

TORQUEMASTER

BRUSH SERVO MOTORS

2100 SERIES

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Series 2100, is a high performance, permanent magnet brush servo motor for use in various industrial direct drive or geared servo systems

- Rugged industrial construction
- Continuous torque ratings up to 53 oz.-in. — with speeds up to 6500 RPM (no load)
- Peak torque ratings up to 300 oz.-in.
- High torque-to-inertia ratio delivers maximum torque per frame size
- Superior low speed performance
- Numerous custom options available



BRUSH SERVO MOTOR CHARACTERISTICS

SYMBOL		UNITS	2105	2110	2115	2120	2130
T _C	Cont. Torque	Oz-In	12	18	30	38	53
T _P	Peak Torque	Oz-In	50	100	150	200	300
T _F	Static Friction	Oz-In	3	3	3	3	3
F _I	Viscous Friction	Oz-In/KRPM	0.2	0.3	0.3	0.4	0.5
T _R	Cogging Torque	Oz-In	0.2	0.3	0.5	0.5	0.5
J _M	Inertia	Oz-In-sec ²	0.0018	0.0031	0.0044	0.0057	0.0083
R _{TH}	Thermal Res	Deg C/watt	6.9	6.2	5	4.5	3.8
T _{TH}	Thermal Time	Minute	10	10	15	15	20
t _m	Mech Time	Millisec	24.3	12.19	8.62	8.07	7.20
t _e	Elect Time	Millisec	1.6	1.9	2.1	2.1	2.2
F _C	Commutation	Watts x Oz In / Amps	488	722	1260	1548	2116
Wt	Weight	Lbs	1.9	2.9	3.1	3.3	4.3

Note: All values at 25°C Ambient.

WINDING

A	K _T	Torq. Sens.	Oz-In/Amp	2.27	3.8	6.12	7.74	11.2
	R _A	Arm. Resis.	Ohms	0.29	0.40	0.52	0.60	0.80
	K _V	Back E.M.F	Volts/KRPM	1.7	2.8	4.5	5.7	8.3
	F _C /K _T	P _b	Watts	215	190	206	200	189
B	K _T	Torq. Sens.	Oz-In/Amp	2.77	4.7	7.48	9.46	13.6
	R _A	Arm. Resis.	Ohms	0.44	0.61	0.77	0.89	1.18
	K _V	Back E.M.F	Volts/KRPM	2	3.5	5.5	7.0	10.1
	F _C /K _T	P _b	Watts	176	154	168	164	156
C	K _T	Torq. Sens.	Oz-In/Amp	3.53	5.9	9.52	12	17.3
	R _A	Arm. Resis.	Ohms	0.70	0.97	1.25	1.44	1.92
	K _V	Back E.M.F	Volts/KRPM	2.6	4.4	7.0	8.9	12.8
	F _C /K _T	P _b	Watts	138	122	132	129	122
D	K _T	Torq. Sens.	Oz-In/Amp	4.41	7.4	11.9	15	21.7
	R _A	Arm. Resis.	Ohms	1.13	1.52	1.96	2.25	3.01
	K _V	Back E.M.F	Volts/KRPM	3.3	5.5	8.8	11.1	16.0
	F _C /K _T	P _b	Watts	111	98	106	103	98
E	K _T	Torq. Sens.	Oz-In/Amp	5.54	9.3	15	19	27
	R _A	Arm. Resis.	Ohms	1.77	2.40	3.11	3.61	4.67
	K _V	Back E.M.F	Volts/KRPM	4.1	6.9	11.1	14.0	20.0
	F _C /K _T	P _b	Watts	88	78	84	81	78
F	K _T	Torq. Sens.	Oz-In/Amp	6.93	11.7	18.7	23.6	34
	R _A	Arm. Resis.	Ohms	2.78	3.80	4.84	5.57	7.40
	K _V	Back E.M.F	Volts/RPM	5.1	8.6	13.8	17.4	25.1
	F _C /K _T	P _b	Watts	70	62	67	66	62
G	K _T	Torq. Sens.	Oz-In/Amp	8.57	14.4	23	29	42
	R _A	Arm. Resis.	Ohms	4.31	5.76	7.32	8.41	11.29
	K _V	Back E.M.F	Volts/KRPM	6.3	10.6	17.0	21.4	31.0
	F _C /K _T	P _b	Watts	57	50	55	53	50
H	K _T	Torq. Sens.	Oz-In/Amp	10.71	18	29	36	52
	R _A	Arm. Resis.	Ohms	6.84	9.00	11.64	12.96	17.31
	K _V	Back E.M.F	Volts/KRPM	7.9	13.3	21.4	26.6	38.4
	F _C /K _T	P _b	Watts	46	40	43	43	41

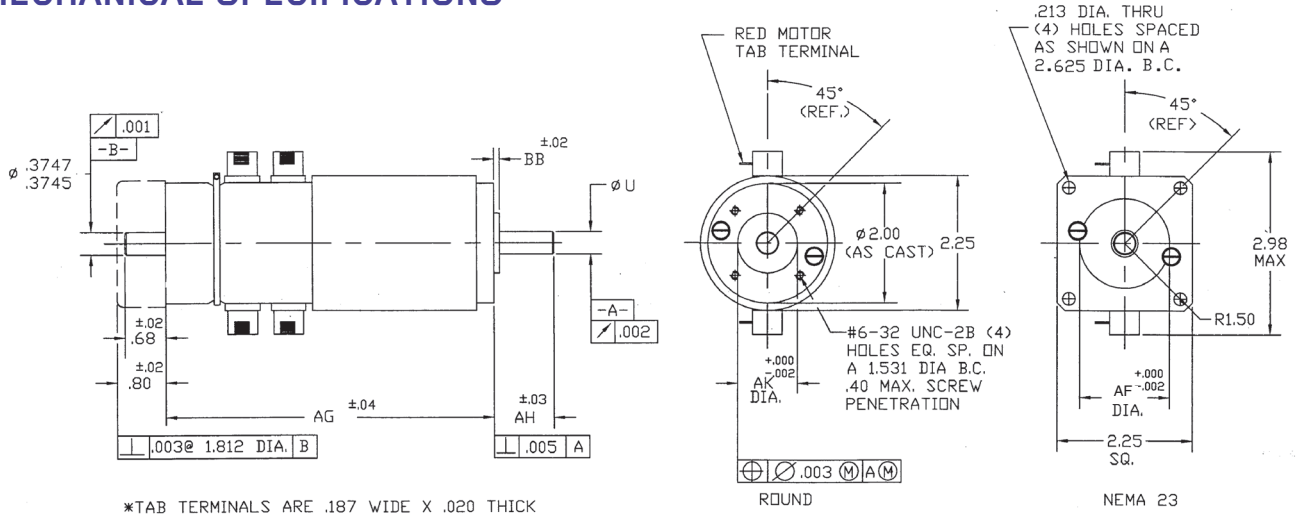
Note: Continuous torque specifications obtained with motor mounted to an 10" x 10" x 0.25" alum. plate at 25 °C ambient. Typical values are within ±10% of rating.

For custom designs please consult factory.

All specifications subject to change without notice.



MECHANICAL SPECIFICATIONS*



DIMENSION CHART*

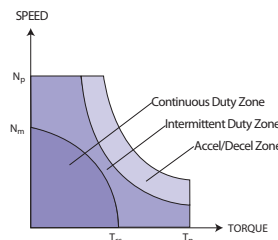
MOTOR	AG	AG	U DIA.		AH		AK	AF	BB	
	Motor Only Inches (Metric)	Motor Tach Inches (Metric)	STD	NEMA	STD	NEMA	STD	NEMA	STD	NEMA
2105	3.13 (79.5)	4.60 (116.8)	.3750/.3745	.2500/.2495	1.00	0.77	1.000	1.500	0.10	0.06
2110	3.63 (92.2)	5.10 (129.5)	.3750/.3745	.2500/.2495	1.00	0.77	1.000	1.500	0.10	0.06
2115	4.13 (104.9)	5.60 (142.2)	.3750/.3745	.2500/.2495	1.00	0.77	1.000	1.500	0.10	0.06
2120	4.63 (117.6)	6.10 (154.9)	.3750/.3745	.2500/.2495	1.00	0.77	1.000	1.500	0.10	0.06
2130	5.63 (143.0)	7.10 (180.3)	.3750/.3745	.2500/.2495	1.00	0.77	1.000	1.500	0.10	0.06

METRIC (mm): DIMENSIONS ALL FRAME SIZES

SHAFT: DIA	8j6	MOUNTING: PILOT	25.0
LENGTH	25.0	HOLE SIZE	M4

*All specifications are for reference only. Please consult the factory for certified dimension drawings. Standard Direction of Rotation: CCW rotation viewed from shaft end with red motor terminal positive with respect to black motor terminal.

TORQUE PERFORMANCE CURVES



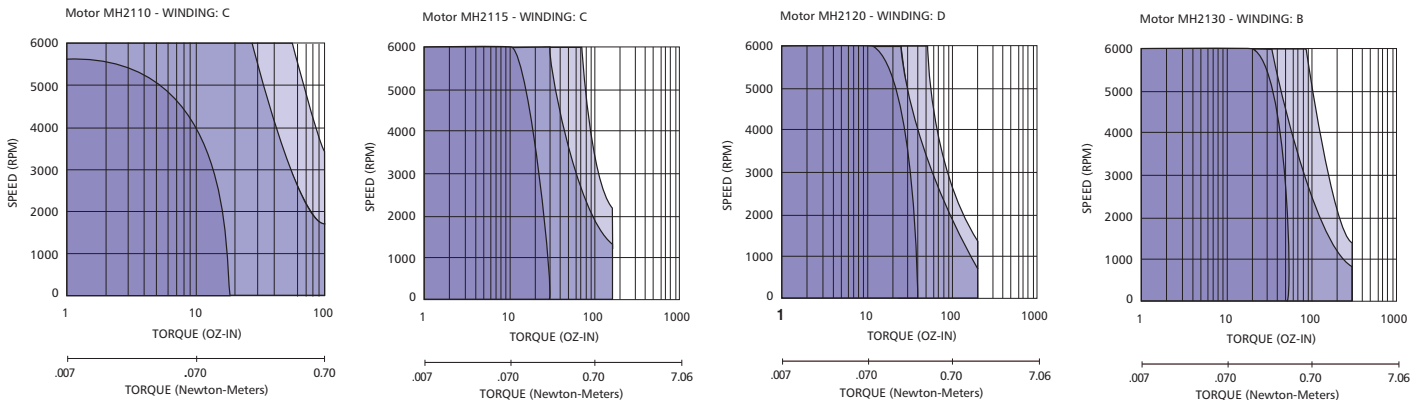
NOTE: Continuous torque specifications obtained with motor mounted to an 10"x10"x.25" aluminum plate at 25 C° ambient. Typical values are within $\pm 10\%$ of rating.

STANDARD WINDING SPEED/TORQUE CURVE DATA FOR SIZING A SERVO MOTOR

- N_m = Maximum speed, continuous operation
- N_p = Peak speed, acceleration/deceleration and intermittent duty
- T_{cs} = Continuous stall torque
- T_p = Peak torque

All specifications subject to change without notice.

TORQUE PERFORMANCE CURVES



VOLTAGE EQUATION FOR MOTORS

$$\text{Volts} = \frac{K_T \times \text{RPM}}{1,350} + \frac{T \times R_A}{K_T} + V_B$$

Where:
 K_T = torque constant, oz.-in. per amp
 T = load torque plus motor friction torque-oz.-in.
 R_A = armature resistance + brush resistance
 V_B = brush voltage drop = 2 volts
Note: For armature resistance at maximum temperature rating, multiply catalog value of R by 1.5

MOTOR TORQUE RATING VS. SPEED

$$T_R = .94K_T \left[\frac{130 - \frac{\text{RPM} \times T_F}{1,350} - \frac{\text{RPM}^2 \times F_i}{1,350,000}}{1.5 R_A} \right]^{1/2} - T_F - \left[\frac{\text{RPM} \times F_i}{1000} \right]$$

Where:
 T_R = rated torque (25°C ambient)-oz.-in.
 K_T = torque sensitivity-oz.-in./amp
 R_A = armature resistance
 RPM = revolutions per minute
 T_F = static friction torque-oz.-in.
 F_i = viscous friction-oz.-in.
 R_{TH} = thermal resistance

To Find: Higher Torque Rating for Intermittent Duty

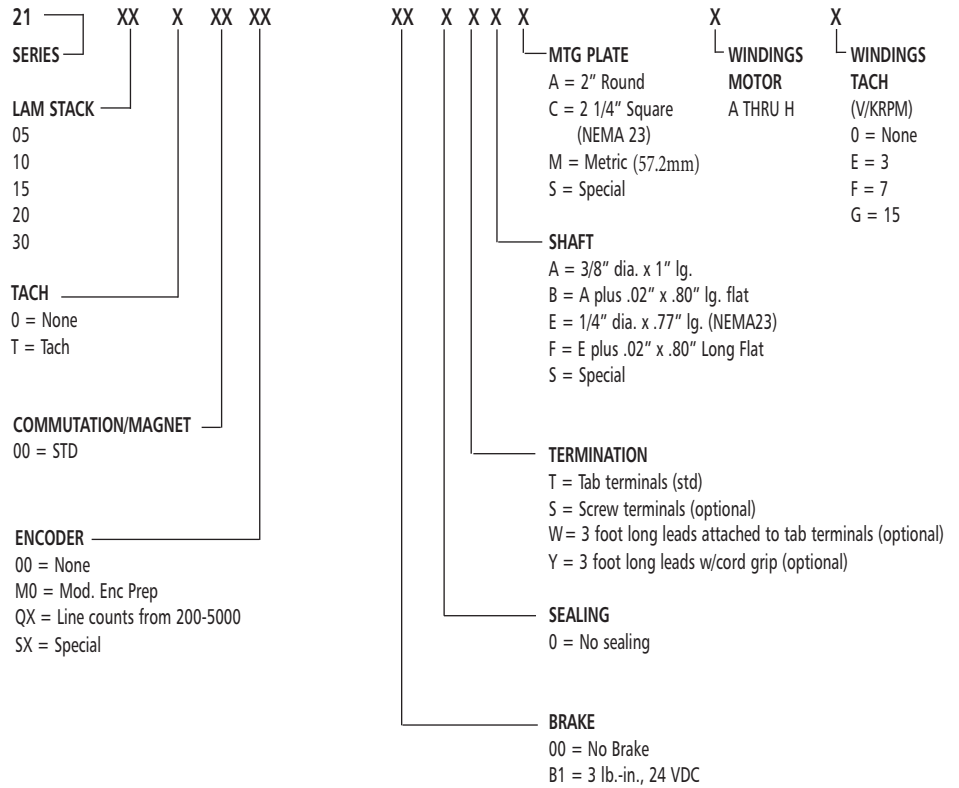
Let $A = \frac{\text{total cycle time in seconds}}{\text{thermal time constant of motors in seconds}}$

Let $B = \frac{\text{"on" time in seconds per cycle}}{\text{thermal time constant of motor in seconds}}$

then with T_R = Rated torque for 100% duty
and T_{MAX} = Rated torque for intermittent duty

$$T_{MAX} = T_R \times \left[\frac{1 - e^{-A}}{1 - e^{-B}} \right]^{1/2}$$

ORDERING INFORMATION (For Standard Options)



CUSTOMIZE THE 2100 SERIES TO YOUR EXACT REQUIREMENTS

To satisfy various applications with cost-effective solutions, 2100 Series motors are readily available with a wide range of standard capabilities. Final designs are often the result of cooperative efforts between the customer's engineering department and Torque Systems. For assistance, call your local distributor or Torque Systems direct. We look forward to meeting your custom requirements.

ASK ABOUT OTHER MOTION CONTROL SOLUTIONS & CAPABILITIES FROM TORQUE SYSTEMS

- Brushless TorqueMaster® Servo Motors
- Shaft-mounted DataTorque™ Encoders
- Gearboxes/Brakes
- Expert application engineering
- Complete repair & refurbishing services



Torque Systems
6 Enterprise Road
Billerica, MA 01821
Tel: 978.667.5100 or 1.800.669.5112
Fax: 978.600.0280
sales: customer@slmti.com
www.torquesystems.com

