

## Bearing Fatigue Life Help Guide



### Understanding Bearing Fatigue Life

Bearing fatigue life (L10) is a calculation of the length of service life in hours that 90 percent of a group of identical bearings will achieve before a fatigue spall develops. The L10 life also is associated with 90 percent reliability for a single bearing operating under a particular load and speed.

### How to Use the Bearing Fatigue Life Calculator

Follow these steps to get bearing fatigue life calculations that can help you design Timken® bearings into your project.

1. Go to [engineering.timken.com](http://engineering.timken.com).
2. Select [Bearing Fatigue Life](#) from the home page.
3. Enter 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 [Timken](#) or [ISO 281:2007 calculations](#). The [Timken](#) method uses Timken-specific life adjustment factors based on extensive in-house testing of Timken bearings. The [ISO 281:2007](#) method uses the Timken bearing rating with the ISO Life Adjustment Factors. Unless specifically looking for the ISO calculations, use the [Timken method](#).
5. Select [Bearing Type](#) from the drop-down.
6. Search By [Part Number](#) or [Geometry Values](#).

#### Using the Timken Method

1. Determine whether you want to apply life adjustment factors in your life calculation or perform a simple catalog life calculation (no adjustments) by selecting the "Apply Life Adjustment Factors" check box. Selecting to apply life adjustment factors will include the lubricant's influence on the calculated life along with the calculation of a low load factor (where applicable).

### Outputs and Interpretation

With this tool, you can obtain the following outputs depending on where you selected the Timken or ISO 281:2007 method:

#### Timken Method Outputs

- [Catalog L10](#). This is the L10 life in hours based only on bearing rating, applied loads, and speeds. Remember: L10 is the life that 90 percent of a group of apparently identical bearings is expected to meet or exceed before a fatigue spall develops.

2. If you've selected "No" to Life Adjustments, enter the [Speed](#), [Radial Load](#) and [Axial Load](#).
3. If Apply Life Adjustments is selected, enter the [Speed](#), [Radial Load](#), [Axial Load](#) and [Operating Temperature](#). [Select a Lubricant Type](#) (oil or grease) and [Select a Lubricant](#) name from the drop-down menu. When one is selected, the reference lubricant viscosities will appear in the [Viscosity fields](#).

Alternatively, you can directly enter the two lubricant reference viscosities if your specific lubricant is not available in the drop-down menu.

#### Using the ISO 281:2007 Method

1. Enter the [Speed](#), [Radial Load](#), [Axial Load](#) and [Operating Temperature](#). [Select a Lubricant Type](#) (oil or grease) and [Select a Lubricant](#) name from the drop-down menu. When one is selected, the reference lubricant viscosities will appear in the [Viscosity fields](#).

Alternatively, you can directly enter the two lubricant reference viscosities if your specific lubricant is not available in the drop-down menu.

2. Enter the applied [Radial load](#), [Axial load](#), and [Rotational Speed](#).

To determine [Contamination Factor](#): Enter a value between 0 and 1. See ISO 281 for details on how to calculate the [Contamination Factor](#).

- The [Lubrication and Low Load](#) life adjustment factors.
- The [Adjusted L10 Life](#), which is the product of the Catalog L10 life times the life adjustment factors (lube and low load). ( $\text{Adjusted Life } L10a = L10 * a3l * a3p$ )
- [Viscosity at Operating Temp](#), which is the calculated lubricant viscosity based on the [selected Lubricant and Operating Temperature](#) chosen in the input section

## ISO 281:2007 Method Outputs

- **Catalog L10.** This is the L10 life in hours based only on bearing rating, applied loads, and speeds. Remember: L10 is the life that 90 percent of a group of apparently identical bearings is expected to meet or exceed before a fatigue spall develops.
- **Adjusted Life L10 ISO:** this is the product of the **Catalog Life** and the **ISO Life Modification Factor**.
- **Fatigue Limit Load:** The bearing load under which the fatigue stress limit is just reached in the most heavily loaded raceway contact.
- **Kappa(=Viscosity ratio  $v/v_1$ ):** This is the actual kinematic oil viscosity at operating temperature divided by the reference kinematic viscosity for adequate lubrication.
- **Viscosity at Operating Temp.** which is the calculated lubricant viscosity based on the **selected Lubricant and Operating Temperature** chosen in the input section.
- **ISO Life Modification Factor:** This output is calculated based on the applied **Loads, Contamination Factor,** calculated **Fatigue Limit Load,** and **Kappa** value. See the ISO standard for more details.



## Still Need Help?

- Further information on the Timken method of calculating bearing life can be found in the [Timken Engineering Manual](#).
- Further information on the ISO 281: 2007 method of calculating bearing life can be found in the [ISO Standards](#).
- Contact your Timken sales office. Locate your local office by visiting [locations.timken.com](https://locations.timken.com).
- Email us at [TimkenEngineeringHelp@timken.com](mailto: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.