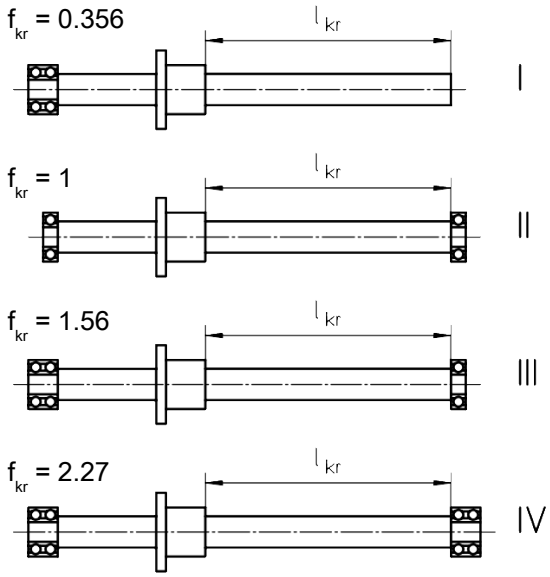
Critical bending speed

Critical bending speed is the speed at which the forces of rotational imbalance initiate resonant vibration of the spindle. The cause of this imbalance is the sag of the ball screw spindle under its own weight. The critical bending speed is similar to the buckling load in that its value depends on the bearings of the ball screw spindle. For this purpose both the fixed bearing and also the floating bearing can be assumed to be rigid or non-rigid. These assignments yield 4 possible variants.



Critical speed:

$$n_{kr} = 1{,}08 \cdot 10^8 \cdot f_{kr} \cdot \frac{d}{l_{kr}^2}$$

wit h

$$d = \frac{d_A + d_K}{2}$$

n_{kr}	[rpm]
d, d_A, d_k	[mm]
L_{kr}	[mm]

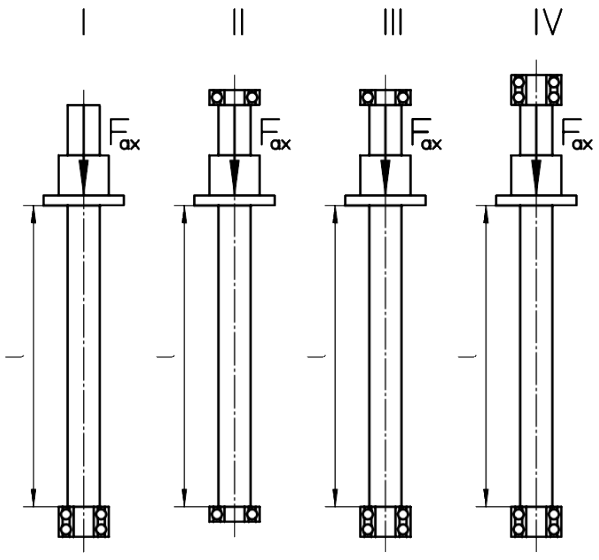
The permissible speed must not be greater than a maximum of 80 % of the critical speed.

Permissible speed:

$$n_{zul} = 0{,}8 \cdot n_{kr}$$

Critical buckling load

For slender components there is a risk of lateral buckling under axial forces. The procedure described below allows the permissible axial force to be determined for four different support bearing cases, using Euler's method. Allowance should always be made of machine-specific safety factors.



l_{kr} = 2 l l_{kr} = l l_{kr} = 0.7 l L_{kr} = 0.5 l

Critical buckling load:

$$F_{kr} = 1{,}017 \cdot 10^5 \cdot \frac{d_2^4}{l_{kr}^2}$$

F_{kr}	[N]
d_2	[mm]
l_{kr}	[mm]