

Electric Actuator

(compatible with stepper motors)

ECS Series

Food manufacturing processes

ECS FP Series

Compatible with Secondary Battery

ECS P4 Series

INSTRUCTION MANUAL

SM-A48287-A



- Be sure to read this instruction manual before using the product.
- Pay extra attention to the instructions concerning safety.
- After reading this instruction manual, keep it in a safe and convenient place.

Introduction

Thank you for purchasing our **“ECS Series,” “ECS FP Series” or “ECS P4 Series” Electric Actuator**. This Instruction Manual describes basic instructions particularly on mounting and operation methods so that the product can perform at its full potential. Please read it carefully and use the product properly.

Please keep this instruction manual in a safe place where it will not get lost.

Specifications and appearance described in this manual may be changed without prior notice.

- This product is intended for people who have basic knowledge of materials, wiring, electricity, mechanism, etc. CKD is not responsible for accidents caused by the selection and use of the product by persons without knowledge or sufficient training.
- Since our customers use this product for a very wide range of applications, CKD cannot keep track of all of them. Depending on the application and usage, the product may not be able to perform at its full potential due to fluid, wiring or other conditions, or it may lead to an accident. It is the customer's responsibility to check the specifications of the product and decide how to use it according to the intended application and usage.

For Safe Operation

When designing and manufacturing equipment using this product, it is obligatory to manufacture safe equipment. To do so, make sure that the mechanism of the equipment and the system that controls it electrically are safe.




In order to use CKD products safely, it is important to appropriately select, use, handle and maintain products.

To secure product safety, be sure to observe the warnings and precautions described in this Instruction Manual.

This product incorporates many functions and mechanisms to ensure safety. However, mishandling of the product by a customer may lead to accidents. In order to avoid such accidents,

Be sure to read this Instruction Manual carefully and understand its contents before use.

Precautions are divided into 3 categories: "DANGER," "WARNING" and "CAUTION," in order to indicate the level of potential hazard.

| | |
|--|---|
|  DANGER | If mishandled, dangerous situations leading to fatal or serious injuries may occur and there is a high degree of emergency. |
|  WARNING | If mishandled, dangerous situations leading to fatal or serious injuries may occur. |
|  CAUTION | If mishandled, dangerous situations leading to injuries or damage to property may occur. |

Note that even some precautions described as "CAUTION" may lead to serious results depending on a situation.

Any of these precautions contain important information, so be sure to follow them.

In addition, general notes and usage tips are indicated with the following icon.



General notes and usage tips are described.

Precautions related to the product

DANGER

Do not use this product for the following purposes.

- Medical equipment related to sustainment and control of human life or body
- Mechanical devices and mechanisms designed for the purpose of moving or transporting people
- Critical security parts in mechanical devices

WARNING

Use the product within product specifications.

Precautions related to disposal

CAUTION

When disposing of this product, follow the Law on Waste Disposal and Cleaning, and have it disposed of by a specialized waste disposer.

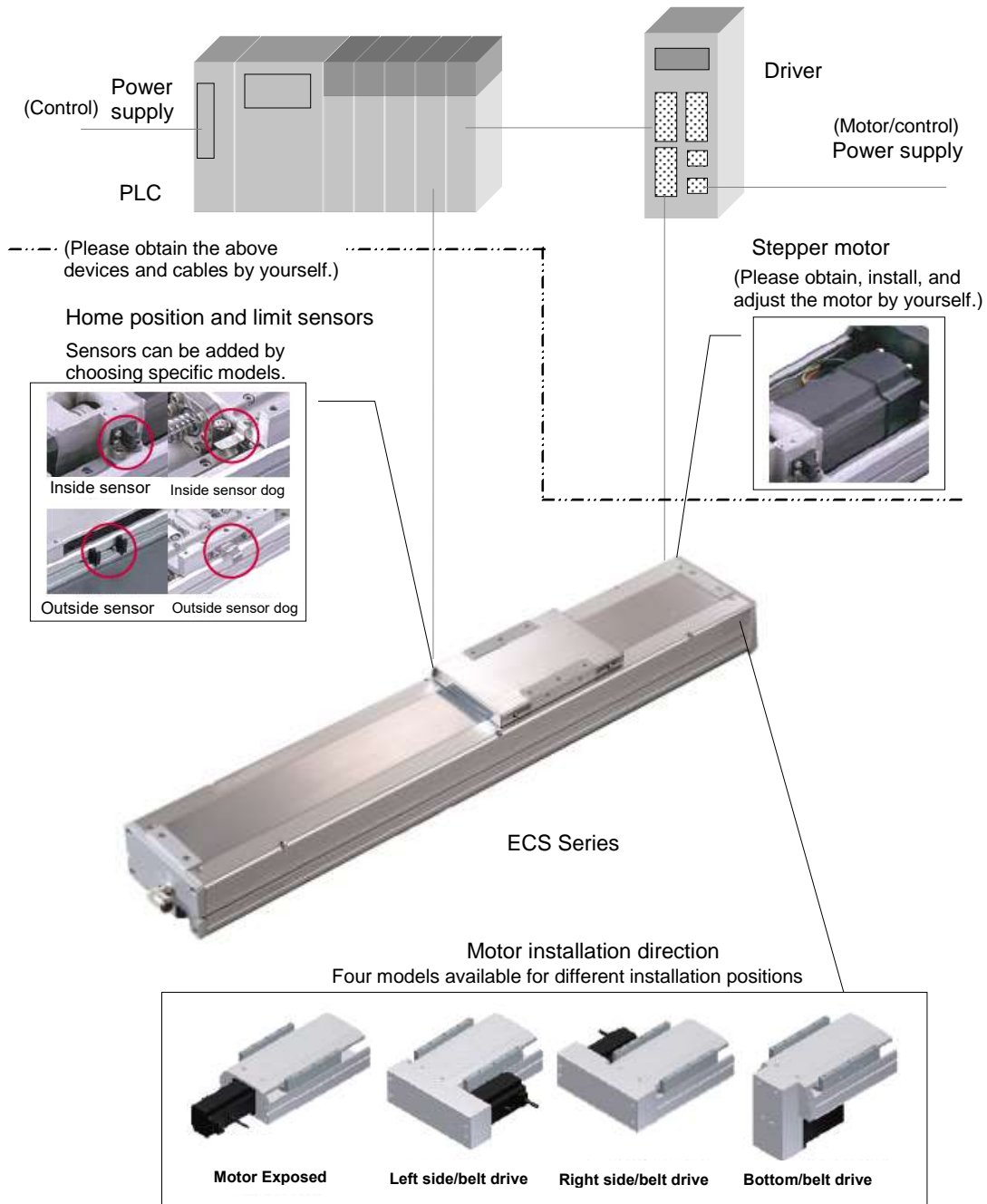
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1. Product Overview

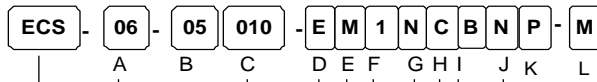
1.1 System Overview

1.1.1 System Configuration



1.2 Model number

1.2.1 ECS Series (compatible with stepper motors)



Model No.

| Symbol | Description |
|-----------|--|
| A: | Body size (mm) |
| 05 | Width 51 x height 54 |
| 06 | Width 65 x height 56 |
| 10 | Width 102 x height 78.5 |
| 12 | Width 102 x height 82.5 |
| 14 | Width 135 x height 91 |
| B: | Thread lead (See Table 1 in the next section) |
| 02 | 2 mm |
| 05 | 5 mm |
| 10 | 10 mm |
| 16 | 16 mm |
| 20 | 20 mm |
| C: | Stroke length (See Table 1 in the next section) |
| 005 | 50 mm to 1050 mm |
| - 105 | (50-mm pitch) Indication is 1/10 |
| D: | Motor installation direction (See Table 2 in the next section) |
| E | Motor Exposed |
| D | Bottom/belt drive |
| L | Left side/belt drive |
| R | Right side/belt drive |
| E: | Specifications of the installed motor (See Table 3 in the next section) |
| A | For details on specifications of the installed motor, see the table below |
| B | |
| C | |
| F: | Motor size (See Table 2 in the next section) |
| A | □42 |
| B | □56 |
| C | □60 |
| G: | Brake |
| N | Without |
| H: | Home position sensor (1 pc. see Table 4 in the next section) |
| N | Without |
| A | Inside: Motor side |
| B | Inside: Opposite side to motor |
| C | Outside: Motor side (Installed at shipment) |
| D | Outside: Opposite side to motor (Installed at shipment) |
| I: | Limit sensor (2 pcs, see Table 4 in the next section) |
| N | Without |
| A | Inside (Installed at shipment) |
| B | Outside (Installed at shipment) |
| J: | Grease nipple (See Table 5 in the next section) |
| N | None (body mounting direction: standard) |
| D | None (body mounting direction: bottomsides) |
| R | Right direction |
| L | Left direction |
| K: | Positioning pin hole (See Table 6 in the next section) |
| N | None |
| P | Yes |
| L: | Magnet slider type |
| | Standard |
| M | Adopted |

<Example of model number>

ECS-06-05010-EAANCBNP-M

- A) Body size: Width 65 x height 56 mm
- B) Thread lead: 5 mm
- C) Stroke length: 100 mm
- D) Motor installation direction:
Motor Exposed
- E) Specifications of the installed motor: A
- F) Motor size: □42
- G) Brake: Without
- H) Home position sensor: Outer motor side
- I) Limit sensor: Outside
- J) Grease nipple: None (body mounting direction: standard)
- K) Positioning pin hole: YES
- L) Magnet slider type: Adopted

E) Specifications of the installed motor

| Specifications of the installed motor | | A | B | C |
|---------------------------------------|--------------------------|-------|-------|-------|
| Symbol | Manufacturer | <□42> | <□56> | <□60> |
| A | ORIENTAL MOTOR Co., Ltd. | ○ | — | ○ |
| B | MinebeaMitsumi Inc. | ○ | ○ | — |
| | Dyadic Systems Co.,Ltd. | ○ | — | — |
| C | | — | ○ | — |

[FP series]



Food manufacturing processes

[P4 series]



Compatible with Secondary Battery

| Symbol | Description |
|--------|---------------------|
| M: | Anti-rust treatment |
| N | None |
| U | Yes |

Table 1: (B) Thread lead and (C) stroke length

| Model | (B) Thread lead (mm) | | | | | (C) Stroke length (mm) | |
|----------|----------------------|---|----|----|----|------------------------|--|
| | 2 | 5 | 10 | 16 | 20 | (50 mm pitch) | |
| ECS - 05 | ○ | ○ | ○ | - | - | 50-800 | |
| ECS - 06 | ○ | ○ | ○ | - | - | 50-800 | |
| ECS - 10 | - | ○ | ○ | ○ | ○ | 50-1050 | |
| ECS - 12 | - | ○ | ○ | ○ | ○ | 50-1050 | |
| ECS - 14 | - | ○ | ○ | ○ | ○ | 50-1050 | |

Table 2: (D) Motor installation direction and (F) Motor size

| Model | (D) Motor installation direction | | | | (F) Motor size | | |
|----------|----------------------------------|---------------------|-------------------------|------------------------|----------------|---------|---------|
| | Motor Exposed | Bottom / Belt drive | Right side / Belt drive | Left side / Belt drive | A <□42> | B <□56> | C <□60> |
| ECS - 05 | ○ | ○ | ○ | ○ | ○ | - | - |
| ECS - 06 | ○ | ○ | ○ | ○ | ○ | - | - |
| ECS - 10 | ○ | ○ | ○ | ○ | - | ○ | ○ |
| ECS - 12 | ○ | ○ | ○ | ○ | - | ○ | ○ |
| ECS - 14 | ○ | ○ | ○ | ○ | - | ○ | ○ |

Table 3: (E) Motor manufacturer and recommended motor model No./motor size

| (E) Specifications of the installed motor | | Motor (without brake) | Motor (with brake) | Motor size |
|---|-------------------------|-----------------------|--------------------|------------|
| Symbol | Manufacturer | | | |
| A | ORIENTAL MOTOR Co.,Ltd. | AZM46A□□,ARM46A□□ | AZM46M□□,ARM46M□□ | A <□42> |
| | | AZM66A□□,ARM66A□□ | AZM66M□□,ARM66M□□ | C <□60> |
| | | AZM69A□□,ARM69A□□ | AZM69M□□,ARM69M□□ | C <□60> |
| B | MinebeaMitsumi Inc. | A17PM□□□□CSTBCN | - | A <□42> |
| | | A23KM□□□□CSTBCN | - | B <□56> |
| C | Dyadic Systems Co.,Ltd. | RMJ0411 | - | A <□42> |
| | | RMJ0611,RMJ1211 | - | B <□56> |

*1 For other motor manufacturers and models, contact us.

Table 4: (H) Home position sensor and (I) limit sensor

| Model | (H) Home position sensor (1 pc) | | | | | (I) Limit sensor (2 pcs) | | |
|----------|---------------------------------|------------|------------------------|------------|------------------------|--------------------------|--------|---------|
| | Without *1 | Inside | | Outside | | Without *1 | Inside | Outside |
| | | Motor side | Opposite side to motor | Motor side | Opposite side to motor | | | |
| ECS - 05 | ○ | - | - | ○ | ○ | ○ | - | ○ |
| ECS - 06 | ○ | - | - | ○ | ○ | ○ | - | ○ |
| ECS - 10 | ○ | ○ | ○ *2 | ○ | ○ | ○ | ○ *2 | ○ |
| ECS - 12 | ○ | ○ *3 | ○ | ○ | ○ | ○ | ○ *3 | ○ |
| ECS - 14 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

*1: The home position sensor and limit sensors are used together. If either is "without," select "without" for the other. Example: A combination of the home position sensor "without" and the limit sensor "with (inside/outside)" is not available.

*2: For ECS-10, a combination of the home position sensor "B (inside/opposite side to motor)" and the limit sensor "A (inside)" is not available.

*3: For ECS-12, when the motor installation direction is "R (right side installation)" or "L (left side installation)," a combination of the home position sensor "A (inside/motor side)" and the limit sensor "A (inside)" is not available.

*4: In the case of sensor inside installation, the positions of the sensor dog and sensor cannot be changed at the customer. In the case of sensor outside installation, the positions of the sensor dog and sensor can be changed at the customer.

Table 5: (J) Grease nipple

| Model | (J) Grease nipple | | | | |
|----------------|--|---------------------|-------------------------|------------------------|----|
| | Motor Exposed | Bottom / Belt drive | Right side / Belt drive | Left side / Belt drive | |
| ECS - 05 to 06 | For N only (Body installation direction: Standard (lower side only)) | | | | *1 |
| ECS - 10 to 14 | N/R/L | | N/L | N/R | *2 |

*1: No grease nipples can be installed.

*2: This is an instruction for grease nipple installation options. "N": None, "R": Right Side, "L": Left Side shall be selected.

*3: If you want to use the home position sensor, limit sensor and grease nipple in the same direction, contact us.

Table 6: (K) Positioning pin hole

| Model | (K) Positioning pin hole |
|----------------|--------------------------|
| ECS - 05 to 14 | N/P |



- This product has no motor.
- Please obtain, install, and adjust the motor and driver by yourself.

1.3 Specifications

1.3.1 Specifications

[Applicable motor size: A <□42>]

| Item | Model | | | | | | |
|-------------------------------------|--|-----|-----|-----------------------|-----|-----|----|
| | ECS-05 | | | ECS-06 | | | |
| Ball screw diameter (mm) | 12 | | | | | | |
| Ball screw precision grade | C7 | | | | | | |
| Stroke length *1 (mm) | 50 to 800 | | | | | | |
| Thread lead (mm) | 2 | 5 | 10 | 2 | 5 | 10 | |
| Max. load capacity *2 | Horizontal (kg) | 10 | 10 | 5 | 30 | 30 | 15 |
| | Vertical (kg) | 7 | 3 | 1.5 | 15 | 10 | 5 |
| Max. speed *3 (mm/s) | 100 | 250 | 500 | 100 | 250 | 500 | |
| Rated thrust *2 (N) | 825 | 330 | 165 | 854 | 341 | 170 | |
| Repeatability (mm) | ±0.01 | | | | | | |
| Lost motion (mm) | 0.1 or less | | | | | | |
| Drive part mass (Kg) | 0.3 | | | 0.5 | | | |
| Other inertia (Kg·cm ²) | 0.024 (0.120) *4 | | | 0.024 (0.120) *4 | | | |
| Coefficient of friction | 0.05 | | | 0.05 | | | |
| Mechanical efficiency | 0.8 | | | 0.8 | | | |
| Ball screw length (mm) | Stroke length + 200 | | | Stroke length + 200 | | | |
| Dynamic allowable load (N) | 551 | | | 1209 | | | |
| Static allow able moment (N·m) | MP:20 MY:16 MR:19 | | | MP:80 MY:70 MR:75 | | | |
| Dynamic allow able moment (N·m) | Mp:2.8 My:2.8 Mr:6.8 | | | Mp:8.9 My:8.9 Mr:24.8 | | | |
| Operating ambient temperature (°C) | 0 to 40 (Without condensation or freezing) | | | | | | |
| Operating ambient humidity (%) | 35 to 85 (Without condensation or freezing) | | | | | | |
| Storage ambient temperature (°C) | -10 to 50 (Without condensation or freezing) | | | | | | |
| Storage ambient humidity (%) | 35 to 85 (Without condensation or freezing) | | | | | | |

[Applicable motor size: B <□56>, C<□60>]

| Item | Model | | | | | | | | | | | | |
|-------------------------------------|--|-----|-----|------|-------------------------|-----|-----|------|----------------------------|-----|-----|------|----|
| | ECS-10 | | | | ECS-12 | | | | ECS-14 | | | | |
| Ball screw diameter (mm) | 16 | | | | | | | | | | | | |
| Ball screw precision grade | C7 | | | | | | | | | | | | |
| Stroke length *1 (mm) | 50 to 1050 | | | | | | | | | | | | |
| Thread lead (mm) | 5 | 10 | 16 | 20 | 5 | 10 | 16 | 20 | 5 | 10 | 16 | 20 | |
| Max. load capacity *2 | Horizontal (kg) | 50 | 30 | 22 | 18 | 50 | 30 | 22 | 18 | 110 | 88 | 48 | 40 |
| | Vertical (kg) | 12 | 8 | 5 | 3 | 12 | 8 | 5 | 3 | 33 | 22 | 10 | 8 |
| Max. speed *3 (mm/s) | 250 | 500 | 800 | 1000 | 250 | 500 | 800 | 1000 | 250 | 500 | 800 | 1000 | |
| Rated thrust *2 (N) | 683 | 341 | 213 | 174 | 683 | 341 | 213 | 174 | 1388 | 694 | 433 | 347 | |
| Repeatability (mm) | ±0.01 | | | | | | | | | | | | |
| Lost motion (mm) | 0.1 or less | | | | | | | | | | | | |
| Drive part mass (Kg) | 1.2 | | | | 0.9 | | | | 1.6 | | | | |
| Other inertia (Kg·cm ²) | 0.074 (0.730) *4 | | | | 0.040 (0.730) *4 | | | | 0.074 (0.870) *4 | | | | |
| Coefficient of friction | 0.05 | | | | 0.05 | | | | 0.05 | | | | |
| Mechanical efficiency | 0.8 | | | | 0.8 | | | | 0.8 | | | | |
| Ball screw length (mm) | Stroke length + 200 | | | | Stroke length + 200 | | | | Stroke length + 200 | | | | |
| Dynamic allowable load (N) | 2651 | | | | 1660 | | | | 6567 | | | | |
| Static allow able moment (N·m) | MP:110 MY:110 MR:120 | | | | MP:150 MY:150 MR:130 | | | | MP:552 MY:551 MR:485 | | | | |
| Dynamic allow able moment (N·m) | Mp:24.1 My:24.1 Mr:24.8 | | | | Mp:42.3 My:42.3 Mr:53.1 | | | | Mp:262.7 My:262.7 Mr:261.0 | | | | |
| Operating ambient temperature (°C) | 0 to 40 (Without condensation or freezing) | | | | | | | | | | | | |
| Operating ambient humidity (%) | 35 to 85 (Without condensation or freezing) | | | | | | | | | | | | |
| Storage ambient temperature (°C) | -10 to 50 (Without condensation or freezing) | | | | | | | | | | | | |
| Storage ambient humidity (%) | 35 to 85 (Without condensation or freezing) | | | | | | | | | | | | |

*1: The stroke pitch is 50 mm.

*2 The values of the rated thrust force and maximum load capacity are the allowable values of the actuator body, and the actual thrust force and load capacity may be limited by the motor used by the customer.

*3 The maximum speed is a value on the assumption that the motor installed by the customer outputs a rotational speed of 3,000 rpm.

*4 The values in parentheses indicate the other inertia values for the belt-driven motor mounted on a side.

Stroke and maximum speed

| Model No. | Applicable motor size | Thread lead (mm) | Stroke (mm) and max. speed (mm/s) | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|-----------------------|------------------|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|---------------|------|------|------|------|------|--|
| | | | 50 | ... | 550 | 600 | 650 | 700 | 750 | 800 | 850 | 900 | 950 | 1000 | 1050 | 1100 | 1150 | 1200 | 1250 | 1300 | 1350 | 1400 | 1450 | 1500 | |
| Small Body size | ECS-05 | □42 | 2 | 100 | | | | | | | | | | 90 | 80 | 70 | 60 | ⌚ | 13.53 seconds | | | | | | |
| | | | 5 | 250 | | | | | | | | | | 225 | 20 | 17 | 15 | ⌚ | 5.53 seconds | | | | | | |
| | | | 10 | 500 | | | | | | | | | | 450 | 40 | 35 | 30 | ⌚ | 2.87 seconds | | | | | | |
| | ECS-06 | □42 | 2 | 100 | | | | | | | | | | 90 | 80 | 70 | 60 | ⌚ | 13.53 seconds | | | | | | |
| | | | 5 | 250 | | | | | | | | | | 22 | 200 | 17 | 150 | ⌚ | 5.53 seconds | | | | | | |
| | | | 10 | 500 | | | | | | | | | | 45 | 40 | 35 | 300 | ⌚ | 2.87 seconds | | | | | | |
| ECS-10 | □56 □60 | 5 | 250 | | | | | | | | | | 22 | 20 | 17 | 150 | 125 | ⌚ | 8.60 seconds | | | | | | |
| | | 10 | 500 | | | | | | | | | | 45 | 40 | 35 | 300 | 250 | ⌚ | 4.40 seconds | | | | | | |
| | | 16 | 800 | | | | | | | | | | 72 | 64 | 56 | 480 | 400 | ⌚ | 2.83 seconds | | | | | | |
| | | 20 | 1000 | | | | | | | | | | 90 | 80 | 70 | 600 | 500 | ⌚ | 2.30 seconds | | | | | | |
| ECS-12 | □56 □60 | 5 | 250 | | | | | | | | | | 22 | 20 | 17 | 150 | 125 | ⌚ | 8.60 seconds | | | | | | |
| | | 10 | 500 | | | | | | | | | | 45 | 40 | 35 | 300 | 250 | ⌚ | 4.40 seconds | | | | | | |
| | | 16 | 800 | | | | | | | | | | 72 | 64 | 56 | 480 | 400 | ⌚ | 2.83 seconds | | | | | | |
| | | 20 | 1000 | | | | | | | | | | 90 | 80 | 70 | 600 | 500 | ⌚ | 2.30 seconds | | | | | | |
| Body size Large | □56 □60 | 5 | 250 | | | | | | | | | | 22 | 20 | 17 | 150 | 125 | ⌚ | 8.60 seconds | | | | | | |
| | | 10 | 500 | | | | | | | | | | 45 | 40 | 35 | 300 | 250 | ⌚ | 4.40 seconds | | | | | | |
| | | 16 | 800 | | | | | | | | | | 72 | 64 | 56 | 480 | 400 | ⌚ | 2.83 seconds | | | | | | |
| | | 20 | 1000 | | | | | | | | | | 90 | 80 | 70 | 600 | 500 | ⌚ | 2.30 seconds | | | | | | |



- The values of the rated thrust force and maximum load capacity are the allowable values of the actuator body, and the actual thrust force and load capacity may be limited by the motor used by the customer.
- The maximum speed is a value on the assumption that the motor installed by the customer outputs a rotational speed of 3,000 rpm.
- ⌚ indicates the positioning time. It is on the assumption that the longest stroke is operated at horizontal setting, maximum speed, and maximum acceleration/deceleration. Note that this is not the value for the maximum carrying capacity.

2. Installation

DANGER

Do not operate the product where there are hazardous materials such as combustibles, flammables, and explosives.

The product may ignite, catch fire, or explode.

Avoid splashing water or oil on the product.

They may cause fire, electric leakage or product failure. Do not use oil droplets or oil mist.

Securely hold and lock the product (including workpieces) when installing the product.

The operator may be injured due to falling, dropping, or abnormal operation of the product.

The driver power supply and the I/O circuit power supply should be selected and used after carefully reading the catalogs and instruction manuals of the manufacturer of the motor used.

Connecting the product directly to the AC power source may cause fire, explosion, or damage.

In accordance with 'JIS B 9960-1: 2019 Safety of machinery-Electrical equipment of machines- Part 1: General requirements,' install overcurrent protection equipment (circuit breakers or circuit protectors, etc.) on the primary power supply side of wiring.

Reference: Excerpt from JIS B 9960-1: 2019 "7.2.1 General"

Overcurrent protection shall be provided if the circuit current in the machine (electrical device) may exceed the rated value of the component or the current carrying capacity of the conductor, whichever is smaller. Rated values or set values to be selected are specified in 7.2.10.

 **WARNING****Do not mount the product on flammable materials.**

Attachment of the product directly to or near flammable items could cause fire.

Design the safety circuit/device so that the product's movement causes no damage to the operator or equipment if the machine stops due to emergency stop, power outage, or other system errors.**Perform D-class grounding (with ground resistance of 100 ohms or less) with the product.**

In the event of current leakage, there is a fear of an electric shock and product malfunction.

Check the wiring of the product in this instruction manual and make sure that there is no miswiring or loosening of the connector. Also, check the insulation of the wiring.

Avoid contact with other circuits, ground fault, and poor insulation between terminals. The product may be damaged by overcurrent. They may cause malfunction or fire.

Insulate the wiring which is not used.

Otherwise malfunction, failure or electric shock may result.

Do not damage or stress cables and do not put heavy objects on cables or pinch them.

Doing so may lead to poor conduction or an electric shock.

Install the emergency stop button in a location where it is easy to operate.

Use a structure and wiring in which the emergency stop button is not automatically reset and cannot be reset carelessly.

When an emergency stop is performed, it may take several seconds to stop depending on the moving speed and load.

Mount the product indoors and keep it away from humid places.

Current leakage or fire may occur in places where the product is exposed to water or humidity (80% or more, or dew condensation).

Do not use or store the product in places with strong electromagnetic waves, ultraviolet rays or radioactivity.

They may cause product failure or malfunction.

Consider the possibility of power source failure.

Take appropriate measures so that no damage or breakage will occur to the operator or equipment even if the power source fails.

Consider the operation status when the machine is reactivated after emergency stop or abnormal stop.**Design a safe controller if it is necessary to reset the actuator to the starting position.****Since it has a built-in precision machine, do not overturn, vibrate or give an impact to it during transportation.**

Doing so may result in damages to the parts.

If the actuator is used in a non-horizontal installation, use an actuator with a brake.

If the actuator is not equipped with a brake, injury or damage to workpieces may occur due to falling of the moving parts when the servo is OFF (including emergency stops and alarms) or the power is OFF.

Do not hold the moving parts or cables of the product during transportation or installation.

Doing so may result in injury or disconnection.


CAUTION
The wiring shall be such that inductive noise is not applied.

- Avoid places where large currents or strong magnetic fields are generated.
- Do not use the same piping or wiring (by multi-core cable) as other large motor power lines than this product.
- Do not use the same piping or wiring as the inverter power supply used for robots, etc., but provide frame grounding for the power supply and a filter for the output connectors.

Do not use the product in an environment where strong magnetic field is generated.

Doing so may result in a malfunction.

Separate the power supply to the output part of the product from the power supply to the dielectric load which generates surge such as solenoid valves and relays.

If a power supply is shared, a surge current may be applied to the output, causing damage.

If a separate power supply is not available, connect a surge absorber directly and in parallel to all dielectric loads.

Do not perform a withstand voltage test or an insulation resistance test on the equipment to which the product is attached.

A capacitor is connected between the circuit and the metal body to prevent static electricity damage to the control board built in this product. Therefore, the product may be damaged if the tests described above are performed with the device to which this product is attached. If testing is required as a device, remove this product before performing the test.

If electrical welding is performed on the equipment to which this product is attached, remove all the F.G. (frame grounding) connections of this product before performing electrical welding.

If electrical welding is performed with the F.G. connection installed, the product may be damaged by welding current, excessive high voltage during welding, or surge voltage.

Select a power supply that can supply more power than required by the installed products.

Insufficient capacity can cause product malfunction.

Do not disassemble the product.
Do not bend the fixed cable repeatedly.

If bending repeatedly, use a movable cable.

Fix the movable cable so that it does not move easily.
When an external stopper or a holding mechanism (brake, etc.) is installed, arrange it so as not to affect the detection of the home position.

The home position is detected when the power is turned on. If the detection operation is inhibited by an external stopper or a holding mechanism, an unintended position may be recognized as the home position.

Do not use the product in a place where it is exposed to ultraviolet radiation and atmospheres containing corrosive gas or salt.

Doing so may cause degradation in strength due to performance degradation, product malfunction, and rust formation.

Do not install the product in places subject to strong vibration or impact.

If large vibration or impact is transmitted to the product, malfunction may occur.

Do not use the product in a place where dew condensation can occur due to rapid change in ambient temperature.
Note that the customer is responsible for checking the compatibility of our product with the system, machine, and device to be used by the customer.
Do not use other cables than dedicated cables to connect the product.

Doing so may result in failure or unexpected accident.

Do not hold the moving parts or cables of the product during transportation or installation.

Doing so may result in injury or disconnection.

Secure a space necessary for maintenance and inspection.

Inadequate maintenance and inspection may result in equipment shutdown, damage, or personal injury.

When transporting and installing the product, ensure the safety of workers by securely supporting it with lifts and supports or by multiple workers.
Install the product so that no twisting or bending force is applied to it.
Before the gain adjustment is performed, securely fix the actuator body to a rigid housing or the like, and securely fix a jig or the like.
When using locating pin holes, use pins that are sized to not be press-fitted.

Due to press-fit load, there is a risk of damage, distortion, or loss of accuracy of the guide.

2.1 Installation environment

- Check the ambient temperature and atmosphere of the product specifications for product storage and operation.
- Use the product in a place where the ambient temperature is 0 to 40°C. Ventilate the place if the heat is trapped there.
- Install the product in a place where there are no dust, corrosive gas, explosive gas, flammable gas, and flammables, avoiding places exposed to direct sunlight or near a heat generating element. This product is not designed to be resistant to chemical substances.
- Mount the actuator on a smooth surface.
- Installing the actuator on a surface with dents, even if the surface is flat, may result in damage or malfunction of the product.

2.2 Unpacking



- When transporting or handling the product, be careful not to drop or otherwise give a shock to the product.
 - A heavy package shall not be carried by one person alone.
 - When placing the product in a static position, place it horizontally.
 - Never get on the package.
 - Do not place heavy objects that deform the package or objects that concentrate the load on the package.
 - When unpacking the actuator from the package, hold the body part and pick it up.
 - Do not apply an external force to every part of the actuator.
-
- Make sure that the product model number you ordered is the same as the one shown on the product.
 - Check that there is no damage on the outside of the product.

2.3 Installation method

2.3.1 Accessories

<Basic type>

Motor-mounting bolt (common to all motor installation directions)

| Model No. | Specifications of the installed motor | Motor size | Size | Quantity |
|-----------|---------------------------------------|--------------------|------|----------|
| ECS-05 | A | A <□42> | M3 | 4 |
| ECS-06 | B | | M3 | 4 |
| ECS-10 | A | B <□56> C <□60> | M4 | 4 |
| ECS-12 | B | | M4 | 4 |
| ECS-14 | C | | M4 | 4 |

<Per motor installation direction>

| Model No. | Accessory name | Quantity |
|---|-------------------------------------|----------|
| E (Motor Exposed) | Coupling (Installed at shipment) | 1 |
| R (Right side/belt drive) L (Left side/belt drive) | Timing belt | 1 |
| D (Bottom/belt drive) | Pulley | 1 |

<When home position/limit sensors are selected *1>

| Sensor installation direction | Shipment configuration | Quantity |
|-------------------------------|--------------------------------|----------|
| Inside sensor | To be fixed at shipped product | 3 *2 |
| Outside sensor | Attached at shipment *3 | |

*1: The shipment configuration of home position and limit sensors varies by installation (inside/outside).

*2: If "none" is selected for either of home position or limit sensor, the other will be "none."

The sensor rail (ECS-10, ECS-12) is shipped when "none" is selected.









*3: The sensor-mounting screws are also attached.




2.3.2 Motor installation method



- Installing and adjusting a motor requires expertise and technical skills. The work may be hazardous for individuals not having such expertise.
- Before work, always power down the motor and sensors. Failure to do so may damage the product.










<Body Size: 05 to 06 Motor installation direction: E (Motor Exposed)>

| Order | Procedure | Description |
|-------|--|---|
| (1) | Remove the four mounting bolts of the cover on the coupling and remove the cover on the coupling. |  |
| (2) | Loosen the coupling-fixing bolt on the motor side. |  |
| (3) | Remove the two dustproof plate mounting bolts and the dustproof plate retainer. |  |
| (4) | Remove the four body cover mounting bolts and remove the body cover. |  |
| (5) | Remove the four nuts temporarily fixing the four motor mounting bolts. (The nuts are not used when mounting the motor.) |  |
| (6) | Check that there is no foreign object on the mounting surface, and then install the motor. (Pay attention to the position of the motor cable.) After temporarily tightening the four motor mounting bolts, further tighten them diagonally to fix the motor. |  |
| (7) | Tighten the coupling-fixing bolt on the motor side. |  |
| (8) | Install the body cover and tighten the four mounting bolts. |  |








| | | |
|------|--|---|
| (9) | Install the dustproof plate retainer and tighten the two dustproof plate mounting bolts. |  |
| (10) | Install the cover on the coupling and tighten the four mounting bolts of the cover. |  |
| (11) | The motor installation is completed. |  |

<Body size: 05 to 06

Motor installation direction: R (right side/belt drive), L (left side/belt drive), D (bottom/belt drive)>










| Order | Procedure | Description |
|-------|---|---|
| (1) | Remove the four mounting bolts fixing the belt cover and the four mounting bolts of the motor plate. |  |
| (2) | Loosen the four mounting bolts of the motor plate. |  |
| (3) | Check that there is no foreign object on the mounting surface, and then install the motor. (Pay attention to the position of the motor cable.) After temporarily tightening the four motor mounting bolts, further tighten them diagonally to fix the motor. |  |
| (4) | Remove the attachments (belt and pulley) and check the conditions of the pulley. (Align the inside slot with the outside slot.) |  |
| (5) | Mount the pulley on the motor shaft and tighten the two pulley mounting bolts. Provide clearance between the pulley and the motor shaft. |  |
| (6) | Loop the belt over the smaller pulley, and then loop the belt over the larger pulley. Adjust the belt position at the center of the pulley. |  |
| (7) | While adjusting the motor plate, adjust the belt tension appropriately, and then tighten the motor plate-mounting bolts. |  |
| (8) | Check the belt tension with the belt tension meter. For details on the belt tension, see page 17. |  |
| (9) | Install the belt cover and tighten the four belt cover mounting bolts. The motor installation is completed. |  |

<Body Size: 10 to 14 Motor installation direction: E (Motor Exposed)>

| Order | Procedure | Description |
|-------|--|--|
| (1) | Remove the four actuator top cover mounting bolts and the top cover. |  |
| (2) | Loosen the coupling-fixing bolt on the motor side. |  |
| (3) | Check that there is no foreign object on the mounting surface, and then install the motor. (Pay attention to the position of the motor cable.) |  |
| (4) | After temporarily tightening the four motor mounting bolts, further tighten them diagonally to fix the motor. |  |
| (5) | Tighten the coupling-fixing bolt on the motor side. |  |
| (6) | Install the actuator top cover and tighten the four mounting bolts of the cover. |  |
| (7) | The motor installation is completed. |  |

<Body size: 10 to 14

Motor installation direction: R (right side/belt drive), L (left side/belt drive), D (bottom/belt drive)>

| Order | Procedure | Photographic description |
|-------|--|---|
| (1) | Remove the four mounting bolts fixing the belt cover and the four mounting bolts of the motor plate. |  |
| (2) | Loosen the four mounting bolts of the motor plate. |  |
| (3) | Remove the attachments (belt and pulley). Check the condition of the pulley. (Align the inside slot with the outside slot.) |  |
| (4) | Mount the pulley on the motor shaft. Provide clearance between the pulley and the motor shaft. |  |
| (5) | Check that there is no foreign object on the mounting surface, and then install the motor. (Pay attention to the position of the motor cable.) |  |
| (6) | Loop the belt over the smaller pulley, and then loop the belt over the larger pulley. Adjust the belt position at the center of the pulley. |  |
| (7) | While adjusting the motor plate, adjust the belt tension appropriately, and then tighten the motor plate-mounting bolts. Check the belt tension with the belt tension meter. For details on the belt tension, see page 17. |  |
| (8) | Install the belt cover and tighten the four belt cover mounting bolts. |  |
| (9) | The motor installation is completed. |  |

Belt tension for belt-drive type motors

| Model No. | Belt tension (N) |
|-----------|------------------|
| ECS-05 | 12 to 17 |
| ECS-06 | 12 to 17 |
| ECS-10 | 32 to 42 |
| ECS-12 | 32 to 42 |
| ECS-14 | 60 to 75 |

Tightening torque when engaging motor shaft with pulley

| Screw size | Tightening torque (N·m) |
|------------|-------------------------|
| M3 | 1.7±10% |
| M4 | 3.7±10% |
| M5 | 6.7±10% |
| M6 | 9.7±10% |

Tightening torque when engaging motor shaft with coupling

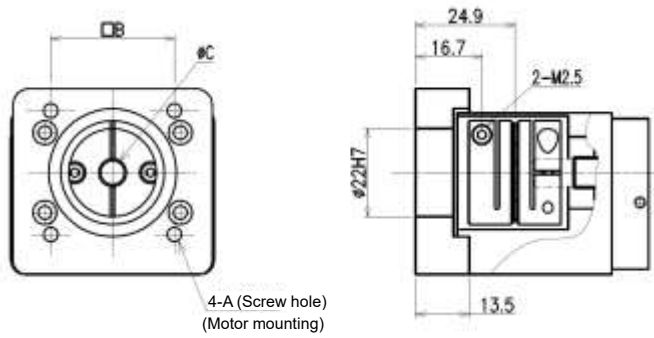
| Model No. | Screw size | Tightening torque (N·m) |
|-----------|------------|-------------------------|
| ECS-05 | M2.5 | 0.4 to 0.5 |
| ECS-06 | M2.5 | 0.4 to 0.5 |
| ECS-10 | M3 | 1.5 to 1.9 |
| ECS-12 | M3 | 1.5 to 1.9 |
| ECS-14 | M3 | 1.5 to 1.9 |

Tightening torque of motor-mounting bolt

| Model No. | Specifications of the installed motor | Motor size | Size | Tightening torque (N·m) |
|-----------|---------------------------------------|------------|------|-------------------------|
| ECS-05 | A | A <□42> | M3 | 0.7 |
| ECS-06 | B | | M3 | 0.7 |
| ECS-10 | A | B <□56> | M4 | 1.5 |
| ECS-12 | B | | M4 | 1.5 |
| ECS-14 | C | C <□60> | M4 | 1.5 |

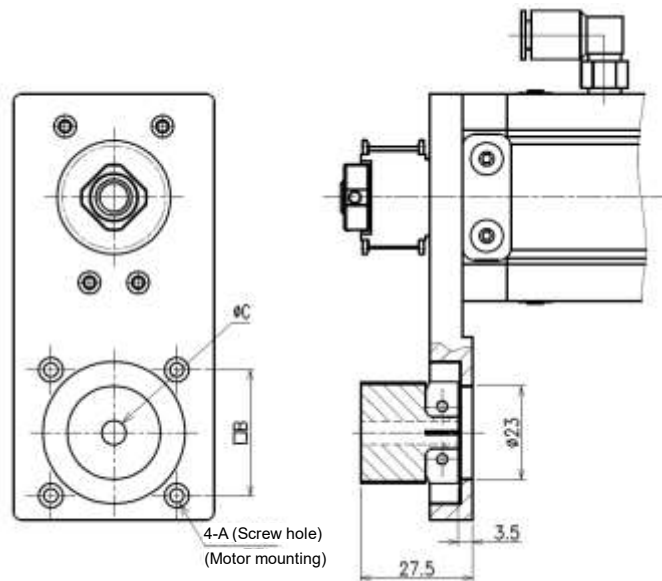
2.3.3 Dimensions of Motor Attachment

[ECS-05-****-E]



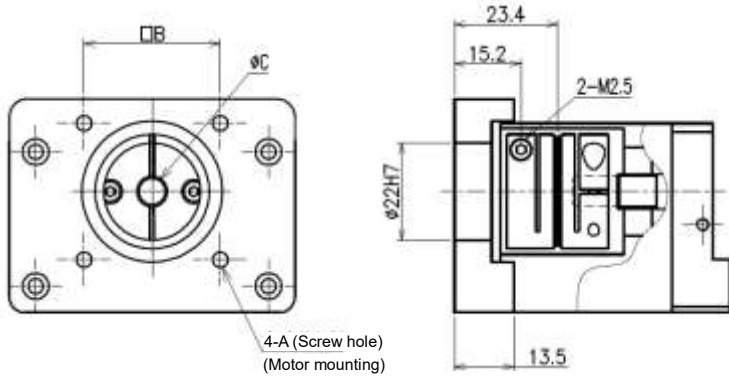
| Specifications of the installed motor | A | B | C | Motor mounting bolt |
|---------------------------------------|------|----|---|---------------------|
| A | Φ3.6 | 31 | 6 | 4-M3×L16 |
| B | Φ3.6 | 31 | 5 | 4-M3×L16 |

[ECS-05-****-R/L/D]



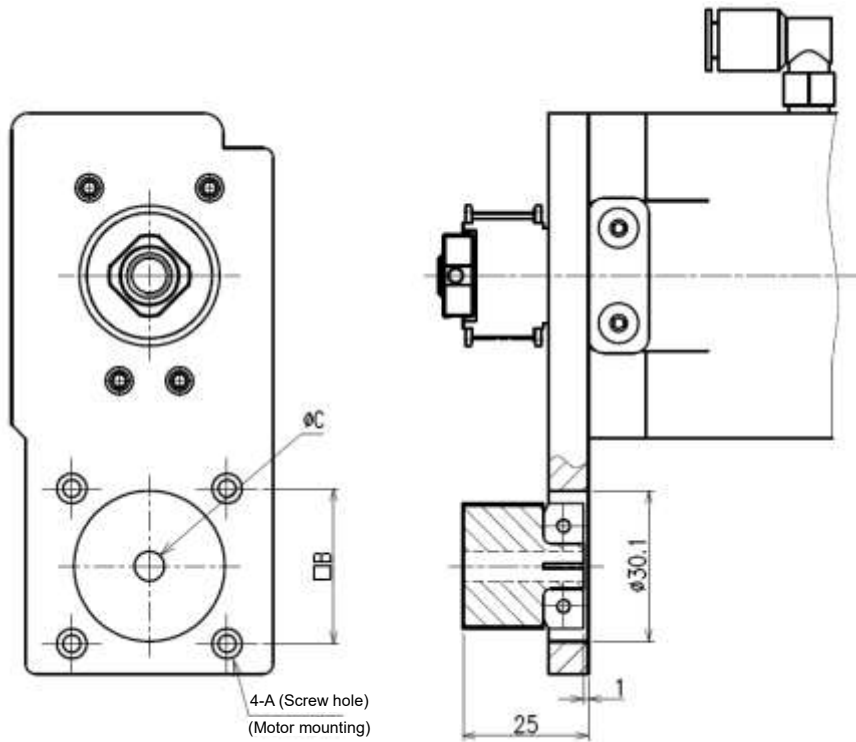
| Specifications of the installed motor | A | B | C | Motor mounting bolt |
|---------------------------------------|------|----|---|---------------------|
| A | Φ3.4 | 31 | 6 | 4-M3×L14 |
| B | Φ3.4 | 31 | 5 | 4-M3×L14 |

[ECS-06-****-E]



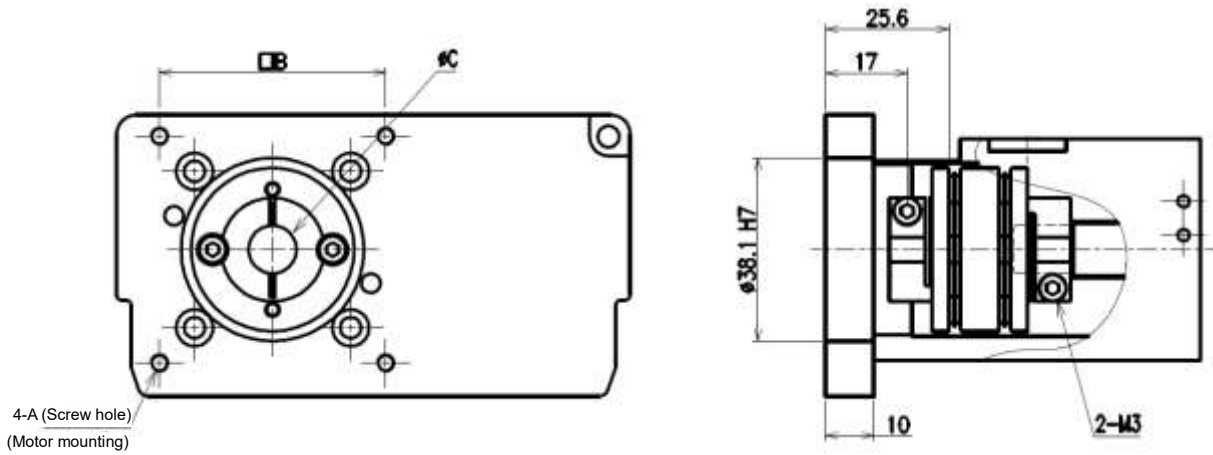
| Specifications of the installed motor | A | B | C | Motor mounting bolt |
|---------------------------------------|------|----|---|---------------------|
| A | Φ3.5 | 31 | 6 | 4-M3×L16 |
| B | Φ3.5 | 31 | 5 | 4-M3×L16 |

[ECS-06-****-R/L/D]

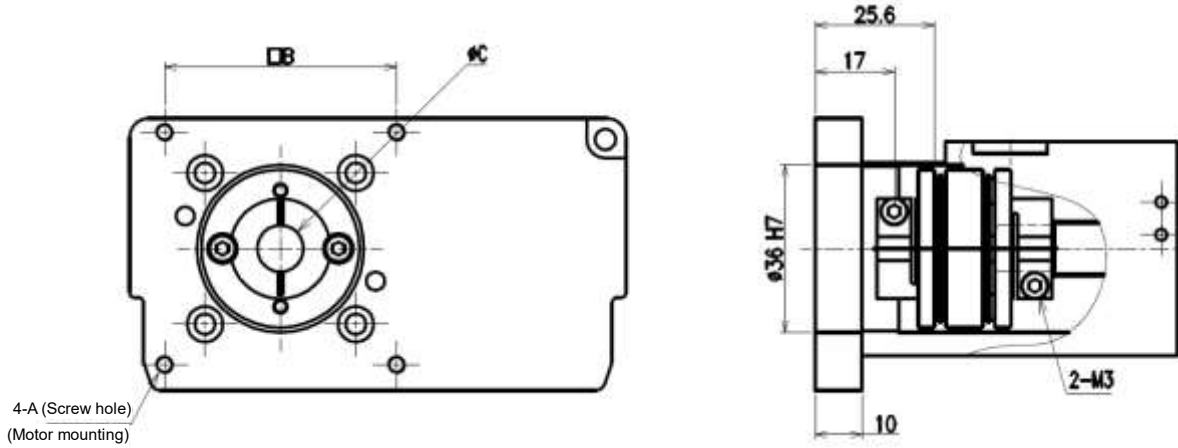


| Specifications of the installed motor | A | B | C | Motor mounting bolt |
|---------------------------------------|------|----|---|---------------------|
| A | Φ3.5 | 31 | 6 | 4-M3×L12 |
| B | Φ3.5 | 31 | 5 | 4-M3×L12 |

[ECS-10-****-E] (Motor Size: B <□56>)

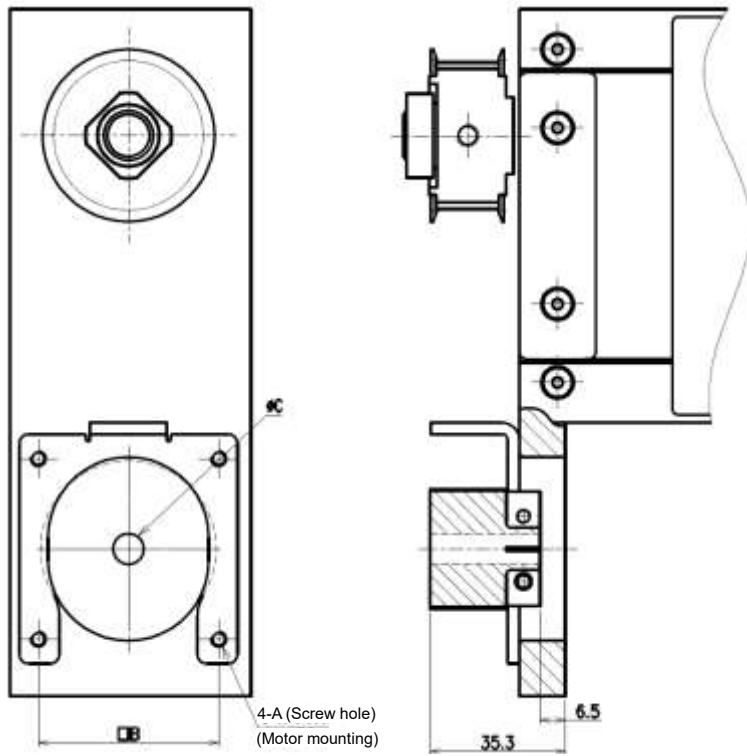


[ECS-10-****-E] (Motor Size: C <□60>)

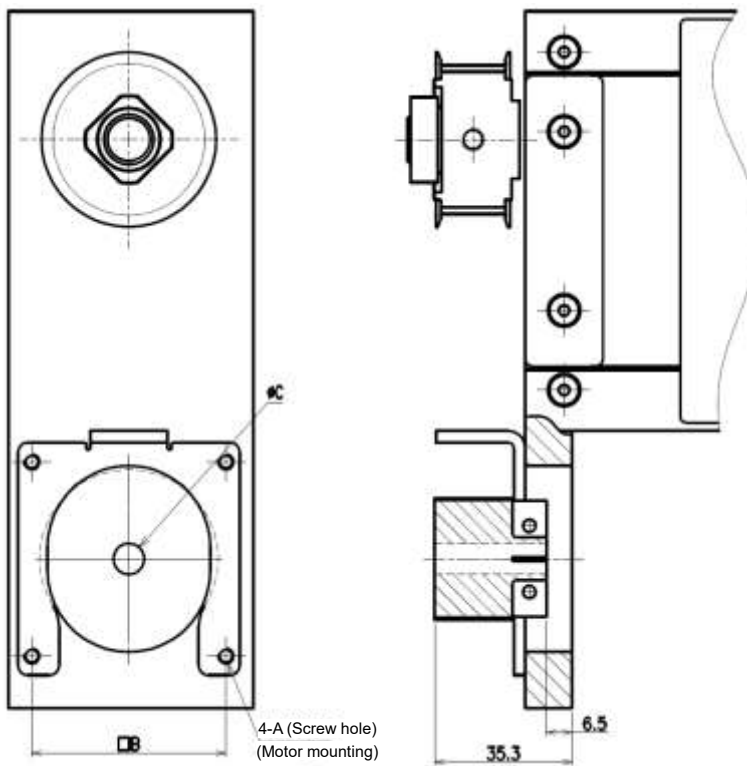


| Specifications of the installed motor | Motor size | A | B | C | Motor mounting bolt |
|---------------------------------------|------------|----|-------|------|---------------------|
| A | C <□60> | M4 | 50 | 10 | 4-M4×L12 |
| B | B <□56> | M4 | 47.14 | 6.35 | 4-M4×L12 |
| C | B <□56> | M4 | 47.14 | 8 | 4-M4×L12 |

[ECS-10-****-R/L/D] (Motor Size: B <□56>)

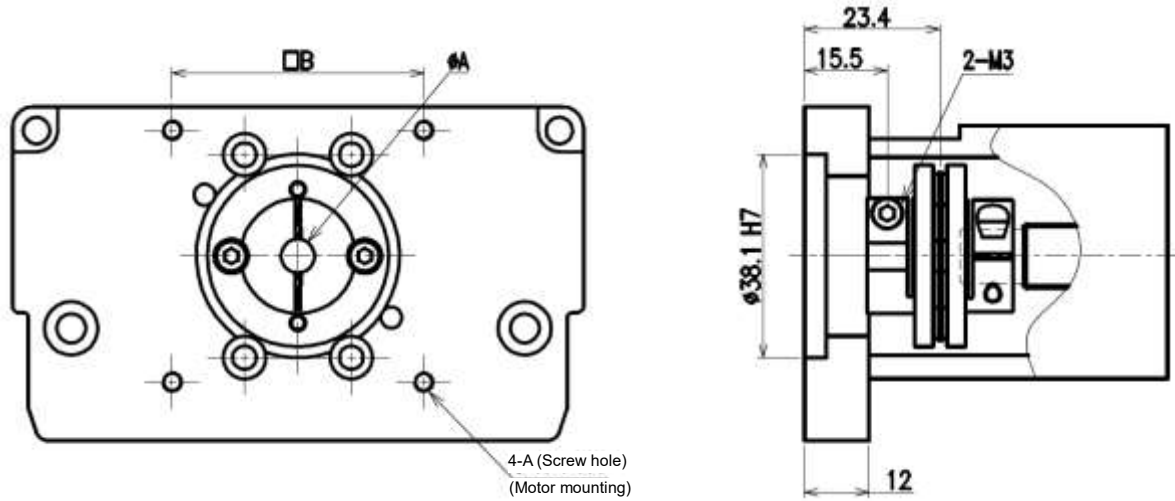


[ECS-10-****-R/L/D] (Motor Size: C <□60>)

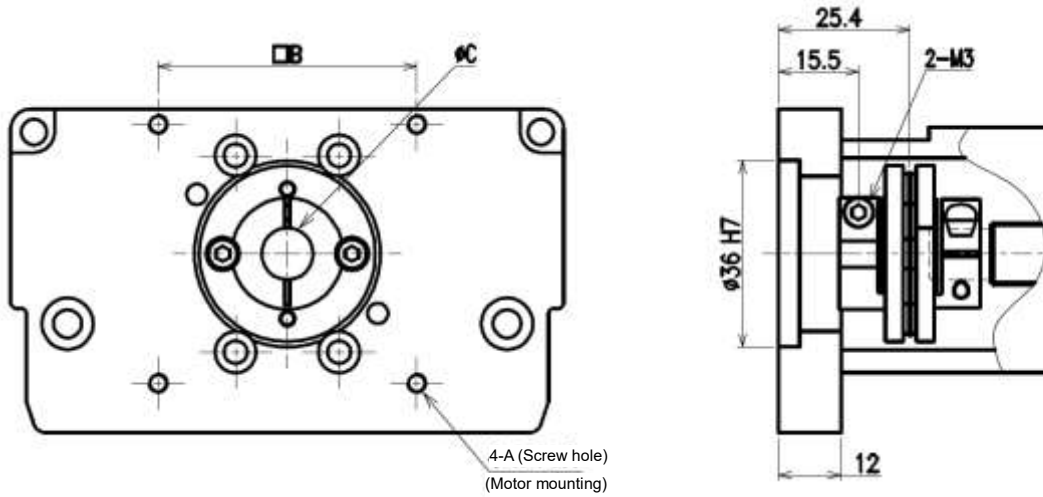


| Specifications of the installed motor | Motor size | A | B | C | Motor mounting bolt |
|---------------------------------------|------------|----|-------|------|---------------------|
| A | C <□60> | M4 | 50 | 10 | 4-M4×L16 |
| B | B <□56> | M4 | 47.14 | 6.35 | 4-M4×L16 |
| C | B <□56> | M4 | 47.14 | 8 | 4-M4×L16 |

[ECS-12-****-E] (Motor Size: B <□56>)

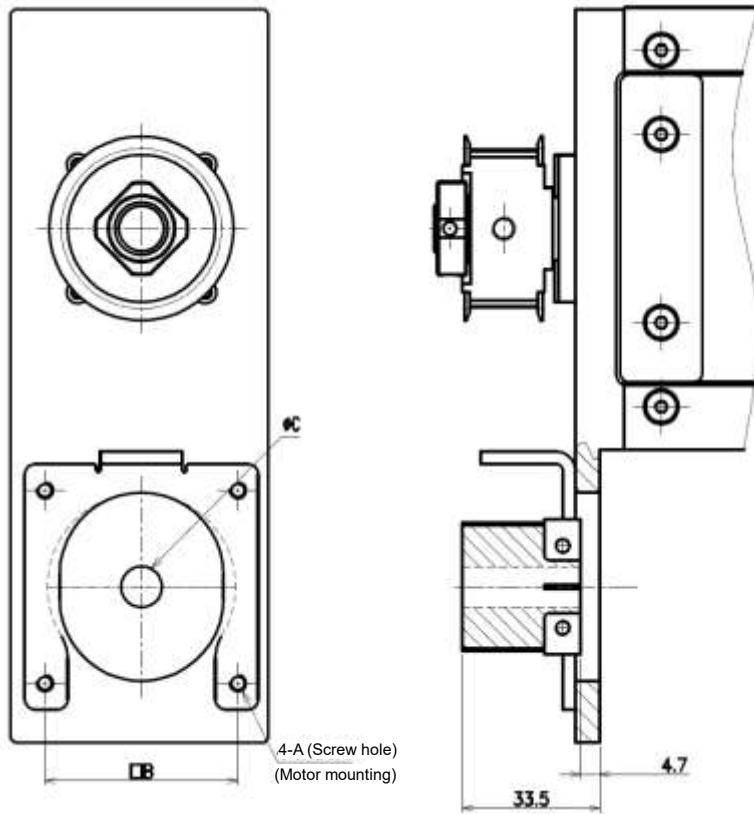


[ECS-12-****-E] (Motor Size: C <□60>)

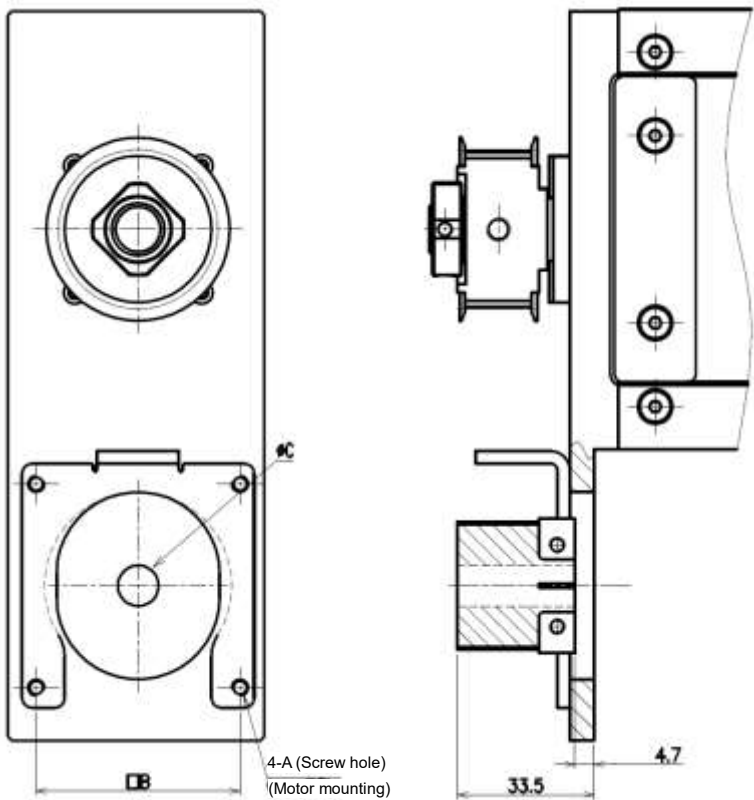


| Specifications of the installed motor | Motor size | A | B | C | Motor mounting bolt |
|---------------------------------------|------------|----|-------|------|---------------------|
| A | C <□60> | M4 | 50 | 10 | 4-M4×L16 |
| B | B <□56> | M4 | 47.14 | 6.35 | 4-M4×L16 |
| C | B <□56> | M4 | 47.14 | 8 | 4-M4×L16 |

[ECS-12-****-R/L/D] (Motor Size: B <□56>)

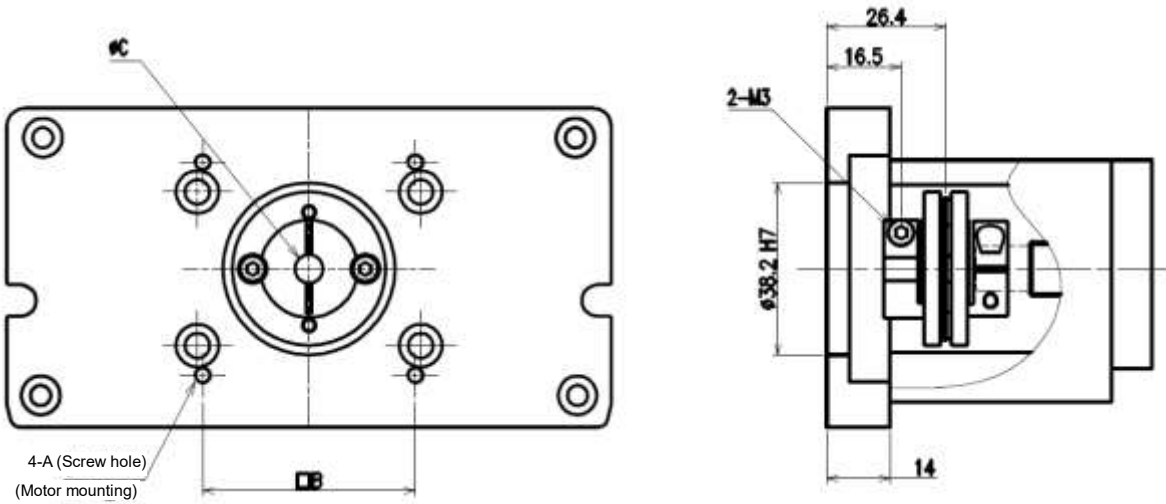


[ECS-12-****-R/L/D] (Motor Size: C <□60>)

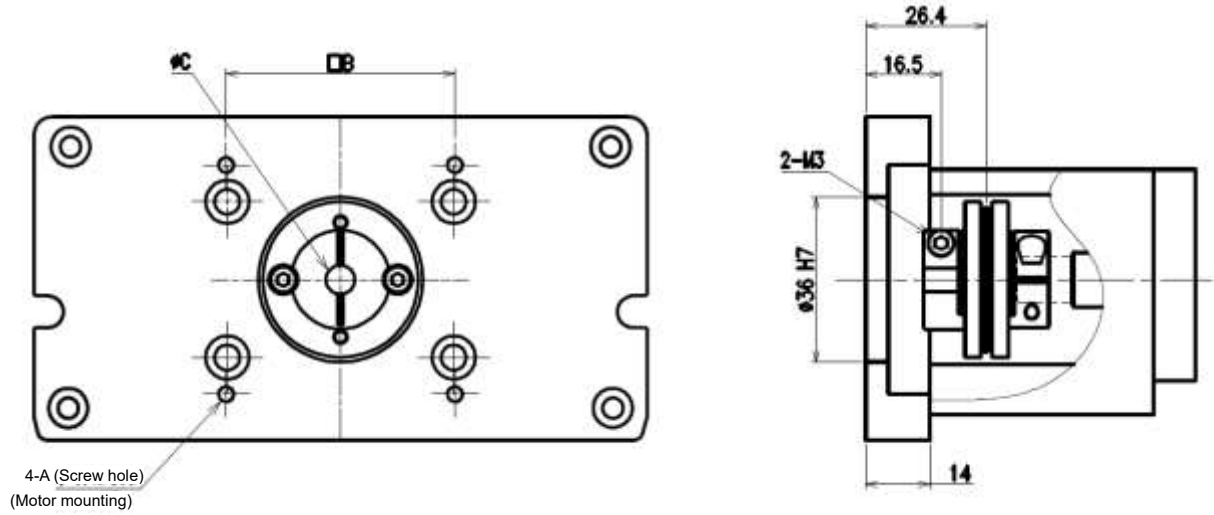


| Specifications of the installed motor | Motor size | A | B | C | Motor mounting bolt |
|---------------------------------------|------------|----|-------|------|---------------------|
| A | C <□60> | M4 | 50 | 10 | 4-M4×L16 |
| B | B <□56> | M4 | 47.14 | 6.35 | 4-M4×L16 |
| C | B <□56> | M4 | 47.14 | 8 | 4-M4×L16 |

[ECS-14-****-E] (Motor Size: B <□56>)

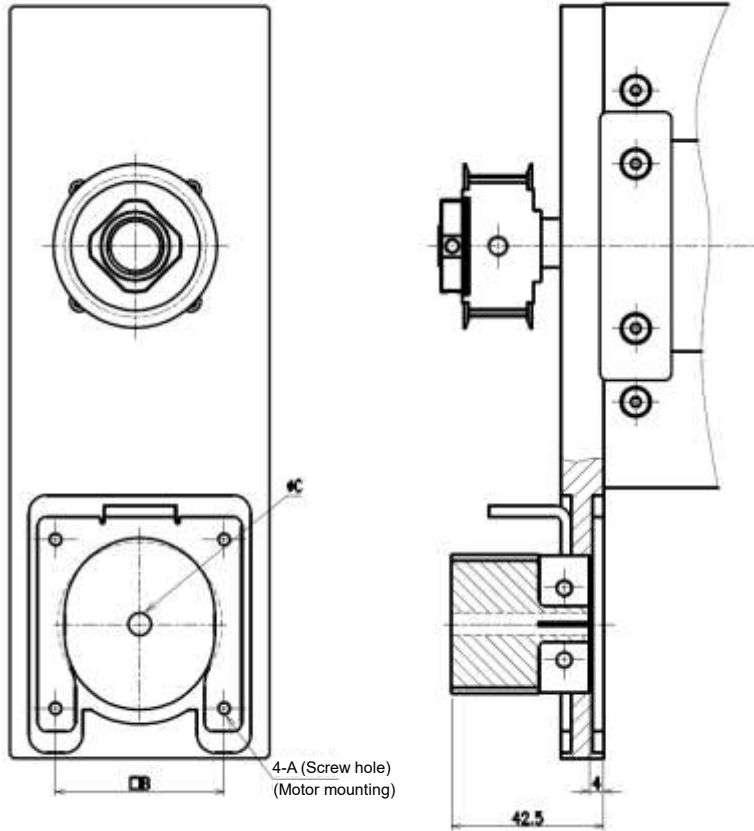


[ECS-14-****-E] (Motor Size: C <□60>)

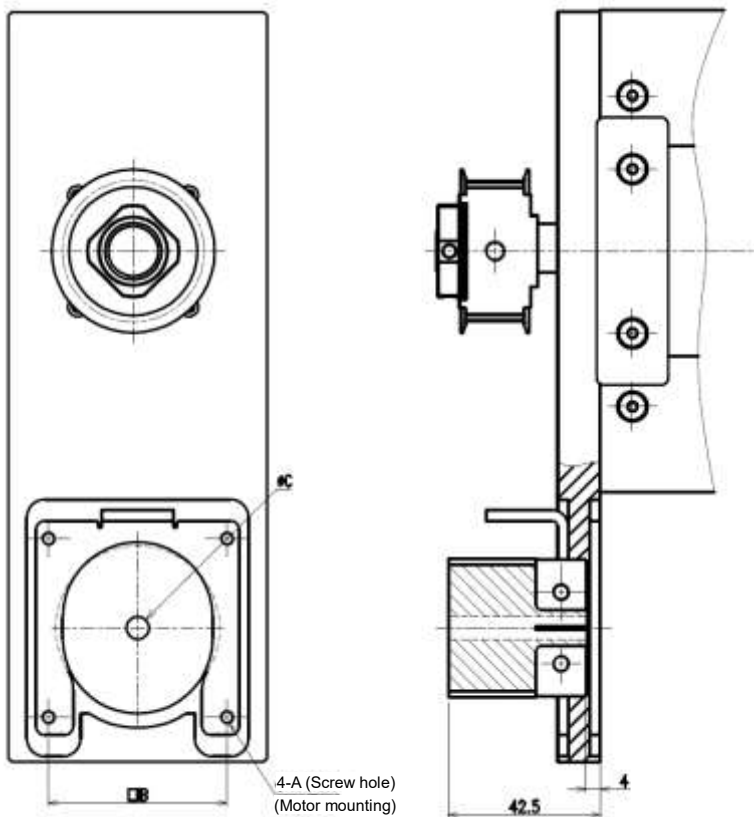


| Specifications of the installed motor | Motor size | A | B | C | Motor mounting bolt |
|---------------------------------------|------------|----|-------|------|---------------------|
| A | C <□60> | M4 | 50 | 10 | 4-M4×L16 |
| B | B <□56> | M4 | 47.14 | 6.35 | 4-M4×L16 |
| C | B <□56> | M4 | 47.14 | 8 | 4-M4×L16 |

[ECS-14-****-R/L/D1 (Motor Size: B <□56>)




[ECS-14-****-R/L/D] (Motor Size: C <□60>)



| Specifications of the installed motor | Motor size | A | B | C | Motor mounting bolt |
|---------------------------------------|------------|----|-------|------|---------------------|
| A | C <□60> | M4 | 50 | 10 | 4-M4×L20 |
| B | B <□56> | M4 | 47.14 | 6.35 | 4-M4×L20 |
| C | B <□56> | M4 | 47.14 | 8 | 4-M4×L20 |

2.3.4 Installation of main body and transfers

- The flatness of the mounting surface where the actuator is installed should be 0.05 mm/200 mm or less, and do not give twist or bending force to the product. Installing the actuator on an uneven surface may result in damage or malfunction of the product.
- When installing the product on the mounting surface, tighten the screws with the following proper torque:



| | |
|-----|----------|
| M4 | 1.5 N·m |
| M5 | 3.0 N·m |
| M6 | 5.2 N·m |
| M8 | 12.5 N·m |
| M10 | 24.5 N·m |

- The flatness of the mounting surface where the transfer to be attached to the product should be 0.05 mm/200 mm or less, and do not give twist or bending force to the product.
- Use the product within the specified transport load, allowable moment, and overhang amount.

3. How to Use

3.1 Precautions on Use

WARNING

Ensure the safety of the operating range of the device before supplying electricity to the product.

Carelessly supplying power to it may lead to an electric shock or injury.

Do not enter the operating range when the product is ready to operate.

The product may move suddenly and lead to injury. Fingers may be caught between the motor and slider.

Do not touch or come into contact with the product body during operation or immediately after it stops operating.

Doing so may result in burns.

Do not put yourself or anything on the product.

Doing so may cause falling accidents, product turnover, injury due to drops, product breakdown, product malfunction due to damage, loss of control, and others.

Take appropriate measures so that no damage will occur to human body or equipment even if the power source fails.

Before operating the product from a position from which the actuator is not visible, make sure that it is safe if the actuator runs.

When the timing belt is abnormal, immediately stop the operation and replace the timing belt. In particular, it is very dangerous if the timing belt is broken when it is used vertically, so replace it early.

Check the timing belt for wear, swelling, longitudinal tearing of the teeth, cracking or softening of the back of the timing belt, or partial cutting.

CAUTION

Do not operate the moving part of the product or decelerate rapidly by an external force.

The regenerative current may cause product malfunction or breakdown.

Do not hit the table against mechanical stoppers or the like.

The shock may damage the guides, ball screws, belt, internal stoppers, etc., and cause malfunction.

Do not make dents or scratches on the moving part.

Doing so may result in malfunctions.

Since the life of the product varies depending on the transportation load and environment, the transportation load shall be set sufficiently with a margin.

Do not apply shock to the moving parts.

Do not turn the servo OFF when the product is under gravity or inertia force.

When the servo is turned off, the slider or rod may continue to move or fall. The operation of turning the servo off shall be performed in an equilibrium state with no gravity or inertial force, or after confirming safety.

Do not issue a stop command during acceleration or deceleration.

Doing so may cause a speed change (acceleration) and cause danger.

 **CAUTION**
If the belt drive causes vibration, change the set speed so that vibration does not occur.

The product may vibrate even within the operating speed range depending on the operating conditions.

In belt drive type motors, wear particles are generated from the belt.

Please be careful when you use it at the installation place and above the workpiece.

Do not apply pressure from the suction port.

Doing so may scatter grease and shorten product life.

Use the required amount of air suction.

| | | | | |
|---------------------|---------------------|---------------------|---------------------|---------------------|
| ECS-05 | ECS-06 | ECS-10 | ECS-12 | ECS-14 |
| 30Nℓ/min or less | 40Nℓ/min or less | 50Nℓ/min or less | 50Nℓ/min or less | 60Nℓ/min or less |

4. Maintenance and inspection

WARNING

Do not perform wiring before installing the product.

Doing so may result in an electric shock.

Do not work with wet hands.

Doing so may result in an electric shock.

Do not perform wiring and inspection before 5 minutes or more have passed after the power is turned off and before the voltage is checked with a tester.

Doing so may result in an electric shock.

Do not install or remove wiring or connectors while the power is on.

Otherwise malfunction, failure or electric shock may result.

Do not disassemble or modify the product.

Doing so may cause injury, accident, malfunction or failure.

CAUTION

Wiring and inspection shall be performed by specialized engineers.

The lead wire used for the power cable shall have a wire diameter that is sufficiently large to allow the maximum instantaneous current.

Otherwise heat generation or damage may occur during operation.

Conduct periodical inspections (two to three times a year) to make sure that the product works properly.

The standard grease supply interval is usually 100 km.

However, it depends on the operating conditions, so consider and determine the lubrication interval at the initial inspection.

If an abnormal condition occurs in the product, such as generating heat, smoke, odor, noise, or vibration, immediately turn the power off.

The product may be damaged or a fire may occur if the current continues to flow.

Before performing maintenance, inspection, or repair, stop the power supply to the product.

Call attention to the others around you so that they do not turn the power on carelessly.

4.1 Periodical inspection

In order to use the product in the optimum conditions, perform two to three periodical inspections per year.

Check the timing belt every 500 km.

4.1.1 Inspection Items

Be sure to turn off the power before performing the check items 1, 2, 3 and 4 below.

| No. | Inspection Items | Inspection Methods | Treatment method |
|-----|---|----------------------|--|
| 1 | Check that the product mounting bolts, terminal block screws, and connectors are not loose. | Looseness inspection | Additionally tighten them. |
| 2 | Check the cables for breaks or damages. | Visual inspection | Replace the cable. |
| 3 | Check whether foreign matter is accumulated or caught in the moving parts. | Visual inspection | Clean the product. Note 1 Feed grease after cleaning. |
| 4 | Check the timing belt for scratches, cracks or swelling. | Visual inspection | Replace the timing belt. |
| 5 | Check for any vibration or noise during halts as if the product is in operation. | Sound inspection | Please contact your dealer. |
| 6 | Check whether the power supply voltage is normal. | Check by a tester | Check the power supply system and use the product within the specified power supply voltage range. |

Note 1: Use a soft cloth for cleaning and make sure that no foreign object remains in the moving parts.

4.1.2 Greasing



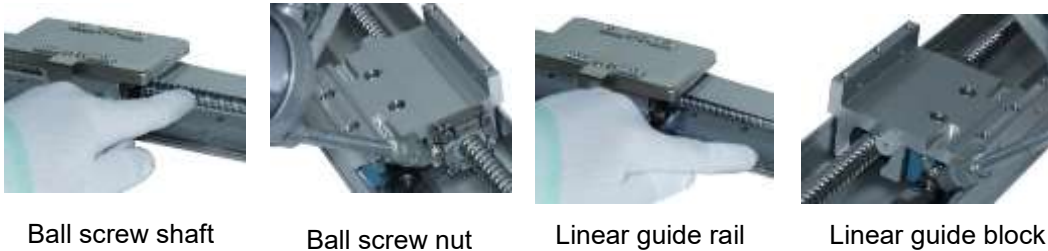
- Before greasing, turn the power off.

| | Recommended grease |
|-----------------|---|
| Standard series | AFEP2 (YAMABARA) |
| ETS FP series | Super Lube (Synco Chemical) (multipurpose grease) |
| ETS P4 series | Contact your nearest CKD sales office. |

- a) Model equipped with grease nipple:
 Pump grease through the grease nipple on the slider part.
 (The linear guide and ball screw part are greased.)



- b) Model equipped with no grease nipple:
 Grease the following parts (ball screw shaft/nut, linear guide rail, and linear guide block).



Ball screw shaft

Ball screw nut

Linear guide rail

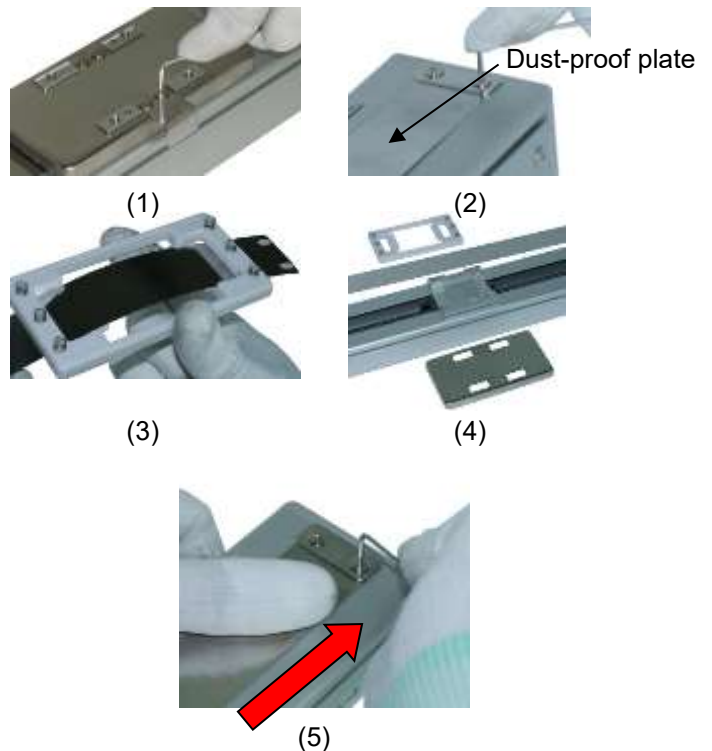
Linear guide block

4.1.3 Replacement and adjustment of dustproof plate



- Before replacing or adjusting the dustproof plate, turn the power off.
- Note that the dustproof plate is easily deformed. Handle it with due care.

- (1) Remove the screws on the slider part.
- (2) Remove the screws on both sides of the dust-proof plate.
- (3) Remove the plastic holding springs of the slider carefully not to lose them.
- (4) Clean and replace the plate.
- (5) When mounting the dust-proof plate, stretch the plate toward both ends so that there is no warp on it, and then tighten the screws.



5. Warranty provision

5.1 Warranty conditions

■ Scope of warranty

If the product becomes defective for reasons attributable to CKD during the period of warranty indicated below, CKD will provide a replacement for the product, provide necessary replacement parts, or repair the product at no charge to the customer.

However, following circumstances are excluded from this warranty:

- Handling or use in conditions and environments other than those described in catalogs, specifications, or instruction manuals
- Damage caused by exceeding of the durability conditions (such as frequency, distance and period of time) are exceeded or the product becomes defective for reasons relating to consumables
- Damage caused by reasons attributable to anything other than the product
- Operation of the product in any unintended manner
- Damage caused by modification or repair not involving CKD
- Damage caused by reasons unforeseen at the level of technology available at the time of delivery
- Damage caused by reasons not attributable to CKD, such as a natural disaster

Please note that this warranty concerns only the delivered product itself. Any direct, indirect, or consequential damage that may arise from failure with the delivered product are not covered under this warranty.

■ Confirmation of compatibility

Please note that the customer is responsible for checking the compatibility of our product with the system, machine, and device to be used by the customer.

■ Other

This Warranty Clause stipulates basic provisions.

If warranty information given on individual specification drawings or specification sheets differs from that given herein, priority will be given to the specification drawings and specification sheets.

5.2 Term of Warranty

The period of warranty for the product specified herein is one year from the date of delivery to the site designated by the customer.