



High Performance Slotless Brushless DC Servo Motors

AMETEK slotless brushless motor designs offer many advantages over conventional slotted stator construction. Negligible magnetic cogging provides improved servo efficiency and enables extremely smooth, quiet motion. Low inductance and high current bandwidth provides precise control. Slotless construction also provides excellent winding heat transfer for high thermal efficiency and transient load capacity. These motors are smaller, lighter and more efficient than brush motors with comparable outputs.

AMETEK slotless brushless motors have no teeth to attract the magnets, cogging is eliminated, and the motor produces smooth, quiet rotation. The absence of teeth also provides room for larger and more wire in the windings, which means that slotless motors can generate more torque without a corresponding increase in size. Additionally, the slotless design significantly reduces damping losses. In both slotted and slotless motors, eddy currents are induced as the magnets pass the stator. However, these currents are weaker in slotless motors, because the distance between the stack and the magnets is greater than in slotted motors. This makes slotless brushless motors more efficient than slotted motors.

X - Available Option		C - Consult Factory for Availability		Available Motor Options															
E High Performance Slotless Brushless DC Motors				Encoders		Drives													
Series	Diameter	Torque	RPM Max.	±	E30	Z	48132	48133	48140										
0.375-in. (9.5 mm)	0.375-in. (9.5 mm)	0.3 oz-in. (0.002 Nm)	70,000																
0.5-in. (12.7 mm)	0.5-in. (12.7 mm)	0.9 - 1.1 oz-in. (0.006 - 0.007 Nm)	60,000				X	X											
0.8-in. (20 mm)	0.8-in. (20 mm)	1.8 - 4.3 oz-in. (0.012 - 0.030 Nm)	60,000			C	X	X											
1.1-in. (28 mm)	1.1-in. (28 mm)	6.2 - 14.9 oz-in. (0.043 - 0.105 Nm)	25,000	C	C	C	X	X											

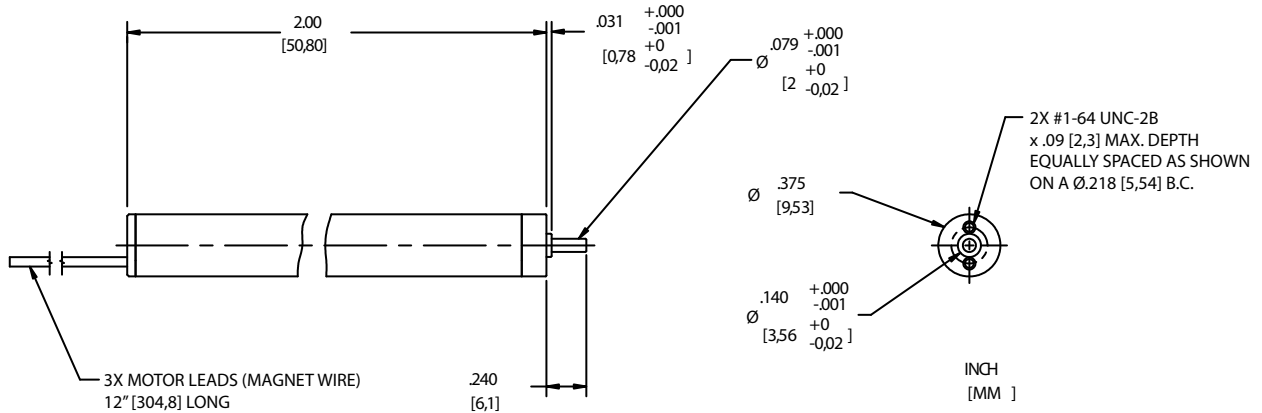


PITTMAN®

High Performance Slotless Brushless DC Motors

0.375" x 2.00" (9.53mm x 50.8mm) Series

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Specification	Units	Part/Model Number
		BI-04-100-0.30
Supply Voltage	VDC	12.0
Continuous Torque	oz-in Nm	0.30 0.0021
Speed @ Cont. Torque	RPM	30000
Current @ Cont. Torque	Amps (A)	0.8
Continuous Output Power	Watts (W)	6
Motor Constant	oz-in/sqrt W Nm/sqrt W	0.21 0.001
Torque Constant	oz-in/A Nm/A	0.41 0.003
Voltage Constant	V/krpm V/rad/s	0.30 0.003
Terminal Resistance	Ohms	3.70
Inductance	mH	4.70
No-Load Current	Amps (A)	0.07
No-Load Speed	RPM	40000
Stall Current	Amps (A)	1.5
Stall Torque	oz-in Nm	1.3 0.0092
Electrical Time Constant	ms	1.27
Mechanical Time Constant	ms	2.9
Thermal Resistance	Celsius/W	43
Max. Winding Temperature	Celsius	130
Rotor Inertia	oz-in-sec ² kg-m ²	9.70E-7 7.0E-9
Weight (Mass)	oz g	0.80 22.7

Performance (24 V Winding)	Standard Features	Connection Chart								
<p>Speed (rpm) vs Torque (oz-in) and Current (A) graph. The graph shows a linear relationship between torque and speed, and a linear relationship between torque and current.</p>	<ul style="list-style-type: none"> Shielded Ball Bearings 2-Pole Rotor Neodymium Magnets 3-Phase Stator Sensorless Stainless Construction 	<table border="1"> <thead> <tr> <th>Label</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>C</td> <td>Motor ΦC</td> </tr> <tr> <td>A</td> <td>Motor ΦA</td> </tr> <tr> <td>B</td> <td>Motor ΦB</td> </tr> </tbody> </table>	Label	Function	C	Motor ΦC	A	Motor ΦA	B	Motor ΦB
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B	Motor ΦB									
	<p>Complementary Products</p> <ul style="list-style-type: none"> Autoclavable versions 	<p>No Hall Sensors</p>								
	<p>Notes</p> <ol style="list-style-type: none"> All values specified at 25°C ambient temperature and without heat sink. Peak values are theoretical and supplied for reference only. Continuous Torque Recorded at max. winding temperature at 25°C ambient, mounted to a 5.0"x5.0"x0.25" heatsink 									

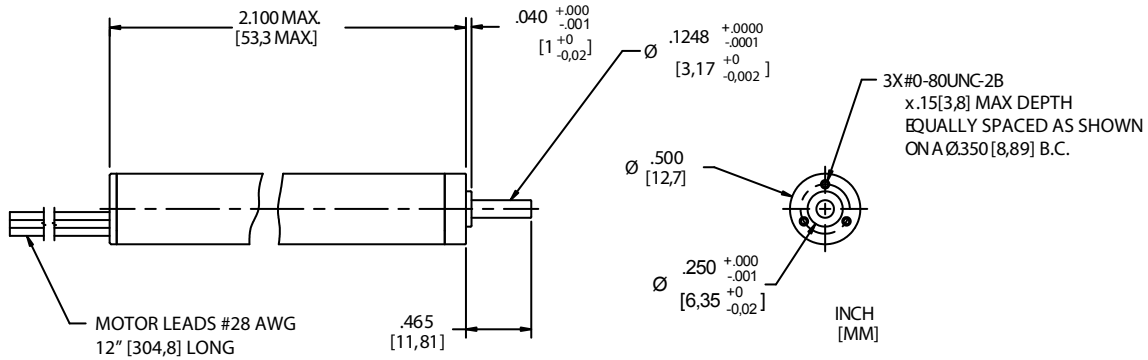
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High Performance Slotless Brushless DC Motors

0.5" x 2.10" (12.7mm x 53.3mm) Series

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Specification	Units	Part/Model Number	
		BI-05-075-0.54	BI-05-075-1.08
Supply Voltage	VDC	24	24
Continuous Torque	oz-in	0.5	0.6
	Nm	0.0035	0.0042
Speed @ Cont. Torque	RPM	31900	8000
Current @ Cont. Torque	Amps (A)	0.73	0.45
Continuous Output Power	Watts (W)	11	4
Motor Constant	oz-in/sqrt W	0.24	0.27
	Nm/sqrt W	0.002	0.002
Torque Constant	oz-in/A	0.73	1.46
	Nm/A	0.005	0.01
Voltage Constant	V/krpm	0.54	1.08
	V/rad/s	0.005	0.01
Terminal Resistance	Ohms	9.0	29.2
Inductance	mH	9.6	38.4
No-Load Current	Amps (A)	0.12	0.03
No-Load Speed	RPM	44450	22220
Stall Current	Amps (A)	2.7	0.8
Stall Torque	oz-in	1.95	1.2
	Nm	0.0138	0.0085
Electrical Time Constant	ms	1.07	1.3
Mechanical Time Constant	ms	10.5	8.5
Thermal Resistance	Celsius/W	18	18
Max. Winding Temperature	Celsius	130	130
Rotor Inertia	oz-in-sec ²	4.60E-6	4.60E-6
	kg-m ²	3.2E-8	3.2E-8
Weight (Mass)	oz	1.5	1.5
	g	42.5	42.5

Performance (BI-05-075-0.54)	Standard Features	Connection Chart																		
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		120° Electrical Spacing																		

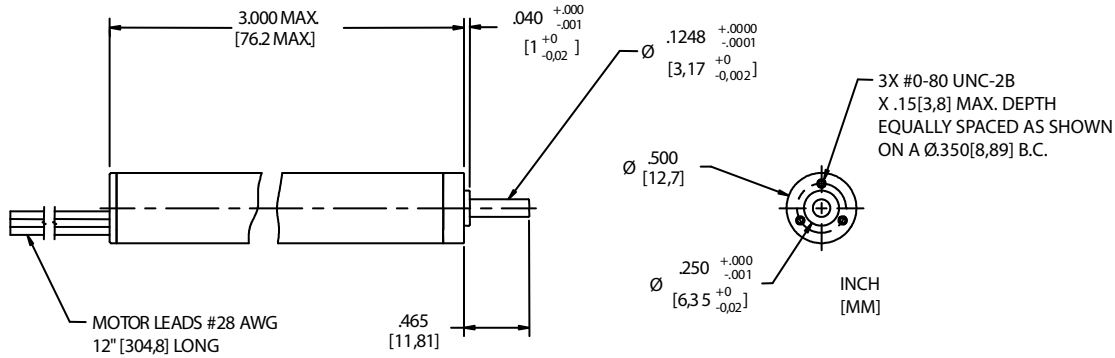
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High Performance Slotless Brushless DC Motors

0.5" x 3.0" (12.7mm x 76.2mm) Series

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Specification	Units	Part/Model Number	
		BI-05-150-0.73	BI-05-150-1.08
Supply Voltage	VDC	24	24.0
Continuous Torque	oz-in	0.90	0.8
	Nm	0.0064	0.0056
Speed @ Cont. Torque	RPM	21000	6250
Current @ Cont. Torque	Amps (A)	1.00	0.60
Continuous Output Power	Watts (W)	13	4
Motor Constant	oz-in/sqrt W	0.34	0.29
	Nm/sqrt W	0.002	0.002
Torque Constant	oz-in/A	0.99	1.46
	Nm/A	0.007	0.01
Voltage Constant	V/krpm	0.73	1.08
	V/rad/s	0.007	0.01
Terminal Resistance	Ohms	8.5	26
Inductance	mH	11	39
No-Load Current	Amps (A)	0.10	0.05
No-Load Speed	RPM	32870	22220
Stall Current	Amps (A)	2.8	0.92
Stall Torque	oz-in	2.79	1.35
	Nm	0.0197	0.0095
Electrical Time Constant	ms	1.29	1.50
Mechanical Time Constant	ms	5.8	8.1
Thermal Resistance	Celsius/W	13	13
Max. Winding Temperature	Celsius	130	130
Rotor Inertia	oz-in-sec ²	4.90E-6	4.90E-6
	kg-m ²	3.5E-8	3.5E-8
Weight (Mass)	oz	2.5	2.5
	g	70.9	70.9

Performance (BI-05-150-0.73)	Standard Features	Connection Chart																		
<p>Speed (rpm) vs Torque (oz-in) and Current (A) graph. The x-axis is Torque (oz-in) from 0 to 3.5. The left y-axis is Speed (rpm) from 0 to 35000. The right y-axis is Current (A) from 0 to 3.5. A solid line represents Speed, and a dashed line represents Current. Both show a linear relationship.</p>	<ul style="list-style-type: none"> Shielded Ball Bearings 4-Pole Rotor Neodymium Magnets 3-Phase Stator Hall Sensor Feedback (120° elec.) Stainless Construction 	<table border="1"> <thead> <tr> <th>Label</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>Black</td> <td>Motor ΦC</td> </tr> <tr> <td>Violet</td> <td>Vcc</td> </tr> <tr> <td>Blue</td> <td>Sensor 3</td> </tr> <tr> <td>Green</td> <td>Sensor 2</td> </tr> <tr> <td>Yellow</td> <td>Sensor 1</td> </tr> <tr> <td>Orange</td> <td>Ground</td> </tr> <tr> <td>Red</td> <td>Motor ΦA</td> </tr> <tr> <td>White</td> <td>Motor ΦB</td> </tr> </tbody> </table>	Label	Function	Black	Motor ΦC	Violet	Vcc	Blue	Sensor 3	Green	Sensor 2	Yellow	Sensor 1	Orange	Ground	Red	Motor ΦA	White	Motor ΦB
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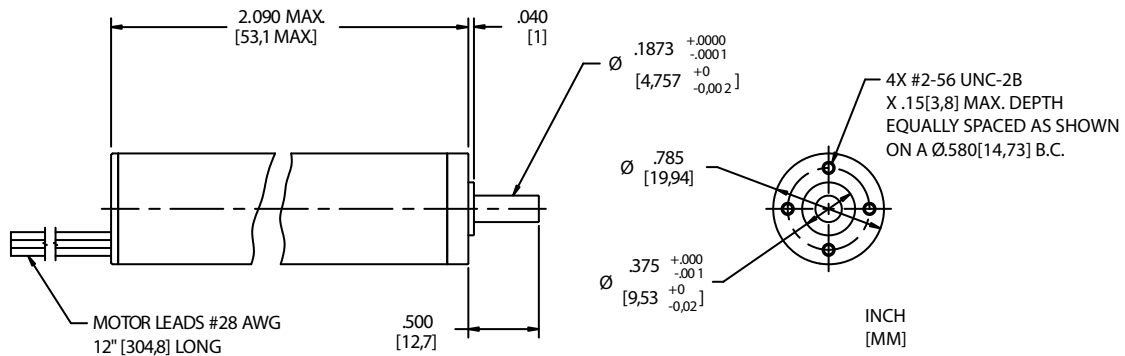
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High Performance Slotless Brushless DC Motors

0.8" x 2.1" (20mm x 53mm) Series

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Specification	Units	Part/Model Number	
		BI-08-075-0.56	BI-08-075-1.1
Supply Voltage	VDC	12	24
Continuous Torque	oz-in	1.8	2.00
	Nm	0.0127	0.0141
Speed @ Cont. Torque	RPM	18400	19400
Current @ Cont. Torque	Amps (A)	2.8	1.60
Continuous Output Power	Watts (W)	25	29
Motor Constant	oz-in/sqrt W	0.98	1.10
	Nm/sqrt W	0.007	0.008
Torque Constant	oz-in/A	0.757	1.49
	Nm/A	0.005	0.011
Voltage Constant	V/krpm	0.56	1.10
	V/rad/s	0.005	0.011
Terminal Resistance	Ohms	0.60	1.80
Inductance	mH	0.30	0.90
No-Load Current	Amps (A)	0.40	0.05
No-Load Speed	RPM	21430	21800
Stall Current	Amps (A)	20	13
Stall Torque	oz-in	15	20
	Nm	0.1059	0.1412
Electrical Time Constant	ms	0.50	0.50
Mechanical Time Constant	ms	5.6	4.30
Thermal Resistance	Celsius/W	14	14
Max. Winding Temperature	Celsius	130	130
Rotor Inertia	oz-in-sec ²	3.93E-5	3.93E-5
	kg-m ²	2.78E-7	2.78E-7
Weight (Mass)	oz	3.0	3.0
	g	85	85

Performance (BI-08-075-0.56)	Standard Features	Connection Chart																		
<p>Speed (rpm) vs Torque (oz-in) and Current (A) graph. The x-axis is Torque (oz-in) from 0 to 20. The left y-axis is Speed (rpm) from 0 to 30000. The right y-axis is Current (A) from 0 to 30. A solid line represents Speed, and a dashed line represents Current. Both show a linear decrease as torque increases.</p>	<ul style="list-style-type: none"> Shielded Ball Bearings 4-Pole Rotor Neodymium Magnets 3-Phase Stator Hall Sensor Feedback (120° elec.) Stainless Construction 	<table border="1"> <thead> <tr> <th>Label</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>Black</td> <td>Motor ΦC</td> </tr> <tr> <td>Violet</td> <td>Vcc</td> </tr> <tr> <td>Blue</td> <td>Sensor 3</td> </tr> <tr> <td>Green</td> <td>Sensor 2</td> </tr> <tr> <td>Yellow</td> <td>Sensor 1</td> </tr> <tr> <td>Orange</td> <td>Ground</td> </tr> <tr> <td>Red</td> <td>Motor ΦA</td> </tr> <tr> <td>White</td> <td>Motor ΦB</td> </tr> </tbody> </table>	Label	Function	Black	Motor ΦC	Violet	Vcc	Blue	Sensor 3	Green	Sensor 2	Yellow	Sensor 1	Orange	Ground	Red	Motor ΦA	White	Motor ΦB
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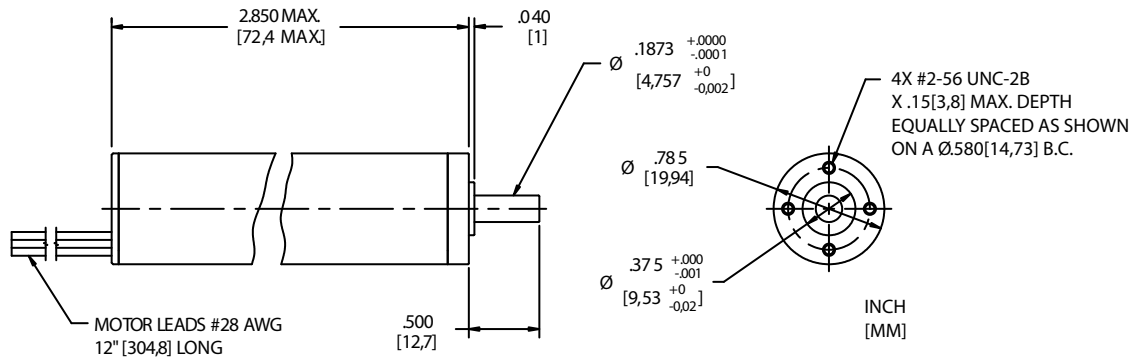
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High Performance Slotless Brushless DC Motors

0.8" x 2.9" (20mm x 74mm) Series

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Specification	Units	Part/Model Number	
		BI-08-150-0.72	BI-08-150-2.00
Supply Voltage	VDC	12	24
Continuous Torque	oz-in	3.10	3.9
	Nm	0.0219	0.0275
Speed @ Cont. Torque	RPM	14100	9050
Current @ Cont. Torque	Amps (A)	3.70	1.60
Continuous Output Power	Watts (W)	33	26
Motor Constant	oz-in/sqrt W	1.4	1.5
	Nm/sqrt W	0.01	0.011
Torque Constant	oz-in/A	0.97	2.70
	Nm/A	0.007	0.019
Voltage Constant	V/krpm	0.72	2.0
	V/rad/s	0.007	0.019
Terminal Resistance	Ohms	0.48	3.2
Inductance	mH	0.34	2.7
No-Load Current	Amps (A)	0.50	0.15
No-Load Speed	RPM	16670	12000
Stall Current	Amps (A)	25	7.5
Stall Torque	oz-in	24.3	20.3
	Nm	0.1716	0.1433
Electrical Time Constant	ms	0.71	0.84
Mechanical Time Constant	ms	4.2	3.7
Thermal Resistance	Celsius/W	11	11
Max. Winding Temperature	Celsius	130	130
Rotor Inertia	oz-in-sec ²	6.20E-5	6.20E-5
	kg-m ²	4.38E-7	4.38E-7
Weight (Mass)	oz	5.0	5.0
	g	141.7	141.7

Performance (BI-08-150-0.72)	Standard Features	Connection Chart																		
<p>Speed (rpm) vs Torque (oz-in) and Current (A) graph. The x-axis is Torque (oz-in) from 0 to 30. The left y-axis is Speed (rpm) from 0 to 17500. The right y-axis is Current (A) from 0 to 35. A solid line represents Speed, and a dashed line represents Current. Both show a linear decrease as torque increases.</p>	<ul style="list-style-type: none"> Shielded Ball Bearings 4-Pole Rotor Neodymium Magnets 3-Phase Stator Hall Sensor Feedback (120° elec.) Stainless Construction 	<table border="1"> <thead> <tr> <th>Label</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>Black</td> <td>Motor ΦC</td> </tr> <tr> <td>Violet</td> <td>Vcc</td> </tr> <tr> <td>Blue</td> <td>Sensor 3</td> </tr> <tr> <td>Green</td> <td>Sensor 2</td> </tr> <tr> <td>Yellow</td> <td>Sensor 1</td> </tr> <tr> <td>Orange</td> <td>Ground</td> </tr> <tr> <td>Red</td> <td>Motor ΦA</td> </tr> <tr> <td>White</td> <td>Motor ΦB</td> </tr> </tbody> </table>	Label	Function	Black	Motor ΦC	Violet	Vcc	Blue	Sensor 3	Green	Sensor 2	Yellow	Sensor 1	Orange	Ground	Red	Motor ΦA	White	Motor ΦB
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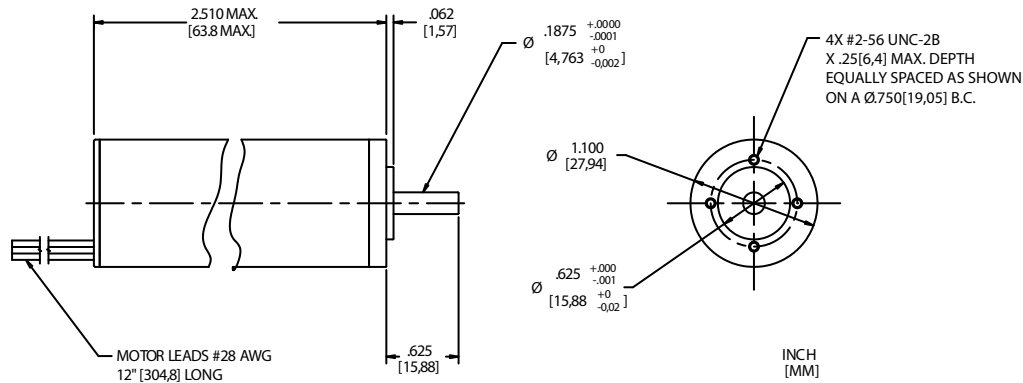
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1.10" x 2.5" (28mm x 64mm) Series

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Specification	Units	Part/Model Number	
		150958-50 / BI-11-075-0.97	150957-00 / BI-11-075-2.20
Supply Voltage	VDC	12.0	24.0
Continuous Torque	oz-in	6.8	6.2
	Nm	0.048	0.0438
Speed @ Cont. Torque	RPM	8400	8500
Current @ Cont. Torque	Amps (A)	4.70	2.30
Continuous Output Power	Watts (W)	42	39
Motor Constant	oz-in/sqrt W	2.07	2.16
	Nm/sqrt W	0.015	0.015
Torque Constant	oz-in/A	1.31	2.97
	Nm/A	0.009	0.021
Voltage Constant	V/krpm	0.97	2.20
	V/rad/s	0.009	0.021
Terminal Resistance	Ohms	0.40	1.90
Inductance	mH	0.13	0.50
No-Load Current	Amps (A)	0.60	0.10
No-Load Speed	RPM	12370	10900
Stall Current	Amps (A)	30.0	12.60
Stall Torque	oz-in	39.0	38
	Nm	0.2753	0.2683
Electrical Time Constant	ms	0.325	0.26
Mechanical Time Constant	ms	7.50	6.9
Thermal Resistance	Celsius/W	8.60	8.6
Max. Winding Temperature	Celsius	130	130
Rotor Inertia	oz-in-sec ²	2.38E-4	2.38E-4
	kg-m ²	1.68E-6	1.68E-6
Weight (Mass)	oz	7.5	7.5
	g	212.6	212.6

Performance (BI-11-075-097)	Standard Features	Connection Chart																		
<p>Speed (rpm) vs Torque (oz-in) and Current (A) graph. The x-axis is Torque (oz-in) from 0 to 40. The left y-axis is Speed (rpm) from 0 to 15000. The right y-axis is Current (A) from 0 to 30. A solid line represents Speed, and a dashed line represents Current. Both show a linear decrease as torque increases.</p>	<ul style="list-style-type: none"> Shielded Ball Bearings 4-Pole Rotor Neodymium Magnets 3-Phase Stator Hall Sensor Feedback (120° elec.) Stainless Construction 	<table border="1"> <thead> <tr> <th>Label</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>Black</td> <td>Motor ΦC</td> </tr> <tr> <td>Violet</td> <td>Vcc</td> </tr> <tr> <td>Blue</td> <td>Sensor 3</td> </tr> <tr> <td>Green</td> <td>Sensor 2</td> </tr> <tr> <td>Yellow</td> <td>Sensor 1</td> </tr> <tr> <td>Orange</td> <td>Ground</td> </tr> <tr> <td>Red</td> <td>Motor ΦA</td> </tr> <tr> <td>White</td> <td>Motor ΦB</td> </tr> </tbody> </table>	Label	Function	Black	Motor ΦC	Violet	Vcc	Blue	Sensor 3	Green	Sensor 2	Yellow	Sensor 1	Orange	Ground	Red	Motor ΦA	White	Motor ΦB
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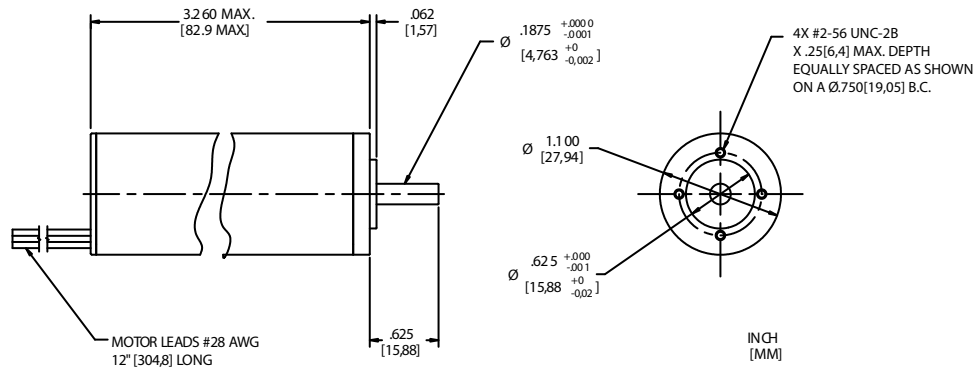
This document is for informational purposes only and should not be considered as a binding description of the products or their performance in all applications. The performance data on this page depicts typical performance under controlled laboratory conditions. Actual performance will vary depending on the operating environment and application. AMETEK reserves the right to revise its products without notification. The above characteristics represent standard products. For products designed to meet specific applications, contact PITTMAN Motor Sales Department.

PITTMAN PRODUCTS
 343 Godshall Drive, Harleysville, PA 19438
 USA: +1 267 933 2105 - Europe: +33 240928751 - Asia: +86 21 5763 1258
www.pittman-motors.com

High Performance Slotless Brushless DC Motors

1.10" x 3.26" (28mm x 83mm) Series

PITTMAN®



Specification	Units	Part/Model Number	
		150956-50	150955-50
Supply Voltage	VDC	12.0	24.0
Continuous Torque	oz-in	11.4	11.3
	Nm	0.0805	0.0798
Speed @ Cont. Torque	RPM	9400	5300
Current @ Cont. Torque	Amps (A)	8.4	2.50
Continuous Output Power	Watts (W)	79	44
Motor Constant	oz-in/sqrt W	2.93	3.53
	Nm/sqrt W	0.021	0.025
Torque Constant	oz-in/A	1.31	4.73
	Nm/A	0.009	0.033
Voltage Constant	V/krpm	0.97	3.50
	V/rad/s	0.009	0.033
Terminal Resistance	Ohms	0.20	1.80
Inductance	mH	0.07	0.61
No-Load Current	Amps (A)	0.60	0.03
No-Load Speed	RPM	12370	6860
Stall Current	Amps (A)	60.0	13.0
Stall Torque	oz-in	79.0	63.0
	Nm	0.5577	0.4448
Electrical Time Constant	ms	0.325	0.34
Mechanical Time Constant	ms	5.9	4.0
Thermal Resistance	Celsius/W	6.5	6.5
Max. Winding Temperature	Celsius	130	130
Rotor Inertia	oz-in-sec ²	3.73E-4	3.73E-4
	kg-m ²	2.63E-6	2.63E-6
Weight (Mass)	oz	10.0	10.0
	g	283.5	283.5

Performance (150956-50)	Standard Features	Connection Chart																		
<p>Speed (rpm) vs Torque (oz-in) and Current (A) graph. The x-axis represents Torque (oz-in) from 0 to 80. The left y-axis represents Speed (rpm) from 0 to 15000. The right y-axis represents Current (A) from 0 to 60. A solid black line shows Speed decreasing from ~12000 rpm at 0 torque to 0 rpm at 80 oz-in. A dashed blue line shows Current increasing from 0 A at 0 torque to 60 A at 80 oz-in.</p>	<ul style="list-style-type: none"> Shielded Ball Bearings 4-Pole Rotor Neodymium Magnets 3-Phase Stator Hall Sensor Feedback (120° elec.) Stainless Construction 	<table border="1"> <thead> <tr> <th>Label</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>Black</td> <td>Motor ΦC</td> </tr> <tr> <td>Violet</td> <td>Vcc</td> </tr> <tr> <td>Blue</td> <td>Sensor 3</td> </tr> <tr> <td>Green</td> <td>Sensor 2</td> </tr> <tr> <td>Yellow</td> <td>Sensor 1</td> </tr> <tr> <td>Orange</td> <td>Ground</td> </tr> <tr> <td>Red</td> <td>Motor ΦA</td> </tr> <tr> <td>White</td> <td>Motor ΦB</td> </tr> </tbody> </table>	Label	Function	Black	Motor ΦC	Violet	Vcc	Blue	Sensor 3	Green	Sensor 2	Yellow	Sensor 1	Orange	Ground	Red	Motor ΦA	White	Motor ΦB
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