

## OPERATING MANUAL

### Brushless Motor BLM Motor Cable Type

#### Introduction

##### ■ Before using the motor

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, 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 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	<b>BLM</b> Motor Cable Type OPERATING MANUAL (this document)
Driver	<b>BMU</b> Series OPERATING MANUAL


For other descriptions, refer to the operating manual of the driver.


#### 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.

 <b>WARNING</b>	Handling the product without observing the instructions that accompany a "WARNING" symbol may result in serious injury or death.
 <b>CAUTION</b>	Handling the product without observing the instructions that accompany a "CAUTION" symbol may result in injury or property damage.
 <b>Note</b>	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.



 <b>WARNING</b>	
	<ul style="list-style-type: none"> <li>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.</li> <li>Do not transport, install the product, perform connections or inspections when the power is on. Always turn the power off before carrying out these operations. Failure to do so may result in electric shock or equipment damage.</li> <li>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.</li> <li>Do not machine or modify the motor cable or connection cable. Doing so may result in fire, electric shock or damage to equipment.</li> <li>Do not forcibly bend, pull or pinch the cables. Doing so may result in fire, electric shock or damage to equipment.</li> <li>Do not touch the motor or driver when conducting insulation resistance measurement or dielectric strength test. Accidental contact may result in electric shock.</li> <li>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.</li> </ul>
	<ul style="list-style-type: none"> <li>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 equipment damage.</li> <li>The motor and driver are Class I equipment. When installing the motor and driver, connect their Protective Earth Terminals. Failure to do so may result in electric shock.</li> <li>Use a motor (gearhead) and driver only in the specified combination. An incorrect combination may cause in fire, electric shock or equipment damage.</li> <li>Always turn off the power before performing maintenance/inspection. Failure to do so may result in electric shock.</li> </ul>

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.

#### **CAUTION**

	<ul style="list-style-type: none"> <li>Do not use the motor (gearhead) beyond the specifications. Doing so may result in fire, electric shock, injury or damage to equipment.</li> <li>Do not touch the motor (gearhead) while operating or immediately after stopping. The surface of the motor (gearhead) is hot and it may cause a skin burn(s).</li> <li>Do not leave anything around the motor and driver that would obstruct ventilation. Doing so may result in damage to equipment.</li> <li>Do not carry the product by holding the motor (gearhead) output shaft or any of the cables. Doing so may result in injury.</li> <li>Do not touch the motor output shaft (tip or pinion) with bare hands. Doing so may result in injury.</li> <li>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.</li> <li>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.</li> <li>Do not touch the rotating part (output shaft) when operating the motor. Doing so may result in injury.</li> </ul>
	<ul style="list-style-type: none"> <li>Securely install the motor (gearhead) to their respective mounting plates. Inappropriate installation may cause the motor (gearhead) to detach and fall, resulting in injury or equipment damage.</li> <li>Provide a cover on the rotating part (output shaft) of the motor (gearhead). Failure to do so may result in injury.</li> <li>Securely install the load on the motor (gearhead) output shaft. Inappropriate installation may result in injury.</li> <li>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.</li> <li>The motor surface temperature may exceed 70 °C (158 °F) even under normal operating conditions. If the operator is allowed to approach a running motor, attach a warning label as shown in the figure in a conspicuous position. Failure to do so may result in skin burn(s).</li> <li>Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.</li> </ul>



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
<b>5, 10, 15, 20, 200</b>	Same as the motor output shaft
<b>30, 50, 100*</b>	Opposite to the motor output shaft

\* Same as the motor output shaft when the gear ratio is 100:1 for the 200 W and 300 W types

## Checking the product

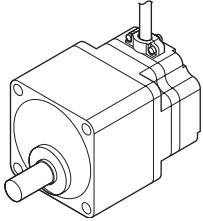
This chapter explains the items you should check, as well as the names and functions of each part.

### 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.

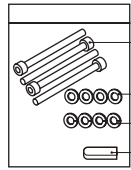
#### Motor..... 1 unit

The figure shows an example of the combination type.  
Combination type: With a gearhead



#### Mounting screw set..... 1

Supplied with the combination type.



- ① Hexagonal socket head screw: 4 pieces
- ② Plain washer: 4 pieces
- ③ Spring washer: 4 pieces
- ④ Parallel key: 1 piece  
(200W, 300W, 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.

◆ in the model name indicates **A** (no machining) or **AC** (shaft flat) for the round shaft type.

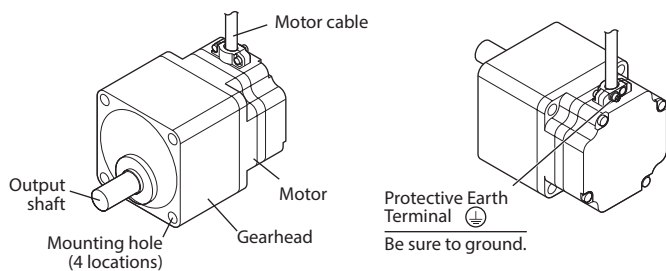
#### Combination type • parallel shaft gearhead

Output power	Combination motor model	Motor model	Gearhead model
30 W	<b>BLM230-□B</b>	BLM230-GFV2	GFV2G□
60 W	<b>BLM460S-□B</b>	BLM460S-GFV2	GFV4G□
120 W	<b>BLM5120-□B</b>	BLM5120-GFV2	GFV5G□
200 W	<b>BLM6200S-□B</b>	BLM6200S-GFV	GFV6G□
300 W	<b>BLM6300S-□B</b>	BLM6300S-GFV	
400 W	<b>BLM6400S-□B</b>	BLM6400S-GFV	

#### Round shaft type

Output power	Motor model
30 W	<b>BLM230-◆2</b>
60 W	<b>BLM260-◆2</b>
120 W	<b>BLM5120-◆2</b>
200 W	<b>BLM5200-◆</b>
300 W	<b>BLM5300-◆</b>
400 W	<b>BLM5400-◆</b>

### 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

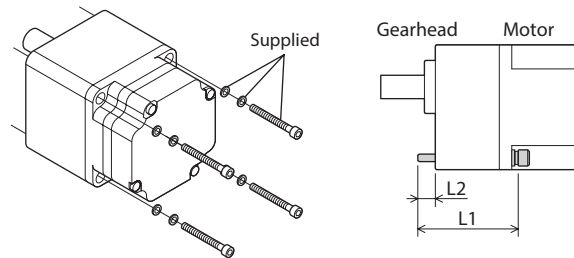
Install the product in a well-ventilated location that provides easy access for inspection.

- 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

#### Installing the combination type • parallel shaft gearhead

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.)]	
<b>BLM230</b>	<b>5 to 20</b>	M4	50 (1.97)	6 (0.24)	1.4 N-m (12.3 lb-in)
	<b>30 to 100</b>		55 (2.17)	7 (0.28)	
	<b>200</b>		60 (2.36)	7 (0.28)	
<b>BLM460S</b>	<b>5 to 20</b>	M6	60 (2.36)	8 (0.31)	5.0 N-m (44 lb-in)
	<b>30 to 100</b>		65 (2.56)	8 (0.31)	
	<b>200</b>		70 (2.76)	8 (0.31)	
<b>BLM5120</b>	<b>5 to 20</b>	M8	70 (2.76)	11.5 (0.45)	12.0 N-m (106 lb-in)
	<b>30 to 100</b>		85 (3.35)	13.5 (0.53)	
	<b>200</b>		90 (3.54)	12.5 (0.49)	
<b>BLM6200S</b> <b>BLM6300S*1</b> <b>BLM6400S*2</b>	<b>5 to 20</b>	M8	85 (3.35)	11 (0.43)	12.0 N-m (106 lb-in)
	<b>30, 50</b>		100 (3.94)	14 (0.55)	
	<b>100, 200</b>		110 (4.33)	10 (0.39)	

\*1 The gear ratio of the **BLM6300S** is 5:1 to 100:1.

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

#### Removing/Installing the gearhead

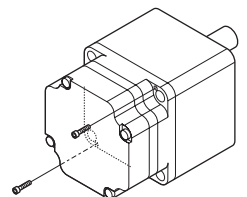
See the following steps to replace the gearhead or to change the cable position.

##### 1. Removing the gearhead

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

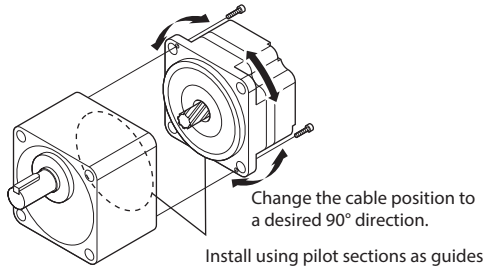
- Assembly hexagonal socket head screw

Model	Screw size	Tightening torque
<b>BLM230</b> <b>BLM460S</b>	M2.6	0.4 N-m (3.5 lb-in)
<b>BLM5120</b> <b>BLM6200S</b> <b>BLM6300S</b> <b>BLM6400S</b>	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

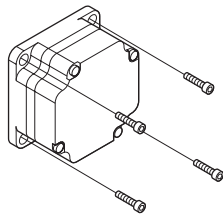
- Do not forcibly assemble the motor and gearhead. Also, do not let metal objects or other foreign matter enter the gearhead. The pinion of the motor output shaft or gear may be damaged, resulting in noise or shorter service life.
- Do not allow dust to attach to the pilot sections of the motor and gearhead. 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 the round shaft type

Secure the motor with hexagonal socket head screws (not supplied) through the four mounting holes provided. Do not leave a gap between the motor and mounting plate.

### Applicable mounting screw

Model	Screw size	Tightening torque*
BLM230 BLM260	M4	1.8 N·m (15.9 lb-in) [1.4 N·m (12.3 lb-in)]
BLM5120 BLM5200 BLM5300 BLM5400	M8	15.5 N·m (137 lb-in) [12.0 N·m (106 lb-in)]



\* The brackets [ ] indicate the value for stainless steel.

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).

[mm (in.)]

Model	Size of mounting plate	Thickness	Material
BLM230	115×115 (4.53×4.53)	5 (0.20)	Aluminum alloy
BLM260	135×135 (5.31×5.31)		
BLM5120	165×165 (6.50×6.50)		
BLM5200	200×200 (7.87×7.87)		
BLM5300 BLM5400	250×250 (9.84×9.84)	6 (0.24)	

### Note

Do not install the motor to the mounting hole diagonally or assemble the motor forcibly. Doing so may cause damage to the flange pilot section, thereby resulting in damage to 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.

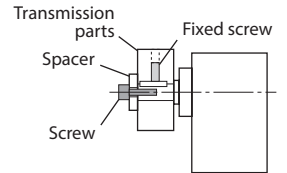
### Note

- 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	M5	10 mm (0.39 in.)
GFV5G GFV6G	M6	12 mm (0.47 in.)

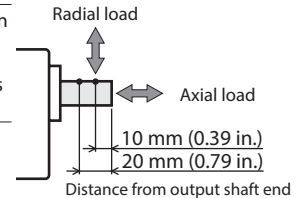


## ■ Permissible radial load and permissible axial load

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.



## ● Combination type • parallel shaft gearhead

Model	Gear ratio	Permissible radial load [N (lb.)]*1 Distance from tip of gearhead output shaft		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 BLM6300S*2 BLM6400S*3	5 to 20	550 (123) [500 (112)]	800 (180) [700 (157)]	200 (45)
	30, 50	1000 (220) [900 (200)]	1250 (280) [1100 (240)]	300 (67)
	100, 200	1400 (310) [1200 (270)]	1700 (380) [1400 (310)]	400 (90)

\*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 BLM6300S is 5:1 to 100:1.

\*3 The gear ratio of the BLM6400S is 5:1 to 50:1.

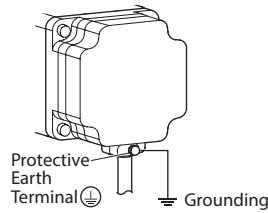
## ● Round shaft type

Model	Permissible radial load [N (lb.)] Distance from output shaft end of the motor		Permissible axial load [N (lb.)]
	10 mm (0.39 in.)	20 mm (0.79 in.)	
BLM230 BLM260	80 (18)	100 (22)	Not to exceed one-half the motor's mass*
BLM5120 BLM5200 BLM5300 BLM5400	150 (33)	170 (38)	

\* Minimize the axial load. If an axial load must be applied, do not let it exceed one-half the motor's mass.

## Grounding

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

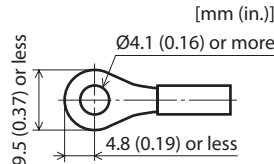


### Note

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 mm<sup>2</sup>)



## 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
BLM260, BLM460S	135×135 (5.31×5.31)		
BLM5120	165×165 (6.50×6.50)		
BLM5200, BLM6200S	200×200 (7.87×7.87)		
BLM5300, BLM5400 BLM6300S, 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, dust, water or oil. Cannot be used in radioactive materials, magnetic field, vacuum or other special environment. Details about the installation location are described on p.2.
	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	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
Shipping environment	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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