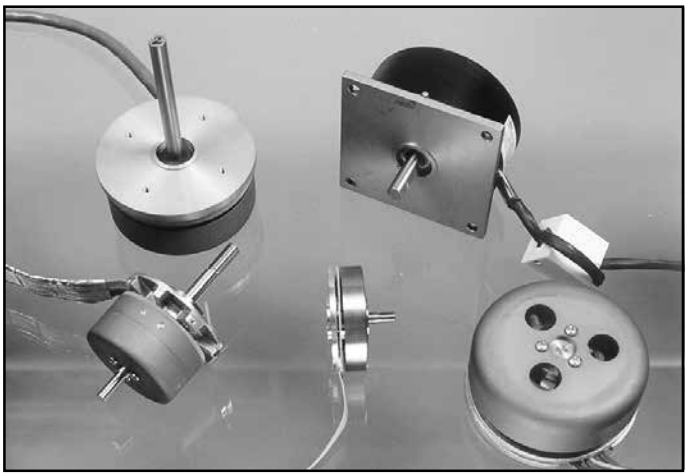
Brushless DC Motors

Outside Rotor
Fractional Horsepower

BON35 Series



TYPICAL APPLICATIONS

- Medical equipment (pumps and blowers)
- HVAC systems (air handling equipment)
- Industrial automation
- Scanners
- Office automation equipment

FEATURES

- Length – 2.0 inches
- Continuous torques from 58.0 to 76.0 oz-in
- Bonded neodynium magnets
- Safe, arcless operation
- High speed capabilities – up to 6,700 rpm
- 4 and 8 pole designs
- Options include electronic drives, encoders, Hall effect or sensorless feedback
- Available as a parts set or a complete housed motor

BENEFITS

- Operate over a wide range of speeds - not limited to AC frequency
- Extremely quiet operation with long life capability
- Precise, variable speed control
- Motor life is not limited to brush or commutator life
- Efficient operation without losses associated with brushes and commutation or armature induction

ENCODERS

High resolution, high reliability, and state-of-the-art technology in a small package:

- Bidirectional incremental code
- Up to 1024 cycles standard
- Up to 3 channels: A, B, and index
- TTL / CMOS compatible
- Other configurations and resolutions available

Quiet, Brushless Motors

BON35 motors provide smooth, efficient operation at high speeds. The brushless design ensures low audible noise and long life. Utilizing bonded neodynium magnets, these brushless motors provide excellent performance and value demonstrated by their low cost to high torque ratio. Available with a variety of options, including custom windings to achieve different speed / torque operating points, electronic drives, encoders and Hall effect or sensorless feedback.

In some applications, motors with an outside rotor have several advantages over their counterparts with inside rotors. Motors with outside rotors perform especially well in applications with significant torque oscillation. Also, BON outside rotor motors have relatively low profile dimensions for height so they can easily fit in an envelope that is wider than it is tall - such as medical equipment or industrial machines.

We have designed thousands of DC motors, so if our BON series doesn't meet your needs, call us to talk about your specifications. One of our other designs may meet your needs, or our engineering department can design a motor to meet your specific requirement.

SPECIFICATION AND NUMBERING SYSTEM

Part Numbering System Guide

BON35 □ □ □ □ □ □ T F O

BRUSHLESS MOTOR

OUTSIDE ROTOR

FRAME COMMERCIAL DC MOTOR
35 – Size 35

MAGNET TYPE
N – Bonded Neodymium

BASIC MOTOR LENGTH
20 – Refer to motor data table for standard offerings.

MECHANICAL OPTIONS
AA - standard mechanical configuration.

Refer to notes for Standard Motor Options offered. Many other custom mechanical options are available.

ELECTRICAL
01 – 48 Volts DC
02 – 160 Volts (Rectified AC)

Other voltages and custom windings available

TERMINATION
L – Leads
C – Connector

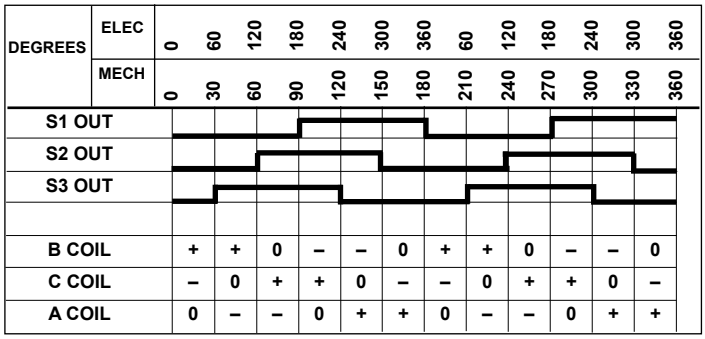
FEEDBACK OPTIONS
H – Hall Effect (std)
S – Sensorless

OTHER OPTIONS
E – Encoder

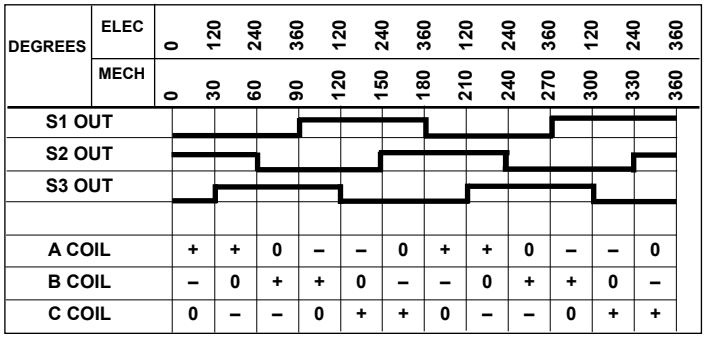
Conversion Table

FROM	*TO*	*MULTIPLY BY*
Length		
inches	cm	2.540
feet	cm	30.48
cm	inches	.3937
cm	feet	3.281×10^{-2}
Mass		
oz	g	28.35
lb	g	453.6
g	oz	3.527×10^{-2}
lb	oz	16.0
g	lb	2.205×10^{-3}
oz	lb	6.250×10^{-2}
Torque		
oz-in	g-cm	72.01
lb-ft	g-cm	1.383×10^{4}
g-cm	oz-in	1.389×10^{-2}
lb-ft	oz-in	192.0
g-cm	lb-ft	7.233×10^{-5}
oz-in	lb-ft	5.208×10^{-3}
Rotation		
rpm	degrees/sec	6.0
rad/sec	degrees/sec	57.30
degrees/sec	rpm	.1667
rad/sec	rpm	9.549
degrees/sec	rad/sec	1.745×10^{-2}
rpm	rad/sec	.1047
Moment Of Inertia		
oz-in^2	g-cm^2	182.9
lb-ft^2	g-cm^2	4.214×10^{5}
g-cm^2	oz-in^2	5.467×10^{-3}
lb-ft^2	oz-in^2	2.304×10^{3}
g-cm^2	lb-ft^2	2.373×10^{-6}
oz-in^2	lb-ft^2	4.340×10^{-4}
oz-in-sec^2	g-cm^2	7.062×10^{4}

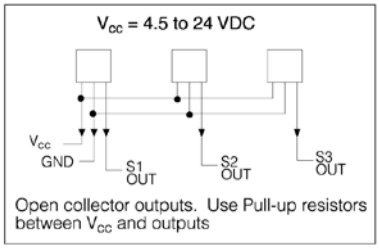
Timing Diagram CCW Shaft Rotation - 4 Poles



Timing Diagram CCW Shaft Rotation - 8 Poles



Hall Effect Switches



Termination Table

PIN NUMBER	FUNCTION	COLOR
3	A	BLUE
2	B	PURPLE
1	C	GRAY
6	S1	ORANGE
5	S2	YELLOW
4	S3	GREEN
7	Vcc	BROWN
8	GROUND	RED

BON35 Specifications

BON35 SPECIFICATIONS -

Continuous Stall Torque 59.7 - 78.3 oz-in (0.4216 - 0.5529 Nm)
Peak Torque 379 - 806 oz-in (2.6763 - 5.6916 Nm)

Part Number*		BON35-20AA-□□ T F O		BON35-20BA-□□ T F O	
Winding Code**		01	02	01	02
L = Length	inches	2.00		2.00	
	millimeters	50.8		50.8	
Terminal Voltage	volts DC	48.0	160.0	48.0	160.0
Peak Torque	oz-in	379.0	457.0	755.0	806.0
	Nm	2.6763	3.2271	5.3314	5.6916
Continuous Stall Torque	oz-in	59.7	60.3	76.2	78.3
	Nm	0.4216	0.4258	0.5382	0.5529
Rated Speed	RPM	4000.0	4900.00	4000.0	4000.0
	rad/sec	419	513	419	419
Rated Torque	oz-in	58.0	58.5	74.0	76.0
	Nm	0.4096	0.4131	0.5226	0.5367
Rated Current	Amps	5.56	1.95	6.74	2.10
Rated Power	watts	172.0	212.0	219.0	225.0
Torque Sensitivity	oz-in/amp	11.72	33.80	12.44	41.04
	Nm/amp	0.0828	0.2387	0.0878	0.2898
Back EMF	volts/KRPM	8.66	24.99	9.20	30.35
	volts/rad/sec	0.0828	0.2387	0.0878	0.2898
Terminal Resistance	ohms	1.48	11.80	0.79	8.13
Terminal Inductance	mH	2.26	18.78	1.16	12.62
Motor Constant	oz-in/sq.rt.watt	9.63	9.84	14.00	14.39
	Nm/sq.rt.watt	0.06803	0.06948	0.09883	0.10164
Rotor Inertia	oz-in-sec^2	99.00	99.00	99.00	99.00
	g-cm^2	6986.4	6986.4	6986.4	6986.4
Weight	oz	44.1	44.1	42.5	42.5
	g	1251.6	1253.3	1207.9	1207.0
# of Poles		4.0	4.0	8.0	8.0
Timing		60°	60°	120°	120°
Mech. Time Constant	ms	151.0	144.7	71.5	67.6
Electrical Time Constant	ms	1.53	1.59	1.47	1.55
Thermal Resistivity	°C/watt	1.1	1.1	1.0	0.9

Notes:
1. Motor mounted to a 6 x 6 x 1/4 inches aluminum plate, in still, 25°C ambient air.
2. Maximum winding temperature of 155°C.
3. 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.
5. For MS (military style) connector, please specify connector housing and terminal.
6. 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.

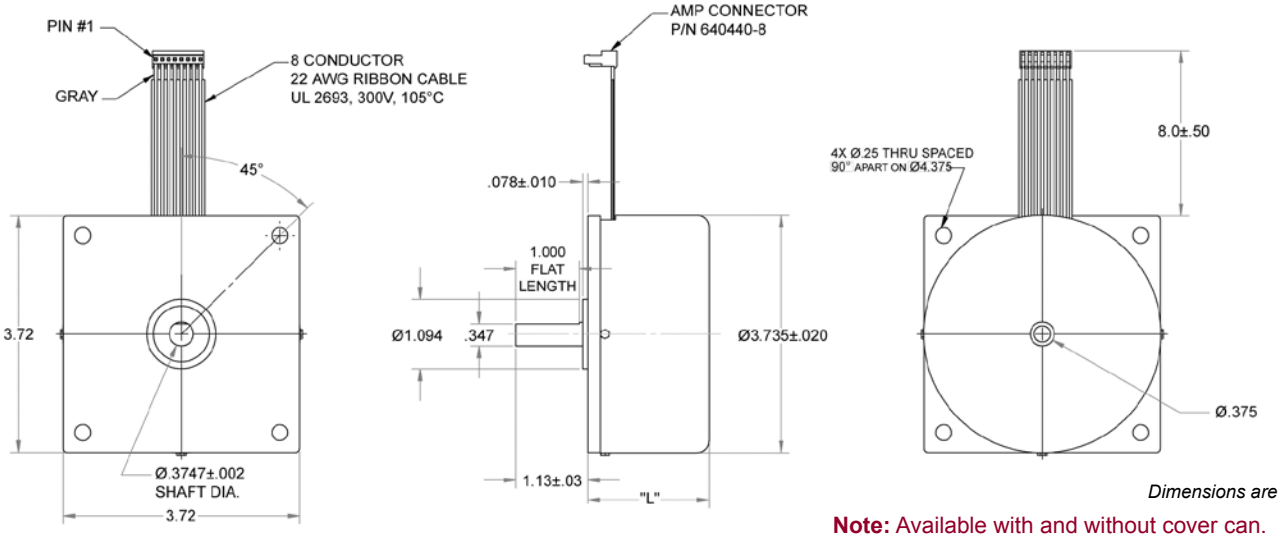
Select your options below and place their code in its corresponding block as shown on page 85.

T TERMINATION
L – Leads (std)
C – Connector
M – MS connector

F FEEDBACK OPTIONS
H – Hall Effect (std)
S – Sensorless

O OTHER OPTIONS
E – Encoder
G – Gearhead

BON35 Typical Outline Drawing

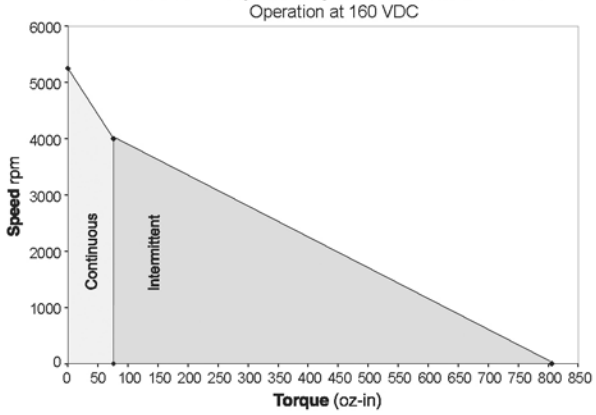


Dimensions are in inches

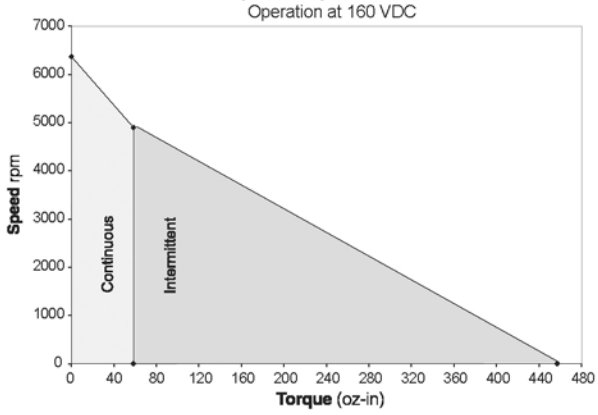
Note: Available with and without cover can.

BON35 Performance Curves

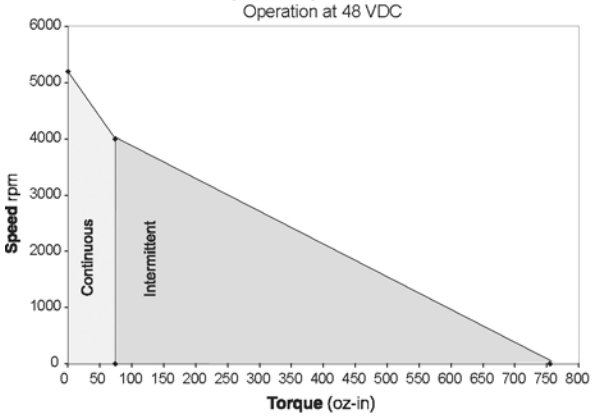
BON35-20BA-02 Speed-Torque: Continuous and Intermittent Operation at 160 VDC



BON35-20AA-02 Speed-Torque: Continuous and Intermittent Operation at 160 VDC



BON35-20BA-01 Speed-Torque: Continuous and Intermittent Operation at 48 VDC



BON35-20AA-01 Speed-Torque: Continuous and Intermittent Operation at 48 VDC