

Service Life of Roller, Rail Guide and Ball Screw

It is primarily the guide values for the mechanical linear drive that are used when calculating nominal service life. The ball screw must also be taken into consideration for the drive with ball screw spindle. With the multitude of parameters crucial for the service life of the entire mechanical linear drive (forces and moments, taking into consideration directions and possible combinations, lead to a moderate load (F_m); ambient conditions, duty cycle...), the following simplified formulae only serve as an initial estimate.

1. Moderate load of the guide or ball screw

$$F_m = (F_1^3 \cdot q_1 / 100 + F_2^3 \cdot q_2 / 100 + F_n^3 \cdot q_n / 100)^{1/3}$$

2. Nominal service life of the roller guide

$$L = (C / F)^3 \cdot 10^5 \cdot R$$

$$F = F_m + F_v$$

3. Nominal service life of the sliding guide

$$L = (C / F)^3 \cdot 10^5$$

$$F = F_m + F_v$$

4. Nominal service life of the ball screw

$$L_{KGT} = (C_{KGT} / F)^3 \cdot 10^6$$

$$F = F_m + F_v \text{ (} F_v \text{ only with double nut (MM); approx. 10 \%)}$$

Definitions

F_m : Moderate load [N] of guide or ball screw

F_1, F_2, F_n : Stepped single load [N]

q_1, q_2, q_n : Stroke rate for F_1, F_2, F_n [%]

L : Nominal service life of guide [m]

C : Dynamic load rating of guide (C_{dyn}) [N] (see Table on pages TL11 and TL12)

R : Factor for roller guide size

Beta 50 ... Beta 80 + Sigma 70: $R = 0,625$; Beta 80-C + Sigma 90: $R = 0,75$;

Beta 100 + 110 + Sigma 120: $R = 0,87$;

Beta 120 + 140 + Sigma 160: $R = 1,1$;

Delta 90: $R = 0,595$ (Y) und $R = 0,625$ (Z)

F : Equivalent load [N] for guide or ball screw

F_v : Pretensioning [N] (3 % of C_{dyn} , 5 % for roller guide (see Table on pages TL11 and TL12)

L_{KGT} : Nominal service life of the ball screw [revolutions]

C_{KGT} : Dynamic load rating of the ball screw (C_{dyn}) [N] (see Table on page TL13)