

Misalignment

In practice, shaft and housing axes can never be perfectly aligned. Even the smallest angular deviations – known as misalignments – change the load distribution within the bearing and directly affect its load carrying capacity, friction and service life. To ensure reliable operation, permissible misalignment limits must be defined and maintained. Typical permissible misalignments:

Single-row deep groove ball bearings: up to approx. 0.14° (8') under light load, up to approx. 0.28° (16') under heavy load

Cylindrical roller bearings: 0.02° ($\approx 2'$) to 0.07° ($\approx 4'$), depending on series

Spherical roller bearings: 1° to 2.5° total angular error

Thrust bearings (cylindrical/spherical/needle): 0.5° to 2° , depending on the load ratio P/C

Adhering to defined misalignment tolerances is essential to achieve the intended bearing life and efficiency. For higher deviations, bearings with integrated self-aligning capability (such as spherical roller bearings) or flexible shaft and housing supports are recommended to prevent peak loads and premature wear.

| Bearing type | Series/Design | Condition | Misalignment |
|--|-----------------------|-----------|-----------------|
| Deep groove ball bearings | Series 60, 62, 63, 64 | P/C < 0,2 | 5' ... 12' |
| | | P/C ≥ 0,2 | 8' ... 16' |
| | Series 618, 619, 160 | P/C < 0,2 | 3' ... 8' |
| | | P/C ≥ 0,2 | 5' ... 10' |
| | Double-row | | Not permissible |
| Self-aligning ball bearings | Series 12 / 22 | | 2,5° |
| | Series 13 / 23 | | 3° |
| | Sealed version | | 1,5° |
| Angular contact ball bearings (Single- and double-row) | | | Not permissible |
| Needle bearings | | P/C < 0,2 | 1' ... 2' |
| | | P/C ≥ 0,2 | 2' ... 4' |

| Bearing type | Series/Design | Condition | Misalignment |
|------------------------------------|--------------------|-----------|-----------------------------------|
| Thrust needle roller bearings | | P/C < 0,2 | 2° |
| | | P/C ≥ 0,2 | 0,5° |
| Cylindrical roller bearings | Width series 0 & 1 | | ≈ 4' (0,0012 rad) |
| | Width series 2 | | ≈ 2' (0,0006 rad) |
| | Double-row | | Not permissible |
| Tapered roller bearings | | | ≈ 3' (0,0009 rad) |
| Spherical roller bearings | | P/C < 0,2 | 2° |
| | | P/C ≥ 0,2 | 0,5° |
| Support and cam rollers | | | Not permissible |
| Thrust cylindrical roller bearings | | | ≈ 1° ... 2° (0,018 ... 0,036 rad) |
| Thrust spherical roller bearings | | P/C < 0,2 | 2° |
| | | P/C ≥ 0,2 | 0,5° |

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