

## TRANSFORMER SPECIFICATION:

### 1) SCOPE:

1.1) This specification defines general requirements for Ventilated Dry-type Distribution and Power Transformers with ratings of 500KVA to 5000KVA , 3 phase, 60 hertz, 150 degrees C rise with a High-Voltage 2400 to 34500Volts,Low-Voltage 208Y/120 to 4160 Volts.

1.2) Usual Service Conditions :

Service conditions shall be in accordance with ANSI/IEEE C57.12.01-1979

1.3) Ratings :

Self - cooled (AA)	Forced-cooled (AA/FA)
KVA	kVA
500	666
750	1000
1000	1333
1500	2000
2000	2667
2500	3333
3750	5000
5000	6667

1.4) The transformer will be two winding.

1.5) The high voltage will be provided with no-load full capacity taps, two 2½% below and two 2 ½% above the rated voltage.

1.6) Standard Insulation levels will be as follows:

High-voltage (Volts)	BIL (kV)	Hi-pot (kV rms)	Low-voltage (Volts)	BIL (kV)	Hi-pot (kVrms)
2400	20	10	208Y/120	10	4
4160	30	12	480	10	4
4800	30	12	480Y/277	10	4
6900	30	12	2400	20	10
7200	30	12	4160Grd Y/2400	20	12
12000	60	31	4160	30	12
13200	60	31			
13800	60	31			
23000	110	37			
34500	150	50			

1.7) Other Ratings and Characteristics:

a) Insulation system:

BIL (kV)	Voltage Range (Volts)	BIL (kV)	Voltage Range (Volts)
20	2160 - 2500	95	13801- 18000
30	2501 - 7200	110	18001- 23000
45	7201 - 8320	125	23001- 27600
60	8321 - 13800	150	27601- 34500

b) Temperature Rise

Rise Deg.C	Limiting Temp. Deg.C	Insulation System Deg.C
80	150	220
115	185	220
150	220	220

1.8) The transformer will have standard impedance per Table 4 of ANSI C57.12.52-1981 or a latest revision referred to this document

## **2.0) CONSTRUCTION:**

### 2.1). General:

Transformers shall meet or exceed latest revisions of ANSI,NEMA,IEEE Standards under the guidelines of ISO 9001 quality assurance program.

### 2.2) Core.

Rectangular or Cruciform cores are built employing Mitred or Butt-lap construction with high grade; non-aging, high permeability, grain orientated silicon steel laminations. The ground strap is used to ground the core to the coreclmp which is grounded to the ground pad or bus by flexible conductor.

### 2.3) Coils.

Coils will be rectangular or circular type of aluminum or copper( if required) conductor. They shall be suitably bonded and braced to provide adequate short circuit strength verified by actual test and/or field experience or by industrially recognized design programs.

Windings shall be barrel, random or disc type depending on BIL levels. Windings rated 45kV BIL and below shall be layer type and above shall be random or disc type. Windings are insulated to withstand surge voltages and provide a guaranteed BIL levels.

All insulation materials used are of highest quality class H (220 Deg.C). Standard designs are for 150 deg.c rise. Also the designs for 115 deg.C and 80 deg.C rise which will allow 15% and 30% Continuous overload capacity respectively shall also be available.

Coils shall be processed in a Vacuum Pressure Impregnation (VPI) system which improves the insulation system, audible sound level as well as the short-circuit capability; and ultimately the life expectancy of the transformer significantly.

### 2.4) Core & Coil Assembly:

The whole core & coil assembly shall be subjected to VPI process and maintained a vacuum between 2.0 and 5.0 mm mercury and baked in an automated oven at 350 – 375 deg. F.

Three types of core & coil assemblies are required to match customer supplied primary and secondary equipment.

Type A (standard) – Primary and Secondary terminations at opposite end of core & coil (Top terminated)

Type B (compact) – Primary termination front or rear, Secondary terminations on opposite side (Top terminated)

Type C (custom) – Primary terminations at one end ( Top or bottom terminated), Secondary terminations at opposite end, rear or front (Top terminated)

### 2.5) Enclosure

The dry-type indoor or outdoor ventilated enclosures shall be designed for appearance, durability and ease of maintenance. Custom coordination with customer equipment is accomplished by means of approval or certified drawings.

The enclosure shall have a fabricated steel base frame suitable for skidding in any direction with provisions for jacking, lifting and rolling. For ease of maintenance a construction style employing

throughout with bolted cornerpost, interior angle liners and removable butt-lap panels with metal grille openings at top and bottom shall be provided.

Outdoor enclosures shall be designed for use in outdoor areas accessible only to authorized personnel Where a tamper-proof construction is required. Ventilation grille openings at top and bottom of panels shall utilize transfer core grilles which prevents wind driven rain, sleet and snow.

Totally enclosed non-ventilated enclosures shall also be available in both gasketed and non-gasketed designs depending on application.

Enclosures shall be cleaned, primed and finished with ANSI 60 light gray paint.

Provision for lifting shall be provided on core & coil assembly.

#### 2.6) Design options:

- a. Special sound levels
- b. Special BIL levels
- c. 50Hz Export application
- d. Bus terminations for customer equipments
- e. Special temperature-rise
- f. Core & coil assembly - Lefthand or Righthand

### **3.0) TESTS**

Transformer shall be tested in accordance with ANSI C57-12.91 and ANSI C57-12.01

### **4.0) ACCESSORIES./OPTIONS**

#### 4.1) Forced Air Cooling

- a. Future Forced Air Cooling (FFA)  
Fan mounting provisions are provided.
- b. Forced Air Cooling (FA)  
Fan and controls are provided
- c. Control Power Transformers

#### 4.2) Air Terminal Chamber (Primary and / Secondary)

#### 4.3) Key Interlocks.

#### 4.4) Lightning Arrestors

#### 4.5) Pot Heads – Single or Three conductor

#### 4.6) Load Interrupter Switch (5kV or kV)

Fused or Unfused

#### 4.7) CT's and PT's

#### 4.8) Secondary Metering:

Ammeter, Voltmeter, Watthour- meter

#### 4.9) Secondary Breakers

#### 4.10) Manual (DE-energized) Tap Changer switch (5-15kV)

#### 4.11) Air Filters (For use in adverse environments)

#### 4.12) Name Plate

### **5.0) QUALITY ASSURANCE**

In addition to standard Routine and Design tests, a quality assurance program such as ISO 9001

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shall provides continual monitoring of all stages of manufacturing process.

The check list shall include the following tests/inspection

- a. Coil test
- b. Core Inspection
- c. Preliminary assembly
- d. Preliminary Tests
- e. Vacuum Pressure Impregnation
- f. Final Assembly and painting
- g. Final Tests
- h. Final Inspection.
- i. Sign-off Inspection

## **6.0) DRAWINGS**

- 6.1) Outline and nameplate drawings will be provided within one weeks of the order.
- 6.2) Installation and maintenance manuals will be shipped with the transformer.