

# Techniques and Benefits of Anti-friction Rotary Bushings

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TOOL LIFE, accuracy and surface finish are improved by the use of anti-friction rotary bushings in place of solid bushings for the support of cutting tool bars and arbors. Operations such as drilling, reaming, spot-facing, boring, arbor milling, etc., where radial support of the tool or arbor is required near the cutting point, are just a few of the applications ideally suited for the use of rotary bushings.

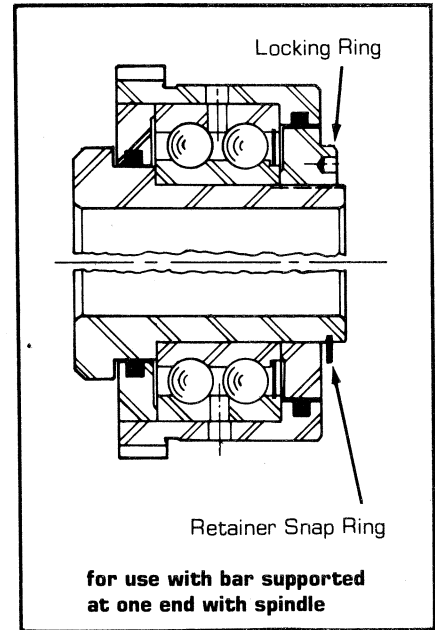
A solid bushing, by its very nature, requires running clearance between the static bushing and the rotating tool or tool holder. The thermal expansion, due to friction, that occurs during operation often necessitates excessive clearance that cannot be tolerated. Or, all too frequently, insufficient clearance is provided and thermal expansion results in a "frozen" tool and needless hours of "down-time" and expense for repairs and replacements. Rotary bushings, on the other hand, virtually eliminate friction-heat. Consequently, clearance between the tool or tool holder and the rotary bushing is minimal, usually .0003 to .0005 inch, producing a smoother, chatter-free operation with greatly improved tool-life and accuracy, as well as surface finish, with resultant significant reduction in scrappage. Other advantages thus derived are

increased production rates, due to higher permissible operating speeds, and down-time reduction, all resulting in lower unit cost.

Anti-friction rotary bushings are self-contained, sealed units basically comprised of: an inner liner; ball, needle, or roller bearings; and an outer case. Once installed, the liner, having an inside diameter to fit the tool or cutter bar, and the inner race of the bearing rotate with the tool. The bearing outer race and the case remain stationary.

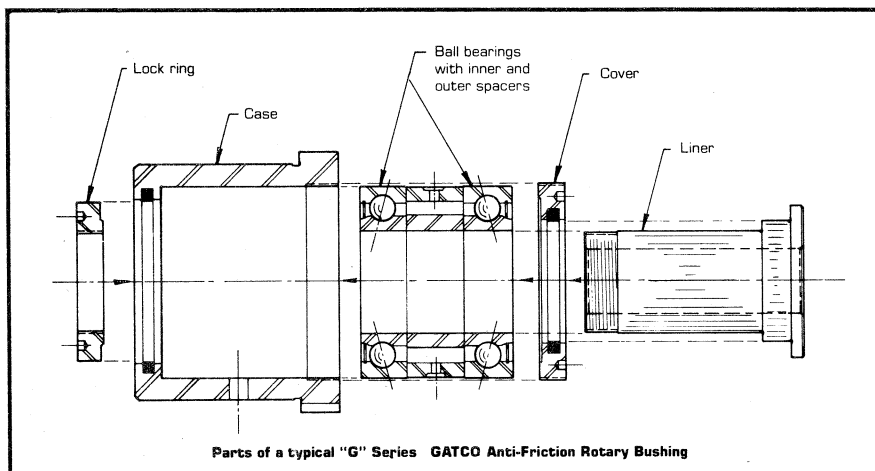
Rotary bushings are available with: a single, heavy duty double-row ball bearing (for bars supported at one end by a spindle); one or two needle bearings (for supported bars or limited space); two spaced single-row ball bearings (for floating or supported bars); or two spaced tapered-roller bearings (for floating or supported bars, or heavier load requirements). Models having two spaced bearings are also recommended for longer bar travels. The increased ratio of bearing spread to bar diameter provides maximum support of the tool or tool holder. Other manufacturers use different construction and may or may not have bushings for all of the above applications.

Standard models are available for bar diameters ranging from .250 to

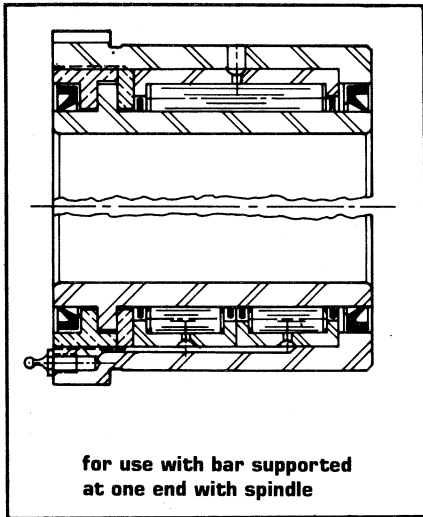


6.500 inches (with additional sizes outside this range available as special designs), and maximum permissible speeds up to 11,200 R.P.M. Radial load capacities of standard units can exceed 60,000 pounds, while thrust load capacities are available in excess of 32,000 pounds. These load ratings apply to bearings only and are based on 1500 hours B<sub>10</sub> life.

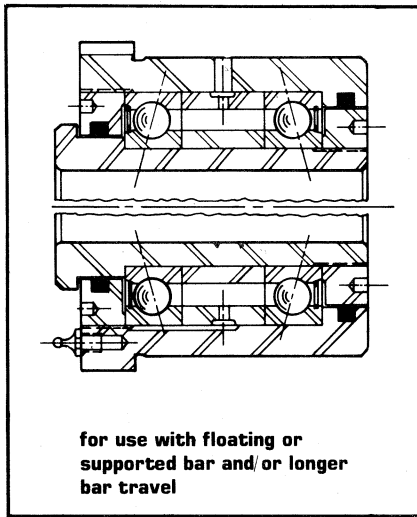
The installation, along with assured I.D. runout accuracy, of the rotary bushing is a relatively simple matter. Rotary bushings are normally supplied with grinding stock on the outside, or "housing fit" diameter (bushings with the outside diameter finish ground can also be ordered). For the user to grind the outside diameter to a predetermined housing bore, it is merely a matter of pressing a tightly fit arbor into the liner I.D. and grinding the rotated outer case while keeping the arbor (and the liner) "dead." This procedure assures an accurately fit rotary bushing to a housing that was previously bored without the need for



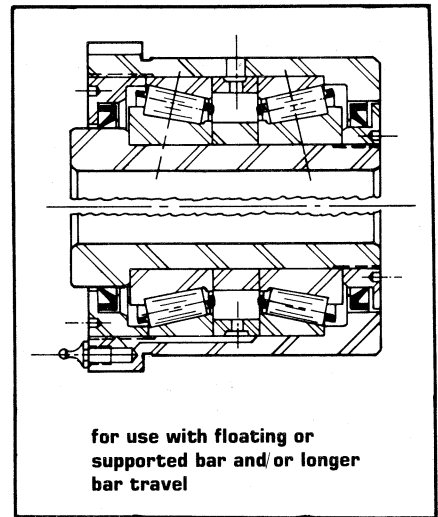
Parts of a typical "G" Series GATCO Anti-Friction Rotary Bushing



for use with bar supported at one end with spindle



for use with floating or supported bar and/or longer bar travel



for use with floating or supported bar and/or longer bar travel

close tolerance boring. (Recommended fit diameter of the rotary bushing is the housing bore diameter  $+.0000/-.0005$  inch.) It also guarantees exceptional I.D. runout accuracy in that the outside diameter is finish ground from the bearing axis established by the inner liner which supports the tool or tool holder.

Although it is a common practice to rely upon the housing fit alone to contain the rotary bushing, the use of standard bushing clamps or similar devices, applied to the case flange, may be preferred for securing the bushing to the housing. Interference fitting, however light, may create an undesirable pre-load on the bearing which results in premature bearing failure and unnecessary loss of bushing life.

The  $.0003$ - to  $.0005$ -inch clearance (depending upon bar size) recommended between the tooling bar and the liner I.D. is normally adequate to "drive" the liner, and thus assure that friction-free rota-

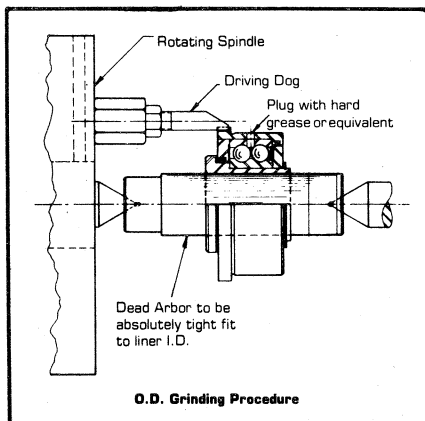
tion occurs within the bearing. However, positive drive elements, such as keys, keyways, pins, etc., can be incorporated into special designs of most models. Conversely, where conditions dictate that certain protrusions affixed to the tooling bar, such as carbide cartridges or keys, must also pass through the inside diameter, clearance slots can also be provided.

One of the most commonly encountered misconceptions that occurs in the purchasing of rotary bushings is a requirement for unnecessarily close tolerances. Upon closer analysis of tolerance application, either on the part print

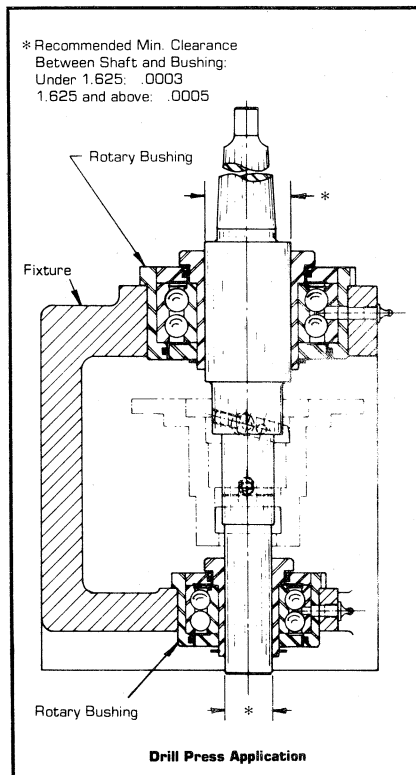
(where tolerances are often applied arbitrarily), or in the part processing, it is usually found that standard rotary bushing runout and fit tolerances are adequate for the operation to be performed. Unnecessarily close tolerances may increase the cost of the bushing significantly.

Rotary bushings are normally furnished for right hand, or clockwise, rotation as viewed from the flange, or "head," end. However, bushings can be supplied for left hand rotation as well.

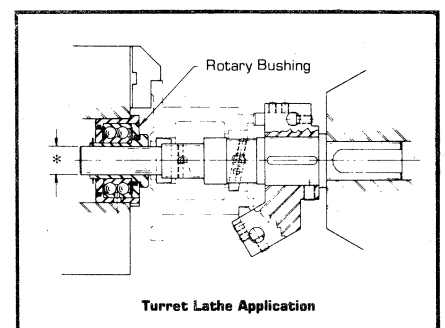
Lubrication holes or fittings are a standard feature with most models, and normal, routine lubrication procedures are highly recommended for prolonging the life of the rotary bushing. General purpose, light duty grease is the standard lubricant used, but oil lubrication is also possible. Bearings or liners do eventually wear. Increased life and cost reduction of the original bushing can be achieved by replacing bearings and inner liner, resulting in "as new" runout accuracy. ● ● ●



O.D. Grinding Procedure



Drill Press Application



Turret Lathe Application