



# installation instructions

## For GRAPHALLOY Bushings

GRAPHALLOY bushings are normally designed to be held in a housing with a press (interference) fit. This press-fit alone is usually sufficient to hold the bushing during use.

GRAPHALLOY materials have a coefficient of thermal expansion about half that of carbon steel and the bushing must be designed with enough press fit to maintain an interference fit at the operating temperature.

The interference fit depends upon:

- the maximum operating temperature expected,
- the materials of the shaft and housing, and
- the size of the bushing.

Fits up to .5% of the OD size – .010 to .025" (.25 to .63 mm) – are not unusual and can be installed without difficulty.

After being pressed in, the bushing ID will shrink nearly the full amount of the OD interference. The bushing and housing may require 24 hours to reach final size.

**Installation at room temperature:** The most common installation is to press the bushing, dry, into its housing. Dipping the bushing in water or a solvent will make for an easier installation.

**Installation into heated housings:** Bushings may be slipped into a heated housing (Caution: do not heat the housing higher than the maximum temperature allowed for the bushing material). When installing a bushing into a heated housing, have a press nearby to assist if the bushing does not slip into place.

**Installation by cooling the bushing:** Some customers cool the bushing (for example: using dry ice or liquid nitrogen) to increase the clearance between the bushing and the housing. This method nearly always also requires the assistance of a press.

If you have questions about the design or the magnitude of the press fits, please contact our engineers.

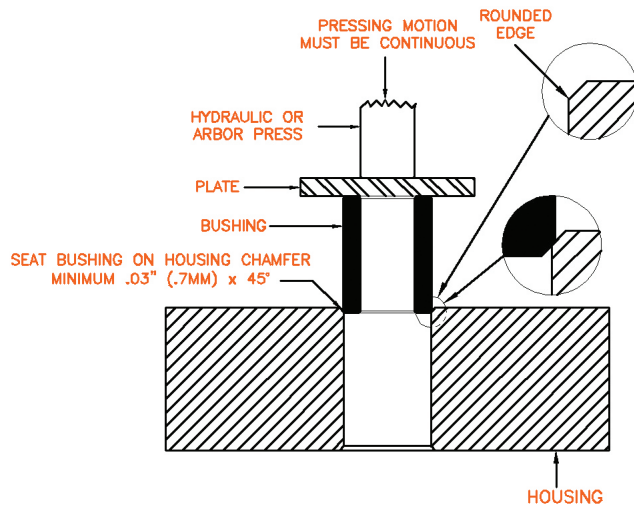


Fig. 1 - Installation Using a Press

Typically, each GRAPHALLOY Bushing is normally pressed into a housing by means of an arbor press or hydraulic press.

The housing ID should have a chamfer of .03 to .06" (.75 to 1.5 mm) X 45° to match the chamfer on the bushing. This will facilitate aligning the bushing and housing. Note: Sharp edges on the housing ID must be eliminated to avoid shaving the bushing during installation.

Place the bushing on top of the housing. The chamfers on the bushing and housing will seat when the bushing is properly aligned.

A flat plate may be used as shown in the diagram. A stepped mandrel or arbor can be helpful to assure the bushing is lined up properly. The plate or the large diameter of the mandrel should completely cover the surface of the bushing.

Once started, the pressing motion must be uninterrupted until the bushing is completely in place. Stopping while partially installed creates high stress at the edge of the housing and may crack the bushing.

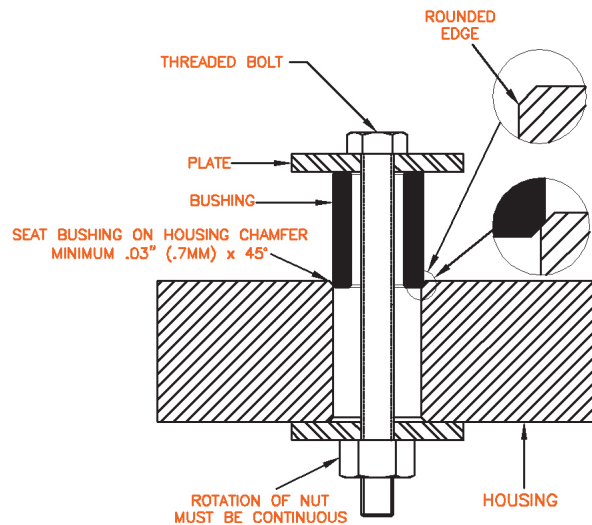


Fig. 2 - Installation Using a Nut and Bolt

Where a press is not available, the bushing may be installed into the housing by the bolt-and-nut method, with a plate or heavy washer on either side. The nut must be continuously tightened - preferably by a pneumatic wrench. This method is not recommended for bushings above 3" (75mm) OD.