BLF Series

●Additional Information●
Technical reference ➜ Page G-1
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The **BLF** Series brushless motor achieves a maximum motor speed of 4000 r/min. With the digital operator, digital setting and display are possible, offering a wide range of functions to meet your diverse needs.

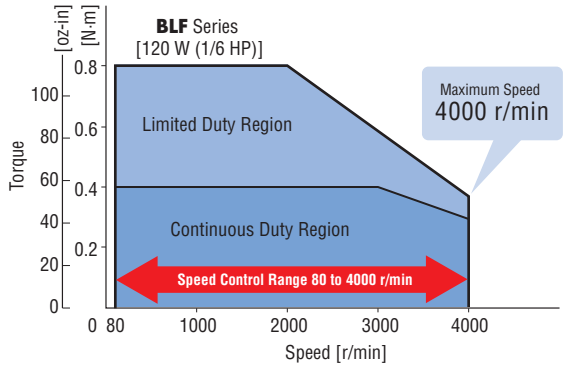
Motor: c UL us CE Driver: c UL us LISTED CE RoHS

●For detailed product safety standard information including standards, file number and certification body, please visit www.orientalmotor.com.

Features

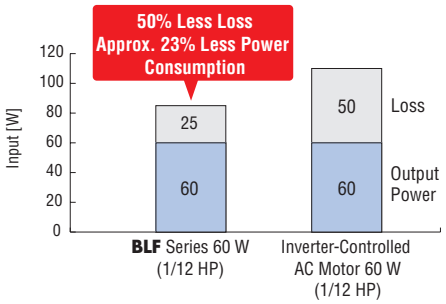
●Wide Speed Control Range from 80 r/min up to 4000 r/min

A wide speed control range from 80 to 4000 r/min (speed ratio of 50:1) enables the motor to be used for various applications.



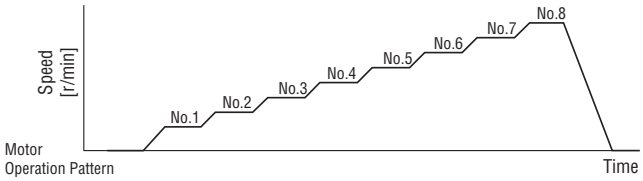
●Energy-Saving

At an output power of 60 W (1/12 HP), the power loss of the **BLF** Series is approximately half that of an inverter-controlled AC motor, which contributes to the energy-saving operation of your equipment.



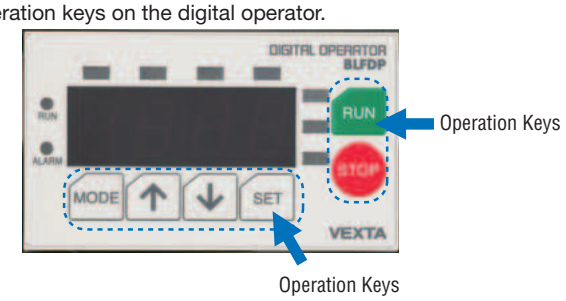
●Multi-Speed Operation Using up to Eight Speeds

Up to eight speeds can be set by digital setting. On the digital operator, the speed can be set in units of 1 r/min and a different acceleration/deceleration time can be set for each speed. Switch the speed according to your needs.



●Easy Operation with the Digital Operator

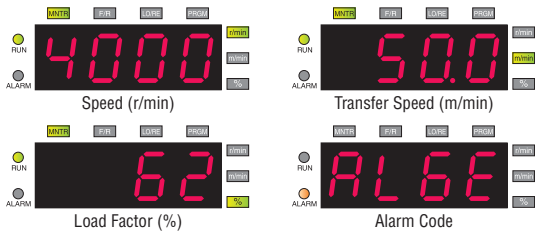
You can perform various settings and operations using the six operation keys on the digital operator.



●Various Digital Displays

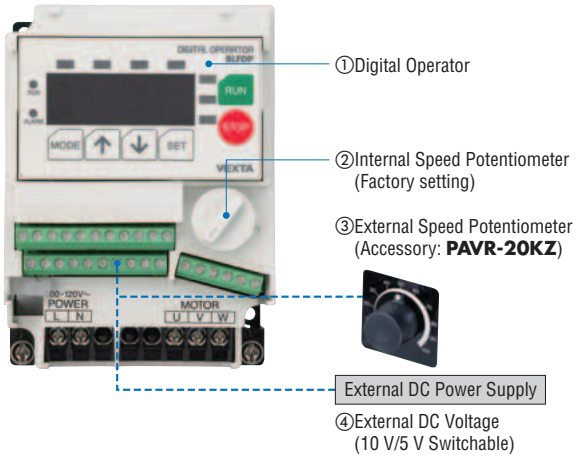
Speed, load factor, alarm code, etc. can be displayed digitally.

●The speed can be displayed as gearhead output shaft speed.



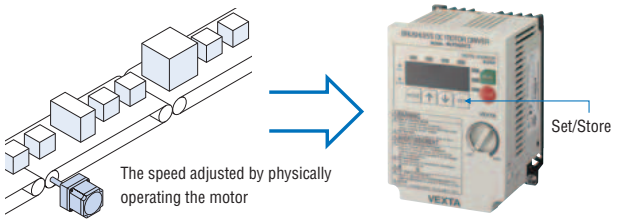
●Four Speed Setting Methods

Select one of four speed setting methods according to the condition in which your equipment is used.



●Speed Teaching Function

The speed adjusted by physically operating the motor can be set and stored.



●Sink/Source Logic Switchable

To ensure safety and usability, sink/source logic can be selected by a switch.

- The factory setting is the sink logic.

●Full Range of Protective Functions

The **BLF** Series detects various motor and driver errors such as overload, overvoltage, undervoltage, 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.

●Detachable Digital Operator

The digital operator can be detached from the driver and used at a location as far as 5 m (16.4 ft.) away using an accessory remote-control kit (sold separately). Use the digital operator as a handy operation unit or display outside the switch board. (The digital operator conforms to IP65 when the remote-control kit is used.)

Digital Operator

●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 capable of an extension of the motor/driver wiring distance to a maximum of 20 m (65.6 ft.).
Select connection cables (sold separately) from among eight lengths [1 to 20 m (3.3 to 65.6 ft.)].

Note

- Be sure to purchase connection cables (sold separately).

Motor Side Driver Side

Motor Connection Cable

Motor Side Driver Side

Signal Connection Cable

●Uses a Terminal Block for Driver Connection

The driver-end of each cable has terminals, instead of a connector, to make it easy to wire the cable into a switch board.

●Long Life Gearhead Rating of 10000 Hours

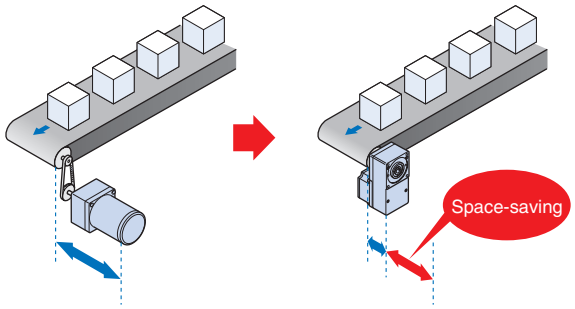
The rated life of the parallel shaft gearhead and hollow shaft flat gearhead is 10000 hours (at 3000 r/min). The parallel shaft gearhead achieves a rated life of twice as long as that of a conventional gearhead.

- The 60 W (1/12 HP), 120 W (1/6 HP), 200 W (1/4 HP) and 400 W (1/2 HP) parallel shaft gearhead has a tapped hole at the shaft end.

●Features of Hollow Shaft Flat Gearhead

◇Space-Saving and Low-Cost

The output shaft can be coupled directly to a driven shaft without using a coupling, which allows you to reduce the size and installation space of your equipment. Since no shaft-coupling parts are needed, the parts and labor cost will also decrease.

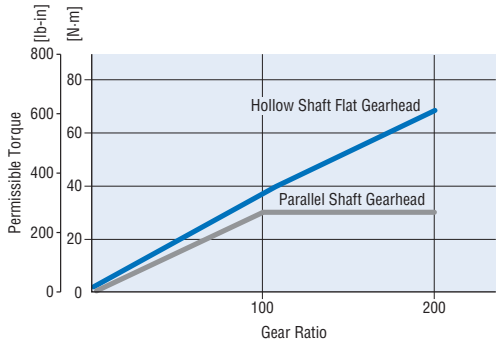


[For Three-Phase Motor and Parallel Shaft Gearhead]

[For Brushless Motor and Hollow Shaft Flat Gearhead]

◇High Permissible Torque

While the permissible torque of parallel shaft gearhead saturates at high gear ratios, the hollow shaft flat gearhead enables the motor torque to be fully utilized.



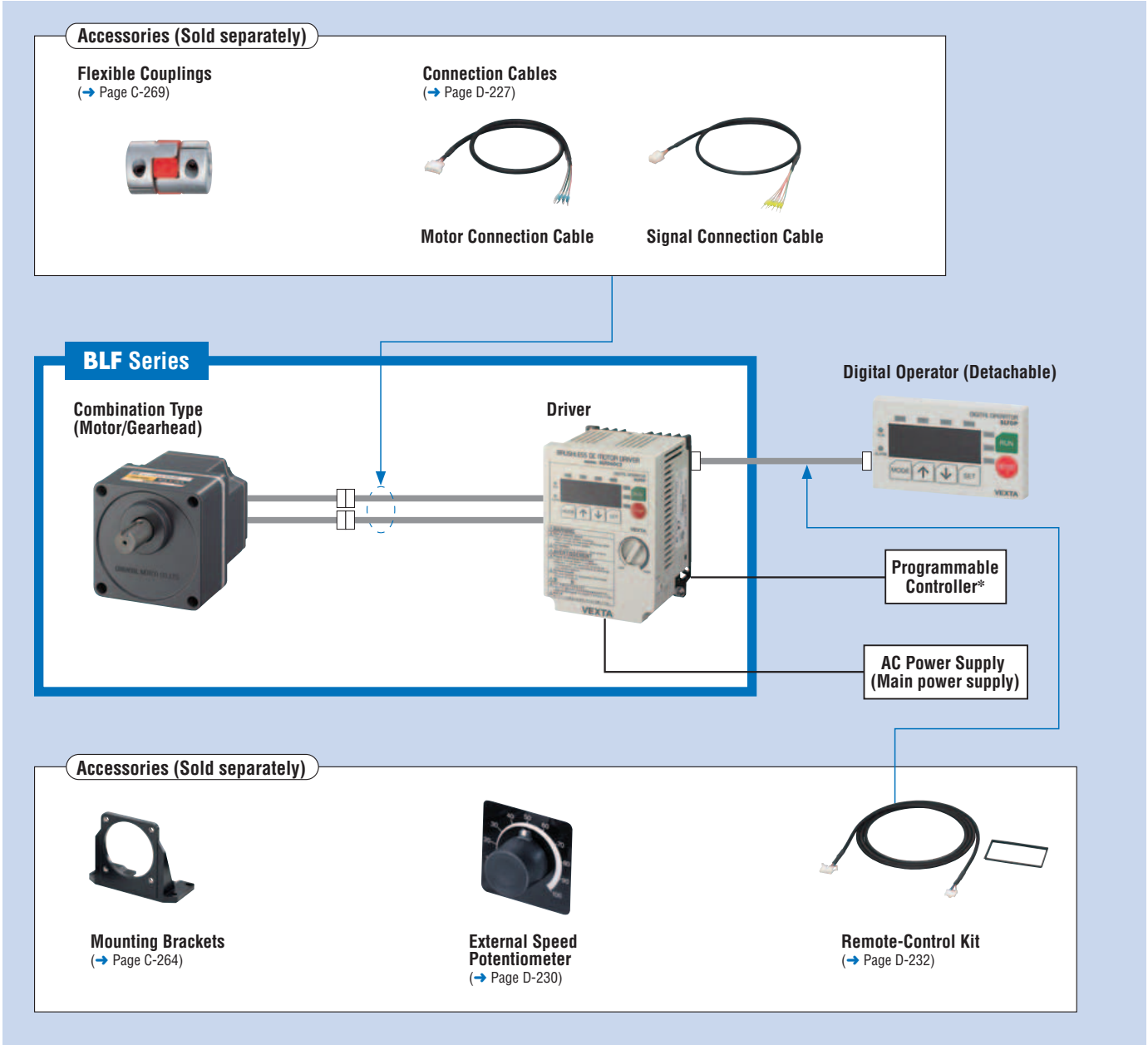
[Frame size 90 mm (3.54 in.)]

●IP65 Protection

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

System Configuration



●Example of System Configuration

BLF Series Combination Type – Parallel Shaft	Sold Separately				
	Connection Cable [Cable Set, 1 m (3.3 ft.)]	Remote-Control Kit [2 m (6.6 ft.)]	Mounting Bracket	Flexible Coupling	External Speed Potentiometer
BLF460A-30	CC01BLF	+ BLFHS-02	SOL4M6	MCL5515F10	PAVR-20KZ

●The system configuration shown above is an example. Other combinations are available.
*Not supplied

Product Number Code

BLF 2 30 A - 5 FR
① ② ③ ④ ⑤ ⑥

①	Series	**BLF**: **BLF** Series
②	Motor Frame Size	**2**: 60 mm (2.36 in.) **4**: 80 mm (3.15 in.) **5**: 90 mm (3.54 in.) **6**: 104 mm (4.09 in.) [110 mm (4.33 in.) for Gearhead]
③	Output Power (W)	(Example) **30**: 30 W (1/25 HP)
④	Power Supply Voltage	**A**: Single-Phase 100-120 VAC **C**: Single-Phase 200-240 VAC **S**: Three-Phase 200-240 VAC
⑤	Gear Ratio/Shaft Type	Number: Gear ratio for combination types: 8 types from **5** to **200** **A**: Round Shaft Type
⑥	Blank: Combination Type – Parallel Shaft Gearhead **FR**: Combination Type – Hollow Shaft Flat Gearhead	

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Product Line

Combination Type The combination type comes with the motor and its dedicated gearhead pre-assembled which simplifies installation in equipment. Motors and gearheads are also available separately to facilitate changes or repairs.

Combination Type – Parallel Shaft Gearhead

Output Power	Power Supply Voltage	Model	Gear Ratio
30 W (1/25 HP)	Single-Phase 100-120 VAC	**BLF230A-□**	**5, 10, 15, 20, 30, 50, 100, 200**
	Single-Phase 200-240 VAC	**BLF230C-□**	**5, 10, 15, 20, 30, 50, 100, 200**
	Three-Phase 200-240 VAC	**BLF230S-□**	**5, 10, 15, 20, 30, 50, 100, 200**
60 W (1/12 HP)	Single-Phase 100-120 VAC	**BLF460A-□**	**5, 10, 15, 20, 30, 50, 100, 200**
	Single-Phase 200-240 VAC	**BLF460C-□**	**5, 10, 15, 20, 30, 50, 100, 200**
	Three-Phase 200-240 VAC	**BLF460S-□**	**5, 10, 15, 20, 30, 50, 100, 200**
120 W (1/6 HP)	Single-Phase 100-120 VAC	**BLF5120A-□**	**5, 10, 15, 20, 30, 50, 100, 200**
	Single-Phase 200-240 VAC	**BLF5120C-□**	**5, 10, 15, 20, 30, 50, 100, 200**
	Three-Phase 200-240 VAC	**BLF5120S-□**	**5, 10, 15, 20, 30, 50, 100, 200**
200 W (1/4 HP)	Single-Phase 100-120 VAC	**BLF6200A-□**	**5, 10, 15, 20, 30, 50, 100, 200**
	Single-Phase 200-240 VAC	**BLF6200C-□**	**5, 10, 15, 20, 30, 50, 100, 200**
	Three-Phase 200-240 VAC	**BLF6200S-□**	**5, 10, 15, 20, 30, 50, 100, 200**
400 W (1/2 HP)	Three-Phase 200-240 VAC	**BLF6400S-□**	**5, 10, 15, 20, 30, 50, 100, 200**

The following items are included in each product.
Motor, Driver, Gearhead, Mounting Screws, Parallel Key, Operating Manual

Combination Type – Hollow Shaft Flat Gearhead

Output Power	Power Supply Voltage	Model	Gear Ratio
30 W (1/25 HP)	Single-Phase 100-120 VAC	**BLF230A-□FR**	**5, 10, 15, 20, 30, 50, 100, 200**
	Single-Phase 200-240 VAC	**BLF230C-□FR**	**5, 10, 15, 20, 30, 50, 100, 200**
	Three-Phase 200-240 VAC	**BLF230S-□FR**	**5, 10, 15, 20, 30, 50, 100, 200**
60 W (1/12 HP)	Single-Phase 100-120 VAC	**BLF460A-□FR**	**5, 10, 15, 20, 30, 50, 100, 200**
	Single-Phase 200-240 VAC	**BLF460C-□FR**	**5, 10, 15, 20, 30, 50, 100, 200**
	Three-Phase 200-240 VAC	**BLF460S-□FR**	**5, 10, 15, 20, 30, 50, 100, 200**
120 W (1/6 HP)	Single-Phase 100-120 VAC	**BLF5120A-□FR**	**5, 10, 15, 20, 30, 50, 100, 200**
	Single-Phase 200-240 VAC	**BLF5120C-□FR**	**5, 10, 15, 20, 30, 50, 100, 200**
	Three-Phase 200-240 VAC	**BLF5120S-□FR**	**5, 10, 15, 20, 30, 50, 100, 200**
200 W (1/4 HP)	Single-Phase 100-120 VAC	**BLF6200A-□FR**	**10, 15, 20, 30, 50, 100**
	Single-Phase 200-240 VAC	**BLF6200C-□FR**	**10, 15, 20, 30, 50, 100**
	Three-Phase 200-240 VAC	**BLF6200S-□FR**	**10, 15, 20, 30, 50, 100**
400 W (1/2 HP)	Three-Phase 200-240 VAC	**BLF6400S-□FR**	**5, 10, 15, 20, 30, 50, 100**

The following items are included in each product.
Motor, Driver, Gearhead, Mounting Screws, Parallel Key, Safety Cover (with screws), Operating Manual

Round Shaft Type

Output Power	Power Supply Voltage	Model
30 W (1/25 HP)	Single-Phase 100-120 VAC	**BLF230A-A**
	Single-Phase 200-240 VAC	**BLF230C-A**
	Three-Phase 200-240 VAC	**BLF230S-A**
60 W (1/12 HP)	Single-Phase 100-120 VAC	**BLF460A-A**
	Single-Phase 200-240 VAC	**BLF460C-A**
	Three-Phase 200-240 VAC	**BLF460S-A**
120 W (1/6 HP)	Single-Phase 100-120 VAC	**BLF5120A-A**
	Single-Phase 200-240 VAC	**BLF5120C-A**
	Three-Phase 200-240 VAC	**BLF5120S-A**
200 W (1/4 HP)	Single-Phase 100-120 VAC	**BLF6200A-A**
	Single-Phase 200-240 VAC	**BLF6200C-A**
	Three-Phase 200-240 VAC	**BLF6200S-A**
400 W (1/2 HP)	Three-Phase 200-240 VAC	**BLF6400S-A**

The following items are included in each product.
Motor, Driver, Operating Manual

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

Connection Cables (Sold separately)

◇Cable Set

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

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, between the connection of the motor and driver. Be sure to purchase the connection cable set as it is sold separately.

Specifications

●30 W (1/25 HP) RoHS

Motor: c UL us CE / Driver: c UL us CE

Model			BLF230A-□	BLF230C-□	BLF230S-□
	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	VAC	Single-Phase 100-120	Single-Phase 200-240	Three-Phase 200-240
	Permissible Voltage Range		±10%		
	Rated Frequency	Hz	50/60		
	Permissible Frequency Range		±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)		
Rated Speed		r/min	3000		
Speed Control Range		r/min	80～4000		
Round Shaft Type Permissible Load Inertia J		$\times10^{-4}$ kg·m^2 (oz-in^2)	1.8 (9.8)		
Rotor Inertia J		$\times10^{-4}$ kg·m^2 (oz-in^2)	0.087 (0.48)		
Speed Regulation* (When digital operator is used)	Load		±0.2% max. (0～Rated torque, at rated speed, at rated voltage, at normal ambient temperature)		
	Voltage		±0.2% max. (Rated voltage ±10%, at rated speed, with no load, at normal ambient temperature)		
	Temperature		±0.2% max. [0～+50°C (+32～+122°F), at rated speed, with no load, at rated voltage]		

●60 W (1/12 HP) RoHS

Motor: c UL us CE / Driver: c UL us CE

Model			BLF460A-□	BLF460C-□	BLF460S-□
	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	VAC	Single-Phase 100-120	Single-Phase 200-240	Three-Phase 200-240
	Permissible Voltage Range		±10%		
	Rated Frequency	Hz	50/60		
	Permissible Frequency Range		±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)		
Starting Torque		N·m (oz-in)	0.4 (56)		
Rated Speed		r/min	3000		
Speed Control Range		r/min	80～4000		
Round Shaft Type Permissible Load Inertia J		$\times10^{-4}$ kg·m^2 (oz-in^2)	3.75 (21)		
Rotor Inertia J		$\times10^{-4}$ kg·m^2 (oz-in^2)	0.24 (1.31)		
Speed Regulation* (When digital operator is used)	Load		±0.2% max. (0～Rated torque, at rated speed, at rated voltage, at normal ambient temperature)		
	Voltage		±0.2% max. (Rated voltage ±10%, at rated speed, with no load, at normal ambient temperature)		
	Temperature		±0.2% max. [0～+50°C (+32～+122°F), at rated speed, with no load, at rated voltage]		

●120 W (1/6 HP) RoHS

Motor: c UL us CE / Driver: c UL us CE

Model			BLF5120A-□	BLF5120C-□	BLF5120S-□
	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	VAC	Single-Phase 100-120	Single-Phase 200-240	Three-Phase 200-240
	Permissible Voltage Range		±10%		
	Rated Frequency	Hz	50/60		
	Permissible Frequency Range		±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)		
Starting Torque		N·m (oz-in)	0.8 (113)		
Rated Speed		r/min	3000		
Speed Control Range		r/min	80～4000		
Round Shaft Type Permissible Load Inertia J		$\times10^{-4}$ kg·m^2 (oz-in^2)	5.6 (31)		
Rotor Inertia J		$\times10^{-4}$ kg·m^2 (oz-in^2)	0.61 (3.3)		
Speed Regulation* (When digital operator is used)	Load		±0.2% max. (0～Rated torque, at rated speed, at rated voltage, at normal ambient temperature)		
	Voltage		±0.2% max. (Rated voltage ±10%, at rated speed, with no load, at normal ambient temperature)		
	Temperature		±0.2% max. [0～+50°C (+32～+122°F), at rated speed, with no load, at rated voltage]		

✻Speed regulation values vary depending on the speed setting method.
Settings from internal speed potentiometer, external speed potentiometer, external DC voltage; Load: ±0.5% max., Voltage: ±0.5% max., Temperature: ±0.5% max.

● The values for each specification apply to the motor only.

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

● 200 W (1/4 HP), 400 W (1/2 HP) RoHS

Motor: c UL us CE / Driver: c UL us LISTED CE

Model			BLF6200A-□	BLF6200C-□	BLF6200S-□	BLF6400S-□
	Combination Type – Parallel Shaft Gearhead		BLF6200A-□FR	BLF6200C-□FR	BLF6200S-□FR	BLF6400S-□FR
	Round Shaft Type		BLF6200A-A	BLF6200C-A	BLF6200S-A	BLF6400S-A
Rated Output Power (Continuous)		W (HP)	200 (1/4)			400 (1/2)
Power Source	Rated Voltage	VAC	Single-Phase 100-120	Single-Phase 200-240	Three-Phase 200-240	Three-Phase 200-240
	Permissible Voltage Range		±10%			
	Rated Frequency	Hz	50/60			
	Permissible Frequency Range		±5%			
	Rated Input Current	A	4.7	2.8	1.7	2.8
	Maximum Input Current	A	8.8	5.1	3.4	5.6
Rated Torque		N·m (oz-in)	0.65 (92)			1.3 (184)
Starting Torque		N·m (oz-in)	1.15 (163)			1.8 (250)
Rated Speed		r/min	3000			
Speed Control Range		r/min	80～4000			
Round Shaft Type Permissible Load Inertia J		$\times 10^{-4}$ kg·m² (oz-in²)	8.75 (48)			15 (82)
Rotor Inertia J		$\times 10^{-4}$ kg·m² (oz-in²)	0.61 (3.3)			0.66 (3.6)
Speed Regulation* (When digital operator is used)	Load		±0.2% max. (0～Rated torque, at rated speed, at rated voltage, at normal ambient temperature)			
	Voltage		±0.2% max. (Rated voltage ±10%, at rated speed, with no load, at normal ambient temperature)			
	Temperature		±0.2% max. [0～+50℃ (+32～+122℉), at rated speed, with no load, at rated voltage]			

*Speed regulation values vary depending on the speed setting method.
Settings from internal speed potentiometer, external speed potentiometer, external DC voltage; Load: ±0.5% max., Voltage: ±0.5% max., Temperature: ±0.5% max.

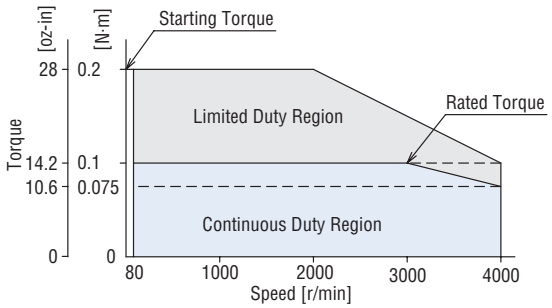
● The values for each specification apply to the motor only.

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

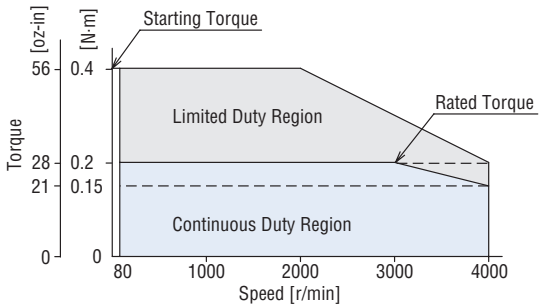
Speed – Torque Characteristics

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 five seconds, overload protection is activated and the motor coasts to a stop.

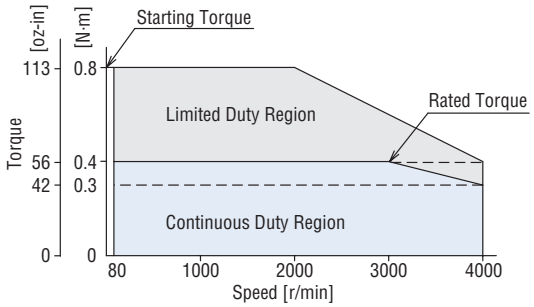
BLF230□-□/BLF230□-□FR/BLF230□-A



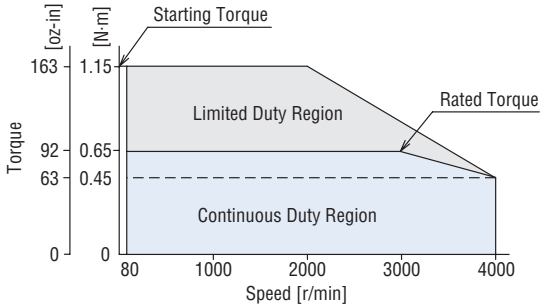
BLF460□-□/BLF460□-□FR/BLF460□-A



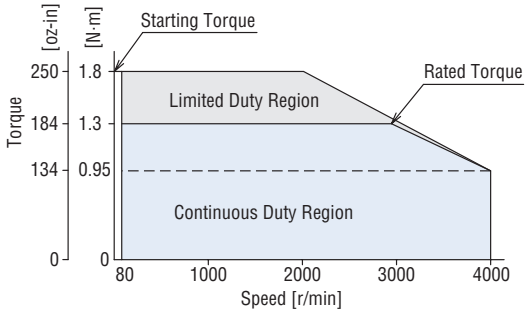
BLF5120□-□/BLF5120□-□FR/BLF5120□-A



BLF6200□-□/BLF6200□-□FR/BLF6200□-A



BLF6400S-□/BLF6400S-□FR/BLF6400S-A



● The characteristics shown above are applicable for the motors only.

● Enter the power supply voltage (**A**, **C** or **S**) in the box (■) within the model name.
Enter the gear ratio in the box (□) within the model name.

Common Specifications

Item	Specifications
Speed Setting Methods	Select one of the following methods: · Set using the internal speed potentiometer · Set using the digital operator: Up to eight speeds · Set using an accessory external speed potentiometer: **PAVR-20KZ** (20 kΩ, 1/4 W) (sold separately) · Set using external DC voltage: 0～5 VDC or 0～10 VDC
Acceleration/Deceleration Time (At 3000 r/min)	0.2～15 sec. (factory setting: 0.5 sec.) Up to eight speeds using the digital operator
Input Signals (In the remote mode)	Photocoupler input Input resistance 3.3 kΩ Internal power supply voltage: 14 VDC±10% Connectable external voltage: 24 VDC±10% (only for source logic) Sink input (factory setting), Source input/2-wire input mode (factory setting), or 3-wire input mode CW [START/STOP] input, CCW [RUN/BRAKE] input, STOP-MODE [CW/CCW] input, Speed data select, Alarm reset input, External error input Names in [ ] apply in the 3-wire input mode.
Output Signals	Open-collector output 4.5～26.4 VDC, 10 mA max. (5～10 mA for Speed output) Speed output (30 pulses/rotation), Alarm output1, Alarm output2
Protective Functions*	When the following are activated, the "Alarm" signal will be output and the motor will coast to a stop. (The motor will stop instantaneously when an external error is input.) · Overload protection: Activated when the motor load exceeds rated torque for a minimum of 5 seconds. · Overvoltage protection: Activated when the voltage applied to the driver exceeds 120 VAC or 240 VAC by a minimum of 20%, a gravitational operation is performed or a load exceeding the permissible load inertia is driven. · Undervoltage protection: Activated when the voltage applied to the driver falls below 100 VAC or 200 VAC by a minimum of 40%. · Motor sensor error: Activated when an error is detected in the signals received from the motor due to improper connection or disconnection of the signal cable, etc. · Overspeed protection: Activated when the speed of the motor shaft exceeds 4800 r/min. · Overcurrent protection: Activated when an excessive current flows through the driver due to a ground fault, etc. · CPU error, EEPROM error, External error, Operation error
Maximum Cable Extension Distance	Motor/Driver Distance: 20.4 m (66.9 ft.) (when a dedicated connection cable is used)
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 permissible load inertia is driven or a gravitational operation is performed, the overvoltage protective function will be activated and the motor will coast to a stop.

General Specifications

Item		Motor	Driver
Insulation Resistance		100 MΩ or more when 500 VDC megger is applied between the windings and the case after continuous operation under normal ambient temperature and humidity.	100 MΩ or more when 500 VDC megger is applied between the power supply terminal and the protective earth terminal, and between the power supply terminal and the I/O terminal after continuous operation under normal ambient temperature and humidity.
Dielectric Strength		Sufficient to withstand 1.5 kVAC at 50 Hz applied between the windings and the case for 1 minute after continuous operation under normal ambient temperature and humidity.	Sufficient to withstand 1.8 kVAC at 50 Hz applied between the power supply terminal and the protective earth terminal for 1 minute, and 3 kVAC at 50 Hz applied between the power supply terminal and the I/O terminal for 1 minute after continuous operation under normal ambient temperature and humidity.
Temperature Rise		Temperature rise of the windings and the case are 50°C (90°F) or less, and 40°C (72°F) or less*1 respectively measured by the thermocouple method after continuous operation under normal ambient temperature and humidity.	Temperature rise of heat sink is 50°C (90°F) or less measured by the thermocouple method after continuous operation under normal ambient temperature and humidity.
Operating Environment	Ambient Temperature	0～+50°C (+32～+122°F) (non-freezing)	
	Ambient Humidity	85% or less (non-condensing)	
	Altitude	Up to 1000 m (3300 ft.) above sea level	
	Atmosphere	No corrosive gases or dust. Cannot be used in a radioactive area, magnetic field, vacuum or other special environment	
	Vibration	Not subject to continuous vibration or excessive impact In conformance with JIS C 60068-2-6, "Sine-wave vibration test method" Frequency range: 10～55 Hz Pulsating amplitude: 0.15 mm (0.006 in.) Sweep direction: 3 directions (X, Y, Z) Number of sweeps: 20 times	
Storage Condition*2	Ambient Temperature	−25～+70°C (−13～+158°F) (non-freezing)	
	Ambient Humidity	85% or less (non-condensing)	
	Altitude	Up to 3000 m (10000 ft.) above sea level	
Thermal Class		UL/CSA standards: 105 (A), EN standards: 120 (E)	–
Degree of Protection		IP65 (Excluding the mounting surface of the round shaft type and connectors)	IP20

*1 For round shaft types, please attach to the heat radiation plate (material: aluminum) of the following sizes to maintain a maximum motor case temperature of 90°C (194°F).
BLF230□-A: 115×115 mm (4.53×4.53 in.), 5 mm (0.20 in.) thick **BLF460□-A**: 135×135 mm (5.31×5.31 in.), 5 mm (0.20 in.) thick
BLF5120□-A: 165×165 mm (6.50×6.50 in.), 5 mm (0.20 in.) thick **BLF6200□-A**: 200×200 mm (7.87×7.87 in.), 5 mm (0.20 in.) thick
BLF6400S-A: 250×250 mm (9.84×9.84 in.), 6 mm (0.24 in.) thick
●Enter the power supply voltage (**A**, **C** or **S**) in the box (□) within the model name.
*2 The storage condition applies to a short period such as a period during transportation.

Note
●Do not measure insulation resistance or perform the dielectric strength test while the motor and driver are connected.

Gearmotor – Torque Table of Combination Type

Combination Type – Parallel Shaft Gearhead

Unit = N·m (lb-in)

Model	Gear Ratio	5	10	15	20	30	50	100	200
	Motor Speed [r/min] 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
	4000 r/min	800	400	267	200	133	80	40	20
BLF230■-□	80~3000 r/min	0.45 (3.9)	0.9 (7.9)	1.4 (12.3)	1.8 (15.9)	2.6 (23)	4.3 (38)	6 (53)	6 (53)
	4000 r/min	0.34 (3.0)	0.68 (6.0)	1.0 (8.8)	1.4 (12.3)	1.9 (16.8)	3.2 (28)	5.4 (47)	5.4 (47)
BLF460■-□	80~3000 r/min	0.90 (7.9)	1.8 (15.9)	2.7 (23)	3.6 (31)	5.2 (46)	8.6 (76)	16 (141)	16 (141)
	4000 r/min	0.68 (6.0)	1.4 (12.3)	2 (17.7)	2.7 (23)	3.9 (34)	6.5 (57)	12.9 (114)	14 (123)
BLF5120■-□	80~3000 r/min	1.8 (15.9)	3.6 (31)	5.4 (47)	7.2 (63)	10.3 (91)	17.2 (152)	30 (260)	30 (260)
	4000 r/min	1.4 (12.3)	2.7 (23)	4.1 (36)	5.4 (47)	7.7 (68)	12.9 (114)	25.8 (220)	27 (230)
BLF6200■-□	80~3000 r/min	2.9 (25)	5.9 (52)	8.8 (77)	11.7 (103)	16.8 (148)	28 (240)	52.7 (460)	70 (610)
	4000 r/min	2.0 (17.7)	4.1 (36)	6.1 (53)	8.1 (71)	11.6 (102)	19.4 (171)	36.5 (320)	63 (550)
BLF6400S-□	80~3000 r/min	5.9 (52)	11.7 (103)	17.6 (155)	23.4 (200)	33.5 (290)	55.9 (490)	70 (610)	70 (610)
	4000 r/min	4.3 (38)	8.6 (76)	12.8 (113)	17.1 (151)	24.5 (210)	40.9 (360)	63 (550)	63 (550)

● A colored background ( ) indicates gear shaft rotation in the same direction as the motor shaft, while the others rotate in the opposite direction.

Combination Type – Hollow Shaft Flat Gearhead

Unit = N·m (lb-in)

Model	Gear Ratio	5	10	15	20	30	50	100	200
	Motor Speed [r/min] 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
	4000 r/min	800	400	267	200	133	80	40	20
BLF230■-□FR	80~3000 r/min	0.4 (3.5)	0.85 (7.5)	1.3 (11.5)	1.7 (15.0)	2.6 (23)	4.3 (38)	8.5 (75)	17 (150)
	4000 r/min	0.3 (2.6)	0.64 (5.6)	0.96 (8.4)	1.3 (11.5)	1.9 (16.8)	3.2 (28)	6.4 (56)	12.8 (113)
BLF460■-□FR	80~3000 r/min	0.85 (7.5)	1.7 (15.0)	2.6 (23)	3.4 (30)	5.1 (45)	8.5 (75)	17 (150)	34 (300)
	4000 r/min	0.64 (5.6)	1.3 (11.5)	1.9 (16.8)	2.6 (23)	3.8 (33)	6.4 (56)	12.8 (113)	25.5 (220)
BLF5120■-□FR	80~3000 r/min	1.7 (15.0)	3.4 (30)	5.1 (45)	6.8 (60)	10.2 (90)	17 (150)	34 (300)	68 (600)
	4000 r/min	1.3 (11.5)	2.6 (23)	3.8 (33)	5.1 (45)	7.7 (68)	12.8 (113)	25.5 (220)	51 (450)
BLF6200■-□FR	80~3000 r/min	–	5.5 (48)	8.3 (73)	11.1 (98)	16.6 (146)	27.6 (240)	55.3 (480)	–
	4000 r/min	–	3.8 (33)	5.7 (50)	7.7 (68)	11.5 (101)	19.1 (169)	38.3 (330)	–
BLF6400S-□FR	80~3000 r/min	5.5 (48)	11.1 (98)	16.6 (146)	22.1 (195)	33.2 (290)	55.3 (480)	110 (970)	–
	4000 r/min	4.0 (35)	8.1 (71)	12.1 (107)	16.2 (143)	24.2 (210)	40.4 (350)	80.8 (710)	–

● The flat gearhead rotates in the opposite direction to the motor when viewed from the front of the gearhead. It rotates in the same direction as the motor when viewed from the rear (motor mounting surface) of the gearhead. Rotation direction of the hollow shaft flat gearhead ➜ Page D-243

Permissible Overhung Load and Permissible Thrust Load

Combination Type – Parallel Shaft Gearhead

Model	Gear Ratio		Permissible Overhung Load: 10 mm (0.39 in.) from shaft end N	10 mm (0.39 in.) from shaft end lb.	20 mm (0.79 in.) from shaft end N	20 mm (0.79 in.) from shaft end lb.	Permissible Thrust Load N	Permissible Thrust Load 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		
BLF6200■-□ **BLF6400S-□**	**5, 10, 15, 20**	80~3000 r/min	550	123	800	180	200	45
		4000 r/min	500	112	700	157		
	30, 50	80~3000 r/min	1000	220	1250	280	300	67
		4000 r/min	900	200	1100	240		
	100, 200	80~3000 r/min	1400	310	1700	380	400	90
		4000 r/min	1200	270	1400	310		

● Enter the power supply 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 gearhead		20 mm (0.79 in.) from mounting surface of 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		
BLF6200□-□FR **BLF6400S-□FR**	**5***, **10**	80～3000 r/min	1230	270	1070	240	800	180
		4000 r/min	1130	250	990	220		
	15, **20**	80～3000 r/min	1680	370	1470	330		
		4000 r/min	1550	340	1360	300		
	30, **50**, **100**	80～3000 r/min	2040	450	1780	400		
		4000 r/min	1900	420	1660	370		

∗Only the **BLF6400S-□FR** is supported.

●The permissible overhung load can also be calculated with a formula. Permissible overhung load calculation ➜ Page D-242

●Round Shaft Type

Model	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.	
BLF230□-A	80	18	100	22	The permissible thrust load should not be greater than half the motor mass.
BLF460□-A	110	24	130	29	
BLF5120□-A	150	33	170	38	
BLF6200□-A **BLF6400S-A**	197	44	221	49	

●Enter the power supply voltage (**A**, **C** or **S**) in the box (□) within the model name.
Enter the gear ratio in the box (□) within the model name.

Permissible Load Inertia J of Combination Type

Combination Type – Parallel Shaft Gearhead

Unit = $\times 10^{-4}$ kg·m^2 (oz-in^2)

Model	Gear Ratio	5	10	15	20	30	50	100	200
BLF230■**-**□		12 (66)	50 (270)	110 (600)	200 (1090)	370 (2000)	920 (5000)	2500 (13700)	5000 (27000)
	When instantaneous stop or instantaneous bi-directional operation is performed	1.55 (8.5)	6.2 (34)	14.0 (77)	24.8 (136)	55.8 (310)	155 (850)	155 (850)	155 (850)
BLF460■**-**□		22 (120)	95 (520)	220 (1200)	350 (1910)	800 (4400)	2200 (12000)	6200 (34000)	12000 (66000)
	When instantaneous stop or instantaneous bi-directional operation is performed	5.5 (30)	22 (120)	49.5 (270)	88 (480)	198 (1080)	550 (3000)	550 (3000)	550 (3000)
BLF5120■**-**□		45 (250)	190 (1040)	420 (2300)	700 (3800)	1600 (8800)	4500 (25000)	12000 (66000)	25000 (137000)
	When instantaneous stop or instantaneous bi-directional operation is performed	25 (137)	100 (550)	225 (1230)	400 (2200)	900 (4900)	2500 (13700)	2500 (13700)	2500 (13700)
BLF6200■**-**□ **BLF6400S-**□		100 (550)	460 (2500)	1000 (5500)	1700 (9300)	3900 (21000)	9300 (51000)	18000 (98000)	37000 (200000)
	When instantaneous stop or instantaneous bi-directional operation is performe	37.5 (210)	150 (820)	338 (1850)	600 (3300)	1350 (7400)	3750 (21000)	3750 (21000)	3750 (21000)

Combination Type – Hollow Shaft Flat Gearhead

Unit = $\times 10^{-4}$ kg·m^2 (oz-in^2)

Model	Gear Ratio	5	10	15	20	30	50	100	200
BLF230■**-**□**FR**		12 (66)	50 (270)	110 (600)	200 (1090)	370 (2000)	920 (5000)	2500 (13700)	5000 (27000)
	When instantaneous stop or instantaneous bi-directional operation is performed	1.55 (8.5)	6.2 (34)	14.0 (77)	24.8 (136)	55.8 (310)	155 (850)	155 (850)	155 (850)
BLF460■**-**□**FR**		22 (120)	95 (520)	220 (1200)	350 (1910)	800 (4400)	2200 (12000)	6200 (34000)	12000 (66000)
	When instantaneous stop or instantaneous bi-directional operation is performed	5.5 (30)	22 (120)	49.5 (270)	88 (480)	198 (1080)	550 (3000)	550 (3000)	550 (3000)
BLF5120■**-**□**FR**		45 (250)	190 (1040)	420 (2300)	700 (3800)	1600 (8800)	4500 (25000)	12000 (66000)	25000 (137000)
	When instantaneous stop or instantaneous bi-directional operation is performed	25 (137)	100 (550)	225 (1230)	400 (2200)	900 (4900)	2500 (13700)	2500 (13700)	2500 (13700)
BLF6200■**-**□**FR**		–	460 (2500)	1000 (5500)	1700 (9300)	3900 (21000)	9300 (51000)	18000 (98000)	–
	When instantaneous stop or instantaneous bi-directional operation is performe	–	150 (820)	338 (1850)	600 (3300)	1350 (7400)	3750 (21000)	3750 (21000)	–
BLF6400S-□**FR**		100 (550)	460 (2500)	1000 (5500)	1700 (9300)	3900 (21000)	9300 (51000)	18000 (98000)	–
	When instantaneous stop or instantaneous bi-directional operation is performe	37.5 (210)	150 (820)	338 (1850)	600 (3300)	1350 (7400)	3750 (21000)	3750 (21000)	–

● Enter the power supply voltage (**A**, **C** or **S**) in the box (■) within the model name.
Enter the gear ratio in the box (□) within the model name.

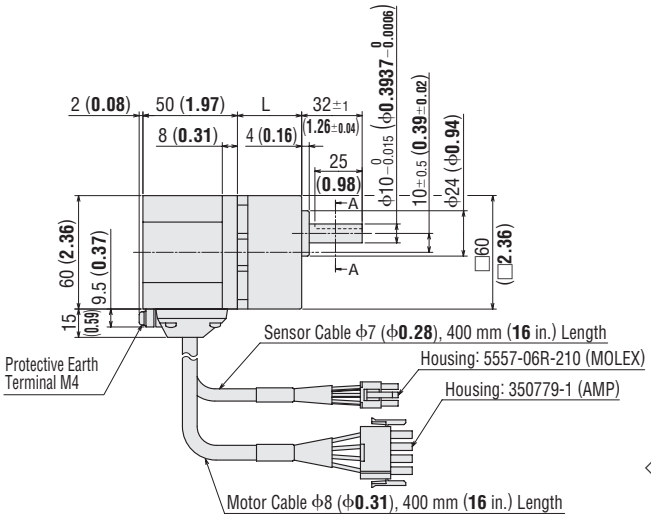
Dimensions Unit = mm (in.)

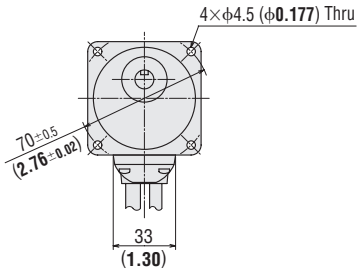
● Mounting screws are included with the combination type. Dimensions for mounting screws ➜ Page D-242

●30 W (1/25 HP)

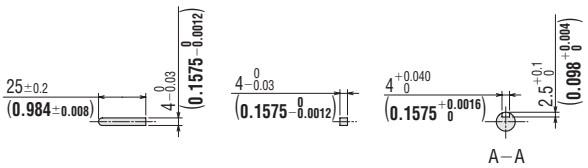
◇Motor/Parallel Shaft Gearhead

Model	Motor Model	Gearhead Model	Gear Ratio	L	Mass kg (lb.)	DXF
BLF230A-□ **BLF230C-□** **BLF230S-□**	BLFM230-GFS	GFS2G□	**5**～**20**	34 (1.34)	1.1 (2.4)	A407A
			30～**100**	38 (1.50)		A407B
			200	43 (1.69)		A407C





◇Key and Key Slot (Included)



◇Motor/Hollow Shaft Flat Gearhead

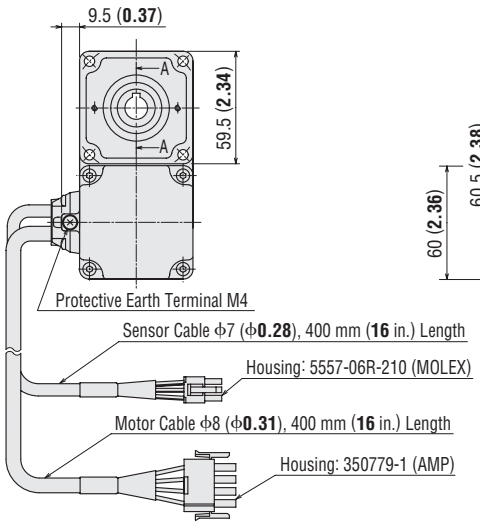
BLF230A-□FR, **BLF230C-□FR**, **BLF230S-□FR**

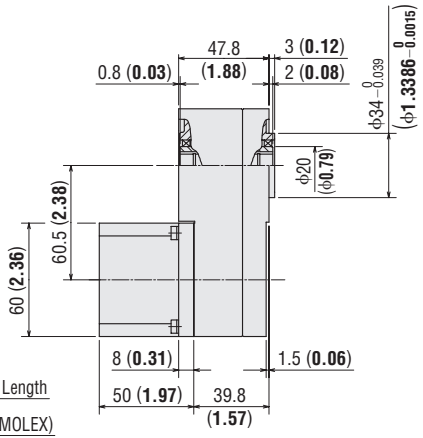
Motor: BLFM230-GFS

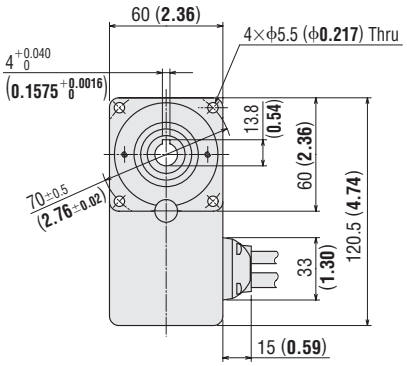
Gearhead: GFS2G□FR

Mass: 1.4 kg (3.1 lb.) (Including gearhead)

DXF A408







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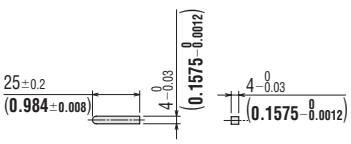
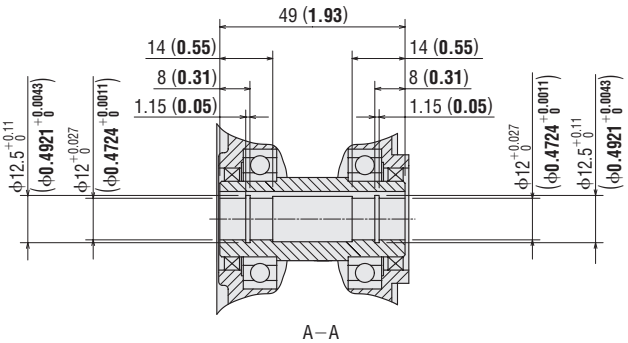




● Enter the gear ratio in the box (□) within the model name.

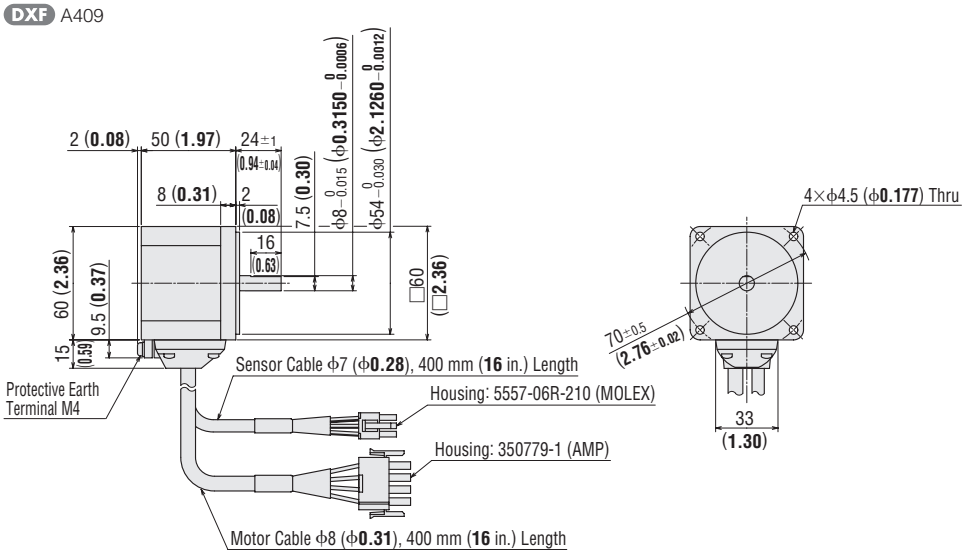
◇Round Shaft Type

BLF230A-A, **BLF230C-A**, **BLF230S-A**

Motor: BLFM230-A

Mass: 0.6 kg (1.32 lb.)

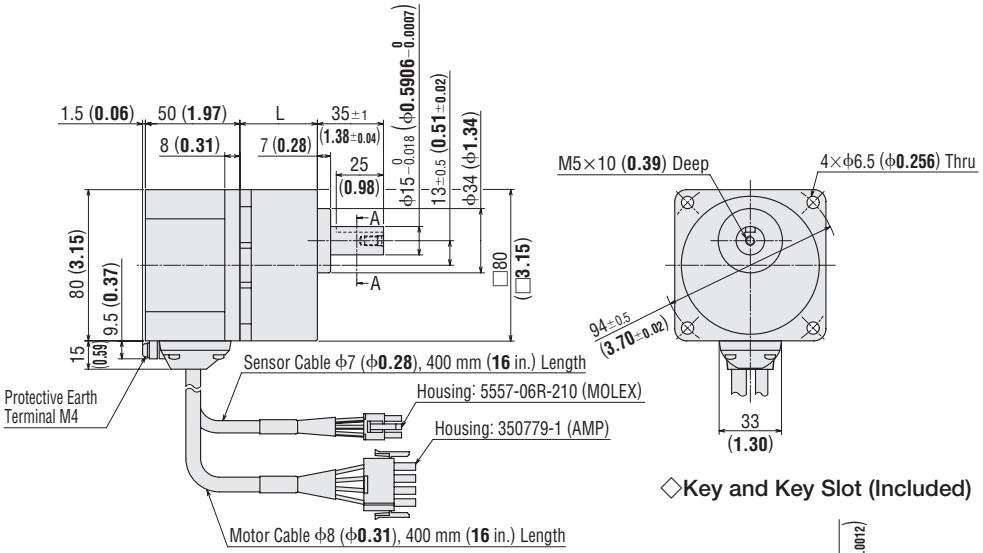
DXF A409



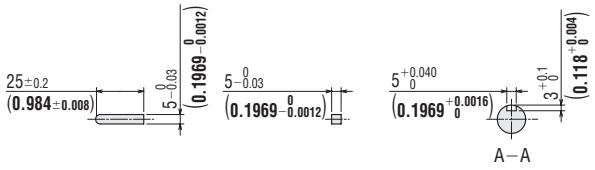
●60 W (1/12 HP)

◇Motor/Parallel Shaft Gearhead

Model	Motor Model	Gearhead Model	Gear Ratio	L	Mass kg (lb.)	DXF
BLF460A-□	BLFM460-GFS	GFS4G□	**5~20**	41 (1.61)	1.9 (4.2)	A410A
BLF460C-□			**30~100**	46 (1.81)		A410B
BLF460S-□			**200**	51 (2.01)		A410C



◇Key and Key Slot (Included)



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

◇Motor/Hollow Shaft Flat Gearhead

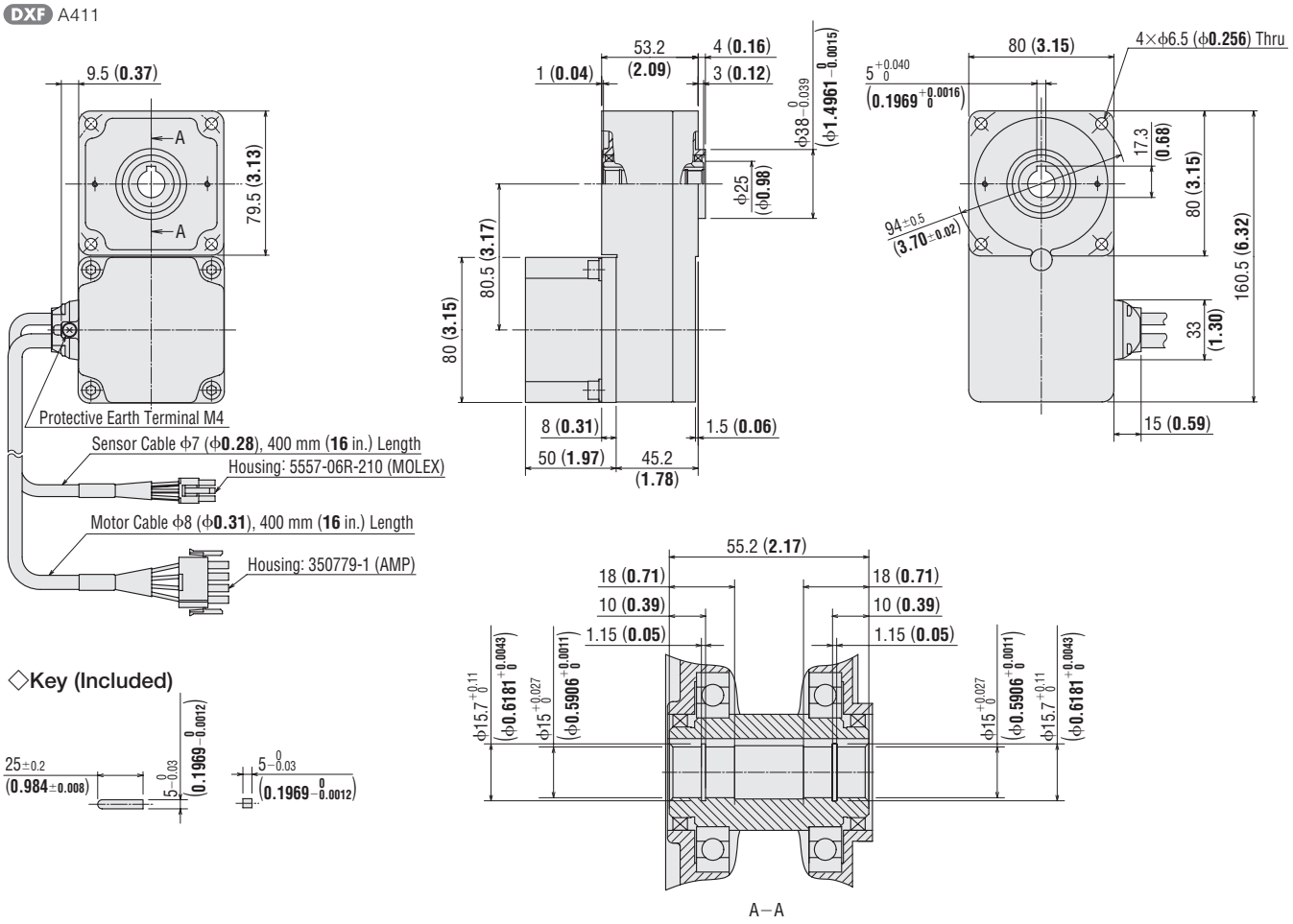
BLF460A-□FR, **BLF460C-□FR**, **BLF460S-□FR**

Motor: BLFM460-GFS

Gearhead: GFS4G□FR

Mass: 2.5 kg (5.5 lb.) (Including gearhead)

DXF A411



◇Key (Included)

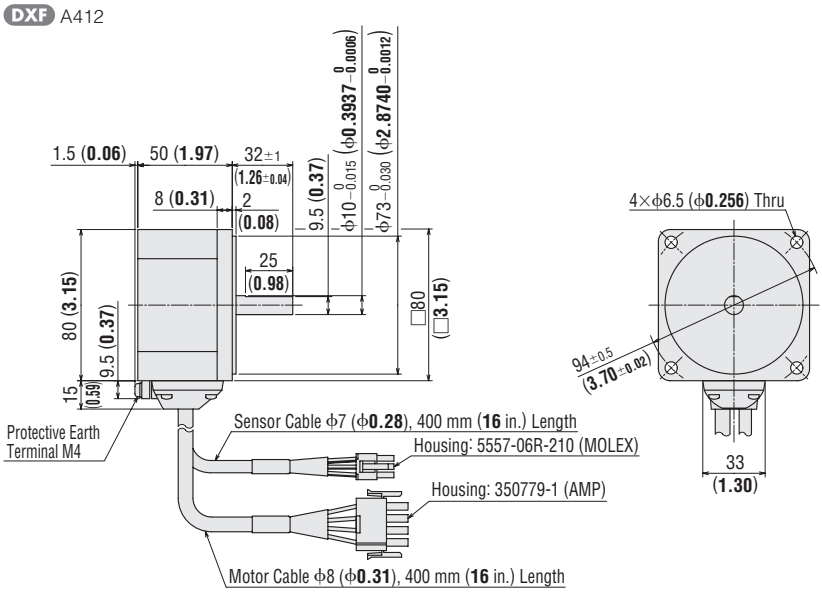
◇Round Shaft Type

BLF460A-A, **BLF460C-A**, **BLF460S-A**

Motor: BLFM460-A

Mass: 0.9 kg (2.0 lb.)

DXF A412

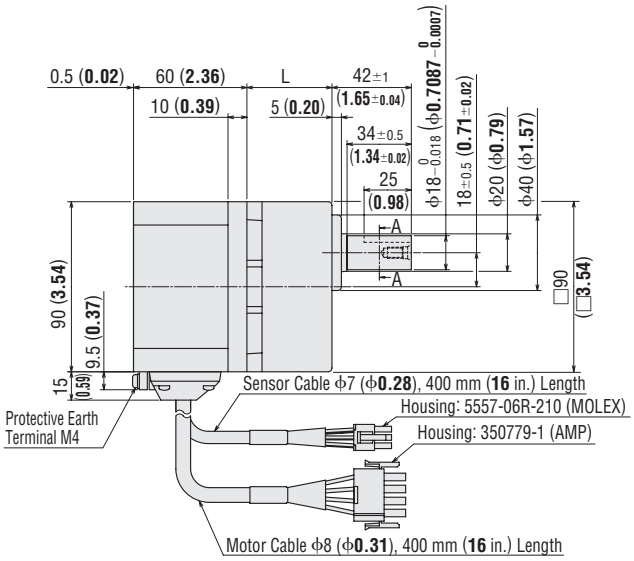


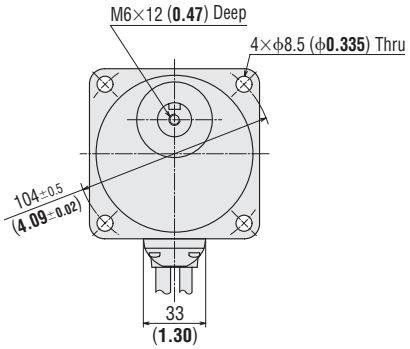
● Enter the gear ratio in the box (□) within the model name.

●120 W (1/6 HP)

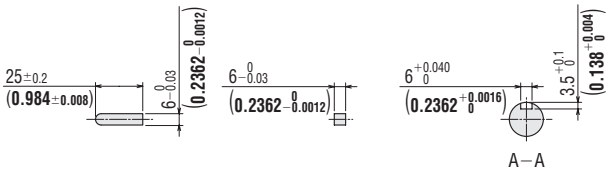
◇Motor/Parallel Shaft Gearhead

Model	Motor Model	Gearhead Model	Gear Ratio	L	Mass kg (lb.)	DXF
BLF5120A-□	BLFM5120-GFS	GFS5G□	**5～20**	45 (1.77)	3.0 (6.6)	A413A
BLF5120C-□			**30～100**	58 (2.28)		A413B
BLF5120S-□			**200**	64 (2.52)		A413C





◇Key and Key Slot (Included)



◇Motor/Hollow Shaft Flat Gearhead

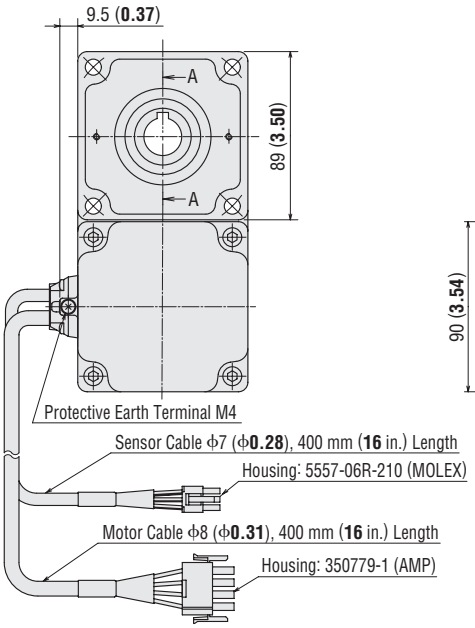
BLF5120A-□FR, **BLF5120C-□FR**, **BLF5120S-□FR**

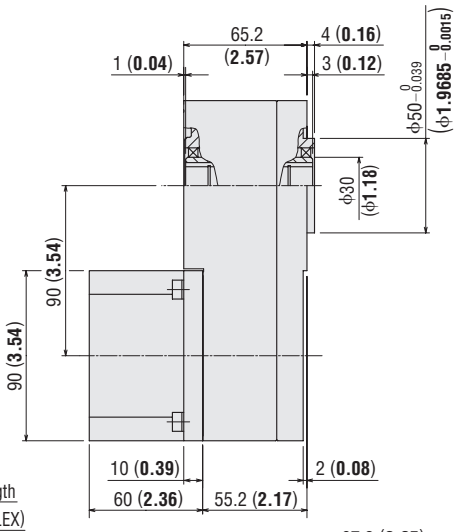
Motor: BLFM5120-GFS

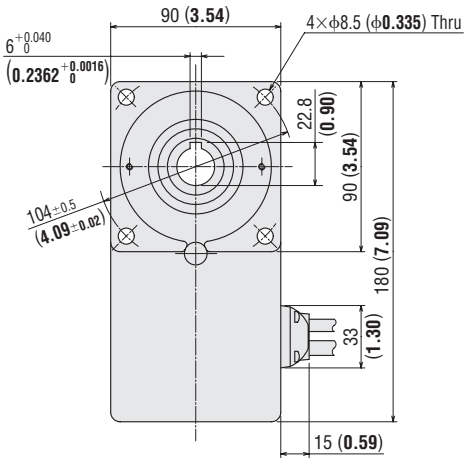
Gearhead: GFS5G□FR

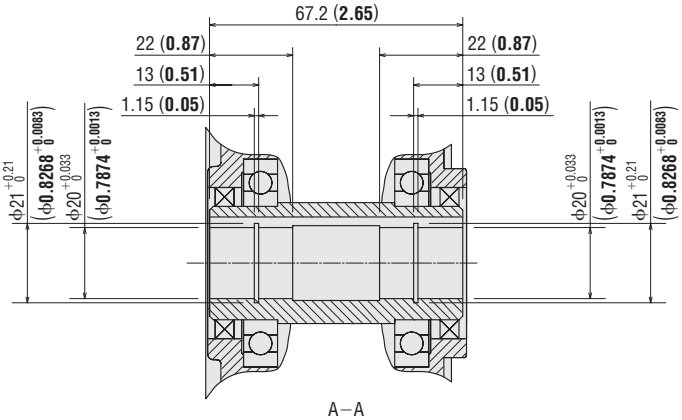
Mass: 3.7 kg (8.1 lb.) (Including gearhead)

DXF A414

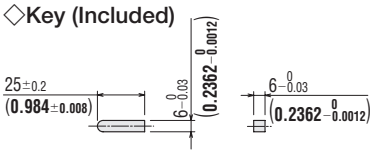








◇Key (Included)



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

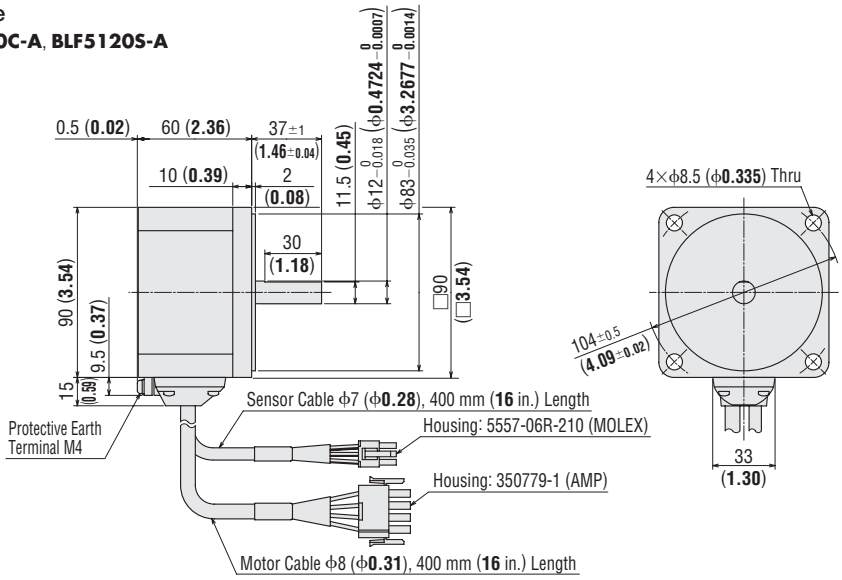
◇Round Shaft Type

BLF5120A-A, **BLF5120C-A**, **BLF5120S-A**

Motor: BLFM5120-A

Mass: 1.5 kg (3.3 lb.)

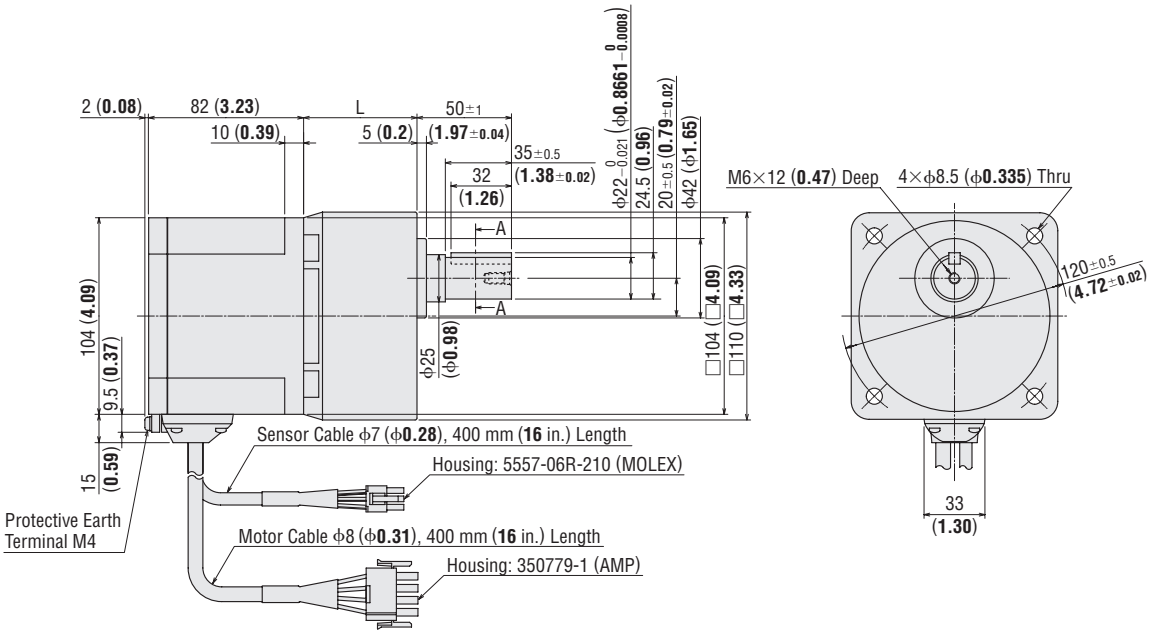
DXF A415



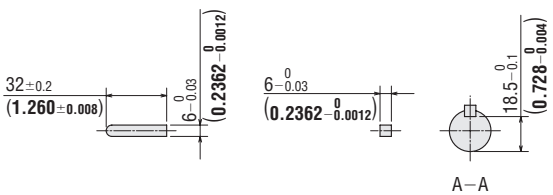
●200 W (1/4 HP), 400 W (1/2 HP)

◇Motor/Parallel Shaft Gearhead

Model	Motor Model	Gearhead Model	Gear Ratio	L	Mass kg (lb.)	DXF
BLF6200A-□	BLFM6200-GFS	GFS6G□	**5**~**20**	60 (2.36)	5.4 (11.9)	A652A
BLF6200C-□	BLFM6200-GFS		**30**, **50**	72 (2.83)		A652B
BLF6200S-□	BLFM6200-GFS					
BLF6400S-□	BLFM6400-GFS		**100**, **200**	86 (3.39)		A652C



◇Key and Key Slot (Included)

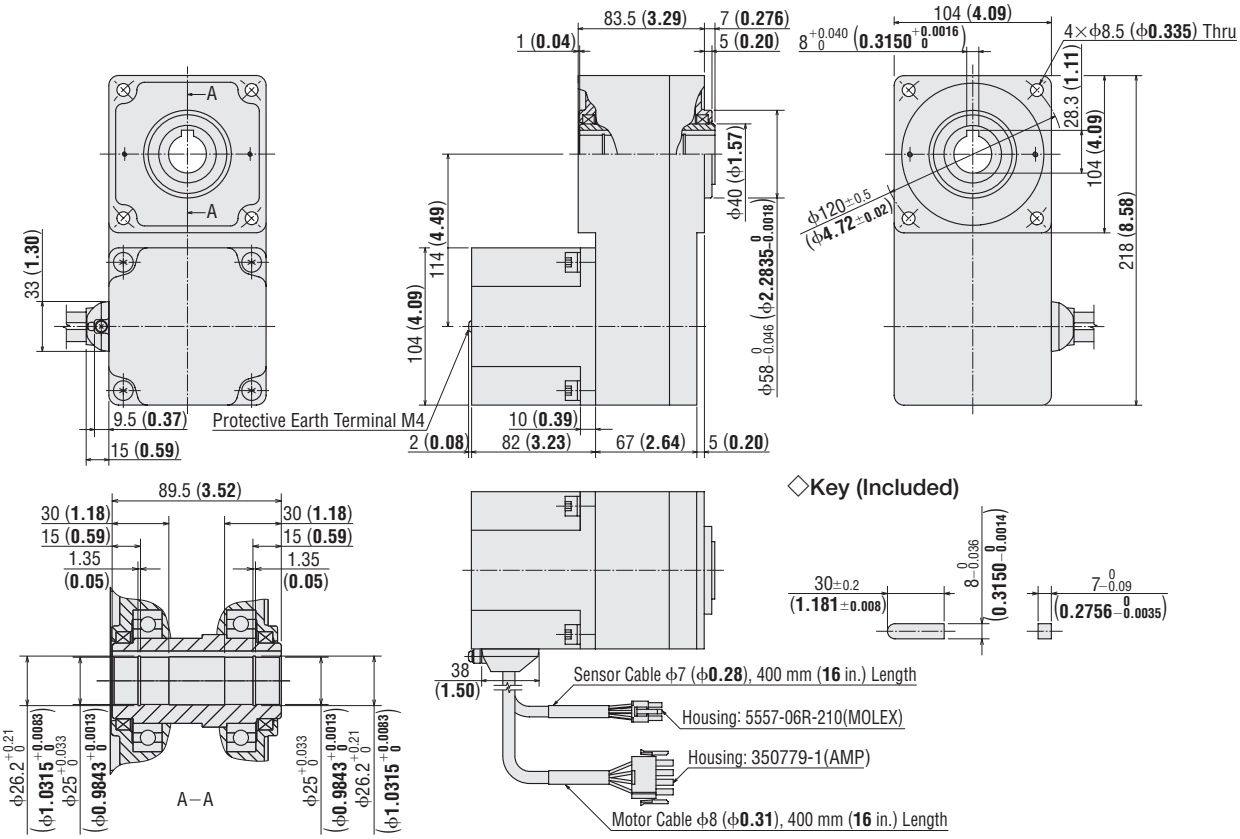


● At the time of shipment, a key is inserted on the gearhead's shaft.

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

◇Motor/Hollow Shaft Flat Gearhead

Model	Motor Model	Gearhead Model	Mass kg (lb.)	DXF
BLF6200A-□FR **BLF6200C-□FR** **BLF6200S-□FR**	BLFM6200-GFS	GFS6G□FR	7.2 (15.8)	A1146
BLF6400S-□FR	BLFM6400-GFS			



◇Key (Included)

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

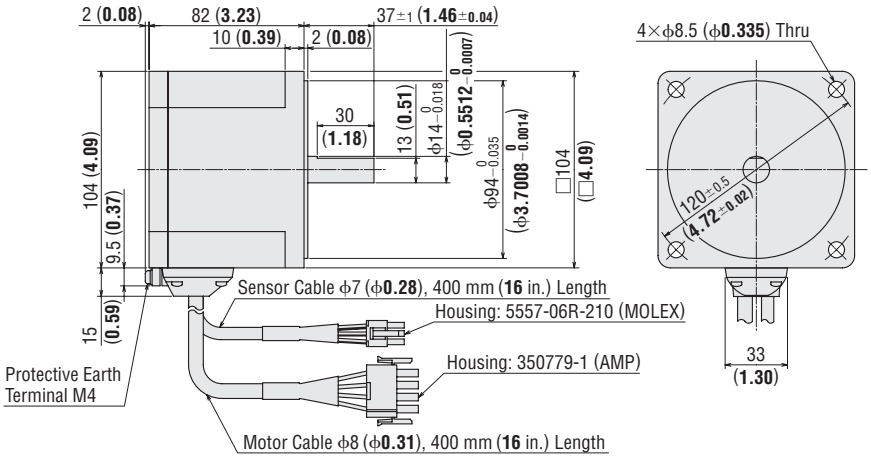
◇Round Shaft Type

BLF6200A-A, **BLF6200C-A**, **BLF6200S-A**, **BLF6400S-A**

Motor: BLFM6200-A, BLFM6400-A

Mass: 2.4 kg (5.3 lb.)

DXF A653

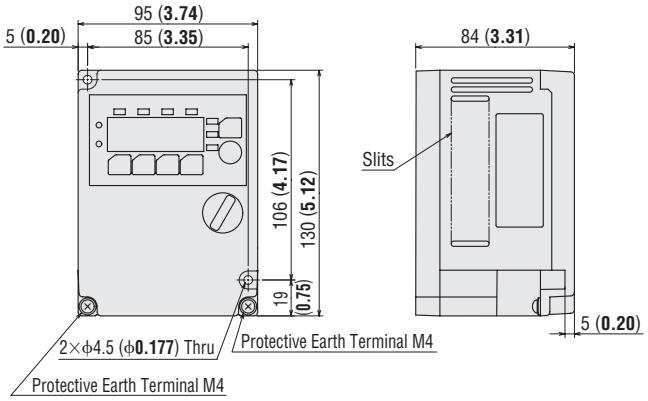


◇Driver

BLFD30A2, BLFD30C2, BLFD30S2
BLFD60A2, BLFD60C2, BLFD60S2
BLFD120A2, BLFD120C2, BLFD120S2

Mass: 0.9 kg (2.0 lb.)

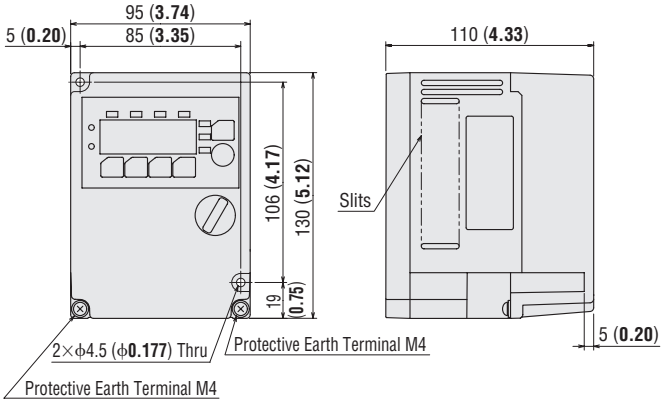
DXF A416



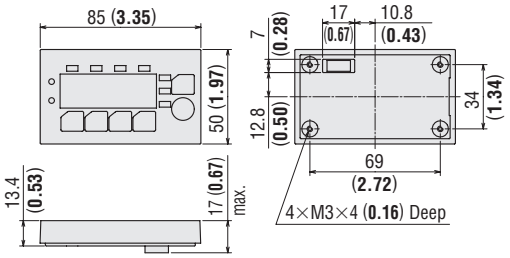
BLFD200A2, BLFD200C2, BLFD200S2,
BLFD400S2

Mass: 1.3 kg (2.9 lb.)

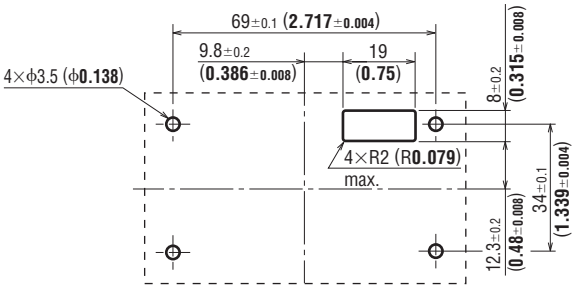
DXF A654



◇Digital Operator
(Detached from the driver)

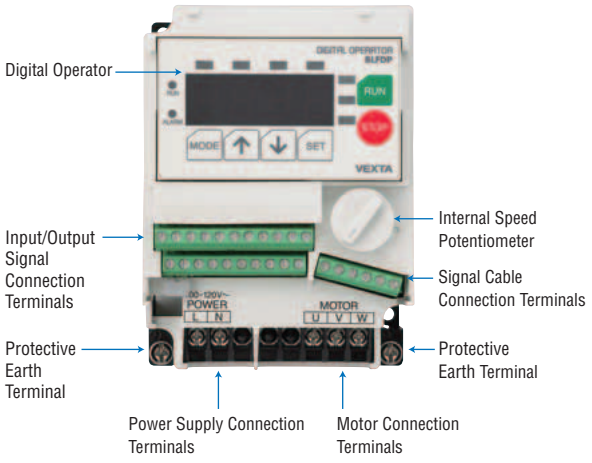


◇Digital Operator Panel Cut-Out

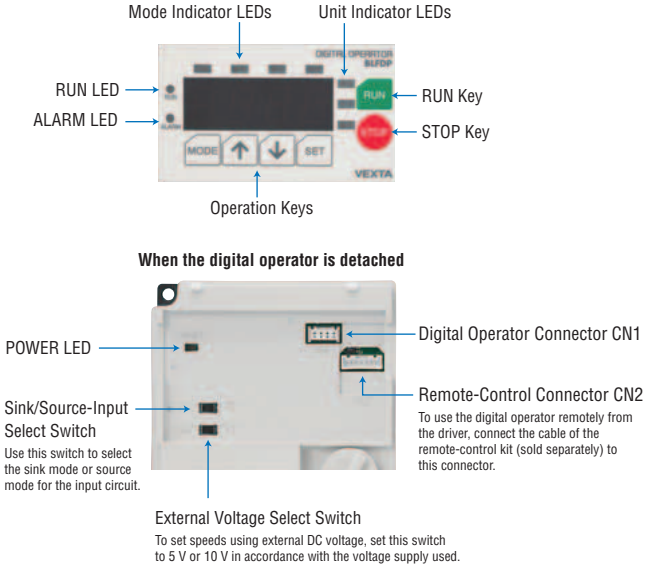


Connection and Operation

Names and Functions of Driver Parts



◇Digital Operator



Input/Output Signals

Terminal Name	Signal	Signal Name	Function
TH	Input	N. C.	Do not connect any signals to this terminal.
TH		N. C.	Do not connect any signals 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 speed potentiometer or external DC voltage.
VM		VM Input	
VL		VL Input	
C3		IN-COM1	Input signal common (0 V)
X0*1		EXT-ERROR Input	External error input (Normally closed)
C0		IN-COM0	Input signal common
C1		IN-COM0	Input signal common
X1*2		2-Wire Mode: CW Input	Clockwise rotation/stop switch input signal
		3-Wire Mode: START/STOP Input	Start/stop input signal
X2*2		2-Wire Mode: CCW Input	Counterclockwise rotation/stop switch input signal
		3-Wire Mode: RUN/BRAKE Input	Run/instantaneous stop input signal
X3*2		2-Wire Mode: STOP-MODE Input	This signal is input to select the motor stop action.
		3-Wire Mode: CW/CCW Input	Clockwise/counterclockwise direction input signal
X4		N. C.	Do not connect any signals 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 protective function or overload warning function. (Normally closed)
Y0		SPEED-OUT Output	30 pulses are output per each rotation of the motor output shaft.
C2		OUT-COM	Output signal common

*1 Do not remove the short circuit 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.

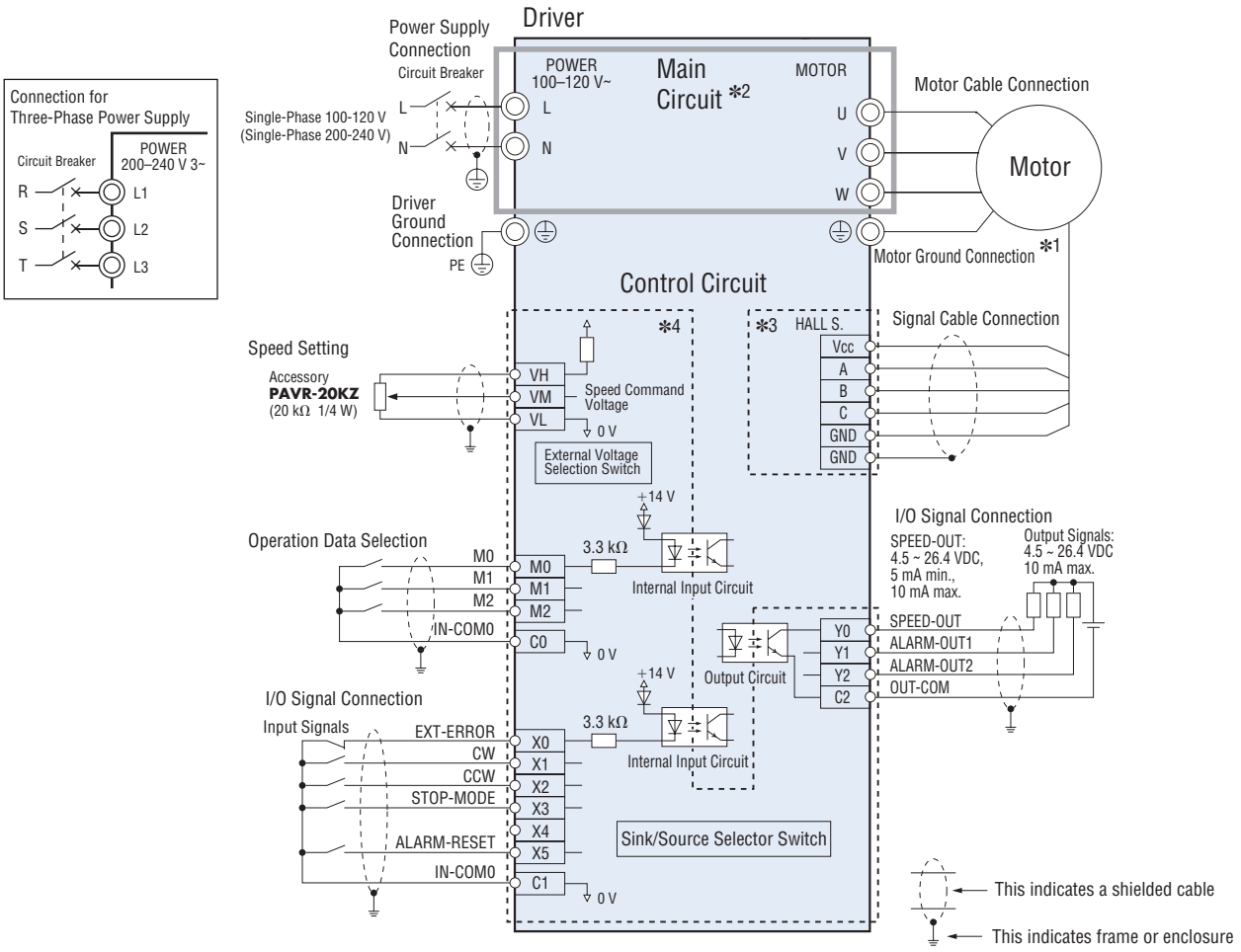
Digital Operator Indicator

Display		Function	Description
RUN		Running	A green LED stays lit while the motor is running.
ALARM		Alarm	A red LED 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 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 approximately 20% may generate when the motor is operated at the rated speed under the rated load.

●Connection Diagram

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 position.



*1 The grounding method will vary depending on the length of the connection cable.
When the connection cable is 7 m (23.0 ft.) or shorter: Connect the protective earth terminal on the connection cable to the protective earth terminal on the driver.
When the connection cable is 10 m (32.8 ft.) or longer: Connect the protective earth terminal of the motor directly to the grounding point.

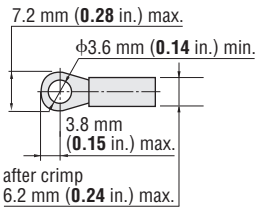
*2 The main circuit is insulated to prevent electrical shock resulting from accidental contact by a hand, etc.

*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 earth terminal.

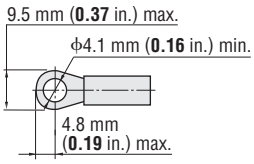
*4 The I/O signal connection terminals comprise a SELV circuit, which is insulated from dangerous voltages by means of double insulation or reinforced insulation.

◇Applicable Crimp Terminals

· Power Supply Connection Terminals (M3.5): Round Terminal with Insulation

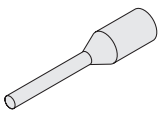


· Protective Earth Terminals (M4): Round Terminal with Insulation



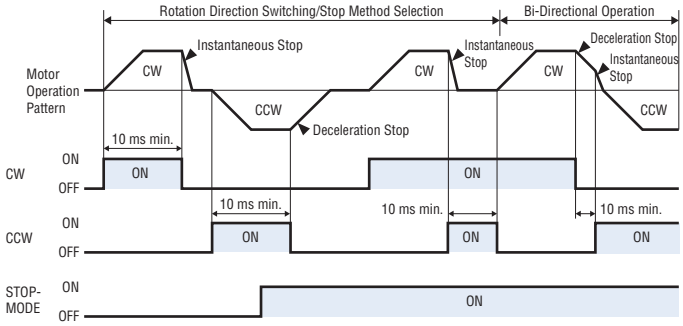
· I/O Terminals

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 AWG24 to 22.
[Manufacturer: Phoenix Contact]
AI 0.25-6 Applicable wire size
: AWG24 (0.2 mm²)
AI 0.34-6 Applicable wire size
: AWG22 (0.3 mm²)



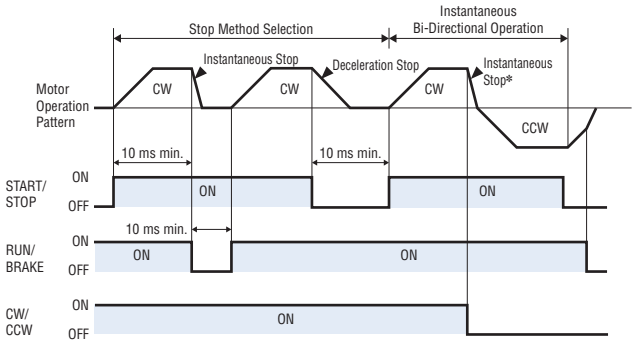
●Timing Chart

◇2-Wire Mode



- The CW input signal, CCW input signal and STOP-MODE 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 STOP-MODE signal ON will cause the motor to decelerate at the deceleration time (DEC) set on the digital operator until it eventually stops. Switching the STOP-MODE signal OFF will cause the motor to stop instantaneously.

◇3-Wire Mode



- 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.

*Changing the direction while the motor is running will cause the motor to stop instantaneously and then change its direction.

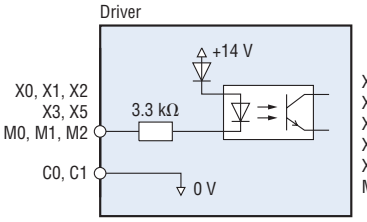
●Input/Output Signal Circuits

The initial setting is the sink logic. Select the sink logic or source logic according to the controller you will be using.

◇Input Circuit

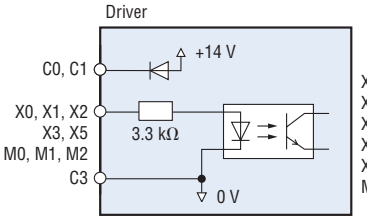
Common to the CW (START/STOP), CCW (RUN/BRAKE), STOP-MODE (CW/CCW), EXT-ERROR, ALARM-RESET and operation-data selection inputs.

• Sink Logic



X0: EXT-ERROR Input
X1: CW Input
X2: CCW Input
X3: STOP-MODE Input
X5: ALARM-RESET Input
M0, M1, M2: Operation data selection inputs

• Source Logic

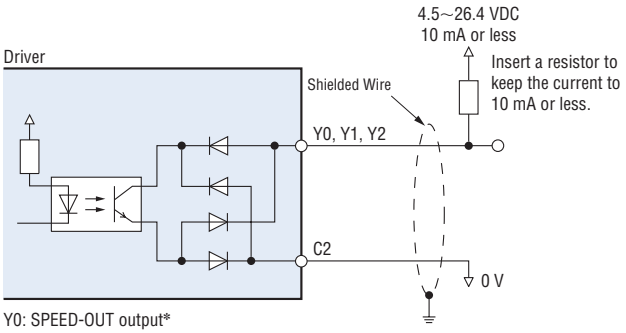


X0: EXT-ERROR Input
X1: CW Input
X2: CCW Input
X3: STOP-MODE Input
X5: ALARM-RESET Input
M0, M1, M2: Operation data selection inputs

◇Output Circuit

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

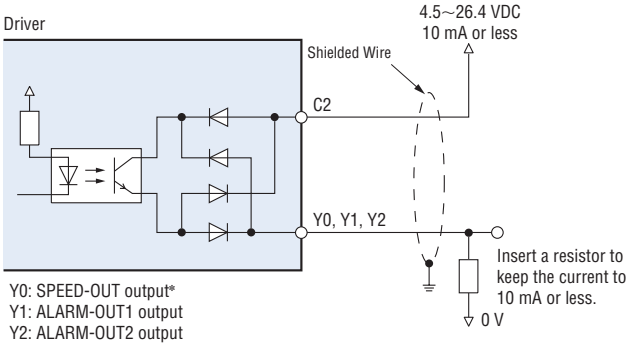
• Sink Logic



Y0: SPEED-OUT output*
Y1: ALARM-OUT1 output
Y2: ALARM-OUT2 output

*Supply a current of 5 mA or more to the SPEED-OUT output.

• Source Logic



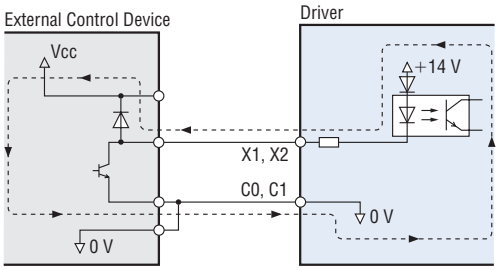
Y0: SPEED-OUT output*
Y1: ALARM-OUT1 output
Y2: ALARM-OUT2 output

*Supply a current of 5 mA or more to the SPEED-OUT output.

◇When an External Control Device with a Built-In Clamp Diode is Used

When you want to use an external control device with a built-in clamp diode, if the external control device power is turned off with the driver power turned on, current will be applied and the motor may run. When the power is turned on or off simultaneously, the motor may run temporarily due to differences in power capacity. The external control device power must be turned on first and driver power must be turned off first.

• Example of Sink Logic



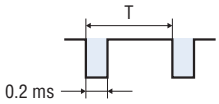
◇SPEED-OUT Output

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

By measuring the frequency of SPEED-OUT 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 protective functions is activated, the ALARM-OUT1 output will turn OFF and the digital operator will display an alarm code. The motor will coast to a stop.

◇ALARM-OUT2 Output

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

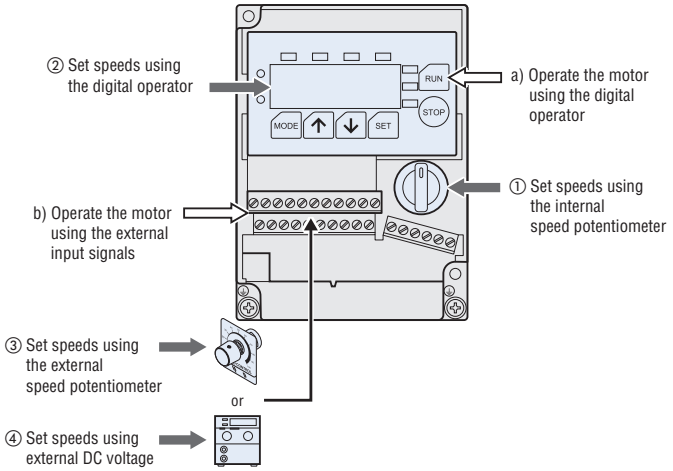
The overload warning function is activated based on a preset load factor relative to the rated torque. The ALARM-OUT2 output will turn OFF once the set load factor is exceeded.

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

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

*A maximum error of approximately 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 mode and external input signal mode.

a) Operate the motor using the RUN and STOP keys on the digital operator

b) 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 speed potentiometer

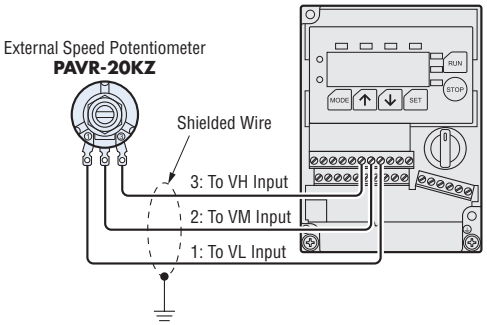
Set speeds using the potentiometer provided on the driver's front panel.

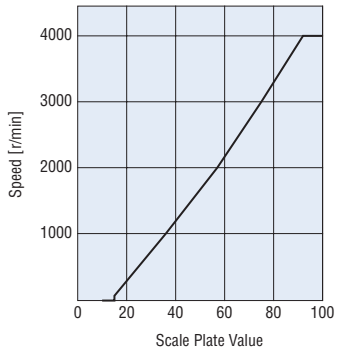
② Set speeds using the digital operator

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 speed potentiometer (sold separately)

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





External Speed Potentiometer Scale – Speed Characteristics (Representative values)

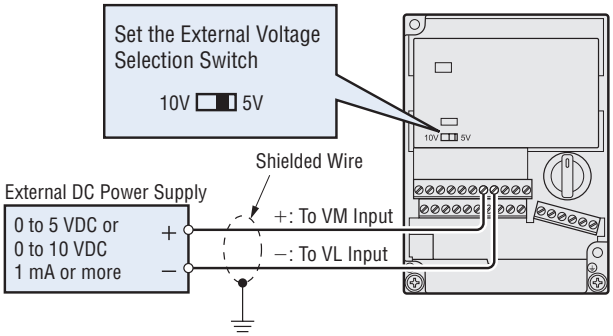
Note

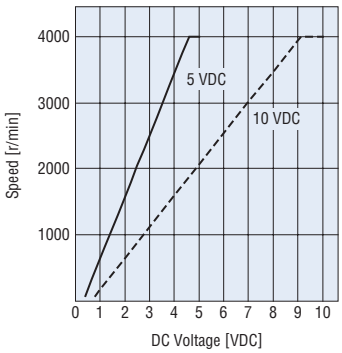
●The speed in the graph represents the speed of a motor alone. The gearhead output shaft speed of the combination type is calculated by dividing the graph speed by the gear ratio.

④ Set speeds using external DC voltage

Set the external voltage select 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 – Speed Characteristics (Representative values)

Note

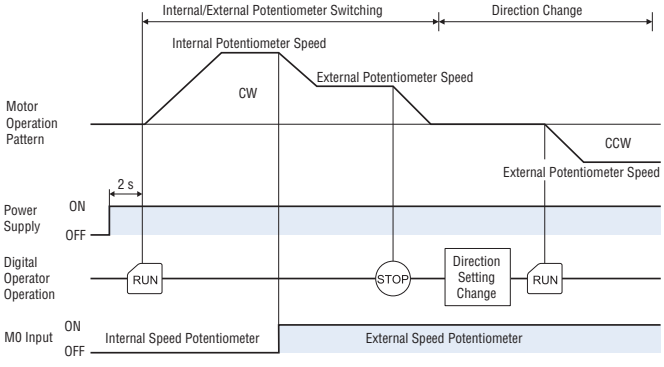
●The speed in the graph represents the speed of a motor alone. The gearhead output shaft speed of the combination type is calculated by dividing the graph speed by the gear ratio.

●Multi-Speed Operation

◇Two-Speed Operation

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

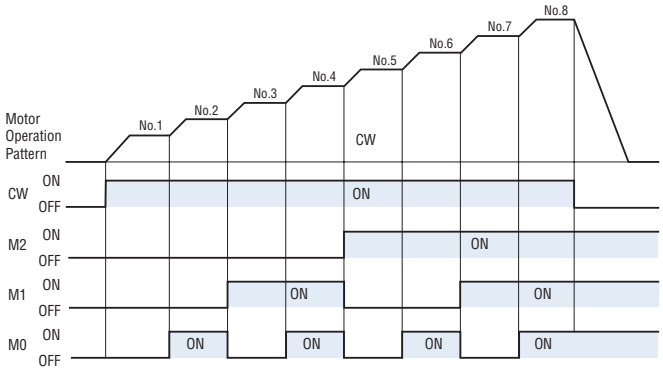
M0 Input	M1 Input	M2 Input	Speed Setting Method
OFF	OFF	OFF	Internal speed potentiometer
ON	OFF	OFF	External speed potentiometer



◇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 operation-data selection input M0, M1 or M2.

Operation Data	M0 Input	M1 Input	M2 Input	Speed Setting Method
No. 1	OFF	OFF	OFF	Internal speed potentiometer/Digital operator
No. 2	ON	OFF	OFF	External speed 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



●Multi-Motor Control

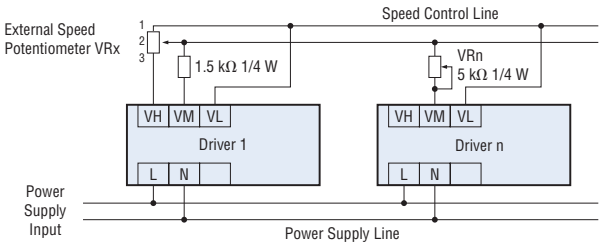
Two or more motors can be operated at the same speed by using a single external speed potentiometer or external DC voltage.
The diagram below applies to a single-phase power supply specification. For a three-phase power supply specification, change the power supply line to a three-phase type. Also note that the diagram does not show the motor or operation control part.

◇Using an External Speed Potentiometer

As shown in the diagram, use a common power supply line and a common speed control line for each driver and set speeds by using the external speed potentiometer VRx.
The resistance of the external speed potentiometer is determined using the formula below:

Resistance when the number of drivers is n:
VRx = 20/n (kΩ), n/4 (W)
Example: When two drivers are connected
VRx = 20/2 = 10 (kΩ), 2/4 = 1/2 (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 speed potentiometer.

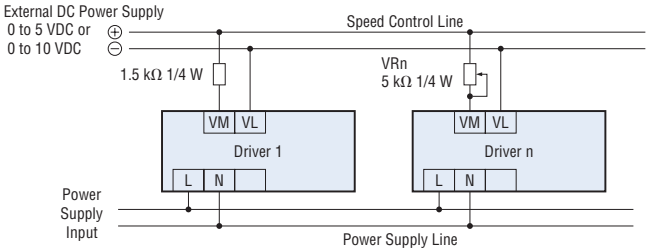


◇Using External DC Voltage

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 DC power supply is determined using the formula below:

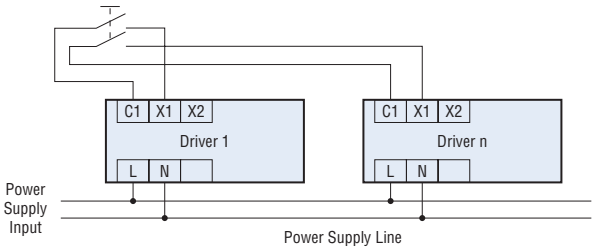
Power-supply capacity when the number of drivers is n:
I = 1 × n (mA)
Example: When two drivers are connected
I = 1 × 2 = 2 (mA)
Accordingly, the power-supply capacity is calculated as 2 mA or more.

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 and the same data is set digitally where the same data are set digitally in each driver, the operations of multiple motors can be controlled via an external input signal using the wiring circuit shown below.



List of Motor and Driver Combinations

Combination Type – Parallel Shaft Gearhead

The combination type comes with the motor and parallel shaft gearhead pre-assembled.

Output Power	Model	Motor Model	Gearhead Model	Driver Model
30 W (1/25 HP)	**BLF230A-□**	BLFM230-GFS	GFS2G□	BLFD30A2
	BLF230C-□			BLFD30C2
	BLF230S-□			BLFD30S2
60 W (1/12 HP)	**BLF460A-□**	BLFM460-GFS	GFS4G□	BLFD60A2
	BLF460C-□			BLFD60C2
	BLF460S-□			BLFD60S2
120 W (1/6 HP)	**BLF5120A-□**	BLFM5120-GFS	GFS5G□	BLFD120A2
	BLF5120C-□			BLFD120C2
	BLF5120S-□			BLFD120S2
200 W (1/4 HP)	**BLF6200A-□**	BLFM6200-GFS	GFS6G□	BLFD200A2
	BLF6200C-□			BLFD200C2
	BLF6200S-□			BLFD200S2
400 W (1/2 HP)	**BLF6400S-□**	BLFM6400-GFS		BLFD400S2

Combination Type – Hollow Shaft Flat Gearhead

The combination type comes with the motor and hollow shaft flat gearhead pre-assembled.

Output Power	Model	Motor Model	Gearhead Model	Driver Model
30 W (1/25 HP)	**BLF230A-□FR**	BLFM230-GFS	GFS2G□FR	BLFD30A2
	BLF230C-□FR			BLFD30C2
	BLF230S-□FR			BLFD30S2
60 W (1/12 HP)	**BLF460A-□FR**	BLFM460-GFS	GFS4G□FR	BLFD60A2
	BLF460C-□FR			BLFD60C2
	BLF460S-□FR			BLFD60S2
120 W (1/6 HP)	**BLF5120A-□FR**	BLFM5120-GFS	GFS5G□FR	BLFD120A2
	BLF5120C-□FR			BLFD120C2
	BLF5120S-□FR			BLFD120S2
200 W (1/4 HP)	**BLF6200A-□FR**	BLFM6200-GFS	GFS6G□FR	BLFD200A2
	BLF6200C-□FR			BLFD200C2
	BLF6200S-□FR			BLFD200S2
400 W (1/2 HP)	**BLF6400S-□FR**	BLFM6400-GFS	GFS6G□FR	BLFD400S2

Round Shaft Type

Output Power	Model	Motor Model	Driver Model
30 W (1/25 HP)	**BLF230A-A**	BLFM230-A	BLFD30A2
	BLF230C-A		BLFD30C2
	BLF230S-A		BLFD30S2
60 W (1/12 HP)	**BLF460A-A**	BLFM460-A	BLFD60A2
	BLF460C-A		BLFD60C2
	BLF460S-A		BLFD60S2
120 W (1/6 HP)	**BLF5120A-A**	BLFM5120-A	BLFD120A2
	BLF5120C-A		BLFD120C2
	BLF5120S-A		BLFD120S2
200 W (1/4 HP)	**BLF6200A-A**	BLFM6200-A	BLFD200A2
	BLF6200C-A		BLFD200C2
	BLF6200S-A		BLFD200S2
400 W (1/2 HP)	**BLF6400S-A**	BLFM6400-A	BLFD400S2

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