Brushless DC Motor Systems

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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.

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.

Additional Functionality

OPX-1A Control Module

Safety Standards and CE Making

<table>
<thead>
<tr>
<th>Model</th>
<th>Standards</th>
<th>Certification Body</th>
<th>Standards File No.</th>
<th>CE Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>BXM230</td>
<td>UL60950</td>
<td>UL</td>
<td>UL File No. E208200</td>
<td></td>
</tr>
<tr>
<td>BXM460</td>
<td>CSA C22.2 No.60950</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BXM5120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BXM6200</td>
<td>UL1004</td>
<td>UL</td>
<td>UL File No. E62327</td>
<td></td>
</tr>
<tr>
<td>BXM6400</td>
<td>UL1004</td>
<td>UL</td>
<td>UL File No. E62327</td>
<td></td>
</tr>
</tbody>
</table>

- 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 B-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.

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

**Mounting Brackets**
(→Page A-204)

**Flexible Couplings**
(→Page A-208)

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

- **Mounting Brackets**
- **Flexible Couplings**
- **DIN Rail Mounting Plate**

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**Combination Type**
(Pre-assembled Gearmotor)

- **Extension Cables**
(→Page B-33)
- **Programmable Controller**
(Not Supplied)

**BX Series**

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### 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.)

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### 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

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### Product Line

#### Combination Type/Standard

<table>
<thead>
<tr>
<th>Output Power</th>
<th>Power Supply Voltage</th>
<th>Model</th>
<th>Gear Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/25 30</td>
<td>Single-Phase 100-115 VAC</td>
<td>BX230A</td>
<td>5 - 200</td>
</tr>
<tr>
<td></td>
<td>Single-Phase, Three-Phase 200-230 VAC</td>
<td>BX230C</td>
<td>5 - 200</td>
</tr>
<tr>
<td>1/12 60</td>
<td>Single-Phase 100-115 VAC</td>
<td>BX460A</td>
<td>5 - 200</td>
</tr>
<tr>
<td></td>
<td>Single-Phase, Three-Phase 200-230 VAC</td>
<td>BX460C</td>
<td>5 - 200</td>
</tr>
<tr>
<td>1/6 120</td>
<td>Single-Phase 100-115 VAC</td>
<td>BX5120A</td>
<td>5 - 200</td>
</tr>
<tr>
<td></td>
<td>Single-Phase, Three-Phase 200-230 VAC</td>
<td>BX5120C</td>
<td>5 - 200</td>
</tr>
<tr>
<td>1/4 200</td>
<td>Single-Phase 100-115 VAC</td>
<td>BX6200A</td>
<td>5 - 200</td>
</tr>
<tr>
<td></td>
<td>Single-Phase, Three-Phase 200-230 VAC</td>
<td>BX6200C</td>
<td>5 - 200</td>
</tr>
<tr>
<td>1/2 400</td>
<td>Three-Phase 200-230 VAC</td>
<td>BX6400S</td>
<td>5 - 200</td>
</tr>
</tbody>
</table>

#### Combination Type/Electromagnetic Brake

<table>
<thead>
<tr>
<th>Output Power</th>
<th>Power Supply Voltage</th>
<th>Model</th>
<th>Gear Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/25 30</td>
<td>Single-Phase 100-115 VAC</td>
<td>BX230AM</td>
<td>5 - 200</td>
</tr>
<tr>
<td></td>
<td>Single-Phase, Three-Phase 200-230 VAC</td>
<td>BX230CM</td>
<td>5 - 200</td>
</tr>
<tr>
<td>1/12 60</td>
<td>Single-Phase 100-115 VAC</td>
<td>BX460AM</td>
<td>5 - 200</td>
</tr>
<tr>
<td></td>
<td>Single-Phase, Three-Phase 200-230 VAC</td>
<td>BX460CM</td>
<td>5 - 200</td>
</tr>
<tr>
<td>1/6 120</td>
<td>Single-Phase 100-115 VAC</td>
<td>BX5120AM</td>
<td>5 - 200</td>
</tr>
<tr>
<td></td>
<td>Single-Phase, Three-Phase 200-230 VAC</td>
<td>BX5120CM</td>
<td>5 - 200</td>
</tr>
<tr>
<td>1/4 200</td>
<td>Single-Phase 100-115 VAC</td>
<td>BX6200AM</td>
<td>5 - 200</td>
</tr>
<tr>
<td></td>
<td>Single-Phase, Three-Phase 200-230 VAC</td>
<td>BX6200CM</td>
<td>5 - 200</td>
</tr>
<tr>
<td>1/2 400</td>
<td>Three-Phase 200-230 VAC</td>
<td>BX6400SM</td>
<td>5 - 200</td>
</tr>
</tbody>
</table>

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* 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.

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- **Enter the gear ratio in the box within the model name.**
### Specifications

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

**Combinations**

- **Round Shaft Type/Standard**
- **Round Shaft Type/Electromagnetic Brake**

#### Power Source

- **(Voltage, Frequency)**
  - 100-115 VAC Specifications
  - 200-230 VAC Specifications

**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 oz-in (N-m)**

- 28 (0.2)
- 56 (0.4)
- 113 (0.8)
- 184 (1.3)

**Meaning in Torque**

- 2.4 (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)

**Rotor 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)
- 96 (17.5×10^-4)

**Power Source (Voltage, Frequency)**

- 100-115 VAC Specifications
- 200-230 VAC Specifications

**Permissible Load Inertia J oz-in^2 (kg m^2)**

- 0.04 (0.088×10^-4)
- 0.46 (0.088×10^-4)
- 0.8 (0.088×10^-4)
- 1.2 (0.088×10^-4)
- 1.6 (0.088×10^-4)

**Electromagnetic Brake**

#### Active when the power is off, automatically controlled by the driver.

- **Brake Type**
- **Static Friction Torque oz-in (N-m)**

**Motor Heat Sink**

- **(Material: Aluminum)**
- **Frame Size: in sq. (mm sq.)**
- **Thickness: in sq. (mm sq.)**

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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

<table>
<thead>
<tr>
<th>BX Series Standard</th>
<th>BX Series with optional OPX-1A control module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Speed Range (r/min)</td>
<td>30~3000 (Analog speed setting)</td>
</tr>
</tbody>
</table>
| Acceleration/Deceleration Time (at 3000 r/min) | Preset Acceleration/Deceleration time is shared by all data index operations of one of the following:  
- Internal potentiometer with analog setting (0.1~15 sec.)  
- Digital setting (0~30 sec. Setting resolution: 0.001 sec.) | Shared by all data index operations.  
- 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 | Digital six-step speed setting | Digital eight-step speed setting |

### 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 (20kΩ, 1/4W) or  
- External DC Voltage, 0~5VDC (input impedance: 15kΩ) |
| Acceleration/Deceleration Time (at 3000 r/min) | Preset Acceleration/Deceleration time is shared by all data index operations of 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 of 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.

<table>
<thead>
<tr>
<th>Torque-Limiting Setting Method</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>By one of the following:</td>
<td></td>
</tr>
<tr>
<td>• Digital Common Torque Setting: A torque-limiting value can be set for all data sets (No. 0 – 7) in one operation.</td>
<td></td>
</tr>
<tr>
<td>• Digital Independent Torque Setting: A torque-limiting value can be set independently for each data set (No. 0 – 7).</td>
<td></td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td>External analog input:</td>
<td></td>
</tr>
<tr>
<td>• External potentiometer (20 kΩ, 1/4 W) or</td>
<td></td>
</tr>
<tr>
<td>• External DC Voltage, 0 – 5 VDC (input impedance: 15 kΩ)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Torque-Limiting Setting Range</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assuming that peak (starting) torque is 100 %, torque limiting values can be selected by one of the following:</td>
<td></td>
</tr>
<tr>
<td>• Digital Setting: 1 – 100 % (Resolution 1 %)</td>
<td></td>
</tr>
<tr>
<td>• External Analog Input, 1 – 100 % by:</td>
<td></td>
</tr>
<tr>
<td>• External potentiometer (20 kΩ, 1/4 W) or</td>
<td></td>
</tr>
<tr>
<td>• External DC Voltage, 0 – 5 VDC (input impedance: 15 kΩ)</td>
<td></td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Insulation Class</td>
<td>Class A [221 °F (105 °C)]</td>
</tr>
<tr>
<td>Control System</td>
<td>PWM Control</td>
</tr>
<tr>
<td>Speed and Positioning Control Detection System</td>
<td>Optical Encoder (500 P/R)</td>
</tr>
<tr>
<td>Input Signal *</td>
<td>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</td>
</tr>
<tr>
<td>Output Signal *</td>
<td>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.</td>
</tr>
<tr>
<td>Protection Functions</td>
<td>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.</td>
</tr>
</tbody>
</table>

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

**General Specifications**

<table>
<thead>
<tr>
<th>Item</th>
<th>Motor</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation Resistance</td>
<td>100 MΩ or more when 500 VDC is applied between the windings and the frame.</td>
<td>100 MΩ or more when 500 VDC is applied between the following places: Frame—Power Input Terminal Signal Terminal—Power Input Terminal</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>Sufficient to withstand 1500 VAC at 50 Hz applied between the windings and the frame.</td>
<td>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</td>
</tr>
<tr>
<td>Operating Environment Conditions</td>
<td>Ambient Temperature</td>
<td>32 °F – 122 °F (0 °C – 50 °C), nonfreezing</td>
</tr>
<tr>
<td></td>
<td>Humidity</td>
<td>85% maximum, noncondensing</td>
</tr>
<tr>
<td></td>
<td>Atmosphere</td>
<td>No corrosive gases or dust</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Gear Ratio</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>30</th>
<th>50</th>
<th>100</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Range r/min</td>
<td>6 (0.6) ~ 600</td>
<td>3 (0.3) ~ 300</td>
<td>2 (0.2) ~ 200</td>
<td>1.5 (0.15) ~ 150</td>
<td>1 (0.1) ~ 100</td>
<td>0.6 (0.06) ~ 60</td>
<td>0.3 (0.03) ~ 30</td>
<td>0.15 (0.015) ~ 15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BX230</td>
<td>3.9</td>
<td>7.9</td>
<td>12.3</td>
<td>15.9</td>
<td>23</td>
<td>38</td>
</tr>
<tr>
<td>BX230 M</td>
<td>0.45</td>
<td>0.9</td>
<td>1.4</td>
<td>1.8</td>
<td>2.6</td>
<td>4.3</td>
</tr>
<tr>
<td>BX460</td>
<td>7.9</td>
<td>15.9</td>
<td>23</td>
<td>31</td>
<td>46</td>
<td>76</td>
</tr>
<tr>
<td>BX460 M</td>
<td>0.9</td>
<td>1.8</td>
<td>2.7</td>
<td>3.6</td>
<td>5.2</td>
<td>8.6</td>
</tr>
<tr>
<td>BX5120</td>
<td>15.9</td>
<td>31</td>
<td>47</td>
<td>63</td>
<td>91</td>
<td>152</td>
</tr>
<tr>
<td>BX5120 M</td>
<td>1.8</td>
<td>3.6</td>
<td>5.4</td>
<td>7.2</td>
<td>10.3</td>
<td>17.2</td>
</tr>
<tr>
<td>BX6200</td>
<td>23</td>
<td>46</td>
<td>69</td>
<td>84</td>
<td>125</td>
<td>200</td>
</tr>
<tr>
<td>BX6200 M</td>
<td>2.6</td>
<td>5.3</td>
<td>7.9</td>
<td>9.5</td>
<td>14.2</td>
<td>23.7</td>
</tr>
<tr>
<td>BX6400S</td>
<td>46</td>
<td>92</td>
<td>139</td>
<td>168</td>
<td>250</td>
<td>350</td>
</tr>
<tr>
<td>BX6400SM</td>
<td>5.3</td>
<td>10.5</td>
<td>15.8</td>
<td>19</td>
<td>29.5</td>
<td>40</td>
</tr>
</tbody>
</table>

* 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

<table>
<thead>
<tr>
<th>Model</th>
<th>Gear Ratio</th>
<th>Permissible Thrust Load lb. (N)</th>
<th>Permissible Overhung Load lb. (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>from the tip of the shaft 0.39 inch (10 mm)</td>
<td>from the tip of the shaft 0.79 inch (20 mm)</td>
</tr>
<tr>
<td>BX230□, BX30□</td>
<td>5</td>
<td>9 (40)</td>
<td>22 (100)</td>
</tr>
<tr>
<td>BX230□, BX30□</td>
<td>10 – 20</td>
<td>9 (40)</td>
<td>33 (150)</td>
</tr>
<tr>
<td>BX230□</td>
<td>30 – 200</td>
<td>9 (40)</td>
<td>45 (200)</td>
</tr>
<tr>
<td>BX32□</td>
<td>5</td>
<td>─</td>
<td>19.6 (87.2)</td>
</tr>
<tr>
<td>BX46□</td>
<td>10 – 20</td>
<td>22 (100)</td>
<td>45 (200)</td>
</tr>
<tr>
<td>BX62□</td>
<td>30 – 200</td>
<td>22 (100)</td>
<td>101 (450)</td>
</tr>
<tr>
<td>BX46A□</td>
<td>5</td>
<td>─</td>
<td>26 (117)</td>
</tr>
<tr>
<td>BX51</td>
<td>5</td>
<td>33 (150)</td>
<td>67 (300)</td>
</tr>
<tr>
<td>BX51</td>
<td>10 – 20</td>
<td>33 (150)</td>
<td>90 (400)</td>
</tr>
<tr>
<td>BX51</td>
<td>30 – 200</td>
<td>33 (150)</td>
<td>112 (500)</td>
</tr>
<tr>
<td>BX51A</td>
<td>5</td>
<td>─</td>
<td>35 (156)</td>
</tr>
<tr>
<td>BX62</td>
<td>5 – 15</td>
<td>45 (200)</td>
<td>123 (550)</td>
</tr>
<tr>
<td>BX62</td>
<td>20 – 200</td>
<td>45 (200)</td>
<td>146 (650)</td>
</tr>
<tr>
<td>BX62A</td>
<td>5</td>
<td>─</td>
<td>44 (197)</td>
</tr>
<tr>
<td>BX64</td>
<td>5 – 15</td>
<td>45 (200)</td>
<td>123 (550)</td>
</tr>
<tr>
<td>BX64</td>
<td>20 – 200</td>
<td>45 (200)</td>
<td>146 (650)</td>
</tr>
<tr>
<td>BX64A</td>
<td>5</td>
<td>─</td>
<td>44 (197)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Gear Ratio</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>30</th>
<th>50</th>
<th>100</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>BX230□, BX30□</td>
<td>5</td>
<td>66</td>
<td>270</td>
<td>600</td>
<td>1090</td>
<td>2000</td>
<td>5000</td>
<td>13700</td>
<td>27000</td>
</tr>
<tr>
<td>BX230C□, BX30CM□</td>
<td>1.2×10⁻³</td>
<td>5×10⁻³</td>
<td>1.1×10⁻²</td>
<td>2×10⁻²</td>
<td>3.7×10⁻²</td>
<td>9.2×10⁻²</td>
<td>2.5×10⁻¹</td>
<td>5×10⁻¹</td>
<td></td>
</tr>
<tr>
<td>When quick stop or instantaneous bidirectional motion is used</td>
<td>8.5</td>
<td>34</td>
<td>77</td>
<td>137</td>
<td>310</td>
<td>850</td>
<td>1560</td>
<td>1560</td>
<td>1560</td>
</tr>
<tr>
<td>BX46A□, BX46AM□</td>
<td>1.56×10⁻⁴</td>
<td>1.62×10⁻⁴</td>
<td>1.41×10⁻⁴</td>
<td>2.5×10⁻⁴</td>
<td>5.6×10⁻⁴</td>
<td>9.5×10⁻⁴</td>
<td>2.2×10⁻¹</td>
<td>5.6×10⁻⁴</td>
<td></td>
</tr>
<tr>
<td>BX46C□, BX46CM□</td>
<td>2.2×10⁻³</td>
<td>2.2×10⁻³</td>
<td>2.2×10⁻³</td>
<td>2.2×10⁻³</td>
<td>4×10⁻³</td>
<td>8×10⁻³</td>
<td>2.2×10⁻¹</td>
<td>6.2×10⁻¹</td>
<td></td>
</tr>
<tr>
<td>When quick stop or instantaneous bidirectional motion is used</td>
<td>31</td>
<td>520</td>
<td>1200</td>
<td>1910</td>
<td>4400</td>
<td>12000</td>
<td>34000</td>
<td>66000</td>
<td>66000</td>
</tr>
<tr>
<td>BX51</td>
<td>5.63×10⁻⁴</td>
<td>123</td>
<td>280</td>
<td>490</td>
<td>900</td>
<td>1100</td>
<td>3100</td>
<td>3100</td>
<td>3100</td>
</tr>
<tr>
<td>BX51</td>
<td>22.5×10⁻⁴</td>
<td>50.7×10⁻⁴</td>
<td>90×10⁻⁴</td>
<td>202×10⁻⁴</td>
<td>562×10⁻⁴</td>
<td>562×10⁻⁴</td>
<td>3100</td>
<td>3100</td>
<td>3100</td>
</tr>
<tr>
<td>BX51C□, BX51CM□</td>
<td>4.5×10⁻³</td>
<td>1.9×10⁻²</td>
<td>4.2×10⁻²</td>
<td>7×10⁻²</td>
<td>1.6×10⁻¹</td>
<td>4.5×10⁻¹</td>
<td>66000</td>
<td>137000</td>
<td>137000</td>
</tr>
<tr>
<td>When quick stop or instantaneous bidirectional motion is used</td>
<td>137</td>
<td>550</td>
<td>1230</td>
<td>2200</td>
<td>4900</td>
<td>90000</td>
<td>210000</td>
<td>98000</td>
<td>200000</td>
</tr>
<tr>
<td>BX62</td>
<td>25×10⁻⁴</td>
<td>100×10⁻⁴</td>
<td>225×10⁻⁴</td>
<td>400×10⁻⁴</td>
<td>900×10⁻⁴</td>
<td>2500×10⁻⁴</td>
<td>2500×10⁻⁴</td>
<td>2500×10⁻⁴</td>
<td>2500×10⁻⁴</td>
</tr>
<tr>
<td>BX62</td>
<td>1×10⁻²</td>
<td>4.6×10⁻³</td>
<td>5500</td>
<td>1.7×10⁻¹</td>
<td>30000</td>
<td>1.8×10⁻¹</td>
<td>3.7×10⁻³</td>
<td>3.7×10⁻³</td>
<td>3.7×10⁻³</td>
</tr>
<tr>
<td>BX62A</td>
<td>210</td>
<td>37.5×10⁻⁴</td>
<td>1840</td>
<td>600×10⁻⁴</td>
<td>3300</td>
<td>7400</td>
<td>210000</td>
<td>98000</td>
<td>200000</td>
</tr>
<tr>
<td>BX62C□, BX62CM□</td>
<td>37.5×10⁻⁴</td>
<td>150×10⁻⁴</td>
<td>337×10⁻⁴</td>
<td>600×10⁻⁴</td>
<td>1350×10⁻⁴</td>
<td>3750×10⁻⁴</td>
<td>3750×10⁻⁴</td>
<td>3750×10⁻⁴</td>
<td>3750×10⁻⁴</td>
</tr>
<tr>
<td>When quick stop or instantaneous bidirectional motion is used</td>
<td>210</td>
<td>820</td>
<td>1840</td>
<td>3300</td>
<td>7400</td>
<td>210000</td>
<td>98000</td>
<td>200000</td>
<td>200000</td>
</tr>
</tbody>
</table>

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.

---

**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.

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

Regenerative power \( W = 0.1047 \times T_l \times N \) \( \text{[W]} \) where 
- \( T_l \): Load torque, \( \text{[N-m]} \)
- \( N \): Rotating speed, \( \text{[r/min]} \)

* Use the electromagnetic-brake type for gravitational operation.

---

**Rotational Characteristics**

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

* Install the regeneration unit in the place which has the same heat radiation capability as heat radiation plate [13.8 inch \( \times \) 13.8 inch \( \times \) 0.12 inch (350 mm \( \times \) 350 mm \( \times \) 3 mm)].

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

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

* 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-**
  - Motor: BXM230-GFH2
  - Gearhead: GFH2G2
  - Weight: 2.6 lb. (1.2 kg) including gearhead

  - C147A (GFH2G5–20)
  - C147B (GFH2G3–100)
  - C147C (GFH2G200)

- **BX230C-**
  - Motor: BXM230-GFH2
  - Gearhead: GFH2G2
  - Weight: 4.4 lb. (2 kg) including gearhead

  - C147A (GFH2G5–20)
  - C147B (GFH2G3–100)
  - C147C (GFH2G200)

---

**Key and Key Slot**

(The key is provided with the gearhead)

![Diagram of Key and Key Slot]

- **Shaft Cross Section AA**

---

**Motor/Gearhead**

- **BX460A-**
  - Motor: BXM460-GFH2
  - Gearhead: GFH4G2
  - Weight: 4.4 lb. (2 kg) including gearhead

  - C148A (GFH4G5–20)
  - C148B (GFH4G3–100)
  - C148C (GFH4G200)

- **BX460C-**
  - Motor: BXM460-GFH2
  - Gearhead: GFH4G2
  - Weight: 2.6 lb. (1.2 kg) including gearhead

  - C148A (GFH4G5–20)
  - C148B (GFH4G3–100)
  - C148C (GFH4G200)

---

**Key and Key Slot**

(The key is provided with the gearhead)

![Diagram of Key and Key Slot]

- **Shaft Cross Section AA**

---

**Dimensions**

- C147A: L = 1.34 (34)
- C147B: L = 1.50 (38)
- C147C: L = 1.69 (43)

- C148A: L = 1.61 (41)
- C148B: L = 1.81 (46)
- C148C: L = 2.0 (51)
Motor/Gearhead
BX5120A, BX5120C
Motor: BXM5120-GFH2
Gearhead: GFH5G
Weight: 6.8 lb. (3.1 kg) including gearhead

C149A (GFH5G – 20)
C149B (GFH5G30 – 100)
C149C (GFH5G200)

Motor/Gearhead
BX6200A, BX6200C
BX6400S
Motor: BXM6200-GH
Gearhead: 6GH
Weight: 11 lb. (4.9 kg) including gearhead

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)

**BX5120A-A, BX5120C-A**
Motor: BXM5120-A2
Weight: 3.5 lb. (1.6 kg)

**BX460A-A, BX460C-A**
Motor: BXM460-A2
Weight: 2.2 lb. (1.0 kg)

**BX6200A-A, BX6200C-A, BX6400S-A**
Motor: BXM6200-A
BXM6400-A
Weight: 5.5 lb. (2.5 kg)
Combination Type with Electromagnetic Brake

**BX230AM**, BX230CM

Motor: BX230M-GFH2
Gearhead: GFH2
Weight: 3.3 lb. (1.5 kg) including gearhead

- **C153A** (GFH2G5 – 20)
- **C153B** (GFH2G30 – 100)
- **C153C** (GFH2G200)

Motor:
- BXM230M-GFH2

Gearhead:
- GFH2G

Weight: 3.3 lb. (1.5 kg) including gearhead

- **C153A** (GFH2G5 – 20)
- **C153B** (GFH2G30 – 100)
- **C153C** (GFH2G200)

**BX460AM**, BX460CM

Motor: BX460M-GFH2
Gearhead: GFH4
Weight: 5.5 lb. (2.5 kg) including gearhead

- **C154A** (GFH4G5 – 20)
- **C154B** (GFH4G30 – 100)
- **C154C** (GFH4G200)

Motor:
- BXM460M-GFH2

Gearhead:
- GFH4G

Weight: 5.5 lb. (2.5 kg) including gearhead

- **C154A** (GFH4G5 – 20)
- **C154B** (GFH4G30 – 100)
- **C154C** (GFH4G200)

---

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

**Shaft Cross Section AA**

---

Specifications

- **GFH2G5 – 20**: L = 1.34 (34)
- **GFH2G30 – 100**: L = 1.50 (38)
- **GFH2G200**: L = 1.80 (43)

---

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

**Shaft Cross Section AA**

---

Specifications

- **GFH4G5 – 20**: L = 1.81 (41)
- **GFH4G30 – 100**: L = 1.81 (46)
- **GFH4G200**: L = 2.0 (51)
Introduction

Before Using a Speed Control System

BX5120AM-, BX5120CM-
Motor: BXM5120M-GFH2
Gearhead: GFH5G
Weight: 8.1 lb. (3.7 kg) including gearhead

BX6200AM-, BX6200CM-
Motor: BXM6200M-GH
Gearhead: GH
Weight: 13 lb. (5.9 kg) including gearhead

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

Shaft Cross Section AA

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)

BX460AM-A, BX460CM-A
Motor: BXM460M-A2
Weight: 3.3 lb. (1.5 kg)

BX5120AM-A, BX5120CM-A
Motor: BXM5120M-A2
Weight: 4.8 lb. (2.2 kg)
### BX6200AM-A, BX6200CM-A
### BX6400SM-A

**Motor:** BXM6200M-A, BXM6400M-A  
**Weight:** 7.7 lb. (3.5 kg)

**Speed Control Systems**
- **Brushless DC Motor Systems**
- **AC Input**

**BX6200AM-A, BX6200CM-A**

**Dimensions**
- Width: 5.91 (150)
- Height: 1.46 (37)
- Depth: 0.51 (14.4)

**Connection and Operation**

**Motor and Driver Combinations**

**Motor:** BXM6200M-A, BXM6400M-A  
**Weight:** 7.7 lb. (3.5 kg)

**Driver**
**Weight:** 1.8 lb. (0.8 kg)

**External Speed Potentiometer (included)**

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

---

**Cable**
- 16 inch (400 mm) Length

**Driver Mounting Tab**
- (2 pieces included)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>0.39</td>
</tr>
<tr>
<td>Length</td>
<td>5.29</td>
</tr>
<tr>
<td>Width</td>
<td>5.91</td>
</tr>
<tr>
<td>Height</td>
<td>1.46</td>
</tr>
<tr>
<td>Depth</td>
<td>0.51</td>
</tr>
</tbody>
</table>

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

---

**Driver Mounting Tab**
- (2 pieces included)

**External Speed Potentiometer (included)**

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

---

**Driver Mounting Tab**
- (2 pieces included)

**External Speed Potentiometer (included)**

---

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

---

**Driver Mounting Tab**
- (2 pieces included)

**External Speed Potentiometer (included)**
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

<table>
<thead>
<tr>
<th>Display</th>
<th>Color</th>
<th>Function</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>Green</td>
<td>Power Input Indication</td>
<td>When current is applied</td>
</tr>
<tr>
<td>Alarm</td>
<td>Red</td>
<td>Alarm Output Indication</td>
<td>When the protection function has activated</td>
</tr>
</tbody>
</table>

### Alarm Functions

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

* 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

Input and Output Signals

<table>
<thead>
<tr>
<th>Terminal Number</th>
<th>Signal</th>
<th>Standard Model</th>
<th>With Control Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Input</td>
<td>CW</td>
<td>CW</td>
</tr>
<tr>
<td>2</td>
<td>CCW</td>
<td>CCW</td>
<td>HOME-LS</td>
</tr>
<tr>
<td>3</td>
<td>M0</td>
<td>M0</td>
<td>M0</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>M1</td>
<td>M1</td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
<td>M2</td>
<td>M2</td>
</tr>
<tr>
<td>6</td>
<td>FREE</td>
<td>FREE</td>
<td>FREE</td>
</tr>
<tr>
<td>7</td>
<td>BRAKE/ACL</td>
<td>BRAKE/ACL</td>
<td>BRAKE/ACL</td>
</tr>
<tr>
<td>8</td>
<td>Input</td>
<td>IN-COM</td>
<td>IN-COM</td>
</tr>
<tr>
<td>9</td>
<td>Analog</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>10</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>11</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>12</td>
<td>ALM</td>
<td>ALM</td>
<td>ALM</td>
</tr>
<tr>
<td>13</td>
<td>Output</td>
<td>BUSY/ALP</td>
<td>BUSY (TLM)<strong>/ALP</strong></td>
</tr>
<tr>
<td>14</td>
<td>ASG</td>
<td>ASG</td>
<td>ASG</td>
</tr>
<tr>
<td>15</td>
<td>BSG</td>
<td>BSG</td>
<td>BSG</td>
</tr>
<tr>
<td>16</td>
<td>Output</td>
<td>OUT-COM</td>
<td>OUT-COM</td>
</tr>
</tbody>
</table>

* 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

Connection Diagram using the OPX-1A Control Module—Position Control Modes

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

Notes:
- When it is needed to 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]
  - Three-Phase 200-230 VAC, 4-core cable [conductor cross-sectional area: AWG18 (0.75 mm²) or more]

- When wiring the control I/O signal lines, keep a minimum distance of 12 inch (300 mm) from power lines (AC line, motor line and other large-current circuits). Also, do not route the control I/O signal lines in the same duct or piping as that is used for power lines.
- Cables for the power-supply lines and control I/O signal lines are not supplied with the product. Provide appropriate cables separately.
- When grounding the driver, connect the ground wire to the Protective Earth terminal (M4) and connect the other end to a single point using a cable with a size of AWG 16 (1.25 mm²) or greater.

Dimensions B-17
Connection and Operation B-24
Motor and Driver Combinations B-33
**Using the OPX-1A Control Module — Position Control Mode**

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 model 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 function 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.

- **Photocoupler state**
  - Terminal level
  - Photocoupler state

**Driver Internal Circuits**

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

1. When operating motor, BRAKE input should be turned "ON".
2. The circled number located in front of each signal represents the number of the corresponding I/O signal terminal.
3. 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.
Speed Control Systems

Introduction

Before Using a Speed Control System

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

<table>
<thead>
<tr>
<th>MO</th>
<th>Speed Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Internal Potentiometer</td>
</tr>
<tr>
<td>ON</td>
<td>External Analog Setting</td>
</tr>
</tbody>
</table>

CW Input

BRAKE Input

M0 Input

Motor behavior

CW operation

CCW operation

CW operation

Deceleration time

Deceleration time

Deceleration time

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 according to the gearhead ratio. See the table of permissible torques on page B-14 for details.
◆ 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.

**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.”

**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.”

**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-27)

**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).

<table>
<thead>
<tr>
<th>M0</th>
<th>M1</th>
<th>M2</th>
<th>Speed data number in speed control or position control mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>No. 0 (internal potentiometer or digital setting)</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>No. 1 (external analog setting or digital setting)</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>No. 2 (digital setting)</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>No. 3 (digital setting)</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>No. 4 (digital setting)</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>No. 5 (digital setting)</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
<td>No. 6 (digital setting)</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>No. 7 (digital setting)</td>
</tr>
</tbody>
</table>

**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**

- **START Input**
  - OFF → ON
  - 10 ms or more → 10 ms or more

- **M0～M2 Input**
  - Data No. Confirmation
  - 0.5 ms or more

- **BUSY Output**
  - OFF → ON

- **Speed**
  - Acceleration Time
  - Deceleration Time

*When the digital independent torque-limit function is set, the data numbers will be reflected as necessary even during an index operation.*
**Operation Data Selection (M0, M1, M2) Inputs**
The M0, M1 and M2 inputs will function. The particular combination of these inputs selects travel amount data during positioning or continuous operation, as well as the return to mechanical or electrical home operation. The speed follows the settings in the table below.

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

*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 characteristic graphs and formulas shown below.

Gearhead output shaft speed $N_g$ = Motor speed $\times$ 1 / Gearhead ratio

Gearhead output shaft torque $T_g$ = Motor torque $\times$ Gearhead ratio $\times$ 0.9 (coefficient)

**Speed — Torque Limit Characteristics (Reference Values)**

Torque vs. speed graphs for different models are shown, with each model's peak and rated torque values indicated. The graphs illustrate how torque limits are set based on speed, with different models having different torque limits across various speeds.

**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

<table>
<thead>
<tr>
<th>Type</th>
<th>Model</th>
<th>Motor Model</th>
<th>Gearhead Model</th>
<th>Driver Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Round Shaft Type</td>
<td>BX230A-</td>
<td>BXM230M-GFH2</td>
<td>BXM5120M-GFH2</td>
<td>BXM460M-GFH2</td>
</tr>
<tr>
<td>Standard Round Shaft Type</td>
<td>BX230C-</td>
<td>BXM230M-GFH2</td>
<td>BXM5120M-GFH2</td>
<td>BXM460M-GFH2</td>
</tr>
<tr>
<td>Standard Round Shaft Type</td>
<td>BX6400SM-A</td>
<td>BXM6400M-GFH2</td>
<td>BXM6400M-GFH2</td>
<td>BXM6400M-GFH2</td>
</tr>
</tbody>
</table>

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

Accessories (Sold Separately)

Extension Cable / Flexible Extension Cable

For Motor

For Encoder

Regeneration Unit

EPRC-400P, RGB100
Weight: 0.55 lb. (0.25 kg)

Extension Cable

Flexible Extension Cable

Regeneration Unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Length ft. (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC01SBF</td>
<td>3.3 (1)</td>
</tr>
<tr>
<td>CC02SBF</td>
<td>6.6 (2)</td>
</tr>
<tr>
<td>CC03SBF</td>
<td>9.8 (3)</td>
</tr>
<tr>
<td>CC05SBF</td>
<td>16.4 (5)</td>
</tr>
<tr>
<td>CC07SBF</td>
<td>23.0 (7)</td>
</tr>
<tr>
<td>CC10SBF</td>
<td>32.8 (10)</td>
</tr>
<tr>
<td>CC15SBF</td>
<td>49.2 (15)</td>
</tr>
<tr>
<td>CC20SBF</td>
<td>65.6 (20)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Length ft. (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC01SBF</td>
<td>3.3 (1)</td>
</tr>
<tr>
<td>CC02SBF</td>
<td>6.6 (2)</td>
</tr>
<tr>
<td>CC03SBF</td>
<td>9.8 (3)</td>
</tr>
<tr>
<td>CC05SBF</td>
<td>16.4 (5)</td>
</tr>
<tr>
<td>CC07SBF</td>
<td>23.0 (7)</td>
</tr>
<tr>
<td>CC10SBF</td>
<td>32.8 (10)</td>
</tr>
<tr>
<td>CC15SBF</td>
<td>49.2 (15)</td>
</tr>
<tr>
<td>CC20SBF</td>
<td>65.6 (20)</td>
</tr>
</tbody>
</table>

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

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).

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

Safety Standards and CE Marking

<table>
<thead>
<tr>
<th>Standards</th>
<th>Certification Body</th>
<th>Standards File No.</th>
<th>CE Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UL1004</td>
<td>UL</td>
<td>E62327</td>
<td></td>
</tr>
<tr>
<td>CSA C22.2 No.100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EN60950</td>
<td>DEMKO</td>
<td>124688</td>
<td></td>
</tr>
<tr>
<td>EN60034-1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EN60034-5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UL508C</td>
<td>UL</td>
<td>E171462</td>
<td></td>
</tr>
<tr>
<td>CSA C22.2 No.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EN60950*</td>
<td>DEMKO</td>
<td>131974</td>
<td></td>
</tr>
</tbody>
</table>

* 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

- **Mounting Brackets** (Accessories) (→Page A-204)
- **Flexible Couplings** (Accessories) (→Page A-208)
- **Motor Speed Indicator** (Accessories) Not a standard certified product (→Page A-214)
- **DIN Rail Mounting Plate** (Accessories) (→Page A-217)

**BXFBL** 2

**AXU**

**HESUS**

*Introduction*

**Before Using a Speed Control System**

**AC Input**

**DC Input**

**ABU**

**BH**

**ES**

**US**

**Main Components**

- **Mounting Brackets** (Accessories)
- **Flexible Couplings** (Accessories)
- **Motor Speed Indicator** (Accessories)
- **DIN Rail Mounting Plate** (Accessories)

**Combination Type** (Pre-assembled Gearmotor)

**Extension Cables** (Accessories) (→Page B-44)

**Driver**

**AC Power Supply** (Not Supplied)

**Programmable Controller** (Not Supplied)

**24 VDC Power Supply** (Not Supplied)

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
- **Output Power**: 75 W (1/10 HP)
  - **FBL575AW-**
  - **FBL575CW-**
  - **FBL575SW-**
  - **FBL575AW-A**
  - **FBL575CW-A**
  - **FBL575SW-A**
  - **FBL5120AW-**
  - **FBL5120CW-**
  - **FBL5120SW-**
  - **FBL5120CW-A**
  - **FBL5120SW-A**

- **Motor Frame Size**: 5.34 in. sq. (90 mm sq.)

**Series**

**FBL : FBLII Series**

## Product Line

### Combination Type

<table>
<thead>
<tr>
<th>Output Power HP</th>
<th>Power Supply Voltage</th>
<th>Model</th>
<th>Gear Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/10</td>
<td>Single-Phase 100-115 VAC</td>
<td>FBL575AW-A</td>
<td>5, 10, 15, 20, 30, 50, 100, 200</td>
</tr>
<tr>
<td>1/6</td>
<td>Single-Phase 200-230 VAC</td>
<td>FBL575CW-A</td>
<td>5, 10, 15, 20, 30, 50, 100, 200</td>
</tr>
<tr>
<td></td>
<td>Three-Phase 200-230 VAC</td>
<td>FBL575SW-A</td>
<td>5, 10, 15, 20, 30, 50, 100, 200</td>
</tr>
<tr>
<td></td>
<td>Single-Phase 100-115 VAC</td>
<td>FBL5120AW-A</td>
<td>5, 10, 15, 20, 30, 50, 100, 200</td>
</tr>
<tr>
<td></td>
<td>Single-Phase 200-230 VAC</td>
<td>FBL5120CW-A</td>
<td>5, 10, 15, 20, 30, 50, 100, 200</td>
</tr>
<tr>
<td></td>
<td>Three-Phase 200-230 VAC</td>
<td>FBL5120SW-A</td>
<td>5, 10, 15, 20, 30, 50, 100, 200</td>
</tr>
</tbody>
</table>

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

### Round Shaft Type

<table>
<thead>
<tr>
<th>Output Power HP</th>
<th>Power Supply Voltage</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/10</td>
<td>Single-Phase 100-115 VAC</td>
<td>FBL575AW-A</td>
</tr>
<tr>
<td>1/6</td>
<td>Single-Phase 200-230 VAC</td>
<td>FBL5120AW-A</td>
</tr>
</tbody>
</table>

- Required when the driver’s built-in power supply is not used.

A flexible extension cable is available for FBLII Series. It is most suitable for uses where the cable is bent, twisted or rotated. (→Page B-44)

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

### Product Line

**Combination Type**

1. **Output Power HP**: 1/10 75
2. **Power Supply Voltage**: Single-Phase 100-115 VAC
3. **Model**: FBL575AW-A
4. **Gear Ratio**: 5, 10, 15, 20, 30, 50, 100, 200

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

#### Model

<table>
<thead>
<tr>
<th>Combination Type</th>
<th>Model</th>
<th>Round Shaft Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBL575AW-A</td>
<td>FBL575SCW-A</td>
<td>FBL575SW-A</td>
</tr>
<tr>
<td>FBL5120AW-A</td>
<td>FBL5120CW-A</td>
<td>FBL5120SW-A</td>
</tr>
</tbody>
</table>

#### Power Source

- **Rated Output Power**: HP (W)
- **Voltage**: Single-Phase 100-115 VAC ± 10% 200-230 VAC ± 10% Three-Phase 200-230 VAC ± 10%
- **Frequency**: 50/60 Hz
- **Rated Input Current**: A
- **Maximum Input Current**: A
- **Rated Torque**: oz-in (N-m)
- **Starting Torque**: oz-in (N-m)
- **Permissible Load Inertia J**: (oz-in² (N·m²))
- **Rated Speed**: r/min
- **Variable Speed Range**: r/min
- **Load**: −1% Max. (0—rated torque, at 3000 r/min)
- **Speed Regulation**: ±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)

#### Common Specifications

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

**1 With the FBLII 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

<table>
<thead>
<tr>
<th>Item</th>
<th>Motor</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation Resistance</td>
<td>100 MΩ or more when 500 VDC megger is applied between the windings and the frame under normal ambient temperature and humidity.</td>
<td></td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Operating Ambient Temperature</td>
<td>32°F ~ 122°F (0°C ~ 50°C) (nonfreezing)</td>
<td></td>
</tr>
<tr>
<td>Environmental Ambient Humidity</td>
<td>85% maximum (noncondensing)</td>
<td></td>
</tr>
<tr>
<td>Conditions</td>
<td>No corrosive gases or dust</td>
<td></td>
</tr>
<tr>
<td>Degree of Protection</td>
<td>IP40</td>
<td>IP10</td>
</tr>
</tbody>
</table>
Introduction

Before Using a Speed Control System

Motor and Driver Combinations

Dimensions

Gearmotor — Torque Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Gear Ratio</th>
<th>Speed Range r/min</th>
<th>Permissible Overhung Load</th>
<th>Permissible Thrust Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>60–600</td>
<td>30–300</td>
<td>20–200</td>
</tr>
<tr>
<td>FBL575AW-</td>
<td>5</td>
<td>9.7</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>FBL575CW-</td>
<td>1.1</td>
<td>2.3</td>
<td>3.4</td>
<td>4.5</td>
</tr>
<tr>
<td>FBL575SW-</td>
<td>1.8</td>
<td>3.6</td>
<td>5.4</td>
<td>7.2</td>
</tr>
<tr>
<td>FBL5120AW-</td>
<td>15.9</td>
<td>31</td>
<td>47</td>
<td>63</td>
</tr>
<tr>
<td>FBL5120CW-</td>
<td>1.8</td>
<td>3.6</td>
<td>5.4</td>
<td>7.2</td>
</tr>
<tr>
<td>FBL5120SW-</td>
<td>30–200</td>
<td>112</td>
<td>500</td>
<td>146</td>
</tr>
</tbody>
</table>

● 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

<table>
<thead>
<tr>
<th>Model</th>
<th>Gear Ratio</th>
<th>Permissible Overhung Load</th>
<th>Permissible Thrust Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.39 in. (10 mm) from shaft end</td>
<td>0.79 in. (20 mm) from shaft end</td>
</tr>
<tr>
<td>FBL575AW-</td>
<td>5</td>
<td>67</td>
<td>300</td>
</tr>
<tr>
<td>FBL575CW-</td>
<td>29</td>
<td>130</td>
<td>33</td>
</tr>
<tr>
<td>FBL575SW-</td>
<td>36</td>
<td>160</td>
<td>38</td>
</tr>
<tr>
<td>FBL5120AW-</td>
<td>10–20</td>
<td>90</td>
<td>400</td>
</tr>
<tr>
<td>FBL5120CW-</td>
<td>25</td>
<td>100</td>
<td>225</td>
</tr>
<tr>
<td>FBL5120SW-</td>
<td>137</td>
<td>550</td>
<td>1230</td>
</tr>
<tr>
<td>FBL5575AW-</td>
<td>137</td>
<td>550</td>
<td>1230</td>
</tr>
<tr>
<td>FBL5575CW-</td>
<td>25</td>
<td>100</td>
<td>225</td>
</tr>
<tr>
<td>FBL5575SW-</td>
<td>137</td>
<td>550</td>
<td>1230</td>
</tr>
<tr>
<td>FBL5120AW-</td>
<td>10–20</td>
<td>90</td>
<td>400</td>
</tr>
<tr>
<td>FBL5120CW-</td>
<td>25</td>
<td>100</td>
<td>225</td>
</tr>
<tr>
<td>FBL5120SW-</td>
<td>137</td>
<td>550</td>
<td>1230</td>
</tr>
</tbody>
</table>

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

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

Permissible Load Inertia J for Combination Type

<table>
<thead>
<tr>
<th>Model</th>
<th>Gear Ratio</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>30</th>
<th>50</th>
<th>100</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBL575AW-</td>
<td></td>
<td>137</td>
<td>550</td>
<td>1230</td>
<td>2200</td>
<td>4900</td>
<td>13700</td>
<td>13700</td>
<td>13700</td>
</tr>
<tr>
<td>FBL575CW-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBL575SW-</td>
<td></td>
<td>25</td>
<td>100</td>
<td>225</td>
<td>400</td>
<td>900</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td>FBL5120AW-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBL5120CW-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBL5120SW-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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.

FBL5120AW- A/FBL5120CW-A/FBL5120SW-A
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-A, FBL575CW-A, FBL575SW-A (Combination Type)
Motor: FBLS575W-GFB
Gearhead: GFB5G-
Weight: 6.6 lb. (3.0 kg) included gearhead

DXF A204A (GFB5G5 – 20)
A204B (GFB5G30 – 100)
A204C (GFB5G200)

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

B-36 Characteristics
System Configuration
Features
Specifications

Motor/Gearhead
FBL5120AW-A, FBL5120CW-A, FBL5120SW-A (Combination Type)
Motor: FBLS5120W-GFB
Gearhead: GFB5G-
Weight: 8.8 lb. (4.0 kg) included gearhead

DXF A205A (GFB5G5 – 20)
A205B (GFB5G30 – 100)
A205C (GFB5G200)

B-35 System Configuration
B-34 Features
B-36 Specifications
B-37 Characteristics

Motor/Gearhead
FBL575AW-A, FBL575CW-A, FBL575SW-A (Round Shaft Type)
Motor: FBLS575W-A
Weight: 3.3 lb. (1.5 kg)

DXF A206

Motor/Gearhead
FBL5120AW-A, FBL5120CW-A, FBL5120SW-A (Round Shaft Type)
Motor: FBLS5120W-A
Weight: 5.5 lb. (2.5 kg)

DXF A207

Key and Key Slot (Scale 1/2)
(The key is provided with the gearhead.)
Speed Control Systems

Brushless DC Motor Systems

Driver
FBLD75AW, FBLD75CW, FBLD75SW, FBLD120AW, FBLD120CW, FBLD120SW

Weight: 1.8 lb. (0.8 kg)

Introduction

Before Using a Speed Control System

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

Speed Control Systems

Built-in Potentiometer

<table>
<thead>
<tr>
<th>Display</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEED S.S.</td>
<td>Built-in Speed Potentiometer for Acceleration Time 0.5 – 15 sec. (at 3000 r/min)</td>
</tr>
<tr>
<td>S.D.</td>
<td>Potentiometer for Deceleration Time 0.5 – 15 sec. (at 3000 r/min)</td>
</tr>
</tbody>
</table>

For Motor Connector

Power Supply Terminal Block

Execution and Operation

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

LED Display

<table>
<thead>
<tr>
<th>Display</th>
<th>Function</th>
<th>Lighting Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER</td>
<td>Power Indicator</td>
<td>Lights when the power is ON.</td>
</tr>
</tbody>
</table>
| 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

<table>
<thead>
<tr>
<th>Display</th>
<th>Function and Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXT.</td>
<td>When controlling from a programmable controller or other external power supply. (Factory setting)</td>
</tr>
<tr>
<td>INT.</td>
<td>When controlling with a relay or switch. (Driver built-in power supply)</td>
</tr>
</tbody>
</table>

I/O Power Supply Switch

<table>
<thead>
<tr>
<th>Display</th>
<th>Signal</th>
<th>Function and Operation</th>
</tr>
</thead>
</table>
| 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 | Speed Control Input | Used when controlling the speed by an external potentiometer or DC voltage. |
| M | — | Used when controlling the speed by an external potentiometer or DC voltage. |
| L | — | Used when monitoring the rate of rotation; 12 pulses are output for each motor rotation. |
| 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**

- **Motor**
  - Motor cable w/connector 20 inch (500 mm)
  - Single-phase 100-115 VAC ± 10% 50/60 Hz
  - Single-phase 200-230 VAC ± 10% 50/60 Hz
  - Protective Earth (P.E.)
  - Cross sectional area: AWG18 (0.75 mm² min.)

- **Input Signal Timing Chart**

<table>
<thead>
<tr>
<th>Input Signal</th>
<th>Run/Speed-Select/Stop</th>
<th>Run/Brake</th>
<th>Change Direction/Quick Reverse</th>
<th>Acceleration/Deceleration/Brake</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>CCW</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>SLOW DOWN</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>EXT.VR.</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

- **Motor**
  - CW
  - CCW
  - SLOW DOWN

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.

---

**FBL575SW, FBL5120SW**

- **Motor**
  - Motor cable w/connector 20 inch (500 mm)
  - Three-phase 200-230 VAC ± 10% 50/60 Hz

- **Input Signal Timing Chart**

<table>
<thead>
<tr>
<th>Input Signal</th>
<th>Run/Speed-Select/Stop</th>
<th>Run/Brake</th>
<th>Change Direction/Quick Reverse</th>
<th>Acceleration/Deceleration/Brake</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>CCW</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>SLOW DOWN</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>EXT.VR.</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

- **Motor**
  - CW
  - CCW

Notes:
- 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 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.
**Input Signal Circuit**

**Input Circuit**
Common to EXT.VR., CW, CCW, SLOW DOWN

- Flip the I/O power supply switch to “INT.”.

**Output Signal Circuit**

**Output Circuit**
Common to SPEED OUT and ALARM OUT

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

- **Connection Example for Input Signals**
  - Control by Small Capacity Relays
  - Control by Transistor Output Type PLC

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.

**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.

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

**Connection Example for Output Signals**

- 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.
Before Using a Speed Control System

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.

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

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.

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

<table>
<thead>
<tr>
<th>Output Power</th>
<th>Model</th>
<th>Motor Model</th>
<th>Gearhead Model</th>
<th>Driver Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP</td>
<td>W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/10</td>
<td>75</td>
<td>FBL575AW</td>
<td>FBLM575W-GFB</td>
<td>GFB5G</td>
</tr>
<tr>
<td>1/6</td>
<td>120</td>
<td>FBL5120AW</td>
<td>FBLM5120W-GFB</td>
<td></td>
</tr>
</tbody>
</table>

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

### Round Shaft Type

<table>
<thead>
<tr>
<th>Output Power</th>
<th>Model</th>
<th>Motor Model</th>
<th>Driver Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/10</td>
<td>75</td>
<td>FBL575AW</td>
<td>FBLD75AW</td>
</tr>
<tr>
<td>1/6</td>
<td>120</td>
<td>FBL5120AW</td>
<td>FBLD120AW</td>
</tr>
</tbody>
</table>
## Accessories (Sold separately)

### Extension Cable

<table>
<thead>
<tr>
<th>Model</th>
<th>Length: L [ft. (m)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC01FBL</td>
<td>3.3 (1)</td>
</tr>
<tr>
<td>CC02FBL</td>
<td>6.6 (2)</td>
</tr>
<tr>
<td>CC03FBL</td>
<td>9.8 (3)</td>
</tr>
<tr>
<td>CC05FBL</td>
<td>16.4 (5)</td>
</tr>
<tr>
<td>CC07FBL</td>
<td>23.0 (7)</td>
</tr>
<tr>
<td>CC10FBL</td>
<td>32.8 (10)</td>
</tr>
</tbody>
</table>

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

### Flexible Extension Cable

<table>
<thead>
<tr>
<th>Model</th>
<th>Length: L [ft. (m)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC01FBLR</td>
<td>3.3 (1)</td>
</tr>
<tr>
<td>CC02FBLR</td>
<td>6.6 (2)</td>
</tr>
<tr>
<td>CC03FBLR</td>
<td>9.8 (3)</td>
</tr>
<tr>
<td>CC05FBLR</td>
<td>16.4 (5)</td>
</tr>
<tr>
<td>CC07FBLR</td>
<td>23.0 (7)</td>
</tr>
<tr>
<td>CC10FBLR</td>
<td>32.8 (10)</td>
</tr>
</tbody>
</table>

- 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.
**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.

### 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.

### Safety Standards and CE Marking

<table>
<thead>
<tr>
<th>Standards</th>
<th>Certification Body</th>
<th>Standards File No.</th>
<th>CE Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor</td>
<td>UL1950</td>
<td>UL</td>
<td>E208200</td>
</tr>
<tr>
<td></td>
<td>CSA C22.2 No.950</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EN60950</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EN60034-1</td>
<td>Conform to EN/IEC Standards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EN60034-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Unit</td>
<td>UL508C</td>
<td>UL</td>
<td>E171462</td>
</tr>
<tr>
<td></td>
<td>CSA C22.2 No.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EN60950</td>
<td>Conform to EN/IEC Standards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EN50178</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 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.
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.)

#### 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**
  - **50**: Gear ratio of 50:1
  - **10X**: Denotes decimal gearhead with 10:1 gear ratio

- **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

<table>
<thead>
<tr>
<th>Output Power</th>
<th>Power Supply Voltage</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/75 10 W</td>
<td>Single-Phase 100-115 VAC</td>
<td>AXU210A-GN AXU210A-A</td>
</tr>
<tr>
<td>1/75 25 W</td>
<td>Single-Phase 200-230 VAC</td>
<td>AXU210C-GN AXU210C-A</td>
</tr>
<tr>
<td>1/75 40 W</td>
<td>Three-Phase 200-230 VAC</td>
<td>AXU210S-GN AXU210S-A</td>
</tr>
<tr>
<td>1/100 10 X</td>
<td>Single-Phase 100-115 VAC</td>
<td>AXU425A-GN AXU425A-A</td>
</tr>
<tr>
<td>1/100 25 X</td>
<td>Single-Phase 200-230 VAC</td>
<td>AXU425C-GN AXU425C-A</td>
</tr>
<tr>
<td>1/100 40 X</td>
<td>Three-Phase 200-230 VAC</td>
<td>AXU425S-GN AXU425S-A</td>
</tr>
<tr>
<td>1/100 90 X</td>
<td>Single-Phase 100-115 VAC</td>
<td>AXU590A-GN AXU590A-A</td>
</tr>
<tr>
<td>1/100 20 X</td>
<td>Single-Phase 200-230 VAC</td>
<td>AXU590C-GN AXU590C-A</td>
</tr>
<tr>
<td>1/100 30 X</td>
<td>Three-Phase 200-230 VAC</td>
<td>AXU590S-GN AXU590S-A</td>
</tr>
</tbody>
</table>

### Gearheads (Sold Separately)

- **Gearhead Model**
  - **2GNKA**: 2GNKA (Decimal Gearhead)
  - **4GN10XK**: 4GN10XK (Decimal Gearhead)
  - **5GN10XK**: 5GN10XK (Decimal Gearhead)

- **Gear Ratio**
  - **3 - 180**

- **Enter the appropriate gear ratio in the box ( ) within the gearhead model name.**
Specifications

### Package Model

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AXU210A-A</td>
<td>AXU210C-A</td>
<td>AXU210S-A</td>
<td>AXU425A-A</td>
<td>AXU425C-A</td>
<td>AXU425S-A</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AXU210A-A</td>
<td>AXU210C-A</td>
<td>AXU210S-A</td>
<td>AXU425A-A</td>
<td>AXU425C-A</td>
<td>AXU425S-A</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AXU210A-A</td>
<td>AXU210C-A</td>
<td>AXU210S-A</td>
<td>AXU425A-A</td>
<td>AXU425C-A</td>
<td>AXU425S-A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AXU210A-A</td>
<td>AXU210C-A</td>
<td>AXU210S-A</td>
<td>AXU425A-A</td>
<td>AXU425C-A</td>
<td>AXU425S-A</td>
</tr>
</tbody>
</table>

### Power Source

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Single-Phase 100-115 VAC ±10%</th>
<th>Single-Phase 200-230 VAC ±10%</th>
<th>Three-Phase 200-230 VAC ±10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Rated Input Current A</td>
<td>0.7</td>
<td>0.4</td>
<td>0.25</td>
</tr>
<tr>
<td>Maximum Input Current A</td>
<td>1.2</td>
<td>0.8</td>
<td>0.6</td>
</tr>
<tr>
<td>Rated Torque oz-in (N-m)</td>
<td>7.1 (0.05)</td>
<td>17.7 (0.125)</td>
<td></td>
</tr>
<tr>
<td>Starting Torque oz-in (N-m)</td>
<td>8.5 (0.06)</td>
<td>21 (0.15)</td>
<td></td>
</tr>
<tr>
<td>Permissible Load Inertia J* oz-in² (×10 kg·m²)</td>
<td>2.7 (0.5)</td>
<td>9.6 (1.8)</td>
<td></td>
</tr>
</tbody>
</table>

### Variable Speed Range

<table>
<thead>
<tr>
<th>Range r/min</th>
<th>100–2000 (speed ratio 20:1)</th>
</tr>
</thead>
</table>

### Speed Regulation

<table>
<thead>
<tr>
<th>Load</th>
<th>Voltage</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>−2% Max. (0–rated torque, at rated speed)</td>
<td>±1% Max. (power supply voltage ±10%, at rated speed with no load)</td>
<td>±1% Max. (32°F–104°F [0°C–+40°C] at rated speed with no load)</td>
</tr>
</tbody>
</table>

### Common Specifications

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

*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

<table>
<thead>
<tr>
<th>Item</th>
<th>Motor</th>
<th>Control Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation Resistance</td>
<td>100 MΩ or more when 500 VDC megger is applied between the windings and the frame.</td>
<td>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.</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>Sufficient to withstand 1.5 kVAC at 50 Hz applied between the windings and the frame for 1 minute.</td>
<td>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.</td>
</tr>
<tr>
<td>Operating Ambient Temperature</td>
<td>32°F – 122°F (0°C – +50°C) (nonfreezing)</td>
<td>32°F – 104°F (0°C – +40°C) (nonfreezing)</td>
</tr>
<tr>
<td>Environment Humidity</td>
<td>85% maximum (noncondensing)</td>
<td>—</td>
</tr>
<tr>
<td>Condition Atmosphere</td>
<td>No corrosive gases or dust</td>
<td>—</td>
</tr>
<tr>
<td>Degree of Protection</td>
<td>IP65 (except for the mounting surface)</td>
<td>IP10</td>
</tr>
</tbody>
</table>

- 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 with AXU10XX**: 26 lb-in (3 N·m)
- **AXU425 with AXU10XX**: 70 lb-in (8 N·m)
- All gear ratios except 25:1, 30:1, 36:1: 53 lb-in (6 N·m)
- AXU210 with AXU10XX: 88 lb-in (10 N·m)
- AXU540 with AXU10XX: 177 lb-in (20 N·m)
- AXU540 with AXU10XX: 260 lb-in (30 N·m)

### Gearmotor – Gearhead

#### Maximum Torque When Using a Decimal Gearhead

- **2GN with 2GN10XX**: 26 lb-in (3 N·m)
- **4GN with 4GN10XX**: 70 lb-in (8 N·m)
- All gear ratios except 25:1, 30:1, 36:1: 53 lb-in (6 N·m)

<table>
<thead>
<tr>
<th>Model and Motor/Gearhead</th>
<th>Speed Range r/min</th>
<th>Gear Ratio</th>
<th>Model and Motor/Gearhead</th>
<th>Speed Range r/min</th>
<th>Gear Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXU210A-AN</td>
<td>667 – 1100</td>
<td>3-18</td>
<td>AXU900A-AN</td>
<td>1700 – 3600</td>
<td>3-18</td>
</tr>
<tr>
<td>AXU210C-AN</td>
<td>667 – 1100</td>
<td>3-18</td>
<td>AXU900C-AN</td>
<td>1700 – 3600</td>
<td>3-18</td>
</tr>
<tr>
<td>AXU425A-AN</td>
<td>667 – 1100</td>
<td>3-18</td>
<td>AXU900C-AN</td>
<td>1700 – 3600</td>
<td>3-18</td>
</tr>
<tr>
<td>AXU425C-AN</td>
<td>667 – 1100</td>
<td>3-18</td>
<td>AXU900C-AN</td>
<td>1700 – 3600</td>
<td>3-18</td>
</tr>
<tr>
<td>AXU540A-AN</td>
<td>667 – 1100</td>
<td>3-18</td>
<td>AXU900C-AN</td>
<td>1700 – 3600</td>
<td>3-18</td>
</tr>
<tr>
<td>AXU540C-AN</td>
<td>667 – 1100</td>
<td>3-18</td>
<td>AXU900C-AN</td>
<td>1700 – 3600</td>
<td>3-18</td>
</tr>
<tr>
<td>AXU590A-GU</td>
<td>667 – 1100</td>
<td>3-18</td>
<td>AXU900A-AN</td>
<td>1700 – 3600</td>
<td>3-18</td>
</tr>
<tr>
<td>AXU590C-GU</td>
<td>667 – 1100</td>
<td>3-18</td>
<td>AXU900C-AN</td>
<td>1700 – 3600</td>
<td>3-18</td>
</tr>
</tbody>
</table>

- 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

<table>
<thead>
<tr>
<th>Model</th>
<th>Gear Ratio</th>
<th>Permissible Overhung Load</th>
<th>Permissible Thrust Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.39 in. (10 mm) from shaft end</td>
<td>0.79 in. (20 mm) from shaft end</td>
<td>lb</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Permissible Overhung Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.39 in. (10 mm) from shaft end</td>
</tr>
<tr>
<td></td>
<td>lb.</td>
</tr>
<tr>
<td>AXU210-A</td>
<td>15.7</td>
</tr>
<tr>
<td>AXU425-A</td>
<td>27</td>
</tr>
<tr>
<td>AXU540-A</td>
<td>36</td>
</tr>
<tr>
<td>AXU590-A</td>
<td>36</td>
</tr>
</tbody>
</table>

- 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**

<table>
<thead>
<tr>
<th>Model</th>
<th>Gear Ratio</th>
<th>Motor/Gearhead</th>
<th>Unit= Upper Values: oz-in2/Lower Values: ×10⁻⁴ kg-m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXU210GN/2GNKA</td>
<td>3, 3.6, 5, 6, 7.5, 9, 12.5, 15, 18, 25, 30, 36, 50, 60, 75, 90, 100, 120, 150, 180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AXU425GN/4GNKA</td>
<td>10.8, 15.6, 30, 43, 68, 97, 124, 178, 234, 344, 495, 713, 1370, 1970, 2800, 5500, 5500, 5500, 5500, 5500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AXU540GN/5GNKA</td>
<td>19.7, 28, 55, 79, 123, 177, 225, 324, 430, 590, 910, 1370, 1970, 2800, 5500, 10000, 25000, 25000, 25000, 25000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AXU590GU/5GUWA</td>
<td>49, 71, 137, 197, 310, 440, 563, 81, 156, 225, 324, 490, 850, 1370, 1970, 2800, 5500, 10000, 25000, 25000, 25000, 25000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AXU590GU/5GUWKA</td>
<td>9, 13, 25, 36, 56, 81, 156, 225, 324, 490, 850, 1370, 1970, 2800, 5500, 10000, 25000, 25000, 25000, 25000, 25000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Enter the appropriate gear ratio in the box (A) within the gearhead model name.

- **Speed-Torque Characteristics**


- Starting Torque
- Limited Duty Region
- Rated Torque


- Starting Torque
- Limited Duty Region
- Rated Torque


- Starting Torque
- Limited Duty Region
- Rated Torque

**AXU590A-GN/AXU590C-GN/AXU590S-GN AXU590A-A/AXU590C-A/AXU590S-A**

- Starting Torque
- Limited Duty Region
- Rated Torque
**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

- Gearhead: 2GN-KA
- Weight: 1.1 lb. (0.5 kg)

**AXU210-2A**

- Weight: 0.88 lb. (0.4 kg)

**DXF A289AU (2GN3KA ~ 18KA)**

**AXU210-2A**

- Weight: 0.88 lb. (0.4 kg)

**AXU210-2A**

- Weight: 0.88 lb. (0.4 kg)

**DXF A291BU (2GN25KA ~ 180KA)**

**Round Shaft Type**

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

Motor: AXUM210-A

- Gearhead: 2GN-KA
- 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 A103**

**Motor/Gearhead**

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

Motor: AXUM425-GN

- Gearhead: 4GN-KA
- Weight: 1.76 lb. (0.8 kg)

**DXF A291AU (4GN3KA ~ 18KA)**

**AXU425-2A**

- Weight: 1.43 lb. (0.65 kg)

**AXU425-2A**

- Weight: 1.43 lb. (0.65 kg)

**DXF A291BU (4GN25KA ~ 180KA)**

**Motor/Gearhead**

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

Motor: AXUM425-GN

- Gearhead: 4GN-KA
- Weight: 1.76 lb. (0.8 kg)

**DXF A291AU (4GN3KA ~ 18KA)**

**AXU425-2A**

- Weight: 1.43 lb. (0.65 kg)

**AXU425-2A**

- Weight: 1.43 lb. (0.65 kg)

**DXF A291BU (4GN25KA ~ 180KA)**

**Mounting screws are included with gearheads. Dimensions for screws → Page B-133**
**Round Shaft Type**

**AXU425A-A, AXU425C-A, AXU425S-A**

Round Shaft Type

Motor: AXUM425-A

Weight: 1.76 lb. (0.8 kg)

**Decimal Gearhead**

(Can be connected to AXU425GN pinion shaft type.)

4GN10XK

Weight: 0.88 lb. (0.4 kg)

**Motor/Gearhead**

**AXU540A-GN, AXU540C-GN, AXU540S-GN**

Pinion Shaft Type

Motor: AXUM540-GN

Weight: 3.1 lb. (1.4 kg)

Weight: 3.3 lb. (1.5 kg)

**Round Shaft Type**

**AXU540A-A, AXU540C-A, AXU540S-A**

Round Shaft Type

Motor: AXUM540-A

Weight: 3.1 lb. (1.4 kg)

**Decimal Gearhead**

(Can be connected to AXU540GN pinion shaft type.)

5GN10XK

Weight: 1.32 lb. (0.6 kg)
Motor/Gearhead

**AXUS590A-GU, AXUS590C-GU, AXUS590S-GU**  Pinion Shaft Type

Motor

**AXUM590-GU**  
Weight: 3.1 lb. (1.4 kg)

**SGU**  
Weight: 3.1 lb. (1.4 kg)

Motor Gearhead

**AXUM590-GU**

- MOTOR: AXU590A-GU, AXU590C-GU, AXU590S-GU
- WEIGHT: 3.3 lb. (1.5 kg)

**Round Shaft Type**

**AXUS590A-A, AXUS590C-A, AXUS590S-A**  Round Shaft Type

Motor: AXUM590-A

Weight: 3.1 lb. (1.4 kg)

**Decimal Gearhead**

**SGU10XKB** (for **SGU**)

**SGU10XX** (for **SGU**)

Weight: 1.32 lb. (0.6 kg)

**High-Power Type Gearhead**

**SGU** (For **AXUS590GU** type)

Weight: 4.2 lb. (1.9 kg)

**Key and Key Slot (Scale 1/2)**

(The key is provided with the gearhead)

---

**Dimensions B-51**

**Connection and Operation B-55**

**Motor and Control Unit Combinations B-57**

---

**B-53**
Control Unit
AXUD10A, AXUD10C, AXUD10S
AXUD25A, AXUD25C, AXUD25S
AXUD40A, AXUD40C, AXUD40S
AXUD90A, AXUD90C, AXUD90S
Weight: 0.88 lb. (0.4 kg)

Control Unit Panel Cut-Out

Connection Cable (included)

For single-phase: 3 wires (UL Style 3266, AWG20/1-UL Style 3266, AWG 18)
For three-phase: 4 wires (UL Style 3266, AWG20/1-UL Style 3266, AWG 18)
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

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

0.24 inch max. (6.2 mm)

0.13 inch min. (3.2 mm)

0.35 inch min. (9 mm)

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

Run/direction of rotation selection  Run/instantaneous stop/reversing after instantaneous stop

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**

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

**Input Circuit Connection Example**

- **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.

**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

**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.

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

**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

<table>
<thead>
<tr>
<th>Output Power</th>
<th>Model</th>
<th>Motor Model</th>
<th>Control Unit Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/75 10</td>
<td>AXU210A-GN</td>
<td>AXUM210-A</td>
<td>AXUD10A</td>
</tr>
<tr>
<td></td>
<td>AXU210C-GN</td>
<td>AXUM210-C</td>
<td>AXUD10C</td>
</tr>
<tr>
<td></td>
<td>AXU210S-GN</td>
<td>AXUM210-S</td>
<td>AXUD10S</td>
</tr>
<tr>
<td>1/30 25</td>
<td>AXU425A-GN</td>
<td>AXUM425-A</td>
<td>AXUD25A</td>
</tr>
<tr>
<td></td>
<td>AXU425C-GN</td>
<td>AXUM425-C</td>
<td>AXUD25C</td>
</tr>
<tr>
<td></td>
<td>AXU425S-GN</td>
<td>AXUM425-S</td>
<td>AXUD25S</td>
</tr>
<tr>
<td>1/19 40</td>
<td>AXU540A-GN</td>
<td>AXUM540-A</td>
<td>AXUD40A</td>
</tr>
<tr>
<td></td>
<td>AXU540C-GN</td>
<td>AXUM540-C</td>
<td>AXUD40C</td>
</tr>
<tr>
<td></td>
<td>AXU540S-GN</td>
<td>AXUM540-S</td>
<td>AXUD40S</td>
</tr>
<tr>
<td>1/8 90</td>
<td>AXU590A-GU</td>
<td>AXUM590-A</td>
<td>AXUD90A</td>
</tr>
<tr>
<td></td>
<td>AXU590C-GU</td>
<td>AXUM590-C</td>
<td>AXUD90C</td>
</tr>
<tr>
<td></td>
<td>AXU590S-GU</td>
<td>AXUM590-S</td>
<td>AXUD90S</td>
</tr>
</tbody>
</table>

#### Round Shaft Type

<table>
<thead>
<tr>
<th>Output Power</th>
<th>Model</th>
<th>Motor Model</th>
<th>Control Unit Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/75 10</td>
<td>AXU210A-A</td>
<td>AXUM210-A</td>
<td>AXUD10A</td>
</tr>
<tr>
<td></td>
<td>AXU210C-A</td>
<td>AXUM210-C</td>
<td>AXUD10C</td>
</tr>
<tr>
<td></td>
<td>AXU210S-A</td>
<td>AXUM210-S</td>
<td>AXUD10S</td>
</tr>
<tr>
<td>1/30 25</td>
<td>AXU425A-A</td>
<td>AXUM425-A</td>
<td>AXUD25A</td>
</tr>
<tr>
<td></td>
<td>AXU425C-A</td>
<td>AXUM425-C</td>
<td>AXUD25C</td>
</tr>
<tr>
<td></td>
<td>AXU425S-A</td>
<td>AXUM425-S</td>
<td>AXUD25S</td>
</tr>
<tr>
<td>1/19 40</td>
<td>AXU540A-A</td>
<td>AXUM540-A</td>
<td>AXUD40A</td>
</tr>
<tr>
<td></td>
<td>AXU540C-A</td>
<td>AXUM540-C</td>
<td>AXUD40C</td>
</tr>
<tr>
<td></td>
<td>AXU540S-A</td>
<td>AXUM540-S</td>
<td>AXUD40S</td>
</tr>
<tr>
<td>1/8 90</td>
<td>AXU590A-A</td>
<td>AXUM590-A</td>
<td>AXUD90A</td>
</tr>
<tr>
<td></td>
<td>AXU590C-A</td>
<td>AXUM590-C</td>
<td>AXUD90C</td>
</tr>
<tr>
<td></td>
<td>AXU590S-A</td>
<td>AXUM590-S</td>
<td>AXUD90S</td>
</tr>
</tbody>
</table>

### Accessories (Sold Separately)

#### Extension Cables

<table>
<thead>
<tr>
<th>Model</th>
<th>Length: L [ft. (m)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC01AXU</td>
<td>3.3 (1)</td>
</tr>
<tr>
<td>CC02AXU</td>
<td>6.6 (2)</td>
</tr>
<tr>
<td>CC03AXU</td>
<td>9.8 (3)</td>
</tr>
<tr>
<td>CC05AXU</td>
<td>16.4 (5)</td>
</tr>
<tr>
<td>CC10AXU</td>
<td>32.8 (10)</td>
</tr>
</tbody>
</table>

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.

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.

Features

• 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

<table>
<thead>
<tr>
<th>Standards</th>
<th>Certification Body</th>
<th>Standards File No.</th>
<th>CE Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXH015 type</td>
<td>UL1950</td>
<td>UL</td>
<td>E208200</td>
</tr>
<tr>
<td>AXH230 type</td>
<td>CSA C22.2 No.950</td>
<td>UL</td>
<td>E208200</td>
</tr>
<tr>
<td>AXH450 type</td>
<td>UL60950</td>
<td>UL</td>
<td>E208200</td>
</tr>
<tr>
<td>AXH5100 type</td>
<td>CSA C22.2 No.60950</td>
<td>UL</td>
<td>E208200</td>
</tr>
</tbody>
</table>

• 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 -**

- **C**: Cable Type
  - None: Lead Wire Type
- **K**: Power Supply Voltage
  - 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.)
- **Gear Ratio or Shaft Type Number**: Gear Ratio
  - **A**: Round Shaft Type
- **Series**: AXH: AXH Series

Product Line

- **Geared Type/Combination Type**

<table>
<thead>
<tr>
<th>Output Power HP</th>
<th>Model</th>
<th>Gear Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/50</td>
<td>AXH015K-A</td>
<td>5, 10, 15, 20, 30, 50, 100</td>
</tr>
<tr>
<td>1/25</td>
<td>AXH230KC-A</td>
<td>5, 10, 15, 20, 30, 50, 100, 200</td>
</tr>
<tr>
<td>1/15</td>
<td>AXH450KC-A</td>
<td>5, 10, 15, 20, 30, 50, 100, 200</td>
</tr>
<tr>
<td>1/8</td>
<td>AXH5100KC-A</td>
<td>5, 10, 15, 20, 30, 50, 100, 200</td>
</tr>
</tbody>
</table>

- **Round Shaft Type**

<table>
<thead>
<tr>
<th>Output Power HP</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/50</td>
<td>AXH015K-A</td>
</tr>
<tr>
<td>1/25</td>
<td>AXH230KC-A</td>
</tr>
<tr>
<td>1/15</td>
<td>AXH450KC-A</td>
</tr>
<tr>
<td>1/8</td>
<td>AXH5100KC-A</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Model/Type</th>
<th>AXH015K-□</th>
<th>AXH230KC-□</th>
<th>AXH450KC-□</th>
<th>AXH5100KC-□</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round Shaft</td>
<td>AXH015K-A</td>
<td>AXH230KC-A</td>
<td>AXH450KC-A</td>
<td>AXH5100KC-A</td>
</tr>
</tbody>
</table>

#### Power Source
- **Rated Output Power** | HP (W) | 1/50 (15) | 1/25 (30) | 1/15 (50) | 1/8 (100) |
- **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-in²(x10³ kg·m²) )** | 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) |
- **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

#### Protection Functions
- **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.
- **Speed Protection**: Activated when the motor rotates at an abnormal speed above 3500 r/min.

#### Motor Insulation Class
- **Class E [248°F (120°C)]**

#### Protection Functions Note
- **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.

#### General Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Motor</th>
<th>Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insulation Resistance</strong></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>Dielectric Strength</strong></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>Temperature Rise</strong></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient Temperature</strong></td>
<td>32°F〜122°F (0°C〜50°C) (nonfreezing)</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient Humidity</strong></td>
<td>85% maximum (noncondensing)</td>
<td></td>
</tr>
<tr>
<td><strong>Atmosphere</strong></td>
<td>No corrosive gases or dust</td>
<td></td>
</tr>
<tr>
<td><strong>Degree of Protection</strong></td>
<td>15W Type: IP 40 30W〜100W Type: IP 65 (except for the mounting surface)</td>
<td></td>
</tr>
</tbody>
</table>

* 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
### Permissible Overhung Load and Permissible Thrust Load
#### Geared Type/Combination Type

<table>
<thead>
<tr>
<th>Model</th>
<th>Gear Ratio</th>
<th>Permissible Overhung Load</th>
<th>Permissible Thrust Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.39 in. (10 mm) from shaft end</td>
<td>0.79 in. (20 mm) from shaft end</td>
</tr>
<tr>
<td>AXH015K-A</td>
<td>5 – 100</td>
<td>11.2</td>
<td>50</td>
</tr>
<tr>
<td>AXH230KC-A</td>
<td>5</td>
<td>22</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>10 – 20</td>
<td>33</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>30 – 200</td>
<td>45</td>
<td>200</td>
</tr>
<tr>
<td>AXH450KC-A</td>
<td>5</td>
<td>45</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>10 – 20</td>
<td>67</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>30 – 200</td>
<td>101</td>
<td>450</td>
</tr>
<tr>
<td>AXH5100KC-A</td>
<td>5</td>
<td>67</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>10 – 20</td>
<td>90</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>30 – 200</td>
<td>112</td>
<td>500</td>
</tr>
</tbody>
</table>

- 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-A** model.

### Round Shaft Type

<table>
<thead>
<tr>
<th>Model</th>
<th>Permissible Overhung Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.39 in. (10 mm) from shaft end</td>
</tr>
<tr>
<td>AXH015K-A</td>
<td>11.2</td>
</tr>
<tr>
<td>AXH230KC-A</td>
<td>15.7</td>
</tr>
<tr>
<td>AXH450KC-A</td>
<td>27</td>
</tr>
<tr>
<td>AXH5100KC-A</td>
<td>36</td>
</tr>
</tbody>
</table>

- 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

<table>
<thead>
<tr>
<th>Model</th>
<th>Gear Ratio</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>30</th>
<th>50</th>
<th>100</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXH015K-A</td>
<td>2.2</td>
<td>9.3</td>
<td>21</td>
<td>33</td>
<td>38</td>
<td>56</td>
<td>15.7</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>0.4</td>
<td>1.7</td>
<td>3.9</td>
<td>7.0</td>
<td>18.6</td>
<td>43.7</td>
<td>43.7</td>
<td>43.7</td>
<td>—</td>
</tr>
<tr>
<td>AXH230KC-A</td>
<td>8.5</td>
<td>34</td>
<td>77</td>
<td>136</td>
<td>248</td>
<td>310</td>
<td>55.8</td>
<td>850</td>
<td>850</td>
</tr>
<tr>
<td></td>
<td>1.55</td>
<td>6.2</td>
<td>14.0</td>
<td>24.8</td>
<td>55.8</td>
<td>850</td>
<td>155</td>
<td>155</td>
<td>155</td>
</tr>
<tr>
<td>AXH450KC-A</td>
<td>30</td>
<td>120</td>
<td>270</td>
<td>480</td>
<td>1080</td>
<td>3000</td>
<td>3000</td>
<td>3000</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>5.5</td>
<td>22</td>
<td>49.5</td>
<td>88</td>
<td>198</td>
<td>550</td>
<td>550</td>
<td>550</td>
<td>550</td>
</tr>
<tr>
<td>AXH5100KC-A</td>
<td>137</td>
<td>547</td>
<td>1230</td>
<td>2188</td>
<td>4923</td>
<td>13675</td>
<td>13675</td>
<td>13675</td>
<td>13675</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>100</td>
<td>225</td>
<td>400</td>
<td>900</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
</tr>
</tbody>
</table>

- 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**

![Graph showing speed vs. torque characteristics](image)

**AXH230KC-□/AXH230KC-A**

![Graph showing speed vs. torque characteristics](image)

**AXH450KC-□/AXH450KC-A**

![Graph showing speed vs. torque characteristics](image)

**AXH5100KC-□/AXH5100KC-A**

![Graph showing speed vs. torque characteristics](image)

* 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)

- Connector Housing: 171822 – 8(AMP)

#### Round Shaft Type

**AXH015K-A**

Motor: AXHM015K-A

Weight: 0.55 lb. (0.25 kg)

- Connector Housing: 171822 – 8(AMP)
**Motor/Gearhead**

**AXH230KC-GFH** (Combination Type)
- Motor: AXHM230KC-A
- Gearhead: GFH2G
- Weight (including gearhead): 2.2 lb. (1.0 kg)
- Dimensions B-62
- Connection and Operation B-66
- Motor and Driver Combinations B-65

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

**Key and Key Slot (Scale 1/2)**
(The key is provided with the gearhead.)

**AXH230KC-5**: L = 2.01 (51)

**Motor/Gearhead**

**AXH450KC-GFH** (Combination Type)
- Motor: AXHM450KC-A
- Gearhead: GFH4G
- Weight (including gearhead): 4.0 lb. (1.8 kg)
- Dimensions B-62
- Connection and Operation B-66
- Motor and Driver Combinations B-65

**AXH450KC-30**: L = 1.65 (30)
**AXH450KC-5**: L = 0.94 (24)

**Key and Key Slot (Scale 1/2)**
(The key is provided with the gearhead.)

**AXH230KC-A**
- Motor: AXHM230KC-A
- Weight: 1.1 lb. (0.5 kg)

**AXH230KC-200**
- Motor: AXHM230KC-A
- Weight: 1.76 lb. (0.8 kg)

**Round Shaft Type**

**AXM230KC-A**
- Motor: AXHM230KC-A
- Weight: 1.1 lb. (0.5 kg)

**AXM230KC-200**
- Motor: AXHM230KC-A
- Weight: 1.76 lb. (0.8 kg)

**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)

**ΩXP** A401AU (GFH5G5–20)
A401BU (GFH5G30–100)
A401CU (GFH5G200)

**Round Shaft Type**

**AXH5100KC-A**

Motor: AXHM5100KC-A

Weight: 3.1 lb. (1.4 kg)

**ΩXP** A402U

---

**Connection Housing:** 178288-3 (AMP)
Connector Housing: 51103–0500 (MOLEX)

**Key and Key Slot (Scale 1/2)**

(The key is provided with the gearhead.)
**Driver**

AXHD15K, AXHD30K, AXHD50K  
Weight: 0.22 lb. (0.1 kg)

AXHD100K  
Weight: 0.66 lb. (0.3 kg)

---

**List of Motor and Driver Combinations**

### Geared Type/Combination Type

<table>
<thead>
<tr>
<th>Output Power</th>
<th>Model</th>
<th>Motor Model</th>
<th>Gearhead Model</th>
<th>Driver Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/50 HP 15 W</td>
<td>AXH015K-</td>
<td>AXHM015K-GFH</td>
<td>GFH2G</td>
<td>AXHD15K</td>
</tr>
<tr>
<td>1/25 HP 30 W</td>
<td>AXH230KC-</td>
<td>AXHM230KC-GFH</td>
<td>GFH2G</td>
<td>AXHD30K</td>
</tr>
<tr>
<td>1/15 HP 50 W</td>
<td>AXH450KC-</td>
<td>AXHM450KC-GFH</td>
<td>GFH4G</td>
<td>AXHD50K</td>
</tr>
<tr>
<td>1/8 HP 100 W</td>
<td>AXH5100KC-</td>
<td>AXHM5100KC-GFH</td>
<td>GFH5G</td>
<td>AXHD100K</td>
</tr>
</tbody>
</table>

- Enter the gear ratio in the box (___) with in the model name.
- *Geared Motor Model*

---

**Round Shaft Type**

<table>
<thead>
<tr>
<th>Output Power</th>
<th>Model</th>
<th>Motor Model</th>
<th>Driver Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/50 HP 15 W</td>
<td>AXH015K-A</td>
<td>AXHM015K-A</td>
<td>AXHD15K</td>
</tr>
<tr>
<td>1/25 HP 30 W</td>
<td>AXH230KC-A</td>
<td>AXHM230KC-A</td>
<td>AXHD30K</td>
</tr>
<tr>
<td>1/15 HP 50 W</td>
<td>AXH450KC-A</td>
<td>AXHM450KC-A</td>
<td>AXHD50K</td>
</tr>
<tr>
<td>1/8 HP 100 W</td>
<td>AXH5100KC-A</td>
<td>AXHM5100KC-A</td>
<td>AXHD100K</td>
</tr>
</tbody>
</table>
Connection and Operation

Connection Diagrams

15 W, 30 W, 50 W

Motor

Driver

Power supply connection
24 VDC (±10%)

Start/Stop Input
ON (L level): Start
OFF (H level): Stop

Brake Input
ON (L level): Run
OFF (H level): Brake

Rotation Direction
ON (L level): CW
OFF (H level): CCW

Speed Potentiometer
ON (L level): Internal
OFF (H level): External

Alarm Reset Input
ON (L level): Reset
OFF (H level): Normal

External DC Power Supply
ON (L level): 5 VDC

GND

GND

Speed Output
ON (L level): CW
OFF (H level): CCW

Alarm Output
ON (L level): Start
OFF (H level): Stop

ON (L level): Run
OFF (H level): Brake

ON (L level): Stop
OFF (H level): Start

ON (L level): Internal
OFF (H level): External

ON (L level): Speed
OFF (H level): Output

ON (L level): 0–5 VDC
OFF (H level): mA min.

- 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.
Introduction

Before Using a Speed Control System

AC Input

Example of Input Circuit Connection

Control by Small Capacity Relay, Switch, or Similar Device
Switch capacity: 24 VDC 10 mA

Transient 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.

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

SPEED output frequency (Hz) = \( \frac{1}{T} \) 0.3 ms

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)

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)]