



OPERATING MANUAL

Brushless Motor

BLM Motor Cable Type



Introduction

Before using the motor

Only qualified and educated personnel should work with the product. Use the product correctly after thoroughly reading the section "Safety precautions." Should you require the inspection or repair of internal parts, contact the Oriental Motor office where you purchased the product. 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 for this product are listed below. 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	BLM Motor Cable Type OPERATING MANUAL (this document)
Driver	BMU Series OPERATING MANUAL

Refer to the operating manual of the driver for details about connections and operations.

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.



The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.

Description 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. Electric shock or damage to equipment may result.
- Do not use a motor in a vertical application. If the driver's protection function is activated, the motor will stop and the moving part of the equipment will drop, thereby causing injury or equipment damage.
- Do not machine or modify the cable. Doing so may result in fire, electric shock, or damage to equipment.
- Do not forcibly bend, pull or pinch the cable. Doing so may result in fire, electric shock, or damage to equipment.
- Do not touch the motor or driver when conducting the insulation resistance measurement or dielectric strength test. Accidental contact may result in electric shock.
- Do not disassemble or modify the motor. This may result in electric shock, injury or damage to equipment. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

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.

WARNING



- 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, electric shock, injury, or damage to equipment.
- The motor is Class I equipment. Install the motor so as to avoid contact with hands, or ground it to prevent the risk of electric shock.
- Use a motor and driver only in the specified combination. Failure to do so may result in fire, electric shock, or damage to equipment.
- 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 the specifications. Doing so may result in fire, electric shock, 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 product by holding the output shaft or the cable. Doing so may result in injury.
- Do not touch the motor output shaft (end or pinion) with bare hands. Doing so may cause 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 equipment and motor. Injury may result.
- Do not touch the rotating part (output shaft) while operating the motor. Doing so may cause 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 and driver to prevent them 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 motor in operation, attach a warning label in a conspicuous position as shown in the figure. Failure to do so may result in a skin burn(s).
- Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.



Warning label

Precautions for use

Be sure to match the motor output power with the driver output power.

Connecting the motor and driver

Use an accessory connection cable (sold separately) when extending the wiring distance between the motor and the driver.

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.

Caution when using under low temperature environment

When an ambient temperature is low, since the load torque may increase by the oil seal or viscosity increment of grease used in the gearhead, the output torque may decrease or an overload alarm may generate. However, as time passes, the oil seal or grease is warmed up, and the motor can be driven without generating an overload alarm.

● **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.

● **Rotation direction of gearhead output shaft**

In the case of the combination type-parallel shaft gearhead, the rotation direction of the gearhead output shaft may differ from that of the motor output shaft depending on the gear ratio of the gearhead.

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

* Same as the motor output shaft when the gear ratio is 100:1 for the 200 W type.

Checking the product

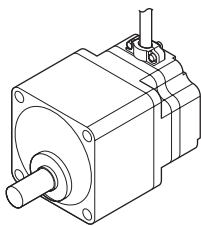
This chapter explains the items you should check, as well as the names and functions of each part.

Package contents

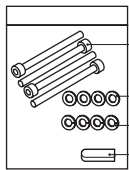
Verify that the items listed below are included. Report any missing or damaged items to the branch or sales office from which you purchased the product.

Motor.....1 unit

With a gearhead



Mounting screw set...1



- ① Hexagonal socket head screw: 4 pieces
- ② Plain washer: 4 pieces
- ③ Spring washer: 4 pieces
- ④ Parallel key: 1 piece
(200W and 400W types are fixed to the output shaft)

Instructions and Precautions for Safe Use 1 copy

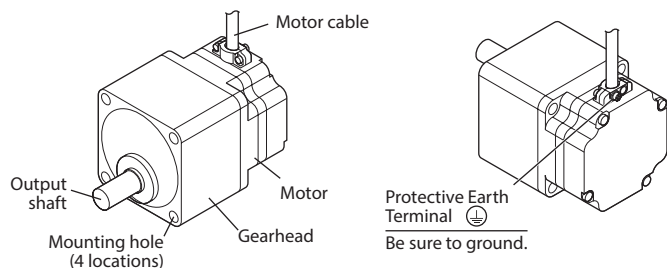
Model

Verify the model number of the purchased product against the number shown on the package label. Check the model number of the motor and gearhead against the number shown on their nameplates, respectively.

In the model name indicates a number representing the gear ratio.

Output power	Combination motor model	Motor model	Gearhead model
30 W	BLM230-□A	BLM230-GFV2	GFV2G□A
60 W	BLM460S-□A	BLM460S-GFV2	GFV4G□A
120 W	BLM5120-□A	BLM5120-GFV2	GFV5G□A
200 W	BLM6200S-□A	BLM6200S-GFV	GFV6G□A
400 W	BLM6400S-□A	BLM6400S-GFV	

Names and functions of parts



Installation

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

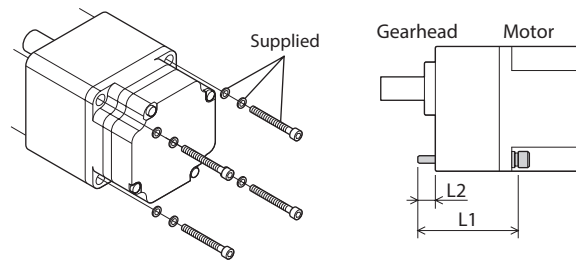
Installation location

Install the product in a well-ventilated location that provides easy access for inspection.

- Inside an enclosure installed indoors (provide a ventilation hole)
- Operating ambient temperature: 0 to +40 °C (+32 to +104 °F) (non-freezing)
- Operating 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
- Altitude Up to 1000 m (3300 ft.) above sea level

Installation method

Secure the motor through four mounting holes using the supplied mounting screw set. Do not leave a gap between the motor and mounting plate.



Model	Gear ratio	Hexagonal socket head screw (Material: Stainless steel)			Tightening torque
		Screw size	L1 [mm (in.)]	L2 [mm (in.)]	
BLM230	5 to 20	No.8-32UNC	50.8 (2)	7 (0.28)	1.4 N·m (12.3 lb·in)
	30 to 100		57.2 (2.25)	9 (0.35)	
	200		63.5 (2.5)	11 (0.43)	
BLM460S	5 to 20	1/4-20UNC	63.5 (2.5)	12 (0.47)	5.0 N·m (44 lb·in)
	30 to 100		69.9 (2.75)	13 (0.51)	
	200		76.2 (3)	15 (0.59)	
BLM5120	5 to 20	5/16-18UNC	69.9 (2.75)	12.5 (0.49)	12.0 N·m (106 lb·in)
	30 to 100		82.6 (3.25)	11.5 (0.45)	
	200		88.9 (3.5)	12.5 (0.49)	
BLM6200S BLM6400S*	5 to 20	5/16-18UNC	88.9 (3.5)	16 (0.63)	12.0 N·m (106 lb·in)
	30, 50		101.6 (4)	17 (0.67)	
	100, 200		114.3 (4.5)	15 (0.59)	

* The gear ratio of the **BLM6400S** is 5:1 to 50:1.

● Removing/Installing the gearhead

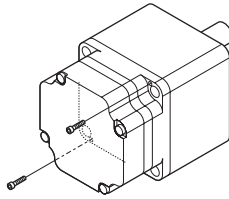
See the following steps to replace the gearhead or to change the cable position.

1. Removing the gearhead

Remove the hexagonal socket head screws assembling the motor and gearhead and detach the motor from the gearhead.

- Assembly hexagonal socket head screw

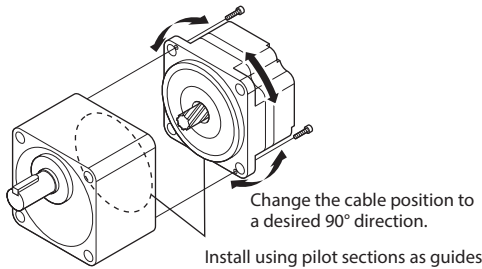
Model	Screw size	Tightening torque
BLM230 BLM460S	M2.6	0.4 N·m (3.5 lb-in)
BLM5120 BLM6200S BLM6400S	M3	0.6 N·m (5.3 lb-in)



2. Installing the gearhead

Using the pilot sections of the motor and gearhead as guides, install the gearhead to the motor and tighten the hexagonal socket head screws. Confirm that no gaps remain between the motor flange surface and the end face of the gearhead pilot section.

At this time, the motor cable position can be changed to a 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.



Note

- Do not forcibly assemble the motor and gearhead. Also, do not let metal objects or other foreign matter enter 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.
- The hexagonal socket head screws assembling the motor and gearhead are used to attach the motor and gearhead temporarily. Be sure to use the supplied mounting screw set to install the motor.

■ Installing a load

When installing a load on the motor (gearhead), pay attention to the following points.

- Align the centerline of the motor output shaft (gearhead output shaft) with the centerline of the load.
- A key slot is provided on the output shaft of each combination type • parallel shaft gearhead. Form a key slot on the load side and secure the load using the supplied parallel key.

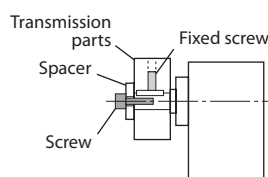
Note

- When coupling the motor (gearhead) 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 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.

When using the output shaft end tapped hole of a gearhead (GFV4G, GFV5G, GFV6G only)

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 of screw
GFV4G	No.10-24UNC	10 mm (0.39 in.)
GFV5G GFV6G	No.12-24UNC	12 mm (0.47 in.)

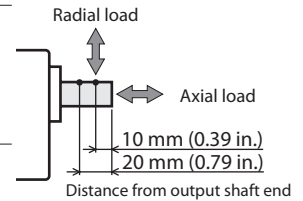


■ Permissible radial load and permissible axial load

The radial load and the axial load on the output shaft of the motor (gearhead) must be kept under the permissible values listed below.

Note

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



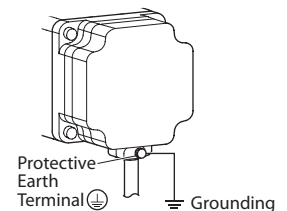
Model	Gear ratio	Permissible radial load [N (lb.)]*1		Permissible axial load [N (lb.)]
		10 mm (0.39 in.)	20 mm (0.79 in.)	
BLM230	5	100 (22) [90 (20)]	150 (33) [110 (24)]	40 (9)
	10 to 20	150 (33) [130 (29)]	200 (45) [170 (38)]	
	30 to 200	200 (45) [180 (40)]	300 (67) [230 (51)]	
BLM460S	5	200 (45) [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)]	
BLM5120	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)]	
BLM6200S BLM6400S*2	5 to 20	550 (123) [500 (112)]	800 (180) [700 (157)]	200 (45)
	30, 50	1000 (220) [900 (200)]	1250 (280) [1100 (240)]	
	100, 200	1400 (310) [1200 (270)]	1700 (380) [1400 (310)]	

*1 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.

*2 The gear ratio of the BLM6400S is 5:1 to 50:1.

Grounding

Connect the Protective Earth Terminal (⊕) on the motor to the ground near the motor. Minimize the wiring length of the ground cable.

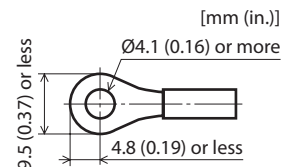


Note

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.

■ Ground terminal

- Applicable crimp terminal: Round crimp terminal with insulation cover
- Thread size of terminal: M4
- Tightening torque: 1.2 N·m (10.6 lb-in)
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)



■ Precautions about static electricity

Static electricity may cause the driver to malfunction or suffer damaged. Be sure to ground the motor and driver to prevent them from being damaged by static electricity.

Inspection

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

Note 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.

■ During inspection

- Are any of the mounting screws of the motor and gearhead loose?
- Are there any abnormal noises from inside of the motor or gearhead?
- Is there any misalignment between the load shaft and the motor output shaft or the gearhead output shaft?
- Are there any scratches, signs of stress or loose driver connections in the cable?

Regulations and standards

■ Standard and CE Marking

This product is recognized by UL under the UL and CSA standards, and it is also affixed the CE Marking under the Low Voltage Directive.
The motor model name represents the model that conforms to the standards.

● UL Standards and CSA Standards

Applicable Standards

Applicable Standards	Certification Body	Standards File No.
UL 1004-1 CSA C22.2 No.100	UL	E335369

* Thermal class UL/CSA Standards: 105(A)

● Low Voltage Directive

- This product is designed and manufactured to be incorporated in equipment.
- This product cannot be used in IT power distribution systems.
- Install the product within the enclosure in order to avoid contact with hands.
- Ground the Protective Earth Terminals for the motor and driver securely.
- Isolate the motor cable, power-supply cable and other drive cables from the signal cables by means of double insulation.

Applicable Standards

EN 60034-1, EN 60034-5, EN 60664-1

Installation conditions (EN Standard)

- For incorporating in equipment
- Overvoltage category: II
- Pollution degree: 2
- Protection against electric shock: Class I

* Thermal class EN Standards: 120(E)

● The motor temperature rise tests

A temperature test has been conducted with a heatsink plate.
The size, thickness and material of the heatsink plates are as table.

[mm (in.)]

Motor model	Size	Thickness	Material
BLM230	115×115 (4.53×4.53)	5 (0.20)	Aluminum alloy
BLM460S	135×135 (5.31×5.31)		
BLM5120	165×165 (6.50×6.50)		
BLM6200S	200×200 (7.87×7.87)		
BLM6400S	250×250 (9.84×9.84)	6 (0.24)	

■ RoHS Directive

The products do not contain the substances exceeding the restriction values of RoHS Directive (2011/65/EU).

General specifications

Operation environment	Ambient temperature	0 to +40 °C [+32 to +104 °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 or dust. Cannot be used in radioactive materials, magnetic field, vacuum or other special environment. Details about the installation location are described on p.2.
Storage environment	Ambient temperature	-20 to +70 °C [-4 to +158 °F] (non-freezing)
	Ambient Humidity	85% or less (non-condensing)
Shipping environment	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

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

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