

Slotless Brushless DC Servo Motors

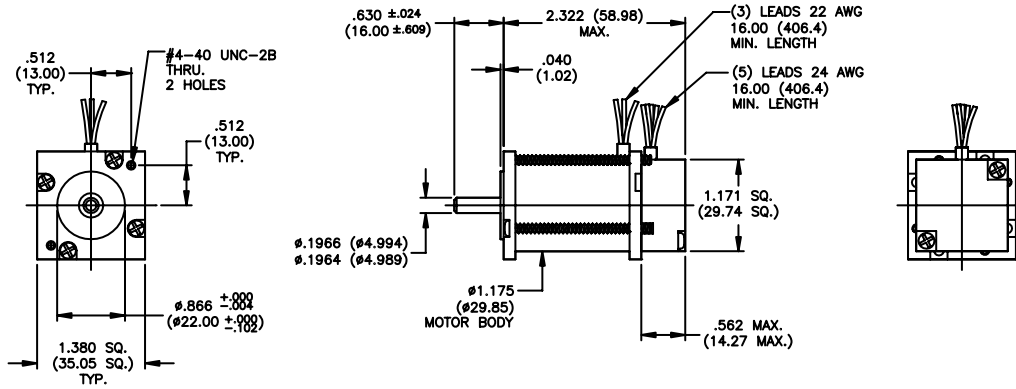
AMETEK slotless brushless motor designs offer many advantages over conventional slotted stator construction. Negligible magnetic cogging provides improved servo efficiency and enables extremely smooth, quiet motion. Low inductance and high current bandwidth provides precise control. Slotless construction also provides excellent winding heat transfer for high thermal efficiency and transient load capacity.

AMETEK slotless brushless motors have internal Hall Effect feedback sensors for linear speed-torque characteristics, high starting torque and variable speed control with appropriate drive electronics. Modifications to the shaft, winding and mechanical mounting are available for OEM applications.

X - Available Option		C - Consult Factory for Availability		Available Motor Options													
D Slotless Brushless DC Servo Motors				Encoders			Gears			Brakes		Drives					
Series	Diameter	Torque	RPM Max.	E22A	E30	E35A	N	Z	G30A	G40A	G42B	B30A	B49A	48132	48133	48134	48140
3400	1.38-in. (35mm)	4 - 5.8 oz-in. (0.028 - 0.040 Nm)	8,000	C	X	C			X			C		X			X
4400	1.65-in. (42mm)	12 - 19 oz-in. (0.084 - 0.134 Nm)	8,000		X	C	C		X			C	C	X			X
5400	2.28-in. (58mm)	25 - 43 oz-in. (0.176 - 0.303 Nm)	5,000		X	C	C		X			C		X			X



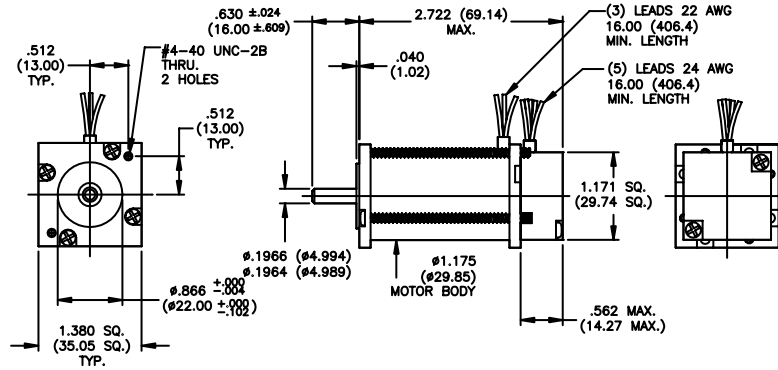
PITTMAN®



Specification	Units	Part/Model Number							
		3411 12.0 V	3411 15.2 V	3411 19.1 V	3411 24.0 V	3411 30.3 V	3411 38.2 V	3411 48.0 V	3411 60.0 V
Supply Voltage	VDC	12.0	15.2	19.1	24.0	30.3	38.2	48.0	60.6
Continuous Torque	oz-in	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
	Nm	0.0289	0.0289	0.0289	0.0289	0.0289	0.0289	0.0289	0.0289
Speed @ Cont. Torque	RPM	4010	3510	3810	4020	3460	4110	4010	3450
Current @ Cont. Torque	Amps (A)	2.21	1.76	1.40	1.11	0.89	0.70	0.56	0.44
Continuous Output Power	Watts (W)	12	11	12	12	11	12	12	10
Motor Constant	oz-in/sqrt W	1.6	1.5	1.5	1.6	1.5	1.6	1.6	1.5
	Nm/sqrt W	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Torque Constant	oz-in/A	2.245	2.799	3.543	4.475	5.598	7.085	8.937	11.196
	Nm/A	0.016	0.02	0.025	0.032	0.04	0.05	0.063	0.079
Voltage Constant	V/krpm	1.66	2.07	2.62	3.31	4.14	5.24	6.61	8.28
	V/rad/s	0.016	0.02	0.025	0.032	0.04	0.05	0.063	0.079
Terminal Resistance	Ohms	1.98	3.55	5.25	7.90	14.2	19.6	31.6	56.8
Inductance	mH	0.18	0.32	0.46	0.70	1.28	1.83	2.80	5.12
No-Load Current	Amps (A)	0.11	0.085	0.072	0.057	0.047	0.036	0.030	0.024
No-Load Speed	RPM	7110	7200	7150	7120	7160	7160	7120	7150
Peak Current	Amps (A)	6.06	4.28	3.64	3.04	2.13	1.95	1.52	1.07
Peak Torque	oz-in	13.3	11.8	12.6	13.3	11.7	13.5	13.3	11.7
	Nm	0.0939	0.0833	0.089	0.0939	0.0826	0.0953	0.0939	0.0826
Coulomb Friction Torque	oz-in	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Nm	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Viscous Damping Factor	oz-in/krpm	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
	Nm s/rad	1.07E-6	1.07E-6	1.07E-6	1.07E-6	1.07E-6	1.07E-6	1.07E-6	1.07E-6
Electrical Time Constant	ms	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Mechanical Time Constant	ms	7.8	9.0	8.3	7.8	9.0	7.8	7.8	9.0
Thermal Time Constant	min	14	14	14	14	14	14	14	14
Thermal Resistance	Celsius/W	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
Max. Winding Temperature	Celsius	130	130	130	130	130	130	130	130
Rotor Inertia	oz-in-sec ²	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014
	kg-m ²	9.89E-7	9.89E-7	9.89E-7	9.89E-7	9.89E-7	9.89E-7	9.89E-7	9.89E-7
Weight (Mass)	oz	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
	g	170.1	170.1	170.1	170.1	170.1	170.1	170.1	170.1

Performance (24 V Winding)	Standard Features	Connection Chart																		
	<ul style="list-style-type: none"> Shielded Ball Bearings 4-Pole Rotor Neodymium Magnets 3-Phase Stator Hall Sensor Feedback (120° elec.) NEMA 14 Mounting 	<table border="1"> <thead> <tr> <th>Color/Pin</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>Brown</td> <td>Motor ΦA</td> </tr> <tr> <td>Red</td> <td>Motor ΦB</td> </tr> <tr> <td>Orange</td> <td>Motor ΦC</td> </tr> <tr> <td>Grey</td> <td>Sensor 1</td> </tr> <tr> <td>Blue</td> <td>Sensor 2</td> </tr> <tr> <td>White</td> <td>Sensor 3</td> </tr> <tr> <td>Violet</td> <td>Vcc</td> </tr> <tr> <td>Black</td> <td>Ground</td> </tr> </tbody> </table>	Color/Pin	Function	Brown	Motor ΦA	Red	Motor ΦB	Orange	Motor ΦC	Grey	Sensor 1	Blue	Sensor 2	White	Sensor 3	Violet	Vcc	Black	Ground
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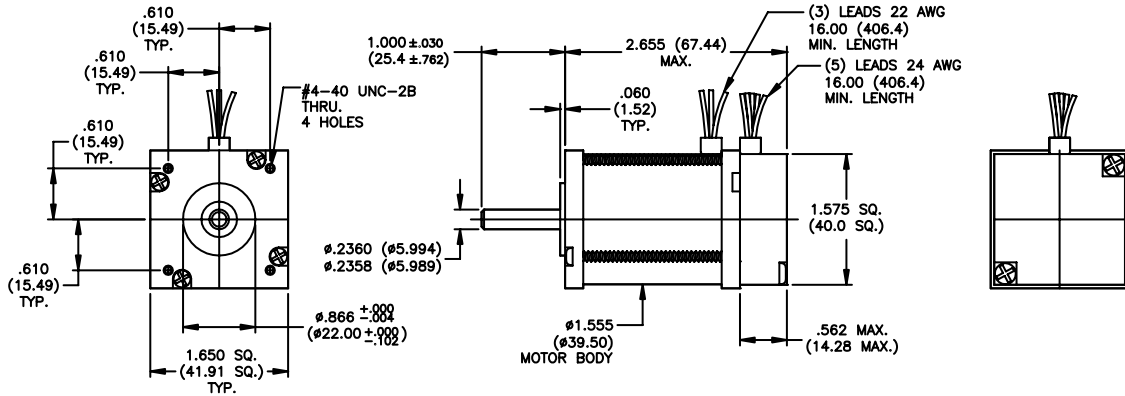
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		3412 12.0 V	3412 15.2 V	3412 19.1 V	3412 24.0 V	3412 30.3 V	3412 38.2 V	3412 48.0 V	3412 60.0 V
Supply Voltage	VDC	12.0	15.2	19.1	24.0	30.3	38.2	48.0	60.6
Continuous Torque	oz-in	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
	Nm	0.0409	0.0409	0.0409	0.0409	0.0409	0.0409	0.0409	0.0409
Speed @ Cont. Torque	RPM	4970	5200	5130	5620	5170	5570	5610	5160
Current @ Cont. Torque	Amps (A)	3.24	2.50	2.04	1.63	1.25	1.02	0.81	0.63
Continuous Output Power	Watts (W)	21	22	22	24	22	24	24	22
Motor Constant	oz-in/sqrt W	2.1	2.2	2.1	2.3	2.2	2.3	2.3	2.2
	Nm/sqrt W	0.015	0.016	0.015	0.016	0.016	0.016	0.016	0.016
Torque Constant	oz-in/A	2.163	2.812	3.434	4.313	5.625	6.882	8.640	11.236
	Nm/A	0.015	0.02	0.024	0.03	0.04	0.049	0.061	0.079
Voltage Constant	V/krpm	1.60	2.08	2.54	3.19	4.16	5.09	6.39	8.31
	V/rad/s	0.015	0.02	0.024	0.03	0.04	0.049	0.061	0.079
Terminal Resistance	Ohms	1.10	1.63	2.67	3.62	6.52	9.32	14.5	26.0
Inductance	mH	0.12	0.19	0.29	0.48	0.76	1.16	1.92	3.04
No-Load Current	Amps (A)	0.19	0.15	0.12	0.10	0.075	0.060	0.049	0.041
No-Load Speed	RPM	7350	7200	7380	7400	7170	7400	7400	7160
Peak Current	Amps (A)	10.9	9.33	7.15	6.63	4.65	4.10	3.31	2.33
Peak Torque	oz-in	23.3	25.8	24.2	28.2	25.7	27.8	28.2	25.7
	Nm	0.1645	0.1821	0.1709	0.1991	0.1814	0.1963	0.1991	0.1814
Coulomb Friction Torque	oz-in	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	Nm	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Viscous Damping Factor	oz-in/krpm	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037
	Nm s/rad	2.48E-6	2.48E-6	2.48E-6	2.48E-6	2.48E-6	2.48E-6	2.48E-6	2.48E-6
Electrical Time Constant	ms	0.11	0.12	0.11	0.13	0.12	0.12	0.13	0.12
Mechanical Time Constant	ms	6.7	6.0	6.5	5.6	6.0	5.7	5.6	5.9
Thermal Time Constant	min	15	15	15	15	15	15	15	15
Thermal Resistance	Celsius/W	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Max. Winding Temperature	Celsius	130	130	130	130	130	130	130	130
Rotor Inertia	oz-in-sec ²	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020
	kg-m ²	1.41E-6	1.41E-6	1.41E-6	1.41E-6	1.41E-6	1.41E-6	1.41E-6	1.41E-6
Weight (Mass)	oz	7.4	7.4	7.40	7.40	7.40	7.40	7.40	7.40
	g	209.8	209.8	209.8	209.8	209.8	209.8	209.8	209.8

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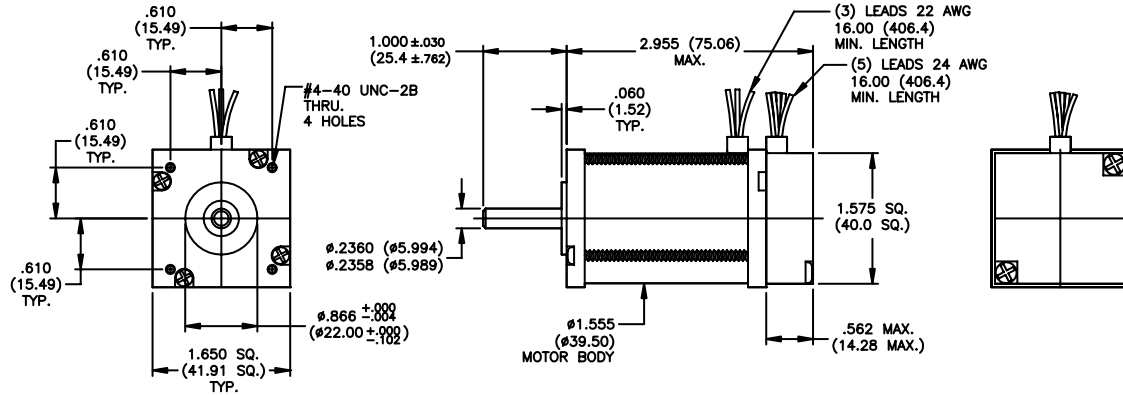
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		4411 15.2 V	4411 19.1 V	4411 24.0 V	4411 30.3 V	4411 38.2 V	4411 48.0 V	4411 60.0 V	4411 76.4 V	
Supply Voltage	VDC	15.2	19.1	24.0	30.3	38.2	48.0	60.6	76.4	
Continuous Torque	oz-in	12	12	12	12	12	12	12	12	
	Nm	0.0847	0.0847	0.0847	0.0847	0.0847	0.0847	0.0847	0.0847	
Speed @ Cont. Torque	RPM	4850	4820	4830	4830	4820	4830	4830	4830	
Current @ Cont. Torque	Amps (A)	3.90	3.09	2.47	1.95	1.54	1.24	0.98	0.77	
Continuous Output Power	Watts (W)	43	42	43	43	42	43	43	43	
Motor Constant	oz-in/sqrt W	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	
	Nm/sqrt W	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	
Torque Constant	oz-in/A	3.529	4.462	5.584	7.044	8.924	11.155	14.062	17.848	
	Nm/A	0.025	0.032	0.039	0.05	0.063	0.079	0.099	0.126	
Voltage Constant	V/krpm	2.61	3.30	4.13	5.21	6.60	8.25	10.4	13.2	
	V/rad/s	0.025	0.032	0.039	0.05	0.063	0.079	0.099	0.126	
Terminal Resistance	Ohms	0.75	1.19	1.89	3.00	4.76	7.56	12.0	19.0	
Inductance	mH	0.14	0.21	0.34	0.54	0.84	1.34	2.20	3.36	
No-Load Current	Amps (A)	0.043	0.034	0.027	0.021	0.017	0.014	0.011	0.009	
No-Load Speed	RPM	5810	5780	5800	5800	5780	5800	5800	5780	
Peak Current	Amps (A)	20.3	16.1	12.7	10.1	8.03	6.35	5.05	4.02	
Peak Torque	oz-in	71.4	71.4	70.7	71.1	71.4	70.7	71.0	71.6	
	Nm	0.5041	0.5041	0.4991	0.502	0.5041	0.4991	0.5013	0.5055	
Coulomb Friction Torque	oz-in	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	
	Nm	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	
Viscous Damping Factor	oz-in/krpm	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	
	Nm s/rad	1.61E-6	1.61E-6	1.61E-6	1.61E-6	1.61E-6	1.61E-6	1.61E-6	1.61E-6	
Electrical Time Constant	ms	0.19	0.18	0.18	0.18	0.18	0.18	0.18	0.18	
Mechanical Time Constant	ms	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.4	
Thermal Time Constant	min	23	23	23	23	23	23	23	23	
Thermal Resistance	Celsius/W	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	
Max. Winding Temperature	Celsius	130	130	130	130	130	130	130	130	
Rotor Inertia	oz-in-sec ²	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	0.00064	
	kg-m ²	4.52E-6	4.52E-6	4.52E-6	4.52E-6	4.52E-6	4.52E-6	4.52E-6	4.52E-6	
Weight (Mass)	oz	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	
	g	396.9	396.9	396.9	396.9	396.9	396.9	396.9	396.9	

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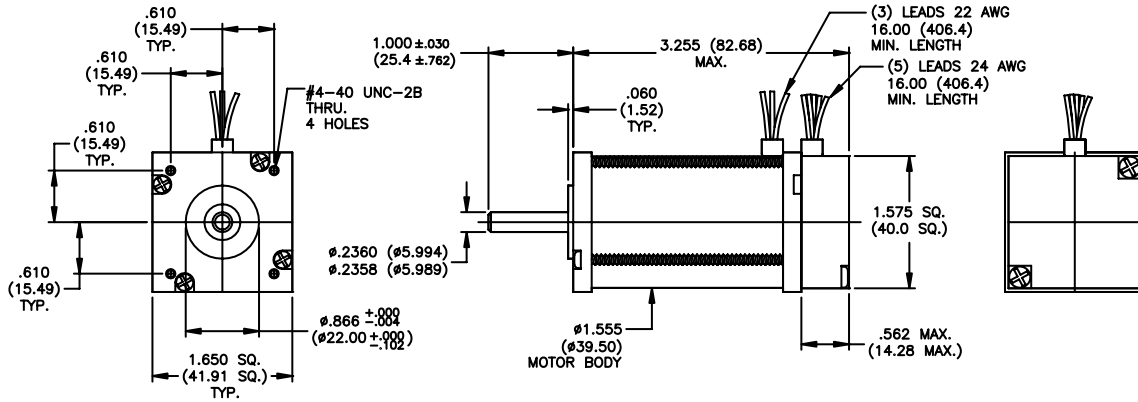
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Supply Voltage	VDC	19.1	24.0	30.3	38.2	48.0	60.6	76.4	96.0
Continuous Torque	oz-in	14	14	14	14	14	14	14	14
	Nm	0.0988	0.0988	0.0988	0.0988	0.0988	0.0988	0.0988	0.0988
Speed @ Cont. Torque	RPM	5240	5210	5250	5230	5210	5250	5230	5210
Current @ Cont. Torque	Amps (A)	3.82	3.02	2.42	1.91	1.51	1.21	0.95	0.76
Continuous Output Power	Watts (W)	55	55	56	55	55	56	55	55
Motor Constant	oz-in/sqrt W	4.8	4.8	4.7	4.8	4.8	4.7	4.8	4.8
	Nm/sqrt W	0.034	0.034	0.033	0.034	0.034	0.033	0.034	0.034
Torque Constant	oz-in/A	4.327	5.463	6.842	8.667	10.939	13.683	17.334	21.880
	Nm/A	0.031	0.039	0.048	0.061	0.077	0.097	0.122	0.155
Voltage Constant	V/krpm	3.20	4.04	5.06	6.41	8.09	10.12	12.82	16.18
	V/rad/s	0.031	0.039	0.048	0.061	0.077	0.097	0.122	0.155
Terminal Resistance	Ohms	0.82	1.31	2.08	3.30	5.24	8.32	13.2	21.0
Inductance	mH	0.16	0.26	0.41	0.64	1.04	1.60	2.60	4.16
No-Load Current	Amps (A)	0.035	0.028	0.022	0.017	0.014	0.011	0.009	0.007
No-Load Speed	RPM	5960	5920	5980	5950	5920	5980	5950	5920
Peak Current	Amps (A)	23.3	18.3	14.6	11.6	9.16	7.28	5.79	4.58
Peak Torque	oz-in	101	100	99	100	100	99	100	100
	Nm	0.7131	0.706	0.6989	0.706	0.706	0.6989	0.706	0.706
Coulomb Friction Torque	oz-in	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	Nm	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Viscous Damping Factor	oz-in/krpm	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
	Nm s/rad	1.81E-6	1.81E-6	1.81E-6	1.81E-6	1.81E-6	1.81E-6	1.81E-6	1.81E-6
Electrical Time Constant	ms	0.20	0.20	0.20	0.19	0.20	0.19	0.20	0.20
Mechanical Time Constant	ms	5.0	5.0	5.1	5.0	5.0	5.1	5.0	5.0
Thermal Time Constant	min	26	26	26	26	26	26	26	26
Thermal Resistance	Celsius/W	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Max. Winding Temperature	Celsius	130	130	130	130	130	130	130	130
Rotor Inertia	oz-in-sec ²	0.00080	0.00080	0.00080	0.00080	0.00080	0.00080	0.00080	0.00080
	kg-m ²	5.65E-6	5.65E-6	5.65E-6	5.65E-6	5.65E-6	5.65E-6	5.65E-6	5.65E-6
Weight (Mass)	oz	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
	g	453.6	453.6	453.6	453.6	453.6	453.6	453.6	453.6

Performance (24 V Winding)	Standard Features	Connection Chart																		
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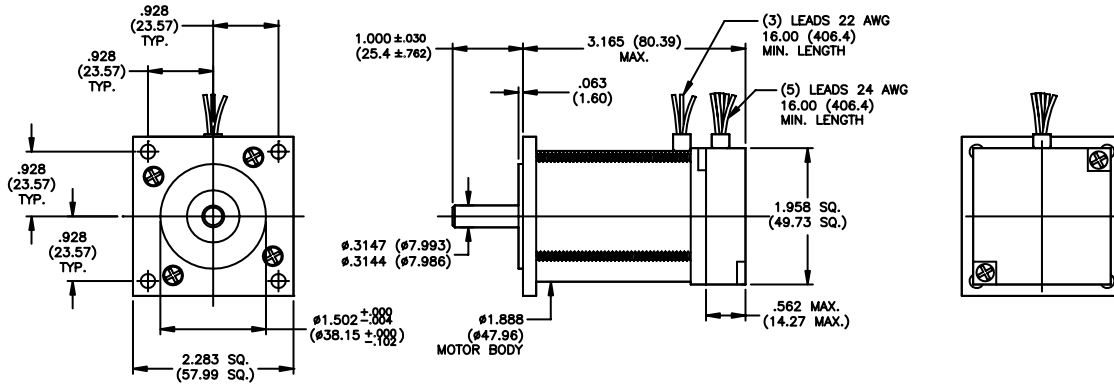
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Specification	Units	Part/Model Number								
		4413 24.0 V	4413 30.3 V	4413 38.2 V	4413 48.0 V	4413 60.0 V	4413 76.4 V	4413 96.0 V	4413 121.2 V	
Supply Voltage	VDC	24.0	30.3	38.2	48.0	60.6	76.4	96.0	121.2	
Continuous Torque	oz-in	19	19	19	19	19	19	19	19	
	Nm	0.1341	0.1341	0.1341	0.1341	0.1341	0.1341	0.1341	0.1341	
Speed @ Cont. Torque	RPM	5300	5300	5330	5300	5300	5330	5300	5300	
Current @ Cont. Torque	Amps (A)	3.96	3.13	2.50	1.98	1.57	1.25	0.99	0.78	
Continuous Output Power	Watts (W)	75	75	75	75	75	75	75	75	
Motor Constant	oz-in/sqrt W	5.9	5.9	5.8	5.9	5.9	5.8	5.9	5.9	
	Nm/sqrt W	0.042	0.042	0.041	0.042	0.042	0.041	0.042	0.042	
Torque Constant	oz-in/A	5.544	7.004	8.775	11.101	14.062	17.577	22.175	27.989	
	Nm/A	0.039	0.049	0.062	0.078	0.099	0.124	0.157	0.198	
Voltage Constant	V/krpm	4.10	5.18	6.49	8.21	10.4	13.0	16.4	20.7	
	V/rad/s	0.039	0.049	0.062	0.078	0.099	0.124	0.157	0.198	
Terminal Resistance	Ohms	0.89	1.42	2.26	3.58	5.68	9.04	14.3	22.7	
Inductance	mH	0.19	0.30	0.47	0.74	1.20	1.88	2.96	4.80	
No-Load Current	Amps (A)	0.027	0.022	0.017	0.014	0.011	0.009	0.007	0.006	
No-Load Speed	RPM	5840	5840	5880	5840	5840	5890	5840	5840	
Peak Current	Amps (A)	27.0	21.3	16.9	13.4	10.7	8.45	6.70	5.33	
Peak Torque	oz-in	150	149	148	149	149	148	149	149	
	Nm	1.059	1.0519	1.0449	1.0519	1.0519	1.0449	1.0519	1.0519	
Coulomb Friction Torque	oz-in	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	
	Nm	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	
Viscous Damping Factor	oz-in/krpm	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	
	Nm s/rad	2.22E-6	2.22E-6	2.22E-6	2.22E-6	2.22E-6	2.22E-6	2.22E-6	2.22E-6	
Electrical Time Constant	ms	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	
Mechanical Time Constant	ms	3.5	3.5	3.6	3.5	3.5	3.6	3.5	3.5	
Thermal Time Constant	min	27	27	27	27	27	27	27	27	
Thermal Resistance	Celsius/W	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	
Max. Winding Temperature	Celsius	130	130	130	130	130	130	130	130	
Rotor Inertia	oz-in-sec ²	0.00086	0.00086	0.00086	0.00086	0.00086	0.00086	0.00086	0.00086	
	kg-m ²	6.07E-6	6.07E-6	6.07E-6	6.07E-6	6.07E-6	6.07E-6	6.07E-6	6.07E-6	
Weight (Mass)	oz	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	
	g	510.3	510.3	510.3	510.3	510.3	510.3	510.3	510.3	

Performance (24 V Winding)	Standard Features	Connection Chart																		
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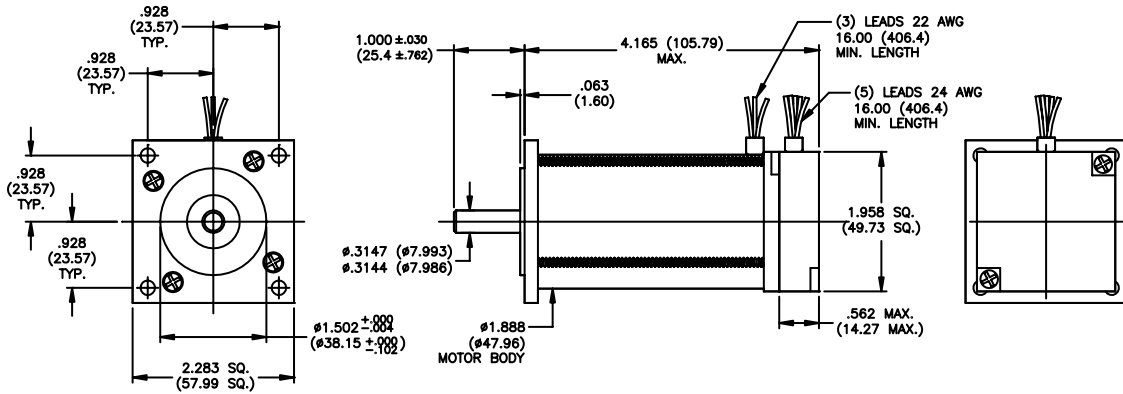
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Specification	Units	Part/Model Number							
		5411 12.0 V	5411 15.2 V	5411 19.1 V	5411 24.0 V	5411 30.3 V	5411 38.2 V	5411 48.0 V	5411 60.0 V
Supply Voltage	VDC	12.0	15.2	19.1	24.0	30.3	38.2	48.0	60.6
Continuous Torque	oz-in	25	25	25	25	25	25	25	25
	Nm	0.1765	0.1765	0.1765	0.1765	0.1765	0.1765	0.1765	0.1765
Speed @ Cont. Torque	RPM	4460	4310	4450	4410	4470	4450	4420	4470
Current @ Cont. Torque	Amps (A)	9.81	7.18	5.68	4.49	3.60	2.84	2.25	1.80
Continuous Output Power	Watts (W)	82	80	82	82	83	82	82	83
Motor Constant	oz-in/sqrt W	5.9	6.5	6.9	6.9	6.9	6.9	6.9	6.9
	Nm/sqrt W	0.042	0.046	0.049	0.049	0.049	0.049	0.049	0.049
Torque Constant	oz-in/A	2.961	4.043	5.11	6.46	8.07	10.2	12.9	16.1
	Nm/A	0.021	0.029	0.036	0.046	0.057	0.072	0.091	0.114
Voltage Constant	V/krpm	2.19	2.99	3.78	4.78	5.97	7.56	9.54	11.9
	V/rad/s	0.021	0.029	0.036	0.046	0.057	0.072	0.091	0.114
Terminal Resistance	Ohms	0.25	0.39	0.55	0.88	1.37	2.20	3.5	5.48
Inductance	mH	0.06	0.10	0.17	0.27	0.41	0.66	1.06	1.65
No-Load Current	Amps (A)	0.14	0.10	0.082	0.065	0.052	0.041	0.033	0.026
No-Load Speed	RPM	5470	5070	5040	5010	5070	5040	5020	5070
Peak Current	Amps (A)	48.0	39.0	34.7	27.3	22.1	17.4	13.6	11.1
Peak Torque	oz-in	142	157	177	176	178	177	175	178
	Nm	1.0025	1.1084	1.2496	1.2426	1.2567	1.2496	1.2355	1.2567
Coulomb Friction Torque	oz-in	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
	Nm	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Viscous Damping Factor	oz-in/krpm	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
	Nm s/rad	1.28E-5	1.28E-5	1.28E-5	1.28E-5	1.28E-5	1.28E-5	1.28E-5	1.28E-5
Electrical Time Constant	ms	0.24	0.26	0.31	0.31	0.30	0.30	0.30	0.30
Mechanical Time Constant	ms	10.0	8.4	7.4	7.4	7.4	7.4	7.4	7.4
Thermal Time Constant	min	14	14	14	14	14	14	14	14
Thermal Resistance	Celsius/W	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Max. Winding Temperature	Celsius	130	130	130	130	130	130	130	130
Rotor Inertia	oz-in-sec ²	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
	kg-m ²	1.77E-5	1.77E-5	1.77E-5	1.77E-5	1.77E-5	1.77E-5	1.77E-5	1.77E-5
Weight (Mass)	oz	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	g	623.7	623.7	623.7	623.7	623.7	623.7	623.7	623.7

Performance (24 V Winding)	Standard Features	Connection Chart																		
<p>Speed (rpm) vs Torque (oz-in) and Current (A) vs Torque (oz-in) graph.</p>	<ul style="list-style-type: none"> Shielded Ball Bearings 4-Pole Rotor Neodymium Magnets 3-Phase Stator Hall Sensor Feedback (120° elec.) NEMA 23 Mounting 	<table border="1"> <thead> <tr> <th>Color/Pin</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>Brown</td> <td>Motor ΦA</td> </tr> <tr> <td>Red</td> <td>Motor ΦB</td> </tr> <tr> <td>Orange</td> <td>Motor ΦC</td> </tr> <tr> <td>Grey</td> <td>Sensor 1</td> </tr> <tr> <td>Blue</td> <td>Sensor 2</td> </tr> <tr> <td>White</td> <td>Sensor 3</td> </tr> <tr> <td>Violet</td> <td>Vcc</td> </tr> <tr> <td>Black</td> <td>Ground</td> </tr> </tbody> </table>	Color/Pin	Function	Brown	Motor ΦA	Red	Motor ΦB	Orange	Motor ΦC	Grey	Sensor 1	Blue	Sensor 2	White	Sensor 3	Violet	Vcc	Black	Ground
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Specification	Units	Part/Model Number							
		5413 19.1 V	5413 24.0 V	5413 30.3 V	5413 38.2 V	5413 48.0 V	5413 60.0 V	5413 76.4 V	5413 96.0 V
Supply Voltage	VDC	19.1	24.0	30.3	38.2	48.0	60.6	76.4	96.0
Continuous Torque	oz-in	43	43	43	43	43	43	43	43
	Nm	0.3036	0.3036	0.3036	0.3036	0.3036	0.3036	0.3036	0.3036
Speed @ Cont. Torque	RPM	4120	3870	3950	3950	3970	3960	3950	3970
Current @ Cont. Torque	Amps (A)	8.86	6.50	5.13	4.06	3.25	2.57	2.03	1.63
Continuous Output Power	Watts (W)	131	123	126	126	126	126	126	126
Motor Constant	oz-in/sqrt W	9.8	10.5	11.1	11.1	11.1	11.1	11.1	11.1
	Nm/sqrt W	0.069	0.074	0.078	0.078	0.078	0.078	0.078	0.078
Torque Constant	oz-in/A	5.62	7.66	9.70	12.250	15.3	19.4	24.5	30.6
	Nm/A	0.04	0.054	0.068	0.087	0.108	0.137	0.173	0.216
Voltage Constant	V/krpm	4.16	5.66	7.17	9.06	11.3	14.3	18.1	22.6
	V/rad/s	0.04	0.054	0.068	0.087	0.108	0.137	0.173	0.216
Terminal Resistance	Ohms	0.33	0.53	0.76	1.21	1.90	3.03	4.9	7.60
Inductance	mH	0.09	0.16	0.26	0.41	0.65	1.03	1.65	2.58
No-Load Current	Amps (A)	0.10	0.074	0.059	0.047	0.037	0.029	0.023	0.019
No-Load Speed	RPM	4590	4230	4220	4210	4230	4220	4210	4230
Peak Current	Amps (A)	57.9	45.3	39.9	31.6	25.3	20.0	15.8	12.6
Peak Torque	oz-in	325	346	386	386	386	387	385	386
	Nm	2.2945	2.4428	2.7252	2.7252	2.7252	2.7322	2.7181	2.7252
Coulomb Friction Torque	oz-in	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
	Nm	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Viscous Damping Factor	oz-in/krpm	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	Nm s/rad	1.68E-5	1.68E-5	1.68E-5	1.68E-5	1.68E-5	1.68E-5	1.68E-5	1.68E-5
Electrical Time Constant	ms	0.27	0.30	0.34	0.34	0.34	0.34	0.34	0.34
Mechanical Time Constant	ms	7.2	6.2	5.5	5.5	5.6	5.5	5.5	5.6
Thermal Time Constant	min	22	22	22	22	22	22	22	22
Thermal Resistance	Celsius/W	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Max. Winding Temperature	Celsius	130	130	130	130	130	130	130	130
Rotor Inertia	oz-in-sec ²	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048
	kg-m ²	3.39E-5	3.39E-5	3.39E-5	3.39E-5	3.39E-5	3.39E-5	3.39E-5	3.39E-5
Weight (Mass)	oz	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
	g	992.2	992.2	992.2	992.2	992.2	992.2	992.2	992.2

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