Definition of Dynamic and Static Radial Load Ratings

The size of a bearing to be used for an application is initially selected on the basis of its load carrying capacity in relation to the loads to be carried and the requirements regarding life and reliability. Numerical values of basic load ratings are used in calculations to express load carrying capacity. The basic dynamic load rating C and the basic static load rating Co are quoted in the bearing tables. All values expressed are radial ratings.

Dynamic Radial Load Rating

The basic dynamic load rating C is used for calculations involving the selection of bearings which rotate under load. It expresses the bearing radial load which will give a basic rating life of one million revolutions. The actual calculated life depends on the magnitude of the imposed load. The imposed load produces rolling element and raceway deformation as illustrated in figure 1, resulting in tensile (t) and compressive (c) stresses as each rolling element passes through the loaded zone. As these stress cycles are repeated, as determined by the number of revolutions of calculated life, sub-surface metal fatigue cracks occur which eventually propagate to the raceway surface causing metal flaking, or spalling, at which time the bearing has achieved its useful life.

The basic dynamic radial load ratings of MRC Bearings have been determined in accordance with the latest ISO and ABMA standards and are based on the material and manufacturing techniques used for MRC standard production. They apply to radial loads acting on radial and angular contact bearings which are constant in magnitude and direction. For single row angular contact bearings, the radial load rating refers to the radial component of that load which causes a purely radial displacement of the bearing rings in relation to each other.

Static Radial Load Rating

The basic static radial load rating C_o is used when bearings rotate at very slow speeds, are subjected to very slow oscillations, or stationary under load. It also must be considered when heavy shock loads of short duration act on a rotating bearing.

The basic static radial load rating is defined in accordance with ISO and ABMA standards as the static radial load which corresponds to a calculated contact stress at the center of the most heavily loaded rolling element/raceway contact of 609000 PSI for all radial and angular contact ball bearings. For this contact stress, a total permanent deformation of rolling element and raceway occurs which is approximately 0.0001 of the rolling element diameter as shown in figure 2.

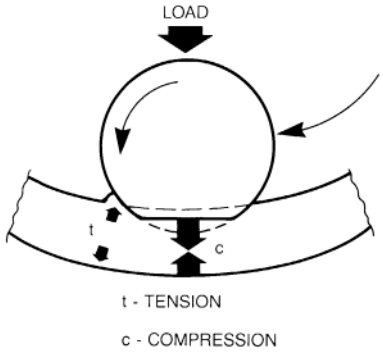

Figure 1

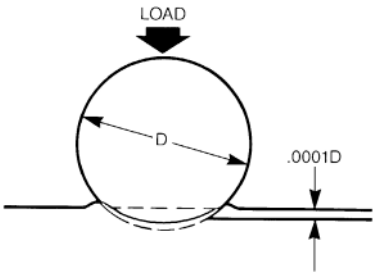

Figure 2

Definition of Bearing Life

The life of a rolling bearing is defined as the number of revolutions or the number of hours at a given speed which the bearing is capable of enduring before the first sign of fatigue failure occurs on one of its rings or rolling elements.

The fatigue failure usually takes the form of surface spalling or flaking which progresses to the point where the bearing become inoperative. The load ratings shown in this catalog are based on the useful life of a bearing as limited by this type of failure.

When a group of identical bearings are run under a set condition of speed and load, there will be considerable variation in the fatigue lives in the group. As a result, life must be treated statistically.

The life which 90% of a group of bearings will exceed is known as the ''minimum life'' or ''rating life''. A commonly used term as used in this catalog is ''L10''. The life which 50% of a group of bearings will exceed is the ''median life'' (L50) and is approximately five times the ''minimum life''.

The actual life of a specific bearing is referred to as ''service life'' and unlike ''minimum'' or ''rating'' life, is not generated by fatigue. It is the result of contamination, corrosion, misalignment, etc., significantly reducing life.

Life Adjustment Factor for Reliability, a_1

To determine bearing life in accordance with reliability greater than 90%, the L10 life must be multiplied by the factor a_1 as shown in the table below.

Life Adjustment Factor for Reliability, a_1		
Reliability %	**L_{ma}**	**a_1**
90	L_{10}	1
95	L_5	0.62
96	L_4	0.53
97	L_3	0.44
98	L_2	0.33
99	L_1	0.21

When bearings are stationary, rotate or oscillate very slowly or subjected to heavy shock loads, the basic static load rating (Co) must not be exceeded. As specified in ABMA and ISO standards, the static load rating is that load which produces a total permanent deformation of the rolling element or raceway which is approximately 0.0001 of the rolling element diameter. Deformation greater than this amount may result in noisy operation and premature failure.

Determination of Bearing Life

Bearing ''rating life'' can be calculated by referring to the procedure and examples located at the back of each bearing section. Both Dynamic (C) and static (Co) load ratings are listed on the preceding pages. The load ratings and life calculation method agree with ABMA and ISO standards, with the exception of Mast Guide and PumPac bearings. The rating of these bearings has been modified to reflect raceway curvatures less than a total of 54 percent.