

ER Series Rotary Motor and Gearmotor

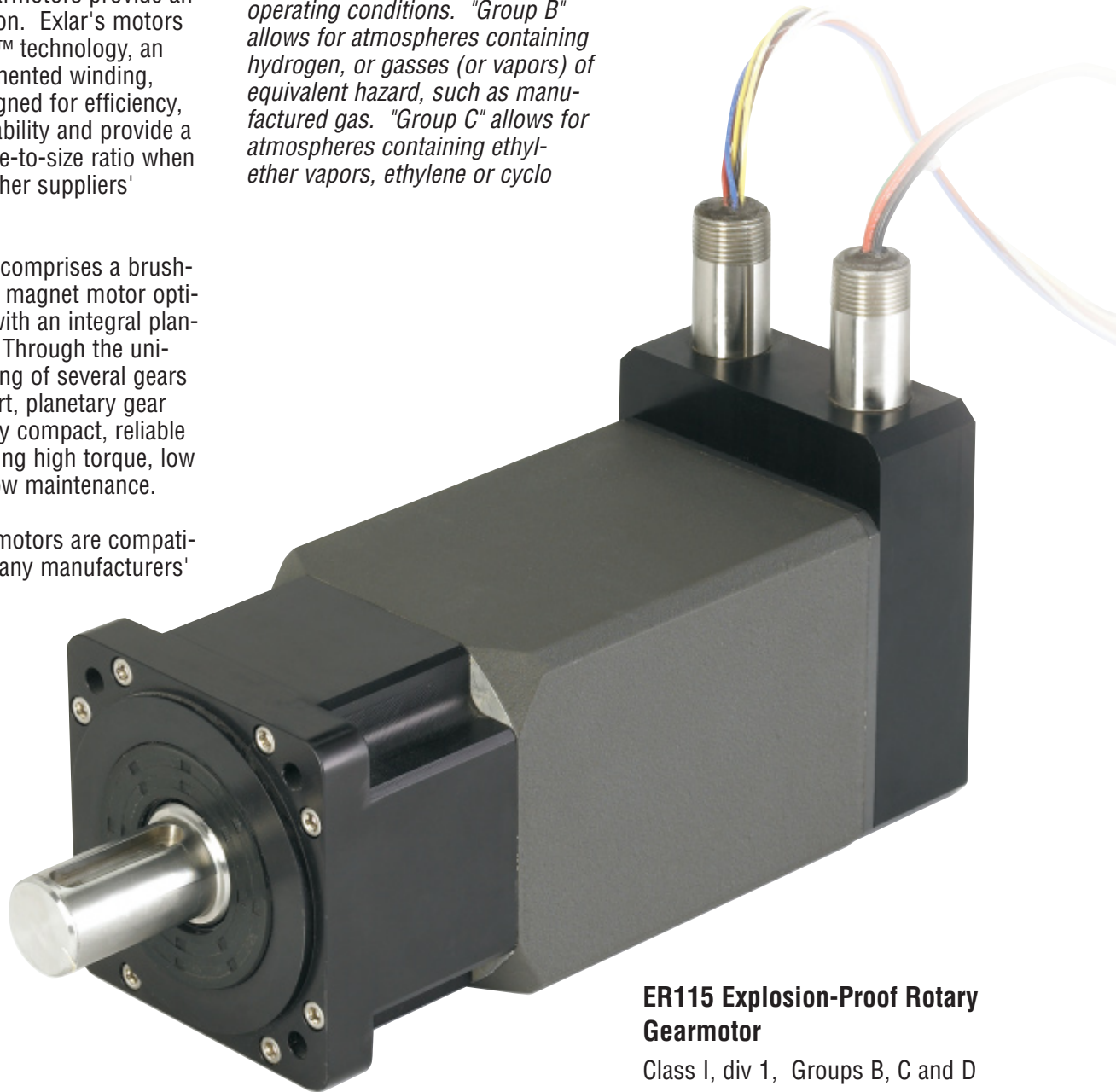
For hazardous duty environments with constant exposure to flammable gasses or vapors* Exlar's ER Series rotary explosion-proof motors and gearmotors provide an excellent solution. Exlar's motors utilizing T-LAM™ technology, an innovative segmented winding, have been designed for efficiency, power and 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

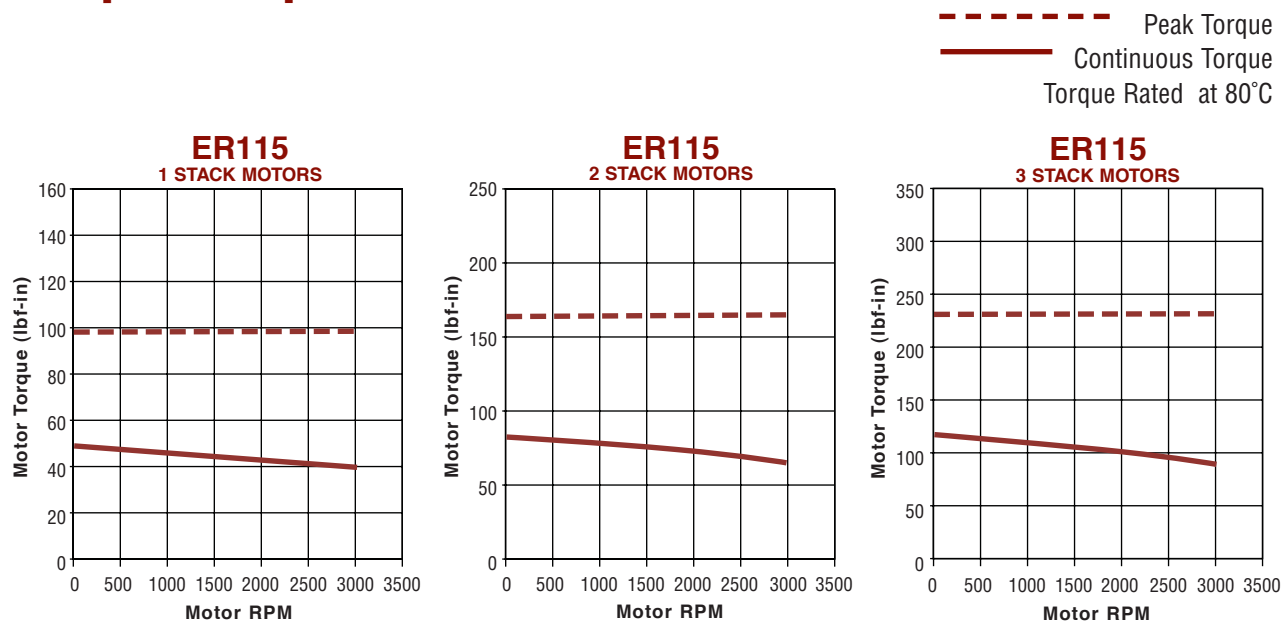
Engine test stands

Fuel distribution systems

Chemical process plants

Shipbound fuel management

ER Speed/Torque Curves



ER115 Electrical/Mechanical Specifications

| ER115 Motor Stator Data | | 1A8 | 1B8 | 118 | 138 | 158 | 168 | 2A8 | 2B8 | 238 | 258 | 268 | 338 | 358 | 368 | |
|---------------------------------------|------------------------|-----------|---------|---------|---------|---------|---------|---------|------------|---------|---------|---------|---------|---------|---------|--|
| Sinusoidal Commutation Data | | | | | | | | | | | | | | | | |
| 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 | |
| | (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 | |
| | (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 | |
| Trapezoidal Commutation Data | | | | | | | | | | | | | | | | |
| 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 | |
| | (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 | |
| | (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 | |
| Motor Data | | | | | | | | | | | | | | | | |
| 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 ² | 0.00555 | | | | | 0.00833 | | | | | 0.01112 | | | | |
| | (kg-cm ²) | (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 | | | | | | | | | | | | | | |
| Thermal Switch, Stator Temp. | °C | T4 = 130° | | | | | | | T3A = 165° | | | | | | | |
| Environmental Rating | | IP65 | | | | | | | | | | | | | | |

ER115 Gearmotor Data

| | | | | | | | | | | | | | | | | |
|--|--|-------------------------|--|--|-----------------------|----------------------------------|-------------------------|--|--|-------------------------|-----------------------|----------------|-----------------------|--|--|--|
| ER 115 Armature Inertia* | lbf-in-sec ² (kg-cm ²) | 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 ² | | | (kg-cm ²) | | Gear Stages | | | lbf-in-sec ² | | | (kg-cm ²) | | | |
| | 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 | | | | | | | | | | | | | | | | |

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) |
| ER115 | 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 for full details on radial load and bearing life.

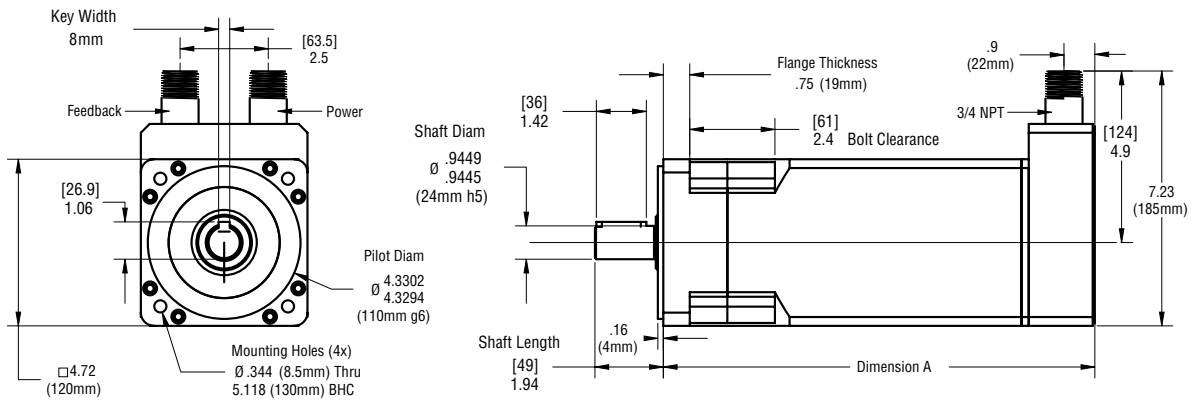
| RPM | | 50 | 100 | 250 | 500 | 1000 |
|-------|---------|------------|------------|------------|------------|------------|
| ER115 | lbf (N) | 939 (4177) | 745 (3314) | 549 (2442) | 435 (1935) | 346 (1539) |

Motor and Gearmotor Weight

| ER115 | 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) |

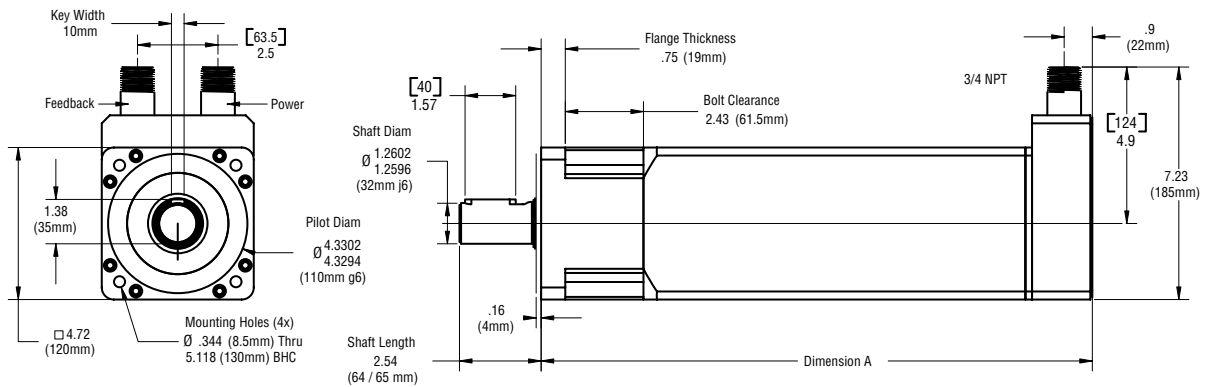
ER115 Brake Add 4.1 lbs.

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

X = Special Gear Reduction Ratio

C = Shaft Type

K = Keyed

R = Smooth /Round

X = Special shaft

D = Connector Options

N## = Potted NPT with flying leads

= length of flying leads in feet

F = Brake Options

S = Standard no brake

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

-Standard Resolver – Size 15 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 or encoder

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

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

II = Speed Designations

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

JJJ = Hazardous Location Temperature Rating

T3B = 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.