Critical revolution – Spindle supports

The critical revolution is the revolution at which a ball screw exhibits resonance.
With a rotating spindle, the maximum revolution is determined by the so-called critical revolution. This depends on the nominal diameter, the free spindle length and the bearing type.
For mechanical linear units, the free spindle length can be changed by installing spindle supports.
An approximate calculation of the critical revolution for HSB linear units can be performed using the following formula:

$$n_k = k \bullet d_n \bullet l_s^{-2} \bullet 10^7 \ [rpm]$$

n_k = Critical revolution [rpm]
d_n = Nominal diameter of spindle [mm]
l_s = Unsupported or free spindle length [mm]
k = Bearing coefficient:

fixed – fixed (tension bearing as 2nd bearing)	25.5
fixed – movable (fixed/movable bearing)	17.7

Standard bearings (fixed/movable bearings) were used to calculate the number of spindle supports (see SA diagrams).

For vertical installation with the fixed bearing at the bottom, the additional buckling must be taken into account.