

Given: Bearing must last for 1800 hr with a reliability of 90 percent.

Find: Rated life of bearing.

Solution: The L_{10} life has a 90% reliability. Therefore the L_{10} rated life must be 1800 hr.

Given: Ball bearing must withstand 4 kN for 1800 hr with a reliability of 90% at a speed of 600 rev/min.

The catalog rating sheets are based on an L_{10} life of 3800 hr at 500 rev/min.

Find: Load to be used with catalog data to select the bearing.

Solution:

$$L_1 = (600 \text{ rev/min}) (1800 \text{ hr}) \left(\frac{60 \text{ min}}{\text{hr}} \right) \quad F_1 = 4 \text{ kN}$$
$$= 43.2 \times 10^6 \text{ rev.}$$

$$L_2 = (500 \text{ rev/min}) (3800 \text{ hr}) \left(\frac{60 \text{ min}}{\text{hr}} \right) \quad F_2 = ?$$
$$= 114 \times 10^6 \text{ rev.}$$

$$\frac{L_2}{L_1} = \left(\frac{F_1}{F_2} \right)^k \Rightarrow F_2 = F_1 \left(\frac{L_2}{L_1} \right)^{1/k}$$

for a ball bearing, $k=3$

$$\Rightarrow F_2 = 4 \text{ kN} \cdot \left(\frac{114 \times 10^6}{43.2 \times 10^6} \right)^{1/3}$$

$$F_2 = 5.53 \text{ kN}$$