

C57.12.34™

IEEE Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers (2500 kVA and Smaller)—High-Voltage: 34 500 GrdY/19 920 Volts and Below; Low-Voltage: 480 Volts and Below

IEEE Power Engineering Society

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Transformers Committee



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IEEE Power Engineering Society

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Abstract: Certain electrical, dimensional, and mechanical characteristics are set forth as well as certain safety features of three-phase, 60 Hz, mineral-oil-immersed, self-cooled, pad-mounted, compartmental-type distribution transformers. These transformers are rated 2500 kVA and smaller, with high-voltages of 34 500 GrdY / 19 920 volts and below, and with low-voltages of 480 volts and below. This standard covers the connector, bushing and terminal arrangements for radial or loop feed systems. This standard does not cover the electrical and mechanical requirements of any accessory devices that may be supplied with the transformer.

Keywords: compartmental, connector arrangements, loop, pad mounted, radial, three phase, three-phase pad-mounted distribution transformers, transformer

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Introduction

This introduction is not part of IEEE Std C57.12.34-2004, IEEE Standard Requirements for Pad-Mounted Compartmental-Type, Self-Cooled, Three-Phase, Distribution Transformers (2500 kVA and Smaller)—High-Voltage: 34 500 GrdY/19 920 Volts and Below; Low-Voltage: 480 Volts and Below.

The Accredited Standards Committee on Transformers, Regulators, and Reactors, C57 has for many years been developing standards on transformers, regulators, and reactors. The data has been obtained from many sources, including the standards of the Institute of Electrical and Electronics Engineers (IEEE) and the National Electrical Manufacturers Association (NEMA), reports of committees of the Edison Electrical Institute, and others.

This standard was prepared by the Working Group of the Subcommittee on Distribution Transformers, Three Phase, Pad-Mounted, and is a revision and combination of IEEE Std C57.12.22-1987 and IEEE Std C57.12.26-1992.

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1. Overview

1.1 Purpose

This standard is intended for use as a basis for determining performance, interchangeability, and safety of the equipment covered, and to assist in the proper selection of such equipment.

1.2 Scope

This standard covers certain electrical, dimensional, and mechanical characteristics and takes into consideration certain safety features of three-phase, 60 Hz, mineral-oil-immersed, self-cooled, pad-mounted, compartmental-type distribution transformers. These transformers are rated 2500 kVA and smaller, with high-voltages of 34 500 GrdY/ 19 920 volts and below, and with low-voltages of 480 volts and below. These transformers are generally used for step-down purposes from an underground primary cable supply. This standard covers the connector, bushing and terminal arrangements for radial or loop feed systems. Either certain minimum dimensions (see Figures 1, 2, 3, 7, 8, and 11) or certain specific dimensions (see Figures 4, 5, 6, 9, 10, and 12) shall be specified. This standard does not cover the electrical and mechanical requirements of any accessory devices that may be supplied with the transformer.

NOTE—Refer to latest USA federal regulations concerning PCB contamination in transformers.¹

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

2. Normative references

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

ANSI C57.12.20, American National Standard for Overhead-Type Distribution Transformers, 500 kVA and Smaller: High-Voltage, 34 500 Volts and Below; Low-Voltage, 7970/13 800Y Volts and Below.²

ANSI 57.12.28, American National Standard—Pad-Mounted Equipment—Enclosure Integrity.

IEEE Std 386TM, IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems above 600 V.^{3,4}

IEEE Std C57.12.00TM, IEEE Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.

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

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

IEEE Std C57.12.90TM, IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers.

IEEE Std C57.91TM, IEEE Guide for Loading Mineral Oil-Immersed Transformers.

3. Definitions

For the purposes of this standard, the following terms and definitions apply. IEEE 100, *The Authoritative Dictionary of IEEE Standards Terms*, Seventh Edition, should be referenced for terms not defined in this clause.

3.1 safety factor: The ratio of the ultimate stress of the material used in the lifting provisions to the working stress.

3.2 working stress: The maximum combined stress developed in the lifting provisions by the static load of the completely assembled transformer.

4. Ratings

4.1 Kilovolt-ampere ratings

Kilovolt-ampere ratings are for continuous operation and based on not exceeding either a 65°C average winding temperature rise or an 80°C hot-spot conductor temperature rise. The temperature rise of the insulating oil shall not exceed 65°C when measured near the top of the tank. These kilovolt-ampere ratings

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are based on the usual temperature and altitude service conditions specified in IEEE Std C57.12.00.⁵ The kilovolt-ampere ratings shall be as follows:

Kilovolt-ampere ratings	
75	750
112.5	1000
150	1500
225	2000
300	2500
500	-----

4.2 Voltage ratings

Voltage ratings shall be in accordance with Table 1 of this standard.

4.3 Tap ratings

When specified, high-voltage taps shall be as given in Table 2 of this standard. The tap changer handle or the area next to the handle in the terminating compartment shall be marked indicating suitability for de-energized operation only.

5. Basic lightning impulse insulation levels

Basic lightning impulse insulation levels (BILs) shall be in accordance with Table 1, Table 3, and Table 4 of this standard.

6. Dielectric test levels

Dielectric test levels shall be in accordance with the distribution levels in Table 5 of IEEE Std C57.12.00.

7. Impedance voltage

7.1 Nominal percent impedance voltage

The percent impedance voltage, as measured on the rated voltage connection, shall be as follows:

Rating (kVA)	Impedance Voltage (%)
75	1.10 – 5.75 ^a
112.5 – 300	1.40 – 5.75 ^a
500	1.70 – 5.75 ^a
750 – 2500	5.75 nominal

^a The minimum impedance listed above may produce available fault currents greater than the interrupting rating of down line equipment.

⁵ Information on references can be found in Clause 2.

7.2 Tolerance on impedance voltage

The tolerance on nominal impedance voltages shall be as specified in 9.2 of IEEE Std C57.12.00.

7.3 Tolerance on impedance voltage on a tap

The percent departure of the tested impedance voltage on any tap from the tested impedance voltage at rated voltage shall not be greater than the total tap voltage range and shall be expressed as a percentage of the rated voltage.

8. Tests

8.1 General

Except as specified in 8.2 of this standard, tests shall be performed as specified in IEEE Std C57.12.00 and IEEE Std C57.12.90.

8.2 Dielectric tests

For wye-wye connected transformers, no applied voltage test is required on the high-voltage winding. An induced voltage test shall be performed as specified in IEEE Std C57.12.90. The voltage induced between the high-voltage line terminals and ground shall be the lower of the following values:

- a) 3.46 times the rated high-voltage winding voltage plus 1000 volts, or
- b) The applied voltage test values provided in IEEE Std C57.12.00, Table 5.

9. Construction

9.1 General

A pad-mounted, compartmental-type transformer shall consist of a tank with high-voltage and low-voltage cable terminating compartments, as shown in Figures 3 and 6 or Figures 8 and 10 of this standard. The compartment shall be separated by a barrier of metal or other rigid material.

9.2 Compartment configuration

The high-voltage and low-voltage compartments shall be located side-by-side on one side of the transformer tank. When viewed from the front, the low-voltage compartment shall be on the right.

9.3 Access

Each compartment shall have a door so constructed as to provide access to the high-voltage compartment only after the door to the low-voltage compartment has been opened. There shall be one or more additional captive fastening devices that must be disengaged before the high-voltage door can be opened. Where the low-voltage compartment door is of a flat panel design, the door shall have three-point latching with a handle provided for a locking device. The compartment doors shall be of sufficient size to provide adequate operating and working space when removed or open. The doors shall either be equipped for latching in the open position or designed for manual removal.