



OPERATING MANUAL

Electric Gripper EH Series Actuator

Table of contents

Introduction	1	Connection	7
Safety precautions	1	Inspection and maintenance	7
Precautions for use	2	Troubleshooting	7
Preparation	3	Specifications	7
Installation	4	Regulations and standards	8

Introduction

■ Before use

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.

■ Overview of the product

The electric gripper **EH** Series (hereinafter referred to as gripper) is an actuator that a rack-and-pinion mechanism is combined with a motor. Maintenance-free linear guides are used in the **EH** Series.

The **AXSTEP AZ** Series equipped with the mechanical multiple-rotation absolute sensor (ABZO sensor) is used for the motor.

■ Related operating manuals

For operating manuals not included with the product, download from Oriental Motor Website Download Page or contact your nearest Oriental Motor sales office.

Operating manual name	Included or not included with product
EH Series OPERATING MANUAL Actuator (this document)	Included
AZ Series/Motorized actuator equipped with AZ Series OPERATING MANUAL Function Edition	Not included
Motorized actuator Electric gripper Function Setting Edition *	Not included

* Be sure to read the operating manual "Function Setting Edition" which is exclusively for 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 prevent danger or injury to the user and other personnel through safe, correct use of the product. 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 the 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

	<ul style="list-style-type: none"> • Do not use the gripper in explosive or corrosive environments, in the presence of flammable gases, locations 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 gripper while the power is supplied. Doing so may result in electric shock. • Do not forcibly bend, pull, or pinch the cable. Doing so may result in fire and electric shock. • Do not disassemble or modify the gripper. Doing so may result in injury or damage to equipment. • Never use the gripper in a medical device used in connection with the maintenance or management of human life or health, or in a transportation system whose purpose is to move or carry people. • Be sure to provide a safety cage conforming to EN ISO 13857 to prevent persons from entering the moving range of the gripper while power is supplied to the gripper. Turn off the main power to the driver before performing adjustment or inspection in which the finger is moved manually. Failure to do so may result in injury.
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⚠ WARNING

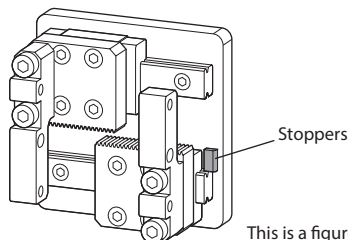


- Assign qualified personnel to the task of installing, wiring, operating/controlling, inspecting and troubleshooting the gripper. Failure to do so may result in fire, electric shock, injury or damage to equipment.
- When setting the data, do so outside the safety cage. Failure to do so may result in 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 inside an enclosure. Failure to do so may result in electric shock or injury.
- When installing the gripper, prevent from directly touching the gripper, or make sure to ground it. Accidental contact may result in electric shock.
- Provide an emergency stop device or emergency stop circuit external to the 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 traveling direction or others before operating the gripper. If the gripper is operated without setting the parameters, the fingers may move to unexpected directions or run at unexpected speeds, leading to injury or mechanical damage.

⚠ CAUTION



- Do not use the gripper beyond its specifications. Doing so may result in electric shock, injury or damage to equipment.
- Keep your fingers and objects out of the openings in the gripper. Failure to do so may result in fire, electric shock or injury.
- Do not touch the gripper during operation or immediately after stopping. Doing so may result in a skin burn(s).
- Do not carry the gripper by holding the moving part or cable. Doing so may cause injury.
- Do not place combustibles around the gripper. Doing 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. Doing so may result in electric shock.
- While the gripper is operated, do not make the cable contact with the moving part. Doing so may result in disconnection in the cable, leading to electric shock or damage.
- When opening or closing the fingers, do not hit the moving parts to the stoppers inside the product. Doing so may result in damage to equipment.



- Do not apply a load to only one side of the fingers. Doing so may result in injury or damage to equipment.



- Use the gripper and driver only in the specified combination. Failure to do so may result in fire.
- Wear a helmet, safety shoes, gloves or other protective gear when transporting or installing the gripper. Failure to do so may result in injury.

⚠ CAUTION



- The motor surface temperature may exceed 70 °C (158 °F) even under normal operating conditions. If the operator is allowed to approach the gripper in 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 chapter covers restrictions and requirements the user should consider when using the product.

● General

- **Be sure to use our cable to connect the gripper and the driver.**

Check on the Oriental Motor Website for the model name 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 dielectric strength test with the gripper and driver connected may result in damage to the gripper.

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

Do not make the gripper fall. Also, do not hit or strike the gripper. Making an impact on the gripper may cause the positioning accuracy to decrease, the gripper to damage, or the lifetime to reduce.

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

- Making a strong impact on an encoder (ABZO sensor) may cause the gripper malfunction or damage to the encoder (ABZO sensor).
- When transporting the gripper or installing a load, handle the gripper carefully not to make a strong impact on the moving part.

- **Do not move the encoder (ABZO sensor) toward a strong magnetic field.**

A magnetic sensor is built into the encoder (ABZO sensor). If the gripper is installed close to equipment which generates a strong magnetic field, the encoder (ABZO sensor) may break or malfunction. Note on the environment when transporting and storing or the installation location when using. Keep the magnetic flux density on the surface of the encoder (ABZO sensor) so as not to exceed the values in the table.

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

* When the magnetic flux density is exceeding 1 mT and 2 mT or less, use in an environment where the operating ambient temperature is exceeding 20 °C (68 °F) and 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 conditions where the motor surface temperature does not exceed 80 °C (176 °F).**

The motor surface temperature may exceed 80 °C (176 °F) under certain conditions (ambient temperature, operating speed, duty cycle, etc.). In order to protect the encoder (ABZO sensor), use the motor in conditions where the motor surface temperature does not exceed 80 °C (176 °F).

If the encoder (ABZO sensor) temperature reaches the upper limit, the motor overheat protection alarm will generate.

- **Operate the gripper in 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 the gripper and driver.**

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

• Holding force at standstill

The holding force at standstill for the gripper is a value when the current cutback function (stop current 50 %) is enabled. Note the holding force is decreased in the current cutback state. In addition, turning off the power supply causes the holding force of the gripper to lose. Make sure a load does not fall.

• Grease leakage

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

● Inspection

• Abnormal noise

If abnormal noise (such as scratch noise or metallic noise) is generated during operation, the gears of the gripper may have jammed foreign particles. Stop the operation immediately, and contact your nearest Oriental Motor sales office.

■ Notes when the connection cable is used

Note the following points when our 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.

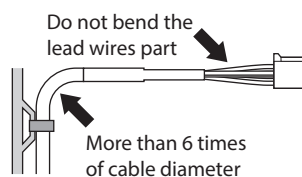


• When pulling out the connector

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

• Bending radius of cable

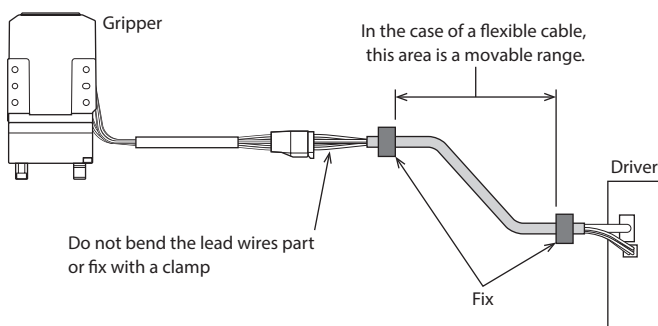
Use the cable in a state where the bending radius of the cable is more than six times of the cable diameter. Do not bend the lead wires part or fix it with a clamp. Doing so may cause damage to the connector.



• How to fix the cable

Fix the cable near the connector so that stress is not applied to the connector part.

Use a wide clamp or fix the connector at two places to prevent stress from being applied to the connector.



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 gripper1 unit
- OPERATING MANUAL Actuator.....1 copy (this document)

■ How to identify the product model

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

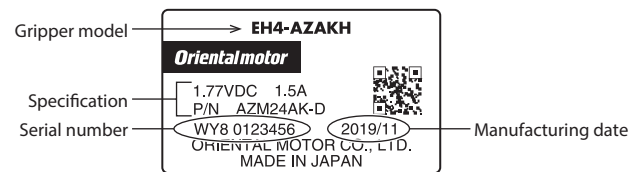
EH 4 - AZ A K H
1 2 3 4 5 6

1	Series	EH: EH Series
2	Frame size	3: Width 36 mm × height 36 mm (Finger side) 4: Width 46 mm × height 46 mm (Finger side)
3	Equipped motor	AZ: AZ Series
4	Additional function	A: Without additional function
5	Motor power supply input	K: DC power input type
6	Cable outlet direction	H: Right or left direction *

* Cable outlet direction when viewed from the front side with fingers vertical.

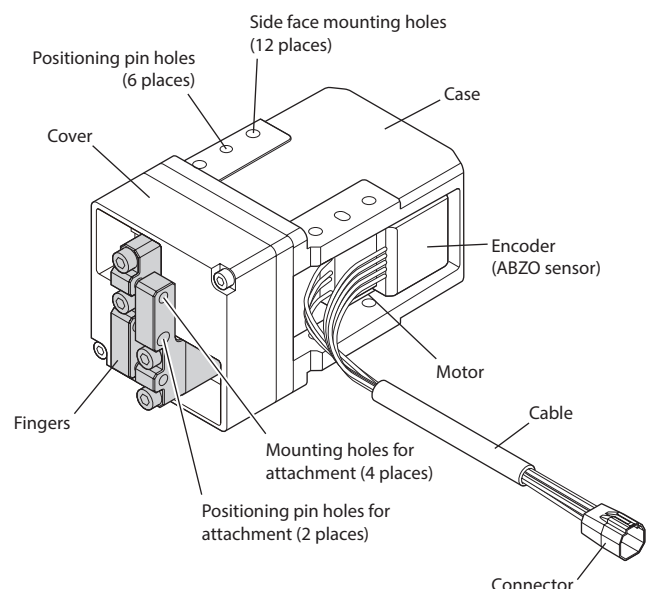
■ Information about nameplate

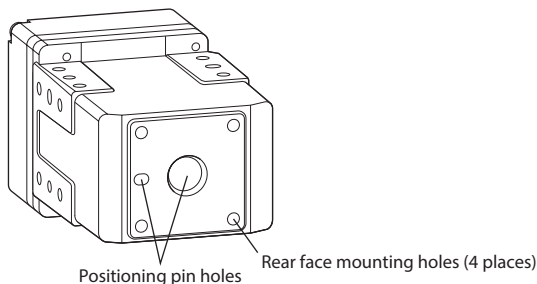
The figure shows an example.



■ Names of parts

The area indicated in gray color represents a moving part. The figure shows the EH4.





Driver for possible combinations

Use the **EH** Series in combination with the **AZ** Series DC power input type driver.

Installation

Location for installation

The gripper is designed and manufactured to be incorporated in an 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 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
- Up to 1,000 m (3,300 ft.) above sea level

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

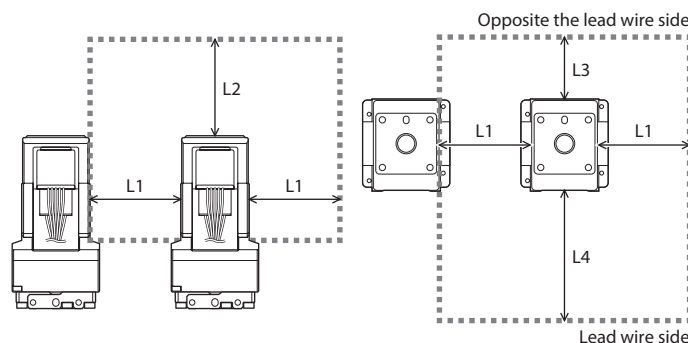
A magnetic sensor is built into the encoder (ABZO sensor). If the gripper is installed close to equipment which generates a strong magnetic field, the encoder (ABZO sensor) may break or malfunction. Make sure to prevent the magnetic flux density on the surface of the encoder (ABZO sensor) from exceeding 2 mT (*).

* When the magnetic flux density is exceeding 1 mT and 2 mT or less, use in an environment where the operating ambient temperature is exceeding 20 °C (68 °F) and 40 °C (104 °F) or less.

Note Do not install the gripper close to equipment which generates a strong magnetic field.

When grippers are installed side by side

The encoder (ABZO sensor) of the gripper is easily affected by a magnetic field, so make sure the installation location. When installing two or more grippers side by side, provide clearances in the horizontal and vertical directions more than the specified distances in the figure.



Model	L1	L2	L3	L4
EH3	4	6	4	12
EH4	16	17	11	23

Unit: mm

Installation overview

The gripper can be installed in any direction.

Install the gripper onto an appropriate flat mounting plate [thickness approximately 5 mm (0.2 in.) or more] having excellent vibration resistance and heat conductivity. If high accuracy is required, design the thickness of the mounting plate in consideration of the installation conditions such as load condition, rigidity, vibration and others.

Values of the tightening torque are recommended. Tighten with an appropriate torque according to the design conditions of the mounting plate and attachment.

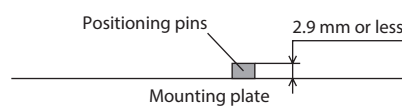
There are two installation methods, side face mounting and rear face mounting.

Installation method by side face mounting

Secure the gripper to a mounting plate using the side face mounting holes.

Design for mounting plate (Unit: mm)

When the positioning pins for gripper are installed on the mounting plate, the height of the positioning pins should be 2.9 mm or less from the upper surface of the mounting plate.



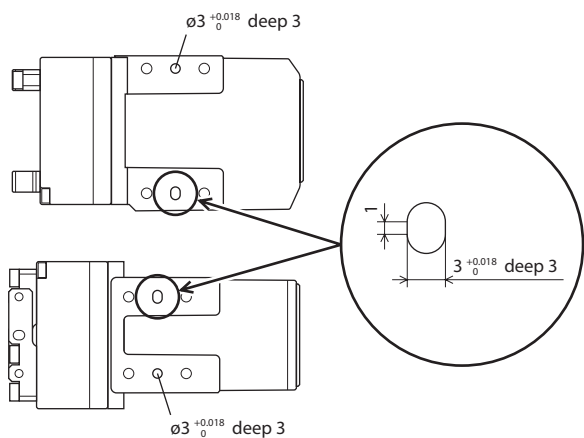
Note Be sure to keep the height of the positioning pins to 2.9 mm or less from the upper surface of the mounting plate. Exceeding 2.9 mm may cause the case to break, leading to injury or mechanical damage.

Specifications of side face mounting holes

Model	Nominal size	Tightening torque	Effective depth of screw thread
EH3	M3	1 N·m (142 oz-in)	5 mm
EH4	M4	2 N·m (280 oz-in)	6 mm

● Specifications of positioning pin holes (Unit: mm)

Recommended size of positioning pin: $\varnothing 3_{-0.01}^0$

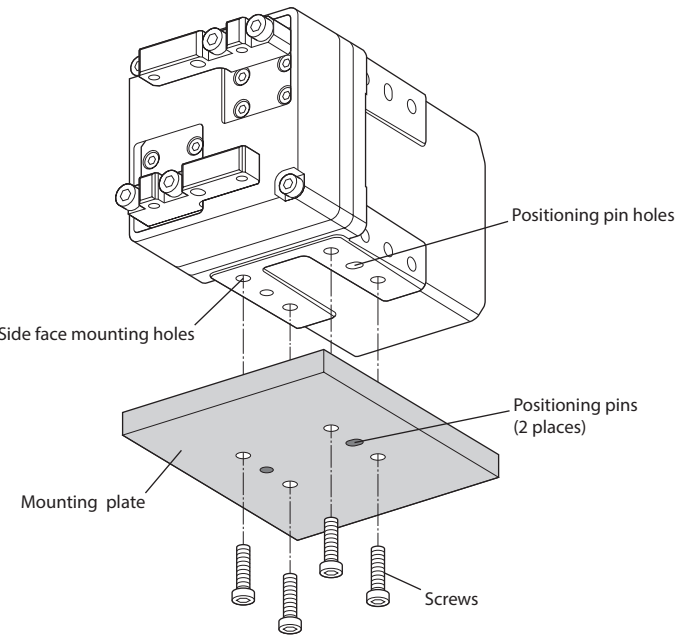


● Installation method

1. Install the positioning pins on the mounting plate.

Note Be sure to install the positioning pins on the mounting plate. Pressing the positioning pins into the case may cause damage.

2. Install the case while the positioning pins are inserted into the positioning pin holes of the case, and secure the side face mounting holes with screws (not included).

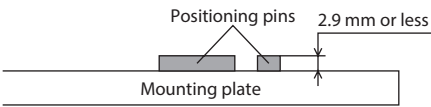


■ Installation method by rear face mounting

Secure the gripper to a mounting plate using the rear face mounting holes.

● Design for mounting plate (Unit: mm)

When the positioning pins for gripper are installed on the mounting plate, the height of the positioning pins should be 2.9 mm or less from the upper surface of the mounting plate.

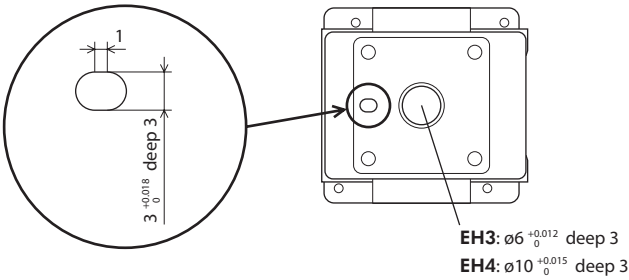


Note Be sure to keep the height of the positioning pins to 2.9 mm or less from the upper surface of the mounting plate. Exceeding 2.9 mm may cause the case to break, leading to injury or mechanical damage.

● Specifications of rear face mounting holes

Model	Nominal size	Tightening torque	Effective depth of screw thread
EH3	M3	1 N·m (142 oz-in)	5 mm
EH4	M4	2 N·m (280 oz-in)	6 mm

● Specifications of positioning pin holes (Unit: mm)



Recommended size of positioning pin

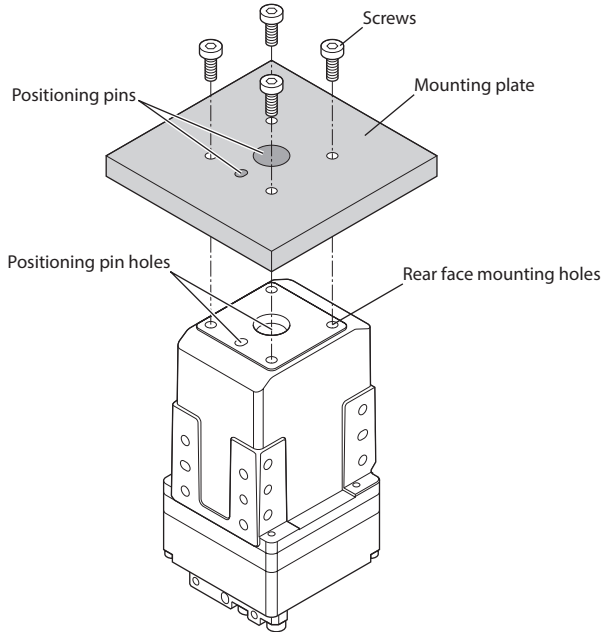
Model	For round hole	For elongated hole
EH3	$\varnothing 6_{-0.012}^0$	$\varnothing 3_{-0.01}^0$
EH4	$\varnothing 10_{-0.015}^0$	

● Installation method

1. Install the positioning pins on the mounting plate.

Note Be sure to install the positioning pins on the mounting plate. Pressing the positioning pins into the case may cause damage.

2. Install the case while the positioning pins are inserted into the positioning pin holes of the case, and secure the rear face mounting holes with screws (not included).

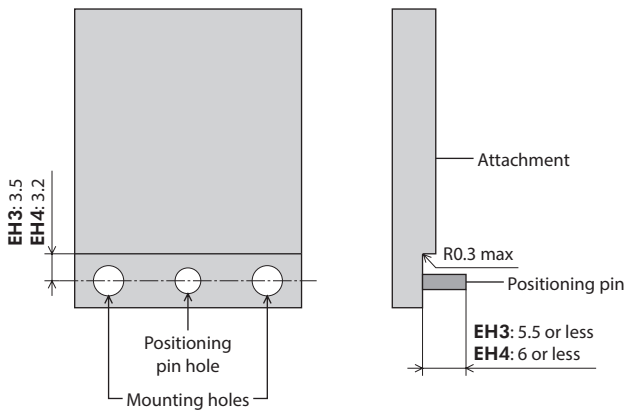


■ Installing an attachment

Install an attachment to the finger using the mounting holes for attachment.

● Design for attachment (Unit: mm)

Design so that the length of the positioning pin should be the specified value in the figure or less from the attachment when installing the positioning pin on the attachment.

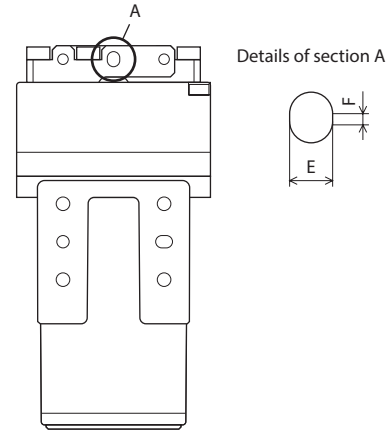


Note Be sure the length of the positioning pin from the attachment should be the specified value or less shown in the figure. Exceeding the specified value may damage the fingers, resulting in injury or damage to the machine.

● Specification of mounting holes for attachment

Model	Nominal size	Tightening torque	Effective depth of screw thread
EH3	M2.5	0.5 N·m (71 oz-in)	5.5 mm
EH4	M3	1 N·m (142 oz-in)	6 mm

● Specification of positioning pin hole for attachment (Unit: mm)



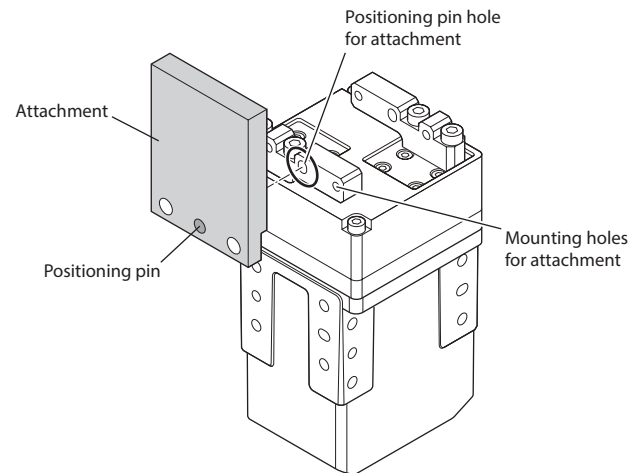
Model	Recommended size of positioning pin	Finger thickness	Positioning pin hole	
			E	F
EH3	$\varnothing 3 \begin{smallmatrix} 0 \\ -0.01 \end{smallmatrix}$	6	$3 \begin{smallmatrix} +0.018 \\ 0 \end{smallmatrix}$	1
EH4		6.5	$3 \begin{smallmatrix} +0.03 \\ 0 \end{smallmatrix}$	0.6

● Installation method

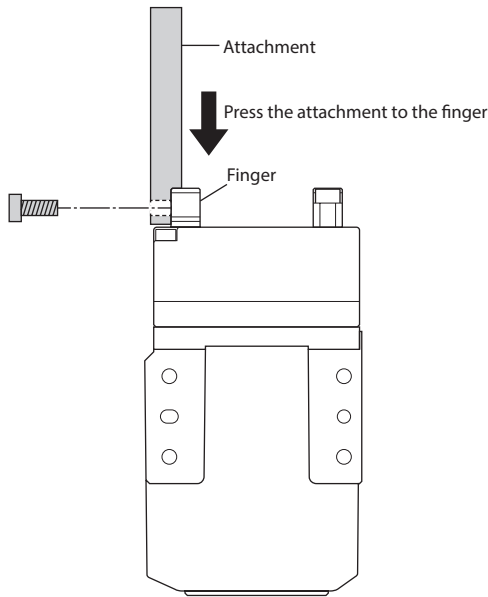
1. Install the positioning pin on the attachment.

Note Be sure to install the positioning pin on the attachment. Pressing the positioning pins into the finger may cause damage.

2. Insert the positioning pin installed on the attachment to the positioning pin hole for attachment provided on the finger.



- Secure the mounting holes for attachment with screws (not included) while pressing the attachment to the finger.



Connection

Refer to the operating manual of the driver for how to connect with the driver and the wiring distance between the gripper and driver.

Inspection and maintenance

■ Maintenance

● External inspection

Check the items specified in table.

Item	Inspection item	Remedial action
Gripper	<ul style="list-style-type: none"> Check if any of the screws having installed the gripper comes loose. Check if any of the screws having installed the attachment comes loose. 	Tighten the screws securely.
Cable, connector	<ul style="list-style-type: none"> Check if a damage or stress is applied on the cable. Check if the connection part between the gripper and driver comes loose. 	<ul style="list-style-type: none"> Replace the cable. Disconnect and reconnect the connector.
Operation	Check if an unusual noise or vibration is generated from the gripper.	Check the installation of the attachment and operation speed.

● External cleaning

Clean the exterior surface of the gripper whenever necessary.

- Wipe off any dirt and stains using a soft cloth.
- Do not apply compressed air. Dust may enter from a space, resulting in malfunction.
- To remove stubborn stains, wipe the area using a soft cloth moistened with neutral detergent.
- Do not use petroleum solvents, since they will damage the coated surface.

■ Warranty

Check on the Oriental Motor Website or General Catalog for the product warranty.

■ Disposal

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

Troubleshooting

During gripper operation, the gripper may fail to function properly due to an improper setting or wiring. When the gripper cannot be operated properly, refer to the contents provided in this section and take an appropriate action. If the problem persists, contact your nearest Oriental Motor sales office.

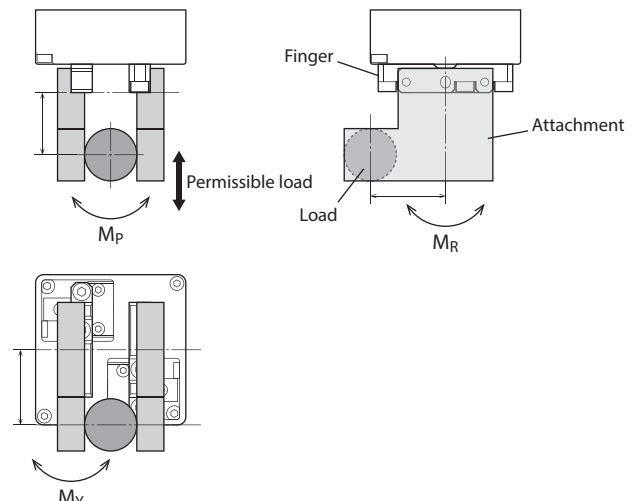
Phenomenon	Possible cause	Remedial action
Malfunction of gripper.	A load moment exceeding the specification value is applied.	Use the gripper with a load moment of the specification value or smaller.
The gripping force of the gripper has lowered.	The wiring distance is exceeded the specification value.	Set the distance between the gripper and driver within 20 m (65.6 ft.) or less.
	The viscosity of the grease was changed.	Refer to "General specifications" and check the operating ambient temperature.

Specifications

■ Product specifications

Gripper model		EH3-AZAKH	EH4-AZAKH
Equipped motor		AZM14	AZM24
Maximum gripping force [N]		7	25
Repetitive positioning accuracy [mm]	One side	±0.02	±0.02
	Both sides	0.2	0.1
Backlash [mm]	One side	15	25
	Both sides	7.5	12.5
Maximum speed [mm/s]	One side	156	156
	Both sides	78	78
Maximum acceleration rate [m/s ²]	One side	20	20
	Both sides	10	10
Push speed [mm/s]	One side	20	20
	Both sides	10	10
Minimum travel amount [mm]	One side	0.02	0.02
	Both sides	0.01	0.01
Permissible load [N]		2	5
Static permissible moment [N·m] *		M _P : 0.7 M _V : 0.2 M _R : 0.2	M _P : 1.2 M _V : 0.12 M _R : 0.4

* It is the static permissible moment at the end of the finger. Use by taking the mass of a load and attachment, and the gripping force (including an impact load) into consideration.





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 an upper limit and with a sufficient margin.

■ 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
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
Heat resistance class		130 (B)
Insulation resistance	100 MΩ or more when 500 VDC megger is applied between the following places: • Case - Motor windings	
Dielectric strength	Sufficient to withstand the following for 1 minute. • Case - Motor windings 0.5 kVAC 50 Hz or 60 Hz	

Regulations and standards

■ CE Marking

● EMC Directive

The equipped motor conforms to the EMC Directive in a state where the motor is connected with the driver. For details, refer to the operating manual of the driver.

■ RoHS Directive

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

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- 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 your nearest Oriental Motor sales office.
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