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Bearing Fitting Practice Help Guide

Understanding Bearing Fitting Practice

Bearing fitting practice specifies how two components, such as a shaft and a bearing inner ring, fit together. It determines whether interference or clearance exists between the two components. Two components could be tightly fit together (denoted by a "T" or a "-" sign), loosely fit together (denoted by an "L" or a "+" sign), or somewhere in between the two designations (transition fit).

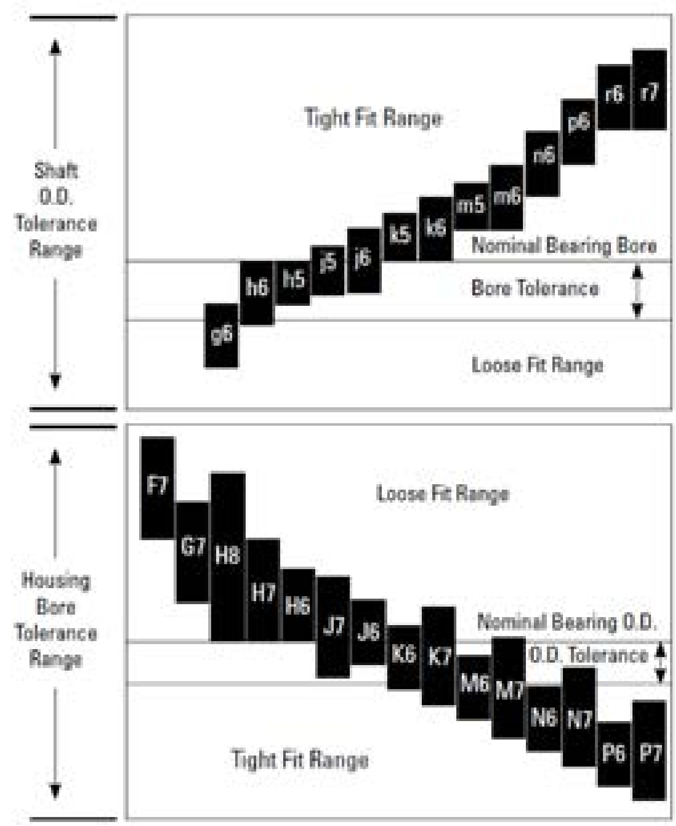
In general, bearing rings mounted on a rotating member should have an interference fit. Loose fits may allow the ring to creep or turn and cause wear to the mating surface and backing shoulder. This wear can result in excessive bearing looseness and result in damage to the bearing, shaft, or housing. Creep or turning also may produce abrasive metal particles that can enter the bearing and cause damage and vibration.

Assembly procedures and the means and ease of obtaining the bearing setting may require special fits. In these cases, experience should be used as a guideline. Timken engineers can offer suggestions as well.

The choice of fitting practices will mainly depend upon the following parameters:

- Precision class of the bearing
- Rotating or stationary ring
- Type of layout (single- or double-row bearings)
- Type and direction of load (continuous or rotating load)
- Specific running conditions like shock, vibration, over-loading, or high speeds
- The capability for finishing the seats (grinding, turning, or boring)
- Shaft and housing section and material
- Assembly and setting methods

An ISO fit designation can also be assigned as shown in the following figure. Inner-ring fits are given a lowercase letter to differentiate between the outer-ring fit nomenclature, which starts with a capital letter. The image below is a graphical representation of roller bearing shaft and housing fit selection that conforms to accepted industry standards and practices. The bars designated g6, h6, etc., represent shaft/housing diameter tolerance ranges to achieve various loose and interference fits required for different load and ring-rotation conditions.



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Prior to determining the resultant fit, the tolerance of the bearing must be known which is based on the specific bearing class. The following table summarizes the different specifications and classes for ball, tapered roller, cylindrical roller, and spherical roller bearings. Need help determining the exact tolerances for your application? Try our Bearing Tolerances tool.

System	Specification	Bearing Type	Standard Bearing Class		Precision Bearing Class			
Metric	Timken	Tapered Roller Bearings	K	N	C	B	A	AA
	ISO/DIN	All Bearing Tyoes	PO	P6	P5	P4	P2	–
	ABMA	Cylindrical, Spherical Roller Bearings	RBEC 1	RBEC 3	RBEC 5	RBEC 7	RBEC 9	–
		Ball Bearings	ABEC 1	ABEC 3	ABEC 5	ABEC 7	ABEC 9	–
		Tapered Roller Bearings	K	N	C	B	A	–
Inch	Timken	Tapered Roller Bearings	4	2	3	0	00	000
	ABMA	Tapered Roller Bearings	4	2	3	0	00	–

How to Use the Bearing Fitting Practice Tool

Follow these simple steps to get quick and accurate fitting practice to help you design Timken bearings into your project.

1. Go to engineering.timken.com.
2. Select Fitting Practice from the home page.
3. Select Display Units.
4. Enter any part of your part number in to the Bearing Part Number field and select Lookup. From the pop-up window, select the radio button for the line item desired and click Done. This will bring the selected part number back in to the tool.
5. If a tapered roller bearing is selected, you must denote the Design Units. This value should correspond with the desired bearing class. i.e., If the intended bearing class is K, N, B, C, or A, "Metric" should be selected.
6. Select from Timken Fitting Practice or ISO Fitting Practice methods.
7. Select Bearing Class. Refer to the chart above for classifications.
8. For all bearing types excluding tapered roller bearings, if you wish to determine the component dimensions by using standard ISO fits, select ISO Fitting Practice.
9. If ISO Fitting Practice is chosen, select the desired ISO fits for the shaft and housing from the drop-down menus.
10. Select the Calculate button.
11. To determine the inner-ring and outer-ring fitting practice, using the Timken method, perform the following steps. Instructions vary based on bearing type.

For tapered roller bearings:

Inner

12. Select the Application Type.
13. Select Rotating or Stationary Shaft.
14. Select the Shaft Surface.
15. Select the Loading Condition.
16. Click the Retrieve Fittings button.

Outer

17. Select the Application Type.
18. Select Rotating or Stationary Housing.
19. Select the Housing Material Type.
20. Select the Mounting Type.

For other bearing types:

Inner

12. Select the Bearing Rotation and Load.
13. Select the Operating Conditions.

Outer

14. Select the Housing.
15. Select Bearing Rotation and Load.
16. Select the Operating Conditions and Axial Displacement Limitations.

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Output and Interpretations

You can take these results and ....

- Enter them into your design software.
- Enter them into Timken's Syber™ Bearing System Designer software.
- Use the data as input into our online Clearance Calculations tool.
- Use the data as input into our online Bearing Installation Calculation tool.
- Use the data to size/manufacture a shaft outside diameter and housing bore.
- If you need to download a CAD file, go to cad.timken.com.

Still Need Help?

- Contact your Timken sales office. Locate your local office by visiting locations.timken.com.
- Email us at TimkenEngineeringHelp@timken.com.

Appendix

Additional Bearing Fitting Practice Considerations

The term **"rotating inner ring"** describes a condition in which the inner ring rotates relative to the load. This may occur with a rotating inner ring under a stationary load or a stationary inner ring with a rotating load. Tight fits should almost always be used on the rotating ring or when the load rotates relative to the ring. In special cases, loose fits may be considered if it has been determined by test or experience they will perform satisfactorily.

Inner Ring Fitting Practice

Inner ring fitting practice depends on the application.

- With rotating inner rings under conditions of high speeds, heavy loads, or shocks, interference fits using heavy-duty fitting practices should be used.
- With rotating inner rings mounted on unground shafts subjected to moderate loads (no shock) and moderate speeds, a line-to-line or near-zero average fit should be used.
- With stationary inner rings using unground shafts, or when using ground shafts with moderate loads (no shock), a minimum fit near zero to a maximum looseness that varies with the inner ring bore size is suggested. In stationary inner ring applications requiring hardened and ground spindles, a slightly looser fit may be satisfactory.
- Special fits also may be necessary on installations with multiple bearings mounted in close proximity to each other or when special assembly requirements exist.

Outer Ring Fitting Practice

Stationary, non-adjustable and fixed single-row outer ring applications should be applied with a tight fit wherever practical. Generally, adjustable fits may be used where the bearing setup is obtained by sliding the outer ring axially in the housing bore. However, in certain heavy-duty, high-load applications, tight fits are necessary to prevent pounding and plastic deformation of the housing. Tightly fitted outer rings mounted in carriers can be used. Tight fits should always be used when the load rotates relative to the outer ring or when the outer ring rotates relative to the load.

Double-row stationary double outer rings are generally mounted with loose fits to permit assembly and disassembly. The loose fit also permits float when a floating bearing is mounted in conjunction with an axially fixed bearing on the other end of the shaft.