

## ER Series Rotary Motor and Gearmotor

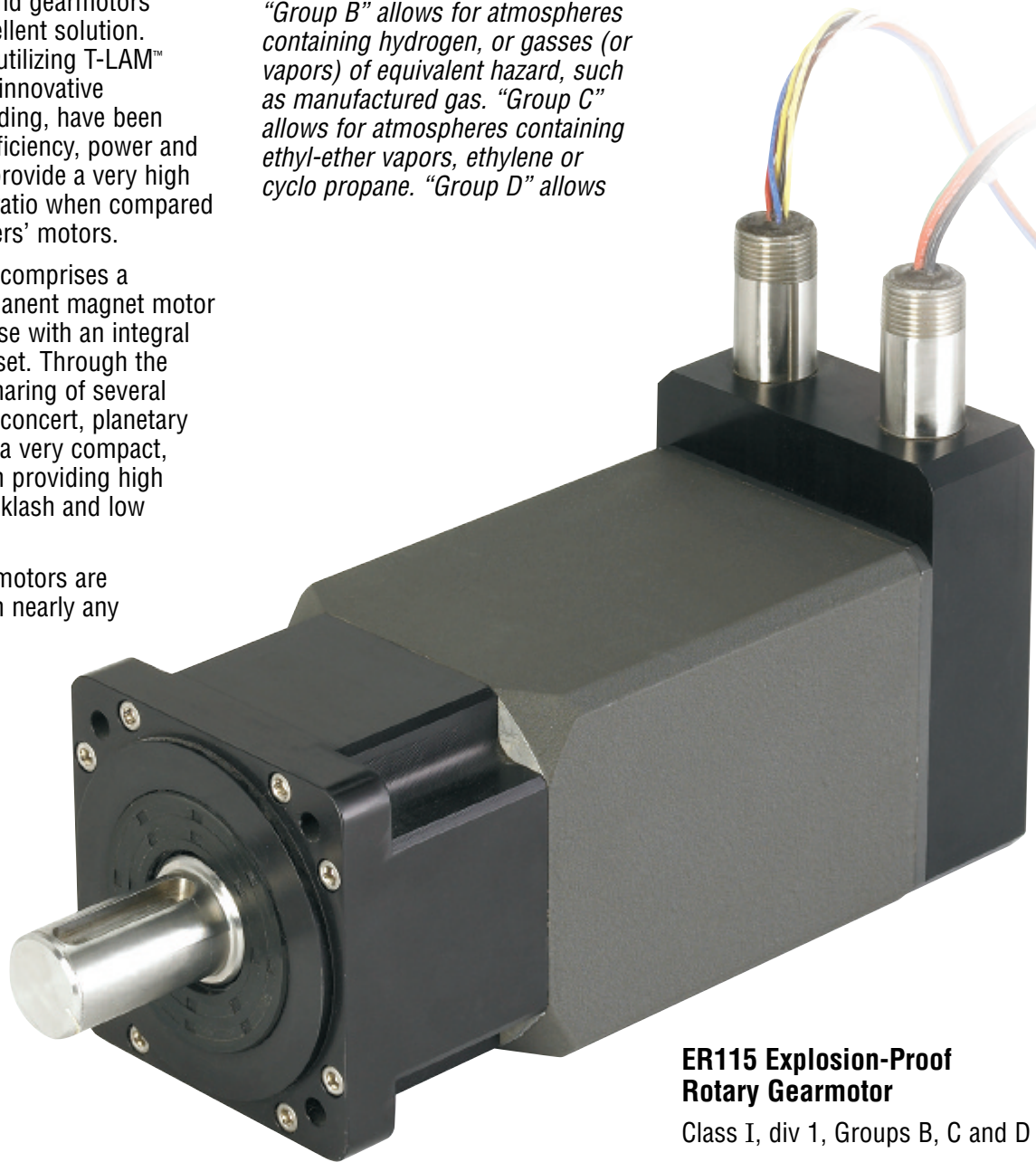
For hazardous duty environments with constant exposure to flammable gasses or vapors\* Exlar's ER Series rotary explosion-proof motors and gearmotors provide an excellent solution. Exlar's motors utilizing T-LAM™ technology, an innovative segmented winding, have been designed for efficiency, power and 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 EL SERIES EXPLOSION-PROOF MOTORS ARE WELL-SUITED TO MANY APPLICATIONS SUCH AS:**

Turbine fuel flow

Printing presses

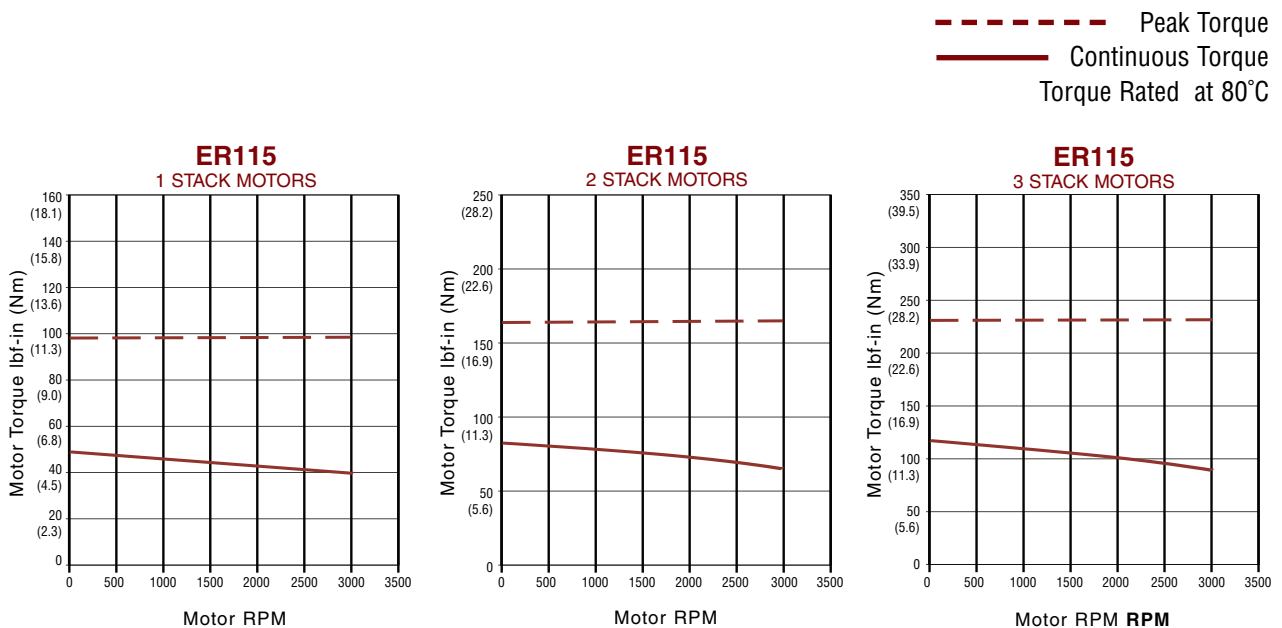
Engine test stands

Fuel distribution systems

Chemical process plants

Shipbound fuel management

## ER Speed/Torque Curves



## ER115 Electrical/Mechanical Specifications

ER115 Motor Stator Data—T4 Ratings		1A8	1B8	118	138	158	168	2A8	2B8	238	258	268	338	358	368	
<b>Sinusoidal Commutation Data</b>																
Continuous Motor Torque**	lbf-in	49.7	49.7	50.5	50.5	50.6	50.5	83.3	83.3	84.0	82.5	84.0	117.3	117.6	120.4	
(+/- 10% @ 80°C)	(N-m)	(5.61)	(5.61)	(5.70)	(5.70)	(5.72)	(5.70)	(9.41)	(9.41)	(9.49)	(9.32)	(9.49)	(13.25)	(13.29)	(13.60)	
Peak Motor Torque	lbf-in	99.3	99.3	101.0	101.0	101.2	100.9	166.6	166.6	168.0	165.0	168.0	234.6	235.3	240.8	
(+/- 10% @ 80°C)	(N-m)	(11.22)	(11.22)	(11.41)	(11.41)	(11.44)	(11.40)	(18.82)	(18.82)	(18.98)	(18.64)	(18.98)	(26.50)	(26.58)	(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)	N-m/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	
Cont. 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	47.4	47.4	48.2	48.2	48.3	48.2	79.5	79.5	80.2	78.8	80.2	112.0	112.3	115.0	
(+/- 10% @ 80°C)	(N-m)	(5.36)	(5.36)	(5.45)	(5.45)	(5.46)	(5.45)	(8.99)	(8.99)	(9.06)	(8.90)	(9.06)	(12.66)	(12.69)	(12.99)	
Peak Motor Torque	lbf-in	94.8	94.8	96.4	96.4	96.7	96.4	159.1	159.1	160.4	157.6	160.4	224.0	224.7	230.0	
(+/- 10% @ 80°C)	(N-m)	(10.71)	(10.7)	(10.9)	(10.9)	(10.9)	(10.9)	(18.0)	(18.0)	(18.1)	(17.8)	(18.1)	(25.3)	(25.4)	(26.0)	
Torque Constant (Kt)**	lbf-in/A	4.12	4.12	3.39	6.78	12.22	13.55	4.12	4.12	6.78	12.37	13.55	6.63	12.37	13.70	
(+/- 10% @ 80°C)	(N-m/A)	(0.47)	(0.47)	(0.38)	(0.77)	(1.38)	(1.53)	(0.47)	(0.47)	(0.77)	(1.40)	(1.53)	(0.75)	(1.40)	(1.55)	
Cont. 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)**	Vrms/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)	Vpk /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>	0.00555					0.00833					0.01112				
	(kg-cm <sup>2</sup> )	(6.27)					(9.42)					(12.56)				
Mech. 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	0.21	0.21	0.21	0.21	0.21	0.21	0.35	0.35	0.35	0.35	0.35	0.40	0.40	0.40	
	(N-m/krpm)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.045)	(0.045)	(0.045)	
Friction Torque	lbf-in	0.56	0.56	0.56	0.56	0.56	0.56	1.00	1.00	1.00	1.00	1.00	1.20	1.20	1.20	
	(N-m)	(0.063)	(0.063)	(0.063)	(0.063)	(0.063)	(0.063)	(0.113)	(0.113)	(0.113)	(0.113)	(0.113)	(0.136)	(0.136)	(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	
Motor Wire Insulation	°C (class)	180(H)														
Insulation System Voltage Rating		460														
Class Temperature	°C	T4 = 135°							T3A = 180°							
Environmental Rating		IP65														

## ER115 Gearmotor Data

ER 115 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% 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.

## ER 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

		Maximum		Output Torque @ Speed for 10,000 Hour Life					
		Output Torque		1000 RPM		3000 RPM		5000 RPM	
Model	Ratio	lbf-in	(Nm)	lbf-in	(Nm)	lbf-in	(Nm)	lbf-in	(Nm)
<b>ER115</b>	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

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.

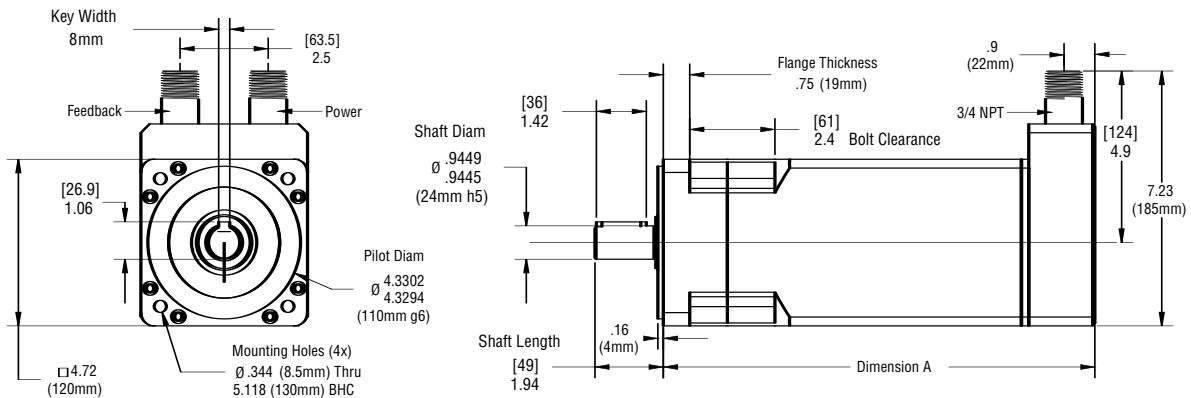
RPM		50	100	250	500	1000
<b>ER115</b>	lbf (N)	939 (4177)	745 (3314)	549 (2442)	435 (1935)	346 (1539)

### Motor and Gearmotor Weight

<b>ER115</b>	Motor	1 Stage	2 Stage
	lb (kg)	lb (kg)	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)

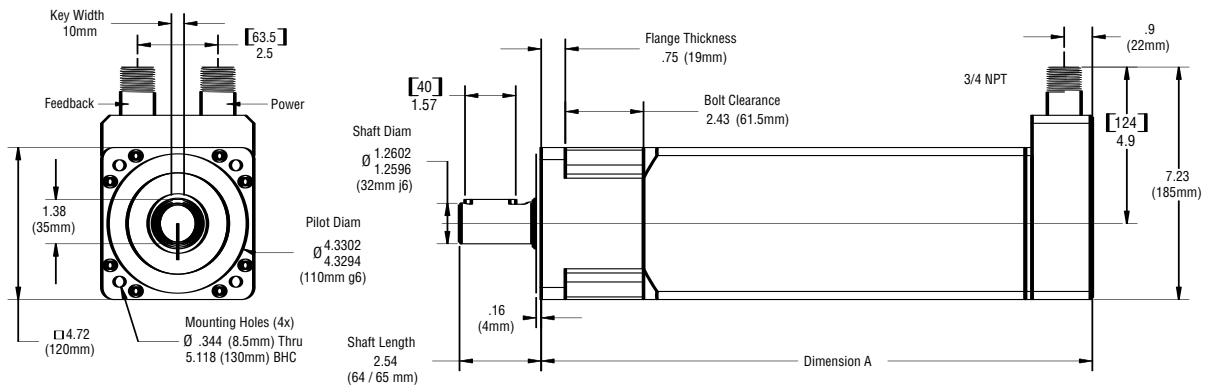
ER Series

# ER115



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

# ER115 With Gear Reduction Option



Gear Reduction		Dimension "A"
Stages	Stacks	Length
1	1	11.6" (293 mm)
1	2	13.6" (344 mm)
1	3	15.6" (395 mm)
2	1	13.2" (334 mm)
2	2	15.2" (385 mm)
2	3	17.2" (436 mm)

Drawings subject to change. Consult Exlar for certified drawings.

## ER115 Series Motor Ordering Information

**ERAAA** - **BBB** - **CDF** - **GGG** - **HHH** - **II** - **JJJ** - **XX** - **#####**

### ER = Model Series

ER = ER Series

### AAA = Frame Size

115 = 115 mm frame

### 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

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

-Standard Resolver – Size 15 1024 line (2048 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:

001 = Feedback Mount Only – .375 inch shaft ready for size 15 resolver

002 = Feedback Mount Only – 8 mm shaft ready for feedback device

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

DT2 = Delta Tau Data Systems – Standard Resolver

EL1 = Elmo Motion Control – Standard Resolver

EM4 = Emerson/Control Techniques – 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

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

### C = Shaft Type

K = Keyed

R = Smooth /Round

X = Special shaft

### HHH = Motor Stator, All 8 Pole

1A8 = 1 stack, 24 Vrms, 8 pole    2A8 = 2 stack, 24 Vrms, 8 pole    338 = 3 stack, 230 Vrms, 8 pole

1B8 = 1 stack, 48 Vrms, 8 pole    2B8 = 2 stack, 48 Vrms, 8 pole    358 = 3 stack, 400 Vrms, 8 pole

118 = 1 stack, 115 Vrms, 8 pole    238 = 2 stack, 230 Vrms, 8 pole    368 = 3 stack, 460 Vrms, 8 pole

138 = 1 stack, 230 Vrms, 8 pole    258 = 2 stack, 400 Vrms, 8 pole

158 = 1 stack, 400 Vrms, 8 pole    268 = 2 stack, 460 Vrms, 8 pole

168 = 1 stack, 460 Vrms, 8 pole

### D = Connector Options

N## = Potted NPT with flying leads

## = length of flying leads in feet

### II = Speed Designations

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

### F = Brake Options

S = Standard no brake

### 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

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