

Orientalmotor

HM-5293

BLH Series Motor

OPERATING MANUAL



Thank you for purchasing an Oriental Motor product.

This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.
- Only qualified personnel of electrical and mechanical engineering should work with the product.
- Use the product correctly after thoroughly reading the section "Safety precautions." In addition, be sure to observe the contents described in warning and caution in this document.
- The product described in this document is designed and manufactured to be incorporated in general industrial equipment. Do not use for any other purpose.
Oriental Motor Co., Ltd. is not responsible for any compensation for damage caused through failure to observe this warning.

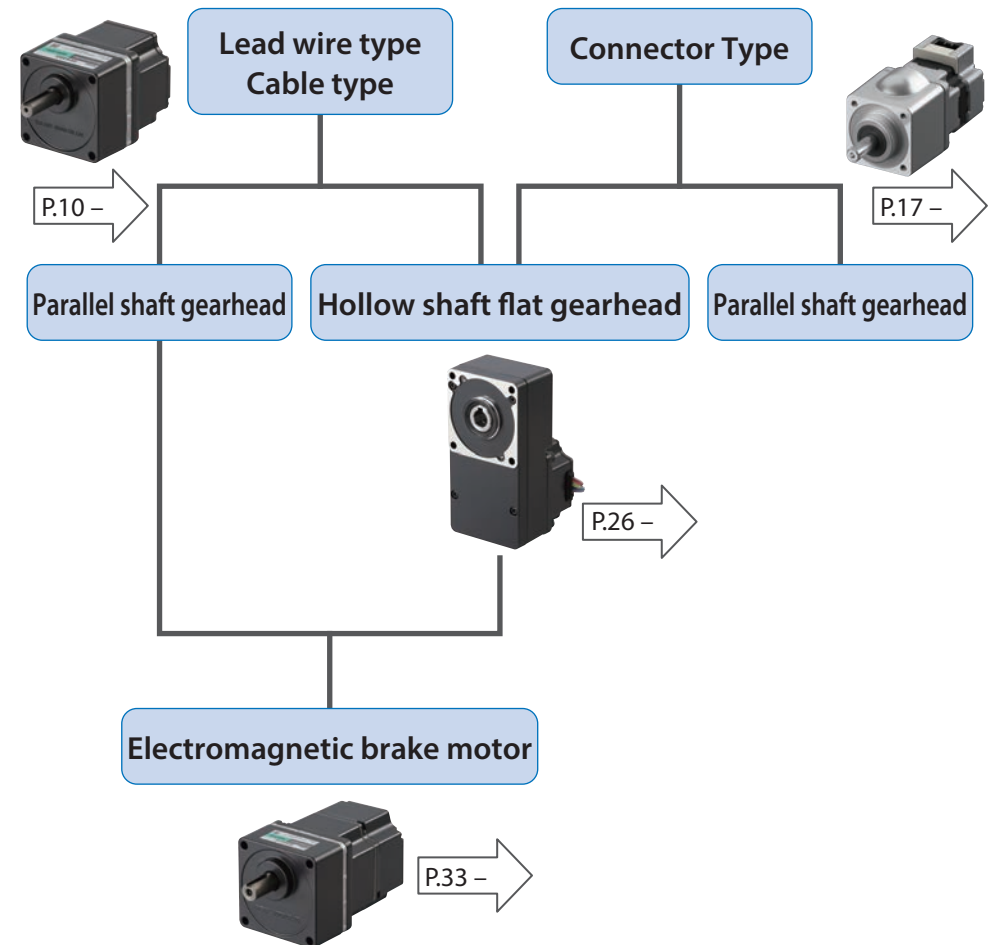
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Verify the model name of the purchased product against the model shown on the nameplate.

How to identify the product model

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1. Safety precautions



The precautions described below are intended to ensure the safe and correct use of the product, and to prevent the customer and others from exposure to the risk of injury. Use the product only after carefully reading and fully understanding these instructions.




Description of signs




 WARNING	Handling the product without observing the instructions that accompany a "WARNING" symbol may result in serious injury or death.
 CAUTION	Handling the product without observing the instructions that accompany a "CAUTION" symbol may result in injury or property damage.
 Note	The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.
 memo	The items under this heading contain related information and contents to gain a further understanding of the text in this manual.

Explanation of graphic symbols

	Indicates "prohibited" actions that must not be performed.
	Indicates "compulsory" actions that must be performed.

 WARNING	
	Do not use the product in explosive or corrosive environments, in the presence of flammable gases, in places subjected to splashing water, or near combustibles. Doing so may result in fire, electric shock, or injury.
	Do not transport, install, connect, or inspect the product while the power is supplied. Always turn off the power before carrying out these operations. This may result in electric shock or damage to equipment.
	Do not use the electromagnetic brake of the motor as a safety brake. Provide safety measures in equipment side. Failure to do so may result in injury or damage to equipment.
	Do not use a motor in a vertical application. If the driver protective function is activated, the motor will stop and the moving part may drop, thereby causing injury or damage to equipment.
	Do not machine or modify the cable. Doing so may result in fire or damage to equipment.
	Do not apply any excessive force to the motor connector. Doing so may result in fire or damage to equipment.
	Do not forcibly bend, pull or pinch the cable. Doing so may result in fire or damage to equipment.
	Do not touch the motor and driver when conducting the insulation resistance measurement or dielectric strength test. Accidental contact may result in electric shock.

 WARNING	
	Do not disassemble or modify the motor. Doing so may result in injury or damage to equipment. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.
	Only qualified and educated personnel should be allowed to perform installation, connection, operation and inspection/troubleshooting of the product. Handling by unqualified and uneducated personnel may result in fire, injury, or damage to equipment.
	Use a motor and a driver only in the specified combination. An incorrect combination may cause fire or damage to equipment.
	Install the motor inside an enclosure. Failure to do so may result in injury.
	Always turn off the power before performing maintenance or inspection. Failure to do so may result in electric shock.

 CAUTION	
	Do not use the motor beyond its specifications. Doing so may result in fire, injury, or damage to equipment.
	Do not touch the motor while operating or immediately after stopping. The surface of the motor is hot and it may cause a skin burn(s).
	Do not leave anything around the motor that would obstruct ventilation. Doing so may result in damage to equipment.
	Do not lift up the motor by holding the output shaft or the cable. Doing so may result in injury.
	Do not touch the motor output shaft (shaft end or pinion) with bare hands. Doing so may result in injury.
	When assembling the motor with the gearhead, exercise caution not to pinch your fingers or other parts of your body between the motor and gearhead. Injury may result.
	When installing the motor in equipment, exercise caution not to pinch your fingers or other parts of your body between the product and equipment. Injury may result.
	Do not touch the rotating part (output shaft) while operating the motor. Doing so may result in injury.
	Securely install the motor to the mounting plate. Inappropriate installation may cause the motor to detach and fall, resulting in injury or damage to equipment.
	Provide a cover over the rotating part (output shaft). Failure to do so may result in injury.
	Securely install a load on the output shaft. Inappropriate installation may result in injury.
	Be sure to ground the motor to prevent it from being damaged by static electricity. Failure to do so may result in fire or damage to equipment.
	The motor surface temperature may exceed 70 °C (158 °F) even under normal operating conditions. If the operator is allowed to approach the operating motor, attach a warning label as shown in the figure in a conspicuous position. Failure to do so may result in a skin burn(s).



Warning label

This section covers restrictions and requirements the user should consider when using the product.

Use a motor and a driver only in the specified combination.

■ Wiring

To connect a motor and a driver, always use the dedicated connection cable (sold separately). The maximum extension distance between a motor and a driver is 5 m (16.4 ft.). Limit the number of times so that attaching/detaching between the connection cable and the motor or driver will not exceed 30 times. Repeatedly attaching and detaching the connection cable may cause malfunction or damage to the motor or driver.

■ Installation circumstances

● Grease measures

On rare occasions, grease may ooze out from the gearhead. If there is concern over possible environmental contamination resulting from the leakage of grease, check for grease stains during regular inspections. Alternatively, install an oil pan or other device to prevent damage resulting from contamination. Grease leakage may lead to problems in the user's equipment or products.

● When using in low temperature environment

When the ambient temperature is low, the load torque may increase due to the oil seal or the viscosity of the grease used in the gearhead, and the output torque may decrease or the overload alarm may be generated. However, as time passes, the oil seal or grease is warmed up, and the motor can be operated without generating the overload alarm.

● Apply grease to the hollow output shaft of a hollow shaft flat gearhead.

When using a hollow shaft flat gearhead, apply grease (molybdenum disulfide grease, etc.) on the surface of the load shaft and inner walls of the hollow output shaft to prevent seizure.

■ Insulation resistance measurement and dielectric strength test

● Do not conduct the insulation resistance measurement or the dielectric strength test with the motor and driver connected.

Conducting the insulation resistance measurement or dielectric strength test with the motor and driver connected may result in damage to the product.

■ Operations

● Do not perform gravitational operation (vertical drive)

If this product is performed operation (i.e. gravitational operation) in which the motor output shaft is turned from the load side, the motor speed cannot be controlled. Also, if gravitational operation is performed, since the internal voltage of the driver may exceed the permissible value, the protective function may be activated. As a result, the motor may coast to a stop, causing the load to fall.

● Activate the electromagnetic brake to hold the position after the motor stops. (Electromagnetic brake motor only)

Do not use the electromagnetic brake built-in the motor for braking the output shaft (load) being rotated. Be sure to check the motor output shaft is stopped before activating the electromagnetic brake to hold the position.

● Rotation direction of the gearhead output shaft

The rotation direction of the gearhead output shaft may vary with that of the motor output shaft depending on the gear ratio of the gearhead.

Geared motor (15 W)

Gear ratio	Rotation direction of the gearhead output shaft
5, 10, 15, 50, 100	Same direction as the motor output shaft
20, 30	Opposite direction to the motor output shaft

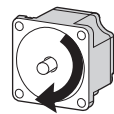
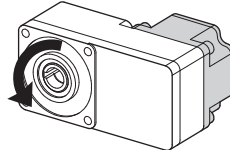
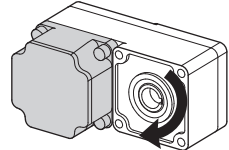
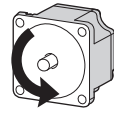
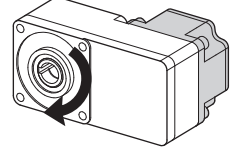
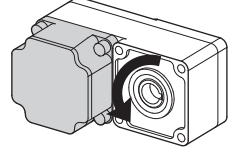
Parallel shaft gearhead, geared motor (30 W, 50 W)

Gear ratio	Rotation direction of the gearhead output shaft
5, 10, 15, 20, 200	Same direction as the motor output shaft
30, 50, 100	Opposite direction to the motor output shaft

Hollow shaft flat gearhead

The rotation directions of the gearhead output shaft relative to the motor output shaft are as shown in the figures below.

Check the operating manual of the driver for the rotation direction of the motor output shaft relative to the operation input signals of the driver.

Motor output shaft	Gearhead output shaft	
	Front	Rear
		
		

3.1 Package contents

Verify that the items listed below are included.

Report any missing or damaged items to the branch or sales office from which you purchased the product.

Tell us the model name, product serial number, and manufacturing date when you contact us.

■ Motor

● Pinion shaft type motor, Round shaft type motor

- Motor 1 unit
- Varistor* 1 piece
- Instructions and Precautions for Safe Use 1 copy

* Electromagnetic brake motor only

● Geared type motor

- Motor 1 unit
- Parallel key* 1 piece (Fixed to the output shaft)
- Instructions and Precautions for Safe Use 1 copy

* Frame size 60 mm (2.36 in.) only



The geared motor represents a single component that integrates a motor and a gearhead. Do not disassemble the gearhead from the motor.

■ Gearhead (sold separately)

● Parallel shaft gearhead

- Motor 1 unit
- Mounting screw 1 set
Hexagonal socket head screw, plain washer, spring washer, nut: 4 pieces each
Parallel key: 1 piece
- Screw for motor assembly 1 set
Hexagonal socket head screw: 2 pieces

● Hollow shaft flat gearhead

- Motor 1 unit
- Safety cover 1 set
Safety cover: 1 piece, mounting screw for safety cover: 2 pieces
- Mounting screw 1 set
Hexagonal socket head screw, plain washer, spring washer, nut: 4 pieces each
Parallel key: 1 piece
- Screw for motor assembly 1 set
Hexagonal socket head screw: 4 pieces

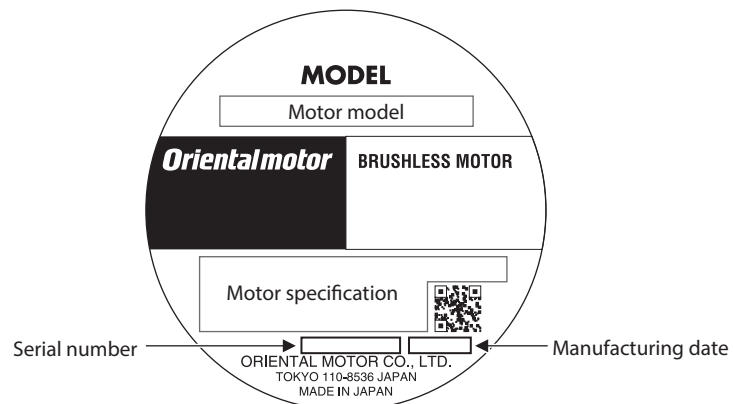
3.2 Information about nameplate

Tell us the model name, product serial number, and manufacturing date when you contact us.



The position describing the information may vary depending on the product.

Motor



Gearhead



3.3 How to identify the product model

Verify the model name of the purchased product against the model shown on the name plate of the product.

Motor

BLHM 4 50 K C M - GFS
 1 2 3 4 5 6 7

BLM 2 30 H K - 5 CS
 1 2 3 5 4 7 8

1	Motor type	BLHM, BLM: Brushless motor
2	Frame size	0: 42 mm (1.65 in.) 2: 60 mm (2.36 in.) 4: 80 mm (3.15 in.) 5: 90 mm (3.54 in.)
3	Output power	15: 15 W 30: 30 W 50: 50 W 100: 100 W
4	Power supply voltage	K: 24 VDC
5	Motor connection method	Blank: Lead wire type C: Cable type H: Connector type
6	Motor additional function	M: Electromagnetic brake motor
7	Gear ratio · motor shaft type	Number: Gear ratio of gearhead GFS: GFS pinion shaft type A: Round shaft type AC: Round shaft type (shaft flat)
8	Gearhead type	CS: CS geared motor

Gearhead (sold separately)

GFS 5 G 30 FR
 1 2 3 4

1	Pinion shaft type	GFS: GFS gearhead
2	Gearhead rame size	2: 60 mm (2.36 in.) 4: 80 mm (3.15 in.) 5: 90 mm (3.54 in.)
3	Gear ratio	Number: Gear ratio of gearhead
4	Gearhead type	Blank: Parallel shaft gearhead FR: Hollow shaft flat gearhead

4.1 Installation location

This section explains the installation method of a load in addition to the installation location and installation method of the product.

Common to all products

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature: 0 to +50 °C (+32 to +122 °F) (non-freezing)
- Operating ambient humidity 85 % or less (non-condensing)
- Area free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area free of excessive salt
- Area not subject to continuous vibrations or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum
- Altitude Up to 1000 m (3300 ft.) above sea level

Lead wire type, connector Type

- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids

Cable type

- Not exposed to oil (oil droplets) or chemicals.
The motor can be used in an environment where it is splashed with water (excluding the connectors and mounting surface of the round shaft type motor).
However, do not use it under water or in high water pressure.

4.2 Specifications

Check on the Oriental Motor Website for the product specifications.

4.3 General specifications

Operating environment	Ambient temperature	0 to +50 °C [+32 to +122 °F] (non-freezing)
	Ambient humidity	85 % or less (non-condensing)
	Altitude	Up to 1000 m (3300 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil. Cannot be used in radioactive materials, magnetic field, vacuum or other special environments.
	Vibration	Not subject to continuous vibrations or excessive impact. In conformance with JIS C 60068-2-6 "Sine-wave vibration test method" Frequency range: 10 to 55 Hz Pulsating amplitude: 0.15 mm Sweep direction: 3 directions (X, Y, Z) Number of sweeps: 20 times
Storage environment Shipping environment	Ambient temperature	-20 to +70 °C [-4 to +158 °F] (non-freezing)*
	Ambient humidity	85 % or less (non-condensing)
	Altitude	Up to 3000 m (10000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil. Cannot be used in radioactive materials, magnetic field, vacuum or other special environment.
Degree of protection	IP40	Lead wire type Connector type (when connecting the connector)
	IP65	Cable type (Excluding the mounting surface of the round shaft type motor and connectors)

* Electromagnetic brake motor: -25 to +70 °C [-13 to +158 °F] (non-freezing)

5.1 Inspection

It is recommended that periodic inspections are conducted for the items listed below after each operation of the motor. If an abnormality is generated, discontinue any use and contact your nearest Oriental Motor sales office.



Do not conduct the insulation resistance measurement or dielectric strength test with the motor and driver connected. Conducting the insulation resistance measurement or dielectric strength test with the motor and driver connected may result in damage to the product.

■ Inspection item

- Check if any of the mounting screws of the motor and gearhead is loose.
- Check if the bearing part (ball bearings) of the motor generates unusual noises.
- Check if the bearing part (ball bearings) or gear meshing part of the gearhead generates unusual noises.
- Check if the output shaft of the motor and gearhead and a load shaft are out of alignment.
- Check if a damage or stress is applied on the cable or the connection part between the cable and driver is loose.

5.2 Warranty

Check on the Oriental Motor Website for the product warranty.

5.3 Disposal

Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.

6. Regulations and standards

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■ UL Standards, CSA Standards

This product is recognized by UL under UL and CSA Standards.

■ EU RoHS Directive

This product does not contain the substances exceeding the restriction values.

7. Lead wire type, cable type

7.1 Combination tables

Check the against the model name shown on their nameplates.

Motor

The box (□) in the model name indicates a number representing the gear ratio.

Geared type motor

Output power	Motor model	□: Gear ratio
15 W	BLHM015K-□	5, 10, 15, 20, 30, 50, 100

For the geared type motor, the gearhead cannot be removed from the motor.

Pinion shaft type motor / Parallel shaft gearhead

Output power	Motor model	Applicable gearhead model	
		Model	□: Gear ratio
30 W	BLHM230K-GFS	GFS2G□	5, 10, 15, 20, 30, 50, 100, 200
	BLHM230KC-GFS		
50 W	BLHM450K-GFS	GFS4G□	
	BLHM450KC-GFS		
100 W	BLHM5100K-GFS	GFS5G□	
	BLHM5100KC-GFS		

Pinion shaft type motor / Hollow shaft flat gearhead

For details on the list of combinations and installation method, refer to p.26 and the following pages.

Round shaft type motor

Output power	Motor model
15 W	BLHM015K-A
30 W	BLHM230K-A
	BLHM230KC-A
50 W	BLHM450K-A
	BLHM450KC-A
100 W	BLHM5100K-A
	BLHM5100KC-A

Drivers that can be combined

Products with which the motors can be combined are listed below.

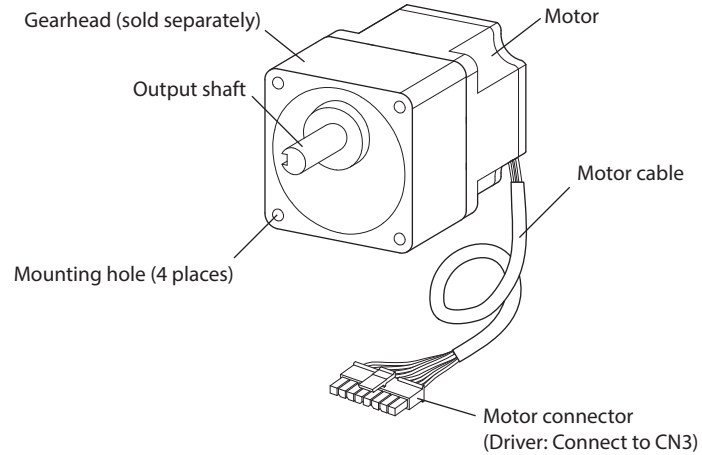


Output power	Motor model	Driver model (24 VDC)		
		Analog setting type	Digital setting type	RS-485 communication type
15 W	BLHM015K-□* BLHM015K-A	BLH2D15-K	BLH2D15-KD	BLH2D15-KR
30 W	BLHM230K-GFS BLHM230KC-GFS BLHM230K-A BLHM230KC-A	BLH2D30-K	BLH2D30-KD	BLH2D30-KR
50 W	BLHM450K-GFS BLHM450KC-GFS BLHM450K-A BLHM450KC-A	BLH2D50-K	BLH2D50-KD	BLH2D50-KR
100 W	BLHM5100K-GFS BLHM5100KC-GFS BLHM5100K-A BLHM5100KC-A	BLHD100K	-	-

* The box (□) in the model name indicates a number representing the gear ratio.

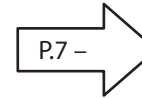
7.2 Names of parts

The figure shows the lead wire type.



7.3 Installation method

Maintenance and inspection

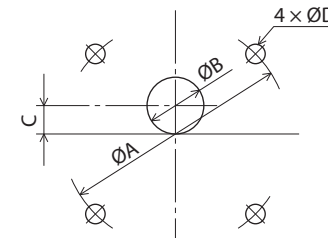


■ Assembling a motor and a gearhead

● Geared type motor

Note Do not install the motor to the mounting hole diagonally or assemble the motor forcibly. Doing so may damage the motor.

1. Drill mounting holes in the mounting plate.



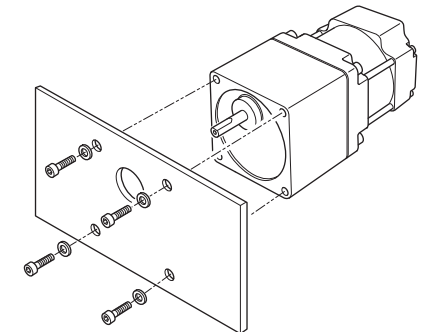
Unit: mm (in.)

Motor model	ØA	ØB*	C	ØD
BLHM015	43.8 (1.72)	16 (0.63)	8 (0.31)	4.5 (0.177)

* ØB indicates the external dimension of the product.
Drill holes with a minimum diameter of $\text{ØB} + 1 \text{ mm}$ (0.04 in.).
Provide a hole with a diameter of $\text{ØB} + 1 \text{ mm}$ (0.04 in.) or more.

2. Secure the product using hexagonal socket head screws (not included) through the four mounting holes. Do not leave a gap between the product and mounting plate. The effective depth of screw is 8 mm (0.31 in.).

Motor model	Screw size	Tightening torque [N·m (lb-in)]
BLHM015	M4	1.8 (15.9)



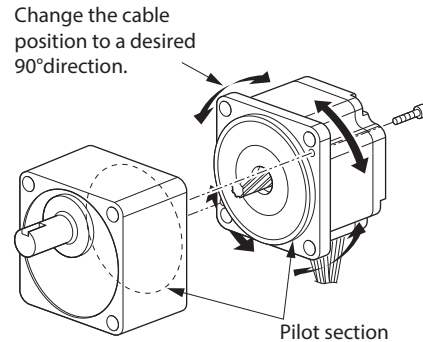
Note Fit the boss section on the gearhead mounting surface into a counterbore or through pilot-receiving hole.

7. Lead wire type, cable type

● Pinion shaft type motor / Parallel shaft gearhead

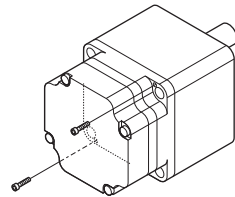
Note Do not install the motor to the mounting hole diagonally or assemble the motor forcibly. Doing so may damage the motor.

1. Keep the pilot sections of the motor and gearhead in parallel, and assemble the gearhead with the motor while slowly rotating it clockwise/counterclockwise. At this time, note so that the pinion of the motor output shaft does not hit the side panel or gears of the gearhead strongly.



2. Check that there is no gap between the motor and the gearhead, and tighten them using the hexagonal socket head screws (2 pieces) included with the gearhead.

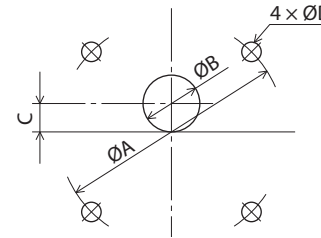
Gearhead model	Screw size	Tightening torque [N·m (lb-in)]
GFS2G GFS4G	M2.6	0.4 (3.5)
GFS5G	M3	0.6 (5.3)



Note

- Do not forcibly assemble the motor and gearhead. Also, do not allow metal objects or foreign substances to enter the gearhead. The pinion of the motor output shaft or gear may be damaged, resulting in noise or reduction in service life.
- Do not allow dust to attach to the pilot sections of the motor and gearhead. Also, take care not to pinch the O-ring on the motor pilot section. If the O-ring is crushed or severed, grease may leak from the gearhead.

3. Drill mounting holes in the mounting plate.



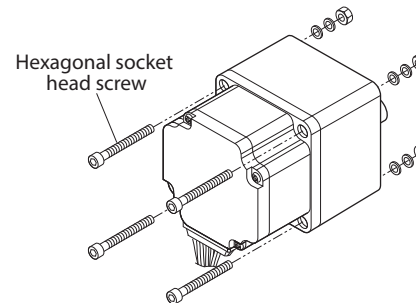
Unit: mm (in.)

Gearhead model	ØA	ØB *1	C	ØD	Maximum applicable plate thickness *2
GFS2G	70 (2.76)	24 (0.94)	10 (0.39)	4.5 (0.177)	5 (0.20)
GFS4G	94 (3.70)	34 (1.34)	13 (0.51)	6.5 (0.256)	8 (0.31)
GFS5G	104 (4.09)	40 (1.57)	18 (0.71)	8.5 (0.335)	12 (0.47)

*1 ØB indicates the external dimensions of the product.
Drill holes with a minimum diameter of ØB + 1 mm (0.04 in.).
Provide a hole with a diameter of ØB + 1 mm or more.

*2 The values in the table indicate when the mounting screw set (included with the gearhead) is used.

4. Use the mounting screw set (included with the gearhead) to secure the product through the four mounting holes so that there is no gap between the product and the mounting plate to be installed.



Gearhead model	Screw size	Tightening torque [N·m (lb-in)]
GFS2G	M4	1.8 (15.9)
GFS4G	M6	6.4 (56)
GFS5G	M8	15.5 (137)

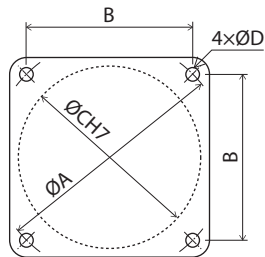
7. Lead wire type, cable type

● Round shaft type motor



Do not install the motor to the mounting hole diagonally or assemble the motor forcibly. Doing so may damage the motor.

1. Drill mounting holes in the mounting plate.



Unit: mm (in.)

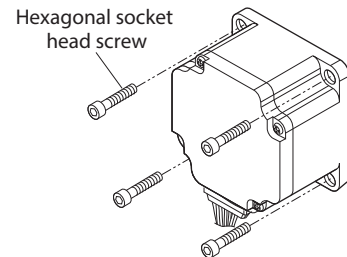
Motor model	ØA	B	ØCH7	ØD
BLHM015	48 (1.89)	33.94 (1.34)	$37.6^{+0.025}_0$ ($1.4803^{+0.0010}_0$)	3.5 (0.138)
BLHM230	70 (2.76)	49.5 (1.95)	$54^{+0.030}_0$ ($2.1260^{+0.0012}_0$)	4.5 (0.177)
BLHM450	94 (3.70)	66.47 (2.62)	$73^{+0.030}_0$ ($2.8740^{+0.0012}_0$)	6.5 (0.256)
BLHM5100	104 (4.09)	73.54 (2.90)	$83^{+0.035}_0$ ($3.2677^{+0.0014}_0$)	8.5 (0.335)

ØC indicates the pilot diameter on the flange.

2. Secure the product using hexagonal socket head screws (not included) through the four mounting holes.
Do not leave a gap between the product and mounting plate.

Applicable mounting screws

Motor model	Screw size	Tightening torque [N·m (lb-in)]
BLHM015	M3	1 (8.8)
BLHM230	M4	1.8 (15.9)
BLHM450	M6	6.4 (56)
BLHM5100	M8	15.5 (137)



Install the motor to a mounting plate of the following size or larger, so that the motor case temperature will not exceed 90 °C (194 °F).

(The **BLHM015** has no limitation on the mounting plate size.)

Motor model	Size of mounting plate [mm (in.)]	Thickness [mm (in.)]	Material
BLHM230	115×115 (4.53×4.53)	5 (0.20)	Aluminum alloy
BLHM450	135×135 (5.31×5.31)		
BLHM5100	200×200 (7.87×7.87)		

■ Installing a load

When installing a load, align the center of the output shaft with the center of the load shaft.

Note

- When coupling with a load, pay attention to centering, belt tension, parallelism of pulleys, etc. Also, firmly secure the tightening screws of the coupling or pulleys.
- When installing a load, do not damage the output shaft or bearing. Forcibly inserting the load by driving it with a hammer may damage the bearing. Do not apply any excessive force to the output shaft.
- Do not modify or machine the output shaft. This may damage the bearing, resulting in damage to the motor and gearhead.

● Output shaft shape

Pinion shaft type motor / Parallel shaft gearhead

A key slot is provided on the output shaft of gearhead. Form a key slot on the load side, and secure the load using the included parallel key.

Gearhead model	Parallel key dimension
GFS2G	4 mm (0.1575 in.)
GFS4G	5 mm (0.1969 in.)
GFS5G	6 mm (0.2362 in.)

Geared type motor, Round shaft type motor

A flat section is provided on the output shaft of the geared type motor and round shaft type motor. Apply a double-point screw, etc., at the flat section to firmly secure the load and prevent it from spinning.

● How to install a load

Using a coupling

Align the centerline of the motor or gearhead output shaft with the centerline of the load shaft.

Using a belt

Adjust the motor or gearhead output shaft to lie parallel with the load shaft, and form right angles between the output shaft/load shaft and the line connecting the centers of both pulleys.

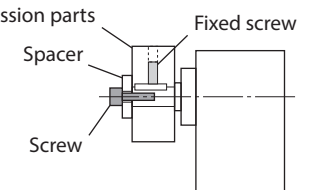
Using a gear

Adjust the motor or gearhead output shaft to lie parallel with the gear shaft, and allow the output shaft to mesh correctly with the centers of the gear teeth.

When using the output shaft end tapped hole of a gearhead (Excluding **GFS2G**)

Use a tap hole provided at the end of the output shaft as an auxiliary means for preventing the transfer mechanism from disengaging.

Gearhead model	Screw size	Effective depth
GFS4G	M5	10 mm (0.39 in.)
GFS5G	M6	12 mm (0.47 in.)



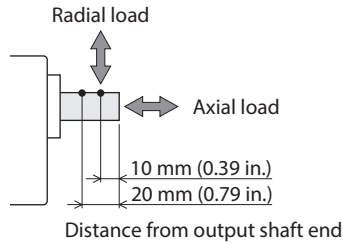
7. Lead wire type, cable type

■ Permissible radial load and permissible axial load

Make sure a radial load and axial load applied to the output shaft will not exceed the permissible values shown in the table below.

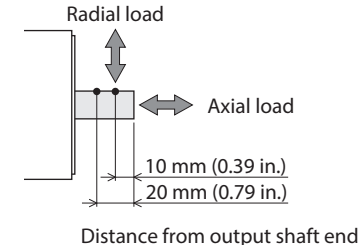
Note Failure due to fatigue may occur when the motor or gearhead bearings and output shaft are subject to repeated loading by a radial or axial load that is in excess of the permissible limit.

● Geared type motor, Pinion shaft type motor / Parallel shaft gearhead



Motor model/Gearhead model	□: Gear ratio	Permissible radial load [N (lb.)] Distance from output shaft end of pthe gearhead		Permissible axial load [N (lb.)]
		10 mm (0.39 in.)	20 mm (0.79 in.)	
BLHM015K -□ (Geared type motor)	5 to 100	50 (11.2)	-	30 (6.7)
BLHM230K-GFS/GFS2G □ BLHM230KC-GFS/GFS2G □	5	100 (22)	150 (33)	40 (9)
	10 to 20	150 (33)	200 (45)	
BLHM450K-GFS/GFS4G □ BLHM450KC-GFS/GFS4G □	30 to 200	200 (45)	300 (67)	100 (22)
	5	200 (45)	250 (56)	
	10 to 20	300 (67)	350 (78)	
BLHM5100K-GFS/GFS5G □ BLHM5100KC-GFS/GFS5G □	30 to 200	450 (101)	550 (123)	150 (33)
	5	300 (67)	400 (90)	
	10 to 20	400 (90)	500 (112)	
	30 to 200	500 (112)	650 (146)	

● Round shaft type motor

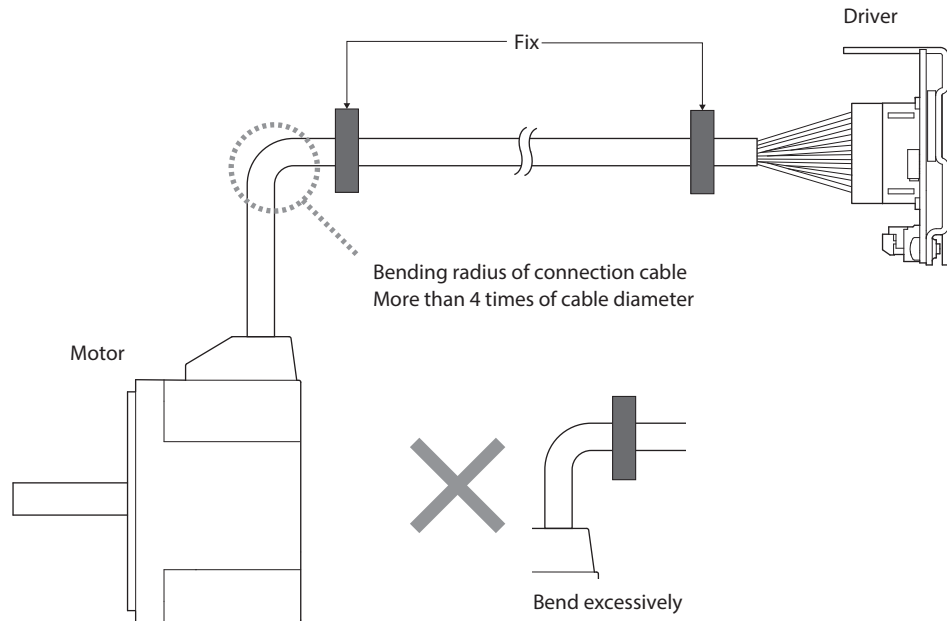


Motor model	Permissible radial load [N (lb.)] Distance from output shaft end of pthe motor		Permissible load Axial load [N (lb.)]
	10 mm (0.39 in.)	20 mm (0.79 in.)	
BLHM015	50 (11.2)	-	5 (1.12)
BLHM230	70 (15.7)	100 (22)	15 (3.3)
BLHM450	120 (27)	140 (31)	20 (4.5)
BLHM5100	160 (36)	170 (38)	25 (5.6)

7.4 Connection and grounding

Notes about wiring

Fix the connection cable near each connection part of the connectors on the motor and driver sides to prevent from applying stress on the connection parts.



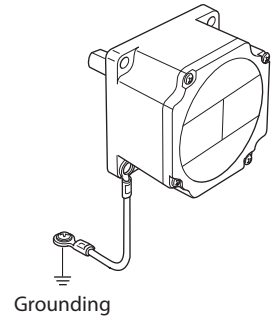
Note

When fixing the connection cable, do not excessively bend it near the connection part of the connector. Applying stress on the connector or terminals due to self-weight or bending of the connection cable may cause poor contact or disconnection.

Grounding

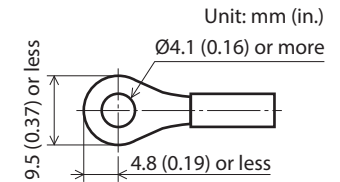
Ground the motor using one of the four mounting holes on the motor frame shown in the figure. If the mounting surface of the gearhead is coated with paint, remove the paint and install to a metal surface that has grounded.

The wire used to ground the motor must be as thick and short to the grounding point as possible so that no potential difference is generated. Choose a large, thick and uniformly conductive surface for the grounding point.



Ground wire with terminal

- Applicable crimp terminal: Insulated round crimp terminal
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)
- Screw size: M4
- Tightening torque: 1.2 N·m (10.6 lb-in)



Note

Be sure to ground the motor and driver. Failure to do so may result in electric shock or damage to the product. Static electricity may cause damage to the product if the protective earth terminals are not grounded.



Refer to the operating manual of the driver for the operating method.

8.1 Combination tables

Check the against the model name shown on their nameplates.

■ Motor

● Geared type motor

Output power	Motor model	□: Gear ratio
15 W	BLM015HK-□	5, 10, 15, 20, 30, 50, 100
	BLM015HK-□CS	5, 10, 15, 20
30 W	BLM230HK-□CS	

For the geared type motor, the gearhead cannot be removed from the motor.

● Pinion shaft type motor / Parallel shaft gearhead

Output power	Motor model	Applicable gearhead model	
		Model	□: Gear ratio
30 W	BLM230HK-GFS	GFS2G□	5, 10, 15, 20, 30, 50, 100
50 W	BLM450HK-GFS	GFS4G□	

● Pinion shaft type motor / Hollow shaft flat gearhead

For details on the list of combinations and installation method, refer to p.26 and the following pages.

● Round shaft type motor

Output power	Motor model
15 W	BLM015HK-A
30 W	BLM230HK-A
50 W	BLM450HK-A

● Round shaft type motor (shaft flat)

Output power	Motor model
15 W	BLM015HK-AC
30 W	BLM230HK-AC
50 W	BLM450HK-AC

■ Drivers possible to combine

Products with which the motors can be combined are listed below.



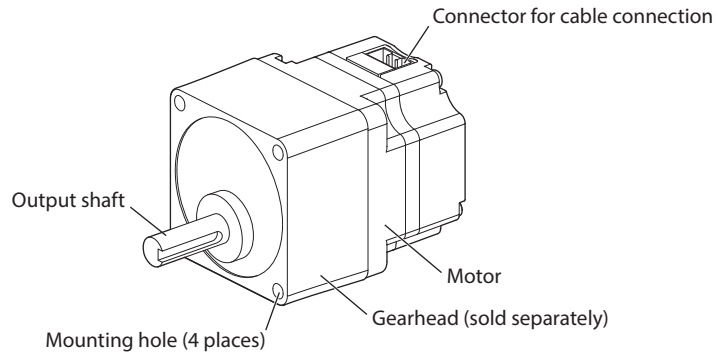
Output power	Motor model	Driver model (24 VDC)		
		Analog setting type	Digital setting type	RS-485 communication type
15 W	BLM015HK-□* BLM015HK-□CS* BLM015HK-A BLM015HK-AC	BLH2D15H-K	BLH2D15H-KD	BLH2D15H-KR
30 W	BLM230HK-□CS* BLM230HK-GFS BLM230HK-A BLM230HK-AC	BLH2D30H-K	BLH2D30H-KD	BLH2D30H-KR
50 W	BLM450HK-GFS BLM450HK-A BLM450HK-AC	BLH2D50H-K	BLH2D50H-KD	BLH2D50H-KR

* The box (□) in the model name indicates a number representing the gear ratio.

8.2 Names of parts

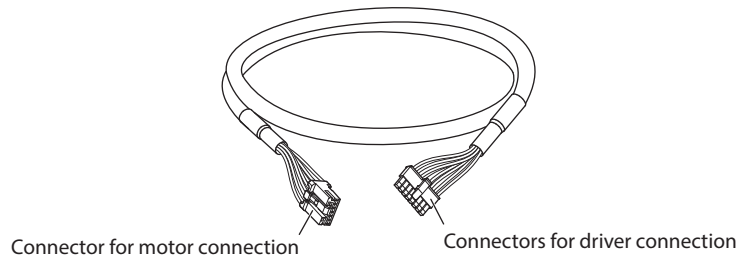
Motor

The figure shows the pinion shaft type motor / Parallel shaft gearhead.



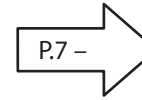
Connection cable (sold separately)

To connect a motor and a driver, always use the dedicated connection cable (sold separately). The figure shows a connection cable of 1 m (3.3 ft.) to 5 m (16.4 ft.) length. The connection cable of 0.5 m (1.6 ft.) length is the lead wire type.



8.3 Installation method

Maintenance and inspection



Assembling a motor and a gearhead

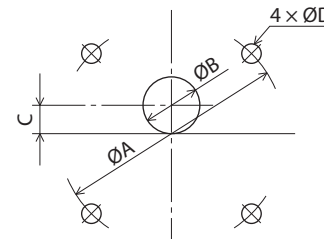
Geared type motor (BLM015HK-□)

The box (□) in the model name indicates a number representing the gear ratio.



Do not install the motor to the mounting hole diagonally or assemble the motor forcibly. Doing so may damage the motor.

1. Drill mounting holes in the mounting plate.

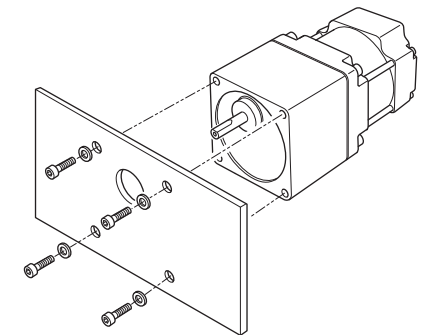


Motor model	ØA	ØB*	C	ØD
BLM015HK-□	43.8 (1.72)	16 (0.63)	8 (0.31)	4.5 (0.177)

Unit: mm (in.)
 * ØB indicates the external dimension of the product.
 Drill holes with a minimum diameter of $\text{ØB} + 1 \text{ mm}$ (0.04 in.).
 Provide a hole with a diameter of $\text{ØB} + 1 \text{ mm}$ (0.04 in.) or more.

2. Secure the product using hexagonal socket head screws (not included) through the four mounting holes. Do not leave a gap between the product and mounting plate. The effective depth of screw is 8 mm (0.31 in.).

Motor model	Screw size	Tightening torque [N·m (lb-in)]
BLM015HK-□	M4	2.0 (17.7)



Fit the boss section on the gearhead mounting surface into a counterbore or through pilot-receiving hole.

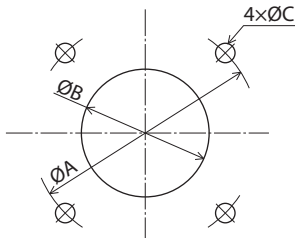
8. Connector type

● Geared type motor (BLM015HK-□CS)

The box (□) in the model name indicates a number representing the gear ratio.

Note Do not install the motor to the mounting hole diagonally or assemble the motor forcibly. Doing so may damage the motor.

1. Drill mounting holes in the mounting plate.



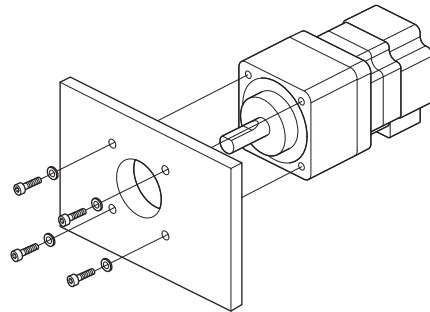
Unit: mm (in.)

Motor model	ØA	ØB*	ØC
BLM015HK-□CS	43.8 (1.72)	26 (1.02)	4.5 (0.18)

* ØB indicates the external dimensions of the product.
 Drill holes with a minimum diameter of ØB + 1 mm (0.04 in.).
 Provide a hole with a diameter of ØB + 1 mm (0.04 in.) or more.

2. Secure the product using hexagonal socket head screws (not included) through the four mounting holes. Do not leave a gap between the product and mounting plate. The effective depth of screw is 8 mm (0.31 in.).

Motor model	Screw size	Tightening torque [N·m (lb-in)]
BLM015HK-□CS	M4	2.0 (17.7)



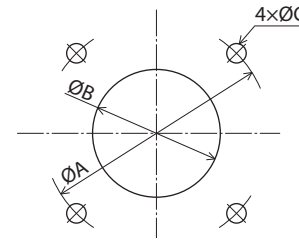
Note Fit the boss section on the gearhead mounting surface into a counterbore or through pilot-receiving hole.

● Geared type motor (BLM230HK-□CS)

The box (□) in the model name indicates a number representing the gear ratio.

Note Do not install the motor to the mounting hole diagonally or assemble the motor forcibly. Doing so may damage the motor.

1. Drill mounting holes in the mounting plate.

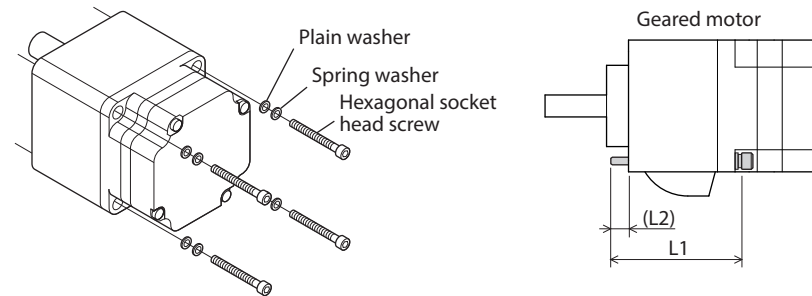


Unit: mm (in.)

Motor model	ØA	ØB*1	ØC	Maximum applicable plate thickness *2
BLM230HK-□CS	70 (2.76)	37 (1.46)	4.5 (0.177)	5 (0.20)

*1 ØB indicates the external dimensions of the product.
 Drill holes with a minimum diameter of ØB + 1 mm (0.04 in.).
 Provide a hole with a diameter of ØB + 1 mm (0.04 in.) or more.
 *2 The values in the table indicate when the mounting screw set (included with the gearhead) is used.

2. Use the mounting screw set (included with the gearhead) to secure the product through the four mounting holes so that there is no gap between the product and the mounting plate to be installed.

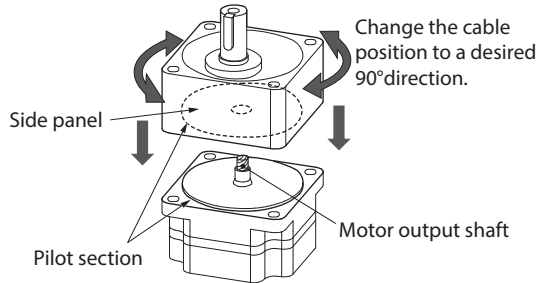


Motor model	□: Gear ratio	Hexagonal socket head screw			Tightening torque [N·m (lb-in)]
		Screw size	L1 [mm (in.)]	L2 [mm (in.)]	
BLM230HK-□CS	5 to 20	M4	60 (2.36)	10 (0.39)	2.0 (17.7)

● Pinion shaft type motor / Parallel shaft gearhead

Note Do not install the motor to the mounting hole diagonally or assemble the motor forcibly. Doing so may damage the motor.

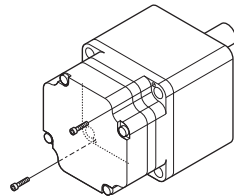
1. Keep the pilot sections of the motor and gearhead in parallel, and assemble the gearhead with the motor while slowly rotating it clockwise/counterclockwise. At this time, note so that the motor output shaft does not hit the side panel or gears of the gearhead strongly.



Assemble the gearhead to the motor in a condition where the motor output shaft is in an upward direction.

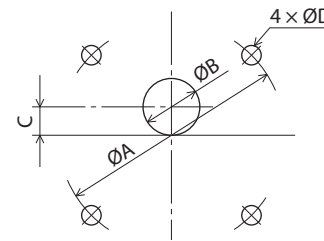
2. Check that there is no gap between the motor and the gearhead, and tighten them using the hexagonal socket head screws (2 pieces) included with the gearhead.

Gearhead model	Screw size	Tightening torque [N·m (lb-in)]
GFS2G GFS4G	M2.6	0.4 (3.5)



- Note**
- Do not forcibly assemble the motor and gearhead. Also, prevent metal objects or foreign substances from entering in the gearhead. The motor output shaft or gear may be damaged, resulting in noise or shorter service life.
 - Do not allow dust to attach to the pilot sections of the motor and gearhead. Also, assemble the motor and gearhead carefully by not pinching the O-ring at the motor pilot section. If the O-ring is crushed or severed, grease may leak from the gearhead.

3. Drill mounting holes in the mounting plate.

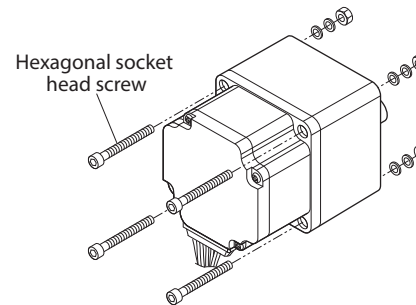


Unit: mm (in.)

Gearhead model	ØA	ØB*1	C	ØD	Maximum applicable plate thickness *2
GFS2G	70 (2.76)	24 (0.94)	10 (0.39)	4.5 (0.177)	5 (0.20)
GFS4G	94 (3.70)	34 (1.34)	13 (0.51)	6.5 (0.256)	8 (0.31)

*1 ØB indicates the external dimensions of the product. Drill holes with a minimum diameter of ØB + 1 mm (0.04 in.). Provide a hole with a diameter of ØB + 1 mm (0.04 in.) or more.
*2 The values in the table indicate when the mounting screw set (included with the gearhead) is used.

4. Use the mounting screw set (included with the gearhead) to secure the product through the four mounting holes so that there is no gap between the product and the mounting plate to be installed.

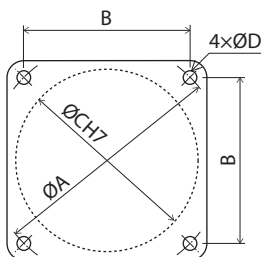


Gearhead model	Screw size	Tightening torque [N·m (lb-in)]
GFS2G	M4	2.0 (17.7)
GFS4G	M6	5.0 (44)

8. Connector type

● Round shaft type motor

1. Drill mounting holes in the mounting plate.



Unit: mm (in.)

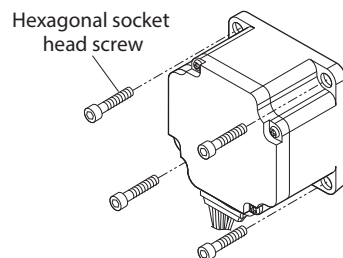
Motor model	ØA	B	ØCH7	ØD
BLM015	48 (1.89)	33.94 (1.34)	37.6 ^{+0.025} ₀ (1.4803 ^{+0.0010})	3.5 (0.138)
BLM230	70 (2.76)	49.5 (1.95)	54 ^{+0.030} ₀ (2.1260 ^{+0.0012})	4.5 (0.177)
BHM450	94 (3.70)	66.47 (2.62)	73 ^{+0.030} ₀ (2.8740 ^{+0.0012})	6.5 (0.256)

ØC indicates the pilot diameter on the flange.

2. Secure the motor using the hexagonal socket head screws (not included) through the four mounting holes. Install so that there is no gap between the product and the mounting plate.

Applicable mounting screws

Motor model	Screw size	Tightening torque [N·m (lb·in)]
BLM015	M3	1 (8.8)
BLM230	M4	1.8 (15.9)
BLM450	M6	6.4 (56)



Install the motor to a mounting plate of the following size or larger, so that the motor case temperature will not exceed 90 °C (194 °F).

Motor model	Size of mounting plate [mm (in.)]	Thickness [mm (in.)]	Material
BLM015 BLM230	115×115 (4.53×4.53)	5 (0.20)	Aluminum alloy
BLM450	135×135 (5.31×5.31)		

■ Installing a load

When installing a load, align the centers of the output shaft and load.

Note

- When installing a load, pay attention to centering, belt tension, parallelism of pulleys, etc. Also, firmly secure the tightening screws of the coupling or pulleys.
- When installing a load, do not damage the output shaft or the bearings. Forcibly inserting the load by driving it with a hammer may damage the bearing. Do not apply any excessive force to the output shaft.
- Do not modify or machine the output shaft. This may damage the bearing, resulting in damage to the motor and gearhead.

● Output shaft shape

The box (□) in the model name indicates a number representing the gear ratio.

Geared type motor (**BLM230HK-□CS**), Pinion shaft type motor / Parallel shaft gearhead

A key slot is provided on the output shaft. Form a key slot on the load side and secure the load using the included parallel key.

Motor model	Parallel key dimension
BLM230HK-□CS	3 mm (0.1181 in.)
BLM230HK-GFS	4 mm (0.1575 in.)
BLM450HK-GFS	5 mm (0.1969 in.)

Geared type motor (**BLM015HK-□**, **BLM015HK-□CS**), Round shaft type motor

A flat section is provided on the output shaft. Apply a double-point screw, etc., at the flat section to firmly secure the load and prevent it from spinning.

● How to install a load

Using a coupling

Align the centers of the output shaft and load shaft in a straight line.

Using a belt

Align the output shaft and load shaft in parallel with each other, and position both pulleys so that the line connecting their centers is at a right angle to the shafts.

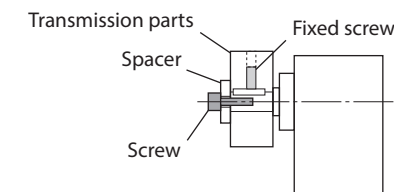
Using a gear drive

Align the output shaft and gear shaft in parallel with each other, and let the gears mesh at the center of the tooth widths.

When using the output shaft end tapped hole of a gearhead (Excluding **GFS2G**)

Use a tapped hole provided at the end of the output shaft as an auxiliary means for preventing the transfer mechanism from disengaging.

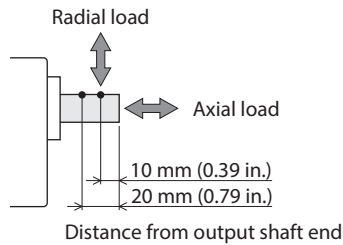
Gearhead model	Screw size	Effective depth
GFS4G	M5	10 mm (0.39 in.)



■ Permissible radial load and permissible axial load

Make sure a radial load and axial load applied to the output shaft will not exceed the permissible values shown in the table below.

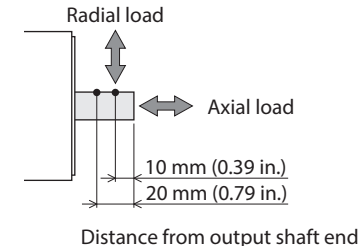
Note Failure due to fatigue may occur when the motor or gearhead bearings and output shaft are subject to repeated loading by a radial or axial load that is in excess of the permissible limit.



● Geared type motor, Pinion shaft type motor / Parallel shaft gearhead

Motor model/Gearhead model	□: Gear ratio	Permissible radial load [N (lb.)] Distance from output shaft end of pthe gearhead		Permissible load Axial load [N (lb.)]
		10 mm (0.39 in.)	20 mm (0.79 in.)	
BLM015HK-□ (Geared type motor)	5 to 100	50 (11.2)	-	30 (6.7)
BLM015HK-□CS (Geared type motor)	5	50 (11.2)	-	40 (9.0)
	10 to 20	80 (18)		
BLM230HK/GFS2G□	5	100 (22)	150 (33)	40 (9.0)
	10 to 20	150 (33)	200 (45)	
	30 to 100	200 (45)	300 (67)	
BLM230HK-□CS (Geared type motor)	5	150 (33)	190 (42)	70 (15.7)
	10 to 20	200 (45)	260 (58)	
BLM450HK/GFS4G□	5	200 (45)	250 (56)	100 (22)
	10 to 20	300 (67)	350 (78)	
	30 to 100	450 (101)	550 (123)	

● Round shaft type motor



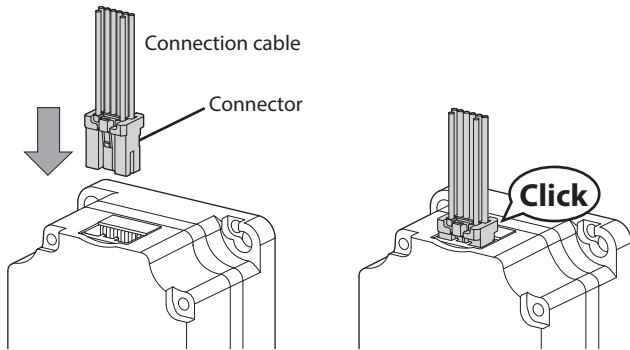
Motor model	Permissible radial load [N (lb.)] Distance from output shaft end of pthe motor		Permissible load Axial load [N (lb.)]
	10 mm (0.39 in.)	20 mm (0.79 in.)	
BLM015	50 (11.2)	-	5 (1.12)
BLM230	70 (15.7)	100 (22)	15 (3.3)
BLM450	120 (27)	140 (31)	20 (4.5)

8.4 Connection and grounding

■ Connecting the motor and the connection cable

● Connecting the connection cable to the motor

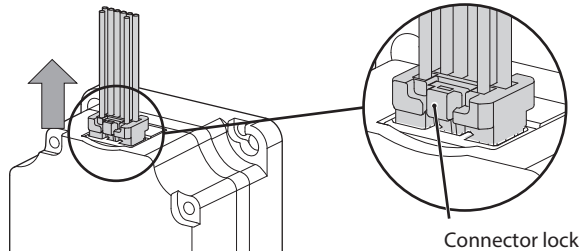
Hold the connector main body of the connection cable, and insert the connector until making a clicking noise.



Note Make sure to insert the connector securely. Insecure connector connection may cause malfunction.

● Removing the connection cable from the motor

Hold the connector main body and pull out the connector while pressing the connector lock. Do not apply stress on the connection part of the lead wires and connector.

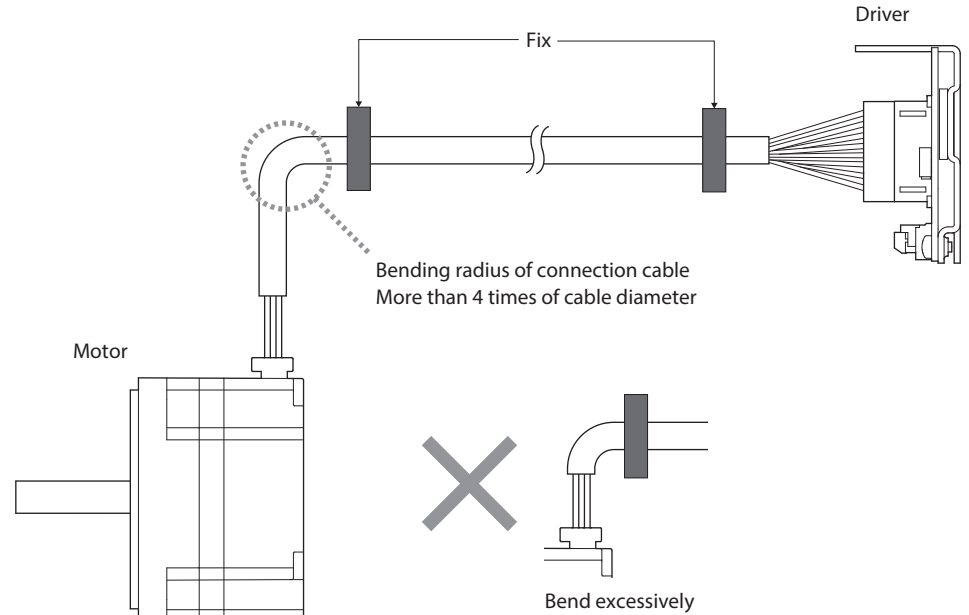


Note

- Be sure to insert and pull out the connector while holding the connector part. Failure to do so may result in damage to the connector and the motor.
- Do not lift up the product by holding the connection cable. Doing so may result in damage to the product.

■ Notes about wiring

Fix the connection cable near each connection part of the connectors on the motor and driver sides to prevent from applying stress on the connection parts.

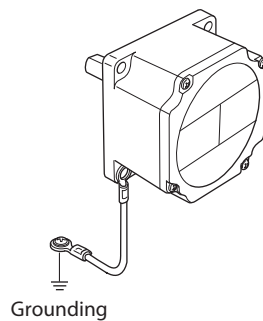


Note When fixing the connection cable, do not excessively bend it near the connection part of the connector. Applying stress on the connector or terminals due to self-weight or bending of the connection cable may cause poor contact or disconnection.

■ Grounding

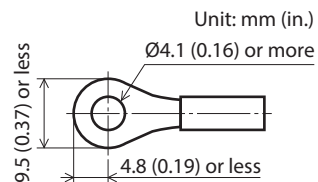
Ground the motor using one of the four mounting holes on the motor frame shown in the figure. If the mounting surface of the gearhead is coated with paint, remove the paint and install to a metal surface that has grounded.

The wire used to ground the motor must be as thick and short to the grounding point as possible so that no potential difference is generated. Choose a large, thick and uniformly conductive surface for the grounding point.



Ground wire with terminal

- Applicable crimp terminal: Insulated round crimp terminal
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)
- Screw size: M4
- Tightening torque: 1.2 N·m (10.6 lb-in)



Note

Be sure to ground the motor and driver. Failure to do so may result in electric shock or damage to the product. Static electricity may cause damage to the product if the protective earth terminals are not grounded.

Inspection and maintenance [P.8 –](#) Regulations and standards [P.9 –](#)

Refer to the operating manual of the driver for the operating method.

9.1 Combination tables

Check the against the model name shown on their nameplates.

■ Motor

● Lead wire type, cable type

Pinion shaft type motor / Hollow shaft flat gearhead

Output power	Motor model	Applicable gearhead model	
		Model	□: Gear ratio
30 W	BLHM230K-GFS	GFS2G□FR	5, 10, 15, 20, 30, 50, 100, 200
	BLHM230KC-GFS		
50 W	BLHM450K-GFS	GFS4G□FR	
	BLHM450KC-GFS		
100 W	BLHM5100K-GFS	GFS5G□FR	
	BLHM5100KC-GFS		

Electromagnetic brake motor pinion shaft type motor / Hollow shaft flat gearhead

Output power	Motor model	Applicable gearhead model	
		Model	□: Gear ratio
30 W	BLHM230KCM-GFS	GFS2G□FR	5, 10, 15, 20, 30, 50, 100, 200
50 W	BLHM450KCM-GFS	GFS4G□FR	
100 W	BLHM5100KCM-GFS	GFS5G□FR	

● Connector type

Pinion shaft type motor / Hollow shaft flat gearhead

Output power	Motor model	Applicable gearhead model	
		Model	□: Gear ratio
30 W	BLM230HK-GFS	GFS2G□FR	5, 10, 15, 20, 30, 50, 100, 200
50 W	BLM450HK-GFS	GFS4G□FR	

■ Drivers possible to combine

Products with which the motors can be combined are listed below.



● Lead wire type, cable type

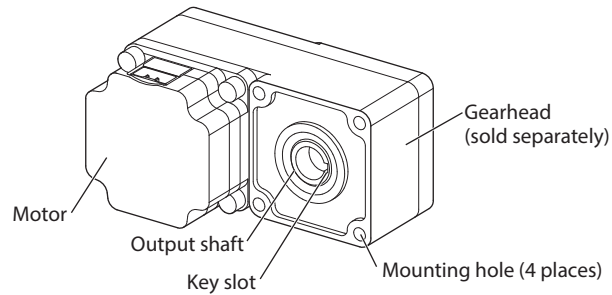
Output power	Motor model	Driver model (24 VDC)		
		Analog setting type	Digital setting type	RS-485 communication type
30 W	BLHM230K-GFS BLHM230KC-GFS BLHM230KCM-GFS	BLH2D30-K	BLH2D30-KD	BLH2D30-KR
50 W	BLHM450K-GFS BLHM450KC-GFS BLHM450KCM-GFS	BLH2D50-K	BLH2D50-KD	BLH2D50-KR
100 W	BLHM5100K-GFS BLHM5100KC-GFS BLHM5100KCM-GFS	BLHD100K	-	-

● Connector type

Output power	Motor model	Driver model (24 VDC)		
		Analog setting type	Digital setting type	RS-485 communication type
30 W	BLM230HK-GFS	BLH2D30H-K	BLH2D30H-KD	BLH2D30H-KR
50 W	BLM450HK-GFS	BLH2D50H-K	BLH2D50H-KD	BLH2D50H-KR

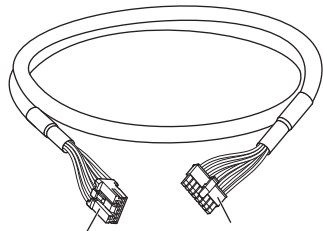
9.2 Names of parts

Motor



Connection cable (sold separately) connector Type only

To connect a motor and a driver, always use the dedicated connection cable (sold separately). The figure shows a connection cable of 1 m (3.3 ft.) to 5 m (16.4 ft.) length. The connection cable of 0.5 m (1.6 ft.) length is the lead wire type.

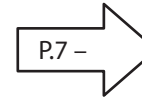


Connector for motor connection

Connectors for driver connection

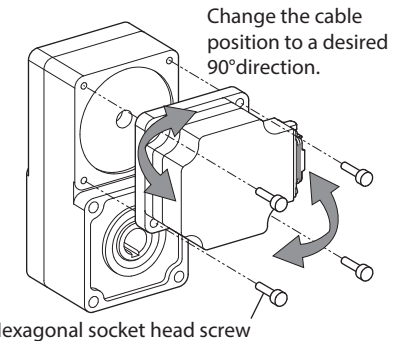
9.3 Installation method

Maintenance and inspection



Assembling a motor and a gearhead

1. Keep the pilot sections of the motor and gearhead in parallel, and assemble the motor with the gearhead while slowly rotating it clockwise/counterclockwise. At this time, note so that the pinion of the motor output shaft does not hit the gearhead strongly.



2. Check that there is no gap between the motor and the gearhead, and tighten them using the hexagonal socket head screws (4 places) included with the gearhead.

Gearhead model	Screw size	Tightening torque [N·m (lb-in)]
GFS2G	M4	1.8 (15.9)
GFS4G	M6	6.4 (56)
GFS5G	M8	15.5 (137)

Note

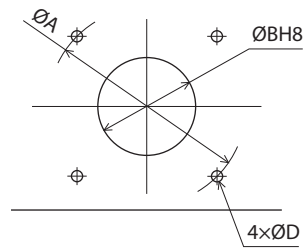
- Do not forcibly assemble the motor and gearhead. Also, prevent metal objects or foreign substances from entering in the gearhead. The pinion of the motor output shaft or gear may be damaged, resulting in noise or shorter service life.
- Do not allow dust to attach to the pilot sections of the motor and gearhead. Also, assemble the motor and gearhead carefully by not pinching the O-ring at the motor pilot section. If the O-ring is crushed or severed, grease may leak from the gearhead.

9. Hollow shaft flat gearhead

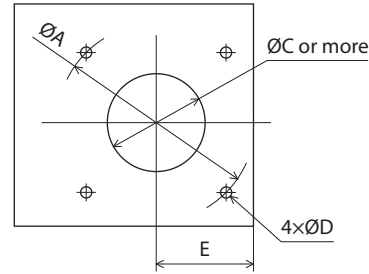
3. Drill mounting holes in the mounting plate.

A gearhead can be installed by using either its front or rear side as the mounting surface.

• Using the front side as the mounting surface



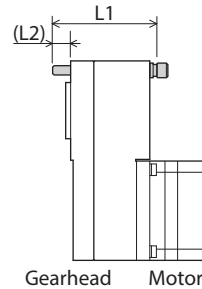
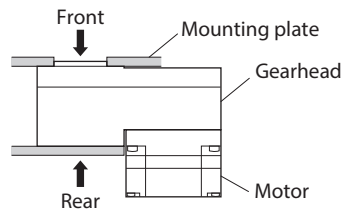
• Using the rear side as the mounting surface



Unit: [mm (in.)]

Gearhead model	ØA	ØBH8	ØC	ØD	E
GFS2G	70 (2.76)	34 ^{+0.039} ₀ (1.34 ^{+0.0015} ₀)	25 (0.98)	5.5 (0.217)	29 (1.14)
GFS4G	94 (3.70)	38 ^{+0.039} ₀ (1.50 ^{+0.0015} ₀)	30 (1.18)	6.5 (0.256)	39 (1.54)
GFS5G	104 (4.09)	50 ^{+0.039} ₀ (1.97 ^{+0.0015} ₀)	35 (1.38)	8.5 (0.335)	44 (1.73)

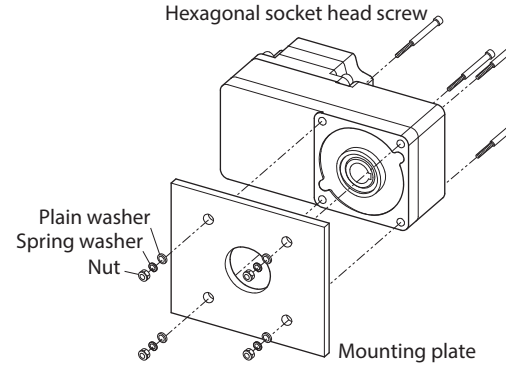
4. Use the four mounting holes to secure the product with the mounting screw set (included with the gearhead) so that there is no gap between the product and the mounting plate to be installed. Also, attach the included safety cover to the hollow output shaft on the end opposite from the one where the load shaft is installed.



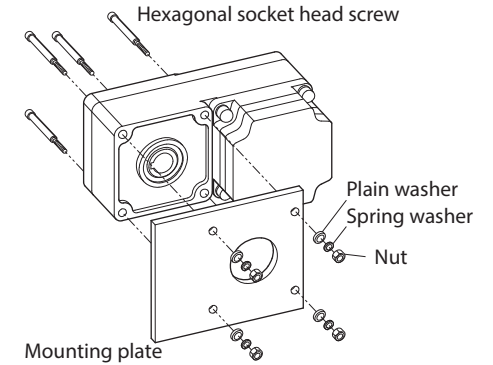
Gearhead model	Hexagonal socket head screw (Material: stainless steel)			Tightening torque [N·m (lb-in)]
	Screw size	L1 [mm (in.)]	L2 [mm (in.)]	
GFS2G	M5	65 (2.56)	15 (0.59)	3.8 (33)
GFS4G	M6	70 (2.76)	14 (0.55)	6.4 (56)
GFS5G	M8	90 (3.54)	21 (0.83)	15.5 (137)

• Using the front side as the mounting surface

When the gearhead is installed by using its front side as the mounting surface, use the boss section of the output shaft to align the center.

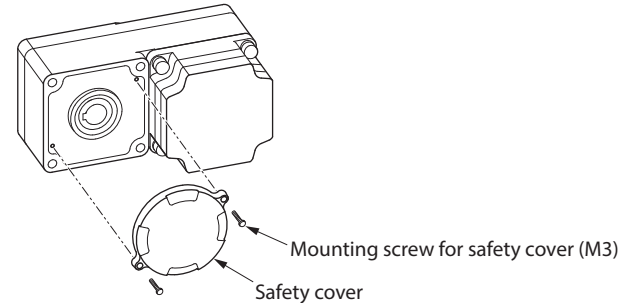


• Using the rear side as the mounting surface



• Installing the safety cover

After installing a load, attach the included safety cover. The safety cover can be attached to either face.
Tightening torque: 0.45 N·m (3.9 lb-in)



9. Hollow shaft flat gearhead

■ Installing a load

If a large impact occurs at instantaneous stop or a large radial load is applied, use a stepped load shaft.

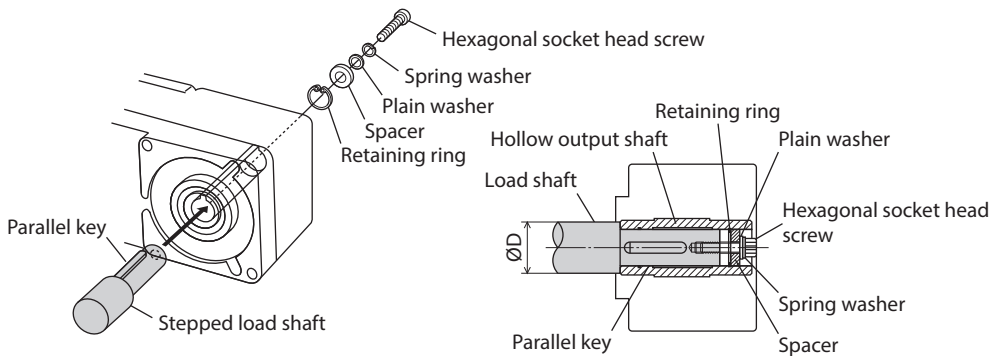
Note

- Apply grease (molybdenum disulfide grease, etc.) on the surface of the load shaft and inner walls of the hollow output shaft to prevent seizure.
- When installing a load, do not damage the motor output shaft (gearhead output shaft) or bearing. Forcing in the load by driving it with a hammer, etc., may break the bearing. Do not apply any excessive force to the output shaft.
- Do not modify or machine the motor (gearhead) output shaft. The bearing may be damaged or motor (gearhead) may break.

● Stepped load shaft

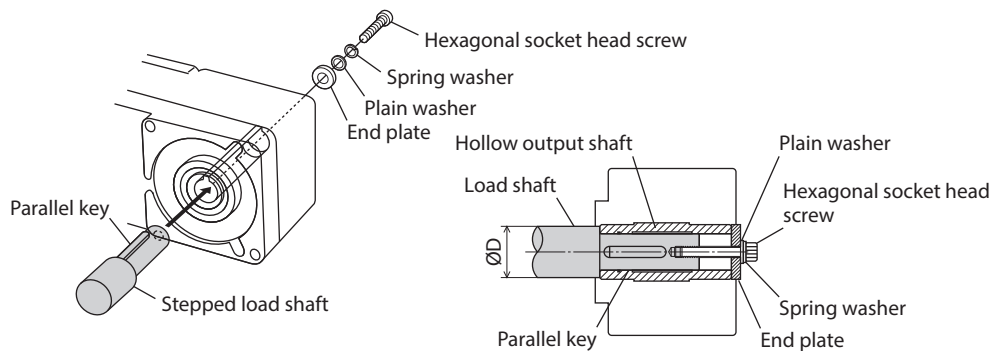
● Mounting method using retaining ring

Secure the retaining ring to the load shaft by tightening the hexagonal socket head screw over a spacer, plain washer and spring washer.



● Mounting method using end plate

Secure the end plate to the load shaft by tightening the hexagonal socket head screw over a flat washer and spring washer.

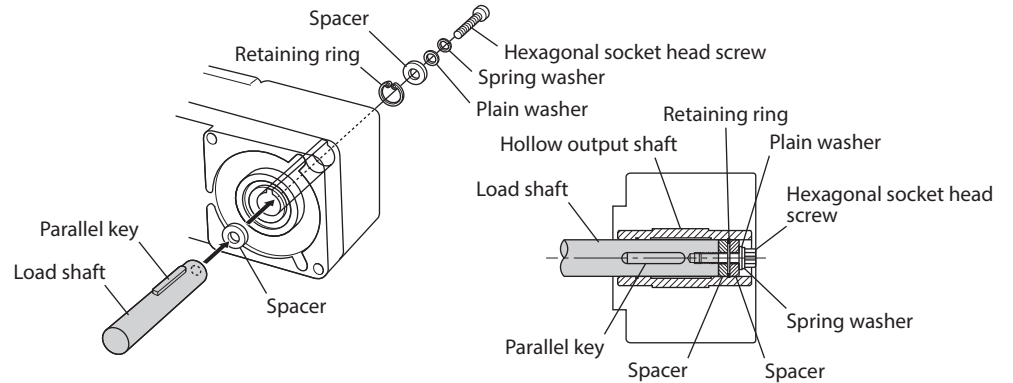


Note

The safety cover (supplied) cannot be attached due to contact between the safety cover and hexagonal socket head screw. Take safety measures against rotating part.

● Non-stepped load shaft

Install a spacer on the load shaft side and secure the retaining ring to the load shaft by tightening the hexagonal socket head screw over a spacer, flat washer and spring washer.



● Recommended load shaft installation dimensions

Unit: mm (in.)

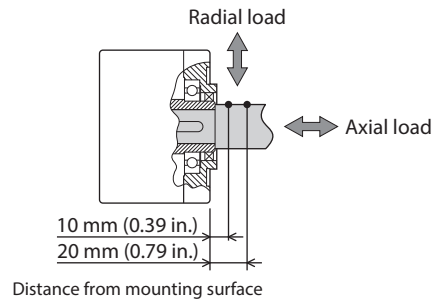
Gearhead model	Inner diameter of hollow shaft (H8)	Recommended tolerance of load shaft (h7)	Nominal diameter of retaining ring	Applicable screw	Spacer thickness	Outer diameter of stepped shaft (ØD)
GFS2G	$\varnothing 12^{+0.027}_0$ ($\varnothing 0.4724^{+0.0011}_0$)	$\varnothing 12^{0}_{-0.018}$ ($\varnothing 0.4724^{0}_{-0.0007}$)	$\varnothing 12$ (Ø0.47)	M4	3 (0.12)	20 (0.79)
GFS4G	$\varnothing 15^{+0.027}_0$ ($\varnothing 0.5906^{+0.0011}_0$)	$\varnothing 15^{0}_{-0.018}$ ($\varnothing 0.5906^{0}_{-0.0007}$)	$\varnothing 15$ (Ø0.59)	M5	4 (0.16)	25 (0.98)
GFS5G	$\varnothing 20^{+0.033}_0$ ($\varnothing 0.7874^{+0.0013}_0$)	$\varnothing 20^{0}_{-0.021}$ ($\varnothing 0.7874^{0}_{-0.0008}$)	$\varnothing 20$ (Ø0.79)	M6	5 (0.20)	30 (1.18)

■ Permissible radial load and permissible axial load

Make sure a radial load and axial load applied to the output shaft will not exceed the permissible values shown in the table below.



Failure due to fatigue may occur when the motor or gearhead bearings and output shaft are subject to repeated loading by a radial or axial load that is in excess of the permissible limit.



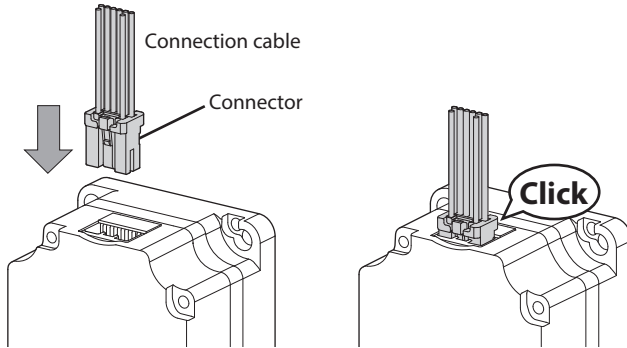
Gearhead model	□: Gear ratio	Permissible radial load [N (lb.)] Distance from output shaft end of the gearhead		Permissible axial load [N (lb.)]
		10 mm (0.39 in.)	20 mm (0.79 in.)	
GFS2G□FR	5, 10	450 (101)	370 (83)	200 (45)
	15 to 200	500 (112)	400 (90)	
GFS4G□FR	5, 10	800 (180)	660 (148)	400 (90)
	15 to 200	1200 (270)	1000 (220)	
GFS5G□FR	5, 10	900 (200)	770 (173)	500 (112)
	15, 20	1300 (290)	1110 (240)	
	30 to 200	1500 (330)	1280 (280)	

9.4 Connection and grounding

■ Connecting the motor and the connection cable (Connector type only)

● Connecting the connection cable to the motor

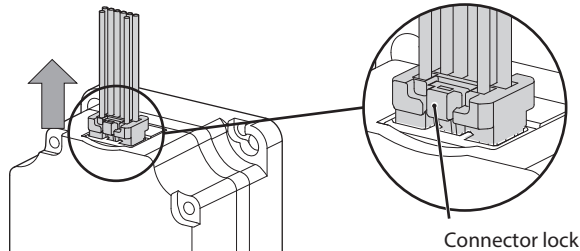
Hold the connector main body of the connection cable, and insert the connector until making a clicking noise.



Note Make sure to insert the connector securely. Insecure connector connection may cause malfunction.

● Removing the connection cable from the motor

Hold the connector main body and pull out the connector while pressing the connector lock. Do not apply stress on the connection part of the lead wires and connector.

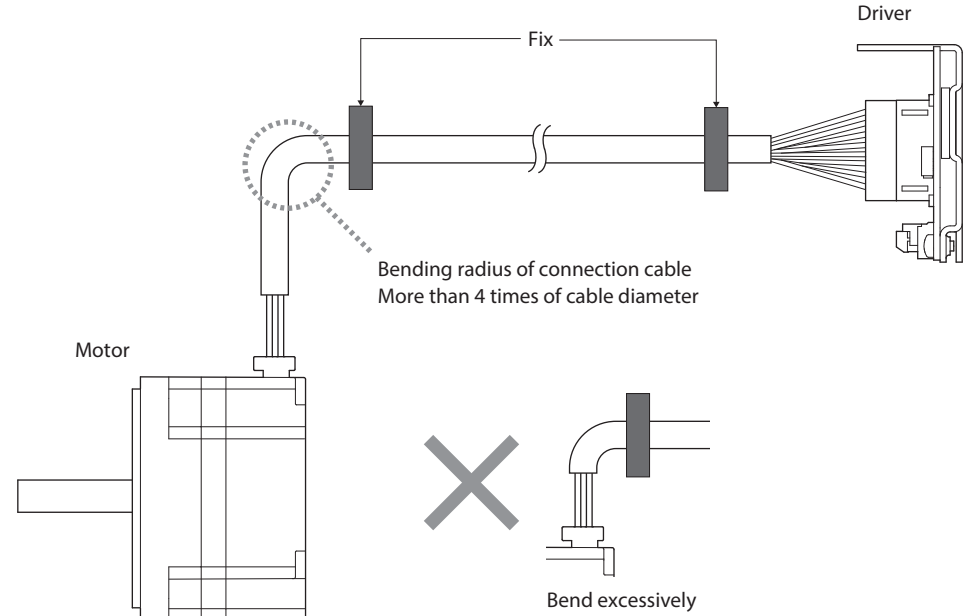


Note

- Be sure to insert and pull out the connector while holding the connector part. Failure to do so may result in damage to the connector and the motor.
- Do not lift up the product by holding the connection cable. Doing so may result in damage to the product.

■ Notes about wiring

Fix the connection cable near each connection part of the connectors on the motor and driver sides to prevent from applying stress on the connection parts.

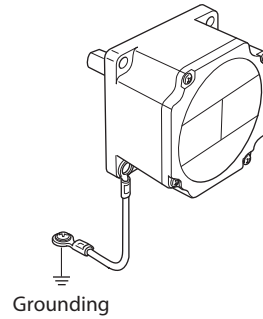


Note When fixing the connection cable, do not excessively bend it near the connection part of the connector. Applying stress on the connector or terminals due to self-weight or bending of the connection cable may cause poor contact or disconnection.

■ Grounding

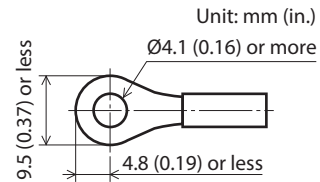
Ground the motor using one of the four mounting holes on the motor frame shown in the figure. If the mounting surface of the gearhead is coated with paint, remove the paint and install to a metal surface that has grounded.

The wire used to ground the motor must be as thick and short to the grounding point as possible so that no potential difference is generated. Choose a large, thick and uniformly conductive surface for the grounding point.



Ground wire with terminal

- Applicable crimp terminal: Insulated round crimp terminal
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)
- Screw size: M4
- Tightening torque: 1.2 N·m (10.6 lb-in)



Note

Be sure to ground the motor and driver. Failure to do so may result in electric shock or damage to the product. Static electricity may cause damage to the product if the protective earth terminals are not grounded.

Inspection and maintenance [P.8 –](#) Regulations and standards [P.9 –](#)

Refer to the operating manual of the driver for the operating method.

10.1 Combination tables

Check the against the model name shown on their nameplates.

■ Motor

Electromagnetic brake motor pinion shaft type motor / Parallel shaft gearhead

Output power	Motor model	Applicable gearhead model	
		Model	□: Gear ratio
30 W	BLHM230KCM-GFS	GFS2G□	5, 10, 15, 20, 30, 50, 100, 200
50 W	BLHM450KCM-GFS	GFS4G□	
100 W	BLHM5100KCM-GFS	GFS5G□	

● Electromagnetic brake motor pinion shaft type motor / Hollow shaft flat gearhead

For details on the list of combinations and installation method, refer to p.26 and the following pages.

Electromagnetic brake motor round shaft type motor

Output power	Motor model
30 W	BLHM230KCM-A
50 W	BLHM450KCM-A
100 W	BLHM5100KCM-A

■ Drivers possible to combine

Products with which the motors can be combined are listed below.

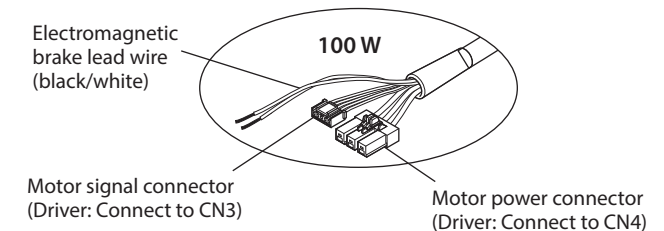
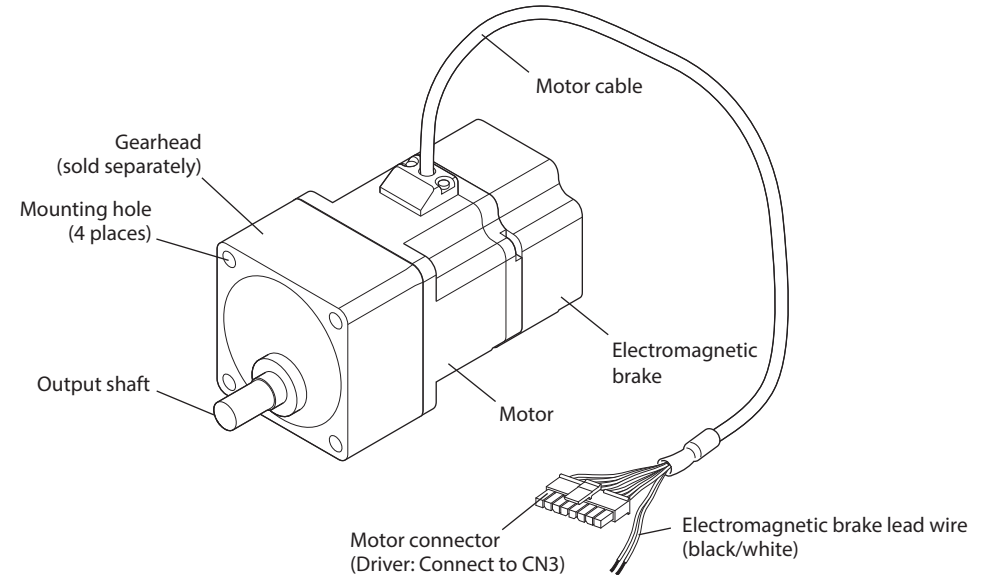


Output power	Motor model	Driver model (24 VDC)		
		Analog setting type	Digital setting type	RS-485 communication type
30 W	BLHM230KCM-GFS BLHM230KCM-A	BLH2D30-K	BLH2D30-KD	BLH2D30-KR
50 W	BLHM450KCM-GFS BLHM450KCM-A	BLH2D50-K	BLH2D50-KD	BLH2D50-KR
100 W	BLHM5100KCM-GFS BLHM5100KCM-A	BLHD100K	-	-

10.2 Names of parts

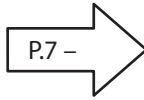
■ Motor

The figure shows the pinion shaft type motor / Parallel shaft gearhead (30 W, 50 W).



10.3 Installation method

Maintenance and inspection

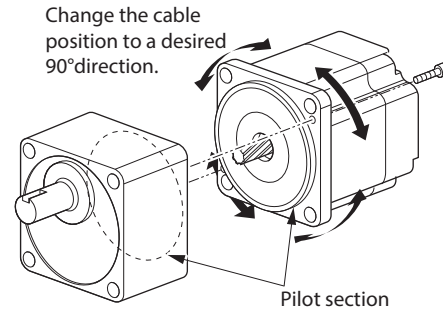


■ Assembling a motor and a gearhead

● Electromagnetic brake motor pinion shaft type motor / Parallel shaft gearhead

Note Do not install the motor to the mounting hole diagonally or assemble the motor forcibly. Doing so may damage the motor.

1. Keep the pilot sections of the motor and gearhead in parallel, and assemble the gearhead with the motor while slowly rotating it clockwise/counterclockwise. At this time, note so that the pinion of the motor output shaft does not hit the side panel or gears of the gearhead strongly.

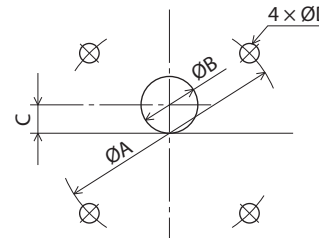


2. Check that there is no gap between the motor and the gearhead, and tighten them using the hexagonal socket head screws (2 pieces) included with the gearhead.

Gearhead model	Screw size	Tightening torque [N·m (lb-in)]
GFS2G GFS4G	M2.6	0.4 (3.5)
GFS5G	M3	0.6 (5.3)

- Note**
- Do not forcibly assemble the motor and gearhead. Also, prevent metal objects or foreign substances from entering in the gearhead. The motor output shaft or gear may be damaged, resulting in noise or shorter service life.
 - Do not allow dust to attach to the pilot sections of the motor and gearhead. Also, assemble the motor and gearhead carefully by not pinching the O-ring at the motor pilot section. If the O-ring is crushed or severed, grease may leak from the gearhead.

3. Drill mounting holes in the mounting plate.



Unit: mm (in.)

Gearhead model	ØA	ØB *1	C	ØD	Maximum applicable plate thickness*2
GFS2G	70 (2.76)	24 (0.94)	10 (0.39)	4.5 (0.177)	5 (0.20)
GFS4G	94 (3.70)	34 (1.34)	13 (0.51)	6.5 (0.256)	8 (0.31)
GFS5G	104 (4.09)	40 (1.57)	18 (0.71)	8.5 (0.335)	12 (0.47)

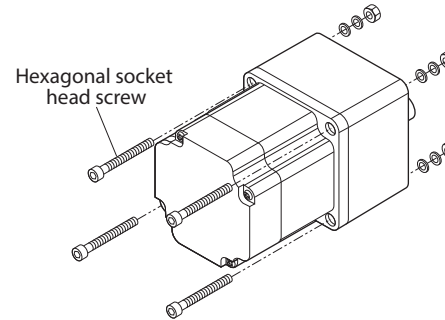
*1 ØB indicates the external dimensions of the product.

Drill holes with a minimum diameter of $\text{ØB} + 1 \text{ mm}$ (0.04 in.).

Provide a hole with a diameter of $\text{ØB} + 1 \text{ mm}$ (0.04 in.) or more.

*2 The values in the table indicate when the mounting screw set (included with the gearhead) is used.

4. Use the mounting screw set (included with the gearhead) to secure the product through the four mounting holes so that there is no gap between the product and the mounting plate to be installed.



Gearhead model	Screw size	Tightening torque [N·m (lb-in)]
GFS2G	M4	1.8 (15.9)
GFS4G	M6	6.4 (56)
GFS5G	M8	15.5 (137)

● Electromagnetic brake motor round shaft type motor

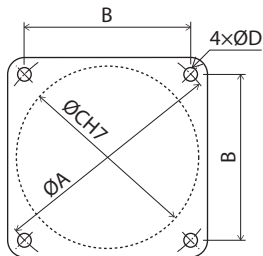


Do not install the motor to the mounting hole diagonally or assemble the motor forcibly. Doing so may damage the motor.

Install the motor to a mounting plate of the following size or larger, so that the motor case temperature will not exceed 90°C (194°F)

Motor model	Size of mounting plate [mm (in.)]	Thickness [mm (in.)]	Material
BLHM230	115×115 (4.53×4.53)	5 (0.20)	Aluminum alloy
BLHM450	135×135 (5.31×5.31)		
BLHM5100	200×200 (7.87×7.87)		

1. Drill mounting holes in the mounting plate.



Unit: mm (in.)

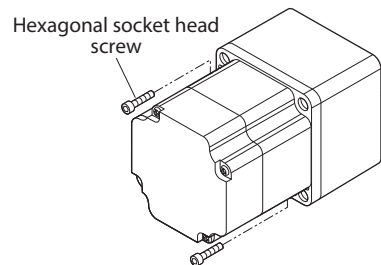
Motor model	ØA	B	ØCH7	ØD
BLHM230	70 (2.76)	49.5 (1.95)	$54^{+0.030}_0$ (2.1260 ^{+0.0012})	4.5 (0.177)
BLHM450	94 (3.70)	66.47 (2.62)	$73^{+0.030}_0$ (2.8740 ^{+0.0012})	6.5 (0.256)
BLHM5100	104 (4.09)	73.54 (2.90)	$83^{+0.035}_0$ (3.2677 ^{+0.0014})	8.5 (0.335)

ØC indicates the pilot diameter on the flange.

2. Secure the motor using the hexagonal socket head screws (not included) through the four mounting holes. Install so that there is no gap between the product and the mounting plate.

Applicable mounting screws

Motor model	Screw size	Tightening torque [N·m (lb-in)]
BLHM230	M4	1.8 (15.9)
BLHM450	M6	6.4 (56)
BLHM5100	M8	15.5 (137)



■ Installing a load

When installing a load, align the center of the output shaft with the center of the load shaft.

Note

- When coupling with a load, pay attention to centering, belt tension, parallelism of pulleys, etc. Also, firmly secure the tightening screws of the coupling or pulleys.
- When installing a load, do not damage the output shaft or bearing. Forcibly inserting the load by driving it with a hammer may damage the bearing. Do not apply any excessive force to the output shaft.
- Do not modify or machine the output shaft. This may damage the bearing, resulting in damage to the motor and gearhead.

● Output shaft shape

Electromagnetic brake motor pinion shaft type motor / Parallel shaft gearhead

A key slot is provided on the output shaft of gearhead. Form a key slot on the load side, and secure the load using the included parallel key.

Gearhead model	Parallel key dimension
GFS2G	4 mm (0.1575 in.)
GFS4G	5 mm (0.1969 in.)
GFS5G	6 mm (0.2362 in.)

Electromagnetic brake motor round shaft type motor

A flat section is provided on the output shaft of round shaft type motor.

Apply a double-point screw, etc., at the flat section to firmly secure the load and prevent it from spinning.

● How to install a load

Using a coupling

Align the centerline of the motor or gearhead output shaft with the centerline of the load shaft.

Using a belt

Adjust the motor or gearhead output shaft to lie parallel with the load shaft, and form right angles between the output shaft/load shaft and the line connecting the centers of both pulleys.

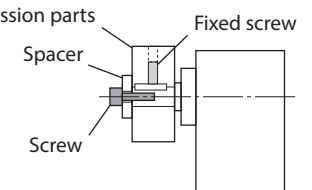
Using a gear

Adjust the motor or gearhead output shaft to lie parallel with the gear shaft, and allow the output shaft to mesh correctly with the centers of the gear teeth.

When using the output shaft end tapped hole of a gearhead (Excluding **GFS2G**)

Use a tap hole provided at the end of the output shaft as an auxiliary means for preventing the transfer mechanism from disengaging.

Gearhead model	Screw size	Effective depth
GFS4G	M5	10 mm (0.39 in.)
GFS5G	M6	12 mm (0.47 in.)



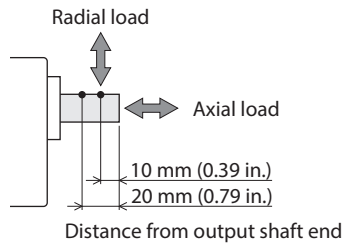
10. Electromagnetic brake motor

■ Permissible radial load and permissible axial load

Make sure a radial load and axial load applied to the output shaft will not exceed the permissible values shown in the table below.

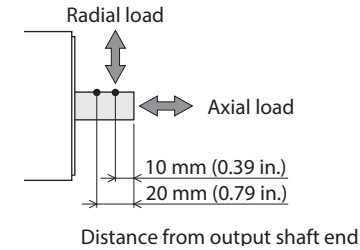
Note Failure due to fatigue may occur when the motor or gearhead bearings and output shaft are subject to repeated loading by a radial or axial load that is in excess of the permissible limit.

● Electromagnetic brake motor pinion shaft type motor / Parallel shaft gearhead



Gearhead model	□: Gear ratio	Permissible radial load [N (lb.)] Distance from output shaft end of pthe gearhead		Permissible load Axial load [N (lb.)]
		10 mm (0.39 in.)	20 mm (0.79 in.)	
GFS2G □	5	100 (22)	150 (33)	40 (9)
	10 to 20	150 (33)	200 (45)	
	30 to 200	200 (45)	300 (67)	
GFS4G □	5	200 (45)	250 (56)	100 (22)
	10 to 20	300 (67)	350 (78)	
	30 to 200	450 (101)	550 (123)	
GFS5G □	5	300 (67)	400 (90)	150 (33)
	10 to 20	400 (90)	500 (112)	
	30 to 200	500 (112)	650 (146)	

● Electromagnetic brake motor round shaft type motor

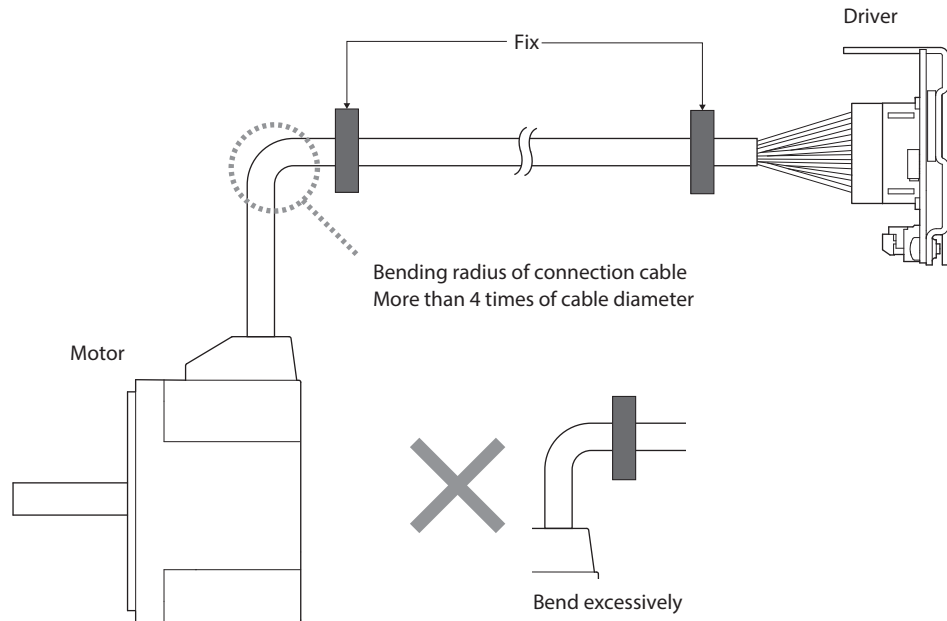


Motor model	Permissible radial load [N (lb.)] Distance from output shaft end of pthe motor		Permissible load Axial load [N (lb.)]
	10 mm (0.39 in.)	20 mm (0.79 in.)	
BLHM230	70 (15.7)	100 (22)	10 (2.2)
BLHM450	120 (27)	140 (31)	20 (4.5)
BLHM5100	160 (36)	170 (38)	25 (5.6)

10.4 Connection and grounding

Notes about wiring

Fix the connection cable near each connection part of the connectors on the motor and driver sides to prevent from applying stress on the connection parts.



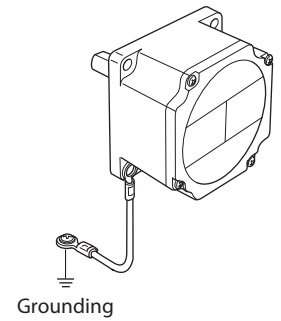
Note

When fixing the connection cable, do not excessively bend it near the connection part of the connector. Applying stress on the connector or terminals due to self-weight or bending of the connection cable may cause poor contact or disconnection.

Grounding

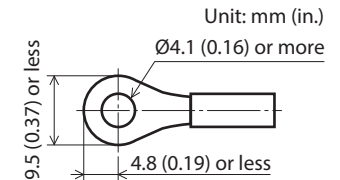
Ground the motor using one of the four mounting holes on the motor frame shown in the figure. If the mounting surface of the gearhead is coated with paint, remove the paint and install to a metal surface that has grounded.

The wire used to ground the motor must be as thick and short to the grounding point as possible so that no potential difference is generated. Choose a large, thick and uniformly conductive surface for the grounding point.



Ground wire with terminal

- Applicable crimp terminal: Insulated round crimp terminal
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)
- Screw size: M4
- Tightening torque: 1.2 N·m (10.6 lb-in)



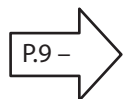
Note

Be sure to ground the motor and driver. Failure to do so may result in electric shock or damage to the product. Static electricity may cause damage to the product if the protective earth terminals are not grounded.

Inspection and maintenance



Regulations and standards



Refer to the operating manual of the driver for the operating method.

10.5 Operation (how to use electromagnetic brake)

! WARNING

- Do not use the electromagnetic brake of the motor as a safety brake. It is intended to hold the moving part and motor positions. Since the power off activated type electromagnetic brake is equipped, it can hold the position of a load when the power is cut off. However, this brake is not a mechanism to hold the load in position steadily. Provide safety measures in equipment side.
- If the electromagnetic brake is activated to hold the motor output shaft in a state where the motor is rotating, the brake hub of the electromagnetic brake may wear significantly, leading to damage. Be sure to check the motor output shaft is stopped before activating the electromagnetic brake to hold the position.

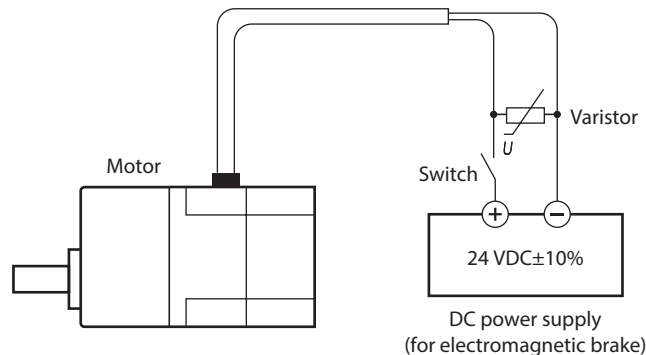
■ Connection method

- Connect the lead wires of the electromagnetic brake to a DC power supply for electromagnetic brake. The lead wires of the electromagnetic brake have no polarity. Lead wire size: AWG24
- Connect the varistor (included) in parallel between +24 VDC terminal and GND terminal of the DC power supply. The varistor has no polarity.



Model: Z15D121 (Manufacturer: SEMITEC)
Varistor voltage: 120 V

- The electromagnetic brake is released when voltage is applied to it.



Note

Do not apply voltage in excess of the specified value. Doing so may cause heat generation of the electromagnetic brake to increase, resulting in damage to the product. On the contrary, too low voltage may not release the electromagnetic brake.

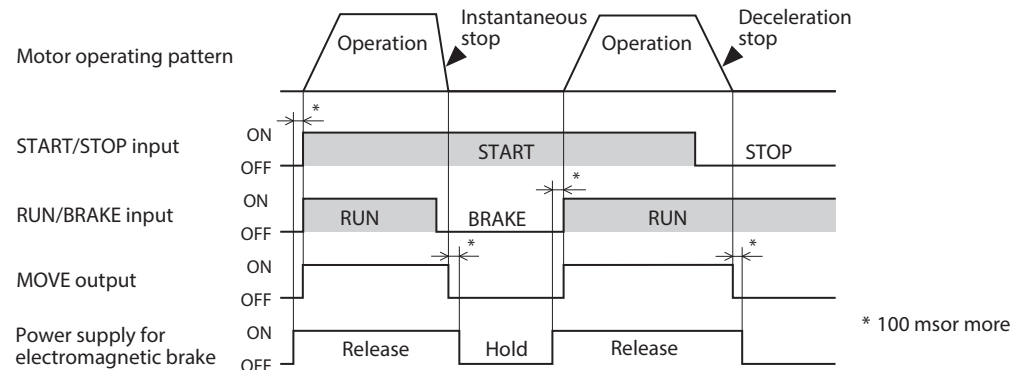
■ Electromagnetic brake specification

Model	BLHM230	BLHM450	BLHM5100
Type	Power off activated type (for holding)		
Power supply voltage	24 VDC±10%		
Power supply current	0.084 A	0.31 A	0.31 A
Brake activate time	100 ms		
Brake release time	100 ms		
Time rating	Continuous		

■ Timing chart

Note

Check the motor has been stopped before activating the electromagnetic brake to hold a load. Activating the electromagnetic brake to hold during motor rotation may cause damage to the product.



• Note on starting

Turn on the switch for the electromagnetic brake and waiting for at least 100 ms (brake releasing time) before operating the motor.

• Note on stopping

Activate the electromagnetic brake to hold the position after the motor output shaft is stopped completely. (Before use, check the time needed for the motor to stop in a state where the motor is installed in the equipment actually used.)

In the case of the **BLH** Series digital setting type and RS-485 communication type, you can check whether the motor output shaft is stopped or not by the status of the MOVE output.

After the MOVE output is turned OFF, wait for at least 100 ms before activating the electromagnetic brake to hold the position.

For **BLH** Series analog setting type

Activate the electromagnetic brake to hold the position by detecting the motor rotation because the driver does not have the MOVE output. Provide an external sensor, etc. to detect the motor rotation.

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ORIENTAL MOTOR U.S.A. CORP.
Technical Support Tel:800-468-3982
8:30am EST to 5:00pm PST (M-F)

ORIENTAL MOTOR (EUROPA) GmbH
Schiebsstraße 44, 40549 Düsseldorf, Germany
Technical Support Tel:00 800/22 55 66 22

ORIENTAL MOTOR (UK) LTD.
Unit 5 Faraday Office Park, Rankine Road,
Basingstoke, Hampshire RG24 8QB UK
Tel:+44-1256347090

ORIENTAL MOTOR (FRANCE) SARL
Tel:+33-1 47 86 97 50

ORIENTAL MOTOR ITALIA s.r.l.
Tel:+39-02-93906347

ORIENTAL MOTOR ASIA PACIFIC PTE. LTD.
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ORIENTAL MOTOR CO., LTD.
4-8-1 Higashiueno, Taito-ku, Tokyo
110-8536 Japan
Tel:+81-3-6744-0361
www.orientalmotor.co.jp/ja