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IEEE Guide for Application of Transformer Connections in Three-Phase Electrical Systems

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IEEE Power and Energy Society

Developed by the
Transformers Committee

IEEE Std C57.105™-2019
(Revision of IEEE Std C57.105-1978)

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Abstract: This guide describes transformer connections and configurations in three-phase electrical systems. The characteristics of the various transformer connections and possible operating problems under normal or abnormal conditions are treated. All combinations of delta and wye, grounded and ungrounded, T-connected, zigzag, and certain special connections are considered. Only two-winding and auto-transformers are included.

Keywords: connections, delta, ferroresonance, IEEE C57.105™, three-phase, transformer, unsymmetrical banks, wye, zigzag

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Introduction

This introduction is not part of IEEE Std C57.105-2019, IEEE Guide for Application of Transformer Connections in Three-Phase Electrical Systems.

In the fall of 1968, a Working Group was formed by the Performance Characteristics Subcommittee of the IEEE Transformers Committee to prepare a user's guide for application of Y-Y transformers considering user systems, manufacturing capabilities, tank heating, ferroresonance, and telephone interference. The scope of the proposed user's guide was subsequently expanded to cover the full range of transformer connections commonly used in three-phase distribution systems with emphasis on those characteristics of the connections that distinguish one from another, appear most prominently with asymmetrical system conditions, and affect the selection of the connections.

The guide was originally published in 1978 and was reaffirmed three times in 1987, 1992, and 2008. A PAR with revised title and scope was approved in spring 2015. A Working Group was formed by the Performance Characteristics Subcommittee of the IEEE Transformers Committee to revise the guide with updated information and references as needed.

The guide assumes the reader has an educational or practical background equivalent to that of a graduate electrical engineer with some knowledge of transformers and distribution practices. Since the guide would be most needed by, and most useful for, the engineer with relatively little experience, the Working Group has incorporated explanatory material where considered to be helpful.

The 2015 revision revised the scope of the document to include three-phase "electrical systems" instead of "distribution systems" due to the content of the guide applying to many three-phase connections regardless of voltage.

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IEEE Guide for Application of Transformer Connections in Three-Phase Electrical Systems

1. Overview

1.1 Scope

This guide describes transformer connections and configurations in three-phase electrical systems, the characteristics of these various connections, and the possible operating problems under normal or abnormal conditions.

All combinations of delta and wye, grounded and ungrounded, T-connected, zigzag, and certain special connections are considered. Only two-winding and auto-transformers are included.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

IEEE Std C57.12.70™, IEEE Standard for Terminal Markings and Connections for Distribution and Power Transformers.[1,2]

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

3. Definitions

The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.[3]

Except as modified in this standard, transformer terminology found in IEEE Std C57.12.80 shall apply.

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