

BASIC BEARING LIFE

2.1.2 Required Basic Life

With the aid of the life equations according to section 2.1.1, the correct bearing size can be selected, if the required life is known from the conditions of the machine operation and the requirements on the operating reliability. If data concerning the required life is not available, approximate values can be obtained from figure 1.

2.1.3 Service Life

The service life is the life actually reached by a roller bearing, which can deviate from the calculated life. For instance, misalignment between shaft and housing, contamination of the bearings, too high operating temperatures or insufficient lubrication may cause premature failure due to wear or fatigue.

Unfavorable operating conditions such as oscillating bearing motion with very small angles of oscillation, or vibrations of the bearings while not rotating, may also cause premature bearing failure due to brinelling.

Considering the multitude of applications and operating conditions, the service life of bearings cannot be exactly determined. The safest way to estimate the service life, now as before, is by comparison with similar applications.

2.2 Static Load Carrying Capacity

The static load carrying capacity is limited by the permanent deformation of the rolling elements and raceways, which is still considered permissible with the regard to the noise level during subsequent bearing operation. This definition of permissible permanent deformation leads to the term static load rating. The measure of static load rating is defined by the static load safety factor.

2.2.1 Static Load Safety Factor

The static load safety factor indicates the safety against the permissible permanent deformation in the bearing and is defined as follows:

$$S_0 = C_0 / F_0 \quad (4)$$

S_0 —
static load safety factor

C_0 lbf
basic static load rating. In radial bearings, C_0 is the load in the radial direction and in thrust bearings the concentrically acting axial load, for which the Hertzian pressure between the rolling elements and the raceways at the most highly loaded position in the bearing reaches the value 580,000 psi (4000 N/mm²). This load causes, under normal contact conditions, a permanent total deformation of 1/10,000 of the rolling element diameter.

F_0 lbf
maximum load of the radial or thrust bearings

2.2.2 Required Static Load Safety Factor

The guideline values shown in table 1 are recommended for the static load safety factor.

Table 1 • Recommended static load safety factor

Application	S_0
Quiet, vibration free operation with low demands for smooth running; bearings with only slight rotational movement.	≥ 1
Normal operation with higher demands for smoother running	≥ 2
Operation with distinct shock loads	≥ 3
Bearing arrangements with high demands for accuracy and smooth running	≥ 4

For shell bearings, the value $S_0 \geq 3$ should be used.

2.3 Influences on the Load Carrying Capacity

The basic load ratings shown in this catalog are valid for a hardness of 670 to 840 HV (RC 58 to 65) for raceways and rolling elements with a fine grain material structure which is characteristic for rolling bearing components.

BASIC BEARING LIFE

a_1 —
factor for reliability other than 90%

a_2 —
material factor

a_3 —
factor for operating conditions, especially for lubrication conditions.

Under normal conditions $a_1 = a_2 = a_3 = 1$, so equation (3) is identical to equation (1).

For determination of the adjustment factors, it is necessary that all operating conditions (individual loading conditions, influence of misalignment, bearing temperature, etc.) are exactly known. If this is the case, the adjustment factors can be determined, based on special guidelines, by the INA Engineering Department and then substituted into equation (3).

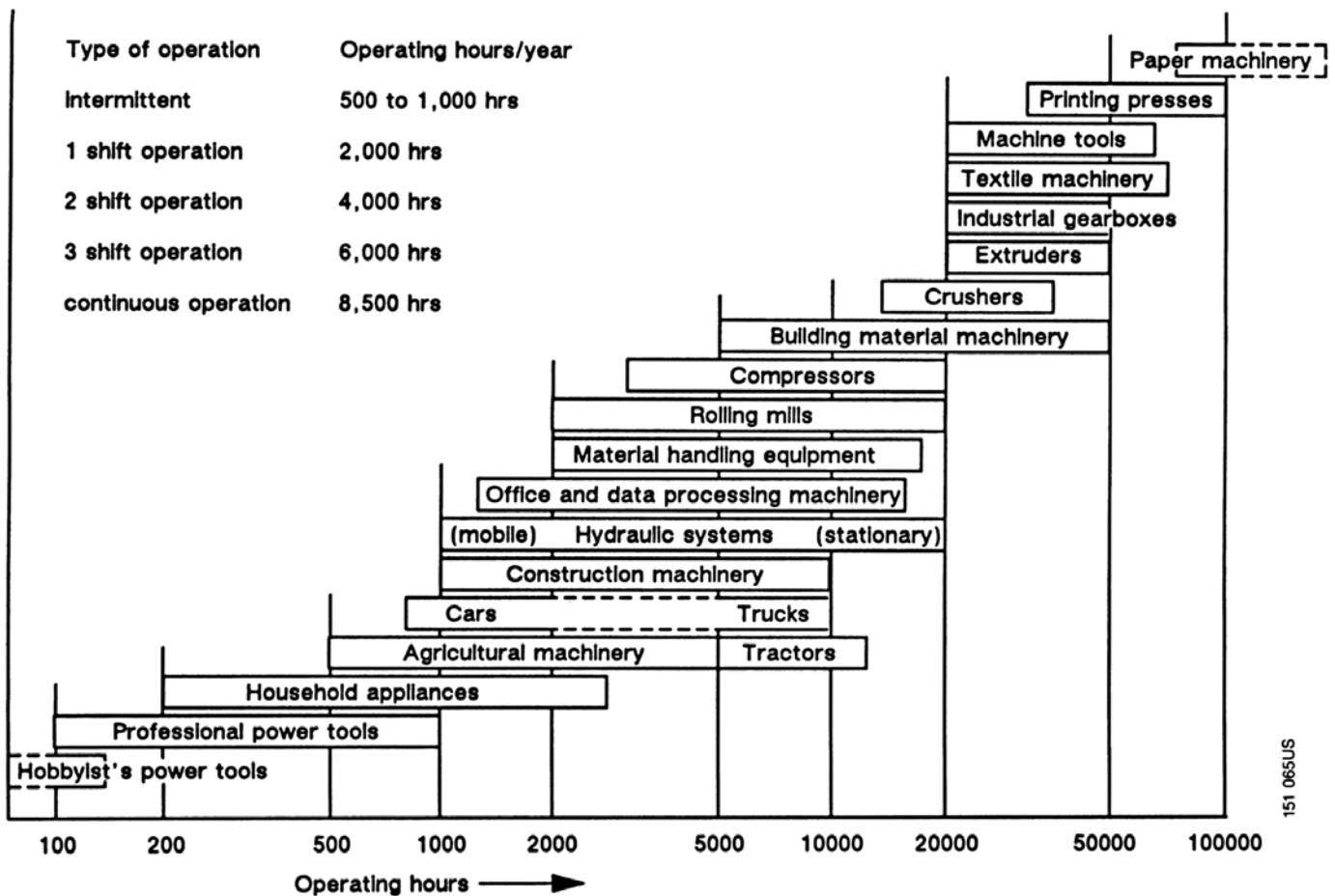


Figure 1 • Approximate values for the basic life of rolling bearings