

Electric Servo Actuators
for Process Control

EXLAR
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WRIGHT**



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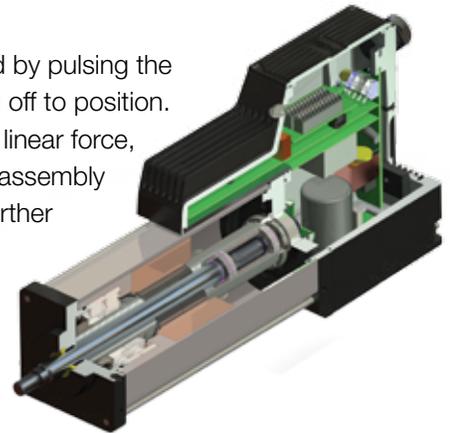
A Change of Perception

Think electric actuators are not adequate for modulating control valves? Think again.

Electric valve actuators have long been known as a great option for valve automation, but perceived as deficient and unacceptable when it comes to modulating control. Exlar is changing this perception of electric actuation by manufacturing actuators with no duty cycle limitations, virtually no dead time, response and stroke times of milliseconds and life cycles in the hundreds of million operations.

Traditional electric actuators rely on a gear train such as worm gears and spur gears to produce output torque. Continuous operation is prohibited since the motor heat buildup can be excessive. For this reason, they have a duty cycle rating, which is the percentage of time the actuator may operate in relation to the time it must rest. Speeds are slow, and positioning is

accomplished by pulsing the motor on and off to position. To produce a linear force, a lead screw assembly is required, further adding to the complexity and more wear areas.



Exlar's Tritex II easy-to-use integrated actuator above provides a compact and high-efficiency electric actuator solution.



The more traditional gear train options are laden with complex and inefficient mechanical components.





“In the history of steam turbine control improvements few upgrades have afforded as much advantage as the installation of electric actuators for governor valve control.”

– Turbine Control Manufacturer



Efficiency and Speed

A key differentiating benefit in the Exlar solution is the technology used to convert the rotary motion of a motor directly to a linear force by integrating a roller screw into a servo motor. The roller screw is extremely efficient, providing very precise positioning capabilities and has a life well over 15 times that of a lead screw used in standard electric actuators. The design allows the motor to be wrapped directly onto the outer shell; rotating the roller screw up to the full RPM's of the motor. This provides linear movement as fast as 40 inches per second — speeds unheard of in typical electric actuators. The servo motor provides closed loop feedback, high torque-to-inertia ratio, 90% efficiency and reserve power of up to 2x continuous power. Servo motors are designed for continuous motion, so duty cycles are always 100%, meeting IEC S9 standards.

Exlar's rotary actuators have all of the benefits of our linear product, but use a planetary gear head in place of the roller screw. This allows the same performance and life, but in a multi-turn package.

Flexibility

The control and positioner used with Exlar actuators provides closed loop feedback, eliminating the need for limit switches, torque switches or any mechanical means of feedback. The electronics provide a 4-mA input and output, as well as digital capability. In addition, extensive diagnostics are available providing insight to the health of the actuator as well as the valve or damper.

Life

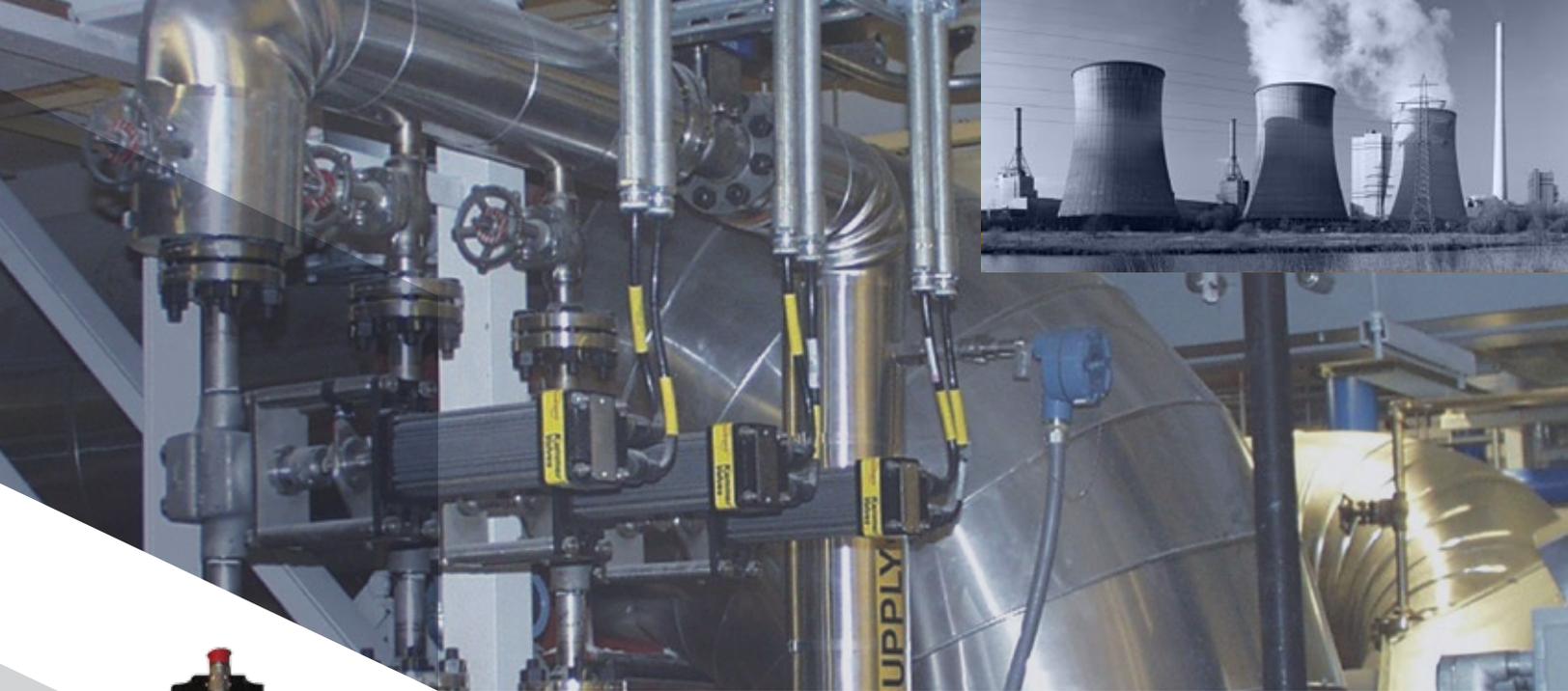
Think 50,000 cycles is a good life estimate? Think again.

The design life of an Exlar actuator is measured in hundreds of million strokes vs. thousands like typical electric actuators.



Key Benefits

- Compact
- 100% duty cycle
- Fast strokes
- Long life



Power Utility Proven Solutions

Balance of Plant

Exlar actuators are the perfect choice for power plants of all types that are seeking the best heat rate or efficiency. Replacement of high maintenance traditional electric or hydraulic actuators is one place to start.

A few examples include injection spray valve actuators, pressure control actuators, boiler bypass and soot blower actuators. Many of these valves need to operate at low flow rates. Achieving a fast response to small signals with the required precision is difficult when using conventional actuator technologies. With the high stiffness and precise closed loop feedback available with an Exlar actuator, control of high pressure differentials down to the smallest flow rate is customary. Exlar also employs valve seat technology to assure a tight shutoff for retrofitted valves as well as new installations. With cycle counts in the hundreds of millions, the life of an Exlar actuator is peerless.

Steam Turbines

Turbine engineers have utilized the Exlar advantage for years by replacing their hydraulic actuators in governor valve control applications with Exlar's patented roller screw actuators. Advantages include improved frequency control, faster start-up, less maintenance and the elimination of hydraulic oil and all of its nuances such as filters and pumps. Exlar's capable actuator lines offer linear forces up to 40,000 lbs.

In addition to the replacement of the main governor actuator, Exlar electric actuators are also used for pilot valve applications where the replacement of the main hydraulic is not feasible. With this application the effects of friction and hydraulic reaction forces acting on the spool valve are greatly reduced, leading to increased sensitivity. With the reduced dead band, the high static and dynamic control accuracy can be better than 0.02 percent.

Exlar is pleased to work with all turbine OEMs and turbine retrofitters.





POWER

In all power plant types, there is a continuing need for the upgrading of existing final control elements. In many cases installed damper, valve and actuator designs are not able to provide the reliable performance or precise control required for plant operation. Exlar's actuation technology is designed for various power plant valve applications that offer significant cost savings related to extended life and improved control.

Gas Turbines

Industrial gas turbine packages must deliver efficient and dependable performance with low operating and maintenance costs in order to compete in today's global market place. Exlar actuators offer several advantages.

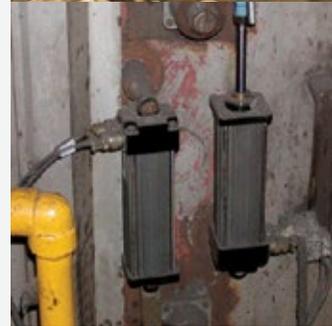
- **Fuel Control Valve** — The use of electric actuated fuel control valves on skids can eliminate the need for an air compressor.
- **Inlet Guide Vanes** — For gas turbines with variable guide vanes, Exlar actuators provide superior performance to other technologies. Precise positioning and feedback provides the ability to fine-tune injector airflow to maintain CO and NOx emissions.
- **Bleed Valve** — High accuracy and speed make Exlar servo electric actuators an excellent choice for your variable air bleed valves and inlet bleed heat valves.



Dampers

As clean air regulations become more stringent, many plants rely upon low-NOx burners within their boilers. These burners depend upon accurate control of the combustion air to achieve the required NOx reduction. Controlling combustion air is achieved through precise control of multiple dampers. Many older units operate with damper drives that are not responsive to small input changes. Exlar has the capability of controlling dampers with extreme precision in a very robust package reducing maintenance by 90% compared to other technologies.

In addition to secondary air dampers, Exlar is also an excellent choice for ID and FD dampers, burner tilts, scrubber dampers, and flop gates.





Oil & Gas Proven Solutions

Pipeline

High performance actuators are needed in pipelines in order to run close to pressure constraints without excessive throttling. They provide tighter process control at individual pump stations, reducing risk of line shut downs due to pressure excursions. Frequent changes in flow rates and delivery locations along with batch transport of widely differing products introduce performance demands on the entire pressure control system.

With minimal dead band and fast response, the Exlar Tritex II Series actuators are a perfect choice for these pressure valves and can easily be retrofitted in the field. A fully integrated system designed for outdoor use with Class I Div 2 ratings makes the Tritex II actuator the perfect choice in both northern and southern climates. Analog control as well as Modbus RTU is standard, with the option of Ethernet IP.

Well Site

At the drilling site, the use of robust Exlar servo controls can be found in many applications.

- **Choke valve** — Proper pressure control is critical, and the response time and stiffness of Exlar actuators makes them an excellent choice.
- **Down hole** — Exlar roller screw and robust servo motors are compact and suitable for various down hole applications
- **Drill Rig** — Exlar servo actuators can be used for improving the safety of workers, including automation of Kelly valves
- **Fracking & completion systems** — Eliminate air compressors or hydraulics with the use of Exlar electric actuators



OIL & GAS

Whether it's upstream or downstream, the oil and gas industry requires actuators that can excel in demanding applications in hazardous and explosive environments. Most applications are outdoors, which can be problematic for many actuator technologies. Exlar manufactures a full line of electric actuators well-suited for hazardous environments and outdoor temperatures.

Production

You can eliminate methane emission problems on your separators and other pressure valve applications with the 12-48VDC Tritex II DC actuators. Exlar works with all valve manufacturers to provide a seamless installation for retrofits or new installations. Low power consumption for battery use, plus analog or Modbus communications that can tie directly into the SCADA system are just a few benefits of the Tritex II DC actuator.

When used in the natural gas industry, typical pneumatic injection pumps and sampling systems release methane gas to the atmosphere. The Tritex II actuator series offers a unique combination of high speed, performance and accuracy in a compact, lightweight package perfect for high stroke needs on injection pumps and sampling systems.

Typical Applications

- Dump Valve
- Pressure Valves
- Gas Lift Valves
- Compressor Scrubbers
- Separators



Key Benefits

- 12 – 48VDC Solar bus capability
- Fail safe positioning if low bus voltage limit is reached
- Analog, Modbus or Ethernet communications
- Additional I/O
- Retrofit to any valve



The Ultimate Electric Actuator Design

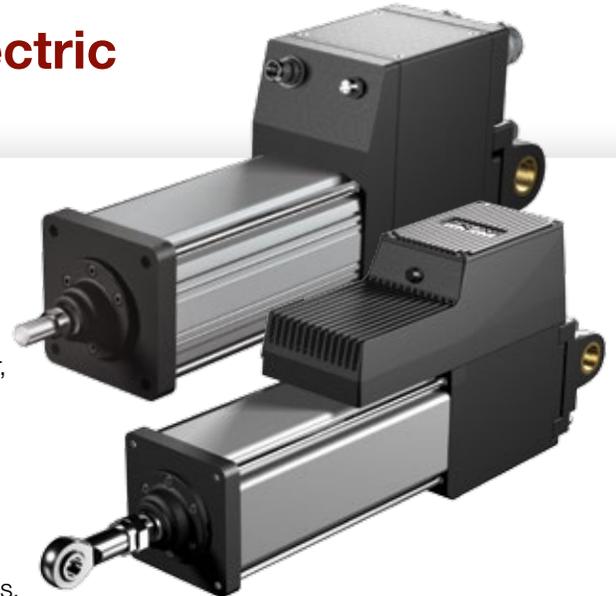
Tritex II actuators are well suited for hazardous damper and valve control.

Typical Applications

- Separators
- Pipelines
- Pressure control
- Pilot Valves
- Guide Vanes
- Dampers
- Injection Valves
- Fuel Valves

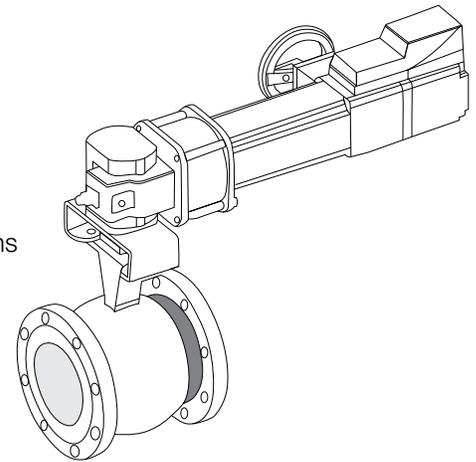
Tritex II Linear Actuators

The Tritex II™ Series actuators integrate an AC or DC powered servo drive, digital position controller, brushless motor and linear actuator in one elegant, compact, sealed package. Fully programmable to follow an analog or digital signal, the Tritex II linear actuator is perfectly designed for control valve applications.

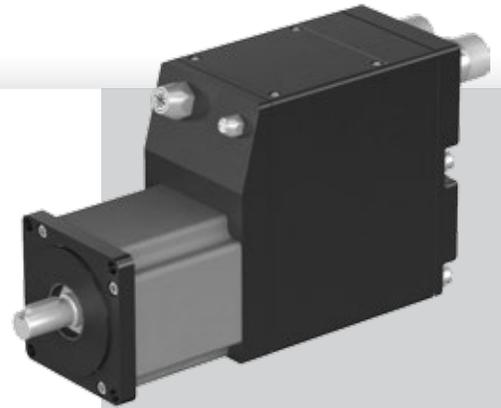


Features

- Continuous modulation duty – S9
- Built in positioner with analog and digital feedback
- Additional digital I/O
- Thrust range to 3225 lbf
- Programmable speed up to 37.5 in/sec
- Temperature range -40 to 65°C
- Cycle counts in the hundreds of millions
- Class I Div 2 Groups A,B,C,D certification
- IP65S
- AC Power 100V – 240V
- DC Power 12-48 VDC
- Strokes to 18 inches for damper applications
- Two manual override options
- Compact and light weight
- Easily adaptable to rack and pinion hardware for large rotary valve applications



Size	Voltage	Continuous Stall Force lbf (N)	Max Speed in/sec (mm/sec)	Approx. Weight lb. (kg)
TDM060	12-48VDC	528 (2,349)	33.33 (846.6)	4 (1.8)
TDM075	12-48VDC	872 (3,879)	25.00 (635)	11 (5)
T2M075	100-240VAC	1,037 (4,613)	25.00 (635)	12 (5.4)
T2M090	100-240VAC	1,448 (6,441)	33.33 (846)	14 (6.35)
T2M115	100-240VAC	3,224 (14,341)	25.00 (635)	34 (15.5)



Tritex II Rotary Actuators

The Tritex™ II Series rotary actuators are ideal for operating quarter-turn, full-turn or multi-turn valves. Similar to the linear actuator, rotary designs provide the same high power density, feedback device, and a planetary gear reducer and controller in one compact package. Gear ratios of 4:1 to 100:1 allow the power of a Tritex II actuator to be applied to a broad range of applications providing high turndown with no loss of accuracy.

Features

- Integrated servo motor, planetary gearing and positioner
- Up to 4,000 lbf-in output torque
- Continuous modulation duty – S9
- Additional digital I/O
- Temperature range -40 to 65°C
- Cycle counts in the hundreds of millions
- IP65S, Class I Div 2 Groups A,B,C,D certification
- AC Power 100V – 240V
- DC Power 12-48 VDC
- Two manual override options
- Compact and light weight

Our Tritex II Rotary actuators are also available as the driving mechanism for our FT Series and K Series roller screw actuators. This provides higher forces and longer strokes than our standard linear Tritex, perfect for damper control of larger control valves.



Size	Voltage	Gearmotor Output Torque lbf-in. (Nm)	Max Speed (RPM)	Approx. Weight lb. (kg)
RDM/G075	12-48VDC	264 (29.8)	4000	9.8 (4.4)
RDM/G090	12-48VDC	1,763 (199.2)	3300	20.5 (9.3)
R2G075	100-240VAC	273 (30.8)	4000	9.8 (4.4)
R2G090	100-240VAC	2,078 (234.8)	4000	19 (8.6)
R2G115	100-240VAC	4,066 (459.4)	3000	34 (15.5)



A superior actuator design in process industry products.

GSX/GSM Features

- Speeds to 40 in/sec
- Thrusts to 11,500 lbs.
- Strokes to 24 inches
- Two manual override options
- Class I Div 2 (Resolver feedback)
- IP65S
- 24VDC to 460VAC rms

GSX/GSM Series Linear Actuators

For applications that need forces up to 12,000 lbs, or temperatures up to 100C, the GS Series of actuators is a perfect choice. The GS Series provide an integrated servo motor and roller screw with options on feedback type and brand of position controller. Common applications include hydraulic replacement on turbines and larger valves.



Model	Max. Stroke in (mm)	Continuous Force lbf (N)	Max Speed in/sec (mm/sec)	Weight lb. (kg) approx.
GSM/X30	24 (610)	1,277 (5,680)	25 (635)	9.5 (4.3) to 20 (11.3)
GSM/X40	24 (610)	3,457 (15,377)	37.5 (953)	20 (9.1) to 44 (20)
GSM/X50	18 (455)	7,150 (31,805)	40 (1,016)	54 (24) to 70 (32)
GSM/X60	12 (305)	11,528 (51,278)	40 (1,016)	69 (31) to 101 (46)

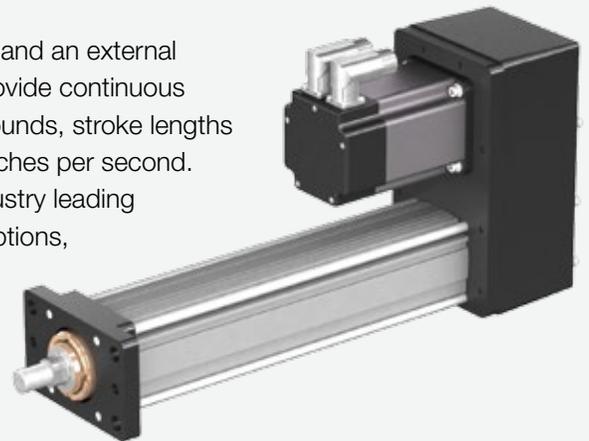
FT Series Features

- Strokes to 96 inches
- Multiple actuator mountings

FT Series Actuators

Utilizing our roller screw technology and an external motor, FT Series linear actuators provide continuous force ratings in excess of 40,000 pounds, stroke lengths up to 8 feet and speeds up to 60 inches per second. Our FT Series products provide industry leading flexibility in stroke length, rod end options, case options, and motor mounting.

Lower force K Series actuators are also available.



Model	Frame Size in (mm)	Gear Motor	Max Stroke in (mm)	Max Output Force lbf-in (Nm)	Max Speed in/sec (mm/sec)
FT35	3.5 (89)	SLG60	48 (1,219)	2,000 (8,896)	60 (1,524)
FT60	6.0 (152)	SLG90	96 (2,438)	10,000 (44,482)	39 (991)
FT80	8.0 (203)	SLG115	96 (2,438)	20,000 (88,964)	35 (889)



Our superior line of products includes:

EL Series Explosion-Proof Actuators

Our EL actuator line offers all the advantages of our GS line, but in an explosion-proof package. Voltage is dependent on the position controller chosen.

Rotary explosion-proof also available in the ER Series actuator.



EL Series Features

- Resolver Feedback
- Thrusts to 4080 lbf
- IP65S
- 24VDC to 460VAC rms
- Strokes to 18 inches (EL120)
- Two manual override options (EL120)

Model	Max. Stroke in (mm)	Continuous Force lbf-in (Nm)	Max Speed in/sec (mm/sec)	Weight lb. (kg) approx.
EL30	6 (152)	885 (3936)	25 (635)	12 (5.4) to 15 (6.8)
EL100	6 (152)	2011 (8945)	33.3 (846)	26 (11.8)
EL120	18 (457)	4081 (18152)	37.5 (953)	30 (13.6)

SLM Series Brushless Motors and SLG Series Brushless Servo Gear-motors

Similar to our rotary Tritex II actuators, the 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. The SLM Series motors offer up to 600 lbf-in continuous torque and speeds to 5000 rpm. The SLG Series gearmotors offer up to 4600 lbf-in continuous torque. The SL Series is commonly coupled to our FT actuators in high temperature or high force applications.



SLM/G Series Features

- Resolver Feedback
- Class 1, Div 2 groups A, B, C & D certified
- Terminal box with NPT ports

Model	Max Output Torque lbf-in (Nm)	Max Speed (RPM)	Weight lb. (kg) approx.
SLM/G060	525 (59.3)	5,000	3 (1.3) to 11.5 (5.2)
SLM/G090	1,892 (213.8)	4,000	5.4 (2.4) to 19.6 (8.9)
SLM/G115	4,696 (530.4)	3,000	14.2 (6.4) to 49.6 (22.5)

* Weights vary by number of motor stacks and gear stages.



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 provides sales and support world-wide. To find your local representative, visit our website at www.exlar.com or call our headquarters at 952-500-6200.

Other product literature is also available from Exlar as seen in the brochures below.



The main product Catalog includes full specifications on Exlar's GSX, GSM, EL, FT and K linear actuators and SLM, SLG and ER Series rotary actuators.



The Tritex II Series literature offers actuators that combine a brushless motor, servo amplifier and position controller in a single enclosure for a simple and low-cost solution.

Exlar Corporation
18400 West 77th Street
Chanhassen, MN 55317

TEL: 952.500.6200
Toll FREE in US and Canada: 855.620.6200
General FAX: 952.368.4877
Order Only FAX: 952.368.4359

www.exlar.com

