

CURTISS - WRIGHT

GSM Series Linear Actuator INSTALLATION AND SERVICE MANUAL



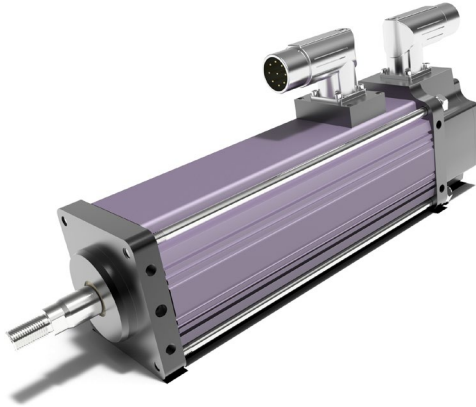
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GSM Series Linear Actuator Installation and Service Manual



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Refer to www.exlar.com for connector and wiring information.

1.0 INTRODUCTION

1.1 Warranty and Limitation of Liability

WARRANTY AND LIMITATION OF LIABILITY: Please see our warranty on our website here: [Division Policies | About | Actuation Division | Curtiss-Wright Actuation Group \(cw-actuation.com\)](#) for details.

1.2 Safety Considerations

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

CAUTION



WARNING



Pay particular attention to these paragraphs. They are intended to provide you with helpful information to ensure safe and trouble-free installation.

2.0 SYSTEM CONFIGURATION

2.1 GSM Series Actuator System Configuration

GSM Series actuators incorporate an integral brushless servo motor. The design of this motor and selection of the proper feedback configuration allows GSM Series actuators to be powered by nearly every brand of brushless motor amplifier on the market.

This flexibility allows GSM Series actuators to be incorporated into the highest performance single and multi-axis motion control systems in use today. In applications varying from food and beverage packaging to multi-axis turning centers to aircraft assembly, the GSM Series of actuators show incredible performance and durability.

The high torque to volume ratio available from a brushless motor, combined with the robust, high speed and high load capability of the planetary roller screw, make the Exlar line of linear actuators a true, all electric replacement for cumbersome high maintenance hydraulics. The use of electronic servo control provides simpler set up and more precise control than hydraulic systems as well.

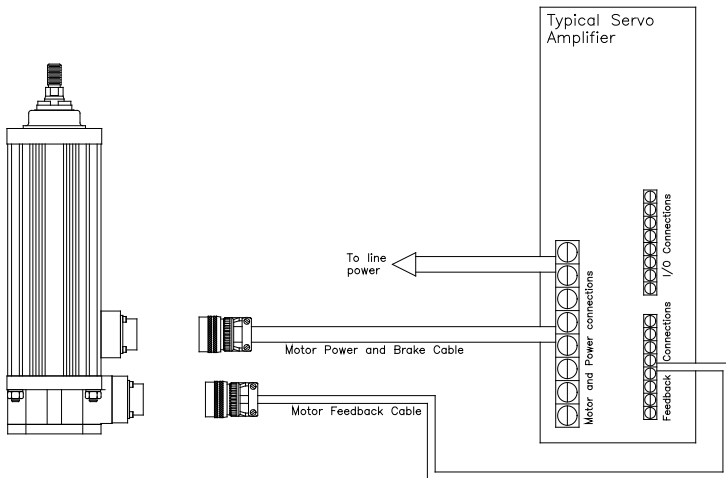
The schematic, next page, shows the typical connections for a single axis system incorporating an Exlar GSM Series actuator and servo amplifier. Each brand of brushless motor amplifiers may have unique wiring requirements, parameter settings and operational principals that affect how the actuator operates. The drawing on the following page shows general connection principals for typical resolver and encoder feedback amplifiers. Details on connections to specific brands of amplifiers can be obtained from www.exlar.com.



WARNING: Attempting to connect the power cable to the motor feedback connector may cause damage to the connector. Verify that pin patterns match before attempting to connect cables to actuator.

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

Typical System Connections



2.2 Typical System Wiring

Please refer to www.exlar.com for information on connectors and wiring.

2.3 Feedback Information

GSM Series actuators incorporate a quadrature incremental encoder with commutation signals as the primary rotary feedback device. The alignment of this feedback device is dictated by the amplifier that the end user chooses for operating the actuator. This amplifier is indicated in the model number of the GSM Series actuator as a 3 digit code consisting of 2 letters and 1 number.

Each amplifier has specific requirements for the feedback on the motor. 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 a GSM Series actuator, 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 actuator with the selected amplifier. Wiring the feedback cable improperly can cause unstable operation, incorrect operation or no operation at all. In some cases, if the proper current limits are not set in the amplifier, improper wiring of the feedback cable can lead to damage of the motor.

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.

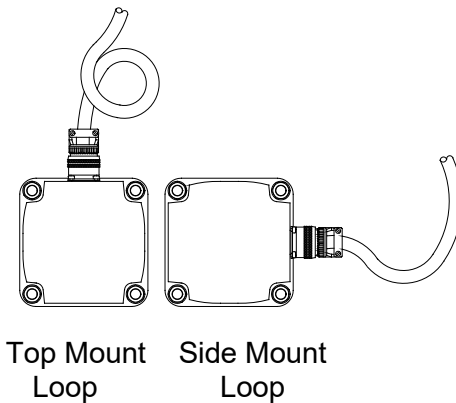
GSM Series Feedback Devices

Standard GSM Series actuators use 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. Always consult Exlar for the correct wiring details or visit www.exlar.com.

2.4 Cable Routing

Over time, liquid contaminants such as oil and cleaning solutions will run down the cables and into any exposed connectors. To minimize the introduction of contaminants to the connector, route the cables so that there is a loop in the cable just prior to its attachment to the connector.

Two examples are shown below, depending on the orientation of the connectors. Units mounted in such a way that the connectors are on the bottom surface of the actuator require no looping.



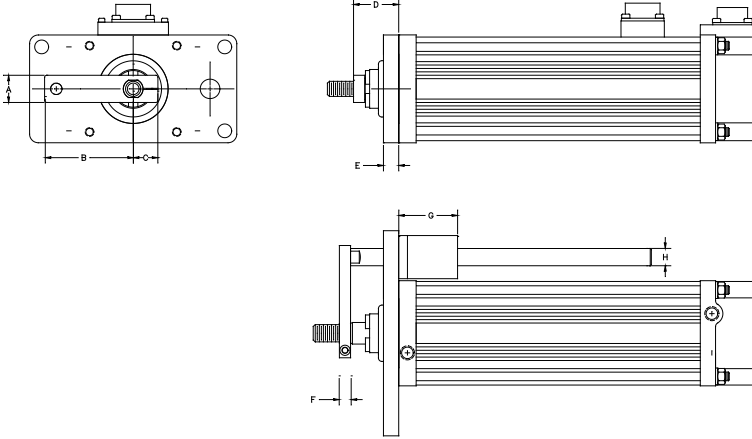
2.5 GSM Series Linear Actuator Anti-rotation Option

The unique design of the GSM 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 the anti-rotation systems shown below. The drawings on the next page show the rod and bushing on only one side of the actuator. For long stroke actuators, the rod and bushing are required on both sides of the actuator.

Anti-Rotate Option Dimensions

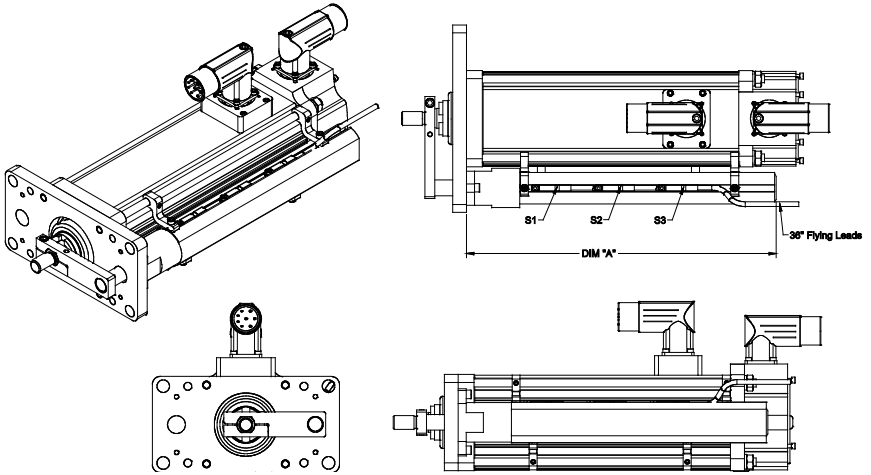


Dimensions in inches	GSM20	GSM30	GSM40
A	0.60	0.79	1.25
B	1.81	2.54	3.78
C	0.54	0.71	0.98
D	1.00	1.29	1.65
E	0.44	0.44	0.63
F	0.28	0.32	0.38
G	0.31	1.69	1.69
H	0.37	0.50	0.50

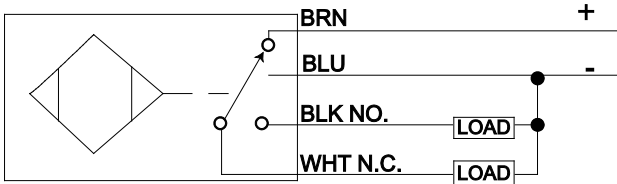
2.6 GSM Linear Actuator External Limit Switch

With the anti-rotate option (Section 2.6) the GSM actuator can accommodate 1, 2 or 3 external limit switches for use as end of travel limit switches or home position sensors in low profile extruded channel housing. A bracket with inductive proximity switches mounts to the tie rods and senses a traveling magnet inside the extrusion.

External Limit Switch Dimensions



DIM "A"	3" Stroke	6" Stroke	10" Stroke	12" Stroke	18" Stroke
GSM20	5.515	8.515	<i>n/a</i>	14.515	<i>n/a</i>
GSM30	6.932	9.832	13.832	15.832	21.832
GSM40	<i>n/a</i>	9.832	13.832	15.832	21.832



The number of switches desired is selected by ordering the L1, L2 or L3 option, in which 1, 2, or 3 switches will be provided, respectively. The switches are 9-30 VDC powered, PNP output, with either normally open or normally closed logic operation depending on the switch configuration ordered. Below is a diagram indicating which logic operation will be provided for each switch, based on the option ordered.

Configuration of Logic of Standard Switch Option Selections			
Option	SW1	SW2	SW3
L1	Not Supplied	Normally Open	Not Supplied
L2	Normally Closed	Not Supplied	Normally Closed
L3	Normally Closed	Normally Open	Normally Closed

Switch Type	Exlar Part Number	Turck Part Number
Normally Closed Switch	43404	BIM-UNT-RP6X
Normally Open Switch	43403	BIM-UNT-AP6X

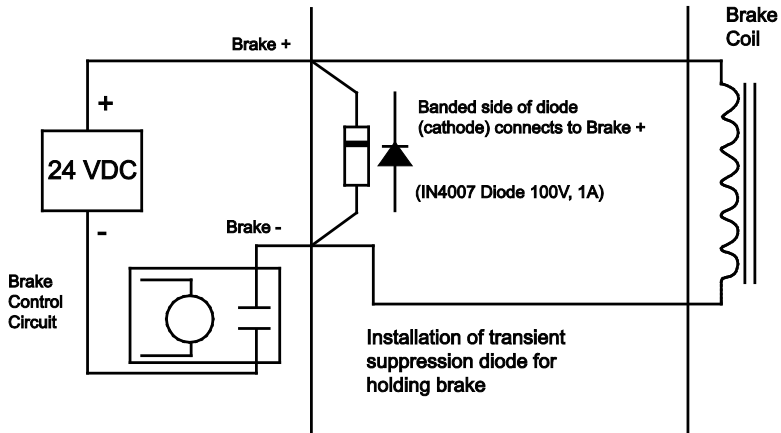
2.7 Internal Holding Brake

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 to prevent the inverted roller screw from turning and prevent the output rod from back driving, which therefore prevents the output rod from moving.

The holding brake is permanent magnet engaged and electrically released. The mechanical advantage of the roller screw allows the holding brake to prevent back driving of the load. The holding capacity of the brake is sufficient to hold the rated force of the actuator when used in grease lubricated units.

Historically, Exlar actuators and motors with holding brakes provided a transient suppression diode wired internally to the actuator or motor. With the changes in servo amplifier and control technology, there are now instances where the diode is not required to be within the motor. An example of this is a control system using a dedicated brake control relay containing transient suppression components.

Because of this change in technology, Exlar now provides the transient suppression diode separately from the actuator, for inclusion in the brake control circuitry as needed by the end user. A schematic is provided below showing the typical use of the transient suppression diode.



If the user is uncertain about the requirements for transient suppression, they should refer to their servo amplifier or controller technical documentation, or contact their servo amplifier or controller manufacturer for technical support.

For connection of your amplifier and actuator (including rear brake leads), refer to the wiring information at www.exlar.com/cables-connections/.

The rear brake option adds length to the dimensions of the GSM actuators as follows: (See drawings in Section 5.2.)

GSM20: Add 1.784 inches (45.3 mm) if ordering brake

GSM30: Add 1.6 inches (40.6mm) if ordering brake

GSM40: Add 2.33 inches (59.2 mm) if ordering brake

BRAKE SPECIFICATIONS	GSM20	GSM30	GSM40
Holding torque	19 lb-in	70 lb-in	97 lb-in
Voltage	24 VDC	24 VDC	24 VDC
Current required	0.75 Amps	0.75 Amps	0.88 Amps
Coil resistance (polarity sensitive)	70.6 Ohms	48 Ohms	36 Ohms



DO NOT attempt to operate the actuator with the brake applied. Allowing the actuator to operate with the brake applied may cause serious damage

to the actuator 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.

2.8 Ingress Protection Rating

The standard IP rating for GSM Series actuators is IP54S with an option for IP65S. Ingress protection is divided into two categories; solids and liquids. For example, in IP65 the three digits following “IP” represent different forms of environmental influence:

- The first digit represents protection against ingress of solid objects.
- The second digit represents protection against ingress of liquids.
- The suffix digit represents conditions of motion during the operation.

Digit 1 - Ingress of Solid Objects

The IP rating system provides for 6 levels of protection against solids.

1	Protected against solid objects over 50mm e.g. hands, large tools.
2	Protected against solid objects over 12.5mm e.g. hands, large tools.
3	Protected against solid objects over 2.5mm e.g. wire, small tools.
4	Protected against solid objects over 1.0mm e.g. wires.
5	Limited protection against dust ingress.
6	Totally protected against dust ingress.

Digit 2 - Ingress of Liquids

The IP rating system provides for 9 levels of protection against liquids.

1	Protected against vertically falling drops of water or condensation.
2	Protected against falling drops of water, if the case is disposed up to 15 degrees from vertical.
3	Protected against sprays of water from any direction, even if the case is disposed up to 60 degrees from vertical.
4	Protected against splash water from any direction.
5	Protected against low pressure water jets from any direction. Limited ingress permitted.

6	Protected against high pressure water jets from any direction. Limited ingress permitted.
7	Protected against short periods of immersion in water of 1m or less for 30 minutes or less.
8	Protected against long durations of immersion in water.
9	High-pressure, high-temperature wash-down applications.

Suffix

S	Device standing still during operation
M	Device moving during operation

3.0 INSTALLATION AND OPERATION

3.1 Lubrication Requirements

The GSM Series actuator is shipped from the factory fully greased and ready for installation. Exlar recommends using Mobilith SHC 220, 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. Mobilith SHC allows for very low starting and running torque values. Its operating range is -40° C to 177° C (-40° F to 350° F).

3.2 Mounting Configurations

The standard configurations available are Rear Clevis, Front Flange, Extended Tie Rods, Side Trunnions and side tapped mounting holes. General drawings are shown in the product section guide.

3.3 Mounting Considerations

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.



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 inline with the actuator output rod.

3.4 General Operation

The GSM Series linear actuators function in the same manner as a brushless servomotor. The servo amplifier is used to rotate the motor at controlled speed and torque, and for controlled numbers of revolutions and move times. This rotary motion is translated into linear motion by the internal planetary roller screw mechanism of the GSM Series linear actuator.

The relationships between the rotary motion of the motor and the linear motion of the actuator correspond to the following relationships:

Linear Distance Traveled (in) = (Motor Revolutions)*(Roller Screw Lead)

Linear Speed (in/sec) = ((Motor RPM) / 60)*(Roller Screw Lead)

Linear Force (lbf) = ((Motor Torque (in-lbf))*(2 π)*(efficiency)) / (Roller Screw Lead (in))

All of the above relationships require proper anti-rotation of the GSM Series actuator rod.

For more information on sizing and selection of GSM Series actuators and servo amplifiers, consult the sizing and selection section of the Exlar catalog.



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



Care should be taken not to exceed the physical travel limits of GSM Series Actuators. 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. Care should be taken to avoid high speed impact with objects of high rigidity that immediately stop the travel of the actuator with no deceleration or energy absorption. An example would be a high speed impact of two solid steel parts. The resulting impact will create a very short effective deceleration time. Kinetic energy contained in the rotating inertia of the actuator and motor can possibly generate extremely high impact forces that exceed the mechanical capacities of the actuator and cause physical damage

to the actuator. For applications requiring this type of impact, contact Exlar application engineering to insure that the actuator is properly sized or provisions are made to absorb the induced energy.

3.5 Manual Drive Operating Instructions



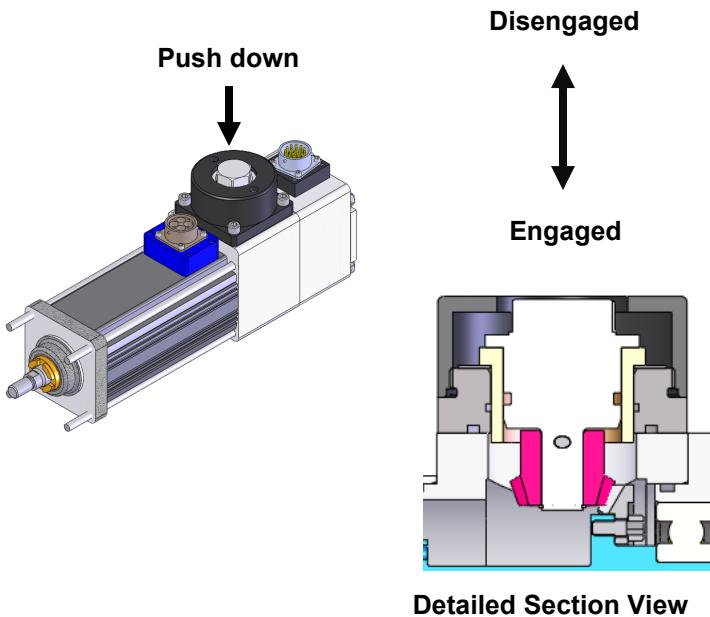
Important: If manually driving through a brake or high force is necessary, please consult Exlar engineering. If a power tool is used to operate the manual drive the speed should be limited to 600 RPM. An impact driver should never be used to operate the manual drive.

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

- 1) Press down on the hex until you feel you have bottomed out the manual drive. Constant downward force is required to maintain engagement during operation.
- 2) Give the hex a slight turn while observing if you are moving the rod or not. It is possible that during engagement the gear teeth have not completely engaged; this will prevent the gears from meshing. If the rod is not moving continue to press down while turning the manual drive slowly until it pushes farther down. When this happens you have proper gear engagement.
- 3) After gear engagement is achieved, the manual drive can be operated. The maximum torque input for the manual drive should not exceed the values shown in Table 1.
- 4) When the manual drive movement is completed, cease the downward force and the manual drive will disengage.

Table 1- Maximum operating conditions

Model	Maximum Torque in-lbs / (Nm)
GSM 20	10 / (1.1)
GSM 30	30 / (3.4)
GSM 40	40 / (4.5)



4.0 MAINTENANCE PROCEDURES

4.1 Disassembly



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.

Refer to the exploded view on the page 20.

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 two machine screws that clamp the anti-rotate cross member to the actuator output rod. Slide the anti-rotate mechanism forward and off the actuator.
3. Remove the rear tie rod nuts from the back of the actuator.



The end cap houses the feedback device. Alignment of this feedback device to the phases of the motor is critical to the operation of the system. Extreme care should be taken when removing the tie rod nuts or tie rods so as not to twist or pull on the end cap of the actuator. Some feedback devices are sensitive to movement of their mounting surface once installed and can be damaged if care is not taken.

- If your actuator does not have a front flange, skip this step. Slide the front flange forward and off the actuator. The tie rods will remain attached to the front flange.



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.

- When the face plate is removed, the thrust bearing and the open end of the roller screw internally threaded cylinder (ITC) are 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.

4.2 Lubrication Maintenance

Grease lubricated units will require periodic inspection and renewal of the bearing and 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)	CASE TEMP 95°C (203°F)
250	10,000	5,000	2,500
500	8,500	4,250	2,125
1000	6,000	3,000	1,500
1500+	3,500	1,750	875

Grease Renewal

The bearings located in the front of the actuator, the roller screw cylinder, and the roller screw assemblies 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.
- 3.) Force grease into the front of the thrust bearing assembly. Make a concerted effort to insure that the grease is well worked in. Grease must reach the bearing just behind the bearing that is visible as well. Use the following amounts of grease for each size roller screw and bearing:
GSM20: 0.5 in³
GSM30: 0.75 in³
GSM40: 1.00 in³

4.3 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 face plate and bushing/seal assembly over the actuator rod end, while guiding the tie rods through the holes in the rear end cap of the actuator. The seal is a tight fit on the rod end. Take care not to damage the seal on the threads of the extending rod. Standard GSM Series rods have a chamfer to provide a lead in for replacement of the seal and bushing. Be sure that the faceplate seats completely and squarely on the front of the actuator. The inner surface of the faceplate provides the pre-loading for the bearings, and it is important that it is properly seated.

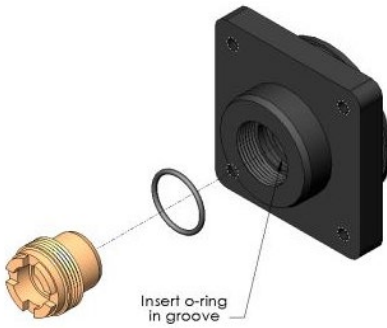
Units with a Front Flange

Replace the faceplate as described above. Remount front flange by sliding tie rods through the holes in the faceplate and through the holes in the rear end cap. Pilot the flange on the pilot diameter located on the front of the faceplate.

- 4.) Replace the rear tie rod washers and nuts and tighten to the proper torque. Tighten the nuts simultaneously by partially tightening each in an opposing corner pattern until each is torqued to the rated value shown below.
GSM20: 30 lbf-in (2.5 lbf-ft, 3.39 N-m)
GSM30: 90 lbf-in (7.5 lbf-ft, 10.16 N-m)
GSM40: 240 lbf-in (20 lbf-ft, 27.12 N-m)
- 5.) 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 two screws that clamp the assembly to the actuator rod.

4.4 Seal Maintenance

If you have chosen the IP65 sealing option (-P5) on your GSM actuator, it is recommended that the main rod seal and bushing assembly be replaced at the suggested time of lubrication. The main rod seal can be removed by threading it out of the face plate using a standard rod seal gland wrench or spanner wrench. A new main rod seal can be slid over the main rod, taking care not to touch the seal material to the threaded rod end. To have this service performed for you, contact Exlar Engineering or arrange with Exlar Returns Department to send your unit in for service



Main Rod Seal Gland and Bushing

	Standard Main Rod Seal Gland Part Numbers	Install Torque
GSM20	18929	100 lb-in (11.29 N-m)
GSM30	19020	200 lb-in (22.58 N-m)
GSM40	19021	360 lb-in (40.67 N-m)

Note: Some actuators are provided with special seals due to chemical exposure or other special requirements. Contact Exlar if there is a question about your particular actuator having a standard material main rod seal gland.

Main Rod Seal Gland Installation/Replacement:

1. Using proper sized gland or spanner wrench, remove existing seal from actuator face plate, and slide off the actuator rod. This will require the removal of any rod attachments. One source for gland wrenches is Martin Fluid Power, <https://www.mfpseals.com/>

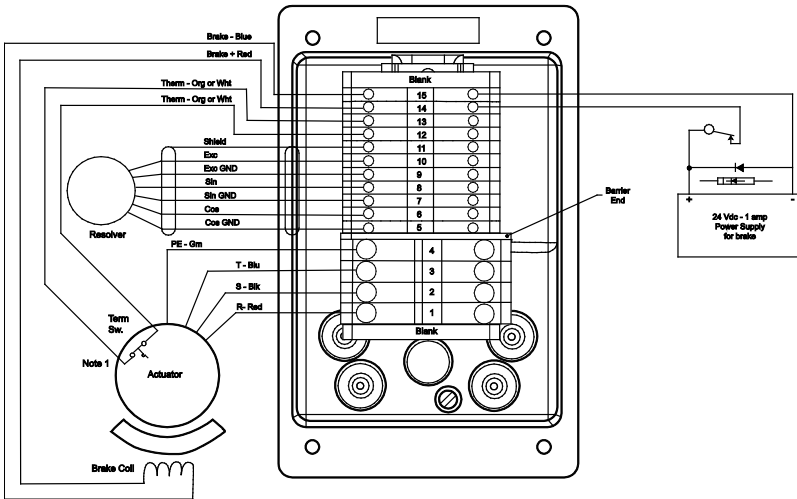
Exlar Actuator Model	Martin Fluid Power Part No.	Size (in)	Description
GSM20-30	PH-0695900000	1/2, 5/8	Rod Gland Wrench
GSM40	PH-0695910000	1	Rod Gland Wrench

2. Remove the O-ring from the O-ring groove located inside the opening from which the seal was just removed.
3. Replace the O-ring with the O-ring supplied with the new main rod seal gland.
4. Taking care not to touch the seal material to any sharp rod features such as threads, slide the seal gland on to the actuator rod and to the face plate.
5. Using the appropriate gland and spanner wrench, tighten the seal to the proper torque level indicated in the previous table.

5.0 CLASS 1 DIVISION 2 OPTION

Class 1 division 2 products are provided with an electrical box containing terminal blocks for wiring. The electrical box has two NPT ports for customer conduit connection. It is the responsibility of the installer to ensure that the interconnecting wire, cabling and conduit meet any local or regional required electrical codes and standards.

5.1 Terminal Box Wiring Diagram



Note 1: Thermal switch normally closed; opens when stator temp exceeds 130 deg. C.

5.2 Class 1 Division 2 Terminal Box Terminations

Exlar uses spring clamp terminals for maximum vibration resistance and ease of connection

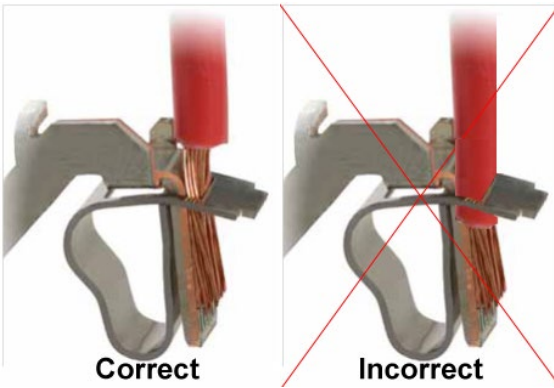
- Tin-plated terminals and stainless steel spring clamps for resistance to corrosion and vibration
- Spring clamp design to minimize stress relaxation and maintain contact force, even under vibration

To use spring clamp terminals:

1. Strip the wire to .5 inch (12-13 mm). Longer is better than shorter since you can always trim to fit.
2. Open the terminal by inserting a flat blade screwdriver into the spring release and slide wire in until it stops.



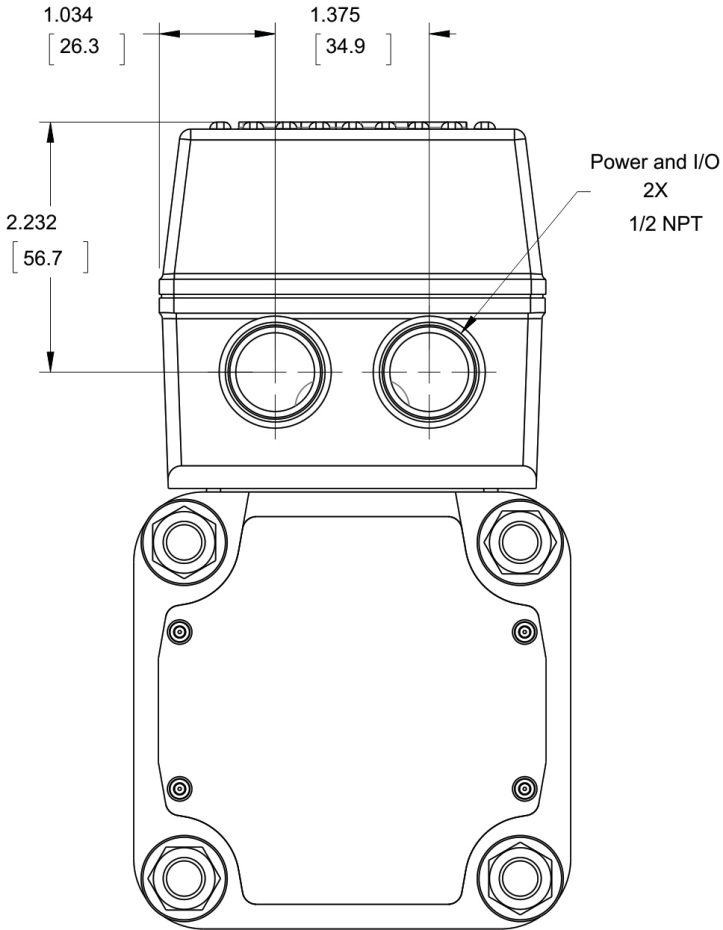
3. Make sure exposed wire is in the clamp, not insulated wire.



4. Remove the screwdriver. The clamp pressure will keep the wire in place. No exposed wire should protrude past the cage opening



5.3 Terminal Box Dimensions



GSM30, GSM40

6.0 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 GSM 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, and inertia. 3. Feedback wiring may be incorrect. 4. Feedback conductors are 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. 3. Misalignment of output rod to load. 4. Amplifier has too low of current capacity or is limited to too low of current capacity.
Actuator housing moves or vibrates when shaft is in motion.	<ol style="list-style-type: none"> 1. Check actuator mounting. Insure that the actuator is securely mounted. 2. Amplifier is improperly tuned (wrong gain settings). Tune amplifier.
Output rod rotates during motion and thus does not provide proper linear motion.	<ol style="list-style-type: none"> 1. Install Exlar anti-rotation assembly or incorporate anti-rotation into the application.
Limit switches not functioning.	<ol style="list-style-type: none"> 1. Limit switches wired improperly. Refer to manual. 2. The device being driven by the limit switches is not compatible with the electrical output of the limit switch. Check device requirements. 3. Switches have been damaged by improper wiring or improper voltage applied. Replace switches.

Brake does not hold load in place.	<ol style="list-style-type: none"> 1. Load is larger than the capacity of the brake. -check load level against actuator rating. -oil lubricated units reduce holding capacity of the brake. 2. Brake is not engaged. (Power is not removed from brake) 3. Brake is being used as other than a power loss holding brake.
Actuator is overheating.	<ol style="list-style-type: none"> 1. Insufficient cooling for application requirements. See oil cooling section of this manual or Exlar catalog or contact Exlar engineering. 2. Actuator is being operated outside of continuous ratings. 3. Amplifier is poorly tuned causing excessive unnecessary current to be applied to motor. Check Gain settings.

6.1 Returning a Product for Repair

STANDARD EVALUATION AND REPAIR LEADTIME:

- Lead-time is dependent upon production capacity and level of demand. Please contact the factory for current lead-time.

EXPEDITED EVALUATION LEADTIME:

- An additional charge per unit can be quoted to expedite an evaluation.
- Ability to expedite is dependent upon production capacity and level of demand. Please contact the factory for current expedited evaluation lead-time.

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 an online RGA request form located at <http://exlar.com/return-authorization-request/>
 - 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; \$750 on warranty returns (refunded if warranty status is confirmed by the factory), or for the desired service package charge per unit on all non-warranty units.

7.0 CERTIFICATIONS

UK Declaration of Conformity

This declaration is issued under the sole responsibility of the manufacturer.

*The undersigned, representing the
Manufacturer
Exlar Corporation
18400 West 77th Street
Chanhassen, MN 55317 USA*

*Declares, that the Exlar Brand Products:
GSX, GSM, SR, SLM, SLG Linear and Rotary Actuators*

Complete Model identification:

*GSX20, GSX30, GSX40, GSX50, GSX60,
GSX90, GSX115, SR21, SR31, SR41,
SLM060, SLM075, SLM090, SLM115, SLM142, SLM180,
SLG060, SLG075, SLG090, SLG115, GSM20, GSM30, GSM40*

*The objects of the declaration described above is in conformity with the
relevant UK Statutory Instrument (and their amendments):*

Per directives listed below:

<i>2016 No. 1091</i>	<i>Electromagnetic Compatibility Regulations (EMC)</i>
<i>2016 No. 1101</i>	<i>Electrical Equipment (Safety) Regulations (LV)</i>
<i>2012 No. 3032</i>	<i>The Restriction of the Use of Hazardous Substances in Electrical and Electronic Equipment Regulations (RoHS)</i>

*Using the relevant section of the following Harmonized standards and other
normative documents:*

<i>EMC:</i>	<i>EN 55014-1:2017 EN55014-2:2015</i>
<i>Safety:</i>	<i>EN 61800-3:2004+A1:2012, Part 3, Adjustable Speed Electrical Power Drive Systems -Part 3:</i>

Signature:



*Name: Robert Schulz
Position: Sr. Engineering Manager
Date of Issue: May 3, 2022*

EU Declaration of Conformity

This declaration is issued under the sole responsibility of the manufacturer.

*The undersigned, representing the
Manufacturer
Exlar Corporation
18400 West 77th Street
Chanhassen, MN 55317 USA*

*Declares, that the Exlar Brand Products:
GSX, GSM, SR, SLM, SLG Powered Linear and Rotary
(Complete Model Listing Below)*

*Model identification:
GSX20, GSX30, GSX40, GSX50, GSX60,
GSX90, GSX115, SR21, SR31, SR41,
SLM060, SLM075, SLM090, SLM115, SLM142, SLM180,
SLG060, SLG075, SLG090, SLG115, GSM20, GSM30, GSM40*

*The objects of the declaration described above is in conformity with the
relevant European Union harmonization legislation.*

Per directives listed below:

*EU EMC Directive 2014/30/EU
EU Low Voltage Directive 2014/35/EU
RoHS Directive (2011/65/EU, as amended by (EU) 2015/863)*

*Using the relevant section of the following Harmonized standards and other
normative documents:*

*EMC: EN 55014-1:2017
EN 55014-2:2015*

LVD: EN 60034-1:2010

Signature:



Name: Robert Schulz
Position: Sr. Engineering Manager
Date of Issue: May 3, 2022

Per EU directives implemented on April 20th, 2016 the following requirement for requirement must be followed by Importers and Distributors.

The requirements for importers include:

Importers shall indicate their name, registered trade name or registered trade mark and the postal address at which they can be contacted on the apparatus (unless that is not possible, in which case it should be included on the packaging or in an accompanying document).

Importers shall ensure that the product is accompanied by instructions and safety information in a language which can be easily understood by end-users, as determined by the Member State concerned.

Importer is to translate the EU declaration of conformity into the languages required by the member state(s), where the product is sold.” Importers shall keep a copy of the EU declaration of conformity (for 10 years).

Importers shall provide a reasoned request from a competent national authority and provide it with all the information and documentation in paper or electronic form necessary to demonstrate the conformity of a product in a language which can be easily understood by that authority.

Importers shall ensure that, while apparatus is under their responsibility, its storage or transport conditions do not jeopardize its compliance with the safety objectives.

Importer shall corrective action necessary when they consider or have reason to believe that the product is not in conformity with its directive(s).

The requirements for distributor include:

Distributors shall indicate their name, registered trade name or registered trade mark and the postal address at which they can be contacted on the apparatus (unless that is not possible, in which case it should be included on the packaging or in an accompanying document).

Distributor shall ensure that apparatus is accompanied by instructions and safety information in an appropriate language. Distributor shall translate the EU declaration of conformity into the languages required by the member state(s), where the product is sold.” Distributors shall keep a copy of the EU declaration of conformity (for 10 years).

Distributor shall ensure that, while apparatus is under their responsibility, its storage or transport conditions do not jeopardize its compliance with the safety objectives.

Distributor shall corrective action necessary when they consider or have reason to believe that the product is not in conformity with its directive(s).

CERTIFICATE OF COMPLIANCE

Certificate Number 20130403-E225288
Report Reference E225288-20020531
Issue Date 2013-APRIL-03

Issued to: EXLAR CORP
18400 W 77TH ST
CHANHASSEN MN 55317



This is to certify that representative samples of COMPONENT - SERVO AND STEPPER MOTORS
See Addendum

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: UL 1004-1, Rotating Electrical Machines – General Requirements
UL 1004-6, Servo and Stepper Motors
CSA C22.2 No. 100-04, Motors and Generators

Additional Information: See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Recognized Component Marks for the U.S. and Canada should be considered as being covered by UL's Recognition and Follow-Up Service and meeting the appropriate U.S. and Canadian requirements.

The UL Recognized Component Mark for the U.S. generally consists of the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory. As a supplementary means of identifying products that have been produced under UL's Component Recognition Program, UL's Recognized Component Mark:  may be used in conjunction with the required Recognized Marks. The Recognized Component Mark is required when specified in the UL Directory preceding the recognitions or under "Markings" for the individual recognitions. The UL Recognized Component Mark for Canada consists of the UL Recognized Mark for Canada:  and the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory.

Recognized components are incomplete in certain constructional features or restricted in performance capabilities and are intended for use as components of complete equipment submitted for investigation rather than for direct separate installation in the field. The final acceptance of the component is dependent upon its installation and use in complete equipment submitted to UL LLC.

Look for the UL Recognized Component Mark on the product.



William R. Carney, Director, North American Certification Programs
UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensees of UL. For questions, please contact a local UL Customer Service Representative at www.ul.com/contact



CERTIFICATE OF COMPLIANCE

Certificate Number 20130403-E225288
Report Reference E225288-20020531
Issue Date 2013-APRIL-03

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

Permanent Magnet servo motors, GSX or SR Series, Model GSM or GSX or SR;
followed by 20, 21, 30, 31, 40, 41, 50, 60, 90 or 115;
followed by 01 through 24 or XX;
followed by 01 through 99 or XX;
followed by A, B, D, E, I, J, M, N, O, P, S, T or X;
followed by B, C, D, E, F, G, J, K, M, Q, R, S, T, Z or X;
followed by A, B, F, L, M, R, V, W or X;
followed by three letters or numbers;
followed by 1, 2, 3 or X;
followed by A, B, C, 1, 3, 5, 6 or X;
followed by 6 or 8;
may be followed by 01 through 99, AR, AS, AX, CF, EB, EN, ES, ET, FC, FF, FG, FM, FX, HB, HC,
HW, L1, L2, L3, LT, MW, NI, P5, PB, PF, RB, RD, SD, SR, SS, XH, XL, XM, N4, XT, XX;
may be followed by 00000 through 99999.



William R. Carney, Director, North American Certification Programs
UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at www.ul.com/contact





Certificate of Compliance

Certificate: 2257566 (109156_0_000)

Master Contract: 163694

Project: 70105667

Date Issued: 2017-03-10

Issued to: Exlar Corporation
18400 West 77th St
Chanhassen, Minnesota 55317
USA

Attention: Larry Lunzer

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: Sorin Tat
Sorin Tat

PRODUCTS

CLASS - C322882 - VALVES-Actuators - For Hazardous Locations-Certified to U.S. Standards

CLASS - C322802 - VALVES-Actuators - For Hazardous Locations

Class I, Division 2, Group A, B, C and D:

-GSX & GSM Series Linear Actuators and SLM & SLG Series Rotary Actuators, input rated 24Vdc, 48Vdc, 120Vdc, 115Vrms, 230Vrms, 400Vrms, 460Vrms (or a Special Voltage Rating not exceeding 460 Vrms) and 50A max.; Temperature Code T4 (135°C), -50°C ≤ Ta ≤ +65°C (see note 2).

Model Code Information:

GSX/GSMxx-xx xx-Txx-aaa-xbx-xx-(xx..c..NI..xx)

aaa – resolver feedback

b - Voltage Rating

A = 24Vdc

B = 48Vdc

C = 120Vdc

I = 115Vrms



Certificate: 2257566
Project: 70105667

Master Contract: 163694
Date Issued: 2017-03-10

3 = 230Vrms
5 = 400Vrms
6 = 460Vrms
X = Special Voltage Rating - Not to Exceed 460Vrms

c – Optional Mechanical and Speed Designations
HW = Hand-Wheel Switch
xx = denotes other options not affecting safety

x – denotes options not affecting safety

SLM/SLGxxx-xxx-xTxx-aaa-xbx-xx-(xx..c..NL.xx)

aaa – Resolver Feedback

b - Voltage Rating
A = 24Vdc
B = 48Vdc
C = 120Vdc
1 = 115Vrms
3 = 230Vrms
5 = 400Vrms
6 = 460Vrms
X = Special Voltage Rating - Not to Exceed 460Vrms

c – Optional Mechanical and Speed Designations
HW = Hand-Wheel Switch
xx = denotes other options not affecting safety

x – denotes options not affecting safety

Conditions of Certifications

1. This Certification covers the actuator only. The end use suitability of the combination of the associated electronic controller and the actuator is to be determined by the local inspection authority having jurisdiction.
2. The actuators may include a hand-wheel switch (denoted by HW in Model Code). In such cases, the hand-wheel switch conduit must be sealed within 18 inches. When the handwheel option is included the maximum ambient temperature rating is $-20^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$.
3. The actuators may include a holding brake. The thermal effects of the brake pad have not been evaluated and are to be considered by the authority having jurisdiction.

APPLICABLE REQUIREMENTS

CAN/CSA Standard C22.2 No. 0-10
(Tenth Edition – September 2010)

- General Requirements - Canadian Electrical Code, Part II



Certificate: 2257566
Project: 70105667

Master Contract: 163694
Date Issued: 2017-03-10

CSA Standard C22.2 No. 0.4-04
(October 2008 including updates No. 1 & 2)
CSA Standard C22.2 No. 139-2013
CSA Standard C22.2 No. 213-M1987
(Reaffirmed 2008)
UL Standard 429 - 7th Edition
ANSI/ISA-12.12.01-2007

- Bonding of Electrical Equipment
- Electrically Operated Valves
- Non-incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations
- Electrically Operated Valves
- Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Division 1 and 2 Hazardous (Classified) Locations



Supplement to Certificate of Compliance

Certificate: 2257566 (109156_0_000)

Master Contract: 163694

*The products listed, including the latest revision described below,
are eligible to be marked in accordance with the referenced Certificate.*

Product Certification History

Project	Date	Description
70105667	2017-03-10	To update the 2257566 report to CSA 139-13 and UL 427 7th Edition as per CSA Signal Sensing and Controls No.12.
2631418	2013-06-19	Update of Report 2257566 to include minor alterations to the models within said report.
2530873	2012-08-09	Update to report 2399789 to include revised controlled drawings as per "project Instructions" and add alternate Resolvers and Holding Brakes.
2399789	2011-02-18	Update to Report 2293203 to cover error corrections, drawing updates and substitution of potting material.
2293203	2010-04-01	Update to report 2257566 to correct model mask information.
2257566	2010-02-12	Evaluation of GSX/GSM and SLM/SLG for hazardous locations

CSA Certified Product



The GSM Linear Actuators are marked as shown after passing a rigorous set of design and testing criteria developed by CSA International (C22.2 No. 139). This label indicates that CSA certifies this product to be safe when installed according to the installation guidelines and used with the scope of the product specifications.

- Maximum Rated Force: Up to 3,457 lbf (15.3 kN)