COMPRESSION LOADING

If a sufficiently heavy load is applied to a long ball bearing screw it could buckle. The three factors that determine a safe compression load are the length between the load point and the end bearings, load and the rigidity of the end mountings (end fixity).

Compression Loading Formula

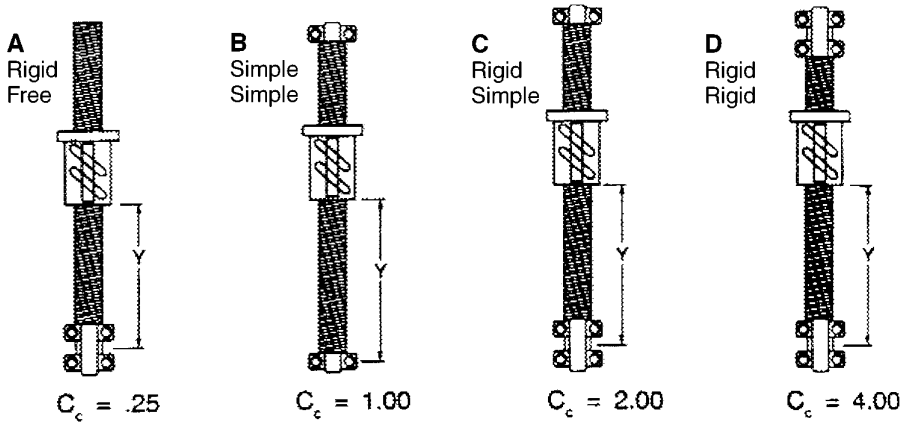
$P_{CR}=C_C \times 14.05 \times 10^6 \times \frac{D^4}{Y^2}$

Where:

- P_{CR} = Critical Column Load (pounds)
- D = Minor (root) Diameter (inches)
- Y = Unsupported Length (inches)
- C_C = End Fixity Factor for Column Loads

C_C	End Supports
.25	One end rigid, one end free
1.00	Both ends simple
2.00	One end rigid, one end simple
4.00	Both ends rigid

Bearing support arrangements

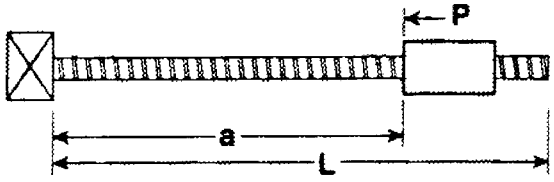


This applies only when the screw is loaded under a compression condition. End fixity or support means will affect substantially the allowable load on the screw. If the model you initially selected does not meet the safe compression load value recommended, consider using a more rigid end mounting configuration or select a larger diameter screw. For other configurations (such as pin-pin, stepped column, etc.), please contact our technical department. We have specialized programs and techniques that will calculate the critical loads.

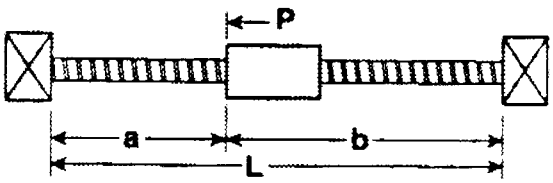
SPRING RATE vs. LENGTH

To arrive at the spring rates or degree of stiffness of a ballscrew, the following formulas are used

A.



B.



If the screw is supported at one end only as shown in sketch (A), the spring rate of the screw is: $KS = \frac{A\,E}{a}$

For screws with angular-contact bearings at both ends, sketch (B): $KS = \frac{A\,E\,L}{a\,b}$

Where:

- a,b = Dimensions, inches
- A = Cross-section Area, in^2
- E = Young's Modulus (29×10^6), $lb./in^2$
- P = Applied Axial Load, lb.
- KS = Spring Rate of Screw, lb./in.