

An American National Standard

**IEEE Standard Test Procedure for
Thermal Evaluation of Insulation Systems for
Ventilated Dry-Type Power and
Distribution Transformers**

Sponsor

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

Secretariat

**Institute of Electrical and Electronics Engineers
National Electrical Manufacturers Association**

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Foreword

(This Foreword is not a part of ANSI/IEEE C57.12.56-1986, IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Ventilated Dry-Type Power and Distribution Transformers.)

This standard was developed to provide a method for evaluating insulation systems for ventilated dry-type transformers with high-voltage ratings greater than 600 V. Since the procedures contained herein are new, experience factors may require future revision.

The working group that developed this standard used AIEE 65-1956, the Proposed Test for Thermal Evaluation of Ventilated Dry-Type Power and Distribution Transformers, as a starting point. New materials and coil-design techniques necessitated a revision of the procedure to recognize such factors as layer insulation, higher impulse withstand capabilities, and new organic, high-temperature insulations. This standard describes methods that take the new materials and processes into account.

The working group was unable to define an existing insulation system to use as a control for comparison with an insulation system under test; therefore, an arbitrary extrapolation criteria of 40 000 h was selected for the evaluation. The working group urges the Dry-Type Transformer Industry to report results of tests using this standard to provide a basis for future improvement.

The working group considered aging under voltage stresses which might cause partial discharge but ruled it out since present transformer designs are generally made to be as free of partial discharges as practical.

The working group considered a vibration and shock procedure as one of the aging factors. So little information is published regarding the effects of vibration and shock in high-voltage insulation systems that it was impossible to include it in this standard. The working group urges the industry to report procedures and results of testing insulation systems with vibration and shock so that revisions of this standard may incorporate these factors, if they are found to be significant.

This standard relates voltage withstand end-point criteria to the impulse voltage distribution within the coil or to the initial-voltage withstand of the coil. A relationship between impulse withstand of the insulation and short-term 60 Hz withstand is identified so that 50/60 Hz testing of model coils is possible.

Acknowledgement and thanks are extended to those who have so freely given their time and knowledge and have conducted experimental work on which this standard is based.

This standard was developed by a working group of the Dry-Type Transformer Subcommittee of the IEEE Transformer Committee of the IEEE Power Engineering Society.

At the time it approved this standard, the C57 Committee had the following membership:

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CLAUSE	PAGE
1. Introduction	1
1.1 Scope	1
1.2 Purpose	1
1.3 References	1
1.4 Applicable Document in Preparation	2
2. Basic Considerations	2
2.1 General	2
2.2 Intent	2
2.3 Aging Factors	2
2.4 Data Treatment	3
3. Test Procedures	3
3.1 General	3
3.2 Test Models	4
3.3 Screening	7
3.4 Test Cycles	8
3.5 Temperature Aging	8
3.6 Humidity Conditioning	9
3.7 Dielectric Tests	9
4. Reporting	12
Annex A (informative)	13
Annex B (informative)	15

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IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Ventilated Dry-Type Power and Distribution Transformers

1. Introduction

1.1 Scope

This standard is intended to establish a uniform method for determining the temperature classification of ventilated dry-type power and distribution transformer insulation systems by test rather than by chemical composition.

These insulation systems are intended for use in transformers listed in ANSI C57.12.50-1981 [1]¹ and ANSI C57.12.51-1981 [2], and whose highest voltages exceed nominal 600 V.

NOTE — In this standard, the term *transformer* shall be considered to mean *ventilated dry-type transformer* unless qualified by other descriptive terms.

1.2 Purpose

The purpose of this standard is to establish a uniform method

- 1) For providing data for selection of the temperature classification of the insulation system
- 2) For providing data which may be used as a basis for a loading guide
- 3) For comparative evaluation of different insulation systems

1.3 References

[1] ANSI C57.12.50-1981, American National standard Ventilated Dry-Type Distribution Transformers, 1 to 500 kVA, Single-Phase, and 15 to 500 kVA, Three-Phase, with High-Voltage 601 to 34 500 Volts, Low-Voltage 120 to 600 Volts²

[2] ANSI C57.12.51-1981, American National Standard Requirements for Ventilated Dry-Type Power Transformers, 501 kVA and Larger, Three-Phase with High-Voltage 601 to 34 500 Volts, Low-Voltage 208Y/120 to 4160 Volts.

[3] ANSI/ASTM D149-81, Standard Test Methods for Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies.

¹The numbers in brackets correspond to those of the references listed in 1.3.

²ANSI publications are available from the Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018.