

## Creceed Electric Actuators **ELEWAVE Series**

● NS Sliders ● Electric Rotary Actuators ● Electric Hands



**Environmentally friendly**  
**RoHS Compliant Product**



### **New Variations**

- Electric Rotary Actuators EWHRT1A, 40A, 60A
- Pulse Train Input Type Controller

# Electric Actuators ELEWAVE



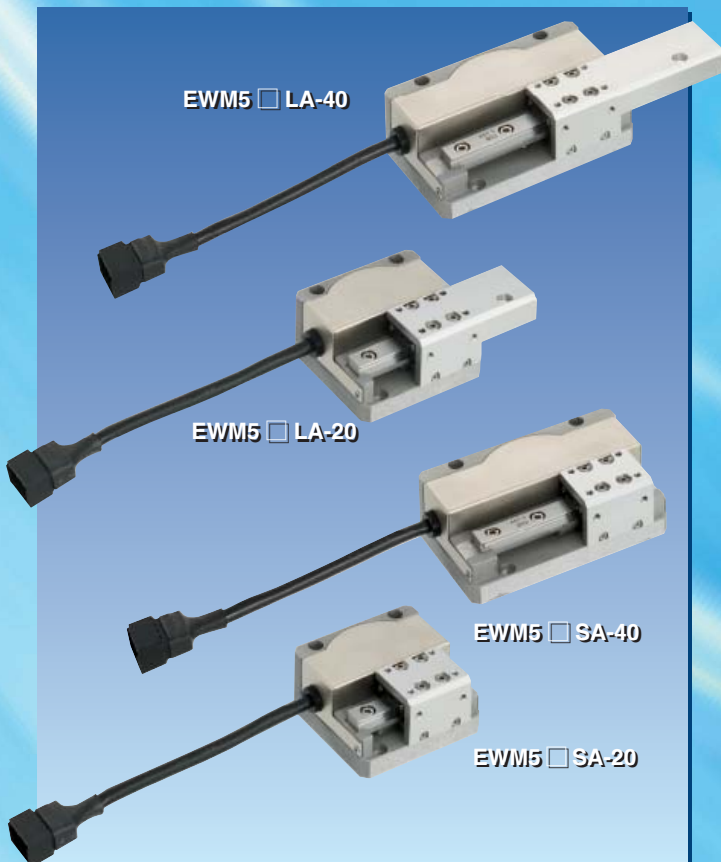
Environmentally friendly **RoHS** compliant product!

Offering compact, lightweight, and low priced products.  
The Koganei electric actuator, Elewave Series.

## NS Sliders

Page 16

Compact, thin-type square actuators expand your creativity.



- High-speed type (120 mm/s [4.72 in./sec.]) and high-thrust type (50 N [11.2 lbf])
- Short stroke actuator minimizes dead space in stroke direction (st.20, 40 [0.79, 1.57 in.])
- Long table type selection available, suitable for push control
- Multipoint positioning operation available (64 points)
- Shockless start and stop
- Desired acceleration and deceleration (smooth, shockless operation even at low speed)
- Soft contact to workpiece through desired speed control
- Linear guide improves precision and rigidity
- Mode selection available for positioning and thrust control
- Stepping motor and encoder for force control and missed step detection
- Communication function enables push position sensing (with distance measurement function)
- Size detection enables workpiece selection

## Electric Rotary Actuators

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Table type Rotary Actuators with 7 torque capacity ranges (using hollow shaft)



**0.1 N·m** [0.9 in·lbf] **NEW**, **0.25 N·m** [2.2 in·lbf],  
**0.5 N·m** [4.4 in·lbf], **1.0 N·m** [8.9 in·lbf],  
**2.0 N·m** [17.7 in·lbf], **4.0 N·m** [35.4 in·lbf] **NEW**,  
**6.0 N·m** [53.1 in·lbf] **NEW**

**Shaft thru hole diameter**

**φ6** [0.236 in.] (EWHRT1A, EWHRT3A, EWHRT5A)  
**φ12** [0.472 in.] (EWHRT10A, EWHRT20A)  
**φ17** [0.669 in.] (EWHRT40A, EWHRT60A)

- High precision, high resolution positioning (Koganei's unique construction eliminates backlash)
- Stepping motor and missed step detection encoder
- Desired swing angle setting (64 points)
- Shockless start and stop
- Desired acceleration and deceleration (smooth, shockless operation even at low speed)
- Continuous operation in the same direction possible
- Optional brake attachment (not available for EWHRT1A)



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## Electric Hands

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Various gripping force products for ease of use



- Compact and lightweight type (EWHA12A), and high gripping force with long stroke type (EWHA24A, 36A)
- Soft contact to workpiece through desired speed control
- Desired stroke setting
- Linear guide improves precision and rigidity
- Mode selection available for positioning and gripping force control
- Stepping motor and encoder for force control and missed step detection
- Shockless start and stop
- Communication function enables measurement of gripping position
- Size detection enables workpiece selection

- Point Input Type Controller



- Pulse Train Input Type Controller

NEW

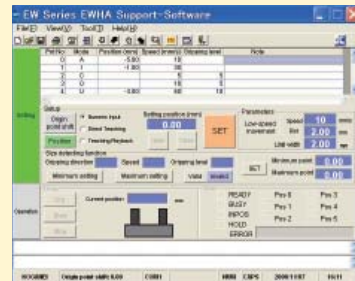


## Support Software

(Operating system: Windows 95, Windows 98, Windows 2000, Windows Me, Windows NT4.0, Windows XP)

Support software for NS Sliders, Electric Rotary Actuators and Electric Hands

※ Windows is a registered trademark of Microsoft Corporation.



Free

- Dedicated support software for the Elewave Series
- Free downloads from Koganei Website
- Support software enables parameter and point data editing
- Support software enables operation on specified points

## Teaching Box

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Teaching Box for NS Sliders, Electric Rotary Actuators and Electric Hands



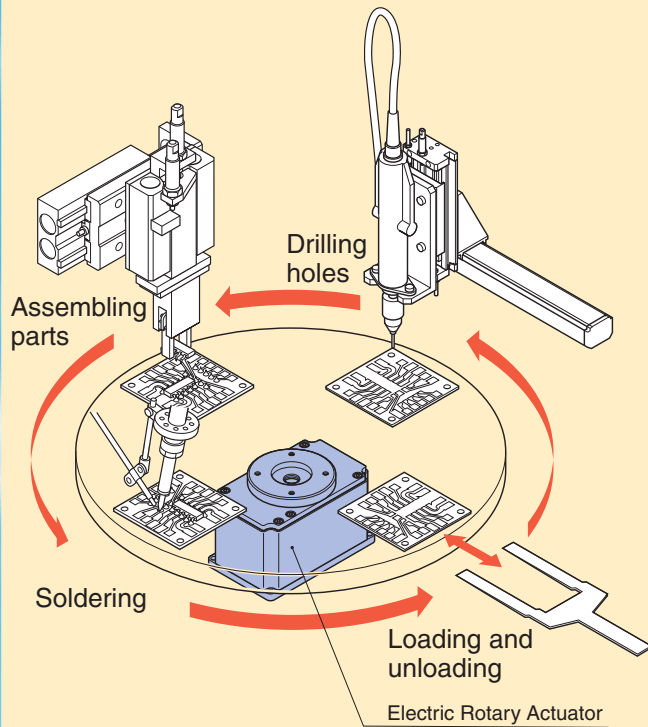
- Enables parameter and point data settings
- Enables point movement and teaching movement
- Installs simple programming function



**Caution** Before use, be sure to read the "Safety Precautions" on p. 7.

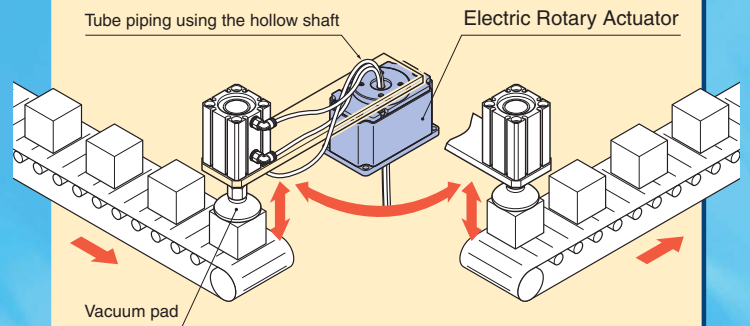
# Users' applications of the ELEWAVE Series broaden Application Examples

## Indexing Table for Automatic Assembly



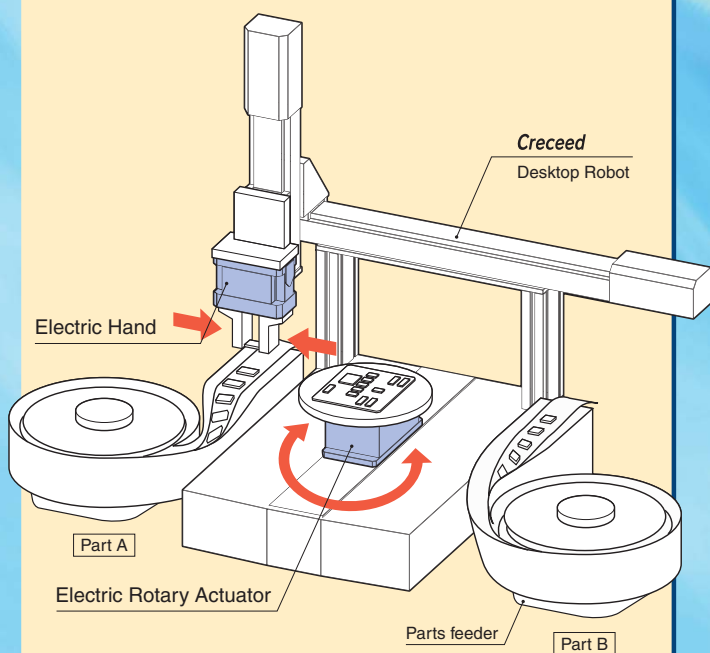
## Swing Loading the Workpiece

This shows an example of tube piping using a hollow shaft.



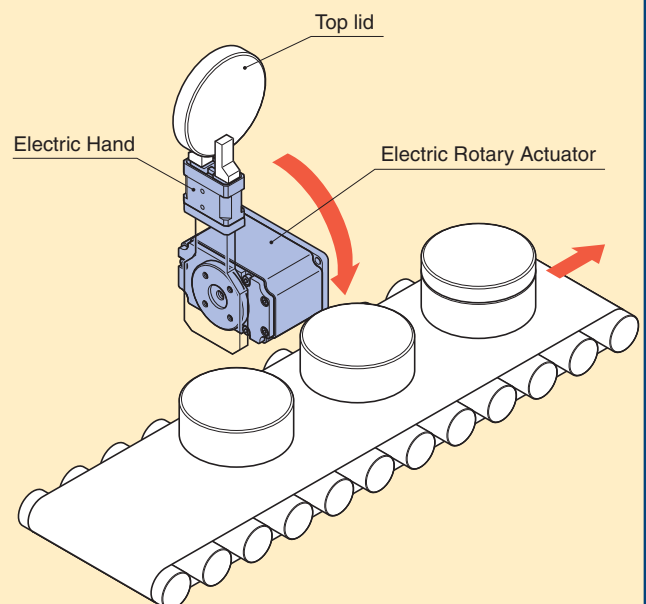
## Loading Device for Different-shaped Parts

The example shows a loading device for different-shaped parts, in combination with the *Creceed* Desktop Robot, the Electric Hand, and the Electric Rotary Actuator.



## Supplying Workpieces

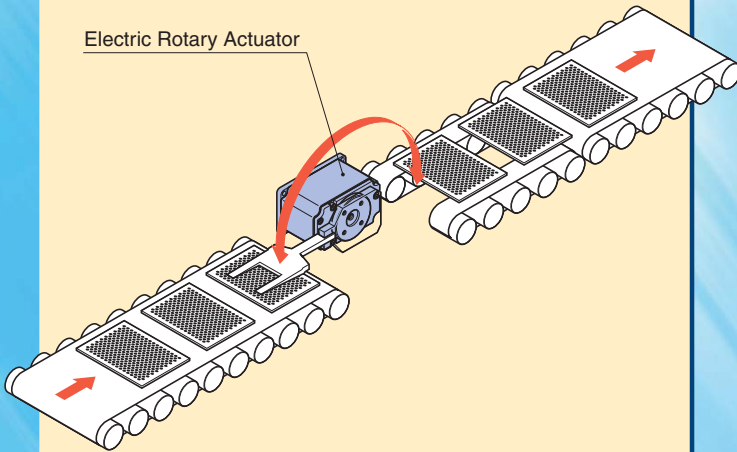
Application example of wall mounting. Ability to perform at desired speeds in a swiveling motion from vertically mounted position to ensure a stable speed for workpieces.



# possibilities for manufacturing!

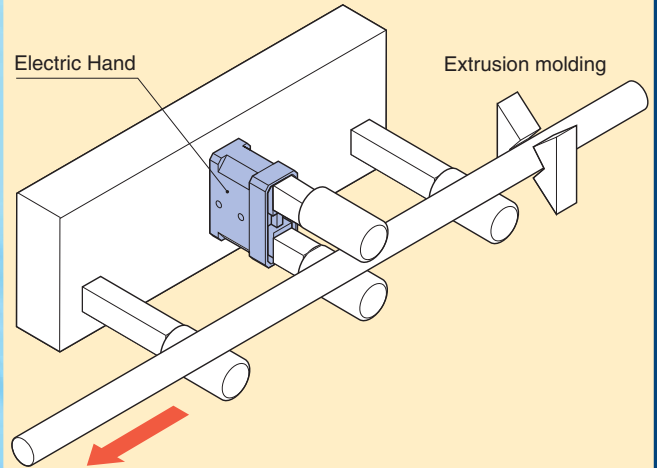
## PCB Flipping Operation

Ability to perform at desired speeds in a swiveling motion from vertically mounted position to ensure a stable speed for workpieces. In addition, controlled adjustable speed enables for the smooth movement of shock-sensitive workpieces.



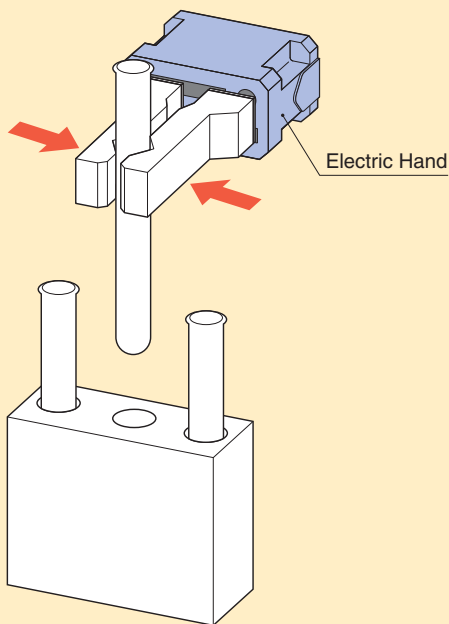
## Measurement of Outer Diameter

Application example of prevention of mixing of defective molded tubes (of different diameters). Uses gripping mode and communication function to determine the outer diameter of the gripped tube and send the data to a PC for tolerance pass/fail determination.



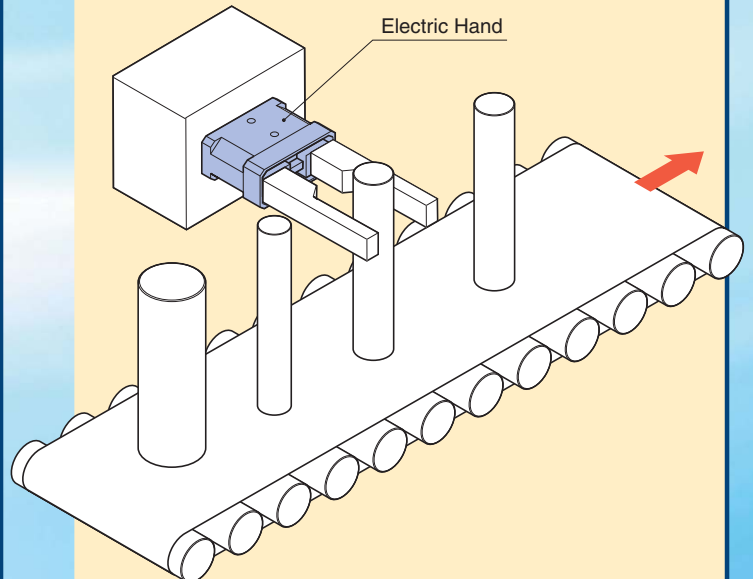
## Gripping a Test Tube

The example shows a gripping operation for delicate workpieces such as test tubes.



## Workpiece Tolerance Determination

Application example of prevention of mixing of workpieces with different diameters, and prevention of defective goods. Uses gripping mode to grip the workpiece and determine tolerance pass/fail.

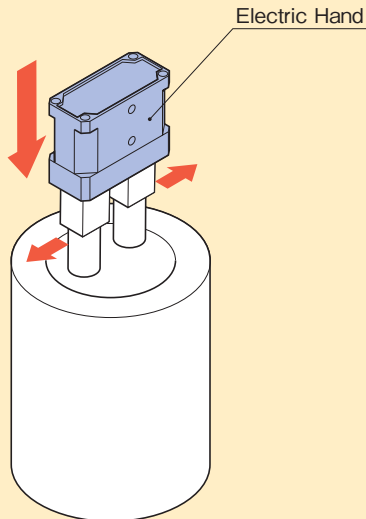




# Application Examples

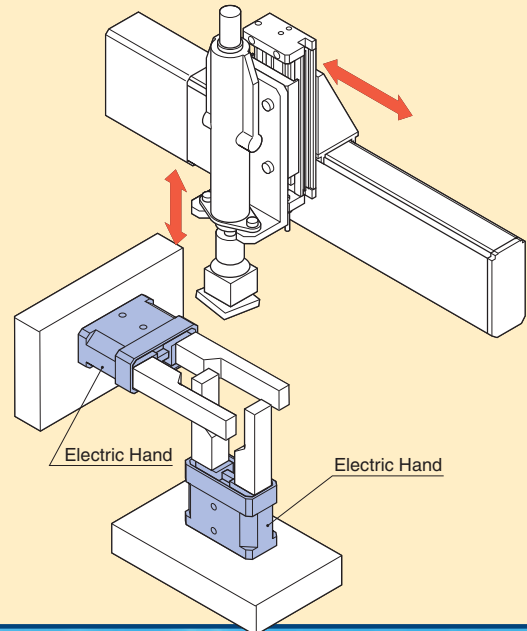
## Measurement of Inner Diameter

Application example of go/no go determination of inner diameter for containers and after hole machining. Attaches a tool to the Electric Hand, and uses gripping mode to bring the hand into contact with the inner surface of the workpiece to determine tolerance go/no go.



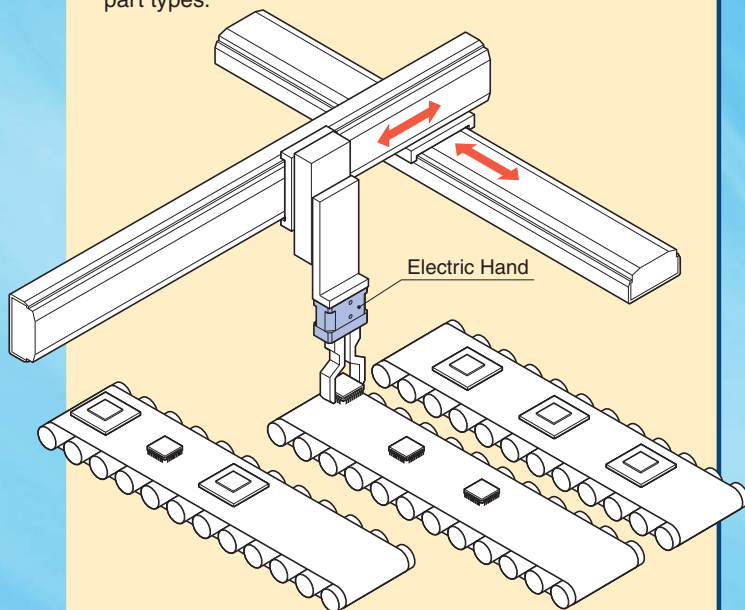
## Correction of Parts Position

Application example of positioning mode used to grip the workpiece and perform positioning control. Corrects the parts position in pick and place operations in the IC mounting process. Uses two Electric Hands for simultaneous correction in the lateral and vertical directions.



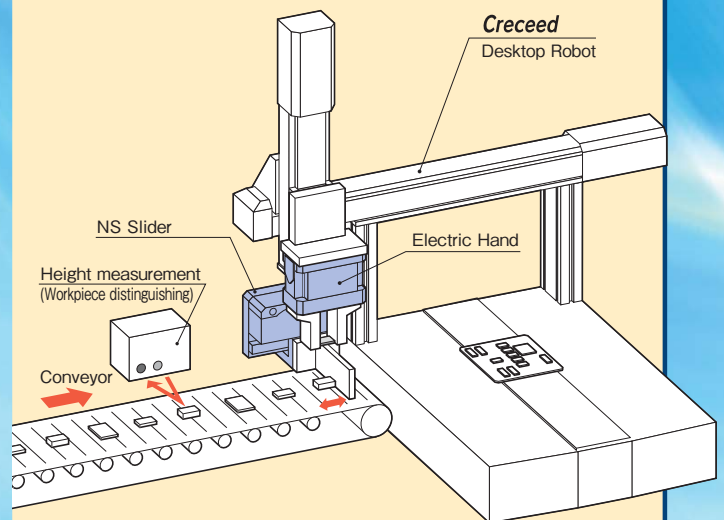
## Workpiece Separation

Application example of workpiece separation. Uses size determination to create a separation between two types of workpieces (eliminates need for set-up changing). Separates workpieces of small lots containing multiple part types.



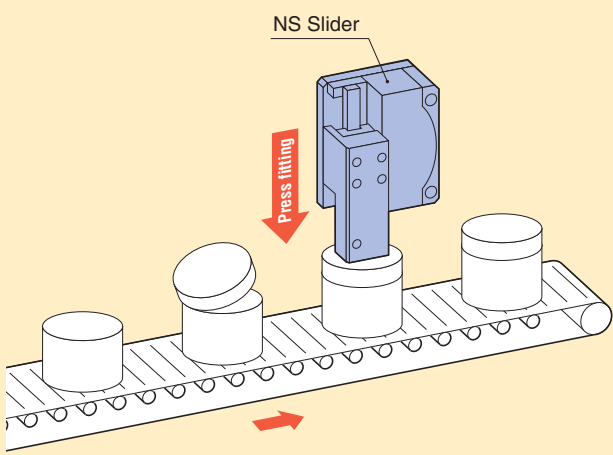
## Positioning Mechanism for Workpiece Loading

Application example for loading a workpiece to the Cell Master. Distinguishes between workpiece types in the previous stage, moves to the position required for the workpiece, and stops.



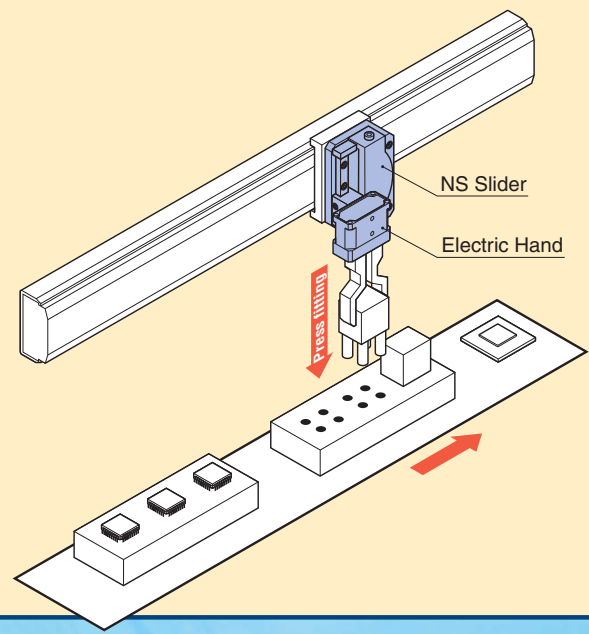
### Capping Operation

Application example for pharmaceutical product capping or crimping operations.  
 Addition of determination function enables detection of workpiece protrusion and missing caps.



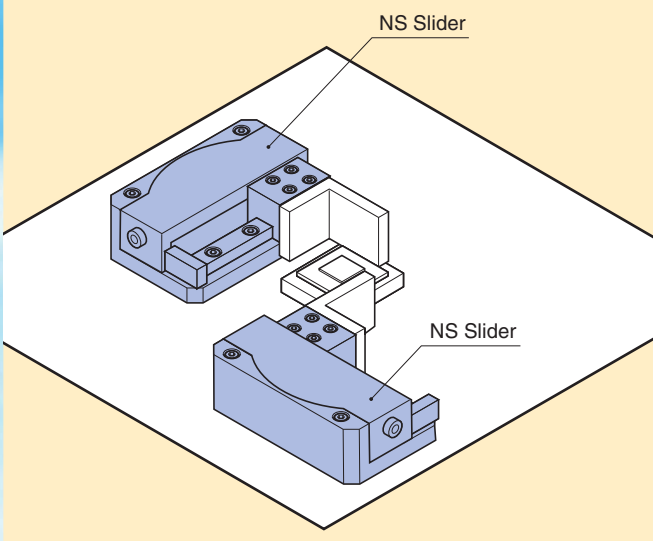
### Workpiece Press Fitting

Application example of connector pin press fitting for compact parts, case shrinking operations, etc.  
 Uses positioning mode for lifting action, and pressing mode for press fitting of workpieces.  
 Addition of determination function enables detection of press fitting failures and mis-gripping of the workpiece.



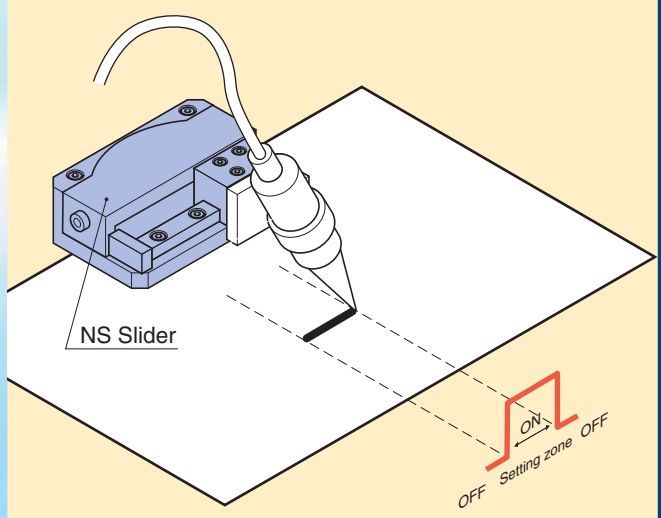
### Correction of Parts Position

Application example of positioning mode used to grip the workpiece and perform positioning control.  
 Corrects the device position in the SMT process.  
 Uses two NS Sliders for simultaneous correction in the lateral and vertical directions.







### Zone Output (For Pulse Train Input Type Controllers)

Application example of zone output.  
 Zone output during point movement performs external output and dispensing at a fixed distance. Implements simple straight-line solvent applications, fixed amount dispensing applications, etc.



Before selecting and using the products, please read all the Safety Precautions carefully to ensure proper product use. The Safety Precautions shown below are to help you use the product safely and correctly, and to prevent injury or damage to you, other people, and assets beforehand. Follow the Safety Precautions for: JIS B 8433 (Manipulating industrial robots—Safety)

**The directions are ranked according to degree of potential danger or damage: “DANGER!”, “WARNING!”, “CAUTION!”, and “ATTENTION!”**

|  |   |
|--|---|
|  <b>DANGER</b>    | Expresses situations that can be clearly predicted as dangerous. If the noted danger is not avoided, it could result in death or serious injury. It could also result in damage or destruction of assets.                         |
|  <b>WARNING</b>   | Expresses situations that, while not immediately dangerous, could become dangerous. If the noted danger is not avoided, it could result in death or serious injury. It could also result in damage or destruction of assets.      |
|  <b>CAUTION</b>   | Expresses situations that, while not immediately dangerous, could become dangerous. If the noted danger is not avoided, it could result in light or semi-serious injury. It could also result in damage or destruction of assets. |
|  <b>ATTENTION</b> | While there is little chance of injury, this content refers to points that should be observed for appropriate use of the product.   |

- **This product was designed and manufactured as parts for use in General Industrial Machinery.**
- In the selection and handling of the equipment, a system designer or other person with fully adequate knowledge and experience should always read the Safety Precautions, Catalog, Owner’s Manual and other literature before commencing operation. Making mistakes in handling is dangerous.
- The customer should take responsibility to verify that the product is compatible with the customer’s systems. Use the product based on your good judgment.
- After reading the Owner’s Manual, Catalog, etc., always place them where they can be easily available for reference to users of this product.
- If transferring or lending the product to another person, always attach the Owner’s Manual, Catalog, etc., to the product where they are easily visible, to ensure that the new user can use the product safely and properly.
- The danger, warning, and caution items listed under these “Safety Precautions” do not cover all possible cases. Read the Catalog and Owner’s Manual carefully, and always keep safety first.

## **DANGER**

- Do not use the product for the purposes listed below:
  1. Medical equipment related to maintenance or management of human lives or bodies.
  2. Mechanical devices or equipment designed for the purpose of moving or transporting people.
  3. Critical safety components in mechanical devices.
 This product has not been planned or designed for purposes that require advanced stages of safety. It could cause injury to human life.
- Do not use the product in locations with or near dangerous substances such as flammable or ignitable substances. It could ignite or burst into flames.
- Do not enter the machine’s operating area while the product is in operation, or while it is in an operation-ready state. In addition, do not make any adjustments to the interior or to the attached mechanism of the product in operation. The actuator can move suddenly, possibly resulting in injury.
- Persons who use a pacemaker, etc., should keep a distance of at least 1 meter [3.28 ft.] away from the product. There is a possibility that the pacemaker will malfunction due to the strong magnet built into the product.
- When mounting the product and workpiece, always firmly support and secure them in place. Dropping or falling the product or improper operation could result in injury.
- Never attempt to remodel the product. It could result in abnormal operation leading to injury, electric shock, fire, etc.
- Never attempt inappropriate disassembly, or assembly of the product relating to basic construction, or to its performance or to functions. It could result in injury, electric shock, fire, etc.
- Do not splash water on the product. Spraying it with water, washing it, or using it underwater could result in malfunction of the product leading to injury, electric shock, fire, etc.

## **WARNING**

- Do not use the actuator as a device for absorbing the shocks and vibrations of mechanical equipment. The actuator could be damaged, resulting in injury or in damage to mechanical equipment.
- Do not use the product in excess of its specification range. Such use could result in product breakdowns, function stop, damage, or drastically reduce the operating life.
- Design safety circuits and equipment systems so as to avoid

- equipment damage or personal injury when the machine is shut down due to an emergency stop, power outages, or other system abnormalities.
- If using the product in the locations listed below, implement adequate shielding measures. Failure to implement these measures may lead to erratic operation that could cause equipment damage or personal injury:
  1. Locations subject to large electric current or magnetic fields
  2. Locations subject to noise due to static electricity, etc.
  3. Locations with the possibility of exposure to radiation
- Always implement D-class grounding work (ground resistance 100 Ω or less). Current leakage could cause electric shock or erratic operation.
- Before installing products to the equipment, always check that the mounting and wiring, and operation command are correct. If not checked, it could result in injury and could cause equipment damage by coming in contact with moving parts.
- Before supplying electricity to the device and before starting operation, always conduct a safety check of the area of machine operation. Unintentional supply of electricity could possibly result in electric shock, or in injury caused by contact with moving parts.
- Do not touch the terminals and the miscellaneous switches, etc., while the device is powered on. There is a possibility of electric shock and abnormal operation.
- Avoid scratching the cords of cables, etc. Letting the cords be subject to scratching, excessive bending, pulling, rolling up, or being placed under heavy objects or squeezed between two objects, may result in current leaks or defective continuity that lead to fire, electric shock, or abnormal operation.
- If abnormal noise occurs or vibrations are excessive, immediately cease operation. Continued use in this condition may result in abnormal operation or runaway that could lead to product damage or destruction.
- Do not throw the product into fire. The product could explode and/or release toxic gases.
- Do not sit on the product, place your foot on it, or place other objects on it. Accidents such as falling and tripping over could result in injury. Dropping the product may result in injury, or also damage or break the product resulting in abnormal or erratic operation, or runaway, etc.
- For inspection, maintenance, replacement, or other kinds of operations related to the product, always completely cut off the power supply before proceeding.
- Operate within the recommended loads and specified speeds.



## CAUTION

- Do not use the product in locations that are subject to direct sunlight (ultraviolet rays), dust, salt, iron powder, high humidity, or in ambient atmospheres that include organic solvents, phosphate ester type hydraulic oil, sulphur dioxide, chlorine gas, acids, etc. It could lead to early shutdown of function or a sudden degradation of performance, and result in a reduced operating life.
- Do not use the product in atmospheres subject to corrosive gases, flammable gases, flammable liquids, etc. It could lead to a decrease in strength due to rust, or to risk of the motor igniting or product exploding.
- Always use the controller designated for the product. Use of a non-designated controller could lead to product breakdown or runaway operation.
- Install the main unit and controller in locations with as little dust or dirt as possible. Installation in locations subject to lots of dust or dirt can lead to erratic operation.
- Do not install the product in locations subject to heavy vibrations (4.9 m/s<sup>2</sup> [0.5G] or more). Transmission of heavy vibrations to the product could lead to erratic operation.
- When mounting the product, leave room for adequate working space around it. Failure to ensure adequate working space will make it more difficult to conduct daily inspections or maintenance, which could eventually lead to system shutdown or damage to the product.
- Do not bring floppy disks or magnetic media, etc., within 1 meter [3.28 ft.] of the product. There is a possibility that the data on the floppy disks will be destroyed due to the magnetism of the magnet.
- Do not scratch, dent, or deform the driving portion by stepping on the product, using it as a scaffold, or placing objects on top of it. It could lead to damaged or broken products that result in operation shutdown or degraded performance.
- Always post an "operations in progress" sign for installations, adjustments, or other operations, to avoid unintentional supplying electrical power, etc. Such accidental supplies may cause electrical shock, or sudden activation of the actuator that could result in physical injury.
- Never perform insulation resistance tests or dielectric strength tests on the controller.

## ATTENTION

- When considering the possibility of using this product in situations or environments not specifically noted in the Catalog or Owner's Manual, or in applications where safety is an important requirement such as in an airplane facility, combustion equipment, leisure equipment, safety equipment, and other places where human life or assets may be greatly affected, take adequate safety precautions such as an application with enough margins for ratings and performance or fail-safe measure. Be sure to consult us with such applications.
- Use a protective cover, etc., to ensure that the operating portions of mechanical devices, etc., are isolated and do not come into direct contact with human bodies.
- Do not control the product in a way that would cause a workpiece to fall during a power failure. Take control measures so that they prevent the workpiece, etc., from falling during a power failure or emergency stop of the mechanical devices.
- Always check the Owner's Manual and other reference materials for product installation and wiring.
- When handling the product, wear protective gloves, safety glasses, safety shoes, etc., to keep safety.
- Perform daily inspections to check that system functions are performing as required to prevent accidents from happening.
- When the product can no longer be used, or is no longer necessary, dispose of it appropriately as industrial waste.
- For inquiries about the product, consult your nearest Koganei sales office or Koganei overseas department. The address and telephone number are shown on the back cover of this catalog.

## OTHERS

- Always observe the following items.
  1. When using this product into systems, always use genuine KOGANEI parts or compatible parts (recommended parts). When performing maintenance and repairs, always use genuine KOGANEI parts or compatible parts (recommended parts). Always observe the required methods and procedure.
  2. Never attempt inappropriate disassembly or assembly of the product relating to basic construction, or its performance or functions.

Koganei cannot be responsible if these items are not properly observed.

## Handling Instructions and Precautions



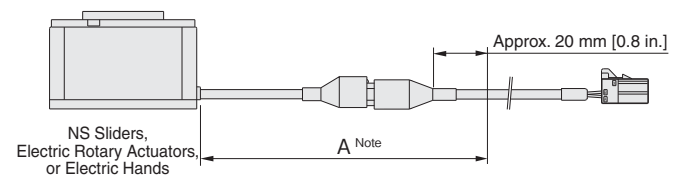
### General precautions

#### Environment

1. Avoid using the main unit and controller in locations subjected to dripping water or oil, or in dusty locations.
2. Avoid using the product in locations where sulfuric acid, hydrochloric acid, or other corrosive gases are present.
3. Avoid using the product in locations subject to strong vibrations or shocks.

#### Wiring

1. The I/O wiring connection method for connecting an **EWC-R** (for Electric Rotary Actuators) and an **EWC-H** (for Electric Hands) controller to a programmable controller, or other external device, differs from that for current **EWHC-RA**, **ERHC-RS**, **EWHCP-RA**, and **EWHCP-RS** (for Electric Rotary Actuators) controllers and for **EWHC-NH** and **EWHCP-NH** (for NS Sliders, Electric Hands) controllers. When replacing the old controller with the current controller, always be sure to refer to the Owner's Manual to confirm the connection method.
2. Do not use the cable applied repetitive bending between the main unit and connector (shown in the portion A in the diagram below).



Note: For the Electric Rotary Actuator EWHRT40A and EWHRT60A, approx. 50 mm [2.0 in.] from the main unit connector.

#### Other

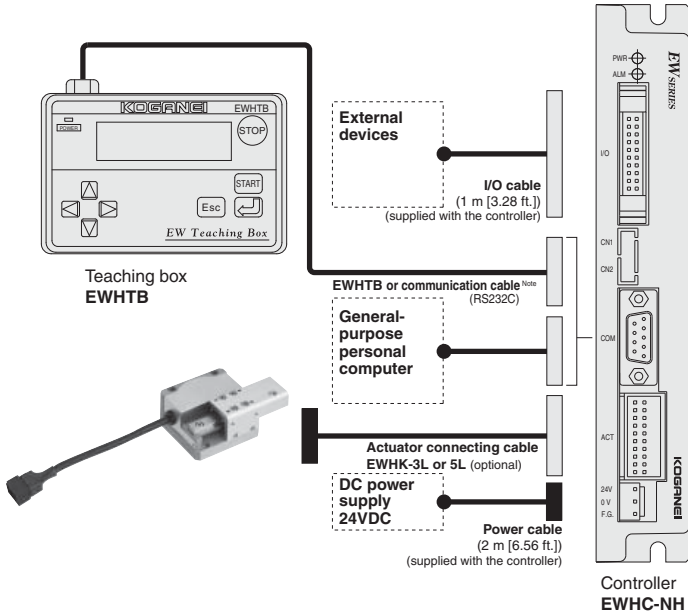
Before use, always read the Owner's Manual provided with the main unit and controller.

# Handling Instructions and Precautions



## Selection

### ● System Configuration (example)



Note: RS232C cable (reference)

Specifications: D-sub 9 pin (female) ↔ D-sub 9 pin (female) andcross cable

Model: C232R-EC0915 (1.5 m [4.92 ft.])  
C232R-EC0930 (3.0 m [9.84 ft.])

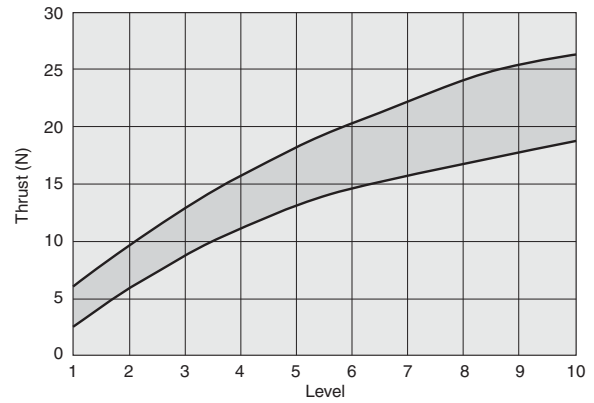
Manufacturer: Elecom Co., Ltd.

Regarding the communication cable, please purchase it separately.

### ● NS Sliders

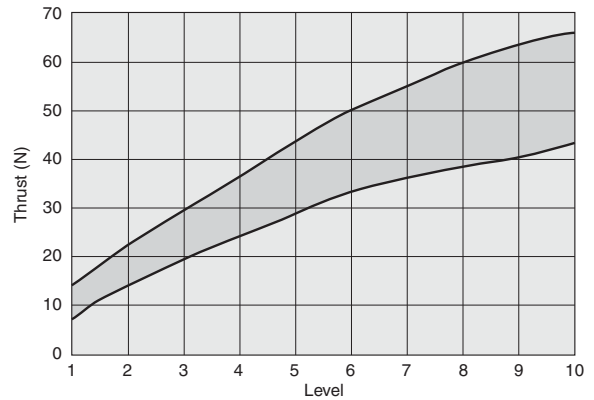
#### ● Thrust

EWM5H  A



1 N = 0.225 lbf.

EWM5S  A



1 N = 0.225 lbf.

### ● NS Sliders operation mode (For Point Input Type Controller)

| Mode              | Positioning   |  | Pushing <sup>Note</sup>                                  |                     | Pushing with acceleration/deceleration movement  |
|-------------------|---|--|--|---------------------|--|
|                   | Moves to the specified point with acceleration/deceleration, and then stops.          |  | Operates at constant speed, and pushes at the set force. |                     | Performs pushing operation during acceleration/deceleration movement.  |
| Setting value     | A   | I  | C  | O                   | U  |
| Description       | Moves to the specified point position in the coordinate system where the origin is 0. | Moves from the current position to the point specified position. | Operates to + side.                                      | Operates to - side. | Moves to the specified point, and performs pushing operation at the speed set in PRM7 from the distance forward the point set in PRM8. |
| Operation pattern |   |  |  |                     |  |
| Remark            | —   |  | —  |                     | Suitable for soft pushing with high cycle operation  |

Caution: Pushing mode changes from C to O, and from O to C cannot be performed.

## ● Electric Rotary Actuators

- When using screws to secure a workpiece to the electric rotary actuator table, be sure to hold either the table or the workpiece during tightening.

### ● Duty cycle limits

Use the electric rotary actuator with a duty cycle of 50% or less.

$$\text{Duty cycle} = \frac{\text{Operating time}}{\text{Operating time} + \text{Down time}} \times 100 (\%)$$

### ● Limits on load torque and speed

When mounting the product on the table in a vertical position, design the workpiece so that it will not exert load torque as much as possible. Limit the load torque to 60% or less of the actuator's maximum torque.

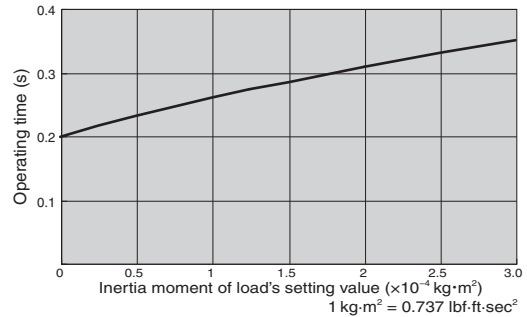
**Caution:** When a load torque is applied, limit the speed settings as shown below.

| Load ratio (%)    | 20      | 40      | 60      |
|-------------------|---------|---------|---------|
| Speed setting (%) | Max. 50 | Max. 33 | Max. 25 |

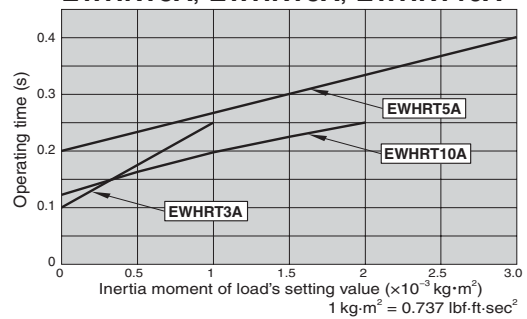
$$\text{Load ratio} (\%) = \frac{\text{Load torque}}{\text{Maximum torque}} \times 100 (\%)$$

## ● Operating time (operating angle 90°)

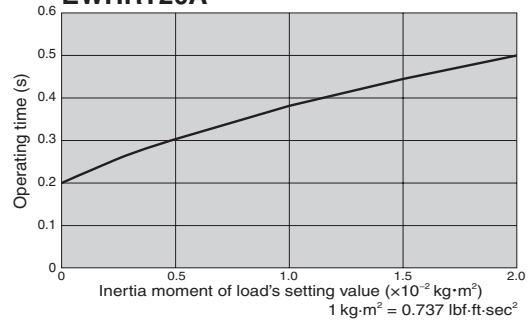
### EWHRT1A



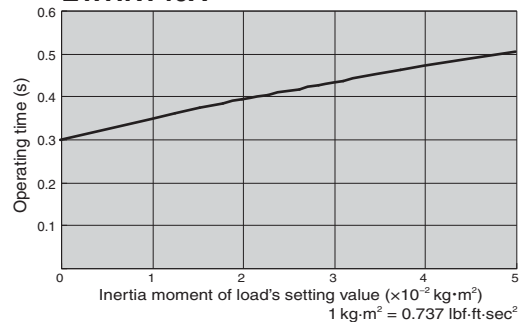
### EWHRT3A, EWHRT5A, EWHRT10A



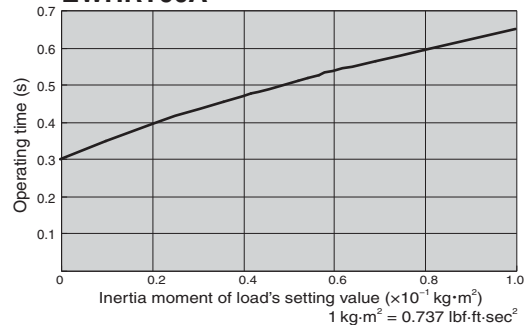
### EWHRT20A



### EWHRT40A



### EWHRT60A



Remark: Graphs obtained at the maximum speed and the maximum acceleration (when no load torque is applied)



## ● Calculation examples for moment of inertia

**Caution:** Moment of inertia of the workpiece should always be at or below the maximum load inertia.

### 1. Disk-shaped load rotating about its axis

Load material: Aluminum alloy (density  $2.7 \times 10^3 \text{ kg/m}^3$ )

$$I = \frac{md^2}{8}$$

I : Moment of inertia rotating about its axis ( $\text{kg} \cdot \text{m}^2$ )

d : Disk diameter (m)

m : Mass (kg)

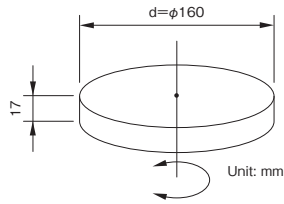
d = 0.16 (m)

$$m = \frac{\pi \times 0.16^2}{4} \times 0.017 \times 2.7 \times 10^3$$

$$= 0.92 \text{ (kg)}$$

$$I = \frac{0.92 \times 0.16^2}{8}$$

$$= 3.0 \times 10^{-3} \text{ (kg} \cdot \text{m}^2)$$



This is the maximum load inertia for **EWHRT5A**.

### 2. Rectangular load offset from its rotating axis

Load material: Aluminum alloy (density  $2.7 \times 10^3 \text{ kg/m}^3$ )

$$I = \frac{m}{12}(a^2 + b^2) + mL^2$$

I : Moment of inertia rotating about its axis ( $\text{kg} \cdot \text{m}^2$ )

a, b : Length of sides (m)

L : Offset distance from its rotating axis to the center of load (m)

m : Mass (kg)

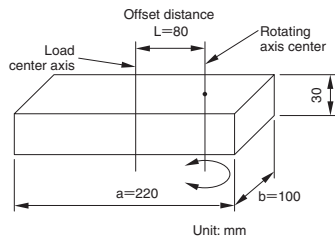
$$m = 0.22 \times 0.1 \times 0.03 \times 2.7 \times 10^3$$

$$= 1.78 \text{ (kg)}$$

$$I = \frac{m}{12}(a^2 + b^2) + mL^2$$

$$= \frac{1.78}{12}(0.22^2 + 0.1^2) + (1.78 \times 0.08^2)$$

$$= 2.0 \times 10^{-2} \text{ (kg} \cdot \text{m}^2)$$



This is the maximum load inertia for **EWHRT20A**.

## ● Calculation examples for moment of inertia

**Caution:** Moment of inertia of the workpiece should always be at or below the maximum load inertia.

### 1. Disk-shaped load rotating about its axis

Load material: Aluminum alloy (density 169 lbf./ft.<sup>3</sup>)

$$I = \frac{wd^2}{8 \times 32.2}$$

I : Moment of inertia rotating about its axis ( $\text{lbf} \cdot \text{ft} \cdot \text{sec}^2$ )

d : Disk diameter (ft.)

w : Mass (lbf.)

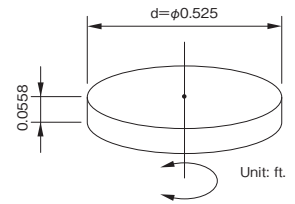
d = 0.525 (ft.)

$$m = \frac{\pi \times 0.525^2}{4} \times 0.0558 \times 169$$

$$= 2.04 \text{ (lbf.)}$$

$$I = \frac{2.04 \times 0.525^2}{8 \times 32.2}$$

$$= 2.18 \times 10^{-3} \text{ (lbf} \cdot \text{ft} \cdot \text{sec}^2)$$



This is the maximum load inertia for **EWHRT5A**.

### 2. Rectangular load offset from its rotating axis

Load material: Aluminum alloy (density 169 lbf./ft.<sup>3</sup>)

$$I = \frac{w}{12 \times 32.2}(a^2 + b^2) + \frac{wL^2}{32.2}$$

I : Moment of inertia rotating about its axis ( $\text{lbf} \cdot \text{ft} \cdot \text{sec}^2$ )

a, b : Length of sides (ft.)

L : Offset distance from its rotating axis to the center of load (ft.)

w : Mass (lbf.)

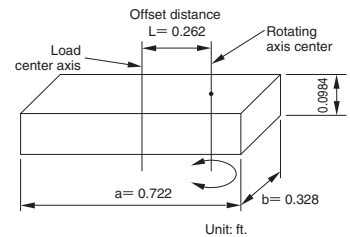
$$w = 0.722 \times 0.328 \times 0.0984 \times 169$$

$$= 3.94 \text{ (lbf.)}$$

$$I = \frac{w}{12 \times 32.2}(a^2 + b^2) + \frac{wL^2}{32.2}$$

$$= \frac{3.94}{12 \times 32.2}(0.722^2 + 0.328^2) + \frac{3.94 \times 0.262^2}{32.2}$$

$$= 1.48 \times 10^{-2} \text{ (lbf} \cdot \text{ft} \cdot \text{sec}^2)$$



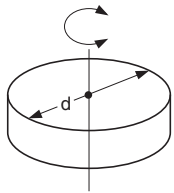
This is the maximum load inertia for **EWHRT20A**.

## ● Electric Rotary Actuators

### ■ Diagram for calculating mass moment of inertia

[When the rotation axis passes through the workpiece]

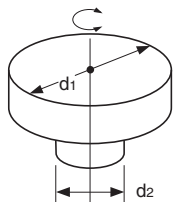
#### ● Disk



|            |          |  |                   |
|------------|----------|--|-------------------|
| ● Diameter | d (m)    | ■ Mass moment of inertia I (kg·m <sup>2</sup> )        | ■ Rotating radius |
| ● Mass     | m (kg)   | $I = \frac{md^2}{8}$                                   | $\frac{d^2}{8}$   |
| ● Diameter | d [ft.]  | ■ Mass moment of inertia I' [lbf·ft·sec <sup>2</sup> ] | ■ Rotating radius |
| ● Weight   | w [lbf.] | $I' = \frac{wd^2}{8 \times 32.2}$                      | $\frac{d^2}{8}$   |

Remark: No particular mounting direction. For sliding use, see separate materials.

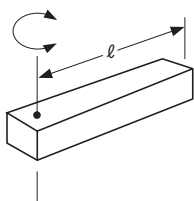
#### ● Stepped disk



|                                 |                       |   |                           |
|---------------------------------|-----------------------|---|---------------------------|
| ● Diameter                      | d <sub>1</sub> (m)    | ■ Mass moment of inertia I (kg·m <sup>2</sup> )             | ■ Rotating radius         |
| ● Mass d <sub>1</sub> portion   | d <sub>2</sub> (m)    | $I = \frac{1}{8}(m_1d_1^2 + m_2d_2^2)$                      | $\frac{d_1^2 + d_2^2}{8}$ |
| ● Mass d <sub>2</sub> portion   | m <sub>2</sub> (kg)   |   |                           |
| ● Diameter                      | d <sub>1</sub> [ft.]  | ■ Mass moment of inertia I' [lbf·ft·sec <sup>2</sup> ]      | ■ Rotating radius         |
| ● Weight d <sub>1</sub> portion | d <sub>2</sub> [ft.]  | $I' = \frac{1}{8 \times 32.2} \times (w_1d_1^2 + w_2d_2^2)$ | $\frac{d_1^2 + d_2^2}{8}$ |
| ● Weight d <sub>2</sub> portion | w <sub>2</sub> [lbf.] |   |                           |

Remark: The d<sub>2</sub> portion can be negligible when it is much smaller than the d<sub>1</sub> portion.

#### ● Bar (rotation center is at the edge)



|              |          |  |                    |
|--------------|----------|--|--------------------|
| ● Bar length | ℓ (m)    | ■ Mass moment of inertia I (kg·m <sup>2</sup> )        | ■ Rotating radius  |
| ● Mass       | m (kg)   | $I = \frac{m \ell^2}{3}$                               | $\frac{\ell^2}{3}$ |
| ● Bar length | ℓ [ft.]  | ■ Mass moment of inertia I' [lbf·ft·sec <sup>2</sup> ] | ■ Rotating radius  |
| ● Weight     | w [lbf.] | $I' = \frac{w \ell^2}{3 \times 32.2}$                  | $\frac{\ell^2}{3}$ |

Remark: Mounting direction is horizontal.

If the mounting direction is vertical, the swing time will change.

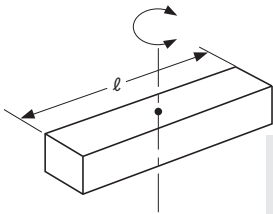
## Handling Instructions and Precautions

### ● Electric Rotary Actuators

#### ■ Diagram for calculating mass moment of inertia

[When the rotation axis passes through the workpiece]

#### ● Bar (rotation center is through the center of gravity)



- Bar length  $l$  (m)
- Mass  $m$  (kg)

■ Mass moment of inertia  $I$  ( $\text{kg} \cdot \text{m}^2$ )

$$I = \frac{m l^2}{12}$$

■ Rotating radius

$$\frac{l^2}{12}$$

- Bar length  $l$  [ft.]
- Weight  $w$  [lbf.]

■ Mass moment of inertia  $I'$  [ $\text{lbf} \cdot \text{ft} \cdot \text{sec}^2$ ]

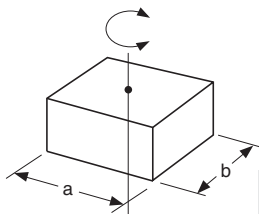
$$I' = \frac{w l^2}{12 \times 32.2}$$

■ Rotating radius

$$\frac{l^2}{12}$$

Remark: No particular mounting direction.

#### ● Rectangular parallelepiped



- Length of sides  $a$  (m)
- Length of sides  $b$  (m)
- Mass  $m$  (kg)

■ Mass moment of inertia  $I$  ( $\text{kg} \cdot \text{m}^2$ )

$$I = \frac{m}{12} (a^2 + b^2)$$

■ Rotating radius

$$\frac{a^2 + b^2}{12}$$

- Length of sides  $a$  [ft.]
- Length of sides  $b$  [ft.]
- Weight  $w$  [lbf.]

■ Mass moment inertia  $I'$  [ $\text{lbf} \cdot \text{ft} \cdot \text{sec}^2$ ]

$$I' = \frac{w}{12 \times 32.2} (a^2 + b^2)$$

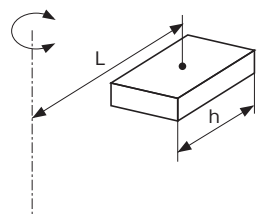
■ Rotating radius

$$\frac{a^2 + b^2}{12}$$

Remark: No particular mounting direction. For sliding use, see separate materials.

#### [When the rotation axis is offset from the workpiece]

#### ● Rectangular parallelepiped



- Length of side  $h$  (m)
- Distance from rotation axis to the center of load  $L$  (m)
- Mass  $m$  (kg)

■ Mass moment of inertia  $I$  ( $\text{kg} \cdot \text{m}^2$ )

$$I = \frac{m h^2}{12} + m L^2$$

- Length of side  $h$  [ft.]
- Distance from rotation axis to the center of load  $L$  [ft.]
- Weight  $w$  [lbf.]

■ Mass moment of inertia  $I'$  [ $\text{lbf} \cdot \text{ft} \cdot \text{sec}^2$ ]

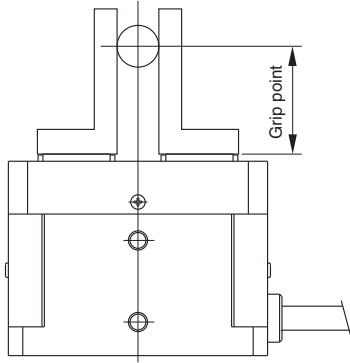
$$I' = \frac{w h^2}{32.2 \times 12} + \frac{w L^2}{32.2}$$

Remark: Same for cube.



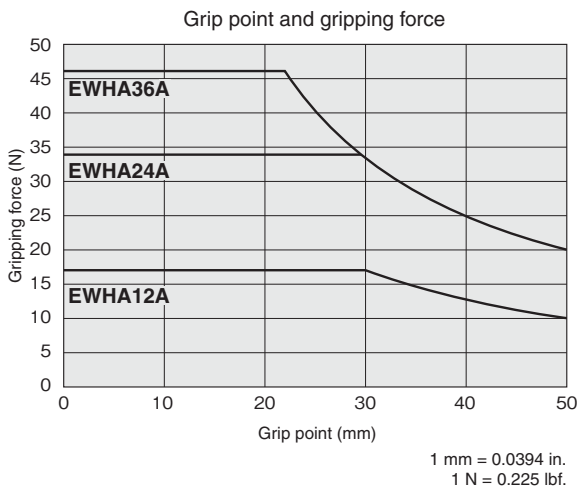
## ● Electric Hands

### ● Limits on gripping force at grip points



※ Set the gripping force at the grip point within the range shown in the graph below

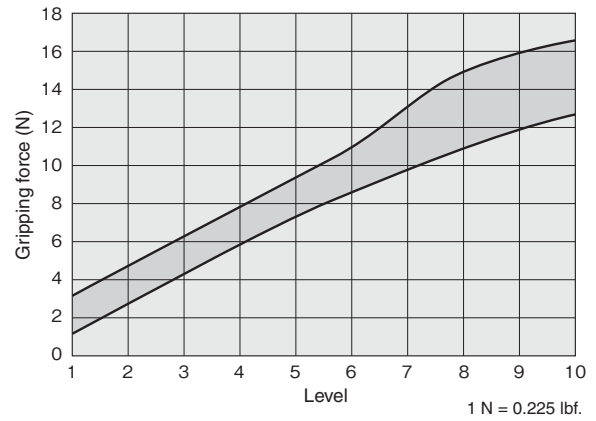
Allowable moment { **EWHA12A** : 0.51 N·m [4.51 in·lbf]  
**EWHA24A, 36A** : 1.0 N·m [8.9 in·lbf]



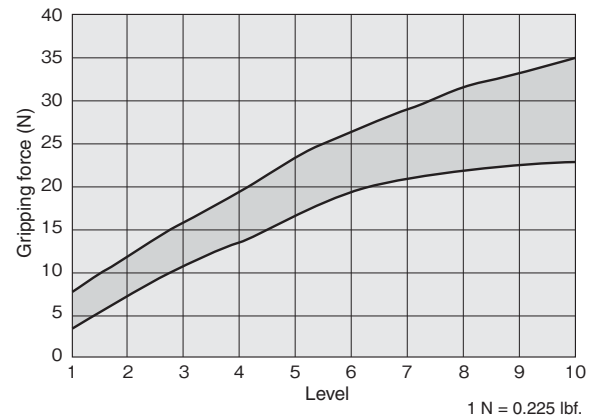
### ● Range of gripping force

Forces are generated within the range shown in the graphs below at each set level. Note that the gripping force repeatability at the same position is 5% or less.

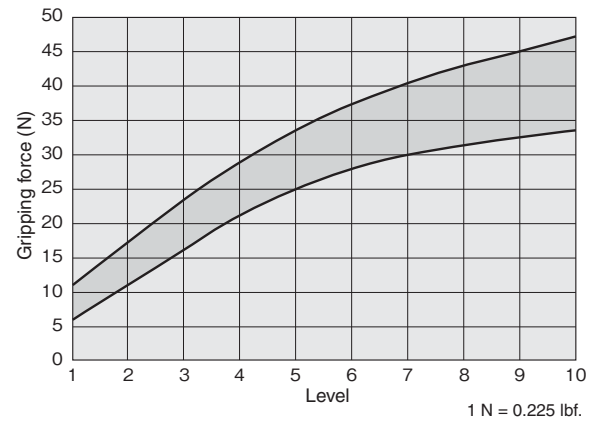
#### EWHA12A



#### EWHA24A



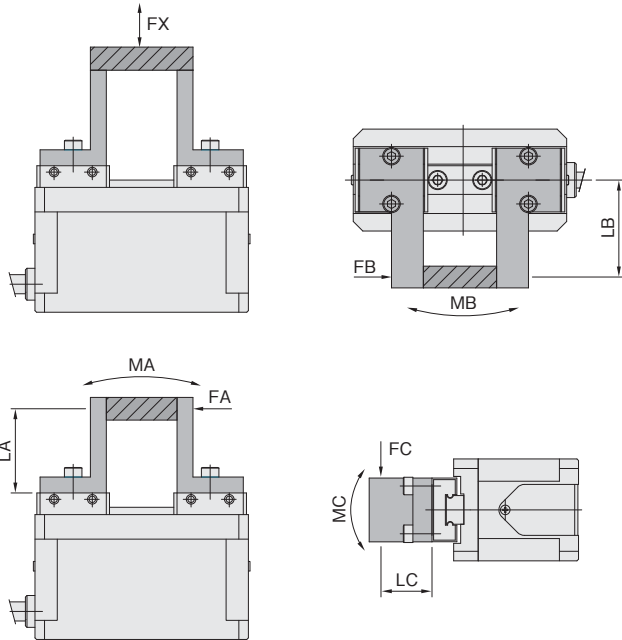
#### EWHA36A



# Handling Instructions and Precautions

## ● Electric Hands

### ● Allowable Load and Allowable Moment



- $MA = FA \times LA$  N·m [in·lbf]
- $MB = FB \times LB$  N·m [in·lbf]
- $MC = FC \times LC$  N·m [in·lbf]

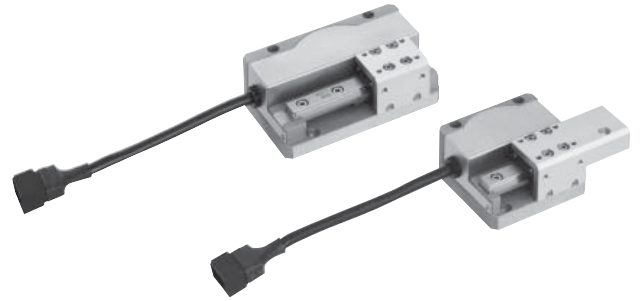
| Model                            | Load and moment<br>FX<br>N [lbf.] | MA<br>N·m [in·lbf] | MB<br>N·m [in·lbf] | MC<br>N·m [in·lbf] |
|----------------------------------|-----------------------------------|--------------------|--------------------|--------------------|
| <b>EWHA12A</b>                   | 40 [9]                            | 0.51 [4.51]        | 0.30 [2.7]         | 0.60 [5.3]         |
| <b>EWHA24A</b><br><b>EWHA36A</b> | 120 [27]                          | 1.0 [8.9]          | 1.00 [8.9]         | 2.00 [17.7]        |

### ● Electric Hands operation mode (For Point Input Type Controller)

| Mode              | Positioning   |  | Gripping <sup>Note</sup>                                |                           | Gripping with acceleration/deceleration movement  |
|-------------------|---|--|---|---------------------------|---|
|                   | Moves to the specified point with acceleration/deceleration, and then stops.          |  | Operates at constant speed, and grips at the set force. |                           | Performs gripping operation during acceleration/deceleration movement.  |
| Setting value     | A   | I  | C   | O                         | U   |
| Description       | Moves to the specified point position in the coordinate system where the origin is 0. | Moves from the current position to the point specified position. | Operates to closing side.                               | Operates to opening side. | Moves to the specified point, and performs gripping operation at the speed set in PRM7 from the distance forward the point set in PRM8. |
| Operation pattern |   |  |   |                           |   |
| Remark            | —   |  | —   |                           | Suitable for soft gripping with high cycle operation  |

**Caution:** Gripping mode changes from C to O, and from O to C cannot be performed.

# NS Sliders

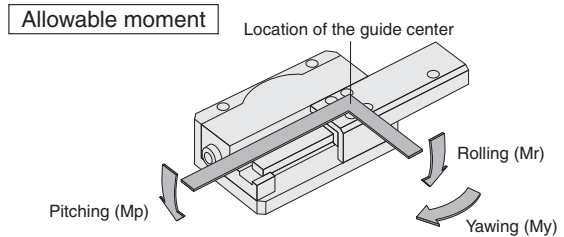


## Specifications

### Basic specifications of main unit

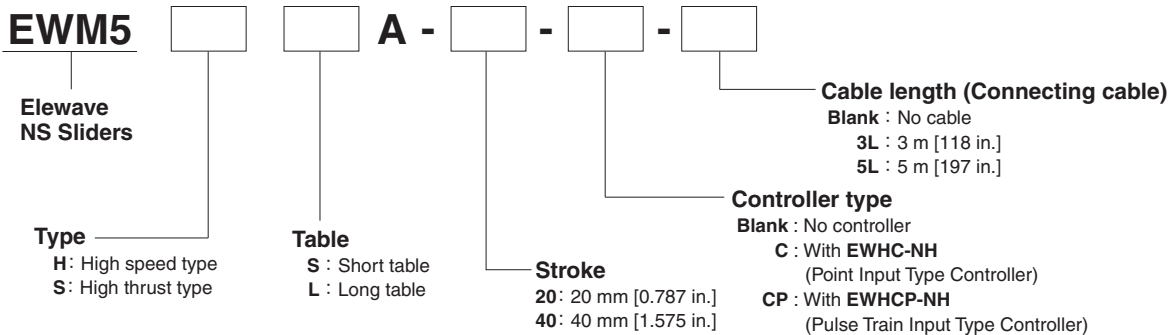
| Item                               | Model                          | EWM5HSA · EWM5HLA   | EWM5SSA · EWM5SLA                          |
|------------------------------------|--------------------------------|---|--|
| Motor                              |                                | 2-phase stepping motor  |  |
| Maximum thrust <sup>Note1</sup>    | N [lbf.]                       | 18~27 [4.0~6.1]   | 42~65 [9.4~14.6]                           |
| Maximum load mass <sup>Note2</sup> | kg [lb.]                       | 1 [2.2] (horizontal), 0.4 [0.9] (vertical)                                  | 2 [4.4] (horizontal), 0.8 [1.8] (vertical) |
| Maximum speed                      | mm/s [in./sec.]                | 120 [4.72]  | 50 [1.97]                                  |
| Minimum operation time             | s                              | 0.25 (st.20), 0.42 (st.40)  | 0.50 (st.20), 0.90 (st.40)                 |
| Minimum speed                      | mm/s [in./sec.]                | 1 [0.04]  |  |
| Repeatability                      | mm [in.]                       | ± 0.03 [ ± 0.0012]  |  |
| Operating temperature range        | °C [°F]                        | 0 ~ 40 [32 ~ 104]   |  |
| Allowable moment                   | My (yawing) N · m [in · lbf]   | 1 [8.9]   |  |
|                                    | Mp (pitching) N · m [in · lbf] | 1 [8.9]   |  |
|                                    | Mr (rolling) N · m [in · lbf]  | 1.5 [13.3]  |  |
| Mass                               | kg [lb.]                       | 0.27 [0.60] (st.20, short table type), 0.30 [0.66] (st.20, long table type) |  |
|                                    |                                | 0.35 [0.77] (st.40, short table type), 0.40 [0.88] (st.40, long table type) |  |
| Applicable controller              |                                | EWHC-NH, EWHCP-NH   |  |

Note: 1. For details of the thrust, see the graphs on p.9.  
 2. Holding function cannot be performed when the power is switched off.  
 3. Maximum speed during pressing is 10 mm/s [0.39 in./sec.].



For the controller specifications, see pp.25-26.

## Order Codes



### Additional Parts

Point Input Type Controller

**EWHC - NH**



Cable (Connecting cable)

**EWHKA -** [ ]



**Cable length**  
 3L: 3 m [118 in.]  
 5L: 5 m [197 in.]

Pulse Train Input Type Controller

**EWHCP - NH**



Teaching Box <sup>Note</sup>

**EWHTB**

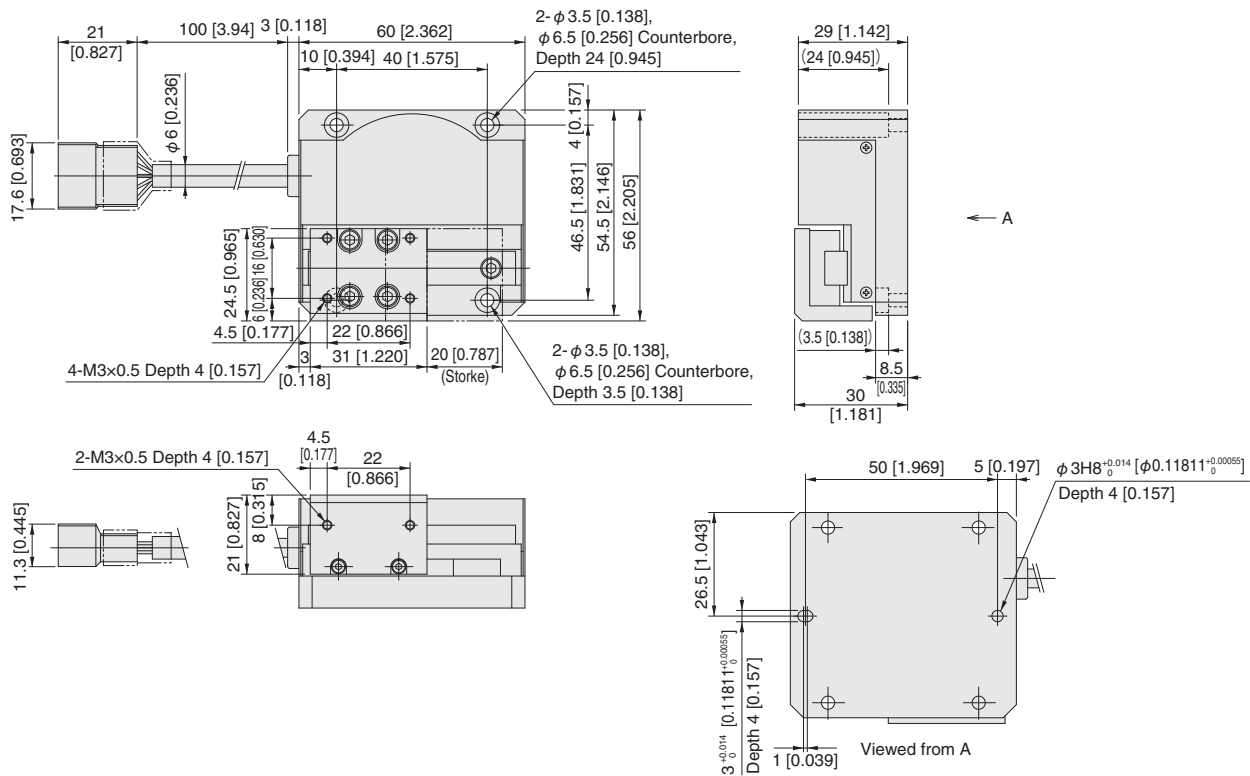


Note: For specifications and dimensions, see p.20.

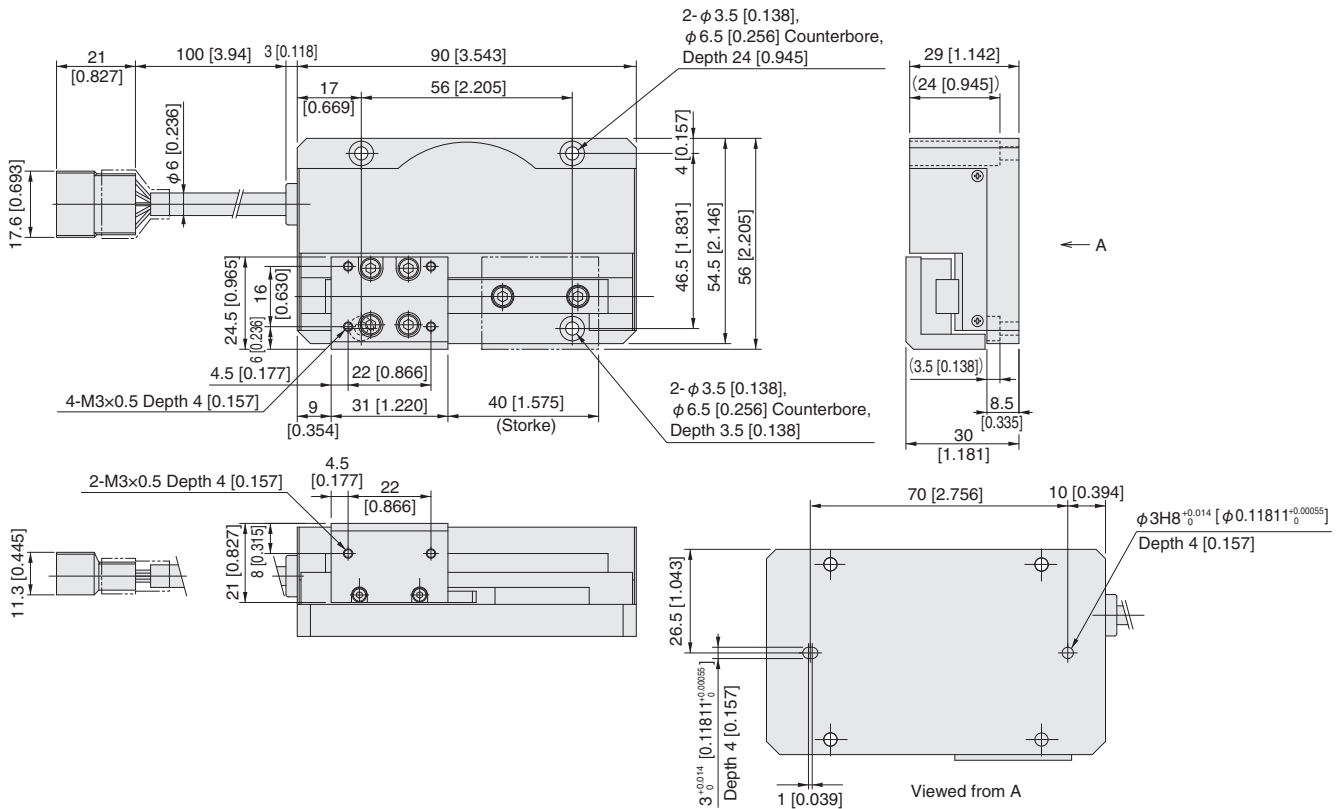


# NS Sliders Dimensions mm [in.]

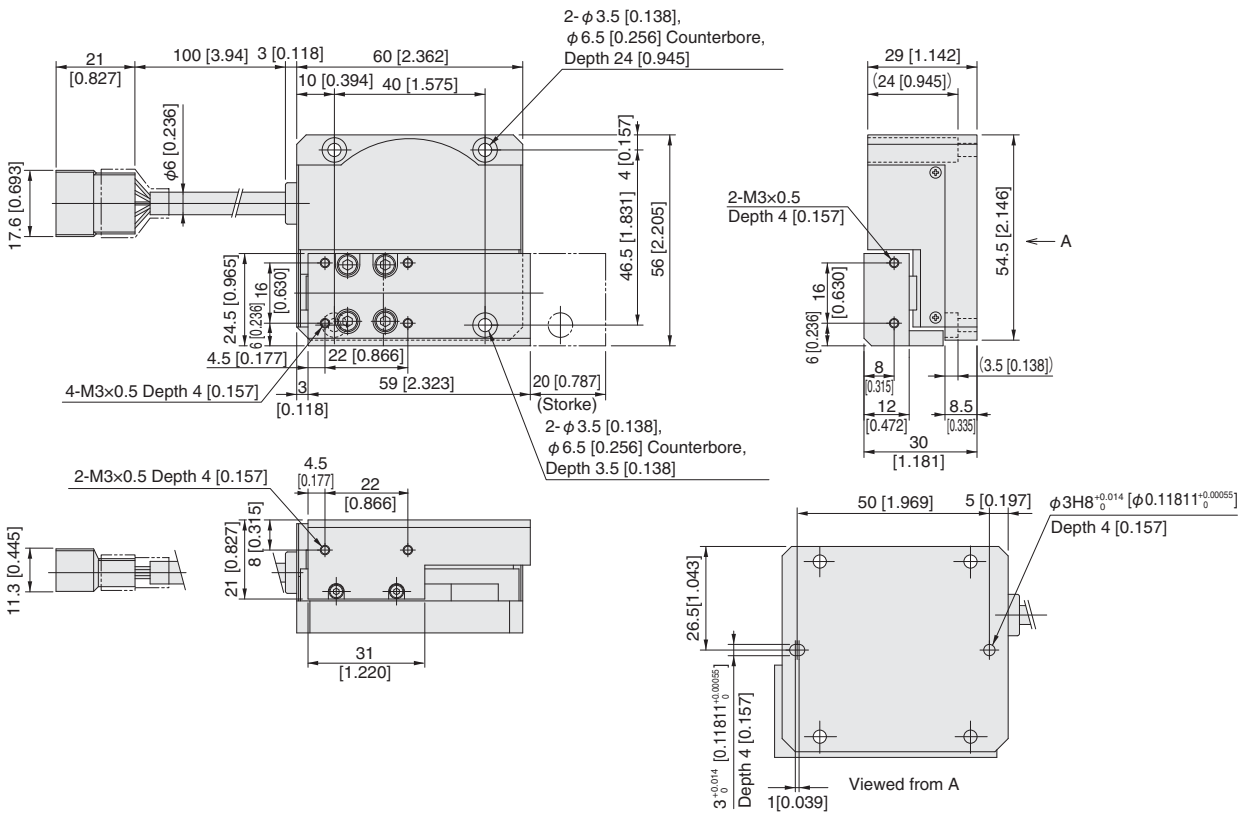
## EWM5HSA-20 EWM5SSA-20



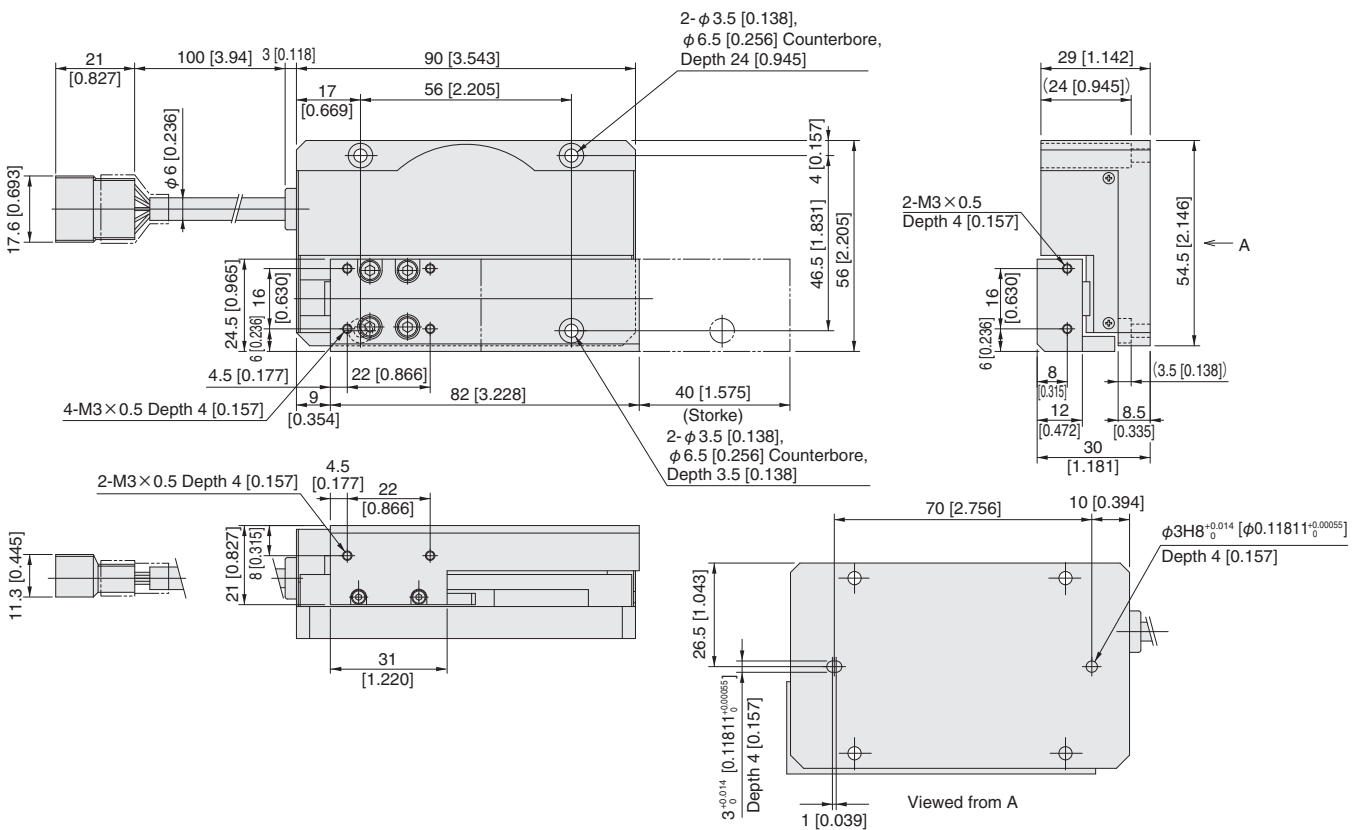
## EWM5HSA-40 EWM5SSA-40



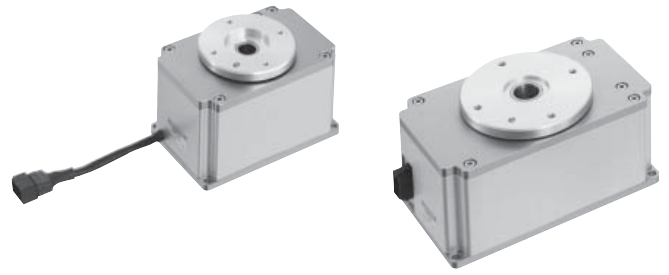
# EWM5HLA-20 EWM5SLA-20



# EWM5HLA-40 EWM5SLA-40



# Electric Rotary Actuators



## Specifications

### Basic specifications of main unit

| Item                                    | Model  | EWHRT1A                                       | EWHRT3A                                       | EWHRT5A                                       | EWHRT10A                                      | EWHRT20A                                      | EWHRT40A <sup>Note1</sup>                     | EWHRT60A <sup>Note1</sup>                     |
|---|--|---|---|---|---|---|---|---|
| Motor                                   |  | 2-phase stepping motor                        |   |   |   |   |   |   |
| Maximum torque                          | N·m [in·lbf]                                 | 0.1 [0.9]                                     | 0.25 [2.2]                                    | 0.5 [4.4]                                     | 1.0 [8.9]                                     | 2.0 [17.7]                                    | 4.0 [35.4]                                    | 6.0 [53.1]                                    |
| Repeatability <sup>Note2</sup>          |  | ±0.02°  |   |   |   |   |   |   |
| Angle detection                         |  | Optical encoder (origin point available)      |   |   |   |   |   |   |
| Maximum load inertia <sup>Note3</sup>   | kg·m <sup>2</sup> [lbf·ft·sec <sup>2</sup> ] | 3.0×10 <sup>-4</sup> [2.21×10 <sup>-4</sup> ] | 1.0×10 <sup>-3</sup> [0.74×10 <sup>-3</sup> ] | 3.0×10 <sup>-3</sup> [2.21×10 <sup>-3</sup> ] | 2.0×10 <sup>-3</sup> [1.48×10 <sup>-3</sup> ] | 2.0×10 <sup>-2</sup> [1.48×10 <sup>-2</sup> ] | 5.0×10 <sup>-2</sup> [3.69×10 <sup>-2</sup> ] | 1.0×10 <sup>-1</sup> [0.74×10 <sup>-1</sup> ] |
| Minimum operation time <sup>Note4</sup> | (90°, at no load)                            | s   | 0.2   | 0.1   | 0.2   | 0.12  | 0.2   | 0.3   |
|   | (90°, at maximum load)                       | s   | 0.35  | 0.25  | 0.4   | 0.25  | 0.5   | 0.65  |
| Minimum speed                           | rps  | 0.5   | 0.01  |   |   |   |   |   |
| Operating temperature range             | °C [°F]                                      | 0~40 [32~104]                                 |   |   |   |   |   |   |
| Allowable thrust load                   | N [lbf.]                                     | 100 [22.5]                                    |   |   | 200 [45.0]                                    |   | 400 [89.9]                                    |   |
| Allowable radial load                   | N [lbf.]                                     | 100 [22.5]                                    |   |   | 200 [45.0]                                    |   | 400 [89.9]                                    |   |
| Allowable moment                        | N·m [in·lbf]                                 | 2.5 [22.1]                                    |   |   | 5.5 [48.7]                                    |   | 10.0 [88.5]                                   |   |
| Mass <sup>Note5</sup>                   | kg [lb.]                                     | 0.3 [0.7]                                     | 0.34 [0.75]                                   | 0.4 [0.9]                                     | 0.8 [1.8]                                     | 0.9 [2.0]                                     | 2.0 [4.4]                                     | 2.3 [5.1]                                     |
| Applicable controller                   |  | EWHC-RS, EWHCP-RS                             |   |   | EWHC-RA, EWHCP-RA                             |   |   |   |

Notes: 1. EWHRT40A and EWHRT60A do not use cables protruding from the main unit (connector is built into the side of the main unit).

2. Repeatability at one direction swing.

3. The workpiece moment of inertia should always be at or below the maximum load inertia.

4. Values are for no load torque applied.

5. Figures in parentheses show the mass of the with-brake type.

For the controller specifications, see pp. 25-26.

## Order Codes

**EWHRT** [ ] **A** - [ ] - [ ] - [ ]

**ELEWAVE Electric Rotary Actuators**

**Size**

- 1 : Torque 0.1 N·m [0.9 in·lbf]
- 3 : Torque 0.25 N·m [2.2 in·lbf]
- 5 : Torque 0.5 N·m [4.4 in·lbf]
- 10 : Torque 1.0 N·m [8.9 in·lbf]
- 20 : Torque 2.0 N·m [17.7 in·lbf]
- 40 : Torque 4.0 N·m [35.4 in·lbf]
- 60 : Torque 6.0 N·m [53.1 in·lbf]

**Brake**

- Blank : No brake
- B : With brake <sup>Note</sup>

Note: There is no with-brake type for EWHRT1A.

**Cable length (Connecting cable)**

- Blank : No cable
- 3L : 3 m [118 in.]
- 5L : 5 m [197 in.]

**Controller type**

- Blank : No controller
- C : With EWHC-RA or EWHC-RS (Point Input Type Controller)
- CP : With EWHCP-RA or EWHCP-RS (Pulse Train Input Type Controller)

### Additional Parts

Point Input Type Controller

**EWHC - RA**



**EWHC - RS** (For EWHRT1A)



Pulse Train Input Type Controller

**EWHCP - RA**



**EWHCP - RS** (For EWHRT1A)



Cable (Connecting cable)

**EWHKA -** [ ]



**Cable length**  
3L : 3 m [118 in.]  
5L : 5 m [197 in.]

Teaching box <sup>Note</sup>

**EWHTB**

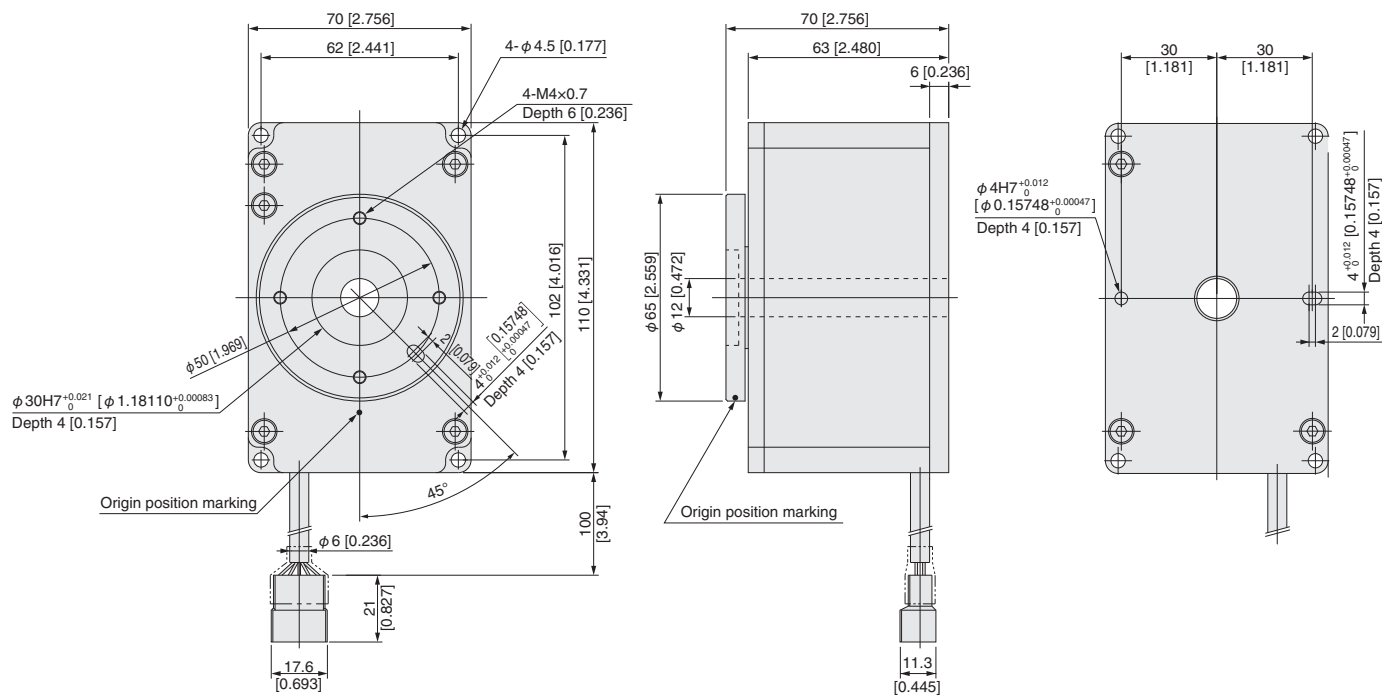


Note: For specifications and dimensions, see p. 29.



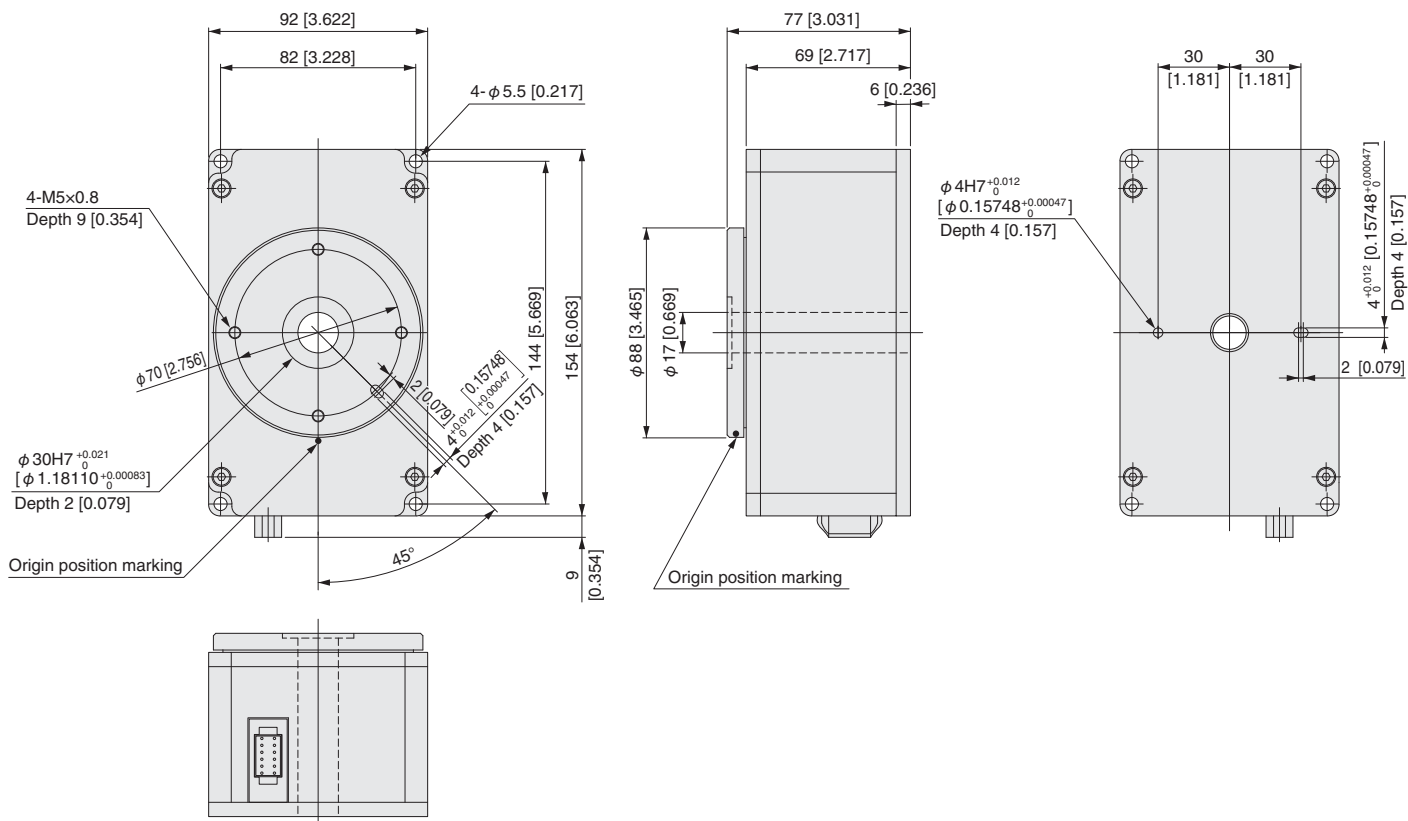


**EWHRT10A**  
**EWHRT20A**



Note: The table origin position is when the locating dowel pin oval hole is at the position shown in the above drawing.

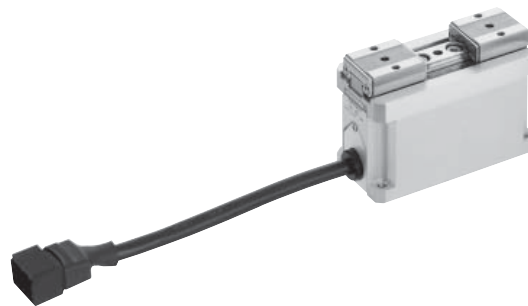
**EWHRT40A**



Note: The table origin position is when the locating dowel pin oval hole is at the position shown in the above drawing.



# Electric Hands



## Specifications

### ● Basic specifications of main unit

| Item                                      | Model           | EWHA12A                         | EWHA24A                          | EWHA36A                       |
|---|-----------------|---------------------------------|----------------------------------|-------------------------------|
| Motor                                     |                 | 2-phase stepping motor          |                                  |                               |
| Maximum speed <sup>Note1</sup>            | mm/s [in./sec.] | 70 [2.76] (Speed on one side)   | 35 [1.38] (Speed on one side)    | 24 [0.94] (Speed on one side) |
| Minimum speed                             | mm/s [in./sec.] | 1 [0.04] (Speed on one side)    |                                  |                               |
| Effective gripping force <sup>Note2</sup> | N [lbf.]        | 12~17 [2.7~3.8]                 | 22~35 [4.9~7.9]                  | 33~47 [7.4~10.6]              |
| Operating temperature range               | °C [°F]         | 0~40 [32~104]                   |                                  |                               |
| Open/closed stroke                        | mm [in.]        | 14 [0.551] (One side 7 [0.276]) | 20 [0.787] (One side 10 [0.394]) |                               |
| Repeatability                             | mm [in.]        | ±0.03 [±0.0012]                 |                                  | ±0.05 [±0.0020]               |
| Mass                                      | kg [lb.]        | 0.17 [0.37]                     |                                  | 0.26 [0.57]                   |
| Applicable controller                     |                 | EWHC-NH, EWHCP-NH               |                                  |                               |

Notes: 1. Maximum speed during gripping operation mode for **EWHA12A** is 35 mm/s [1.38 in./sec.], and for **EWHA24A** and **EWHA36A** is 10 mm/s [0.39 in./sec.].  
 2. For more information about gripping force, see the graphs on p. 4.

● For the controller specifications, see pp. 25-26.

## Order Codes

**EWHA**  **A** -  -

**ELEWAVE**  
Electric Hands

**Size**

12 : Gripping force 12 N [2.7 lbf.]  
 24 : Gripping force 24 N [5.4 lbf.]  
 36 : Gripping force 36 N [8.1 lbf.]

**Controller type**

**Blank** : No controller  
**C** : With **EWHC-NH**  
 (Point Input Type Controller)  
**CP** : With **EWHCP-NH**  
 (Pulse Train Input Type Controller)

**Cable length (Connecting cable)**

**Blank** : No cable  
**3L** : 3 m [118 in.]  
**5L** : 5 m [197 in.]

### ● Additional Parts

Point Input Type  
Controller

**EWHC - NH**



Pulse Train Input  
Type Controller

**EWHCP - NH**



Cable  
(Connecting cable)

**EWHKA -**



**Cable length**

**3L** : 3 m [118 in.]  
**5L** : 5 m [197 in.]

Teaching  
Box <sup>Note</sup>

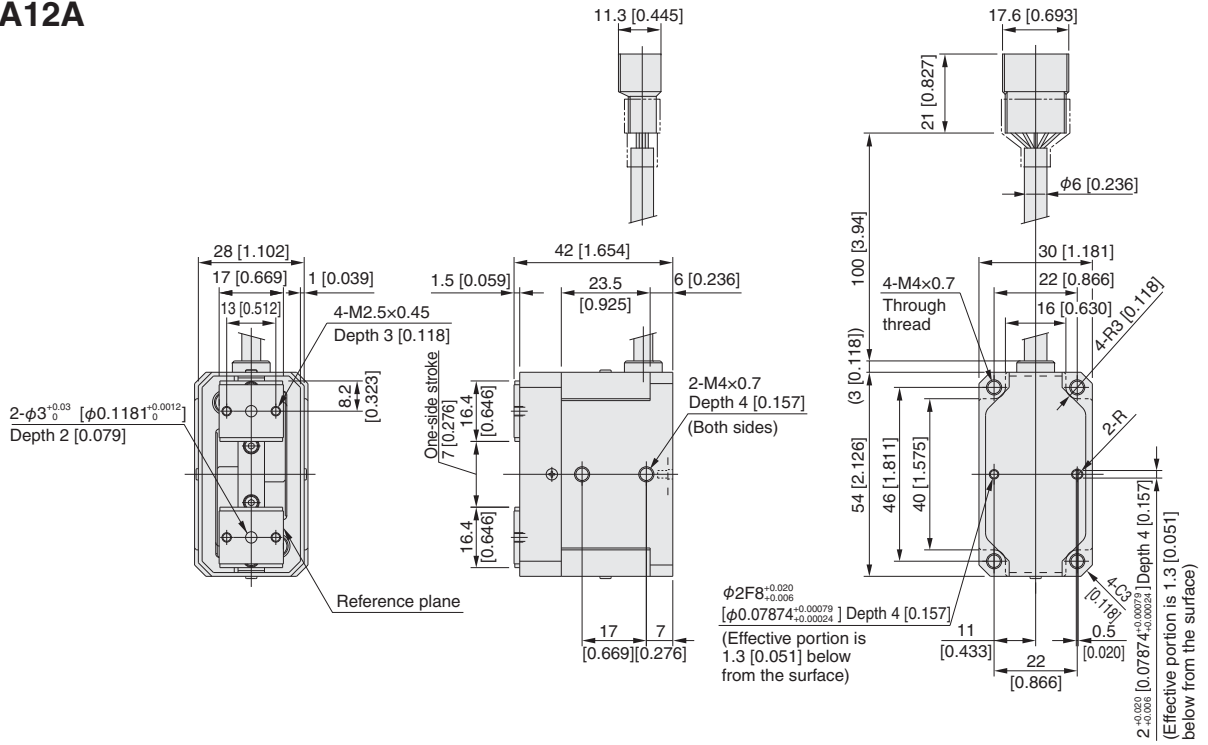
**EWHTB**



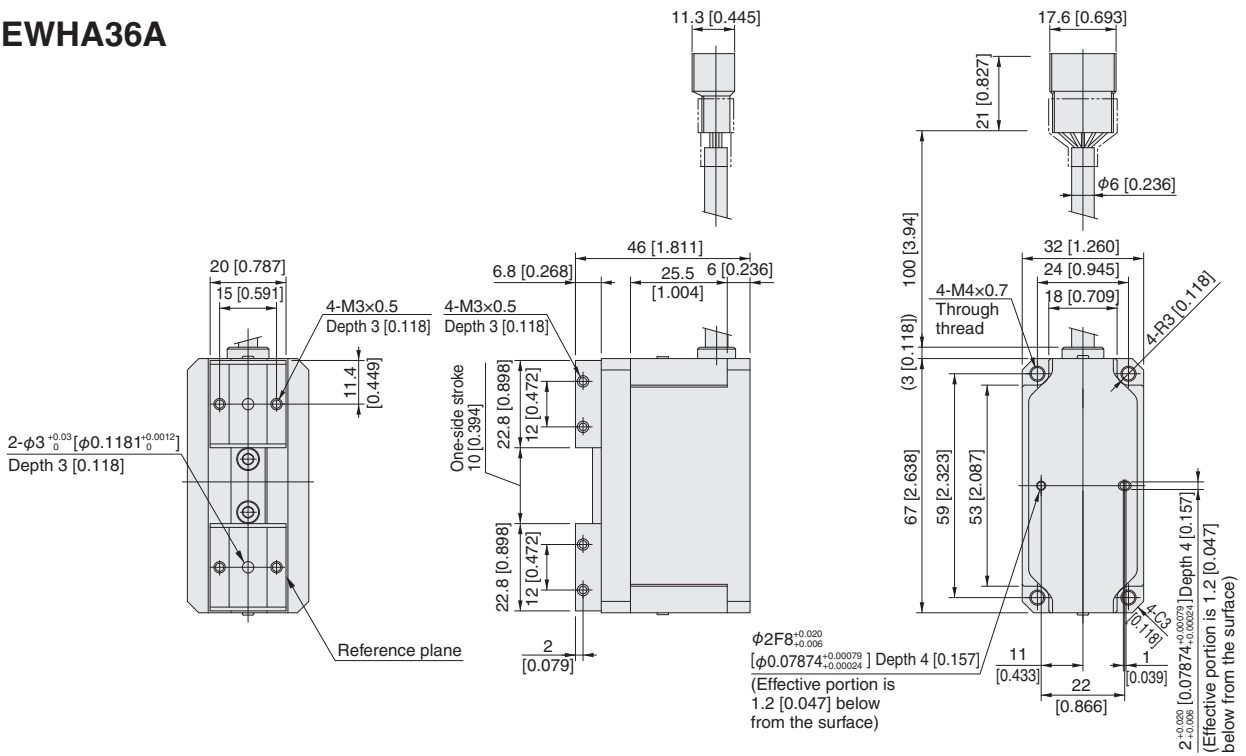
Note: For specifications and dimensions, see p. 29.



### EWHA12A



### EWHA24A EWHA36A



# Controller

## Point Input Type



## Specifications

| Item                   | Model                          | EWHC-NH  | EWHC-RA, EWHC-RS   |
|------------------------|--------------------------------|--|--|
| Axis control           | Motor drive method             | Microstep drive  |  |
|                        | Control method                 | Closed loop control  |  |
|                        | Operation method               | PTP, force control   | PTP  |
|                        | Origin detection method        | Detection at stroke end  | Encoder Z phase  |
|                        | Position detection method      | Encoder A, B phase output  |  |
|                        | Minimum setting distance/angle | 0.01 mm [0.0004 in.]   | 0.01°  |
|                        | Acceleration setting           | 1 ~ 100%   | 1 ~ 100% (Automatic setting based on load inertia)                               |
|                        | Point setting                  | 64 points  |  |
|                        | Point input method             | Numeric input, teaching input, direct teaching                       |  |
| External input/output  | Point setting input            | 6 inputs, optical coupling, 5 mA TYP/1 input                         |  |
|                        | Control input                  | 3 inputs (ORG, START, STOP), optical coupling, 5mA TYP/1 input       |  |
|                        | Control output                 | 4 outputs (READY, BUSY, HOLD, INPOS), 30 mA Max./1 output            | 3 outputs (READY, BUSY, INPOS), 30 mA Max./1 output                              |
|                        | Abnormality detection output   | Overload, disconnection, incorrect data, system abnormality          |  |
|                        | External communications        | RS232C 1ch (Communication with a personal computer and Teaching Box) |  |
|                        | Motor drive output             | Dedicated cable (with F.G.)  |  |
|                        | Encoder input                  | Dedicated cable (with shield)  |  |
| General specifications | Mass                           | 0.2 kg [0.44 lb.]  |  |
|                        | Power supply                   | 24VDC±10% 0.6 A Max. (Motor and I/O share the same power supply)     | 24VDC±10% 1.6 A Max. (Motor and I/O share the same power supply) <sup>Note</sup> |
|                        | Operating temperature          | 0 ~ 40°C [32 ~ 104°F]  |  |
|                        | Operating humidity             | 35 ~ 85% RH (no condensation allowed)                                |  |
|                        | Storage temperature            | -10 ~ 65°C [14 ~ 149°F]  |  |
|                        | Back-up                        | EEPROM used to maintain setting conditions                           |  |
|                        | Noise resistance               | IEC61000-4-4 level 2   |  |
|                        | Accessories                    | I/O cable, power cable   |  |

Note: Maximum consumption current value varies depending on the actuator. See the table below.

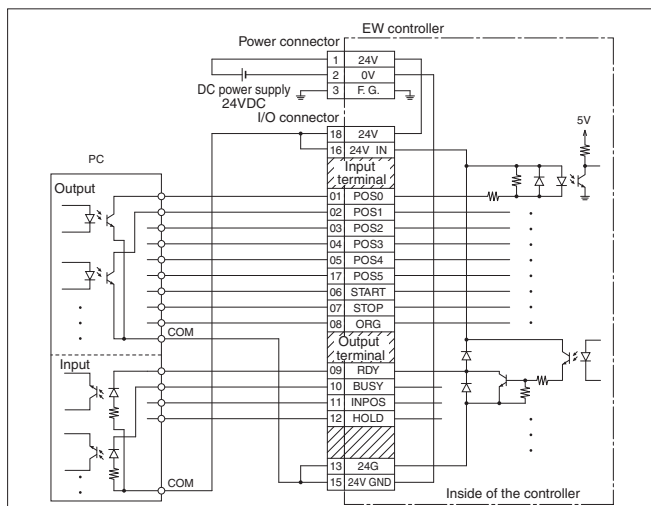
### Maximum consumption current

(A)

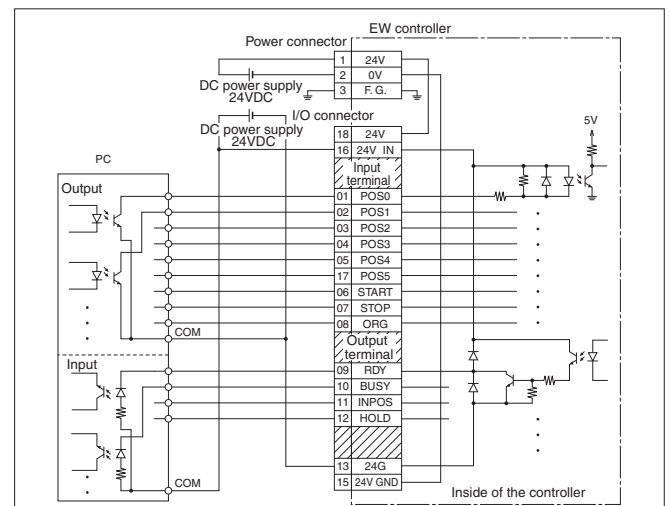
| Electric Rotary Actuator | EWHRT1A | EWHRT3A | EWHRT5A | EWHRT10A | EWHRT20A | EWHRT40A | EWHRT60A |
|--------------------------|---------|---------|---------|----------|----------|----------|----------|
| Standard                 | 0.6     |         | 1.0     |          |          | 1.3      |          |
| With-brake type          | —       |         | 1.0     |          |          | 1.6      |          |

## Controller Wiring

### 1. Wiring system when using the controller's internal power supply (Electric Hands and NS Sliders)



### 2. Wiring system when using another power supply in place of the controller's internal power supply (Electric Hands and NS Sliders)



※ For the Electric Rotary Actuator connection method, see the Owner's Manual.

# Controller

## Pulse Train Input Type



## Specifications

| Item                   | Model   | EWHCP-NH  | EWHCP-RA, EWHCP-RS  |
|------------------------|---|---|---|
| Axis control           | Motor drive method                              | Microstep drive   |   |
|                        | Control method                                  | Closed loop control   |   |
|                        | Operation method                                | Positioning and power control based on pulse train input  | Positioning control based on pulse train input  |
|                        | Origin detection method                         | Stroke end detection  | Encoder Z phase   |
|                        | Position detection method                       | Encoder A, B phase output   |   |
|                        | Pulse train input method                        | Differential line driver/Open collector   |   |
|                        | Maximum input pulse frequency <sup>Note 1</sup> | Max. 200 kpps (Differential line driver)/Max. 60 kpps (Open collector)  |   |
|                        | Pulse train input command format                | CW/CCW, Pulse/Code (Plus/minus logic possible)  |   |
| External input/output  | Control input                                   | 6 inputs (Alarm reset, Counter clear, Shift to pushing mode, Servo ON, Prohibit pulse input/Stop return to origin, Return to origin) 5 mA TYP/1 input | 6 inputs (Alarm reset, Counter clear, Brake release, Servo ON, Prohibit pulse input/Stop return to origin, Return to origin) 5 mA TYP/1 input |
|                        | Control output                                  | 4 outputs (Preparation complete, Enable acceptance of pulse input, Positioning complete/Pushing operation complete, Zone output) 30 mA Max./1 output  | 4 outputs (Preparation complete, Enable acceptance of pulse input, Positioning complete, Zone output) 30 mA Max./1 output                     |
|                        | Abnormality detection output                    | Overload, disconnection, incorrect data, system abnormality   |   |
|                        | External communications                         | RS232C 1ch (Communication with a personal computer and Teaching Box)  |   |
|                        | Motor drive output                              | Dedicated cable (with F.G.)   |   |
|                        | Encoder input                                   | Dedicated cable (with shield)   |   |
|                        | Pulse train input                               | Dedicated cable (Twisted-pair wire)   |   |
| General specifications | Mass  | 0.2 kg [0.44 lb.]   |   |
|                        | Power supply                                    | 24VDC±10% 0.6 A Max. (Motor and I/O share the same power supply)  | 24VDC±10% 1.6 A Max. (Motor and I/O share the same power supply) <sup>Note 2</sup>  |
|                        | Operating temperature                           | 0~40°C [32~104°F]   |   |
|                        | Operating humidity                              | 35~85% RH(no condensation allowed)  |   |
|                        | Storage temperature                             | -10~65°C [14~149°F]   |   |
|                        | Back-up   | EEPROM used to maintain setting conditions  |   |
|                        | Noise resistance                                | IEC61000-4-4 level 2  |   |
|                        | Accessories                                     | I/O cable, power cable, pulse train input cable <sup>Note 3</sup>   |   |

- Notes: 1. The actual maximum input pulse number is restricted by the maximum speed of each actuator.  
 2. Maximum consumption current value varies depending on the actuator. See the table below.  
 3. The length of the pulse train input cable is 1 m.

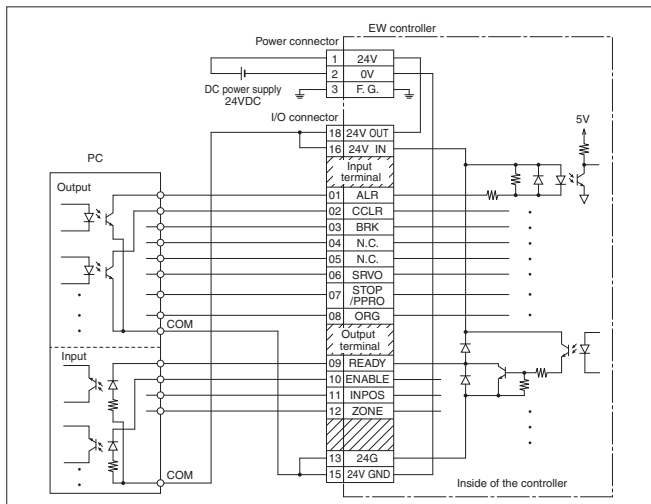
### Maximum consumption current

(A)

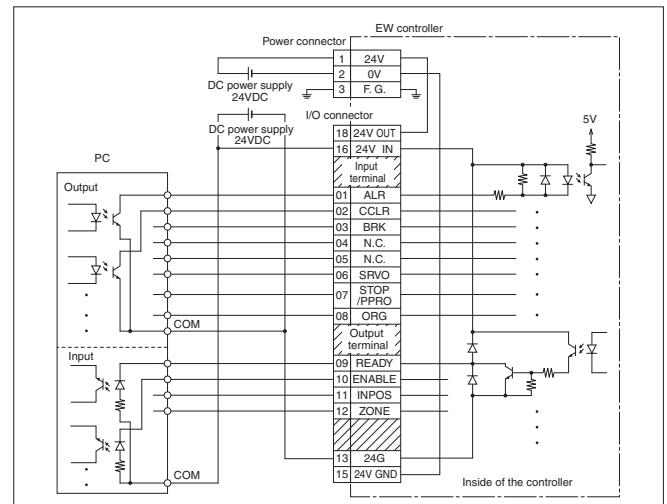
| Electric Rotary Actuator | EWHRT1A | EWHRT3A | EWHRT5A | EWHRT10A | EWHRT20A | EWHRT40A | EWHRT60A |
|--------------------------|---------|---------|---------|----------|----------|----------|----------|
| Standard                 | 0.6     |         |         | 1.0      |          |          | 1.3      |
| With-brake type          | —       |         |         | 1.0      |          |          | 1.6      |

## Controller Wiring

### 1. Wiring system when using the controller's internal power supply (Electric Rotary Actuators)



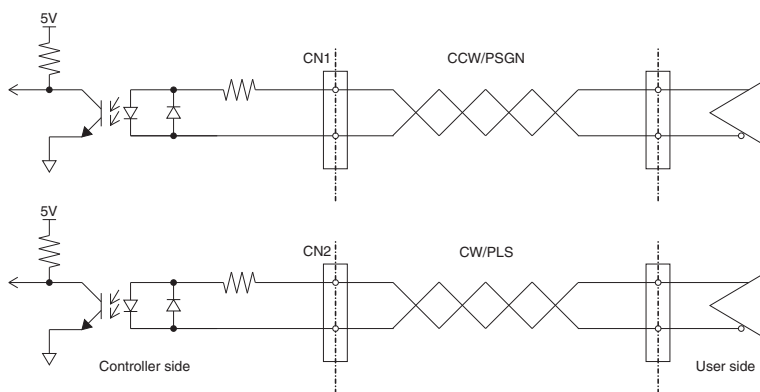
### 2. Wiring system when using another power supply in place of the controller's internal power supply (Electric Rotary Actuators)



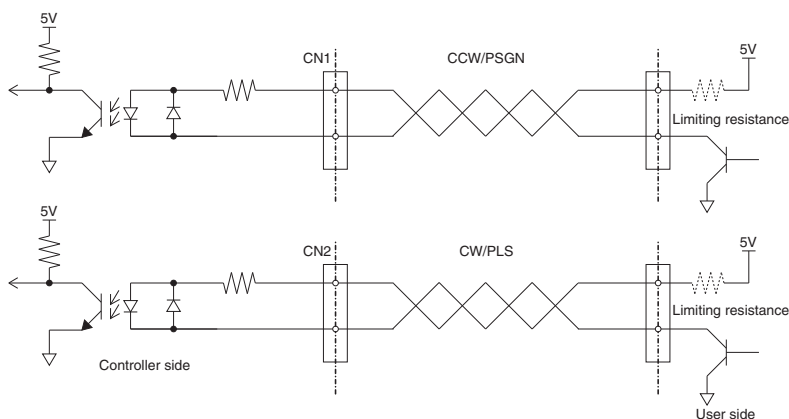
※ For the Electric Hand and NS Slider connection method, see the Owner's Manual.

## Controller Connection Method (Pulse Train Input Type)

### Differential Line Driver Input Circuit



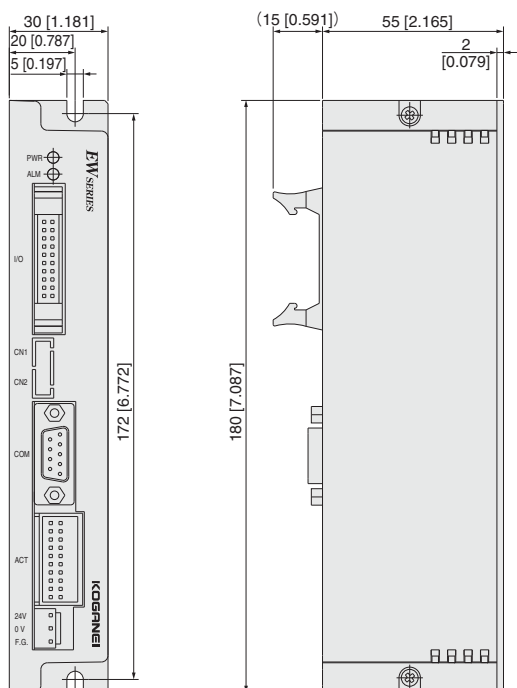
### Open Collector Input Circuit



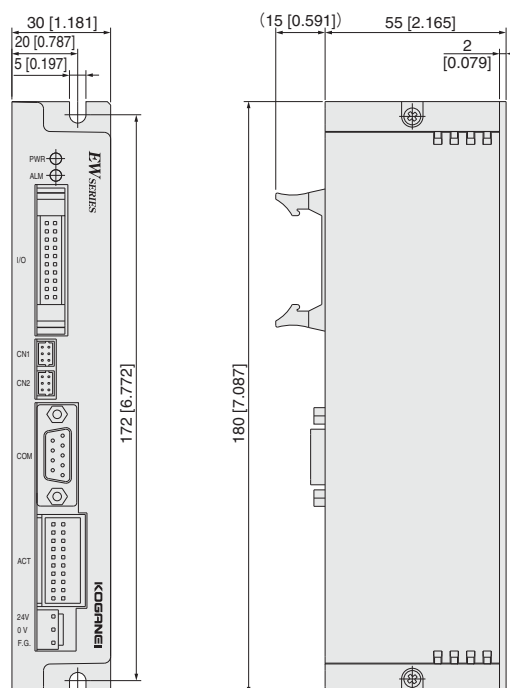
Caution: When supplying voltage of 5.5V or more, install current limiting resistance (of 10 mA or less).

## Controller Dimensions mm [in.]

### EWHC-NH EWHC-RA EWHC-RS (Point Input Type)



### EWHCP-NH EWHCP-RA EWHCP-RS (Pulse Train Input Type)

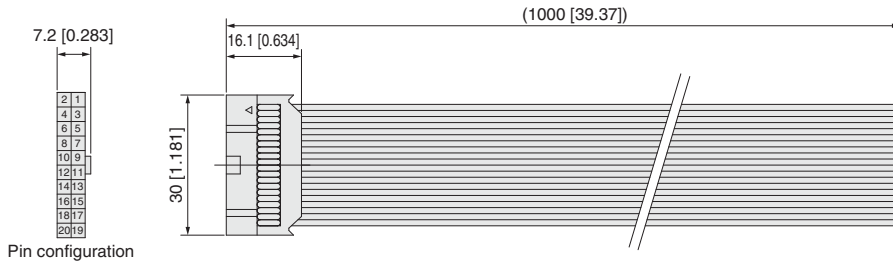




# Controller Dimensions mm [in.]

## Controller Accessories

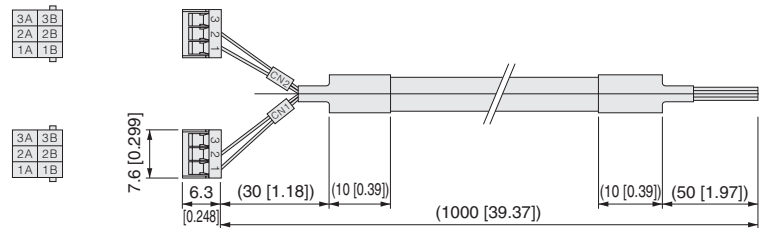
- I/O cable



- Power cable



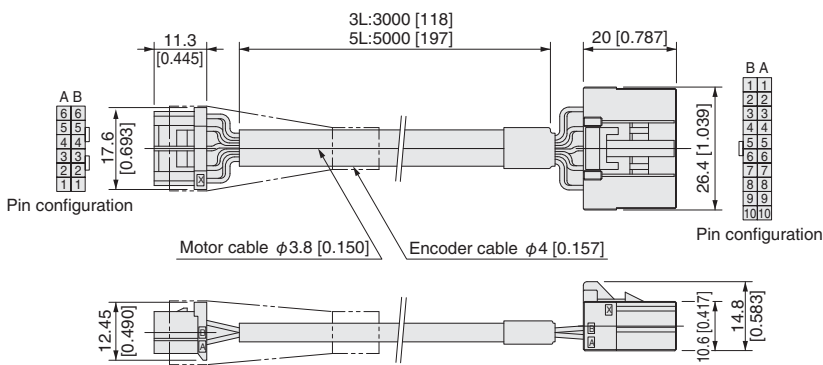
- Pulse train input cable (For Pulse Train Input Type Controller only)



## Cable (Additional Part)

- Connecting cable

**EWHKA-**



### Connector on main unit side

| No. | Name   | Color  |
|-----|--------|--------|
| A1  | F.G.   | Brown  |
| A2  | A+     | Red    |
| A3  | A-     | Yellow |
| A4  | B+     | Green  |
| A5  | B-     | White  |
| A6  | BRK    | Black  |
| B1  | Shield |        |
| B2  | GND    | Red    |
| B3  | 5V     | Yellow |
| B4  | EA     | Green  |
| B5  | EB     | White  |
| B6  | EC     | Black  |

### Connector on controller side

| No. | Name   | Color  |
|-----|--------|--------|
| A1  | A+     | Red    |
| B1  | B+     | Green  |
| A2  | A-     | Yellow |
| B2  | B-     | White  |
| A3  | F.G.   | Brown  |
| B3  | BRK    | Black  |
| A4  | COM1   | —      |
| B4  | COM2   | —      |
| A5  |        | —      |
| B5  |        | —      |
| A6  | F.G.   | —      |
| B6  | GND 5V | —      |
| A7  | DV+    | Yellow |
| B7  | DV-    | Red    |
| A8  | EA+    | —      |
| B8  | EA-    | Green  |
| A9  | EB+    | —      |
| B9  | EB-    | White  |
| A10 | EC+    | —      |
| B10 | EC-    | Black  |

Controller/Teaching Box

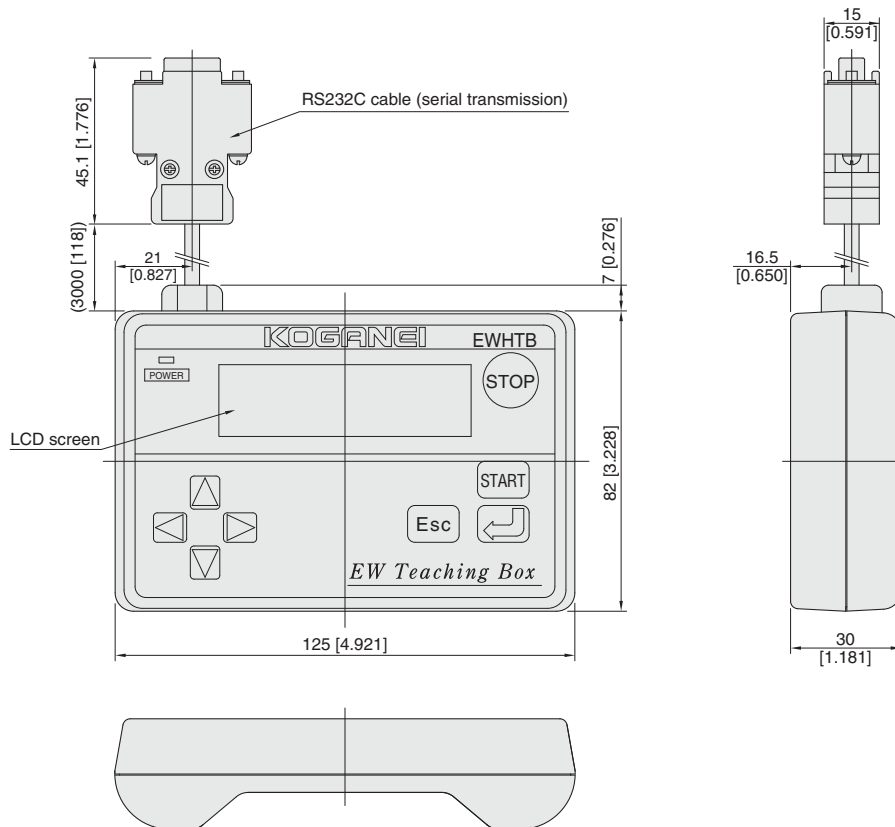
# Teaching Box



## Specifications

| Item                   | Model                 | EWHTB  |
|------------------------|-----------------------|--|
| Power supply           | Voltage               | 12VDC (supplied from the controller)                 |
|                        | Consumption current   | 50 mA Max.   |
| Indicator              | Display of setting    | LCD 16 characters × 2 lines                          |
|                        | Power indicator       | When power is supplied, LED lights up (internal 5V). |
| General specifications | Setting method        | Key operation: 8 buttons                             |
|                        | Communication method  | RS232C (serial transmission)                         |
|                        | Cable length          | 3 m [118 in.]  |
|                        | Mass                  | Body: 200 g [7.05 oz.]                               |
|                        | Operating temperature | 0~40°C [32~104°F]                                    |
|                        | Operating humidity    | 35 to 80% RH (no condensation allowed)               |
|                        | Storage temperature   | -10~65°C [14~149°F]                                  |

## Teaching Box Dimensions mm [in.]



# References

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# Appendix

## Frequently Asked Questions

| Item  | Question  | Response   |
|---|---|--|
| General for ELEWAVE Series  | Can the Support Software be used to run the program?                            | No. Higher level devices are required for control of the ELEWAVE Series. The Support Software is used for inputting data to the controller.  |
|   | How much force will cause the table to miss step?                               | Missed step is a possibility with a force of 60% or more of maximum torque (Actuators), maximum gripping force (Hands), or maximum thrust (NS Sliders).  |
|   | Is the connecting cable (robot cable) extendable?                               | Since extension can reduce the cable resistance to noise, in principle do not use it in an extended condition.   |
|   | Can a single controller be used to control multiple actuators?                  | One controller is used for control of one actuator.  |
|   | Is the unit compatible with clean specifications?                               | Special specification products using low-dust generation grease for the main units are available.  |
|   | Is the cable extending from the main unit a robot cable?                        | The cable extending from the main unit is not a robot cable. During use, always secure it in place. Attempting to use the device without securing the cable can result in disconnection.   |
|   | What is POS0-5 on the Support Software display?                                 | It displays the I/O input status during position movement. The ELEWAVE Series can be set to a total of 64 different points in binary combinations from POS0 to 5.  |
|   | What is origin shift?   | Shifts from the coordinate values of the return to origin completed point to the data input by the parameter. The post-shift position is reset as the 0 position. When setting origin shift, after the return to origin command is entered, the device always moves to the original origin and then implements origin shift. |
|   | Can the position be detected?   | Yes. While the communication command "@?POS" can be used to detect the position, there is a time lag. As a result, basically perform position detection when the unit is stopped.  |
|   | What is the noise tolerance level?  | IEC61000-4-4 Level 2.  |
|   | What does the control output signal INPOS mean?                                 | This signal means that movement of the actuator to the specified position has been completed.  |
|   | What does the control output signal HOLD mean?                                  | This signal means gripping a workpiece by the Electric Hands or pushing it by the NS Sliders has been completed.   |
|   | What is the purpose of the RS232C external communication connection?            | The RS232C functions as a communication connection with a PC or EWHTB that enables the sending or receiving of points and parameters, and of commands from a PC.   |
|   | Are there differences between older and newer versions of the Support Software? | The Support Software is subject to change at any time. You can download the latest Support Software version from the Koganei website.  |
| When the alarm sounds, is it possible to check what kind of an alarm it is? | You can communicate using the RS232C to check the alarm history.                |  |

| Item   | Question   | Response   |
|--|--|--|
| General for ELEWAVE Series                       | How much is the robot cable bending strength?  | It is 5 to 10 times more durable than ordinary cables. (Note that the cable extending from the main unit is not resistant to bending.)   |
|  | How much bending can the robot cable tolerate?   | The fixed bending radius is at least 4 times the cable diameter, while the bending radius for cable carrier is 32 mm [1.26 in.] or more.   |
|  | Can the main unit be installed in locations subject to vibration?  | Avoid installation of the main unit in locations subject to 4.9 m/s <sup>2</sup> [0.5G] vibration or more.   |
|  | What is the actuator number?   | This is the number required for inputting data corresponding to the actuator. If the actuator number is wrong, the actuator will not operate correctly. Be sure to input the correct number. |
| Pulse Train Input Controller                     | What pulse input methods are available?  | The open collector method and line driver method.  |
|  | What kind of pulse train input command formats are available?  | Formats include CW/CCW and pulse/coding methods.   |
|  | What are the pulse train input controller I/O functions?   | Functions include return to origin, brake control, positioning complete signal, zone output, counter clear, and shift to gripping mode.  |
|  | What happens if trying to input pulses in excess of the maximum pulse speed?   | The main unit could become missed step.  |
|  | What happens if trying to input pulses in excess of the maximum pulse rate?  | The main unit could become missed step.  |
|  | Can the pulse train input controller be used for point input operations?   | No, it cannot be used in that manner.  |
| Electric Hands                                   | What happens during positioning operations (A or I mode) if an obstacle is encountered before arriving at the specified point? | An overload alarm occurs, and operations are stopped.  |
|  | What are gripping modes (C and O)?   | The C and O modes are for gripping force control operation. You can set the gripping force level during data editing, to achieve a soft grip on the workpiece.                               |
|  | What happens if the power is cut off while a workpiece is being gripped?   | If the power is cut off, the thrust cannot be maintained.  |
|  | Can the gripping force level be set to intermediate levels?  | There are 10 setting levels available.   |
|  | If a gripped workpiece slips out of the fingers, can this be detected?   | Yes. Since the HOLD signal goes OFF, monitoring the HOLD signal enables detection.   |
|  | Can grip points of 50 mm [1.969 in.] or more be attained?  | Yes, so long as the gripping force is limited to the allowable moment or less.   |
| Can the unit be used while horizontally mounted? | Yes. However, be sure to use it at or below the allowable moment.  |  |
|  | What is the minimum setting distance?  | It is 0.01 mm [0.0004 in.].  |



## Frequently Asked Questions

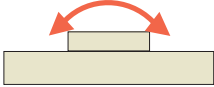
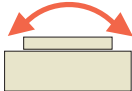
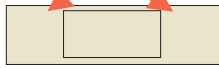
| Item                      | Question  | Response  |
|---------------------------|---|---|
| Electric Hands            | What is the operation time?   | When set at the maximum speed, the values are shown as below. For other setting speeds, see the tact calculation software listed on the Koganei website:<br>EWHA12A: 0.11 s (st7 [0.276 in.])<br>EWHA24A: 0.30 s (st10 [0.394 in.])<br>EWHA36A: 0.43 s (st10 [0.394 in.])<br>* In positioning mode at the maximum speed |
|                           | Does the operation time vary depending on the load?   | The load makes no difference to the operation time. You can use the point data speed settings to change the operation time.   |
|                           | Can the gripping force be controlled through numerical control rather than level settings?                                    | No, it cannot.  |
|                           | What is a determination output?   | A function for determining that a workpiece is of the specified size. When the workpiece is within the setting range, an INPOS signal is output.  |
|                           | What is the drive method?   | A rack & pinion structure.  |
|                           | What is the thrust during positioning mode?   | It is the same as level 10 in gripping mode. Note, however, that gripping cannot be performed while in positioning mode.  |
|                           | Is maintenance needed?  | While no particular maintenance is needed, use lithium-based grease for greasing.   |
|                           | What are the materials that are used for the main parts?  | Table: Aluminum alloy (anodized)<br>Main unit: Aluminum alloy (anodized)<br>Slider: Stainless steel   |
| NS Sliders                | Is a with-brake type available?   | No, it's not available due to its inner construction.   |
|                           | What is the minimum setting distance?   | 0.01 mm [0.0004 in.].   |
|                           | What is determination output?   | A function for determining that a workpiece is of the specified size. When the pushing position is within the setting range, an INPOS signal is output.   |
|                           | Can the pushing force be controlled through numerical control rather than level settings?                                     | No, it cannot.  |
|                           | What is the drive configuration?  | A rack & pinion structure.  |
|                           | What is the thrust during positioning operations?   | It is the same as level 10 in pushing operations. Note, however, that pushing cannot be performed while in positioning mode.  |
|                           | Is maintenance needed?  | While no particular maintenance is needed, use lithium-based grease for greasing.   |
|                           | What are the materials that are used for the main parts?  | Table: Aluminum alloy (anodized)<br>Main unit: Aluminum alloy (anodized)  |
| Electric Rotary Actuators | What is the minimum setting angle?  | 0.01 degree.  |
|                           | Since acceleration is set automatically based on the load inertia, does changing the inertia change the acceleration display? | The display changes in line with inertia. If you want to reduce the number from a 100% acceleration displayed value, you must change the numeric data.  |
|                           | What is the minimum operation time?   | It depends on the main unit size. For the minimum operation time, see the catalog specification table.  |

| Item   | Question  | Response  |
|--|---|---|
| Electric Rotary Actuators                                | Is continuous rotation possible?  | The initial setting is 1 rotation (360°).<br>The parameter can be changed to allow continuous rotation up to 90 rotations (Max. 32400°).  |
|  | What is the maximum inertia moment for loads attached to the table?   | See the maximum load inertia in the catalog specification table.  |
|  | Are there any restrictions to the main unit mounting direction?   | No. It can be mounted either on the top or bottom.  |
|  | What is the maximum load mass?  | Rather than mass, use inertia moment to calculate the load. Maintain the inertia moment so that it remains at or below the maximum load inertia.  |
|  | What is the drive method?   | Spur gears are used to drive.   |
|  | What kind of drive system is the spur gear?   | This is the most common kind of gear. However, this product uses a special configuration to prevent backlash.   |
|  | What is a brake option used for?  | It is used to prevent the unit from dropping when mounted on a wall. Since the no-brake configuration lets the rotation axis rotate freely when the power is OFF, the brake option is recommended when mounting on a wall.  |
|  | When stopped, to what extent can the external force (torque) be applied on the direction of table rotation?               | Within 60% of the maximum torque.   |
|  | Are there restrictions to operation frequency?  | Use at a duty of 50% or less.   |
|  | Can anything be passed through the $\phi 6$ [0.236 in.] shaft thru hole?  | The following air tubes and Koganei cylinder sensor switches can be passed:<br><ul style="list-style-type: none"> <li>• Three <math>\phi 1.8</math> [0.071 in.] tubes</li> <li>• One <math>\phi 1.8</math> [0.071 in.] tube and one <math>\phi 4</math> [0.157 in.] tube</li> <li>• One <math>\phi 1.8</math> [0.071 in.] tube and one sensor switch</li> <li>• Two sensors switches</li> </ul>   |
|  | Can anything be passed through the $\phi 12$ [0.472 in.] shaft thru hole?   | The following air tubes and Koganei cylinder sensor switches can be passed:<br><ul style="list-style-type: none"> <li>• Six <math>\phi 1.8</math> [0.071 in.] tubes</li> <li>• Three <math>\phi 1.8</math> [0.071 in.] tubes and two sensors switches</li> <li>• One <math>\phi 1.8</math> [0.071 in.] tube, two <math>\phi 4</math> [0.157 in.] tubes and two sensor switches</li> <li>• Three <math>\phi 4</math> [0.157 in.] tubes</li> <li>• Four sensors switches</li> </ul> |
|  | Is there any change in the load capacity when the table surface is installed downward?                                    | The load capacity is the same as when the table surface is mounted up.  |
|  | When the table is moved in the same direction in I mode, is the amount of table displacement included in the calculation? | Since the displacement is not part of the specified value, it is also not included in the calculation for movement in the same direction.   |
|  | Is maintenance needed?  | No particular maintenance is needed.  |
| What are the materials that are used for the main parts? | Table: Aluminum alloy (anodized)<br>Main unit body: Aluminum alloy (anodized)   |   |

## Troubleshooting

For when errors and alarms occur, see the Owner's Manual for each model.

## ELEWAVE Series - Related Terms List

|                              | Term  | Explanation  |
|------------------------------|---|--|
| A                            | Absolute  | Absolute position. Position (coordinate value) from a reference point.   |
|                              | Actuator No.  | A system enabling easy changes of controller settings to specifications of a main unit model to which it is connected. Numbers are allocated to the various main unit models, and inputting one of those numbers during the initial controller setting automatically changes the parameters in the controller to the required specification. |
|                              | Alarm message   | Message sent from the controller when some kind of problem occurs. When the dedicated output READY is OFF, the alarm goes ON. Symptoms include cable disconnections, data damage, etc.   |
|                              | Alarm reset input (ALR)   | Input during an alarm status (READY: OFF; ALARM LED: Lights up), to cancel the alarm.<br>* Available in pulse train input type only  |
|                              | Allowable moment  | When a workpiece has been placed at a position off-center from the center position of the slider table, force is applied on the table in the direction of rotation. This rotation force is called moment, and the direction of force is categorized as rolling (Mr), pitching (Mp), and yawing (My); each has their allowable values.        |
|                              | Allowable pitching (Mp) moment  | Allowable moment in the pitching direction.   |
|                              | Allowable rolling (Mr) moment   | Allowable moment in the rolling direction.    |
| Allowable yawing (My) moment | Allowable moment in the yawing direction.  |  |
| B                            | Brake release input (BRK)   | Input to cancel the actuator brake mechanism.<br>* Available in pulse train input type only  |
| C                            | Class 3 (D type) ground   | Ground for low-voltage devices of 300V or less, with a resistance value of 100 Ω or less, and a wiring diameter of 1.6 mm [0.63 in] or more. Ground categories are classified A to D.  |
|                              | Closed loop control   | Method for performing feedback on the status of a control target, and using the conditions so obtained to proceed with various control processes. For Electric Rotary Actuators, this involves feedback of the current position information from the encoder to the controller, to perform error correction.                                 |
|                              | Command executing output (BUSY)   | Output signal that goes ON during execution of a dedicated command, or of a command from a PC. When this signal is ON, controllers cannot receive other dedicated command inputs or commands from PCs.   |
|                              | Communication command   | Command text issued by an external device with a PC or other communication function, and connected to a controller for operations and actions. ELEWAVE Series command functions divide broadly into 4 categories: (1) Robot language; (2) Data handling; (3) Utilities; (4) Special codes.   |
|                              | Communication function  | Function allowing setting changes or operations to be performed from an external device. In general, a PC is used for the external device, and the connection is usually serial communication through an RS-232C.  |
|                              | Counter clear input (CCLR)  | Resets the counter (encoder count, energizing count, deviation count) in the controller.<br>* Available in pulse train input type only   |
|                              | D   | Dedicated command input  |
| Dedicated output             |   | Output implementing signal interaction with a programmable controller or other external device.  |
| Determination output         |   | Function outputting a measurement value to an external device when it is within the range of the set threshold value.  |
| Duty                         |   | In cyclic operations, the ratio in which operations are ongoing and continuing to occur in a certain period. In Electric actuators, it means the ratio of operations time per one cycle (rate of operation).   |

|   | Term                                | Explanation   |
|---|-------------------------------------|---|
| E | Electrically Erasable PROM (EEPROM) | A type of semiconductor memory, this is a ROM that allows device users to electrically write or delete information.   |
|   | Encoder Z phase                     | A signal generated in the rotary encoder one time only for each rotation, and used as the origin point within the rotary encoder's one rotation.<br>In addition to the Z phase, other encoder signals include the A phase and B phase that use phase differences to check encoder movement.   |
|   | Error message                       | Message sent from the controller when an error occurs during use. Symptoms include incorrect commands or failure to reach the origin point.   |
| G | Grip point                          | Distance from surface of the Electric Hand table to the grip center position of a workpiece.  |
|   | Gripping completed output (HOLD)    | Output signal that goes ON when gripping operations end normally. When a specific command is received, it first turns OFF, and then ON when the execution process is completed normally.  |
|   | Gripping force                      | A firm holding force, or securely holding force to grip a workpiece.  |
|   | Gripping mode shift input (PRESS)   | Input that shifts actuator to a gripping mode.<br>* Available in pulse train input type only  |
|   | Ground                              | Refers to the connection via an electrical conductor between a reference potential point and the reference potential wiring for a device frame, neutral point on an electric line, or electronic device, or to the reference potential point itself. While this name is used because the ground was originally used as the reference for this effect, its use is now also extended to situations in which the ground is not used. Also known as ground earth. |
| I | Increment                           | Relative position. Amount of movement from the current position or movement position.   |
| L | Length measurement function         | A function that uses the communication function to read the current position data in the encoder. In the ELEWAVE Series, the communication command "@?POS" is used to enable read-out of the current position.  |
|   | Linear guide                        | A part that uses rolling balls to perform linear motion, based on rolling contact by the ball between a rail and block.   |
|   | Load inertia                        | Inertia moment of a load. For Electric Rotary Actuators, the inertia moment of the workpiece must be kept at or below the maximum load inertia specification value.   |
|   | Lost motion                         | For a given position (a measurement position used as a reference), positioning is performed from the forward facing direction (motor rotation CW direction). After further progress in the forward facing direction, a command is issued with the same amount in the opposite facing direction (motor rotation CCW direction) to measure that position. The difference is called lost motion.   |
| M | Maximum tightening torque           | In tightening operations when securing the main unit or fixtures in place, the maximum torque that can be used to tighten screws or bolts.  |
|   | Microstep                           | Stepping motor control includes full-step, half-step, and microstep, enabling fine-tuned adjustment of the step angle (angle when moving for one pulse). The benefits are improved resolution, and suppression of vibration and noise.  |
|   | Missed step detection               | Missed step refers to failure of motor rotation in pulse motors such as stepping motors, even though a pulse has been sent. The causes are rotation at high speed, a large load, etc., and position deviation can arise after occurrence. A countermeasure is to use a rotary encoder to detect whether rotation in relation to pulse output is correct.  |
|   | Multipoint positioning operation    | A characteristic of electric drive products that can allow use of point data to stop movement at multiple positions. Enables complex operations beyond mere reciprocation between two points.   |
| N | Noise resistance                    | Standardization of resistance to obstructions, at locations affected by noise interfering with necessary signals. The ELEWAVE Series conforms to the international standard IEC61000-4-4 Level 2.   |
| O | Optical coupling                    | A type of element transmitting electrical signals, consisting of a light emitting element (light emitting diode) and a light receiving element (photo transistor), and enclosed in a package that shuts off light from the outside. The optical coupling converts the input electrical signals into light, and brings the light receiving element into conduction by the light to achieve signal transmission.  |
|   | Origin return incomplete            | A situation in which identification of origin position is lost immediately after power is supplied, or after emergency stop, etc. A condition in which return to origin is required.  |
|   | Origin shift                        | Refers to movement of coordinate data for the origin position to a desired position. Also called the virtual origin point. Shift means to "move position."  |
|   | Overhang                            | The center of gravity for a carried load is at the front or rear, left or right, or up or down from the center position on the actuator slider surface.   |

## ELEWAVE Series - Related Terms List

|                          | Term   | Explanation   |
|--------------------------|--|---|
| O                        | Overload   | State of load in excess of tolerable value being applied to a machine's movable portion. Excessive load.  |
| P                        | Parameter  | Value setting the operation conditions for electronic devices. In the ELEWAVE Series, parameters for easy setting of the controller or specifications are used in the software in place of the potentiometers, switches, and other hardware adjustment configurations.  |
|                          | Point data   | Coordinate data or movement data when performing positioning operations.  |
|                          | Point input method   | Method for inputting point data. The ELEWAVE Series includes the teaching box method, support software method, and communication function method.   |
|                          | Point setting input (POS0 to 5)  | Dedicated command input when connecting to a programmable controller (PLC) or other output circuit, and specifying a point No.  |
|                          | Positioning A mode   | Acceleration/deceleration mode that moves to a point specified on a coordinate system from the origin position as 0, and hold it. (Absolute operation)  |
|                          | Positioning completed output (INPOS)   | Signal output when positioning operation is ended normally. When a dedicated command is received, it first turns OFF, and then goes ON when the execution process is completed normally.  |
|                          | Positioning completed/ Pushing, gripping operation completed output (INPOS/HOLD) | Signal showing positioning completed when PRESS input is OFF. When PRESS input is ON, it is a signal showing a pushing or gripping operation is completed.<br>* Available in pulse train input type only  |
|                          | Positioning I mode   | Acceleration/deceleration mode that moves by the point specification data from its current position and holds the position. (Increment operation)   |
|                          | Preparation completed output (READY)   | Output signal checking whether the controller system is operating normally. In normal times, this is ON. During an alarm, it is switched OFF, and the motor enters a non-energized state. Recovery requires re-supply of power.   |
|                          | Pulse signal   | An electrical signal shaped like a rectangular wave.  |
|                          | Pulse train input  | Operation method for inputting pulse signals to the motor and performing predetermined movements (stroke, rotation angle). The pulse signal input can be used for adjustment of movement amount or acceleration/deceleration.   |
|                          | Pulse train input command mode   | Pulse waveforms output from a higher level device can be classified into 3 types (CW/CCW method, pulse/encoding method, A phase-B phase pulse input method). The ELEWAVE controller can handle the CW/CCW method and pulse/encoding method.   |
|                          | Pulse train input method   | Pulse output methods from higher level devices include the (differential) line driver method and open collector method. The (differential) line driver method outputs an output signal and its inverse polarity signal, and uses the difference as the signal. The open collector method outputs on a single line, and uses the potential difference between the signal line and GND (0V) as the signal. In recent years, the (differential) line driver method has come into more common use because of its superior noise resistance performance. |
|                          | Pulse train receivable output (ENABLE)   | Turned ON when controller is in a state to receive pulse train input.<br>* Available in pulse train input type only   |
|                          | Pushing, gripping C mode   | Operates at fixed speed and a set force toward the closed side, to push or grip.  |
| Pushing, gripping O mode | Operates at fixed speed and a set force toward the open side, to push or grip.   |   |
| R                        | Radial load  | Load applied in a radial direction in relation to the axis of rotation.   |
|                          | Repeatability  | Amount of variation when repeatedly moving from the same direction to one given point (a reference measurement point).  |
|                          | Return to origin   | In the increment device, shutting off the power supply results in loss of coordinate data information about the origin position for each actuator, so that reconfirmation of each origin position is required when the power is switched on. This operation is called "return to origin." There are two return to origin methods, the sensor method and contact method.   |
|                          | Return to origin signal (ORG)  | Dedicated input command for return to origin, determined by parameters.   |
|                          | Robot cable  | A cable used for movable parts of machine tools and industrial robots that is particularly resistant to bending. General name for cables demonstrating durability in cable fully reversed bending tests, cord fully reversed bending tests, and cable torsion tests.  |



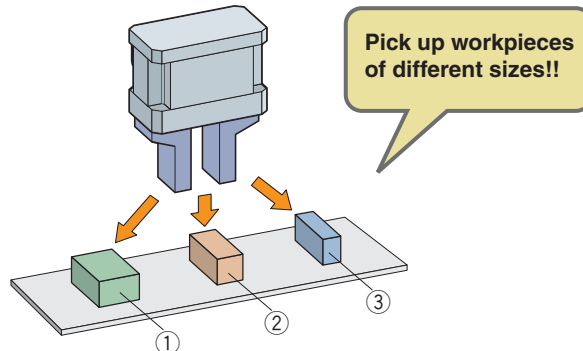
|   | Term   | Explanation   |
|---|--|---|
| R | Rotary encoder   | Encoding involves following certain set rules to convert data values into code suited to the objective, and the devices for performing this action are called encoders. The Electric Rotary Actuator's encoder is attached to the motor axis of rotation, and is used as a sensor for rotation angle (amount of movement) and rotation direction. |
|   | RS232C   | A serial communication standard established by the Electronic Industries Alliance (EIA), and the most common serial communication method in use. Maximum cable length is about 15 m [49.2 ft.] with a maximum communication speed of 115.2 kbps, with most connectors consisting of a D-sub 25 pin or D-sub 9 pin configuration.                  |
| S | Servo ON signal (SRVO)                                       | Uses this input to perform motor energization. When the servo is switched ON, the ENABLE signal goes ON and pulse train input can be used. At the same time, the energizing counter and encoder counter are cleared.<br>* Available in pulse train input type only  |
|   | Shockless start & stop                                       | The ELEWAVE Series uses acceleration/deceleration control, a superior aspect of electric drive products, to enable smooth acceleration and deceleration that suppresses moving speed shocks at the start and end points. This function enables smooth movement up to top speed.   |
|   | Size detecting function                                      | In pushing or gripping mode, a function that outputs position data to an external device if it is within a setting range when a pushing or gripping operation is completed.   |
|   | Soft limit   | Sets a limit in the software to prevent strokes from advancing beyond a certain amount.   |
|   | Start signal input (START)                                   | Dedicated command input that moves from the current position by the point number data specified in POS0 to 5.   |
|   | Stepping motor   | Motor using open loop control to perform angle positioning in proportion to the input pulse signal.   |
|   | Stop return to origin/ Input to stop pulse input (STOP/PPRO) | Input during return to origin that interrupts the return to origin. If this input is received in any other condition, the controller stops pulse train input.<br>* Available in pulse train input type only   |
|   | Stop signal input (STOP)                                     | Dedicated command input for temporarily stopping actuator movement.   |
| T | Thrust (gripping force) control                              | Controls the pushing force (thrust) in pushing operations. Pushing at a fixed thrust is one characteristic of electric drive products.  |
|   | Thrust load  | Load applied in the axial direction.  |
|   | Timing chart   | A diagram that shows changes over time in input or output signals.  |
|   | Torque   | When a body is rotated around a fixed axis of rotation center, the rotation force that is generated around the axis of rotation. Also called the torsional moment. Torque is expressed as a product of force and distance. Unit is N·m (newton-meter).  |
|   | Twisted pair lines   | A type of cable that twists pairs of electrical wires. Reduces the effects of noise as compared to simple parallel lines.   |
| U | U mode   | Performs acceleration and deceleration, and adds gripping operations.   |
| W | With-brake type  | A specified product holding the table in place when the power is OFF. The standard specification (no-brake type) leaves the table in a free state when the power is OFF. This is a selectable option in the EWHRT3A, 5A, 10A, 20A, 40A, and 60A Electric Rotary Actuators.  |
| Z | Zone output function   | A function of the ELEWAVE Series pulse train input type. The function stores 2-point position data in the controller, and switches ZONE output ON by the I/O when the actuator moves between the two points. Can set zone ranges for up to a maximum of four locations.   |

# Operation Method

## 1. Size Detection Function (Electric Hands) ※ For point input type controller only

Effective when used to determine good and defective workpieces. **Minimum setting range of 0.01 mm [0.0004 in.]**.

Example: Workpiece ② is good, and workpieces ① and ③ are defective.



○ **When ordinary gripping control is performed...**  
 Grips the workpiece with a fixed force.  
 Uses the gripping control to enable the grip on a workpiece.  
 Since the same signal is output regardless of which workpiece is gripped, however, it is impossible to determine whether the workpiece being gripped is a good or defective piece.

### Signal output status

| Dedicated output | ①   | ②   | ③   |
|------------------|-----|-----|-----|
| READY            | ON  | ON  | ON  |
| BUSY             | OFF | OFF | OFF |
| INPOS            | OFF | OFF | OFF |
| HOLD             | ON  | ON  | ON  |

※ Signal status are the same for all workpieces.

○ **When size detection function is used...**  
 The dimensions of a good workpiece are input to the controller in advance, so that the output signal when a good piece is gripped differs from the signal when a defective piece is gripped.

⇒ **Workpieces can be differentiated by monitoring the signals!**

### Signal output status

| Dedicated output | ①   | ②   | ③   |
|------------------|-----|-----|-----|
| READY            | ON  | ON  | ON  |
| BUSY             | OFF | OFF | OFF |
| INPOS            | OFF | ON  | OFF |
| HOLD             | ON  | ON  | ON  |

※ Pieces within the good range turn ON the INPOS signal. Signals are sent to an external device to enable determination of workpieces!!

※ **The size detection function can be controlled on the open side as well as the closed side.**

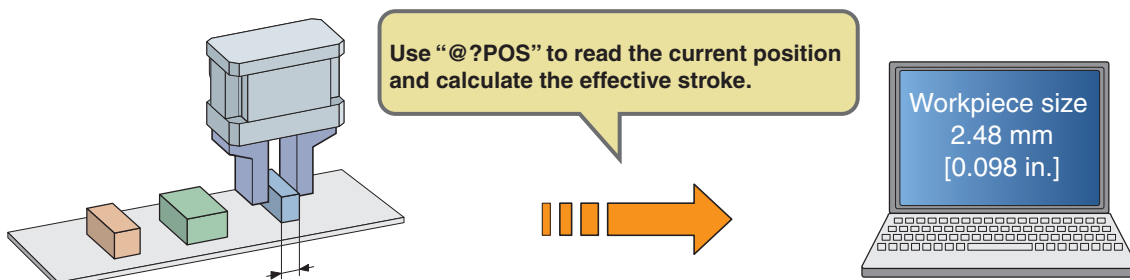
Remark: For the NS Sliders, the same checks can be made with pushing operations.

## 2. Work Size Measurement Function (Electric Hands)

You can use communication with a PC to perform detection of position where fingers are gripping a workpiece.  
 You can use the PC to calculate the difference between the value in the communication command and the effective stroke, to enable measurement of the size of the gripped workpiece.  
 Communication command used : "@?POS" (command for reading the current position)

Example: When conveyed workpieces of unknown sizes come down a production line, and you want to know the size of each workpiece

**Use the Electric Hands in gripping mode to complete a grip of the workpiece, and then use the RS232C communication device to read the gripping point.**



Note: Since dimension measurement precision is dependent on the precision of fingers mounted on the guide and on the workpiece grip point, caution is necessary.

※ **The workpiece size measurement function can be controlled on the open side as well as the closed side.**

Remark: For the NS Sliders, the same checks can be made with pushing operations.

### 3. Workpiece Grip Check Function (Electric Hands) ※ For point input type controller only

You can use this function to determine whether a workpiece has actually been gripped in the gripping operation. You can monitor the I/O output status to check whether gripping has been performed.



#### ○ Workpiece not found when gripping operation performed

##### Signal output status

| Dedicated output | During operation | Operation completed |
|------------------|------------------|---------------------|
| READY            | ON               | ON                  |
| BUSY             | ON               | OFF                 |
| INPOS            | OFF              | OFF                 |
| HOLD             | OFF              | OFF                 |

\* When the communication function is in use, an error (stop limit) is displayed.

Note: To determine whether a workpiece is present in cases when the slider does not move all the way to the stroke end due to fingers attached to the Electric Hands, you will need to adjust the soft limit by changing the parameter data.

Remark: For the NS Sliders, the same checks can be made with pushing operations.

#### ○ Workpiece gripped normally

##### Signal output status

| Dedicated output | During operation | Operation completed (Gripping completed) |
|------------------|------------------|--|
| READY            | ON               | ON                                       |
| BUSY             | ON               | OFF                                      |
| INPOS            | OFF              | OFF                                      |
| HOLD             | OFF              | ON                                       |

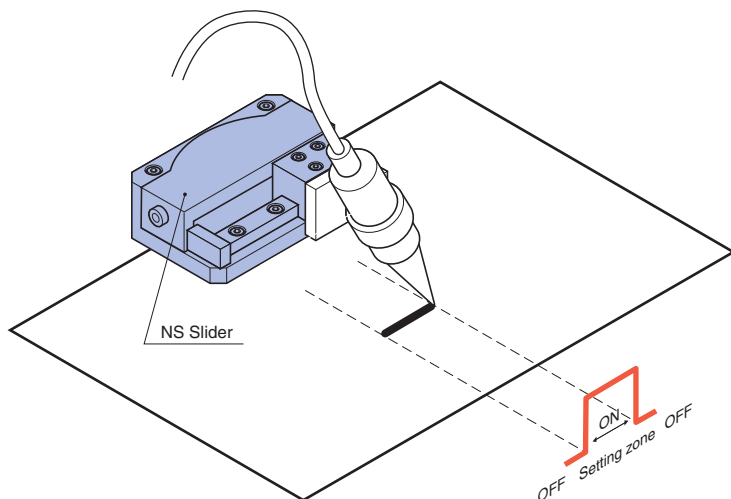


### 4. Zone Output Function (NS Sliders) ※ For pulse train type controller only

When the actuator is being moved, the output can be switched ON when the actuator exceeds a range set in advance in the controller.

Zone output is a function for freely setting a range between strokes, and outputting a signal when the slider moves through that range. You can use it for interlocks and timing with peripheral devices. The zone data consists of a total of 4 points.

Example: Simple dispensing during linear movement



Remark: The zone output function can also be used with the Electric Hands and Electric Rotary Actuators when using the pulse train input type controller.

# ELEWAVE Series Compatibility Table

## How to Read the Table

Example: When using the controller model "EWHC-NH (V2.00 and up) and EWHKA-□ L" in combination with the main unit model "EWM5 □□ A", the combinations marked with ○ in the compatibility table below are acceptable for use.

| Main unit model | Actuator No.   | Controller model (version) and cable model |                                     |                                      |                                       |
|-----------------|----------------|--|-------------------------------------|--------------------------------------|---------------------------------------|
|                 |                | EWHC-H (~V1.01)<br>and<br>EWHK-□ L         | EWHC-H (V1.02 ~)<br>and<br>EWHK-□ L | EWHC-NH (V2.00 ~)<br>and<br>EWHK-□ L | EWHC-NH (V2.00 ~)<br>and<br>EWHKA-□ L |
| EWM5 □□         | 30, 31, 32, 33 | ○*1  | ○*1                                 | ○                                    | ×                                     |
| EWM5 □□ A       |                | ○*1, 2                                     | ○*1, 2                              | ○*2                                  | ○                                     |

※ 1: Controller version upgrade required.

※ 2: Must be used in combination with conversion cable "EWTK" (for information about conversion cable "EWTK", consult us).

Corresponding column

### ● Code key

Combination column shows [○] ······Combination use is allowed.

Combination column shows [※] ······Combination use is allowed when parts are added or controller version is updated.

Combination column shows [×] ······Combination use not allowed. Consult us.

### ● Cautions

Compatibility table is as of January 15, 2008.

Products available as of January 15, 2008 are noted in orange.

## 1. Electric Rotary Actuators

### (1) Point Input Type Controller

| Main unit model       | Actuator No.   | Controller model (version) and cable model |                           |                             |                             | Main unit cable length | RoHS-compliant |
|-----------------------|----------------|--|---------------------------|-----------------------------|-----------------------------|------------------------|----------------|
|                       |                | EWC-R<br>and<br>EWK-□ L                    | EWHC-R<br>and<br>EWHK-□ L | EWHC-RA<br>and<br>EWHKA-□ L | EWHC-RS<br>and<br>EWHKA-□ L |                        |                |
| EWR3                  | 60             | ○  | ○                         | ×                           | ×                           | 250 mm [9.84 in]       | ×              |
| EWHRT3, 5, 10, 20     | 61, 62, 63, 64 | ×  | ○                         | ×                           | ×                           | 100 mm [3.94 in]       | ○*3            |
| EWHRT3A, 5A, 10A, 20A | 61, 62, 63, 64 | ×  | ○*2                       | ○                           | ×                           | 100 mm [3.94 in]       | ○              |
| EWHRT40A, 60A         | 65, 66         | ×  | ○*1, 2                    | ○                           | ×                           | 100 mm [3.94 in]       | ○              |
| EWHRT1A               | 50             | ×  | ×                         | ×                           | ○                           | 100 mm [3.94 in]       | ○              |

### (2) Pulse Train Input Type Controller

| Main unit model       | Actuator No.   | Controller model (version) and cable model |                              |                              | Main unit cable length | RoHS-compliant |
|-----------------------|----------------|--|------------------------------|------------------------------|------------------------|----------------|
|                       |                | EWHCP-R<br>and<br>EWHK-□ L                 | EWHCP-RA<br>and<br>EWHKA-□ L | EWHCP-RS<br>and<br>EWHKA-□ L |                        |                |
| EWR3                  | 60             | ×  | ×                            | ×                            | 250 mm [9.84 in]       | ×              |
| EWHRT3, 5, 10, 20     | 61, 62, 63, 64 | ○  | ×                            | ×                            | 100 mm [3.94 in]       | ○*3            |
| EWHRT3A, 5A, 10A, 20A | 61, 62, 63, 64 | ○*2  | ○                            | ×                            | 100 mm [3.94 in]       | ○              |
| EWHRT40A, 60A         | 65, 66         | ○*1, 2                                     | ○                            | ×                            | 100 mm [3.94 in]       | ○              |
| EWHRT1A               | 50             | ×  | ×                            | ○                            | 100 mm [3.94 in]       | ○              |

※ 1: Controller version upgrade required.

※ 2: Must be used in combination with conversion cable "EWTK" (for information about conversion cable "EWTK", consult us).

※ 3: Some products shipped are not RoHS-compliant.

## 2. Electric Hands

### (1) Point Input Type Controller

| Main unit model | Actuator No. | Controller model (version) and cable model |                                |                                |                                 |                                  | Main unit cable length                             | RoHS-compliant |
|-----------------|--------------|--|--------------------------------|--------------------------------|---------------------------------|----------------------------------|--|----------------|
|                 |              | EWC-H and EWK- □ L                         | EWHC-H (~ V1.01) and EWHK- □ L | EWHC-H (V1.02 ~) and EWHK- □ L | EWHC-NH (V2.00 ~) and EWHK- □ L | EWHC-NH (V2.00 ~) and EWHKA- □ L |  |                |
| EWH12           | 83           | ○  | ○                              | ○                              | ○                               | ×                                | 250 mm [9.84 in]                                   | ×              |
| EWHA12          | 83           | ○  | ○                              | ○                              | ○                               | ×                                | 250 mm [9.84 in] (100 mm [3.94 in] <sup>※3</sup> ) | ×              |
|                 | 84           | ○ <sup>※1</sup>                            | ○ <sup>※1</sup>                | ○                              | ○                               | ×                                | 100 mm [3.94 in]                                   | ○              |
| EWHA24          | 85           | ×  | ○ <sup>※1</sup>                | ○ <sup>※1</sup>                | ○                               | ×                                | 100 mm [3.94 in]                                   | ○              |
| EWHA36          | 86           | ×  | ○ <sup>※1</sup>                | ○ <sup>※1</sup>                | ○                               | ×                                | 100 mm [3.94 in]                                   | ○              |
| EWHA12A         | 84           | ×  | ○ <sup>※1, 2</sup>             | ○ <sup>※1, 2</sup>             | ○ <sup>※2</sup>                 | ○                                | 100 mm [3.94 in]                                   | ○              |
| EWHA24A         | 85           | ×  | ○ <sup>※1, 2</sup>             | ○ <sup>※1, 2</sup>             | ○ <sup>※2</sup>                 | ○                                | 100 mm [3.94 in]                                   | ○              |
| EWHA36A         | 86           | ×  | ○ <sup>※1, 2</sup>             | ○ <sup>※1, 2</sup>             | ○ <sup>※2</sup>                 | ○                                | 100 mm [3.94 in]                                   | ○              |

### (2) Pulse Train Input Type Controller

| Main unit model | Actuator No. | Controller model (version) and cable model |                                   | Main unit cable length                            | RoHS-compliant |
|-----------------|--------------|--|-----------------------------------|---|----------------|
|                 |              | EWHCP-NH (V1.00 ~) and EWHK- □ L           | EWHCP-NH (V1.00 ~) and EWHKA- □ L |   |                |
| EWH12           | 83           | ×  | ×                                 | 250 mm [9.84 in]                                  | ×              |
| EWHA12          | 83           | ×  | ×                                 | 250 mm [9.84 in] (100mm [3.94 in] <sup>※3</sup> ) | ×              |
|                 | 84           | ○  | ×                                 | 100 mm [3.94 in]                                  | ○              |
| EWHA24          | 85           | ○  | ×                                 | 100 mm [3.94 in]                                  | ○              |
| EWHA36          | 86           | ○  | ×                                 | 100 mm [3.94 in]                                  | ○              |
| EWHA12A         | 84           | ○ <sup>※2</sup>                            | ○                                 | 100 mm [3.94 in]                                  | ○              |
| EWHA24A         | 85           | ○ <sup>※2</sup>                            | ○                                 | 100 mm [3.94 in]                                  | ○              |
| EWHA36A         | 86           | ○ <sup>※2</sup>                            | ○                                 | 100 mm [3.94 in]                                  | ○              |

※ 1: Controller version upgrade required.

※ 2: Must be used in combination with conversion cable "EWTK" (for information about conversion cable "EWTK", consult us).

※ 3: For the products manufactured in June 2005 and later, the main unit cable length is 100 mm. [3.94 in]

## 3. NS Sliders

### (1) Point Input Type Controller

| Main unit model | Actuator No.   | Controller model (version) and cable model |                                |                                 |                                  | Main unit cable length | RoHS-compliant |
|-----------------|----------------|--|--------------------------------|---------------------------------|----------------------------------|------------------------|----------------|
|                 |                | EWHC-H (~ V1.01) and EWHK- □ L             | EWHC-H (V1.02 ~) and EWHK- □ L | EWHC-NH (V2.00 ~) and EWHK- □ L | EWHC-NH (V2.00 ~) and EWHKA- □ L |                        |                |
| EW5 □ □         | 30, 31, 32, 33 | ○ <sup>※1</sup>                            | ○ <sup>※1</sup>                | ○                               | ×                                | 100 mm [3.94 in]       | ○              |
| EW5 □ □ A       |                | ○ <sup>※1, 2</sup>                         | ○ <sup>※1, 2</sup>             | ○ <sup>※2</sup>                 | ○                                | 100 mm [3.94 in]       | ○              |

### (2) Pulse Train Input Type Controller

| Main unit model | Actuator No.   | Controller model (version) and cable model |                                   | Main unit cable length | RoHS-compliant |
|-----------------|----------------|--|-----------------------------------|------------------------|----------------|
|                 |                | EWHCP-NH (V1.00 ~) and EWHK- □ L           | EWHCP-NH (V1.00 ~) and EWHKA- □ L |                        |                |
| EW5 □ □         | 30, 31, 32, 33 | ○  | ×                                 | 100 mm [3.94 in]       | ○              |
| EW5 □ □ A       |                | ○ <sup>※2</sup>                            | ○                                 | 100 mm [3.94 in]       | ○              |

※ 1: Controller version upgrade required.

※ 2: Must be used in combination with conversion cable "EWTK" (for information about conversion cable "EWTK", consult us).

## 4. Teaching Box

| Main unit model | version  | Controller model |                 |                 |                 |                 |                 | RoHS-compliant |
|-----------------|----------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|
|                 |          | EWC-R            | EWHC-R          | EWHC-NH         | EWHC-R □        | EWHCP-R         | EWHCP-R □       |                |
|                 |          | EWC-H            | EWHC-H          |                 |                 | EWHCP-NH        |                 |                |
| EWTB            | Ver.1.00 | ○                | ○ <sup>※3</sup> | ○ <sup>※2</sup> | ×               | ×               | ×               | ×              |
|                 | Ver.2.00 | ○                | ○               | ○ <sup>※2</sup> | ×               | ×               | ×               | ×              |
| EWHB            | Ver.1.00 | ×                | ○               | ○ <sup>※2</sup> | ○ <sup>※1</sup> | ○ <sup>※1</sup> | ○ <sup>※1</sup> | ○              |
|                 | Ver.2.00 | ×                | ○               | ○               | ○ <sup>※1</sup> | ○ <sup>※1</sup> | ○ <sup>※1</sup> | ○              |
|                 | Ver.3.00 | ×                | ○               | ○               | ○ <sup>※1</sup> | ○               | ○ <sup>※1</sup> | ○              |
|                 | Ver.4.00 | ×                | ○               | ○               | ○               | ○               | ○               | ○              |

※ 1: Teaching Box version update required.

※ 2: If connecting actuator is EWHA12, settings are allowed.

※ 3: Can be used in other situations other than an additional controller function.



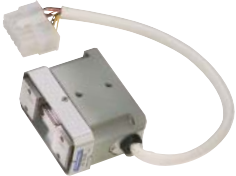



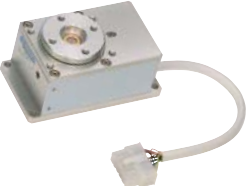

# Information

## Discontinued Models and Recommended Replacement Models





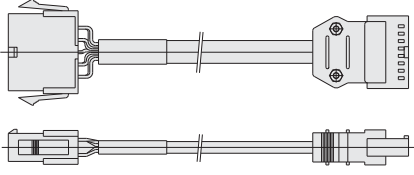
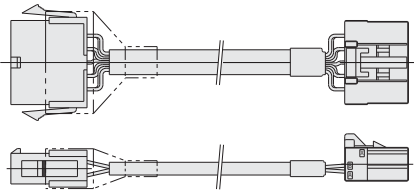
### Interchangeability

Due to a change in the connector on the main unit, the robot cable connector has been changed.

Due to a change in the controller specification, the connector on the controller side has been changed.

| No. | Product name              | Model        | Image  | Discontinued date     | Replacement model |
|-----|---------------------------|--------------|--|-----------------------|-------------------|
| 1   | DC Sliders                | EWLMT4 □ - □ |    | End of March 2006     | —                 |
| 2   | DC Slider Controller      | EWC-LM       |     | End of March 2006     | —                 |
| 3   | Electric Hands            | EWH12        |     | End of March 2006     | EWHA12A           |
| 4   |                           | EWHA □       |  | End of February 2008  | EWHA □ A          |
| 5   | Electric Hand Controller  | EWC-H        |   | End of March 2006     | EWHC-NH           |
| 6   |                           | EWHC-H       |  | End of September 2006 |                   |
| 7   | Electric Rotary Actuators | EWRT3        |   | End of March 2006     | EWHRT3A           |
| 8   |                           | EWHRT □      |   | End of February 2008  | EWHRT □ A         |



| No. | Product name                            | Model    | Image  | Discontinued date    | Replacement model |
|-----|---|----------|--|----------------------|-------------------|
| 9   | Controller for Electric Rotary Actuator | EWC-R    |     | End of March 2006    | EWHC-RA           |
| 10  |   | EWHC-R   |    | End of February 2008 |                   |
| 11  | NS Sliders                              | EWM5 □ □ |   | End of February 2008 | EWM5 □ □ A        |
| 12  | Teaching Box                            | EWTB     |   | End of March 2006    | EWHTB             |
| 13  | Cables (Connecting cables)              | EWK- □   |  | End of March 2006    | —                 |
| 14  |   | EWHK- □  |  | End of February 2008 | EWHKA- □          |





# Limited Warranty

KOGANEI CORP. warrants its products to be free from defects in material and workmanship subject to the following provisions.

**Warranty Period** The warranty period is 180 days from the date of delivery.

**Koganei Responsibility** If a defect in material or workmanship is found during the warranty period, KOGANEI CORP. will replace any part proved defective under normal use free of charge and will provide the service necessary to replace such a part.

**Limitations**

- This warranty is in lieu of all other warranties, expressed or implied, and is limited to the original cost of the product and shall not include any transportation fee, the cost of installation or any liability for direct, indirect or consequential damage or delay resulting from the defects.

- KOGANEI CORP. shall in no way be liable or responsible for injuries or damage to persons or property arising out of the use or operation of the manufacturer's product.

- This warranty shall be void if the engineered safety devices are removed, made inoperative or not periodically checked for proper functioning.

- Any operation beyond the rated capacity, any improper use or application, or any improper installation of the product, or any substitution upon it with parts not furnished or approved by KOGANEI CORP., shall void this warranty.

- This warranty covers only such items supplied by KOGANEI CORP. The products of other manufacturers are covered only by such warranties made by those original manufacturers, even though such items may have been included as the components.

The specifications are subject to change without notice.

ISO9001  
ISO14001



- ISO 9001 certified offices are Main Office, Tokyo Plant, Komagane Plant and Sales Offices.

- ISO 14001 certified offices are Main Office, Tokyo Plant and Komagane Plant.

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