

**American National Standard
for Transformers –**

**Pad-Mounted Compartmental-Type,
Self-Cooled, Three-Phase Distribution Transformers
for Use with Separable Insulated High-Voltage
Connectors, High-Voltage, 34 500 Grd Y/19 920 Volts
and Below; 2500 kVA and Smaller**

Secretariat

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

Approved April 16, 1986

American National Standards Institute, Inc

American National Standard

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Foreword

(This Foreword is not part of American National Standard C57.12.26-1987.)

The Accredited Standards Committee on Transformers, Regulators, and Reactors, C57, has for a number of years been developing and correlating standards on transformers and regulators. The data used in this work have been gathered from many sources, including the standards of the Institute of Electrical and Electronics Engineers and the National Electrical Manufacturers Association, reports of committees of the Edison Electric Institute, and others.

This standard and the related standards on three- and single-phase distribution transformers were prepared by the Subcommittee on Distribution Transformers, Overhead and Pad-Mounted, C57.12.2.

Suggestions for improvement of this standard will be welcome. They should be sent to the National Electrical Manufacturers Association, 2101 L Street, NW, Washington, DC 20037.

This standard was processed and approved for submittal to ANSI by Accredited Standards Committee on Transformers, Regulators, and Reactors, C57. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the C57 Committee had the following members:

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Contents

SECTION	PAGE
1. Scope and Purpose	7
2. Related Standards	7
2.1 General	7
2.2 Revision of American National Standards.	7
3. Ratings	8
3.1 Kilovolt-Ampere Ratings.	8
3.2 Voltage Ratings and Tap Ratings	8
4. Basic Lightning Impulse Insulation Levels and Dielectric Test Levels	8
5. Impedance Voltage	8
5.1 Percent Impedance Voltage	8
5.2 Tolerance.	8
5.3 Tolerance on a Tap	8
6. Tests.	8
6.1 General	8
6.2 Dielectric Test	8
6.3 Reference Temperature	8
7. Construction	10
7.1 General	10
7.2 Connectors and Terminals.	11
7.3 High-Voltage and Low-Voltage Compartments	11
7.4 Instruction Nameplate	11
7.5 Oil Preservation.	11
7.6 Tanks	12
7.7 Components for Loop Primary Cable Systems.	12
8. Other Requirements That May Be Specified for Some Applications.	12
Tables	
Table 1 Range of kVA and Voltage Ratings	8
Table 2 High-Voltage Taps	9
Table 3 Electrical Characteristics of Low-Voltage Terminals and Minimum Electrical Clearances.	9
Table 4 Transformers and Connectors High-Voltage Ratings and Electrical Characteristics	10
Figures	
Figure 1 Minimum Dimensions for Radial-Feed Transformers	13
Figure 2 Minimum Dimensions for Loop-Feed Transformers	14
Figure 3 Compartment Designations and Minimum Dimensions for Loop-Feed or Radial-Feed Transformers	15
Figure 4 Low-Voltage Terminal Arrangements and Minimum Dimensions.	16
Figure 5A Specific Dimensions for Radial-Feed Transformers.	17
Figure 5B Specific Dimensions for Radial-Feed Transformers.	18
Figure 6A Specific Dimensions for Loop-Feed Transformers	19
Figure 6B Specific Dimensions for Loop-Feed Transformers	20
Figure 6C Specific Dimensions for Loop-Feed Transformers	21
Figure 7 Compartment Designations and Specific Dimensions for Loop-Feed and Radial-Feed Transformers	22
Figure 8 Low-Voltage Terminal Arrangements and Specific Dimensions.	23
Figure 9 Low-Voltage Terminals.	24
Figure 10 Angular Displacement	26
Figure 11 Captive and Recessed Pentahead and Hex Head Bolts	27

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1. Scope and Purpose

1.1 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 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 with separable insulated high-voltage connectors. These transformers are rated 2500 kVA and smaller, with high voltages of 34 500 Grd Y/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.

NOTE: Refer to latest Federal Regulations concerning polychlorinated biphenyl (PCB) contamination in transformers.

1.3 This standard covers connector and terminal arrangements for both radial-feed and loop-feed systems. Either certain minimum dimensions (see Figures 1 through 4) or certain specific dimensions (see Figures 5 through 8) shall be specified.

1.4 This standard does not cover the electrical and mechanical requirements of any accessory devices that may be supplied with the transformer.

2. Related Standards

2.1 General. All characteristics, definitions, terminology, voltage designations, and tests, except as other-

wise specified herein, shall be in accordance with the following American National Standards (see 2.2):

ANSI C57.12.20-1981, Requirements for Overhead-Type Distribution Transformers, 500 kVA and Smaller: High-Voltage, 67 000 Volts and Below, Low-Voltage, 15 000 Volts and Below

ANSI C57.12.70-1978, Terminal Markings and Connections for Distribution and Power Transformers

ANSI/IEEE C57.12.00-1980, General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers

ANSI/IEEE C57.12.80-1978, Terminology for Power and Distribution Transformers

ANSI/IEEE C57.12.90-1980, Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers

ANSI/IEEE C57.91-1981, Guide for Loading Mineral-Oil-Immersed Overhead and Pad-Mounted Distribution Transformers Rated 500 kVA and Less with 65°C or 55°C Average Winding Rise

ANSI/IEEE C57.92-1981, Guide for Loading Mineral-Oil-Immersed Power Transformers up to and including 100 MVA with 55°C or 65°C Winding Rise

ANSI/IEEE 386-1985, Separable Insulated Connector Systems for Power Distribution Systems above 600V

2.2 Revision of American National Standards. When an American National Standard referred to in this document is superseded by a revision approved by the American National Standards Institute, Inc, the revision shall apply.

3. Ratings

3.1 Kilovolt-Ampere Ratings. Kilovolt-ampere ratings are continuous 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 are based on the temperature and service conditions specified in ANSI/IEEE C57.12.00-1980. The kilovolt-ampere ratings shall be as follows:

75	500
112-1/2	750
150	1000
225	1500
300	2000
	2500

3.2 Voltage Ratings and Tap Ratings

3.2.1 Voltage ratings shall be in accordance with Table 1.

3.2.2 Voltage taps shall be as given in Table 2. The tap changer handle in the terminating compartment shall be marked for de-energized operation.

4. Basic Lightning Impulse Insulation Levels and Dielectric Test Levels

4.1 Basic lightning impulse insulation levels (BILs) shall be in accordance with Tables 2 and 3.

4.2 Dielectric test levels shall be in accordance with the distribution levels specified in Table 4 of ANSI/IEEE C57.12.00-1980.

5. Impedance Voltage

5.1 Percent Impedance Voltage. The percent impedance voltage, as measured on the rated voltage connection, shall be as follows:

kVA Rating	Percent Impedance Voltage
75-500	Not Specified
750-2500	5.75

5.2 Tolerance. The tolerance on impedance voltage shall be as specified in 9.2 of ANSI/IEEE C57.12.00-1980.

5.3 Tolerance 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

Table 1
Range of kVA and Voltage Ratings

High-Voltage Ratings (volts)	kVA Ratings	
	Low-Voltage Ratings (volts) 208Y/120, 240	Low-Voltage Ratings (volts) 480Y/277, 480
Delta or wye		
2 400	75- 750	75- 750
4 160	75-1000	75-1000
4 800	75-1000	75-1500
7 200	75-1000	75-2000
12 000, 12 470	75-1000	75-2500
13 200, 13 800, 16 340	75-1000	75-2500
Grounded wye		
22 860, 23 900, 24 940	75-1000	75-2500
34 500	75-1000	75-2500

NOTES:

(1) Kilovolt-ampere ratings separated by a dash indicate that all intervening ratings covered in this standard are included.

(2) Unsymmetrical loading of wye-wye connected units may cause heating of their tanks in excess of that which would be produced by balanced conditions. To reduce the probability of tank heating, such units shall be provided with a core construction that will not saturate when 33% zero sequence voltage is applied.

(3) For complete connector ratings, see ANSI/IEEE 386-1985.

than the total tap voltage range and shall be expressed as a percentage of the rated voltage.

6. Tests

6.1 General. Except as specified in 6.2, tests shall be performed as specified in ANSI/IEEE C57.12.00-1980 and ANSI/IEEE C57.12.90-1980.

6.2 Dielectric Test. For wye-wye connected units, the transformer primary is designed for solidly grounded application, and no applied-potential test is required. The induced-potential test shall be performed by applying, between the terminals of each winding, a voltage that will develop from the high-voltage line terminals to ground a voltage of 1000 volts plus 3.46 times rated transformer winding voltage, but in no case shall the line-to-ground voltage developed exceed 40 000 volts for 125 kV BIL and 50 000 volts for 150 kV BIL. For this test the neutral terminal shall be grounded. However, under conditions where the neutral terminal ground connection can be removed, both the applied potential test and the induced potential test as specified in ANSI/IEEE C57.12.00-1980 may be performed.

6.3 Reference Temperature. The reference temperature to which losses, impedance, regulation, and efficiency are corrected shall be 85°C.

Table 2
High-Voltage Taps

High-Voltage Taps					
75–500 kVA					
High-Voltage Ratings (volts)	BIL (kV)	Low-Voltage Ratings 208Y/120 (volts)	Low-Voltage Ratings 240, 480Y/277, 480 (volts)		750–2500 kVA Low-Voltage Ratings 208Y/120, 240 480Y/277, 480 (volts)
		Below	Above	Below	
2 400	45	4–2-1/2%	2–2-1/2%	2–2-1/2%	2520/2460/2340/2280
4 160	60	4–2-1/2%	2–2-1/2%	2–2-1/2%	4360/4260/4055/3950
4 800	60	4–2-1/2%	2–2-1/2%	2–2-1/2%	5040/4920/4680/4560
7 200	75	4–2-1/2%	2–2-1/2%	2–2-1/2%	7560/7380/7020/6840
12 000	95	4–2-1/2%	2–2-1/2%	2–2-1/2%	12 600/12 300/11 700/11 400
12 470	95	4–2-1/2%	2–2-1/2%	2–2-1/2%	13 090/12 780/12 160/11 850
13 200	95	4–2-1/2%	2–2-1/2%	2–2-1/2%	13 860/13 530/12 870/12 540
13 800	95	4–2-1/2%	*	*	14 400/14 100/13 500/13 200
16 340	95	*	*	*	17 200/16 770/15 910/15 480
22 860 Grd Y/13 200	125	4–2-1/2%	2–2-1/2%	2–2-1/2%	24 003/23 431/22 288/21 717
23 900 Grd Y/13 800	125	4–2-1/2%	2–2-1/2%	2–2-1/2%	25 095/24 497/23 302/22 705
24 940 Grd Y/14 400	125	4–2-1/2%	2–2-1/2%	2–2-1/2%	26 187/25 563/24 316/23 693
34 500 Grd Y/19 920	150	4–2-1/2%	2–2-1/2%	2–2-1/2%	36 225/35 363/33 638/32 775

*Taps are the same as those for 750–2500 kVA ratings (see last column).

Table 3
Electrical Characteristics of
Low-Voltage Terminals and Minimum Electrical Clearances

Low-Voltage Ratings (volts)	BIL (kV)	60-Hz Dry One-Minute Withstand (kV)	Minimum Clearance, Live Parts to Ground* (inches)	Minimum Clearance, Live Parts Phase to Phase* (inches)
208Y/120	30	10	1	1
240	30	10	1	1
480Y/277	30	10	1	1
480	30	10	1	1

*These dimensions should be increased wherever possible to allow for ease in making connections by the user.