

# Brushless DC Products



- Same performance as permanent magnet DC systems. No brushes to replace.
- Proven system solutions. High-speed designs available.
- Economical alternative to stepper and servo systems.

# Brushless DC Motors

## Technical Information

### Brushless Motor Construction

Because most people who work with motors are familiar with brush-type permanent magnet (PM) motors, it is helpful to explain the construction of a brushless DC (BLDC) motor by comparing it to the PM motor. BLDC motors are sometimes referred to as “inside-out PM motors” because their speed-torque curves are very similar to those of PM motors. However, BLDC motors have their magnets on the rotating part of the motor instead of on the stationary part. Accordingly, they have their windings on the stationary part of the motor instead of on the rotating part, as in a PM motor. **Figure 1** shows the construction differences between the BLDC and the PM motors.

The other major construction difference is the means for switching winding phases on and off, as shown in **Figure 2**. A PM motor uses brushes that press against a commutator attached to the armature. As the armature turns, the brushes come into contact with different segments of the commutator and change the current path through the winding. The interaction between the magnetic field created in the armature and the permanent magnet field in the stationary part of the motor results in rotation of the armature. Operation of a BLDC motor is similar except that the winding phases are switched on

and off electronically by means of a control device. The control “knows” when to switch the windings because of feedback it receives from rotor position Hall effect sensors.

### Benefits of Brushless

- Having the winding, which is the heat-generating part of the motor, closer to the outside surface of the motor results in a motor that dissipates heat well and that can therefore handle higher continuous loads without exceeding its temperature limit.
- Having no brushes results in a motor that requires less maintenance and that has a longer life because there are no brushes or commutator to wear out.
- The absence of brushes also results in a motor that is quieter because there is no sliding friction to create audible noise and no current arcing across an air gap to create electrical noise.
- There is also no brush dust generated by a brushless motor, so they won't contaminate a clean room environment.
- The lower inertia of a brushless rotor, compared to a wound armature, results in a motor that can accelerate and decelerate quickly.

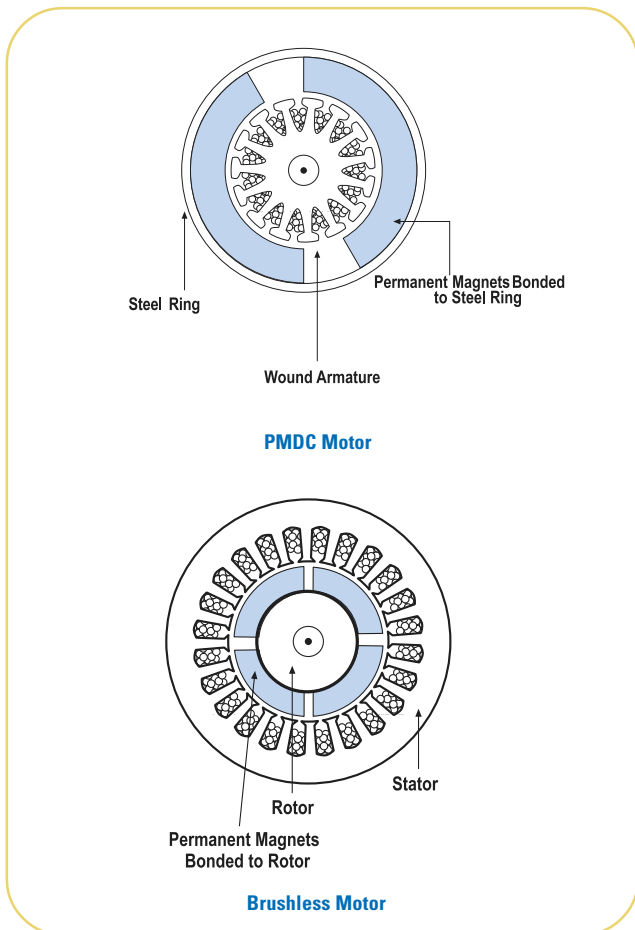
### Typical Applications

Brushless DC motors are well-suited for applications that require very high speeds, where a brush-type motor would generate a loud noise and wear out brushes very quickly. Examples include centrifuges, grinders, and fans.

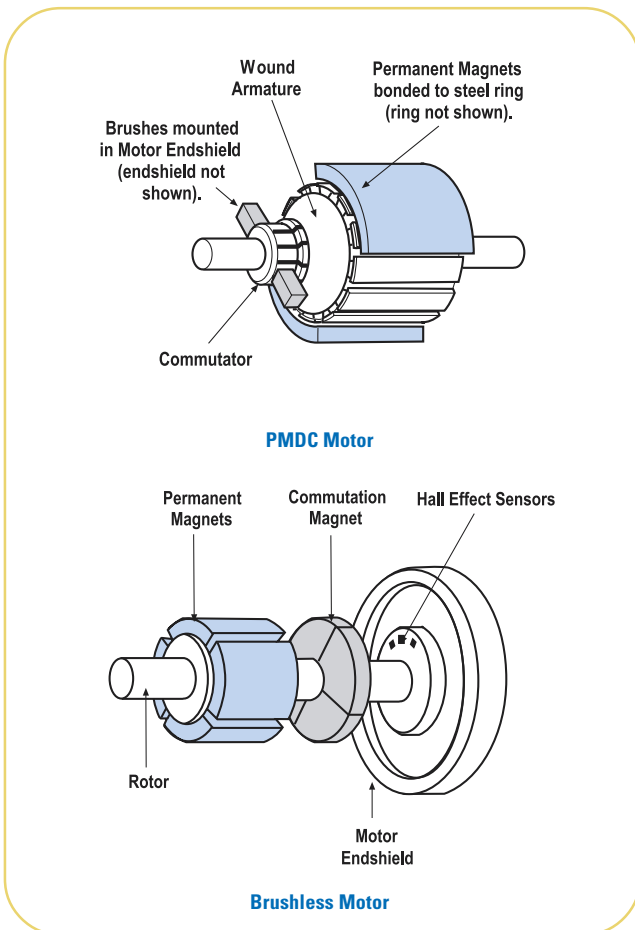
Because brushless DC motor speed controls rely on hall sensor feedback for speed regulation instead of back-EMF, there is only minimal speed drift as the motor warms up. This is beneficial in applications where the speed can't deviate from its setting from the time the machine is turned on until the time it is turned off. Examples include film processors, commercial food ovens, and medical pumps.

The low inertia of the brushless DC motor, coupled with the high peak torque capacity, result in a motor capable of quick accelerations and decelerations. This makes them an excellent choice in “servo” type applications where quick and precise positioning is needed. Examples include screen printing machinery, material handling equipment, and office machinery.

**Figure 1:** Basic Motor Construction



**Figure 2:** Commutation Methods



# Brushless DC Motors

## Electrical Connections

### Wiring Harness for 24 Volt Motors and Gearmotors

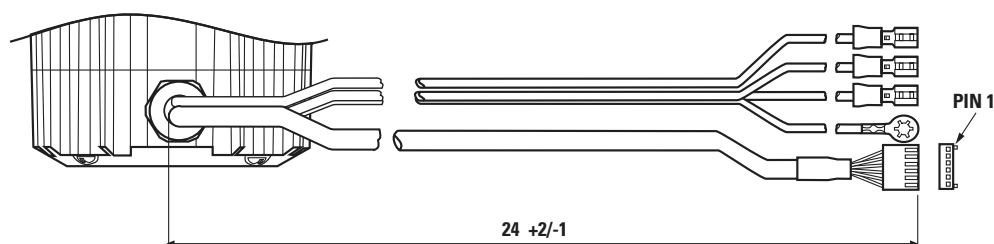
Bodine 24 Volt motors and gearmotors have four 18 AWG wires and a five-conductor shielded cable for connection to a Bodine 24 Volt control. The three motor phase connections are made with .250" quick

connect receptacles. The ground lead is terminated with a ring terminal and the 24 AWG commutation leads inside the 5-conductor shielded cable are terminated in a 6-pin in-line connector with 0.1"

center distances. The harness is a nominal 24" long from the motor housing to the end of the connections.

Pin Location	Wire Color & Size	Pin Part No.	Connector Part No.	Function
-	Red, 18 AWG	-	AMP 640902-1	Phase B
-	Brown, 18 AWG	-	AMP 640902-1	Phase A
-	Orange, 18 AWG	-	AMP 640902-1	Phase C
-	Green/Yellow, 18 AWG	-	AMP 640204-1	Earth /Ground Shield Drain
1	Drain Wire	MOLEX 08-50-0113	MOLEX 22-01-3067	Sensor Common
2	Black, 24 AWG	MOLEX 08-50-0113		Hall C
3	Green, 24 AWG	MOLEX 08-50-0113		Hall B
4	White, 24 AWG	MOLEX 08-50-0113		Hall A
5	Brown, 24 AWG	MOLEX 08-50-0113		Sensor Power
6	Red, 24 AWG	MOLEX 08-50-0113		

### Wiring Harness for 24 Volt Motors and Gearmotors (34B shown)



### Wiring Harness for 130 Volt Motors and Gearmotors

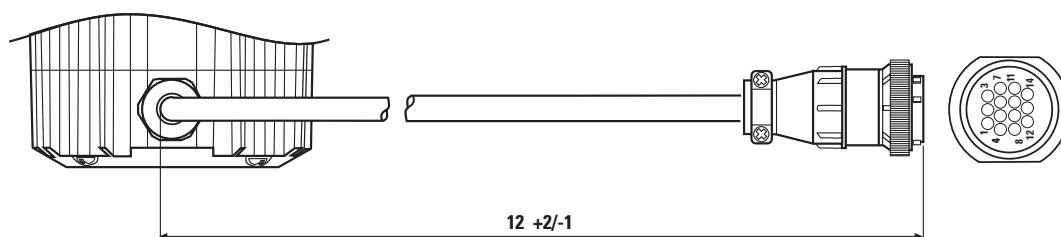
Bodine 130 Volt motors and gearmotors have a single 14-pin plug & twist connector at the end of a nominal 12" long harness. This provides a quick and easy means of connecting the motor or gearmotor to a Bodine 115VAC control. An interface

cable is needed between the motor and the control. This cable may be supplied by the customer or it can be purchased from Bodine Electric. Model 3983 is a 6' long cable that can be used to connect 130 Volt motors and gearmotors to Bodine control

models 3910, 3911, and 3921. Model 3982 is a 6' long cable that can be used to connect 130 Volt motors and gearmotors to Bodine control model 3912. It can also be used as an extension cable for use with any of the above mentioned controls. Encased model 3912 includes a 6' cable.

Pin Location	Wire Color & Size	Pin Part No.	Connector Part No.	Function
2	Red, 18 AWG	AMP 66098-7	AMP 206044-1	Phase B
1	Brown, 18 AWG	AMP 66098-7		Phase A
3	Orange, 18 AWG	AMP 66098-7		Phase C
4	Green/Yellow, 18 AWG	AMP 66098-7		Earth Ground Shield Drain
11	Drain Wire	AMP 66102-7		Sensor Common
10	Black, 24 AWG	AMP 66102-7		Hall C
14	Green, 24 AWG	AMP 66102-7		Hall B
13	White, 24 AWG	AMP 66102-7		Hall A
12	Brown, 24 AWG	AMP 66102-7		Sensor Power
9	Red, 24 AWG	AMP 66102-7		

### Wiring Harness for 130 Volt Motors and Gearmotors (34B shown)



# Brushless DC Motors

1/16 - 1/5 HP



22B

FOR MODELS WITH  
BUILT-IN CONTROLS

**INTEGRAMOTOR™**

SEE PAGES 7-10

### Standard Features

- Totally Enclosed, Non-Ventilated
- IP-44, 130V only
- Plug-in connectors facilitate electrical connections
- Electronic commutation provides quiet operation and low electro-magnetic interference (EMI) while eliminating brush maintenance and contamination from brush dust
- Molded hall sensor assembly for accurate commutation
- Wound stator with exposed laminations provides excellent heat transfer and allows maximum power per motor frame size
- Rare earth magnets on the rotor provide high torque and low rotor inertia

### Application Information

- Brushless motors require a control
- Electrical connections shown on page 105
- Performance ratings based on 115° C winding, 25° C ambient, and no heat sink
- May have to be operated below ratings if unfiltered

control is used and if duty is continuous (see page 121 for specific unfiltered ratings)

- May be operated above ratings if duty is intermittent and/or if heat sink is provided (consult a Bodine applications engineer first)
- Face mounting is standard

### Optional Accessories

- 360 pulse/revolution optical encoder model 0940, see page 122 (requires adaptor plate model 0993 also)
- Cable model 3983 for connecting 130V motors to Bodine chassis controls, see page 122
- Adaptor model 0993 for mounting encoder, see page 122

### Matching Controls

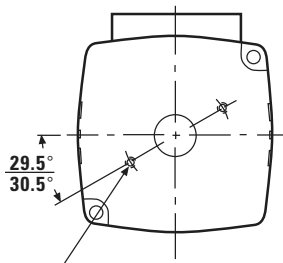
- Motors may be used with a variety of controls, including servo amplifiers, that produce square-wave current for 3-phase, 4-pole brushless motors with 60° commutation
- Bodine stocks a full line of single-quadrant speed controls ideally matched for Bodine's brushless motors, see pages 114-121

Speed (rpm)	Rated Torque (oz-in.)	Motor HP	Torque Constant (oz-in./A)	Voltage Constant (V/krpm)	Winding Res. (ohms)	Winding Induct. (mH)	Rotor Inertia (oz-in.-sec. <sup>2</sup> )	Radial Load (lbs.)	Length XH (inch)	Wt. (lbs.)	Product Type	Model Number <sup>1</sup>			
												24 Volt Winding		130 Volt Winding	
												Acc'y. Shaft	No Acc'y. Shaft	Acc'y. Shaft	No Acc'y. Shaft
2500	25	1/16	8.4	5.8	1.2	2.1	.0036	25	3.67	2.5	22B2BEBL	-	<b>3502</b>	-	-
2500	25	1/16	47	35	40	70	.0036	25	3.67	2.5	22B2BEBL	-	-	-	<b>3302</b>
2500	50	1/8	9.0	6.7	.52	1.1	.0072	25	4.63	3.5	22B4BEBL	<b>3604</b>	N3504	-	-
2500	50	1/8	50	37	15	40	.0072	25	4.63	3.5	22B4BEBL	-	-	<b>3404</b>	<b>3304</b>
10,000	20	1/5	14	9.8	4.8	10	.0072	25	4.63	3.5	22B4BEBL	-	-	-	<b>3314</b>

<sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.

**22B Motor** 130V design shown with optional "accessory ready" mounting holes

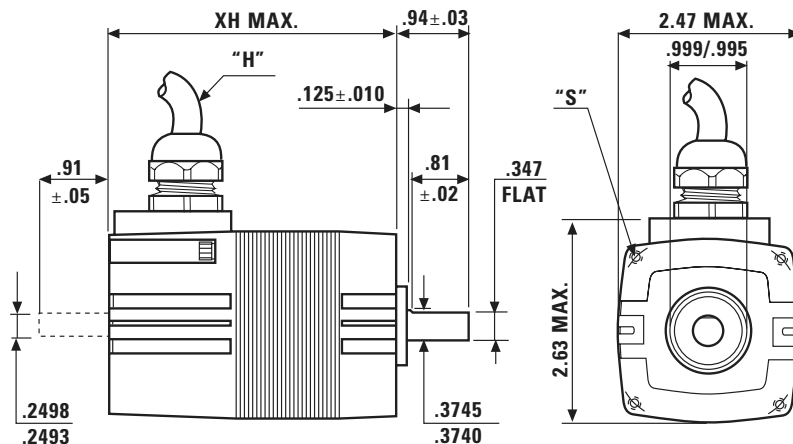
This surface machined only on models with accessory shaft.



(2) #6-32 x .19 deep min.  
180° apart on 1.269/1.279 B.C.

"S" (4) .164-32 UNC-2B, .25 in. deep minimum on 2.626 in. BC.

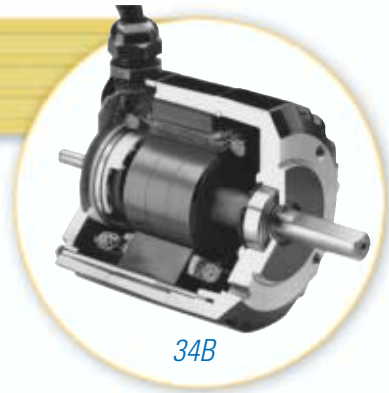
"H" See page 105 for cable length and details.



**BODINE®**  
**ELECTRIC**  
**COMPANY**

# Brushless DC Motors

1/5 - 3/8 HP



34B

## Standard Features

- Totally Enclosed, Non-Ventilated (IP-44)
- Plug-in connectors facilitate electrical connections
- Electronic commutation provides quiet operation and low electromagnetic interference (EMI) while eliminating brush maintenance and contamination from brush dust
- Molded hall sensor assembly for accurate commutation
- Wound stator with integrally cast cooling fins provides excellent heat transfer and allows maximum power per motor frame size
- Rare earth magnets on the rotor provide high torque and low rotor inertia

## Application Information

- Brushless motors require a control
- Electrical connections shown on page 105
- Performance ratings based on 115° C winding, 25° C ambient, and no heat sink
- May have to be operated below ratings if unfiltered control is used and if duty is continuous (see page

121 for specific unfiltered ratings)

- May be operated above ratings if duty is intermittent and/or if heat sink is provided (consult a Bodine applications engineer first)
- Face mounting is standard

## Optional Accessories

- 360 pulse/revolution optical encoder model 0940, see page 122
- Cable model 3983 for connecting 130V motors to Bodine chassis controls, see page 122
- "L" bracket kit model 0979 permits base, ceiling, and sidewall mounting, see page 122

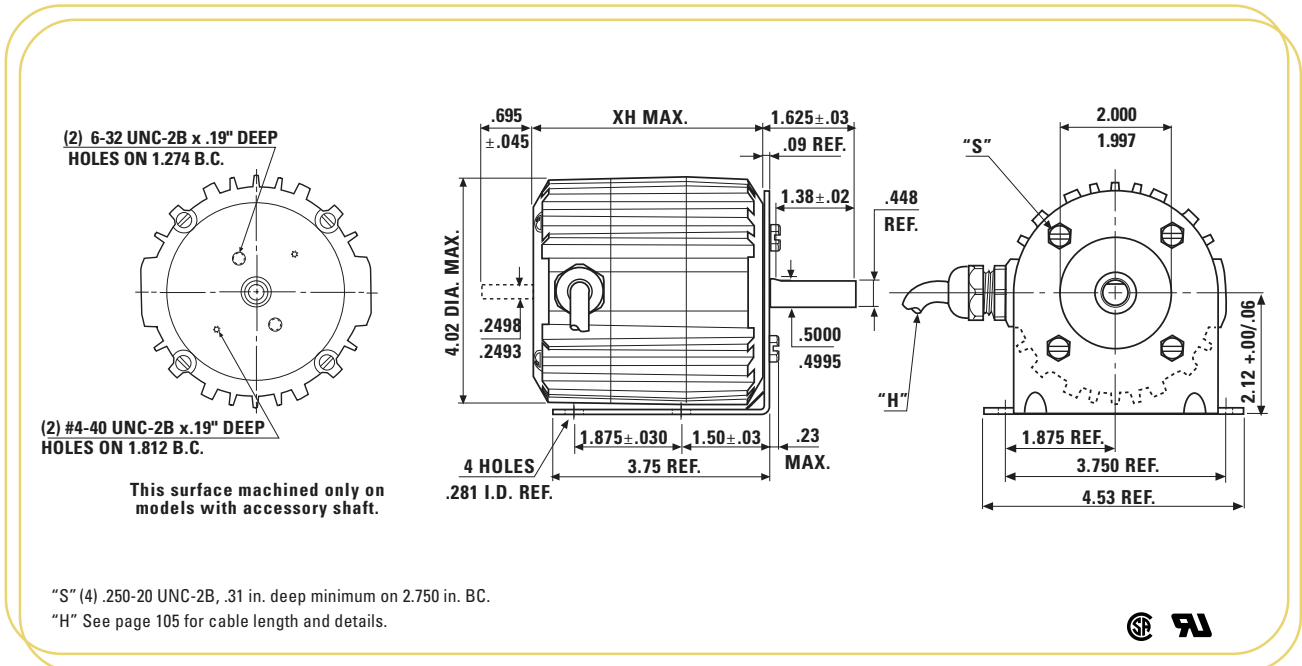
## Matching Controls

- Motors may be used with a variety of controls, including servo amplifiers, that produce square-wave current for 3-phase, 4-pole brushless motors with 60° commutation
- Bodine stocks a full line of single-quadrant speed controls ideally matched for Bodine's brushless motors, see pages 114-121

Speed (rpm)	Rated Torque (oz-in.)	Motor HP	Torque Constant (oz-in./A)	Voltage Constant (V/krpm)	Winding Res. (ohms)	Winding Induct. (mH)	Rotor Inertia (oz-in.-sec. <sup>2</sup> )	Radial Load (lbs.)	Length XH (inch)	Wt. (lbs.)	Product Type	Model Number <sup>1</sup>			
												24 Volt Winding		130 Volt Winding	
												Acc'y. Shaft	No Acc'y. Shaft	Acc'y. Shaft	No Acc'y. Shaft
2500	81	1/5	8.8	6.6	.3	.54	.0115	42	4.06	6.0	34B3BEBL	<b>3600</b>	N3500	—	—
2500	81	1/5	51	38	9.2	24	.0115	42	4.06	6.0	34B3BEBL	—	—	N3406	<b>3306</b>
2500	101	1/4	9.0	6.7	.17	.40	.0154	42	4.56	7.0	34B4BEBL	—	N3507	—	—
2500	101	1/4	51	38	5.8	14	.0154	42	4.56	7.0	34B4BEBL	—	—	—	<b>3307</b>
2500	151	3/8	—	—	—	—	0.215	42	5.56	9.0	34B4BEBL	N3609	N3509	—	—
2500	151	3/8	57	42	3.4	11	.0215	42	5.56	9.0	34B6BEBL	—	—	<b>3404</b>	<b>3309</b>
10,000	33	1/3	14.5	10.7	1.7	4.6	.0154	42	4.56	7.0	34B4BEBL	—	—	—	<b>3317</b>

<sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.

**34B Motor** shown with optional "L" bracket (model 0979) and optional "accessory ready" mounting holes





# Parallel Shaft BLDC Gearmotors

Up to 100 lb-in. continuous

## Standard Features

- Brushless motor for higher torque, smaller size and no maintenance, see page 106
- Industrial lip type seals on motor and output shafts
- Needle bearings on output shaft for increased radial load capacity and long life
- Permanently lubricated with high-performance lubricant
- Wide reinforced thermoplastic helical gear on input stage for quietness and wide hardened steel spur gears on subsequent stages for high output torque and long life
- Helical pinion accurately cut on motor shaft for maximum strength and minimum noise

## Application Information

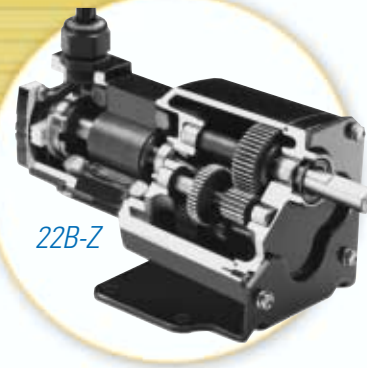
- Brushless motors require a control
- Electrical connections shown on page 105
- Performance ratings based on 115° C winding, 25° C ambient, and no heat sink
- Face mounting is standard

## Optional Accessories

- Encoder model 0940, see page 122 (requires adaptor plate model 0993 also)
- Cable model 3983 for connection to chassis controls, see page 122
- Adaptor model 0993 for encoders, see page 122
- "L" bracket kit model 5968 permits alternate mounting, see page 122

## Matching Controls

- Bodine stocks a full line of speed controls for Bodine's brushless motors, see pages 114-121



22B-Z

FOR MODELS WITH  
BUILT-IN CONTROLS

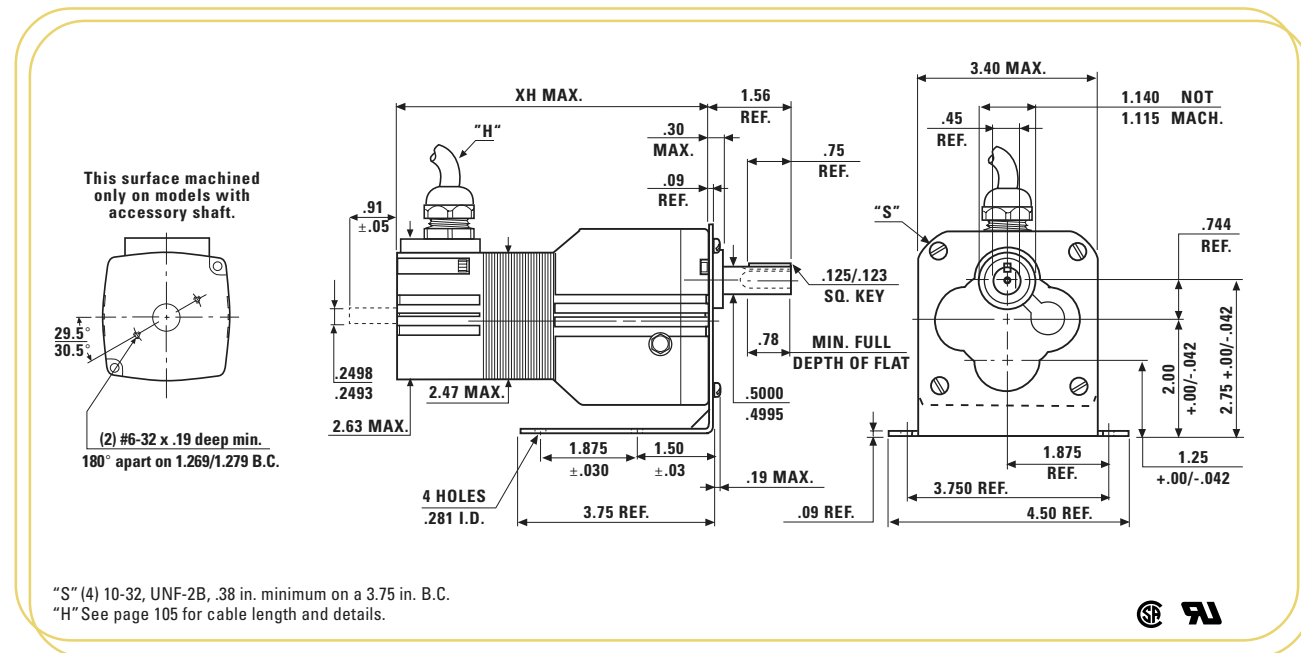
**INTEGRAmotor™**

SEE PAGES 7-10

Speed (rpm)	Rated Torque (lb-in.)	Current @ Rated Torque (Amps)		Peak Torque (lb-in.)	Motor HP	Gear Ratio	Radial Load (lbs.)	Length, XH (inch)	Weight (lbs.)	Product Type	Model Number <sup>1</sup>			
		24 Volt Winding	130 Volt Winding								24 Volt Winding		130 Volt Winding	
											Accessory Shaft	No Accessory Shaft	Accessory Shaft	No Accessory Shaft
14	100	—	.76	115	1/11	180	110	7.29	5.25	22B3BEBL-Z4	—	—	N3463	<b>3363</b>
14	100	3.3	.53	115	1/16	180	110	6.81	4.75	22B2BEBL-Z4	—	N3563	—	—
21	100	3.3	.53	115	1/16	120	110	6.81	4.75	22B2BEBL-Z4	—	N3564	—	N3364
28	100	4.4	.76	115	1/11	90	110	7.29	5.25	22B3BEBL-Z4	—	—	N3462	N3362
28	97	3.3	.53	115	1/16	90	110	6.81	4.75	22B2BEBL-Z4	—	N3562	—	—
42	95	4.4	.76	115	1/11	60	110	7.29	5.25	22B3BEBL-Z3	<b>3661</b>	N3561	N3461	N3361
83	52	4.4	.76	59	1/11	30	125	7.29	5.25	22B3BEBL-Z3	N3660	N3560	N3460	N3360
139	31	4.4	.76	38	1/11	18	125	6.39	5.25	22B3BEBL-Z2	N3659	N3559	N3459	N3359
208	20	4.4	.76	25	1/11	12	120	6.39	5.25	22B3BEBL-Z2	N3658	N3558	N3458	<b>3358</b>
417	10	4.4	.76	13	1/11	6	100	6.39	5.25	22B3BEBL-Z2	N3657	N3557	N3457	<b>3357</b>

<sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.

**22B-Z Gearmotor** 130V design shown with optional "L" bracket (model 5968) and optional "accessory ready" mounting holes



# Parallel Shaft BLDC Gearmotors

Up to 175 lb-in. continuous



34B-W

### Standard Features

- Brushless motor for higher torque, smaller size and no maintenance, see page 107
- Industrial lip type seals on motor and output shafts
- Needle bearings on output shaft for increased radial load capacity and long life
- Permanently lubricated with high-performance lubricant
- Nylon helical gear on input stage for quietness and hardened steel spur gears on subsequent stages for high output torque and long life
- Helical pinion accurately cut on motor shaft for maximum strength and minimum noise

- Performance ratings based on 115° C winding, 25° C ambient, and no heat sink
- Face mounting is standard

### Optional Accessories

- Encoder model 0940, see page 122
- Cable model 3983 for connection to chassis controls, see page 122
- L-Bracket kit model 0970 permits alternate mounting, see page 122
- Adaptor plate kit model 0995 provides for drop-in replacement of competitive gearmotors, see page 122

### Application Information

- Brushless motors require a control
- Electrical connections shown on page 105

### Matching Controls

- Bodine stocks a full line of speed controls for Bodine's brushless motors, see pages 114-121

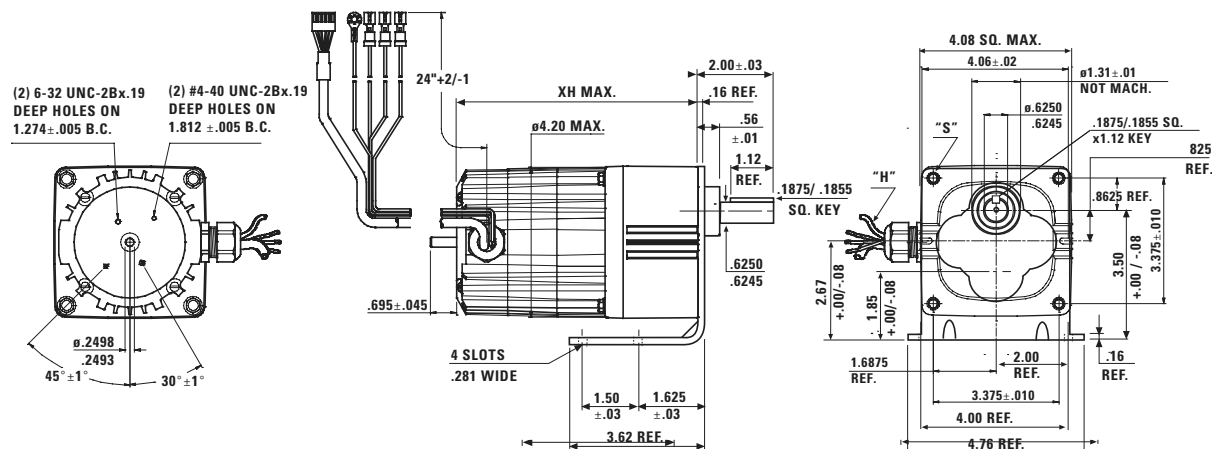
Speed (rpm)	Rated Torque (lb-in.)	Current @ Rated Torque (Amps)		Peak Torque (lb-in.)	Motor HP	Gear Ratio	Radial Load (lbs.)	Length, XH (inch)	Weight (lbs.)	Product Type	Model Number <sup>1</sup>			
		24 Volt Winding	130 Volt Winding								24 Volt Winding		130 Volt Winding	
											Accessory Shaft	No Accessory Shaft	Accessory Shaft	No Accessory Shaft
8	175	9.6	1.6	210	1/5	312.4	130	6.54	9.0	34B3BEBL-W4	N3647	N3547	N3447	N3347
14	166	9.6	1.6	207	1/5	172.1	130	6.54	9.0	34B3BEBL-W4	N3624	N3524	N3446	<b>3346</b>
26	154	9.6	1.6	190	1/5	97.5	140	6.54	9.0	34B3BEBL-W4	N3656	N3556	N3456	N3356
38	143	9.6	1.6	157	1/5	65.5	140	6.54	9.0	34B3BEBL-W3	N3617	N3517	N3455	N3355
84	65	9.6	1.6	71	1/5	29.7	160	6.54	9.0	34B3BEBL-W3	N3653	N3553	N3453	<b>3353</b>
122	46	9.6	1.6	52	1/5	20.4	60	6.54	9.0	34B3BEBL-W2	N3652	N3552	N3452	<b>3352</b>
266	21	9.6	1.6	24	1/5	9.4	80	6.54	9.0	34B3BEBL-W2	N3623	N3523	N3450	N3350
456	12	9.6	1.6	14	1/5	5.5	90	6.54	9.0	34B3BEBL-W2	<b>3611</b>	N3522	N3449	N3349

<sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.

34B-W Gearmotor shown with optional "L" bracket (model 0970) and optional "accessory ready" mounting holes

## New gear housing design—will be phased in during 2nd quarter 2004

New gear housing die casting will eliminate mounting nuts during the second quarter of 2004. Mounting threads and location, and all other dimensions and overall size will not be affected.



"S" (4) .250-28, UNF-2B, .50 in. minimum on a 4.78 in. B.C.  
 "H" See page 105 for cable length and details.



# Parallel Shaft BLDC Gearmotors

Up to 175 lb-in. continuous



34B-W

### Standard Features

- Brushless motor for higher torque, smaller size and no maintenance, see page 107
- Industrial lip type seals on motor and output shafts
- Needle bearings on output shaft for increased radial load capacity and long life
- Permanently lubricated with high-performance lubricant
- Nylon helical gear on input stage for quietness and hardened steel spur gears on subsequent stages for high output torque and long life
- Helical pinion accurately cut on motor shaft for maximum strength and minimum noise

- Performance ratings based on 115° C winding, 25° C ambient, and no heat sink
- Face mounting is standard

### Optional Accessories

- Encoder model 0940, see page 122
- Cable model 3983 for connection to chassis controls, see page 122
- L-Bracket kit model 0970 permits alternate mounting, see page 122
- Adaptor plate kit model 0995 provides for drop-in replacement of competitive gearmotors, see page 122

### Application Information

- Brushless motors require a control
- Electrical connections shown on page 105

### Matching Controls

- Bodine stocks a full line of speed controls for Bodine's brushless motors, see pages 114-121

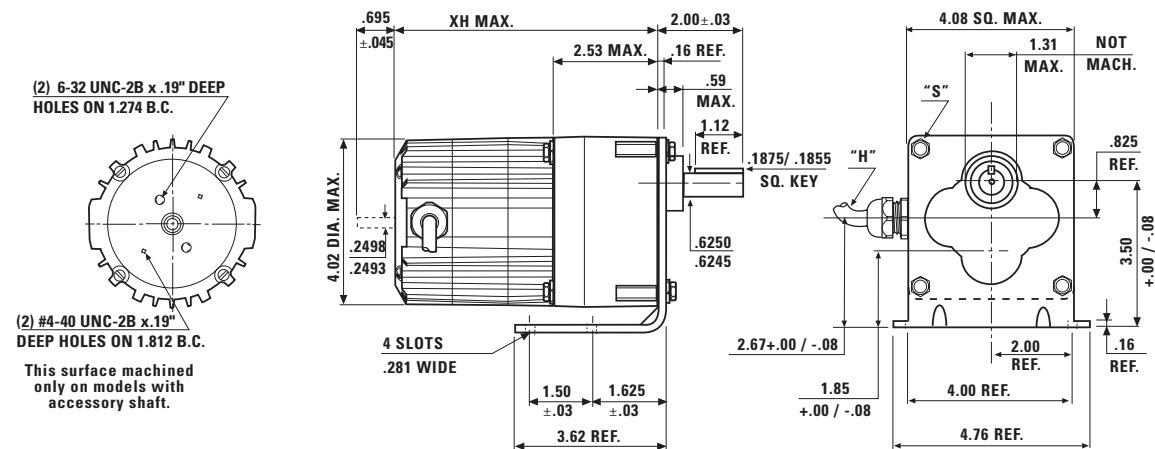
Speed (rpm)	Rated Torque (lb-in.)	Current @ Rated Torque (Amps)		Peak Torque (lb-in.)	Motor HP	Gear Ratio	Radial Load (lbs.)	Length, XH (inch)	Weight (lbs.)	Product Type	Model Number <sup>1</sup>			
		24 Volt Winding	130 Volt Winding								24 Volt Winding		130 Volt Winding	
											Accessory Shaft	No Accessory Shaft	Accessory Shaft	No Accessory Shaft
8	175	9.6	1.6	210	1/5	312.4	130	6.54	9.0	34B3BEBL-W4	N3647	N3547	N3447	N3347
14	166	9.6	1.6	207	1/5	172.1	130	6.54	9.0	34B3BEBL-W4	N3624	N3524	N3446	<b>3346</b>
26	154	9.6	1.6	190	1/5	97.5	140	6.54	9.0	34B3BEBL-W4	N3656	N3556	N3456	N3356
38	143	9.6	1.6	157	1/5	65.5	140	6.54	9.0	34B3BEBL-W3	N3617	N3517	N3455	N3355
84	65	9.6	1.6	71	1/5	29.7	160	6.54	9.0	34B3BEBL-W3	N3653	N3553	N3453	<b>3353</b>
122	46	9.6	1.6	52	1/5	20.4	60	6.54	9.0	34B3BEBL-W2	N3652	N3552	N3452	<b>3352</b>
266	21	9.6	1.6	24	1/5	9.4	80	6.54	9.0	34B3BEBL-W2	N3623	N3523	N3450	N3350
456	12	9.6	1.6	14	1/5	5.5	90	6.54	9.0	34B3BEBL-W2	<b>3611</b>	N3522	N3449	N3349

<sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.

34B-W Gearmotor shown with optional "L" bracket (model 0970) and optional "accessory ready" mounting holes

## Current design – will be phased out during 2nd quarter 2004

New gear housing die casting will eliminate mounting nuts during the second quarter of 2004. Mounting threads and location, and all other dimensions and overall size will not be affected.

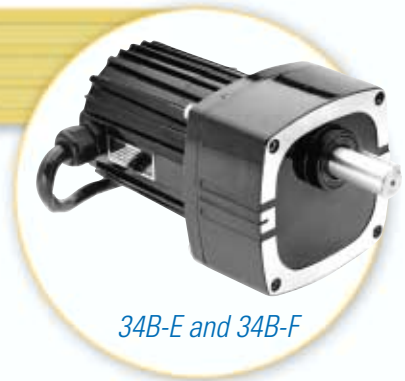


"S" (4) .250-28, UNF-2B, .50 in. minimum on a 4.78 in. B.C.  
 "H" See page 105 for cable length and details.



# Parallel Shaft BLDC Gearmotors

Up to 350 lb-in. continuous



34B-E and 34B-F

## Standard Features

- Brushless motor for higher torque, smaller size and no maintenance, see page 107
- Industrial lip type seals on motor and output shafts
- Needle bearings throughout for increased radial load capacity and long life
- Permanently lubricated with high-performance lubricant
- Selectively hardened all steel helical gearing for quietness and high output to size ratio

## Application Information

- Brushless motors require a control
- Electrical connections shown on page 105
- Performance ratings based on 115° C winding, 25° C ambient, and no heat sink
- Face mounting is standard

## Optional Accessories

- Encoder model 0940, see page 122
- Cable model 3983 for connection to chassis controls, see page 122
- L-Bracket kit model 0969 permits alternate mounting, see page 122
- Adaptor plate kit model 0995 provides for drop-in replacement of competitive gearmotors, see page 122

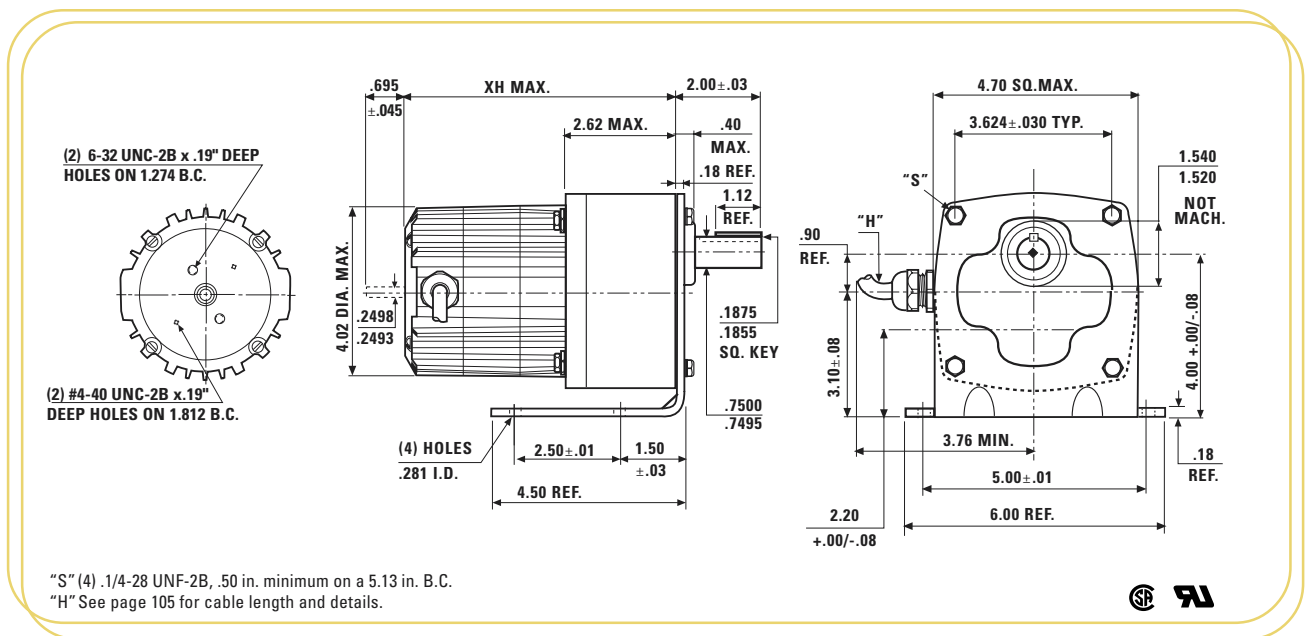
## Matching Controls

- Bodine stocks a full line of speed controls for Bodine's brushless motors, see pages 114-121

Speed (rpm)	Rated Torque (lb-in.)	Current @ Rated Torque (Amps)		Peak Torque (lb-in.)	Motor HP	Gear Ratio	Radial Load (lbs.)	Length, XH (inch)	Weight (lbs.)	Product Type	Model Number <sup>1</sup>			
		24 Volt Winding	130 Volt Winding								24 Volt Winding		130 Volt Winding	
											Accessory Shaft	No Accessory Shaft	Accessory Shaft	No Accessory Shaft
8.3	310	9.6	1.6	475	1/5	300	220	6.689	11.0	34B3BEBL-E4	—	N3575	—	N3375
14	341	9.6	1.6	475	1/5	180	200	6.689	11.0	34B3BEBL-E4	—	N3574	—	<b>3374</b>
21	350	9.6	1.6	475	1/5	120	195	6.689	11.0	34B3BEBL-E4	—	N3573	—	<b>3373</b>
42	270	12	2.0	421	1/4	60	240	7.189	12.0	34B4BEBL-E3	N3685	<b>3585</b>	N3485	<b>3385</b>
83	245	—	2.6	475	3/8	30	250	8.189	14.0	34B6BEBL-F3	—	—	—	N3372
83	135	12	2.0	318	1/4	30	300	7.189	12.0	34B4BEBL-E3	N3683	N3583	<b>3483</b>	<b>3383</b>
125	163	—	2.6	333	3/8	20	290	8.189	14.0	34B6BEBL-F3	—	—	—	N3371
125	90	12	2.0	220	1/4	20	300	7.189	12.0	34B4BEBL-E3	N3682	N3582	N3482	<b>3382</b>
250	82	—	2.6	166	3/8	10	300	8.189	14.0	34B6BEBL-F2	—	—	N3470	N3370
250	45	12	2.0	106	1/4	10	300	7.189	12.0	34B4BEBL-E2	N3680	N3580	N3480	<b>3380</b>
500	42	—	2.6	86	3/8	5	60	8.189	14.0	34B6BEBL-F1	—	—	—	<b>3369</b>
500	25	12	2.0	55	1/4	5	60	7.189	12.0	34B4BEBL-E1	—	N3579	—	<b>3379</b>

<sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.

**34B-E Gearmotor** shown with optional "L" bracket (model 0969) and optional "accessory ready" mounting holes



# Right Angle BLDC Gearmotors

Up to 37 lb-in. continuous



22B-3N

FOR MODELS WITH  
BUILT-IN CONTROLS

**INTEGRAmotor™**

SEE PAGES 7-10

### Standard Features

- Brushless motor for higher torque, smaller size and no maintenance, see page 106
- Industrial lip type seals on motor and output shafts
- Needle bearings on output shaft for increased radial load capacity and long life
- Permanently lubricated with high-performance lubricant
- Bronze gear for high shock load capability
- Hardened and ground worm for high strength and long life

### Application Information

- Brushless motors require a control
- Electrical connections shown on page 105
- Performance ratings are based on 115° C winding, 25° C ambient, and no heat sink
- Mounting holes are on gearhousing
- Hollow shaft available. See Web site

### Optional Accessories

- Encoder model 0940, see page 122 (requires adaptor plate model 0993 also)
- Cable model 3983 for connection to chassis controls, see page 122
- Baseplate kit model 0967, see page 122

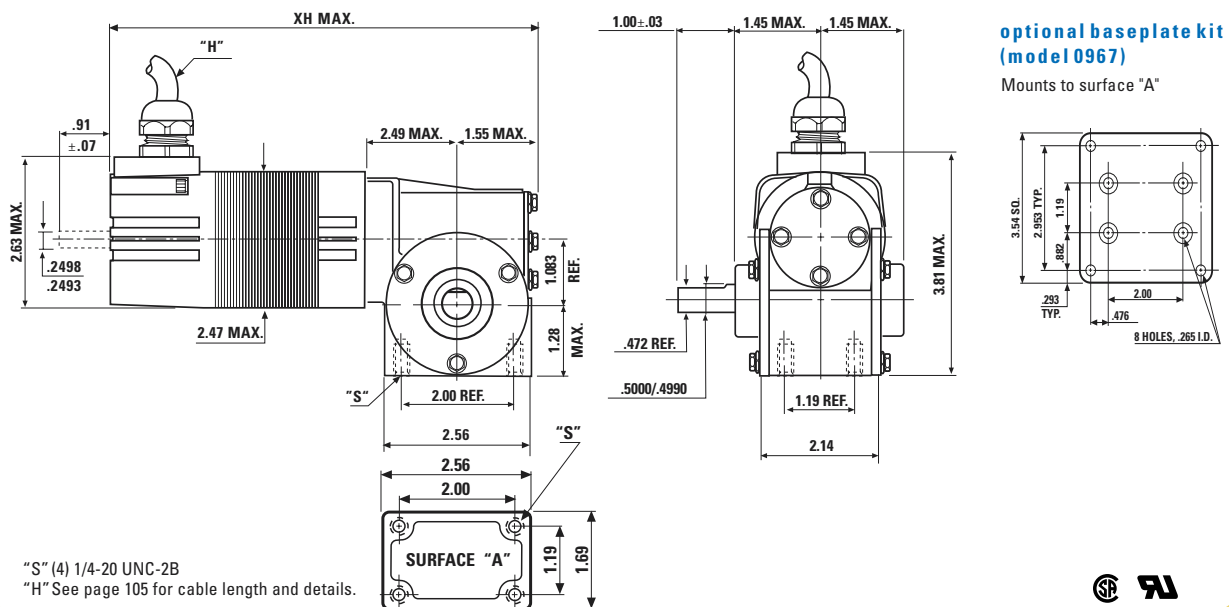
### Matching Controls

- Bodine stocks a full line of speed controls for Bodine's brushless motors, see pages 114-121

Speed (rpm)	Rated Torque (lb-in.)	Current @ Rated Torque (Amps)		Peak Torque (lb-in.)	Motor HP	Gear Ratio	Radial Load (lbs.)	Length, XH (inch)	Weight (lbs.)	Product Type	Model Number <sup>1</sup>			
		24 Volt Winding	130 Volt Winding								24 Volt Winding		130 Volt Winding	
											Accessory Shaft	No Accessory Shaft	Accessory Shaft	No Accessory Shaft
42	37	5.9	1.0	147	1/8	60	100	8.75	5.4	22B4BEBL-3N	N3665	<b>3565</b>	N3421	N3321
62	37	5.9	1.0	123	1/8	40	90	8.75	5.4	22B4BEBL-3N	N3666	N3566	N3422	<b>3322</b>
125	35	5.9	1.0	74	1/8	20	80	8.75	5.4	22B4BEBL-3N	<b>3667</b>	N3567	N3423	N3323
250	22	5.9	1.0	46	1/8	10	70	8.75	5.4	22B4BEBL-3N	N3668	N3568	<b>3424</b>	N3324
500	11	5.9	1.0	23	1/8	5	60	8.75	5.4	22B4BEBL-3N	N3669	N3569	N3425	<b>3325</b>

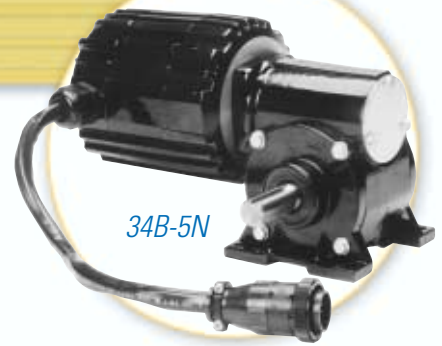
<sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.

### 22B-3N Gearmotor



# Right Angle BLDC Gearmotors

Up to 109 lb-in. continuous



34B-5N

## Standard Features

- Brushless motor for higher torque, smaller size and no maintenance, see page 107
- Industrial lip type seals on motor and output shafts
- Needle bearings on output shaft for increased radial load capacity and long life
- Permanently lubricated with high-performance lubricant
- Bronze gear for high shock load capability
- Hardened and ground worm for strength and long life

## Application Information

- Brushless motors require a control
- Electrical connections shown on page 105
- Performance ratings are based on 115° C winding, 25° C ambient, and no heat sink
- Mounting feet are on gearhousing, horizontal orientation is recommended
- Hollow shaft available. See Web site

## Optional Accessories

- Encoder model 0940, see page 122
- Cable model 3983 for connection to chassis controls, see page 122

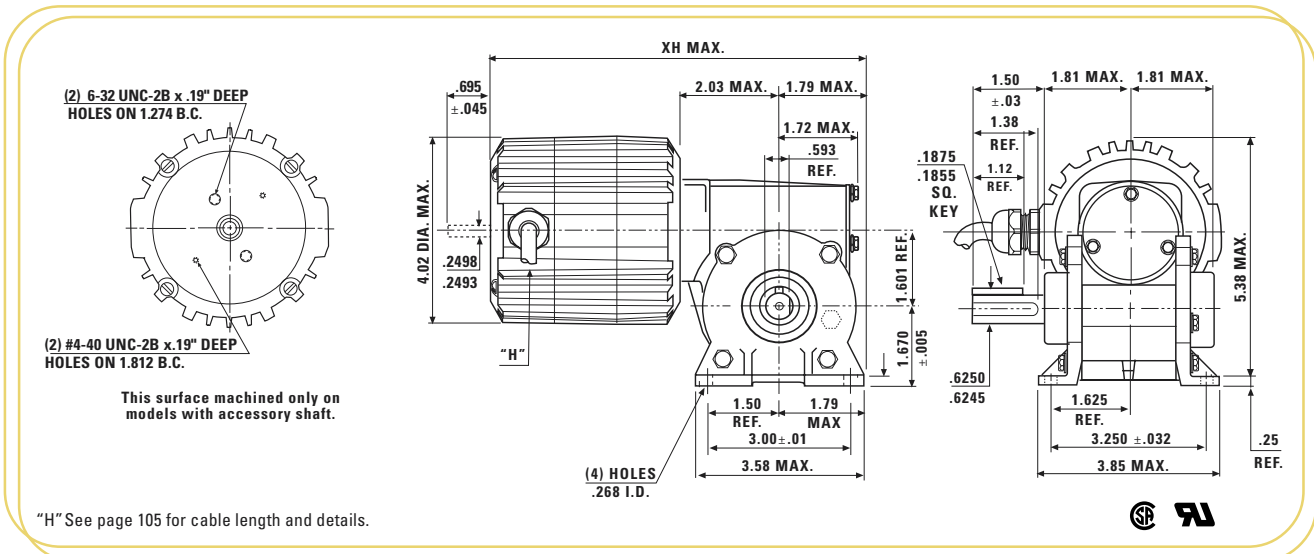
## Matching Controls

- Bodine stocks a full line of speed controls for Bodine's brushless motors, see pages 114-121

Speed (rpm)	Rated Torque (lb-in.)	Current @ Rated Torque (Amps)		Peak Torque (lb-in.)	Motor HP	Gear Ratio	Radial Load (lbs.)	Length, XH (inch)	Weight (lbs.)	Product Type	Model Number <sup>1</sup>			
		24 Volt Winding	130 Volt Winding								24 Volt Winding		130 Volt Winding	
											Accessory Shaft	No Accessory Shaft	Accessory Shaft	No Accessory Shaft
62	109	—	2.6	174	3/8	40	220	9.38	12	34B6EBEL-5N	—	—	—	N3396
62	79	12	2.0	174	1/4	40	230	8.38	10	34B4EBEL-5N	N3691	N3591	N3491	N3391
62	74	9.6	1.6	174	1/5	40	230	7.88	9	34B3EBEL-5N	—	N3586	—	<b>3386</b>
83	104	—	2.6	166	3/8	30	210	9.38	12	34B6EBEL-5N	—	—	—	N3397
83	75	12	2.0	166	1/4	30	210	8.38	10	34B4EBEL-5N	N3692	N3592	N3492	N3392
83	70	9.6	1.6	166	1/5	30	210	7.88	9	34B3EBEL-5N	—	N3587	—	N3387
125	98	—	2.6	156	3/8	20	180	9.38	12	34B6EBEL-5N	—	—	—	N3398
125	75	12	2.0	156	1/4	20	180	8.38	10	34B4EBEL-5N	N3693	N3593	<b>3493</b>	N3393
125	59	9.6	1.6	156	1/5	20	180	7.88	9	34B3EBEL-5N	—	N3588	—	N3388
250	64	—	2.6	161	3/8	10	140	9.38	12	34B6EBEL-5N	—	—	—	<b>3399</b>
250	42	12	2.0	161	1/4	10	140	8.38	10	34B4EBEL-5N	N3694	N3594	N3494	N3394
250	33	9.6	1.6	140	1/5	10	150	7.88	9	34B3EBEL-5N	—	N3589	—	N3389
500	36	—	2.6	142	3/8	5	120	9.38	12	34B6EBEL-5N	—	—	—	N3378
500	24	12	2.0	94	1/4	5	120	8.38	10	34B4EBEL-5N	N3695	N3595	N3495	N3395
500	18.6	9.6	1.6	74	1/5	5	120	7.88	9	34B3EBEL-5N	—	N3590	—	N3390

<sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.

**34B-5N Gearmotor** shown with optional "accessory ready" mounting holes



"H" See page 105 for cable length and details.

# BLDC Motor Controls

A variety of  
**products**  
to fit  
a variety of  
**applications**

## Low Voltage 24 VDC Controls

See pages 115



Can operate from battery (or back-up) power supply

## Open Chassis Controls

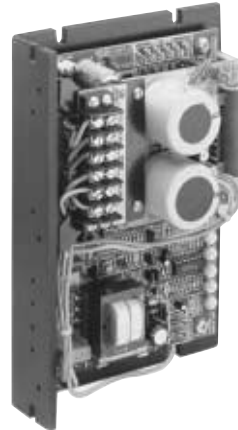
See page 115 for 24 VDC;  
Unfiltered – page 118;  
Filtered – page 116



For lowest cost and when an enclosure is already available

## Filtered 115 VAC Controls

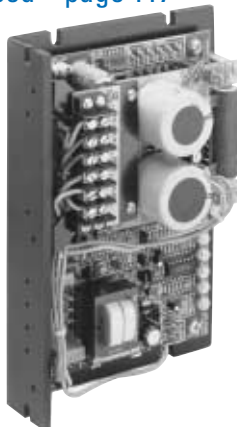
See page 116 for Open Chassis;  
Enclosed – page 117



For cooler motor operation and wider speed range

## Controls for High Speed Motors

See page 116 for Open Chassis;  
Enclosed – page 117



Drive are matched to motors for up to 10,000 RPM

## NEMA 1 Enclosures

See page 117 for 115 VAC



With a convenient user interface and basic environmental protection

# Low Voltage PWM BLDC Controls

## Chassis, Speed and Direction Control

### Standard Features

- 24 Volt power requirement makes this control ideal for portable, battery-operated applications or applications where safety standards dictate a low operating voltage
- On-board speed potentiometer for manual adjustment
- Accepts 0-5 VDC analog signal for remote operation
- Unique Smart Reverse™ circuit provides quick reversing and prevents motor plugging
- Dynamic braking for quicker stops
- 12 pulse/revolution tach output provides indication of motor speed
- Logic output indicates control shutdown due to a motor overload

- Speed can be adjusted manually or by remote control over a range of 30:1
- Inherent closed loop system maintains a 2% maximum change in motor speed from 0 - 100% of rated load when operated at rated speed

### Application Information

- Rated for 50° C ambient.
- To be mounted in separate enclosure supplied by user
- Drives 24 volt Bodine brushless motors shown on pages 106-113
- Requires an unregulated 24 VDC power supply with a minimum 5000 MFD capacitance
- 20 kHz PWM switching frequency
- For selection table, see page 119



ABL

**2 YEAR**  
SYSTEM WARRANTY  
SEE PAGE 128

INTEGRiMotor™

e-TORQ™

Custom

Pacesetter™ Inverter Duty

AC Induction

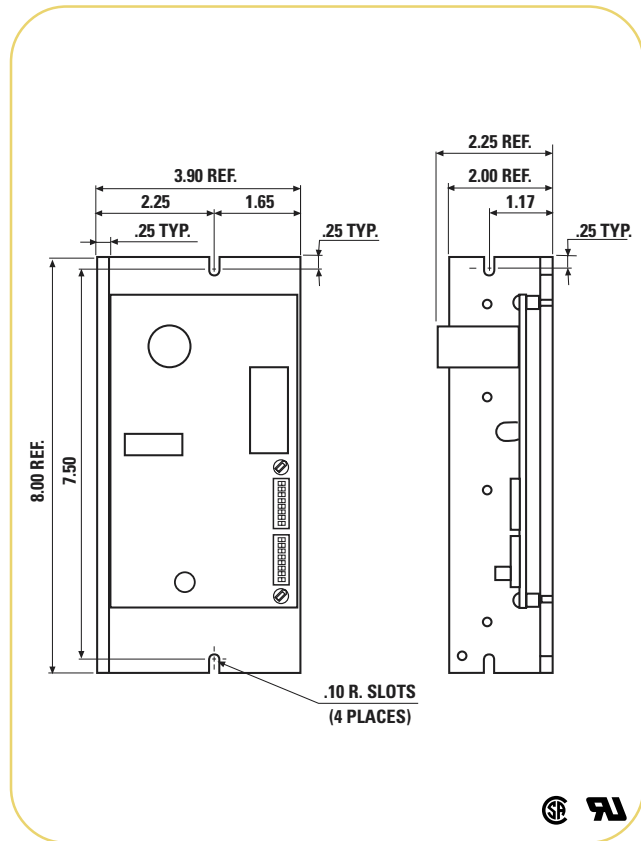
Permanent Magnet DC

Brushless DC

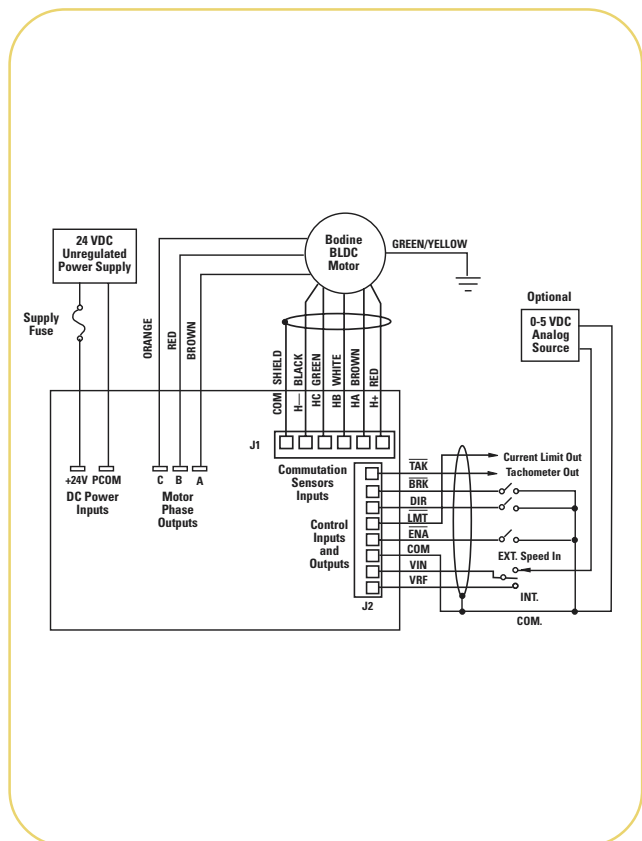
Index

HP Rating	Input Voltage (VDC)	Output Voltage (VDC)	Continuous Output Current (Amps)	Peak Output Current (Amps)	Form Factor	Weight (lbs.)	Product Type	Model Number
1/6	24-35	0-24	10.0	13.5	1.0	2.0	ABL-3905C	3905
1/4	24-35	0-24	15.0	22	1.0	2.0	ABL-3907C	3907

### Dimensions

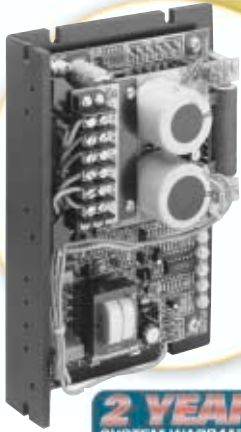


### Connection Diagram



# Filtered SCR BLDC Controls

## Chassis, Speed and Direction Control



ABL

**2 YEAR**  
SYSTEM WARRANTY  
SEE PAGE 128

### Standard Features

- Operates from 115 Volt AC line
- Filtered DC output results in cooler operation of the motor
- Unique Smart Reverse™ circuit for remote control of motor direction
- Dynamic braking for quicker stops
- 12 pulse/revolution tach output provides indication of motor speed
- Green LED indicates AC power on
- Red LED indicates control shutdown due to a fault condition
- Speed can be adjusted manually with a remote 10K ohm potentiometer (included)
- DIP switches set the current limit so that the same control model can drive any size Bodine motor
- Five onboard user-adjustable pots for torque limit, minimum speed limit, maximum speed limit, acceleration time and deceleration time
- Fuseholders for line and motor fuses (fuses included)
- Inherent closed loop system maintains a 1% maximum change in motor speed from 0 - 100% of rated load when operated at rated speed

### Application Information

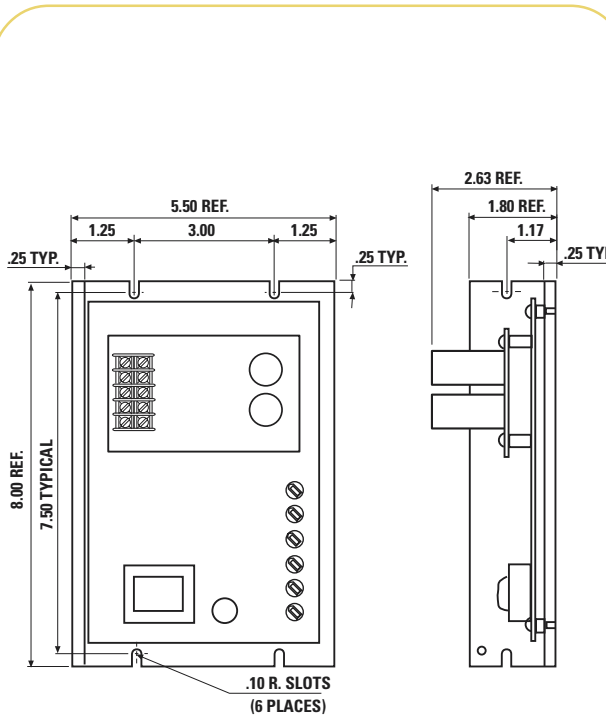
- Rated for 50° C ambient
- Intended to be mounted in separate enclosure supplied by user
- Drives 130 V brushless motors shown on page 106-113
- Screw terminal block for line and motor connections
- Plug-in connector for commutation connections
- .25" quick connect tabs for user interface connections
- Model 3911 for 2500 rpm motors. Model 3921 for 10,000 rpm motors
- See page 120 for selection tables

### Optional Accessories

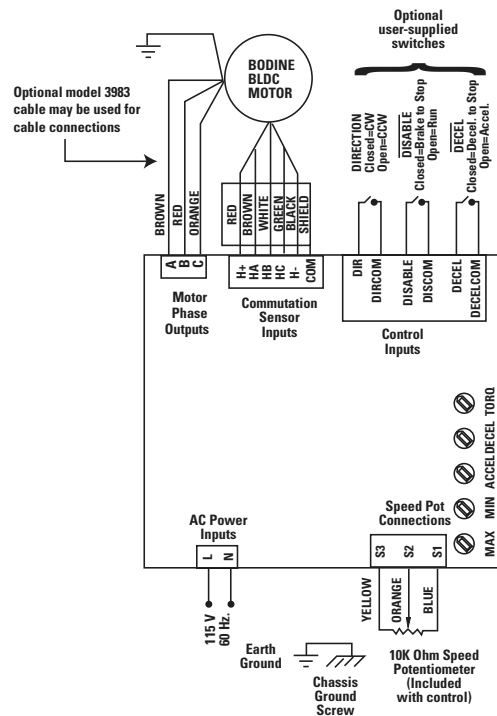
- Model 3983 cable connection assembly, see page 122
- Model 3982 cable extension, see page 122
- Model 3984 analog interface and isolation module, see page 122

HP Rating	Input Voltage (VAC, 50/60 Hz)	Output Voltage (VDC)	Continuous Output Current (Amps)	Peak Output Current (Amps)	Form Factor	Weight (lbs.)	Product Type	Model Number
3/8 @ 2500 rpm	115	0-130	3.0	6.0	1.0	2.5	ABL-3911C	<b>3911</b>
1/3 @ 10,000 rpm	115	0-130	3.0	6.0	1.0	2.5	ABL-3921C	<b>3921</b>

### Dimensions



### Connection Diagram



# Filtered SCR BLDC Controls

## NEMA 12, Speed and Direction Control



ABL

**2 YEAR**  
SYSTEM WARRANTY  
SEE PAGE 128

### Standard Features

- Operates from 115 Volt AC line
- Filtered DC output results in cooler operation of the motor
- Unique Smart Reverse™ circuit allows remote control of motor direction
- NEMA 12 enclosure for environmental protection
- Dynamic braking for quicker stops
- 12 pulse/revolution tach output provides indication of motor speed
- Red LED indicates control shutdown due to a fault condition
- Speed can be adjusted manually using potentiometer on enclosure
- DIP switches set the current limit so that the same control model can drive any size Bodine motor
- Inherent closed loop system maintains a 1% maximum change in motor speed from 0 - 100% of rated load when operated at rated speed
- Toggle switch on enclosure to turn AC power on/off
- Lamp on enclosure indicates AC power on

- Rotary switch on enclosure to select motor direction
- Fuseholders for line and motor fuses (included)
- AC line cable and motor cable factory-installed

### Application Information

- Rated for 40° C ambient
- Drives 130 V brushless motors shown on pages 106-113
- Two means of mounting: face mounting using self-tapping screws on back surface, or flange mounting by installing four brackets (included)
- Model 3912 for 2500 rpm motors. Model 3913 for 10,000 rpm motors.
- For selection tables, see page 120

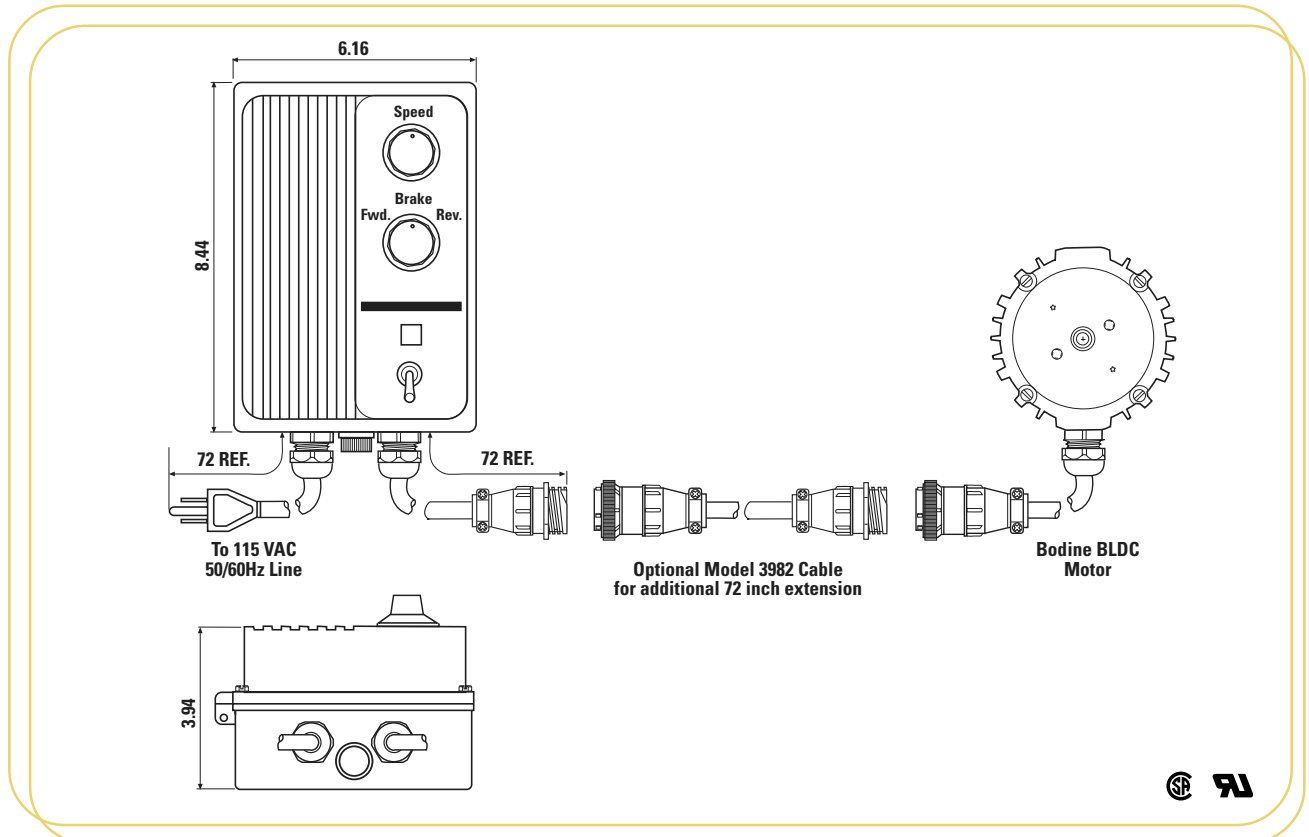
### Optional Accessories

- Model 3982 cable extension, see page 122
- IP44 sealing kit model 0895 for protection against splashing water, see page 122

HP Rating	Input Voltage (VAC, 50/60 Hz)	Output Voltage (VDC)	Continuous Output Current (Amps)	Peak Output Current (Amps)	Form Factor	Weight (lbs.)	Product Type	Model Number <sup>1</sup>
3/8 @ 2500 rpm	115	0-130	3.0	6.0	1.0	7.5	ABL-3912E	<b>3912</b>
1/3 @ 10,000 rpm	115	0-130	3.0	6.0	1.0	7.5	ABL-3913E	<b>N3913</b>

<sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.

### Dimensions And Connections



# Unfiltered SCR BLDC Controls

## Chassis, Speed and Direction Control



ABL

**2 YEAR**  
SYSTEM WARRANTY  
SEE PAGE 128

### Standard Features

- Operates from 115 Volt AC line
- Unique Smart Reverse™ circuit allows remote control of motor direction
- 12 pulse/revolution tach output provides indication of motor speed
- Green LED indicates AC power on
- Red LED indicates control shutdown due to a fault condition
- Speed can be adjusted manually with a remote 10K ohm potentiometer (not included)
- DIP switches set the current limit so that the same control model can drive any size Bodine motor
- Inherent closed loop system maintains a 1% maximum change in motor speed from 0 - 100% of rated load when operated at rated speed
- Fuseholder for line and motor fuses (line fuse only included)

### Application Information

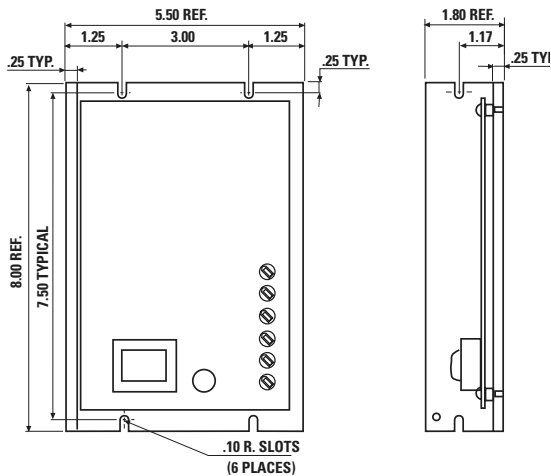
- Rated for 50° C ambient
- Intended to be mounted in separate enclosure supplied by user
- Drives 130 V brushless motors shown on pages 106-113
- .25 inch quick connect tabs for line, motor connections, and user interface connections
- Plug-in connector for commutation connections
- For selection table, see page 121

### Optional Accessories

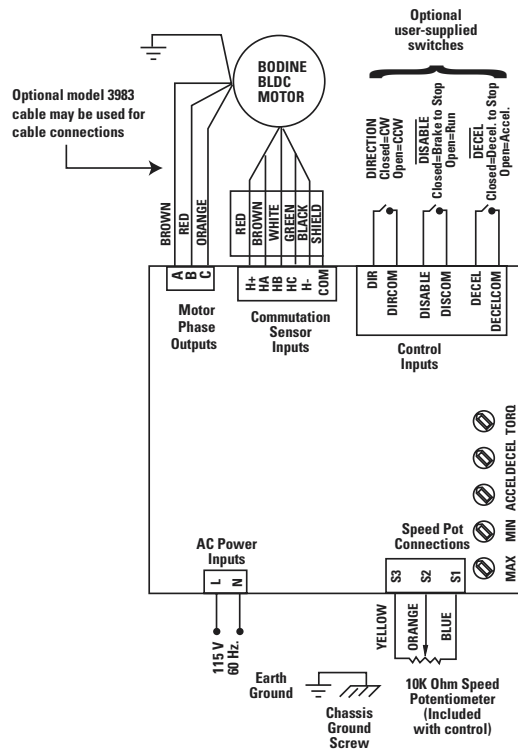
- Model 3983 cable connection assembly, see page 122
- Model 3982 cable extension, see page 122
- Model 3984 analog interface and isolation module, see page 122
- Fuse and speed potentiometer kit (part number 433 00270), see page 122

HP Rating	Input Voltage (VAC, 50/60 Hz)	Output Voltage (VDC)	Continuous Output Current (Amps)	Peak Output Current (Amps)	Form Factor	Weight (lbs.)	Product Type	Model Number
3/8	115	0-90	3.0	6.0	1.6	2.5	ABL-3910C	3910

### Dimensions



### Connection Diagram



user must supply wire for all external connections

# Low Voltage Chassis BLDC Controls

## Type ABL Selection Table

### SYSTEM PERFORMANCE WHEN USING BODINE 24V BLDC MOTORS WITH BODINE LOW VOLTAGE BLDC CONTROLS

		Motor/Gearmotor Specifications					Matching Control Model Numbers
		Model Number					Chassis
Speed Range (rpm)	Continuous Torque (lb-in.)	Accessory Shaft <sup>1</sup>	No Accessory Shaft <sup>1</sup>	Product Type	Nameplate Rating (HP)	Reference Page	
<b>Motors Without Gear Reducers</b>							
150 - 2500	1.6	–	<b>3502</b>	22B2BEBL	1/16	106	<b>3905</b>
150 - 2500	3.1	<b>3604</b>	N3504	22B4BEBL	1/8	106	<b>3905</b>
150 - 2500	5.1	<b>3600</b>	N3500	34B3BEBL	1/5	107	<b>3907</b>
150 - 2500	6.3	–	N3507	34B4BEBL	1/4	107	<b>3907</b>
<b>Parallel Shaft Gearmotors</b>							
0.6 - 14	40	N3636	N3536	22B2BEBL-D4	1/16	108	<b>3905</b>
0.6 - 14	100	–	N3563	22B2BEBL-Z4	1/16	109	<b>3905</b>
0.8 - 21	100	–	N3564	22B2BEBL-Z4	1/16	109	<b>3905</b>
1.2 - 28	40	<b>N3635</b>	N3535	22B2BEBL-D4	1/16	108	<b>3905</b>
1.2 - 28	100	–	N3562	22B2BEBL-Z4	1/16	109	<b>3905</b>
1.7 - 42	40	<b>N3634</b>	N3534	22B2BEBL-D3	1/16	108	<b>3905</b>
3.3 - 83	29	<b>3629</b>	N3529	22B2BEBL-D3	1/16	108	<b>3905</b>
5.6 - 139	17	<b>N3628</b>	N3528	22B2BEBL-D3	1/16	108	<b>3905</b>
8.3 - 208	12	<b>N3627</b>	N3527	22B2BEBL-D3	1/16	108	<b>3905</b>
17 - 417	5.8	<b>N3626</b>	N3526	22B2BEBL-D3	1/16	108	<b>3905</b>
1.7 - 42	95	<b>3661</b>	N3561	22B3BEBL-Z3	1/11	109	<b>3905</b>
3.3 - 83	52	<b>N3660</b>	N3560	22B3BEBL-Z3	1/11	109	<b>3905</b>
5.6 - 139	31	<b>N3659</b>	N3559	22B3BEBL-Z2	1/11	109	<b>3905</b>
8.3 - 208	20	<b>N3658</b>	N3558	22B3BEBL-Z2	1/11	109	<b>3905</b>
17 - 417	10	<b>N3657</b>	N3557	22B3BEBL-Z2	1/11	109	<b>3905</b>
0.3 - 8	175	<b>N3647</b>	N3547	34B3BEBL-W4	1/5	110	<b>3905</b>
0.3 - 8.3	310	–	N3575	34B3BEBL-E4	1/5	111	<b>3905</b>
0.6 - 14	166	<b>N3624</b>	N3524	34B3BEBL-W4	1/5	110	<b>3905</b>
0.6 - 14	341	–	N3574	34B3BEBL-E4	1/5	111	<b>3905</b>
1.0 - 26	154	<b>N3656</b>	N3556	34B3BEBL-W4	1/5	110	<b>3905</b>
1.5 - 38	143	<b>N3617</b>	N3517	34B3BEBL-W3	1/5	110	<b>3905</b>
3.3 - 84	65	<b>N3653</b>	N3553	34B3BEBL-W3	1/5	110	<b>3905</b>
4.9 - 122	46	<b>N3652</b>	N3552	34B3BEBL-W2	1/5	110	<b>3905</b>
11 - 266	21	<b>N3623</b>	N3523	34B3BEBL-W2	1/5	110	<b>3905</b>
18 - 456	12	<b>3611</b>	N3522	34B3BEBL-W2	1/5	110	<b>3905</b>
0.8 - 21	350	–	N3573	34B4BEBL-E4	1/4	111	<b>3907</b>
1.7 - 42	270	<b>N3685</b>	<b>3585</b>	34B4BEBL-E3	1/4	111	<b>3907</b>
3 - 83	135	<b>N3683</b>	N3583	34B4BEBL-E3	1/4	111	<b>3907</b>
5 - 125	90	<b>N3682</b>	N3582	34B4BEBL-E3	1/4	111	<b>3907</b>
10 - 250	45	<b>N3680</b>	N3580	34B4BEBL-E2	1/4	111	<b>3907</b>
20 - 500	25	–	N3579	34B4BEBL-E1	1/4	111	<b>3907</b>
<b>Right Angle Gearmotors</b>							
1.7 - 42	37	<b>N3665</b>	<b>3565</b>	22B4BEBL-3N	1/8	112	<b>3905</b>
2.5 - 62	37	<b>N3666</b>	N3566	22B4BEBL-3N	1/8	112	<b>3905</b>
5 - 125	35	<b>3667</b>	N3567	22B4BEBL-3N	1/8	112	<b>3905</b>
10 - 250	22	<b>N3668</b>	N3568	22B4BEBL-3N	1/8	112	<b>3905</b>
20 - 500	11	<b>N3669</b>	N3569	22B4BEBL-3N	1/8	112	<b>3905</b>
2.5 - 62	74	–	N3586	34B3BEBL-5N	1/5	113	<b>3907</b>
3.3 - 83	70	–	N3587	34B3BEBL-5N	1/5	113	<b>3907</b>
5 - 125	67	–	N3588	34B3BEBL-5N	1/5	113	<b>3907</b>
10 - 250	33	–	N3589	34B3BEBL-5N	1/5	113	<b>3907</b>
20 - 500	18.6	–	N3590	34B3BEBL-5N	1/5	113	<b>3907</b>
2.5 - 62	79	<b>N3691</b>	N3591	34B4BEBL-5N	1/4	113	<b>3907</b>
3.3 - 83	75	<b>N3692</b>	N3592	34B4BEBL-5N	1/4	113	<b>3907</b>
5 - 125	75	<b>N3693</b>	N3593	34B4BEBL-5N	1/4	113	<b>3907</b>
10 - 250	42	<b>N3694</b>	N3594	34B4BEBL-5N	1/4	113	<b>3907</b>
20 - 500	24	<b>N3695</b>	N3595	34B4BEBL-5N	1/4	113	<b>3907</b>

<sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.

# Filtered Chassis BLDC Controls

## Type ABL Selection Table

SYSTEM PERFORMANCE WHEN USING BODINE 130V BLDC MOTORS WITH BODINE FILTERED BLDC CONTROLS (130 VDC OUTPUT)

Motor/Gearmotor Specifications							Matching Control Model Numbers	
Speed Range (rpm)	Cont. Torque (lb-in.)	Model Number		Product Type	Nameplate Rating (HP)	Reference Page	Encased	Chassis
		Accessory Shaft <sup>1</sup>	No Accessory Shaft <sup>1</sup>					
<b>Motors Without Gear Reducers</b>								
150 - 2500	1.6	—	<b>3302</b>	22B2BEBL	1/16	106	<b>3912</b>	<b>3911</b>
150 - 2500	3.1	<b>3404</b>	<b>3304</b>	22B4BEBL	1/8	106	<b>3912</b>	<b>3911</b>
100 - 2500	5.1	N3406	<b>3306</b>	34B3BEBL	1/5	107	<b>3912</b>	<b>3911</b>
400 - 10,000	1.2	—	<b>3314</b>	22B4BEBL	1/5	106	N3913	<b>3921</b>
100 - 2500	6.3	—	N3307	34B4BEBL	1/4	107	<b>3912</b>	<b>3911</b>
400 - 10,000	2.1	—	<b>3317</b>	34B4BEBL	1/3	107	N3913	<b>3921</b>
100 - 2500	9.4	<b>3409</b>	<b>3309</b>	34B6BEBL	3/8	107	<b>3912</b>	<b>3911</b>
<b>Parallel Shaft Gearmotors</b>								
0.6 - 14	40	N3433	<b>3333</b>	22B2BEBL-D4	1/16	108	<b>3912</b>	<b>3911</b>
0.8 - 21	100	—	N3364	22B2BEBL-Z4	1/16	109	<b>3912</b>	<b>3911</b>
1.2 - 28	40	N3431	N3331	22B2BEBL-D4	1/16	108	<b>3912</b>	<b>3911</b>
1.7 - 42	40	N3430	N3330	22B2BEBL-D3	1/16	108	<b>3912</b>	<b>3911</b>
3 - 83	29	N3429	<b>3329</b>	22B2BEBL-D3	1/16	108	<b>3912</b>	<b>3911</b>
5.6 - 139	17	N3428	N3328	22B2BEBL-D3	1/16	108	<b>3912</b>	<b>3911</b>
8.3 - 208	12	N3427	<b>3327</b>	22B2BEBL-D3	1/16	108	<b>3912</b>	<b>3911</b>
17 - 417	5.8	N3426	<b>3326</b>	22B2BEBL-D3	1/16	108	<b>3912</b>	<b>3911</b>
0.6 - 14	100	N3463	<b>3363</b>	22B3BEBL-Z4	1/11	109	<b>3912</b>	<b>3911</b>
1.2 - 28	100	N3462	N3362	22B3BEBL-Z4	1/11	109	<b>3912</b>	<b>3911</b>
1.7 - 42	95	N3461	N3361	22B3BEBL-Z3	1/11	109	<b>3912</b>	<b>3911</b>
3 - 83	52	N3460	N3360	22B3BEBL-Z3	1/11	109	<b>3912</b>	<b>3911</b>
5.6 - 139	31	N3459	N3359	22B3BEBL-Z2	1/11	109	<b>3912</b>	<b>3911</b>
8.3 - 208	20	N3458	<b>3358</b>	22B3BEBL-Z2	1/11	109	<b>3912</b>	<b>3911</b>
17 - 417	10	N3457	<b>3357</b>	22B3BEBL-Z2	1/11	109	<b>3912</b>	<b>3911</b>
0.3 - 8	175	N3447	N3347	34B3BEBL-W4	1/5	110	<b>3912</b>	<b>3911</b>
0.3 - 8.3	310	—	N3375	34B3BEBL-E4	1/5	111	<b>3912</b>	<b>3911</b>
0.6 - 14	341	—	<b>3374</b>	34B3BEBL-E4	1/5	111	<b>3912</b>	<b>3911</b>
0.6 - 14	166	N3446	<b>3346</b>	34B3BEBL-W4	1/5	110	<b>3912</b>	<b>3911</b>
0.8 - 21	350	—	<b>3373</b>	34B3BEBL-E4	1/5	111	<b>3912</b>	<b>3911</b>
1 - 26	154	N3456	N3356	34B3BEBL-W4	1/5	110	<b>3912</b>	<b>3911</b>
1.5 - 38	143	N3455	N3355	34B3BEBL-W3	1/5	110	<b>3912</b>	<b>3911</b>
3.3 - 84	65	N3453	<b>3353</b>	34B3BEBL-W3	1/5	110	<b>3912</b>	<b>3911</b>
4.9 - 122	46	N3452	<b>3352</b>	34B3BEBL-W2	1/5	110	<b>3912</b>	<b>3911</b>
11 - 266	21	N3450	N3350	<i>34B3BEBL-W2</i>	<i>1/5</i>	<i>110</i>	<b>3912</b>	<b>3911</b>
18 - 456	12	N3449	N3349	34B3BEBL-W2	1/5	110	<b>3912</b>	<b>3911</b>
1.7 - 42	270	N3485	<b>3385</b>	34B4BEBL-E3	1/4	111	<b>3912</b>	<b>3911</b>
3 - 83	135	<b>3483</b>	<b>3383</b>	34B4BEBL-E3	1/4	111	<b>3912</b>	<b>3911</b>
5 - 125	90	N3482	N3382	34B4BEBL-E3	1/4	111	<b>3912</b>	<b>3911</b>
10 - 250	45	N3480	<b>3380</b>	34B4BEBL-E2	1/4	111	<b>3912</b>	<b>3911</b>
20 - 500	25	—	<b>3379</b>	34B4BEPM-E1	1/4	111	<b>3912</b>	<b>3911</b>
3 - 83	245	—	N3372	34B6BEBL-F3	3/8	111	<b>3912</b>	<b>3911</b>
5 - 125	163	—	N3371	34B6BEBL-F3	3/8	111	<b>3912</b>	<b>3911</b>
10 - 250	82	N3470	N3370	34B6BEBL-F2	3/8	111	<b>3912</b>	<b>3911</b>
20 - 500	42	—	<b>3369</b>	34B6BEBL-F1	3/8	111	<b>3912</b>	<b>3911</b>
<b>Right Angle Gearmotors</b>								
1.7 - 42	37	N3421	N3321	22B4BEBL-3N	1/8	112	<b>3912</b>	<b>3911</b>
2.5 - 62	37	N3422	<b>3322</b>	22B4BEBL-3N	1/8	112	<b>3912</b>	<b>3911</b>
5 - 125	35	N3423	N3323	22B4BEBL-3N	1/8	112	<b>3912</b>	<b>3911</b>
10 - 250	22	<b>3424</b>	N3324	22B4BEBL-3N	1/8	112	<b>3912</b>	<b>3911</b>
20 - 500	11	N3425	<b>3325</b>	22B4BEBL-3N	1/8	112	<b>3912</b>	<b>3911</b>
2.5 - 62	74	—	<b>3386</b>	34B3BEBL-5N	1/5	113	<b>3912</b>	<b>3911</b>
3 - 83	70	—	N3387	34B3BEBL-5N	1/5	113	<b>3912</b>	<b>3911</b>
5 - 125	59	—	N3388	34B3BEBL-5N	1/5	113	<b>3912</b>	<b>3911</b>
10 - 250	33	—	N3389	34B3BEBL-5N	1/5	113	<b>3912</b>	<b>3911</b>
20 - 500	18.6	—	N3390	34B3BEBL-5N	1/5	113	<b>3912</b>	<b>3911</b>
2.5 - 62	79	N3491	N3391	34B4BEBL-5N	1/4	113	<b>3912</b>	<b>3911</b>
3 - 83	75	N3492	N3392	34B4BEBL-5N	1/4	113	<b>3912</b>	<b>3911</b>
5 - 125	75	<b>3493</b>	N3393	34B4BEBL-5N	1/4	113	<b>3912</b>	<b>3911</b>
10 - 250	42	N3494	N3394	34B4BEBL-5N	1/4	113	<b>3912</b>	<b>3911</b>
20 - 500	24	N3495	N3395	34B4BEBL-5N	1/4	113	<b>3912</b>	<b>3911</b>
2.5 - 62	109	—	N3396	34B6BEBL-5N	3/8	113	<b>3912</b>	<b>3911</b>
3 - 83	104	—	N3397	34B6BEBL-5N	3/8	113	<b>3912</b>	<b>3911</b>
5 - 125	98	—	N3398	34B6BEBL-5N	3/8	113	<b>3912</b>	<b>3911</b>
10 - 250	64	—	<b>3399</b>	34B6BEBL-5N	3/8	113	<b>3912</b>	<b>3911</b>
20 - 500	36	—	N3378	34B6BEBL-5N	3/8	113	<b>3912</b>	<b>3911</b>

<sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.



# Unfiltered Chassis BLDC Controls

## Type ABL Selection Table

SYSTEM PERFORMANCE WHEN USING BODINE 130V BLDC MOTORS WITH BODINE UNFILTERED BLDC CONTROLS (90 VDC OUTPUT)

Motor or Gearmotor Specifications							Matching Control Model Numbers
Speed Range (rpm)	Cont. Torque (lb-in.)	Model Number		Product Type	Nameplate Rating (HP)	Reference Page	
		Accessory Shaft <sup>1</sup>	No Accessory Shaft <sup>1</sup>				Chassis
<b>Motors Without Gear Reducers</b>							
150 - 1725	1.1	–	<b>3302</b>	22B2BEBL	1/16	106	<b>3910</b>
150 - 1725	2.6	<b>3404</b>	<b>3304</b>	22B4BEBL	1/8	106	<b>3910</b>
100 - 1725	3.3	N3406	<b>3306</b>	34B3BEBL	1/5	107	<b>3910</b>
100 - 1725	4.1	–	N3307	34B4BEBL	1/4	107	<b>3910</b>
100 - 1725	6.1	<b>3409</b>	<b>3309</b>	34B6BEBL	3/8	107	<b>3910</b>
<b>Parallel Shaft Gearmotors</b>							
0.6 - 9.6	40	N3433	<b>3333</b>	22B2BEBL-D4	1/16	108	<b>3910</b>
0.8 - 14	100	–	N3364	22B2BEBL-Z4	1/16	109	<b>3910</b>
1.2 - 20	40	N3431	N3331	22B2BEBL-D4	1/16	108	<b>3910</b>
1.7 - 29	40	N3430	N3330	22B2BEBL-D3	1/16	108	<b>3910</b>
3 - 58	24	N3429	<b>3329</b>	22B2BEBL-D3	1/16	108	<b>3910</b>
5.6 - 96	15	N3428	N3328	22B2BEBL-D3	1/16	108	<b>3910</b>
8.3 - 144	9.8	N3427	<b>3327</b>	22B2BEBL-D3	1/16	108	<b>3910</b>
17 - 288	4.6	N3426	<b>3326</b>	22B2BEBL-D3	1/16	108	<b>3910</b>
0.6 - 9.6	100	N3463	<b>3363</b>	22B3BEBL-Z4	1/11	109	<b>3910</b>
1.2 - 20	100	N3462	N3362	22B3BEBL-Z4	1/11	109	<b>3910</b>
1.7 - 29	95	N3461	N3361	22B3BEBL-Z3	1/11	109	<b>3910</b>
3 - 58	38	N3460	N3360	22B3BEBL-Z3	1/11	109	<b>3910</b>
5.6 - 96	24	N3459	N3359	22B3BEBL-Z2	1/11	109	<b>3910</b>
8.3 - 144	16	N3458	<b>3358</b>	22B3BEBL-Z2	1/11	109	<b>3910</b>
17 - 288	8	N3457	<b>3357</b>	22B3BEBL-Z2	1/11	109	<b>3910</b>
0.3 - 5.6	175	N3447	N3347	34B3BEBL-W4	1/5	110	<b>3910</b>
0.3 - 5.8	310	–	N3375	34B3BEBL-E4	1/5	111	<b>3910</b>
0.6 - 9.6	341	–	<b>3374</b>	34B3BEBL-E4	1/5	111	<b>3910</b>
0.6 - 9.6	166	N3446	<b>3346</b>	34B3BEBL-W4	1/5	110	<b>3910</b>
0.8 - 14	299	–	<b>3373</b>	34B3BEBL-E4	1/5	111	<b>3910</b>
1 - 18	154	N3456	N3356	34B3BEBL-W4	1/5	110	<b>3910</b>
1.5 - 26	143	N3455	N3355	34B3BEBL-W3	1/5	110	<b>3910</b>
3.3 - 58	64	N3453	<b>3353</b>	34B3BEBL-W3	1/5	110	<b>3910</b>
4.9 - 85	46	N3452	<b>3352</b>	34B3BEBL-W2	1/5	110	<b>3910</b>
11 - 184	21	N3450	N3350	34B3BEBL-W2	1/5	110	<b>3910</b>
18 - 315	12	N3449	N3349	34B3BEBL-W2	1/5	110	<b>3910</b>
1.7 - 29	199	N3485	<b>3385</b>	34B4BEBL-E3	1/4	111	<b>3910</b>
3 - 58	100	<b>3483</b>	<b>3383</b>	34B4BEBL-E3	1/4	111	<b>3910</b>
5 - 86	66	N3482	N3382	34B4BEBL-E3	1/4	111	<b>3910</b>
10 - 173	33	N3480	<b>3380</b>	34B4BEBL-E2	1/4	111	<b>3910</b>
20 - 345	17	–	<b>3379</b>	34B4BEPM-E1	1/4	111	<b>3910</b>
3 - 58	153	–	N3372	34B6BEBL-F3	3/8	111	<b>3910</b>
5 - 86	102	–	N3371	34B6BEBL-F3	3/8	111	<b>3910</b>
10 - 173	51	N3470	N3370	34B6BEBL-F2	3/8	111	<b>3910</b>
20 - 345	26	–	<b>3369</b>	34B6BEBL-F1	3/8	111	<b>3910</b>
<b>Right Angle Gearmotors</b>							
1.7 - 29	37	N3421	N3321	22B4BEBL-3N	1/8	112	<b>3910</b>
2.5 - 43	37	N3422	<b>3322</b>	22B4BEBL-3N	1/8	112	<b>3910</b>
5 - 86	35	N3423	N3323	22B4BEBL-3N	1/8	112	<b>3910</b>
10 - 173	20	<b>3424</b>	N3324	22B4BEBL-3N	1/8	112	<b>3910</b>
20 - 345	10	N3425	<b>3325</b>	22B4BEBL-3N	1/8	112	<b>3910</b>
2.5 - 43	46	–	<b>3386</b>	34B3BEBL-5N	1/5	113	<b>3910</b>
3 - 58	44	–	N3387	34B3BEBL-5N	1/5	113	<b>3910</b>
5 - 86	37	–	N3388	34B3BEBL-5N	1/5	113	<b>3910</b>
10 - 173	21	–	N3389	34B3BEBL-5N	1/5	113	<b>3910</b>
20 - 345	11.6	–	N3390	34B3BEBL-5N	1/5	113	<b>3910</b>
2.5 - 43	49	N3491	N3391	34B4BEBL-5N	1/4	113	<b>3910</b>
3 - 58	46	N3492	N3392	34B4BEBL-5N	1/4	113	<b>3910</b>
5 - 86	46	<b>3493</b>	N3393	34B4BEBL-5N	1/4	113	<b>3910</b>
10 - 173	26	N3494	N3394	34B4BEBL-5N	1/4	113	<b>3910</b>
20 - 345	14.8	N3495	N3395	34B4BEBL-5N	1/4	113	<b>3910</b>
2.5 - 43	52	–	N3396	34B6BEBL-5N	3/8	113	<b>3910</b>
3 - 58	50	–	N3397	34B6BEBL-5N	3/8	113	<b>3910</b>
5 - 86	52	–	N3398	34B6BEBL-5N	3/8	113	<b>3910</b>
10 - 173	40	–	<b>3399</b>	34B6BEBL-5N	3/8	113	<b>3910</b>
20 - 345	23	–	N3378	34B6BEBL-5N	3/8	113	<b>3910</b>

**BODINE**® <sup>1</sup> NOTE: Model numbers shown in bold type are in stock. "N" model numbers require lead time and minimum quantities.

**ELECTRIC**  
**COMPANY**

**MADE IN U.S.A.**

Catalog S-15 Bodine-Electric.com

121

INTEGRAmotor™

e-TORQ™

Custom

Pacesetter™ Inverter Duty

AC Induction

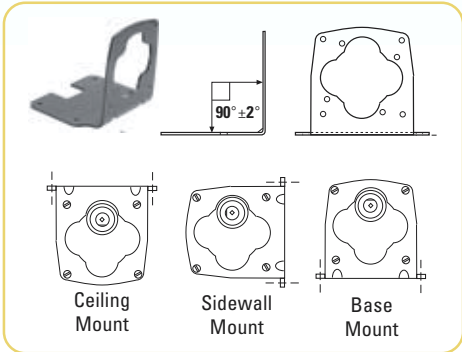
Permanent Magnet DC

Brushless DC

Index

# Accessories

## For Brushless DC Motors and Controls



### Motor and Gearmotor "L" Brackets

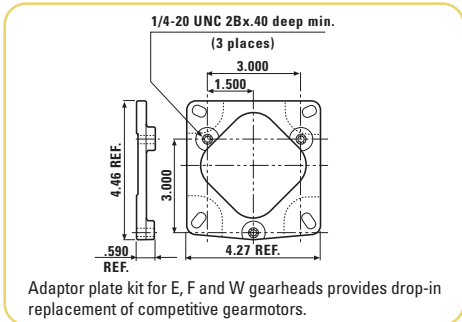
Model No.	Description	Ibs.	Dimensions	Deflection Ibs.
0969	Kit for "E" and "F" Gearmotors	2.5	Page 111	200
0970	Kit for "W" Gearmotors	1.75	Page 110	125
0979	Kit for 34B Motors	1	Page 107	25
5968	22B-D, 22B-Z Gearmotors	1.25	Pages 108, 109	50

Most parallel shaft stock gearmotors have a breather hole on top and require that the driveshaft remain at 12 o'clock position with respect to the horizon. See "Mounting Positions" on page 2.

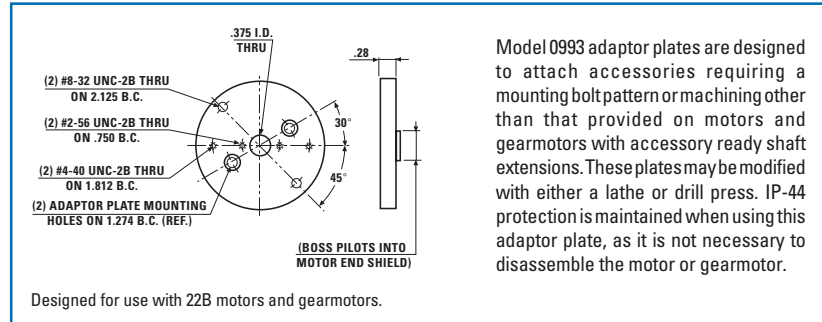
### Other Gearmotor Kits

Model No.	Description	Ibs.	Dimensions
0967	Base plate kit for 3F gearmotors	.5	Page 112

### Model 0995 Adaptor Plate



### Model 0993 Aluminum Adaptor Plate



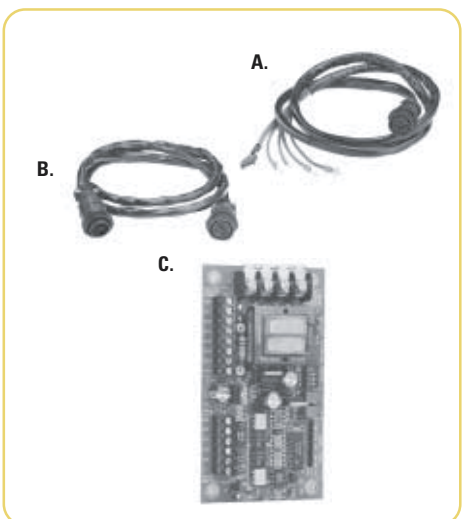
### Encoder Kits



Model Number	Renco Number	Resolution (Pulses per Revolution)	Fits Brushless Bodine Types
0940	RM15D-360-1/4-G6-5CA24-LD-1-C4	360	22B, 34B

- Kits are designed for quick and easy installation to accessory ready models.
- Incremental encoder output may be used for speed verification or motion control.
- 5 VDC, 135 mA Input, TTL/CMOS compatible, 20 mA sink output
- Quadrature, 2 channel output, with 1 index pulse per revolution
- Encoder cable is 24 inches long.
- Terminated with AMP 103650-7 connector.
- 1.50 inch diameter, 0.82 inch long

### 115V Brushless Control Accessories



- Model 3983 Connection Cable Assembly**  
for connecting model 3910, 3921 and 3911 controls to stock 130 V motors. One end of the cable is equipped with a circular connector, the other end is equipped with quick disconnects for phase leads, and a molded connector for the commutation leads. Length: 6 feet.
  - Model 3982 Extension Cable**  
for model 3910, 3911, 3921 and 3912 controls. Extends the cable between the motor and control by six feet. Both ends are equipped with circular connections for easy connection between model 3983 cable assembly or encased control and the motor. Length: six feet.
  - MODEL 3984 ANALOG INTERFACE AND ISOLATION MODULE**  
for model 3910, 3911, 3921 and 3912 controls. Provides Analog interface and isolates controls from system controller input signals which may be at different potentials.
- Fuse and Speed Potentiometer Kit (not shown)**  
(Part No. 433 00270)  
for use with model 3910 control. Contains potentiometer for manually regulating motor speed and an assortment of fuses to cover the range of motors and gearmotors which can be used with the control.
- Model 0895 Enclosure Sealing Kit (not shown)**  
seals the model 3912 or model N3913 enclosure to provide IP 44 splash-proof protection.