Drill Bushing

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Drill jig Bushing

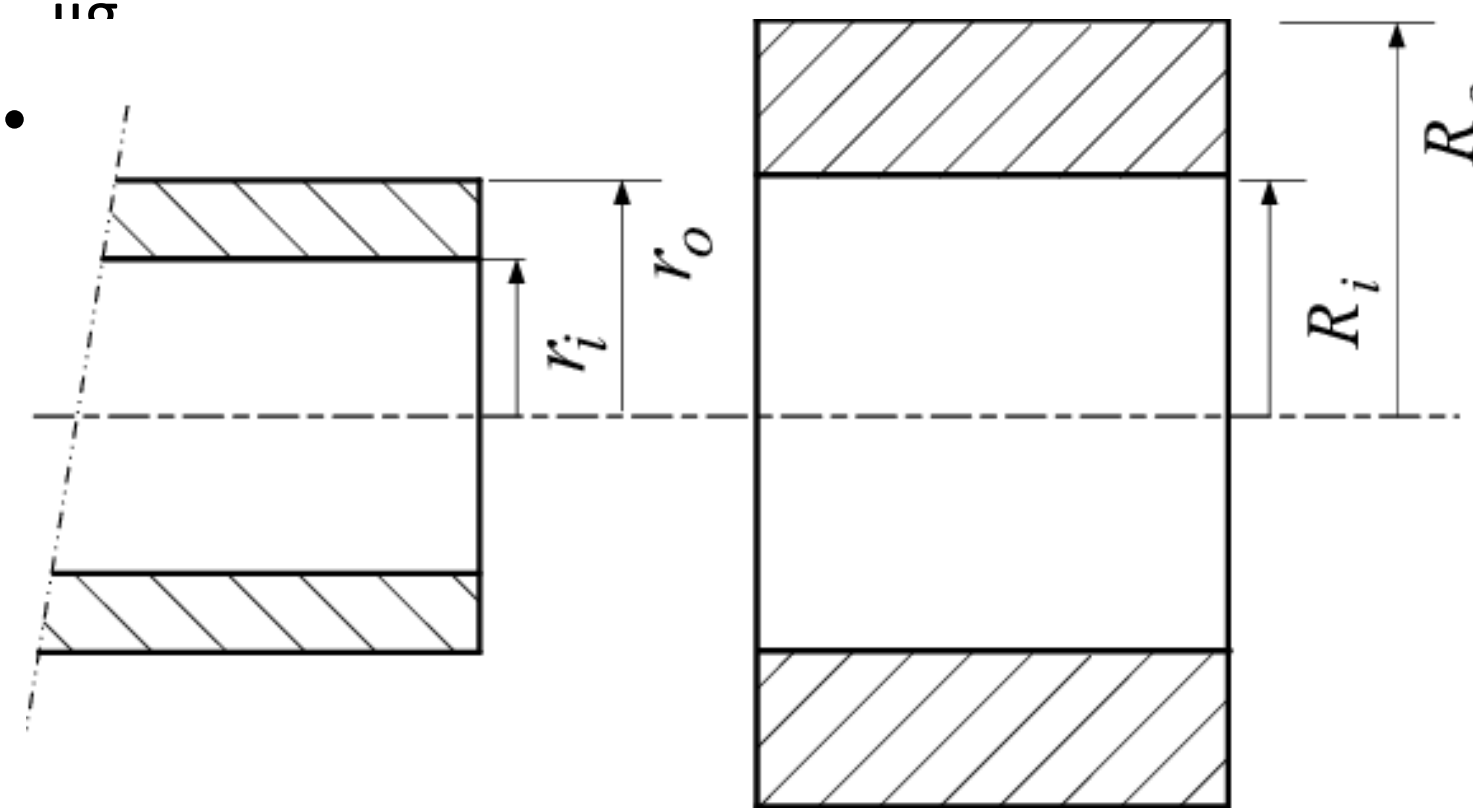
1. Bushings are used to guide the drills, reamers, and other cutting tools into proper position of the workpiece.
2. Materials used: tool steel or hardened to (HRC60 to HRC64)
3. Their use permits giving up the reduction of drill run off and hole expansion.
4. Prevent the bending moment of the drill
5. Helps better accuracy minimize the time for drilling.
6. It protects the drill jig plate.
7. The concentricity of the drill bushes is 0.01.
8. The length of bushing should be approx. twice the diameter of the bush hole.
9. The diameter should be very close to the dia of the drill but not be tight as it will cause drag in bushing.
10. General rule for clearance between 0.013 to0.026 mm. High clearance causes chipped drill margin and inaccuracy.

Types of drill bushes

1. Press fit bushes
   i. Headless or plain bush
   ii. Headed or flanged bush
2. Renewable bushes
   i. Fixed bushes
   ii. Slip bushes
3. Linear bushes
4. Threaded bushes
5. Special purpose bushes

Press fit bushings

- Pressed by interference fit in the bush plates(jig plates)
- Used in batch production where bushes outlast life of jig
- re wable

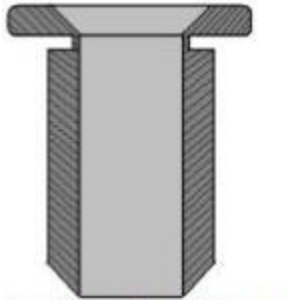


Press fit bushes: Headless or plain bush

1. Headless-press-fit bushings are the most popular and least expensive.
2. They are used in single-size cutting-tool applications where light axial loads are expected.
3. Since they are permanently pressed into the jig plate, they are generally used where replacement is not anticipated during the expected life of the tool.
4. They are ideal where the top of the bushing must be flush with the jig plate, or where hole spacing is too close to use headed bushings.

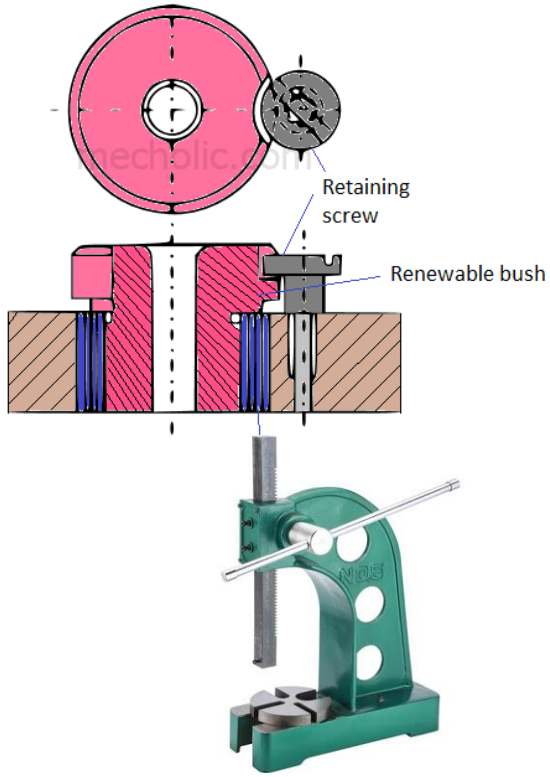
Press fit bushes: Headed or flanged bush

1. Head-press-fit bushings are used for permanent installations requiring greater bearing area or where heavy axial loads that could force the bushing through the jig hole are anticipated.
2. Although designed for permanent installations, press-fit bushings are easily replaced, but at the expense of losing some mounting hole accuracy with each replacement.
3. Since the bearing area extends beyond the jig plate, the thickness of the jig plate often can be reduced, thereby lightening the overall weight of the jig.
4. Cases where the head must be flush with the jig plate require counterboring of the mounting hole in the jig plates.

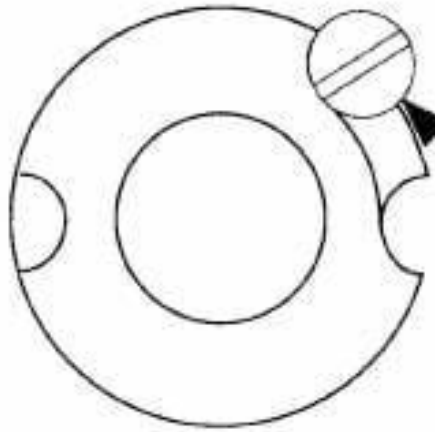


Renewable bushes: fixed renewable bushes

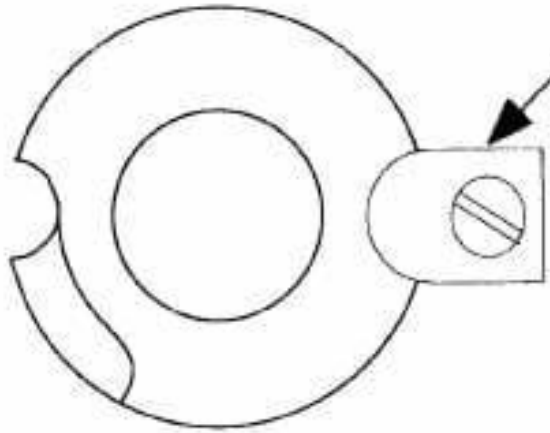
1. When slip-fixed renewable bushings are used on jigs to perform single operations on long production runs, they are usually secured in the fixed mode by a lock screw.
2. When used to perform more than one operation on the same hole, they are secured in the slip mode for easy changing.
3. Liners are used with ASME slip-renewable bushings. These special liners eliminate the need for a bushing locking device.
4. In use, the bushing is locked tight in the liner by the torque of the drill bit. Such liners must be installed with an arbor press.



SLIP RENEWABLE
INSTALLATION



FIXED RENEWABLE
INSTALLATION

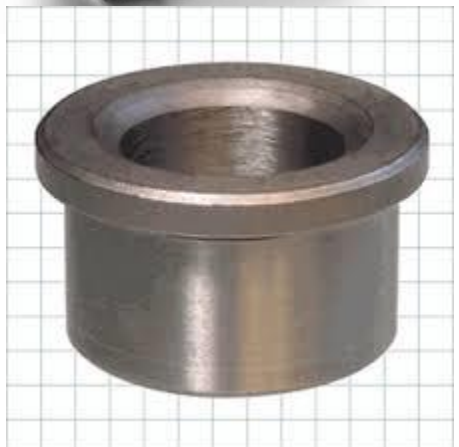


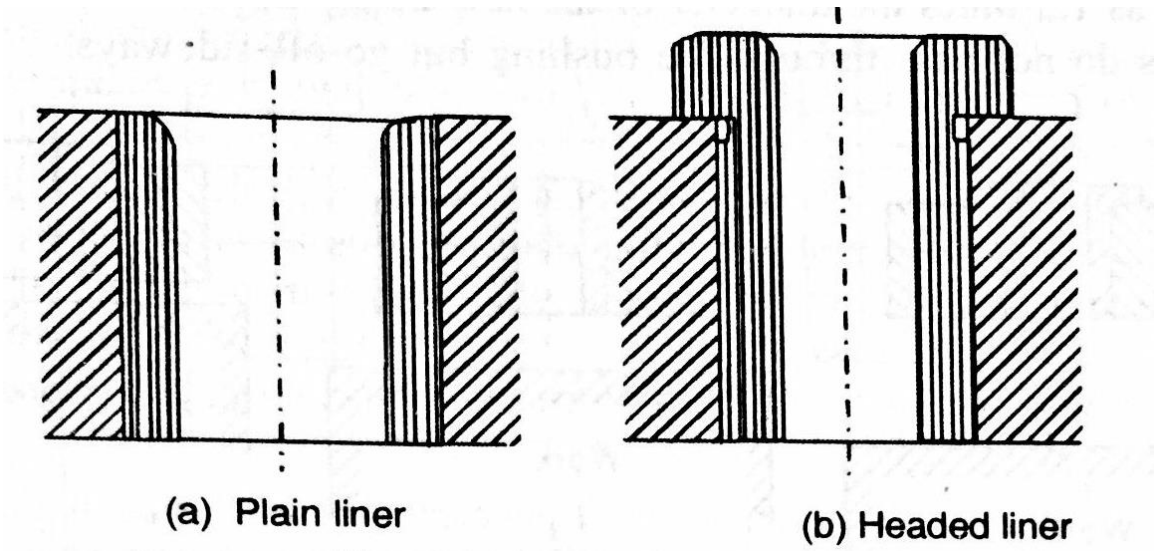
Renewable Bushes: Slip renewable bushes

1. Slip renewable bushings and slip-fixed renewable bushings are used with a headless liner or a head liner where multiple operations, such as drilling and reaming or drilling and tapping, are to be performed on the same hole; or, where long production runs require occasional changing of the bushing to maintain jig integrity.
2. They are available for use with lock screws, round clamps, round end clamps or flat clamps.
3. When used for multiple operations, the first operation bushing is installed and the hole drilled.
4. The bushing is then replaced with the second operation bushing and the second operation performed.
5. This process is repeated until the hole is completely machined.
6. The first operation bushing is then reinstalled and the procedure repeated on the next workpiece.

Liner bushes

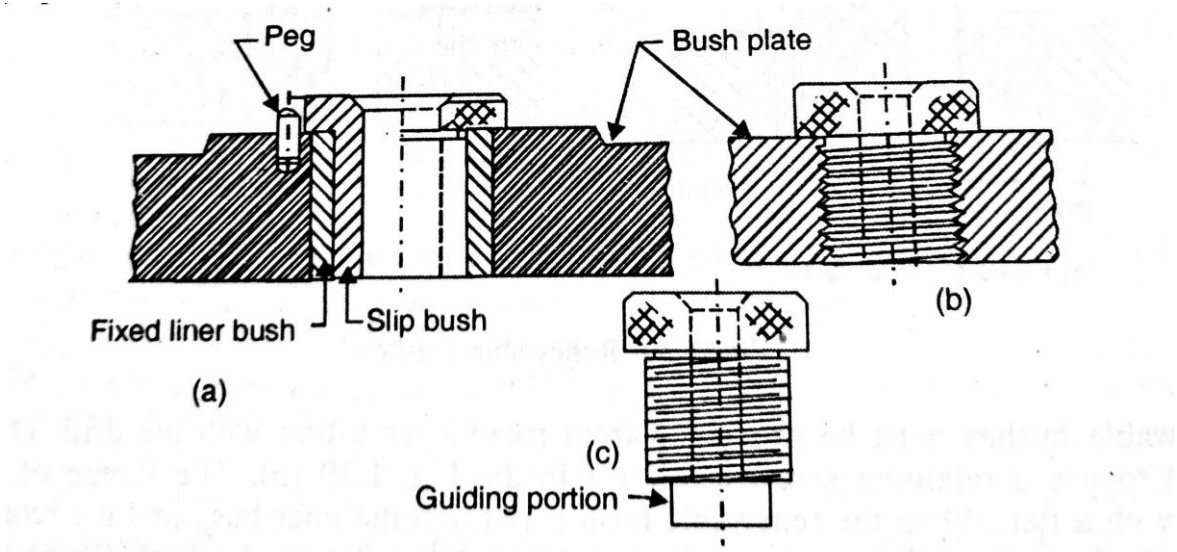
- Known as ‘master bushings’ are permanently fixed into the jig body.
- Liner bushings are available in head OR headless types and are pressed into the jig plate.
- They are hardened and so they provide only a little chance of affecting the accuracy of the tool by changing the bushings.





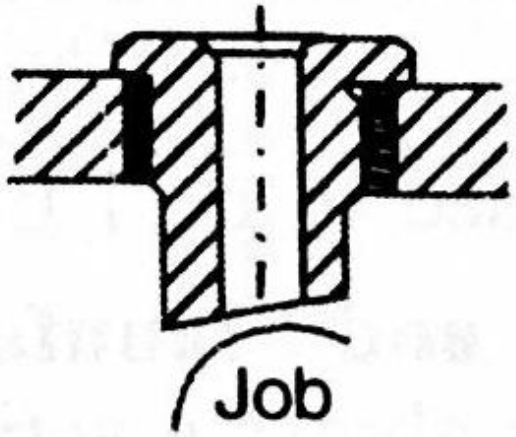
Threaded Bushes

- Used for clamping the work piece are threaded on the outside
- The screwing of the bush into the jig body holds the bush in place &makes bush adjustable.
- Adjusted to suite the length of component.

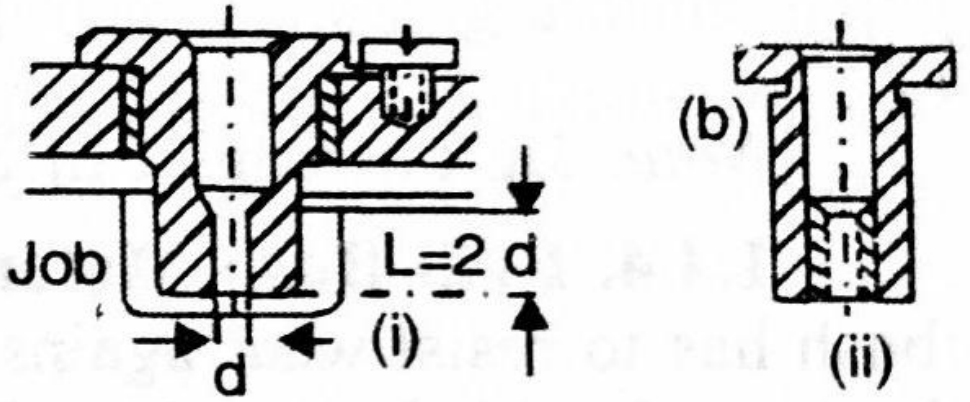


Special Purpose Bushes

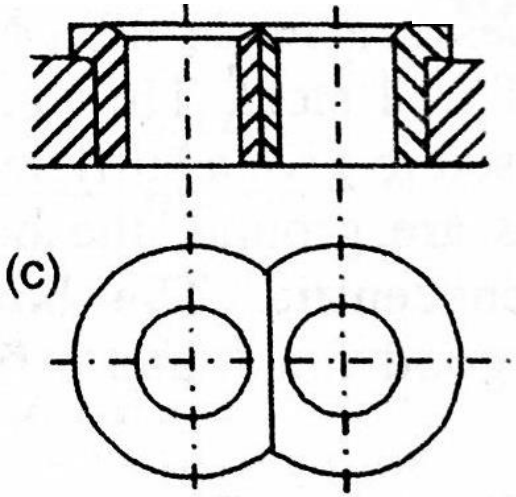
Drilling a hole through inclined surface



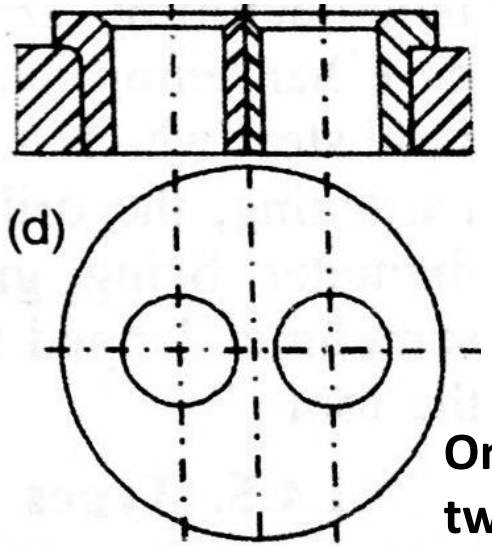
Drilling a hole in a recess



Two close holes are drilled



Two bushings with flats



One bush with two holes

Always remember when installing the drill bush

1. Mounting holes should be round and properly sized to prevent bushing closure and jig-plate distortion. For this reason, it is recommended that the mounting holes be jig-bored or reamed to size.
2. Headless-press-fit and liner bushings generally are installed with a diametral interference of 0.0005–0.0008 in. (0.013–0.020 mm), while headed-press-fit bushings are generally installed with a diametral interference of 0.0003– 0.0005 in. (0.008–0.013 mm).
3. Interference greater than this may reduce the ID of the bushing to the point where the tool may seize, or, in the case of liners, prevent insertion of a renewable bushing. On the other hand, too little interference will result in a loosely installed bushing that may spin or be forced out of place.
4. Drill bushings for special applications should be installed in accordance with the individual manufacturer’s recommendations.

5. Sufficient chip clearance should be provided between the bushing and workpiece to enable chip removal, except in cases where extreme accuracy is required.
6. In this case, the bushing should be in direct contact with the workpiece.
7. In most cases, a clearance of 1–1.5 times the bushing ID should be used when machining materials such as cold-rolled steel, which produces long stringy chips.
8. A clearance of one-half the bushing ID is recommended when machining materials such as cast iron, which produces small chips. Excessive chip clearance should be avoided because most cutting tools are slightly larger at the cutting end due to back taper, and excessive clearance will reduce the guiding effect of the bushing, resulting in less accurate drilling.