-SA Standards Board liaisons:

Satish Aggarwal, *NRC Representative*
Richard DeBlasio, *DOE Representative*
Michael Janezic, *NIST Representative*

Michelle D. Turner
IEEE Standards Program Manager, Document Development

Patricia Gerdon
IEEE Standards Program Manager, Technical Program Development

Contents

IEEE Standard Test Procedure for Single-Phase Induction Motors

1. Overview

This standard test procedure is divided into 11 Clauses. This overview as well as the scope and purpose of this standard test procedure are presented in Clause 1. References to other standards that are useful in applying this standard test procedure as provided in Clause 2. This standard test procedure covers a broad range of basic models of single-phase induction motors; common types of single-phase motors and the tests that are applicable to each are specified in Clause 3. Requirements for test instrumentation and other general testing facilities are presented in Clause 4. General procedures for electrical, mechanical and temperature measurements are presented in Clause 5. General test procedures and safety requirements are presented in Clause 6. A general discussion of loss is presented in Clause 7. Test methods for determination of motor efficiency and power factor are presented in Clause 8. Methods for determination of other performance are presented in Clause 9. Temperature tests are presented in Clause 10. Miscellaneous tests are described in Clause 11. Typical forms for the reporting the results of routine test, complete test, and a determination of efficiency are provided in Annex A. Bibliographic references are provided in Annex B.

1.1 Scope

This standard covers instructions for conducting and reporting the more generally applicable and acceptable tests to determine the performance characteristics of single-phase induction motors. It is not intended that this standard shall cover all possible tests used in production or tests of a research nature. The standard shall not be interpreted as requiring the making of any or all of the tests described herein in any given transaction.