

ER120 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.

The ER Series 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.

* 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.

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 leads

Windings from 24 VDC to 460 VAC rms

Class 180H insulation system

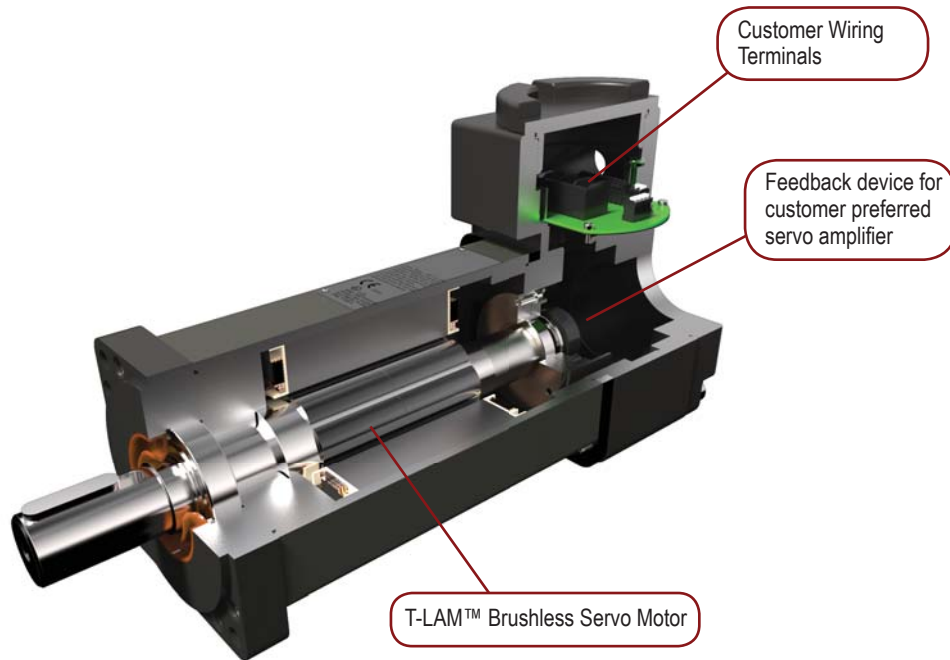
Technical Characteristics

Frame Sizes	4.72 in (120 mm)
Torque Range	up to 4696 lbf-in (530 Nm)
Maximum Speed	3000 rpm

Operating Conditions and Usage

Ambient Conditions:		
Ambient Operating Temperature	°C	-29 to 93
	°F	-20 to 199
Storage Temperature	°C	-54 to 93
IP Rating		IP65S

Product Features



Industries and Applications

Turbine fuel flow
Printing presses
Engine test stands
Valve control
Damper control
Chemical process plants
Fuel distribution systems Shipbound fuel
management
Paint booths
Fuel Skids



Electrical and Mechanical Specifications

Sinusoidal Commutation		1A8	1B8	118	138	158	168	2A8	2B8	238	258	268	338	358	368	
Continuous Motor Torque ^{***}	lbf-in (Nm)	49.6 (5.60)	49.6 (5.60)	50.4 (5.69)	50.4 (5.69)	50.5 (5.71)	50.4 (5.69)	83.1 (9.39)	83.1 (9.39)	83.9 (9.47)	82.4 (9.31)	83.9 (9.47)	117.1 (13.23)	117.4 (13.27)	120.2 (13.58)	
Peak Motor Torque	lbf-in (Nm)	99.1 (11.20)	99.1 (11.20)	100.8 (11.39)	100.8 (11.39)	101.1 (11.42)	100.8 (11.38)	166.3 (18.79)	166.3 (18.79)	167.7 (18.95)	164.7 (18.61)	167.7 (18.95)	234.2 (26.46)	234.8 (26.53)	240.4 (27.16)	
Torque Constant (Kt) ^{***} +/- 10% @ 80°C	lbf-in/A (Nm/A)	5.3 (0.6)	5.3 (0.6)	4.3 (0.5)	8.7 (1.0)	15.7 (1.8)	17.3 (2.0)	5.3 (0.6)	5.3 (0.6)	8.7 (1.0)	15.8 (1.8)	17.3 (2.0)	8.5 (1.0)	15.8 (1.8)	17.5 (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	
O-PEAK SINUSOIDAL COMMUTATION																
Continuous Motor Torque ^{***}	lbf-in (Nm)	49.6 (5.60)	49.6 (5.60)	50.4 (5.69)	50.4 (5.69)	50.5 (5.71)	50.4 (5.69)	83.1 (9.39)	83.1 (9.39)	83.9 (9.47)	82.4 (9.31)	83.9 (9.47)	117.1 (13.23)	117.4 (13.27)	120.2 (13.58)	
Peak Motor Torque	lbf-in (Nm)	99.1 (11.20)	99.1 (11.20)	100.8 (11.39)	100.8 (11.39)	101.1 (11.42)	100.8 (11.38)	166.3 (18.79)	166.3 (18.79)	167.7 (18.95)	164.7 (18.61)	167.7 (18.95)	234.2 (26.46)	234.8 (26.53)	240.4 (27.16)	
Torque Constant (Kt) ^{***} +/- 10% @ 80°C	lbf-in/A (Nm/A)	3.7 (0.42)	3.7 (0.4)	3.1 (0.3)	6.1 (0.7)	11.1 (1.3)	12.3 (1.4)	3.7 (0.4)	3.7 (0.4)	6.1 (0.7)	11.2 (1.3)	12.3 (1.4)	6.0 (0.7)	11.2 (1.3)	12.4 (1.4)	
Continuous Current Rating	A	14.8	14.8	18.4	9.2	5.1	4.6	24.9	24.9	15.3	8.2	7.6	21.8	11.7	10.8	
Peak Current Rating	A	29.7	29.7	36.7	18.4	10.2	9.2	49.8	49.8	30.6	16.4	15.3	43.6	23.4	21.7	
MOTOR DATA																
Voltage Constant (Ke) ^{***}	Vpk/Krpm	36.1	36.1	29.6	59.2	106.9	118.5	36.1	36.1	59.2	108.2	118.5	58.0	108.2	119.8	
(+/- 10% @ 80°C)	Vrms/Krpm	51.1	51.0	41.9	83.8	151.2	167.6	51.0	51.0	83.8	153.0	167.6	82.0	153.0	169.4	
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	0.127	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 ² (Kg-cm ²)	0.00538 (6.082)						0.00818 (9.242)					0.01097 (12.400)			
Mechanical Time Constant (tm)	ms	0.94	0.94	0.91	0.91	0.90	0.91	0.58	0.58	0.57	0.59	0.57	0.47	0.47	0.45	
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	
Friction Torque	lbf-in (Nm)	1.39 (0.157)	1.39 (0.157)	1.39 (0.157)	1.39 (0.157)	1.39 (0.157)	1.39 (0.157)	1.75 (0.197)	1.75 (0.197)	1.75 (0.197)	1.75 (0.197)	1.75 (0.197)	2.25 (0.254)	2.25 (0.254)	2.25 (0.25)	
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°														
Environmental Rating		IP65S														
Brake Inertia	lb-in-sec ² (Kg-cm ²)	0.00030 (0.339)														

Gearmotor Data

	1 Stack Motor			2 Stack Motor			3 Stack Motor					
SLG Armature Inertia [*] lbf-in-sec ² (Kg-cm ²)	0.00538 (6.085)			0.00820 (9.274)			0.01102 (12.464)					
GEARING REFLECTED INERTIA	SINGLE REDUCTION						DOUBLE REDUCTION					
	Gear Stages		lbf-in-sec ²	(Kg-cm ²)		Gear Stages		lbf-in-sec ²	(Kg-cm ²)			
	4:1		0.000851	(0.961)		16:1		0.000510	(0.576)			
	5:1		0.000557	(0.629)		20:1, 25:1		0.000344	(0.389)			
10:1		0.000145	(0.164)		40:1, 50:1, 100:1		0.000092	(0.104)				
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 geared system inertia

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

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

ER120 Ratio	Maximum Allowable Output Torque lbf-in (Nm)	Output Torque @ Speed for 10,000 Hour Life – lbf-in (Nm)		
		1000 RPM	2000 RPM	3000 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	ER120 lbf (N)	RPM	ER120 (Gear) lbf (N)
50	579 (2576)	50	1223 (5440)
100	460 (2046)	100	971 (4318)
250	339 (1508)	250	715 (3181)
500	269 (1197)	500	568 (2525)
1000	214 (952)	1000	451 (2004)
3000	148 (658)	3000	218 (970)

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

Visit www.exlar.com for full details on radial load and bearing life.

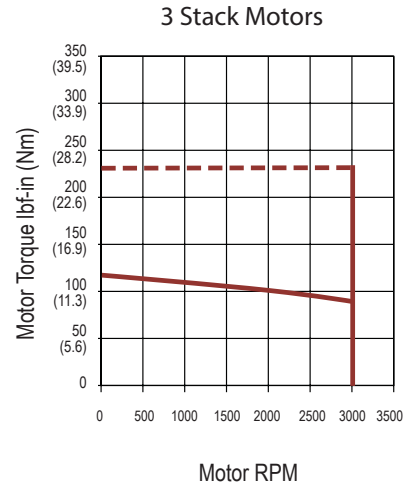
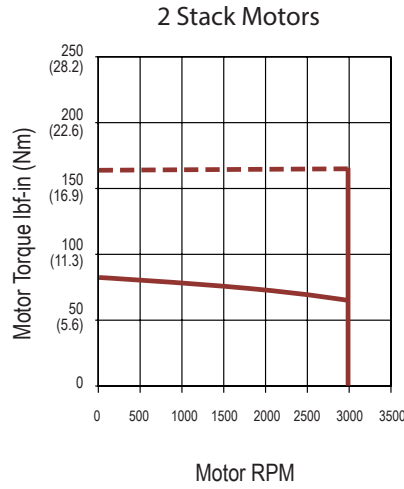
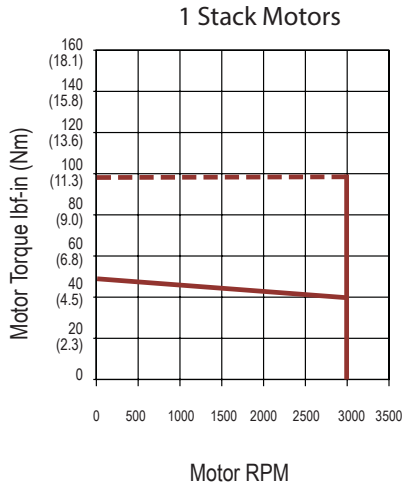
Motor and Gearmotor Weight

ER120	Motor	Gearmotor	
	Motor Weight lb (kg)	1 Stage lb (kg)	2 Stage lb (kg)
1 Stack	29.9 (13.56)	37.7 (17.10)	43.2 (19.60)
2 Stack	37.4 (16.96)	45.2 (20.50)	50.7 (23.00)
3 Stack	44.8 (20.32)	52.7 (23.90)	58.3 (26.45)

* For brake option add 0.9 lb (0.408 kg) mass.

Speed/Torque Curves

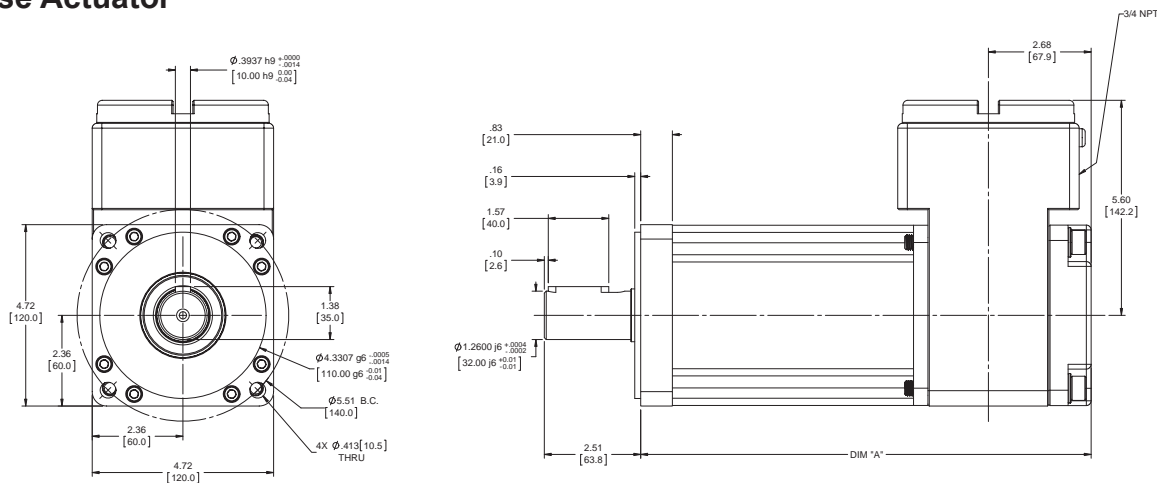
- - - Peak Torque
— Continuous Torque Torque Rated at 80°C



For gearmotors, divide speed by gear ratio; multiply torque by gear ratio and efficiency. Efficiencies: 1 Stage = 0.91, 2 Stage = 0.86

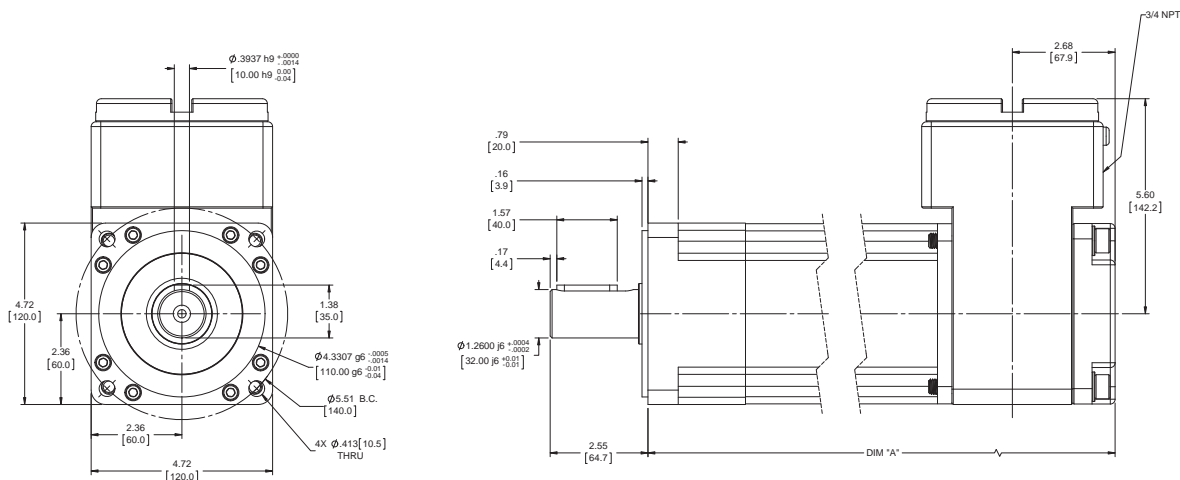
ER120 Explosion-Proof Motors

Dimensions Base Actuator



Gear Reduction		Dimension "A"
Stages	Stacks	Length in (mm)
0	1	11.73 (297.9)
	2	13.73 (348.7)
	3	15.73 (399.5)

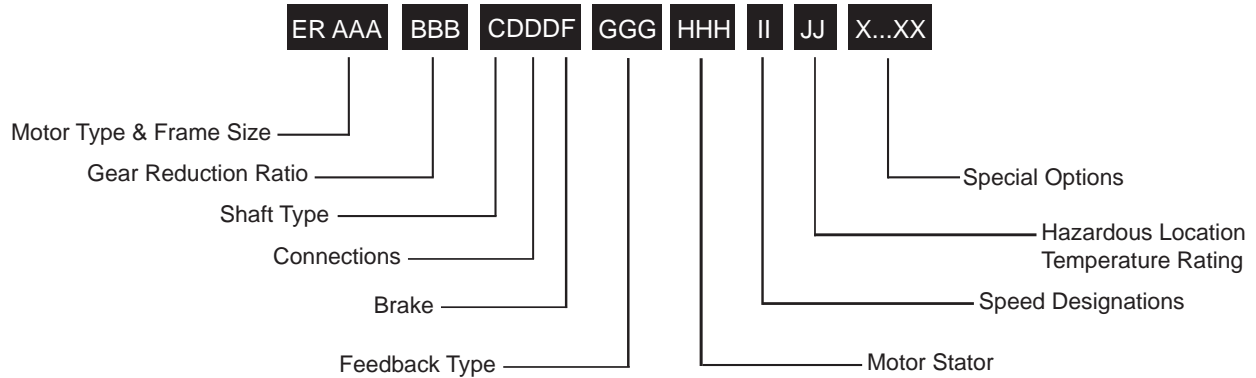
ER120 with Gear Reduction Option



Gear Reduction		Dimension "A"
Stages	Stacks	Length in (mm)
1	1	15.35 (389.8)
	2	17.35 (440.7)
	3	19.35 (491.5)

Gear Reduction		Dimension "A"
Stages	Stacks	Length in (mm)
2	1	16.93 (429.9)
	2	18.93 (480.8)
	3	20.93 (531.6)

Pre-sale drawings and models are representative and are subject to change. Certified drawings and models are available for a fee. Consult your local Exlar representative for details.



ER = Model Series

ER = Series

AAA = Frame Size

115 = 115 mm
120 = 120 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 Single 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

C = Shaft Type

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

DDD = Connection Options

N## = Potted NPT with flying leads
= length of flying leads in feet (not to exceed 99') contact your local sales representative if longer lengths are needed.

F = Brake Options

S = Standard no brake
B = Brake

GGG = Feedback Type

(Also specify the Amplifier/Drive Model being used when ordering) - Std 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 – contact your local sales representative – 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

YS5 = Yaskawa UTSAH

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. Maximum speed 3000 rpm.

JJ = Hazardous Location Temperature Rating

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

XX = Optional Speed & Mechanical Designations

XL = Special lubrication

Contact your local sales representative regarding all special actuator components.