

BMR 4000 **S E R I E S**

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



Performance Benefits

Cleveland Motion Controls specializes in the design of high performance brushless servo motors that provide efficiency, flexibility of application, and a long and trouble-free service life. Our TORQUEMASTER™ BMR 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 servo motors to provide smooth operation throughout a full speed range. The BMR 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 brushless amplifiers, TORQUEMASTER BMR 4000 servo motors provide effective and highly efficient motion control solutions for a wide range of applications—including factory automation, packaging, robotics, machine tools, semi-conductor, 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 to meet your most demanding applications.

Each servo motor in the TORQUEMASTER 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. For severe duty environments, the BMR design is also available with IP65 sealing.

TORQUEMASTER BMR 4000 Series servo motors come standard with hall sensor or resolver commutation. Encoders, brakes, gearheads and other options are available.

BMR 4000 S E R I E S

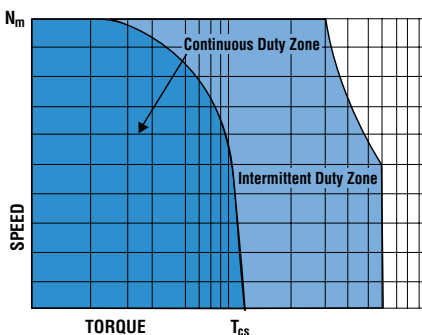
- UL recognition
- Continuous torque range of 27 lb.-in. to 67 lb.-in.
- Neodymium magnet construction
- More torque per smaller frame size
- IP65 Sealing available
- Speeds to 10,000 RPM
- High torque-to-inertia ratios



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 ² (Kg-m ²)	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 0.50" steel 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 = Line-to-line volts-peak / Krpm*

K_T = Pound-inches (lb-in) / peak phase amps

K_e is related to K_t as follows:

$K_T = K_e / 11.834$ for 3 phase square wave current driven amplifiers

$K_T = K_e / 13.662$ for 3 phase sinusoidal wave current driven amplifiers

*Krpm = 1000 rpm

For "RMS" values, divide peak values by $\sqrt{3}$

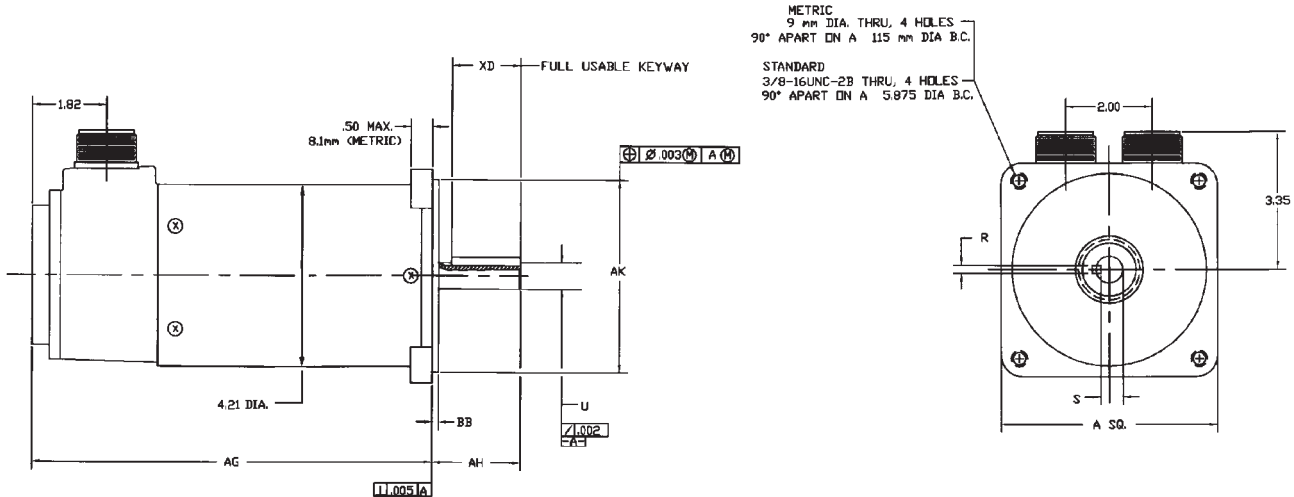
STANDARD SPEED/TORQUE CURVE DATA FOR SIZING A SERVO MOTOR

N_m = Maximum speed, continuous operation

T_{cs} = Continuous stall torque

All specifications subject to change without notice.

MECHANICAL SPECIFICATIONS



DIMENSION CHART

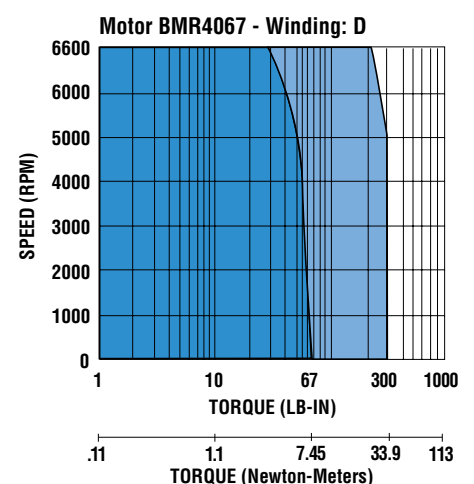
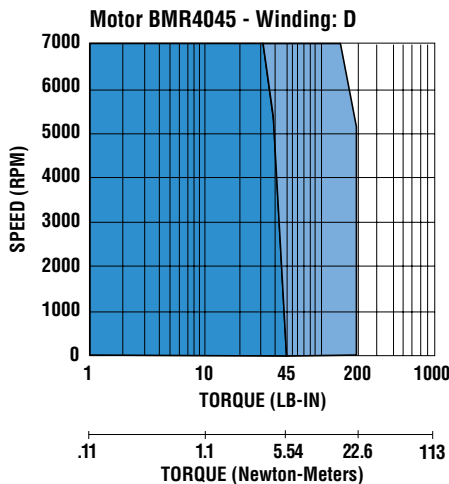
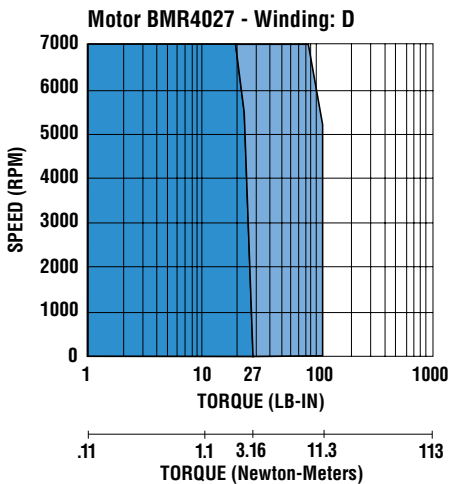
PART NUMBER	AG	A	AK	BB	U	AH	XD	S	R
STD (inch)		STD NEMA 42	STD NEMA 42			STD NEMA 42			
BMR4027	8.50	5.00 4.25	4.500 2.187	.15	.625	2.04 1.38	1.56	.188	.517/.502
BMR4045	9.75	5.00 4.25	4.500 2.187	.15	.625	2.04 1.38	1.56	.188	.517/.502
BMR4067	11.75	5.00 4.25	4.500 2.187	.15	.750	2.04 1.38	1.56	.188	.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 a commutation feedback device and/or a secondary feedback device as shown on ordering information.
For internal brake add 2.0" to dimension "AG"

TORQUE PERFORMANCE CURVES



BRUSHLESS SERVO MOTORS

BMR 4000 SERIES

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

TORQUEMASTER™

BMR ORDERING INFORMATION - (For Standard Options)

BNR 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
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/1.25" 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
BRAKE (Internal) (see note 4)
0 = None
B = 24 VDC Coil

EXAMPLE:

BMR 4 027 A RA B A C A A 000

MODEL/FRAME — 4
27 LB-IN STALL TORQUE — 027
WINDING — A
COMMUTATION — RA
BRAKE — B
MOUNTING FEATURES — A
TERMINATIONS — C
MATING CONNECTORS — A
ENGINEERING MODIFICATIONS — A
SEALING — A

Notes:

- Standard BMR4000 motor mounting flanges use NEMA 42 standards but have 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 CMC regarding acceptable load limits before ordering or applying this option.
- The above motors include standard MS connectors. Connector mates or cables must be ordered separately.
- 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 BMR 4000 Series To Your Exact Requirements

To satisfy various applications with cost-effective solutions, BMR 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 CMC. For assistance, call your local CMC distributor or CMC direct. We look forward to meeting your custom requirements.

