Oriental motor

HM-5284

Brushless Motor

BLE 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.

Table of contents

1 Introduction

■ Before use

Only qualified personnel should work with the product. Use the product correctly after thoroughly reading the section "2 Safety precautions." In addition, be sure to observe the contents described in warning, caution, and note in this manual.

The product described in this manual has been 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 damage caused through failure to observe this warning.

■ Related operating manuals

Operating manuals are not included with the product. Download from Oriental Motor Website Download Page or contact your nearest Oriental Motor sales office.

	Operating manual name
Motor	**BLE** Series Motor OPERATING MANUAL (this document)
Driver*	**BLE** Series CC-Link Driver Installation/Connection OPERATING MANUAL
	BLE Series CC-Link Driver Operation OPERATING MANUAL
	BLE Series RS-485 communication type Driver OPERATING MANUAL

* Refer to "4.2 Combination tables" for the applicable driver.

2 Safety precautions

The precautions described below are intended to prevent danger or injury to the user and other personnel through safe, correct use of the product. Please read and understand these precautions thoroughly before using the product.

⚠ **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 the 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.

⚠ WARNING

- Do not use the product in a place exposed to explosive, flammable or corrosive gases or water splashes or near combustible materials. Doing so may result in fire, electric shock or injury.
- Only qualified personnel should be allowed to perform installation, connection, operation and inspection/ troubleshooting of the product. Handling by unqualified personnel may result in fire, electric shock, injury or equipment damage.
- Do not move, install, connect or inspect the product while the power is supplied. Perform these operations after turning off the power. Failure to observe these instructions may result in electric shock.
- Use an electromagnetic brake motor in an application of vertical drive such as elevating equipment. If a power failure occurs or the driver protective function is activated in a state where the motor without an electromagnetic brake is used, the moving part may fall when the motor stops. This may cause injury or damage to equipment.
- Do not use the brake mechanism of the electromagnetic brake motor as a safety brake. It is intended to hold the moving part and motor positions. Using it as a safety brake may result in injury or damage to equipment.
- Use a specified motor (gearhead) and driver combination. Failure to do so may result in fire, electric shock or equipment damage.
- The motor is Class Ⅰ equipment. When installing the motor, ground the Protective Earth Terminals. Failure to do so may result in electric shock.
- Install the motor in an enclosure. Failure to do so may result in electric shock or injury.
- Do not forcibly bend, pull or pinch the cables. Doing so may result in fire or electric shock.
- Do not machine or modify the motor cable or connection cable. Doing so may result in electric shock or fire.
- Always turn off the power before performing maintenance/ inspection. Failure to do so may result in electric shock.
- Do not touch the motor or driver when measuring insulation resistance or performing a dielectric strength test. Accidental contact may result in electric shock.
- Do not disassemble or modify the motor (gearhead). Doing so may result in electric shock, injury or equipment damage. Should you require inspection or repair of internal parts, please contact the Oriental Motor branch or sales office from which you purchased the product.

⚠ CAUTION

- Do not use the product in conditions exceeding the motor (gearhead) specifications. Doing so may result in electric shock, fire, injury or equipment damage.
- Do not touch the motor (gearhead) or driver during the operation or immediately after the operation has stopped. Touching a hot motor (gearhead) or driver surface may cause skin burn(s).
- Do not carry the product by the motor (gearhead) output shaft or any of the cables. Doing so may result in injury.
- Do not place around the motor any object blocking the air flows. Doing so may result in equipment damage.
- Do not touch the motor output shaft (key groove or pinion) with bare hands. Doing so may result in injury.
- When assembling the motor (pinion shaft) with the gearhead, exercise caution not to pinch your fingers or other parts of your body between the motor and gearhead. Injury may result.
- Securely affix the driver to mounting plates. Inappropriate installation may cause the driver to detach and fall, resulting in equipment damage.
- Provide a cover on the rotating part (output shaft) of the motor (gearhead). Failure to do so may result in injury.
- When installing the motor (gearhead) in the equipment, exercise caution not to pinch your fingers or other parts of your body between the equipment and motor or gearhead. Injury may result.
- Securely install the load on the motor output shaft. Inappropriate installation may result in injury.
- Be sure to ground the motor to prevent them from being damaged by static electricity. Failure to do so may result in fire or damage to equipment.
- Do not touch the rotating part (output shaft) during operation. Doing so may result in injury.
- The motor surface temperature may exceed 70 °C (158 °F), even in a normal operating condition. If the operator is allowed to approach the running motor, attach a warning label as shown below in a conspicuous position. Failure to do so may result in skin burn(s).

Warning label

3 Precautions for use

This chapter explains the restrictions and other items you should take heed of when using the **BLE** Series.

■ Conduct the insulation resistance measurement or withstand voltage test separately on the motor and the driver

Conducting the insulation resistance measurement or withstand voltage test with the motor and driver connected may result in injury or damage to the product.

■ Grease measures

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

■ Apply grease on the output shaft of hollow shaft flat gearhead

If you are 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.

4 Preparation

This chapter explains what you must do before using the **BLE** Series, as well as the name and function of each part of the unit.

4.1 Checking the product

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.
Verify the model number of the purchased product against the number shown on the namepanel.

■ Motor

- ☐ Motor..... 1 unit
- ☐ Instructions and Precautions for Safe Use ..... 1 copy

■ Gearhead (sold separately)

● Parallel shaft gearhead

- ☐ Parallel shaft gearhead ..... 1 unit
- ☐ Mounting screw..... 1 set
  (Hexagonal socket head screw, flat 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

- ☐ Hollow shaft flat gearhead ..... 1 unit
- ☐ Mounting screw..... 1 set
  (Hexagonal socket head screw, flat washer, spring washer, nut: 4 pieces each)
- ☐ Parallel key..... 1 piece
- ☐ Safety cover..... 1 set (safety cover: 1 pices, safety cover mounting screw: 2 pieces)
- ☐ Screw for motor assembly ..... 1 set (Hexagonal socket head screw: 4 pieces)

4.2 Combination tables

□ in the model names indicates a number representing the gear ratio.

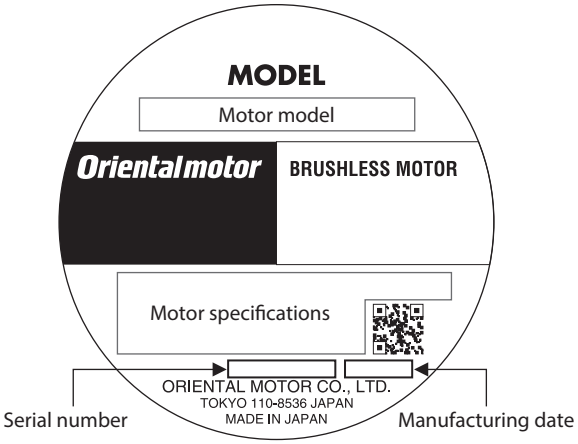
	Output power	Motor model	Applicable gearhead model	Applicable driver model	
				RS-485 communication	CC-Link
Pinion shaft type/ parallel shaft gearhead	30 W	**BLEM23-GFS**	**GFS2G□**	**BLED3AM-R BLED3CM-R**	**BLED3A-CC BLED3C-CC**
	60 W	**BLEM46-GFS**	**GFS4G□**	**BLED6AM-R BLED6CM-R**	**BLED6A-CC BLED6C-CC**
	120 W	**BLEM512-GFS**	**GFS5G□**	**BLED12AM-R BLED12CM-R**	**BLED12A-CC BLED12C-CC**
Pinion shaft type/ hollow shaft flat gearhead	30 W	**BLEM23-GFS**	**GFS2G□FR**	**BLED3AM-R BLED3CM-R**	**BLED3A-CC BLED3C-CC**
	60 W	**BLEM46-GFS**	**GFS4G□FR**	**BLED6AM-R BLED6CM-R**	**BLED6A-CC BLED6C-CC**
	120 W	**BLEM512-GFS**	**GFS5G□FR**	**BLED12AM-R BLED12CM-R**	**BLED12A-CC BLED12C-CC**
Round shaft type	30 W	**BLEM23-A**	–	**BLED3AM-R BLED3CM-R**	**BLED3A-CC BLED3C-CC**
	60 W	**BLEM46-A**	–	**BLED6AM-R BLED6CM-R**	**BLED6A-CC BLED6C-CC**
	120 W	**BLEM512-A**	–	**BLED12AM-R BLED12CM-R**	**BLED12A-CC BLED12C-CC**
Electromagnetic brake type Pinion shaft type/ parallel shaft gearhead	30 W	**BLEM23M2-GFS**	**GFS2G□**	**BLED3AM-R BLED3CM-R**	–
	60 W	**BLEM46M2-GFS**	**GFS4G□**	**BLED6AM-R BLED6CM-R**	–
	120 W	**BLEM512M2-GFS**	**GFS5G□**	**BLED12AM-R BLED12CM-R**	–
Electromagnetic brake type Pinion shaft type/ hollow shaft flat gearhead	30 W	**BLEM23M2-GFS**	**GFS2G□FR**	**BLED3AM-R BLED3CM-R**	–
	60 W	**BLEM46M2-GFS**	**GFS4G□FR**	**BLED6AM-R BLED6CM-R**	–
	120 W	**BLEM512M2-GFS**	**GFS5G□FR**	**BLED12AM-R BLED12CM-R**	–
Electromagnetic brake type Round shaft type	30 W	**BLEM23M2-A**	–	**BLED3AM-R BLED3CM-R**	–
	60 W	**BLEM46M2-A**	–	**BLED6AM-R BLED6CM-R**	–
	120 W	**BLEM512M2-A**	–	**BLED12AM-R BLED12CM-R**	–

4.3 Information about nameplate

The figure shows an example.

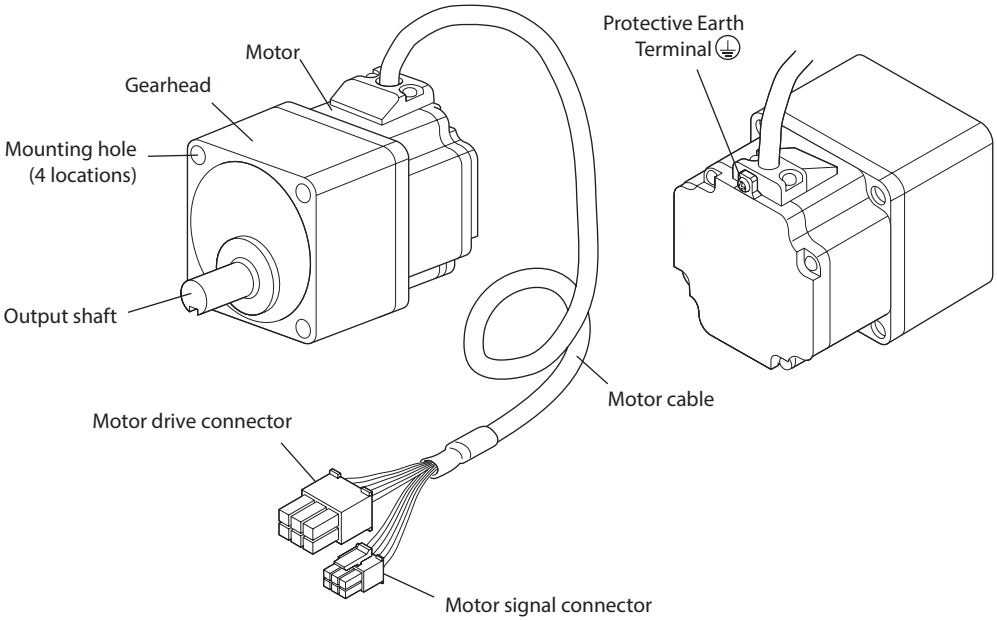
memo The position describing the information may vary depending on the product.

■ Motor



■ Gearhead

4.4 Names and functions of parts



* Illustration shows pinion shaft type/parallel shaft gearhead.

5 Installation

5.1 Installation location

The motor is designed and manufactured for use as internal components of equipment.
Install the motor in a well-ventilated place where they can be inspected easily and the following conditions are satisfied:

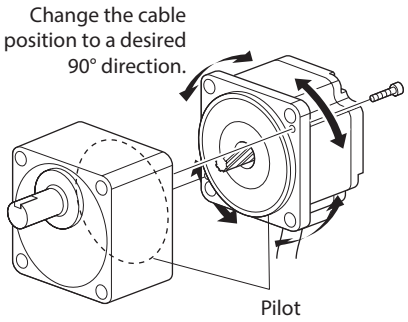
- Inside an enclosure installed indoors (provide a ventilation hole)
- Ambient temperature: 0 to +50 °C (+32 to +122 °F) (non-freezing)
- Ambient humidity: 85% or less (non-condensing)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum

Install the motor to a flat mounting plate offering excellent vibration resistance and high heat conductivity.

5.2 Installing the Pinion shaft type/parallel shaft gearhead

■ Assembling the motor and gearhead

Using the pilot sections of the motor and gearhead as guides, install the gearhead to the motor and tighten them with screw set for motor assembly (Included with gearhead).
At this time, the motor cable position can be changed to the desired 90° direction. When installing the gearhead, slowly rotate it clockwise/counterclockwise to prevent the pinion of the motor output shaft from contacting the side panel or gear of the gearhead. Also confirm that no gaps remain between the motor flange surface and the end face of the gearhead's pilot section.



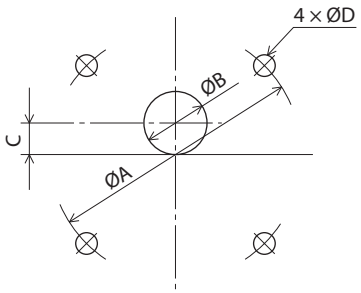
Motor model	Gearhead model	Nominal thread size	Tightening torque
BLEM23-GFS **BLEM23M2-GFS**	**GFS2G□**	M2.6	0.4 N·m (3.5 lb-in)
BLEM46-GFS **BLEM46M2-GFS**	**GFS4G□**		
BLEM512-GFS **BLEM512M2-GFS**	**GFS5G□**	M3	0.6 N·m (5.3 lb-in)

Note

- Do not forcibly assemble the motor and gearhead. Also, do not let metal objects or other foreign matter enter the gearhead. The pinion or gear of the motor output shaft 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's pilot section. If the O-ring is crushed or severed, grease may leak from the gearhead.
- The screw set for motor assembly assembling the motor and gearhead are affixing the motor and gearhead only temporarily. When installing the gearhead, be sure to use the mounting screw set (Included with gearhead).

■ Installing to equipment

1. Open mounting holes in the mounting plate.



Unit: mm (in.)

Motor model	Gearhead model	ØA	ØB	C	ØD
BLEM23-GFS **BLEM23M2-GFS**	**GFS2G□**	70 (2.76)	24 (0.94)	10 (0.39)	4.5 (0.177)
BLEM46-GFS **BLEM46M2-GFS**	**GFS4G□**	94 (3.70)	34 (1.34)	13 (0.51)	6.5 (0.256)
BLEM512-GFS **BLEM512M2-GFS**	**GFS5G□**	104 (4.09)	40 (1.57)	18 (0.71)	8.5 (0.335)

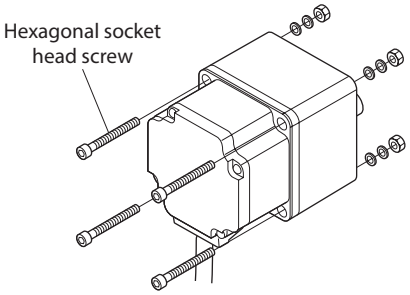
* ØB indicates the external dimensions of the product.
Open holes with a minimum diameter of ØB + 1 mm (0.04 in.).

Maximum applicable plate thickness

Motor model	Gearhead model	Maximum applicable plate thickness
BLEM23-GFS **BLEM23M2-GFS**	**GFS2G□**	5 mm (0.20 in.)
BLEM46-GFS **BLEM46M2-GFS**	**GFS4G□**	8 mm (0.31 in.)
BLEM512-GFS **BLEM512M2-GFS**	**GFS5G□**	12 mm (0.47 in.)

* The figures in the table apply when the mounting screw set (Included with gearhead) is used.

2. Install the mounting screw set (Included with gearhead) in the four mounting holes you just opened and tighten the nuts until no gaps remain between the motor and mounting plate.



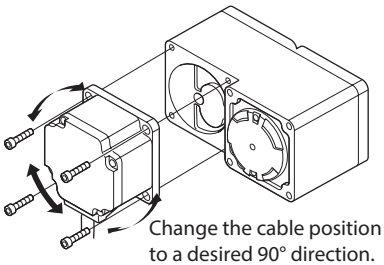
Motor model	Gearhead model	Nominal thread size	Tightening torque
BLEM23-GFS **BLEM23M2-GFS**	**GFS2G□**	M4	1.8 N·m (15.9 lb-in)
BLEM46-GFS **BLEM46M2-GFS**	**GFS4G□**	M6	6.4 N·m (56 lb-in)
BLEM512-GFS **BLEM512M2-GFS**	**GFS5G□**	M8	15.5 N·m (137 lb-in)

Note Fit the boss on the gearhead mounting surface into a pilot-receiving hole.

5.3 Installing the Pinion shaft type/hollow shaft flat gearhead

■ Assembling the motor and gearhead

Using the pilot sections of the motor and hollow shaft flat gearhead as guides, install the motor to the hollow shaft flat gearhead and tighten the hexagonal socket head screws.
At this time, the motor cable position can be changed to one of three 90° directions. Install the motor carefully to prevent the pinion of the motor output shaft from contacting the casing or gear of the hollow shaft flat gearhead. Also confirm that no gaps remain between the motor flange surface and the end face of the hollow shaft flat gearhead's pilot section.



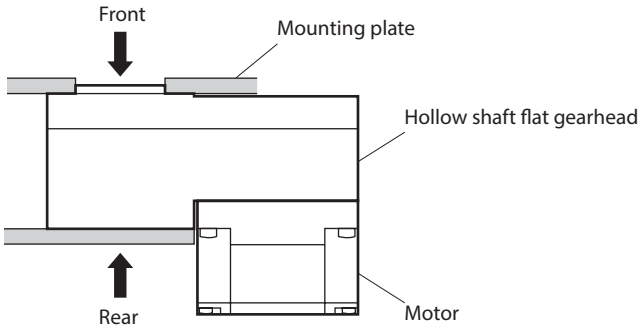
Motor model	Gearhead model	Nominal thread size	Tightening torque
BLEM23-GFS **BLEM23M2-GFS**	**GFS2G□FR**	M4	1.8 N·m (15.9 lb-in)
BLEM46-GFS **BLEM46M2-GFS**	**GFS4G□FR**	M6	6.4 N·m (56 lb-in)
BLEM512-GFS **BLEM512M2-GFS**	**GFS5G□FR**	M8	15.5 N·m (137 lb-in)

Note

- Do not forcibly assemble the motor and hollow shaft flat gearhead. Also, do not let metal objects or other foreign matter enter the hollow shaft flat gearhead.
  The pinion of the motor output shaft or the hollow shaft flat gearhead itself may be damaged, resulting in noise or shorter service life.
- Do not allow dust to attach to the pilot sections of the motor and hollow shaft flat gearhead. Also, assemble the motor carefully by not pinching the O-ring at the motor's pilot section. If the O-ring is pinched, the coupling strength will drop and grease may leak from the hollow shaft flat gearhead.

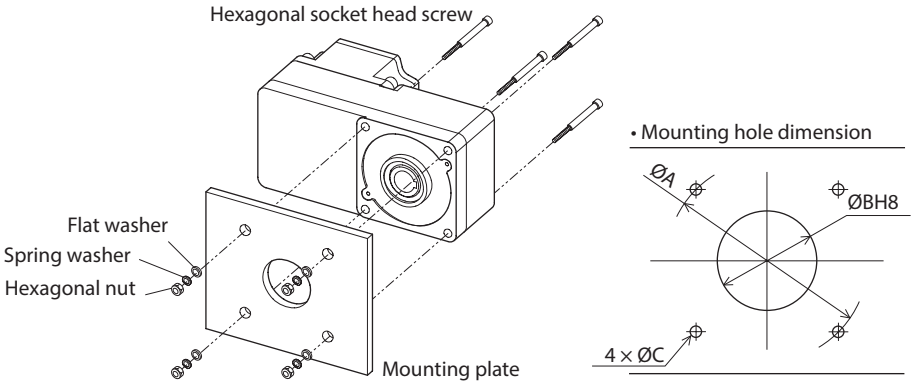
■ Installing to equipment

A hollow shaft flat gearhead can be installed by using either its front or rear side as the mounting surface. Install the mounting screw set (Included with gearhead) in the four mounting holes you opened and tighten the nuts until no gaps remain between the motor and mounting plate. Also, attach the safety cover (Included with gearhead) to the hollow output shaft on the end opposite from the one where the load shaft is installed.

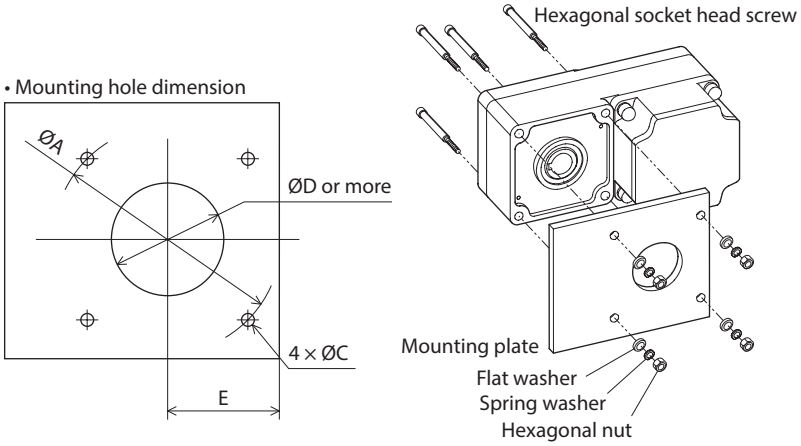


● Using the front side as the mounting surface

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



● Using the rear side as the mounting surface



● Mounting hole dimension [unit: mm (in.)]

Motor model	Gearhead model	ØA	ØBH8	ØC	ØD	E	Maximum applicable plate thickness*
BLEM23-GFS **BLEM23M2-GFS**	**GFS2G□FR**	70 (2.76)	$34\ ^{+0.039}_{0}$ $(1.34\ ^{+0.0015}_{0})$	5.5 (0.217)	25 (0.98)	29 (1.14)	5 mm (0.20 in.)
BLEM46-GFS **BLEM46M2-GFS**	**GFS4G□FR**	94 (3.70)	$38\ ^{+0.039}_{0}$ $(1.50\ ^{+0.0015}_{0})$	6.5 (0.256)	30 (1.18)	39 (1.54)	8 mm (0.31 in.)
BLEM512-GFS **BLEM512M2-GFS**	**GFS5G□FR**	104 (4.09)	$50\ ^{+0.039}_{0}$ $(1.97\ ^{+0.0015}_{0})$	8.5 (0.335)	35 (1.38)	44 (1.73)	12 mm (0.47 in.)

* The figures mounting screw set (Included with gearhead) the mounting screw set (Included with gearhead) is used.

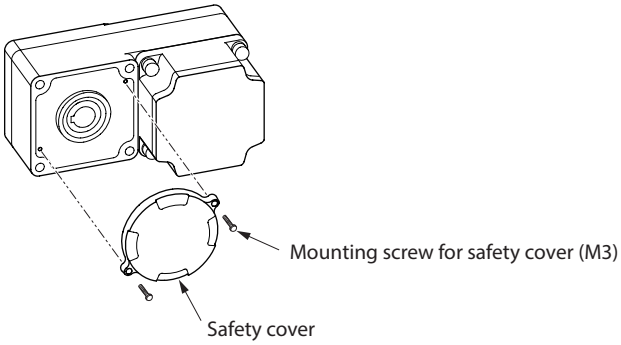
Note When installing the gearhead by using its rear side as the mounting surface, prevent contact between the mounting plate and motor by keeping dimension E below the specified value.

● Applicable hexagonal socket head screw and tightening torque

Motor model	Gearhead model	Nominal thread size	Tightening torque
BLEM23-GFS **BLEM23M2-GFS**	**GFS2G□FR**	M5	3.8 N·m (33 lb-in)
BLEM46-GFS **BLEM46M2-GFS**	**GFS4G□FR**	M6	6.4 N·m (56 lb-in)
BLEM512-GFS **BLEM512M2-GFS**	**GFS5G□FR**	M8	15.5 N·m (137 lb-in)

● **Installing the safety cover**

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

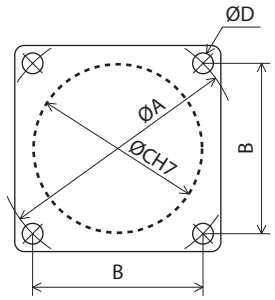


5.4 Installing the round shaft type

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 radiation plate [mm (in.)]	Thickness [mm (in.)]	Material
BLEM23-A **BLEM23M2-A**	115×115 (4.53×4.53)	5 (0.20)	Aluminum
BLEM46-A **BLEM46M2-A**	135×135 (5.31×5.31)		
BLEM512-A **BLEM512M2-A**	165×165 (6.50×6.50)		

1. Open mounting holes in the mounting plate.

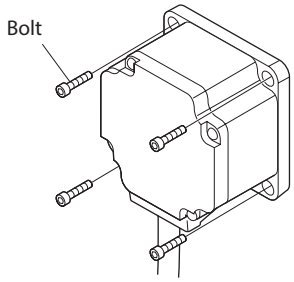


Unit: mm (in.)

Motor model	ØA	B	ØCH7	ØD
BLEM23-A **BLEM23M2-A**	70 (2.76)	49.5 (1.949)	$54\ ^{+0.030}_{0}$ $(2.1260\ ^{+0.0012}_{0})$	4.5 (0.177)
BLEM46-A **BLEM46M2-A**	94 (3.70)	66.47 (2.617)	$73\ ^{+0.030}_{0}$ $(2.8740\ ^{+0.0012}_{0})$	6.5 (0.256)
BLEM512-A **BLEM512M2-A**	104 (4.09)	73.54 (2.895)	$83\ ^{+0.035}_{0}$ $(3.2677\ ^{+0.0014}_{0})$	8.5 (0.335)

* ØC indicates the pilot diameter on the flange.

2. Install four screws (not supplied) in the four mounting holes you just opened and tighten the nuts until no gaps remain between the motor and mounting plate.



Motor model	Nominal thread size	Tightening torque
BLEM23-A **BLEM23M2-A**	M4	1.8 N·m (15.9 lb-in)
BLEM46-A **BLEM46M2-A**	M6	6.4 N·m (56 lb-in)
BLEM512-A **BLEM512M2-A**	M8	15.5 N·m (137 lb-in)

Note Insert the pilot located on the motor's installation surface into the mounting plate's.

5.5 Installing a load on the parallel gearhead or round shaft type

When installing a load on the motor (gearhead), align the center of the motor output shaft (gearhead output shaft) with the center of the load shaft.

Note

- When coupling the motor (gearhead) with a load, pay attention to centering, belt tension, parallelism of pulleys, etc. Also, securely affix the tightening screws of the coupling or pulleys.
- 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.

■ Output shaft shape

● Parallel shaft gearhead

A key groove is provided on the output shaft of each parallel shaft gearhead. Form a key groove on the load side and affix the load using the parallel key (Included with gearhead).

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

● Round shaft type

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

■ How to install a load

● Using a coupling

Align the centerline of the motor (gearhead) output shaft with the centerline of the load shaft.

● Using a belt

Adjust the motor (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 (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.

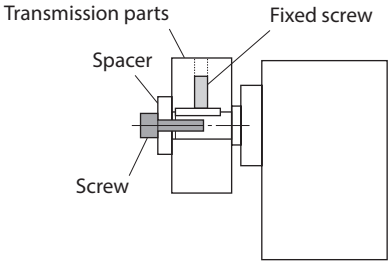
● When using the output axis tip screw hole of a gearhead

Use a screw hole provided at the tip of the output shaft as an auxiliary means for preventing the transfer mechanism from disengaging. (**GFS2G□** type have no output shaft tip screw hole.)

Gearhead model *	Output shaft tip screw hole
GFS4G□	M5, effective depth 10 mm (0.39 in.)
GFS5G□	M6, effective depth 12 mm (0.47 in.)

* The square box in the gearhead model will contain a value representing the gear ratio.

The example of output axis tip screw hole use



■ Permissible radial load and permissible axial load

Make sure the radial load and axial load received by the gearhead output shaft will not exceed the allowable values shown in the table below.

Note If the radial load or axial load exceeds the specified allowable value, repeated load applications may cause the bearing or output shaft of the gearhead to undergo a fatigue failure.

● **Parallel shaft gearhead**

Gearhead model		Distance from tip of gearhead output shaft and permissible radial load [N (lb.)] *		Permissible axial load [N (lb.)]
	Gear ratio	10 mm (0.39 in.)	20 mm (0.79 in.)	
GFS2G□	**5**	100 (22) [90 (20)]	150 (33) [110 (24)]	40 (9)
	10 to **20**	150 (33) [130 (29)]	200 (45) [170 (38)]	
	30 to **200**	200 (45) [180 (40)]	300 (67) [230 (51)]	
GFS4G□	**5**	200 (45) [180 (40)]	250 (56) [220 (49)]	100 (22)
	10 to **20**	300 (67) [270 (60)]	350 (78) [330 (74)]	
	30 to **200**	450 (101) [420 (94)]	550 (123) [500 (112)]	
GFS5G□	**5**	300 (67) [230 (51)]	400 (90) [300 (67)]	150 (33)
	10 to **20**	400 (90) [370 (83)]	500 (112) [430 (96)]	
	30 to **200**	500 (112) [450 (101)]	650 (146) [550 (123)]	

* The values assume a rated speed of 3000 r/min or below.
The values in [ ] are based on a rated speed of 4000 r/min.

● **Round shaft type**

Motor model	Distance from tip of motor output shaft and permissible radial load [N (lb.)]		Permissible axial load [N (lb.)]
	10 mm (0.39 in.)	20 mm (0.79 in.)	
BLEM23-A **BLEM23M2-A**	80 (18)	100 (22)	Not to exceed one-half the motor's dead weight *
BLEM46-A **BLEM46M2-A**	110 (24)	130 (29)	
BLEM512-A **BLEM512M2-A**	150 (33)	170 (38)	

* Minimize the axial load. If a axial load must be applied, do not let it exceed one-half the motor's dead weight.

5.6 Installing a load on the hollow shaft flat gearhead

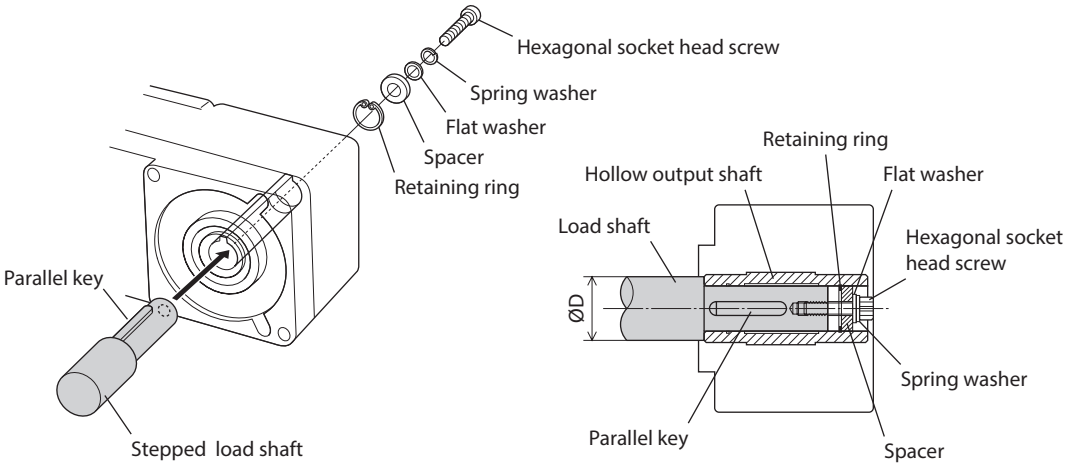
If the motor is subject to a strong impact upon instantaneous stop or receives a large radial load, use a stepped load shaft.

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

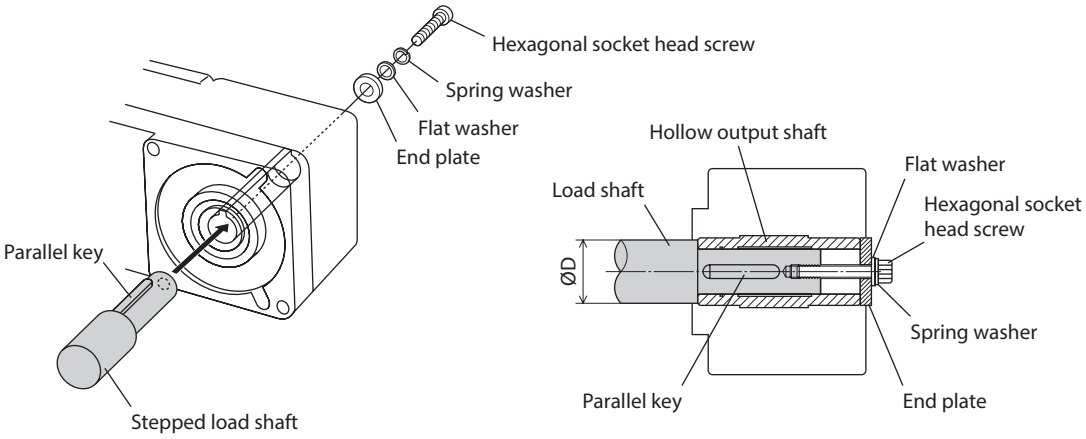
● Mounting method using retaining ring

Install each hexagonal socket head screw over a retaining ring, spacer, flat washer and spring washer and securely affix the ring.



● 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.



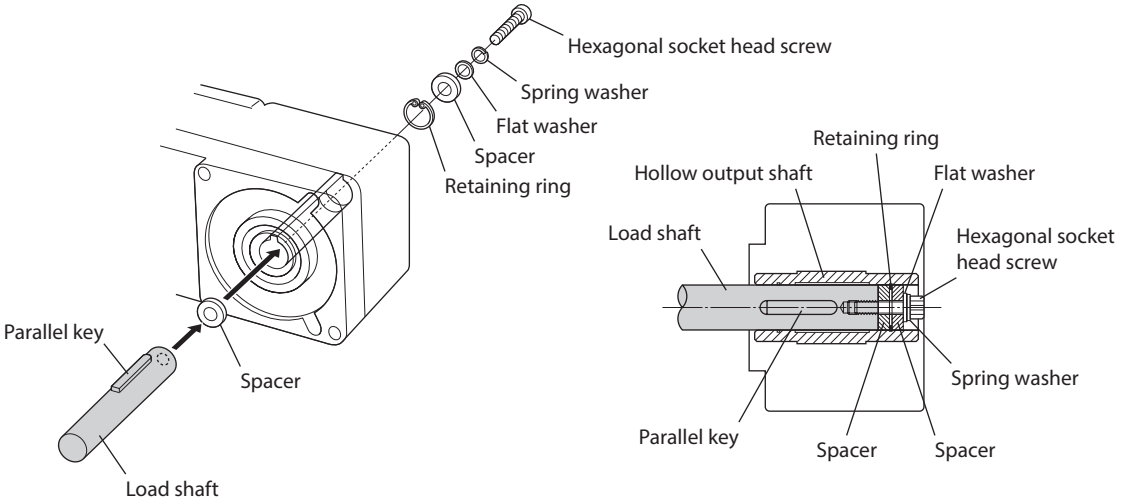
Note The safety cover (supplied) cannot be attached due to contact between the safety cover and hexagonal socket head screw. Take safety measures against rotating part.

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□FR	Ø12 $^{+0.027}_{0}$ (Ø0.4724 $^{+0.0011}_{0}$)	Ø12 $^{0}_{-0.018}$ (Ø0.4724 $^{0}_{-0.0007}$)	Ø12 (Ø0.47)	M4	3 (0.12)	20 (0.79)
GFS4G□FR	Ø15 $^{+0.027}_{0}$ (Ø0.5906 $^{+0.0011}_{0}$)	Ø15 $^{0}_{-0.018}$ (Ø0.5906 $^{0}_{-0.0007}$)	Ø15 (Ø0.59)	M5	4 (0.16)	25 (0.98)
GFS5G□FR	Ø20 $^{+0.033}_{0}$ (Ø0.7874 $^{+0.0013}_{0}$)	Ø20 $^{0}_{-0.021}$ (Ø0.7874 $^{0}_{-0.0008}$)	Ø20 (Ø0.79)	M6	5 (0.20)	30 (1.18)

■ Non-stepped load shaft

Install each hexagonal socket head screw over a retaining ring, spacer, flat washer and spring washer and securely affix the ring. Also insert a spacer on the load shaft side.



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
GFS2G□FR	$Ø12\ ^{+0.027}_{0}$ ($Ø0.4724\ ^{+0.0011}_{0}$)	$Ø12\ ^{0}_{-0.018}$ ($Ø0.4724\ ^{0}_{-0.0007}$)	Ø12 (Ø0.47)	M4	3 (0.12)
GFS4G□FR	$Ø15\ ^{+0.027}_{0}$ ($Ø0.5906\ ^{+0.0011}_{0}$)	$Ø15\ ^{0}_{-0.018}$ ($Ø0.5906\ ^{0}_{-0.0007}$)	Ø15 (Ø0.59)	M5	4 (0.16)
GFS5G□FR	$Ø20\ ^{+0.033}_{0}$ ($Ø0.7874\ ^{+0.0013}_{0}$)	$Ø20\ ^{0}_{-0.021}$ ($Ø0.7874\ ^{0}_{-0.0008}$)	Ø20 (Ø0.79)	M6	5 (0.20)

■ Permissible radial load and permissible axial load

Make sure the radial load and axial load received by the gearhead output shaft will not exceed the allowable values shown in the table below.

Note If the radial load or axial load exceeds the specified allowable value, repeated load applications may cause the bearing or output shaft of the gearhead to undergo fatigue failure.

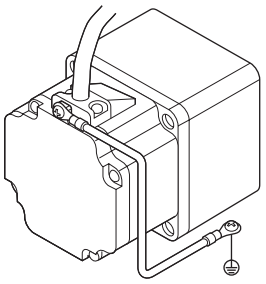
● Hollow shaft flat gearhead

Gearhead model		Distance from hollow shaft flat gearhead mounting surface and radial load [N (lb.)] *		Permissible axial load [N (lb.)]
	Gear ratio	10 mm (0.39 in.)	20 mm (0.79 in.)	
GFS2G□FR	**5**, **10**	450 (101) [410 (92)]	370 (83) [330 (74)]	200 (45)
	15 to **200**	500 (112) [460 (103)]	400 (90) [370 (83)]	
GFS4G□FR	**5**, **10**	800 (180) [730 (164)]	660 (148) [600 (135)]	400 (90)
	15 to **200**	1200 (270) [1100 (240)]	1000 (220) [910 (200)]	
GFS5G□FR	**5**, **10**	900 (200) [820 (184)]	770 (173) [700 (157)]	500 (112)
	15, **20**	1300 (290) [1200 (270)]	1110 (240) [1020 (220)]	
	30 to **200**	1500 (330) [1400 (310)]	1280 (280) [1200 (270)]	

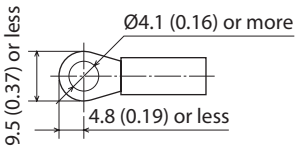
* The values assume a rated speed of 3000 r/min or below.
The values in [ ] are based on a rated speed of 4000 r/min.

6 Grounding

Connect the Protective Earth Terminal on the motor to the ground near the motor. Minimize the wiring length of the ground cable.
Tightening torque: 0.8 to 1.0 N·m (113.6 to 142 oz-in)



- Applicable crimp terminal: Round crimp terminal with insulation cover
- Thread size of terminal: M4
- Tightening torque: 0.8 to 1.0 N·m (113.6 to 142 oz-in)
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm^2)



Unit: [mm (in.)]

7 Maintenance and inspection

7.1 Inspection

It is recommended that the items listed below be inspected regularly after motor operation. If any abnormality is found, stop using the motor and call our Technical Support Line.

Note Never measure insulation resistance or conduct a dielectric strength test with the motor and driver connected. Doing so may damage the motor/driver.

■ Inspection items

- The motor/gearhead mounting screws are not loose.
- The bearing (ball bearing) and other parts of the motor are not generating noise.
- The bearing (ball bearing) and gear meshing parts of the gearhead are not generating noise.
- The motor/gearhead output shaft is not misaligned with the load shaft.
- The cables are free from damage or stress and are securely connected to the driver.

7.2 Warranty

Check on the Oriental Motor Website for the product warranty.

7.3 Disposal

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

8 Specifications

8.1 Specifications

Check on the Oriental Motor Website for the product Specifications.

8.2 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 environment.
	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 (0.006 in.) Sweep direction: 3 directions (X, Y, Z) Number of sweeps: 20 times
Storage environment Shipping environment	Ambient temperature	–25 to +70 °C [–13 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		IP65 (Excluding the mounting surface of the round shaft type and connectors)

9 Regulations and standards

9.1 UL Standards, CSA Standards

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

9.2 CE Marking

This product is affixed with the marks under the following directives.

■ Low Voltage Directive

Installation conditions

Overvoltage category	Ⅲ *1
Pollution degree	3
Degree of protection	IP65 *2
Protection against electric shock	Class Ⅰ equipment

*1 Overvoltage category II when EN 60950-1 is applicable.
*2 Excluding the mounting surface of the round shaft type and the connector part.

9.3 RoHS Directive

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

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• Please contact your nearest Oriental Motor office for further information.

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