Spherical Plain Bearing Life and Load Ratings

Dynamic Load Rating

Dynamic load rating is used for calculations when the spherical plain bearing is subjected to dynamic stress. It represents the load, constant in magnitude and direction, under which a basic rating service life, expressed as a sliding distance, will be attained for continuous oscillating movement at a defined sliding velocity and at room temperature. It presupposes that the load acting on radial and angular spherical plain bearings and on rod ends is purely radial and that the load acting on spherical plain thrust bearings is purely axial and acts centrically. Dynamic stresses occur when tilting, oscillatory or rotational movements are made under load as well as micro-sliding movements under alternating loads, e.g. resulting from vibration, or loads which alternate at high frequency. The various types of dynamic stress often occur in combination.

The values of load ratings are always dependent on the definition used. It is therefore not always possible to make direct comparisons with load ratings published by other manufactures.

Static Load Rating

Static load rating is used when spherical plain bearings remain stationary under load (or make occasional alignment movements) and it should also be considered when dynamically loaded bearings are subjected to heavy shock loads. The static load rating represents the load which can be taken by a spherical plain bearing when static contact stress of bearing contact surface reaches the material stress limit. It is valid at room temperature and it is presupposed that the surrounding components prevent deformation of the bearing. At higher temperature, the static load rating must be multiplied by a temperature factor, depend on the sliding contact surface combination. The temperature factor is the same as for dynamically stressed bearing. It is also necessary to take into consideration the permissible temperature range for the various sliding contact surface combinations. For rod ends, it is the strength of the rod end housing under stationary load which is considered. The rod end static load ratings give a safety factor of 1.2 times the tensile strength of the rod end housing material.

Service Life of Spherical Plain Bearings

The service life of a spherical plain bearing operated under mixed or dry friction conditions is determined by the increase in bearing clearance or bearing friction caused by progressive wear of the sliding surfaces, plastic deformation of the sliding material, or fatigue of the sliding surface. Depending on the application, the permissible wear or permissible increase in friction will be different. This means that under the same operating conditions the service life which can be obtained in practice will be different.

The service life of a spherical plain bearing is the number of oscillating movements, or the number of operating hours, which the bearing will service before a defined increase in bearing clearance or a defined increase in friction is reached.

The effective service life is that life which will be attained by a given spherical plain bearing under actual operating conditions. It is determined by the magnitude and type of load, but also by several other factors, such

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as contamination, corrosion, high-frequency load and movement cycles, shock etc. Some of these factors are impossible to determine or can only be determined with difficulty.

Bearing Contact Pressure

If an adequate operating life is to be achieved, a basic requirement is that the bearing contact pressure is compatible with the operating conditions. The bearing contact pressure identifies the surface pressure occurring in the bearing and is a decisive criterion for the assessment of a spherical plain bearing in each individual application. The maximum allowable static contact pressure is 50,000 psi (345 MPa) and the maximum allowable dynamic contact pressure is 12,500 psi (86 MPa). Below is a formula for determining contact pressure in a given application. Please contact AST Engineering for further assistance.

$$p = k \cdot \frac{P}{C_d}$$

p=contact pressure	N/mm^2
k=contact pressure parameter	N/mm^2
C_d =Dynamic load rating	kN
P=Equivalent dynamic bearing load	kN

Contact Surface Combination	Value of load ratio C_d/P	Load Factor k
Steel / Steel	2.00	100
Steel / Bronze	2.00	50
Steel / PTFE Fabric	1.75	150
Steel / PTFE Composite Material	2.00	100
Steel / Cooper Alloy	2.00	100