



Lead Screws in Mechanical Design Questions & Answers

A complete list of lead screw sizes and specifications.

Lead Screws in Mechanical Design

The use of lead screws for providing actuation in machine designs and other types of mechanical design is growing because of advances in:

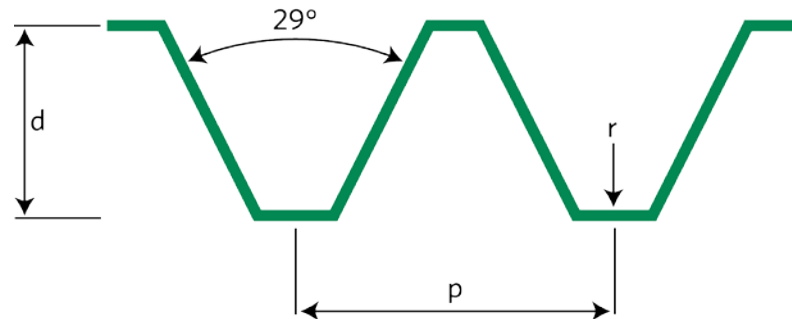
- Lead Screw Design
- Screw and Nut Materials
- Manufacturing Technologies



Q: What is a lead screw?

A: A lead screw is a trapezoidal-threaded screw that when combined with a mating nut utilizes the helical configuration of the threads to control linear actuation. The most well known lead screw is the Acme screw, which has a 29° thread angle with a thread height that is half of the pitch, the distance between a point on one thread and a corresponding point on the next thread that is parallel to the axis.

Precision lead screw assemblies can be configured with trapezoidal thread forms with thread angles ranging from 30° to 40° , providing greater strength for larger loads. The efficiency of a lead screw is highly dependent upon the helix angle of the screw thread.



General-Purpose Acme

Q: What are the advantages of using lead screws for linear actuation in mechanical design?

A: Lead screws are cost-effective and self-locking (do not require a braking system), and provide the accuracy and repeatability required by most mechanical design applications.

Q: What causes the generation of noise in a lead screw assembly during actuation?

A: Lead screws generally operate quietly, but when a lead screw makes noise, it is typically caused by a combination of the material used for the screw and/or nut, the alignment of the lead screw assembly, or the linear motion control system's orientation. The exact cause of lead screw noise should be determined on a case-by-case basis because of the potential combination of variables. Solutions to dampening noise in lead screw assemblies include changing system speed, improving alignment, and controlling vibration.

Q: What characteristics contribute to reduced lead screw vibration within a lead screw assembly?

A: Features that can influence lead screw vibration include screw straightness, screw length, and journal runout (radial play in the assembly).

Q: What type of lead screw is best for applications that do not require precise accuracy?

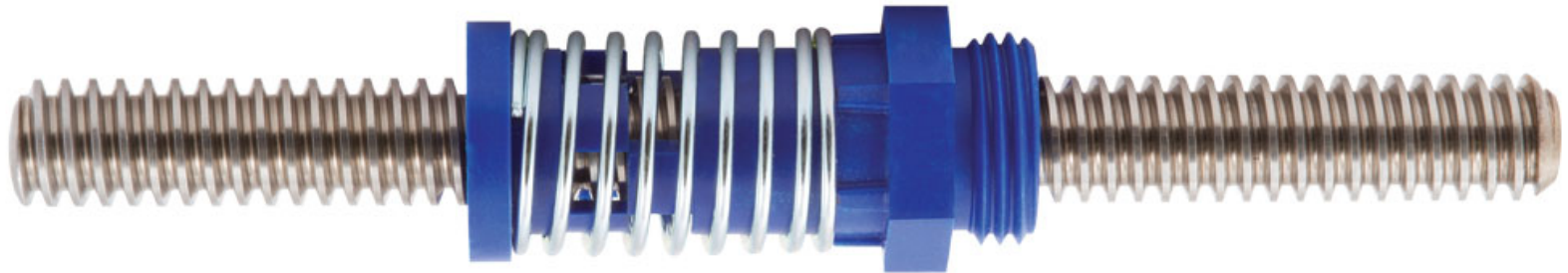
A: The exact configuration depends on the load and speed of the application, but generally speaking, a lead screw with a standard nut rather than an anti-backlash nut would be best.

Q: When should you adjust the tension of the backlash-reducing nut?

A: Adjusting the tension of the backlash-reducing nut is best left to the experts to set at the factory because it is highly dependent on nut design.

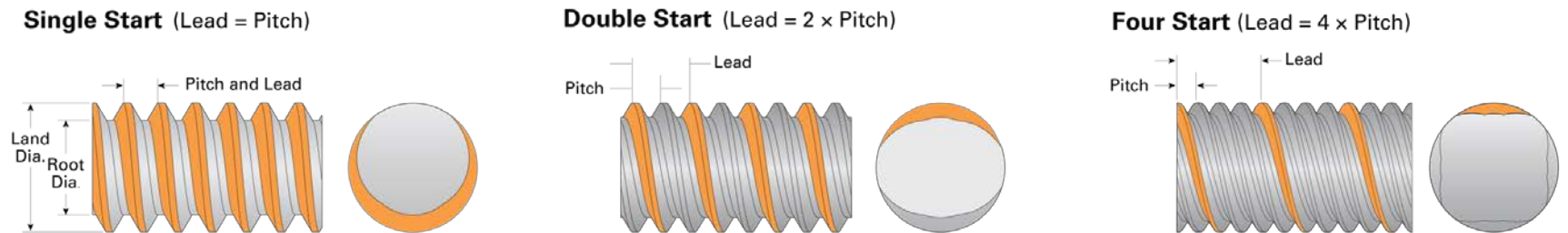
Q: What is a preloaded anti-backlash nut?

A: The nut in a lead screw assembly can be preloaded to eliminate axial free play in the assembly. Typically preloading of a nut is generally done by creating an assembly that utilizes two nuts and a spring between them.



Q: What is the difference between lead and pitch?

A: The lead in a lead screw assembly is the axial distance that the nut travels after one full revolution of the screw. The pitch in a lead screw assembly is the axial distance between a point on one thread and a corresponding point on the next thread. The lead is equal to the pitch times the number of starts, and the pitch is equal to the lead in a single start screw.



Q: Is there a way to protect lead screws from debris?

A: You can protect the lead screw assembly with an extruded aluminum enclosure, an accordion-style boot, a seal, or a wiper, depending on the application and the type of operational environment.

Q: Will a long lead screw assembly bend, and if so, is there a solution to eliminate bending?

A: Under certain loading scenarios, a long lead screw can bend. One possible solution when using long lead screws is to use intermediate supports, such as a spring-loaded arm with a plastic sleeve that supports the screw during operation but drops away from the assembly as the nut passes.

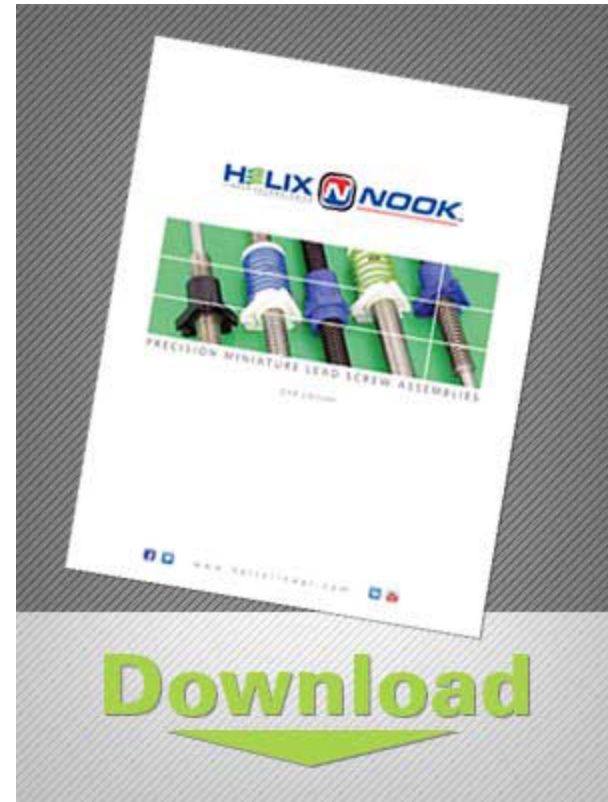
Q: What does efficiency mean when referring to lead screws vs. ball screws?

A: The efficiency of a screw refers to how well it converts rotary energy into linear energy or motion. Ball screws are more efficient because they utilize rolling contact as opposed to the sliding contact of a lead screw. Rolling contact has a lower coefficient of friction than sliding contact, and ball screws provide a relatively constant efficiency rate of greater than 90 percent. Lead screws, including Acme screws, offer efficiency levels of between 20 percent and 80 percent and operate purely with sliding contact. You can improve lead screw efficiency by increasing the helix thread angle and by using PTFE dry lubricant coatings as well as grease.

Consult HELIX to Determine the Right Screw Thread for You

For design engineers who have screw thread questions or need a screw thread form that isn't standard, contact Helix. Whatever configuration you need, we can walk you through the process of specifying a screw thread that best fits your particular application.

To learn more about screw threads and HELIX options and capabilities, download our catalog.



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