

Size 16, Encoder Feedback, Specifications

| Parameter | Symbol | Units | SM160A | SM160B | SM161A | SM161B | SM162A | SM162B |
|--|-----------------------|------------------------|----------|----------|----------|----------|----------|----------|
| Stall Torque Continuous ¹ | T_{cs} | lb-in | 0.8 | 0.8 | 1.6 | 1.6 | 2.9 | 3.1 |
| | | oz-in | 13 | 13 | 26 | 26 | 47 | 49 |
| | | Nm | 0.09 | 0.09 | 0.18 | 0.18 | 0.33 | 0.34 |
| Stall Current Continuous ^{1,4,8} | $I_{cs}(\text{sine})$ | Amps Peak | 2.8 | 5.6 | 2.7 | 5.2 | 2.6 | 5.1 |
| Stall Current Continuous ^{1,7} | $I_{cs}(\text{trap})$ | Amps DC | 2.5 | 4.8 | 2.3 | 4.5 | 2.3 | 4.4 |
| Peak Torque ⁶ | T_{pk} | lb-in | 2.5 | 2.5 | 4.9 | 4.9 | 8.8 | 9.1 |
| | | oz-in | 40 | 40 | 78 | 78 | 141 | 145 |
| | | Nm | 0.28 | 0.28 | 0.55 | 0.54 | 0.99 | 1.02 |
| Peak Current ^{4,6,8} | $I_{pk}(\text{sine})$ | Amps Peak | 8.5 | 16.7 | 8.1 | 15.5 | 7.8 | 15.2 |
| Peak Current ^{6,7} | $I_{pk}(\text{trap})$ | Amps DC | 7.4 | 14.4 | 7.0 | 13.4 | 6.8 | 13.2 |
| Rated Speed ² | ω_r | rpm | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 | 7,500 |
| Current @ Rated Speed | $I_r(\text{sine})$ | Amps | 2.5 | 4.9 | 2.2 | 4.2 | 2.2 | 4.3 |
| Current @ Rated Speed | $I_r(\text{trap})$ | Amps | 2.2 | 4.2 | 1.9 | 3.6 | 1.9 | 3.8 |
| Torque @ Rated Speed | T_r | lb-in | 0.6 | 0.6 | 1.1 | 1.1 | 2.3 | 2.3 |
| | | oz-in | 10 | 10 | 18 | 18 | 37 | 37 |
| | | Nm | 0.07 | 0.07 | 0.13 | 0.13 | 0.26 | 0.26 |
| Shaft Power @ Rated Speed | P_o | watts | 57 | 55 | 97 | 100 | 205 | 204 |
| Voltage Constant ^{3,4} | K_b | volts/radian/sec | 0.038 | 0.020 | 0.079 | 0.041 | 0.147 | 0.078 |
| Voltage Constant ^{3,4} | K_e | volts/KRPM | 4.02 | 2.08 | 8.27 | 4.29 | 15.39 | 8.17 |
| Torque Constant ⁹ | $K_t(\text{sine})$ | oz-in/Amp Peak | 4.71 | 2.43 | 9.69 | 5.03 | 18.03 | 9.57 |
| | | Nm/Amp Peak | 0.033 | 0.017 | 0.068 | 0.035 | 0.126 | 0.067 |
| Torque Constant ^{3,4} | $K_t(\text{trap})$ | oz-in/Amp DC | 5.43 | 2.81 | 11.19 | 5.81 | 20.82 | 11.04 |
| | | Nm/Amp DC | 0.038 | 0.02 | 0.078 | 0.041 | 0.146 | 0.077 |
| Resistance ³ | R | Ohms | 3.43 | 0.90 | 4.53 | 1.24 | 6.50 | 1.73 |
| Inductance ⁵ | L | mH | 0.53 | 0.13 | 0.81 | 0.21 | 1.39 | 0.33 |
| Maximum Bus Voltage | V_m | Volts DC | 100 | 100 | 170 | 170 | 170 | 170 |
| Thermal Resistance Wind-Amb | R_{th-w-a} | °C/watt | 3.20 | 3.20 | 2.70 | 2.70 | 2.00 | 2.00 |
| Motor Constant | K_m | oz-in/√watt | 2.93 | 2.96 | 5.26 | 5.21 | 8.16 | 8.40 |
| | | Nm/√watt | 0.021 | 0.021 | 0.037 | 0.036 | 0.057 | 0.059 |
| Viscous Damping | B | oz-in/Krpm | 0.162 | 0.162 | 0.284 | 0.284 | 0.300 | 0.300 |
| | | Nm/Krpm | 1.13 E-3 | 1.13 E-3 | 1.99 E-3 | 1.99 E-3 | 2.10 E-3 | 2.10 E-3 |
| Static Friction | T_f | oz-in | 0.10 | 0.10 | 0.15 | 0.15 | 0.20 | 0.20 |
| | | Nm | 7.0 E-4 | 7.0 E-4 | 1.05 E-3 | 1.05 E-3 | 1.40 E-3 | 1.40 E-3 |
| Motor Thermal Time Constant | τ_{th} | minutes | 10 | 10 | 11.6 | 11.6 | 14.2 | 14.2 |
| Electrical Time Constant | τ_{elec} | milliseconds | 0.16 | 0.15 | 0.18 | 0.17 | 0.21 | 0.19 |
| Mechanical Time Constant | τ_{mch} | milliseconds | 11.7 | 11.5 | 7.7 | 7.8 | 5.5 | 5.2 |
| Intermittent Torque Duration ¹⁰ | T_{2x} | seconds | 8 | 8 | 9 | 9 | 14 | 14 |
| Peak Torque Duration ¹¹ | T_{3x} | seconds | 3 | 3 | 4 | 4 | 5 | 5 |
| Rotor Inertia | J | lb-in-sec ² | 4.4 E-5 | 4.4 E-5 | 9.4 E-5 | 9.4 E-5 | 1.6 E-4 | 1.6 E-4 |
| | | kg-m ² | 5.0 E-6 | 5.0 E-6 | 1.1 E-5 | 1.1 E-5 | 1.8 E-5 | 1.8 E-5 |
| Number of Poles | Np | | 4 | 4 | 4 | 4 | 4 | 4 |
| Weight | # | lbs | 0.7 | 0.7 | 1.1 | 1.1 | 1.6 | 1.6 |
| | | kg | 0.3 | 0.3 | 0.5 | 0.5 | 0.7 | 0.7 |
| Winding Class | | | H | H | H | H | H | H |

¹ @ 25°C ambient, 125°C winding temperature, motor connected to a 10"x10"x1/4" aluminum mounting plate, @40°C ambient derate phase currents and torques by 12%.

² Maximum speed is 7500RPM with 500 line Encoder. For 1000 line encoders, derate to 6000RPM. For higher speed operation please call the factory.

³ Measured Line to Line, ±10% line-to-line

⁴ Value is measured peak of sine wave.

⁵ ±30%, Line-to-Line, inductance bridge measurement @ 1 kHz

⁶ Initial winding temperature must be 60°C or less before peak current is applied.

⁷ DC current through a pair of motor phases of a trapezoidally (six state) commutated motor.

⁸ Peak of the sinusoidal current in any phase for a sinusoidally commutated motor.

⁹ Total motor torque per peak of the sinusoidal amps measured in any phase, +/-10%.

¹⁰ Maximum Time duration with 2 times rated applied with initial winding temp at 60°C.

¹¹ Maximum Time duration with 3 times rated applied with initial winding temp at 60°C.

Note: These specifications are based on theoretical motor performance and are not specific to any amplifier.

Servo Motors

