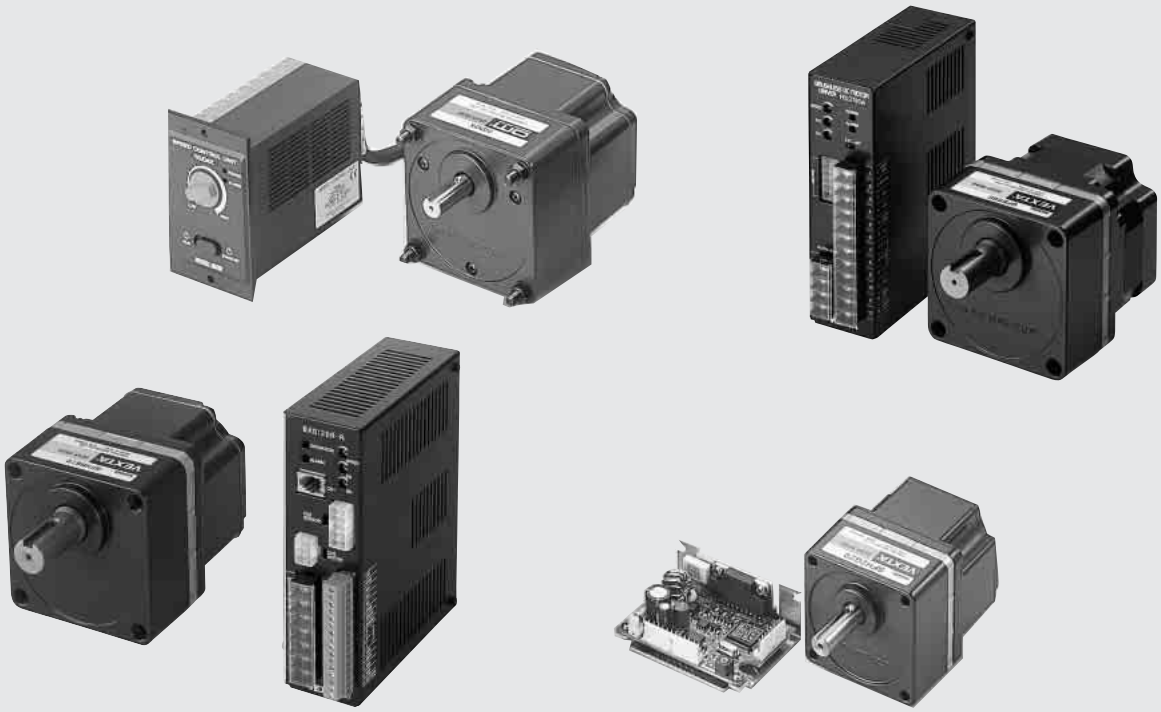


Brushless DC Motor Systems

Additional Information

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

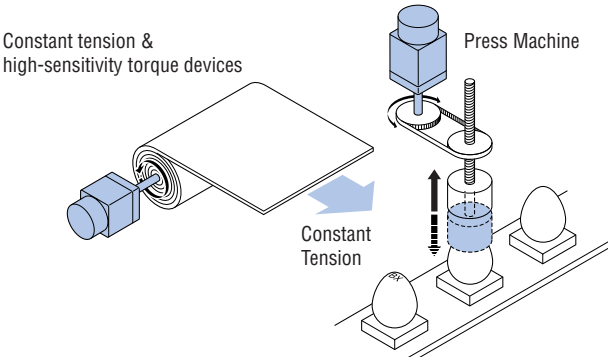
With up to eight individual speed settings available, the use of the **OPX-1A** control module increases the speed range of the **BX** Series to 3 to 3,000 r/min.

- Monitoring Functionality

The **OPX-1A** displays position, speed and torque data, as well as alarm history.

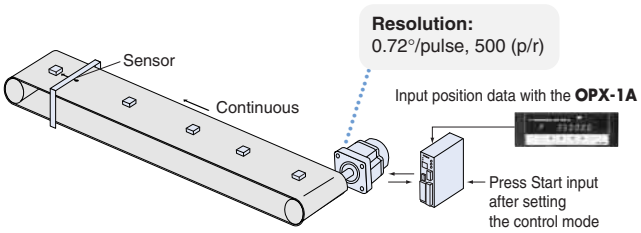
- Torque Limiting Functionality

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.

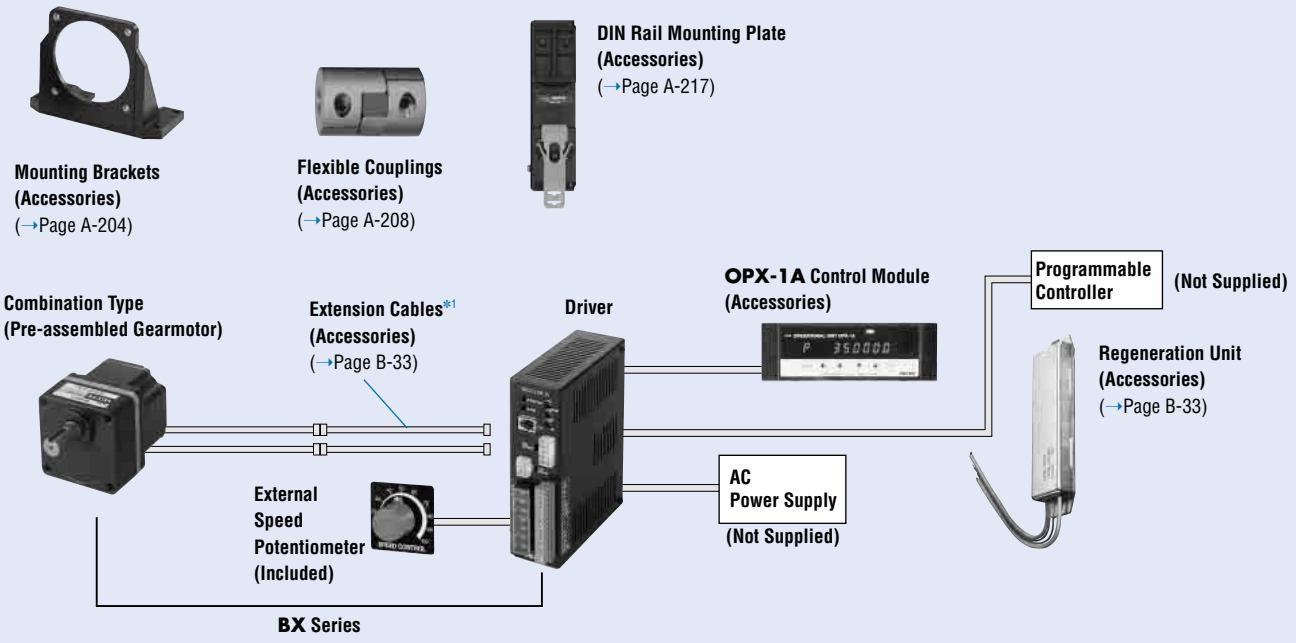


Position Control Mode

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.



System Configuration



*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
2: 2.36 in. sq.(60 mm sq.)
4: 3.15 in. sq.(80 mm sq.)
5: 3.54 in. sq.(90 mm sq.)
6: 4.09 in. sq.(104 mm sq.)

Output Power
30: 30 W (1/25 HP)
60: 60 W (1/12 HP)
120: 120 W (1/6 HP)
200: 200 W (1/4 HP)
400: 400 W (1/2 HP)

Voltage
A: Single-Phase 100-115 VAC
C: Single-Phase/Three-Phase 200-230 VAC
S: Three-Phase 200-230 VAC

M: Electromagnetic Brake
Blank: Standard Type

Number: Gear Ratio
A: Round Shaft

Product Line

Combination Type/Standard

Output Power HP	Output Power W	Power Supply Voltage	Model	Gear Ratio
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 HP	Output Power W	Power Supply Voltage	Model	Gear Ratio
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.

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

Product Line

Round Shaft Type/Standard

Output Power HP	Output Power W	Power Supply Voltage	Model
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 HP	Output Power W	Power Supply Voltage	Model
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-in ^{2} (kg·m^2)	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-in ^{2} (kg·m^2)	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.

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)
	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)
	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.

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.)

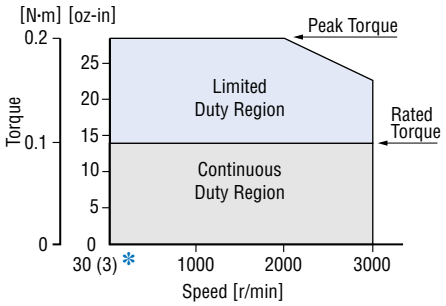
Continuous Duty Region

Continuous operation is possible in this region.

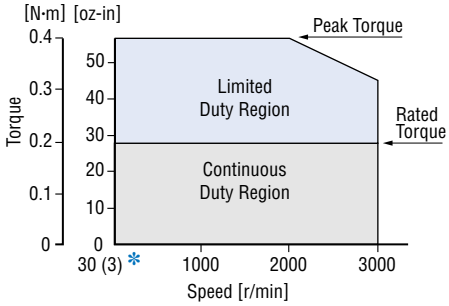
Limited Duty Region

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.

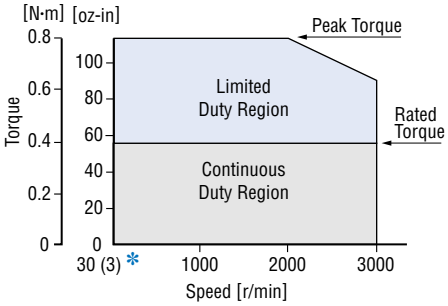
BX230□-A/BX230□-□
BX230□M-A/BX230□M-□



BX460□-A/BX460□-□
BX460□M-A/BX460□M-□

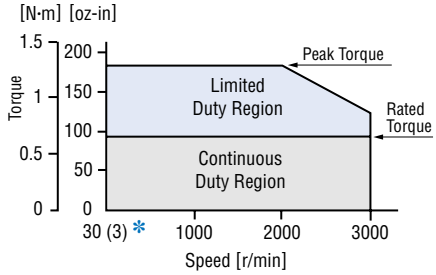


BX5120□-A/BX5120□-□
BX5120□M-A/BX5120□M-□

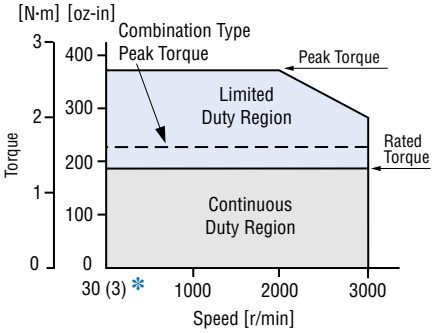


✻ Values in parentheses only apply if the optional **OPX-1A** control module is used.

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.

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

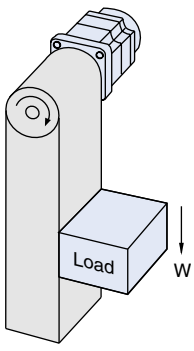
The regenerative power can be estimated using the formula below. Use the calculated value as a guideline.

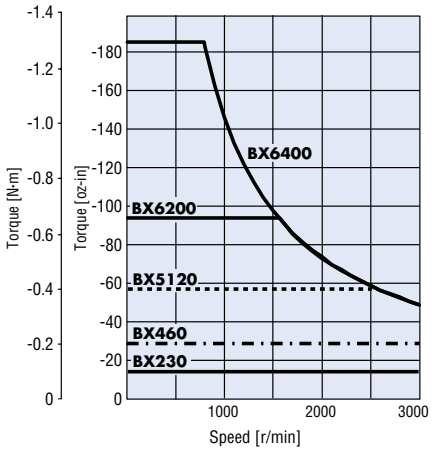
Regenerative power (W) = $0.1047 \times T_L$ [N·m] × N [r/min]

T_L: Load torque N: Rotating speed

✻ Use the electromagnetic-brake type for gravitational operation.

Gravitational Operation Ability





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

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

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

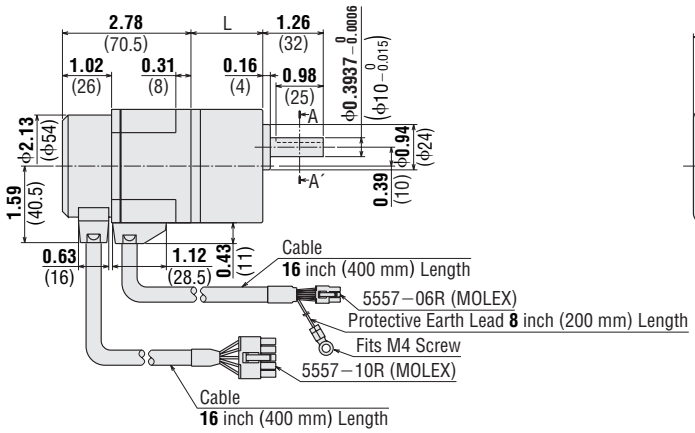
- Enter the gear ratio in the box (□) within the model name.

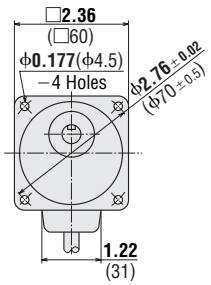
Combination Type/Standard

Motor/Gearhead

BX230A-□, BX230C-□

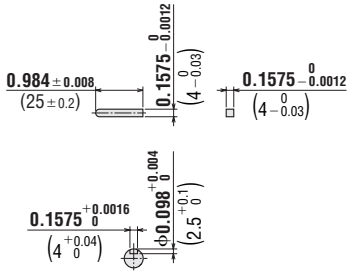
Motor: BXM230-GFH2
Gearhead: GFH2G□
Weight: 2.6 lb. (1.2 kg) including gearhead
DXF C147A (GFH2G5~20)
C147B (GFH2G30~100)
C147C (GFH2G200)





Key and Key Slot

(The key is provided with the gearhead)



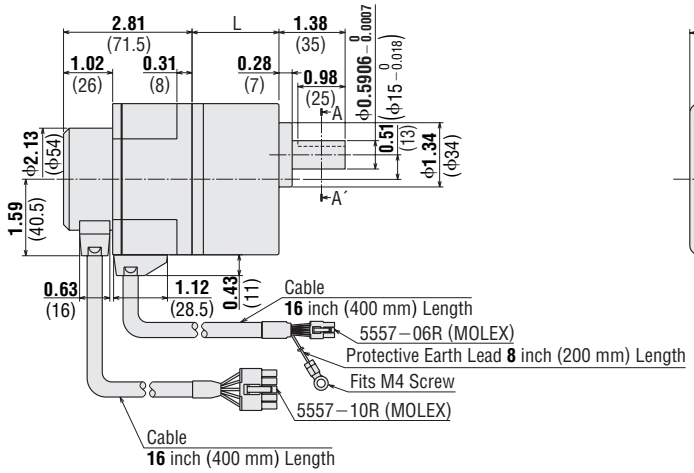
Shaft Cross Section AA´

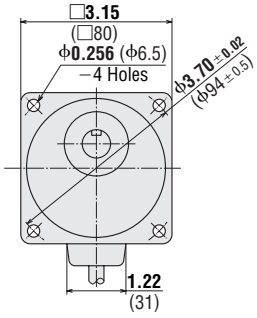
GFH2G5~20: L = **1.34** (34)
GFH2G30~100: L = **1.50** (38)
GFH2G200: L = **1.69** (43)

Motor/Gearhead

BX460A-□, BX460C-□

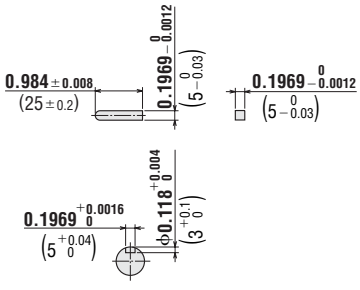
Motor: BXM460-GFH2
Gearhead: GFH4G□
Weight: 4.4 lb. (2 kg) including gearhead
DXF C148A (GFH4G5~20)
C148B (GFH4G30~100)
C148C (GFH4G200)





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)

◆ Motor/Gearhead

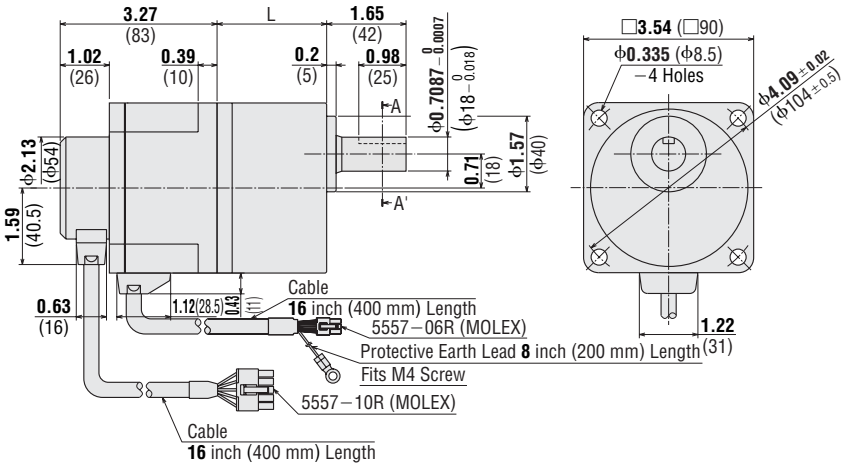
BX5120A-□, BX5120C-□

Motor: BXM5120-GFH2

Gearhead: GFH5G□

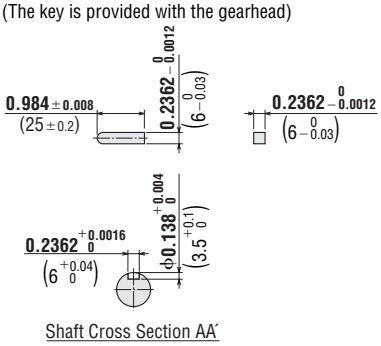
Weight: 6.8 lb. (3.1 kg) including gearhead

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

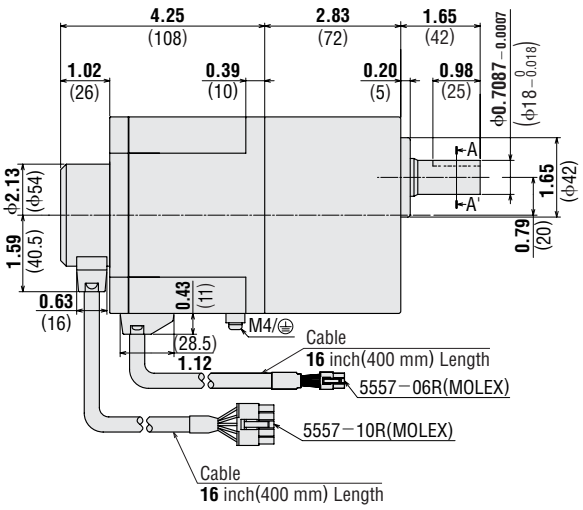
BX6200A-□, BX6200C-□
BX6400S-□

Motor: BXM6200-GH
BXM6400-GH

Gearhead: 6GH□K

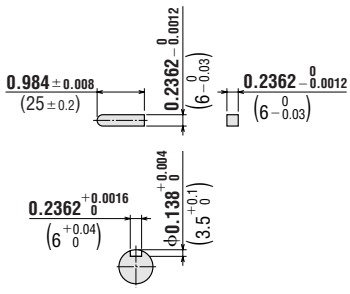
Weight: 11 lb. (4.9 kg) including gearhead

DXF C181



◆ Key and Key Slot

(The key is provided with the gearhead)

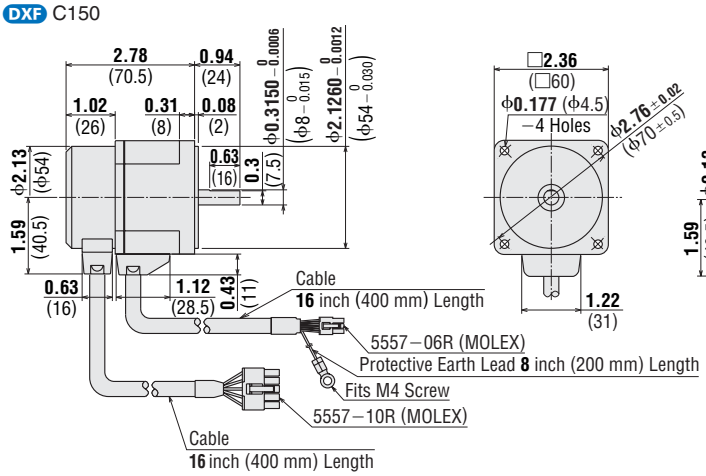


Shaft Cross Section AA′

● Round Shaft Type/Standard

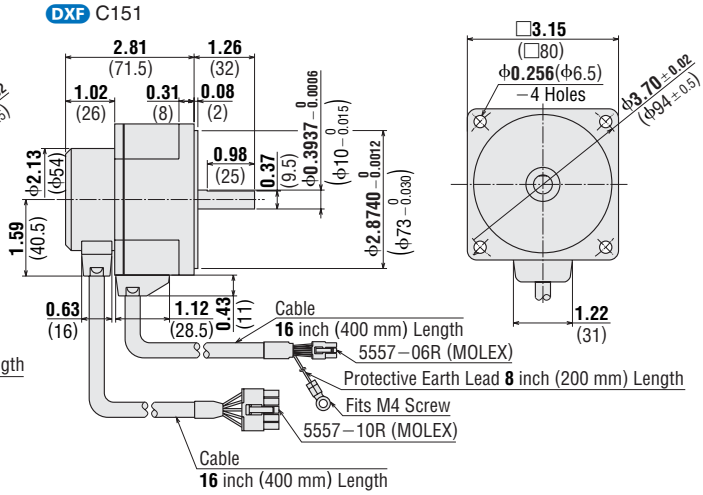
BX230A-A, BX230C-A

Motor: BXM230-A2
Weight: 1.5 lb. (0.7 kg)
DXF C150



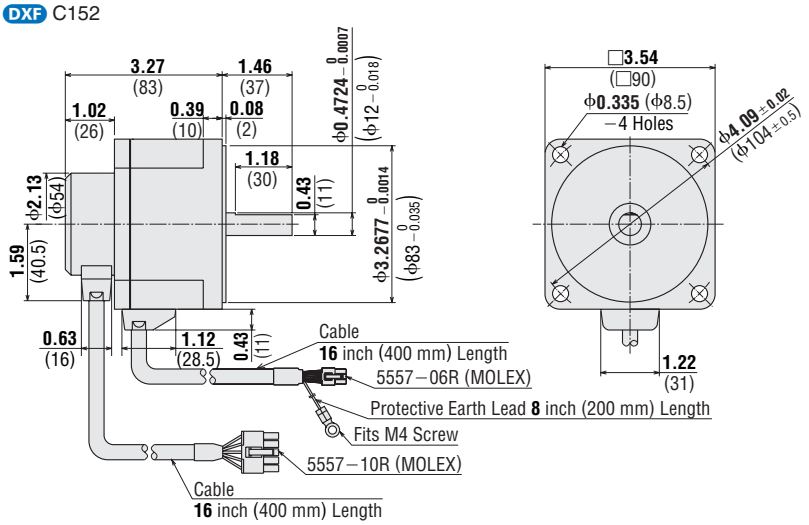
BX460A-A, BX460C-A

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



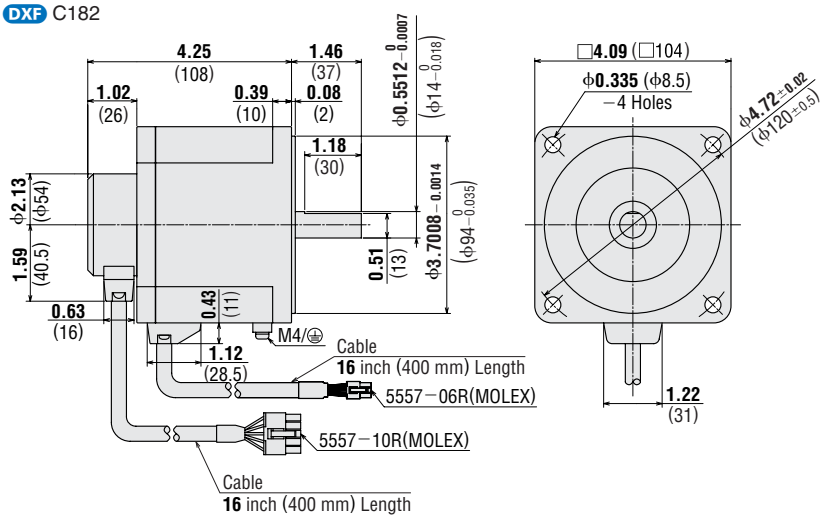
BX5120A-A, BX5120C-A

Motor: BXM5120-A2
Weight: 3.5 lb. (1.6 kg)
DXF C152



BX6200A-A, BX6200C-A, BX6400S-A

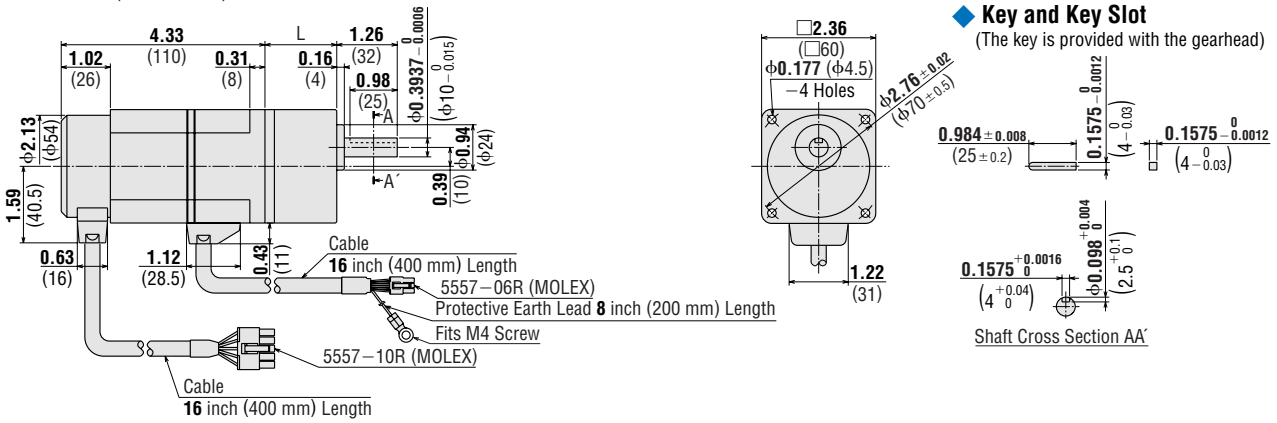
Motor: BXM6200-A
BXM6400-A
Weight: 5.5 lb. (2.5 kg)
DXF C182



● 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)



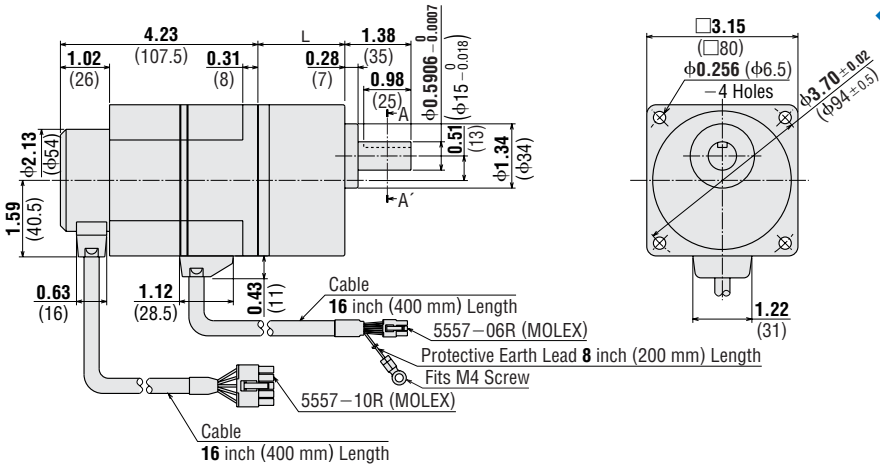
◆ Key and Key Slot

(The key is provided with the gearhead)

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

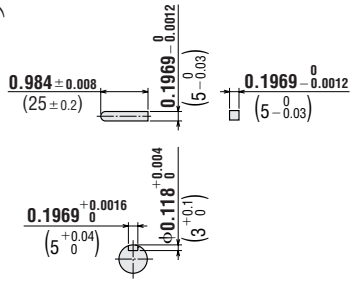
BX460AM-□, BX460CM-□

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)



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

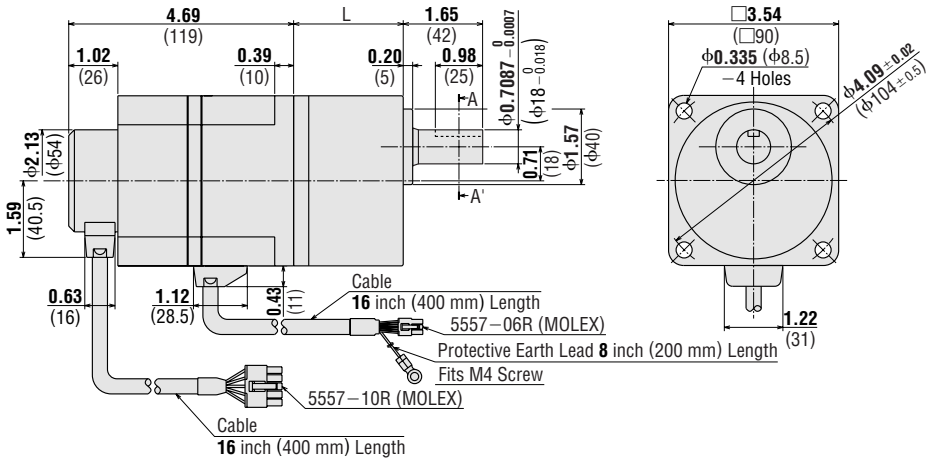
BX5120AM-□, BX5120CM-□

Motor: BXM5120M-GFH2

Gearhead: GFH5G□

Weight: 8.1 lb. (3.7 kg) including gearhead

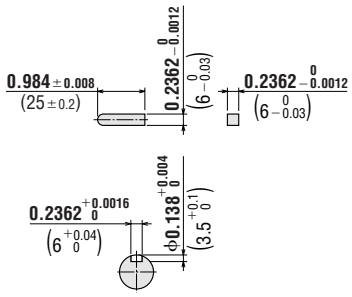
DXF C155A (GFH5G5~20)
C155B (GFH5G30~100)
C155C (GFH5G200)



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

Key and Key Slot

(The key is provided with the gearhead)



Shaft Cross Section AA´

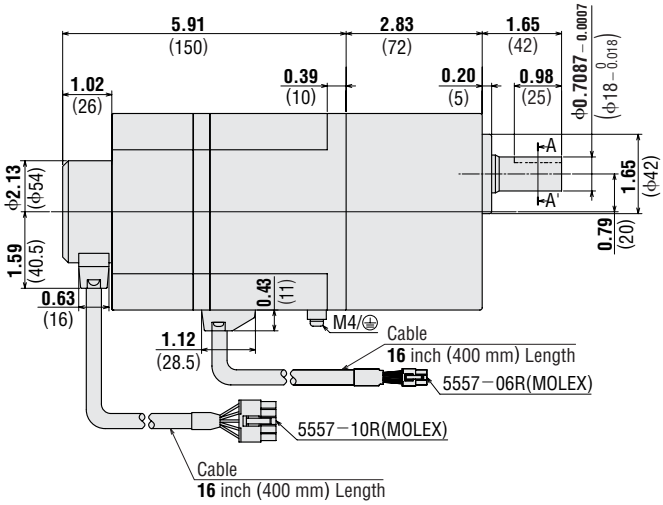
BX6200AM-□, BX6200CM-□
BX6400SM-□

Motor: BXM6200M-GH
BXM6400M-GH

Gearhead: 6GH□K

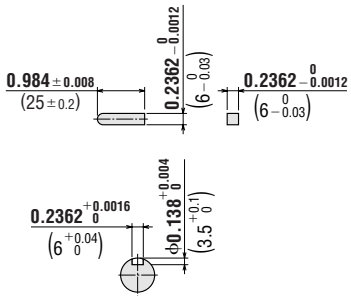
Weight: 13 lb. (5.9 kg) including gearhead

DXF C183



Key and Key Slot

(The key is provided with the gearhead)

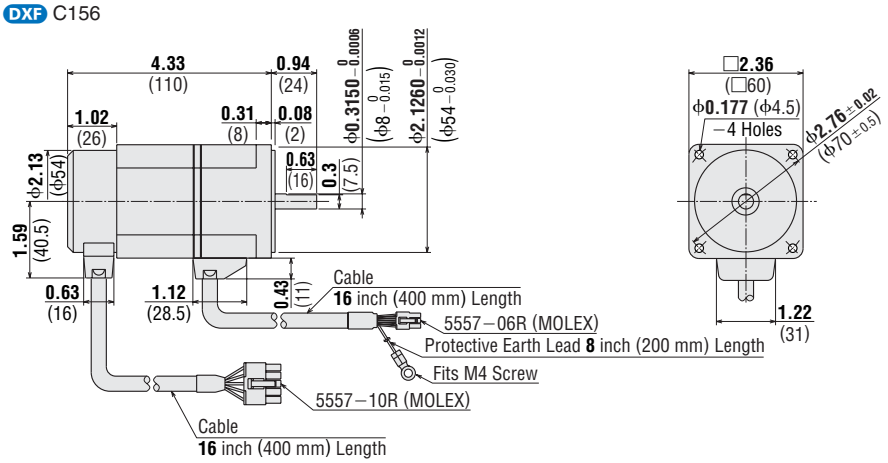


Shaft Cross Section AA´

● Round Shaft Type with Electromagnetic Brake

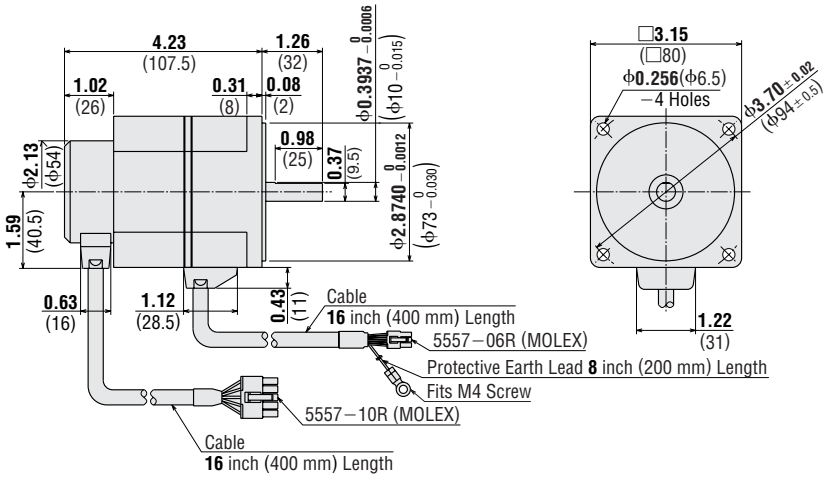
BX230AM-A, BX230CM-A

Motor: BXM230M-A2
Weight: 2.2 lb. (1 kg)
DXF C156



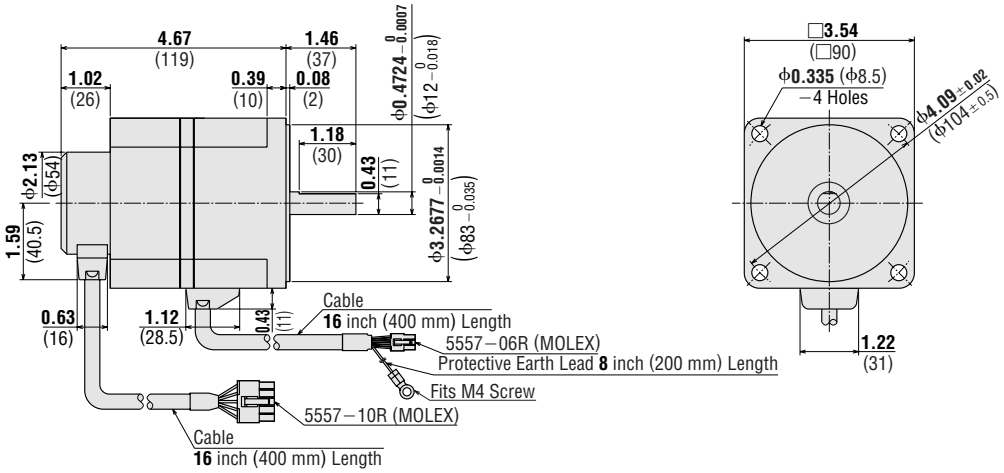
BX460AM-A, BX460CM-A

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

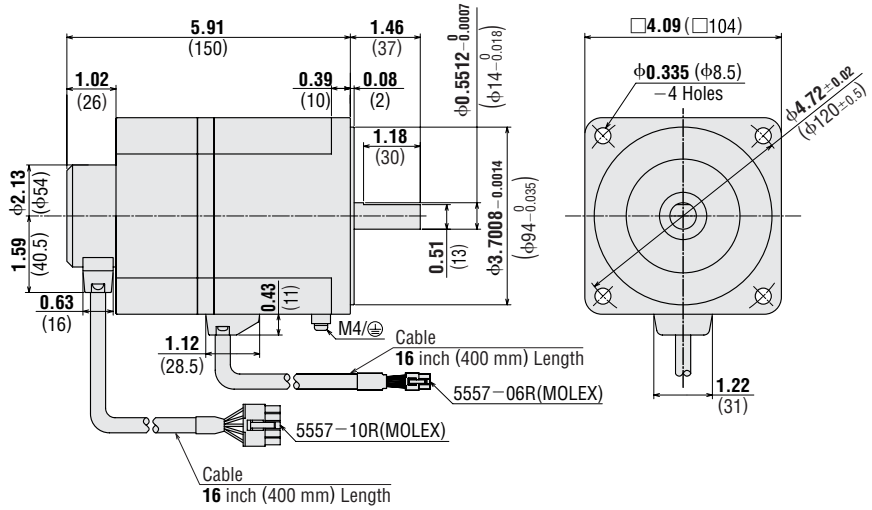


BX6200AM-A, BX6200CM-A
BX6400SM-A

Motor: BXM6200M-A
BXM6400M-A

Weight: 7.7 lb. (3.5 kg)

DXF C184

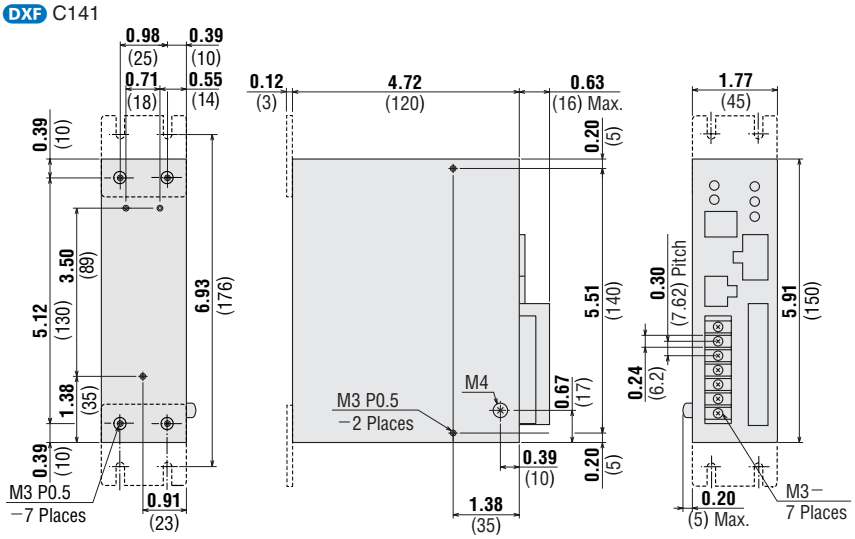


Driver

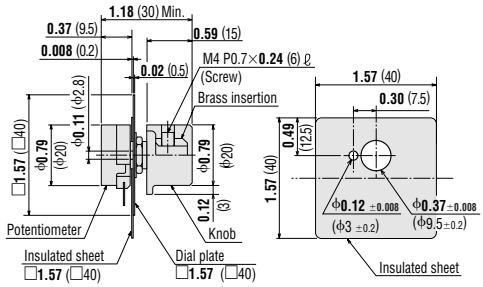
BXD30A-A, BXD60A-A, BXD120A-A, BXD200A-A,
BXD30A-C, BXD60A-C, BXD120A-C, BXD200A-C, BXD400A-S, BXD400B-S

Weight: 1.8 lb. (0.8 kg)

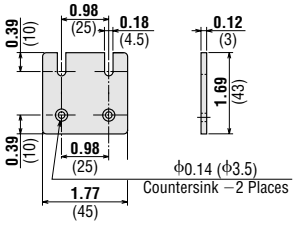
DXF C141



External Speed Potentiometer (included)



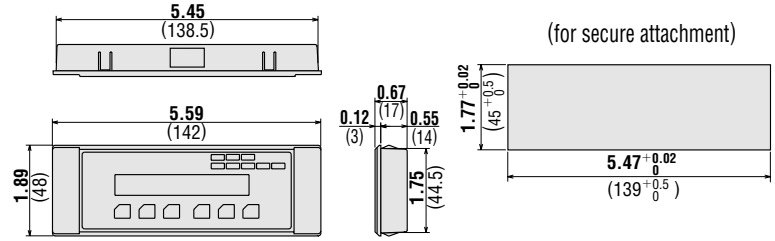
Driver Mounting Tab (2 pieces included)



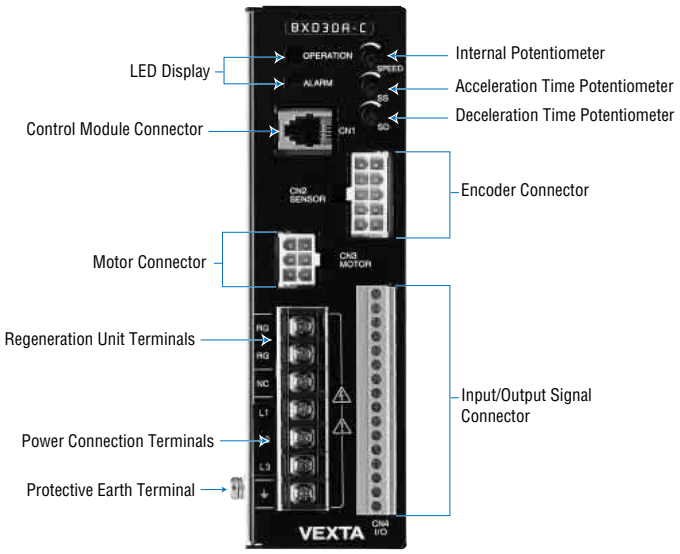
Control Module (Sold Separately)

OPX-1A

Weight: 0.15 lb. (0.07 kg)



Connection and Operation



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.

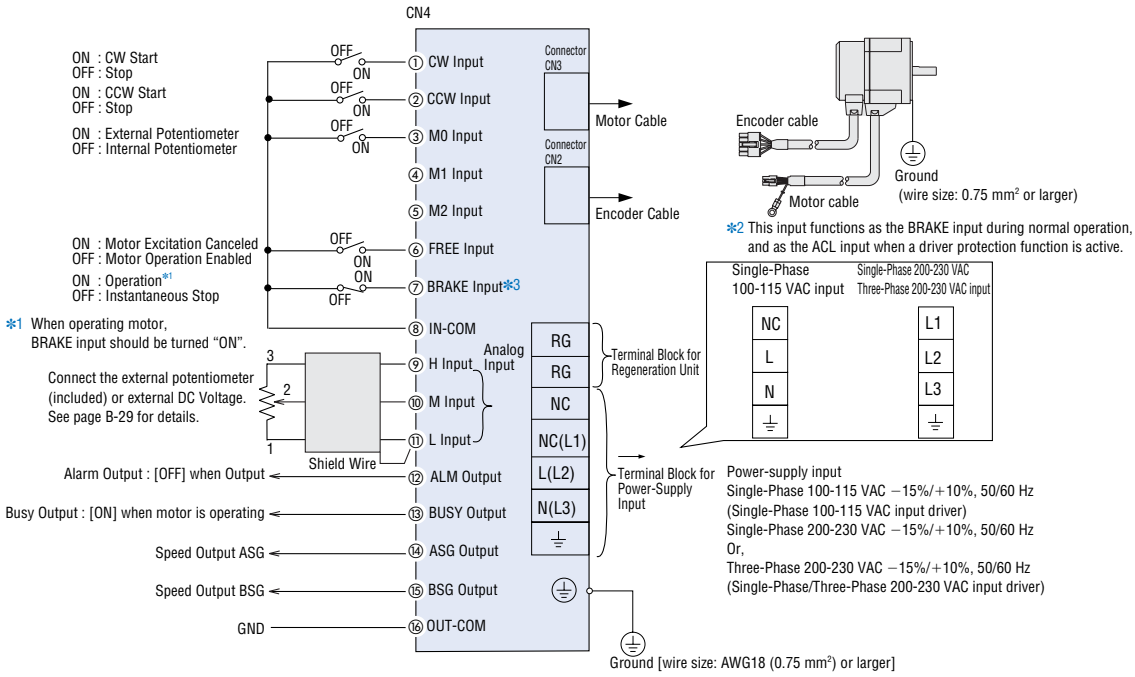
Input and Output Signals

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

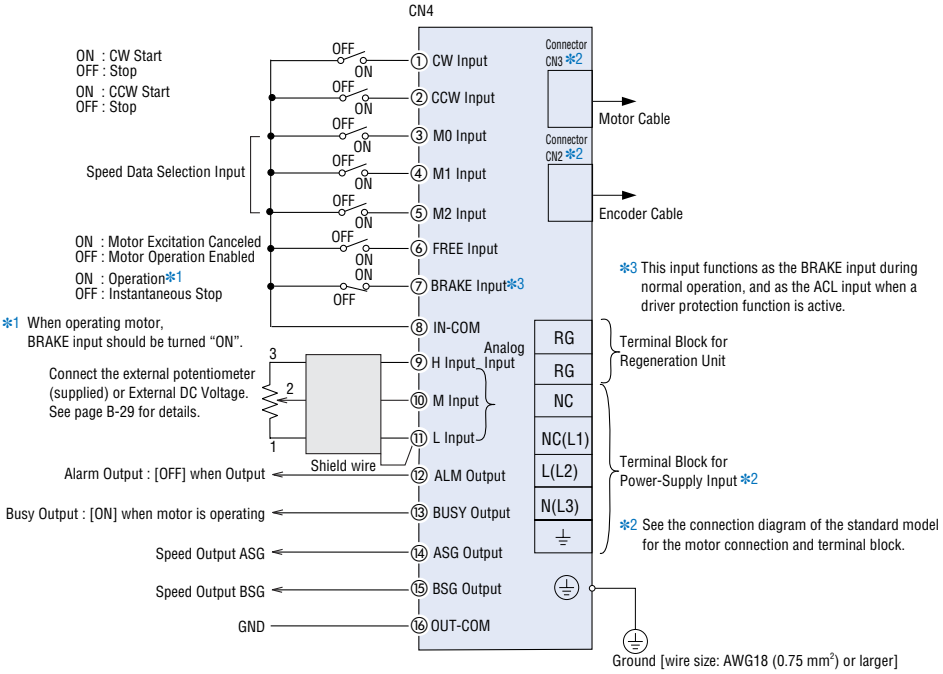
* The BUSY output can be changed to the torque-limiting output only when a torque limit is set. Details of Input and Output Signals →Page B-27

Connection Diagrams

Standard Model



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

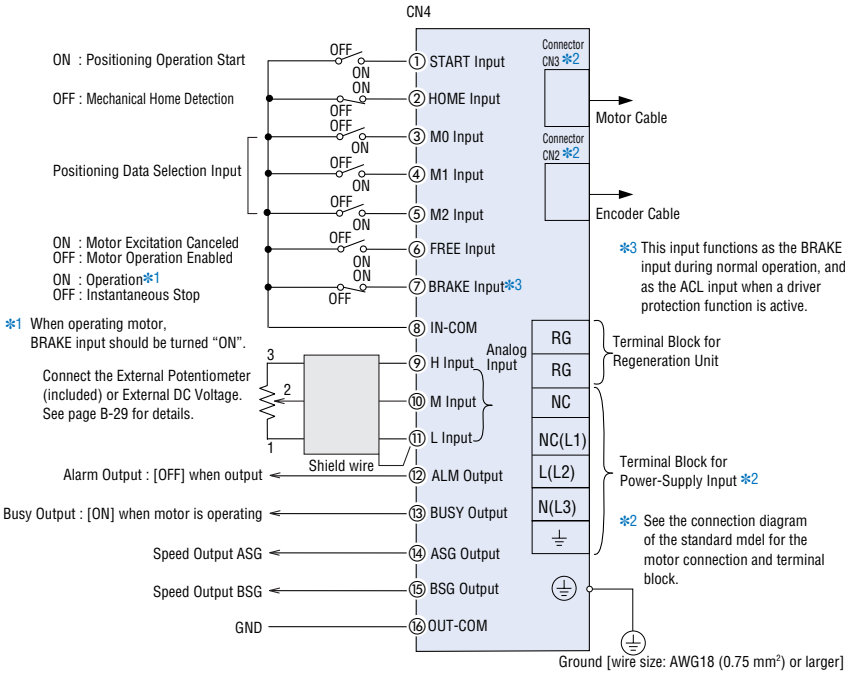


Connection Diagram using the **OPX-1A** Control Module—Position Control Modes→Page B-26

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.

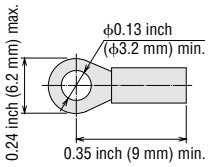
◆ Using the OPX-1A Control Module — Position Control Mode



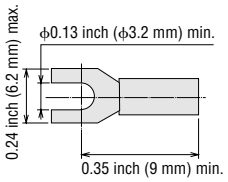
■ Terminals

● Power Supply Terminals

Insulated ring terminal



Insulated fork terminal



● I/O Terminals (CN4)

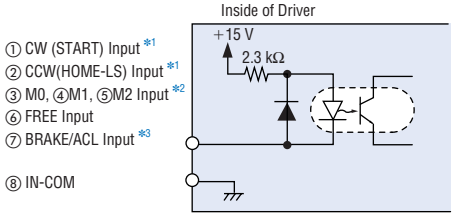
When using a crimp terminal for connection, use one of the terminals listed below. The applicable crimp terminal varies, depending on the wire size.
When the following terminals are used, the applicable wire size will be between AWG 26 and 18.

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

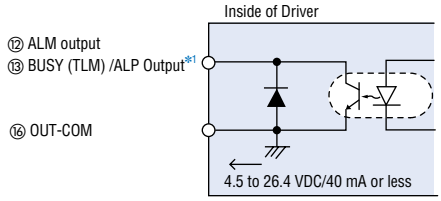
The circled number located in front of each signal represents the number of the corresponding I/O signal terminal.



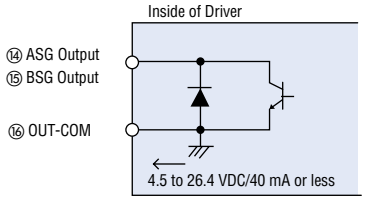
*1 The CW and CCW inputs function in the speed control mode on the standard model and when the **OPX-1A** control module is used.
The START and HOME-LS inputs function in the position control mode when the **OPX-1A** control module is used.
*2 The M0 input is the only operation data selection input available 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.

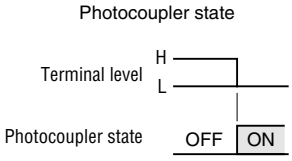


*1 This output functions as the BUSY output during normal operation, and as the ALP output when a driver protection is active. When the **OPX-1A** control module is used, the BUSY output can be changed to the TLM output.



● 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.



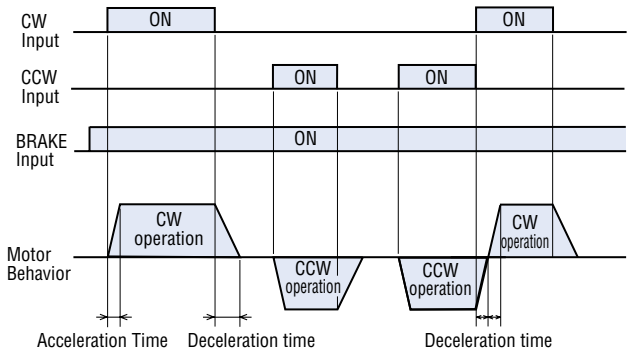
● Standard Model Input Signals

◆ 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.



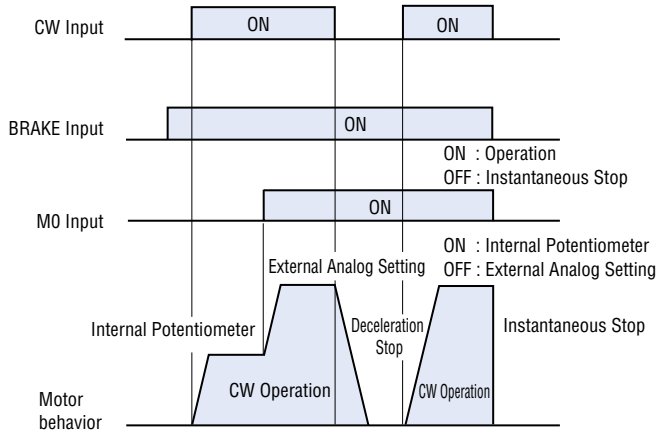
✻ If the direction of rotation has been changed, acceleration and deceleration will be performed at the rate set by time potentiometers.

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.

M0	Speed Data
OFF	Internal Potentiometer
ON	External Analog Setting



✻ The deceleration time potentiometer is effective upon speed change.

◆ Motor Control Release (FREE) Input

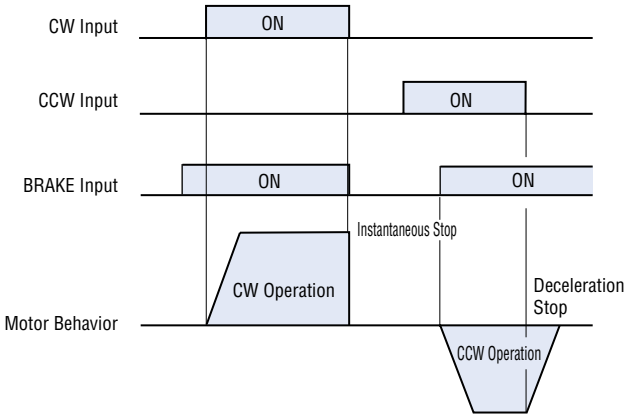
When the photocoupler is turned ON, the motor excitation is cancelled and the electromagnetic brake is released. The FREE input is given the highest priority regardless of the condition of other inputs. The FREE input functions even when a protection function is activated.

◆ 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.

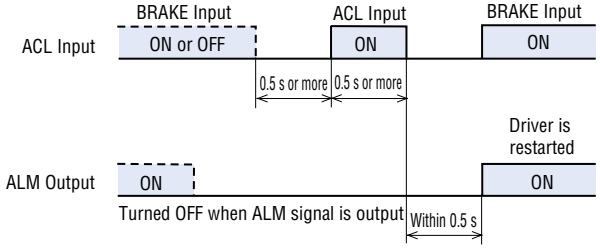
During Normal Operation (BRAKE Input)

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)

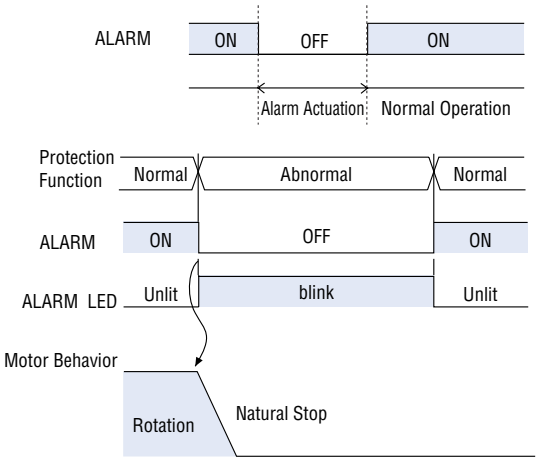
The activated protection function is reset and the driver is restarted. This input is used to reset protection functions while power is supplied. Note, however, that if the protection function is for overcurrent, EEPROM data failure, system failure or encoder failure have been activated, they cannot 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

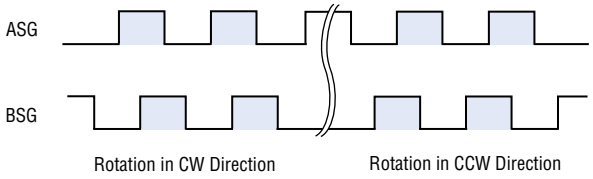
The photocoupler turns OFF when a driver protection function is active. When overload, overcurrent or other abnormality is detected, the alarm signal is output and the ALARM LED on the driver is blinked and the motor stops naturally. The electromagnetic brake will be activated. To reset the alarm signal 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.



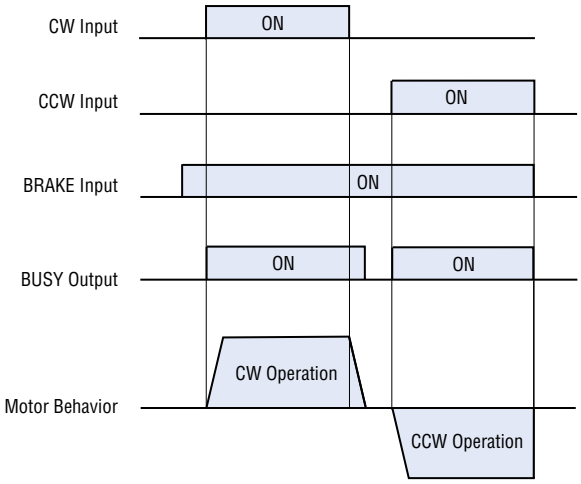
◆ Busy (BUSY) [Torque-Limiting (TLM)]/Alarm Pulse (ALP) Output

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)

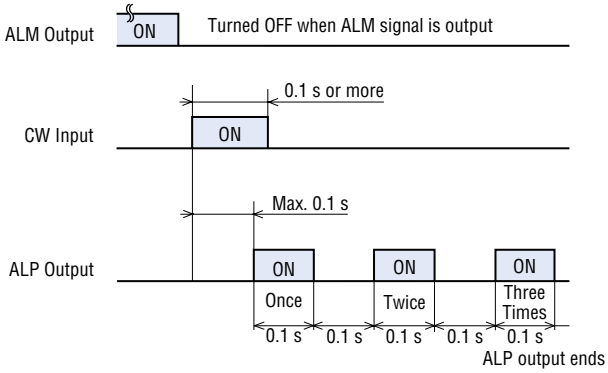
Speed control mode: The photocoupler turns ON during motor operation.

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)

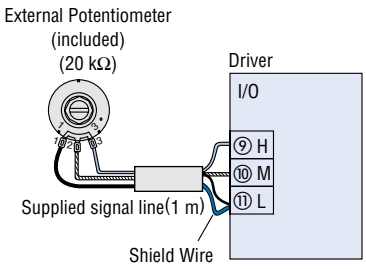
If a one shot input (0.1s or more) is given to the rotational direction or START input, the ALARM LED will blink a number of times corresponding to the protective function that has been activated. This blinking pattern will be repeated every five seconds. This makes it possible for a PLC or other controller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

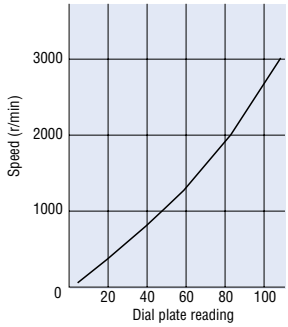


Example: Three outputs (overvoltage protection)

● 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."

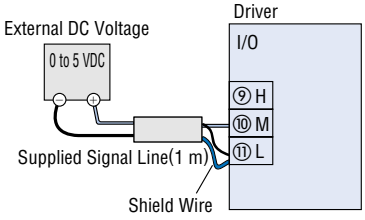


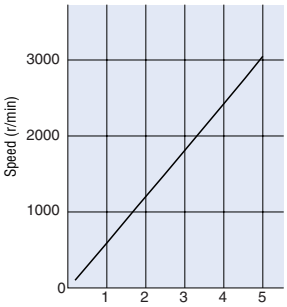


External potentiometer dial plate reading vs. speed characteristics

● 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.

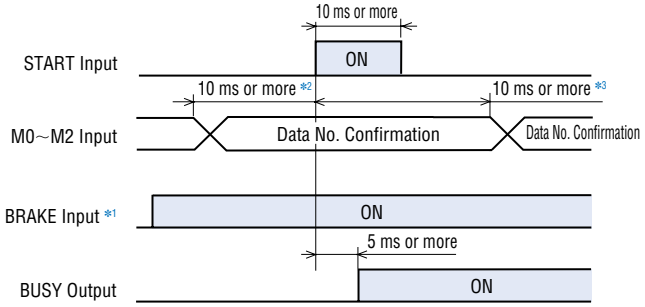
Data No. 0, 1: Positioning operation data / Continuous operation data

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

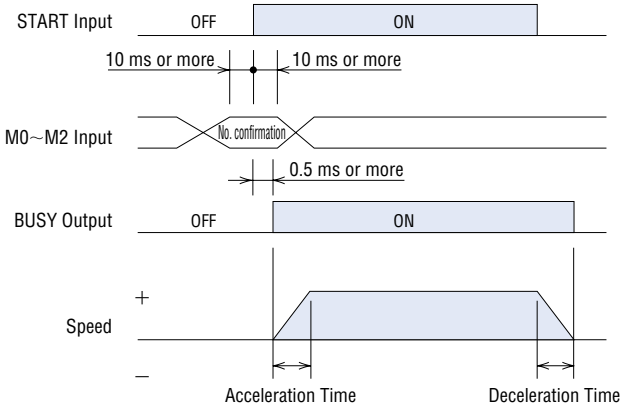


✻1 The motor stops when the BRAKE input is turned OFF. Before starting motor operation, be sure to turn the BRAKE input to ON.

✻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



✻ 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.

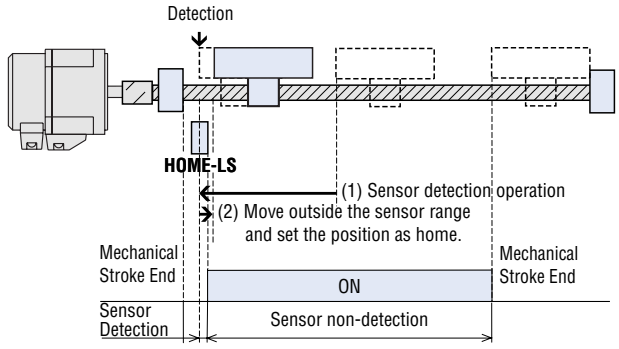
• Mechanical Home Sensor (HOME-LS) Input

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)

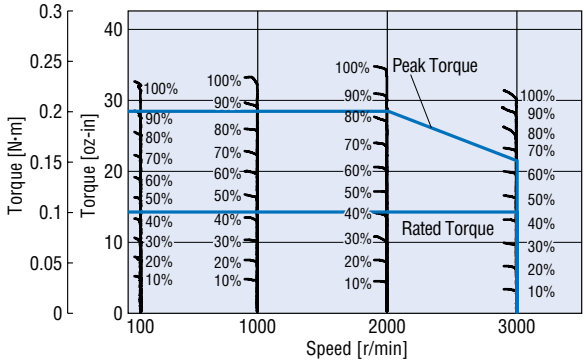
Torque-Limiting Function When Using the OPX-1A Control Module

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.

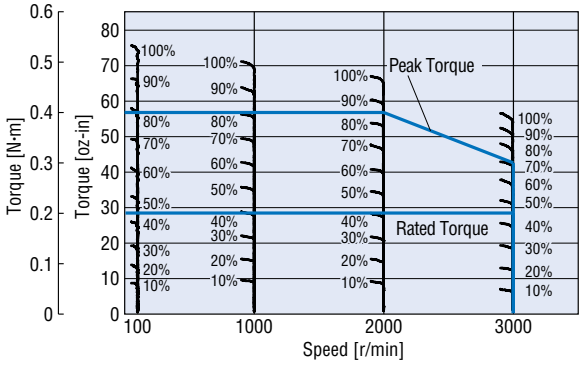
Gearhead output shaft speed N_G=Motor speed×1 / Gearhead ratio
Gearhead output shaft torque T_G=Motor torque×Gearhead ratio×0.9 (coefficient)

Speed — Torque Limit Characteristics (Reference Values)

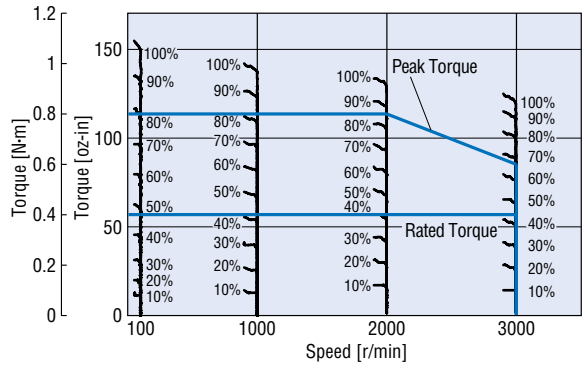
BX230□-A/BX230□-□
BX230□M-A/BX230□M-□



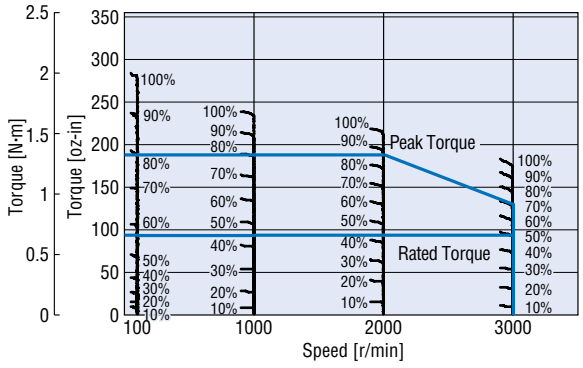
BX460□-A/BX460□-□
BX460□M-A/BX460□M-□



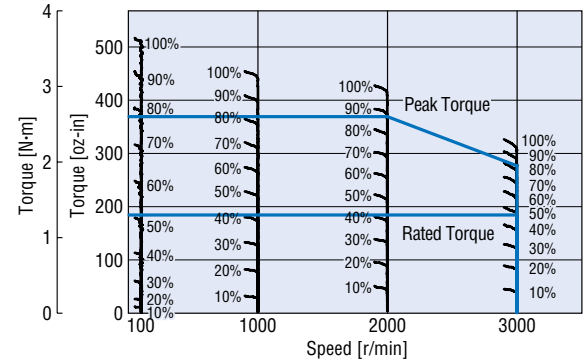
BX5120□-A/BX5120□-□
BX5120□M-A/BX5120□M-□



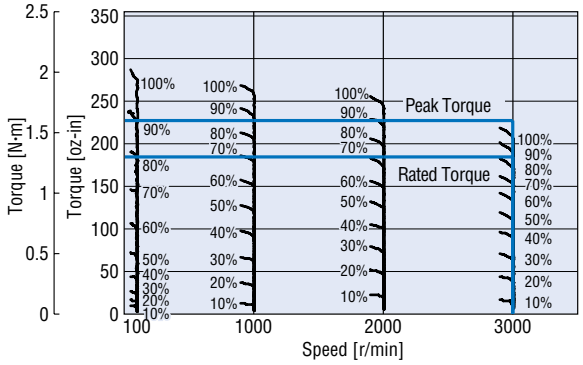
BX6200□-A/BX6200□-□
BX6200□M-A/BX6200□M-□



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.

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.

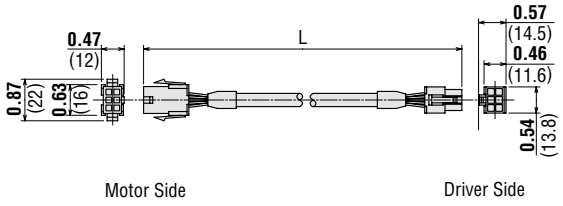
Round Shaft with Electromagnetic Brake

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

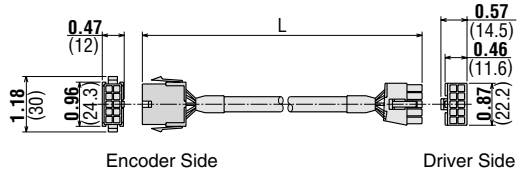
Accessories (Sold Separately)

Extension Cable / Flexible Extension Cable

For Motor



For Encoder

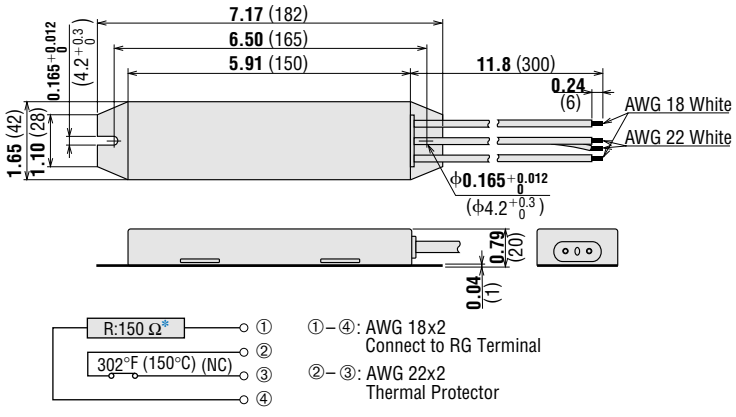


Regeneration Unit

EPRC-400P, RGB100

Weight: 0.55 lb. (0.25 kg)

DXF C194



* **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.

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

Brushless DC Motor Systems

FBLⅡ Series

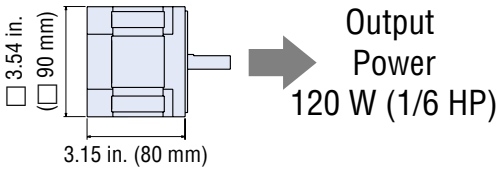
The **FBLⅡ** Series consists of a high performance, compact, brushless DC motor and driver. This product is available with 75 W (1/10 HP) and 120 W (1/6 HP) output power.
For easy installation, the combination type (pre-assembled gearmotors) comes with the motor and gearhead already assembled.

Combination Type (Pre-assembled Gearmotors)
The combination type (pre-assembled gearmotors) come with the motor and its dedicated gearhead already assembled. This simplifies installation in equipment. Motors and gearheads are also available separately so they can be on hand to make changes or repair.

Features

Compact and High Power

The use of brushless DC motor greatly reduces the total motor length while achieving high power. The **FBLⅡ** outputs a high power of 120 W (1/6 HP) with a frame size of 3.54 in. sq. (90 mm sq.) and a total length of 3.15 in. (80 mm), allowing to easily downsize applications.



FBL5120

Excellent Speed Stability

The **FBLⅡ** Series offers excellent speed fluctuation characteristics. Speed fluctuation is only minimally affected by the load.
Speed regulation: with load −1% maximum,
with voltage ±1% maximum,
with temperature ±1% maximum

Wide Range of Speed Control

In addition to offering a wide speed control range from 300 r/min to 3000 r/min, the motor generates constant torque across the entire speed range.

Acceleration and Deceleration Function

The driver is provided with an acceleration/deceleration function which makes it possible to smoothly start and stop the motor.

High Strength Gearheads

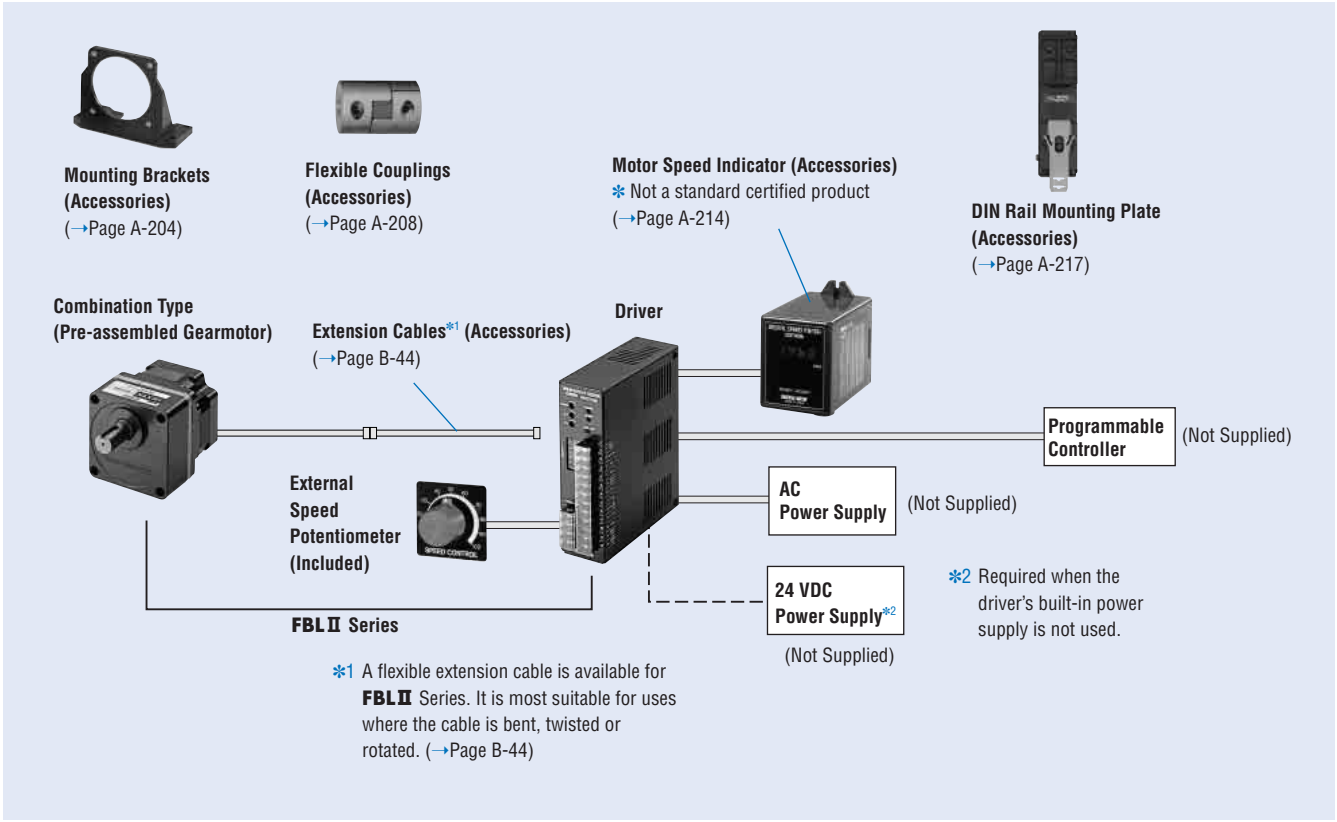
Pre-assembled gearmotors use specifically designed high strength **GFB** gearheads, providing torque of up to 260 lb-in (30 N·m).

Safety Standards and CE Marking

Standards		Certification Body	Standards File No.	CE Marking
Motor	UL1004	UL	E62327	Low Voltage Directives
	CSA C22.2 No.100			
	EN60950	DEMKO	124888	
	EN60034-1	Conform to EN/IEC Standards		
	EN60034-5			
Driver	UL508C	UL	E171462	
	CSA C22.2 No.14			
	EN60950*	DEMKO	131974	

✻ The three-phase 200-230 VAC type conforms to EN standards.
- **Details of Safety Standards**→Page G-2
- When the system is approved under various safety standards, the model names in the motor and driver nameplates are the approved model names.
  List of Motor and Driver Combinations → Page B-43

System Configuration



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

Product Number Code

FBL 5 75 A W - 5

- **Number**: Gear Ratio
- **A**: Round Shaft Type
- **W**: Meets Safety Standards
- **Voltage** **A**: Single-Phase 100-115 VAC, **C**: Single-Phase 200-230 VAC, **S**: Three-Phase 200-230 VAC
- **Output Power** **75**: 75 W (1/10 HP), **120**: 120 W (1/6 HP)
- **Motor Frame Size** **5**: 3.54 in. sq. (90 mm sq.)
- **Series** **FBL** : **FBLⅡ** Series

Product Line

Combination Type

Output Power HP	Output Power W	Power Supply Voltage	Model	Gear Ratio
1/10	75	Single-Phase 100-115 VAC	**FBL575AW-□**	**5, 10, 15, 20, 30, 50, 100, 200**
		Single-Phase 200-230 VAC	**FBL575CW-□**	**5, 10, 15, 20, 30, 50, 100, 200**
		Three-Phase 200-230 VAC	**FBL575SW-□**	**5, 10, 15, 20, 30, 50, 100, 200**
1/6	120	Single-Phase 100-115 VAC	**FBL5120AW-□**	**5, 10, 15, 20, 30, 50, 100, 200**
		Single-Phase 200-230 VAC	**FBL5120CW-□**	**5, 10, 15, 20, 30, 50, 100, 200**
		Three-Phase 200-230 VAC	**FBL5120SW-□**	**5, 10, 15, 20, 30, 50, 100, 200**

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

Round Shaft Type

Output Power HP	Output Power W	Power Supply Voltage	Model
1/10	75	Single-Phase 100-115 VAC	**FBL575AW-A**
		Single-Phase 200-230 VAC	**FBL575CW-A**
		Three-Phase 200-230 VAC	**FBL575SW-A**
1/6	120	Single-Phase 100-115 VAC	**FBL5120AW-A**
		Single-Phase 200-230 VAC	**FBL5120CW-A**
		Three-Phase 200-230 VAC	**FBL5120SW-A**

Specifications

Model		Combination Type	FBL575AW-□	FBL575CW-□	FBL575SW-□	FBL5120AW-□	FBL5120CW-□	FBL5120SW-□
		Round Shaft Type	FBL575AW-A	FBL575CW-A	FBL575SW-A	FBL5120AW-A	FBL5120CW-A	FBL5120SW-A
Rated Output Power		HP (W)	1/10 (75)			1/6 (120)		
Power Source	Voltage		Single-Phase 100-115 VAC±10%	Single-Phase 200-230 VAC±10%	Three-Phase 200-230 VAC±10%	Single-Phase 100-115 VAC±10%	Single-Phase 200-230 VAC±10%	Three-Phase 200-230 VAC±10%
	Frequency		50/60 Hz					
	Rated Input Current	A	2.3	1.4	0.75	3.0	1.8	1.0
	Maximum Input Current	A	2.6	2.0	1.2	3.8	2.7	1.6
Rated Torque		oz-in (N·m)	35 (0.25)			56 (0.4)		
Starting Torque		oz-in (N·m)	45 (0.32)			71 (0.5)		
Permissible Load Inertia J *1		oz-in^2 ($\times10^{-4}$ kg·m^2)	20 (3.75)			30 (5.6)		
Rated Speed		r/min	3000					
Variable Speed Range		r/min	300～3000					
Speed Regulation	Load		−1% Max. (0～rated torque, at 3000 r/min)					
	Voltage		±1% Max. (Power supply voltage ±10%, at 3000 r/min with no load)					
	Temperature		±1% Max. [32°F～122°F (0°C～+50°C) at 3000 r/min with no load]					

*1 The permissible load inertia specified above is only applicable for round shaft type. Permissible Load Inertia for Combination Type → Page B-37
*2 Single-phase motors are certified by DEMKO.
● Enter the gear ratio in the box (□) with the model name.
● The values for each item is for the motor only.

Common Specifications

Item	Specifications
Acceleration/Deceleration Time	0.5～15 sec. (at 3000 r/min)
Speed Control Method	Any one of the following methods 1. By built-in potentiometer (1 piece) 2. By external potentiometer (20 kΩ 1/4 W) 3. By DC voltage control (0～5 VDC)
Input Signal	Photocoupler Input Input Impedance 4.8 kΩ 24 VDC±10% Common to EXT. VR., CW, CCW, SLOW DOWN
Output Signal	Open Collector Output External Use Condition 26.4VDC, 10 mA Max. Common to SPEED OUT, ALARM OUT
Protection Functions*1	When the following are activated, the alarm signal will be output and the motor will come to a natural stop: ● Overload Protection: Activated within approximately 5 seconds of the motor load exceeding rated torque. ● Overheat Protection: Activated when the temperature of the heat sink inside driver exceeds approximately 194°F (90°C). ● Overvoltage Protection: Activated when driving a load exceeding the permissible load inertia, or when motor speed is increased due to gravitational forces. ● Undervoltage Protection: Activated when an input voltage to the driver is less than the specified voltage (−10%). ● Out-of-phase Protection: Activated when the sensor wire inside the motor cable is disconnected during motor operation.
Motor Insulation Class*2	Class E [248°F (120°C)]
Rating	Continuous

*1 With the **FBL Ⅱ** Series, motor speed cannot be controlled in applications where the motor's shaft is turned by the load, as in lowering operations. Also, to prevent damage to the driver during lowering operations, if the primary voltage of the driver's inverter exceeds the permissible value, the protection circuit engages and the motor comes to a natural stop.
*2 Motor insulation is recognized as Class A [221°F (105°C)] by UL and CSA standards.

General Specifications

Item		Motor	Driver
Insulation Resistance		100 MΩ or more when 500 VDC megger is applied between the windings and the frame under normal ambient temperature and humidity.	100 MΩ or more when 500 VDC megger is applied between the power supply input terminal and the Protective Earth terminal, between the power supply input terminal and I/O terminal after continuous operation under normal ambient temperature and humidity.
Dielectric Strength		Sufficient to withstand 1.5 kV at 50 Hz applied between the windings and the frame for 1 minute after continuous operation under normal ambient temperature and humidity.	Sufficient to withstand 1.8 kV (3 kV) at 50 Hz applied between the power supply input terminal and the Protective Earth terminal (I/O terminal) for 1 minute after continuous operation under normal ambient temperature and humidity.
Operating Environmental Conditions	Ambient Temperature	32°F～122°F (0°C～+50°C) (nonfreezing)	
	Ambient Humidity	85% maximum (noncondensing)	
	Atmosphere	No corrosive gases or dust	
Degree of Protection		IP40	IP10

Gearmotor — Torque Table

Unit = Upper values: lb-in/Lower values: N·m

Model	Speed Range r/min	60~600	30~300	20~200	15~150	10~100	6~60	3~30	1.5~15
	Gear Ratio	**5**	**10**	**15**	**20**	**30**	**50**	**100**	**200**
FBL575AW-□ **FBL575CW-□** **FBL575SW-□**		9.7 1.1	20 2.3	30 3.4	39 4.5	57 6.5	95 10.8	190 21.5	260 30
FBL5120AW-□ **FBL5120CW-□** **FBL5120SW-□**		15.9 1.8	31 3.6	47 5.4	63 7.2	91 10.3	152 17.2	260 30	260 30

- Enter the gear ratio in the 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.

Permissible Overhung Load and Permissible Thrust Load

Combination Type

Model	Gear Ratio	Permissible Overhung Load				Permissible Thrust Load	
		0.39 in. (10 mm) from shaft end		0.79 in. (20mm) from shaft end			
		lb.	N	lb.	N	lb.	N
FBL575AW-□ **FBL575CW-□**	**5**	67	300	90	400	33	150
FBL575SW-□ **FBL5120AW-□**	**10~20**	90	400	112	500		
FBL5120CW-□ **FBL5120SW-□**	**30~200**	112	500	146	650		

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

Round Shaft Type

Model	Permissible Overhung Load			
	0.39 in. (10mm) from shaft end		0.79 in. (20 mm) from shaft end	
	lb.	N	lb.	N
FBL575AW-A **FBL575CW-A** **FBL575SW-A**	29	130	33	150
FBL5120AW-A **FBL5120CW-A** **FBL5120SW-A**	36	160	38	170

- Permissible Thrust Load: Avoid thrust loads as much as possible.
  If thrust load is unavoidable, keep it to no more than half the motor weight.

Permissible Load Inertia J for Combination Type

Unit = Upper values: oz-in^2/Lower values: $\times 10^{-4}$ kg·m^2

Model / Gear Ratio	5	10	15	20	30	50	100	200
FBL575AW-□ **FBL575CW-□** **FBL575SW-□**	137	550	1230	2200	4900	13700	13700	13700
FBL5120AW-□ **FBL5120CW-□** **FBL5120SW-□**	25	100	225	400	900	2500	2500	2500

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

Speed — Torque Characteristics

(The characteristics shown below are only applicable for the motors only.)

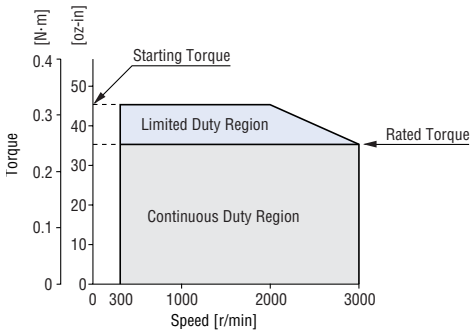
Continuous Duty Region

Continuous operation is possible in this region.

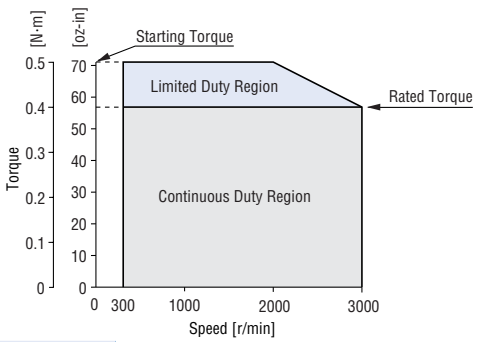
Limited Duty Region

This region is used primarily when accelerating. When a load that exceeds the rated torque is applied continuously for approximately 5 seconds, overload protection is activated and the motor comes to stop.

FBL575AW-□/FBL575CW-□/FBL575SW-□
FBL575AW-A/FBL575CW-A/FBL575SW-A



FBL5120AW-□/FBL5120CW-□/FBL5120SW-□
FBL5120AW-A/FBL5120CW-A/FBL5120SW-A



Dimensions B-38 | Connection and Operation B-40 | Motor and Driver Combinations B-43

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.

Motor/Gearhead

FBL575AW-□, FBL575CW-□, FBL575SW-□ (Combination Type)

Motor: FBLM575W-GFB

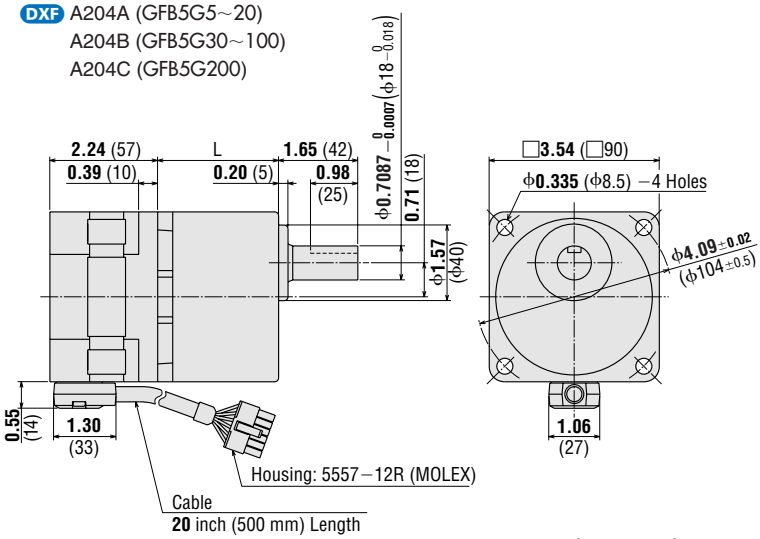
Gearhead: GFB5G□

Weight: 6.6 lb. (3.0 kg) included gearhead

DXF A204A (GFB5G5～20)

A204B (GFB5G30～100)

A204C (GFB5G200)

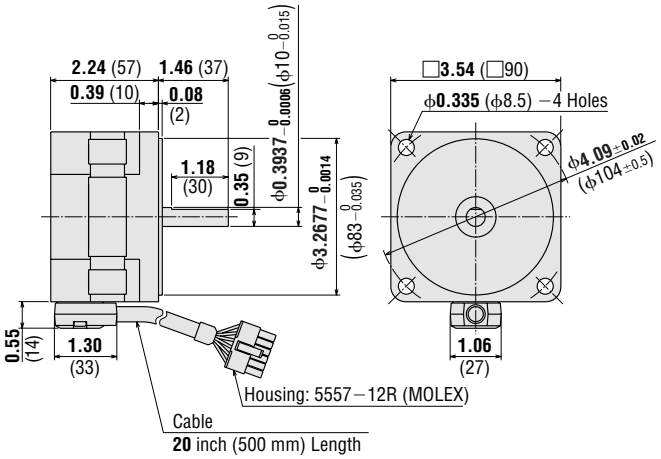


FBL575AW-A, FBL575CW-A, FBL575SW-A (Round Shaft Type)

Motor: FBLM575W-A

Weight: 3.3 lb. (1.5 kg)

DXF A206



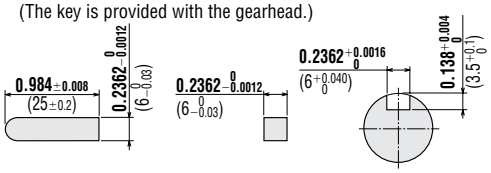
GFB5G5～20: L = **1.77** (45)

GFB5G30～100: L = **2.28** (58)

GFB5G200: L = **2.52** (64)

●Key and Key Slot (Scale 1/2)

(The key is provided with the gearhead.)



Motor/Gearhead

FBL5120AW-□, FBL5120CW-□, FBL5120SW-□ (Combination Type)

Motor: FBLM5120W-GFB

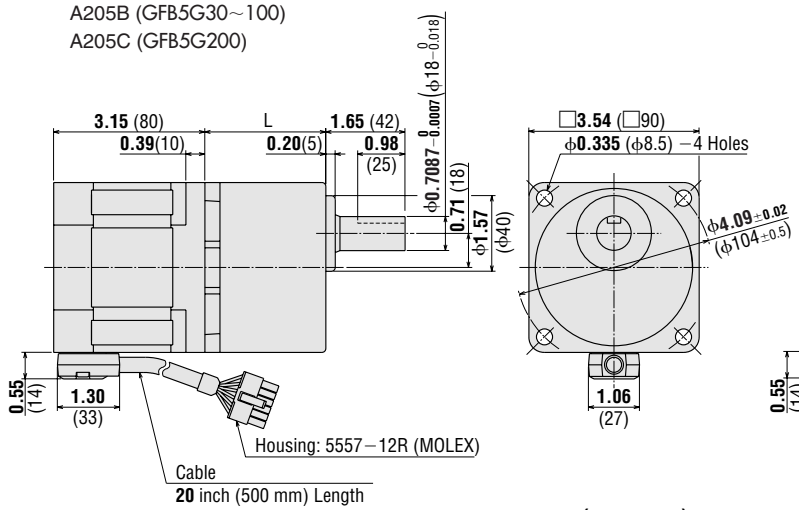
Gearhead: GFB5G□

Weight: 8.8 lb. (4.0 kg) included gearhead

DXF A205A (GFB5G5～20)

A205B (GFB5G30～100)

A205C (GFB5G200)

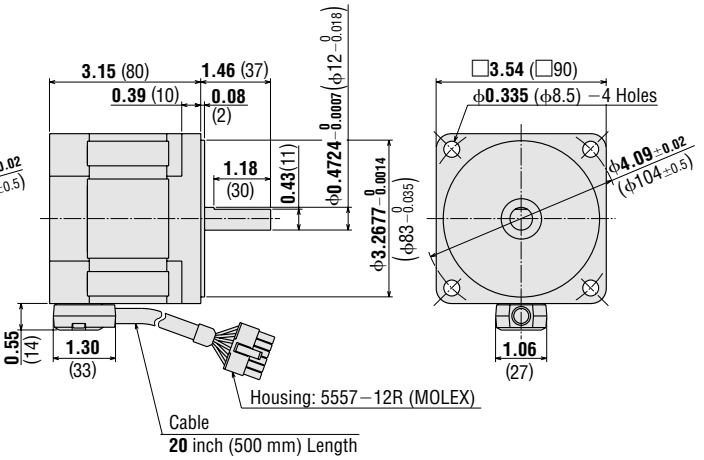


FBL5120AW-A, FBL5120CW-A, FBL5120SW-A (Round Shaft Type)

Motor: FBLM5120W-A

Weight: 5.5 lb. (2.5 kg)

DXF A207



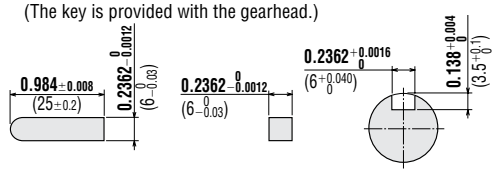
GFB5G5～20: L = **1.77** (45)

GFB5G30～100: L = **2.28** (58)

GFB5G200: L = **2.52** (64)

●Key and Key Slot (Scale 1/2)

(The key is provided with the gearhead.)

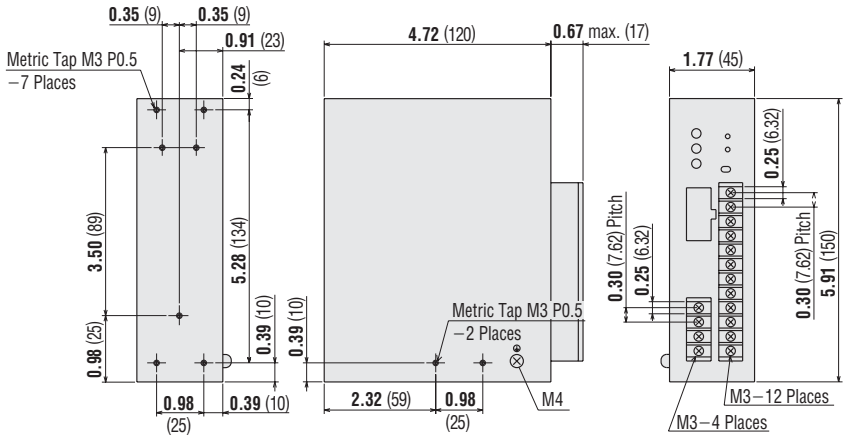


Driver

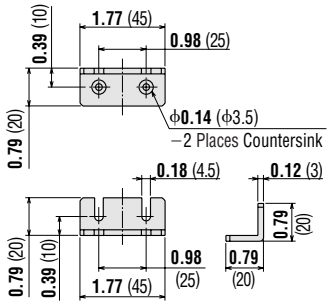
FBLD75AW, FBLD75CW, FBLD75SW, FBLD120AW, FBLD120CW, FBLD120SW

Weight: 1.8 lb. (0.8 kg)

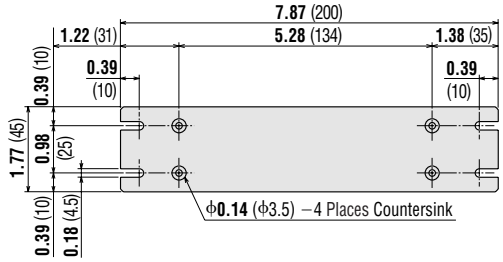
DXF A283



Driver Base Mounting Bracket Tab (1 set of 2 pieces included)

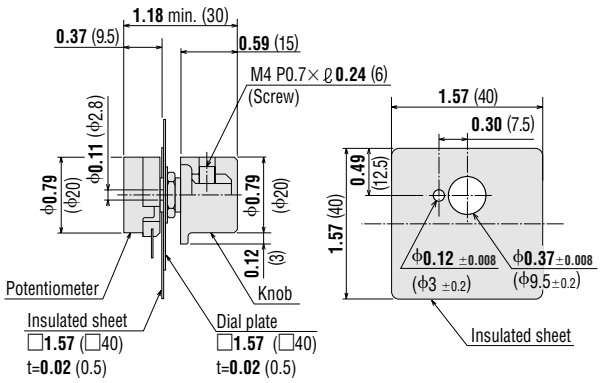


Driver Back Mounting Tab (included)



External Speed Potentiometer (included) (Scale 1/2)

PAVR-20KZ

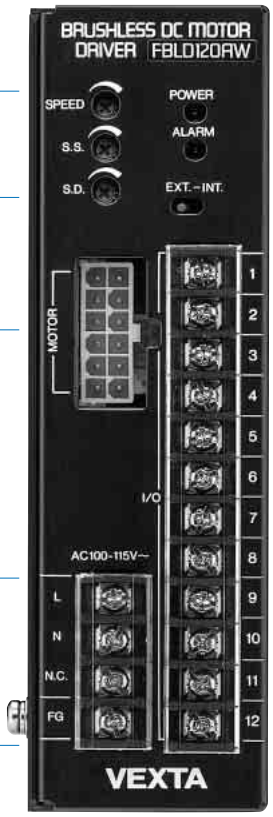


Connection and Operation

Built-in Potentiometer	
Display	Function
SPEED S.S. S.D.	Built-in Speed Potentiometer Potentiometer for Acceleration Time 0.5~15 sec. (at 3000 r/min) Potentiometer for Deceleration Time 0.5~15 sec. (at 3000 r/min)

For Motor Connector

Power Supply Terminal Block



LED Display		
Display	Function	Lighting Condition
POWER	Power Indicator	Lights when the power is ON.
ALARM	Alarm Indicator	●When a load exceeding the rated torque is applied to the motor for 5 seconds or more. ●When the temperature of the heat sink inside driver exceeds approximately 194°F (90°C). ●When the motor is driving a load inertia exceeding the permissible load inertia, or when the motor shaft is turned by the load (during lowering operations). ●When an input voltage to the driver is less than the specified voltage (−10%). ●When the sensor wire inside the motor cable is disconnected.

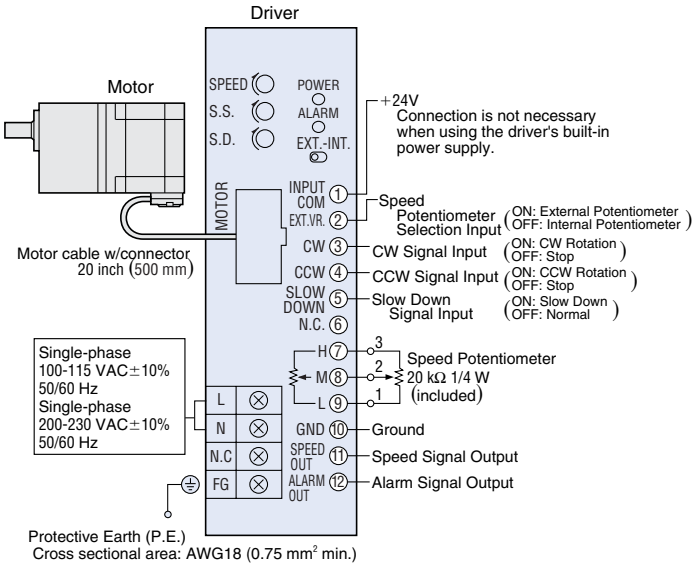
I/O Power Supply Switch	
Display	Function and Operation
EXT.	When controlling from a programmable controller or other external power supply. (Factory setting)
INT.	When controlling with a relay or switch. (Driver built-in power supply)

✻ When the switch is set to EXT., the input circuit is insulated by the photocoupler. However when the switch is set to INT., the input circuit is not insulated, so the system will not work, even if an input signal is input, unless GND is connected to a controller.

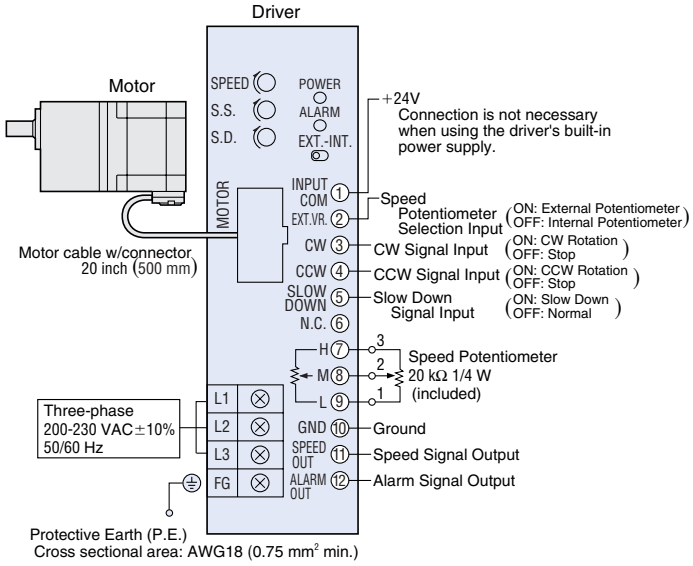
Input/Output Signal Terminal Block		
Display	Signal	Function and Operation
INPUT COM	Power Supply for Input Signals	External power supply +24 VDC A connection is not necessary when using the driver's built-in power supply.
EXT. VR.	Speed Potentiometer Selection Input	Input signal for selecting built-in or external speed potentiometer.
CW	CW Rotation Input	Input signal for selecting CW rotation/stop.
CCW	CCW Rotation Input	Input signal for selecting CCW rotation/stop.
SLOW DOWN	Deceleration Input	Input terminal for decelerating the motor to a stop.
N.C.	—	Not used.
H M L	Speed Control Input	Used when controlling the speed by an external potentiometer or DC voltage.
GND	Ground	Common ground terminal for input/output signals.
SPEED OUT	Speed Signal Output (Open-Collector Output)	Used when monitoring the rate of rotation; 12 pulses are output for each motor rotation.
ALARM OUT	Alarm Signal Output (Open-Collector Output)	This signal is output when a protection function is activated. The ALARM LED lights and the motor comes to a stop. To reset, turn off the power for 30 seconds, then turn the power on again.

Connection Diagrams

FBL575AW, FBL575CW, FBL5120AW, FBL5120CW



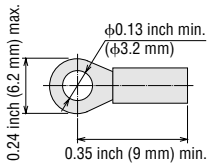
FBL575SW, FBL5120SW



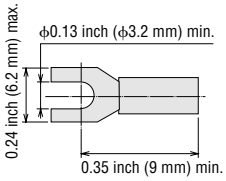
- Motor cable should be no more than 34.4 feet (10.5 m) in length. The motor comes with 20 inch (500 mm) long connector-equipped cable which can be extended by using an accessory extension cable (sold separately).
- There are six different length extension cables. Also there are flexible extension cables.
  [Length: 3.3 ft. (1 m), 6.6 ft. (2 m), 9.8 ft. (3 m), 16.8 ft. (5 m), 23 ft. (7 m), 32.8 ft. (10 m)]
- Extension Cables→ Page B-44
- Signal wires and motor wires should be kept away from equipment, power cables and other sources of magnetic noise.

Terminals

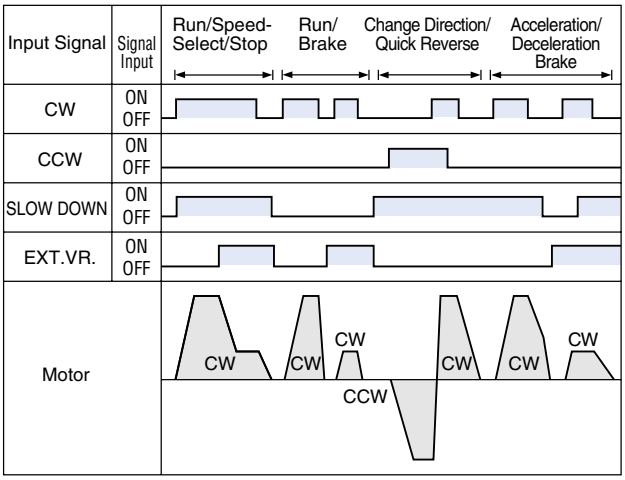
- Round Terminal with Insulation



- U-Shape Terminal with Insulation



Signal Input Timing Chart



- All operations of run, stop, direction change, deceleration and instantaneous stop can be controlled by the input signals of CW, CCW and SLOW DOWN.
- If the CW input is set to ON, the motor rotates in a clockwise direction as viewed from the shaft end of the motor; if the CW input is set to OFF, the motor stops. If the CCW input is set to ON, the motor rotates in the counterclockwise direction as viewed from the shaft end of the motor; if the CCW input is set to OFF, the motor stops. If both of the CW and CCW input are set to ON, the motor rotates in the clockwise direction. The acceleration time is set by the built-in acceleration potentiometer (S.S.).
- If the SLOW DOWN input is set to ON, the deceleration time is the value set by the built-in deceleration potentiometer (S.D.); if this input is set to OFF, the motor stops instantaneously.
- If the EXT. VR. input is set to ON, the external speed potentiometer or external DC voltage can be selected; if this input is set to OFF, the built-in speed potentiometer is selected.

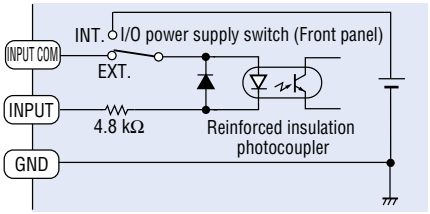
Notes:

- Pay attention to the temperature rise of the motor when used in applications requiring short cycles or bi-directional operation.
- Operate the motor so that the temperature of the motor case remains below 194°F (90°C) and the temperature of the driver remains below 176°F (80°C). If the temperature of the heat sink in the driver exceeds 194°F (90°C), the overheat performing protection activates and stops the motor.
- Precautions should be taken to ensure that while lowering the load or other operations in which the load exerts a rotational force on the motor shaft, the inverter's primary voltage does not exceed permissible levels, which could damage the driver.

● Input Signal Circuit

◆ Input Circuit

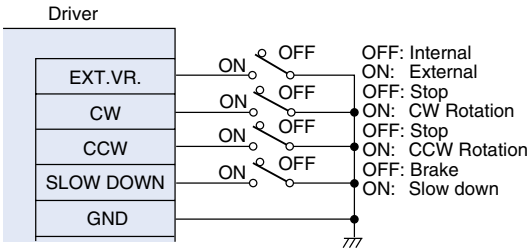
Common to EXT.VR., CW, CCW, SLOW DOWN



◆ Connection Example for Input Signals

· Control by Small Capacity Relays

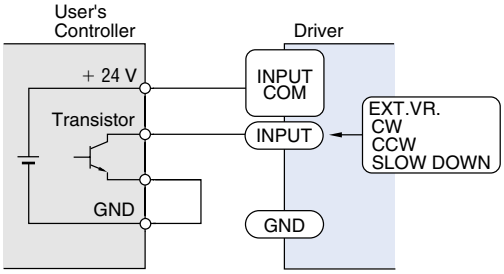
Flip the I/O power supply switch to "INT.".



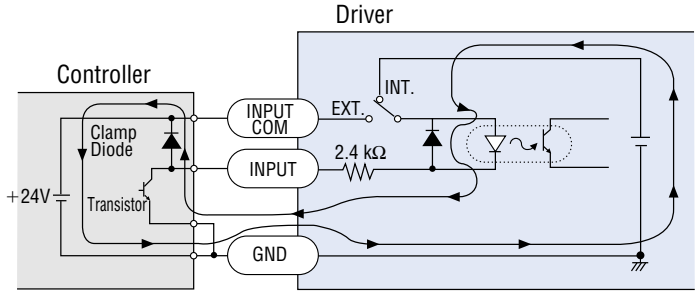
Use a small capacity contact point type relay capable of switching 24 VDC, 0.5 mA.

· Control by Transistor Output Type PLC

Flip the I/O power supply switch to EXT. position (factory setting).



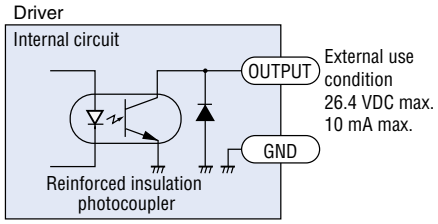
Precautions to observe when using a controller with an internal clamp diode: When using a controller with an internal clamp diode, be sure to set the I/O power supply switch on the front panel to the EXT. (external DC power supply) position. If the I/O power supply switch is in the INT. (built-in power supply) position, the current will flow as indicated by the arrows in the diagram, thereby causing the motor to run abnormally.



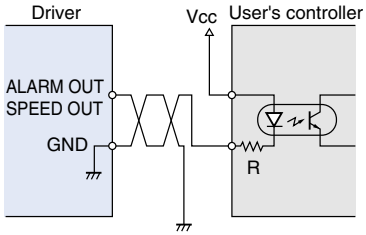
● Output Signal Circuit

◆ Output Circuit

Common to SPEED OUT and ALARM OUT



◆ Connection Example for Output Signals



Note:

- Since the signal output is an "Open Collector" output, an external power supply (Vcc) is necessary. For the external power supply, use 26.4 VDC or less and connect a limit resistance (R) not exceeding 10 mA. This connection is not necessary when the speed output or the alarm output functions are not used.

Speed signal output: Output at a rate of 12 pulses per motor rotation.

$$\text{Motor speed} = \frac{\text{Speed output cycle rate [Hz]}}{12} \times 60 \text{ [r/min]}$$

Alarm signal output: Output when the protection function for overload, overheat, overvoltage, under voltage or out-of-phase has been activated. When output, the current flows between ALARM OUT and GND terminal.

✻ To check the motor speed visually, connect a speed indicator **SDM496** (sold separately). See page A-214 for more information.

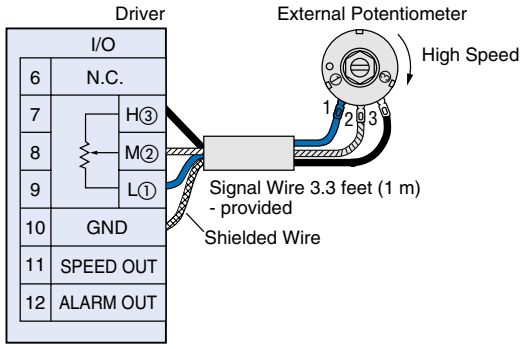
● Method of Speed Setting

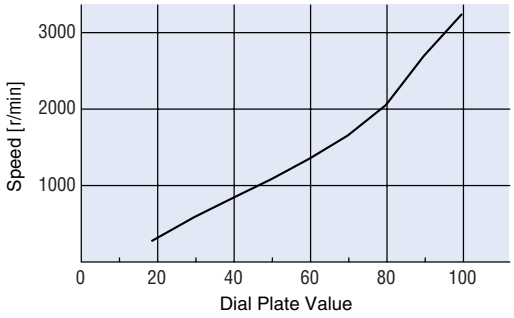
◆ Speed Control by Built-in Potentiometer

Motor speed is adjusted by using the built-in potentiometer located on the front panel. The built-in potentiometer is selected when the EXT. VR. input has been set to OFF.

◆ Speed Control by External Potentiometer

To control the speed of the motor with an external potentiometer, connect the external potentiometer provided with the motor as follows. The EXT. VR. input should be set to ON.

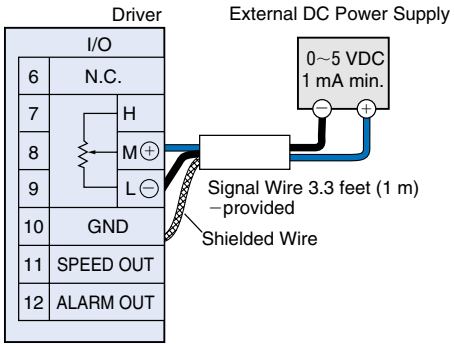


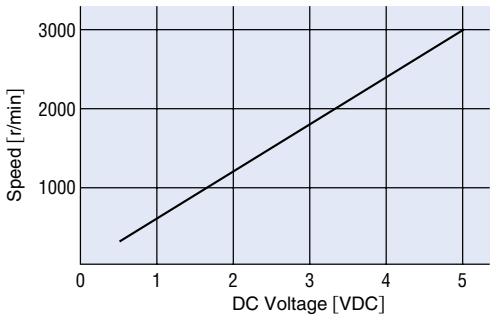


External speed potentiometer dial scale–speed characteristics (Representative Values)

◆ Speed Control by External DC Voltage

To control the speed of the motor by DC voltage, connect the DC power supply as follows. The EXT. VR input should be set to ON.





DC voltage–speed characteristics (Representative Values)

Notes:

- Signal wires provided should be used. (0.13 in. dia. 3.3 ft. length)
  The shielded wire of the signal line should be connected to the GND terminal. Also ensure that the shielded wire does not come into contact with other terminals on the external potentiometer or DC voltage source.
- Do not allow the voltage to exceed 5V, and be sure that there are no errors in polarity when making the connections.

■ List of Motor and Driver Combinations

Model name for motor, driver and gearhead combinations are shown below.

● Combination Type

Output Power HP	Output Power W	Model	Motor Model	Gearhead Model	Driver Model
1/10	75	**FBL575AW-□**	FBLM575W-GFB	GFB5G□	FBLD75AW
		FBL575CW-□			FBLD75CW
		FBL575SW-□			FBLD75SW
1/6	120	**FBL5120AW-□**	FBLM5120W-GFB		FBLD120AW
		FBL5120CW-□			FBLD120CW
		FBL5120SW-□			FBLD120SW

- Enter the gear ratio in the box (□) with the model name.

● Round Shaft Type

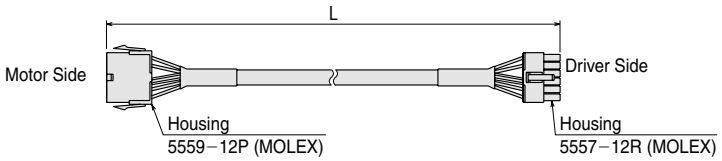
Output Power HP	Output Power W	Model	Motor Model	Driver Model
1/10	75	**FBL575AW-A**	FBLM575W-A	FBLD75AW
		FBL575CW-A		FBLD75CW
		FBL575SW-A		FBLD75SW
1/6	120	**FBL5120AW-A**	FBLM5120W-A	FBLD120AW
		FBL5120CW-A		FBLD120CW
		FBL5120SW-A		FBLD120SW

Dimensions B-38 | Connection and Operation B-40 | Motor and Driver Combinations B-43

Accessories (Sold separately)

Extension Cable

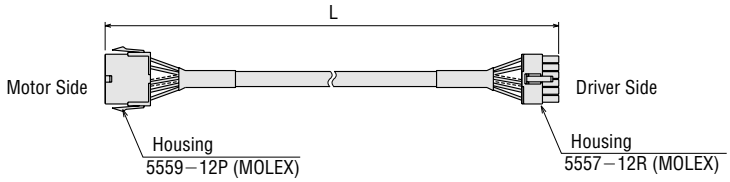
Model	Length: L [ft. (m)]
CC01FBL	3.3 (1)
CC02FBL	6.6 (2)
CC03FBL	9.8 (3)
CC05FBL	16.4 (5)
CC07FBL	23.0 (7)
CC10FBL	32.8 (10)



- Max. extended length: 34.5 feet (10.5 m)

Flexible Extension Cable

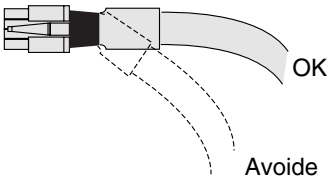
Model	Length: L [ft. (m)]
CC01FBLR	3.3 (1)
CC02FBLR	6.6 (2)
CC03FBLR	9.8 (3)
CC05FBLR	16.4 (5)
CC07FBLR	23.0 (7)
CC10FBLR	32.8 (10)



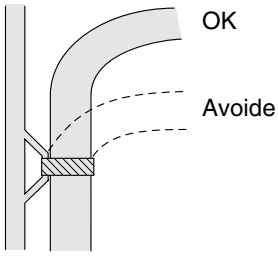
- Max. extended length: 34.5 feet (10.5 m)

Precautions for use of the Flexible Extension Cables

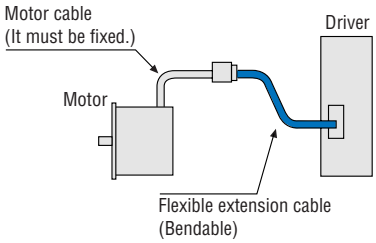
(1) Do not bend the cable at the cable connector location.



(2) Use the product with a minimum bend radius of 2.36 inch (60 mm).



(3) The motor cable itself is not designed to be bent. When bending is necessary, be sure to bend at the flexible extension cable.



Motor and Driver Combinations B-43

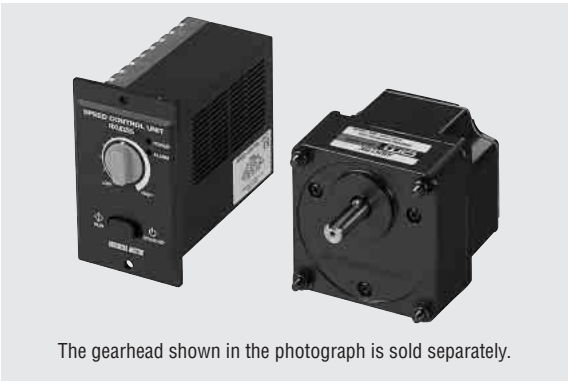
Connection and Operation B-40

Dimensions B-38

Brushless DC Motor Systems

AXU Series

The **AXU** Series combines a compact, brushless DC motor with a speed control unit. These systems provide space savings, easy wiring and simple operation.

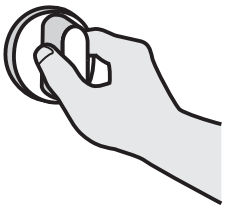


The gearhead shown in the photograph is sold separately.

Features

Easy Connection and Simple Operation

Just connect the motor connector to the control unit, and the **AXU** is ready for immediate use. The rate of rotation is easy to adjust using the speed control dial on the front of the speed control unit.



Thin and Compact

Compared to an AC speed control motor, the use of a brushless DC motor significantly reduces the size of the motor.

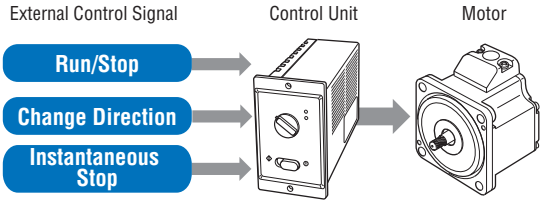
Motor Length: 1.65 inch (42 mm) for 10 W, 25 W
2.24 inch (57 mm) for 40 W, 90 W

Wide Speed Range and Constant Torque

Even with an available speed range of 100～2000 r/min, the **AXU** Series motor maintains a constant torque.

External Control Possible

Run/Stop, rotation direction and instantaneous stops can be controlled with external signals.



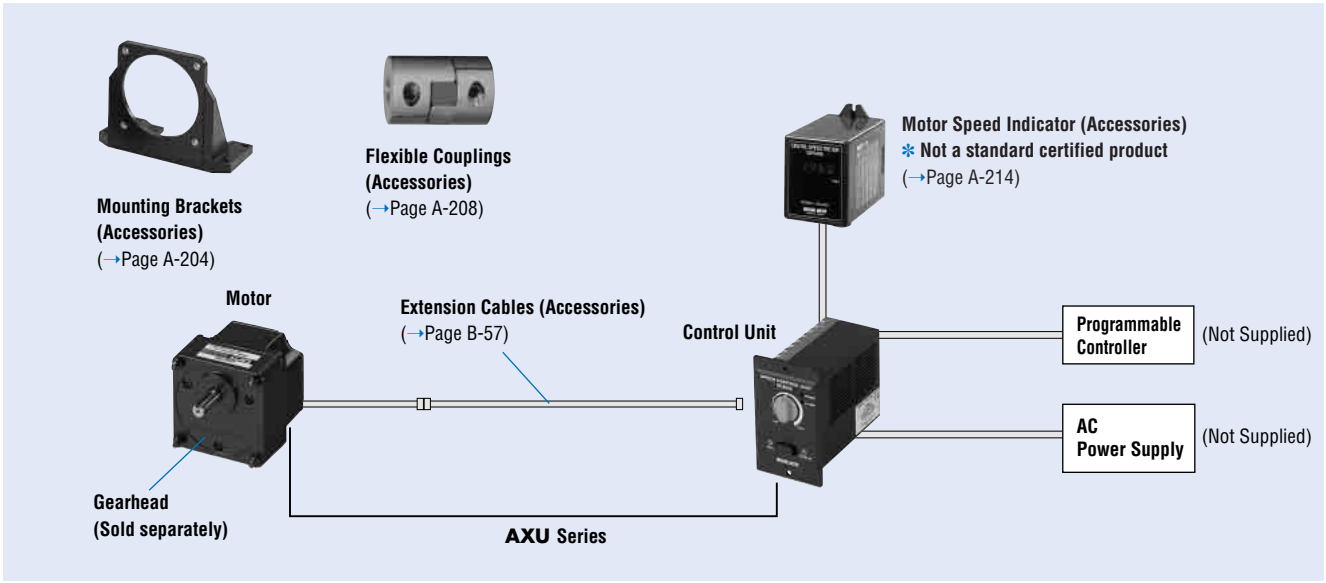
- Superior Speed Stability
  Speed regulation characteristics are −2% maximum with load, ±1% maximum with voltage and ±1% maximum with temperature.
- Acceleration/Deceleration Functions
  AXU Series motors can be set to accelerate and decelerate when the start and stop input is used.
- Protective Functions
  The **AXU** Series is equipped with protective functions to handle overload, overvoltage, out-of-phase, undervoltage and overspeed. When an abnormality is detected, an alarm is output and the motor comes to a stop.
- Motor Construction IP65
  A grade IP65 indicates protection against jets of water. It is safety if get splashed accidentally. However it is not suitable for washing the motor nor being operated under the circumstance of being splashed constantly.

Safety Standards and CE Marking

Standards		Certification Body	Standards File No.	CE Marking
Motor	UL1950	UL	E208200	Low Voltage Directives EMC Directives
	CSA C22.2 No.950			
	EN60950	Conform to EN/IEC Standards		
	EN60034-1			
	EN60034-5			
Control Unit	UL508C	UL	E171462	
	CSA C22.2 No.14			
	EN60950	Conform to EN/IEC Standards		
	EN50178			

- When the system is approved under various safety standards, the model names on the motor and control unit nameplates are the approved model names.
  List of Motor and Control Unit Combinations→Page B-57
- **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/control unit incorporated in the equipment.

System Configuration



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

Product Number Code

Motor and Control Unit

AXU 4 25 A - GN

Shaft Type **GN**: Pinion Shaft (for use with **GN** gearhead)
GU: Pinion Shaft (for use with **GU** gearhead)
A: Round Shaft

Voltage **A**: Single-Phase 100-115 VAC
C: Single-Phase 200-230 VAC
S: Three-Phase 200-230 VAC

Output Power **10**: 10 W (1/75 HP)
25: 25 W (1/30 HP)
40: 40 W (1/19 HP)
90: 90 W (1/8 HP)

Motor Frame Size **2**: 2.36 in. sq. (60 mm sq.)
4: 3.15 in. sq. (80 mm sq.)
5: 3.54 in. sq. (90 mm sq.)

Series
AXU: **AXU** Series

Gearhead

4 GN 50 KA

Type of Bearings and Shaft Size
KA: Ball bearing type and inch-sized output shaft
KHA: Ball bearing type and inch-sized output shaft for higher torque

Gear Ratio
(Example) **50**: Gear ratio of 50:1
10X: Denotes decimal gearhead with 10:1 gear ratio

Gearhead Type **GN**: **GN** type (for use with **GN**-type pinion shaft motor)
GU: **GU** type (for use with **GU**-type pinion shaft motor)

Gearhead Frame Size
2: 2.36 in. sq. (60 mm sq.)
4: 3.15 in. sq. (80 mm sq.)
5: 3.54 in. sq. (90 mm sq.)

● Gearheads must match the motor installation dimensions and shaft type.

Product Line

AXU Series

Output Power HP	Output Power W	Power Supply Voltage	Model: Pinion Shaft	Model: Round Shaft
1/75	10	Single-Phase 100-115 VAC	**AXU210A-GN**	**AXU210A-A**
		Single-Phase 200-230 VAC	**AXU210C-GN**	**AXU210C-A**
		Three-Phase 200-230 VAC	**AXU210S-GN**	**AXU210S-A**
1/30	25	Single-Phase 100-115 VAC	**AXU425A-GN**	**AXU425A-A**
		Single-Phase 200-230 VAC	**AXU425C-GN**	**AXU425C-A**
		Three-Phase 200-230 VAC	**AXU425S-GN**	**AXU425S-A**
1/19	40	Single-Phase 100-115 VAC	**AXU540A-GN**	**AXU540A-A**
		Single-Phase 200-230 VAC	**AXU540C-GN**	**AXU540C-A**
		Three-Phase 200-230 VAC	**AXU540S-GN**	**AXU540S-A**
1/8	90	Single-Phase 100-115 VAC	**AXU590A-GU**	**AXU590A-A**
		Single-Phase 200-230 VAC	**AXU590C-GU**	**AXU590C-A**
		Three-Phase 200-230 VAC	**AXU590S-GU**	**AXU590S-A**

Gearheads (Sold Separately)

Gearhead Model	Gear Ratio
2GN□KA	**3~180**
2GN10XK (Decimal Gearhead)	
4GN□KA	**3~180**
4GN10XK (Decimal Gearhead)	
5GN□KA	**3~180**
5GN10XK (Decimal Gearhead)	
5GU□KA	**3~180**
5GU10XKB (Decimal Gearhead)[for **5GU□KA**]	
5GU□KHA (High Power Type)	**50~180**
5GU10XK (Decimal Gearhead)[for **5GU□KHA**]	

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

Dimensions B-51 | Connection and Operation B-55 | Motor and Control Unit Combinations B-57

Specifications

Package Model	Pinion Shaft Type	AXU210A-GN	AXU210C-GN	AXU210S-GN	AXU425A-GN	AXU425C-GN	AXU425S-GN
	Round Shaft Type	AXU210A-A	AXU210C-A	AXU210S-A	AXU425A-A	AXU425C-A	AXU425S-A
Rated Output Power	HP (W)	1/75 (10)			1/30 (25)		
Power Source	Voltage	Single-Phase 100-115 VAC±10%	Single-Phase 200-230 VAC±10%	Three-Phase 200-230 VAC±10%	Single-Phase 100-115 VAC±10%	Single-Phase 200-230 VAC±10%	Three-Phase 200-230 VAC±10%
	Frequency	50/60 Hz					
	Rated Input Current A	0.7	0.4	0.25	1.1	0.65	0.4
	Maximum Input Current A	1.2	0.8	0.6	1.9	1.2	0.9
Rated Torque	oz-in (N·m)	7.1 (0.05)			17.7 (0.125)		
Starting Torque	oz-in (N·m)	8.5 (0.06)			21 (0.15)		
Permissible Load Inertia J *	oz-in^2 ($\times 10^{-4}$kg·m^2)	2.7 (0.5)			9.8 (1.8)		
Rated Speed	r/min	2000					
Variable Speed Range	r/min	100～2000 (speed ratio 20:1)					
Speed Regulation	Load	−2% Max. (0～ rated torque, at rated speed)					
	Voltage	±1% Max. (power supply voltage ±10 %, at rated speed with no load)					
	Temperature	±1% Max. (32°F～104°F [0°C～+40°C] at rated speed with no load)					

Package Model	Pinion Shaft Type	AXU540A-GN	AXU540C-GN	AXU540S-GN	AXU590A-GU	AXU590C-GU	AXU590S-GU
	Round Shaft Type	AXU540A-A	AXU540C-A	AXU540S-A	AXU590A-A	AXU590C-A	AXU590S-A
Rated Output Power	HP (W)	1/19 (40)			1/8 (90)		
Power Source	Voltage	Single-Phase 100-115 VAC±10%	Single-Phase 200-230 VAC±10%	Three-Phase 200-230 VAC±10%	Single-Phase 100-115 VAC±10%	Single-Phase 200-230 VAC±10%	Three-Phase 200-230 VAC±10%
	Frequency	50/60 Hz					
	Rated Input Current A	1.65	1.0	0.5	2.5	1.45	0.8
	Maximum Input Current A	2.4	1.5	1.0	3.8	2.4	1.5
Rated Torque	oz-in (N·m)	28 (0.20)			63 (0.45)		
Starting Torque	oz-in (N·m)	34 (0.24)			76 (0.54)		
Permissible Load Inertia J *	oz-in^2 ($\times 10^{-4}$kg·m^2)	18.1 (3.3)			32 (5.8)		
Rated Speed	r/min	2000					
Variable Speed Range	r/min	100～2000 (speed ratio 20:1)					
Speed Regulation	Load	−2% Max. (0～ rated torque, at rated speed)					
	Voltage	±1% Max. (power supply voltage ±10 %, at rated speed with no load)					
	Temperature	±1% Max. (32°F～104°F [0°C～+40°C] at rated speed with no load)					

* The Permissible Load Inertia specified above is only applicable to round shaft types. Permissible Load Inertia for Gearmotor Type→Page B-50

Common Specifications

Item	Specifications
Acceleration/Deceleration Time	0.5～10 sec. (at 2,000 r/min with no load) set by a potentiometer
Speed Control Method	Speed potentiometer on front panel
Input Signal	Photocoupler Input, Input Impedance 2 kΩ, Operated by internal power supply Common Clockwise (CW) and Counterclockwise (CCW) Inputs
Output Signal	Open Collector Output, External Use Condition 26.4 VDC, 10 mA Max. Speed Signal Output (SPEED OUT) 30 P/R, Alarm Signal Output (ALARM OUT)
Protection Functions *1	When the following are activated, the alarm signal will be output and the motor will come to a stop: ● Overload Protection: Activated when the motor load exceeds rated torque for a minimum of 5 seconds. ● Overvoltage Protection: Activated when the voltage applied to the control unit exceeds 115 VAC or 230 VAC by a minimum of 20%. ● Out-of-Phase Protection: Activated when the sensor wire inside the motor cable is disconnected during motor operation. ● Undervoltage Protection: Activated when the voltage applied to the control unit falls below 100 VAC or 200 VAC by a minimum of 30%. ● Overspeed Protection: Activated when the speed exceeds 2800 r/min.
Motor Insulation Class	Class E (248°F [120°C]) *2
Rating	Continuous

*1 Motor speed cannot be controlled in applications where the motor's shaft is turned by the load, as in lowering operations. To prevent damage to the driver during lowering operations, the motor comes to a natural stop if the primary voltage of the driver's inverter exceeds the permissible value.
*2 Motor insulation is recognized as Class A [221°F (105°C)] by UL and CSA standards.

General Specifications

Item		Motor	Control Unit
Insulation Resistance		100 MΩ or more when 500 VDC megger is applied between the windings and the frame.	100 MΩ or more when 500 VDC megger is applied between the power supply input terminal and the ground terminal, and between the power supply input terminal and the I/O terminal.
Dielectric Strength		Sufficient to withstand 1.5 kVAC at 50 Hz applied between the windings and the frame for 1 minute.	Sufficient to withstand 1.8 kVAC at 50 Hz applied between the ground terminal and the power supply input terminal for 1 minute, and 3 kVAC at 50 Hz applied between the ground terminal and the I/O terminal for 1 minute.
Operating Environment Conditions	Ambient Temperature	32°F~122°F (0°C~+50°C)* (nonfreezing)	32°F~104°F (0°C~+40°C)*(nonfreezing)
	Humidity	85% maximum (noncondensing)	
	Atmosphere	No corrosive gases or dust	
Degree of Protection		IP65 (except for the mounting surface)	IP10

- For round shaft types: Please attach to the following sizes of heat sinks to maintain a maximum motor housing temperature of 194 °F (90 °C)
- **AXU210□-A**: 5:31 in. ×5.31 in. (135 mm×135 mm), 0.20 in. (5 mm) thick
- **AXU425□-A**: 6:50 in. ×6.50 in. (165 mm×165 mm), 0.20 in. (5 mm) thick
- **AXU540□-A**: 7.87 in. ×7.87 in. (200 mm×200 mm), 0.20 in. (5 mm) thick
- **AXU590□-A**: 7.87 in. ×7.87 in. (200 mm×200 mm), 0.20 in. (5 mm) thick

* Ambient temperature of the motor is recognized as 32 °F~104 °F (0 °C~+40 °C) by UL and CSA Standards.

Gearmotor–Torque Table

Maximum Torque When Using a Decimal Gearhead

- **2GN□KA** with **2GN10XK**: 26 lb-in (3 N·m)
- **4GN□KA*** with **4GN10XK**: 70 lb-in (8 N·m)
- **5GN□KA** with **5GN10XK**: 88 lb-in (10 N·m)
- **5GU□KA** with **5GU10XKB**: 177 lb-in (20 N·m)
- **5GU□KHA** with **5GU10XK**: 260 lb-in (30 N·m)

* All gear ratios except 25:1, 30:1, 36:1: 53 lb-in (6 N·m)

Unit=Upper Values: lb-in/Lower Values: N·m

Model / Motor/Gearhead	Speed Range r/min	33 ~ 667	28 ~ 556	20 ~ 400	17 ~ 333	13 ~ 267	11 ~ 222	8 ~ 160	6.7 ~ 133	5.6 ~ 111	4 ~ 80	3.3 ~ 67	2.8 ~ 56	2 ~ 40	1.7 ~ 33	1.3 ~ 27	1.1 ~ 22	1 ~ 20	0.83 ~ 17	0.67 ~ 13	0.56 ~ 11
	Gear Ratio	**3**	**3.6**	**5**	**6**	**7.5**	**9**	**12.5**	**15**	**18**	**25**	**30**	**36**	**50**	**60**	**75**	**90**	**100**	**120**	**150**	**180**
AXU210A-GN AXU210C-GN AXU210S-GN / **2GN□KA**		1.06 0.12	1.32 0.15	1.77 0.2	2.1 0.24	2.6 0.3	3.1 0.36	4.5 0.51	5.3 0.61	6.4 0.73	8.0 0.91	9.7 1.1	11.5 1.3	15 1.7	17.7 2	22 2.5	26 3	26 3	26 3	26 3	26 3
AXU425A-GN AXU425C-GN AXU425S-GN / **4GN□KA**		2.6 0.3	3.1 0.36	4.5 0.51	5.3 0.61	6.7 0.76	8.0 0.91	11.5 1.3	13.2 1.5	15.9 1.8	20 2.3	23 2.7	29 3.3	36 4.1	44 5	54 6.2	65 7.4	70 8	70 8	70 8	70 8
AXU540A-GN AXU540C-GN AXU540S-GN / **5GN□KA**		4.3 0.49	5.1 0.58	7.1 0.81	8.5 0.97	10.6 1.2	13.2 1.5	17.7 2.0	21 2.4	25 2.9	32 3.7	38 4.4	46 5.3	58 6.6	69 7.9	87 9.9	88 10	88 10	88 10	88 10	88 10
AXU590A-GU AXU590C-GU AXU590S-GU / **5GU□KA**		9.7 1.1	11.5 1.3	15.9 1.8	19.4 2.2	23 2.7	29 3.3	36 4.1	43 4.9	52 5.9	65 7.4	78 8.9	94 10.7	131 14.9	157 17.8	176 19.9	177 20	177 20	177 20	177 20	177 20
AXU590A-GU AXU590C-GU AXU590S-GU / **5GU□KHA**		—	—	—	—	—	—	—	—	—	—	—	—	131 14.9	157 17.8	176 19.9	210 23.9	230 26.6	260 30	260 30	260 30

- Enter the appropriate gear ratio in the box (□) within the gearhead 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.
- **KA** type is standard gearhead. **KHA** type is high-powered gearhead.

Permissible Overhung Load and Permissible Thrust Load

Gearheads

Model	Gear Ratio	Permissible Overhung Load 0.39 in. (10 mm) from shaft end lb.	Permissible Overhung Load 0.39 in. (10 mm) from shaft end N	Permissible Overhung Load 0.79 in. (20 mm) from shaft end lb.	Permissible Overhung Load 0.79 in. (20 mm) from shaft end N	Permissible Trust Load lb.	Permissible Trust Load N
2GN□KA	**3~18**	11.2	50	18	80	6.7	30
	25~180	27	120	40	180		
4GN□KA	**3~18**	22	100	33	150	11.2	50
	25~180	45	200	67	300		
5GN□KA	**3~18**	56	250	78	350	22	100
	25~180	67	300	101	450		
5GU□KA	**3~9**	90	400	112	500	33	150
	12.5~18	101	450	135	600		
	25~180	112	500	157	700		
5GU□KHA	**50~180**	90	400	135	600	33	150

- Enter the gear ratio in the box (□) within the model name.
- **KA** type is standard gearhead. **KHA** type is high-powered gearhead.

Dimensions B-51 | Connection and Operation B-55 | Motor and Control Unit Combinations B-57

Round Shaft Type

Model	Permissible Overhung Load			
	0.39 in. (10 mm) from shaft end		0.79 in. (20 mm) from shaft end	
	lb.	N	lb.	N
AXU210□-A	15.7	70	22	100
AXU425□-A	27	120	31	140
AXU540□-A	36	160	38	170
AXU590□-A	36	160	38	170

- Enter the appropriate letter in the box (□) within the motor model name. (**A**: Single-phase 100-115 VAC, **C**: Single-phase 200-230 VAC, **S**: Three-phase 200-230 VAC).
- Permissible Thrust Load: Avoid thrust loads as much as possible. If a thrust load is unavoidable, keep it to no more than half the motor weight.

Permissible Load Inertia J

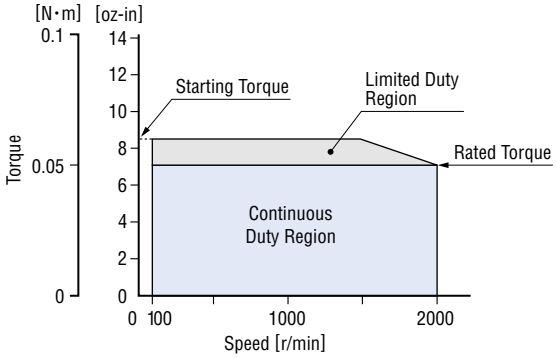
Unit=Upper Values: oz-in^2/Lower Values: $\times 10^{-4}$ kg·m^2

Model Motor/Gearhead \ Gear Ratio	3	3.6	5	6	7.5	9	12.5	15	18	25	30	36	50	60	75	90	100	120	150	180
AXU210□-GN/2GN□KA	3.1 0.558	4.4 0.804	8.5 1.55	12.2 2.23	19.1 3.49	27 5.02	53 9.69	77 14	110 20.1	210 38.8	310 55.8	440 80.4	850 155	850 155	850 155	850 155	850 155	850 155	850 155	850 155
AXU425□-GN/4GN□KA	10.8 1.98	15.6 2.85	30 5.5	43 7.92	68 12.4	97 17.8	188 34.4	270 49.5	390 71.3	750 138	1080 198	1560 285	3000 550	3000 550	3000 550	3000 550	3000 550	3000 550	3000 550	3000 550
AXU540□-GN/5GN□KA	19.7 3.6	28 5.18	55 10	79 14.4	123 22.5	177 32.4	340 62.5	490 90	710 130	1370 250	1970 360	2800 518	5500 1000	5500 1000	5500 1000	5500 1000	5500 1000	5500 1000	5500 1000	5500 1000
AXU590□-GU/5GU□KA	49 9	71 13	137 25	197 36	310 56.3	440 81	850 156	1230 225	1770 324	3400 625	4900 900	7100 1296	13700 2500	13700 2500	13700 2500	13700 2500	13700 2500	13700 2500	13700 2500	13700 2500
AXU590□-GU/5GU□KHA	—	—	—	—	—	—	—	—	—	—	—	—	13700 2500	13700 2500	13700 2500	13700 2500	13700 2500	13700 2500	13700 2500	13700 2500

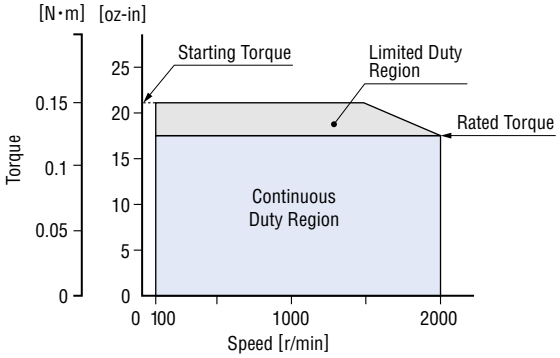
- Enter the appropriate letter in the box (□) within the motor model name. (**A**: Single-phase 100-115 VAC, **C**: Single-phase 200-230 VAC, **S**: Three-phase 200-230 VAC).
- Enter the appropriate gear ratio in the box (□) within the gearhead model name.

Speed–Torque Characteristics

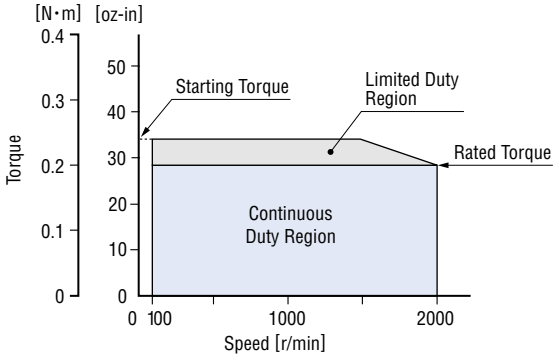
AXU210A-GN/AXU210C-GN/AXU210S-GN
AXU210A-A/AXU210C-A/AXU210S-A



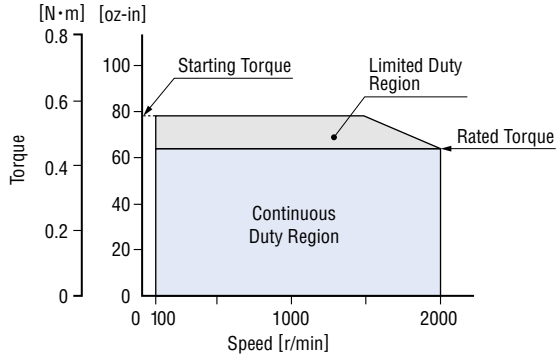
AXU425A-GN/AXU425C-GN/AXU425S-GN
AXU425A-A/AXU425C-A/AXU425S-A



AXU540A-GN/AXU540C-GN/AXU540S-GN
AXU540A-A/AXU540C-A/AXU540S-A



AXU590A-GU/AXU590C-GU/AXU590S-GU
AXU590A-A/AXU590C-A/AXU590S-A



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

Mounting screws are included with gearheads. Dimensions for screws → Page B-133

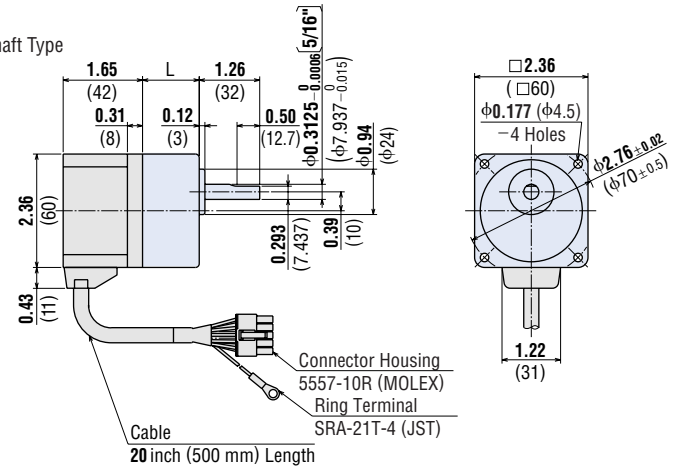
Motor/Gearhead

AXU210A-GN, AXU210C-GN, AXU210S-GN Pinion Shaft Type

Motor
AXUM210-GN
Weight: 1.1 lb. (0.5 kg)

Gearhead
2GN□KA
Weight: 0.88 lb. (0.4 kg)

DXF A289AU (**2GN3KA**~**18KA**)
A289BU (**2GN25KA**~**180KA**)



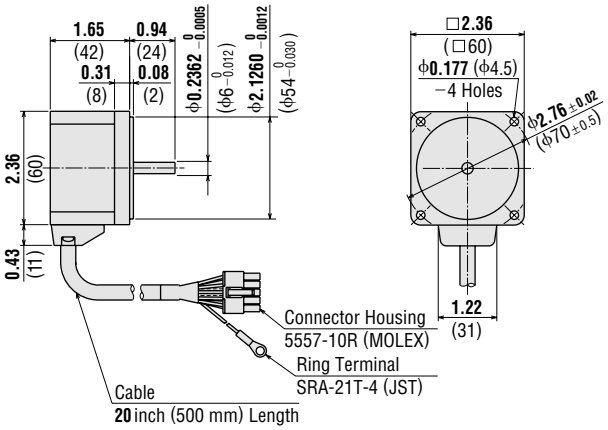
2GN3KA~**18KA**: L = **1.18** (30)
2GN25KA~**180KA**: L = **1.57** (40)

Round Shaft Type

AXU210A-A, AXU210C-A, AXU210S-A Round Shaft Type

Motor: AXUM210-A
Weight: 1.1 lb. (0.5 kg)

DXF A316



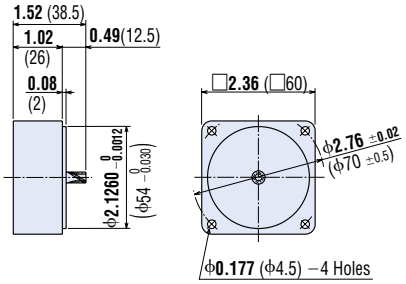
Decimal Gearhead

(Can be connected to **AXU210GN** pinion shaft type.)

2GN10XK

Weight: 0.44 lb. (0.2 kg)

DXF A003



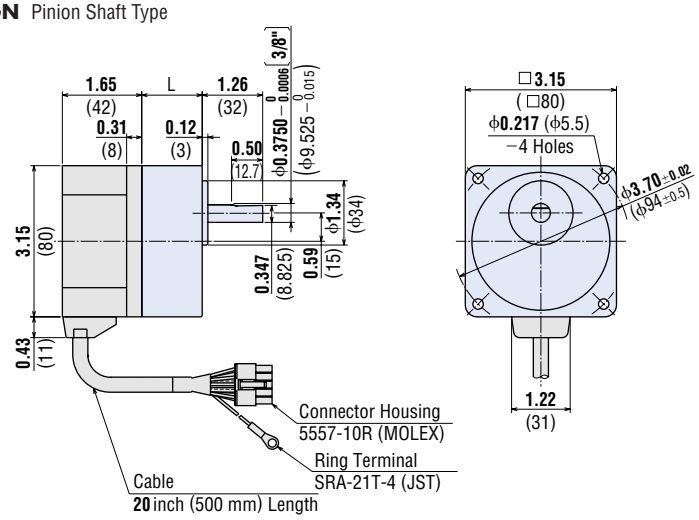
Motor/Gearhead

AXU425A-GN, AXU425C-GN, AXU425S-GN Pinion Shaft Type

Motor
AXUM425-GN
Weight: 1.76 lb. (0.8 kg)

Gearhead
4GN□KA
Weight: 1.43 lb. (0.65 kg)

DXF A291AU (**4GN3KA**~**18KA**)
A291BU (**4GN25KA**~**180KA**)

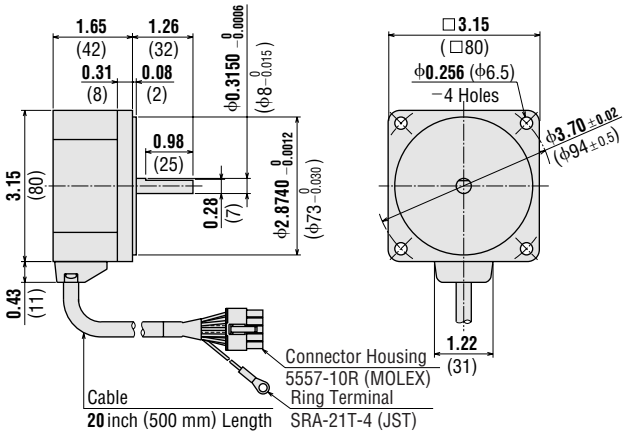


4GN3KA~**18KA**: L = **1.26** (32)
4GN25KA~**180KA**: L = **1.67** (42.5)

◆ Round Shaft Type

AXU425A-A, AXU425C-A, AXU425S-A Round Shaft Type
Motor: AXUM425-A
Weight: 1.76 lb. (0.8 kg)

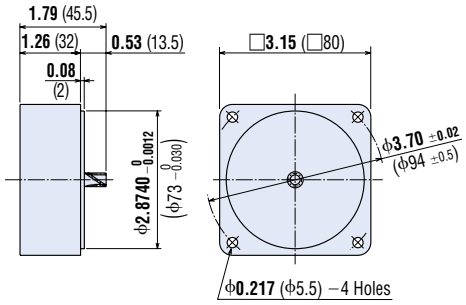
DXF A317



◆ Decimal Gearhead

(Can be connected to **AXU425GN** pinion shaft type.)
4GN10XK
Weight: 0.88 lb. (0.4 kg)

DXF A013

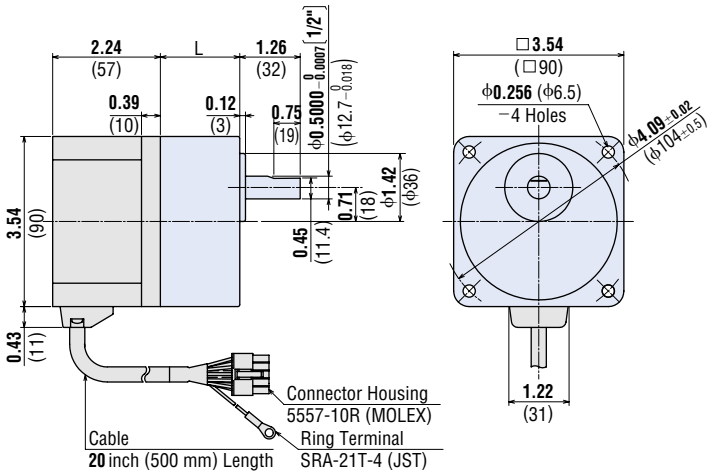


◆ Motor/Gearhead

AXU540A-GN, AXU540C-GN, AXU540S-GN Pinion Shaft Type

Motor	Gearhead
AXUM540-GN	**5GN□KA**
Weight: 3.1 lb. (1.4 kg)	Weight: 3.3 lb. (1.5 kg)

DXF A313AU (**5GN3KA**~**18KA**)
A313BU (**5GN25KA**~**180KA**)

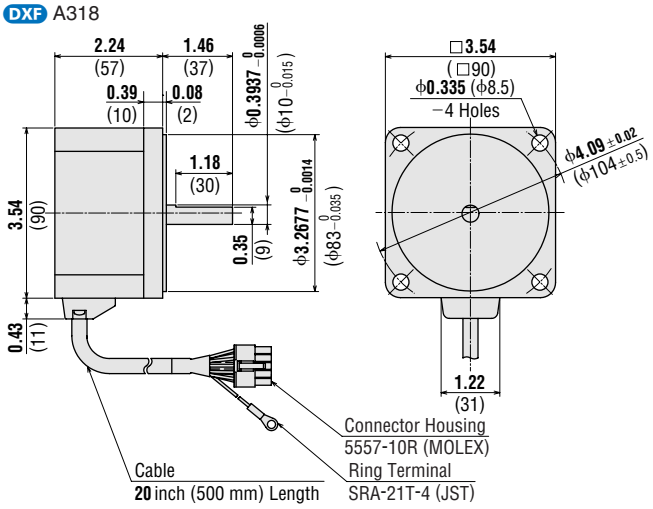


5GN3KA~**18KA** : L = **1.65** (42)
5GN25KA~**180KA**: L = **2.36** (60)

◆ Round Shaft Type

AXU540A-A, AXU540C-A, AXU540S-A Round Shaft Type
Motor: AXUM540-A
Weight: 3.1 lb. (1.4 kg)

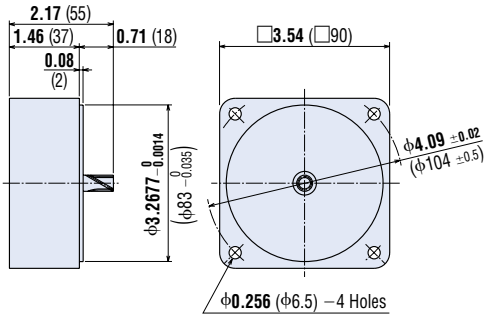
DXF A318



◆ Decimal Gearhead

(Can be connected to **AXU540GN** pinion shaft type.)
5GN10XK
Weight: 1.32 lb. (0.6 kg)

DXF A022

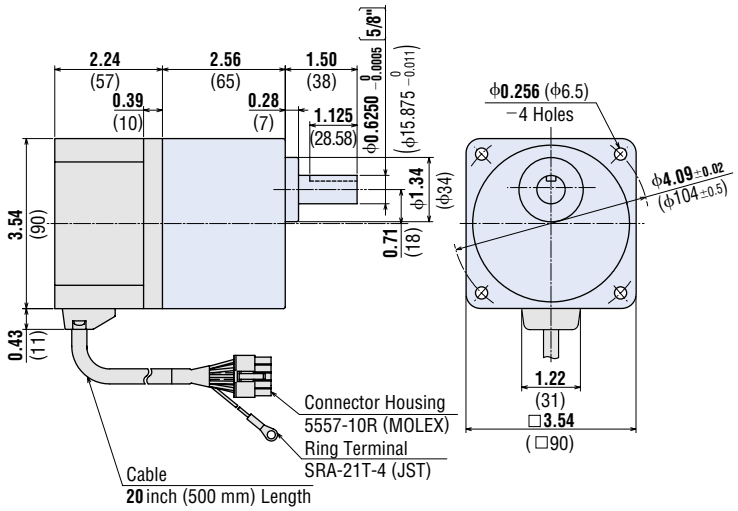


◆ Motor/Gearhead

AXU590A-GU, AXU590C-GU, AXU590S-GU Pinion Shaft Type

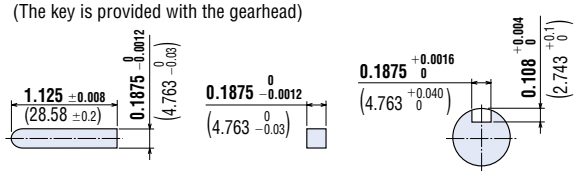
Motor	Gearhead
AXUM590-GU	**5GU□KA**
Weight: 3.1 lb. (1.4 kg)	Weight: 3.3 lb. (1.5 kg)

DXF A315



●Key and Key Slot (Scale 1/2)

(The key is provided with the gearhead)



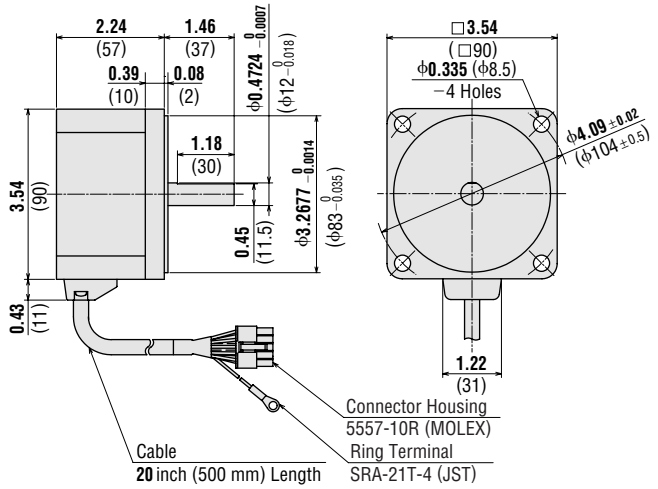
◆ Round Shaft Type

AXU590A-A, AXU590C-A, AXU590S-A Round Shaft Type

Motor: AXUM590-A

Weight: 3.1 lb. (1.4 kg)

DXF A314



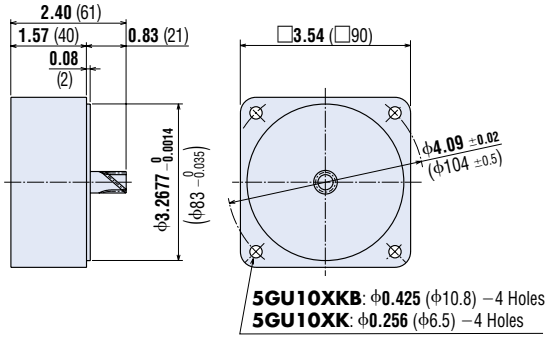
◆ Decimal Gearhead

5GU10XKB (for **5GU□KA**)

5GU10XK (for **5GU□KHA**)

Weight: 1.32 lb. (0.6 kg)

DXF A029

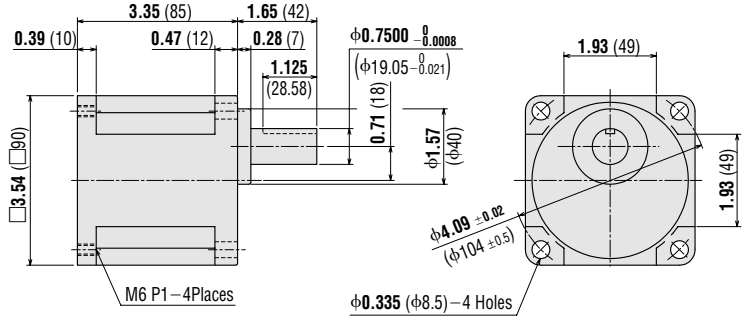


◆ High-Power Type Gearhead

5GU□KHA (For AXU590GU type)

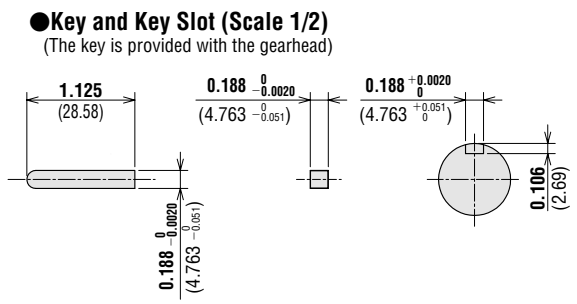
Weight: 4.2 lb. (1.9 kg)

DXF A038U



●Key and Key Slot (Scale 1/2)

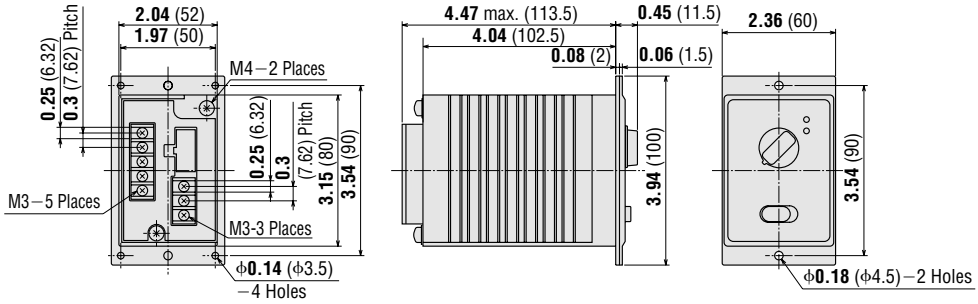
(The key is provided with the gearhead)



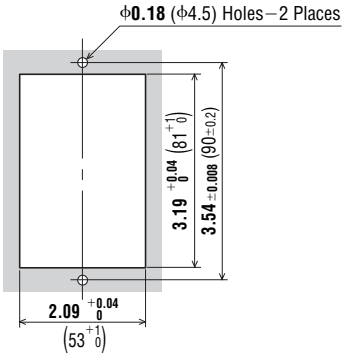
◆ Control Unit

AXUD10A, AXUD10C, AXUD10S
AXUD25A, AXUD25C, AXUD25S
AXUD40A, AXUD40C, AXUD40S
AXUD90A, AXUD90C, AXUD90S
Weight: 0.88 lb. (0.4 kg)

DXF A293

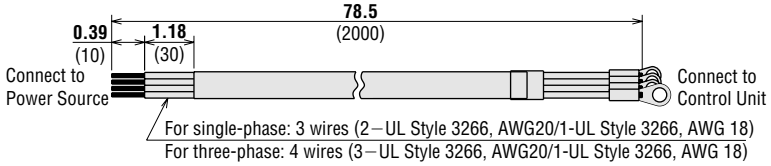


◆ Control Unit Panel Cut-Out



Panel Cut-Out

◆ Connection Cable (included)

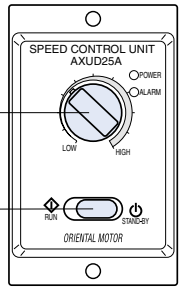


Connection and Operation

Names and Functions of Control Unit

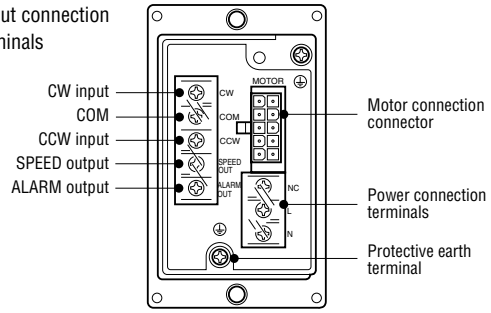
Speed potentiometer
Turning the potentiometer clockwise causes the speed to increase.
Speed setting range is 100～2000 r/min.
The setting is 0 r/min at the time of shipment.

RUN/STAND-BY Switch



Front of Control Unit

Input/output connection signal terminals

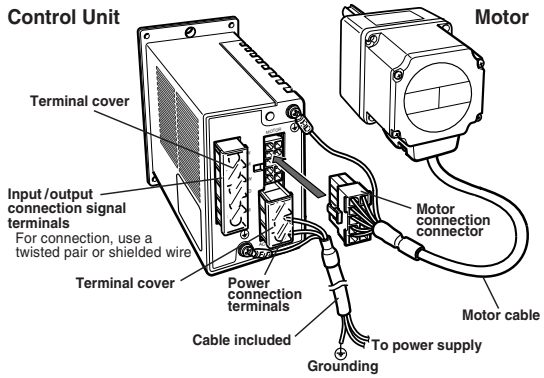


Back of Control Unit

Notes:
- The RUN/STAND-BY switch is not a power ON/OFF switch.
- When you want to stop the motor for an extended period, turn off the control unit power.

Connection Diagrams

Motor and Control Unit Connection



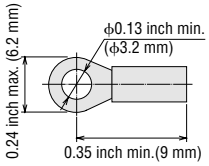
Motor Connection

Insert the motor cable connector into the motor connector (MOTOR) on the control unit. Insert it until a click sound is audible. To expand the distance between the motor and control unit, use an optional extension cable. The connection can be extended to a maximum of 34.4 feet (10.5 m).
Extension cable→Page B-57

Power Connection

Connect the included power supply cable to the power supply terminal of the control unit. When the included power supply cable is not used, use a cable with a diameter equivalent to AWG22 or more. In that case, round crimp terminals with insulation should be used.

Recommended Crimp Terminals



Ground

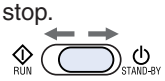
For the Protective Earth cable, use a cable with a diameter equivalent to AWG18 or more.

Operation

The direction of motor rotation is as viewed from the output shaft end of the motor. "CW" indicates clockwise direction, while "CCW" indicates counterclockwise direction.

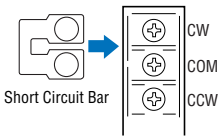
Operation Using the RUN/STAND-BY Switch

When the RUN/STAND-BY switch is set to the "RUN" position, the motor will run. When it is set to the "STAND-BY" position, the motor will stop.

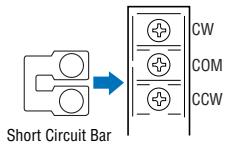


The direction of rotation depends on how the short circuit bar at the back of control unit is connected. Connect the short circuit bar between the CW and COM or CCW and COM. Do not use the short circuit bar for any other purpose.

CW Rotation



CCW Rotation



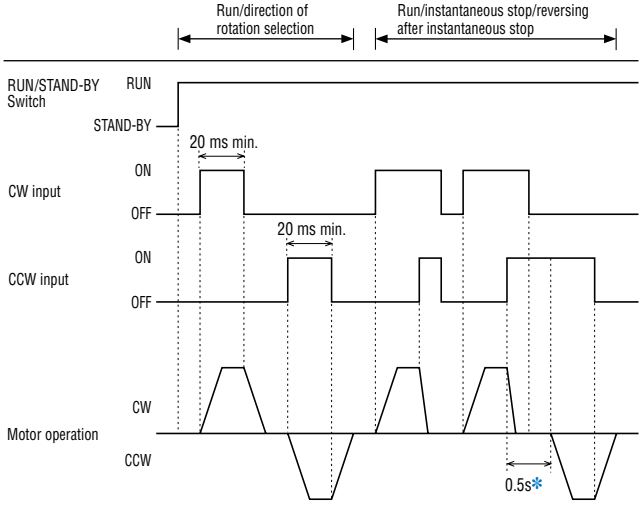
Operating Using External Signals

Set the RUN/STAND-BY switch to the "RUN" position.

- See "Input Circuit Connection Example" shown on the next page for connection.

Timing Chart

Operating Using External Signals

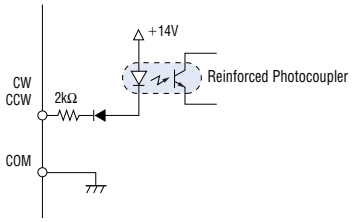


Note:
The CW and CCW input signals must be ON for at least 20 ms.

When both the CW and CCW inputs are turned on, the motor stops instantaneously.
※Motor does not run for 0.5 s after instantaneous stop, if a reversing run signal is input.

● Signal Input Circuit

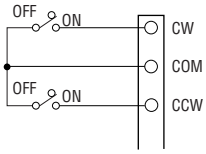
◆ Input Circuit



◆ Input Circuit Connection Example

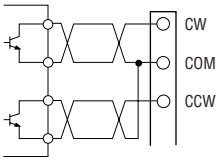
Set the RUN/STAND-BY switch to the "RUN" position.

- Small-capacity switch and relay



- Use a small-capacity contact type relay capable of opening and closing 12 VDC, 5 mA.

- Transistor output type controller



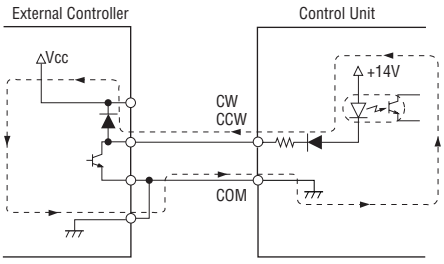
Rotation Direction of Motor

- CW (clockwise) directional operation
  When CW input is turned on, the motor runs in a clockwise direction. When CW input is turned off, the motor stops.
- CCW (counterclockwise) directional operation
  When CCW input is turned on, the motor runs in a counterclockwise direction. When CCW input is turned off, the motor stops.

When both the CW and CCW inputs are turned on simultaneously, the motor stops instantly. Instantaneous reversing operation is not possible.

Notes:

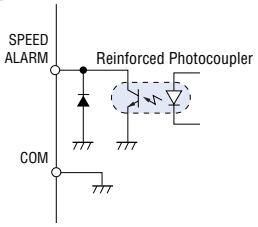
- Wait for more than 20 ms when changing input signals of CW and CCW.
- Do not use a solid state relay (SSR) to turn on or off power. The motor and control unit may be damaged if it is used.
- When you want to use the controller with a built-in clamp diode, pay attention to the sequence of turning on or off the power.
  Power ON : Controller ON→Control Unit ON
  Power OFF : Control Unit OFF→Controller OFF



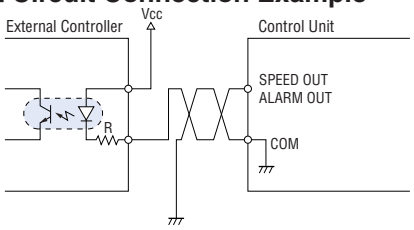
If the control unit power is turned on first when connected as shown above, or the controller power is turned off with the control unit power turned on, current will be applied, as indicated by the arrows in the diagram. This may cause the motor to run.
When the power is turned on or off simultaneously, the motor may run temporarily due to differences in power capacity. The controller power must be turned on first, and control unit power must be turned off first.

● Signal Output Circuit

◆ Output Circuit



◆ Output Circuit Connection Example



Notes:

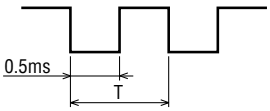
- The signal output is Open Collector Output.
- Use the power supply of 26.4 VDC or less to connect the limit resistance (R) so that output current does not exceed 10 mA.

SPEED Output

The speed output signal is synchronized with the motor speed. The system outputs pulses (with a width of approximately 0.5 ms) at a rate of 30 pulses per rotation of the motor output shaft. You can measure the speed output frequency and calculate motor speed.

$$\text{Motor Speed (r/min)} = \frac{\text{SPEED Output Frequency [Hz]}}{30} \times 60$$

$$\text{SPEED Output Frequency (Hz)} = \frac{1}{T}$$



To check the reduced motor speed visually (the speed at the motor output shaft or at the gearhead output shaft), connect a speed indicator **SDM496** (sold separately). Speed Indicator→Page A-214

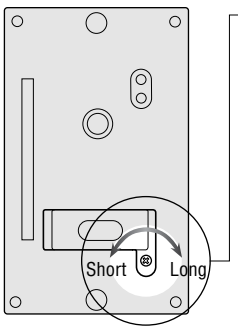
Notes for Connection:

- When you want to extend the input/output signal cable, the length must not exceed 6.6ft. (2m). The cable should be as short as possible in order to minimize noise.
- Signal wires and motor wires should be kept away from equipment, power cables and other sources of magnetic noise.

● Setting the Acceleration/Deceleration Time

The motor accelerates slowly when it starts up and decelerates slowly when it stops. This acceleration/deceleration time can be set within the range from 0.5 to 10 sec (2000 r/min without load). The time can be set using the acceleration/deceleration potentiometer. Remove the front panel of control unit to access the potentiometer.

✻ The figure shows the control unit with the front panel removed.



Acceleration/Deceleration time setting potentiometer

Time is increased by turning the switch clockwise. Use an insulated Phillips Screwdriver for this operation. The shortest time is selected at the time of shipment.

List of Motor and Control Unit Combinations

Pinion Shaft Type

Output Power HP	Output Power W	Model	Motor Model	Control Unit Model
1/75	10	**AXU210A-GN**	AXUM210-GN	AXUD10A
		AXU210C-GN		AXUD10C
		AXU210S-GN		AXUD10S
1/30	25	**AXU425A-GN**	AXUM425-GN	AXUD25A
		AXU425C-GN		AXUD25C
		AXU425S-GN		AXUD25S
1/19	40	**AXU540A-GN**	AXUM540-GN	AXUD40A
		AXU540C-GN		AXUD40C
		AXU540S-GN		AXUD40S
1/8	90	**AXU590A-GU**	AXUM590-GU	AXUD90A
		AXU590C-GU		AXUD90C
		AXU590S-GU		AXUD90S

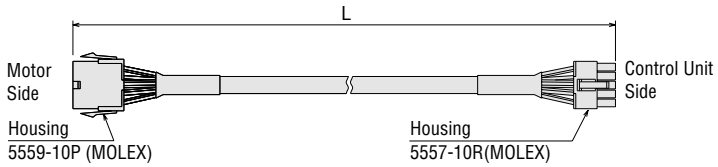
Round Shaft Type

Output Power HP	Output Power W	Model	Motor Model	Control Unit Model
1/75	10	**AXU210A-A**	AXUM210-A	AXUD10A
		AXU210C-A		AXUD10C
		AXU210S-A		AXUD10S
1/30	25	**AXU425A-A**	AXUM425-A	AXUD25A
		AXU425C-A		AXUD25C
		AXU425S-A		AXUD25S
1/19	40	**AXU540A-A**	AXUM540-A	AXUD40A
		AXU540C-A		AXUD40C
		AXU540S-A		AXUD40S
1/8	90	**AXU590A-A**	AXUM590-A	AXUD90A
		AXU590C-A		AXUD90C
		AXU590S-A		AXUD90S

Accessories (Sold Separately)

Extension Cables

Model	Length: L [ft. (m)]
CC01AXU	3.3 (1)
CC02AXU	6.6 (2)
CC03AXU	9.8 (3)
CC05AXU	16.4 (5)
CC10AXU	32.8 (10)



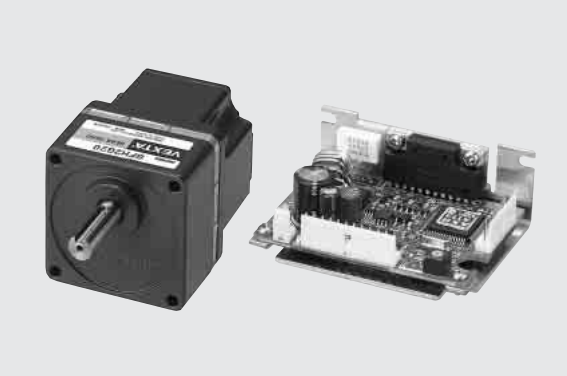
- Maximum extension length is 34.4 ft. (10.5m).

Brushless DC Motor Systems

AXH Series

The **AXH** Series combines a compact, brushless DC speed control motor and 24 VDC board-level driver. These systems provide space savings and high power output, and are easy to use.

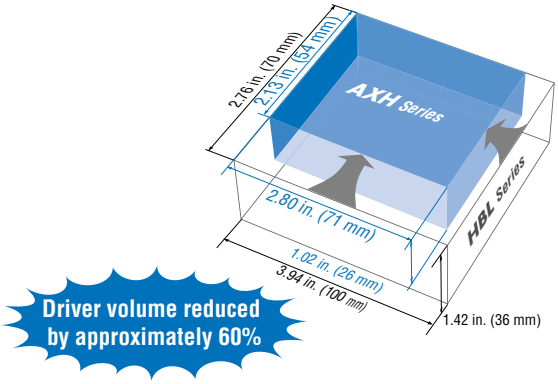
Combination Type (Pre-assembled Gearmotors)
The combination type (pre-assembled gearmotors) come with the motor and its dedicated gearhead already assembled. This simplifies installation in equipment.
Motors and gearheads are also available separately so they can be on hand to make changes or repairs.
✻ Except for 15W type



Features

Compact Board-Level Driver

The size of the **AXH** driver has been reduced by approximately 60% when compared to conventional DC brushless drivers. (Driver for 15W-50W)



Compact, High Power Motors

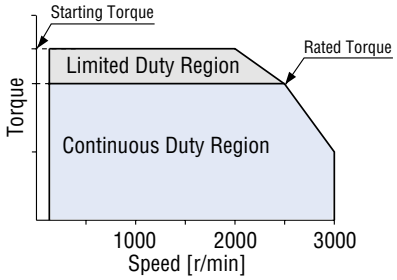
The size of the **AXH** Motor has been reduced by approximately 55% when compared to conventional AC speed control motors [□3.15 in. (□80mm) size]. The motor has extremely high output power for its small size.

Superior Speed Stability

The fluctuation is only ±1% for load, voltage and temperature. These motors provide superior speed stability with minimal speed fluctuation.

Constant Torque over a Wide Speed Range

The speed can be set within the wide range of 100 r/min to 3000 r/min (30:1). The **AXH** Series maintains a constant torque from low speed to high speed.



Gearheads Provide High Torque

AXH geared type motors come pre-assembled with a gearhead. These gearheads provide torque up to 17.7 lb-in (2N·m) for the 15 W motors and up to 141 lb-in (16N·m) with the 50 W motors.

Protective Functions

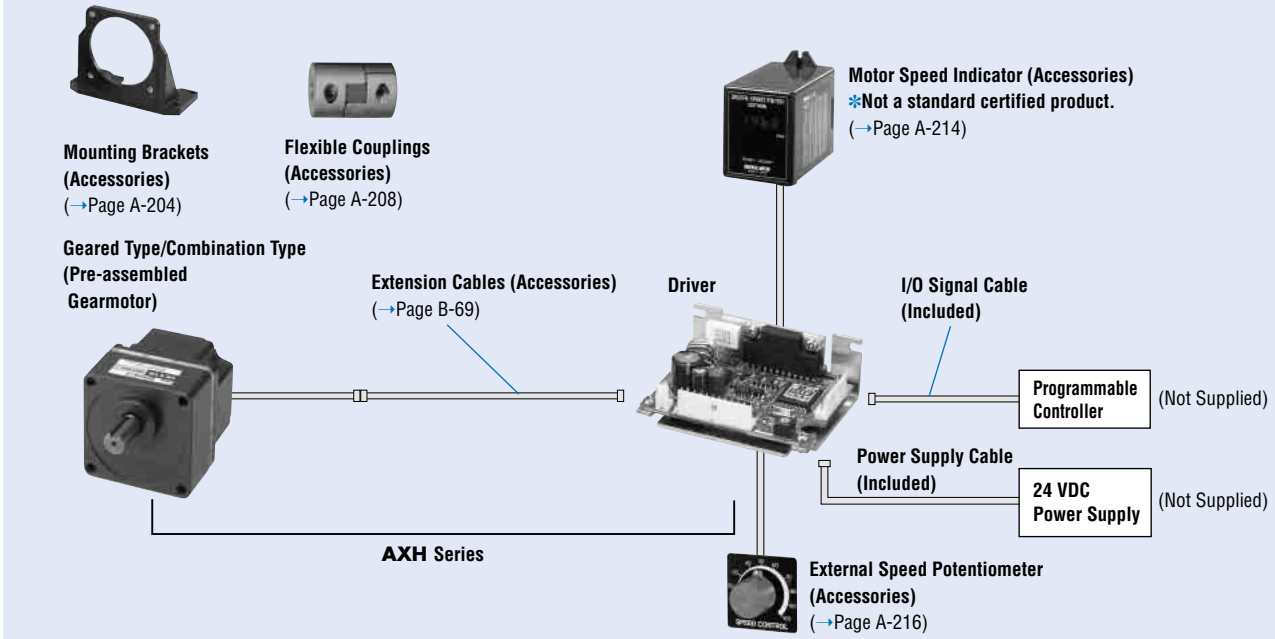
The **AXH** Series is equipped with protective functions to handle overload, overvoltage, undervoltage, overspeed and out-of-phase power. When one of these protective functions detects an abnormality, a LED blinks and motor comes to a stop.

Safety Standards and CE Marking

Standards		Certification Body	Standards File No.	CE Marking
AXH015 type **AXH230** type **AXH450** type	UL1950 CSA C22.2 No.950	UL	E208200	EMC Directives
AXH5100 type	UL60950 CSA C22.2 No.60950	UL	E208200	

- 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-68
- **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.

System Configuration



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

Product Number Code

AXH 4 50 K C - □

- **Gear Ratio or Shaft Type**
  Number: Gear Ratio
  A: Round Shaft Type
- **C**: Cable Type
  None: Lead Wire Type
- **Power Supply Voltage**
  K: 24 VDC
- **Output Power**
  15: 15W (1/50 HP)
  30: 30W (1/25 HP)
  50: 50W (1/15 HP)
  100: 100W (1/8 HP)
- **Motor Frame Size**
  0: 1.65 in. sq (42 mm sq.)
  2: 2.36 in. sq (60 mm sq.)
  4: 3.15 in. sq (80 mm sq.)
  5: 3.54 in. sq (90 mm sq.)
- **Series**
  AXH: **AXH** Series

Product Line

Geared Type/Combination Type

Output Power HP	Output Power W	Model	Gear Ratio
1/50	15	**AXH015K-□**	**5,10, 15, 20, 30, 50, 100**
1/25	30	**AXH230KC-□**	**5, 10, 15, 20, 30, 50, 100, 200**
1/15	50	**AXH450KC-□**	**5, 10, 15, 20, 30, 50, 100, 200**
1/8	100	**AXH5100KC-□**	**5, 10, 15, 20, 30, 50, 100, 200**

- **AXH015K-□** are Geared Type and the others are combination type.
- Enter the gear ratio in the box (□) within the model name.

Round Shaft Type

Output Power HP	Output Power W	Model
1/50	15	**AXH015K-A**
1/25	30	**AXH230KC-A**
1/15	50	**AXH450KC-A**
1/8	100	**AXH5100KC-A**

Dimensions B-62 | Connection and Operation B-66 | Motor and Driver Combinations B-65

Specifications

Model	Geared Type/Combination Type	AXH015K-□	AXH230KC-□	AXH450KC-□	AXH5100KC-□
	Round Shaft Type	AXH015K-A	AXH230KC-A	AXH450KC-A	AXH5100KC-A
Rated Output Power	HP (W)	1/50 (15)	1/25 (30)	1/15 (50)	1/8 (100)
Power Source	Voltage	24 VDC ±10%			
	Rated Input Current A	1.0	2.1	3.1	6.0
	Maximum Input Current A	2.0	3.5	5.0	9.0
Rated Torque	oz-in (N·m)	7.1 (0.05)	17 (0.12)	28 (0.20)	56 (0.40)
Starting Torque	oz-in (N·m)	10.6 (0.075)	21 (0.15)	34 (0.24)	71 (0.50)
Permissible Load Inertia J *	oz-in^2(×10^{-4} kg·m^2)	2.7 (0.5)	9.8 (1.8)	18.1 (3.3)	31 (5.6)
Maximum Speed	r/min	3000			
Rated Speed	r/min	3000	2500		
Variable Speed Range	r/min	100～3000 (30:1)			
Speed Regulation	Load	±1% Max. (0～rated torque, at rated speed)			
	Voltage	±1% Max. (Power supply voltage ±10%, at rated speed with no load)			
	Temperature	±1% Max. (32°F～122°F [0°C～+50°C] at rated speed with no load)			

* The permissible load inertia specified above is only applicable for round shaft type. Permissible Load Inertia for Geared Type and Combination Type → Page B-61
- Enter the gear ratio in the box (□) with the model name.
- The values for each item is for the motor only.

Common Specifications

Item	Specifications		
Speed Control Method	Any one of the following methods. 1. By built-in potentiometer 2. By external potentiometer 3. By DC voltage (0～5 VDC)		
Input Signals	C-MOS negative logic	L: (ON) : 0～0.5 VDC	H: (OFF) : 4～5 VDC
	START/STOP input	L: START	H: STOP
	Brake input	L: RUN	H: Instantaneous stop
	Direction of rotation input	L: CW	H: CCW
	Speed setting method	L: Internal	H: External
	Alarm reset	L: Reset	H: Normal
Output Signals	Open collector output External use conditions 26.4 VDC, 10 mA Max. Speed Signal Output (SPEED OUT) 30 P/R, Alarm Signal Output (ALARM OUT)		
Protection Functions *1	When the following are activated, the alarm signal will be output and the motor will come to a natural stop. ● Overload Protection: Activated when a load exceeding the rated torque is applied to the motor for approximately 5 seconds or more. ● Out-of-Phase Protection: Activated when the sensor wire inside the motor cable is disconnected. ● Overvoltage Protection: Activated when the voltage applied to the driver exceeds 24 VDC by approximately 15% or more. ● Undervoltage Protection: Activated when the voltage applied to the driver falls at least 25% below 24 VDC. ● Over Speed Protection: Activated when the motor rotates at an abnormal speed above 3500 r/min.		
Motor Insulation Class *2	Class E [248°F (120°C)]		
Rating	Continuous		

*1 With the **AXH** Series the motor speed cannot be controlled in applications where the motor shaft is turned by the load, as in lowering operations. Also, the motor will stop naturally if the load exceeds the permissible load inertia or the overvoltage protection function is activated during load lowering operations.
*2 Motor insulation is recognized as class A [221°F(105°C)] by UL and CSA standards.

General Specifications

Item	Motor	Driver
Insulation Resistance	100 MΩ or more when 500 VDC megger is applied between the windings and the frame after continuous operation under normal ambient temperature and humidity.	100 MΩ or more when 500 VDC megger is applied between the power supply input and the frame after continuous operation under normal ambient temperature and humidity.
Dielectric Strength	Sufficient to withstand 0.5 kVAC at 50 Hz applied between the windings and the frame for 1 minute after continuous operation under normal ambient temperature and humidity.	Sufficient to withstand 0.5 kVAC at 50 Hz applied between the power supply input and the frame for 1 minute after continuous operation under normal ambient temperature and humidity.
Temperature Rise	90°F (50°C) or less measured by the thermocoupler method after the temperature of the coil has stabilized under normal operation at the rated voltage and frequency under normal ambient temperature and humidity, with a connected gearhead or equivalent heat radiation plate.*	—
Ambient Temperature	32°F～122°F (0°C～+50°C) (nonfreezing)	
Ambient Humidity	85% maximum (noncondensing)	
Atmosphere	No corrosive gases or dust	
Degree of Protection	15W Type: IP 40 30W～100W Type: IP65 (except for the mounting surface)	IP 00

* Size of heat radiation plate (Material: Aluminum)
AXH230KC-A: 4.53 in. × 4.53 in. (115 mm × 115 mm), 0.20 in. (5 mm) thick
AXH450KC-A: 5.31 in. × 5.31 in. (135 mm × 135 mm), 0.20 in. (5 mm) thick
AXH5100KC-A: 7.87 in. × 7.87 in.(200 mm × 200 mm), 0.20 in. (5 mm) thick

Gearmotor — Torque Table (Geared Type/Combination Type)

Unit = Upper values: lb-in/Lower values: N·m

Model	Speed Range * r/min	20~500 (20~600)	10~250 (10~300)	6.7~167 (6.7~200)	5~125 (5~150)	3.3~83 (3.3~100)	2~50 (2~60)	1~25 (1~30)	0.5~12.5
	Gear Ratio	**5**	**10**	**15**	**20**	**30**	**50**	**100**	**200**
AXH015K-□		2.0 0.23	3.9 0.45	6.0 0.68	7.6 0.86	11.5 1.3	17.7 2.0	17.7 2.0	—
AXH230KC-□		4.7 0.54	9.7 1.1	14.1 1.6	19.4 2.2	27 3.1	46 5.2	53 6.0	53 6.0
AXH450KC-□		7.9 0.9	15.9 1.8	23 2.7	31 3.6	46 5.2	76 8.6	141 16	141 16
AXH5100KC-□		15.9 1.8	31 3.6	47 5.4	63 7.2	91 10.3	152 17.2	260 30	260 30

- Enter the gear ratio in the 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.

* Values inside parentheses ( ) are for the **AXH015K-□** model.

Permissible Overhung Load and Permissible Thrust Load

Geared Type/Combination Type

Model	Gear Ratio	Permissible Overhung Load				Permissible Thrust Load	
		0.39 in. (10 mm) from shaft end		0.79 in. (20 mm) from shaft end			
		lb.	N	lb.	N	lb.	N
AXH015K-□	**5~100**	11.2	50	—	—	6.7	30
AXH230KC-□	**5**	22	100	33	150	9	40
	10~20	33	150	45	200		
	30~200	45	200	67	300		
AXH450KC-□	**5**	45	200	56	250	22	100
	10~20	67	300	78	350		
	30~200	101	450	123	550		
AXH5100KC-□	**5**	67	300	90	400	33	150
	10~20	90	400	112	500		
	30~200	112	500	146	650		

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

Round Shaft Type

Model	Permissible Overhung Load			
	0.39 in. (10mm) from shaft end		0.79 in. (20 mm) from shaft end	
	lb.	N	lb.	N
AXH015K-A	11.2	50	—	—
AXH230KC-A	15.7	70	22	100
AXH450KC-A	27	120	31	140
AXH5100KC-A	36	160	38	170

- Permissible Thrust Load: Avoid thrust loads as much as possible. If thrust load is unavoidable, keep it to no more than half the motor weight.

Permissible Load Inertia J for Geared Type/Combination Type

Unit = Upper values: oz-in^2/Lower values: $\times 10^{-4}$ kg·m^2

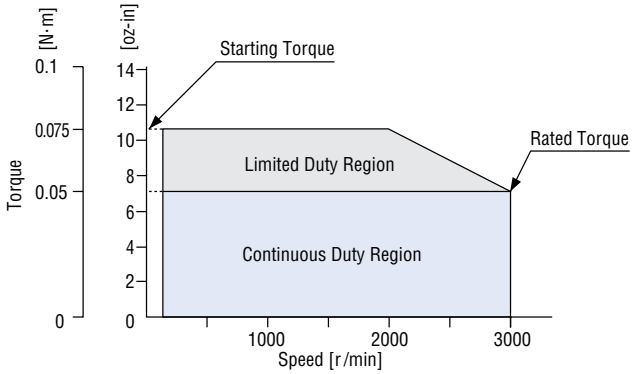
Model \ Gear Ratio	**5**	**10**	**15**	**20**	**30**	**50**	**100**	**200**
AXH015K-□	2.2 0.4	9.3 1.7	21 3.9	38 7.0	86 15.7	240 43.7	240 43.7	—
AXH230KC-□	8.5 1.55	34 6.2	77 14.0	136 24.8	310 55.8	850 155	850 155	850 155
AXH450KC-□	30 5.5	120 22	270 49.5	480 88	1080 198	3000 550	3000 550	3000 550
AXH5100KC-□	137 25	547 100	1230 225	2188 400	4923 900	13675 2500	13675 2500	13675 2500

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

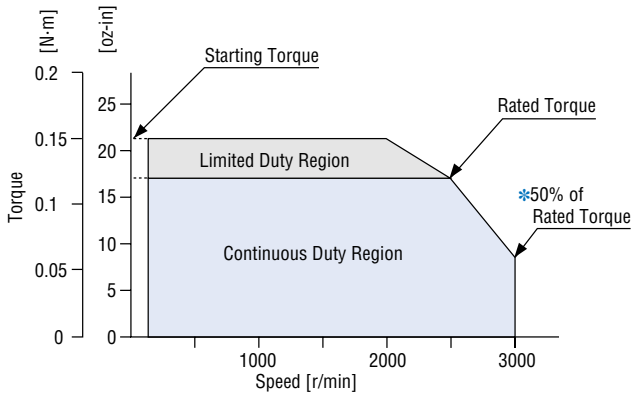
Speed — Torque Characteristics

- For the geared type and combination type, the values are for the motor alone.
- Enter the gear ratio in the box (□) within the model name.

AXH015K-□/AXH015K-A

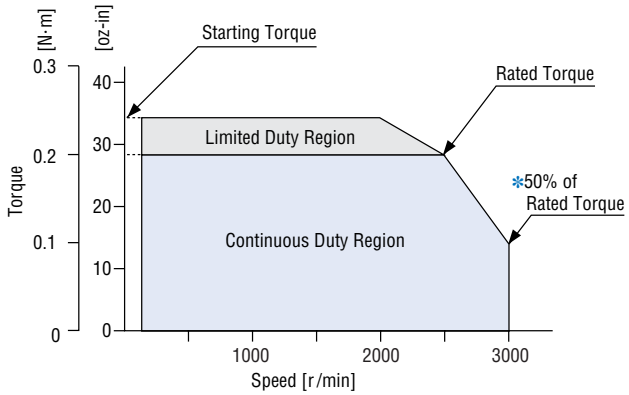


AXH230KC-□/AXH230KC-A



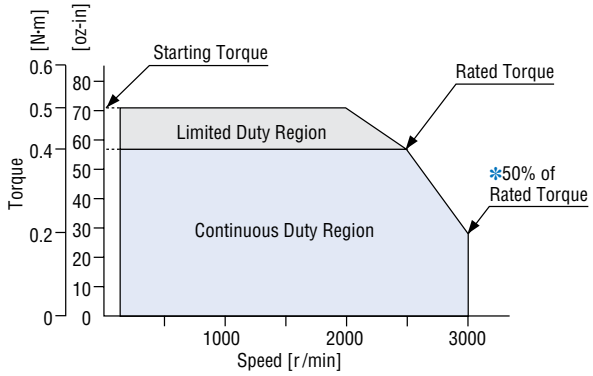
* Values for 24 VDC with no extension cable

AXH450KC-□/AXH450KC-A



* Values for 24 VDC with no extension cable

AXH5100KC-□/AXH5100KC-A



* Values for 24 VDC with no extension cable

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.

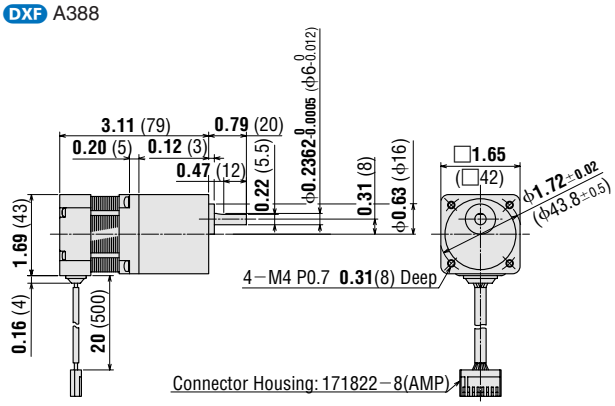
Motor/Gearhead

AXH015K-□ (Geared Type)

Geared motor: AXHM015K-□

Weight: 1.1 lb. (0.5 kg)

DXF A388



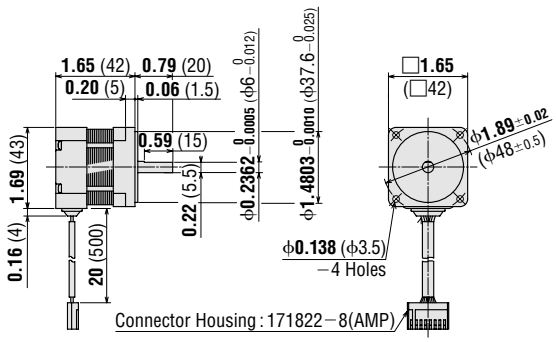
Round Shaft Type

AXH015K-A

Motor: AXHM015K-A

Weight: 0.55 lb. (0.25 kg)

DXF A389

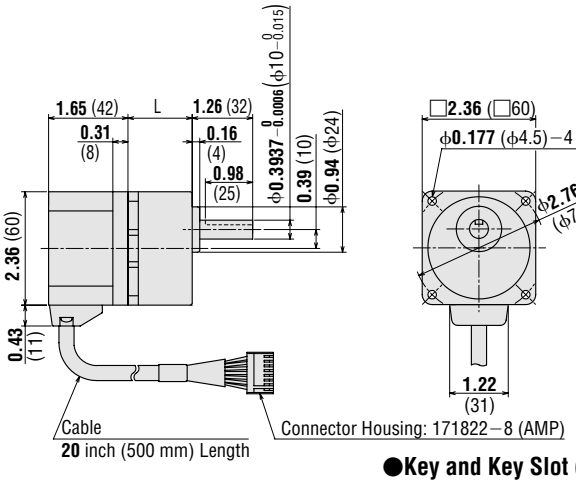


● Motor/Gearhead

AXH230KC-□ (Combination Type)

Motor: AXHM230KC-GFH
Gearhead: GFH2G□
Weight (including gearhead): 2.2 lb. (1.0 kg)
DXF A294AU (GFH2G5~20)
A294BU (GFH2G30~100)
A294CU (GFH2G200)

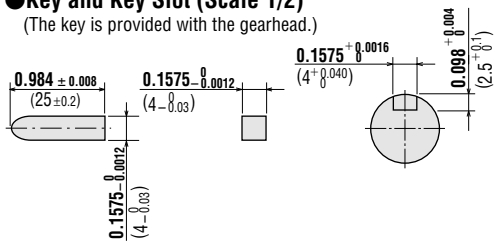
Lead Wire Types are also available. Contact your Oriental Motor Representative for more information.



AXH230KC-5~20: L = **1.34** (34)
AXH230KC-30~100: L = **1.50** (38)
AXH230KC-200: L = **1.69** (43)

●Key and Key Slot (Scale 1/2)

(The key is provided with the gearhead.)

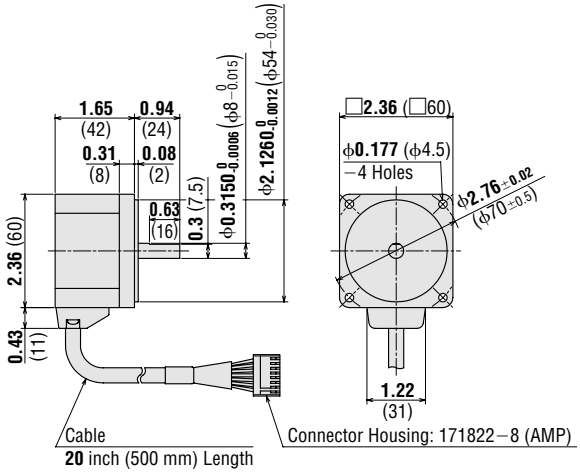


● Round Shaft Type

AXH230KC-A

Motor: AXHM230KC-A
Weight: 1.1 lb. (0.5 kg)
DXF A295U

Lead Wire Types are also available. Contact your Oriental Motor Representative for more information.

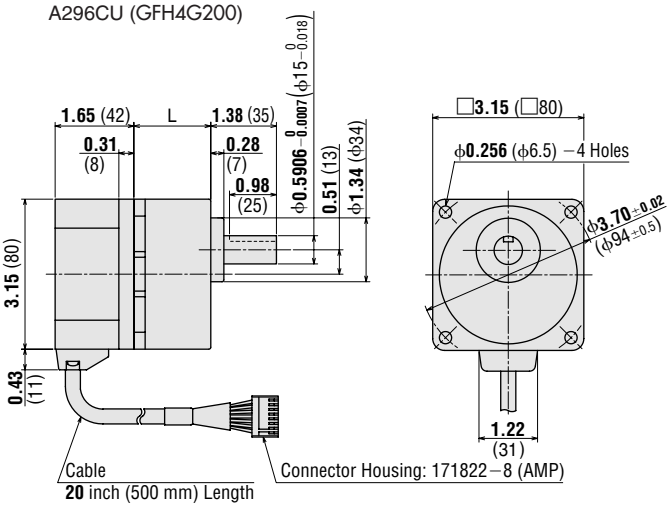


● Motor/Gearhead

AXH450KC-□ (Combination Type)

Motor: AXHM450KC-GFH
Gearhead: GFH4G□
Weight (including gearhead): 4.0 lb. (1.8 kg)
DXF A296AU (GFH4G5~20)
A296BU (GFH4G30~100)
A296CU (GFH4G200)

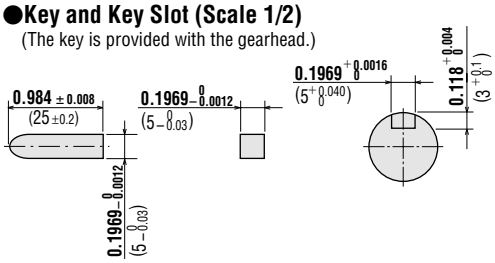
Lead Wire Types are also available. Contact your Oriental Motor Representative for more information.



AXH450KC-5~20: L = **1.61** (41)
AXH450KC-30~100: L = **1.81** (46)
AXH450KC-200: L = **2.01** (51)

●Key and Key Slot (Scale 1/2)

(The key is provided with the gearhead.)

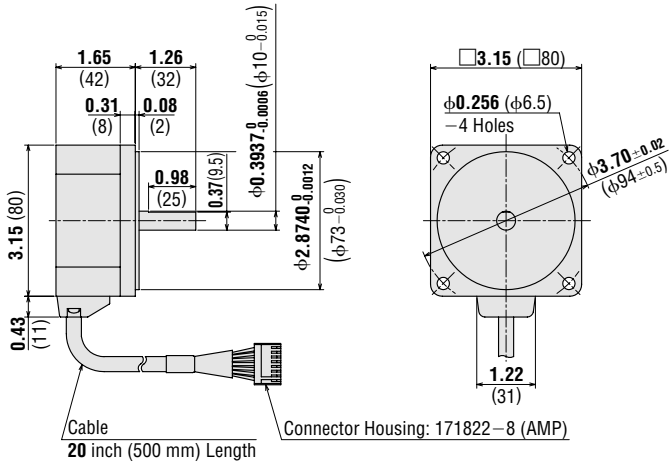


● Round Shaft Type

AXH450KC-A

Motor: AXHM450KC-A
Weight: 1.76 lb. (0.8 kg)
DXF A297U

Lead Wire Types are also available. Contact your Oriental Motor Representative for more information.



● Motor/Gearhead

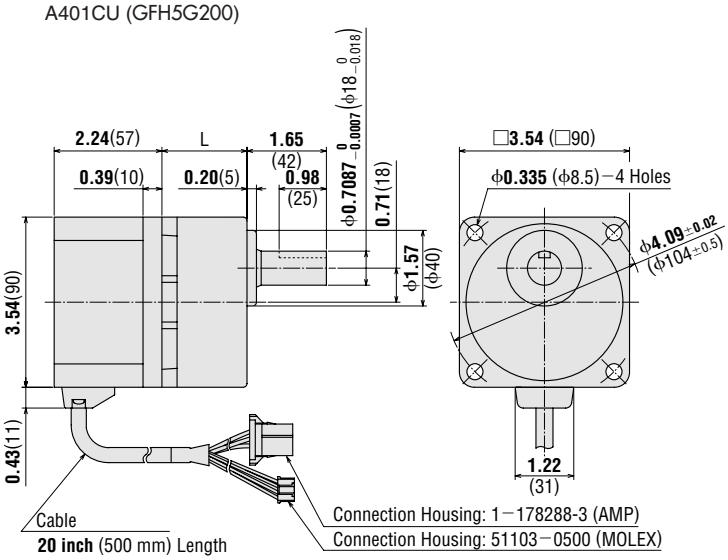
AXH5100KC-□ (Combination Type)

Motor: AXHM5100KC-GFH

Gearhead: GFH5G□

Weight (including gearhead): 6.4 lb. (2.9 kg)

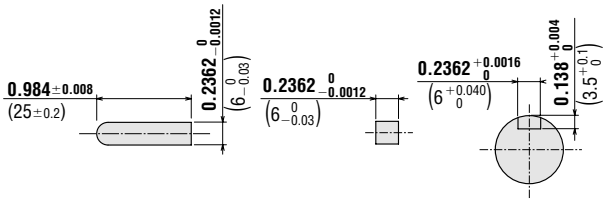
DXF A401AU (GFH5G5~20)
A401BU (GFH5G30~100)
A401CU (GFH5G200)



AXH5100KC-5~20: L = 1.77 (45)
AXH5100KC-30~100: L = 2.28 (58)
AXH5100KC-200: L = 2.52 (64)

●Key and Key Slot (Scale 1/2)

(The key is provided with the gearhead.)



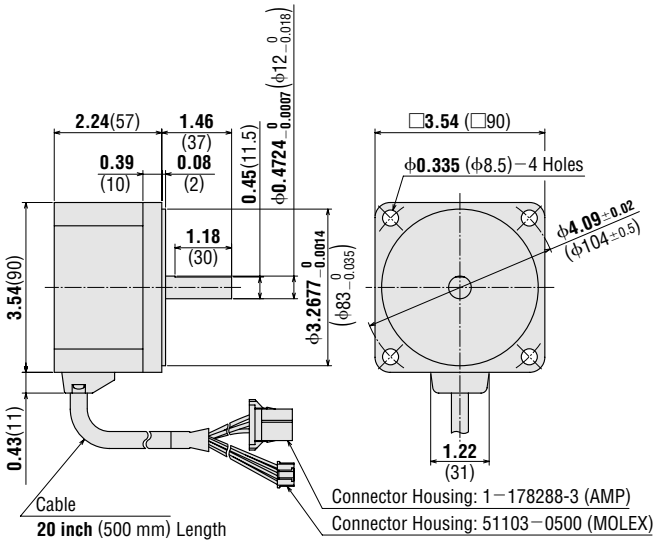
● Round Shaft Type

AXH5100KC-A

Motor: AXHM5100KC-A

Weight: 3.1 lb. (1.4 kg)

DXF A402U

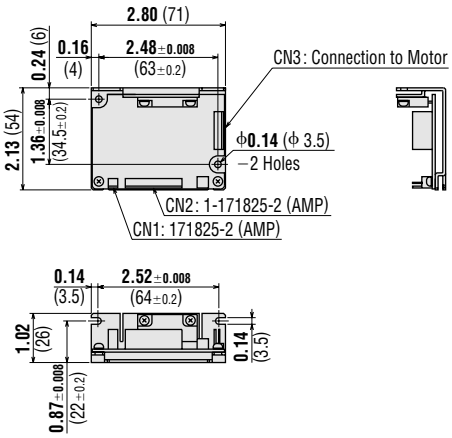


Driver

AXHD15K, AXHD30K, AXHD50K

Weight: 0.22 lb. (0.1 kg)

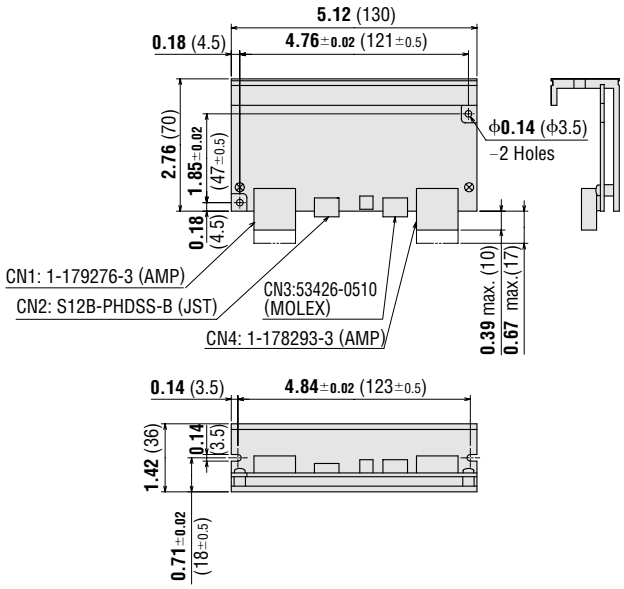
DXF A298



AXHD100K

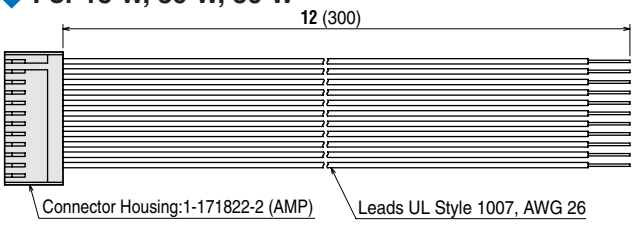
Weight: 0.66 lb. (0.3 kg)

DXF A403

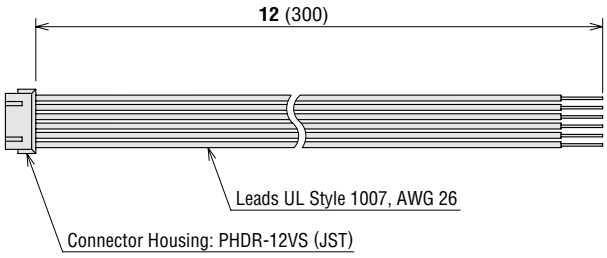


Driver Input Signal Cable (Included)

For 15 W, 30 W, 50 W

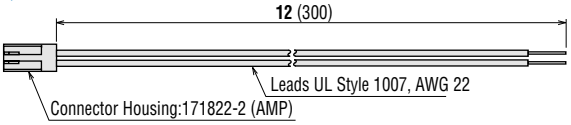


For 100 W

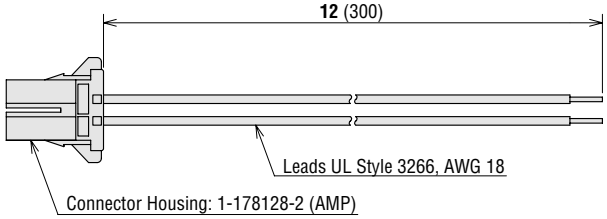


Driver Power Supply Cable (Included)

For 15 W, 30 W, 50 W



For 100 W



List of Motor and Driver Combinations

Geared Type/Combination Type

Output Power	Model	Motor Model	Gearhead Model	Driver Model
1/50 HP 15 W	**AXH015K-□**	AXHM015K-□*	—	AXHD15K
1/25 HP 30 W	**AXH230KC-□**	AXHM230KC-GFH	GFH2G□	AXHD30K
1/15 HP 50 W	**AXH450KC-□**	AXHM450KC-GFH	GFH4G□	AXHD50K
1/8 HP 100 W	**AXH5100KC-□**	AXHM5100KC-GFH	GFH5G□	AXHD100K

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

✻ Geared Motor Model

Round Shaft Type

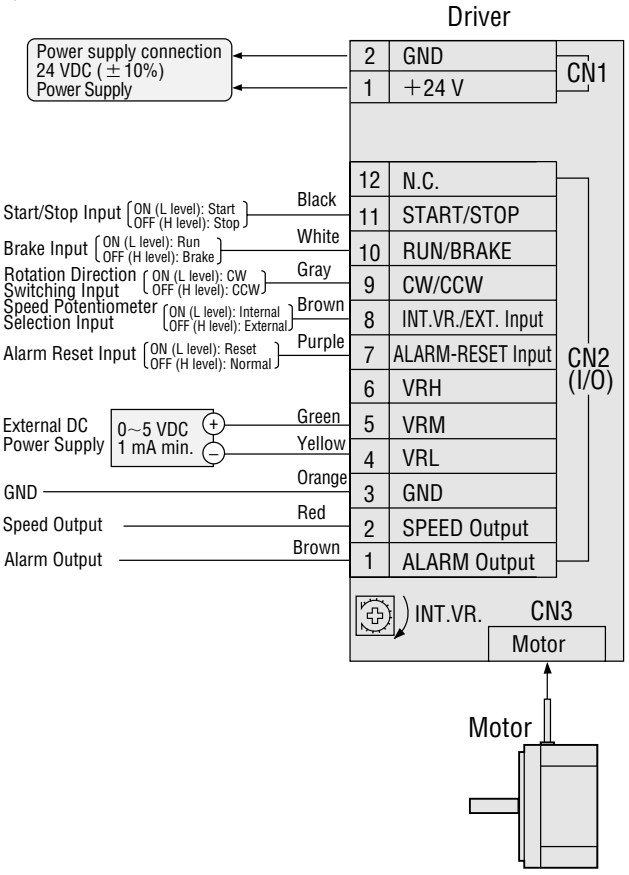
Output Power	Model	Motor Model	Driver Model
1/50 HP 15 W	**AXH015K-A**	AXHM015K-A	AXHD15K
1/25 HP 30 W	**AXH230KC-A**	AXHM230KC-A	AXHD30K
1/15 HP 50 W	**AXH450KC-A**	AXHM450KC-A	AXHD50K
1/8 HP 100 W	**AXH5100KC-A**	AXHM5100KC-A	AXHD100K

Dimensions B-62 | Connection and Operation B-66 | Motor and Driver Combinations B-65

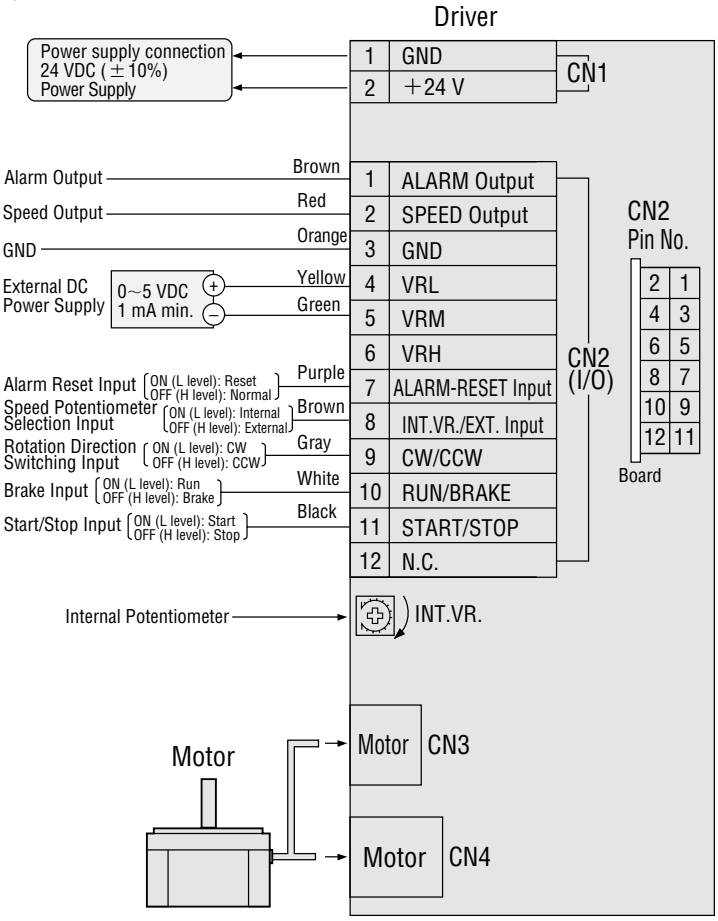
Connection and Operation

Connection Diagrams

15 W, 30 W, 50 W

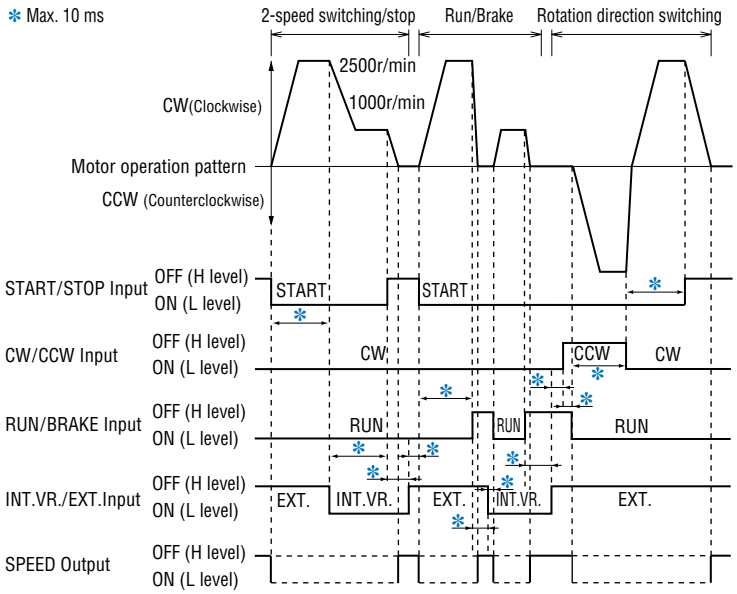


100 W



- When the motor cable needs to be extended, use an optional extension cable [sold separately, 4.9 ft. (1.5 m)].
Extension Cable→Page B-69

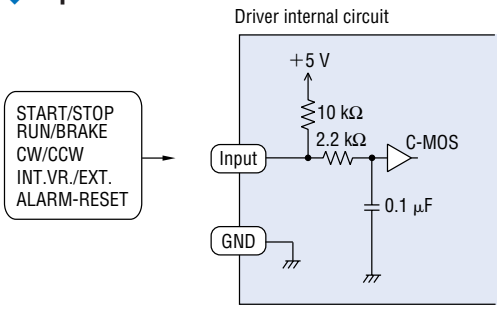
Timing Chart



- Run/stop, instantaneous stopping and rotation direction switching operations can all be controlled with the START/STOP, RUN/BRAKE and CW/CCW signals.
- If both the START/STOP signal and the RUN/BRAKE signal are set to ON (L level), the motor rotates. At this time, if the CW/CCW signal is set to ON (L level), then the motor rotates clockwise as seen from the motor shaft side; if the CW/CCW signal is set to OFF (H level), the motor rotates in the counterclockwise direction.
- If the RUN/BRAKE signal is set to OFF (H level) while the START/STOP signal is ON (L level), the motor stops instantaneously. If the START/STOP signal is set to OFF (H level) while the RUN/BRAKE signal is set to ON (L level), the motor stops naturally.
- Wait for 10 ms before switching the other input signals.
- Do not switch different input signals simultaneously. Wait for 10 ms before switching the other input signals.

● Input Signal Circuit

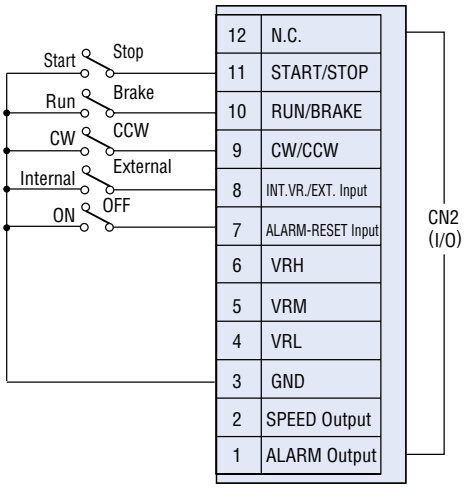
◆ Input Circuit



◆ Example of Input Circuit Connection

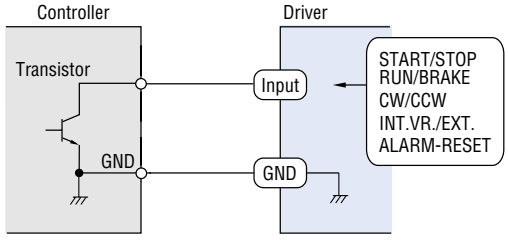
· Control by Small Capacity Relay, Switch, or Similar Device

Switch capacity: 24 VDC 10 mA

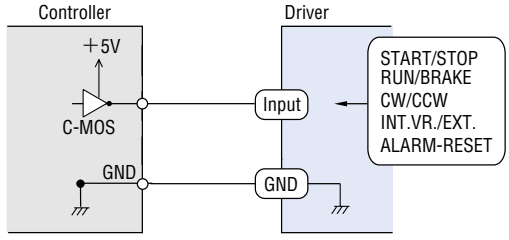


· Control by Controller

■ **Transistor output type**

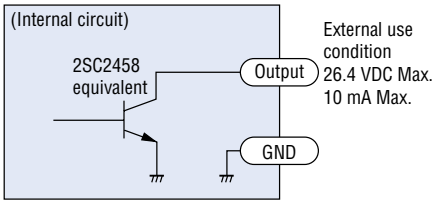


■ **C-MOS type**



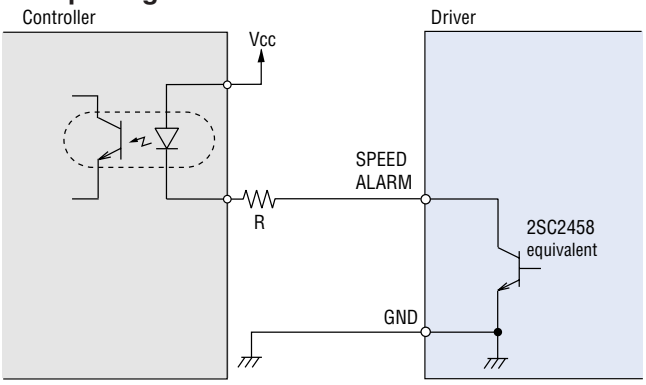
● Output Signal Circuit

◆ Output Circuit



◆ Example of Output Circuit Connection

· Output Signal Connections

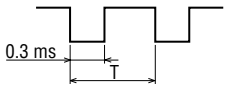


· SPEED Output

The system outputs pulse signals (with a width of 0.3 ms) at a rate of 30 pulses per rotation of the motor output shaft, synchronized with the motor drive. You can measure the SPEED output frequency and calculate the motor speed.

$$\text{Motor speed (r/min)} = \frac{\text{Speed output frequency [Hz]}}{30} \times 60\,[\text{r/min}]$$

$$\text{SPEED output frequency (Hz)} = \frac{1}{T}$$



· ALARM Output

The ALARM output is normally at the ON (L level) and switches to the OFF (H level) when there is an alarm.

· ALARM-RESET

When the motor is stopped, setting this signal to the ON (L level), then returning it to the OFF (H level) resets the alarm. Please return either the START/STOP input or the RUN/BRAKE input to the OFF (H level) before inputting the ALARM-RESET. The ALARM-RESET is not accepted if both these signals are at the ON (L level).

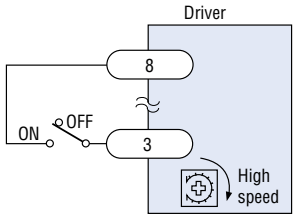
Notes:

- Output signal is open collector output, so an external power supply (Vcc) is required.
- Use a power supply of no more than 26.4 VDC and connect a limit resistance (R) so that the output current does not exceed 10 mA. When using neither the speed output function nor the alarm output function, this connection is not required.

● Speed Setting Method

◆ Speed Control by Internal Potentiometer

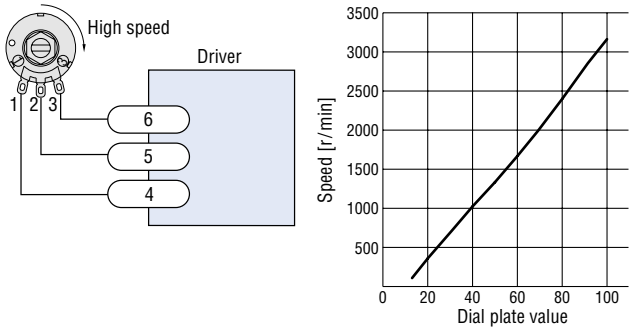
When INT.VR/EXT. input is set to the ON (L level), the speed can be set with the internal speed potentiometer. There is no need for this connection when the internal potentiometer is not used.



◆ Speed Control by External Potentiometer

When separating the motor speed setting from the driver, connect the optional external potentiometer as follows.

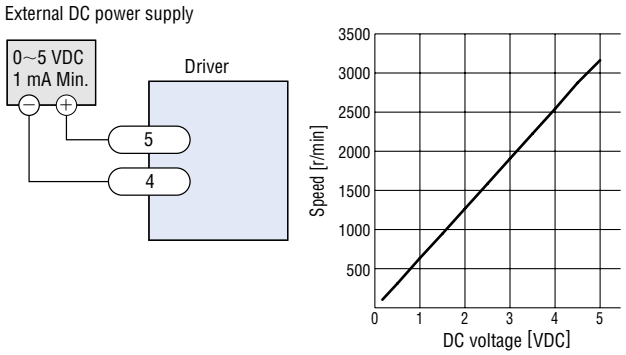
External speed potentiometer
PAVR-20KZ (Sold separately)



External Potentiometer Scale—Speed Characteristics (Representative Values)

◆ Speed Control by External DC Voltage

When setting the motor speed with an external DC voltage, do so in the following manner.



DC Voltage—Speed Characteristics (Representative Values)

■ Accessories (Sold Separately)

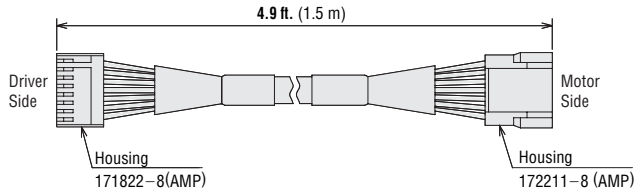
● Extension Cable

The maximum extended length is 6.6 ft. (2 m).

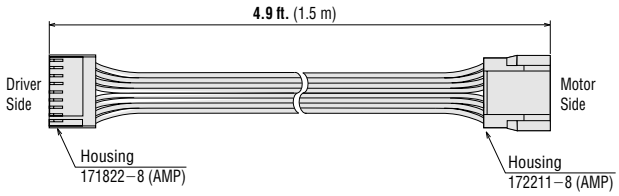
◆ For 15 W, 30 W, 50 W

Two types of cables are available. Covered lead wire type and ribbon cable type.

● CC02AXH [4.9 ft. (1.5 m)]



● FC02HBL [4.9 ft. (1.5 m)]



◆ For 100 W

● CC02AXH2 [4.9 ft. (1.5 m)]