

Buckling strength

Mechanical linear drives with a screw drive, which are installed vertically, must also be tested with regard to the buckling strength if they are installed with the fixed bearing facing downwards.

The buckling strength depends on the buckling load (F_x), the spindle diameter, the free (unsupported) spindle length and the type of bearing.

Installation with the fixed bearing upwards should always be preferred – when the fixed bearing is installed at the bottom, a tension bearing instead of a movable bearing (top) significantly improves the buckling strength.

An approximate calculation of the buckling load for HSB linear units can be performed using the following formula:

$$P_B = m \cdot d_n^4 \cdot l_s^{-2} \cdot 10^4 \text{ [N]}$$

P_B = Buckling load [N]

d_n = Nominal diameter of spindle [mm]

l_s = Unsupported or free spindle length [mm]

m = Bearing coefficient (fixed bearing downwards):

fixed – fixed (tension bearing as 2nd bearing) 22.4

fixed – movable (fixed/movable bearing) 11.2

For dimensioning, we recommend taking a safety factor of 0.5 into account: $F_{x_{\max}} = 0.5 \cdot P_B$