



Maximum permissible bearing speed

Each bearing type has its own limiting speed. The theoretical speed that bearings can run at safely, even if heat generation by internal friction occurs, is called the maximum permissible speed.

The permissible speed is related to bearing type, type of cage, lubricant type, load and cooling conditions to which the bearing is subjected.

For contact rubber seals(2RS type), the permissible speeds are limited by the peripheral velocity of the seal lip. Normally, this is approximately 50 - 60% of that of non-contact rubber seals. If light contact rubber seals are required, this must be stipulated with the order.

If high loads occur, the permissible speed values must be reduced and the following supplementary factors applied, except under standard operating conditions($Cr/P < 12$, $Fa/Fr > 0.2$)

●COMPENSATION FOR MAXIMUM PERMISSIBLE SPEED DEPENDENT ON LOAD RATIO

Cr/P	5	6	7	8	9	10	11	12
COMPENSATION FACTOR	0.72	0.79	0.85	0.90	0.93	0.96	0.98	1.00

●COMPENSATION FOR MAXIMUM PERMISSIBLE SPEED UNDER COMBINED AXIAL AND RADIAL LOAD

Fa/Fr	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00
COMPENSATION FACTOR	1.00	0.95	0.93	0.91	0.89	0.88	0.87	0.86

If the bearing operates at over 70% of the permissible speed value, a lubricant for high speed should be selected.

The values for the permissible speed are for applications with horizontal shafts and with appropriate lubrication. With vertical shafts, only 80% of the maximum speed value should be used. This is necessary due to the reduced cage guidance and reduced lubricant retention in this type of application.



Frictional torque and temperature

FRICIONAL TORQUE

Frictional torque of rolling bearings varies under changing load and lubrication conditions. When grease is used as a lubricant, the grease resistance must be added to the bearing frictional torque.

When adequate lubrication under normal loading conditions($Cr/P > 12$, $Fa/Fr < 0.2$), the frictional torque of a bearing can be expressed as follows:

$M = \mu \cdot F \cdot d / 2 \text{ (N}\cdot\text{mm)}$	M: FRICTIONAL TORQUE(N·mm) F: BEARING LOAD (N) d: SHAFT DIAMETER(mm) μ := 0.0015 COEFFICIENT OF FRICTION
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TEMPERATURE INCREASE

Friction and grease resistance can increase the bearing temperature. In the initial stages of operation, the internal bearing temperature rises rapidly: as the heat dissipates to the shaft and housing and the cooling effect of the lubricant begins to take effect, the temperature stabilizes. Constant high temperatures lead to a reduction in bearing clearance, a deterioration of the running accuracy and of the lubricant and thereby a reduction in bearing life. It is important to consider the effect of temperature increases when selecting the bearing.

Technical

Dimension



Basic rules for selecting and handling of bearings

NOTES ON SELECTING

- ◆ The efficiency of thin type bearings can be greatly affected by the precision of shaft and housing seats. The accuracy of the surrounding structure must be such that it will not adversely affect the operation of the bearing. If you have any questions, in particular regarding series 670 and 680, please contact us.
- ◆ In applications with steel crown type cages (w type), where high acceleration, heavy loads, shock loads or vertical shafts occur or where oil is the only lubricant available, please contact us.
- ◆ Selection of fitting clearance and grease type requires a careful consideration of rotating speed, load conditions and temperature in order to prevent premature bearing failure.
- ◆ Full complement ball bearings are suitable for low speed and heavy radial load conditions. There is a danger of balls being pushed out of the bearing through the filling slot, even under light axial load. For this reason, full complement ball bearings are not suitable for supporting axial loads.

NOTES ON HANDLING

- The actual assembly area should be kept free from dust as any contamination has a detrimental effect on the operation and life of rolling bearings. If there is any doubt concerning the cleanliness of a bearing, it can be washed with a suitable agent and then relubricated.
- When fitting bearings, the fitting forces must not be transmitted via the rolling elements. If it is necessary to heat the bearing to facilitate fitting, the temperature should not exceed +120°C.