

Q&A

Question: What is the definition of Life of Ball Screws?

Is the Ball Screw Life predictable?

Ball Screw Life is classified into 3 type Life, which are flaking, lubrication, wreck, from the point of its function view. Generally flaking Life is called Ball Screw Life.

When Ball Screws are in operation with Axial load, surface of Shaft and Nut groove, and Ball surface receive repeated load. Afterward, Ball Screws are led to flaking because of fatigue of material. Total number of revolutions until first flaking on the surface is called Ball Screw flaking Life. Flaking life has a lot of deviations, so Ball Screw Life is defined below as a statistical phenomenon, which is called Basic Rating Life.

[The Basic Rating Life of Ball Screws means the total number of revolutions, which 90% of Ball Screws can endure. Failure is indicated by flaking caused by rolling fatigue on the surface of grooves or Balls. These figures are valid when a group of the same type Ball Screws are operated individually under the same condition.]

The Basic Dynamic Load Rating C_a is the Axial load for which the Basic Rating Life is 1,000,000 revolutions. Ball Screw's Basic Rating Life L_{10} can be estimated using Basic Dynamic Load Rating C_a in the following formula.

$$L_{10} = \left(\frac{C_a}{f \cdot F_a} \right)^3 \times 10^6 \text{ rev}$$

Also, in place of the total number of revolution, the Basic Rating Life can be expressed in hours (L_{10h}), or traveled distance (L_{10d}), and these can be calculated through the following formulas.

$$L_{10h} = \left(\frac{1}{60 \cdot N} \right) \times L_{10} \text{ hours}$$

$$L_{10d} = \left(\frac{\ell}{10^6} \right) \times L_{10} \text{ km}$$

C_a : Basic Dynamic Load Rating N {kgf}

F_a : Axial load N {kgf}

N : Revolution min^{-1} {rpm}

ℓ : Lead mm

f : Load factor

$f = 1.0 \sim 1.2$ (for almost no vibration, no shock condition)

$f = 1.2 \sim 1.5$ (for slight vibration, shock condition)

$f = 1.5 \sim 3.0$ (for severe vibration, shock condition)

This can be useful to predict the Ball Screw life!!!