When the lubricating condition is ideal enough to form elastic fluid pressure oil film on the rolling contact surface of bearings , and can greatly decrease the probability of fatigue damage caused by surface failure, value a_3 can be chosen above 1.

When the lubrication is so poor that the dynamic viscosity of lubricant under working temperature is less than 13mm²/s for ball bearing, and less than 20mm2/s for roller bearing, or rotation speed is in particularly low (n. D_{pw} <10000; "n" stands for rotation speed, D_{pw} for Pitch circle diameter of rolling group.

11.4 Bearing dimension selection according to static load rating

Under working conditions listed below, the bearing dimension should be selected according to static load rating of bearings to guarantee its good performance.

1.Bearing takes continuous load or interval (impact) load when it remains still or rotates slowly (rotation speed ≤10r/min).

2.Bearing swings slowly under

3.Bearings under normal working load will take discontinuous and relatively large impact load in rotation process.

11.4.1 Static equivalent load of bearings

The radial/axial static equivalent load is radial/axial static load that, during rotation at very slow speed or when bearings are stationary, the same contact stress as that imposed under actual loading condition is generated at the contact center between raceway and rolling element to which the maximum load is applied.

11.4.2 Determine the static load rating required for bearings

The basic formula for selecting bearings according to static load rating should be:

$$C_0 = S_0 P_0$$

In the equation:

C_0: Static load rating N
P_0: Static equivalent load N
S_0: Safety coefficirnt

If the surface hardness of bearing decreases due to special heat treatment, hot operation etc., its capacity for static load will drop accordingly. The influence that material hardness has upon static load of bearing can usually be calculated by the equation below:

$$C_{OH} = \eta_H C_0$$

$$\eta_H = f_H \left(\frac{H_V}{800}\right)^2 \leq 1$$

In the equation:

C_{oH}: Static load rating N after correction of material Hardness
η_H: Hardness coefficient
f_H: Coefficient related to contact type, see Table 11.6
H_V : Vickers hardness value

Table 11.6 f_H value

Contact type	f_H
Ball and surface contact(spherical roller bearing)	1
Ball and raceway groove contact	1.5
Roller and roller contact (spherical roller bearing)	2
Roller and surface contact	2.5

11.4.3 Calculation method for static equivalent load

1.Static equivalent load of radial bearings is calculated according to the following equation:

a=0° radial roller bearing which only takes radial load: $P_{0r} = F_r$

Radial ball bearing and α ≠0° radial roller bearing:

We adopt the relatively larger value calculated by the two equations $P_{0r}=X_0F_r+Y_0F_a$ and $P_{0r}=F_r$

In the equation:

X_0: Static radial load coefficient
Y_0: Static axial load coefficient
For all values of bearing X_0 and Y_0, please refer to dimension and performance table for various bearings.

2.Axial static equivalent load for thrust bearings is calculated according to the following equation:

α =90° thrust bearing

$$P_{0a} = F_a$$

α ≠90° thrust bearing

$$P_{0a} = 2.3F_r tg\alpha + F_a$$

11.5 The selection of safety coefficent S_0

1)Stationary bearing

For stationary bearing as well as bearings that swing or rotate very slowly, safety coefficient S_0 can be chosen according to Table 11.7.

Table 11.7 Safety coefficient S_0 for static bearing

Bearing's application	S_0
Plane laminae of variable pitch propeller	≥0.5
Dam sluice gate Device	≥1
Suspension bridge	≥1.5
Heavy crane hook with small dynamic load	≥1
Minitype handing crane hook crampon with large dynamic load	≥1.6

2) Rotating bearing

For some swivel bearings with big change in bearing load, especially when there is major impact load in operation, we must verify the bearing in reference to static load rating after it was selected according to dynamic load rating. If bearing's rotation speed is low, and the requirement for running precision and friction moment is not high, relatively large contact stress is allowed, i.e. Can be chosenS_0<1 . By contrary, should be chosenS_0> 1 .The safety coefficient S_0 of Swivel bearing could be determined according to Table 11.8:

For spherical thrust roller bearing, whether it rotates or not, must be chosen S_0 ≥4.

In addition, when selecting bearing according to static load rating, we must pay attention to the rigidity of fitting position. When rigidity of bearing housing is relatively low, we could choose higher safety coefficient; contrarily, we should choose lower safety coefficient.

Table 11.8 Safety coefficient S_0 for rotating bearings

Application requirement or load characteristic	S_0	
	Ball bearing	Roller bearing
High requirement for running accuracy and smoothness, with impact load.	1.5~2	2.5~4
Normal use.	0.5~2	1~3.5
Low requirement for running accuracy and smoothness, without impact and vibration.	0.5~2	1~3