



**New OEM Product from Bodine:** 24V Brushless DC Motor with Built-In Voltage Mode PWM Controller. Featuring amplifier enable, direction and dynamic braking inputs. Outputs: 256 PPR, two channel quadrature encoder, and fault signal. Open loop. Literature P/N 07401072.A.

**TABLE 1: MOTOR SPECIFICATIONS**

		22B2BEBL/FV	22B3BEBL/FV	22B4BEBL/FV
Continuous Stall Torque	oz-in	25	36	50
Peak Stall Torque	oz-in	35	50	75
Thermal Resistance	°C/W	3.14	2.83	2.31
Torque Constant	oz-in/A	8.4	8.9	9.0
Voltage Constant	V/kRPM	5.8	6.6	6.7
Current @ Cont. Stall Torque	Amp	2.8	4.0	5.5
Current @ Peak Torque	Amp	3.8	5.8	8.7
Resistance (L-L)	Ohms	1.2	0.75	0.52
Inductance (L-L)	mH	2.1	1.3	1.1
Rated Terminal Voltage	Vdc	24	24	24
Rated Speed @ Terminal Vdc	RPM	2500	2500	2500
Minimum Speed	RPM	60	60	60
Maximum Speed	RPM	4000	4000	4000
Rotor Inertia	oz-in-sec <sup>2</sup>	0.0036	0.0054	0.0072
Feedback (Built-in)	Encoder	256 PPR, 2 Ch	256 PPR, 2 Ch	256 PPR, 2 Ch
Length	Inches	4.7	5.1	5.7
Weight	LB	2.5	3.0	3.5
Rated Ambient Temp.	°C	25	25	25
Environmental Protection	IP	20	20	20
Third Party Markings	cURus, CE	TBA	TBA	TBA
Number of Poles		4	4	4
Bodine Model Number		N3702*	N/A	N3704

\*N-models require 5-piece minimum order releases, special lead-times apply. N3806 N-model number was changed to N3702. All data subject to change without notice. Bodine Electric Company © 03/2005. [FV = Four quadrant Velocity amplifier]

**TABLE 2: ELECTRICAL CONNECTIONS**

Pin Number	Description	
1	24V Common (Motor supply return)	
2	Forward/Reverse (Direction)	
3	Enable (Motor winding power – active low)	
4	Encoder Channel A	
5	Drain / Shield	
6	5VDC Common (Logic supply return)	
7	+24 VDC (Motor power)	
8	Fault output (Low output indicates current limit, undervoltage condition, or incorrect motor sensor states)	
9	PWM Input (18-22 kHz, variable duty cycle input to control motor voltage/speed). A high input applies voltage to the winding.	
10	Encoder Channel B	
11	Brake (High input activates dynamic braking)	
12	+5 VDC (Logic Power)	

## APPLICATION NOTES: (Literature P/N 07401072.Rev.A)



The "22B/FV" *INTEGRAmotor*™ utilizes a 24VDC, voltage mode PWM controller with inputs for PWM voltage control, amplifier enable, direction and dynamic braking. Open loop. No regen.

Outputs include a 256 P.P.R. two channel quadrature encoder, and a fault signal. Provided with a built-in power supply monitor for both the motor and logic power supplies. All inputs and outputs are TTL compatible. Outputs are open collector which are factory terminated to the 5V supply through a 2.21K resistor (other values are available for OEM's). Effective resolution is 1024 C.P.R.

- Four-Quadrant operation (power supply bus must stay below 28VDC – may require external shunt regulator). Bodine Electric offers non-INTEGRA, built-to-order, Brushless DC controls that can operate in full re-generative mode.
- The intended use of this system is with electronic systems that have enough processing capability to provide the PWM and direction command signals and monitor motor velocity and/or position while closing the velocity or position loop in software.
- A power supply monitor will automatically disable the drive stage if the 5V supply falls below 3.5VDC.
- The drain refers to a location to tie the shield on the control cable to. It is connected to the circuit common.
- Pin# 9 should be driven between 18 and 22KHz. It can be run at lower frequencies, but this might result in audible noise. We don't recommend running it above 22KHz due to increasing switch losses in the FET's.
- The dynamic brake input will turn off the high side MOSFET's and turn on all of the low side MOSFET's causing the motor to produce retarding torque that's proportional to motor speed. This feature would normally not be used in a servo application, except as an emergency stop.
- Retarding torque can also be produced by bringing the duty cycle to zero, reversing the direction input and ramping up the PWM duty cycle to increase torque. If too much voltage is applied in the reverse direction, the current limit will kick in. The supply voltage will "pump up" as the motor regenerates energy in this mode. The user must keep the supply voltage below about 28V in this mode. Sometimes it is necessary to add a shunt regulator to the supply to control this voltage during regenerative operation.
- The Fault and encoder outputs are open collector and have internal pull up resistors.
- The PWM input is active high. OEM customers can choose active high or low for this input but it's always pulled up to the 5V supply.

### Connectors:

The connector is the same as on our stock "22B/SR" *INTEGRAmotors*, however the pin out is different. We use Molex P/N 39-29-9127 on the PC board. The mating parts are included with the sample motors, but are as follows:

Bodine P/N	Molex P/N	Description
49501048	39-00-0038 or 39-00-0039	Terminal, 18 - 24AWG
49501049	39-00-0046 or 39-00-0047	Terminal, 22 - 28AWG
49501029	39-01-2125	Receptacle, 94V-0 RATING 12 CIRCUIT

*More parts information for related terminals and housings can be found on the Molex web site at [www.molex.com](http://www.molex.com)*