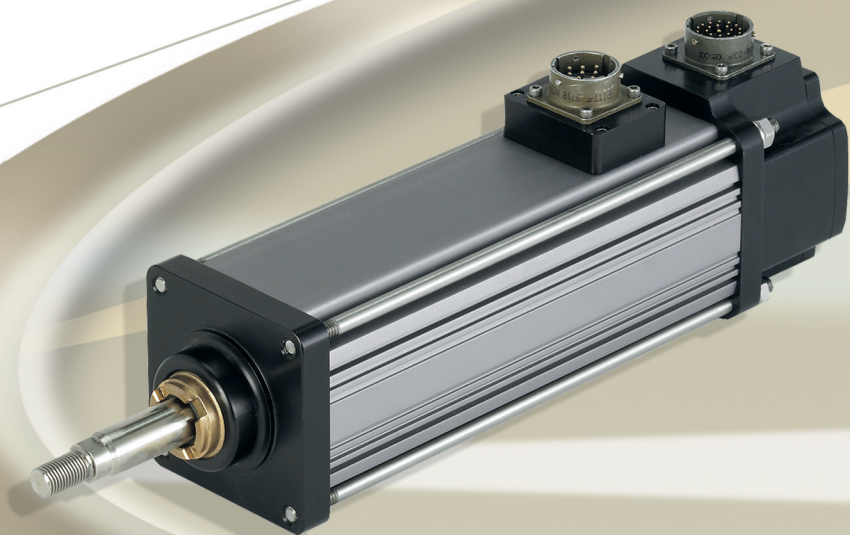


unités motorisables

# VERINS EXLAR

**mécatronique**  
*la force de la gamme !*



**transtechnik**  
systèmes

	page
<b>ROLLER SCREW TECHNOLOGY</b> .....	2
<b>INTEGRATED ACTUATOR TECHNOLOGY</b> .....	3
<b>GSX SERIES LINEAR ACTUATORS</b> .....	4
Performance Specifications .....	11
Drawings .....	28
Ordering Guide .....	36
<b>GSM SERIES LINEAR ACTUATORS</b> .....	38
Performance Specifications .....	40
Drawings .....	49
Ordering Guide .....	54
<b>I SERIES LINEAR ACTUATORS</b> .....	56
Performance Specifications .....	59
Drawings .....	62
Ordering Guide .....	72
<b>FT SERIES LINEAR ACTUATORS</b> .....	74
Performance Specifications .....	78
Drawings .....	80
Ordering Guide .....	88
<b>SLM AND SLG SERIES ROTARY MOTORS AND GEARMOTORS</b> .....	90
Performance Specifications .....	94
Drawings .....	100
Ordering Guide .....	108
<b>CABLES AND FEEDBACK</b> .....	110
<b>HAZARDOUS LOCATION EL SERIES LINEAR ACTUATORS</b> .....	114
Performance Specifications .....	116
Drawings .....	119
Ordering Guide .....	122
<b>HAZARDOUS LOCATION ER SERIES ROTARY ACTUATORS</b> .....	124
Performance Specifications .....	126
Drawings .....	128
Ordering Guide .....	129
<b>HAZARDOUS LOCATION CLASS I DIVISION 2 PRODUCTS</b>	
<b>GSX/GSM SERIES</b> .....	130
Drawings for GSX .....	132
Ordering Guide for GSX .....	136
Drawings for GSM .....	137
Ordering Guide for GSM .....	139
<b>HAZARDOUS LOCATION CLASS I DIVISION 2 PRODUCTS</b>	
<b>SLM/SLG SERIES</b> .....	140
Drawings for SLM .....	142
Drawings for SLG .....	145
Ordering Guide for SLM/SLG .....	147
<b>ENGINEERING REFERENCE</b> .....	156



GSX Series

GSM Series

I Series

FT Series

SLM/SLG Series

Cables

EL Series

ER Series

C1D2, GSX & GSM Series

C1D2, SLM & SLG Series

## Why Consider Roller Screw Technology

Designers have five basic choices when it comes to achieving controlled linear motion. The table on page 3 gives you a quick overview of what general advantages are associated with each. Because the roller screw technology common to all Exlar linear actuators might not be familiar to everyone using this catalog, allow us to present a general overview.

### Roller Screw Basics

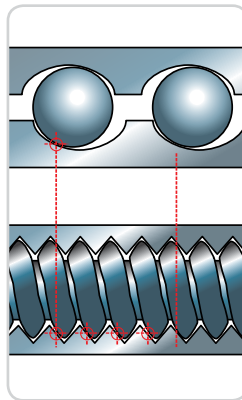
A roller screw is a mechanism for converting rotary torque into linear motion, in a similar manner to acme screws or ball screws. But, unlike those devices, roller screws can carry heavy loads for thousands of hours in the most arduous conditions. This makes roller screws the ideal choice for demanding, continuous-duty applications.



The difference is in the roller screw's design for transmitting forces. Multiple threaded helical rollers are assembled in a planetary arrangement around a threaded shaft (shown above), which converts a motor's rotary motion into linear movement of the shaft or nut.

### Roller Screw vs Hydraulic & Pneumatic – Comparisons:

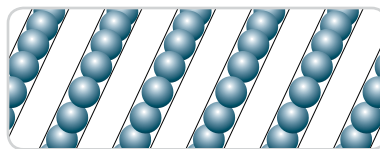
In applications where high loads are anticipated or faster cycling is desired, Exlar's roller screw actuators provide an attractive alternative to the hydraulic or pneumatic options. With their vastly simplified controls, electro-mechanical units using roller screws have major advantages. They do not require a complex support system of valves, pumps, filters and sensors. Thus, Exlar units take up much less space and deliver extremely long working lives with virtually no maintenance. Hydraulic fluid leaks are non-existent. Noise levels are reduced significantly. Additionally, the flexibility of computer programmed positioning can be very desirable in many applications.



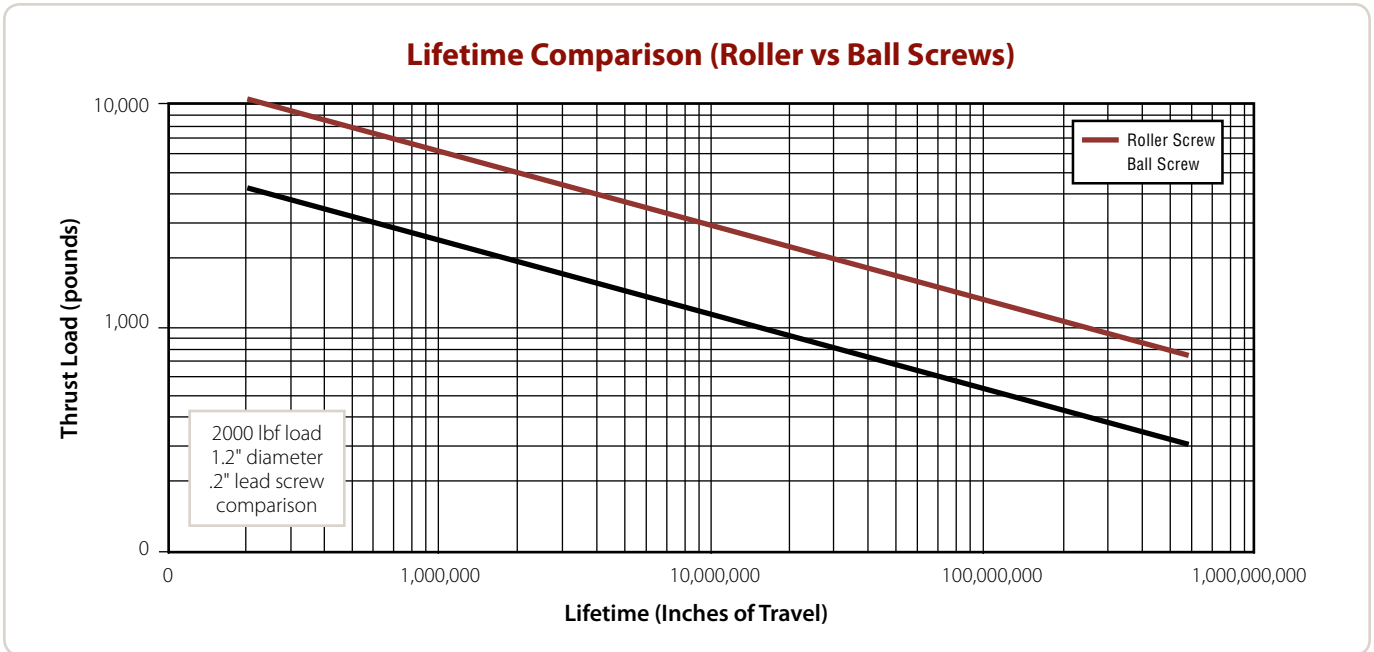
### Roller vs Ball Screw Performance – Comparisons:

**Loads and Stiffness:** Due to design factors, the number of contact points in a ball screw is limited by the ball size. Exlar's planetary roller screw designs provide many more contact points than possible on comparably sized ball screws. Because this number of contact points is greater, roller screws have higher load carrying capacities, plus improved stiffness. In practical terms, this means that typically an Exlar roller screw actuator takes up much less space to meet the designer's specified load rating.

**Travel Life:** As you would expect, with their higher load capacities, roller screws deliver major advantages in working life. Usually measured in "Inches of Travel," the relative travel lives for roller and ball screws are displayed on the graph on page 3. As you can see there, in a 2,000 lb. average load application applied to a 1.2 inch (approximate) screw diameter with a 0.2 inch (approximate) lead, you can predict that the roller screw will have an expected service life that is **15 Times Greater**.



**Speeds:** Typical ball screw speeds are limited to 2000 rpm and less, due to the interaction of the balls colliding with each other as the race rotates. In contrast, the rollers in a roller screw are fixed in planetary fashion by journals at the ends of the nut and therefore do not have this limitation. Hence, roller screws can work at 5000 rpm and higher – producing comparably higher linear travel rates.

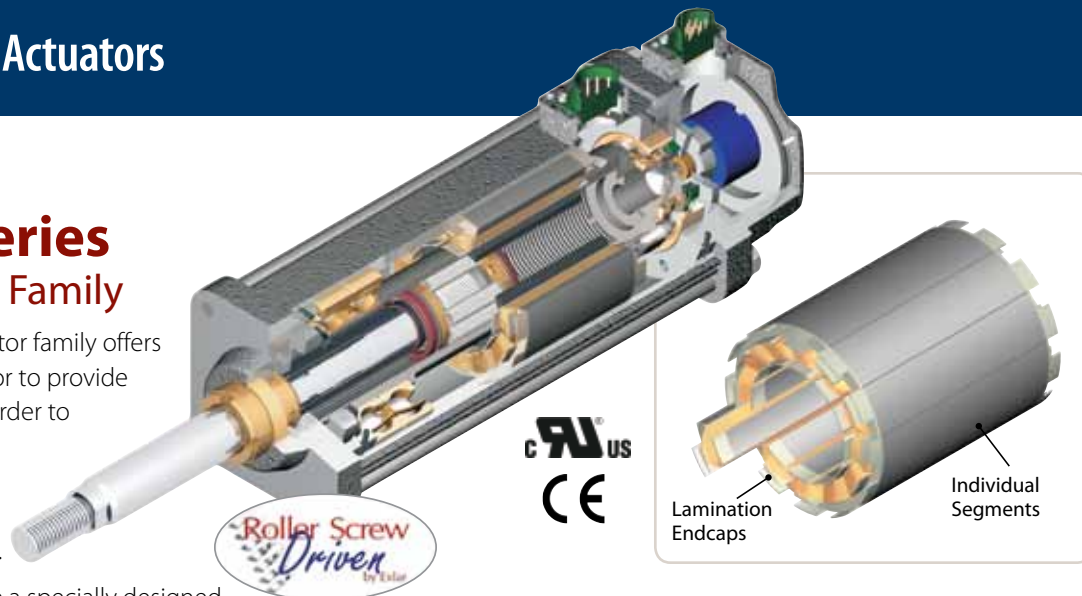


## Roller Screw vs. Other Linear Motion Technologies (Used in electronic positioning applications)

	EXLAR ROLLER SCREWS	ACME SCREWS	BALL SCREWS	HYDRAULIC CYLINDERS	PNEUMATIC CYLINDERS
Load ratings	Very High	High	High	Very High	High
Lifetime	Very long, many times greater than ball screw	Very low, due to high friction & wear	Moderate	Can be long with proper maintenance	Can be long with proper maintenance
Speed	Very high	Low	Moderate	Moderate	Very high
Acceleration	Very high	Low	Moderate	Very high	Very high
Electronic Positioning	Easy	Moderate	Easy	Difficult	Very Difficult
Stiffness	Very high	Very high	Moderate	Very high	Very low
Shock Loads	Very high	Very high	Moderate	Very high	High
Relative Space Requirements	Minimum	Moderate	Moderate	High	High
Friction	Low	High	Low	High	Moderate
Efficiency	>90%	approx 40%	>90%	<50%	<50%
Installation	Compatible with standard servo electronic controls	User may have to engineer a motion/actuator interface	Compatible with standard servo electronic controls	Complex, requires servo-valves, high pressure plumbing, filtering, pumps linear positioning & sensing	Very complex requires servo-valves, plumbing, filtering, compressors linear positioning & sensing
Maintenance	Very low	High, due to poor wear characteristics	Moderate	Very high	High
Environmental	Minimum	Minimum	Minimum	Hydraulic fluid leaks & disposal	High noise levels

## Exlar GS Series Linear Actuator Family

The GS Series linear actuator family offers you two grades of actuator to provide cost effective options in order to meet your application's requirements. View the chart below to compare the GSX and GSM models.



All GS Series actuators use a specially designed roller screw mechanism for converting electric motor power into linear motion within the actuator. Planetary rollers assembled around the actuator's extending rod follow threads which are precisely machined on the inside surface of the actuator's hollow armature. Linear motion is produced in precise synchronization with the armature rotation. Because this roller screw mechanism has an inherently larger cumulative contact surface, these actuators have a much longer working life, and can handle heavier loads at higher speeds than is possible from a similarly sized unit built around a ball screw system.

Exlar's T-LAM segmented lamination stator technology delivers higher continuous motor torque than is available in traditionally wound motors. T-LAM technology consists of stator segments, each containing individual phase wiring for maximum motor performance. The improved efficiencies of the GSX Series are a result of the limited heat generation qualities inherent in the segmented stator design as seen above. The elimination of end turns in the stator, and use of thermally conductive potting removes the parts most susceptible to failure in a traditional stator. Other design advantages include:

- Neodymium-iron-boron magnets provide high flux density and maximum motor torque.
- Thermally conductive potting of the entire stator provides increased heat dissipation and provides protection from contamination in oil-cooled units.
- Each stator segment contains individual phase wiring. External winding of individual segments provides maximum slot fill for maximum motor performance.
- Motors with T-LAM technology have Class 180 H insulation systems compliant with UL requirements. UL recognized component.
- Motors with T-LAM technology are CE compliant

### The Actuator & Motor, All in one Compact Unit

With other actuator technologies, customers are usually responsible for engineering the completed linear motion system. This usually includes purchasing the motor, gear reducer, timing belt, mounting hardware, flexible couplings, etc. separately. Then they all must be assembled to perform properly in a given application.

GS Series actuators eliminate all this systems engineering. These units are single, fully integrated component packages – much smaller than traditional rotary-to-linear conversion mechanisms.

### Designed for Closed Loop Servo Systems

Their brushless servo design means GS Series units can be used in advanced closed-loop servo systems when velocity and positioning is required. Position feedback can be delivered in a number of different forms. These include resolvers, encoders or internally mounted linear position feedback sensors.

GSX and GSM Differences	GSX (pg 4)	GSM (pg 38)
Ingress Protection	IP65	IP54 (IP65 optional)
No. of Stacks	1, 2, 3	1, 2
Life BSY (Ball Screw Years)	15X	2 to 5X
Oil Cooling	Yes	No
Food Grade Paint	Yes	No
Electroless Nickel Housing	Yes	No
Stainless Steel Case	Yes	No
Hard Coat Anodized	Yes	Yes
LVDT FB	Yes (except 2" frame)	Yes (except 2" frame)
5.5 in. Frame	Yes	No
7 in. Frame	Yes	No
Force (lbf)	92 - 15,000	92 - 3,966
1.0 Lead	50 & 60 only	No
Rear Brake	all	all
Speeds (ips)	5 - 40	5 - 37.5
Electroless Nickel Connectors	Yes	Yes

## Exlar GSX Series The Highest Performance and Longest Life Solution

For applications that require long life and continuous duty, even in harsh environments the GSX Series actuator offers a robust solution. The life of the GSX Series can exceed that of a ball screw actuator by 15X while delivering high speeds and high forces. This compact package has all the advantages that our GS Series offers.

### Sealed for Long Life with Minimum Maintenance

GSX Series actuators have strong advantages whenever outside contaminants are an issue. In most rotary-to-linear devices, critical mechanisms are exposed to the environment. Thus, they must be frequently inspected, cleaned and lubricated.

In contrast, the converting components in all Exlar GSX units are mounted within the sealed motor housing. With a simple bushing and seal arrangement on the smooth extending rod, abrasive particles or other contaminants are prevented from reaching the actuator's critical mechanisms. This assures trouble-free operation even in the most harsh environments.

Lubrication requirements are minimal. GSX actuators can be lubricated with either grease or recirculated oil. Grease lubricated units will run up to 10,000 hours without regreasing. Recirculated oil systems eliminate this type of maintenance altogether. A GSX Series actuator with a properly operating recirculating oil system will operate indefinitely without any other lubrication requirements.

### Available in Five Frame Sizes

2" GSX20    3" GSX30    4" GSX40  
5" GSX50    7" GSX60

If you need a custom design, Exlar's Application Engineering department will work with you to engineer a solution specifically tailored to your application.



Feature	Standard	Optional
External anti-rotate mechanism	No	Yes
Pre-loaded follower	No	Yes
Electric brake	No	Yes
External End switches	No	Yes
Connectors	MS or Threaded Circular Style Connectors	Electroless Nickel Connectors/ Male NPT with Potted Leads/ Manufacturers Connectors
Mounting Style	Extended Tie Rods, Side Tapped Mounting Holes, Trunnion, Rear Clevis, Front or Rear Flange	Custom Mountings
Rod End	Male or Female: U.S. Standard or Metric	Specials Available To Meet OEM Requirements
Lubrication	Greased, Oil Connection Ports are Built-in for Customer Supplied Recirculated Oil Lubrication	Specials Available To Meet OEM Requirements
Primary Feedback	Standard Encoders or Resolvers to Meet Most Amplifier Requirements	Custom Feedback
Absolute Linear Feedback	No	ICT, including signal conditioner

# GSX Series Linear Actuators

## Exlar GSX Series Linear Actuators Applications Include:

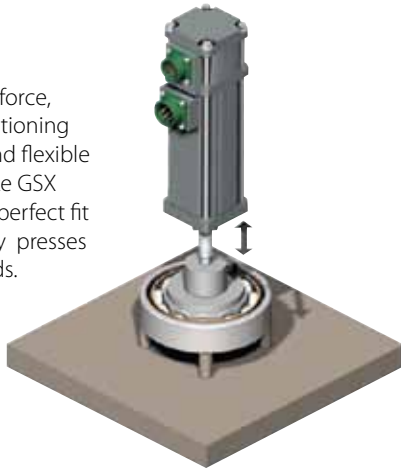
Hydraulic cylinder replacement  
 Ball screw replacement  
 Pneumatic cylinder replacement  
 Chip and wafer handling  
 Automated flexible fixturing  
 Dispensers  
 Machine tool  
 Automated assembly  
 Parts clamping  
 Automatic tool changers  
 Volumetric pumps

Medical equipment  
 Conveyor diverters / gates  
 Plastics equipment  
 Cut-offs  
 Die cutters  
 Packaging machinery  
 Entertainment  
 Sawmill equipment  
 Open / close doors  
 Fillers  
 Formers  
 Precision grinders

Indexing stages  
 Lifts  
 Product sorting  
 Material cutting  
 Material handling  
 Riveting / fastening / joining  
 Molding  
 Volumetric pumps  
 Semiconductor  
 Pick and place systems  
 Robot manipulator arms  
 Simulators

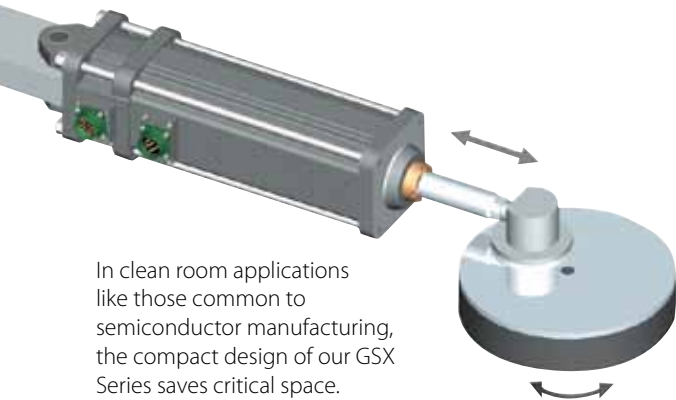
Precision valve control  
 Ventilation control systems  
 Pressing  
 Process control  
 Tube bending  
 Welding  
 Stamping  
 Test stands  
 Tension control  
 Web guidance  
 Wire winding

Repeatable force, reliable positioning accuracy, and flexible control make GSX actuators a perfect fit for assembly presses or test stands.

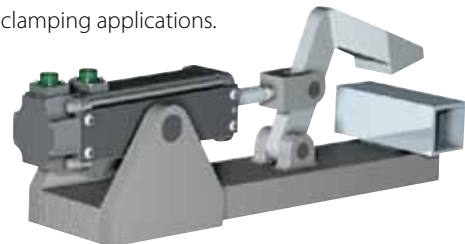


Because they cycle quickly and can be synchronized to line speeds, Exlar actuators produce dramatic improvements in web control applications.

In clean room applications like those common to semiconductor manufacturing, the compact design of our GSX Series saves critical space.



Repeatable force control plus positioning accuracy extends the life of costly tools when Exlar linear actuators are used in precision clamping applications.

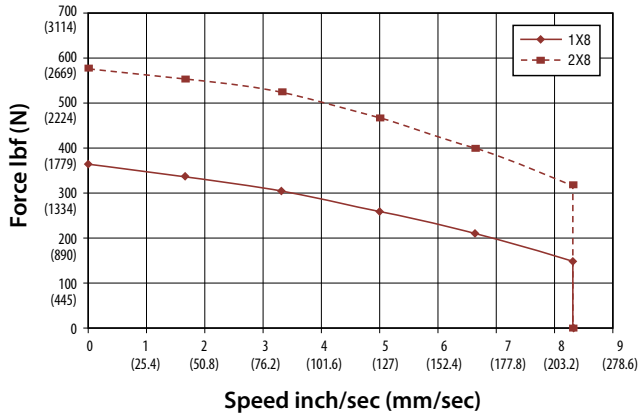


## GSX Series Speed vs. Force Curves

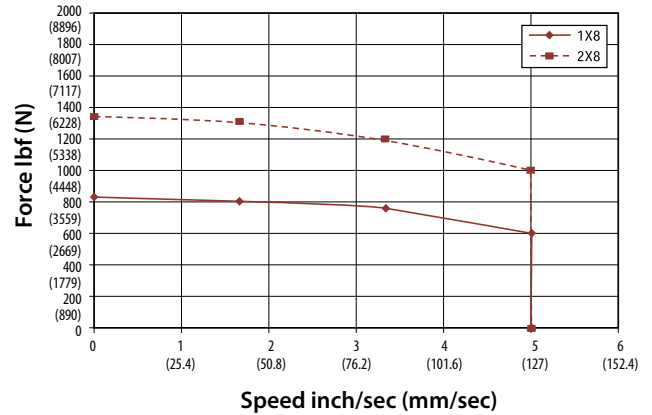
These charts represent typical linear speed versus linear force curves for the GSX actuators using common brushless motor amplifiers. The GSX Series are compatible with many different brushless motor amplifiers, and differences in the performance

ratings of these amplifiers can alter the actuator's performance. Thus, the curves below should be used for estimation only (Further information is available by contacting Exlar Application Engineering.)

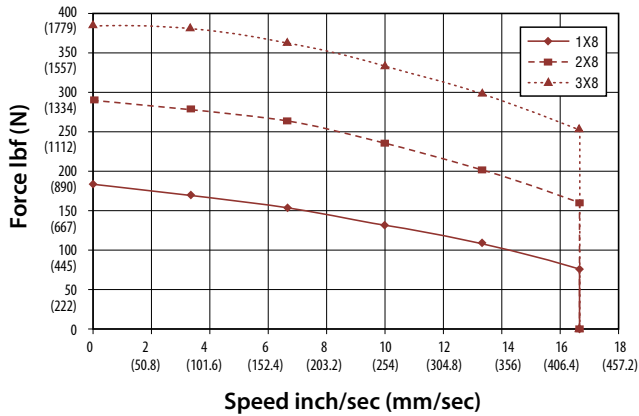
**GSX20-.1 Inch Lead**



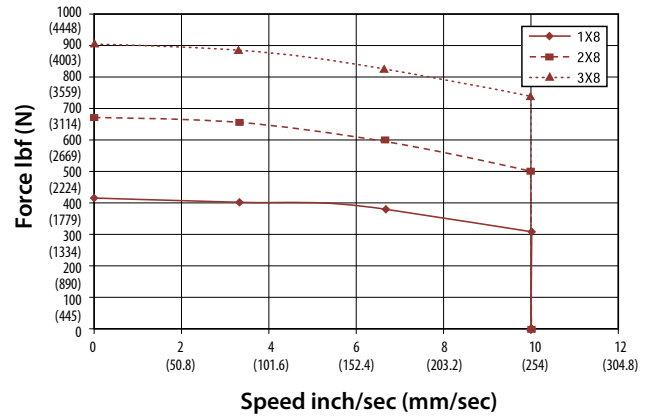
**GSX30-.1 Inch Lead**



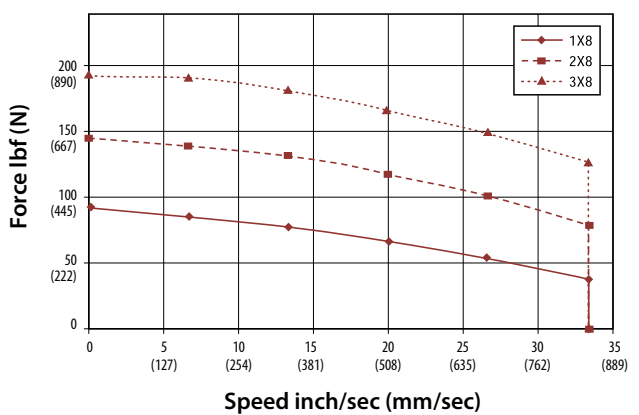
**GSX20-.2 Inch Lead**



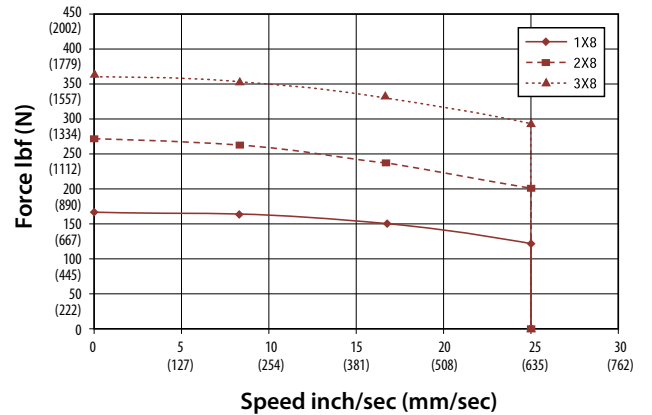
**GSX30-.2 Inch Lead**



**GSX20-.4 Inch Lead**



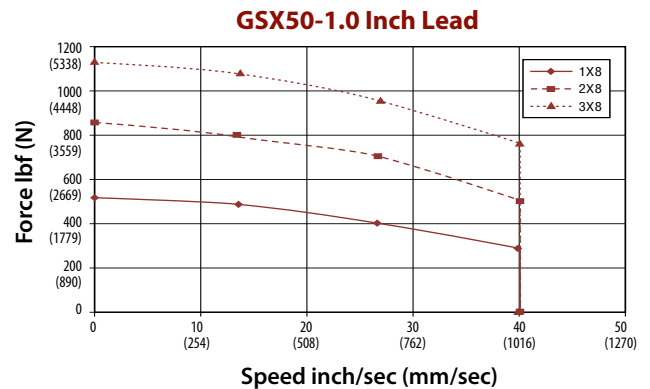
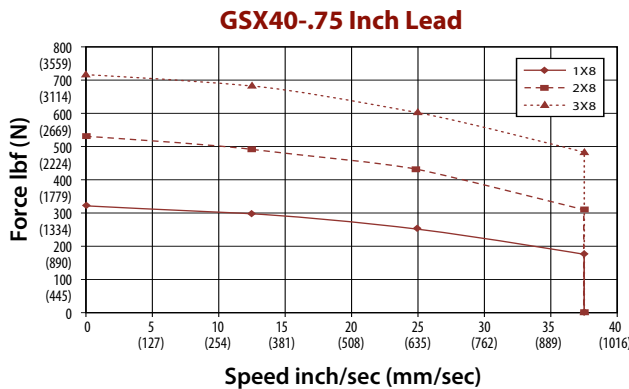
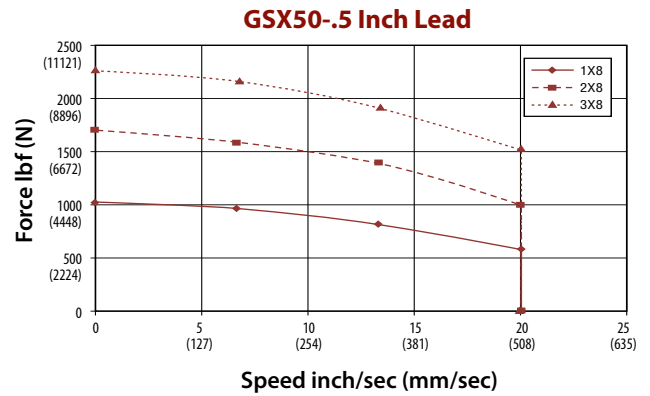
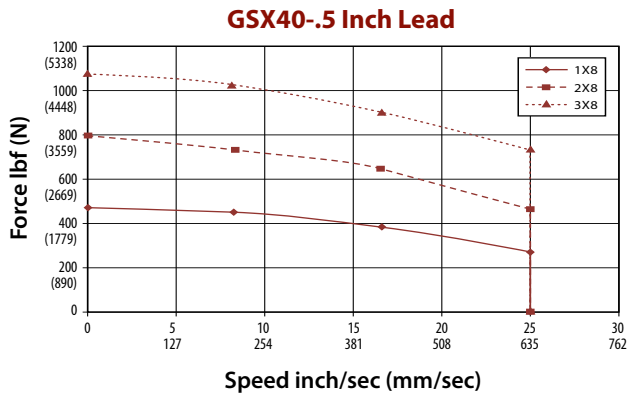
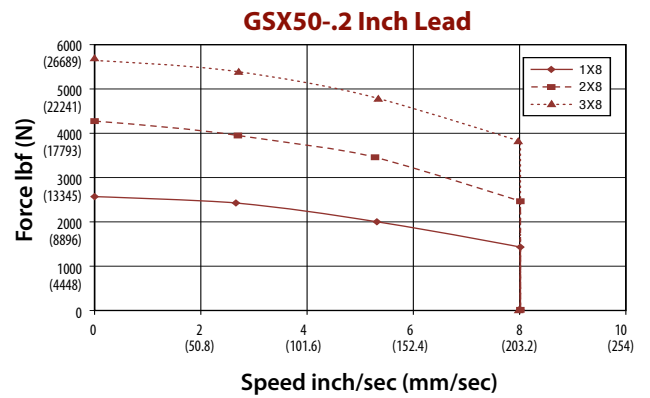
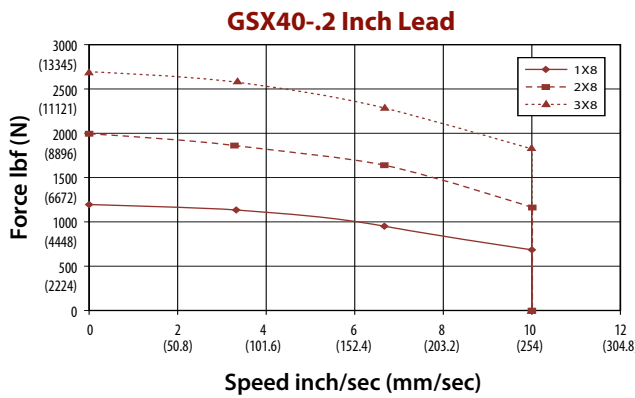
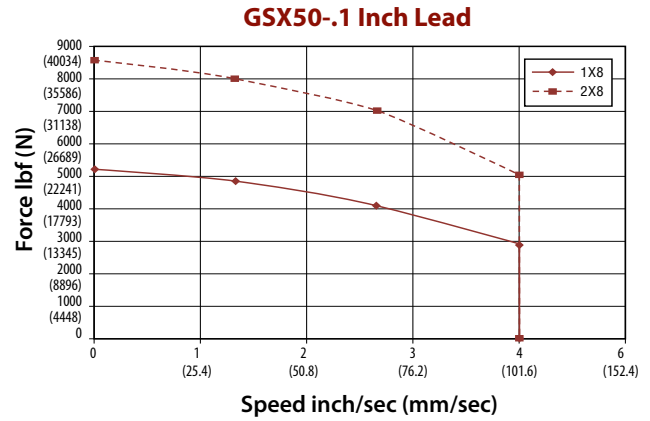
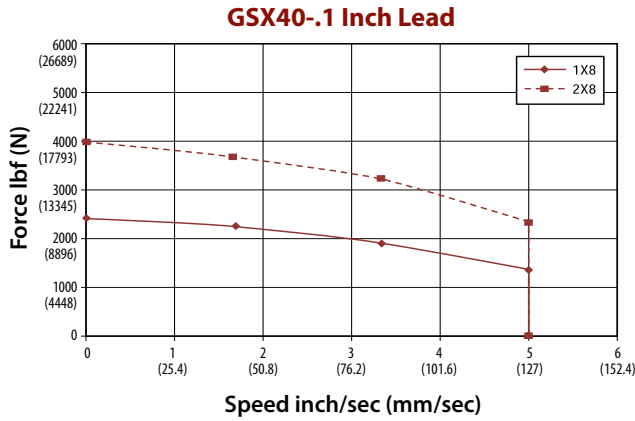
**GSX30-.5 Inch Lead**



Test data derived using NEMA recommended aluminum heatsink 10" x 10" x 1/4" for GSX20 and 10" x 10" x 3/8" for GSX30



## GSX Series Speed vs. Force Curves

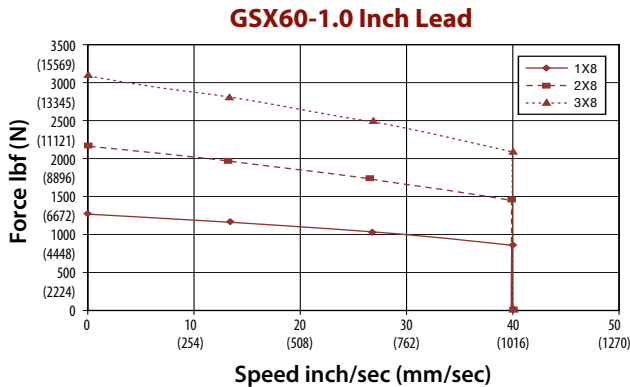
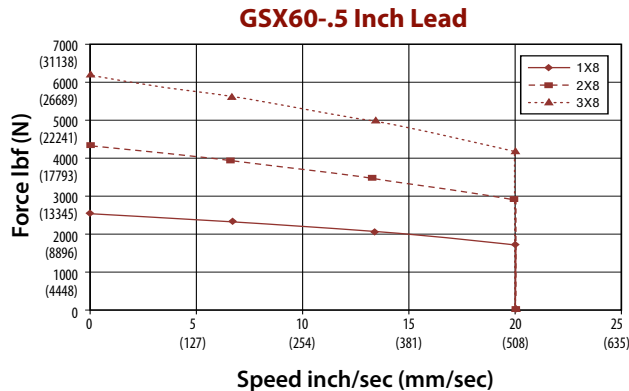
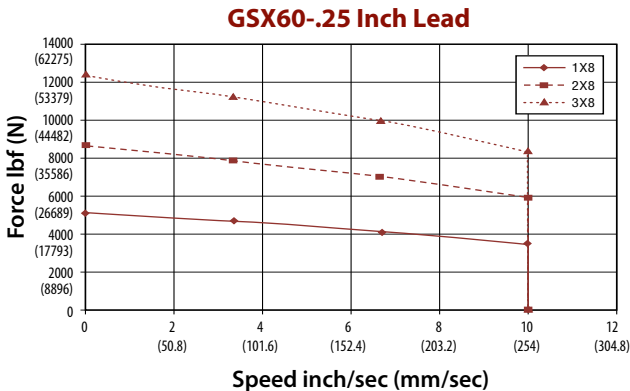


Test data derived using NEMA recommended aluminum heatsink 12" x 12" x 1/2" for GSX40 and 12" x 12" x 1/2" for GSX50

### GSX Series Speed vs. Force Curves

These charts represent typical linear speed versus linear force curves for GSX actuators using common brushless motor amplifiers. The GSX Series are compatible with many different brushless motor amplifiers, and differences in the performance ratings of these amplifiers can alter the actuator's

performance. Thus, the curves below should be used for estimation only. (Further information is available by contacting Exlar Application Engineering.)



## GSX Series Lifetime Curves

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

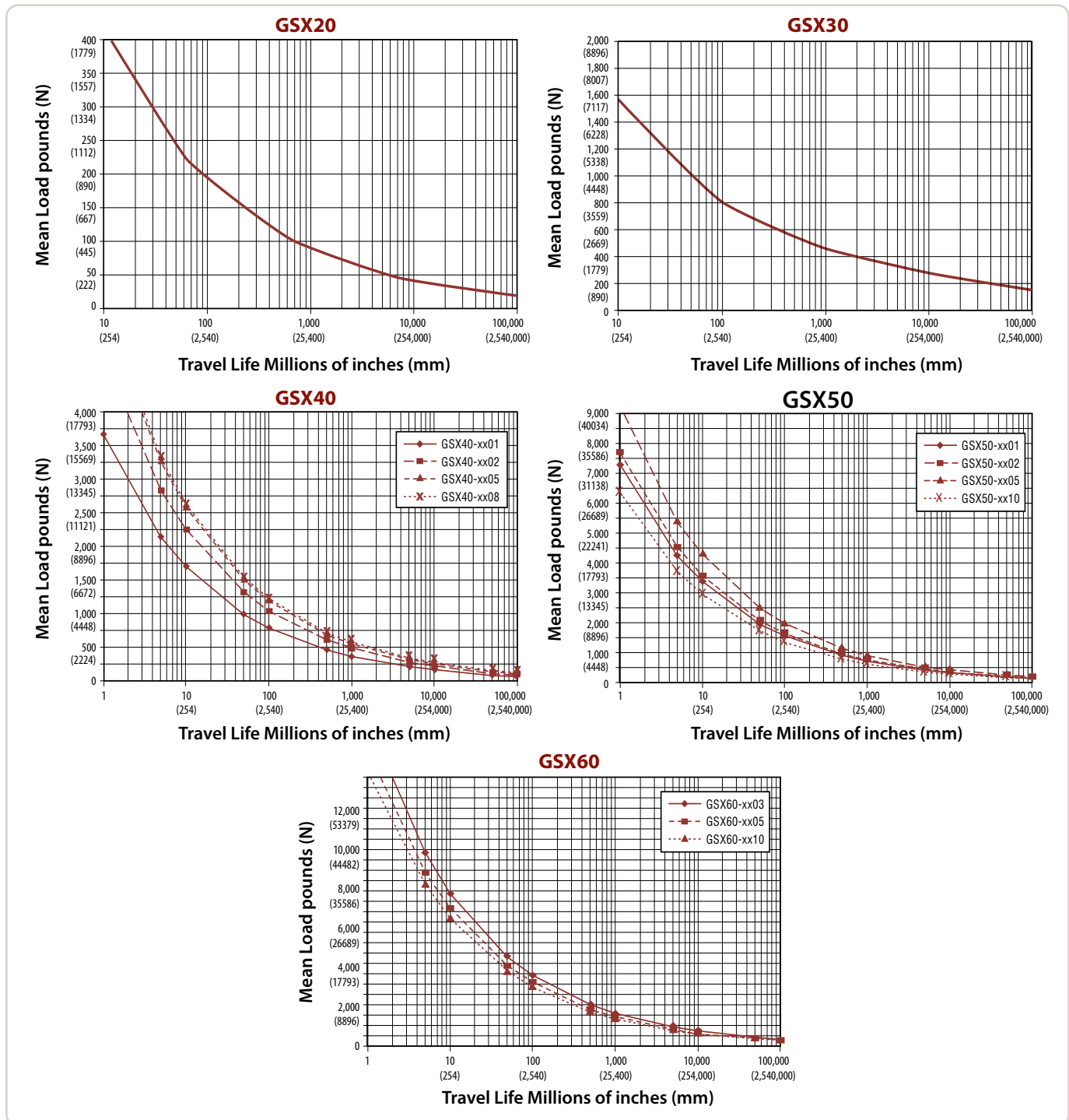
The underlying formula that defines this value is:

*Travel life in millions of inches, where:*

$$L_{10} = \left( \frac{C}{F} \right)^3 \times S =$$

**C** = Dynamic load rating (lbf)  
**F** = Cubic mean applied load (lbf)  
**S** = Roller screws lead (inches)

*All curves represent properly lubricated and maintained actuators.*



## GSX20 & GSX30 Performance Specifications

Model No.	Frame Size in (mm)	Stroke (nominal)* in (mm)	Screw Lead in (mm)	Continuous Force Rating lb (N) 1/2/3 stack	Max Velocity in/sec (mm/sec)	Continuous Motor Torque lb-in (N-m)	Maximum Static Load lb (N)	Armature Inertia** lb-in-s <sup>2</sup> (Kg-m <sup>2</sup> )	Dynamic Load Rating lb (N)	Weight (approx.) lb (kg)
GSX20-0301	2.25 (57)	3 (75)	0.1 (2.54)	367/578/NA (1632/2571/NA)	8.33 (211.67)	7.3/11.5/NA (0.82/1.30/NA)	1250 (5560)	0.00101 (0.000114)	2075 (9230)	6.5 (2.9)
GSX20-0302			0.2 (5.08)	183/289/NA (814/1286/NA)	16.77 (423.33)	7.3/11.5/NA (0.82/1.30/NA)			1540 (6850)	
GSX20-0304			0.4 (10.16)	92/145/NA (409/645/NA)	33.33 (846.67)	7.3/11.5/NA (0.82/1.30/NA)			1230 (5471)	
GSX20-0601	2.25 (57)	6 (150)	0.1 (2.54)	367/578/NA (1632/2571/NA)	8.33 (211.67)	7.3/11.5/NA (0.82/1.30/NA)	1250 (5560)	0.00114 (0.000129)	2075 (9230)	8.0 (3.6)
GSX20-0602			0.2 (5.08)	183/289/385 (814/1286/1713)	16.67 (423.33)	7.3/11.5/15.3 (0.82/1.30/1.73)			1540 (6850)	
GSX20-0604			0.4 (10.16)	92/145/192 (409/645/854)	33.33 (846.67)	7.3/11.5/15.3 (0.82/1.30/1.73)			1230 (5471)	
GSX20-1001	2.25 (57)	10 (250)	0.1 (2.54)	367/578/NA (1632/2571/NA)	8.33 (211.67)	7.3/11.5/NA (0.82/1.30/NA)	1250 (5560)	0.00133 (0.000150)	2075 (9230)	9.5 (4.3)
GSX20-1002			0.2 (5.08)	183/289/385 (814/1286/1713)	16.67 (423.33)	7.3/11.5/15.3 (0.82/1.30/1.73)			1540 (6850)	
GSX20-1004			0.4 (10.16)	92/145/192 (409/645/854)	33.33 (846.67)	7.3/11.5/15.3 (0.82/1.30/1.73)			1230 (5471)	
GSX20-1201	2.25 (57)	12 (300)	0.1 (2.54)	367/578/NA (1632/2571/NA)	8.33 (211.67)	7.3/11.5/NA (0.82/1.30/NA)	1250 (5560)	0.00143 (0.000162)	2075 (9230)	11.0 (4.9)
GSX20-1202			0.2 (5.08)	183/289/385 (814/1286/1713)	16.67 (423.33)	7.3/11.5/15.3 (0.82/1.30/1.73)			1540 (6850)	
GSX20-1204			0.4 (10.16)	92/145/192 (409/645/854)	33.33 (846.67)	7.3/11.5/15.3 (0.82/1.30/1.73)			1230 (5471)	
GSX30-0301	3.125 (79)	3 (75)	0.1 (2.54)	829/1347/NA (3688/5992/NA)	5 (127)	16.5/26.8/NA (1.86/3.03/NA)	2700 (12010)	0.00319 (0.000360)	5516 (24536)	9.5 (4.3)
GSX30-0302			0.2 (5.08)	415/674/NA (1846/2998/NA)	10 (254)	16.5/26.8/NA (1.86/3.03/NA)			5800 (25798)	
GSX30-0305			0.5 (12.7)	166/269/NA (738/1197/NA)	25 (635)	16.5/26.8/NA (1.86/3.03/NA)			4900 (21795)	
GSX30-0601	3.125 (79)	5.9 (150)	0.1 (2.54)	829/1347/NA (3688/5992/NA)	5 (127)	16.5/26.8/NA (1.86/3.03/NA)	2700 (12010)	0.00361 (0.000408)	5516 (24536)	11.5 (5.2)
GSX30-0602			0.2 (5.08)	415/674/905 (1846/2998/4026)	10 (254)	16.5/26.8/36 (1.86/3.03/4.07)			5800 (25798)	
GSX30-0605			0.5 (12.7)	166/269/362 (738/1197/1610)	25 (635)	16.5/26.8/36 (1.86/3.03/4.07)			4900 (21795)	
GSX30-1001	3.125 (79)	10 (250)	0.1 (2.54)	829/1347/NA (3688/5992/NA)	5 (127)	16.5/26.8/NA (1.86/3.03/NA)	2700 (12010)	0.00416 (0.00047)	5516 (24536)	19 (8.6)
GSX30-1002			0.2 (5.08)	415/674/905 (1846/2998/4026)	10 (254)	16.5/26.8/36 (1.86/3.03/4.07)			5800 (25798)	
GSX30-1005			0.5 (12.7)	166/269/362 (738/1197/1610)	25 (635)	16.5/26.8/36 (1.86/3.03/4.07)			4900 (21795)	
GSX30-1201	3.125 (79)	12 (305)	0.1 (2.54)	829/1347/NA (3688/5992/NA)	5 (127)	16.5/26.8/NA (1.86/3.03/NA)	2700 (12010)	0.00443 (0.000501)	5516 (24536)	20.5 (9.3)
GSX30-1202			0.2 (5.08)	415/674/905 (1846/2998/4026)	10 (254)	16.5/26.8/36 (1.86/3.03/4.07)			5800 (25798)	
GSX30-1205			0.5 (12.7)	166/269/362 (738/1197/1610)	25 (635)	16.5/26.8/36 (1.86/3.03/4.07)			4900 (21795)	
GSX30-1401	3.125 (79)	14 (355)	0.1 (2.54)	829/1347/NA (3688/5992/NA)	5 (127)	16.5/26.8/NA (1.86/3.03/NA)	2700 (12010)	0.00473 (0.000534)	5516 (24536)	20.5 (9.3)
GSX30-1402			0.2 (5.08)	415/674/905 (1846/2998/4026)	10 (254)	16.5/26.8/36 (1.86/3.03/4.07)			5800 (25798)	
GSX30-1405			0.5 (12.7)	166/269/362 (738/1197/1610)	25 (635)	16.5/26.8/36 (1.86/3.03/4.07)			4900 (21795)	
GSX30-1801	3.125 (79)	18 (457)	0.1 (2.54)	829/1347/NA (3688/5992/NA)	5 (127)	16.5/26.8/36 (1.86/3.03/4.07)	2700 (12010)	0.00533 (0.000602)	5516 (24536)	25 (11.3)
GSX30-1802			0.2 (5.08)	415/674/905 (1846/2998/4026)	10 (254)	16.5/26.8/36 (1.86/3.03/4.07)			5800 (25798)	
GSX30-1805			0.5 (12.7)	166/269/362 (738/1197/1610)	25 (635)	16.5/26.8/36 (1.86/3.03/4.07)			4900 (21795)	

\* Please note that stroke mm are nominal dimensions. \*\*Inertia +/- 5%  
See page 13 for definition of terms.

Specifications subject to change without notice.

## GSX40 Performance Specifications

Model No.	Frame Size in (mm)	Stroke (nominal)* in (mm)	Screw Lead in (mm)	Continuous Force Rating lb (N) 1/2/3 stack	Max Velocity in/sec (mm/sec)	Continuous Motor Torque lb-in (N-m)	Maximum Static Load lb (N)	Armature Inertia** lb-in-s <sup>2</sup> (Kg-m <sup>2</sup> )	Dynamic Load Rating lb (N)	Weight (approx.) lb (kg)
GSX40-0601	3.9 (99)	6 (150)	0.1 (2.54)	2393/3966/NA (10645/17642/NA)	5 (127)	47.6/78.9/NA (5.38/8.91/NA)	5400 (24020)	0.0152 (0.001717)	7900 (35141)	20 (9.1)
GSX40-0602			0.2 (5.08)	1196/1983/NA (5320/8821/NA)	10 (254)				8300 (36920)	
GSX40-0605			0.5 (12.7)	479/793/NA (2131/3527/NA)	25 (635)				7030 (31271)	
GSX40-0608			0.75 (19.05)	319/529/NA (1419/2353/NA)	37.5 (953)				6335 (28179)	
GSX40-0801	3.9 (99)	8 (200)	0.1 (2.54)	2393/3966/NA (10645/17642/NA)	5 (127)	47.6/78.9/107.1 (5.38/8.91/12.1)	5400 (24020)	0.0163 (0.001842)	7900 (35141)	24 (10.9)
GSX40-0802			0.2 (5.08)	1196/1983/2692 (5320/8821/11975)	10 (254)				8300 (36920)	
GSX40-0805			0.5 (12.7)	479/793/1077 (2131/3527/4791)	25 (635)				7030 (31271)	
GSX40-0808			0.75 (19.05)	319/529/718 (1419/2353/3194)	37.5 (953)				6335 (28179)	
GSX40-1001	3.9 (99)	10 (250)	0.1 (2.54)	2393/3966/NA (10645/17642/NA)	5 (127)	47.6/78.9/107.1 (5.38/8.91/12.1)	5400 (24020)	0.0175 (0.001977)	7900 (35141)	28 (12.7)
GSX40-1002			0.2 (5.08)	1196/1983/2692 (5320/8821/11975)	10 (254)				8300 (36920)	
GSX40-1005			0.5 (12.7)	479/793/1077 (2131/3527/4791)	25 (635)				7030 (31271)	
GSX40-1008			0.75 (19.05)	319/529/718 (1419/2353/3194)	37.5 (953)				6335 (28179)	
GSX40-1201	3.9 (99)	12 (305)	0.1 (2.54)	2393/3966/NA (10645/17642/NA)	5 (127)	47.6/78.9/107.1 (5.38/8.91/12.1)	5400 (24020)	0.0186 (0.002102)	7900 (35141)	32 (14.5)
GSX40-1202			0.2 (5.08)	1196/1983/2692 (5320/8821/11975)	10 (254)				8300 (36920)	
GSX40-1205			0.5 (12.7)	479/793/1077 (2131/3527/4791)	25 (635)				7030 (31271)	
GSX40-1208			0.75 (19.05)	319/529/718 (1419/2353/3194)	37.5 (953)				6335 (28179)	
GSX40-1801	3.9 (99)	18 (457)	0.1 (2.54)	2393/3966/NA (10645/17642/NA)	5 (127)	47.6/78.9/107.1 (5.38/8.91/12.1)	5400 (24020)	0.022 (0.002486)	7900 (35141)	44 (20)
GSX40-1802			0.2 (5.08)	1196/1983/2692 (5320/8821/11975)	10 (254)				8300 (36920)	
GSX40-1805			0.5 (12.7)	479/793/1077 (2131/3527/4791)	25 (635)				7030 (31271)	

\* Please note that stroke mm are nominal dimensions. \*\*Inertia +/- 5%  
See page 13 for definition of terms.

Specifications subject to change without notice.

## GSX50 & GSX60 Performance Specifications

Model No.	Frame Size in (mm)	Stroke (nominal)* in (mm)	Screw Lead in (mm)	Continuous Force Rating lb (N) 1/2/3 stack	Max Velocity in/sec (mm/sec)	Continuous Motor Torque lb-in (N-m)	Maximum Static Load lb (N)	Armature Inertia** lb-in-s <sup>2</sup> (Kg-m <sup>2</sup> )	Dynamic Load Rating lb (N)	Weight (approx.) lb (kg)
GSX50-0601	5.0 (127)	6 (150)	0.1 (2.54)	5127/8544/NA (22806/38006/NA)	4 (101.6)	102/170/NA (11.5/19.2/NA)	13200 (58717)	0.03241 (0.003662)	15693 (69806)	54 (24)
GSX50-0602			0.2 (5.08)	2564/4272/NA (11405/19003/NA)	8 (203)				13197 (58703)	
GSX50-0605			0.5 (12.7)	1026/1709/NA (4564/7602/NA)	20 (508)				11656 (51848)	
GSX50-0610			1.0 (25.4)	513/855/NA (2282/3803/NA)	40 (1016)				6363 (28304)	
GSX50-1001	5.0 (127)	10 (250)	0.1 (2.54)	5127/8544/NA (22806/38006/NA)	4 (101.6)	102/170/NA (11.5/19.2/NA)	13200 (58717)	0.03725 (0.004209)	15693 (69806)	62 (28)
GSX50-1002			0.2 (5.08)	2564/4272/5655 (11405/19003/25155)	8 (203)	13197 (58703)				
GSX50-1005			0.5 (12.7)	1026/1709/2261 (4564/7602/10057)	20 (508)	11656 (51848)				
GSX50-1010			1.0 (25.4)	513/855/1131 (2282/3803/5031)	40 (1016)	6363 (28304)				
GSX50-1402	5.0 (127)	14 (355)	0.2 (5.08)	2564/4272/5655 (11405/19003/25155)	8 (203)	102/170/226 (11.5/19.2/25.5)	13200 (58717)	0.04208 (0.004756)	13197 (58703)	70 (32)
GSX50-1405			0.5 (12.7)	1026/1709/2261 (4564/7602/10057)	20 (508)	11656 (51848)				
GSX60-0603	3.125 (79)	6 (150)	0.25 (6.35)	5098/NA/NA (22677/NA/NA)	10 (254)	241/NA/NA (27/NA/NA)	25000 (111200)	0.1736 (0.019614)	25300 (112540)	69 (31)
GSX60-0605			0.5 (12.7)	2549/NA/NA (11339/NA/NA)	20 (508)				22800 (101420)	
GSX60-0610			1.0 (25.4)	1275/NA/NA (5671/NA/NA)	40 (1018)				21200 (94302)	
GSX60-1003	3.125 (79)	10 (250)	0.25 (6.35)	5098/8656/12389 (22677/38504/55109)	10 (254)	241/409/585 (27/46/66)	25000 (111200)	0.1943 (0.021953)	25300 (112540)	101 (46)
GSX60-1005			0.5 (12.7)	2549/4328/6195 (11339/19252/27557)	20 (508)				22800 (101420)	
GSX60-1010			1.0 (25.4)	1275/2164/3097 (5671/9626/13776)	40 (1018)				21200 (94302)	

\* Please note that stroke mm are nominal dimensions. \*\*Inertia +/- 5%

Specifications subject to change without notice.

### DEFINITION OF TERMS:

**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:** 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 GSX Series actuators. For calculation purposes, this value includes the screw inertia in a GSX actuator.

**Dynamic Load Rating:** A design constant used in calculating the estimated travel life of the roller screw. The cubic mean load is the load at which the device will perform one million revolutions.

GSX offers 1, 2, or 3 stack stators providing 3 torque force levels.

## GSX20 Mechanical and Electrical Specifications

Nominal Backlash	in (Nm)	0.004 (.10)											
Maximum Backlash (pre-loaded)	in (Nm)	0.0											
Lead Accuracy	in/ft (mm/300 mm)	0.001 (.025)											
Maximum Radial Load	lb (N)	20 (90)											
Environmental Rating: Standard		IP65											
<b>Motor Stator</b>		<b>118</b>	<b>138</b>	<b>158</b>	<b>168</b>	<b>218</b>	<b>238</b>	<b>258</b>	<b>268</b>	<b>318*</b>	<b>338*</b>	<b>358*</b>	<b>368*</b>
<b>RMS SINUSOIDAL COMMUTATION</b>													
Continuous Motor Torque	lbf-in (Nm)	7.6 (0.86)	7.3 (0.83)	7.0 (0.79)	7.0 (0.79)	11.9 (1.35)	11.5 (1.30)	11.2 (1.27)	11.3 (1.28)	15.3 (1.73)	15.3 (1.73)	14.8 (1.67)	15.0 (1.69)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	2.5 (0.28)	5.2 (0.59)	8.3 (0.94)	9.5 (1.07)	2.5 (0.28)	5.2 (0.59)	8.9 (1.00)	10.2 (1.15)	2.3 (0.26)	5.3 (0.60)	8.8 (0.99)	10.2 (1.15)
Continuous Current Rating:	Greased (IG) A	3.4	1.6	0.9	0.8	5.4	2.5	1.4	1.2	7.3	3.2	1.9	1.6
	Oiled (IL) A	6.9	3.1	1.9	1.6	10.8	4.9	2.8	2.5	14.6	6.5	3.8	3.3
Peak Current Rating	Amps	6.9	3.1	1.9	1.6	10.8	4.9	2.8	2.5	14.6	6.5	3.8	3.3
<b>TRAPEZOIDAL COMMUTATION</b>													
Continuous Motor Torque	lbf-in (Nm)	7.3 (0.82)	7.0 (0.79)	6.7 (0.76)	6.7 (0.76)	11.4 (1.29)	11.0 (1.24)	10.7 (1.21)	10.8 (1.22)	14.7 (1.66)	14.6 (1.65)	14.1 (1.60)	14.3 (1.61)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	1.9 (0.22)	4.1 (0.46)	6.5 (0.73)	7.4 (0.84)	1.9 (0.22)	4.1 (0.46)	6.9 (0.78)	7.9 (0.89)	1.8 (0.21)	4.1 (0.46)	6.9 (0.77)	7.9 (0.89)
Continuous Current Rating	Greased (IG) A	4.2	1.9	1.1	1.0	6.6	3.0	1.7	1.5	9.0	4.0	2.3	2.0
	Oiled (IL) A	8.4	3.9	2.3	2.0	13.2	6.0	3.5	3.0	17.9	8.0	4.6	4.0
Peak Current Rating	Amps	8.4	3.9	2.3	2.0	13.2	6.0	3.5	3.0	17.9	8.0	4.6	4.0
<b>MOTOR STATOR DATA</b>													
Voltage Constant (Ke)	Vrms/Krpm	16.9	35.6	56.9	64.9	16.9	35.6	60.5	69.4	16.0	36.0	60.0	69.4
	Vpk/Krpm	23.9	50.3	80.5	91.8	23.9	50.3	85.5	98.1	22.6	50.9	84.9	98.1
Pole Configuration	8	8	8	8	8	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	0.62	3.1	9.4	12.2
Inductance (L-L) (+/- 15%)	mH	5.1	22.8	58.3	75.8	2.5	11.0	31.7	41.7	1.5	7.4	20.5	27.4
Brake Inertia	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00012 (0.135)											
Brake Current @ 24 VDC	A	0.33											
Brake Holding Torque	lbf-in (Nm)	19 (2.2)											
Brake Engage/Disengage Time	ms	14/28											
Mechanical Time Constant (tm), ms	min	6.0	6.5	7.1	7.1	2.5	2.7	2.9	2.8	1.6	1.6	1.7	1.7
	max	8.5	9.2	10.1	10.1	3.6	3.9	4.0	4.0	2.2	2.2	2.4	2.4
Electrical Time Constant (te)	ms	2.0	1.8	1.7	1.7	2.2	2.1	2.0	2.0	2.4	2.4	2.2	2.2
Damping Constant	lbf-in/krpm (N-m/krpm)	0.55 (0.06)				0.55 (0.06)				0.55 (0.06)			
Friction Torque	lbf-in (Nm)	1.00 (0.11)				1.00 (0.11)				1.00 (0.11)			
Bus Voltage	Vrms	115	230	400	460	115	230	400	460	115	230	400	460
Speed @ Bus Voltage	rpm	5000											
Insulation Class		180 (H)											

All ratings at 25 degrees Celsius

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.

\*Refer to performance specifications on page 11 for availability of 3 stack stator by stroke/lead combination.

Test data derived using NEMA recommended aluminum heatsink 10" x 10" x 1/4"

Specifications subject to change without notice.

## GSX30 Mechanical and Electrical Specifications

Nominal Backlash	in (Nm)	0.004 (.10)											
Maximum Backlash (pre-loaded)	in (Nm)	0.0											
Lead Accuracy	in/ft (mm/300 mm)	0.001 (.025)											
Maximum Radial Load	lb (N)	30 (134)											
Environmental Rating: Standard		IP65											
<b>Motor Stator</b>		<b>118</b>	<b>138</b>	<b>158</b>	<b>168</b>	<b>218</b>	<b>238</b>	<b>258</b>	<b>268</b>	<b>318*</b>	<b>338*</b>	<b>358*</b>	<b>368*</b>
<b>RMS SINUSOIDAL COMMUTATION</b>													
Continuous Motor Torque	lbf-in (Nm)	16.6 (1.87)	16.5 (1.77)	15.7 (1.78)	15.7 (3.03)	26.8 (3.03)	26.8 (3.02)	26.7 (3.01)	26.7 (4.38)	38.7 (4.33)	38.3 (4.10)	36.3 (4.10)	36.3
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	4.4 (0.49)	8.7 (0.99)	15.5 (1.75)	17.5 (1.98)	4.4 (0.49)	8.7 (0.99)	15.5 (1.75)	17.5 (1.98)	4.4 (0.50)	8.7 (0.98)	15.7 (1.77)	17.6 (1.98)
Continuous Current Rating:	Greased (IG) A	4.2	2.1	1.1	1.0	6.9	3.4	1.9	1.7	9.7	4.9	2.6	2.3
	Oiled (IL) A	8.5	4.2	2.3	2.0	13.7	6.8	3.8	3.4	19.5	9.9	5.2	4.6
Peak Current Rating	Amps	8.5	4.2	2.3	2.0	13.7	6.8	3.8	3.4	19.5	9.9	5.2	4.6
<b>TRAPEZOIDAL COMMUTATION</b>													
Continuous Motor Torque	lbf-in (Nm)	15.9 (1.78)	15.8 (1.69)	14.9 (1.70)	15.0 (2.89)	25.6 (2.89)	25.6 (2.88)	25.5 (2.88)	25.5 (4.18)	37.0 (4.13)	36.6 (3.91)	34.6 (3.92)	34.7
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	3.4 (0.39)	6.8 (0.77)	12.1 (1.37)	13.6 (1.54)	3.4 (0.39)	6.8 (0.77)	12.1 (1.37)	13.6 (1.54)	3.5 (0.39)	6.8 (0.76)	12.2 (1.38)	13.7 (1.55)
Continuous Current Rating:	Greased (IG) A	5.2	2.6	1.4	1.2	8.4	4.2	2.4	2.1	11.9	6.0	3.2	2.8
	Oiled (IL) A	10.4	5.2	2.8	2.5	16.8	8.4	4.7	4.2	23.9	12.1	6.3	5.7
Peak Current Rating	Amps	10.4	5.2	2.8	2.5	16.8	8.4	4.7	4.2	23.9	12.1	6.3	5.7
<b>MOTOR STATOR DATA</b>													
Voltage Constant (Ke)	Vrms/Krpm	29.9	59.7	106.0	119.5	29.9	59.7	106.0	119.5	30.3	59.2	106.9	119.9
	Vpk/Krpm	42.2	84.5	149.9	169.0	42.2	84.5	149.9	168.9	42.9	83.8	151.2	169.6
Pole Configuration	8	8	8	8	8	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	0.65	2.6	9.3	11.6
Inductance (L-L) (+/- 15%)	mH	7.7	30.7	96.8	123.0	3.7	14.7	46.2	58.7	2.5	9.5	30.9	38.8
Brake Inertia	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00033 (0.38)											
Brake Current @ 24 VDC	A	.05											
Brake Holding Torque	lbf-in (Nm)	70 (8)											
Brake Engage/Disengage Time	ms	19/29											
Mechanical Time Constant (tm), ms	min	6.5	6.5	7.3	7.2	2.6	2.6	2.6	2.6	1.5	1.5	1.7	1.7
	max	10.8	10.9	12.2	12.0	4.3	4.3	4.4	4.4	2.5	2.5	2.8	2.8
Electrical Time Constant (te)	ms	2.8	2.7	2.5	2.5	3.3	3.3	3.3	3.3	3.8	3.7	3.3	3.3
Damping Constant	lbf-in/krpm (N-m/krpm)	1.23 (.14)				1.23 (.14)				1.23 (.14)			
Friction Torque	lbf-in (Nm)	2.00 (0.23)				2.00 (0.23)				2.00 (0.23)			
Bus Voltage	Vrms	115	230	400	460	115	230	400	460	115	230	400	460
Speed @ Bus Voltage	rpm	3000											
Insulation Class		180 (H)											

All ratings at 25 degrees Celsius

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.

\*Refer to performance specifications on page 11 for availability of 3 stack stator by stroke/lead combination.

Test data derived using NEMA recommended aluminum heatsink 10" x 10" x 3/8"

Specifications subject to change without notice.



## GSX40 Mechanical and Electrical Specifications

Nominal Backlash	in (Nm)	0.004 (.10)											
Maximum Backlash (pre-loaded)	in (Nm)	0.0											
Lead Accuracy	in/ft (mm/300 mm)	0.001 (.025)											
Maximum Radial Load	lb (N)	40 (179)											
Environmental Rating: Standard		IP65											
<b>Motor Stator</b>		<b>118</b>	<b>138</b>	<b>158</b>	<b>168</b>	<b>238</b>	<b>258</b>	<b>268</b>	<b>338*</b>	<b>358*</b>	<b>368*</b>		
<b>RMS SINUSOIDAL COMMUTATION</b>													
Continuous Motor Torque	lbf-in (Nm)	47.6 (5.38)	47.6 (5.37)	44.7 (5.05)	45.5 (5.14)	78.8 (8.91)	78.8 (8.91)	79.7 (9.00)	107.1 (12.10)	105.5 (11.92)	107.1 (12.10)		
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	4.1 (0.46)	8.2 (0.93)	14.6 (1.65)	16.8 (1.90)	8.2 (0.93)	14.6 (1.65)	16.8 (1.90)	8.4 (0.95)	14.6 (1.65)	16.8 (1.90)		
Continuous Current Rating:	Greased (IG) A	12.9	6.5	3.4	3.0	10.7	6.0	5.3	14.2	8.1	7.1		
	Oiled (IL) A	25.9	12.9	6.9	6.0	21.4	12.1	10.6	28.5	16.2	14.2		
Peak Current Rating	Amps	25.9	12.9	6.9	6.0	21.4	12.1	10.6	28.5	16.2	14.2		
<b>TRAPEZOIDAL COMMUTATION</b>													
Continuous Motor Torque	lbf-in (Nm)	45.5 (5.14)	45.4 (5.13)	42.7 (4.83)	43.5 (4.91)	75.3 (8.51)	75.3 (8.50)	76.1 (8.60)	102.3 (11.56)	100.7 (11.38)	102.3 (11.56)		
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	3.2 (0.36)	6.4 (0.72)	11.4 (1.28)	13.1 (1.48)	6.4 (0.72)	11.4 (1.28)	13.1 (1.48)	6.6 (0.74)	11.4 (1.28)	13.1 (1.48)		
Continuous Current Rating:	Greased (IG) A	15.9	7.9	4.2	3.7	13.1	7.4	6.5	17.4	9.9	8.7		
	Oiled (IL) A	31.7	15.8	8.4	7.4	26.3	14.8	13.0	34.9	19.8	17.4		
Peak Current Rating	Amps	31.7	15.8	8.4	7.4	26.3	14.8	13.0	34.9	19.8	17.4		
<b>MOTOR STATOR DATA</b>													
Voltage Constant (Ke) (+/- 10% @ 25°C)	Vrms/Krpm	28.1	56.1	99.5	114.8	56.1	99.5	114.8	57.4	99.5	114.8		
	Vpk/Krpm	39.7	79.4	140.7	162.4	79.4	140.7	162.4	81.2	140.7	162.4		
Pole Configuration		8	8	8	8	8	8	8	8	8			
Resistance (L-L)(+/- 5% @ 25°C)	Ohms	0.4	1.7	6.0	7.8	0.7	2.26	3.0	0.5	1.52	1.9		
Inductance (L-L)(+/- 15%)	mH	3.0	11.9	37.5	49.9	5.8	18.2	24.2	4.0	12.0	16.0		
Brake Inertia	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00096 (1.08)											
Brake Current @ 24 VDC	A	0.67											
Brake Holding Torque	lbf-in (Nm)	97 (11)											
Brake Engage/Disengage Time	ms	20/29											
Mechanical Time Constant (tm), ms	min	5.3	5.3	6.0	5.8	2.3	2.3	2.2	1.5	1.5	1.5		
	max	7.7	7.7	8.7	8.4	3.3	3.3	3.2	2.1	2.2	2.1		
Electrical Time Constant (te)	ms	7.0	7.0	6.2	6.4	8.0	8.0	8.2	8.2	7.9	8.2		
Damping Constant	lbf-in/krpm (N-m/krpm)	3.25 (0.37)				3.25 (0.37)				3.25 (0.37)			
Friction Torque	lbf-in (Nm)	4.5 (0.51)				4.5 (0.51)				4.5 (0.51)			
Bus Voltage	Vrms	115	230	400	460	230	400	460	230	400	460		
Speed @ Bus Voltage	rpm	3000											
Insulation Class		180 (H)											

All ratings at 25 degrees Celsius

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.

\*Refer to performance specifications on page 12 for availability of 3 stack stator by stroke/lead combination.

Test data derived using NEMA recommended aluminum heatsink 12" x 12" x 1/2"

Specifications subject to change without notice.

## GSX50 Mechanical and Electrical Specifications

Nominal Backlash	in (Nm)	0.004 (.10)							
Maximum Backlash (pre-loaded)	in (Nm)	0.0							
Lead Accuracy	in/ft (mm/300 mm)	0.001 (.025)							
Maximum Radial Load	lb (N)	75 (337)							
Environmental Rating: Standard		IP65							
<b>Motor Stator</b>		<b>138</b>	<b>158</b>	<b>168</b>	<b>238</b>	<b>258</b>	<b>268</b>	<b>358*</b>	<b>368*</b>
<b>RMS SINUSOIDAL COMMUTATION</b>									
Continuous Motor Torque	lbf-in (Nm)	106.9 (12.07)	104.4 (11.80)	106.2 (12.00)	179.2 (20.25)	178.2 (20.13)	177.2 (20.02)	236.4 (26.71)	237.5 (26.83)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	11.8 (1.33)	20.1 (2.28)	23.5 (2.66)	11.8 (1.33)	20.1 (2.28)	23.5 (2.66)	20.1 (2.28)	23.9 (2.70)
Continuous Current Rating:	Greased (IG) A	10.2	5.8	5.0	17.0	9.9	8.4	13.1	11.1
	Oiled (IL) A	20.3	11.6	10.1	34.1	19.8	16.8	26.2	22.2
Peak Current Rating	Amps	20.3	11.6	10.1	34.1	19.8	16.8	26.2	22.2
<b>TRAPEZOIDAL COMMUTATION</b>									
Continuous Motor Torque	lbf-in (Nm)	102.0 (11.53)	99.7 (11.26)	101.5 (11.46)	171.1 (19.34)	170.1 (19.22)	169.2 (19.12)	225.8 (25.51)	226.8 (25.62)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	9.2 (1.04)	15.7 (1.77)	18.3 (2.07)	9.2 (1.04)	15.7 (1.77)	18.3 (2.07)	15.7 (1.77)	18.7 (2.11)
Continuous Current Rating:	Greased (IG) A	12.4	7.1	6.2	20.9	12.1	10.3	16.1	13.6
	Oiled (IL) A	24.9	14.2	12.4	41.7	24.2	20.6	32.1	27.2
Peak Current Rating	Amps	24.9	14.2	12.4	41.7	24.2	20.6	32.1	27.2
<b>MOTOR STATOR DATA</b>									
Voltage Constant (Ke) (+/- 10% @ 25°C)	Vrms/Krpm (Vpk/Krpm)	80.3 (113.5)	137.6 (194.6)	160.6 (227.1)	80.3 (113.5)	137.6 (194.6)	160.6 (227.1)	137.6 (194.6)	163.4 (231.1)
Pole Configuration		8	8	8	8	8	8	8	
Resistance (L-L) (+/- 5% @ 25°C)	Ohms	1.00	3.09	4.06	0.37	1.11	1.52	0.66	0.92
Inductance (L-L) (+/- 15%)	mH	23.7	69.6	94.8	10.7	31.6	43.0	20.3	28.7
Brake Inertia	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.0084 (9.5)							
Brake Current @ 24VDC	A	1							
Brake Holding Torque	lbf-in (Nm)	354 (40)							
Brake Engage/Disengage Time	ms	25/73							
Mechanical Time Constant (tm), ms	min	3.3	3.4	3.3	1.2	1.2	1.2	0.7	0.7
	max	4.7	5.0	4.8	1.8	1.8	1.8	1.1	1.0
Electrical Time Constant (te)	ms	23.6	22.6	23.4	28.9	28.5	28.2	31.0	31.2
Damping Constant	lbf-in/krpm (N-m/krpm)	7.00 (0.79)			7.00 (0.79)			7.00 (0.79)	
Friction Torque	lbf-in (Nm)	8.00 (0.90)			8.00 (0.90)			8.00 (0.90)	
Bus Voltage	Vrms	230	400	460	230	400	460	400	460
Speed @ Bus Voltage	rpm	2400							
Insulation Class		180 (H)							

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414. Test data derived using NEMA recommended aluminum heatsink 12" x 12" x 1/2"

Specifications subject to change without notice.

## GSX60 Mechanical and Electrical Specifications

Nominal Backlash	in (Nm)	0.004 (.10)							
Maximum Backlash (pre-loaded)	in (Nm)	0.0							
Lead Accuracy	in/ft (mm/300 mm)	0.001 (.025)							
Maximum Radial Load	lb (N)	100 (445)							
Environmental Rating: Standard		IP65							
Motor Stator		138	158	168	238	258	268	358	368
<b>RMS SINUSOIDAL COMMUTATION</b>									
Continuous Motor Torque	lbf-in (Nm)	252.6 (28.53)	249.9 (28.23)	252.6 (28.53)	424.8 (47.79)	423.0 (47.79)	427.5 (48.30)	604.2 (68.26)	615.0 (69.49)
Torque Constant (Kt) (+/- 10% @ 25° C)	lbf-in/A (Nm/A)	12.6 (1.42)	21.8 (2.46)	25.2 (2.84)	12.6 (1.42)	21.8 (2.46)	25.2 (2.84)	21.4 (2.42)	25.2 (2.84)
Continuous Current Rating:	Greased (IG) A	22.4	12.8	11.2	37.7	21.7	19.0	31.6	27.3
	Oiled (IL) A	44.9	25.6	22.4	75.5	43.4	38.0	63.1	54.6
Peak Current Rating	Amps	44.9	25.6	22.4	75.5	43.4	38.0	63.1	54.6
<b>TRAPEZOIDAL COMMUTATION</b>									
Continuous Motor Torque	lbf-in (Nm)	241.2 (27.25)	238.6 (26.96)	241.2 (27.25)	405.7 (45.83)	404.0 (45.65)	408.3 (46.13)	577.0 (65.19)	587.3 (66.35)
Torque Constant (Kt) (+/- 10% @ 25° C)	lbf-in/A (Nm/A)	9.8 (1.11)	17.0 (1.92)	19.6 (2.22)	9.8 (1.11)	17.0 (1.92)	19.6 (2.22)	16.7 (1.88)	19.6 (2.22)
Continuous Current Rating:	Greased (IG) A	27.5	15.7	13.7	46.2	26.5	23.3	38.7	33.4
	Oiled (IL) A	54.9	31.4	27.5	92.4	53.0	46.5	77.3	66.9
Peak Current Rating	Amps	54.9	31.4	27.5	92.4	53.0	46.5	77.3	66.9
<b>MOTOR STATOR DATA</b>									
Voltage Constant (Ke) (+/- 10% @ 25° C)	Vrms/Krpm (Vpk/Krpm)	85.9	148.9	171.8	85.9	149.9	171.8	146.1	171.8
Pole Configuration		8	8	8	8	8	8	8	8
Resistance (L-L) (+/- 5% @ 25° C)	Ohms	0.33	1.0	1.3	0.13	0.41	0.53	0.23	0.30
Inductance (L-L) (+/- 15%)	mH	8.3	24.8	33.0	3.9	11.8	15.8	7.5	10.3
Brake Inertia	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.02815 (31.8)							
Brake Current @ 24 VDC	A	1.45							
Brake Holding Torque	lbf-in (Nm)	708 (80)							
Brake Engage/Disengage Time	ms	53/97							
Mechanical Time Constant (tm), ms	min	5.0	5.1	5.0	2.0	2.1	2.0	1.2	1.2
	max	5.6	5.7	5.6	2.3	2.3	2.3	1.3	1.3
Electrical Time Constant (te)	ms	25.4	24.6	25.1	29.4	29.1	29.8	33.0	34.2
Damping Constant	lbf-in/krpm (N-m/krpm)	28.0 (3.16)			28.0 (3.16)			28.0 (3.16)	
Friction Torque	lbf-in (Nm)	20.0 (2.26)			20.0 (2.26)			20.0 (2.26)	
Bus Voltage	Vrms	230	400	460	230	400	460	400	460
Speed @ Bus Voltage	rpm	2400							
Insulation Class		180 (H)							

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.  
 Test data derived using NEMA recommended aluminum heatsink 16" x 16" x 1"  
 The GSX60-06 can only accommodate a single stack stator.

Specifications subject to change without notice.

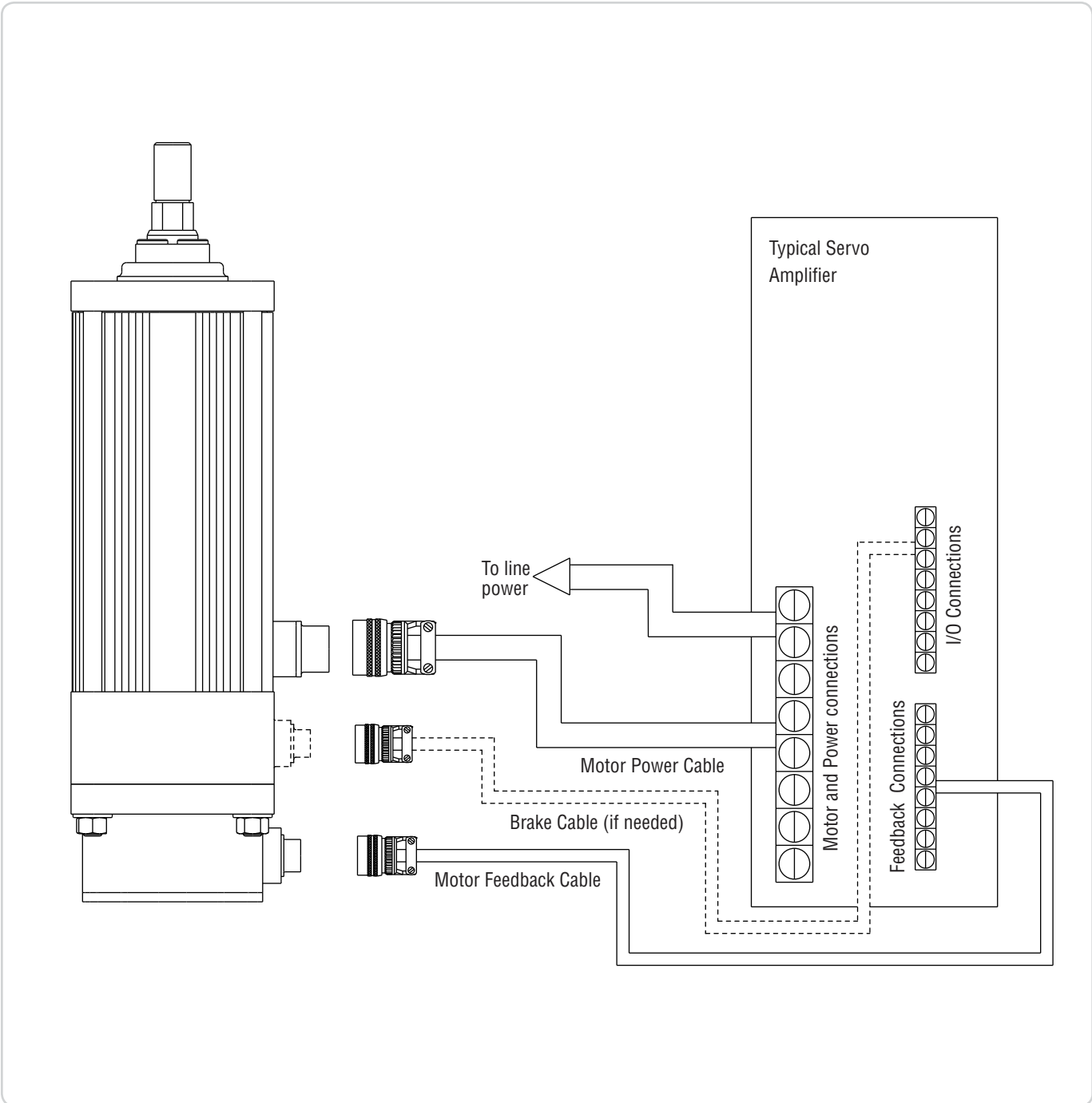
## GSX Series – System Configuration

GSX Series actuators include an integrated brushless servo motor. Exlar's unique design gives users a variety of the feedback configuration options so GSX units can be powered by almost any brushless motor amplifier on the market.

This flexibility means GSX actuators can be incorporated into today's highest performance single and multi-axis motion

control systems. In anything from food and beverage packaging, to multi-axis turning centers, to aircraft assembly, GSX Series units show incredible performance and durability.

The schematic below shows the typical connections for a single axis system with actuator and servo amplifier.



Drawings subject to change. Consult Exlar for certified drawings.

## Oil Cooling and Lubrication

### Consult Exlar if you plan to use oil cooling.

Exlar GSX series actuators can be lubricated with either grease or oil. All are shipped from the factory fully greased and are capable of functioning for many thousands of hours between re-greasings. Typically, greased lubrication is preferred for lower speed or intermittent duty applications. In these situations, you simply mount the actuator, connect the servo amplifier, and run.

However, many GSX Series actuators are deployed into applications involving high speed, high force, or both. To provide the cooling required when operating at these high power levels and/or to eliminate periodic re-greasing, all GSX units have another built-in feature. They are designed with an internal circulation path and the portings necessary for customers to convert from grease by connecting a recirculation oil system. This feature makes GSX units the only all-electric actuators on the market capable of true continuous-duty performance in moderate and high power applications when heat is an issue.

The conversion to externally supplied oil is simple. Identify which port will be lowest when the actuator is mounted. That will become the oil supply side. For optimum cooling it is important that GSX actuators are mounted so the high-side port is at least above the unit's centerline, preferably in the top quarter region. This assures that the stator windings receive the oil's cooling benefits. Just connect your oil lines and you're done (See note 1 on page 21). Residual grease will be flushed out and filtered during initial operation.

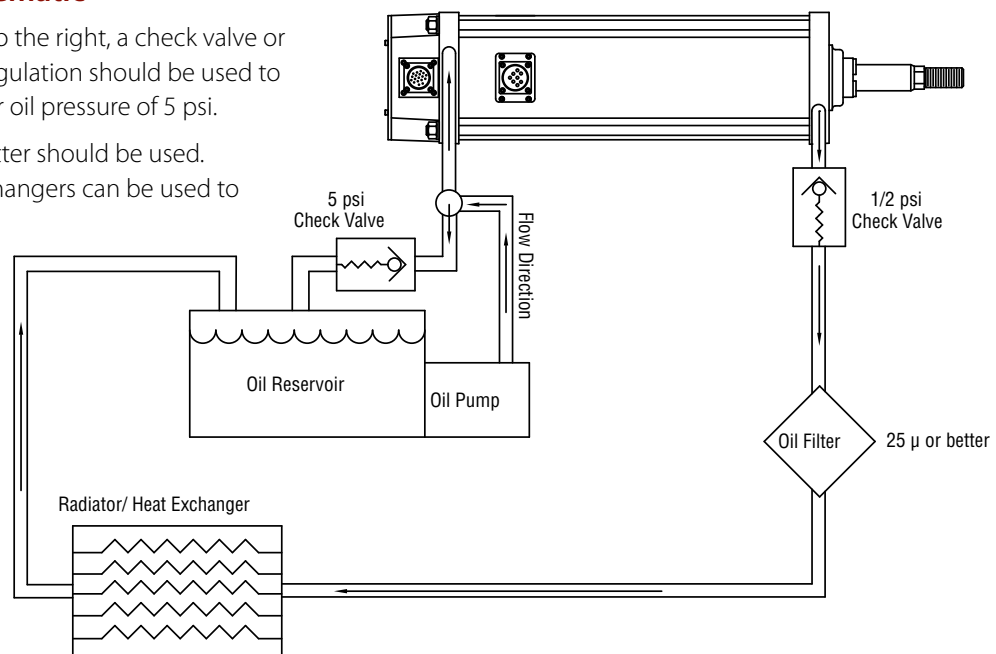
A typical oil cooling system is shown below. Whenever application requirements are such that the RMS current requirement exceeds the continuous current rating of the GSX motor, oil cooling should be used to keep case temperatures below their 85°C maximum specification. For very high speed applications, consult Exlar for oil routing recommendations.

### Simple Oil System Schematic

As shown in the schematic to the right, a check valve or other method of pressure regulation should be used to maintain an internal actuator oil pressure of 5 psi.

Filtering of 25 microns or better should be used. Simple radiators or heat exchangers can be used to maintain oil temperature.

Locate oil system as close to actuator as possible. Use as large as possible oil line to minimize any possibility of flow restriction. The inlet port should be located higher than the outlet port.



Exlar recommends the use of petroleum based gear oils with EP additive. An ISO 100 grade is suitable for most applications. Examples of this type of oil are: Mobil Mobilgear, Exxon Spartan EP, Shell Omala SG2 and Texaco Meropa. Oils meeting the FDA's food grade specifications are also available such as Mobil DTE FM 32.

Oil lubrication will extend the life of the actuator and improve its efficiency. More importantly, oil is required in high power applications for cooling. In applications where the RMS current exceeds IG (see electrical specs on pages 14-18), oil lubrication

is required in order to maintain the case temperature below its maximum of 85°C (see note 2 bottom of page). When such oil lubrication is required, you can determine oil flow rates and case temperatures from this information:

### Actuator Load Constants: $K_L = \left( \frac{^\circ\text{C} \times \text{Gal}}{\text{Hour}} \right)$

$K_L$ GSX20	=	40
$K_L$ GSX30	=	70
$K_L$ GSX40	=	95
$K_L$ GSX50	=	125
$K_L$ GSX60	=	260

### Application Load Factor: $F_L$

Where:

$$F_L = \left( \frac{I_{rms}}{I_G} \right)$$

$I_{rms}$  = actual application current

$I_G$  = actuator current rating from specifications (see pages 14-18)

### Use this relationship to determine oil flow requirements: $W$

$$W = K_L \frac{F_L}{\Delta T}$$

Where:  $\Delta T = T_{CASE} - T_{OIL}$

### Consider The Following Example:

A GSX30-238 requires 4 amps of RMS current to perform the required application. The incoming oil temperature is 45K°C, and we desire to maintain the actuator at it's maximum case temperature of 8°C.

$$F_L = (4/3.4)^2 = 1.38 \quad W = [(1.38 \times 70)/(85 - 45)] = 2.415 \text{ GAL / HOUR}$$

- IMPORTANT:** Some types of connectors or cabling MAY NOT be used with recirculated oil cooling because they are not constructed to prevent oil from passing through them. Some examples of these are any M23 type connectors (Intercontec/Interconnectron style), any embedded leads, or 'M' connectors with -AB5, AB6, AB7, AB8, AB9, ABA and ABB feedback call outs. Please consult Exlar if you plan to use oil cooling to confirm that your selected connectorization is acceptable for use with oil cooling. New connector and feedback types are added regularly. The XL option should be selected in the product model mask and please indicate the intended use of oil cooling.
- GSX Series actuators can be ordered with features that allow them to achieve case temperatures of 150°C. Inquire with Exlar's application engineers or local representative for details.

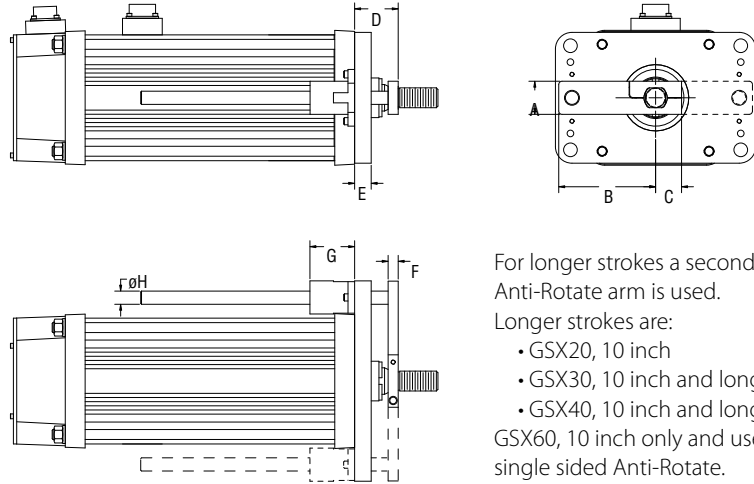
## Anti-rotation Option

The unique design of the GSX Series of linear actuators permits the extending rod to rotate. This simplifies actuator setup by allowing the user to rotate the rod and thread it in and out of the actuator for mechanical attachment or system testing.

However, this feature also requires that once setup and testing are completed, the rod be kept from rotating so proper linear motion will be maintained. In most applications the actuator's load is coupled to linear bearings, or some other support device. In these cases the load cannot rotate, and a separate anti-rotation system is not needed.

For applications in which the load is free to rotate, Exlar offers the anti-rotation systems shown right. Shorter GSX units use an anti-rotation arm on one side of the actuator. Longer strokes (defined above right) use arms on both sides.

## Anti-rotation Option GSX/M20, GSX/M30, GSX/M40 and GSX60



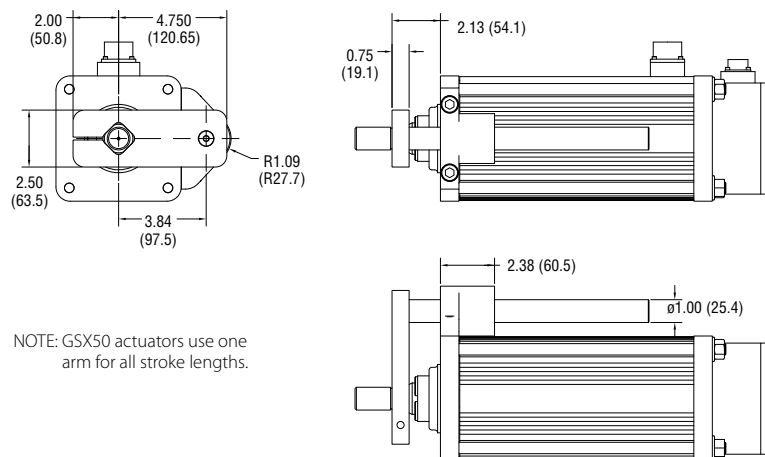
For longer strokes a second Anti-Rotate arm is used. Longer strokes are:

- GSX20, 10 inch
- GSX30, 10 inch and longer.
- GSX40, 10 inch and longer

GSX60, 10 inch only and uses a single sided Anti-Rotate.

Dims- in (mm)	GSX/M20	GSX/M30	GSX/M40	GSX60
A	0.60 (15.2)	0.79 (20.1)	1.25 (31.8)	1.75 (44.5)
B	1.81 (46.0)	2.54 (64.5)	3.78 (96.0)	5.79 (147)
C	0.54 (13.7)	0.71 (18.0)	0.98 (24.9)	1.55 (39.4)
D	1.00 (25.4)	1.30 (33.0)	1.64 (41.7)	1.94 (49.3)
E	0.44 (11.2)	0.44 (11.2)	0.63 (16.0)	0.75 (19.1)
F	0.28 (7.11)	0.32 (8.13)	0.38 (9.65)	0.50 (12.7)
G	0.31 (7.87)	1.69 (42.9)	1.69 (42.9)	2.81 (71.4)
øH	0.37 (9.40)	0.50 (12.7)	0.50 (12.7)	1.00 (25.4)

## Anti-rotation Option GSX50



NOTE: GSX50 actuators use one arm for all stroke lengths.

## GSX Series Travel Options

### PF = Preloaded Follower

This option offers a true zero backlash follower for the GSX Series actuator. The dynamic load rating of zero backlash, preloaded screws is 63% of the dynamic load rating of the standard non-preloaded screws. The calculated travel life of a preloaded screw will be 25% of the calculated travel life of the same size and lead of a non-preloaded screw for the same application. Preloaded follower is not available with LT linear feedback option.

### AR = External Anti-rotate Assembly

This option provides a rod and bushing to restrict the actuator rod from rotating when the load is not held by another method. Shorter actuators have single sided anti-rotation attachments. Longer lengths require attachments on both sides for proper operation.

### RB = Rear Electric Brake

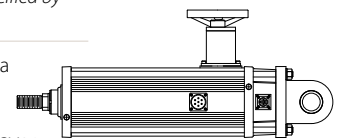
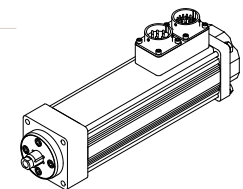
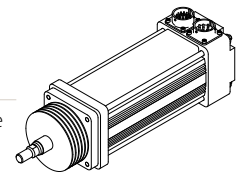
This option provides an internal holding brake for the GSX Series actuators. The brake is spring activated and electrically released.

### XT = Special Travel Option Selections

The XT Option can be used to specify various special travel options on the GSX Series of Linear Actuators. Because this option can be used to specify many things, it is important that an order including the -XT option spell out in detail, the exact options being selected by the including of the -XT in the model number.

It is recommended that prior to ordering an actuator including the -XT specifier that a quote be obtained through Exlar's special products application engineers for the desired options, and that quote be referenced on, or included with any order placed.

	Descriptions
<b>Protective Bellows</b>	This option provides an accordion style protective bellows to protect the main actuator rod from damage due to abrasives or other contaminants in the environment in which the actuator must survive. The standard material of this bellows is S2 Neoprene Coated Nylon, Sewn Construction. This standard bellows is rated for environmental temperatures of -40 to 250 degrees F. Longer strokes may require the main rod of the actuator to be extended beyond standard length. Consult Exlar applications engineers for details.
<b>High Temp Protective Bellows</b>	This option provides an accordion style protective bellows to protect the main actuator rod from damage due to abrasives or other contaminants in the environment in which the actuator must survive. The high temperature material of this bellows is D1 Teflon Coated Fiberglass, Sewn Construction. This standard bellows is rated for environmental temperatures of -67 to 500 degrees F. Longer strokes may require the main rod of the actuator to be extended beyond standard length. Consult Exlar applications engineers for details.
<b>Splined Main Rod</b>	This option provides a main rod manufactured of ball spline shafting, and the front seal and bushing assembly replaced with a ball spline nut to provide the anti-rotate function without using an external mechanism. Rod diameters are the closest metric equivalents to standard Exlar rod sizes. This option is <b>NOT</b> sealed in any way. This option is not suitable for any environment in which contaminants come in contact with the actuator, and may enter the actuator. <i>Note: due to the reduced diameter of the splined main rod on the GSX50, the standard "A" male metric rod end is not available. An "X" should be used in the rod end location of the model mask. If not otherwise specified by the customer, an M24X2 male rod end will be used.</i>
<b>Manual Drive Handwheel</b>	This option provides for a manual drive handwheel on the side of the actuator. The handwheel has a engagement/disengagement lever which allows for disengagement of the handwheel during operation. This engagement/disengagement lever is not tied to the operation of the motor and requires that the user guarantee its disengagement before operating the motor. Not available on GSX20.



### L1, L2, L3 = Adjustable External Travel Switches

This option allows up to 3 external switches to be included with the GSX Series Actuator. These switches provide travel indication to the controller and are adjustable (must purchase external anti-rotate for this option). See page 31 for details.

### XL = Non-Standard Lubrication

This option provides for indication in the model number that the customer has specified a lubrication other than the standard provided by Exlar, including the use of oil cooling (page 20).



## Motor Speed Designators

All Exlar T-LAM™ motors and actuators carry a standard motor speed designator as defined below. This is representative of the standard base speed of the motor, for the selected bus voltage.

If the model number is created and the location for the motor speed designator is left blank, this is the base speed to which each motor will be manufactured. The model number can also be created including this standard speed designator.

Designator	Base Speed	Actuator/ Motor Series
-50	5000 rpm	GSX20
-30	3000 rpm	GSX30, GSX40
-24	2400 rpm	GSX50, GSX60
01-99	Special Speed, Consult Exlar	

Exlar also provides the flexibility to manufacture all of its T-LAM products with special base speeds to match the customer's exact application requirements. This may be a higher than standard speed motor, or lower base speed than standard which will allow the customer to get the required torque, at a speed optimized to their application, and use the minimum amount of current from their amplifier.

The call out for a special speed is configured in the model number by using a two digit code from 01-99. These numbers represent the number, in hundreds, of RPM that will be the base speed for the particular motor.

For example, an GSX30-0301-OSM-AD1-118-30 motor that normally has a 3000 rpm standard winding, can be changed to a 3300 rpm winding by changing the -30, to a -33. It can be changed to a 5000 rpm winding by changing the -30 to a -50.

Changing this speed designator will change the ratings of the motor, and these must be obtained from Exlar applications engineers. Also, it is not possible to produce every possible speed from -01 to -99 for each motor at each voltage so please contact Exlar applications engineers for confirmation of the speed that is desired for the application.

## Feedback Options

### LT = ICT including signal conditioner

This option provides for an actuator containing an internally mounted ICT transducer spanning the full stroke of the actuator. Inquire with Exlar engineering for details and signal conditioner output preference. LT not available with absolute feedback.

Due to the variability in size of some feedback devices, especially absolute feedback devices which are often very large relative to the size of the actuator motor, the actual size of the actuator may differ in length and width from these drawings for feedback types other than standard resolvers and standard encoders. Please consult Exlar for details. In the event that you order an actuator that differs from these standard dimensions, you will be sent a drawing of the final configuration of your actuator for approval.

## Motor Options

GSX motor options are described with a 3 digit code. The first digit calls out the stack length, the second the rated bus voltage, and the third the number of poles of the motor. Refer to the mechanical/electrical specifications for motor torque and actuator rated force.

Code	Stack Length	Rated Bus Voltage	Poles	Class
118 =	1 stack	115 Vrms	8 Pole	Class 180 H
138 =		230 Vrms		
158 =		400 Vrms		
168 =		460 Vrms		
218 =	2 stack	115 Vrms	8 Pole	Class 180 H
238 =		230 Vrms		
258 =		400 Vrms		
268 =		460 Vrms		
318 =	3 stack	115 Vrms	8 Pole	Class 180 H
338 =		230 Vrms		
358 =		400 Vrms		
368 =		460 Vrms		

## Rod End Attachments

**Rear Clevis Pin Rod Eye**      **Spherical Rod Eye Rod Clevis**

See drawings on pages 32-35.

Attachments ordered separate from actuator.

## Housing Options

### FG = Smooth White Epoxy

This option provides for an actuator coated with FDA approved white epoxy.

### EN = Electroless Nickel Plating

This option provides for an actuator with electroless nickel plating.

### SS = Stainless Steel Housing

This option provides an actuator with all stainless steel construction. Housing dimensions for this option are not equal to the standard housing. Force, torque and current ratings are reduced 25% with this option. Please inquire with Exlar for dimensions and ratings.

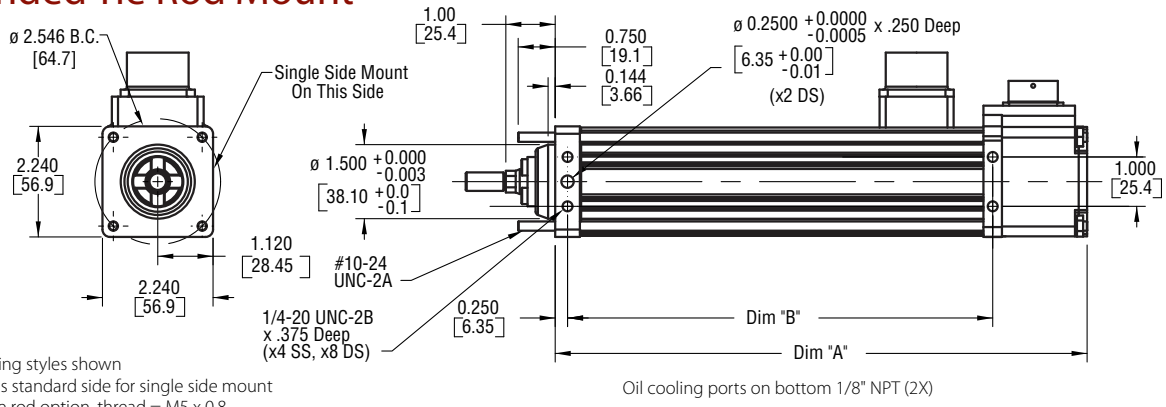
### HC = Type III Hard Coat Anodized, Class I

This option provides an actuator with type III hard coat anodized coating. Class I, no dye.

### XH = Special Housing Option

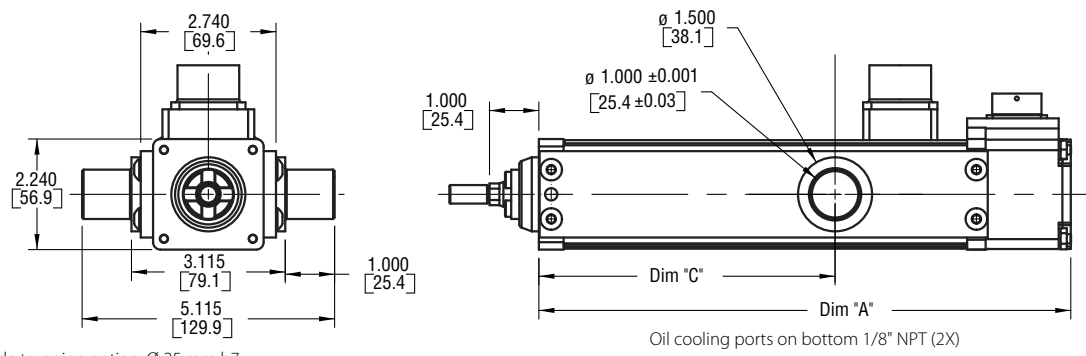
Any housing option that is not designated by the above codes should be listed as XH and described at time of order. All special options must be discussed with Exlar engineering.

## GSX20 Single, Double Side Mounts or Extended Tie Rod Mount



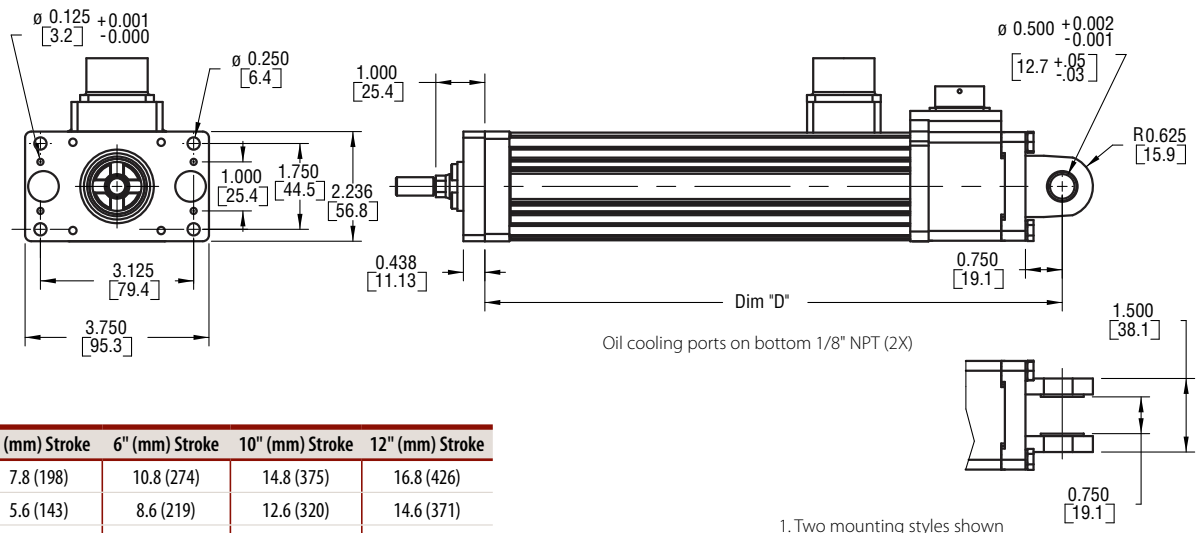
1. Three mounting styles shown
2. Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M5 x 0.8
- \* If "J" or "K" metric side mount options, M6 x 1.0  $\nabla$  9 mm with  $\varnothing$  6 mm M7  $\nabla$  9 mm Dowel Hole

## GSX20 Side Trunnion Mount



\* If "Q" metric side trunnion option,  $\varnothing$  25 mm h7

## GSX20 Rear Clevis Mount or Front Flange Mount



Dim	3" (mm) Stroke	6" (mm) Stroke	10" (mm) Stroke	12" (mm) Stroke
A	7.8 (198)	10.8 (274)	14.8 (375)	16.8 (426)
B	5.6 (143)	8.6 (219)	12.6 (320)	14.6 (371)
C	3.0 (76)	6.0 (152)	10.0 (254)	12.0 (305)
D	8.8 (223)	11.8 (299)	15.8 (401)	17.8 (452)

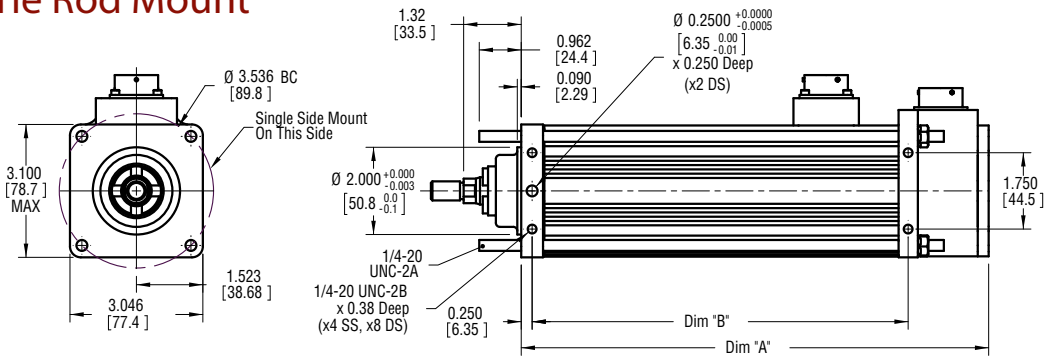
1. Two mounting styles shown
2. With flange mount, dimension A is equivalent to top two drawings

Note: Add 1.784 Inches to Dims "A & D" if ordering a Brake.

Drawings subject to change. Consult Exlar for certified drawings.

Due to the size of many absolute encoders, the selection of such feedback types for the size 20 and 30 actuators results in a larger package size than is shown in the drawings. Consult Exlar for details, or refer to the drawings provided after receipt of order.

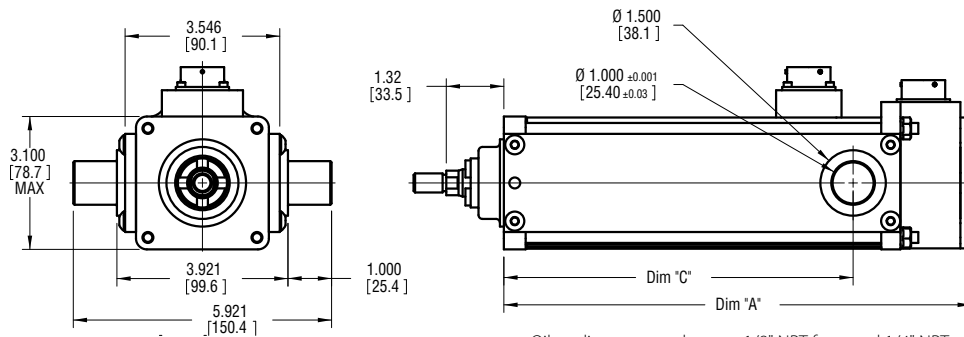
## GSX30 Single, Double Side Mounts or Extended Tie Rod Mount



1. Three mounting styles shown
  2. Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M6 x 1  
 \* If "J" or "K" metric side mount options, M6 x 1.0  $\nabla$  9 mm with  $\varnothing$  6 mm M7  $\nabla$  9 mm Dowel Hole

Oil cooling ports on bottom 1/8" NPT front and 1/4" NPT rear  
 If a rear brake is used both ports are 1/8" NPT

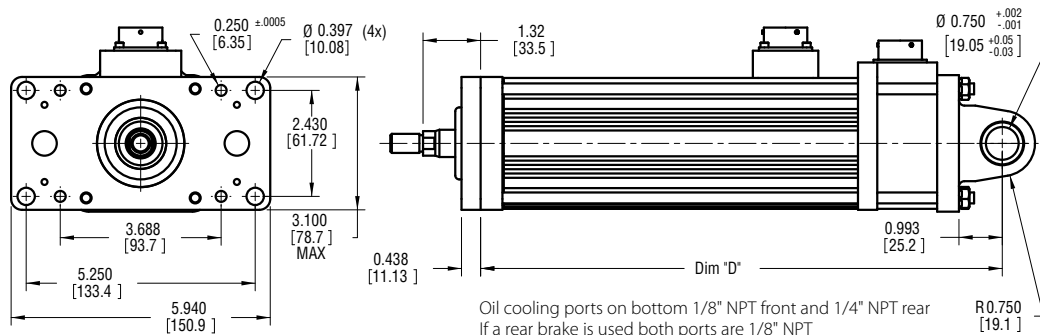
## GSX30 Side Trunnion Mount



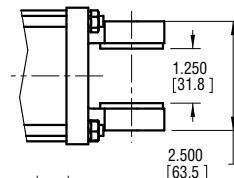
\* If "Q" metric side trunnion option,  $\varnothing$  25 mm h7

Oil cooling ports on bottom 1/8" NPT front and 1/4" NPT rear  
 If a rear brake is used both ports are 1/8" NPT

## GSX30 Rear Clevis Mount or Front Flange Mount



Oil cooling ports on bottom 1/8" NPT front and 1/4" NPT rear  
 If a rear brake is used both ports are 1/8" NPT



1. Two mounting styles shown
2. With flange mount, dimension A is equivalent to top two drawings

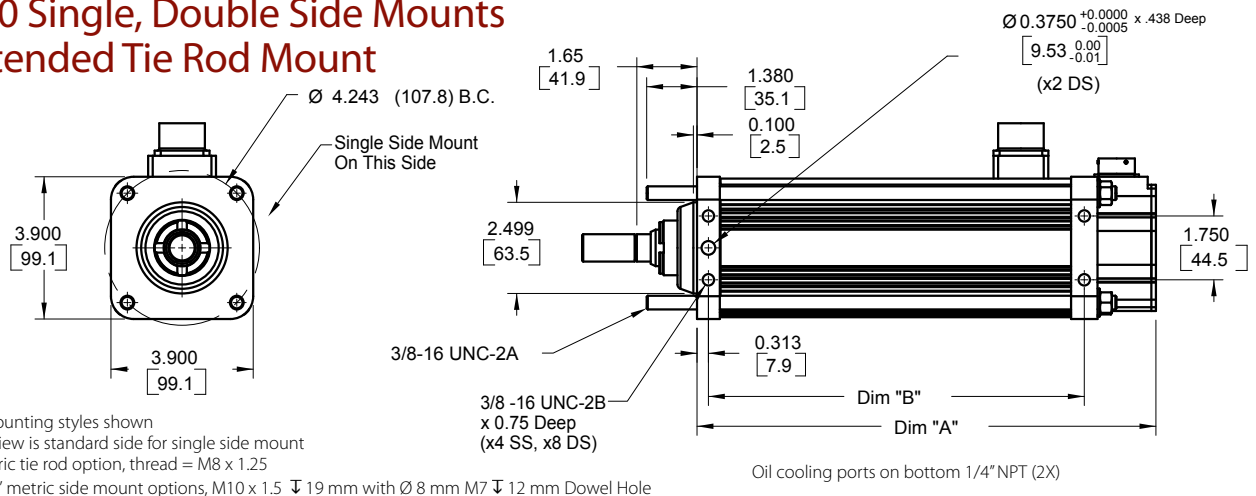
Dim	3" (mm) Stroke	6" (mm) Stroke	10" (mm) Stroke	12" (mm) Stroke	14" (mm) Stroke	18" (mm) Stroke
A	8.2 (209)	10.7 (272)	15.2 (387)	17.2 (437)	19.2 (488)	23.2 (590)
B	6.1 (156)	8.6 (219)	13.1 (333)	15.1 (384)	17.1 (435)	21.1 (536)
C	5.4 (137)	8.0 (203)	10.0 (254)	12.0 (305)	14.0 (356)	18.0 (457)
D	9.5 (241)	12.0 (304)	16.5 (418)	18.5 (469)	20.5 (520)	24.5 (621)

Note: Add 1.6 Inches to Dims "A" & "D" if ordering a Brake.

Drawings subject to change.  
 Consult Exlar for certified drawings.

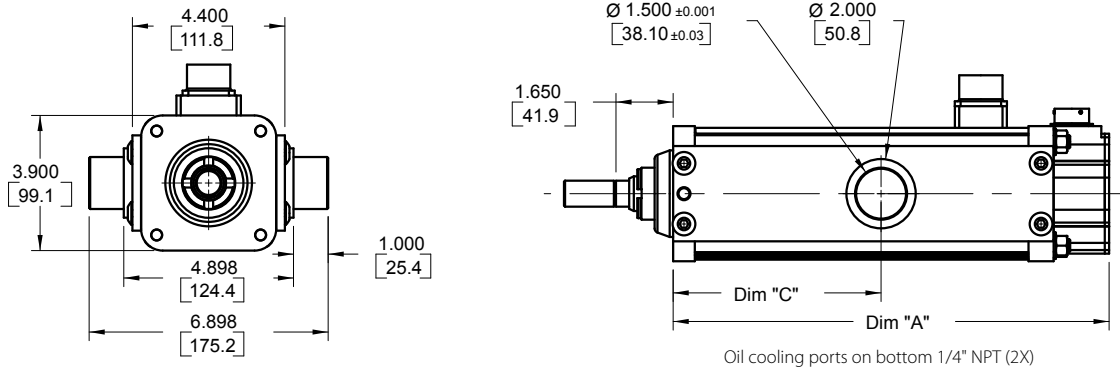
Due to the size of many absolute encoders, the selection of such feedback types for the size 20 and 30 actuators results in a larger package size than is shown in the drawings. Consult Exlar for details, or refer to the drawings provided after receipt of order.

## GSX40 Single, Double Side Mounts or Extended Tie Rod Mount



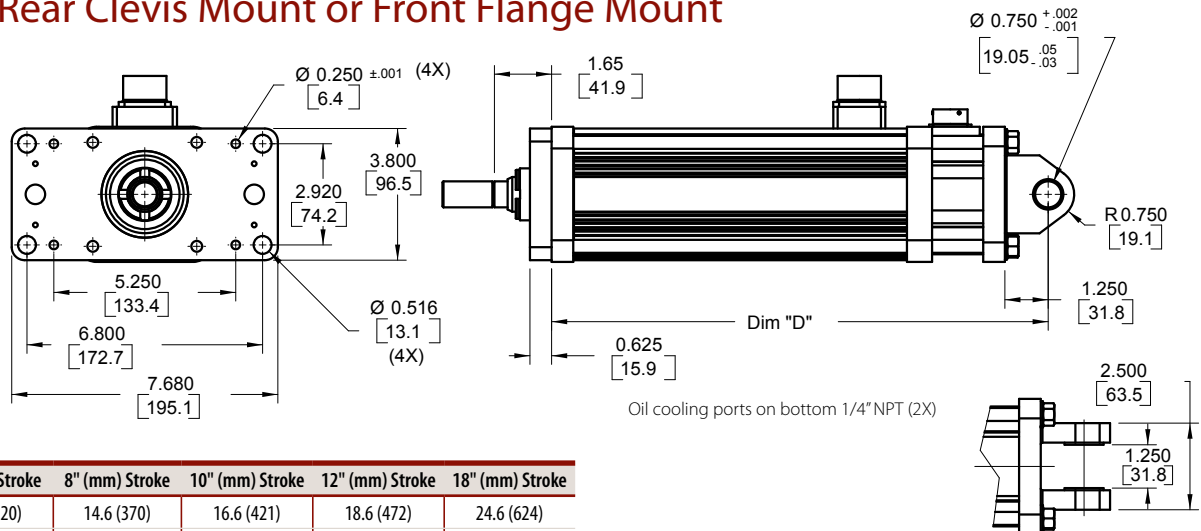
- Three mounting styles shown
  - Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M8 x 1.25  
\* If "J" or "K" metric side mount options, M10 x 1.5  $\downarrow$  19 mm with Ø 8 mm M7  $\downarrow$  12 mm Dowel Hole

## GSX40 Side Trunnion Mount



\* If "Q" metric side trunnion option, Ø 35 mm h7

## GSX40 Rear Clevis Mount or Front Flange Mount



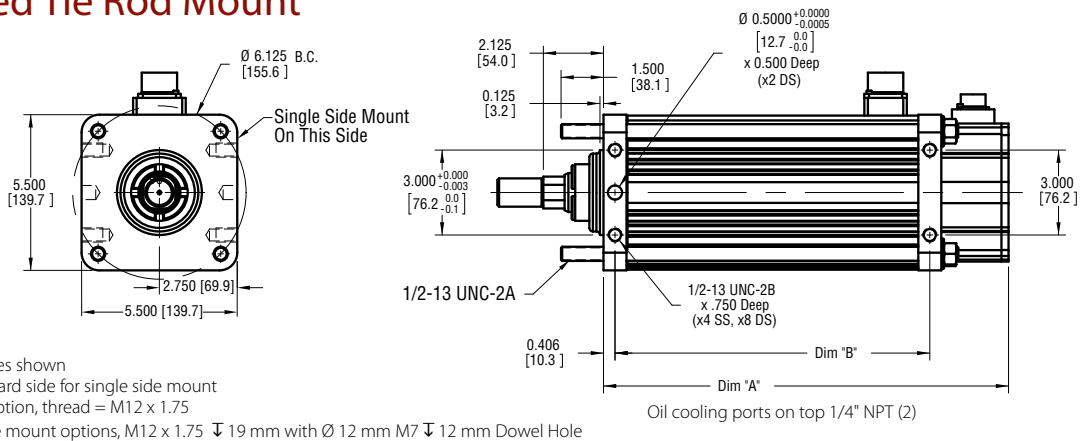
Dim	6" (mm) Stroke	8" (mm) Stroke	10" (mm) Stroke	12" (mm) Stroke	18" (mm) Stroke
A	12.6 (320)	14.6 (370)	16.6 (421)	18.6 (472)	24.6 (624)
B	10.3 (262)	12.3 (313)	14.3 (364)	16.3 (414)	22.3 (567)
C	6.0 (152)	8.0 (203)	10.0 (254)	12.0 (305)	18.0 (457)
D	14.3 (364)	16.3 (415)	18.3 (466)	20.3 (516)	26.3 (669)

Note: Add 2.33 Inches to Dims "A" & "D" if ordering a Brake.

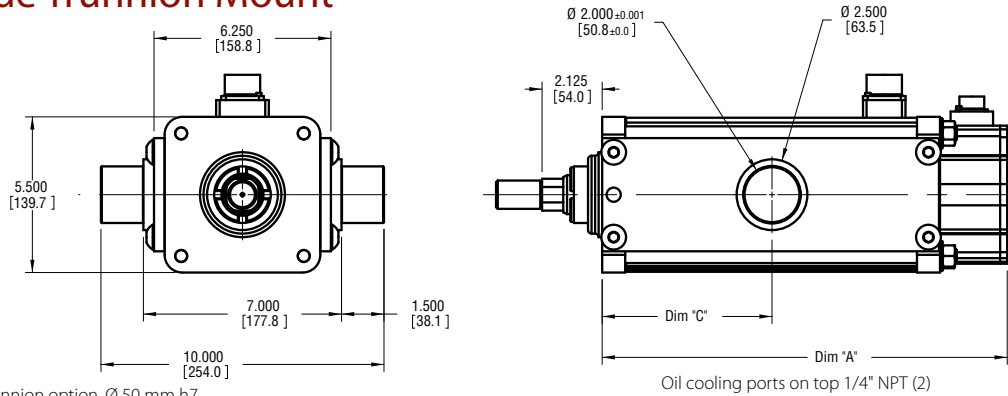
- Two mounting styles shown
- With flange mount, dimension A is equivalent to top two drawings

Drawings subject to change. Consult Exlar for certified drawings.

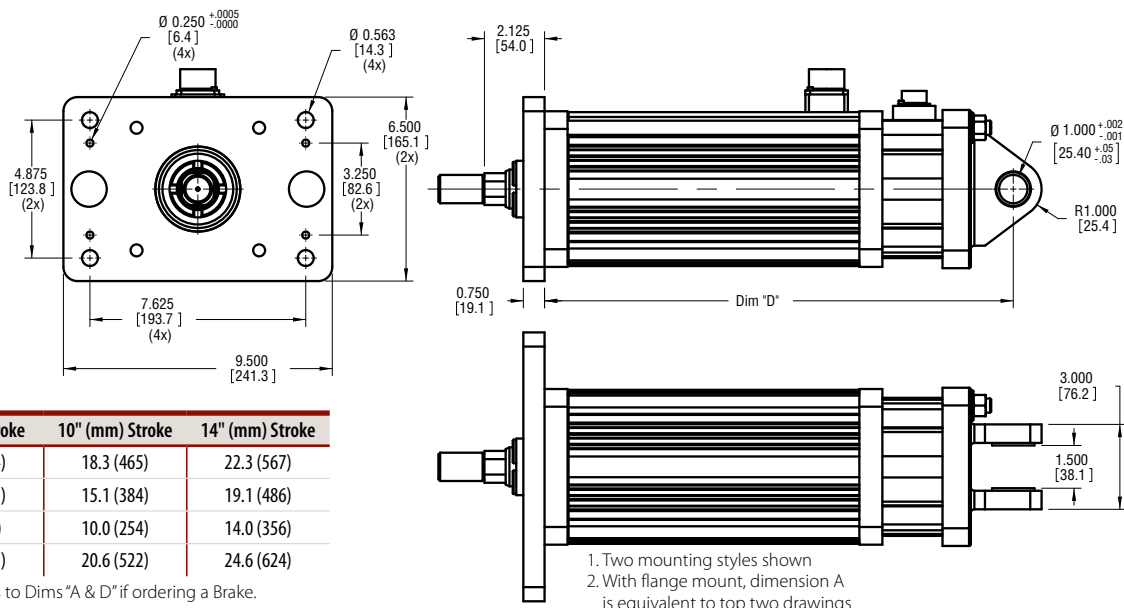
## GSX50 Single, Double Side Mounts or Extended Tie Rod Mount



## GSX50 Side Trunnion Mount



## GSX50 Rear Clevis Mount or Front Flange Mount



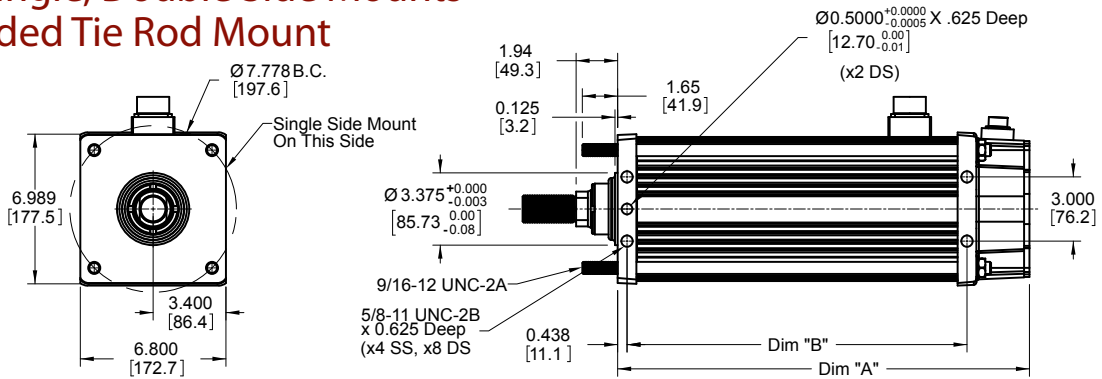
Dim	6" (mm) Stroke	10" (mm) Stroke	14" (mm) Stroke
A	14.3 (364)	18.3 (465)	22.3 (567)
B	11.1 (282)	15.1 (384)	19.1 (486)
C	6.0 (152)	10.0 (254)	14.0 (356)
D	16.6 (421)	20.6 (522)	24.6 (624)

Note: Add 2.5 Inches to Dims "A" & "D" if ordering a Brake.

Drawings subject to change. Consult Exlar for certified drawings.

Oil cooling ports on top 1/4" NPT (2)

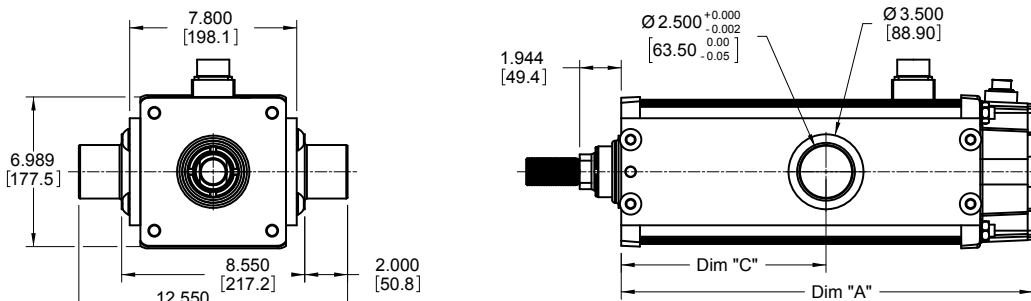
## GSX60 Single, Double Side Mounts or Extended Tie Rod Mount



1. Three mounting styles shown
  2. Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M14 x 2  
 \* If "J" or "K" metric side mount options, M16 x 2.0  $\nabla$  16 mm with  $\nabla$  12 mm M7  $\nabla$  12 mm Dowel Hole

Oil cooling ports on top 1/4" NPT (2X)

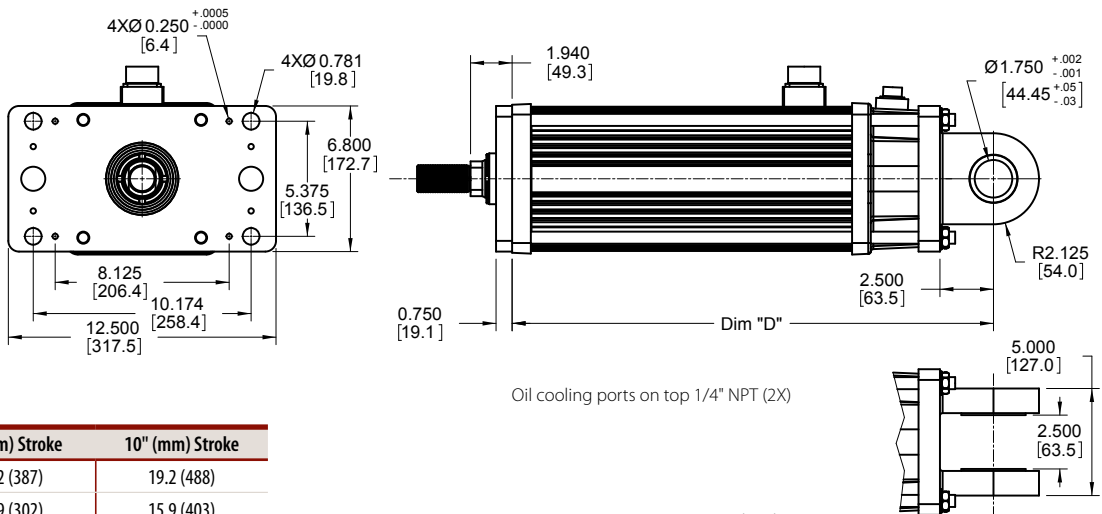
## GSX60 Side Trunnion Mount



\* If "Q" metric side trunnion option, Ø60 mm h9

Oil cooling ports on top 1/4" NPT (2X)

## GSX60 Rear Clevis Mount or Front Flange Mount



Oil cooling ports on top 1/4" NPT (2X)

1. Two mounting styles shown
2. With flange mount, dimension A is equivalent to top two drawings

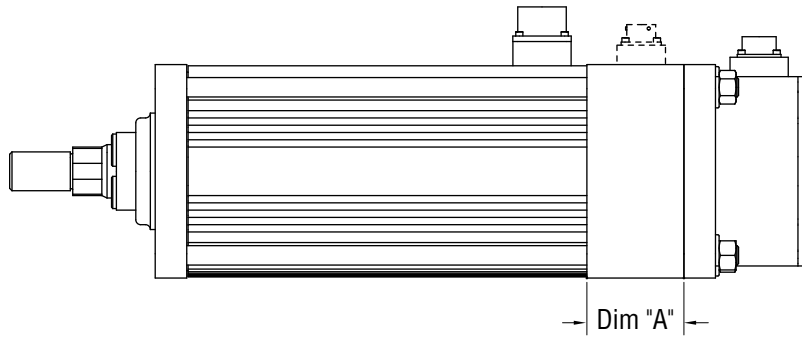
Dim	6" (mm) Stroke	10" (mm) Stroke
A	15.2 (387)	19.2 (488)
B	11.9 (302)	15.9 (403)
C	6.0 (152)	10.0 (254)
D	18.5 (469)	22.5 (571)

Note: Add 3.58 Inches to Dims "A" & "D" if ordering a Brake.

Drawings subject to change. Consult Exlar for certified drawings.

## Rear Brake Extension Option

\*Brake connector if needed.

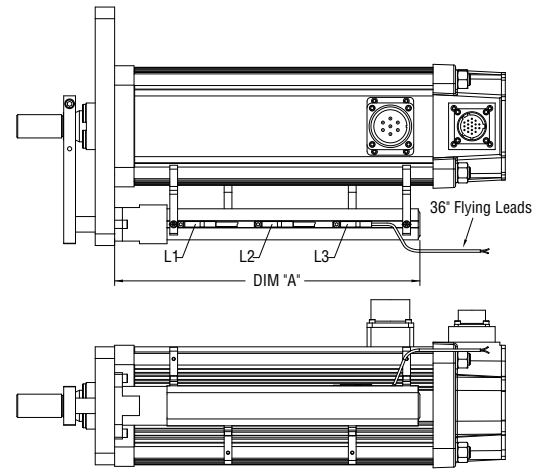
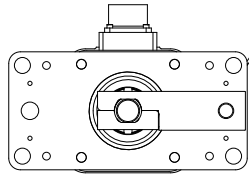
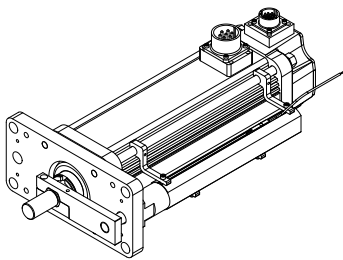


	GSX20	GSX30	GSX40	GSX50	GSX60
<b>A</b> in (mm)	1.78 (45.21)	1.61 (40.9)	2.33 (59.18)	2.5 (63.5)	3.575 (90.8)

\*Consult Exlar for connector and wiring information if ordering brake option.

## GSX20, GSX30, GSX40, GSX50 & GSX60 External Limit Switch Extension Options

Dim A	3 in (mm) stroke	6 in (mm) stroke	8 in (mm) stroke	10 in (mm) stroke	12 in (mm) stroke	14 in (mm) stroke	16 in (mm) stroke
GSX20	5.515 (140.1)	8.515 (216.3)	NA NA	12.500 (317.5)	14.515 (368.7)	NA NA	NA NA
GSX30	6.932 (176.1)	9.832 (249.7)	NA NA	13.832 (351.3)	15.832 (402.1)	17.832 (452.9)	21.832 (554.5)
GSX40	NA NA	9.832 (249.7)	11.83 (300.5)	13.832 (351.3)	15.832 (402.1)	NA NA	21.832 (554.5)
GSX50	NA NA	11.667 (296.3)	NA NA	15.667 (397.9)	NA NA	19.667 (499.5)	NA NA
GSX60	NA NA	10.461 (265.7)	NA NA	14.461 (367.3)	NA NA	NA NA	NA NA



The external limit switch option (requires anti-rotate option) for the GSX Series of linear actuators provides the user with 1, 2 or 3 externally mounted adjustable switches for use as the end of travel limit switches or home position sensors.

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.

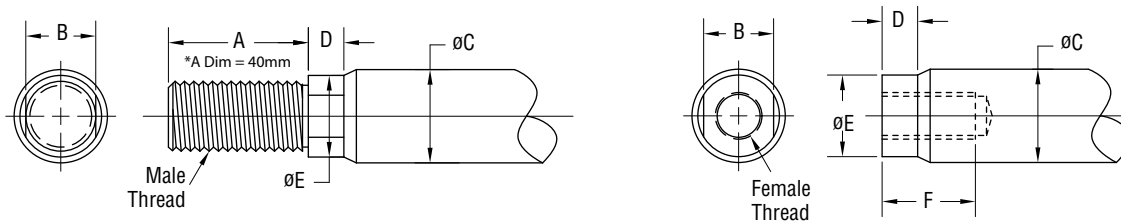
The switches are 9-30 VDC powered, PNP output, with either normally open or normally closed logic operation depending on the switch configuration ordered. Below is a diagram indicating which logic operation will be provided for each switch, based on the option ordered.

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



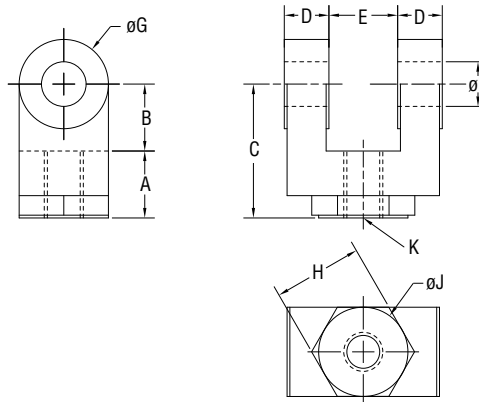
## Actuator Rod End Options



	A	B	øC	D	øE	F	Male U.S.	Male Metric	Female U.S.	Female Metric
<b>GSX20</b> in (mm)	0.813 (20.7)	0.375 (9.5)	0.500 (12.7)	0.200 (5.1)	0.440 (11.2)	0.750 (19.1)	3/8 – 24 UNF – 2A	M8 x 1 6g	5/16 – 24 UNF – 2B	M8 x 1 6h
<b>GSX30</b> in (mm)	0.750 (19.1)	0.500 (12.7)	0.625 (15.9)	0.281 (7.1)	0.562 (14.3)	0.750 (19.1)	7/16 – 20 UNF – 2A	M12 x 1.75* 6g	7/16 – 20 UNF – 2B	M10 x 1.5 6h
<b>GSX40</b> in (mm)	1.500 (38.1)	0.750 (19.1)	1.000 (25.4)	0.381 (9.7)	0.875 (22.2)	1.000 (25.4)	3/4 – 16 UNF – 2A	M16 x 1.5 6g	5/8 – 18 UNF – 2B	M16 x 1.5 6h
<b>GSX50</b> in (mm)	1.625 (41.3)	1.125 (28.6)	1.375 (34.9)	0.750 (19.1)	1.250 (31.8)	1.750 (44.5)	1 – 14 UNS – 2A	M27 x 2 6g	1 – 14 UNS – 2B	M24 x 2 6h
<b>GSX60</b> in (mm)	2.500 (63.5)	1.250 (31.8)	1.750 (44.5)	0.550 (14.0)	1.625 (41.3)	1.750 (44.5)	1 1/4 – 12 UNF – 2A	M30 x 2 6g	7/8 – 14 UNF – 2B	M25 x 1.5 6h

Part numbers for rod attachment options indicate the through hole size or pin diameter. Before selecting a spherical rod eye for use with a GSX series actuator, please consult the information on the anti-rotation option for the GSX actuators. Spherical rod eyes will allow the rod to rotate if the load is not held.

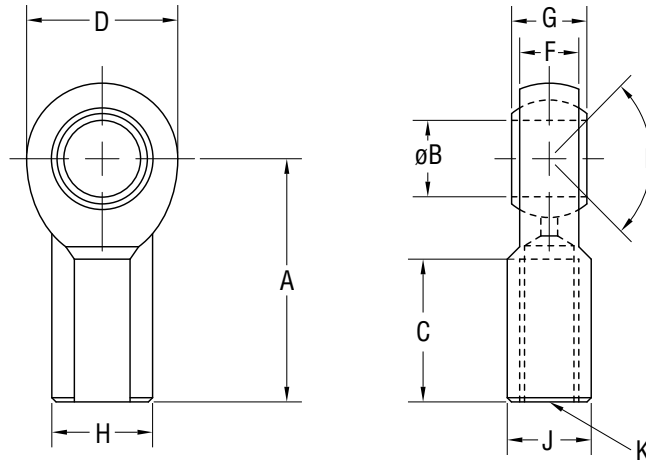
## Rod Clevis Dimensions



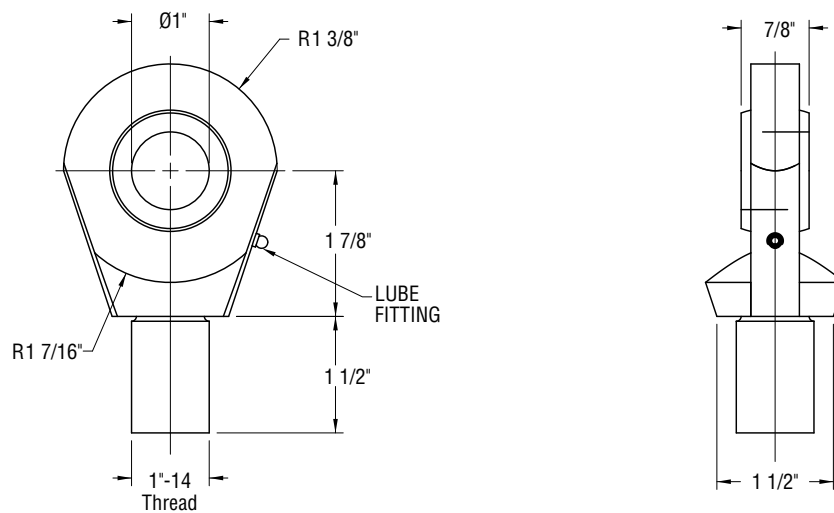
	A	B	C	D	E	øF	øG	H	øJ	K
<b>GSX20 RC038</b> in (mm)	0.787 (20)	0.787 (20)	1.574 (40)	0.575 (14.6)	0.375 (9.5)	0.375 (9.5)	0.75 (19.1)	NA	NA	3/8-24
<b>GSX30 RC050</b> in (mm)	0.75 (19.1)	0.75 (19.1)	1.50 (38.1)	0.50 (12.7)	0.765 (19.43)	0.50 (12.7)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	7/16-20
<b>GSX40 RC075</b> in (mm)	1.125 (28.58)	1.25 (31.75)	2.375 (60.3)	0.625 (15.88)	1.265 (32.13)	0.75 (19.1)	1.50 (38.1)	1.25 (31.75)	1.25 (31.75)	3/4-16
<b>GSX50 RC100</b> in (mm)	1.625 (41.2)	1.500 (38.1)	3.125 (79.4)	0.750 (19.1)	1.515 (38.5)	1.000 (25.4)	2.000 (50.8)	1.500 (38.1)	1.500 (38.1)	1-14
<b>GSX60 RC138</b> in (mm)	2.00 (50.8)	2.125 (53.98)	4.125 (104.78)	1.00 (25.4)	2.032 (51.6)	1.375 (34.93)	2.75 (69.85)	2.00 (50.8)	2.00 (50.8)	1-1/4 - 12

Drawings subject to change. Consult Exlar for certified drawings.

## Spherical Rod Eye Dimensions

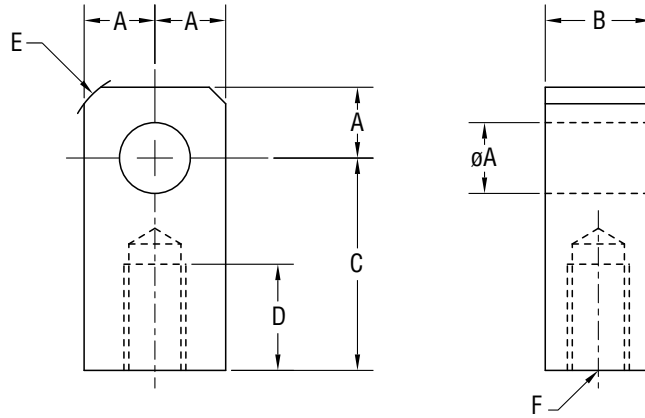


	A	øB	C	D	E	F	G	H	J	K
<b>GSX20 SRM038</b> in (mm)	1.625 (41.3)	.375 (9.525)	.906 (23.0)	1.0 (25.6)	12 deg	.406 (10.3)	.500 (12.7)	.688 (17.7)	.562 (14.3)	3/8-24
<b>GSX30 SRM044</b> in (mm)	1.81 (46.0)	0.438 (11.13)	1.06 (26.9)	1.13 (28.7)	14 deg	0.44 (11.1)	0.56 (14.2)	0.75 (19.1)	0.63 (16.0)	7/16-20
<b>GSX40 SRM075</b> in (mm)	2.88 (73.2)	0.75 (19.1)	1.72 (43.7)	1.75 (44.5)	14 deg	0.69 (17.5)	0.88 (22.3)	1.13 (28.7)	1.00 (25.4)	3/4-16
<b>GSX50 SRM100</b> in (mm)	See GSX50 Special Rod Eye drawing below. Requires female rod end.									



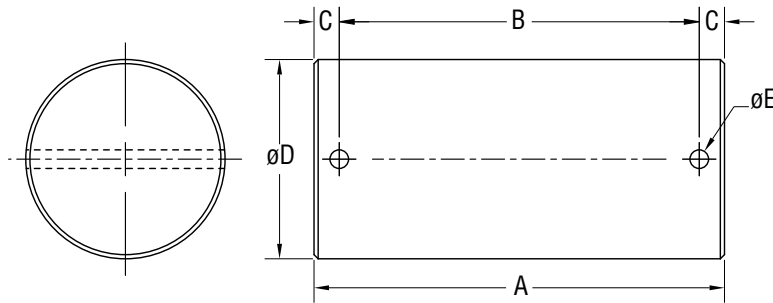
Drawings subject to change. Consult Exlar for certified drawings.

## Rod Eye Dimensions



	$\phi A$	B	C	D	E	F
<b>GSX30 RE050</b> in (mm)	0.50 (12.7)	0.75 (19.1)	1.50 (38.1)	0.75 (19.1)	0.63 (15.9)	7/16 - 20
<b>GSX40 RE075</b> in (mm)	0.75 (19.1)	1.25 (31.8)	2.06 (52.3)	1.13 (28.7)	0.88 (22.3)	3/4 - 16
<b>GSX50 RE100</b> in (mm)	1.00 (25.4)	1.50 (38.1)	2.81 (71.4)	1.63 (41.4)	1.19 (30.2)	1 - 14
<b>GSX60 RE138</b> in (mm)	1.375 (34.93)	2.0 (50.8)	3.44 (87.3)	2.0 (50.8)	1.837 (46.67)	1 1/4 - 12

## Clevis Pin Dimensions



	A	B	C	$\phi D$	$\phi E$
<b>GSX20</b> in (mm) CP050-Rear Clevis	2.28 (57.9)	1.94 (49.28)	0.17 (4.32)	0.50" +0.000/-0.002 (12.7 mm +0.00/-0.05)	0.106 (2.69)
<b>GSX30</b> in (mm) CP050-Rod eye, Rod Clevis	2.28 (57.9)	1.94 (49.28)	0.17 (4.32)	0.50" +0.000/-0.002 (12.7 mm +0.00/-0.05)	0.106 (2.69)
<b>GSX30</b> in (mm) CP075-Rear Clevis	3.09 (78.5)	2.72 (69.1)	0.19 (4.82)	0.75" +0.000/-0.002 (19.1 mm +0.00/-0.05)	0.14 (3.56)
<b>GSX40</b> in (mm) CP075-Rod eye, Rod Clevis Spherical Eye, Rear Clevis	3.09 (78.5)	2.72 (69.1)	0.19 (4.82)	0.75" +0.000/-0.002 (19.1 mm +0.00/-0.05)	0.14 (3.56)
<b>GSX50</b> in (mm) CP100-Rod eye, Rod Clevis Spherical Eye, Rear Clevis	3.59 (91.2)	3.22 (81.8)	0.19 (4.82)	1.00" +0.000/-0.002 (25.4 mm +0.00/-0.05)	0.14 (3.56)
<b>GSX60</b> in (mm) CP138-Rod eye, Rod Clevis	4.66 (118.3)	4.25 (108)	0.20 (5.08)	1.375" +0.000/-0.002 (34.93 mm +0.00/-0.05)	0.173 (4.39)
<b>GSX60</b> in (mm) CP175-Rear Clevis	5.656 (143.6)	5.25 (133.3)	0.203 (5.15)	1.750" +0.000/-0.002 (44.4 mm +0.00/-0.05)	0.173 (4.39)

Drawings subject to change. Consult Exlar for certified drawings.



## AA = GSX Actuator Frame Size (Nominal)

- 20 = 2 in (60 mm)
- 30 = 3 in (80 mm)
- 40 = 4 in (100 mm)
- 50 = 5 in (142 mm)
- 60 = 7 in (180 mm)

## BB = Stroke Length

- 03 = 3 in (75 mm) GSX20, GSX30
- 06 = 5.9 in (150 mm) GSX30, 6 in (152 mm) GSX20, GSX40, GSX50, GSX60
- 08 = 8 in (200 mm) GSX40
- 10 = 10 in (250 mm) all models
- 12 = 12 in (300 mm) GSX20, GSX30, GSX40
- 14 = 14 in (355 mm) GSX30, GSX50
- 18 = 18 in (450 mm) GSX30, GSX40

## CC = Lead

- 01 = 0.1 in (GSX20, GSX30, GSX40, GSX50)<sup>12</sup>
- 02 = 0.2 in (GSX20, GSX30, GSX40, GSX50)
- 03 = 0.25 in (GSX60)
- 04 = 0.4 in (GSX20 only)
- 05 = 0.5 in (GSX30, GSX40, GSX50, GSX60)
- 08 = 0.75 in (GSX40)<sup>8</sup>
- 10 = 1.0 in (GSX50, GSX60)<sup>9</sup>

## D = Connections

- M = Manufacturer's connector<sup>6</sup>
- I = Exlar standard M23 style<sup>10</sup>
- A = MS style (anodized)
- D = MS style (electroless nickel)
- B = Embedded leads 3 ft. std.
- P = Embedded leads w/plug 3 ft. std. w/"A" plug
- J = Embedded leads w/"I" plug, 3' standard
- X = Special (please specify)

## E = Mounting

- B = Front and rear flange
- C = Rear clevis
- F = Front flange
- R = Rear flange
- S = Side mount
- D = Double side mount
- T = Side trunnion
- E = Extended tie rods
- J = Metric side mount
- K = Metric double side mount
- Q = Metric side trunnion
- M = Metric extended tie rods
- G = Metric rear clevis
- X = Special (please specify)

## F = Rod End

- M = Male, US std. thread
- A = Male, metric thread
- F = Female, US std. thread
- B = Female, metric thread
- W = Male, US std. thread 17-4 SS
- R = Male metric thread 17-4 SS
- V = Female, US std. thread 17-4 SS
- L = Female, metric thread 17-4 SS
- X = Special (please specify)

## GGG = Feedback Type (Also specify the Amplifier/Drive Model being used when ordering)

- Standard Incremental Encoder – 2048 line (8192 cts) per rev. index pulse, Hall commutation, 5vdc
- Standard Resolver – Size 15, 1024 line (2048 cts) per rev. two pole resolver
- Motor files for use with select Emerson/CT, Rockwell /AB and Danaher/Kollmorgen Drives are available at [www.exlar.com](http://www.exlar.com)
- Custom Feedback** - Please consult application engineering:  
XX1 = Wiring and feedback device information must be provided and new feedback callout will be created

**Allen-Bradley/Rockwell: (Actuators used with Kinetix and/or Sercos based control systems require a 3rd party motion database purchased from AB/Rockwell. Please contact your AB/Rockwell representative for support.)**

- AB5 = Stegmann SRM050 Hiperface multi-turn absolute encoder - MPL 100mm or higher motor wiring w/MS connectors for 'M' option – Plug & Play feedback option
- AB6 = Standard Resolver
- AB7 = Standard Incremental Encoder – MPL 100mm or higher motor wiring w/MS connectors for 'M' option
- AB8 = Standard Incremental Encoder – MPL 75mm or less motor wiring w/M23 euro connectors for 'M' option
- AB9 = Hiperface Stegmann SRM050 multi-turn absolute encoder - MPL 75mm or less motor wiring w/M23 euro connectors for 'M' option – Plug & Play feedback option
- ABA = Hiperface Stegmann SKM036 multi-turn absolute encoder – MPL 215mm or higher motor wiring w/MS connectors for 'M' option – 460V Stator only – Plug & Play feedback option
- ABB = Hiperface Stegmann SKM036 multi-turn absolute encoder – MPL 75mm or less motor wiring w/M23 euro connectors for 'M' option – 460V Stator only – Plug & Play feedback option

## AMKASYN:

- AK1 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – DS motor wiring w/M23 euro connectors for 'M' option
- AK2 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – DS motor wiring w/M23 euro connectors for 'M' option

## Advanced Motion Control:

- AM1 = Standard Incremental Encoder
- AM2 = Encoder 1000 line, w/commutation, 5 VDC
- AM3 = Standard Resolver
- AM5 = Encoder 5000 line, w/commutation, 5 VDC

## API Controls:

- AP1 = Standard Resolver
- AP2 = Standard Incremental Encoder

## Aerotech:

- AR1 = Encoder 5000 line, w/commutation, 5 VDC
- AR2 = Standard Incremental Encoder

## ABB Robot:

- BB1 = LTN Resolver

## Baldor:

- BD2 = Standard Resolver – BSM motor wiring w/M23 connectors for 'M' option
- BD3 = Standard Incremental Encoder – BSM motor wiring w/M23 connectors for 'M' option

## Beckhoff:

- BE1 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – AM2XX motor wiring w/M23 euro connectors for 'M' option

## Baumuller:

- BM2 = Standard Resolver

## B&R Automation:

- BR1 = Standard Resolver
- BR2 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – 8LS/8LM motor wiring w/M23 euro connectors for 'M' option

## Comau Robot:

- CM1 = Standard Resolver

## Copley Controls:

- CO1 = Standard Incremental Encoder
- CO2 = Standard Resolver

## Control Techniques/Emerson:

- CT1 = Hiperface Stegmann SRM050 multi-turn absolute encoder – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option
- CT3 = Hiperface Stegmann SKM036 multi-turn absolute encoder – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option
- CT4 = Standard Incremental Encoder – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option
- CT5 = Standard Resolver – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option
- CT7 = Encoder 5000 line, with commutation, 5 VDC – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option

## Delta Tau Data Systems:

- DT1 = Encoder 1000 line, with commutation, 5 VDC
- DT2 = Standard Resolver

## Elmo Motion Control:

- EL1 = Standard Resolver
- EL2 = Standard Incremental Encoder
- EL3 = EnDat Heidenhain EQN1125 multi-turn absolute encoder

## Emerson/Control Techniques:

- EM2 = Standard Incremental Encoder – NT motor wiring w/MS connectors for 'M' option
- EM5 = Encoder 5000 line, with commutation, 5 VDC – NT motor wiring w/MS connectors for 'M' option

## Elau:

- EU1 = Hiperface Stegmann SRM050 multi-turn absolute encoder – SH motor wiring w/MS connectors for 'M' option
- EU4 = Hiperface Stegmann SKM036 multi-turn absolute encoder – SH motor wiring w/MS connectors for 'M' option

## Exlar:

- EX4 = Standard Resolver

## Fanuc Pulsecoder: Consult Exlar

## G&L Motion Control/Danaher Motion:

- GL1 = Standard Incremental Encoder – HSM motor wiring w/ MS connectors for 'M' option
- GL2 = Standard Incremental Encoder – LSM-MSM motor wiring w/M23 euro connectors for 'M' option

GL3 = Standard Incremental Encoder – NSM motor wiring w/MS connectors for 'M' option  
 GL4 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – AKM motor wiring w/ M23 euro connectors for 'M' option

**Infranor:**

IF1 = Standard Resolver

**Indramat/Bosch-Rexroth:**

IN6 = Standard Resolver – MKD/MHD motor wiring w/M23 euro connectors for 'M' option  
 IN7 = Hiperface Stegmann SKM036 multi-turn absolute encoder – MSK motor wiring w/M23 euro connectors for 'M' option – plug & play option

**Jetter Technologies:**

JT1 = Standard Resolver – JH/JL motor wiring w/ M23 euro connectors for 'M' option

**Kollmorgen/Danaher:**

KM4 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – AKM motor wiring w/ M23 euro connectors for 'M' option  
 KM5 = Standard Resolver – AKM motor wiring w/ M23 euro connectors for 'M' option  
 KM6 = Standard Incremental Encoder – AKM motor wiring w/ M23 euro connectors for 'M' option

**Kuka Robot:**

KU1 = Tyco Size 21 Resolver

**Kawasaki Robot:**

KW1 = Kawasaki Special Encoder

**Lenze/AC Tech:**

LZ1 = Hiperface Stegmann SRM050 multi-turn absolute encoder – MCS motor wiring w/M23 euro connectors for 'M' option  
 LZ5 = Standard Resolver – MCS motor wiring w/ M23 euro connectors for 'M' option  
 LZ6 = Standard Incremental Encoder – MCS motor wiring w/ M23 euro connectors for 'M' option

**Matuschek:**

MC1 = LTN Resolver

**Metronix:**

MX1 = Standard Resolver  
 MX2 = Hiperface Stegmann SKM036 multi-turn absolute encoder  
 MX3 = EnDat Heidenhain EQN1125 multi-turn absolute encoder

**Mitsubishi:**

MT1 = Mitsubishi Absolute Encoder – HF-SP motor wiring with 'M' option

**Modicon:**

MD1 = Standard Resolver

**Momentum:**

MN1 = Hyperface Stegmann SRM050 multi-turn absolute encoder – MN motor wiring w/ M23 connectors for 'M' option  
 MN2 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – MN motor wiring connectors for 'M' option  
 MN3 = Std incremental encoder – MN motor wiring w/M23 connectors for 'M' option  
 MN4 = Std resolver – MN motor wiring w/M23 connectors for 'M' option

**Moog:**

MG1 = Standard Resolver

**Motoman Robot:**

MM1 = Yaskawa Serial Encoder

**Nachi Robot:**

NC1 = Tamagawa Serial Encoder

**Ormec:**

OR1 = Standard Resolver  
 OR2 = Standard Incremental Encoder – G series motor wiring w/ MS connectors for 'M' option

**Parker Compumotor:**

PC6 = Standard Incremental Encoder – SMH motor wiring w/M23 connectors for 'M' option – European only  
 PC7 = Standard Resolver – SMH motor wiring w/M23 connectors for 'M' option – European only  
 PC8 = Standard Incremental Encoder – MPP series motor wiring w/PS connectors for 'M' option – US Only  
 PC9 = Hiperface Stegmann SRM050 multi-turn absolute encoder – MPP motor wiring w/PS connectors for 'M' option – US Only  
 PC0 = Standard Resolver – MPP motor wiring w/PS connectors for 'M' option – US Only

**Pacific Scientific:**

PS2 = Standard Incremental Encoder  
 PS3 = Standard Resolver – PMA motor wiring w/M23 connectors for 'M' option

**Stober Drives:**

SB3 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – ED/EK motor wiring w/M23 euro connectors for 'M' option

**Siemens:**

SM2 = Standard Resolver – 1FK7 motor wiring w/M23 connectors for 'M' option  
 SM3 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – 1FK7 motor wiring w/M23 euro connectors for 'M' option  
 SM4 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – 1FK7 motor wiring w/M23 euro connectors for 'M' option

**SEW/Eurodrive:**

SW1 = Standard Resolver – CM motor wiring w/ M23 euro connectors for 'M' option  
 SW2 = Standard Incremental Encoder  
 SW3 = Hiperface Stegmann SRM050 multi-turn absolute encoder – CM motor wiring w/ M23 euro connectors for 'M' option

**Whedco:**

WD1 = Standard Resolver

**Yaskawa:**

YS2 = Yaskawa Absolute Encoder – SGMGH motor wiring 40/50/60 Exlar Frame Sizes  
 YS3 = Yaskawa Absolute Encoder – SGMGH motor wiring 20/30 Exlar Frame Sizes

**HHH = Motor Stator – 8 Pole<sup>2</sup> Class 180H**

118 = 1 stack	115 Vrms	158 = 1 stack	400 Vrms
218 = 2 stack		258 = 2 stack	
318 = 3 stack		358 = 3 stack	
138 = 1 stack	230 Vrms	168 = 1 stack	460 Vrms
238 = 2 stack		268 = 2 stack	
338 = 3 stack		368 = 3 stack	

**II = Motor Speed**

24 = 2400 rpm, GSX50, GSX60  
 30 = 3000 rpm, GSX30, GSX40  
 50 = 5000 rpm, GSX20  
 01- 99 = Customer specified base speed

**XX .. XX = Options**

**Travel Options**

PF = Preloaded follower<sup>1</sup>  
 AR = External anti-rotate assembly  
 RB = Rear electric brake<sup>4</sup>  
 RD = Rear manual drive<sup>13</sup>  
 SD = Hex side drive  
 HW = Side handwheel manual drive, with limit switch  
 XT = Special travel option (see pg. 23), and high temp protective bellows or splined main rod<sup>11</sup>  
 L1/L2/L3 = External limit switches<sup>7</sup>

**Motor Options**

XM = Special motor option  
 XL = Special lubrication food grade or Mobilgrease 28 or use of oil cooling, specify

**Housing Options**

FG = Smooth white epoxy<sup>5</sup>  
 EN = Electroless nickel plating<sup>5</sup>  
 HC = Type III hard coat anodized, class I<sup>5</sup>  
 SS = Stainless steel housing<sup>5</sup>  
 XH = Special housing option

**Absolute Linear Feedback**

LT = ICT, including signal conditioner<sup>1,3 & 13</sup>

- The dynamic load rating of zero backlash, preloaded screws is 63% of the dynamic load rating of the standard non-preloaded screws. The calculated travel life of a preloaded screw will be 25% of the calculated travel life of the same size and lead of a non-preloaded screw. Preloaded follower is not available with absolute linear (LT) internal feedback option.
- Stator voltage and pole options allow for catalog rated performance at varying amplifier bus voltages and pole configuration requirements. Refer to performance specification on pages 11-12 for availability of 3 stack stator.
- Linear feedback is not available in the GSX20 and not available in the GSX30, 14" and 18" or with absolute feedback.
- The brake option may require a third cable, consult Exlar.
- These housing options would typically be accompanied by the choice of the electroless nickel connectors if a connectorized unit were selected. This choice may also indicate the need for special material main rods or flanges.
- Available as described in Feedback Types.
- Requires AR option.
- 0.75 lead not available above 12".
- 1.0 lead not available above 10" stroke.
- GSX60 uses M40 size 1.5 power connector.
- If not otherwise specified by the customer, an M24X2 male rod end will be used. See note on page 23.
- 0.1 lead not available over 10" stroke on GSX50.
- Not available with absolute feedback.

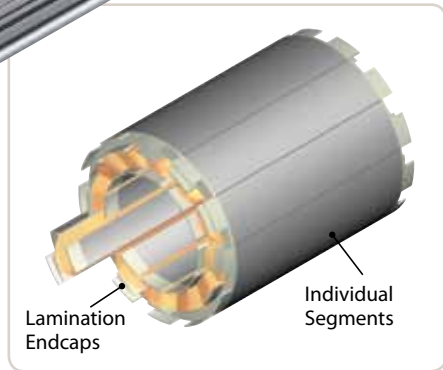
## GSM Series Excellent Ball Screw Replacement

This design incorporates Exlar's patented roller screw technology with an integral brushless servo motor for medium to high performance motion control applications. The GSM Series offers 5 times the travel life of similarly sized ball screw actuators. It also provides a smaller package with higher speed and higher load capacity than ball screws and other traditional rotary to linear conversion mechanisms. These features make the GSM Series an excellent replacement for ball screw actuators.

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.

Exlar's T-LAM technology incorporated into the motor design provides a solution with 35% more torque in the same package size as traditional brushless motors. The efficiencies of the GSM Series are a result of the limited heat generation qualities inherent in the segmented stator design. The elimination of end turns in the stator, and the use of thermally conductive potting removes the parts most susceptible to failure in a traditional stator. Other benefits include:

- Neodymium iron boron magnets provide high flux density and maximum motor torque.
- Thermally conductive potting of the entire stator provides increased heat dissipation and provides protection from contamination in oil-cooled units.
- Each stator segment contains individual phase wiring. External winding of individual segments provides maximum slot fill for maximum motor performance.
- Motors with T-LAM technology have Class H insulation systems compliant with UL requirements.



### Features/Characteristics

T-LAM™ segmented lamination stator technology

2.25, 3.3 or 3.9 inch frame size

3, 5.9, 10, 12 and 18 inch strokes

0.1, 0.2, 0.4, 0.5 and .75 inch lead roller screws

7 to 75 lbf-in torque motor availability

Up to 33 inch per second linear speeds

92 to 1983 lbf thrust capacity depending on motor selection

Front flange, rear flange, rear clevis, trunnion, side, double side or extended tie rods mounting options

Encoder feedback with MS style connectors

Molded and shielded cables available

Anodized aluminum housing

Competitively priced with ball screw actuators

5 times the life of a similar sized ball screw actuator

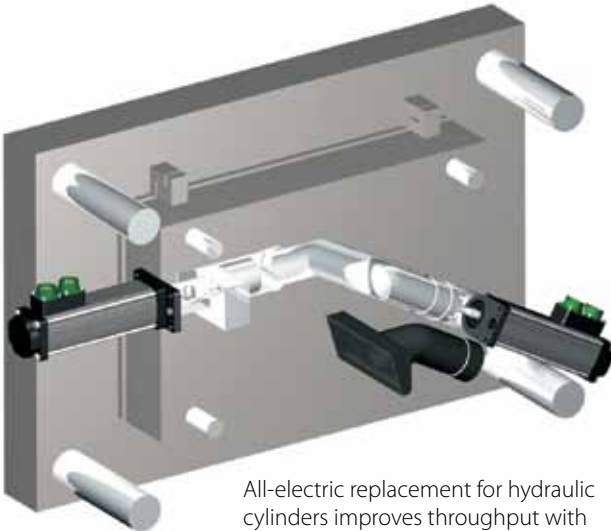
IP54 or IP65 sealing

Class 180 H insulation

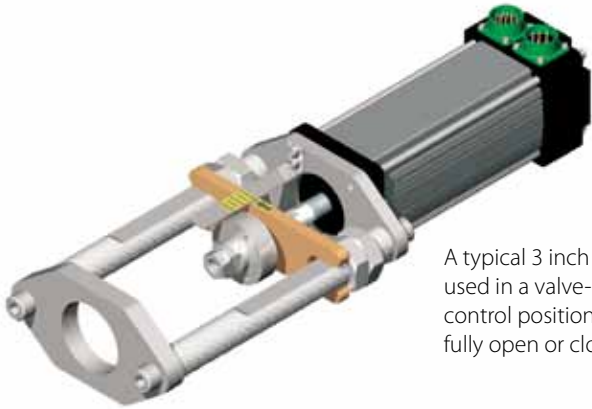
UL recognized component

## Exlar GSM Series Linear Actuators Applications Include:

- |                                |                            |                                |                             |
|--------------------------------|----------------------------|--------------------------------|-----------------------------|
| Hydraulic cylinder replacement | Medical equipment          | Indexing stages                | Precision valve control     |
| Ball screw replacement         | Conveyor diverters / gates | Lifts                          | Ventilation control systems |
| Pneumatic cylinder replacement | Plastics equipment         | Product sorting                | Pressing                    |
| Chip and wafer handling        | Cut-offs                   | Material cutting               | Process control             |
| Automated flexible fixturing   | Die cutters                | Material handling              | Tube bending                |
| Dispensers                     | Packaging machinery        | Riveting / fastening / joining | Welding                     |
| Machine tool                   | Entertainment              | Molding                        | Stamping                    |
| Automated assembly             | Sawmill equipment          | Volumetric pumps               | Test stands                 |
| Parts clamping                 | Open / close doors         | Semiconductor                  | Tension control             |
| Automatic tool changers        | Fillers                    | Pick and place systems         | Web guidance                |
| Volumetric pumps               | Formers                    | Robot manipulator arms         | Wire winding                |
|                                | Precision grinders         | Simulators                     |                             |



All-electric replacement for hydraulic cylinders improves throughput with servo control and less maintenance for core-pull cylinders.



A typical 3 inch stroke GSM Series actuator used in a valve-modulating application can control position to +/- .5% while ready to fully open or close in less than 200 mSec.

GSM-Series actuators can provide the precision at high force loads for fluid dispensing in a medical environment.

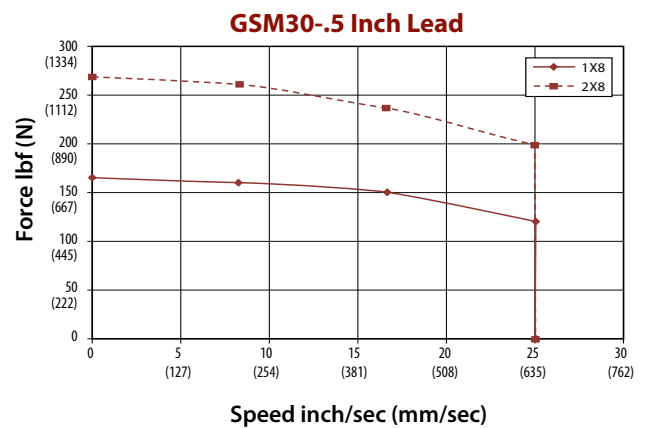
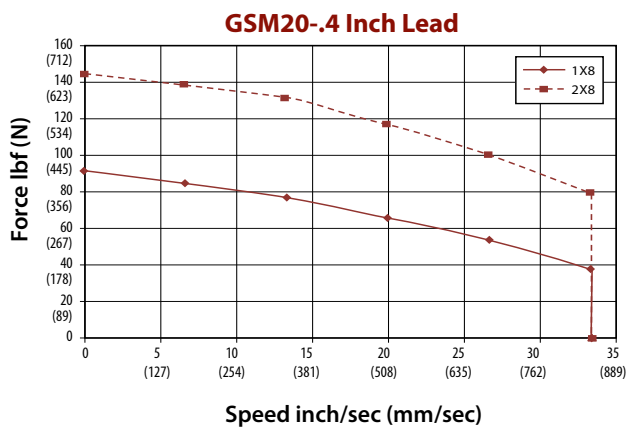
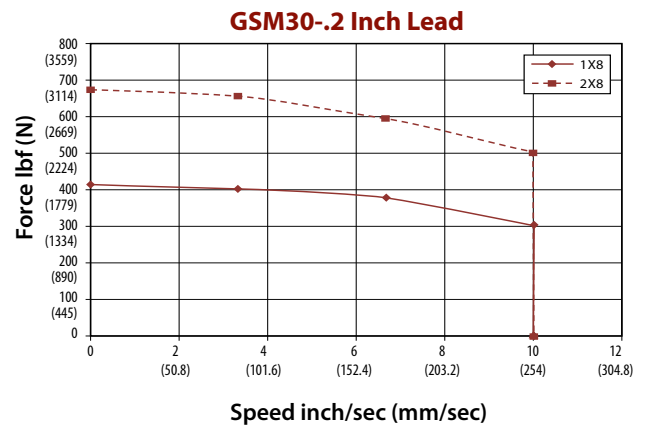
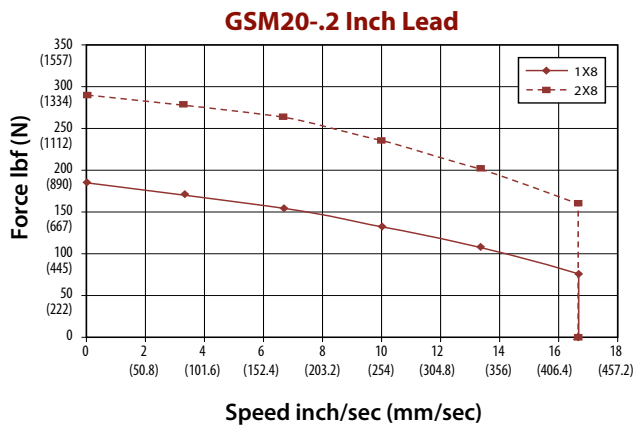
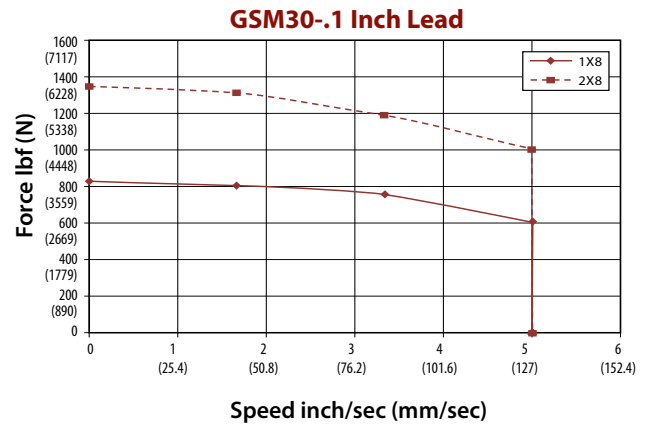
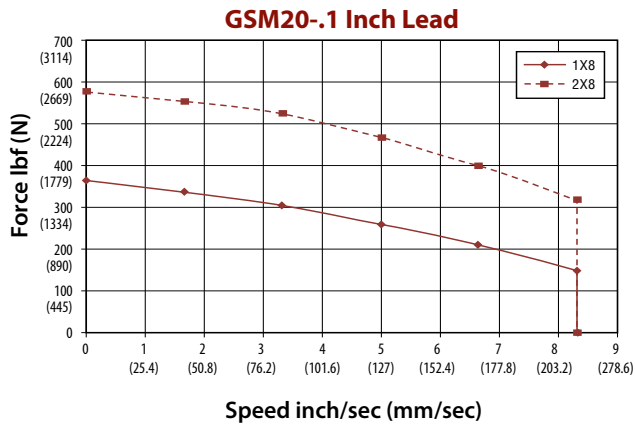




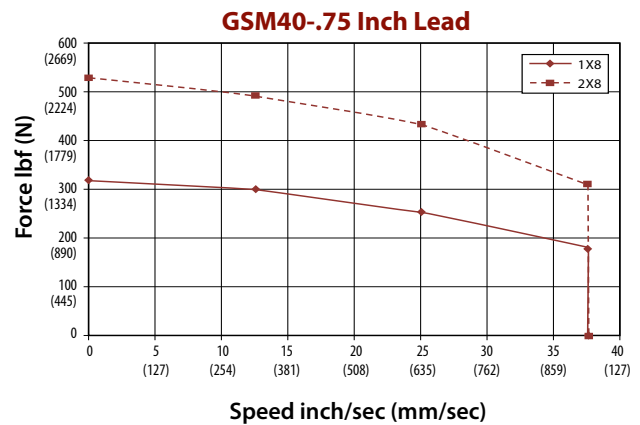
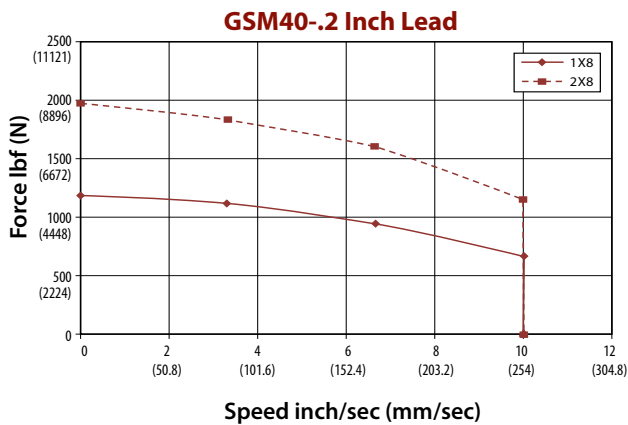
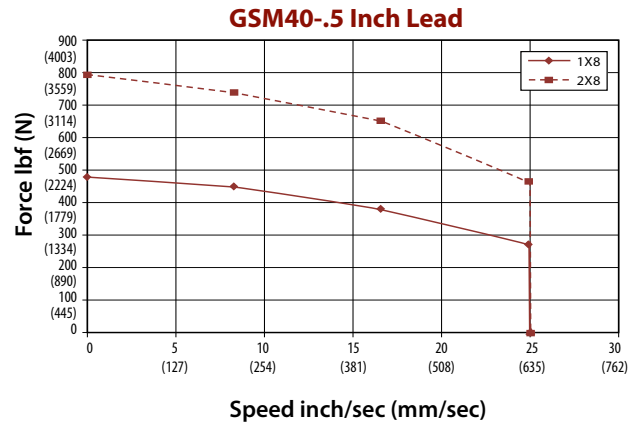
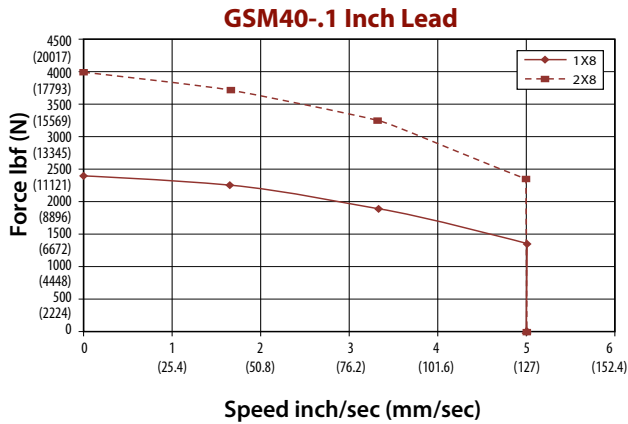
## GSM Series Performance

The below speed vs. force curves represent approximate continuous thrust ratings at indicated linear speed. Different types of servo amplifiers will offer varying motor torque and

thus actuator thrust. These values are at constant velocity and do not account for motor torque required for acceleration.



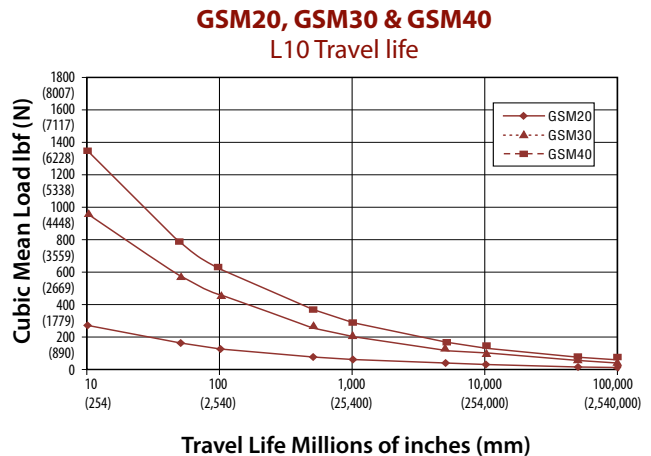
Test data derived using NEMA recommended aluminum heatsink 10" x 10" x 1/4" on GSM20 and 10" x 10" x 3/8" on GSM30



Test data derived using NEMA recommended aluminum heatsink 12" x 12" x 1/2" on GSM40

## Life Curves

The estimated travel life indicates the approximate expected travel life from the roller screw mechanism within the GSM30 at indicated cubic mean load. The chart below represents  $L_{10}$  travel life estimates. The reliability for these values is 90%. For higher than 90% reliability, the result should be multiplied by the following factors: 95% x 0.62; 96% x 0.53; 97% x 0.44; 98% x 0.33; 99% x 0.21. This information assumes that the roller screw is properly maintained and lubricated. The equation used to calculate the  $L_{10}$  life is:  $\text{Travel } (C/F)^3$  (lead) in millions of inches/mm. Where C = the dynamic load rating of the screw and F is the cubic mean load rating of the application. For higher than 90% reliability, derating of this value is implemented. Contact Exlar application engineering for details.



## GSM20 & GSM30 Performance Specifications

Model No.	Frame Size in (mm)	Stroke (nominal)* in (mm)	Screw Lead in (mm)	Continuous Force Rating	Max Velocity	Approx. Continuous Motor Torque	Maximum Static Load	Armature Inertia**	Dynamic Load Rating	Weight (approx.)
				lb (N) 1 stack/2 stack	in/sec (mm/sec)	1 stack/2 stack lb-in (N-m)				
GSM20-0301	2.25 (57)	3 (75)	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)	1568 (6970)	6.5 (2.9)
GSM20-0302			0.2 (5.08)	183/289 (814/1286)	16.77 (423.33)				1219 (5422)	
GSM20-0304			0.4 (10.16)	92/145 (409/645)	33.33 (846.67)				738 (3283)	
GSM20-0601	2.25 (57)	6 (150)	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)
GSM20-0602			0.2 (5.08)	183/289 (814/1286)	16.67 (423.33)				1219 (5422)	
GSM20-0604			0.4 (10.16)	92/145 (409/645)	33.33 (846.67)				738 (3283)	
GSM20-1001	2.25 (57)	10 (254)	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)
GSM20-1002			0.2 (5.08)	183/289 (814/1286)	16.67 (423.33)				1219 (5422)	
GSM20-1004			0.4 (10.16)	92/145 (409/645)	33.33 (846.67)				738 (3283)	
GSM20-1201	2.25 (57)	12 (300)	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)
GSM20-1202			0.2 (5.08)	183/289 (814/1286)	16.67 (423.33)				1219 (5422)	
GSM20-1204			0.4 (10.16)	92/145 (409/645)	33.33 (846.67)				738 (3283)	
GSM30-0301	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)
GSM30-0302			0.2 (5.08)	415/674 (1846/2998)	10 (254)				3570 (15880)	
GSM30-0305			0.5 (12.7)	166/269 (738/1197)	25 (635)				3016 (13416)	
GSM30-0601	3.3 (84)	5.9 (150)	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)
GSM30-0602			0.2 (5.08)	415/674 (1846/2998)	10 (254)				3570 (15880)	
GSM30-0605			0.5 (12.7)	166/269 (738/1197)	25 (635)				3016 (13416)	
GSM30-1001	3.3 (84)	10 (250)	0.1 (2.54)	829/1347 (3688/5992)	5 (127)	16.5/26.8 (1.86/3.03)	1620 (7206)	0.00416 (0.00047)	3310 (14724)	19 (8.6)
GSM30-1002			0.2 (5.08)	415/674 (1846/2998)	10 (254)				3570 (15880)	
GSM30-1005			0.5 (12.7)	166/269 (738/1197)	25 (635)				3016 (13416)	
GSM30-1201	3.3 (84)	12 (305)	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)
GSM30-1202			0.2 (5.08)	415/674 (1846/2998)	10 (254)				3570 (15880)	
GSM30-1205			0.5 (12.7)	166/269 (738/1197)	25 (635)				3016 (13416)	
GSM30-1801	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)
GSM30-1802			0.2 (5.08)	415/674 (1846/2998)	10 (254)				3570 (15880)	
GSM30-1805			0.5 (12.7)	166/269 (738/1197)	25 (635)				3016 (13416)	

\* Please note that stroke mm are nominal dimensions. \*\*Inertia +/- 5%

See page 43 for definition of terms.

## GSM40 Performance Specifications

Model No.	Frame Size in (mm)	Stroke (nominal)* in (mm)	Screw Lead in (mm)	Continuous Force Rating	Max Velocity	Approx. Continuous Motor Torque	Maximum Static Load	Armature Inertia**	Dynamic Load Rating	Weight (approx.)
				lb (N) 1 stack/2 stack	in/sec (mm/sec)	1 stack/2 stack lb-in (N-m)				
GSM40-0601	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)
GSM40-0602			0.2 (5.08)	1196/1983 (5320/8821)	10 (254)				4890 (21751)	
GSM40-0605			0.5 (12.7)	479/793 (2131/3527)	25 (635)				4218 (18763)	
GSM40-0608			0.75 (19.05)	319/529 (1419/2353)	37.5 (953)				3328 (14804)	
GSM40-0801	3.9 (99)	8 (200)	0.1 (2.54)	2393/3966/NA (10645/17642/NA)	5 (127)	47.6/78.9/NA (5.38/8.91/NA)	3966 (17642)	0.0163 (0.001842)	4736 (21067)	24 (10.9)
GSM40-0802			0.2 (5.08)	1196/1983/2692 (5320/8821/11975)	10 (254)	4890 (21751)				
GSM40-0805			0.5 (12.7)	479/793/1077 (2131/3527/4791)	25 (635)	4218 (18763)				
GSM40-0808			0.75 (19.05)	319/529/718 (1419/2353/3194)	37.5 (953)	3328 (14804)				
GSM40-1001	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)
GSM40-1002			0.2 (5.08)	1196/1983 (5320/8821)	10 (254)				4890 (21751)	
GSM40-1005			0.5 (12.7)	479/793 (2131/3527)	25 (635)				4218 (18763)	
GSM40-1008			0.75 (19.05)	319/529 (1419/2353)	37.5 (953)				3328 (14804)	
GSM40-1201	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)
GSM40-1202			0.2 (5.08)	1196/1983 (5320/8821)	10 (254)				4890 (21751)	
GSM40-1205			0.5 (12.7)	479/793 (2131/3527)	25 (635)				4218 (18763)	
GSM40-1208			0.75 (19.05)	319/529 (1419/2353)	37.5 (953)				3328 (14804)	
GSM40-1801	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 (19.9)
GSM40-1802			0.2 (5.08)	1196/1983 (5320/8821)	10 (254)				4890 (21751)	
GSM40-1805			0.5 (12.7)	479/793 (2131/3527)	25 (635)				4218 (18763)	

\* Please note that stroke mm are nominal dimensions. \*\*Inertia +/- 5%

See below for definition of terms.

### DEFINITION OF TERMS:

**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:** 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 GSM Series actuators. For calculation purposes, this value includes the screw inertia in a GSM actuator.

**Dynamic Load Rating:** A design constant used in calculating the estimated travel life of the roller screw. The cubic mean load is the load at which the device will perform one million revolutions.

## GSM20 Mechanical and Electrical Specifications

Nominal Backlash	in (mm)	0.008 (.20)							
Lead Accuracy	in/ft (mm/300 mm)	0.001 (.025)							
Maximum Radial Load	lb (N)	15 (67)							
Environmental Rating: Standard/Optional		IP54/IP65							
<b>Motor Stator</b>		<b>118</b>	<b>138</b>	<b>158</b>	<b>168</b>	<b>218</b>	<b>238</b>	<b>258</b>	<b>268</b>
<b>RMS SINUSOIDAL COMMUTATION</b>									
Continuous Motor Torque	lbf-in (Nm)	7.6 (0.86)	7.3 (0.83)	7.0 (0.79)	7.0 (0.79)	11.9 (1.35)	11.5 (1.30)	11.2 (1.27)	11.3 (1.28)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	2.5 (0.28)	5.2 (0.59)	8.3 (0.94)	9.5 (1.07)	2.5 (0.28)	5.2 (0.59)	8.9 (1.00)	10.2 (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
<b>TRAPEZOIDAL COMMUTATION</b>									
Continuous Motor Torque	lbf-in (Nm)	7.3 (0.82)	7.0 (0.79)	6.7 (0.76)	6.7 (0.76)	11.4 (1.29)	11.0 (1.24)	10.7 (1.21)	10.8 (1.22)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	1.9 (0.22)	4.1 (0.46)	6.5 (0.73)	7.4 (0.84)	1.9 (0.22)	4.1 (0.46)	6.9 (0.78)	7.9 (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
<b>MOTOR STATOR DATA</b>									
Voltage Constant (Ke) (+/- 10% @ 25°C)	Vrms/Krpm Vpk/Krpm	16.9	35.6	56.9	64.9	16.9	35.6	60.5	69.4
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 <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00012 (0.135)							
Brake Current @ 24 VDC	A	0.33							
Brake Holding Torque	lbf-in (Nm)	19 (2.2)							
Brake Engage/Disengage Time	ms	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 (N-m/krpm)	0.55 (0.06)							
Friction Torque	lbf-in (Nm)	1.00 (0.11)							
Bus Voltage	Vrms	115	230	400	460	115	230	400	460
Speed @ Bus Voltage	rpm	5000							
Insulation Class		180 (H)							

All ratings at 25 degrees Celsius  
 For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.  
 Test data derived using NEMA recommended aluminum heatsink 10" x 10" x 1/4"

Specifications subject to change without notice.

## GSM30 Mechanical and Electrical Specifications

Nominal Backlash	in (mm)	0.008 (.20)							
Lead Accuracy	in/ft (mm/300 mm)	0.001 (.025)							
Maximum Radial Load	lb (N)	20 (90)							
Environmental Rating: Standard/Optional		IP54/IP65							
<b>Motor Stator</b>		<b>118</b>	<b>138</b>	<b>158</b>	<b>168</b>	<b>218</b>	<b>238</b>	<b>258</b>	<b>268</b>
<b>RMS SINUSOIDAL COMMUTATION</b>									
Continuous Motor Torque	lbf-in (Nm)	16.6 (1.88)	16.5 (1.87)	15.7 (1.77)	15.7 (1.78)	26.8 (3.03)	26.8 (3.03)	26.7 (3.02)	26.7 (3.01)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	4.4 (0.49)	8.7 (0.99)	15.5 (1.75)	17.5 (1.98)	4.4 (0.49)	8.7 (0.99)	15.5 (1.75)	17.5 (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
<b>TRAPEZOIDAL COMMUTATION</b>									
Continuous Motor Torque	lbf-in (Nm)	15.9 (1.79)	15.8 (1.78)	14.9 (1.69)	15.0 (1.70)	25.6 (2.89)	25.6 (2.89)	25.5 (2.88)	25.5 (2.88)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	3.4 (0.39)	6.8 (0.77)	12.1 (1.37)	13.6 (1.54)	3.4 (0.39)	6.8 (0.77)	12.1 (1.37)	13.6 (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
<b>MOTOR STATOR DATA</b>									
Voltage Constant (Ke) (+/- 10% @ 25°C)	Vrms/Krpm Vpk/Krpm	29.9	59.7	106.0	119.5	29.9	59.7	106.0	119.5
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-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00033 (0.38)							
Brake Current @ 24 VDC	A	.5							
Brake Holding Torque	lbf-in (Nm)	70 (8)							
Brake Engage/Disengage Time	ms	19/29							
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 (N-m/krpm)	1.23 (0.14)							
Friction Torque	lbf-in (Nm)	2.00 (0.23)							
Bus Voltage	Vrms	115	230	400	460	115	230	400	460
Speed @ Bus Voltage	rpm	3000							
Insulation Class		180 (H)							

All ratings at 25 degrees Celsius  
 For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.  
 Test data derived using NEMA recommended aluminum heatsink 10" x 10" x 3/8"

Specifications subject to change without notice.

## GSM40 Mechanical and Electrical Specifications

Nominal Backlash	in (mm)	0.008 (.20)							
Lead Accuracy	in/ft (mm/300 mm)	0.001 (.025)							
Maximum Radial Load	lb (N)	30 (135)							
Environmental Rating: Standard/Optional		IP54/IP65							
<b>Motor Stator</b>		<b>118</b>	<b>138</b>	<b>158</b>	<b>168</b>	<b>218</b>	<b>238</b>	<b>258</b>	<b>268</b>
<b>RMS SINUSOIDAL COMMUTATION</b>									
Continuous Motor Torque	lbf-in (Nm)	47.6 (5.38)	47.6 (5.37)	44.7 (5.05)	45.5 (5.14)	78.9 (8.91)	78.9 (8.91)	78.8 (8.91)	79.7 (9.00)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	4.1 (0.46)	8.2 (0.93)	14.6 (1.65)	16.8 (1.90)	4.1 (0.46)	8.2 (0.93)	14.6 (1.65)	16.8 (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
<b>TRAPEZOIDAL COMMUTATION</b>									
Continuous Motor Torque	lbf-in (Nm)	45.5 (5.14)	45.4 (5.13)	42.7 (4.83)	43.5 (4.91)	75.3 (8.51)	75.3 (8.51)	75.3 (8.50)	76.1 (8.60)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	3.2 (0.36)	6.4 (0.72)	11.4 (1.28)	13.1 (1.48)	3.2 (0.36)	6.4 (0.72)	11.4 (1.28)	13.1 (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
<b>MOTOR STATOR DATA</b>									
Voltage Constant (Ke) (+/- 10% @ 25°C)	Vrms/Krpm Vpk/Krpm	28.1	56.1	99.5	114.8	28.1	56.1	99.5	114.8
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-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00096 (1.08)							
Brake Current @ 24 VDC	A	0.67							
Brake Holding Torque	lbf-in (Nm)	97 (11)							
Brake Engage/Disengage Time	ms	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 (N-m/krpm)	3.25 (0.37)							
Friction Torque	lbf-in (Nm)	4.50 (0.51)							
Bus Voltage	Vrms	115	230	400	460	115	230	400	460
Speed @ Bus Voltage	rpm	3000							
Insulation Class		180 (H)							

All ratings at 25 degrees Celsius  
 For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.  
 Test data derived using NEMA recommended aluminum heatsink 12" x 12" x 1/2"

Specifications subject to change without notice.

## GSM Series Travel Options

### PF = Preloaded Follower

This option offers a true zero backlash follower for the GSM Series actuator. The dynamic load rating of zero backlash, preloaded screws is 63% of the dynamic load rating of the standard non-preloaded screws. The calculated travel life of a preloaded screw will be 25% of the calculated travel life of the same size and lead of a non-preloaded screw for the same application. Preloaded follower is not available with LT Linear feedback option.

### AR = External Anti-rotate Assembly

This option provides a rod and bushing to restrict the actuator rod from rotating when the load is not held by another method. Shorter actuators have single sided anti-rotation attachments. Longer lengths require attachments on both sides for proper operation. For AR dimensions, see page 22.

### RB = Rear Electric Brake

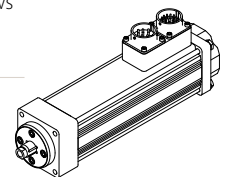
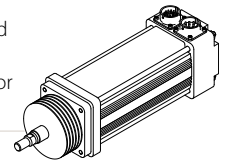
This option provides an internal holding brake for the GSM Series actuators. The brake is spring activated and electrically released.

### XT = Special Travel Option Selections

The XT Option can be used to specify various special travel options on the GSM Series of Linear Actuators. Because this option can be used to specify many things, it is important that an order including the -XT option spell out in detail, the exact options being selected by the including of the -XT in the model number.

It is recommended that prior to ordering an actuator including the -XT specifier that a quote be obtained through Exlar's special products application engineers for the desired options, and that quote be referenced on, or included with any order placed.

DESCRIPTIONS	
<b>Protective Bellows</b>	This option provides an accordion style protective bellows to protect the main actuator rod from damage due to abrasives or other contaminants in the environment in which the actuator must survive. The standard material of this bellows is S2 Neoprene Coated Nylon, Sewn Construction. This standard bellows is rated for environmental temperatures of -40 to 250 degrees F. Longer strokes may require the main rod of the actuator to be extended beyond standard length. Consult Exlar applications engineers for details.
<b>High Temp Protective Bellows</b>	This option provides an accordion style protective bellows to protect the main actuator rod from damage due to abrasives or other contaminants in the environment in which the actuator must survive. The high temperature material of this bellows is D1 Teflon Coated Fiberglass, Sewn Construction. This standard bellows is rated for environmental temperatures of -67 to 500 degrees F. Longer strokes may require the main rod of the actuator to be extended beyond standard length. Consult Exlar applications engineers for details.
<b>Splined Main Rod</b>	This option provides a main rod manufactured of ball spline shafting, and the front seal and bushing assembly replaced with a ball spline nut to provide the anti-rotate function without using an external mechanism. Rod diameters are the closest metric equivalents to standard Exlar rod sizes. This option is <b>NOT</b> sealed in any way. This option is not suitable for any environment in which contaminants come in contact with the actuator, and may enter the actuator.



### L1, L2, L3 = Adjustable External Travel Switches

This option allows up to 3 external switches to be included with the GSM Series Actuator. These switches provide travel indication to the controller and are adjustable. See drawing on page 53.

Must purchase external anti-rotate with this option.

### XL = Non-Standard Lubrication

This option provides for indication in the model number that the customer has specified a lubrication other than the standard provided by Exlar.



## Motor Speed Designators

All Exlar T-LAM™ motors and actuators carry a standard motor speed designator as defined below. This is representative of the standard base speed of the motor, for the selected bus voltage.

If the model number is created and the location for the motor speed designator is left blank, this is the base speed to which each motor will be manufactured. The model number can also be created including this standard speed designator.

Designator	Base Speed	Actuator/Motor Series
-50	5000 rpm	GSM20
-30	3000 rpm	GSM30, GSM40
01-99	Special Speed, Consult Exlar	

Exlar also provides the flexibility to manufacture all of its T-LAM products with special base speeds to match the customer's exact application requirements. This may be a higher than standard speed motor, or lower base speed than standard which will allow the customer to get the required torque, at a speed optimized to their application, and use the minimum amount of current from their amplifier.

The call out for a special speed is configured in the model number by using a two digit code from 01-99. These numbers represent the number, in hundreds, of RPM that will be the base speed for the particular motor.

For example, an GSM30-0301-MFM-EM2-138-30 motor that normally has a 3000 rpm standard winding, can be changed to a 3300 rpm winding by changing the -30, to a -33. It can be changed to a 5000 rpm winding by changing the -30 to a -50.

Changing this speed designator will change the ratings of the motor, and these must be obtained from Exlar applications engineers. Also, it is not possible to produce every possible speed from -01 to -99 for each motor at each voltage so please contact Exlar applications engineers for confirmation of the speed that is desired for the application.

## Feedback Options

### LT = ICT including signal conditioner

This option provides for an actuator containing an internally mounted ICT transducer spanning the full stroke of the actuator. Inquire with Exlar engineering for details and signal conditioner output preference. LT is not available with absolute feedback.

Due to the variability in size of some feedback devices, especially absolute feedback devices which are often very large relative to the size of the actuator motor, the actual size of the actuator may differ in length and width from these drawings for feedback types other than standard resolvers and standard encoders. Please consult Exlar for details. In the event that you order an actuator that differs from these standard dimensions, you will be sent a drawing of the final configuration of your actuator for approval.

## Motor Options

GSM motor options are described with a 3 digit code. The first digit calls out the stack length, the second the rated bus voltage, and the third the number of poles of the motor. Refer to the mechanical/electrical specifications for motor torque and actuator rated force.

<b>118 =</b>	1 stack	115 Vrms	8 Pole	Class 180 H
<b>138 =</b>		230 Vrms		
<b>158 =</b>		400 Vrms		
<b>168 =</b>		460 Vrms		
<b>218 =</b>	2 stack	115 Vrms	8 Pole	Class 180 H
<b>238 =</b>		230 Vrms		
<b>258 =</b>		400 Vrms		
<b>268 =</b>		460 Vrms		

Note: 3 stack not available in GSM Series

## Rod End Attachments

**Rear Clevis Pin Rod Eye**      **Spherical Rod Eye Rod Clevis**

See drawings on pages 52-53.

Attachments ordered separate from actuator.

## Housing Options

**P5 = IP65 Sealing Option**

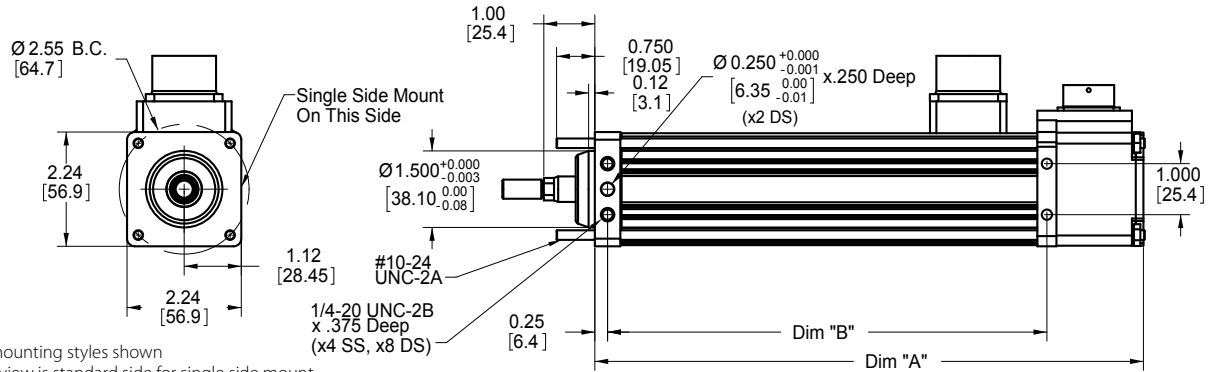
**HC = Type III Hard Coat Anodized, Class I**

This option provides an actuator with type III hard coat anodized coating. Class I, no dye.

**XH = Special Housing Option**

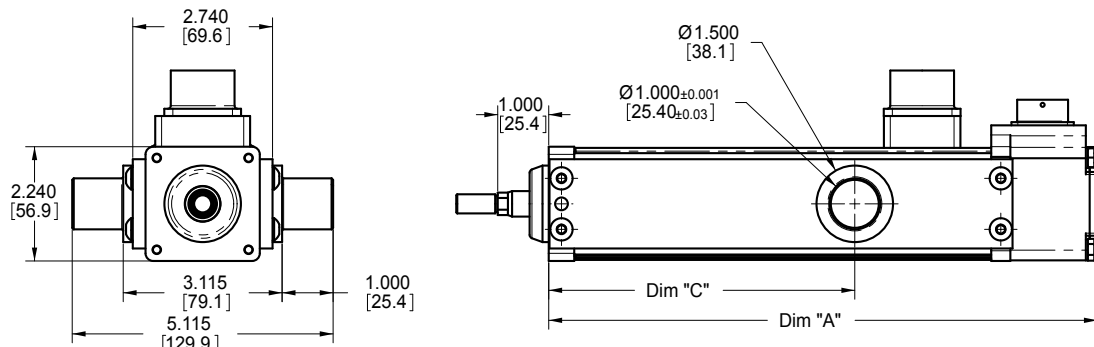
Any housing option that is not designated by the above codes should be listed as XH and described at time of order. All special options must be discussed with Exlar engineering.

### GSM20 Single, Double Side Mounts or Extended Tie Rod Mount



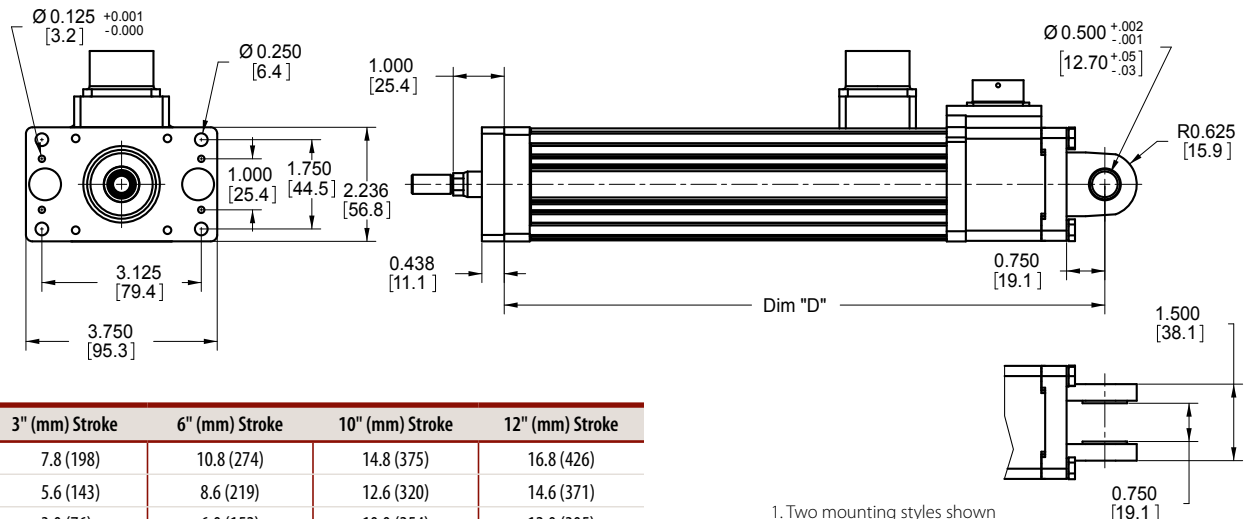
- 1. Three mounting styles shown
- 2. Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M5 x 0.8
- \* If "J" or "K" metric side mount options, M6 x 1.0 ⚓ 9 mm with Ø 6 mm M7 ⚓ 9 mm Dowel Hole

### GSM20 Side Trunnion Mount



\* If "Q" metric side trunnion option, Ø 25 mm h7

### GSM20 Rear Clevis Mount or Front Flange Mount



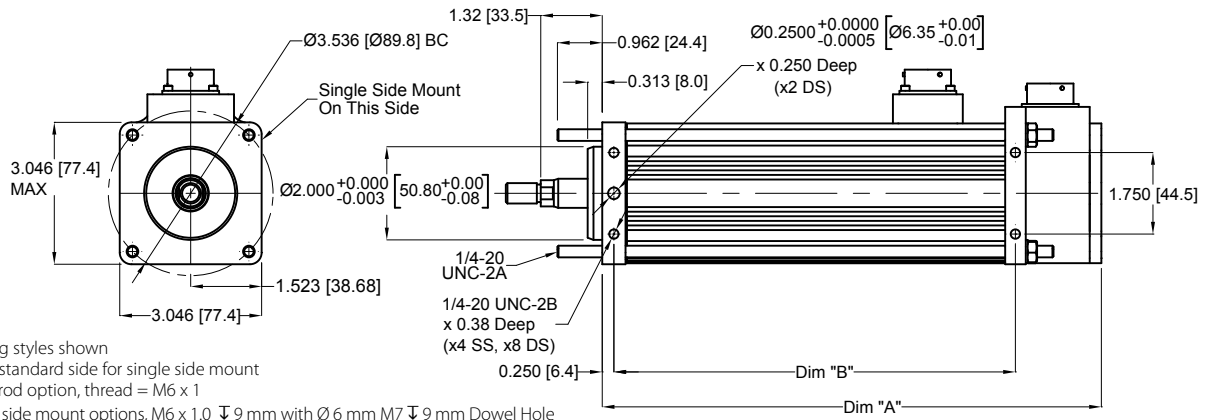
Dim	3" (mm) Stroke	6" (mm) Stroke	10" (mm) Stroke	12" (mm) Stroke
A	7.8 (198)	10.8 (274)	14.8 (375)	16.8 (426)
B	5.6 (143)	8.6 (219)	12.6 (320)	14.6 (371)
C	3.0 (76)	6.0 (152)	10.0 (254)	12.0 (305)
D	8.8 (223)	11.8 (299)	15.8 (401)	17.8 (452)

- 1. Two mounting styles shown
- 2. With flange mount, dimension A is equivalent to top two drawings

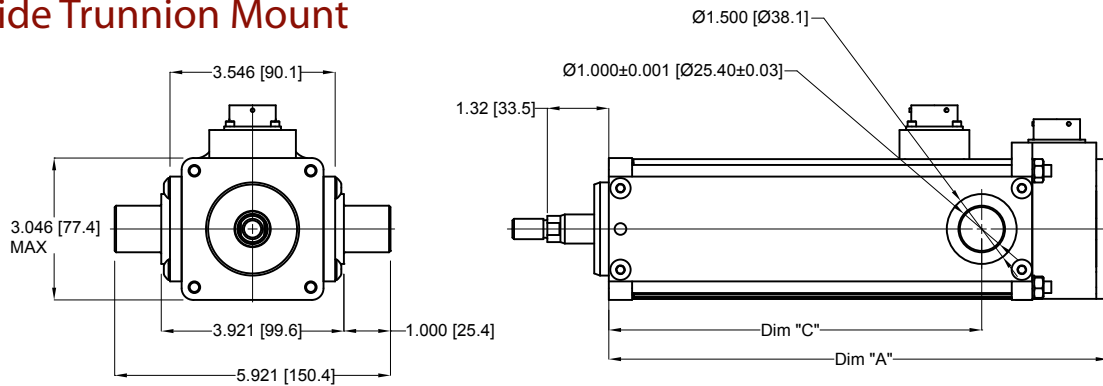
Note: Add 1.784 Inches to Dims "A & D" if ordering a Brake

Due to the size of many absolute encoders, the selection of such feedback types for the size 20 and 30 actuators results in a larger package size than is shown in the drawings. Consult Exlar for details, or refer to the drawings provided after receipt of order.

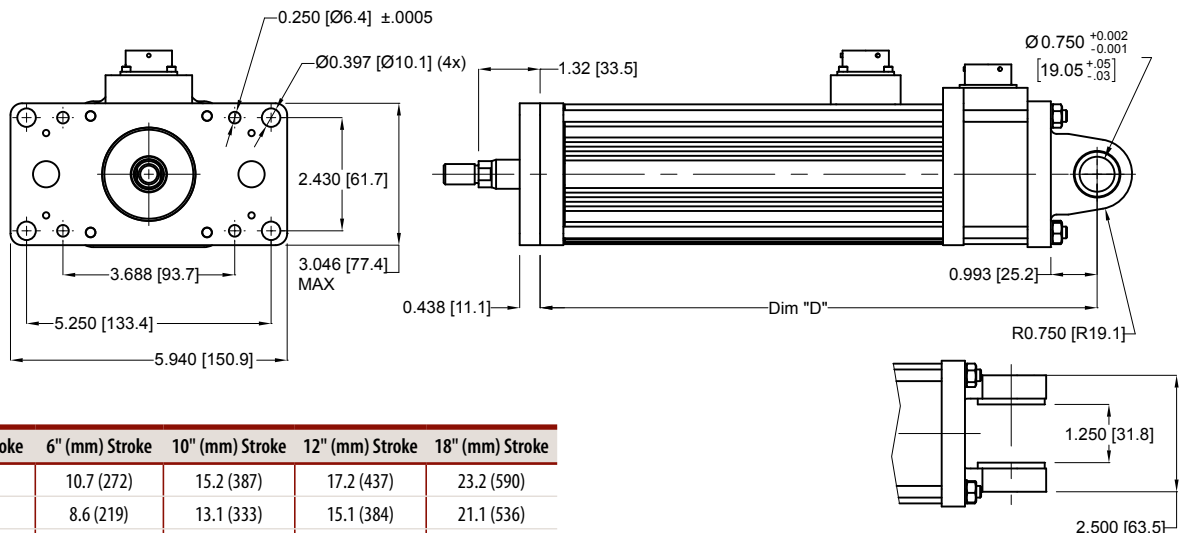
## GSM30 Single, Double Side Mounts or Extended Tie Rod Mount



## GSM30 Side Trunnion Mount



## GSM30 Rear Clevis Mount or Front Flange Mount



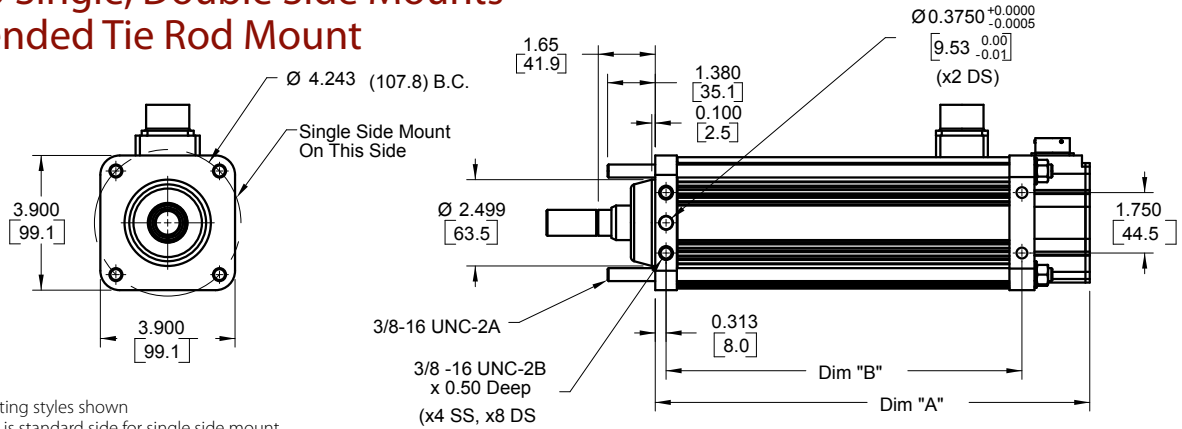
Dim	3" (mm) Stroke	6" (mm) Stroke	10" (mm) Stroke	12" (mm) Stroke	18" (mm) Stroke
A	8.2 (209)	10.7 (272)	15.2 (387)	17.2 (437)	23.2 (590)
B	6.1 (156)	8.6 (219)	13.1 (333)	15.1 (384)	21.1 (536)
C	5.4 (137)	8.0 (203)	10.0 (254)	12.0 (305)	18.0 (457)
D	9.5 (241)	12.0 (304)	16.5 (418)	18.5 (469)	24.5 (621)

Note: Add 1.6 Inches (40.64 mm) to Dims "A" & "D" if ordering a Brake.

Drawings subject to change.  
 Consult Exlar for certified drawings.

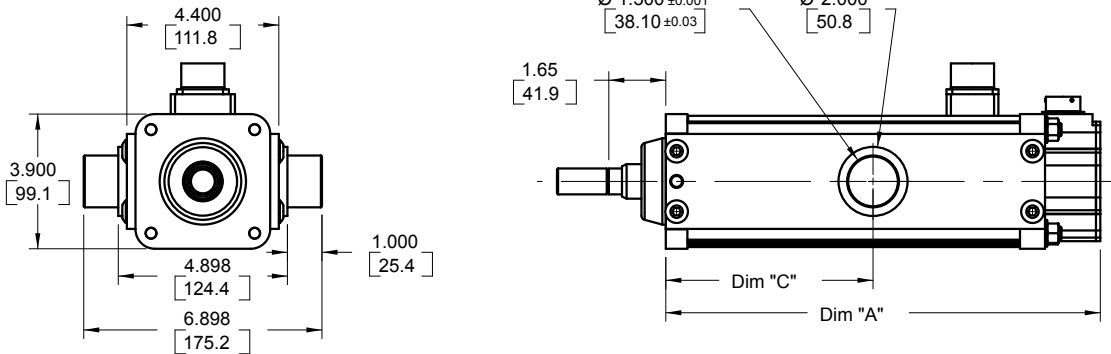
Due to the size of many absolute encoders, the selection of such feedback types for the size 20 and 30 actuators results in a larger package size than is shown in the drawings. Consult Exlar for details, or refer to the drawings provided after receipt of order.

## GSM40 Single, Double Side Mounts or Extended Tie Rod Mount



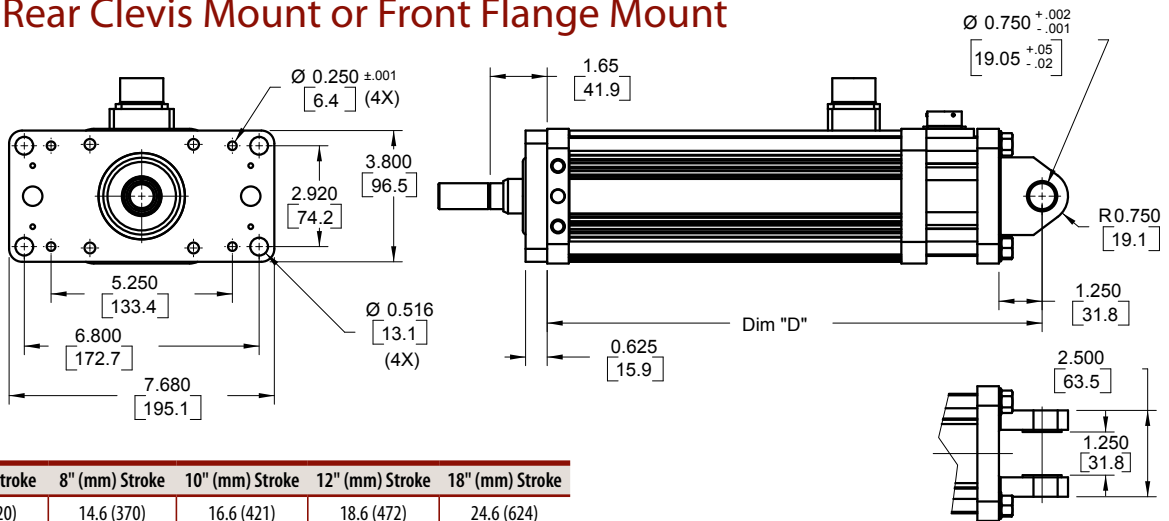
- Three mounting styles shown
  - Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M8 x 1.25  
 \* If "J" or "K" metric side mount options, M10 x 1.5  $\nabla$  19 mm with  $\varnothing$  8 mm M7  $\nabla$  12 mm Dowel Hole

## GSM40 Side Trunnion Mount



\* If "Q" metric side trunnion option,  $\varnothing$  35 mm h7

## GSM40 Rear Clevis Mount or Front Flange Mount



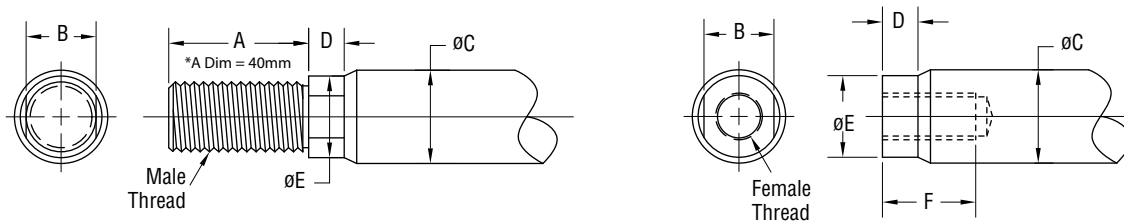
Dim	6" (mm) Stroke	8" (mm) Stroke	10" (mm) Stroke	12" (mm) Stroke	18" (mm) Stroke
A	12.6 (320)	14.6 (370)	16.6 (421)	18.6 (472)	24.6 (624)
B	10.3 (262)	12.3 (313)	14.3 (364)	16.3 (414)	22.3 (567)
C	6.0 (152)	8.0 (203)	10.0 (254)	12.0 (305)	18.0 (457)
D	14.3 (364)	16.3 (415)	18.3 (466)	20.3 (516)	26.3 (669)

Note: Add 2.33 Inches (59.18 mm) to Dims "A" & "D" if ordering a Brake (p. 30).

Drawings subject to change. Consult Exlar for certified drawings.

- Two mounting styles shown
- With flange mount, dimension A is equivalent to top two drawings

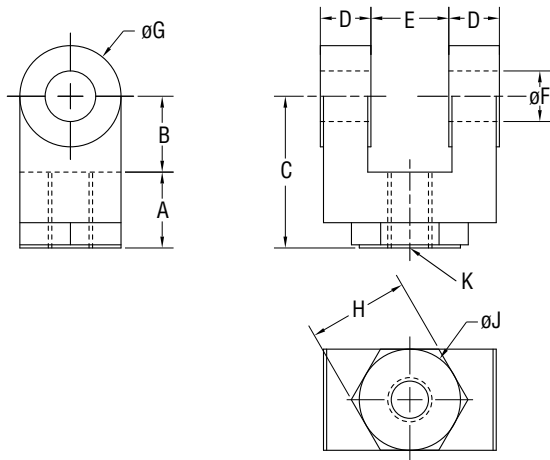
## Actuator Rod End Options



	A	B	ØC	D	ØE	F	Male U.S.	Male Metric	Female U.S.	Female Metric
<b>GSM20</b> in (mm)	0.813 (20.7)	0.375 (9.5)	0.500 (12.7)	0.200 (5.1)	0.440 (11.2)	0.750 (19.1)	3/8 – 24 UNF – 2A	M8 x 1.6g	5/16 – 24 UNF – 2B	M8 x 1.6h
<b>GSM30</b> in (mm)	0.750 (19.1)	0.500 (12.7)	0.625 (15.9)	0.281 (7.1)	0.562 (14.3)	0.750 (19.1)	7/16 – 20 UNF – 2A	M12 x 1.75* 6g	7/16 – 20 UNF – 2B	M10 x 1.5 6h
<b>GSM40</b> in (mm)	1.500 (38.1)	0.750 (19.1)	1.000 (25.4)	0.381 (9.7)	0.875 (22.2)	1.000 (25.4)	3/4 – 16 UNF – 2A	M16 x 1.5 6g	5/8 – 18 UNF – 2B	M16 x 1.5 6h

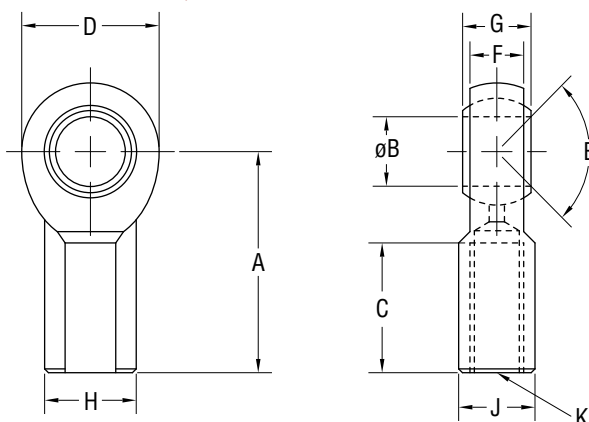
Part numbers for rod attachment options indicate the through hole size or pin diameter. Before selecting a spherical rod eye for use with a GSM series actuator, please consult the information on the anti-rotation option for the GSM actuators. Spherical rod eyes will allow the rod to rotate if the load is not held.

## Rod Clevis Dimensions



in (mm)	GSM20 RC038	GSM30 RC050	GSM40 RC075
<b>A</b>	0.787 (20)	0.75 (19.1)	1.125 (28.58)
<b>B</b>	0.787 (20)	0.75 (19.1)	1.25 (31.75)
<b>C</b>	1.574 (40)	1.50 (38.1)	2.375 (60.3)
<b>D</b>	.575 (14.6)	0.50 (12.7)	0.625 (15.88)
<b>E</b>	0.375 (9.5)	0.765 (19.43)	1.265 (32.13)
<b>ØF</b>	0.375 (9.5)	0.50 (12.7)	0.75 (19.1)
<b>ØG</b>	0.75 (19.1)	1.00 (25.4)	1.50 (38.1)
<b>H</b>	NA	1.00 (25.4)	1.25 (31.75)
<b>ØJ</b>	NA	1.00 (25.4)	1.25 (31.75)
<b>K</b>	3/8-24	7/16-20	3/4-16

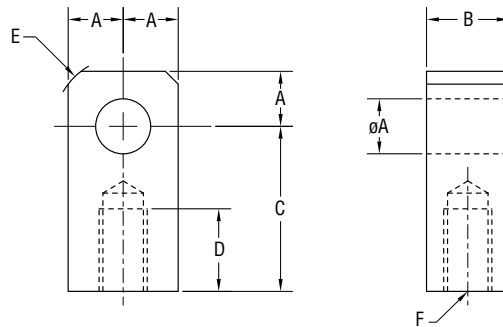
## Spherical Rod Eye Dimensions



in (mm)	GSM20 SRM038	GSM30 SRM044	GSM40 SRM075
<b>A</b>	1.625 (41.3)	1.81 (46.0)	2.88 (73.2)
<b>ØB</b>	.375 (9.525)	0.438 (11.13)	0.75 (19.1)
<b>C</b>	.906 (23.0)	1.06 (26.9)	1.72 (43.7)
<b>D</b>	1.0 (25.4)	1.13 (28.7)	1.75 (44.5)
<b>E</b>	6 deg	14 deg	14 deg
<b>F</b>	.406 (10.3)	0.44 (11.1)	0.69 (17.5)
<b>G</b>	.500 (12.7)	0.56 (14.2)	0.88 (22.3)
<b>H</b>	.688 (17.4)	0.75 (19.1)	1.13 (28.7)
<b>J</b>	.562 (14.3)	0.63 (16.0)	1.00 (25.4)
<b>K</b>	3/8-24	7/16-20	3/4-1

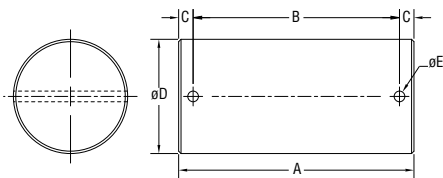
Drawings subject to change. Consult Exlar for certified drawings.

## Rod Eye Dimensions



in (mm)	GSM30 RE050	GSM40 RE075
ØA	0.50 (12.7)	0.75 (19.1)
B	0.75 (19.1)	1.25 (31.8)
C	1.50 (38.1)	2.06 (52.3)
D	0.75 (19.1)	1.13 (28.7)
E	0.63 (16.0)	0.88 (22.3)
F	7/16 - 20	3/4 - 16

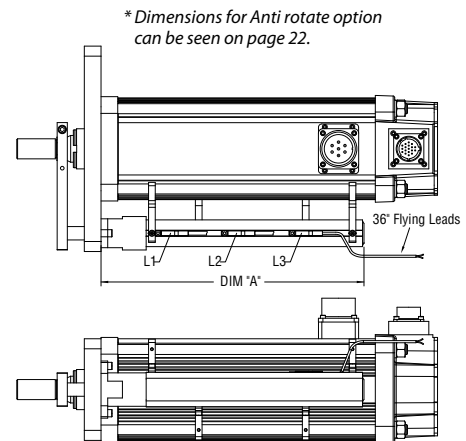
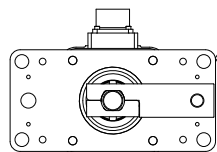
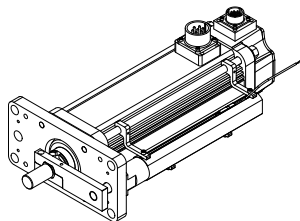
## Rod Clevis Pin Dimensions



in (mm)	A	B	C	ØD	ØE
<b>GSM20 Clevis or GSM30 Rod Eye CP050</b>	2.28 (57.9)	1.94 (49.28)	0.17 (4.32)	0.50" +0.000/-0.002 (12.7 mm +0.00/-0.05)	0.106 (2.69)
<b>GSM30 Clevis GSM40 Clevis CP075</b>	3.09 (78.5)	2.72 (69.1)	0.19 (4.82)	0.75" +0.000/-0.002 (19.1 mm +0.00/-0.05)	0.14 (3.56)

## GSM20, GSM30 and GSM40 External Limit Switch Extension Options

Dim A	3 in (mm) stroke	6 in (mm) stroke	10 in (mm) stroke	12 in (mm) stroke	18 in (mm) stroke
<b>GSM20</b>	5.515 (140.1)	8.515 (216.3)	12.5 (317.5)	14.515 (368.7)	NA
<b>GSM30</b>	6.932 (176.1)	9.832 (249.7)	13.832 (351.3)	15.832 (402.1)	21.832 (554.5)
<b>GSM40</b>	NA	9.832 (249.7)	13.832 (351.3)	15.832 (402.1)	21.832 (554.5)



The external limit switch option (requires anti-rotate option) for the GSM Series of linear actuators provides the user with 1, 2 or 3 externally mounted adjustable switches for use as the end of travel limit switches or home position sensors.

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 which logic operation will be provided for each switch, based on the option ordered.

Option	SW1	SW2	SW3
<b>L1</b>	Not Supplied	Normally Open	Not Supplied
<b>L2</b>	Normally Closed	Not Supplied	Normally Closed
<b>L3</b>	Normally Closed	Normally Open	Normally Closed

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

Drawings subject to change. Consult Exlar for certified drawings.

## AA = GSM Actuator Size (nominal)

- 20 = 2 in (60 mm) frame
- 30 = 3 in (80 mm) frame
- 40 = 4 in (100 mm) frame

## BB = Stroke Length

- 03 = 3 in (75 mm) GSM20 and GSM30
- 06 = 6 in (150 mm) all GSM30 = 5.9 in (150 mm)
- 08 = 8 in (200 mm) GSM40
- 10 = 10 in (250 mm) GSM20, GSM30 and GSM40
- 12 = 12 in (300 mm) GSM20, GSM30 and GSM40
- 18 = 18 in (450 mm) GSM30 and GSM40

## CC = Lead

- 01 = 0.1 inch (all models)
- 02 = 0.2 inch (all models)
- 04 = 0.4 inch (GSM20)
- 05 = 0.5 inch (GSM30 and GSM40)
- 08 = 0.75 inch (GSM40)<sup>3</sup>

## D = Connections

- M = Manufacturer's connector<sup>1</sup>
- I = Exlar standard M23 style
- A = MS style (anodized)
- D = MS style (electroless nickel)
- B = Embedded leads 3 ft. std.
- P = Embedded leads w/plug 3 ft. standard w/"A" plug
- J = Embedded leads w/"I" plug, 3 ft. std
- X = Special (please specify)

## E = Mounting

- B = Front and rear flange
- C = Rear clevis
- F = Front flange
- R = Rear flange
- S = Side mount
- D = Double side mount
- T = Side trunnion
- E = Extended tie rods
- J = Metric side mount
- K = Metric double side mount
- Q = Metric side trunnion
- M = Metric extended tie rods
- G = Metric rear clevis
- Z = Clevis mount with same pin to pin as SR Series
- X = Special (please specify)

## F = Rod End

- M = Male, US std. thread
- A = Male, metric thread
- F = Female, US std. thread
- B = Female, metric thread
- W = Male, US std. thread 17-4 SS
- R = Male metric thread 17-4 SS
- V = Female, US std. thread 17-4 SS
- L = Female, metric thread 17-4 SS
- X = Special (please specify)

## GGG = Feedback Type (Also specify the Amplifier/Drive Model being used when ordering)

- Standard Incremental Encoder – 2048 line (8192 cts) per rev. index pulse, Hall commutation, 5vdc
- Standard Resolver – Size 15, 1024 line (2048 cts) per rev. two pole resolver
- Motor files for use with select Emerson/CT, Rockwell /AB and Danaher/Kollmorgen Drives are available at [www.exlar.com](http://www.exlar.com)
- Custom Feedback:** Please consult application engineering:
- XX1 = Wiring and feedback device information must be provided and new feedback callout will be created

## Allen-Bradley/Rockwell: (Actuators used with Kinetix and/or Sercos based control systems require a 3rd party motion database purchased from AB/Rockwell. Please contact your AB/Rockwell representative for support.)

- AB5 = Stegmann SRM050 Hiperface multi-turn absolute encoder - MPL 100mm or higher motor wiring w/MS connectors for 'M' option – Plug & Play feedback option
- AB6 = Standard Resolver
- AB7 = Standard Incremental Encoder – MPL 100mm or higher motor wiring w/MS connectors for 'M' option
- AB8 = Standard Incremental Encoder – MPL 75mm or less motor wiring w/M23 euro connectors for 'M' option
- AB9 = Hiperface Stegmann SRM050 multi-turn absolute encoder - MPL 75mm or less motor wiring w/M23 euro connectors for 'M' option – Plug & Play feedback option
- ABA = Hiperface Stegmann SKM036 multi-turn absolute encoder – MPL 215mm or higher motor wiring w/MS connectors for 'M' option – 460V Stator only – Plug & Play feedback option
- ABB = Hiperface Stegmann SKM036 multi-turn absolute encoder – MPL 75mm or less motor wiring w/M23 euro connectors for 'M' option – 460V Stator only – Plug & Play feedback option

## AMKASYN:

- AK1 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – DS motor wiring w/M23 euro connectors for 'M' option
- AK2 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – DS motor wiring w/M23 euro connectors for 'M' option

## Advanced Motion Control:

- AM1 = Standard Incremental Encoder
- AM2 = Encoder 1000 line, w/commutation, 5 VDC
- AM3 = Standard Resolver
- AM5 = Encoder 5000 line, w/commutation, 5 VDC

## API Controls:

- AP1 = Standard Resolver
- AP2 = Standard Incremental Encoder

## Aerotech:

- AR1 = Encoder 5000 line, w/commutation, 5 VDC
- AR2 = Standard Incremental Encoder

## ABB Robot:

- BB1 = LTN Resolver

## Baldor:

- BD2 = Standard Resolver – BSM motor wiring w/M23 connectors for 'M' option
- BD3 = Standard Incremental Encoder – BSM motor wiring w/M23 connectors for 'M' option

## Beckhoff:

- BE1 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – AM2XX motor wiring w/M23 euro connectors for 'M' option

## Baumuell:

- BM2 = Standard Resolver

## B&R Automation:

- BR1 = Standard Resolver
- BR2 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – 8LS/8LM motor wiring w/M23 euro connectors for 'M' option

## Comau Robot:

- CM1 = Standard Resolver

## Copley Controls:

- CO1 = Standard Incremental Encoder
- CO2 = Standard Resolver

## Control Techniques/Emerson:

- CT1 = Hiperface Stegmann SRM050 multi-turn absolute encoder – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option
- CT3 = Hiperface Stegmann SKM036 multi-turn absolute encoder – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option
- CT4 = Standard Incremental Encoder – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option
- CT5 = Standard Resolver – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option
- CT7 = Encoder 5000 line, with commutation, 5 VDC – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option

## Delta Tau Data Systems:

- DT1 = Encoder 1000 line, with commutation, 5 VDC
- DT2 = Standard Resolver

## Elmo Motion Control:

- EL1 = Standard Resolver
- EL2 = Standard Incremental Encoder
- EL3 = EnDat Heidenhain EQN1125 multi-turn absolute encoder

## Emerson/Control Techniques:

- EM2 = Standard Incremental Encoder – NT motor wiring w/MS connectors for 'M' option
- EM5 = Encoder 5000 line, with commutation, 5 VDC – NT motor wiring w/MS connectors for 'M' option

## Elau:

- EU1 = Hiperface Stegmann SRM050 multi-turn absolute encoder – SH motor wiring w/MS connectors for 'M' option
- EU4 = Hiperface Stegmann SKM036 multi-turn absolute encoder – SH motor wiring w/MS connectors for 'M' option

## Exlar:

- EX4 = Standard Resolver

## Fanuc Pulsecode:

Consult Exlar

## G&L Motion Control/Danaher Motion:

- GL1 = Std Incremental Encoder – HSM motor wiring w/ MS connectors for 'M' option
- GL2 = Std Incremental Encoder – LSM-MSM motor wiring w/M23 euro connectors for 'M' option

GL3 = Standard Incremental Encoder – NSM motor wiring w/MS connectors for 'M' option  
 GL4 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – AKM motor wiring w/M23 euro connectors for 'M' option

**Infranor:**

IF1 = Standard Resolver

**Indramat/Bosch-Rexroth:**

IN6 = Standard Resolver – MKD/MHD motor wiring w/M23 euro connectors for 'M' option  
 IN7 = Hiperface Stegmann SKM036 multi-turn absolute encoder – MSK motor wiring w/M23 euro connectors for 'M' option – plug & play option

**Jetter Technologies:**

JT1 = Standard Resolver – JH/JL motor wiring w/M23 euro connectors for 'M' option

**Kollmorgen/Danaher:**

KM4 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – AKM motor wiring w/M23 euro connectors for 'M' option  
 KM5 = Standard Resolver – AKM motor wiring w/M23 euro connectors for 'M' option  
 KM6 = Standard Incremental Encoder – AKM motor wiring w/ M23 euro connectors for 'M' option

**Kuka Robot:**

KU1 = Tyco Size 21 Resolver

**Kawasaki Robot:**

KW1 = Kawasaki Special Encoder

**Lenze/AC Tech:**

LZ1 = Hiperface Stegmann SRM050 multi-turn absolute encoder – MCS motor wiring w/M23 euro connectors for 'M' option  
 LZ5 = Std Resolver – MCS motor wiring w/ M23 euro connectors for 'M' option  
 LZ6 = Std Incremental Encoder – MCS motor wiring w/ M23 euro connectors for 'M' option

**Matuschek:**

MC1 = LTN Resolver

**Metronix:**

MX1 = Standard Resolver  
 MX2 = Hiperface Stegmann SKM036 multi-turn absolute encoder  
 MX3 = EnDat Heidenhain EQN1125 multi-turn absolute encoder

**Mitsubishi:**

MT1 = Mitsubishi Absolute Encoder – HF-SP motor wiring with 'M' option

**Modicon:**

MD1 = Standard Resolver

**Momentum:**

MN1 = Hyperface Stegmann SRM050 multi-turn absolute encoder – MN motor wiring w/M23 connectors for 'M' option  
 MN2 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – MN motor wiring connectors for 'M' option  
 MN3 = Std incremental encoder – MN motor wiring w/M23 connectors for 'M' option  
 MN4 = Std resolver – MN motor wiring w/M23 connectors for 'M' option

**Moog:**

MG1 = Standard Resolver

**Motoman Robot:**

MM1 = Yaskawa Serial Encoder

**Nachi Robot:**

NC1 = Tamagawa Serial Encoder

**Ormec:**

OR1 = Standard Resolver  
 OR2 = Std Incremental Encoder – G series motor wiring w/ MS connectors for 'M' option

**Parker Compumotor:**

PC6 = Std Incremental Encoder – SMH motor wiring w/M23 connectors for 'M' option – European only  
 PC7 = Std Resolver – SMH motor wiring w/M23 connectors for 'M' option – European only  
 PC8 = Std Incremental Encoder – MPP series motor wiring w/PS connectors for 'M' option – US Only  
 PC9 = Hiperface Stegmann SRM050 multi-turn absolute encoder – MPP motor wiring w/PS connectors for 'M' option – US Only  
 PC0 = Standard Resolver – MPP motor wiring w/PS connectors for 'M' option – US Only

**Pacific Scientific:**

PS2 = Standard Incremental Encoder  
 PS3 = Standard Resolver – PMA motor wiring w/M23 connectors for 'M' option

**Stober Drives:**

SB3 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – ED/EK motor wiring w/M23 euro connectors for 'M' option

**Siemens:**

SM2 = Standard Resolver – 1FK7 motor wiring w/M23 connectors for 'M' option  
 SM3 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – 1FK7 motor wiring w/M23 euro connectors for 'M' option  
 SM4 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – 1FK7 motor wiring w/M23 euro connectors for 'M' option

**SEW/Eurodrive:**

SW1 = Standard Resolver – CM motor wiring w/ M23 euro connectors for 'M' option  
 SW2 = Standard Incremental Encoder  
 SW3 = Hiperface Stegmann SRM050 multi-turn absolute encoder – CM motor wiring w/ M23 euro connectors for 'M' option

**Whedco:**

WD1 = Standard Resolver

**Yaskawa:**

YS2 = Yaskawa Absolute Encoder – SGMGH motor wiring 40/50/60 Exlar Frame Sizes  
 YS3 = Yaskawa Absolute Encoder – SGMGH motor wiring 20/30 Exlar Frame Sizes

**HHH = Motor Stator<sup>2</sup> – All 8 Pole**

118 = 1 stack	115	158 = 1 stack	400
218 = 2 stack	Vrms	258 = 2 stack	Vrms
138 = 1 stack	230	168 = 1 stack	460
238 = 2 stack	Vrms	268 = 2 stack	Vrms

**II = Motor Speed**

30 = 3000 rpm, GSM30, GSM40  
 50 = 5000 rpm, GSM20  
 01- 99 = Customer specified base speed

**XX .. XX = Travel and Housing Options (please list desired options)**

**Travel Options**

AR = External anti-rotate  
 HW = Side handwheel manual drive with limit switch  
 RB = Rear brake  
 RD = Rear manual drive<sup>9</sup>  
 SD = Hex side drive  
 PF = Preloaded follower<sup>4</sup>  
 L1/L2/L3 = External limit switch<sup>8</sup>  
 XT = Special travel options, protective and high temperature bellows or splined main rod

**Housing Options**

EN = Electroless nickel plating  
 HX = Special housing  
 P5 = IP65 sealing option<sup>5</sup>  
 HC = Type III hard coat anodized<sup>6</sup>  
 XL = Special lubrication, food grade or Mobilgrease 28, specify  
 XM = Special motor options

**Absolute Linear Feedback**

LT = ICT, including signal conditioner<sup>4,7,9</sup>

**Note:**

- Available as described in Feedback Types.
- Stator voltage and pole options allow for catalog rated performance at varying amplifier bus voltages and pole configuration requirements.
- 0.75 lead not available over 12" stroke
- The dynamic load rating of zero backlash, preloaded screws is 63% of the dynamic load rating of the standard non-preloaded screws. The calculated travel life of a preloaded screw will be 25% of the calculated travel life of the same size and lead of a non-preloaded screw. Preloaded follower is not available with absolute linear (LT) internal feedback option.
- Not available with splined main rod option.
- This housing option would typically be accompanied by the choice of the electroless nickel connectors if a connectorized unit were selected. This choice may also indicate the need for special material main rods or mounting.
- Linear feedback is not available in the GSM20 and not available in the GSM30, 14" and 18".
- Requires AR option
- Not available with absolute feedback.



## Exlar I Series Explosion Proof Linear Actuators

Exlar I Series™ actuators present a new range of alternatives for linear motion solutions. The I Series actuators offer all of the benefits of Exlar's planetary roller screw technology, along with extreme flexibility in actuator mounting style, and the type of motor used to drive the actuator.

Exlar's roller screw technology has been the integral component in creating the most reliable, long lasting electromechanical actuators on the market. Over the last 15 years, Exlar's inverted roller screw actuators have provided a long-life, all-electric replacement for hydraulic cylinders in thousands of applications.

The I Series actuators offer this same technology in a series of actuators that are economical and allow the use of lower cost motor technology.

### Two Models to Fit Your Needs

Two product performance levels are available, so you can choose which option best suits your application and budgetary requirements. The IM Series offers Exlar's standard capacity inverted roller screw in actuators with up to 5 times the travel life of ball screw actuators. The IX Series offers the same load carrying capacity as the IM Series but offers up to 15 times the life of an equivalent ball screw.

### I Series™ Features

- Proven Exlar roller screw technology
- Flexible mounting options
- Adapts to various types of motors
- Optional inline planetary gear reducer for high force output from lower motor torques

### IX Series™ Features

- IP65 sealing
- Roller screw provides 15X life of ball screw
- Low backlash

### IM Series™ Features

- IP54 sealing
- Roller screw provides 5X life of ball screw
- Standard backlash



## The Exlar Advantage

### Motor Flexibility

The I Series actuators can be ordered to accept the motor type of your choice. Whether a brushed type DC motor or stepper motor for lower performance applications, or a high performance brushless motor like Exlar's SLM Series, the I Series actuators offer complete flexibility in ordering to accept any type.

### Integral Planetary Gearing

The I Series actuators offer economical planetary gearing as an input reduction option. Compared to the low performance spur gears provided by most ball screw actuators, the I Series' planetary gears offer an extended life, high input speed and output torque and quiet operation. The performance of the actuator is not limited by the gearing. Standard available ratios of 5:1 and 10:1 allow you to utilize smaller, lower torque motors to drive the I Series actuators, while still achieving the desired output force from the actuator.



## Sealed Actuator Body

The base unit of the IX Series actuators is offered with a standard IP65 rating. The in-line motor mounting adapters and parallel motor mounting adapters can be ordered as IP65 if required for the application.

The base unit of the IM Series actuators is offered with a standard IP54 rating. An optional IP65 sealed base unit is available.

The in-line motor mounting adapters and parallel motor mounting adapters can be ordered with IP65 if required for the application.

## Wear and Corrosion Resistant Output Rod

The standard actuator main extending rods for the I Series actuators are provided with a surface treatment that provides equivalent corrosion resistance and superior wear resistance to chrome plated rods. The thermo-chemical process creates a surface that is a microstructural zone of iron nitrides, integral with the base material. The resultant surface not only has superior wear qualities compared to chrome, and equivalent corrosion resistance, but also eliminates the flaking issues of an electro-chemically applied process such as chrome plating.

## Large Diameter Output Rod

The I Series actuators provide a large diameter output rod and excellent internal bushing support which offers you long life in resistance to side loading.

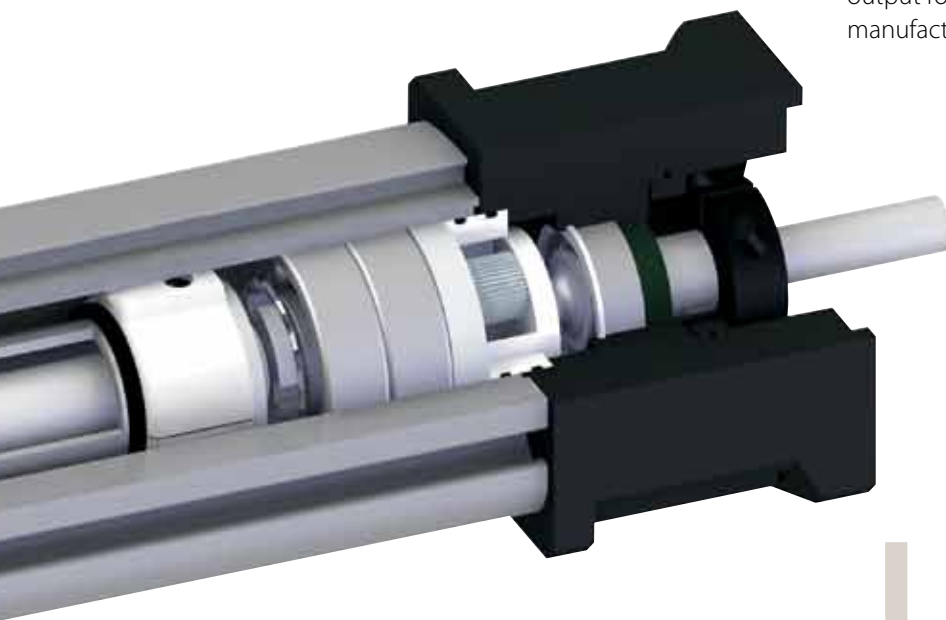
## Actuator Materials and Coating

The standard IM and IX Series actuators provide case materials made of aluminum with clear and black anodized coatings. These materials offer a durable and corrosion resistant package. The standard mounting hardware for the actuators are manufactured from black oxide-coated mild steel.

## Alternative Materials and Coatings

The I Series actuators offer several options to the standard construction for applications requiring further corrosion resistance. The actuator's case parts can be ordered as electroless nickel coated and white powder coat epoxy. Alternatively, the entire case can be constructed from stainless steel using materials you select.

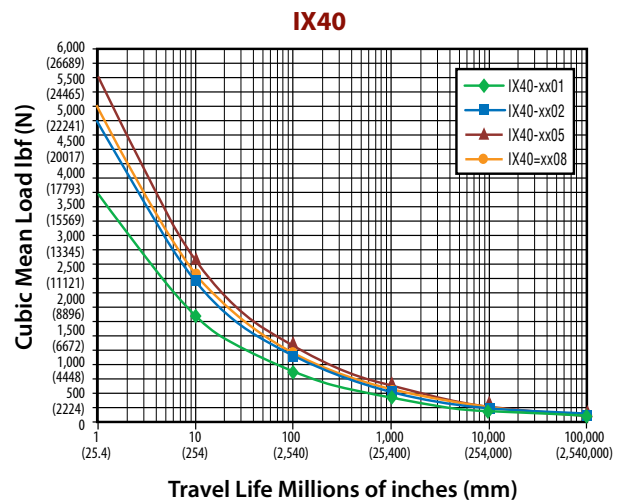
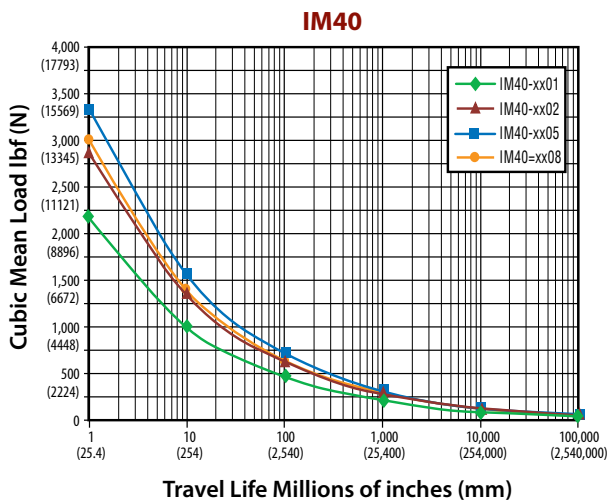
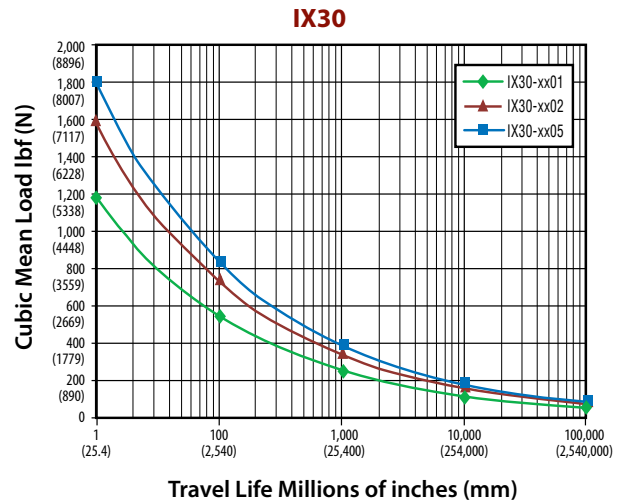
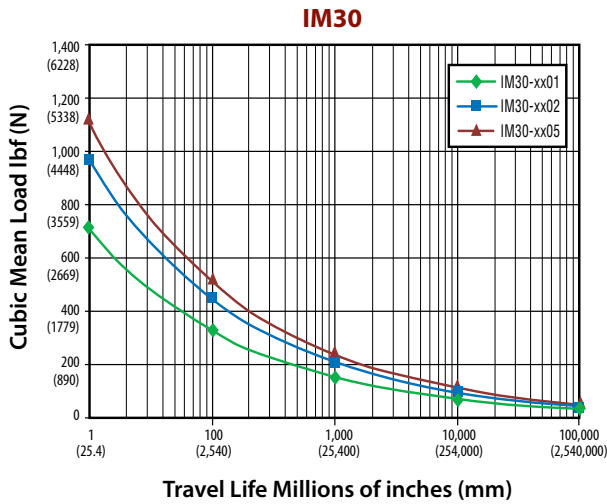
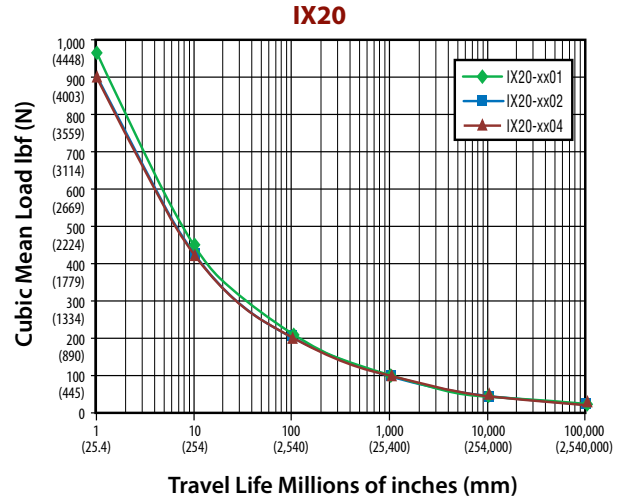
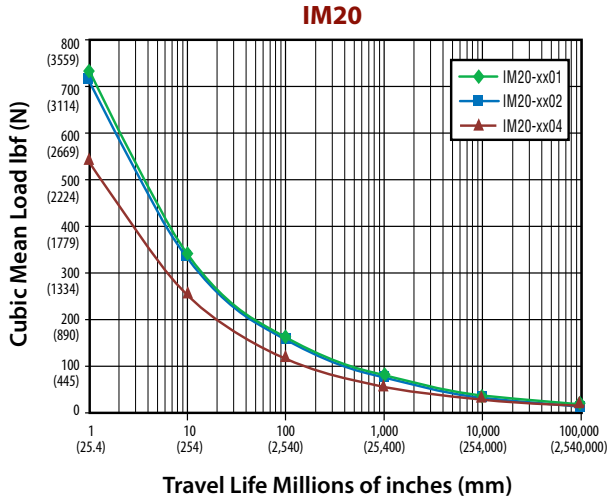
The mounting hardware for the I Series actuators can be ordered in two varieties offering more corrosion resistance than the standard components. These include the "corrosion resistant" mounting accessories which are constructed of mild steel and provided with the same surface preparation as the output rod. Also offered are mounting accessories manufactured from stainless steel.



# Ultimate Flexibility

# I Series Linear Actuators

## I Series Life Curves See page 82 for explanation of life curve calculation.



## I Series Performance Specifications

Model No.	Approx Frame Size in (mm)	Continuous Force* lbf (N)	Peak Force lbf (N)	Speed at Max Rated RPM in/sec (mm/sec)	Life at Rated Continuous Force inx10 <sup>6</sup> (mmx10 <sup>6</sup> )	Dynamic Load Rating lbf (N)	Screw Lead in (mm)	Allowable Continuous Input Torque lbf-in (Nm)	Allowable Peak Input Torque lbf-in (Nm)	Max Rated Input RPM
IM20-xx01	2 (51)	578 (2571)	1156 (5142)	8.33 (212)	2.9 (73.7)	1782 (7927)	0.1 (2.54)	11.5 (1.3)	23 (2.6)	5000
IM20-xx02		289 (1286)	578 (2571)	16.67 (423)	13.1 (332.7)	1165 (5182)	0.2 (5.08)	11.5 (1.3)	23 (2.6)	
IM20-xx04		145 (645)	289 (1286)	33.33 (847)	44.7 (1135.4)	696 (3096)	0.4 (10.16)	11.5 (1.3)	23 (2.6)	
IX20-xx01		578 (2571)	1156 (5142)	8.33 (212)	7.8 (198.2)	2470 (10987)	0.1 (2.54)	11.5 (1.3)	23 (2.6)	
IX20-xx02		385 (1713)	769 (3420)	16.67 (423)	41.3 (1049)	2273 (10111)	0.2 (5.08)	15.3 (1.73)	30.6 (3.5)	
IX20-xx04		192 (854)	385 (1713)	33.33 (847)	140.6 (3571.2)	1357 (6036)	0.4 (10.16)	15.3 (1.73)	30.6 (3.5)	
IM30-xx01	3 (76)	1347 (5992)	2694 (11984)	6.67 (169)	2.1 (53.3)	3697 (16445)	0.1 (2.54)	26.8 (3.03)	53.6 (6.1)	4000
IM30-xx02		674 (2998)	1347 (5992)	13.33 (338)	7.0 (177.6)	2204 (9804)	0.2 (5.08)	26.8 (3.03)	53.6 (6.1)	
IM30-xx05		269 (1197)	539 (2398)	33.33 (846)	346.0 (8788.4)	2383 (10600)	0.5 (12.7)	26.8 (3.03)	53.6 (6.1)	
IX30-xx01		1347 (5992)	2694 (11984)	6.67 (169)	5.5 (139.8)	5124 (22793)	0.1 (2.54)	26.8 (3.03)	53.6 (6.1)	
IX30-xx02		905 (4026)	1810 (8051)	13.33 (338)	21.5 (546.1)	4300 (19127)	0.2 (5.08)	36.0 (4.07)	72.0 (8.1)	
IX30-xx05		362 (1610)	724 (3221)	33.33 (846)	1059.8 (26918.2)	4649 (20680)	0.5 (12.7)	36.0 (4.07)	72.0 (8.1)	
IM40-xx01	4 (102)	3966 (17642)	7932 (35283)	5 (127)	0.4 (10.16)	6124 (27241)	0.1 (2.54)	78.9 (8.91)	157.8 (17.8)	3000
IM40-xx02		1983 (8821)	3966 (17642)	10 (254)	2.1 (53.3)	4353 (19363)	0.2 (5.08)	78.9 (8.91)	157.8 (17.8)	
IM40-xx05		793 (3527)	1586 (7055)	25 (635)	32.6 (829)	3193 (14203)	0.5 (12.7)	78.9 (8.91)	157.8 (17.8)	
IM40-xx08		529 (2351)	1058 (4706)	37.5 (952)	174.3 (4427.2)	3251 (14461)	0.75 (19.05)	78.9 (8.91)	157.8 (17.8)	
IX40-xx01		3966 (17642)	7932 (35283)	5 (127)	1.0 (25.4)	8488 (37757)	0.1 (2.54)	78.9 (8.91)	157.8 (17.8)	
IX40-xx02		2692 (11975)	5383 (23945)	10 (254)	6.3 (160)	8492 (37774)	0.2 (5.08)	107.1 (12.1)	214.2 (24.2)	
IX40-xx05		1077 (4791)	2153 (9577)	25 (635)	96.9 (2461.2)	6230 (27712)	0.5 (12.7)	107.1 (12.1)	214.2 (24.2)	
IX40-xx08		718 (3193)	1436 (6388)	37.5 (952)	517.5 (13144.5)	6343 (28215)	0.75 (19.05)	107.1 (12.1)	214.2 (24.2)	

\*The continuous force rating is achieved at the allowable continuous input torque level.

Specifications subject to change without notice.

For configurations that use an input ratio, the input torque rating must be divided by the ratio. The output force ratings remain the same.

For the 2:1 parallel belt ratio the input torque ratings must be divided by 2 for allowable motor torque.

For the 5:1 internal planetary gearing option the input torque ratings must be divided by 5 for allowable motor torque.

For the 10:1 internal planetary gearing option the input torque ratings must be divided by 10 for allowable motor torque.

For any custom belt ratio or externally mounted gearing, the input torque ratings must be divided by that ratio for the allowable motor torque.

## I Series Mechanical Specifications

		IM20/IX20	IM30/IX30	IM40/IX40
Nominal Backlash	in (Nm)	.008 (.2) / .004 (.1)	.008 (.2) / .004 (.1)	.008 (.2) / .004 (.1)
Lead Accuracy	(mm/300 mm)	.001 (.025)	.001 (.025)	.001 (.025)
Maximum Radial Load	lb (N)	25 (111)	35 (155)	45 (200)
Friction Torque	lbf-in (Nm)	1.5 (0.17) / 3 (0.34)	2 (0.28) / 4 (0.45)	3 (0.34) / 6 (0.68)
Damping Constant	lbf-in/Krpm (Nm/Krpm)	0.5 (0.06)	1 (0.10)	3 (0.34)
Environmental Rating: Standard/optional for IM		IP54 / IP65	IP54 / IP65	IP54 / IP65
Maximum Operating Temperature		175°F / 80°C	175°F / 80°C	175°F / 80°C
<b>WEIGHTS</b>		<b>lb (kg)</b>		
Base Unit - Zero Stroke		2.32 (1.1)	5.29 (2.4)	14.6 (6.6)
Adder per inch of stroke		0.33 (.15)	0.63 (.3)	1.31 (.6)
Adder for inline (excluding motor)		0.73 (.33)	0.98 (.44)	0.2* (.09)
Adder for gearset		1.63 (.74)	3.32 (1.5)	9.91 (4.5)
Adder for front flange		0.44 (.2)	1.74 (.79)	2.6 (1.2)
Adder for parallel drive (excluding motor)		2.53 (1.15)	2.51(1.14)	11.7** (5.3)
Adder for 2 trunnions		2.12 (.96)	2.12 (.96)	2 (.91)
Adder for 2 side mounts		1.75 (.79)	1.75 (.79)	2.69 (1.2)
Adder for 2 adjustable flanges		1.46 (.66)	2.24 (1.02)	4.28 (1.94)

\* For Nema motor size matching actuator size

\*\* For Nema motor size matching actuator size (I40 adder for Nema 34 = 7.3)

Specifications subject to change without notice.

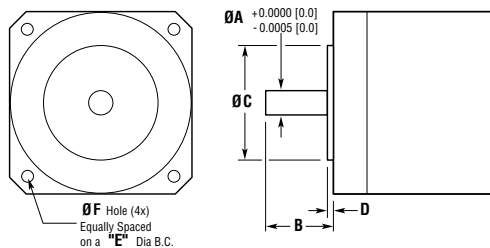
## I Series Inertia

	Actuator Configuration	lbf-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )
<b>I20 ACTUATOR</b>	Base Unit - Input drive shaft only	0.0001+ 0.0000047/in (0.11 + 0.0053/in)
	Inline Unit - w/ motor collar clamp	0.00013+ 0.0000047/in (0.14 + 0.0053/in)
	5:1 Gearhead - w/ motor collar clamp	0.000062+ 0.00000019/in (0.07 + 0.00021/in)
	10:1 Gearhead - w/ motor collar clamp	0.000056+ 0.000000047/in (0.063 + 0.000053/in)
	1:1 Reduction parallel drive	0.00046+ 0.0000047/in (0.52 + 0.0053/in)
	2:1 Reduction parallel drive	0.00048+ 0.0000012/in (0.54 + 0.0013/in)
	1:2 Speed up ratio parallel drive	0.0015+ 0.000019/in (1.7 + 0.021/in)
<b>I30 ACTUATOR</b>	Base Unit - Input drive shaft only	0.00043+ 0.000023/in (0.487 + 0.0256/in)
	Inline Unit - w/ motor collar clamp	0.00053+ 0.000023/in (0.596 + 0.0256/in)
	5:1 Gearhead - w/ motor collar clamp	0.00023+ 0.000001/in (0.254 + 0.001/in)
	10:1 Gearhead - w/ motor collar clamp	0.00020+ 0.0000003/in (0.23 + 0.00026/in)
	1:1 Reduction parallel drive	0.00075+ 0.000023/in (0.845 + 0.0256/in)
	2:1 Reduction parallel drive	0.00046+ 0.0000057/in (0.52 + 0.0256/in)
	1:2 Speed up ratio parallel drive	0.003+ 0.000091/in (3.4 + 0.1/in)
<b>I40 ACTUATOR</b>	Base Unit - Input drive shaft only	0.00145+ 0.000073/in (1.65 + 0.0823/in)
	Inline Unit - w/ motor collar clamp	0.002+ 0.000073/in (2.15 + 0.0823/in)
	5:1 Gearhead - w/ motor collar clamp	0.0045+ 0.000003/in (5.11 + 0.00329/in)
	10:1 Gearhead - w/ motor collar clamp	0.0034+ 0.0000007/in (3.87 + 0.000823/in)
	1:1 Reduction parallel drive, 3 inch motor"	0.0023 + 0.000073/in (2.67 + 0.082/in)
	2:1 Reduction parallel drive, 3 inch motor"	0.00073 + 0.000018/in (0.83 + 0.02/in)
	1:2 Speed up ratio parallel drive, 3 inch motor"	0.011 + 0.00029/in (12.6 + 0.34/in)
	1:1 Reduction parallel drive, 4 inch motor"	0.021 + 0.000073/in (23.9 + 0.082/in)
	2:1 Reduction parallel drive, 4 inch motor"	0.0082 + 0.000018/in (9.27 + 0.020/in)
1:2 Speed up ratio parallel drive, 4 inch motor"	0.039 + 0.000029/in (44.4 + 0.33/in)	

## NEMA Standard Motor Dimensions

The I Series actuators offer the selection for motor mounting provisions to be the various NEMA motor sizes. Because there are variations from brand to brand of motor as to what is called NEMA dimensions, we publish this table of NEMA dimensions

that we use as the standards for the product line. If the motor that you choose differs from these dimensions, it would not be called out by the N23, N34, N42, N56 call outs, and rather, by the A## alpha numeric callout for specific motors.

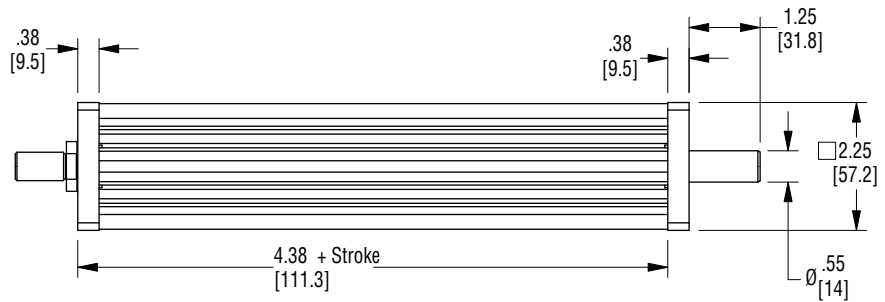
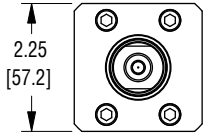


Dimension (in)	NEMA 23	NEMA 34	NEMA 42	NEMA 56
"A" Motor Shaft Diameter	0.25	0.5	0.75	0.625
"B" Motor Shaft Length	0.81	1.19	2.19	2.0625
"C" Motor Pilot Diameter	1.5	2.875	2.186	4.5
"D" Pilot Depth	0.05	0.0625	0.0625	0.1 - 0.16
"E" Mounting Bolt Circle	2.625	3.875	4.95	5.875
"F" Mounting Bolt Hole Dia.	0.205	0.223	0.328	3/8-16 UNC tap

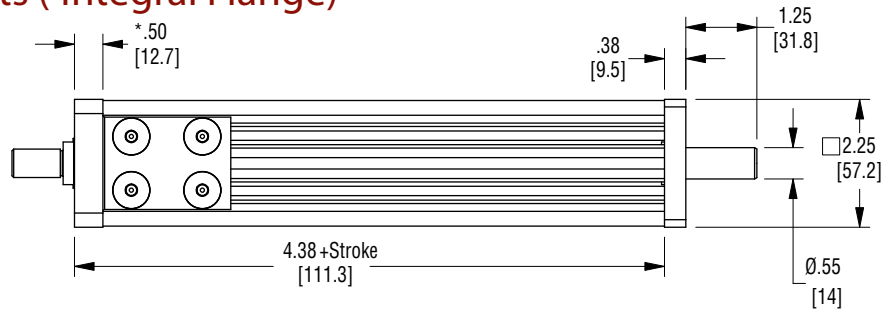
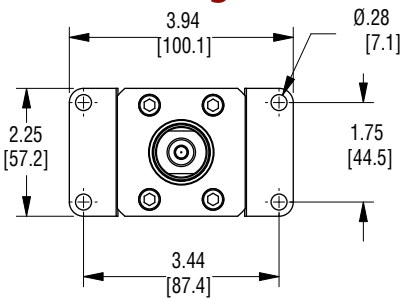
Specifications subject to change without notice.

# I Series Linear Actuators

## I20 Base Unit

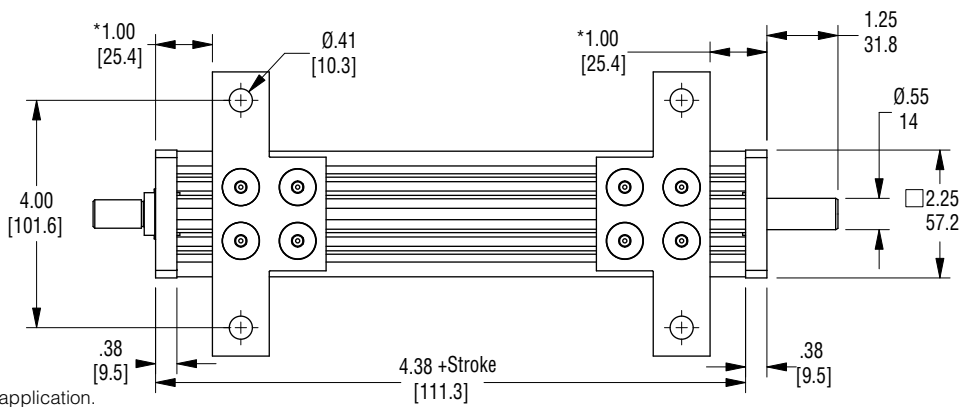
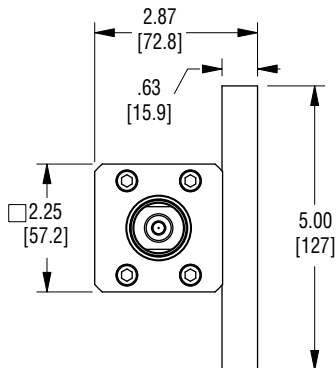


## I20 Side Flange Attachments (\*Integral Flange)



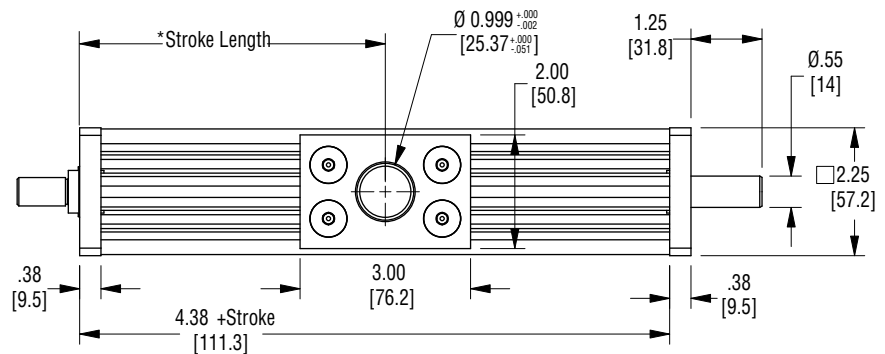
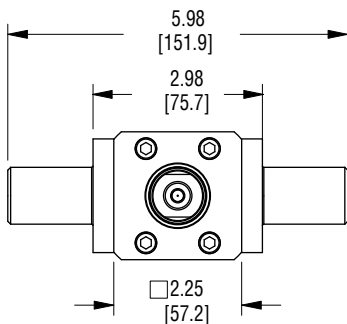
\*Note: If using integral flange this dimension is .38 [9.5]

## I20 Side Lug Attachments



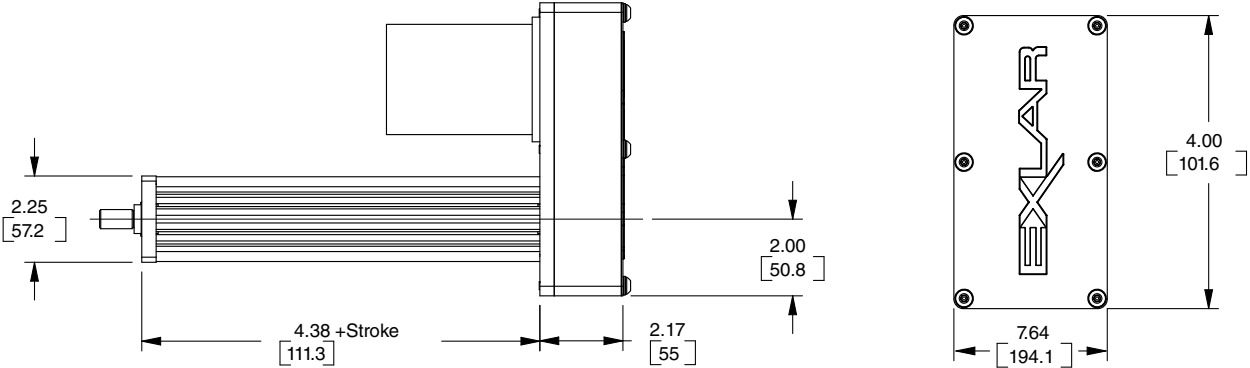
\*Note: Approximate distance for shipping. May be re-positioned by customer per application.

## I20 Side Trunnion Attachments

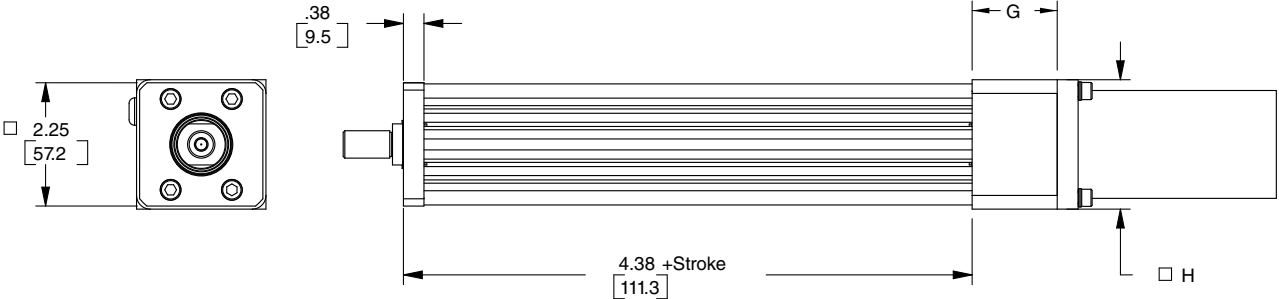


\*Note: Approximate distance for shipping. May be re-positioned by customer per application.

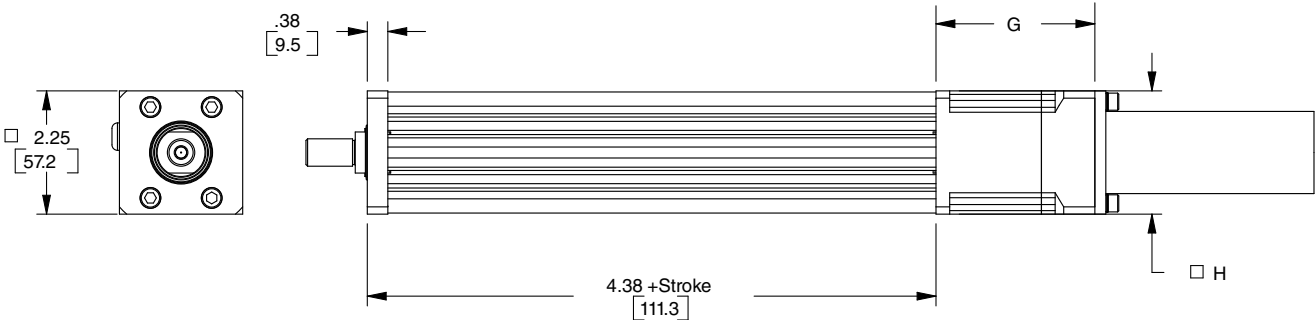
I20 Parallel Drive



I20 Inline Integrated Coupling



I20 5:1, 10:1 Planetary Gearset

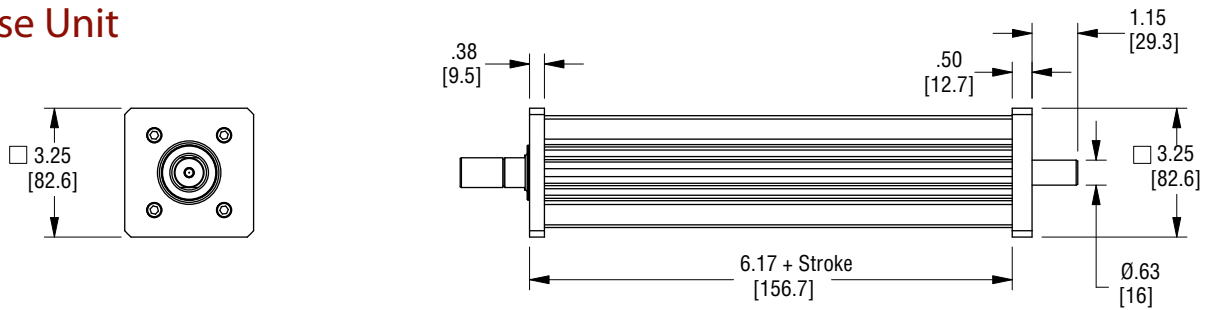


Motor Frame Size (Inline Integrated Coupling)	G in (mm)	H in (mm)
NEMA 23	1.25 (31.8)	2.25 (51.2)
Exlar 60 mm	1.55 (39.4)	2.36 (60.0)
NEMA 34	1.37 (34.7)	3.25 (82.6)
NEMA 42	1.37 (34.7)	4.19 (106.4)
Motor Frame Size (5:1, 10:1 Planetary Gearset)		
NEMA 23	2.90 (73.7)	2.25 (57.2)
NEMA 34	8.57 (217.7)	11.04 (280.5)

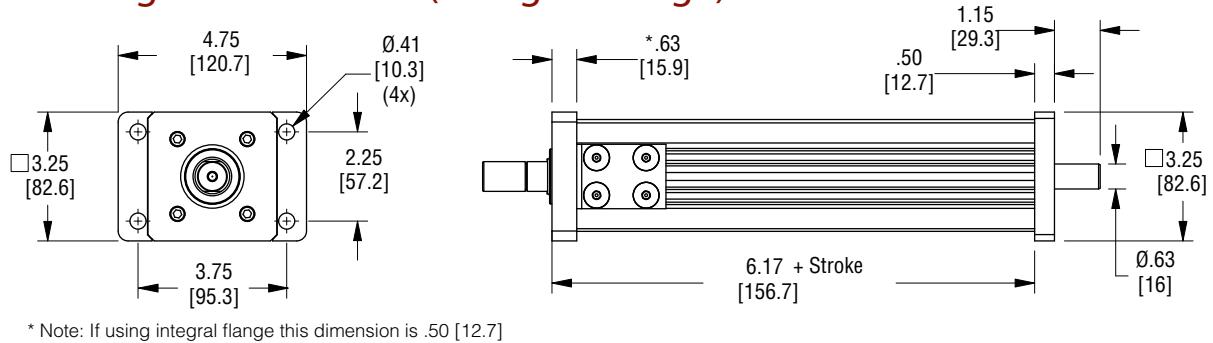


# I Series Linear Actuators

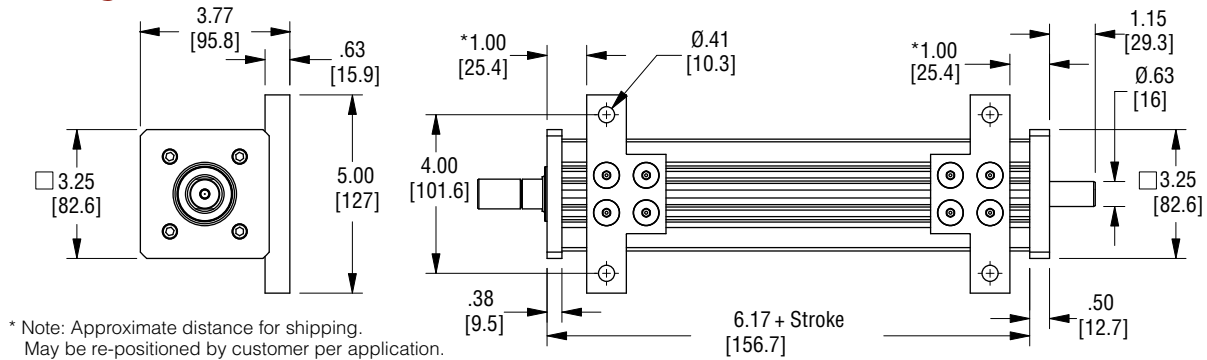
## I30 Base Unit



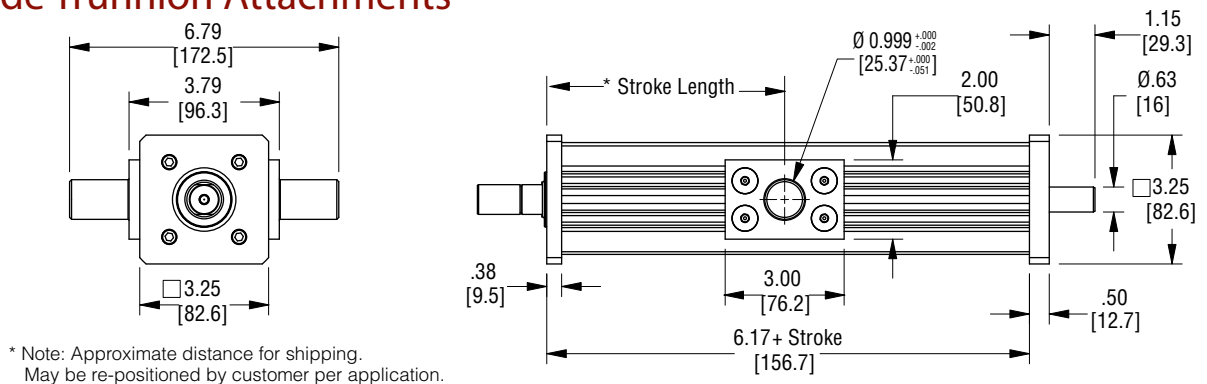
## I30 Side Flange Attachments (\*Integral Flange)



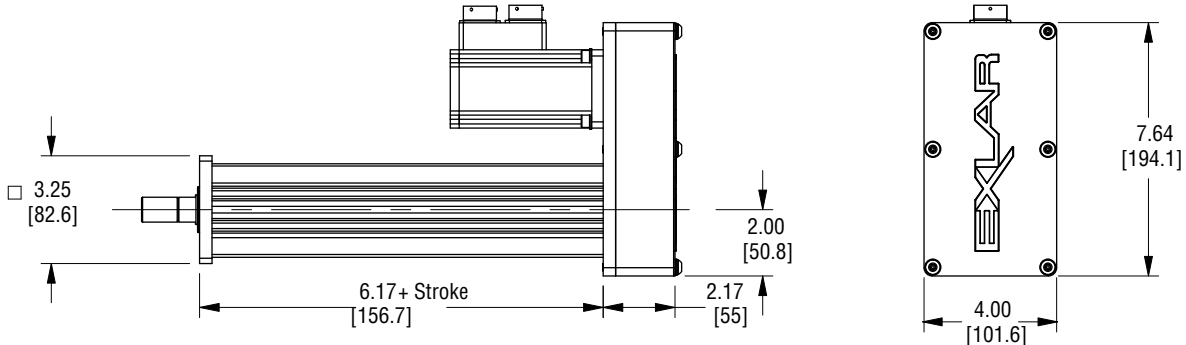
## I30 Side Lug Attachments



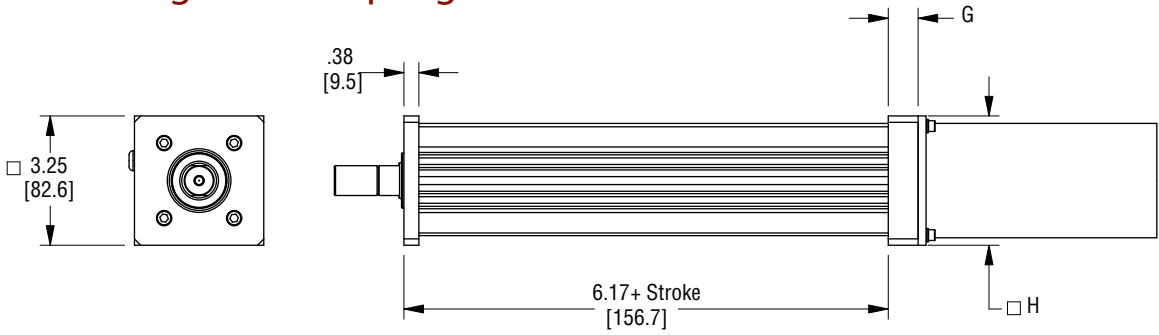
## I30 Side Trunnion Attachments



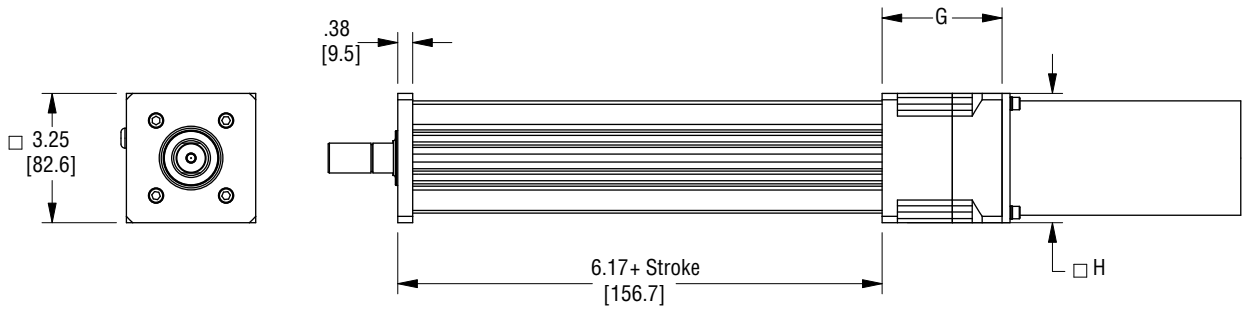
I30 Parallel Drive



I30 Inline Integrated Coupling



I30 5:1, 10:1 Planetary Gearset

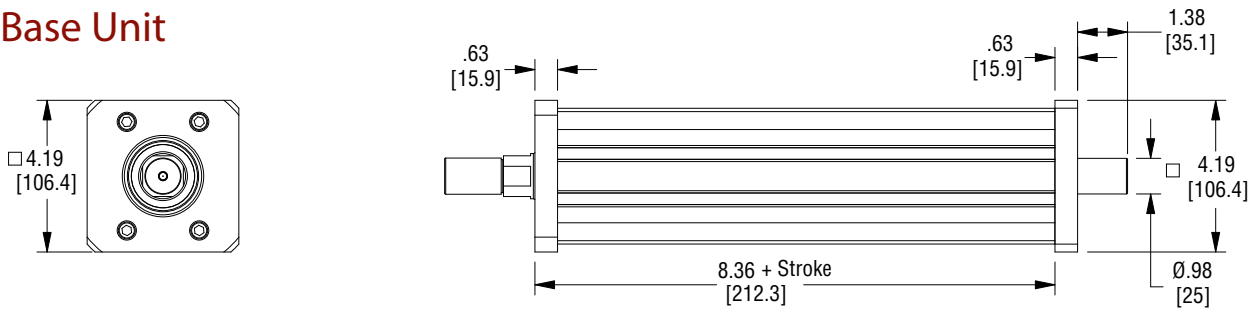


Motor Frame Size (Inline Integrated Coupling)	G in (mm)	H in (mm)
NEMA 23	0.80 (20.3)	3.25 (82.6)
Exlar 60 mm	0.80 (20.3)	3.25 (82.6)
NEMA 34	0.68 (17.1)	3.25 (82.6)
NEMA 42	0.68 (17.1)	4.19 (106.4)
Motor Frame Size (5:1, 10:1 Planetary Gearset)		
NEMA 23	2.95 (74.8)	3.25 (82.6)
Exlar 60 mm	2.95 (74.8)	3.25 (82.6)
NEMA 34	2.95 (74.8)	3.25 (82.6)
Exlar 90 mm	3.29 (83.4)	3.52 (89.4)
NEMA 42	2.95 (74.8)	4.19 (106.4)

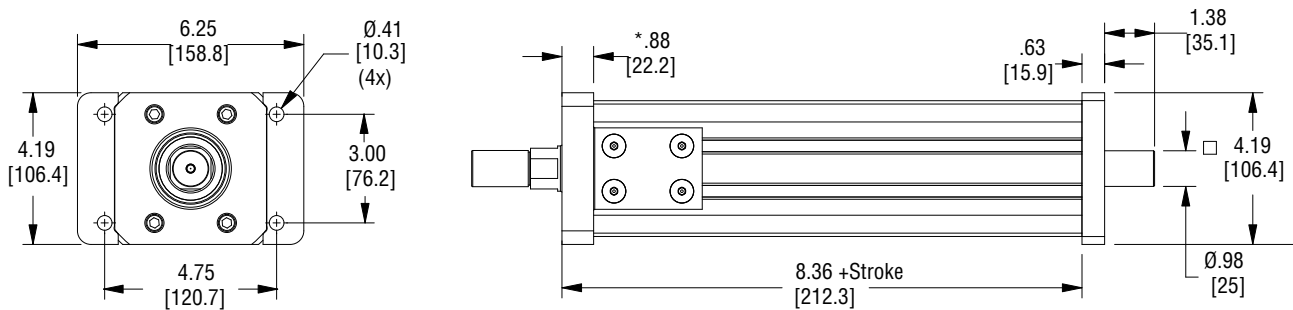
I Series

# I Series Linear Actuators

## I40 Base Unit

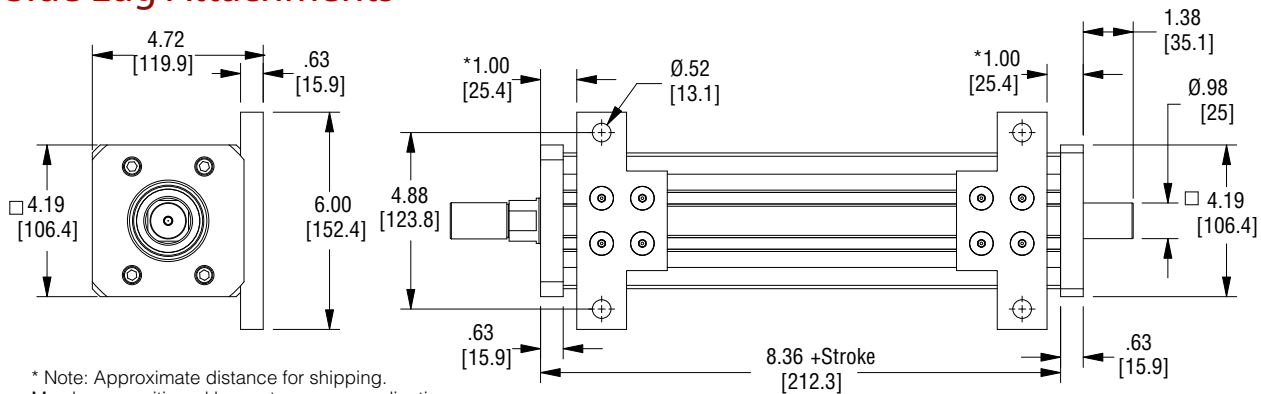


## I40 Side Flange Attachments (\*Integral Flange)



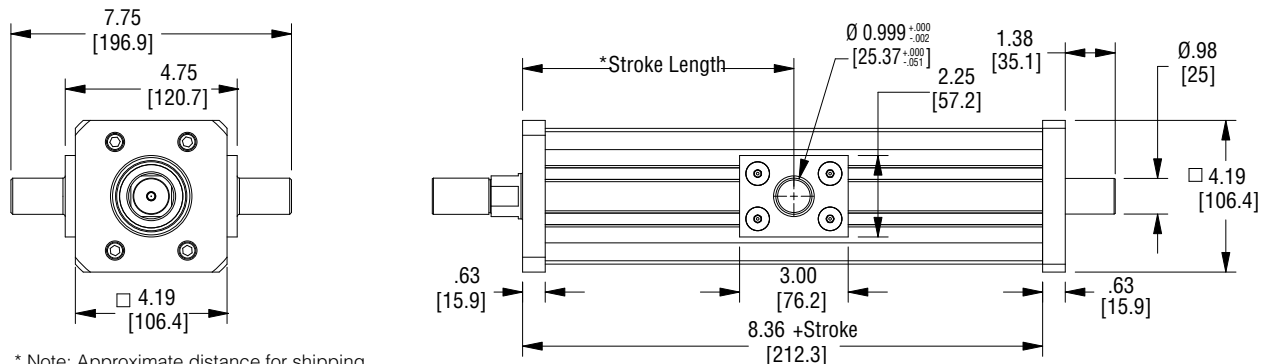
\* Note: If using integral flange this dimension is .63 [15.9]

## I40 Side Lug Attachments



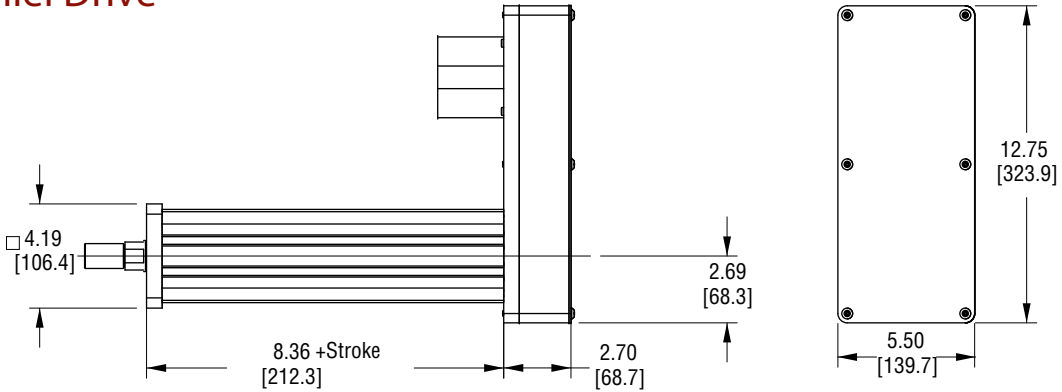
\* Note: Approximate distance for shipping. May be re-positioned by customer per application.

## I40 Side Trunnion Attachments

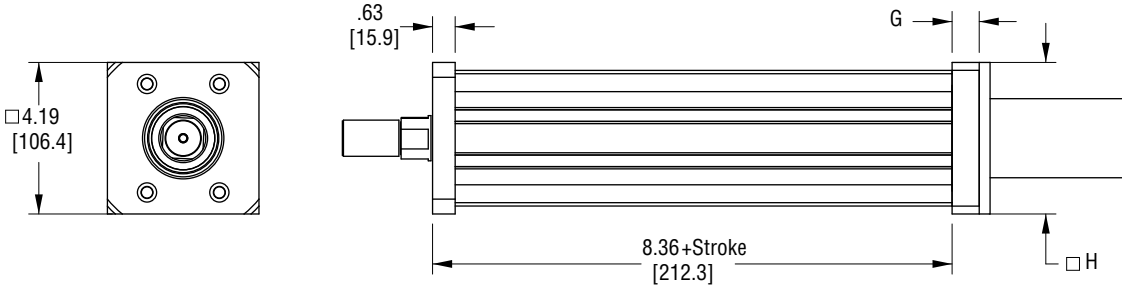


\* Note: Approximate distance for shipping. May be re-positioned by customer per application.

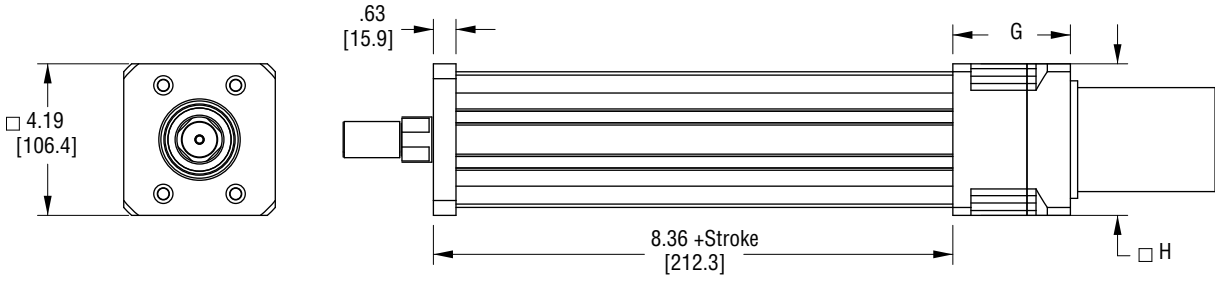
I40 Parallel Drive



I40 Inline Integrated Coupling



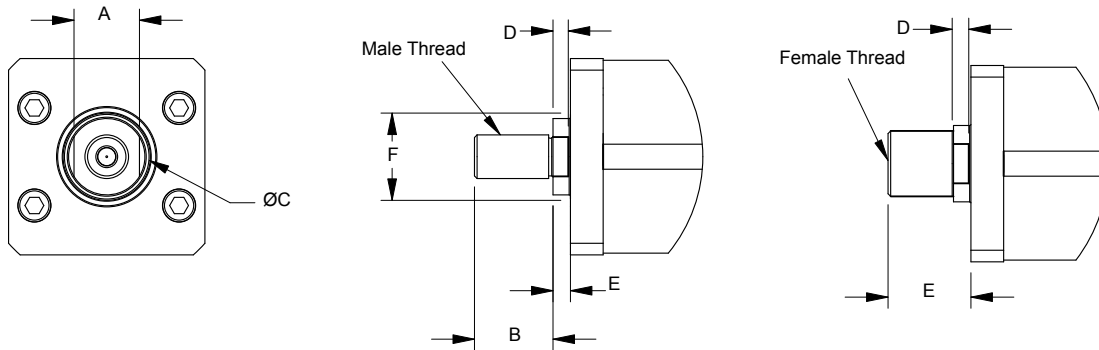
I40 5:1, 10:1 Planetary Gearset



Motor Frame Size (Inline Integrated Coupling)	G in (mm)	H in (mm)
NEMA 34	0.75 (19.1)	4.19 (106.4)
Exlar 90 mm	1.00 (25.4)	
NEMA 42	0.75 (19.1)	
Exlar 115 mm	1.25 (31.75)	
Motor Frame Size (5:1, 10:1 Planetary Gearset)		
NEMA 34	3.25 (82.6)	4.19 (106.4)
Exlar 90 mm	3.45 (87.6)	
NEMA 42	3.25 (82.6)	

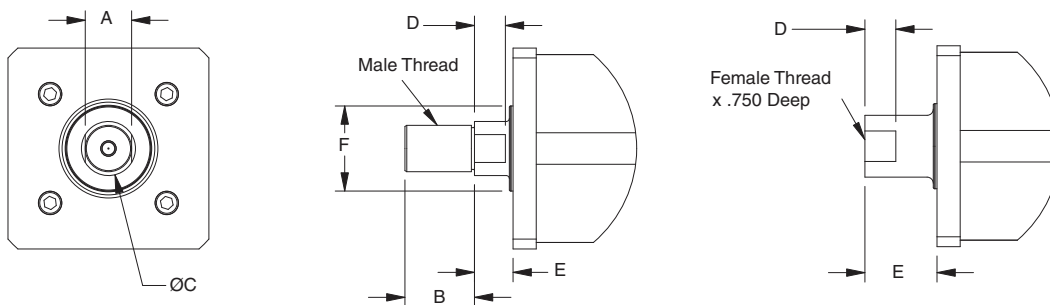
I Series

## I20 Rod Ends



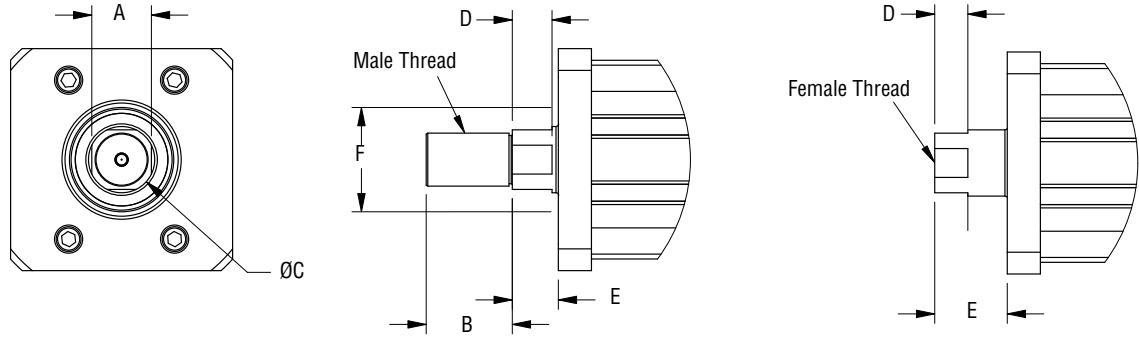
Rod End Option	Thread	A in (mm)	B in (mm)	C in (mm)	D in (mm)	E in (mm)	F in (mm)
M	U.S. Male 1/2-20 UNF-2A	0.7 (19.1)	0.90 (22.9)	0.88 (22.2)	0.18 (4.4)	0.20 (5.1)	1.00 (25.4)
F	U.S. Female 1/2-20 UNF-2B		na			0.95 (24.1)	
A	Metric Male M12 x 1.5		0.90 (22.9)			0.20 (5.1)	
B	Metric Female M12 x 1.5		na			0.95 (24.1)	

## I30 Rod Ends



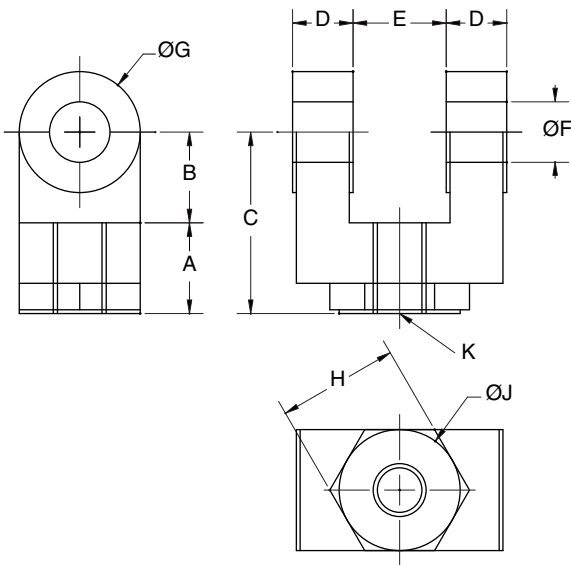
Rod End Option	Thread	A in (mm)	B in (mm)	C in (mm)	D in (mm)	E in (mm)	F in (mm)
M	U.S. Male 3/4-16 UNF	0.75 (19.1)	1.13 (28.6)	0.88 (22.3)	0.50 (12.7)	0.62 (15.8)	1.38 (35.0)
F	U.S. Female 3/4-16 UNF	0.87 (22.1)	na	1.00 (25.4)		1.17 (29.7)	
A	Metric Male M16 x 1.5	0.75 (19.1)	1.13 (28.6)	0.88 (22.3)		0.62 (15.8)	
B	Metric Female M16 x 1.5	0.87 (22.1)	na	1.00 (25.4)		1.17 (29.7)	

I40 Rod Ends



Rod End Option	Thread	A in (mm)	B in (mm)	C in (mm)	D in (mm)	E in (mm)	F in (mm)
M	U.S. Male 1/14 UNS-2A	1.13 (28.6)	1.63 (41.3)	1.25 (31.8)	0.75 (19.1)	0.87 (22.1)	1.97 (50.0)
F	U.S. Female 1/14 UNS-2B		na		0.63 (15.9)	1.37 (34.8)	
A	Metric Male M27 x 2		1.63 (41.3)		0.75 (19.1)	0.87 (22.1)	
B	Metric Female M24 x 2		na		0.63 (15.9)	1.37 (34.8)	

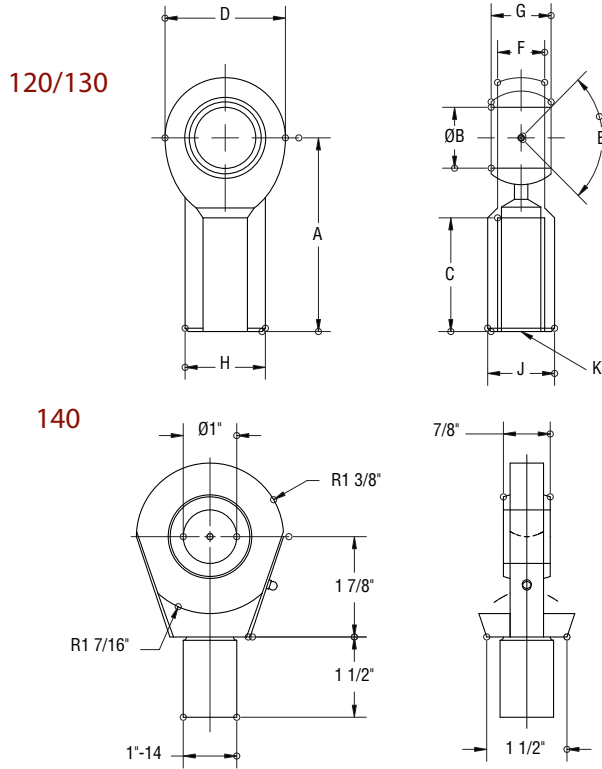
Rod Clevis Dimensions



in (mm)	I20* RC1050	I30 RC075	I40 RC100
A	0.750 (19.05)	1.125 (28.58)	1.625 (41.2)
B	0.750 (19.05)	1.25 (31.75)	1.500 (38.1)
C	1.500 (38.1)	2.375 (60.3)	3.125 (79.4)
D	0.500 (12.7)	0.625 (15.88)	.750 (19.1)
E	0.765 (19.43)	1.265 (32.13)	1.515 (38.5)
ØF	0.500 (12.7)	0.75 (19.1)	1.000 (25.4)
ØG	1.000 (25.4)	1.50 (38.1)	2.000 (50.8)
H	1.000 (25.4)	1.25 (31.75)	1.500 (38.1)
ØJ	NA	1.25 (31.75)	1.500 (38.1)
K	1/2-20	3/4-16	1-14

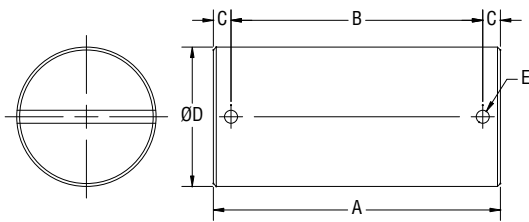
\*Requires 0.5 in. dia. pin CPO50.

## Spherical Rod Eye Dimensions



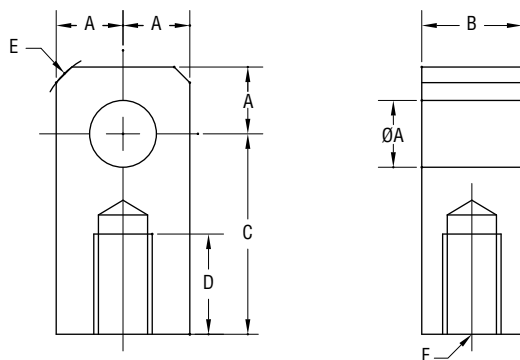
in (mm)	I20 SRM050	I30 SRM075	I40 SRF100
<b>A</b>	2.125 (54.0)	2.88 (73.2)	See Spherical Rod Eye Drawing. Requires Female Rod End.
<b>ØB</b>	.500 (12.7)	0.75 (19.1)	
<b>C</b>	1.156 (29.4)	1.72 (43.7)	
<b>D</b>	1.312 (33.3)	1.75 (44.5)	
<b>E</b>	6 Deg	14 Deg	
<b>F</b>	.500 (12.7)	0.69 (17.5)	
<b>G</b>	.625 (15.9)	0.88 (22.3)	
<b>H</b>	.875 (22.2)	1.13 (28.7)	
<b>J</b>	.750 (19.1)	1.00 (25.4)	
<b>K</b>	1/2-20	3/4-16	

## Clevis Pin Dimensions



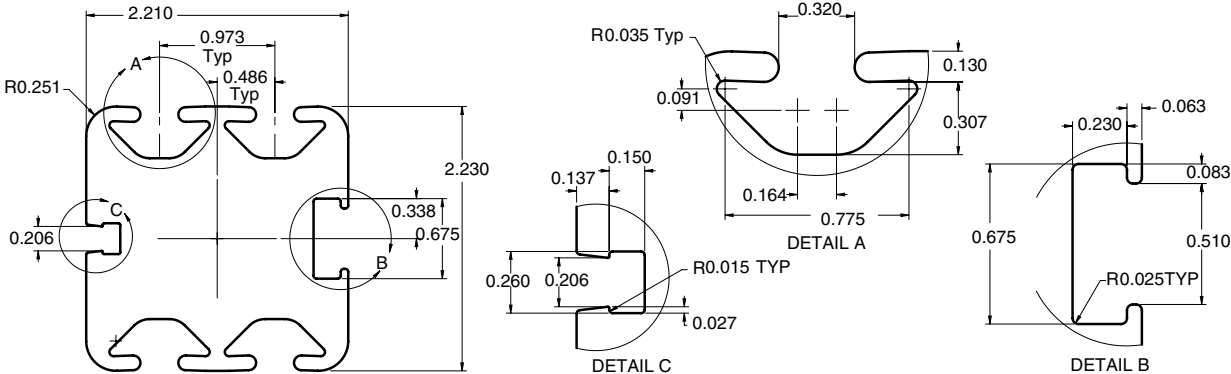
	A in (mm)	B in (mm)	C in (mm)	ØD in (mm)	ØE in (mm)
<b>120 CP050</b>	2.28 (57.9)	1.94 (49.28)	0.17 (4.32)	0.50" +0.000/-0.002 (12.7 mm +0.00/-0.05)	0.106 (2.69)
<b>130 CP075</b>	3.09 (78.5)	2.72 (69.1)	0.19 (4.82)	0.75" +0.000/-0.002 (19.1 mm +0.00/-0.05)	0.14 (3.56)
<b>140 CP100</b>	3.59 (91.2)	3.22 (81.8)	0.19 (4.82)	1.00" +0.000/-0.002 (25.4 mm +0.00/-0.05)	0.14 (3.56)

## Rod Eye Dimensions

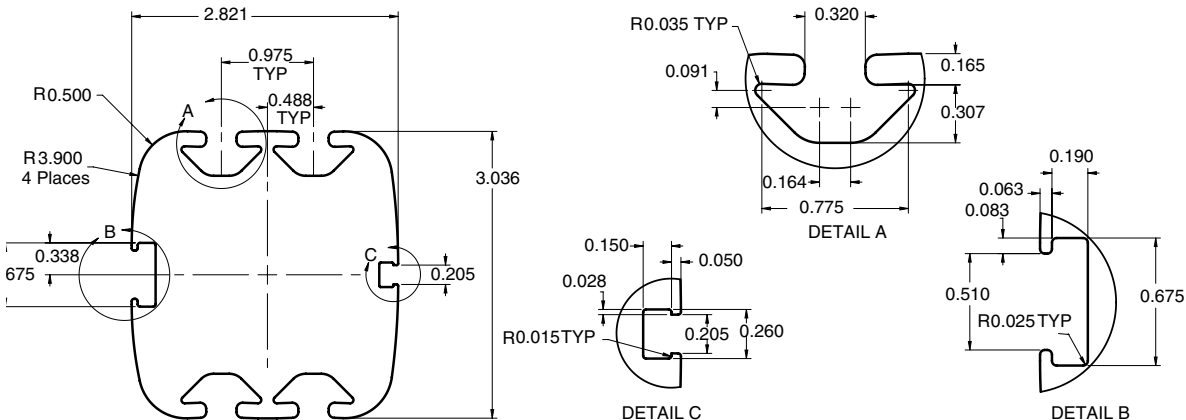


in (mm)	I20 REI050	I30 RE075	I40 RE100
<b>ØA</b>	0.50 (12.7)	0.75 (19.05)	1.00 (25.4)
<b>B</b>	0.75 (19.05)	1.25 (31.8)	1.50 (38.1)
<b>C</b>	1.50 (38.1)	2.06 (52.3)	2.81 (71.4)
<b>D</b>	0.75 (19.05)	1.13 (28.7)	1.63 (41.4)
<b>E</b>	0.375 (9.53)	0.88 (22.2)	1.19 (30.2)
<b>F</b>	1/2-20	3/4-16	1-14

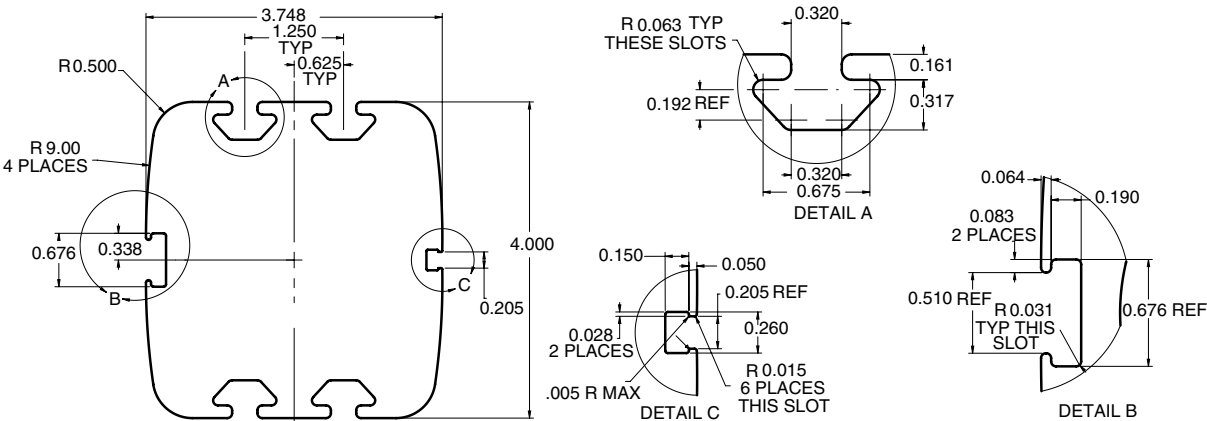
I20 Case Dimensions



I30 Case Dimensions



I40 Case Dimensions



I Series



# I Series Accessories Ordering Guide

I Series Mounting Attachments (includes proper number of standard T nuts and screws)	
<b>Side Flange Attachments (Black Oxide Steel)</b>	
ISFA-20	Size 20 I Series (2)
ISFA-30	Size 30 I Series (2)
ISFA-40	Size 40 I Series (2)
<b>Side Trunnion Attachments</b>	
ISTA-20	Size 20 I Series (2)
ISTA-30	Size 30 I Series (2)
ISTA-40	Size 40 I Series (2)
<b>Side Lug Attachments</b>	
ISLA-20	Size 20 I Series (2)
ISLA-30	Size 30 I Series (2)
ISLA-40	Size 40 I Series (2)

Mounting Attachments, Corrosion Resistant or Stainless Steel	
<b>Stainless Steel Side Flange Attachments (Stainless Steel)</b>	
ISSF-20	Size 20 I Series
ISSF-30	Size 30 I Series
ISSF-40	Size 40 I Series
<b>Corrosion Resistant Side Trunnion Attachments (Treated Hardened Steel Trunnions)</b>	
ICRT-20	Size 20 I Series
ICRT-30	Size 30 I Series
ICRT-40	Size 40 I Series
<b>Stainless Steel Side Trunnion Attachments (Hardened Stainless Steel Trunnions)</b>	
ISST-20	Size 20 I Series
ISST-30	Size 30 I Series
ISST-40	Size 40 I Series
<b>Stainless Steel Side Lug Attachments (Stainless Steel)</b>	
ISSL-20	Size 20 I Series
ISSL-30	Size 30 I Series
ISSL-40	Size 40 I Series
<b>Standard T Nuts and Screws</b>	
ITNUT	5/16 - 18 T nut - use with all mounts
ISCR34	5/16 - 18 x 3/4" screw - use with trunnion mounts
ISCR10	5/16 - 18 x 1" screw - use with side flange and side lug mount

Rod End Attachments, Standard Materials (Consult Factory for Corrosion Resistant Options)	
<b>Spherical Rod Eye</b>	
SRM-050	Size 20 I Series
SRM-075	Size 30 I Series
SRF-100	Size 40 I Series (fits standard imperial female threaded rod)
<b>Rod Eye</b>	
REI-050	Size 20 I Series
RE-075	Size 30 I Series
RE-100	Size 40 I Series
<b>Rod Clevis</b>	
RCI-050	Size 20 I Series (requires 0.5" dia. Pin, CP-050)
RC-075	Size 30 I Series
RC-100	Size 40 I Series
<b>Clevis Pins for Rod Clevis/Rod Eye</b>	
CP-050	Size 20 I Series
CP-075	Size 30 I Series
CP-100	Size 40 I Series
<b>Clevis Pins for Spherical Rod Eye</b>	
CP-050	Size 20 I Series
CP-075	Size 30 I Series
CP-100	Size 40 I Series

## Replacement Limit Switches

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

Consult Exlar's application engineering department regarding all special actuator components.

## Actuator Series

IM = Standard mechanical grade, IP54  
IX = Premium mechanical grade, IP65

## AA = Frame Size (nominal)

20 = 2 inch (60 mm)  
30 = 3 inch (80 mm)  
40 = 4 inch (100 mm)

## BB = Stroke Length

02-18 = 2 to 18 inch (50-455 mm) 12 in. max on I20 in 2 inch (300 mm) increments. Special available strokes: Maximum 24 inch (609 mm) stroke is available for the I30 and maximum 24 in. (609 mm) stroke for the I40.

## CC = Lead (linear motion per screw revolution)

01 = 0.1 inch (2.54 mm)  
02 = 0.2 inch (5.08 mm)  
04 = 0.4 inch (10.16 mm) I20 only  
05 = 0.5 inch (12.7 mm) I30 and I40 only  
08 = 0.75 inch (19.05 mm) I40 only, up to 8 inch stroke max.<sup>1</sup>

## D = Mounting Options

N = None, base unit  
F = Front flange  
X = Special

## E = Rod End

M = Male, US std. thread  
A = Male, metric thread  
F = Female, US std. thread  
B = Female, metric thread  
X = Special (please specify)

## FFF = Input Drive Provisions

NMT = Drive shaft only, no motor mount  
G05 = Inline planetary gearing, 5:1 ratio  
G10 = Inline planetary gearing, 10:1 ratio  
ISC = Inline, includes shaft coupling  
P10 = Parallel, 1:1 ratio  
P20 = Parallel, 2:1 ratio  
P## = Custom ratio, (ex. P13 = 1.3:1 ratio)

## GGG = Motor Mount Provisions<sup>6</sup>

A## = Alpha numeric motor call out - contact Exlar Applications Engineering Department. Motor not included.  
NMT = No motor mount - keyed shaft on base unit only  
N23 = Nema 23 standard dimension  
N34 = Nema 34 standard dimension  
N42 = Nema 42 standard dimension. Not available on I20.  
N56 = Nema 56 standard demension. Not available on I20 or I30.  
M60 = Exlar 60 mm SLM. Motor not included. Not available on I40.  
M90 = Exlar 90 mm SLM. Motor not included.  
M11 = Exlar 115 mm SLM and ER. Motor not included. Available on I40 only.  
M14 = Exlar 142 mm SLM. Motor not included. Available on I40 only.  
G60 = Exlar 60 mm SLG. Motor not included. Not available on I40.  
G90 = Exlar 90 mm SLG. Motor not included.  
G11 = Exlar 11 mm SLG and ER. Motor not included. Available on I40 only.  
AB3,4 = Allen Bradley 3 & 4 inch motors  
BD3,4 = Baldor 3 & 4 inch motors  
CE3,4 = Parker (Custom Servo Motors) Imperial 3 & 4 inch motors  
CM3,4 = Parker (Custom Servo Motors) Metric 3 & 4 inch motors  
EE3,4 = Emerson EMC Imperial 3 & 4 inch motors  
EM3,4 = Emerson CT Metric 3 & 4 inch motors  
FA4 = Fanuc 4 inch motors  
IN3,4 = Bosch-Rexroth (Indramat) 3 & 4 inch motors  
KM2,4 = Kollmorgen 2, 3 & 4 inch motors  
MT3,4 = Mitsubishi 3 & 4 inch motors  
PS3,4 = Pacific Scientific PMA/PMB Series 3 & 4 inch motors  
PC2,3 = Parker Compumotor 2.7, 3.6, 4.5, & 5.6 inch motors  
YS3,4 = Yaskawa 3 & 4 inch motors  
MXX = Unlisted or special motor mounting provisions to be assigned an alpha numeric code at time of order

## X..XX = Travel and Housing Options (Multiple Possible)

EN = Electroless nickel plating of housing parts  
HC = Hard coat anodized, acceptable for food grade  
PB = Protective bellows for extending rod  
L1 = One external limit switch, channel mount magnetic sensing proximity switch, N.O.<sup>3</sup>  
L2 = Two external limit switches, channel mount magnetic sensing proximity switch, N.C. 10-30 VDC<sup>3</sup>  
L3 = Three external limit switches, channel mount magnetic sensing proximity switch, 1 N.O., 2 N.C. 10-30 VDC<sup>3</sup>  
L# = External limit switches, channel mount magnetic sensing prox switch<sup>3</sup>.  
P5 = IP65 sealed housing (option for IM Series)  
PF = Pre-loaded follower<sup>2</sup>  
XH = Special housing option  
XL = Special lubrication  
XT = Special travel option

## ##### = 5 digit part number assigned to designate special model numbers.

Optional 5 digit assigned part number to designate unique model numbers

Consult Exlar's application engineering department regarding all special actuator components.

### Note:

1. Maximum stroke length for 0.75 inch lead (19.05 mm) on I40 is 8" (228.6 mm).
2. The dynamic load rating of zero backlash, preloaded screws is 63% of the dynamic load rating of the standard non-preloaded screws. The calculated travel life of a preloaded screw will be 25% of the calculated travel life of the same size and lead of a non-preloaded screw.
3. Please see page 53 for limit switch details and replacements.
4. 90 mm square max frame size for I20. 100 mm square max frame size for I30. 120 mm square max frame size for I40. Consult Application Engineer for larger motors.
5. These housing options would typically be accompanied by the choice of the electroless nickel connectors if a connectorized unit were selected. This choice may also indicate the need for special material main rods or mounting.
6. NEMA callout must meet specifications on page 67 or use alpha numeric callout.

## FT Series Linear Actuators

Exlar FT Series force tube actuators use a planetary roller screw mounted inside a telescoping tube mechanism. The follower is attached to the moveable force tube, which then extends and retracts as the screw rotates. An external motor (supplied by Exlar or the customer) provides the rotational force.

### High Performance

As with all of Exlar's roller screw products, the FT Series actuators deliver heavy load capacity, high speed capabilities, and exceptionally long life when compared to other linear actuator technologies.

Other comparably-sized screw actuator products on the market - specifically ball screw and acme screw actuators - have relatively low load capacities, short working lives and limited speed capabilities. At equivalent sizes, under moderate to heavy loads, it is reasonable to project that FT units will deliver up to 15 times the working life of those other designs. For OEM designers, this often means much more power and durability can be achieved from a much smaller footprint when Exlar FT units are used.

### Contamination Protection

The FT Series design has all the contamination-isolation advantages of hydraulic cylinders without the limited load, life, and speed of designs built around ball or acme screws. The bearing and roller screw components in the Exlar FT Series force tubes are mounted within the sealed housing. This prevents abrasive particles and other contaminants from entering the actuator's critical mechanisms, and assures trouble-free operation even in the most severe environments.

FT Series actuators are provided with standard grease lubrication. Custom provisions can be made for oil filled lubrication.

### Engineered Compatibility

Exlar has removed much of the end-user-engineering burden by designing the FT series to be compatible with a wide variety of standard motors. Motor mounting, actuator mounting, and gearing configurations are available to meet nearly any application's requirements.



Motors shown in drawings are for illustrative purposes only and are not included with FT Actuators.

Feature	Standard	Optional
<b>Long Strokes</b>	12 inches to 8 feet	Intermediate & Custom Stroke Lengths
<b>Pre-Loaded Follower</b>	No	Yes
<b>External End Switches</b>	No	One, two or three Adjustable Switches
<b>Multiple Actuator Mountings</b>	Side Mount, Side Lug, Extended Tie Rods, Rear Clevis, Front Flange, Side Trunnion, Rear Flange, Front/Rear Flange	Specials Available
<b>Multiple Motor Mounting Configurations</b>	Inline Direct Drive, Parallel 1:1 Drive, Parallel, 2:1 Reduction	Specials Available

## Special Sealing Options

The base unit of the FT actuators are sealed at the extending rod end by a rod seal, and on the drive end by a shaft seal (see base unit drawings on pages 86, 88 and 90). These rod and shaft seals, and o-ring sealing provides IP65 sealing for the FT actuator base units.

In standard units with inline, or parallel motor mounting, the mounting surface between the actuator and the motor, and between the end cover, or inline cover of the actuator and the actuator housing are not sealed as a standard feature.

These areas of the FT actuators can be sealed as a special option if the environment in which the actuator will be mounted requires the actuator to be sealed. Because of the vast differences in the design of various brands of motors that are mounted to the FT Series actuators, sealing of these two areas may alter the design of the actuator. Consult Exlar applications engineering for details and quotations on special sealing of this type.



Stainless steel FT35 with stainless steel SLM115 motor



Food grade & stainless steel FT60 with food grade SLG90 motor



Food grade & stainless steel FT35 with food grade SLM90 motor

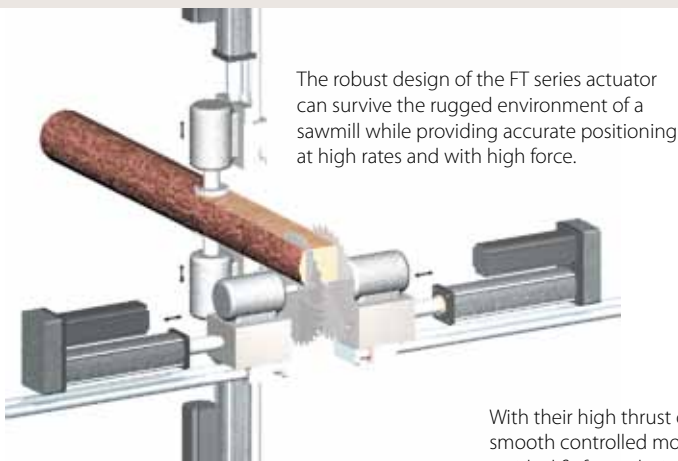
## Exlar FT Series Actuators Applications Include:

Hydraulic cylinder replacement  
Ball screw replacement  
Pneumatic cylinder replacement  
Chip and wafer handling  
Automated flexible fixturing  
Dispensers  
Machine tool  
Automated assembly  
Parts clamping  
Automatic tool changers  
Volumetric pumps

Medical equipment  
Conveyor diverters / gates  
Plastics equipment  
Cut-offs  
Die cutters  
Packaging machinery  
Entertainment  
Sawmill equipment  
Open / close doors  
Fillers  
Formers  
Precision grinders

Indexing stages  
Lifts  
Product sorting  
Material cutting  
Material handling  
Riveting / fastening / joining  
Molding  
Volumetric pumps  
Semiconductor  
Pick and place systems  
Robot manipulator arms  
Simulators

Precision valve control  
Ventilation control systems  
Pressing  
Process control  
Tube bending  
Welding  
Stamping  
Test stands  
Tension control  
Web guidance  
Wire winding



The robust design of the FT series actuator can survive the rugged environment of a sawmill while providing accurate positioning at high rates and with high force.

*Motors shown in drawings are for illustrative purposes only and are not included with FT Actuators.*

With their high thrust capability, compact size and smooth controlled motion, FT Series actuators are an ideal fit for replacing hydraulics or pneumatics on injection mold toggles. Control improvements from an electromechanical servo system offer less abuse of valuable molds and more consistent performance.

The smooth and accurate motion of Exlar's actuators combined with today's servo technology make multiple degree of freedom motion simulation applications easier to implement, cleaner and more efficient than hydraulic solutions.



## FT Series Lifetime Curves

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

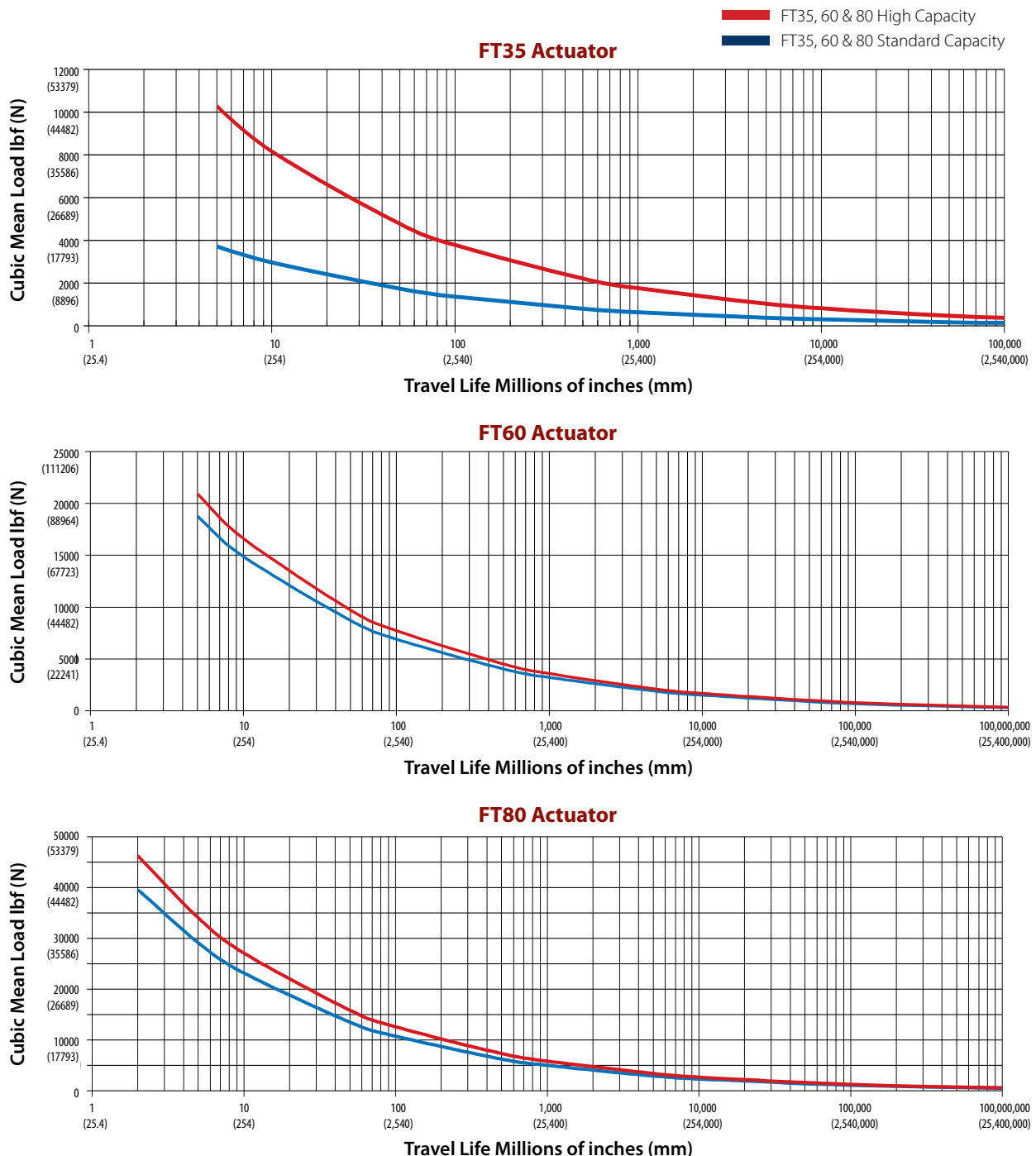
The underlying formula that defines this value is:

*Travel life in millions of inches, where:*

$$L_{10} = \left( \frac{C}{F} \right)^3 \times S =$$

**C** = Dynamic load rating (lbf)  
**F** = Cubic mean applied load (lbf)  
**S** = Roller screws lead (inches)

*All curves represent properly lubricated and maintained actuators.*



## FT35 Series Performance Specifications

Model No.	Approx Frame Size in (mm)	Stroke in (mm)	Screw Lead in (mm)	Speed at Max Rated RPM in/sec (mm/sec)	Dynamic Load Rating (std. capacity) lbf (kN)	Dynamic Load Rating (high capacity) <sup>1</sup> lbf (kN)	Torque @ Max. Force lb-in (N-m)	Screw Inertia lb-in-s <sup>2</sup> (Kg-m <sup>2</sup> )	Max Force <sup>2</sup> lbf (kN)	Max Rated Input rpm	Weight Base lb (kg)
FT35-0605	3.5 (89)	6 (152)	0.2 (5)	14.7 (373)	10700 (47.5)	26168 (116.4)	150 (16.5)	0.0019 (0.00022)	4000 (17.8)	4500	30 (14)
FT35-0610			0.39 (10)	29.5 (750)	8700 (38.5)	21177 (94.2)	300 (33.9)				
FT35-0620			0.79 (20)	59.3 (1500)	7100 (31.5)	23987 (106.7)	600 (67.8)				
FT35-1205	3.5 (89)	12 (304)	0.2 (5)	14.7 (373)	10700 (47.5)	26168 (116.4)	150 (16.5)	0.0027 (0.00031)	4000 (17.8)	4500	35 (16)
FT35-1210			0.39 (10)	29.5 (750)	8700 (38.5)	21177 (94.2)	300 (33.9)				
FT35-1220			0.79 (20)	59.3 (1500)	7100 (31.5)	23987 (106.7)	600 (67.8)				
FT35-1805	3.5 (89)	18 (457)	0.2 (5)	14.7 (373)	10700 (47.5)	26168 (116.4)	150 (16.5)	0.0037 (0.00042)	4000 (17.8)	4500	40 (18)
FT35-1810			0.39 (10)	29.5 (750)	8700 (38.5)	21177 (94.2)	300 (33.9)				
FT35-1820			0.79 (20)	59.3 (1500)	7100 (31.5)	23987 (106.7)	600 (67.8)				
FT35-2405	3.5 (89)	24 (610)	0.2 (5)	14.7 (373)	10700 (47.5)	26168 (116.4)	150 (16.5)	0.0045 (0.00051)	4000 (17.8)	4500	45 (21)
FT35-2410			0.39 (10)	29.5 (750)	8700 (38.5)	21177 (94.2)	300 (33.9)				
FT35-2420			0.79 (20)	59.3 (1500)	7100 (31.5)	23987 (106.7)	600 (67.8)				
FT35-3605	3.5 (89)	36 (914)	0.2 (5)	8.9 (226)	10700 (47.5)	26168 (116.4)	150 (16.5)	0.0061 (0.00069)	4000 (17.8)	2700	55 (25)
FT35-3610			0.39 (10)	17.8 (452)	8700 (38.5)	21177 (94.2)	300 (33.9)				
FT35-3620			0.79 (20)	35.6 (903)	7100 (31.5)	23987 (106.7)	600 (67.8)				
FT35-4805	3.5 (89)	48 (1219)	0.2 (5)	5.7 (145)	10700 (47.5)	26168 (116.4)	150 (16.5)	0.0076 (0.00086)	4000 (17.8)	1700	65 (30)
FT35-4810			0.39 (10)	11.4 (290)	8700 (38.5)	21177 (94.2)	300 (33.9)				
FT35-4820			0.79 (20)	22.4 (568)	7100 (31.5)	23987 (106.7)	600 (67.8)				

FT Series

Intermediate and custom stroke lengths are available. Intermediate leads may also be available. Belt and pulley inertia varies with ratio & motor selection. Contact Exlar's Applications Engineering Department for more information. See page 78 for definition of terms.

<sup>1</sup> FT35 actuators with high capacity screw option are 20 mm longer. See dimensions page 80.

<sup>2</sup> The rated and max force on the FT series actuators are those forces derived from using typical servo motors of similar frame size to the actuator, at their rated continuous and peak torques. In many cases FT actuators can be configured with input torque sufficient to exceed these forces. Contact Exlar for further details.

Pulley inertias lbf-in-sec<sup>2</sup>, reflected at motor including typical pulleys, belt and standard bushings. Because of differences in belt and pulley selection due to particular motor choices, please contact Exlar's Application Engineering Department if these values are critical to your application.

FT Standard Inline Coupling Maximum Torque Ratings and Inertia		
FT35	Torque Rating	Inertia
	40N-m (354 lbf-in)	0.30 lb-in <sup>2</sup> , 0.000777 lbf-in-sec <sup>2</sup>

FT35 3 inch motor 1:1 = 0.004874

FT35 3 inch motor 2:1 = 0.002087

FT35 4 inch motor 1:1 = 0.009993

FT35 4 inch motor 2:1 = 0.005003

## FT60 Series Performance Specifications

Model No.	Approx Frame Size in (mm)	Stroke in (mm)	Screw Lead in (mm)	Speed at Max. Rated RPM in/sec (mm/sec)	Dynamic Load Rating (std. capacity) lbf (kN)	Dynamic Load Rating (high capacity) lbf (kN)	Torque @ Max. Force lb-in (N-m)	Screw Inertia lb-in-s <sup>2</sup> (Kg-m <sup>2</sup> )	Max. Force* lbf (kN)	Max. Rated Input rpm	Weight Base lb (kg)
FT60-1206	6.0 (152)	12 (305)	0.23 (6)	7.9 (201)	51900 (231)	57933 (257.7)	920 (103.9)	0.0454 (0.0051)	20,000 (90.8)	2000	100 (45)
FT60-1212			0.47 (12)	15.8 (401)	44600 (199)	49750 (221.3)	1720 (194.3)				
FT60-1230			1.18 (30)	39.0 (1000)	41700 (186)	63958 (284.5)	4400 (497.1)				
FT60-2406		24 (610)	0.23 (6)	7.9 (201)	51900 (231)	57933 (257.7)	920 (103.9)	0.073 (0.0083)			
FT60-2412			0.47 (12)	15.8 (401)	44600 (199)	49750 (221.3)	1720 (194.3)				
FT60-2430			1.18 (12)	39.0 (1000)	41700 (186)	63958 (284.5)	4400 (497.1)				
FT60-3606		36 (914)	0.23 (6)	7.9 (201)	51900 (231)	57933 (257.7)	920 (103.9)	0.1 (0.0113)			
FT60-3612			0.47 (12)	15.8 (401)	44600 (199)	49750 (221.3)	1720 (194.3)				
FT60-3630			1.18 (30)	39.0 (1000)	41700 (186)	63958 (284.5)	4400 (497.1)				
FT60-4806		48 (1219)	0.23 (6)	7.9 (201)	51900 (231)	57933 (257.7)	920 (103.9)	0.126 (0.0142)			
FT60-4812			0.47 (12)	15.8 (401)	44600 (199)	49750 (221.3)	1720 (194.3)				
FT60-4830			1.18 (30)	39.0 (1000)	41700 (186)	63958 (284.5)	4400 (497.1)				

Intermediate and custom stroke lengths are also available. Intermediate leads may also be available. Belt and pulley inertia varies with ratio and motor selection.

\*The rated and max force on the FT series actuators are those forces derived from using typical servo motors of similar frame size to the actuator, at their rated continuous and peak torques. In many cases FT actuators can be configured with input sufficient to exceed these forces. Contact Exlar for further details.

Pulley inertias lbf-in-sec<sup>2</sup>, reflected at motor including typical pulleys, belt and standard bushings. Because of differences in belt and pulley selection due to particular motor choices, please contact Exlar's Application

FT Standard Inline Coupling Maximum Torque Ratings and Inertia	
FT60	Torque Rating
	100N-m (885 lbf-in)
Inertia	0.90 lb-in <sup>2</sup> , 0.002331 lbf-in-sec <sup>2</sup>

Engineering Department if these values are critical to your application.

FT60 1:1 = 0.030000 FT60 2:1 = 0.035000

### DEFINITIONS:

**Max Linear Speed:** The linear speed achieved by the actuator at a screw speed equal to the max rotational speed value.

**Rated Force:** The linear force produced by the actuator at the torque at the rated force value.

**Dynamic Load Rating:** A design constant used in calculating the estimated travel life of the roller screw. The dynamic mean load is the mean load at which the device will perform one million revolutions.

**Torque at Rated Force:** The torque required at the screw to produce the force rating.

**Screw Inertia:** The rotary inertia of the planetary roller screw in the actuator.

**Max. Rot. Speed:** The maximum allowable rotational screw speed determined by the screw length or the rotational speed limit of the roller screw nut.

## FT80 Series Performance Specifications

Model No.	Approx Frame Size in (mm)	Stroke in (mm)	Screw Lead in (mm)	Speed at Max. Rated RPM in/sec (mm/sec)	Dynamic Load Rating (std. capacity) lbf (kN)	Dynamic Load Rating (high capacity) lbf (kN)	Torque @ Max. Force lb-in (N-m)	Screw Inertia lb-in- <sup>2</sup> (Kg-m <sup>2</sup> )	Max. Force* lbf (kN)	Max. Rated Input rpm	Weight Base lb (kg)
FT80-1206	8.0 (203)	12 (305)	0.23 (6)	6.9 (175)	80700 (358)	94330 (419.6)	1950 (220.3)	0.1630 (0.0184)	40,000 (178)	1750	190 (86)
FT80-1212			0.47 (12)	13.8 (351)	70200 (312)	84079 (374.0)	3550 (401.1)				
FT80-1230			1.18 (30)	34.4 (875)	64700 (288)	95971 (426.9)	8840 (998.8)				
FT80-2406		24 (610)	0.23 (6)	6.9 (175)	80700 (358)	94330 (419.6)	1950 (220.3)	0.247 (0.0279)			265 (120)
FT80-2412			0.47 (12)	13.8 (351)	70200 (312)	84079 (374.0)	3550 (401.1)				
FT80-2430			1.18 (12)	34.4 (875)	64700 (288)	95971 (426.9)	8840 (998.8)				
FT80-3606		36 (914)	0.23 (6)	6.9 (175)	80700 (358)	94330 (419.6)	1950 (220.3)	0.331 (0.0374)			340 (153)
FT80-3612			0.47 (12)	13.8 (351)	70200 (312)	84079 (374.0)	3550 (401.1)				
FT80-3630			1.18 (30)	34.4 (875)	64700 (288)	95971 (426.9)	8840 (998.8)				
FT80-4806		48 (1219)	0.23 (6)	6.9 (175)	80700 (358)	94330 (419.6)	1950 (220.3)	0.415 (0.0468)			415 (187)
FT80-4812			0.47 (12)	13.8 (351)	70200 (312)	84079 (374.0)	3550 (401.1)				
FT80-4830			1.18 (30)	34.4 (875)	64700 (288)	95971 (426.9)	8840 (998.8)				

Intermediate and custom stroke lengths are also available. Intermediate leads may also be available. Belt and pulley inertia varies with ratio and motor selection. Please contact Exlar's Applications Engineering Department for more information. See page 78 for definitions of terms.

\*The rated and max force on the FT series actuators are those forces derived from using typical servo motors of similar frame size to the actuator, at their rated continuous and peak torques. In many cases FT actuators can be configured with input torque sufficient to exceed these forces. Contact Exlar for further details.

Pulley inertias lbf-in-sec<sup>2</sup>, reflected at motor including typical pulleys, belt and standard bushings. Because of differences in belt and pulley selection due to particular motor choices, please contact Exlar's Application

FT Standard Inline Coupling Maximum Torque Ratings and Inertia	
FT80	Inertia
Torque Rating	200N-m (1770 lbf-in)
Inertia	3.89 lb-in <sup>2</sup> , 0.010075 lbf-in-sec <sup>2</sup>

Engineering Department if these values are critical to your application.

FT80 1:1 = 0.235000

FT80 2:1 = 0.157000

## FT Series Mechanical Specifications

Model No.	FT35, FT60, FT80
Roller Screw Backlash in (mm)	0.0004 - 0.001 (0.01 - 0.03)
Preloaded Loader Screw Backlash	0
System Backlash* in (mm)	0.002 (0.06)
Standard Lead Accuracy** in/ft (mm/mm)	0.001 (.025/300)
Dynamic Torque Values (lbf in/krpm) nm/krpm	FT35: 6.0 (0.68) FT60: 11.0 (1.24) FT80: 20.0 (2.26)
Friction Torque Values (lbf in) nm	FT35: 7.0 (0.79) FT60: 14.0 (1.58) FT80: 35.0 (3.95)
Maximum Radial Load	0
Environmental Rating (Base Unit Only)***	IP65 Standard
Case: Standard Optional	Epoxy-coated aluminum Food Grade Coating

\* System backlash will be different with various types of motor mounting arrangements and couplings. Please discuss your particular configuration with Exlar application engineers.

\*\* Optional lead accuracy – from 0.0002 in/ft (6mm/300mm) to 0.002 in/ft (200mm/10000mm) – are also available.

\*\*\* For IP65 scaling of unit with motor mounted, please contact Exlar's Applications Engineering Department for more information and ordering information.

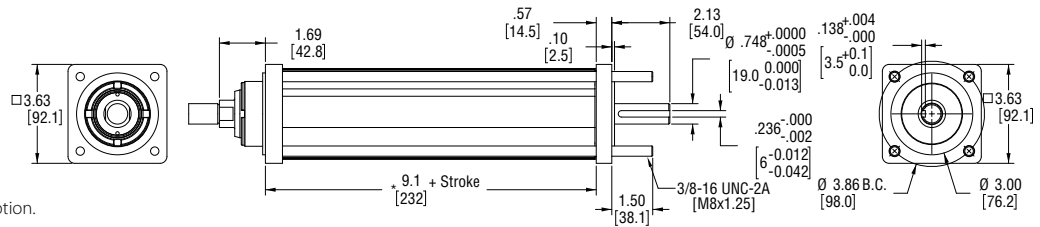


# FT35 Series Linear Actuators

## Base Unit

All dimensions shown in inches with millimeter equivalent in brackets.

See rod ends for rod end thread details.



\*Add 20mm if choosing high capacity option.

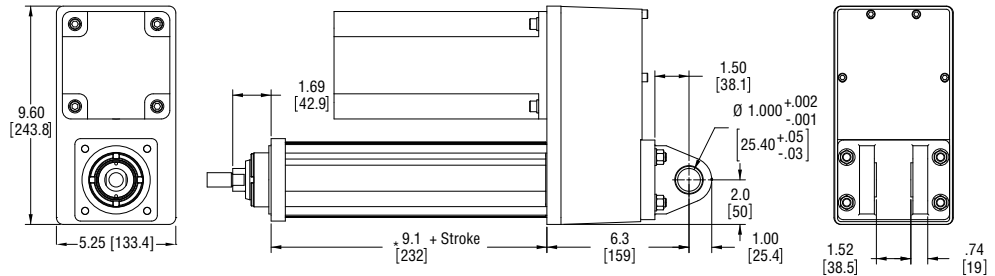
## Clevis Mount Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeter equivalent in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



\*Add 20mm if choosing high capacity option.

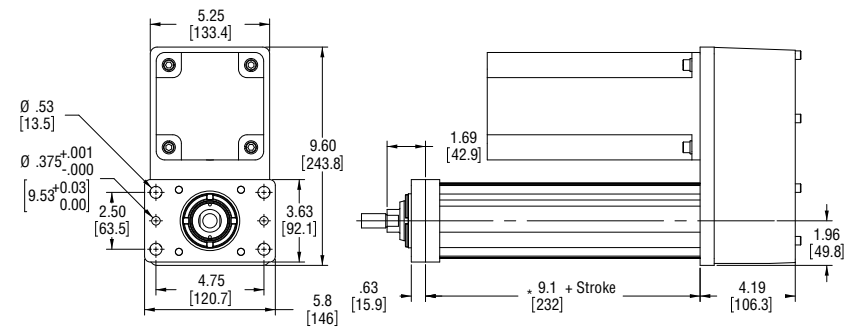
## Front Flange Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeter equivalent in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



\*Add 20mm if choosing high capacity option.

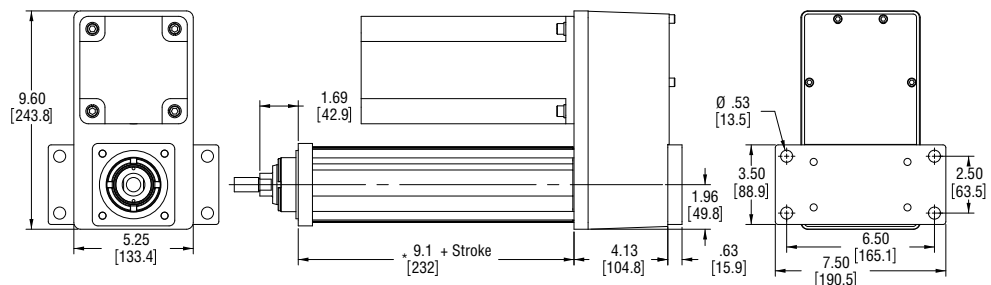
## Rear Flange Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeter equivalent in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



\*Add 20mm if choosing high capacity option.

Drawings subject to change. Consult Exlar for certified drawings.

## Trunnion Unit

Parallel motor mount shown.

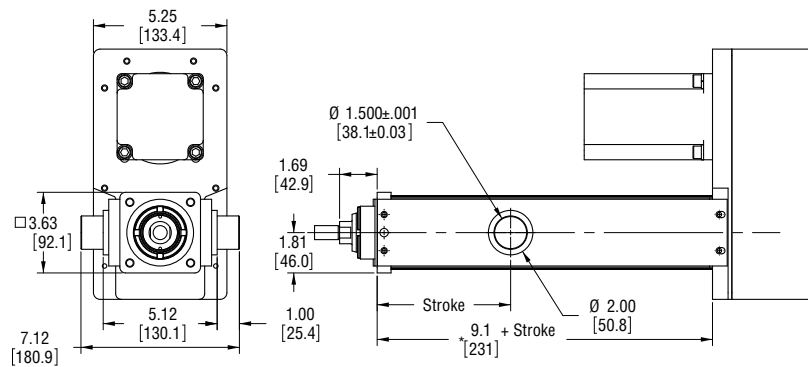
All dimensions shown in inches with millimeters equivalents in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.

\*Add 20mm if choosing high capacity option.

\* If "Q" metric side trunnion option, Ø 35 mm h7



## Extended Tie Rod Unit

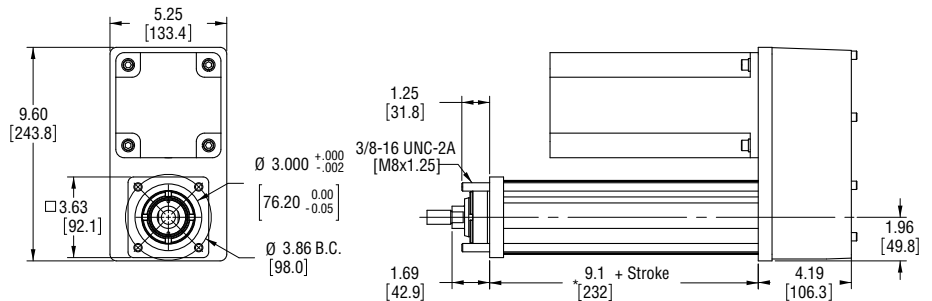
Parallel motor mount shown.

All dimensions shown in inches with millimeters equivalents in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.

\*Add 20mm if choosing high capacity option.



## Side Lug Unit

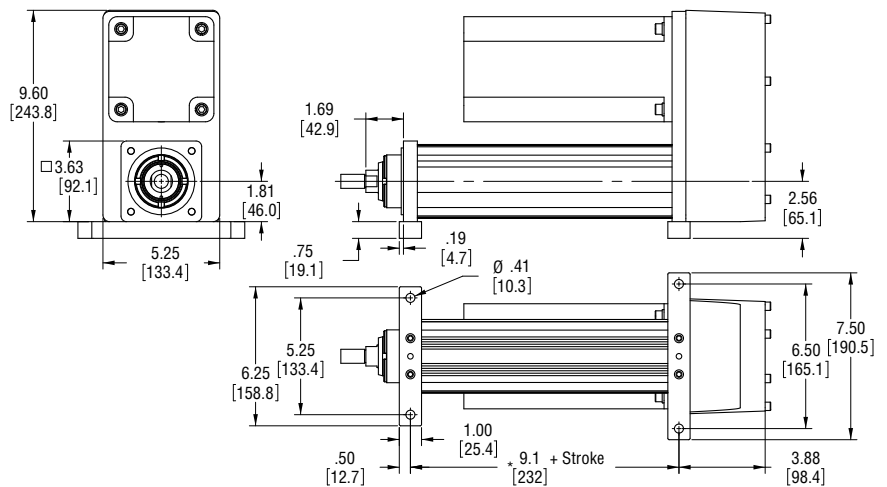
Parallel motor mount shown.

All dimensions shown in inches with millimeters equivalents in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.

\*Add 20mm if choosing high capacity option.



## Side Mount Unit

Parallel motor mount shown.

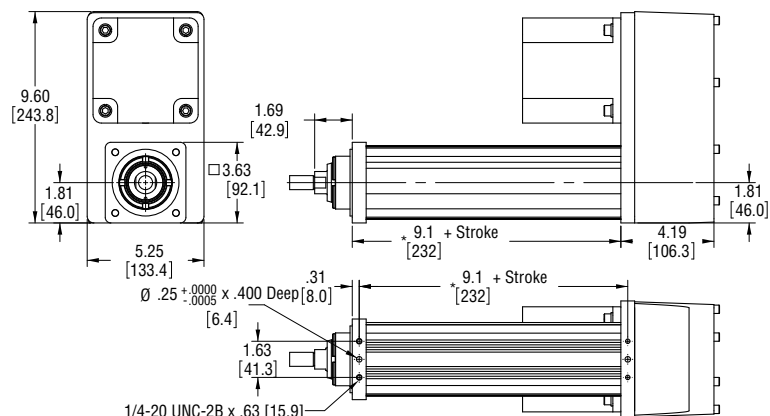
All dimensions shown in inches with millimeters equivalents in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.

\*Add 20mm if choosing high capacity option.

\* If "J" or "K" metric side mount options, M6 x 1.0  $\nabla$  9 mm with  $\text{Ø } 6$  mm M7  $\nabla$  9 mm Dowel Hole



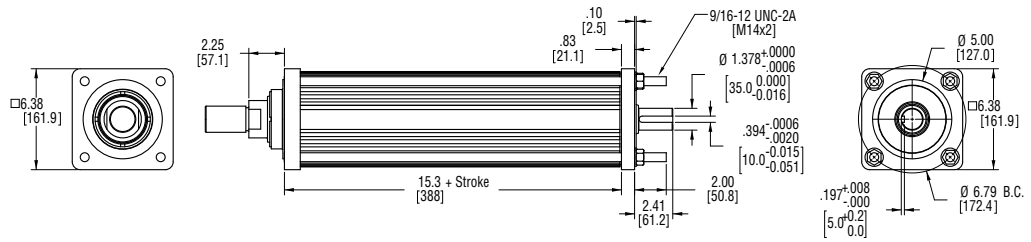
Drawings subject to change. Consult Exlar for certified drawings.

# FT60 Series Linear Actuators

## Base Unit

All dimensions shown in inches with millimeter equivalent in brackets.

See rod ends for rod end thread details.



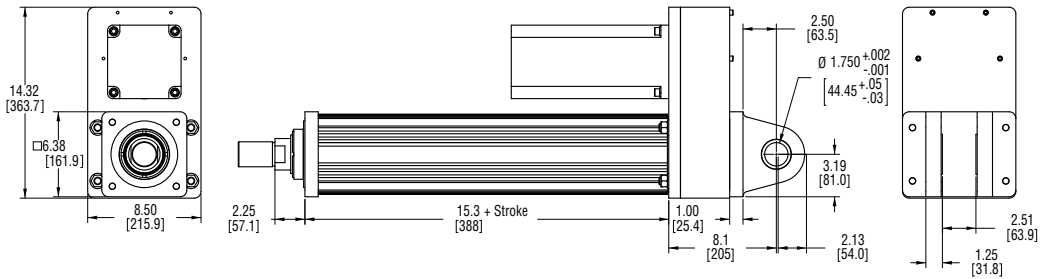
## Clevis Mount Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeter equivalent in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



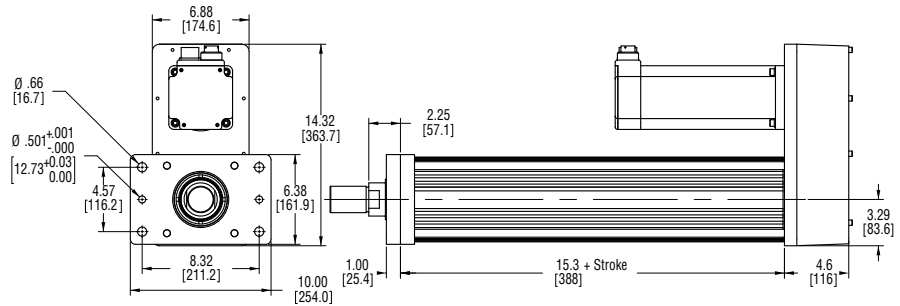
## Front Flange Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeter equivalent in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



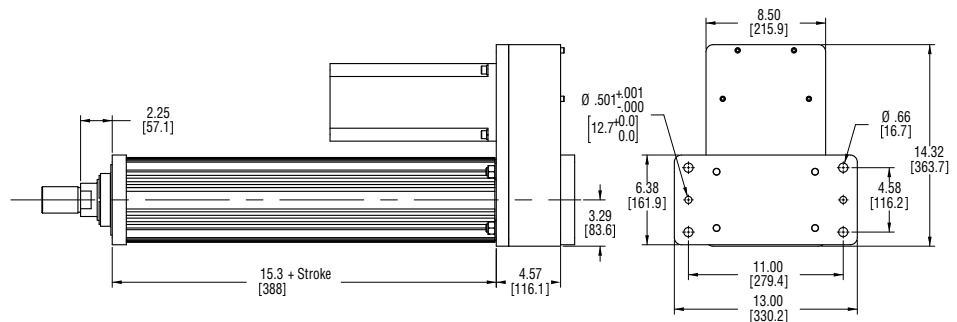
## Rear Flange Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeter equivalent in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



Drawings subject to change. Consult Exlar for certified drawings.

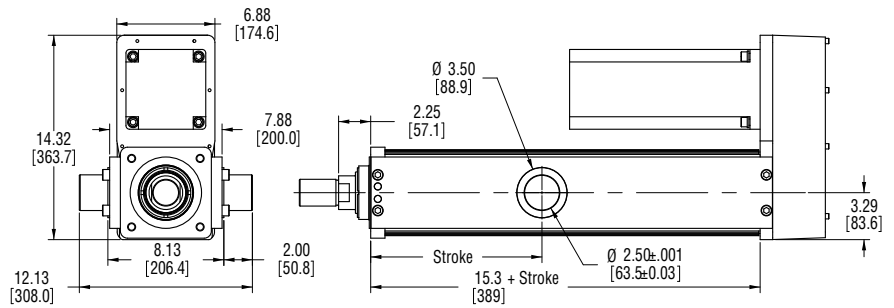
## Trunnion Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeters equivalents in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



\* If "Q" metric side trunnion option,  $\varnothing 60$  mm h9

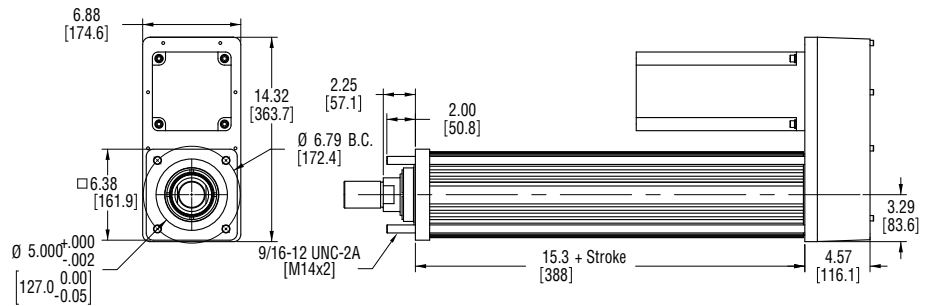
## Extended Tie Rod Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeters equivalents in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



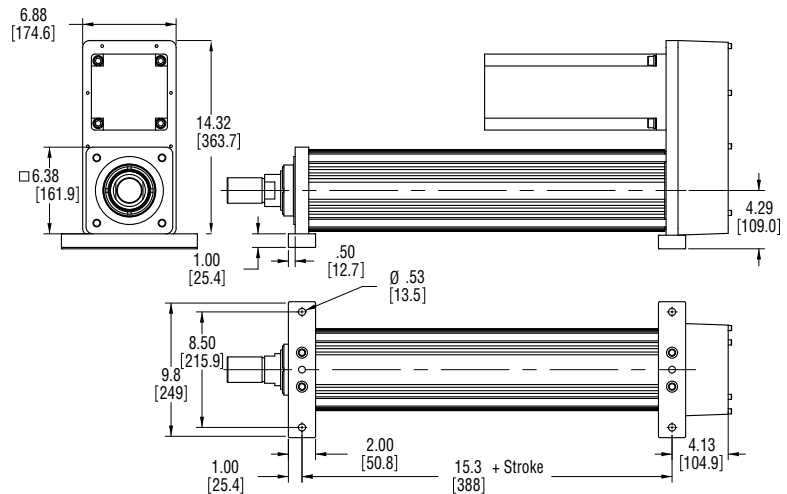
## Side Lug Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeters equivalents in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



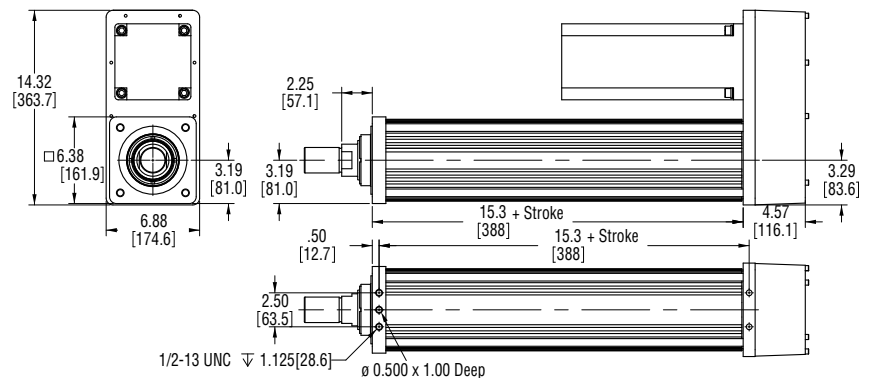
## Side Mount Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeters equivalents in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



\* If "J" or "K" metric side mount options, M12 x 1.75  $\nabla$  19 mm with  $\varnothing 12$  mm M7  $\nabla$  12 mm Dowel Hole

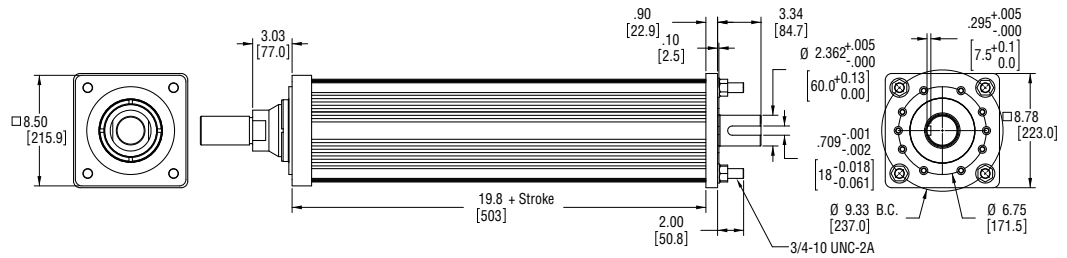
Drawings subject to change. Consult Exlar for certified drawings.

# FT80 Series Linear Actuators

## Base Unit

All dimensions shown in inches with millimeter equivalent in brackets.

See rod ends for rod end thread details.



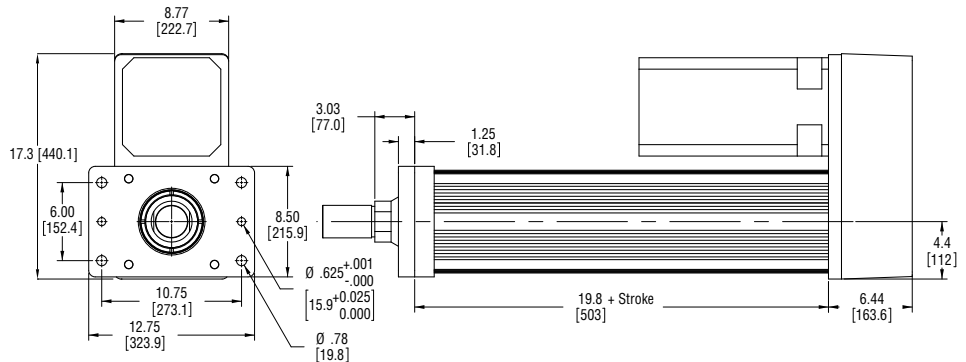
## Front Flange Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeter equivalent in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



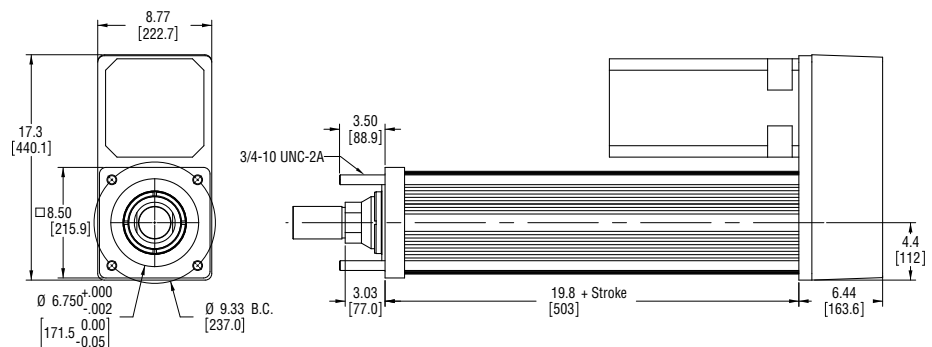
## Extended Tie Rod Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeter equivalent in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



Drawings subject to change. Consult Exlar for certified drawings.

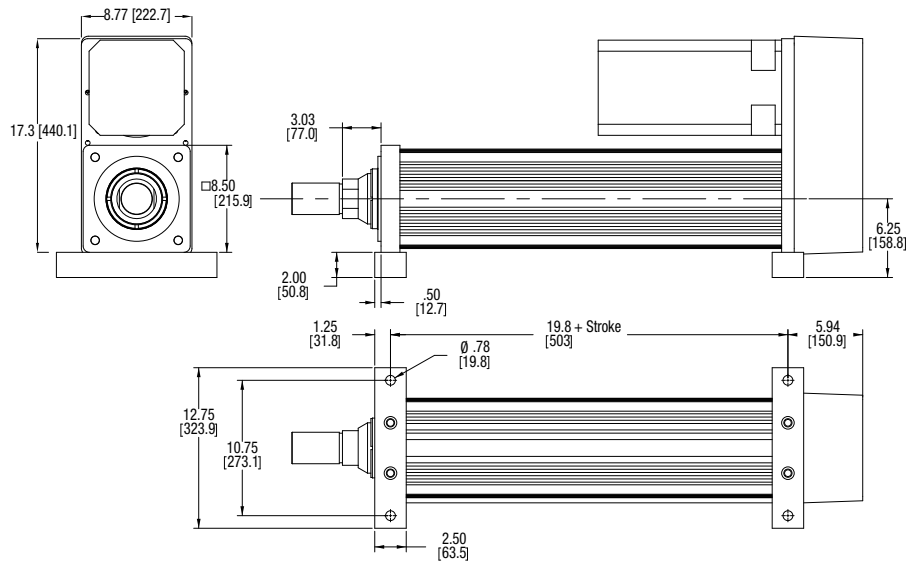
## Side Lug Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeters equivalents in brackets.

See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



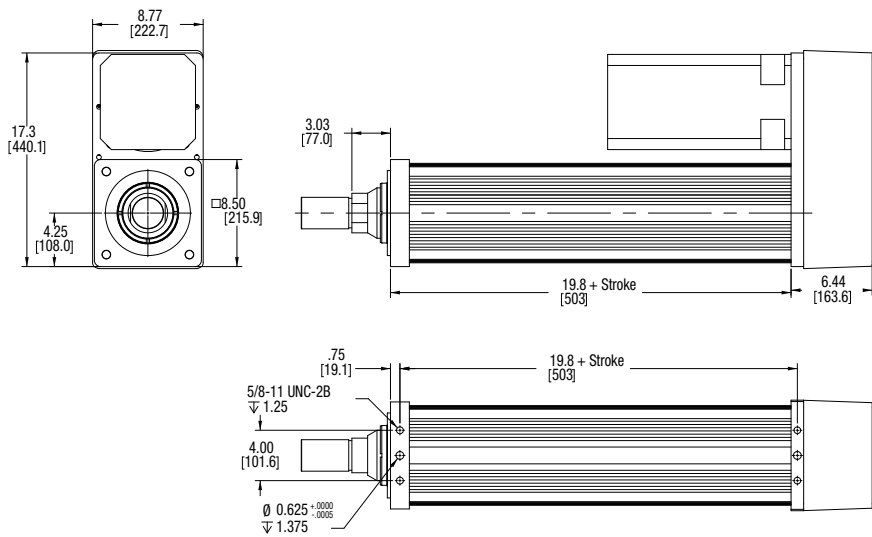
## Side Mount Unit

Parallel motor mount shown.

All dimensions shown in inches with millimeters equivalents in brackets.

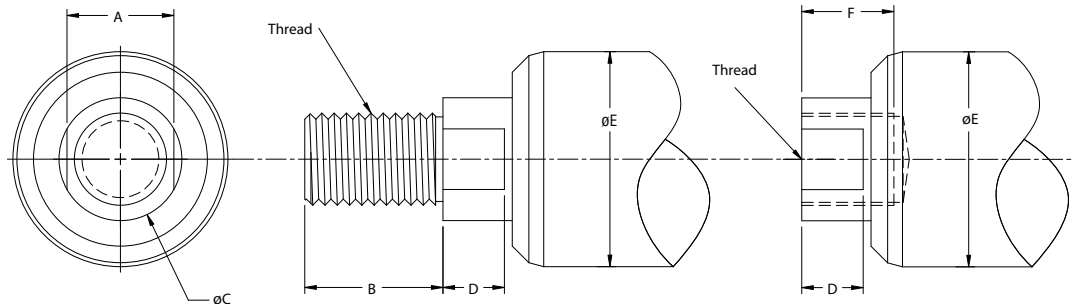
See rod ends for rod end thread details.

Motor plate and cover dimensions are subject to change depending on the motor selection.



\* If "J" or "K" metric side mount options, M16 x 2.0  $\nabla$  16 mm with  $\varnothing$  12 mm M7  $\nabla$  12 mm Dowel Hole

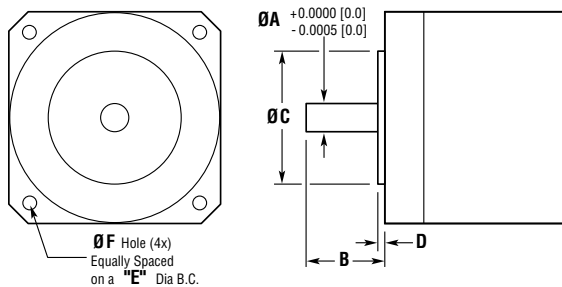
## Rod Ends



	A in (mm)	B in (mm)	øC in (mm)	D in (mm)	øE in (mm)	F in (mm)	Male U.S.	Male Metric	Female U.S.	Female Metric
FT35	0.87 (22.1)	1.125 (28.6)	1.000 (25.4)	0.500 (12.7)	1.750 (44.5)	0.750 (19.1)	3/4-16 UNF-2A	M16x1.5 6g	3/4-16 UNF-2B	M16x1.5 6h
FT60	2.00 (50.8)	2.750 (69.9)	2.360 (59.9)	0.750 (19.1)	3.000 (76.2)	2.000 (50.8)	1 7/8-12 UN-2A	M42x4.5 6g	1 7/8-12 UN-2B	M42x4.5 6h
FT80	2.75 (69.9)	4.019 (102.1)	3.143 (79.8)	1.000 (25.4)	4.000 (101.6)	2.250 (57.2)	2 1/2-12 UN-2A	M56x5.5 6g	2 1/2-12 UN-2B	M56x5.5 6h

## NEMA Standard Motor Dimensions

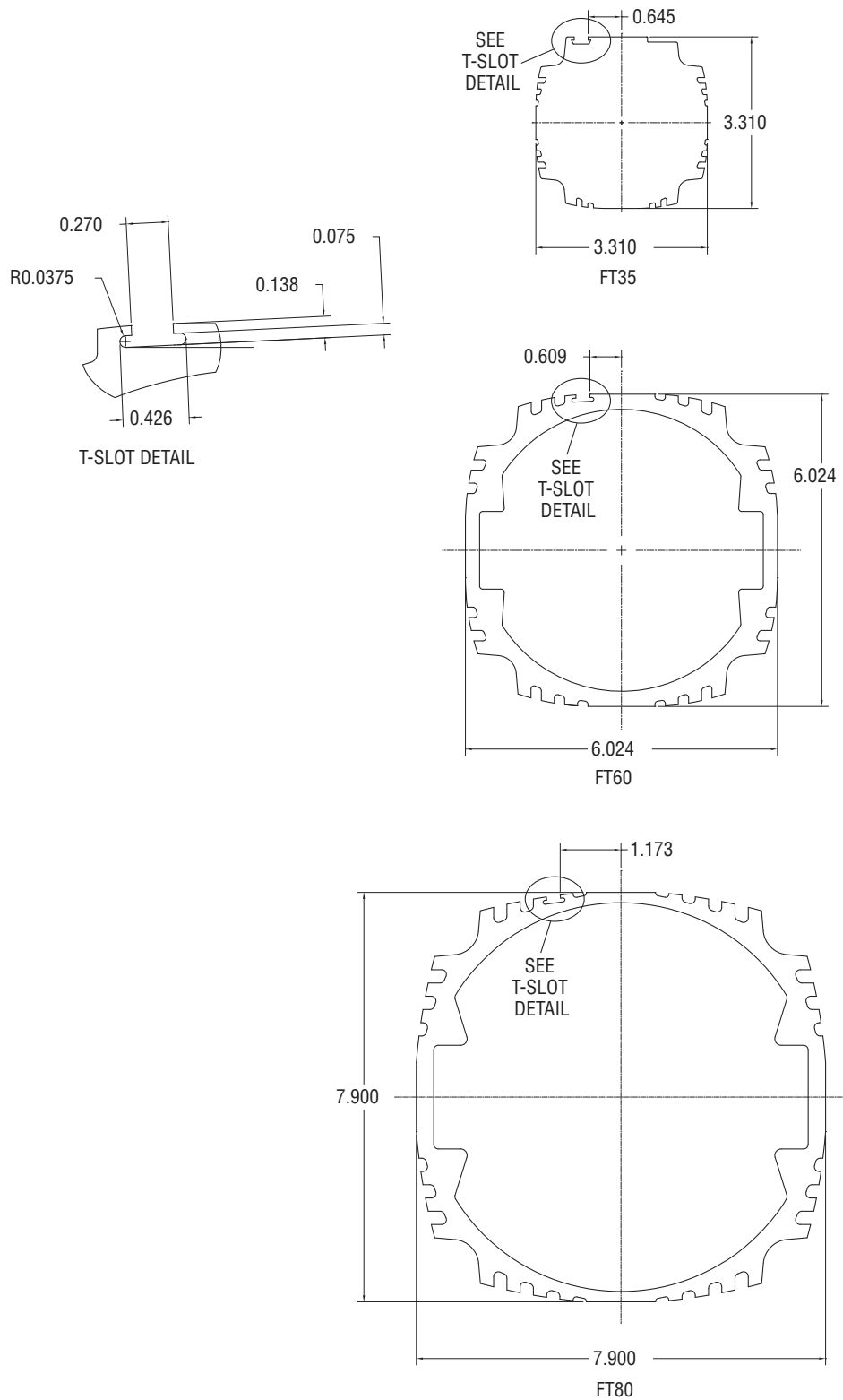
The I Series actuators offer the selection for motor mounting provisions to be the various NEMA motor sizes. Because there are variations from brand to brand of motor as to what is called NEMA dimensions, we publish this table of NEMA dimensions that we use as the standards for the product line. If the motor that you choose differs from these dimensions, it would not be called out by the N23, N34, N42, N56 call outs, and rather, by the A## alpha numeric callout for specific motors.



Dimension (in)	NEMA 23	NEMA 34	NEMA 42	NEMA 56
"A" Motor Shaft Diameter	0.25	0.5	0.75	0.625
"B" Motor Shaft Length	0.81	1.19	2.19	2.0625
"C" Motor Pilot Diameter	1.5	2.875	2.186	4.5
"D" Pilot Depth	0.05	0.0625	0.0625	0.1 - 0.16
"E" Mounting Bolt Circle	2.625	3.875	4.95	5.875
"F" Mounting Bolt Hole Dia.	0.205	0.223	0.328	3/8-16 UNC tap

Drawings subject to change. Consult Exlar for certified drawings.

## Case Dimensions





**AA = FT Frame Size**

- 35 = 3.5 inch (90 mm)
- 60 = 6.0 inch (150 mm)
- 80 = 8.0 inch (200 mm)

**BB = Stroke Length**

- 06 = 6 inch (150 mm) FT35
- 12 = 12 inch (300 mm) FT35, 60, 80
- 18 = 18 inch (450 mm) FT35
- 24 = 24 inch (600 mm) FT35, 60, 80
- 36 = 36 inch (915 mm) FT35, 60, 80
- 48 = 48 inch (1220 mm) FT35, 60, 80

**CC = Screw Lead**

- 05 = 0.2 inch, FT35
- 06 = 0.23 inch, FT60, 80
- 10 = 0.39 inch, FT35
- 12 = 0.47 inch, FT60, 80
- 20 = 0.79 inch, FT35
- 30 = 1.18 inch, FT60, 80

**D = Mounting Style<sup>1</sup>**

- L = Side lugs
- B = Front/rear flange (5)
- C = Rear clevis (5)
- F = Front flange
- R = Rear flange (5)
- S = Side mount
- D = Double side mount
- T = Side trunnion mount (5)
- E = Extended tie rods
- J = Metric side mount
- K = Metric double side mount
- Q = Metric side trunnion
- M = Metric extended tie rods
- G = Metric rear clevis (5)
- X = Special (please specify)

**E = Motor Mounting Configurations**

- N = None
- I = Inline direct drive (includes Exlar standard coupling)
- P = Parallel, 1:1 drive
- Q = Parallel, 2:1 reduction
- X = Special

**F = Rod End**

- M = Male, US std. thread
- A = Male, metric thread
- F = Female, US std. thread
- B = Female, metric thread
- W = Male, US std. thread 416C SS, rod end only
- R = Male metric thread 416C SS, rod end only
- V = Female, US std. thread 416C SS, rod end only
- L = Female, metric thread 416C SS, rod end only
- X = Special (please specify)

**GGG = Motor Mount Provisions<sup>3,4</sup>**

- A## = Alpha numeric motor call out – contact Exlar Applications Engineering Department. Motor not included.
- NMT = No motor mount – keyed shaft on base unit only
- N23 = Nema 23 standard dimension
- N34 = Nema 34 standard dimension
- N42 = Nema 42 standard dimension.
- N56 = Nema 56 standard demension.
- M60 = Exlar 60 mm SLM. Motor not included.
- M90 = Exlar 90 mm SLM. Motor not included.
- M11 = Exlar 115 mm SLM and ER. Motor not included.
- M14 = Exlar 142 mm SLM. Motor not included.
- G60 = Exlar 60 mm SLG. Motor not included.
- G90 = Exlar 90 mm SLG. Motor not included.
- G11 = Exlar 115 mm SLG and ER. Motor not included.
- AB3, 4, 6, 8 = Allen Bradley Ultra 3, 4, 6 and 8 inch motors

- BD3, 4, 6, 8 = Baldor 3, 4, 6 & 8 inch motors
- CE3, 4, 6, 8 = Parker (Custom Servo Motors) Imperial 3, 4, 6 and 8 inch motors
- CM3, 4, 6, 8 = Parker (Custom Servo Motors) Metric 3, 4, 6 & 8 inch motors
- EC3, 4, 6, 8 = ElectroCraft F&H 3000, 4000, 6000 and 8000 Series
- EE3, 4 = Emerson EMC Imperial 3 & 4 inch
- EM3, 4, 6, 8 = Emerson EMC Metric 3, 4, 6 & 8 inch
- FA 4, 6, 8 = Fanuc 4, 6 & 8 inch motors
- IN3, 4, 6, 8 = Bosch-Rexroth (Indramat) 3, 4, 6 and 8 inch motors
- KM2, 4, 6, 8 = Kollmorgen B & M 20, 40, 60 and 80 Series
- MT3, 4, 6, 8 = Mitsubishi 3, 4, 6 & 8 inch motors
- PS3, 4, 6, 8 = Pacific Scientific PMA/PMB Series
- PC2, 3, 4, 6 = Parker Compumotor Apex 2.7, 3.6, 4.5 and 5.6 inch
- YS3, 4, 6, 8 = Yaskawa 3, 4, 6 and 8 inch motors
- MXX = Unlisted or special motor mounting provisions

**XX .. XX = Options**

**Housing Options**

- XH = Special housing options
- HC = Type III hard coat anodized, class I<sup>2</sup>
- XT = High capacity roller screw
- SS = Stainless steel<sup>2</sup>
- FG = Smooth white epoxy<sup>2</sup>
- (IP65 sealing of unit with motor mounted requires “XH” option.)<sup>2</sup>

**Special Follower**

- PF = Preloaded follower. The dynamic load rating of zero backlash, preloaded screws is 63% of the dynamic load rating of the standard non-preloaded screws. The calculated travel life of a preloaded screw will be 25% of the calculated travel life of the same size and lead non-preloaded screw for the same application.
- FX = Special follower

**End Switches** (adjustable position throughout stroke)

- L1 = One adjustable switch, (10-30 VDC, PNP, N.C., 1m. 3 wire embedded cable)
- L2 = Two adjustable switches, (10-30 VDC, PNP, N.C., 1m. 3 wire embedded cable)
- L3 = Three adjustable switches, (10-30 VDC, PNP, N.C., 1m. 3 wire embedded cable)

*Please provide a drawing of motor dimensions with all orders to insure proper mounting compatibility.*

**Note:**

1. Mounting face size, shaft length and other details of particular motors may require special adapters or provisions for mounting. Always discuss your motor selection with Exlar engineering.
2. These housing options may also indicate the need for special material main rods, faceplate and motor mounting provisions. Internal anti-rotate is not available with stainless steel options. Consult Exlar Applications Engineering.
3. NEMA callout must meet specifications on page 92 or use alpha-numeric callout.
4. MAX Std. motor size FT35: 4 inch/115 mm, FT60 & 80: 8 inch/200 mm. For oversized motors, consult Exlar Applications Engineer.
5. Not available with inline motor mount. Consult Exlar Applications Engineering.

Consult Exlar's Application Engineering Department regarding all special actuator components.



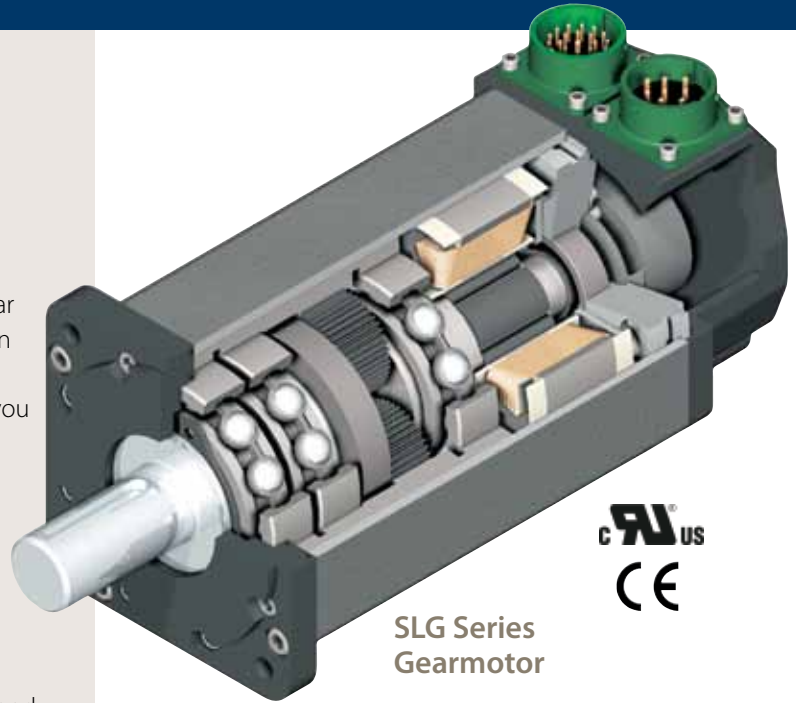
## Introducing Exlar's SLM Series Motors and SLG Series Integrated Gearmotors

Brushless servo motor and gearmotor technology from Exlar provides the highest torque-to-size ratio available in motion control today. Small size, outstanding performance specifications, quality and customization capabilities offer you the solution you need for your motion control application.

### Very High Torque Density

Exlar's T-LAM technology produces an efficient and powerful motor in a very small package.

- **60 mm SLM060** offers continuous torque up to 15 lbf-in and base speed of 5000 rpm.
- **90 mm SLM090** offers continuous torque up to 56 lbf-in and base speed of 4000 rpm.
- **115 mm SLM115** offers continuous torque up to 176 lbf-in and base speed of 3000 rpm.
- **142 mm SLM142** offers continuous torque up to 237 lbf-in and base speed of 2400 rpm.



SLG Series Gearmotor



#### Standard Features

<b>SLM Motor</b>	SLM Motor Standard Features
	UL recognized component IP65 sealing
	MS connectors embedded leads, or embedded leads with cable plugs
	Feedback configurations for nearly all servo amplifiers 115, 230 or 460 Vrms motor voltages
Annodized housings Class 180H insulation system	
<b>SLG Gearmotor</b>	All features of SLM motor shown above plus...
	High side load bearing design
	Integrated armature and sun gear
	Higher stiffness than bolt-on gearhead and motor
	10 arc minute standard backlash, single stage; 13 arc minute standard backlash, dual stage
Single and double reduction ratios: 4:1, 5:1, 10:1, 16:1, 20:1, 25:1, 40:1, 50:1, and 100:1	

## Unique T-LAM™ Stator Design Advantage

This innovative design offers several advantages over traditional motor winding for a more efficient and powerful motor.

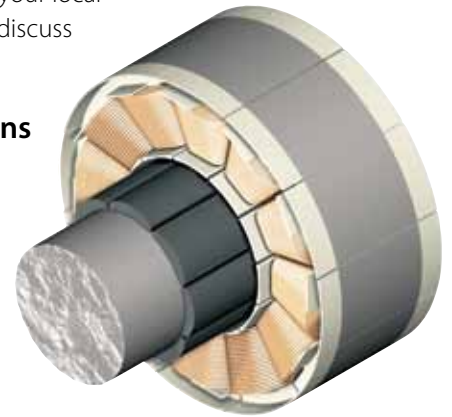
Built for durability, T-LAM segmented lamination stator technology consists of individual segments, each containing individual phase wiring for maximum motor performance. The robust insulation, high coercive strength magnets, and complete thermal potting all provide a more robust motor design – a design yielding a 35 to 70% torque increase in the same package size! T-LAM motor designs have Class 180-H insulation systems and UL recognition.

## Customization to Suit Your Requirements

Exlar Corporation has capabilities allowing custom motors to be manufactured to meet your OEM requirements. Whatever your special requirements are... custom shafts, custom mountings, custom stators, custom housing materials... please contact Exlar or your local sales representative to discuss your needs.

## Typical Applications

SLM Series Motors and SLG Series Gearmotors are perfectly suited for applications in any industry.



## EXLAR SLM & SLG Series Motors applications include:

Semiconductor

Plastics Machinery

Tensioning

Web Feed

Fluid Handling

Stage Positioning

Medical Applications

Winding Machines

Glass Manufacturing

Conveyor Drives

Automotive Assembly

Parts Handling

Screw Drives

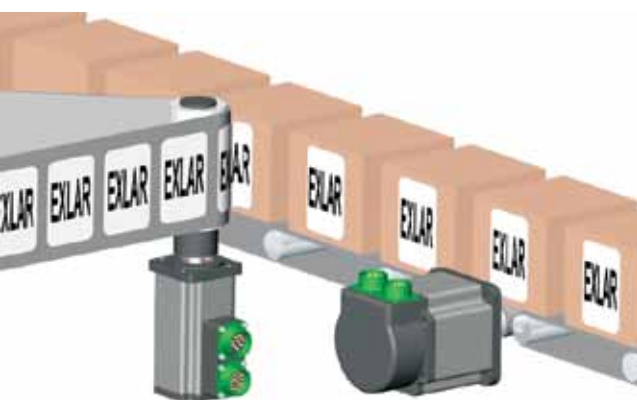
Labeling

Machine Tools

Simulation Robotics

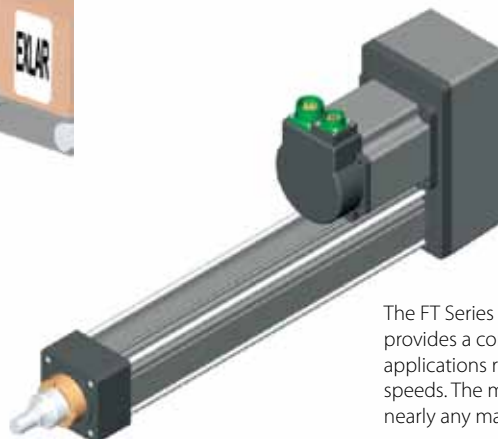
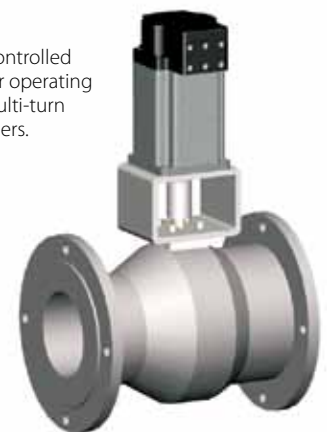
Packaging

SLM/SLG Series



Exlar's brushless motors are the highest performance with very compact size. This makes them perfect for high-speed labeling and demanding conveyor drive applications.

Exlar's closed-loop, servo-controlled rotary actuators are ideal for operating quarter-turn, full-turn, or multi-turn valves or shaft driven dampers.

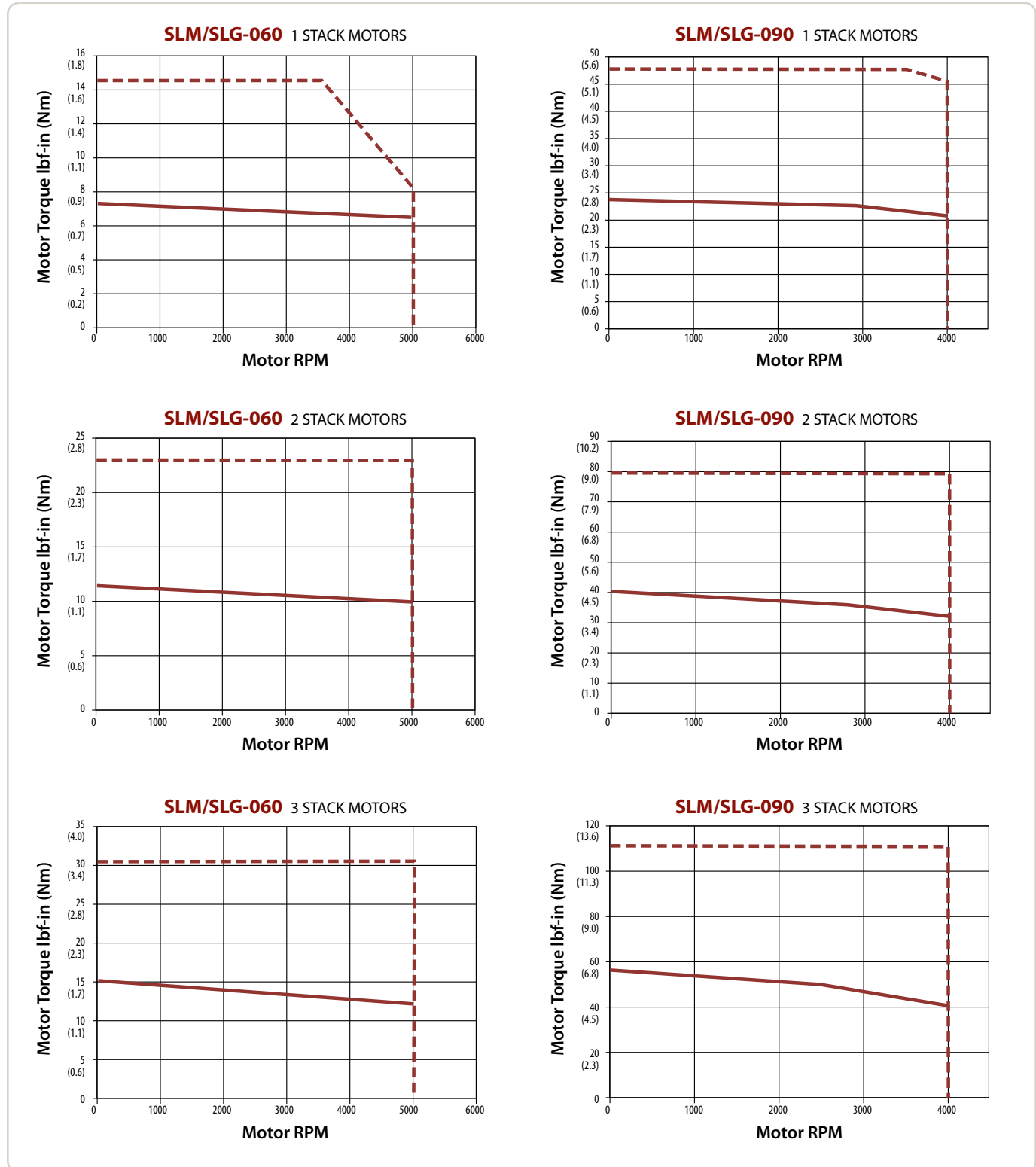


The FT Series combined with SLM/G Series motors provides a complete Exlar actuator solution for applications requiring heavy load capacity and high speeds. The motor can be configured to operate with nearly any manufacturer's servo amplifier.

## SLM/SLG Speed/Torque Curves

These speed vs. torque curves represent approximate continuous torque ratings at indicated rpms. Different types of servo amplifiers will offer varying motor torque.

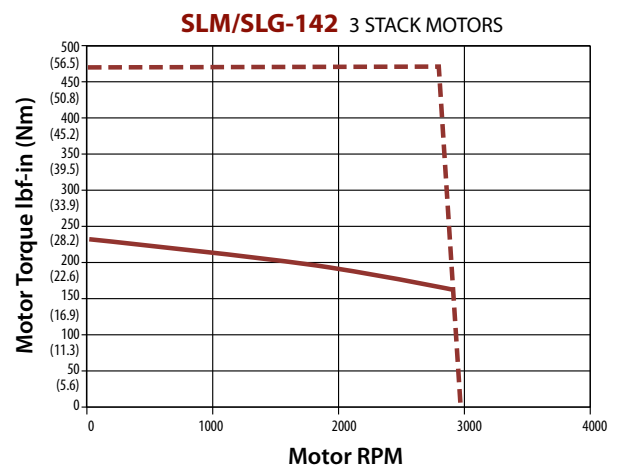
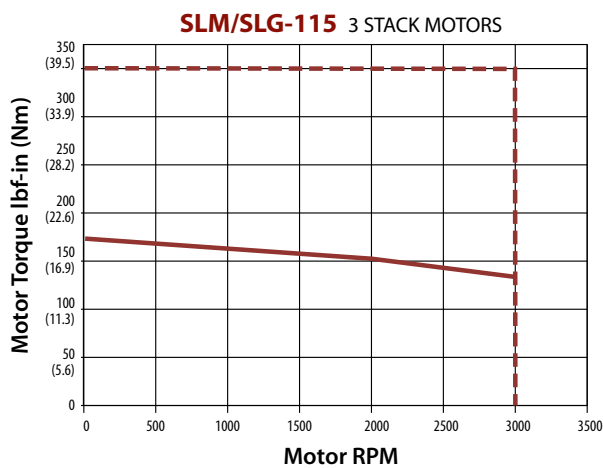
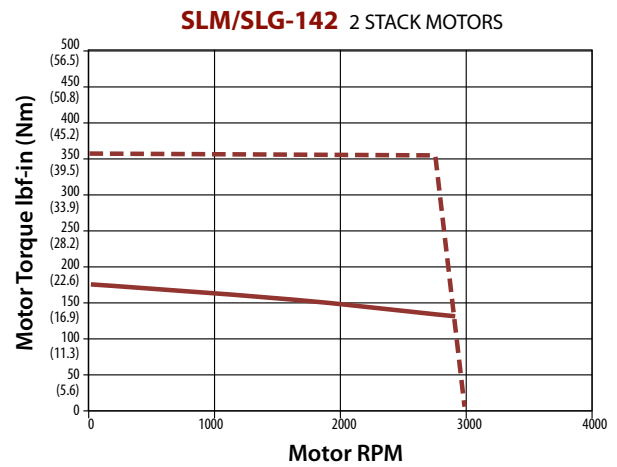
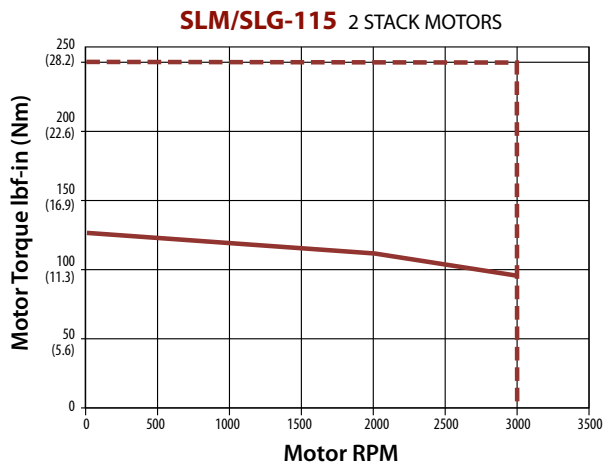
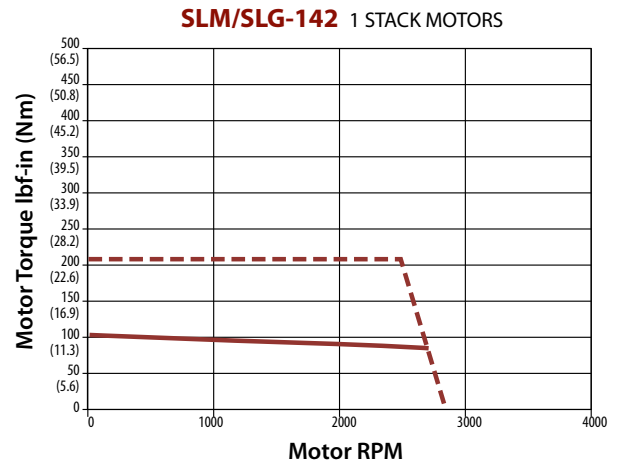
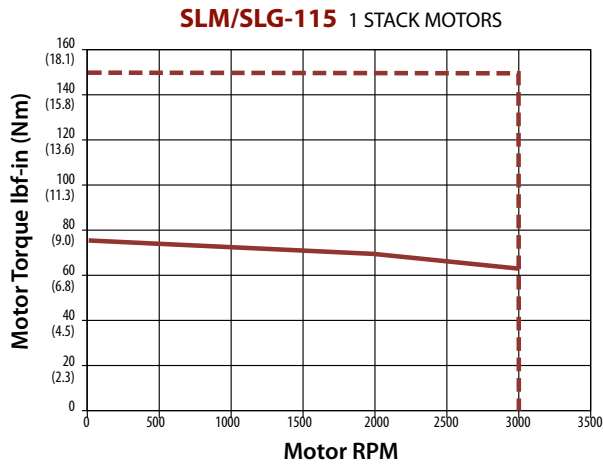
--- Peak Torque  
 — Continuous Torque



Test data derived using NEMA recommended aluminum heatsink 10" x 10" x 1/4" on SLM/SLG060 and 10" x 10" x 3/8" on SLM/SLG090

## SLM/SLG Speed/Torque Curves

- - - Peak Torque  
— Continuous Torque



Test data derived using NEMA recommended aluminum heatsink 12" x 12" x 1/2" on SLM/SLG115 and 12" x 12" x 1/2" on SLM/SLG142

SLM/SLG Series

## SLM/SLG060 Electrical/Mechanical Specifications

SLM/G060 Stator Data		1 Stack Motor				2 Stack Motor				3 Stack Motor			
Sinusoidal Commutation Data		118	138	158	168	218	238	258	268	318	338	358	368
Continuous Motor Torque	lbf-in (Nm)	7.6 (0.86)	7.3 (0.83)	7.0 (0.79)	7.0 (0.79)	11.9 (1.35)	11.5 (1.30)	11.2 (1.27)	11.3 (1.28)	15.3 (1.73)	15.3 (1.73)	14.8 (1.67)	15.0 (1.69)
Peak Motor Torque	lbf-in (Nm)	15.3 (1.72)	14.7 (1.66)	14.0 (1.58)	14.0 (1.58)	23.8 (2.69)	23.0 (2.60)	22.5 (2.54)	22.6 (2.56)	30.7 (3.47)	30.7 (3.46)	29.6 (3.34)	29.9 (3.38)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	2.5 (0.28)	5.2 (0.6)	8.3 (0.9)	9.5 (1.1)	2.5 (0.3)	5.2 (0.6)	8.9 (1.0)	10.2 (1.1)	2.3 (0.3)	5.3 (0.6)	8.8 (1.0)	10.2 (1.1)
Continuous Current Rating	A	3.4	1.6	1.9	0.8	5.4	2.5	1.4	1.2	7.3	3.2	1.9	1.6
Peak Current Rating	A	6.9	3.1	3.8	1.6	10.8	4.9	2.8	2.5	14.6	6.5	3.8	3.3
<b>TRAPEZOIDAL COMMUTATION DATA</b>													
Continuous Motor Torque	lbf-in (Nm)	7.3 (0.82)	7.0 (0.79)	6.7 (0.76)	6.7 (0.76)	11.4 (1.29)	11.0 (1.24)	10.7 (1.21)	10.8 (1.22)	14.7 (1.66)	14.6 (1.65)	14.1 (1.6)	14.3 (1.61)
Peak Motor Torque	lbf-in (Nm)	14.6 (1.65)	14.0 (1.6)	13.4 (1.5)	13.4 (1.5)	22.8 (2.6)	22.0 (2.5)	21.5 (2.4)	21.6 (2.4)	29.3 (3.3)	29.3 (3.3)	28.3 (3.2)	28.6 (3.2)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	1.93 (0.22)	4.06 (0.46)	6.5 (0.73)	7.41 (0.84)	1.93 (0.22)	4.06 (0.46)	6.90 (0.78)	7.92 (0.89)	1.83 (0.21)	4.11 (0.46)	6.85 (0.77)	7.92 (0.89)
Continuous Current Rating	A	4.22	1.93	1.15	1.01	6.59	3.02	1.74	1.52	8.96	3.98	2.30	2.02
Peak Current Rating	A	8.44	3.86	2.3	2.02	13.18	6.04	3.47	3.04	17.92	7.96	4.61	4.04
<b>MOTOR DATA</b>													
Voltage Constant (Ke)	Vpk/Krpm	23.9	50.3	80.5	91.8	23.9	50.3	85.5	98.1	22.6	50.9	84.9	98.1
(+/- 10% @ 25°C)	Vrms/Krpm	16.9	35.6	56.9	64.9	16.9	35.6	60.5	69.4	16.0	36.0	60.0	69.4
Pole Configuration		8	8	8	8	8	8	8	8	8	8	8	8
Resistance (L-L)(+/- 5% @ 25°C)	Ohms	2.62	12.52	35.22	45.79	1.11	5.26	15.95	20.69	0.62	3.14	9.36	12.22
Inductance (L-L)(+/- 15%)	mH	3.1	13.7	35.0	45.5	1.5	6.6	19.0	25.0	0.9	4.4	12.3	16.5
SLM Armature Inertia (+/- 5%)	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.000237 (0.268)				0.000237 (0.268)				0.000237 (0.268)			
Brake Inertia	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00012 (0.135)				0.000120 (0.135)				0.000120 (0.135)			
Brake Current @ 24VDC	A	.33				.33				.33			
Brake Holding Torque	lbf-in (Nm)	19 (2.2)				19 (2.2)				19 (2.2)			
Brake Engage/Disengage Time	ms	14/28				14/28				14/28			
Mechanical Time Constant (tm)	ms	1.41	1.52	1.67	1.67	0.60	0.64	0.67	0.66	0.37	0.37	0.40	0.39
Electrical Time Constant (te)	ms	1.18	1.09	0.99	0.99	1.34	1.25	1.19	1.21	1.42	1.41	1.32	1.35
Damping Constant	lbf-in/krpm (N-m/krpm)	0.02 (0.002)				0.03 (0.003)				0.05 (0.006)			
Friction Torque	lbf-in (Nm)	0.07 (0.008)				0.10 (0.011)				0.14 (0.016)			
Voltage Rating	Vrms	115	230	400	460	115	230	400	460	115	230	400	460
Speed @ Bus Voltage	rpm	5000											
Insulation Class		180 (H)											
Insulation System Volt Rating	Vrms	460											
Environmental Rating		IP65											

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.

## SLG060 Gearmotor Data

	1 Stack Motor			2 Stack Motor			3 Stack Motor		
SLG Armature Inertia* lbf-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.000226 (0.255)			0.000401 (0.453)			0.000576 (0.651)		
<b>GEARING REFLECTED INERTIA</b>	<b>SINGLE REDUCTION</b>						<b>DOUBLE REDUCTION</b>		
	Gear Stages	lbf-in-sec <sup>2</sup>	(Kg-cm <sup>2</sup> )	Gear Stages	lbf-in-sec <sup>2</sup>	(Kg-cm <sup>2</sup> )			
	4:1	0.0000132	(0.0149)	16:1	0.0000121	(0.0137)			
	5:1	0.0000087	(0.00984)	20:1, 25:1	0.0000080	(0.00906)			
	10:1	0.0000023	(0.00261)	40:1, 50:1, 100:1	0.0000021	(0.00242)			
Backlash at 1% rated torque:	10 Arc minutes Efficiency: Single reduction 91%						13 Arc minutes Double Reduction: 86%		

\* Add armature inertia to gearing inertia for total SLG system inertia  
Test data derived using NEMA recommended aluminum heatsink 10" x 10" x 1/4"

## SLM/SLG090 Electrical/Mechanical Specifications

SLM/G090 Stator Data		1 Stack Motor				2 Stack Motor				3 Stack Motor		
Sinusoidal Commutation Data		118	138	158	168	218	238	258	268	318	338	368
Continuous Motor Torque	lbf-in (Nm)	23.8 (2.69)	24.0 (2.71)	23.7 (2.68)	24.0 (2.71)	39.6 (4.48)	40.0 (4.52)	39.6 (4.47)	40.0 (4.52)	55.8 (6.31)	55.5 (6.27)	55.8 (6.30)
Peak Motor Torque	lbf-in (Nm)	47.6 (5.38)	48.0 (5.43)	47.4 (5.35)	48.0 (5.42)	79.2 (8.95)	80.1 (9.05)	79.1 (8.94)	80.0 (9.04)	111.6 (12.61)	111.0 (12.54)	111.6 (12.61)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	3.2 (0.37)	6.6 (0.7)	11.6 (1.3)	13.3 (1.5)	3.2 (0.4)	6.6 (0.7)	11.6 (1.3)	13.3 (1.5)	6.6 (0.7)	11.6 (1.3)	13.1 (1.5)
Continuous Current Rating	A	8.2	4.0	2.3	2.0	13.6	6.8	3.8	3.4	9.5	5.3	4.8
Peak Current Rating	A	16.4	8.1	4.6	4.0	27.3	13.5	7.6	6.7	19.0	10.7	9.5
<b>TRAPEZOIDAL COMMUTATION DATA</b>												
Continuous Motor Torque	lbf-in (Nm)	22.7 (2.57)	22.9 (2.59)	22.6 (2.56)	22.9 (2.59)	37.8 (4.27)	38.2 (4.32)	37.8 (4.27)	38.2 (4.31)	53.3 (6.02)	53.0 (5.99)	53.3 (6.02)
Peak Motor Torque	lbf-in (Nm)	45.4 (5.13)	45.9 (5.2)	45.3 (5.1)	45.8 (5.2)	75.7 (8.5)	76.5 (8.6)	75.6 (8.5)	76.4 (8.6)	106.6 (12.0)	106.0 (12.0)	106.6 (12.0)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	2.53 (0.29)	5.17 (0.58)	9.02 (1.02)	10.34 (1.17)	2.53 (0.29)	5.17 (0.58)	9.02 (1.02)	10.34 (1.17)	5.11 (0.58)	9.07 (1.03)	10.23 (1.16)
Continuous Current Rating	A	10.04	4.96	2.80	2.48	16.71	8.27	4.68	4.13	11.65	6.53	5.82
Peak Current Rating	A	20.08	9.92	5.61	4.96	33.42	16.54	9.36	8.26	23.30	13.05	11.64
<b>MOTOR DATA</b>												
Voltage Constant (Ke) (+/- 10% @ 25°C)	Vpk/Krpm	31.3	64.0	111.7	128.1	31.3	64.0	111.7	128.1	63.4	112.4	126.7
	Vrms/Krpm	22.2	45.3	79.0	90.6	22.2	45.3	79.0	90.6	44.8	79.5	89.6
Pole Configuration		8	8	8	8	8	8	8	8	8	8	8
Resistance (L-L)(+/- 5% @ 25°C)	Ohms	0.75	3.06	9.57	12.28	0.30	1.21	3.78	4.86	0.69	2.19	2.75
Inductance (L-L)(+/- 15%)	mH	3.7	15.4	78.0	61.5	1.8	7.3	37.2	29.3	4.7	24.7	18.8
SLM Armature Inertia (+/- 5%)	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00054 (0.609)				0.00097 (1.09)				0.00140 (1.58)		
Brake Inertia	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00096 (1.08)				0.00096 (1.08)				0.00096 (1.08)		
Brake Current @ 24VDC	A	.67				.67				.67		
Brake Holding Torque	lbf-in (Nm)	97 (11)				97 (11)				97 (11)		
Brake Engage/Disengage Time	ms	20/29				20/29				20/29		
Mechanical Time Constant (tm)	ms	0.51	0.52	0.76	0.52	0.38	0.37	0.54	0.37	0.31	0.44	0.31
Electrical Time Constant (te)	ms	5.14	5.02	8.14	5.01	5.93	6.06	9.85	6.04	6.86	11.30	6.86
Damping Constant	lbf-in/krpm (N-m/krpm)	0.07 (0.008)				0.12 (0.014)				0.18 (0.020)		
Friction Torque	lbf-in (Nm)	0.20 (0.023)				0.35 (0.040)				0.50 (0.056)		
Voltage Rating	Vrms	115	230	400	460	115	230	400	460	230	400	460
Speed @ Bus Voltage	rpm	4000										
Insulation Class		180 (H)										
Insulation System Volt Rating	Vrms	460										
Environmental Rating		IP65										

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.

## SLG090 Gearmotor Data

	1 Stack Motor			2 Stack Motor			3 Stack Motor		
SLG Armature Inertia* lbf-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00114 (1.29)			0.00157 (1.77)			0.00200 (2.26)		
<b>GEARING REFLECTED INERTIA</b>	<b>SINGLE REDUCTION</b>						<b>DOUBLE REDUCTION</b>		
	Gear Stages	lbf-in-sec <sup>2</sup>	(Kg-cm <sup>2</sup> )	Gear Stages	lbf-in-sec <sup>2</sup>	(Kg-cm <sup>2</sup> )			
	4:1	0.000154	(0.174)	16:1	0.000115	(0.130)			
	5:1	0.000100	(0.113)	20:1, 25:1	0.0000756	(0.0854)			
	10:1	0.0000265	(0.0300)	40:1, 50:1, 100:1	0.0000203	(0.0230)			
Backlash at 1% rated torque:	10 Arc minutes Efficiency: Single reduction 91%						13 Arc minutes Double Reduction: 86%		

\* Add armature inertia to gearing inertia for total SLG system inertia  
Test data derived using NEMA recommended aluminum heatsink 10" x 10" x 3/8"

SLM/SLG Series



## SLM/SLG115 Electrical/Mechanical Specifications

SLM/SLG115 Stator Data		1 Stack Motor				2 Stack Motor			3 Stack Motor		
Sinusoidal Commutation Data		118	138	158	168	238	258	268	338	358	368
Continuous Motor Torque	lbf-in (Nm)	75.8 (8.57)	74.2 (8.39)	74.4 (8.41)	74.2 (8.38)	123.8 (13.99)	121.6 (13.74)	123.8 (13.99)	174.2 (19.68)	173.1 (19.56)	177.1 (20.01)
Peak Motor Torque	lbf-in (Nm)	151.7 (17.14)	148.5 (16.77)	148.9 (16.82)	148.4 (16.77)	247.6 (27.98)	243.2 (27.48)	247.6 (27.98)	348.4 (39.36)	346.2 (39.11)	354.2 (40.02)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	4.5 (0.51)	8.7 (1.0)	15.7 (1.8)	17.4 (2.0)	8.7 (1.0)	15.9 (1.8)	17.4 (2.0)	8.5 (1.0)	15.9 (1.8)	17.6 (2.0)
Continuous Current Rating	A	18.7	9.5	5.3	4.8	15.9	8.6	8.0	22.9	12.2	11.3
Peak Current Rating	A	37.4	19.1	10.6	9.5	31.8	17.1	15.9	45.8	24.4	22.5
<b>TRAPEZOIDAL COMMUTATION DATA</b>											
Continuous Motor Torque	lbf-in (Nm)	72.4 (8.18)	70.9 (8.01)	71.1 (8.03)	70.9 (8.01)	118.2 (13.36)	116.1 (13.12)	118.2 (13.36)	166.4 (18.8)	165.3 (18.67)	169.1 (19.11)
Peak Motor Torque	lbf-in (Nm)	144.8 (16.36)	141.8 (16.0)	142.1 (16.1)	141.7 (16.0)	236.5 (26.7)	232.3 (26.2)	236.5 (26.7)	332.7 (37.6)	330.6 (37.3)	338.2 (38.2)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	3.53 (0.40)	6.78 (0.77)	12.22 (1.38)	13.55 (1.53)	6.78 (0.77)	12.37 (1.40)	13.55 (1.53)	6.63 (0.75)	12.37 (1.40)	13.7 (1.55)
Continuous Current Rating	A	22.89	11.69	6.50	5.84	19.5	10.49	9.75	28.04	14.93	13.79
Peak Current Rating	A	45.78	23.38	12.99	11.68	39.0	20.98	19.18	55.24	29.85	27.18
<b>MOTOR DATA</b>											
Voltage Constant (Ke) (+/- 10% @ 25°C)	Vpk/Krpm Vrms/Krpm	43.8 31.0	83.9 59.4	151.4 107.1	167.9 118.7	83.9 59.4	153.3 108.4	167.9 118.7	82.1 58.1	153.3 108.4	169.7 120
Pole Configuration		8	8	8	8	8	8	8	8	8	8
Resistance (L-L)(+/- 5% @ 25°C)	Ohms	0.21	0.80	2.60	3.21	0.34	1.17	1.35	0.20	0.69	0.81
Inductance (L-L)(+/- 15%)	mH	2.1	7.8	25.5	31.3	3.8	12.7	15.2	2.4	8.4	10.2
SLM Armature Inertia (+/- 5%)	lbf-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00344 (3.89)				0.00623 (7.036)			0.00901 (10.181)		
Brake Inertia	lbf-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00327 (3.70)				0.00327 (3.70)			0.00327 (3.70)		
Brake Current @ 24 VDC	A	.75				.75			.75		
Brake Holding Torque	lbf-in (Nm)	195 (22)				195 (22)			195 (22)		
Brake Engage/Disengage Time	ms	25/50				25/50			25/50		
Mechanical Time Constant (tm)	ms	0.49	0.51	0.51	0.51	0.39	0.40	0.39	0.34	0.34	0.33
Electrical Time Constant (te)	ms	10.18	9.76	9.81	9.75	11.23	10.84	11.23	12.11	12.11	12.69
Damping Constant	lbf-in/krpm (N-m/krpm)	0.21 (0.024)				0.35 (0.040)			0.40 (0.045)		
Friction Torque	lbf-in (Nm)	0.56 (0.06)				1.00 (0.113)			1.20 (0.136)		
Voltage Rating	Vrms	115	230	400	460	230	400	460	230	400	460
Speed @ Bus Voltage	rpm	3000									
Insulation Class		180 (H)									
Insulation System Volt Rating	Vrms	460									
Environmental Rating		IP65									

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.

## SLG115 Gearmotor Data

	1 Stack Motor			2 Stack Motor			3 Stack Motor			
SLG Armature Inertia* lbf-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00538 (6.08)			0.00816 (9.22)			0.00109 (12.37)			
<b>GEARING REFLECTED INERTIA</b>	<b>SINGLE REDUCTION</b>						<b>DOUBLE REDUCTION</b>			
	Gear Stages	lbf-in-sec <sup>2</sup>		(Kg-cm <sup>2</sup> )		Gear Stages	lbf-in-sec <sup>2</sup>		(Kg-cm <sup>2</sup> )	
	4:1	0.0000635		(0.717)		16:1	0.000513		(0.580)	
	5:1	0.0000428		(0.484)		20:1, 25:1	0.000350		(0.396)	
	10:1	0.0000111		(0.125)		40:1, 50:1, 100:1	0.000911		(0.103)	
Backlash at 1% rated torque:	10 Arc minutes Efficiency: Single reduction 91%						13 Arc minutes Double Reduction: 86%			

\* Add armature inertia to gearing inertia for total SLG system inertia  
Test data derived using NEMA recommended aluminum heatsink 12" x 12" x 1/2"

## SLM142 Electrical/Mechanical Specifications

SLM142 Stator Data		1 Stack Motor				2 Stack Motor			3 Stack Motor	
Sinusoidal Commutation Data		118	138	158	168	238	258	268	358	368
Continuous Motor Torque	lbf-in (Nm)	108.1 (12.21)	106.8 (12.07)	104.4 (11.79)	109.0 (12.31)	179.2 (20.25)	178.2 (20.13)	177.2 (20.02)	236.4 (26.70)	237.5 (26.83)
Peak Motor Torque	lbf-in (Nm)	216.1 (24.42)	213.7 (24.14)	208.8 (23.59)	218.0 (24.63)	358.4 (40.50)	356.3 (40.26)	354.4 (40.04)	472.7 (53.41)	474.9 (53.66)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	5.9 (0.66)	11.8 (1.3)	20.1 (2.3)	23.5 (2.7)	11.8 (1.3)	20.1 (2.3)	23.5 (2.7)	20.1 (2.3)	23.9 (2.7)
Continuous Current Rating	A	20.5	10.2	5.8	5.2	17.0	9.9	8.4	13.1	11.1
Peak Current Rating	A	41.1	20.3	11.6	10.4	34.1	19.8	16.8	26.2	22.2
<b>TRAPEZOIDAL COMMUTATION DATA</b>										
Continuous Motor Torque	lbf-in (Nm)	103.2 (11.66)	102.0 (11.53)	99.7 (11.26)	104.1 (11.76)	171.1 (19.34)	170.1 (19.22)	169.2 (19.12)	225.7 (25.50)	226.8 (25.62)
Peak Motor Torque	lbf-in (Nm)	206.4 (23.32)	204.1 (23.1)	199.4 (22.5)	208.2 (23.5)	342.3 (38.7)	340.3 (38.4)	338.4 (38.2)	451.4 (51.0)	453.5 (51.2)
Torque Constant (Kt) (+/- 10% @ 25°C)	lbf-in/A (Nm/A)	4.58 (0.52)	9.16 (1.04)	15.71 (1.77)	18.33 (2.07)	9.16 (1.04)	15.71 (1.77)	18.33 (2.07)	15.71 (1.77)	18.66 (2.11)
Continuous Current Rating	A	25.16	12.44	7.09	6.34	20.87	12.10	10.32	16.05	13.58
Peak Current Rating	A	50.33	24.88	14.18	12.69	41.73	24.20	20.63	32.11	27.16
<b>MOTOR DATA</b>										
Voltage Constant (Ke) (+/- 10% @ 25°C)	Vpk/Krpm (Vrms/Krpm)	56.8	113.5	194.6	227.1	113.5	194.6	227.1	194.6	231.1
Pole Configuration		8	8	8	8	8	8	8	8	8
Resistance (L-L)(+/- 5% @ 25°C)	Ohms	0.21	0.87	2.68	3.34	0.359	1.01	1.39	0.61	0.858
Inductance (L-L)(+/- 15%)	mH	5.4	21.7	63.9	78.3	10.4	30.5	41.5	20.0	28.2
Armature Inertia (+/- 5%)	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00927 (10.47)				0.01537 (17.36)			0.02146 (24.25)	
Brake Inertia	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.008408 (9.5)				0.008408 (9.5)			0.008408 (9.5)	
Brake Current @ 24 VDC	A	1.0				1.0			1.0	
Brake Holding Torque	lbf-in (Nm)	354 (39.99)				354 (39.99)			354 (39.99)	
Brake Engage/Disengage Time	ms	25/73				25/73			25/73	
Mechanical Time Constant (tm)	ms	0.79	0.81	0.85	0.78	0.52	0.53	0.54	0.45	0.45
Electrical Time Constant (te)	ms	25.59	25.02	23.88	23.43	30.58	30.22	29.89	32.60	32.90
Damping Constant	lbf-in/krpm (N-m/krpm)	0.60 (0.068)				0.80 (0.090)			1.20 (0.136)	
Friction Torque	lbf-in (Nm)	1.50 (0.17)				1.75 (0.20)			2.00 (0.23)	
Bus Voltage	Vrms	115	230	400	460	230	400	460	400	460
Speed @ Bus Voltage	rpm	2400								
Insulation Class		180 (H)								
Insulation System Volt Rating	Vrms	460								
Environmental Rating		IP65								

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.  
 Gearmotor not available on 142 frame motor.  
 Test data derived using NEMA recommended aluminum heatsink 12" x 12" x 1/2"

SLM/SLG Series

## SLG Series Gearmotor General Performance Specifications

Two torque ratings for the SLG Series Gearmotors are given in the table below. The left hand columns give the maximum (peak) allowable output torque for the indicated ratios of each size SLG Series Gearmotor. This is **NOT** the rated output torque of the motor multiplied by the ratio of the reducer.

It is possible to select a configuration of the motor selection and gear ratio such that the rated motor torque, multiplied by

the gear ratio exceeds these ratings. It is the responsibility of the user to ensure that the settings of the system, including the amplifier, do not allow these values to be exceeded.

The right hand columns give the output torque at the indicated speed which will result in 10,000 hour (L10). The setup of the system, including the amplifier, will determine the actual output torque and speed.

### Output Torque Ratings—Mechanical

Model	Ratio	Maximum Allowable Output Torque – Set by User	Output Torque @ Speed for 10,000 Hour Life – lbf. in (Nm)		
			1000 RPM	3000 RPM	5000 RPM
SLG060	4:1	603 (68.1)	144 (16.2)	104 (11.7)	88 (9.9)
	5:1	522 (58.9)	170 (19.2)	125 (14.1)	105 (11.9)
	10:1	327 (36.9)	200 (22.6)	140 (15.8)	120 (13.6)
	16:1	603 (68.1)	224 (25.3)	160 (18.1)	136 (15.4)
	20:1	603 (68.1)	240 (27.1)	170 (19.2)	146 (16.5)
	25:1	522 (58.9)	275 (31.1)	200 (22.6)	180 (20.3)
	40:1	603 (68.1)	288 (32.5)	208 (23.5)	180 (20.3)
	50:1	522 (58.9)	340 (38.4)	245 (27.7)	210 (23.7)
	100:1	327 (36.9)	320 (36.1)	280 (31.6)	240 (27.1)
				<b>1000 RPM</b>	<b>2500 RPM</b>
SLG090	4:1	2078 (234.8)	600 (67.8)	456 (51.5)	396 (44.7)
	5:1	1798 (203.1)	775 (87.6)	590 (66.7)	510 (57.6)
	10:1	1126 (127.2)	890 (100.6)	680 (76.8)	590 (66.7)
	16:1	2078 (234.8)	912 (103.4)	688 (77.7)	592 (66.9)
	20:1	2078 (234.8)	980 (110.7)	740 (83.6)	640 (72.3)
	25:1	1798 (203.1)	1250 (141.2)	950 (107.3)	825 (93.2)
	40:1	2078 (234.8)	1200 (135.6)	920 (103.9)	800 (90.4)
	50:1	1798 (203.1)	1550 (169.4)	1200 (135.6)	1000 (112.9)
	100:1	1126 (127.2)	1100 (124.3)	1100 (124.3)	1100 (124.3)
				<b>1000 RPM</b>	<b>2000 RPM</b>
SLG115	4:1	4696(530.4)	1392 (157.3)	1132 (127.9)	1000 (112.9)
	5:1	4066 (459.4)	1445 (163.3)	1175 (132.8)	1040 (117.5)
	10:1	2545 (287.5)	1660 (187.6)	1350 (152.6)	1200 (135.6)
	16:1	4696 (530.4)	2112 (238.6)	1714 (193.0)	1518 (171.0)
	20:1	4696 (530.4)	2240 (253.1)	1840 (207.9)	1620 (183.0)
	25:1	4066 (459.4)	2350 (265.5)	1900 (214.7)	1675 (189.2)
	40:1	4696 (530.4)	2800 (316.4)	2240 (253.1)	2000 (225.9)
	50:1	4066 (459.4)	2900 (327.7)	2350 (265.5)	2100 (237.3)
	100:1	2545 (287.5)	2500 (282.5)	2500 (282.5)	2400 (271.2)

### Radial Load and Bearing Life

RPM	SLM/G060 lbf (N)	SLM/G090 lbf (N)	SLM/G115 lbf (N)	SLM142 lbf (N)
50	195 (867)	389 (1730)	939 (4177)	1350 (6006)
100	155 (690)	309 (1375)	745 (3314)	1071 (4767)
250	114 (507)	227 (1010)	549 (2442)	789 (3512)
500	90 (400)	180 (801)	435 (1935)	626 (2788)
1000	72 (320)	143 (636)	346 (1539)	497 (2213)

Side load ratings shown below are for 10,000 hour bearing life at 25mm from motor face at given rpm.

Visit [www.exlar.com](http://www.exlar.com) for full details on radial load and bearing life.

### Motor and Gearmotor Weight (lbs)

	SLM/G060			SLM/G090			SLM/G115			SLM142
	Motor	1 Stage	2 Stage	Motor	1 Stage	2 Stage	Motor	1 Stage	2 Stage	
1 Stack	3.0	7.5	9.3	5.4	12.8	14.8	14.2	28	34	31
2 Stack	4.1	8.6	10.4	7.8	15.2	17.2	22.0	35.8	41.8	39
3 Stack	5.2	9.7	11.5	10.2	17.6	19.6	29.8	43.6	49.6	47
Brake		1.8			2.7			4.1		6.0

(gear stages not available on SLM142)

## Motor Speed Designators

All Exlar T-LAM motors and actuators carry a standard motor speed designator as defined below. This is representative of the standard base speed of the motor, for the selected bus voltage.

If the model number is created and the location for the motor speed designator is left blank, this is the base speed to which each motor will be manufactured. The model number can also be created including this standard speed designator.

Designator	Base Speed	Motor Series
-50	5000 rpm	SLM/SLG060
-40	4000 rpm	SLM/SLG090
-30	3000 rpm	SLM/SLG115
-24	2400 rpm	SLM142
01-99	Special Speed, Consult Exlar	

Exlar also provides the flexibility to manufacture all of its "T-LAM" products with special base speeds to match the customer's exact application requirements. This may be a higher than standard speed motor, or lower base speed than standard which will allow the customer to get the required torque, at a speed optimized to their application, and use the minimum amount of current from their amplifier.

The call out for a special speed is configured in the model number by using a two digit code from 01-99. These numbers represent the number, in hundreds, of RPM that will be the base speed for the particular motor.

For example, an SLG090-010-KCGS-AB1-138-40 motor that normally has a 4000 rpm standard winding, can be changed to a 3300 rpm winding by changing the -40, to a -33. It can be changed to a 5000 rpm winding by changing the -40 to a -50.

Changing this speed designator will change the ratings of the motor, and these must be obtained from Exlar applications engineers. Also, it is not possible to produce every possible speed from -01 to -99 for each motor at each voltage so please contact Exlar applications engineers for confirmation of the speed that is desired for the application.

## Motor Options

SLM/SLG motor options are described with a 3 digit code. The first digit calls out the stack length, the second the rated bus voltage, and the third the number of poles of the motor. Refer to the mechanical/ electrical specifications for motor torque and actuator rated force.

<b>118 =</b>	1 stack	115 Vrms	8 Pole	Class 180 H
<b>138 =</b>		230 Vrms		
<b>158 =</b>		400 Vrms		
<b>168 =</b>		460 Vrms		
<b>218 =</b>	2 stac	115 Vrms	8 Pole	Class 180 H
<b>238 =</b>		230 Vrms		
<b>258 =</b>		400 Vrms		
<b>268 =</b>		460 Vrms		
<b>318 =</b>	3 stac	115 Vrms	8 Pole	Class 180 H
<b>338 =</b>		230 Vrms		
<b>358 =</b>		400 Vrms		
<b>368 =</b>		460 Vrms		

Refer to specification pages 94-97 for availability of 115V stators by configuration.

## Housing Options

### G = Anodized Aluminum

### F = Smooth White Epoxy

This option provides for an actuator coated with FDA approved white epoxy.

### E = Electroless Nickel Plating

This option provides for an actuator with electroless nickel plating.

### SS = Stainless Steel Housing

This option provides an actuator with all stainless steel construction. Housing dimensions for this option are not equal to the standard housing. Force, torque and current ratings are reduced 25% with this option. Please inquire with Exlar for dimensions and ratings.

### HC = Type III Hard Coat Anodized, Class I

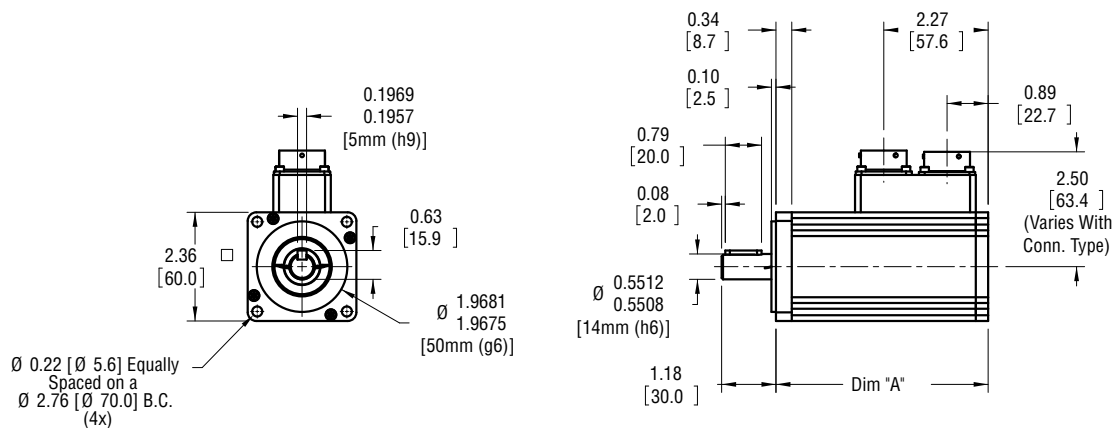
This option provides an actuator with type III hard coat anodized coating. Class I, no dye.

### XH = Special Housing Option

Any housing option that is not designated by the above codes should be listed as XH and described at time of order. All special options must be discussed with Exlar engineering.

# SLM060 Series Linear Actuators

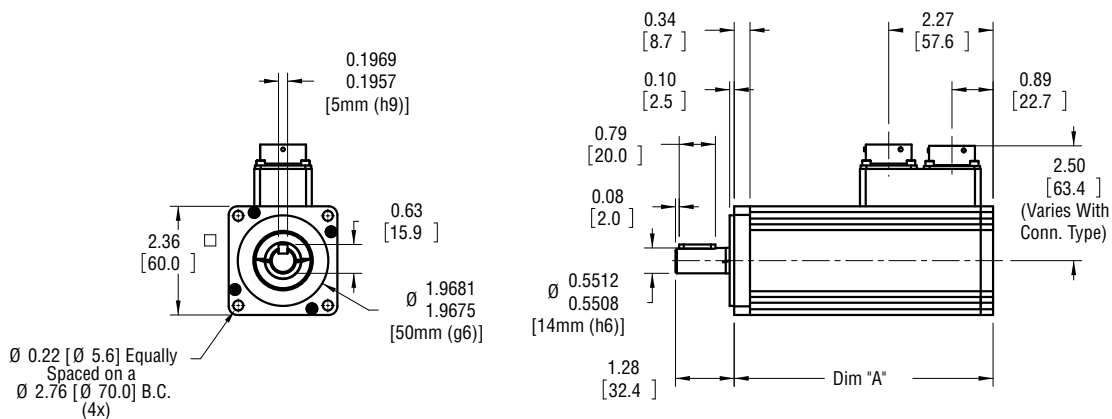
## SLM060



DIM	1 Stack Motor in (mm)	2 Stack Motor in (mm)	3 Stack Motor in (mm)
A	4.61 (117.1)	5.86 (149.9)	7.11 (180.6)

Face plate edge is not intended for alignment of shaft (use pilot)

## SLM060 With Brake Option

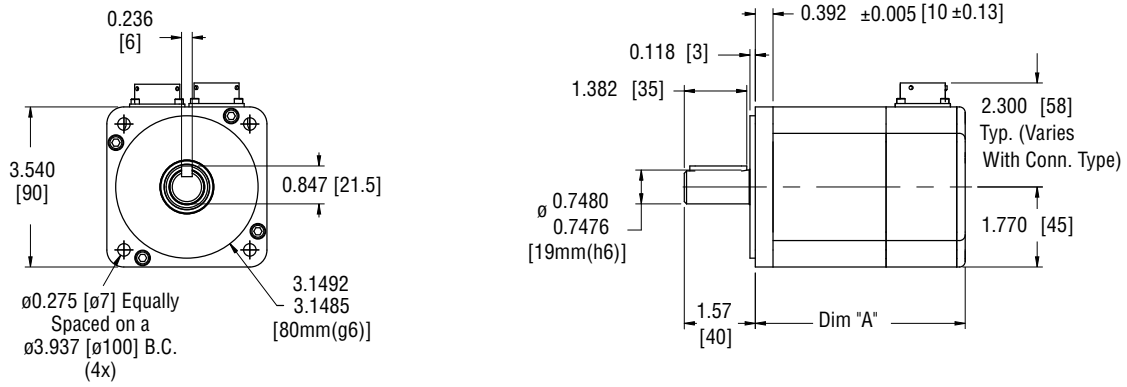


DIM	1 Stack Motor in (mm)	2 Stack Motor in (mm)	3 Stack Motor in (mm)
A	5.63 (143.0)	6.88 (174.7)	8.13 (206.4)

Face plate edge is not intended for alignment of shaft (use pilot)

Drawings subject to change. Consult Exlar for certified drawings.

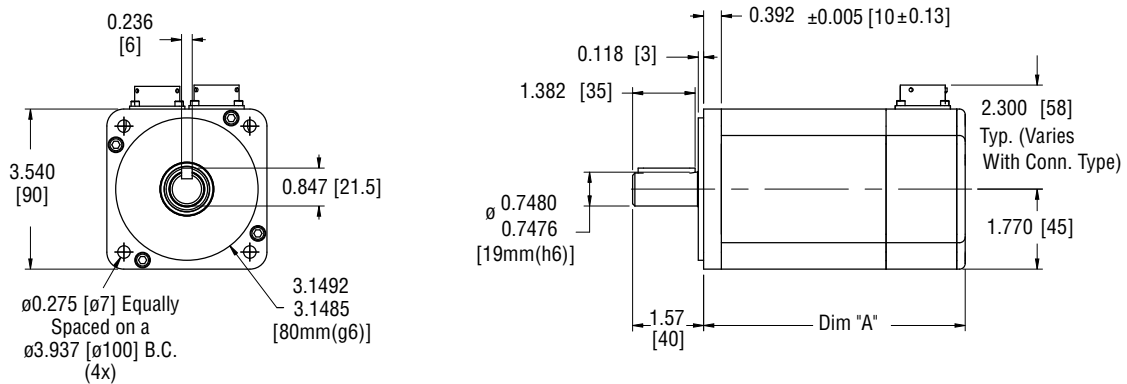
## SLM090



DIM	1 Stack Motor in (mm)	2 Stack Motor in (mm)	3 Stack Motor in (mm)
A	4.650 (118)	5.650 (144)	6.650 (169)

Face plate edge is not intended for alignment of shaft (use pilot)

## SLM090 With Brake Option

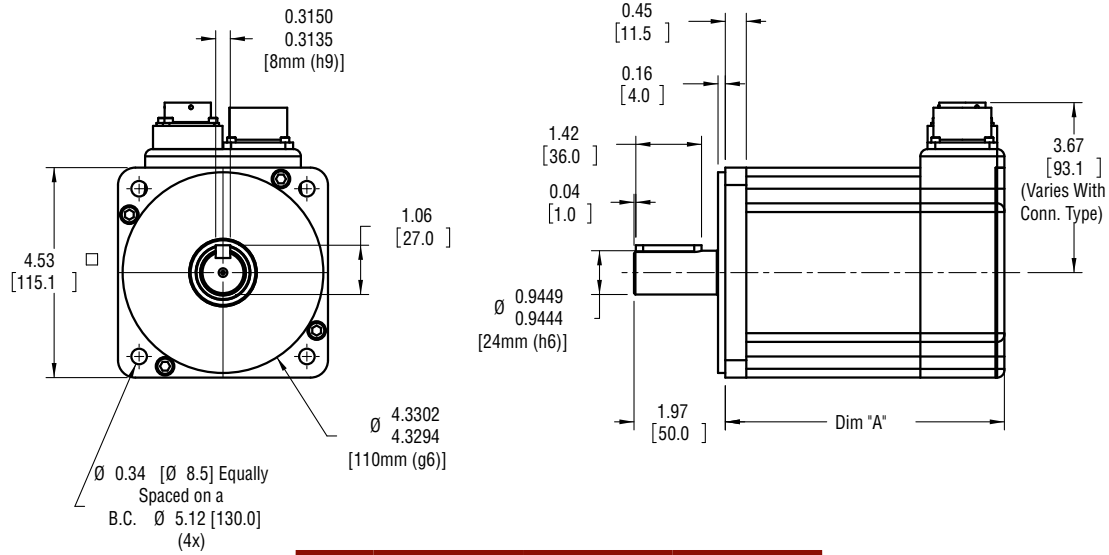


DIM	1 Stack Motor in (mm)	2 Stack Motor in (mm)	3 Stack Motor in (mm)
A	5.960 (151)	6.960 (177)	7.960 (202)

Face plate edge is not intended for alignment of shaft (use pilot)

# SLM115 Series Linear Actuators

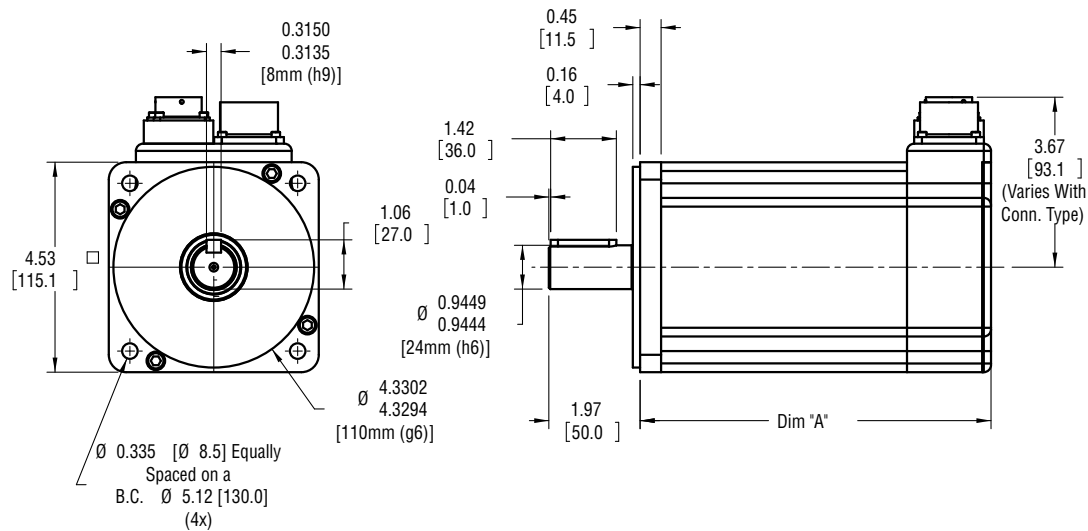
## SLM115



DIM	1 Stack—no brake in (mm)	2 Stack—no brake in (mm)	3 Stack—no brake in (mm)
A	6.02 (153.0)	8.02 (203.7)	10.02 (254.5)

Face plate edge is not intended for alignment of shaft (use pilot)

## SLM115 With Brake Option

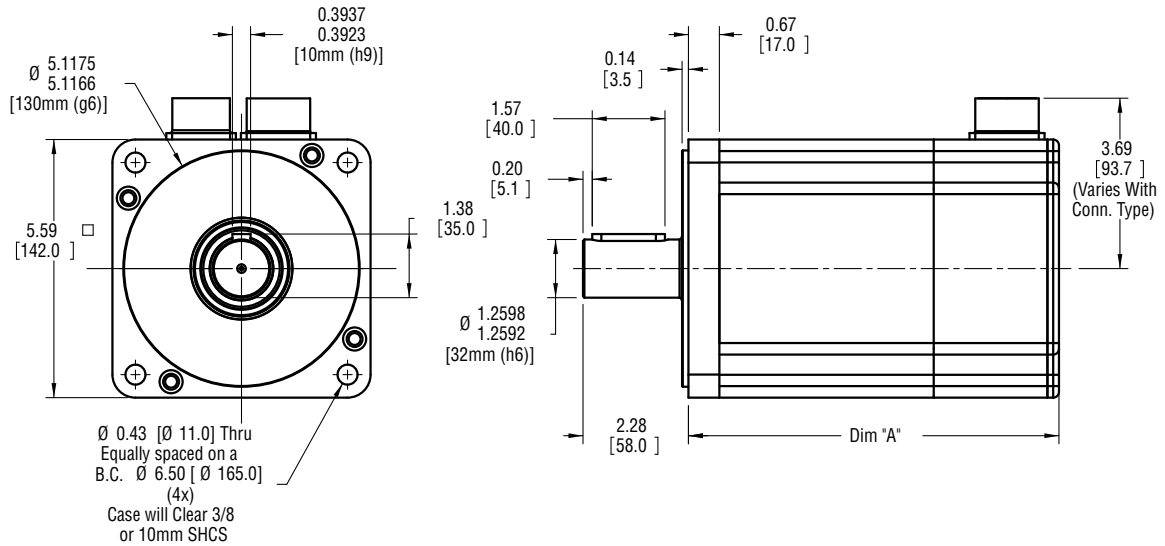


DIM	1 Stack—with brake in (mm)	2 Stack—with brake in (mm)	3 Stack—with brake in (mm)
A	7.75 (196.9)	9.75 (247.7)	11.75 (298.5)

Face plate edge is not intended for alignment of shaft (use pilot)

Drawings subject to change. Consult Exlar for certified drawings.

## SLM142

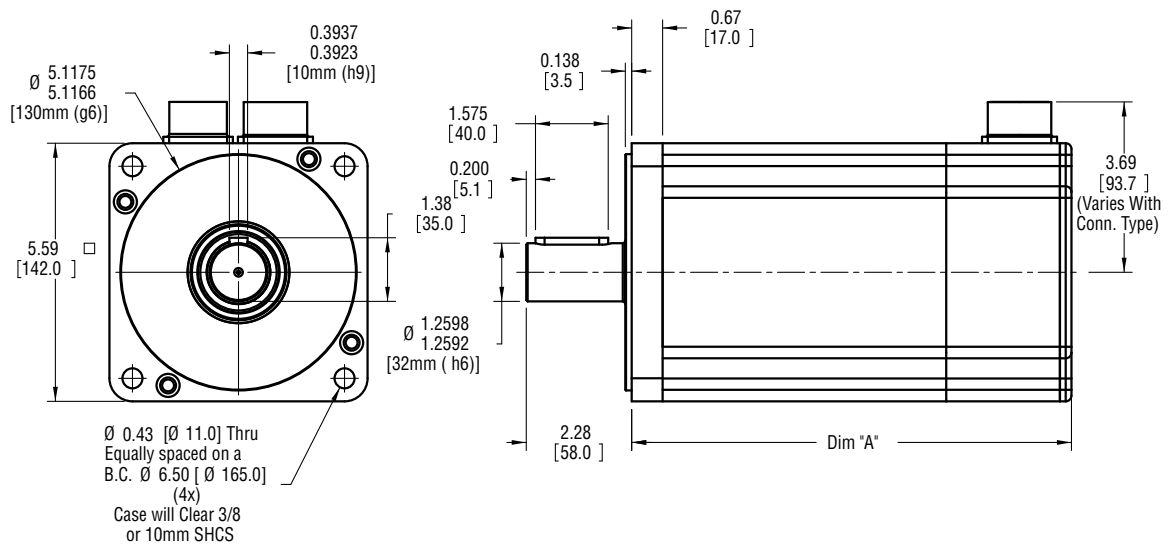


DIM	1 Stack—no brake in (mm)	2 Stack—no brake in (mm)	3 Stack—no brake in (mm)
A	7.87 (199.8)	9.62 (244.2)	11.37 (288.7)

Face plate edge is not intended for alignment of shaft (use pilot)

SLM/SLG  
Series

## SLM142 With Brake Option



DIM	1 Stack—with brake in (mm)	2 Stack—with brake in (mm)	3 Stack—with brake in (mm)
A	9.53 (241.9)	11.28 (286.4)	13.03 (330.8)

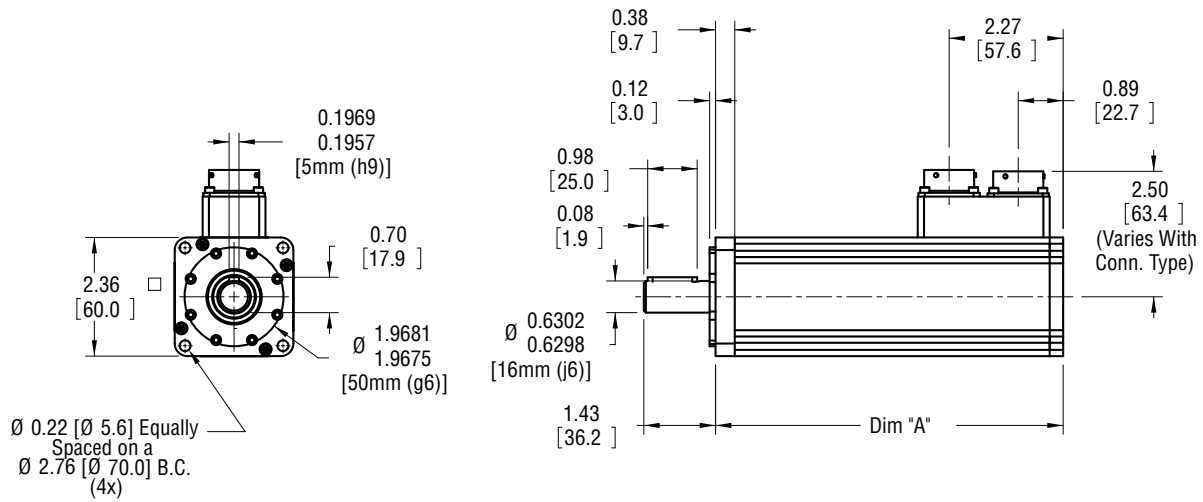
Face plate edge is not intended for alignment of shaft (use pilot)

Drawings subject to change. Consult Exlar for certified drawings.



# SLG060 Series Linear Actuators

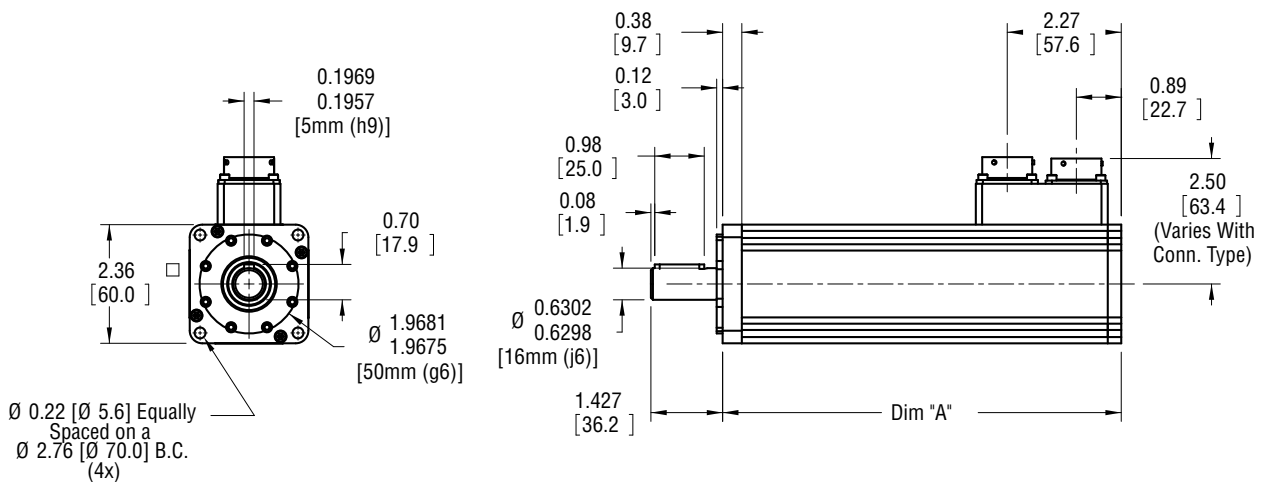
## SLG060



DIM	1 Stack Stator in (mm) 1 Stage Gearhead	2 Stack Stator in (mm) 1 Stage Gearhead	3 Stack Stator in (mm) 1 Stage Gearhead
A	6.915 (176)	8.165 (207)	9.415 (239)
	2 Stage Gearhead	2 Stage Gearhead	2 Stage Gearhead
	7.960 (202)	9.210 (234)	10.460 (266)

Face plate edge is not intended for alignment of shaft (use pilot)

## SLG060 With Brake Option

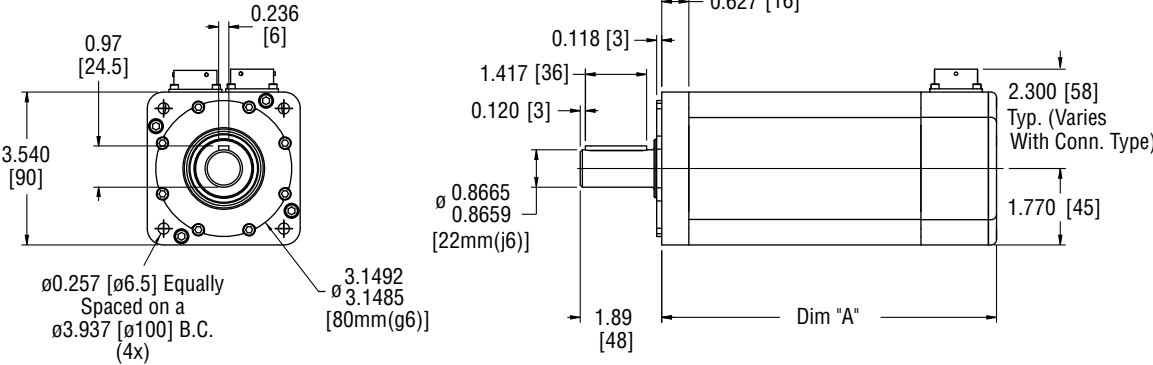


DIM	1 Stack Stator in (mm) 1 Stage Gearhead	2 Stack Stator in (mm) 1 Stage Gearhead	3 Stack Stator in (mm) 1 Stage Gearhead
A	7.930 (201)	9.180 (233)	10.430 (265)
	2 Stage Gearhead	2 Stage Gearhead	2 Stage Gearhead
	8.975 (228)	10.225 (260)	11.475 (291)

Face plate edge is not intended for alignment of shaft (use pilot)

Drawings subject to change. Consult Exlar for certified drawings.

SLG090

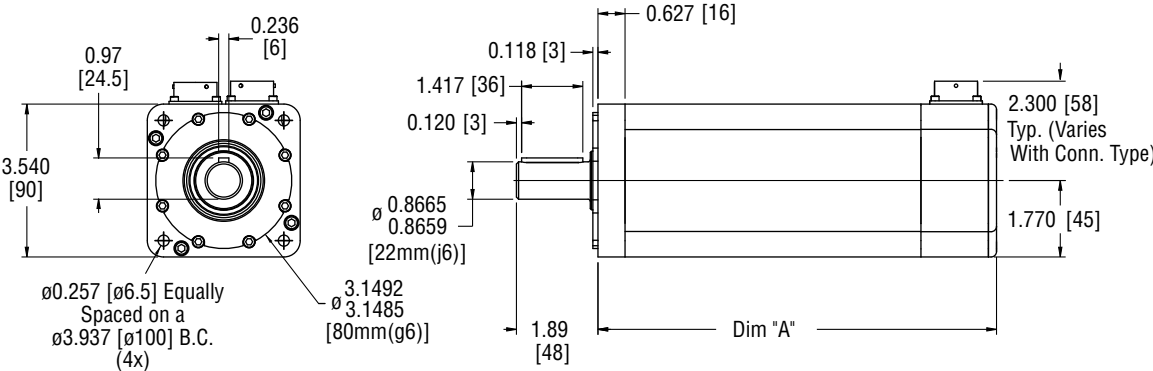


DIM	1 Stack Stator in (mm) 1 Stage Gearhead	2 Stack Stator in (mm) 1 Stage Gearhead	3 Stack Stator in (mm) 1 Stage Gearhead
A	7.760 (197)	8.760 (223)	9.760 (248)
	2 Stage Gearhead	2 Stage Gearhead	2 Stage Gearhead
	9.025 (229)	10.025 (255)	11.025 (280)

Face plate edge is not intended for alignment of shaft (use pilot)

SLM/SLG Series

SLG090 With Brake Option



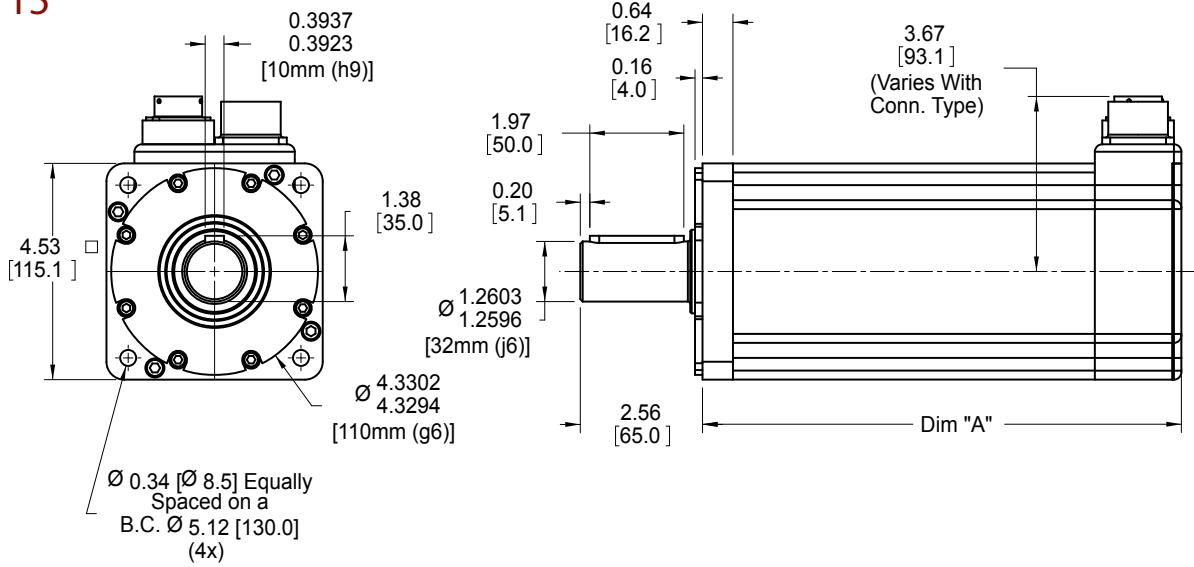
DIM	1 Stack Stator in (mm) 1 Stage Gearhead	2 Stack Stator in (mm) 1 Stage Gearhead	3 Stack Stator in (mm) 1 Stage Gearhead
A	9.070 (230)	10.070 (256)	11.070 (281)
	2 Stage Gearhead	2 Stage Gearhead	2 Stage Gearhead
	10.335 (263)	11.335 (288)	12.335 (313)

Face plate edge is not intended for alignment of shaft (use pilot)

Drawings subject to change. Consult Exlar for certified drawings.

# SLG115 Series Linear Actuators

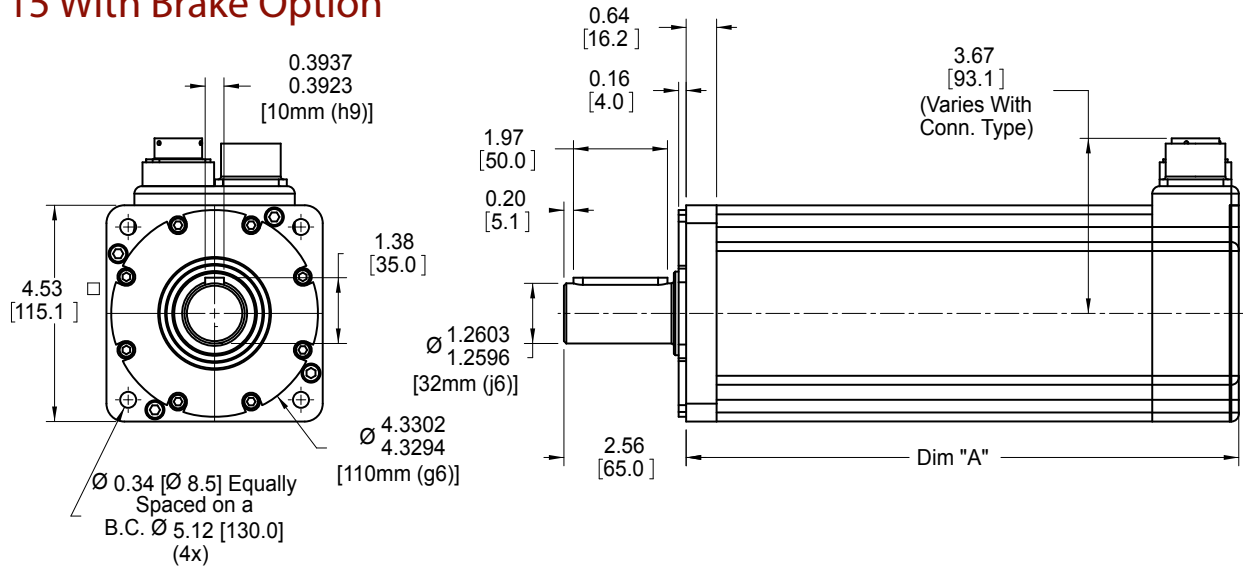
## SLG115



DIM	1 Stack Stator in (mm) 1 Stage Gearhead	2 Stack Stator in (mm) 1 Stage Gearhead	3 Stack Stator in (mm) 1 Stage Gearhead
A	10.03 (254.8)	12.03 (305.6)	14.03 (356.4)
	2 Stage Gearhead	2 Stage Gearhead	2 Stage Gearhead
	11.64 (295.7)	13.64 (346.5)	15.64 (397.3)

NOTE: Dimension format = in. (mm)  
Face plate edge is not intended for alignment of shaft (use pilot)

## SLG115 With Brake Option



DIM	1 Stack Stator in (mm) 1 Stage Gearhead	2 Stack Stator in (mm) 1 Stage Gearhead	3 Stack Stator in (mm) 1 Stage Gearhead
A	11.58 (294.2)	13.58 (345.0)	15.58 (395.8)
	2 Stage Gearhead	2 Stage Gearhead	2 Stage Gearhead
	13.19 (335.1)	15.19 (385.9)	17.19 (436.7)

NOTE: Dimension format = in. (mm)  
Face plate edge is not intended for alignment of shaft (use pilot)

Drawings subject to change. Consult Exlar for certified drawings.



## SLM/G = Model Series

SLG = SLG Series Servo Gear Motor  
 SLM = SLM Series Servo Motor  
 (No Gear Reduction)

## AAA = Frame Size

060 = 60 mm  
 090 = 90 mm  
 115 = 115 mm  
 142 = 142 mm

## BBB = Gear Reduction Ratio

Blank = SLM

### Single reduction ratios

004 = 4:1  
 005 = 5:1  
 010 = 10:1

### Double reduction ratios

016 = 16:1  
 020 = 20:1  
 025 = 25:1  
 040 = 40:1  
 050 = 50:1  
 100 = 100:1

## CC = Shaft Type

K = Keyed  
 R = Smooth/round  
 X = Special shaft

## D = Connections

M = Manufacturer's connector<sup>2</sup>  
 I = Exlar standard M23 style  
 A = MS style (anodized)  
 D = MS style (electroless nickel)  
 B = Embedded leads 3 ft. std.  
 P = Embedded leads w/plug  
 3 ft. std.w/"A" plug  
 J = Embedded leads w/"I" plug  
 3 ft. std.  
 X = Special (please specify)

## E = Coating Options<sup>1</sup>

G = Anodized aluminum  
 E = Electroless nickel plated  
 F = Smooth white epoxy  
 X = Special coating

## F = Brake Options

B = Brake  
 S = Standard no brake

## GGG = Feedback Type (Also specify the Amplifier/Drive Model being used when ordering)

- Standard Incremental Encoder – 2048 line (8192 cts) per rev. index pulse, Hall commutation, 5vdc  
 - Standard Resolver – Size 15, 1024 line (2048 cts) per rev. two pole resolver  
 - Motor files for use with select Emerson/CT, Rockwell /AB and Danaher/Kollmorgen Drives are available at [www.exlar.com](http://www.exlar.com)

### Custom Feedback - Please consult application engineering:

XX1 = Wiring and feedback device information must be provided and new feedback callout will be created

**Allen-Bradley/Rockwell:** (Actuators used with Kinetix and/or Sercos based control systems require a 3rd party motion database purchased from AB/Rockwell. Please contact your AB/Rockwell representative for support.)

AB5 = Stegmann SRM050 Hiperface multi-turn absolute encoder - MPL 100mm or higher motor wiring w/MS connectors for 'M' option – Plug & Play feedback option

AB6 = Standard Resolver

AB7 = Standard Incremental Encoder – MPL 100mm or higher motor wiring w/MS connectors for 'M' option

AB8 = Standard Incremental Encoder – MPL 75mm or less motor wiring w/M23 euro connectors for 'M' option

AB9 = Hiperface Stegmann SRM050 multi-turn absolute encoder - MPL 75mm or less motor wiring w/M23 euro connectors for 'M' option – Plug & Play feedback option

ABA = Hiperface Stegmann SKM036 multi-turn absolute encoder – MPL 215mm or higher motor wiring w/MS connectors for 'M' option – 460V Stator only – Plug & Play feedback option

ABB = Hiperface Stegmann SKM036 multi-turn absolute encoder – MPL 75mm or less motor wiring w/M23 euro connectors for 'M' option – 460V Stator only – Plug & Play feedback option

### AMKASYN:

AK1 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – DS motor wiring w/M23 euro connectors for 'M' option

AK2 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – DS motor wiring w/M23 euro connectors for 'M' option

### Advanced Motion Control:

AM1 = Standard Incremental Encoder  
 AM2 = Encoder 1000 line, w/commutation, 5 VDC

AM3 = Standard Resolver

AM5 = Encoder 5000 line, w/commutation, 5 VDC

### API Controls:

AP1 = Standard Resolver  
 AP2 = Standard Incremental Encoder

## Aerotech:

AR1 = Encoder 5000 line, w/commutation, 5 VDC

AR2 = Standard Incremental Encoder

## ABB Robot:

BB1 = LTN Resolver

## Baldor:

BD2 = Standard Resolver – BSM motor wiring w/ M23 connectors for 'M' option

BD3 = Standard Incremental Encoder – BSM motor wiring w/M23 connectors for 'M' option

## Beckhoff:

BE1 = EnDat Heidenhain EQN1125 multi-turn absolute encoderr – AMXX motor wiring w/M23 euro connectors for 'M' option

## Baumüller:

BM2 = Standard Resolver

## B&R Automation:

BR1 = Standard Resolver

BR2 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – 8LS/8LM motor wiring w/M23 euro connectors for 'M' option

## Comau Robot:

CM1 = Standard Resolver

## Copley Controls:

CO1 = Standard Incremental Encoder

CO2 = Standard Resolver

## Control Techniques/Emerson:

CT1 = Hiperface Stegmann SRM050 multi-turn absolute encoder – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option

CT3 = Hiperface Stegmann SKM036 multi-turn absolute encoder – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option

CT4 = Standard Incremental Encoder – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option

CT5 = Standard Resolver – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option

CT7 = Encoder 5000 line, with commutation, 5 VDC – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option

## Delta Tau Data Systems:

DT1 = Encoder 1000 line, with commutation, 5 VDC

DT2 = Standard Resolver

## Elmo Motion Control:

EL1 = Standard Resolver

EL2 = Standard Incremental Encoder

EL3 = EnDat Heidenhain EQN1125 multi-turn absolute encoder

## Emerson/Control Techniques:

EM2 = Standard Incremental Encoder – NT motor wiring w/MS connectors for 'M' option

EM5 = Encoder 5000 line, with commutation, 5 VDC – NT motor wiring w/MS connectors for 'M' option

## Elau:

EU1 = Hiperface Stegmann SRM050 multi-turn absolute encoder – SH motor wiring w/MS connectors for 'M' option

EU4 = Hiperface Stegmann SKM036 multi-turn absolute encoder – SH motor wiring w/MS connectors for 'M' option

## Exlar:

EX4 = Standard Resolver

**Fanuc Pulsecoder:** Consult Exlar

## G&L Motion Control/Danaher Motion:

GL1 = Standard Incremental Encoder – HSM motor wiring w/ MS connectors for 'M' option

GL2 = Standard Incremental Encoder – LSM-MSM motor wiring w/M23 euro connectors for 'M' option

GL3 = Standard Incremental Encoder – NSM motor wiring w/MS connectors for 'M' option

GL4 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – AKM motor wiring w/M23 euro connectors for 'M' option

## Infranor:

IF1 = Standard Resolver

## Indramat/Bosch-Rexroth:

IN6 = Standard Resolver – MKD/MHD motor wiring w/M23 euro connectors for 'M' option

IN7 = Hiperface Stegmann SKM036 multi-turn absolute encoder – MSK motor wiring w/M23 euro connectors for 'M' option – plug & play option

## Jetter Technologies:

JT1 = Standard Resolver – JH/JL motor wiring w/M23 euro connectors for 'M' option

## Kollmorgen/Danaher:

KM4 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – AKM motor wiring w/M23 euro connectors for 'M' option

KM5 = Standard Resolver – AKM motor wiring w/M23 euro connectors for 'M' option

KM6 = Standard Incremental Encoder – AKM motor wiring w/ M23 euro connectors for 'M' option

## Kuka Robot:

KU1 = Tyco Size 21 Resolver

## Kawasaki Robot:

KW1 = Kawasaki Special Encoder

## Lenze/AC Tech:

LZ1 = Hiperface Stegmann SRM050 multi-turn absolute encoder – MCS motor wiring w/M23 euro connectors for 'M' option

LZ5 = Standard Resolver – MCS motor wiring w/ M23 euro connectors for 'M' option

LZ6 = Standard Incremental Encoder – MCS motor wiring w/ M23 euro connectors for 'M' option

## Matuschek:

MC1 = LTN Resolver

## Metronix:

MX1 = Standard Resolver

MX2 = Hiperface Stegmann SKM036 multi-turn absolute encoder

MX3 = EnDat Heidenhain EQN1125 multi-turn absolute encoder

## Mitsubishi:

MT1 = Mitsubishi Absolute Encoder – HF-SP motor wiring with 'M' option

## Modicon:

MD1 = Standard Resolver

## Momentum:

MN1 = Hiperface Stegmann SRM050 multi-turn absolute encoder – MN motor wiring w/M23 connectors for 'M' option

MN2 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – MN motor wiring connectors for 'M' option

MN3 = Std incremental encoder – MN motor wiring w/M23 connectors for 'M' option

MN4 = Std resolver – MN motor wiring w/M23 connectors for 'M' option

## Moog:

MG1 = Standard Resolver

## Motoman Robot:

MM1 = Yaskawa Serial Encoder

## Nachi Robot:

NC1 = Tamagawa Serial Encoder

## Ormec:

OR1 = Standard Resolver

OR2 = Std Incremental Encoder – G series motor wiring w/ MS connectors for 'M' option

## Parker Compumotor:

PC6 = Std Incremental Encoder – SMH motor wiring w/M23 connectors for 'M' option – European only

PC7 = Std Resolver – SMH motor wiring w/M23 connectors for 'M' option – European only

PC8 = Std Incremental Encoder – MPP series motor wiring w/PS connectors for 'M' option – US Only

PC9 = Hiperface Stegmann SRM050 multi-turn absolute encoder – MPP motor wiring w/PS connectors for 'M' option – US Only

PC0 = Std Resolver – MPP motor wiring w/PS connectors for 'M' option – US Only

## Pacific Scientific:

PS2 = Standard Incremental Encoder

PS3 = Standard Resolver – PMA motor wiring w/M23 connectors for 'M' option

## Stober Drives:

SB3 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – ED/EK motor wiring w/M23 euro connectors for 'M' option

## Siemens:

SM2 = Standard Resolver – 1FK7 motor wiring w/M23 connectors for 'M' option

SM3 = EnDat Heidenhain EQN1325 multi-turn absolute encoder – 1FK7 motor wiring w/M23 euro connectors for 'M' option

SM4 = EnDat Heidenhain EQN1125 multi-turn absolute encoder – 1FK7 motor wiring w/M23 euro connectors for 'M' option

## SEW/Eurodrive:

SW1 = Standard Resolver – CM motor wiring w/ M23 euro connectors for 'M' option

SW2 = Standard Incremental Encoder

SW3 = Hiperface Stegmann SRM050 multi-turn absolute encoder – CM motor wiring w/ M23 euro connectors for 'M' option

## Whedco:

WD1 = Standard Resolver

## HHH = Motor Stator – All 8 Pole<sup>3</sup>

118 = 1 stack	115 Vrms	158 = 1 stack	400 Vrms
218 = 2 stack		258 = 2 stack	
318 = 3 stack		358 = 3 stack	
138 = 1 stack	230 Vrms	168 = 1 stack	460 Vrms
238 = 2 stack		268 = 2 stack	
438 = 3 stack		368 = 3 stack	

## II = Optional Speed and Mechanical Designations

30 = 3000 rpm, SLM/G115

40 = 4000 rpm, SLM/G090

50 = 5000 rpm, SLM/G060

01-99 = Special speed, consult Exlar

## XX = Part Number Designator for specials

HC = Type III hard coat anodized, class I<sup>1</sup>

HW = Side handwheel drive with limit switch

RD = Rear manual drive<sup>5</sup>

SD = Hex side drive

SS = Stainless steel housing<sup>1</sup>

XH = Special housing or mounting option<sup>4</sup>

XM = Special motor options

XF = Special feedback option

XL = Special lubrication, food grade or Mobilgrease 28, specify

XT = Special option

## #### = Part Number Designator for Specials

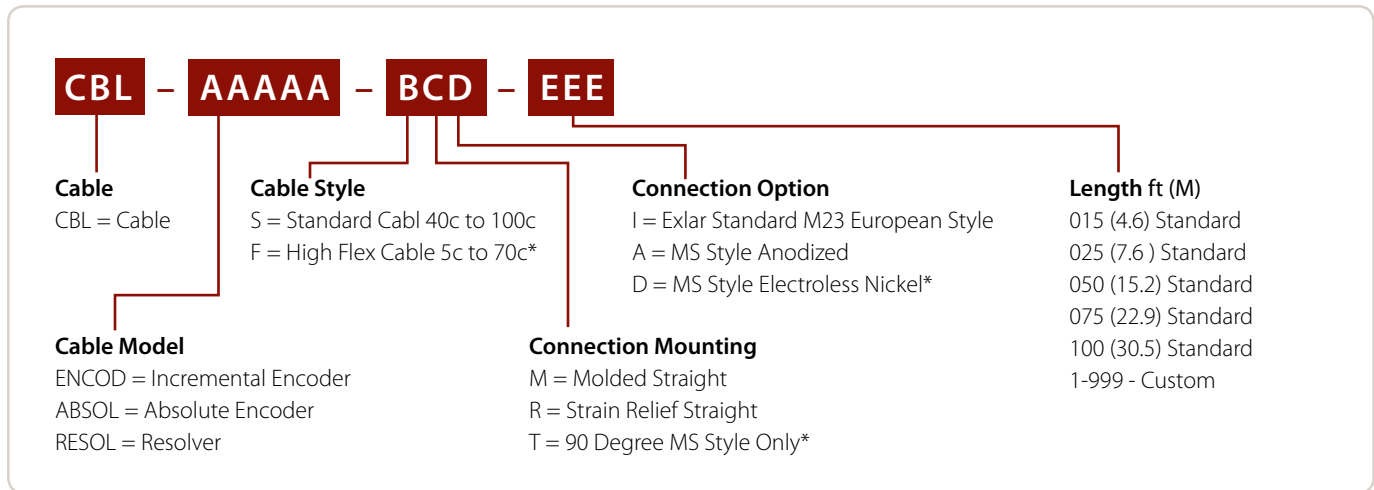
## ##### = Optional 5 digit assigned part number to designate unique model number for specials

### Note:

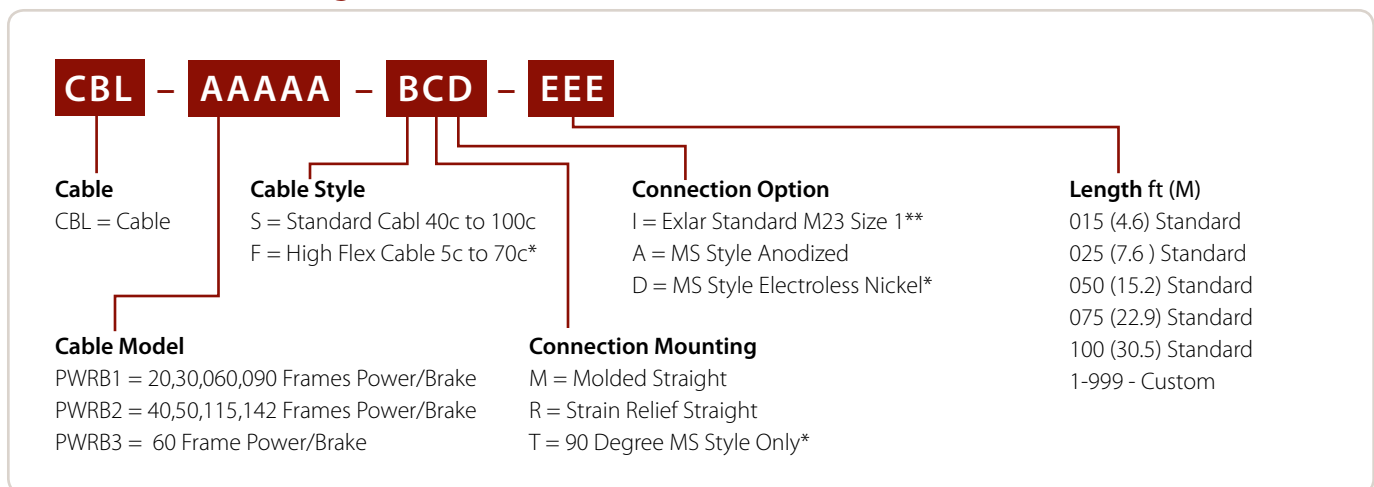
Any specials denoted by an X in the part number require definition and quotation from the factory.

1. These housing options would typically be accompanied by the choice of the electroless nickel connectors if a connectorized unit were selected. Please inquire with Exlar Engineering.
2. Available as described in Feedback Types.
3. See page 99 for explanation of voltage, speed and stack options.
4. When selecting special housing options, use "G" in this model mask location.
5. Not available with absolute feedback.

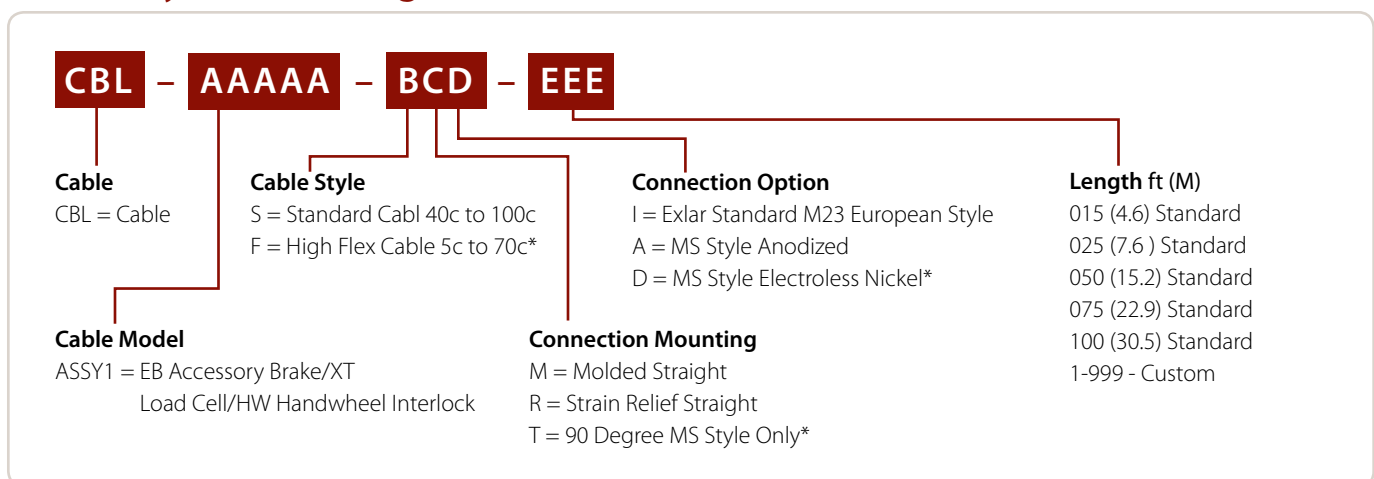
## Feedback Cable Configuration - e.g. CBL-ENCOD-SMI-015



## Power Cable Configuration - e.g. CBL-PWRB1-SMI-015



## Accessory Cable Configuration - e.g. CBL-ASSY1-SMI-015



\* Non-standard options – require longer lead times.  
\*\* PWRB3 uses M40 size 1.5.

## Manufacturers Feedback Cable Selection Guide

Amplifier/Drive Selected	Feedback Selected	Manufacturers Part Number
<b>Allen-Bradley/Rockwell:</b> Ultra 3000/5000/Kinetix 6000	AB1 AB5/AB7/ABA AB8/AB9/ABB	2090-UXNFBHF-Sxx 2090-UXNFBMP-Sxx 2090-XXNFMF-Sxx (Drive side flying leads)
<b>AMKASYN:</b> All Drives	AK1/AK2	DS Series Absolute Encoder Cable
<b>Beckhoff:</b> All Drives	BE1	ZK4000-26yy-2zzz
<b>B&amp;R Automation:</b> All Drives	BR1 BR2	8CRxxx.12-1 8CExxx.12-1
<b>Emerson/Control Techniques:</b> Unidrive SP/Epsilon EP	CT1/CT3 CT2/EM2/EM5 CT4/CT7 CT5	SSBAP/SSBAHC UFCS SIBAA/SIBAAA SRBAC/SRBABB
En/Epsilon/MDS	CT4/CT7 EM2/EM5	SIBAH/SIBafa CFCS
<b>Elau:</b> All Drives	EU1/EU4	SH Series Absolute Encoder Cable
<b>G&amp;L Motion Control/Danaher Motion:</b> MMC Smart Drive/ Digital MMC Control	GL1 GL2 GL3 GL4	ENC-H&F ENC-L&M ENC-NSM ENDAT-AKM
<b>Indramat/Bosch-Rexroth:</b> DKC Series/DIAX  IndraDrive	IN1 IN5 IN6 IN7	IKS4001 IKS4001 IKS4374 RKG4200
<b>Jetter Technologies:</b> JetMove 2xx JetMove 6xx	JT1 JT1	JH/JL Series Resolver Cable Nr. 23 JH/JL Series Resolver Cable Nr. 423
<b>Kollmorgen/Danaher:</b> All Drives	KM4 KM5 KM6	AKM Series Absolute Encoder Cable AKM Series Resolver Cable AKM Series Incremental Encoder Cable
<b>Lenze/AC Tech:</b> All Drives	LZ1 LZ5 LZ6	MCS Series Absolute Encoder Cable MCS Series Resolver Cable MCS Series Incremental Encoder Cable
<b>Mitsubishi:</b> MR-J3	MT1	MR-J3ENSCLxxM-H
<b>Momentum:</b> All Drives	MN1 MN2 MN3 MN4	SC-AE1-xxx SC-AE2-xxx SC-IE1-xxx SC-RS1-xxx
<b>Ormec:</b> All Drives	OR2	Consult Exlar
<b>Parker Compumotor:</b> All Drives	PC6 PC7 PC8 PC9/ PC10	SMH Series Incremental Encoder Cable SMH Series Resolver Cable COMPAX3 F-2C1-xx or Aries F-1A1-xx F-2B1-xx
<b>Pacific Scientific:</b> All Drives	PS3	CEF-RO-XXX-900X
<b>Stober Drives:</b> FDS/MDS 5000	SB3	Stober Absolute Encoder Cable
<b>Siemens:</b> 611U/Masterdrives/SMC20	SM2 SM3/SM4 SM5	6FX5002-2CF02-.... 6FX5002-2EQ10-.... 6FX5002-2CA31-....
<b>SEW/Eurodrive:</b> All Drives	SW1 SW3	CM Series Resolver Cable CM Series Absolute Encoder Cable
<b>Yaskawa:</b> Sigma II Series	YS2/YS3	JZSP-CMP02-XX(B)



# Manufacturers Power/Brake Cables

Models: GSM/GSX20, GSM/GSX30, SLM/SLG060, SLM/SLG090					GSM
Amplifier/Drive Selected	Feedback Selected	Power only 4 wire	Power + Brake/Therm	Brake Cable	Feedback Selected
<b>Allen-Bradley/Rockwell:</b> Ultra 3000/5000/Kinetix 6000	AB1 AB5/AB7/ABA AB8/AB9/ABB	N/A 2090-XXNPMP-16Sxx N/A	Exlar CBL-PWRB1-xxA-xxx N/A 2090-XXNPMF-16Sxx	Exlar CBL-ASSY1-xxA-xxx 2090-UXNBMP-18Sxx N/A	AB1 AB5/AB7/ABA AB8/AB9/ABB
<b>AMKASYN:</b> All Drives	AK1/AK2	N/A	DS Series Power Cable Size 1	N/A	AK1/AK2
<b>Beckhoff:</b> All Drives	BE1	N/A	ZK4000-2xx1-2xxxx	N/A	BE1
<b>B&amp;R Automation:</b> All Drives	BR1/BR2	N/A	8CMxxx.12-1	N/A	BR1/BR2
<b>Emerson/Control Techniques:</b> All Drives	CT1/CT3/CT4/CT5/CT7 CT2/EM2/EM5	PSBxA CMDS	PBBxA N/A	N/A CBMS	CT1/CT3/CT4/CT5/CT7 CT2/EM2/EM5
<b>Elau:</b> All Drives	EU1/EU4	N/A	E-M0-111	N/A	EU1/EU4
<b>G&amp;L Motion Control/ Danaher Motion:</b> MMC Smart Drive/ Digital MMC Control	GL1 GL2 GL3 GL4	PWR-H&F...16AA N/A PWR-NSM...16AA N/A	N/A PWR-L&M...16-64 N/A PWR-AKM...16-64	Exlar CBL-ASSY1-xxA-xxx N/A Exlar CBL-ASSY1-xxA-xxx N/A	GL1 GL2 GL4
<b>Indramat/Bosch-Rexroth:</b> DKC Series/DIAX IndraDrive	IN1/IN5/IN6 IN7	N/A N/A	MKD/MHD Power Cable Size 1 MSK Power Cable Size 1	N/A N/A	IN1/IN5/IN6 IN7
<b>Jetter Technologies:</b> All Drives	JT1	N/A	JH/JL Power Cable Size 1 #24.1	N/A	JT1
<b>Kollmorgen/Danaher:</b> All Drives	KM4/KM5/KM6	N/A	AKM Power Cable Size 1	N/A	KM4/KM5/KM6
<b>Lenze/AC Tech:</b> All Drives	LZ1/LZ5/LZ6	N/A	MCS Power Cable Size 1	N/A	LZ1/LZ5/LZ6
<b>Mitsubishi:</b> MR-J3	MT1	MR-J3P2-xM	N/A	MR-J3BRKS1-xM	MT1
<b>Momentum:</b> All Drives	MN1/MN2/MN3/MN4	PCBL1.5-MNT-xxx	PCBL1.5-MNB-xxx	N/A	MN1/MN2/MN3/MN4
<b>Ormec:</b> All Drives	OR2		Consult Exlar		OR2
<b>Parker Compumotor:</b> All Drives	PC6/PC7 PC8/PC9/PC0	N/A N/A	SMH Power Cable Size 1 P-3B1-xx	N/A N/A	PC6/PC7 PC8/PC9/PC0
<b>Pacific Scientific:</b> All Drives	PS3	N/A	PMA Power Cable Size 1	N/A	PS3
<b>Stober Drives:</b> FDS/MDS 5000	SB3	N/A	Stober Power Cable Size 1	N/A	SB3
<b>Siemens:</b> All Drives with flying leads	SM2/SM3/SM4/SM5		6FX5002-5DA01-....	N/A	SM2/SM3/SM4/SM5
<b>SEW/Eurodrive:</b> All Drives	SW1/SW3	N/A	CM Power Cable Size 1	N/A	SW1/SW3
<b>Yaskawa:</b> Sigma II Series	YS3	B1E-xxA	B1BE-xxA	N/A	YS2

/GSX40, GSX50, SLM/SLG115, SLM142			GSX60			
Power only 4 wire	Power + Brake/Therm	Brake Cable	Feedback Selected	Power only 4 wire	Power + Brake/Therm	Brake Cable
N/A 2090-UXNPMP-14Sxx N/A	Exlar CBL-PWRB2-xxA-xxx N/A 2090-XXNPMF-14Sxx	Exlar CBL-ASSY1-xxA-xxx 2090-UXNBMP-18Sxx N/A	AB1 AB5/AB7/ABA AB8/AB9/ABB	N/A 2090-UXNPMP-10Sxx N/A	Exlar CBL-PWRB3-xxA-xxx N/A Exlar CBL-PWRB3-xxI-xxx	N/A 2090-UXNBMP-18Sxx N/A
N/A	DS Series Power Cable Size 1	N/A	AK1/AK2	N/A	DS Series Power Cable Size 1.5	N/A
N/A	ZK4000-2xx1-2xxxx	N/A	BE1	N/A	Exlar CBL-PWRB3-xxI-xxx	N/A
N/A	8CMxxx.12-3	N/A	BR1/BR2	N/A	8CMxxx.12-5	N/A
PSBxA CMMS	PBBxA N/A	N/A CBMS	CT1/CT3/CT4/CT5/CT7 CT2/EM2/EM5	PSBxB CMLS	PBBxB N/A	N/A CBMS
N/A	E-MO-112	N/A	EU1/EU4	N/A	E-MO-114	N/A
PWR-H&F...14-AA N/A N/A	N/A PWR-L&M...14-6H PWR-AKM...14-6H	Exlar CBL-ASSY1-xxA-xxx N/A N/A	GL1 GL2 GL4	PWR-H&F...10-AA N/A N/A	N/A PWR-L&M...12-6H PWR-AKM...12-6H	Exlar CBL-ASSY1-xxA- xxx N/A N/A
N/A N/A	MKD/MHD Power Cable Size 1 MSK Power Cable Size 1	N/A N/A	IN1/IN5/IN6 IN7	N/A N/A	MKD/MHD Power Cable Size 1.5 MSK Power Cable Size 1.5	N/A N/A
N/A	JH/JL Power Cable Size 1 #24.1	N/A	JT1	N/A	Exlar CBL-PWRB3-xxI-xxx	N/A
N/A	AKM Power Cable Size 1	N/A	KM4/KM5/KM6	N/A	AKM Power Cable Size 1.5	N/A
N/A	MCS Power Cable Size 1	N/A	LZ1/LZ5/LZ6	N/A	MCS Power Cable Size 1.5	N/A
MR-J3P6-xM	N/A	MR-J3BRKS1-xM	MT1	MR-J3P7-xM	N/A	MR-J3BRKS1-xM
PCBL2.5-MNT-xxx	PCBL2.5-MNB-xxx	N/A	MN1/MN2/MN3/MN4	PCBL4.0-MNT-xxx	PCBL4.0-MNB-xxx	N/A
	Consult Exlar		OR2		Consult Exlar	
N/A N/A	SMH Power Cable Size 1 P-4B1-xx	N/A N/A	PC6/PC7 PC8/PC9/PC0	N/A N/A	SMH Power Cable Size 1.5 P-6B2-xx	N/A N/A
N/A	PMA Power Cable Size 1	N/A	PS3	N/A	Exlar CBL-PWRB3-xxI-xxx	N/A
N/A	Stober Power Cable Size 1	N/A	SB3	N/A	Stober Power Cable Size 1.5	N/A
		N/A				N/A
	6FX5002-5DA11-....		SM2/SM3/SM4/SM5		6FX5002-5DA61-....	
N/A	CM Power Cable Size 1	N/A	SW1/SW3	N/A	SM Power Cable Size 1.5	N/A
B1E-xxA	B1BE-xxA	N/A	YS2	B2E-xxA	B2BE-xxA	N/A

(Please note, Euro style connectors are size 1.5 M40 connectors. If Manufacturer does not offer a size 1.5 M40 power cable, an Exlar Power Cable must be purchased.

# Hazardous Location EL Series Linear Actuators

## EL Series Explosion Proof Linear Actuators

This electromechanical system provides process engineers a clean, fast, simple and cost effective replacement for Hydraulic actuation and a longer life alternative to pneumatic actuation. The roller screw technology manufactured by Exlar outperforms rival ball screws by 15 times in travel life, and can carry higher loads. The compact design allows users to effectively replace hydraulic or air cylinders with an electromechanical actuator, yet meet all required capabilities of the application. Reduced emissions, reduced energy consumption (80% system energy efficiency), increased position control and accuracy – all leading to reduced cost – are provided by servo electric actuation.

The EL30 explosion-proof linear actuator offers CSA Class I\*, Division 1, Groups B, C or D rating.

The EL100 explosion-proof linear actuator offers a Class I, Division, Groups B, C, D & T3. The EL100 linear actuators. Also meet ATEX essential requirements and are in Conformance with the EU ATEX Directive 94/9/EC.

The EL Series linear actuators are compatible with nearly any Manufacturers' resolver-based amplifier.

*\*"Class I" means that flammable gases or vapors may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. "Division 1" means that hazardous concentrations in the air may exist continuously, intermittently, or periodically under normal operating conditions. "Group B" allows for atmospheres containing hydrogen, or gases (or vapors) of equivalent hazard, such as manufactured gas. "Group C" allows for atmospheres containing ethyl-ether vapors, ethylene or cyclo propane. "Group D" allows for atmospheres containing gasoline, hexane, naphtha, benzene, butane, alcohol, acetone, benzol, lacquer solvent vapors or natural gas. EL Series actuators are not rated for operation in atmospheres containing acetylene Temperature classification defines the maximum surface temperature the product will reach at full load. T3 = 300 °C, T3A – 180 °C, T4 = 135 °C*

**Typical Applications for EL Series explosion-proof motors are well-suited to many applications:**

Turbine fuel flow	Chemical process plants
Printing presses	Fuel distribution systems
Engine test stands	Shipbound fuel management
Value control	Refineries
Pamper control	Paint booths



**EL30  
Explosion-Proof  
Linear Actuator**

Class I, div 1, Groups B, C and D



II 2G  
SIRA 10ATEX1037X  
Ex d II B T3 Gb IP66



163694  
Class I, Div 1  
Group B,C,D,T3



**EL100  
Explosion-Proof  
Linear Actuator**

Class I, div 1, Groups B, C, D and T3

### Features

T-LAM technology yielding 35% increase in continuous motor torque over traditional windings

Forces to 2000 lbs

Speeds to 25 ips

Resolver feedback

Strokes up to 6 inches

8 pole motors

Rod end options

Several mounting configurations

Potted NPT connectors

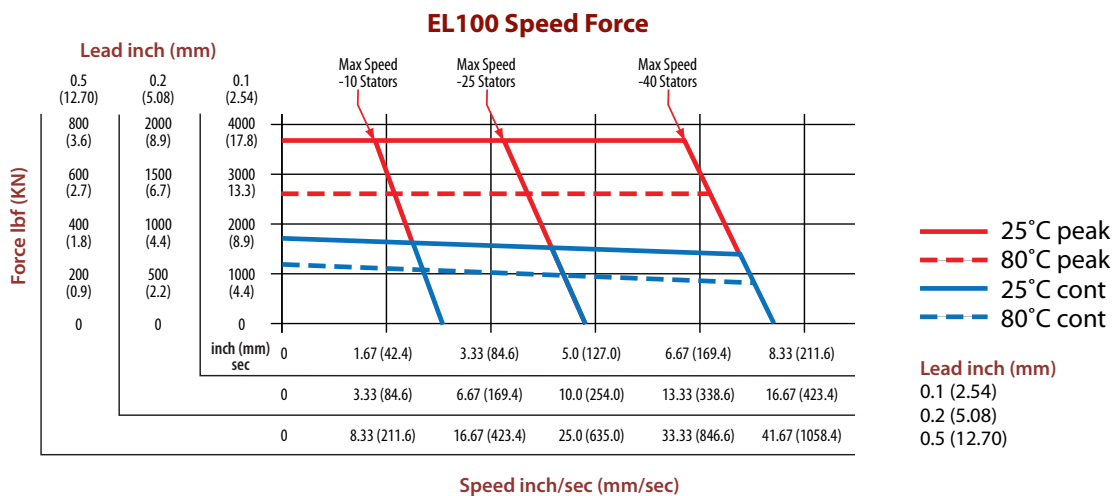
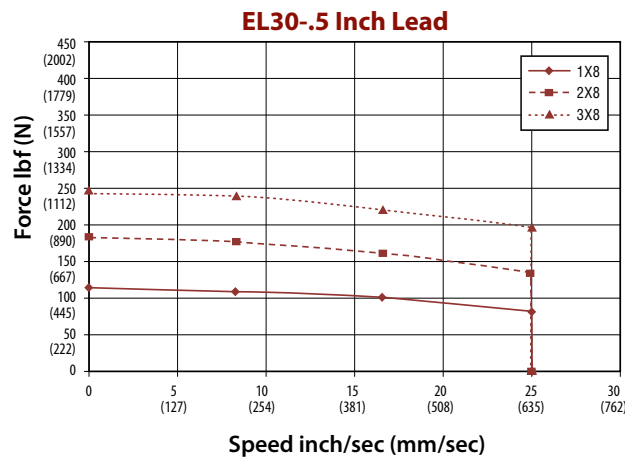
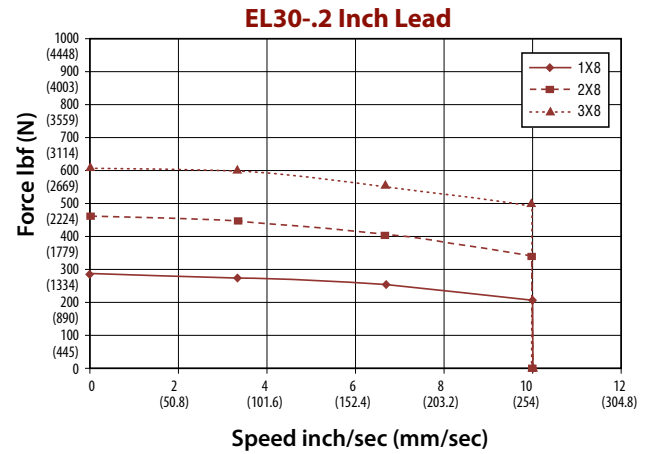
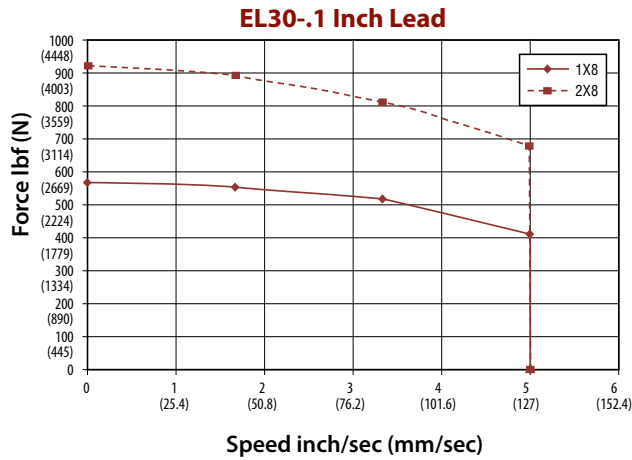
Windings available from 24 VDC to 460 VAC rms

Class 180H insulation

## EL Series Performance Curves

The below speed vs. force curves represent approximate continuous thrust ratings at indicated linear speed. Different types of servo amplifiers will offer varying motor torque and

thus actuator thrust. These values are at constant velocity and do not account for motor torque required for acceleration.



# Hazardous Location EL Series Linear Actuators

## EL Performance Specifications

Model No.	Frame Size in (mm)	Stroke (nominal)* in (mm)	Stator	Screw Lead in (mm)	Force Rating lb (N) 25°C/80°C	Max Velocity in/sec (mm/sec)	Approx* Cont. Motor Torque lb-in (N-m)	Maximum Static Load lb (N)	Armature Inertia Rating** lb-in-s <sup>2</sup> (Kg-m <sup>2</sup> )	Dynamic Load lb (N)	Weight (approx.) lb (kg)
EL30-0301	3.125 (79.0)	3 (75.0)		0.1 (2.54)	543/885/NA (2415/3936/NA)	5 (127.0)	10.8/17.6/NA (1.22/1.99/NA)	2700 (12010)	0.00319 (0.00036)	5516 (24536)	12 (5.4)
EL30-0302				0.2 (5.08)	271/442/NA (1205/1966/NA)	10 (254.0)				5800 (25798)	
EL30-0305				0.5 (12.7)	109/177/NA (485/787/NA)	25 (635.0)				4900 (21795)	
EL30-0601	3.125 (79.0)	6 (150.0)		0.1 (2.54)	543/885/NA (2415/3936/NA)	5 (127.0)	10.8/17.6/NA (1.22/1.99/NA)	2700 (12010)	0.00361 (0.00041)	5516 (24536)	15 (6.8)
EL30-0602				0.2 (5.08)	271/442/626 (1205/1966/2785)	10 (254.0)	10.8/17.6/24.9 (1.22/1.99/2.81)			5800 (25798)	
EL30-0605				0.5 (12.7)	109/177/250 (485/787/1112)	25 (635.0)	10.8/17.6/24.9 (1.22/1.99/2.81)			4900 (21795)	
EL100-0601	3.9 (100)	6 (150)	2A8-10 2B8-25 2C8-40 218-40 238.40 258.40 268.40	0.01 (2.54)	1806/1246 (8032/5542)	1.66 (4.16)	35.9 (24.8)	2700 (12010)	0.00361 (0.000408)	5516 (24536)	26.2 (11.9)
					1806/1246 (8032/5542)	41.66 (105.66)	35.9 (24.8)				
					1834/1266 (8160/5631)	6.66 (169.33)	36.5 (25.2)				
					1989/1373 (8848/6105)	6.66 (169.33)	39.6 (27.3)				
					2011/1387 (8943/6171)	6.66 (169.33)	40 (27.6)				
					1986/1371 (8835/6097)	6.66 (169.33)	39.5 (27.3)				
					2008/1385 (8930/6162)	6.66 (169.33)	39.9 (27.6)				
EL100-0602	3.9 (100)	6 (150)	2A8-10 2B8-25 2C8-40 218-40 238.40 258.40 268.40	0.2 (5.08)	903/623 (4016/2771)	3.33 (84.58)	35.9 (24.8)	2700 (12010)	0.00361 (0.000408)	5800 (25798)	26.2 (11.9)
					903/623 (4016/2771)	8.33 (211.58)	35.9 (24.8)				
					917/633 (4080/2815)	13.33 (338.58)	36.5 (25.2)				
					995/686 (4424/3053)	13.33 (338.58)	39.6 (27.3)				
					1005/694 (4472/3086)	13.33 (338.58)	40 (27.6)				
					993/685 (4417/3048)	13.33 (338.58)	39.5 (27.3)				
					1004/693 (4465/3081)	13.33 (338.58)	39.9 (27.6)				
EL100-0605	3.9 (100)	6 (150)	2A8-10 2B8-25 2C8-40 218-40 238.40 258.40 268.40	0.5 (12.70)	361/249 (1606/1108)	8.33 (211.58)	35.9 (24.8)	2700 (12010)	0.00361 (0.000408)	4900 (21795)	26.2 (11.9)
					361/249 (1606/1108)	20.83 (9529.08)	35.9 (24.8)				
					367/253 (1632/1126)	33.33 (846.58)	36.5 (25.2)				
					398/275 (1770/1221)	33.33 (846.58)	39.6 (27.3)				
					402/277 (1789/1234)	33.33 (846.58)	40 (27.6)				
					397/274 (1767/1219)	33.33 (846.58)	39.5 (27.3)				
					402/277 (1786/1232)	33.33 (846.58)	39.9 (27.6)				

\* Please note that stroke mm are nominal dimensions. \*\*Inertia +/- 5%  
See page 13 for definition of terms.

Specifications subject to change without notice.

## EL30 Series Mechanical/Electrical Specifications

Maximum Backlash (not preloaded)	in (mm)	0.004 (.10)															
Maximum Backlash (preloaded)	in (mm)	0.0															
Lead Accuracy	in/ft (mm/300 mm)	0.001 (.025)															
Maximum Radial Load	lb (N)	30 (134)															
Environmental Rating:	Standard	IP65															
Motor Stator-T4 Ratings		1A8	AB8	118	138	158	168	2A8	2B8	218	238	258	268	318*	338*	358*	368*
RMS SINUSOIDAL COMMUTATION																	
Continuous Motor Torque** (+/- 10% @ 25°C)	lbf-in (Nm)	10.8 (1.22)	10.8 (1.22)	10.9 (1.23)	10.8 (1.22)	10.7 (1.21)	10.3 (1.16)	17.4 (1.97)	17.4 (1.97)	17.6 (1.99)	17.6 (1.99)	17.5 (1.98)	17.5 (1.98)	25.2 (2.85)	24.9 (2.81)	23.6 (2.67)	23.6 (2.67)
Torque Constant (Kt)** (+/- 10% @ 25°C)	lbf-in/ (Nm/A)	1.1 (0.13)	1.1 (0.13)	4.4 (0.49)	8.7 (0.99)	15.5 (1.75)	17.5 (1.98)	1.1 (0.13)	1.1 (0.13)	4.4 (0.49)	8.7 (0.99)	15.5 (1.75)	17.5 (1.98)	4.4 (0.50)	8.7 (0.98)	15.7 (1.77)	17.6 (1.98)
Continuous Current Rating**	Amps	10.7	10.7	2.8	1.4	0.8	0.7	17.3	17.3	4.5	2.2	1.3	1.1	6.3	3.2	1.7	1.5
Peak Current Rating	Amps	21.3	21.3	5.6	2.8	1.5	1.3	34.5	34.5	9.0	4.5	2.5	2.2	12.7	6.4	3.4	3.0
TRAPEZOIDAL COMMUTATION																	
Continuous Motor Torque** (+/- 10% @ 80°C)	lbf-in (Nm)	10.3 (1.16)	10.3 (1.16)	10.4 (1.17)	10.3 (1.17)	10.2 (1.15)	9.8 (1.11)	16.6 (1.88)	16.6 (1.88)	16.8 (1.90)	16.8 (1.90)	16.7 (1.89)	16.7 (1.89)	24.1 (2.72)	23.8 (2.69)	22.5 (2.55)	22.6 (2.55)
Torque Constant (Kt)** (+/- 10% @ 80°C)	lbf-in/A (Nm/A)	0.9 (0.10)	0.9 (0.10)	3.4 (0.39)	6.8 (0.77)	12.1 (1.37)	13.6 (1.54)	0.9 (0.10)	0.9 (0.10)	3.4 (0.39)	6.8 (0.77)	12.1 (1.37)	13.6 (1.54)	3.5 (0.39)	6.8 (0.76)	12.2 (1.38)	13.7 (1.55)
Continuous Current Rating	Amps	13.1	13.1	3.4	1.7	0.9	0.8	21.1	21.1	5.5	2.8	1.5	1.4	7.8	3.9	2.1	1.8
Peak Current Rating	Amps	26.1	26.1	6.8	3.4	1.9	1.6	42.3	42.3	11.0	5.5	3.1	2.7	15.5	7.9	4.1	3.7
MOTOR STATOR DATA																	
Voltage Constant (Ke)** (+/- 10% @ 25°C)	Vrms/Krpm Vpk/Krpm	7.7 10.9	7.7 10.9	29.9 42.2	59.7 84.5	106.0 149.9	119.5 168.9	7.7 10.9	7.7 10.9	29.9 42.2	59.7 84.5	106.0 149.9	119.5 168.9	30.3 42.9	59.2 83.8	106.9 151.2	119.9 169.6
Pole Configuration		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Resistance (L-L)(+/- 5% @ 80°C)	Ohms	0.19	0.19	2.8	11.2	36.3	49.6	0.08	0.08	1.1	4.5	14.1	18.0	0.65	2.6	9.3	11.6
Inductance (L-L)(+/- 5%)	mH	0.51	0.51	7.7	30.7	96.8	123.0	0.24	0.24	3.7	14.7	46.2	58.7	2.5	9.5	30.9	38.8
Mech Time Constant (tm)	ms min	6.6	6.6	6.5	6.5	6.7	7.2	2.6	2.6	2.6	2.6	2.6	2.6	1.5	1.5	1.7	1.7
	max	7.4	7.4	7.3	7.4	7.6	8.1	3.0	3.0	2.9	2.9	3.0	3.0	1.7	1.7	1.9	1.9
Electrical Time Constant (te)	ms	2.7	2.7	2.8	2.7	2.7	2.5	3.2	3.2	3.3	3.3	3.3	3.3	3.8	3.7	3.3	3.3
Damping Constant	lbf-in/krpm (N-m/krpm)	1.23 (0.14)															
Friction Torque	lbf-in (Nm)	2.00 (0.23)															
Bus Voltage	Vrms	24VDC	48VDC	115	230	400	460	24VDC	48VDC	115	230	400	460	115	230	400	460
Speed @ Bus Voltage	rpm	1500	3000	3000	3000	3000	3000	1500	3000	3000	3000	3000	3000	3000	3000	3000	3000
Insulation Class		180 (H)															
Temperature Class	°C	T4 = 135°C    T3A = 180°C															
Connectors		Potted NPT Connectors Only															

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414. Specifications reflect 80°C test environment

Specifications subject to change without notice.

\*Not available with 3" stroke

\*\*For T3A Temperature Class multiply Kt & Ke ratings by 0.83; Continuous Current by 1.245; Continuous Torque by 1.095

# Hazardous Location EL Series Linear Actuators

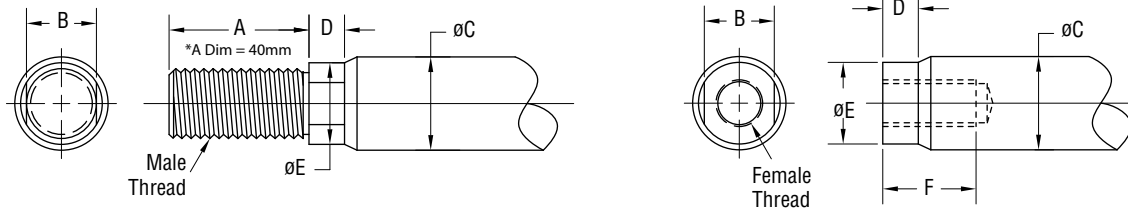
## EL100 Series Mechanical/Electrical Specifications

Nominal Backlash	in (mm)	0.004 (.10)							
Maximum Backlash (preloaded)	in (mm)	0.0							
Lead Accuracy in/ft	(mm/300 mm)	0.001 (.025)							
Maximum Radial Load	lb (N)	40 (179)							
Environmental Rating	Standard	IP66							
Motor Stator Ambient Temperature		2A8-10 25°/80°C	2B8-25 25°/80°C	2C8-40 25°/80°C	218-40 25°/80°C	238-40 25°/80°C	258-40 25°/80°C	268-40 25°/80°C	
<b>RMS SINUSOIDAL COMMUTATION DATA</b>									
Continuous Motor Torque	lbf-in (Nm)	35.9/24.8 (4.06/2.80)	35.9/24.8 (4.06/2.80)	36.5/25.2 (4.12/2.85)	39.6/27.3 (4.47/3.09)	40.0/27.6 (4.52/3.12)	39.5/27.3 (4.46/3.08)	39.9/27.6 (4.51/3.11)	
Torque Constant @ 25° C (Kt)	lbf-in/(Nm/A)	1.7 (0.19)	1.7 (0.19)	2.6 (0.30)	3.2 (0.37)	6.6 (0.75)	11.6 (1.31)	13.2 (1.50)	
Continuous Current Rating (IG)	Amps	23.6/16.3	23.6/16.3	15.6/10.7	13.6/9.4	6.8/4.7	3.8/2.6	3.4/2.3	
Peak Current Rating	Amps	47.1/32.5	47.1/32.5	31.1/21.5	27.3/18.8	13.5/9.3	7.6/5.3	6.7/4.7	
<b>TRAPEZOIDAL COMMUTATION DATA</b>									
Continuous Motor Torque	lbf-in (Nm)	34.3/23.7 (3.88/2.67)	34.3/23.7 (3.88/2.67)	34.9/24.0 (3.94/2.72)	37.8/26.1 (4.27/2.95)	38.2/26.4 (4.32/2.98)	37.7/26.0 (4.26/2.94)	38.1/26.3 (4.31/2.97)	
Torque Constant @ 25° C (Kt)	lbf-in/A (Nm/A)	1.3 (0.15)	1.3 (0.15)	2.0 (0.23)	2.5 (0.29)	5.2 (0.58)	9.0 (1.02)	10.3 (1.17)	
Continuous Current Rating (IG)	Amps	28.9/19.9	28.9/19.9	19.1/13.2	16.7/11.5	8.3/5.7	4.7/3.2	4.1/2.8	
Peak Current Rating	Amps	57.7/39.8	57.7/39.8	38.1/26.3	33.4/23.1	16.5/11.4	9.4/6.5	8.3/5.7	
<b>MOTOR STATOR DATA</b>									
Voltage Constant @ 25° C (Ke)	Vrms/Krpm	11.6	11.6	17.9	22.1	45.2	78.9	90.4	
	Vpk/Krpm	16.5	16.5	25.3	31.3	64.0	111.6	127.9	
Pole Configuration		8	8	8	8	8	8	8	
Resistance (L-L)	Ohms	0.10	0.10	0.20	0.30	1.2	3.8	4.86	
Inductance (L-L)	mH	0.79	0.79	1.9	2.93	12.2	37.2	48.9	
Brake Inertia	lbf-in-sec <sup>2</sup> (kg-cm <sup>2</sup> )	0.00047 (.53)							
Brake Current @24VDC +/- 10%	A	0.5							
Brake Holding Torque - Dry	lbf-in (Nm/A)	70 (8)							
Brake Engage/Disengage Time	ms	25/50							
Mechanical Time Constant (tm)	ms	1.7	1.7	1.7	1.4	1.4	1.4	1.4	
Electrical Time Constant (te)	ms	7.9	7.9	8.2	9.9	10.1	9.9	10.1	
Bus Voltage	Vrms	24 VDC	48 VDC	120 VDC	115 VDC	230 VDC	400 VDC	460 VDC	
Speed @ Bus Voltage	rpm	1000	2500	4000	4000	4000	4000	4000	
Insulation Class		180 (H)							
Ambient Temperature Rating		-29° C to 93° C							
CSA/ATEX Temperature Class		T3, 200° C Maximum Allowable Surface Temperature							
Continuous Force Ratings		25°/80°C	25°/80°C	25°/80°C	25°/80°C	25°/80°C	25°/80°C	25°/80°C	
0.1 inch lead	EL100-0601	lbf (N)	1806/1246 8032/5542	1806/1246 8032/5542	1834/1266 8160/5631	1989/1373 8848/6105	2011/1387 8943/6171	1986/1371 8835/6097	2008/1385 8930/6162
0.2 inch lead	EL100-0602	lbf (N)	903/623 4016/2771	903/623 4016/2771	917/633 4080/2815	995/686 4424/3053	1005/694 4472/3086	993/685 4417/3048	1004/693 4465/3081
0.5 inch lead	EL100-0605	lbf (N)	361/249 1606/1108	361/249 1606/1108	367/253 1632/1126	398/275 1770/1221	402/277 1789/1234	397/274 1767/1219	402/277 1786/1232

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by 0.707, and peak current by 1.414. All temperature ratings ambient.

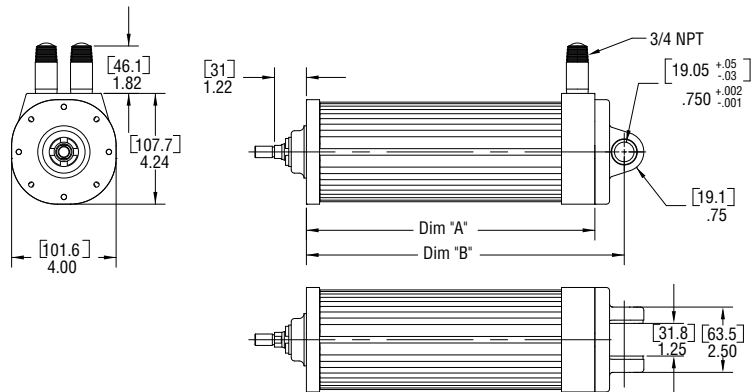
Specifications subject to change without notice.

## Actuator Rod End Options

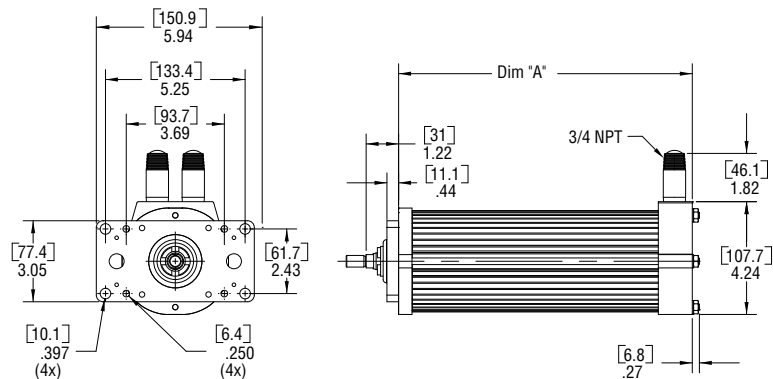


	A	B	øC	D	øE	F	Male U.S.	Male Metric	Female U.S.	Female Metric
EL30 in (mm)	0.750 (19.1)	0.500 (12.7)	0.625 (15.9)	0.281 (7.1)	0.562 (14.3)	0.750 (19.1)	7/16 - 20 UNF - 2A	M12 x 1.75' 6g	7/16 - 20 UNF - 2B	M10 x 1.5 6h

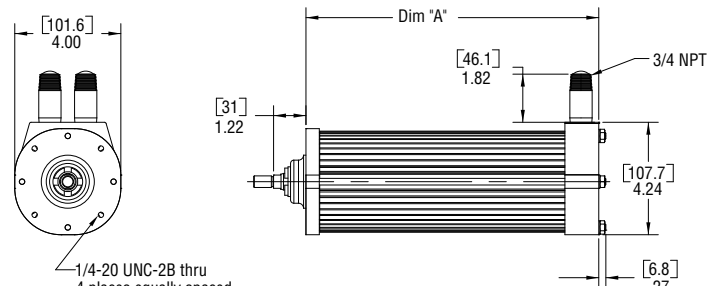
## EL30 Clevis Mount



## EL30 Front Flange Mount



## EL30 Base Unit



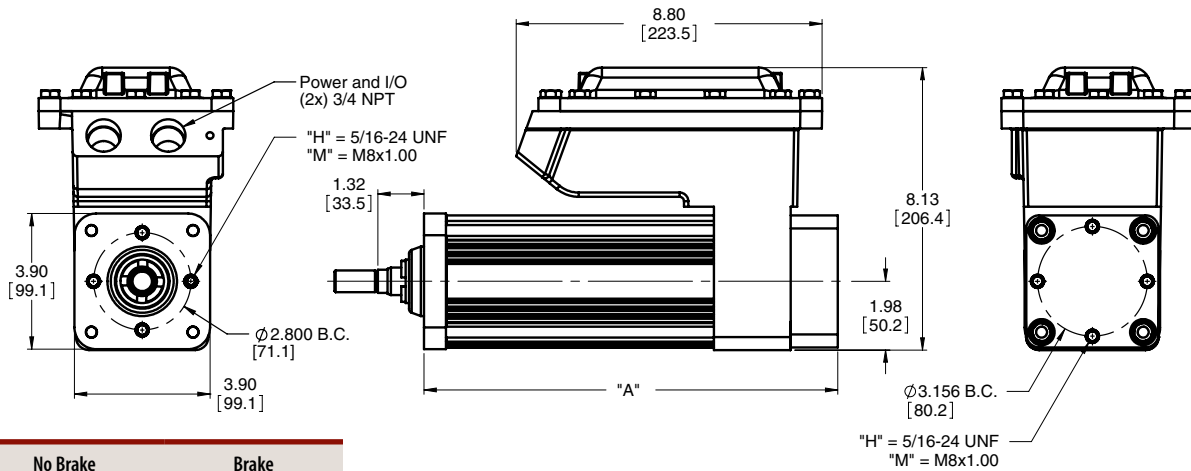
Dim	3" (76.2 mm) Stroke	6" (152.4 mm) Stroke
A	8.6 (218)	11.0 (281)
B	9.7 (246)	12.2 (309)

EL Series



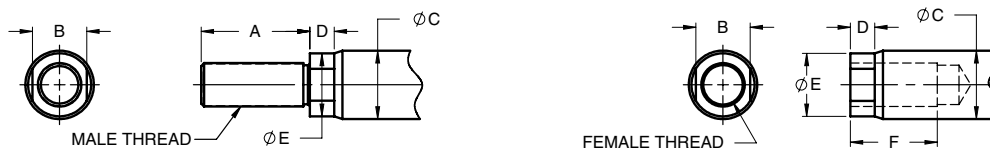
# Hazardous Location EL Series Linear Actuators

## EL100 Dimensions



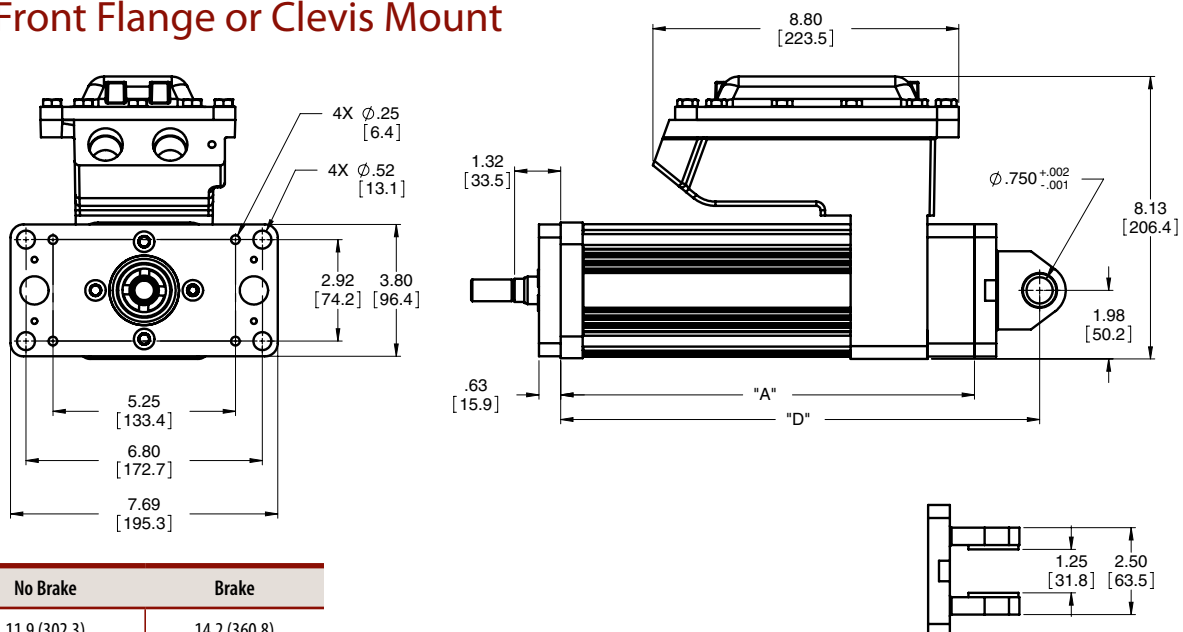
Dim	No Brake	Brake
A	11.9 (302.3)	14.2 (360.8)

## EL100 Actuator Rod End Options



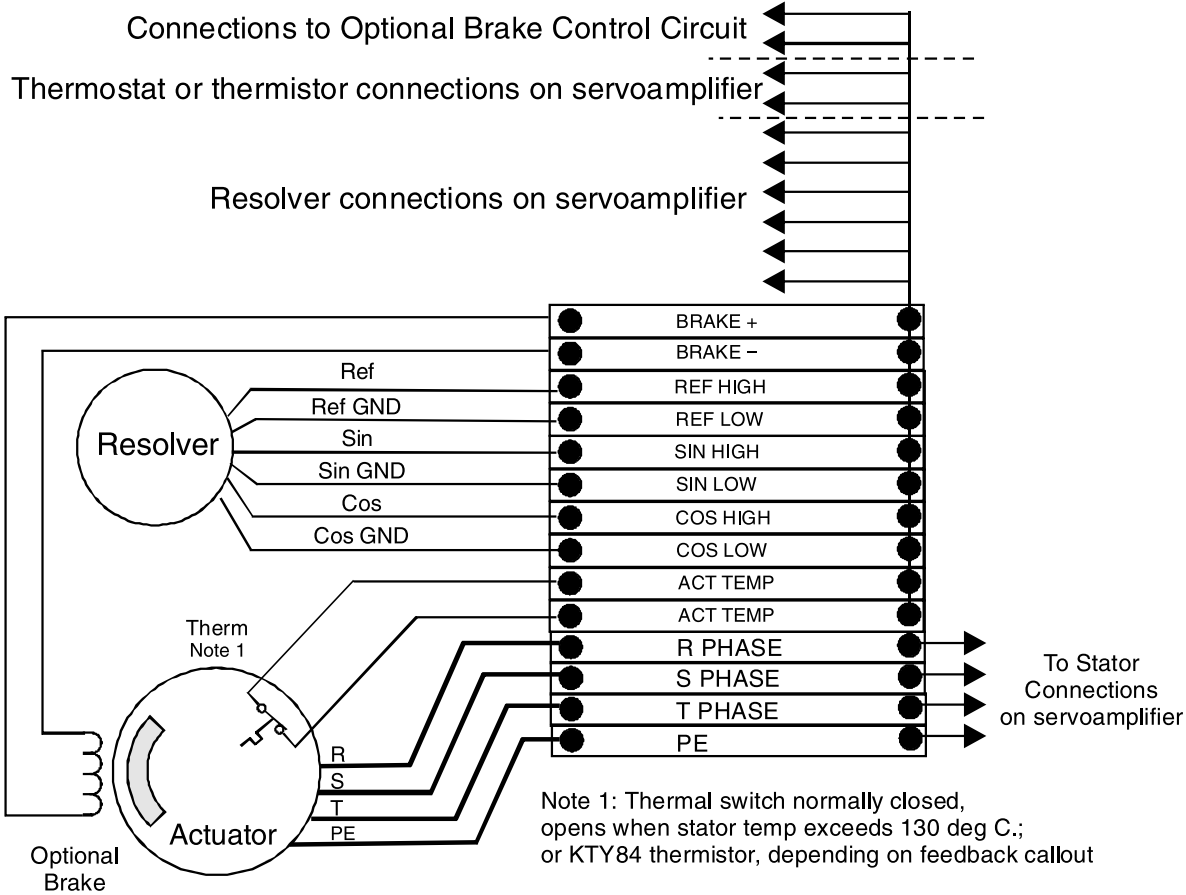
	A	B	ØC	D	ØE	F	Male "M" Inch	Male "A" Metric	Female "F" Inch	Female "B" Metric
EL100 in (mm)	1.250 (31.8)	0.625 (17.0)	0.787 (20.0)	0.281 (7.1)	0.725 (18.4)	1.000 (25.4)	1/2 - 20 UNF - 2A	M16 x 1.5 6g	1/2 - 20 UNF - 2B	M16 x 1.5 6h

## EL100 Front Flange or Clevis Mount



Dim	No Brake	Brake
A	11.9 (302.3)	14.2 (360.8)
D	13.77 (349.9)	16.7 (408.2)

## EL100 Terminal Box Wiring



## EL30 = Model Series

### AA = Frame Size

30 = 3 inch (80 mm) nominal

### BB = Nominal Stroke Length

03 = 3 inch (75 mm) stroke  
 06 = 6 inch (150 mm) stroke  
 XX = Special stroke not to exceed 6 inch (150 mm)

### CC = Screw Lead

01 = 0.1 inch lead  
 02 = 0.2 inch lead  
 05 = 0.5 inch lead  
 XX = Special

### DDD = Connector Options

N## = Potted NPT with flying leads  
 ## = Length of flying leads in feet (not to exceed 99') Consult Exlar application engineering if longer length is needed.

### E = Mounting Options

F = Front Flange  
 C = Rear Clevis  
 H = Threaded Face  
 X = Special Mounting

### F = Rod Ends

M = Male, US std thread  
 A = Male, Metric std thread  
 F = Female, US std thread  
 B = Female, Metric std thread

## GGG = FeedbackType

(Also specify the Amplifier/Drive Model being used when ordering) -- Standard Resolver  
 -- Size 15 1024 line (2068 cts) per rev, two phase resolver

XX1 = Custom Feedback – Wiring and feedback device information must be provided and new feedback callout will be created – Please consult application engineering. Resolver only.

AB6 = Allen-Bradley/Rockwell – Standard Resolver

AM3 = Advanced Motion Control – Standard Resolver

AP1 = API Controls – Standard Resolver

BD2 = Baldor – Standard Resolver

BM2 = Baumuller – Standard Resolver

BR1 = B&R Automation – Standard Resolver

CO2 = Copley Controls – Standard Resolver

CT5 = Standard Resolver – FM/UM/EZ motor wiring w/M23 euro connectors for 'M' option

DT2 = Delta Tau Data Systems – Standard Resolver

EL1 = Elmo Motion Control – Standard Resolver

EX4 = Exlar – Standard Resolver

IF1 = Infranor – Standard Resolver

IN6 = Indramat/Bosch-Rexroth – Standard Resolver

JT1 = Jetter Technologies – Standard Resolver

KM5 = Kollmorgen/Danaher – Standard Resolver

LZ5 = Lenze/AC Tech – Standard Resolver

MD1 = Modicon – Standard Resolver

MG1 = Moog – Standard Resolver

MN4 = Momentum – Standard Resolver

MX1 = Metronix – Standard Resolver

OR1 = Ormec – Standard Resolver

PC7 = Parker – Standard Resolver – European only

PC0 = Parker – Standard Resolver – US Only

PS3 = Pacific Scientific – Standard Resolver

SM2 = Siemens – Standard Resolver

SW1 = SEW/Eurodrive – Standard Resolver

WD1 = Whedco/Fanuc – Standard Resolver

## HHH = Motor Stator all 8 pole

1A8 = 1 stack, 24 Vrms

218 = 2 stack, 115 Vrms

1B8 = 1 stack, 48 Vrms

238 = 2 stack, 230 Vrms

118 = 1 stack, 115 Vrms

258 = 2 stack, 400 Vrms

138 = 1 stack, 230 Vrms

268 = 2 stack, 460 Vrms

158 = 1 stack, 400 Vrms

318 = 3 stack, 115 Vrms<sup>2</sup>

168 = 1 stack, 460 Vrms

338 = 3 stack, 230 Vrms<sup>2</sup>

2A8 = 2 stack, 24 Vrms

358 = 3 stack, 400 Vrms<sup>2</sup>

2B8 = 2 stack, 48 Vrms

368 = 3 stack, 460 Vrms<sup>2</sup>

## II = Motor Speed

01-99 = Two digit number - rated speed in rpm x 100

## JJJ = Hazardous Location Temperature Rating

T3A = 180° C (Samarium Cobalt magnets)

T4 = 135° C (Neodymium-Iron-Boron magnets)

## XX = Optional Speed & Mechanical Designations

### – Multiples possible

XL = Special lubrication

PF = Preloaded follower<sup>1</sup>

XT = Special travel option

## ##### = Part Number Designator for Specials

## ##### = Optional 5 digit assigned part number to designate unique model number for specials

### Notes:

1. The dynamic load rating of zero backlash, preloaded screws is 63% of the dynamic load rating of the standard non-preloaded screws. The calculated travel life of a preloaded screw will be 25% of the calculated travel life of the same size and lead of a non-preloaded screw. Preloaded follower is not available with absolute internal feedback option.

2. Not available with 3" stroke.

**EL100 = Model Series**

**CC = Stroke Length**

06 = 5.9 inch (150 mm)

**DD = Roller Screw Lead (Linear Travel per Screw Revolution)**

01 = 0.1 in/rev (2.54 mm/rev)  
 02 = 0.2 in/rev (5.08 mm/rev)  
 05 = 0.5 in/rev (12.7 mm/rev)  
 XX = Special Lead

**E = Connections**

S = Terminal strips with 3/4" NPT port access, single row

**F = Mounting**

H = Threaded front and rear face, US standard thread  
 N = Threaded front and rear face, metric thread  
 B = Front and rear clevis  
 F = Standard front flange  
 C = Standard rear clevis  
 R = Rear flange  
 X = Special flange, clevis or threaded face mount

**G = Rod End**

M = Male, US standard thread  
 A = Male, metric thread  
 F = Female, US standard thread  
 B = Female, metric thread  
 W = Male, US standard thread 17-4 SS  
 R = Male, metric thread 17-4 SS  
 V = Female, US standard thread 17-4 SS  
 L = Female, metric thread 17-4 SS  
 X = Special rod end (consult Exlar)

**HHH = Controller Feedback Option**

XX1 = Custom Feedback. Resolver only. Consult Exlar  
 AB6 = Allen-Bradley/Rockwell - standard resolver  
 AM3 = Advanced Motion Control - standard resolver  
 AP1 = API Controls - standard resolver  
 BD2 = Baldor - standard resolver  
 BM2 = Baumuller - standard resolver  
 BR1 = B&R Automation  
 CT5 = Control Techniques - standard resolver  
 CO2 = Copely Controls - standard resolver  
 DT2 = Delta Tau Data Systems - standard resolver  
 EL1 = Elmo Motion Control - standard resolver  
 EX4 = Exlar - standard resolver  
 IF1 = Infranor - standard resolver  
 IN6 = Indramat/Bosch-Rexroth - standard resolver  
 JT1 = Jetter Technologies - standard resolver  
 KM5 = Kollmorgen/Danaher - standard resolver  
 LZ5 = Lenze/AC Tech - standard resolver  
 MD1 = Modicon - standard resolver  
 MG1 = Moog - standard resolver  
 MN4 = Momentum - Standard Resolver  
 MX1 = Metronix - standard resolver  
 OR1 = Ormec - standard resolver  
 PC7 = Parker - standard resolver - European only  
 PC0 = Parker - standard resolver - US only  
 PS3 = Pacific Scientific - standard resolver  
 SM2 = Siemens - standard resolver  
 SW1 = SEW/Eurodrive - standard resolver  
 WD1 = Whedco/Fanuc - standard resolver

**I = Motor Stacks**

2 = 2 stack motor

**J = Rated Voltage**

A = 24 VDC  
 B = 48 VDC  
 C = 120 VDC  
 1 = 115 Volt RMS  
 3 = 230 Volt RMS  
 5 = 400 Volt RMS  
 6 = 460 Volt RMS  
 X = Special voltage rating - not to exceed 460 Volt RMS

**K = Motor Poles**

8 = 8 Pole Motor

**LL = Rated Motor Speed at Rated Voltage**

01 - 99 = Two digit number x 100 = rated RPM

**MM = Mechanical Option (Multiple options may apply - separated by "-")**

XL = Special lubrication, Mobilgrease 28 or other (please specify)  
 PF = Pre-loaded roller screw follower<sup>1</sup>  
 AR = External anti-rotate assembly (requires flange mount option)  
 RB = Rear brake  
 XT = Special housing option (see options below)  
 Hard anodized aluminum motor housing parts  
 Epoxy coated terminal housing (casting)

**NN = Haz Loc Temp Rating**

T3 = 200° C max allowable surface temperature

**##### = Part Number**

5 digit numeric part number unique to model

**Notes:**

1. The dynamic load rating of zero backlash, preloaded screws is 63% of the dynamic load rating of the standard non-preloaded screws. The calculated travel life of a preloaded screw will be 25% of the calculated travel life of the same size and lead of a non-preloaded screw. Preloaded follower is not available with absolute internal feedback option.

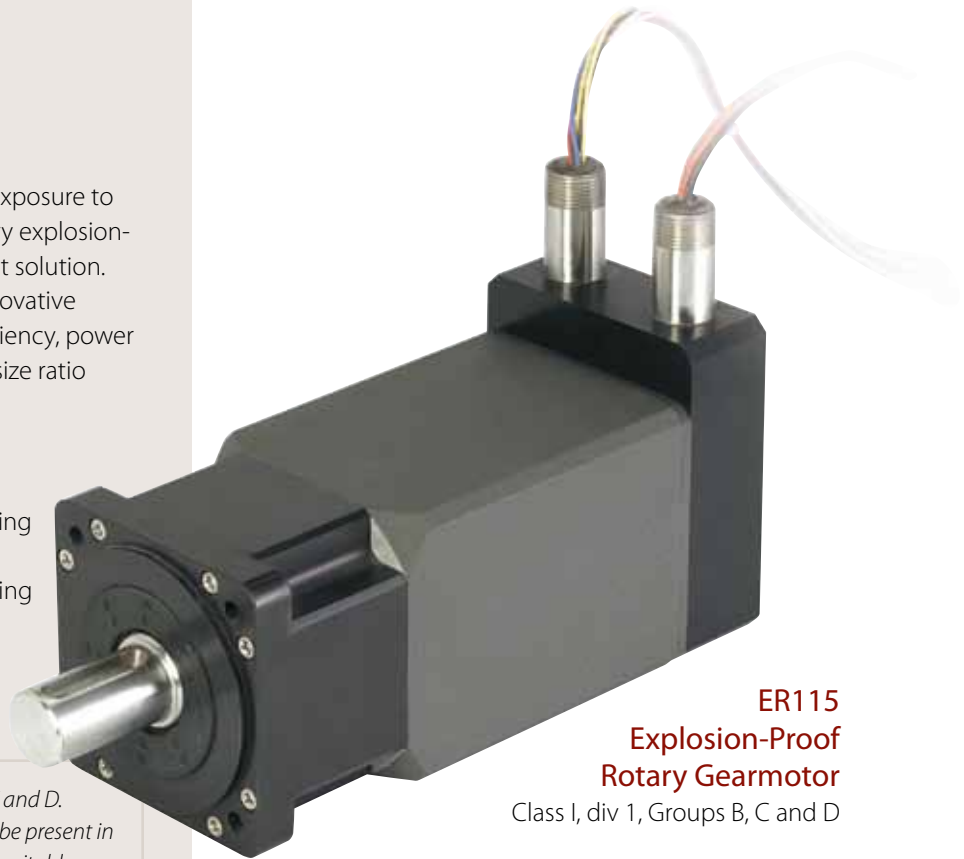
## ER Series Explosion-Proof Rotary Motor and Gearmotor

For hazardous duty environments with constant exposure to flammable gasses or vapors\* Exlar's ER Series rotary explosion-proof motors and gearmotors provide an excellent solution. Exlar's motors utilizing T-LAM™ technology, an innovative segmented winding, have been designed for efficiency, power and durability and provide a very high torque-to-size ratio when compared to other suppliers' motors.

The gearmotor comprises a brushless permanent magnet motor optimized for use with an integral planetary gear set. Through the uniform load sharing of several gears acting in concert, planetary gear heads are a very compact, reliable solution providing high torque, low backlash and low maintenance.

The ER Series motors are compatible with nearly any manufacturers' resolver-based amplifier.

*\*ER Series motors are rated for Class I, div 1, Groups B, C and D. "Class I" means that flammable gasses or vapors may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. "Division 1" means that hazardous concentrations in the air may exist continuously, intermittently, or periodically under normal operating conditions. "Group B" allows for atmospheres containing hydrogen, or gasses (or vapors) of equivalent hazard, such as manufactured gas. "Group C" allows for atmospheres containing ethyl-ether vapors, ethylene or cyclo propane. "Group D" allows for atmospheres containing gasoline, hexane, naphtha, benzene, butane, alcohol, acetone, benzol, lacquer solvent vapors or natural gas. ER Series motors are not rated for operation in atmospheres containing acetylene.*



**ER115  
Explosion-Proof  
Rotary Gearmotor**

Class I, div 1, Groups B, C and D

### Features

T-LAM technology yielding 35% increase in continuous motor torque over traditional windings

Resolver feedback

8 pole motors

Rod end options

1, 2, or 3 stack motor availability compatible with nearly any resolver based servo amplifier

Several mounting configurations

Potted NPT connectors

Windings from 24 VDC to 460 VAC rms

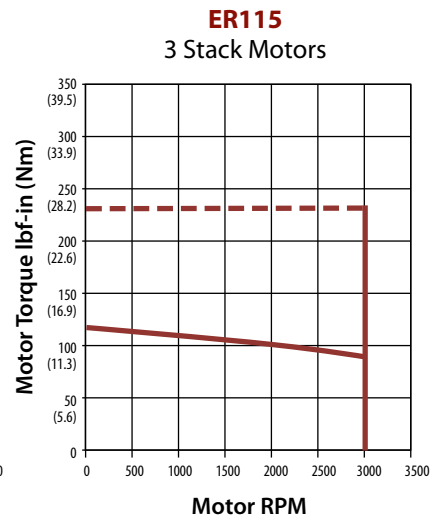
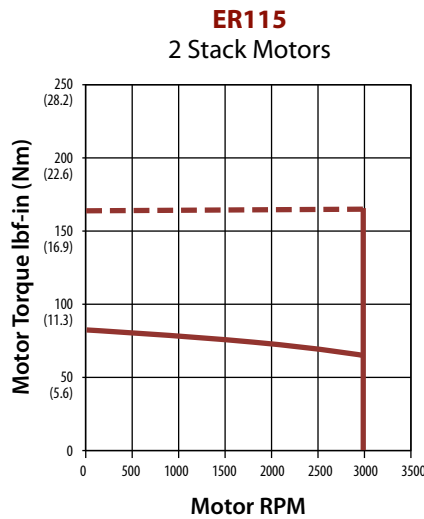
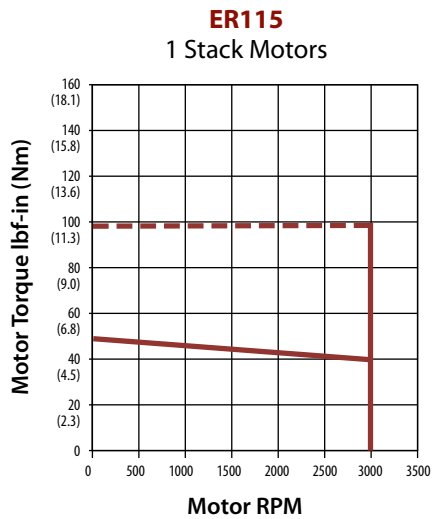
Class 180H insulation system

Typical Applications for ER Series explosion-proof motors are Well-suited to many applications such as:

- Turbine fuel flow
- Printing presses
- Engine test stands
- Fuel distribution systems
- Chemical process plants
- Shipbound fuel management
- Paint booths

## ER Speed/Torque Curves

- - - - Peak Torque  
— Continuous Torque  
 Torque Rated at 80°C



# Hazardous Location ER Series Linear Actuators

## ER115 Electrical/Mechanical Specifications

Sinusoidal Commutation Data		1A8	1B8	118	138	158	168	2A8	2B8	238	258	268	338	358	368
Continuous Motor Torque**	lbf-in (Nm)	49.7 (5.61)	49.7 (5.61)	50.5 (5.70)	50.5 (5.70)	50.6 (5.72)	50.5 (5.70)	83.3 (9.41)	83.3 (9.41)	84.0 (9.49)	82.5 (9.32)	84.0 (9.49)	117.3 (13.25)	117.6 (13.29)	120.4 (13.60)
Peak Motor Torque	lbf-in (Nm)	99.3 (11.22)	99.3 (11.22)	101.0 (11.41)	101.0 (11.41)	101.2 (11.44)	100.9 (11.40)	166.6 (18.82)	166.6 (18.82)	168.0 (18.98)	165.0 (18.64)	168.0 (18.98)	234.6 (26.50)	235.3 (26.58)	240.8 (27.21)
Torque Constant (Kt)**	lbf-in/A	5.3	5.3	4.3	8.7	15.7	17.4	5.3	5.3	8.7	15.9	17.4	8.5	15.9	17.6
(+/- 10% @ 80°C)	(Nm/A)	0.60	0.6	0.5	1.0	1.8	2.0	0.6	0.6	1.0	1.8	2.0	1.0	1.8	2.0
Continuous Current Rating	A	10.5	10.5	13.0	6.5	3.6	3.2	17.6	17.6	10.8	5.8	5.4	15.4	8.3	7.7
Peak Current Rating	A	21.0	21.0	26.0	13.0	7.2	6.5	35.2	35.2	21.6	11.6	10.8	30.8	16.6	15.3
<b>TRAPEZOIDAL COMMUTATION DATA</b>															
Continuous Motor Torque**	lbf-in (Nm)	47.4 (5.36)	47.4 (5.36)	48.2 (5.45)	48.2 (5.45)	48.3 (5.46)	48.2 (5.45)	79.5 (8.99)	79.5 (8.99)	80.2 (9.06)	78.8 (8.90)	80.2 (9.06)	112.0 (12.66)	112.3 (12.69)	115.0 (12.99)
Peak Motor Torque	lbf-in (Nm)	94.8 (10.71)	94.8 (10.7)	96.4 (10.9)	96.4 (10.9)	96.7 (10.9)	96.4 (10.9)	159.1 (18.0)	159.1 (18.0)	160.4 (18.1)	157.6 (17.8)	160.4 (18.1)	224.0 (25.3)	224.7 (25.4)	230.0 (26.0)
Torque Constant (Kt) (+/- 10% @ 80°C)	lbf-in/A (Nm/A)	4.12 (0.47)	4.12 (0.47)	3.39 (0.38)	6.78 (0.77)	12.22 (1.38)	13.55 (1.53)	4.12 (0.47)	4.12 (0.47)	6.78 (0.77)	12.37 (1.40)	13.55 (1.53)	6.63 (0.75)	12.37 (1.40)	13.70 (1.55)
Continuous Current Rating	A	12.85	12.85	15.90	7.95	4.42	3.97	21.55	21.55	13.23	7.12	6.61	18.88	10.14	9.38
Peak Current Rating	A	25.69	25.69	31.81	15.90	8.84	7.95	43.10	43.10	26.46	14.23	13.23	37.76	20.29	18.76
<b>MOTOR DATA</b>															
Voltage Constant (Ke)**	Vpk/Krpm	36.1	36.1	29.7	59.4	107.1	118.7	36.1	36.1	59.4	108.4	118.7	58.1	108.4	120.0
(+/- 10% @ 80°C)	Vrms/Krpm	51.1	51.1	42.0	83.9	151.4	167.9	53.1	51.1	83.9	153.3	167.9	82.1	153.3	169.7
Pole Configuration		8	8	8	8	8	8	8	8	8	8	8	8	8	8
Resistance (L-L)(+/- 5% @ 25°C)	Ohms	0.31	0.31	0.20	0.80	2.60	3.21	0.13	0.13	0.34	1.17	1.35	0.20	0.69	0.81
Inductance (L-L)(+/- 15%)	mH	4.8	4.8	3.3	13.0	42.4	52.1	2.3	2.3	6.3	21.1	25.3	4.0	13.9	17.1
Armature Inertia	lb-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00555 (6.27)						0.00833 (9.42)				0.01112 (12.56)			
Mechanical Time Constant (tm)	ms	0.85	0.85	0.82	0.82	0.82	0.82	0.53	0.53	0.52	0.54	0.52	0.43	0.42	0.40
Electrical Time Constant (te)	ms	15.73	15.73	16.26	16.26	16.34	16.25	18.41	18.41	18.72	18.06	18.72	20.08	20.19	21.16
Damping Constant	lbf-in/krpm (N-m/krpm)	0.21 (0.024)	0.21 (0.024)	0.21 (0.024)	0.21 (0.024)	0.21 (0.024)	0.21 (0.024)	0.35 (0.040)	0.35 (0.040)	0.35 (0.040)	0.35 (0.040)	0.35 (0.045)	0.40 (0.045)	0.40 (0.045)	0.40 (0.045)
Friction Torque	lbf-in (Nm)	0.56 (0.063)	0.56 (0.063)	0.56 (0.063)	0.56 (0.063)	0.56 (0.063)	0.56 (0.063)	1.00 (0.113)	1.00 (0.113)	1.00 (0.113)	1.00 (0.113)	1.00 (0.136)	1.20 (0.136)	1.20 (0.136)	1.20 (0.136)
Bus Voltage	Vrms	24VDC	48VDC	115	230	400	460	24VDC	48VDC	230	400	460	230	400	460
Speed @ Bus Voltage	rpm	300	750	3000	3000	3000	3000	300	750	3000	3000	3000	3000	3000	3000
Insulation Class		180 (H)													
Insulation System Volt Rating	Vrms	460													
Class Temperature	°C	T4 = 135° T3A = 180°													
Environmental Rating		IP65													

## ER115 Gearmotor Data

	1 Stack Motor	2 Stack Motor	3 Stack Motor
ER115 Armature Inertia* lbf-in-sec <sup>2</sup> (Kg-cm <sup>2</sup> )	0.00344 (3.89)	0.00441 (4.99)	0.00538 (6.08)

For amplifiers using peak sinusoidal ratings, multiply RMS sinusoidal Kt by .707 and current by 1.414.

GEARING REFLECTED INERTIA	SINGLE REDUCTION			DOUBLE REDUCTION		
	Gear Stages	lbf-in-sec <sup>2</sup>	(Kg-cm <sup>2</sup> )	Gear Stages	lbf-in-sec <sup>2</sup>	(Kg-cm <sup>2</sup> )
	4:1	0.0000132	(0.0149)	16:1	0.0000121	(0.0137)
	5:1	0.0000087	(0.00984)	20:1, 25:1	0.0000080	(0.00906)
	10:1	0.0000023	(0.00261)	40:1, 50:1, 100:1	0.0000021	(0.00242)
Backlash at 1% rated torque:	10 Arc minutes Efficiency: Single reduction 91%			13 Arc minutes Double Reduction: 86%		

\* Add armature inertia to gearing inertia for total ER system inertia

\*\* For T3A Temperature Class multiply Kt and Ke ratings by 0.83; continuous current by 1.245; continuous torque by 1.095.

## ER115 Series Gearmotor General Performance Specifications

Two torque ratings for the ER Series Gearmotors are given in the table below. The left hand columns give the maximum (peak) allowable output torque for the indicated ratios of each size ER Series Gearmotor. This IS NOT the rated output torque of the motor multiplied by the ratio of the reducer.

It is possible to select a configuration of the motor selection and gear ratio such that the rated motor torque, multiplied by

the gear ratio exceeds these ratings. It is the responsibility of the user to ensure that the settings of the system, including the amplifier, do not allow these values to be exceeded.

The right hand columns give the output torque at the indicated speed which will result in 10,000 hour (L10). The setup of the system, including the amplifier, will determine the actual output torque and speed.

### Output Torque Ratings – Mechanical

ER115 Ratio	Maximum Allowable Output Torque ibf. in (Nm)	Output Torque @ Speed for 10,000 Hour Life – ibf. in (Nm)		
		1000 RPM	3000 RPM	5000 RPM
4:1	4696 (530.4)	1392 (157.3)	1132 (127.9)	1000 (112.9)
5:1	4066 (459.4)	1445 (163.3)	1175 (132.8)	1040 (117.5)
10:1	2545 (287.5)	1660 (187.6)	1350 (152.6)	1200 (135.6)
16:1	4696 (530.4)	2112 (238.6)	1714 (193.0)	1518 (171.0)
20:1	4696 (530.4)	2240 (253.1)	1840 (207.9)	1620 (183.0)
25:1	4066 (459.4)	2350 (265.5)	1900 (214.7)	1675 (189.2)
40:1	4696 (530.4)	2800 (316.4)	2240 (253.1)	2000 (225.9)
50:1	4066 (459.4)	2900 (327.7)	2350 (265.5)	2100 (237.3)
100:1	2545 (287.5)	2500 (282.5)	2500 (282.5)	2400 (271.2)

### Radial Load and Bearing Life

RPM	ER115 lbf (N)
50	939 (4177)
100	745 (3314)
250	549 (2442)
500	435 (1935)
1000	346 (1539)

Side load ratings shown below are for 10,000 hour bearing life at 25mm from motor face at given rpm.

Visit [www.exlar.com](http://www.exlar.com) for full details on radial load and bearing life.

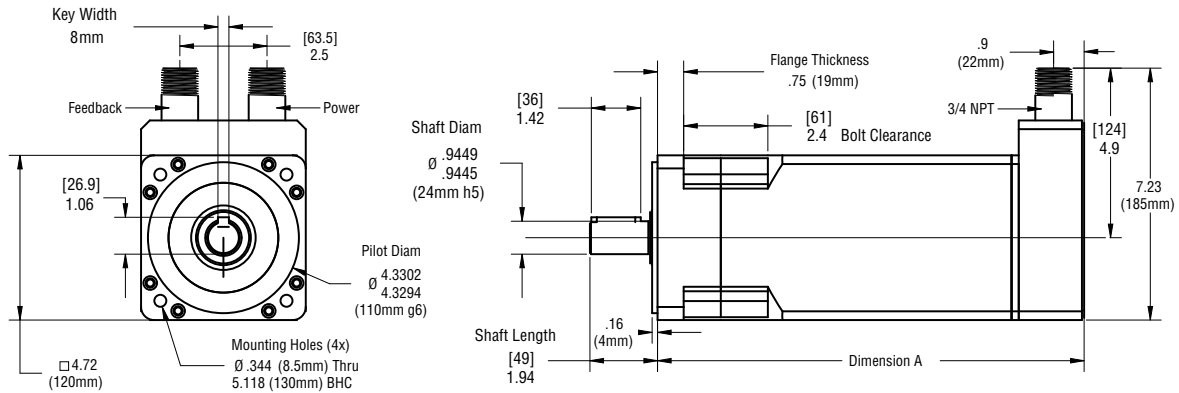
### Motor and Gearmotor Weight

ER115	Motor lb (kg)	1 Stage lb (kg)	2 Stage lb (kg)
1 Stack	14.2 (6.4)	28 (12.7)	34 (15.4)
2 Stack	22.0 (10)	35.8 (16.2)	41.8 (18.9)
3 Stack	29.8 (13.5)	43.6 (19.8)	49.6 (22.5)



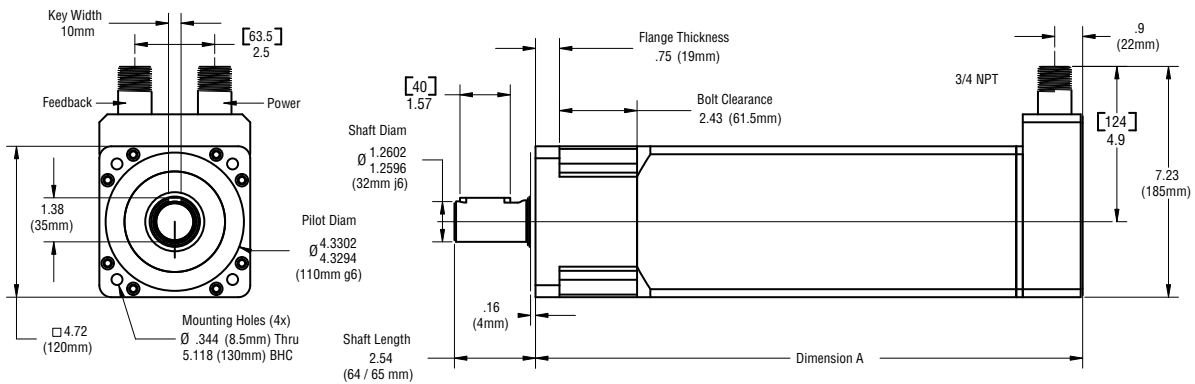
# Hazardous Location ER Series Linear Actuators

## ER115



Gear Reduction		Dimension "A"
Stages	Stacks	Length in (mm)
0	1	8.3 (210)
0	2	10.3 (261)
0	3	12.3 (311)

## ER115 with Gear Reduction Option



Gear Reduction		Dimension "A"
Stages	Stacks	Length in (mm)
1	1	11.6 (293)
	2	13.6 (344)
	3	15.6 (395)

Gear Reduction		Dimension "A"
Stages	Stacks	Length in (mm)
2	1	13.2 (334)
	2	15.2 (385)
	3	17.2 (436)

Drawings subject to change. Consult Exlar for certified drawings.

**ER = Model Series**

ER = Series

**AAA = Frame Size**

115 = 115 mm

**BBB = Gear Reduction Ratio**

(Optional - blank for motor)

- 004 = 4:1 Single stage reduction
- 005 = 5:1 Single stage reduction
- 010 = 10:1 Single stage reduction
- 016 = 16:1 Two stage reduction
- 020 = 20:1 Two stage reduction
- 025 = 25:1 Two stage reduction
- 040 = 40:1 Two stage reduction
- 050 = 50:1 Two stage reduction
- 100 = 100:1 Two stage reduction

**CC = Shaft Type**

- K = Keyed
- R = Smooth /Round
- X = Special shaft

**D = Connection Options**

- N## = Potted NPT with flying leads
- ## = length of flying leads in feet (not to exceed 99') consult Exlar applications engineering if longer lengths are needed.

**F = Brake Options**

- S = Standard no brake

**GGG = Feedback Type**

(Also specify the Amplifier/Drive Model being used when ordering)

- Standard Resolver – Size 15 1024 line (2048 cts) per rev., two pole resolver
- XX1 = Custom Feedback – Wiring and feedback device information must be provided and new feedback callout will be created – Please consult application engineering – Resolver only
- AB6 = Allen-Bradley/Rockwell – Standard Resolver
- AM3 = Advanced Motion Control – Standard Resolver
- AP1 = API Controls – Standard Resolver
- BD2 = Baldor – Standard Resolver
- BM2 = Baumuller – Standard Resolver
- BR1 = B&R Automation – Standard Resolver
- CO2 = Copley Controls – Standard Resolver
- CT5 = Standard Resolver
- DT2 = Delta Tau Data Systems – Standard Resolver
- EL1 = Elmo Motion Control – Standard Resolver
- EX4 = Exlar – Standard Resolver
- IF1 = Infranor – Standard Resolver
- IN6 = Indramat/Bosch-Rexroth – Standard Resolver
- JT1 = Jetter Technologies – Standard Resolver
- KM5 = Kollmorgen/Danaher – Standard Resolver
- LZ5 = Lenze/AC Tech – Standard Resolver
- MD1 = Modicon – Standard Resolver
- MG1 = Moog – Standard Resolver
- MN4 = Momentum – Standard Resolver
- MX1 = Metronix – Standard Resolver
- OR1 = Ormec – Standard Resolver
- PC7 = Parker – Standard Resolver – European only
- PC0 = Parker – Standard Resolver – US only
- PS3 = Pacific – Scientific Standard Resolver
- SM2 = Siemens – Standard Resolver
- SW1 = SEW/Eurodrive – Standard Resolver
- WD1 = Whedco/Fanuc – Standard Resolver

**HHH = Motor Stator, All 8 Pole**

- 1A8 = 1 stack, 24 Vrms
- 1B8 = 1 stack, 48 Vrms
- 118 = 1 stack, 115 Vrms
- 138 = 1 stack, 230 Vrms
- 158 = 1 stack, 400 Vrms
- 168 = 1 stack, 460 Vrms
- 2A8 = 2 stack, 24 Vrms
- 2B8 = 2 stack, 48 Vrms
- 238 = 2 stack, 230 Vrms
- 258 = 2 stack, 400 Vrms
- 268 = 2 stack, 460 Vrms
- 338 = 3 stack, 230 Vrms
- 358 = 3 stack, 400 Vrms
- 368 = 3 stack, 460 Vrms

**II = Speed Designations**

01-99 Two digit number. Rated speed in rpm X 100

**JJJ = Hazardous Location Temperature Rating**

- T3A = 180°C (Samarium Cobalt magnets)
- T4 = 135°C (Neodymium-Iron-Boron magnets)

**XX = Optional Speed & Mechanical Designations**

- XL = Special lubrication

**##### = Part Number Designator for Specials**

##### = Optional 5 digit assigned part number to designate unique model number for specials

## GSX/GSM Linear Actuator with Class I Division 2 Option

The GSX and GSM linear actuators are available with Class I Division 2 certification for hazardous locations. A hazardous location is defined as a place where concentrations of flammable gases or vapors occur. Electrical equipment that must be installed in these locations is designed and tested to ensure it does not initiate an explosion due to arcing contacts or high surface temperature of equipment.

The GSX or GSM actuators with this option offer the same product performance of the standard product offering as described in the GSX and GSM sections of this catalog. Please see those sections for performance and mechanical specifications.


Options for Class I Division 2 products:

- Resolver feedback
- Handwheel

The GSX/M actuators are ideally suited for process control valve and damper applications in harsh environments. These actuators continuously hold the position of the valve stem or shaft allowing extremely fast response to the smallest command signal changes without overshoot even when friction is present. This results in improved loop performance and reduced process variability.



GSX/GSM  
Linear Actuator

 163694  
Class I, Division 2

### Typical Applications

Chemical Processing  
Turbine Control  
Fuel Skids  
Oil & Gas Upstream & Downstream  
Power Utilities  
Pulp & Paper

### Features

T-LAM™ segmented lamination stator technology

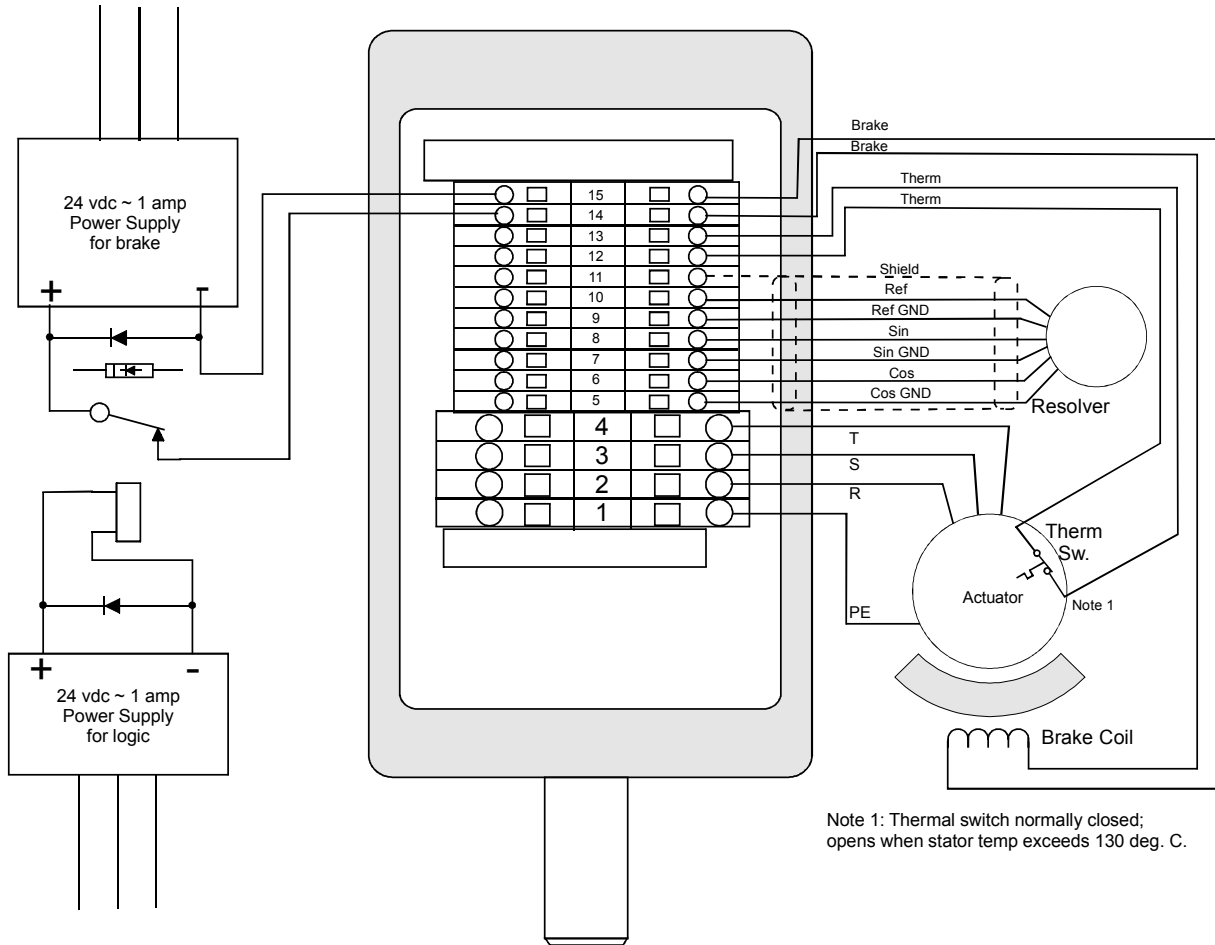
Up to 33 inch per second linear speeds

Resolver feedback

Class I, Division 2, Groups A, B, C & D certified

Terminal box with NPT ports

## Terminal Box Wiring Diagram



## Ordering Information

Please use the ordering guide from the GSX (page 136) and GSM (page 139) sections with two callout selections as described below. The required connections selection is "T" and the required options selection is "NI"

GSX - AA - BB - CC - **D** - E - F - GGG - HHH - II - (XX...XX)

↓

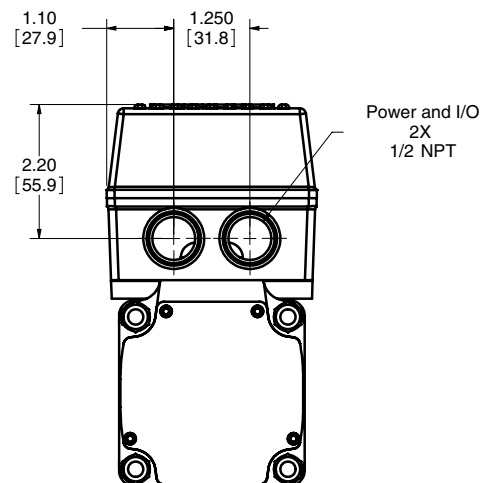
T

↓

NI

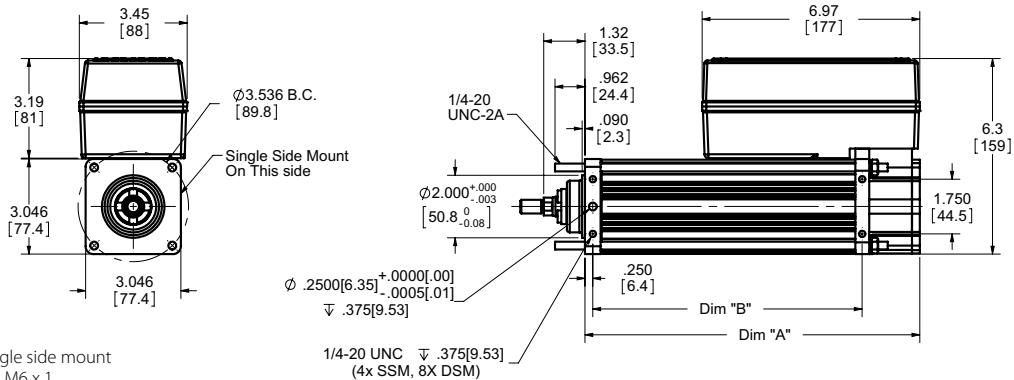
Connections
T = Terminal box with NPT ports
Options
NI = Non-Incendive

## Terminal Box Dimensions



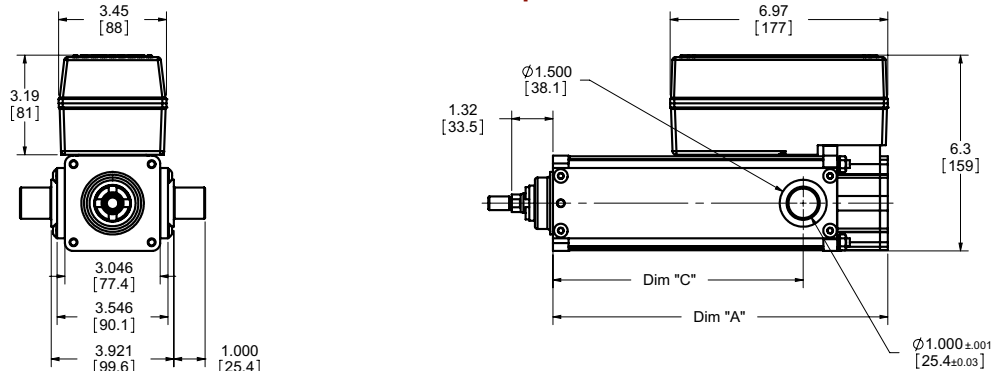
# GSX30 Hazardous Location Class I Division 2 Products

## GSX30 Single, Double Side Mounts or Extended Tie Rod Mount with Class I Div 2 Option



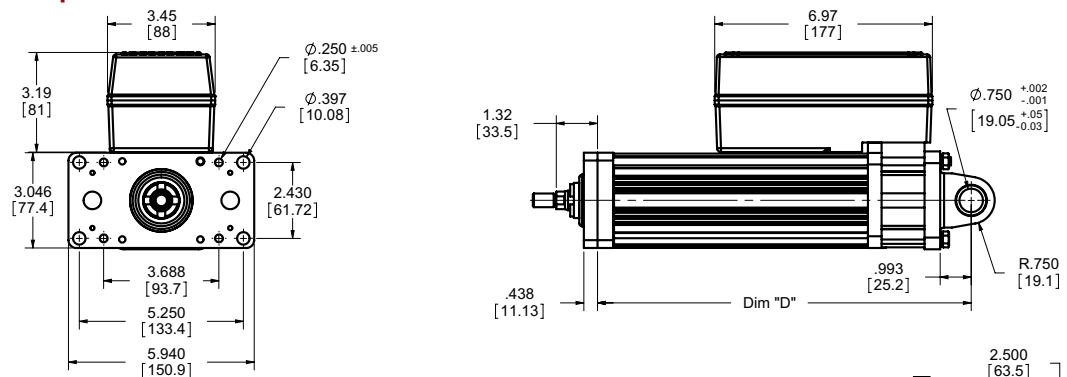
1. Three mounting styles shown
  2. Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M6 x 1  
 \* If "J" or "K" metric side mount options, M6 x 1.0  $\nabla$  9 mm with  $\varnothing$  6 mm M7  $\nabla$  9 mm Dowel Hole

## GSX30 Side Trunnion Mount with Class I Div 2 Option



\*If "Q" metric side trunnion option,  $\varnothing$  25 mm h7

## GSX30 Rear Clevis Mount or Front Flange Mount with Class I Div 2 Option



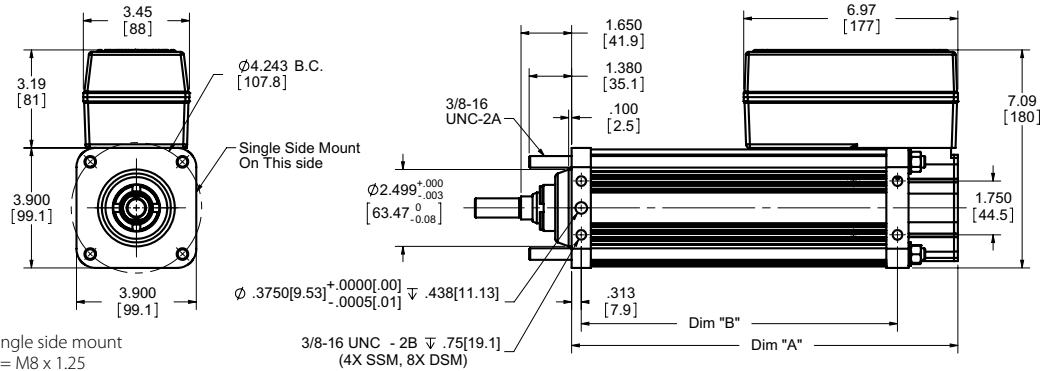
Dim	3" (mm) Stroke	6" (mm) Stroke	10" (mm) Stroke	12" (mm) Stroke	14" (mm) Stroke	18" (mm) Stroke
A	8.2 (209)	10.7 (272)	15.2 (387)	17.2 (437)	19.2 (488)	23.2 (590)
B	6.1 (156)	8.6 (219)	13.1 (333)	15.1 (384)	17.1 (435)	21.1 (536)
C	5.4 (137)	8.0 (203)	10.0 (254)	12.0 (305)	14.0 (356)	18.0 (457)
D	9.5 (241)	12.0 (304)	16.5 (418)	18.5 (469)	20.5 (520)	24.5 (621)

1. Two mounting styles shown
2. With flange mount, dimension A is equivalent to top two drawings

Note: Add 1.6 Inches (40.64 mm) to Dims "A" & "D" if ordering a Brake.

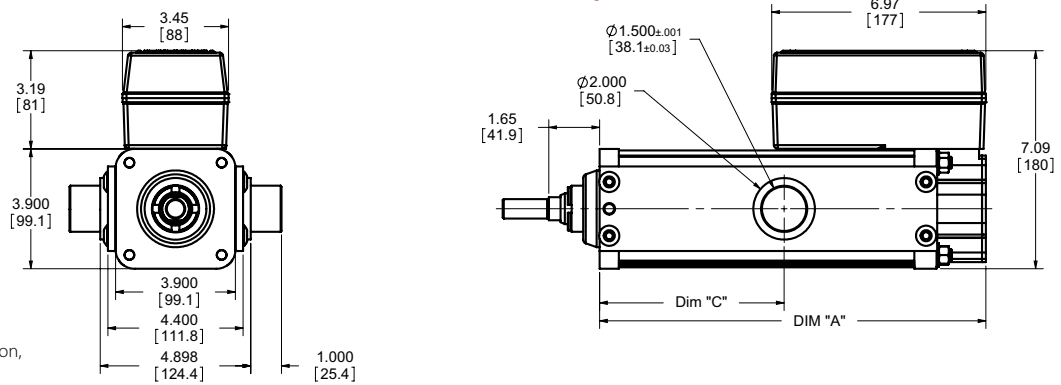
Drawings subject to change. Consult Exlar for certified drawings.

## GSX40 Single, Double Side Mounts or Extended Tie Rod Mount with Class I Div 2 Option



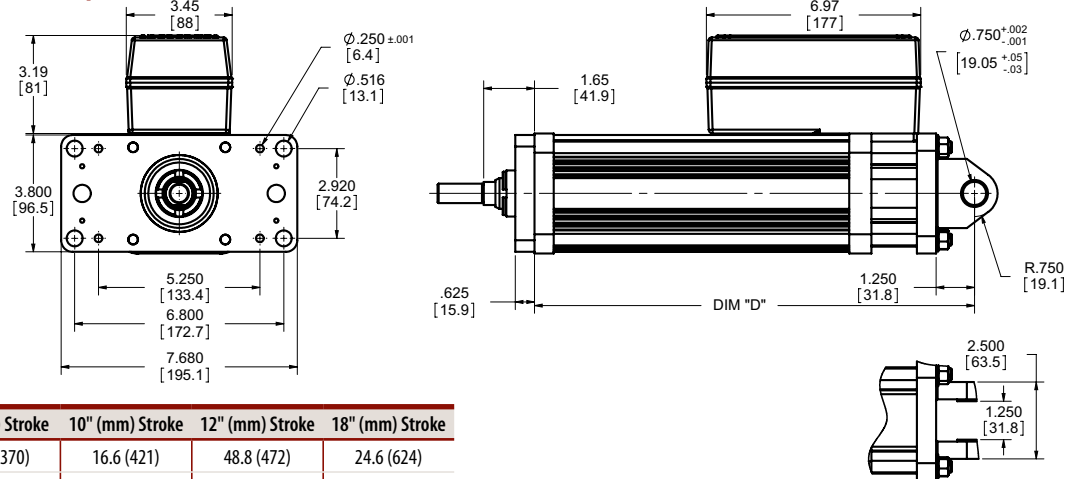
1. Three mounting styles shown
  2. Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M8 x 1.25  
 \* If "J" or "K" metric side mount options, M10 x 1.5  $\nabla$  19 mm with  $\varnothing$  8 mm M7  $\nabla$  12 mm Dowel Hole

## GSX40 Side Trunnion Mount with Class I Div 2 Option



\* If "Q" metric side trunnion option,  $\varnothing$  35 mm h7

## GSX40 Rear Clevis Mount or Front Flange Mount with Class I Div 2 Option



Dim	6" (mm) Stroke	8" (mm) Stroke	10" (mm) Stroke	12" (mm) Stroke	18" (mm) Stroke
A	012.6 (320)	14.6 (370)	16.6 (421)	48.8 (472)	24.6 (624)
B	10.3 (262)	12.3 (313)	14.3 (364)	16.3 (414)	22.3 (567)
C	6.0 (152)	8.0 (203)	10.0 (254)	12.0 (305)	18.0 (457)
D	14.5 (364)	16.3 (415)	18.3 (466)	20.3 (516)	26.3 (669)

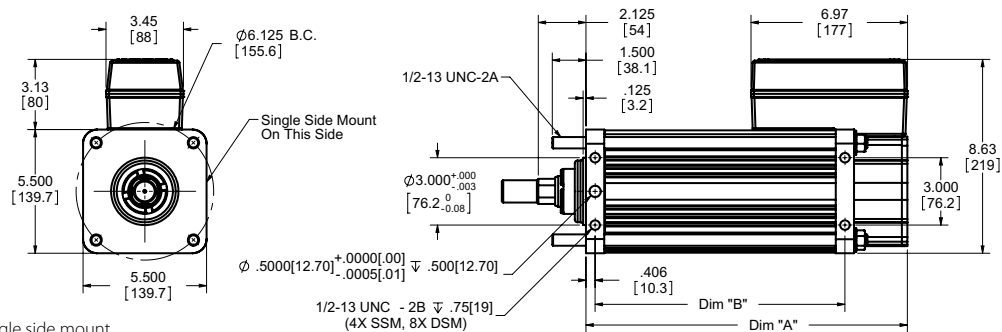
1. Two mounting styles shown
2. With flange mount, dimension A is equivalent to top two drawings

Note: Add 2.33 Inches (59.18 mm) to Dims "A" & "D" if ordering a Brake.

Drawings subject to change. Consult Exlar for certified drawings.

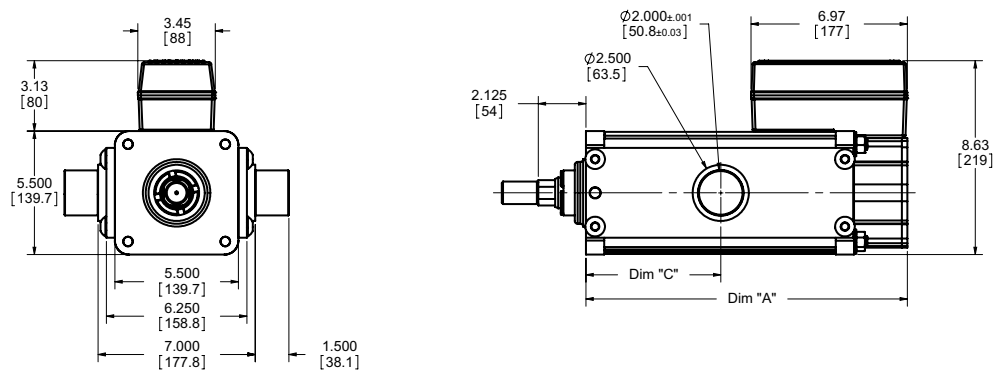
# GSX50 Hazardous Location Class I Division 2 Products

## GSX50 Single, Double Side Mounts or Extended Tie Rod Mount with Class I Div 2 Option



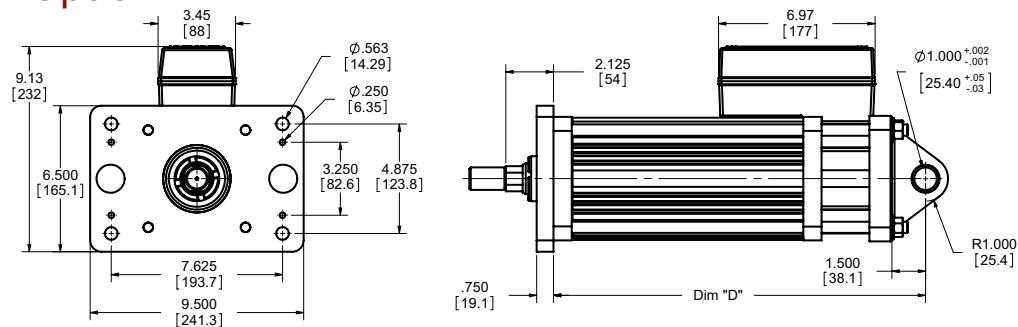
1. Three mounting styles shown
  2. Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M8 x 1.25  
 \* If "J" or "K" metric side mount options, M12 x 1.75  $\nabla$  19 mm with  $\varnothing$  12 mm M7  $\nabla$  12 mm Dowel Hole

## GSX50 Side Trunnion Mount with Class I Div 2 Option



\* If "Q" metric side trunnion option,  $\varnothing$  50 mm h7

## GSX50 Rear Clevis Mount or Front Flange Mount with Class I Div 2 Option

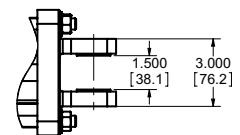


Dim	6" (mm) Stroke	10" (mm) Stroke	14" (mm) Stroke
A	14.3 (364)	18.3 (465)	22.3 (567)
B	11.1 (282)	15.1 (384)	19.1 (486)
C	6.0 (152)	10.0 (254)	14.0 (356)
D	16.6 (421)	20.6 (522)	24.6 (624)

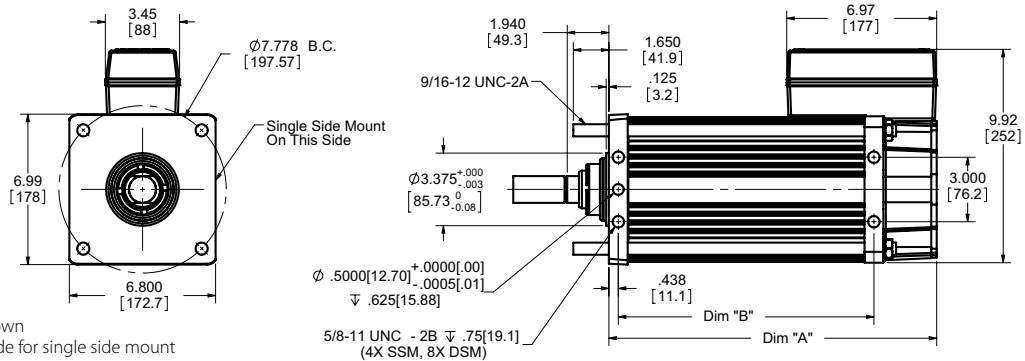
Note: Add 2.5 Inches to Dims "A" & "D" if ordering a Brake.

Drawings subject to change. Consult Exlar for certified drawings.

1. Two mounting styles shown
2. With flange mount, dimension A is equivalent to top two drawings

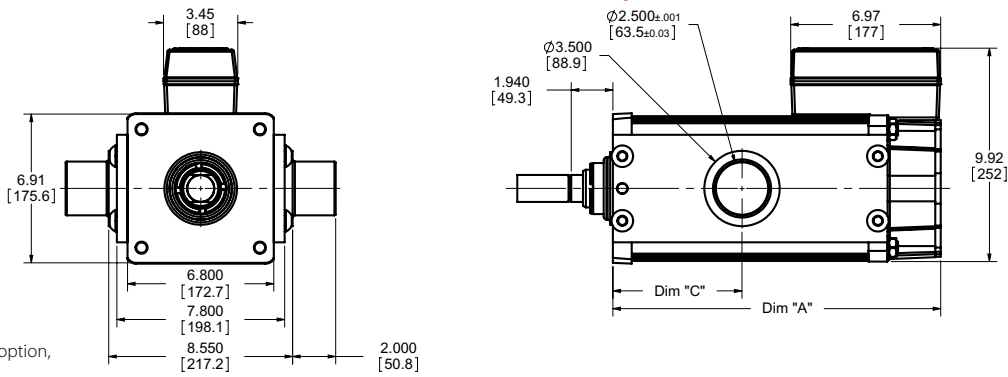


## GSX60 Single, Double Side Mounts or Extended Tie Rod Mount with Class I Div 2 Option



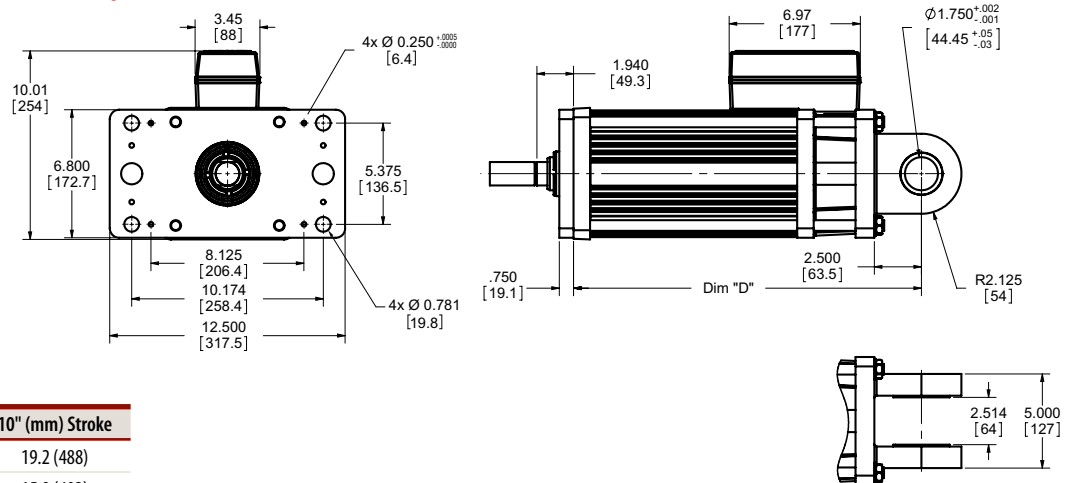
1. Three mounting styles shown
  2. Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M14 x 2  
 \* If "J" or "K" metric side mount options, M16 x 2.0  $\nabla$  16 mm with  $\varnothing$  12 mm M7  $\nabla$  12 mm Dowel Hole

## GSX60 Side Trunnion Mount with Class I Div 2 Option



\* If "Q" metric side trunnion option,  $\varnothing$  60 mm h9

## GSX60 Rear Clevis Mount or Front Flange Mount with Class I Div 2 Option



Dim	6" (mm) Stroke	10" (mm) Stroke
A	15.2 (387)	19.2 (488)
B	11.9 (302)	15.9 (403)
C	6.0 (152)	10.0 (254)
D	18.5 (469)	22.5 (571)

1. Two mounting styles shown
2. With flange mount, dimension A is equivalent to top two drawings

Note: Add 3.575 Inches to Dims "A" & "D" if ordering a Brake.

Drawings subject to change. Consult Exlar for certified drawings.



**AA = Actuator Frame Size**

- 30 = 3 inch (75 mm)
- 40 = 4 inch (100 mm)
- 50 = 5 inch (125 mm)
- 60 = 7 inch (175 mm)

**BB = Stroke Length**

- 03 = 3 inch (75 mm) GSX30
- 06 = 5.9 inch (150 mm) GSX30  
6 inch (GSX20, 40, 50, 60)
- 08 = 8 inch (200 mm) GSX40
- 10 = 10 inch (250 mm) all models
- 12 = 12 inch (300 mm) GSX30, 40
- 14 = 14 inch (355 mm) GSX30, 50
- 18 = 18 inch (450 mm) GSM30, 40

**CC = Lead (position change per motor revolution)**

- 01 = 0.1 inch (2.54 mm) GSX/M30, 40, 50<sup>8</sup>
- 02 = 0.2 inch (5.08 mm) GSX30, 40, 50
- 03 = 0.25 inch (6.35 mm) GSX60
- 05 = 0.5 inch (12.7 mm) GSX/M30, 40, GSX50, 60
- 08 = 0.75 inch (20.32 mm) GSX/M40<sup>3</sup>
- 10 = 1.0 inch (25.4 mm) GSX50, 60<sup>4</sup>
- XX = Special lead

**D = Connections**

- T = Terminal box with NPT ports

**E = Mounting**

- B = Front and rear flange
- C = Rear clevis
- F = Front flange
- R = Rear flange
- S = Side mount
- D = Double side mount
- T = Side trunnion
- E = Extended tie rods
- J = Metric side mount
- K = Metric double side mount
- Q = Metric side trunnion
- M = Metric extended tie rods
- G = Metric rear clevis
- X = Special (please specify)

**F = Rod End**

- M = Male, US std thread
- A = Male, metric thread
- F = Female, US std thread
- B = Female, metric thread
- W = Male, US std thread 440C SS
- R = Male metric thread 440C SS
- V = Female, US std thread 440C SS
- L = Female metric thread 440C SS
- X = Special (please specify)

**GGG = Feedback Type (Also specify the Amplifier/Drive Model being used when ordering) Resolver Only.**

Standard Resolver – Size 15, 1024 line (2048 cts) per rev, 2 pole resolver

**Custom Feedback: Please consult application engineering:**

- XX1 = Wiring and feedback device information must be provided and new feedback callout will be created
- AB6 = Allen Bradley/Rockwell - Std Resolver
- AM3 = Advanced Motion Control - Std Resolver
- AP1 = API Controls - Standard Resolver
- BD2 = Baldor - Standard Resolver
- BM2 = Baumuller - Standard Resolver
- BR1 = B&R Automation - Standard Resolver
- CO2 = Copely Controls - Standard Resolver
- CT5 = Control Techniques/Emerson - Standard Resolver
- DT2 = Delta Tau Data Systems - Std Resolver
- EL1 = Elmo Motion Control - Std Resolver
- EX4 = Exlar - Standard Resolver
- IF1 = Infranor - Standard Resolver
- IN6 = Indramat/Bosch-Rexroth - Std Resolver
- JT1 = Jetter Technologies - Std Resolver
- KM5 = Kollmorgen/Danaher - Std Resolver
- LZ5 = Lenze/AC Tech - Standard Resolver
- MD1 = Modicon - Standard Resolver
- MG1 = Moog - Standard Resolver
- MX1 = Metronix - Standard Resolver
- MN4 = Momentum - Std resolver
- OR1 = Ormec - Standard Resolver
- PC7 = Parker Compumotor - Std Resolver – European only
- PC0 = Parker Compumotor - Std Resolver – US Only
- PS3 = Pacific Scientific - Standard Resolver
- SM2 = Siemens - Standard Resolver
- SW1 = SEW/Eurodrive - Standard Resolver
- WD1 = Whedco - Standard Resolver

**H = Motor Stacks**

- 1 = 1 stack magnets      2 = 2 stack magnets
- 3 = 3 stack magnets<sup>7</sup>    x = Special

**I = Voltage Rating**

- A = 24 V DC    B = 48 V DC    C = 120 V DC
- 1 = 115 Volt RMS      3 = 230 Volt RMS
- 5 = 400 Volt RMS      6 = 460 Volt RMS
- X = Special voltage rating - not to exceed 460 Vrms

**J = Motor Poles**

- 8 = 8 motor poles

**KK = Motor Speed**

- 24 = 2400 rpm, GSX/M50, GSX60
- 30 = 3000 rpm, GSX/M30, 40
- 01-99 = Rated speed in RPM x 100

**XX .. XX = Options (please list desired options)**

**Travel Options**

- AR = External anti-rotate<sup>2</sup>
- HW = Side handwheel manual drive including Class I Div 2 limit switch
- NI = Non-incendive construction
- PF = Preloaded follower<sup>1</sup>
- RB = Rear electric brake
- RD = Rear manual drive
- SD = Hex side drive

**Housing Options**

- EN = Electroless nickel plating<sup>5</sup>
- FG = Food grade paing<sup>5</sup>
- HC = type III anodizing hard coat<sup>5</sup>
- SS = Stainless steel housing<sup>5,9</sup>
- XH = Special housing option
- XL = Special lubrication (greases only)
- XM = Special motor option
- XT = Special travel options including: protective rod bellows splined main rod<sup>6</sup>

**##### = Part No. Designator for Specials**

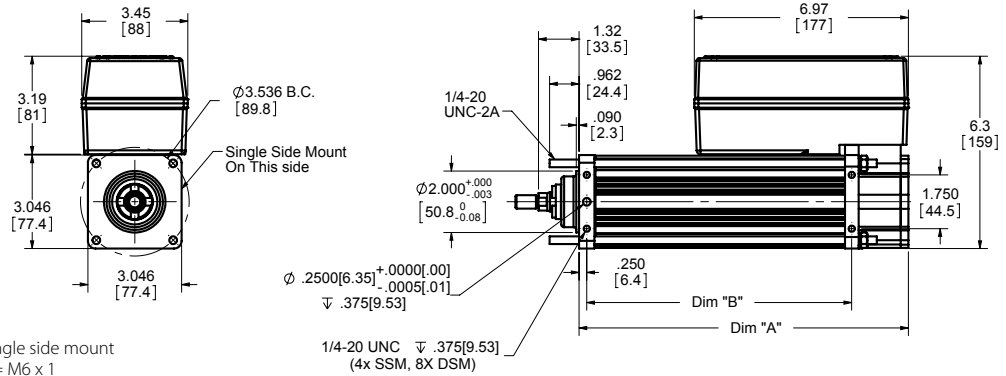
Optional 5 digit assigned part number to designate unique model numbers for specials.

**Notes:**

1. The dynamic load rating of preloaded screws is 63% of the rating of non-preloaded screws. Travel life of preloaded screw is 25% of non-preloaded screw of same size. Preloaded follower is not available with absolute internal feedback option.
2. A second anti-rotate arm is used on GSX30 10 inch and longer stroke; GSX40 12 inch and longer.
3. 0.75 inch (20.32 mm) lead N/A above 12 inch (305 mm) stroke on GSX40.
4. 1.0 inch (25.4 mm) lead N/A above 10 inch (250 mm) stroke on GSX50 or 60.
5. These housing options would typically be accompanied by the choice of the electroless nickel connectors if a connectorized unit were selected. This choice may also indicate the need for special material main rods or mounting.
6. Due to reduced dia of splined main rod on GSX50, the std "A" mail metric rod end is N/A. An "X" should be used in the rod end location of the model mask. If not otherwise specified by customer, an M24X2 male rod end will be used.
7. 3 stack stator not available on 3" stroke.
8. 0.1 inch lead N/A over 10 stroke on GSX50.
9. Force, torque and current ratings are reduced 25% with this option.

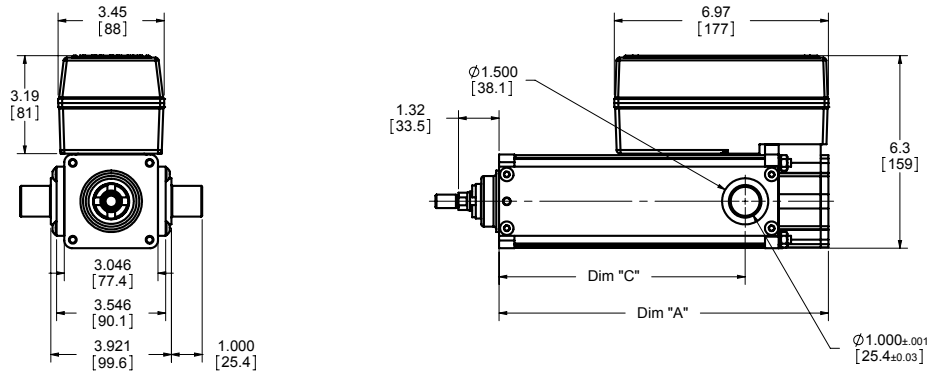
See page 11 for Accessories and page 42 for Cables.

## GSM30 Single, Double Side Mounts or Extended Tie Rod Mount with Class I Div 2 Option



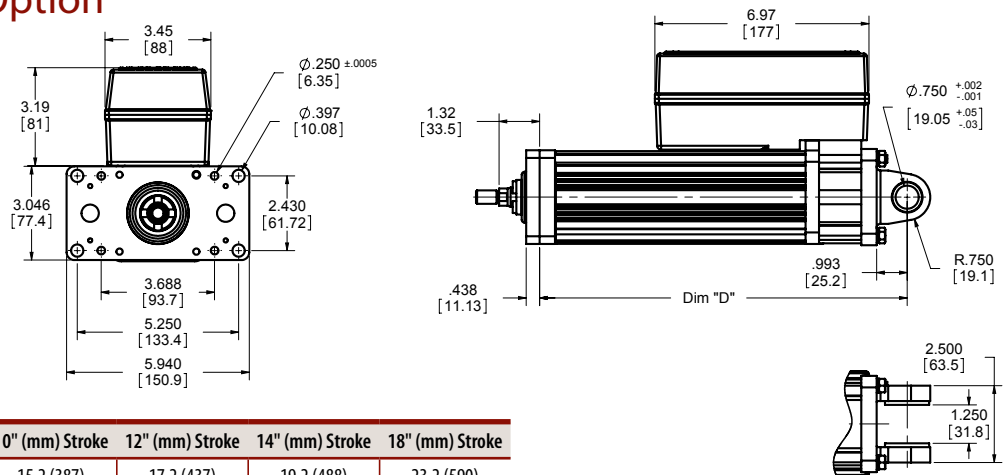
1. Three mounting styles shown
  2. Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M6 x 1  
 \* If "J" or "K" metric side mount options, M6 x 1.0  $\nabla$  9 mm with  $\varnothing$  6 mm M7  $\nabla$  9 mm Dowel Hole

## GSM30 Side Trunnion Mount with Class I Div 2 Option



\* If "Q" metric side trunnion option,  $\varnothing$  25 mm h7

## GSM30 Rear Clevis Mount or Front Flange Mount with Class I Div 2 Option



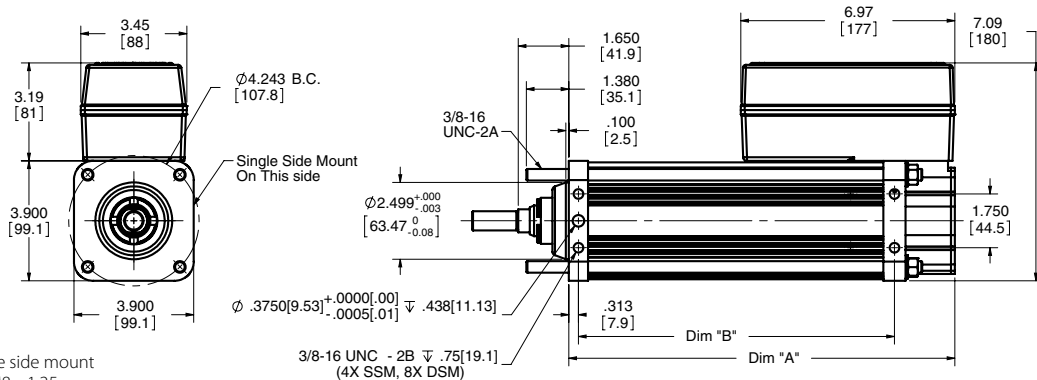
Dim	3" (mm) Stroke	6" (mm) Stroke	10" (mm) Stroke	12" (mm) Stroke	14" (mm) Stroke	18" (mm) Stroke
A	8.2 (209)	10.7 (272)	15.2 (387)	17.2 (437)	19.2 (488)	23.2 (590)
B	6.1 (156)	8.6 (219)	13.1 (333)	15.1 (384)	17.1 (435)	21.1 (536)
C	5.4 (137)	8.0 (203)	10.0 (254)	12.0 (305)	14.0 (356)	18.0 (457)
D	9.5 (241)	12.0 (304)	16.5 (418)	18.5 (469)	20.5 (520)	24.5 (621)

1. Two mounting styles shown
2. With flange mount, dimension A is equivalent to top two drawings

Note: Add 1.6 Inches (40.64 mm) to Dims "A" & "D" if ordering a Brake.

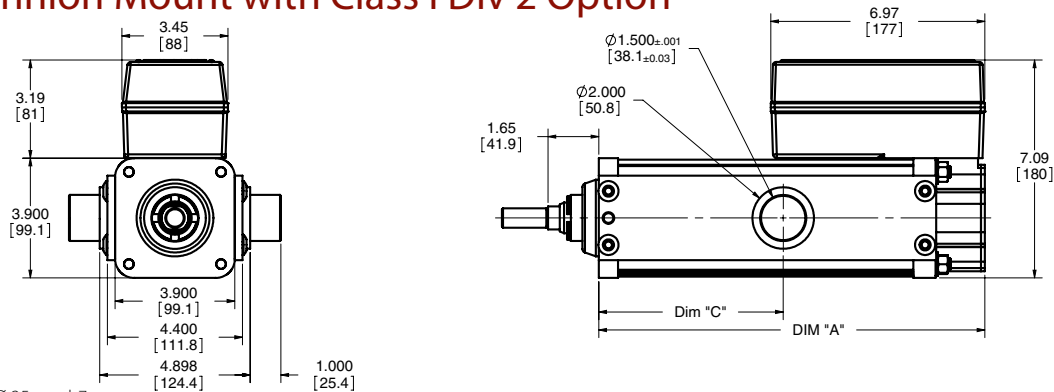
Drawings subject to change. Consult Exlar for certified drawings.

## GSM40 Single, Double Side Mounts or Extended Tie Rod Mount with Class I Div 2 Option



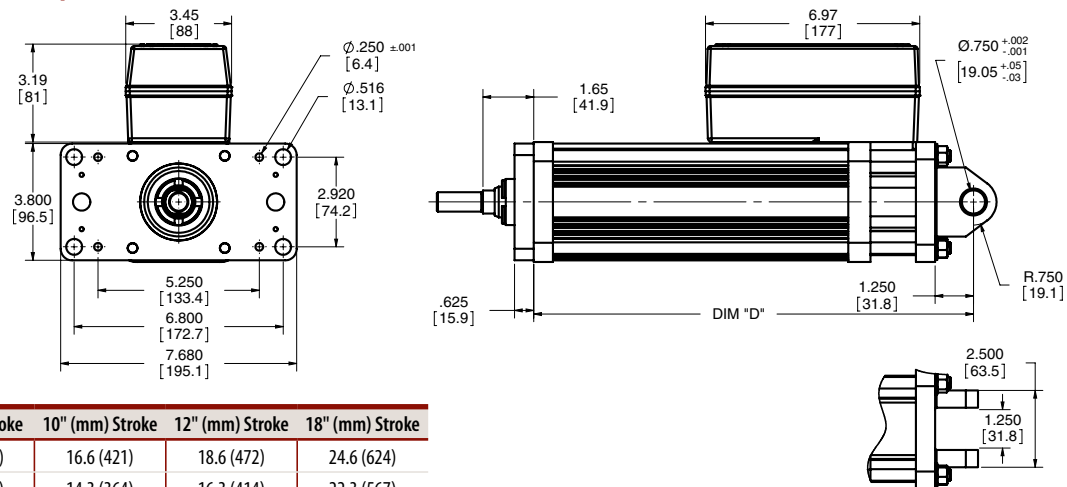
1. Three mounting styles shown
  2. Shown view is standard side for single side mount
- \* If "M" metric tie rod option, thread = M8 x 1.25  
 \* If "J" or "K" metric side mount options, M10 x 1.5  $\nabla$  19 mm with  $\varnothing$  8 mm M7  $\nabla$  12 mm Dowel Hole

## GSM40 Side Trunnion Mount with Class I Div 2 Option



\* If "Q" metric side trunnion option,  $\varnothing$  35 mm h7

## GSM40 Rear Clevis Mount or Front Flange Mount with Class I Div 2 Option



Dim	6" (mm) Stroke	8" (mm) Stroke	10" (mm) Stroke	12" (mm) Stroke	18" (mm) Stroke
A	012.6 (320)	14.6 (370)	16.6 (421)	18.6 (472)	24.6 (624)
B	10.3 (262)	12.3 (313)	14.3 (364)	16.3 (414)	22.3 (567)
C	6.0 (152)	8.0 (203)	10.0 (254)	12.0 (305)	18.0 (457)
D	14.5 (364)	16.3 (415)	18.3 (466)	20.3 (516)	26.3 (669)

1. Two mounting styles shown
2. With flange mount, dimension A is equivalent to top two drawings

Note: Add 2.33 Inches (59.18 mm) to Dims "A & D" if ordering a Brake.

Drawings subject to change. Consult Exlar for certified drawings.

**AA = Actuator Frame Size**

- 30 = 3 inch (75 mm)
- 40 = 4 inch (100 mm)

**BB = Stroke Length**

- 03 = 3 inch (75 mm) GSM30
- 06 = 6 inch (150 mm) all models  
GSM30 = 5.9 inch
- 08 = 0.75 inch (20.32 mm) GSM40
- 10 = 10 inch (250 mm) all models
- 12 = 12 inch (300 mm) all models
- 18 = 18 inch (450 mm) GSM30, 40

**CC = Lead (position change per motor revolution)**

- 01 = 0.1 inch (2.54 mm)
- 02 = 0.2 inch (5.08 mm)
- 03 = 0.25 inch (6.35 mm)
- 05 = 0.5 inch (12.7 mm)
- 08 = 0.75 inch (20.32 mm)<sup>3</sup>
- 10 = 1.0 inch (25.4 mm)
- XX = Special lead

**D = Connections**

- T = Terminal Box with NPT ports

**E = Mounting**

- B = Front and rear flange
- C = Rear clevis
- F = Front flange
- R = Rear flange
- S = Side mount
- D = Double side mount
- T = Side trunnion
- E = Extended tie rods
- J = Metric side mount
- K = Metric double side mount
- Q = Metric side trunnion
- M = Metric extended tie rods
- G = Metric rear clevis
- Z = Clevis mount with same pin to pin as SR Series
- X = Special (please specify)

**F = Rod End**

- M = Male, US std thread
- A = Male, metric thread
- F = Female, US std thread
- B = Female, metric thread
- W = Male, US std thread 17-4 SS
- R = Male metric thread 17-4 SS
- V = Female, US std thread 17-4 SS
- L = Female metric thread 17-4 SS
- X = Special (please specify)

**GGG = Feedback Type (Also specify the Amplifier/ Drive Model being used when ordering) Resolver Only**

Standard Resolver – Size 15, 1024 line (2048 cts) per rev, 2 pole resolver

**Custom Feedback: Please consult application engineering:**

- XX1 = Wiring and feedback device information must be provided and new feedback callout will be created
- AB6 = Allen Bradley/Rockwell - Std Resolver
- AM3 = Advanced Motion Control - Std Resolver
- AP1 = API Controls - Std Resolver
- BD2 = Baldor - Std Resolver - BSM motor wiring w/ M23 connectors for "M" option
- BM2 = Baumuell - Std Resolver
- BR1 = B&R Automation - Std Resolver
- CO2 = Copely Controls - Std Resolver
- CT5 = Control Techniques/Emerson - Std Resolver – FM/UM/EZ motor wiring w/M23 euro connectors for "M" option
- DT2 = Delta Tau Data Systems - Std Resolver
- EL1 = Elmo Motion Control - Std Resolver
- EX4 = Exlar - Std Resolver
- IF1 = Infranor - Std Resolver
- IN6 = Indramat/Bosch-Rexroth-Std Resolver – MKD/MHD motor wiring w/M23 euro connectors for "M" option
- JT1 = Jetter Technologies - Std Resolver – JH/JL motor wiring w/M23 euro connectors for "M" option
- KM5 = Kollmorgen/Danaher - Std Resolver – AKM motor wiring w/M23 euro connectors for "M" option
- LZ5 = Lenze/AC Tech - Std Resolver – MCS motor wiring w/M23 euro connectors for "M" option
- MD1 = Modicon - Std Resolver
- MG1 = Moog - Std Resolver
- MX1 = Metronix - Std Resolver
- MN4 = Momentum - Std resolver
- OR1 = Ormec - Std Resolver
- PC7 = Parker Compumotor - Std Resolver –SMH motor wiring w/M23 connectors for "M" option – European only
- PC0 = Parker Compumotor - Std Resolver – MPP motor wiring w/PS connectors for "M" option – US Only
- PS3 = Pacific Scientific - Std Resolver – PMA motor wiring w/M23 connectors for "M" option

- SM2 = Siemens - Std Resolver – 1FK7 motor wiring w/M23 connectors for "M" option
- SW1 = SEW/Eurodrive - Std Resolver – CM motor wiring w/ M23 euro connectors for "M" option
- WD1 = Whedco - Std Resolver

**H = Motor Stacks**

- 1 = 1 stack magnets
- 2 = 2 stack magnets
- 3 = 3 stack magnets
- x = Special

**I = Voltage Rating**

- A = 24 Volt DC
- B = 48 Volt DC
- C = 120 Volt DC
- 1 = 115 Volt RMS
- 3 = 230 Volt RMS
- 5 = 400 Volt RMS
- 6 = 460 Volt RMS
- X = Special Voltage Rating - Not to exceed 460 Vrms

**J = Motor Poles**

- 8 = 8 Motor Poles

**KK = Motor Speed**

- 24 = 2400 rpm, GSX/M50, GSX60
- 30 = 3000 rpm, GSX/M30, 40
- 01-99 = Rated speed in RPM x 100

**XX .. XX = Options (please list desired options)**

**Travel Options**

- AR = External anti-rotate<sup>4</sup>
- NI = Non-incendive construction
- PF = Preloaded follower<sup>1</sup>
- RB = Rear electric brake
- RD = Rear manual drive
- SD = Hex side drive
- HW = Side handwheel manual drive including Class I Div 2 limit switch

**Housing Options**

- EN = Electroless nickel plating<sup>2</sup>
- HC = type III anodizing hard coat<sup>2</sup>
- XH = Special housing option
- XL = Special lubrication (greases only)
- XM = Special motor option

**##### = Part No. Designator for Specials**

Optional 5 digit assigned part number to designate unique model numbers for specials.

**Notes:**

1. The dynamic load rating of preloaded screws is 63% of the rating of non-preloaded screws. Travel life of preloaded screw is 25% of non-preloaded screw of same size. Preloaded follower is not available with absolute internal feedback option.
2. These housing options would typically be accompanied by the choice of the electroless nickel connectors if a connectorized unit were selected. This choice may also indicate the need for special material main rods or mounting.
3. 0.75 inch (20.32 mm) lead N/A over 12 inch (450 mm) stroke.
4. A second anti-rotate arm is used on GSM30 10 inch and longer stroke; GSM40 12 inch and longer stroke.

## SLM/SLG Linear Actuator with Class I Division 2 Option

The SLM/G rotary motors are available with Class I Division 2 certification for hazardous locations. A hazardous location is defined as a place where concentrations of flammable gases or vapors occur. Electrical equipment that must be installed in these locations is designed and tested to ensure it does not initiate an explosion due to arcing contacts or high surface temperature of equipment.

The SLM/G motors with this option offer the same product performance of the standard product offering as described in the SLM/G section of this catalog. Please see those sections for mechanical specifications.

Class I Division 2 Options include:

- Resolver feedback
- Handwheel


The SLM/G actuators are ideal for operating quarter turn or multi turn valves or shaft driven dampers in hazardous environments. These actuators are directly coupled shaft-to-shaft, eliminating ungainly mechanisms needed by the linear motion of pneumatics. Our compact T-lam servo motors outperform any standard motor, providing excellent continuous modulating service.

### Typical Applications

Chemical Processing  
Fuel Skids  
Oil & Gas Upstream & Downstream  
Power Utilities  
Basic Weight  
Paint Booths



SLM/SLG  
Linear Actuator

 163694  
Class I, Division 2

### Features

T-LAM™ Segmented lamination stator technology

Resolver feedback

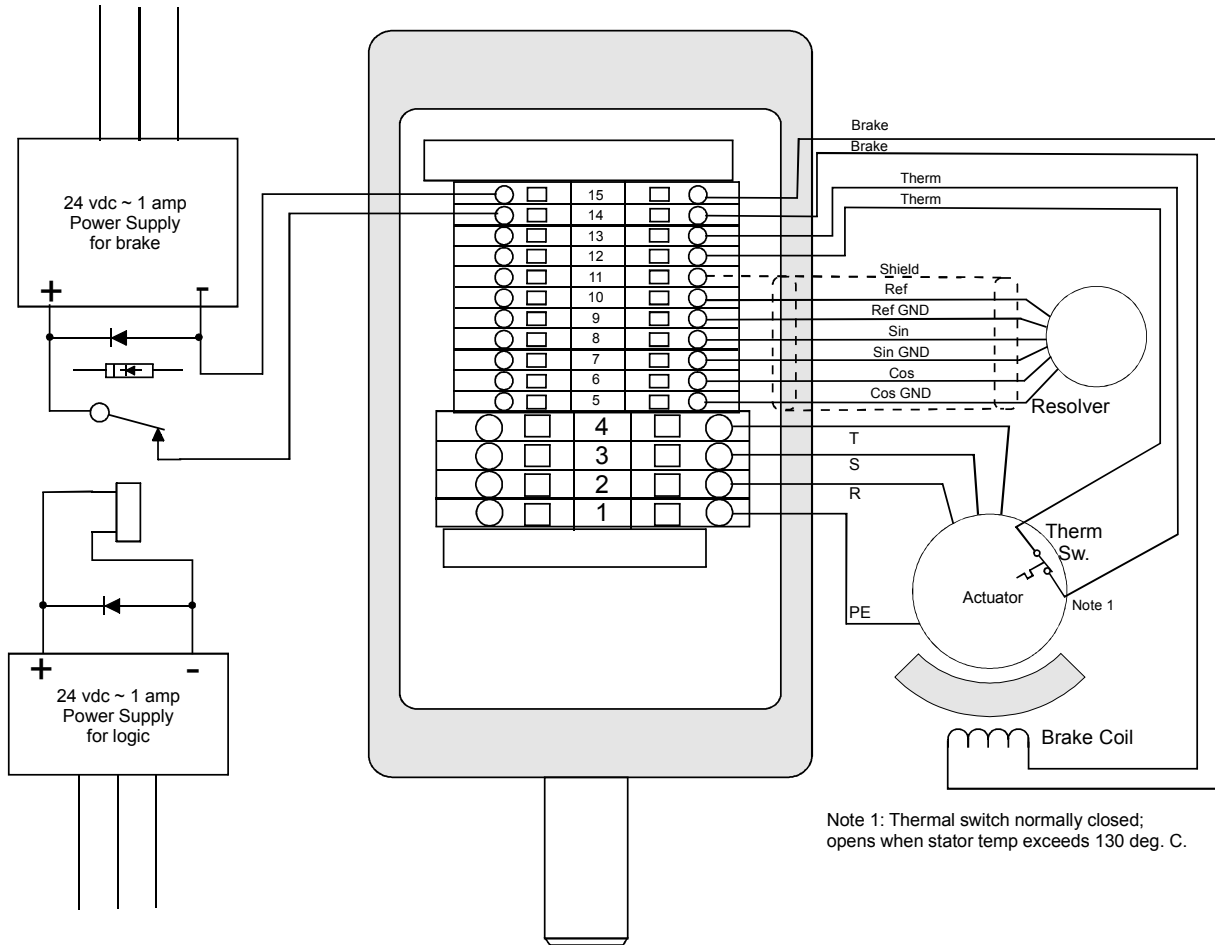
High load bearing design

Integrated armature and sun gear for SLG models

Class I, Div 2 groups A, B, C & D certified

Terminal box with NPT ports

## Terminal Box Wiring Diagram



## Ordering Information

Please use the ordering guide from the SLM and SLG (page 147) sections with two callout selections as described below. The required connections selection is "T" and the required options selection is "NI".

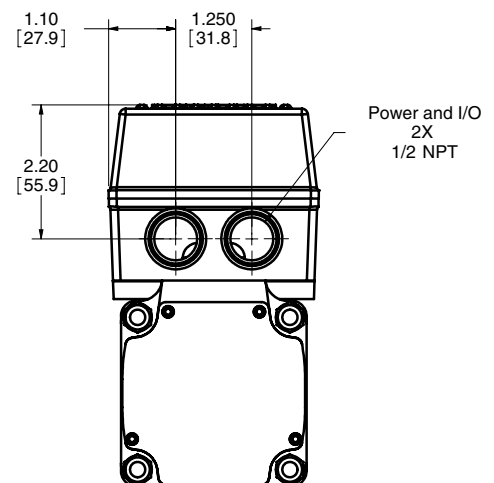
SLM/GAAA - BBB - CDEF - GGG - HHH - II - (XX-#####)

T

NI

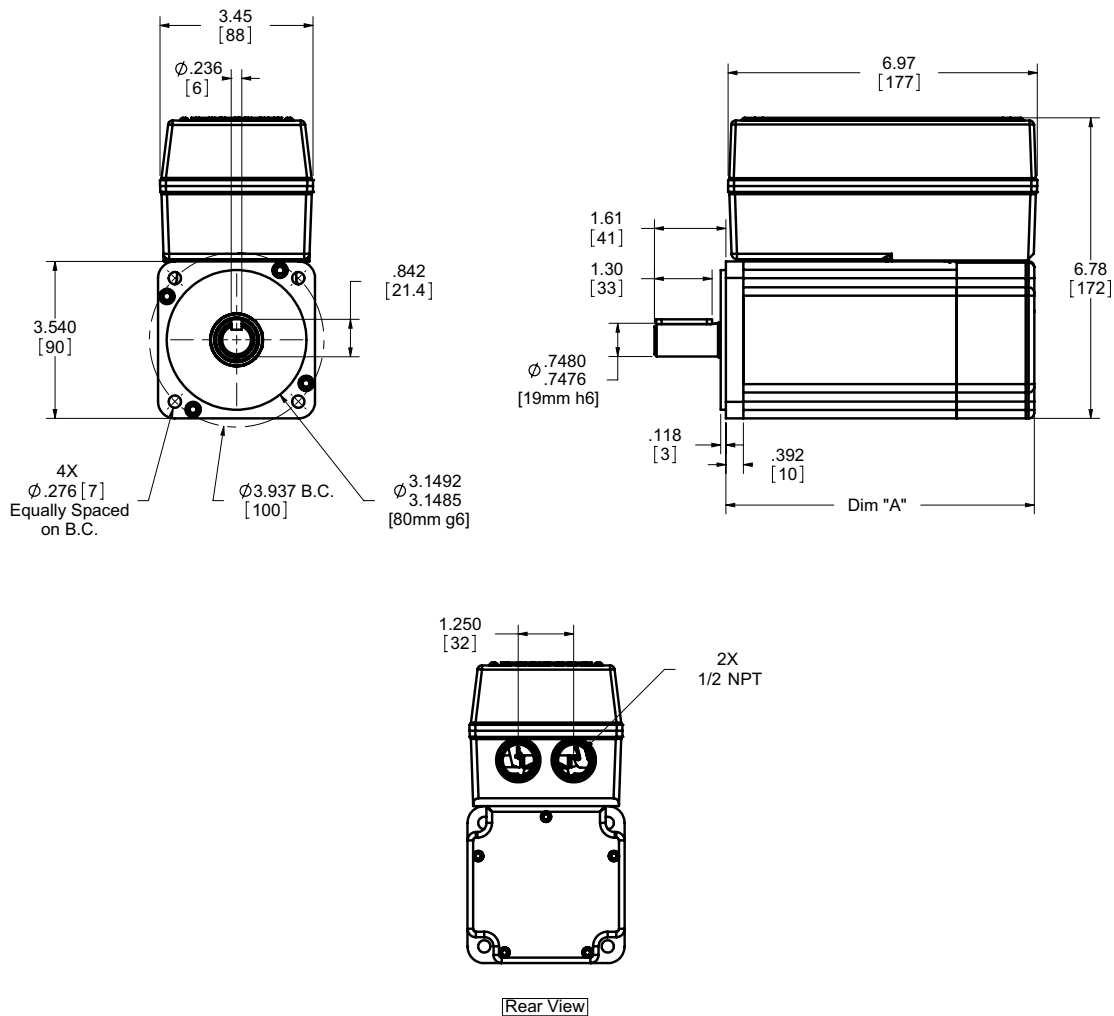
Connections
T = Terminal box with NPT ports
Options
NI = Non-Incendive

## Terminal Box Dimensions



# SLM090 Hazardous Location with Class I Division 2 Option

## SLM090 with Brake and Class I Div 2 Option

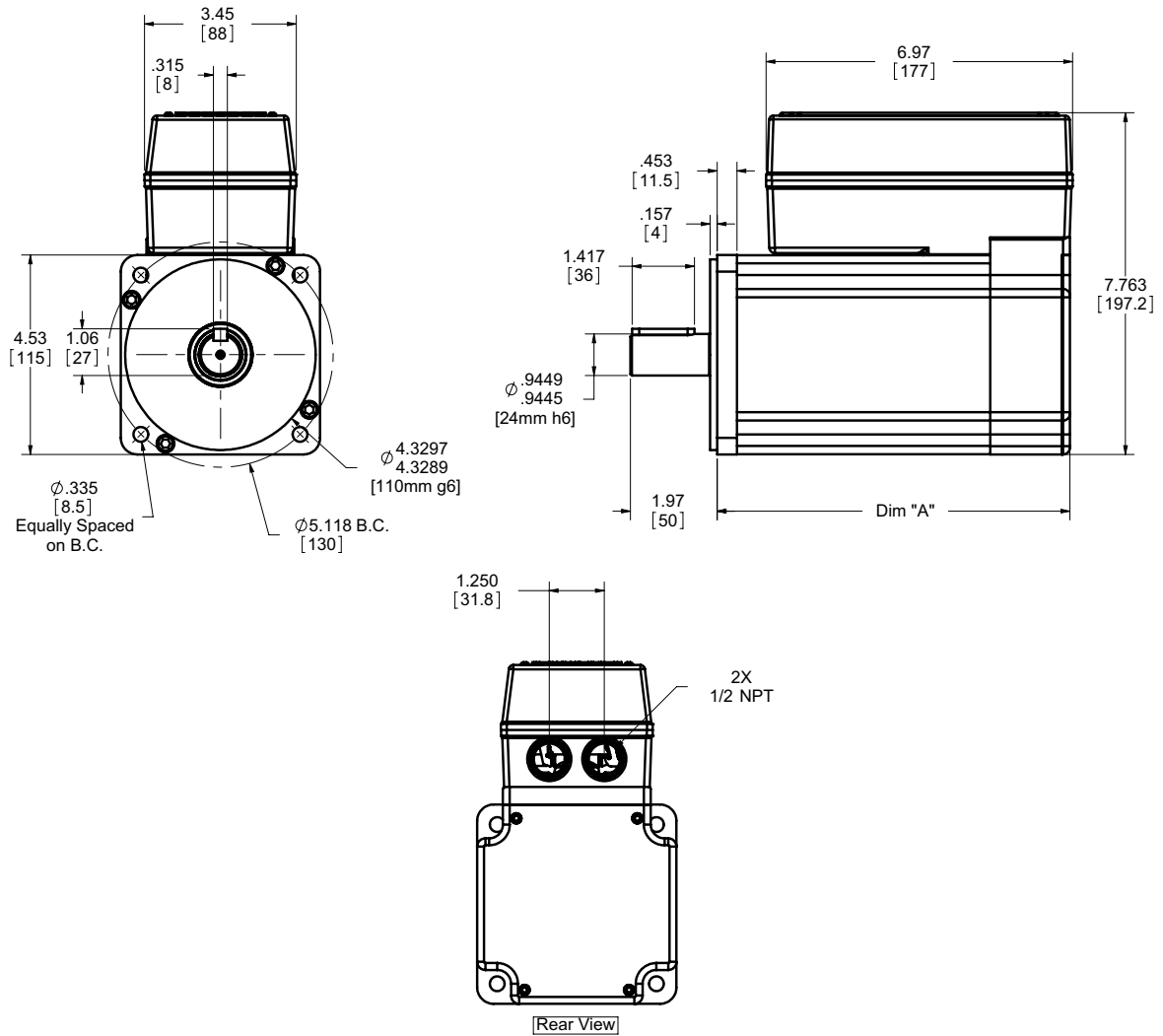


SLM090 Dim. in. (mm)	1 Stack Stator	2 Stack Stator	3 Stack Stator	1 Stack Stator with Brake	2 Stack Stator with Brake	3 Stack Stator with Brake
<b>A</b>	NA	5.65 (144)	6.65 (169)	5.96 (151)	6.96 (177)	7.96 (202)

Face plate edge is not intended for alignment of shaft (use pilot)

Drawings subject to change. Consult Exlar for certified drawings.

## SLM115 with Brake and Class I Div 2 Option



SLM15 Dim in. (mm)	1 Stack Stator	2 Stack Stator	3 Stack Stator	1 Stack Stator with Brake	2 Stack Stator with Brake	3 Stack Stator with Brake
<b>A</b>	6.02 (153)	8.02 (203.7)	10.02 (254.5)	7.75 (196.9)	9.75 (247.7)	11.75 (298.5)

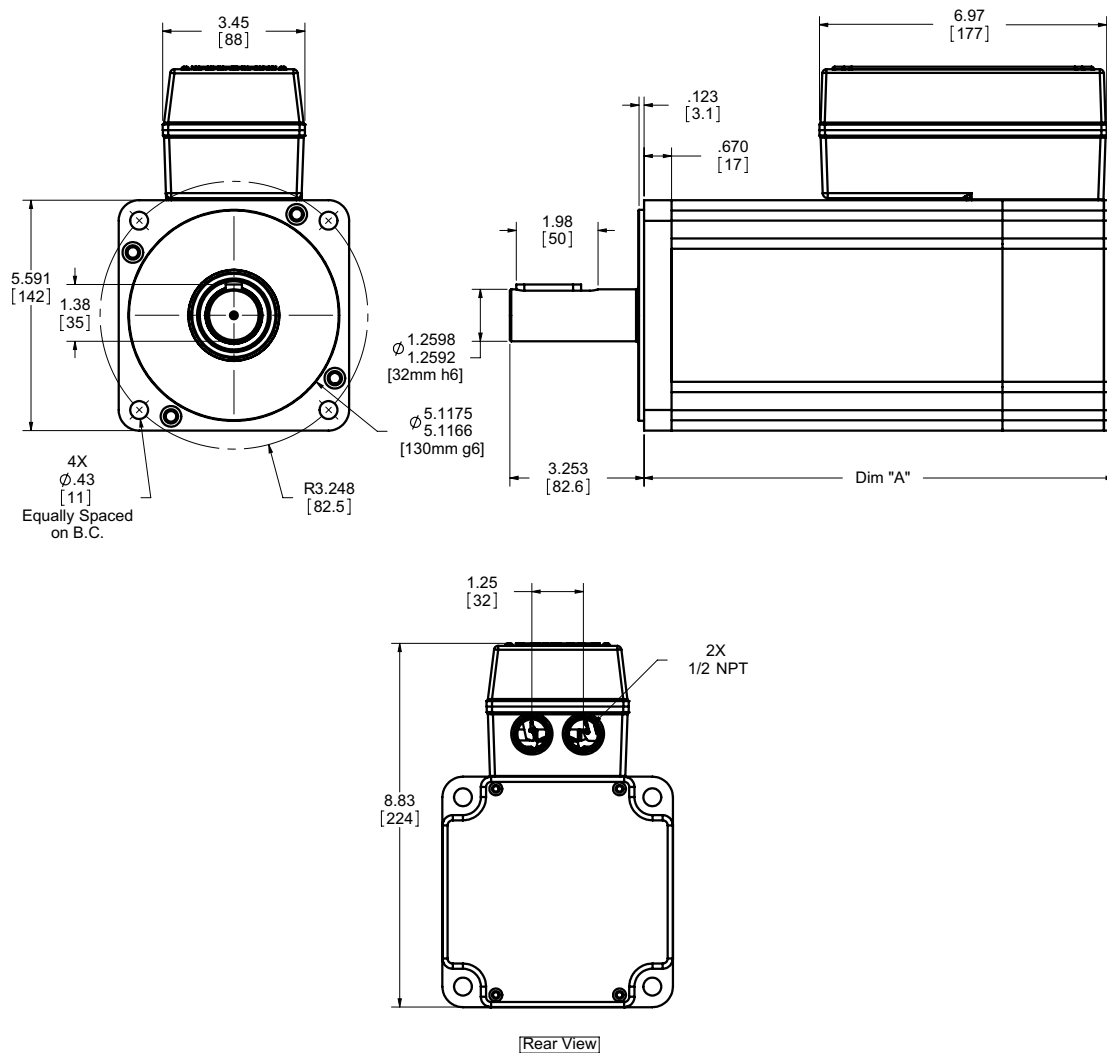
Face plate edge is not intended for alignment of shaft (use pilot)

Drawings subject to change. Consult Exlar for certified drawings.



# SLM142 Hazardous Location with Class I Division 2 Option

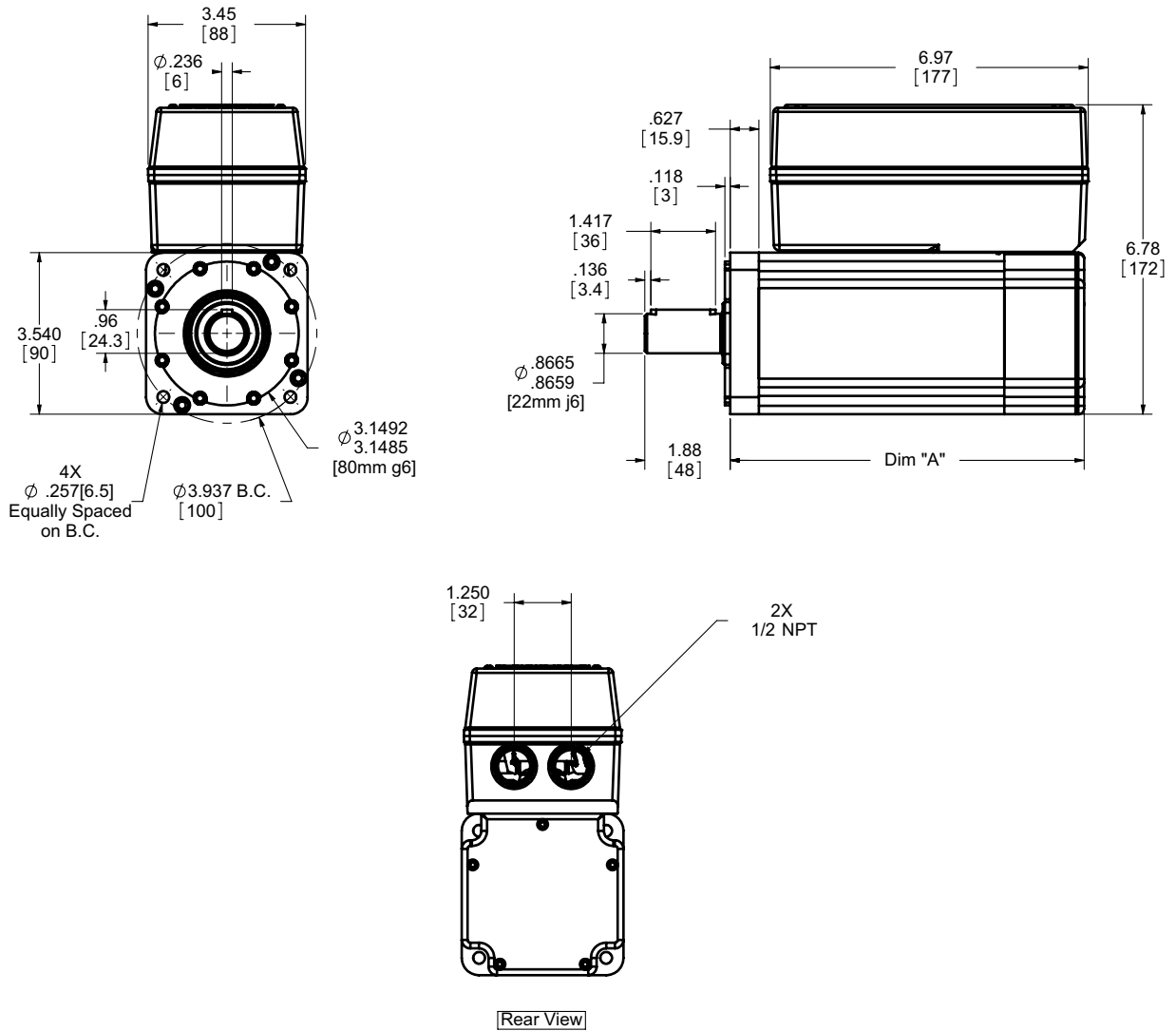
## SLM142 with Brake and Class I Div 2 Option



SLM142 Dim. in. (mm)	1 Stack Stator	2 Stack Stator	3 Stack Stator	1 Stack Stator with Brake	2 Stack Stator with Brake	3 Stack Stator with Brake
<b>A</b>	7.87 (199.8)	9.62 (244.2)	11.37 (288.7)	9.53 (241.9)	11.28 (286.4)	13.03 (330.8)

Face plate edge is not intended for alignment of shaft (use pilot)

## SLG090 with Brake and Class I Div 2 Option

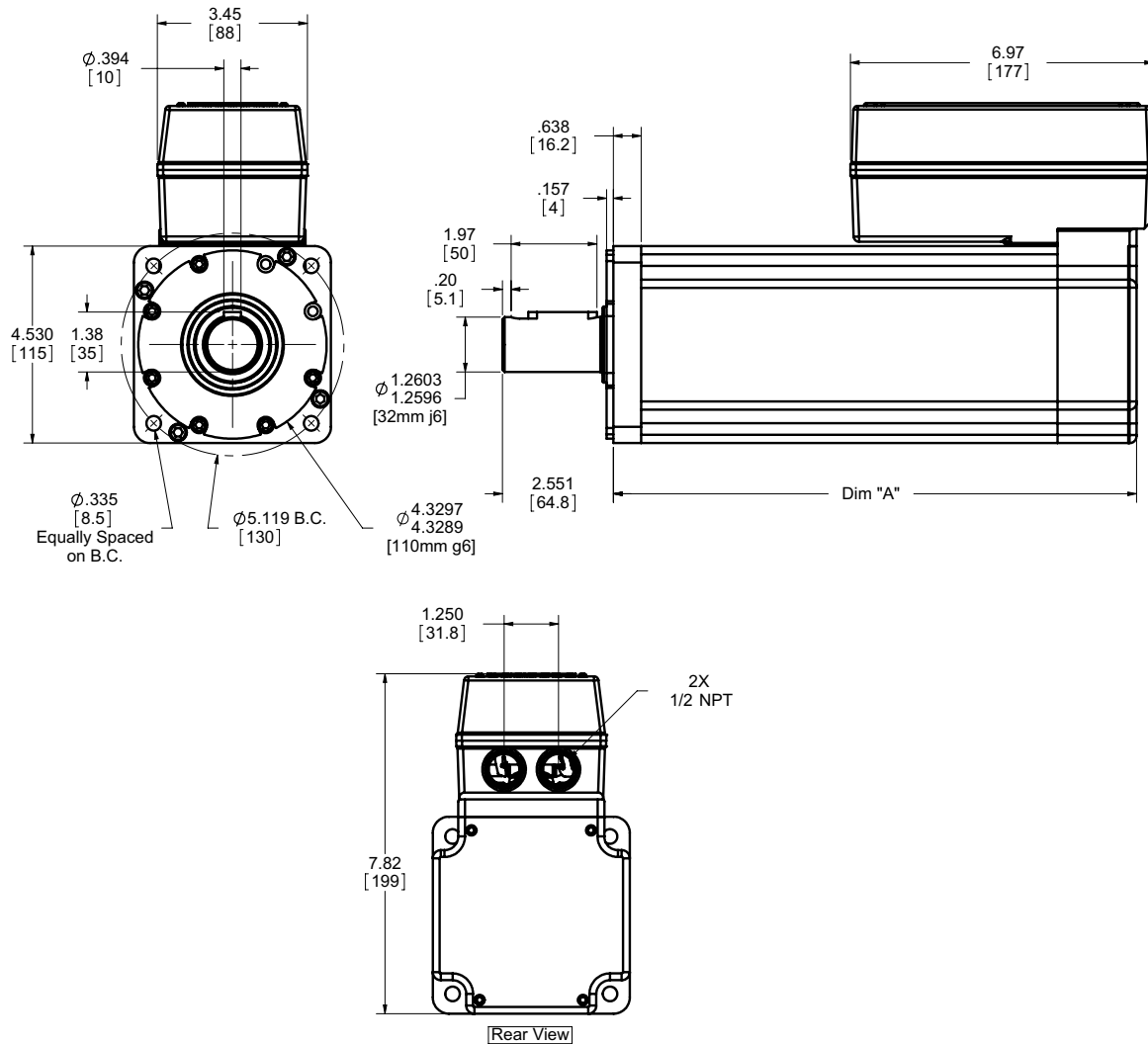


SLG090 Dim. in. (mm)	1 Stack Stator	2 Stack Stator	3 Stack Stator	1 Stack Stator with Brake	2 Stack Stator with Brake	3 Stack Stator with Brake
<b>A</b>						
<b>1 Stage Gearhead</b>	7.76 (197)	8.76 (223)	9.96 (248)	9.07 (230)	10.07 (256)	11.07 (281)
<b>A</b>						
<b>2 Stage Gearhead</b>	9.03 (229)	10.03 (255)	11.03 (280)	10.34 (263)	11.34 (288)	12.34 (313)

Face plate edge is not intended for alignment of shaft (use pilot)

# SLG115 Hazardous Location with Class I Division 2 Option

## SLG115 with Brake and Class I Div 2 Option



SLG115 Dim. in. (mm)	1 Stack Stator	2 Stack Stator	3 Stack Stator	1 Stack Stator with Brake	2 Stack Stator with Brake	3 Stack Stator with Brake
<b>A</b> 1 Stage Gearhead	10.03 (254.8)	12.03 (305.6)	14.03 (356.4)	11.58 (294.2)	13.58 (345)	15.58 (395.8)
<b>A</b> 2 Stage Gearhead	11.64 (295.7)	13.64 (346.5)	15.64 (397.3)	13.19 (335.1)	15.19 (385.9)	17.19 (436.7)

Face plate edge is not intended for alignment of shaft (use pilot)

Drawings subject to change. Consult Exlar for certified drawings.

## SLM/G = Model Series

SLG = SLG Series Servo Gearmotor  
 SLM = SLM Series Servo Motor  
 (no gear reduction)

## AAA = Motor Frame Size

090 = 90 mm  
 115 = 115 mm  
 142 = 142 mm

## BBB = Gear Reduction Ratio

(leave blank for SLM Motor)  
 004 = 4:1 Single Reduction  
 005 = 5:1 Single Reduction  
 010 = 10:1 Single Reduction  
 016 = 16:1 Double Reduction  
 020 = 20:1 Double Reduction  
 025 = 25:1 Double Reduction  
 040 = 40:1 Double Reduction  
 050 = 50:1 Double Reduction  
 100 = 100:1 Double Reduction

## C = Shaft Type

K = Keyed  
 R = Smooth/round  
 X = Special shaft

## D = Connections

T = Terminal box with NPT ports

## E = Coating Options (1)

G = Anodized aluminum  
 E = Electroless nickel plated  
 F = Food grade white  
 X = Special coating

## F = Brake Options

B = Brake  
 S = Standard no brake

## GGG = Feedback Type (Also specify the Amplifier/Drive Model being used when ordering) Resolver Only.

Standard Resolver – Size 15, 1024 line  
 (2048 cts) per rev, 2 pole resolver

## Custom Feedback: Please consult application engineering:

XX1 = Wiring and feedback device information must be provided and new feedback callout will be created  
 AB6 = Allen BradleyRockwell - Std Resolver  
 AM3 = Advancec Motion Control - Std Resolver  
 AP1 = API Controls - Std Resolver  
 BD2 = Baldor - Std Resolver - BSM motor wiring w/M23 connectors for "M" option  
 BM2 = Baumuller - Std Resolver  
 BR1 = B&R Automation - Std Resolver  
 CO2 = Copely Controls - Std Resolver  
 CT5 = Control Techniques/Emerson - Standard Resolver – FM/UM/EZ motor wiring w/M23 euro connectors for "M" option  
 DT2 = Delta Tau Data Systems - Std Resolver  
 EL1 = Elmo Motion Control - Std Resolver  
 EX4 = Exlar - Std Resolver  
 IF1 = Infranor - Std Resolver  
 IN6 = Indramat/Bosch-Rexroth - Std Resolver – MKD/MHD motor wiring w/M23 Euro connectors for "M" option  
 JT1 = Jetter Technologies - Std Resolver – JH/JL motor wiring w/M23 euro connectors for "M" option  
 KM5 = Kollmorgen/Danaher - Std Resolver – AKM motor wiring w/M23 euro connectors for "M" option  
 LZ5 = Lenze/AC Tech - Std Resolver – MCS motor wiring w/ M23 euro connectors connectors for "M" option  
 MD1 = Modicon - Std Resolver  
 MG1 = Moog - Std Resolver  
 MX1 = Metronix - Std Resolver  
 MN4 = Momentum - Standard resolver - MN motor wiring w/M23 connectors for "M" option  
 OR1 = Ormec - Std Resolver  
 PC7 = Parker Compumotor - Std Resolver – SMH motor wiring w/M23 connectors for "M" option – European only  
 PC0 = Parker Compumotor - Std Resolver – MPP motor wiring w/PS connectors for "M" option – US Only  
 PS3 = Pacific Scientific - Std Resolver – PMA motor wiring w/M23 connectors for "M" option  
 SM2 = Siemens - Std Resolver – 1FK7 motor wiring w/M23 connectors for "M" option  
 SW1 = SEW/Eurodrive - Std Resolver – CM motor wiring w/ M23 euro connectors for "M" option  
 WD1 = Whedco - Std Resolver

## H = Motor Stacks

1 = 1 stack magnets  
 2 = 2 stack magnets<sup>2</sup>  
 3 = 3 stack magnets<sup>2</sup>  
 x = Special

## I = Voltage Rating

A = 24 Volt DC  
 B = 48 Volt DC  
 C = 120 Volt DC  
 1 = 115 Volt RMS<sup>2</sup>  
 3 = 230 Volt RMS  
 5 = 400 Volt RMS  
 6 = 460 Volt RMS  
 X = Special voltage rating – not to exceed 460 Vrms

## J = Motor Poles

8 = 8 motor poles

## KK = Motor Speed

24 = 2400 rpm, SLM142  
 30 = 3000 rpm, SLM/G115  
 40 = 4000 rpm, SLM/G090  
 50 = 5000 rpm, SLM/G060  
 01-99 Special speed, consult Exlar

## XX .. XX = Options

(please list desired options)

## Travel Options

AR = External anti-rotate  
 NI = Non-incendive construction  
 PF = Preloaded follower  
 RB = Rear electric brake  
 HW = Side handwheel manual drive including Class I Div 2 limit switch  
 RD = Rear manual drive  
 SD = Hex side drive

## Housing Options

EN = Electroless nickel plating  
 HC = Type III anodizing hard coat  
 XH = Special housing option  
 XL = Special lubrication  
 XM = Special motor option

### Notes:

- These housing options would typically be accompanied by the choice of the electroless nickel connectors if a connectorized unit were selected. This choice may also indicate the need for special material main rods or mounting.
- 115 Vrms is not available on a 2 or 3 stack SLM/G, or a 3 stack SLM/G090.

## Sizing and Selection of Exlar Linear and Rotary Actuators

### Move Profiles

The first step in analyzing a motion control application and selecting an actuator is to determine the required move profile. This move profile is based on the distance to be traveled and the amount of time available in which to make that move. The calculations below can help you determine your move profile.

Each motion device will have a maximum speed that it can achieve for each specific load capacity. This maximum speed will determine which type of motion profile can be used to complete the move. Two common types of move profiles are trapezoidal and triangular. If the average velocity of the profile, is less than half the max. velocity of the actuator, then triangular profiles can be used. Triangular Profiles result in the lowest possible acceleration and deceleration. Otherwise a trapezoidal profile can be used. The trapezoidal profile below with 3 equal divisions will result in 25% lower maximum speed and 12.5% higher acceleration and deceleration. This is commonly called a 1/3 trapezoidal profile.

The following pages give the required formulas that allow you to select the proper Exlar linear or rotary actuator for your application.

The first calculation explanation is for determining the required thrust in a linear application. The second provides the necessary equations for determining the torque required from a linear or rotary application. For rotary applications this includes the use of reductions through belts or gears, and for linear applications, through screws.

Pages are included to allow you to enter your data and easily perform the required calculations. You can also describe your application graphically and fax it to Exlar for sizing. Reference tables for common unit conversions and motion system constants are included at the end of the section.

### Linear Move Profile Calculations

$V_{max}$  = max. velocity-in/sec (m/sec)

$V_{avg}$  = avg. velocity-in/sec (m/sec)

$t_{acc}$  = acceleration time (sec)

$t_{dec}$  = deceleration time (sec)

$t_{cv}$  = constant velocity (sec)

$t_{total}$  = total move time (sec)

$acc$  = accel-in/sec<sup>2</sup> (m/sec<sup>2</sup>)

$dec$  = decel-in/sec<sup>2</sup> (m/sec<sup>2</sup>)

$cv$  = constant vel.-in/sec (m/sec)

$D$  = total move distance-in (m)  
or revolutions (rotary)

### Standard Equations

$V_{avg} = D / t_{total}$

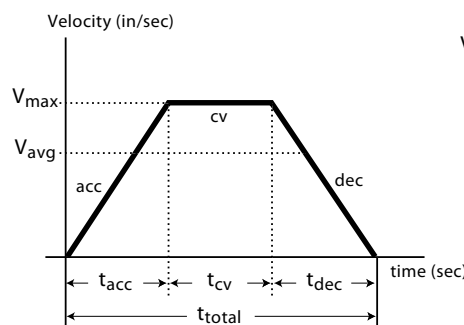
If  $t_{acc} = t_{dec}$  Then:  $V_{max} = (t_{total} / (t_{total} - t_{acc})) (V_{avg})$

and

$D = \text{Area under profile curve}$

$D = (1/2)(t_{acc} + t_{dec}) + t_{cv} (V_{max})$

### Trapezoidal Move Profile



### Trapezoidal Equations

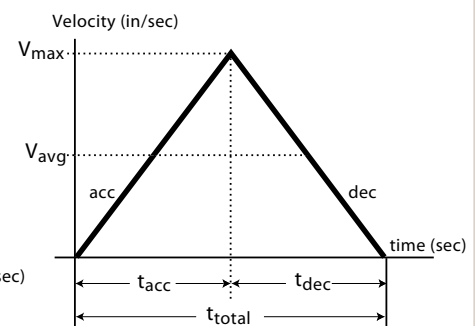
If  $t_{acc} = t_{cv} = t_{dec}$  Then:

$V_{max} = 1.5 (V_{avg})$

$D = (2/3) (t_{total}) (V_{max})$

$acc = dec = \frac{V_{max}}{t_{acc}}$

### Triangular Move Profile



### Triangular Equations

If  $t_{acc} = t_{total}/2$  Then:

$V_{max} = 2.0 (V_{avg})$

$D = (1/2) (t_{total}) (V_{max})$

$acc = dec = \frac{V_{max}}{t_{acc}}$

## Terms and (units)

- THRUST** = Total linear force-lbf (N)  
 $\theta$  = Angle of inclination (deg)  
**Ffriction** = Force from friction-lbf (N)  
**tacc** = Acceleration time (sec)  
**Facc** = Acceleration force-lbf (N)  
**v** = Change in velocity-in/sec (m/s)  
**Fgravity** = Force due to gravity-lbf (N)  
 $\mu$  = Coefficient of sliding friction  
**Fapplied** = Applied forces-lbf (N)  
 (refer to table on page 136 for different materials)  
**WL** = Weight of Load-lbm (kg)  
 $g = 386.4$ : Acceleration of gravity - in/sec<sup>2</sup> (9.8 m/sec<sup>2</sup>)

## Thrust Calculation Equations

$$\text{THRUST} = \text{Ffriction} + [\text{Facceleration}] + \text{Fgravity} + \text{Fapplied}$$

$$\text{THRUST} = \text{WL}\mu\cos\theta + [(\text{WL}/386.4)(\text{v}/\text{tacc})] + \text{WL}\sin\theta + \text{Fapplied}$$

**Sample Calculations:** Calculate the thrust required to accelerate a 200 pound mass to 8 inches per second in an acceleration time of 0.2 seconds. Calculate this thrust at inclination angles( $\theta$ ) of 0°, 90° and 30°. Assume that there is a 25 pound spring force that is applied against the acceleration.

$$\text{WL} = 200 \text{ lbf}, \text{v} = 8.0 \text{ in/sec}, \text{ta} = 0.2 \text{ sec}, \text{Fapp.} = 25 \text{ lbf}, \mu = 0.15$$

$$\theta = 0^\circ$$

$$\begin{aligned} \text{THRUST} &= \text{WL}\mu\cos\theta + [(\text{WL}/386.4)(\text{v}/\text{tacc})] + \text{WL}\sin\theta + \text{Fapplied} \\ &= (200)(0.15)(1) + [(200/386.4)(8.0/0.2)] + (200)(0) + 25 \\ &= 30 \text{ lbs} + 20.73 \text{ lbs} + 0 \text{ lbs} + 25 \text{ lbs} = \mathbf{75.73 \text{ lbs force}} \end{aligned}$$

$$\theta = 90^\circ$$

$$\begin{aligned} \text{THRUST} &= \text{WL}\mu\cos\theta + [(\text{WL}/386.4)(\text{v}/\text{tacc})] + \text{WL}\sin\theta + \text{Fapplied} \\ &= (200)(0.15)(0) + [(200/386.4)(8.0/0.2)] + (200)(1) + 25 \\ &= 0 \text{ lbs} + 20.73 \text{ lbs} + 200 \text{ lbs} + 25 \text{ lbs} = \mathbf{245.73 \text{ lbs force}} \end{aligned}$$

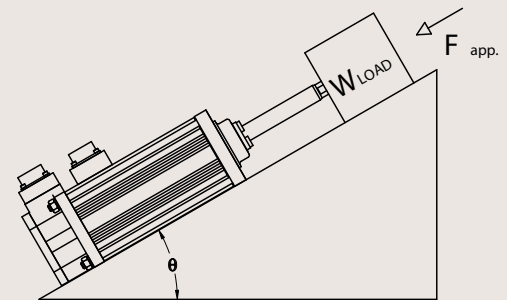
$$\theta = 30^\circ$$

$$\begin{aligned} \text{THRUST} &= \text{WL}\mu\cos\theta + [(\text{WL}/386.4)(\text{v}/\text{tacc})] + \text{WL}\sin\theta + \text{Fapplied} \\ &= (200)(0.15)(0.866) + [(200/386.4)(8.0/0.2)] + (200)(0.5) + 25 \\ &= 26 \text{ lbs} + 20.73 \text{ lbs} + 100 + 25 = \mathbf{171.73 \text{ lbs force}} \end{aligned}$$

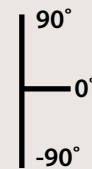
## Thrust Calculations

### Definition of thrust:

The thrust necessary to perform a specific move profile is equal to the sum of four components of force. These are the force due to acceleration of the mass, gravity, friction and applied forces such as cutting and pressing forces and overcoming spring forces.



## Angle of Inclination



Note: at  $\theta = 0^\circ$   
 $\cos\theta = 1$ ;  $\sin\theta = 0$   
 at  $\theta = 90^\circ$   
 $\cos\theta = 0$ ;  $\sin\theta = 1$

It is necessary to calculate the required thrust for an application during each portion of the move profile, and determine the worst case criteria. The linear actuator should then be selected based on those values. The calculations at the right show calculations during acceleration which is often the most demanding segment of a profile.

## Motor Torque Calculations

When selecting an actuator system it is necessary to determine the required motor torque to perform the given application. These calculations can then be compared to the torque ratings of the given amplifier and motor combination that will be used to control the actuator's velocity and position.

When the system uses a separate motor and screw, like the FT actuator, the ratings for that motor and amplifier are consulted. In the case of the GSX Series actuators with their integral brushless motors, the required torque divided by the torque constant of the motor ( $K_t$ ) must be less than the current rating of the GSX or SLM motor.

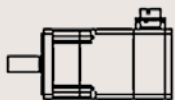
Inertia values and torque ratings can be found in the GSX, FT and SLM/SLG Series product specifications.

For the GSX Series the screw and motor inertia are combined.

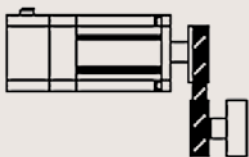
### Motor with screw (GSX, GSM & FT)



### Motor & motor with reducer (SLM/SLG)



### Motor with belt and pulley



## Terms and (units)

$\lambda$	=	Required motor torque, lbf-in (N-m)
$\lambda_a$	=	Required motor acceleration torque, lbf-in (N-m)
<b>F</b>	=	Applied force load, non inertial, lbf (N)
<b>S</b>	=	Screw lead, in (mm)
<b>R</b>	=	Belt or reducer ratio
<b>T<sub>L</sub></b>	=	Torque at driven load lbf-in (N-m)
<b>v<sub>L</sub></b>	=	Linear velocity of load in/sec (m/sec)
$\omega_L$	=	Angular velocity of load rad/sec
$\omega_m$	=	Angular velocity of motor rad/sec
$\eta$	=	Screw or ratio efficiency ( $\approx 85\%$ for roller screws)
<b>g</b>	=	Gravitational constant, 386.4 in/s <sup>2</sup> (9.75 m/s <sup>2</sup> )
$\alpha$	=	Angular acceleration of motor, rad/s <sup>2</sup>
<b>m</b>	=	Mass of the applied load, lb (N)
<b>J<sub>L</sub></b>	=	Reflected Inertia due to load, lbf-in-s <sup>2</sup> (N-m-s <sup>2</sup> )
<b>J<sub>r</sub></b>	=	Reflected Inertia due to ratio, lbf-in-s <sup>2</sup> (N-m-s <sup>2</sup> )
<b>J<sub>s</sub></b>	=	Reflected Inertia due to external screw, lbf-in-s <sup>2</sup> (N-m-s <sup>2</sup> )
<b>J<sub>m</sub></b>	=	Motor armature inertia, lbf-in-s <sup>2</sup> (N-m-s <sup>2</sup> )
<b>L</b>	=	Length of screw, in (m)
$\rho$	=	Density of screw material, lb/in <sup>3</sup> (kg/m <sup>3</sup> )
<b>r</b>	=	Radius of screw, in (m)
$\pi$	=	pi (3.14159)
<b>C</b>	=	Dynamic load rating, lbf (N)

## Velocity Equations

Screw drive:  $V_L = m \cdot S / 2\pi$  in/sec (m/sec)

Belt or gear drive:  $\omega_m = \omega_L \cdot R$  rad/sec

## Torque Equations

### Torque Under Load

Screw drive (GSX, FT or separate screw):  $\lambda = \frac{S \cdot F}{2 \cdot \pi \cdot \eta}$  lbf-in (N-m)

Belt and Pulley drive:  $\lambda = T_L / R \eta$  lbf-in (N-m)

Gear or gear reducer drive:  $\lambda = T_L / R \eta$  lbf-in (N-m)

### Torque Under Acceleration

$\lambda_a = (J_m + J_R + (J_s + J_L) / R^2) \alpha$  lbf-in

$\alpha = \text{angular acceleration} = ((\text{RPM} / 60) \times 2\pi) / t_{\text{acc}}$ , rad/sec<sup>2</sup>.

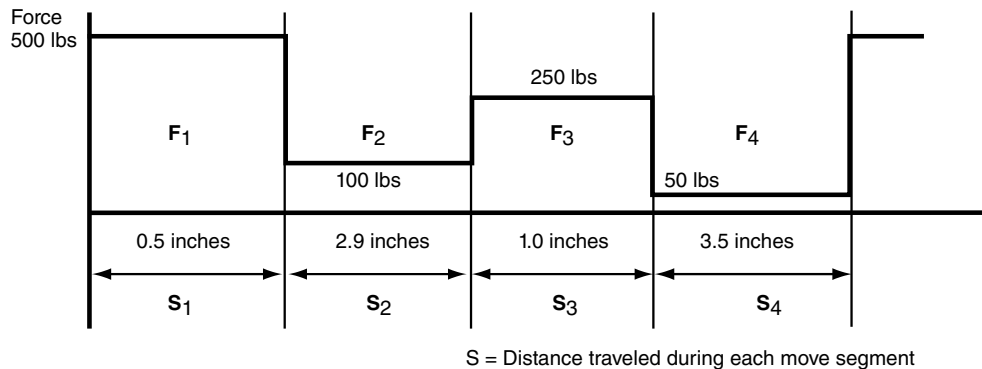
$J_s = \frac{\pi \cdot L \cdot \rho \cdot r^4}{2 \cdot g}$  lb-in-s<sup>2</sup> (N-m-s<sup>2</sup>)

### Total Torque per move segment

$\lambda_T = \lambda_a + \lambda$  lbf-in (N-m)

## Mean Load Calculations

For accurate lifetime calculations of a roller screw in a linear application, the cubic mean load should be used. Following is a graph showing the values for force and distance as well as the calculation for cubic mean load. Forces are shown for example purposes. Negative forces are shown as positive for calculation.



Cubic Mean Load Equation

$$\sqrt[3]{\frac{F_1^3 S_1 + F_2^3 S_2 + F_3^3 S_3 + F_4^3 S_4}{S_1 + S_2 + S_3 + S_4}}$$

Value from example numbers is 217 lbs.

## Lifetime Calculations

The expected  $L_{10}$  life of a roller screw is expressed as the linear travel distance that 90% of the screws are expected to meet or exceed before experiencing metal fatigue. The mathematical formula that defines this value is below. *The life is in millions of inches (mm)*. This standard  $L_{10}$  life calculation is what is expected of 90% of roller screws manufactured and is not a guarantee. Travel life estimate is based on a properly maintained screw that is free of contaminants and properly lubricated. Higher than 90% requires de-rating according to the following factors:

95% x 0.62	96% x 0.53
97% x 0.44	98% x 0.33
99% x 0.21	

Note: The dynamic load rating of zero backlash, preloaded screws is 63% of the dynamic load rating of the standard non-preloaded screws. The calculated travel life of a preloaded screw will be 25% of the calculated travel life of the same size and lead of a non-preloaded screw for the same application.

**Single (non-preloaded) nut:**

$$L_{10} = \left(\frac{C}{F}\right)^3 \times S$$

**Preloaded (split) nut:**

$$L_{10} = (L_{10(1)}^{-10/9} + L_{10(2)}^{-10/9})^{-9/10}$$

**where:**

$L_{10}$  = Travel life in millions of inches (mm)

$L_{10(1)}$  = Expected life in the extend direction, as determined by the single nut lifetime equation

$L_{10(2)}$  = Expected life in the retract direction, as determined by the single nut lifetime equation



## Total Thrust Calculations

### Terms and (units)

**THRUST** = Total linear force-lbf (N)  
**F<sub>friction</sub>** = Force from friction-lbf (N)  
**F<sub>acc</sub>** = Acceleration force-lbf (N)  
**F<sub>gravity</sub>** = Force due to gravity-lbf (N)  
**F<sub>applied</sub>** = Applied forces-lbf (N)  
 386.4 = Acceleration of gravity - in/sec<sup>2</sup> (9.8 m/sec<sup>2</sup>)

### Variables

$\emptyset$  = Angle of inclination - deg..... = \_\_\_\_\_  
**t<sub>acc</sub>** = Acceleration time - sec..... = \_\_\_\_\_  
**v** = Change in velocity - in/sec (m/s)..... = \_\_\_\_\_  
 $\mu$  = Coefficient of sliding friction..... = \_\_\_\_\_  
**W<sub>L</sub>** = Weight of Load-lbm (kg) ..... = \_\_\_\_\_  
**F<sub>applied</sub>** = Applied forces-lbf (N) ..... = \_\_\_\_\_

## Thrust Calculation Equations

$$\text{THRUST} = [ F_{\text{friction}} ] + [ F_{\text{acceleration}} ] + F_{\text{gravity}} + F_{\text{applied}}$$

$$\text{THRUST} = [ W_L \times \mu \times \cos \emptyset ] + [ (W_L / 386.4) \times (v / t_{\text{acc}}) ] + W_L \sin \emptyset + F_{\text{applied}}$$

$$\text{THRUST} = [ ( ) \times ( ) \times ( ) ] + [ ( / 386.4) \times ( / ) ] + [ ( ) ( ) ] + ( )$$

$$\text{THRUST} = [ ] + [ ( ) \times ( ) ] + [ ] + ( )$$

= \_\_\_\_\_ lbf.

Calculate the thrust for each segment of the move profile. Use those values in calculations below. Use the units from the above definitions.

## Cubic Mean Load Calculations

$$\sqrt[3]{F_1^3 S_1 + F_2^3 S_2 + F_3^3 S_3 + F_4^3 S_4}$$

$$S_1 + S_2 + S_3 + S_4$$

F<sub>1</sub>= \_\_\_\_\_ S<sub>1</sub>= \_\_\_\_\_ F<sub>1</sub><sup>3</sup> t<sub>1</sub>= \_\_\_\_\_

F<sub>2</sub>= \_\_\_\_\_ S<sub>2</sub>= \_\_\_\_\_ F<sub>2</sub><sup>3</sup> t<sub>2</sub>= \_\_\_\_\_

F<sub>3</sub>= \_\_\_\_\_ S<sub>3</sub>= \_\_\_\_\_ F<sub>3</sub><sup>3</sup> t<sub>3</sub>= \_\_\_\_\_

F<sub>4</sub>= \_\_\_\_\_ S<sub>4</sub>= \_\_\_\_\_ F<sub>4</sub><sup>3</sup> t<sub>4</sub>= \_\_\_\_\_

Move Profiles may have more or less than four components. Adjust your calculations accordingly.

## Torque Calculations

### Terms and (units)

$\lambda$	= Torque, lb-in (N-m).....	= -----
<b>F</b>	= Applied Load, non inertial, lbf (N).....	= -----
<b>S</b>	= Screw lead, in (m).....	= -----
$\eta$	= Screw or ratio efficiency (~85% for roller screws).....	= -----
<b>g</b>	= Gravitational constant, 386 in/s <sup>2</sup> (9.8 m/s <sup>2</sup> ).....	= -----
$\alpha$	= Acceleration of motor, rad/s <sup>2</sup> .....	= -----
<b>R</b>	= Belt or reducer ratio.....	= -----
<b>T<sub>L</sub></b>	= Torque at driven load, lbf-in (N-m).....	= -----
<b>V<sub>L</sub></b>	= Linear velocity of load, in/sec (m/sec).....	= -----
$\omega_L$	= Angular velocity of load, rad/sec.....	= -----
$\omega_m$	= Angular velocity of motor, rad/sec.....	= -----
<b>m</b>	= Mass of the applied load, lbm (kg).....	= -----
<b>J<sub>R</sub></b>	= Reflected Inertia due to ratio, lb-in-s <sup>2</sup> (N-m-s <sup>2</sup> ).....	= -----
<b>J<sub>S</sub></b>	= Reflected Inertia due to screw, lb-in-s <sup>2</sup> (N-m-s <sup>2</sup> ).....	= -----
<b>J<sub>L</sub></b>	= Reflected Inertia due to load, lb-in-s <sup>2</sup> (N-m-s <sup>2</sup> ).....	= -----
<b>J<sub>M</sub></b>	= Motor armature inertia, lb-in-s <sup>2</sup> (N-m-s <sup>2</sup> ).....	= -----
$\pi$	= pi (3.14159).....	= 3.14159
<b>K<sub>t</sub></b>	= Motor Torque constant, lb-in/amp (N-m/amp).....	= -----

\* For the GS Series **J<sub>S</sub>** and **J<sub>M</sub>** are one value from the GS Specifications.

### Torque Equations

#### Torque From Calculated Thrust.

$$\lambda = \frac{SF}{2 \cdot \pi \cdot \eta} \text{ lb-in (N-m)} = ( \quad ) \times ( \quad ) / 2\pi (0.85) = ( \quad ) \times ( \quad ) / 5.34 = \text{-----}$$

#### Torque Due To Load, Rotary.

Belt and pulley drive:  $\lambda = T_L / R \eta$  lbf-in (N-m)

Gear or gear reducer drive:  $\lambda = T_L / R\eta$  lbf-in (N-m)

#### Torque During Acceleration due to screw, motor, load and reduction, linear or rotary.

$$I = (J_m + (J_S + J_L) / R^2) \alpha \text{ lb-in (N-m)} = [ ( \quad ) + ( \quad + \quad ) / ( \quad ) ] ( \quad ) = \text{-----}$$

**Total Torque** = Torque from calculated Thrust + Torque due to motor, screw and load

$$( \quad ) + ( \quad ) + ( \quad ) = \text{-----}$$

**Motor Current** =  $\lambda / K_t = ( \quad ) / ( \quad ) = \text{-----}$

## Exlar Application Worksheet

FAX to:  
**Exlar Corporation**  
(952) 368-4877  
Attn: Applications Engineering

Date: \_\_\_\_\_ Company Name: \_\_\_\_\_

Address: \_\_\_\_\_

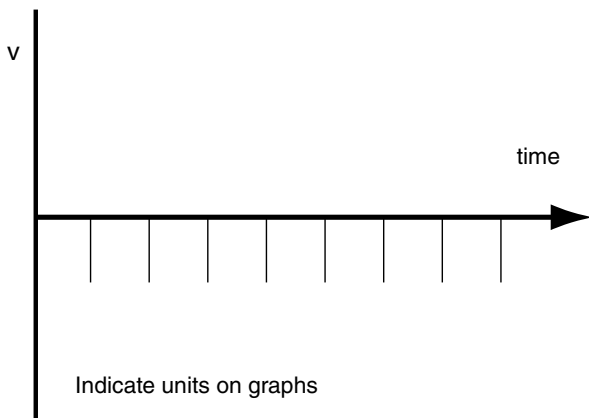
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

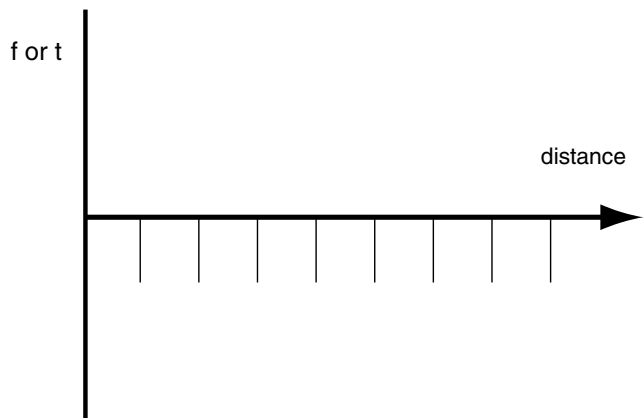
Contact: \_\_\_\_\_ Title: \_\_\_\_\_

## Sketch/Describe Application

Velocity vs. Time



Force or Torque vs. Distance



Exlar Application Worksheet

Date: \_\_\_\_\_ Contact: \_\_\_\_\_ Company: \_\_\_\_\_

Stroke & Speed Requirements

Maximum Stroke Needed \_\_\_\_\_ inches (mm), revs
Index Stroke Length \_\_\_\_\_ inches (mm), revs
Index Time \_\_\_\_\_ sec
Max Speed Requirements \_\_\_\_\_ in/sec (mm/sec), revs/sec
Min Speed Requirements \_\_\_\_\_ in/sec (mm/sec), revs/sec
Required Positional Accuracy \_\_\_\_\_ inches (mm), arc min

Load & Life Requirements

Gravitational Load \_\_\_\_\_ lb (N)
External Applied Load \_\_\_\_\_ lbf (N)
Inertial Load \_\_\_\_\_ lbf (N)
Friction Load \_\_\_\_\_ lbf (N)
Rotary Inertial Load \_\_\_\_\_ lbf-in-sec^2 (Kg-m^2)
or rotary mass, radius of gyr. \_\_\_\_\_ lb (kg) \_\_\_\_\_ in (mm)
Side Load (rot. or lin. actuator) \_\_\_\_\_ lb (N)

Force Direction \_\_\_\_\_ Extend \_\_\_\_\_ Retract \_\_\_\_\_ Both
Actuator Orientation \_\_\_\_\_ Vertical Up \_\_\_\_\_ Vertical Down \_\_\_\_\_ Horizontal
\_\_\_\_\_ Fixed Angle \_\_\_\_\_ Degrees from Horizontal
\_\_\_\_\_ Changing Angle \_\_\_\_\_ to \_\_\_\_\_

Cycling Rate \_\_\_\_\_ Cycles/min/hr/day
Operating Hours per Day \_\_\_\_\_ Hours
Life Requirement \_\_\_\_\_ Cycles/hr/inches/mm

Configuration

Mounting: \_\_\_\_\_ Side \_\_\_\_\_ Flange \_\_\_\_\_ Ext Tie Rod \_\_\_\_\_ Clevis \_\_\_\_\_ Trunnion
Rod End: \_\_\_\_\_ Male \_\_\_\_\_ Female \_\_\_\_\_ Sph Rod Eye \_\_\_\_\_ Rod Eye \_\_\_\_\_ Clevis
Rod Rotation Limiting: \_\_\_\_\_ Appl Inherent \_\_\_\_\_ External Required
Holding Brake Required: \_\_\_\_\_ Yes \_\_\_\_\_ No
Cable Length: \_\_\_\_\_ ft (m)

## Rotary Inertia

To obtain a conversion from A to B, multiply by the value in the table.

B	Kg-m <sup>2</sup>	Kg-cm <sup>2</sup>	g-cm <sup>2</sup>	kgf-m-s <sup>2</sup>	kgf-cm-s <sup>2</sup>	gf-cm-s <sup>2</sup>	oz-in <sup>2</sup>	ozf-in-s <sup>2</sup>	lb-in <sup>2</sup>	lbf-in-s <sup>2</sup>	lb-ft <sup>2</sup>	lbf-ft-s <sup>2</sup>
A												
Kg-m <sup>2</sup>	1	10 <sup>4</sup>	10 <sup>7</sup>	0.10192	10.1972	1.01972x10 <sup>4</sup>	5.46745x10 <sup>4</sup>	1.41612x10 <sup>2</sup>	3.41716x10 <sup>3</sup>	8.850732	23.73025	0.73756
Kg-cm <sup>2</sup>	10 <sup>-4</sup>	1	10 <sup>3</sup>	1.01972x10 <sup>3</sup>	1.01972x10 <sup>3</sup>	1.01972	5.46745	1.41612x10 <sup>-2</sup>	0.341716	8.85073x10 <sup>-4</sup>	2.37303x10 <sup>-3</sup>	7.37561x10 <sup>-5</sup>
g-cm <sup>2</sup>	10 <sup>-7</sup>	10 <sup>-3</sup>	1	1.01972x10 <sup>-8</sup>	1.01972x10 <sup>-6</sup>	1.01972x10 <sup>-3</sup>	5.46745x10 <sup>-3</sup>	1.41612x10 <sup>-5</sup>	3.41716x10 <sup>-4</sup>	8.85073x10 <sup>-7</sup>	2.37303x10 <sup>-6</sup>	7.37561x10 <sup>-8</sup>
kgf-m-s <sup>2</sup>	9.80665	9.80665x10 <sup>4</sup>	9.80665x10 <sup>7</sup>	1	10 <sup>2</sup>	10 <sup>5</sup>	5.36174x10 <sup>5</sup>	1.388674x10 <sup>3</sup>	3.35109x10 <sup>4</sup>	86.79606	2.32714x10 <sup>2</sup>	7.23300
kgf-cm-s <sup>2</sup>	9.80665x10 <sup>-2</sup>	9.80665x10 <sup>2</sup>	9.80665x10 <sup>5</sup>	10 <sup>-2</sup>	1	10 <sup>5</sup>	5.36174x10 <sup>3</sup>	13.8874	3.35109x10 <sup>-2</sup>	0.86796	2.32714	7.23300x10 <sup>-2</sup>
gf-cm-s <sup>2</sup>	9.80665x10 <sup>-5</sup>	0.980665	9.80665x10 <sup>2</sup>	10 <sup>-5</sup>	10 <sup>-3</sup>	1	5.36174	1.38874 x10 <sup>-2</sup>	0.335109	8.67961x10 <sup>-4</sup>	2.32714x10 <sup>-3</sup>	7.23300x10 <sup>-5</sup>
oz-in <sup>2</sup>	1.82901x10 <sup>-5</sup>	0.182901	1.82901x10 <sup>2</sup>	1.86505x10 <sup>-6</sup>	1.86505x10 <sup>-4</sup>	0.186506	1	2.59008 x10 <sup>-3</sup>	6.25 x10 <sup>-2</sup>	1.61880x10 <sup>-4</sup>	4.34028x10 <sup>-4</sup>	1.34900x10 <sup>-3</sup>
oz-in-s <sup>2</sup>	7.06154x10 <sup>-3</sup>	70.6154	7.06154x10 <sup>4</sup>	7.20077x10 <sup>4</sup>	7.20077x10 <sup>-2</sup>	72.0077	3.86089x10 <sup>2</sup>	1	24.13045	6.25 x10 <sup>-2</sup>	0.167573	5.20833x10 <sup>-4</sup>
lb-in <sup>2</sup>	2.92641x10 <sup>-4</sup>	2.92641	2.92641x10 <sup>3</sup>	2.98411x10 <sup>3</sup>	2.98411x10 <sup>3</sup>	2.98411	16	4.14414 x10 <sup>2</sup>	1	2.59008x10 <sup>3</sup>	6.94444x10 <sup>-3</sup>	2.15840x10 <sup>-4</sup>
lbf-in-s <sup>2</sup>	0.112985	1.129x10 <sup>3</sup>	1.12985x10 <sup>6</sup>	1.15213x10 <sup>3</sup>	1.15213	1.51213 x10 <sup>3</sup>	6.1774 x10 <sup>3</sup>	16	3.86088x10 <sup>2</sup>	1	2681175	8.3333x10 <sup>-2</sup>
lbf-ft <sup>2</sup>	4.21403x10 <sup>-2</sup>	4.21403x10 <sup>2</sup>	4.21403x10 <sup>5</sup>	4.29711x10 <sup>3</sup>	0.429711	4.297114	2.304 x10 <sup>3</sup>	5.96755	144	0.372971	1	3.10809x10 <sup>-2</sup>
lbf-ft-s <sup>2</sup>	1.35583	1.35582x10 <sup>4</sup>	1.35582x10 <sup>7</sup>	0.138255	13.82551	1.38255x10 <sup>4</sup>	7.41289x10 <sup>4</sup>	192	4.63306x10 <sup>3</sup>	12	32.17400	1

## Torque

To obtain a conversion from A to B, multiply A by the value in the table.

B	N-m	N-cm	dyn-cm	Kg-m	Kg-cm	g-cm	oz-in	ft-lb	in-lb
A									
N-m	1	10 <sup>-2</sup>	10 <sup>7</sup>	0.109716	10.19716	1.019716 x10 <sup>4</sup>	141.6199	0.737562	8.85074
N-cm	102	1	10 <sup>5</sup>	1.019716 x10 <sup>3</sup>	0.1019716	1.019716 x10 <sup>2</sup>	1.41612	7.37562 x10 <sup>-3</sup>	8.85074 x10 <sup>-2</sup>
dyn-cm	10 <sup>-7</sup>	10 <sup>-5</sup>	1	1.019716 x10 <sup>-8</sup>	1.019716 x10 <sup>-6</sup>	1.019716 x10 <sup>-3</sup>	1.41612 x10 <sup>-5</sup>	7.2562 x10 <sup>-8</sup>	8.85074 x10 <sup>-7</sup>
Kg-m	9.80665	980665x10 <sup>2</sup>	9.80665 x10 <sup>7</sup>	1	10 <sup>2</sup>	10 <sup>5</sup>	1.38874 x10 <sup>3</sup>	7.23301	86.79624
Kg-cm	9.80665x10 <sup>-2</sup>	9.80665	9.80665 x10 <sup>5</sup>	10 <sup>-2</sup>	1	10 <sup>3</sup>	13.8874	7.23301 x10 <sup>-2</sup>	0.86792
g-cm	9.80665x10 <sup>-5</sup>	9.80665x10 <sup>-3</sup>	9.80665 x10 <sup>2</sup>	10 <sup>-5</sup>	10 <sup>-3</sup>	1	1.38874 x10 <sup>-2</sup>	7.23301 x10 <sup>-5</sup>	8.679624 x10 <sup>-4</sup>
oz-in	7.06155x10 <sup>-3</sup>	0.706155	7.06155 x10 <sup>4</sup>	7.20077 x10 <sup>-4</sup>	7.20077 x10 <sup>-2</sup>	72,077	1	5.20833 x10 <sup>-3</sup>	6.250 x10 <sup>-2</sup>
ft-lb	1.35582	1.35582x10 <sup>2</sup>	1.35582 x10 <sup>7</sup>	0.1382548	13.82548	1.382548 x10 <sup>4</sup>	192	1	12
in-lb	0.113	11.2985	1.12985 x10 <sup>6</sup>	1.15212 x10 <sup>-2</sup>	1.15212	1.15212 x10 <sup>3</sup>	16	8.33333 x10 <sup>-2</sup>	1

## Common Material Densities

Material	oz/in <sup>3</sup>	gm/cm <sup>3</sup>
Aluminum (cast or hard drawn)	1.54	2.66
Brass (cast or rolled)	4.80	8.30
Bronze (cast)	4.72	8.17
Copper (cast or hard drawn)	5.15	8.91
Plastic	0.64	1.11
Steel (hot or cold rolled)	4.48	7.75
Wood (hard)	0.46	0.80
Wood (soft)	0.28	0.58

## Coefficients of Sliding Friction

Materials in contact	μ
Steel on Steel (dry)	0.58
Steel on Steel (lubricated)	0.15
Aluminum on Steel	0.45
Copper on Steel	0.36
Brass on Steel	0.44
Plastic on Steel	0.20
Linear Bearings	0.001

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