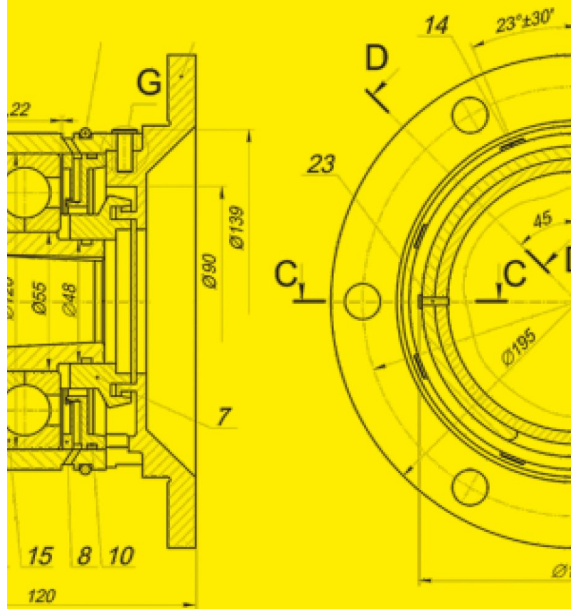




CK BIRLA GROUP

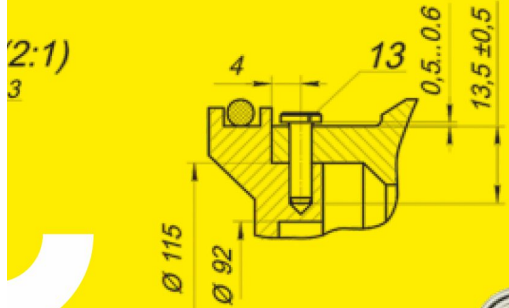


CATALOGUE/TC-106, 01/2024



ROLLING BEARINGS

Limiting Speed



This version supersedes all previously published versions. All the bearing mentioned in this catalogue are manufactured with normal tolerance class. We can, however, supply other class bearing against specific requirement.

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2 WHEELERS



3 WHEELERS



4 WHEELERS



TRACTORS



LCV, HCV



INDUSTRIES



RAILWAYS



AEROSPACE



WINNER
DOMING GRAND PRIZE

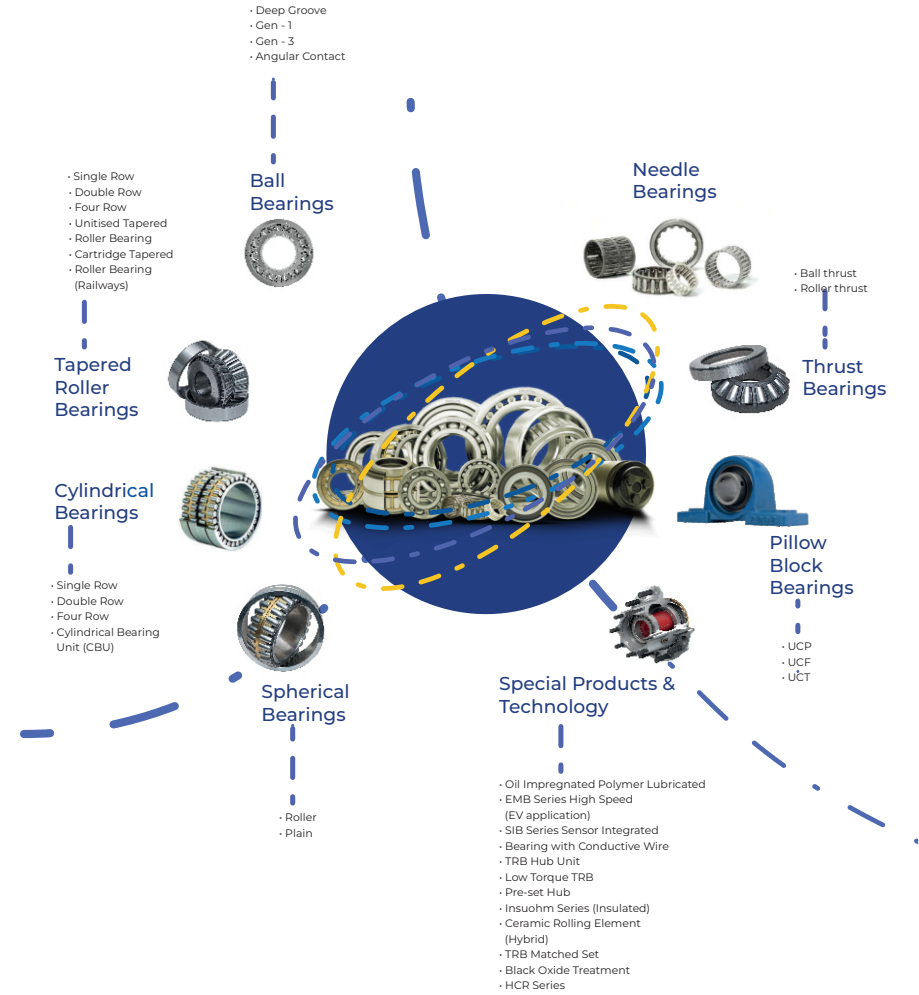
Products from NBC

Founded in 1946, NBC is India's first bearings manufacturer and the last word in quality and durability. In 2020, the company acquired leading European manufacturer, Kinex Bearings to further boost its expertise.

75 years since its beginning, NBC remains India's leading bearings manufacturer and exporter. NBC is also the world's only bearings manufacturer to receive the prestigious Deming Grand Prize for Total Quality Management.



Since the challenges faced by industry are many, NBC offers a diverse range of exceptional bearings. NBC bearings are available in sizes from 04 mm bore to 2000 mm outer diameter.



* Products with special features like high temperature application, special heat treatment, coated roller/faces and cage options are also available across product range.

09 Limiting Speed

As bearing rotational speed increases, the temperature of the bearing also increases due to friction heat generated in the bearing interior. If the temperature continues to rise and exceeds certain limits, the efficiency of the lubricant drastically decreases, this causes damage to the bearing such as seizure and the bearing can no longer continue to operate in a stable manner.

Therefore, the maximum speed at which it is possible for the bearing to continuously operate without the generation of excessive heat beyond specified limits is called the **limiting speed or allowable speed (r/min)**. The limiting speed is derived from ISO 15312 standard.

The factors that can affect the maximum allowable bearing speed include:

- (1) Bearing type
- (2) Bearing dimension and accuracies
- (3) Lubrication system (grease lubrication, air-oil lubrication, jet lubrication, etc.)
- (4) Internal clearance or preload on the bearing
- (5) Bearing arrangement (2-row, 3-row, 4-row)
- (6) Bearing load (C/P ratio)
- (7) Accuracies of shaft, housing, etc.
- (8) Type of Cage & design
- (9) Centrifugal forces, gyroscopic moments etc.
- (10) Loss of fits
- (11) Temperature increase results in heat generation, viscosity loss and reduces clearance

Besides the precision of the bearing itself, the magnitude and direction of the load, the type of cage, the type of lubricant and lubrication system, the rate of heat dissipation, the alignment, the mounting practice, and the balance of the rotating components all play a significant role in deciding limiting speed of bearing. Since each application must be evaluated on its own merits, it is recommended to consult NBC application engineering when the speed approaches the limiting value.

The maximum allowable speeds listed in the bearing dimensions tables are reference values and are applicable only to individual bearings that are adequately lubricated and correctly preloaded under a condition where the heat is reliably removed from the bearing arrangement. The limiting speeds listed in the bearing tables for grease and oil lubrication are for standard NBC bearings under normal operating conditions, correctly installed, using the suitable lubricants with adequate supply and proper maintenance. Consult NEI engineering for limiting speed for bearings with polyamide cage, contact type sealed bearings and higher requiring higher accuracy class.

In the case of grease lubrication, these speeds are attainable only when the bearing is filled with an adequate amount of high-quality grease, the bearing is sufficiently run in, and heat is removed by an arrangement such as a cooling jacket. The maximum allowable speed of a particular bearing can vary depending on the relation between heat generation and heat dissipation in the bearing as well as how well the bearing is lubricated.

The bearing dimensions table gives approximate Allowable/limiting rotational speeds for grease and oil lubrication. The values are based on the following:

- The bearing must have the proper internal clearance prescribed in the NBC Engineering standard design specifications and must be properly installed.
- A quality lubricant must be used.
- The lubricant must be Replenished and changed when necessary.
- The bearing must be operated at normal operating temperature under ordinary load conditions ($P \leq 0.09 C_r$ & $F_a / F_r \leq 0.3$).
- If load is $P \leq 0.04 C_{or}$, the rolling elements may not turn smoothly. If so, please contact NBC Engineering for more information.
- Allowable rotational speed for deep groove ball bearings with contact seal (LLU type) or low-torque seal (LLH type) is determined according to the circumferential speed of the seal.
- For bearings to be used other than standard mentioned conditions please consult NBC engineering for limiting speed.
- Always limit the speed of Bearing 80% less than Limiting speed

Correction of Limiting speed

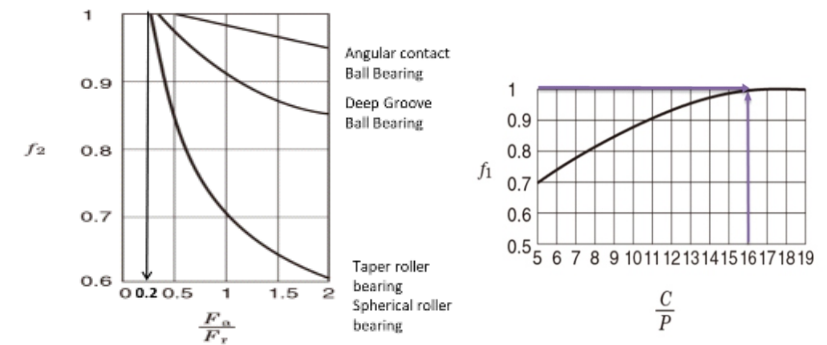
During operation when the load condition are $C/P = 16$ and the limiting speed must be corrected by multiplying the limiting speed given in the bearing catalogue using the formula and the values of f_1 & f_2 from the graphs

Where,

f_1 - Limiting speed correction factor for Dynamic Load (C) to equivalent Load ratio

f_2 - Limiting speed factor for Combined Load Ratio B/w Axial (F_a) and Radial Loads (F_r)

N – Limiting speed given in bearing tables.



From both graphs f_1, f_2 are equal to 1 for the condition $C/P = 16$ and $F_a = 0.2 F_r$. For other condition like C/P and $F_a = 0.2 F_r$, corresponding values of f_1, f_2 to be multiplied for correcting the limiting speed.