

(RoHS) RoHS-Compliant
Brushless DC Motor and Driver Package
with Digital Operator

BLF Series

30 W (1/25 HP) / 60 W (1/12 HP) / 120 W (1/6 HP)

The **BLF** Series Brushless DC Motor and driver package adopts a brand new design for its motor, gearhead and driver. In addition to achieving a maximum motor speed of 4000 r/min, the **BLF** Series provides easy operation via a detachable digital operator and offers wide-ranging functions and motor variations to meet the increasingly diverse needs of manufacturers.



Brushless DC Motor and Driver Package with Digital Operator

New BLF Series



The **BLF** Series combines the attractive features of a brushless DC motor, such as compact size, high output, flat torque, excellent speed stability and energy-saving design, with exciting new enhancements that include a wider speed range and multi-speed operation. Using the digital operator, you can draw the maximum performance out of this feature-rich **BLF** Series with ease.

Digital Operator

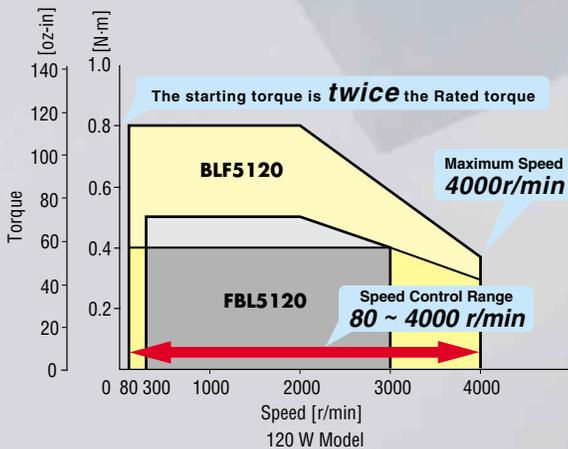
Makes the user-friendly driver even easier to use

The driver of the **BLF** Series comes standard with a digital operator that can be used as a data setting unit and display. Using the operation keys, you can input speed settings digitally in no time. The digital operator also provides full driver functions, such as:

- Three speed display modes
- Multi-speed operation using up to eight speeds
- Four speed setting methods
- Various protection functions

A Wide Speed Control Range From 80 to 4000 r/min

The maximum motor speed of the **BLF** Series is 4000 r/min, which is higher than the 3000 r/min achieved by our previous products. The speed control range has also expanded to cover velocities from 80 to 4000 r/min (speed ratio of 50:1; measured at the motor shaft), thus allowing you to program operations at various speeds from low to high.



Slim, Yet Powerful Design

A slim body and high output are two key features of a brushless DC motor. The **BLF** Series does not disappoint the users expecting these attributes. From its space-saving compact body with a frame size of 90 mm and overall motor length of 60 mm, the **BLF** Series produces a high output of 120 W.

Long-life Gearhead

The gearhead of the **BLF** Series is designed for use with high-speed motors, but its rated life is 10,000 hours at 3000 r/min, almost twice the life of conventional gearheads.

IP65* Protection

The motor (excluding the mounting surface of the round shaft type and the connector) and digital operator (when an optional remote-control kit is used) provide a high level of protection conforming to IP65. It means you can use the **BLF** Series in locations where the unit may come in contact with water.

* The **BLF** Series is not designed for washing directly in water or use in an environment where the unit constantly receives water splashes. The protection class of the driver is IP20.

Easy Wiring

- A maximum motor/driver wiring distance of 20 m (65.6 ft.)

By separating the motor cable and signal cable, the **BLF** Series is less vulnerable to noise and thus allows for an extension of the motor/driver wiring distance to a maximum of 20 m (65.6 ft.). [Select an optional connection cable set from among the eight lengths of 1 to 20 m (3.3 to 65.6 ft.)]

- Uses a terminal block for driver connection

The driver-end of each cable has a terminal block, instead of a connector, to make it easy to wire the cable into a distribution board, control panel, etc.

RoHS RoHS-Compliant

The **BLF** Series conforms to the RoHS Directive that prohibits the use of six chemical substances including lead and cadmium.

RoHS (Restriction of Hazardous Substances) Directive:

Directive on restriction of the use of certain hazardous substances in electrical and electronic equipment (2002/95/EC).

The RoHS Directive prohibits the use of six chemical substances in electrical and electronic products sold in the E.U. member countries on or after July 1, 2006. The six controlled substances are: lead, hexavalent chromium, cadmium, mercury and two specific brominated flame-retardants (PBB and PBDE).

VEXTA

A Wide Lineup

The **BLF** Series consists of three types, including two combination types integrated with a parallel shaft gearhead or a hollow shaft flat gearhead, and one round shaft type. All models come in three output levels of 30, 60 and 120 W, and the frame size and power supply specifications are also selectable from three choices. Mix and match to select the best combination meeting the specification and application requirements of your equipment.

Combination Type Parallel Shaft Gearhead



- Frame Size
 - 60 mm (□2.36 inch)
 - 80 mm (□3.15 inch)
 - 90 mm (□3.54 inch)
- Output Power
 - 30 W (1/25 HP)
 - 60 W (1/12 HP)
 - 120 W (1/6 HP)
- Power Supply Voltage
 - Single-Phase 100–120 V
 - Single-Phase 200–240 V
 - Three-Phase 200–240 V

For added convenience of securely mounting pulleys, gears, etc., the □90 mm (□3.54 inch) frame sized gearhead has a tapped hole on the end of the output shaft.

Combination Type Hollow Shaft Flat Gearhead



- Frame Size
 - 60 mm (□2.36 inch)
 - 80 mm (□3.15 inch)
 - 90 mm (□3.54 inch)
- Output Power
 - 30 W (1/25 HP)
 - 60 W (1/12 HP)
 - 120 W (1/6 HP)
- Power Supply Voltage
 - Single-Phase 100–120 V
 - Single-Phase 200–240 V
 - Three-Phase 200–240 V

Round Shaft Type



- Frame Size
 - 60 mm (□2.36 inch)
 - 80 mm (□3.15 inch)
 - 90 mm (□3.54 inch)
- Output Power
 - 30 W (1/25 HP)
 - 60 W (1/12 HP)
 - 120 W (1/6 HP)
- Power Supply Voltage
 - Single-Phase 100–120 V
 - Single-Phase 200–240 V
 - Three-Phase 200–240 V

Achieving High Function with Easy Operation

Digital Operator – Enhancing the Ease of Operation

The driver of the **BLF Series** comes standard with a detachable digital operator. You can perform various settings and operations using the six operation keys on the digital operator.



High-Function Driver

The driver offers new functions not available with conventional brushless DC motors, such as the multi-speed operation function and speed teaching function.

Different Speed Display Modes

The **BLF Series** supports three speed display modes. Choose a mode that best suits your application.

Motor speed display [r/min]

In this mode, the speed of the motor shaft or gear output shaft is displayed.

Conveyor speed display [m/min]

In this mode, the transfer speed of the work on a conveyor, etc., is displayed.

Load factor display [%]

In this mode, the actual load is displayed as a percentage of the rated load being 100%.*

* A maximum error of approx. 20% may generate when the motor is operated at the rated speed under the rated load.

Detachable Digital Operator

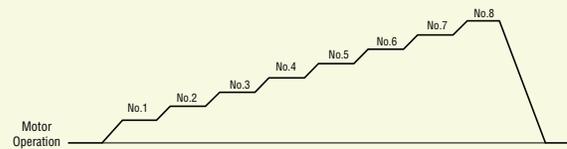
The digital operator, which serves as both a data setting unit and a display, can be detached from the driver and used at a location as far as 5 m (16.4 ft.) away using an optional remote-control kit. Use the digital operator as a handy operation unit or a display outside the distribution panel. (The digital operator conforms to IP65 when the remote-control kit is used.)



Multi-Speed Operation Using Up to Eight Speeds

The **BLF Series** lets you program multi-speed operations. Up to eight speeds can be set and registered, and selected freely using external signals.

Speeds can be set in units of 1 r/min on the digital operator and a different acceleration/deceleration time can be set for each speed, thus allowing creation of diverse profiles for various operation patterns of your equipment.



| Operation Data | M0 Input | M1 Input | M2 Input | Speed Setting Method |
|----------------|----------|----------|----------|---|
| No. 1 | OFF | OFF | OFF | Internal Potentiometer/Digital Operator |
| No. 2 | ON | OFF | OFF | External Potentiometer/Digital Operator |
| No. 3 | OFF | ON | OFF | Digital Operator |
| No. 4 | ON | ON | OFF | Digital Operator |
| No. 5 | OFF | OFF | ON | Digital Operator |
| No. 6 | ON | OFF | ON | Digital Operator |
| No. 7 | OFF | ON | ON | Digital Operator |
| No. 8 | ON | ON | ON | Digital Operator |

Speed Teaching Function

The speed teaching function allows you to set speeds by physically operating the motor. It's an easy way to set speeds regardless of the mechanism of your equipment.

Various Protection Functions

The **BLF Series** detects various motor and driver errors such as overload, overvoltage, low-voltage, missing phase, overspeed, overcurrent, EEPROM error, CPU error, operation error and external error. Upon detection of an error, the driver will immediately stop the motor and output an alarm signal.

Switchable Sink/Source Inputs

Select the sink mode or source mode for the input terminals. You can change the setting at any time.

Four Speed Setting Methods to Match Different Conditions of Use

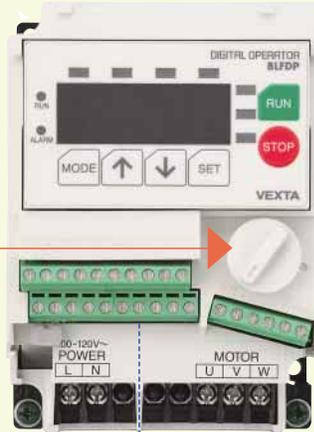
The **BLF Series** lets you control speeds using one of four methods. Select the internal potentiometer, digital operator, external potentiometer or external DC voltage according to the condition in which your equipment is used. (Details of each speed setting method → Page 23)

① Internal Potentiometer

Turn the built-in speed setting knob on the driver to set a desired speed.

③ External Potentiometer

You can use an optional external potentiometer to set speeds at a location away from the driver.



② Digital Operator

Directly enter a desired value using the operation keys on the digital operator located on the driver's front panel. Speeds can be set in 1 r/min increments using the digital operator.

④ External DC voltage

Speeds can be set by connecting an external DC power supply and supplying DC voltage to the driver. The **BLF Series** supports two DC power supplies of 5 VDC and 10 VDC.

External DC power supply

■ Safety Standards and CE Marking

| Model | Standards | Certification Body | Standards File No. | CE Marking |
|-------------|------------------|------------------------------|--------------------|--|
| Motor | UL 1004 | UL | E62327 | Low Voltage Directives EMC Directives |
| | CSA C22.2 No.100 | | | |
| | EN 60950-1 | Conforms to EN/IEC Standards | | |
| | EN 60034-1 | | | |
| | EN 60034-5 | | | |
| IEC 60664-1 | | | | |
| Driver | UL 508C | UL | E171462 | |
| | CSA C22.2 No.14 | | | |
| | EN 60950-1 | Conforms to EN/IEC Standards | | |
| | EN 50178 | | | |

● Compliance Conditions under EN Standards

- Incorporation in equipment
- Overvoltage category Motor: III Driver: III
- Pollution degree Motor: 3 Driver: 2
- Electrical shock protection Motor: Class I equipment Driver: Class I equipment

● Use Conditions

- Protective earth: The motor and driver have been designed and evaluated as Class I equipment. Therefore, measures are needed to protect against electrical shock, such as providing a protective grounding or incorporating the motor/driver in the equipment to prevent contact with the bare hands.
- Power supply: The motor and driver have been designed and evaluated under Overvoltage Category III.
- Surroundings: The motor has been designed and evaluated in an environment with a pollution degree 3, and the driver has been designed and evaluated in an environment with pollution degree 2. When using the driver in an environment with pollution degree 3, it must be protected within an IP54 enclosure.

• EMC:

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 user's equipment. If you require EMC data of this product, please contact your nearest Oriental Motor office.

● Applicable Standards

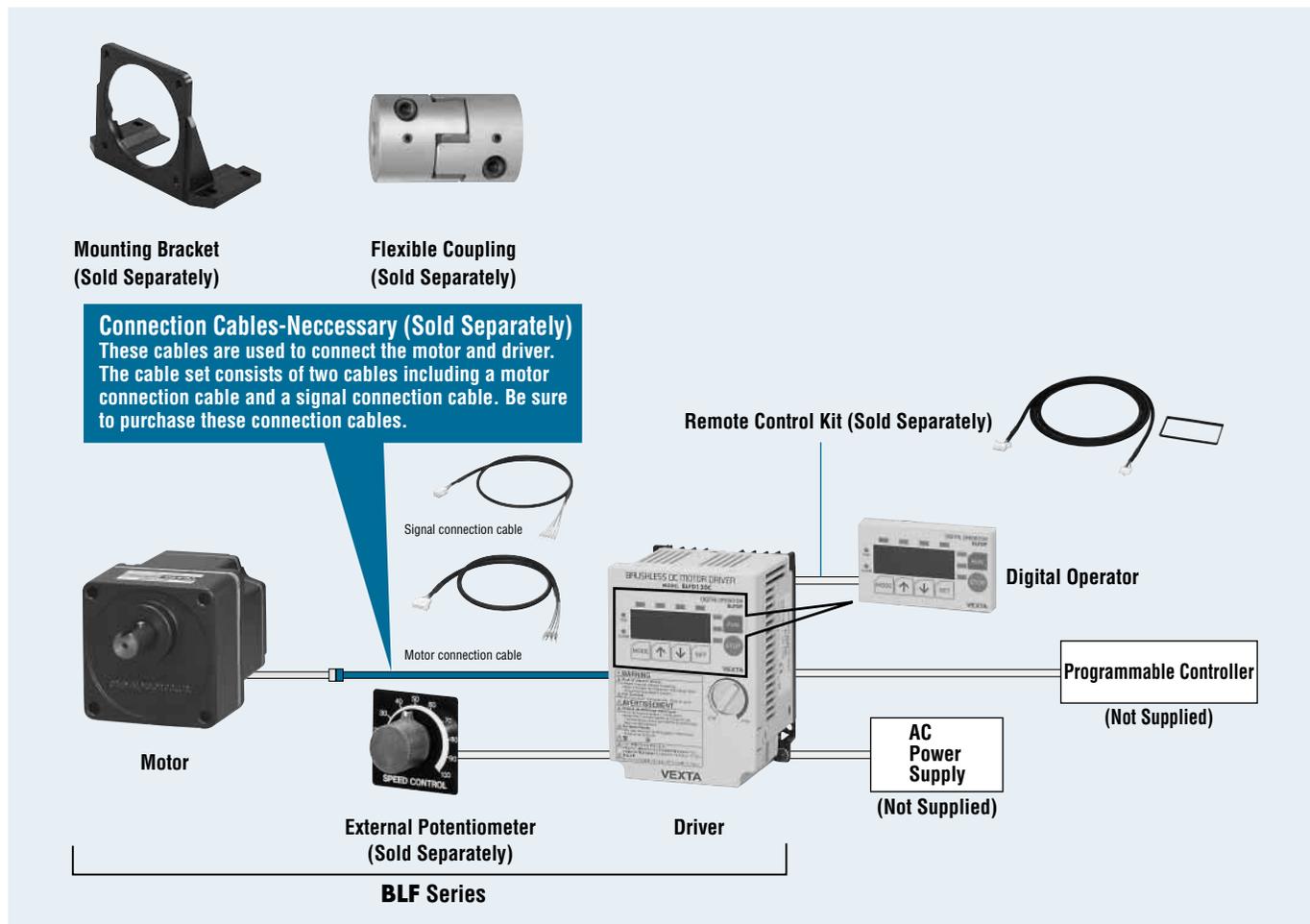
- EMI

| | |
|--------------------------|--------------|
| Emission Tests: | EN 61000-6-4 |
| Radiated Emission Test: | EN 55011 |
| Conducted Emission Test: | EN 55011 |
- EMS

| | |
|---|----------------|
| Immunity Tests: | EN 61000-6-2 |
| Electrostatic Discharge Immunity Test: | IEC 61000-4-2 |
| Radiation Field Immunity Test: | IEC 61000-4-3 |
| Fast Transient/Burst Immunity Test: | IEC 61000-4-4 |
| Surge Immunity Test: | IEC 61000-4-5 |
| Conductive Noise Immunity Test: | IEC 61000-4-6 |
| Power Frequency Magnetic Field Immunity Test: | IEC 61000-4-8 |
| Voltage Dip Immunity Test: | IEC 61000-4-11 |
| Voltage Interruption Immunity Test: | IEC 61000-4-11 |

System Configuration

Combination Type –Parallel Shaft Gearhead, Round Shaft Type



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

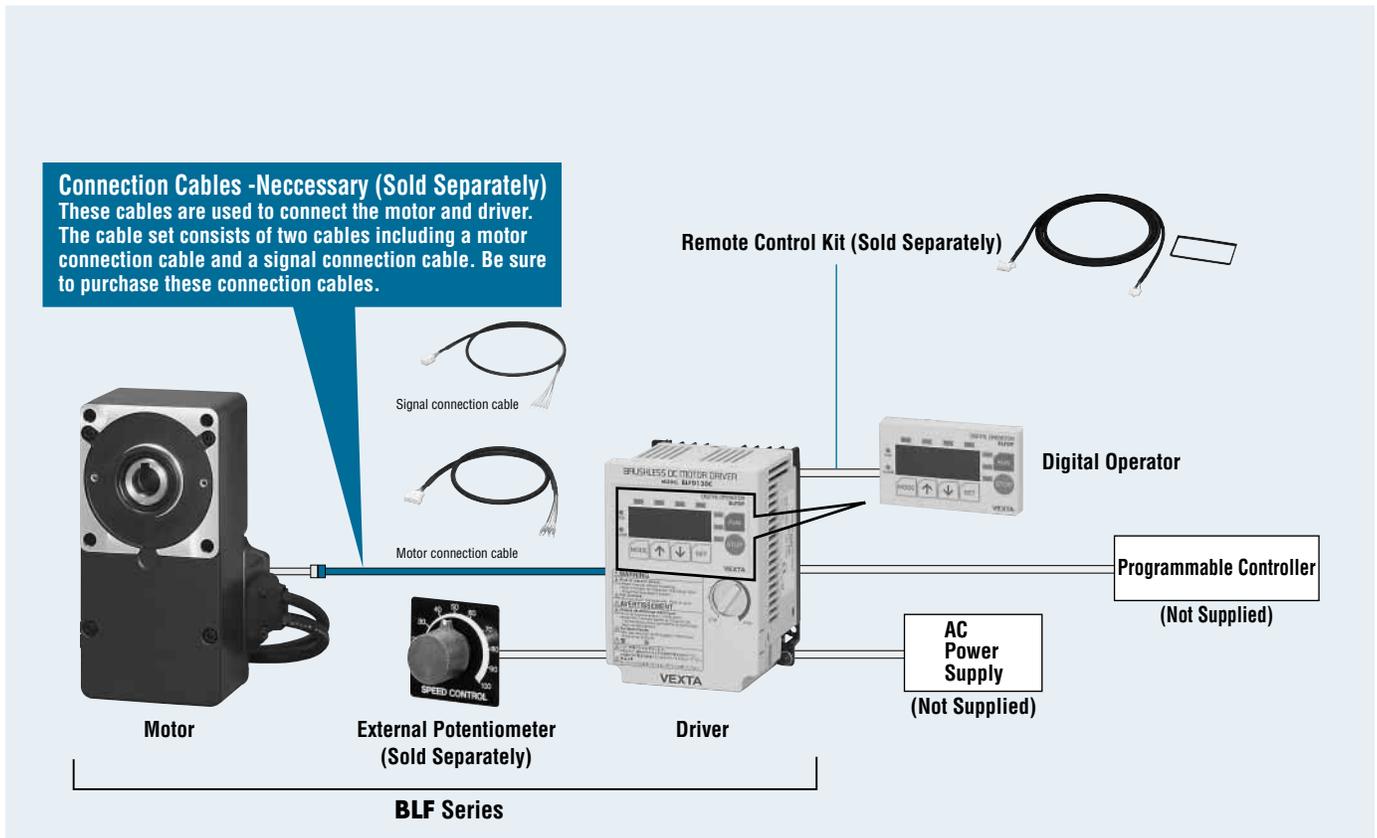
Connection Cables

The **BLF** Series requires two dedicated cables, one for the motor and the other for signals, for connection between the motor and driver.

These connection cables are not supplied with the **BLF** Series, so be sure to purchase an optional connection cable set.

The optional cable set consists of two cables including a motor connection cable and a signal connection cable. Specify a desired cable length from the eight choices of 1 m (3.3 ft.) to 20 m (65.6 ft.). → Page 26

● **Combination Type –Hollow Shaft Flat Gearhead**



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

■ Connection Cables

The **BLF** Series requires two dedicated cables, one for the motor and the other for signals, for connection between the motor and driver. These connection cables are not supplied with the **BLF** Series, so be sure to purchase an optional connection cable set. The optional cable set consists of two cables including a motor connection cable and a signal connection cable. Specify a desired cable length from the eight choices of 1 m (3.3 ft.) to 20 m (65.6 ft.). → Page 26

Product Number Code

BLF **2** **30** **A** **-** **5** **FR**

① ② ③ ④ ⑤ ⑥

| | | |
|---|-----------------------------------|---|
| ① | Series | BLF Series |
| ② | Motor Frame Size | 2: 60 mm (2.36 in) sq. 4: 80 mm (3.15 in) sq. 5: 90 mm (3.54 in) sq. |
| ③ | Output Power | 30: 30 W (1/25 HP) 60: 60 W (1/12HP) 120: 120 W (1/6 HP) |
| ④ | Voltage | A: Single-Phase 100–120 VAC C: Single-Phase 200–240 VAC S: Three-Phase 200–240 VAC |
| ⑤ | Gear Ratio or Shaft Type | Number: Gear Ratio A: Round Shaft Type |
| ⑥ | Gearhead Type of Combination Type | None: Parallel Shaft Gearhead FR: Hollow Shaft Flat Gearhead |

Product Line

Combination Type (Pre-assembled Gearmotor)

The combination type (pre-assembled gearmotor) comes 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.

Combination Type –Parallel Shaft Gearhead

| Output Power | Voltage | Model | Gear Ratio | Motor/Driver Combination | | |
|-------------------|--------------------------|-------------------|--------------------|--------------------------|----------------|--------------|
| | | | | Motor Model | Gearhead Model | Driver Model |
| 30 W (1/25 HP) | Single-Phase 100–120 VAC | BLF230A-□ | 5, 10, 15, | BLFM230-GFS | GFS2G□ | BLFD30A |
| | Single-Phase 200–240 VAC | BLF230C-□ | 20, 30, 50, | | | BLFD30C |
| | Three-Phase 200–240 VAC | BLF230S-□ | 100, 200 | | | BLFD30S |
| 60 W (1/12 HP) | Single-Phase 100–120 VAC | BLF460A-□ | 5, 10, 15, | BLFM460-GFS | GFS4G□ | BLFD60A |
| | Single-Phase 200–240 VAC | BLF460C-□ | 20, 30, 50, | | | BLFD60C |
| | Three-Phase 200–240 VAC | BLF460S-□ | 100, 200 | | | BLFD60S |
| 120 W (1/6 HP) | Single-Phase 100–120 VAC | BLF5120A-□ | 5, 10, 15, | BLFM5120-GFS | GFS5G□ | BLFD120A |
| | Single-Phase 200–240 VAC | BLF5120C-□ | 20, 30, 50, | | | BLFD120C |
| | Three-Phase 200–240 VAC | BLF5120S-□ | 100, 200 | | | BLFD120S |

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

Combination Type –Hollow Shaft Flat Gearhead

| Output Power | Voltage | Model | Gear Ratio | Motor/Driver Combination | | |
|-------------------|--------------------------|---------------------|--------------------|--------------------------|----------------|--------------|
| | | | | Motor Model | Gearhead Model | Driver Model |
| 30 W (1/25 HP) | Single-Phase 100–120 VAC | BLF230A-□FR | 5, 10, 15, | BLFM230-GFS | GFS2G□FR | BLFD30A |
| | Single-Phase 200–240 VAC | BLF230C-□FR | 20, 30, 50, | | | BLFD30C |
| | Three-Phase 200–240 VAC | BLF230S-□FR | 100, 200 | | | BLFD30S |
| 60 W (1/12 HP) | Single-Phase 100–120 VAC | BLF460A-□FR | 5, 10, 15, | BLFM460-GFS | GFS4G□FR | BLFD60A |
| | Single-Phase 200–240 VAC | BLF460C-□FR | 20, 30, 50, | | | BLFD60C |
| | Three-Phase 200–240 VAC | BLF460S-□FR | 100, 200 | | | BLFD60S |
| 120 W (1/6 HP) | Single-Phase 100–120 VAC | BLF5120A-□FR | 5, 10, 15, | BLFM5120-GFS | GFS5G□FR | BLFD120A |
| | Single-Phase 200–240 VAC | BLF5120C-□FR | 20, 30, 50, | | | BLFD120C |
| | Three-Phase 200–240 VAC | BLF5120S-□FR | 100, 200 | | | BLFD120S |

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

● Round Shaft Type

| Output Power | Voltage | Model | Motor/Driver Combination | |
|-------------------|--------------------------|-------------------|--------------------------|--------------|
| | | | Motor Model | Driver Model |
| 30 W (1/25 HP) | Single-Phase 100–120 VAC | BLF230A-A | BLFM230-A | BLFD30A |
| | Single-Phase 200–240 VAC | BLF230C-A | | BLFD30C |
| | Three-Phase 200–240 VAC | BLF230S-A | | BLFD30S |
| 60 W (1/12 HP) | Single-Phase 100–120 VAC | BLF460A-A | BLFM460-A | BLFD60A |
| | Single-Phase 200–240 VAC | BLF460C-A | | BLFD60C |
| | Three-Phase 200–240 VAC | BLF460S-A | | BLFD60S |
| 120 W (1/6 HP) | Single-Phase 100–120 VAC | BLF5120A-A | BLFM5120-A | BLFD120A |
| | Single-Phase 200–240 VAC | BLF5120C-A | | BLFD120C |
| | Three-Phase 200–240 VAC | BLF5120S-A | | BLFD120S |

● Pinion Shaft Type

| Output Power | Voltage | Model | Motor/Driver Combination | |
|-------------------|--------------------------|---------------------|--------------------------|--------------|
| | | | Motor Model | Driver Model |
| 30 W (1/25 HP) | Single-Phase 100–120 VAC | BLF230A-GFS | BLFM230-GFS | BLFD30A |
| | Single-Phase 200–240 VAC | BLF230C-GFS | | BLFD30C |
| | Three-Phase 200–240 VAC | BLF230S-GFS | | BLFD30S |
| 60 W (1/12 HP) | Single-Phase 100–120 VAC | BLF460A-GFS | BLFM460-GFS | BLFD60A |
| | Single-Phase 200–240 VAC | BLF460C-GFS | | BLFD60C |
| | Three-Phase 200–240 VAC | BLF460S-GFS | | BLFD60S |
| 120 W (1/6 HP) | Single-Phase 100–120 VAC | BLF5120A-GFS | BLFM5120-GFS | BLFD120A |
| | Single-Phase 200–240 VAC | BLF5120C-GFS | | BLFD120C |
| | Three-Phase 200–240 VAC | BLF5120S-GFS | | BLFD120S |

● Gearheads

◇ Parallel Shaft Gearhead

| Model | Gear Ratio |
|---------------------------------------|--------------------|
| GFS2G <input type="checkbox"/> | 5, 10, 15, |
| GFS4G <input type="checkbox"/> | 20, 30, 50, |
| GFS5G <input type="checkbox"/> | 100, 200 |

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

◇ Hollow Shaft Flat Gearhead

| Model | Gear Ratio |
|---|--------------------|
| GFS2G <input type="checkbox"/> FR | 5, 10, 15, |
| GFS4G <input type="checkbox"/> FR | 20, 30, 50, |
| GFS5G <input type="checkbox"/> FR | 100, 200 |

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

● Connection Cables (Sold Separately)

◇ Cable Set

| Length | Model |
|-----------------|----------------|
| 1 m (3.3 ft.) | CC01BLF |
| 2 m (6.6 ft.) | CC02BLF |
| 3 m (9.8 ft.) | CC03BLF |
| 5 m (16.4 ft.) | CC05BLF |
| 7 m (23.0 ft.) | CC07BLF |
| 10 m (32.8 ft.) | CC10BLF |
| 15 m (49.2 ft.) | CC15BLF |
| 20 m (65.6 ft.) | CC20BLF |

● The **BLF** Series requires two dedicated cables, one for the motor and the other for signals, for connection between the motor and driver. These connection cables are not supplied with the **BLF** Series, so be sure to purchase an optional connection cable set.

The optional cable set consists of two cables including a motor connection cable and a signal connection cable.

Specifications



Motor: / Driver:

| Combination Type - Parallel Shaft Gearhead | | BLF230A-□ | BLF230C-□ | BLF230S-□ |
|--|---|---|----------------------------|---|
| Model | Combination Type - Hollow Shaft Flat Gearhead | BLF230A-□FR | BLF230C-□FR | BLF230S-□FR |
| | Round Shaft Type | BLF230A-A | BLF230C-A | BLF230S-A |
| | | | | |
| Rated Output Power (Continuous) | | W (HP) | | 30 (1/25) |
| Power Source | Rated Voltage | V | Single-Phase 100–120 ±10% | Single-Phase 200–240 ±10% Three-Phase 200–240 ±10% |
| | Rated Frequency | Hz | 50/60 ±5% | |
| | Rated Input Current | A | 1.3 | 0.8 0.45 |
| | Maximum Input Current | A | 3.0 | 1.7 1.2 |
| Rated Torque | | N·m (oz-in) | 0.1 (14.2) | |
| Starting Torque | | N·m (oz-in) | 0.2 (28.4) | |
| Rated Speed | | r/min | 3000 | |
| Speed Control Range | | r/min | 80~4000 | |
| Permissible Load Inertia*1 | | J kg·m ² (oz-in ²) | 1.8×10 ⁻⁴ (9.8) | |
| Speed Regulation*2 (Using the digital operator) | Load | ±0.2% maximum (0~Rated torque, at rated speed, at rated voltage, at normal ambient temperature) | | |
| | Voltage | ±0.2% maximum (Rated voltage ±10%, at rated speed, with no load, at normal ambient temperature) | | |
| | Temperature | ±0.2% maximum (0~50°C, at rated speed, with no load, at rated voltage) | | |

| Combination Type - Parallel Shaft Gearhead | | BLF460A-□ | BLF460C-□ | BLF460S-□ |
|--|---|---|------------------------------|---|
| Model | Combination Type - Hollow Shaft Flat Gearhead | BLF460A-□FR | BLF460C-□FR | BLF460S-□FR |
| | Round Shaft Type | BLF460A-A | BLF460C-A | BLF460S-A |
| | | | | |
| Rated Output Power (Continuous) | | W (HP) | | 60 (1/12) |
| Power Source | Rated Voltage | V | Single-Phase 100–120 ±10% | Single-Phase 200–240 ±10% Three-Phase 200–240 ±10% |
| | Rated Frequency | Hz | 50/60 ±5% | |
| | Rated Input Current | A | 2.0 | 1.2 0.7 |
| | Maximum Input Current | A | 4.5 | 3.0 1.5 |
| Rated Torque | | N·m (oz-in) | 0.2 (28.4) | |
| Starting Torque | | N·m (oz-in) | 0.4 (56.8) | |
| Rated Speed | | r/min | 3000 | |
| Speed Control Range | | r/min | 80~4000 | |
| Permissible Load Inertia*1 | | J kg·m ² (oz-in ²) | 3.75×10 ⁻⁴ (20.5) | |
| Speed Regulation*2 (Using the digital operator) | Load | ±0.2% maximum (0~Rated torque, at rated speed, at rated voltage, at normal ambient temperature) | | |
| | Voltage | ±0.2% maximum (Rated voltage ±10%, at rated speed, with no load, at normal ambient temperature) | | |
| | Temperature | ±0.2% maximum (0~50°C, at rated speed, with no load, at rated voltage) | | |

| Combination Type - Parallel Shaft Gearhead | | BLF5120A-□ | BLF5120C-□ | BLF5120S-□ |
|--|---|---|-----------------------------|---|
| Model | Combination Type - Hollow Shaft Flat Gearhead | BLF5120A-□FR | BLF5120C-□FR | BLF5120S-□FR |
| | Round Shaft Type | BLF5120A-A | BLF5120C-A | BLF5120S-A |
| | | | | |
| Rated Output Power (Continuous) | | W (HP) | | 120 (1/6) |
| Power Source | Rated Voltage | V | Single-Phase 100–120 ±10% | Single-Phase 200–240 ±10% Three-Phase 200–240 ±10% |
| | Rated Frequency | Hz | 50/60 ±5% | |
| | Rated Input Current | A | 3.3 | 2.0 1.1 |
| | Maximum Input Current | A | 7.0 | 4.5 2.5 |
| Rated Torque | | N·m (oz-in) | 0.4 (56.8) | |
| Starting Torque | | N·m (oz-in) | 0.8 (113) | |
| Rated Speed | | r/min | 3000 | |
| Speed Control Range | | r/min | 80~4000 | |
| Permissible Load Inertia*1 | | J kg·m ² (oz-in ²) | 5.6×10 ⁻⁴ (30.6) | |
| Speed Regulation*2 (Using the digital operator) | Load | ±0.2% maximum (0~Rated torque, at rated speed, at rated voltage, at normal ambient temperature) | | |
| | Voltage | ±0.2% maximum (Rated voltage ±10%, at rated speed, with no load, at normal ambient temperature) | | |
| | Temperature | ±0.2% maximum (0~50°C, at rated speed, with no load, at rated voltage) | | |

*1 The permissible load inertia specified above is only applicable for round shaft models. Permissible load inertia for combination type → Page 14

*2 Speed regulation values vary depending on the speed setting method. Setting from internal potentiometer; Load: ±0.5% maximum, Voltage: ±0.5% maximum, Temperature: ±0.5% maximum
Setting from external potentiometer or external DC voltage; Load: ±0.5% maximum, Voltage: ±0.5% maximum, Temperature: ±1% maximum

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

● The value for each item is for the motor only.

Common Specifications

| Item | Specification |
|--|--|
| Speed Setting Method | Select one of the following methods: 1. Set using the internal potentiometer 2. Set using the digital operator: Up to eight speeds (Speeds can be set in 1 r/min increments using the digital operator.) 3. Set using an optional external potentiometer: PAVR-20KZ (20 kΩ, 1/4 W) 4. Set using external DC voltage: 0 to 5 VDC or 0 to 10 VDC |
| Acceleration/Deceleration Time (at 3000 r/min) | 0.2 to 15 seconds (factory setting: 0.5 second). Up to eight speeds using the digital operator |
| Input Signals (In the remote mode) | Photocoupler input mode: Input resistance 2.4 kΩ, ON (L level): 1 V or less, OFF (H level): Open (14 V ± 10%) Sink input (factory setting) or source input / 2-wire input mode (factory setting) or 3-wire input mode CW [START/STOP] input, CCW [RUN/BRAKE] input, DEC-STOP [CW/CCW] input, speed-data selection input, alarm reset input, external error input The names in [] apply in the 3-wire input mode. |
| Output Signals | Open collector output: 4.5 to 26.4 VDC or less, 10 mA or less (speed output: 5 mA or more/10 mA or less) Speed output (30 pulses/revolution), alarm output 1, alarm output 2 |
| Protection Functions* | Upon actuation of any of the following protection functions, the driver will output an alarm signal and cause the motor to decelerate to a stop (the motor will stop instantaneously in the event of an external error input): ● Overload protection function: A load exceeding the rated torque was applied to the motor for approx. 5 seconds or more. ● Overvoltage protection function: The driver voltage exceeded 120 or 240 VAC by approx. 20% or more. A gravitational operation was performed or a load exceeding the allowable load inertia was driven. ● Low-voltage protection function: The driver voltage dropped to approx. 40% or more below 100 VAC or 200 VAC. ● Missing-phase protection function: An error was detected in the signals received from the motor due to poor connection or breakage of the signal cable, etc. ● Overspeed protection function: The speed of the motor shaft exceeded approx. 4800 r/min. ● Overcurrent protection function: An excessive current flowed through the driver due to a ground fault, etc. ● CPU error, EEPROM error, external error or operation error |
| Motor Insulation Class | Class E [120°C (248°F)] |
| Time Rating | Continuous |

* With the **BLF** Series, the motor speed cannot be controlled in a gravitational operation or other application where the motor shaft is turned by the load. When a load exceeding the allowable load inertia is driven or a gravitational operation is performed, the overvoltage protection function will actuate to cause the motor to decelerate to a stop.

General Specifications (After rated operation under normal ambient temperature and humidity)

| Item | Motor | Driver |
|-----------------------|---|---|
| Insulation Resistance | 100MΩ or more when 500 VDC megger is applied between the windings and the frame. | 100MΩ or more when 500 VDC megger is applied between the power supply input terminal and the Protective Earth terminal, between the power supply input terminal and I/O terminal. |
| Dielectric Strength | Sufficient to withstand 1.5 kV at 50 Hz applied between the windings and the frame for 1 minute . | Sufficient to withstand 1.8 kV (3 kV) at 50 Hz applied between the power supply input terminal and Protective Earth terminal (I/O terminal) for one minute. |
| Operating Conditions | | |
| Ambient Temperature | | 0°C~50°C (32°F~122°F), nonfreezing |
| Ambient Humidity | | 85 % maximum, noncondensing |
| Atmosphere | | No corrosive gas or dust |
| Degree of Protection | IP 65 (excluding the motor-installation surface of the round shaft type and the connector) | Driver: IP 20 (In the cabinet) Digital Operator: IP 65 (Optional remote operation kit is used) |

Note:

For round shaft types, please attach to the following sizes of heat sink (material: aluminum) to maintain a maximum motor housing temperature of 90°C (194°F).

BLF230: 115 mm × 115 mm (4.53 in. × 4.53 in.), 5 mm (0.20 in.) thick

BLF460: 135 mm × 135 mm (5.31 in. × 5.31 in.), 5 mm (0.20 in.) thick

BLF5120: 165 mm × 165 mm (6.50 in. × 6.50 in.), 5 mm (0.20 in.) thick

■ Gearmotor – Torque Table

● Combination Type –Parallel Shaft Gearhead

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

| Model | Motor Speed | Gear Ratio | 5 | 10 | 15 | 20 | 30 | 50 | 100 | 200 | |
|------------|------------------|------------|------------|------|------|------|------|------|------|-----|-----|
| | | | 80 r/min | 16 | 8 | 5.3 | 4 | 2.7 | 1.6 | 0.8 | 0.4 |
| | | | 3000 r/min | 600 | 300 | 200 | 150 | 100 | 60 | 30 | 15 |
| BLF230■-□ | at 80~3000 r/min | 4000 r/min | 800 | 400 | 267 | 200 | 133 | 80 | 40 | 20 | |
| | | 0.45 | 0.9 | 1.4 | 1.8 | 2.6 | 4.3 | 6 | 6 | | |
| | | 3.9 | 7.9 | 12.3 | 15.9 | 23 | 38 | 53.1 | 53.1 | | |
| BLF460■-□ | at 4000 r/min | 0.34 | 0.68 | 1 | 1.4 | 1.9 | 3.2 | 5.4 | 5.4 | | |
| | | 3 | 6 | 8.8 | 12.3 | 16.8 | 28.3 | 47.7 | 47.7 | | |
| | | 0.9 | 1.8 | 2.7 | 3.6 | 5.2 | 8.6 | 16 | 16 | | |
| BLF5120■-□ | at 80~3000 r/min | 7.9 | 15.9 | 23.8 | 31.8 | 46 | 76.1 | 141 | 141 | | |
| | | 0.68 | 1.4 | 2 | 2.7 | 3.9 | 6.5 | 12.9 | 14 | | |
| | | 6 | 12.3 | 17.7 | 23.8 | 34.5 | 57.5 | 114 | 123 | | |
| BLF5120■-□ | at 4000 r/min | 1.8 | 3.6 | 5.4 | 7.2 | 10.3 | 17.2 | 30 | 30 | | |
| | | 15.9 | 31.8 | 47.7 | 63.7 | 91.1 | 152 | 265 | 265 | | |
| | | 1.4 | 2.7 | 4.1 | 5.4 | 7.7 | 12.9 | 25.8 | 27 | | |
| | | | 12.3 | 23.8 | 36.2 | 47.7 | 68.1 | 114 | 228 | 238 | |

- Enter the letter representing the voltage (**A**, **C** or **S**) in the box (■) within the model name.
- 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.

● Combination Type –Hollow Shaft Flat Gearhead

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

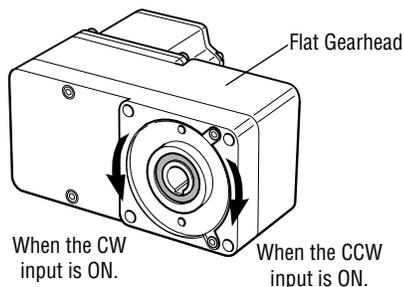
| Model | Motor Speed | Gear Ratio | 5 | 10 | 15 | 20 | 30 | 50 | 100 | 200 | |
|--------------|------------------|------------|------------|------|------|------|------|------|------|-----|-----|
| | | | 80 r/min | 16 | 8 | 5.3 | 4 | 2.7 | 1.6 | 0.8 | 0.4 |
| | | | 3000 r/min | 600 | 300 | 200 | 150 | 100 | 60 | 30 | 15 |
| BLF230■-□FR | at 80~3000 r/min | 4000 r/min | 800 | 400 | 267 | 200 | 133 | 80 | 40 | 20 | |
| | | 0.4 | 0.85 | 1.3 | 1.7 | 2.6 | 4.3 | 8.5 | 17 | | |
| | | 3.5 | 7.5 | 11.5 | 15 | 23 | 38 | 75.2 | 150 | | |
| BLF460■-□FR | at 4000 r/min | 0.3 | 0.64 | 0.96 | 1.3 | 1.9 | 3.2 | 6.4 | 12.8 | | |
| | | 2.6 | 5.6 | 8.4 | 11.5 | 16.8 | 28.3 | 56.6 | 113 | | |
| | | 0.85 | 1.7 | 2.6 | 3.4 | 5.1 | 8.5 | 17 | 34 | | |
| BLF5120■-□FR | at 80~3000 r/min | 7.5 | 15 | 23 | 30 | 45.1 | 75.2 | 150 | 300 | | |
| | | 0.64 | 1.3 | 1.9 | 2.6 | 3.8 | 6.4 | 12.8 | 25.5 | | |
| | | 5.6 | 11.5 | 16.8 | 23 | 33.6 | 56.6 | 113 | 225 | | |
| BLF5120■-□FR | at 4000 r/min | 1.7 | 3.4 | 5.1 | 6.8 | 10.2 | 17 | 34 | 68 | | |
| | | 15 | 30 | 45.1 | 60 | 90 | 150 | 300 | 601 | | |
| | | 1.3 | 2.6 | 3.8 | 5.1 | 7.7 | 12.8 | 25.5 | 51 | | |
| | | | 11.5 | 23 | 33.6 | 45.1 | 68.1 | 113 | 225 | 451 | |

- Enter the letter representing the voltage (**A**, **C** or **S**) in the box (■) within the model name.
- Enter the gear ratio in the box (□) within the model name.

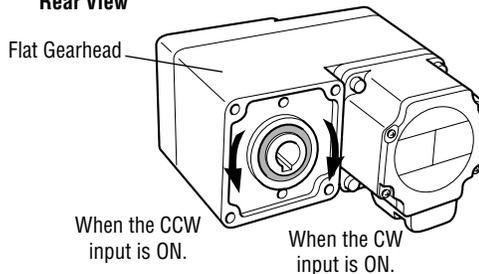
■ Rotating Direction of the Hollow Shaft Flat Gearhead

The hollow-shaft flat gearhead of the combination type rotates in the direction as shown below, with respect to the direction input from the driver.

Front View



Rear View



■ Permissible Overhung Load and Permissible Thrust Load

● Combination Type –Parallel Shaft Gearhead

| Model | Gear Ratio | | Permissible Overhung Load | | | | Permissible Thrust Load | |
|--------------------|-------------------------|---------------|---------------------------------|-----|---------------------------------|-----|-------------------------|-----|
| | | | 10 mm (0.39 in.) from shaft end | | 20 mm (0.79 in.) from shaft end | | | |
| | | | N | lb. | N | lb. | N | lb. |
| BLF230 ■-□ | 5 | 80~3000 r/min | 100 | 22 | 150 | 33 | 40 | 9 |
| | | 4000 r/min | 90 | 20 | 110 | 24 | | |
| | 10, 15, 20 | 80~3000 r/min | 150 | 33 | 200 | 45 | | |
| | | 4000 r/min | 130 | 29 | 170 | 38 | | |
| | 30, 50, 100, 200 | 80~3000 r/min | 200 | 45 | 300 | 67 | | |
| | | 4000 r/min | 180 | 40 | 230 | 51 | | |
| BLF460 ■-□ | 5 | 80~3000 r/min | 200 | 45 | 250 | 56 | 100 | 22 |
| | | 4000 r/min | 180 | 40 | 220 | 49 | | |
| | 10, 15, 20 | 80~3000 r/min | 300 | 67 | 350 | 78 | | |
| | | 4000 r/min | 270 | 60 | 330 | 74 | | |
| | 30, 50, 100, 200 | 80~3000 r/min | 450 | 101 | 550 | 123 | | |
| | | 4000 r/min | 420 | 94 | 500 | 112 | | |
| BLF5120 ■-□ | 5 | 80~3000 r/min | 300 | 67 | 400 | 90 | 150 | 33 |
| | | 4000 r/min | 230 | 51 | 300 | 67 | | |
| | 10, 15, 20 | 80~3000 r/min | 400 | 90 | 500 | 112 | | |
| | | 4000 r/min | 370 | 83 | 430 | 96 | | |
| | 30, 50, 100, 200 | 80~3000 r/min | 500 | 112 | 650 | 146 | | |
| | | 4000 r/min | 450 | 101 | 550 | 123 | | |

● Enter the letter representing the voltage (**A, C** or **S**) in the box (■) within the model name.

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

● Combination Type –Hollow Shaft Flat Gearhead

| Model | Gear Ratio | | Permissible Overhung Load | | | | Permissible Thrust Load | |
|----------------------|---------------------------------|---------------|---|-----|---|-----|-------------------------|-----|
| | | | 10 mm (0.39 in.) from mounting surface of hollow shaft gearhead | | 20 mm (0.79 in.) from mounting surface of hollow shaft gearhead | | | |
| | | | N | lb. | N | lb. | N | lb. |
| BLF230 ■-□FR | 5, 10 | 80~3000 r/min | 450 | 101 | 370 | 83 | 200 | 45 |
| | | 4000 r/min | 410 | 92 | 330 | 74 | | |
| | 15, 20, 30, 50, 100, 200 | 80~3000 r/min | 500 | 112 | 400 | 90 | | |
| | | 4000 r/min | 460 | 103 | 370 | 83 | | |
| BLF460 ■-□FR | 5, 10 | 80~3000 r/min | 800 | 180 | 660 | 148 | 400 | 90 |
| | | 4000 r/min | 730 | 164 | 600 | 135 | | |
| | 15, 20, 30, 50, 100, 200 | 80~3000 r/min | 1200 | 270 | 1000 | 220 | | |
| | | 4000 r/min | 1100 | 240 | 910 | 200 | | |
| BLF5120 ■-□FR | 5, 10 | 80~3000 r/min | 900 | 200 | 770 | 173 | 500 | 112 |
| | | 4000 r/min | 820 | 184 | 700 | 157 | | |
| | 15, 20 | 80~3000 r/min | 1300 | 290 | 1110 | 240 | | |
| | | 4000 r/min | 1200 | 270 | 1020 | 220 | | |
| | 30, 50, 100, 200 | 80~3000 r/min | 1500 | 330 | 1280 | 280 | | |
| | | 4000 r/min | 1400 | 310 | 1200 | 270 | | |

● Enter the letter representing the voltage (**A, C** or **S**) in the box (■) within the model name.

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

● Round Shaft Type

| Model | Permissible Overhung Load | | | |
|--------------------|---------------------------------|-----|---------------------------------|-----|
| | 10 mm (0.39 in.) from shaft end | | 20 mm (0.79 in.) from shaft end | |
| | N | lb. | N | lb. |
| BLF230 ■-A | 80 | 18 | 100 | 22 |
| BLF460 ■-A | 110 | 24 | 130 | 29 |
| BLF5120 ■-A | 150 | 33 | 170 | 38 |

Note:

Avoid thrust as much as possible for the round shaft motors. If thrust load is unavoidable, keep it to no more than half the motor weight.

● Enter the letter representing the voltage (**A, C** or **S**) in the box (■) within the model name.

Permissible Load Inertia J for Combination Type

Combination Type –Parallel Shaft Gearhead

Unit=Upper values: $\times 10^{-4}$ kg · m²/Lower values: oz-in²

| Model \ Gear Ratio | 5 | 10 | 15 | 20 | 30 | 50 | 100 | 200 |
|--------------------|------|-----|------|------|------|-------|-------|-------|
| BLF230■-□ | 1.55 | 6.2 | 14 | 24.8 | 55.8 | 155 | 155 | 155 |
| | 8.5 | 34 | 77 | 136 | 310 | 850 | 850 | 850 |
| BLF460■-□ | 5.5 | 22 | 49.5 | 88 | 198 | 550 | 550 | 550 |
| | 30 | 120 | 270 | 480 | 1080 | 3000 | 3000 | 3000 |
| BLF5120■-□ | 25 | 100 | 225 | 400 | 900 | 2500 | 2500 | 2500 |
| | 137 | 550 | 1230 | 2200 | 4900 | 13700 | 13700 | 13700 |

- Enter the letter representing the voltage (**A**, **C** or **S**) in the box (■) within the model name.
- Enter the gear ratio in the box (□) within the model name.

Combination Type –Hollow Shaft Flat Gearhead

Unit=Upper values: $\times 10^{-4}$ kg · m²/Lower values: oz-in²

| Model \ Gear Ratio | 5 | 10 | 15 | 20 | 30 | 50 | 100 | 200 |
|--------------------|------|-----|------|------|------|-------|-------|-------|
| BLF230■-□FR | 1.55 | 6.2 | 14 | 24.8 | 55.8 | 155 | 155 | 155 |
| | 8.5 | 34 | 77 | 136 | 310 | 850 | 850 | 850 |
| BLF460■-□FR | 5.5 | 22 | 49.5 | 88 | 198 | 550 | 550 | 550 |
| | 30 | 120 | 270 | 480 | 1080 | 3000 | 3000 | 3000 |
| BLF5120■-□FR | 25 | 100 | 225 | 400 | 900 | 2500 | 2500 | 2500 |
| | 137 | 550 | 1230 | 2200 | 4900 | 13700 | 13700 | 13700 |

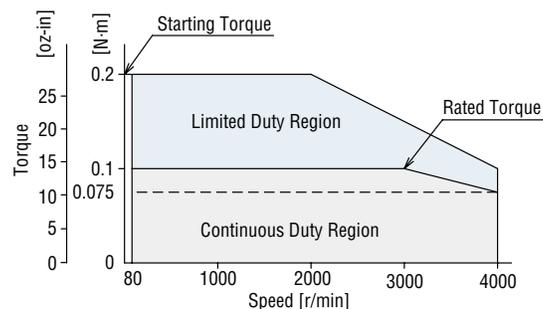
- Enter the letter representing the voltage (**A**, **C** or **S**) in the box (■) within the model name.
- Enter the gear ratio in the box (□) within the model name.

Speed – Torque Characteristics

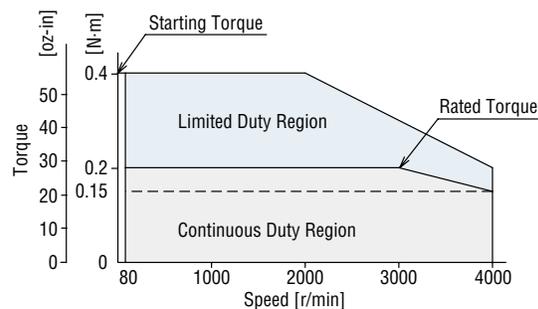
Continuous Duty Region: Continuous operation is possible in this region.

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.

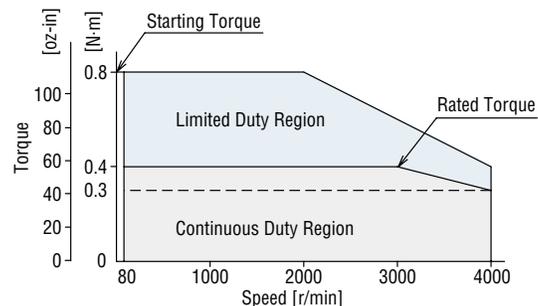
BLF230■-□/ BLF230■-□FR/ BLF230■-A



BLF460■-□/ BLF460■-□FR/ BLF460■-A



BLF5120■-□/ BLF5120■-□FR/ BLF5120■-A



- The characteristics shown above are applicable for the motors only.
- Enter the letter representing the voltage (**A**, **C** or **S**) in the box (■) within the model name.
- Enter the gear ratio in the box (□) within the model name.

Dimensions unit: mm (inch)

Mounting screws are included with the combination type.

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

◇ Motor/Parallel Shaft Gearhead

BLF230A-□, **BLF230C**-□, **BLF230S**-□ (Combination type -Parallel shaft gearhead)

Motor: BLFM230-GFS

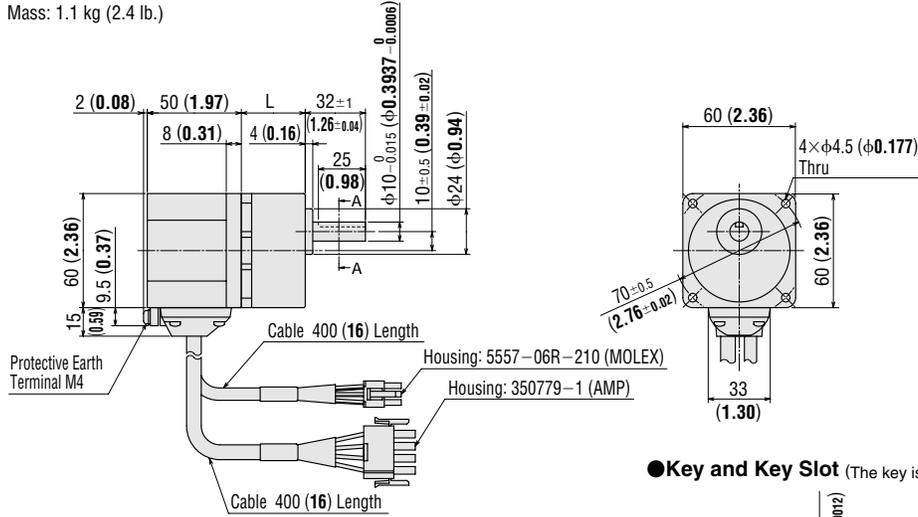
Gearhead: GFS2G□

Mass: 1.1 kg (2.4 lb.)

CAD A407A (GFS2G5~20)

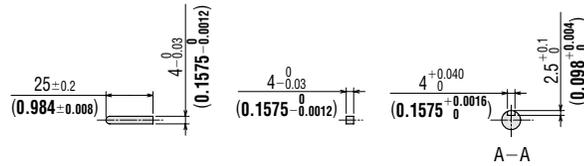
A407B (GFS2G30~100)

A407C (GFS2G200)



GFS2G5~20: L=34 (1.34)
 GFS2G30~100: L=38 (1.50)
 GFS2G200: L=43 (1.69)

● Key and Key Slot (The key is included with the gearhead.)



◇ Motor/Hollow Shaft Flat Gearhead

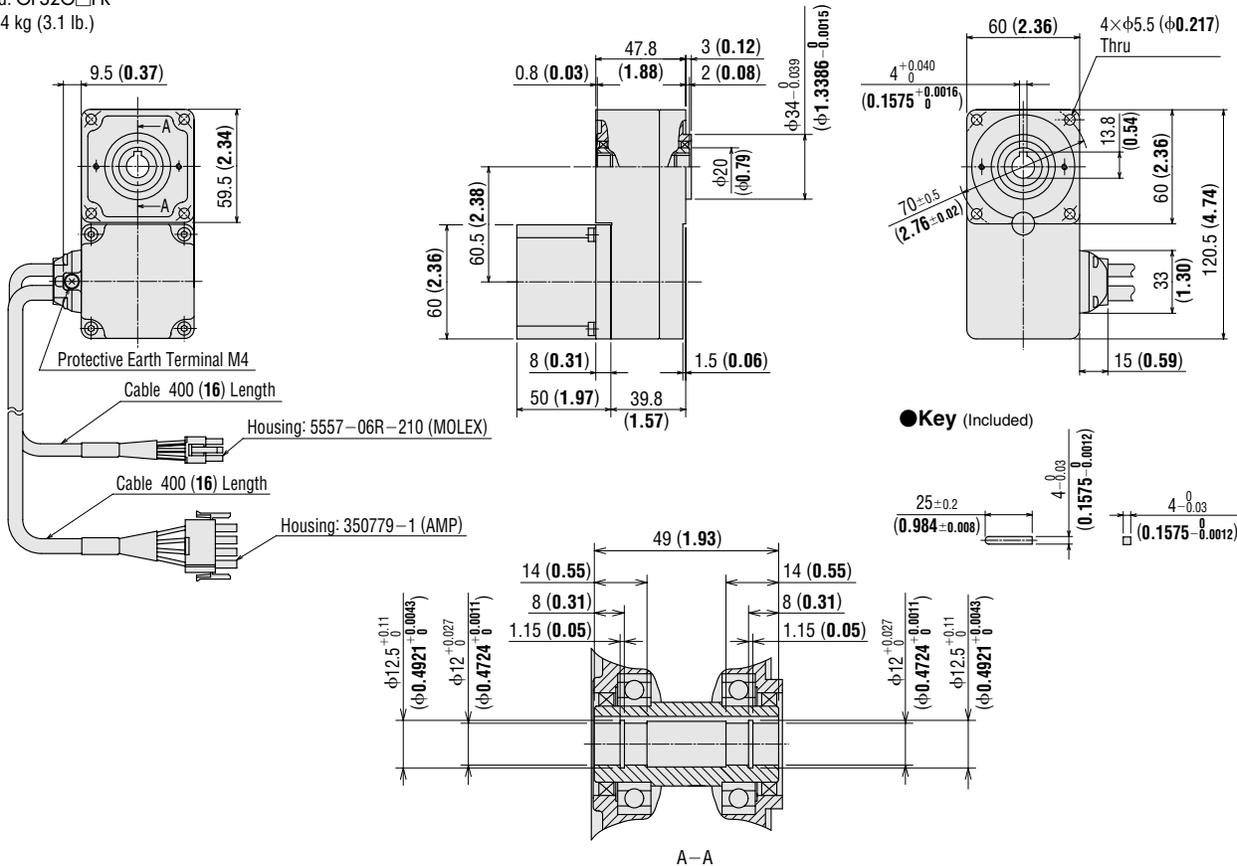
BLF230A-□FR, **BLF230C**-□FR, **BLF230S**-□FR (Combination type -Hollow shaft flat gearhead)

CAD A408

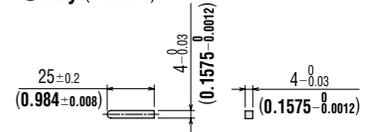
Motor: BLFM230-GFS

Gearhead: GFS2G□FR

Mass: 1.4 kg (3.1 lb.)



● Key (Included)



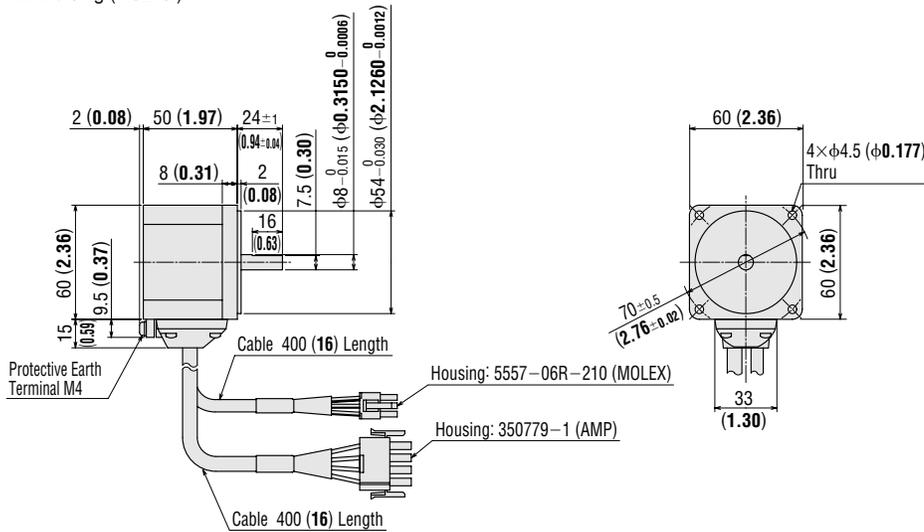
◆ Round Shaft Type

BLF230A-A, BLF230C-A, BLF230S-A (Round shaft type)

Motor: BLFM230-A

Mass: 0.6 kg (1.32 lb.)

CAD A409



◆ Motor/Parallel Shaft Gearhead

BLF460A-□, BLF460C-□, BLF460S-□ (Combination type -Parallel shaft gearhead)

Motor: BLFM460-GFS

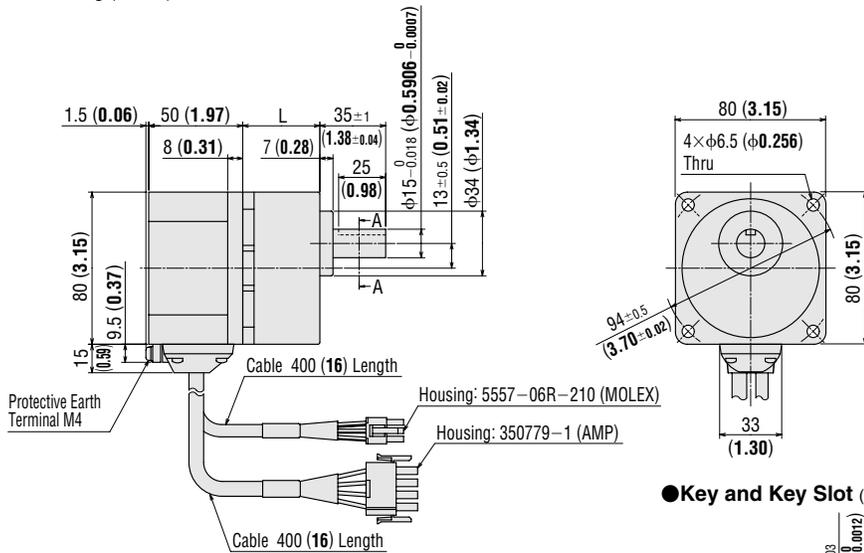
Gearhead: GFS4G□

Mass: 1.9 kg (4.2 lb.)

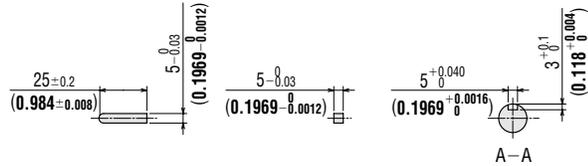
CAD A410A (GFS4G5~20)

A410B (GFS4G30~100)

A410C (GFS4G200)



● Key and Key Slot (The key is included with the gearhead.)



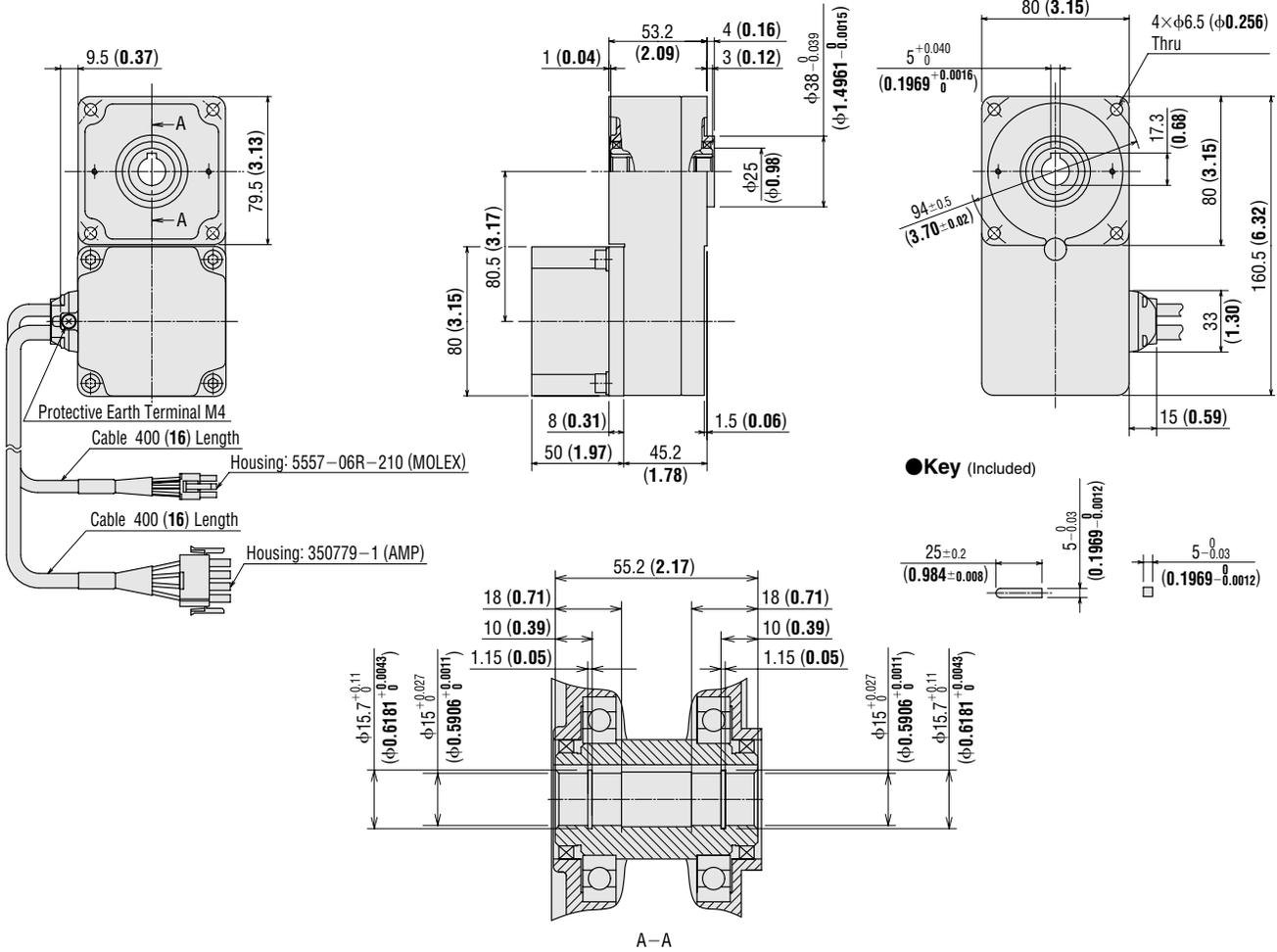
GFS4G5~20: L=41 (1.61)
GFS4G30~100: L=46 (1.81)
GFS4G200: L=51 (2.01)

◇ Motor/Hollow Shaft Flat Gearhead

BLF460A-□FR, BLF460C-□FR, BLF460S-□FR (Combination type -Hollow shaft flat gearhead)

CAD A411

Motor: BLM460-GFS
 Gearhead: GFS4G□FR
 Mass: 2.5 kg (5.5 lb.)

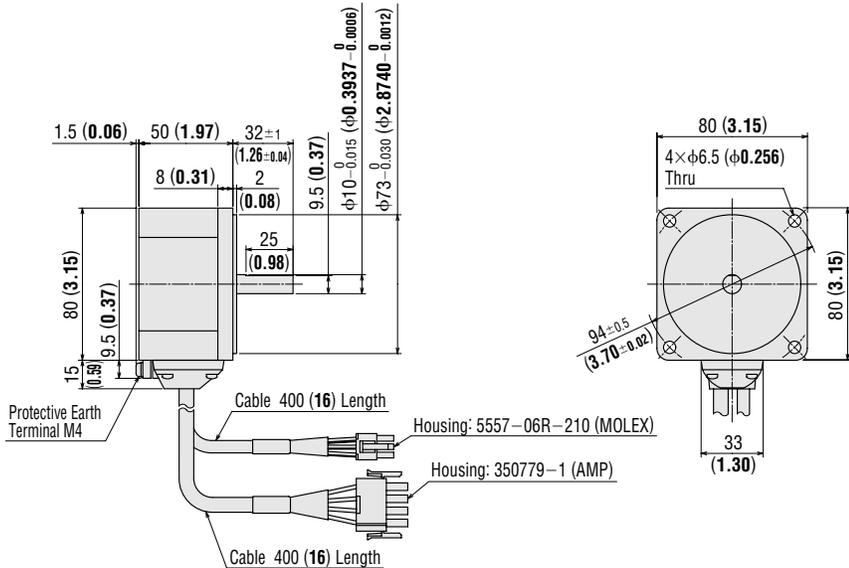


◇ Round Shaft Type

BLF460A-A, BLF460C-A, BLF460S-A (Round shaft type)

CAD A412

Motor: BLM460-A
 Mass: 0.9 kg (2.0 lb.)



◇ Motor/Parallel Shaft Gearhead

BLF5 120A-□, **BLF5 120C**-□, **BLF5 120S**-□ (Combination type -Parallel shaft gearhead)

Motor: BLFM5120-GFS

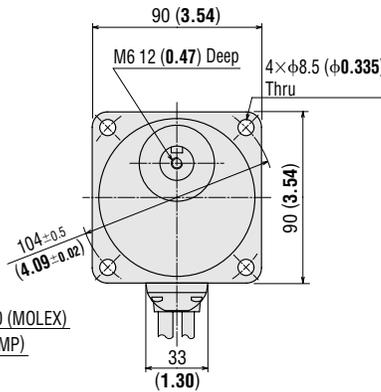
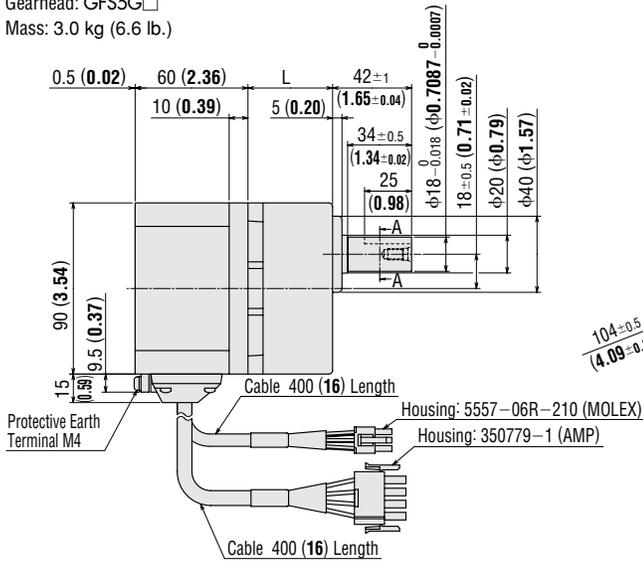
Gearhead: GFS5G□

Mass: 3.0 kg (6.6 lb.)

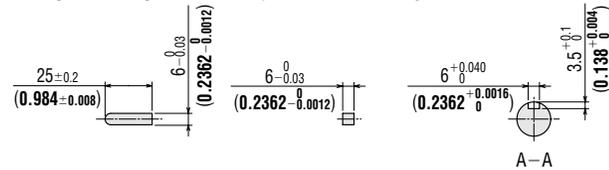
CAD A413A (GFS5G5~20)

A413B (GFS5G30~100)

A413C (GFS5G200)



● **Key and Key Slot** (The key is included with the gearhead.)



GFS5G5~20: L=45 (1.77)
GFS5G30~100: L=58 (2.28)
GFS5G200: L=64 (2.52)

◇ Motor/Hollow Shaft Flat Gearhead

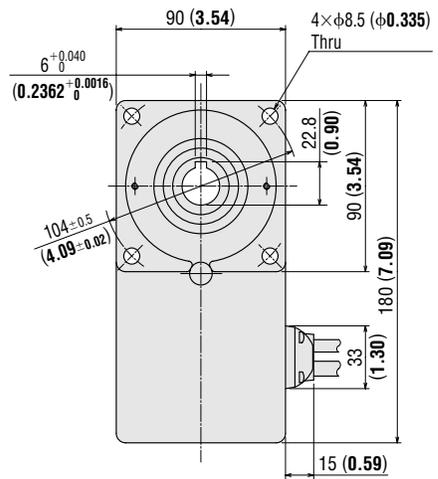
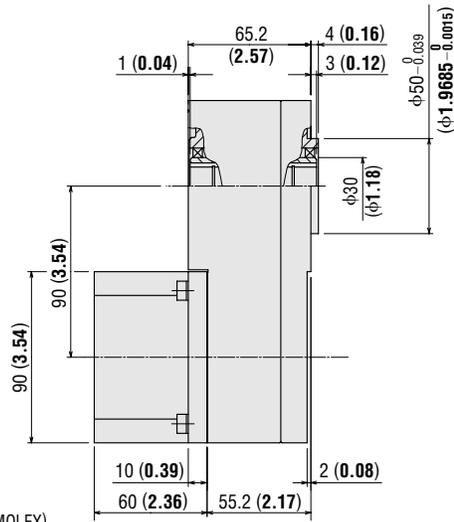
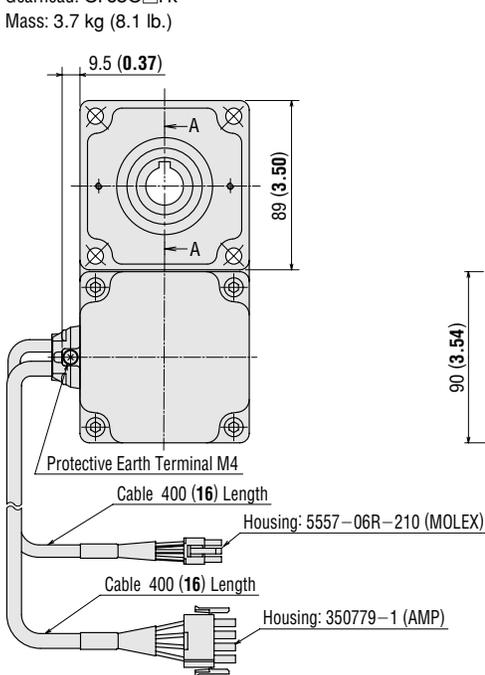
BLF5 120A-□FR, **BLF5 120C**-□FR, **BLF5 120S**-□FR (Combination type -Hollow shaft flat gearhead)

CAD A414

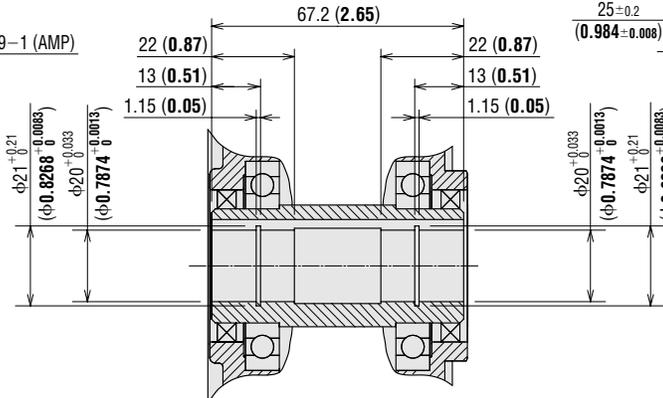
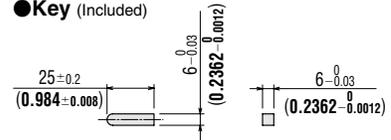
Motor: BLFM5120-GFS

Gearhead: GFS5G□FR

Mass: 3.7 kg (8.1 lb.)



● **Key** (Included)



A-A

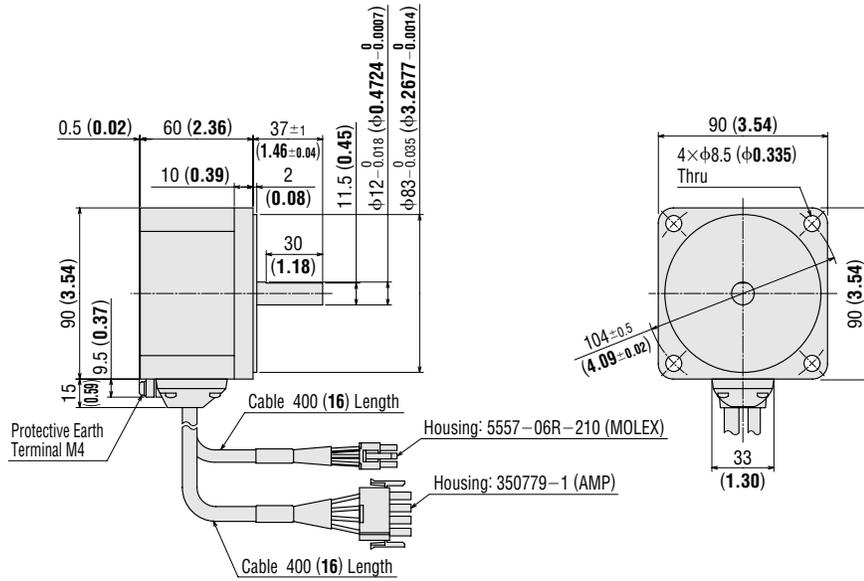
◇ Round Shaft Type

BLF5120A-A, BLF5120C-A, BLF5120S-A (Round shaft type)

Motor: BLFM5120-A

Mass: 1.5 kg (3.3 lb.)

CAD A415



◇ Driver

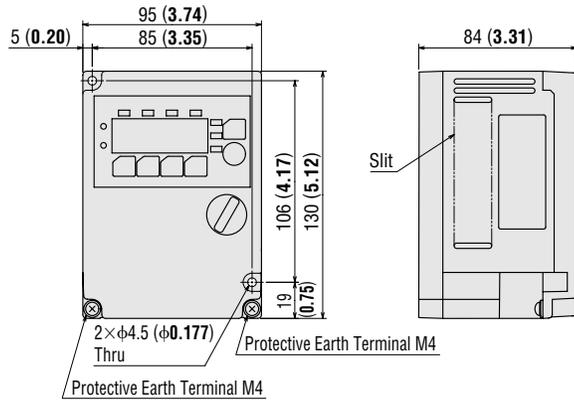
BLFD30A, BLFD30C, BLFD30S

BLFD60A, BLFD60C, BLFD60S

BLFD120A, BLFD120C, BLFD120S

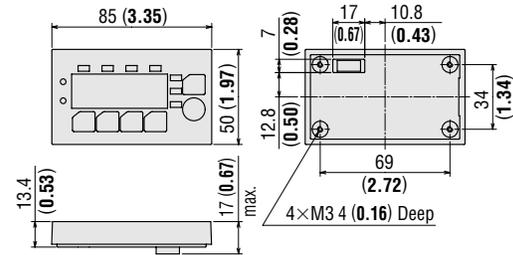
Mass: 0.9 kg (2.0 lb.)

CAD A416

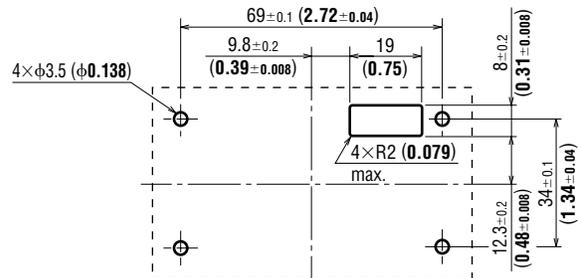


◇ Digital Operator

(Detached from the driver)

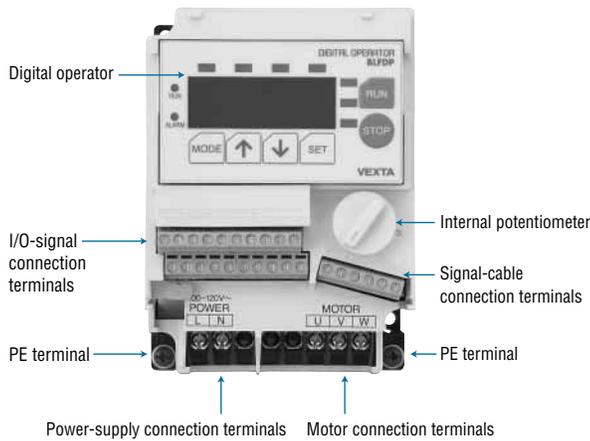


◇ Digital Operator Panel Cut-Out

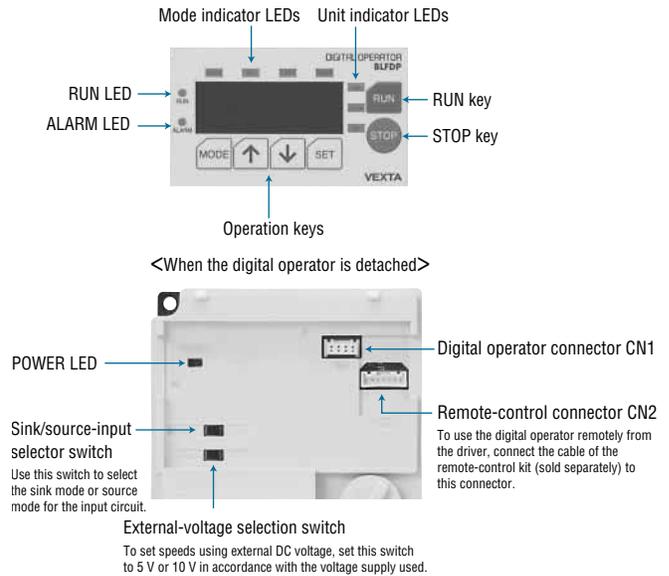


Connection and Operation

Name and Function of each Part of the Driver



Digital Operator



I/O Signals

| Terminal Name | Signal | Signal Name | Function and Operation |
|---------------|-----------------------------|--|--|
| TH | Input | - | Do not connect any signal to this terminal. |
| TH | | - | Do not connect any signal to this terminal. |
| M0 | | M0 Input | These signals are used to select operation data in multi-speed operation. One of up to eight preset speed data can be selected using the M0, M1 and M2 inputs. |
| M1 | | M1 Input | |
| M2 | | M2 Input | |
| VH | | VH Input | These signals are used to set speeds via an external potentiometer or external DC Voltage. |
| VM | | VM Input | |
| VL | | VL Input | |
| X0*1 | | EXT-ERROR Input | External error input (Normal Close) |
| C0 | | IN-COM | Input signal common |
| C1 | | IN-COM | Input signal common |
| X1*2 | | 2-wire Mode: CW Input | Clockwise direction/stop switch input signal |
| | | 3-wire Mode: START/STOP Input | Start/stop input signal |
| X2*2 | | 2-wire Mode: CCW Input | Counterclockwise direction/stop switch input signal |
| | | 3-wire Mode: RUN/BRAKE Input | Run/instantaneous stop input signal |
| X3*2 | 2-wire Mode: DEC-STOP Input | This signal is input to cause the motor to decelerate to a stop. | |
| | 3-wire Mode: CW/CCW Input | Clockwise/counterclockwise direction input signal | |
| X4 | - | Do not connect any signal to this terminal. | |
| X5 | ALARM-RESET Input | This signal is used to reset alarms. | |
| Y1 | Output | ALARM-OUT1 Output | This signal is output upon generation of an alarm. (Normally closed) |
| Y2 | | ALARM-OUT2 Output | This signal is output upon actuation of the overload protection function or overload warning function. (Normally closed) |
| Y0 | | SPEED-OUT Output | 30 pulses are output per each revolution of the motor output shaft. |
| C2 | | OUT-COM | Output signal common. |

*1 Do not remove the short bar if the EXT-ERROR input is not used.

*2 The functions of the external-input signal terminals X1, X2 and X3 can be changed between the 2-wire input mode and 3-wire input mode. The functions under the 2-wire input mode are initially assigned to the terminals.

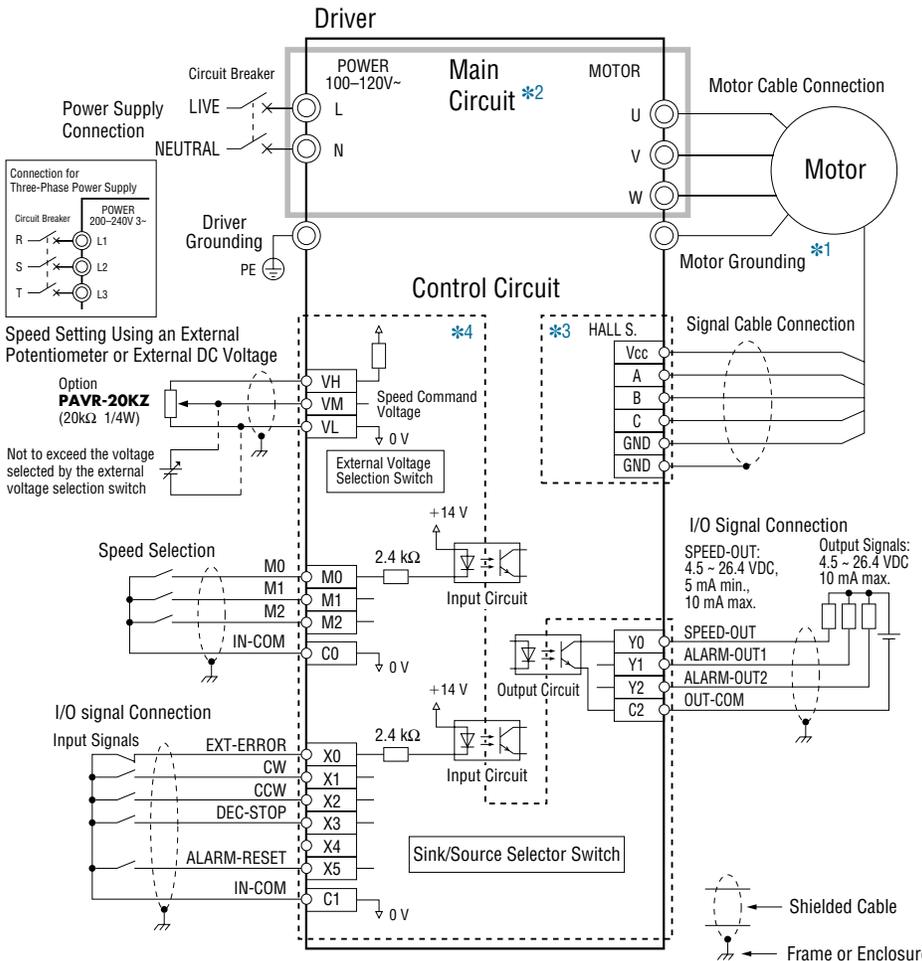
Digital Operator Indicators

| Display | Function | Details |
|--------------|----------|---|
| RUN | Running | A green lamp stays lit while the motor is running. |
| ALARM | Alarm | A red lamp turns on when an alarm occurs. |
| Mode | MNTR | Monitor mode The motor can be operated in this mode. The motor speed and load condition are displayed during motor operation. |
| | F/R | Direction setting mode If the digital operator is used to operate the motor, set the motor direction in this mode. For: Clockwise direction, rEv: Counterclockwise direction |
| | LO/RE | Digital operator/external-input signal setting mode In this mode, set whether to use the digital operator or external I/O signals to input the motor operation/stop signals. Lo: Digital operator, rE: External input signals |
| | PRGM | Data setting mode In this mode, set the data needed to operate the motor. Operation data (eight speeds and acceleration/deceleration times) Gear ratio setting/conveyor speed setting Input mode Overload warning function |
| Display Unit | r/min | Motor speed The speed of the motor or gearhead output shaft is displayed. |
| | m/min | Conveyor speed An equivalent moving speed of the work on a conveyor or other transfer system is displayed. |
| | % | Load factor* The actual load is displayed as a percentage of the rated torque being 100%. |

* A maximum error of approx. 20% may generate when the motor is operated at the rated speed under the rated load.

● Connection Diagrams

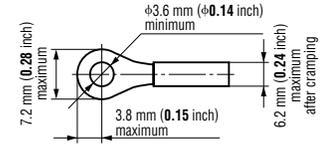
The figure below is a connection diagram for a configuration based on a single-phase 100–120 V supply voltage, with the sink/source selector switch set to the sink side.



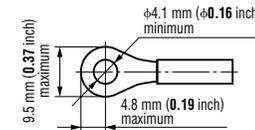
- *1 The grounding method will vary depending on the length of the connection cable.
When the connection cable is 7 m (23 ft.) or shorter: Connect the protective grounding terminal on the connection cable to the protective grounding terminal on the driver.
When the connection cable is 10 m (32.8 ft.) or longer: Connect the protective grounding terminal of the motor directly to the grounding point.
- *2 The main circuit is insulated to prevent electrical shock resulting from accidental contact by a hand, etc.
- *3 The signal-cable connection terminals and the signal cable including the shielded cable comprise an ELV circuit, which is insulated from dangerous voltages only by means of basic insulation. Therefore, connect the shielded cable to the GND point specified in the connection diagram, instead of connecting it to a protective grounding terminal.
- *4 The I/O-signal connection terminals comprise a SELV circuit, which is insulated from dangerous voltages by means of double insulation or reinforced insulation.

◆ Applicable Crimp Terminals

- Power Supply Connection Terminal (M3.5): Round shape terminal with insulator



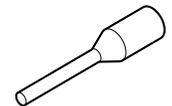
- Protective Earth Terminal (M4): Round shape terminal with insulator



• I/O Terminals

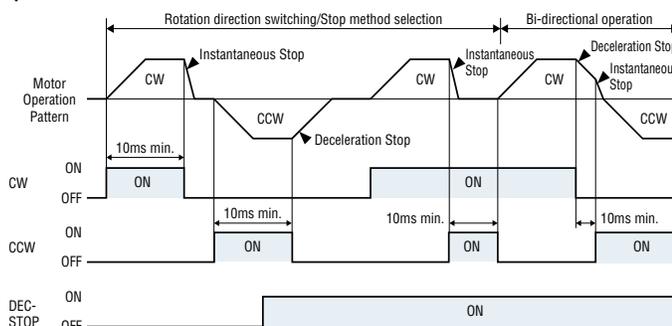
Use the terminals specified below for connection using crimp terminals. Please note that the applicable crimp terminal will vary depending on the size of the wire. The following terminals can be used with wires of AWG26 to 22.

- [Manufacturer: Phoenix Contact]
- AI 0.25-6 Applicable cable size : AWG26~24 (0.14~0.2 mm²)
- AI 0.34-6 Applicable cable size : AWG22 (0.35 mm²)



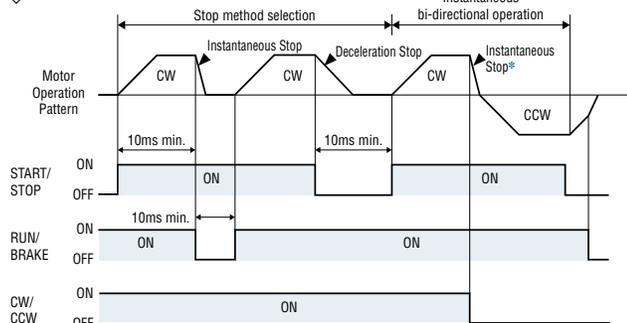
● Timing Chart

◆ 2-wire Mode



- The CW input signal, CCW input signal and DEC-STOP signal can be used to control all motor operations, such as run, stop, direction switching, deceleration stop and instantaneous stop.
- Switching the CW signal ON will cause the motor to turn clockwise as viewed from the motor shaft, while switching the CCW signal ON will cause the motor to turn counterclockwise. Switching each signal OFF will stop the motor. If both the CW signal and CCW signal are turned ON at the same time, the motor will stop instantaneously. The motor will start at the rise time corresponding to the acceleration time (ACC) set on the digital operator.
- Switching the DEC-STOP signal ON will cause the motor to decelerate at the deceleration time (DEC) set on the digital operator until it eventually stops. Switching the DEC-STOP signal OFF will cause the motor to stop instantaneously.

◆ 3-wire Method



- The START/STOP signal, RUN/BRAKE signal and CW/CCW signal can be used to control all motor operations, such as run/stop, instantaneous stop and direction switching.
- Switching both the START/STOP signal and RUN/BRAKE signal ON at the same time will start the motor. At this time, switching the CW/CCW signal ON will cause the motor to turn clockwise as viewed from the motor shaft, while switching the signal OFF will cause the motor to turn counterclockwise. The motor will start at the rise time corresponding to the acceleration time (ACC) set on the digital operator.
- Switching the RUN/BRAKE signal OFF while the START/STOP signal is ON will cause the motor to stop instantaneously. Switching the START/STOP signal OFF while the RUN/BRAKE signal is ON will cause the motor to decelerate at the deceleration time (DEC) set on the digital operator until it eventually stops.

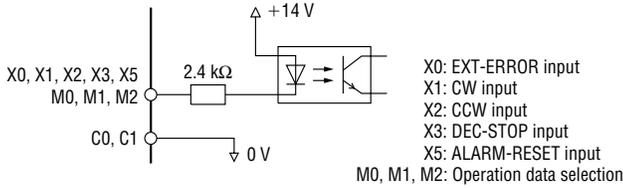
I/O Signal Circuits

The input signal circuit can be switched between the sink mode and source mode using the sink/source selector switch on the driver. The factory setting is the sink mode.

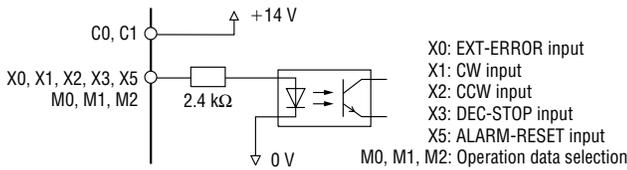
◇ Input Circuit

Common to the CW (START/STOP), CCW (RUN/BRAKE), DEC-STOP (CW/CCW), EXT-ERROR, ALARM-RESET and operation-data selection inputs.

● Sink Input



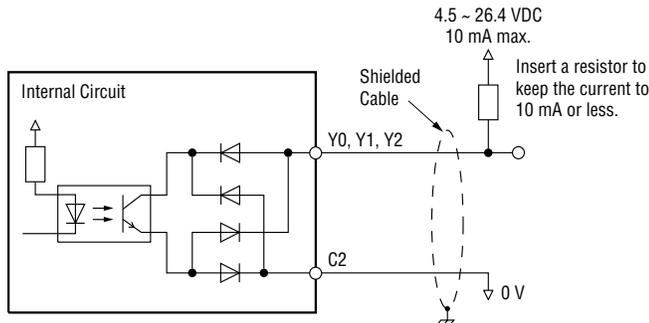
● Source Input



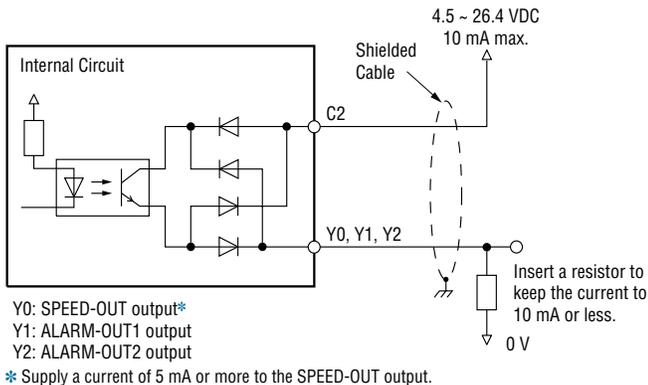
◇ Output Circuit

Common to the SPEED-OUT, ALARM-OUT1 and ALARM-OUT2 outputs.

● Sink Output



● Source Output

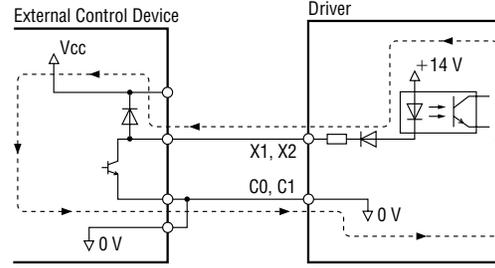


◇ When a Controller with a Built-in Clamp Diode is Used

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 → Driver ON

Power OFF: Driver OFF → Controller OFF



If the driver power is turned on first when connected as shown above, or the controller power is turned off with the driver power turned on, current will be applied, as indicated by the arrows in the diagram. This may cause the motor to run.

When the power is turned on or off simultaneously, the motor may run temporarily due to differences in power capacity. The controller power must be turned on first, and driver power must be turned off first.

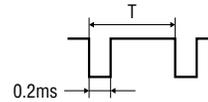
◇ SPEED-OUT Output

Pulse signals of 30 pulses (pulse width: 0.2 ms) are output per each revolution of the motor output shaft in synchronization with the motor operation.

By measuring the frequency of SPEED outputs, the motor speed can be calculated.

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

$$\text{Motor Shaft Speed (r/min)} = \frac{\text{SPEED-OUT Output Frequency}}{30} \times 60$$



◇ ALARM-OUT1 Output

When any of the driver's protection functions is actuated, the ALARM-OUT1 output will turn OFF and the digital operator will display an alarm code. The motor will decelerate to a stop.

◇ ALARM-OUT2 Output

The ALARM-OUT2 output will turn OFF when the driver's overload protection function or overload warning function is actuated. Actuation of any other protection function will not turn this output OFF.

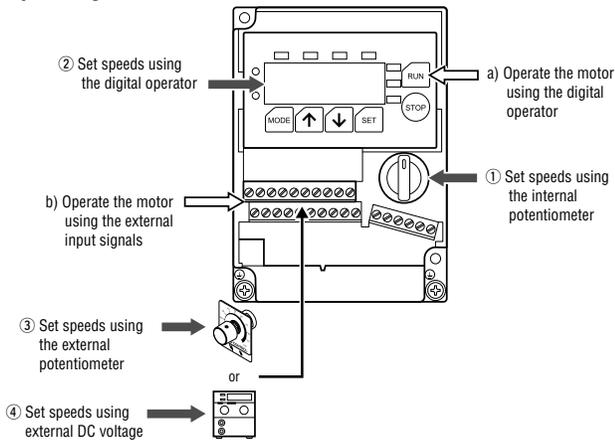
The overload warning function is actuated based on a preset load factor relative to the rated torque. The ALARM-OUT2 output will turn OFF once the set load factor is exceeded.

(A desired load factor can be set at 10% intervals between 50 and 100%.)

| Type of Protection Function | ALARM-OUT1 Output | ALARM-OUT2 Output |
|------------------------------|-------------------|-------------------|
| Normal Operation | ON | ON |
| Overload Protection Function | OFF | OFF |
| Other Protection Function | OFF | ON |
| Overload Warning Function* | ON | OFF |

* A maximum error of approx. 20% may generate when the motor is operated at the rated speed under the rated load.

Operating Methods



One of the following two operating methods (a and b) can be set by switching between the digital-operator setting mode and external-input signal setting mode.

- Operate the motor using the RUN and STOP keys on the digital operator
- Operate the motor using external input signals

Speed Setting Methods

One of the following four methods (① to ④) can be used to set speeds:

① Set speeds using the internal potentiometer

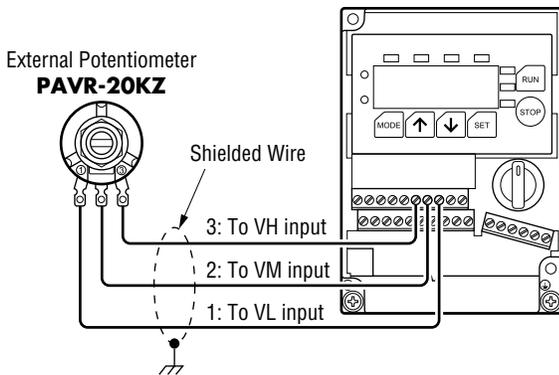
Set speeds using the potentiometer provided on the driver's front panel.

② Set speeds using the digital operator

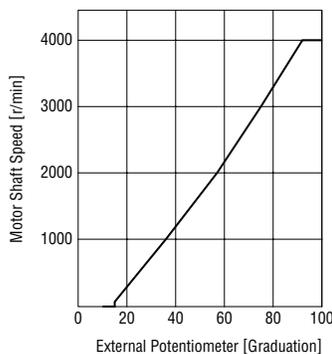
The digital operator can be used to set speeds in units of 1 r/min. Up to eight speed data can be set.

③ Set speeds using an External Potentiometer (sold separately)

To set speeds at a location away from the driver, connect an optional external potentiometer as shown below.



External Potentiometer Graduation vs. Speed Characteristics
(Representative values)

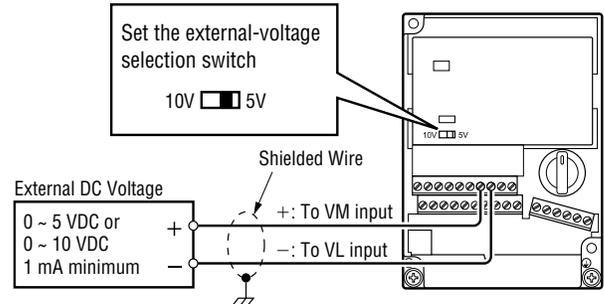


Note:

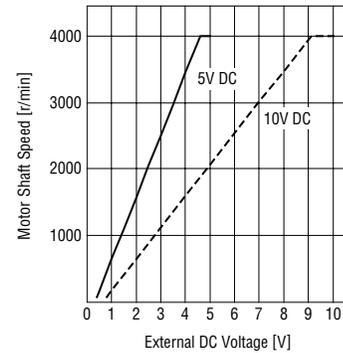
The speed in the graph represents the speed of a motor alone. The gear output shaft speed of the combination type is calculated by dividing the graph speed by the gear ratio.

④ Set speeds using external DC voltage

Set the external-voltage selection switch on the driver in accordance with the external DC voltage to be supplied. Detach the digital operator and set the switch to either 5 V or 10 V. Thereafter, connect an external DC power supply as shown below. Connect the positive and negative terminals of the power supply correctly.



External DC Voltage vs. Speed Characteristics
(Representative values)



Note:

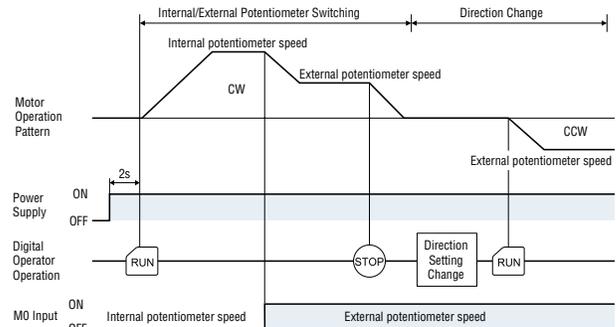
The speed in the graph represents the speed of a motor alone. The gear output shaft speed of the combination type is calculated by dividing the graph speed by the gear ratio.

Multi-Speed Operation

◇ Two-Speed Operation

The speed set by the internal potentiometer and another set by an external potentiometer can be combined for two-speed operation by switching the operation-data selection input M0.

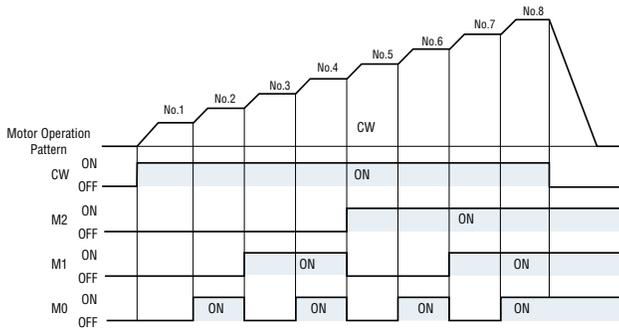
| M0 Input | M1 Input | M2 Input | Speed Setting Method |
|----------|----------|----------|------------------------|
| OFF | OFF | OFF | Internal potentiometer |
| ON | OFF | OFF | External potentiometer |



◇Eight-Speed Operation

A multi-speed operation using up to eight speeds can be performed by setting desired speeds in operation data No. 1 to 8 and then switching the speed using external input signals.

| Operation Data | M0 Input | M1 Input | M2 Input | Speed Setting Method |
|----------------|----------|----------|----------|---|
| No. 1 | OFF | OFF | OFF | Internal potentiometer/Digital operator |
| No. 2 | ON | OFF | OFF | External potentiometer/Digital operator |
| No. 3 | OFF | ON | OFF | Digital operator |
| No. 4 | ON | ON | OFF | Digital operator |
| No. 5 | OFF | OFF | ON | Digital operator |
| No. 6 | ON | OFF | ON | Digital operator |
| No. 7 | OFF | ON | ON | Digital operator |
| No. 8 | ON | ON | ON | Digital operator |



●Parallel Operation

Two or more motors can be operated at the same speed using a single external potentiometer or external DC power supply.

The diagram below applies to a single-phase power supply specification. For a three-phase power supply specification, change the power-supply line to a three-phase type. Also note that the diagram does not show the motor or operation control part.

◇Using an External Potentiometer

As shown in the diagram, use a common power-supply line and a common speed-control line for each driver and set speeds using the external potentiometer VRx.

The resistance of the external potentiometer is determined using the formula below:

Resistance when n numbers of drivers are connected: $VRx = 20 / n$ (kΩ), $n / 4$ (W)

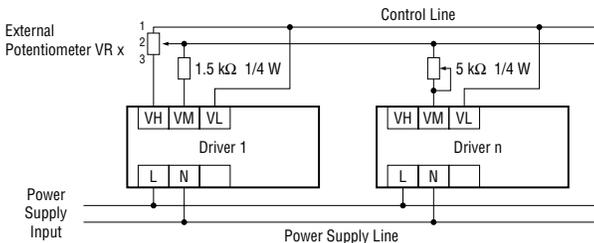
Example: When two drivers are connected

$$VRx = 20 / 2 = 10 \text{ (k}\Omega\text{)}, 2 / 4 = 1 / 2 \text{ (W)}$$

Accordingly, the resistance is calculated as 10 kΩ, 1/2 W.

To adjust the speed difference between motors, connect a 1.5 kΩ, 1/4 W resistor to the VM terminal on the first driver, and connect a 5 kΩ, 1/4 W variable resistor (VRn) to the VM terminal on each of the remaining drivers.

Up to five drivers can be operated in parallel using an external potentiometer.



◇Using External DC Voltage

As shown in the diagram, use a common power-supply line and a common speed-control line for each driver and connect all drivers to a 5 or 10 VDC power supply.

The power-supply capacity of the external power supply is determined using the formula below:

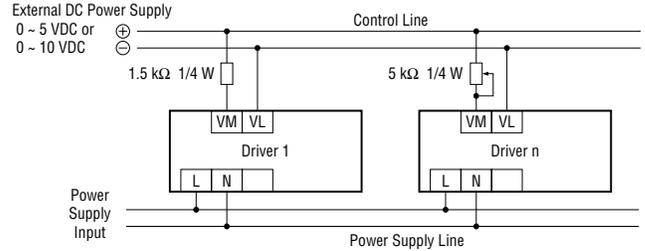
Power-supply capacity when n numbers of drivers are connected: $I = 1 \times n$ (mA)

Example: When two drivers are connected

$$I = 1 \times 2 = 2 \text{ (mA)}$$

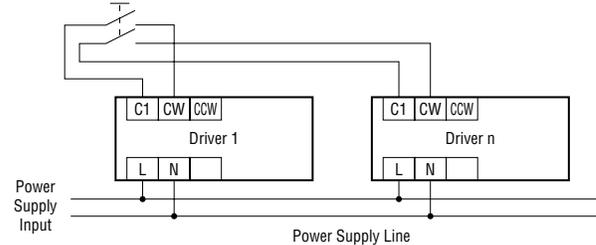
Accordingly, the power-supply capacity is calculated as 2 mA or more.

To adjust the speed difference between motors, connect a 1.5 kΩ, 1/4 W resistor to the VM terminal on the first driver, and connect a 5 kΩ, 1/4 W variable resistor (VRn) to the VM terminal on each of the remaining drivers.



◇Using the Digital Operator

When multiple drivers are connected where the same data are set digitally in each driver, the operations of multiple motors can be controlled via a single set of external input signals using the wiring circuit shown below.



Installation of the Hollow-Shaft Flat Gearhead

● Installing the Load Shaft

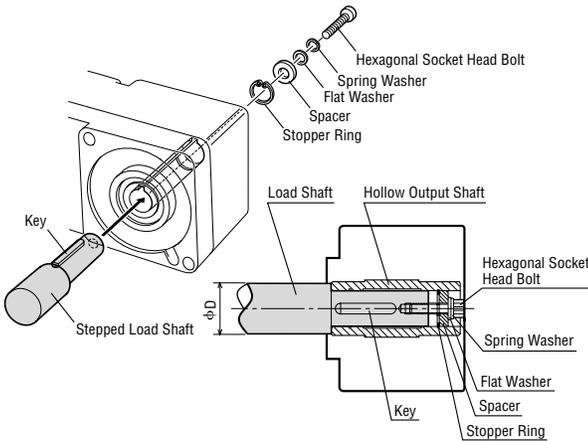
- Install the load shaft to the hollow output shaft by aligning the center of the hollow shaft with that of the load shaft.
- The hollow output shaft has a key groove. Machine a matching key groove on the load shaft side and use the supplied key to affix the two shafts across the grooves.
- A recommended tolerance of the load shaft is h7.
- If the motor will receive large impacts due to frequent instantaneous stops or carry a large overhung load, use a stepped load shaft.

Notes:

- When installing the load shaft to the hollow output shaft, be careful not to damage the hollow output shaft or bearing.
- To prevent seizure, apply a coat of molybdenum disulfide grease on the exterior surface of the load shaft and interior surface of the hollow output shaft.
- Do not attempt to modify or machine the hollow output shaft. Doing so may damage the bearing and cause the hollow-shaft flat gearhead to break.

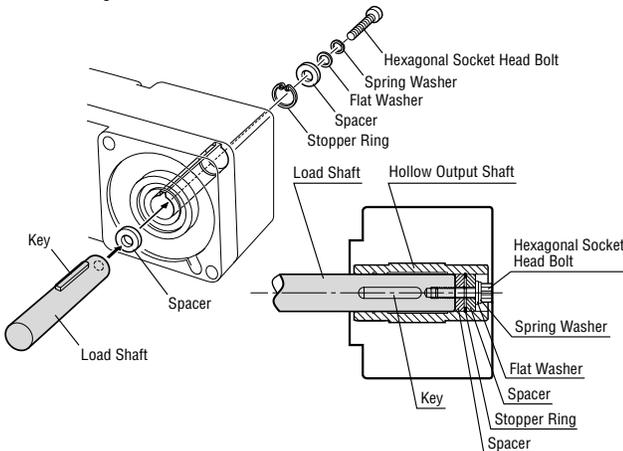
◇ Stepped Load Shaft

Install a hexagonal socket head bolt over a stopper ring, spacer, flat washer and spring washer, and tighten the bolt to affix the load shaft.



◇ Straight Load Shaft

Install a hexagonal socket head bolt over a stopper ring, spacer, flat washer and spring washer, with a spacer also inserted underneath the load shaft, and tighten the bolt to affix the load shaft.



● Recommended Load Shaft Installation Dimensions

Unit=mm (inch)

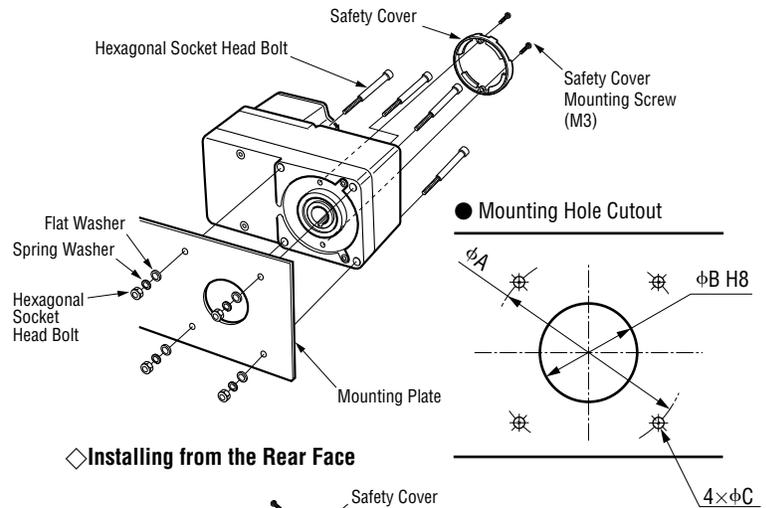
| Model | BLF230 | BLF460 | BLF5120 |
|--|---|---|---|
| Inner Diameter of Hollow Shaft (h8) | $\phi 12 \begin{matrix} +0.027 \\ 0 \end{matrix}$ $(\phi 0.4724 \begin{matrix} +0.0011 \\ 0 \end{matrix})$ | $\phi 15 \begin{matrix} +0.027 \\ 0 \end{matrix}$ $(\phi 0.5906 \begin{matrix} +0.0011 \\ 0 \end{matrix})$ | $\phi 20 \begin{matrix} +0.033 \\ 0 \end{matrix}$ $(\phi 0.7874 \begin{matrix} +0.0013 \\ 0 \end{matrix})$ |
| Recommended Tolerance of Load Shaft (h7) | $\phi 12 \begin{matrix} 0 \\ -0.018 \end{matrix}$ $(\phi 0.4724 \begin{matrix} 0 \\ -0.0007 \end{matrix})$ | $\phi 15 \begin{matrix} 0 \\ -0.018 \end{matrix}$ $(\phi 0.5906 \begin{matrix} 0 \\ -0.0007 \end{matrix})$ | $\phi 20 \begin{matrix} 0 \\ -0.021 \end{matrix}$ $(\phi 0.7874 \begin{matrix} 0 \\ -0.0008 \end{matrix})$ |
| Nominal Diameter of Stopper Ring | $\phi 12 (\phi 0.47)$, C-shaped | $\phi 15 (\phi 0.59)$, C-shaped | $\phi 20 (\phi 0.79)$, C-shaped |
| Applicable Bolt | M4 | M5 | M6 |
| Spacer Thickness* | 3 (0.12) | 4 (0.16) | 5 (0.20) |
| Outer Diameter of step part ϕD | 20 (0.79) | 25 (0.98) | 30 (1.18) |

* Determine the spacer thickness in conformance with the table. If the spacer is thicker than the specified dimension, the bolt will project from the surface and interfere with the safety cover.

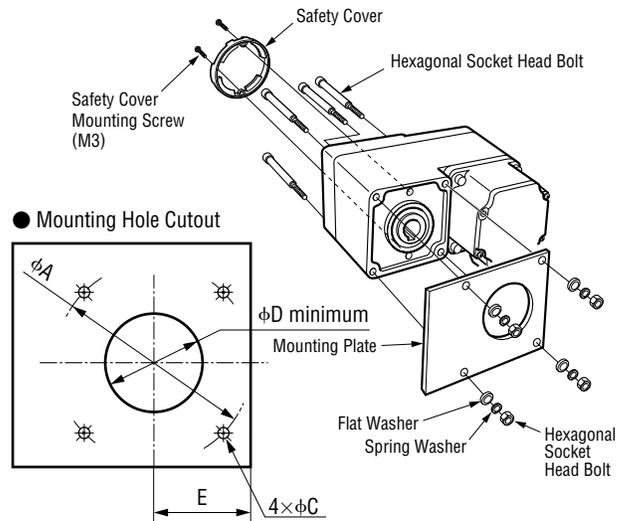
● Installing the Hollow Shaft

◇ Installing from the Front Face

The output shaft boss (h8) can be used to align the shaft.



◇ Installing from the Rear Face



Note:

When installing the hollow-shaft flat gearhead from the rear face, provide dimension E to prevent the mounting plate from contacting the motor.

● Mounting Hole Dimensions

Unit=mm (inch)

| Model | BLF230 | BLF460 | BLF5120 |
|-------------------|---|---|---|
| Nominal Bolt Size | M5 | M6 | M8 |
| ϕA | 70 (2.76) | 94 (3.70) | 104 (4.09) |
| ϕB H8 | $34 \begin{matrix} +0.039 \\ 0 \end{matrix}$ $(1.34 \begin{matrix} +0.0015 \\ 0 \end{matrix})$ | $38 \begin{matrix} +0.039 \\ 0 \end{matrix}$ $(1.50 \begin{matrix} +0.0015 \\ 0 \end{matrix})$ | $50 \begin{matrix} +0.039 \\ 0 \end{matrix}$ $(1.97 \begin{matrix} +0.0015 \\ 0 \end{matrix})$ |
| ϕC | 5.5 (0.22) | 6.5 (0.26) | 8.5 (0.33) |
| ϕD | 25 (0.98) | 30 (1.18) | 35 (1.38) |
| E | 29 (1.14) | 39 (1.54) | 44 (1.73) |

Connection Cables (RoHS) (Sold Separately)

These cables are used to connect the motor and driver. The **BLF** Series does not come with connection cables, so be sure to purchase an optional connection cable set.

The optional cable set consists of two cables including a motor connection cable and a signal connection cable.



Motor Connection Cable



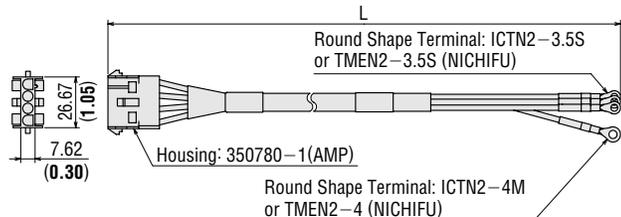
Signal Connection Cable

Cable Set

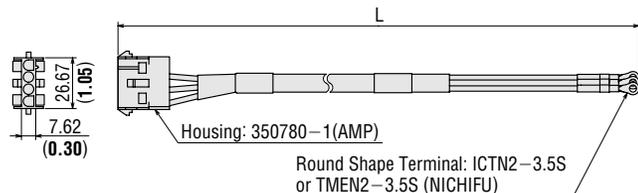
| Model | Length (L) |
|----------------|-----------------|
| CC01BLF | 1 m (3.3 ft.) |
| CC02BLF | 2 m (6.6 ft.) |
| CC03BLF | 3 m (9.8 ft.) |
| CC05BLF | 5 m (16.4 ft.) |
| CC07BLF | 7 m (23 ft.) |
| CC10BLF | 10 m (32.8 ft.) |
| CC15BLF | 15 m (49.2 ft.) |
| CC20BLF | 20 m (65.6 ft.) |

Dimensions unit: mm (inch)

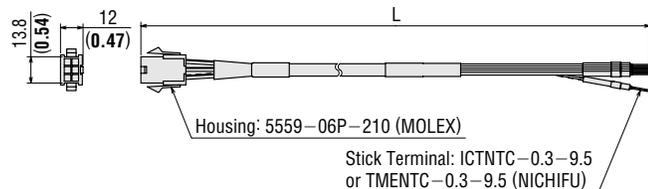
Motor Connection Cable 1~7 m (3.3~23 ft.)



Motor Connection Cable 10~20 m (32.8~65.6 ft.)



Signal Connection Cable



Accessories (Sold Separately)

Remote-Control Kit (RoHS)

The remote-control kit is useful if you want to detach the digital operator from the driver and install it on the frame of the equipment, etc., for remote operation.

The kit includes an extension cable for digital operator/driver connection [2 or 5 m (6.6 or 16.4 ft.)] and a rubber gasket.

| Model | Extension Cable Length |
|-----------------|------------------------|
| BLFHS-02 | 2 m (6.6 ft.) |
| BLFHS-05 | 5 m (16.4 ft.) |



<Example of use>



External Potentiometer (RoHS)

Model: **PAVR-20KZ**

(20kΩ, 1/4W, with a linear resistance vs. angle curve)



Mounting Bracket (RoHS)

These mounting brackets are useful for installing or fixing the parallel shaft combination type and round shaft type.

To mount the round shaft type, mounting screws must be provided separately. Please note that these mounting brackets cannot be used with hollow shaft flat gearheads.



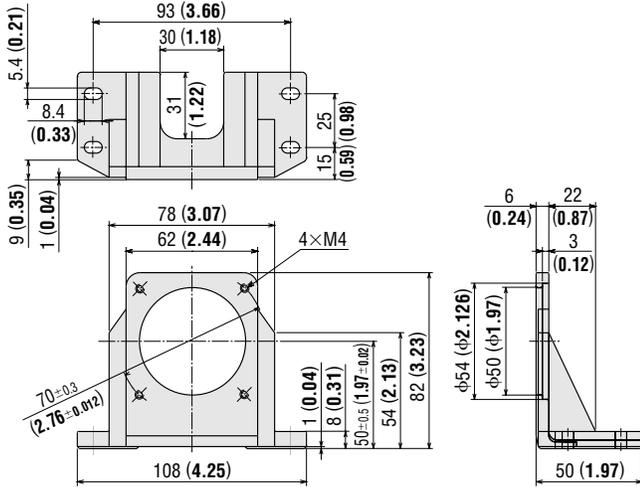
| Model | Applicable Products |
|---------------|--|
| SOL2M4 | BLF230 ■-□ BLF230 ■-A |
| SOL4M6 | BLF460 ■-□ BLF460 ■-A |
| SOL5M8 | BLF5120 ■-□ BLF5120 ■-A |

- Enter the letter representing the voltage (**A**, **C** or **S**) in the box (■) within the applicable motor model name.
- Enter the gear ratio in the box (□) within the applicable motor model name.
- The mounting brackets come with tapped holes. To mount the motor and gearhead, simply fasten with the screws provided to the gearhead.

● **Dimensions** unit: mm (inch)

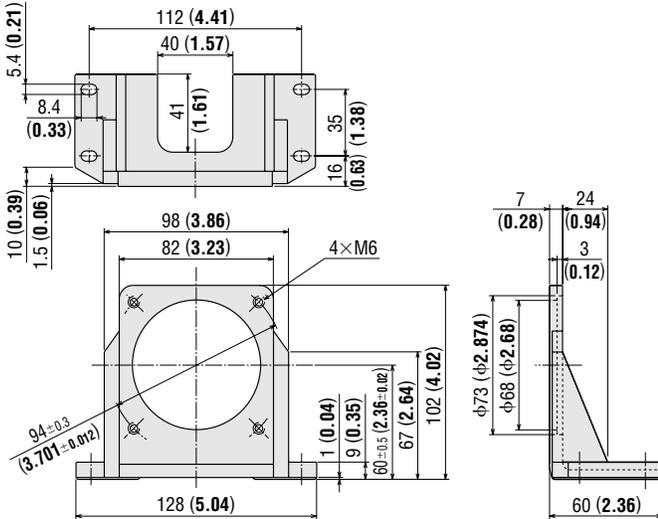
Model: SOL2M4

Mass: 135 g (4.8 oz.) Material: Aluminum **CAD** A321



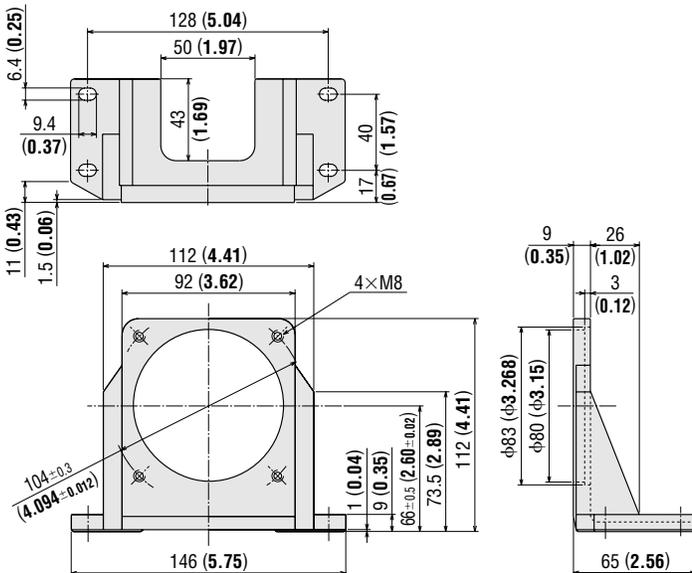
Model: SOL4M6

Mass: 210 g (7.4 oz.) Material: Aluminum **CAD** A237



Model: SOL5M8

Mass: 270 g (9.5 oz.) Material: Aluminum **CAD** A239



■ **Flexible Coupling** **(RoHS)**

These products are clamping type couplings to connect between the shaft of motor/gearhead and the shaft of the equipment to be connected. Couplings come with shaft holes and have standardized combinations for different diameter shaft holes.



| Applicable Motor | Shaft Diameter | Type of Load | Coupling Type |
|--------------------|---------------------|---------------|-------------------|
| BLF230 ■-□ | φ10 mm (φ0.39 inch) | Constant Load | MCL30 Type |
| | | Shock Load | MCL40 Type |
| BLF230 ■-A | φ8 mm (φ0.31 inch) | Constant Load | MCL20 Type |
| | | Shock Load | MCL30 Type |
| BLF460 ■-□ | φ15 mm (φ0.59 inch) | Constant Load | MCL40 Type |
| | | Shock Load | MCL55 Type |
| BLF460 ■-A | φ10 mm (φ0.39 inch) | Constant Load | MCL30 Type |
| | | Shock Load | MCL40 Type |
| BLF5120 ■-□ | φ18 mm (φ0.71 inch) | Constant Load | MCL55 Type |
| | | Shock Load | |
| BLF5120 ■-A | φ12 mm (φ0.47 inch) | Constant Load | MCL30 Type |
| | | Shock Load | MCL40 Type |

- Enter the letter representing the voltage (**A**, **C** or **S**) in the box (■) within the applicable motor model name.
- Enter the gear ratio in the box (□) within the applicable motor model name.

This product is manufactured at a plant certified with the international standards **ISO 9001** (for quality assurance) and **ISO 14001** (for systems of environmental management).

Specifications are subject to change without notice.

This catalog was published in July, 2006.

ORIENTAL MOTOR U.S.A. CORP.

Western Sales and Customer Service Center

Tel: (310) 784-8200 Fax: (310) 325-1076

Dallas

Tel: (214) 432-3386

Denver

Tel: (303) 202-5111

Los Angeles

Tel: (310) 784-8200

San Jose

Tel: (408) 392-9735

Midwest Sales and Customer Service Center

Tel: (847) 285-5100 Fax: (847) 843-4121

Chicago

Tel: (847) 285-5100

Toronto

Tel: (905) 502-5333

Eastern Sales and Customer Service Center

Tel: (781) 848-2426 Fax: (781) 848-2617

Atlanta

Tel: (770) 716-2800

Boston

Tel: (781) 848-2426

New York

Tel: (973) 359-1100

Technical Support

Tel: (800) 468-3982 / 7:30 a.m. to 5:00 p.m., P.S.T. (M-F)

E-mail: techsupport@orientalmotor.com

Obtain Specifications, Online Training

and Purchase Products at:

www.orientalmotor.com