# *TORQUEMASTER*<sup>™</sup>



#### **Performance Benefits**

CMC Torque Systems 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<sup>™</sup> BNR 3300 series is no exception.

With fast response, accurate control and high torque-to-inertia ratios, you can count on the TORQUEMASTER 3300 series of servo motors to provide smooth operation throughout a full speed range. The BNR 3300 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 BNR 3300 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.



#### *Improving Productivity Worldwide*

#### **Design Features**

TORQUEMASTER BNR 3300 Series servo motors are rated from 12 lb.-in. to 34 lb.-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 to meet your most demanding applications.

Each servo motor in the TORQUEMASTER 3300 Series is ruggedly designed and manufactured for reliable performance. To satisfy many different applications, TORQUEMASTER 3300 Series motors are manufactured to NEMA/IEC specifications. For severe duty environments, the BNR design is also available with IP65 sealing.





Series 3300, 325 VDC brushless servo motor provides fast response, accurate control and high torque-to-inertia ratios

- Continuous torque ratings up to 34 lb.-in. —with speeds up to 10,000 RPM
- 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



### BRUSHLESS SERVO MOTORS BNR 3300 S E R I E S

- Continuous torque range of 12 lb.-in. to 34 lb.-in.
- Neodymium magnet construction
- More torque per smaller frame size
- IP65 Sealing available
- Speeds to 10,000 RPM
- High torque-to-inertia ratios
- UL recognition pending

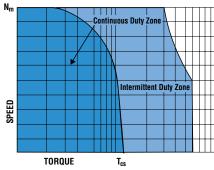
### **MOTOR CHARACTERISTICS**

## TORQUEMASTER



| SYMBOL          | MOTOR PARAMETER         | UNITS               | BNR3312A            | BNR3324D            | BNR3334E            |
|-----------------|-------------------------|---------------------|---------------------|---------------------|---------------------|
| N <sub>m</sub>  | Max Operating Speed     | RPM                 | 10,000              | 7000                | 5800                |
| T <sub>C</sub>  | Max Stall Torque        | lbin.(Nm)           | 12 (1.4)            | 24 (2.7)            | 34 (3.8)            |
| T <sub>Pk</sub> | Peak Torque             | lbin.(Nm)           | 60 (6.78)           | 110 (12.4)          | 150 (16.95)         |
| K <sub>T</sub>  | Torque Sensitivity      | lbin./AMP(Nm/Amp)   | 1.69 (.19)          | 4.22 (.47)          | 5.07 (.57)          |
| K <sub>e</sub>  | Back E.M.F.             | Volts/Krpm          | 20                  | 50                  | 60                  |
| R <sub>a</sub>  | Resistance Line to Line | Ohms                | 1.24                | 2.6                 | 2.1                 |
| L               | Inductance Line to Line | Millihenry          | 2                   | 5.1                 | 4.7                 |
| J <sub>m</sub>  | Rotor Inertia           | lbinsec²<br>(Kg-m²) | 0.0008<br>(0.00009) | 0.0015<br>(0.00017) | 0.00196<br>(0.0011) |
| T <sub>F</sub>  | Static Friction         | lbin.(Nm)           | 0.10 (.011)         | 0.10 (.011)         | .125 (.014)         |
| Fi              | Viscous Friction        | Lb-In/Krpm          | .075                | 0.094               | 0.156               |
| R <sub>th</sub> | Thermal Resistance      | Deg C/Watt          | 1.2                 | 0.92                | 0.8                 |
| T <sub>m</sub>  | Mechanical Time Const.  | Millisec.           | 3.2                 | 1.98                | 1.41                |
| T <sub>e</sub>  | Electrical Time Const.  | Millisec.           | 1.5                 | 2.0                 | 3.6                 |
| WT              | Motor Weight            | Lbs(Kg)             | 6 (2.71)            | 8 (3.62)            | 9.5 (4.30)          |

### TORQUE PERFORMANCE CURVES



TOROUE SYSTEMS

**NOTE:** Continuous torque specifications obtained with motor mounted to an  $8.5'' \times 12'' \times 0.50''$  steel plate at 25°C ambient. Typical values are within ±10% of rating.

#### Relationship Between K<sub>e</sub> & K<sub>T</sub>

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**<sub>e</sub> = Line-to-line volts-peak / Krpm\*
- K<sub>T</sub> = Pound-inches (lb-in) / peak phase amps
- K<sub>e</sub> is related to Kt as follows:
- $K_T = K_e/11.834$  for 3 phase square wave current driven amplifiers
- $\mathbf{K}_{\mathbf{T}} = K_{e}/13.662$  for 3 phase sinusoidal wave current driven amplifiers
- \*Krpm = 1000 rpm
- For "RMS" values, divide peak values by  $\sqrt{2}$

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

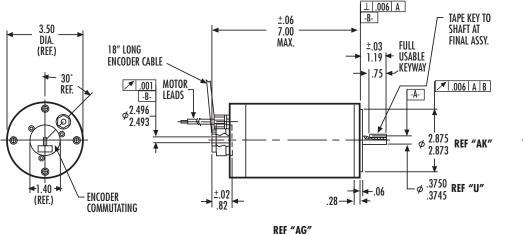
- $\mathbf{N}_{\mathbf{m}}$  = Maximum speed, continuous operation
- $\mathbf{T_{cs}}$  = Continuous stall torque

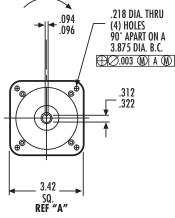
All specifications subject to change without notice.

## *TORQUEMASTER*<sup>™</sup>

### **MECHANICAL SPECIFICATIONS**







#### **DIMENSION CHART**

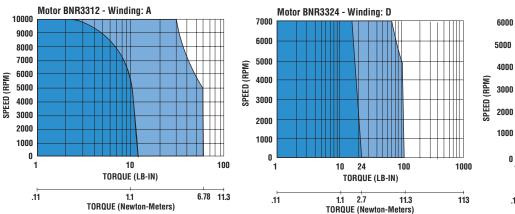
| PART NUMBER                  | R AG | Α    | AK    | BB  | U                                      | AH                                     | XD  | S    | R         |
|------------------------------|------|------|-------|-----|--|--|-----|------|-----------|
| <u>STD (inch)</u><br>BNR3312 | 6.40 | 3.42 | 2.875 | .06 | <u>STD</u> <u>NEMA 34</u><br>.500 .375 | <u>STD</u> <u>NEMA 34</u><br>1.00 1.19 | .62 | .125 | .420/.413 |
| BNR3324                      | 7.40 | 3.42 | 2.875 | .06 | .500 .375                              | 1.00 1.19                              | .62 | .125 | .420/.413 |
| BNR3334                      | 8.40 | 3.42 | 2.875 | .06 | .500 .375                              | 1.00 1.19                              | .62 | .125 | .420/.413 |
|                              |      |      |       |     |  |  |     |      |           |

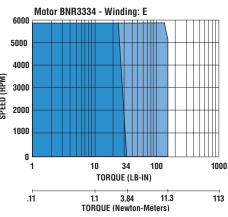
All dimensions meet NEMA 34 specifications except where indicated as standard.

| <u>Metric IEC 72 (mm)</u><br>BNR3312 | 162.6 | 86.9 | 60j6 | 2.5 | 1 <i>5</i> j6 | 30 | 23 | 5.0 | 12 |
|--------------------------------------|-------|------|------|-----|---------------|----|----|-----|----|
| BNR3324                              | 187.9 | 86.9 | 60j6 | 2.5 | 15j6          | 30 | 23 | 5.0 | 12 |
| BNR3334                              | 213.4 | 86.9 | 60j6 | 2.5 | 1 <i>5</i> j6 | 30 | 23 | 5.0 | 12 |

NOTE: Dimension AG includes commutation feedback device and/or a secondary feedback device as shown on ordering information. With internal brake option add 2.0" to dimension "AG"

### **TORQUE PERFORMANCE CURVES**





TORQUE SPEED CURVES OF OTHER WINDINGS AVAILABLE, CONSULT FACTORY.



### BRUSHLESS SERVO MOTORS

# **BNR 3300** s e r i e s

#### **TERMINATION CHART**

#### MOTOR/CABLE CODE

| Function         | Wire Color |  |  |  |  |  |
|------------------|------------|--|--|--|--|--|
| Motor M1         | White      |  |  |  |  |  |
| Motor M2         | Black      |  |  |  |  |  |
| Motor M3         | Red        |  |  |  |  |  |
| HALL CONNECTIONS |            |  |  |  |  |  |
| +5-24V           | Red        |  |  |  |  |  |
| Common           | Black      |  |  |  |  |  |
| HI               | Yellow     |  |  |  |  |  |
| H2               | Orange     |  |  |  |  |  |
| H3               | Green      |  |  |  |  |  |

Note: Separate drain wires for motor power and halls

#### **ENCODER WIRING CONNECTION CODE** Function Wire Color Encoder Output A Green Encoder Output Ā Brown Encoder Output B Orange Encoder Output B Yellow Encoder Output M White Encoder Output M Blue Encoder +5 VDC Red Encoder Common Black Case Ground Drain

#### 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 BNR 3300 To Your Exact Requirements

To satisfy various applications with costeffective solutions, BNR 3300 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.



6 Enterprise Road, Billerica, MA 01821-5734 Call: 800-669-5112 or 978-667-5100 Fax: 888-295-5550 or 978-667-4989

# *TORQUEMASTER*<sup>™</sup>

#### **BNR ORDERING INFORMATION - (For Standard Options)** BNR <u>3 312</u> A HA B 0 P Α A 000 FRAME SIZE ENGINEERING 3 = 3.38" Dia. MODIFICATIONS STALL TORQUE SEALING 312 = 12 lb-in 0 = None A = per IP65 w/o shaft seal 324 = 24 lb-in 334 = 34 lb-in B = per IP65 w/shaft sealWINDINGS-MOUNTING (see note 1) A = 20 V/Krpm A = 3.42" Sq. Flange with .500" Dia. x 1.00" long shaft D = 50 V/KrpmE = 60 V/KrpmD = NEMA 34 Flange with 0.375" Dia. x 1.19" long shaft COMMUTATION/FEEDBACK (see note 2) M = Metric IEC72 Flange w/12/6 Dia. shaft S = Special Flange and shaft HA = Hall Sensor only RA = Resolver, 12 Arc Min PA = Resolver, 7 Arc Min **TERMINATIONS** C = Connector, MS3102A-20-4P Motor SP = Special MS3102A-22-14P Feedback Commutating line Modular H = Heyco seal-tite w/1.5 ft shielded cable Count Encoders P = Pipe Tap (NPT) w/1.5 ft shielded cable Encoders CC 500 MC = CD 1000 = = MD MATING CONNECTORS CE = 1024 ME = 0 = None CF = 2500 = MFSC = Special = MS \*Modular Encoder selection includes Hall Sensor Commutation BRAKE (Internal) (see note 3) -0 = NoneB = 30 lb-in brake BMR 3 324 A RA B O C A A 000 **EXAMPLE:** MODEL/FRAME -ENGINEERING MODIFICATIONS 24 LB-IN STALL TORQUE - SEALING WINDING -- MOUNTING FFATURES COMMUTATION · -TERMINATIONS BRAKE -MATING CONNECTORS

Notes:

- Standard BMR3300 motor mounting flanges use NEMA 34 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.
- 2. Standard encoders are dual channel line driver output with a marker pulse and complementary outputs.
- 3. Brakes are for holding static loads and not designed to stop moving loads. Standard coils are 24 volts DC.

### Customize The BNR 3300 Series To Your Exact Requirements

To satisfy various applications with cost-effective solutions, BNR 3300 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.

Visit Us: www.torquesystems.com

