



Technical Bulletin: SHA Comparison with Ball Screw and Roller Screw EMAs

Products:

SMART Hydraulic Actuator (SHA) S, E, H Series

Kyntronics SMART Hydraulic Actuators - Comparison with Electro-Mechanical Ball Screw / Roller Screw Actuators (EMAs)

Much has been published comparing EMA technology against hydraulic cylinders connected to hydraulic power units. Recently, new actuation technology developed by Kyntronics combines the advantages of hydraulic power with the advantages of servo-control resulting in an "all-in-one" actuator that outperforms alternative approaches including EMAs.

The Kyntronics SMART Hydraulic Actuator (SHA) System

Often referred to as an "Electro-Hydraulic Actuator" (EHA), the Kyntronics SHA is an All-in-One system that is pre-engineered to your application and comes complete with Power Unit, Servo Drive, Cylinder, and integral Force and Position Feedback sensors. After simple mounting and hook-up of electrical connections, the SHA is ready to operate with minimal maintenance required.

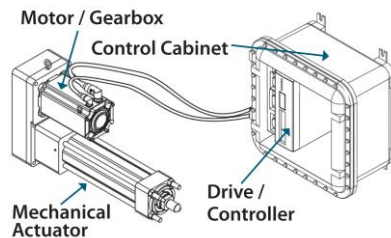
Kyntronics SHA



- High-Precision Brushless Servo Motor
- Servo-Controlled, Precise Displacement, Bi-Directional Variable Speed Pump
- Manifold with Integral Valve Controls
- Heavy-Duty Rod / Cylinder with Patent-Pending Rod Compensation
- Servo Drive / Motion Controller
- Fieldbus Interface, IoT Compatible
- Pressure Sensor for Force Control Operation
- High-Resolution Position Sensor

Ball Screw / Roller Screw EMAs

EMAs generally consist of a mechanical screw assembly, gear train or belt drive, servo motor and servo drive/controller.



Typical Electro-Mechanical Ball Screw / Roller Screw (EMA) System



The SHA's use of a hydraulic cylinder eliminates the problem of uneven screw loading and wear associated with EMA's

The following list of challenges inherent to EMAs are absent from Kyntronics SMART Hydraulic Actuators:

- Many required components – Ball nuts and roller screws rely on many precision components for operation which increases cost.
- Multi-stage gear train – each stage reduces system efficiency and wastes energy.
- Built-in fatigue failure – every turn of the screw under load produces another fatigue cycle.
- Screws require elaborate bearing supports – Column strength and critical speed depend on the screw end supports.
- Lubrication / maintenance is critical to screw performance and life – Application environment can severely affect performance.
- Ball/Roller screw life decreases with load. SHA Life is independent of load.

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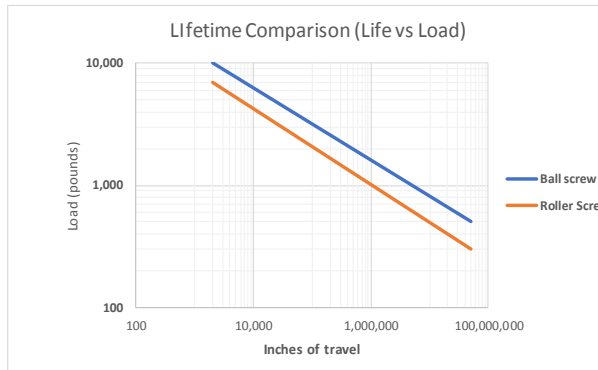


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Actuator Reliability Comparison: SHA vs. Ball Screw / Roller Screw Actuator



EMA (Electro-Mechanical Actuation)

- At 10,000lbf (44kN) EMA is at 100,000 inches (254,000 cm) of travel
- At 1,000lbf (4.4kN), EMA is at 10,000,000 inches (25,400,000 cm) of travel

Kyntronics SHA

- Exceeds 50,000,000 in (127,000,000 cm) of travel with no Maintenance
- Exceeds 100,000,000 in (254,000,000 cm) of travel with a simple Rod Seal Cartridge change
- No metal to metal contact leads to increased reliability (load independent)
- The SHA Provides 10X – 100X Better Reliability compared with Ball Screw / Roller Screw Actuators

Additional Advantages of the SHA over Ball Screw & Roller Screw Actuators:

- Higher “force-density” than EMAs, results in a smaller footprint and package
- EMAs are often over-sized for an application to improve reliability which increases cost. The SHA incurs a modest cost increase as force and load requirements increase
- The SHA is tolerant of “shock loads” which are very damaging to EMAs
- The SHA has higher efficiency, no metal-to-metal contact improves reliability and reduces cost
- The SHA cannot be “back-driven”. EMAs require an expensive brake

SHA Configurations – Flexibility to fit your space envelope

Unlike EMA configurations which are limited by mechanical gear train and linkages, the SHA can be supplied in many different configurations. This is possible because the transfer of power is accomplished through the fluid path.



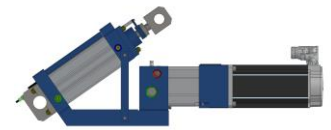
In-Line



Parallel



Right-Angle



Offset

The SHA’s efficient method of converting electrical power to mechanical force results in a smaller, more cost-effective package and it’s “power on demand” feature provides significant energy savings. A fundamental difference between SHA and EMA technology is that the SHA utilizes an integral hydraulic pump and cylinder to move the load, while the EMA uses a gearbox and mechanical screw/nut system to move the load

Conclusion:

Recent innovations in actuation technology developed by Kyntronics have combined the power of hydraulics with the precision control of servo technology resulting in an actuation system with superior performance at a reduced cost compared with hydraulic and electro-mechanical actuation technology.

The Kyntronics SMART Hydraulic Actuator (SHA) is a very cost-effective solution for a multitude of situations ranging from simple applications requiring a load to be moved from point A to point B, to higher precision applications with position, force and speed control and multiple actuator synchronization.

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Interested in how Kyntronics can help solve your actuation challenges, [contact our Engineering team.](#)

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