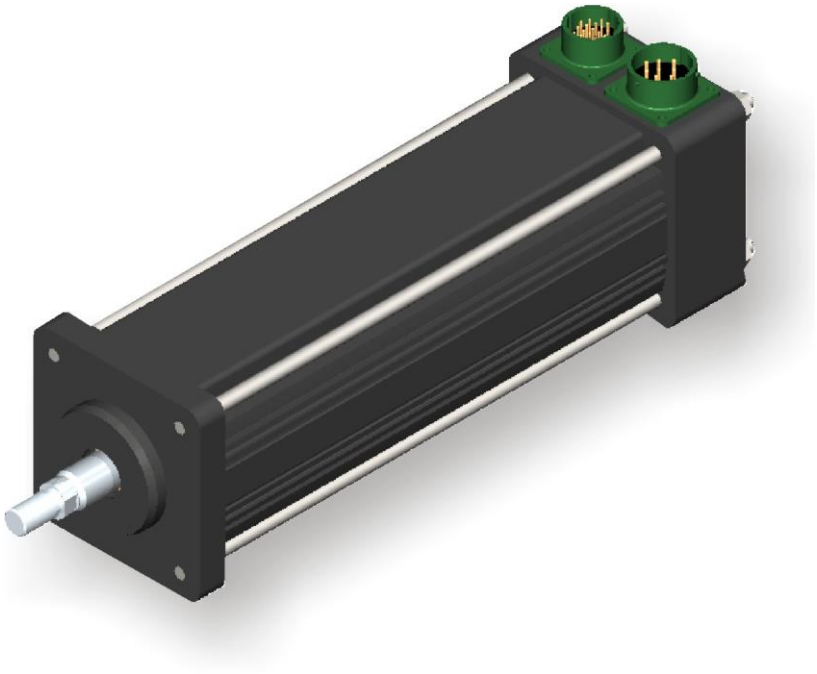
SR SERIES LINEAR ACTUATOR
INSTALLATION AND SERVICE MANUAL



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1.0 INTRODUCTION

1.1 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.

1.2 Safety Considerations

As with any electro-mechanical device, safety should be considered during the installation and operation of your SR 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 SR Series Actuator System Configuration

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

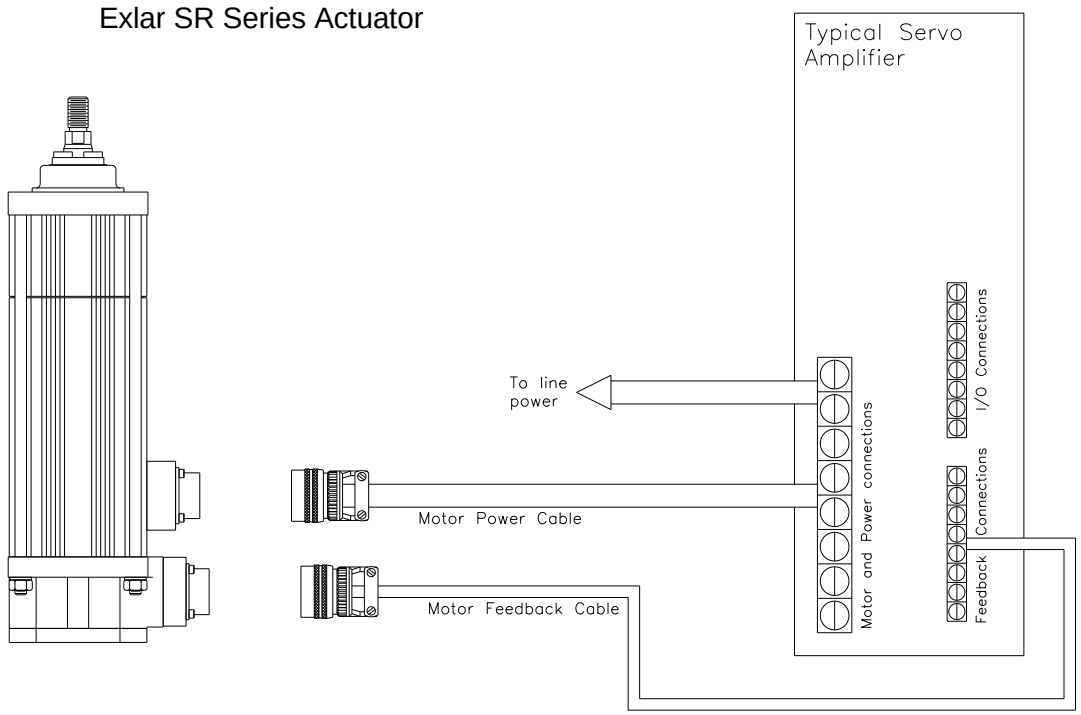
This flexibility allows SR Series actuators to be incorporated into the highest performance single and multi-axis motion control systems in use today. In applications varying from food and beverage packaging to multi-axis turning centers to aircraft assembly, the SR Series of actuators show incredible 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 SR 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 Exlar applications engineering or from Section 7.0.

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 Section 7.0 for specific wiring information.

2.3 Standard Actuator Pin-outs and Connections

Please refer to Section 7.0 for specific pin-out and connections information.

2.4 Feedback Information

SR 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 SR 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 SR 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.

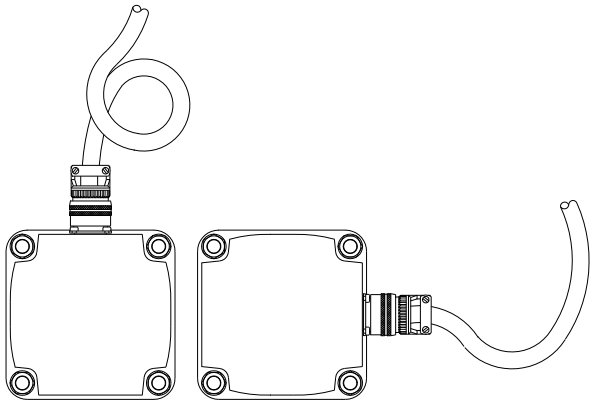
SR Series Feedback Devices

Standard SR 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 Section 7.0 for proper wiring, or contact Exlar for the correct wiring details.

2.5 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.



Top Mount Loop Side Mount Loop

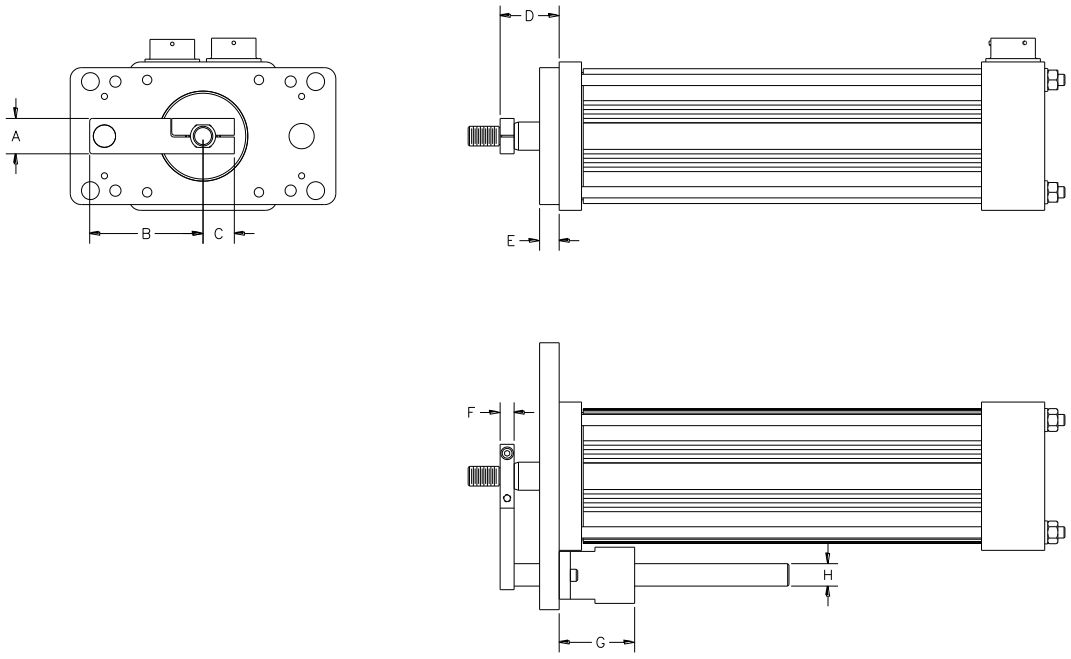
2.6 SR Series Linear Actuator Anti-rotation Option

The unique design of the SR 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 below 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

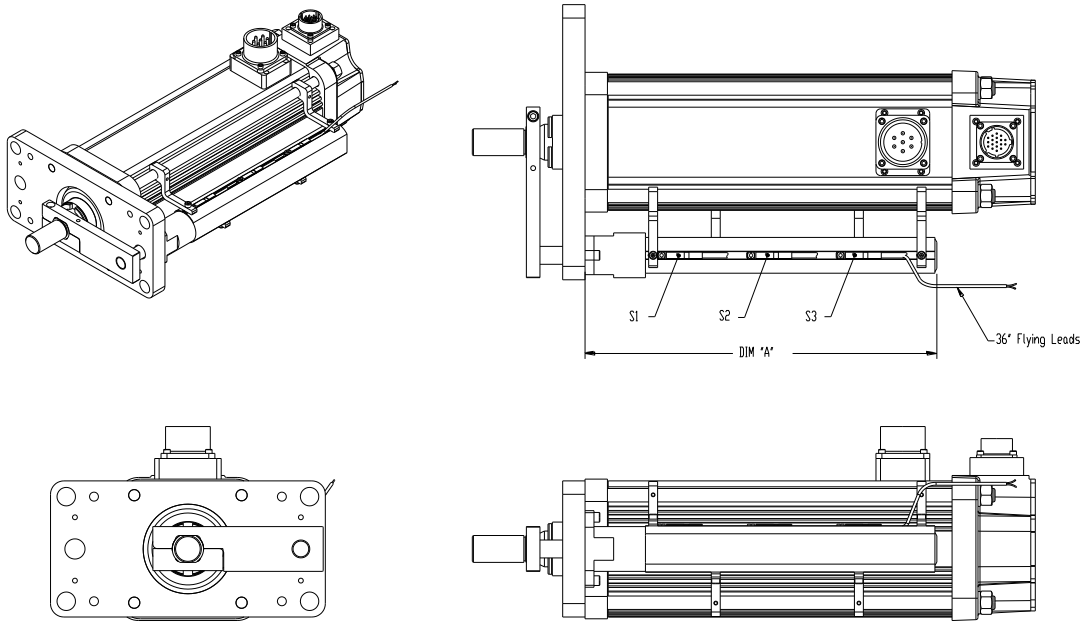


Dimensions in inches	SR21	SR31	SR41
A	0.60	0.79	1.25
B	1.81	2.54	3.78
C	0.54	0.71	0.98
D	1.00	1.29	1.65
E	0.44	0.44	0.63
F	0.28	0.32	0.38
G	0.31	1.69	1.69
H	0.37	0.50	0.50

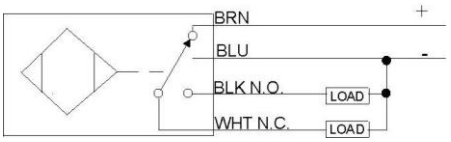
2.7 SR Linear Actuator External Limit Switch

With the anti-rotate option (Section 2.6) the SR actuator can accommodate 1, 2 or 3 external limit switches for use as end of travel limit switches or home position sensors in a 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	14" Stroke	18" Stroke
GSX20/SR21	5.515	8.515	*n/a*	14.515	*n/a*	*n/a*
GSX30/SR31	6.932	9.832	13.832	15.832	17.832	21.832
GSX40/SR41	*n/a*	9.832	13.832	15.832	17.832	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

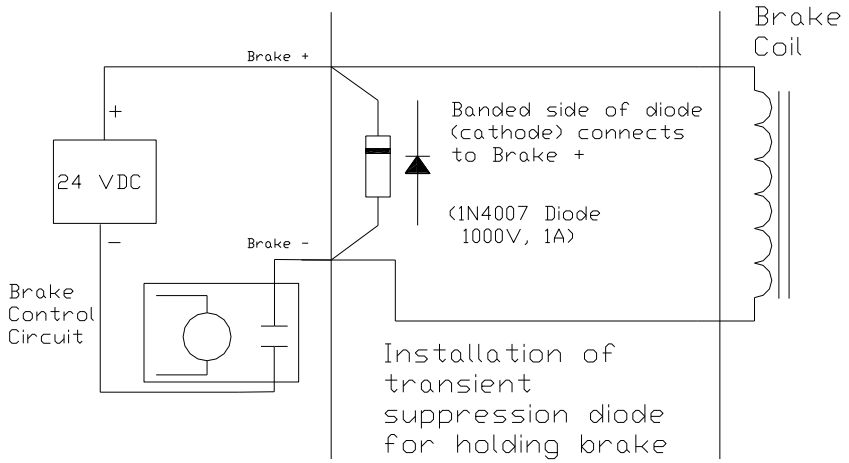
2.8 Internal Holding Brake

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 spring 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 in Section 7.0 of this manual.

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

SR21: Add 1.9 inches (48 mm) if ordering brake
SR31: Add 1.6 inches (40.6mm) if ordering brake
SR41: Add 1.52 inches (38.6 mm) if ordering brake

BRAKE SPECIFICATIONS	SR21	SR31	SR41
Holding torque	25 lb-in	40 lb-in	120 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.

3.0 INSTALLATION AND OPERATION

3.1 Lubrication Requirements

The SR 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 degrees C to 177 degrees C (-40 degrees F to 350 degrees F).

3.2 Mounting Configurations

The standard configurations available are Rear Clevis and Front Flange. 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 in line with the actuator output rod.

3.4 General Operation

The SR 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 SR 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))*(2π)*(efficiency)) / (Roller Screw Lead (in))

All of the above relationships require proper anti-rotation of the SR Series actuator rod.
For more information on sizing and selection of SR 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 SR 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 SR Series actuator or damage to the stator will result.

Care should be be taken not to exceed the physical travel limits of SR 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.

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 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 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.

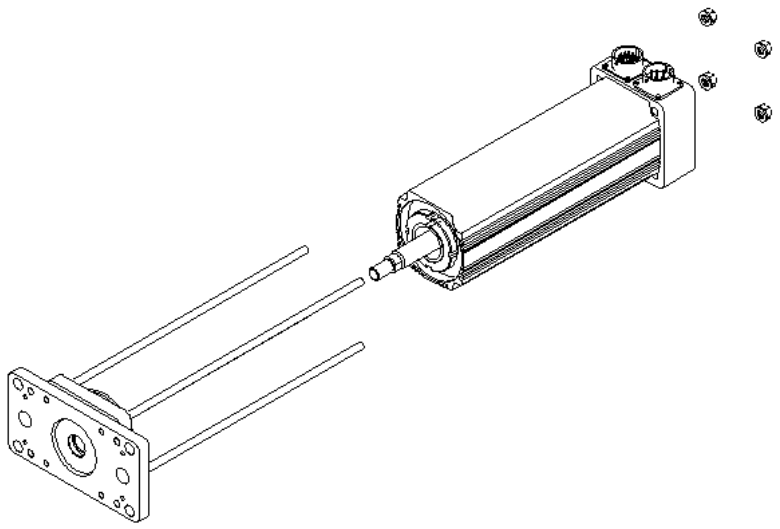
3.) Remove the rear tie rod nuts from the back of the actuator.

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.

4.) 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.

5.) 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.

Exploded View of SR Series Actuator



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 angular contact thrust bearings located in the front of the actuator, 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 in^3 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:
SR21: 0.5 in^3
SR31: 0.75 in^3
SR41: 1.00 in^3

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 SR 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

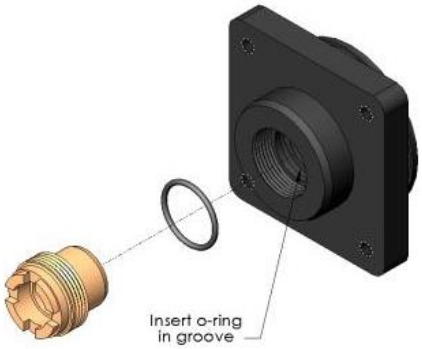
Replace the faceplate as described above. Remount front flange by sliding tie rods through the holes in the faceplate and through the holes in the rear end cap. Pilot the flange on the pilot diameter located on the front of the faceplate.

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.
SR21: 20 lbf-in (1.7 lbf-ft, 2.26 N-m)
SR31: 90 lbf-in (7.5 lbf-ft, 10.16 N-m)
SR41: 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 SR actuator, it is recommended that the main rod seal and bushing assembly (FSB) 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 FSB and Bushing

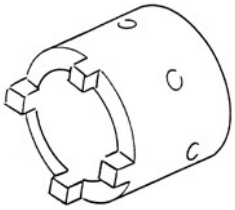
	Standard FSB Part Numbers	Install Torque
SR21	18929	100 lb-in (11.29 N-m)
SR31	19020	200 lb-in (22.58 N-m)
SR41	19021	360 lb-in (40.67 N-m)

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

FSB Installation/Replacement:

1. Using proper sized gland or spanner wrench, remove existing FSB 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, http://www.mfpseals.com/seal_repair_kits/parker-2.shtml.

Exlar Actuator Model	Martin Fluid Power Part No.	Size (in)	Description
SR21-31	PH-0695900000	1/2, 5/8	Rod Gland Wrench
SR41	PH-0695910000	1	Rod Gland Wrench



2. Remove the o-ring from the 0-ring groove located inside the opening from which the FSB was just removed.

3. Replace the o-ring with the o-ring supplied with the new FSB.

4. Taking care not to touch the seal material to any sharp rod features such as threads, slide the FSB on to the actuator rod and to the face plate.

5. Using the appropriate gland and spanner wrench, tighten the FSB to the proper torque level indicated in the previous table.

5.0 SPECIFICATIONS

5.1 Performance Specifications

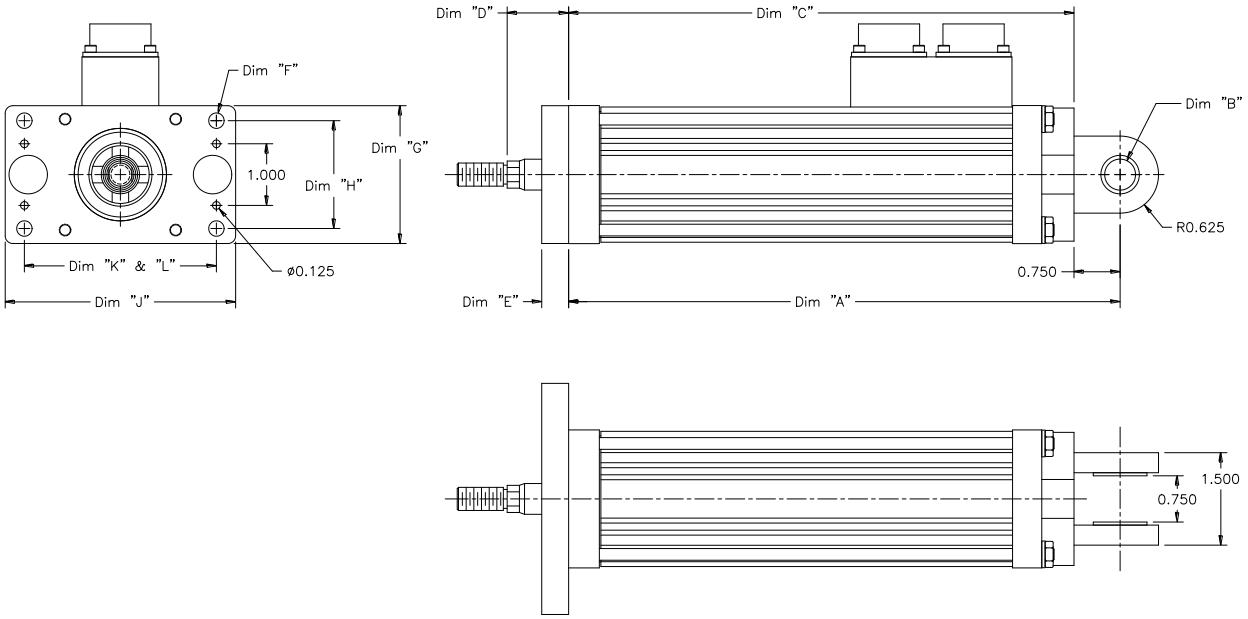
Model	Frame Size In (mm)	Stroke In (mm)	Screw Lead In (mm)	Force* Rating 1 Stk/2Stk lb (N)	Max Velocity In/sec (mm/sec)	Approx* Cont Motor Torque 1 Stk/2Stk Lb-in (Nm)	Maximum Static Load Lb (N)	Armature Inertia Lb-in-s2 (Kg-m2)	Dynamic Load Rating Lb (N)	Weight (approx) lb (Kg)
SR21-0301	2.25 (57)	3 (76)	0.1 (2.54)	367/578 (1632/2571)	8.33 (211.67)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00101 (0.000114)	1567 (6970)	6.5 (2.9)
SR21-0302	2.25 (57)	3 (76)	0.2 (5.08)	183/289 (814/1286)	16.67 (423.33)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00101 (0.000114)	1219 (5422)	6.5 (2.9)
SR21-0304	2.25 (57)	3 (76)	0.4 (10.16)	92/145 (409/645)	33.33 (846.67)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00101 (0.000114)	738 (3283)	6.5 (2.9)
SR21-0601	2.25 (57)	6 (152)	0.1 (2.54)	367/578 (1632/2571)	8.33 (211.67)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00114 (0.000129)	1567 (6970)	7.0 (3.2)
SR21-0602	2.25 (57)	6 (152)	0.2 (5.08)	183/289 (814/1286)	16.67 (423.33)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00114 (0.000129)	1219 (5422)	7.0 (3.2)
SR21-0604	2.25 (57)	6 (152)	0.4 (10.16)	92/145 (409/645)	33.33 (846.67)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00114 (0.000129)	738 (3283)	7.0 (3.2)
SR21-1001	2.25 (57)	10 (250)	0.1 (2.54)	367/578 (1632/2571)	8.33 (211.67)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00133 (0.000150)	1567 (6970)	7.5 (3.4)
SR21-1002	2.25 (57)	10 (250)	0.2 (5.08)	183/289 (814/1286)	16.67 (423.33)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00133 (0.000150)	1219 (5422)	7.5 (3.4)
SR21-1004	2.25 (57)	10 (250)	0.4 (10.16)	92/145 (409/645)	33.33 (846.67)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00133 (0.000150)	738 (3283)	7.5 (3.4)
SR21-1201	2.25 (57)	12 (304)	0.1 (2.54)	367/578 (1632/2571)	8.33 (211.67)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00143 (0.000162)	1567 (6970)	8.0 (3.6)
SR21-1202	2.25 (57)	12 (304)	0.2 (5.08)	183/289 (814/1286)	16.67 (423.33)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00143 (0.000162)	1219 (5422)	8.0 (3.6)
SR21-1204	2.25 (57)	12 (304)	0.4 (10.16)	92/145 (409/645)	33.33 (846.67)	7.3/11.5 (0.82/1.30)	750 (3336)	0.00143 (0.000162)	738 (3283)	8.0 (3.6)
SR31-0301	3.3 (84)	3 (75)	0.1 (2.54)	829/1347 (3688/5992)	5 (127)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00319 (0.000360)	3310 (14724)	9.5 (4.3)
SR31-0302	3.3 (84)	3 (75)	0.2 (5.08)	415/674 (1846/2998)	10 (254)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00319 (0.000360)	3570 (15880)	9.5 (4.3)
SR31-0305	3.3 (84)	3 (75)	0.5 (12.7)	166/269 (738/1197)	25 (635)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00319 (0.000360)	3016 (13416)	9.5 (4.3)
SR31-0601	3.3 (84)	5.9 (140)	0.1 (2.54)	829/1347 (3688/5992)	5 (127)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00361 (0.000408)	3310 (14724)	11.5 (5.2)
SR31-0602	3.3 (84)	5.9 (140)	0.2 (5.08)	415/674 (1846/2998)	10 (254)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00361 (0.000408)	3570 (15880)	11.5 (5.2)
SR31-0605	3.3 (84)	5.9 (140)	0.5 (12.7)	166/269 (738/1197)	25 (635)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00361 (0.000408)	3016 (13416)	11.5 (5.2)
SR31-1001	3.3 (84)	10 (254)	0.1 (2.54)	829/1347 (3688/5992)	5 (127)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00416 (0.000547)	3310 (14724)	19 (8.6)
SR31-1002	3.3 (84)	10 (254)	0.2 (5.08)	415/674 (1846/2998)	10 (254)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00416 (0.000547)	3570 (15880)	19 (8.6)
SR31-1005	3.3 (84)	10 (254)	0.5 (12.7)	166/269 (738/1197)	25 (635)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00416 (0.000547)	3016 (13416)	19 (8.6)
SR31-1201	3.3 (84)	12 (304)	0.1 (2.54)	829/1347 (3688/5992)	5 (127)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00443 (0.000501)	3310 (14724)	22 (10)
SR31-1202	3.3 (84)	12 (304)	0.2 (5.08)	415/674 (1846/2998)	10 (254)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00443 (0.000501)	3570 (15880)	22 (10)
SR31-1205	3.3 (84)	12 (304)	0.5 (12.7)	166/269 (738/1197)	25 (635)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00443 (0.000501)	3016 (13416)	22 (10)
SR31-1801	3.3 (84)	18 (455)	0.1 (2.54)	829/1347 (3688/5992)	5 (127)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00533 (0.000602)	3310 (14724)	25 (11.3)
SR31-1802	3.3 (84)	18 (455)	0.2 (5.08)	415/674 (1846/2998)	10 (254)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00533 (0.000602)	3570 (15880)	25 (11.3)
SR31-1805	3.3 (84)	18 (455)	0.5 (12.7)	166/269 (738/1197)	25 (635)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00533 (0.000602)	3016 (13416)	25 (11.3)
SR41-0601	3.9 (99)	6 (150)	0.1 (2.54)	2393/3966 (10645/17642)	5 (127)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0152 (0.001717)	4736 (21067)	20 (9.1)
SR41-0602	3.9 (99)	6 (150)	0.2 (5.08)	1196/1983 (5320/8821)	10 (254)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0152 (0.001717)	4890 (21751)	20 (9.1)
SR41-0605	3.9 (99	6 (150)	0.5 (12.7)	479/793 (2131/3527)	25 (635)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0152 (0.001717)	4218 (18763)	20 (9.1)
SR41-0608	3.9 (99	6 (150)	0.75 (19.05)	319/529 (1419/2353)	37.5 (953)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0152 (0.001717)	3328 (14804)	20 (9.1)

Model	Frame Size In (mm)	Stroke Nominal In (mm)	Screw Lead In (mm)	Force* Rating 1 Stk/2Stk lb (N)	Max Velocity In/sec (mm/sec)	Approx* Cont Motor Torque 1 Stk/2Stk Lb-in (Nm)	Maximum Static Load Lb (N)	Armature Inertia Lb-in-s2 (Kg-m2)	Dynamic Load Rating Lb (N)	Weight (approx) lb (Kg)
SR41-1001	3.9 (99)	10 (250)	0.1 (2.54)	2393/3966 (10645/17642)	5 (127)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0175 (0.001977)	4736 (21067)	28 (12.7)
SR41-1002	3.9 (99)	10 (250)	0.2 (5.08)	1196/1983 (5320/8821)	10 (254)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0175 (0.001977)	4890 (21751)	28 (12.7)
SR41-1005	3.9 (99	10 (250)	0.5 (12.7)	479/793 (2131/3527)	25 (635)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0175 (0.001977)	4218 (18763)	28 (12.7)
SR41-1008	3.9 (99	10 (250)	0.75 (19.05)	319/529 (1419/2353)	37.5 (953)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0175 (0.001977)	3328 (14804)	28 (12.7)
SR41-1201	3.9 (99)	12 (305)	0.1 (2.54)	2393/3966 (10645/17642)	5 (127)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0186 (0.002102)	4736 (21067)	32 (14.5)
SR41-1202	3.9 (99)	12 (305)	0.2 (5.08)	1196/1983 (5320/8821)	10 (254)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0186 (0.002102)	4890 (21751)	32 (14.5)
SR41-1205	3.9 (99	12 (305)	0.5 (12.7)	479/793 (2131/3527)	25 (635)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0186 (0.002102)	4218 (18763)	32 (14.5)
SR41-1208	3.9 (99	12 (305)	0.75 (19.05)	319/529 (1419/2353)	37.5 (953)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0186 (0.002102)	3328 (14804)	32 (14.5)
SR41-1801	3.9 (99)	18 (455)	0.1 (2.54)	2393/3966 (10645/17642)	5 (127)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0220 (0.002486	4736 (21067)	44 (20)
SR41-1802	3.9 (99)	18 (455)	0.2 (5.08)	1196/1983 (5320/8821)	10 (254)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0220 (0.002486	4890 (21751)	44 (20)
SR41-1805	3.9 (99	18 (455)	0.5 (12.7)	479/793 (2131/3527)	25 (635)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0220 (0.002486	4218 (18763)	44 (20)
SR41-1808	3.9 (99	18 (455)	0.75 (19.05)	319/529 (1419/2353)	37.5 (953)	47.6/78.9 (5.38/8.91)	3966 (17642)	0.0220 (0.002486	3328 (14804)	44 (20)

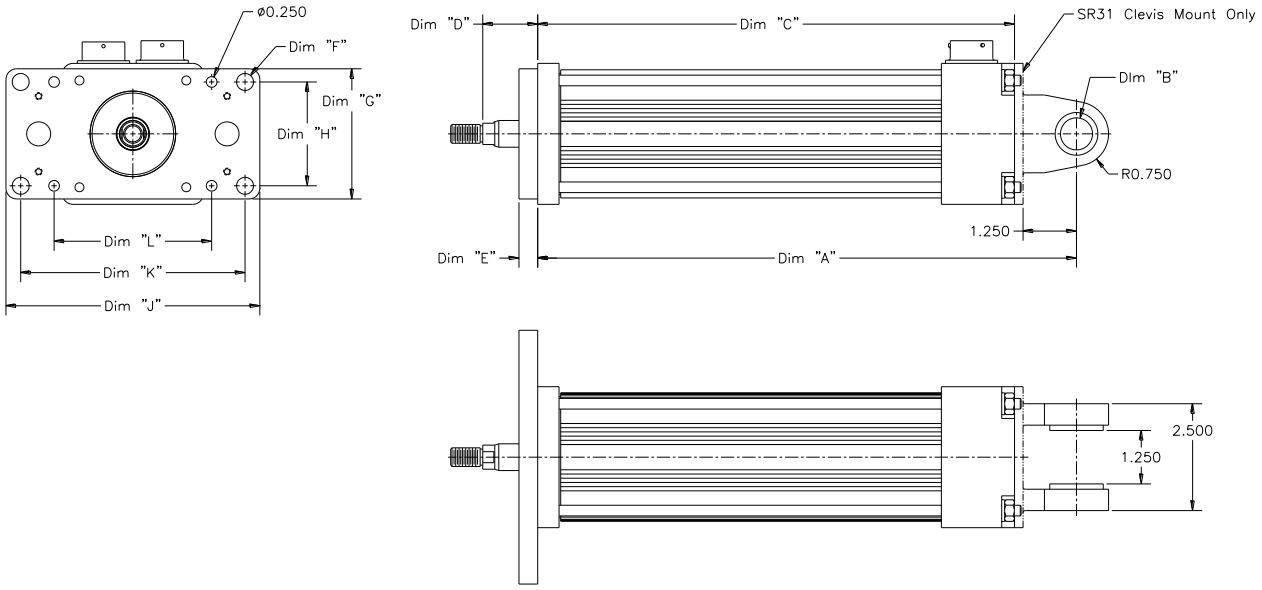
***Definitions ****Values are approximate and depend on motor voltage and commutation type. See motor specs for exact motor torque.*
Force Rating: *The linear force produced by the actuator at continuous motor torque.*
Max Velocity: *The linear velocity that the actuator will achieve at rated motor rpm.*
Continuous Motor Torque: *The torque produced by the motor at rated continuous current.*
Maximum Static Load: *The mechanical load limit of the actuator if re-circulated oil or other cooling method is used to allow higher than rated torque from the motor.*
Armature Inertia: *The rotary inertia of the armature of the SR Series actuators. For calculation purposes, this value includes the screw inertia in a GS actuator Inertia tolerance is +/- 5%.*
Dynamic Load Rating: *A design constant used in calculating the estimated travel life of the roller screw. The dynamic mean load is the load at which the device will perform one million revolutions.*

5.2 Dimensions

Model SR21



DIM	SR21	SR21	SR21	SR21
	3 " Stroke	6" Stroke	10" Stroke	12" Stroke
A	8.975	11.975	15.975	17.975
B	⌀.502 $^{+.000}_{-.001}$	⌀.502 $^{+.000}_{-.001}$	⌀.502 $^{+.000}_{-.001}$	⌀.502 $^{+.000}_{-.001}$
C	8.225	11.225	15.225	17.225
D	1.000	1.000	1.000	1.000
E	.438	.438	.438	.438
F	⌀0.250	⌀0.250	⌀0.250	⌀0.250
G	2.236	2.236	2.236	2.236
H	1.750	1.750	1.750	1.750
J	3.750	3.750	3.750	3.750
K	3.125	3.125	3.125	3.125
L	3.125	3.125	3.125	3.125



DIM	SR31	SR31	SR31	SR31	SR31	SR41	SR41	SR41	SR41
	3 " Stroke	6" Stroke	10" Stroke	12" Stroke	18" Stroke	6" Stroke	10" Stroke	12" Stroke	18" Stroke
A	9.609	12.609	17.108	19.108	25.108	14.145	18.145	20.145	26.145
B	⌀.7505 $^{+.000}_{-.001}$	⌀.7505 $^{+.000}_{-.001}$	⌀.7505 $^{+.000}_{-.001}$	⌀.7505 $^{+.000}_{-.001}$	⌀.7505 $^{+.000}_{-.001}$	⌀.752 $^{+.000}_{-.001}$	⌀.752 $^{+.000}_{-.001}$	⌀.752 $^{+.000}_{-.001}$	⌀.752 $^{+.000}_{-.001}$
C	8.225	11.225	15.225	17.225	23.225	12.895	16.895	18.895	24.895
D	1.29	1.29	1.29	1.29	1.29	1.65	1.65	1.65	1.65
E	.438	.438	.438	.438	.438	.438	.438	.438	.438
F	⌀0.397	⌀0.397	⌀0.397	⌀0.397	⌀0.397	⌀0.516	⌀0.516	⌀0.516	⌀0.516
G	3.046	3.046	3.046	3.046	3.046	3.800	3.800	3.800	3.800
H	2.430	2.430	2.430	2.430	2.430	2.920	2.920	2.920	2.920
J	5.940	5.940	5.940	5.940	5.940	7.680	7.680	7.680	7.680
K	5.250	5.250	5.250	5.250	5.250	6.800	6.800	6.800	6.800
L	3.688	3.688	3.688	3.688	3.688	5.250	5.250	5.250	5.250

5.2 Mechanical / Electrical Specifications

SR Series Mechanical / Electrical Specifications									
Nominal Backlash	in (mm)	0.004(.10)							
Lead Accuracy	in/ft (μm/300 mm)	0.001(25)							
Maximum Radial Load	lb (N)	15 (67)							
Environmental Rating: Standard		IP54							
		SR21							
		118	**138**	**158**	**168**	**218**	**238**	**258**	**268**
Trapezoidal Commutation Motor Data									
Continuous Motor Torque	Lbf-in	7.3	7.0	6.7	6.7	11.4	11.0	10.7	10.8
	(N-m)	(0.82)	(0.79)	(0.76)	(0.76)	(1.29)	(1.24)	(1.21)	(1.22)
Torque Constant (Kt)	Lbf-in/A	1.9	4.1	6.5	7.4	1.9	4.1	6.9	7.9
+/- 10% @ 25°C	(N-m/A)	(0.22)	(0.46)	(0.73)	(0.84)	(0.22)	(0.46)	(0.78)	(0.89)
Continuous Current Rating	Amps	4.2	1.9	1.1	1.0	6.6	3.0	1.7	1.5
Peak Current Rating	Amps	8.4	3.9	2.3	2.0	13.2	6.0	3.5	3.0
RMS Sinusoidal Commutation Motor Data									
Continuous Motor Torque	Lbf-in	7.6	7.3	7.0	7.0	11.9	11.5	11.2	11.3
	(N-m)	(0.86)	(0.83)	(0.79)	(0.79)	(1.35)	(1.30)	(1.27)	(1.28)
Torque Constant (Kt)	Lbf-in/A	2.5	5.2	8.3	9.5	2.5	5.2	8.9	10.2
+/- 10% @ 25°C	(N-m/A)	(0.28)	(0.59)	(0.94)	(1.07)	(0.28)	(0.59)	(1.00)	(1.15)
Continuous Current Rating	Amps	3.4	1.6	0.9	0.8	5.4	2.5	1.4	1.2
Peak Current Rating	Amps	6.9	3.1	1.9	1.6	10.8	4.9	2.8	2.5
Motor Stator Data									
Voltage Constant (Ke)	Vrms / Krpm	16.9	35.6	56.9	64.9	16.9	35.6	60.5	69.4
+/- 10% @ 25°C	Vpk / Krpm	23.9	50.3	80.5	91.8	23.9	50.3	85.5	98.1
Pole Configuration		8	8	8	8	8	8	8	8
Resistance (L-L) +/- 5% @ 25°C	Ohms	2.6	12.5	35.2	45.8	1.1	5.3	16.0	20.7
Inductance (L-L) +/- 15%	mH	5.1	22.8	58.3	75.8	2.5	11.0	31.7	41.7
Brake Inertia	lb-in-sec^2	0.000336	0.000336	0.000336	0.000336	0.000336	0.000336	0.000336	0.000336
	Kg-cm^2	(0.38)	(0.38)	(0.38)	(0.38)	(0.38)	(0.38)	(0.38)	(0.38)
Brake Current @ 24 Vdc	A	.33	.33	.33	.33	.33	.33	.33	.33
Brake Holding Torque	lbf-in	18	18	18	18	18	18	18	18
	(Nm)	(2.2)	(2.2)	(2.2)	(2.2)	(2.2)	(2.2)	(2.2)	(2.2)
Brake Engage/Disengage Time	ms	14/28	14/28	14/28	14/28	14/28	14/28	14/28	14/28
Mechanical Time Constant (tm), ms	min	6.0	6.5	7.1	7.1	2.5	2.7	2.9	2.8
	max	8.5	9.2	10.1	10.1	3.6	3.9	4.0	4.0
Electrical Time Constant (te)	ms	2.0	1.8	1.7	1.7	2.2	2.1	2.0	2.0
Damping Constant	lbf-in/krpm	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
	(N-m/krpm)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Friction Torque	lbf-in	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	(N-m)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
Bus Voltage	VDC	115	230	400	460	115	230	400	460
Speed @ Bus Voltage	RPM	5000	5000	5000	5000	5000	5000	5000	5000
Motor Wire Insulation		Class 180 H							
Motor Stator Rating		Class 180 H							
Thermal Switch, case temperature	°C	100							
Std Connectors ("S" Option):	Motor & Brake	MS-3112-E16-8P							
	Feedback	MS-3112-E16-23P							

For amplifiers with peak sinusoidal commutation Kt = Ktrms (0.707), Ic = Icrms/(0.707), Ipk = Ipkrms/(0.707). All ratings at 25 degrees Celsius.

SR Series Mechanical / Electrical Specifications

Nominal Backlash	in (mm)	0.004(.10)							
Lead Accuracy	in/ft (μm/300 mm)	0.001(25)							
Maximum Radial Load	lb (N)	20 (90)							
Environmental Rating: Standard		IP54							
		SR31							
		118	**138**	**158**	**168**	**218**	**238**	**258**	**268**
Trapezoidal Commutation Motor Data									
Continuous Motor Torque	Lbf-in	15.9	15.8	14.9	15.0	25.6	25.6	25.5	25.5
	(N-m)	(1.79)	(1.78)	(1.69)	(1.70)	(2.89)	(2.89)	(2.88)	(2.88)
Torque Constant (Kt)	Lbf-in/A	3.4	6.8	12.1	13.6	3.4	6.8	12.1	13.6
+/- 10% @ 25°C	(N-m/A)	(0.39)	(0.77)	(1.37)	(1.54)	(0.39)	(0.77)	(1.37)	(1.54)
Continuous Current Rating	Amps	5.2	2.6	1.4	1.2	8.4	4.2	2.4	2.1
Peak Current Rating	Amps	10.4	5.2	2.8	2.5	16.8	8.4	4.7	4.2
RMS Sinusoidal Commutation Motor Data									
Continuous Motor Torque	Lbf-in	16.6	16.5	15.7	15.7	26.8	26.8	26.7	26.7
	(N-m)	(1.88)	(1.87)	(1.77)	(1.78)	(3.03)	(3.03)	(3.02)	(3.01)
Torque Constant (Kt)	Lbf-in/A	4.4	8.7	15.5	17.5	4.4	8.7	15.5	17.5
+/- 10% @ 25°C	(N-m/A)	(0.49)	(0.99)	(1.75)	(1.98)	(0.49)	(0.99)	(1.75)	(1.98)
Continuous Current Rating	Amps	4.2	2.1	1.1	1.0	6.9	3.4	1.9	1.7
Peak Current Rating	Amps	8.5	4.2	2.3	2.0	13.7	6.8	3.8	3.4
Motor Stator Data									
Voltage Constant (Ke)	Vrms / Krpm	29.9	59.7	106.0	119.5	29.9	59.7	106.0	119.5
+/- 10% @ 25°C	Vpk / Krpm	42.2	84.5	149.9	168.9	42.2	84.5	149.9	168.9
Pole Configuration		8	8	8	8	8	8	8	8
Resistance (L-L) +/- 5% @ 25°C	Ohms	2. 8	11.2	39.5	49.6	1.1	4.5	14.1	18.0
Inductance (L-L) +/- 15	mH	7.7	30.7	96.8	123.0	3.7	14.7	46.2	58.7
Brake Inertia	lb-in-sec2	.000938	.000938	.000938	.000938	.000938	.000938	.000938	.000938
	Kg-cm2	(1.06)	(1.06)	(1.06)	(1.06)	(1.06)	(1.06)	(1.06)	(1.06)
Brake Current @ 24 VDC	A	.66	.66	.66	.66	.66	.66	.66	.66
Brake Holding Torque	lbf-in-sec2	28	28	28	28	28	28	28	28
	Kg-cm2	(3.2)	(3.2)	(3.2)	(3.2)	(3.2)	(3.2)	(3.2)	(3.2)
Brake Engage/Disengage Time	ms	20/29	20/29	20/29	20/29	20/29	20/29	20/29	20/29
Mechanical Time Constant (tm), ms	min	6.5	6.5	7.3	7.2	2.6	2.6	2.6	2.6
	max	10. 8	10.9	12.2	12.0	4.3	4.3	4.4	4. 4
Electrical Time Constant (te)	ms	2.8	2.7	2.5	2.5	3.3	3.3	3.3	3.3
Damping Constant	lbf-in/krpm	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23
	(N-m/krpm)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
Friction Torque	lbf-in	2.00	2.00	2.0	2.00	2.00	2.00	2.00	2.00
	(N-m)	(0.23)	(0.23)	(0.23)	(0.23)	(0.23)	(0.23)	(0.23)	(0.23)
Bus Voltage	VDC	115	230	400	460	115	230	400	460
Speed @ Bus Voltage	RPM	3000	3000	3000	3000	3000	3000	3000	3000
Motor Wire Insulation		Class 180 H							
Motor Stator Rating		Class 180 H							
Thermal Switch, case temperature	°C	100							
Standard Connectors ("S" Option):	Motor	MS-3112-E16-8P							
	Feedback	MS-3112-E16-23P							

For amplifiers with peak sinusoidal commutation Kt = Ktrms (0.707), Ic = Icrms/(0.707), Ipk = Ipkrms/(0.707). All ratings at 25 degrees Celsius.

SR Series Mechanical / Electrical Specifications

Nominal Backlash	in (mm)	0.004(.10)							
Lead Accuracy	in/ft (μm/300 mm)	0.001(25)							
Maximum Radial Load	lb (N)	30 (133)							
Environmental Rating: Standard		IP54							
		SR41							
		118	**138**	**158**	**168**	**218**	**238**	**258**	**268**
Trapezoidal Commutation Motor Data									
Continuous Motor Torque	Lbf-in	45.5	45.4	42.7	43.5	75.3	75.3	75.3	76.1
	(N-m)	(5.14)	(5.13)	(4.83)	(4.91)	(8.51)	(8.51)	(8.50)	(8.60)
Torque Constant (Kt)	Lbf-in/A	3.2	6.4	11.4	13.1	3.2	6.4	11.4	13.1
+/- 10% @ 25°C	(N-m/A)	(0.36)	(0.72)	(1.28)	(1.48)	(0.36)	(0.72)	(1.28)	(1.48)
Continuous Current Rating	Amps	15.9	7.9	4.2	3.7	26.3	13.1	7.4	6.5
Peak Current Rating	Amps	31.7	15.8	8.4	7.4	52.5	26.3	14.8	13.0
RMS Sinusoidal Commutation Motor Data									
Continuous Motor Torque	Lbf-in	47.6	47.6	44.7	45.5	78.9	78.9	78.8	79.7
	(N-m)	(5.38)	(5.37)	(5.05)	(5.14)	(8.91)	(8.91)	(8.91)	(9.00)
Torque Constant (Kt)	Lbf-in/A	4.1	8.2	14.6	16.8	4.1	8.2	14.6	16.8
+/- 10% @ 25°C	(N-m/A)	(0.46)	(0.93)	(1.65)	(1.90)	(0.46)	(0.93)	(1.65)	(1.90)
Continuous Current Rating	Amps	12.9	6.5	3.4	3.0	21.4	10.7	6.0	5.3
Peak Current Rating	Amps	25.9	12.9	6.9	6.0	42.9	21.4	12.1	10.6
Motor Stator Data									
Voltage Constant (Ke)	Vrms / Krpm	28.1	56.1	99.5	114.8	28.1	56.1	99.5	114.8
+/- 10% @ 25°C	Vpk / Krpm	39.7	79.4	140.7	162.4	39.7	79.4	140.7	162.4
Pole Configuration		8	8	8	8	8	8	8	8
Resistance (L-L) +/- 5% @ 25°C	Ohms	0.42	1.7	6.0	7.8	0.18	0.72	2.26	3.0
Inductance (L-L) +/- 15%	mH	3.0	11.9	37.5	49.8	1.4	5.8	18.2	24.2
Brake Inertia	lb-in-sec2	.000938	.000938	.000938	.000938	.000938	.000938	.000938	.000938
	Kg-cm2	(1.06)	(1.06)	(1.06)	(1.06)	(1.06)	(1.06)	(1.06)	(1.06)
Brake Current @ 24 VDC		.66	.66	.66	.66	.66	.66	.66	.66
Brake Holding Torque		97	97	97	97	97	97	97	97
		(11)	(11)	(11)	(11)	(11)	(11)	(11)	(11)
Brake Engage/Disengage Time		20/29	20/29	20/29	20/29	20/29	20/29	20/29	20/29
Mechanical Time Constant (tm), ms	min	5.3	5.3	6.0	5.8	2.3	2.3	2.3	2.3
	max	7.7	7.7	8.7	8.4	3.3	3.3	3.3	3.2
Electrical Time Constant (te)	ms	7.0	7.0	6.2	6.4	8.0	8.0	8.0	8.2
Damping Constant	lbf-in/krpm	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
	(N-m/krpm)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)
Friction Torque	lbf-in	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
	(N-m)	(0.51)	(0.51)	(0.51)	(0.51)	(0.51)	(0.51)	(0.51)	(0.51)
Bus Voltage	VDC	115	230	400	460	115	230	400	460
Speed @ Bus Voltage	RPM	3000	3000	3000	3000	3000	3000	3000	3000
Motor Wire Insulation		Class 180 H							
Motor Stator Rating		Class 180 H							
Thermal Switch, case temperature	°C	100							
Standard Connectors ("S" Option):	Motor	MS-3102-E20-15P							
	Feedback	MS-3112-E16-23P							

For amplifiers with peak sinusoidal commutation Kt = Ktrms (0.707), Ic = Icrms/(0.707), Ipk = Ipkrms/(0.707).

All ratings are at 25 degrees Celsius.

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 SR Series actuator.

Symptom / Trouble	Possible Cause / Troubleshooting Procedure
No response from actuator.	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.	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 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.	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.	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.	1. Install Exlar anti-rotation assembly or incorporate anti-rotation into the application.
Limit switches not functioning.	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.	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.	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 REPAIR LEADTIME:

- Two weeks for written evaluation from Exlar
- Two weeks from receipt of approval (by fax or email) for repair where parts are available.
- An evaluation charge per unit after evaluation applies if customer chooses not to repair; or if product is found not in need of repair.

EXPEDITED REPAIR LEADTIME:

- An expedite charge per unit can be quoted.
- This provides one week for written evaluation from Exlar
- This provides one week from receipt of approval (by fax or email) for repair where parts are available.

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 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.

7.0 SYSTEM INSTALLATION

This section provides you with cable and wiring information for operation of your SR Series with both Exlar's and other manufacturers' servo drives. (NOTE: If the amplifier you are using is not represented in the following sections, contact Exlar for assistance.)

The "M" connector option on the SR series of actuators provides for an actuator configured with connectors that allow the end user to purchase the feedback cable, or power and feedback cables for their actuator from the manufacturer of their servo amplifier, thus eliminating the headaches and confusion that can arise from power and feedback wiring.

The "S" connector option on the SR series of actuators provides for an actuator with Exlar's standard MS style connectors, compatible with Exlar's standard cables.

For amplifier manufacturers who use standard style military connectors, with molded and shielded cables, the feedback cable can be purchased from the amplifier manufacturer, and the power cable purchased from Exlar. The Exlar power cables with the PCx-MC-xxx model numbers are molded and shielded and provide a good match with the cables provided by most amplifier manufacturer using standard style military connectors.

For some amplifier manufacturers who utilize a different style of connector, when the "M" option is available from Exlar, both the connectors will be configured to allow the feedback and power cables to be purchased from the amplifier manufacturer. Consult Exlar for details on all connector configurations.

In some instances, depending on actuator size, voltage, and the cable availability from the amplifier manufacturer, some cables will still need to be obtained from Exlar. The following pages contain interconnect information and cable pin-outs for several brands of servo amplifiers. These are also available on our website at **www.exlar.com.**

The tables below outline the "S" and "M" connector options for Exlar actuators, the cable part numbers, manufacturer, and cable part numbers for each.

CABLE SELECTION FOR SR SERIES ACTUATORS WITH "S" CONNECTORS

Exlar Actuator	Cable Type	Cable Manufacturer	Drive Manufacturer	Cable P/N No Brake	Cable P/N With Brake
SR21, 31	Power Cable	Exlar	A-B Ultra Series	PC6-MC-xxx	PC1-AC-xxx
SR21, 31	Feedback Cable	Exlar	A-B Ultra Series	EC4-MC-xxx	--
SR21, 31	Power Cable	Exlar	EC BRU Advantage	PC6-MC-xxx	PC1-AC-xxx
SR21, 31	Feedback Cable	Exlar	EC BRU Advantage	EC4-MC-xxx	--
SR41	Power Cable	Exlar	A-B Ultra Series	PC7-MC-xxx	PC7-AC-xxx
SR 41	Feedback Cable	Exlar	A-B Ultra Series	EC4-MC-XXX	--
SR 41	Power Cable	Exlar	EC BRU Advantage	PC7-MC-xxx	PC7-AC-xxx
SR 41	Feedback Cable	Exlar	EC BRU Advantage	EC4-MC-XXX	--

Each of the cables shown in the above table is connectorized with military connectors on the motor end and has flying leads on the amplifier end. These cables will require the end user to attach any required connectors on the amplifier end. Amplifiers with screw terminals or interface terminal strips can be directly connected using these cables.

CABLE SELECTION FOR SR SERIES ACTUATORS WITH "M" CONNECTORS

Exlar Actuator	Amp Manufacturer and Model	Cable Type	Cable Manufacturer	Manufacturer Cable Part Number
SR21, 31	Emerson EN and Epsilon Series	Power	Emerson	CMDS-xxx
SR21, 31	Emerson EN and Epsilon Series	Encoder Feedback	Emerson	CFCS-xxx
SR21, 31	Emerson Epsilon Series	Power	Exlar	PC6-MC-xxx
SR21, 31	Emerson Epsilon Series	Encoder Feedback	Exlar	EC3-MC-xxx
SR41	Emerson EN and Epsilon Series	Power	Emerson	CMMS-xxx
SR41	Emerson EN and Epsilon Series	Encoder feedback	Emerson	CFCS-xxx

Always look for more configurations of "M" connections to be published by Exlar. If you would like to use a configuration not yet published by Exlar, contact our applications engineering department.

DRIVE SET-UP WITH SR SERIES ACTUATORS

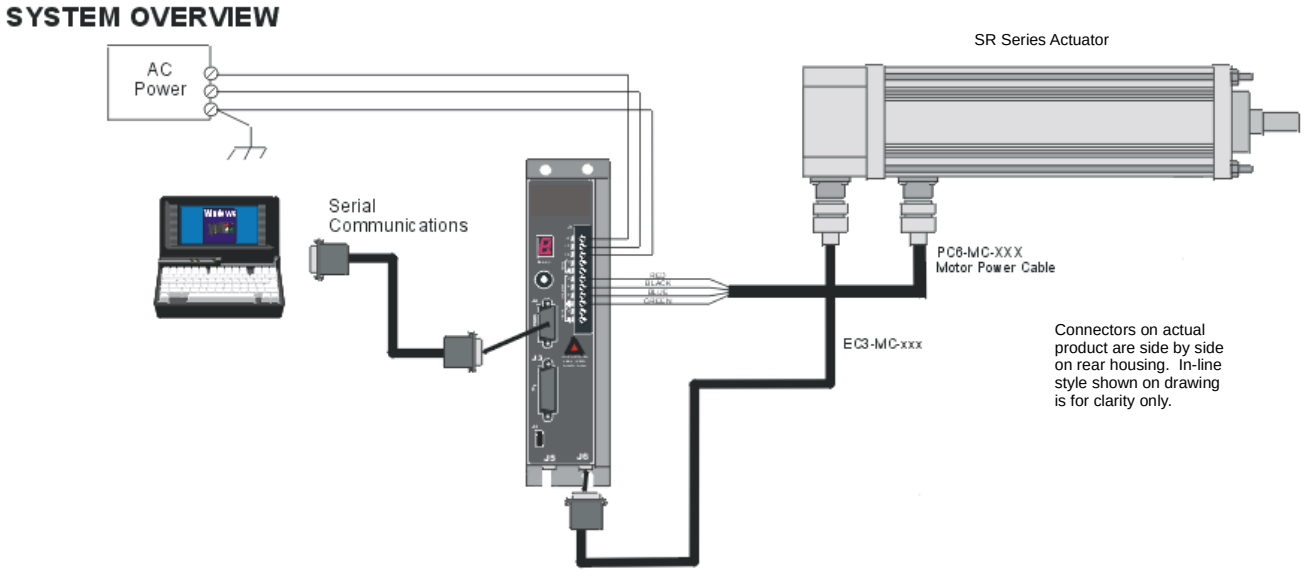
Specific set-up instructions for each manufacturer's drives are included at the beginning of each section. The following table contains Exlar's SR motor file names, which you will need to transfer to the amplifier's software to allow Exlar motors to be selected within the drive setup routine.

Emerson EN and Epsilon Series	Use motor.ddf file found on **www.exlar.com**
Allen-Bradley Ultra 100/1000 or	Use motor .mxf files found on **www.exlar.com**
Electro-Craft BRU Advantage Line	Use motor .mtr files found on **www.exlar.com**

SR21 Motor File	3" Stroke	6" Stroke	10" Stroke	12"Stroke	18"Stroke
118 (170V Single Stack 8 Pole)	SR211803	SR211806	SR211810	SR211812	
138 (325V Single Stack 8 Pole)	SR213803	SR213806	SR213810	SR213812	
168 (650V Single Stack 8 Pole)	SR216803	SR216806	SR216810	SR216812	
218 (170V Double Stack 8 Pole)	SR221803	SR221806	SR221810	SR221812	
238 (325V Double Stack 8 Pole)	SR223803	SR223806	SR223810	SR223812	
268 (650V Double Stack 8 Pole)	SR226803	SR226806	SR226810	SR226812	
SR31 Motor File					
118 (170V Single Stack 8 Pole)	SR311803	SR311806	SR311810	SR311812	SR311818
138 (325V Single Stack 8 Pole)	SR313803	SR313806	SR313810	SR313812	SR313818
168 (650V Single Stack 8 Pole)	SR316803	SR316806	SR316810	SR316812	SR316818
218 (170V Double Stack 8 Pole)	SR321803	SR321806	SR321810	SR321812	SR321818
238 (325V Double Stack 8 Pole)	SR323803	SR323806	SR323810	SR323812	SR323818
268 (650V Double Stack 8 Pole)	SR326803	SR326806	SR326810	SR326812	SR326818
SR41 Motor File					
118 (170V Single Stack 8 Pole)		SR411806	SR411810	SR411812	SR411818
138 (325V Single Stack 8 Pole)		SR413806	SR413810	SR413812	SR413818
168 (650V Single Stack 8 Pole)		SR416806	SR416810	SR416812	SR416818
218 (170V Double Stack 8 Pole)		SR421806	SR421810	SR421812	SR421818
238 (325V Double Stack 8 Pole)		SR423806	SR423810	SR423812	SR423818
268 (650V Double Stack 8 Pole)		SR426806	SR426810	SR426812	SR426818

SR Series Actuator	Inertia lb-in-s^2
SR21-03xx	0.00101
SR21-06xx	0.00114
SR21-12xx	0.00143
SR31-06xx	0.00361
SR31-10xx	0.00416
SR41-06xx	0.0152
SR41-12xx	0.0186

7.1 Emerson Epsilon Series Drive with SR Series Actuator (M Connector Option)



Note: Dangerous voltages exist. Use extreme caution when operating this equipment. Sufficient energy remains in the Epsilon Series drive to cause motion even with the power removed. Wait for the 7-segment display to dim to off when powering down the drive. At start-up, be sure to have the proper motor file selected and limit the maximum acceleration until proper operation is verified.

SETTING UP THE EPSILON SERIES DRIVE TO RUN SR SERIES ACTUATORS

The quick touch setup cannot be used to select the Exlar actuator. The motor file containing the Exlar actuators is supplied by Exlar and must be saved as the motor.ddf file in the Power Tools main directory of the personal computer. When running PTOOLS, the actuator can be selected from the motor list and downloaded to the Epsilon Series drive by following these steps:

1. Click on the PowerTools Icon.
2. From the menu bar, select File-New.
3. Select Predefined Setup Selection appropriate for the application.
4. Enter the appropriate ID name; drive address, line voltage, and operating mode.
5. Enter the Epsilon drive type.
6. At this point if it asks you to enter a motor, then from the pull down menu, select the appropriate SR actuator.
7. Click on the Inputs, then Outputs tabs and configure the I/O, as required.
8. Click on the Position, Velocity, and Torque tabs and configure the I/O, as required.
9. Click on the Motor tab, then the drop-down Motor Type. The Exlar SR Series actuators should be included in the list. If they are not, the motor.ddf file from Exlar must be loaded into the Power Tools directory.
10. Download to the Epsilon Series drive by clicking on Device – Download from the menu items.

Basic SR Series Parameter Settings for Epsilon Series Drives*			
		SR21	SR31, 41
Number of Poles		8	8
Maximum Speed	RPM	5000	3000
J_m	Lb-in-s^2	**	**
Encoder Size	Lines	2048	2048
Index Offset	Degrees	330	330
Hall Offset	Degrees	330	330

*Appropriate motor files may be obtained from Exlar or www.exlar.com and downloaded to Epsilon-XXX drives.
** See Inertia Table in Section 7.0

CABLES FOR EMERSON EPSILON DRIVE WITH SR SERIES ACTUATOR (M CONNECTOR OPTION)

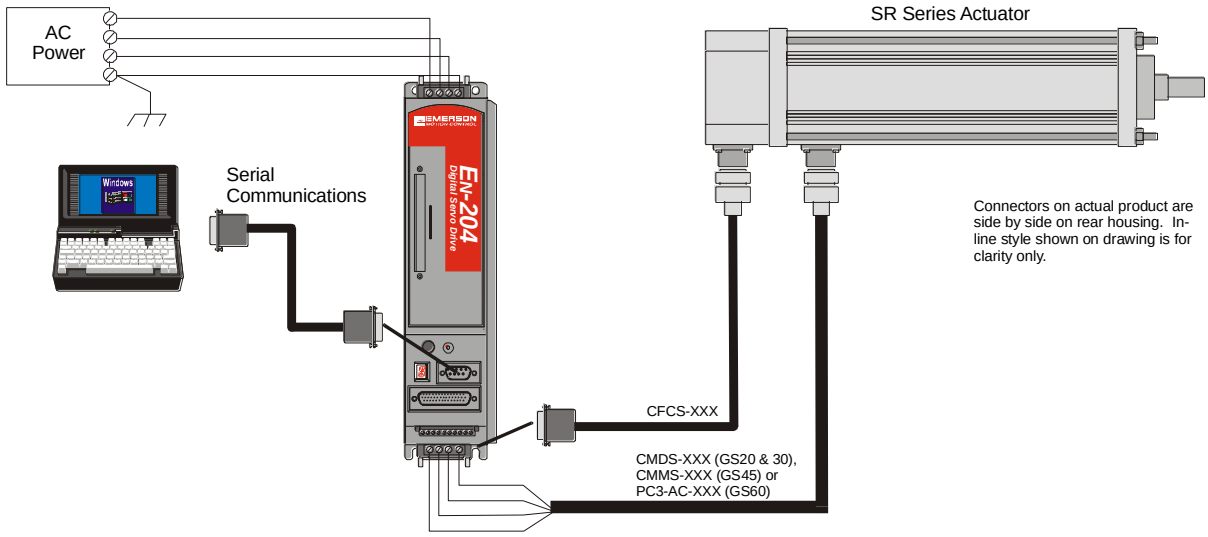
SR21, SR31 - EM2-M			
Exlar Connector Pin Number	Drive Connection	Mating Cable PC6 No Brake	Alternate PC1 With Brake
A	R	Brown	Red
B	S	Black	Black
C	T	Blue	Blue
D	GND	Green/Yellow	Green
E			-
F	Brake -		Blue/White
G	Brake +		Blue
H			
J			

SR41 - EM2-M			
Exlar Connector Pin Number	Drive Connection	Mating Cable PC7-MC No Brake	Alternate PC7-AC With Brake
A	R	Brown	Red
B	S	Black	Black
C	T	Blue	Blue
D	GND	Green/Yellow	Green
E			
F	Brake -		Blue/White
G	Brake +		Blue
H			
J			

Encoder Cable EC3/4-MC-XXX			
Exlar Connector	Wire Color	Function	J5, DB-26 Connection
A	Red/Green	Motor Overtemp	9
B	Blue	A+	1
C	Orange	A-	10
D		Overtemp Gnd	17
E	White/Brown	U+	4
F	White/Gray	V+	5
G	Red/Orange	W+	6
H	Orange/Red	W-	15
J			16
K	Red/Blue	+ 5 VDC	7
L		+ 5 VDC	N/C
M	Black	Z+	3
N	Green	B+	2
P	Brown	B-	11
R	Brown/White	U-	13
S	Gray/White	V-	14
T	Blue/Red	GND	17
U	Yellow	Z-	12
V			N/C
W			N/C
X			N/C
Y			N/C
Z	Shield		
EC4 is flying leads. EC3-MC cable is connectorized on both ends.			

7.2 Emerson EN Series Drive with SR Series Actuator (M Connector Option)

Emerson EN Series



Note: Dangerous voltages exist. Use extreme caution when operating this equipment. Sufficient energy remains in the EN Series drive to cause motion even with the power removed. Wait for the 7-segment display to dim to off when powering down the drive. At start-up, be sure to have the proper motor file selected and limit the maximum acceleration until proper operation is verified.

SETTING UP THE EMERSON EN SERIES DRIVE TO RUN THE SR SERIES ACTUATOR

The quick touch setup cannot be used to select the Exlar actuator. The motor file containing the Exlar actuators is supplied by Exlar and must be saved as the motor.ddf file in the Power Tools main directory of the personal computer. When running PTOOLS, the actuator can be selected from the motor list and downloaded to the EN Series drive by following these steps:

1. Click on the PowerTools Icon.
2. From the menu bar, select File-New.
3. Select Predefined Setup Selection appropriate for the application.
4. Enter the appropriate ID name; drive address, line voltage, and operating mode.
5. Enter the EN Series drive type.
6. At this point, if it asks you to enter a motor, then from the pull down menu, select the appropriate SR Series actuator.
7. Click on the Inputs, then Outputs tabs and configure the I/O, as required.
8. Click on the Position, Velocity, and Torque tabs and configure the I/O, as required.
9. Click on the Motor tab, then the drop-down Motor Type. The Exlar SR Series actuators should be included in the list. If they are not, the motor.ddf file from Exlar must be loaded into the Power Tools directory.
10. Download to the EN Series drive by clicking on Device – Download from the menu items.

Basic SR Series Parameter Settings for Emerson En-XXX Drives*			
		SR21	**SR31, 41**
Number of Poles		8	8
Maximum Speed	RPM	5000	3000
J_m	Lb-in-s^2	**	**
Encoder Size	Lines	2048	2048
Index Offset	Degrees	330	330
Hall Offset	Degrees	330	330

* Appropriate motor files may be obtained from Exlar and downloaded to EN-XXX drives.
** See Inertia Table in Section 7.0

CABLES FOR EMERSON EN SERIES WITH SR SERIES ACTUATOR (M CONNECTOR OPTION)

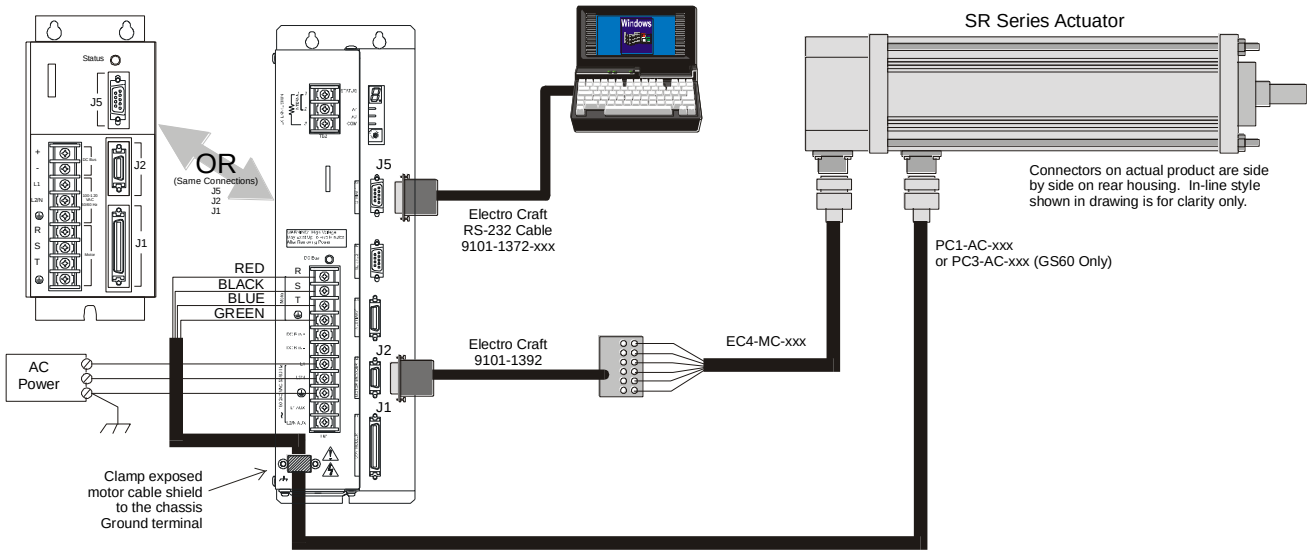
Refer to the diagram at the beginning of Section 7.2. The required cables are identified in the table below.

Emerson EN Series Cable Part Numbers (-xxx denotes cable length)	
SR21, 31, and 41 Feedback	CFCS-XXX
Motor Power SR21/31	CMDS-XXX / SR21 with Brake - Exlar PC1-AC-xxx
Motor Power SR41	CMMS-XXX

SR21, SR31 - EM2-M			
Exlar Connector Pin Number	**Drive Connection**	**Mating Cable PC6 No Brake**	**Alternate PC1 With Brake**
A	R	Brown	Red
B	S	Black	Black
C	T	Blue	Blue
D	GND	Green/Yellow	Green
E			
F	Brake -		Blue/White
G	Brake +		Blue
H			
J			

SR41 - EM2-M			
Exlar Connector Pin Number	**Drive Connection**	**Mating Cable PC7-MC No Brake**	**Alternate PC7-AC With Brake**
A	R	Brown	Red
B	S	Black	Black
C	T	Blue	Blue
D	GND	Green/Yellow	Green
E			
F	Brake -		Blue/White
G	Brake +		Blue
H			
J			

7.3 Allen-Bradley/Electro-Craft Drives with SR Actuator (S Connector Option)



Dangerous voltages exist. Use extreme caution when operating this equipment. Sufficient energy remains in the DDM-XXX to cause motion even with the power removed. To verify that the equipment is safe, insure that the voltage across the DC+ and DC- terminals is at 0VDC. At startup, reduce the positive and negative current to below the rated current, such that accelerating torque is limited, until proper control is verified.

SETTING UP THE DDM-XXX DRIVE TO RUN EXLAR SR SERIES ACTUATORS

In order to program the drive to run the Exlar actuators, the motor parameter files provided by Exlar must be loaded into the motor directory, which by default is named "c:\brudrive\motordir". Once the motor files are loaded, the following steps will set up the DDM-XXX drives to run the Exlar actuators:

1. Connect the serial cable from the PC to J5 of the DDM-XXX.
2. With the motor power cable disconnected from the motor, apply power to the DDM-XXX.
3. Double click on the Ultra Master or BRU Master icon to start the program.
4. Following the upload of drive information, click on the Drive Setup icon.
5. Click on the down arrow for the motor model and select the appropriate Exlar actuator model number.
6. The warnings generated after changing the motor are normal.
7. The motor parameters are now downloaded into the drive and configuration for the motor is complete.
8. Power down the drive and reconnect the motor cable.

Basic SR Series Parameter Settings for Allen-Bradley/Electro-Craft Drives			
		SR21	**SR31, 41**
Integral Thermostat		Note 2	Note 2
Number of Poles		8	8
Thermal Time Constant	Seconds	780	780
Maximum Speed	RPM	5000	3000
J_m	Kg-cm^2	**	**
Encoder Line Count	Lines	2048	2048
Index Offset	Degrees	0	0
Hall Offset	Degrees	240	240
Startup Commutation		Hall/Hall	Hall/Hall
Current Feed forward	Degrees/KRPM	0	0

** See Inertia Table in Section 7.0

(1) Appropriate motor files may be obtained from Exlar and downloaded to DDM-XXX drives. Changes to motor parameters require the advanced option for BRU Master or Ultra Master. Add /a to the command line of shortcut for the BRU Master or Ultra Master software to enable the advanced option. These Parameters and others specific to each motor winding are included in the motor file listed in the table in section 7.0.
(2) Set to "yes" if TS+ and TS- from the motor cable are connected to J2 pins 19 and 20.
(3) Voltage is 0 – peak of sinusoid, measured phase-to-phase
(4) Current is 0 – peak of sinusoid

CABLES FOR A-B / E-C DDM-XXX DRIVE AND SR SERIES ACTUATORS (S CONNECTOR OPTION)

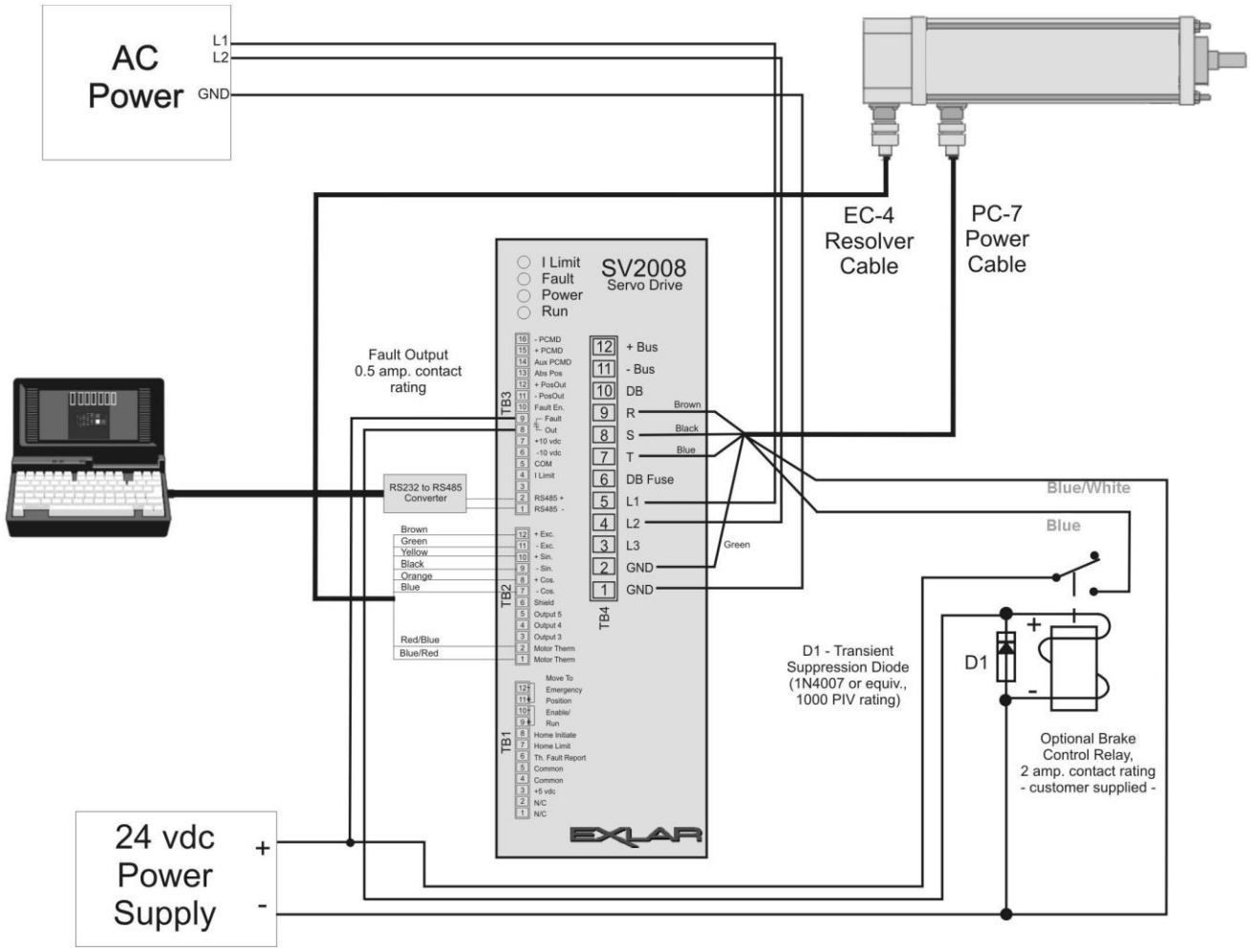
Refer to the diagram at the beginning of Section 7.3. The required cables are identified in the table below.

Encoder Cable EC4-MC-XXX			
AB1 Amplifier Function	**Motor Feedback Pin**	**EC4 Cable Colors**	**J2 Connector AB-9101-1366**
Motor Overtemp	A	Red/Green	19
A+	B	Blue	7
A-	C	Orange	8
GND	D, T	N/C	N/C
Hall C	E	White/Brown	15
Hall B	F	White/Gray	14
Hall A	G	Red/Orange	13
	H	Orange/Red	N/C
	J		
EPWR	K, L	Red/Blue	
EPWR	L, K		
Z	M	Black	11
B -	N	Green	10
B+	P	Brown	9
	R	Brown/White	N/C
	S	Gray/White	N/C
GND	T, D	Blue/Red	2, 46,20
Z-	U	Yellow	12
Motor Overtemp	V	Green/Red	
	W		
	X		
	Y		
Shield	Z		

SR21, SR31 - AB1-S Options			
Exlar Connector Pin Number	Drive Connection	Mating Cable PC6 No Brake	Alternate PC1 With Brake
A	R	Brown	Red
B	S	Black	Black
C	T	Blue	Blue
D	GND	Green/Yellow	Green
E			
F	Brake -		Blue/White
G	Brake +		Blue
H			
J			

SR41 - AB1-S Options			
Exlar Connector Pin Number	Drive Connection	Mating Cable PC7-MC No Brake	Alternate PC7-AC With Brake
A	R	Brown	Red
B	S	Black	Black
C	T	Blue	Blue
D	GND	Green/Yellow	Green
E			
F	Brake -		Blue/White
G	Brake +		Blue
H			
J			

7.4 Exlar SV Series Drives with SR Actuator



FOR DETAILED SET UP INSTRUCTIONS SEE THE SV SERIES INSTALLATION AND CONFIGURATION MANUAL.

Motor Cable PC7-AC/MC-XXX			
Exlar Connector	**Wire Color**	**Function**	**SV2000 terminal**
A	Brown	R Phase	TB4-9
B	Black	S Phase	TB4-8
C	Blue	T Phase	TB4-7
D	Green/Yellow	GND	TB4-2
F	Blue/White	Brake –	External Brake Control Relay
G	Blue	Brake +	External Brake Control Relay

7.4 Exlar SV Series Drives with SR Actuator (Cont'd)

Resolver Cable EC4-AC-XXX			
Exlar Connector	**Wire Color**	**Function**	**SV2000 Terminal**
P	Brown	Ref	TB2-12
N	Green	Ref GND	TB2-11
U	Yellow	Sin	TB2-10
M	Black	Sin GND	TB2-9
C	Orange	Cos	TB2-8
B	Blue	Cos GND	TB2-7
K	Red/Blue	Motor Therm	TB2-2
T	Blue/Red	Motor Therm	TB2-1

EX4 Resolver Feedback (17308) with Brake				
Actuator	**Connector**	**P/N**	**Cables**	**Cable Descr.**
SR21/31	S	10221	PC6/PC1	Stator/Brake
		13595	EC4	Feedback
	M	10221	PC6/PC1	Stator/Brake
		10220	RC1	Feedback
SR41	S	14480	PC7	Stator/Brake
		13595	EC4	Feedback
	M	14480	PC7	Stator/Brake
		10220	RC1	Feedback

8.0 EC Conformance Certification

Declaration of Conformity

The undersigned, representing the Manufacturer

Exlar Corporation
18400 West 77th Street
Chanhassen, MN 55317 USA

and the authorized representative established within the community.

Exlar GmbH
Frankfurter Str. 107
65479 Raunheim, Germany

declares, that the Exlar Brand products:

GSX, GSM, SR, SLM, SLG Linear and Rotary Actuators
(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

to which this declaration relates and are in conformity with the relevant EU Directives listed below:

EU EMC Directive 2004/108/EC
EU Low Voltage Directive 2006/95/EC

using the relevant section of the following EU standards and other normative documents:

EMC: EN 55014-1: 2006 + A1:2009 + A2:2011
EN 55014-2: 1997 + A1: 2001 + A2: 2008

Safety: IEC/EN 60034-1: 2010

Year of CE Marking: 2004

Manufacturer:

Signature:
Name: Bill Zerull
Position: Chief Technology Officer
Date of Issue: 24-June-2014

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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

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/contactus

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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

William R. Carney, Director, North American Certification Programs

UL LLC