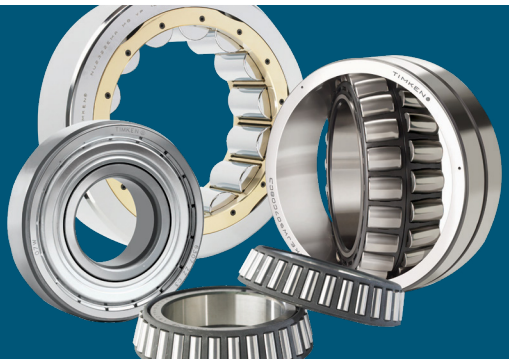
TIMKEN

Bearing Installation Calculation Help Guide



Understanding Bearing Installation Practices

To achieve expected bearing performance, it is critical that proper mounting design, fitting practices, settings, and installation procedures are followed. Proper bearing installation, including cleanliness of the components, as well as use of proper tools, may also affect bearing performance.

Most applications require a tight interference fit of one or both rings. To properly install the bearing, the bearing fits must be established original equipment manufacturer (OEM) specifications. If the shaft and housing fits are not known they can be calculated using the Bearing Fitting Practice tool.

Follow OEM specifications whenever possible.

Determining the bearing clearance is also a requirement prior to installation as changing clearance can have a significant effect on bearing performance. If the desired bearing setting is not known, it can be calculated using the Bearing Clearance Calculations tool.

Once the bearing fits and clearances are established, the Bearing Installation Calculation tool can be used to calculate the required installation forces, resulting contact pressure for tight fit rings and stresses in the rings and mating components.

How to Use Our Bearing Installation Calculation Tool

Follow these simple steps to calculate accurate data to aide Timken bearing installation into your equipment.

1. Go to engineering.timken.com.
2. Select Bearing Installation Calculations from the home page.
3. Enter in a Timken Bearing Part Number. Don't know the part number? Use our bearing search tool to select one from our online product catalog.
4. Select the desired Display Units and enter the Timken bearing part number.
5. Select Inner Install Calculation or Outer Install Calculation depending on whether you seek a calculation for an inner-ring or outer-ring installation.
6. For the Inner Install Calculation, select the Shaft Material. This will automatically populate the Young's Modulus and Poisson's Ratio fields or you may enter the material properties directly.
7. Enter the Shaft Inner Diameter of the shaft on which the bearing inner ring will be installed. Enter zero for a solid shaft.
8. Enter the Axial Load. This is the applied axial load during installation of the bearing. This only affects and is required for tapered roller bearings (TRBs).
9. Enter the Inner Fit and Friction Coefficient.
10. Click the Calculate button.
11. For the Outer Install Calculation, select Housing Material. This will automatically populate the Young's Modulus and Poisson's Ratio fields or you may enter the material properties directly.
12. Enter the Axial Load. This is the applied axial load during installation of the bearing. This only affects and is required for TRBs.
13. Enter the Outer Fit and Friction Coefficient.
14. Click the Calculate button.

How to Apply the Results

Inner-Ring Installation

This tool will help you understand the resultant effects of the fits on installation, including:

- Contact Pressure, which is the pressure between the bearing ring and either shaft or housing depending on which ring is being installed
- Inner Ring Push-Up Force is the force needed to overcome the contact friction of the shaft in order to install the inner ring
- Change in Shaft Inner Diameter due to the interference fit.
- The Radial Clearance Lost due to Fit describes the impact on internal clearance due to the fits. (Note: Affected by tight fits only.) Using an interference fit on the inner ring will cause an increase in diameter and therefore a decrease in radial clearance. Utilize the Radial Clearance (or Lateral Loss for tapered roller bearings) Lost Due to Fit to make sure the correct setting of the bearing is still achieved. This effect can also be calculated in the Clearance Calculations tool.

TIMKEN

Axial Load Effects

This tool also will help you understand the resultant effects on Tapered Roller Bearings (only) due to applied axial load during installation, such as:

- A decrease in cone bore
- Modified contact pressure caused specifically by the axial load
- A decrease in the shaft ID due to the axial load
- Axial deflection from cone contraction due to the axial load applied

Fit & Axial Effects

This tool offers visibility to the combined fit and axial effects:

- Maximum Radial Stress in the Shaft calculates the stress in the shaft due to the pressure caused by the fit of the inner ring in the radial direction.
- Maximum Shaft ID Hoop Stress is the circumferential stress found in the inner diameter of a hollow shaft (if present).
- Decrease in the shaft ID when a hollow shaft is input due to both the fits and applied axial loads.

Outer-Ring Installation

This tool will help you understand fit effects – the resultant effects due to the fits for installation, including:

- Outer Ring/Housing Contact Pressure is the pressure between the bearing outer ring and housing due to bearing fit.
- Outer Ring Push-Up Force through Outer Ring is the necessary force to overcome the contact friction from the housing for installing the outer ring.

Due to the bearing outer ring fit, the bearing housing outer diameter may increase due to stress in the housing.

Using an interference fit on the outer ring will cause a decrease in diameter and therefore decrease radial clearance. Use the Radial Clearance Lost Due to Fit to make sure the correct setting of the bearing is still achieved.

Maximum Radial Stress in Housing calculates the stress in the housing due to the pressure caused by a radial interference outer ring fit.

Axial Load Effects

This tool also will help you understand the resultant effects on Tapered Roller Bearings (only) due to applied axial load during installation, such as:

- Increase in Cup OD is the resultant increase in the outer ring outer diameter due to installation
- Modified contact pressure between Cup and Housing is the pressure caused by the axial load.
- An increase in Housing OD due to the axial load
- Axial Deflection from Cup Expansion due to the axial load applied

Fit & Axial Effects

This section offers visibility to the combined fit and axial effects:

- Maximum Radial Stress in Housing calculates the stress in the housing due to the pressure caused by the fit of the outer ring in the radial direction.
- Maximum Housing ID Hoop Stress is the circumferential stress found in the inner diameter of the housing.
- Increase in the housing OD due to both the fits and applied axial loads.

You can take these results and ....

- Use them to help plan Timken bearing installation.
- Use the data to understand effects due to tight fits, the applied axial installation loads or a combination of both.
- Use the data to check selected bearing clearance and fit calculations.
- Enter them into your design software.
- Enter them into Timken's Syber™ Bearing System Designer software.
- Use the data as input into our online Bearing Fitting Practice and Clearance Calculations tools.
- 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.

IMPORTANT NOTE: The accuracy of the technical information supplied through this engineering tool is dependent upon the accuracy and completeness of information supplied to Timken. Actual product performance is affected by many factors beyond the control of Timken, and which cannot be modeled through this engineering tool. Therefore, you must validate the suitability and feasibility of all designs and product selection. The technical information is presented solely to provide you, a customer of Timken or its affiliates, with data to assist you in your design. No warranty, expressed or implied, including any warranty of fitness for a particular purpose, is made by Timken through the provision of this information.

The Timken team applies their know-how to improve the reliability and performance of machinery in diverse markets worldwide. The company designs, makes and markets bearings, gear drives, automated lubrication systems, belts, brakes, clutches, chain, couplings, linear motion products and related industrial motion rebuild and repair services.

08-25 Order No. 11519 POD | Timken® is a registered trademark of The Timken Company. | © 2025 The Timken Company | Printed in U.S.A.