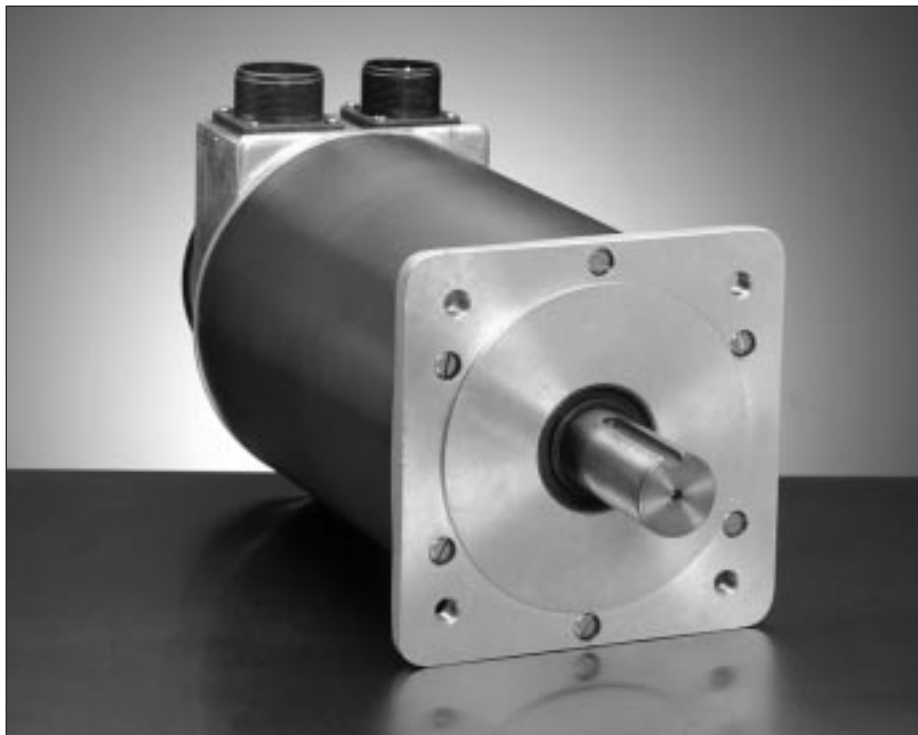


BNR 5000 **S E R I E S**

Series 5000, 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 145 lb.-in.—with speeds up to 3500 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



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™ BNR 5000 series is no exception.

With fast response, accurate control and high torque-to-inertia ratios, you can count on the TORQUEMASTER 5000 Series of servo motors to provide smooth operation throughout a full speed range. The BNR 5000 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 5000 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 BNR 5000 Series servo motors are rated from 110 lb.-in. to 145 lb.-in. with speeds and torque stability up to 3,500 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 TORQUEMASTER 5000 Series is ruggedly designed and manufactured for reliable performance. To satisfy many different applications, TORQUEMASTER 5000 Series motors are manufactured to NEMA/IEC specifications. For severe duty environments, the BNR design is also available with IP65 sealing.

TORQUEMASTER BNR 5000 Series servo motors come standard with hall sensor or resolver commutation. Encoders, brakes, gearheads and other options are available.



BNR 5000 S E R I E S

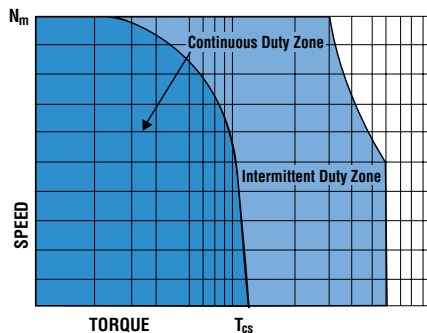
- Continuous torque range of 110 lb.-in. to 145 lb.-in.
- Neodymium magnet construction
- More torque per smaller frame size
- IP65 Sealing available
- Speeds to 3500 RPM
- High torque-to-inertia ratios



MOTOR CHARACTERISTICS

| SYMBOL | MOTOR PARAMETER | UNITS | BNR5110J | BNR5145L |
|----------|-------------------------|--|-------------------|------------------|
| N_m | Max Operating Speed | RPM | 3500 | 2500 |
| T_C | Max Stall Torque | lb.-in.(Nm) | 110 (12.3) | 145 (16.4) |
| T_{Pk} | Peak Torque | lb.-in.(Nm) | 345 (38.9) | 460 (52) |
| K_T | Torque Sensitivity | lb.-in./AMP(Nm/Amp) | 8.4 (.95) | 11.8 (1.33) |
| K_e | Back E.M.F. | Volts/Krpm | 100 | 140 |
| R_a | Resistance Line to Line | Ohms | .71 | .917 |
| L | Inductance Line to Line | Millihenry | 5.46 | 13.5 |
| J_m | Rotor Inertia | lb.-in.-sec ² (Kg-m ²) | .0089 (0.0010) | .0113 (.0013) |
| T_F | Static Friction | lb.-in. | 3.14 | 3.0 |
| F_i | Viscous Friction | Lb-In/Krpm | .53 | 1.3 |
| R_{th} | Thermal Resistance | Deg C/Watt | 0.55 | 0.49 |
| T_m | Mechanical Time Const. | Millisec. | .78 | .85 |
| T_e | Electrical Time Const. | Millisec. | 7.7 | 14.7 |
| W_T | Motor Weight | Lbs (Kg) | 42 (93) | 51 (113) |

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 $\sqrt{3}$

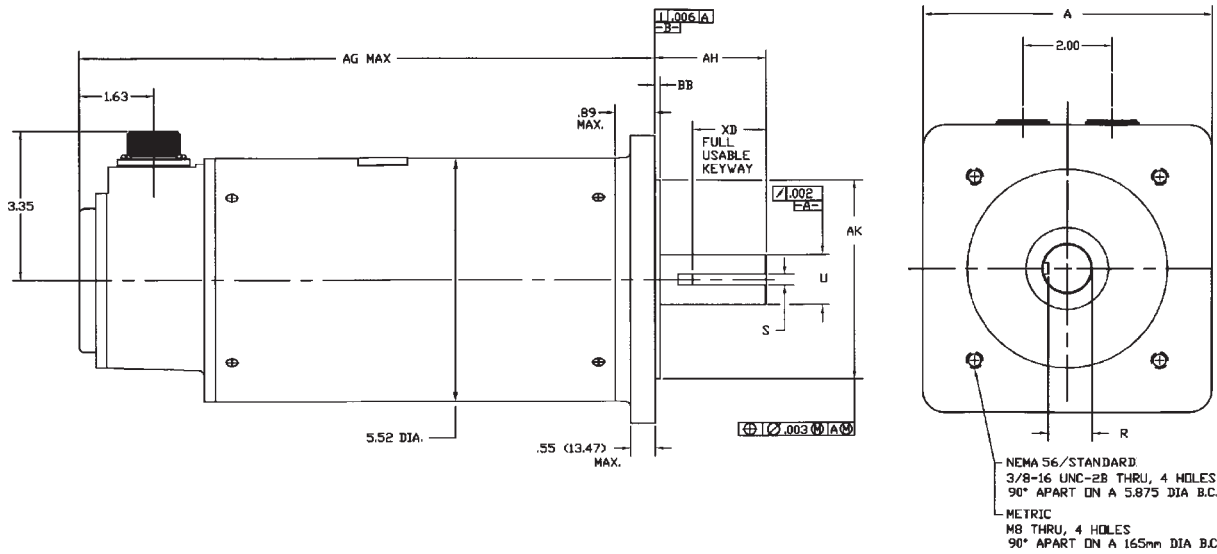
STANDARD SPEED/TORQUE CURVE DATA FOR SIZING A SERVO MOTOR

N_m = Maximum speed, continuous operation

T_{cs} = Continuous stall torque

All specifications subject to change without notice.

MECHANICAL SPECIFICATIONS

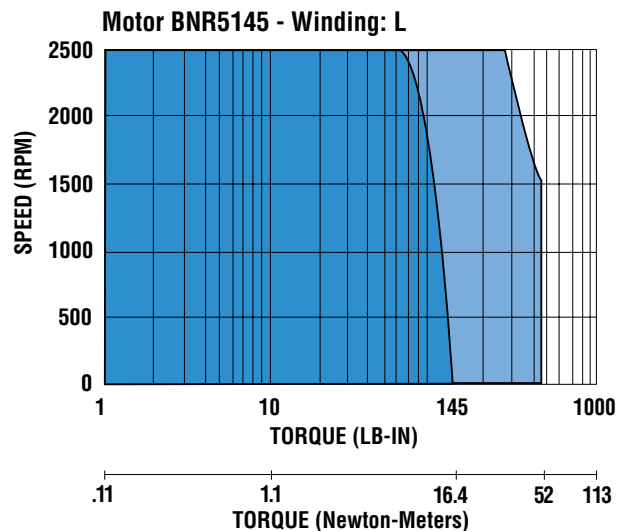
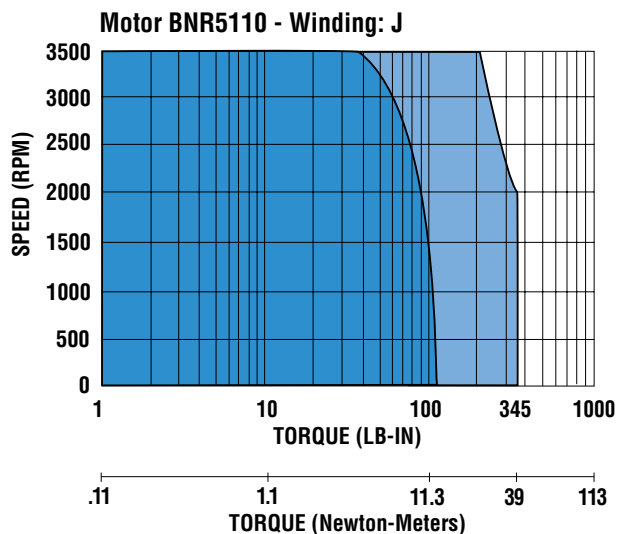


DIMENSION CHART

| PART NUMBER | AG | A | AK | BB | U | AH | XD | S | R |
|---------------------------|-------|-------|-------|-----|-------|------|------|------|-----------|
| <u>NEMA (inch)</u> | | | | | | | | | |
| BNR5110 | 12.92 | 6.50 | 4.500 | .11 | 1.125 | 2.38 | 1.66 | .250 | .986/.971 |
| BNR5145 | 14.49 | 6.50 | 4.500 | .11 | 1.125 | 2.38 | 1.66 | .250 | .986/.971 |
| <u>Metric IEC 72 (mm)</u> | | | | | | | | | |
| BNR5110 | 328.2 | 165.1 | 130j6 | 3.5 | 28j6 | 60 | 40 | 8.0 | 24 |
| BNR5145 | 368.0 | 165.1 | 130j6 | 3.5 | 28j6 | 60 | 40 | 8.0 | 24 |

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



TORQUE SPEED CURVES OF OTHER WINDINGS AVAILABLE, CONSULT FACTORY.

BRUSHLESS SERVO MOTORS

BNR 5000 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 \bar{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

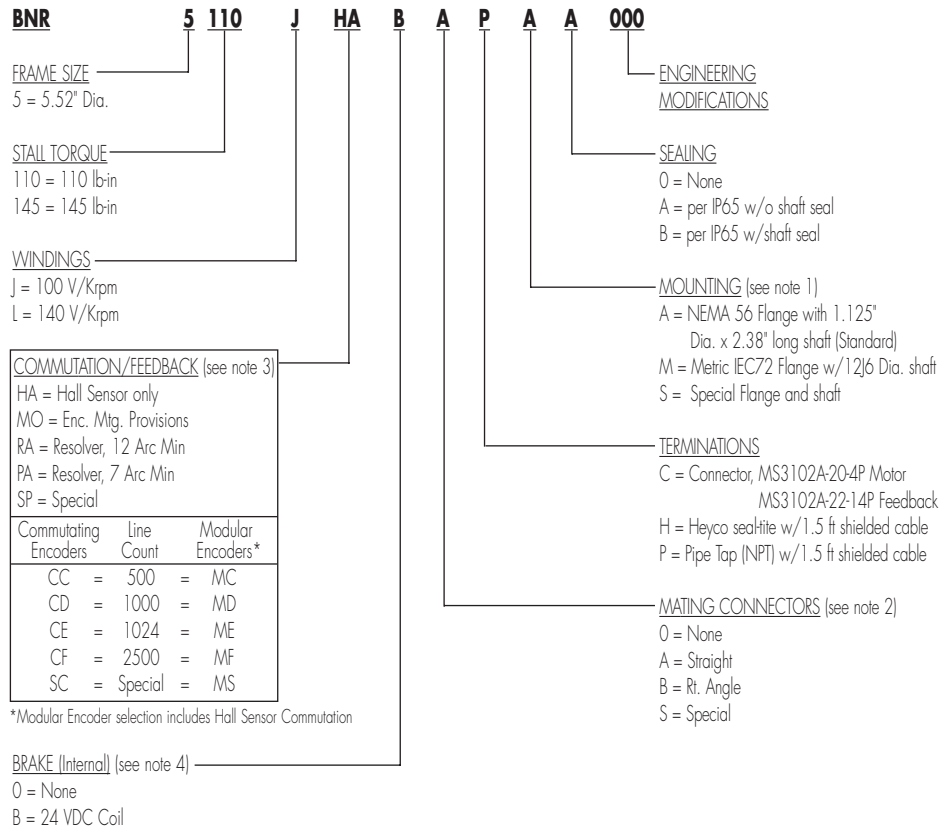
Current = 250 ma

MOTOR POWER CONNECTIONS

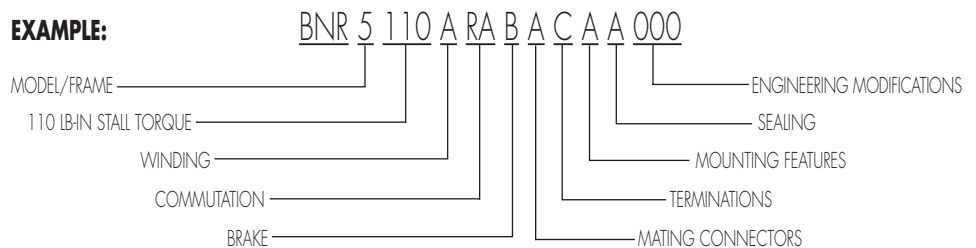
| (B STANDARD) MS3102R-20-4P | |
|----------------------------|---------------|
| PIN | Motor Winding |
| A | M1 |
| B | M2 |
| C | M3 |
| D | CASE |

TORQUEMASTER™

BMR ORDERING INFORMATION - (For Standard Options)



EXAMPLE:



Notes:

- Standard BNR5000 motor mounting flanges use NEMA 56 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 BNR 5000 Series To Your Exact Requirements

To satisfy various applications with cost-effective solutions, BNR 5000 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.

