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Periodic Frequency Help Guide

Understanding Periodic Frequency

Periodic frequency is the measurement of cyclical rotations per second of each of the bearing primary components – i.e., the inner and outer rings, the rolling elements, and retainer – based on the geometry and operating speed of the bearing. Periodic frequencies are helpful to know when monitoring equipment health and using vibration signature analysis to determine potential damage modes.

Each component has a fundamental frequency based on the bearing internal geometry. This fundamental frequency is then used to calculate the periodic frequency at a particular operating speed. If a bearing component experiences damage, the damage may cause noticeable vibration during operation at the periodic frequency of that component.

How to Use the Periodic Frequency Tool

Follow these simple steps to get quick and accurate frequency data for the Timken bearings in your application.

1. Go to engineering.timken.com.
2. Select Periodic Frequencies from the home page.
3. Select the Bearing Type. Don't know the bearing type? Use our bearing search tool to find the bearing type based on your part number.
4. 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.
5. Select Units.
6. Enter the Operating Speed in revolutions per minute (RPM).
7. Click the Calculate button.

Output and Interpretations

This calculation considers the fundamental frequency of each bearing component based on internal geometry and applies the operating speed to find the periodic frequency of each component.

Outputs from the tool include:

- ball or roller pass frequency relative to the inner ring (BPFI)
- ball or roller pass frequency relative to the outer ring (BPFO)
- ball or roller spin frequency (BSF)
- fundamental train frequency for inner ring rotation
- fundamental train frequency for outer ring rotation

These values are then used to provide:

- frequencies of the eccentricity (f0 or f1)
- ball or roller irregularities (f2)
- inner raceway irregularities (f3)
- outer raceway irregularities (f4)
- ball or roller size variations with a rotating inner (f5), or
- ball or roller size variations with a rotating outer (f6).

If you are testing a system, these outputs may provide insight into the vibration produced in an application. These values can help predict component damage or errors in installation, such as incorrect fits, too much axial play, etc..

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How to Apply the Results

You can take these results and ....

- Enter them in to your vibration analysis software.
- Use the data to compare your own bearing frequencies in an application and detect or analyze trends in component damage.
- Calculate other harmonic frequencies of the bearing assembly.
- 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.

Cautions

The Effects of Loads

It's worth noting that any loads applied to the bearing, especially radial loads, will impact the load zone and component vibration. Individual rollers may have a different frequency when in the load zone versus outside the load zone. The size of the load zone will also have an impact. This can make it difficult to identify roller damage based on a periodic frequency. Similar concerns may apply to ball bearings with a specified contact angle experiencing large loading conditions. The contact angles can shift due to the applied loading and may impact the detected frequencies.

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.

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