

Silencer® Series Brushless DC Motors with Integral Drives

TYPICAL APPLICATIONS

- Medical equipment - pumps, blowers and centrifuges
- HVAC and other air handling equipment
- Packaging and printing equipment
- Semiconductor handling and insertion machines
- Robotic tape storage and retrieval
- Industrial automation equipment
- Office automation equipment
- Actuators

FEATURES

- Integral two quadrant speed controllers for electronically commutating three-phase brushless motors
- Uses built-in Hall effect sensors for rotor position feedback
- All motor, drive and feedback connections are pre-wired internally to the package
- Motor speed is controlled by an external 0 - 5 VDC command voltage
- Direction of rotation is set by the direction input control
- Maximum current limit has been pre-set to protect motor and drive
- Controller is protected against thermal overload by means of an internal thermal cutoff (BN23)
- Efficient PWM speed control using power MOSFET technology
- Compact size – lengths from 2.4 to 4.3 inches
- Diameter – 1.2 inches and 2.25 inches
- Torque ratings from 1.7 oz-in to 22.0 oz-in
- Operating temperature range -10 to 45° C

BENEFITS

- Compact packaging minimizes space required
- Matched motors and drives from a single supplier
- Integrated electronics simplifies installation and wiring
- Complete system testing insures high reliability
- High performance, low cost speed controller
- Motor life not limited to brush and commutator life
- Extremely quiet operation
- Low emitted EMI
- Efficient operation
- Long life

BN12 and BN23 with Integral Drive Electronics



Silencer® Brushless DC motors with integral electronics provide smooth, quiet and efficient operation over a wide speed range. Each frame size is available in several different lengths, with the electronics optimized for the specific motor's operating parameters. Moog Components Group has already performed motor / drive system integration, mechanically, electrically and thermally and offers off-the-shelf models for a wide variety of applications.

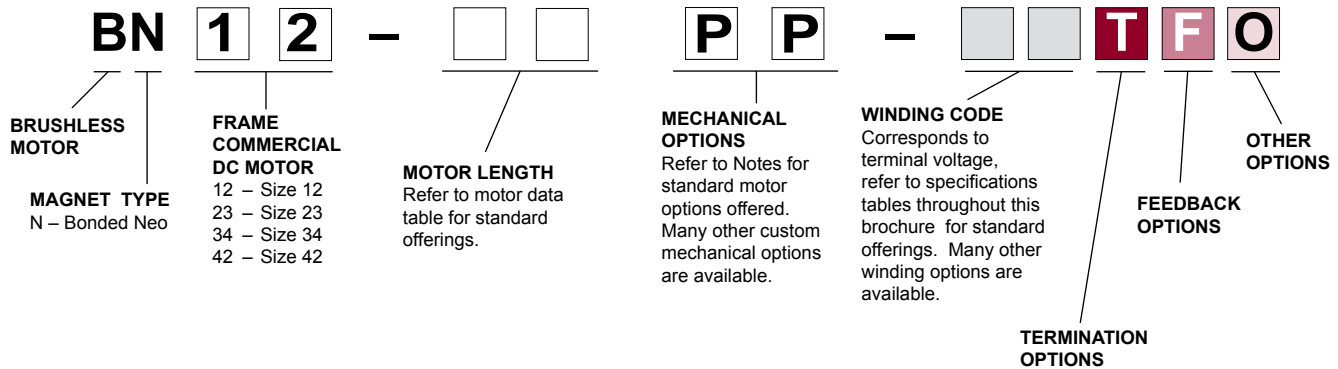
Utilizing bonded neo magnets and Surface Mount Technology (SMT), the BN series motors provide excellent value with their low-cost and high torque. The compact BN motors are well suited for applications demanding low audible noise, long life and ease of installation.

If you have any questions about the Silencer BN motors and drives, or would like to speak with an application engineer, please call us or visit our web site.

Brushless Motors

SPECIFICATION AND NUMBERING SYSTEM

Part Numbering System Guide



BN12 SPECIFICATIONS - *Continuous Stall Torque 3 - 5 oz-in (0.0212 - 0.0353 Nm)* *Peak Torque 15 - 27 oz-in (0.1059 - 0.1907 Nm)*

Part Number*		BN12-13PP- <input type="text"/> <input type="text"/> T <input type="text"/> <input type="text"/> -100	BN12-18PP- <input type="text"/> <input type="text"/> T <input type="text"/> <input type="text"/> -100	BN12-23PP- <input type="text"/> <input type="text"/> T <input type="text"/> <input type="text"/> -100
Winding Code**		02	03	03
L = Length	inches	2.37	2.37	3.37
	millimeters	60.2	60.2	85.6
Terminal Voltage	volts DC (nom)	24	24	24
Peak Torque	oz-in (max)	15	9	24
	Nm (max)	0.1059	0.0636	0.1695
Continuous Stall Torque	oz-in (max)	3	2	5
	Nm (max)	0.0212	0.0141	0.0353
Rated Speed	RPM	11700	6510	6480
	rad/sec	1225	682	679
Rated Torque	oz-in (max)	1.7	2.1	4.0
	Nm (max)	0.0120	0.0148	0.0282
Rated Current	amps	0.93	0.75	1.20
Rated Power	watts	15	10	19
Torque Sensitivity (K _T)	oz-in/amp	2.22	3.18	3.69
	Nm/amp	0.0157	0.0225	0.0261
Back EMF (K _E)	volts/KRPM	1.64	2.35	2.73
	volts/rad/sec	0.0157	0.0225	0.0261
Motor Constant (K _M)	oz-in/sq.rt.watt	1.17	1.11	1.91
	Nm/sq.rt.watt	0.00823	0.00738	0.01348
Rotor Inertia	oz-in-sec ² x 10 ⁻³	0.04	0.04	0.08
	g-cm ²	2.8	2.9	5.7
Weight	oz	5	5	7
	gm	142.0	142.0	198.8
Number of Poles		8	8	8
Timing		120°	120°	120°
Mech. Time Constant	ms	4.2	4.7	3.1
Electrical Time Constant	ms	0.14	0.13	0.21
Thermal Resistivity	deg. C/watt	13.8	13.3	10.9
Speed/Torque Gradient	rpm/oz-in	996.8	1100.5	370.7
				391.8

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.
- For MS (military style) connector, please specify connector housing and terminal.
- Data for informational purposes only. Should not be considered a binding performance agreement. For specific applications, please contact the factory.

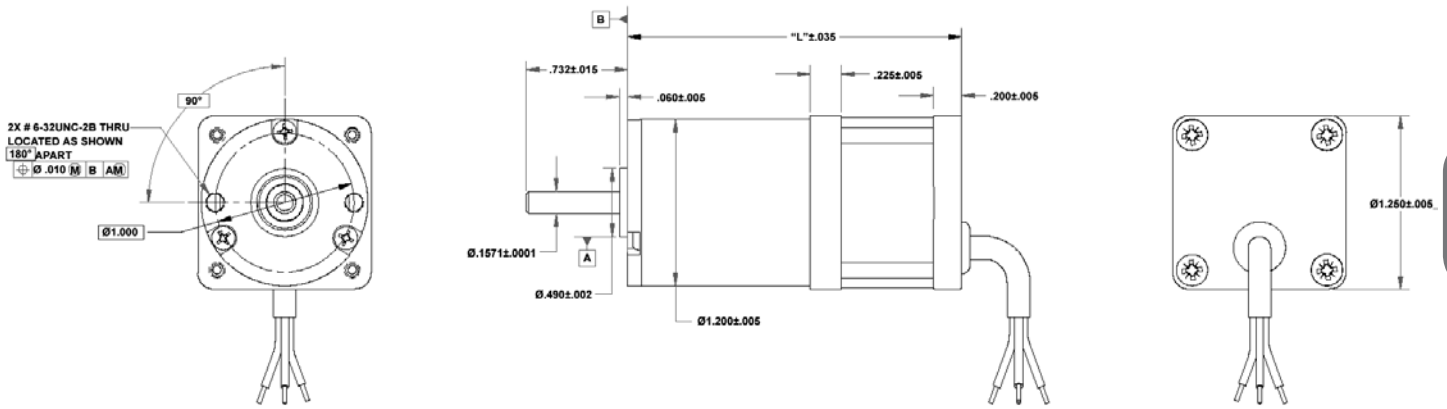
*Many other custom mechanical options are available – consult factory.

**Many other winding options are available – consult factory.

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

- | | | |
|------------------------------|---------------------------|------------------------|
| T TERMINATION OPTIONS | F FEEDBACK OPTIONS | ⓐ OTHER OPTIONS |
| L – Leads (std) | H – Hall Effect (std) | D – Integral Drive |
| C – Connector | | G – Gearhead |
| M – MS connector | | |

Typical Outline Drawing



Dimensions are in inches

Connection Diagram

DESIGNATOR	WIRE COLOR
+ Input	RED
GND	BLACK*
Speed Command	YELLOW*
Tach	ORG
Direction	WHT

UNIT TYPE	"L"
BN12-13PP - [] []	3.11
BN12-15PP - [] []	3.61
BN12-18PP - [] []	4.11

*Apply 0 - 5 VDC speed command between (+) and GND (-), being sure to observe polarity.

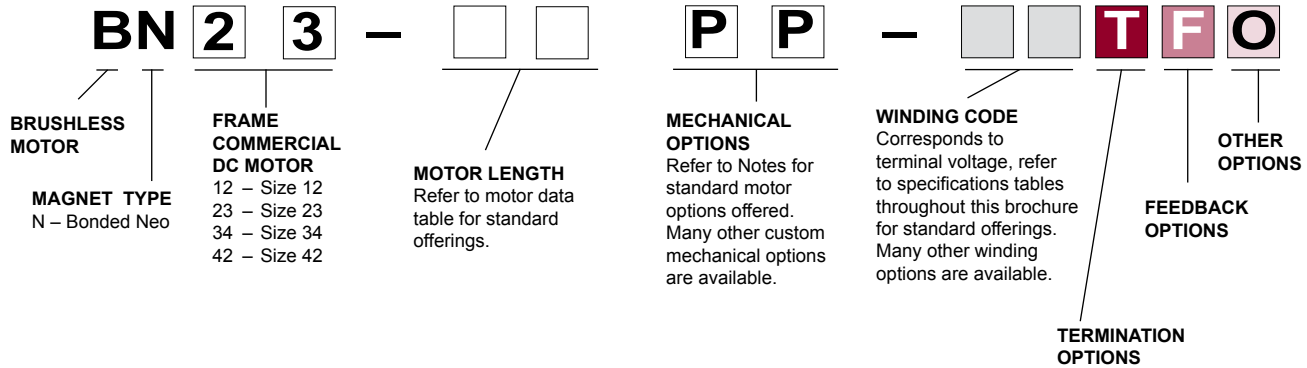
Notes:

1. Observe proper polarity in connecting + input and GND to power supply. Reverse polarity will damage or destroy drive circuitry and will void warranty.
2. Reverse and TACH output available upon request - contact factory for information.
3. Voltage range 12 to 24 VDC.
4. **This is a closed loop velocity feedback controller.**

Brushless Motors

SPECIFICATION AND NUMBERING SYSTEM

Part Numbering System Guide



BN23 SPECIFICATIONS - Typical Electrical Specifications (25°C)

Part Number*		BN23-13PP- <input type="text"/> <input type="text"/> -100	BN23-18PP- <input type="text"/> <input type="text"/> -100	BN23-23PP- <input type="text"/> <input type="text"/> -100
Winding Code**		01	02	02
L = Length (Motor + Driver)	inches	3.27	3.27	4.27
	millimeters	83.1	83.1	108.5
No Load Speed @ 12 VDC	rpm	5659	3967	2792
	rad/sec	593	415	292
Rated Speed @ 12 VDC	rpm	4820	2690	2270
	rad/sec	505	282	238
Rated Torque @12 VDC	oz-in (max)	11	12	22
	Nm (max)	0.0777	0.0847	0.1554
Rated Current @ 12 VDC	amps	4.5	3.4	4.4
No-Load Speed @ 24 VDC	rpm	11956	8335	5885
	rad/sec	1252	873	616
Rated Speed @ 24 VDC	rpm	10850	7050	5360
	rad/sec	1136	738	561
Rated Torque @ 24 VDC	oz-in (max)	8.7	12	22
	Nm (max)	0.0614	0.0847	0.1554
Rated Current @ 24 VDC	amps	3.8	3.5	4.5
Torque Sensitivity (Kt)	oz-in/amp	2.59	3.70	5.26
	Nm/amp	0.0183	0.0261	0.0371
Rotor Inertia	oz-in-sec ² x 10 ⁻³	0.51	0.51	1.50
	g-cm ²	36	36	105.9
Weight	oz	14	14	25
	gm	397.06	397.6	710
Number Of Poles		8	8	8
Mech. Time Constant	ms	5	5	2.7
Elect. Time Constant	ms	0.80	0.81	1.18
Thermal Resistivity	deg. C/watt	1.7	1.2	0.9
Speed/Torque Gradient	rpm/oz-in	127	108	24

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.
- For MS (military style) connector, please specify connector housing and terminal.
- Data for informational purposes only. Should not be considered a binding performance agreement. For specific applications, please contact the factory.

*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.

T TERMINATION

- L – Leads (std)
- C – Connector
- M – MS connector

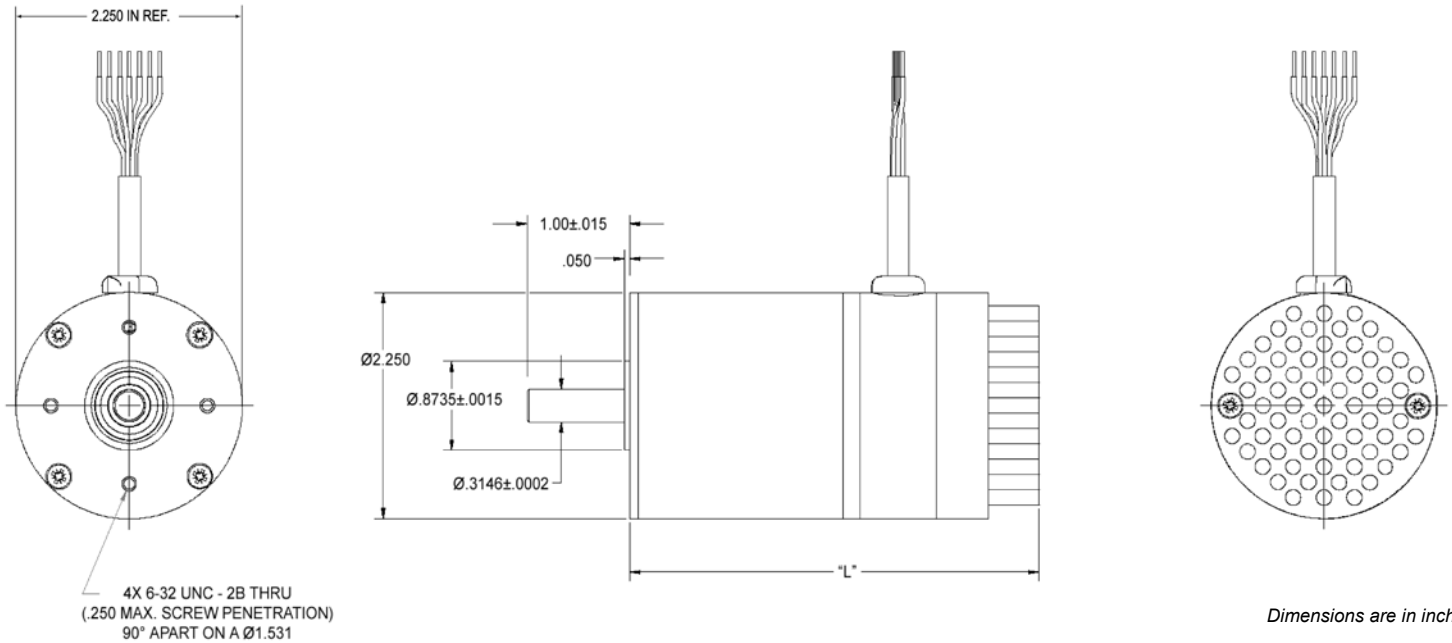
F FEEDBACK OPTIONS

- H – Hall Effect (std)

O OTHER OPTIONS

- D – Drive
- G – Gearhead

Typical Outline Drawing - BN23D



Connection Diagram

CONTROL INPUT	INPUT OPEN OR HIGH	INPUT GND OR LOW
REV	Motor Runs CCW	Motor Runs CW
DIS	Controller Active	Controller Inactive
BRAKE	Controller Inactive	Controller Active

DESIGNATOR	WIRE COLOR
+ Input	RED
GND	BLACK*
SV	YELLOW*
REV	ORANGE
DIS	WHITE
BRAKE	BLUE

UNIT TYPE	"L"
BN23-13PP - [[]]	3.11
BN23-18PP - [[]]	3.61
BN23-23PP - [[]]	4.11

* Apply 0 - 5 VDC speed command between SV (+) and GND (-), being sure to observe polarity.

Notes:

1. Observe proper polarity in connecting + input and GND to power supply. Reverse polarity will damage or destroy drive circuitry and will void warranty.
2. Reverse and TACH output available upon request - contact factory for information.
3. Voltage range 12 to 40 VDC.