

# Silencer® Series Brushless DC Motor

## TYPICAL APPLICATIONS

- Robotics
- Commercial and military aircraft actuation systems
- Oil exploration equipment
- Medical pumps and compressors
- Packaging equipment

## FEATURES

- 6 pole inside rotor for quick acceleration
- High torque / volume ratio
- High energy sintered neodymium magnets
- High stator slot fill for high Km
- Skewed rotor for minimum detent torque

## BENEFITS

- Operation at any single speed - not limited to AC frequency
- Motor life is not limited to brush or commutator life
- An essentially linear speed / torque curve
- Efficient operation without losses associated with brushes and commutation or armature induction
- Precise, variable speed control
- Extremely quiet operation
- Long-life operation
- High performance in a compact package

## BS12 High Performance



The BS12 is a very high energy size 12 brushless DC motor. Utilizing rare earth sintered magnets and hand inserted stator windings, the motor has a very high torque / volume ratio. Ideal for applications requiring a high energy, high efficiency brushless DC motor where space is limited.

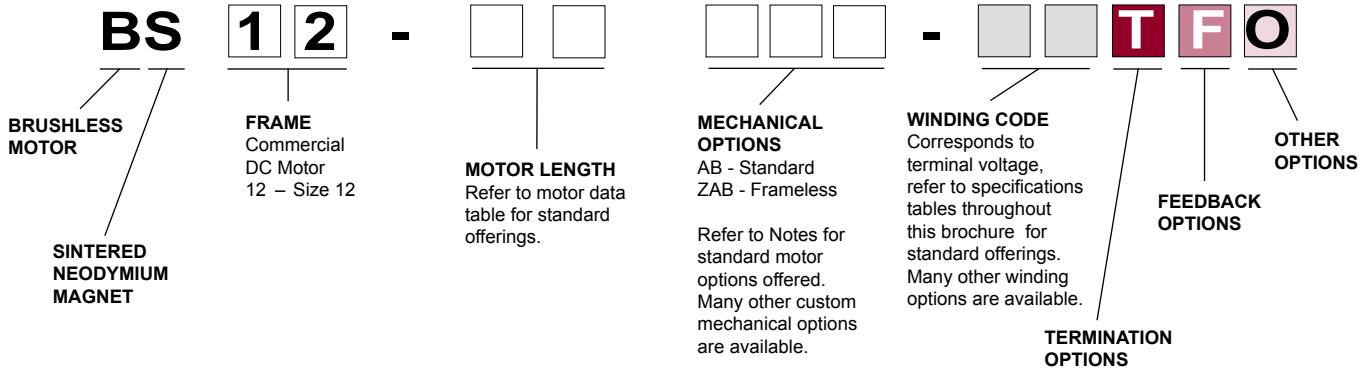
Hall-effect feedback is standard with sensorless or resolver feedback optional. Other options include gearheads and ballscrews. Custom solutions available.

For more information about how this product can be tailored to fit your specific application, contact our applications engineers.

# Brushless Motors

## SPECIFICATION AND NUMBERING SYSTEM

### Part Numbering System Guide



### BS12 SPECIFICATIONS -

Continuous Stall Torque 12 - 14 oz-in (.085 - .099 Nm)  
Peak Torque 35 oz-in (0.25 Nm)

| Part Number*             |  | BS12-20AB- <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> T F O |         |         | BS12-20ZAB- <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> T F O |         |         |
|--------------------------|--|---|---------|---------|--|---------|---------|
| Winding Code**           |  | 01  | 02      | 03      | 01   | 02      | 03      |
| L = Length               | inches                                   | 2   |         |         | 1.485  |         |         |
|                          | millimeters                              | 50.8  |         |         | 37.7   |         |         |
| Terminal Voltage         | volts DC                                 | 12  | 24      | 24      | 12   | 24      | 24      |
| Peak Torque              | oz-in                                    | 35  | 35      | 35      | 35   | 35      | 35      |
|                          | Nm                                       | 0.25  | 0.25    | 0.25    | 0.25   | 0.25    | 0.25    |
| Continuous Stall Torque  | oz-in                                    | 14  | 13      | 12      | 14   | 13      | 12      |
|                          | Nm                                       | .099  | .092    | .085    | .099   | .092    | .085    |
| Rated Speed              | rpm                                      | 4750  | 5250    | 15000   | 4750   | 5250    | 15000   |
|                          | rad/sec                                  | 497   | 550     | 1571    | 497  | 550     | 1571    |
| Rated Torque             | oz-in                                    | 12  | 11.6    | 10      | 12   | 11.6    | 10      |
|                          | Nm                                       | 0.0847  | 0.0819  | 0.0706  | 0.0847   | 0.0819  | 0.0706  |
| Rated Current            | Amps                                     | 6.30  | 2.90    | 8       | 6.30   | 2.90    | 8       |
| Rated Power              | watts                                    | 42.2  | 45      | 110     | 42.2   | 45      | 110     |
| Torque Sensitivity       | oz-in/amp                                | 1.99  | 4.28    | 1.42    | 1.99   | 4.28    | 1.42    |
|                          | Nm/amp                                   | 0.0141  | 0.0302  | 0.0100  | 0.0141   | 0.0302  | 0.0100  |
| Back EMF                 | volts/KRPM                               | 1.47  | 3.16    | 1.05    | 1.47   | 3.16    | 1.05    |
|                          | volts/rad/sec                            | 0.0141  | 0.0302  | 0.0100  | 0.0141   | 0.0302  | 0.0100  |
| Terminal Resistance      | ohms                                     | 0.32  | 1.43    | 0.22    | 0.32   | 1.43    | 0.22    |
| Terminal Inductance      | mH                                       | 0.22  | 0.95    | 0.11    | 0.22   | 0.95    | 0.11    |
| Motor Constant           | oz-in/sq.rt.watts                        | 3.52  | 3.58    | 3.03    | 3.52   | 3.58    | 3.03    |
|                          | Nm/sq.rt.watts                           | 0.02484   | 0.02527 | 0.02138 | 0.02484  | 0.02527 | 0.02138 |
| Rotor Inertia            | oz-in-sec <sup>2</sup> x10 <sup>-3</sup> | 0.048   | 0.048   | 0.048   | 0.037  | 0.037   | 0.037   |
|                          | g-cm <sup>2</sup>                        | 3.4   | 3.4     | 3.4     | 2.6  | 2.6     | 2.6     |
| Weight                   | oz                                       | 5.3   | 5.3     | 5.3     | 4.4  | 4.4     | 4.4     |
|                          | g  | 150.5   | 150.5   | 150.5   | 125.0  | 125.0   | 125.0   |
| # of Poles               |  | 6   | 6       | 6       | 6  | 6       | 6       |
| Timing                   |  | 120°  | 120°    | 120°    | 120  | 120°    | 120°    |
| Mech. Time Constant      | ms                                       | 0.5   | 0.5     | 0.7     | 0.4  | 0.4     | 0.6     |
| Electrical Time Constant | ms                                       | 0.69  | 0.66    | 0.50    | 0.69   | 0.66    | 0.50    |
| Thermal Resistivity      | deg. C/watt                              | 3.5   | 3.5     | 3.5     | 3.5  | 3.5     | 3.5     |
| Speed/Torque Gradient    | rpm/oz-in                                | 109.3   | 105.6   | 147.6   | 109.3  | 105.6   | 147.6   |
| No Load Speed            | rpm                                      | 7480  | 7255    | 21900   | 7480   | 7255    | 21900   |
|                          | rad/sec                                  | 783   | 760     | 2293    | 783  | 760     | 2293    |

**Notes:**

- Motor mounted to a 4" x 4" x 1/4" aluminum plate, still air.
- Maximum winding temperature of 155°C.
- Typical electrical specifications at 25°C.
- Motor Terminal Voltages are representative only; motors may be operated at voltages other than those listed in the table. For assistance please contact our applications engineer.
- Calculated (theoretical) speed/torque gradient.

\*Many other custom mechanical options are available – consult factory.

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Select your options below and place their code in its corresponding block as shown above.

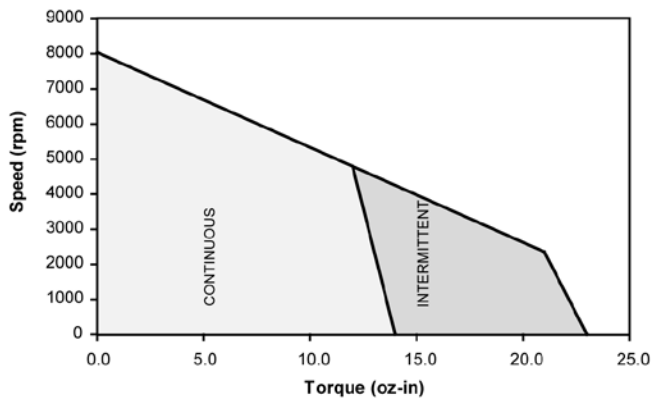
- |                      |                           |                        |
|----------------------|---------------------------|------------------------|
| <b>T</b> TERMINATION | <b>F</b> FEEDBACK OPTIONS | <b>O</b> OTHER OPTIONS |
| L – Leads (std)      | H – Hall Effect (std)     | D – Drive              |
| C – Connector        | R – Resolver              | G – Gearhead           |
| M – MS connector     | S – Sensorless            | E – Encoder            |



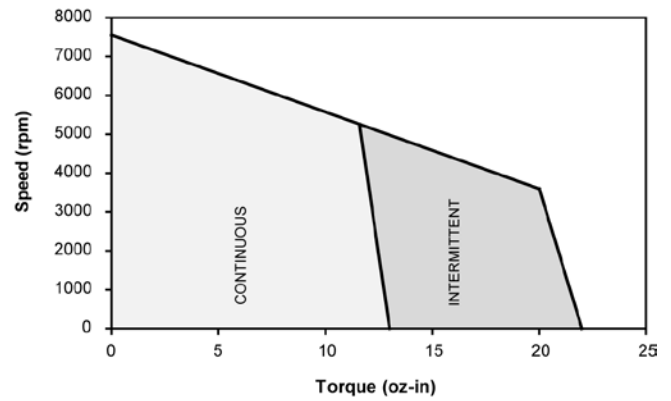
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## BS12 Performance Curves

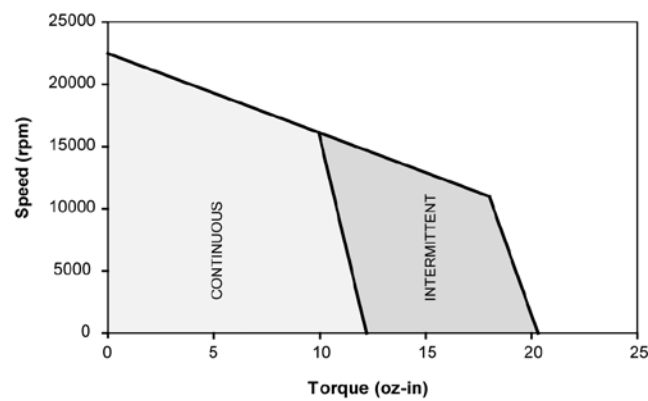
**BS12 -01: Continuous & Intermittent  
12-Volt Winding**



**BS12 -02: Continuous & Intermittent  
24-Volt Winding**



**BS12 -03: Continuous & Intermittent  
24-Volt Winding**



**Note:** Intermittent operation is based on a 20% duty cycle of one minute on, four minutes off. Please contact the factory regarding the duty cycle of your application.