

Linear Bushing Bearings

General Description

AST's Linear Bushing products are high precision linear motion rolling guides which travel along shafts to achieve linear motion. In the external cylinder, steel balls are accurately guided by a retainer so that low frictional resistance and stable linear motion can be achieved. For each dimensional series, standard, adjustable clearance and open types are available with and without seals, so the best linear bushing for the application may be selected. Linear Bushings made of stainless steel are also available, suitable for applications where corrosion resistance is important. It is easy to use Linear Bushings instead of conventional plain bushings because both types are used with a round shaft, and no major redesign is necessary.



Nomenclature/Dimensions

The following are series designations for each available linear bushing bearing that AST offers.

Inch Series:

- **LBB** – Inch Dimensions, without seals, standard closed,
- **LBB-AJ** – Inch Dimensions, without seals, adjustable clearance,
- **LBB-OP** – Inch Dimensions, without seals, open type
- **LBB-UU** – Inch Dimensions, with seals, standard closed,
- **LBB-UUAJ** – Inch Dimensions, with seals, adjustable clearance,
- **LBB-UUOP** – Inch Dimensions, with seals, open type

Metric Series:

- **LBD** –Metric Dimensions, without seals, standard closed,
- **LBD-AJ** – Metric Dimensions, without seals, adjustable clearance,
- **LBD-OP** – Metric Dimensions, without seals, open type
- **LBD-UU** – Metric Dimensions, with seals, standard closed,
- **LBD-UUAJ** – Metric Dimensions, with seals, adjustable clearance,
- **LBD-UUOP** – Metric Dimensions, with seals, open type
- **LBE** –Metric Dimensions, Small Profile, without seals, standard closed,
- **LBE-AJ** – Metric Dimensions, Small Profile, without seals, adjustable clearance,
- **LBE-OP** – Metric Dimensions, Small Profile, without seals, open type
- **LBE-UU** – Metric Dimensions, Small Profile, with seals, standard closed,
- **LBE-UUAJ** – Metric Dimensions, Small Profile, with seals, adjustable clearance,
- **LBE-UUOP** – Metric Dimensions, Small Profile, with seals, open type



Internal Clearance/Preload

Some types of Linear Bushing Bearings are available which allow you to adjust internal clearance as needed. Standard type bearings are widely used as a general purpose linear guide, and do not have adjustable clearance. High and precision classes are available.

Open type bearings have one or two fewer ball circuits than the standard type, creating an open section to allow clearance for a shaft support. The open type bushing is commonly used with long shafts when one or more support blocks are needed to reduce shaft deflection or sag. The width of the support blocks can be determined to match the (E) dimension of the fan shaped open section shown in the dimension tables found in the AST Catalog. The radial internal clearance can be adjusted.

Adjustable clearance type bearings have a slot in the longitudinal direction made on the external cylinder in order to adjust the clearance. When this type is used with a housing which can adjust the bore diameter, the radial internal clearance can be adjusted without fit selection between the linear bushing and shaft. It is possible to give a preload. However, if the degree of the adjustment is excessive, deformation at the contact points between steel balls and shaft or external cylinder becomes large, resulting in short life. Therefore, it is recommended to prepare a shaft with a specified fit tolerance and adjust the radial internal clearance to zero or minimal preload by matching the individual components.

The clearance is adjusted while checking with a dial gage. The adjustment is generally completed when the shaft is rotated in an unloaded condition and light resistance is caused by the rotation of shaft. In this condition, the radial internal clearance becomes zero or minimal preload.

Lubrication

Lithium-soap base grease (MULTEMP PS No.2 (KYODO YUSHI)) is recommended for all linear bushing bearings. However, as the quality of any grease will gradually deteriorate as operating time passes, periodic re-lubrication is necessary. The re-lubrication interval varies depending on the operating conditions of the rolling guides. A six month interval is generally recommended, and, if the machine operation consists of reciprocating motions with many cycles and long strokes, re-lubrication every three months is recommended.

Fitting and mounting

Since Linear Bushings operate with a shaft as a raceway surface, the shaft should be heat-treated and ground. Surface hardness should be 58HRc min. and roughness should be 0.2 μ mRa or better.

The recommended fit tolerances for Linear Bushings are shown below. The fit between Linear Bushing and housing is usually clearance fit. For some special applications, an interference fit may be required. For adjustable clearance or open type Linear Bushings, the following recommendations apply. The shaft diameter is finished smaller than the lower limit of the tolerance range of the inscribed circle diameter of the Linear Bushing, while the housing diameter is finished larger than the upper limit of the tolerance range of the outside diameter of the external cylinder of the Linear Bushing.

Type \ Item		Shaft		Housing	
		Normal clearance	Closer clearance	Clearance fit	Interference fit
LBD, LBB	High class	f6,g6	h6	H7	J7
LM, LMB	Precision class	f5,g5	h5	H6	J6
LBE, LME	—	h6	j6	H7	J7

When press-fitting a Linear Bushing into a housing, do not hit the end plate. The correct method is to gradually push the external cylinder with a jig for assembling. Then the external cylinder is fixed in the axial direction with a stop ring or a stopper plate. When inserting the shaft into the Linear Bushing assembled into its housing, gradually and gently insert the shaft avoiding any impact on the steel balls and retainers. If two shafts are used in parallel, fix one shaft accurately as a datum shaft and locate the second shaft to the datum shaft keeping the parallelism.

Life and Load Ratings

Basic dynamic load rating **C**

The basic dynamic load rating is defined as the constant load both in direction and magnitude under which a group of identical Linear Bushings are individually operated and 90% of the units in the group can travel 50×10^3 meters free from material damage due to rolling contact fatigue.

Basic static load rating **C₀**

The basic static load rating is defined as the static load that gives a prescribed constant contact stress at the center of the contact area between the rolling element and raceway receiving the maximum load.

Relationships between load ratings and the position of ball circuits

Load ratings of Linear Bushing are affected by the position of the ball circuits. In the table of dimensions, two types of load ratings are shown corresponding to the load directions and steel ball circuit positions as shown below. In figure 1, the load direction is in line with the steel ball circuit position and this direction is referred to as load direction A in the table of dimensions. In general, the load ratings for this direction are also used, when the load direction is indeterminate or the steel ball circuit position in relation to the load direction cannot be determined. In figure 2, the load direction is pointed at the center of two ball circuits and this direction is referred to as load direction B in the table of dimensions. In general, a larger load can be received in this case compared with load direction A.

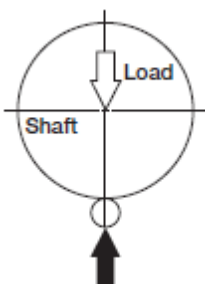


Figure 1

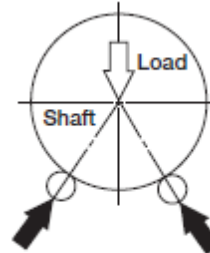


Figure 2