S-Series

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 options available

Includes Hall effect sensors for commutation

Follows the 2011/65/EU RoHS 2 Directive

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 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 and cogging torque that produces velocity disturbance. 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 0.20 N-m to 29.09 N-m. Peak torque ranges from 0.82 N-m to 116.37 N-m. 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) and S-240 (240 mm diameter) 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 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 Ndrive 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 motor is used in Aerotech's high-performance ADR direct-drive rotary stage.

S-Series SPECIFICATIONS

Motor Model	Units	S-50-39		S-50-52		S-50-86		S-76-35		S-76-85		S-76-149	
Winding Designation		-A	-B	-A	-B	-A	-B	-A	-B	-A	-B	-A	-B
Performance Specifications[1,2]													
Stall Torque, Continuous[3]	N-m	0.20		0.33		0.56		0.48		1.60		2.86	
Peak Torque[4]	N-m	0.82		1.31		2.26		1.92		6.41		11.43	
Rated Speed	rpm	4,000	8,000	4,000	8,000	3,000	8,000	3,000	5,000	3,000	4,000	2,000	1,500
Power Output, Continuous	W	85.7	171.5	112.1	224.1	132.4	353.2	150.8	251.4	381.2	508.2	457	342.8
Electrical Specifications[2]													
BEMF Const., Line-Line, Max	V_{pk}/krpm	10.3	3.4	19.0	6.3	40	13.3	29.1	14.5	57	38	79	118.5
Continuous Current, Stall[3]	Amp_{pk}	2.4	7.2	2.3	6.9	2.1	6.3	2.0	4.0	3.80	5.70	4.90	3.27
	Amp_{rms}	1.7	5.1	1.6	4.9	1.5	4.5	1.4	2.8	2.7	4.0	3.5	2.3
Peak Current, Stall[3]	A_{pk}	9.6	28.8	9.2	27.6	8.4	25.2	8.0	16.0	15.2	22.8	19.6	13.1
Torque Constant[5,6]	N-m/Amp_{pk}	0.09	0.03	0.14	0.05	0.27	0.09	0.24	0.12	0.42	0.28	0.58	0.87
	N-m/Amp_{rms}	0.12	0.04	0.20	0.07	0.38	0.13	0.34	0.17	0.60	0.40	0.82	1.24
Motor Constant[3,5]	N-m/√W	0.034		0.050		0.076		0.075		0.179		0.280	
Resistance, 25°C, Line-Line	ohms	6.6	0.7	8.4	0.9	12.9	1.4	10.5	2.6	5.7	2.5	4.4	10.0
Inductance, Line-Line	mH	1.50	0.17	1.30	0.14	2.40	0.27	1.40	0.35	1.10	0.49	0.87	1.96
Maximum Bus Voltage	VDC	340											
Thermal Resistance	°C/W	2.02		1.73		1.35		1.83		0.93		0.72	
Number of Poles		8						14					
Mechanical Specifications													
Frameless Motor Weight	kg	0.32		0.48		0.90		0.64		2.20		4.30	
Frameless Rotor Inertia	kg-m^2	$1.11x10^{-5}$		$1.70x10^{-5}$		$3.40x10^{-5}$		$1.06x10^{-4}$		$4.20x10^{-4}$		$8.30x10^{-4}$	
Length of Winding, Frameless Motor	mm	39.1		51.8		85.8		35.0		84.8		149.0	
Outside Diameter, Frameless Motor	mm	50.8						76.0					
Inside Shaft Diameter, Frameless Motor	mm	9.5						30.0					
Standards		2011/65/EU RoHS 2 Directive											

Notes:
1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature.
2. All performance and electrical specifications ±10%.
3. Values shown @ 75°C rise above a 25°C ambient temperature, with housed motor mounted to a 250 mm x 250 mm x 6 mm aluminum heat sink.
4. Peak torque assumes correct rms current; consult Aerotech.
5. Torque constant and motor constant specified at stall.
6. All Aerotech amplifiers are rated Apk; use torque constant in N-m/Apk when sizing.
7. Specifications given are for the motor only. When integrated into a housing with bearings, additional losses should be considered.
8. Maximum winding temperature is 100°C; thermistor trips at 100°C.
9. Ambient operating temperature range 0°C - 25°C; consult Aerotech for performance in elevated ambient temperatures.

S-Series SPECIFICATIONS

Motor Model	Units	S-130-39		S-130-60		S-130-81		S-130-102		S-130-123	
Winding Designation		-A	-B	-A	-B	-A	-B	-A	-B	-A	-B
Performance Specifications[1,2]											
Stall Torque, Continuous[3]	N-m	2.36		4.18		5.89		7.69		8.65	
Peak Torque[4]	N-m	9.42		16.73		23.55		30.75		34.61	
Rated Speed	rpm	2,000	4,000	1,000	2,000	750	1,500	500	1,000	375	750
Power Output, Continuous	W	493.4	986.9	437.9	875.9	462.4	924.9	402.5	805.1	339.8	679.5
Electrical Specifications[2]											
BEMF Const., Line-Line, Max	V_{pk}/krpm	75.1	37.5	148.9	74.4	222.7	111.4	300.2	150.1	374.1	187.0
Continuous Current, Stall[3]	Amp_{pk}	3.8	7.6	3.4	6.8	3.2	6.4	3.1	6.2	2.8	5.6
	Amp_{rms}	2.7	5.4	2.4	4.8	2.3	4.5	2.2	4.4	2.0	4.0
Peak Current, Stall[3]	A_{pk}	15.2	30.4	13.6	27.2	12.8	25.6	12.4	24.8	11.2	22.4
Torque Constant[5,6]	N-m/Amp_{pk}	0.62	0.31	1.23	0.62	1.84	0.92	2.48	1.24	3.09	1.55
	N-m/Amp_{rms}	0.88	0.44	1.74	0.87	2.60	1.30	3.51	1.75	4.37	2.18
Motor Constant[3,5]	N-m/√W	0.265		0.446		0.586		0.710		0.816	
Resistance, 25°C, Line-Line	ohms	5.6	1.4	7.8	2.0	10.1	2.5	12.5	3.1	14.7	3.7
Inductance, Line-Line	mH	1.70	0.43	1.80	0.45	2.80	0.70	3.67	0.92	4.60	1.15
Maximum Bus Voltage	VDC	340									
Thermal Resistance	°C/W	0.95		0.85		0.74		0.64		0.67	
Number of Poles		18									
Mechanical Specifications											
Frameless Motor Weight	kg	1.87		3.60		5.30		7.00		8.70	
Frameless Rotor Inertia	kg-m^2	$1.60x10^{-3}$		$3.00x10^{-3}$		$4.70x10^{-3}$		$6.20x10^{-3}$		$7.80x10^{-3}$	
Length of Winding, Frameless Motor	mm	38.7		59.7		80.7		101.7		122.7	
Outside Diameter, Frameless Motor	mm	128.9									
Inside Shaft Diameter, Frameless Motor	mm	50.8									
Standards		2011/65/EU RoHS 2 Directive									

Notes:
1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature.
2. All performance and electrical specifications ±10%.
3. Values shown @ 75°C rise above a 25°C ambient temperature, with housed motor mounted to a 250 mm x 250 mm x 6 mm aluminum heat sink.
4. Peak torque assumes correct rms current; consult Aerotech.
5. Torque constant and motor constant specified at stall.
6. All Aerotech amplifiers are rated Apk; use torque constant in N-m/Apk when sizing.
7. Specifications given are for the motor only. When integrated into a housing with bearings, additional losses should be considered.
8. Maximum winding temperature is 100°C; thermistor trips at 100°C.
9. Ambient operating temperature range 0°C - 25°C; consult Aerotech for performance in elevated ambient temperatures.

S-Series SPECIFICATIONS

Motor Model	Units	S-180-44		S-180-69		S-180-94		S-240-43		S-240-63		S-240-83	
Winding Designation		-A	-B	-A	-B	-A	-B	-A	-B	-A	-B	-A	-B
Performance Specifications[1,2]													
Stall Torque, Continuous[3]	N-m	5.99		11.12		15.93		10.73		19.71		29.09	
Peak Torque[4]	N-m	23.98		44.47		63.70		42.90		78.82		116.37	
Rated Speed	rpm	500	1,000	500	1,000	250	500	600	1,200	250	500	200	400
Power Output, Continuous	W	313.8	627.7	582.1	1,164.3	416.9	833.8	673.9	1,347.9	515.9	1,031.8	609.3	1,218.6
Electrical Specifications[2]													
BEMF Const., Line-Line, Max	V_{pk}/krpm	268.7	134.4	263.9	131.9	393.4	196.7	209.4	104.7	404.3	202.2	607.2	303.6
Continuous Current, Stall[3]	Amp_{pk}	2.7	5.4	5.1	10.2	4.9	9.8	6.2	12.4	5.9	11.8	5.8	11.6
	Amp_{rms}	1.9	3.8	3.6	7.2	3.5	6.9	4.4	8.8	4.2	8.3	4.1	8.2
Peak Current, Stall[4]	A_{pk}	10.8	21.6	20.4	40.8	19.6	39.2	24.8	49.6	23.6	47.2	23.2	46.4
Torque Constant[5,6]	$N\text{-}m/Amp_{pk}$	2.22	1.11	2.18	1.09	3.25	1.63	1.73	0.87	3.34	1.67	5.02	2.51
	$N\text{-}m/Amp_{rms}$	3.14	1.57	3.08	1.54	4.60	2.30	2.45	1.22	4.72	2.36	7.09	3.55
Motor Constant[3,5]	$N\text{-}m/\sqrt{W}$	0.628		1.053		1.391		0.845		1.405		1.893	
Resistance, 25°C, Line-Line	ohms	12.8	3.2	4.4	1.1	5.6	1.4	4.3	1.1	5.8	1.5	7.2	1.8
Inductance, Line-Line	mH	3.40	0.85	1.70	0.43	2.60	0.65	2.15	0.54	2.90	0.73	4.30	1.08
Maximum Bus Voltage	VDC	340											
Thermal Resistance	°C/W	0.82		0.67		0.57		0.47		0.38		0.32	
Number of Poles		18						26					
Mechanical Specifications													
Frameless Motor Weight	kg	4.24		8.10		11.90		5.80		11.00		16.20	
Frameless Rotor Inertia	$kg\text{-}m^2$	$7.40x10^{-3}$		$1.48x10^{-2}$		$2.20x10^{-2}$		$2.30x10^{-2}$		$4.50x10^{-2}$		$7.00x10^{-2}$	
Length of Winding, Frameless Motor	mm	43.2		68.2		93.2		42.7		62.7		82.7	
Outside Diameter, Frameless Motor	mm	180.0						239.2					
Inside Shaft Diameter, Frameless Motor	mm	86.4						120.6					
Standards		2011/65/EU RoHS 2 Directive											

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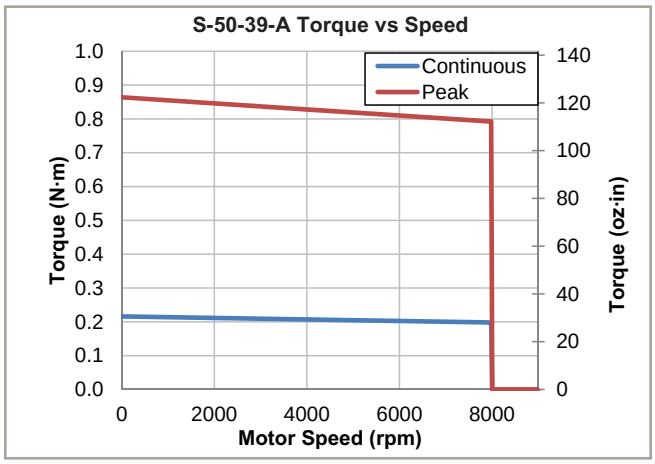
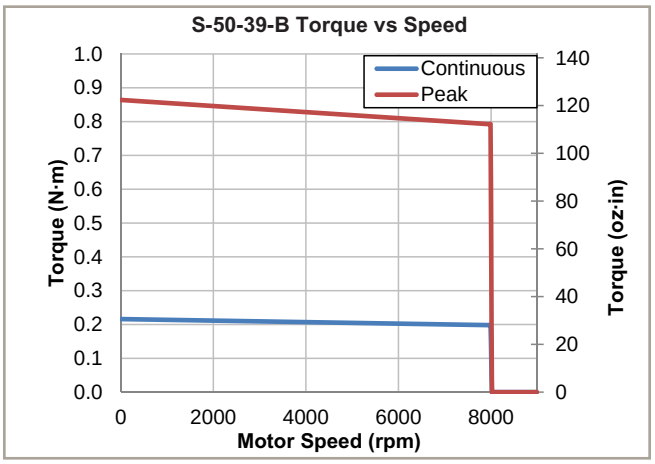
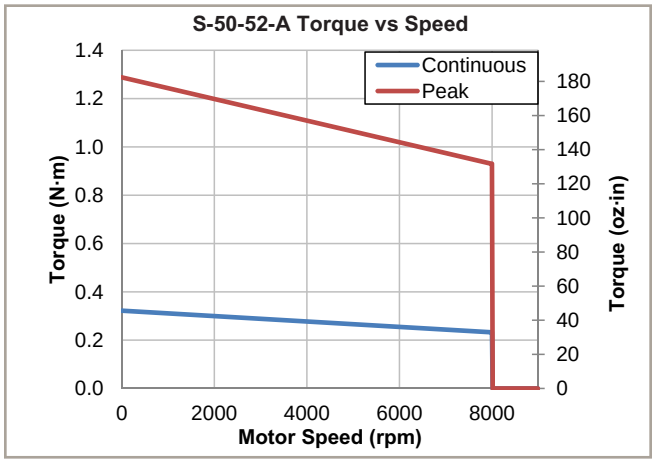
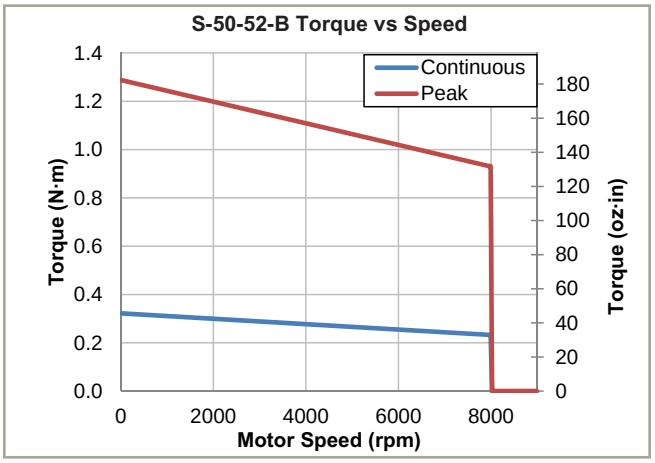
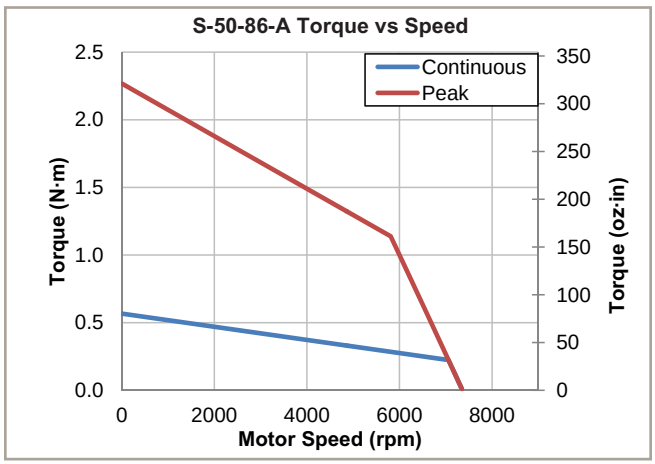
S-Series PERFORMANCE

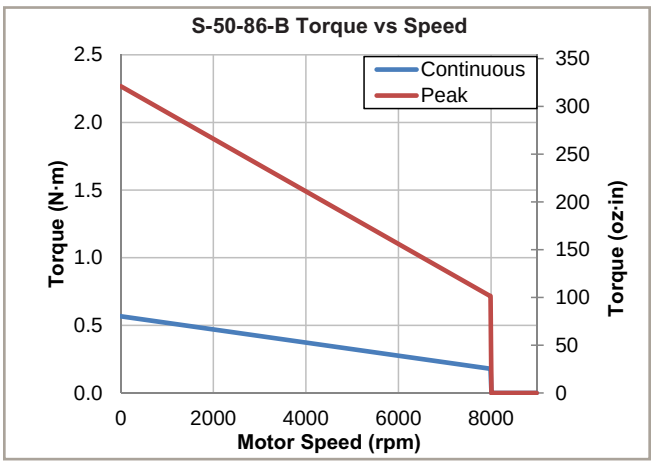












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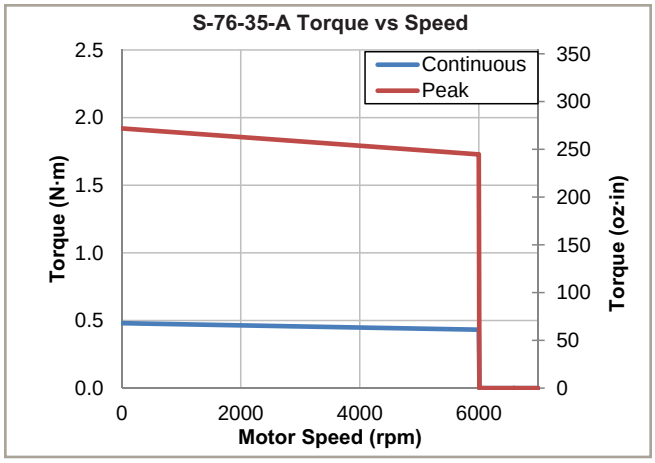

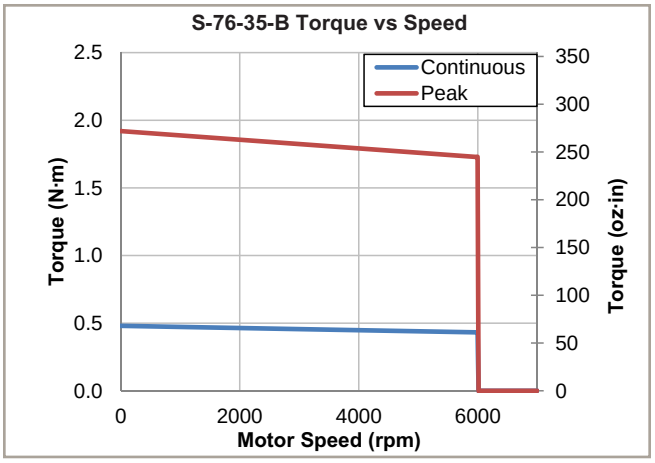

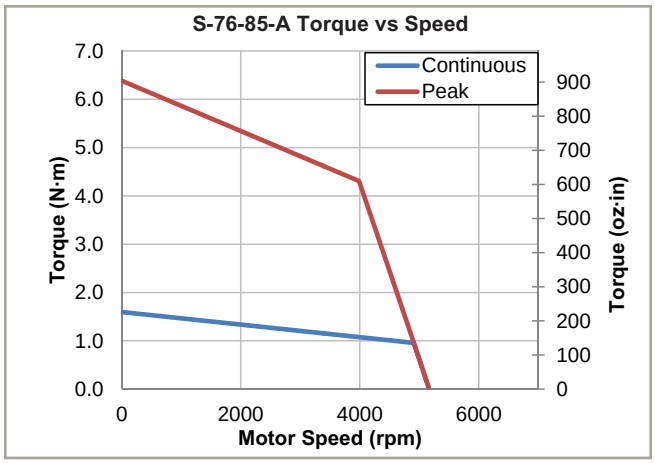

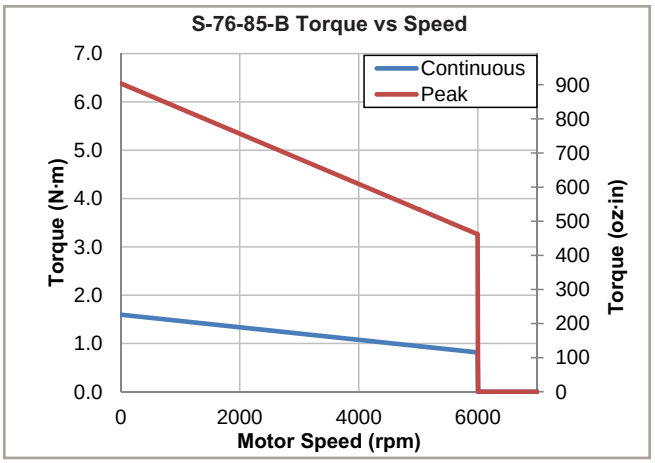

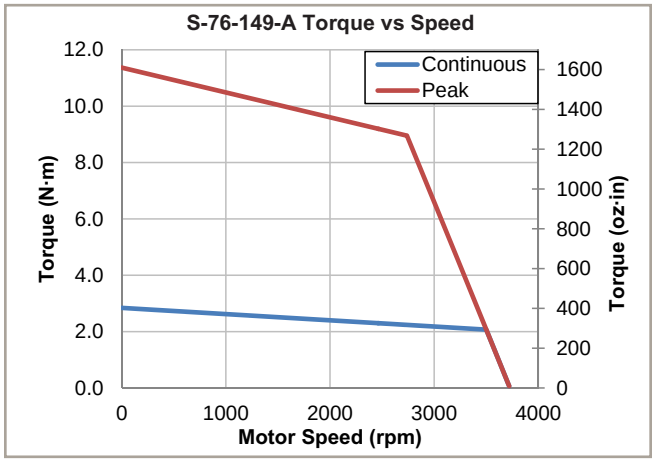

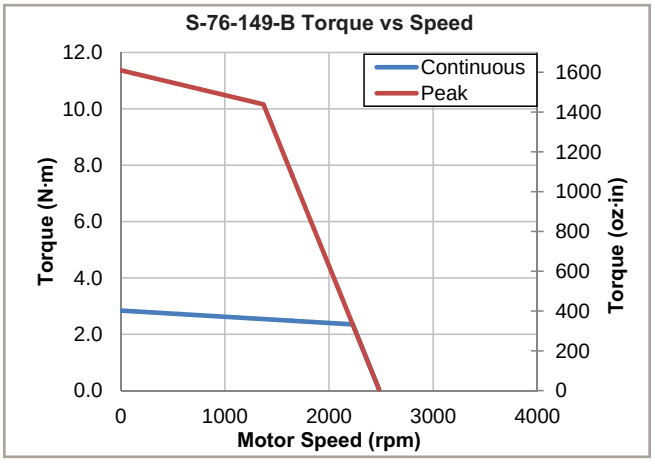

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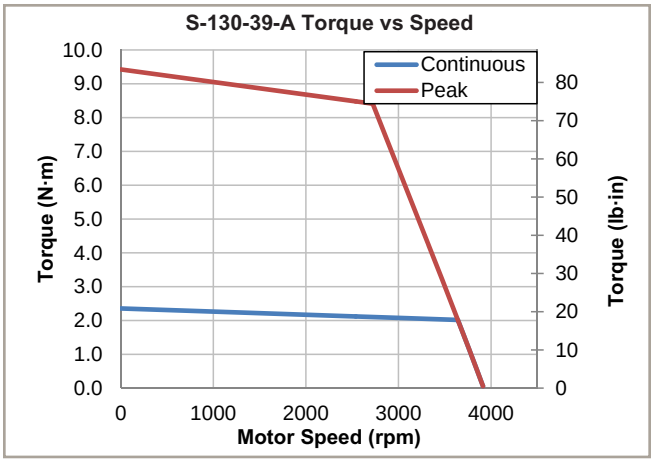

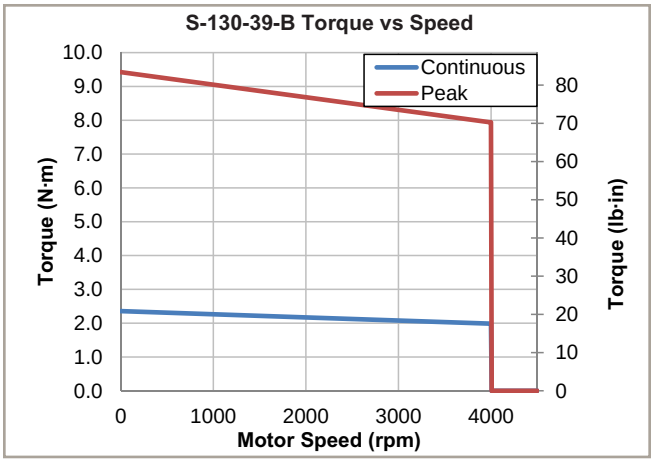

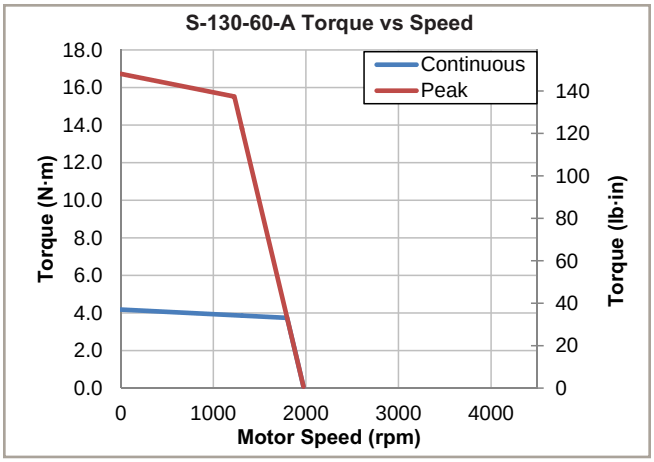

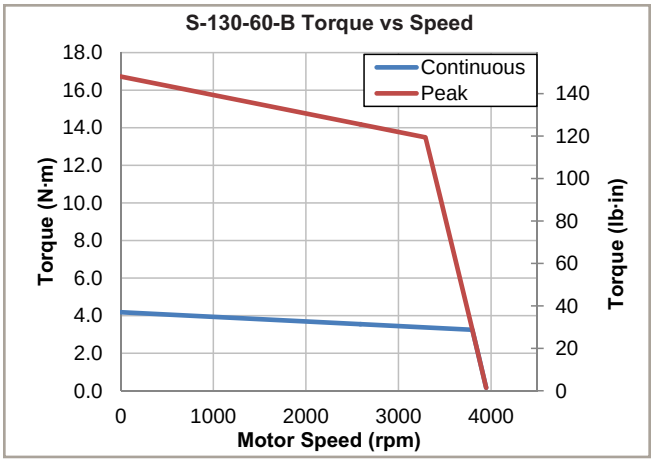

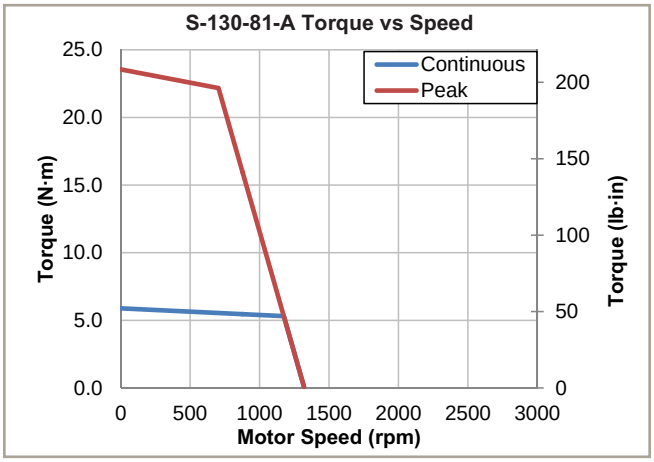

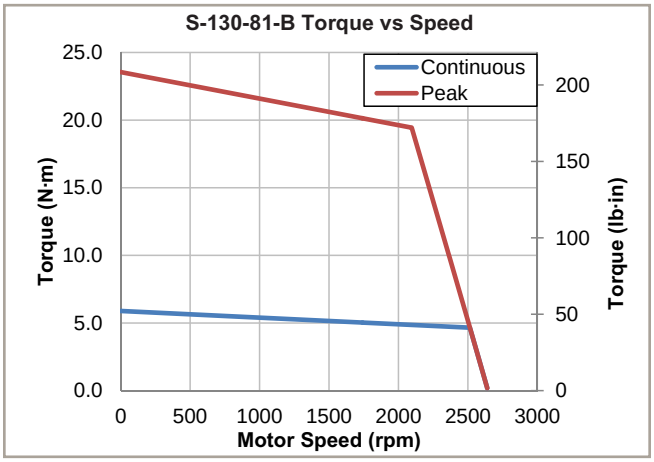

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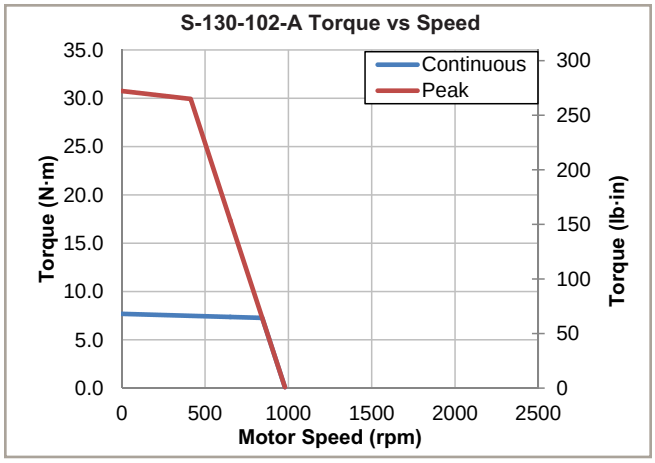
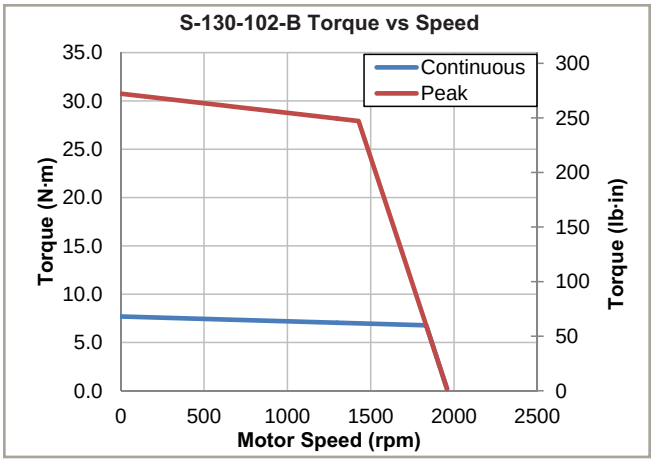
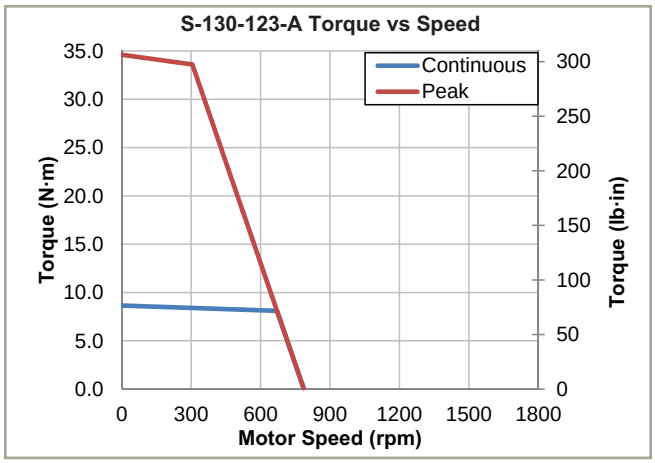
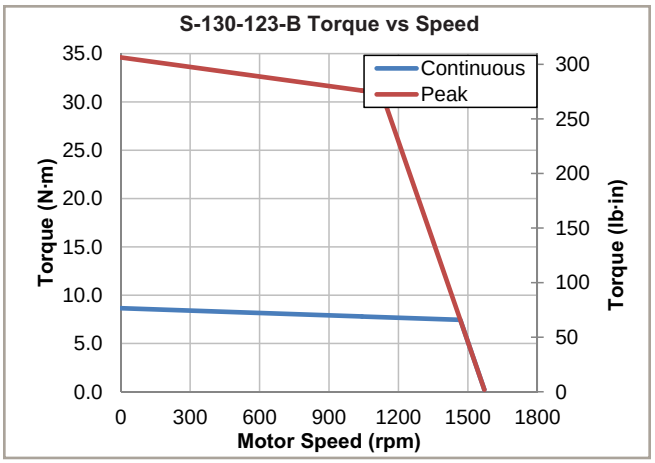
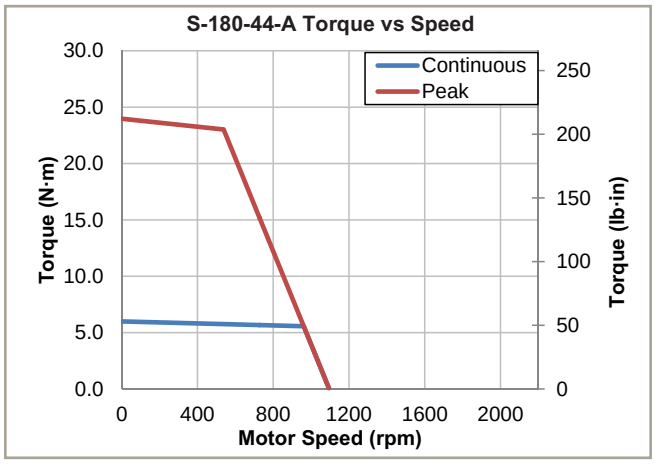
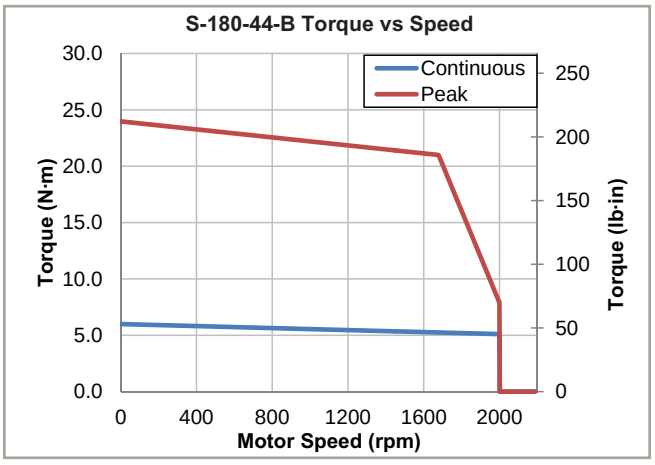




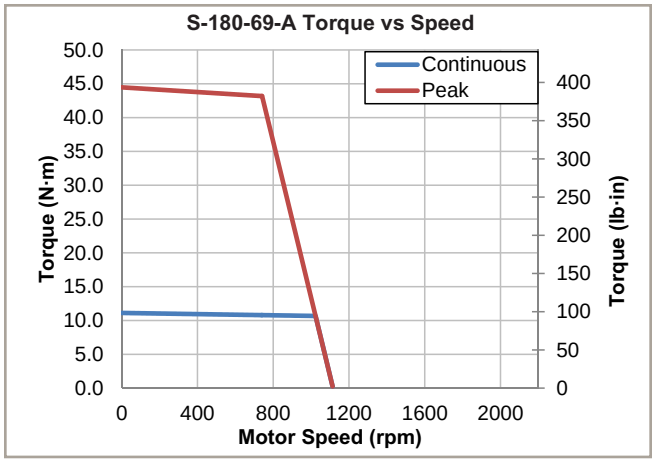


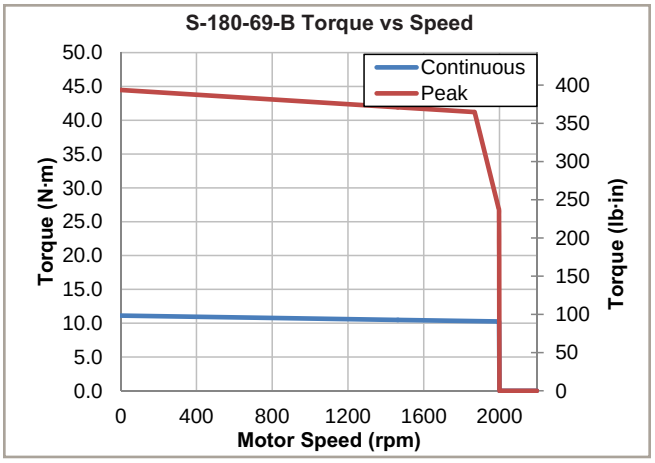


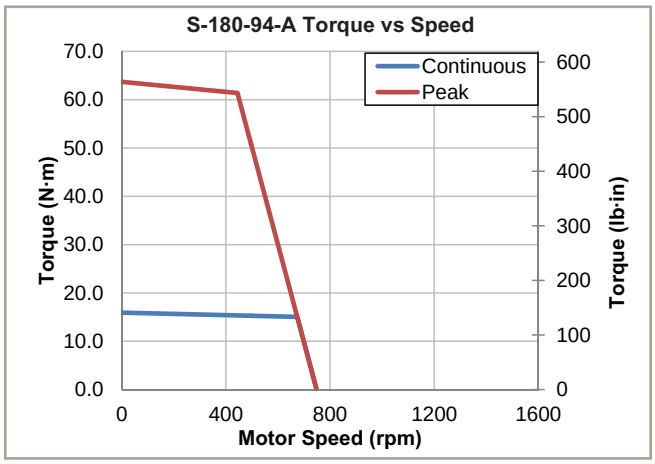


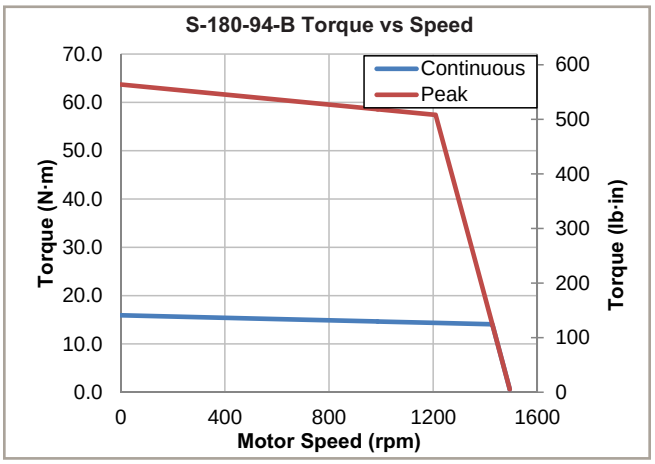


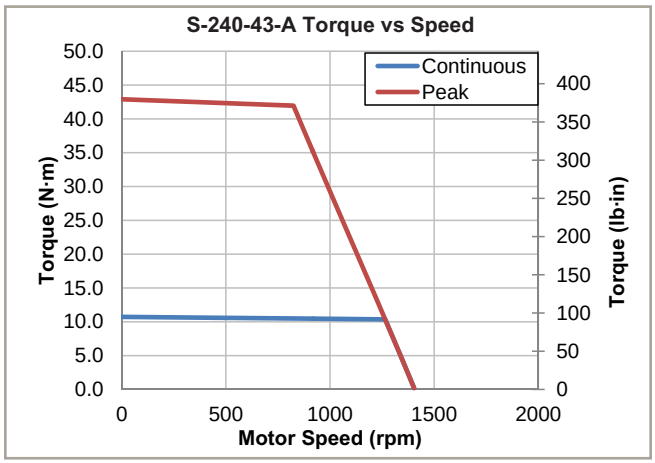
S-Series PERFORMANCE

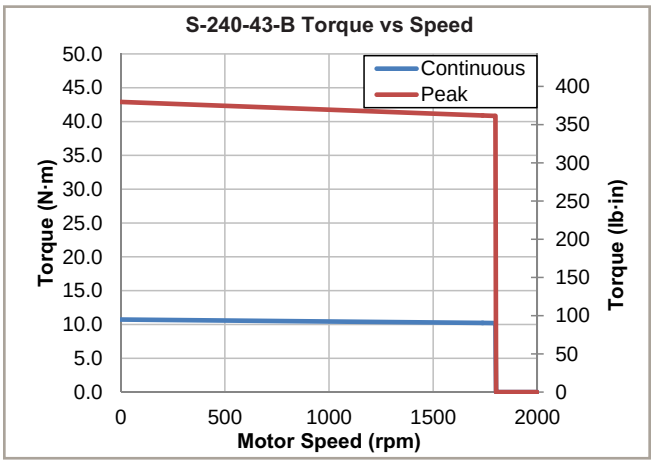




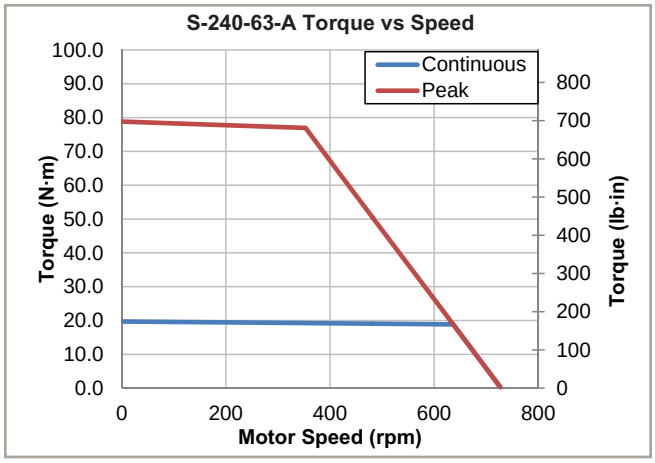


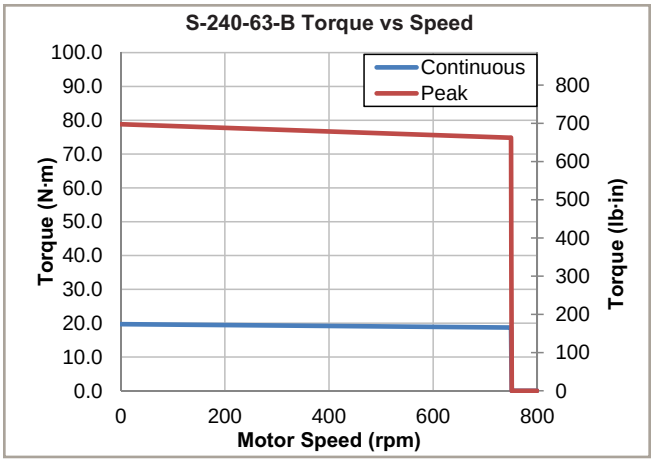


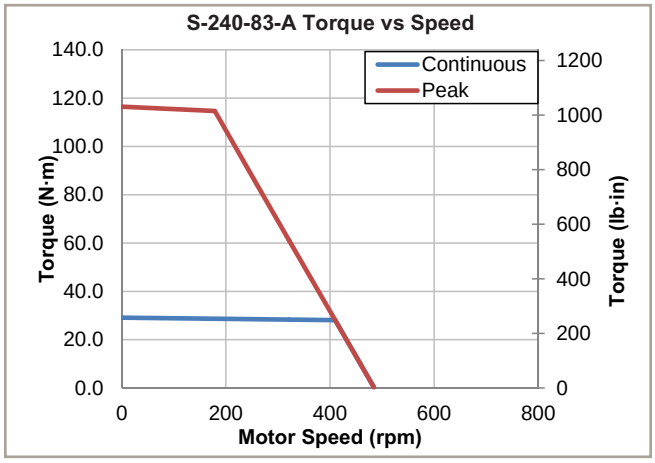


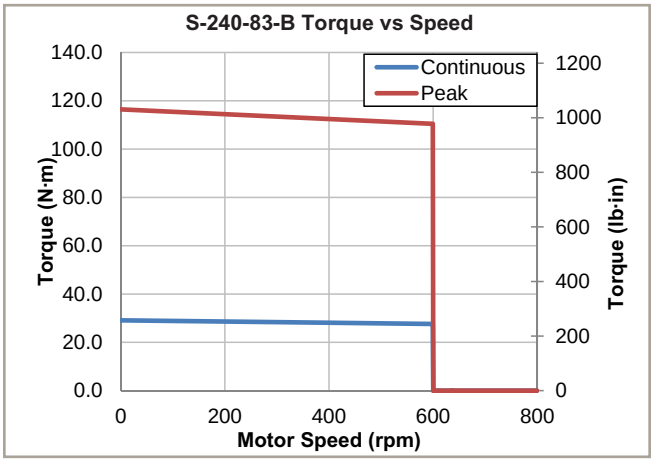


S-Series PERFORMANCE







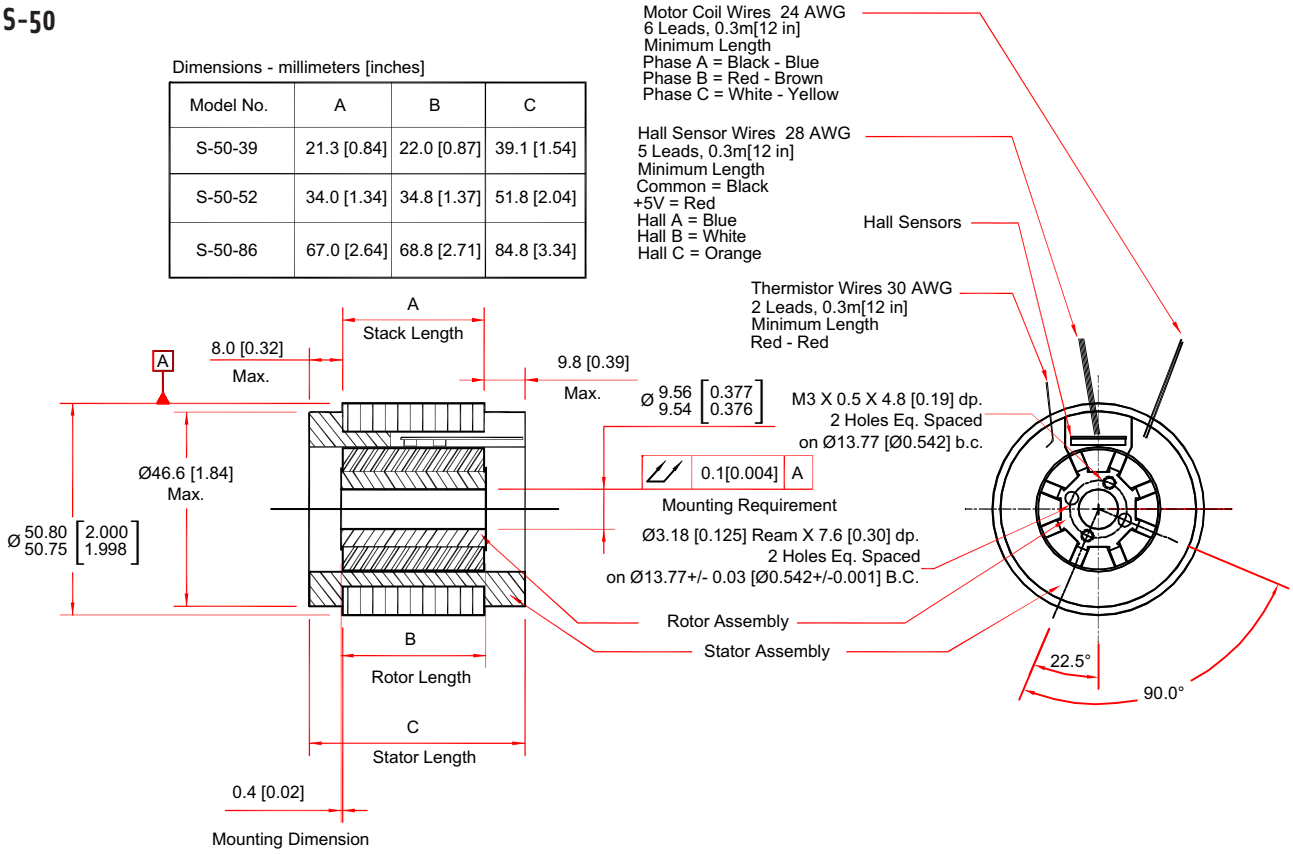


S-Series DIMENSIONS

S-50

Dimensions - millimeters [inches]

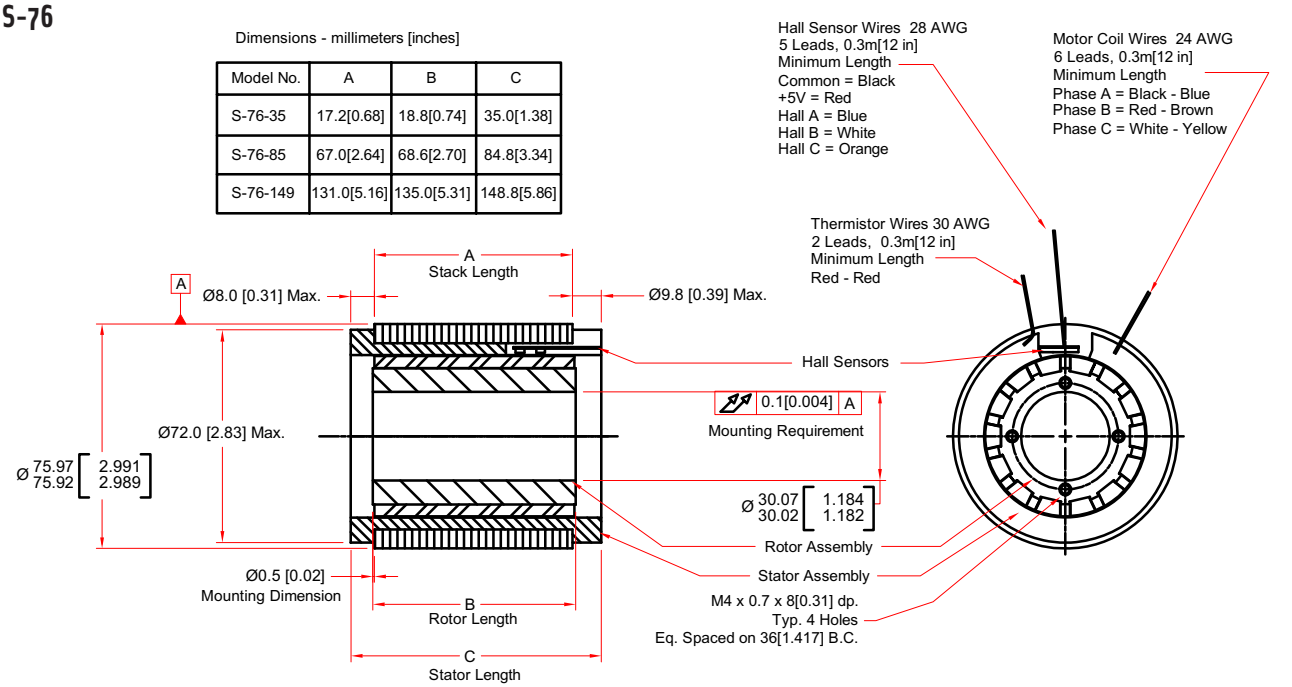
Model No.	A	B	C
S-50-39	21.3 [0.84]	22.0 [0.87]	39.1 [1.54]
S-50-52	34.0 [1.34]	34.8 [1.37]	51.8 [2.04]
S-50-86	67.0 [2.64]	68.8 [2.71]	84.8 [3.34]



S-76

Dimensions - millimeters [inches]

Model No.	A	B	C
S-76-35	17.2[0.68]	18.8[0.74]	35.0[1.38]
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]	148.8[5.86]

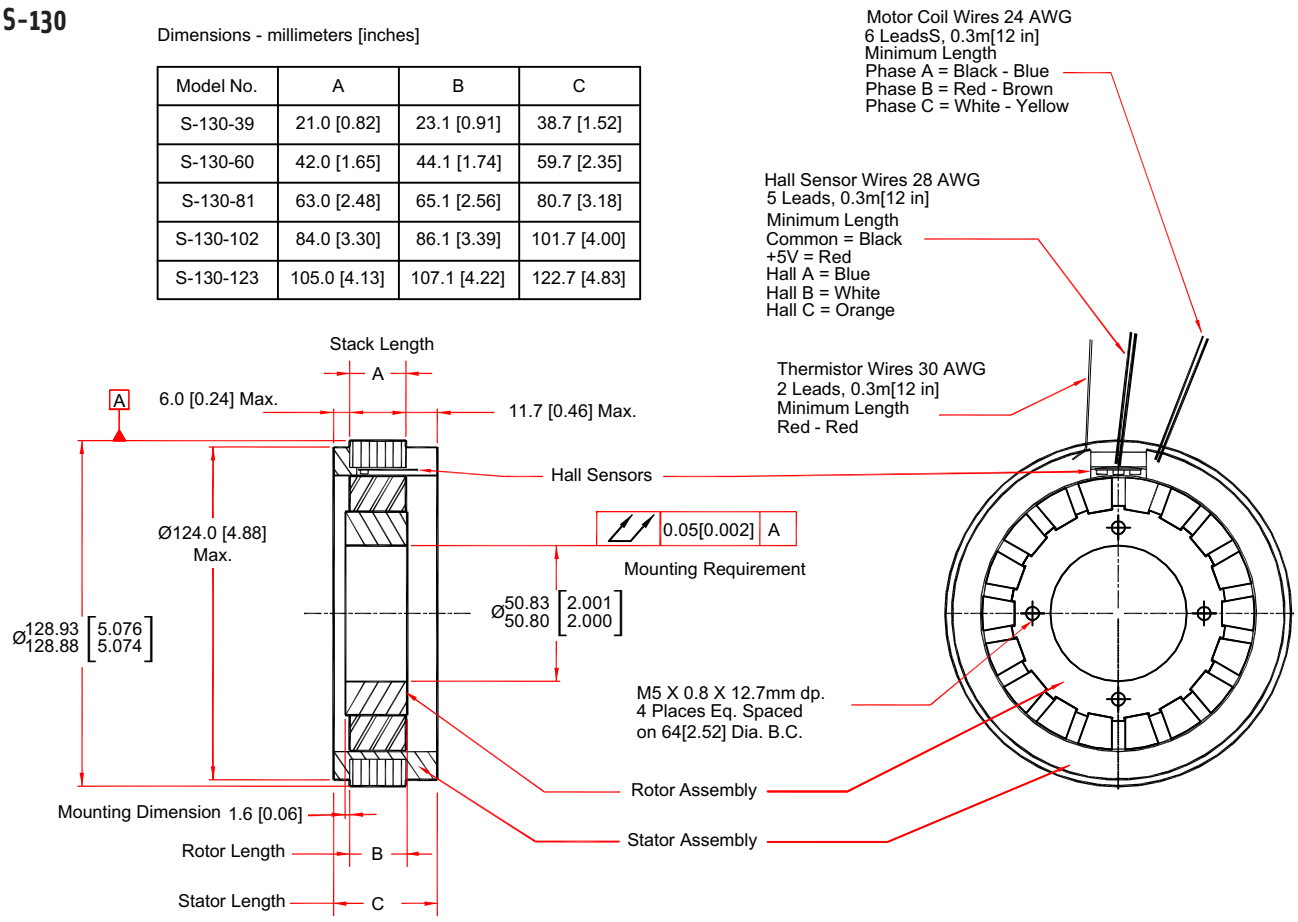


S-Series DIMENSIONS

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]

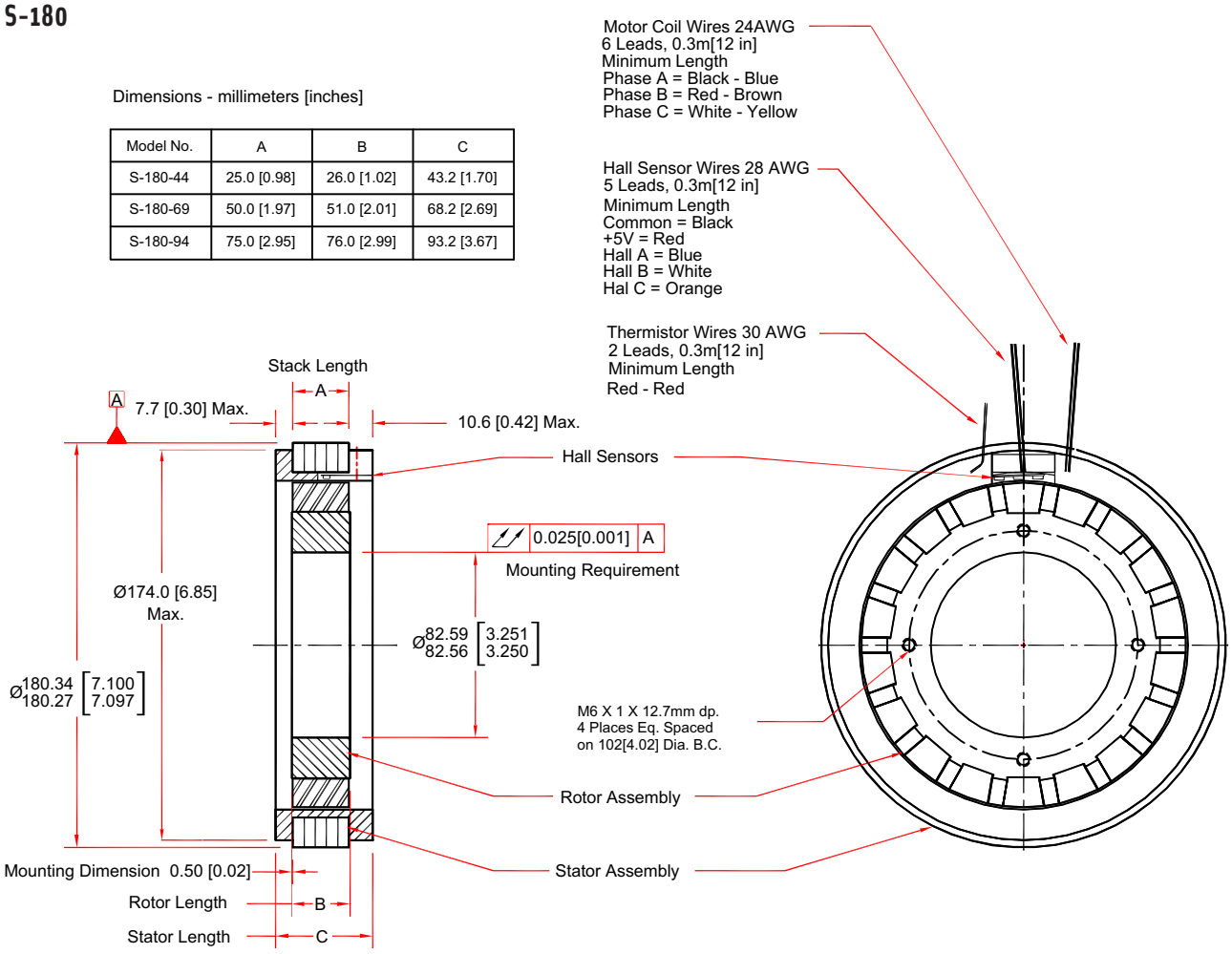


S-Series DIMENSIONS

S-180

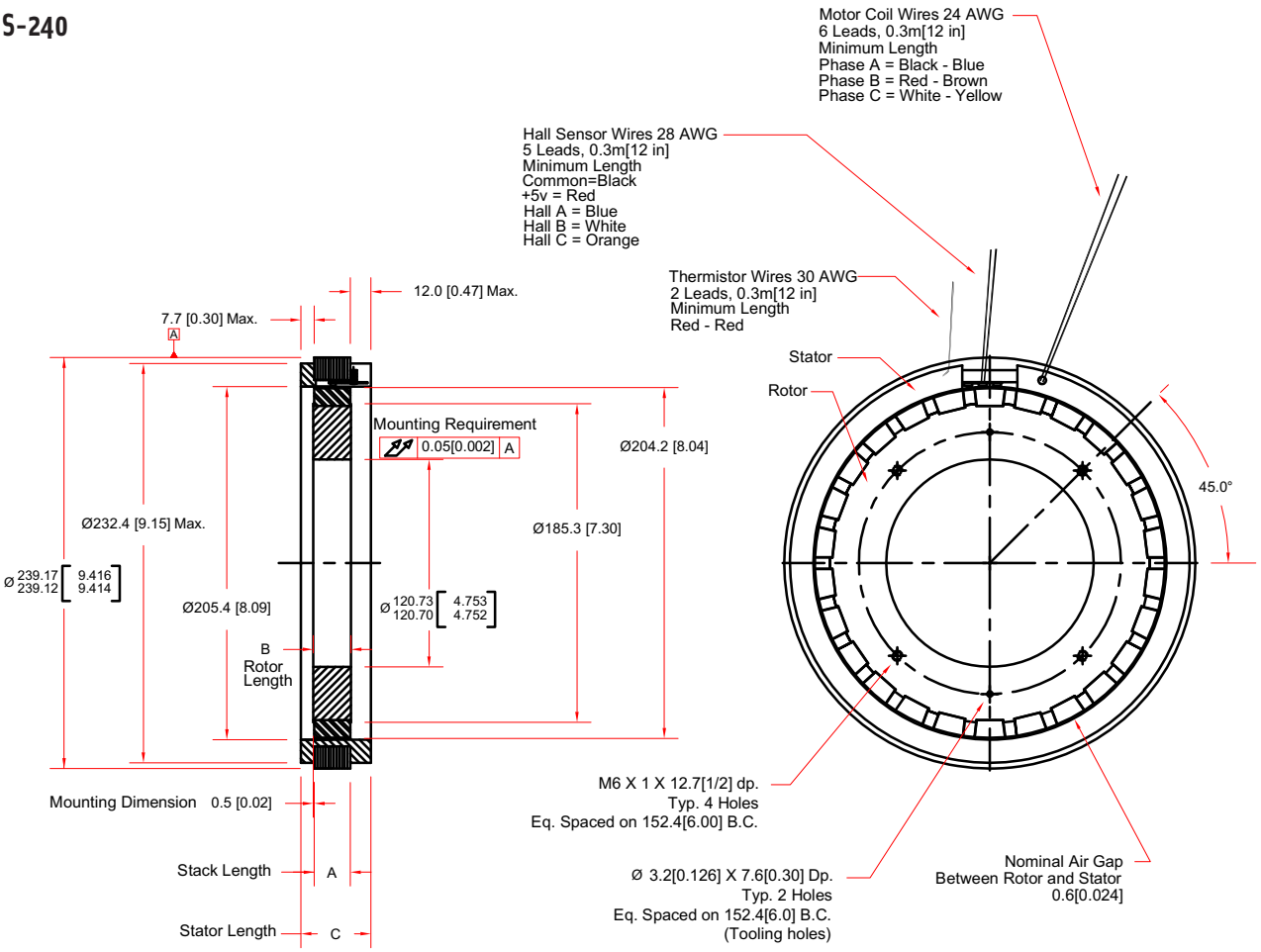
Dimensions - millimeters [inches]

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]



S-Series DIMENSIONS

S-240



Dimensions - milimeters [inches]

Model No.	A	B	C
S-240-43	21.0 [0.827]	22.0 [0.866]	40.7 [1.602]
S-240-63	42.0 [1.653]	43.0 [1.693]	61.7 [2.429]
S-240-83	63.0 [2.480]	64.0 [2.520]	82.7 [3.256]

S-Series ORDERING INFORMATION

Ordering Example

S	-130	-60	-A
Motor Series	**Motor Diameter (mm)**	**Length of Motor (Laminations and Windings) in mm**	**Winding**
	50, 76, 130, 180, 240	39, 52, 86 for 50 mm diameter motors 35, 85, 149 for 76 mm diameter motors 39, 60, 81, 102, 123 for 130 mm diameter motors 44, 69, 94 for 180 mm diameter motors 43, 63, 83 for 240 mm diamter motors	A B

Slotless Torque Ring "Kit" Servomotors

S-50-39-A	Slotless motor, rotor and stator, 50 mm O.D., cont. stall torque: 0.20 Nm
S-50-52-A	Slotless motor, rotor and stator, 50 mm O.D., cont. stall torque: 0.33 Nm
S-50-86-A	Slotless motor, rotor and stator, 50 mm O.D., cont. stall torque: 0.56 Nm
S-76-35-A	Slotless motor, rotor and stator, 50 mm O.D., cont. stall torque: 0.53 Nm
S-76-85-A	Slotless motor, rotor and stator, 76 mm O.D., cont. stall torque: 1.60 Nm
S-76-149-A	Slotless motor, rotor and stator, 76 mm O.D., cont. stall torque: 2.86 Nm
S-130-39-A	Slotless motor, rotor and stator, 130 mm O.D., cont. stall torque: 2.36 Nm
S-130-60-A	Slotless motor, rotor and stator, 130 mm O.D., cont. stall torque: 4.18 Nm
S-130-81-A	Slotless motor, rotor and stator, 130 mm O.D., cont. stall torque: 5.89 Nm
S-130-102-A	Slotless motor, rotor and stator, 130 mm O.D., cont. stall torque: 7.69 Nm
S-130-123-A	Slotless motor, rotor and stator, 130 mm O.D., cont. stall torque: 8.65 Nm
S-180-44-A	Slotless motor, rotor and stator, 180 mm O.D., cont. stall torque: 5.99 Nm
S-180-69-A	Slotless motor, rotor and stator, 180 mm O.D., cont. stall torque: 11.12 Nm
S-180-94-A	Slotless motor, rotor and stator, 180 mm O.D., cont. stall torque: 15.93 Nm
S-240-43-A	Slotless motor, rotor and stator, 240 mm O.D., cont. stall torque: 10.73 Nm
S-240-63-A	Slotless motor, rotor and stator, 240 mm O.D., cont. stall torque: 19.71 Nm
S-240-83-A	Slotless motor, rotor and stator, 240 mm O.D., cont. stall torque: 29.09 Nm

Note: S-Series torque ring motors include the stator w/flying leads, adjustable-phase Hall bd., and rotor w/magnets