MOTION & CONTROL NSK

TECHNICAL INSIGHT

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Yield Longer Life in Motors and Gearboxes

Bearings operating in manufacturing equipment in extreme environments must perform well at higher speeds with heavier loads. Reliability of the equipment is equally important, and some applications once designed with ball bearings in mind no longer meet demand for longer life or higher reliability.

Cylindrical roller bearings are commonly used when high load-carrying capability and long life are required to meet design specifications.

Substituting Cylindrical Roller Bearings

Large horsepower electric motors illustrate the shift away from ball bearings. Often in many applications the drive end bearing is a deep groove ball bearing, however, these bearings may not be able to carry the required radial loads and subsequently do not yield a satisfactory life. Therefore substituting a cylindrical roller bearing allows the motor to perform more reliably under high loads.

Like the electric motor, many high-speed applications combine a cylindrical roller bearing with a ball bearing on the shaft, since there are key similarities between the two bearings:

- Dimensionally, ball bearings and cylindrical roller bearings are interchangeable. For example, an NU310 cylindrical roller bearing shares the same bore, O.D. and width as a 6310 ball bearing.
- Both bearing types have similar limiting speed capabilities, allowing the cylindrical roller bearing to operate at maximum speeds virtually identical to the ball bearing.

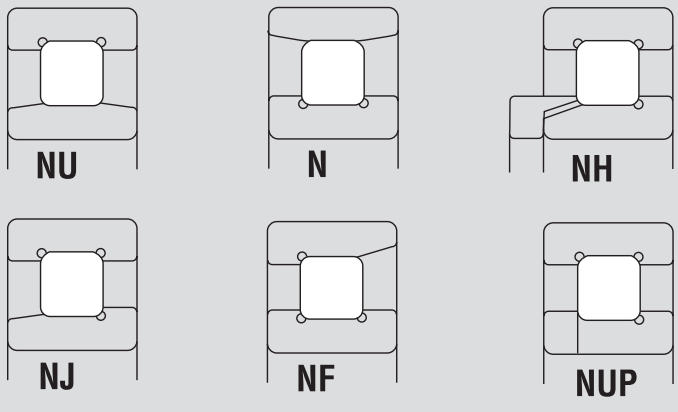
Wide Variety of Designs Available

Cylindrical roller bearings are available in a variety of designs, allowing you to customise for specific applications. Choosing the right design for the job at hand depends on the mounting arrangement and whether or not the bearing must carry an axial (thrust), as well as a radial load. Here are the different types of cylindrical roller bearings available:

Cylindrical roller bearings come in multi-row designs as well. Typically, bearings for ultra-high speed machine tool spindles are double row – either an NNU or NN-type. Four-row NU-type bearings are common in wire and bar mill rolling stands in steel mills.

Tolerances for bearing bore, O.D. and width normally adhere to ISO specifications. While Class Normal is the standard tolerance, higher precision cylindricals are available for special applications. Tolerance and class designations are identical to those used for ball and spherical roller bearings.

Several different cage variations are available for cylindrical roller bearings. Stamped steel is common for small sizes, most often the one-piece window type. Some small sizes use high-strength polyamide materials. Larger bearings call for machine brass cages, either two-piece riveted or one-piece designs. Multi-row bearings usually employ a one-piece finger type cage made of machined brass.



Important Design Considerations

High radial loads affecting both bearings on a shaft will lead some engineers to consider cylindrical rollers in both positions. Thus, the bearings may carry some axial (thrust) loads as well. The engineer may choose to specify a pair of NJ or NF-type cylindricals in these situations.

Typical applications are gearboxes or a pulley jack shaft, where small axial loads result from gear loads or belt alignment. The thrust load such bearings can carry depends on the series, normal operating speed and lubricant type. As a rule of thumb, when bearing speed increases, thrust load capability decreases. If oil is used as the lubricant instead of grease, the bearing can carry a higher axial load.

For best results when specifying a cylindrical roller bearing, contact NSK engineering to determine the right bearing selection.

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