

**RoHS** RoHS-Compliant  
**Brushless Motor Systems**  
**BLF Series**

● Additional Information ●  
 Technical reference → Page F-1  
 Safety standards → Page G-2

The **BLF** Series brushless motor achieved a maximum motor speed of 4000 r/min. With the digital operator, digital setting and display are possible, offering wide-ranging functions to meet your diverse needs.

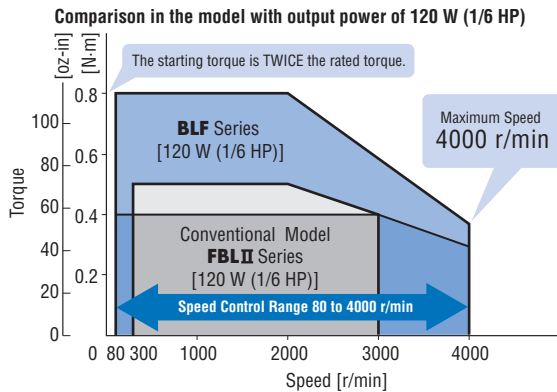
Motor: **UL** **US** **CE** Driver: **UL** **US** **CE**  
 ● List of safety standard approved products (Model, Standards, File No., Certification Body)  
 → Page G-11



**Features**

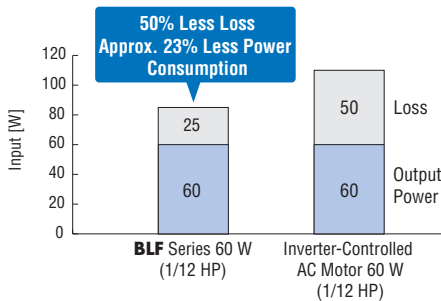
● **Wide Speed Control Range from 80 r/min up to 4000 r/min**

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.



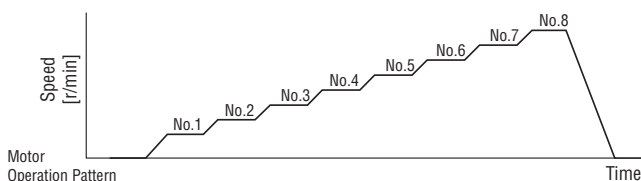
● **Energy-Saving**

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.



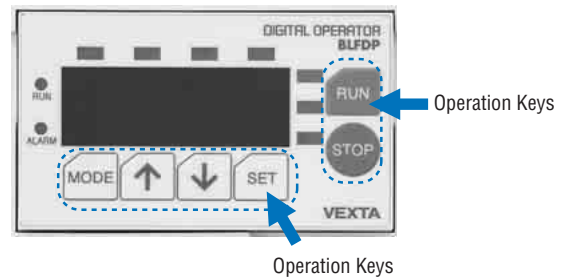
● **Multi-Speed Operation Using up to Eight Speeds**

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**

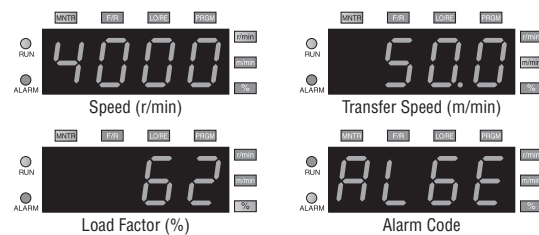
You can perform various settings and operations using the six operation keys on the digital operator.



● **Various Digital Displays**

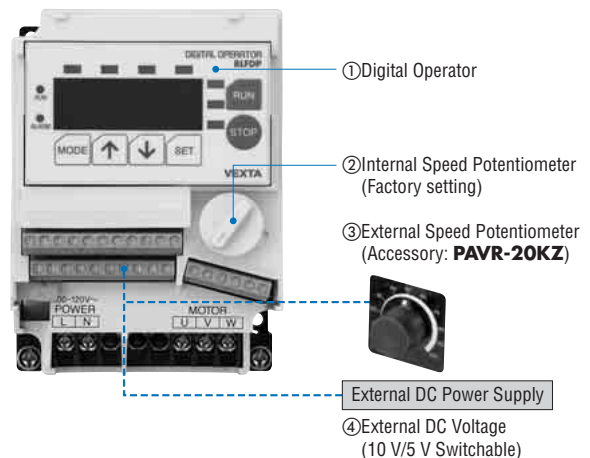
Speed, load factor, alarm code, etc. can be displayed digitally.

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



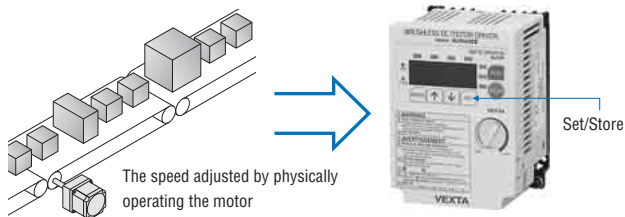
● **Four Speed Setting Methods**

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.)



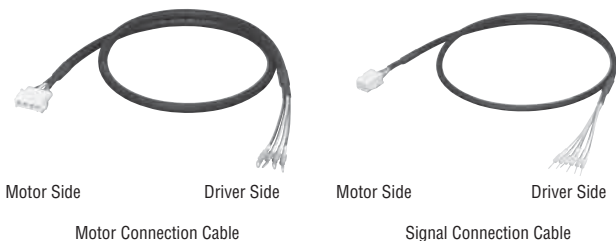
● **A Maximum Motor/Driver Wiring Distance of 20 m (65.6 ft.)**

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 the eight lengths of 1 to 20 m (3.3 to 65.6 ft.).

**Note:**

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



● **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**

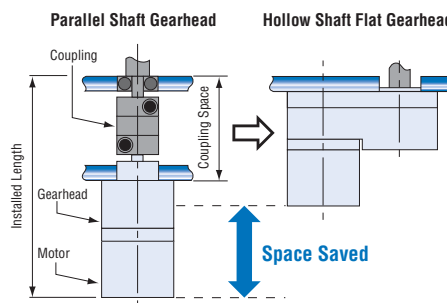
The rated life of the parallel shaft gearhead and hollow shaft flat gearhead is 10000 hours (at 3000 r/min). The parallel shaft gearhead achieves a rated life of twice as long as that of a conventional gearhead.

● 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**

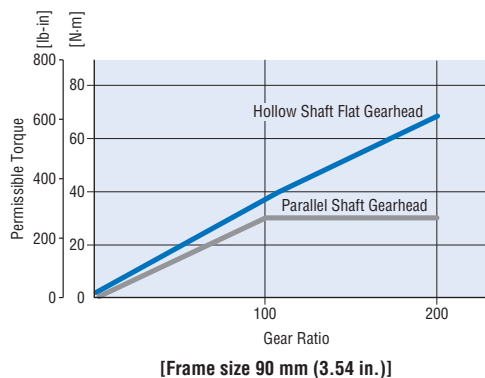
◇ **Space-Saving and Low-Cost**

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 cost and labor will also decrease.



◇ **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.



● **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. It means 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.

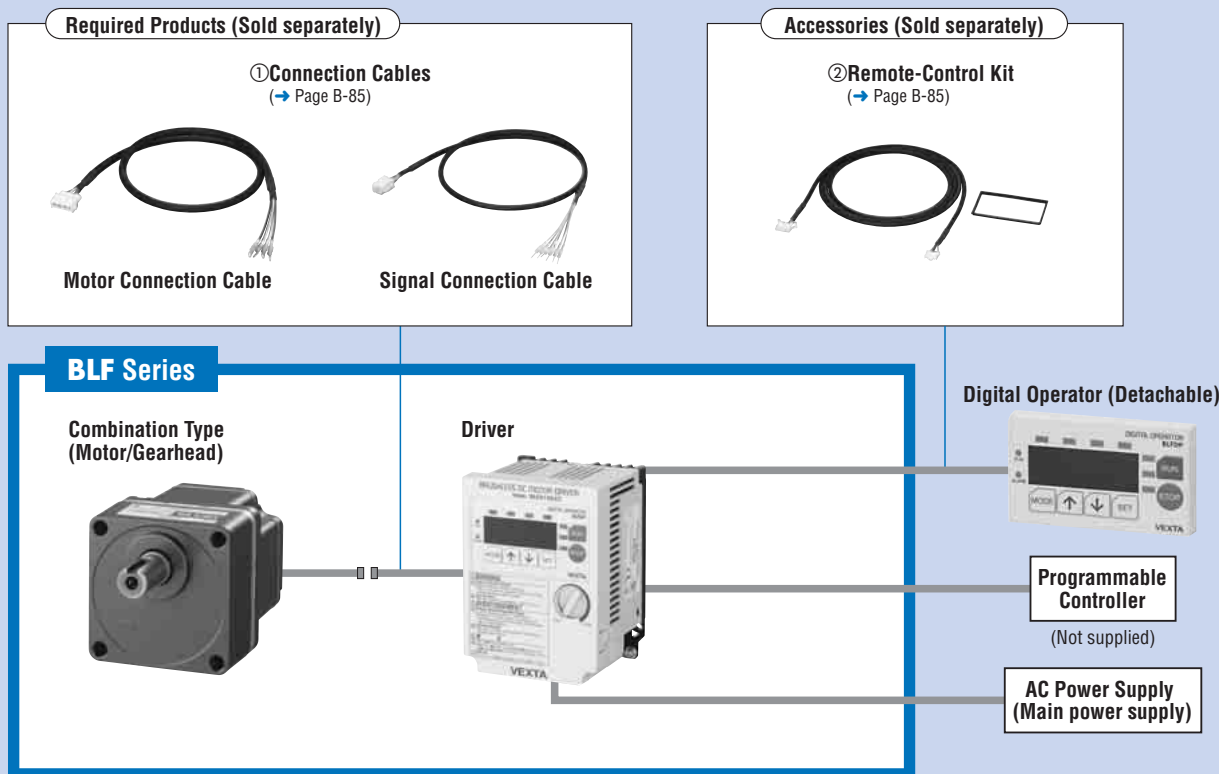
● **RoHS** RoHS-Compliant

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

● Details of RoHS Directive → Page G-38

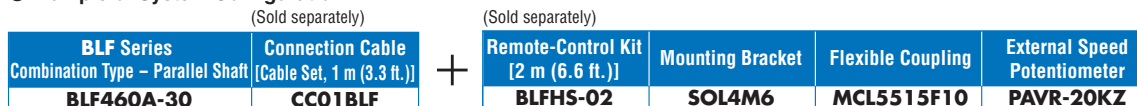
## System Configuration

### Combination Type – Parallel Shaft Gearhead/Round Shaft Type



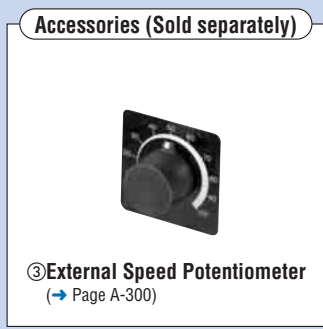
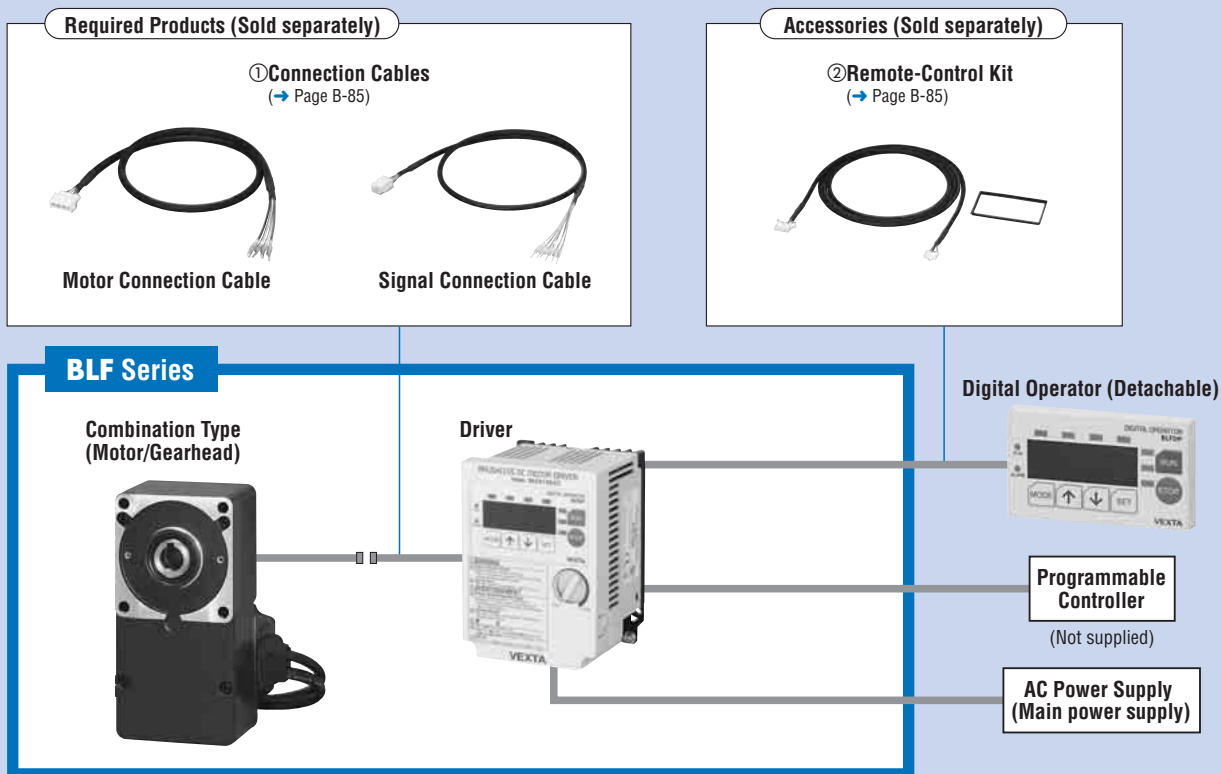
No.	Product Name	Overview	Page
①	Connection Cables	Dedicated cable for connecting the motor and driver [1 to 20 m (3.3 to 65.6 ft.)]. Be sure to purchase this cable.	B-85
②	Remote-Control Kit	Use this kit when removing the digital operator from the driver to operate it remotely.	B-85
③	Mounting Brackets	Dedicated mounting bracket for the motor and gearhead.	A-288
④	Flexible Couplings	Clamp type coupling that connects the motor or gearhead shaft to the driven shaft.	A-292
⑤	External Speed Potentiometer	Used to set and adjust the speed of the speed control motor ( <b>PAVR-20KZ</b> ).	A-300

### Example of System Configuration



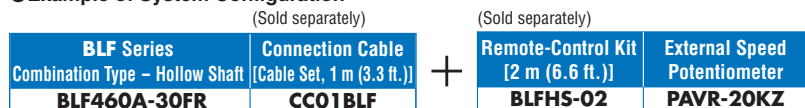
● The system configuration shown above is an example. Other combinations are available.

● Combination Type – Hollow Shaft Flat Gearhead



No.	Product Name	Overview	Page
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● Example of System Configuration



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## Product Number Code

# BLF 2 30 A - 5 FR

① ② ③ ④ ⑤ ⑥

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

## 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	<b>BLF230A-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Single-Phase 200-240 VAC	<b>BLF230C-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Three-Phase 200-240 VAC	<b>BLF230S-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
60 W (1/12 HP)	Single-Phase 100-120 VAC	<b>BLF460A-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Single-Phase 200-240 VAC	<b>BLF460C-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Three-Phase 200-240 VAC	<b>BLF460S-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
120 W (1/6 HP)	Single-Phase 100-120 VAC	<b>BLF5120A-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Single-Phase 200-240 VAC	<b>BLF5120C-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Three-Phase 200-240 VAC	<b>BLF5120S-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
200 W (1/4 HP)	Single-Phase 100-120 VAC	<b>BLF6200A-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Single-Phase 200-240 VAC	<b>BLF6200C-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Three-Phase 200-240 VAC	<b>BLF6200S-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
400 W (1/2 HP)	Three-Phase 200-240 VAC	<b>BLF6400S-</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>

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

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	<b>BLF230A-</b> <input type="checkbox"/> <b>FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Single-Phase 200-240 VAC	<b>BLF230C-</b> <input type="checkbox"/> <b>FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Three-Phase 200-240 VAC	<b>BLF230S-</b> <input type="checkbox"/> <b>FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
60 W (1/12 HP)	Single-Phase 100-120 VAC	<b>BLF460A-</b> <input type="checkbox"/> <b>FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Single-Phase 200-240 VAC	<b>BLF460C-</b> <input type="checkbox"/> <b>FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Three-Phase 200-240 VAC	<b>BLF460S-</b> <input type="checkbox"/> <b>FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
120 W (1/6 HP)	Single-Phase 100-120 VAC	<b>BLF5120A-</b> <input type="checkbox"/> <b>FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Single-Phase 200-240 VAC	<b>BLF5120C-</b> <input type="checkbox"/> <b>FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
	Three-Phase 200-240 VAC	<b>BLF5120S-</b> <input type="checkbox"/> <b>FR</b>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>

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

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	<b>BLF230A-A</b>
	Single-Phase 200-240 VAC	<b>BLF230C-A</b>
	Three-Phase 200-240 VAC	<b>BLF230S-A</b>
60 W (1/12 HP)	Single-Phase 100-120 VAC	<b>BLF460A-A</b>
	Single-Phase 200-240 VAC	<b>BLF460C-A</b>
	Three-Phase 200-240 VAC	<b>BLF460S-A</b>
120 W (1/6 HP)	Single-Phase 100-120 VAC	<b>BLF5120A-A</b>
	Single-Phase 200-240 VAC	<b>BLF5120C-A</b>
	Three-Phase 200-240 VAC	<b>BLF5120S-A</b>
200 W (1/4 HP)	Single-Phase 100-120 VAC	<b>BLF6200A-A</b>
	Single-Phase 200-240 VAC	<b>BLF6200C-A</b>
	Three-Phase 200-240 VAC	<b>BLF6200S-A</b>
400 W (1/2 HP)	Three-Phase 200-240 VAC	<b>BLF6400S-A</b>

The following items are included in each product.

Motor, Driver, Operating Manual

## ● Gearhead

### ◇ Parallel Shaft Gearhead

Output Power of Applicable Motor (Pinion shaft type)	Gearhead Model	Gear Ratio
30 W (1/25 HP)	<b>GFS2G</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
60 W (1/12 HP)	<b>GFS4G</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
120 W (1/6 HP)	<b>GFS5G</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
200 W (1/4 HP) 400 W (1/2 HP)	<b>GFS6G</b> <input type="checkbox"/>	<b>5, 10, 15, 20, 30, 50, 100, 200</b>

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

The following items are included in each product.

Gearhead, Screws for Connecting Motor and Gearhead, Mounting Screws, Parallel Key, Operating Manual

## ● 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.)	<b>CC01BLF</b>
2 m (6.6 ft.)	<b>CC02BLF</b>
3 m (9.8 ft.)	<b>CC03BLF</b>
5 m (16.4 ft.)	<b>CC05BLF</b>
7 m (23.0 ft.)	<b>CC07BLF</b>
10 m (32.8 ft.)	<b>CC10BLF</b>
15 m (49.2 ft.)	<b>CC15BLF</b>
20 m (65.6 ft.)	<b>CC20BLF</b>

● The **BLF** Series requires two dedicated cables, one for the motor and the other for signals, for connection between the motor and driver. Be sure to purchase the connection cable set.

## ● Pinion Shaft Type

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

The following items are included in each product.

Motor, Driver, Operating Manual

### ◇ Hollow Shaft Flat Gearhead

Output Power of Applicable Motor (Pinion shaft type)	Gearhead Model	Gear Ratio
30 W (1/25 HP)	<b>GFS2G</b> <input type="checkbox"/> FR	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
60 W (1/12 HP)	<b>GFS4G</b> <input type="checkbox"/> FR	<b>5, 10, 15, 20, 30, 50, 100, 200</b>
120 W (1/6 HP)	<b>GFS5G</b> <input type="checkbox"/> FR	<b>5, 10, 15, 20, 30, 50, 100, 200</b>

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

The following items are included in each product.

Gearhead, Screws for Connecting Motor and Gearhead, Mounting Screws, Parallel Key, Safety Cover (with screws), Operating Manual

## Specifications

### ● 30 W (1/25 HP) (RoHS)

 Motor:   / Driver:  

Model	Combination Type – Parallel Shaft Gearhead		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	×10 <sup>-4</sup> kg·m <sup>2</sup> (oz-in <sup>2</sup> )	1.8 (9.8)		
Rotor Inertia J	×10 <sup>-4</sup> kg·m <sup>2</sup> (oz-in <sup>2</sup> )	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:   / Driver:  

Model	Combination Type – Parallel Shaft Gearhead		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	×10 <sup>-4</sup> kg·m <sup>2</sup> (oz-in <sup>2</sup> )	3.75 (21)		
Rotor Inertia J	×10 <sup>-4</sup> kg·m <sup>2</sup> (oz-in <sup>2</sup> )	0.236 (1.29)			
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:   / Driver:  

Model	Combination Type – Parallel Shaft Gearhead		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	×10 <sup>-4</sup> kg·m <sup>2</sup> (oz-in <sup>2</sup> )	5.6 (31)		
Rotor Inertia J	×10 <sup>-4</sup> kg·m <sup>2</sup> (oz-in <sup>2</sup> )	0.614 (3.4)			
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.

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

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

● 200 W (1/4 HP), 400 W (1/2 HP) (RoHS)

Motor:  / Driver: 

Model	Combination Type – Parallel Shaft Gearhead					
	BLF6200A-□	BLF6200C-□	BLF6200S-□	BLF6400S-□		
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	
	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		×10 <sup>-4</sup> kg·m <sup>2</sup> (oz·in <sup>2</sup> )	8.75 (48)		15 (82)	
Permissible Load Inertia J						
Rotor Inertia J		×10 <sup>-4</sup> kg·m <sup>2</sup> (oz·in <sup>2</sup> )	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°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.

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

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

## Common Specifications

Item	Specifications
Speed Setting Methods	Select one of the following methods: <ul style="list-style-type: none"> <li>Set using the internal speed potentiometer</li> <li>Set using the digital operator: Up to eight speeds</li> <li>Set using an accessory external speed potentiometer: <b>PAVR-20KZ</b> (20 kΩ, 1/4 W) (sold separately)</li> <li>Set using external DC voltage: 0~5 VDC or 0~10 VDC</li> </ul>
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.) <ul style="list-style-type: none"> <li>Overload protection: Activated when the motor load exceeds rated torque for a minimum of 5 seconds.</li> <li>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.</li> <li>Undervoltage protection: Activated when the voltage applied to the driver falls below 100 VAC or 200 VAC by a minimum of 40%.</li> <li>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.</li> <li>Overspeed protection: Activated when the speed of the motor shaft exceeds 4800 r/min.</li> <li>Overcurrent protection: Activated when an excessive current flows through the driver due to a ground fault, etc.</li> <li>CPU error, EEPROM error, External error, Operation error</li> </ul>
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
Insulation Class	UL, CSA: Class A [105°C (221°F)] EN: Class E [120°C (248°F)]	-
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		80 r/min	16	8	5.3	4	2.7	1.6	0.8
<b>BLF230</b> <input type="checkbox"/> - <input type="checkbox"/>	3000 r/min		600	300	200	150	100	60	30	15
	4000 r/min		800	400	267	200	133	80	40	20
	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)
<b>BLF460</b> <input type="checkbox"/> - <input type="checkbox"/>	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)
	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)
<b>BLF5120</b> <input type="checkbox"/> - <input type="checkbox"/>	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)
	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)
<b>BLF6200</b> <input type="checkbox"/> - <input type="checkbox"/>	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)
	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)

● 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.

● 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		80 r/min	16	8	5.3	4	2.7	1.6	0.8
<b>BLF230</b> <input type="checkbox"/> - <input type="checkbox"/> FR	3000 r/min		600	300	200	150	100	60	30	15
	4000 r/min		800	400	267	200	133	80	40	20
	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)
<b>BLF460</b> <input type="checkbox"/> - <input type="checkbox"/> FR	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)
	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)
<b>BLF5120</b> <input type="checkbox"/> - <input type="checkbox"/> 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)

● 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.

● 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 B-83

## ■ 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 <input type="checkbox"/> - <input type="checkbox"/>	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 <input type="checkbox"/> - <input type="checkbox"/>	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 <input type="checkbox"/> - <input type="checkbox"/>	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 <input type="checkbox"/> - <input type="checkbox"/> BLF6400S- <input type="checkbox"/>	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 <input type="checkbox"/> - <input type="checkbox"/> 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 <input type="checkbox"/> - <input type="checkbox"/> 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 <input type="checkbox"/> - <input type="checkbox"/> 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 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.

### ● 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 <input type="checkbox"/> - <b>A</b>	80	18	100	22	The permissible thrust load shall be no greater than half the motor mass.
BLF460 <input type="checkbox"/> - <b>A</b>	110	24	130	29	
BLF5120 <input type="checkbox"/> - <b>A</b>	150	33	170	38	
BLF6200 <input type="checkbox"/> - <b>A</b>	197	44	221	49	
BLF6400S- <b>A</b>					

● Enter the power supply voltage (**A**, **C** or **S**) 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<sup>2</sup> (oz·in<sup>2</sup>)

Model \ Gear Ratio	5	10	15	20	30	50	100	200
<b>BLF230</b> <input type="checkbox"/> - <input type="checkbox"/>	1.55 (8.5)	6.2 (34)	14 (77)	24.8 (136)	55.8 (310)	155 (850)	155 (850)	155 (850)
<b>BLF460</b> <input type="checkbox"/> - <input type="checkbox"/>	5.5 (30)	22 (120)	49.5 (270)	88 (480)	198 (1080)	550 (3000)	550 (3000)	550 (3000)
<b>BLF5120</b> <input type="checkbox"/> - <input type="checkbox"/>	25 (137)	100 (550)	225 (1230)	400 (2200)	900 (4900)	2500 (13700)	2500 (13700)	2500 (13700)
<b>BLF6200</b> <input type="checkbox"/> - <input type="checkbox"/> <b>BLF6400S</b> <input type="checkbox"/> - <input type="checkbox"/>	37.5 (210)	150 (820)	338 (1850)	600 (3300)	1350 (7400)	3750 (21000)	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.

### ● Combination Type – Hollow Shaft Flat Gearhead

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

Model \ Gear Ratio	5	10	15	20	30	50	100	200
<b>BLF230</b> <input type="checkbox"/> - <input type="checkbox"/> <b>FR</b>	1.55 (8.5)	6.2 (34)	14 (77)	24.8 (136)	55.8 (310)	155 (850)	155 (850)	155 (850)
<b>BLF460</b> <input type="checkbox"/> - <input type="checkbox"/> <b>FR</b>	5.5 (30)	22 (120)	49.5 (270)	88 (480)	198 (1080)	550 (3000)	550 (3000)	550 (3000)
<b>BLF5120</b> <input type="checkbox"/> - <input type="checkbox"/> <b>FR</b>	25 (137)	100 (550)	225 (1230)	400 (2200)	900 (4900)	2500 (13700)	2500 (13700)	2500 (13700)

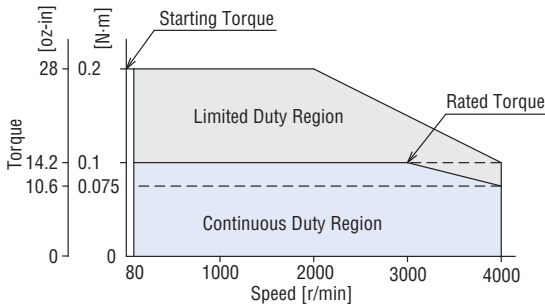
- Enter the power supply voltage (**A**, **C** or **S**) in the box () within the model name.
- Enter the gear ratio in the box () within the model name.

## ■ Speed – Torque Characteristics

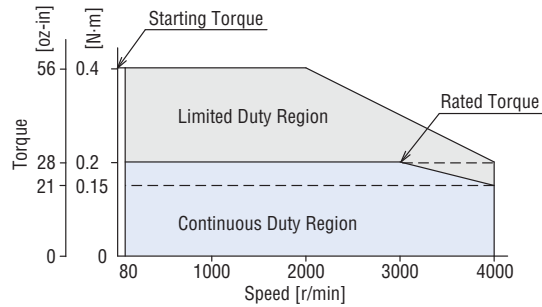
Continuous Duty Region: Continuous operation is possible in this region.

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.

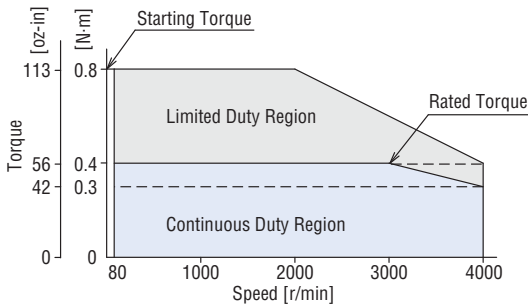
### BLF230 -/BLF230 -FR/BLF230 -**A**



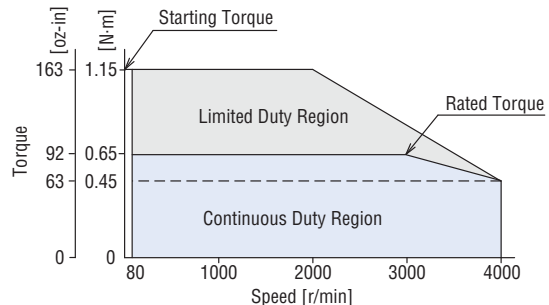
### BLF460 -/BLF460 -FR/BLF460 -**A**



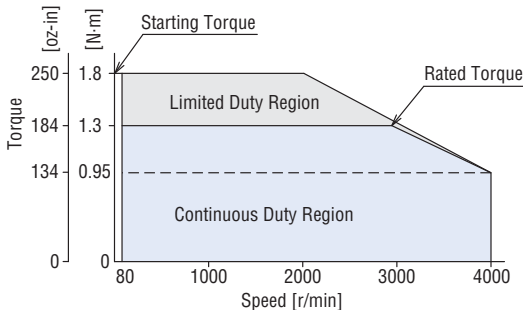
### BLF5120 -/BLF5120 -FR/BLF5120 -**A**



### BLF6200 -/BLF6200 -**A**



### BLF6400S -/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.

## Dimensions Unit = mm (in.)

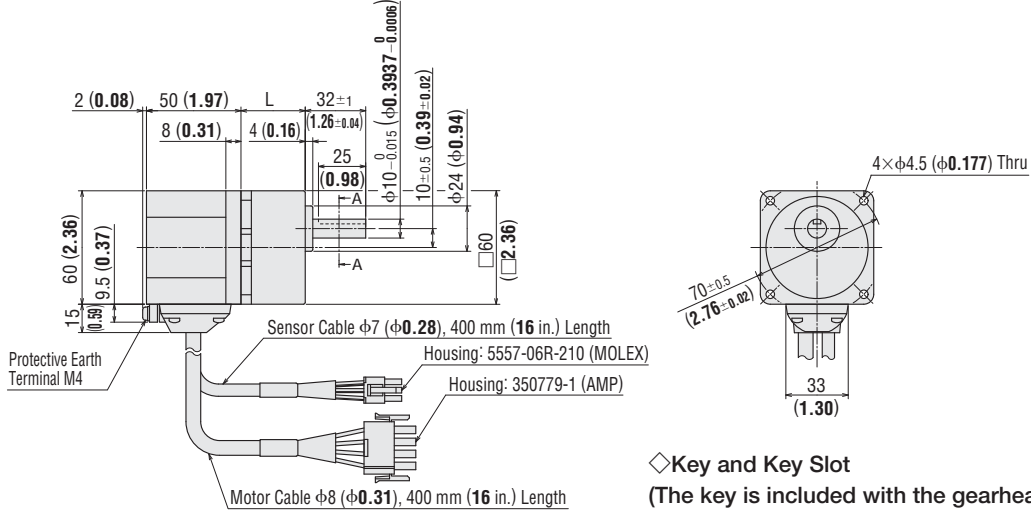
● Mounting screws are included with the combination type. Dimensions for mounting screws → Page B-222

### ● 30 W (1/25 HP)

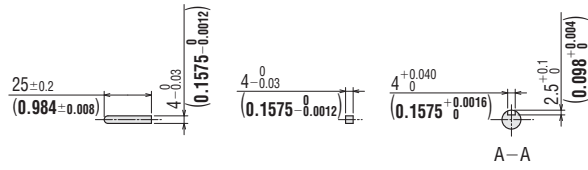
#### ◇ Motor/Parallel Shaft Gearhead

Model	Motor Model	Gearhead Model	Gear Ratio	L	DXF
<b>BLF230A</b> -□	BLFM230-GFS	GFS2G□	<b>5~20</b>	34 (1.34)	A407A
<b>BLF230C</b> -□			<b>30~100</b>	38 (1.50)	A407B
<b>BLF230S</b> -□			<b>200</b>	43 (1.69)	A407C

Mass: 1.1 kg (2.4 lb.) (Including gearhead)



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



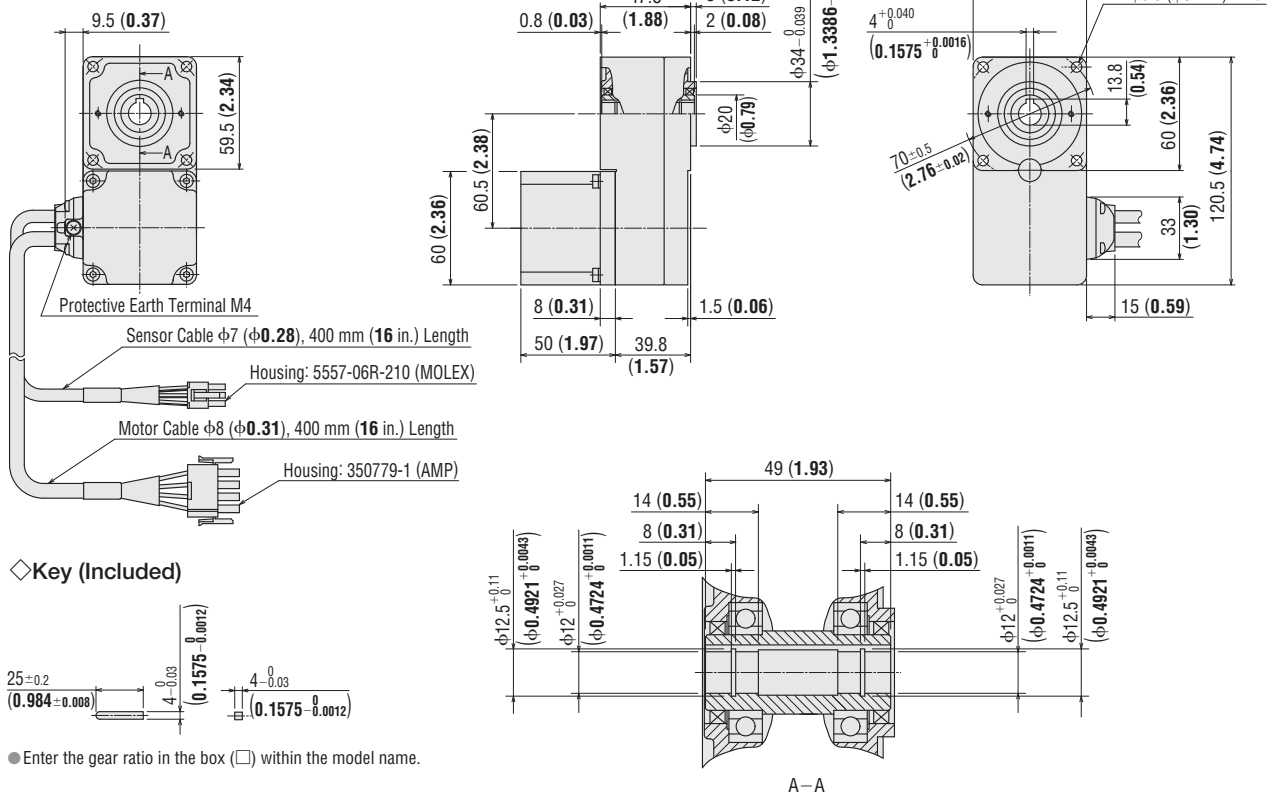
#### ◇ Motor/Hollow Shaft Flat Gearhead

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

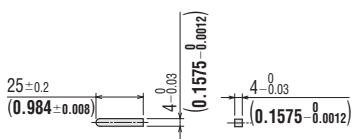
Motor: BLFM230-GFS  
Gearhead: GFS2G□FR

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

DXF A408



◇ Key (Included)



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

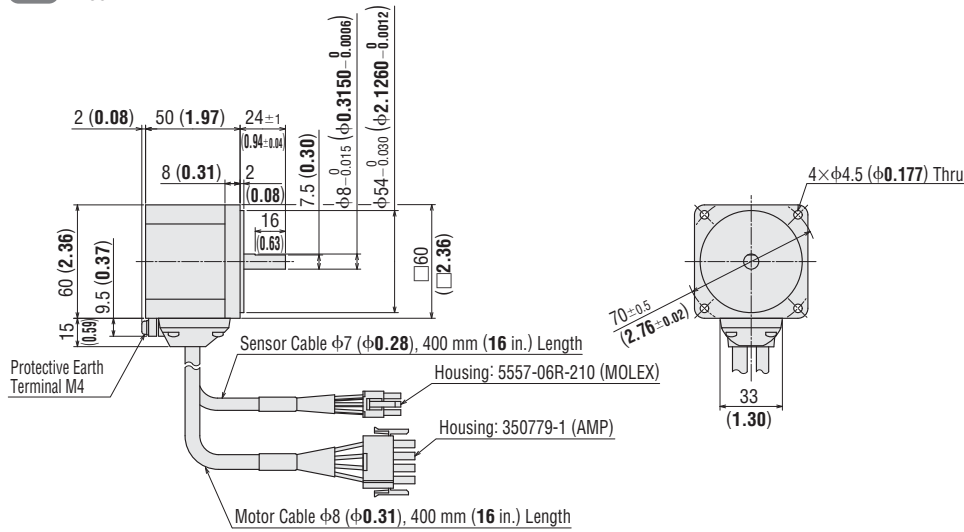
◇ Round Shaft Type

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

Motor: BLM230-A

Mass: 0.6 kg (1.32 lb.)

**DXF** A409

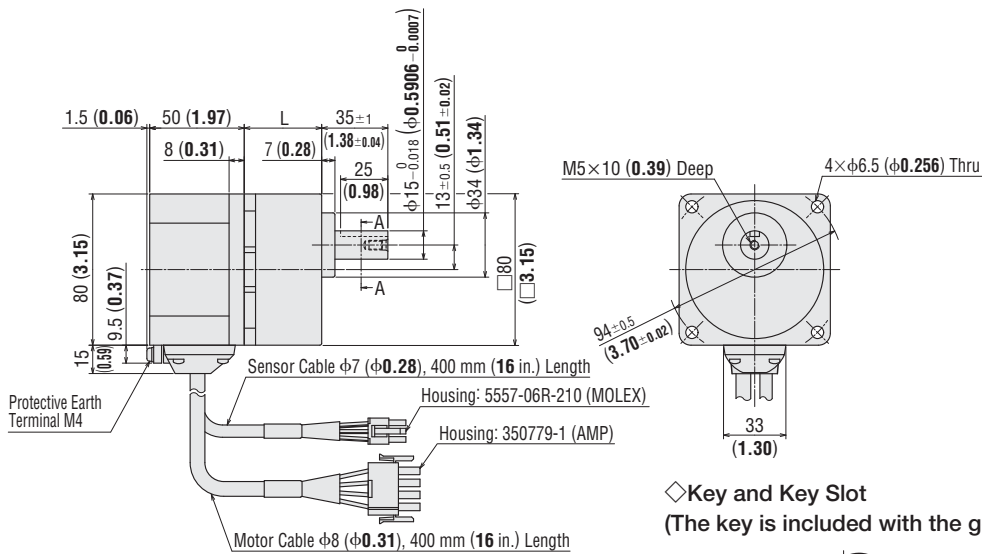


● 60 W (1/12 HP)

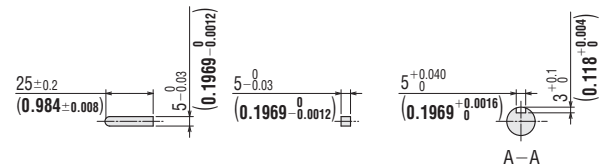
◇ Motor/Parallel Shaft Gearhead

Model	Motor Model	Gearhead Model	Gear Ratio	L	DXF
<b>BLF460A</b> -□	BLFM460-GFS	GFS4G□	<b>5~20</b>	41 (1.61)	A410A
<b>BLF460C</b> -□			<b>30~100</b>	46 (1.81)	A410B
<b>BLF460S</b> -□			<b>200</b>	51 (2.01)	A410C

Mass: 1.9 kg (4.2 lb.) (Including gearhead)



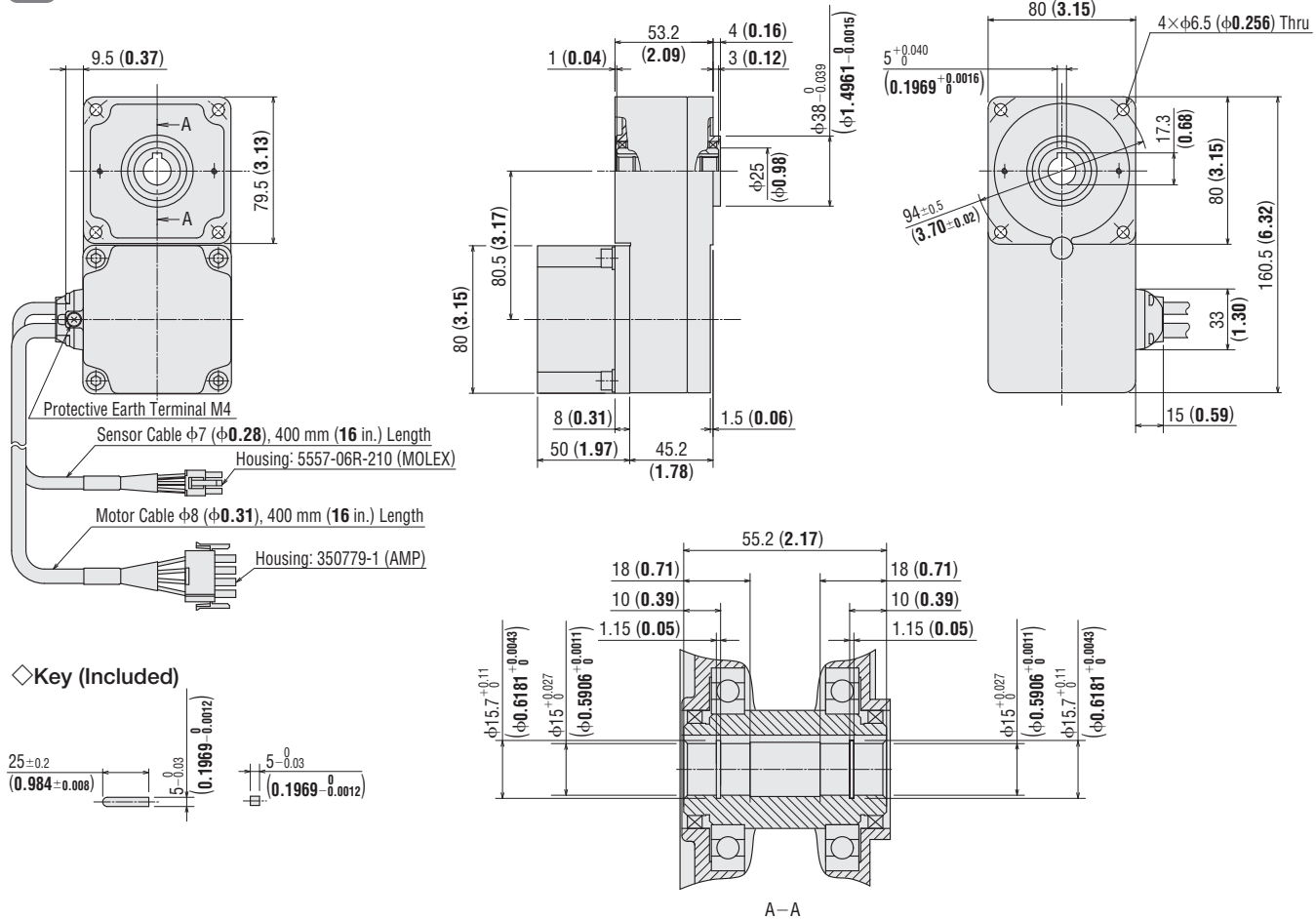
◇ Key and Key Slot  
(The key is included with the gearhead)



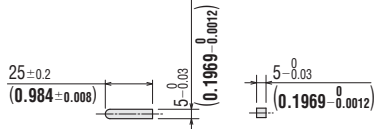
● Enter the gear ratio in the box (□) within the model name.

◇ 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

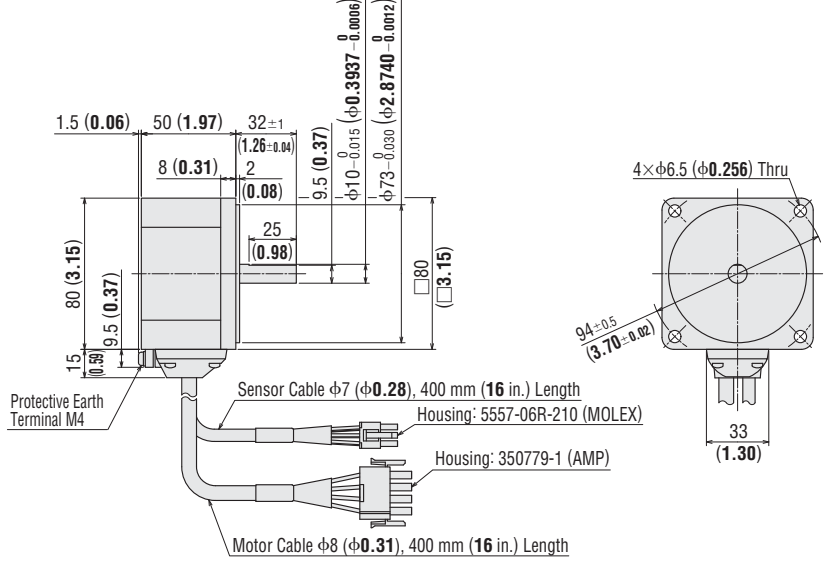


◇ Key (Included)



◇ Round Shaft Type  
**BLF460A-A, BLF460C-A, BLF460S-A**

Motor: BLFM460-A  
 Mass: 0.9 kg (2.0 lb.)  
**DXF** A412



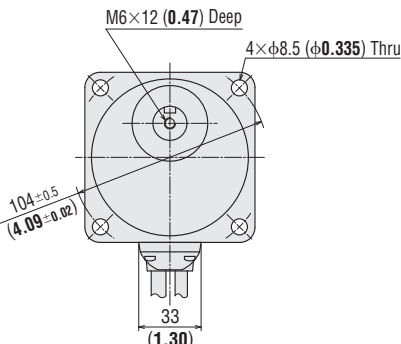
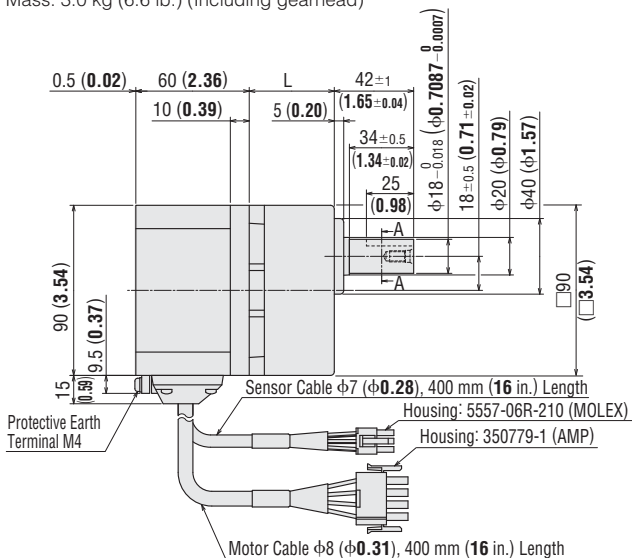
● Enter the gear ratio in the box (□) within the model name.

● 120 W (1/6 HP)

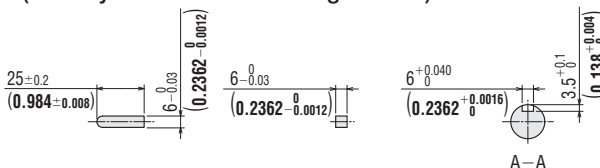
◇ Motor/Parallel Shaft Gearhead

Model	Motor Model	Gearhead Model	Gear Ratio	L	DXF
<b>BLF5120A</b> -□	BLFM5120-GFS	GFS5G□	<b>5~20</b>	45 (1.77)	A413A
<b>BLF5120C</b> -□			<b>30~100</b>	58 (2.28)	A413B
<b>BLF5120S</b> -□			<b>200</b>	64 (2.52)	A413C

Mass: 3.0 kg (6.6 lb.) (Including gearhead)



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



◇ Motor/Hollow Shaft Flat Gearhead

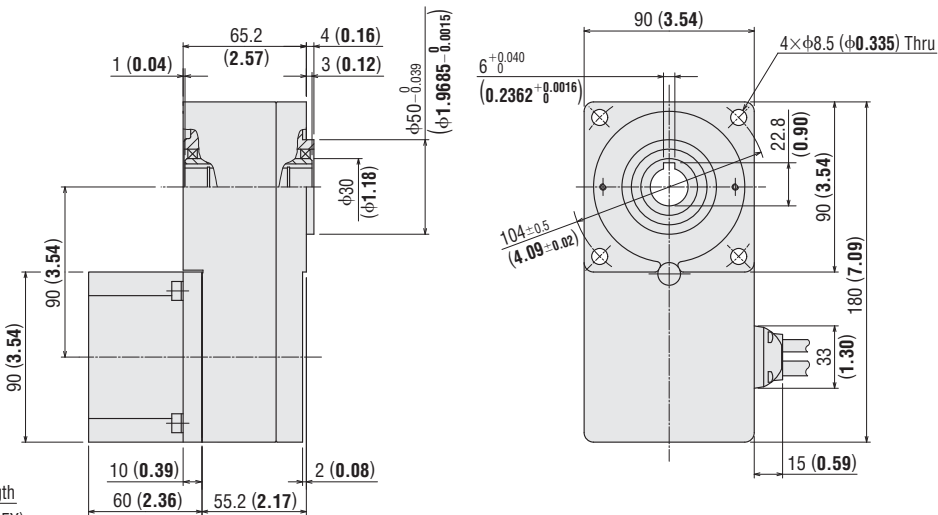
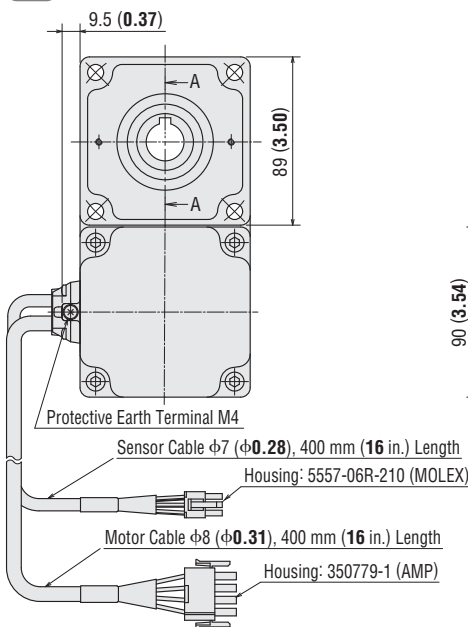
**BLF5120A**-□FR, **BLF5120C**-□FR, **BLF5120S**-□FR

Motor: BLFM5120-GFS

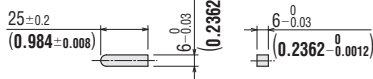
Gearhead: GFS5G□FR

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

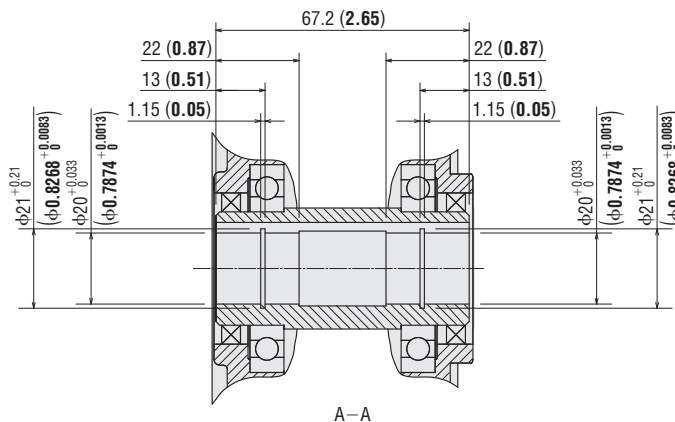
**DXF** A414



◇ Key (Included)



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

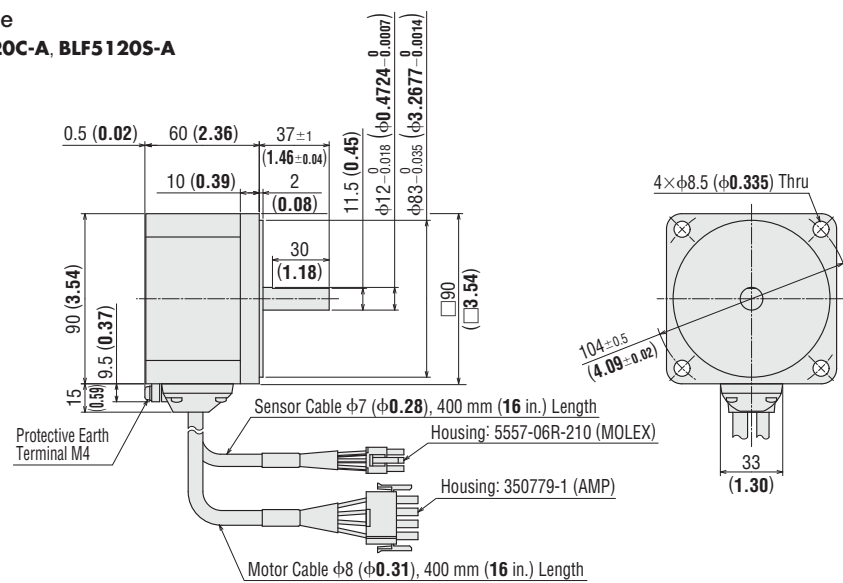


◇ Round Shaft Type

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

Motor: BLFM5120-A  
Mass: 1.5 kg (3.3 lb.)

**DXF** A415

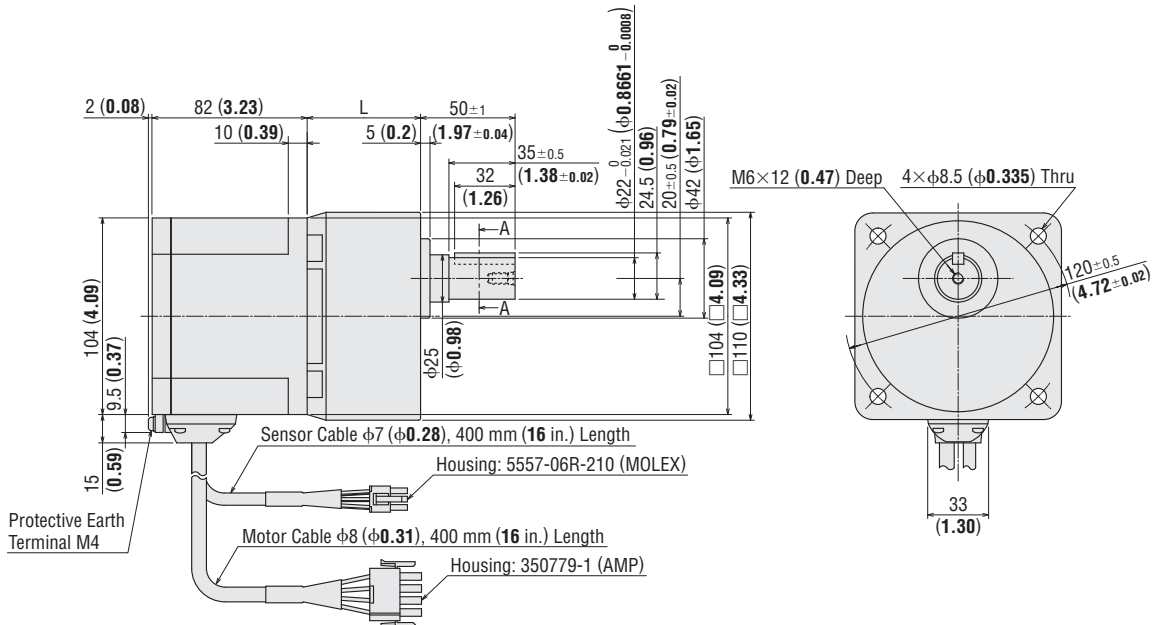


● 200 W (1/4 HP), 400 W (1/2 HP)

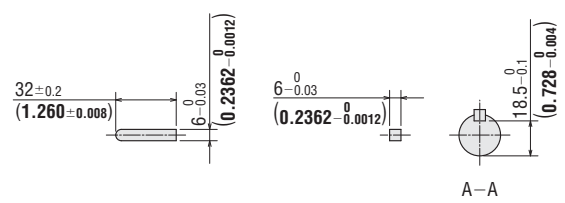
◇ Motor/Parallel Shaft Gearhead

Model	Motor Model	Gearhead Model	Gear Ratio	L	DXF
<b>BLF6200A-</b> □	BLFM6200-GFS	GFS6G□	<b>5~20</b>	60 (2.36)	A652A
<b>BLF6200C-</b> □	BLFM6200-GFS		<b>30, 50</b>	72 (2.83)	A652B
<b>BLF6200S-</b> □	BLFM6200-GFS		<b>100, 200</b>	86 (3.39)	A652C
<b>BLF6400S-</b> □	BLFM6400-GFS				

Mass: 5.4 kg (11.9 lb.) (Including gearhead)



◇ Key and Key Slot



● 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.



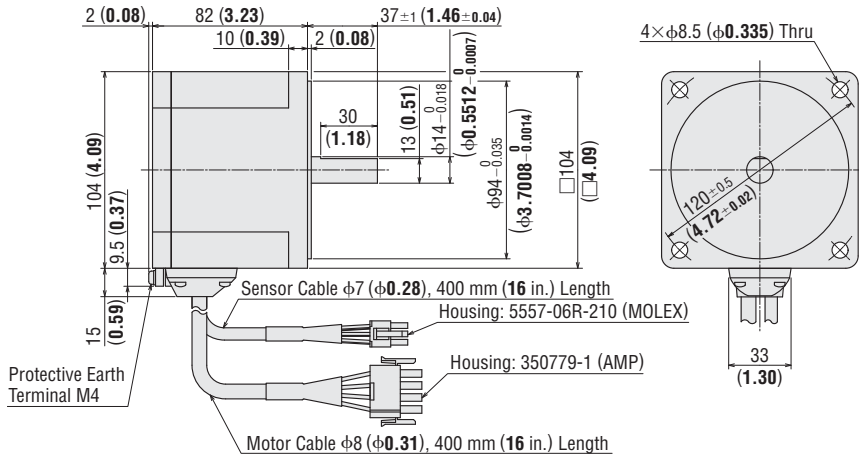
◇ Round Shaft Type

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

Motor: BLFM6200-A, BLFM6400-A

Mass: 2.4 kg (5.3 lb.)

**DXF** A653

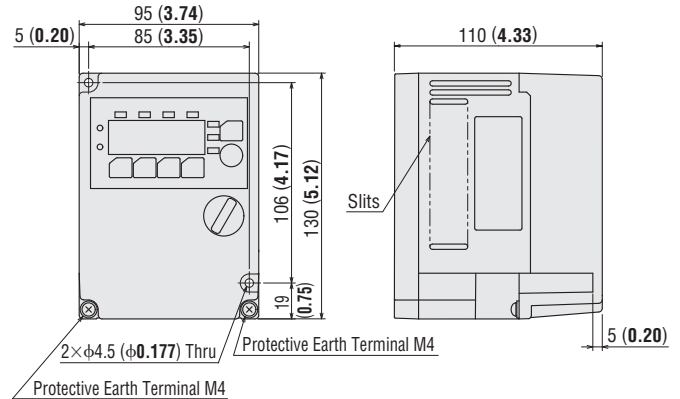
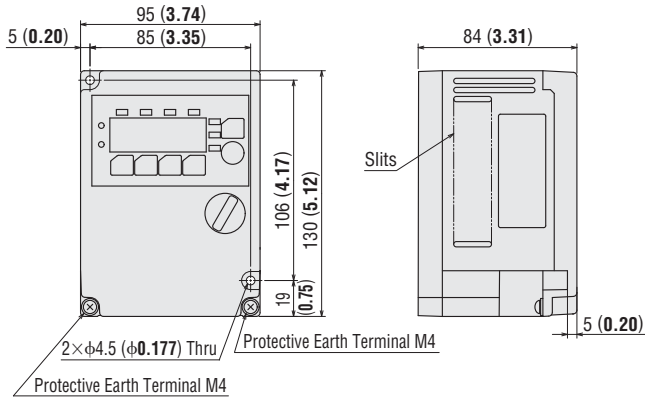


◇ Driver

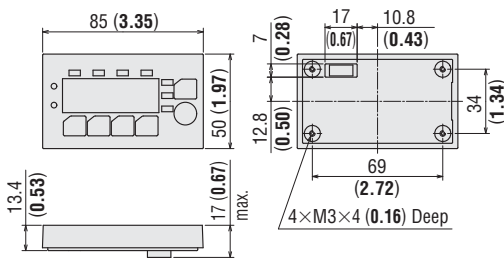
BLFD30A2, BLFD30C2, BLFD30S2  
 BLFD60A2, BLFD60C2, BLFD60S2  
 BLFD120A2, BLFD120C2, BLFD120S2  
 Mass: 0.9 kg (2.0 lb.)

**DXF** A416

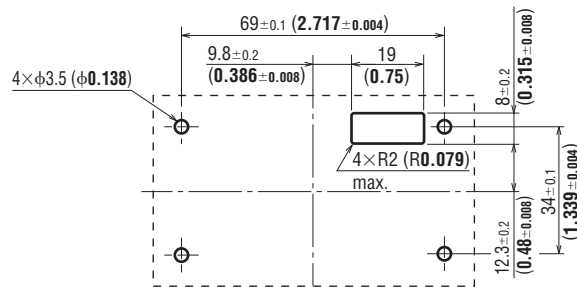
BLFD200A2, BLFD200C2, BLFD200S2,  
 BLFD400S2  
 Mass: 1.3 kg (2.9 lb.)  
**DXF** A654



◇ Digital Operator  
 (Detached from the driver)

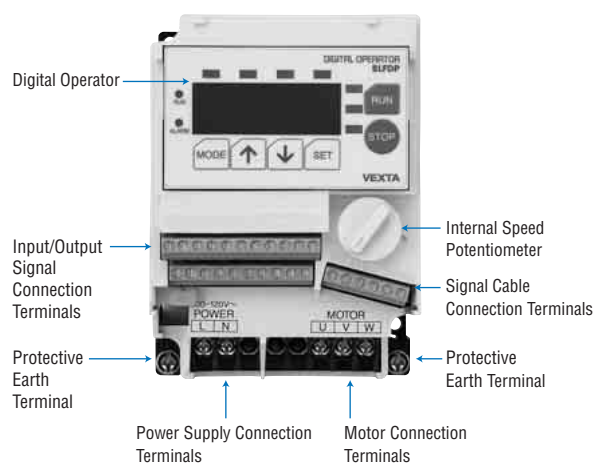


◇ Digital Operator Panel Cut-Out

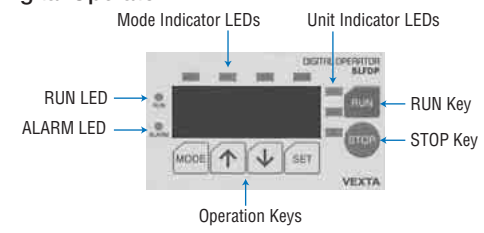


# Connection and Operation

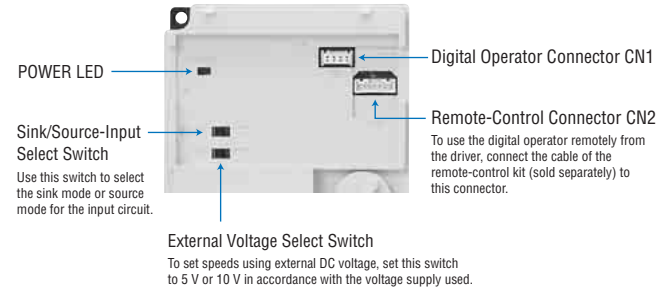
## Names and Functions of Driver Parts



## Digital Operator



### When the digital operator is detached



## 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)
		ALARM-OUT2 Output	This signal is output upon actuation of the overload protective function or overload warning function. (Normally closed)
		SPEED-OUT Output	30 pulses are output per each rotation of the motor output shaft.
		C2	OUT-COM

\*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.

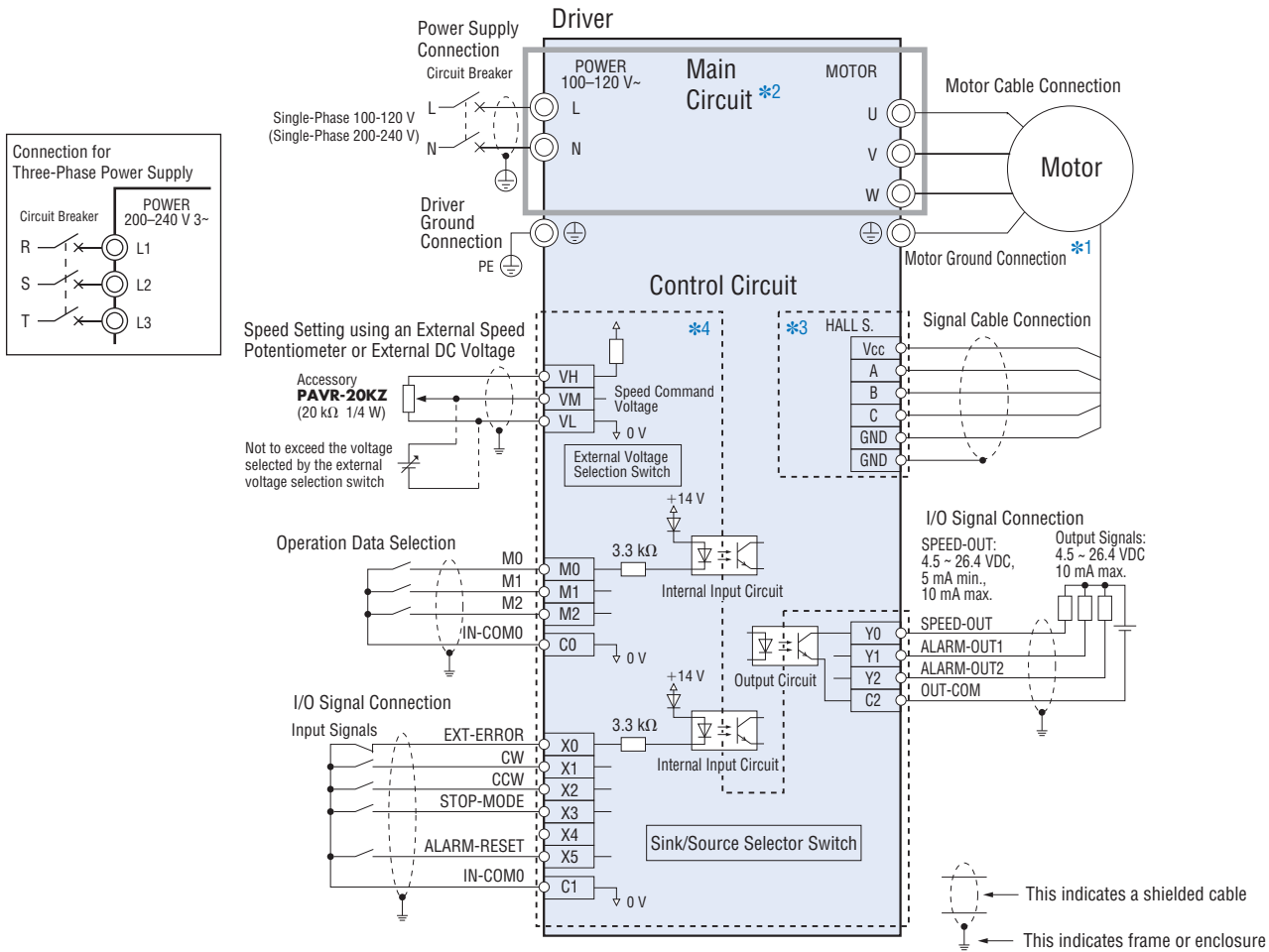
## Digital Operator Indicator

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, rE: 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

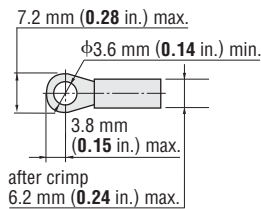
The figure below is a connection diagram for a configuration based on a single-phase 100-120 V supply voltage, with the sink/source selector switch set to the sink side.



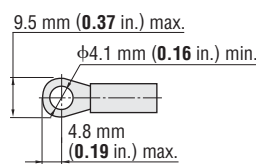
- \*1 The grounding method will vary depending on the length of the connection cable.  
When the connection cable is 7 m (23.0 ft.) or shorter: Connect the protective earth terminal on the connection cable to the protective earth terminal on the driver.  
When the connection cable is 10 m (32.8 ft.)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



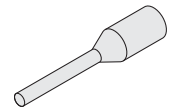
· Protective Earth Terminals (M4):  
Round Terminal with Insulation



· I/O Terminals

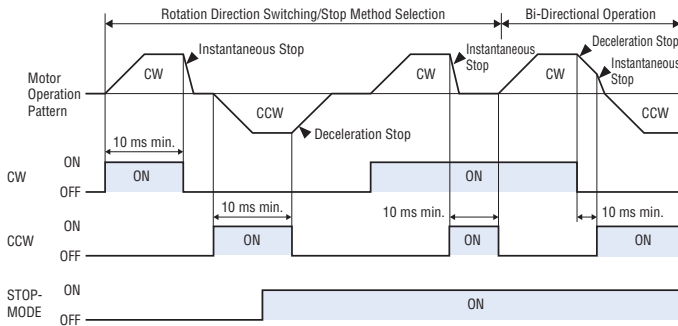
Use the terminals specified below for connection using crimp terminals. Please note that the applicable crimp terminal will vary depending on the size of the wire. The following terminals can be used with wires of AWG26 to 22.

- [Manufacturer: Phoenix Contact]
- Al 0.25-6 Applicable wire size : AWG26 to 24 (0.14 to 0.2 mm<sup>2</sup>)
- Al 0.34-6 Applicable wire size : AWG22 (0.3 mm<sup>2</sup>)



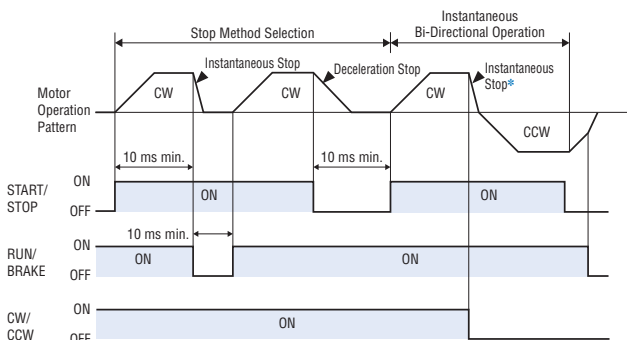
## ● Timing Chart

### ◇ 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



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

- 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.

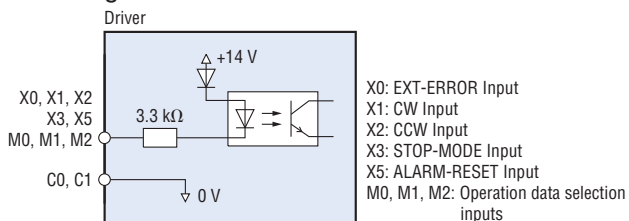
● **Input/Output Signal Circuits**

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

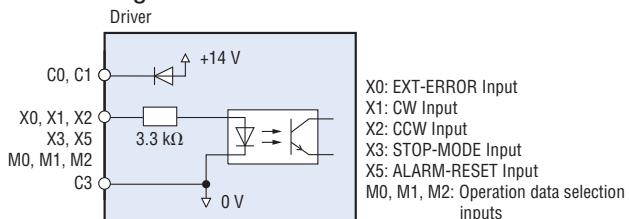
◇ **Input Circuit**

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

● **Sink Logic**



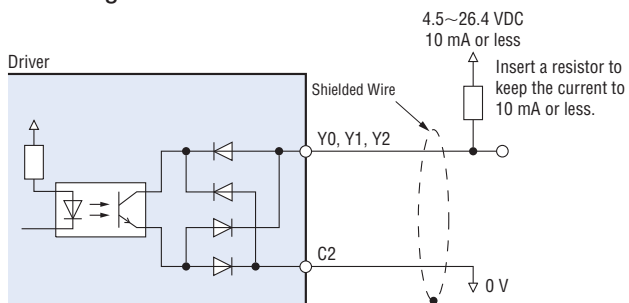
● **Source Logic**



◇ **Output Circuit**

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

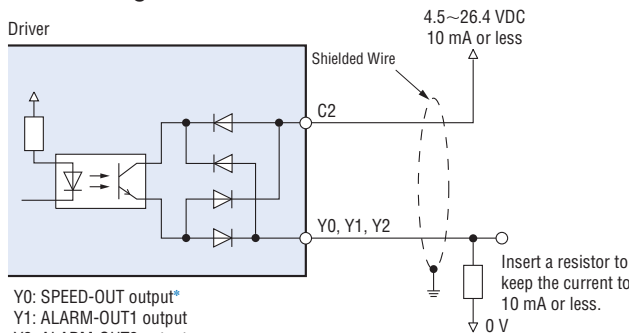
● **Sink Logic**



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**



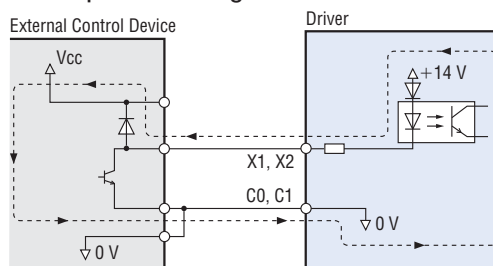
Y0: SPEED-OUT output\*  
Y1: ALARM-OUT1 output  
Y2: ALARM-OUT2 output

\*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**



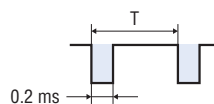
◇ **SPEED-OUT Output**

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.

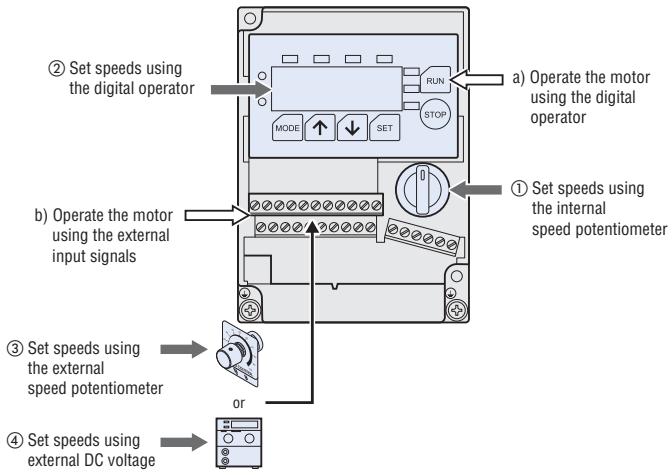
The overload warning function is activated based on a preset load factor relative to the rated torque. The ALARM-OUT2 output will turn OFF once the set load factor is exceeded.

(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



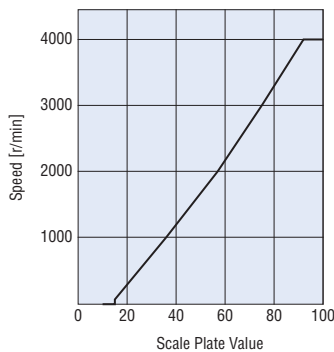
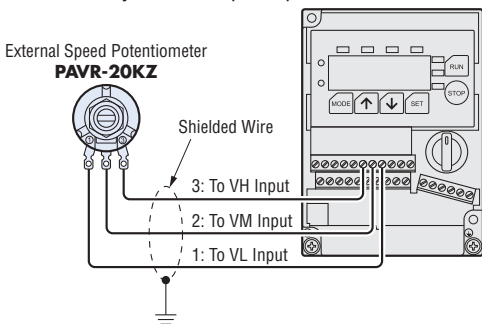
One of the following two operating methods (a and b) can be set by switching between the digital operator mode and external input signal mode.

- 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)

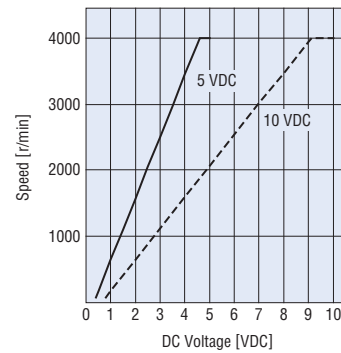
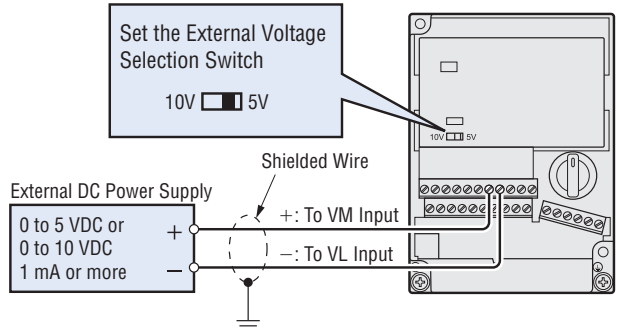
Note:

● 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:

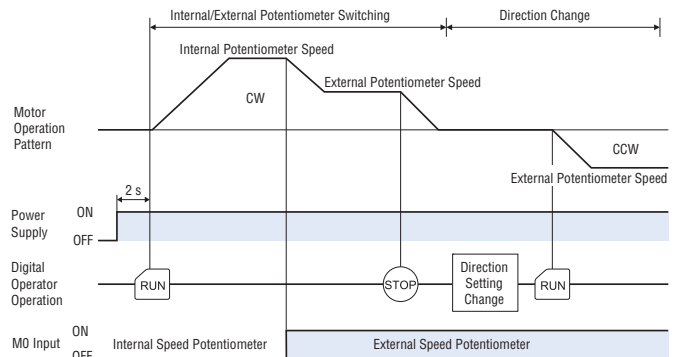
● The speed in the graph represents the speed of a motor alone. The gearhead output shaft speed of the combination type is calculated by dividing the graph speed by the gear ratio.

● 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.

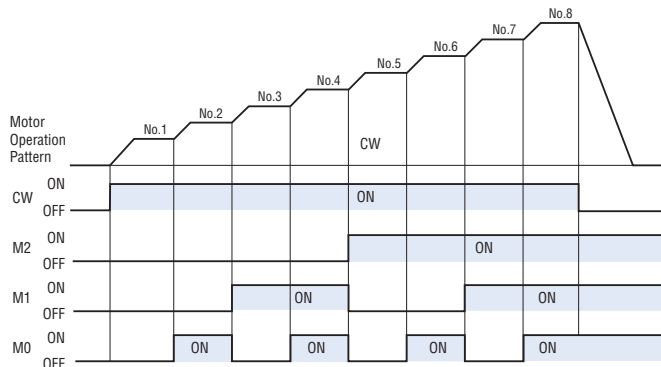
M0 Input	M1 Input	M2 Input	Speed Setting Method
OFF	OFF	OFF	Internal speed potentiometer
ON	OFF	OFF	External speed potentiometer



### ◇ 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:

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

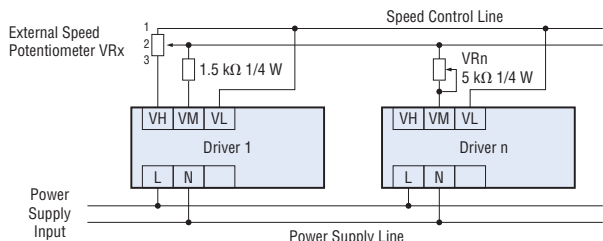
Example: When two drivers are connected

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

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 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:

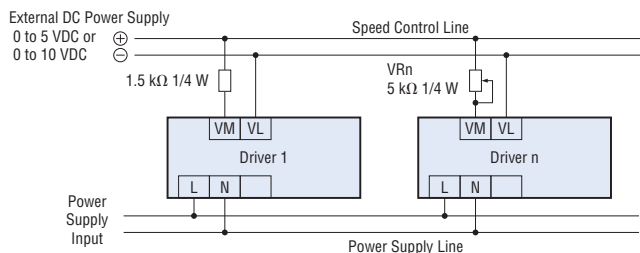
$$I = 1 \times n \text{ (mA)}$$

Example: When two drivers are connected

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

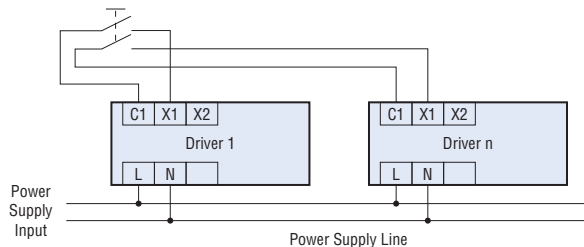
Accordingly, the power-supply capacity is calculated as 2 mA or more.

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

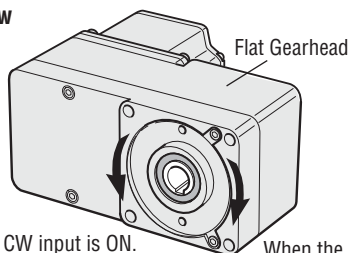
When multiple drivers are connected where the same data are set digitally in each driver, the operations of multiple motors can be controlled via an external input signal using the wiring circuit shown below.



## Rotation 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.

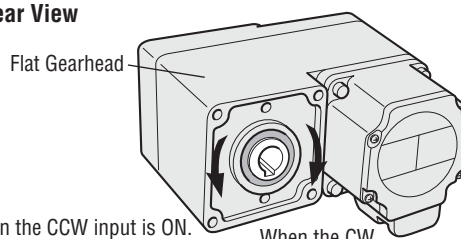
Front View



When the CW input is ON.

When the CCW input is ON.

Rear View



When the CCW input is ON.

When the CW input is ON.

## 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

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

### 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

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

### Round Shaft Type

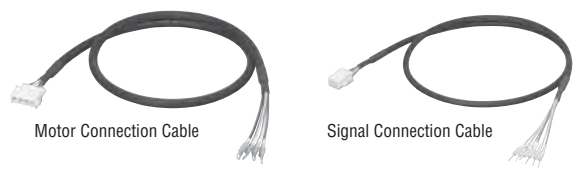
Output Power	Model	Motor Model	Driver Model
30W (1/25 HP)	BLF230A-A	BLFM230-A	BLFD30A2
	BLF230C-A		BLFD30C2
	BLF230S-A		BLFD30S2
60W (1/12 HP)	BLF460A-A	BLFM460-A	BLFD60A2
	BLF460C-A		BLFD60C2
	BLF460S-A		BLFD60S2
120W (1/6 HP)	BLF5120A-A	BLFM5120-A	BLFD120A2
	BLF5120C-A		BLFD120C2
	BLF5120S-A		BLFD120S2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



## ● Pinion Shaft Type

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

## Connection Cables (Sold separately) RoHS



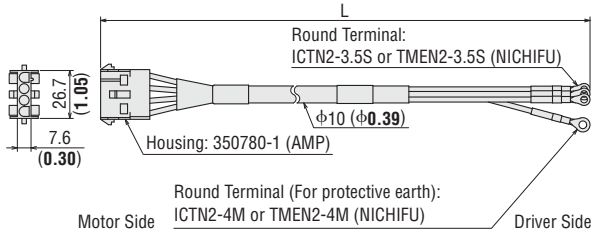
### Product Line

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

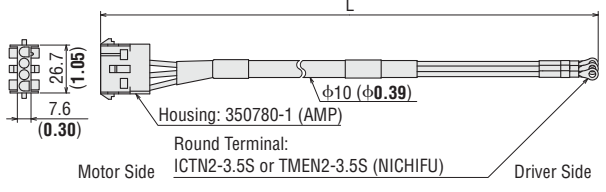
Model	Length: L [m (ft.)]
<b>CC01BLF</b>	1 (3.3)
<b>CC02BLF</b>	2 (6.6)
<b>CC03BLF</b>	3 (9.8)
<b>CC05BLF</b>	5 (16.4)
<b>CC07BLF</b>	7 (23.0)
<b>CC10BLF</b>	10 (32.8)
<b>CC15BLF</b>	15 (49.2)
<b>CC20BLF</b>	20 (65.6)

### Dimensions Unit = mm (in.)

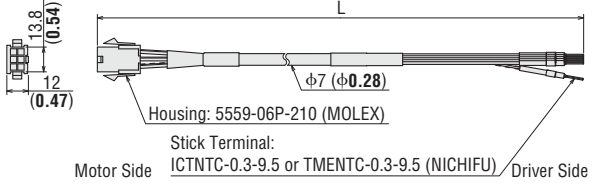
#### Motor Connection Cable L: 1 to 7 m (3.3 to 23.0 ft.)



#### Motor Connection Cable L: 10 to 20 m (32.8 to 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	Length: m (ft.)
<b>BLFHS-02</b>	2 (6.6)
<b>BLFHS-05</b>	5 (16.4)

