

**W-T-631c**

June 4, 1964

**SUPERSEDING**

Int. Fed. Spec. W-T-00631b (GSA-FSS)

July 23, 1963 and

Fed. Spec. W-T-631a

August 8, 1956

**FEDERAL SPECIFICATION**

*This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.*

**TRANSFORMER, POWER, DISTRIBUTION****1. SCOPE AND CLASSIFICATION**

**1.1 Scope.** This specification covers single-phase and three-phase 60 cycle, overhead-type, liquid-immersed, air-cooled distribution power transformers rated 500 kv.-a and smaller; high voltage, 67,000 volts and below; low voltage 15,000 volts and below.

**1.2 Classification.**

**1.2.1 Types and classes.** Distribution transformers furnished under this specification shall be of the following types and classes, as specified (see 6.1).

*Types:*

Type I—Mineral oil insulated.

Type II—Nonflammable liquid insulated.

Type III—Mineral oil insulated, wholly self-protected.

*Classes:*

Class 1—Single phase.

Class 2—Three phase.

**1.2.2 Ratings.** Transformers furnished under this specification shall be of standard commercial kv.-a and voltage ratings, as specified (see 6.1).

**2. APPLICABLE SPECIFICATIONS, STANDARDS, AND OTHER PUBLICATIONS**

**2.1 Specifications and standards.** The fol-

lowing specifications and standards, of the issues in effect on date of invitation for bids, form a part of this specification.

*Federal Specifications:*

VV-I-530—Insulating Oil, Electrical, (For Transformers, Switches and Circuit Breakers).

*Federal Standards:*

Fed. Std. No. 102—Preservation, Packaging and Packing Levels.

Fed. Std. No. 123—Marking for Domestic Shipment (Civilian Agencies).

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, and Seattle, Wash.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.

**FSC 6120**

**W-T-631c****Military Specification:**

MIL-E-17555—Electronic and Electrical Equipment and Associated Repair Parts, Preparation for Delivery of.

**Military Standards:**

MIL-STD-105—Sampling Procedures and Tables for Inspection by Attributes.

MIL-STD-129—Marking for Shipment and Storage.

MIL-STD-130—Identification Marking for U.S. Military Property.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following publications form a part of this specification. Unless otherwise specified, the issue in effect on date of invitation for bids shall apply.

**American Standards Association, (ASA) Inc. Standards:**

C57.12.00—Transformers, Regulators, and Reactors; General.

C57.12.20—Transformers, Regulators, and Reactors; Overhead-Type Distribution Transformers 67,000 Volts and Below, 500 KVA and Smaller.

C57.12.80—Transformers, Regulators, and Reactors; Terminology.

C57.12.90—Transformers, Regulators, and Reactors; Test Code.

(Copies may be obtained from the American Standards Association, Inc., 10 East 40th Street, New York 16, N. Y.).

**3. REQUIREMENTS**

3.1 Description. Transformers furnished under this specification shall conform to ASA C57.12.00, C57.12.20, and C57.12.90.

3.2 Materials. The materials used in the construction of the transformers shall con-

form to the requirements of the applicable ASA Standards.

3.3 Definitions. The definitions for the various technical terms used throughout this specification are set forth in ASA C57.12.80.

**3.4 Windings.**

3.4.1 Unless otherwise specified, transformers shall have two separate windings, a high-voltage and a low-voltage, suitably insulated from each other and from grounded parts. The contractor shall supply the transformers with the high-and low-voltage windings connected for their rated voltage.

3.4.2 Class 1 transformer secondaries shall be capable of series, multiple and 3 wire operation, and the winding shall be connected in series, for delivery, with the mid-point available for 3 wire connection. Class 1 and class 2 transformer secondaries capable of series-multiple connection shall be connected in series delivery. Unless otherwise specified, class 2 transformer secondaries designed for delta and wye operation shall be connected for the wye voltage for delivery.

3.4.3 When specified that the transformers shall be suitable for operation on solidly grounded common neutral circuits only (see 6.1), the transformers shall have two separate windings, a high-voltage and a low-voltage, suitably insulated from each other, but each supplied with suitable means for solidly connecting each winding to the tank. Such transformers shall be shipped with their connections made at the factory.

3.4.4 Transformers of a given rating, on the same order, shall be suitable for successful operation in parallel with each other or in a delta-delta bank. When specified, transformers shall be suitable for successful operation in parallel with existing transformers or in a 3 phase combination of existing transformers.

3.4.5 *Taps.* Unless otherwise specified, the transformers shall be supplied with taps conforming to the requirements of ASA C57.12.20.

3.5 *Tanks.* Transformer tanks shall be of sealed construction in accordance with ASA C57.12.20. Tanks shall be finished with one priming coat and one finish coat, or equivalent. The resultant finish shall be dark and weather resistant. Unless otherwise specified, tank covers shall be finished in the same manner as the tanks, or they shall be coated with a commercially acceptable weather-resistant plastic coating. The color of the top may be a lighter shade than that of the tank.

3.6 *Insulating material.* Transformers shall be delivered with the proper quantity of insulating liquid contained therein.

3.6.1 *Oil.* The oil shall comply with the requirements of VV-I-530. Unless otherwise specified, an inhibited oil shall be provided (see 6.1).

3.6.2 *Nonflammable liquid.* The liquid shall be clear and have a dielectric strength when shipped of not less than 26,000 volts at 25°C. when tested between vertical surfaces 1 inch in diameter and 0.10 inch apart.

3.7 *Type III transformers.* In addition to complying with all of the other requirements of this specification, type III transformers shall comply with the requirements of 3.7.1 and 3.7.6 inclusive.

3.7.1 *Lighting arresters* shall be mounted integrally with the transformer and connected between high-voltage leads in the tank. The arresters shall positively interrupt the flow of dynamic current after surge has been discharged and shall limit the rise in surge voltage to a value well within the impulse strength of the windings.

3.7.2 *Overload and short-circuit protection* shall be provided by circuit breakers connected in series with the secondary winding, normally tripping when dangerous copper

temperature is approached. The breaker shall be mounted under the surface of the oil. An operating lever shall be provided and shall be mounted on the outside of the transformer tank and connected to the breaker through a oiltight stuffing box. The lever shall open, close, or reset the breaker after tripping.

3.7.3 A bull's eye indicating lamp shall be provided in the transformer tank of two-bushing transformers 5 kv.-a and above and single-bushing transformers 10 kv.-a and above. The lamp shall light (and remain lighted until manually reset) when the temperature of the winding rises to a predetermined point below the tripping temperature. The lamp shall be energized from an independent winding on the core.

3.7.4 The high-voltage winding shall be provided with protective links capable of interrupting full fault current.

3.7.5 A manually operated device to permit emergency operation on overload shall be provided on the circuit breaker for two-bushing transformers 5 kv.-a and above and for single-bushing type 10 kv.-a and above.

3.7.6 Type III transformers shall have two high-voltage bushings, unless only one is specified (see 6.1).

3.8 *Identification.* When specified, transformers shall be marked for installation in accordance with MIL-STD-130.

3.9 *Workmanship.* Workmanship shall be in accordance with the ASA standards referenced herein. The transformers shall be free of defects which might render them unsuitable for use.

#### 4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 *Responsibility for inspection.* Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection require-

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ments as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Classification of inspection. Inspection shall be classified as follows:

- (a) Acceptance inspection of transformers.
- (b) Inspection of preparation for delivery.

## 4.3 Acceptance inspection.

4.3.1 *Sampling.* Sampling for inspection shall be in accordance with MIL-STD-105.

4.3.2 *Examination.* Samples selected in accordance with 4.3.1 shall be examined for defects listed below. AQL shall be 1.5 percent defective for major defects and 6.5 percent defective for minor defects.

*Major:*

- 101. Terminal leads not identified.
- 102. Length of terminal leads not adequate.
- 103. Improper identification marking.
- 104. Defective insulating oil sealing.
- 105. Improper neutral termination.
- 106. Improper or defective bushings.
- 107. Improper insulating oil level.

*Minor:*

- 201. Finish not as specified.
- 202. Poor external finish.

4.3.3 *Test.* The transformers shall be subjected to the routine tests specified in ASA C57.12.00 and C57.12.20, conducted in accordance with the applicable provisions of ASA C57.12.90. When so specified, see (6.1), additional special tests shall be made for basic impulse insulation level, insulation power factor, and short-circuit calculations.

4.4 *Inspection of preparation for delivery.* The packaging and marking shall be examined and tested to determine compliance with section 5 of this specification.

## 5. PREPARATION FOR DELIVERY

(For civil agency procurement, the definitions and applications of the various levels of packaging and packing shall be as specified in Fed. Std. No. 102).

5.1 *Preservation and packaging.* Preservation and packaging shall be level A or C, as specified.

5.1.1 *Level A.* The transformers shall be preserved and packaged in accordance with the level A requirements of MIL-E-17555.

5.1.2 *Level C.* The transformers shall be preserved and packaged to afford protection against deterioration and damage from the supply source to the first receiving activity.

5.2 *Packing.* Packing shall be level A, B, or C, as specified.

5.2.1 *Level A.* The transformers shall be packed in accordance with level A requirements of MIL-E-17555.

5.2.2 *Level B.* The transformers shall be packed in accordance with level B requirements of MIL-E-17555.

5.2.3 *Level C.* The transformers shall be packed in substantial commercial containers or on pallets of the type, size, and kind commonly used for the purpose, so constructed as to insure acceptance and safe delivery by common or other carriers, at the lowest rate, to point of delivery called for in the contract or purchase order.

5.3 *Marking.*

5.3.1 *Civil agencies.* In addition to any special marking required in the contract or purchase order, shipping containers shall be marked in accordance with Fed. Std. No. 123.

5.3.2 *Military agencies.* In addition to any

special marking required in the contract or purchase order, shipping containers shall be marked in accordance with MIL-STD-129.

## 6. NOTES

6.1 **Ordering data.** Purchasers should exercise any desired options offered herein and procurement documents should specify the following:

- (a) Title, symbol, and date of this specification.
- (b) Type and class of transformer (1.2.1).
- (c) KVA and voltage ratings required (1.2.2).
- (d) Number of windings, if other than specified (3.4.1).
- (e) Operation on solidly grounded common neutral circuits, if required (3.4.3).
- (f) Taps, if other than specified (3.4.5).
- (g) Finish of tank covers, if other than specified (3.5).
- (h) Insulating oil, if other than specified (3.6.1).
- (i) Number of high voltage bushings (3.7.6).
- (j) Identification marking, if required (3.8).
- (k) Inspection responsibility, if other than specified (4.1).
- (l) Additional tests, if required (4.3.3).
- (m) Level of packaging and packing required (5.1 and 5.2).
- (n) Special marking, if required (5.3).

6.2 **Certification.** A certificate, signed by a responsible officer of the contracting firm, may be required by the contracting officer in the invitation for bids, certifying that the equipment supplied does comply with the requirements of the specification.

6.3 When transformers of a given rating on the same order are intended for use in parallel or as part of a delta-delta bank with existing transformers, the invitation

for bid should so specify and should include the characteristics of the existing transformers (see 3.4.4).

6.4 **Guarantee.** It is suggested that contracting officers require a guarantee against defective material and workmanship for a period of not less than one year from date of delivery and that replacement be required of all parts found defective within the guarantee period without cost to the Government.

6.5 It is believed that this specification adequately describes the characteristics necessary to secure the desired material, and that normally no samples will be necessary prior to award to determine compliance with this specification. If, for any particular purpose, samples with bids are necessary, they should be specifically asked for in the invitation for bids, and the particular purpose to be served by the bid samples should be definitely stated, the specification to apply in all other respects.

6.6 Federal specifications do not include all types, classes, grades, sizes, etc., of the commodities indicated by the titles of the specifications, or which are commercially available, but are intended to cover the types, etc., which are suitable for Federal Government requirements.

6.7 **Transportation description.** Transportation descriptions and minimum weights applicable to this commodity are:

### *Rail:*

Transformers, not otherwise indexed by name.  
Carload minimum weight 30,000 pounds.

### *Motor:*

Transformers, not otherwise indexed.  
Truckload minimum weight 30,000 pounds, subject to Rule 115, National Motor Freight Classification.

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**MILITARY CUSTODIANS:**

Army—MO

Navy—YD

Air Force—11

*Review Interest:*

MO, EL, YD, 11, 88

*User Interest:*

MC

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Copies of this specification may be purchased for 5 cents each.