



LJ Linear Head

OPERATING MANUAL

Before using the product

Safety precautions

Precautions for use

Checking the product

Installation

Inspection and maintenance

Specifications

Thank you for purchasing an Oriental Motor product.

This Operating Manual describes product handling procedures and safety precautions.

- Please read the operating manual (this document) and also that of the motor combined thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

1	Before using the product	3
2	Safety precautions	4
3	Precautions for use	6
4	Checking the product	8
	4-1 Package contents.....	8
	4-2 How to identify the product model	8
	4-3 Information about nameplate	8
	4-4 Products possible to combine	9
	4-5 Names of parts.....	9
5	Installation	10
	5-1 Installation location	10
	5-2 Installation method of linear head.....	10
	5-3 Installing a load	13
	5-4 Permissible radial load.....	14
	5-5 Remedial action when the rack has removed	15
6	Inspection and maintenance	16
	6-1 Inspection.....	16
	6-2 Warranty.....	16
	6-3 Disposal.....	16
7	Specifications	17
	7-1 Product specifications.....	17
	7-2 General specifications.....	18

1 Before using the product

Only qualified personnel of electrical and mechanical engineering 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 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.

■ Related operating manual

The operating manual (this document) is not included with the product. Download it from Oriental Motor Website Download Page or contact your nearest Oriental Motor sales office.





■ RoHS Directive

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

2 Safety precautions

The precautions described below are intended to ensure the safe and correct use of the product, and to prevent the user and other personnel 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.
	The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.
	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	
	<ul style="list-style-type: none"> Do not disassemble or modify the linear head. 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.
	<ul style="list-style-type: none"> Check the rack is set in a direction not to fall before cutting off the cable tie. When transporting or when assembling the motor, if the linear head is tilted in a direction where the rack is positioned in vertical, the rack may fall, causing injury or damage to equipment. Use the included screw for fall-off prevention of key to take measures so that the parallel key is not come off. The rack may fall, causing to injury or damage to equipment. Make sure the moving direction of the rack before installing to equipment. Failure to do so may result in injury or damage to equipment. If the product is used in vertical drive such as elevating equipment, be sure to provide a measure for the position retention of the moving part. Failure to do so may result in injury or damage to equipment. When operating the product, check the settings of the speed and travel amount carefully in order to prevent the rack from falling off. Failure to do so may result in injury or damage to equipment. When operating the product, install a mechanical stopper or the like in order to prevent the rack from falling off. Failure to do so may result in injury or damage to equipment.


CAUTION

	<ul style="list-style-type: none"> • Do not use the linear head beyond its specifications. Doing so may result in injury or damage to equipment. • Do not touch the rack while operating. Doing so may result in injury. • Do not remove the motor in a state where a load is installed. Doing so may result in injury or damage to equipment.
	<ul style="list-style-type: none"> • Install the included safety cover on the rotating part. Failure to do so may result in injury. • Be sure to attach a cover or equivalent to the rack. Failure to do so may result in injury. • When assembling the motor with the linear head, exercise caution not to pinch your fingers or other parts of your body. This may cause injury. • When installing the linear head on the mounting plate, exercise caution not to pinch your fingers or other parts of your body. This may cause injury. • Securely assemble the linear head with the motor before operating. Failure to do so may result in injury or damage to equipment. • When assembling the product to equipment to start operation, make sure the motor can be stopped in an emergency before doing so. Failure to do so may result in injury. • Wear safety goggles while operating because grease applied to the rack may scatter during operation. If grease gets into eyes or comes in contact with the skin, immediately flush the area thoroughly with water.

3 Precautions for use

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

■ Installation

● Grease

- On rare occasions, a small amount of grease may ooze out from the linear head. If there is concern over possible environmental contamination resulting from the leakage of grease, provide an oil tray or similar oil catching mechanism in order not to cause a secondary damage. Grease leakage may lead to problems in the user's equipment or products.
- Grease is applied on the tooth surface of the rack at the time of shipment. Do not wipe off grease on the surface or the tooth surface of the rack. Wiping off the grease reduces the lubrication between the tooth surfaces, leading to a shorter life of the rack and pinion. Always operate the product in a state where grease is applied on the surface and tooth surfaces of the rack properly.

● When using in low temperature environment

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

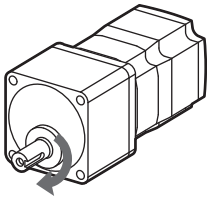
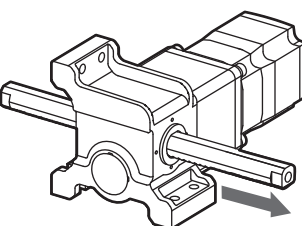
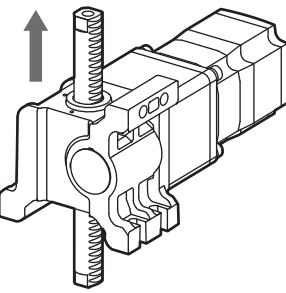
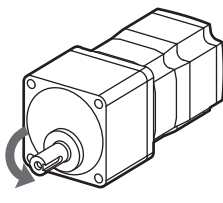
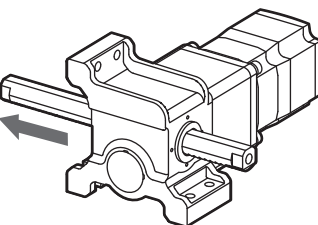
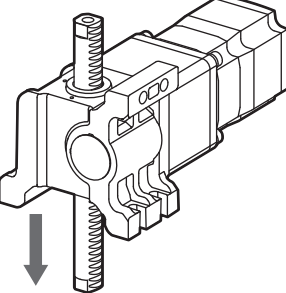
■ Operations

● Do not perform instantaneous bidirectional operation of the motor.

Performing instantaneous bidirectional operation may cause damage to the product.

● Moving direction of rack and rotation direction of motor output shaft

The moving direction of the rack varies depending on the rotation direction of the motor output shaft. Refer to the operating manual of the motor combined.

Rotation direction of motor output shaft (a gearhead has assembled)	Moving direction of rack	
	Horizontal installation	Vertical installation
		
		

● Use an electromagnetic brake motor in an application of vertical drive such as elevating equipment.

To hold the position of a load or the rack, use an electromagnetic brake motor in an application of vertical drive such as elevating equipment.

- **Operate the product in a state of equal to or less than the maximum transportable mass.**

Operating the product in a state where a load exceeding the maximum transportable mass is applied may cause damage to the product. Be sure to operate in a state of equal to or less than the maximum transportable mass. Refer to P.17 "7-1 Product specifications" for the maximum transportable mass.

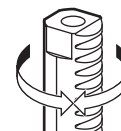
- **Operate the product in a state of equal to or less than the permissible radial load.**

Continuing the operation in a state where a load exceeding the permissible radial load is applied may cause the rack bushings to abrade away in a short time or to damage. Be sure to operate in a state of equal to or less than the permissible radial load.

Even if a load is equal to or less than the permissible radial load, operating the linear head repeatedly will cause the rack bushings to abrade. To suppress abrasion of the rack bushings, install a guide or the like to reduce the radial load.

- **Do not apply force in the direction where the rack will rotate.**

Applying force in the direction where the rack will rotate may cause damage to the product. If force is applied, install a guide.

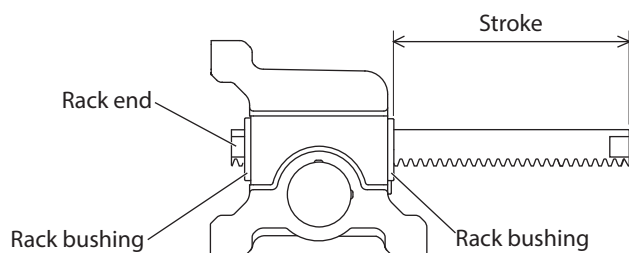


- **Rack stroke**

The rack stroke represents a length from the rack end to the rack bushing (per one side).

When operating the linear head, be sure to reverse the moving direction of the rack before one end of the rack enters in the rack bushing. Proper operation can be performed when the rack is supported by the rack bushings located on both ends of the rack case.

If the rack bushing on the mounting foot side is difficult to check when the linear head is installed vertically, it is recommended to use the rack with a sufficient stroke to prevent the rack from entering in the rack bushing.



- **Push-motion operation**

When using in combination with the **K I S** series, do not perform push-motion operation. Doing so may damage the product.

4 Checking the product

This chapter explains the items you should check, as well as the name of each part.

4-1 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.

- Linear Head 1 unit
- Screw for fall-off prevention of key 1 set
(Hexagonal socket head screw, spacer, spring washer, 1 piece each)
- Safety cover 1 piece
- Caution card 1 copy
- Instructions and Precautions for Safe Use 1 copy

4-2 How to identify the product model

Check the model name of the linear head against the model shown on the nameplate.

- The box (□) in the model name indicates a number representing the stroke length.

Model	Stroke		
AGL5H18-□	1: 100 mm (3.94 in.)	2: 200 mm (7.87 in.)	3: 300 mm (11.81 in.)
	4: 400 mm (15.75 in.)	5: 500 mm (19.69 in.)	6: 600 mm (23.62 in.)
	7: 700 mm (27.56 in.)		

4-3 Information about nameplate

The figure shows an example.



4-4 Products possible to combine

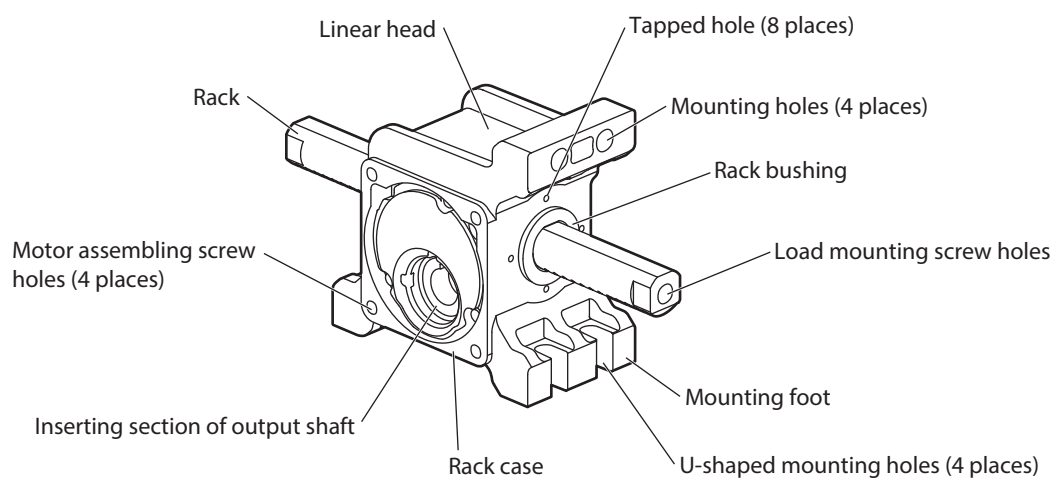
Products that can be combined with the linear head are shown below. Refer to the operating manual of the motor combined.

Series name	Gear ratio
KIS Series *1 60 W, 100 W	7.5, 9, 12.5, 15, 18, 25, 30, 36, 50, 60, 75, 90, 100, 120, 150, 180, 250, 300 *2
AZ Series TS geared type frame size 90 mm (3.54 in.)	10, 20, 30

*1 Electromagnetic brake motor only

*2 Gear ratios of 250 and 300 are for a 60 W motor only

4-5 Names of parts



5 Installation

This chapter explains the installation location, the installation method, and how to install a load.

5-1 Installation location

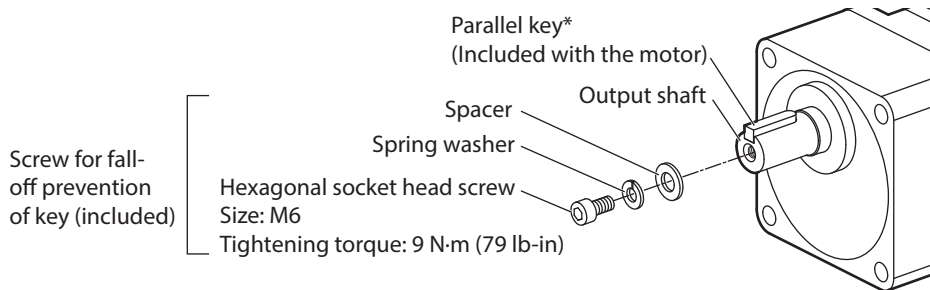
The installation conditions are as follows. Also check the operating manual of the motor to be combined. The rack and pinion is designed and manufactured to be incorporated in equipment. Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature: -10 to +50 °C (+14 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 not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- 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
- Up to 1,000 m (3,300 ft.) above sea level

5-2 Installation method of linear head

■ Prevention from coming-off the parallel key

Assemble the included screw for fall-off prevention of key to the output shaft so that the parallel key does not come off.



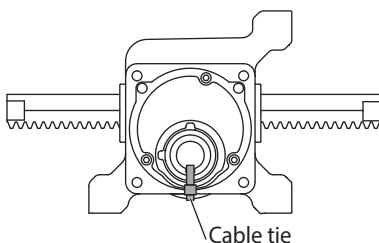
* For some motors, the parallel key is press-fitted to the output shaft beforehand.



- When fitting the screw for fall-off prevention of key, make sure that the spacer does not protrude from the outer diameter of the motor output shaft. If the motor is assembled with the linear head in a state where the spacer protrudes from the outer diameter of the output shaft, the product may be damaged.
- Check the parallel key is fitted to the output shaft. The rack may fall if the parallel key is not fitted.

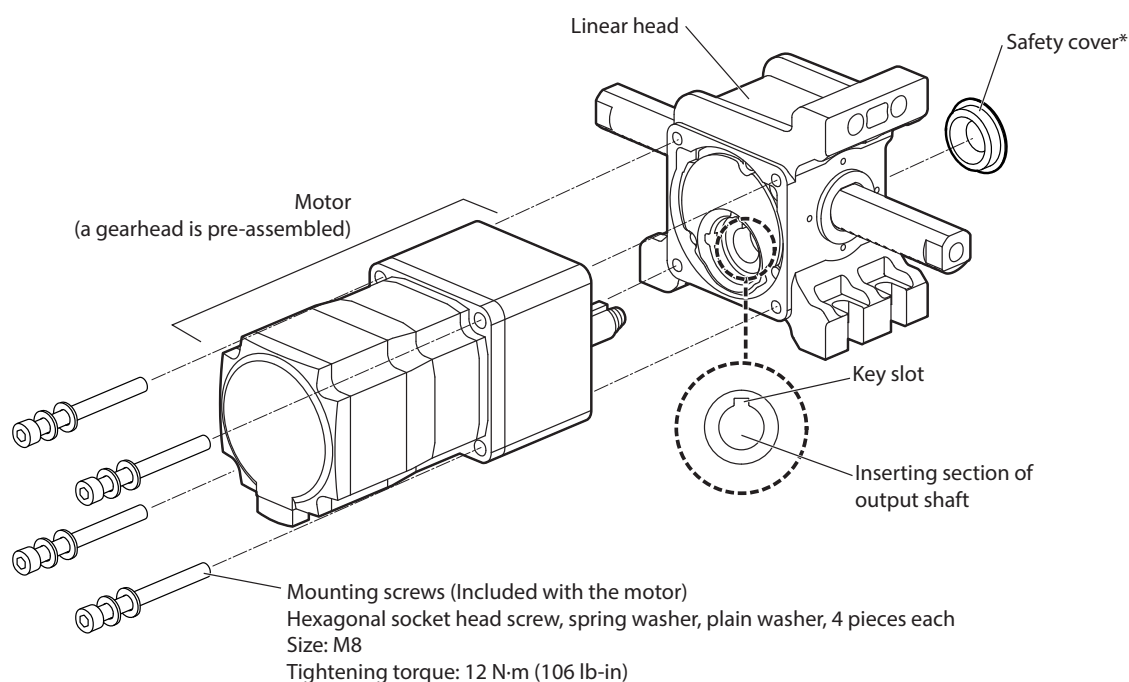
■ Cutting off the cable tie

Check the rack is set in a direction not to fall before cutting off the cable tie.



■ Assembling the motor

1. Check the parallel key is fitted to the output shaft before assembling the motor with the linear head.
2. Check there is no gap between the linear head and the motor to secure with mounting screws (4 pieces).
3. Attach the safety cover to the linear head.



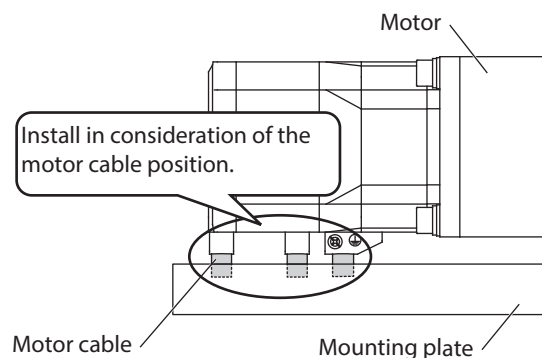
* If it is difficult to attach the safety cover, apply molybdenum disulfide grease to the fixing part (housing) of the safety cover.

Note

- Do not forcibly assemble the motor with the linear head. Doing so may result in abnormal noise or shorter service life.
- When assembling the motor with the linear head, apply molybdenum disulfide grease to the inserting section of the output shaft in order to prevent seizure.

● Cable outlet position

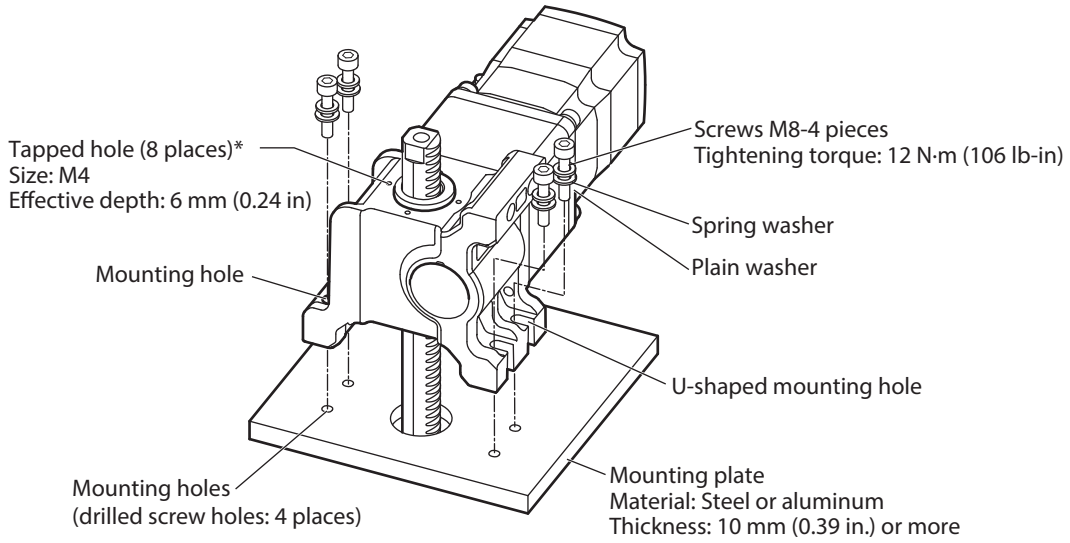
If the motor is assembled with the linear head in a state of facing the motor cable outlet downward, the motor cable contacts the mounting plate.



■ Installing to equipment

Ensure that there is no gap between the mounting plate having excellent vibration resistance and the linear head before installing.

Screws for mounting are required separately.



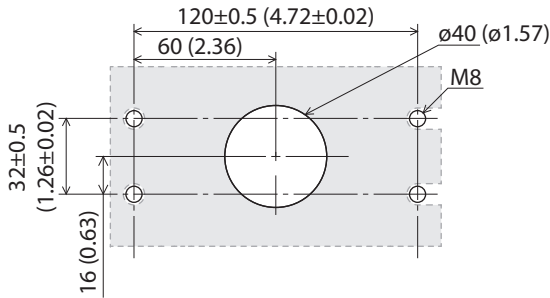
* Feel free to use tapped holes. Check on the Oriental Motor Website for machining dimensions of the tapped holes.

Note When using the tapped holes, do not use screws which length exceeds the effective depth. This may cause damage to the product.

memo It is recommended to use rack covers or the like to prevent the grease from scattering or to prevent from pinching. Use tap holes to secure the rack covers.

● Reference mounting hole dimensions [Unit: mm (in.)]

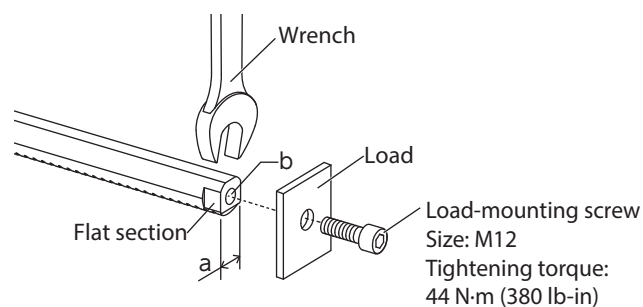
When moving the rack vertically, make a hole that the rack passes through.



5-3 Installing a load

Install a load to the tapped hole on the rack. A load-mounting screw is required separately. Check on the Oriental Motor Website for machining dimensions of the load-mounting screw hole.

Use the flat section of the rack to secure the rack with a wrench. Install a load so that a rotational force is not applied to the rack.



Width of flat section [a]: 21 mm (0.83 in.)
Effective depth of load-mounting screw hole [b]:
15 mm (0.59 in.)

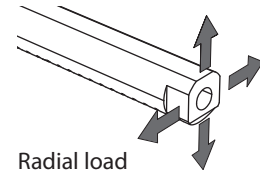
Note

- When installing a load, do not use a screw which length exceeds the effective depth. This may cause damage to the product.
- When installing a load, do not apply force in the direction where the rack will rotate. This may cause damage to the product.
- Do not remove the motor in a state where a load is installed. Doing so may cause the load or the rack to fall.

5-4 Permissible radial load

■ Permissible radial load

The radial load applied to the rack is determined based on a load applied to the rack bushings. Operating the product in a state where a load exceeding the permissible radial load may cause the rack bushings to abrade away in a short time or to damage.



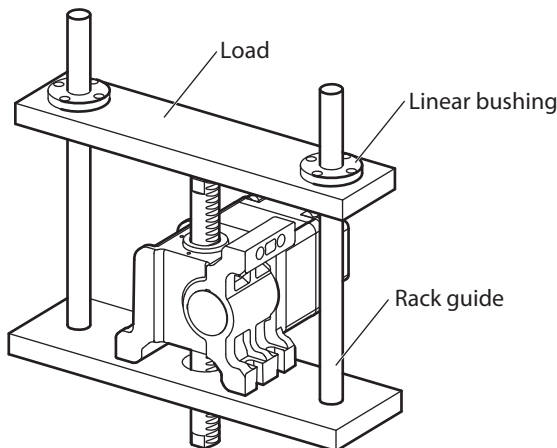
Be sure to operate the product in a state where the radial load applied to the rack end is equal to or less than the permissible value.

If a load exceeding the permissible radial load is applied, install a guide.

Stroke [mm (in.)]	100 (3.94)	200 (7.87)	300 (11.81)	400 (15.75)	500 (19.69)	600 (23.62)	700 (27.56)
Permissible radial load [N (lb.)]*	120 (27)	90 (20)	70 (15.7)	50 (11.2)	40 (9.0)	30 (6.7)	30 (6.7)

* The value is an operating speed of up to 45 mm/s. Install a guide when operating at a speed exceeding 45 mm/s.

● Installation example of guide



Note

- Be sure to operate the product in a state of equal to or less than the permissible radial load. Continuing the operation in a state where a load exceeding the permissible radial load is applied may cause the rack bushings to abrade away in a short time, resulting in decrease in the positioning accuracy or damage to the rack or rack case.
- Do not apply force to the rack in the direction it will rotate. Applying improper force may cause damage to the product.

memo

If a load is applied to the rack even in a state where the radial load is equal to or less than the permissible value, it is recommended to install a guide to reduce and disperse the load.

■ Gap between rack and rack bushing

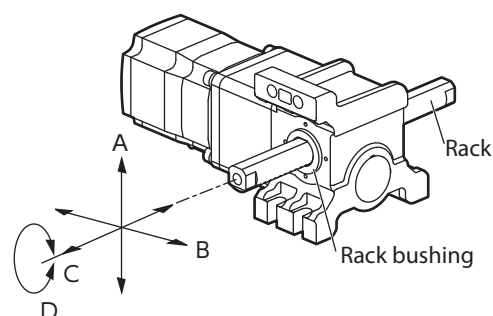
There is a small gap between the rack and the rack bushing. Initial values of the backlash generated from the gap are as follows.

Backlash generated from gap

A, B directions: About 2 mm (0.08 in.)*

C direction: About 0.5 mm (0.02 in.)

D direction: About 5°



* The values are measured at 500 mm (19.69 in.) from the end face of the rack case.

As the rack is operated repeatedly, the rack bushings will abrade, and also this backlash will increase. Install a guide to suppress the backlash.

5-5 Remedial action when the rack has removed

If the rack has accidentally removed from the case during installation or operation, refer to the following to take a suitable remedial action. Be sure to turn off the power supply and remove the load before taking a remedial action.

1. Remove the motor mounting screws (4 pieces) to detach the motor from the linear head.
2. Insert the rack having removed into the rack bushing of the rack case. Insert the rack until it comes out from the rack bushing on the opposite side of the inserting side.
3. Take a measure to prevent the rack from falling off and assemble the motor again.

Note

- The linear head has no holding force to keep the rack position in a state where the motor is not assembled. Make sure that the rack does not fall off. This may result in injury or damage to equipment.
- Slowly insert the rack into the case. Failure to do so may result in damage to the gear of the rack.

6 Inspection and maintenance

6-1 Inspection

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

■ Inspection item

- Check if any of the mounting screws of the linear head is loose.
- Check if the bearing part (ball bearings) of the linear head or the meshing part with the rack generates unusual noises.
- Check if the grease on the rack is insufficient.
- Check if the gap between the rack and the rack bushing is increased.
- Check if the load mounting screw is loose.

6-2 Warranty

Check on the Oriental Motor Website for the product warranty.

6-3 Disposal

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

7 Specifications

7-1 Product specifications

Maximum speed	500 mm/s
Maximum transportable mass	200 kg (440 lb.)
Maximum input speed	265.3 r/min
Maximum input torque	39.3 N·m (340 lb-in)

The maximum speed and the maximum transportable mass vary depending on the gear ratio of the motor combined.

■ Operating speed

Check the speed of the motor assembled with the linear head so that the operating speed does not exceed 500 mm/s.

● When KIS Series and inverter are used in combination

When a gearhead which gear ratio is 7.5 to 12.5 is combined, use the inverter setting frequency shown below as the upper limit.

The upper limit of the inverter setting frequency is 120 Hz.

Gear ratio	Inverter setting frequency	Motor shaft speed*	Operating speed mm/s
	Hz	r/min	
7.5	66	1989	500
9	80	2387	
12.5	111	3316	

* This is the synchronous speed of the motor calculated from the inverter setting frequency.

If the gear ratio is 15 or larger, the operating speed can be calculated using the following formula.

$$V = N_G \times \frac{1}{60} \times \pi \times D_P$$

V: Operating speed [mm/s]

N_G: Gearhead output shaft speed [r/min]

D_P: Pitch circle diameter of pinion [mm] (= 36.0)

Note

- If the product is stopped operating with the electromagnetic brake, keep the motor shaft speed at 1800 r/min or less.
- When a load is moved at a high speed in vertical drive, an alarm of the inverter may be detected by the regenerative power if the load is large. Reconsider the conditions such as the load or the speed.
- If the electromagnetic brake is released in vertical drive, the rack may move downward depending on the size of a load. Delay the timing of releasing the electromagnetic brake, or reconsider the size of the load to prevent the rack from falling.

■ Transportable mass

Check the torque of the motor assembled with the linear head so that the transportable mass does not exceed 200 kg (440 lb.).

The transportable mass can be calculated by the following formula.

$$F = T_G \times \frac{2}{D_P \times 10^{-3}} \times \eta$$

$$W = F / 9.807$$

F: Trust [N]

W: Transportable mass [kg]

T_G: Gearhead output shaft torque [N·m]

D_P: Pitch circle diameter of pinion [mm] (= 36.0)

η: Transmission efficiency of rack and pinion of linear head (=0.9)

7-2 General specifications

Operating environment	Ambient temperature	-10 to +50 °C [+14 to +122 °F] (non-freezing)
	Ambient humidity	85% or less (non-condensing)
	Altitude	Up to 1,000 m (3,300 ft.) above sea level
	Surrounding atmosphere	No corrosive gas or dust. No water or oil.
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 3,000 m (10,000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas or dust. No water or oil.

- Unauthorized reproduction or copying of all or part of this manual is prohibited.
If a new copy is required to replace an original manual that has been damaged or lost, please contact your nearest Oriental Motor sales office.
- Oriental Motor shall not be liable whatsoever for any problems relating to industrial property rights arising from use of any information, circuit, equipment or device provided or referenced in this manual.
- Characteristics, specifications and dimensions are subject to change without notice.
- While we make every effort to offer accurate information in the manual, we welcome your input. Should you find unclear descriptions, errors or omissions, please contact the nearest office.
- **Orientalmotor** is a registered trademark or trademark of Oriental Motor Co., Ltd., in Japan and other countries. Other product names and company names mentioned in this manual may be registered trademarks or trademarks of their respective companies and are hereby acknowledged. The third-party products mentioned in this manual are recommended products, and references to their names shall not be construed as any form of performance guarantee. Oriental Motor is not liable whatsoever for the performance of these third-party products.

© Copyright ORIENTAL MOTOR CO., LTD. 2022

Published in October 2022

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

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

ORIENTAL MOTOR (EUROPA) GmbH
Schiesstraße 44, 40549 Düsseldorf, Germany
Technical Support Tel:00 800/22 55 66 22
www.orientalmotor.de

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

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

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

ORIENTAL MOTOR ASIA PACIFIC PTE. LTD.
Singapore
Tel:1800-842-0280
www.orientalmotor.com.sg

ORIENTAL MOTOR (MALAYSIA) SDN. BHD.
Tel:1800-806-161
www.orientalmotor.com.my

ORIENTAL MOTOR (THAILAND) CO., LTD.
Tel:1800-888-881
www.orientalmotor.co.th

ORIENTAL MOTOR (INDIA) PVT. LTD.
Tel:1800-120-1995 (For English)
1800-121-4149 (For Hindi)
www.orientalmotor.co.in

TAIWAN ORIENTAL MOTOR CO., LTD.
Tel:0800-060708
www.orientalmotor.com.tw

SHANGHAI ORIENTAL MOTOR CO., LTD.
Tel:400-820-6516
www.orientalmotor.com.cn

INA ORIENTAL MOTOR CO., LTD.
Korea
Tel:080-777-2042
www.inaom.co.kr

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