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S-SERIES MOTORS

DC Brushless, Frameless Torque Motors

- Slotless, brushless ring motors with high torque output and zero cogging
- Frameless design for easy integration into OEM machines
- Various winding and magnet options available
- Includes Hall board for six-step referencing of sine commutation



The S-series motors are Aerotech's high-performance brushless, frameless torque motors. The motors feature neodymium iron boron magnets for maximum torque and acceleration in a compact stator assembly.

High-Performance Design

The S-series motors utilize a slotless stator design and high pole-count rotor to provide zero cogging for exceptional velocity stability. The laminations contain no slots, eliminating torque ripple that

produces velocity disturbance. The eighteen high-energy magnet poles and slotless stator design provide superior smoothness and velocity control. The S-series motors are well-suited for direct-drive applications such as printing and scanning where velocity ripple cannot be tolerated.

Wide Range of Output Torque and Sizes

The S-series slotless motors cover a wide range of torque and package sizes. Continuous torque ranges from 0.42 N-m (3.5 lb-in) to 20.0 N-m (177 lb-in). Peak torque ranges from 1.68 N-m (238 oz-in) to 80.0 N-m (708 lb-in). The open design of the S-series motors allows for custom winding or mechanical variations to meet any application need.

The S-series motors are designed for applications in OEM machines. The S-50 (50-mm diameter) motor is ideal for small, tight spaces such as spindles or small feed rolls. The S-180 (180-mm diameter) motor can provide up to 20 N-m (708 lb-in) of peak torque that can accelerate large print drums or precision positioning tables.

Easy Machine Integration

All S-series motors are supplied as two pieces – a slotless stator coil and permanent magnet rotor. The stator is

APPLICATION




S-series motor used in Aerotech's high-performance ADR direct-drive rotary stage.

AEROTECH ADVANTAGES



S-series motors with matched BA amplifiers and UNIDEX® series controllers provide a single-source solution.

a standard 3-phase coil assembly with Hall-effect devices. They can be driven using a simple six-step or sinusoidal commutation algorithm. Aerotech's BA series amplifiers are performance-matched to the S-series motors for easy integration. The hollow rotor mounts directly to a drive axis with no gearing required.

Custom variations can be engineered to your requirements with minimal lead time. 



S-Series Frameless Motors

MOTOR MODEL	UNITS	S-50-52	S-50-86	S-76-85	S-76-149
PERFORMANCE SPECIFICATIONS¹					
Winding Designation		-A	-A	-A -B	-A -B
Stall Torque, Continuous	N-m	0.42	0.69	1.96	3.29
Rated Speed	rpm	4,000	3,000	3,000 4,000	2,000 1,500
Power Output, Continuous	W	175	217	600 780	670 520
Maximum Mechanical Speed	rpm	12,000	12,000	15,000	15,000
Continuous Torque at Rated Speed	N-m	0.42	0.69	1.90 1.86	3.20 3.25
Peak Torque	N-m	1.68	2.76	7.84	13.2
Continuous Current, Stall	Amp _{pk} Amp _{rms}	2.6 1.8	2.2 1.5	3.7 5.5 2.6 3.9	4.7 3.1 3.3 2.2
Peak Current, Stall	A _{pk}	10.4	8.7	11.0 16.5	14.0 9.3
Heat Dissipation	W	47.4	52.5	70.0	88.0
Thermal Resistance	°C/W	1.59	1.43	1.07	0.85
Motor Constant ²	N-m/√W	0.061	0.095	0.23	0.35
ELECTRICAL SPECIFICATIONS²					
Cold Resistance, line-line	ohms	7.2	11.4	5.7 2.5	4.44 10
Inductance, line-line	mH	1.1	2.2	1.1 0.5	0.87 1.95
Torque Constant	N-m/Amp _{pk} N-m/Amp _{rms}	0.16 0.23	0.32 0.45	0.55 0.37 0.78 0.52	0.73 1.10 1.03 1.56
BEMF Const., line-line, max	V/krpm	19.4	38.3	66.5 44.0	88.0 132.0
BEMF, line-line, max, rated speed	V	77.7	115.0	200.0 177.0	176.0 198.0
Cogging Torque	N-m	0	0	0	0
Ripple Torque, Linear Sine-Wave Drive	%	0.05	0.05	0.06	0.06
Number of Poles	P	8	8	14	14
MECHANICAL SPECIFICATIONS					
Frameless Motor Weight	kg	0.5	0.9	2.2	4.3
Frameless Rotor Inertia	kg-m ²	0.17x10 ⁻⁴	0.34x10 ⁻⁴	0.00042	0.00083
Outside Diameter, Frameless Motor	mm	50.80	50.80	76.00	76.00
Inside Shaft Diameter, Frameless Motor	mm	9.54	9.54	12.7	12.7
Length of Winding, Frameless Motor	mm	51.8	85.8	84.8	149.0

1. Performance depends upon heat sink configuration, system cooling conditions, and ambient temperature.

Values with housed motor mounted on 250mm x 250mm x 6mm aluminum sink, ambient 25°C.

2. Not dependent upon heat sinks, system cooling conditions, or ambient temperature.

3. All Aerotech amplifiers are rated Amp_{pk}; use torque constant in N-m/Amp_{pk} when sizing.

4. All values are ±10%. Winding temperature 100°C.



Aerotech has extensive in-house design and manufacturing capabilities. Custom configurations are available for all products.



S-Series Frameless Motor Specifications

MOTOR MODEL	UNITS	S-130-39		S-130-60		S-130-81		S-180-44		S-180-69		S-180-94	
PERFORMANCE SPECIFICATIONS¹													
Winding Designation		-A	-B	-A	-B	-A	-B	-A	-B	-A	-B	-A	-B
Stall Torque, Continuous	N-m	2.92		5.20		7.45		7.46		13.90		20.00	
Rated Speed	rpm	2,000	4,000	1,000	2,000	750	1,500	500	1,000	500	1,000	250	500
Power Output, Continuous	W	585	863	540	976	565	1,070	388	761	718	1,350	522	1000
Maximum Mechanical Speed	rpm	6,000		6,000		6,000		6,000		6,000		6,000	
Continuous Torque at Rated Speed	N-m	2.80	2.10	5.20	4.70	7.20	6.80	7.41	7.27	13.7	12.9	19.9	19.2
Peak Torque	N-m	11.7		21.2		29.8		30.0		55.6		80.0	
Continuous Current, Stall	Amp _{pk}	3.8	7.6	3.4	6.7	3.2	6.4	2.7	5.3	5.1	10.2	4.9	10.0
	Amp _{rms}	2.7	5.4	2.4	4.8	2.3	4.5	1.9	3.8	3.6	7.2	3.5	7.1
Peak Current, Stall	Amp _{pk}	15.2	30.4	13.4	26.9	12.9	25.8	10.7	21.4	20.3	40.6	19.7	39.5
Heat Dissipation	W	82.0		92.0		103.0		90.6		112.0		134.0	
Thermal Resistance	°C/W	0.91		0.81		0.73		0.83		0.67		0.56	
Motor Constant ²	N-m/√W	0.322		0.542		0.738		0.784		1.31		1.73	
ELECTRICAL SPECIFICATIONS²													
Cold Resistance, line-line	ohms	5.6	1.4	7.8	1.95	10.1	2.52	12.8	3.21	4.42	1.1	5.63	1.4
Inductance, line-line	mH	1.7	0.42	1.8	0.45	2.8	0.7	3.4	0.85	1.7	0.425	2.6	0.65
Torque Constant	N-m/Amp _{pk}	0.77	0.38	1.53	0.76	2.29	1.15	2.77	1.39	2.72	1.36	4.05	2.02
	N-m/Amp _{rms}	1.09	0.54	2.17	1.08	3.24	1.62	3.92	1.96	3.84	1.92	5.72	2.86
BEMF Const., line-line, max	V/krpm	92.1	46.0	187.0	94.0	277.0	138.0	335.0	168.0	329.0	164.0	490.0	245.0
BEMF, line-line, max, rated speed	V	184		187		208		168		164		122	
Cogging Torque	N-m	0		0		0		0		0		0	
Ripple Torque, Linear Sine-Wave Drive	%	0.06		0.06		0.06		0.06		0.06		0.06	
Number of Poles	P	18		18		18		18		18		18	
MECHANICAL SPECIFICATIONS													
Frameless Motor Weight	kg	1.9		3.6		5.3		4.3		8.1		11.9	
Frameless Rotor Inertia	kg-m ²	0.0016		0.003		0.0047		0.0074		0.0148		0.022	
Outside Diameter, Frameless Motor	mm	128.93		128.93		128.93		180.34		180.34		180.34	
Inside Shaft Diameter, Frameless Motor	mm	50.83		50.83		50.83		86.59		86.59		86.59	
Length of Winding, Frameless Motor	mm	38.7		59.7		80.7		43.2		68.2		93.2	

- Performance depends upon heat sink configuration, system cooling conditions, and ambient temperature. Values with housed motor mounted on 250mm x 250mm x 6mm aluminum sink, ambient 25°C.
- Not dependent upon heat sinks, system cooling conditions, or ambient temperature.
- All Aerotech amplifiers are rated Amp_{pk}; use torque constant in N-m/Amp_{pk} when sizing.
- All values are ±10%. Winding temperature 100°C.



S-Series Frameless Motor Specifications

MOTOR MODEL	UNITS	S-240-43		S-240-63		S-240-83	
PERFORMANCE SPECIFICATIONS¹							
Winding Designation		-A	-B	-A	-B	-A	-B
Stall Torque, Continuous	N-m	13.3		24.9		36.5	
Rated Speed	rpm	600	1200	250	500	200	400
Power Output, Continuous	W	835	1670	650	1300	764	1528
Maximum Mechanical Speed	rpm	3000		3000		3000	
Continuous Torque at Rated Speed	N-m	13.3		24.9		36.5	
Peak Torque	N-m	53.2		100		146	
Continuous Current, Stall	Amp _{pk}	6.2	12.4	5.9	11.8	5.8	11.6
	Amp _{rms}	4.4	8.8	4.2	8.4	4.1	8.2
Peak Current, Stall	A _{pk}	24.8	49.6	23.7	47.4	23.1	46.2
Heat Dissipation	W	160		198		240	
Thermal Resistance	°C/W	0.47		0.38		0.31	
Motor Constant ²	N-m/√W	1.05		1.77		2.35	
ELECTRICAL SPECIFICATIONS²							
Cold Resistance, line-line	ohms	4.3	1.08	5.8	1.45	7.2	1.8
Inductance, line-line	mH	2.15	0.54	2.9	0.72	4.3	1.08
Torque Constant	N-m/Amp _{pk}	2.16	1.08	4.18	2.09	6.27	3.13
	N-m/Amp _{rms}	3.04	1.52	5.9	2.95	8.84	4.42
BEMF Const., line-line, max	V/krpm	260	130	508	254	756	378
BEMF, line-line, max, rated speed	V	156		127		151	
Cogging Torque	N-m	0		0		0	
Ripple Torque, Linear Sine-Wave Drive	%	0.06		0.06		0.06	
Number of Poles	P	26		26		26	
MECHANICAL SPECIFICATIONS							
Frameless Motor Weight	kg	5.8		11		16.2	
Frameless Rotor Inertia	kg-m ²	0.023		0.045		0.07	
Outside Diameter, Frameless Motor	mm	239.2		239.2		239.2	
Inside Shaft Diameter, Frameless Motor	mm	120.6		120.6		120.6	
Length of Winding, Frameless Motor	mm	42.7		62.7		82.7	

1. Performance depends upon heat sink configuration, system cooling conditions, and ambient temperature.

Values with housed motor mounted on 330 mm x 330 mm x 13 mm aluminum sink, ambient 25°C.

2. Not dependent upon heat sinks, system cooling conditions, or ambient temperature.

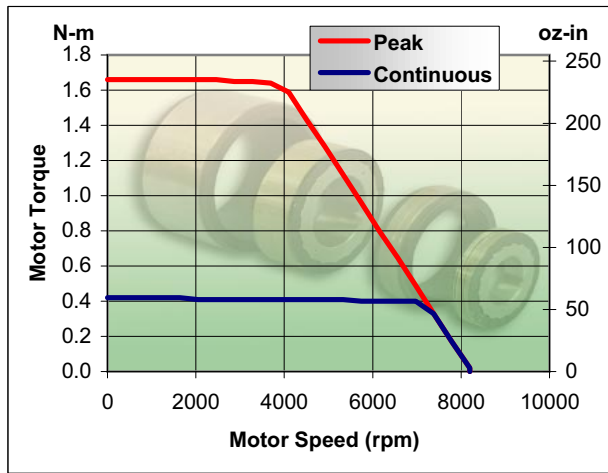
3. All Aerotech amplifiers are rated Amp_{pk}; use torque constant in N-m/Amp_{pk} when sizing.

4. All values are ±10%. Winding temperature 100°C.

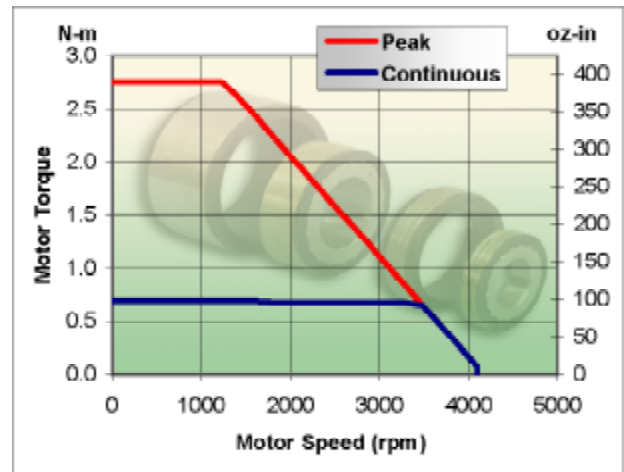


S-Series Frameless Motor Performance

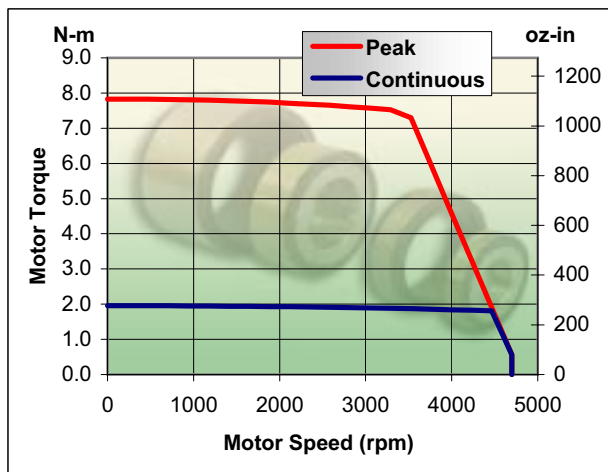
S-50-52



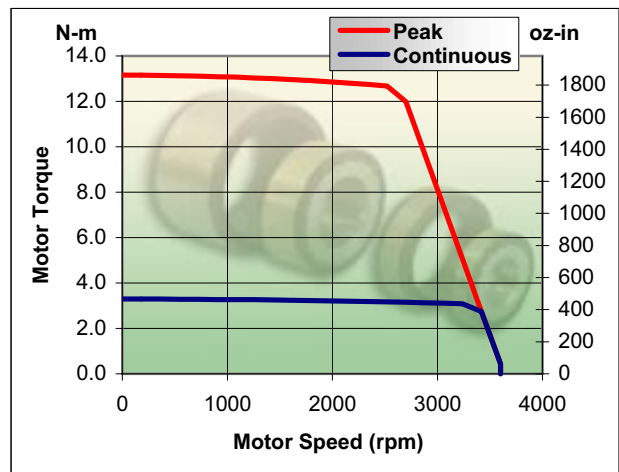
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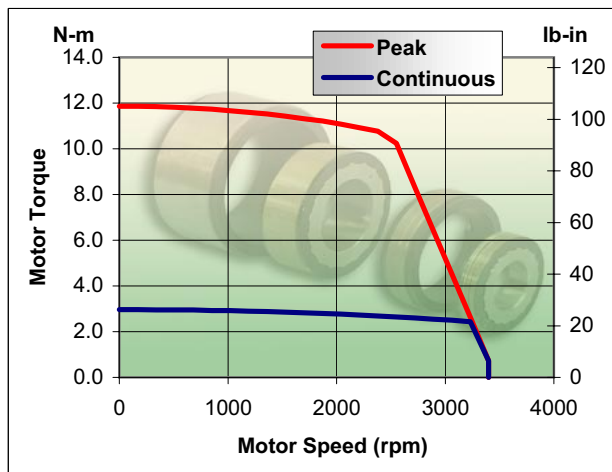
S-76-85



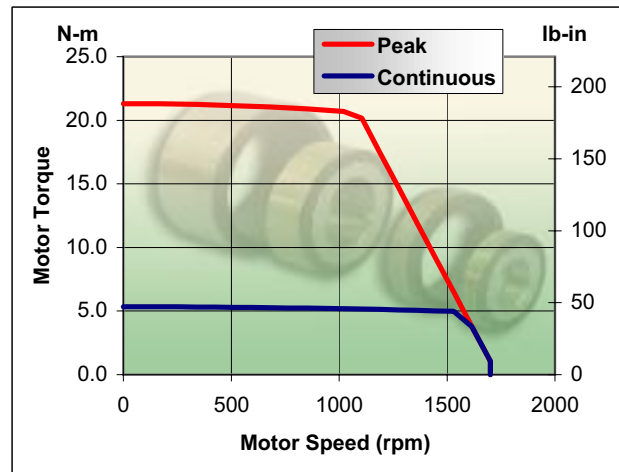
S-76-149



S-130-39



S-130-60

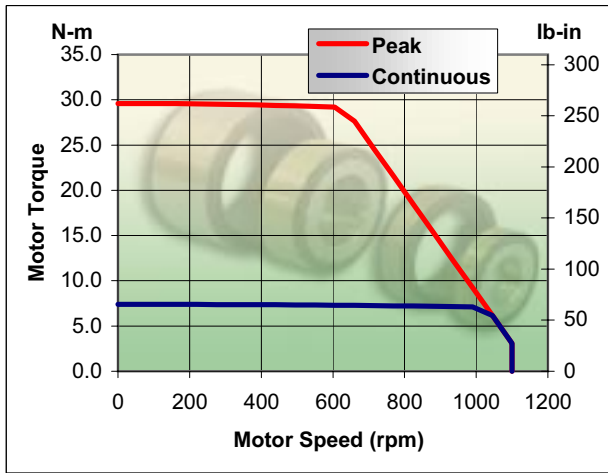


ROTARY MOTORS

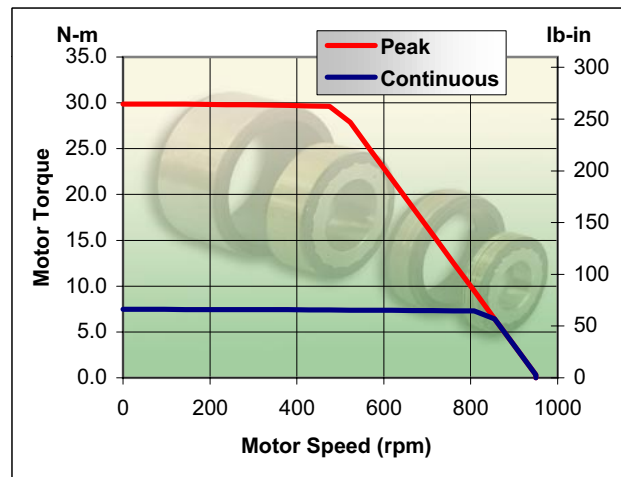


S-Series Frameless Motor Performance

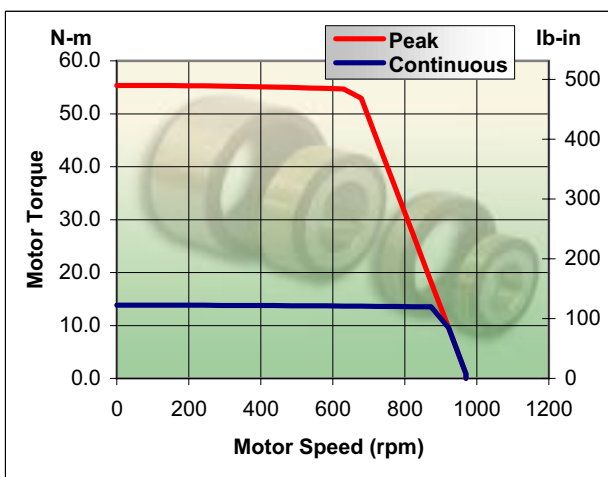
S-130-81



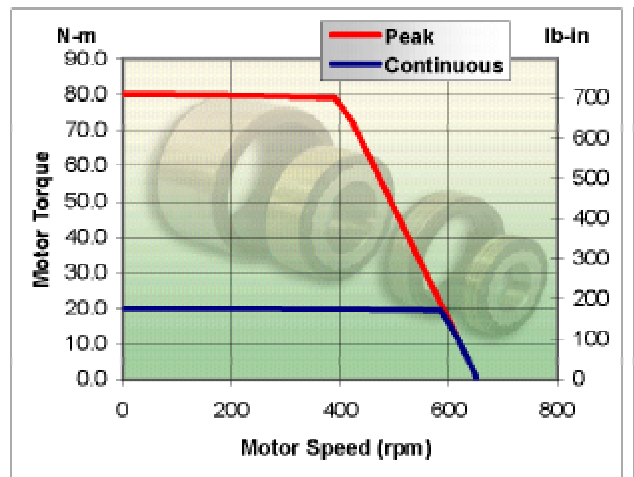
S-180-44



S-180-69



S-180-94

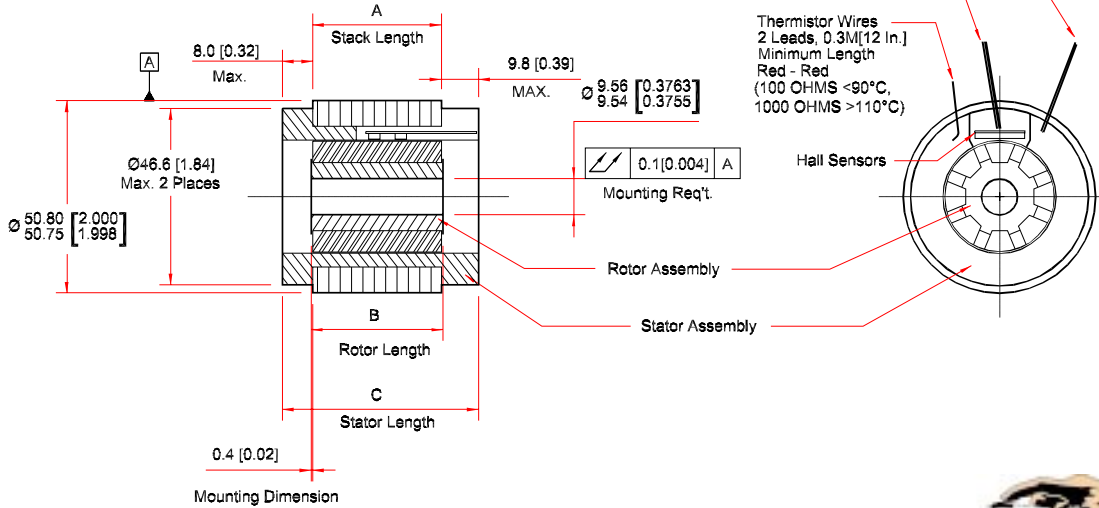


S-Series Frameless Motor Dimensions

S-50

Dimensions - millimeters [inches]

Model No.	A	B	C
S-50-52	34.0[1.34]	34.8[1.37]	51.8[2.04]
S-50-86	67.0[2.64]	68.8[2.71]	84.8[3.34]

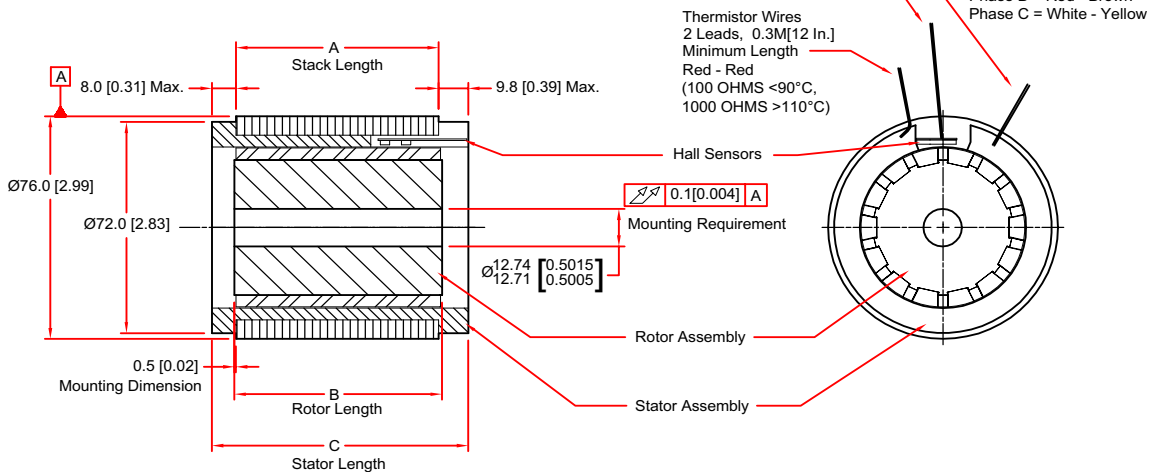


S-76

S-76

Dimensions - millimeters [inches]

Model No.	A	B	C
S-76-85	67.0[2.64]	68.6[2.70]	84.8[3.34]
S-76-149	131.0[5.16]	135.0[5.31]	149.0[5.87]

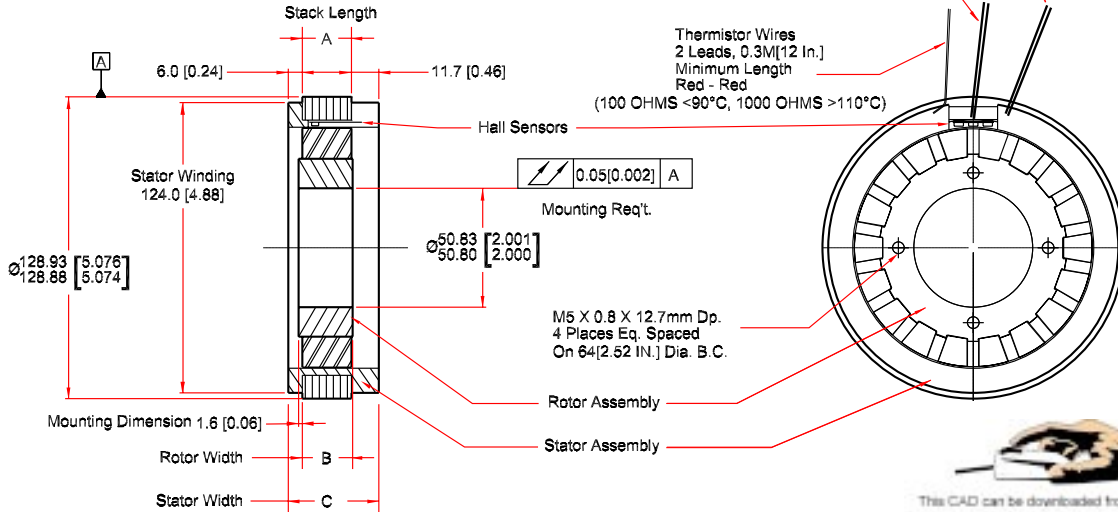


S-Series Frameless Motors

S-130

Dimensions - millimeters [inches]

Model No.	A	B	C
S-130-39	21.0 0.82"	23.1 0.91"	38.7 1.52"
S-130-60	42.0 1.65"	44.1 1.74"	59.7 2.35"
S-130-81	63.0 2.48"	65.1 2.56"	80.7 3.18"
S-130-102	84.0 3.30"	86.1 3.39"	101.7 4.00"
S-130-123	105.0 4.13"	107.1 4.22"	122.7 4.83"

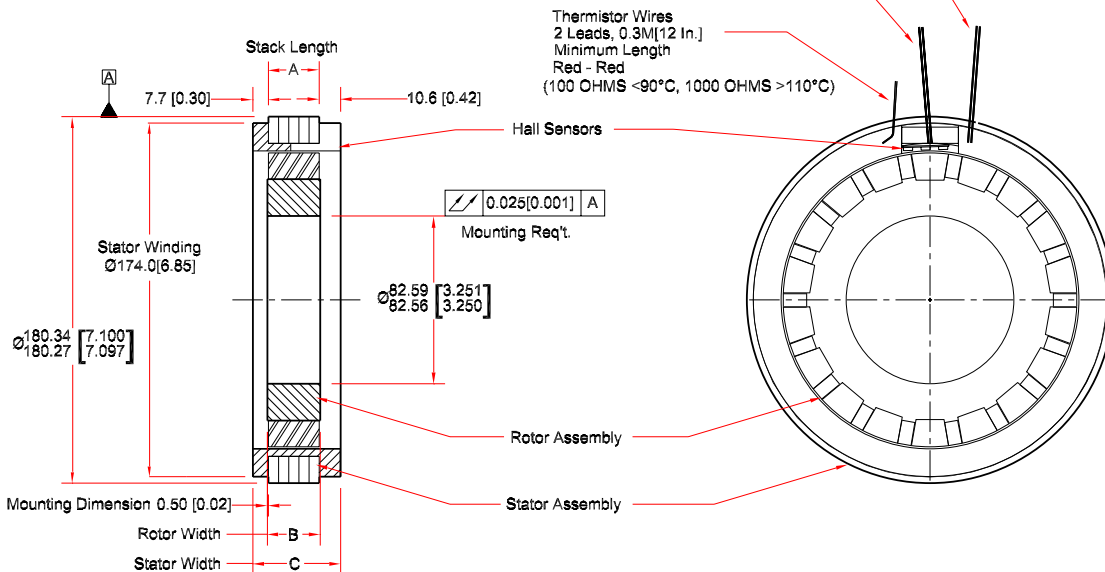


This CAD can be downloaded from our web site

S-180

Dimensions - millimeters [inches]

Model No.	A	B	C
S-180-44	25.0 0.98"	26.0 1.02"	43.2 1.70"
S-180-69	50.0 1.97"	51.0 2.01"	68.2 2.69"
S-180-94	75.0 2.95"	76.0 2.99"	93.2 3.67"



This CAD can be downloaded from our web site



S-Series Frameless Motor Ordering Information

QUICK SELECTION GUIDE

MODEL	CONTINUOUS TORQUE (N-m)	PEAK TORQUE (N-m)	RATED SPEED (rpm)	OUTSIDE DIAMETER (mm)	INSIDE DIAMETER (mm)	OVERALL LENGTH (mm)
S-50-52-A	0.42	0.69	4,000	50.8	9.6	51.8
S-50-86-A	1.68	2.76	3,000	50.8	9.6	85.8
S-76-85-A	1.96	7.84	3,000	76.0	12.7	84.8
S-76-149-A	3.29	13.2	2,000	76.0	12.7	149.0
S-130-39-A	2.92	11.7	2,000	128.9	50.8	38.7
S-130-60-A	5.2	21.2	1,000	128.9	50.8	59.7
S-130-81-A	7.45	29.8	750	128.9	50.8	80.7
S-180-44-A	7.46	30.0	500	180.3	86.4	43.2
S-180-69-A	13.9	55.6	500	180.3	86.4	68.2
S-180-94-A	20.0	80.0	250	180.3	86.4	93.2

PART NUMBER AND ORDERING EXAMPLE: S-130-60-A

S	-130	-60	-A
Motor Series	Motor Diameter (mm)	Length of Motor (Laminations and Windings) in mm	Winding
Slotless Brushless Torque Motors	50, 76, 130, 180	52, 86 for 50 mm diameter motors 85, 149 for 76 mm diameter motors 39, 60, 81 for 130 mm diameter motors 44, 69, 94 for 180 mm diameter motors	A = Standard

Slotless Torque ring "kit" Servomotors

S-50-52-A	Slotless motor, rotor and stator, 50 mm O.D., Cont. Stall torque: 0.42 Nm (60 oz-in)
S-50-86-A	Slotless motor, rotor and stator, 50 mm O.D., Cont. Stall torque: 0.69 Nm (100 oz-in)
S-76-85-A	Slotless motor, rotor and stator, 76 mm O.D., Cont. Stall torque: 1.96 Nm (280 oz-in)
S-76-149-A	Slotless motor, rotor and stator, 76 mm O.D., Cont. Stall torque: 3.29 Nm (466 oz-in)
S-130-39-A	Slotless motor, rotor and stator, 130 mm O.D., Cont. Stall torque: 2.92 Nm (415 oz-in)
S-130-60-A	Slotless motor, rotor and stator, 130 mm O.D., Cont. Stall torque: 5.20 Nm (736 oz-in)
S-130-81-A	Slotless motor, rotor and stator, 130 mm O.D., Cont. Stall torque: 6.45 Nm (915 oz-in)
S-180-44-A	Slotless motor, rotor and stator, 180 mm O.D., Cont. Stall torque: 7.46 Nm (1060 oz-in)
S-180-69-A	Slotless motor, rotor and stator, 180 mm O.D., Cont. Stall torque: 13.9 Nm (1970 oz-in)
S-180-94-A	Slotless motor, rotor and stator, 180 mm O.D., Cont. Stall torque: 20.0 Nm (2832 oz-in)
S-xx-yy-z	Custom models available. Please consult the factory and web site for latest information.

- NOTE: 1. S-Series torque ring motors include the stator w/flying leads, adjustable-phase Hall bd., and rotor w/magnets
2. Please consult factory for optional winding and mechanical configuration.



We constantly improve the quality and performance of our products. Please check our web site for the most current specifications.

