



## INSTRUCTIONS

GEH-1630A  
Supersedes GEH-1630  
& GEH-440

# APPARATUS BUSHINGS TYPE A

### INTRODUCTION

Type A bushings are designed for application on transformers, generators, and regulators. The bushings use porcelain as the major insulation. The porcelain extends inboard of the apparatus to insulate the conductor from the grounded mounting surface of the apparatus.

Bushings designed for transformers and regulators are furnished in voltage classes of 1.2 kv through 25 kv. Bushings designed for use on generators are

usually in the 23 kv class, but can be supplied at higher ratings. Bushings rated 600 amperes and lower have detachable cable-type conductors which allow the bushings to be removed without disturbing connections inside the apparatus. See Fig. 1 for a sketch of a detachable-cable bushing. Fixed-conductor-type bushings are available in current ratings through 5000 amperes. They are center-clamped to develop maximum strength in the porcelains. By use of spring washers or multi-spring mechanisms at the bottom ends, pressure-tight seals are made at the outer ends. Refer to Figs. 2, 3, and 4.

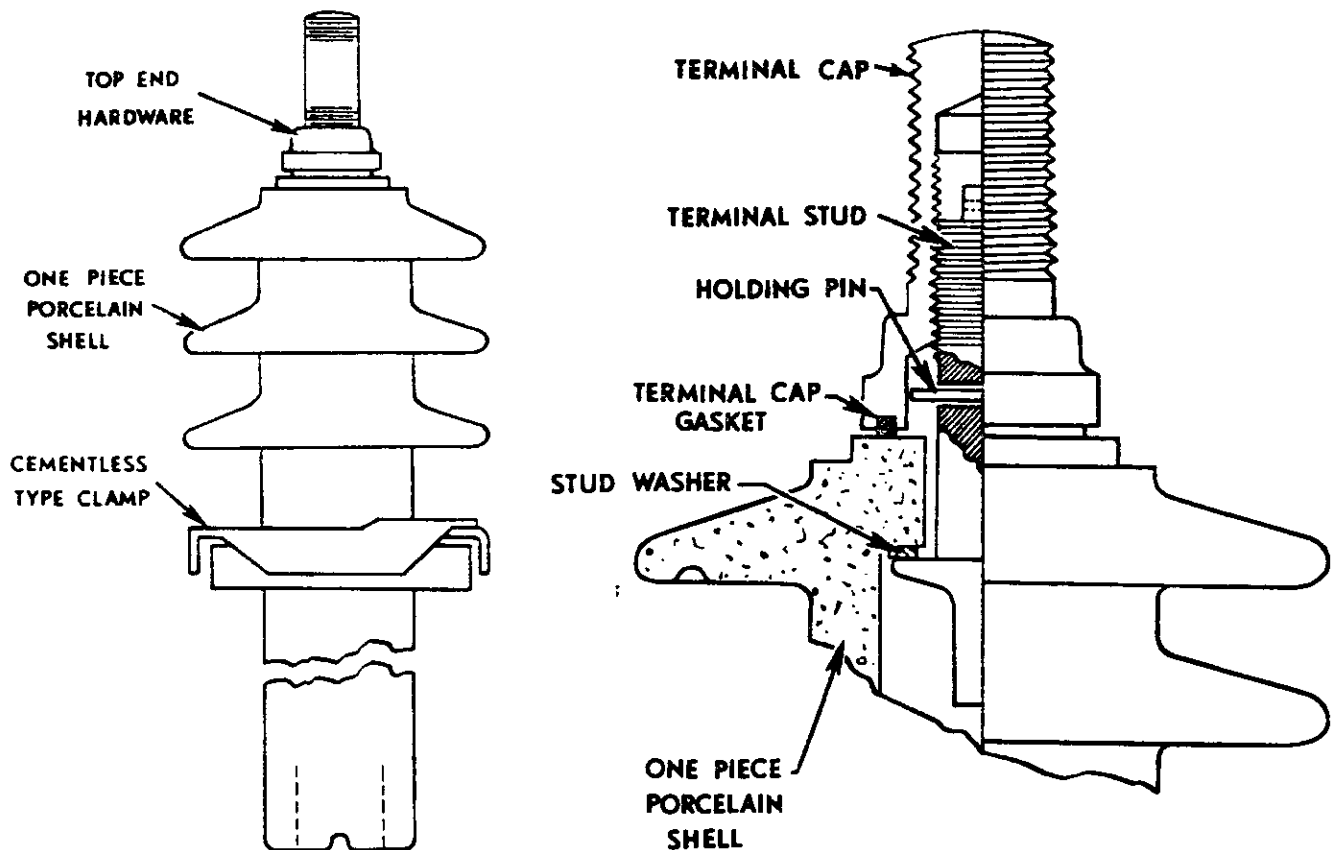


Fig. 1 Type A bushing with detachable cable (600 amperes and below)

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

GENERAL  ELECTRIC

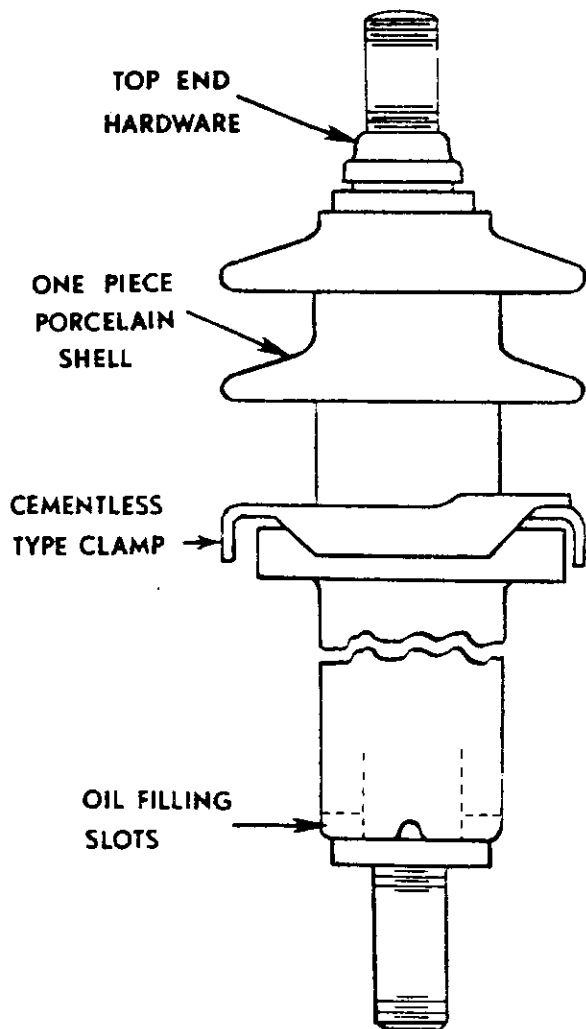


Fig. 2 Type A bushing with a fixed conductor (1200 amperes)

### UNPACKING

As soon as a shipment is received, examine it for any damage which might have occurred in transit. If there is evidence of damage or rough handling, file a claim with the transportation company and notify your General Electric Sales Representative.

Avoid rough treatment in opening the shipping container to prevent damage, especially to the porcelain insulators. As each bushing is unpacked, inspect it carefully for damage such as a chipped or cracked porcelain and wipe it dry and clean.

### STORAGE

Store the bushing in a clean, dry place, preferably in an upright position. Particular care should be taken to keep dust and dirt out of the inside of the bushing.

### TYPE A FEATURES

The detachable-cable bushing has a pin-connected terminal stud. Any bushing rated up to 3000 amperes uses a loose, multi-piece mounting flange. A fixed-conductor bushing, for cover or side-wall mounting, is not sealed at the bottom end; therefore, it is self filling. Oil from the transformer can enter into the bushing.

The Type A bushing for generator use has a fixed attached mounting support and is filled at the factory with a solid-type insulating compound which should not require attention during the life of the bushing.

The Type A bushing has satisfactory radio influence voltage characteristics under normal operating conditions. The electrical characteristics comply with ANSI standard requirements. Since the construction is simple and sturdy, the Type A bushing has had an excellent service record since being introduced in 1935.

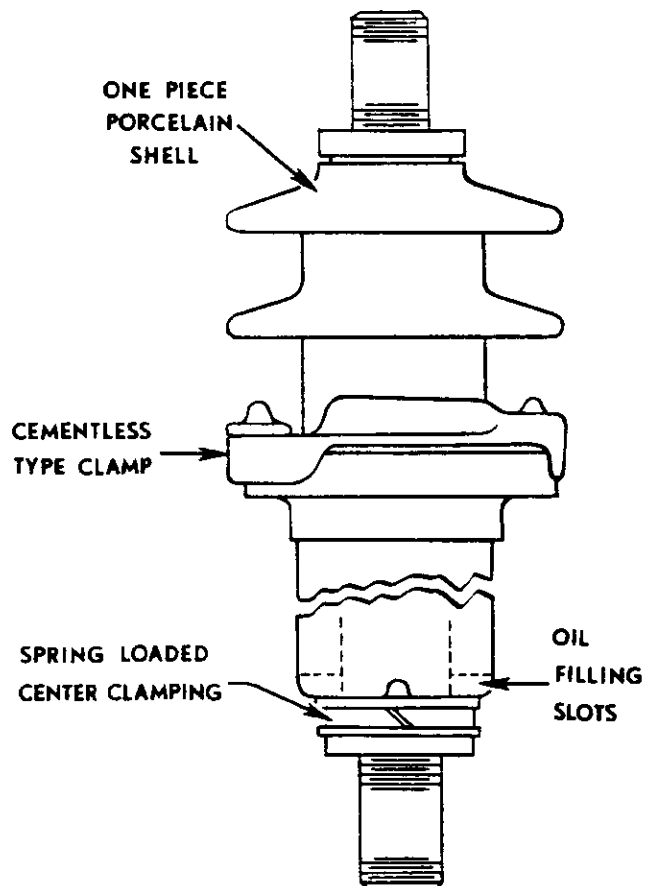


Fig. 3 Type A bushing with a fixed conductor (2000 amperes)

## INSTALLATION

Type A bushings are shipped ready for installation. An apparatus manufacturer may ship the apparatus with the bushings completely installed. For a detachable-cable bushing the manufacturer, if removing the complete bushing for shipment, may ship the top hardware and mounting hardware as separate loose parts from the porcelain.

When assembling a bushing on the apparatus, tighten carefully the mounting bolts. Work in one direction around the bolt circle, tightening each bolt in succession a fraction of a turn each time. Careful and gradual bolt tightening will prevent unequal clamping strains and possible damage to the bushing porcelain support or mounting clamp.

The torque values that follow should be sufficient for satisfactory sealing when tightening the bolts.

BOLT DIAMETER-THREAD	MAXIMUM TORQUE
1/2-inch—13	20 foot-pounds
3/4-inch—10	30 foot-pounds

### DETACHABLE CABLE BUSHING

The flexible cable lead for a low-current bushing is included as an integral part of the apparatus on which the bushing is to be installed. The cable will have the terminal stud brazed to it. Remove the terminal cap, stud holding pin, and stud washer. (The terminal stud has already been removed.) Assemble the stud washer onto the terminal stud. Pass a wire or cord down through the tubular porcelain and attach it to the terminal stud on the flexible cable lead. Lower the bushing into position while drawing the flexible lead up through the porcelain. Pin the terminal stud into position. Coat the terminal cap gasket with a thin film of light oil; then position the gasket in the terminal cap. Tighten the cap on the stud to compress the gasket, thus sealing the bushing.

On a bushing of older design, the stud is brought into position with a sealing nut. Remove the terminal cap and sealing nut (the stud is already removed) from the top end of the bushing. After positioning the terminal stud in the porcelain, assemble the gasket and sealing nut on the stud. Turn up the nut tightly to compress the gasket and seal the nut.

The detachable cable bushing has a loose, cementless-type, multi-piece clamp for attachment to the apparatus. See Fig. 5.

### FIXED CONDUCTOR BUSHING

A cover or side-wall bushing, with a fixed conductor, is not sealed at the bottom (inboard) end. In-

sulating oil from the apparatus is permitted to enter the bushing, when installed and operating. Threaded clamping members at the bottom end are assembled to gasket-seal the top (outboard) end of the bushing and to compressibly load the porcelain.

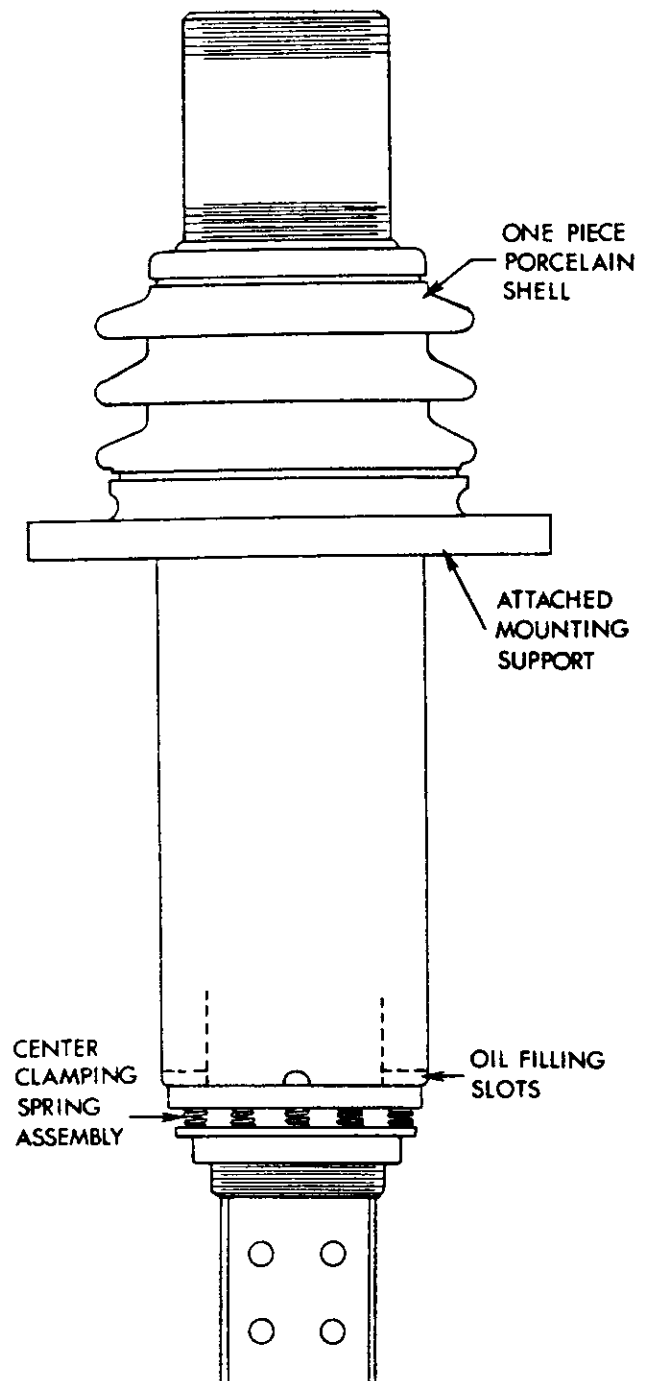


Fig. 4 Type A bushing with a fixed conductor (4000 and 5000 amperes)

Fixed-conductor bushings rated 4000 and 5000 amperes have epoxy attached, and gasket-to-porcelain sealed, supports. Bushings with fixed conductors should be bolted to the apparatus prior to making bottom and top end terminal connections.

#### EXTERNAL LINE CONNECTIONS

Connections from a bus to the top end of a bushing should be made securely to avoid their loosening in service and producing thermal stresses which could damage the porcelain. There should be sufficient flexibility in the connections to prevent mechanical stresses from expansion, contraction, and wind sway. Long spans of unsupported conductor, especially if outdoors, should be avoided.

#### MAINTENANCE

Since porcelain is the major insulation in Type A bushings, they require little - if any - maintenance



Fig. 5 Typical mounting clamp and cushion

other than cleaning when they are operating under very dirty conditions. Inspection should be made regularly for cracked porcelains which could contribute to oil leakage, especially on self-filling, side-wall mounted bushings or on bushings used with transformers equipped with oil expansion tanks above the cover level.



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PITTSFIELD, MASS.