Why Consider Roller Screw Technology

Designers have five basic choices when it comes to achieving controlled linear motion. The table on page 2 gives you a quick overview of what general advantages are associated with each. Because the roller screw technology common to all Exlar linear actuators might not be familiar to everyone using this catalog, allow us to present a general overview.

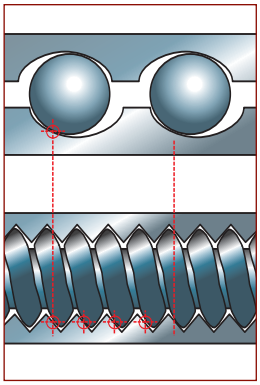
Roller Screw Basics

A roller screw is a mechanism for converting rotary torque into linear motion, in a similar manner to acme screws or ball screws. But, unlike those devices, roller screws can carry heavy loads for thousands of hours in the most arduous conditions. This makes roller screws the ideal choice for demanding, continuous-duty applications.

The difference is in the roller screw's design for transmitting forces. Multiple threaded helical rollers are assembled in a planetary arrangement around a threaded shaft (shown above), which converts a motor's rotary motion into linear movement of the shaft or nut.

Roller Screw vs Hydraulic & Pneumatic – Comparisons:

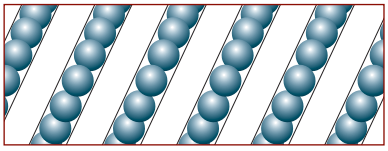
In applications where high loads are anticipated or faster cycling is desired, Exlar's roller screw actuators provide an attractive alternative to the hydraulic or pneumatic options. With their vastly simplified controls, electro-mechanical units using roller screws have major advantages. They do not require a complex support system of valves, pumps, filters and sensors. Thus, Exlar units take up much less space and deliver extremely long working lives with virtually no maintenance. Hydraulic fluid leaks are non-existent. Noise levels are reduced significantly. Additionally, the flexibility of computer programmed positioning can be very desirable in many applications.



Roller vs Ball Screw Performance – Comparisons:

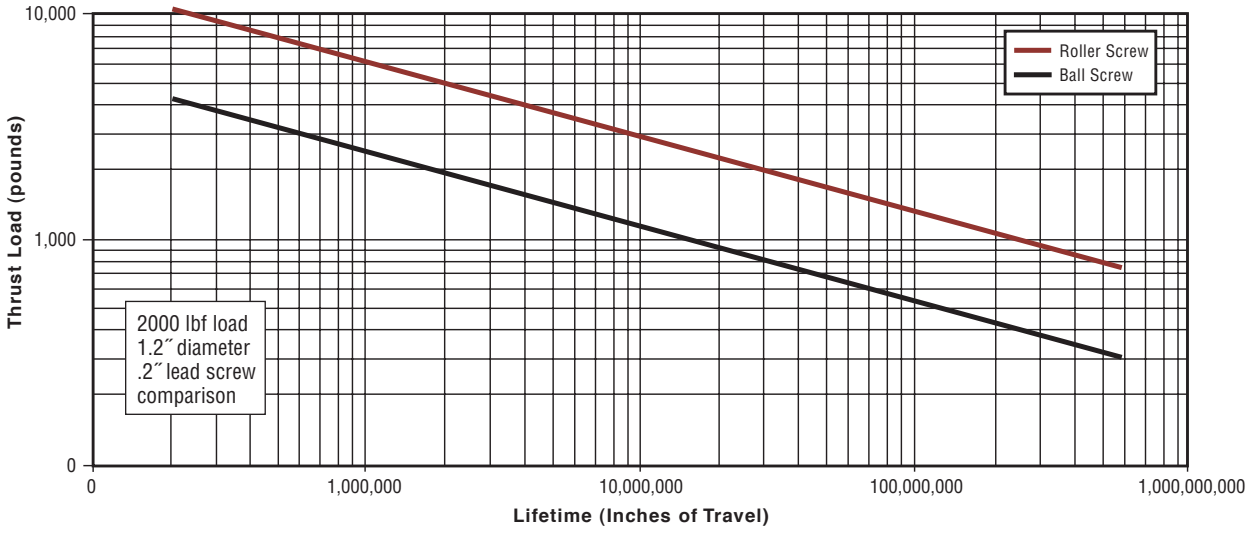
Loads and Stiffness: *Due to design factors, the number of contact points in a ball screw is limited by the ball size. Exlar's planetary roller screw designs provide many more contact points than possible on comparably sized ball screws. Because this number of contact points is greater, roller screws have higher load carrying capacities, plus improved stiffness. In practical terms, this means that typically an Exlar roller screw actuator takes up much less space to meet the designer's specified load rating.*

Travel Life: *As you would expect, with their higher load capacities, roller screws deliver major advantages in working life. Usually measured in "Inches of Travel," the relative travel lives for roller and ball screws are displayed on the graph on page 2. As you can see there, in a 2,000 lb. average load application applied to a 1.2 inch (approximate) screw diameter with a 0.2 inch (approximate) lead, you can predict that the roller screw will have an expected service life that is* ***15 Times Greater.***



Speeds: *Typical ball screw speeds are limited to 2000 rpm and less, due to the interaction of the balls colliding with each other as the race rotates. In contrast, the rollers in a roller screw are fixed in planetary fashion by journals at the ends of the nut and therefore do not have this limitation. Hence, roller screws can work at 5000 rpm and higher – producing comparably higher linear travel rates.*

Lifetime Comparison (Roller vs Ball Screws)



Roller Screw vs. Other Linear Motion Technologies

(Used in electronic positioning applications)

	EXLAR ROLLER SCREWS	ACME SCREWS	BALL SCREWS	HYDRAULIC CYLINDERS	PNEUMATIC CYLINDERS
Load ratings	Very High	High	High	Very High	High
Lifetime	Very long, many times greater than ball screw	Very low, due to high friction & wear	Moderate	Can be long with proper maintenance	Can be long with proper maintenance
Speed	Very high	Low	Moderate	Moderate	Very high
Acceleration	Very high	Low	Moderate	Very high	Very high
Electronic Positioning	Easy	Moderate	Easy	Difficult	Very Difficult
Stiffness	Very high	Very high	Moderate	Very high	Very low
Shock Loads	Very high	Very high	Moderate	Very high	High
Relative Space Requirements	Minimum	Moderate	Moderate	High	High
Friction	Low	High	Low	High	Moderate
Efficiency	>90%	approx 40%	>90%	<50%	<50%
Installation	Compatible with standard servo electronic controls	User may have to engineer a motion/actuator interface	Compatible with standard servo electronic controls	Complex, requires servo-valves, high pressure plumbing, filtering, pumps linear positioning & sensing	Very complex requires servo-valves, plumbing, filtering, compressors linear positioning & sensing
Maintenance	Very low	High, due to poor wear characteristics	Moderate	Very high	High
Environmental	Minimal	Minimal	Minimal	Hydraulic fluid leaks & disposal	High noise levels