

# TORQUEMASTER

## BRUSH SERVO MOTORS



## **2300 SERIES**

### Performance Benefits

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® 2300 series is no exception.

With fast response, accurate control and high torque-to-inertia ratios, you can count on the TORQUEMASTER 2300 Series of brush servo motors to provide smooth operation throughout a full speed range. The 2300 Series delivers smooth and superior low speed performance, and maximum power ratings with low thermal resistance for high speed performance. In addition, with maximum torque in a smaller package, you can count on better pricing for a better overall value.

When integrated with high performance brush amplifiers, TORQUEMASTER 2300 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.

### Design Features

TORQUEMASTER BNL 2300 Series servo motors are rated from 50 oz.-in. to 140 oz.-in. with speeds and torque stability up to 10,000 RPM—accommodating DC bus voltages up to 325 volts. They utilize the latest in high performance Neodymium, permanent magnet technology, and are available in several standard windings (as well as custom windings) to meet your most demanding applications.

Each servo motor in the TORQUE-MASTER 2300 Series is ruggedly designed and manufactured for reliable performance. To satisfy many different applications, TORQUEMASTER 2300 Series motors are manufactured to NEMA/IEC specifications.

### **Series 2300, 325 VDC brushless servo motor — provides fast response, accurate control and high torque-to-inertia ratios**

- 8 pole brushless design
- Continuous torque ratings up to 140 oz.-in.—with speeds up to 10,000 RPM
- IP65 Sealing available
- NEMA 23 mounting features standard
- IEC 72 Metric specifications available
- Maximum torque per frame size with high performance Neodymium magnets
- Superior low speed performance
- Numerous custom options available



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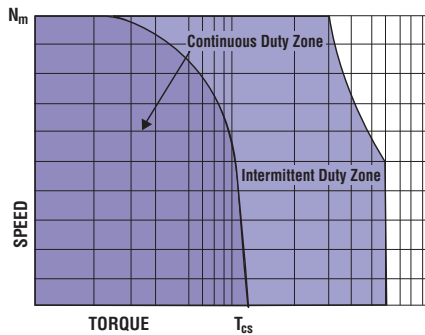


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# BRUSHLESS SERVO MOTOR CHARACTERISTICS

SYMBOL	MOTOR PARAMETER	UNITS	BNL2305T	BNL2310T	BNL2315T	BNL2320T
$N_m$	Max Operating Speed	RPM	10,000	10,000	10,000	10,000
$T_C$	Max Stall Torque	oz.-in.(Nm)	50 (.353)	100 (.706)	120 (.847)	140 (.99)
$T_{pk}$	Peak Torque	oz.-in.(Nm)	250 (1.76)	500 (3.52)	600 (4.23)	700 (4.94)
$K_T$	Torque Sensitivity	oz.-in./AMP(Nm/Amp)	13.4 (.095)	13.4 (.095)	13.4 (.095)	13.4 (.095)
$K_e$	Back E.M.F.	Volts/Krpm	10	10	10	10
$R_a$	Resistance Line to Line	Ohms	1.7	.70	.38	.31
$L$	Inductance Line to Line	MilliHenry	1.62	.78	.45	.38
$J_m$	Rotor Inertia	oz.-in.-sec <sup>2</sup> (Kg-m <sup>2</sup> )	.001586 .0000112	.002805 .0000198	.00380 .0000268	.004797 .0000338
$T_F$	Static Friction	oz.-in.(Nm)	2.56 (.018)	2.56 (.018)	2.56 (.018)	2.56 (.018)
$W_T$	Motor Weight	Lbs(Kg)	1.25 (.57)	1.65	2.05	2.45

## TORQUE PERFORMANCE CURVES



**NOTE:** Continuous torque specifications obtained with motor mounted to an 8.5"x12"x 0.25" aluminum plate at 25°C ambient. Typical values are within ±10% of rating.

### Relationship Between $K_e$ & $K_T$

Torque Systems uses the following important motor performance parameters for the 3 phase square wave and 3 phase sine wave brushless motors in order to properly account for the British Imperial unit system currently used in the US.

$$K_e = \text{Line-to-line volts-peak} / \text{Krpm}^*$$

$$K_T = \text{Pound-inches (lb-in)} / \text{peak phase amps}$$

$K_e$  is related to  $K_t$  as follows:

$$K_T = K_e / 11.834 \text{ for 3 phase square wave current driven amplifiers}$$

$$K_T = K_e / 13.662 \text{ for 3 phase sinusoidal wave current driven amplifiers}$$

$$*\text{Krpm} = 1000 \text{ rpm}$$

For "RMS" values, divide peak values by  $\sqrt{2}$

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

$N_m$  = Maximum speed, continuous operation

$T_{cs}$  = Continuous stall torque

All specifications subject to change without notice.

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## TERMINATION CHART

MOTOR/CABLE CODE	
Function	Wire Color
Motor M1	White
Motor M2	Black
Motor M3	Red
G-round	Green
HALL CONNECTIONS	
+5-24V	Red
Common	Black
H1	Yellow
H2	Orange
H3	Green
<b>Note:</b> Separate drain wires for motor power and halls	

### Note 1. Hall Sensor Specifications

Voltage = 5V to 24V  
 Current = 10 ma typical, 25 ma max.  
 Output = Open collector

### Note 2. Com. Encoder

Current = 250 ma

## CUSTOMIZE THE 2300 SERIES TO YOUR EXACT REQUIREMENTS

To satisfy various applications with cost-effective solutions, 2300 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.

## BMR ORDERING INFORMATION – (For Standard Options)

BNL23      XX      X      XX      X      XXX

### STALL TORQUE

05 = 50 oz-in  
 10 = 100 oz-in  
 15 = 120 oz-in  
 20 = 140 oz-in

### WINDINGS

T = 10 V/Krpm (K<sub>T</sub> = 13.4 oz-in/Amp)  
 A = 20 V/Krpm (K<sub>T</sub> = 26.8 oz-in/Amp)  
 B = 30 V/Krpm (K<sub>T</sub> = 40.5 oz-in/Amp)

### COMMUTATION/FEEDBACK (see note 2)

HA = Hall Sensor only  
 (includes encoder mounting provision)  
 Encoder Mounting  
 (2) 4-40 on 1.812 BC, .375 Dia. Shaft

Modular Encoder			Hollow Shaft Encoder		
Commutating	Count	Non-Comm*	Commutating	Count	Non-Comm*
CC =	500	MC	PC =	500	QC
CD =	1000	MD	PD =	1000	QD
CE =	1024	ME	PE =	1024	QE
CF =	2500	MF	PF =	2500	QF
CG =	2000	MG	PG =	2000	QG
----	Special	----	----	Special	----

\*includes Hall Sensor Commutation

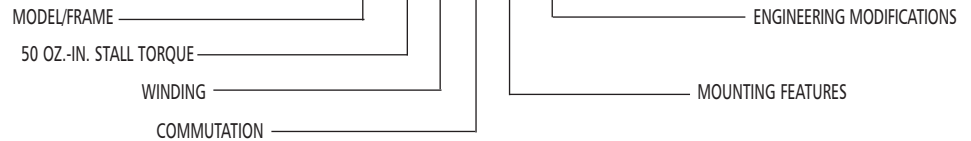
ENGINEERING MODIFICATIONS

### MOUNTING (see note 1)

A = NEMA 23 Flange with 0.375" Dia. x 0.81" long shaft, .63" long flat  
 D = NEMA 23 Flange with 0.250" Dia. x 0.81" long shaft, .63" long flat  
 M = Metric IEC72 Flange w/M8J6 shaft  
 S = Special Flange and shaft  
 B = Same as "A", no flat  
 E = Same as "D", no flat

### EXAMPLE:

**BNL23 05 T CD A 000**



### Notes:

- Standard BMR2300 motor mounting flanges use NEMA 23 standards but allow oversized shaft diameters to carry the rated torque load. Standard NEMA shaft diameters are typically undersized for most servo ratings and are not recommended. Consult factory regarding acceptable load limits before ordering or applying this option.
- Standard encoders are dual channel line driver output with a marker pulse and complementary outputs.
- Brakes are for holding static loads and not designed to stop moving loads. Standard coils are 24 volts DC.

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