THE ENGINEER’S GUIDE: LEAD SCREWS VS. BALL SCREWS

A breakdown of the advantages and disadvantages of lead screws and ball screws.
It’s All about the Application

Each type of actuator has its advantages and disadvantages. Before you can decide on what type of screw to use, you need to understand how the distinct characteristics of each match your specific application. In most cases, evaluating the load, accuracy, and lead for your application will most generally answer the question of ball screw vs. lead screw.

A new generation of precision lead screws—such as those offered by HELIX™ Linear Technologies—significantly increases lead screw accuracy. Using advanced thread-rolling processes and material composition technologies, HELIX offers precision engineered processes screws that are just as accurate and repeatable as ball screws.
Today’s motion-driven automation environments demand effective linear motion control systems, such as lead screws and ball screws. Although lead screws are often seen as less expensive substitutes for ball screws, making a decision on which type of screw to use is a lot more complicated than focusing solely on cost.

The basic difference between lead screws and ball screws is that a ball screw uses ball bearings to eliminate the friction between the nut and screw and lead screws do not.
Lead Screws use deeper helical threads and a mating nut, which is usually made of a polymer composite or bronze.
The screw and nut on a ball screw have matching helical grooves that allow ball bearings to re-circulate in those races, and they are typically semi-circular in shape to accept the spherical ball bearing.
Lead Screw Advantages

- Cost less
- Self-locking and do not require a braking system
- Better for vertical applications
- Some lead screws do not require lubrication
- More suitable for simple transfer applications requiring:
  - Speed
  - Accuracy
  - Precision
  - Rigidity
Lead Screw Disadvantages

- Generally less efficient, requiring greater torque and a larger motor and drive
- Have higher friction and run a hotter temperature
- Most lead screws are not well suited to high throughput, high speed applications or those with continuous or long cycle times.
- Need to be replaced more frequently
Ball Screw Advantages

• More efficient, requiring less torque
• Lower friction and run at cooler temperatures
• Need to be replaced less frequently
• Ball screws are well-suited to high-throughput, high-speed applications or those with continuous or long cycle times.
Ball Screw Disadvantages

- Need to be replaced more frequently
- More expensive than lead screws
- Require braking mechanisms to eliminate backdriving
- Noisy
- Require grease or oil lubrication to achieve design life
Quality Next-Generation Lead Screws

To help you evaluate whether to use a lead screw or ball screw for your linear-motion application, contact HELIX Linear Technologies. We manufacture the broadest product line of lead screws in the world.

To learn more about HELIX precision lead screw products, download a copy of the newest HELIX catalog.
We hope that you have found this presentation to be helpful.

For more information please visit us at www.helixlinear.com