

OPERATING MANUAL

Electric Gripper EH Series 3-Finger Type Actuator Edition

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Introduction

■ 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 "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.

■ Overview of the product

The electric gripper EH Series (hereinafter referred to as gripper) is an actuator that a gear reduction mechanism is combined with a motor. The **αSTEP AZ** Series equipped with the mechanical multiple-rotation absolute sensor (ABZO sensor) is used for the motor.

■ Related operating manuals

For operating manuals, download from Oriental Motor Website Download Page or contact your nearest Oriental Motor sales office.

- EH Series 3-Finger Type OPERATING MANUAL Actuator Edition (this document)
- AZ Series / Motorized Actuator equipped with AZ Series OPERATING MANUAL Function Edition
- Motorized Actuator Electric Gripper OPERATING MANUAL Function Setting Edition*

* Be sure to read the OPERATING MANUAL Function Setting Edition for the exclusive use of the electric gripper.

Refer to the operating manual of the driver for contents not described in these manuals.

Thank you for purchasing an Oriental Motor product.

This 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.

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.

In regard to a gripper, it is prohibited to start operating the gripper (i.e., to operate the device in accordance with the specified purpose) when the machine in which the gripper is incorporated does not satisfy any relevant safety standards. The factory safety manager or safety personnel in charge of the applicable machine must ensure that the machine is operated only by qualified personnel who are familiar with the operation of electronic equipment, and thereby prevent injury or damage to the equipment. The term "qualified personnel" refers to persons who have received the necessary training or education and have pertinent experience; who are familiar with the relevant standards, regulations, accident-prevention rules and inspection conditions; who are authorized by the factory safety manager to engage in the necessary activities; and who have the ability to discern and prevent potential dangers.


Description of signs

	Handling the product without observing the instructions that accompany a "WARNING" symbol may result in serious injury or death.
	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.

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 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 or injury. • Do not forcibly bend, pull, or pinch the cable.
Doing so may result in fire. • Do not disassemble or modify the gripper.
Doing so may result in injury or damage to equipment. • Never use the product in a medical device used in connection with the maintenance or management of human life or health, and in a transportation system whose purpose is to move or carry people. • Do not enter the movable range of the gripper while the power is supplied. Be sure to provide a safety cage according to EN ISO 13857. When manually operating the fingers for adjustment or inspection, turn off the main power to the driver.
Failure to do so may result in injury. |
|---|---|

⚠ WARNING



- Assign qualified personnel to the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Handling by unqualified personnel may result in fire, injury, or damage to equipment.
- When setting the data, do so outside the safety cage. Failure to do so may result in injury.
- Take a measure to prevent a load from falling since the gripper stops to lose the holding force if an alarm (protective function) of the driver is generated. Failure to do so may result in injury or damage to equipment.
- Install the gripper in an enclosure. Failure to do so may result in injury.
- Provide an emergency-stop device or emergency-stop circuit external to equipment so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.
- When having replaced the driver, set parameters such as the resolution, the moving direction or others before operating the gripper. If the gripper is operated without setting parameters, the fingers may move to an unexpected direction or run at an unexpected speed, causing injury or damage to equipment.

⚠ CAUTION



- Do not use the gripper beyond the specifications. Doing so may result in injury or damage to equipment.
- Do not touch the gripper while operating or immediately after stopping. Doing so may result in a skin burn(s).
- Do not carry the gripper by holding the moving part or motor cable. Doing so may result in injury.
- Keep the area around the gripper free of combustible materials. Failure to do so may result in fire or a skin burn(s).
- Do not leave anything around the gripper that would obstruct ventilation. Doing so may result in damage to equipment.
- Do not touch the moving part during operation. Doing so may result in injury.
- Do not touch the terminals while conducting the insulation resistance measurement or the dielectric strength test. Accidental contact may result in electric shock.
- Do not allow the cable to contact with the moving part while operating the gripper. Doing so may cause the cable to break, resulting in fire or damage to the product.
- When performing operations other than push-motion operation, do not strike the fingers against each other or the fingers against the gripped object at a speed higher than the maximum pushing speed. Doing so may result in damage to equipment.
- Do not apply a load to only one finger. Doing so may result in injury or damage to equipment.



- Use a gripper and a driver only in the specified combination. An incorrect combination may cause a fire.
- Wear a helmet, safety shoes, gloves or other protective gears when transporting or installing the gripper. Failure to do so may result in injury.
- The motor surface temperature may exceed 70 °C (158 °F) even under normal operating conditions of the gripper. If the operator is allowed to approach the gripper during operation, affix a warning label shown in the figure on a conspicuous position. Failure to do so may result in a skin burn(s).



Warning label

Precautions for use

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

● General

- **Always use an Oriental Motor cable to connect a gripper and a driver.**

Check on the Oriental Motor Website for the model of cables.

- **When conducting the insulation resistance measurement or the dielectric strength test, be sure to separate the connection between the gripper and the driver.**

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

- **Do not make a strong impact on the gripper.**

Do not drop the gripper. Also, do not hit or strike the gripper. An impact on the gripper may result in a decrease in the positioning accuracy, damage to the gripper, or a reduction in the product life.

- **Make sure not to hit the encoder (ABZO sensor) or apply a strong impact to it.**

- Applying a strong impact to the encoder (ABZO sensor) may damage to the encoder (ABZO sensor) or cause the motor to malfunction.
- When transporting the gripper or installing a load, do not apply a strong impact to the moving part.

- **Keep the encoder (ABZO sensor) away from a strong magnetic field.**

A magnetic sensor is built into the encoder (ABZO sensor). If the gripper is installed near equipment that generates a strong magnetic field, the encoder (ABZO sensor) may break or malfunction. Note on the environment for transport and storage or the installation location for use. Keep the magnetic flux density on the surface of the encoder (ABZO sensor) in order not to exceed the values in the table.

	When transporting and storing	When operating
Magnetic flux density	5 mT	2 mT*

* When it exceeds 1 mT and is 2 mT or less, use in a condition where the ambient temperature exceeds 20 °C (68 °F) and is 40 °C (104 °F) or less.

- **Meshing noise of mechanical sensor**

A gear type mechanical sensor is built into the encoder (ABZO sensor). Although the meshing noise of gears may generate, it is not malfunction.

● Temperature

- **Use the gripper in a condition where the motor surface temperature does not exceed 80 °C (176 °F).**

The surface temperature of the motor may exceed 80 °C (176 °F) depending on operating conditions such as ambient temperature, operating speed, duty cycle, and others. In order to protect the encoder (ABZO sensor), use the motor in a condition where the surface temperature of the motor does not exceed 80 °C (176 °F).

If the encoder (ABZO sensor) temperature reaches the upper limit, an alarm of motor overheat protection will be generated.

- **Operate the gripper within the range of the operating ambient temperature.**

Using the gripper out of the operating ambient temperature may change the viscosity of the grease, causing the gripping force to decrease.

● Operation

- Keep 20 m (65.6 ft.) or less for the wiring distance between a gripper and a driver.

Exceeding 20 m (65.6 ft.) may cause the gripping force to decrease.

- Holding force at standstill

The holding force when the gripper stops is the value in the current cutback state (stop current 50 %). Note on the reduction of the holding force in the current cutback state. Also, make sure that a load does not fall, as the holding force of the gripper is lost when the power supply is turned off.

- Grease leakage measures

On rare occasions, a small amount of grease may ooze out from the mechanism part. 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 damage resulting from contamination. Oil leakage may lead to problems in the customer's equipment or products.

■ Notes when the connection cable is used

Note the following points when an Oriental Motor cable is used.

- When inserting the connector

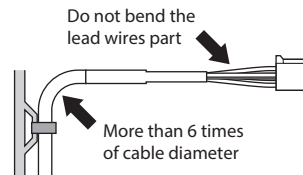
Hold the connector main body, and insert it in straight securely. Inserting the connector in an inclined state may result in damage to terminals or a connection failure.

- When pulling out the connector

Pull out the connector in straight while releasing the lock part of the connector. Pulling out the connector while holding the lead wires may result in damage to the connector.

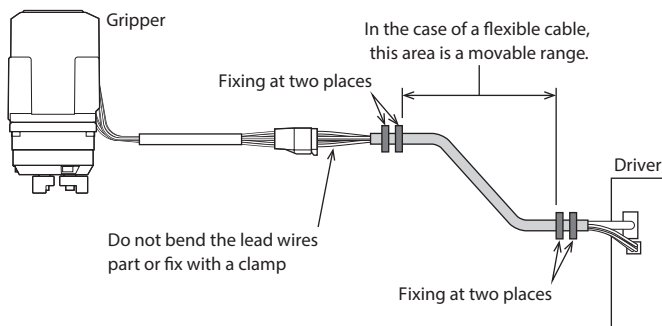
- Bending radius of cable

Use the cable in a state where the bending radius of the cable is more than six times of the cable diameter. Do not bend the lead wires part or secure with a clamp, etc. Doing so may result in damage to the connector.



- How to fix the cable

Fix the cable at two places near the connectors as shown in the figure or fix it with a wide clamp to take measures to prevent stress from being applied to the connectors.



Preparation

■ Checking the product

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

- Electric gripper 1 unit
- Instructions and Precautions for Safe Use 1 copy

■ How to identify the product model

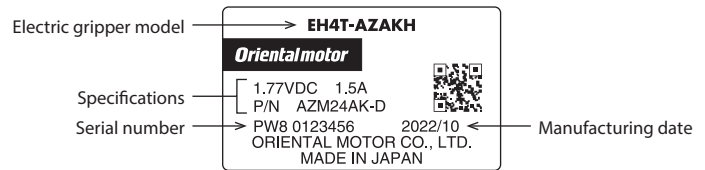
Verify the model name of the purchased product against the model shown on the name plate of the product.

EH 4 T - AZ A K H
 1 2 3 4 5 6 7

1	Series	EH: EH Series
2	Frame size	4: 46 mm Wide × 46 mm High (finger side)
3	Finger type	T: 3-Finger type
4	Equipped motor	AZ: AZ Series
5	Additional function	A: Without additional function
6	Motor specifications	K: DC power input type
7	Shape	Blank: Without mounting cover H: With mounting cover

■ Information about nameplate

The figure shows an example.



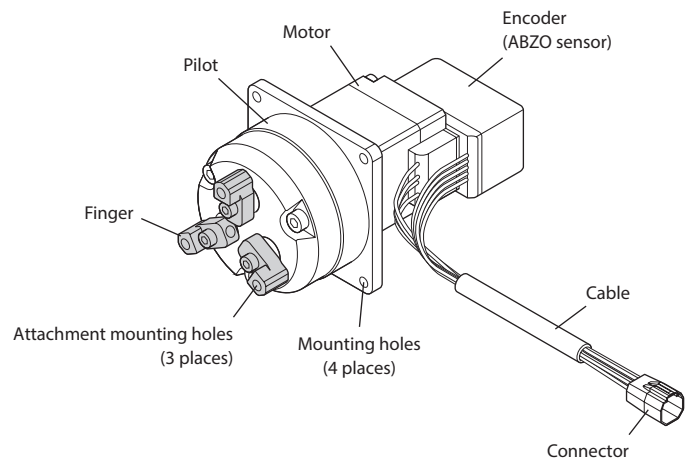
■ Drivers possible to combine

Use the **EH** Series 3-finger type in combination with the **AZ** Series DC input type driver.

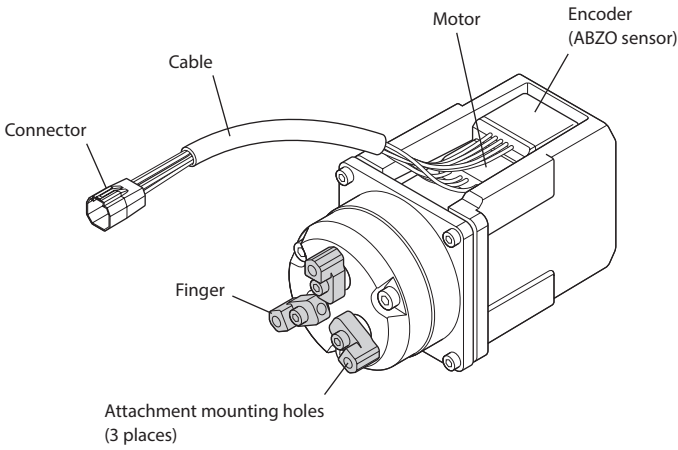
■ Names of parts

Moving parts are shown in gray color.

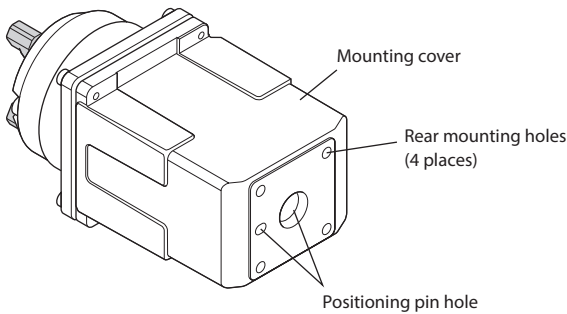
- Without mounting cover



• With mounting cover



In the case of the gripper with mounting cover, the pilot cannot be used as a fit.



Installation

Installation location

The gripper 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: 0 to +40 °C [+32 to +104 °F] (non-freezing)
- Operating ambient humidity: 85 % or less (non-condensing)
- Area free of explosive atmosphere, 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
- Up to 1,000 m (3,300 ft.) above sea level

When a gripper is installed in an environment where a magnetic field is generated

A magnetic sensor is built into the encoder (ABZO sensor). If the gripper is installed near equipment that generates a strong magnetic field, the encoder (ABZO sensor) may break or malfunction. Make sure that the magnetic flux density on the surface of the encoder (ABZO sensor) does not exceed 2 mT (*).

* When it exceeds 1 mT and is 2 mT or less, use in a condition where the ambient temperature exceeds 20 °C (68 °F) and is 40 °C (104 °F) or less.

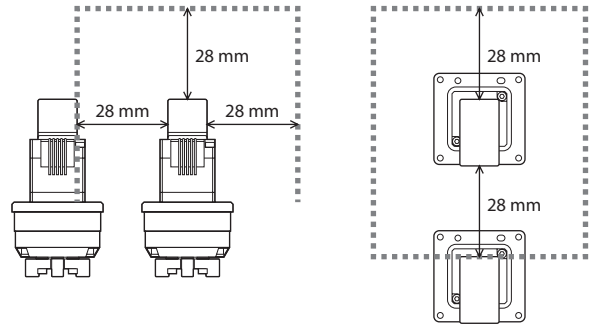


Do not install the gripper near equipment that generates a strong magnetic field.

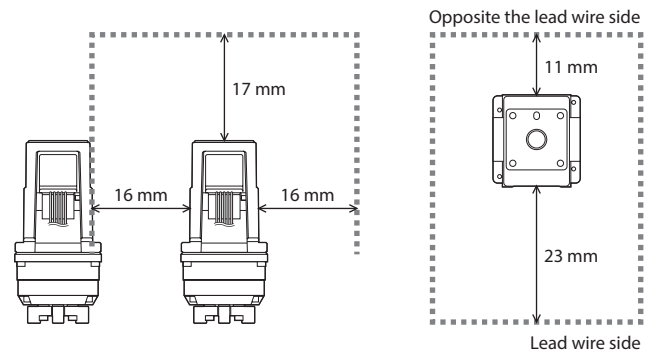
• When installing grippers side by side

Note on the installation location since the encoder (ABZO sensor) of the gripper is easily affected by magnetism. When installing two or more grippers side by side, provide more clearance in the horizontal and vertical directions than the specified values shown in the figure.

• Without mounting cover



• With mounting cover



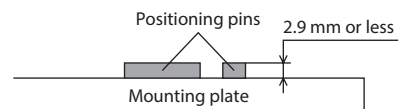
Overview of installation

The gripper can be installed in any direction. Install the gripper onto an appropriate flat plate [thickness about 5 mm (0.2 in.) or more] having excellent vibration resistance and heat conductivity. If high accuracy is required, design the plate thickness taking into account the installation conditions such as load condition, rigidity, vibration and others. The values of the tightening torque are recommended. Tighten with an appropriate torque according to the design conditions of the mounting plate and attachment.

How to install the gripper with the mounting cover

• Design of mounting plate (Unit: mm)

Design the mounting plate so that the height of the positioning pin should be 2.9 mm or less from the upper face of the mounting plate when the positioning pin is installed on the mounting plate.

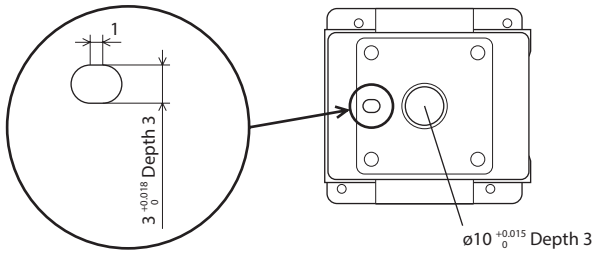


Make sure the height of the positioning pin is 2.9 mm or less from the upper face of the mounting plate. Exceeding 2.9 mm may cause the motor to damage, resulting in injury or damage to machine.

• Specifications of rear mounting holes

- Screw size: M4
- Tightening torque: 2 N·m (280 oz-in)
- Effective depth: 6 mm

● Specifications of positioning pin holes (Unit: mm)



Recommended positioning pin size (Unit: mm)

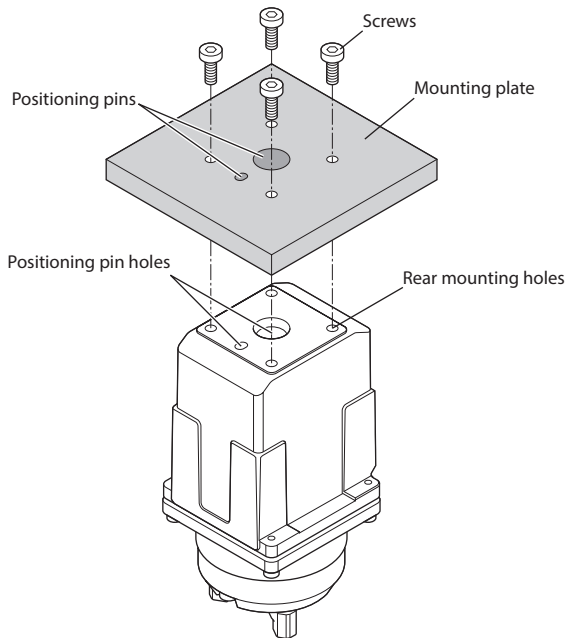
- For round hole: $\phi 10_{-0.015}^0$
- For elongated hole: $\phi 3_{-0.01}^0$

● Installation method

1. Install the positioning pins on the mounting plate.

Note Be sure to install the positioning pins on the mounting plate. Press fitting on the mounting cover may cause damage it.

2. Align the mounting holes of the mounting cover with the positioning pins on the mounting plate and install, and secure the rear mounting holes with screws (not included).



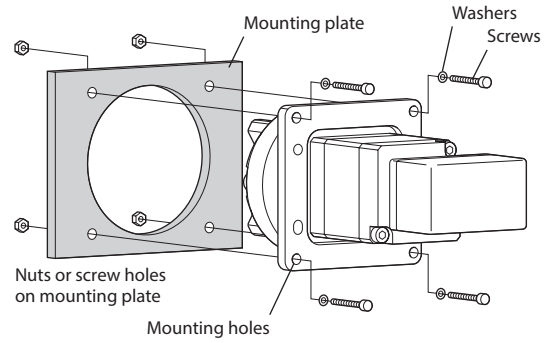
■ How to install the gripper without the mounting cover

● Specifications of mounting holes

- Screw size: M2.5
- Tightening torque: 0.5 N·m (71 oz-in)

● Installation method

Use screws (not included) to secure the mounting holes.



■ Installing the attachment

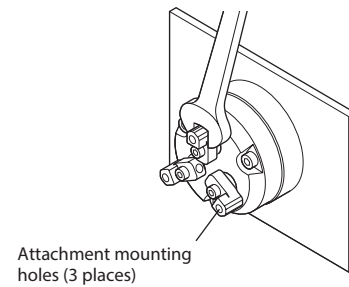
Use the attachment hole to install the attachment to the finger.

● Specifications of attachment mounting hole

- Screw size: M3
- Tightening torque: 1 N·m (142 oz-in)
- Effective depth: 6 mm

● Installation method

Use a screw (not included) to install the attachment to the attachment mounting hole. When installing the attachment, use a tool such as a wrench to fix the finger so that the finger does not move.



Connection

Refer to the operating manual of the driver for the connection method with the driver and the wiring distance between the gripper and the driver.

Inspection and maintenance

■ Inspection

● Check for appearance

Check the items shown in the table below.

Check item	Check point	Remedial action
Gripper	<ul style="list-style-type: none"> Check that none of the screws securing the gripper are loose. Check that none of the screws securing the attachment are loose. 	Tighten the screws again.
Cable, connector	<ul style="list-style-type: none"> Check that the cable is not damaged or subjected to stress. Check that none of the connection parts for the gripper and the driver are loose. 	<ul style="list-style-type: none"> Replace the cable. Reconnect the connector.
Operating condition	Check that the gripper does not produce abnormal noise or vibration.	Check that the installation status of the attachment or the operating speed.

● Cleaning for outside

Clean the outside of the gripper regularly.

- Wipe off the dirt with a soft cloth.
- Do not blow with compressed air. Dust may enter through the gap, resulting in product failure.
- If it is very dirty, wipe off with a soft cloth with neutral detergent.
- Do not use petroleum solvents. Doing so may damage the coating surface.

■ Warranty

Check on the Oriental Motor Website for the product warranty.

■ Disposal

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

Troubleshooting

When operating the gripper, the gripper may not operate properly due to an improper setting or wrong connection. When the gripper cannot operate properly, refer to the contents provided in this chapter and take an appropriate remedial action. If the problem persists, contact your nearest Oriental Motor sales office.

Phenomenon	Possible cause	Remedial action
Gripper malfunction.	A load exceeding the specified value was applied.	Use the gripper in a condition where the load is within the specified value.
The gripping force of the gripper is reduced.	The wiring distance exceeds the specified value.	Keep 20 m (65.6 ft.) or less for the wiring distance between the gripper and the driver.
	The grease viscosity has changed.	Check the operating ambient temperature in "General specifications" and use within the specifications.

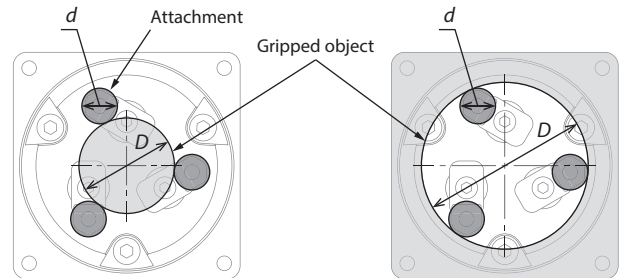
Specifications

■ Product specifications

Electric gripper model		EH4T-AZAKH EH4T-AZAK
Motor with which the actuator is equipped		AZM24
Gear ratio		5
Maximum gripping force [N]		50
Gripping diameter [mm]*1*2	Grasp the outer diameter of the object	ø2 to ø24
	Grasp the inner diameter of the object	ø14 to ø36
Maximum speed [r/min]*3		1,200
Push speed [r/min]*3		12
Permissible axial load [N]		15
Permissible radial load [N]*4		23

*1 It is a value that takes into account a clearance of about 0.5 mm (0.02 in.) (minimum value) for the diameter (D) of the gripped object.

*2 It is when the diameter (d) of the attachment is ø6 mm (ø0.24 in.).



Grasp the outer diameter of the object

Grasp the inner diameter of the object

*3 It is the rotation speed of the finger.

*4 It is a value at 10 mm (0.39 in.) from the attachment mounting surface. It is the sum of the mass of a load and attachment and the gripping force (including an impact load).

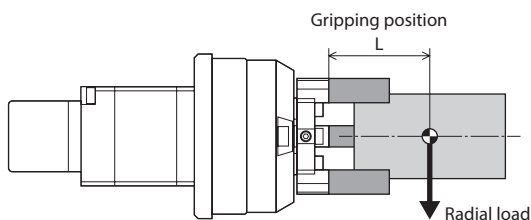


- The mass of a load that can actually be transported varies greatly depending on the attachment, the friction coefficient of a load, the acceleration rate and others. Use the gripper with one tenth of the gripping force as the upper limit and with a sufficient margin.
- The gripping force may exceed the maximum gripping force depending on the design of the gripped object and the attachment. Use in this condition may damage the product. If the maximum gripping force is exceeded, adjust the operating current so that the actual gripping force is less than the maximum gripping force.
- The diameter of the object that can be gripped varies depending on the size and clearance of the attachment.
- Set an appropriate clearance between the attachment and the gripped object according to the dimensional accuracy of the gripped object and the operating accuracy of the equipment. If an appropriate clearance cannot be maintained, there is a risk of interference between the gripped object and the attachment during operation.

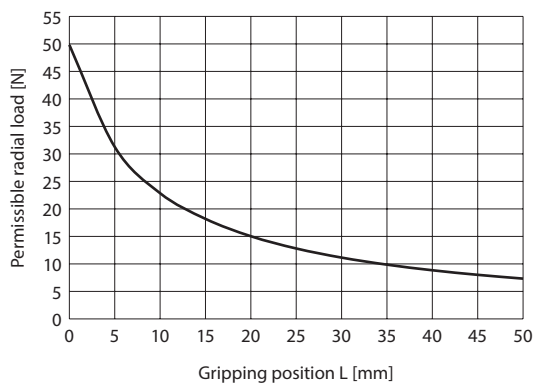
Relationship between gripping position and permissible radial load

The permissible radial load of the gripper varies depending on the length of the gripped object.

Make sure that the radial load applied to the gripping position is less than the permissible radial load. Using the product in a condition where the radial load applied to the gripping position exceeds the permissible radial load may cause damage.



Gripping position and permissible radial load (reference)



General specifications

Operating environment	Ambient temperature	0 to +40 °C [+32 to +104 °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 exposure to water, oil, etc.
Shipping environment Storage environment	Ambient temperature	-20 to +60 °C [-4 to +140 °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 exposure to water, oil, etc.
Thermal Class:		130 (B)
Insulation resistance	100 MΩ or more when 500 VDC megger is applied between the following places: • Between case and motor windings	
Dielectric strength	Sufficient to withstand the specified voltage applied between the following places for 1 minute: • Between case and motor windings 0.5 kVAC 50 Hz or 60 Hz	

Regulations and standards

CE Marking

EMC Directive

The driver in combination with the electric gripper is affixed with the CE Marking under the EMC Directive. Refer to the operating manual of the driver for details about the applicable standards.

RoHS Directive

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

- Unauthorized reproduction or copying of all or part of this manual is prohibited.
- 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.
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- 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
 Schiessstraße 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 CO., LTD.
 4-8-1Higashiueno,Taito-ku,Tokyo 110-8536
 Japan
 Tel:+81-3-6744-0361
www.orientalmotor.co.jp

ORIENTAL MOTOR ASIA PACIFIC PTE. LTD.
 Singapore
 Tel:1800-842-0280
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