# TORQUEMASTER
## BRUSH SERVO MOTORS

# MS15 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® MS15 series is no exception when integrated with high performance brush amplifiers, TORQUE-MASTER MS15 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 1.5" O.D.package
- Rugged industrial construction
- Continuous torque ratings up to 10 oz.-in with *a Max speed at 10000 RPM.*
- Power up to 50 Watts (Peak)
- Peak torque ratings up to 77.8 oz.-in.
- High torque-to-inertia ratio delivers maximum torque per frame size
- Custom options available

## Design Features:

- Dual Stage Dynamic Balancing
- Diamond Finished Commutators
- ABEC 3 Double Shielded Ball Bearings
- Low Torque Ripple
- Stainless Steel Shafts
- 100% Inspection and Testing
- Tapered-Field Magnet Technology
- Replaceable Copper Graphite Brushes
- Fully Neutralized, Bidirectional Operation

TORQUE SYSTEMS

CE



SL-MTI™

## MS15 PERFORMANCE CHART

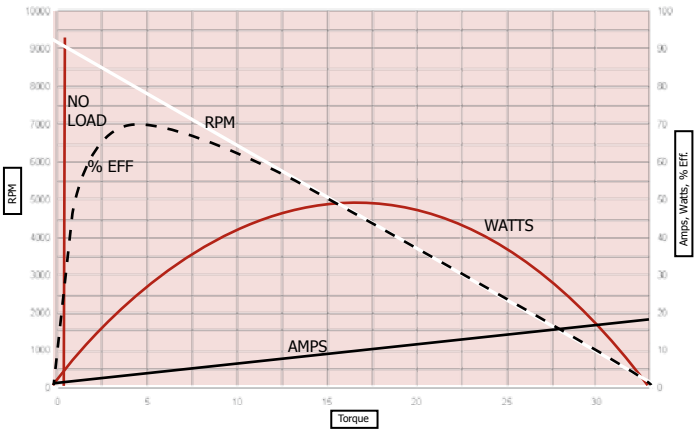
| Power Option | | | 09 | | | | 17 | | | | 25 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage option | | | A(12V) | B(24V) | C(36V) | D(48V) | A(12V) | B(24V) | C(36V) | D(48V) | A(12V) | B(24V) | C(36V) | D(48V) |
| Parameters | Symbol | Unit | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Rated Voltage Range | Vrange | V | 0-15 | 0-30 | 0-45 | 0-60 | 0-15 | 0-30 | 0-45 | 0-60 | 0-15 | 0-30 | 0-45 | 0-60 |
| Rated Output Power | Pout | Watts | 30 | 30 | 30 | 30 | 40 | 40 | 40 | 40 | 50 | 50 | 50 | 50 |
| No Load Speed | Snl | RPM | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 | 8000 |
| Rated Speed | Sr | RPM | 6700 | 6700 | 6700 | 6700 | 6700 | 6700 | 6700 | 6700 | 6700 | 6700 | 6700 | 6700 |
| Max Speed | Smax | RPM | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 |
| Rated Torque | Tr | oz in | 6 | 6 | 6 | 6 | 8 | 8 | 8 | 8 | 10 | 10 | 10 | 10 |
| | | N cm | 4.24 | 4.24 | 4.24 | 4.24 | 5.65 | 5.65 | 5.65 | 5.65 | 7.06 | 7.06 | 7.06 | 7.06 |
| Peak Torque | Tp | oz in | 43 | 43 | 43 | 43 | 58.8 | 58.8 | 58.8 | 58.8 | 77.8 | 77.8 | 77.8 | 77.8 |
| | | N cm | 30.36 | 30.36 | 30.36 | 30.36 | 41.51 | 41.51 | 41.51 | 41.51 | 54.93 | 54.93 | 54.93 | 54.93 |
| Thermal Resistance* | Rm | C/w | 8.7 | 8.7 | 8.7 | 8.7 | 6.2 | 6.2 | 6.2 | 6.2 | 4.1 | 4.1 | 4.1 | 4.1 |
| Thermal Time Constant* | τtm | min | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Mech. Time Constant | τm | ms | 19 | 19 | 19 | 19 | 22 | 22 | 22 | 22 | 24 | 24 | 24 | 24 |
| Amature Inertia | Ja | oz -in s² | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| | | kg m² | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Max. Acceleration | εmax | kRad/s² | 65 | 65 | 65 | 65 | 55 | 55 | 55 | 55 | 45 | 45 | 45 | 45 |
| Back_EMF Constant | Ke | V/KRPM | 1.4 | 2.7 | 4.4 | 5.5 | 1.7 | 2.8 | 4.5 | 5.7 | 1.5 | 3 | 4.5 | 6 |
| | | V/rad/s | 0.013 | 0.026 | 0.042 | 0.053 | 0.016 | 0.027 | 0.043 | 0.054 | 0.014 | 0.029 | 0.043 | 0.057 |
| Torque Constant | Kt | oz-in/A | 1.89 | 3.65 | 5.99 | 7.42 | 2.3 | 3.75 | 6.08 | 7.7 | 2.04 | 4.08 | 6.08 | 8.17 |
| | | N m/A | 0.013 | 0.026 | 0.042 | 0.052 | 0.016 | 0.026 | 0.043 | 0.054 | 0.014 | 0.029 | 0.043 | 0.058 |
| No Load Current | Inl | A | 0.53 | 0.27 | 0.12 | 0.13 | 0.65 | 0.26 | 0.16 | 0.13 | 0.74 | 0.36 | 0.23 | 0.17 |
| Rated Current | Ir | A | 3.25 | 1.68 | 1 | 0.83 | 3.66 | 2.22 | 1.38 | 1.09 | 4.5 | 2.45 | 1.63 | 1.22 |
| Peak Current | Ip | A | 22.7 | 11.8 | 8.2 | 5.8 | 31 | 15.6 | 9.7 | 7.6 | 48.7 | 24.35 | 16.22 | 12.17 |
| Terminal Resistance | R | Ω | 0.72 | 2.7 | 6.4 | 10.26 | 0.87 | 1.8 | 3.8 | 5.94 | 0.31 | 1.23 | 2.55 | 4.73 |

| Flange Dimensions | D | in | 1.5 | | | | 1.5 | | | | 1.5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Axial Length | AL | In | 2.5 | 2.5 | 2.5 | 2.5 | 3.25 | 3.25 | 3.25 | 3.25 | 4.122 | 4.122 | 4.122 | 4.122 |
| Weight | Wm | oz | 8.4 | 8.4 | 8.4 | 8.4 | 12 | 12 | 12 | 12 | 16 | 16 | 16 | 16 |
| | | | | | | | | | | | | | | |
| Operating Temp, | | | -40 - 115 | | | | -40 - 115 | | | | -40 - 115 | | | |
| Ingress Protection Rating | | | IP65 | | | | IP65 | | | | IP65 | | | |

* Custom voltages available
* Values apply at rated voltage, torque & speeds
** Based on 10" x 10" x 1/4" Aluminum Plate Heatsink

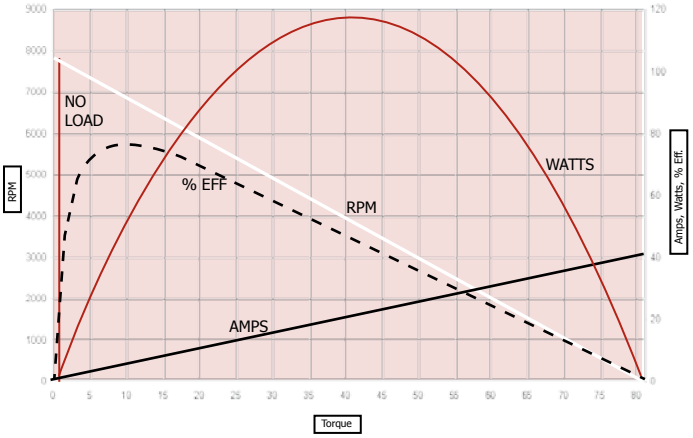
**MS1509-A**

12 Vdc
Motor Performance Chart




**MS1525-A**

12 Vdc
Motor Performance Chart




TORQUE SYSTEMS

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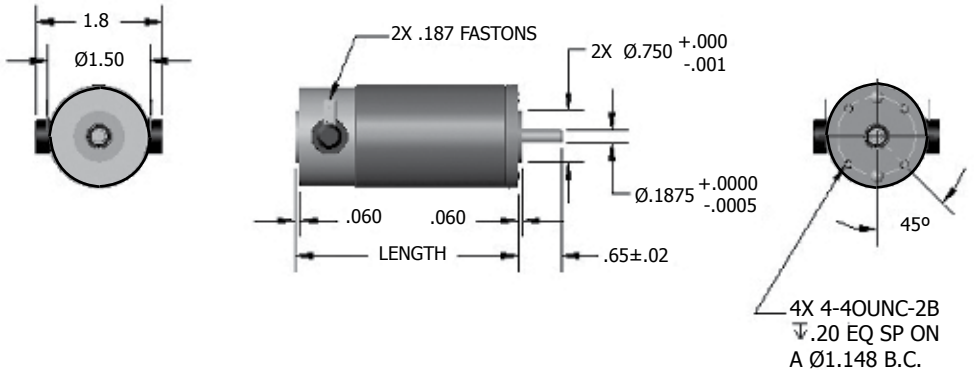
SL-MTI™

# MECHANICAL SPECIFICATIONS*




| OPTIONS | Length Inches | MM |
|---|---|---|
| MS1509 | 2.500 | 63.50 |
| MS1517 | 3.250 | 82.55 |
| MS1525 | 4.122 | 104.70 |

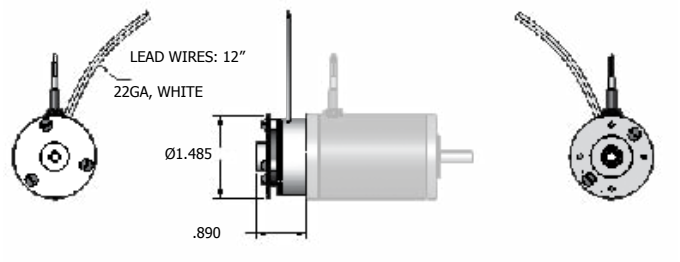
# DIMENSION CHART*

| MOTOR | LENGTH Motor Only Inches (Metric) | LENGTH Motor Tach Inches (Metric) | SHAFT DIA. STD | SHAFT DIA. NEMA-17 | SHAFT LENGTH STD | SHAFT LENGTH NEMA | PILOT STD | PILOT NEMA | PILOT DEPTH STD | PILOT DEPTH NEMA |
|---|---|---|---|---|---|---|---|---|---|---|
| MS1509 | 2.50 (63.50) | 3.00 (76.2) | .1875/.1870 | .1969/.1964 | .65 | 0.812+/-.031 | .75/.748 | 0.08661/0.08461 | 0.06 | 0.06+/-.03 |
| MS1517 | 3.25 (82.55) | 3.75 (95.2) | .1875/.1870 | .1969/.1964 | .65 | 0.812+/-.031 | .75/.748 | 0.80661/0.08461 | 0.06 | 0.06+/-.03 |
| MS1525 | 4.10 (104.70) | 4.55 (115.57) | .1875/.1870 | .1969/.1964 | .65 | 0.812+/-.031 | .75/.748 | 0.08661/0.08461 | 0.06 | 0.06+/-.03 |

**May include a "Flat" for NEMA: 0.185" across**

*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 postive with respect to black motor terminal.

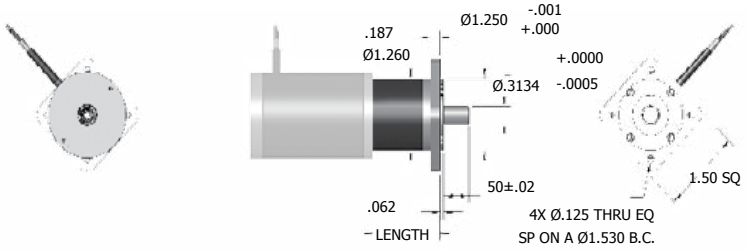
## REAR OPTION-FAIL SAFE BRAKE DETAILS BELOW




- Spring Applied Friction Brake.
- Failsafe brake is designed to hold or decelerate inertial loads when the voltage is turned off

| | |
|---|---|
| TORQUE | 1 LB-IN |
| VOLTAGE | 24 VDC |
| CURRENT | .170 AMPS |
| INERTIA | .0004 LB-IN2 |

## FRONT OPTION- GI GEARHEAD DETAILS BELOW




| | 005 | 016 | 025 | 036 | 064 | 125 | 256 | | |
|---|---|---|---|---|---|---|---|---|---|
| Ratio | 5.18:1 | 15.88:1 | 25.01:1 | 34.97:1 | 68.06:1 | 123.97:1 | 252.24:1 | 493.18:1 | 1011.84:1 |
| Length Inches | 0.926 | 1.296 | 1.296 | 1.296 | 1.662 | 1.662 | 2.032 | 2.032 | 2.032 |
| Peak Efficiency | 80% | 75% | 75% | 75% | 70% | 70% | 65% | 65% | 65% |
| Max Backlash °Deg | 2 | 1.55 | 1.55 | 1.55 | 1.60 | 1.60 | 1.65 | 1.65 | 1.65 |

Modular designed gearhead allows virtually unlimited motor flange options. Customize the output flange and shaft to fit your current application or use our standard flange for efficiency. Other options include: Plastic gears for quiet operation, Special seals for advance IP classifications, Stainless output shaft.

## 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*)

**MS15 XX X XX X XX X X X - X X**

**FRAME SIZE**
09
17
25

**TACH OPTION**
0 = None
T = Tach
S = Special

**ENCODER OPTION**
00 = None
M0 = Encoder Prep
Q_ = Quantum Enc.
QC = 500 PPR
QD = 1000 PPR
QE = 1024 PPR
QF = 1500 PPR
QG = 2000 PPR
QH = 2048 PPR
QJ = 2500 PPR
QK = 5000 PPR
SS = Special

**BRAKE OPTION**
0 = None
B = Fail Safe Brake
S = Special

**TACH WINDING**
W = 1V
A = 2V
E = 3V

**MOTOR WINDING**
A = 12V
B = 24V
C = 36V
D = 48V
*see page 2 for KE (V/krpm)*

**MOUNTING OPTION**
A = Standard Round
(1.5" diam; .748/.750" x .06" pilot; 4x #4-40 threads on 1.148" B.C.)
B = NEMA std
S = Special

**SHAFT OPTION**
A = .1875" x .65", round
B = NEMA 17 std
S = Special

**TERMINAL OPTION**
T = Std Tab Terminals
S = Special

**GEARBOX OPTION**
00 = None
GI = GearBox *(specify ratio)*
SS = Special

## Customize The MS15 Series To Your Exact Requirements

To satisfy various applications with cost-effective solutions, MS15 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
- Gearboxes/Brakes
- Expert application engineering
- Complete repair & refurbishing services