



EX 7 1/2

RECEIVING • INSTALLATION • MAINTENANCE
INSTRUCTIONS

OUTDOOR CONDENSER BUSHINGS

Types S₁ and OS₁

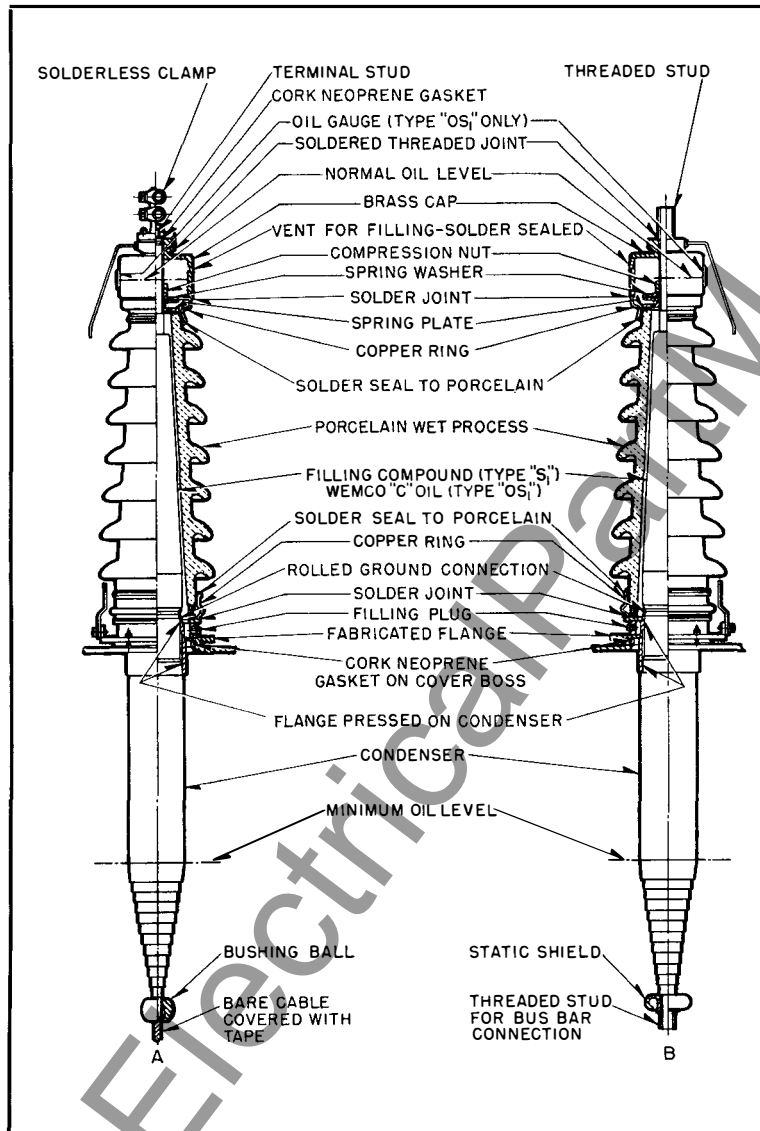


FIG. 1. Sectional View—(A) Bushing with Fished-Through Cable; (B) Bushing with Solid Copper Bar.

TYPES S₁ AND OS₁ CONDENSER BUSHINGS are designed for transformer applications. Each bushing (see Fig. 1) consists principally of a cylindrical condenser, protected on its outer end with a porcelain weather casing made by the wet-process and on its inner end with polymerizing oil and

varnish. The space between the condenser and the weather casing is filled with a low-melting-point plastic compound having high dielectric strength and moisture resisting properties. Sufficient space is left at the top for expansion. Although plastic encased bushings are standard, the space between the condenser and the weather casing may be filled with Wemco C transformer oil.

Type S₁ designation (marked on the bushing nameplate) is applied to bushings filled with No. 7399-1 Westinghouse bushing plastic.

Type OS₁ designation (marked on the bushing nameplate) is applied to bushings filled with standard Westinghouse Wemco C transformer oil. Oil-filled bushings are usually furnished with a magnetic oil gauge mounted on the side of the bushing cap. The magnetic gauge is in two parts: (1) the mechanism inside the sealed bushing, and (2) the outside dial which is fastened to the cap by two brass screws. In case of damage to the dial, it may be replaced without opening the bushing cap.

Oil-filled bushings rated at 2000 amperes and above, which may be subjected to extremely heavy short-circuit currents, are furnished with a glass sight gauge.

The condenser consists of a central copper tube or stud upon which is wound specially treated kraft paper, under heat and pressure. At specified diameters, metal foil is inserted to form condensers.

By proportioning the lengths and thicknesses of the paper layers, a series of equal capacity condensers, uniformly arranged along the length of the bushing, is formed between the central conductor and the outermost layer of metal foil which is connected to the grounded flange. When the current-carrying capacity of the bushing does not

CONDENSER BUSHINGS TYPES S₁ AND OS₁

exceed 400 amperes, the condenser is wound on a copper tube and the lead is fished through from the winding to the terminal cap of the bushing. See A, Fig. 1. This arrangement facilitates power factor testing.

The fabricated mounting flange is attached to the condenser by a mechanical press fit which forms a permanent gas and oil tight joint.

The ends of the porcelain weather casing are provided with a special metallic glaze which permits soldering of spun copper rings to the top and bottom ends. The cap can then be soldered to the upper ring, and to the condenser tube or stud and the ring to the flange. All gaskets, packings and cements are thereby eliminated.

The breather opening in the cap is permanently sealed by plugging and soldering to prevent the entrance of moisture. Since no materials subject to deterioration are used, the bushing will remain permanently moisture proof, unless damaged mechanically.

RECEIVING

Whenever practicable, the bushings are shipped installed on the apparatus. When this is not possible, the bushings are shipped in a box or crate of suitable size.

The lower end of the bushing is wrapped with treated cloth and dipped in gum to protect the exposed part of the condenser from moisture, dirt, and damage due to rough handling.

Unpacking and Handling. Care must be used in unpacking to protect the bushing from

damage by tools, or parts of the packing crate. Use care in handling the bushing; *lift by the stud, terminal cap or by flange, but never by the porcelain.* Do not remove the protective wrapping from the lower end of the condenser until immediately before installing in service.

Storing. Bushings that are not placed in service should be stored vertically in a clean dry place. When placing bushings temporarily in a horizontal position, allow them to rest on a clean padded surface.

INSTALLATION

Remove the wrapping from the lower end of the condenser by pulling downward on the rip cord. Do not use knives or scrapers. Remove all gum from the condenser and the flange, as it will discolor the oil in the tank. When cleaning the condenser, use a clean cloth saturated with benzine or warm transformer oil.

Check the power factor and capacity of bushings that have been in storage, before installing in service. For detailed instructions, refer to Manual of Westinghouse Outdoor Bushings, Technical Data 33-156.

MAINTENANCE

Connections to the outside end of the bushing should be made so that no stresses will develop due to the expansion or contraction of the lead with temperature changes. Detailed instructions for maintenance and care are given in Manual of Westinghouse Outdoor Bushings, Technical Data 33-156.



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Types S₁ and OS₁

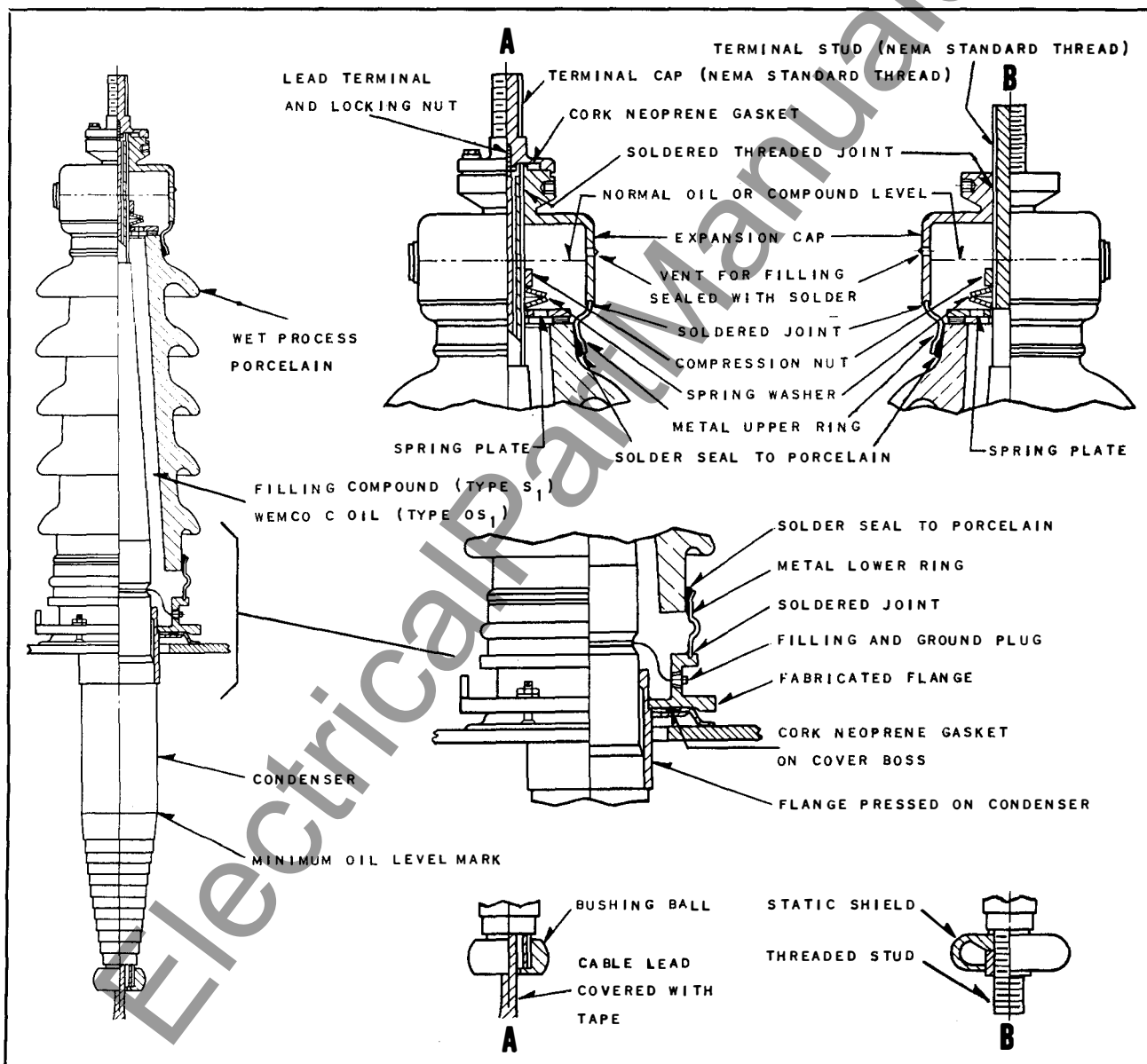


FIG. 1. Sectional View—(A) Bushing with Draw-Through Cable;
(B) Bushing with Solid Copper Conductor.

TYPES S₁ AND OS₁ CONDENSER BUSHINGS are designed for transformer applications. Each bushing (see Fig. 1) consists principally of a cylindrical condenser, protected on its outer end with a porcelain weather casing made by the wet-process and on its inner end with high grade in-

ulating varnish. The space between the condenser and the weather casing of Type "S₁" bushings is filled with a low-melting-point plastic compound having high dielectric strength and moisture resisting properties. In Type "OS₁" bushings the space is filled with "WEMCO C" transformer oil. Oil-filled

CONDENSER BUSHINGS, TYPES S₁ AND OS₁

bushings are usually furnished with a magnetic oil gauge mounted on the side of the bushing cap. The magnetic gauge is in two parts: (1) the mechanism inside the sealed bushing, and (2) the outside dial which is fastened to the cap by two brass screws. In case of damage to the dial, it may be replaced without opening the bushing cap. Sufficient space is left above the filling material for expansion.

The condenser consists of a central copper tube or stud upon which specially treated kraft paper is wound under heat and pressure. At specified diameters, metal foil is inserted to form condensers. By proportioning the lengths and thicknesses of the paper layers, a series of equal capacity condensers, uniformly arranged along the length of the bushing, is formed between the central conductor and the outermost layer of metal foil which is connected to the grounded flange. When the current-carrying capacity of the bushing does not exceed 400 amperes, the condenser is wound on a copper tube and the lead is drawn through from the transformer winding and attached to the terminal cap of the bushing. See A, Fig. 1.

The fabricated mounting flange is attached to the condenser by a mechanical press fit which forms a permanent gas and oil tight joint.

The ends of the porcelain weather casing are provided with a special metallic glaze which permits soldering of spun copper rings to the top and bottom ends. The cap can then be soldered to the upper ring, and to the condenser tube or stud and the lower ring soldered to the flange. All gaskets, packings and cements are thereby eliminated.

The vent for filling in the cap is permanently sealed by a soldered plug to prevent the entrance of moisture. Since no materials subject to deterioration are used, the installed bushing will remain permanently moisture proof, unless damaged mechanically.

RECEIVING

Whenever practicable, the bushings are shipped installed on the apparatus. When this is not possible, the bushings are shipped in a box or crate of suitable size. The lower end of the bushing is wrapped to protect the exposed part of the condenser from moisture, dirt and damage during shipment.

Unpacking and Handling. Care must be used in unpacking to protect the bushing from damage by tools, or parts of the packing crate. Use care in handling the bushing; lift by the stud, cap

nut or by the flange, but never by the porcelain.

The protective covering on the exposed part of the condenser may not be entirely air tight and may accumulate moisture if kept long in a damp place. If the power factor is high, or there is other indication of moisture under the protective covering, it should be removed, the bushing should be dried out and stored in a dry place. The bushing should be removed from the crate and the proximity of conducting surfaces before power factor tests are made, for adjacent surfaces, though not touching the bushing, may increase the power factor reading.

Storing. Bushings that are not placed in service should be stored vertically in a clean dry place with the temperature preferably several degrees above the outside temperature to prevent accumulation of moisture on the condenser. When placing bushings temporarily in a horizontal position, allow them to rest on a clean padded surface.

INSTALLATION

Remove the wrapping from the lower end of the condenser. Do not use knives or scrapers. Remove all compound from the condenser and the flange, as it will discolor the oil in the tank. When cleaning the condenser, use a clean cloth saturated with benzine or warm transformer oil.

Check the power factor and capacity of bushings that have been in storage, before installing in service. For detailed instructions, refer to Manual of Westinghouse Outdoor Bushings, Technical Data 33-156.

Bushings with draw-through cable leads (See A, Fig. 1) should be installed carefully to prevent bends or kinks in the cable which will prevent pulling the lead to its correct length and make it appear to be too short. Bushings are installed and leads cut to correct length and installed before the transformer is tested at the factory. When bushings are removed for shipment the leads are coiled and tied securely to the under side of the blind flange covering the bushing hole or to some convenient place on the under side of the cover easily accessible through the bushing hole. Attached to the cable is a threaded terminal which has a hole in the end to permit pulling the lead through the bushing with a stout cord. The cable should be pulled taut to remove all the slack as the bushing is lowered over it into position. A second hole in the threaded terminal $1\frac{1}{4}$ inches from its end permits holding the terminal and attached lead at the top of the bush-