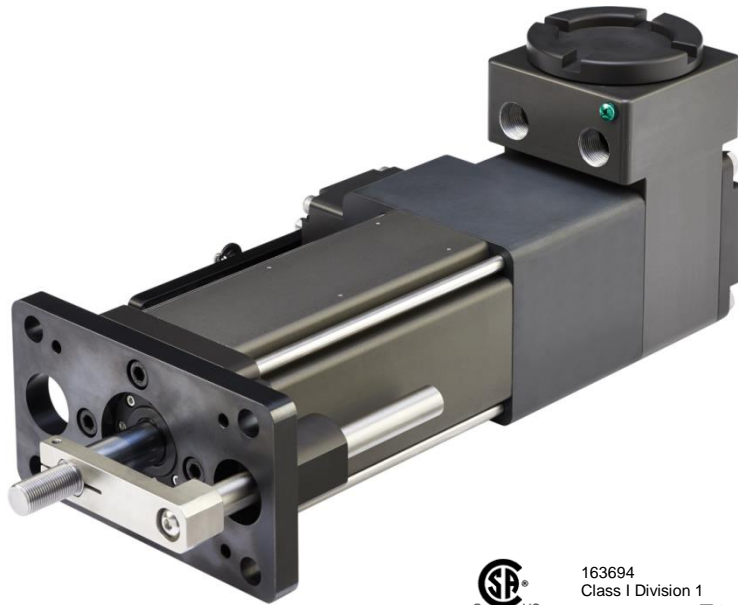


EL120 ACTUATOR INSTALLATION MANUAL



163694
Class I Division 1
Groups B, C, D, T4

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Warranty and Limitation of Liability

Products are warranted for two years from date of manufacture as determined by the serial number on the product label. Labels are generated and applied to the product at the time of shipment. The first and second digits are the year and the third and fourth digits represent the manufacturing week. Product repairs are warranted for 90 days from the date of the repair. The date of repair is recorded within Exlar's database tracked by individual product serial number.

Exlar warrants its product(s) to the original purchaser and in the case of original equipment manufacturers, to their original customer to be free from defects in material and workmanship and to be made only in accordance with Exlar's standard published catalog specifications for the product(s) as published at the time of purchase. Warranty or performance to any other specifications is not covered by this warranty unless otherwise agreed to in writing by Exlar and documented as part of any and all contracts, including but not limited to purchase orders, sales orders, order confirmations, purchase contracts and purchase agreements. In no event shall Exlar be liable or have any responsibility under such warranty if the product(s) has been improperly stored, installed, used or maintained, or if Buyer has permitted any unauthorized modifications, adjustments and/or repairs to such product(s). Seller's obligation hereunder is limited solely to repairing or replacing (at its opinion), at the factory any product(s), or parts thereof, which prove to Seller's satisfaction to be defective as a result of defective materials, or workmanship and within the period of time, in accordance with the Seller's stated product warranty (see Terms and Conditions above), provided, however, that written notice of claimed defects shall have been given to Exlar within thirty (30) days from the date of any such defect is first discovered. The product(s) claimed to be defective must be returned to Exlar, transportation prepaid by Buyer, with written specification of the claimed defect. Evidence acceptable to Exlar must be furnished that the claimed defects were not caused by misuse, abuse, or neglect by anyone other than Exlar.

Components such as seals, wipers, bearings, brakes, bushings, gears, splines, and roller screw parts are considered wear parts and must be inspected and serviced on a regular basis. Any damage caused by failure to properly lubricate Exlar products and/or to replace wear parts at appropriate times, is not covered by this warranty. Any damage due to excessive loading is not covered by this warranty.

The use of products or components under load such that they reach the end of their expected life is a normal characteristic of the application of mechanical products. Reaching the end of a product's expected life does not indicate any defect in material or workmanship and is not covered by this warranty.

Costs for shipment of units returned to the factory for warranty repairs are the responsibility of the owner of the product. Exlar will return ship all warranty repairs or replacements via UPS Ground at no cost to the customer.

For international customers, Exlar will return ship warranty repairs or replacements via UPS Expedited Service and cover the associated shipping costs. Any VAT or local country taxes are the responsibility of the owner of the product.

The foregoing warranty is in lieu of all other warranties (except as Title), whether expressed or implied, including without limitation, any warranty of merchantability, or of fitness for any particular purpose, other than as expressly set forth and to the extent specified herein, and is in lieu of all other obligations or liabilities on the part of Exlar.

Seller's maximum liability with respect to these terms and conditions and any resulting sale, arising from any cause whatsoever, including without limitation, breach of contract or negligence, shall not exceed the price specified herein of the product(s) giving rise to the claim, and in no event shall Exlar be liable under this warranty otherwise for special, incidental or consequential damages, whether similar or dissimilar, of any nature arising or resulting from the purchase, installation, removal, repair, operation, use or breakdown of the product(s) or any other cause whatsoever, including negligence.

The foregoing warranty shall also apply to products or parts which have been repaired or replaced pursuant to such warranty, and within the period of time, in accordance with Seller's stated warranty.

NO PERSON INCLUDING ANY AGENT OR REPRESENTATIVE OF EXLAR, IS AUTHORIZED TO MAKE ANY REPRESENTATION OR WARRANTY ON BEHALF OF EXLAR CONCERNING ANY PRODUCTS MANUFACTURED BY EXLAR, EXCEPT TO REFER PURCHASERS TO THIS WARRANTY.

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Safety Considerations

As with any electro-mechanical device, safety must be considered during the installation and operation of the actuator and controller. Throughout this manual you will see paragraphs marked with CAUTION and WARNING signs as shown below.

WARNING



English

"Warning" indicates the information following is essential to avoiding a safety hazard.

CAUTION



English

"Caution" indicates the information following is necessary for avoiding a risk of damage to the product or other equipment.

WARNING



English

General

Failure to follow safe installation guidelines can cause death or serious injury. The voltages used in the product can cause severe electric shock and/or burns and could be lethal. Extreme care is necessary at all times when working with or adjacent to the product. The installation must comply with all relevant safety legislation in the country of use. The forces created by actuator could be lethal or cause severe injury if proper protection is not provided to keep personnel away from moving components.

WARNING



English

System Design and Safety for Personnel

The actuator is intended to be used as a component for professional incorporation into complete equipment or a system. If installed incorrectly, the actuator may present a safety hazard. The actuator uses high voltages and currents, carry a high level of stored electrical energy, and are used to control equipment which can cause injury. Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction. System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and this manual carefully. **None of the functions or features of the actuator may be used to ensure safety of personnel, i.e. they must not be used for safety-related functions.** For example, when present, the actuator run/reset, enable/disable, brake, stop/start, and forward/reverse functions are not sufficient for use in safety-critical applications without additional independent channels of protection. Careful consideration must be given to the functions of the actuator which might result in a hazard, either through their intended behavior or through incorrect operation due to a fault. In any application where a malfunction of the actuator or the control system could lead to or allow damage, loss or injury, a risk analysis must be carried out, and where necessary, further measures taken to reduce the risk. For example, a failsafe brake in case of loss of actuator or controller power when movement must be stopped to prevent an unsafe condition from developing.

WARNING



English

Dangerous Voltages

Never attempt to connect or disconnect the actuator with power applied. Dangerous voltages are present. Damage to equipment and injury to personnel can result. The controller may have voltage present for a considerable time period after incoming power is removed. Take care to insure that the controller has discharged all power.

WARNING**English****Connected by Exposed Wire**

A special hazard may exist where the actuator is incorporated into a system which is connected using exposed wire. When disconnected, the exposed wire may still be connected to the actuator, which may still have dangerous voltage levels present. It is the responsibility of the user to avoid any possibility of electric shock from the exposed wires, if they are accessible.

WARNING**English****Grounding - High Leakage Current**

The actuator must be grounded by a conductor sufficient to carry all possible fault current in the event of a fault. This equipment has high earth leakage current. You must comply with local safety regulations with respect to minimum size and special installation requirements on the protective earth conductor for high leakage current equipment. The ground connections shown in this manual must be followed.

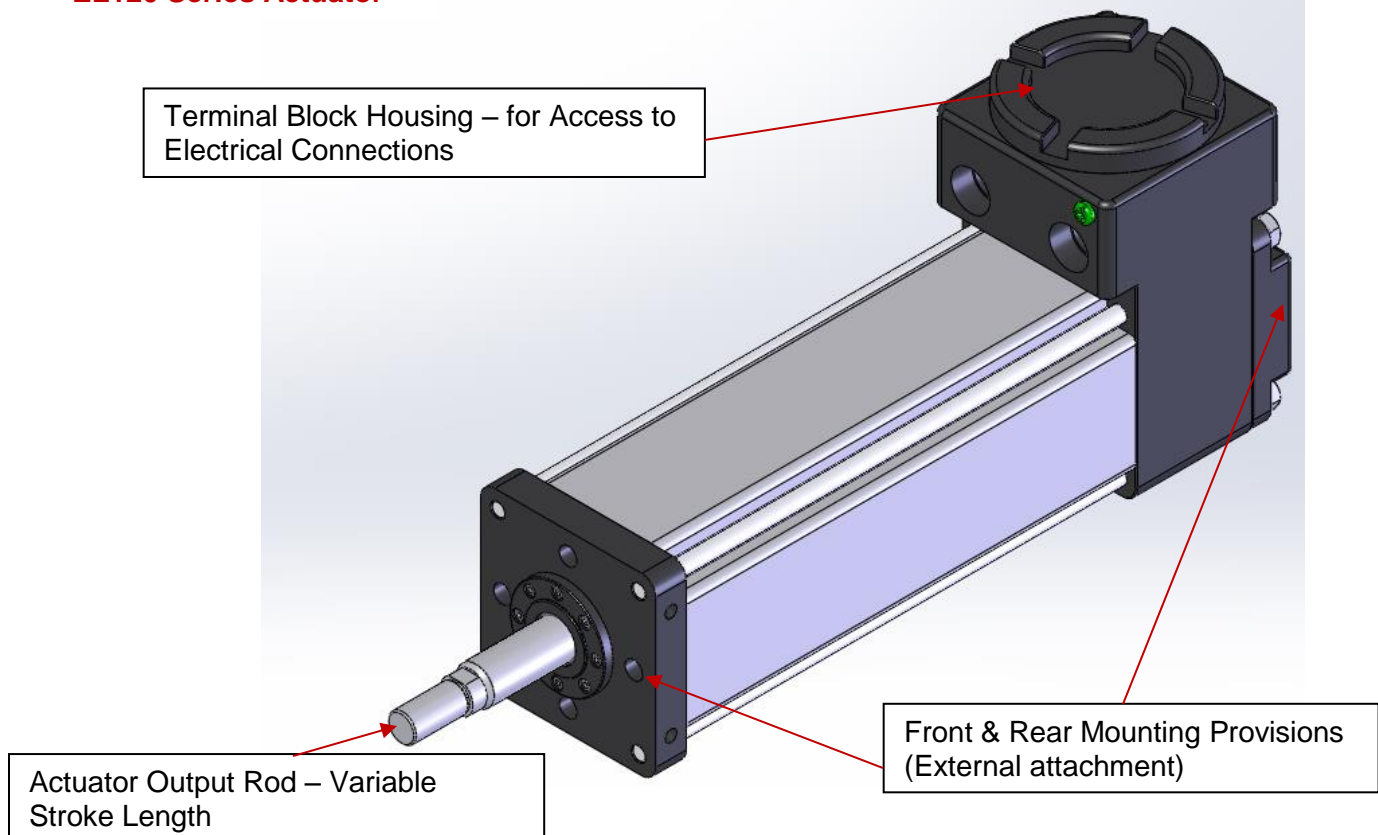
WARNING**English****Hazardous Location Use**

The EL120 series linear actuator is certified for use in hazardous locations. All additional equipment used to install the devices, such as cables, cable glands, sealant, fuses, etc., and installation techniques must be in compliance with local codes regarding use in hazardous locations.

Actuator Description & Markings

The EL120 is a linear actuator incorporating a highly robust roller screw mechanism within the armature of a brushless servo motor. In addition, the EL120 series actuators are designed for use in hazardous locations, the product has been constructed to CSA standards, and certified by the appropriate agencies.

EL120 Series Actuator



Product Marking

The EL120 has been certified for the following markings:

CSA



163694 Class I, Div 1, Group B, C, D, T4

Other Data Included with each label:

Manufacturer: Exlar Actuation Solutions

Voltage Rating: Rated for each motor configuration – (Range of 24 Vdc to 460 Vrms)

Current Rating: Rated for each motor configuration – (Maximum of 30 Arms)

Ambient Temperature Range: - 29 °C to + 93 °C

Part Number & Revision: Each unique configuration marked with 5 digit number and alpha character revision

Serial Number: Serial Number Includes Year & Week of Manufacture

Model Number: The EL120 model numbers define the construction or configuration of subject actuator. The model number information included on each label is included as shown in the tables below:

WARNING



English

Special Conditions for Safe Use: (denoted by X after certificate number)

At the cable entry point the surface temperature may reach up to 125°C, therefore supply cable and entries shall be selected accordingly.

The maximum voltage and current ratings marked on the equipment shall not be exceeded.

Any maintenance of the critical dimensions of the flame paths shall not be undertaken without seeking guidance from the manufacturer of the equipment.

Actuator Model Designation	
EL120-BBCC-DEF-GGG-HHH-II-(XX.XX)-#####	
BB = Stroke Length (18" Max)	
04 in	
06 in	
08 in	
10 in	
12 in	
18 in	
XX = Special Stroke	
CC = Roller 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)	
XX = Special Lead	
D = Connections	
F = Two 3/4" NPT Ports - Front Facing (As Viewed from Shaft End)	
B = Two 3/4" NPT Ports - Back Facing (As Viewed from Shaft End)	
R = Two 3/4" NPT Ports - Right Facing (As Viewed from Shaft End)	
L = Two 3/4" NPT Ports - Left Facing (As Viewed from Shaft End)	
X = Special NPT Ports - up to 4 x 3/4" NPT or Smaller	
E = Mounting	
N = Threaded Front & Rear Face, Metric	
H = Threaded Front & Rear Face, Imperial	
F = Standard Front Flange	
R = Standard Rear Flange	
G = Metric Rear Clevis	
C = Imperial Rear Clevis	
J = Metric Rear Eye	
K = Imperial Rear Eye	
X = Special Flange or Clevis	
F = Rod End	
M = Male, US Standard Thread	
A = Male, Metric Thread	
F = Female, US Standard Thread	
B = Female, Metric Thread	
X = Special Rod End	
GGG = Controller Feedback Option	
Three character code designating a Controller that uses one of the following	
Resolver, Standard Encoder, Absolute Encoder	
The Controller also will designate whether Thermal Protection is performed	
With a Thermik Normally Closed Switch; or a Philips KTY84 Series Thermister	
H = Motor Stator	
1 = 1 Stack Motor	
2 = 2 Stack Motor	
3 = 3 Stack Motor	
H = Rated Voltage	
1 = 115 Volt RMS	
3 = 230 Volt RMS	
5 = 400 Volt RMS	
6 = 460 Volt RMS	
X = Special Voltage Rating – not to exceed 460 Volt RMS	
H = Motor Poles	
8 = 8 Pole Motor	
II = Rated Motor Speed at Rated Voltage (4500 RPM Max)	
01 – 45 Two Digit Number x 100 = Rated RPM	
(XX.XX) = Mechanical Option (Multiple options may apply – separated by "-")	
XL = Special Lubrication	
PF = Pre-Loaded Roller Screw Follower	
AR = External Anti-Rotate Assembly	
RB = Rear Brake	
HW = Handwheel Drive	
SD = Side Hex Drive	
CD = Crank Drive	
XT = Special Travel Option (See List Below)	
- Non Standard Roller Count	
- Deep Groove Ball Bearings	
- Stainless Steel Main Rod	
XH = Special Housing Option	
- Special Coating	
##### = Part Number	
- 5 Digit numeric part number unique to model configuration	

Installation

Mechanical Installation

Lubrication

EL series actuators are shipped from the factory fully greased and ready for installation. Exlar's standard grease is Mobil SHC 220, which is a high performance, extreme-pressure grease. SHC 220 is adequate for a broad range of applications. In the case of extreme temperatures, Exlar recommends using Mobilgrease 28, also a high performance, extreme-pressure grease. The unique physical properties of the synthetic base oil provide outstanding protection against wear, rust, corrosion, and high or low-temperature degradation. Mobilgrease 28 allows for very low starting and running torque values. Its operating range is -55 to 180 °C (-67 to 356 °F).

Other lubricants can be used as well and all special grease can be specified via the "XL" designation in the Options portion of the model mask with the appropriate product identified with Exlar Application engineering at the time of order.

Mounting Configurations

The actuator have provisions for front face, rear face, front flange, rear eye, or rear clevis mounting. Every effort should be made to minimize misalignment. Any misalignment will decrease the life of the components within the actuator and also may create problems within the application associated with misalignment.

See an Exlar catalog or Exlar Supplied mounting drawing for the specific mounting dimensions required for your configuration.

English

CAUTION



Excessive side load on the output rod of the actuator will dramatically reduce the life of the actuator and should be avoided completely. Side load can be caused from misalignment or loading that is not in-line with the actuator output rod.

CAUTION



English

Care should be taken not to exceed the physical travel limits of actuator. Doing so will cause the actuator to end-crash internally. End crashes can physically damage the roller screw and the internal components of the actuator.

General Operation

The EL120 series of actuators function in the same manner as a brushless servomotor. The EL120 actuator must be connected to a servo drive controller to properly commutate the motor and control the torque, speed and position of the actuator. This rotary motion is translated into linear motion by the internal planetary roller screw mechanism of the EL series linear actuator. The rotary motion of the motor and the linear motion of the actuator correspond to the following relationships:

Linear Distance Traveled [in] = Motor Revolutions \times Roller Screw Lead [in/rev]

Linear Speed [in/sec] = $\frac{\text{Motor Speed [RPM]}}{60} \times \text{Roller Screw Lead [in/rev]}$

Linear Force [lbf] = $\frac{\text{Motor Torque [in-lbf]} \times 2\pi \times \text{Efficiency}}{\text{Roller Screw Lead [in/rev]}}$

All of the above relationships require proper anti-rotation of the EL series actuator rod. The unique design of the EL series linear actuators allows the extending rod to rotate. This simplifies the setup of the actuator by allowing the user to rotate the rod and thread it in and out of the actuator for mechanical attachment or system testing.

This feature also requires that the rod be kept from rotating when used in its dedicated application to insure proper linear motion. In most applications, such as those where the load is coupled to linear bearings or some other support device, the load cannot rotate, providing anti-rotation for the extending rod of the actuator.

For applications in which the load is free to rotate, Exlar offers anti-rotation systems. Contact Exlar engineering if the application requires a dedicated anti-rotation system.



Motor RMS current must be maintained at a level below the continuous current rating of the EL Series actuator or damage to the motor stator will result.

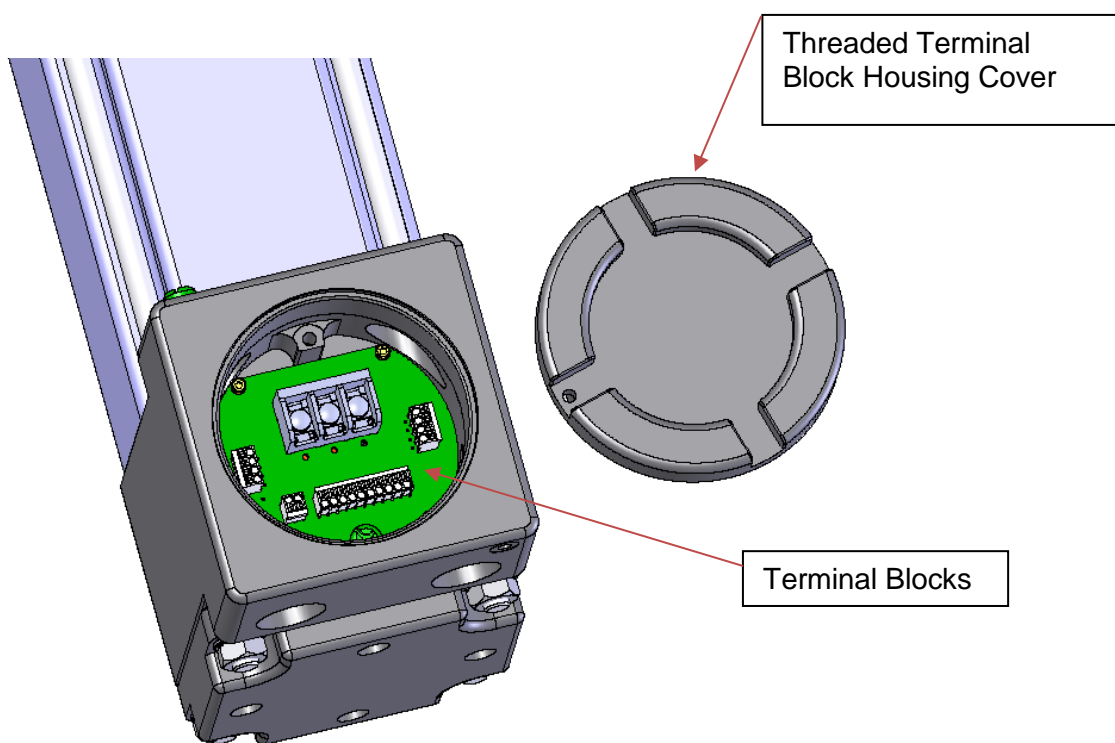
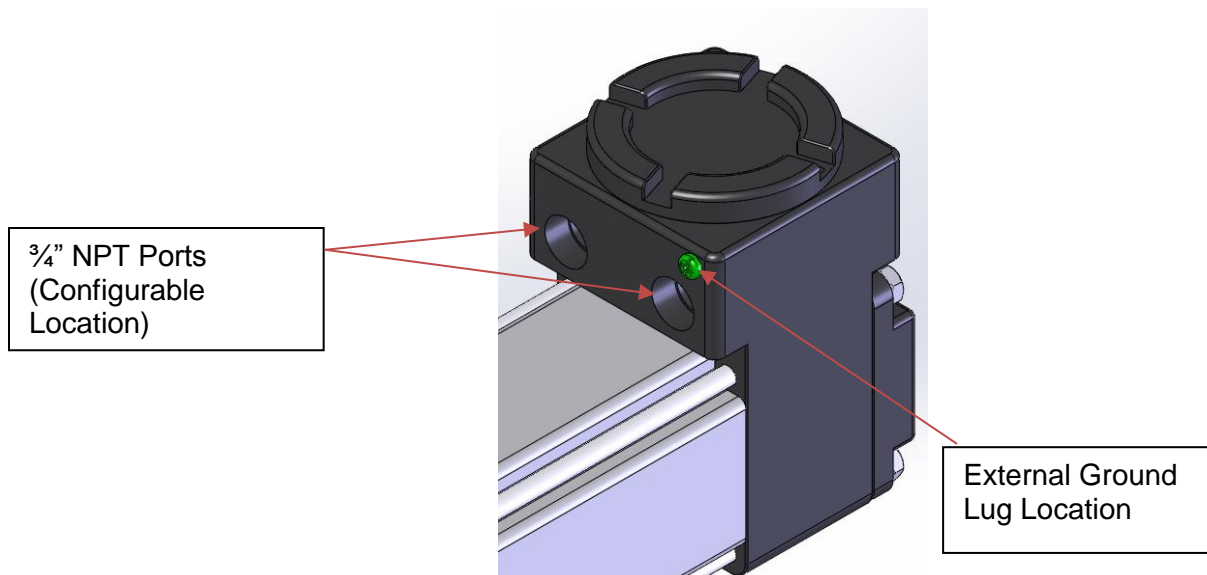
The peak current setting must be maintained at a level below the peak current rating of the EL Series actuator or damage to the stator will result.

Electrical Installation

Introduction

The actuator and a controller combine to provide a complete motion control system. The electrical to mechanical power conversion and position feedback devices are contained in the actuator.

Connections to the actuator are made via the $\frac{3}{4}$ " NPT ports. Normally one port is used to provide access to the power wiring of the motor phases, the other port used to provide access to the feedback wiring.



See diagram below for an example of terminal box connections. When the threaded cover is removed, the installer can have access to the wiring connections.

To properly secure the enclosure, conduit entries must be sealed according to CSA requirements within 18 inches of the actuator.

After making the internal wiring connections, the threaded cover must be screwed down until the cover flange is fully stopped against the top surface of the terminal housing. Once the cover is fully screwed down, tighten the set screw in the cover against the housing to a torque of 10-25 in*lbs (1-3 Nm).

Grounding

WARNING



English

Grounding

Fixed Protective Earth (PE) connections are required for human safety as well as proper operation. PE connections must not be fused or interrupted. Failure to follow proper PE wiring can cause death or serious injury. This equipment has high earth leakage current and requires a redundant PE connection.

A PE Connection is made (as marked) inside the terminal housing as indicated in the wiring diagram. There is also an external lug provided for connection of an external PE connection.

Actuator Connections

CAUTION



English

Always use tinned wire ends or ferruled crimp terminals to prevent stray strands of wire from shorting or falling into open circuit areas.

WARNING



English

Always use cables, cables glands, sealant, and installation techniques in accordance with local codes regarding hazardous locations to avoid creating safety hazards. After making electrical connections always re-install the cover to maintain proper sealing for operation in hazardous locations.

Actuator Electrical Connections are to Terminal Blocks. Wiring will vary based upon feedback device selected. Please refer to the diagram below or contact Exlar technical support.

Most EL Series motors incorporate a 2 pole resolver or quadrature incremental encoder with commutation signals as the primary rotary feedback device. The selection of this feedback device is dictated by the amplifier that the end user will use to operate the motor.

Each amplifier has specific requirements for the feedback on the motor. Not all resolver-based amplifiers can use the same resolver, resolver alignment, or relative direction of resolver rotation. Not all encoder-based amplifiers can use the same encoder, encoder alignment or relative direction of encoder rotation.

Many amplifiers offer software that allows the entering of parameters or the downloading of "motor data files" that dictate how the feedback must be set up on the motor. Exlar can provide many of these data files or the proper parameters to enter. Entering motor parameter data to some amplifiers may require assistance from the amplifier manufacturer.

Feedback Alignment

When Exlar manufactures an EL Series motor, the proper feedback is selected, mounted, aligned and test run on the amplifier that the customer plans to use, or one that is known to be equivalent for confirming proper feedback alignment and operation. In any case where it is determined that the feedback has become misaligned, or an amplifier change is made requiring the feedback to be aligned differently, it is recommended that Exlar be contacted and arrangements made to have that procedure performed.

Feedback Wiring

The wiring of the feedback device is critical to the operation of the motor with the selected amplifier. Wiring the feedback cable incorrectly can cause unstable operation, incorrect operation or no operation at all. In some cases, improper current limits set in the amplifier along with improper wiring of the feedback cable can lead to damage of the motor.

Resolvers

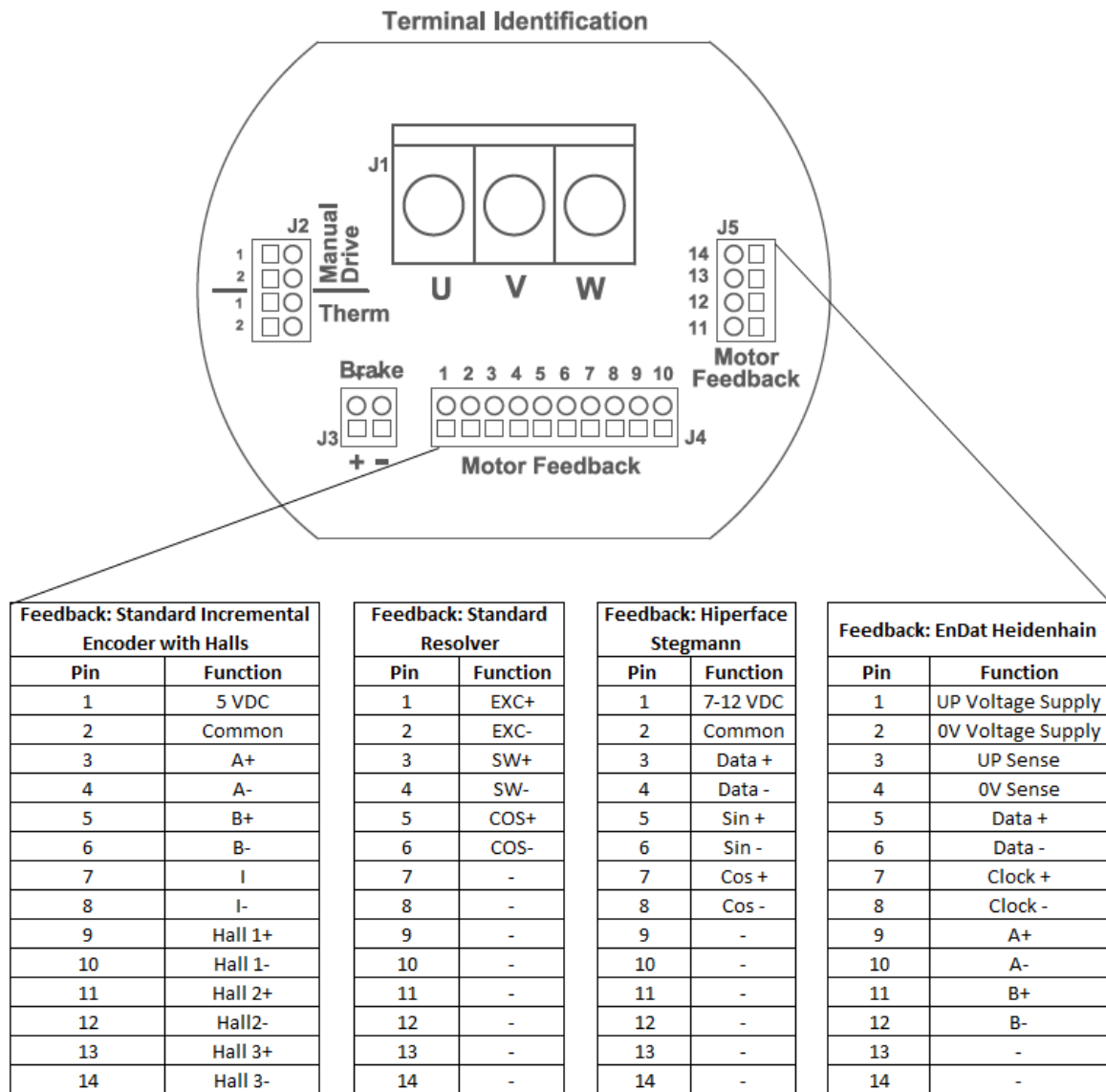
A resolver is a non-electronic device that works like a small transformer. When rotated, it generates 2 sine waves that are out of phase with one another. By decoding these two sine waves, the amplifier can monitor the direction, revolutions, and speed of rotation of the motor. Each sine wave typically represents one revolution of the motor, so the amplifier can also use these signals to know where the motor is within that revolution. By knowing the motor's position, the amplifier can properly time the supply of current and voltage to the motor for it to rotate. This process is **commutation**. For the amplifier to properly commute the motor, it must have a reference, or zero, point from which to track the motor's rotation. This reference point is critical, and is provided to the amplifier through the proper alignment of the resolver to the phases of the motor during the actuator assembly.

Encoders

An incremental encoder is an electronic rotary device that transmits a string of electrical pulses when rotated. Most brushless motors or servo systems that use incremental encoders use what is called a quadrature encoder. Typical brushless motor encoders use two data channels, labeled A&B, to provide direction, velocity and position information. The Channel labeled I or Z has one pulse per revolution and is called the index. The channels labeled as hall signals or commutation signals are typically labeled S1, S2 & S3; Hall 1, 2 & 3; or Hall A, B & C, depending on the manufacturer's conventions. These signals give the amplifier the commutation information that it needs to properly rotate the motor.

EL Series Feedback Devices

Standard EL Series motors use either resolvers or encoders as their primary feedback device. Depending on the amplifier that will be used to operate the actuator, the hookup of the actuator can vary. Refer to www.exlar.com or contact Exlar for the correct wiring details.



Actuator (Motor) Power

Power is provided to the U, V, and W actuator phases using the indicated terminal blocks. The terminal blocks are capable of accepting various wire gauges. Conductor sizes and cable length must be designed for the specific application. There are additional internal lugs that connect to the actuator case for grounding.

Actuator (Motor) Feedback

Actuator position feedback and temperature information are provided using the indicated terminal blocks. The terminal blocks are capable of accepting various wire gauge conductors.

Actuator (Motor) Brake

Many applications require the addition of the rear internal holding brake. The brake is held open by the supply of power to a magnetic/mechanical clutch. Whenever there is not power to the brake, the armature is held in place which prevents the shaft from moving.



DO NOT attempt to operate the motor with the brake applied. Allowing the motor to operate with the brake applied may cause serious damage to the motor and/or the brake. Do not use the brake to support heavy loads while an operator is under the load. Provide another means to lock the load in position. The brake is a spring applied friction mechanism and does not provide a positive lock.

Actuator (Motor) Manual Drive

The actuator may be built with one of three manual drive user interfaces, a handwheel, a hex drive, or a hand crank drive. Each manual drive configuration connects to a drive shaft with a pinion gear inside the actuator. The drive shaft is moved axially to engage or disengage the pinion with the driven gear inside the actuator. When the manual drive is in the engaged position a safety interrupt switch prevents the actuator from operating if properly connected to the control system. All manual drive interfaces have holes that will allow for the use of a lockout device.

WARNING



Never engage the manual drive when power is applied to the actuator. The manual drive is only intended for use during power down or OFF conditions. Engaging the manual drive when power is applied may result in personal harm and/or damage to the actuator. The switch within the manual drive is not a failsafe device and should not be used as an ON/OFF for the actuator. Do not operate the actuator with the manual drive in a partially engaged position. Do not apply power to the actuator unless the manual drive is in the fully disengaged position as indicated by the safety interrupt switch being in the CLOSED state.

Maximum Manual Drive Input Torque

Model	Maximum Torque in-lbs / (Nm)
EL120	40 / (4.5)

CAUTION



If manually driving through a brake or high force is necessary, please consult Exlar engineering. Please note that this will wear the brake, resulting in dust formation and a change in brake performance.

CAUTION



If a power tool is used to operate the hex manual drive, the speed should be limited to 600 RPM. An impact driver should never be used to operate the hex manual drive.

CAUTION



Extreme caution should be taken when approaching the end of stroke of the actuator or system.

OPERATING INSTRUCTIONS

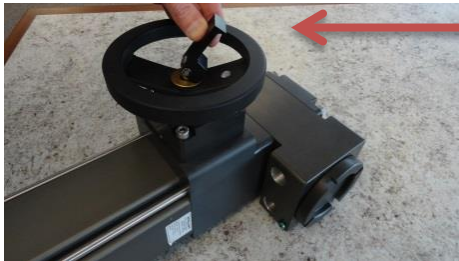
HANDWHEEL:

1. Turn off power to the actuator. If the unit has a brake, disengage it if possible.
2. Move lever to engage or disengage handwheel as shown below. Always move the lever to the full Engage or Disengage position. See pictures below.
3. Confirm the state of the safety interrupt switch. The switch should be in the OPEN state when the handwheel is engaged. The handwheel can now be used.

- Return lever to disengaged position before applying power to actuator.



Handwheel in Disengaged Position



Flip Direction

Move lever as shown (Step 2)



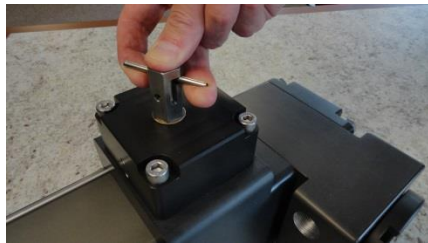
Handwheel in Engaged Position (Step 3)

HEX DRIVE:

- Turn off power to the actuator. If the unit has a brake, disengage it if possible.
- Hook your fingers under the cross-pin on both sides of the hex. Pull the pin away from the body of the actuator and rotate the pin into the longer slot on the hex. Allow the pin and shaft to be pulled down toward the body of the actuator. See pictures below.
- Confirm the state of the safety interrupt switch. The switch should be in the OPEN state when the hex drive is engaged. The hex drive can now be used.
- Return to disengaged position before applying power to actuator.



Hex in Disengaged Position



Hex Engage Direction

Move Pin as Shown (Step 2)



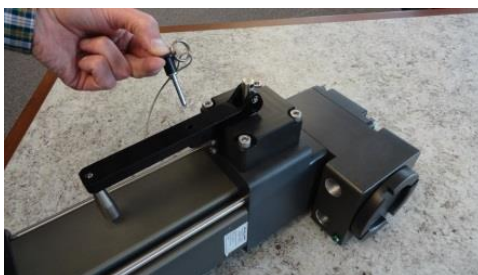
Hex in Engaged Position (Step 3)

HAND CRANK DRIVE:

1. Turn off power to the actuator. If the unit has a brake, disengage it if possible.
2. Remove the lanyard pin. It will be necessary to depress the button on the pin.
3. Lift the hand crank away from the body of the actuator and pivot the crank 180 degrees until the handle is facing away from the body of the actuator.
4. Insert the lanyard pin through the crank and shaft to lock the crank in place. See pictures below.
5. Confirm the state of the safety interrupt switch. The switch should be in the OPEN state when the hand crank is engaged. The hand crank can now be used.
6. Return to disengaged position before applying power to actuator.



Hand Crank in Disengaged Position



Flip Direction

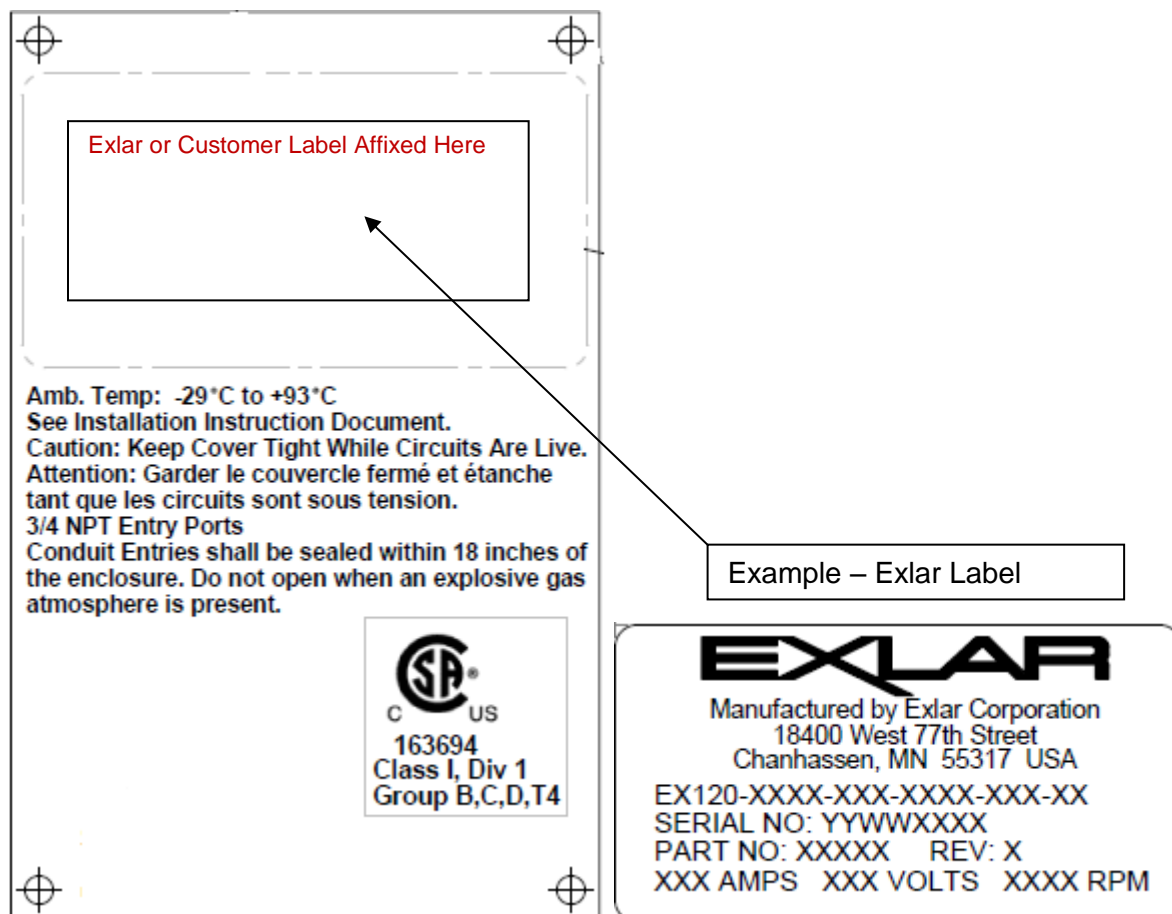
Remove Pin and Flip Hand Crank (Steps 2 & 3)



Re-insert Pin to Engage Hand Crank (Steps 4 & 5)

Actuator Label Designs

Below is the design of the actuator label. The Label is two part – Part 1 is the Aluminum nameplate with Certification Data and other static markings. The top portion of the aluminum label will have a Thermal Transfer Metallized Polyester Label. This portion of the label includes the variable information, Exlar's name & address, Model Number, Serial Number and Electrical Ratings. This label can also be used for a customer specific label where customer logo and part number information can be included. Examples are included in the drawings below:



Product Label

Service & Maintenance

Service and maintenance of the actuator in the field must be limited to mounting, installation, inspection, and re-greasing. Wiring connections will need to be made by access into the Terminal Block Housing. Any additional service or maintenance on the actuator must be conducted at the factory.

Maintenance Procedures for Re-Greasing

Maintenance Procedure for Roller Screw Re-Greasing

CAUTION



If your actuator has a preloaded roller screw, do not remove it from the cylinder. Preloaded screws require special tooling and procedures for proper disassembly and reassembly. Contact Exlar to arrange for maintenance of a preloaded screw actuator.

Disassembly

Refer to the exploded view on the following page.

- 1.) Remove the actuator assembly from the machine by disconnecting the cables, main rod coupling and actuator mounting bolts or fasteners.
- 2.) If your unit does not have an external anti-rotate assembly, skip this step. Loosen the screw that clamps the anti-rotate cross member to the actuator output rod. Slide the anti-rotate mechanism forward and off the actuator.
- 3) Remove the screws holding the seal gland to the face plate. With the screws removed, pull the seal gland off. There is a recess around the gland which may be used for prying.
- 4.) When the seal gland is removed, the open end of the roller screw internally threaded cylinder (ITC) is visible. The roller screw can be removed by turning it counter clockwise and threading it out of the cylinder. It may be necessary to keep the roller screw cylinder from turning to remove the screw.



Lubrication Maintenance

Grease lubricated units will require periodic inspection and renewal of the roller screw grease. The table below shows the recommended grease renewal period.

RMS rotational speed (RPM)	Recommended Grease Renewal Period (hours)	
	CASE TEMP 65°C (149°F)	CASE TEMP 80°C (176°F)
250	10,000	5,000
500	8,500	4,250
1000	6,000	3,000
1500+	3,500	1,750

Grease Renewal

The roller screw cylinder and the roller screw assembly are the components that require grease. They require a coating of grease. They do not need to be packed with grease. Excess grease requires more torque from the motor when returned to operation, and does not improve the lubrication of the unit.

- 1.) Use a brush to work approximately 0.5 in³ of grease for every 3 inches of stroke length into the roller screw cylinder. Be sure to cover all of the threaded areas of the cylinder.
- 2.) Use a brush to work grease in to the roller screw assembly. Be sure to cover all the threaded surfaces of the screw assembly. This can be accomplished by applying grease to a few places on the roller screw assembly and rotating the components repeatedly in both directions to work the grease into the assembly.

Reassembly

- 1.) Rethread the roller screw into the internally threaded cylinder (ITC). It is a multiple start screw, and this is not always easy. **DO NOT FORCE THE ROLLER SCREW INTO THE CYLINDER.** It is best to have the actuator vertical with the open end of the roller screw cylinder facing up. Position the roller screw above the cylinder so that it is aligned axially with the ITC. Slowly turn the roller screw 1/4 to 1/2 a turn counterclockwise with it in contact with the ITC. This will help to align the threads on the roller screw with the threads in the ITC. Rotate the roller screw clockwise and it should begin to thread into the cylinder. If it does not turn freely, remove it and begin again. When threading the screw into the cylinder, it will roll freely into the actuator. When it reaches the portion of the cylinder that contains the motor magnets, the roller screw will be more difficult to turn because of the magnetic field of the magnets. **THIS IS NORMAL.** Continue to thread the roller screw into the cylinder. When it reaches the bottom, it will become difficult to turn and the motor and bearings will begin to rotate with it. The roller screw is now fully inserted into the cylinder.
- 2.) Place a small amount of seal lubricant on the inside surface of the seal/bushing assembly.
- 3.) Carefully slide the bushing/seal assembly over the actuator rod end. The seal is a tight fit on the rod end. Take care not to damage the seal on the threads of the rod. Rods have a chamfer to provide a lead in for replacement of the seal. The mounting screws should have a low or medium strength thread locker added, such as Loctite 222MS.

WARNING



Take caution when installing the gland over the rod and into the actuator housing. These joints compromise flame paths on the actuator. If parts become damaged consult Exlar prior to re-installing.

WARNING



Do not reassemble the gland with fewer than 8 screws. Screws must be stainless steel M4 x 12mm socket head cap screws with a tensile strength of 700 MPa min. Screws must be torqued to 1.6 Nm (14 in*lbs) \pm 10%.

- 4.) If your actuator has an external anti-rotate mechanism, slide the rod or rods of the anti-rotate mechanism through the front flange and into the guide bushing or bushings mounted to the rear of the flange. Position the extending rod so that the wrench flats are parallel to the long side of the flange. Slide the cross member assembly of the anti-rotate mechanism over the end of the rod and onto the wrench flats. Tighten the screw that clamps the assembly to the actuator rod.

Returning Product for Repair

PROCEDURE:

- Please discuss the return with Exlar Technical Support prior to requesting an RGA number to see if it is possible to resolve the issue prior to return.

- If it is determined that an RGA number is required, please do so by completing the RGA Request Form (available at exlar.com) or contacting the Returned Goods Administrator. Phone 952-500-6200 or email cha_returns@curtisswright.com.
- International Repairs: Closely follow instructions provided by the Exlar Returned Goods Administrator. Failure to comply with issued instructions may result in delays for repair and return.
- Exlar requires a purchase order at the time of RGA; \$0 on warranty returns, or for the standard evaluation charge per unit on all non-warranty units for the evaluation fee.
- Following the evaluation, you will receive a quote from Exlar on the charges that will apply. If the actuator repair is approved, the evaluation fee will be waived and we will request an amended PO for the actual repair value.

Product Repair Lead Time

	Evaluation Time: (Quote + Eval Report)	Repair Time: (After Parts Received)	Evaluation & Additional Fees*
Standard	< 10 days	< 7 days	Eval Fee
Standard Expedite	< 3 days	< 3 days	Eval Fee + Expedite Fee
Xtreme™ Expedite	< 24 hours	< 24 hours	Eval Fee + Xtreme Fee + Mat'l Expedite Fees

* Assumes completion of entire RGA Request Form. An additional fee per unit may be applied to orders having incomplete RGA Request Forms.

Note: repair times and costs may vary based upon required component part availability.

TROUBLESHOOTING PROCEDURES

This section provides you with guidelines and hints on troubleshooting various problems that may be encountered during installation and operation of your Exlar GS/X Series actuator.

Symptom / Trouble	Possible Cause / Troubleshooting Procedure
No response from actuator.	<ol style="list-style-type: none"> 1. Check amplifier for faults that may indicate problem. 2. Check to insure that amplifier is enabled. 3. Check for proper wiring.
Actuator seems to be enabled (receiving current) but is not operating or is operating erratically.	<ol style="list-style-type: none"> 1. Amplifier may be improperly tuned. Check all gain settings. If a motor file, or parameters specific to your amplifier/actuator combination have been supplied by Exlar, be sure that they are entered or downloaded properly. 2. Amplifier may be set up improperly for the particular motor being used. Check amplifier settings for number of poles, voltage, current, resistance, inductance, inertia, etc. 3. Feedback wiring may be incorrect. 4. Feedback conductors touching, or feedback cable may be damaged. 5. Motor phases are wired incorrectly or in incorrect order. (R,S,T). 6. Feedback (resolver or encoder) is improperly aligned. Contact Exlar.
Actuator cannot move load.	<ol style="list-style-type: none"> 1. Load is too large for the capacity of the actuator or too much friction is present. 2. Excessive side load.

	<p>3. Misalignment of output rod to load.</p> <p>4. Amplifier has too low of current capacity or is limited to too low of current capacity.</p>
Actuator housing moves or vibrates when shaft is in motion.	<p>1. Check actuator mounting. Insure that the actuator is securely mounted.</p> <p>2. Amplifier is improperly tuned (wrong gain settings.) Tune amplifier.</p>
Output rod rotates during motion and thus does not provide proper linear motion.	<p>1. Install Exlar anti-rotation assembly or incorporate anti-rotation into the application.</p>
Brake does not hold load in place.	<p>1. Load is larger than the capacity of the brake.</p> <p>-check load level against actuator rating</p> <p>-oil lubricated units reduce holding capacity of the brake</p> <p>2. Brake is not engaged. (Power is not removed, or only partially removed from brake).</p> <p>3. Brake is being used as other than a power loss holding brake.</p>
Actuator is overheating.	<p>1. Insufficient cooling for application requirements. See oil cooling section of this manual or Exlar catalog or contact Exlar engineering.</p> <p>2. Actuator is being operated outside of continuous ratings.</p> <p>3. Amplifier is poorly tuned causing excessive unnecessary current to be applied to motor. Check Gain settings.</p>

Certifications



Certificate of Compliance

Certificate: 2166693

Master Contract: 163694

Project: 2669970

Date Issued: April 22, 2014

Issued to: Exlar Corporation
18400 West 77th St
Chanhassen, MN 55317
USA
Attention: Gene Larson

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.



Issued by: Jay McVeigh

PRODUCTS

CLASS 3228 02 - VALVES - Actuators - For Hazardous Locations

CLASS 3228 82 - VALVES - Actuators - For Hazardous Locations-Certified to U.S. Standard

Class I, Division 1, Group BCD, T3C, Ta -29°C to +93°C.

Model EL 100 Linear Actuator,

24-120Vdc – 25A Max, 2420 W Max

115-460 Vac, 50 / 60 Hz, 25A Max, 2420 W Max

Model Code information

EL100-06xx-axx-xxx-xbx-xx-cx-T3-xxxxxx



Certificate: 2166693

Master Contract: 163694

Project: 2669970

Date Issued: April 22, 2014

a – Connections

T – Terminal Strip with 3/4" NPT housing access, Two Rows

S – Terminal Strips with 3/4" NPT housing access, Single Row

b - Voltage Rating

A = 24 VDC

B = 48 VDC

C = 120 VDC

1 = 115 Volt RMS

3 = 230 Volt RMS

5 = 400 Volt RMS

6 = 460 Volt RMS

X = Special Voltage Rating - Not to Exceed 460 Vrms

c – Optional Mechanical and Speed Designations

RB = Rear Brake

01-99 = Speed (RPMx100)

PF = Preloaded Follower

AR = External Anti Rotate Assembly

XT = Special Travel Options

XL = Special Lubricant

x – denotes options not affecting safety

Class I, Division 1, Group BCD, T4 (135C), Ta -29°C to +93°C.



Certificate: 2166693

Master Contract: 163694

Project: 2669970

Date Issued: April 22, 2014

Model EL120 Linear Actuator and ER120 Rotary Actuator

24Vdc, 48Vdc, 120Vdc, 115Vrms, 230Vrms, 400Vrms, 460Vrms (or a Special Voltage Rating not exceeding 460 Vrms) and 30Arms max. Temperature Code T4 (135°C), $-29^{\circ}\text{C} \leq T_a \leq +93^{\circ}\text{C}$, IP66, Enclosure Type 4

EL120 Model Code information:

EL120-aaxx-bxx-xxx-cde-ff-(gg-...-gg)-xxxxx

aa – Stroke length

18" maximum

b – Connection

F - Two 3/4" NPT Ports: Front Facing as viewed from shaft end

B - Two 3/4" NPT Ports: Back Facing as viewed from shaft end

R - Two 3/4" NPT Ports: Right Facing as viewed from shaft end

L - Two 3/4" NPT Ports: Left Facing as viewed from shaft end

X – Special NPT Ports – up to 4 x 3/4" NPT or Smaller

c – Motor Stacks

1 – One stack of magnets

2 – Two stacks of magnets

3 – Three stacks of magnets

d – Voltage Rating

A – 24Vdc

B – 48Vdc

C – 120Vdc

1 – 115Vrms



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Date Issued: April 22, 2014

3 – 230Vrms

5 – 400Vrms

6 – 460Vrms

X – Special Not to Exceed 460Vrms

e – Poles

8 – 8 pole Motor

ff – Motor Speed

01-45 = Speed RPMx100

gg – Optional Mechanical

XL – Special Lubrication

PF – Preloaded Follower

AR = Anti-Rotate Assembly

RB – Rear Brake

HW – Side Handwheel Drive

SD – Side Hex Drive

CD – Crank Drive

XT – Special Travel Option

- Non-Standard Roller Count
- Deep Groove Ball Bearings
- Stainless Steel Main Rod

XH – Special Housing Option

- Special Coating

“x” designation are options that do not affect safety



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Master Contract: 163694

Project: 2669970

Date Issued: April 22, 2014

ER120 Model Code information:

ER120-xxx-xax-xxx-bcd-ee-(ff-...-ff)-xxxxx

a – Connection

F - Two ¾" NPT Ports: Front Facing as viewed from shaft end

B - Two ¾" NPT Ports: Back Facing as viewed from shaft end

R - Two ¾" NPT Ports: Right Facing as viewed from shaft end

L - Two ¾" NPT Ports: Left Facing as viewed from shaft end

X – Special NPT Ports – up to 4 x ¾" NPT or Smaller

b – Motor Stacks

1 – One stack of magnets

2 – Two stacks of magnets

3 – Three stacks of magnets

c – Voltage Rating

A – 24Vdc

B – 48Vdc

C – 120Vdc

1 – 115Vrms

3 – 230Vrms

5 – 400Vrms

6 – 460Vrms

X – Special Not to Exceed 460Vrms

d – Poles

8 – 8 pole Motor



Certificate: 2166693

Master Contract: 163694

Project: 2669970

Date Issued: April 22, 2014

ee – Motor Speed

01-45 = Speed RPMx100

ff – Optional Mechanical

XL – Special Lubrication

LB – Low Backlash Gears

HW – Side Handwheel Drive

SD – Side Hex Drive

CD – Crank Drive

XH – Special Housing Option

- Special Coating

“x” designation are options that do not affect safety

Notes:

- Supply wires to be rated 105C° or more
- This report covers certification of the actuator only. The associated electronic controller(s) required for the use of the actuator are not covered in this report. The suitability of the controller-actuator combination is based upon acceptance of the authority having jurisdiction.
- Maximum Ratings limited to 20 A max and 2420 W when using Allen Bradley 1492-LMJ3 terminals.

APPLICABLE REQUIREMENTS

CAN/CSA Standard C22.2 No. 0-10 - General Requirements - Canadian Electrical Code, Part II

CSA Standard C22.2 No. 0.4-04 - Bonding of Electrical Equipment

CSA Standard C22.2 No. 0.5-1982 - Threaded Conduit Entries

CSA Standard C22.2 No. 30-M1986 - Explosion-Proof Enclosures for Use in Class I Hazardous Locations

CSA Standard C22.2 No. 139-1982 (Reaffirmed 2010) - Electrically Operated Valves

CSA Standard C22.2 No. 145-11- Electric motors and generators for use in hazardous (classified) locations

UL Standard 429 - 6th Edition - Electrically Operated Valves

UL 674 5th Ed - Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations



Certificate: 2166693

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Date Issued: April 22, 2014

ANSI/UL Standard 1203 - 4th Edition - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations

MARKINGS

Metal Nameplate, 0.5 mm thick, mechanically secured to enclosure using rivets, drive pins or welds.

Additionally, items may appear on the following:

Brady B486 metallized polyester adhesive film label manufactured by Brady Worldwide Inc.

Tested previously under project 1538184. For details, see drawing 42289.

- (1) Submittor's name, trademark, or the CSA file number (adjacent the CSA Mark).
- (2) Catalogue / Model designation.
- (3) Complete electrical rating (amps, hertz, and volts).
- (4) Date code / Serial number traceable to month and year of manufacture.
- (5) Hazardous Location designations.
- (6) Temperature code (T3C or T3) for the EL100 Linear Actuator or (T4) for the EL120 Linear and ER120 Rotary Actuators.
- (7) Ambient temperature
- (8) CSA Enclosure type, IP rating
- (9) The CSA, CSAus or cCSAus Mark.
- (10) The following cautions:

"CAUTION: KEEP COVER TIGHT WHILE CIRCUITS ARE ALIVE".

"Attention: Garder le couvercle fermé et étanche tant que les circuits sont sous tension."

Note - Jurisdictions in Canada may require these markings to also be provided in French language. It is the responsibility of the manufacturer to provide bilingual marking, where applicable, in accordance with the requirements of the Provincial Regulatory Authorities. It is the responsibility of the manufacturer to determine this requirement and have bilingual wording added to the "Markings".