

BRUSHLESS DC



EASTERN AIR DEVICES, INC.

1 Progress Drive

Dover, New Hampshire 03820-5449 USA

(603) 742-3330 • FAX (603) 742-9080

web:www.eadmotors.com

EAD: The company that gives you high-performance solutions.

Since 1942, Eastern Air Devices has been manufacturing high-performance rotating products for industry. Our company has broad experience in designing and producing motors, blowers, and fans that meet extremely precise engineering requirements. We are capable of solving difficult design problems involving motion technology.



Experienced, Responsive Application Support:

EAD has developed a team of experienced, highly trained applications engineers available to help you solve your application problems. With knowledge and experience in a wide range of motors and motion control technologies, EAD engineers can help you define your application needs and select the appropriate motor technology.

Wide Range of Products:

EAD has decades of experience in the design and manufacture of a variety of motor technologies. Our expertise in stepping motors, linear actuators, brushless servo motors, and AC motors has made us industry's choice for motion control products.

Fast Response on Optimized Designs:

EAD is unique in the motion control industry for our ability to deliver customized prototypes quickly. EAD maintains a stock of complete motors and motor components on popular frame sizes, which allows us to deliver optimized motors almost as easily as catalog standards.

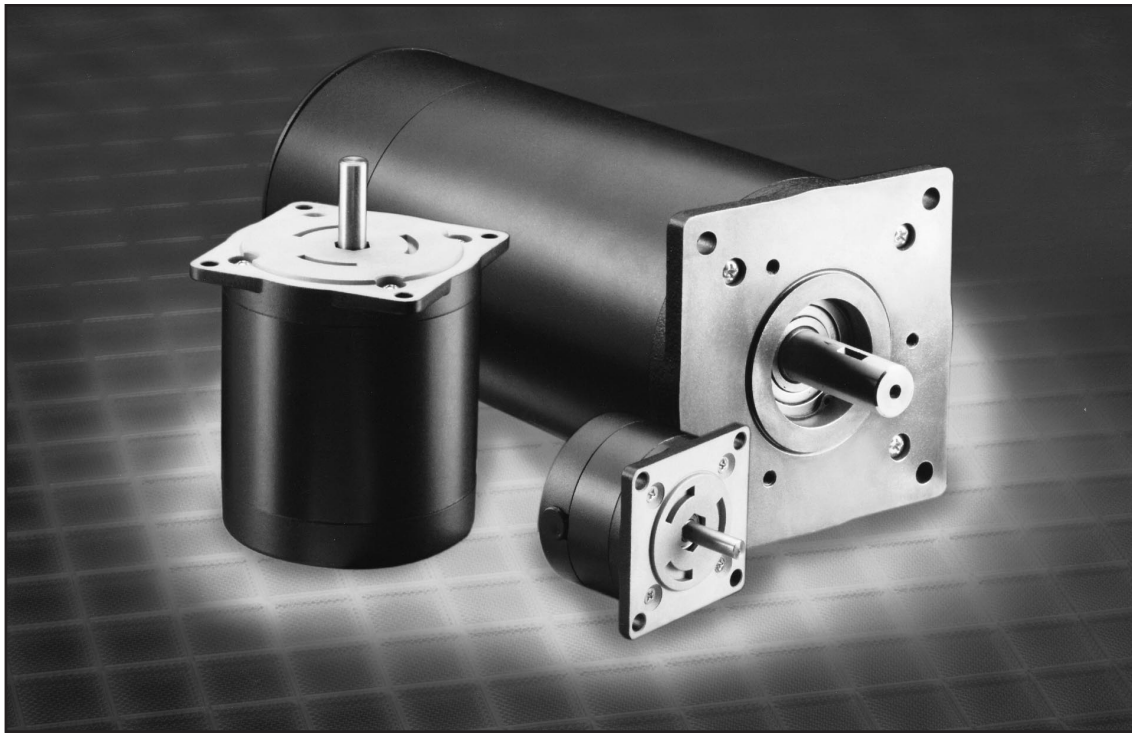
Commitment to Quality:

Commitment to world class quality drives EAD operations. EAD uses Statistical Process Control (SPC) in our operations to guarantee consistent quality product. EAD's reputation for quality has been a cornerstone of our business for over 50 years - just ask our customers!

World Class Manufacturing:

EAD excels at customized mechanical design and optimized windings. Our 40,000 sq ft machine shop is equipped with the latest in CNC machine technology making us the market leader in supplying custom mechanical features on all our motors. Our in-house stator winding capability allows us to optimize windings to any amplifier. Ask EAD engineering how our world class manufacturing can help us solve your problems.





EAD Brushless Servo Motors:

- NEMA standard size 17, 23, 34 and 42 mechanical designs
- Optical Encoders Optional
- High Speed, Smooth Operation
- Cost Effective Designs for OEM Applications
- Industry Standard, 3-phase Designs
- Windings Available to Match Any Servo-amplifier
- Output Power to 1000 Watts (peak)
- Available with Custom Shafts, End Caps, Cables and Connectors

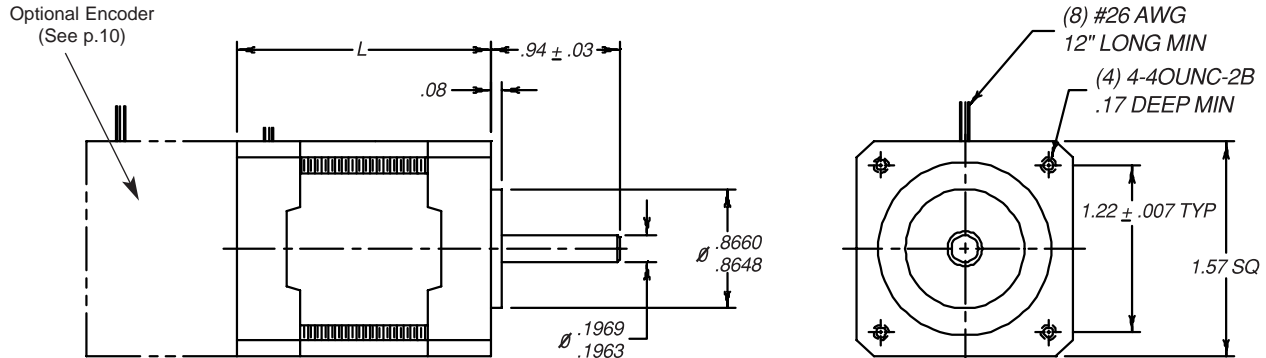
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EASTERN AIR DEVICES, INC.

Size 17 Brushless DC Servo Motor



PARAMETER	SYMBOL	UNITS	DB17CDB				DB17EDB				DB17GDB			
Cont. Stall Torque ¹	T _C	oz-in N-m	7.5 0.05				8 0.06				10 0.07			
Peak Torque ²	T _P	oz-in N-m	18 0.13				26 0.18				33 0.23			
Motor Constant	K _M	oz-in/√watt N-m/√watt	1.9 0.013				2.5 0.017				3.1 0.022			
Elec. Time Constant	τ _E	msec	0.22				0.24				0.29			
Mech. Time Constant	τ _M	msec	9.09				6.64				5.14			
Rotor Inertia	J	oz-in-sec ² gm-cm ²	0.00028 19.8				.00035 24.7				.00042 29.7			
Thermal Resistance	R _{TH}	°C/watt	6.0				5.8				5.6			
Weight	W	oz Kg	9 0.25				11 0.31				13 0.36			
Motor Length	L	inch mm	1.13 28.7				1.38 35.1				1.63 41.4			
Number of Poles	—	—	8				8				8			
WINDING DATA			-10	-11	-12	-13	-10	-11	-12	-13	-10	-11	-12	-13
Design Voltage	V	volts	24	48	90	160	24	48	90	160	24	48	90	160
Cont. Stall Current ¹	I _C	amperes	1.44	0.70	0.37	0.20	1.5	0.8	0.4	0.2	1.7	0.8	0.4	0.2
Peak Current ²	I _P	amperes	3.6	1.9	1.1	.64	4.4	2.34	1.37	.8	4.7	2.6	1.5	.88
Voltage Constant ± 10%	K _E	V/kRPM V/rad/sec	3.70 0.035	6.84 0.065	12.20 0.117	20.71 0.198	4.36 0.042	8.21 0.078	14.05 0.134	24.03 0.230	5.18 0.049	9.47 0.090	16.64 0.159	27.73 0.265
Torque Constant ± 10%	K _T	oz-in/amp N-m/amp	5.0 0.035	9.25 0.065	16.5 0.116	28.0 0.198	5.9 0.042	11.1 0.078	19 0.134	32.5 0.229	7.0 0.049	12.8 0.090	22.5 0.159	37.5 0.265
Resistance ± 10%	R _M	Ohms	6.9	23.7	75.4	217.0	5.8	19.4	57.8	169.0	5.1	17.1	52.7	146.3
Inductance ± 30% ³	L _M	mH	1.28	7.99	13.91	40.08	1.33	4.72	13.83	40.46	1.50	5.03	15.53	43.12

NOTE: Motors are available with different windings and mechanical modifications to meet specific applications, contact the factory for technical and engineering assistance.

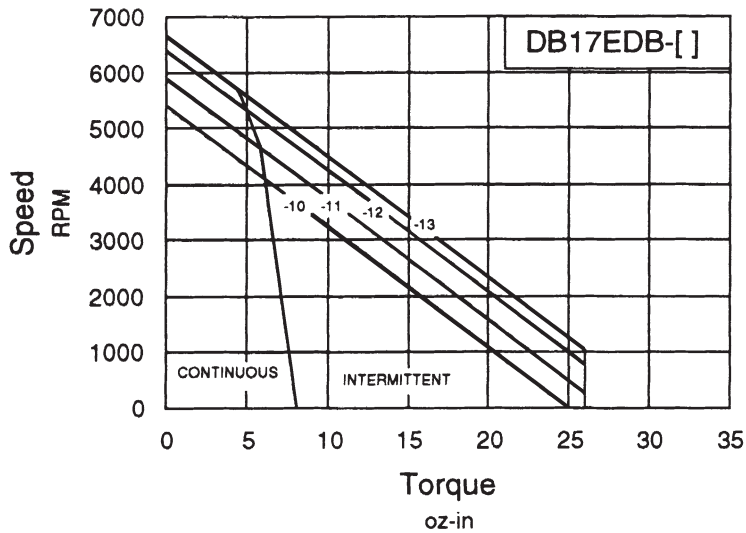
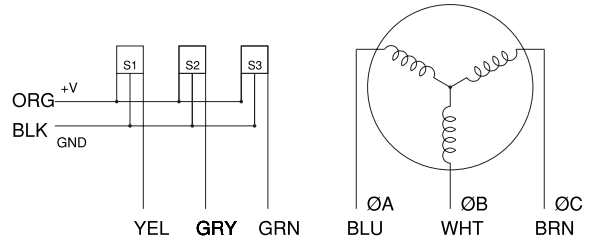
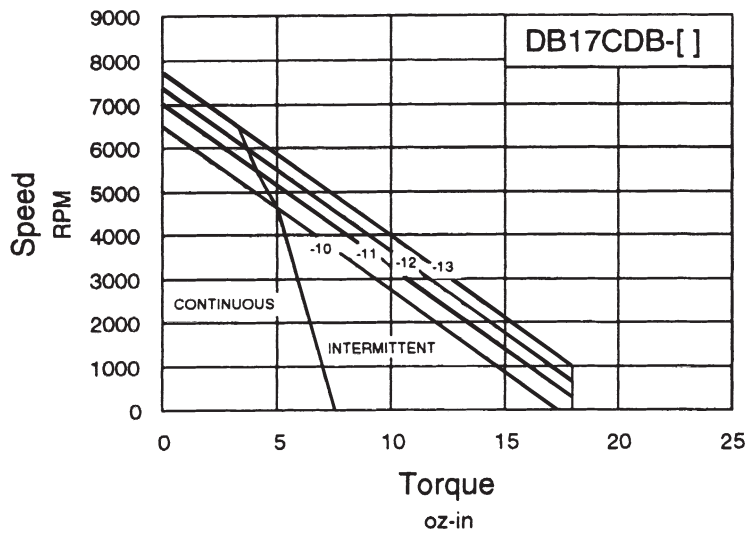
¹Continuous rating based on 25°C ambient temperature, winding temperature rise of 100°C and motor mounted to a 6x6x1/4 inch aluminum heat sink.

²10 second at 25°C ambient, 100°C winding temperature.

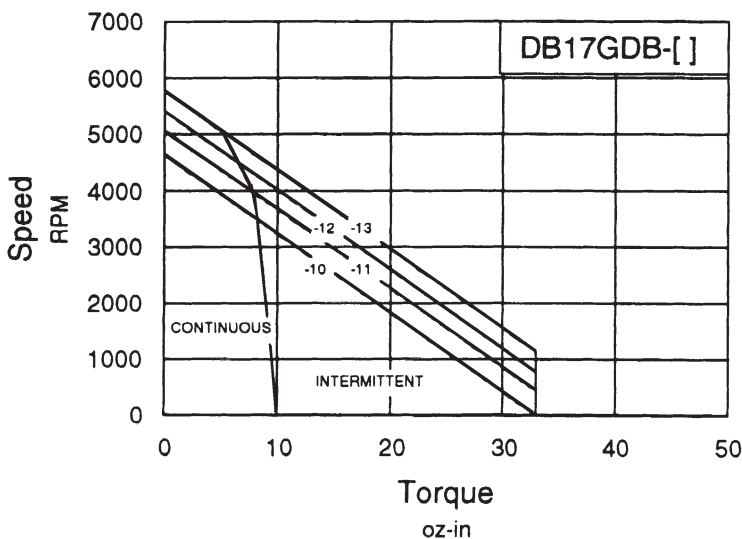
³Inductance bridge measurement method @ 1kHz.



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COMMUTATION TABLE					
SENSOR OUTPUT			DRIVER OUTPUT		
S1	S2	S3	Ø A	Ø B	Ø C
YEL	GRY	GRN	BLU	WHT	BRN
CCW ROTATION FACING LEAD END					
0	0	1	X	HI	LO
0	1	1	HI	X	LO
0	1	0	HI	LO	X
1	1	0	X	LO	HI
1	0	0	LO	X	HI
1	0	1	LO	HI	X
CW ROTATION LEAD END					
0	1	0	LO	HI	X
0	1	1	LO	X	HI
0	0	1	X	LO	HI
1	0	1	HI	LO	X
1	0	0	HI	X	LO
1	1	0	X	HI	LO



Features

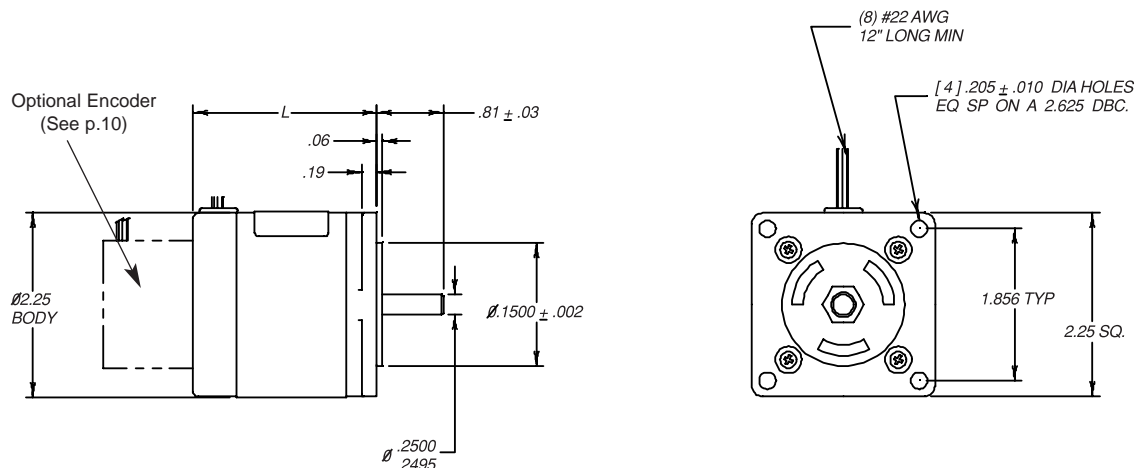
- No Brushes or Commutator
- Ball Bearing Construction
- Dynamically Balanced Rotors
- Low Audible and Magnetic Noise
- High Speed Operation
- Compatible With All Three-Phase Brushless DC Motor Amplifiers

Typical Applications

Centrifuges	Gyroscopes
Bar Code Readers	Conveyors
Film Transport	Paper Feed
Machine Tools	X-Y Positioning
Robotics	Light Industrial
Semiconductor Equipment	

EASTERN AIR DEVICES, INC.

NEMA 23 Brushless DC Servo Motor



PARAMETER	SYMBOL	UNITS	DA23DBB				DA23GBB				DA23JBB			
Cont. Stall Torque ¹	T _C	oz-in N-m	22 0.16				40 0.28				53 0.37			
Peak Torque ²	T _P	oz-in N-m	80 0.56				150 1.06				190 1.34			
Motor Constant	K _M	oz-in/√watt N-m/√watt	4.6 0.032				7.5 0.053				9.1 0.064			
Elec. Time Constant	τ _E	msec	1.14				1.14				1.66			
Mech. Time Constant	τ _M	msec	9.72				5.72				5.39			
Rotor Inertia	J	oz-in-sec ² gm-cm ²	0.00286 202.0				.00470 331.9				.00715 504.9			
Thermal Resistance	R _{TH}	°C/watt	4.12				3.86				3.70			
Weight	W	oz Kg	21 0.59				31 0.87				47 1.32			
Motor Length	L	inch mm	2.25 57.2				3.00 76.2				4.00 101.6			
Number of Poles	—	—	4				4				4			
WINDING DATA			-10	-11	-12	-13	-10	-11	-12	-13	-10	-11	-12	-13
Design Voltage	V	volts	24	48	90	160	24	48	90	160	24	48	90	160
Cont. Stall Current ¹	I _C	amperes	3.3	2.0	1.2	0.8	4.9	2.7	1.6	0.9	6.5	3.6	2.0	1.2
Peak Current	I _P	amperes	10	6.7	4.0	2.6	18.5	10.7	6.6	4.1	25.3	14.4	8.5	5.4
Voltage Constant ± 10%	K _E	V/kRPM V/rad/sec	5.48 0.052	9.13 0.087	15.34 0.146	23.37 0.223	6.12 0.058	10.60 0.101	17.13 0.164	27.73 0.265	5.70 0.054	9.98 0.095	17.10 0.163	27.07 0.259
Torque Constant ± 10%	K _T	oz-in/amp N-m/amp	7.41 0.052	12.34 0.087	20.74 0.146	31.60 0.223	8.27 0.058	14.34 0.101	23.16 0.164	37.50 0.265	7.71 0.054	13.49 0.095	23.12 0.163	36.60 0.258
Resistance ± 10% ²	R _M	Ohms	1.4	4.6	11.7	29.5	0.80	2.0	5.1	13	0.39	1.2	3.1	7.9
Inductance ± 30% ³	L _M	mH	1.64	5.21	13.2	33.5	0.93	2.26	5.80	14.8	0.65	1.98	5.12	13.1

NOTE: Motors are available with different windings and mechanical modifications to meet specific applications, contact the factory for technical and engineering assistance.

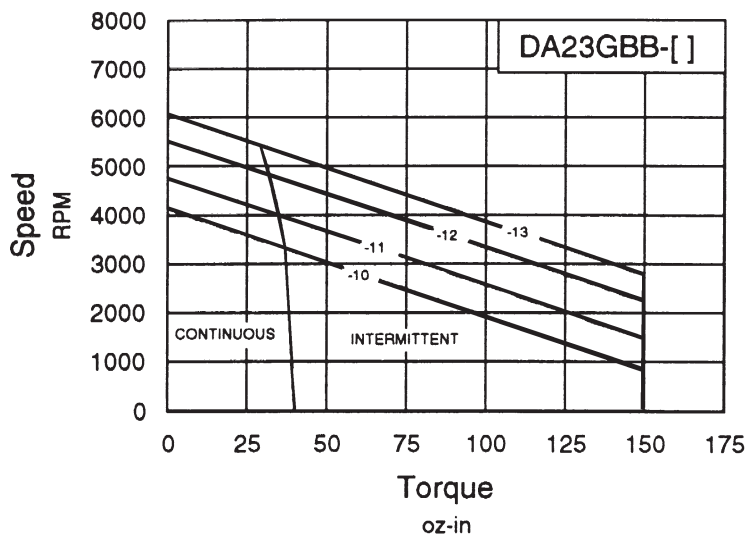
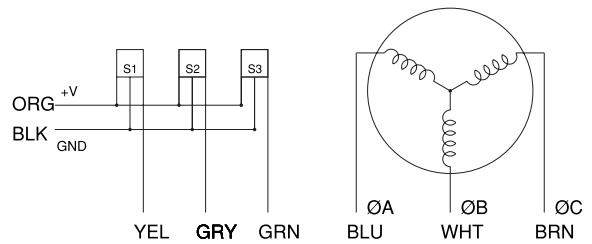
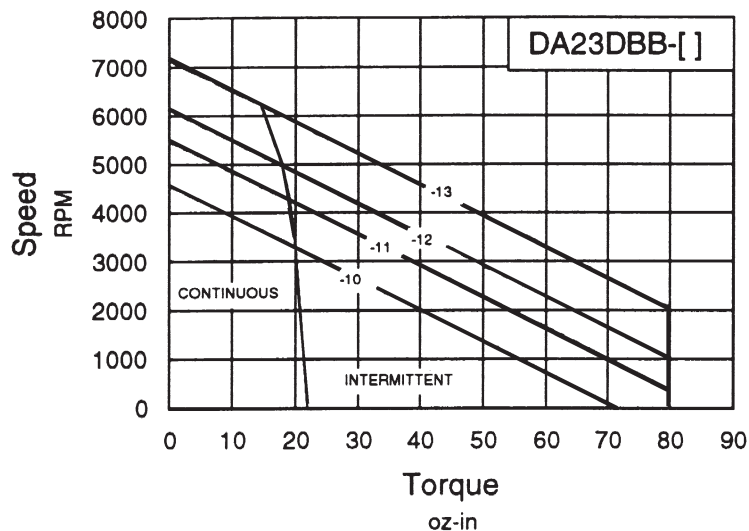
¹Continuous rating based on 25°C ambient temperature, winding temperature rise of 100°C and motor mounted to a 6x6x1/4 inch aluminum heat sink.

²10 second at 25°C ambient, 100°C winding temperature.

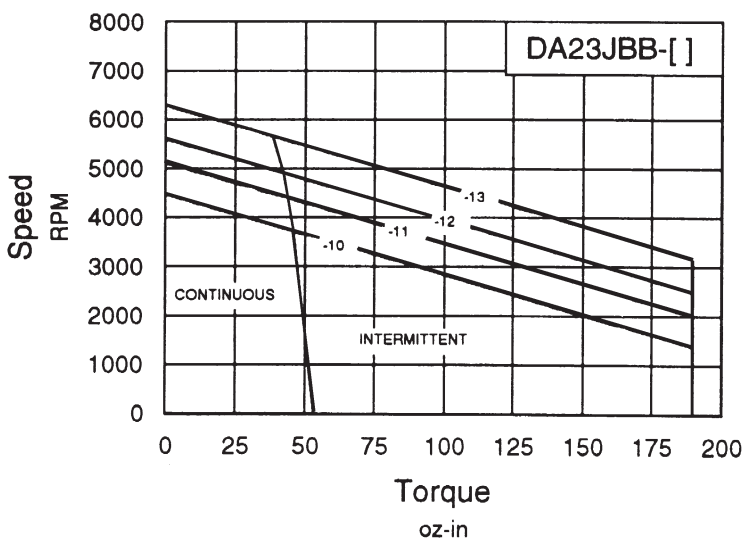
³Inductance bridge measurement method @ 1kHz.



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COMMUTATION TABLE					
SENSOR OUTPUT			DRIVER OUTPUT		
S1	S2	S3	Ø A	Ø B	Ø C
YEL	GRY	GRN	BLU	WHT	BRN
CCW ROTATION FACING LEAD END					
0	0	1	X	HI	LO
0	1	1	HI	X	LO
0	1	0	HI	LO	X
1	1	0	X	LO	HI
1	0	0	LO	X	HI
1	0	1	LO	HI	X
CW ROTATION LEAD END					
0	1	0	LO	HI	X
0	1	1	LO	X	HI
0	0	1	X	LO	HI
1	0	1	HI	LO	X
1	0	0	HI	X	LO
1	1	0	X	HI	LO



Features

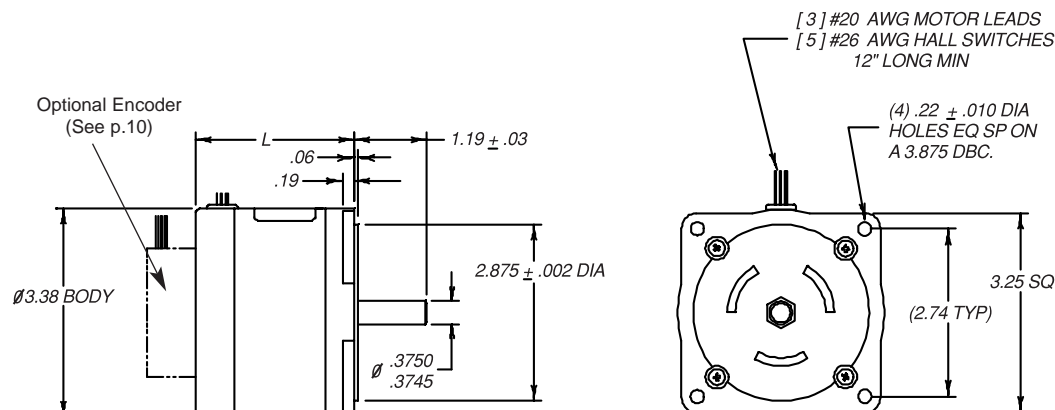
- No Brushes or Commutator
- Ball Bearing Construction
- Dynamically Balanced Rotors
- Low Audible and Magnetic Noise
- High Speed Operation
- Compatible With All Three-Phase Brushless DC Motor Amplifiers

Typical Applications

- | | |
|-------------------------|------------------|
| Centrifuges | Gyroscopes |
| Bar Code Readers | Conveyors |
| Film Transport | Paper Feed |
| Machine Tools | X-Y Positioning |
| Robotics | Light Industrial |
| Semiconductor Equipment | |

EASTERN AIR DEVICES, INC.

NEMA 34 Brushless DC Servo Motor



PARAMETER	SYMBOL	UNITS	DA34DBB				DA34FBB				DA34HBB			
Cont. Stall Torque ¹	T _C	oz-in N-m	63 0.44				105 0.74				155 1.09			
Peak Torque ²	T _P	oz-in N-m	190 1.34				335 2.37				580 4.09			
Motor Constant	K _M	oz-in/√watt N-m/√watt	10.0 0.070				13.2 0.092				19.5 0.137			
Elec. Time Constant	τ _E	msec	1.23				1.40				1.00			
Mech. Time Constant	τ _M	msec	6.75				4.47				6.00			
Rotor Inertia	J	oz-in-sec ² gm-cm ²	0.00913 644.8				0.0139 981.6				0.0193 1363.0			
Thermal Resistance	R _{TH}	°C/watt	2.66				1.98				1.79			
Weight	W	oz Kg	48 1.34				63 1.76				89 2.49			
Motor Length	L	inch mm	3.15 80.0				3.70 94.0				4.70 119.4			
Number of Poles	—	—	4				4				4			
WINDING DATA			-10	-11	-12	-13	-10	-11	-12	-13	-10	-11	-12	-13
Design Voltage	V	volts	24	48	90	160	36	48	90	160	36	48	90	160
Cont. Stall Current ¹	I _C	amperes	5.8	3.5	2.2	1.3	6.8	6.0	3.3	1.9	6.8	6.0	3.9	2.3
Peak Current ²	I _P	amperes	17.2	10.7	7.5	4.6	21.8	20.0	11.6	7.4	23.7	21.8	14.1	9.3
Voltage Constant ± 10%	K _E	V/kRPM	8.37	13.54	19.50	31.42	11.69	12.86	22.21	35.07	18.38	20.23	31.25	47.80
		V/rad/sec	0.080	0.129	0.186	0.300	0.112	0.123	0.212	0.335	0.176	0.193	0.298	0.456
Torque Constant ± 10%	K _T	oz-in/amp	11.32	18.31	26.37	42.49	15.81	17.39	30.04	47.43	24.86	27.35	42.26	64.64
		N-m/amp	0.080	0.129	0.186	0.300	0.112	0.123	0.212	0.335	0.176	0.193	0.298	0.456
Resistance ± 10%	R _M	Ohms	0.8	2.0	4.1	10.3	0.7	0.9	2.8	5.6	1.6	2.0	5.0	10.0
Inductance ± 30% ³	L _M	mH	0.94	2.56	4.96	12.95	1.01	1.32	3.22	8.24	1.56	2.12	4.59	10.32

NOTE: Motors are available with different windings and mechanical modifications to meet specific applications, contact the factory for technical and engineering assistance.

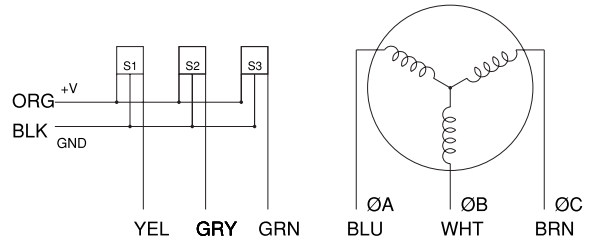
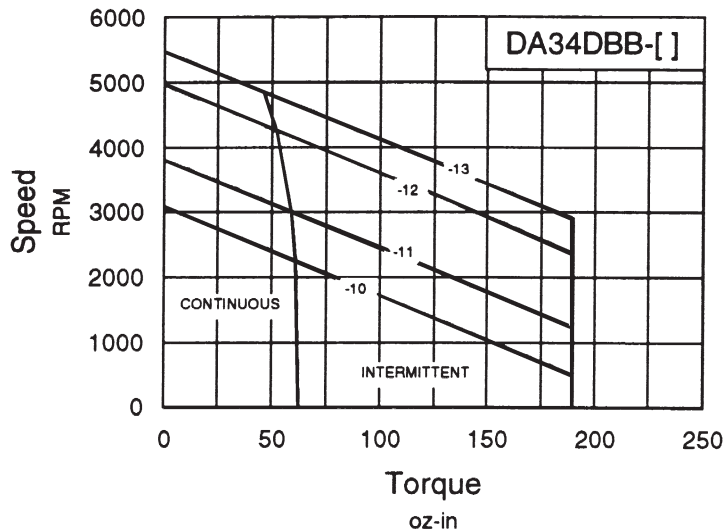
¹Continuous rating based on 25°C ambient temperature, winding temperature rise of 100°C and motor mounted to a 6x6x1/4 inch aluminum heat sink.

²10 second at 25°C ambient, 100°C winding temperature.

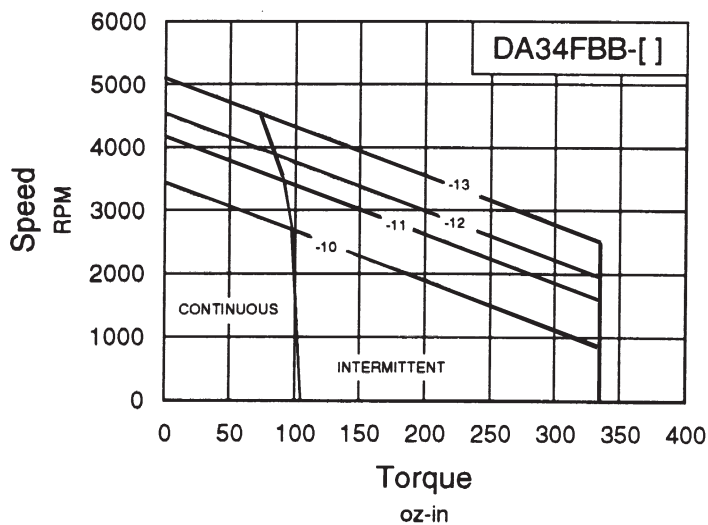
³Inductance bridge measurement method @ 1kHz.



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COMMUTATION TABLE					
SENSOR OUTPUT			DRIVER OUTPUT		
S1	S2	S3	Ø A	Ø B	Ø C
YEL	GRY	GRN	BLU	WHT	BRN
CCW ROTATION FACING LEAD END					
0	0	1	X	HI	LO
0	1	1	HI	X	LO
0	1	0	HI	LO	X
1	1	0	X	LO	HI
1	0	0	LO	X	HI
1	0	1	LO	HI	X
CW ROTATION LEAD END					
0	1	0	LO	HI	X
0	1	1	LO	X	HI
0	0	1	X	LO	HI
1	0	1	HI	LO	X
1	0	0	HI	X	LO
1	1	0	X	HI	LO



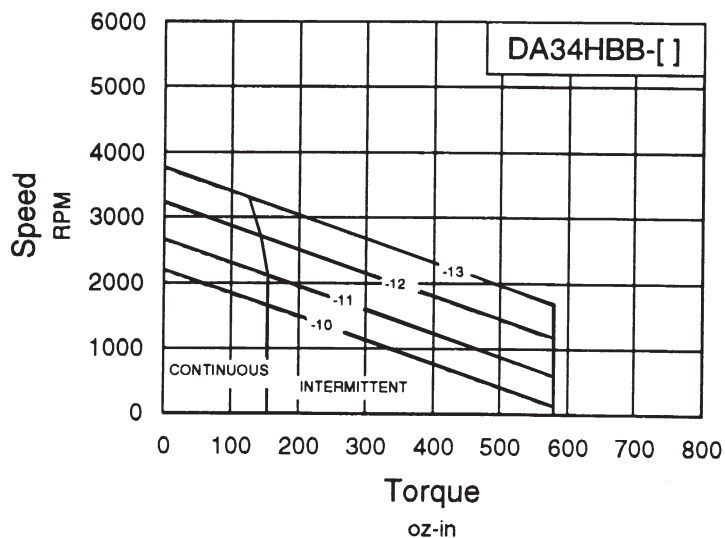
Features

- No Brushes or Commutator
- Ball Bearing Construction
- Dynamically Balanced Rotors
- Low Audible and Magnetic Noise
- High Speed Operation
- Compatible With All Three-Phase Brushless DC Motor Amplifiers

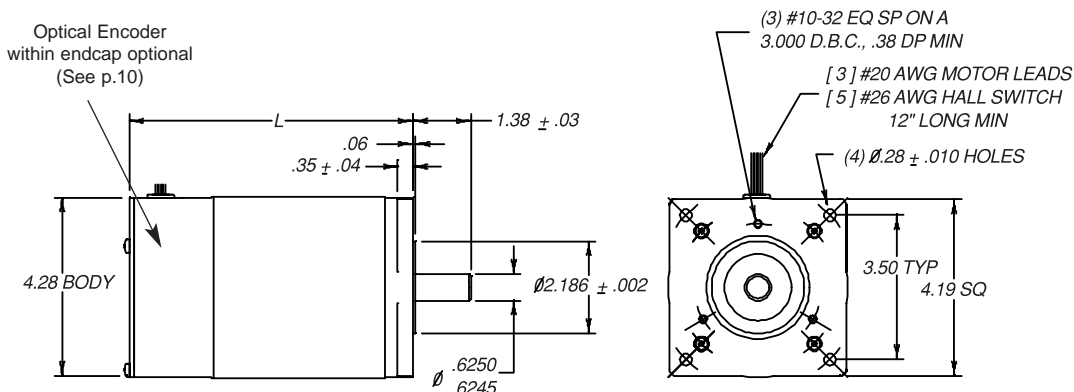
Typical Applications

Centrifuges
Bar Code Readers
Film Transport
Machine Tools
Robotics
Semiconductor Equipment

Gyroscopes
Conveyors
Paper Feed
X-Y Positioning
Light Industrial



NEMA 42 Brushless DC Servo Motor



PARAMETER	SYMBOL	UNITS	DA42DBB				DA42FBB				DA42HBB			
Cont. Stall Torque ¹	T _C	oz-in N-m	123 0.87				180 1.27				265 1.87			
Peak Torque ²	T _P	oz-in N-m	395 2.79				610 4.31				840 5.93			
Motor Constant	K _M	oz-in/√watt N-m/√watt	14.3 0.100				20.0 0.140				28.0 0.196			
Elec. Time Constant	τ _E	msec	1.07				1.39				1.70			
Mech. Time Constant	τ _M	msec	2.08				1.59				1.35			
Rotor Inertia	J	oz-in-sec ² gm-cm ²	0.00357 252.1				.00536 378.5				.00893 630.6			
Thermal Resistance	R _{TH}	°C/watt	1.33				1.20				.95			
Weight	W	oz Kg	230 6.44				255 7.14				300 8.40			
Motor Length	L	inch mm	5.70 144.8				6.20 157.5				7.20 182.9			
Number of Poles	—	—	4				4				4			
WINDING DATA			-10	-11	-12	-13	-10	-11	-12	-13	-10	-11	-12	-13
Design Voltage	V	volts	36	48	90	160	36	48	90	160	36	48	90	160
Cont. Stall Current ¹	I _C	amperes	7.5	6.1	3.8	2.2	8.9	7.6	4.4	2.6	12.3	9.9	5.7	3.4
Peak Current ²	I _P	amperes	24.7	20.6	13.0	7.7	32.2	27.1	15.8	9.8	38.7	31.3	19.1	12.1
Voltage Constant ± 10%	K _E	V/kRPM	11.98	14.42	22.85	38.53	14.12	16.86	28.77	46.81	16.27	20.11	33.13	52.58
		V/rad/sec	0.114	0.138	0.218	0.368	0.135	0.161	0.275	0.447	0.155	0.192	0.316	0.502
Torque Constant ± 10%	K _T	oz-in/amp	16.2	19.5	30.9	52.1	19.1	22.8	38.9	63.3	22.0	27.2	44.8	71.1
		N-m/amp	0.114	0.138	0.218	0.368	0.135	0.161	0.275	0.447	0.155	0.192	0.316	0.502
Resistance ± 10%	R _M	Ohms	1.3	1.9	4.7	13.2	0.9	1.3	3.8	9.9	0.6	0.9	2.6	6.4
Inductance ± 30% ³	L _M	mH	1.37	1.98	4.97	14.13	1.26	1.80	5.25	13.90	1.01	1.54	4.18	12.33

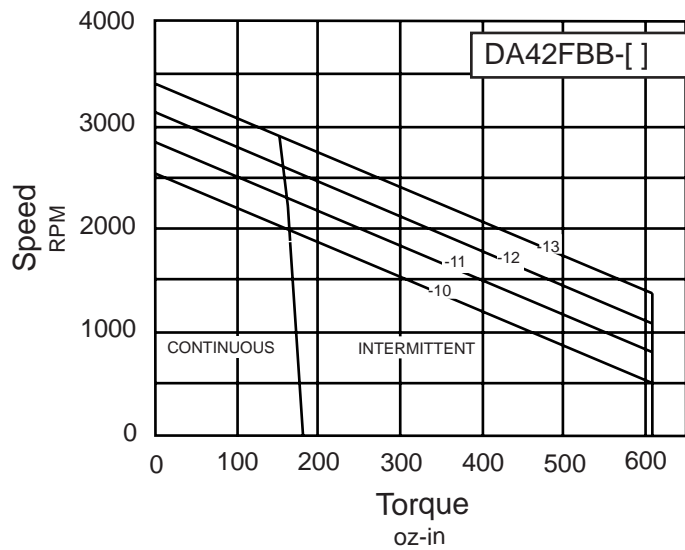
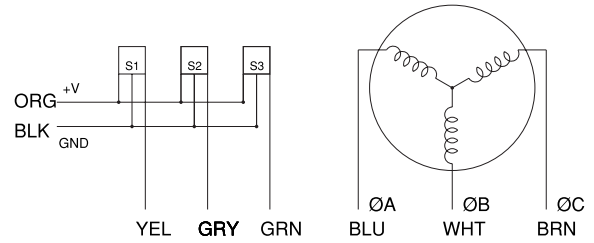
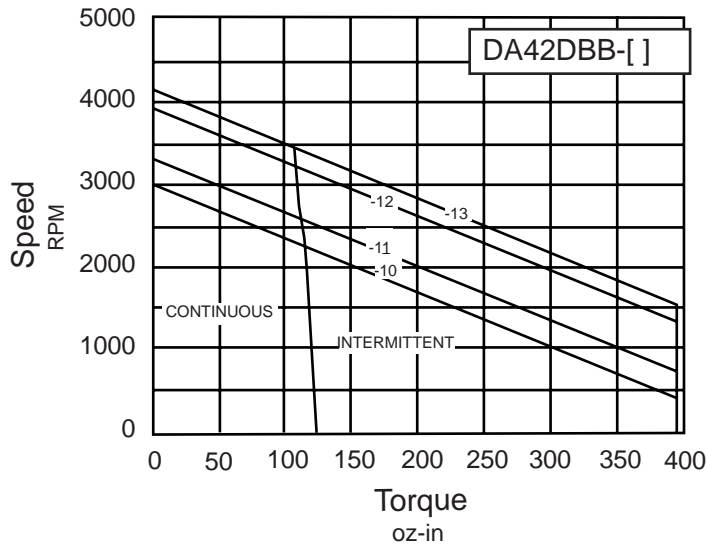
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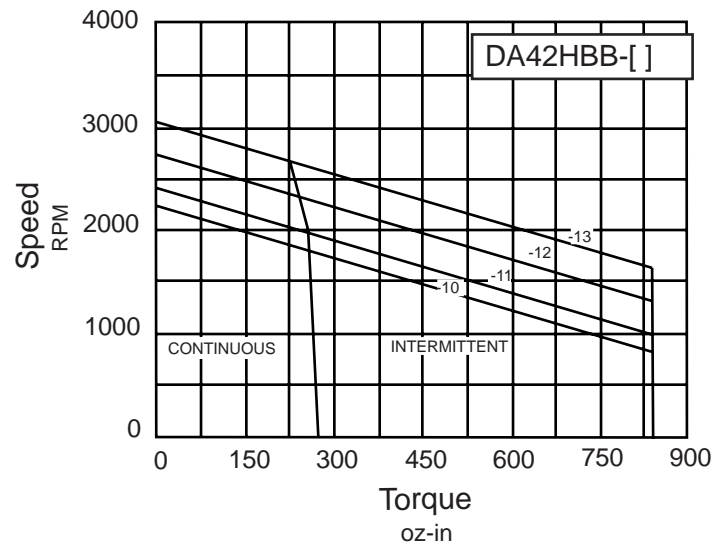
²10 second at 25°C ambient, 100°C winding temperature.

³Inductance bridge measurement method @ 1kHz.





COMMUTATION TABLE					
SENSOR OUTPUT			DRIVER OUTPUT		
S1	S2	S3	Ø A	Ø B	Ø C
YEL	GRY	GRN	BLU	WHT	BRN
CCW ROTATION FACING LEAD END					
0	0	1	X	HI	LO
0	1	1	HI	X	LO
0	1	0	HI	LO	X
1	1	0	X	LO	HI
1	0	0	LO	X	HI
1	0	1	LO	HI	X
CW ROTATION LEAD END					
0	1	0	LO	HI	X
0	1	1	LO	X	HI
0	0	1	X	LO	HI
1	0	1	HI	LO	X
1	0	0	HI	X	LO
1	1	0	X	HI	LO



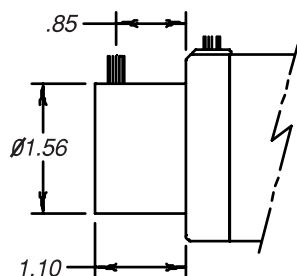
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- High Speed Operation
- Compatible With All Three-Phase Brushless DC Motor Amplifiers

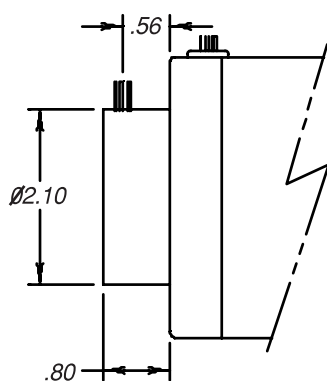
Typical Applications

Centrifuges	Gyroscopes
Bar Code Readers	Conveyors
Film Transport	Paper Feed
Machine Tools	X-Y Positioning
Robotics	Light Industrial
Semiconductor Equipment	

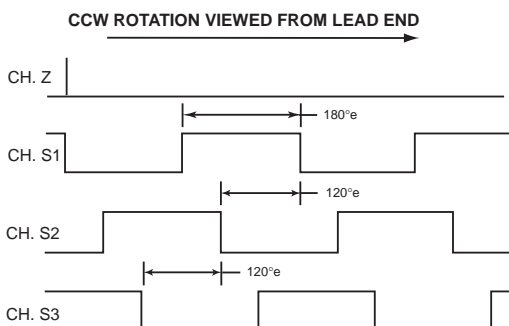
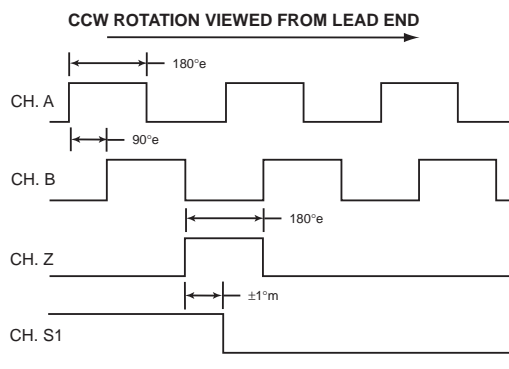
Encoder Options and Specifications



Model E1 & E2



Models E3 - E5



FUNCTION	LEAD COLOR
Vcc Inc.	RED
Vcc Com.	RED / WHT
GND Inc.	BLK
GND Com.	BLK / WHT
A	BLU
A'	BLU / BLK
B	GRN
B'	GRN / BLK
Z	VIO
Z'	VIO / BLK
S1	BRN
S1'	BRN / BLK
S2	GRY
S2'	GRY / BLK
S3	WHT
S3'	WHT / BLK

Resolution: 500, 1000, 2000 (2.10 Dia. Only)

Accuracy: Incremental ± 5 arc-min max.
Commutation ± 6 arc-min max.

Phasing: Incremental $90^\circ \pm 18^\circ$ elec.

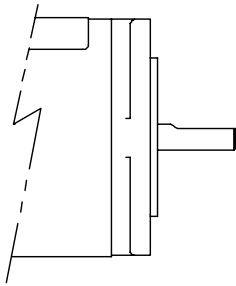
Symmetry: Incremental $120^\circ \pm 18^\circ$ elec.

Power Requirements: 5 VDC $\pm 10\%$ at 120 mA max.

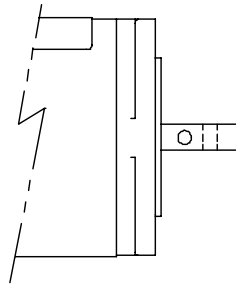
Output Signal: Line Driver ET2722
sink / source 40 mA max.

Frequency Response: 200 kHz max.

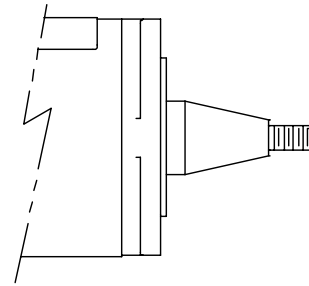
Encoder Part Number Designation		
Encoder Dia	Line Count	P/N
1.56"	500	E1
	1000	E2
2.10"	500	E3
	1000	E4
	2000	E5



FLATS

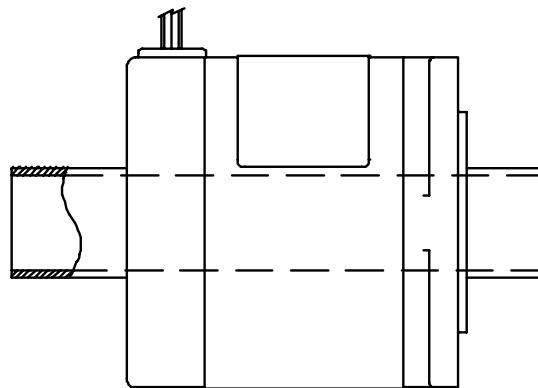


CROSS HOLES

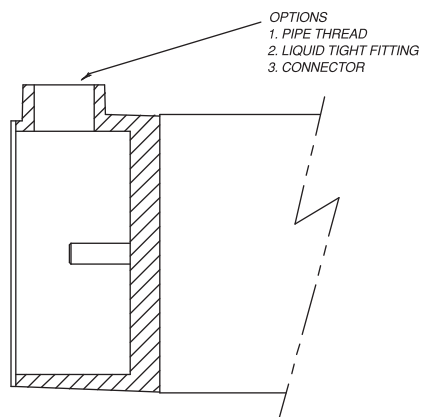


TAPER & THREADS

Shaft Modifications



Hollow Shaft



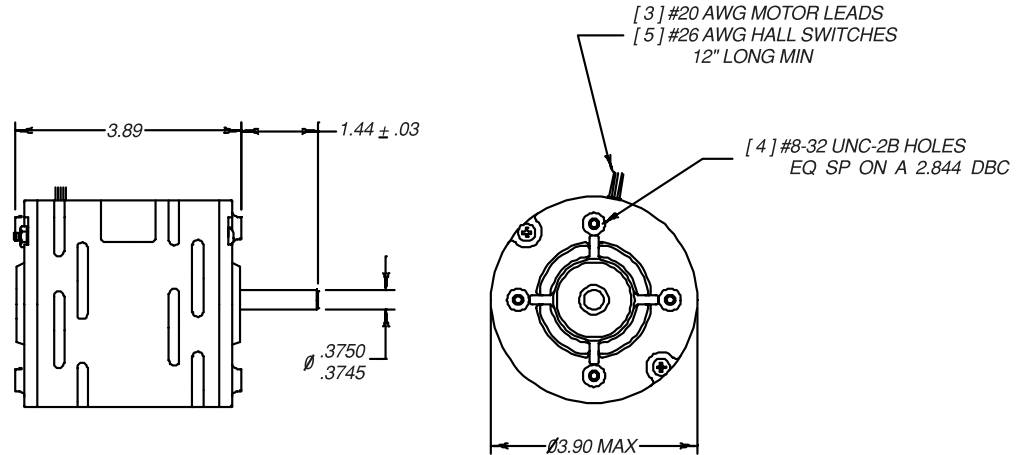
Size 34 Motor with Enclosed Rear End Cap and Connection Options



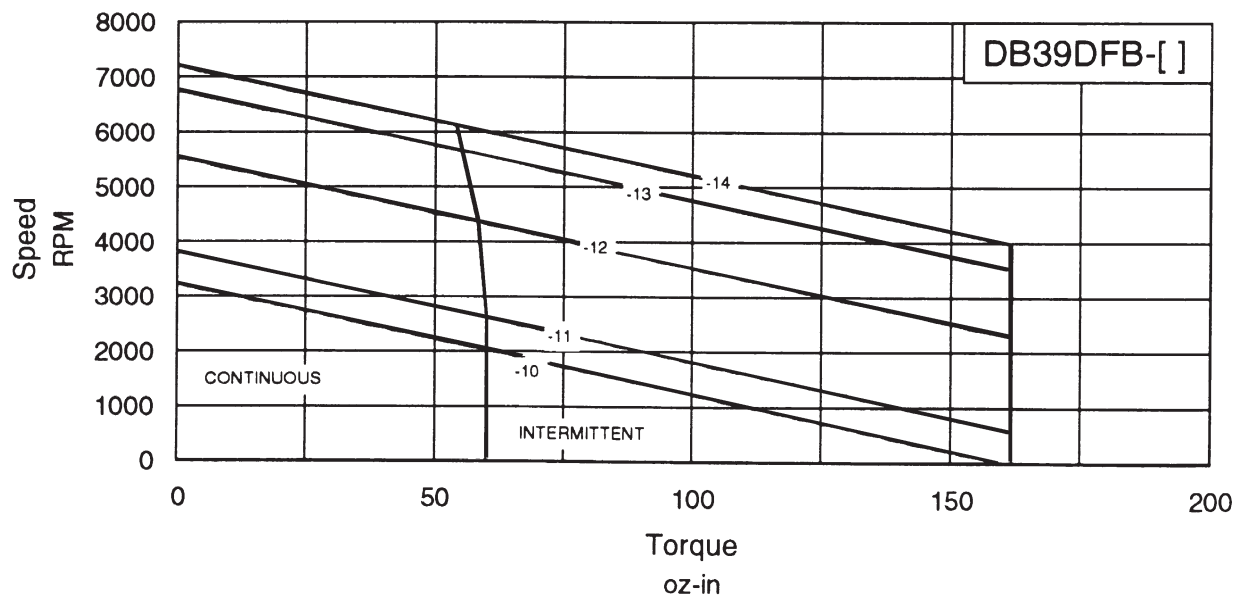
1 Progress Drive • Dover, New Hampshire 03820-5449 USA • (603) 742-3330 • FAX (603) 742-9080
web: www.eadmotors.com

EASTERN AIR DEVICES, INC.

Size 39 Open Frame Brushless DC Motor



	Voltage	Max Speed	Rated Torque	Rated Speed	Rated Current	Peak Torque	Kt	Ke	Km
Motor Part Number	VDC	RPM	oz-in	RPM	Amps.	oz-in	$\frac{\text{oz-in}}{\text{Amp}}$	Volt kRPM	$\frac{\text{oz-in}}{\sqrt{\text{watt}}}$
DB39DFB-10	36	3200	60	2030	4.1	150	15.1	11.2	8.2
DB39DFB-11	48	3800	60	2600	3.7	150	17.1	12.6	8.2
DB39DFB-12	90	5500	58	4370	2.75	150	22.0	16.3	8.2
DB39DFB-13	130	6700	55	5650	2.2	150	25.8	19.1	8.2
DB39DFB-14	160	7200	54	6100	1.9	150	30.2	22.3	8.2



Miniature Brushless DC Motors for Precision Applications

- Precision Engineered for Demanding Applications
- High Speed Ball Bearing Construction Up to 20,000 RPM
- High Temperature, Class F Insulation
- Stainless Steel Shafts and Housings for Medical Applications
- Lightweight Aluminum Housings for Aircraft Applications
- Customized Mechanical Designs
- High Energy Rare Earth Magnets for Maximum Power Density



EAD offers a line of small, custom designed brushless DC motors for demanding applications. EAD has built a reputation for supplying the highest quality miniature brushless DC motors available. These motors are custom designed on an application specific basis to meet the most demanding application requirements. Lightweight aluminum housings and high energy rare earth magnets make these motors ideal for aircraft applications. Modified designs with stainless steel housings are ideal for medical, laboratory, and surgical applications.

Custom Designs Available in the Following Frame Sizes:

<u>Frame Size</u>	<u>Diameter</u>
Size 5	.5"
Size 10	1.0"
Size 15	1.5"
Size 18	1.8"

Contact EAD Engineering for Application Assistance

