

IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Specialty Transformers

Sponsor

**Transformers Committee
of the
IEEE Power Engineering Society**

Approved September 22, 1994

IEEE Standards Board

Abstract: A uniform method by which the thermal endurance of electrical insulation systems for dry-type specialty and general-purpose transformers can be compared is established. These insulation systems are intended for use in the types of transformers described in NEMA ST 1-1988 and NEMA ST 20-1992.

Keywords: dry-type specialty transformers, general-transformers, insulation system, temperature aging, test specimens

The Institute of Electrical and Electronics Engineers, Inc.
345 East 47th Street, New York, NY 10017-2394, USA

Copyright © 1994 by the Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Published 1994. Printed in the United States of America.

ISBN 1-55937-452-7

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

IEEE Standards documents are developed within the Technical Committees of the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Board. Members of the committees serve voluntarily and without compensation. They are not necessarily members of the Institute. The standards developed within IEEE represent a consensus of the broad expertise on the subject within the Institute as well as those activities outside of IEEE that have expressed an interest in participating in the development of the standard.

Use of an IEEE Standard is wholly voluntary. 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. When a document is more than five years old and has not been reaffirmed, 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.

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.

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 all 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 technical committees are not able to provide an instant response to interpretation requests except in those cases where the matter has previously received formal consideration.

Comments on standards and requests for interpretations should be addressed to:

Secretary, IEEE Standards Board
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
USA

IEEE standards documents may involve the use of patented technology. Their approval by the Institute of Electrical and Electronics Engineers does not mean that using such technology for the purpose of conforming to such standards is authorized by the patent owner. It is the obligation of the user of such technology to obtain all necessary permissions.

Introduction

(This introduction is not a part of IEEE Std 259-1994, IEEE Standard Test Procedure for Evaluation of Systems of Insulation for Specialty Transformers.)

This standard was developed to provide a test procedure for evaluating the thermal endurance of insulation systems for dry-type specialty and general-purpose transformers covered by NEMA ST 1-1988^a and by NEMA ST 20-1992. Generally these dry-type transformers are used with the primary windings connected to secondary distribution circuits of 600 V nominal and below to supply electric power to lighting systems, heating systems, signaling systems, machine tool controls, industrial controls, and other power loads in commercial, institutional, and industrial applications.

The IEEE charged its technical committees with the responsibility for developing test procedures for the thermal evaluation and classification of insulation systems used in electrical equipment. These are to be in general accord with IEEE Std 1-1986. The principal objective is to enable the performance of new and old insulation systems to be compared directly in a practical way and in a reasonable time, and to provide a sound basis for introducing new insulation systems into service.

Experience has shown that the thermal life characteristics of composite insulation systems cannot be reliably inferred solely from information concerning component materials. To assure satisfactory service life, insulation specifications need to be supported by service experience or life tests. Accelerated life tests are being used increasingly to evaluate the many new synthetic insulating materials that are available, thus shortening the period of service experience required before they can be used with confidence. Tests on complete insulation systems, representative of each type of equipment, are necessary to confirm the performance of materials for their specific functions in the equipment.

At the time this standard was completed, the Insulation Requirements for Specialty Transformers Working Group had the following membership:

Max A. Cambre, *Chair*

R. A. Bancroft
D. A. Barnard
A. Bimbiris

J. M. Frank
R. J. Mayschak
R. L. Provost
R. W. Simpson

R. E. Uptegraff
R. Wagner
G. C. Zguris

At the time this standard was completed, the Dry-Type Transformers Subcommittee had the following membership:

W. F. Patterson, *Chair*

B. F. Allen
R. A. Bancroft
D. A. Barnard
A. Bimbiris
M. A. Cambre
T. Darr
R. F. Dudley
J. M. Frank

H. E. Gabel
G. L. Gaibrois
R. E. Gearhart
A. J. Jonnatti
S. P. Kennedy
A. D. Kline
E. Koenig
E. P. Marek

W. H. Mutchler
J. J. Nay
P. Payne
L. W. Pierce
R. L. Provost
V. Thenapan
R. E. Uptegraff
H. J. Windisch

^aInformation on references can be found in clause 2.

The following persons were on the balloting committee:

E. J. Adolphson
Louis C. Aicher
D. J. Allan
Ben F. Allen
Raymond Allustiarti
M. S. Altman
J. C. Arnold
J. Aubin
Roy Bancroft
David Barnard
D. L. Basel
P. L. Bellaschi
S. Bennon
Wallace B. Binder
J. V. Bonucchi
J. D. Borst
C. B. Brown
Olin R. Compton
J. L. Corkran
D. W. Crofts
V. Dahinden
John N. Davis
T. Diamantis
David H. Douglas
R. F. Dudley
John C. Dutton
John A Ebert
K. Edwards
Fred E. Elliot
D. J. Fallon
Heinz G. Fischer
Jeffrey A. Fleeman
Sam L. Foster
M. Frydman
Herman E. Gabel
Robert E. Gearhart
Dennis W. Gerlach
A. A. Ghafourian
Donald A. Gillies
R. S. Girgis
Robert L. Grubb
F. J. Gryszkiewicz
Geoff Hall
Kenneth Hanus
Jim H. Harlow
Frank W. Heinrichs
William R. Henning

K. R. Highton
Peter J. Hoeffer
R. H. Hollister
C. C. Honey
Philip J. Hopkinson
J. W. Howard
Edgar Howells
J. Hunt
Peter Y. Iijima
Anthony J. Jonnatti
R. D. Jordan
C. P. Kappeler
Richard B. Kaufman
J. J. Kelly
William N. Kennedy
Sheldon P. Kennedy
James P. Kinney Jr.
Alexander D. Kline
Egon Koenig
J. G. Lackey
J. P. Lazar
Robert E. Lee
Harold F. Light
S. R. Lingren
Leonard W. Long
L. Lowdermilk
Richard L. Lowe
H. B. Margolis
Tito Massouda
John W. Matthews
Jack McGill
Charles J. McMillen
W. J. McNutt
Sam P. Mehta
C. K. Miller
C. H. Millian
Matthew C. Mingoia
Russell E. Minkwitz
Michael I. Mitelman
Harold R. Moore
R. J. Musil
William H. Mutschler
E. T. Norton
R. A. Olsson
P. W. Orehek
G. A. Paiva
Bipin K. Patel

Wesley F. Patterson
J. M. Patton
P. A. Payne
Henry A. Pearce
Dan Perco
D. A. Peters
Linden W. Pierce
Donald W. Platts
J. M. Pollitt
C. P. Raymond
Chris A. Robbins
R. B. Robertson
W. P. Sampat
L. J. Savio
William E. Saxon
Robert W. Scheu
D. N. Sharma
V. Shenoy
H. J. Sim
Leonard R. Smith
Stephen D. Smith
Steven L. Snyder
R. J. Stahara
W. W. Stein
L. R. Stensland
Frank Stevens
D. Sundin
Lennart A. Swenson
David S. Takach
Louis A. Tauber
Virginia Thenappan
R. C. Thomas
James A. Thompson
Jerry C. Thompson
Thomas P. Traub
David E. Truax
W. Bruce Uhl
Roy LE. Uptegraff, Jr.
Georges H. Vaillancourt
R. A. Veitch
Loren B. Wagenaar
Barry H. Ward
R. J. Whearty
D. W. Whitley
Alan L. Wilks
John G. Wood
W. E. Wrenn

When the IEEE Standards Board approved this standard on September 22, 1994, it had the following membership:

Wallace S. Read, *Chair*

Donald C. Loughry, *Vice Chair*

Andrew G. Salem, *Secretary*

Gilles A. Baril
Bruce B. Barrow
José A. Berrios de la Paz
Clyde R. Camp
James Costantino
Stephen L. Diamond
Donald C. Fleckenstein
Jay Forster*
Ramiro Garcia

Donald N. Heirman
Richard J. Holleman
Jim Isaak
Ben C. Johnson
Sonny Kasturi
Lorraine C. Kevra
E. G. "Al" Kiener
Ivor N. Knight

Joseph L. Koepfinger*
D. N. "Jim" Logothetis
L. Bruce McClung
Marco W. Migliaro
Mary Lou Padgett
Arthur K. Reilly
Ronald H. Reimer
Gary S. Robinson
Leonard L. Tripp

*Member Emeritus

Also included are the following nonvoting IEEE Standards Board liaisons:

Satish K. Aggarwal
James Beall
Richard B. Engelman
Robert E. Hebner
David E. Soffrin

Rachel A. Meisel
IEEE Standards Project Editor