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TECHNOLOGY GROUP

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with experienced engineers and technicians on staff.

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along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

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- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

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TORQUEMASTER
BRUSH SERVO MOTORS

3500 SERIES

Torque Systems specializes in the design of high performance brush servo motors that provide efficiency, flexibility of application, and a long and trouble-free service life. Our TORQUEMASTER® 3500 series is no exception, when integrated with high performance brush amplifiers, TORQUE-MASTER 3500 Series brush servo motors provide effective and highly efficient motion control solutions for a wide range of applications including factory automation, packaging, robotics, machine tools, medical instrumentation and more.



Performance Benefits:

- Delivers smooth and superior low speed performance, and maximum power ratings with low thermal resistance for high
speed performance.
- Maximum torque in a smaller package
- Rugged industrial construction
- Continuous torque ratings up to 10.6 in-lbs with speeds up to 4600 RPM *(no load)*
- Peak torque ratings up to 94 in-lbs
- IP65 Sealing available
- High torque-to-inertia ratio delivers maximum torque per frame size
- Numerous custom options available

Design Features:

- Latest in high performance permanent magnet technology, and are available in eight standard windings as well as custom windings
- Motors can be customized to fit your exact application with tachometers, encoders, brakes and other options.
- Specialized machinery designs can install or retrofit servomotor with little or no restrictions
- Multiple configurations accommodate flexible design considerations
- Performance enhancement and feature convenience that allows Torque Systems motors to be incorporated into a broader range of applications

BRUSH SERVO MOTOR CHARACTERISTICS

	SYMBOL		UNITS	3505	3509	3515	3528
	T_C	Cont. Torque	Lb-In	2.63	4.25	6.44	10.63
	T_P	Peak Torque	Lb-In	21.9	37.5	56.3	93.8
	T_F	Static Friction	Lb-In	0.3	0.25	0.3	0.32
	F_i	Viscous Friction	Lb-In/KRPM	0.07	0.08	0.09	0.14
	T_R	Cogging Torque	Lb-In	0.09	0.06	0.07	0.11
	J_M	Inertia	Lb-In-sec^2	0.004	.0006	.0008	.0015
	R_{TH}	Thermal Res	Deg C/watt	4.2	3.7	3.1	2.3
	T_{TH}	Thermal Time	Minute	15	15	20	25
	t_m	Mech Time	Millisec	8.1	5.5	3.9	3.5
	t_e	Elect Time	Millisec	1.5	1.5	1.7	2
	F_C	Commutation	Watts x Lb In / Amps	1475	2060	2990	4960
	Wt	Weight	Lbs	3.2	3.8	5	7.5

Note: All values at 25°C Ambient.

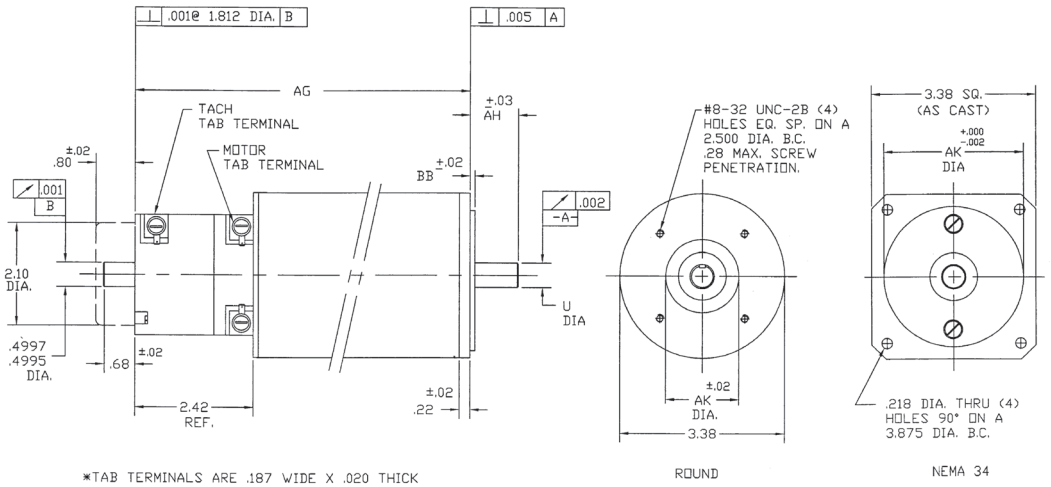
WINDING							
A	K_T	Torq. Sens.	Lb-In/Amp	0.24	0.39	0.59	1.05
	R_A	Arm. Resis.	Ohms	0.13	0.16	0.2	0.3
	K_V	Back E.M.F	Volts/KRPM	2.8	4.6	7.0	12.4
	F_C/K_T	P_b	Watts	388	332	315	295
B	K_T	Torq. Sens.	Lb-In/Amp	0.31	0.52	0.79	1.4
	R_A	Arm. Resis.	Ohms	0.22	0.27	0.34	0.51
	K_V	Back E.M.F	Volts/KRPM	3.7	6.1	9.4	16.6
	F_C/K_T	P_b	Watts	295	248	235	221
C	K_T	Torq. Sens.	Lb-In/Amp	0.39	0.65	0.99	1.74
	R_A	Arm. Resis.	Ohms	0.44	0.53	0.67	1.01
	K_V	Back E.M.F	Volts/KRPM	4.7	7.7	11.8	20.6
	F_C/K_T	P_b	Watts	234	198	188	178
D	K_T	Torq. Sens.	Lb-In/Amp	.5	.82	1.26	2.21
	R_A	Arm. Resis.	Ohms	0.55	0.67	0.84	1.3
	K_V	Back E.M.F	Volts/KRPM	5.9	9.7	14.9	26.2
	F_C/K_T	P_b	Watts	184	157	148	140
E	K_T	Torq. Sens.	Lb-In/Amp	.63	1.04	1.59	2.79
	R_A	Arm. Resis.	Ohms	0.88	1.05	1.34	2.04
	K_V	Back E.M.F	Volts/KRPM	7.5	12.3	18.8	33.0
	F_C/K_T	P_b	Watts	146	124	117	111
F	K_T	Torq. Sens.	Lb-In/Amp	.79	1.29	1.99	3.5
	R_A	Arm. Resis.	Ohms	1.4	1.7	2.12	3.2
	K_V	Back E.M.F	Volts/RPM	9.3	15.3	23.5	41.3
	F_C/K_T	P_b	Watts	117	100	94	89
G	K_T	Torq. Sens.	Lb-In/Amp	1.0	1.64	2.52	4.43
	R_A	Arm. Resis.	Ohms	2.2	2.7	3.4	5.12
	K_V	Back E.M.F	Volts/KRPM	11.8	19.4	29.8	52.3
	F_C/K_T	P_b	Watts	92	78	74	70
H	K_T	Torq. Sens.	Lb-In/Amp	1.26	2.08	3.18	5.59
	R_A	Arm. Resis.	Ohms	3.52	4.3	5.4	8.14
	K_V	Back E.M.F	Volts/KRPM	14.9	24.5	37.6	66.1
	F_C/K_T	P_b	Watts	73	62	59	55

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*



*TAB TERMINALS ARE .187 WIDE X .020 THICK

ROUND

NEMA 34

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
3505	2.49 (63.2)	4.00 (101.6)	.5000/.4995	.3750/.3745	1.00	1.19	1.500	2.875	0.10	0.06
3509	3.24 (82.3)	4.75 (120.7)	.5000/.4995	.3750/.3745	1.00	1.19	1.500	2.875	0.10	0.06
3515	3.99 (101.3)	5.50 (139.7)	.5000/.4995	.3750/.3745	1.00	1.19	1.500	2.875	0.10	0.06
3528	5.24 (133.1)	6.75 (171.5)	.5000/.4995	.3750/.3745	1.00	1.19	1.500	2.875	0.10	0.06

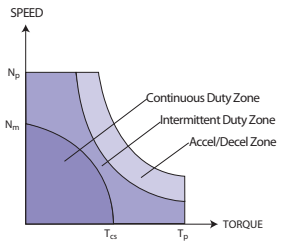
Note: Consult factory for AG length with cover option.

METRIC (mm): DIMENSIONS ALL FRAME SIZES

SHAFT:	DIA	12h6	**MOUNTING:**	PILOT	38
	LENGTH	25.0		B.C.	63.5
				HOLE SIZE	6.6

*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 ±10% of rating.

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

Nm = Maximum speed, continuous operation

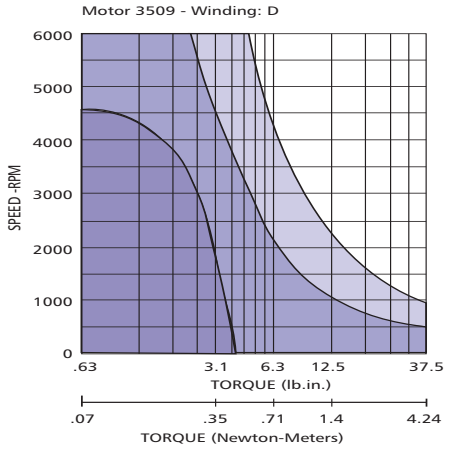
Np = Peak speed, acceleration/deceleration and intermittent duty

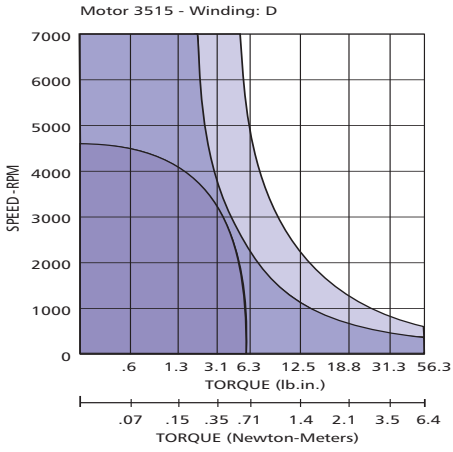
Tcs = Continuous stall torque

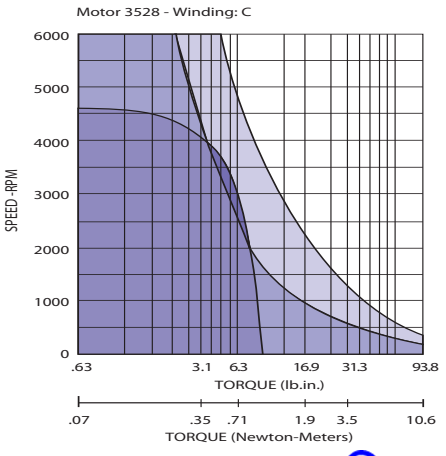
Tp = Peak torque

All specifications subject to change without notice.

TORQUE PERFORMANCE CURVES







Torque Speed Curves of other windings available, consult factory.

VOLTAGE EQUATION FOR MOTORS

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

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

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

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

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

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

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)

35 XX X XX XX XX X X X X X X

SERIES
35

LAM STACK
05
09
15
28

TACH
0 = None
T = Tach

COMMUTATION/MAGNET
00 = STD

ENCODER
00= None
M0 = Mod. Enc Prep
QC = 500
QE = 1024
QD = 1000
QG = 2000
QH = 2048
QJ = 2500
QK = 5000
SX = Special

BRAKE
00 = No Brake
B1 = 15 lb-in, 24 VDC

SEALING
0 = No sealing
B = IP65 w/o shaft seal
S = IP65
} Requires "Y, C, or M" Cover Option from TERMINATION list above

TERMINATION (see note below)
T = Tab terminals (std)
S = Screw terminals (optional)
W = 3 foot leads attached to tab terminals (optional)
Y = Cover w/3 foot long leads and cord grip (optional)
C = Cover w/MS 3102A-20-27P
M = Cover w/NPT

SHAFT
A = 1/2" dia. x 1" lg.
B = A plus 1/8" x .75" lg. keyway
E = 3/8" dia. x 1.19" lg. (NEMA 34)
M = Metric, 12mm dia x 33mm lg. keyway
S= Special

MTG PLATE
A = 3 3/8" Round
C = 3 3/8" Square (NEMA 34)
M= Metric (85.6mm Square)
S= Special

WINDINGS MOTOR
A THRU H

WINDINGS TACH (V/KRPM)
0 = None
E = 3
F = 7
G = 15

NOTE:

Cover Option – consult factory for overall motor length.

CUSTOMIZE THE 3500 SERIES TO YOUR EXACT REQUIREMENTS

To satisfy various applications with cost-effective solutions, 3500 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 Motor
- Gearboxes/Brakes
- Expert application engineering
- Complete repair & refurbishing services

TORQUE SYSTEMS

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