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Dry-type transformers

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Dry-type transformers



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Preface

This is the fifth edition of CSA C9, *Dry-type transformers*. It supersedes the previous editions published in 2002, 1981, 1977, and 1966.

Changes in this edition include the following:

- a) updates to insulation voltage classes and dielectric tests;
- b) updates to Annex D (Comparison of enclosures for indoor and outdoor non-hazardous locations); and
- c) alignment of average audible sound level with current industry practices.

This Standard was prepared by the Technical Committee on Dry-Type Transformers, under the jurisdiction of the Strategic Steering Committee on Power Engineering and Electromagnetic Compatibility, and has been formally approved by the Technical Committee.

Notes:

- 1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
- 2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
- 3) *This Standard was developed by consensus, which is defined by CSA Policy governing standardization — Code of good practice for standardization as “substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity”. It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
- 4) *To submit a request for interpretation of this Standard, please send the following information to inquiries@csagroup.org and include “Request for interpretation” in the subject line:*
 - a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
 - b) *provide an explanation of circumstances surrounding the actual field condition; and*
 - c) *where possible, phrase the request in such a way that a specific “yes” or “no” answer will address the issue.*

Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization and are available on the current Standards Activities page at standardsactivities.csa.ca.
- 5) *This Standard is subject to review within five years from the date of publication. Suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include “Proposal for change” in the subject line:*
 - a) *Standard designation (number);*
 - b) *relevant clause, table, and/or figure number;*
 - c) *wording of the proposed change; and*
 - d) *rationale for the change.*

C9-17

Dry-type transformers

1 Scope

1.1

This Standard applies to single phase and polyphase dry-type transformers, including those with cast or resin encapsulated coils, that are within the limits of the electrical ratings specified in Clauses 7.1 and 7.3, and that are intended for use in accordance with the service conditions for dry-type transformers specified in Annexes A and B.

Notes:

- 1) For information on the loading of dry-type transformers, see IEEE C57.96.
- 2) For additional requirements for dry-type transformers in accordance with the Canadian Electrical Code, Part II, see CSA C22.2 No. 47.

1.2

This Standard deals with the standardization of voltage ratings, kVA capacities, other electrical features, certain mechanical features, and test procedures.

1.3

This Standard does not apply to transformers designed solely for test purposes, rectifier transformers, welding transformers, furnace transformers, instrument transformers, motor-starting autotransformers, or any other special purpose transformers.

1.4

In this Standard, the word “transformer” refers to a dry-type transformer, unless otherwise specifically stated.

1.5

In this Standard, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; “should” is used to express a recommendation or that which is advised but not required; and “may” is used to express an option or that which is permissible within the limits of the standard.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.

Notes to tables and figures are considered part of the table or figure and may be written as requirements.

Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

2 Reference publications

This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

CSA Group

C22.1-15

Canadian Electrical Code, Part I

C22.2 No. 0.12-M1985 (R2016)

Wiring space and wire bending space in enclosures for equipment rated 750 V or less

C22.2 No. 47-13

Air-cooled transformers (dry-type)

C22.2 No. 94.2-15

Enclosures for electrical equipment, environmental considerations

CAN3-C235-83 (R2015)

Preferred voltage levels for AC systems, 0 to 50 000 V

IEC (International Electrotechnical Commission)

ANSI/IEC 60529-2004

Degrees of Protection Provided by Enclosures (IP Code)

IEEE (Institute of Electrical and Electronics Engineers)

C57.12.01-2015

General Requirements for Dry-Type Distribution and Power Transformers

C57.12.91-2011

Test Code for Dry-Type Distribution and Power Transformers

C57.96-2013

Guide for Loading Dry-Type Distribution and Power Transformers

C57.98-2011

Guide for Transformer Impulse Tests

C57.110-2008

Recommended Practice for Establishing Transformer Capability When Supplying Nonsinusoidal Load Currents

C57.12.70-2011

Terminal Markings and Connections for Distribution and Power Transformers

NEMA (National Electrical Manufacturers Association)

250-2014

Enclosures for Electrical Equipment (1000 Volts Maximum)