Brushless **DC** Motor Systems
BX Series

The **BX** Series brushless DC speed control system offers high performance and simple operation from a compact driver and motor. Combined with the optional **OPX-1A** control module, the **BX** Series can also provide excellent position control and torque control capabilities.

■ Features of the **BX** Series Standard Model

● Wide Speed Range, Flat Torque
The **BX** Series offers a wide speed range of 30 to 3,000 r/min. Even with load fluctuations, the speed ratio is 1 to 100 without any reduction in torque.

● Great Speed Regulation
At mid- and high-level speeds, variations, which lead to performance irregularities, are reduced.

● Easy-to-Set Speed Control
Speed may be controlled using either an internal potentiometer, an external potentiometer or an external DC voltage.

● Vertical Application Handler
Electromagnetic brake models allow a load to be held in a stationary position. The ON/OFF switch provides easy operation of the brake function.

Additional Functionality

OPX-1A Control Module

■ Safety Standards and CE Making

	Model	Standards	Certification Body	Standards File No.	CE Marking
Motor	**BXM230** **BXM460** **BXM5120**	UL60950 CSA C22.2 No.60950	UL	UL File No. E208200	Low Voltage Directives EMC Directives
	BXM6200 **BXM6400**	UL1004 CSA C22.2 No. 100	UL	UL File No. E62327	
		EN60034-1 EN60034-5	Conform to EN/IEC Standards		
Driver		UL508C CSA C22.2 No.14	UL	UL File No. E171462	
		EN50178	Conform to EN/IEC Standards		

● When the system is approved under various safety standards, the model names on the motor and driver nameplates are the approved model names.
 List of Motor and Driver Combinations → Page B-33
● **Details of Safety Standards** → Page G-2
● The EMC value changes according to the wiring and layout. Therefore, the final EMC level must be checked with the motor/driver incorporated in the equipment.
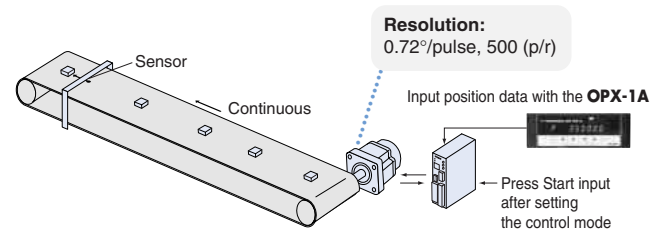
● Features of the **BX** Series with the **OPX-1A** Control Module
● Enhanced Speed Control
With up to eight individual speed settings available, the use of the **OPX-1A** control module increases the speed range of the **BX** Series to 3 to 3,000 r/min.
● Monitoring Functionality
The **OPX-1A** displays position, speed and torque data, as well as alarm history.
● Torque Limiting Functionality
With the **BX** Series, a motor output torque limit can be set using the **OPX-1A** control module, in both speed control and position control modes.

Constant tension & high-sensitivity torque devices — Press Machine — Constant Tension
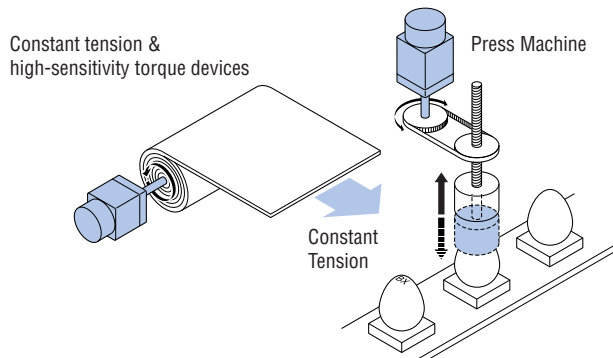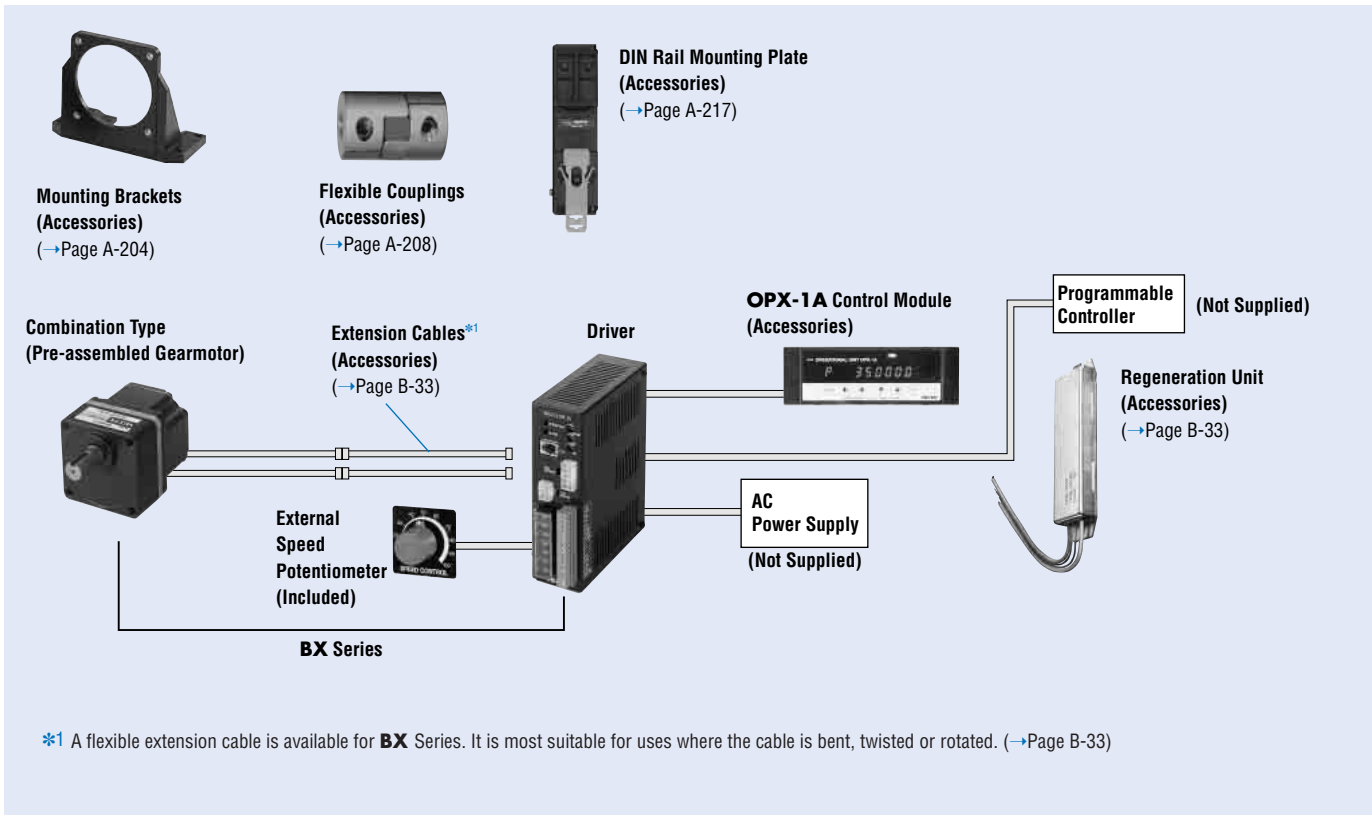
● Position Control Mode
No oscillator is needed for the position control mode, which allows for up to six data sets and two Return to Home positions (mechanical and electrical) to be programmed.
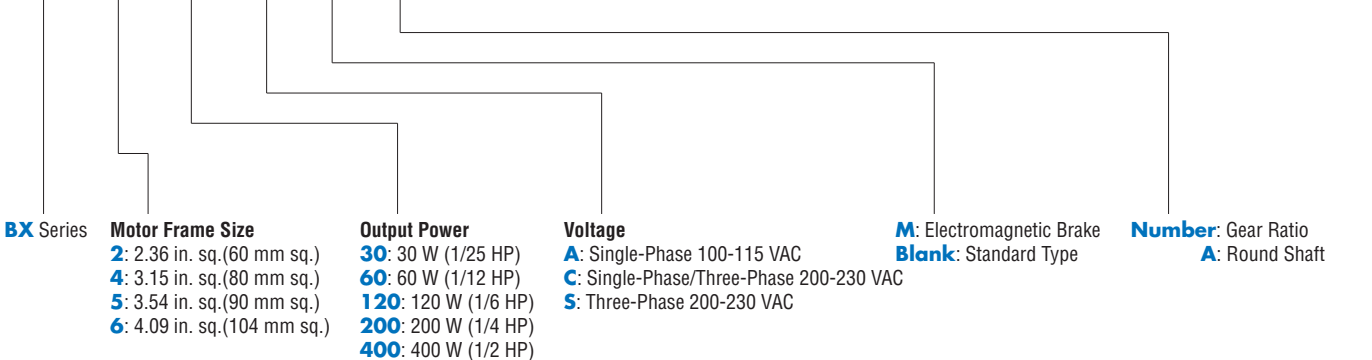
Resolution: 0.72°/pulse, 500 (p/r)
Sensor — Continuous — Input position data with the **OPX-1A** — Press Start input after setting the control mode

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■ System Configuration

Mounting Brackets (Accessories) (→Page A-204)

Flexible Couplings (Accessories) (→Page A-208)

DIN Rail Mounting Plate (Accessories) (→Page A-217)

Combination Type (Pre-assembled Gearmotor)

Extension Cables*1 (Accessories) (→Page B-33)

Driver

OPX-1A Control Module (Accessories)

Programmable Controller (Not Supplied)

Regeneration Unit (Accessories) (→Page B-33)

External Speed Potentiometer (Included)

AC Power Supply (Not Supplied)

BX Series

*1 A flexible extension cable is available for **BX** Series. It is most suitable for uses where the cable is bent, twisted or rotated. (→Page B-33)

The system configuration shown is an example. Other combinations are available.

■ Product Number Code

BX 2 30 A M-A

BX Series	**Motor Frame Size**	**Output Power**	**Voltage**	**M**: Electromagnetic Brake	**Number**: Gear Ratio
	2: 2.36 in. sq.(60 mm sq.)	**30**: 30 W (1/25 HP)	**A**: Single-Phase 100-115 VAC	**Blank**: Standard Type	**A**: Round Shaft
	4: 3.15 in. sq.(80 mm sq.)	**60**: 60 W (1/12 HP)	**C**: Single-Phase/Three-Phase 200-230 VAC		
	5: 3.54 in. sq.(90 mm sq.)	**120**: 120 W (1/6 HP)	**S**: Three-Phase 200-230 VAC		
	6: 4.09 in. sq.(104 mm sq.)	**200**: 200 W (1/4 HP)			
		400: 400 W (1/2 HP)			

■ Product Line

● Combination Type/Standard

Output Power		Power Supply Voltage	Model	Gear Ratio
HP	W			
1/25	30	Single-Phase 100-115 VAC	**BX230A-□**	5~200
		Single-Phase, Three-Phase 200-230 VAC	**BX230C-□**	5~200
1/12	60	Single-Phase 100-115 VAC	**BX460A-□**	5~200
		Single-Phase, Three-Phase 200-230 VAC	**BX460C-□**	5~200
1/6	120	Single-Phase 100-115 VAC	**BX5120A-□**	5~200
		Single-Phase, Three-Phase 200-230 VAC	**BX5120C-□**	5~200
1/4	200	Single-Phase 100-115 VAC	**BX6200A-□**	5~200
		Single-Phase, Three-Phase 200-230 VAC	**BX6200C-□**	5~200
1/2	400	Three-Phase 200-230 VAC	**BX6400S-□**	5~200

● Combination Type/Electromagnetic Brake

Output Power		Power Supply Voltage	Model	Gear Ratio
HP	W			
1/25	30	Single-Phase 100-115 VAC	**BX230AM-□**	5~200
		Single-Phase, Three-Phase 200-230 VAC	**BX230CM-□**	5~200
1/12	60	Single-Phase 100-115 VAC	**BX460AM-□**	5~200
		Single-Phase, Three-Phase 200-230 VAC	**BX460CM-□**	5~200
1/6	120	Single-Phase 100-115 VAC	**BX5120AM-□**	5~200
		Single-Phase, Three-Phase 200-230 VAC	**BX5120CM-□**	5~200
1/4	200	Single-Phase 100-115 VAC	**BX6200AM-□**	5~200
		Single-Phase, Three-Phase 200-230 VAC	**BX6200CM-□**	5~200
1/2	400	Three-Phase 200-230 VAC	**BX6400SM-□**	5~200

● Enter the gear ratio in the box (□) within the model name.

■ Product Line

● Round Shaft Type/Standard

Output Power		Power Supply Voltage	Model
HP	W		
1/25	30	Single-Phase 100-115 VAC	**BX230A-A**
		Single-Phase, Three-Phase 200-230 VAC	**BX230C-A**
1/12	60	Single-Phase 100-115 VAC	**BX460A-A**
		Single-Phase, Three-Phase 200-230 VAC	**BX460C-A**
1/6	120	Single-Phase 100-115 VAC	**BX5120A-A**
		Single-Phase, Three-Phase 200-230 VAC	**BX5120C-A**
1/4	200	Single-Phase 100-115 VAC	**BX6200A-A**
		Single-Phase, Three-Phase 200-230 VAC	**BX6200C-A**
1/2	400	Three-Phase, 200-230 VAC	**BX6400S-A**

● Round Shaft Type/Electromagnetic Brake

Output Power		Power Supply Voltage	Model
HP	W		
1/25	30	Single-Phase 100-115 VAC	**BX230AM-A**
		Single-Phase, Three-Phase 200-230 VAC	**BX230CM-A**
1/12	60	Single-Phase 100-115 VAC	**BX460AM-A**
		Single-Phase, Three-Phase 200-230 VAC	**BX460CM-A**
1/6	120	Single-Phase 100-115 VAC	**BX5120AM-A**
		Single-Phase, Three-Phase 200-230 VAC	**BX5120CM-A**
1/4	200	Single-Phase 100-115 VAC	**BX6200AM-A**
		Single-Phase, Three-Phase 200-230 VAC	**BX6200CM-A**
1/2	400	Three-Phase 200-230 VAC	**BX6400SM-A**

■ Specifications

Model	Combination Type/ Standard	Single-Phase 100-115 VAC	**BX230A-□**	**BX460A-□**	**BX5120A-□**	**BX6200A-□**	—
		Single-Phase 200-230 VAC	**BX230C-□**	**BX460C-□**	**BX5120C-□**	**BX6200C-□**	—
		Three-Phase 200-230 VAC					**BX6400S-□**
	Combination Type/ Electromagnetic Brake	Single-Phase 100-115 VAC	**BX230AM-□**	**BX460AM-□**	**BX5120AM-□**	**BX6200AM-□**	—
		Single-Phase 200-230 VAC	**BX230CM-□**	**BX460CM-□**	**BX5120CM-□**	**BX6200CM-□**	—
		Three-Phase 200-230 VAC					**BX6400SM-□**
	Round Shaft Type/ Standard	Single-Phase 100-115 VAC	**BX230A-A**	**BX460A-A**	**BX5120A-A**	**BX6200A-A**	—
		Single-Phase 200-230 VAC	**BX230C-A**	**BX460C-A**	**BX5120C-A**	**BX6200C-A**	—
		Three-Phase 200-230 VAC					**BX6400S-A**
	Round Shaft Type/ Electromagnetic Brake	Single-Phase 100-115 VAC	**BX230AM-A**	**BX460AM-A**	**BX5120AM-A**	**BX6200AM-A**	—
		Single-Phase 200-230 VAC	**BX230CM-A**	**BX460CM-A**	**BX5120CM-A**	**BX6200CM-A**	—
		Three-Phase 200-230 VAC					**BX6400SM-A**
Rated Output	HP (W)		1/25 (30)	1/12 (60)	1/6 (120)	1/4 (200)	1/2 (400)
Rated Speed	r/min		3000				
Rated Torque	oz-in (N·m)		14.2 (0.1)	28 (0.2)	56 (0.4)	92 (0.65)	184 (1.3)
Peak Torque [1]	oz-in (N·m)		28 (0.2)	56 (0.4)	113 (0.8)	184 (1.3)	220 (1.6): Combination Type 360 (2.6): Round Shaft Type
Rotor Inertia J	oz-in² (kg·m²)		0.48 (0.088×10⁻⁴)	1.06 (0.194×10⁻⁴)	3.4 (0.625×10⁻⁴)	3.6 (0.66×10⁻⁴)	3.6 (0.66×10⁻⁴)
Permissible Load Inertia J	oz-in² (kg·m²)		8.2 (1.5×10⁻⁴)	16.4 (3.0×10⁻⁴)	32 (6.0×10⁻⁴)	54 (10×10⁻⁴)	95 (17.5×10⁻⁴)
Power Source (Voltage, Frequency)	100-115 VAC Specifications		Single-Phase 100-115 VAC −15%～+10% 50/60 Hz				
	200-230 VAC Specifications		Single-Phase or Three-Phase 200-230 VAC (**BX6400**: Three-Phase 200-230 VAC) −15%～+10% 50/60 Hz				
Rated Input Current	Single-Phase 100-115 VAC A		1.4	2.2	3.7	4.7	—
	Single-Phase 200-230 VAC A		0.8	1.4	2.3	2.8	—
	Three-Phase 200-230 VAC A		0.5	0.7	1.1	1.7	2.8
Maximum Input Current	Single-Phase 100-115 VAC A		2.4	3.5	6.7	9	—
	Single-Phase 200-230 VAC A		1.6	2.2	4.1	5.3	—
	Three-Phase 200-230 VAC A		0.8	1.2	2	3.2	3.2: Combination Type 4.4: Round Shaft Type
Electromagnetic Brake[2]	Brake Type		Active when the power is off, automatically controlled by the driver				
	Static Friction Torque oz-in(N·m)		14.2 (0.1)	28 (0.2)	56 (0.4)	92 (0.65)	184 (1.3)
Motor Heat Sink [3] (Material: Aluminum)	Frame Size: in sq. (mm sq.)		4.53 (115)×4.53 (115)	5.31 (135)×5.31 (135)	6.50 (165)×6.50 (165)	7.87 (200)×7.87 (200)	9.84 (250)×9.84 (250)
	Thickness: in sq. (mm sq.)		0.20 (5)	0.20 (5)	0.20 (5)	0.20 (5)	0.24 (6)

[1] The peak torque can be used for a maximum duration of approximately 5 seconds at 2000 r/min or less.
[2] Electromagnetic brakes are for holding the position when the power is off. They cannot be used for complicated braking.
[3] When the motor is used for continuous operation at rated conditions, it should be mounted to a heat sink having a heat radiation power equal to or greater than the heat sink of the size shown.
● Enter the gear ratio in the box (□) within the model name.

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■ Speed Control Mode Specifications

	BX Series Standard	**BX** Series with optional **OPX-1A** control module
Variable Speed Range (r/min)	30～3000 (Analog speed setting)	30～3000 (Analog speed setting) 3～3000 (Digital speed setting resolution 1 r/min)
Acceleration/Deceleration Time (at 3000 r/min)	Shared by all data index operations. Internal potentiometer with analog setting: 0.1～15 sec.	Preset Acceleration/Deceleration time is shared by all data index operations by one of the following: • Internal potentiometer with analog setting (0.1～15 sec.) • Digital setting (0～30 sec. Setting resolution: 0.001 sec.)
Number of Speed Settings	2 by analog two-step speed setting	8 by one of the following: • Analog two-step speed setting + digital six-step speed setting • Digital eight-step speed setting

Speed Control Method	• Internal potentiometer
	• External analog input
	  • External potentiometer (20kΩ, 1/4W) or
	  • External DC Voltage, 0～5VDC (input impedance: 15kΩ)
		• Digital speed setting
		• Internal potentiometer
		• External analog input
		  • External potentiometer (20 kΩ, 1/4 W) or
		  • External DC Voltage, 0～5 VDC (input impedance: 15 kΩ)

Speed Regulation — Load	±0.05 % Max. (0～rated torque at 3000 r/min)	±0.05 % Max. (0～rated torque at 3000 r/min)
Speed Regulation — Voltage	±0.05 % Max. (Power supply input voltage range at 3000 r/min with no load)	±0.05 % Max. (Power supply input voltage range at 3000 r/min with no load)
Speed Regulation — Temperature	±0.5 % Max. (32°F～122°F [0°C～+50°C] at 3000 r/min with no load)	• Analog speed setting: ± 0.5% Max. (32°F～122°F [0°C～+50°C] at 3000 r/min with no load) • Digital speed setting: ± 0.05% Max. (32°F～122°F [0°C～+50°C] at 3000 r/min with no load)

■ Position Control Mode Specifications (with optional **OPX-1A** control module)

◆ Positioning Operation

Number of Position Settings	6 (Data No. 0～5)
Position Setting Method	Incremental (from the current position to relative position) with optional **OPX-1A** control module
Resolution	1 step 0.72°, 500 (P/R)
Position Control Range	−8,388,608～+8,388,607 steps (Data No.0～5)
Speed Setting	By one of the following: • Analog two-step speed setting+digital four-step speed setting • Digital six-step speed setting

Speed Control Method	• Digital speed setting (Data No.0～5)
	• Internal potentiometer
	• External analog input
	  • External potentiometer (20 kΩ, 1/4 W) or
	  • External DC Voltage, 0～5 VDC (input impedance: 15 kΩ)

Acceleration/Deceleration Time (at 3000 r/min)	Preset Acceleration/Deceleration time is shared by all data index operations by one of the following: • Internal potentiometer with analog setting 0.1～15 sec. • Digital setting 0～30 sec. Setting resolution: 0.001 sec.

◆ Continuous Operation

Speed	Same setting as in speed control mode.
Acceleration/Deceleration	Same setting as in speed control mode.
Rotation Direction	CW when the position in Data No. 0 or 1 is set to a value of zero or greater; CCW when the position in Data No. 0 or 1 is set to a value of −1 or less.
Initial Value	0 (CW)

✳ When using the continuous operation, the number of position settings is reduced from 6 (Data No.0～5) to 4 (Data No.2～5)

◆ Return to Mechanical Home Position

Mechanical Home Position Detection	1-sensor method: NC (Normally Closed)
Variable Speed Range	3～3000 r/min (Digital speed setting; Resolution 1 r/min; Data No.7)
Direction of Home Detection Start	Set to CW or CCW
Acceleration/Deceleration Time	Not provided

◆ Return to Electrical Home Position

Movement	From the current motor position to the electrical home position
Variable Speed Range	3～3000 r/min (Digital speed setting; Resolution 1 r/min; Data No.6)
Acceleration/Deceleration Time	Preset Acceleration/Deceleration time is shared by all data index operations by one of the following: • Internal potentiometer 0.1～15 sec. at 3000 r/min. • Digital setting 0～30 sec. at 3000 r/min. Setting resolution 0.001 sec.
Positional Offset Range	−8,388,608～+8,388,607 steps
Initial Offset Value	0

■ Torque-Limiting Function Specifications (with optional **OPX-1A** control module)

You can set the motor output torque-limiting value similarly for both the speed control and position control modes.

Torque-Limiting Setting Method	By one of the following: • Digital Common Torque Setting: A torque-limiting value can be set for all data sets (No. 0∼7) in one operation. • Digital Independent Torque Setting: A torque-limiting value can be set independently for each data set (No. 0∼7). • Analog Common Torque Setting: A torque-limiting value can be set for all data sets (No. 0∼7) in one operation via external analog input. External analog input: 　• External potentiometer (20 kΩ, 1/4 W) or 　• External DC Voltage, 0∼5 VDC (input impedence: 15 kΩ)
Torque-Limiting Setting Range	Assuming that peak (starting) torque is 100 %, torque limiting values can be selected by one of the following: • Digital Setting: 1∼100 % (Resolution 1 %) • External Analog Input, 1∼100 % by: 　• External potentiometer (20 kΩ, 1/4 W) or 　• External DC Voltage, 0∼5 VDC (input impedence: 15 kΩ)

Note:
An error of up to approximately 20 percent may occur between the set value and generated torque due to the speed setting, power-supply voltage and distance of motor cable extension. Repeatability under the same condition is approximately 10 percent. We recommend that the torque limit be set to approximately 20 percent or more.

■ Common Specifications

Item	Specifications
Motor Insulation Class	Class A [221 °F (105 °C)]
Control System	PWM Control
Speed and Positioning Control Detection System	Optical Encoder (500 P/R)
Input Signal *	Activated by the photocoupler equivalent input resistance of 2.3 kΩ and built-in power supply of +15 VDC. CW (START), CCW (HOME position sensor), M0, M1, M2, BRAKE (ALARM CLEAR), FREE
Output Signal *	Open Collector Output (current sink output), 4.5∼26.4 VDC ALM, BUSY (TORQUE LIMITING)/ALARM PULSE Output: 40 mA max. SPEED Output: 20 mA max.
Protection Functions	When the following are activated the alarm signal will be output and the motor will come to a natural stop: Overload Protection, Overvoltage Protection, Excessive Displacement, Overcurrent Protection, Excessive Speed, EEPROM Data Error, Encoder Failure, Low Voltage Protection.

❋ The input and output signals may function differently when the **OPX-1A** control module is used.

■ General Specifications

Item	Motor	Driver
Insulation Resistance	100 MΩ or more when 500 VDC is applied between the windings and the frame.	100 MΩ or more when 500 VDC is applied between the following places: • Frame—Power Input Terminal • Signal Input Terminal—Power Input Terminal
Dielectric Strength	Sufficient to withstand 1500 VAC at 50 Hz applied between the windings and the frame.	Sufficient to withstand the following for one minute • Frame—Power Input Terminal 1500 VAC 50 Hz • Signal Input/Output Terminal—Power Input Terminal 1800 VAC 50 Hz
Operating Environment Conditions	Ambient Temperature	32 °F∼122 °F (0 °C∼+50 °C), nonfreezing
	Humidity	85% maximum, noncondensing
	Atmosphere	No corrosive gases or dust

■ Gearmotor — Torque Table

❋ Values in parentheses only apply if the optional control module (**OPX-1A**) is used.　Unit = Upper values: lb-in/Lower values: N·m

Gear Ratio	5	10	15	20	30	50	100	200
Speed Range r/min Model	6 (0.6)* ∼ 600	3 (0.3)* ∼ 300	2 (0.2)* ∼ 200	1.5 (0.15)* ∼ 150	1 (0.1)* ∼ 100	0.6 (0.06)* ∼ 60	0.3 (0.03)* ∼ 30	0.15 (0.015)* ∼ 15
BX230□-□ **BX230□M-□**	3.9 0.45	7.9 0.9	12.3 1.4	15.9 1.8	23 2.6	38 4.3	53 6	53 6
BX460□-□ **BX460□M-□**	7.9 0.9	15.9 1.8	23 2.7	31 3.6	46 5.2	76 8.6	141 16	141 16
BX5120□-□ **BX5120□M-□**	15.9 1.8	31 3.6	47 5.4	63 7.2	91 10.3	152 17.2	260 30	260 30
BX6200□-□ **BX6200□M-□**	23 2.6	46 5.3	69 7.9	84 9.5	125 14.2	200 23.7	350 40	350 40
BX6400S-□ **BX6400SM-□**	46 5.3	92 10.5	139 15.8	168 19	250 28.5	350 40	350 40	350 40

● Enter the letter representing the voltage (**A** or **C**) in the first box (□) within the model name. Enter the gear ratio in the second box (□) within the model name.
● A colored background indicates gear shaft rotation in the same direction as the motor shaft; a white background indicates rotation in the opposite direction.

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■ Permissible Overhung Load and Permissible Thrust Load

Model	Gear Ratio	Permissible Thrust Load lb. (N)	Permissible Overhung Load lb. (N)	
			from the tip of the shaft 0.39 inch (10 mm)	from the tip of the shaft 0.79 inch (20 mm)
BX230□-□, BX230□M-□	5	9 (40)	22 (100)	33 (150)
BX230□-□, BX230□M-□	10~20	9 (40)	33 (150)	45 (200)
BX230□-□, BX230□M-□	30~200	9 (40)	45 (200)	67 (300)
BX230□-A, BX230□M-A	—	✳	19.6 (87.2)	24 (107)
BX460□-□, BX460□M-□	5	22 (100)	45 (200)	56 (250)
BX460□-□, BX460□M-□	10~20	22 (100)	67 (300)	78 (350)
BX460□-□, BX460□M-□	30~200	22 (100)	101 (450)	123 (550)
BX460□-A, BX460□M-A	—	✳	26 (117)	30 (137)
BX5120□-□, BX5120□M-□	5	33 (150)	67 (300)	90 (400)
BX5120□-□, BX5120□M-□	10~20	33 (150)	90 (400)	112 (500)
BX5120□-□, BX5120□M-□	30~200	33 (150)	112 (500)	146 (650)
BX5120□-A, BX5120□M-A	—	✳	35 (156)	39 (176)
BX6200□-□, BX6200□M-□	5~15	45 (200)	123 (550)	180 (800)
BX6200□-□, BX6200□M-□	20~200	45 (200)	146 (650)	220 (1000)
BX6200□-A, BX6200□M-A	—	✳	44 (197)	49 (221)
BX6400S-□, BX6400SM-□	5~15	45 (200)	123 (550)	180 (800)
BX6400S-□, BX6400SM-□	20~200	45 (200)	146 (650)	220 (1000)
BX6400S-A, BX6400SM-A	—	✳	44 (197)	49 (221)

● Enter the letter representing the voltage (**A** or **C**) in the first box (□) within the model name. Enter the gear ratio in the second box (□) within the model name.
✳ Values should be approximately half the weight of the motor.

■ Permissible Load Inertia J

Unit＝Upper values: oz-in^2 / Lower values: kg·m^2

Model \ Gear Ratio	5	10	15	20	30	50	100	200
BX230A-□, BX230AM-□, BX230C-□, BX230CM-□	66 1.2×10^{-3}	270 5×10^{-3}	600 1.1×10^{-2}	1090 2×10^{-2}	2000 3.7×10^{-2}	5000 9.2×10^{-2}	13700 2.5×10^{-1}	27000 5×10^{-1}
When quick stop or instantaneous bidirectional motion is used ✳	8.5 1.56×10^{-4}	34 6.25×10^{-4}	77 14.1×10^{-4}	137 25×10^{-4}	310 56.3×10^{-4}	850 156×10^{-4}	850 156×10^{-4}	850 156×10^{-4}
BX460A-□, BX460AM-□, BX460C-□, BX460CM-□	120 2.2×10^{-3}	520 9.5×10^{-3}	1200 2.2×10^{-2}	1910 3.5×10^{-2}	4400 8×10^{-2}	12000 2.2×10^{-1}	34000 6.2×10^{-1}	66000 1.2
When quick stop or instantaneous bidirectional motion is used ✳	31 5.63×10^{-4}	123 22.5×10^{-4}	280 50.7×10^{-4}	490 90×10^{-4}	1100 202×10^{-4}	3100 562×10^{-4}	3100 562×10^{-4}	3100 562×10^{-4}
BX5120A-□, BX5120AM-□, BX5120C-□, BX5120CM-□	250 4.5×10^{-3}	1040 1.9×10^{-2}	2300 4.2×10^{-2}	3800 7×10^{-2}	8800 1.6×10^{-1}	25000 4.5×10^{-1}	66000 1.2	137000 2.5
When quick stop or instantaneous bidirectional motion is used ✳	137 25×10^{-4}	550 100×10^{-4}	1230 225×10^{-4}	2200 400×10^{-4}	4900 900×10^{-4}	13700 2500×10^{-4}	13700 2500×10^{-4}	13700 2500×10^{-4}
BX6200A-□, BX6200AM-□, BX6200C-□, BX6200CM-□	550 1×10^{-2}	2500 4.6×10^{-2}	5500 1×10^{-1}	9300 1.7×10^{-1}	21000 3.9×10^{-1}	51000 9.3×10^{-1}	98000 1.8	200000 3.7
When quick stop or instantaneous bidirectional motion is used ✳	210 37.5×10^{-4}	820 150×10^{-4}	1840 337×10^{-4}	3300 600×10^{-4}	7400 1350×10^{-4}	21000 3750×10^{-4}	21000 3750×10^{-4}	21000 3750×10^{-4}
BX6400S-□, BX6400SM-□	550 1×10^{-2}	2500 4.6×10^{-2}	5500 1×10^{-1}	9300 1.7×10^{-1}	21000 3.9×10^{-1}	51000 9.3×10^{-1}	98000 1.8	200000 3.7
When quick stop or instantaneous bidirectional motion is used ✳	210 37.5×10^{-4}	820 150×10^{-4}	1840 337×10^{-4}	3300 600×10^{-4}	7400 1350×10^{-4}	21000 3750×10^{-4}	21000 3750×10^{-4}	21000 3750×10^{-4}

● Enter the gear ratio in the box (□) within the model name.
✳ Only available when the **OPX-1A** (sold separately) is used.

■ Speed — Torque Characteristics (The characteristics shown below are only applicable for the motors only.)
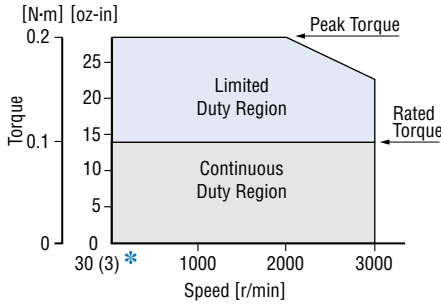
● Continuous Duty Region
Continuous operation is possible in this region.

● Limited Duty Region
This region is used primarily when accelerating. When a load that exceeds the rated torque is applied continuously or the speed is above 2000 r/min, for approximately 5 seconds overload protection is activated and the motor comes to stop.
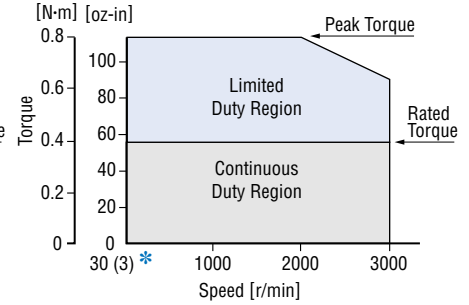
BX230□-A/BX230□-□
BX230□M-A/BX230□M-□

BX460□-A/BX460□-□
BX460□M-A/BX460□M-□
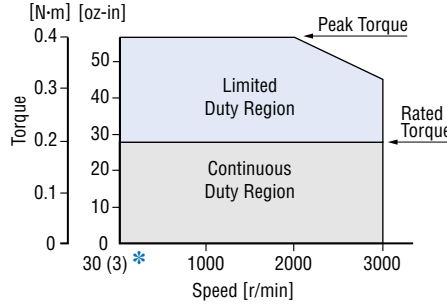
BX5120□-A/BX5120□-□
BX5120□M-A/BX5120□M-□

✻ Values in parentheses only apply if the optional **OPX-1A** control module is used.

BX6200□-A/BX6200□-□
BX6200□M-A/BX6200□M-□
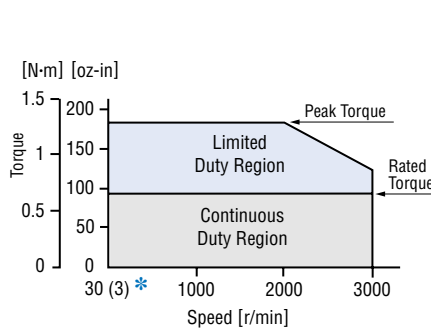
BX6400S-A/BX6400S-□
BX6400SM-A/BX6400SM-□
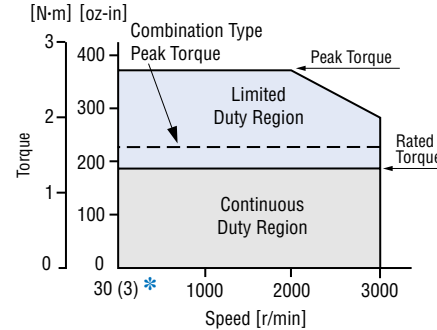
✻ Values in parentheses only apply if the optional **OPX-1A** control module is used.

■ Vertical Drive (Gravitational) Operation

The **BX** Series provides stable speed control during gravitational operation. When a motor is rotated by external power, it works as a generator. The driver may be damaged if the energy that is regenerated during a vertical (gravitational) operation or due to an abrupt start/stop involving a large inertial load exceeds the maximum level that can be absorbed by driver. The optional regeneration unit (sold separately) is designed to discharge the regenerated energy, thereby protecting the driver.

● Gravitational Operation Ability

Regeneration Unit Model	**BX** Model	Rated Output W (HP)	Continuous Regeneration Capability W (HP)	Instantaneous Regeneration Capability W (HP)
EPRC-400P	BX230	30 (1/25)	100 (1/8)	240 (1/3)
	BX460	60 (1/12)		
	BX5120	120 (1/6)		
RGB100	BX6200	200 (1/4)	100 (1/8)	800 (1)
	BX6400	400 (1/2)		

● Install the regeneration unit in the place which has the same heat radiation capability as heat radiation plate [13.8 inch×13.8 inch×0.12 inch (350mm×350mm×3mm)].
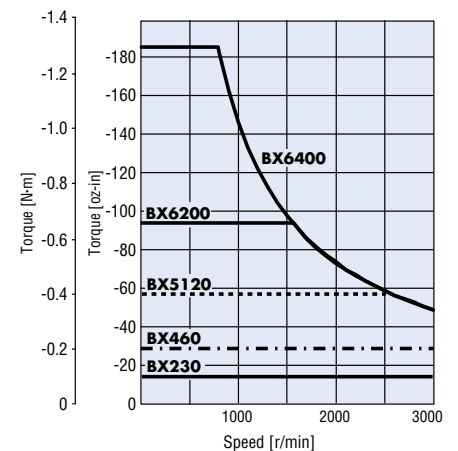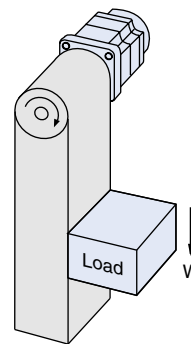
● Regenerative Power
The regenerative power can be estimated using the formula below. Use the calculated value as a guideline.

Regenerative power (W) = $0.1047 \times T_L$ [N·m] $\times N$ [r/min]

T_L: Load torque   N: Rotating speed

✻ Use the electromagnetic-brake type for gravitational operation.

✻ Gravitational operation exceeding the range of continuous regeneration capability will trigger the internal thermal protector (302°F [150°C]).

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■ Dimensions Scale 1/4, Unit = **inch** (mm)

Mounting screws are included with the combination type. Dimensions for screws → Page B-133

● Enter the gear ratio in the box (□) within the model name.

● Combination Type/Standard
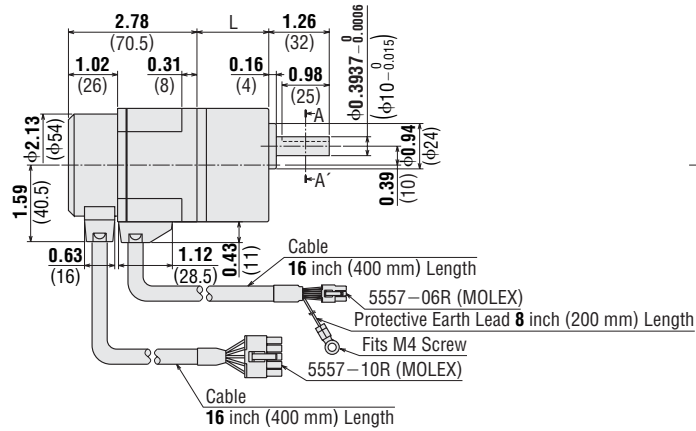### ◆ Motor/Gearhead
BX230A-□, BX230C-□

Motor: BXM230-GFH2
Gearhead: GFH2G□
Weight: 2.6 lb. (1.2 kg) including gearhead
DXF C147A (GFH2G5~20)
C147B (GFH2G30~100)
C147C (GFH2G200)

GFH2G5~20:   L = **1.34** (34)
GFH2G30~100: L = **1.50** (38)
GFH2G200:   L = **1.69** (43)
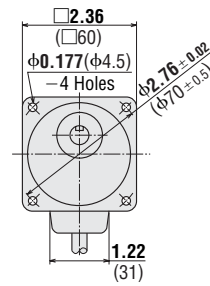
◆ Key and Key Slot
(The key is provided with the gearhead)
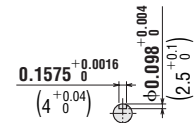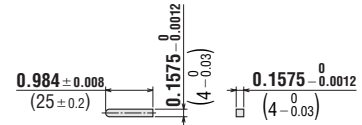
Shaft Cross Section AA′

◆ Motor/Gearhead
BX460A-□, BX460C-□

Motor: BXM460-GFH2
Gearhead: GFH4G□
Weight: 4.4 lb. (2 kg) including gearhead
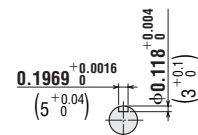**DXF** C148A (GFH4G5~20)
C148B (GFH4G30~100)
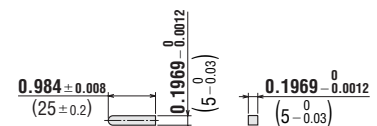C148C (GFH4G200)
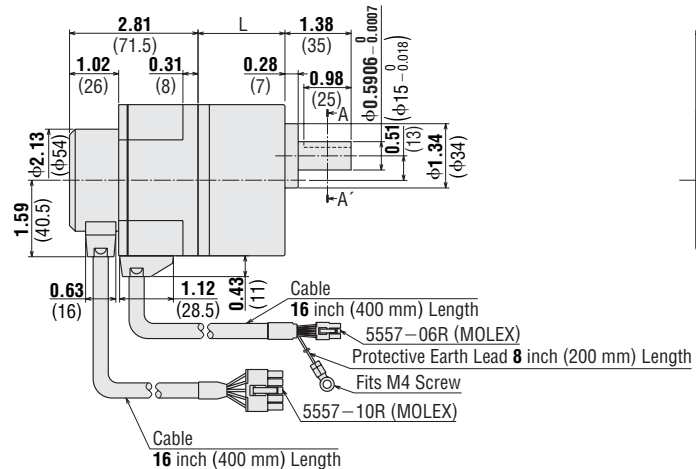
GFH4G5~20:   L = **1.61** (41)
GFH4G30~100: L = **1.81** (46)
GFH4G200:   L = **2.0** (51)
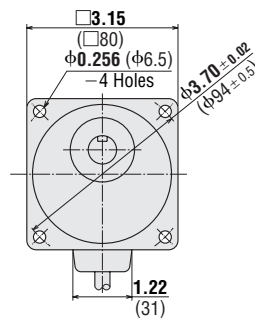
◆ Key and Key Slot
(The key is provided with the gearhead)

Shaft Cross Section AA′

◆ Motor/Gearhead

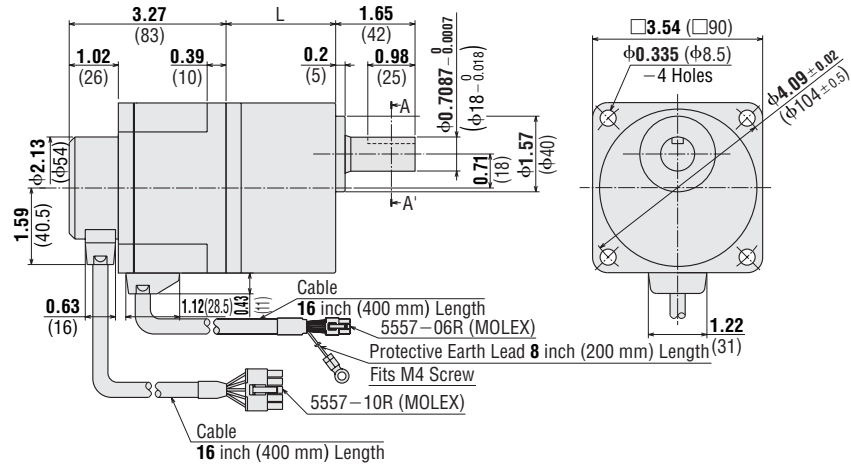**BX5120A-□, BX5120C-□**

Motor: BXM5120-GFH2
Gearhead: GFH5G□
Weight: 6.8 lb. (3.1 kg) including gearhead

DXF C149A (GFH5G5~20)
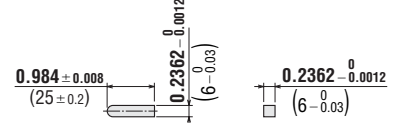C149B (GFH5G30~100)
C149C (GFH5G200)

◆ Key and Key Slot
(The key is provided with the gearhead)

Shaft Cross Section AA′

GFH5G5~20:   L = **1.77** (45)
GFH5G30~100: L = **2.28** (58)
GFH5G200:   L = **2.52** (64)

◆ Motor/Gearhead

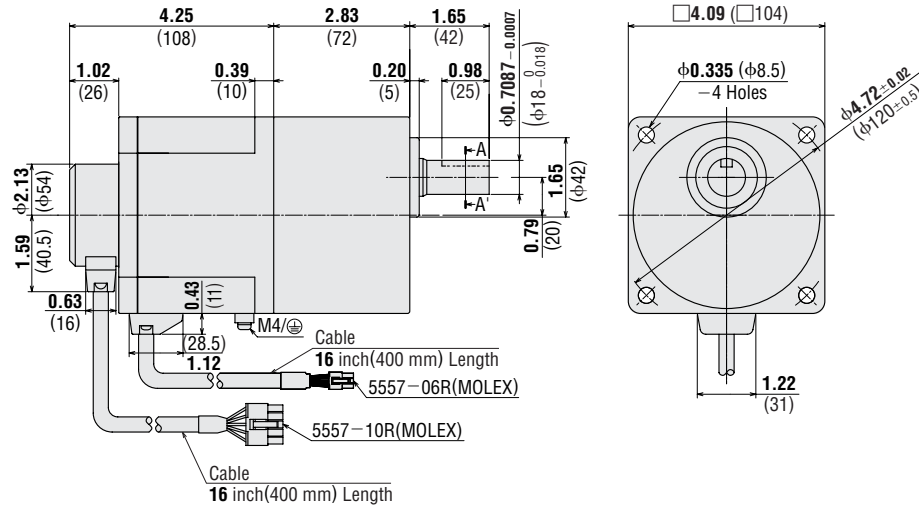**BX6200A-□, BX6200C-□**
BX6400S-□

Motor: BXM6200-GH
         BXM6400-GH
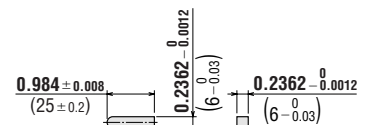Gearhead: 6GH□K
Weight: 11 lb. (4.9 kg) including gearhead

DXF C181

◆ Key and Key Slot
(The key is provided with the gearhead)
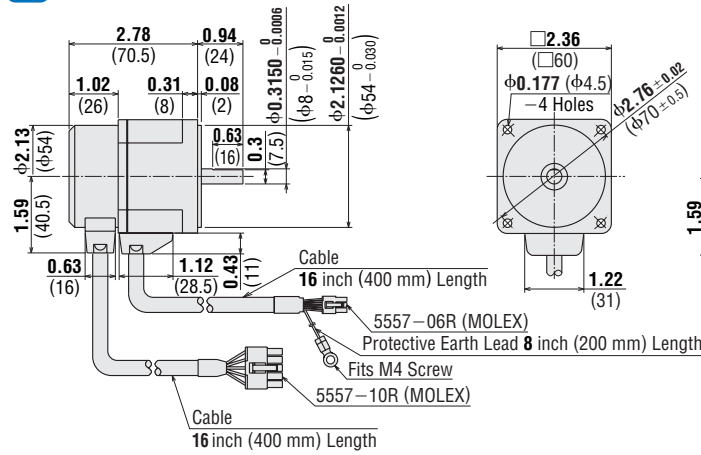
Shaft Cross Section AA′

● **Round Shaft Type/Standard**

BX230A-A, BX230C-A

Motor: BXM230-A2
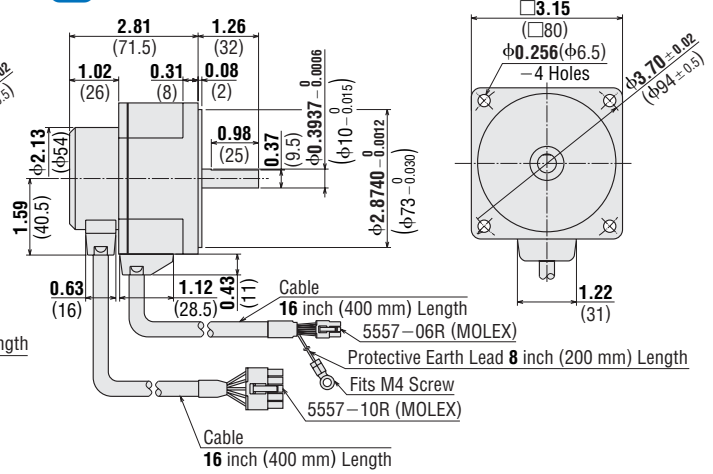Weight: 1.5 lb. (0.7 kg)

DXF C150

BX460A-A, BX460C-A

Motor: BXM460-A2
Weight: 2.2 lb. (1.0 kg)
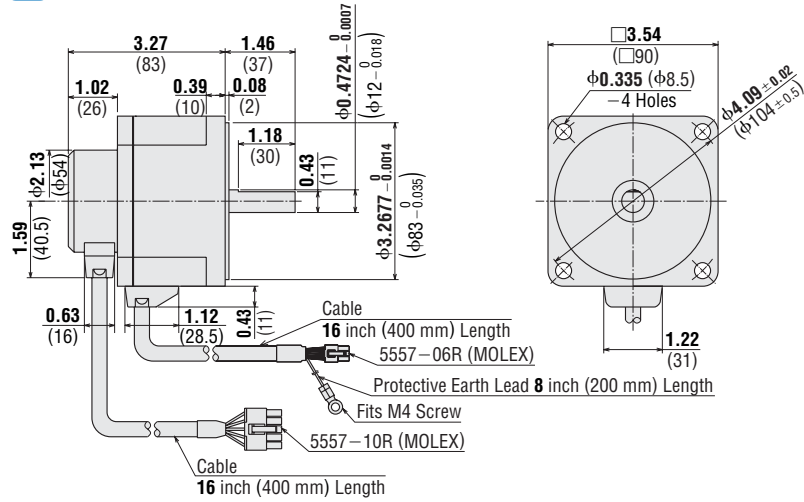
DXF C151

BX5120A-A, BX5120C-A

Motor: BXM5120-A2
Weight: 3.5 lb. (1.6 kg)

DXF C152

**BX6200A-A, BX6200C-A,
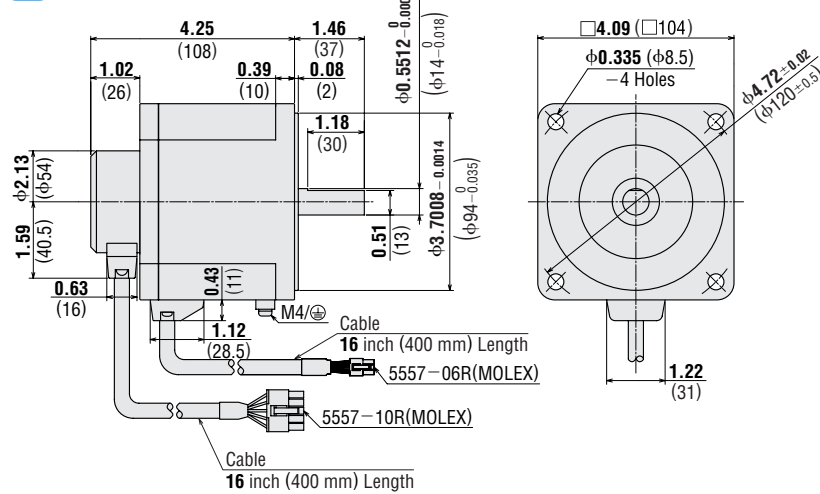BX6400S-A**

Motor: BXM6200-A
        BXM6400-A
Weight: 5.5 lb. (2.5 kg)

DXF C182

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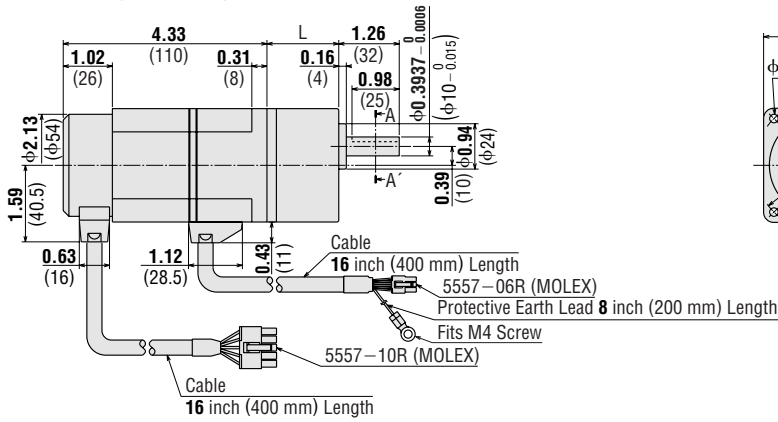● **Combination Type with Electromagnetic Brake**

BX230AM-▢, BX230CM-▢

Motor: BXM230M-GFH2
Gearhead: GFH2G▢
Weight: 3.3 lb. (1.5 kg) including gearhead

DXF C153A (GFH2G5~20)
C153B (GFH2G30~100)
C153C (GFH2G200)

◆ **Key and Key Slot**
(The key is provided with the gearhead)

Shaft Cross Section AA′

GFH2G5~20:   L = **1.34** (34)
GFH2G30~100: L = **1.50** (38)
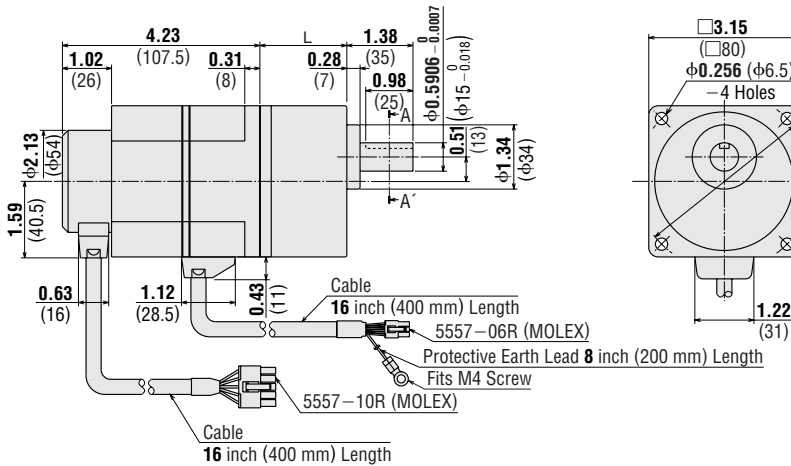GFH2G200:   L = **1.69** (43)

BX460AM-▢, BX460CM-▢

Motor: BXM460M-GFH2
Gearhead: GFH4G▢
Weight: 5.5 lb. (2.5 kg) including gearhead

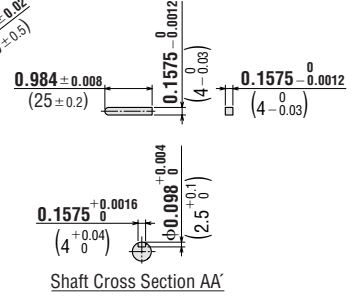**DXF** C154A (GFH4G5~20)
C154B (GFH4G30~100)
C154C (GFH4G200)

◆ **Key and Key Slot**
(The key is provided with the gearhead)

Shaft Cross Section AA′

GFH4G5~20:   L = **1.61** (41)
GFH4G30~100: L = **1.81** (46)
GFH4G200:   L = **2.0** (51)

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BX5120AM-□, BX5120CM-□

Motor: BXM5120M-GFH2
Gearhead: GFH5G□
Weight: 8.1 lb. (3.7 kg) including gearhead

DXF C155A (GFH5G5～20)
C155B (GFH5G30～100)
C155C (GFH5G200)
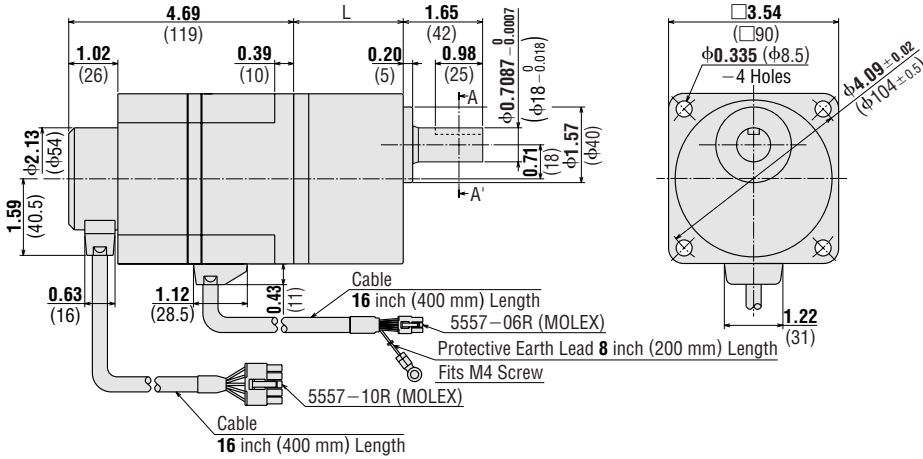
◆ **Key and Key Slot**
(The key is provided with the gearhead)

Shaft Cross Section AA′

GFH5G5～20:   L = **1.77** (45)
GFH5G30～100: L = **2.28** (58)
GFH5G200:   L = **2.52** (64)
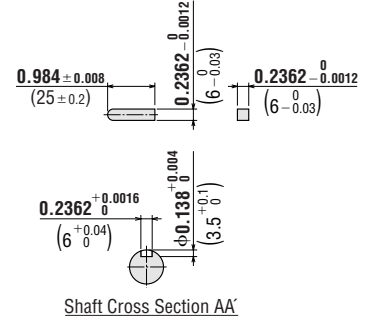
BX6200AM-□, BX6200CM-□
BX6400SM-□

Motor: BXM6200M-GH
        BXM6400M-GH

Gearhead: 6GH□K
Weight: 13 lb. (5.9 kg) including gearhead

DXF C183

◆ **Key and Key Slot**
(The key is provided with the gearhead)

Shaft Cross Section AA′
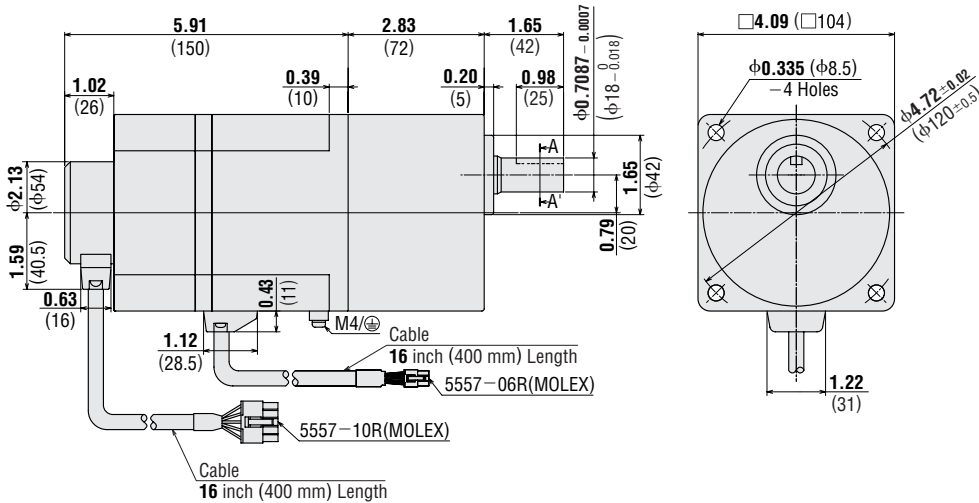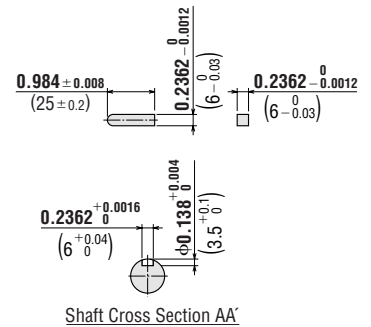
● **Round Shaft Type with Electromagnetic Brake**

BX230AM-A, BX230CM-A

Motor: BXM230M-A2

Weight: 2.2 lb. (1 kg)

DXF C156
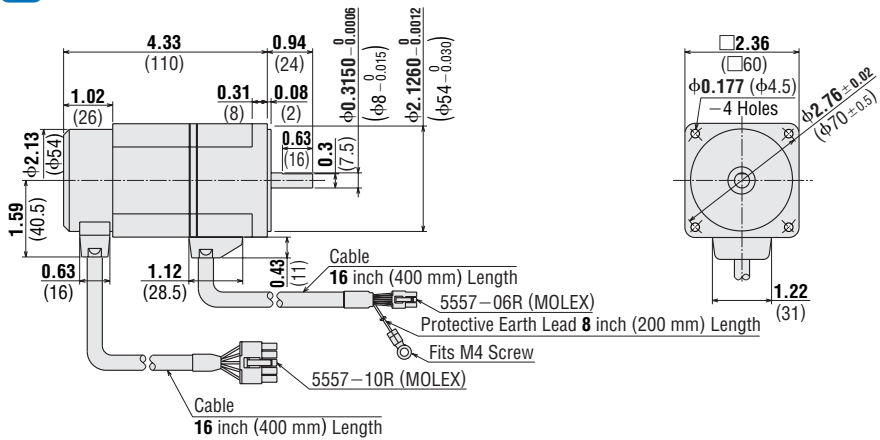
BX460AM-A, BX460CM-A

Motor: BXM460M-A2

Weight: 3.3 lb. (1.5 kg)

DXF C157
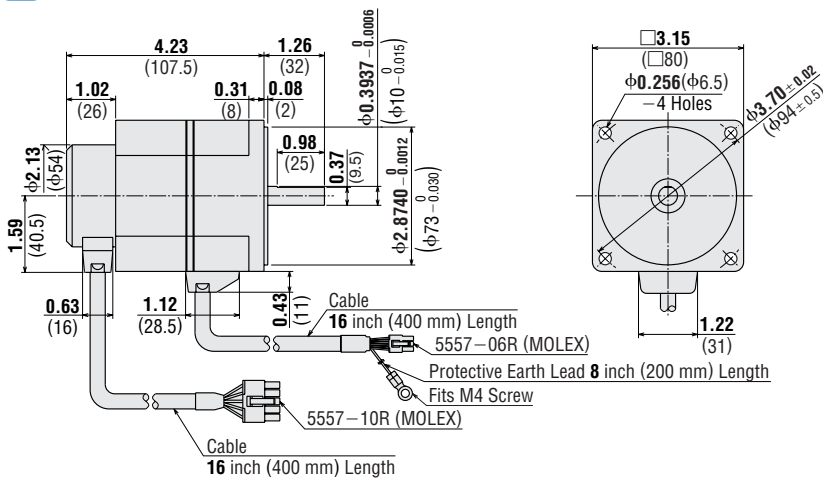
BX5120AM-A, BX5120CM-A

Motor: BXM5120M-A2

Weight: 4.8 lb. (2.2 kg)

DXF C158
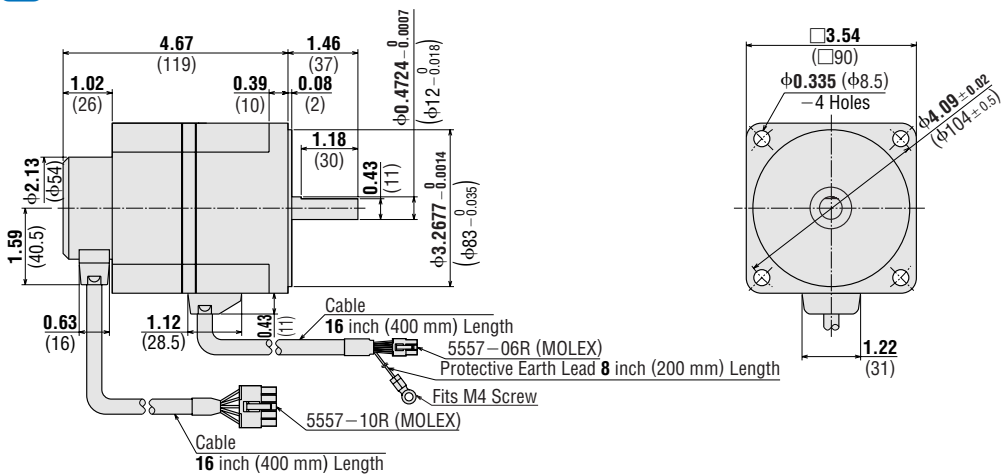
BX6200AM-A, BX6200CM-A
BX6400SM-A
Motor: BXM6200M-A
　　　 BXM6400M-A
Weight: 7.7 lb. (3.5 kg)
DXF C184
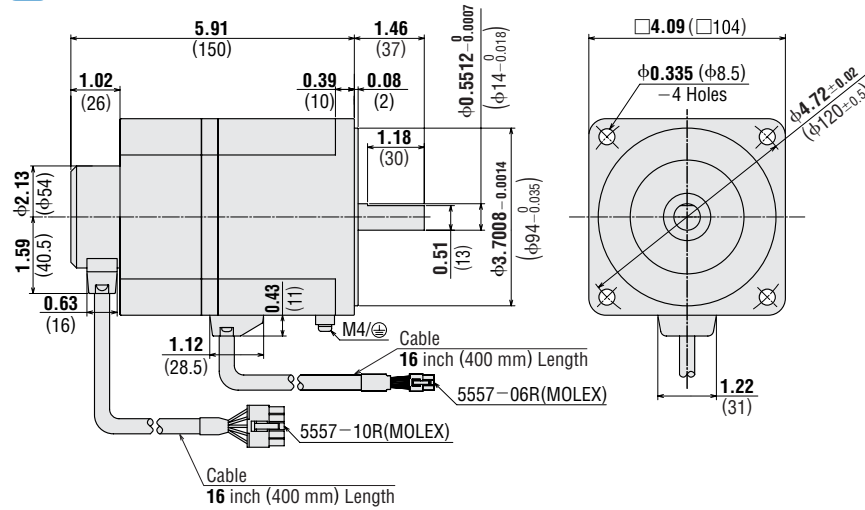
● **Driver**
BXD30A-A, BXD60A-A, BXD120A-A, BXD200A-A,
BXD30A-C, BXD60A-C, BXD120A-C, BXD200A-C, BXD400A-S, BXD400B-S
Weight: 1.8 lb. (0.8 kg)
DXF C141
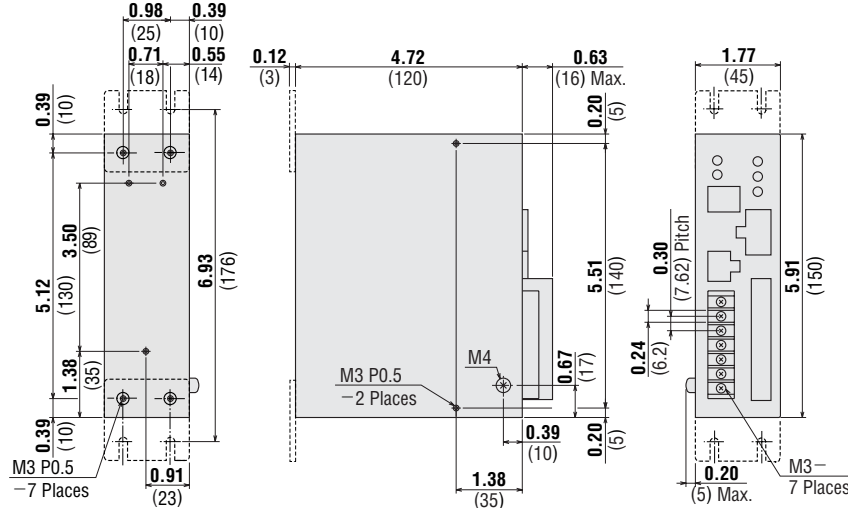
● **External Speed Potentiometer (included)**
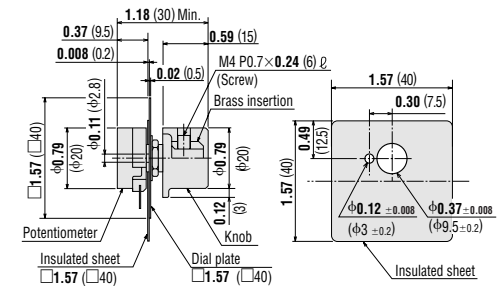
● **Driver Mounting Tab**
(2 pieces included)

● **Control Module (Sold Separately)**
OPX-1A
Weight: 0.15 lb. (0.07 kg)

(for secure attachment)

■ Connection and Operation

LED Display
Internal Potentiometer
Control Module Connector
Acceleration Time Potentiometer
Deceleration Time Potentiometer
Encoder Connector
Motor Connector
Regeneration Unit Terminals
Input/Output Signal Connector
Power Connection Terminals
Protective Earth Terminal
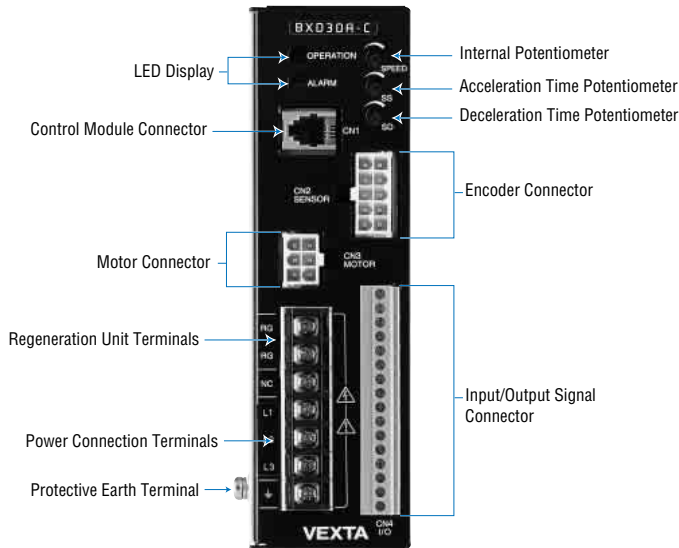
● LED Display

The **BX** Series offers a wide range of protection functions. As shown in the table below, the protection function that is currently active can be identified from the number of LED blinks. By counting the number of blinks, the host controller can determine the type of alarm.

◆ LED Display

Display	Color	Function	Condition
Operation	Green	Power Input Indication	When current is applied
Alarm	Red	Alarm Output Indication	When the protection function has activated

◆ Alarm Functions

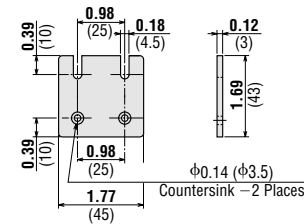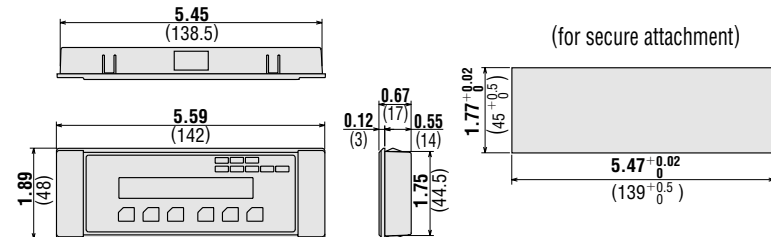| Number of ALARM LED blinks	Protection Function	Cause
2	Overload protection	Load in excess of the rated torque is applied to the motor for about five seconds or more.
3	Overvoltage protection	Primary voltage of the driver inverter has exceeded the upper limit of the specified voltage range.
4	Excessive displacement	The motor in the position control mode* cannot follow the command during operation.
5	Overcurrent protection	Excessive current has flowed to driver inverter power element.
6	Excessive speed	The speed has exceeded 4000 r/min on the motor shaft.
7	EEPROM data error	The data has been corrupted.
8	Encoder failure	A problem has occurred with the feedback signal of the encoder.
9	Low voltage protection	Power supply voltage has dropped below the specified voltage range.

✽ The position control mode is enabled when the control module (**OPX-1A**) is connected.

● Input and Output Signals

Terminal Number	Signal	Standard Model	With Control Module	
		Speed Control Mode	Speed Control Mode	Position Control Mode
1	Input	CW	CW	START
2		CCW	CCW	HOME-LS
3		M0	M0	M0
4		NC	M1	M1
5		NC	M2	M2
6		FREE	FREE	FREE
7		BRAKE/ACL	BRAKE/ACL	BRAKE/ACL
8	Input Signal Common	IN-COM	IN-COM	IN-COM
9	Analog Input	H	H	H
10		M	M	M
11		L	L	L
12	Output	ALM	ALM	ALM
13		BUSY/ALP	BUSY (TLM)✽/ALP	BUSY (TLM)✽/ALP
14		ASG	ASG	ASG
15		BSG	BSG	BSG
16	Output Signal Common	OUT-COM	OUT-COM	OUT-COM

✽ The BUSY output can be changed to the torque-limiting output only when a torque limit is set. Details of Input and Output Signals→Page B-27

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● Connection Diagrams
◆ Standard Model

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ON : CW Start
OFF : Stop
ON : CCW Start
OFF : Stop

ON : External Potentiometer
OFF : Internal Potentiometer

OFF / ON ① CW Input
OFF / ON ② CCW Input
OFF / ON ③ M0 Input
④ M1 Input
⑤ M2 Input

Connector CN3

Connector CN2

Motor Cable

Encoder Cable

Encoder cable

Motor cable

Ground (wire size: 0.75 mm² or larger)

*2 This input functions as the BRAKE input during normal operation, and as the ACL input when a driver protection function is active.

ON : Motor Excitation Canceled
OFF : Motor Operation Enabled
ON : Operation*1
OFF : Instantaneous Stop

OFF / ON ⑥ FREE Input
ON / OFF ⑦ BRAKE Input*3
⑧ IN-COM

*1 When operating motor, BRAKE input should be turned "ON".

Connect the external potentiometer (included) or external DC Voltage. See page B-29 for details.

3 / 2 / 1

⑨ H Input — Analog Input
⑩ M Input
⑪ L Input

Shield Wire

RG
RG
NC

Terminal Block for Regeneration Unit

Single-Phase 100-115 VAC input
NC / L / N / ⏚

Single-Phase 200-230 VAC
Three-Phase 200-230 VAC input
L1 / L2 / L3 / ⏚

Alarm Output : [OFF] when Output ⑫ ALM Output
Busy Output : [ON] when motor is operating ⑬ BUSY Output
Speed Output ASG ⑭ ASG Output
Speed Output BSG ⑮ BSG Output
GND ⑯ OUT-COM

NC(L1)
L(L2)
N(L3)
⏚

Terminal Block for Power-Supply Input

Power-supply input
Single-Phase 100-115 VAC −15%/+10%, 50/60 Hz
(Single-Phase 100-115 VAC input driver)
Single-Phase 200-230 VAC −15%/+10%, 50/60 Hz
Or,
Three-Phase 200-230 VAC −15%/+10%, 50/60 Hz
(Single-Phase/Three-Phase 200-230 VAC input driver)

Ground [wire size: AWG18 (0.75 mm²) or larger]

◆ Using the **OPX-1A** Control Module — Speed Control Modes

CN4

ON : CW Start
OFF : Stop
ON : CCW Start
OFF : Stop

OFF / ON ① CW Input
OFF / ON ② CCW Input

Connector CN3 *2
Connector CN2 *2

Motor Cable

Speed Data Selection Input

OFF / ON ③ M0 Input
OFF / ON ④ M1 Input
OFF / ON ⑤ M2 Input

Encoder Cable

ON : Motor Excitation Canceled
OFF : Motor Operation Enabled
ON : Operation*1
OFF : Instantaneous Stop

OFF / ON ⑥ FREE Input
ON / OFF ⑦ BRAKE Input*3
⑧ IN-COM

*3 This input functions as the BRAKE input during normal operation, and as the ACL input when a driver protection function is active.

*1 When operating motor, BRAKE input should be turned "ON".

Connect the external potentiometer (supplied) or External DC Voltage. See page B-29 for details.

3 / 2 / 1

⑨ H Input — Analog Input
⑩ M Input
⑪ L Input

Shield wire

RG
RG
NC

Terminal Block for Regeneration Unit

Alarm Output : [OFF] when Output ⑫ ALM Output
Busy Output : [ON] when motor is operating ⑬ BUSY Output
Speed Output ASG ⑭ ASG Output
Speed Output BSG ⑮ BSG Output
GND ⑯ OUT-COM

NC(L1)
L(L2)
N(L3)
⏚

Terminal Block for Power-Supply Input *2

*2 See the connection diagram of the standard model for the motor connection and terminal block.

Ground [wire size: AWG18 (0.75 mm²) or larger]

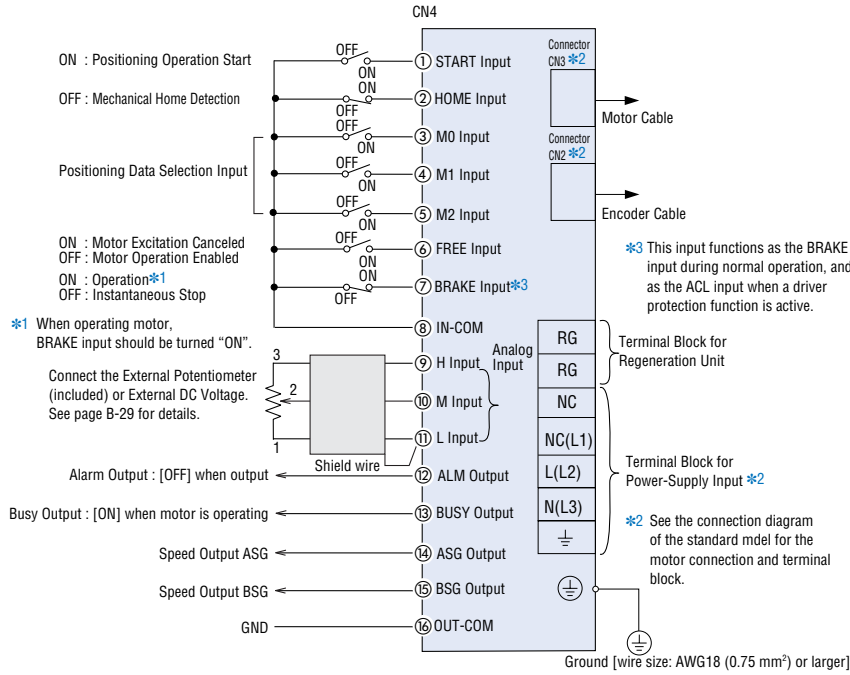Connection Diagram using the **OPX-1A** Control Module—Position Control Modes→Page B-26

Notes:
- When it is needed to the separate the connection by more than 1.31 ft, (0.4 m) between motor and driver the optional extension cable or flexible cable must be used.
- Use one of the following cables for the power-supply line:
Single-Phase 100-115 VAC, 3-core cable [conductor cross-sectional area: AWG18 (0.75 mm²) or more]
Single-Phase 200-230 VAC, 3-core cable [conductor cross-sectional area: AWG18 (0.75 mm²) or more]
Three-Phase 200-230 VAC, 4-core cable [conductor cross-sectional area: AWG18 (0.75 mm²) or more]
- When wiring the control I/O signal lines, keep a minimum distance of 12 inch (300 mm) from power lines (AC line, motor line and other large-current circuits). Also, do not route the control I/O signal lines in the same duct or piping as that is used for power lines.
- Cables for the power-supply lines and control I/O signal lines are not supplied with the product. Provide appropriate cables separately.
- When grounding the driver, connect the ground wire to the Protective Earth terminal (M4) and connect the other end to a single point using a cable with a size of AWG 16 (1.25 mm²) or greater.

Dimensions B-17 Connection and Operation B-24 Motor and Driver Combinations B-33

B-25

◆ Using the **OPX-1A** Control Module — Position Control Mode

CN4

ON : Positioning Operation Start
OFF : Mechanical Home Detection

ON
OFF — ① START Input
ON
OFF — ② HOME Input
OFF
ON — ③ M0 Input
OFF
ON — ④ M1 Input
OFF
ON — ⑤ M2 Input
OFF
ON — ⑥ FREE Input
ON
OFF — ⑦ BRAKE Input*3

Connector CN3 *2 → Motor Cable
Connector CN2 *2 → Encoder Cable

Positioning Data Selection Input

ON : Motor Excitation Canceled
OFF : Motor Operation Enabled
ON : Operation*1
OFF : Instantaneous Stop

*1 When operating motor,
BRAKE input should be turned "ON".

Connect the External Potentiometer
(included) or External DC Voltage.
See page B-29 for details.

⑧ IN-COM
3 — ⑨ H Input
2 — ⑩ M Input
1 — ⑪ L Input
Shield wire

Analog Input

RG
RG
NC
NC(L1)
L(L2)
N(L3)
⏚

Terminal Block for Regeneration Unit
Terminal Block for Power-Supply Input *2

*3 This input functions as the BRAKE input during normal operation, and as the ACL input when a driver protection function is active.

*2 See the connection diagram of the standard mdel for the motor connection and terminal block.

Alarm Output : [OFF] when output — ⑫ ALM Output
Busy Output : [ON] when motor is operating — ⑬ BUSY Output
Speed Output ASG — ⑭ ASG Output
Speed Output BSG — ⑮ BSG Output
GND — ⑯ OUT-COM

⏚
Ground [wire size: AWG18 (0.75 mm²) or larger]

■ Terminals
● Power Supply Terminals

Insulated ring terminal

0.24 inch (6.2 mm) max.
φ0.13 inch (φ3.2 mm) min.
0.35 inch (9 mm) min.

Insulated fork terminal

0.24 inch (6.2 mm) max.
φ0.13 inch (φ3.2 mm) min.
0.35 inch (9 mm) min.

● I/O Terminals (CN4)
When using a crimp terminal for connection, use one of the terminals listed below. The applicable crimp terminal varies, depending on the wire size.
When the following terminals are used, the applicable wire size will be between AWG 26 and 18.

Manufacturer: Phoenix Contact
AI 0.25-6
Applicable wire size: AWG26~24 (0.14~0.2 mm²)
AI 0.34-6
Applicable wire size: AWG22 (0.3 mm²)
AI 0.5-6
Applicable wire size: AWG20 (0.5 mm²)
AI 0.75-6
Applicable wire size: AWG18 (0.75 mm²)

● Driver Internal Circuits
◆ Input Circuit
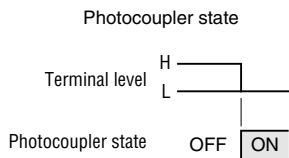The circled number located in front of each signal represents the number of the corresponding I/O signal terminal.

Inside of Driver
+15 V
2.3 kΩ

① CW (START) Input *1
② CCW(HOME-LS) Input *1
③ M0, ④ M1, ⑤ M2 Input *2
⑥ FREE Input
⑦ BRAKE/ACL Input *3
⑧ IN-COM

*1 The CW and CCW inputs function in the speed control mode on the standard model and when the **OPX-1A** control module is used.
The START and HOME-LS inputs function in the position control mode when the **OPX-1A** control module is used.
*2 The M0 input is the only operation data selection input available on the standard model. The M0, M1 and M2 inputs function on the when the **OPX-1A** control module is used.
*3 This input functions as the BRAKE input during normal operation, and as the ACL input when a driver protection is active.

◆ Output Circuit
The circled number located in front of each signal represents the number of the corresponding I/O signal terminal.

Inside of Driver
⑫ ALM output
⑬ BUSY (TLM) /ALP Output*1
⑯ OUT-COM
4.5 to 26.4 VDC/40 mA or less

*1 This output functions as the BUSY output during normal operation, and as the ALP output when a driver protection is active. When the **OPX-1A** control module is used, the BUSY output can be changed to the TLM output.

Inside of Driver
⑭ ASG Output
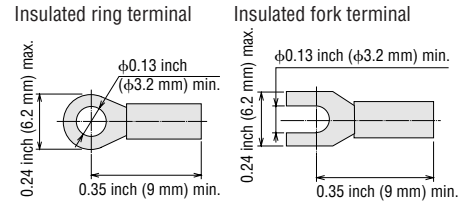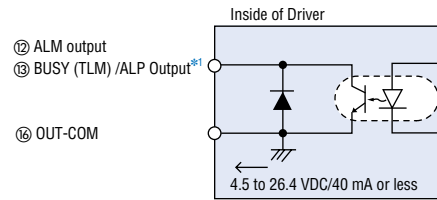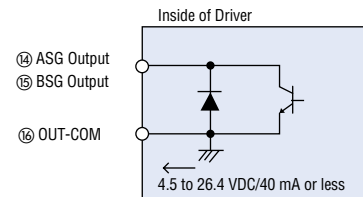⑮ BSG Output
⑯ OUT-COM
4.5 to 26.4 VDC/40 mA or less

● Photocoupler State
The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal photocoupler rather than the voltage level of the signal.

Photocoupler state

Terminal level
H
L

Photocoupler state
OFF | ON

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Before Using a Speed Control System

● Standard Model Input Signals

◆ Clockwise Rotation (CW) Input

This input functions in the speed control mode on the standard model and when the **OPX-1A** control module is used. When the BRAKE input is ON, motor operation is enabled. If the CW input is turned ON, acceleration and operation are performed in the clockwise direction at the rate set by the acceleration time potentiometer. If it is turned OFF, the motor decelerates and the operation stops at the rate set by the deceleration time potentiometer.

◆ Counterclockwise Rotation (CCW) Input

This input functions in the speed control mode on the standard model and when the **OPX-1A** control module is used. When the BRAKE input is ON, motor operation is enabled. If the CCW input is turned ON, acceleration and operation are performed in the counterclockwise direction at the rate set by the acceleration time potentiometer. If it is turned OFF, the motor decelerates and the operation stops at the rate set by the deceleration time potentiometer.
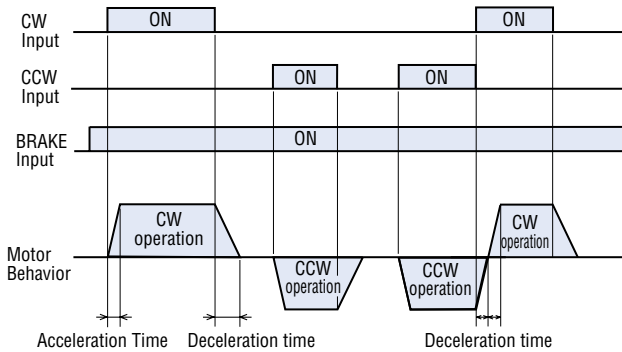
✽ If the direction of rotation has been changed, acceleration and deceleration will be performed at the rate set by time potentiometers.

Note:
The direction of rotation indicates the direction as viewed from the motor's output shaft. With the pre-assembled gearmotor, the direction of rotation varies in according to the gearhead ratio. See the table of permissible torques on page B-14 for details.

◆ Speed Control Data Selection (M0) Input

With the M0 input, the speed can be controlled by either the external potentiometer or an external analog setting.

MO	Speed Data
OFF	Internal Potentiometer
ON	External Analog Setting
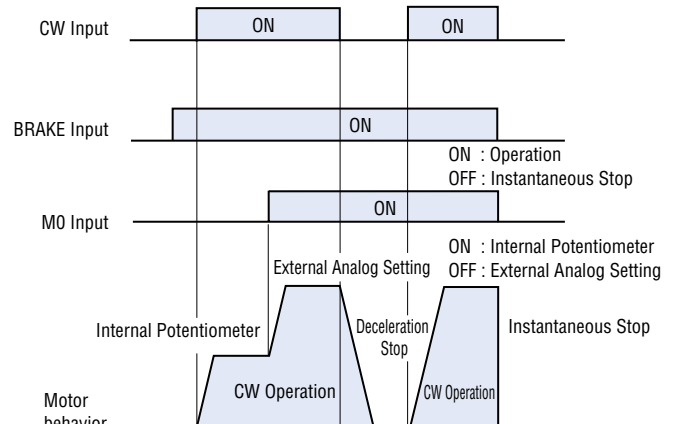
✽ The deceleration time potentiometer is effective upon speed change.

B-27

◆ Motor Control Release (FREE) Input

When the photocoupler is turned ON, the motor excitation is cancelled and the electromagnetic brake is released. The FREE input is given the highest priority regardless of the condition of other inputs. The FREE input functions even when a protection function is activated.

◆ Brake (BRAKE)/Alarm Clear (ACL) Input

This input functions as the BRAKE input during normal operation, and as the ACL input when a driver protection is active.

During Normal Operation (BRAKE Input)

When the BRAKE input is turned ON, motor operation is enabled. If it is turned OFF, the motor is stopped instantaneously. To start motor operation, be sure to set the BRAKE input to ON.
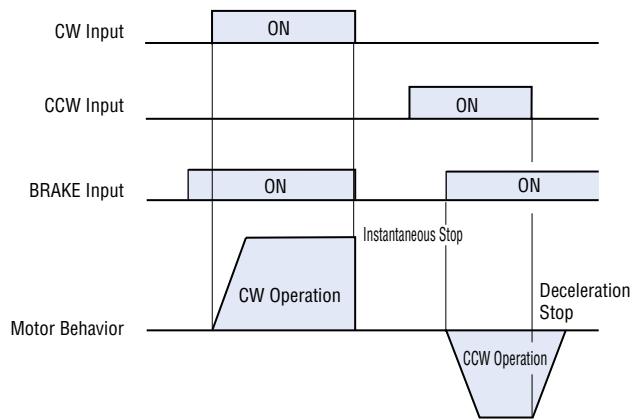
Upon Activation of a Protection Function (ACL Input)

The activated protection function is reset and the driver is restarted. This input is used to reset protection functions while power is supplied. Note, however, that if the protection function is for overcurrent, EEPROM data failure, system failure or encoder failure have been activated, they cannot be reset. If any of these protection functions have been activated, call our Technical Support Line or contact your nearest Oriental Motor representative.
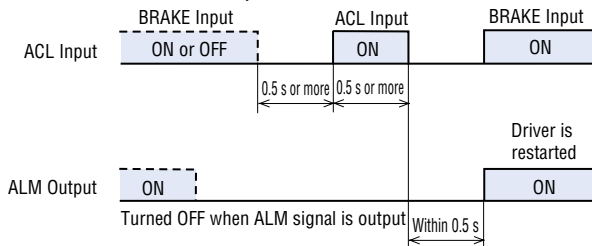
● Standard Model Output Signals
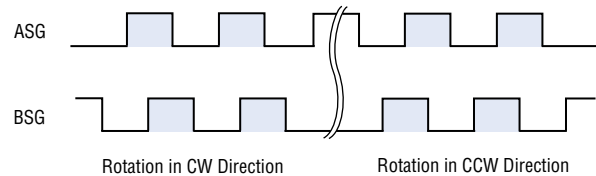### ◆ Alarm (ALM) Output

The photocoupler turns OFF when a driver protection function is active. When overload, overcurrent or other abnormality is detected, the alarm signal is output and the ALARM LED on the driver is blinked and the motor stops naturally. The electromagnetic brake will be activated. To reset the alarm signal output, remove the cause of the problem and ensure the safety of the equipment and load. Then turn on the ACL input or reconnect the power. When reconnecting the power, turn off the power and then wait for at least 30 seconds before turning it back on.
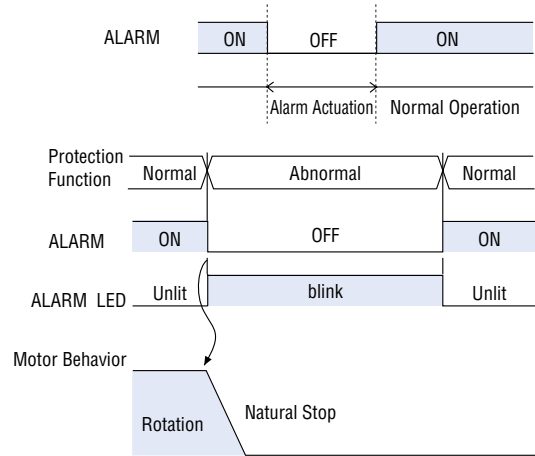
Note: The alarm output logic is opposite that of other signal outputs (positive logic output).

◆ Phase difference (ASG/BSG) Output

Feedback pulses are output from the encoder (500 p/r). This output is used when monitoring the motor speed and position by connecting a counter, etc.

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◆ Busy (BUSY) [Torque-Limiting (TLM)]/Alarm Pulse (ALP) Output

This output functions as the BUSY output during normal operation, and as the ALP output when a driver protection function is active. When the torque-limiting function is set when the **OPX-1A** control module is used. This output can be changed to the TLM output, which indicates that the torque limit has been reached.

During Normal Operation (Busy Output)

Speed control mode: The photocoupler turns ON during motor operation.

Position control mode: The photocoupler turns ON during rotation, and turns OFF upon stopping at the set stop position.
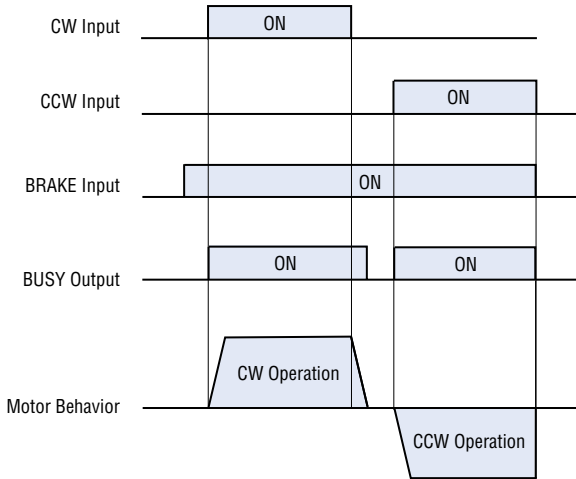

Upon Activation of a Protection Function (ALP Output)

If a one shot input (0.1s or more) is given to the rotational direction or START input, the ALARM LED will blink a number of times corresponding to the protective function that has been activated. This blinking pattern will be repeated every five seconds. This makes it possible for a PLC or other controller to determine the type of protective function that has been activated by counting the number of blinks.


Example: Three outputs (overvoltage protection)
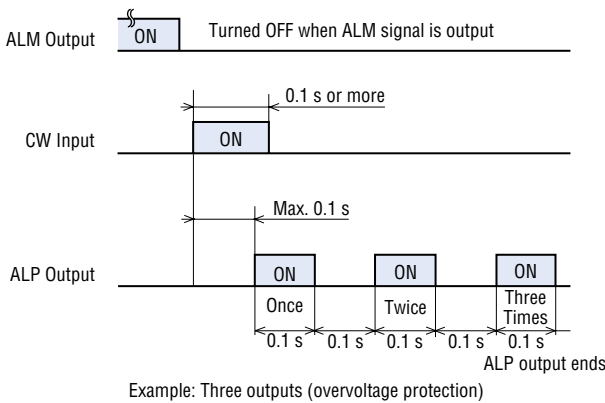
● Using the External Potentiometer (included)

When the motor speed is to be set remotely, connect the supplied external potentiometer as shown below. When the external potentiometer is used, set the M0 terminal to "Photocoupler ON."

External potentiometer dial plate reading vs. speed characteristics
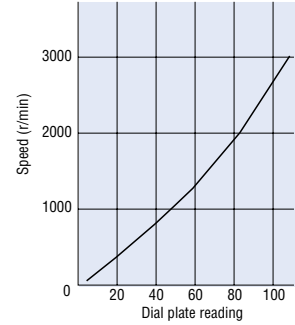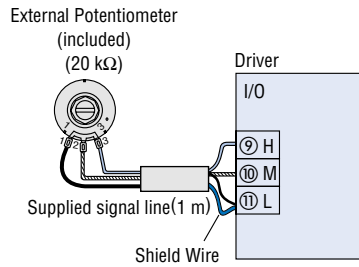
● Speed Setting via External DC Voltage

When the motor speed needs to be set using external DC voltage, connect as follows. In this case, set the M0 terminal to "Photocoupler ON."

DC voltage vs. speed characteristics
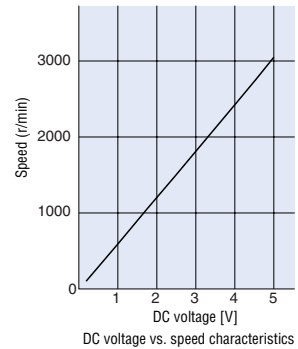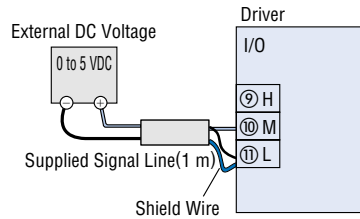
Note:
When setting speeds using the external potentiometer or via external DC voltage, be sure to use the supplied signal line (3.3 mm O.D.×1 m). Connect the shield wire for the signal line to terminal L. Ensure proper connection on the external potentiometer or external DC voltage side so that the shield wire will not contact with another terminal. The input impedance between terminals M and L is approx. 15 kΩ.

OPX-1A Control Module Speed Control Modes

Input/Output signals and operation for speed control when using the **OPX-1A** control module are as follows:

● **Input Signals**
• Clockwise Rotation (CW) Input (same as Standard Model→Page B-27)
• Counterclockwise Rotation (CCW) Input (same as Standard Model → Page B-27)

◆ Output Signals (same as Standard Model → Page B-28)

◆ Operation Data Selection

The M0, M1 and M2 inputs will function. A maximum of eight different data sets can be selected (Common to speed control modes and position control mode).

M0	M1	M2	Speed data number in speed control or position control mode
OFF	OFF	OFF	No. 0 (internal potentiometer or digital setting)
ON	OFF	OFF	No. 1 (external analog setting or digital setting)
OFF	ON	OFF	No. 2 (digital setting)
ON	ON	OFF	No. 3 (digital setting)
OFF	OFF	ON	No. 4 (digital setting)
ON	OFF	ON	No. 5 (digital setting)
OFF	ON	ON	No. 6 (digital setting)
ON	ON	ON	No. 7 (digital setting)

OPX-1A Control Module Position Control Mode

Input/Output signals and operation for position control when using the **OPX-1A** control module are as follows:

◆ Input Signals

• Start (START) Input

This input functions in the position control mode when the **OPX-1A** control module is used. It starts the positioning, continuous, return to mechanical home or return to electrical home operations. Operation will start when the START input is turned ON after selecting the operation data via the combination of M0, M1 and M2 inputs.
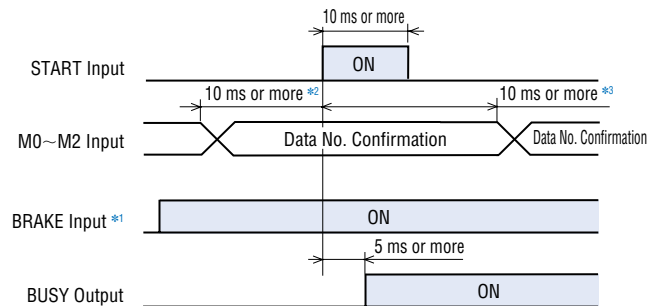Data No. 0, 1: Positioning operation data / Continuous operation data
Data No. 2 to 5: Positioning operation data
Data No. 6: Return to electrical home operation
Data No. 7: Return to mechanical home operation
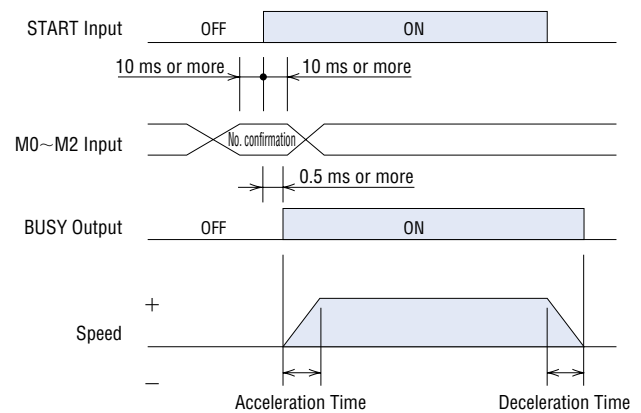
Positioning Operation

START Input — 10 ms or more — ON
M0~M2 Input — 10 ms or more *2 — Data No. Confirmation — 10 ms or more *3 — Data No. Confirmation
BRAKE Input *1 — ON
BUSY Output — 5 ms or more — ON

＊1 The motor stops when the BRAKE input is turned OFF. Before starting motor operation, be sure to turn the BRAKE input to ON.
＊2 Input the operation data confirmation signal at least 10 ms before the input of START signal.
＊3 When confirming the data number for the next travel amount following input of the START signal, input the confirmation signal at least 10 ms after the input of that signal.

Continuous Operation

START Input — OFF — ON
10 ms or more — 10 ms or more
M0~M2 Input — No. confirmation
0.5 ms or more
BUSY Output — OFF — ON
Speed — Acceleration Time — Deceleration Time

＊ When the digital independent torque-limit function is set, the data numbers will be reflected as necessary even during an index operation.

• Operation Data Selection (M0, M1, M2) Inputs

The M0, M1 and M2 inputs will function. The particular combination of these inputs selects travel amount data during positioning or continuous operation, as well as the return to mechanical or electrical home operation. The speed follows the settings in the table below.

M0	M1	M2	Travel amount data number in position control mode
OFF	OFF	OFF	No. 0 (digital setting) Positioning operation 0 / Continuous operation 0
ON	OFF	OFF	No. 1 (digital setting) Positioning operation 1 / Continuous operation 1
OFF	ON	OFF	No. 2 (digital setting) Positioning operation 2
ON	ON	OFF	No. 3 (digital setting) Positioning operation 3
OFF	OFF	ON	No. 4 (digital setting) Positioning operation 4
ON	OFF	ON	No. 5 (digital setting) Positioning operation 5
OFF	ON	ON	Return to electrical home operation
ON	ON	ON	Return to mechanical home operation

✽ No. 0 and No. 1 allow the switching of positioning operation and continuous operation.

• Mechanical Home Sensor (HOME-LS) Input

The HOME-LS input functions in the position control mode when the **OPX-1A** control module is used. It is used during the return to mechanical home operation.

Return to Mechanical Home Operation

The mechanical home sensor (HOME-LS input) installed on the equipment is detected with the motor operated in the set detection start direction. Upon detection of the home sensor, the motor reverses its direction and stops at a position just outside the range of the home sensor.

Mechanical home detection method: 1-sensor mode (contact B input)
Starting direction of home detection: May be set as CW or CCW
Speed Input in data No. 7: No slow-start/slowdown time is set.
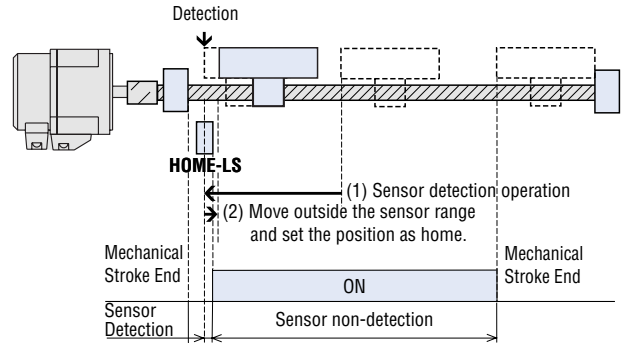
Note:
Install the home sensor (HOME-LS) before the stroke-end sensor on the detection starting side.

◆ **Output Signals** (same as Standard Model→Page B-28)

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# ■ Torque-Limiting Function When Using the **OPX-1A** Control Module

The **BX** Series permits the setting of a motor output torque limit when the **OPX-1A** control module is used in both the speed control mode and position control mode. The torque limit is set relative to the peak torque being 100 percent. When torque needs to be limited continuously during push-motion operation or gravitational operation, set the limit to rated torque or less. Calculate the output torque for the pre-assembled gearmotor based on the applicable speed and torque, using the speed vs. torque limit characteristics graphs and formulas shown below.

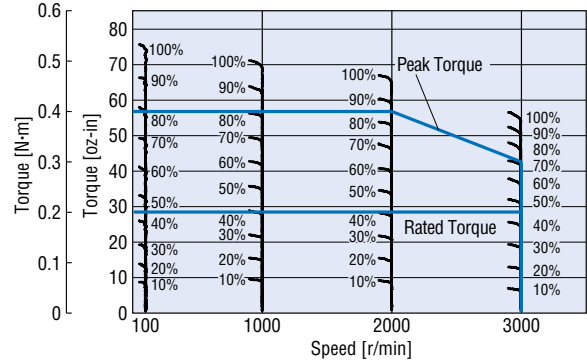Gearhead output shaft speed N_G＝Motor speed×1 / Gearhead ratio
Gearhead output shaft torque T_G＝Motor torque×Gearhead ratio×0.9 (coefficient)

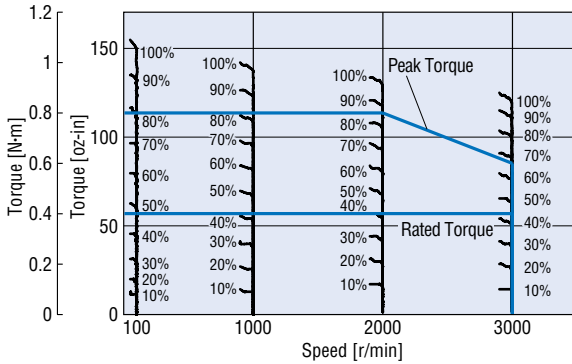## ■ Speed — Torque Limit Characteristics (Reference Values)

BX230□-A/BX230□-□
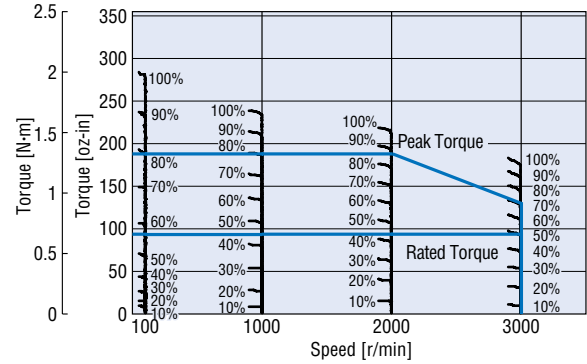**BX230□M-A/BX230□M-□**
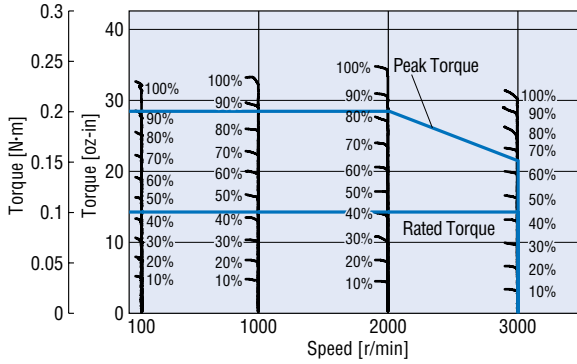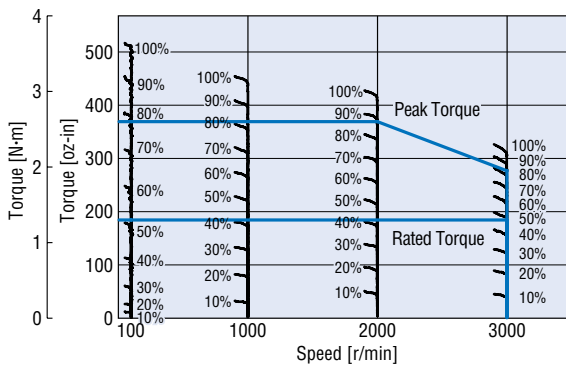

BX460□-A/BX460□-□
BX460□M-A/BX460□M-□
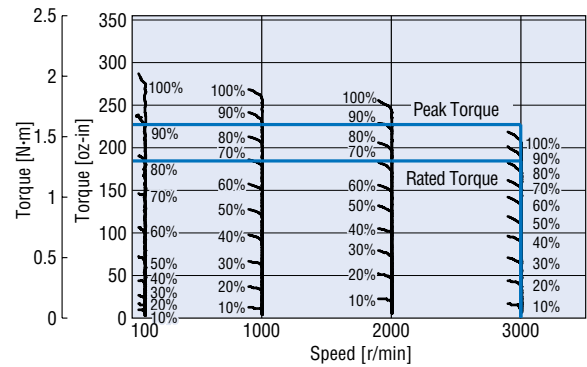

BX5120□-A/BX5120□-□
BX5120□M-A/BX5120□M-□

BX6200□-A/BX6200□-□
BX6200□M-A/BX6200□M-□

BX6400S-A
BX6400SM-A   **Round Shaft**

BX6400S-□
BX6400SM-□   **Combination type**

Note:
An error of up to approximately 20 percent may occur between the set value and generated torque due to the speed setting, power-supply voltage and distance of motor cable extension. Repeatability under the same condition is approximately 10 percent. We recommend that the torque limit be set to approximately 20 percent or more.
● Enter the letter representing the voltage (**A** or **C**) in the first box (□) within the model name. Enter the gear ratio in the second box (□) within the model name.

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BX

FBLⅡ

AXU

AXH

BHF

ES

US

Before Using a
Speed Control
System

Brushless DC Motor Systems

AC Input

DC Input

AC Motor Systems

■ Combinations of Gearhead, Motor and Driver

● Standard Combination Type

Model	Motor Model	Gearhead Model	Driver Model
BX230A-□	BXM230-GFH2	GFH2G□	BXD30A-A
BX230C-□			BXD30A-C
BX460A-□	BXM460-GFH2	GFH4G□	BXD60A-A
BX460C-□			BXD60A-C
BX5120A-□	BXM5120-GFH2	GFH5G□	BXD120A-A
BX5120C-□			BXD120A-C
BX6200A-□	BXM6200-GH	6GH□K	BXD200A-A
BX6200C-□			BXD200A-C
BX6400S-□	BXM6400-GH	6GH□K	BXD400B-S

● Enter gear ratio in the box (□) within the model name.

● Standard Round Shaft Type

Model	Motor Model	Driver Model
BX230A-A	BXM230-A2	BXD30A-A
BX230C-A		BXD30A-C
BX460A-A	BXM460-A2	BXD60A-A
BX460C-A		BXD60A-C
BX5120A-A	BXM5120-A2	BXD120A-A
BX5120C-A		BXD120A-C
BX6200A-A	BXM6200-A	BXD200A-A
BX6200C-A		BXD200A-C
BX6400S-A	BXM6400-A	BXD400A-S

● Combination Type with Electromagnetic Brake

Model	Motor Model	Gearhead Model	Driver Model
BX230AM-□	BXM230M-GFH2	GFH2G□	BXD30A-A
BX230CM-□			BXD30A-C
BX460AM-□	BXM460M-GFH2	GFH4G□	BXD60A-A
BX460CM-□			BXD60A-C
BX5120AM-□	BXM5120M-GFH2	GFH5G□	BXD120A-A
BX5120CM-□			BXD120A-C
BX6200AM-□	BXM6200M-GH	6GH□K	BXD200A-A
BX6200CM-□			BXD200A-C
BX6400SM-□	BXM6400M-GH	6GH□K	BXD400B-S

● Enter gear ratio in the box (□) within the model name.

◆ Round Shaft with Electromagnetic Brake

Model	Motor Model	Driver Model
BX230AM-A	BXM230M-A2	BXD30A-A
BX230CM-A		BXD30A-C
BX460AM-A	BXM460M-A2	BXD60A-A
BX460CM-A		BXD60A-C
BX5120AM-A	BXM5120M-A2	BXD120A-A
BX5120CM-A		BXD120A-C
BX6200AM-A	BXM6200M-A	BXD200A-A
BX6200CM-A		BXD200A-C
BX6400SM-A	BXM6400M-A	BXD400A-S

■ Accessories (Sold Separately)

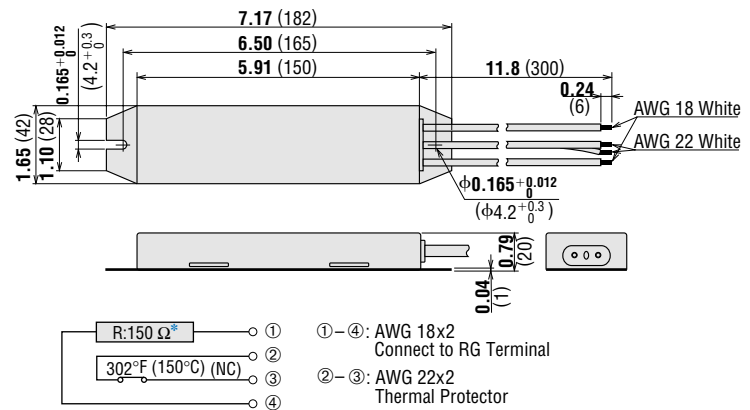### ● Extension Cable / Flexible Extension Cable
◆ For Motor

Motor Side   Driver Side

◆ For Encoder

Encoder Side   Driver Side
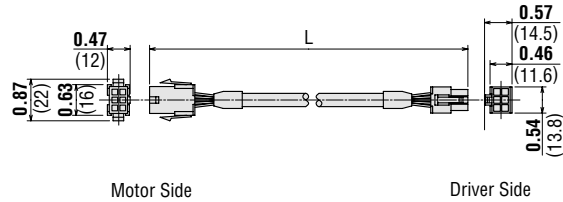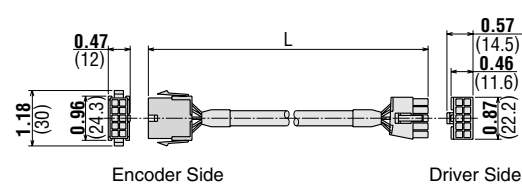
● Regeneration Unit

EPRC-400P, RGB100

Weight: 0.55 lb. (0.25 kg)

DXF C194

AWG 18 White
AWG 22 White

R:150 Ω*   ①
302°F (150°C) (NC)   ②
   ③
   ④

①–④: AWG 18x2
Connect to RG Terminal

②–③: AWG 22x2
Thermal Protector

✻ **EPRC-400P** = 400 Ω

Extension Cable

Model	Length ft.　(m)
CC01SBF	3.3　(1)
CC02SBF	6.6　(2)
CC03SBF	9.8　(3)
CC05SBF	16.4　(5)
CC07SBF	23.0　(7)
CC10SBF	32.8　(10)
CC15SBF	49.2　(15)
CC20SBF	65.6　(20)

Flexible Extension Cable

Model	Length ft.　(m)
CC01SBR	3.3　(1)
CC02SBR	6.6　(2)
CC03SBR	9.8　(3)
CC05SBR	16.4　(5)
CC07SBR	23.0　(7)
CC10SBR	32.8　(10)
CC15SBR	49.2　(15)
CC20SBR	65.6　(20)

Regeneration Unit

Model	Applicable Product	
EPRC-400P	**BX230** (30 W)	
	BX460 (60 W)	
	BX5120 (120 W)	
RGB100	**BX6200** (200 W)	
	BX6400 (400 W)	

● Both extension cable and flexible cable are combined with cables for motor and encoder.