

Bearing Damage Analysis

To learn more about each damage mode, reference the bearing damage analysis brochure, or contact your local Timken sales or service representative.

TIMKEN

Hard particle contamination
Fine particle contamination
Internal cage wear from fine particle contamination
Horizontal grooving

Typical causes include improper cleaning methods, poor oil filtration or seal wear.

Foreign Material

Corrosion on the outer ring race
Etching and corrosion
Advanced corrosion and spalling
Roller-spaced spalling

Typical causes include damaged packaging, improper storage and worn or damaged seals.

Corrosion/Etching

Race deformation from excessive heat generation
Complete bearing lockup
Peeling
Rib and roller end heat damage
Scoring damage on roller end

Typical causes include improper grease or oil viscosity, low flow rate and high operation temperatures.

Inadequate Lubrication

Fatigue spalling on a cylindrical roller bearing
Roller fracture
Fatigue spalling on ball bearing inner ring
Peeling

Typical causes include high load, misalignment and stress concentration.

Excessive Preload, Overload and Rollout

Irregular roller path caused by deflection
Geometric Stress Concentration (GSC) spalling on bearing outer ring
Irregular roller path (180 degree opposite of above)

Typical causes include high load, shaft or housing deflection, inaccurate housing or shaft machining.

Misalignment

Outer ring denting
Fractured inner ring rib
Roller spaced nicking

Typical causes include improper tool selection (hardened drivers) and poor handling practices.

Handling Damage

Cage deformation
Roller binding and skewing
Deep dent on cage

Typical causes include improper handling, tools and procedures.

Cage Damage

Loose outer ring fit in a wheel hub
Fracture on inner ring
Metal contaminant

Typical causes include wrong size and poor form, shaft or housing stress risers and inaccurate machining.

Improper Fitting Practices in Housing or on Shaft

Roller impact damage
True metal deformation
Shock loading

Typical causes include rough handling and shock loads exceeding the material's limits.

Brinell and Impact Damage

False brinell on a shaft where a cylindrical bearing was mounted
Wear caused by vibration
False brinell on outer race

Typical causes include excessive vibration during shipment or when the shaft is stationary.

False Brinelling

Point Surface Origin (PSO) spalling
Geometric Stress Concentration (GSC) spalling

Typical causes of PSO include denting from hard particle contamination, nicking and handling damage. Typical causes of GSC include high load, misalignment and stress concentration.

Fatigue Spalling

Witness mark from high spot in the housing
Resulting localized spalling in raceway

Typical causes include improper machining, grinding or repair methods.

High Spots in Housing

Electric arc fluting
Fluting caused by electric current
Electric arc pitting
Roller with electric arc burns

Typical causes include improper electrical grounding of equipment, welding damage or static discharge.

Burns from Electric Current

Roller flats and adhesive wear
Skidding and wear on raceway surface
Spherical roller bearing with adhesive wear
Cylindrical roller end with adhesive wear

Typical causes include improper oil film, excess cage friction and gross roller sliding.

Adhesive Wear

WARNING
Failure to observe the following warnings could create a risk of death or serious injury.

Never spin a bearing with compressed air. The components may be forcefully expelled.

Proper maintenance and handling practices are critical. Always follow installation instructions and maintain proper lubrication.

A bearing/component should not be put into service if its shelf life has been exceeded.

CAUTION
Failure to follow these cautions may result in property damage.

Use of improper bearing fits may cause damage to equipment.

Do not use damaged bearings.

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