

Advanced Electromechanical
Actuation Technology

Defense Industry



EXLAR



EXLAR

Efficiency. Effectiveness. Survivability. Exlar delivers on all fronts.



In defense industry applications, “close” isn’t good enough. Whether used for loading munitions or fuel flow, equipment in this industry needs to work on time, every time. Plus, it must promote survivability—withstanding shock, vibration and high temperatures to deliver extended operational life.

By making the move from primarily hydraulic actuators to electromechanical actuators for military vehicles and machinery, industry has acknowledged an overwhelming need for reduced life-cycle costs, increased survivability and stealth capabilities, and improved power efficiency, as well as size and weight optimization. While hydraulic actuators are traditionally associated with high maintenance costs and power consumption, electromechanical actuators fit the mold—pairing energy efficiency with simplified design. It’s a design that additionally improves survivability while reducing maintenance costs and frequency.

Exlar’s electromechanical actuators deliver on all fronts. Without requiring additional power capabilities supplied by a military vehicle or machinery for operation, our actuators still boast the power capabilities of legacy

hydraulic systems—with greater power efficiency and maintainability. Plus, unlike hydraulic systems, these actuators do not require users to run new or redundant fluid lines, nor do they require a complex support system of valves, pumps or sensors. This means no hydraulic fluid leaks, lower maintenance costs and significantly reduced noise levels.

Electromechanical actuators provide for simplified designs, a more compact footprint and potentially uninterrupted power—for the most mission-critical tasks. This smaller, more lightweight design ensures electromechanical actuators meld seamlessly into vehicles used in stealth applications, where actuators must run as quietly as the hybrid engines commonly employed in these vehicles.





“The move to integrated all-electric designs will significantly improve efficiency, effectiveness and survivability while simultaneously increasing the design flexibility, reducing costs, and enhancing... quality of service.”

– Office of Naval Research

Exlar actuators: The power of hydraulic meets the efficiency of electric.

Not all actuators are created equal. While electromechanical operation provides many benefits, only Exlar’s roller screw design delivers the full power of hydraulic actuators, without sacrificing efficiency or longevity.

A roller screw is a mechanism for converting rotary torque into linear motion, much like a ball screw. However, while traditional ball screw driven devices may have offered some power consumption efficiencies, they did not and cannot live up to the life and thrust capabilities of hydraulic actuators. There is only one proven electromechanical alternative to hydraulic actuation. Roller screw devices offer the mechanical efficiencies of the ball screw, but they can also provide greater load carrying capabilities in a smaller package, run at much higher speeds and offer up to 15 times the

service life. What’s more, noise levels are significantly reduced and designs are inherently resistant to harsh environmental conditions—not only meeting your actuation requirements, but also providing tangible vehicle design improvements over legacy systems.

Exlar roller screw actuators are built to perform under the most severe environmental conditions. Sealed and designed to inherently resist shock and vibration, whether used on a Navy ship or in a military ground vehicle, and even in operations requiring a 24/7 solution, an Exlar actuator will perform reliably and accurately. This dependability in the field has led Exlar to their role as the world leader in electromechanical industrial-grade, rod-style linear actuators.

Exlar’s innovative motor technology is also built to maximize performance in the smallest possible package. Integrated into the patented GS series linear actuator or sold as a stand-alone motor with or without integral gearing, our T-LAM™ designs provide more than 35% more torque than a similarly-sized traditionally wound servomotor. Maximizing torque density in a servomotor used to drive a roller screw actuator provides vehicle designers with the load carrying capacity they need in the smallest possible package.





The defense industry depends on Exlar.

Exlar's expertise in the defense industry is reflected by those who choose Exlar actuators for their own mission-critical applications. Satisfying a growing industry demand for electronically-powered systems, Exlar builds actuators that are specified on weapons systems for ground combat vehicles, within the Navy's Advanced Gun System, and for valve control on Navy ship systems.

Our experience includes successes in the following programs and applications:

Programs

- Gerald R. Ford Class Aircraft Carrier
- DDG-1000 Advanced Gun System
- Littoral Combat Ship
- Non-Line of Site Cannon and Mortar
- Remotely Operated Weapons Station
- EQ/36 Radar
- MEADS Radar
- Lightweight Counter Measure Radar
- Unmanned Ground Vehicle (UGV)
- Paladin M109 Howitzer
- Remote Guardian System (RGS)
- Remotely Operated Underwater Vehicle (ROV)
- Virginia Class Submarine
- Unmanned Surface Vessel

Applications

- Aircraft Launch and Recovery Equipment (ALRE)
- Weapons Elevator
- Turbine Control
- Vehicle Launch System
- Bulkhead Door Operation
- Ammunition Handling
- Site positioning/control
- Gun Position and Firing
- Mine Detection
- Turret Control
- Automated Door Assist
- Towed Sonar Array
- Gun Charging
- Steering
- Rudder Control





Your specifications are our specialty.

With a complete range of proven Commercial Off-the-Shelf (COTS) actuators, Exlar delivers ready-made products to suit the most stringent defense applications—including those subjected to military specifications for temperature, humidity, shock and vibration. Utilizing this broad standard product line, we leverage our core technology and designs to fulfill demanding requirements, including in space and weight-critical applications.

The power, speed and robustness Exlar delivers in each actuator has made Exlar's technology a popular selection among numerous defense customers: General Dynamics, Lockheed Martin, Northrop Grumman, BAE Systems, the Boeing Company, the US Navy, the US Army, and NASA. Exlar's technology is also used in unforgiving industrial environments demanding 24/7 operations with zero downtime. Automotive plants, food packaging and processing plants, and other industrial users depend on Exlar actuation—day in and day out.

In addition to these superior standard product line, Exlar delivers the highest application flexibility through their modified COTS products. Modification options include:

- **Modified Rod Ends or Motor Shafts**

Non-standard threaded ends, special rod or shaft lengths and many additional options increase application flexibility.

- **Modified Mounting Features**

Exlar can design actuators with unique flange dimensions, non-standard trunnion or clevis diameters, as well as special foot and tapped hole mounts.

- **Coatings and Materials**

Alongside a variety of standard product coatings such as anodizing, hard coat anodizing, plus electroless nickel and epoxy coatings, Exlar also regularly provides actuators and motors with customer-specified coatings ideal for a range of environmental challenges.

Standard Exlar products are provided in steel and aluminum combinations, as well as in stainless steel. For extreme environments, such as subsea conditions, Exlar actuators are constructed with specialty housing materials ranging from specially treated aluminum to all Monel™ construction.

- **Special Connectivity**

While Exlar's standard connectors match the cables of the most popular servo drives on the market today, customers can also specify a preferred type of connector for their actuator or motor selection.

- **Electrical Modifications**

Utilizing a flexible motor manufacturing process, Exlar offers customers the option of electrical modifications—ensuring motors are wound for the optimum speed for the application at hand. Exlar achieves this by offering a wide range of Ke and Kt values beyond our standard offerings.

- **Specifications**

Exlar has manufactured and tested actuators to meet demanding defense industry requirements:

- **MIL-S-901** High Impact Shock Testing for Shipboard Equipment
- **MIL-S-167** Mechanical Vibration of Shipboard Equipment
- **MIL-STD-461** Control of Electromagnetic Interface
- **MIL-STD-810** Environmental Compatibility, Ground Vehicle Shock and Vibration
- **ML-STD-108** Environmental Compatibility for Electronic Equipment





A superior actuator design in each of our defense industry products.

Exlar can also take our expertise deeper into your project.

With our Systems Group, Exlar has the resources and expertise to provide a complete turnkey solution to your vehicle motion applications. Providing program management and integration, we can provide the drive and control systems needed to accompany your Exlar actuator. We can also provide engineering and design analysis and manage MIL-SPEC testing with approved testing agencies.

Industry-specific partnerships allow us to provide customers with full integration and program management. Exlar can also manage product testing at approved laboratories or provide engineering analysis and verification, including:

- Static finite element analysis
- Linear dynamic analysis
- Non-linear static analysis
- Non-linear dynamic analysis
- Linear and non-linear steady state and transient heat transfer

Combining higher forces with a longer operational life, Exlar actuators can now solve more defense applications than have ever been addressed using electromechanical actuation. This is due not only to our groundbreaking roller screw design, but also our unique T-LAM™ segmented stator motor design.

By integrating our roller screw mechanism into a brushless servomotor, Exlar has further improved motor efficiency and performance. In developing this segmented lamination stator technology T-LAM delivers limited heat generation qualities, which in turn improve motor efficiencies.



Exlar's advances in high-performance brushless motor technology are applied to their rotary actuators as well, which provide the highest torque-to-size ratio available in motion control today.

Our dedication to the ongoing innovation of motion control technology is exemplified by our high satisfaction ratings among our customers, whose products are used throughout the world. We take great pride in the innovation and development of dependable, superior-performing products—each of which reflects our commitment to quality engineering.

Precise position control, repeatable force, high force density and high duty cycle combine to make our actuators well suited for defense applications requiring the ultimate in accuracy and reliability.

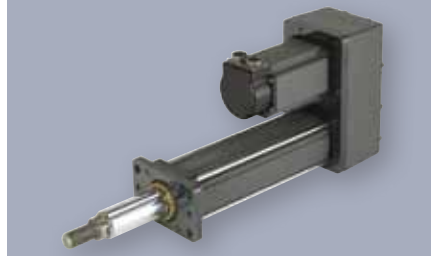


Our superior line of products includes:



GS Series Linear Actuator

Exlar's GS Series combines the advantages of our patented roller screw technology and T-LAM motor technology—yielding the highest performance, longest life and most compact linear actuator on the market. GS Series linear actuators provide a viable, long-lasting alternative to hydraulic actuation.



FT and K Series Actuators

Utilizing our roller screw technology and an external motor, FT and K Series linear actuators provide force ratings in excess of 40,000 pounds, stroke lengths up to 8 feet and speeds up to 60 inches per second.



SLM Series Brushless Motor and SLG Series Brushless Servo Gearmotor

Designed with Exlar's T-LAM technology, SLM brushless servomotors and SLG gearmotors deliver high efficiency and power in a compact package. The SL Series design yields 35-70 percent more torque than traditionally wound motors of the same size.

Exlar Actuator Design Benefit

- **Long Service Life**

Roller screw actuators have up to 15 times the life of a similarly sized ball screw actuator.

- **Robust Design**

Built for continuous duty in harsh environments, Exlar designs are inherently resistant to shock and vibration and are sealed against environmental contaminants.

- **Compact**

The industry's highest possible forces in the smallest possible packages include designs with integrated brushless servomotors and feedback devices.

- **Design Flexibility**

With open feedback configurations and configurable options for paint, coatings and connectors, our actuators are ready for simple integration into your vehicle designs.

- **Product Breadth**

With a broad range of COTS products—from our patented GS style linear actuator with integrated brushless servomotors to our low-cost K series and high-force FT series actuators with a traditional roller screw design and external motor—Exlar has the perfect actuator to meet your design requirements.

- **US Designed, US Built**

Exlar is an ISO 9001 certified, US small business with engineering, design, operations and manufacturing in the USA.





Headquartered at our manufacturing and motion control research center in suburban Minneapolis, MN, Exlar serves a global customer base with an extensive standard product line and complete engineering support for custom applications.

EXLAR

Exlar Corporation
18400 West 77th Street
Chanhassen, MN 55317

TEL: 952.500.6200
General FAX: 952.368.4877
Order Only FAX: 952.368.4359

www.exlar.com