Bearing data

Reduction in radial internal clearance due to fit

The radial internal clearance is reduced due to the fit as a result of expansion of the inner ring and contraction of the outer ring:

\[ \Delta s_p = \Delta d + \Delta D \]

- \( \Delta d \) \( \mu m \): Expansion of the inner ring
- \( \Delta D \) \( \mu m \): Contraction of the outer ring

Expansion of the inner ring

The expansion of the inner ring is calculated as follows:

\[ \Delta d = 0.9 \cdot U \cdot d / F + 0.8 \cdot U \]

- \( d \) mm: Bore diameter of the inner ring
- \( U \) mm: Theoretical interference of the fitted parts with firm seating.
- \( F \) mm: Raceway diameter of the inner ring.

For very thin-walled housings and light metal housings, the reduction in the radial internal clearance must be determined by means of mounting trials.

Contraction of the outer ring

The contraction of the outer ring is calculated as follows:

\[ \Delta D = 0.8 \cdot U \cdot E / D + 0.7 \cdot U \]

- \( E \) mm: Raceway diameter of the outer ring
- \( D \) mm: Outside diameter of the outer ring.

Reduction in radial internal clearance due to temperature

The radial internal clearance can alter considerably if there is a substantial temperature differential between the inner and outer ring.

\[ \Delta s_t = \alpha \cdot d_m \cdot 1000 \cdot (\theta_B - \theta_A) / 1000 \]

- \( \alpha \) K\(^{-1}\): Coefficient of thermal expansion of steel: \( \alpha = 0.000011 \) K\(^{-1}\)
- \( d_m \) mm: Mean bearing diameter \( (d + D) / 2 \)
- \( \theta_B \) °C, K: Temperature of the inner ring
- \( \theta_A \) °C, K: Temperature of the outer ring

(usual temperature difference between inner and outer ring: 5 K to 10 K).

A larger radial internal clearance should be used for shafts running at high speeds, since adequate thermal compensation between the bearing, shaft and housing does not occur in this situation. \( \Delta s_t \) can be significantly higher in this case than for continuous operation.