Haydon kerk Motion Solutions

A Best Fit Technology with Exceptionally Shorter Lead Time

Lead Screws

Using both patented and proprietary technology, we build on the common advantages of traditional Lead Screws and offer exceptional benefits.

Today, Lead Screws offer the latest technology in material science and tribology for motion control, with many distinct advantages. The main contrasting attribute is Lead Screws use two sliding surfaces to achieve motion where ball screws use a series of balls rolling in a race. This alternative approach to motion allows Lead Screws to offer more flexibility in design and opens the door to more challenging environments of operation. With the advent of modern materials friction can be kept very low (less than 0.10) without any external lubrication.

In the past, Lead Screws were believed to be an inexpensive substitute for ball screws and could only be used in less demanding applications.

Key advantages of Lead Screws:

- Zero maintenance
- No lubrication required
- Lower particulate generation (clean option)
- Longer life with non-catastrophic failure
- Quieter operation (no re-circulating ball noise)
- High helix/Fast leads (greater than 100mm/rev)
- Fine threads (as small as 0.3mm/rev)
- Non-backdriving (self-locking) leads
- Multi-function nuts
- Easily customized nut designs
- Zero-backlash with extremely light pre-load/low drag
- Much lower cost/selling price – 25 to 90% less!

Using both patented and proprietary technology, we build on these advantages and offer additional benefits.

Lead Screws are a best fit technology, in applications across many markets where speed, precision, smooth operation, or harsh environments are required.

Champion Advantages of Haydon Kerk Lead Screws:

- Precision thread rolling offers lead accuracy of .0001mm/mm at approximately one tenth the cost of ground screws and lengths up to 4m.
- Polymer composite nut materials that provide high strength (dynamic loads of 250kg.), long life (over 750 million cm. of travel) while being molded to custom shapes to provide additional functionality.
- Anti-backlash nut designs that automatically compensate for wear.

Ball Screw Applications

If the application can tolerate the high cost, the design limitations, the noise and the reduced life, the best ground ball screws offer greater maximum speed, lead accuracy and load capability. Rolled ball screws are less expensive than ground ball screws but have compromises that reduce these advantages.

The user gets a high load rating but is left with a higher maintenance component, shorter life and less design flexibility, that may still cost several times more than a precision rolled Lead Screw assembly.

High Speed Automation Applications

Lead Screws are successful in high-speed automation applications including semiconductor handling, laser scanning, engraving, transportation door actuation and valve actuation. Our thread rolling process produces fast leads available up to l00mm/rev that are both accurate and efficient.

Medical and Lab Applications

Quiet operation is key in many medical and lab environments which can be a challenge for ball screws. The metal to metal contact of recirculating balls in a ball screw nut can generate significant audible noise especially at high or even moderate speeds. The sliding action of a polymer nut on a steel Lead Screw is a much better option where audible noise is not acceptable.

Food and Beverage Applications

Food and beverage wash-down environments are no problem. The materials used and the lubricant-free operation of Lead Screws allow total immersion in water, or many other fluids.

Long Travel Length Applications

Long travel lengths over 4m are both possible and practical with leads of more than 75mm/rev and diameters of 20 to 25mm. This would be impossible for a ball screw. Thread grinding cannot produce these high-helix leads and the cost of a 4m ground screw would be huge. Yet the best Lead Screws are produced in many leads with accuracy of 0.0006mm/mm and special accuracy to 0.000lmm/mm. Rolled multi-start threads also avoid thread drunkenness caused by pitch-to-pitch error of ground or cut multi-start threads.

High Helix, Fast Lead Applications

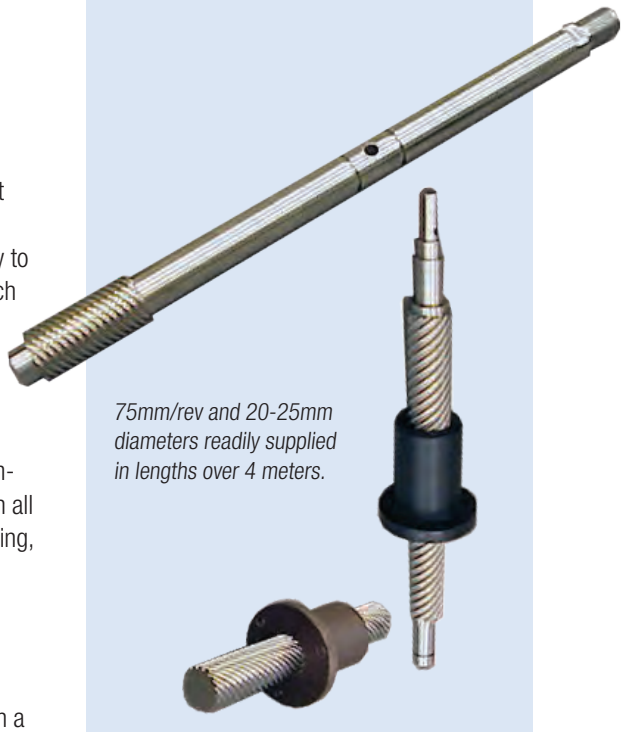
High helix, fast leads are possible in smaller diameters as well. We produce screws of 3mm diameter with leads of l0mm/rev. Screws with 6mm diameter and 25mm/rev leads are very popular in all types of equipment, including printing and scanning, data storage, medical analysis, paper handling, and semiconductor handling applications.

Miniature Footprint Applications

Miniature Lead Screws, with and without anti-backlash compensation provide precision motion in a package size unmatched by other technologies. The ability to produce a high accuracy screw and nut, 2 to 4mm in diameter, with custom features has succeeded in bringing the latest data storage drives and telecommunications equipment to market.

Self-Locking Vertical Axes Applications

Due to the mechanics of rolling elements, ball screws have higher theoretical efficiencies than Lead Screws. In practice, the differences are often smaller because of the effects of lubricant viscosity and manufacturing tolerances. It is these same efficiencies that prevent ball screws from offering self-locking, non-backdriving leads. Varying the material in a Lead Screw assembly enables fine and moderate leads to be non-backdriving.



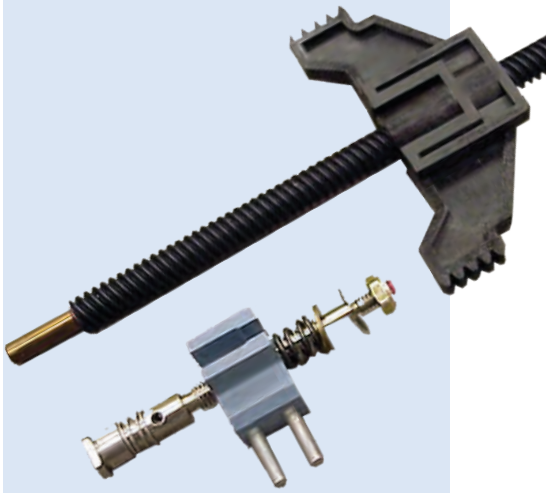
75mm/rev and 20-25mm diameters readily supplied in lengths over 4 meters.

Shown above and left: Lead Screws less than 80mm long, with both right- and left-hand threads, with leads as fine as 0.65mm.

Money, Time and Space Savings

Saving money, time and space are some of the benefits of multifunction, custom-molded lead nuts. Using a variety of materials, Lead Screws offer higher performance at lower costs. Additional examples of multifunction nuts are shown to the right. Imagine how many parts would be needed to perform the functions if only a standard nut configuration was available. Then try to imagine getting this type of customization in a ball nut.

Complex assemblies are reduced to single components. Complete solutions are custom engineered and delivered at a lower cost, and usually in less time than standard offerings from competitive technologies. A great option for design flexibility.



Complex assemblies are reduced to single components.

Simplified Assemblies

Simplification of assembly and alignment, the nut incorporates the carriage and linear guide block. Although this is a high value Lead Screw, the customer sees reduced component costs and dramatically reduces assembly time.

These Lead Screws have nuts with added functions that reduce part count, reduce tolerance stack-up, outlive, outperform and reduce overall product cost compared to more expensive ball screws and less expensive competitors' Lead Screws. These are 4 and 6mm diameter with fast leads used in data storage systems where precision, speed and cost are critical.

Shown: Nut incorporates the carriage and linear guide block. Custom assemblies result in reduced components and simplified integration.

4mm and 6mm diameter Lead Screws.

This technical article was prepared by the engineering team at Haydon Kerk Pittman Motion Solutions, a leader in motion technologies. Complex custom and ready-to-ship standard lead screw assemblies are made at USA facilities with a full range of onsite capabilities including designing, engineering and manufacturing.