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® 4100 series is no exception, when integrated with high performance brush amplifiers, TORQUEMASTER 4100 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 48 in-lbs with speeds up to 3500 RPM (no load)
- Peak torque ratings up to 240 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

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>UNITS</th>
<th>4101</th>
<th>4102</th>
<th>4104</th>
<th>4106</th>
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<tbody>
<tr>
<td>$T_c$</td>
<td>Lb-In</td>
<td>12</td>
<td>24</td>
<td>36</td>
<td>48</td>
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<tr>
<td>$T_p$</td>
<td>Lb-In</td>
<td>60</td>
<td>120</td>
<td>180</td>
<td>240</td>
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<tr>
<td>$T_s$</td>
<td>Lb-In</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
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<tr>
<td>$F_v$</td>
<td>Lb-In</td>
<td>.30</td>
<td>.40</td>
<td>.70</td>
<td>.90</td>
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<tr>
<td>$T_c$</td>
<td>Lb-In</td>
<td>.63</td>
<td>.63</td>
<td>.63</td>
<td>.63</td>
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<tr>
<td>$I_d$</td>
<td>Lb-In-sec</td>
<td>.0078</td>
<td>.011</td>
<td>.018</td>
<td>.024</td>
</tr>
<tr>
<td>$R_h$</td>
<td>Deg/°/watt</td>
<td>1.7</td>
<td>1.2</td>
<td>1.1</td>
<td>1.0</td>
</tr>
<tr>
<td>$T_h$</td>
<td>Minute</td>
<td>52</td>
<td>55</td>
<td>58</td>
<td>60</td>
</tr>
<tr>
<td>$I_m$</td>
<td>Millisec</td>
<td>20</td>
<td>10.5</td>
<td>7.6</td>
<td>6.9</td>
</tr>
<tr>
<td>$t_e$</td>
<td>Millisec</td>
<td>4.8</td>
<td>5.2</td>
<td>5.4</td>
<td>5.7</td>
</tr>
<tr>
<td>$F_c$</td>
<td>Watts x Lb In / Amps</td>
<td>575</td>
<td>956</td>
<td>1438</td>
<td>2011</td>
</tr>
<tr>
<td>$W$</td>
<td>Lbs</td>
<td>12</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
</tbody>
</table>

Note: All values at 25°C Ambient.

### WINDING

#### B
- $K_t$: Torq. Sens. Lb-In/Amp 0.76 1.37 2.40 3.47
- $R_A$: Arm. Resis. Ohms 0.150 0.20 0.30 0.38
- $K_v$: Back E.M.F Volts/KRPM 9 16 28 41
- $F_c/K_t$: Watts 757 689 599 580

#### C
- $K_t$: Torq. Sens. Lb-In/Amp 1.14 2.06 3.60 5.20
- $R_A$: Arm. Resis. Ohms 0.34 0.43 0.62 0.85
- $K_v$: Back E.M.F Volts/KRPM 13 24 42 61.5
- $F_c/K_t$: Watts 504 464 399 387

#### D
- $K_t$: Torq. Sens. Lb-In/Amp 1.52 2.75 4.80 6.94
- $R_A$: Arm. Resis. Ohms 0.6 0.78 1.15 1.55
- $K_v$: Back E.M.F Volts/KRPM 18 33 57 82.1
- $F_c/K_t$: Watts 378 348 300 290

#### E
- $K_t$: Torq. Sens. Lb-In/Amp 1.90 3.44 6.01 8.68
- $R_A$: Arm. Resis. Ohms 0.95 1.24 1.82 2.40
- $K_v$: Back E.M.F Volts/KRPM 22 41 71 103
- $F_c/K_t$: Watts 303 278 239 231

#### F
- $K_t$: Torq. Sens. Lb-In/Amp 2.28 4.13 7.21 10.42
- $R_A$: Arm. Resis. Ohms 1.32 1.68 2.46 3.24
- $K_v$: Back E.M.F Volts/KRPM 27 49 85 123
- $F_c/K_t$: Watts 252 232 199 193

#### G
- $K_t$: Torq. Sens. Lb-In/Amp 2.66 4.78 8.41 12.15
- $R_A$: Arm. Resis. Ohms 1.89 2.47 3.62 4.77
- $K_v$: Back E.M.F Volts/KRPM 31 57 99 144
- $F_c/K_t$: Watts 216 226 171 166

#### H
- $K_t$: Torq. Sens. Lb-In/Amp 3.04 5.50 9.61 13.9
- $R_A$: Arm. Resis. Ohms 2.41 3.15 4.62 6.09
- $K_v$: Back E.M.F Volts/KRPM 36 65 114 164
- $F_c/K_t$: Watts 189 172 155 145

For custom designs please consult factory.

All specifications subject to change without notice.
MECHANICAL SPECIFICATIONS*

Torque Speed Curves of other windings available, consult factory.

TORQUE PERFORMANCE CURVES

NOTE:
Continuous torque specifications obtained with motor mounted to an 8.5"x12"x0.5" aluminum plate at 25°C ambient. Typical values are within ±10% of rating.

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

<table>
<thead>
<tr>
<th>Nm</th>
<th>Np</th>
<th>Tcs</th>
<th>Tp</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
</tr>
<tr>
<td>300</td>
<td>400</td>
<td>500</td>
<td>600</td>
</tr>
</tbody>
</table>

All specifications subject to change without notice.

DIMENSION CHART* (Motor Length - AG in inches)

<table>
<thead>
<tr>
<th>MOTOR</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>4101</td>
<td>6.85</td>
<td>7.19</td>
<td>7.19</td>
<td>174</td>
</tr>
<tr>
<td>4102</td>
<td>7.85</td>
<td>8.19</td>
<td>8.19</td>
<td>199.4</td>
</tr>
<tr>
<td>4104</td>
<td>9.85</td>
<td>10.19</td>
<td>10.19</td>
<td>250.2</td>
</tr>
<tr>
<td>4106</td>
<td>11.85</td>
<td>12.19</td>
<td>12.19</td>
<td>301</td>
</tr>
</tbody>
</table>

*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.

F.E.P.  | AH      | XD      |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>STD C</td>
<td>2.06</td>
<td>1.38</td>
</tr>
<tr>
<td>NEMA 42</td>
<td>1.38</td>
<td>.80</td>
</tr>
<tr>
<td>NEMA 56C</td>
<td>2.06</td>
<td>1.38</td>
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<tr>
<td>METRIC</td>
<td>45</td>
<td>30</td>
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</table>

TORQUE PERFORMANCE CURVES

NOTE: Continuous torque specifications obtained with motor mounted to an 8.5"x12"x0.5" aluminum plate at 25°C ambient. Typical values are within ±10% of rating.

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

Re = Maximum speed, continuous operation
Np = Peak speed, acceleration/deceleration and intermittent duty
Tn = Continuous stall torque
Tp = Peak torque

All specifications subject to change without notice.

Torque Speed Curves of other windings available, consult factory.
VOLTS = KT x RPM + T x RA + VB

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

MOTOR TORSION RATING VS. SPEED

TR = .94KT RTH

Where:
TR = rated torque (25°C ambient)-oz.-in.
KT = torque sensitivity-oz.-in./amp
RTH = thermal resistance

To Find: Higher Torque Rating for Intermittent Duty

Let a = total cycle time in seconds
Let b = thermal time constant of motors in seconds
Then with TR = Rated torque for 100% duty
TMAX = Rated torque for intermittent duty

TMAX = TR x 1 - e^(-a/b)

ORDERING INFORMATION (For Standard Options)

SERIES
41         XX        XX        XX     X          X  XX   X   X             X                             XXX

TACH MINDINGS
E = 3 volts
F = 7 volts
G = 15 volts
H = 19.6 volts

MODIFIERS
Non-Standard Features

MOUNTING PLATE
A = Panel H

ENCODER
BD = None
QC = 308
QE = 1024
QG = 2000
QH = 2048
QJ = 2500
QK = 5000
S = Special
M0 = Encoder Prep
RD = Resolver Prep - Size 21

SEALING
0 = No sealing
S = IP65 w/ Shaft Seal
N = IP65 w/o Shaft Seal

BRAKE
0 = None
1 = 30 lb-in 90 VDC
2 = 30 lb-in 24 VDC

CUSTOMIZE THE 4100 SERIES TO YOUR EXACT REQUIREMENTS

To satisfy various applications with cost-effective solutions, 4100 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.

INTEGRAL DC TACHOMETER SPECIFICATIONS

Winding Options: E F G H

Output volts / 1000 RPM ± 10% 3 7 15 19

Resistance (ohms) ± 15% 45 100 450 390

Maximum ripple ± 0.7% ± 1.7% ± 1.7% ± 2.2%

Voltage change refers only to volt/1000 RPM at 0°C

Motor inertia (oz.-in. sec^2) 0.001 0.001 0.001 0.001

*With a 1.5 kHz filter and 10K ohm load impedance for E and F windings, 40K ohm load impedance for G and H windings

TERMINATIONS

41 = Side Mount
MS3106-18-1P (std)
CO = Rear Mount MS3106-18-1P (opt)
DB = Side Mount Term Box (opt)
S0 = 1/2 NPT Thread (opt)
FS = Metal RSR Cord Grip (opt)

TERMINATION CHART

MS3102R-18-1P

Connection code for CCW rotation

Motor Encoder Brake
PIN Function PIN Function
A Motor+ B Output
B Motor- M Output
C Ground H Brake
D Tach+ J Brake
E Tach- P +5 VDC
F Thermostat R Common
G Thermostat S Case Gnd.
H Brake T Brake
I Brake U Brake

TERMINATION CHART

MS3102R-20-29P

Connection code for CCW rotation

Motor Encoder Mod. Encoder Brake
PIN Function PIN Function
A Motor+ K B Output
B Motor- L B – Output
C Ground M M – Output
D Tach+ N M – Output
E Tach– P +5 VDC
F Thermostat R Common
G Thermostat S Case Gnd.
H Brake T Brake
I Brake U Brake

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