

# TORQUEMASTER

## BRUSH SERVO MOTORS



## **4000 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® 4000 series is no exception.

With fast response, accurate control and high torque-to-inertia ratios, you can count on the TORQUEMASTER 4000 Series of brush servo motors to provide smooth operation throughout a full speed range. The 4000 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 4000 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 BMR 4000 Series servo motors are rated from 27 lb.-in. to 67 lb.-in. with speeds and torque stability up to 10,000 RPM—accommodating DC bus voltages up to 350 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 4000 Series is ruggedly designed and manufactured for reliable performance. To satisfy many different applications, TORQUEMASTER 4000 Series motors are manufactured to NEMA/IEC specifications.

### **Series 4000, 350 VDC brushless servo motor — provides fast response, accurate control and high torque-to-inertia ratios**

- Trouble free brushless construction
- Continuous torque ratings up to 67 lb.-in.—with speeds up to 10,000 RPM
- UL Recognition
- IP65 Sealing available
- NEMA mounting features available
- IEC 72 Metric specifications available
- Maximum torque per frame size with high performance Neodymium magnets
- Superior low speed performance
- Numerous custom options available



Sold & Serviced By:

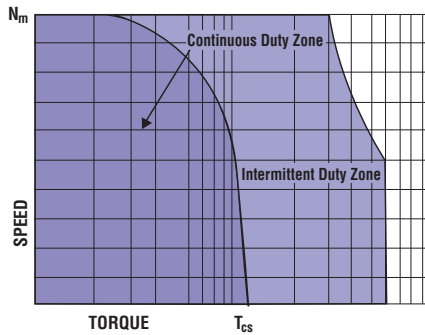


Toll Free Phone (877) SERV098  
Toll Free Fax (877) SERV099  
[www.electromate.com](http://www.electromate.com)  
[sales@electromate.com](mailto:sales@electromate.com)

# BRUSHLESS SERVO MOTOR CHARACTERISTICS

SYMBOL	MOTOR PARAMETER	UNITS	BMR4027D	BMR4045D	BMR4067D
$N_m$	Max Operating Speed	RPM	7000	7000	6600
$T_C$	Max Stall Torque	lb.-in.(Nm)	27 (3.0)	45 (5.1)	67 (7.6)
$T_{Pk}$	Peak Torque	lb.-in.(Nm)	115 (13.0)	200 (22.6)	300 (33.9)
$K_T$	Torque Sensitivity	lb.-in./AMP(Nm/Amp)	4.2 (.47)	4.2 (.47)	4.2 (.47)
$K_e$	Back E.M.F.	Volts/Krpm	50	50	53
$R_a$	Resistance Line to Line	Ohms	2.56	0.92	0.53
$L$	Inductance Line to Line	Millihenry	9.36	5.73	3.34
$J_m$	Rotor Inertia	lb.-in.-sec <sup>2</sup> (Kg-m <sup>2</sup> )	0.0026 (0.00029)	0.0042 (0.00048)	0.0072 (0.00081)
$T_F$	Static Friction	lb.-in.(Nm)	.125 (.014)	.156 (.0176)	.28 (.0316)
$F_i$	Viscous Friction	Lb-In/Krpm	0.125	.188	.28
$R_{th}$	Thermal Resistance	Deg C/Watt	0.725	0.62	.567
$T_m$	Mechanical Time Const.	Millisec.	3.3	1.92	1.9
$T_e$	Electrical Time Const.	Millisec	4	5.7	6.3
$W_T$	Motor Weight	Lbs(Kg)	12 (5.4)	16 (7.24)	23 (10.41)

## 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.

Sold & Serviced By:



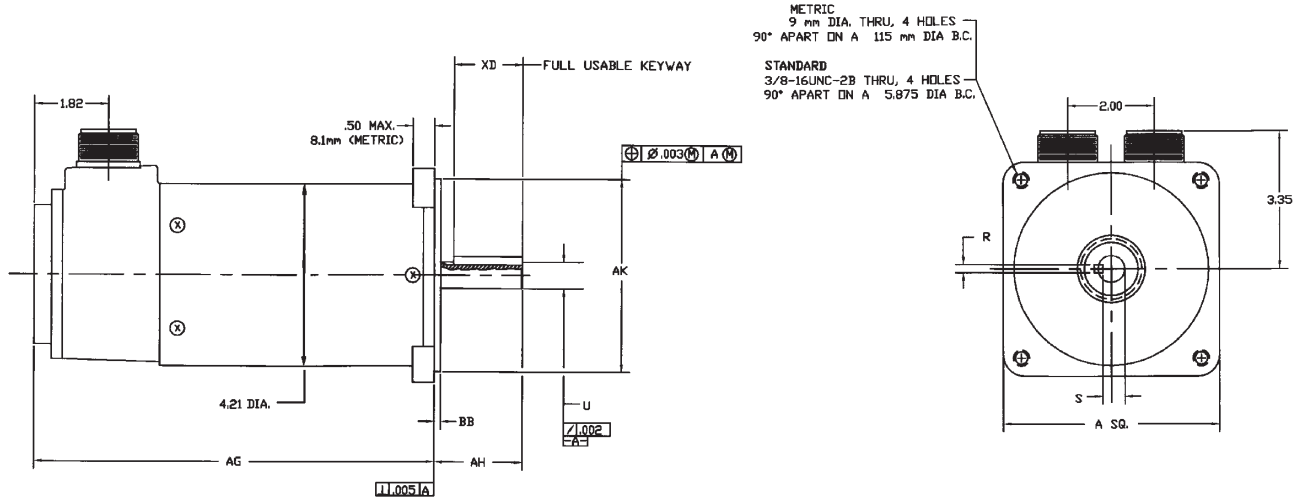
Toll Free Phone (877) SERV098

Toll Free Fax (877) SERV099

www.electromate.com

sales@electromate.com

# MECHANICAL SPECIFICATIONS\*



## DIMENSION CHART\*

PART NUMBER	AG	A	AK	BB	U	AH	XD	S	R
		STD NEMA 42	STD NEMA 42			STD NEMA 42			
BMR4027	8.50	5.00 4.25	4.500 2.187	.15	.625	2.04 1.38	1.56	.188	.517/.502
BMR4045	9.75	5.00 4.25	4.500 2.187	.15	.625	2.04 1.38	1.56	.188	.517/.502
BMR4067	11.75	5.00 4.25	4.500 2.187	.15	.750	2.04 1.38	1.56	.188	.629/.644

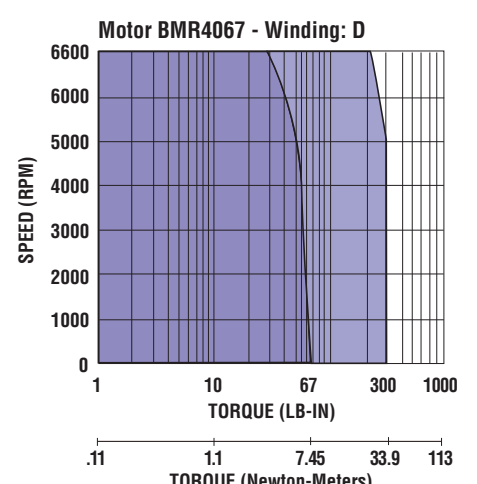
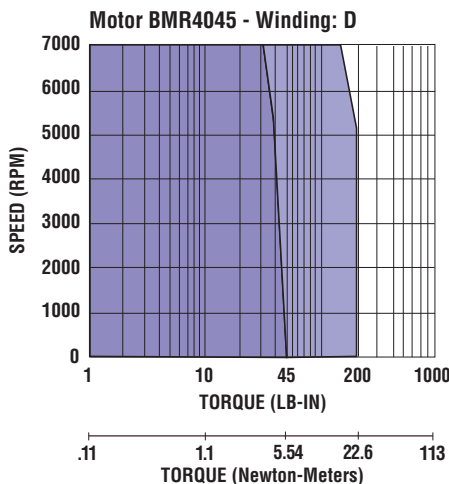
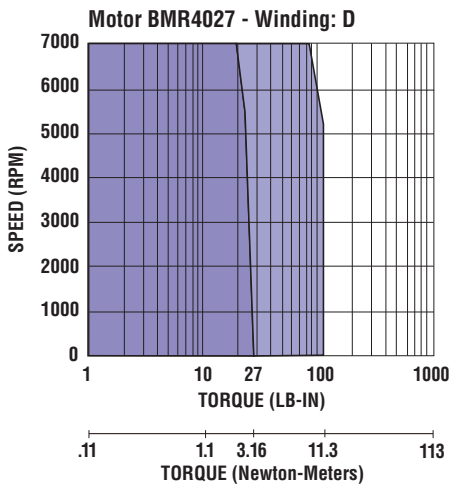
All dimensions meet NEMA 42 specifications except where indicated as standard.

Metric IEC 72 (mm)

BMR4027	215.9	127.0	95j6	3.5	16j6	50	36	6.0	13
BMR4045	247.7	127.0	95j6	3.5	16j6	50	36	6.0	13
BMR4067	298.4	127.0	95j6	3.5	19j6	50	36	6.0	16

NOTE: Dimension "AG" includes commutation feedback device and modular encoder shown on ordering information under COMMUTATION.  
For internal brake add 2.0" to dimension "AG"

## TORQUE PERFORMANCE CURVES



TORQUE SPEED CURVES OF OTHER WINDINGS AVAILABLE, CONSULT FACTORY.

Sold & Serviced By:  
**ELECTROMATE**

Toll Free Phone (877) SERV098  
Toll Free Fax (877) SERV099  
www.electromate.com  
sales@electromate.com

## TERMINATION CHART

### FEEDBACK OPTIONS

#### (B STANDARD) MS3102R-22-14P

PIN	Com. Encoder	Resolver	Hall (Note 1)
A	Brake+	Brake+	Brake+
B	Brake-	Brake-	Brake-
C	-	S2 (Sine+)	-
D	-	S4 (Sine-)	-
E	Encoder $\bar{A}$	-	-
F	Encoder A	-	-
G	Hall U	S1 (Cosine+)	H1
H	Hall V	S3 (Cosine-)	H2
J	Hall W	-	H3
K	Encoder 5V	R1 (Excit.+)	+5V to +24V
L	Encoder Com	R2 (Excit.-)	Common
M	-	-	-
N	Thermostat	Thermostat	Thermostat
P	Thermostat	Thermostat	Thermostat
R	Encoder $\bar{B}$	-	-
S	Encoder B	-	-
T	Encoder M	-	-
V	Encoder $\bar{M}$	-	-

PIN	Modular Encoder	PIN	Modular Encoder
M	5 Volt	S	B
U	Common	R	$\bar{B}$
F	A	T	M
E	$\bar{A}$	V	$\bar{M}$

#### 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

### MOTOR POWER CONNECTIONS

#### (B STANDARD) MS3102R-20-4P

PIN	Motor Winding
A	M1
B	M2
C	M3
D	CASE

## BMR ORDERING INFORMATION – (For Standard Options)

BMR 4 027 A HA B A P A A 000

FRAME SIZE  
 4 = 4.21" Dia.

STALL TORQUE  
 027 = 27 lb-in  
 045 = 45 lb-in  
 067 = 67 lb-in

WINDINGS  
 A = 20 V/Krpm  
 D = 50 V/Krpm  
 E = 60 V/Krpm  
 G = 80 V/Krpm

#### COMMUTATION/FEEDBACK (see note 3)

HA = Hall Sensor only  
 MO = Enc. Mtg. Provisions  
 RA = Resolver, 12 Arc Min  
 PA = Resolver, 7 Arc Min  
 SP = Special

Commutating Encoders	Line Count	Modular Encoders*
CC = 500	=	MC
CD = 1000	=	MD
CE = 1024	=	ME
CF = 2500	=	MF
SC = Special	=	MS

\*Modular Encoder selection includes Hall Sensor Commutation

#### BRAKE (Internal) (see note 4)

0 = None  
 B = 24 VDC Coil

ENGINEERING MODIFICATIONS

SEALING

0 = None

A = per IP65 w/o shaft seal

B = per IP65 w/shaft seal

MOUNTING (see note 1)

A = 5.00 Sq. Flange with .625"

Dia. x 2.04" long shaft

D = NEMA 42 Flange with 0.625"

Dia. x 1.38" long shaft

M = Metric IEC72 Flange w/12J6 Dia. shaft

S = Special Flange and shaft

TERMINATIONS

C = Connector, MS3102A-20-4P Motor

MS3102A-22-14P

Feedback

H = Heyco seal-tite w/1.5 ft shielded cable

P = Pipe Tap (NPT) w/1.5 ft shielded cable

MATING CONNECTORS (see note 2)

0 = None

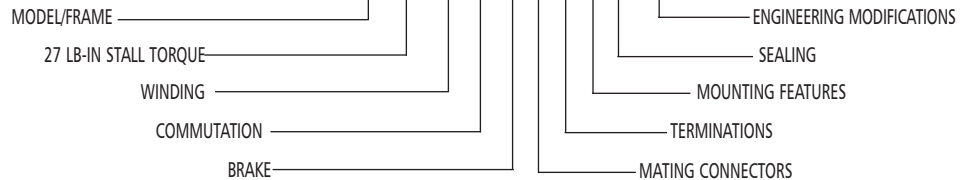
A = Straight

B = Rt. Angle

S = Special

#### EXAMPLE:

BMR 4 027 A RA B A C A A 000



#### Notes:

- Standard BMR4000 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.

## CUSTOMIZE THE 4000 SERIES TO YOUR EXACT REQUIREMENTS

To satisfy various applications with cost-effective solutions, 4000 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.

Sold & Serviced By:



Toll Free Phone (877) SERV098

Toll Free Fax (877) SERV099

www.electromate.com

sales@electromate.com