PITTMAN®
AMETEK®

Shown with optional assembly.

ES050A Series

The ES050A Series Brushless DC Motor is a high torque density model brushless motor with a slotless design in a NEMA 23 configuration. It is offered in 3 motor lengths with continuous torque from 0.176 – 0.304 Nm.

ES Slotless, Brushless Motors For applications that require high acceleration and precision control at all speeds. Torque production is predictable and very controllable.

Benefits

- Speeds up to 5,000 RPM possible
- DC bus voltage up to 120 VDC
- NEMA 23 configuration
- Eight standard windings, special windings available
- 4 pole rare earth design

Optional Assemblies

- Encoder: E30C/D
- Gearboxes: G40A, PLG42S, PLG52
- Brake: B49A
- Programmable Drives: PBL4850E, BGE6015A

Motor Characteristics

Motor Data		Units	Part No. ES050A-1	ES050A-2	ES050A-3
Max DC Terminal Voltage	V_T	V	120		
Max Speed (Mechanical)	ω_{MAX}	rpm	5000		
Continuous Stall Torque[1]	T_{CS}	Nm	0.18	0.25	0.30
		oz-in	25	35	43
Peak Torque (Maximum)[1]	T_{pk}	Nm	0.54	0.77	0.94
		oz-in	76	110	130
Coulomb Friction Torque	T_f	Nm	0.0030	0.0037	0.0040
		oz-in	0.42	0.52	0.57
Viscous Damping Factor	D	Nm/(rad/s)	1.3E-05	1.5E-05	1.7E-05
		oz-in/krpm	0.19	0.22	0.25
Thermal Time Constant	τ_{th}	min	14	17	22
Thermal Resistance	R_{th}	°C/W	4.8	4.5	4.4
Max. Winding Temperature	Θ_{MAX}	°C	130	130	130
Rotor Inertia	J_r	kg-m^2	1.7E-05	2.8E-05	3.4E-05
		oz-in-s^2	0.0025	0.0040	0.0048
Motor Weight	W_m	g	620	850	990
		oz	22	30	35

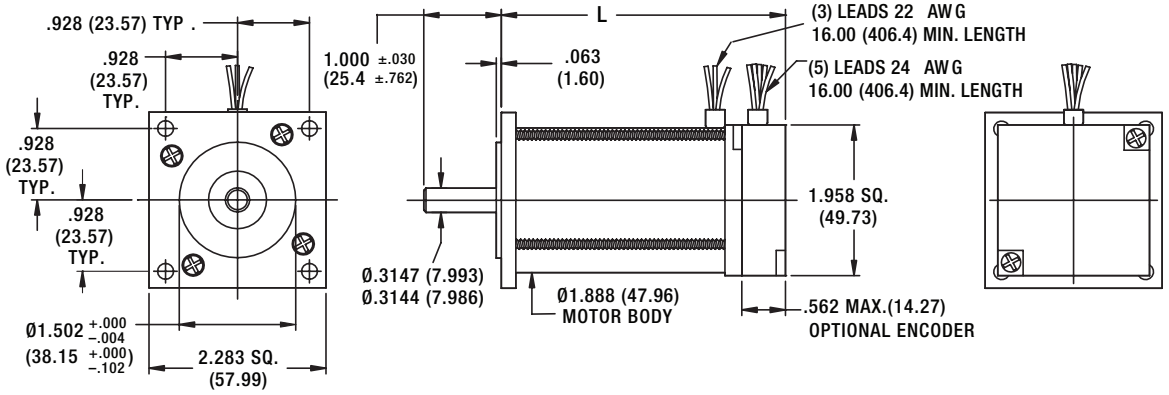
[1]Recorded at maximum winding temperature at 25°C ambient and without heatsink.

Dimensional Drawings: ES050A-1 • ES050A-2 • ES050A-3

Dimensions = inches (mm)

L = Lengths Available

ES050A-1 = 3.165 (80.39) Max.
ES050A-2 = 3.665 (93.09) Max.
ES050A-3 = 4.165 (105.79) Max.

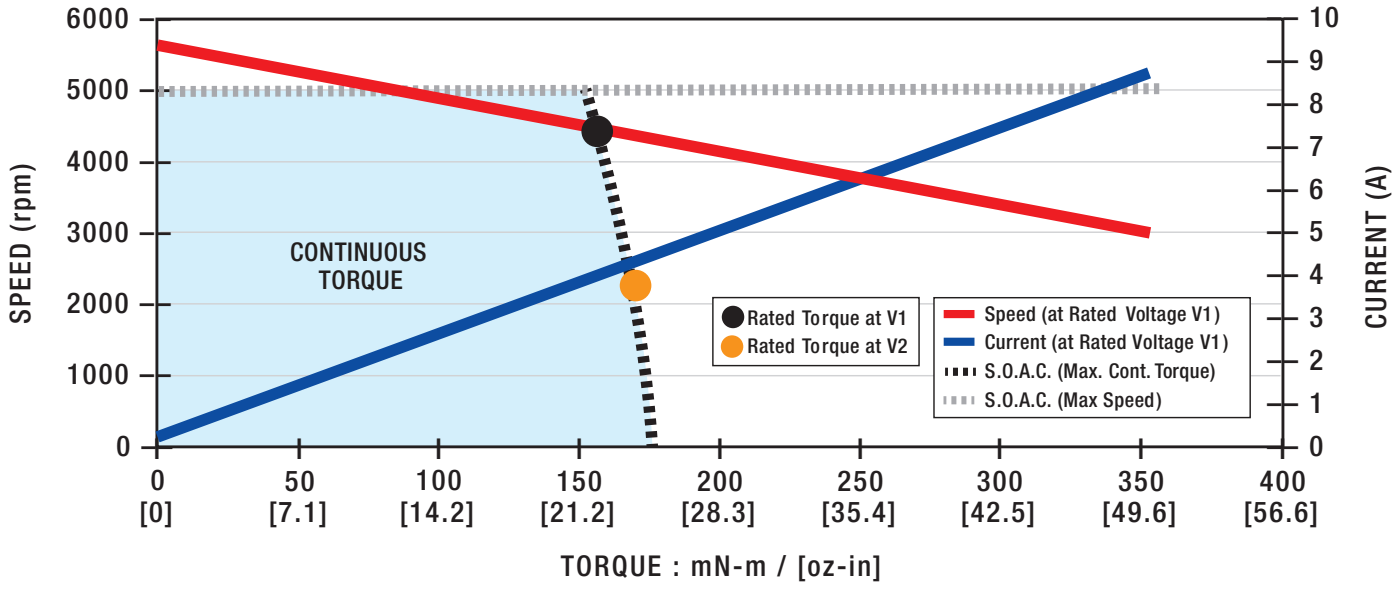


NOTE: All values specified at 25°C ambient temperature. Peak values are theoretical and for reference only.

Performance Data & Graph: **ES050A–1**

Motor Data		Units								
Rated Voltage **V1**	V_r	V	12.0	15.2	19.1	24.0	30.3	38.2	48.0	60.6
Rated Torque[1] •	T_r	Nm	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
		oz-in	23	23	22	22	22	22	22	22
Rated Speed[1]	ω_r	rpm	4480	4320	4460	4430	4490	4470	4430	4500
Rated Current[1]	I_r	A	9.1	6.6	5.1	4.1	3.2	2.6	2.0	1.6
Rated Power[1]	P_r	W	75	72	73	73	73	73	73	74
No Load Speed	ω_{nl}	rpm	5000	5000	5000	4980	5000	5000	4990	5000
No Load Current	I_{nl}	A	0.47	0.34	0.27	0.22	0.17	0.14	0.11	0.086
Rated Voltage **V2**	V_r	V	7.58	9.55	12.0	15.2	19.1	24.0	30.3	38.2
Rated Torque[1] •	T_r	Nm	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
		oz-in	24	24	24	24	24	24	24	24
Rated Speed[1]	ω_r	rpm	2150	2140	2290	2300	2320	2290	2290	2320
Rated Current[1]	I_r	A	9.5	6.9	5.5	4.3	3.5	2.7	2.2	1.7
Rated Power[1]	P_r	W	39	38	41	41	41	41	41	41
No Load Speed	ω_{nl}	rpm	3420	3160	3140	3150	3170	3140	3150	3180
No Load Current	I_{nl}	A	0.37	0.26	0.20	0.16	0.13	0.10	0.079	0.064
Motor Constant	K_M	Nm/√W	0.042	0.046	0.049	0.049	0.049	0.049	0.049	0.049
		oz-in/√W	5.9	6.5	6.9	6.9	6.9	6.9	6.9	6.9
Torque Constant	K_T	Nm/A	0.0209	0.0286	0.0361	0.0456	0.0570	0.0722	0.0911	0.114
		oz-in/A	2.96	4.04	5.11	6.46	8.07	10.2	12.9	16.1
Voltage Constant	K_E	V/(rad/s)	0.0209	0.0286	0.0361	0.0456	0.0570	0.0722	0.0911	0.114
		V/krpm	2.19	2.99	3.78	4.78	5.97	7.56	9.54	11.9
Terminal Resistance	R_{mt}	Ω	0.250	0.390	0.550	0.880	1.37	2.20	3.52	5.48
Inductance	L	mH	0.060	0.10	0.17	0.27	0.41	0.66	1.1	1.7
Peak Current	I_{pk}	A	29	21	17	13	11	8.4	6.6	5.4
Electrical Time Constant	τ_e	ms	0.24	0.26	0.31	0.31	0.30	0.30	0.30	0.30
Mechanical Time Constant	τ_m	ms	10	8.3	7.4	7.4	7.4	7.4	7.4	7.4

[1]Recorded at maximum winding temperature at 25°C ambient and without heatsink.

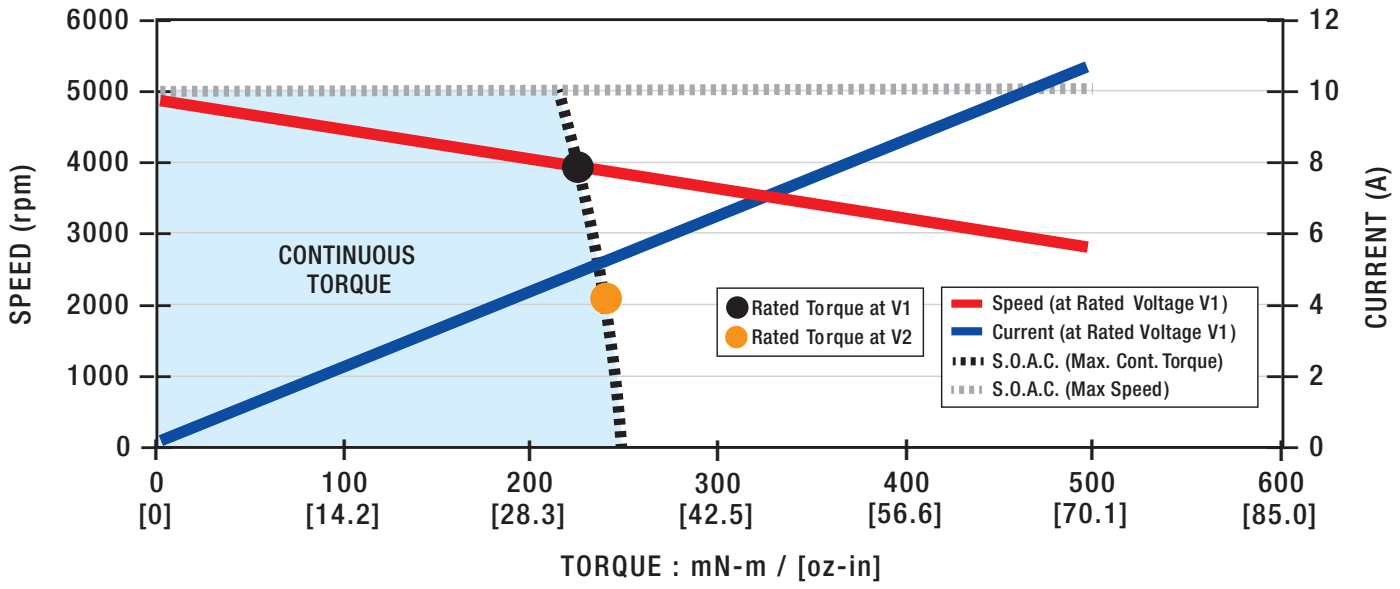


NOTE: All values specified at 25°C ambient temperature. Peak values are theoretical and for reference only. S.O.A.C. = Safe Operating Area for Continuous duty.

Performance Data & Graph: **ES050A–2**

Motor Data		Units								
Rated Voltage **V1**	V_r	V	15.2	19.1	24.0	30.3	38.2	48.0	60.6	76.4
Rated Torque[1] •	T_r	Nm	0.23	0.23	0.22	0.22	0.22	0.22	0.22	0.22
		oz-in	32	32	32	32	32	32	32	32
Rated Speed[1]	ω_r	rpm	4090	3860	3950	3940	3980	3930	3940	3980
Rated Current[1]	I_r	A	8.8	6.4	5.0	4.0	3.2	2.5	2.0	1.6
Rated Power[1]	P_r	W	97	92	92	92	93	92	93	93
No Load Speed	ω_{nl}	rpm	4760	4380	4350	4360	4390	4340	4370	4390
No Load Current	I_{nl}	A	0.37	0.26	0.20	0.16	0.13	0.099	0.080	0.064
Rated Voltage **V2**	V_r	V	9.55	12.0	15.2	19.1	24.0	30.3	38.2	48.0
Rated Torque[1] •	T_r	Nm	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
		oz-in	34	34	34	34	34	34	34	34
Rated Speed[1]	ω_r	rpm	2040	1970	2100	2080	2100	2080	2080	2090
Rated Current[1]	I_r	A	9.2	6.7	5.3	4.2	3.3	2.6	2.1	1.7
Rated Power[1]	P_r	W	51	50	52	52	52	52	52	52
No Load Speed	ω_{nl}	rpm	2990	2750	2750	2740	2760	2740	2750	2760
No Load Current	I_{nl}	A	0.28	0.20	0.16	0.13	0.097	0.076	0.061	0.049
Motor Constant	K_M	Nm/√W	0.056	0.061	0.064	0.064	0.064	0.065	0.064	0.064
		oz-in/√W	8.0	8.6	9.1	9.1	9.1	9.1	9.1	9.1
Torque Constant	K_T	Nm/A	0.0303	0.0413	0.0523	0.0660	0.0826	0.105	0.132	0.165
		oz-in/A	4.29	5.86	7.41	9.34	11.7	14.9	18.7	23.4
Voltage Constant	K_E	V/(rad/s)	0.0303	0.0413	0.0523	0.0660	0.0826	0.105	0.132	0.165
		V/krpm	3.17	4.33	5.48	6.91	8.65	11.0	13.8	17.3
Terminal Resistance	R_{mt}	Ω	0.290	0.460	0.660	1.06	1.65	2.66	4.25	6.62
Inductance	L	mH	0.080	0.13	0.21	0.34	0.53	0.86	1.4	2.1
Peak Current	I_{pk}	A	28	21	16	13	10	8.1	6.6	5.1
Electrical Time Constant	τ_e	ms	0.28	0.28	0.32	0.32	0.32	0.32	0.32	0.32
Mechanical Time Constant	τ_m	ms	8.9	7.6	6.8	6.9	6.8	6.8	6.9	6.8

[1]Recorded at maximum winding temperature at 25°C ambient and without heatsink.



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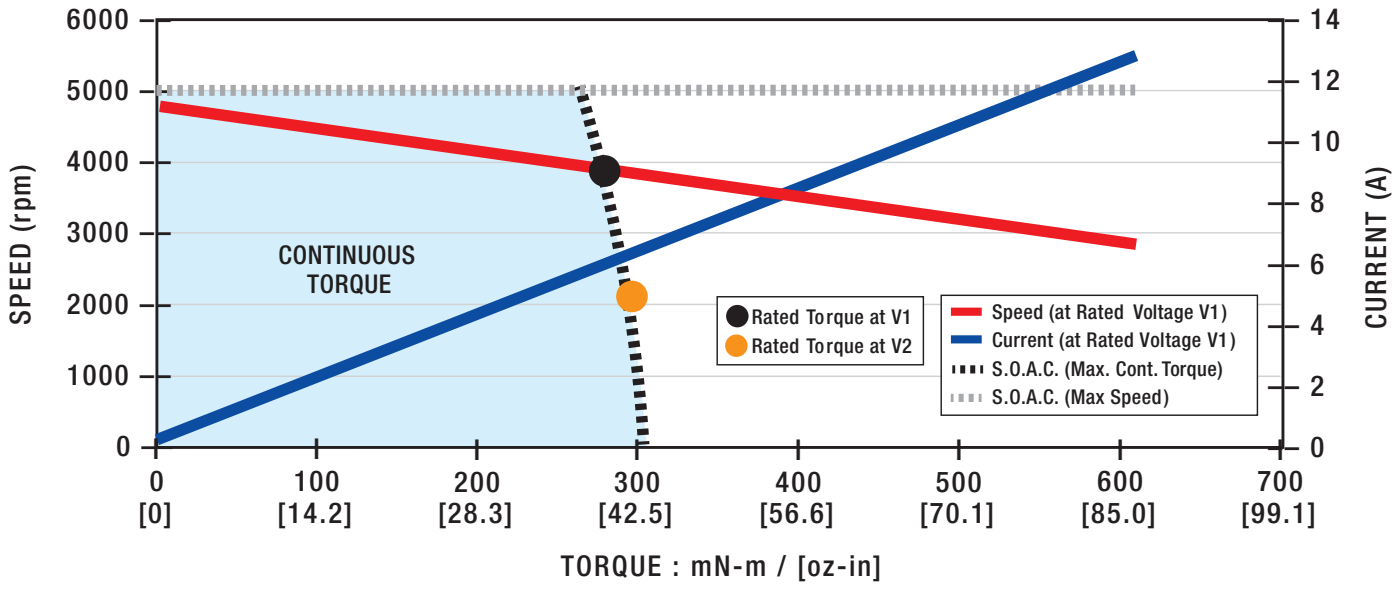
Motor Data		Units								
Rated Voltage **V1**	V_r	V	19.1	24.0	30.3	38.2	48.0	60.6	76.4	96.0
Rated Torque[1] •	T_r	Nm	0.28	0.28	0.27	0.27	0.27	0.27	0.27	0.27
		oz-in	39	39	39	39	39	39	39	39
Rated Speed[1]	ω_r	rpm	4120	3870	3950	3950	3970	3970	3950	3970
Rated Current[1]	I_r	A	8.1	6.0	4.6	3.7	2.9	2.3	1.8	1.5
Rated Power[1]	P_r	W	120	110	110	110	110	110	110	110
No Load Speed	ω_{nl}	rpm	4570	4220	4210	4200	4230	4220	4200	4230
No Load Current	I_{nl}	A	0.31	0.22	0.17	0.14	0.11	0.085	0.067	0.054
Rated Voltage **V2**	V_r	V	12.0	15.2	19.1	24.0	30.3	38.2	48.0	60.6
Rated Torque[1] •	T_r	Nm	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
		oz-in	42	42	41	41	41	41	41	41
Rated Speed[1]	ω_r	rpm	2160	2080	2160	2140	2170	2160	2140	2170
Rated Current[1]	I_r	A	8.5	6.3	4.9	3.9	3.1	2.5	1.9	1.6
Rated Power[1]	P_r	W	66	64	66	66	66	66	66	66
No Load Speed	ω_{nl}	rpm	2870	2670	2650	2640	2670	2660	2640	2670
No Load Current	I_{nl}	A	0.23	0.17	0.13	0.10	0.081	0.064	0.051	0.041
Motor Constant	K_M	Nm/√W	0.069	0.074	0.079	0.079	0.078	0.078	0.079	0.078
		oz-in/√W	9.8	11	11	11	11	11	11	11
Torque Constant	K_T	Nm/A	0.0397	0.0540	0.0685	0.0865	0.108	0.137	0.173	0.216
		oz-in/A	5.63	7.65	9.70	12.3	15.3	19.3	24.5	30.6
Voltage Constant	K_E	V/(rad/s)	0.0397	0.0540	0.0685	0.0865	0.108	0.137	0.173	0.216
		V/krpm	4.16	5.66	7.17	9.06	11.3	14.3	18.1	22.6
Terminal Resistance	R_{mt}	Ω	0.330	0.530	0.760	1.21	1.90	3.03	4.85	7.60
Inductance	L	mH	0.090	0.16	0.26	0.41	0.65	1.0	1.7	2.6
Peak Current	I_{pk}	A	26	19	15	12	9.6	7.5	6.0	4.8
Electrical Time Constant	τ_e	ms	0.27	0.30	0.34	0.34	0.34	0.34	0.34	0.34
Mechanical Time Constant	τ_m	ms	7.1	6.2	5.5	5.5	5.6	5.5	5.5	5.6

[1]Recorded at maximum winding temperature at 25°C ambient and without heatsink.



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