EL120
ATEX Rated Explosion-Proof Linear Actuators
Perfect for valve control or other hazardous environment applications, the EL120 is a high performance electric actuator offered as a direct replacement for hydraulics. EL120 actuators feature longer life, linear speeds up to 37 inches per second, closed loop feedback, 90% efficiency and 100% duty cycle.

For gas turbines with variable guide vanes, EL120 actuators provide precise positioning and feedback for fine tuning injector airflow to effectively manage CO and NOx emissions. In Oil & Gas applications, the EL120 is well suited for position-based drilling choke valves.

EL120 explosion-proof actuators meet ATEX requirements for use in potentially explosive atmospheres and are in conformity with the EU ATEX Directive 2014/34/EU. Additionally, these actuators are rated for Class 1, Division 1, Groups B, C, D, and T4 hazardous environments.

The EL Series integrates a highly efficient planetary roller screw mechanism with a high torque servomotor in a single self-contained package. This highly robust design is engineered to provide reliable and precise operation over thousands of hours, handling heavy loads—even under very arduous conditions.

The EL120 Actuator is compatible with nearly any manufacturer’s servo amplifier.

### Technical Characteristics

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame Sizes in (mm)</td>
<td>4.7 (120)</td>
</tr>
<tr>
<td>Screw Leads in (mm)</td>
<td>0.1 (2.54), 0.2 (5.08), 0.5 (12.7), 0.8 (20.3)</td>
</tr>
<tr>
<td>Standard Stroke Lengths in (mm)</td>
<td>4 (100), 6 (150), 8 (200), 10 (250), 12 (300), 18 (450)</td>
</tr>
<tr>
<td>Force Range</td>
<td>up to 4081 lbf-in (18 kN)</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td>up to 37.5 in/sec (953 mm/s)</td>
</tr>
</tbody>
</table>

### Operating Conditions and Usage

<table>
<thead>
<tr>
<th>Accuracy:</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw Lead Error in/ft (µm / 300 mm)</td>
<td>0.001 (25)</td>
</tr>
<tr>
<td>Screw Travel Variations in/ft (µm / 300 mm)</td>
<td>0.0012 (30)</td>
</tr>
<tr>
<td>Screw Lead Backlash in (mm)</td>
<td>0.004 maximum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambient Conditions:</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature °C</td>
<td>-29 to 93</td>
</tr>
<tr>
<td>Storage Temperature °C</td>
<td>-54 to 93</td>
</tr>
<tr>
<td>IP Rating</td>
<td>IP66S</td>
</tr>
<tr>
<td>Rel. Humidity %</td>
<td>5 to 100 at 60° C</td>
</tr>
<tr>
<td>Vibration</td>
<td>3.5 grms, 5 to 520 hz</td>
</tr>
</tbody>
</table>

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Features
- Forces up to 4000 lbs
- Speeds up to 37.5 ips
- Strokes up to 18 inches
- 8 pole brushless motors
- Feedback configurations for nearly any servo amplifier
- Several mounting configurations
- Windings available from 24 VDC to 460 Vrms
- CSA Class I, Div 1 Group B, C, D, and T4 hazardous environment rating
- ATEX, Ex d IIB +H2 T4 Gb IP66S, Type 4
- IECEx CSA 14.0014
- Completely sealed motor assures trouble-free operation
Product Features

T-LAM Brushless Servo Motor

1. Two 0.75 in NPT Ports, Front Facing (as viewed from rod end)
2. Two 0.75 in NPT Ports, Back Facing (as viewed from rod end)
3. Two 0.75 in NPT Ports, Right Facing (as viewed from rod end)
4. Two 0.75 in NPT Ports, Left Facing (as viewed from rod end)
5. Threaded Front & Rear Face, Metric and Threaded Front & Rear Face, English
6. Standard Front Flange
7. Standard Rear Flange
8. Metric Rear Clevis
9. English Rear Clevis
10. Metric Rear Eye
11. English Rear Eye
13. Male, Metric Thread
14. Female, US Standard Thread
15. Female, Metric Thread
16. External anti-rotate assembly

Sealed output with scraper

Induction hardened chrome plated output rod for maximum wear resistance

Feedback device for customer preferred servo amplifier

Internally threaded Cylinder

High capacity angular contact thrust bearings
## Industries and Applications

**Process Control**
- Valve control
- Damper control
- Turbine control
- Choke valves
- Fuel control
- Plunger pumps

**Automotive**
- Paint booths
- Fuel control
- Engine test stands

**Defense**
- Weapons room

**Material Handling**
- Printing presses

The EL Series of explosion proof actuators is ideal for valve control, as well as many other applications in hazardous environments. These all-electric actuators easily outperform hydraulics and other competing technologies offering long life, high speeds, closed loop feedback, 90% efficiency and 100% duty cycle.

## Notes
# Mechanical Specifications

<table>
<thead>
<tr>
<th>Screw Lead Designator</th>
<th>1 Stack</th>
<th>2 Stack</th>
<th>3 Stack</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Screw Lead</strong></td>
<td><strong>in</strong></td>
<td><strong>mm</strong></td>
<td><strong>Continuous Force</strong></td>
</tr>
<tr>
<td><strong>Electrical</strong></td>
<td><strong>Volts</strong></td>
<td><strong>Amps</strong></td>
<td><strong>(Motor Limited)</strong></td>
</tr>
<tr>
<td><strong>Continuous Force</strong></td>
<td><strong>lbf</strong></td>
<td><strong>N</strong></td>
<td><strong>lbf</strong></td>
</tr>
<tr>
<td><strong>Max Velocity</strong></td>
<td><strong>in/sec</strong></td>
<td><strong>mm/sec</strong></td>
<td><strong>in/sec</strong></td>
</tr>
<tr>
<td><strong>Friction Torque</strong></td>
<td><strong>in-lbf</strong></td>
<td><strong>N-m</strong></td>
<td><strong>in-lbf</strong></td>
</tr>
<tr>
<td><strong>Friction Torque</strong></td>
<td><strong>N</strong></td>
<td><strong>lbf</strong></td>
<td><strong>N</strong></td>
</tr>
<tr>
<td><strong>Back Drive Force</strong></td>
<td><strong>lbf</strong></td>
<td><strong>N</strong></td>
<td><strong>lbf</strong></td>
</tr>
<tr>
<td><strong>Min Stroke</strong></td>
<td><strong>in</strong></td>
<td><strong>mm</strong></td>
<td><strong>in</strong></td>
</tr>
<tr>
<td><strong>Max Stroke</strong></td>
<td><strong>in</strong></td>
<td><strong>mm</strong></td>
<td><strong>in</strong></td>
</tr>
<tr>
<td><strong>Cs (Dynamic Load Rating)</strong></td>
<td><strong>lbf</strong></td>
<td><strong>N</strong></td>
<td><strong>lbf</strong></td>
</tr>
<tr>
<td><strong>Inertia (zero stroke)</strong></td>
<td><strong>lb-in-s²</strong></td>
<td><strong>Kg-m²</strong></td>
<td><strong>lb-in-s²</strong></td>
</tr>
<tr>
<td><strong>Inertia (per inch of stroke)</strong></td>
<td><strong>lb-in-s²/in</strong></td>
<td><strong>Kg-m²/in</strong></td>
<td><strong>lb-in-s²/in</strong></td>
</tr>
<tr>
<td><strong>Weight (zero stroke)</strong></td>
<td><strong>lb</strong></td>
<td><strong>Kg</strong></td>
<td><strong>lb</strong></td>
</tr>
<tr>
<td><strong>Weight Adder (per inch of stroke)</strong></td>
<td><strong>lb/in</strong></td>
<td><strong>Kg/mm</strong></td>
<td><strong>lb/in</strong></td>
</tr>
</tbody>
</table>

### Definitions:

- **Continuous Force**: The linear force produced by the actuator at continuous motor torque.
- **Max Velocity**: The linear velocity that the actuator will achieve at rated motor rpm.
- **Friction Torque (standard screw)**: Amount of torque required to move the actuator when not coupled to a load.
- **Friction Torque (preloaded screw)**: Amount of torque required to move the actuator when not coupled to a load.
- **Back Drive Force**: Amount of axial force applied to the rod end of the actuator that will produce motion with no power applied to the actuator.
- **Min Stroke**: Shortest available stroke length.
- **Max Stroke**: Longest available stroke length.
- **Cs (Dynamic Load Rating)**: A design constant used when calculating the estimated travel life of the roller screw.
- **Inertia (zero stroke)**: Base inertia of an actuator with zero available stroke length.
- **Inertia Adder (per inch of stroke)**: Inertia per inch of stroke that must be added to the base (zero stroke) inertia to determine the total actuator inertia.
- **Weight (zero stroke)**: Base weight of an actuator with zero available stroke length.
- **Weight Adder (per inch of stroke)**: Weight adder per inch of stroke that must be added to the base (zero stroke) weight to determine the total actuator weight.

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* Please note that stroke mm are Nominal dimensions.

** Force ratings at 25°C.

*** Inertia +/-5%

1 Back drive force is a nominal value only. Operating conditions can cause wide variations in back drive force. Exlar cannot assure that an actuator will or will not back drive.
**Electrical Specifications**

<table>
<thead>
<tr>
<th>Motor Stator</th>
<th>118</th>
<th>138</th>
<th>158</th>
<th>168</th>
<th>238</th>
<th>258</th>
<th>268</th>
<th>338</th>
<th>358</th>
<th>368</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus Voltage</td>
<td>Vrms</td>
<td>115</td>
<td>230</td>
<td>400</td>
<td>460</td>
<td>230</td>
<td>400</td>
<td>460</td>
<td>230</td>
<td>400</td>
</tr>
<tr>
<td>Speed @ Bus Voltage</td>
<td>rpm</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td></td>
</tr>
</tbody>
</table>

**RMS SINUSOIDAL COMMUTATION DATA**

| Continuous Motor Torque | lbf-in | 74.1 | 74.1 | 74.3 | 74.1 | 123.6 | 121.4 | 123.6 | 172.3 | 168.9 | 176.9 |
| Peak Motor Torque       | lbf-in | 148.20 | 148.20 | 148.60 | 148.10 | 247.20 | 242.80 | 247.20 | 344.50 | 337.80 | 353.70 |
| Torque Constant (Kt)    | lbf-in/A | 4.30 | 8.70 | 15.70 | 17.30 | 8.70 | 15.80 | 17.30 | 8.50 | 15.80 | 17.50 |

**Continuous Current Rating** | A | 19.10 | 9.50 | 5.30 | 4.80 | 15.90 | 8.60 | 8.00 | 22.70 | 11.90 | 11.30 |

**Peak Current Rating** | A | 38.20 | 19.10 | 10.60 | 9.50 | 31.80 | 17.10 | 15.90 | 45.40 | 23.80 | 22.50 |

**O-PEAK SINUSOIDAL COMMUTATION**

| Continuous Motor Torque | lbf-in | 74.1 | 74.1 | 74.3 | 74.1 | 123.6 | 121.4 | 123.6 | 172.3 | 168.9 | 176.9 |
| Peak Motor Torque       | lbf-in | 148.20 | 148.20 | 148.60 | 148.10 | 247.20 | 242.80 | 247.20 | 344.50 | 337.80 | 353.70 |
| Torque Constant (Kt)    | lbf-in/A | 3.10 | 6.10 | 11.10 | 12.30 | 6.10 | 11.20 | 12.30 | 6.00 | 11.20 | 12.40 |

**Continuous Current Rating** | A | 27.00 | 13.50 | 7.50 | 6.70 | 22.50 | 12.10 | 11.30 | 32.10 | 16.90 | 15.90 |

**Peak Current Rating** | A | 54.00 | 27.00 | 15.00 | 13.50 | 45.00 | 24.20 | 22.50 | 64.20 | 33.70 | 31.90 |

**MOTOR DATA**

| Voltage Constant @ 25°C (Ke) | Vrms | 29.6 | 59.2 | 106.9 | 118.5 | 59.2 | 108.2 | 118.5 | 58.0 | 108.2 | 119.8 |
| Pole Configuration | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Resistance (L-L) | Ohms | 0.20 | 0.80 | 2.60 | 3.21 | 0.34 | 1.17 | 1.35 | 0.20 | 0.72 | 0.81 |
| Inductance (L-L) | mH | 3.30 | 11.90 | 42.40 | 46.30 | 5.90 | 21.10 | 25.30 | 3.70 | 11.60 | 17.10 |

| Brake Inertia | lbf-in-sec² | 0.00146 |
|               | kg-cm²     | 1.66    |
| Brake Current @24 VDC +/- 10% | A | 1.0 |
| Brake Holding Torque - Dry | lbf-in | 177 |
| Brake Engage/Disengage Time | ms | 13/50 |
| Mechanical Time Constant (t_m) | ms | 0.79 | 0.79 | 0.79 | 0.79 | 0.60 | 0.63 | 0.60 | 0.54 | 0.56 | 0.51 |
| Electrical Time Constant (t_e) | ms | 16.26 | 14.88 | 16.34 | 15.06 | 17.60 | 18.06 | 18.72 | 18.51 | 16.06 | 21.16 |
| Friction Torque | lbf-in | 1.43 | 1.43 | 1.43 | 1.43 | 1.81 | 1.81 | 1.81 | 2.32 | 2.32 | 2.32 |
|                 | N-m | 0.16 | 0.16 | 0.16 | 0.16 | 0.20 | 0.20 | 0.20 | 0.26 | 0.26 | 0.26 |

| Insulation Class | 180(H) |
| Ambient Temperature Rating | -29°C to 93°C |
| Insulation System Voltage Rating | T4, 135°C |

Test data derived using NEMA recommended aluminum heatsink 12" x 12" x 1/2" at 25°C ambient.
The **L₁₀** expected life of a roller screw linear actuator is expressed as the linear travel distance that 90% of properly maintained roller screws are expected to meet or exceed. For higher than 90% reliability, multiply the result by the following factors: 95% x 0.62; 96% x 0.53; 97% x 0.44; 98% x 0.33; 99% x 0.21. This is not a guarantee; these charts should be used for estimation purposes only.

The underlying formula that defines this value is:

\[
L_{10} = \left( \frac{C_a}{F_{cm}^{0.62}} \right)^{3} \times \ell
\]

where:
- \( C_a \): Dynamic load rating (lbf)
- \( F_{cm} \): Cubic mean applied load (lbf)
- \( \ell \): Roller screws lead (inches)

All curves represent properly lubricated and maintained actuators. Ratings may vary, depending on the application.

### Speed vs. Force Curves

The speed vs. force curves (below) represent approximate continuous thrust ratings at the indicated linear speed. Different types of servo amplifiers offer varying motor torque and, thus, varying actuator thrust. These values are at constant velocity and do not account for motor torque required for acceleration.

#### Estimated Service Life

The \( L_{10} \) expected life of a roller screw linear actuator is expressed as the linear travel distance that 90% of properly maintained roller screws are expected to meet or exceed. For higher than 90% reliability, multiply the result by the following factors: 95% x 0.62; 96% x 0.53; 97% x 0.44; 98% x 0.33; 99% x 0.21. This is not a guarantee; these charts should be used for estimation purposes only.

The underlying formula that defines this value is:

\[
Travel \ life \ in \ millions \ of \ inches, \ where:\n\]

\[
\text{Travel life in millions of inches} = \left( \frac{C_a}{F_{cm}^{0.62}} \right)^{3} \times \ell
\]

### EL120 Lifetime Curve

![EL120 Lifetime Curve](image-url)
**Dimensions**

**Base Actuator**

All dimensions shown in mm (inches)

- Clevis Mount and Manual Drive Options

- Front and Rear Flange Mount

<table>
<thead>
<tr>
<th>Dim</th>
<th>4 in (102 mm) Stroke in (mm)</th>
<th>6 in (152 mm) Stroke in (mm)</th>
<th>8 in (203 mm) Stroke in (mm)</th>
<th>10 in (254 mm) Stroke in (mm)</th>
<th>12 in (305 mm) Stroke in (mm)</th>
<th>18 in (457 mm) Stroke in (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>345 (13.6)</td>
<td>396 (15.6)</td>
<td>447 (17.6)</td>
<td>498 (19.6)</td>
<td>549 (21.6)</td>
<td>701 (27.6)</td>
</tr>
</tbody>
</table>

Note: Add 1.63 inches (41.4 mm) to Dims “A” if ordering a brake without a manual drive.

Pre-sale drawings and models are representative and are subject to change. Certified drawings and models are available for a fee. Consult your local Exlar representative for details.
Rod End Options

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**EL** = Model Series
EL = Explosion proof linear actuator

**AAA** = Frame Size
120 = 120 mm

**BB** = Stroke Length
04 = 4 in
06 = 6 in
08 = 8 in
10 = 10 in
12 = 12 in
18 = 18 in

**CC** = Screw Lead (linear travel per screw revolution)
01 = 0.1 in/rev (2.54 mm/rev)
02 = 0.2 in/rev (5.08 mm/rev)
05 = 0.5 in/rev (12.7 mm/rev)
08 = 0.8 in/rev (20.3 mm/rev)

**D** = Connections
F = Two 0.75 in NPT Ports, Front Facing (as viewed from rod end)
B = Two 0.75 in NPT Ports, Back Facing (as viewed from rod end)
R = Two 0.75 in NPT Ports, Right Facing (as viewed from rod end)
L = Two 0.75 in NPT Ports, Left Facing (as viewed from rod end)

**E** = Mounting
N = Threaded Front & Rear Face, Metric
H = Threaded Front & Rear Face, English
F = Standard Front Flange
R = Standard Rear Flange
G = Metric Rear Clevis
C = English Rear Clevis
J = Metric Rear Eye
K = English Rear Eye

**F** = Rod End Thread
M = Male, US Standard Thread
A = Male, Metric Thread
F = Female, US Standard Thread
B = Female, Metric Thread

**GGG** = Feedback Type
See page 89 for detailed information

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**H** = Motor Stator
1 = 1 stack motor
2 = 2 stack motor
3 = 3 stack motor

**I** = Rated Voltage
1 = 115 Volt RMS
3 = 230 Volt RMS
5 = 400 Volt RMS
6 = 460 Volt RMS

**J** = Motor Poles
8 = 8 pole motor

**KK** = Rated Motor Speed at Rated Voltage
30 = 3000 RPM

**MM** = Mechanical Option
1 = External anti-rotate assembly
2 = Rear brake

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NOTES:
1. For extended temperature operation consult factory for model number.

For options or specials not listed above or for extended temperature operation, please contact Exlar.