

## BRUSHLESS SERVO MOTORS BMR 4000 SERIES

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

### 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 BMR 4000 series is no exception.

With fast response, accurate control and high torque-to-inertia ratios, you can count on the 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, 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

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 4000 Series is ruggedly designed and manufactured for reliable performance. To satisfy many different applications, 4000 Series motors are manufactured to NEMA/IEC specifications. For severe duty environments, the BMR design is also available with IP65 sealing.

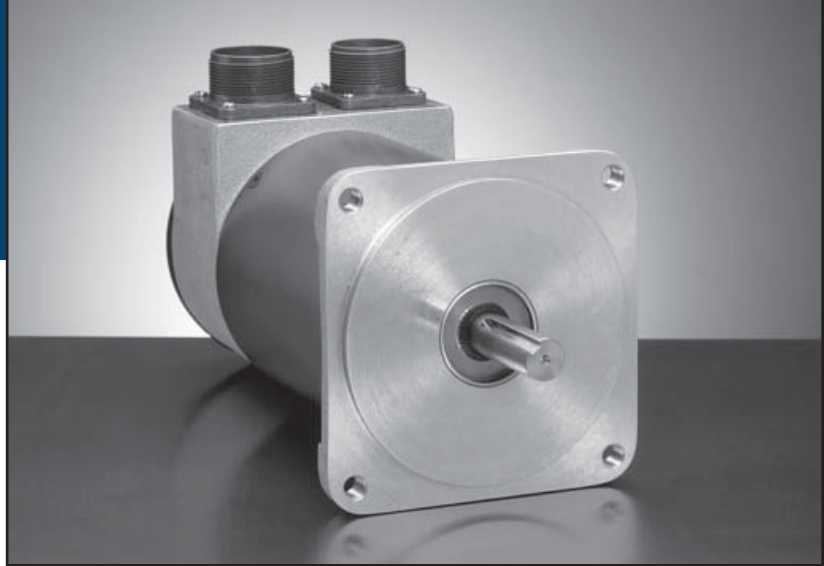
BMR 4000 Series servo motors come standard with hall sensor or resolver commutation. Encoders, brakes, gearheads and other options are available.

- 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
- CE / UL



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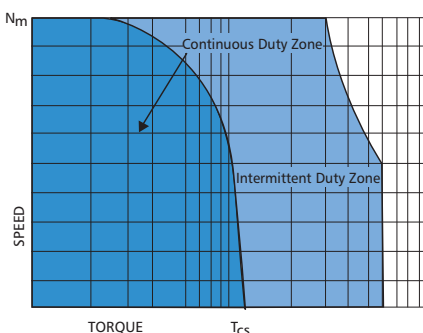
- Continuous torque range of 27 lb-in. to 67 lb-in.
- Neodymium magnet construction
- More torque per smaller frame size
- IP65 Sealing available
- Speeds to 10,000 RPM
- High torque-to-inertia ratios
- CE / UL



## MOTOR SPECIFICATIONS

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 0.50" steel plate at 25°C ambient. Typical values are within ±10% of rating.

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

Cleveland Motion Controls 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

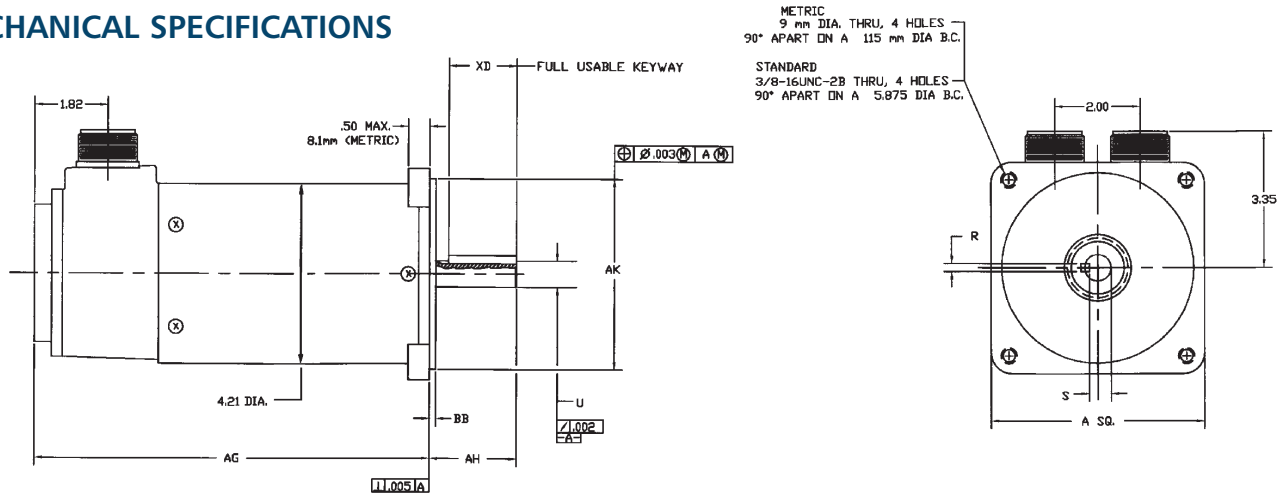
$T_{cs}$  = Continuous stall torque

All specifications subject to change without notice.



# BRUSHLESS SERVO MOTORS BMR 4000 SERIES

## 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

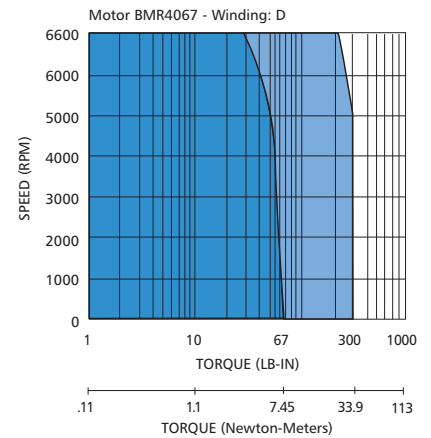
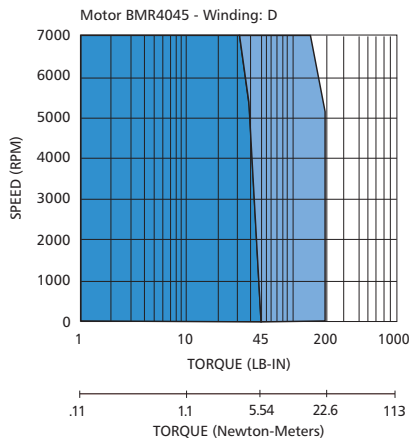
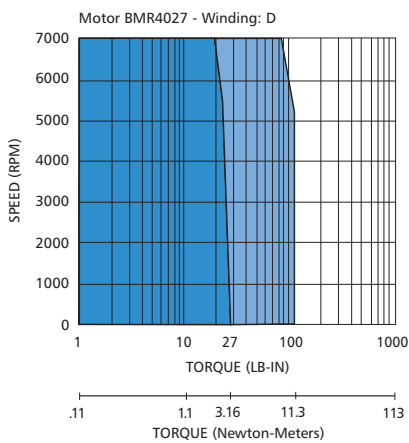
All dimensions meet NEMA 42 specifications except where indicated as standard.

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 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.**



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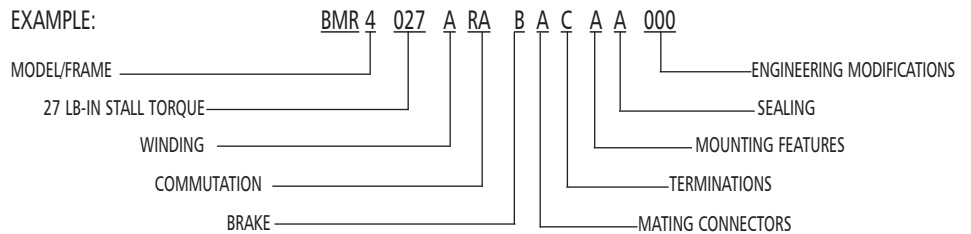
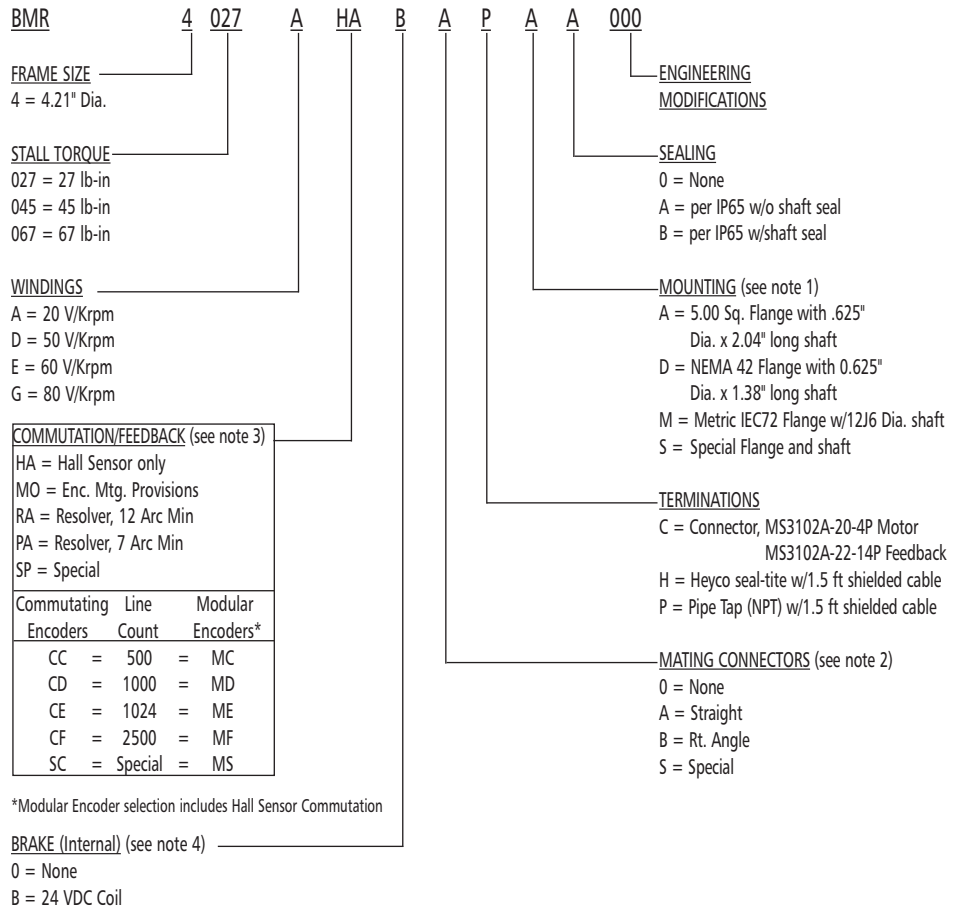
## BMR ORDERING INFORMATION – (For Standard Options)

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



**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 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.

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