APPLICATION EXAMPLE

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Given the following requirements select a ball screw for the application which uses a ball screw for an automatic part feeder on a machine.

Specifications:

- 5000 lb. load supported and guided on linear bearings moving horizontally
- 36" travel
- Complete 36" travel in 10 seconds
- Bearing Support Undecided
- Positioning accuracy ±1/4"

STEP 1

Find the axial force required to move load. The axial force is determined by multiplying the coefficient of friction of the guidance system by the load.

F = μ x N
μ = coefficient of friction of the guidance system

Using Nook linear bearings in this application;
μ = Coefficient of Friction for lubricated Nook Linear Bearings = .0013 (Refer to linear ball bearing engineering data found on page 223.)

N = Load = 5000 pounds
F = μ x N
F = .0013 x 5000 lbs.
F = 6.5 lbs.

Therefore:

The Axial Force the screw must produce to move the load is 6.5 lbs.

STEP 2

Find Average Travel Rate. The average travel rate is determined by dividing travel distance by travel time.
V average = D/t

D = distance = 36 inches
t = total time = 10 seconds
V avg. = D/t
V avg. = 36 in. / 10 sec.
V avg. = 3.69 in / sec. or 216 in/minute

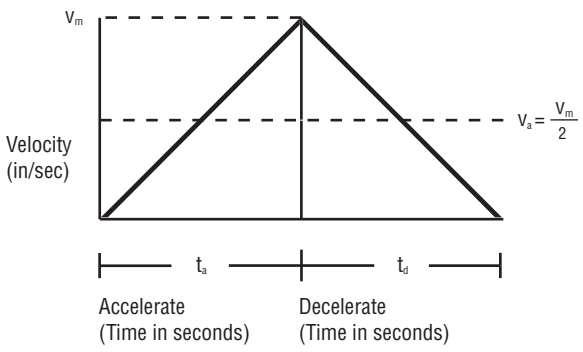
Therefore the average travel rate is 216 in/min.

STEP 3

Find Maximum Travel Rate. When considering critical speed, peak velocity should be used. Using a basic triangular motion profile (acceleration = deceleration with no constant velocity travel), the peak velocity equals twice the average velocity.

V peak = 2 x V avg.
V avg. = 3.6 in / sec. or 216 in/minute
V peak = 2 x 216V avg.
V peak = 432 in/min

The Maximum Travel Rate is 432 in/min during the traverse of 36 inches in 10 seconds.



STEP 4

Determine total unsupported length. Total Travel is given as 36 inches, but extra screw length should be considered for travel nut, carriage, and any extra screw length for over travel.

Based on the travel nut and attachment of the nut to the carriage in this application it is determined an extra 4" of screw length will be required.

(Refer to the dimensional information of the particular nut used)

L total = 36 in + 4 in = 40 inches

The total unsupported length to be used for critical speed and column loading calculations is 40 inches.

STEP 5

Determining end fixity. The layout of the application shows that adequate space is available to use a double bearing EZZE-MOUNT™ at each end.

(See end fixity definitions on page 86-87)

End Fixity = Type “C”

STEP 6

Select a screw based on the critical speed. Use previously determined values with the Critical Speed chart on page 93.

Max Travel Rate = 432 in/min

End Fixity = Type “C”

Length between bearings = 40 inches

Based on the Critical Speed Chart, the best choice, appears to be a 1000-0250 SRT. Since the lead of the 1000-0250 SRT ball screw is .250", the maximum rpm needed to achieve the maximum travel rate would be 1728 rpm.

STEP 7

Check Column Strength of screw. Use previously determined values with the Column Strength Chart.

Load = 6.5 pounds
End Fixity = Type “C”
Length Between Bearing Supports = 40 inches

Based on the Column Strength Chart the load is within the column strength of this screw.

NOTE: Note: If this were a vertical application the full 5000 lb. load would be used. Also under high acceleration conditions the inertia load must be determined and added to the total load for column considerations.

STEP 8

Create a reference number for the assembly. See page 98 for Reference Number System Chart.

The 1000-0250 SRT thread form is desired in a Right hand thread. The end code used for machining this screw is end code 20. The type of end machining will be a Type 3 on both ends of the screw to allow for the mounting of double bearing EZZE-MOUNT™. One of the ends will have an extension to attach a coupling, the other will not. To determine the overall length of the assembly, add up the length of the ends plus the unsupported length:

One end Type 3K (drive end with keyway) = 4.03"

One end Type 3N (no drive end) = 2.71"

40 inches between supports

Overall length: 40" + 4.03" + 2.71" = 46.74"

The Parts List Includes:

- 1000-0250 SRT Ball Screw
- Ball Nut Number: SBN7508
- Flange Number: FLG7571
- EZZE-MOUNT™: EZM-2020 – 2 required

To receive an assembly of these components with the EZZE-MOUNT™, nut, and flange installed on the screw, the order reference number is:

1000-0250 SRT RH/EK/EN/46.74/SBN7508/FS