

Status of Bearing Load Ratings

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Until recently, bearing manufacturers used a standard method of calculating the static and dynamic load ratings. These standard methods were developed in the late '40s and early '50s and were recognized by the International Standards Organization (ISO) and American National Standards Institute (ANSI)/Anti-Friction Bearing Manufacturers Association (AFBMA). The use of these standard methods resulted in a straightforward method for the user to compare bearings.

This all changed during the '60s. Bearing manufacturers realized that since the early 1950s, significant improvements in bearing performance had been achieved, the most important of which were cleaner bearing steels and improved understanding/control of bearing geometry. Although the standards used for calculating the ratings needed to be updated, which would take some time, bearing manufacturers attempted to show this improved performance in their catalogs. Unfortunately, they used different procedures to show these improvements.

Two basic methods were used to show the improved performance of the bearings. The first was to use the original load rating and indicate that life had improved, either in time or revolutions. Bearings were shown to last up to three times longer than before.

The other method of showing the improvement in bearing performance was to increase the load rating for the original life. The improvements in load ratings were up to 1.42 times the original values.

With these two very different methods, it was difficult and sometimes impossible to determine if like bearings had similar performance characteristics.

The ISO and AFBMA have been working for the past several years to update these standards, and it now appears that they will complete their work in the near future. The ISO and AFBMA standards are very similar, although there are some exceptions (which will be covered later). The ISO and AFBMA used the method of increasing the load ratings to show improved bearing performance. The standards are listed below.

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ISO

- ISO 76 Static Load Ratings
- ISO 281 Dynamic Load Ratings

ANSI/AFBMA

- Std. 9 Ball Bearing Load Ratings
- Std. 11 Roller Bearing Load Ratings

The improvement factors for dynamic load ratings in these updated standards are shown below. An improvement factor of 1.0 indicates the rating is the same as the original value.

The only difference between the ISO and AFBMA standards is the improvement factor for insert bearings, which is still in the process of being resolved. There will probably be an effort to make the improvement factor for

tapered roller bearings the same as the spherical roller bearings.

Because they are now based on the maximum contact stress that a bearing can endure before significant permanent damage occurs, static load ratings for ball bearings have been increased. These load ratings used to be based on the allowable permanent deformation. This new method lends itself to a more simple method of calculating the values. Only the ball bearing was changed based on the determination that ball bearings can handle a greater contact stress than roller bearings before significant permanent damage occurs. The ISO and AFBMA improvement factors for static load ratings are the same and are shown below.

DYNAMIC LOAD RATINGS		
Bearing Type	Improvement Factor	
	ISO	AFBMA
Ball Bearings		
Single row radial contact groove ball bearings and single and double row angular contact groove ball bearings	1.3	1.3
Insert ball bearings	1.0	1.3
Filling slot ball bearings	1.1	1.1
Double row radial contact groove ball bearings	1.3	1.3
Single and double row self-aligning ball bearings	1.3	1.3
Single row radial contact separable ball bearings (magenta bearings)	1.3	1.3
Thrust ball bearings	1.3	1.3
Roller Bearings		
Cylindrical roller bearings, tapered roller bearings and needle roller bearings with machined rings	1.1	1.1
Drawn cup needle bearings	1.0	1.0
Spherical roller bearings	1.15	1.15

STATIC LOAD RATINGS	
Bearing Type	Improvement Factor
Radial and angular contact groove ball bearings	1.15
Self-aligning ball bearings	1.50
Thrust ball bearings	1.15
Roller bearings	1.00

The development of these standards is a significant step toward correcting the load-rating situation. The next phase of this effort will be the updating of the manufacturers' catalogs. It is not clear whether all manufacturers will update their catalogs to agree with these new standards; even if they do, it will take a long time and out-of-date catalogs will still exist.

For this reason, bearing users will be faced with this problem for some time. In the meantime, we would recommend that the user specify load ratings based on the ISO and AFBMA standards.