



IEEE Standard General Requirements for Dry-Type Distribution and Power Transformers, Including Those with Solid-Cast and/or Resin Encapsulated Windings

IEEE Power Engineering Society

Sponsored by the
Transformers Committee

IEEE
3 Park Avenue
New York, NY 10016-5997, USA
19 May 2006

IEEE Std C57.12.01™-2005
(Revision of
IEEE Std C57.12.01-1998)

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Approved 8 December 2005

IEEE-SA Standards Board

Abstract: Electrical, mechanical, and safety requirements of ventilated, non-ventilated, and sealed dry-type distribution and power transformers or autotransformers (single and polyphase, with a voltage of 601 V or higher in the highest voltage winding) are described.

Keywords: autotransformer, dry-type distribution, power transformer, voltage winding

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Print: ISBN 0-7381-4880-6 SH95368
PDF: ISBN 0-7381-4881-4 SS95368

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Introduction

This introduction is not part of IEEE Std C57.12.01-2005, IEEE Standard General Requirements for Dry-Type Distribution and Power Transformers, Including Those with Solid-Cast and/or Resin Encapsulated Windings.

This standard is the result of an effort encompassing the interests of users, manufacturers, and others dedicated to producing voluntary consensus standards for dry-type transformers.

This revision continues to improve harmonization with international standards such as IEC 60076-11:2004.

Table 4 and Table 5 in IEEE Std C57.12.01-1998 implied a dependent relationship between high-frequency test levels and the corresponding low-frequency levels. Such a dependency was not intended. These tables have been combined into one table (Table 5) to clarify the proper relationship.

Dielectric tests consist of low-frequency and high-frequency values. Low-frequency tests include induced voltages up to two times rated volts, which are intended to verify the integrity of turn-to-turn and layer-to-layer insulation systems. Applied potential tests verify the integrity of major insulation systems above ground and between separate windings. High-frequency tests include a $1.2 \times 50 \mu\text{s}$ wave and a chopped wave to verify the integrity of electrical windings to withstand lightning and switching transients.

This revision also adds references to NEMA ST-20¹ and the National Electrical Code[®] (NEC[®]) (NFPA 70)² as these standards refer to this standard.

NEMA standard ST-20 is a standard for dry-type transformers with primary windings connected to secondary distribution circuits with voltages of 600 V and below usually installed and used in accordance with the National Electric Code. NEMA ST-20 does, in its content, refer to IEEE Std C57.12.01 and it is referenced here for information on voltages 600 V and below applications only.

Annex A from IEEE Std C57.12.01-1998 has been removed from this revision because the material in question, the operation of transformers at altitudes greater than 1000 m (3300 ft), is covered in IEEE Std C57.96.

This revision was developed by the Working Group of the Dry-Type Transformers Subcommittee of the IEEE Transformer Committee of the IEEE Power Engineering Society.

This standard is a voluntary consensus standard. Its use may become mandatory only when required by a duly constituted legal authority, or when specified in a contractual relationship. To meet specialized needs and to allow innovation, specified changes are permissible when mutually determined by the user and the producer, provided such changes do not violate existing laws and are considered technically adequate for the function intended.

¹ NEMA publications are available from Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112, USA (<http://global.ihs.com/>).

² NFPA publications are available from Publications Sales, National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101, USA (<http://www.nfpa.org/>).

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Interpretations

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1. Overview

1.1 Scope

Electrical, mechanical, and safety requirements of ventilated, non-ventilated, and sealed dry-type distribution and power transformers or autotransformers (single and polyphase, with a voltage of 601 V or higher in the highest voltage winding) are described.

1.2 Purpose

This standard is intended as a basis for the establishment of performance, interchangeability, and safety requirements of equipment described, and for assistance in the proper selection of such equipment.

The information in this standard applies to all dry-type transformers except as follows:

- a) Instrument transformers
- b) Step- and induction-voltage regulators
- c) Arc-furnace transformers
- d) Rectifier transformers
- e) Specialty and general-purpose transformers
- f) Mine transformers
- g) Testing transformers
- h) Welding transformers

1.3 Word usage

When this standard is used on a mandatory basis, the word *shall* indicates mandatory requirements; the words *should* and *may* refer to matters that are recommended or permissive but not mandatory.

NOTE—The introduction of this voluntary consensus standard describes the circumstances under which the standard may be used on a mandatory basis.¹

2. Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANSI C57.12.55, American National Standard for Dry-Type Transformers in Unit Installations, Including Unit Substations—Conformance Standard.²

ANSI C57.12.70, American National Standard for Terminal Markings and Connections for Distribution and Power Transformers.

ANSI C84.1, American National Standard for Electric Power Systems and Equipment—Voltage Ratings (60 Hz).

IEEE Std 315™, IEEE Graphic Symbols for Electrical and Electronics Diagrams.^{3, 4}

IEEE Std C57.12.56™, IEEE Standard Test Procedure for Thermal Evaluation of Insulation Systems for Ventilated Dry-Type Power and Distribution Transformers.

IEEE Std C57.12.60™, IEEE Guide for Test Procedures for Thermal Evaluation of Insulation Systems for Solid Cast and Resin-Encapsulated Power and Distribution Transformers.

IEEE Std C57.12.80™, IEEE Standard Terminology for Power and Distribution Transformers.

IEEE Std C57.12.91™, IEEE Standard Test Code for Dry-Type Distribution and Power Transformers.

IEEE Std C57.96™, IEEE Guide for Loading Dry-Type Distribution and Power Transformers.

IEEE Std C57.124™, IEEE Recommended Practice for the Detection of Partial Discharge and the Measurement of Apparent Charge in Dry-Type Transformers.

IEEE Std C62.22™, IEEE Guide for Application of Metal-Oxide Surge Arresters for Alternating-Current Systems.

¹ Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

² ANSI publications are available from the Sales Department, American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (<http://www.ansi.org/>).

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