



# ROBO Cylinder RCA/RCACR Actuators Slider Type

## Operating Manual

Fourteen Edition

Standard type	Motor Straight Type (Coupling Type)	RCA-SA4C, SA5C, SA6C
	Motor Straight Type (Built-in Type)	RCA-SA4D, SA5D, SA6D SS4D, SS5D, SS6D
	Motor Reversing Type	RCA-SA4R, SA5R, SA6R
Cleanroom type	Motor Straight Type (Coupling Type)	RCACR-SA4C, SA5C, SA6C
	Motor Straight Type (Built-in Type)	RCACR- SA5D, SA6D

RCA2-series >> see page 131



## Please Read Before Use

Thank you for purchasing our product.

This Operation Manual explains the handling methods, structure and maintenance of this product, among others, providing the information you need to know to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

The DVD that comes with the product contains operation manuals for IAI products.

When using the product, refer to the necessary portions of the applicable operation manual by printing them out or displaying them on a PC.

After reading the Operation Manual, keep it in a convenient place so that whoever is handling this product can reference it quickly when necessary.

### [Important]

- This Operation Manual is original.
- The product cannot be operated in any way unless expressly specified in this Operation Manual. IAI shall assume no responsibility for the outcome of any operation not specified herein.
- Information contained in this Operation Manual is subject to change without notice for the purpose of product improvement.
- If you have any question or comment regarding the content of this manual, please contact the IAI sales office near you.
- Using or copying all or part of this Operation Manual without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.

Note

Greasing Actuators of Cleanroom Specification

For ROBO Cylinder actuators of cleanroom specification, use grease of low-dust-raising type for cleanroom applications.

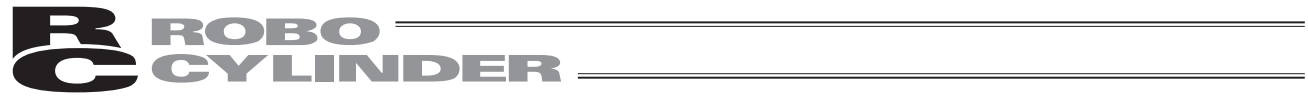
The grease specified in the maintenance/inspection sections of the Operating Manual is for actuators of standard specification.

Using the grease for the standard actuators on the cleanroom actuators may generate dust.

Recommended grease: C Grease by Kuroda  
Precision Industries Ltd.

C Grease by Kuroda Precision Industries is applied to the cleanroom actuators before shipment from IAI.





## **CE Marking**

If a compliance with the CE Marking is required, please follow Overseas Standards Compliance Manual (ME0287) that is provided separately.

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## Safety Guide

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“Safety Guide” has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it before the operation of this product.

### Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

No.	Operation Description	Description
1	Model Selection	<ul style="list-style-type: none"> <li>● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications.               <ol style="list-style-type: none"> <li>1) Medical equipment used to maintain, control or otherwise affect human life or physical health.</li> <li>2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility)</li> <li>3) Important safety parts of machinery (Safety device, etc.)</li> </ol> </li> <li>● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product.</li> <li>● Do not use it in any of the following environments.               <ol style="list-style-type: none"> <li>1) Location where there is any inflammable gas, inflammable object or explosive</li> <li>2) Place with potential exposure to radiation</li> <li>3) Location with the ambient temperature or relative humidity exceeding the specification range</li> <li>4) Location where radiant heat is added from direct sunlight or other large heat source</li> <li>5) Location where condensation occurs due to abrupt temperature changes</li> <li>6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid)</li> <li>7) Location exposed to significant amount of dust, salt or iron powder</li> <li>8) Location subject to direct vibration or impact</li> </ol> </li> <li>● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.</li> </ul>

No.	Operation Description	Description
2	Transportation	<ul style="list-style-type: none"> <li>● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane.</li> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped.</li> <li>● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the operation manual for each model.</li> <li>● Do not step or sit on the package.</li> <li>● Do not put any heavy thing that can deform the package, on it.</li> <li>● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work.</li> <li>● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment's capability limit.</li> <li>● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength.</li> <li>● Do not get on the load that is hung on a crane.</li> <li>● Do not leave a load hung up with a crane.</li> <li>● Do not stand under the load that is hung up with a crane.</li> </ul>
3	Storage and Preservation	<ul style="list-style-type: none"> <li>● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation.</li> <li>● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.</li> </ul>
4	Installation and Start	<p>(1) Installation of Robot Main Body and Controller, etc.</p> <ul style="list-style-type: none"> <li>● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake.</li> <li>● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life.</li> <li>● When using the product in any of the places specified below, provide a sufficient shield.             <ol style="list-style-type: none"> <li>1) Location where electric noise is generated</li> <li>2) Location where high electrical or magnetic field is present</li> <li>3) Location with the mains or power lines passing nearby</li> <li>4) Location where the product may come in contact with water, oil or chemical droplets</li> </ol> </li> </ul>



No.	Operation Description	Description
4	Installation and Start	<p>(2) Cable Wiring</p> <ul style="list-style-type: none"> <li>● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool.</li> <li>● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error.</li> <li>● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error.</li> <li>● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction.</li> <li>● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product.</li> <li>● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.</li> </ul> <p>(3) Grounding</p> <ul style="list-style-type: none"> <li>● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation.</li> <li>● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm<sup>2</sup> (AWG20 or equivalent) or more for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards).</li> <li>● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).</li> </ul>





No.	Operation Description	Description
4	Installation and Start	<p>(4) Safety Measures</p> <ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot's movable range. When the robot under operation is touched, it may result in death or serious injury.</li> <li>● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation.</li> <li>● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product.</li> <li>● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input.</li> <li>● When the installation or adjustment operation is to be performed, give clear warnings such as "Under Operation; Do not turn ON the power!" etc. Sudden power input may cause an electric shock or injury.</li> <li>● Take the measure so that the work part is not dropped in power failure or emergency stop.</li> <li>● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety.</li> <li>● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire.</li> <li>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.</li> </ul>
5	Teaching	<ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the "Stipulations for the Operation" and make sure that all the workers acknowledge and understand them well.</li> <li>● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency.</li> <li>● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly.</li> <li>● Place a sign "Under Operation" at the position easy to see.</li> <li>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.</li> </ul> <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>

No.	Operation Description	Description
6	Trial Operation	<ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation.</li> <li>● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation.</li> <li>● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc.</li> <li>● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.</li> </ul>
7	Automatic Operation	<ul style="list-style-type: none"> <li>● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence.</li> <li>● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication.</li> <li>● Make sure to operate automatic operation start from outside of the safety protection fence.</li> <li>● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product.</li> <li>● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.</li> </ul>

No.	Operation Description	Description
8	Maintenance and Inspection	<ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well.</li> <li>● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch.</li> <li>● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency.</li> <li>● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly.</li> <li>● Place a sign “Under Operation” at the position easy to see.</li> <li>● For the grease for the guide or ball screw, use appropriate grease according to the Operation Manual for each model.</li> <li>● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product.</li> <li>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.</li> <li>● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation.</li> <li>● Pay attention not to lose the cover or untightened screws, and make sure to put the product back to the original condition after maintenance and inspection works.</li> </ul> <p>Use in incomplete condition may cause damage to the product or an injury.</p> <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>
9	Modification and Dismantle	<ul style="list-style-type: none"> <li>● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.</li> </ul>
10	Disposal	<ul style="list-style-type: none"> <li>● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste.</li> <li>● When removing the actuator for disposal, pay attention to drop of components when detaching screws.</li> <li>● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.</li> </ul>
11	Other	<ul style="list-style-type: none"> <li>● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device.</li> <li>● See Overseas Specifications Compliance Manual to check whether complies if necessary.</li> <li>● For the handling of actuators and controllers, follow the dedicated operation manual of each unit to ensure the safety.</li> </ul>

## Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the Operation Manual for each model.

Level	Degree of Danger and Damage	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	 Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	 Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	 Caution
Notice	This indicates lower possibility for the injury, but should be kept to use this product properly.	 Notice

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## Handling Precautions

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1. Do not set a speed or acceleration/deceleration exceeding the applicable rating.

Do not set a speed or acceleration/deceleration exceeding the applicable rating. Doing so may result in vibration, failure or shorter life. If an acceleration/deceleration exceeding the rating is set, creep may occur or the coupling may slip.

2. Keep the load moments to within the allowable value.

Keep the load moments to within the allowable value. If a load exceeding the allowable load moment is applied, the life of the actuator may be reduced. In an extreme case, even flaking may occur.

3. Keep the overhang length to within the allowable value.

Keep the overhang length of the load to within the allowable value. If the overhang length exceeds the allowable value, vibration or noise may occur.

4. Grease film may run out after back-and-forth operations over a short distance.

Grease film may run out if the actuator is moved back and forth continuously over a distance of 30 mm or less. As a guide, perform a back-and-forth operation five times or over a distance of 50 mm or more after a back-and-forth operation over such short distance has been repeated 5,000 to 10,000 times. This will restore oil film.

5. Turn on the servo after making sure the slider or rod is away from the mechanical end.

If the servo is turned on when the slider or rod is positioned near the mechanical end, the pole phase may not be detected and a pole non-confirmation error or excitation detection error may occur. Accordingly, turn on the servo after making sure the slider or rod is away from the mechanical end.

6. Make sure to attach the actuator properly by following this operation manual.

Using the product with the actuator not being certainly retained or affixed may cause abnormal noise, vibration, malfunction or shorten the product life.

## 7. Perform operation with the duty ratio at the allowable value or less.

Duty ratio is the operation rate, in time basis, of the actuator in 1 cycle that is indicated with “%” .

**⚠ Caution:** If an overload error occurs, extend the stopped time to lower the duty or decrease the acceleration/deceleration speed.

### [How to Calculate Duty]

Figure out the load rate and acceleration/deceleration speed time ratio by calculation and read the duty ratio from the graph.

When the load rate is less than 50%, an operation with 100% duty ratio should be available.

#### [1] Load factor LF

It is described in 2. Specifications regarding the maximum transportable weight at the rated acceleration and rated acceleration/deceleration.

$$\text{Load factor :LF} = \frac{M \times \alpha}{M_r \times \alpha_r} [\%]$$

Maximum transportable weight at the rated acceleration :  $M_r$  [kg]  
 Rated acceleration/deceleration :  $\alpha_r$  [G]  
 Transferring mass during operation :  $M$  [kg]  
 Acceleration/deceleration during operation :  $\alpha$  [G]

#### [2] Acceleration/deceleration time ratio $t_{od}$

$$\text{Acceleration/deceleration time ratio } t_{od} = \frac{\text{Acceleration time during operation} + \text{Deceleration time during operation}}{\text{Operating time}} [\%]$$

$$\text{Acceleration time} = \frac{\text{Velocity at operation (mm/s)}}{\text{Acceleration during operation [mm/s}^2\text{]}} [\text{sec.}]$$

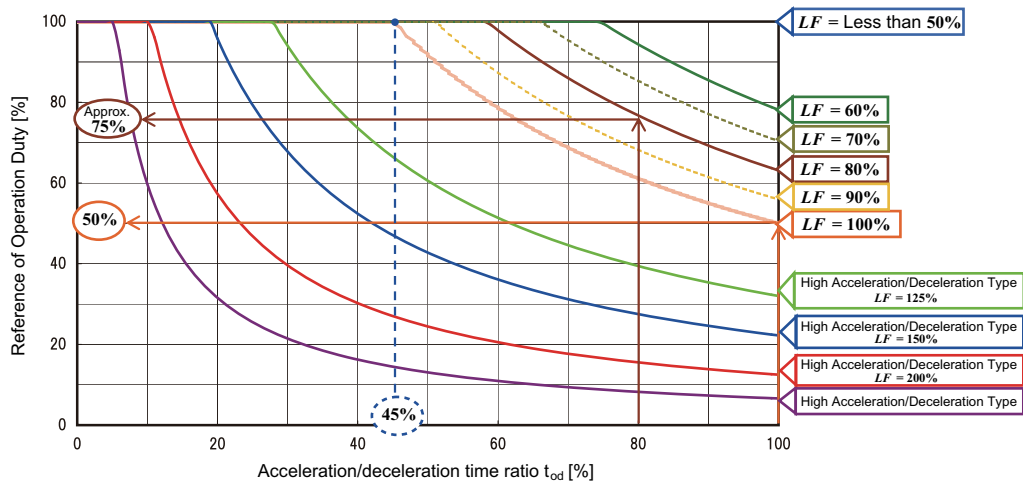
$$\text{Deceleration time} = \frac{\text{Velocity at operation [mm/s]}}{\text{Deceleration during operation [mm/s}^2\text{]}} [\text{sec.}]$$

$$\text{Acceleration [mm/s}^2\text{]} = \text{Acceleration [G]} \times 9,800 \text{ mm/s}^2$$

$$\text{Deceleration [mm/s}^2\text{]} = \text{Deceleration [G]} \times 9,800 \text{ mm/s}^2$$

#### [3] Read the duty ratio from the load rate LF and the acceleration speed time ratio $t_{od}$ that were used to figure out the duty ratio.

Example) If the load factor LF is 80% and acceleration/deceleration time ratio  $t_{od}$  is 80%, the reference duty is approx. 75%.





## 8. If the actuator has a home check sensor (switch) (option), observe applicable precautions such as not bending the switch dog

If the actuator has been ordered with a home check sensor (switch), the switch is stored inside the actuator. (Remove the side cover to access the switch.)

The micro-switch and switch dog have been adjusted to optimal positions prior to shipment.

Be careful not to loosen the mounting screw or bend the switch dog.

If the mounting screw is loosened or switch dog is bent, the aforementioned optional positions are no longer kept and the switch may lose its designed function.

Do not increase the home return speed beyond the factory-set default speed.

If the home return speed is increased beyond the default speed, the switch may be damaged.

Do not move the slider toward the mechanical end from the home position, except during home return operation.

If the slider is moved manually or operated at high speed in the jog mode, etc., until the switch dog hits the micro-switch, the switch may be damaged.

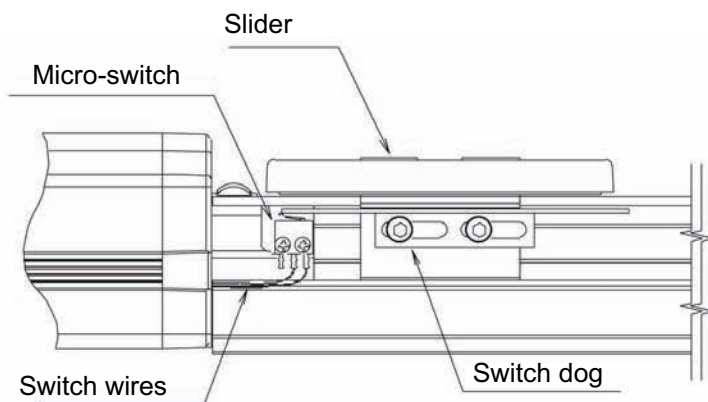
If the slider must be moved manually toward the mechanical end for any reason, such as replacing the motor, do so slowly.

To change the direction of home on the shipped actuator (such as when the actuator was shipped with its home set on the standard side, but a need has arisen subsequently, such as a specification change, to move the home to the opposite side), the micro-switch position and switch dog must be readjusted.

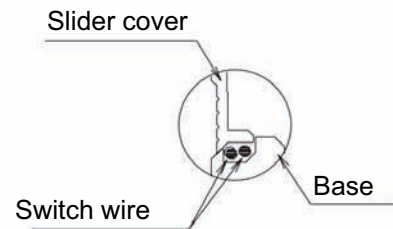
If you must change the direction of home, please contact the IAI sales office near you.

When the side cover which was removed for maintenance, etc., is installed again, be careful not to pinch the switch wires.

Especially when the home is set on the opposite side, the switch wires are stored in the space between the base and side cover, requiring you to pay extra attention.



If the actuator is of the specification where the home set on the opposite side, pay attention to proper storing of switch wires.



## 9. Transporting and Handling

### 9.1 Handling the Actuator

#### 9.1.1 Handling the Packed Unit


Unless otherwise specified, each actuator (axis) is shipped individually. Please take care that the shipping box is not dropped or subjected to strong impact during transport.

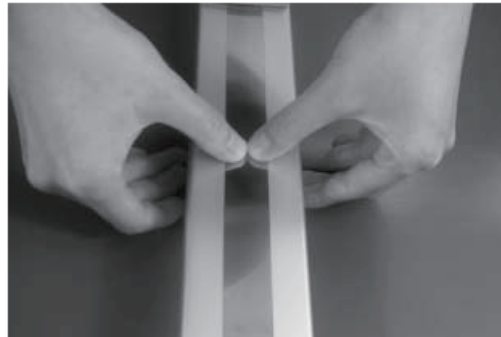
- The operator should not carry heavy shipping boxes by themselves.
- If the shipping box is left standing, it should be in a horizontal position.
- Do not climb on top of the shipping box.
- Do not place heavy objects on top of the shipping box.

#### 9.1.2 Handling the Actuator After It is Unpacked

Lift the actuator up by the base to remove it from the packing.

- When carrying the actuator, take care not to bump it. Take particular care with the front cover and motor cover.
- Do not exert excessive force on any part of the actuator.
- Be careful not to cause the cables to receive a tensile force.
- Note on handling the stainless sheet  
The stainless sheet is designed very thin (thickness: 0.1 mm) in order to ensure flexibility. Therefore, the stainless sheet is easily dented or scratched. Once dented or scratched, the stainless sheet may break during use.

 **Warning:** Do not press the sheet directly with hands.



\* Please refer to “Name of the Parts” for the names of the actuator parts.

## 9.2 Handling the Actuator Assembly

Pay attention to the following instructions when transporting an assembly of actuator axes.

### 9.2.1 Condition of Shipment from IAI (Assembled)

The actuators you have ordered are assembled at IAI, after which the assembly receives a shipping inspection and is shipped in an outer frame with skids.

The assembly is packed with the sliders securely affixed so that they will not move unexpectedly during transportation. In the case of a combined unit, the actuator ends are secured to prevent swinging due to external vibration.

- The package is not designed with special considerations for protection against impact due to dropping or collision, so please handle the package with care. Also, do not place any heavy object on the outer frame, as it is not strong enough to withstand loads.
- When suspending the package using ropes, etc., pass the ropes from underneath the reinforcement frames at the bottom of the skids. When lifting with a forklift, also place the forks underneath the skids.
- Set down the package carefully so as not to apply impact to the assembly or cause it to bounce.

After unpacking, handle the actuator assembly correctly by observing the instructions given below.

### 9.2.2 Handling after Assembly with Peripheral Equipment

When transporting the actuators that have been assembled with peripheral equipment either at IAI or on your site, observe the instructions given below.

- Secure each slider to prevent unexpected movement during transportation.
- If any actuator end is protruding, secure it to prevent swinging due to external vibration.
- If the actuator ends are not secured, do not apply any impact force exceeding 0.3 G during transportation.
- When suspending the actuator-assembled peripheral equipment using ropes, etc., make sure the ropes do not contact the actuators directly.
- Pass the ropes over appropriate cushion materials, and make sure the loads from the ropes will be received by the base of each actuator.
- Secure the end of the Y-axis using a separate rope to maintain the axis in a stable horizontal position. At this time, be careful not to apply loads on the screw cover.
- Be careful not to allow the brackets, covers and connector box of each actuator to receive loads. Also protect the cables from pinching or excessive deformation.

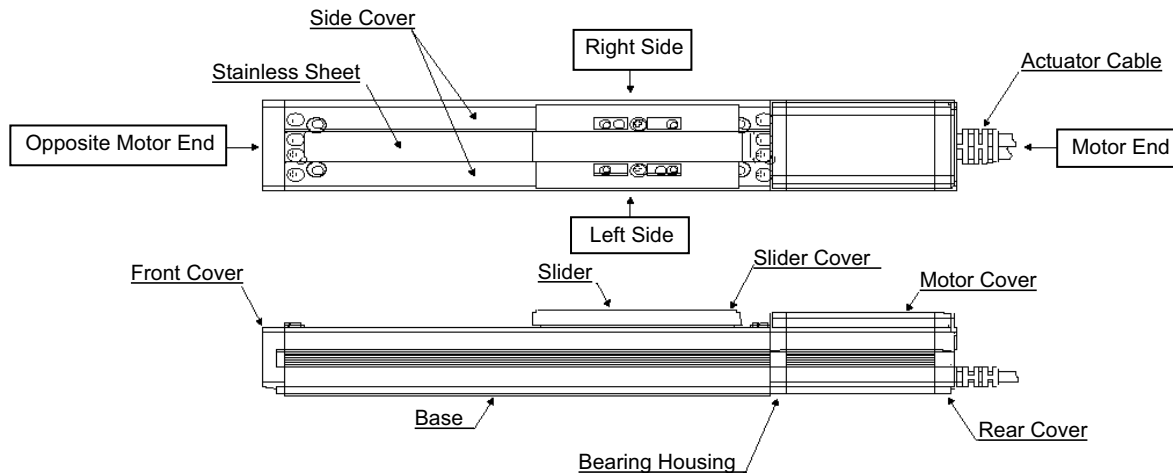
## Names of the Parts

The names of the actuator parts are indicated below.

The left and right sides are indicated by looking at the actuator from the motor end with the actuator set down horizontally. Front end means the side opposite the motor end.

### 1. Motor Straight Type (Standard) RCA

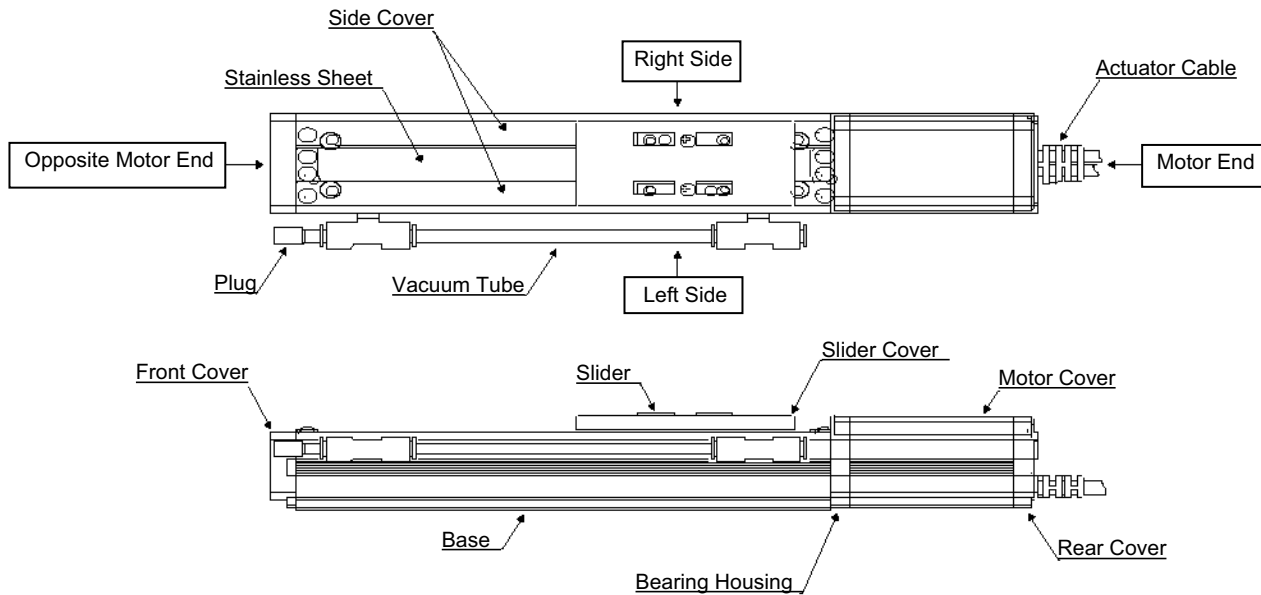
- Coupling Type (SA4C, SA5C, SA6C),  
Built-in Type (SA4D, SA5D, SA6D, SS4D, SS5D, SS6D)



**⚠ Caution:** The cable directly connected to the actuator is not robot cable even when ordered with robot cable option. When designing, please be sure not to give repeated bending loads to this cable. The robot cable is applicable only to the connecting cables.

## 2. Motor Straight Type (Cleanroom Specification) RCACR

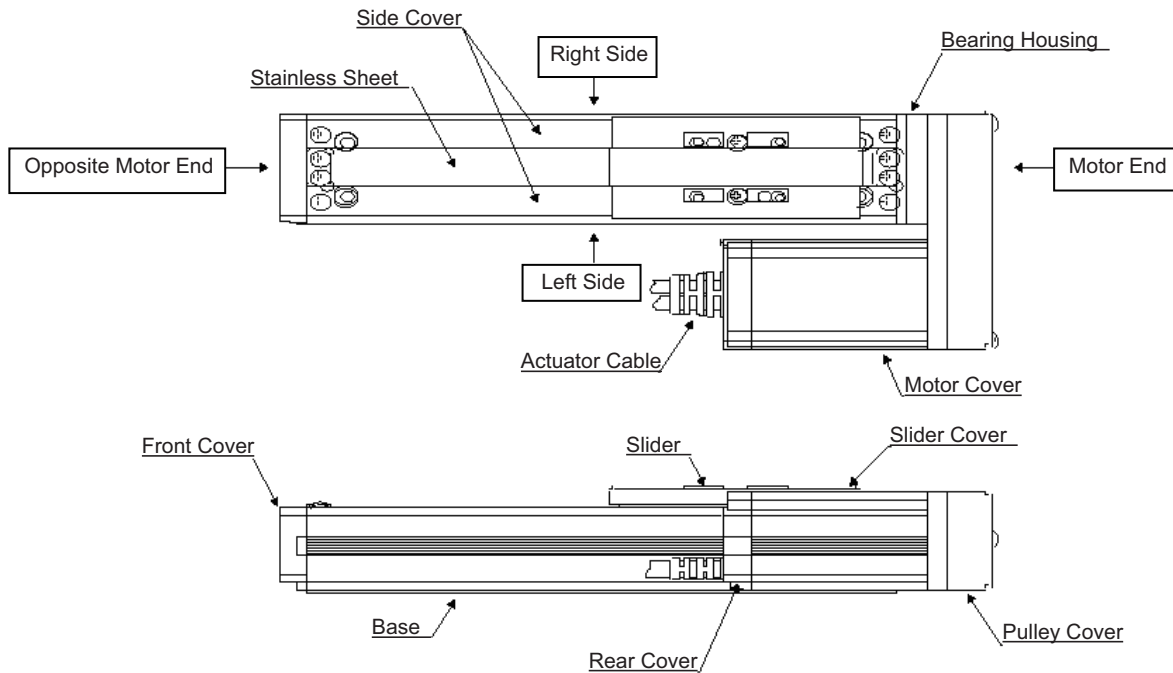
- Coupling Type (SA4C, SA5C, SA6C), Built-in Type (SA5D, SA6D)



**⚠ Caution:** The cable directly connected to the actuator is not robot cable even when ordered with robot cable option. When designing, please be sure not to give repeated bending loads to this cable. The robot cable is applicable only to the connecting cables.

## 3. Motor Reversing Type RCA

- SA4R, SA5R, SA6R



**⚠ Caution:** The cable directly connected to the actuator is not robot cable even when ordered with robot cable option. When designing, please be sure not to give repeated bending loads to this cable. The robot cable is applicable only to the connecting cables.

## 1. Checking the Product

If based on a standard configuration, this product consists of the items listed below.



Caution: Check the packed items against the packing specification. Should you find a wrong model number or any missing item, please contact your IAI dealer or IAI.

### 1.1 Components

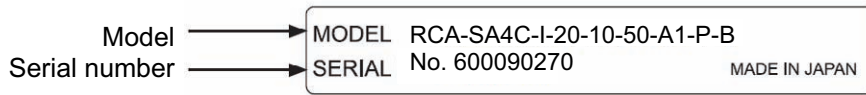
No.	Name	Model number	Remarks
1	Actuator	Refer to "How to Read the Model Nameplate" and "How to Read the Model Number."	
Accessories			
2	Motor/Encoder Cable <sup>*1</sup>		
3	Home Marking Seals		
4	Quick Step Guide		
5	Operation Manual (DVD)		
6	Safety Guide		

\*1 The motor cable and encoder cable that come with the actuator vary depending on the controller used. [Refer to 10, "Motor/Encoder Cables." ]

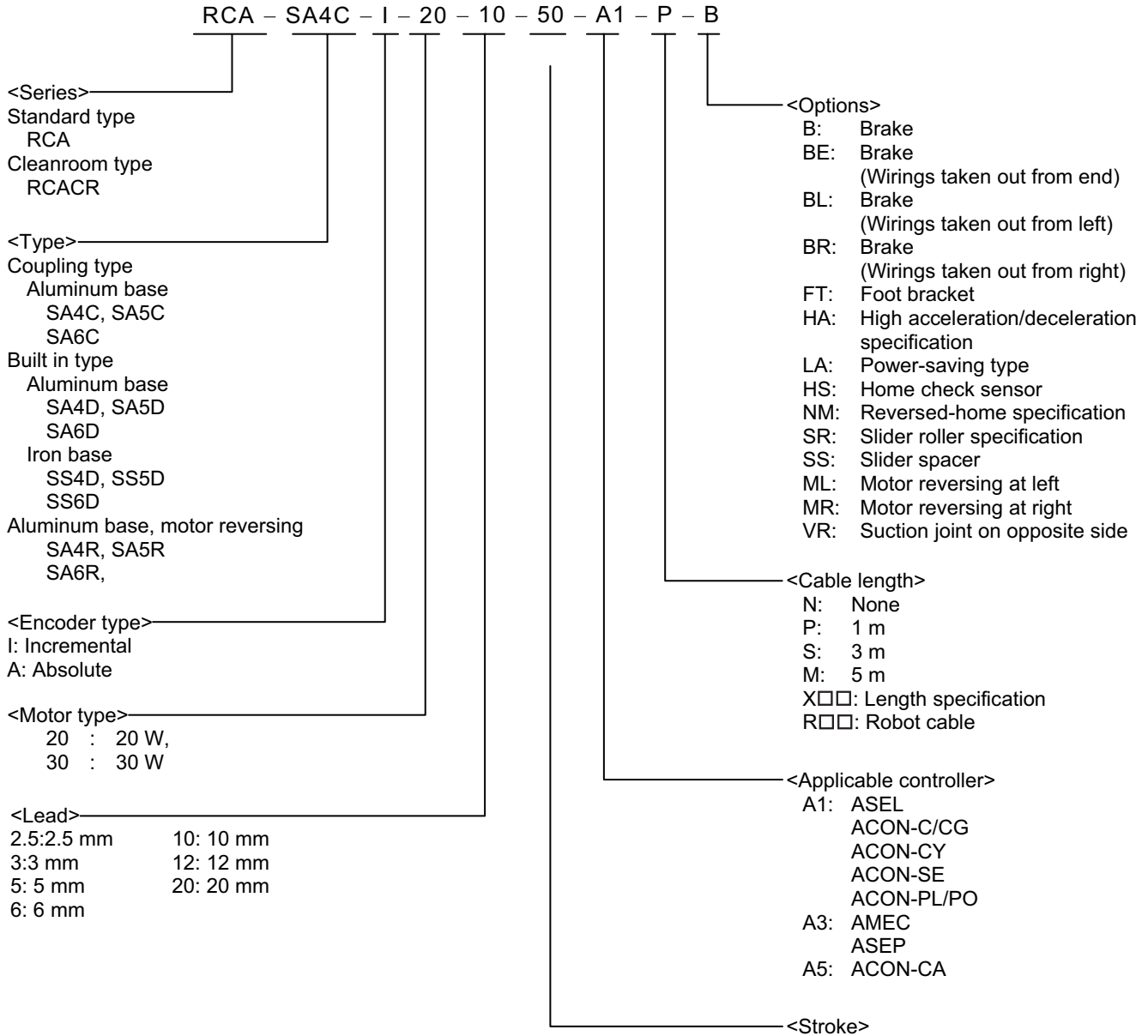
### 1.2 Operation Manuals for Controllers Supported by This Product

No.	Name	Control No.
1	Operation Manual for ASEL Controller	ME0165
2	Operation Manual for ACON-C/CG/CF Controller	ME0176
3	Operation Manual for ACON-CY Controller	ME0167
4	Operation Manual for ACON-SE Controller	ME0171
5	Operation Manual for ACON-PL/PO Controller	ME0166
6	Operation Manual for MEC Controller	ME0245
7	Operation Manual for ASEP/PSEP Controller	ME0216
8	Operation Manual for PC Software IA-101-X-MW/IA-101-X-USBMW	ME0154
9	Operation Manual for PC Software RCM-101-MW/RCM-101-USB	ME0155
10	Operation Manual for MEC PC Software	ME0248
11	Operation Manual for Teaching Pendant SEL-T/TD	ME0183
12	Operation Manual for Teaching Pendant CON-T/TG	ME0178
13	Operation Manual Touch Panel Teaching Pendant CON-PT/PD/PG	ME0227
14	Operation Manual for Touch Panel Teaching Pendant SEP-PT	ME0217
15	Operation Manual for Simple Teaching Pendant RCM-E	ME0174
16	Operation Manual for Data Setter RCM-P	ME0175
17	Operation Manual for Touch Panel Display RCM-PM-01	ME0182

## 1.3 How to Read Model Nameplate



## 1.4 How to Read Model Number





## 2. Specification

### (1) Maximum speed

The maximum speed of the actuator is limited to prevent resonance of the ball screw shaft and also in consideration of the restrictions on motor speed.

Observe the maximum speed limits specified below.

Strokes and maximum speed limits (unit: mm/sec)

Type	Lead (mm)	Stroke (mm)											
		50	100	150	200	250	300	350	400	450	500	550	600
SA4	2.5	165								-	-	-	-
	5	330								-	-	-	-
	10	665								-	-	-	-
SS4	2.5	165						-	-	-	-	-	-
	5	330						-	-	-	-	-	-
	10	665						-	-	-	-	-	-
SA5 SS5	3	200								190	-	-	
	6	400								380	-	-	
	12	800								760	-	-	
SA5C	20	Installed horizontally: 1300 Installed vertically:800								-	-	-	
SA6 SS6	3	200								190	160	135	
	6	400								380	320	270	
	12	800								760	640	540	
SA6C	20	Installed horizontally: 1300 Installed vertically:800								1160	990	-	



**Caution:** Do not set any speed or acceleration/deceleration exceeding the rated speed or acceleration/deceleration. Doing so may result in vibration, failure or shorter life. When combining multiple axes and synchronizing their operations, the speed and acceleration/deceleration to be set should correspond to the highest speed and largest acceleration/deceleration among those of the combined axes. In particular, exercise caution because setting an acceleration/deceleration exceeding the rated acceleration/deceleration may cause the actuator to suffer creep or the coupling to slip.

(2) Maximum acceleration and maximum payload capacity

[Standard Specification/Power-saving Type]

Type	Motor output (W)	Lead (mm)	Rated acceleration (G)	Maximum acceleration (G)	Maximum payload capacity (kg)	
					Horizontal	Vertical
SA4 SS4	20 W	2.5	0.2G	0.2G	8	4.5
		5	0.3G	0.3G	6	2.5
		10	0.3G	0.3G		
SA5 SS5	20 W	3	0.2G	0.2G	12	4
		6	0.3G	0.3G	8	2
		6	0.3G	0.3G		
SA5C	20 W	20	Installed horizontally : 0.3 G Installed vertically : 0.2 G	Installed horizontally : 0.3 G Installed vertically : 0.2 G	2	0.5
SA6 SS6	30 W	3	0.2G	0.2G	18	6
		6	0.3G	0.3G	12	3
		12	0.3G	0.3G	6	1.5
SA6C	30 W	20	Installed horizontally : 0.3 G Installed vertically : 0.2 G	Installed horizontally : 0.3 G Installed vertically : 0.2 G	3	0.5

[High-acceleration/deceleration Type]

Type	Motor output (W)	Lead (mm)	Rated acceleration (G)	Maximum acceleration (G)	Maximum payload capacity (kg)	
					Horizontal	Vertical
RCA-SA4C	20 W	5	0.3G	1.0G	6	2.5
		10	0.3G	1.0G	4	1
RCA-SA5C	20 W	6	0.3G	0.8G	8	2
		12	0.3G	0.8G	4	1
		20	Installed horizontally : 0.3 G Installed vertically : 0.2 G	Installed horizontally : 0.8 G Installed vertically : 0.2 G	2	0.5
RCA-SA6C	30 W	6	0.3G	1.0G	12	3
		12	0.3G	1.0G	6	1.5
		20	Installed horizontally : 0.3 G Installed vertically : 0.2 G	Installed horizontally : 0.8 G Installed vertically : 0.2 G	3	0.5



Caution: Even when the acceleration is less than the rated acceleration, the payload capacity will not exceed the payload capacity at the rated acceleration

**(3) Rated thrust**

Type	Motor output (W)	Lead (mm)	Rated thrust (N)
SA4 SS4	20 W	2.5	78.4
		5	39.2
		10	19.6
SA5 SS5	20 W	3	65.7
		6	33.3
		12	16.7
SA5C	20 W	20	10.7
SA6 SS6	30 W	3	96.8
		6	48.4
		12	24.2
SA6C	30 W	20	15.8

**(4) Driving method**

Type	Motor output (W)	Lead (mm)	Encoder pulses <sup>*1</sup>	Driving method		
SA4 SS4	20 W	2.5	800	Ball screw ∅ 8 mm	Rolled, C10	
		5				
		10				
SA5 SS5	20 W	3				
		6		Ball screw ∅ 10 mm	Rolled, C10	
		12				
SA5C	20 W	20				Ball screw ∅ 10 mm
SA6 SS6	30 W	3		Ball screw ∅ 10 mm	Rolled, C10	
		6				
		12				
SA6C	30 W	20			Ball screw ∅ 10 mm	Rolled, C10

\*1. Number of pulses input to the controller.

16,384 pulses are input when an absolute actuator is used with an ASEL controller.

(5) Common specifications

Item	Specification	
	SA5C, SA6C-Lead other than 20 mm	SA5C, SA6C-Lead 20 mm
Positioning repeatability <sup>*1</sup>	±0.02 mm	±0.03 mm
Backlash <sup>*1</sup>	0.1 mm or less	0.1 mm or less
Base	Material: Aluminum with special alumite treatment	

\*1. Default value.

## (6) Load on the actuator

The allowable moments and allowable overhang load lengths of respective actuators are listed below. Make sure the allowable values applicable to your actuator are not exceeded.

Dynamic allowable moments

Model	Ma	Mb	Mc
SA4 SS4	3.29 N·m (0.33 kgf·m)	4.71 N·m (0.48 kgf·m)	8.07 N·m (0.82 kgf·m)
SA5 SS5	5.81 N·m (0.59 kgf·m)	8.30 N·m (0.85 kgf·m)	14.8 N·m (1.51 kgf·m)
SA6 SS6	11.6 N·m (1.18 kgf·m)	16.6 N·m (1.69 kgf·m)	24.6 N·m (2.51 kgf·m)

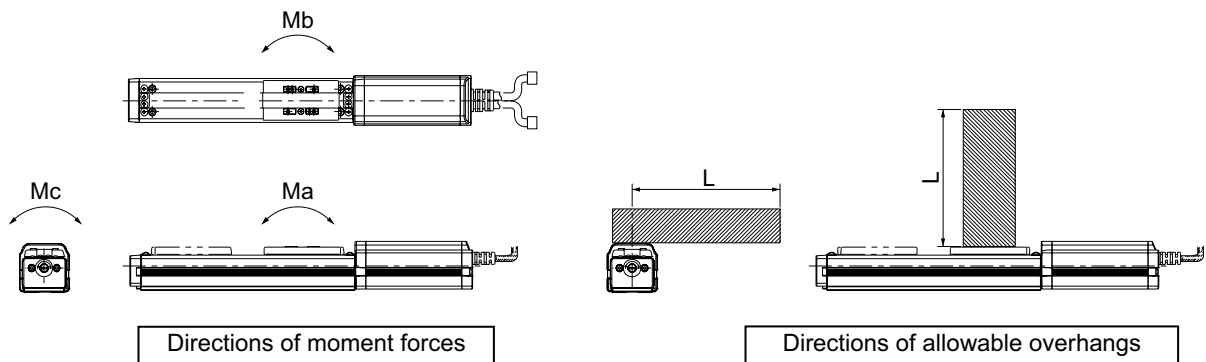
Static allowable moments

Model	Ma	Mb	Mc
SA4 SS4	6.9 N·m (0.7 kgf·m)	9.9 N·m (1.0 kgf·m)	17.0 N·m (1.73 kgf·m)
SA5 SS5	18.6 N·m (1.9 kgf·m)	26.6 N·m (2.71 kgf·m)	47.5 N·m (4.85 kgf·m)
SA6 SS6	38.3 N·m (3.91 kgf·m)	54.7 N·m (5.58 kgf·m)	81.0 N·m (8.27 kgf·m)

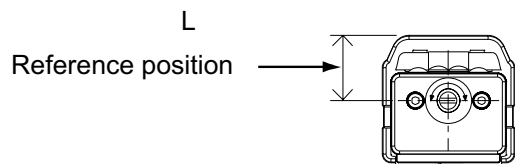
Allowable overhang lengths

Model	Ma	Mb	Mc
SA4 SS4	120 mm or less	120 mm or less	120 mm or less
SA5 SS5	150 mm or less	150 mm or less	150 mm or less
SA6 SS6	220 mm or less	220 mm or less	220 mm or less

- The allowable overhang lengths are based on a configuration where the center of gravity of the load mounted on the actuator corresponds to the center of the overhang length.



(Note) To calculate the moments in  $M_a$  and  $M_c$  directions, shift the reference position by  $L$  mm from the top face of the slider, as shown below.

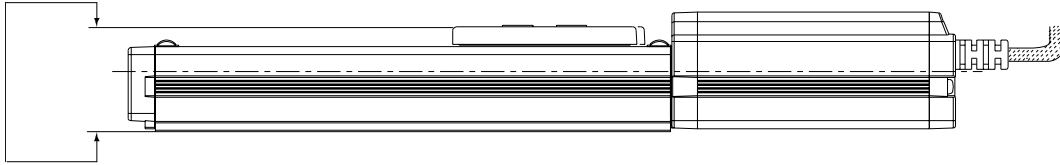


	L
SA4 SS4	31.2 mm
SA5 SS5	39 mm
SA6 SS6	40 mm

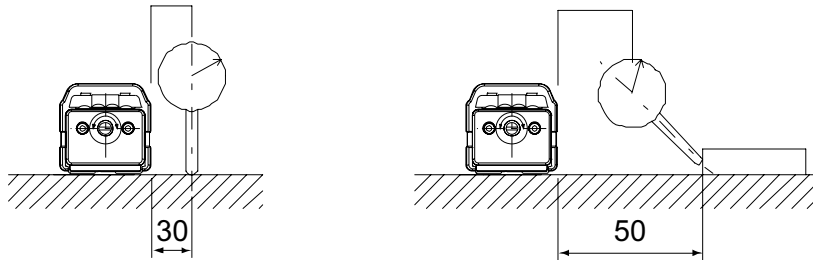
(7) Actuator accuracy

[1] Actuator installation surface

The parallelism between the actuator installation surface (bottom face of the base) and load installations surface (top face) shall be 0.1 mm/m or less at any position over the stroke.



[2] The traveling parallelism shall be 0.05 mm/m or less after the actuator has been installed (secured on a flat smooth surface<sup>\*1</sup>).



Condition: The above values have been calculated at 20°C.

\*1 Parallelism: 0.05 mm/m or less

### 3. Life

The mechanical life of the actuator is represented by that of the guide receiving the greatest moment load. Operation life of the linear guide is to be determined by the total driving distance which can reach without having 90% flaking (peeling on rail surface).

Operation life can be figured out with the calculation method shown below.

#### 3.1 How to Calculate Operation Life

For the operation life of the linear guide, use the dynamic allowable moment stated in 2. Specifications, and figure out with the formula below.

$$L = \left( \frac{C_M}{M} \right)^3 \cdot 5000\text{km}$$

L : Operation life (km)     $C_M$  : Dynamic allowable moment (N·m)  
M : Moment to work (N·m)    5000km : Standard rated life of ROBO cylinder

In addition, have a calculation for the drop of life with the formula below if there is a concern that the life could drop due to the condition of vibration or way to be attached.

$$L = \left( \frac{C_M}{M} \cdot \frac{f_{ws}}{f_w} \cdot \frac{1}{f_\alpha} \right)^3 \cdot 5000\text{km}$$

L : Operation life (km)     $C_M$  : Dynamic allowable moment (N·m)  
M : Moment to work (N·m)     $f_{ws}$  : Standard operational coefficient  
 $f_w$  : Load coefficient     $f_\alpha$  : Attachment coefficient  
5000km : Standard rated life of ROBO cylinder

Explained below is regarding the standard operational coefficient  $f_{ws}$ , load coefficient  $f_w$  and attachment coefficient  $f_\alpha$ .

Refer to the contents below to set them up.

[Standard operational coefficient  $f_{ws}$ ]

For ROBO Cylinders described in this manual,  $f_{ws} = 1.2$ . It is a coefficient defined for each model, some models such as RCS3 high-speed type is 1.35.




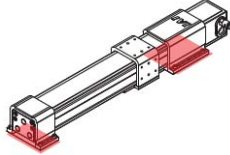
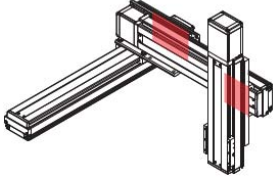
[Load coefficient  $f_w$ ]

It is a coefficient to consider the life drop due to operational conditions.

Load coefficient $f_w$	Operation Condition	Reference for acceleration/deceleration
1.0 to 1.5	Small vibration or impact in slow operation	0.1G or less

[Attachment coefficient  $f_\alpha$ ]

Attachment coefficient  $f_\alpha$  is a coefficient to consider the life drop due to the condition of actuator attachment.

Attachment coefficient $f_\alpha$	1.0	1.2	1.5
	Attachment in whole area	Attachment on both ends	Attachment on spots
Attached condition			

\* As the figures are those in common for each manual, they are not for RCA/RCACR Slider Type.

Replace to figures for RCA/RCACR Slider Type and select the attachment coefficient.

\* Even when in attachment in whole area, and the actuator is seated in the whole length of the product, select 1.2 or 1.5 for the attachment coefficient depending on the position of screw fixing.

\* For attachment in whole area, use all of the tapped holes (counterbored holes) on the seat surface to fix.

## 3.2 Operation Life

The operation life depends on the moment to work. With light load, it will be longer than 5,000km, the standard rated life. With no consideration of vibration and attachment condition, the operation life is 40,000km according to the calculation with formula in the previous page under assumption that  $0.5C_M$  (half of dynamic allowable moment) of moment is applied on. It shows that it can be 8 times longer than the standard rated life, which is 5,000km.

## 4. Operating and Storage/Preservation Environment

### 4.1 Operating Environment

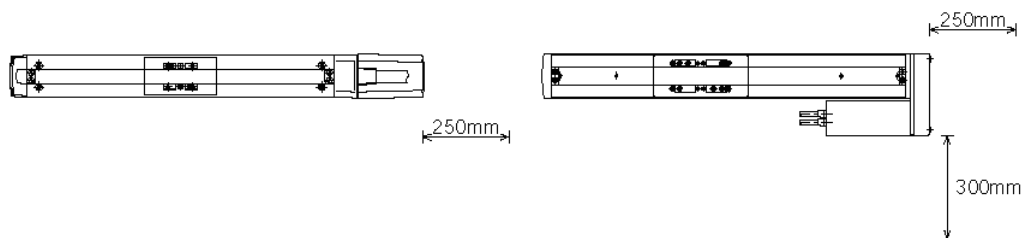
The actuator should be set up in an environment, which meets the following criteria:

- Avoid direct sunlight.
- Avoid radiant heat from strong heat sources such as a furnace.
- Ambient temperature should be 0 ~ 40°C.
- The humidity should be less than 85% and there should be no condensation.
- Avoid exposure to corrosive or combustible gases.
- The area should have very little dust and be suitable for normal assembly operations.
- Avoid exposure to oil mist or fluids used in cutting.
- Not subject to impact or vibration.
- Avoid extreme electromagnetic waves, ultraviolet rays and radiation.
- This product is not intended to be used in a chemical environment.

In general, the environment should be one in which an operator can work without protective gear.

Work space needed for maintenance/inspection  
[Motor straight type]

[Motor reversing type]



### 4.2 Storage/Preservation Environment

The storage/preservation environment should be similar to the operating environment. In addition, you must take precautions against condensation if the unit is to be stored/preserved for a long period of time. Unless there are special instructions, we do not include moisture absorption agents when shipping the unit. If you are storing/preserving the unit where condensation might occur, then you must treat the entire package or treat the unit itself after it is unpacked to prevent condensation. The unit can withstand up to 60°C during a short storage/preservation interval but only up to 50°C if the storage/preservation period is longer than one month.

## 5. Installation

How to install the actuator on/in a mechanical system is explained

### 5.1 Insallation

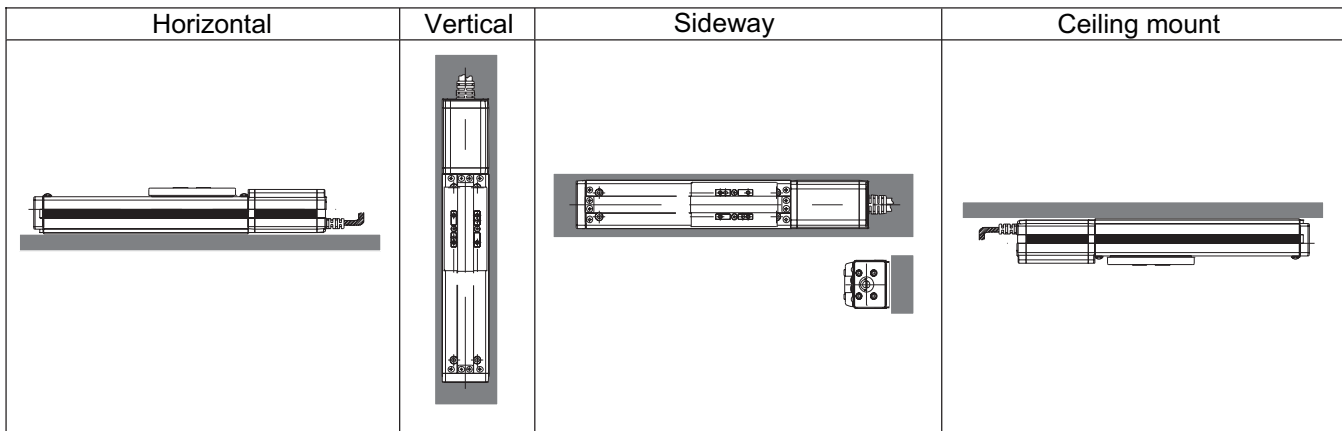
Install the actuator as explained below, as a rule.

Pay attention to these items when installing the actuator (except for custom-order models).

○: Installable    △: Daily inspection is required    x: Not installable

Horizontal installation	Vertical installation	Sideway installation	Ceiling mount installation
○	○	△	△

Installation postures



**Caution:** 1. When the unit is installed vertically oriented, attempt to put the motor up unless there is a special reason. Putting the motor on the lower side would not cause a problem in an ordinary operation. However, it may rarely cause a problem, when it is not operated for a long period, depending on the surrounding environment (especially high temperature), caused by the grease being separated and the base oil flowing into the motor unit.

2. The clean room types listed below cannot be guaranteed to meet Cleanliness Class 10 if they are installed in the vertical orientation, the horizontally wall mounted orientation or in the ceiling mounted orientation since they do not possess a structure to grip the stainless steel sheet from the side cover.

Please contact us if it is necessary to install the following models in an orientation other than the horizontal orientation.

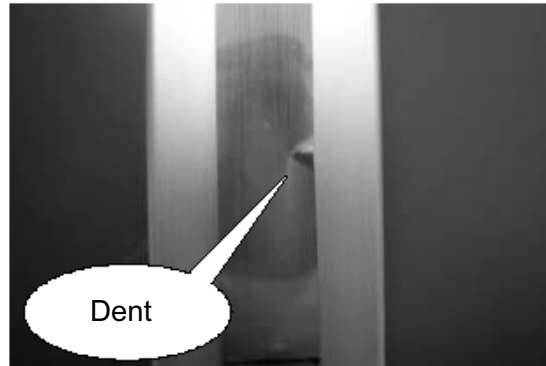
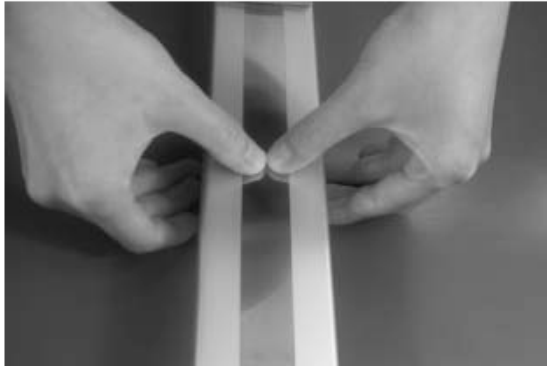
Actuator Model : RCACR-SA5D, RCACR-SA6D

3. Can be installed sideways or ceiling mount, but the actuators must be checked daily. If the actuator is installed sideways or ceiling mount, the stainless sheet may be slacked or displaced. If the actuator is used continuously while the stainless sheet is slacked or displaced, the stainless sheet may break or other problems may occur. Check the actuator daily and if the stainless sheet is found slacked or displaced, make installation adjustment of the stainless sheet. [Refer to 11,8 “Replacing/Adjusting the Stainless Sheet.”]

## 5.2 Note on Installation

The stainless sheet is designed very thin (thickness: 0.1 mm) in order to ensure flexibility. Therefore, the stainless sheet is easily dented or scratched. Once dented or scratched, the stainless sheet may break during use. When installing the stainless sheet, pay attention to the following points:

1. Do not press the sheet directly with hands.
2. Protect the sheet from dents by paying attention not to drop tools and work parts onto the sheet.



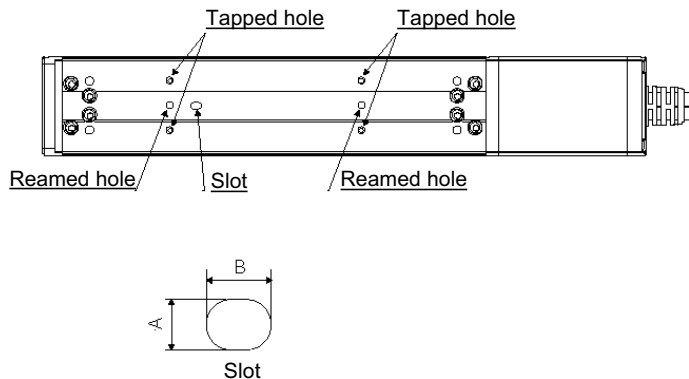
3. Do not allow powder dust or iron powder to generate around the stainless sheet.  
If generation of powder dust/iron powder cannot be fully prevented, wipe the stainless sheet after the operation to remove all particles attached to the sheet.  
If the actuator is operated with the stainless sheet carrying foreign particles, the particles may enter the slider and damage the sheet or cause the sheet to deform, lift or present other problems.

### 5.3 Installing the Main Body

**Mount the actuator to a machined surface or one of comparable precision.**

The side faces and lower surface of the base run parallel with the guides. When traveling precision is required, use these as the reference planes for mounting. Take note that the available mounting methods are different for each actuator type.

#### 5.3.1 Using the Tapped Holes at Back of the Base (All Types Excluding SS)

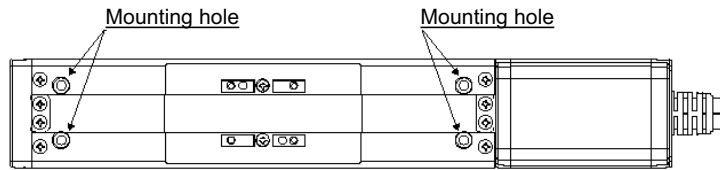


Tapped holes are provided on the back of the base for mounting the actuator. Install the actuator using these tapped holes. The sizes and effective depths of tapped holes are listed below. Be careful not to let the ends of bolts project from the holes. If necessary, use the additional reamed holes that are provided for positioning purpose.

(Two reamed holes are provided, one on the motor side and the other on the counter-motor side. One slot is provided on the counter-motor side.)

Type	Tap size	Tap depth	Reamed hole	Slot
SA4C, D	M3	5 mm	∅ 3H7, depth 5 mm or less	A: 3H7, B: 4, depth 5 mm or less
SA5C, D	M4	7 mm	∅ 4H7, depth 5 mm or less	A: 4H7, B: 5, depth 5 mm or less
SA6C	M5	8 mm	∅ 4H7, depth 5 mm or less	A: 4H7, B: 5, depth 5 mm or less
SA6D	M5	9 mm	∅ 4H7, depth 5 mm or less	A: 3H7, B: 4, depth 5 mm or less
SS4D	M3	5 mm	-	-
SS5D	M4	5 mm	-	-
SS6D	M5	6 mm	∅ 4H7, depth 4 mm or less	-

## 5.3.2 Using the Mounting Holes on Top of the Base (SA4 of 200 mm or Shorter Strokes/SA5 of 300 mm or Shorter Strokes)



Four through holes (two on the motor side and two on the counter-motor side) are provided in the base for installing the actuator on its top face. Use these mounting holes to install the actuator. When installing the actuator using these mounting holes alone, take heed of the following points:

1. SA4: Applicable to models of 200 mm or shorter strokes only
2. SA5: Applicable to models of 300 mm or shorter strokes only
3. SA6: Mounting holes are not provided.

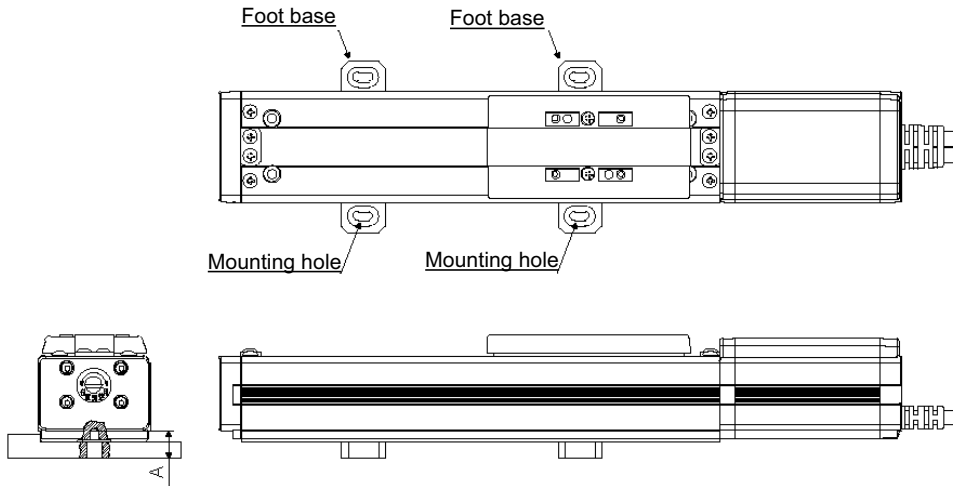
If any model other than those specified in 1 and 2 (longer stroke) is installed using the mounting holes alone, the base may deform and the slider may slide abnormally, generate noise or present other problems.

As for mounting bolts, use hexagon socket-head bolts conforming to the applicable specification in the table below in accordance with the machine frame material.

If necessary, the reamed holes/slot can be used as positioning pin holes. [Refer to 5.3.1.]

Type	Mating material is steel	Mating material is aluminum
SA4, SS4	M3, length 35 mm or more	
SA5, SS5	M4, length 40 mm or more	M4, length 45 mm or more

## 5.3.3 Using Foot Bases (Optional)



By using foot bases (optional), the actuator can be installed on its top face using the mounting holes in the foot bases.

Foot bases provide an effective means for installing the SA4 models of strokes exceeding 200 mm, S5A models of strokes exceeding 300 mm, or all SA6 models.

As for mounting bolts, use hexagon socket-head bolts and flat washers conforming to the applicable specification in the table below in accordance with the machine frame material.

If necessary, the reamed holes/slot can be used as positioning pin holes. [Refer to 5.3.1.]

The depth of reamed holes/slot must conform to dimension A. (Dimension A considers the foot base thickness.)

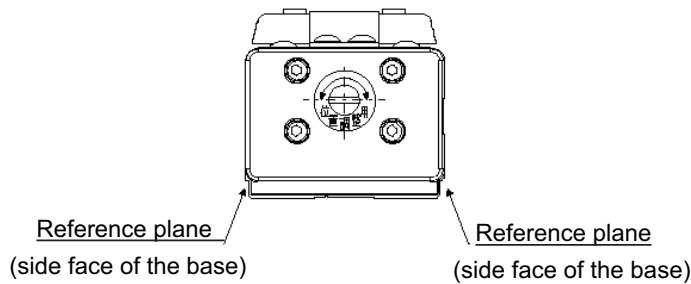
Type	Mating material is steel	Mating material is aluminum	Flat washer	Dimension A
SA4	M4, length 8 mm or more	M4, length 12 mm or more	Nominal diameter 4	12 mm
SA5	M4, length 8 mm or more	M4, length 12 mm or more	Nominal diameter 4	13 mm
SA6	M5, length 10 mm or more	M5, length 15 mm or more	Nominal diameter 5	14 mm

## 5.4 Installation Surface

- The mounting table should have sufficient rigidity to avoid generating vibration.
- The surface where the actuator will be mounted should be machined or be equally level and the flatness tolerance between the actuator and the table should be within 0.05 mm.
- Provide enough space around the actuator to permit maintenance work to be done.

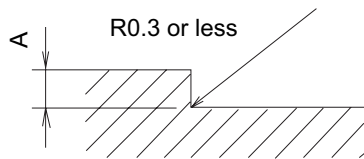
### 5.4.1 Using Side Faces of the Base as Reference Planes

- The side and bottom faces of the actuator base provide the reference planes for slider travel.
- When precision is required, use these surfaces as the reference planes for mounting.



**Caution:** As shown above, the side faces of the base provide the reference planes for slider travel. When precision is required, use these surfaces as the reference planes for mounting

When using the base as the reference planes for mounting the actuator to the machine frame, follow the machining dimensions shown below.

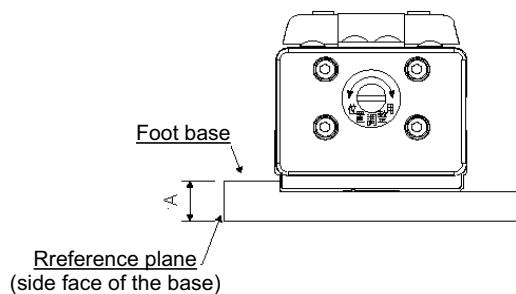


Type	Dimension A
SA4	2 to 3 mm
SA5	2 to 4.5 mm
SA6	2 to 4.5 mm
SS4	2 to 3 mm
SS5	2 to 3.5 mm
SS6	2 to 3.5 mm



## 5.4.2 Using Side Faces of the Foot Base as Reference Planes (If Equipped with Optional Foot Bases)

- The side faces of the foot base provide the reference planes for slider travel.
- When precision is required, use these surfaces as the reference planes for mounting.



Type	Dimension A
SA4	9.5 mm
SA5	11 mm
SA6	12 mm

## 5.5 Clamp Screws

- The male screws for mounting the base should be M3 for SA4/SS4, M4 for SA5/SS5, and M5 for SA6/SS6. (Use hexagon socket-head bolts).
- For the bolts, we recommend high strength bolts of ISO-10.9 or higher.
- When using a foot base to attach to a mounting table, use the special washer made for high strength bolts that comes with the actuator if the bolt is M8 or larger. This is unnecessary for M6 or smaller bolts. Do not use a common spring washer.
- The recommended screw torque is given below.

Screw nominal diameter	Screw Torque	
	When the bolt seating surface is steel	When the bolt seating surface is aluminum
M3	1.5 N·m (0.15 kgf·m)	0.8 N·m (0.08 kgf·m)
M4	3.6 N·m (0.38 kgf·m)	1.8 N·m (0.23 kgf·m)
M5	7.3 N·m (0.77 kgf·m)	3.4 N·m (0.44 kgf·m)

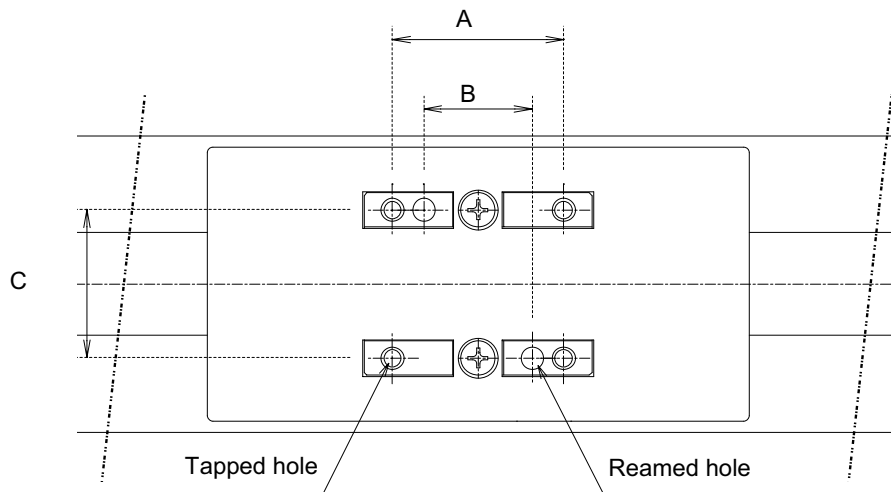
## 5.6 Installing the Load on the Slider

### 5.6.1 Using the Slider

- Tapped holes are provided on the slider for installing the load. The method of clamping varies according to how to mount the main body.
- In case of moving actuator instead of slider, use the same tapped holes on the slider.
- Please use two reamed holes on the slider when repeatability of mounting and dismounting is required. When fine adjustment of the squareness is necessary, use only one reamed hole to allow adjustment.

Sizes and depths of tapped holes and reamed holes on slider

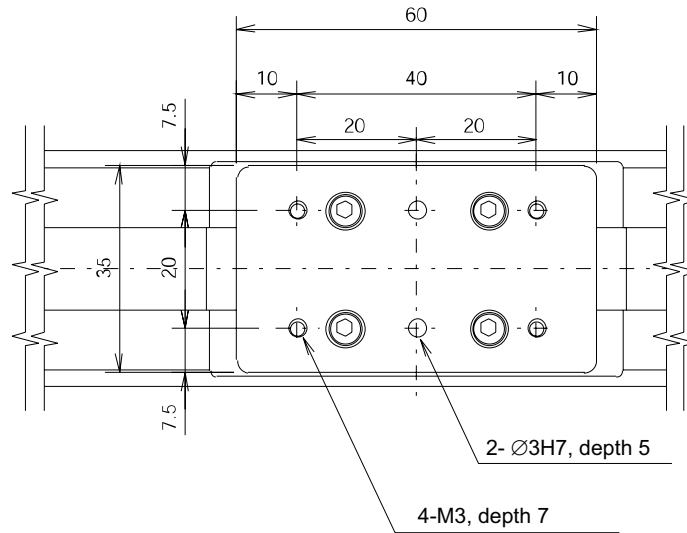
Model	Tap size	Depth of thread	A	B	C	Hole size
SA4	M3	7 mm	24 mm	16 mm	20 mm	∅3 H7, depth 5 mm
SA5	M4	9 mm	30 mm	19 mm	26 mm	∅4 H7, depth 6 mm
SA6	M5	9 mm	50 mm	32 mm	31 mm	∅5 H7, depth 6 mm
SS4	M3	5 mm	24 mm	-	20 mm	-
SS5	M4	5 mm	30 mm	-	26 mm	-
SS6	M5	6 mm	50 mm	32 mm	31 mm	∅5 H7, depth 6 mm or less



**Caution:** When installing the load, do not let adhesives, paints or other viscous substances attach the stainless sheet. Also, avoid applying a concentrated force that will dent the sheet. It may cause the slider to malfunction or damage the sheet.

## 5.6.2 Using a Sub Slider (Optional) (Optional for SA4 Type)

For the SA4 type, a sub-slider is available as an option.  
The figure below shows the positions of load-mounting holes in actuators with a sub-slider.



## 5.7 Cleanroom Specification

**⚠ Caution:** The clean room types listed below cannot be guaranteed to meet Cleanliness Class 10 if they are installed in the vertical orientation, the horizontally wall mounted orientation or in the ceiling mounted orientation since they do not possess a structure to grip the stainless steel sheet from the side cover.  
 Please contact us if it is necessary to install the following models in an orientation other than the horizontal orientation.  
 Actuator Model : RCACR-SA5D, RCACR-SA6D

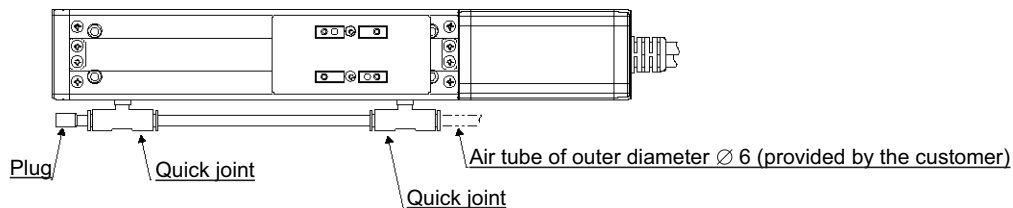
### 5.7.1 Suction Rate

Air inside the actuator must be suctioned to ensure that the actuator operates in conformance with the requirements of cleanliness class 10.  
 Provide an air tube and connect it to a quick joint (outer diameter  $\varnothing 6$ ) provided at the suction section, and connect the other end of the tube to a vacuum pump, blower, ejector, etc., to suction at an applicable flow rate as specified below.

Lead	Recommended suction rate
2.5 mm/3 mm	15 NI/min
5 mm/6 mm	30 NI/min
10 mm/12 mm	50 NI/min
20 mm	80 NI/min

### 5.7.2 Suction Joint

Remove the plug from either quick joint and insert an air tube to suction air from either the motor side or counter-motor side.  
 Remember to cover the unused joint with a plug.



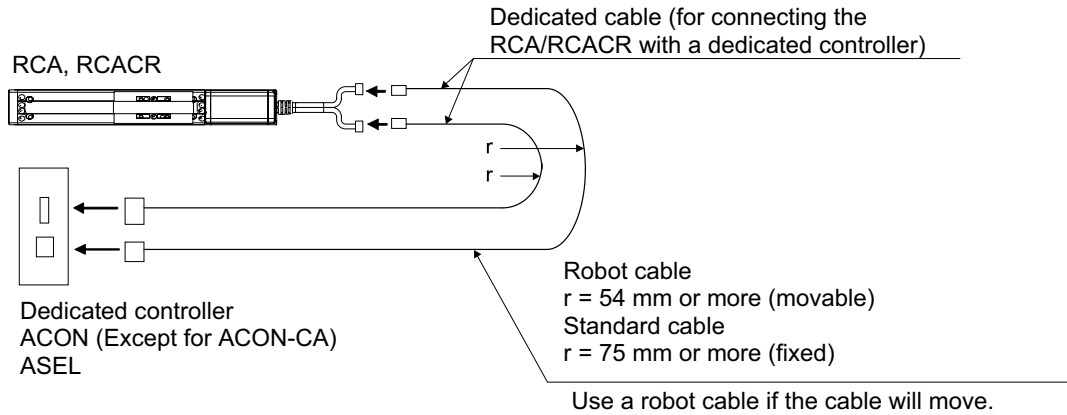
## 6. Connecting to the Controller

### 6.1 Wiring

- If the cable cannot be secured in your specific application, make sure the actuator is used in such a way that the cable deflects only by its own weight, or use a self-supporting cable hose or other means to ensure a large wiring radius so as to reduce the load received by the cable.
- Do not cut to extend or shorten the cable or reconnect the cut end.
- The standard cable has excellent flexibility, but it is not a robot cable. If the cable is to be stored in a movable wiring duct (such as a cable track), use a robot cable.

If you wish to change the cable, please contact IAI.

[Connection with ACON (Except for ACON-CA)/ASEL Controller]

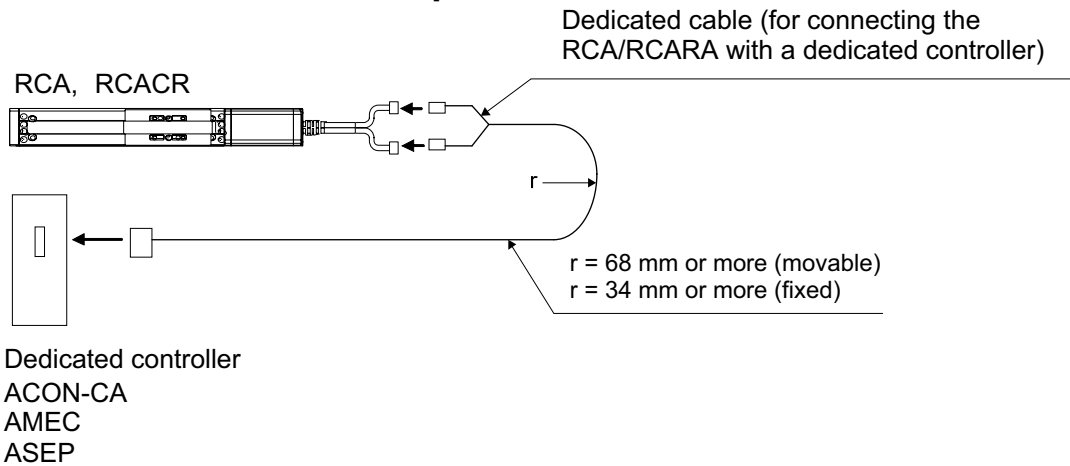


Dedicated cable

- Motor cable (Robot cable) CB-ACS-MA □□□
- Encoder cable CB-ACS-PA □□□/  
Encoder robot cable CB-ACS-PA □□□ -RB

□□□ represents the cable length. A desired length can be specified up to 20 m.  
Example) 080 = 8 m

[Connection with ACON-CA/AMEC/ASEP Controller]



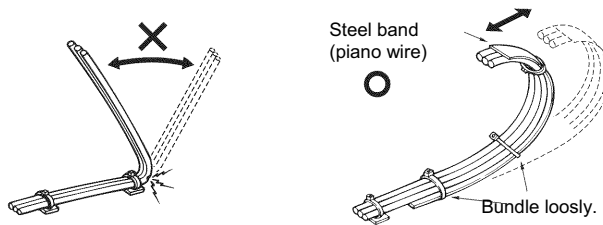
Dedicated cable

- Motor encoder cable CB-ASEP2-MPA □□□

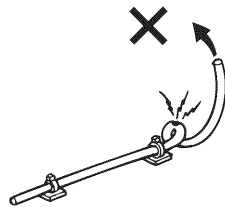
□□□ represents the cable length. A desired length can be specified up to 20 m.  
Example) 080 = 8 m

When building an application system using the actuator and controller, incorrect wiring or connection of each cable may cause broken wire, poor contact or other unexpected problem. The prohibited items relating to cable wiring are explained below.

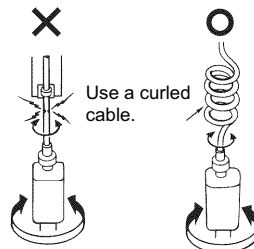
- Do not cut and reconnect the cable to extend or shorten the cable.
- If the cable cannot be secured, reduce the load on the cable by allowing it to deflect only by the weight of the cable or wire it in a self-standing cable hose, etc., having a large radius.
- Prevent the cable from bending at the same point.



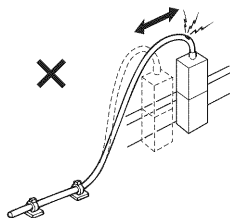
- Do not let the cable bend, kink or twist.



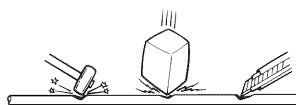
- Do not pull the cable with a strong force.



- Do not let the cable receive a turning force at a single point.

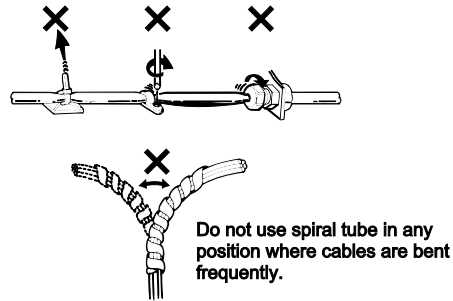


- Do not pinch, drop a heavy object onto or cut the cable.

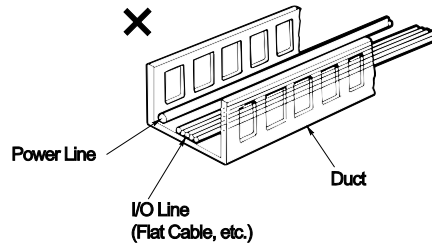




- When fixing the cable, provide a moderate slack and do not tension it too tight.

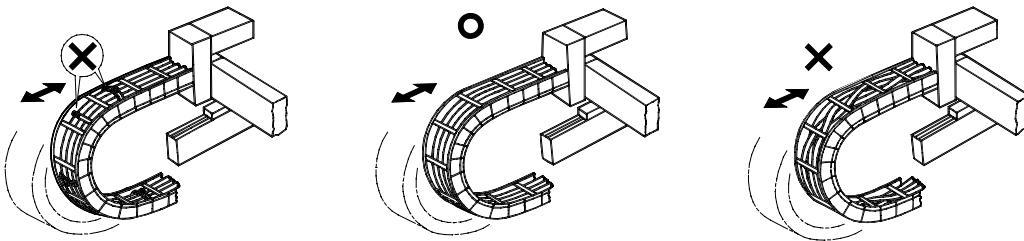


- Separate the I/O and communication lines from the power and drive lines. Do not wire them in the same duct.



Follow the instructions below when using a cable track.

- If there is an indication to the cable for the space factor in a cable track, refer to the wiring instruction given by the supplier when storing the cable in the cable track.
- Avoid getting cables twined or twisted in the cable track, and also having the cables move freely and do not tie them up. (Avoid tension being applied when the cables are bent.)  
Do not pile up cables. It may cause faster abrasion of the sheaths or cable breakage



**Warning:**

- Always turn off the controller power before connecting/disconnecting cables. If cables are connected/disconnected while the power is still supplied, the actuator may malfunction and a serious injury or equipment damage may occur.
- Loose connectors may cause the actuator to malfunction and create a dangerous situation. Be sure to confirm that all connectors are securely connected.

## 7. Setting the Home

### 7.1 Home Return

Home return involves the following operation sequence:

- [1] When a home return command is issued, the actuator moves in the direction specified by the parameter in which the moving direction has been set.
- [2] During this return operation, the mechanical end is detected by the software.
- [3] The actuator reverses at the end and moves until a Z-phase signal is detected, upon which the applicable location is set as the reference point.
- [4] The actuator moves further by the offset set by the parameter, and the attained position is defined as the home.

### 7.2 Fine-tuning the Home Position

How much the motor should turn after the stopper is contacted until a Z-phase signal generates has been adjusted prior to shipment. The table below shows, for each model, the standard distance the actuator travels after the slider contacts the stopper and reverses, until it stops at the home position.

Model name	Distance from mechanical stopper to home [mm]
SA4C, SA4R SA5C, SA5R SA6C, SA6R	Approx. 3 mm
SA4D SS4D	Approx. 2.2 mm
SA5D SS5D SA6D SS6D	Approx. 3 mm

As long as the home return direction remains the same, you can change the setting of an applicable parameter based on the above value to fine-tune the home position for each actuator.

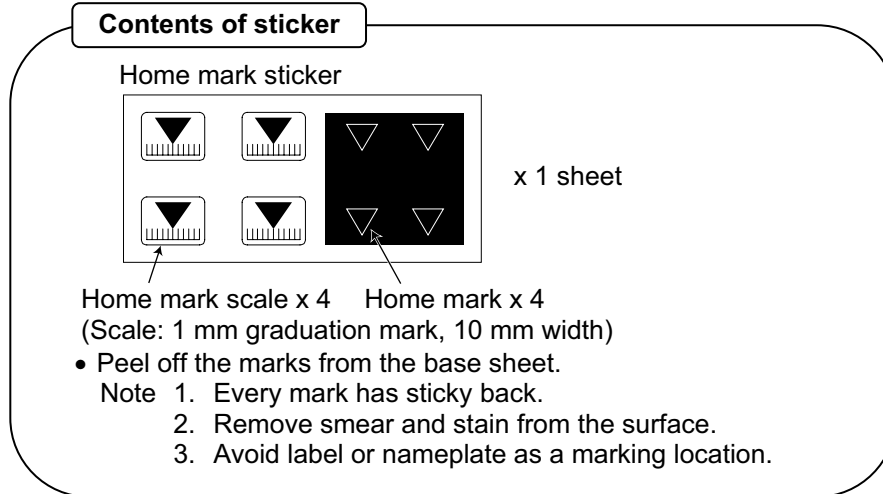
- [1] Perform home return operation to check the home.
- [2] Next, move the actuator to a desired home, check the difference between the two homes, and then correct the home preset parameter when an ASEL controller is used, or home return offset parameter when an ACON controller is used.  
Add or subtract the difference to/from the value currently set.
- [3] If a large offset is provided, the moving range becomes smaller by the corresponding value. If an offset exceeding 1 mm is specified, readjust the stroke limits, as well.

### 7.3 Changing the Direction of Home

If the direction of home is changed after the actuator has been delivered, you may have to adjust the moving direction parameter, and also the encoder's Z-phase on certain models. Please contact IAI.

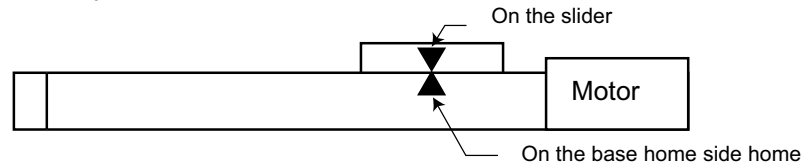
## 7.4 How to use the home mark

- ◆ Please affix these marks to the actuator as home markers as needed.

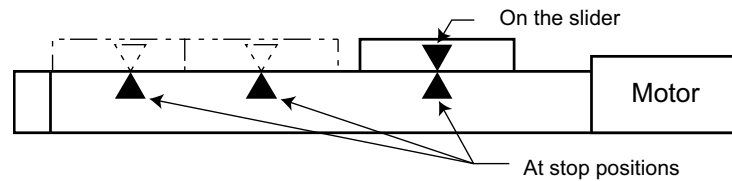


### Example of Use

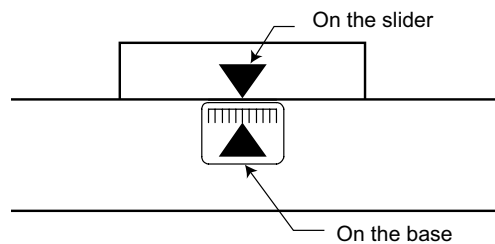
- [1] Used as home position of the actuator



- [2] Used as stop positions



- [3] Used for position deviation check.




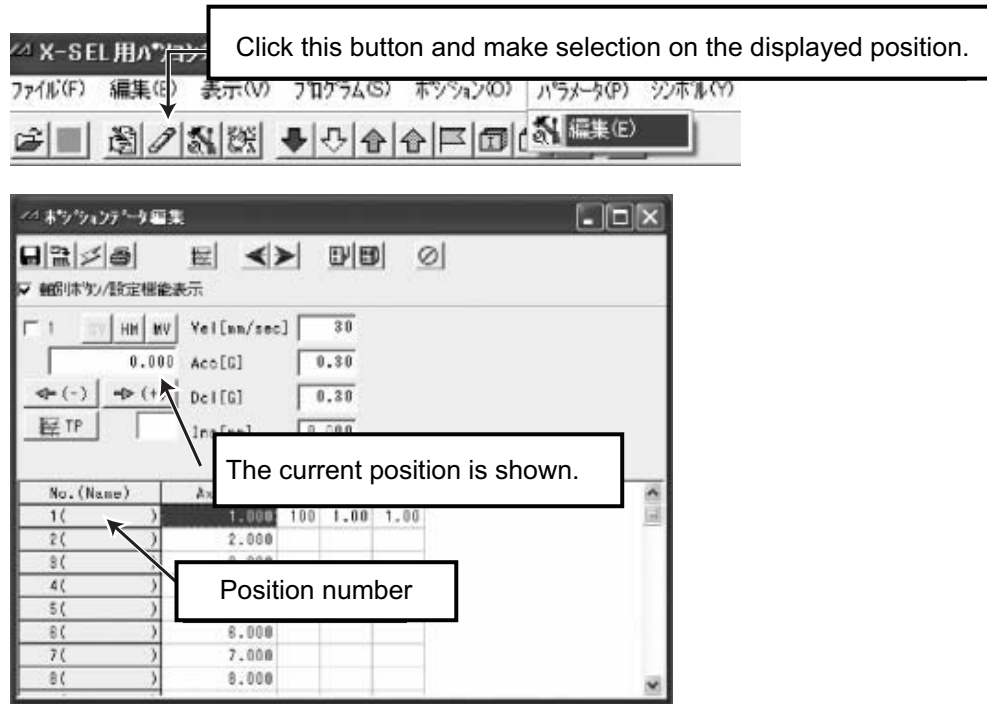
- Place the two marks when the actuator is stopped at home position.

## 7.5 How to Set the Home Preset and Home Return Offset

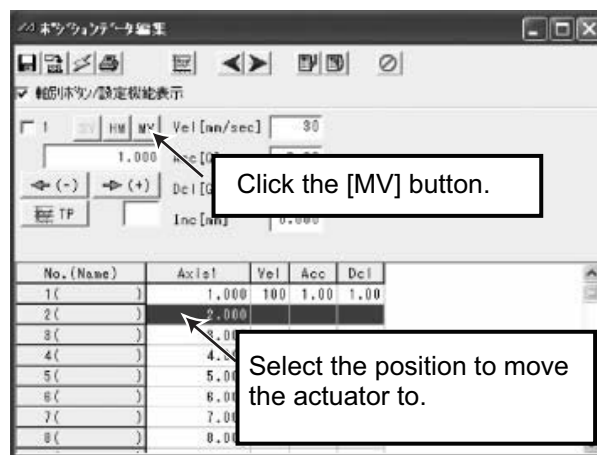
Correct any position deviation by changing the home preset parameter when an ASEL controller is used, or home return offset parameter when an ACON controller is used. How to set each parameter is explained below.

### 7.5.1 ASEL Controller

- Open the position edit screen.  
Click  on the the PC software screen, choose **Select Position Number**, and then click **OK**. The following screen appears.



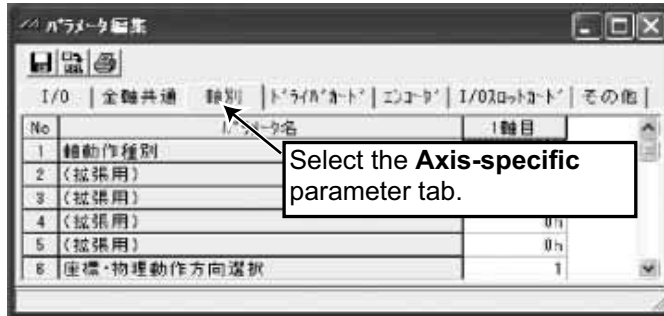
- Compare the value of the current position against that of the position number corresponding to the desired position to which the actuator has been moved, and check the deviation.



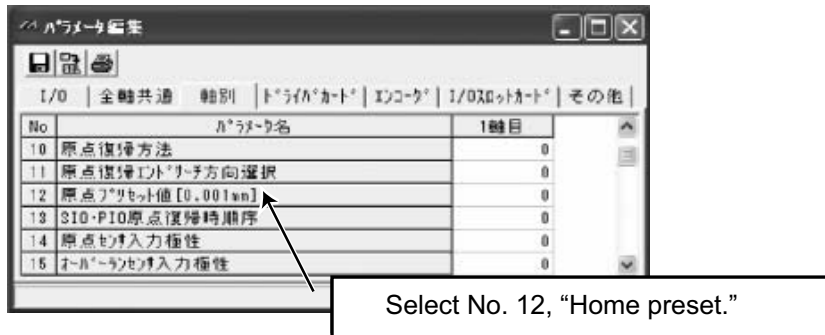
- (3) Select the parameter.



- (4) Select the **Axis-specific** parameter tab.

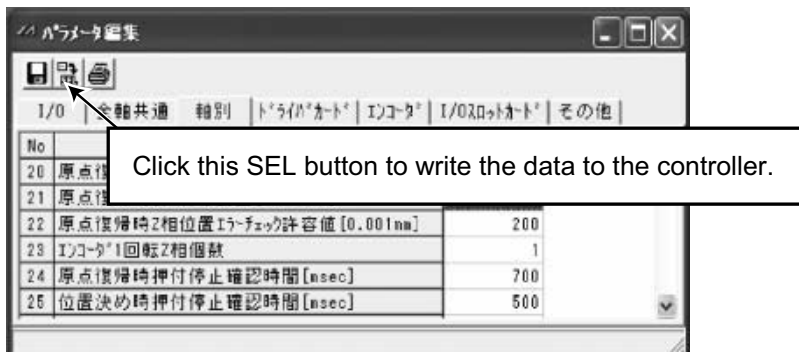


- (5) When the axis-specific parameter screen appears, select No. 12, “Home preset.”



- (6) Change Axis-specific Parameter No. 12 (home preset).  
 Add or subtract the difference measured in (2) to/from the value currently entered.  
 The setting unit is 0.001 mm.  
 Example: When the measured difference is -1 mm:  
 Home preset = Current setting – 1000

- (7) Write the modified data.



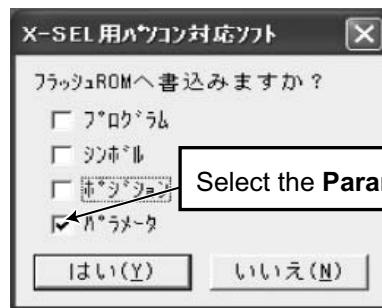
(8) The data is transferred to the controller.



(9) Select **OK**.



(10) Write the data to the flash ROM.



Select the **Parameters** check box.

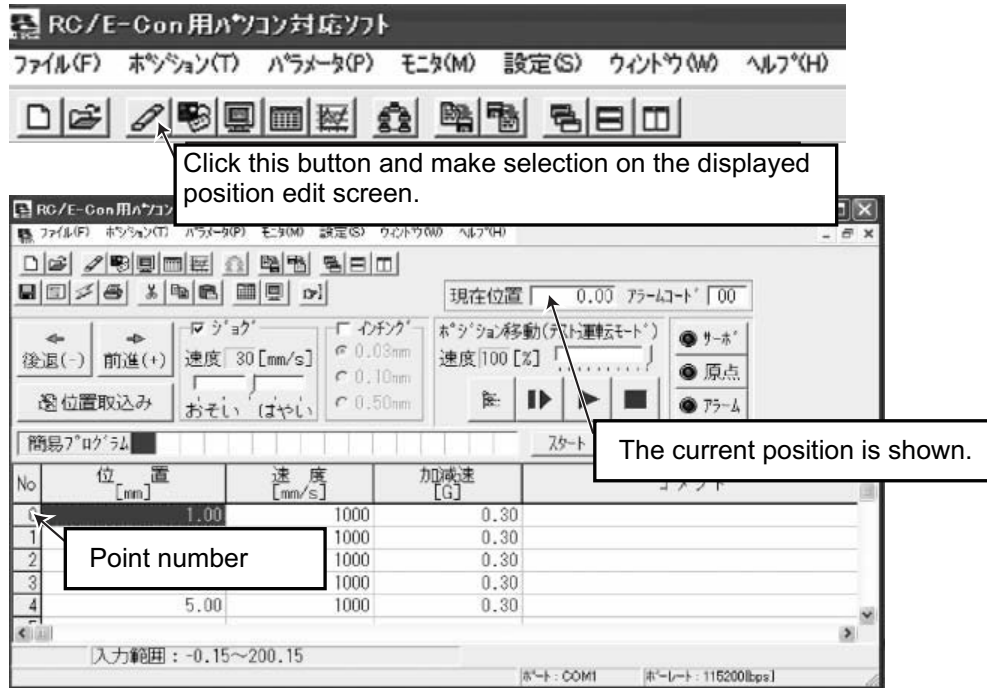
(11) Restart the controller.



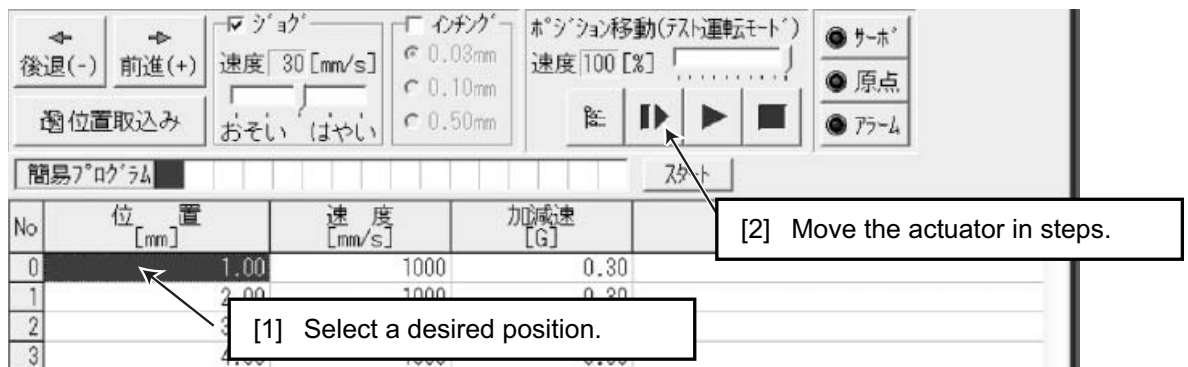
Select **Yes (Y)**.

## 7.5.2 ACON Controller

- Open the position edit screen.  
Click  on the PC software screen, choose **Select Position Number**, and then click **OK**. The following screen appears.



- Compare the value of the current position against that of the position number corresponding to the desired position to which the actuator has been moved.



- (3) Select the parameter.



- (4) Display the user parameter screen.

The screenshot shows a window titled 'パラメータ[No.2]' containing a table of user parameters. The table has three columns: 'No', 'パラメータ名称', and '設定値'. The parameters listed are:

No	パラメータ名称	設定値
9	加減速度初期値[G]	1.00
10	位置決め幅初期値[mm]	0.10
11	(将来の拡張のための予約)	0
12	(将来の拡張のための予約)	35
13	原点復帰時電流制限値[%]	100
14	(将来の拡張のための予約)	0
15	一時停止入力無効選択[0:有効/1:無効]	0
16	SIO通信速度[bps]	38400
17	従局トランスミッタ活性化最小遅延時間(RTIM)[msec]	5
18	原点セキ入力極性[0:不使用/1:a接点/2:b接点]	0
19	(将来の拡張のための予約)	0
20	(将来の拡張のための予約)	0
21	サーボON入力[0:有効/1:無効]	0
22	原点復帰オフセット量[mm]	1.00

- (5) Change User Parameter No. 22 (home return offset).

\* The setting unit is mm.

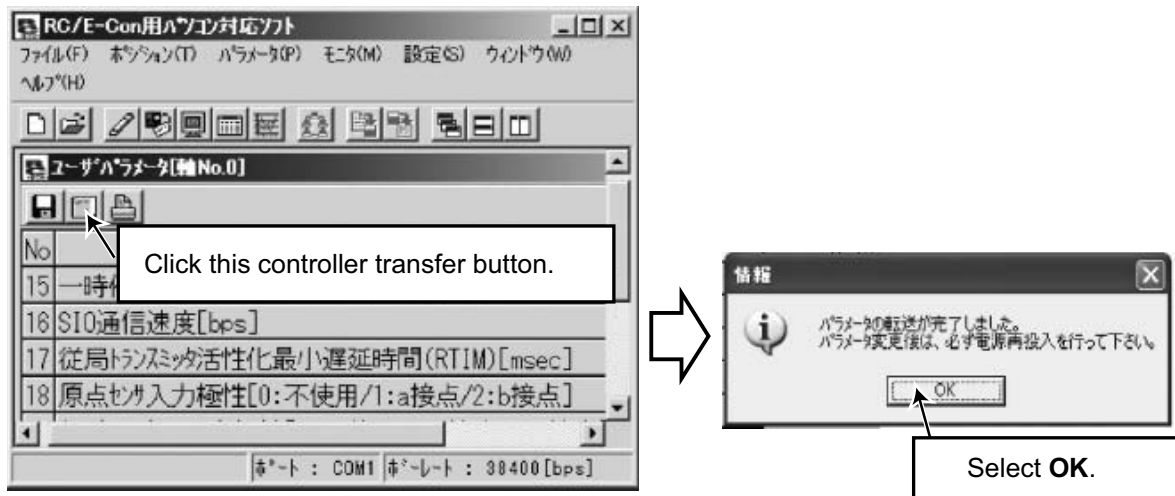
Add or subtract the difference measured in (2) to/from the value currently entered.

Example: When the measured difference is -0.5 mm:

Home return offset = Current setting – 0.5 mm

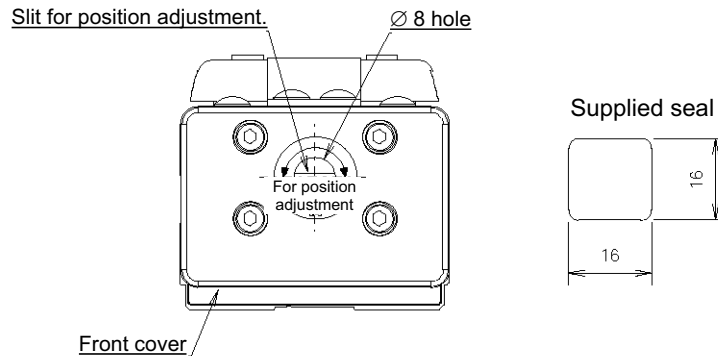


- (6) Write the modified data.  
Click the controller transfer button → OK.  
\* After the data has been written, turn off the controller power.



## 8. Slit for Position Adjustment

A hole is provided in the front cover on the counter-motor side, with a slit machined on the ball screw shaft. Use this slit if you want to fine-tune the slider position (for direct teaching, etc.). Insert a screwdriver with an outer diameter of  $\varnothing 8$  mm or less into the slit, and turn the driver.



**Caution:** Be sure to operate the slit when the servo is off.  
Do not insert a finger or object in this hole while the slider is moving, as it is very dangerous.  
While the slit is not in use, attach the supplied seal or equivalent to cover the hole.  
If the hole remains exposed, a finger or object may enter accidentally, creating a very dangerous situation.  
With the cleanroom specification, leaving this hole open may cause dust and other particles inside the actuator to escape through the hole and affect the cleanliness of the operating room.

## 9. Options

### 9.1 Brake

The brake is a mechanism to hold the slider in place when the actuator is used vertically, to prevent the slider from dropping and thereby damaging the work as the power or servo is turned off.

If an axis is used vertically, it needs an optional brake.

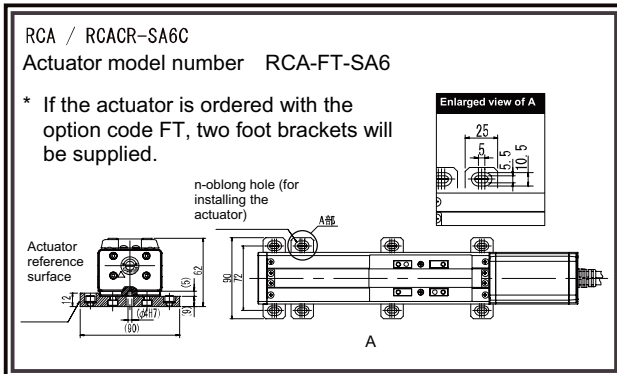
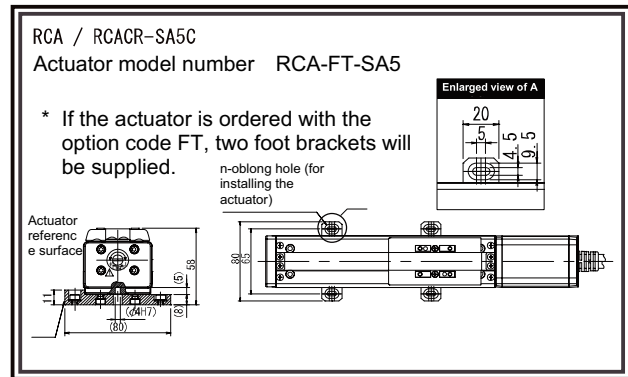
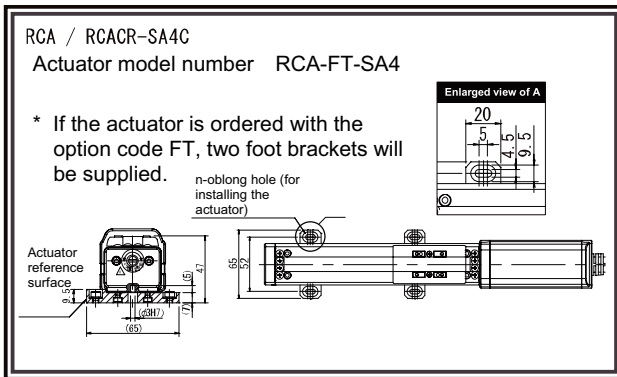
The model number for this option is “B,” “BE,” “BL” or “BR.”

### 9.2 Foot Bracket

This bracket is used to secure the actuator from above using bolts. The model number for this option is “FT.”

If the actuator receives large moment loads, install the actuator with foot brackets attached at all mounting holes in the actuator.

If not enough foot brackets are used, the life of the actuator may be shortened.



### 9.3 High-acceleration/deceleration Type

With this option, the maximum acceleration (0.2 G or 0.3 G) of the standard specification increases to 1.0 G (or 0.8 G on certain models).

Even at the maximum acceleration of 1.0 G (or 0.8 G on certain models), the actuator can operate by maintaining the same payload capacity as permitted for the standard specification.

To operate an actuator of high-acceleration/deceleration type, you need a controller for high-acceleration/deceleration actuator. High-acceleration/deceleration actuator controllers are different from controllers used for standard actuators. The model number for this option is "HA."

### 9.4 Power-saving Type

With this option, the maximum current of the controller becomes lower than when the standard actuator is used. The maximum current varies depending on the model. For details, refer to the operation manual for your controller.

The model number for this option is "LA."

### 9.5 Home Check Sensor

When this option is selected, the actuator comes with a sensor for checking if the slider has actually moved to the home position as a result of home return.

The model number for this option is "HS."

### 9.6 Reversed-home Specification

The reversed-home specification is an option to set the home on the front side. The model number for this option is "NM." If you wish to change the direction of home after the actuator has been delivered, please contact IAI because the moving direction parameter, etc., must be adjusted.

### 9.7 Slider Roller Specification

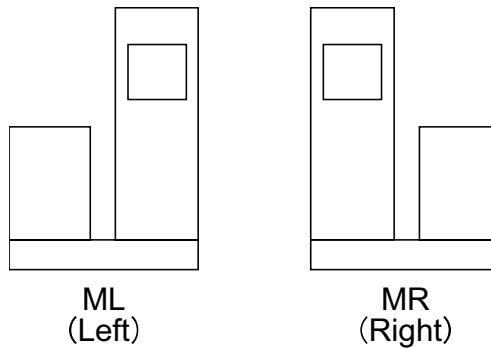
When this option is selected, the slider structure becomes the same as the roller structure adopted for the clean room specification.

The model number for this option is "SR."

## 9.8 Motor Reversing at Left, Motor Reversing at Right

“ML” indicates that the motor reverses on the left side as viewed from the motor, while “MR” represents motor reversing on the right side.

These options can be specified for motor reversing types including the SAR4, SA5R and SA6R.



## 9.9 Suction Joint on Opposite Side

On standard clean room actuators, the suction joint is installed on the left side of the actuator as viewed from the motor side. When this option is selected, the suction joint is installed on the other (opposite) side.

The model number for this option is “VR.”

## 10. Motor/Encoder Cables

### 10.1 ACON-CA/AMEC/ASEP Motor/Encoder Integrated Cables

[1] Motor/encoder integrated cable CB-ASEP2-MPA□□□

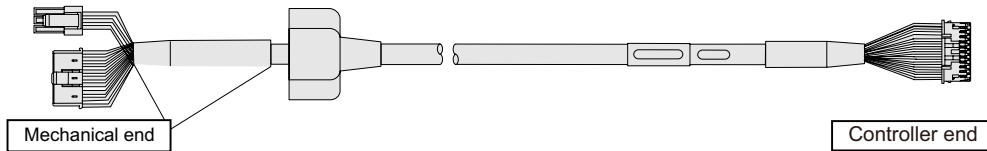
\* □□□ indicates the cable length (L). A desired length can be specified up to 20 m.

Example) 080 = 8 m

[Minimum bending radius]

Movable: 34 mm

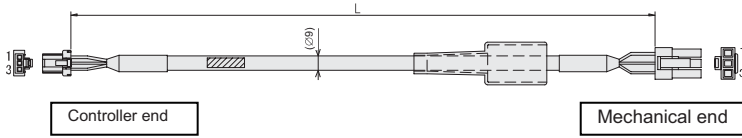
Fixed: 68 mm



Width	Cable Color	Signal Name	Pin No.	Pin No.	Signal Name	Cable Color	Width	
AWG22 (crimped)	Red	U	1	1	U	Red	AWG22 (crimped)	
	Yellow	V	2	2	V	Yellow		
		NC		3	NC			
	Black	W	3	4	NC			
AWG25 (crimped)		NC		5	W	Black	AWG25 (crimped)	
	Orange	BK+	18	6	NC			
	Gray	BK-	17	7	BK+	Orange		
	Black	LS+	7	8	BK-	Gray		
	Brown	LS-	16	9	LS+	Black		
	White	A+	1	10	LS-	Brown		
	Yellow	A-	2	11	A+	White		
	Red	B+	3	12	A-	Yellow		
	Green	B-	4	13	B+	Red		
	Black	Identification Tape	Z+/SD+	10	14	B-		Green
	Brown		Z-/SD-	11	15	Z+/SD+		Black
	White		VCC	14	16	Z-/SD-		Brown
	Yellow		VPS/BAT-	13	17	VCC		White
	Red		GND	15	18	VPS/BAT-		Yellow
Green	Spare	6	19	GND	Red			
		NC	5	20	Spare	Green		
		NC	8	21	BAT+	White	AWG22	
AWG22	White	BAT+	12	22	NC			
		FG	9	23	NC			
				24	FG			

## 10.2 ACON(Except for ACON-CA)/ASEL Controller Cables

### [1] Motor cable CB-ACS-MA□□□

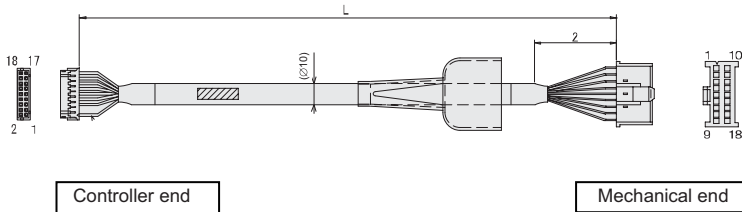


Wiring	Color	Signal	No.	No.	Signal	Color	Wiring
AWG 22 (Crimping)	Red	U	1	1	U	Red	AWG 22 (Crimping)
	White	V	2	2	V	White	
	Black	W	3	3	W	Black	

\* □□□ indicates the cable length (L). A desired length can be specified up to 20 m.

Example) 080 = 8 m  
 [Minimum bending radius]  
 Movable: 35 mm  
 Fixed: 23 mm

### [2] Encoder cable                      CB – ACS – PA □□□ Encoder robot cable              CB – ACS – PA □□□ - RB



\* □□□ indicates the cable length (L). A desired length can be specified up to 20 m.

Example) 080 = 8 m  
 [Minimum bending radius]  
 Robot cable  
 Movable: 54 mm  
 Standard cable  
 Fixed: 75 mm

CN2				CN1			
Cable color		Pin Number	Signal code	Pin Number	Signal code	Cable color	
Robot cable	Standard cable					Robot cable	Standard cable
White/Purple	Blue	LS+	18	1	ENA	Gray	White/Blue
White/Gray	Orange	LS-	17	2	ENA	Red	White/Yellow
Yellow	Green	BK+	16	3	ENB	Black	White/Red
Blue	Brown	BK-	15	4	ENB	Yellow	White/Black
White/Blue	Gray	ENA	14	5	—	—	—
White/Yellow	Red	ENA	13	6	—	—	—
White/Red	Black	ENB	12	7	LS+	Blue	White/Purple
White/Black	Yellow	ENB	11	8	—	—	—
Orange	Pink	ENZ	10	9	FG	Ground	Ground
Green	Purple	ENZ	9	10	ENZ	Pink	Orange
Purple	White	—	8	11	ENZ	Purple	Green
Gray	Blue/Red	VPS	7	12	—	White	Purple
Red	Orange/White	5V	6	13	VPS	Blue/Red	Gray
Black	Green/White	GND	5	14	5V	Orange/White	Red
—	—	—	4	15	GND	Green/White	Black
—	—	—	3	16	LS-	Orange	White/Gray
—	—	—	2	17	BK-	Brown	Blue
—	—	—	1	18	BK+	Green	Yellow
Ground	Ground	F.G	1				

Housing: PHDR – 18VR (JST)  
 Contact: SPHD-001T-P0.5 (JST)

Plug housing: XMP-18V (JST)  
 Socket contact: BXA-001T - P0.6 (JST)  
 Retainer: XMS-09V (JST)

## 11. Maintenance and Inspection

### 11.1 Inspection Items and Schedule

Perform maintenance and inspection at the intervals specified below.

This schedule assumes that the actuator is operated eight hours a day.

If the actuator is operated at a higher utilization, such as when the machine is used continuously day and night, reduce the inspection intervals accordingly.

Schedule	External visual inspection	Internal inspection	Greasing <sup>(Note 1)</sup>
Start of work inspection	○		
1 month inspection	○		
3 month inspection			○
3 months after starting operation			Depends on grease supply timing (reference)
6 months inspection	○	○ <sup>(Note 2)</sup>	
Every 6 month inspection	○	○ <sup>(Note 2)</sup>	

**Note 1** Grease film may run out if the actuator is moved back and forth continuously over a distance of 30mm or less. As a guide, perform a back-and-forth operation five times or so over a distance of 50mm or more after a back-and-forth operation over such short distance has been repeated

5,000 to 10,000 times. This will restore oil film.

**Note 2** Check the condition of grease and wipe it off in case it is extremely dirty before supplying new grease.

[Period of Grease Supply (reference)]

Supply grease in the earlier timing of either the operation distance or months described in the table below.

Max. velocity of use [mm/s]	Period of grease supply (reference)	
	Operation distance	Months described
0 to 750 or less	1,250km	12 months
Above 750 to 1,300	2,500km	



**Warning:** •The grease may be degraded if the actuator has got stored for 6 months or more. Supply grease before starting to use. [Reference to 11.7 Grease Supply]

•The speed of grease degradation differs depending on the environment of use (temperature, humidity and ambient environment).

It is recommended to shorten the period of grease supply in case of use in bad environment with high temperature, high humidity, high rate of dust and so on. Also, it is recommended to improve the environment in case the color of the grease changes remarkably due to bad environmental condition.



## 11.2 Visual Inspection of the Machine Exterior

Check the following items when carrying out visual inspection.

Body	Loose mounting bolts
Cables	Damage to cables or connection to connector box
Stainless sheet	Damage, foreign deposit or slacks
General	Unusual noise or vibrations

- If the stainless sheet is slacked, adjust it as necessary to eliminate the slacks.
- As a rough guide, the stainless sheet will last for 5,000 km of traveling. However, the stainless sheet should be replaced earlier, as deemed appropriate, depending on the specific condition of use. As a rule, the actuator must be brought to IAI to replace the sheet, or it must be replaced on site by IAI's service personnel.
- If the actuator is secured vertically, grease applied on the guide may drip depending on the environment. If this is the case, clean the soiled areas and add grease.

## 11.3 Cleaning

- Clean the exterior as needed.
- Wipe off dirt with a soft cloth.
- Do not use strong compressed air on the actuator as this may force dust into the crevices.
- Do not use petroleum-based solvent on plastic parts or painted surfaces.
- If the unit is badly soiled, apply a neutral detergent or alcohol to a soft cloth, and wipe gently.

## 11.4 Adjusting the Stainless Sheet

On actuators whose stroke is 400 mm or more, check the stainless sheet for slacks, etc., as necessary. If the stainless sheet is found slacked, adjust the stainless sheet.

[For the stainless sheet adjustment procedure, refer to 11.8, "Replacing/Adjusting the Stainless Sheet." ]

## 11.5 Interior Inspection

Turn off the power, remove the side covers, and then visually inspect the interior. Check the following items during interior inspection.  
Internal check points

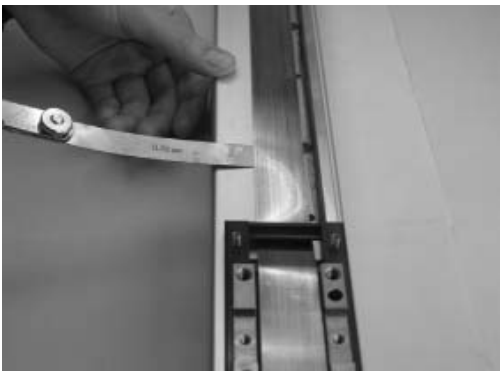
Body	Loose mounting bolts?
Guides	Lubrication appropriate? Soiling?
Ball screw	Lubrication appropriate? Soiling?

- 1) Remove both side covers.  
Use an Allen wrench of 1.5 mm across flats.



Make a visual check of the interior to see if there is any dust or foreign matter in the unit and check the lubrication. Even if the grease you see around the parts is brown, the lubrication is fine as long as the traveling surface appears shiny.

- 2) If the grease becomes dirty and dull or if the grease has worn away due to extended operating time, lubricate the parts after cleaning them.
- 3) When the inspection/maintenance work is complete, install the side covers.  
Tightening torque: Thin-head screw M3 x 6 – 87.2 N·cm (8.90 kgf·cm)



When installing the side covers, do not let them contact the end faces of the stainless sheet. It may damage or bend the stainless sheet, causing the sheet to deteriorate or wear quickly. To prevent this problem, insert a shim (approx. 0.1 to 0.2 mm) between the sheet and each cover to provide an allowance, and gently push in the cover.

- Caution:**
- When checking the interior, be careful not to bend or scratch the stainless sheet. Wear protective gloves when handling the stainless sheet, because it has sharp edges that may cause accidental cuts.  
The front cover is supporting the ball screw; so do not disassemble the front cover. If the front cover is misaligned, the shaft centers may become offset, thus increasing the traveling resistance, reducing the service life of each part, or generating noise.
  - If the actuator is equipped with a microswitch (optional), carefully install the side covers so that the switch cables are not pinched.

## 11.6 Internal Cleaning

- Wipe off dirt with a soft cloth.
- Do not use strong compressed air on the actuator as this may force dust into the crevices.
- Do not use petroleum-based solvent, neutral detergent or alcohol.



Caution: Do not use flushing oil, molybdenum grease or anti-rust lubricant.  
When grease is soiled with large amounts of foreign substances, wipe off the dirty grease and then apply new grease.

## 11.7 Grease Supply

### 11.7.1 Applicable Grease

[Other than Cleanroom Specification]

#### (1) What Grease to Use on the Guides

The following grease is used when we ship the unit.

Idemitsu Kosan	Daphne Eponex Grease No.2
----------------	---------------------------

Other companies also sell a grease similar to this. If ordering from another maker, give the name of this product and request something comparable. Comparable products include the following:

Showa Shell Oil	Albania Grease S2
Mobil Oil	UNIREX N2

#### (2) What Grease to Use on the Ball Screw

The following grease is used when we ship the unit.

This grease offers excellent properties such as low heat generation, and is suitable for lubricating ball screws.

Kyodo Yushi	Multemp LRL3
-------------	--------------




Warning: Never use any fluorine-based grease. It will cause a chemical reaction when mixed with a lithium-based grease and may cause damage to the actuator.


[Cleanroom Specification]

(1) What grease to use on the guide and ball screw

The following grease is used when we ship the unit.  
This grease is of low-dust-raising type.

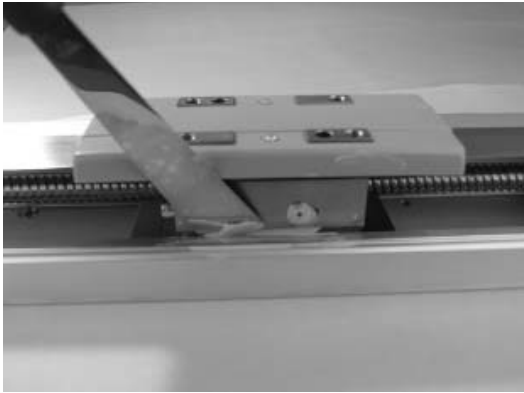
Kuroda Precision Industries	C Grease
-----------------------------	----------

 **Warning:** Never use any fluorine-based grease. It will cause a chemical reaction when mixed with a lithium-based grease and may cause damage to the actuator.

 **Caution:** Never use grease for the standard specification. It may allow dust to generate.

## 11.7.2 How to Apply Grease


- 1) When greasing the guide, use a spatula or grease applicator to squeeze or inject grease into the space between the slider and base, and then move the slider back and forth several times to let the grease spread evenly.  
Apply grease on the guides on both sides.  
Remove excess grease.




- 2) When greasing the ball screw, clean the ball screw, apply grease using a finger, and then move the slider back and forth several times to let the grease spread evenly.  
At this time, be careful not to deform the stainless sheet by accidentally touching the sheet.  
Remove excess grease.



- 3) Install the side covers.  
Tightening torque: Thin-head screw M3 x 6 – 87.2 N·cm (8.90 kgf·cm)  
Refer to 3) in 11.5, “Interior Inspection,” for notes on installing the side covers.

 **Caution:** If the actuator is equipped with a microswitch (optional), carefully install the side covers so that the switch cables are not pinched.

 **Caution:** In case the grease got into your eye, immediately go to see the doctor to get an appropriate care.  
After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease off.

## 11.8 Replacing/Adjusting the Stainless Sheet

### [Items Required for Replacement]

- Replacement stainless sheet
- Clearance-checking tool (a regular slider cover with holes)  
(This tool is available from IAI's Sales Engineering Section. If you are replacing the stainless sheet, please contact us to make a rental arrangement or purchase the tool.)
- Allen wrench set • Phillips screwdriver • Measure

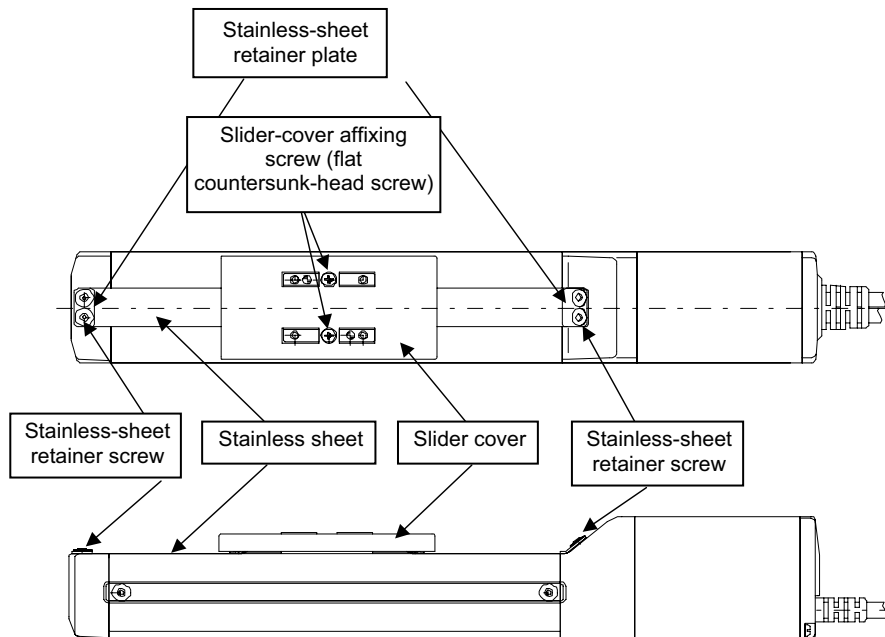
### [Note on Stainless Sheet Tension]

Deterioration and wear of the stainless sheet is affected by its tension.

If the stainless sheet is too tight, excessive clearances will be created between the sheet and slider covers and the sheet may undergo a fatigue failure.

If the stainless sheet is too loose, the sheet will contact the back of the slider covers and generate shaving. Therefore, use a dedicated adjustment tool to properly adjust the tension of the stainless sheet so that the clearances between the stainless sheet and slider covers conform to the specified dimension.

### [Name of Each Part]

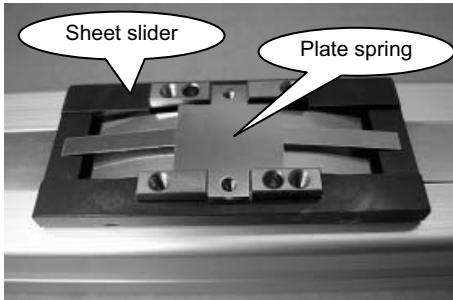


## [Procedure]

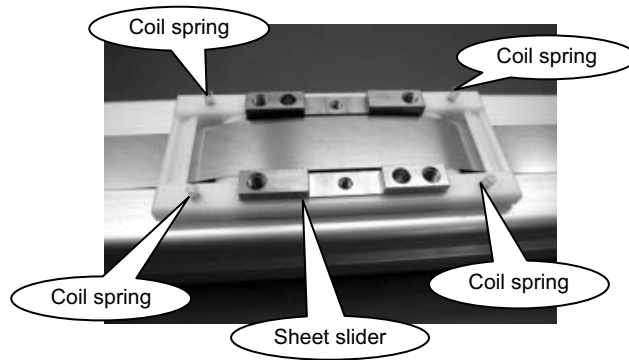
- 1) Remove the slider-cover affixing screws and remove the covers.  
After the slider covers have been removed

### [1] Standard specification (slider structure)

- RCA-SA4/SA5/SS4/SS5

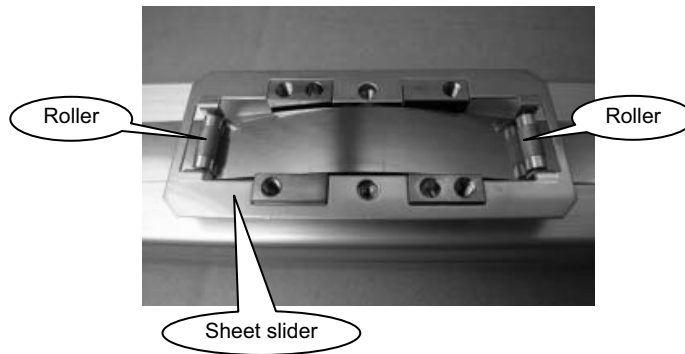


- RCA-SA6/SS6



### [2] Cleanroom specification, slider roller specification (optional) (roller structure)

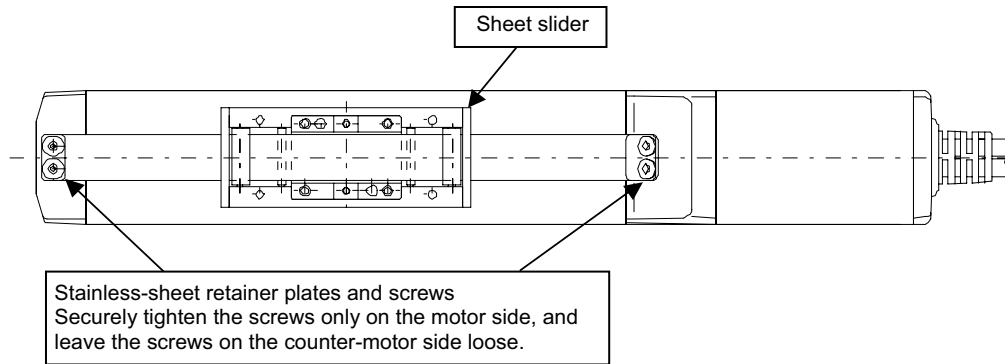
- RCACR-SA4/SA5/SA6



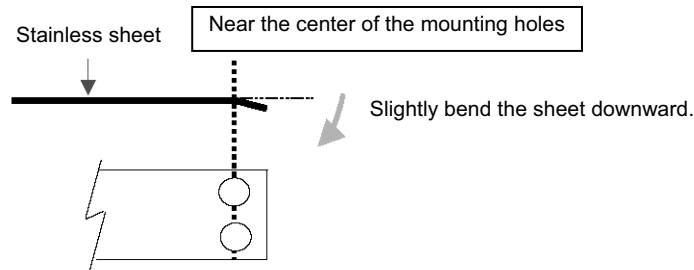
**Caution:** Remove the slider covers slowly and gently. If the actuator is installed on the ceiling or oriented vertically or horizontally on side, place a plastic bag, etc., underneath the slider covers so as not to lose the coil springs in case they drop off.

- 2) Remove the stainless-sheet retainer screws on both sides and pull out the stainless sheet.
- 3) Guide a new stainless sheet into the slider.
- 4) Hold the stainless sheet in place, and affix the retainer plates and screws.
 

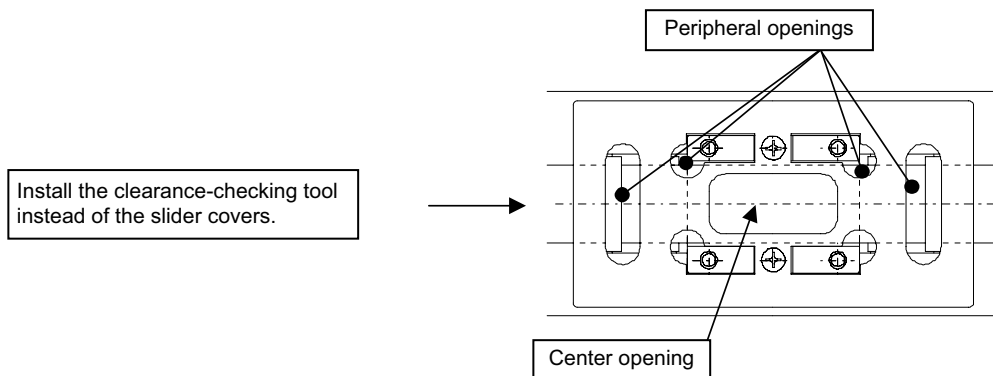
At this time, securely tighten the screws only on the motor side, and leave the screws on the counter-motor side loose.



- How to prevent the stainless sheet from lifting (SA4/SA5/SA6/SS4/SS5/SS6)  
Slightly bend the stainless sheet downward near the center of the mounting holes so that the sheet can be held securely.



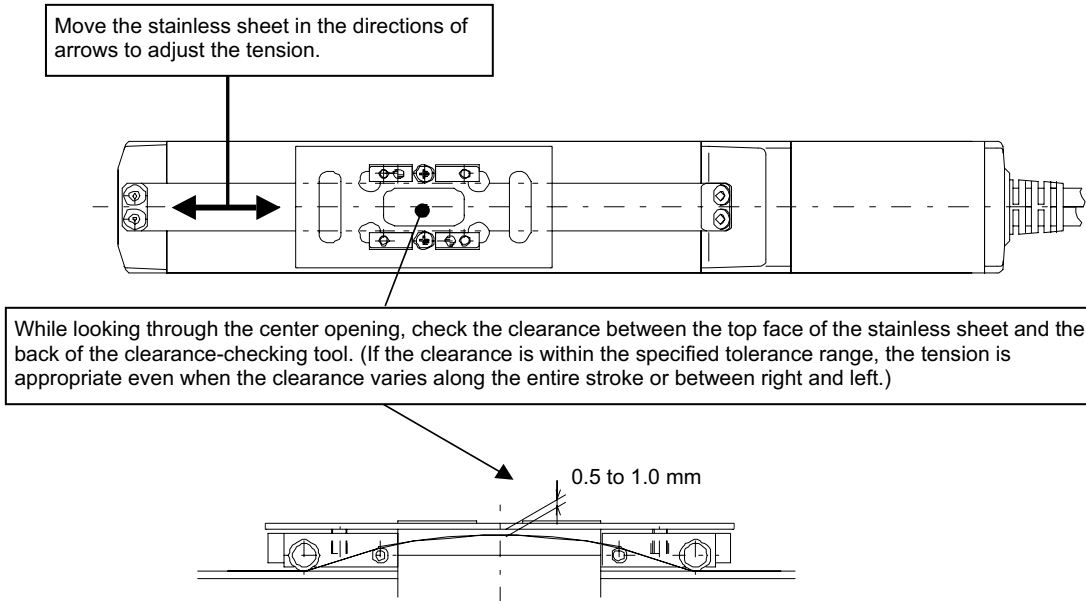
- 5) Install the clearance-checking tool.





6) Adjust the tension of the stainless sheet.

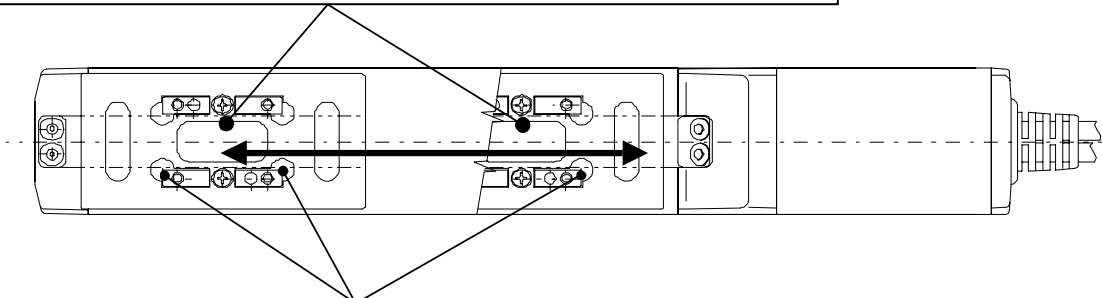
- [1] While looking through the center opening in the clearance-checking tool, move the stainless sheet on the loose end in the directions of arrows until the clearance between the top face of the stainless sheet and the back of the clearance-checking tool falls within the specified range.



- [2] When the stainless sheet has been properly positioned, tighten the screws on the loose end to a level that the stainless sheet no longer moves.

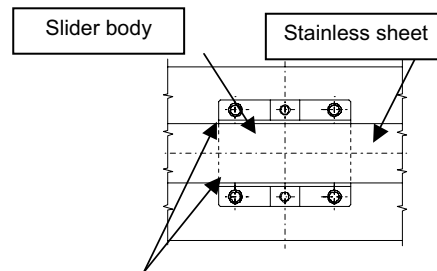
[3] Move the slider and check the tension of the stainless sheet along the entire stroke.

Checkpoint 1:  
Check if the clearance between the top face of the stainless sheet and the back of the clearance-checking tool falls within the specified range along the entire stroke.



Checkpoint 2:  
Look through the peripheral openings and confirm that the stainless sheet edges do not contact the slider body. Move the slider back and forth at least three times over the entire stroke to ensure the edges do not contact the slider. The sheet may move during the slider strokes, but slight movement is acceptable as long as the offset does not increase and the sheet does not contact the slider. If the stainless sheet contacts the slider, repeat the adjustment from [1].

The stainless sheet is not perfectly straight, but it bends to right and left slightly. It is impossible to adjust the right and left clearances perfectly uniform. Slight variation in clearance in the stroke direction or between right and left is acceptable, as long as the stainless sheet edges do not contact the slider body over the entire stroke.

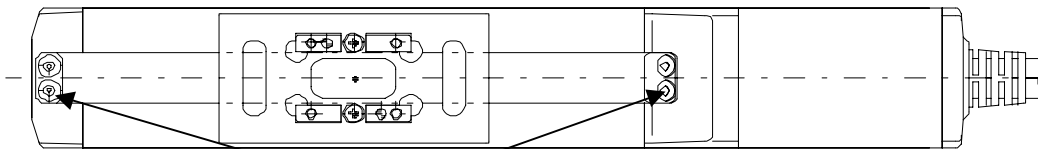


Clearances between stainless sheet edges and slider body

If the conditions in Checkpoints 1 and 2 are not satisfied, loosen the screws and readjust the position and tension of the stainless sheet again from [1].

Note) If the condition in Checkpoint 2 cannot be met after the readjustment, try installing the stainless sheet in the reverse direction or placing it upside down. If the stainless sheet is still not adjusted properly, replace it with a new sheet.

[4] When proper clearances are obtained between the slider body and stainless sheet and an absence of contact between the two is confirmed, tighten the two screws on the loose end alternately, and then finally tighten all screws to a uniform torque to securely affix the stainless sheet. If the screws are not tightened uniformly, the sheet may meander or lift.



Apply additional torque to the screws on both ends until the stainless sheet no longer moves.  
Tightening torque: 87.2 N-cm (8.90 kgf-cm) [Reference value]

[5] Remove the clearance-checking tool and install the slider covers.

Note) Again, pay attention not to lose the coil springs.

## 11.9 Reduction Belt [Motor Reversing Type]

### 11.9.1 Inspecting the Belt

Remove the pulley cover and visually inspect the belt.

Durability of the reduction belt is affected significantly by the operating condition, and there is no standard guideline as to when the belt should be replaced.

Generally, the belt is designed to withstand several millions of flexing loads.

As a practical guideline, replace the reduction belt when any of the conditions listed below is observed:

- The teeth and end faces of the belt have worn significantly.
- The belt has swollen due to deposits of oil, etc.
- Cracks and other damages are found on the teeth or back of the belt.
- The belt has broken.

### 11.9.2 Applicable Belt

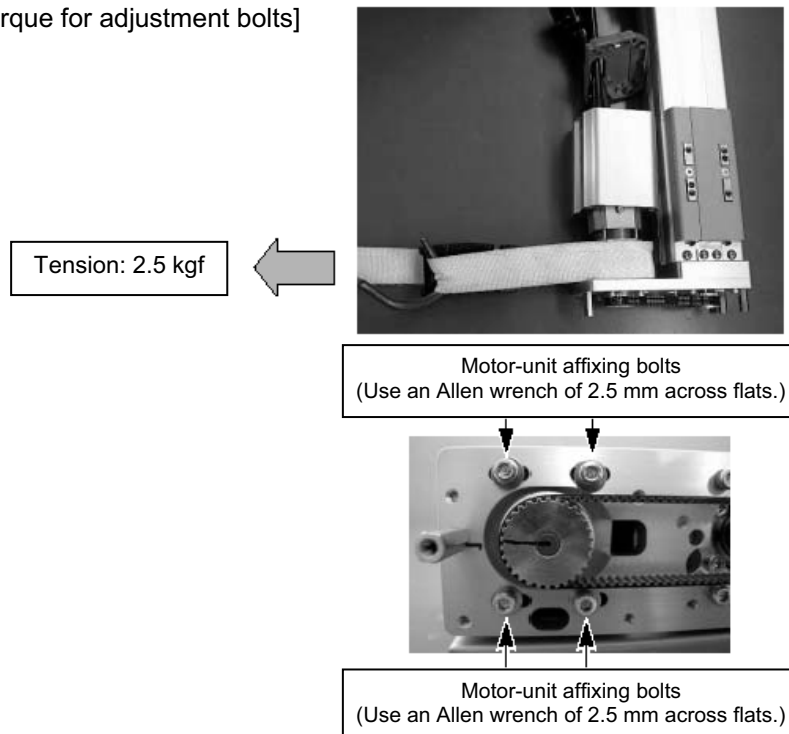
- SA4 - 60S2M160R Rubber, cleanroom type (Bando Chemical Industries) 6 mm wide
- SA5 - 60S2M180R Rubber, cleanroom type (Bando Chemical Industries) 6 mm wide
- SA6 - 60S2M190R Rubber, cleanroom type (Bando Chemical Industries) 6 mm wide

### 11.9.3 Adjusting the Belt Tension

Remove the pulley cover and motor-end cover, and loosen the four motor affixing bolts.

Pass a looped strong string (or long tie-band) around the motor cover and pull it with a tension gauge to the specified tension. In this condition, uniformly tighten the motor-unit affixing bolts.

[Recommended tightening torque for adjustment bolts]  
162 N·cm (16.5 kgf·cm)



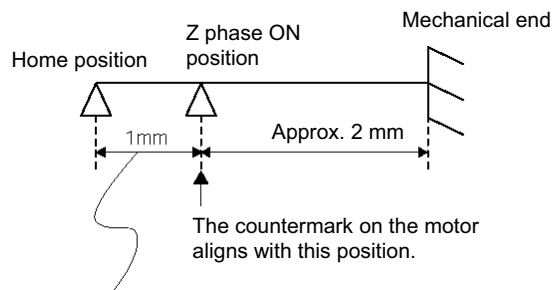
## 11.9.4 Replacing the Belt of the Motor Reversing Type: SA4R, SA5R, SA6R

### [Items Required for Replacement]

- Replacement belt
- Allen wrenches
- Phillips screwdriver
- Tension gauge (capable of tensioning to 7 kgf or greater)
- Strong string, looped (or long tie-band)
- Scale
- Oil-based marker pen
- PC or teaching pendant

### [Overview of Replacement]

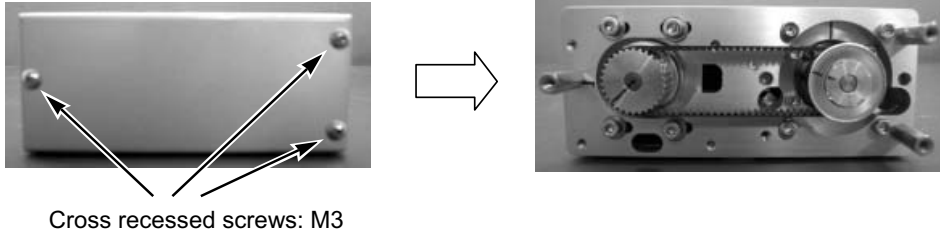
- 1) Move the slider to a position where Z phase turns on (home position) (2 mm from the mechanical end). In this position, loosen the motor-unit affixing bolts and replace the belt.
- 2) Restore the home position.  
Affix the slider at a position 2 mm from the mechanical end on the home side, pass the belt, and adjust the belt to the specified tension.
- 3) Perform homing using a PC or teaching pendant and check for deviation from the initial home position. If there is a deviation, adjust the home offset parameter.



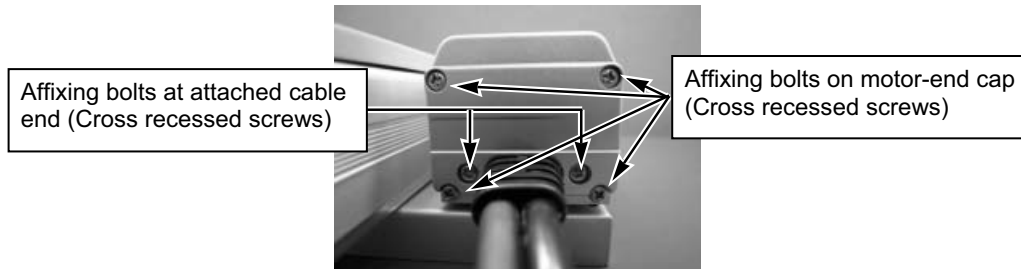
Set by the home offset parameter. (The above value is the factory setting.)

**[Procedure]**

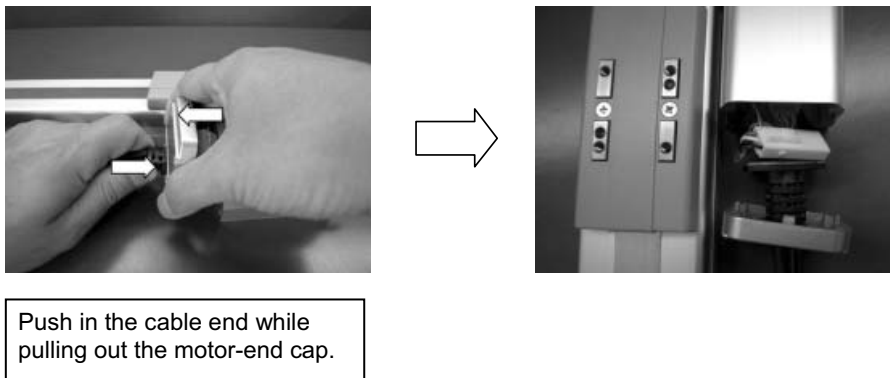
1) Remove the pulley cover using a Phillips screwdriver.



2) Use a Phillips screwdriver to remove the bolts affixing the motor-end cap and attached cables.



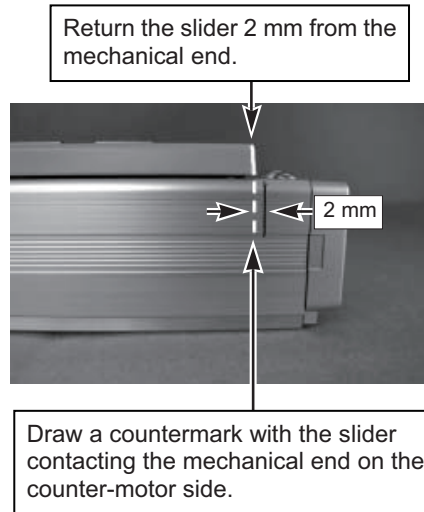
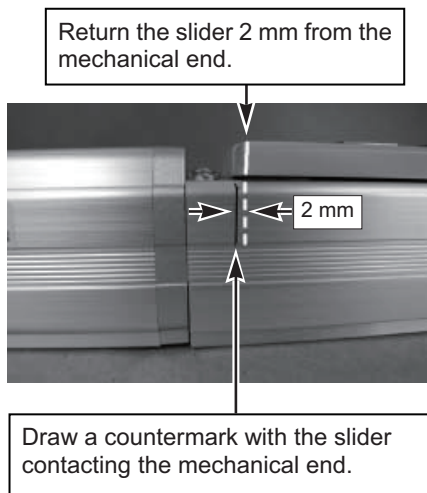
3) Pull out the motor-end cap.



4) Pull out the motor-end cover to expose the motor.

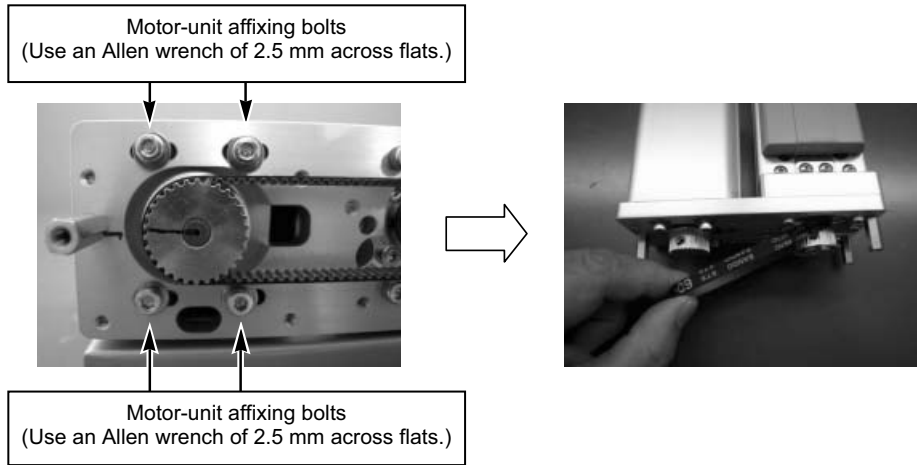


5) Move the slider to a position where Z phase turns on (home position).  
On both standard actuators and actuators whose home is set on the opposite side, this position corresponds to 2 mm from the mechanical end.

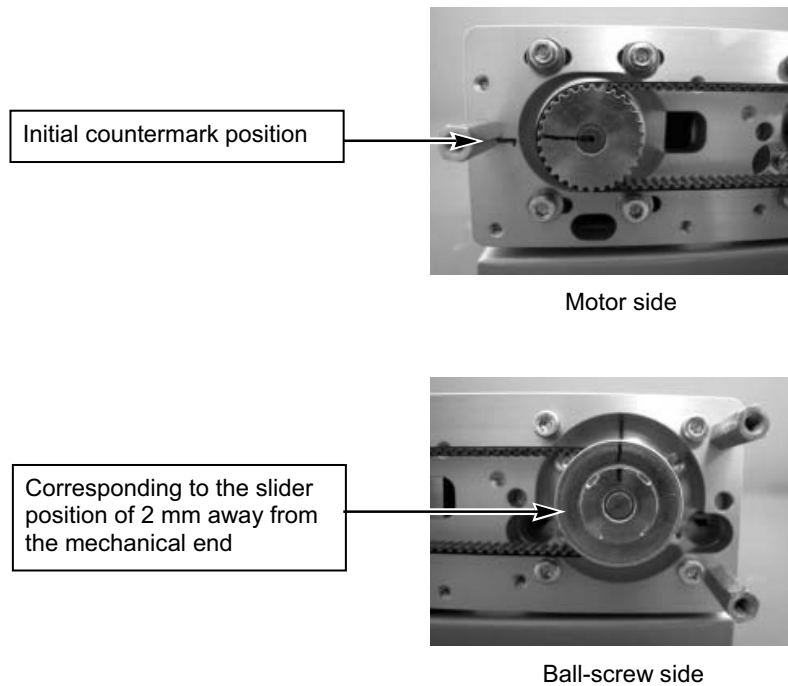


**Warning:** If the actuator is installed vertically, move it after turning on the controller power and forcibly releasing the brake. At this time, beware of danger as the actuator may drop suddenly. Always provide a support to brace the actuator hand to prevent sudden drop, so as not to pinch fingers or damage the load.

- 6) Loosen the motor-unit affixing bolts using an Allen wrench of 2.5 mm across flats. Slide the motor, and loosen and remove the belt.



- 7) Check the following points before restoring the home position:
- The motor side should be aligned with the initial countermark. If the position is offset, adjust it to achieve proper alignment.
  - The ball-screw side should be in a location corresponding to the slide position of 2 mm away from the mechanical end.
- After the check, attach a new belt while holding the pulleys on both sides in position.



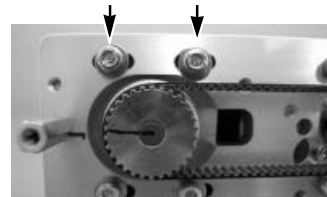
- 8) Adjust the belt tension.  
Pass a looped strong string (or long tie-band) around the motor cover and pull it with a tension gauge to the specified tension. In this condition, uniformly tighten the motor-unit affixing bolts.

[Recommended tightening torque for adjustment bolts]  
162 N·cm (16.5 kgf·cm)

Tension: 2.5 kgf



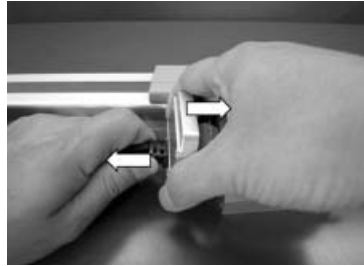
Motor-unit affixing bolts  
(Use an Allen wrench of 2.5 mm across flats.)



Motor-unit affixing bolts  
(Use an Allen wrench of 2.5 mm across flats.)

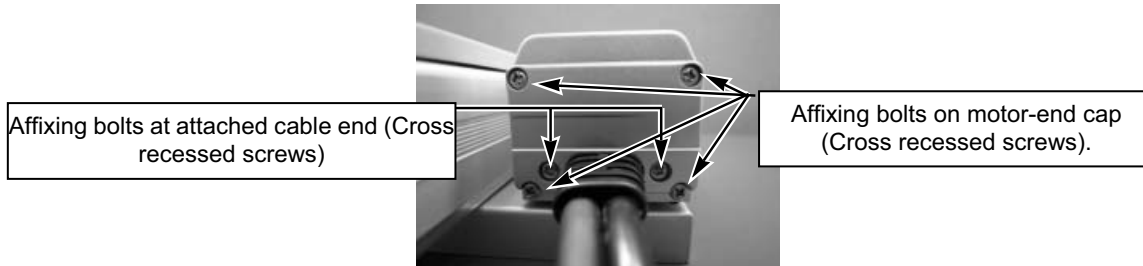


9) Insert the motor-end cover and cap.



Pull out the cable end while pushing in the motor-end cap.

10) Use a Phillips screwdriver to securely tighten the affixing bolts for motor-end cap and attached cables.



11) Use a Phillips screwdriver to securely tighten the affixing bolts for pulley cover.



Cross recessed screws: M3

12) Connect a PC or teaching pendant to the controller to perform homing. (If the actuator is of absolute encoder specification, an absolute reset must be performed.)  
Check for deviation from the initial home position. If there is a deviation, adjust the home offset parameter.

## 11.10 Replacing the Motor

### 11.10.1 Replacing the Motor of the Motor Straight Type (Coupling Type): SA4C, SA5C, SA6C

#### [Items Required for Replacement]

- Replacement motor
- Coupling (with screws)
- Allen wrenches
- Phillips screwdriver
- Scale
- Oil-based marker pen
- Grease

Other than cleanroom specification

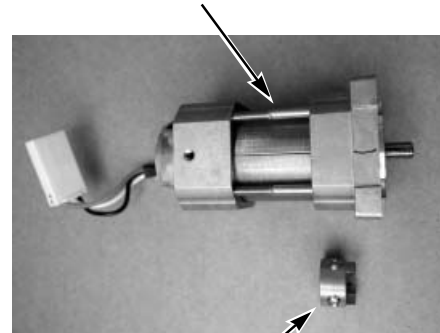
Idemitsu Kosan	Daphne Eponex Grease No.2
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Cleanroom specification

Kuroda Precision Industries	C Grease
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- PC or teaching pendant

Example: Replacement motor (IAI encoder)



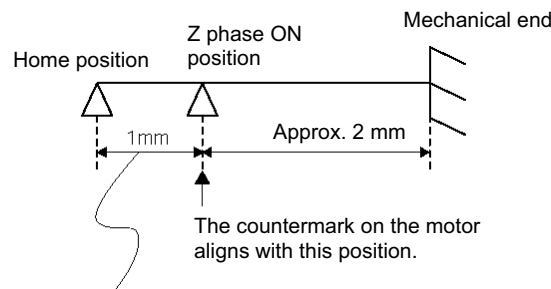
Coupling (with screws)



**Caution:** When replacing the motor, handle the replacement motor with due care. The actuator has been shipped with the encode adjusted to an optimal position, so do not crush the encoder unit. It may displace the encoder, thus impairing proper actuator operation.

#### [Overview of Replacement]

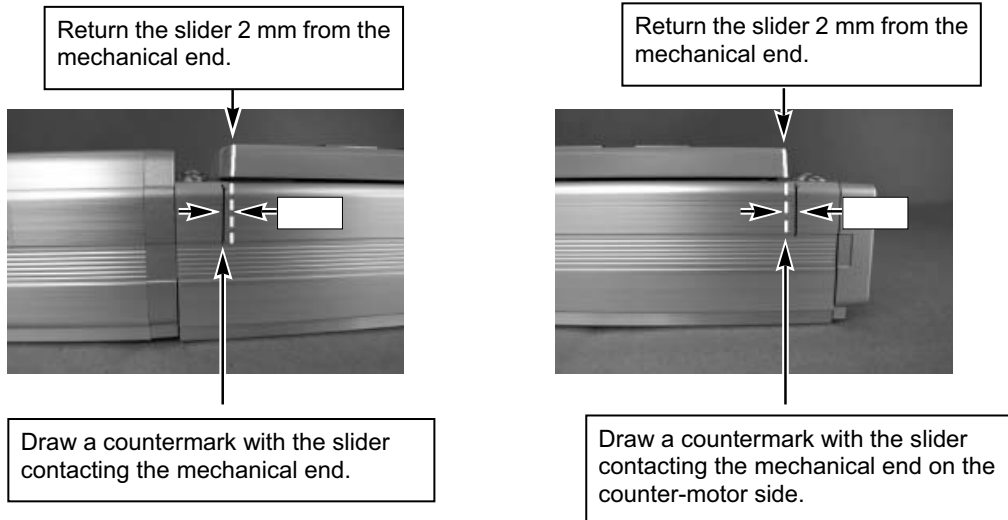
- 1) Move the slider to a position where Z phase turns on (home position) (2 mm from the mechanical end). Replace the motor in this position.
- 2) Perform homing using a PC or teaching pendant and check for deviation from the initial home position. If there is a deviation, adjust the home offset parameter.



Set by the home offset parameter. (The above value is the factory setting.)

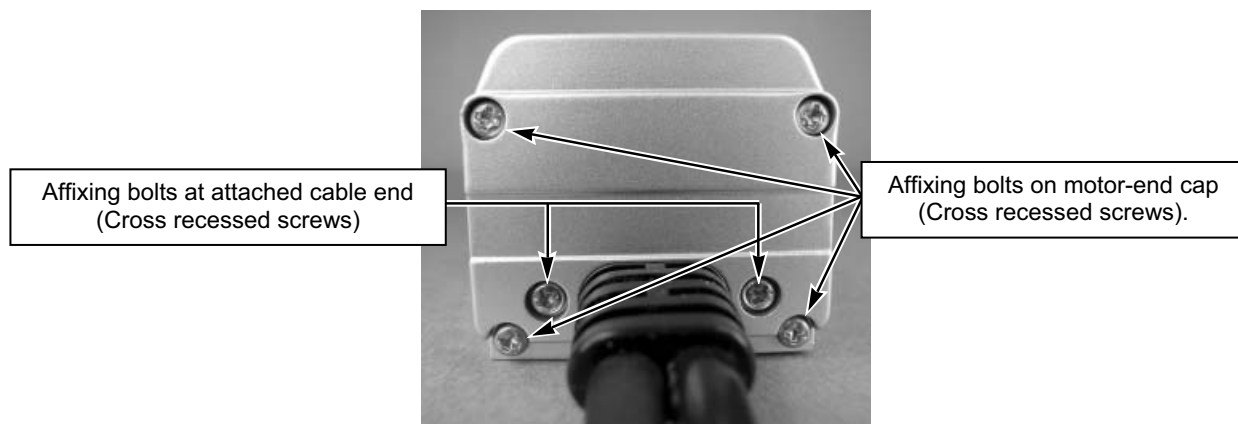
## [Procedure]

- 1) Move the slider to a position where Z phase turns on (home position).  
On both standard actuators and actuators whose home is set on the opposite side, this position corresponds to 2 mm from the mechanical end.

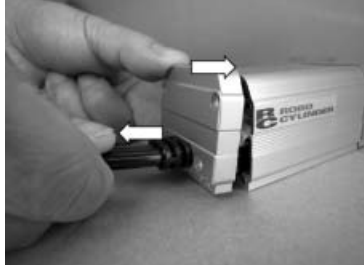


**Warning:** If the actuator is installed vertically, move it after turning on the controller power and forcibly releasing the brake. At this time, beware of danger as the actuator may drop suddenly.  
Always provide a support to brace the actuator hand to prevent sudden drop, so as not to pinch fingers or damage the load.

- 2) Use a Phillips screwdriver to securely tighten the affixing bolts for motor-end cap and attached cables.

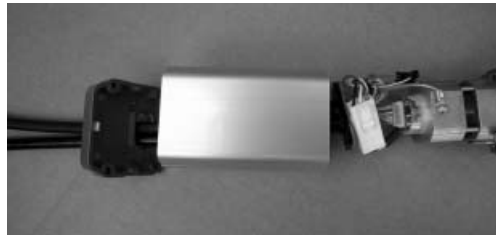


3) Pull out the motor-end cap.

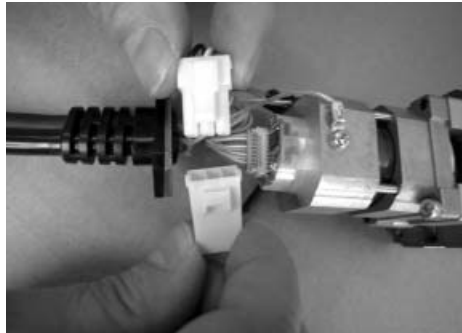


Push in the cable end while pulling out the motor-end cap.

4) Pull out the motor-end cover to expose the motor.



- 5) Detach the attached cables.
- Pull out the motor connector.



- If the actuator has a brake, also detach the brake connector.

- Remove the grounding wire using a Phillips screwdriver.



- While holding the motor with one hand, pull out the encoder cable.  
(The photograph bellow shows the motor (IAI encoder).)

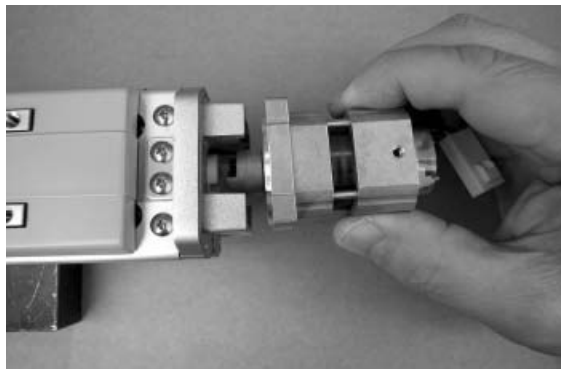
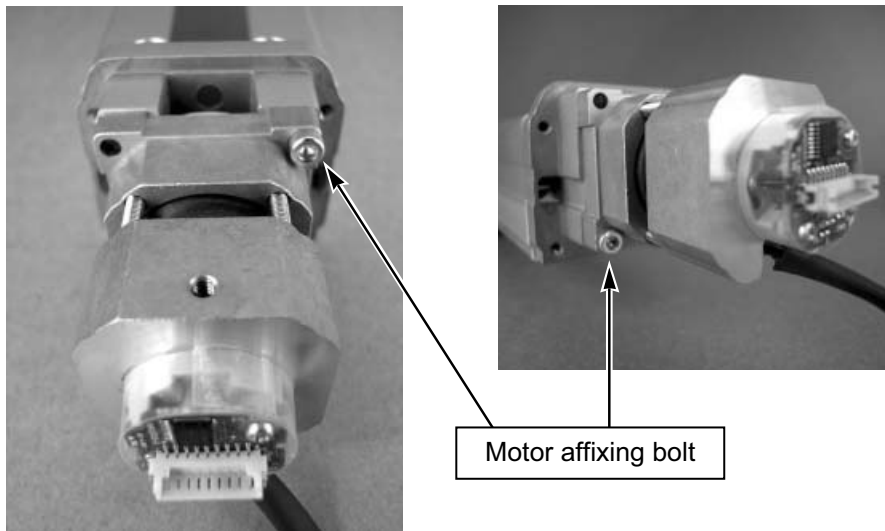


6) Detach the attached cables.

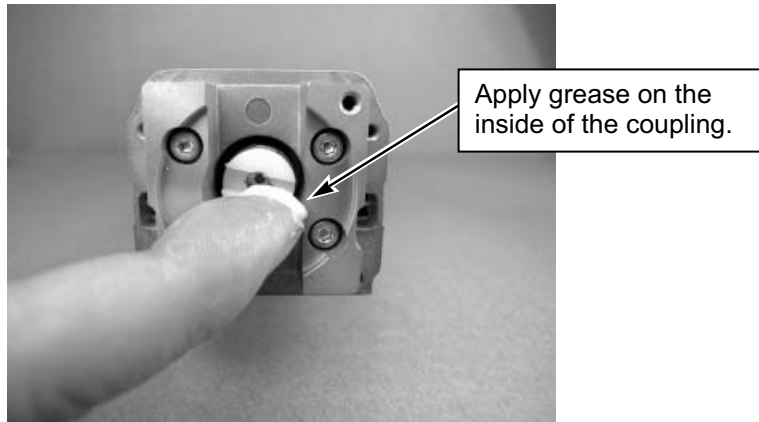


7) Take out the motor.

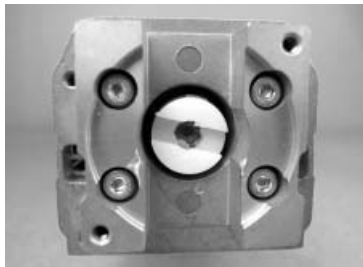
- Remove the two motor affixing bolts using an Allen wrench of 2.5 mm across flats.



8) Apply grease on the actuator coupling.



9) Insert the replacement coupling (with screws) by aligning it with the current orientation of the actuator coupling.



Coupling on actuator side

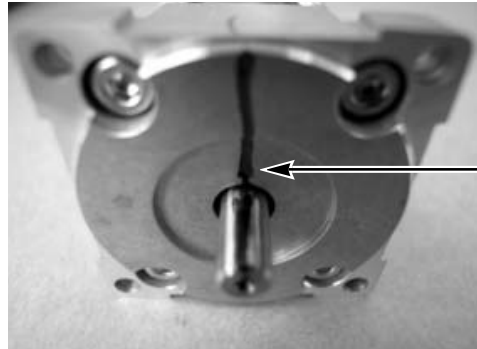


Inserting the coupling (with screws)



Inserted coupling (with screws)

10) Mark the shaft and body of the replacement motor to prevent the motor shaft position from deviating.

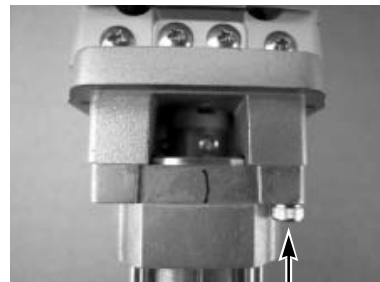


Mark the shaft and body of the replacement motor.

11) Insert the replacement motor into the actuator coupling, and secure with two motor affixing bolts.



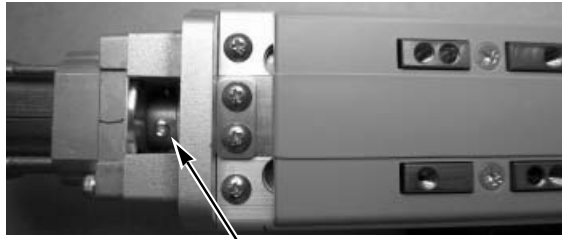
Insert the replacement motor.



Tighten two bolts at top and bottom using an Allen wrench of 2.5 mm across flats.

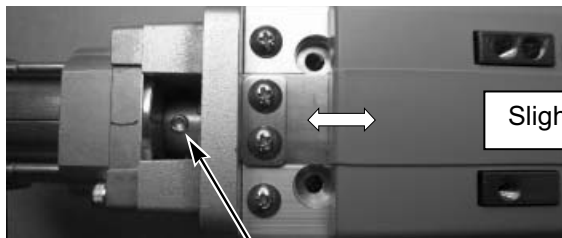


12) Tighten the screw on the coupling.



Tighten the screw on the coupling using an Allen wrench of 2.0 mm across flats.

13) Slightly move the slider to expose the second screw on the coupling, and tighten the screw in the same manner.



Slightly move the slider.

Tighten the screw on the coupling using an Allen wrench of 2.0 mm across flats.

14) Install the attached cables.

- While holding the motor with one hand, insert the encoder cable.  
(The photograph bellow shows the motor (IAI encoder).)



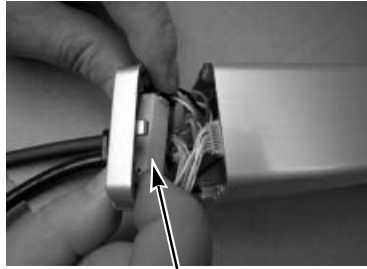
- Install a grounding wire using a Phillips driver.



- Plug the cables into the motor.



- 15) Insert the motor-end cover and cap.  
Store the connector inside the motor-end cap.

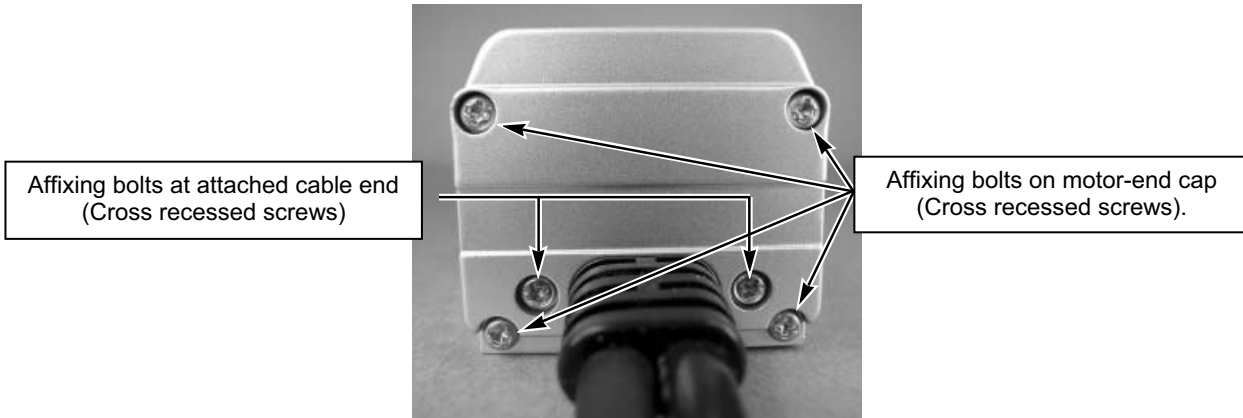


Store the connector inside the motor-end cap.



Pull out the cable end while pushing in the motor-end cap.

- 16) Use a Phillips screwdriver to securely tighten the affixing bolts for motor-end cap and attached cables.



Affixing bolts at attached cable end  
(Cross recessed screws)

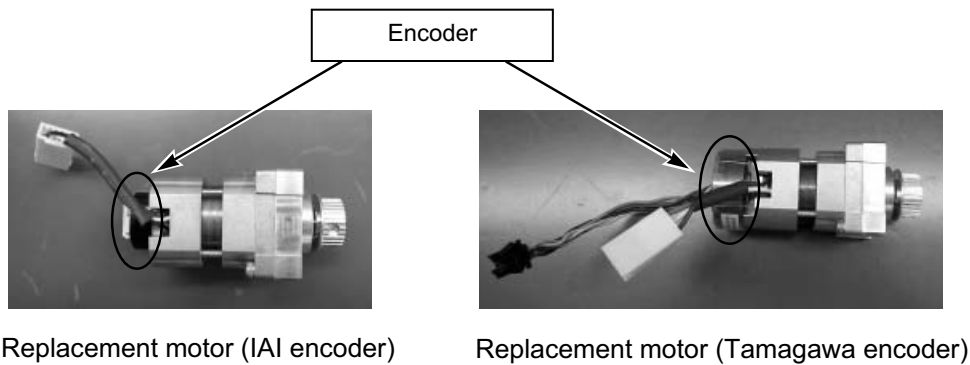
Affixing bolts on motor-end cap  
(Cross recessed screws).

- 17) Connect a PC or teaching pendant to the controller to perform homing. (If the actuator is of absolute encoder specification, an absolute reset must be performed.)  
Check for deviation from the initial home position. If there is a deviation, adjust the home offset parameter.

## 11.10.2 Replacing the Motor of the Motor Reversing Type: SA4R, SA5R, SA6R

### [Items Required for Replacement]

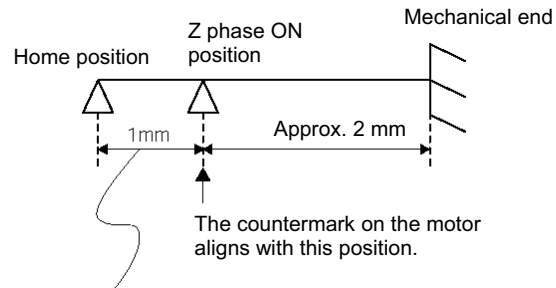
- Replacement motor
- Allen wrenches
- Phillips screwdriver
- Tension gauge (capable of tensioning to 7 kgf or greater)
- Strong string, looped (or long tie-band)
- Scale
- Oil-based marker pen
- PC or teaching pendant



**Caution:** When replacing the motor, handle the replacement motor with due care. The actuator has been shipped with the encode adjusted to an optimal position, so do not crush the encoder unit. It may displace the encoder, thus impairing proper actuator operation.

## [Overview of Replacement]

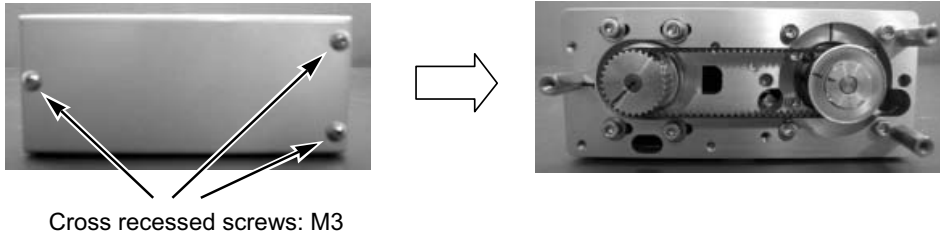
- 1) Loosen the motor-unit affixing bolts to remove the belt, and replace the motor.
- 2) Restore the home position.  
Affix the slider at a position 2 mm from the mechanical end on the home side, pass the belt, and adjust the belt to the specified tension.
- 3) Perform homing using a PC or teaching pendant and check for deviation from the initial home position. If there is a deviation, adjust the home offset parameter.



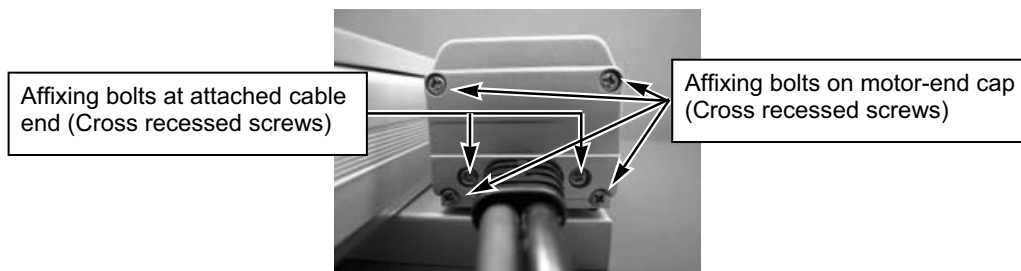
Set by the home offset parameter. (The above value is the factory setting.)

## [Procedure]

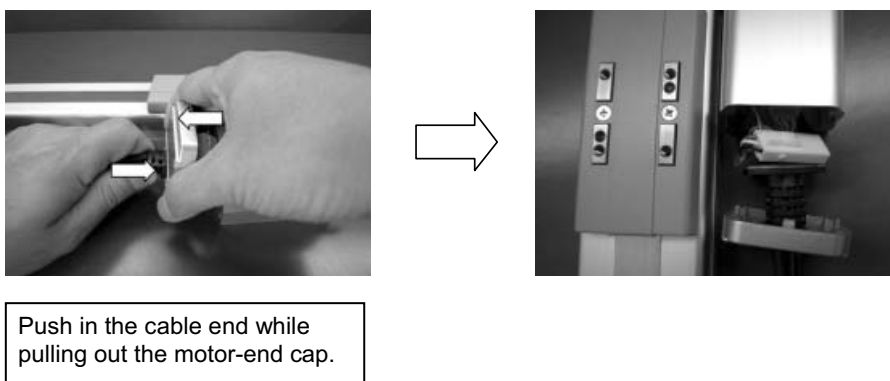
- 1) Remove the pulley cover using a Phillips screwdriver.



- 2) Use a Phillips screwdriver to remove the bolts affixing the motor-end cap and attached cables.



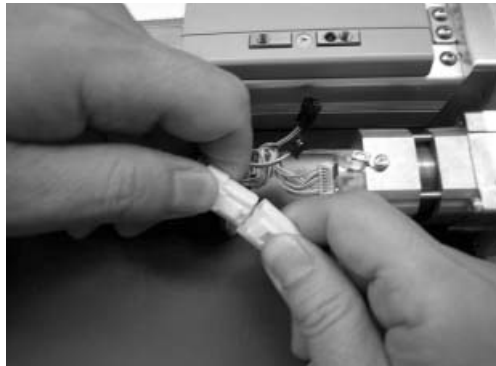
- 3) Pull out the motor-end cap.



- 4) Pull out the motor-end cover to expose the motor.

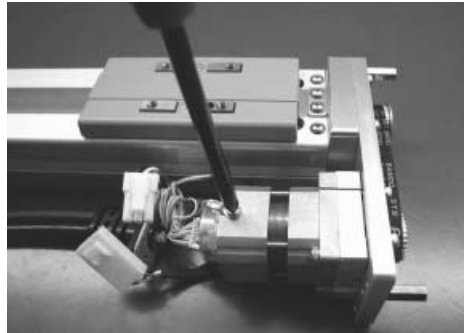


- 5) Detach the attached cables.
  - Pull out the motor connector.



- If the actuator has a brake, also detach the brake connector.

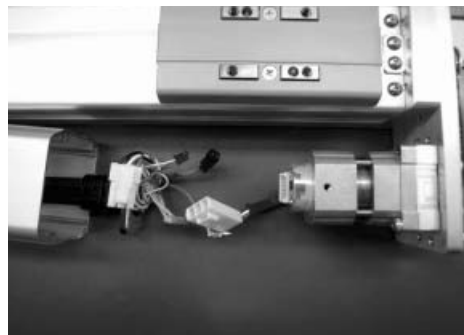
- Remove the grounding wire using a Phillips screwdriver.



- While holding the motor with one hand, pull out the encoder cable. (The photograph below shows the motor (IAI encoder).)

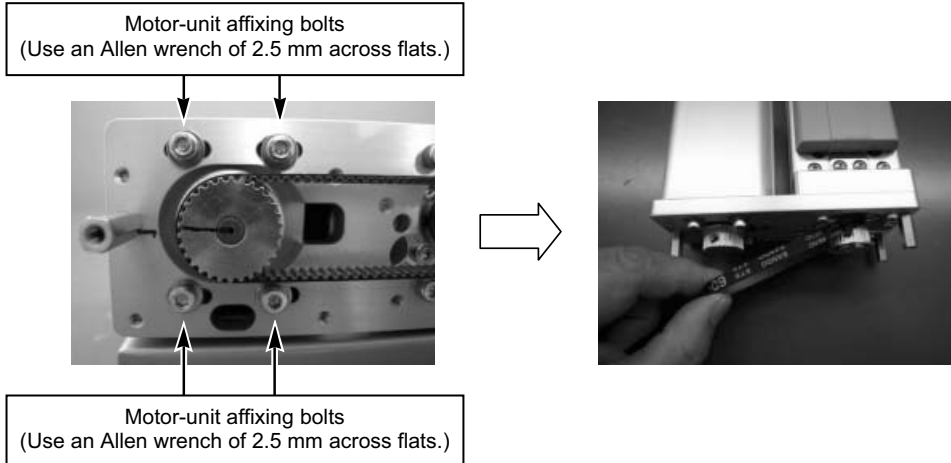


- 6) Detach the attached cables.

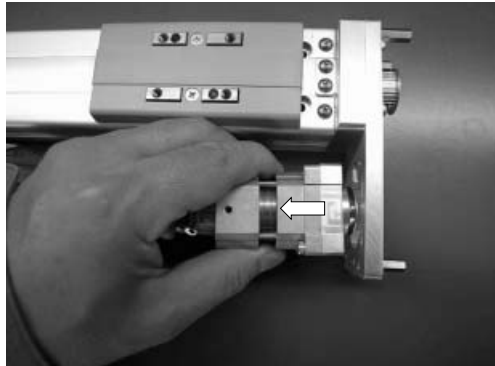




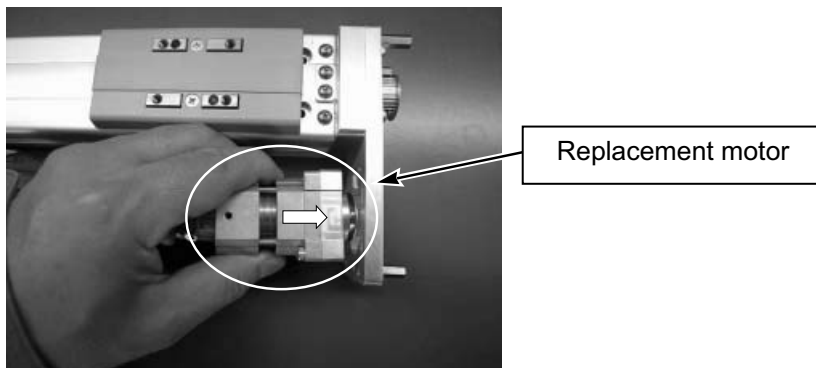
- 7) Loosen the motor-unit affixing bolts using an Allen wrench of 2.5 mm across flats. Slide the motor, and loosen and remove the belt. After the belt has been removed, remove the motor-unit affixing bolts.



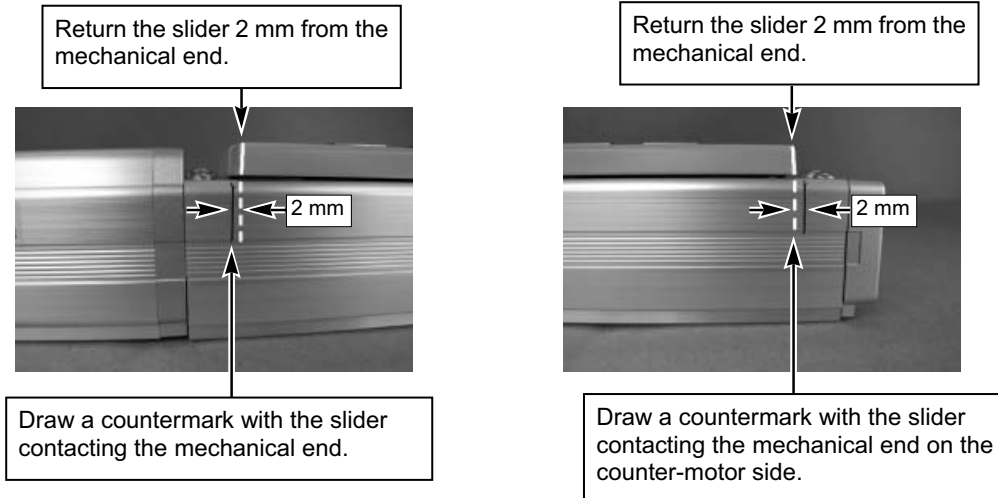
- 8) Take out the motor.



- 9) Install the replacement motor. Loosely tighten the motor-unit affixing bolts.



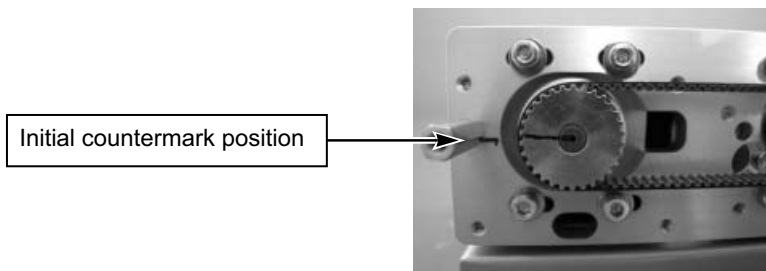
- 10) Move the slider to a position where Z phase turns on (home position).  
 On both standard actuators and actuators whose home is set on the opposite side, this position corresponds to 2 mm from the mechanical end.



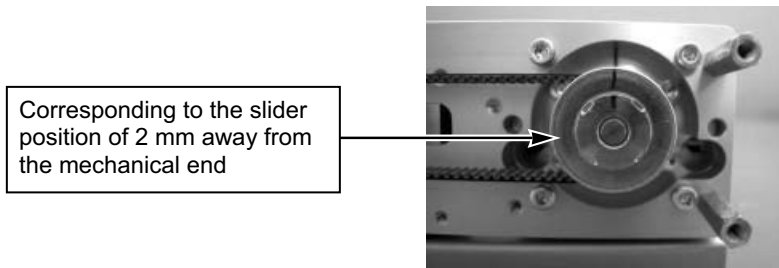
**Warning:** If the actuator is installed vertically, move it after turning on the controller power and forcibly releasing the brake. At this time, beware of danger as the actuator may drop suddenly. Always provide a support to brace the actuator hand to prevent sudden drop, so as not to pinch fingers or damage the load.

- 11) Check the following points before restoring the home position:
- The motor side should be aligned with the initial countermark. If the position is offset, adjust it to achieve proper alignment.
  - The ball-screw side should be in a location corresponding to the slide position of 2 mm away from the mechanical end.

After the check, attach a new belt while holding the pulleys on both sides in position.



Motor side

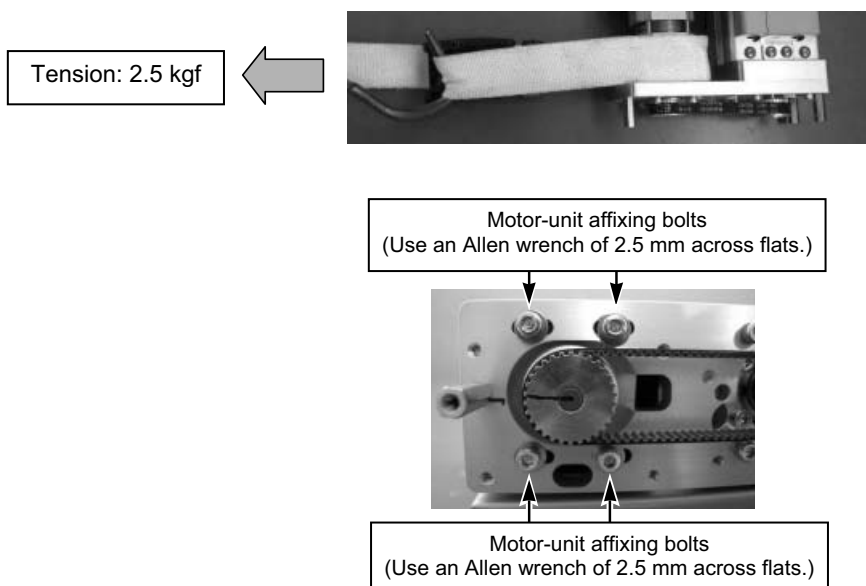


Ball-screw side

12) Adjust the belt tension.

Pass a looped strong string (or long tie-band) around the motor cover and pull it with a tension gauge to the specified tension. In this condition, uniformly tighten the motor-unit affixing bolts.

[Recommended tightening torque for adjustment bolts]  
162 N·cm (16.5 kgf·cm)

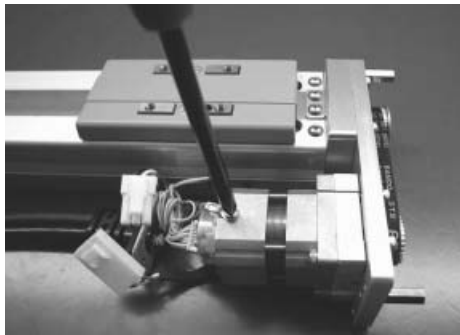


13) Install the attached cables.

- While holding the motor with one hand, insert the encoder cable.  
(The photograph bellow shows the motor (IAI encoder).)



- Install a grounding wire using a Phillips driver.



- Plug the cables into the motor.



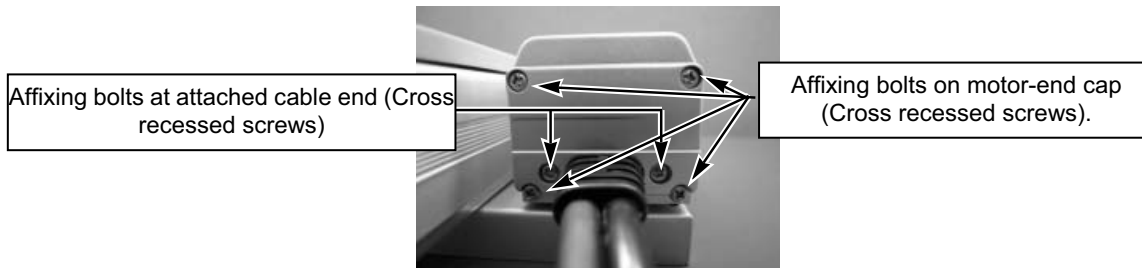
- If the actuator has a brake, also plug in the brake connector.

14) Insert the motor-end cover and cap.



Pull out the cable end while pushing in the motor-end cap.

15) Use a Phillips screwdriver to securely tighten the affixing bolts for motor-end cap and attached cables.



16) Use a Phillips screwdriver to securely tighten the affixing bolts for pulley cover.



Cross recessed screws: M3

17) Connect a PC or teaching pendant to the controller to perform homing. (If the actuator is of absolute encoder specification, an absolute reset must be performed.)  
Check for deviation from the initial home position. If there is a deviation, adjust the home offset parameter.

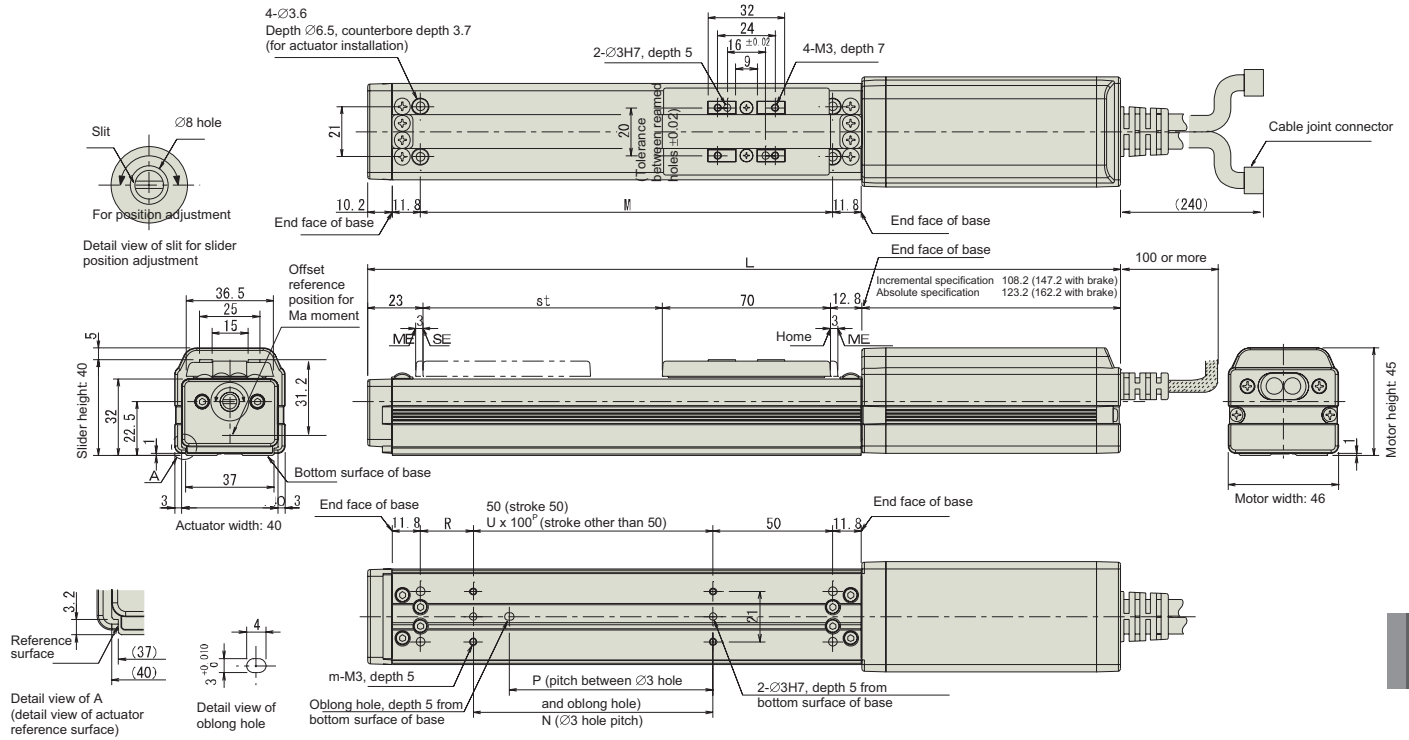
### **11.10.3 Replacing the Motor – Motor Straight Type (Built-in Type) : SA4D, SA5D, SA6D, SS4D, SS5D, SS6D**

If you must replace the motor of your built-in type actuator, please contact IAI because the built-in type actuators are not designed to allow their motor to be replaced by the customer.

## 12. Appendix

### 12.1 External Dimensions

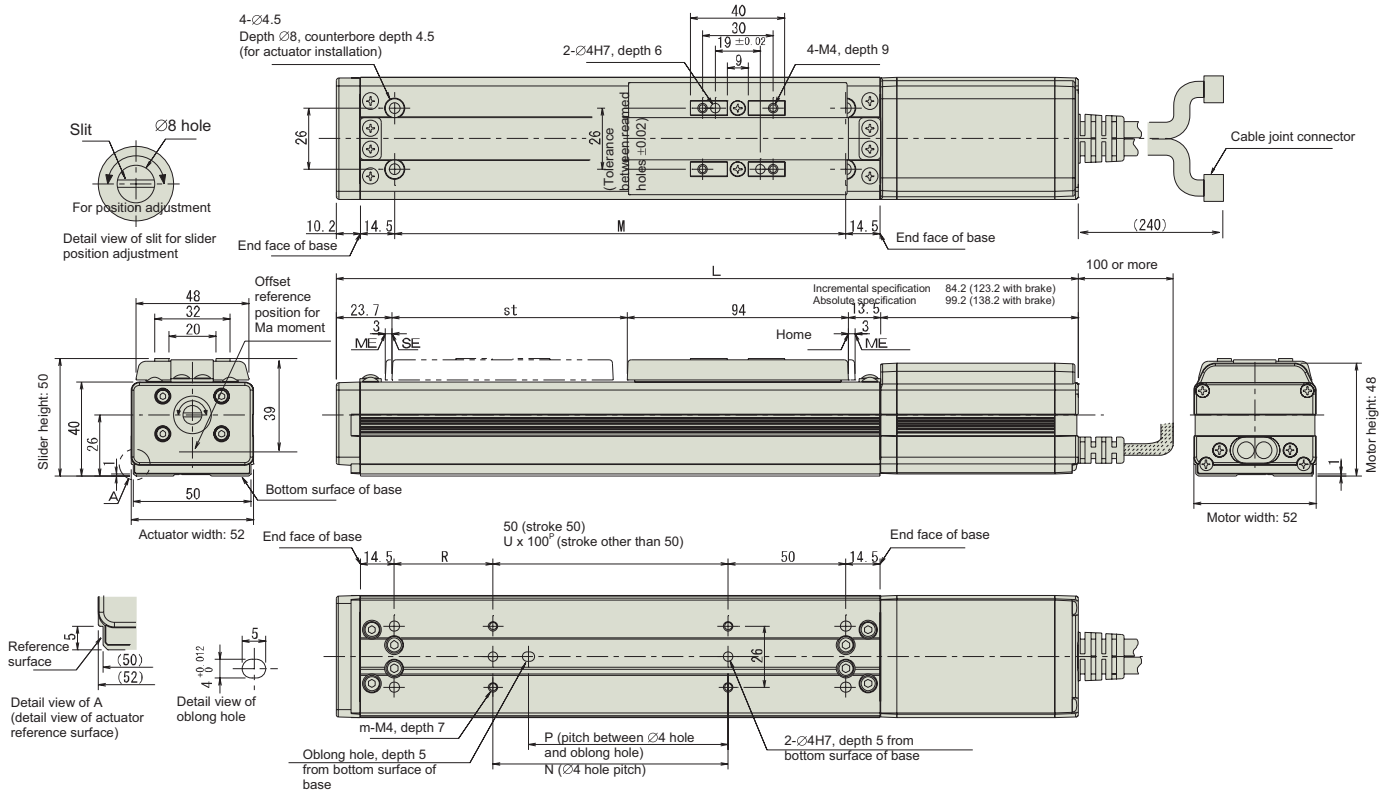
#### 12.1.1 RCA-SA4C



\* The brake-equipped weight increases in 0.3kg.

Stroke		50	100	150	200	250	300	350	400	
L	Incremental	Without brake	264	314	364	414	464	514	564	614
		With brake	303	353	403	453	503	553	603	653
	Absolute	Without brake	279	329	379	429	479	529	579	629
		With brake	318	368	418	468	518	568	618	668
M		122	172	222	272	322	372	422	472	
N		50	100	100	200	200	300	300	400	
P		35	85	85	185	185	285	285	385	
R		22	22	72	22	72	22	72	22	
U		-	1	1	2	2	3	3	4	
m		4	4	4	8	6	8	9	10	
Weight [kg]		Without brake	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4
		With brake	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7

## 12.1.2 RCA-SA5C

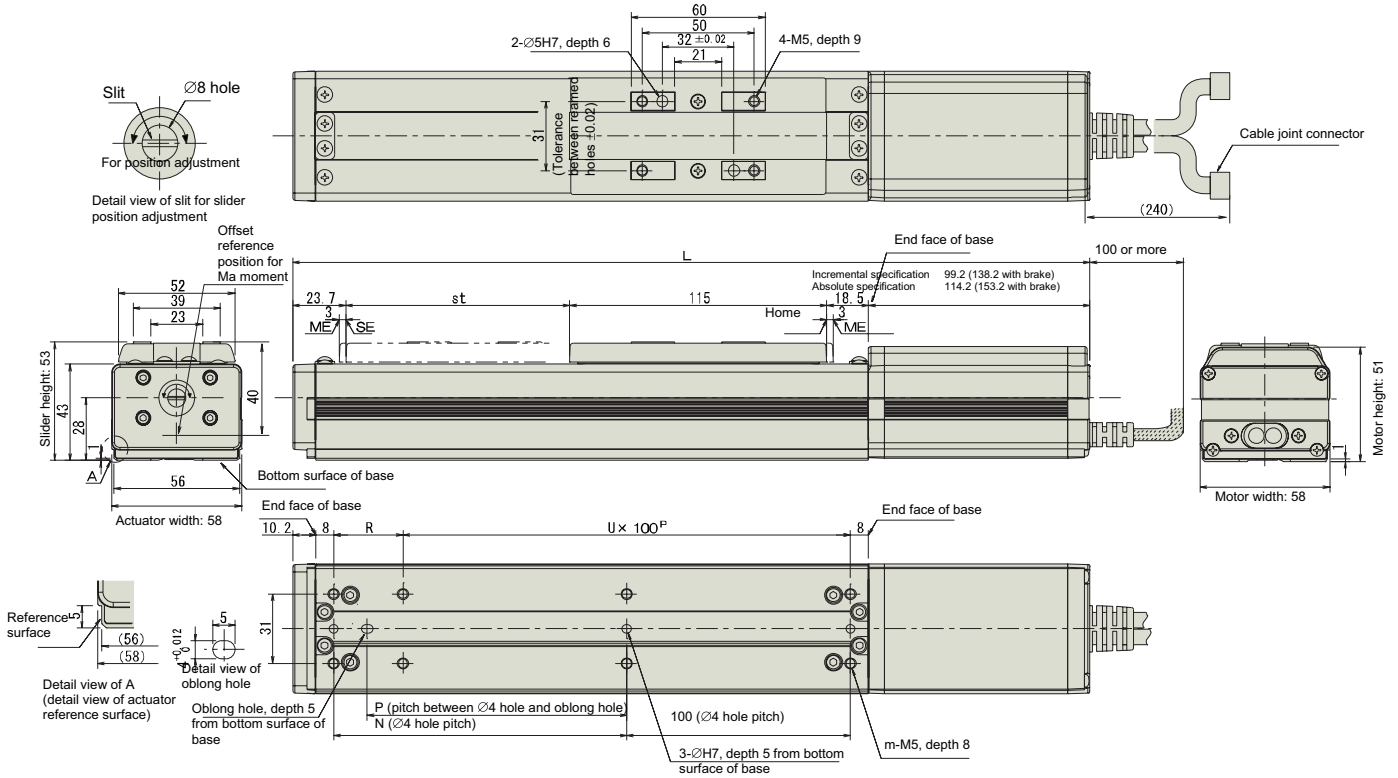


\* The brake-equipped weight increases in 0.3kg.

Stroke		50	100	150	200	250	300	350	400	450	500	
L	Incremental	Without brake	265.4	315.4	365.4	415.4	465.4	515.4	565.4	615.4	665.4	715.4
		With brake	304.4	354.4	404.4	454.4	504.4	554.4	604.4	654.4	704.4	754.4
	Absolute	Without brake	280.4	330.4	380.4	430.4	480.4	530.4	580.4	630.4	680.4	730.4
		With brake	319.4	369.4	419.4	469.4	519.4	569.4	619.4	669.4	719.4	769.4
M		142	192	242	292	342	392	442	492	542	592	
N		50	100	100	200	200	300	300	400	400	500	
P		35	85	85	185	185	285	285	385	385	485	
R		42	42	92	42	92	42	92	42	92	42	
U		-	1	1	2	2	3	3	4	4	5	
m		4	4	4	6	6	8	8	10	10	12	
Weight [kg]	Without brake	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	
	With brake	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	



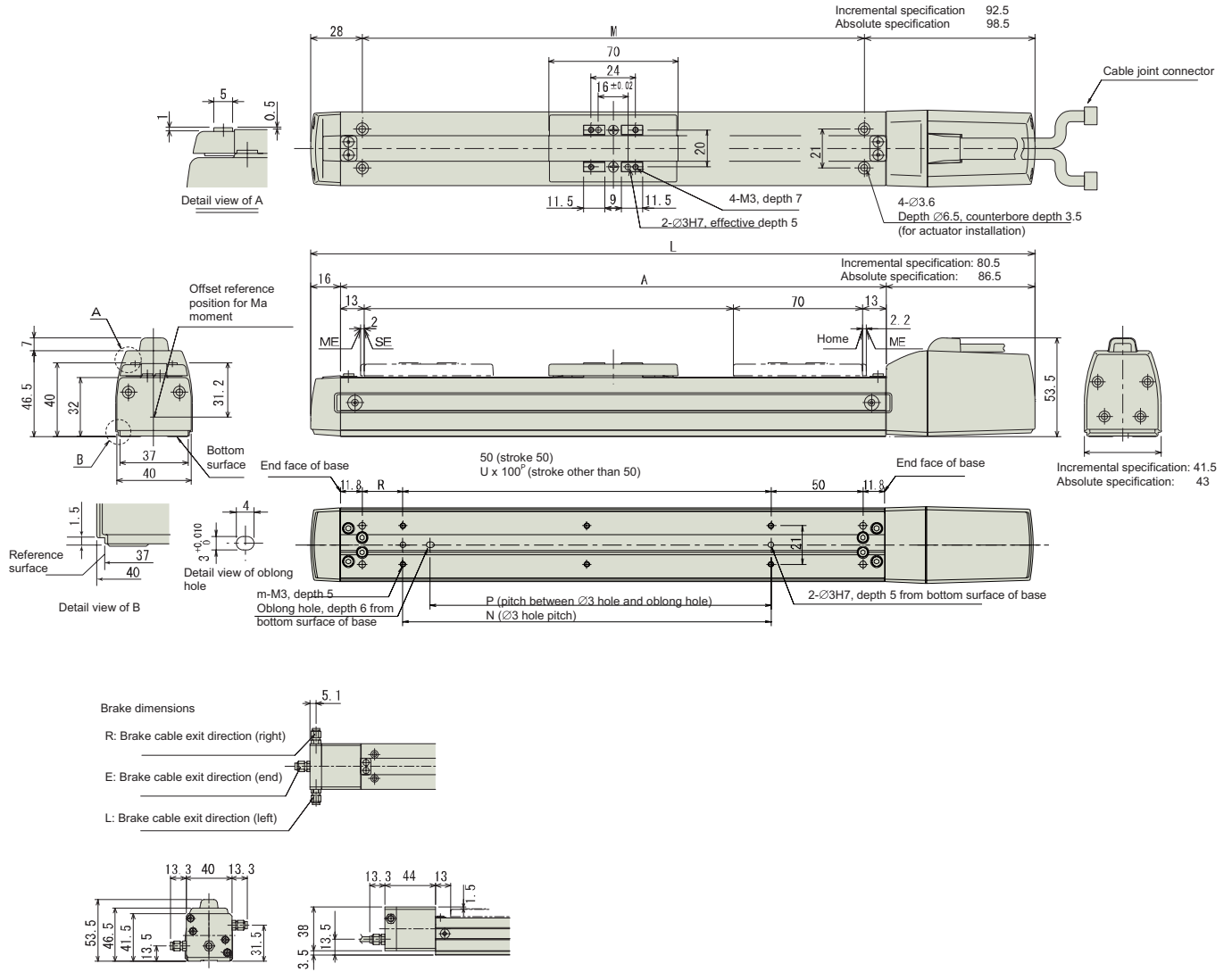
## 12.1.3 RCA-SA6C



\* The brake-equipped weight increases in 0.3kg.

Stroke		50	100	150	200	250	300	350	400	450	500	550	600	
L	Incremental	Without brake	306.4	356.4	406.4	456.4	506.4	556.4	606.4	656.4	706.4	756.4	806.4	856.4
		With brake	345.4	395.4	445.4	495.4	545.4	595.4	645.4	695.4	745.4	795.4	845.4	895.4
	Absolute	Without brake	321.4	371.4	421.4	471.4	521.4	571.4	621.4	671.4	721.4	771.4	821.4	871.4
		With brake	360.4	410.4	460.4	510.4	560.4	610.4	660.4	710.4	760.4	810.4	860.4	910.4
N		81	131	181	231	281	331	381	431	481	531	581	631	
P		66	116	166	216	266	316	366	416	466	516	566	616	
R		81	31	81	31	81	31	81	31	81	31	81	31	
U		1	2	2	3	3	4	4	5	5	6	6	7	
m		6	8	8	10	10	12	12	14	14	16	16	18	
Weight [kg]	Without brake	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	
	With brake	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	

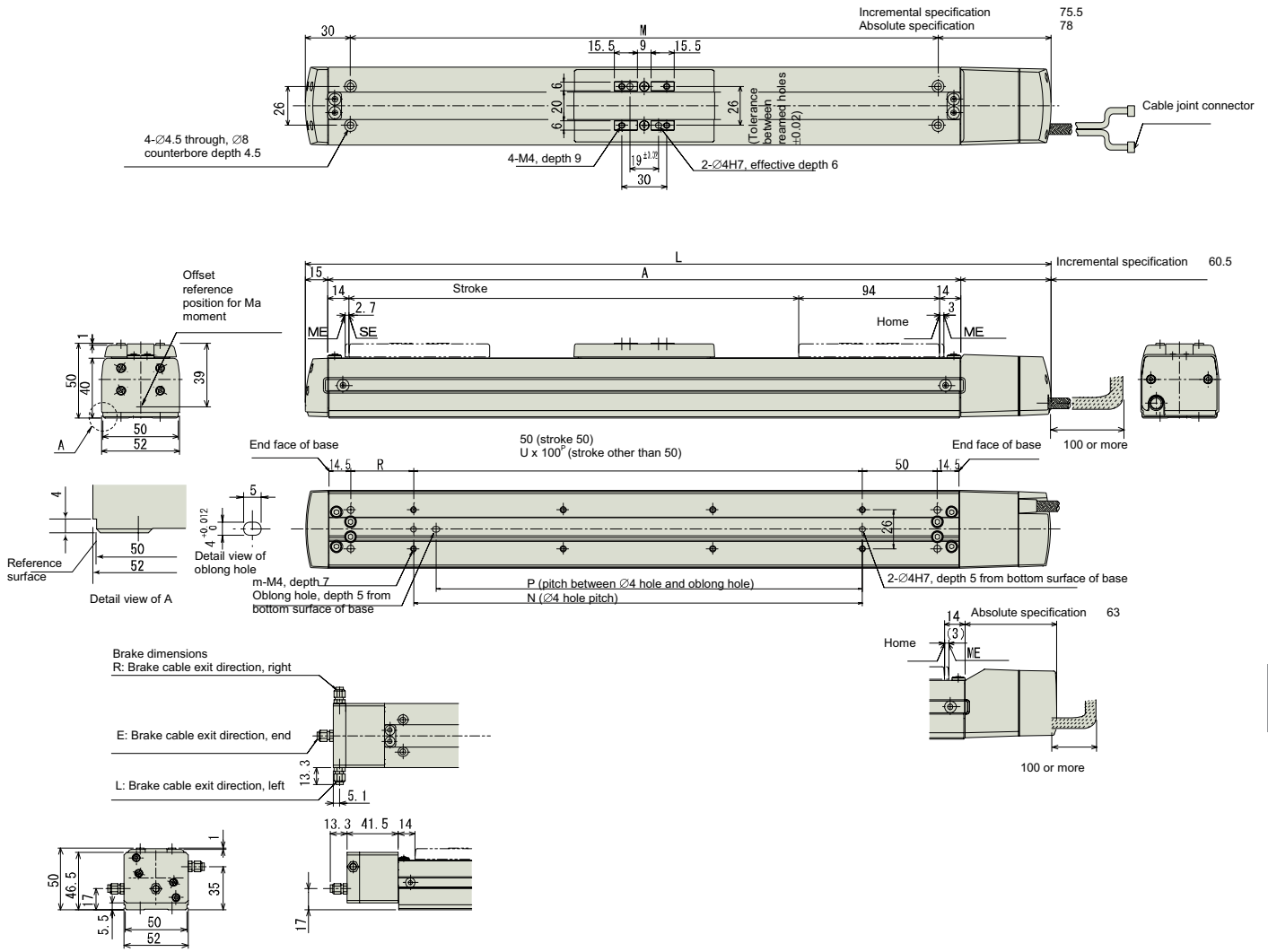
## 12.1.4 RCA-SA4D



\* The brake-equipped type is longer in 28mm (41.3mm for cable end side eject type) and heavier in 0.2kg.

Stroke		50	100	150	200	250	300
L	Incremental	242.5	292.5	342.5	392.5	442.5	492.5
	Absolute	248.5	298.5	348.5	398.5	448.5	498.5
A		146	196	246	296	346	396
M		122	172	222	272	322	372
N		50	100	100	200	200	300
P		35	85	85	185	185	285
R		22	22	72	22	72	22
U		-	1	1	2	2	3
m		4	4	4	6	6	8
Weight [kg]		0.6	0.7	0.8	0.9	1.0	1.1

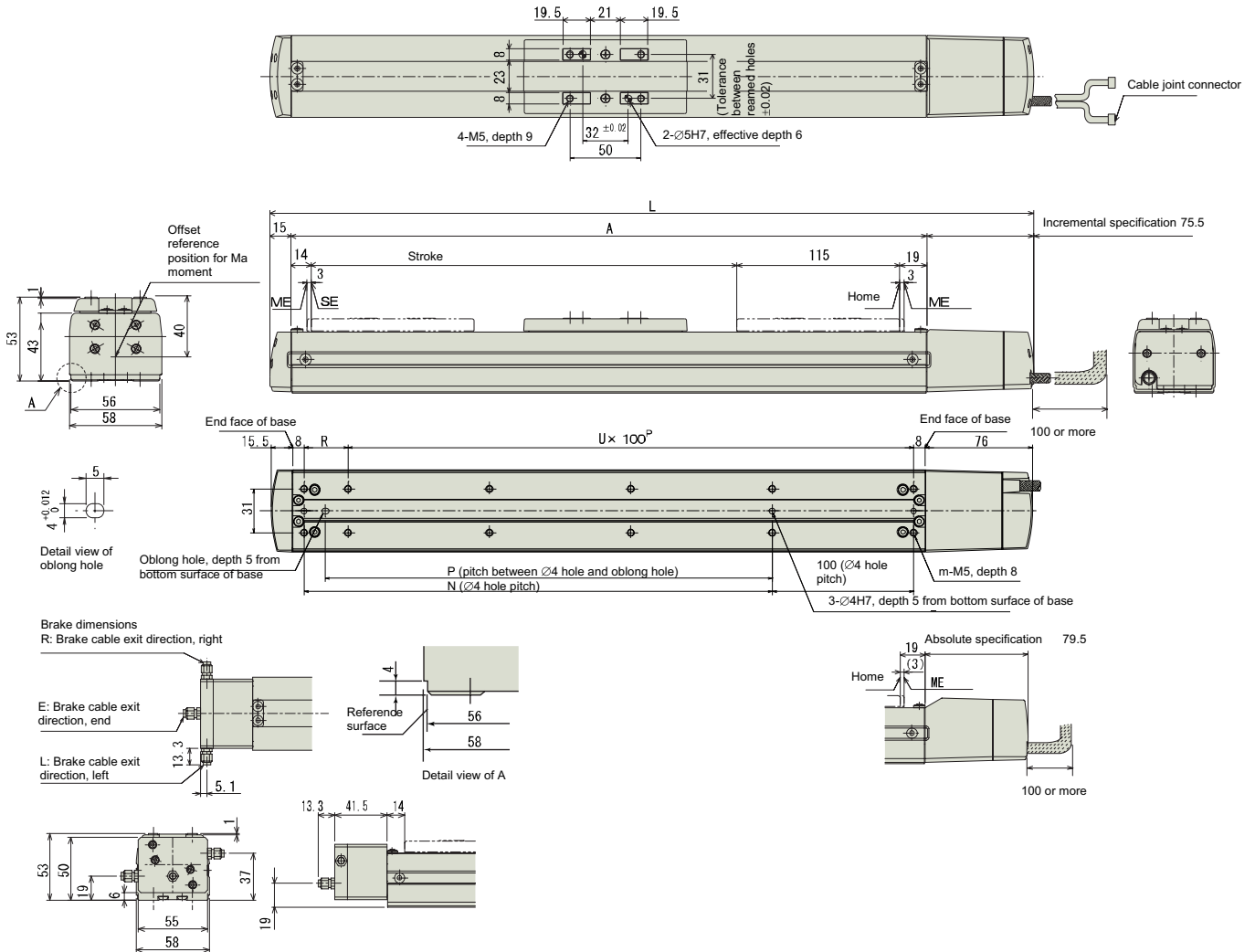
## 12.1.5 RCA-SA5D



\* The brake-equipped type is longer in 26.5mm (39.8mm for cable end side eject type) and heavier in 0.3kg.

Stroke	50	100	150	200	250	300	350	400	450	500	
L	Incremental	247.5	297.5	347.5	397.5	447.5	497.5	547.5	597.5	647.5	697.5
	Absolute	250	300	350	400	450	500	550	600	650	700
A	172	222	272	322	372	422	472	522	572	622	
M	142	192	242	292	342	392	442	492	542	592	
N	50	100	100	200	200	300	300	400	400	500	
P	35	85	85	185	185	285	285	385	385	485	
R	42	42	92	42	92	42	92	42	92	42	
U	-	1	1	2	2	3	3	4	4	5	
m	4	4	4	6	6	8	8	10	10	12	
Weight [kg]	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	

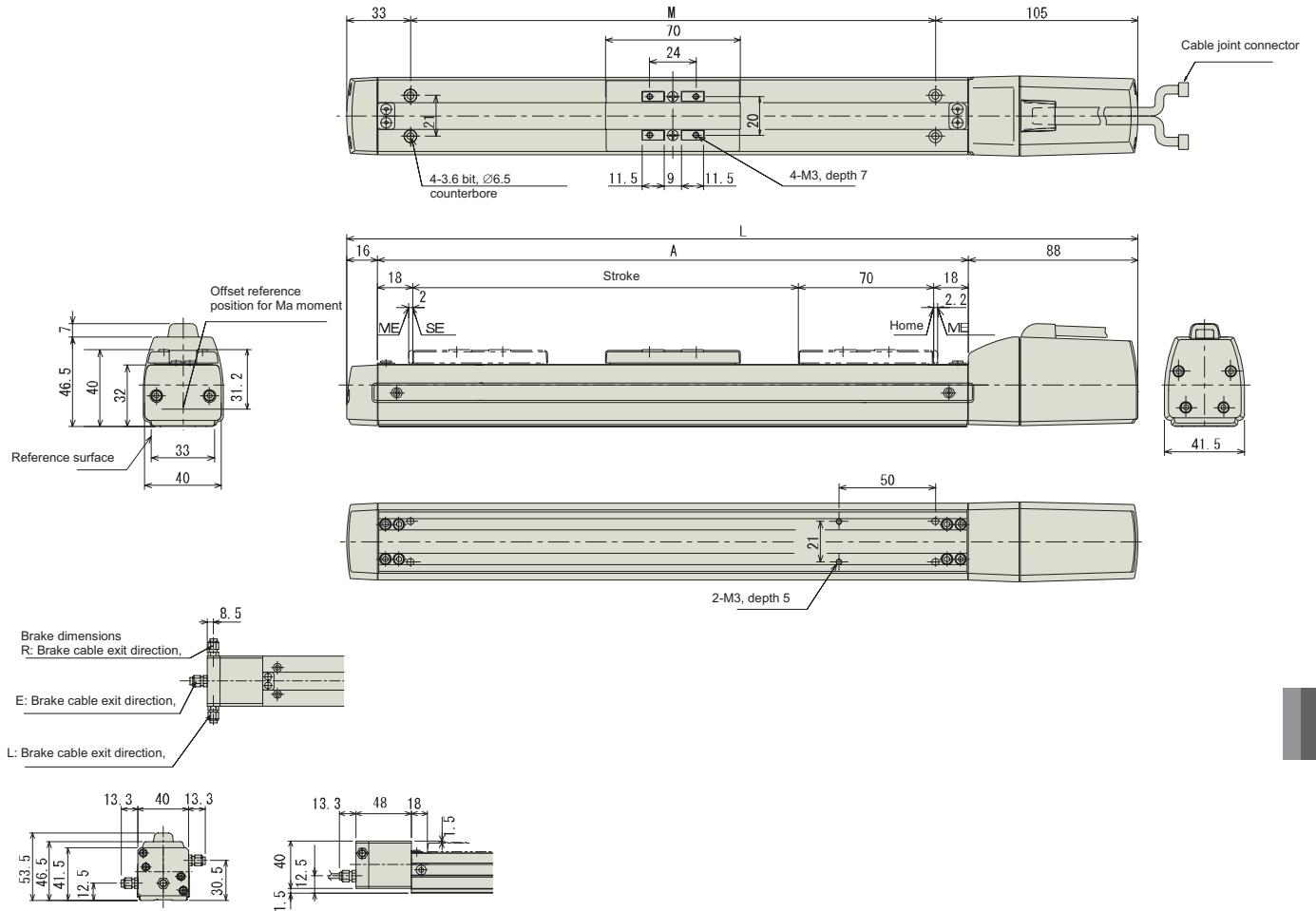
## 12.1.6 RCA-SA6D



\* The brake-equipped type is longer in 26.5mm (39.8mm for cable end side eject type) and heavier in 0.3kg.

Stroke	50	100	150	200	250	300	350	400	450	500	550	600	
L	Incremental	288.5	338.5	388.5	438.5	488.5	538.5	588.5	638.5	688.5	738.5	788.5	838.5
	Absolute	292.5	342.5	392.5	442.5	492.5	542.5	592.5	642.5	692.5	742.5	792.5	842.5
A	198	248	298	348	398	448	498	548	598	648	698	748	
N	81	131	181	231	281	331	381	431	481	531	581	631	
P	66	116	166	216	266	316	366	416	466	516	566	616	
R	81	31	81	31	81	31	81	31	81	31	81	31	
U	1	2	2	3	3	4	4	5	5	6	6	7	
m	6	8	8	10	10	12	12	14	14	16	16	16	
Weight [kg]	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	

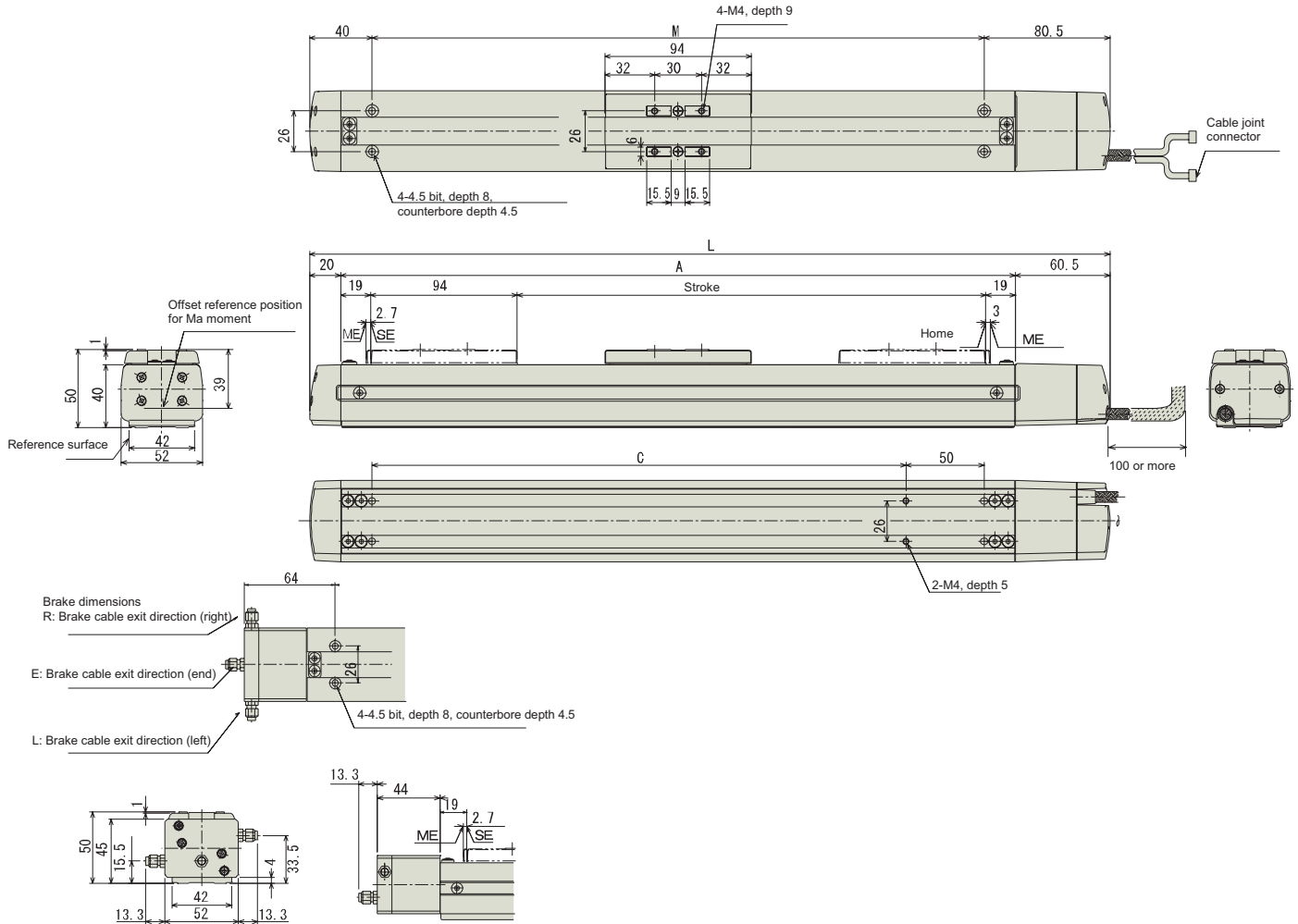
## 12.1.7 RCA-SS4D



\* The brake-equipped type is longer in 32mm (45.3mm for cable end side eject type) and heavier in 0.2kg.

Stroke	50	100	150	200	250	300
L	260	310	360	410	460	510
A	156	206	256	306	356	406
M	122	172	222	272	322	372
Weight [kg]	1.1	1.2	1.3	1.4	1.5	1.6

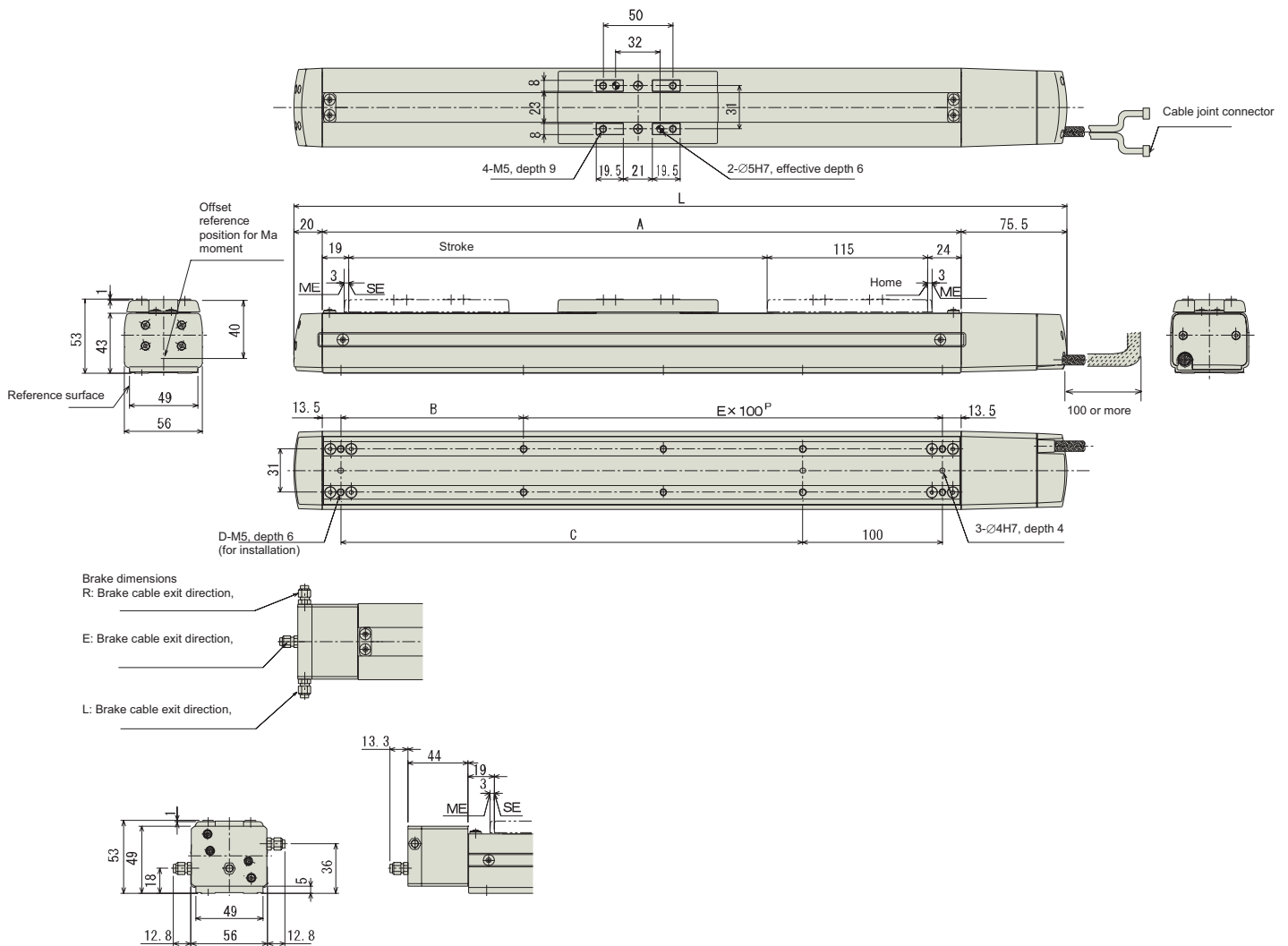
## 12.1.8 RCA-SS5D



\* The brake-equipped type is longer in 24mm (37.3mm for cable end side eject type) and heavier in 0.3kg.

Stroke	50	100	150	200	250	300	350	400	450	500
L	262.5	312.5	362.5	412.5	462.5	512.5	562.5	612.5	662.5	712.5
A	182	232	282	332	382	432	482	532	582	632
M	142	192	242	292	342	392	442	492	542	592
C	92	142	192	242	292	342	392	442	492	542
Weight [kg]	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3

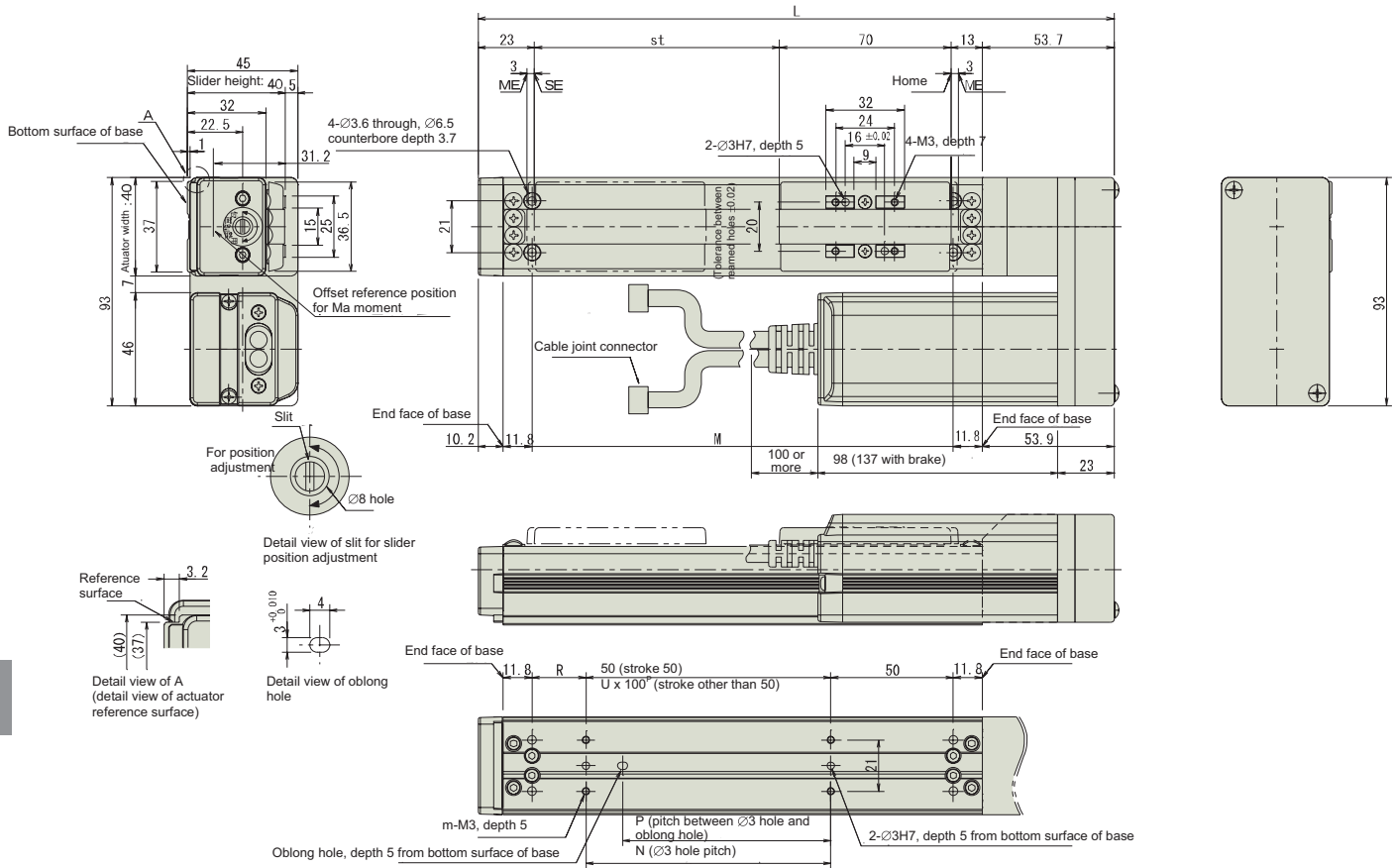
## 12.1.9 RCA-SS6D



\* The brake-equipped type is longer in 24mm (37.3mm for cable end side eject type) and heavier in 0.3kg.

Stroke	50	100	150	200	250	300	350	400	450	500	550	600
L	303.5	353.5	403.5	453.5	503.5	553.5	603.5	653.5	703.5	753.5	803.5	853.5
A	208	258	308	358	408	458	508	558	608	658	708	758
B	81	131	81	131	81	131	81	131	81	131	81	131
C	81	131	181	231	281	331	381	431	481	531	531	631
D	6	6	8	8	10	10	12	12	14	14	16	16
E	1	1	2	2	3	3	4	4	5	5	6	5
Weight [kg]	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.7

## 12.1.10 RCA-SA4R

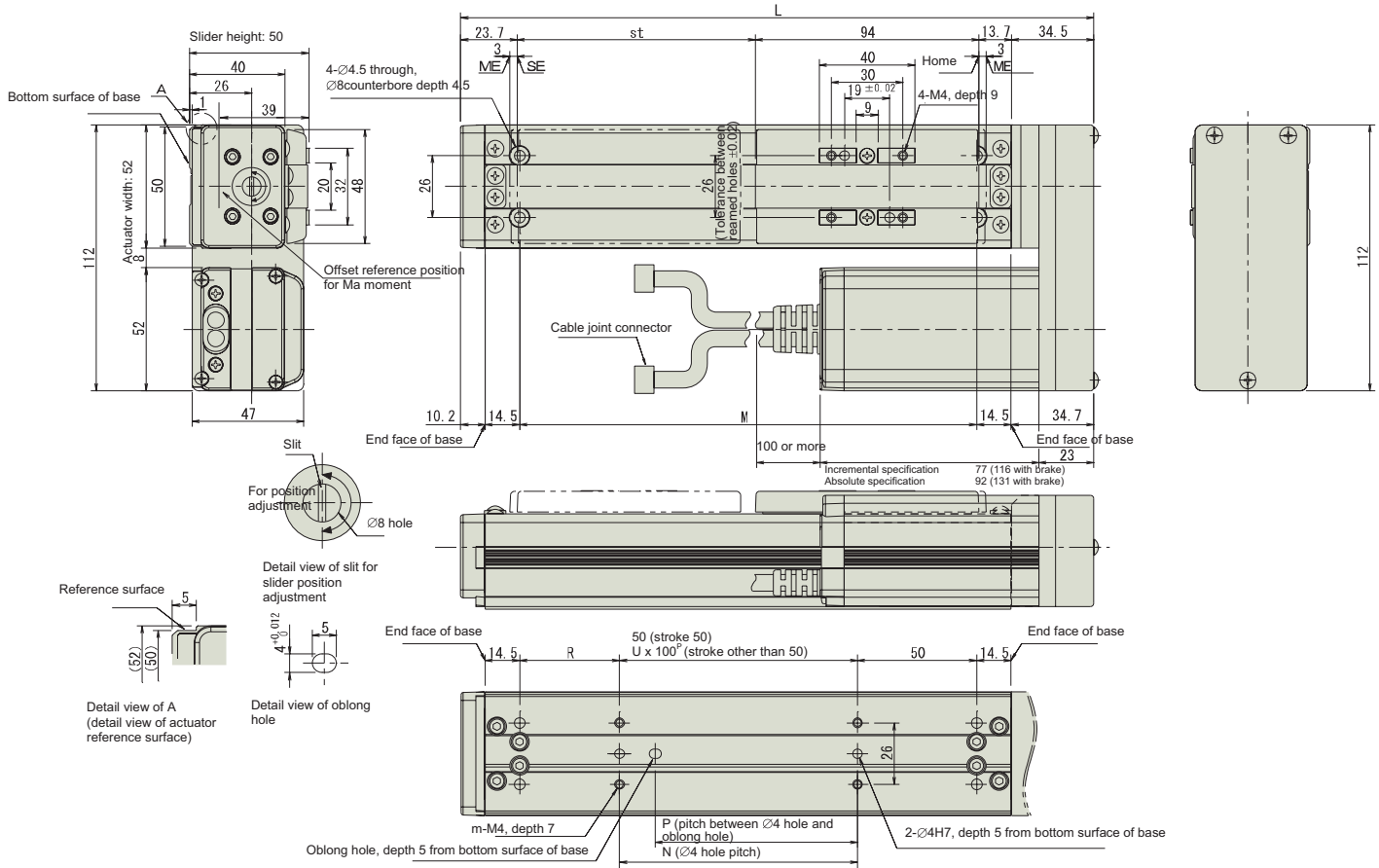


\* The brake-equipped weight increases in 0.3kg.

Stroke	50	100	150	200	250	300	350	400	
L	209.7	259.7	309.7	359.7	409.7	459.7	509.7	559.7	
M	122	172	222	272	322	372	422	472	
N	50	100	100	200	200	300	300	400	
P	35	85	85	185	185	285	285	385	
R	22	22	72	22	72	22	72	22	
U	-	1	1	2	2	3	3	4	
m	4	4	4	6	6	8	8	10	
Weight [kg]	Without brake	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
	With brake	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8



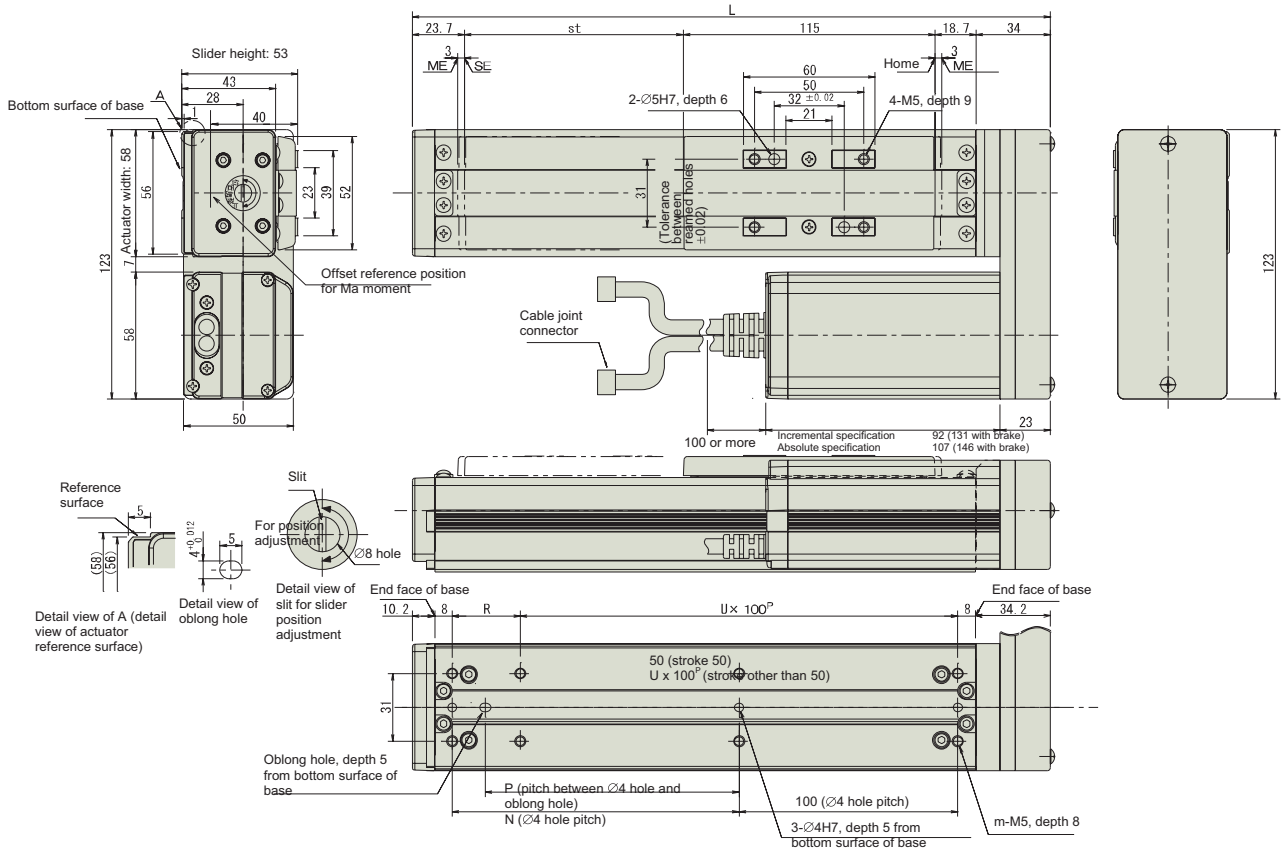
## 12.1.11 RCA- SA5R



\* The brake-equipped weight increases in 0.3kg.

Stroke	50	100	150	200	250	300	350	400	450	500	
L	215.9	265.9	315.9	365.9	415.9	465.9	515.9	565.9	615.9	665.9	
M	142	192	242	292	342	392	442	492	542	592	
N	50	100	100	200	200	300	300	400	400	500	
P	35	85	85	185	185	285	285	385	385	485	
R	42	42	92	42	92	42	92	42	92	42	
U	-	1	1	2	2	3	3	4	4	5	
m	4	4	4	6	6	8	8	10	10	12	
Weight [kg]	Without brake	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4
	With brake	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7

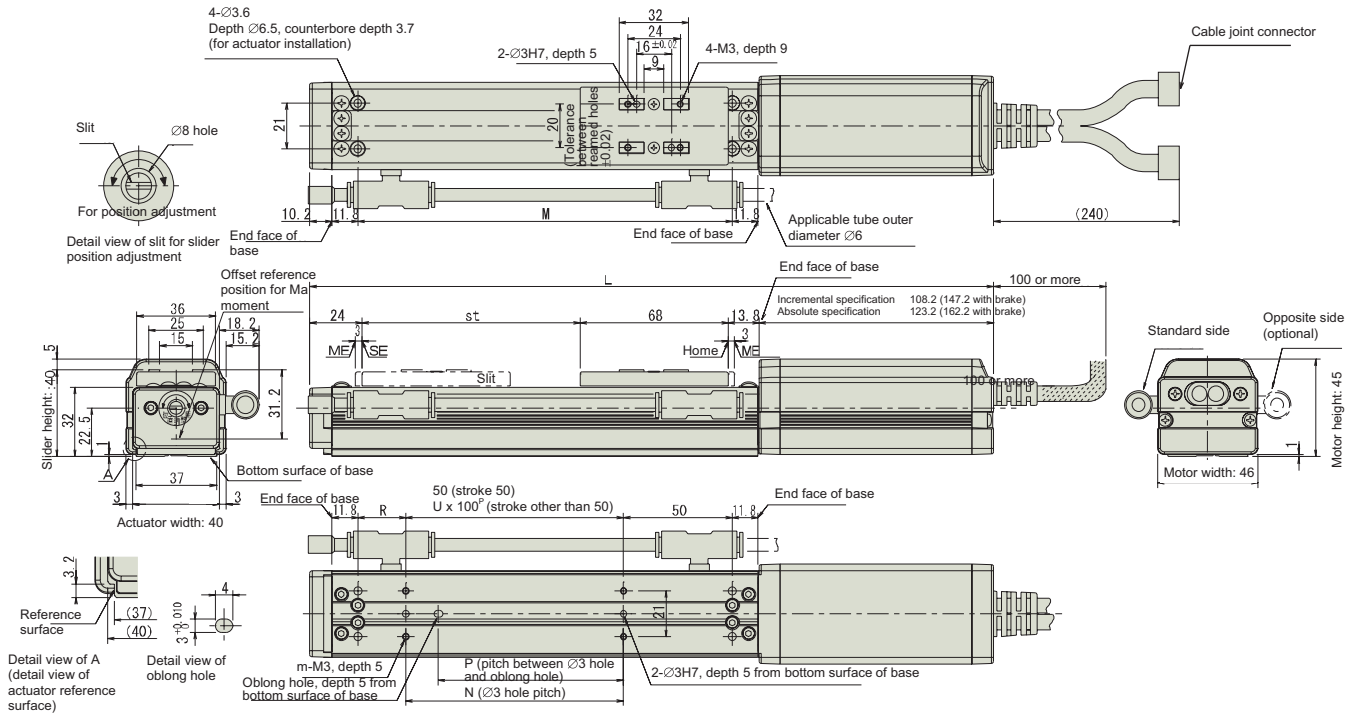
## 12.1.12 RCA-SA6R



\* The brake-equipped weight increases in 0.3kg.

Stroke	50	100	150	200	250	300	350	400	450	500	550	600
L	241.4	291.4	341.4	391.4	441.4	491.4	541.4	591.4	641.4	691.4	741.4	791.4
N	81	131	181	231	281	331	381	431	481	531	581	631
P	66	116	166	216	266	316	366	416	466	516	566	616
R	81	31	81	31	81	31	81	31	81	31	81	31
U	1	2	2	3	3	4	4	5	5	6	6	7
m	6	8	8	10	10	12	12	14	14	16	16	18
Weight [kg]	Without brake	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7
	With brake	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0

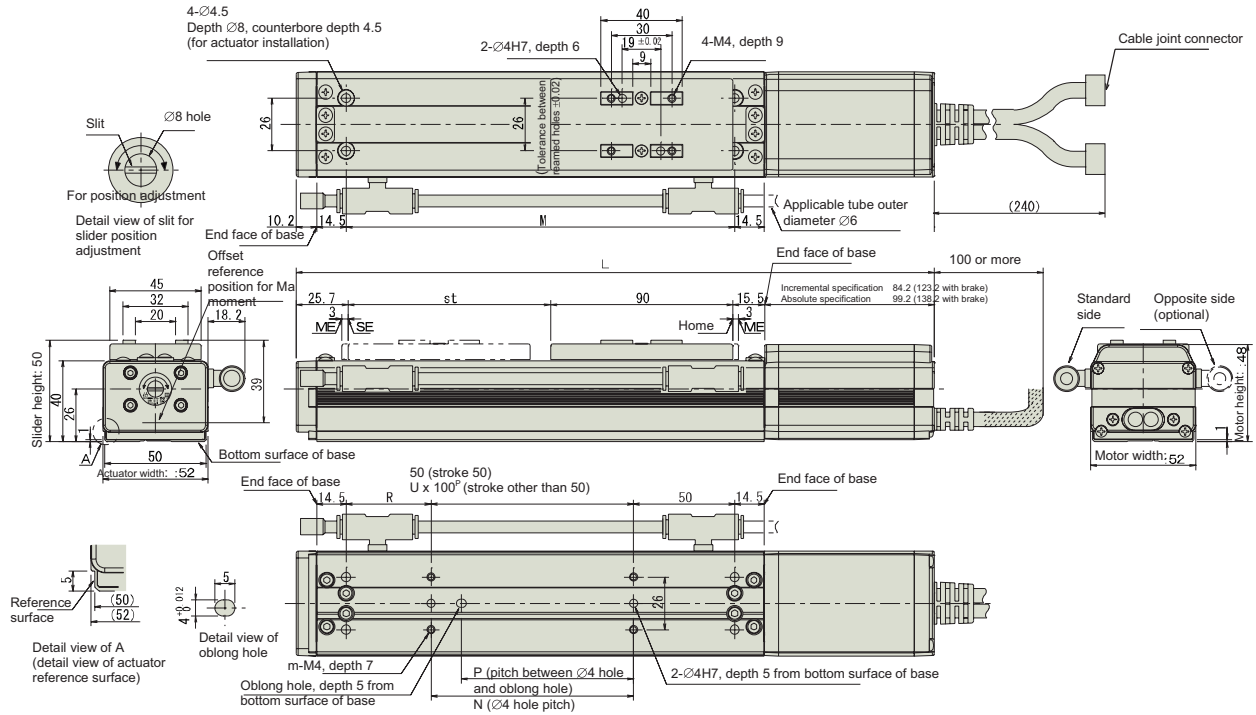
## 12.1.13 RCACR-SA4C



\* The brake-equipped weight increases in 0.3kg.

Stroke		50	100	150	200	250	300	350	400	
L	Incremental	Without brake	264	314	364	414	464	514	564	614
		With brake	303	353	403	453	503	553	603	653
	Absolute	Without brake	279	329	379	429	479	529	579	629
		With brake	318	368	418	468	518	568	618	668
M		122	172	222	272	322	372	422	472	
N		50	100	100	200	200	300	300	400	
P		35	85	85	185	185	285	285	385	
R		22	22	72	22	72	22	72	22	
U		-	1	1	2	2	3	3	4	
m		4	4	4	6	6	8	8	10	
Weight [kg]		Without brake	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4
		With brake	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7

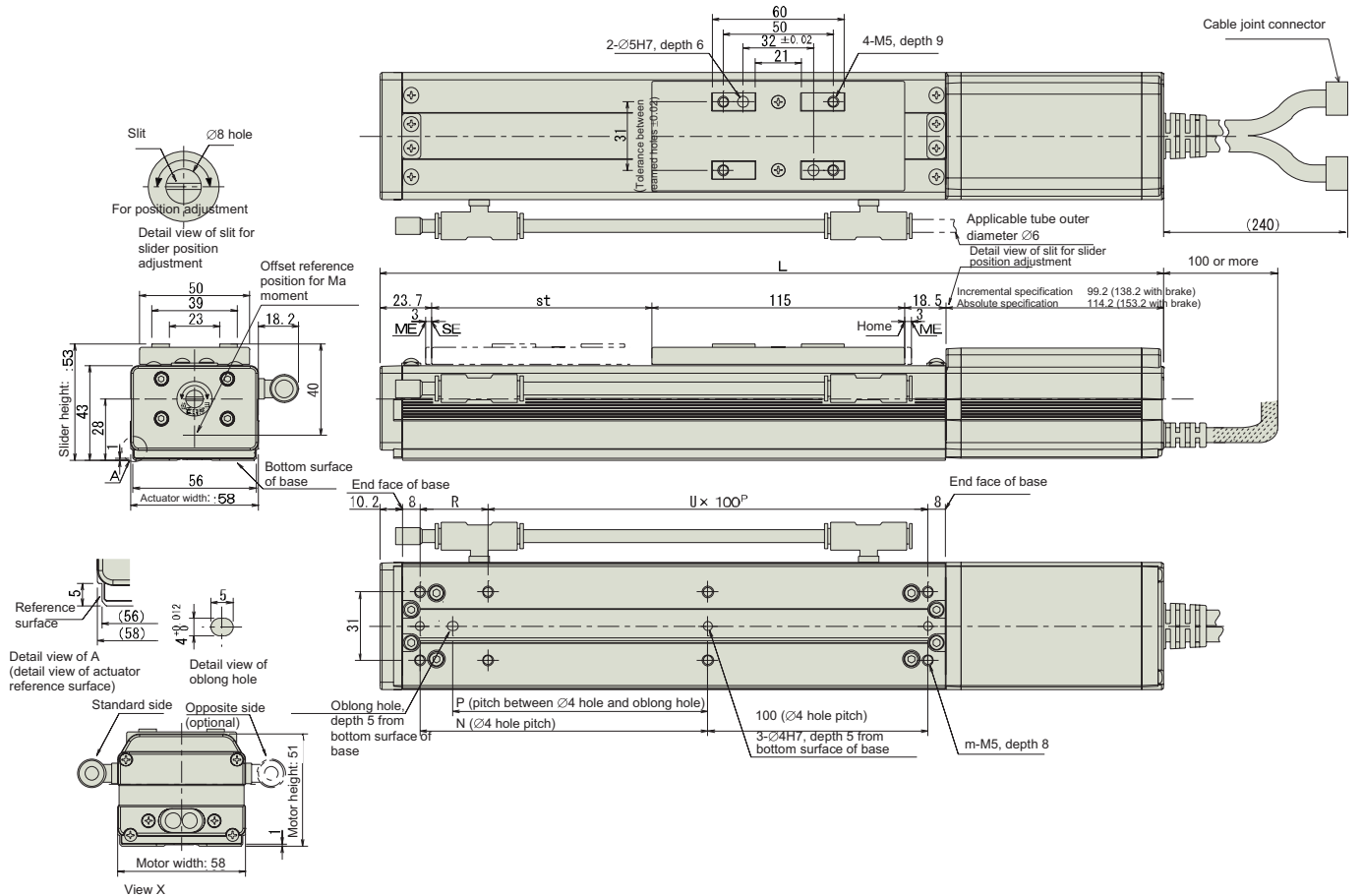
## 12.1.14 RCACR-SA5C



\* The brake-equipped weight increases in 0.3kg.

Stroke		50	100	150	200	250	300	350	400	450	500	
L	Incremental	Without brake	265.4	315.4	365.4	415.4	465.4	515.4	565.4	615.4	665.4	715.4
		With brake	304.4	354.4	404.4	454.4	504.4	554.4	604.4	654.4	704.4	754.4
	Absolute	Without brake	280.4	330.4	380.4	430.4	480.4	530.4	580.4	630.4	680.4	730.4
		With brake	319.4	369.4	419.4	469.4	519.4	569.4	619.4	669.4	719.4	769.4
M		142	192	242	292	342	392	442	492	542	592	
N		50	100	100	200	200	300	300	400	400	500	
P		35	85	85	185	185	285	285	385	385	485	
R		42	42	92	42	92	42	92	42	92	42	
U		-	1	1	2	2	3	3	4	4	5	
m		4	4	4	6	6	8	8	10	10	12	
Weight [kg]	Without brake	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	
	With brake	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	

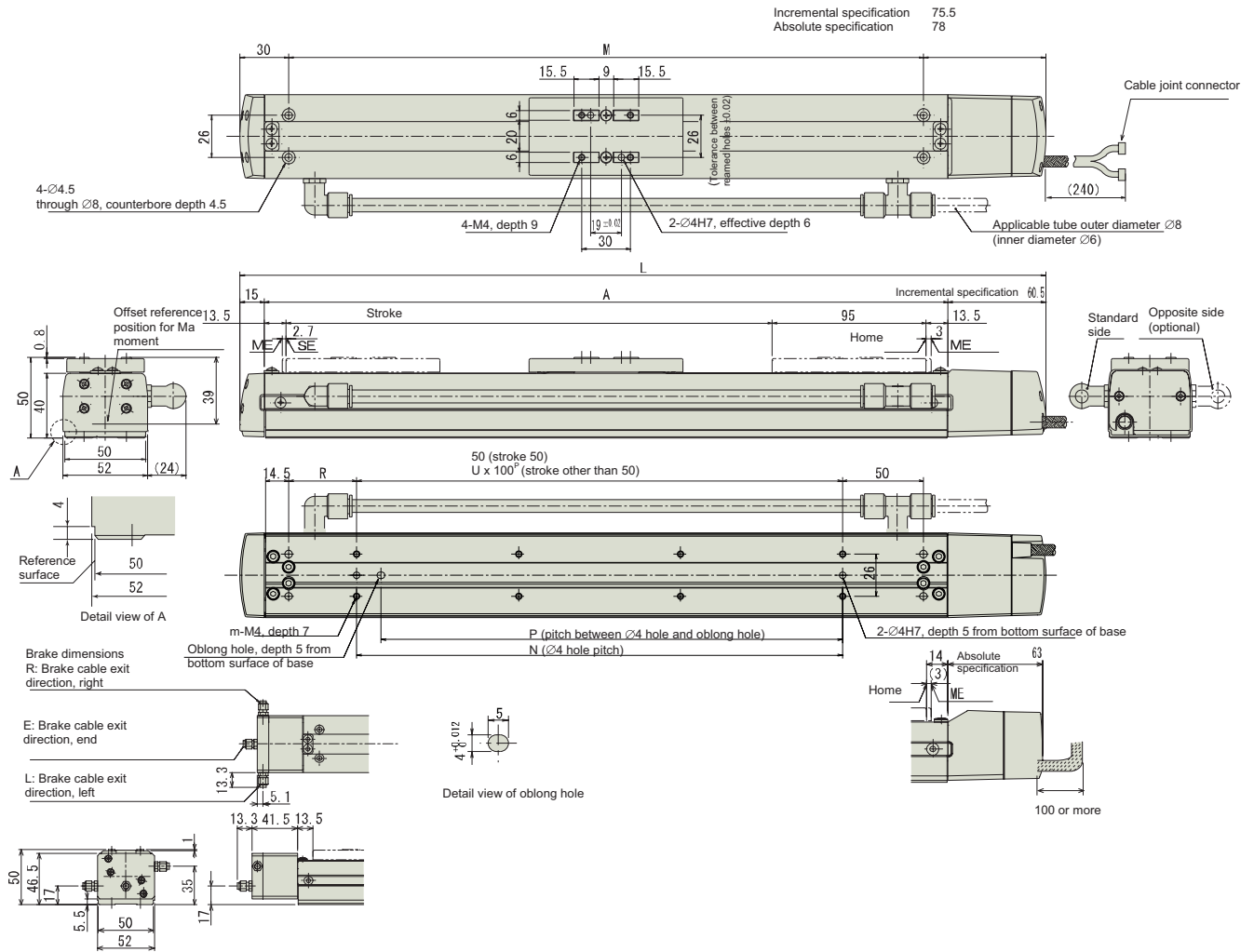
## 12.1.15 RCACR-SA6C



\* The brake-equipped weight increases in 0.3kg.

Stroke		50	100	150	200	250	300	350	400	450	500	550	600	
L	Incremental	Without brake	306.4	356.4	406.4	456.4	506.4	556.4	606.4	656.4	706.4	756.4	806.4	856.4
		With brake	345.4	395.4	445.4	495.4	545.4	595.4	645.4	695.4	745.4	795.4	845.4	895.4
	Absolute	Without brake	321.4	371.4	421.4	471.4	521.4	571.4	621.4	671.4	721.4	771.4	821.4	871.4
		With brake	360.4	410.4	460.4	510.4	560.4	610.4	660.4	710.4	760.4	810.4	860.4	910.4
N		81	131	181	231	281	331	381	431	481	531	581	631	
P		66	116	166	216	266	316	366	416	466	516	566	616	
R		81	31	81	31	81	31	81	31	81	31	81	31	
U		1	2	2	3	3	4	4	5	5	6	6	7	
m		6	8	8	10	10	12	12	14	14	16	16	18	
Weight [kg]	Without brake	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	
	With brake	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	

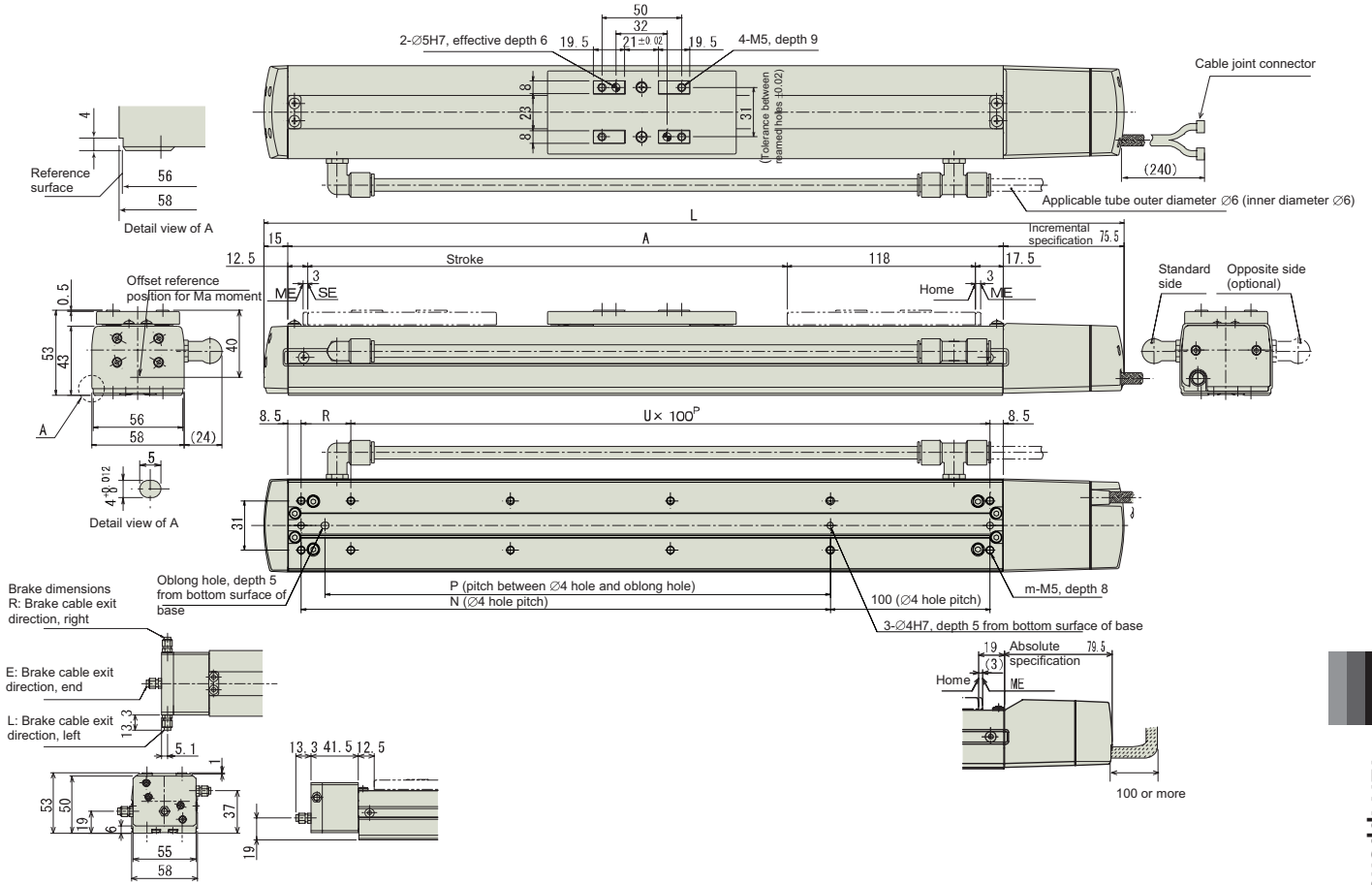
## 12.1.16 RCACR-SA5D



\* The brake-equipped type is longer in 26.5mm (39.8mm for cable end side eject type) and heavier in 0.3kg.

Stroke	50	100	150	200	250	300	350	400	450	500	
L	Incremental	247.5	297.5	347.5	397.5	447.5	497.5	547.5	597.5	647.5	697.5
	Absolute	250	300	350	400	450	500	550	600	650	700
A	172	222	272	322	372	422	472	522	572	622	
M	142	192	242	292	342	392	442	492	542	592	
N	50	100	100	200	200	300	300	400	400	500	
P	35	85	85	185	185	285	285	385	385	485	
R	42	42	92	42	92	42	92	42	92	42	
U	-	1	1	2	2	3	3	4	4	5	
m	4	4	4	6	6	8	8	10	10	12	
Weight [kg]	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	

## 12.1.17 RCACR-SA6D



\* The brake-equipped type is longer in 26.5mm (39.8mm for cable end side eject type) and heavier in 0.3kg.

Stroke		50	100	150	200	250	300	350	400	450	500	550	600
L	Incremental	288.5	338.5	388.5	438.5	488.5	538.5	588.5	638.5	688.5	738.5	788.5	838.5
	Absolute	292.5	342.5	392.5	442.5	492.5	542.5	592.5	642.5	692.5	742.5	792.5	842.5
A		198	248	298	348	398	448	498	548	598	648	698	748
N		81	131	181	231	281	331	381	431	481	531	581	631
P		66	116	166	216	266	316	366	416	466	516	566	616
R		81	31	81	31	81	31	81	31	81	31	81	31
U		1	2	2	3	3	4	4	5	5	6	6	7
m		6	8	8	10	10	12	12	14	14	16	16	18
Weight [kg]		1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5

## 13. Warranty

### 13.1 Warranty Period

One of the following periods, whichever is shorter:

- 18 months after shipment from IAI
- 12 months after delivery to the specified location
- 2,500 hours of operation

### 13.2 Scope of Warranty

Our products are covered by warranty when all of the following conditions are met. Faulty products covered by warranty will be replaced or repaired free of charge:

- (1) The breakdown or problem in question pertains to our product as delivered by us or our authorized dealer.
- (2) The breakdown or problem in question occurred during the warranty period.
- (3) The breakdown or problem in question occurred while the product was in use for an appropriate purpose under the conditions and environment of use specified in the operation manual and catalog.
- (4) The breakdown or problem in question was caused by a specification defect or problem, or by the poor quality of our product.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:

- [1] Anything other than our product
- [2] Modification or repair performed by a party other than us (unless we have approved such modification or repair)
- [3] Anything that could not be easily predicted with the level of science and technology available at the time of shipment from our company
- [4] A natural disaster, man-made disaster, incident or accident for which we are not liable
- [5] Natural fading of paint or other symptoms of aging
- [6] Wear, depletion or other expected result of use
- [7] Operation noise, vibration or other subjective sensation not affecting function or maintenance

Note that the warranty only covers our product as delivered and that any secondary loss arising from a breakdown of our product is excluded from the scope of warranty.

### 13.3 Honoring the Warranty

As a rule, the product must be brought to us for repair under warranty.

### 13.4 Limited Liability

- (1) We shall assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
- (2) We shall not be liable for any program or control method created by the customer to operate our product or for the result of such program or control method.



### **13.5 Conditions of Conformance with Applicable Standards/Regulations, Etc., and Applications**

- (1) If our product is combined with another product or any system, device, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc. In such a case we will not be liable for the conformance of our product with the applicable standards, etc.
- (2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications. Contact us if you must use our product for any of these applications:
  - [1] Medical equipment pertaining to maintenance or management of human life or health
  - [2] A mechanism or mechanical equipment intended to move or transport people (such as a vehicle, railway facility or aviation facility)
  - [3] Important safety parts of mechanical equipment (such as safety devices)
  - [4] Equipment used to handle cultural assets, art or other irreplaceable items
- (3) Contact us at the earliest opportunity if our product is to be used in any condition or environment that differs from what is specified in the catalog or operation manual.

### **13.6 Other Items Excluded from Warranty**

The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:

- [1] Guidance for installation/adjustment and witnessing of test operation
- [2] Maintenance and inspection
- [3] Technical guidance and education on operating/wiring methods, etc.
- [4] Technical guidance and education on programming and other items related to programs

## Change History

Revision Date	Description of Revision
	First edition
March 2007	Second edition • Corrected clerical errors
March 2008	Third edition • P. 25, 26: Added “high-acceleration/deceleration specification.”
July 2010	Forth edition • Added “Notes” at the beginning.”
November 2010	Fifth edition <ul style="list-style-type: none"> <li>• “Please Read Before Use”: Entirely revised the content.</li> <li>• “Safety Guide”: Entirely revised the content.</li> <li>• P. 9: Added “Handling Precautions.”</li> <li>• P. 17: Added 1, “Checking the Product.”</li> <li>• P. 19 to 25: Added “Maximum speed,” “Acceleration and payload capacity,” “Rated thrust,” “Drive method,” “Common specifications,” and “Lead 20” under 2, “Specification.”</li> <li>• P. 9, 57: Added “*1 If continuous back-and-forth operations are performed over a distance of 30 mm or less, grease film may be broken. As a guide, operate the actuator back and forth five times or so over a distance of 50 mm or more after every 5,000 to 10,000 cycles. This should restore oil film.”</li> </ul>
April 2011	Sixth edition • A page for CE Marking added
June 2011	Seventh edition • P.28: Contents of caution for vertically oriented mount changed.
July 2011	Eighth edition <ul style="list-style-type: none"> <li>• P.28: Change in ceiling installation availability (×: Not installable → △ : Daily inspection is requirde)</li> <li>• P.113 to 114: Contents changed in 13. Warranty</li> </ul>
December 2011	Ninth edition <ul style="list-style-type: none"> <li>• Contents changed in Safety Guide Caution notes added for when working with two or more persons</li> <li>• P.28, 38: Note added to state that RCACR-SA5D and RCACR-SA6D cannot be ensured for Cleanliness Class 10 in vertical orientation, horizontally oriented wall mount or in ceiling mount</li> </ul>
January 2012	Tenth edition <ul style="list-style-type: none"> <li>• P.10: How to Calculate Duty is changed.</li> <li>• P.96 to 112: Weight added to external dimensions.</li> </ul>
March 2012	Eleventh edition <ul style="list-style-type: none"> <li>• P.1 to 7: Contents added and changed in Safety Guide</li> <li>• P.9: Note “Make sure to attach the actuator properly by following this instruction manual.” added in Handling Precautions</li> <li>• P.62: Warning notes added such as in case the grease got into your eye, immediately go to see the doctor for an appropriate care.</li> <li>• P.96 to 112: Weight added to external dimensions</li> </ul>
May 2012	Twelfth edition • P.66: Gap checking tool became a plate and figure corrected
January 2013	12 B edition • P.20: Note corrected [High-acceleration/deceleration Type] Maximum acceleration (G) 0.1G → 1.0G

Revision Date	Description of Revision
March 2013	Thirteen edition <ul style="list-style-type: none"> <li>• P. 56: Bend radius of motor cable CB-ACS-MA*** changed Movable: 84mm → 35mm Fixed: 42mm → 23mm</li> </ul>
October 2014	13B edition <ul style="list-style-type: none"> <li>• P. 42: Change made in caution note in use of cable track</li> <li>• P. 64, 67: "Spacer" deleted</li> </ul>
April 2015	Fourteen edition <ul style="list-style-type: none"> <li>• P. 23: Dynamic allowable moment value changed</li> <li>• P. 26: Changed the description about the life</li> <li>• P. 18, 41, 56, 57: Dedicated controller added</li> <li>• P. 58: Change made to inspection schedule</li> </ul>
June 2015	14B edition <ul style="list-style-type: none"> <li>• P. 61: Grease change due to production stop Albania Grease No.2 → Albania Grease S2 Mobilax 2 → UNIREX N2</li> </ul>







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# **ROBO Cylinder RCA2 Actuator Slider Type**

## **Operating Manual**

══════════════════ **Fifteenth Edition** ══════════════════

Motor coupling types: [Slim Small ROBO Cylinder] SA2AC  
SA3C • SA4C • SA5C • SA6C

Motor reversing types: [Slim Small ROBO Cylinder] SA2AR  
SA3R • SA4R • SA5R • SA6R





## **Please Read Before Use**

Thank you for purchasing our product.

This operating manual explains the handling methods, structure and maintenance of this product, among others, providing the information you need to know to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

The DVD that comes with the product contains operating manuals for IAI products. When using the product, refer to the necessary portions of the applicable instruction manual by printing them out or displaying them on a PC.

After reading the operating manual, keep it in a convenient place so that whoever is handling this product can reference it quickly when necessary.

### **[Important]**

- This operating manual is original.
- This product is not to be used for any other purpose from what is noted in this operating manual. IAI shall not be liable whatsoever for any loss or damage arising from the result of using the product for any other purpose from what is noted in the manual.
- The information contained in this operating manual is subject to change without notice for the purpose of production improvement.
- If you have any question or finding regarding the information contained in this operating manual, contact our customer center or our sales office near you.
- Using or copying all or a part of this operating manual without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.

**RC ROBO  
CYLINDER**

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## Safety Guide

“Safety Guide” has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it 1before the operation of this product.

### Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

No.	Operation Description	Description
1	Model Selection	<ul style="list-style-type: none"> <li>● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications.               <ol style="list-style-type: none"> <li>1) Medical equipment used to maintain, control or otherwise affect human life or physical health.</li> <li>2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility)</li> <li>3) Important safety parts of machinery (Safety device, etc.)</li> </ol> </li> <li>● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product.</li> <li>● Do not use it in any of the following environments.               <ol style="list-style-type: none"> <li>1) Location where there is any inflammable gas, inflammable object or explosive</li> <li>2) Place with potential exposure to radiation</li> <li>3) Location with the ambient temperature or relative humidity exceeding the specification range</li> <li>4) Location where radiant heat is added from direct sunlight or other large heat source</li> <li>5) Location where condensation occurs due to abrupt temperature changes</li> <li>6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid)</li> <li>7) Location exposed to significant amount of dust, salt or iron powder</li> <li>8) Location subject to direct vibration or impact</li> </ol> </li> <li>● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.</li> </ul>

No.	Operation Description	Description
2	Transportation	<ul style="list-style-type: none"> <li>● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane.</li> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped.</li> <li>● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the operating manual for each model.</li> <li>● Do not step or sit on the package.</li> <li>● Do not put any heavy thing that can deform the package, on it.</li> <li>● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work.</li> <li>● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment's capability limit.</li> <li>● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength.</li> <li>● Do not get on the load that is hung on a crane.</li> <li>● Do not leave a load hung up with a crane.</li> <li>● Do not stand under the load that is hung up with a crane.</li> </ul>
3	Storage and Preservation	<ul style="list-style-type: none"> <li>● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation.</li> <li>● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.</li> </ul>
4	Installation and Start	<p>(1) Installation of Robot Main Body and Controller, etc.</p> <ul style="list-style-type: none"> <li>● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake.</li> <li>● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life.</li> <li>● When using the product in any of the places specified below, provide a sufficient shield.               <ol style="list-style-type: none"> <li>1) Location where electric noise is generated</li> <li>2) Location where high electrical or magnetic field is present</li> <li>3) Location with the mains or power lines passing nearby</li> <li>4) Location where the product may come in contact with water, oil or chemical droplets</li> </ol> </li> </ul>

No.	Operation Description	Description
4	Installation and Start	<p>(2) Cable Wiring</p> <ul style="list-style-type: none"> <li>● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool.</li> <li>● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error.</li> <li>● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error.</li> <li>● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction.</li> <li>● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product.</li> <li>● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.</li> </ul> <p>(3) Grounding</p> <ul style="list-style-type: none"> <li>● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation.</li> <li>● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm<sup>2</sup> (AWG20 or equivalent) or more for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards).</li> <li>● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).</li> </ul>
4	Installation and Start	<p>(4) Safety Measures</p> <ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot's movable range. When the robot under operation is touched, it may result in death or serious injury.</li> <li>● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation.</li> <li>● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product.</li> <li>● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input.</li> <li>● When the installation or adjustment operation is to be performed, give clear warnings such as "Under Operation; Do not turn ON the power!" etc. Sudden power input may cause an electric shock or injury.</li> <li>● Take the measure so that the work part is not dropped in power failure or emergency stop.</li> <li>● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety.</li> <li>● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire.</li> <li>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.</li> </ul>





No.	Operation Description	Description
5	Teaching	<ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well.</li> <li>● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency.</li> <li>● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly.</li> <li>● Place a sign “Under Operation” at the position easy to see.</li> <li>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.</li> </ul> <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>
6	Trial Operation	<ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation.</li> <li>● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation.</li> <li>● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc.</li> <li>● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.</li> </ul>
7	Automatic Operation	<ul style="list-style-type: none"> <li>● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence.</li> <li>● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication.</li> <li>● Make sure to operate automatic operation start from outside of the safety protection fence.</li> <li>● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product.</li> <li>● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.</li> </ul>



No.	Operation Description	Description
8	Maintenance and Inspection	<ul style="list-style-type: none"> <li>● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.</li> <li>● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well.</li> <li>● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch.</li> <li>● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency.</li> <li>● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly.</li> <li>● Place a sign “Under Operation” at the position easy to see.</li> <li>● For the grease for the guide or ball screw, use appropriate grease according to the operating manual for each model.</li> <li>● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product.</li> <li>● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.</li> <li>● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation.</li> <li>● Pay attention not to lose the cover or untightened screws, and make sure to put the product back to the original condition after maintenance and inspection works.</li> </ul> <p>Use in incomplete condition may cause damage to the product or an injury.</p> <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>
9	Modification and Dismantle	<ul style="list-style-type: none"> <li>● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.</li> </ul>
10	Disposal	<ul style="list-style-type: none"> <li>● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste.</li> <li>● When removing the actuator for disposal, pay attention to drop of components when detaching screws.</li> <li>● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.</li> </ul>
11	Other	<ul style="list-style-type: none"> <li>● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device.</li> <li>● See Overseas Specifications Compliance Manual to check whether complies if necessary.</li> <li>● For the handling of actuators and controllers, follow the dedicated operating manual of each unit to ensure the safety.</li> </ul>

## Alert Indication

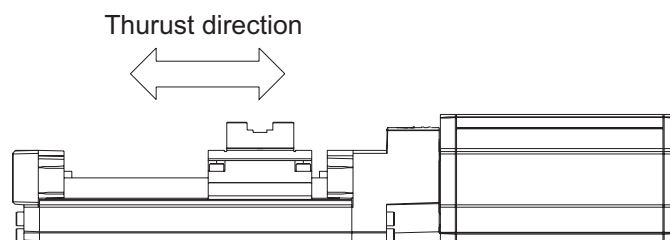
The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the operating manual for each model.

Level	Degree of Danger and Damage	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	 Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	 Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	 Caution
Notice	This indicates lower possibility for the injury, but should be kept to use this product properly.	 Notice

## Caution in Handling

1. **Make sure to follow the usage condition, environment and specification range of the product.**  
Operation out of the guarantee could cause a drop in performance or malfunction of the product.
2. **Do not set a speed or acceleration/deceleration exceeding the applicable rating.**  
Do not set a speed or acceleration/deceleration exceeding the applicable rating. Doing so may result in vibration, failure or shorter life. If an acceleration/deceleration exceeding the rating is set, creep may occur or the coupling may slip.
3. **Keep the load moments to within the allowable value.**  
Keep the load moments to within the allowable value. If a load exceeding the allowable load moment is applied, the life of the actuator may be reduced. In an extreme case, even flaking may occur.
4. **Keep the overhang length to within the allowable value.**  
Keep the overhang length of the load to within the allowable value. If the overhang length exceeds the allowable value, vibration or noise may occur.
5. **Back and forth operation in a short distance may cause wear of grease.**  
If the actuators are moved back and forth continuously over a short distance of 30mm or less, grease film may run out. As a guide, move the actuators back and forth repeatedly for around 5 cycles over a distance of 50mm or more after every 5,000 to 10,000 cycles. This will restore oil film.
6. **Turn on the servo after confirming that the slider or rod is away from the mechanical end.**  
If the servo is turned on when the slider or rod is near the mechanical end, pole phase detection may not be performed correctly and an pole non-confirmation error or excitation detection error may occur. Move the slider or rod away from the mechanical end before turning on the servo.
7. **Be careful not to subject the actuator to an external force or an impact load in the axial or thrust direction in excess of allowable capacity.**  
Subjecting the actuator to an external force or an impact load at levels above the allowable capacity may damage or destroy internal components.

Model	Allowable external force in thrust direction [N (kgf)]
SA3	50 (5.1)
SA4	160 (16.3)
SA5	220 (22.4)
SA6	220 (22.4)



8. Sometimes the slider may not move even when an external force is applied. In this case, do not forcibly move the slider, but use the PC software or teaching pendant to jog the slider.  
actuator damage may occur such as broken nut.
  
9. Handle the stainless steel sheet with special care.
  - The stainless steel sheet is attached by absorption to the side cover. If the environment contains high levels of iron filings or other magnetic matter, this may become absorbed between the stainless steel sheet and the rubber and cause malfunction. For that reason, avoid usage in such an environment.
  - Keep adhesive, paint, and other viscous material off the stainless steel sheet. Such material sticking to the stainless steel sheet can lead to defective slider operation and stainless steel sheet damage.
  - Be careful to avoid localized force on the stainless steel sheet. Such force could deform the stainless steel sheet and cause malfunctions.  
Also, during installation and transport, do not hold on to or press on the stainless steel sheet. Doing so could damage the stainless steel sheet.
  
10. Make sure to attach the actuator properly by following this operating manual.  
Using the product with the actuator not being certainly retained or affixed may cause abnormal noise, vibration, malfunction or shorten the product life.

## International Standards Compliances

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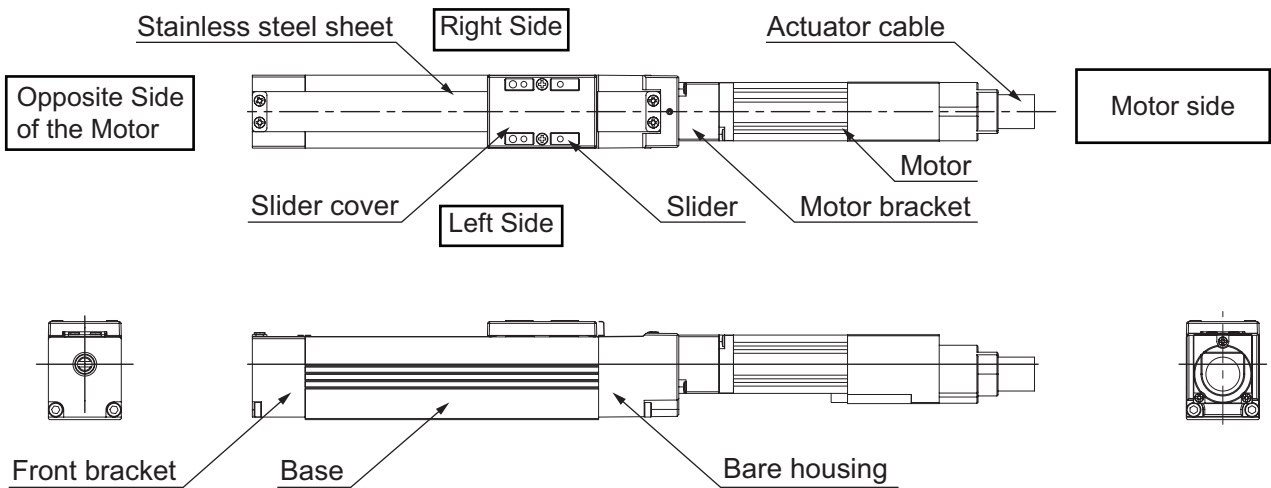
This actuator complies with the following overseas standard.  
Refer to Overseas Standard Compliance Manual (ME0287) for more detailed information.

RoHS Directive	CE Marking
<input type="checkbox"/>	<input type="checkbox"/>

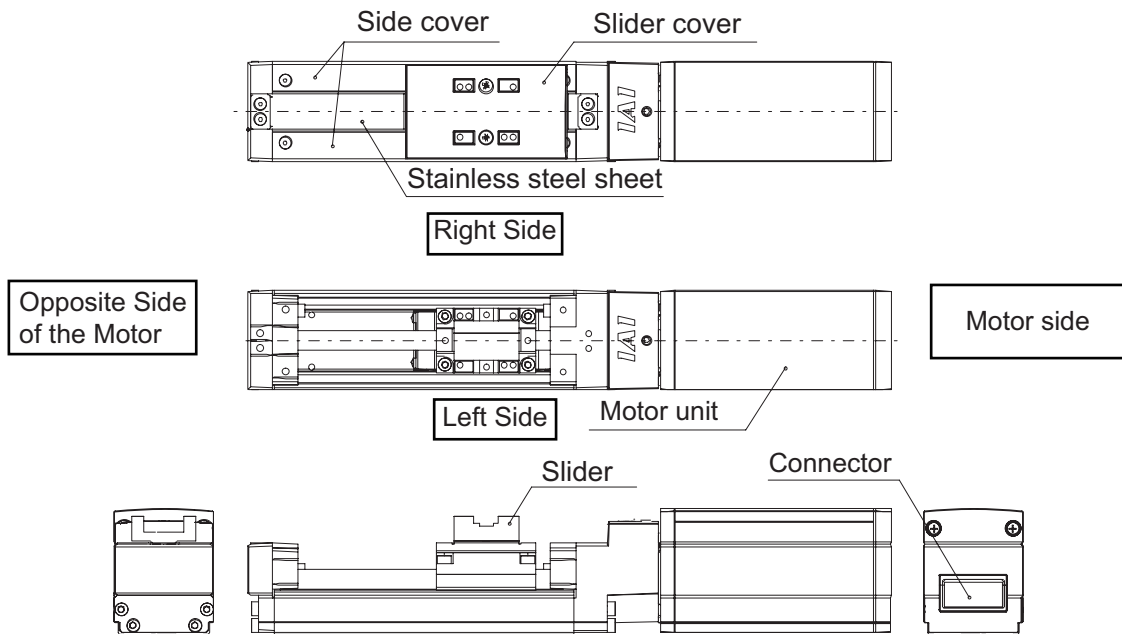
## Names of the Parts

In this Operation Manual, the left and right sides are indicated by looking at the actuator from the motor end, with the actuator placed horizontally, as shown in the figure below.

- Motor coupling types: RCA2-SA2AC

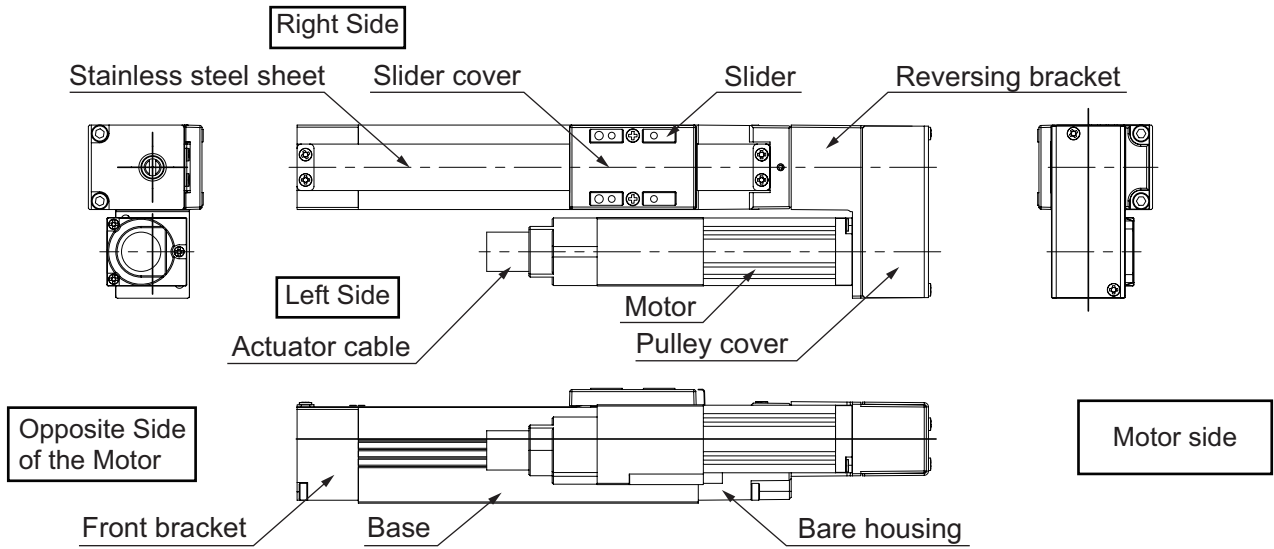


- Motor coupling types: RCA2-SA3C/SA4C/SA5C/SA6C

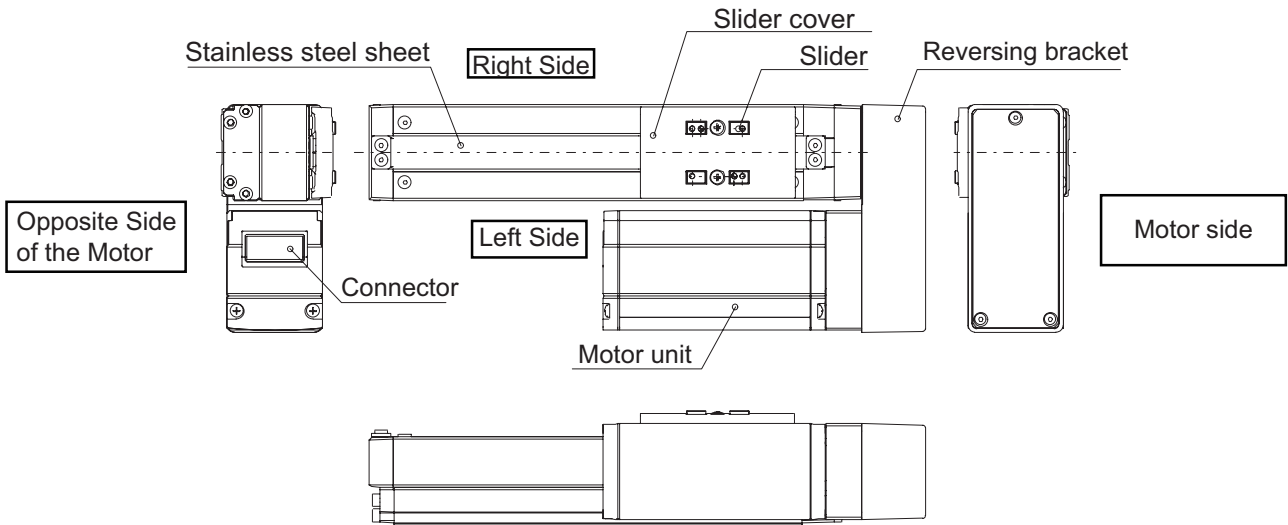


The connector position shown above assumes that the cable exit direction has not been changed.

- Motor reversing types: RCA2-SA2AR



- Motor reversing types: RCA2-SA3R/SA4R/SA5R/SA6R



The connector position shown above assumes that the cable exit direction has not been changed.





# 1. Specifications Check

## 1.1 Checking the Product

The standard configuration of this product is comprised of the following parts. See the component list for the details of the enclosed components. If you find any faulty or missing parts, contact your local IAI distributor.

### 1.1.1 Parts

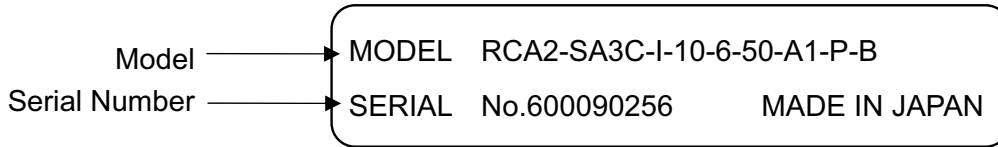
No.	Name	Model number	Quantity	Remarks
1	Actuator	Refer to "How to Read the Model Nameplate" and "How to Read the Model Number."	1	
Accessories				
2	Motor • encoder cables (Note1)		1	
3	First Step Guide		1	
4	Operating Manual (DVD)		1	
5	Safety Guide		1	

Note1 The motor • encoder cables differ between the standard model and robot cable.  
[Refer to 1.4 "Motor • Encoder Cables."]

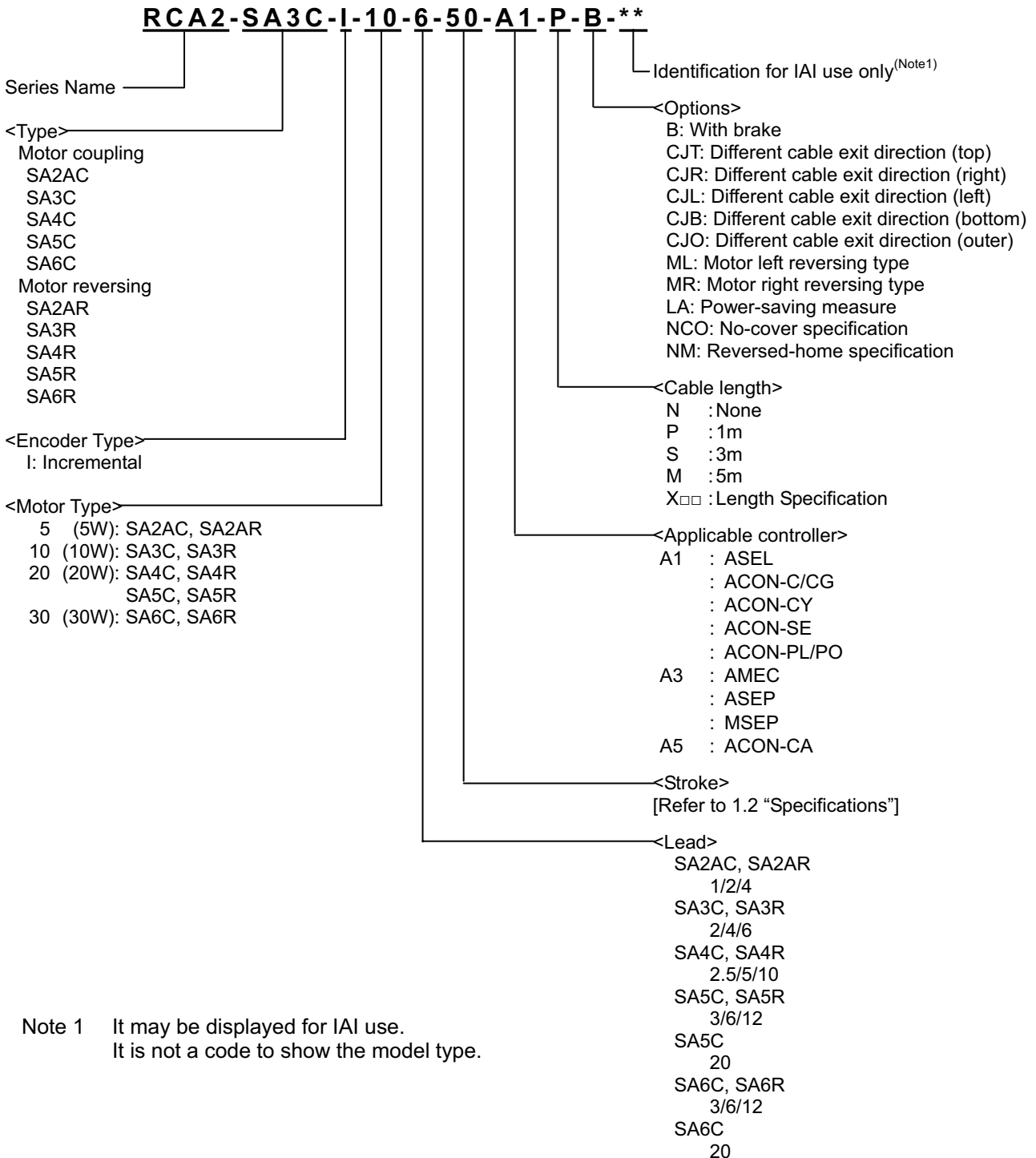
### 1.1.2 Operating Manuals for the Controllers Related to this Product

No.	Name	Control No.
1	Operating Manual for ASEL Controller	ME0165
2	Operating Manual for ACON-C/CG/CF Controller	ME0176
3	Operating Manual for ACON-CY Controller	ME0167
4	Operating Manual for ACON-SE Controller	ME0171
5	Operating Manual for ACON-PL/PO Controller	ME0166
6	Operating Manual for MEC Controller	ME0245
7	Operating Manual for PSEP/ASEP/DSEP Controller	ME0267
8	Operating Manual for MSEP Controller	ME0299
9	Operating Manual for PC Software IA-101-X-MW/IA-101-X-USBMW	ME0154
10	Operating Manual for ROBONET	ME0208
11	Operating Manual for Software RCM-101-MW/RCM-101-USB	ME0155
12	Operating Manual for MEC PC Software	ME0248
13	Operating Manual for Teaching Pendant SEL-T/TD	ME0183
14	Operating Manual for Teaching Pendant CON-T/TG	ME0178
15	Operating Manual for Touch Panel Teaching Pendant CON-PT/PD/PG	ME 0227
16	Operating Manual for Touch Panel Teaching CON-PTA/PDA/PGA	ME0295
17	Operating Manual for Dedicated ASEP/PSEP Touch Panel Teaching SEP-PT	ME0217
18	Operating Manual for Simple Teaching Pendant RCM-E	ME0174
19	Operating Manual for Data Setter RCM-P	ME0175
20	Operating Manual for Touch Panel Display RCM-PM-01	ME0182

## 1.1.3 How to Read the Model Nameplate



## 1.1.4 How to Read the Model Number



## 1.2 Specification

### 1.2.1 Speed

Speed limits (Unit: mm/s)

Model	Motor Type	Lead [mm]	Minimum Speed	Stroke [mm]																
				25	50	75	100	150	200	250	300	350	400	450	500	550	600	650	700	750
SA2A	5W	1	1.25	50			-	-	-	-	-	-	-	-	-	-	-	-	-	-
		2	2.5	100			-	-	-	-	-	-	-	-	-	-	-	-	-	-
		4	5	180	200			-	-	-	-	-	-	-	-	-	-	-	-	-
SA3	10W	2	2.5	-	100	-	100			-	-	-	-	-	-	-	-	-	-	-
		4	5	-	200	-	200			-	-	-	-	-	-	-	-	-	-	-
		6	7.5	-	300	-	300			-	-	-	-	-	-	-	-	-	-	-
SA4	20W	2.5	3.12	-	125	-	125			-	-	-	-	-	-	-	-	-	-	-
		5	6.25	-	250	-	250			-	-	-	-	-	-	-	-	-	-	-
		10	12.5	-	380	-	500			-	-	-	-	-	-	-	-	-	-	-
SA5	20W	3	3.75	-	150	-	150			-	-	-	-	-	-	140	120	105	90	80
		6	7.5	-	300	-	300			-	-	-	-	-	-	285	245	210	185	165
		12	15	-	380	-	540	600			-	-	-	-	-	570	490	425	370	330
SA5C	20W	20	25	-	380	-	540	660	770	860	940	1000			910	790	690	610		
				-	380	-	540	660	770	800 (stroke 250 to 650, installed vertically)			790	690	610					
SA6	30W	3	3.75	-	150	-	150			-	-	-	-	-	140	120	105	90	80	
		6	7.5	-	300	-	300			-	-	-	-	-	285	245	210	185	165	
		12	15	-	380	-	540	600			-	-	-	-	570	490	425	370	330	
SA6C	30W	20	25	-	380	-	540	660	770	860	940	1000			910	790	690	610		
				-	380	-	540	660	770	800 (stroke 250 to 650, installed vertically)			790	690	610					

The maximum speed may not be reached depending on the acceleration/deceleration setting.

### 1.2.2 Acceleration and payload

Model	Motor Type	Lead [mm]	Rated acceleration (G)		Payload (Kg)	Rated thrust (N)
SA2A	5W	1	Horizontal	0.3	2	85.5
			Vertical	0.3	1	
		2	Horizontal	0.3	1	42.3
			Vertical	0.3	0.5	
		4	Horizontal	0.3	0.5	21.4
			Vertical	0.3	0.25	
SA3	10W	2	Horizontal	0.2	3	85
			Vertical	0.2	1.5	
		4	Horizontal	0.3	2	43
			Vertical	0.2	1	
		6	Horizontal	0.3	1	28
			Vertical	0.2	0.5	
SA4	20W	2.5	Horizontal	0.2	6	136
			Vertical	0.2	3	
		5	Horizontal	0.3	4	68
			Vertical	0.2	1.5	
		10	Horizontal	0.3	2	34
			Vertical	0.2	1	
SA5	20W	3	Horizontal	0.3	9	68
			Vertical	0.2	3	
		6	Horizontal	0.3	6	34
			Vertical	0.2	1.5	
		12	Horizontal	0.3	3	17
			Vertical	0.2	1	
SA5C	20W	20	Horizontal	0.3	2	10.1
			Vertical	0.2	0.5	
SA6	30W	3	Horizontal	0.3	10	10.5
			Vertical	0.2	4	
		6	Horizontal	0.3	7	53
			Vertical	0.2	2	
		12	Horizontal	0.3	4	26
			Vertical	0.2	1.5	
SA6C	30W	20	Horizontal	0.3	2	16
			Vertical	0.2	0.5	



**Caution:** Do not set speeds and accelerations/decelerations equal to or greater than the respective ratings. Doing so may result in vibration, failure or shorter life.  
If any acceleration/deceleration equal to or greater than the rated acceleration/deceleration is set, a creep phenomenon or slipped coupling may occur.

### 1.2.3 Drive method

Type	Motor Type	Lead	No. of Encoder Pulses	Ball Screw Type		
				Type	Diameter	Accuracy
SA2A	5W	1	800	Rolled	φ4mm	C10
		2				
		4				
SA3	10W	2		Rolled	φ6mm	C10
		4				
		6				
SA4	20W	2.5		Rolled	φ8mm	C10
		5				
		10				
SA5	20W	3		Rolled	φ10mm	C10
		6				
		12				
SA5C		20				
SA6	30W	3	Rolled	φ10mm	C10	
		6				
		12				
SA6C		20				

### 1.2.4 Common specifications

Item	Specifications	
	SA5C, SA6C – Lead other than 20mm	SA5C, SA6C – Lead 20mm
Positioning Repeatability <sup>(Note1)</sup>	±0.02mm	±0.03mm
Backlash <sup>(Note1)</sup>	0.1mm or less	
Base	SA2AC, SA2AR	Other than SA2AC, SA2AR
	Material: Aluminum with white alumite treatment	Material: Aluminum with special alumite treatment

Note 1 The values shown above are the accuracy at the delivery from the factory.  
It does not include the consideration of time-dependent change as it is used.

### 1.2.5 Duty Ratio in Continuous Operation

The duty ratio is the ratio of operation expressed in % to show the duration when the actuator is operating in 1 cycle.

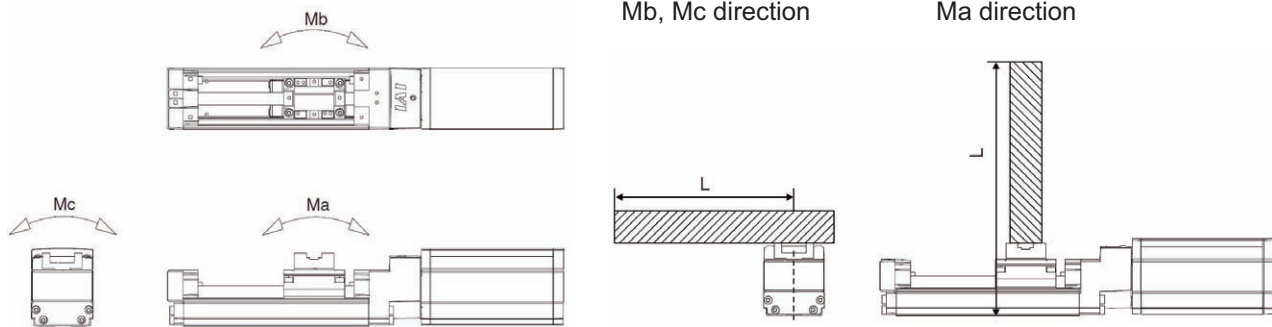
The duty ratio may differ depending on the load ratio and the acceleration/deceleration time ratio.  
[Refer to 4.1 “Duty Ratio in Continuous Operation”]

## 1.2.6 Allowable Moments of the Actuator

Type	Dynamic allowable moment [N·m (Kgf·m)]			Static allowable moment [N·m (Kgf·m)]			Allowable overhang load length (L)
	Ma	Mb	Mc	Ma	Mb	Mc	
SA2A	0.18 (0.018)	0.16 (0.016)	0.23 (0.023)	2.3 (0.23)	1.9 (0.19)	2.9 (0.30)	Ma direction: 40mm or less Mb, Mc direction: 40mm or less
SA3	2.67 (0.27)	3.82 (0.39)	4.27 (0.44)	5.0 (0.51)	7.1 (0.72)	7.9 (0.81)	Ma direction: 100mm or less Mb, Mc direction: 100mm or less
SA4	3.49 (0.36)	4.98 (0.51)	6.78 (0.69)	6.8 (0.69)	9.7 (0.99)	13.3 (1.36)	Ma direction: 120mm or less Mb, Mc direction: 120mm or less
SA5	5.29 (0.54)	7.56 (0.77)	11.6 (1.18)	10.2 (1.04)	14.6 (1.49)	22.4 (2.29)	Ma direction: 130mm or less Mb, Mc direction: 130mm or less
SA6	5.96 (0.61)	8.54 (0.87)	15.1 (1.54)	17.6 (1.80)	25.2 (2.57)	44.5 (4.54)	Ma direction: 150mm or less Mb, Mc direction: 150mm or less

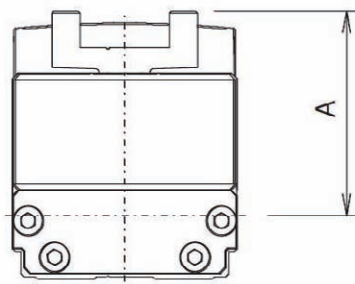
Moment direction

Overhang load length direction



When calculating the moment in Ma or Mc direction, offset the reference position by A mm from the top surface of the slider, as shown in the figure below.

"Slider type"



Ma, Mc moment  
guide offset distance

Model	SA2A	SA3	SA4	SA5	SA6
A (mm)	23.5	29.5	36.5	43.5	47

**Caution:** An operation beyond the allowable moment and overhang load length would not only generate abnormal noise and vibration, but also may shorten the life of actuator extremely.

### 1.3 Options

#### 1.3.1 Brake Types (Model: B)

The brake is a mechanism designed to prevent the slider from dropping on a vertically installed actuator when the power or servo is turned off.

Use the brake to prevent the installed load, etc., from being damaged due to the falling slider.

#### 1.3.2 Power-saving Measure (Model: LA)

As shown in the table below, the maximum load current of the standard specification and high acceleration/deceleration specification can be lowered.

For details, refer to the section on power capacity in the manual for your ACON/ASEL controller.

Model	Standard specification / High acceleration/deceleration specification Maximum load current	Energy-saving measure Maximum load current
SA3, SA5	4.4A	2.5A
SA6	4.0A	2.2A
SA4	5.1A	3.4A

#### 1.3.3 No-cover Specification (Model: NCO)

Actuators of the no-cover specification have no side covers.

(For the external dimensions of actuators with/without side covers, refer to 7. "External Dimensions.")

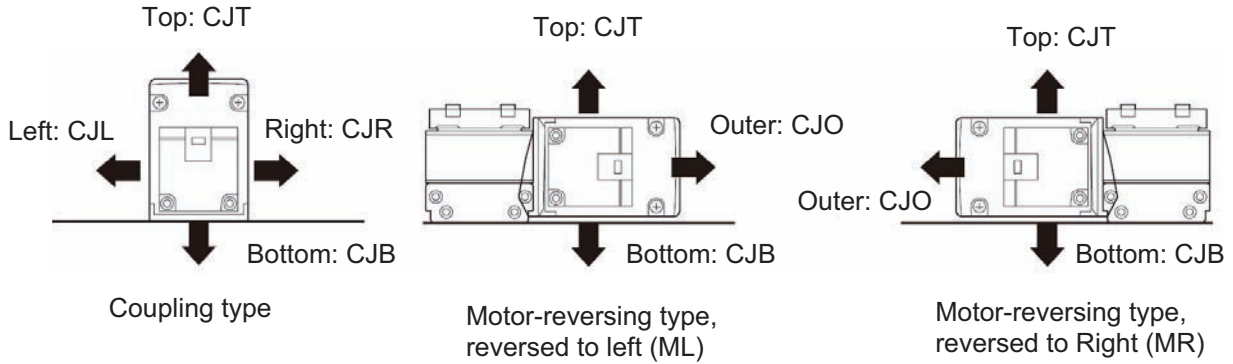
#### 1.3.4 Reversed-home Specification (Model: NM)

The standard home position is on the motor side. However, the motor position will be reversed if it is desirable in view of the layout of the system, etc.

(Note) The home position is adjusted at the factory before shipment. If you wish to change the home after the delivery of your actuator, you must return the actuator to IAI for adjustment.

### 1.3.5 Changing the Cable Exit Direction (Model: CJT, CJR, CJL, CJO, CJB)

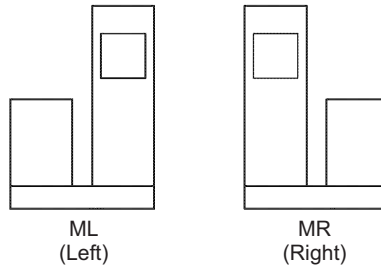
If the cable exit direction is changed, the applicable part of the model number must also be changed. A desired direction can be selected from among the five options of top (CJT in the model number), right (CJR), left (CJL), bottom (CJB) and outer (CJO).



### 1.3.6 Motor Reversing to Left, Motor Reversing to Right (Model: ML, MR)

The reversing direction changes in each model code for the motor reversing types SA2AR, SA3R, SA4R, SA5R and SA6R.

From the view of motor side, reversing to the left is ML and reversing to the right is MR.



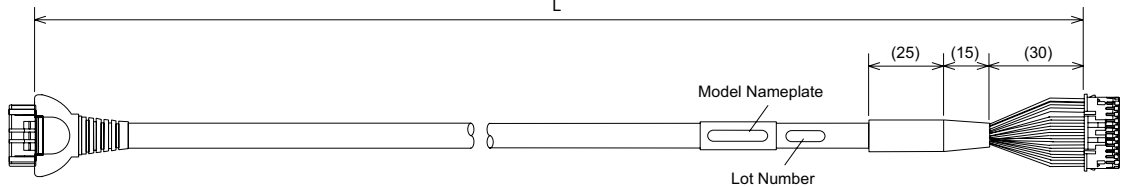


## 1.4 Motor • Encoder Cables

### 1.4.1 ACON-CA, AMEC, ASEP and MSEP Controller Cables

#### Motor • Encoder Integrated Cables (CB-APSEP-MPA□□□)

□□□ indicates the cable length L. Up to 20m can be specified.  
(Example: 080=8m)

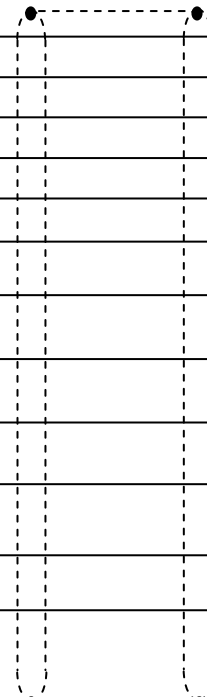


#### Actuator Side

Electric Wire Color	Symbol	Pin No.
Black	U	A1
White	V	B1
Brown	W	A2
Green	-	B2
Yellow	-	A3
Red	-	B3
Orange	BK+	A4
Gray	BK-	B4
White	A+	A6
Yellow	A-	B6
Red	B+	A7
Green	B-	B7
Black	Z+	A8
Brown	Z-	B8
Black (Identification tape)	LS+	A5
Brown (Identification tape)	LS-	B5
Green (Identification tape)	GND <sub>LS</sub>	A9
Red (Identification tape)	VPS	B9
White (Identification tape)	VCC	A10
Yellow (Identification tape)	GND	B10
-	NC	A11
-	Shield, FG	B11

#### Controller Side

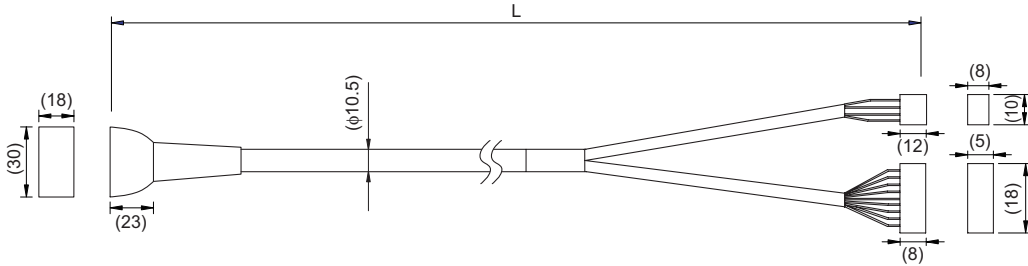
Pin No.	Symbol	Electric Wire Color
1	U	Black
2	V	White
5	W	Brown
3	-	Green
4	-	Yellow
6	-	Red
7	BK+	Orange
8	BK-	Gray
11	A+	White
12	A-	Yellow
13	B+	Red
14	B-	Green
15	Z+	Black
16	Z-	Brown
9	LS+	Black (Identification tape)
10	LS-	Brown (Identification tape)
20	GND <sub>LS</sub>	Green (Identification tape)
18	VPS	Red (Identification tape)
17	VCC	White (Identification tape)
19	GND	Yellow (Identification tape)
21	NC	-
24	Shield, FG	-
22	-	-
23	-	-



## 1.4.2 ACON (Except for ACON-CA), RACON, ASEL Controller Cables

Motor • Encoder Integrated Cables for RCA2  
(CB-ACS-MPA□□□)

□□□ indicates the cable length L. Up to 20m can be specified.  
(Example: 080=8m)



Actuator Side

Electric Wire Color	Symbol	Pin No.
Red	U	A1
Yellow	V	B1
Black	W	A2
-	NC	B2
-	NC	A3
-	NC	B3
Yellow (Red•)	BK+	A4
Yellow (Blue•)	BK-	B4
Pink (Red•)	LS+	A5
Pink (Blue•)	LS-	B5
White (Red•)	A+	A6
White (Blue•)	A-	B6
Orange (Red•)	B+	A7
Orange (Blue•)	B-	B7
Gray (Red•)	Z+	A8
Gray (Blue•)	Z-	B8
Orange (Red• continuous)	-	A9
Orange (Blue• continuous)	/PS	B9
Gray (Red• continuous)	VCC	A10
Gray (Blue• continuous)	GND	B10
-	NC	A11
-	Shield, FG	B11

Controller Side

Pin No.	Symbol	Electric Wire Color
1	U	Red
2	V	Yellow
3	W	Black
4	NC	-
3	NC	-
2	NC	-
16	BK+	Yellow (Red•)
15	BK-	Yellow (Blue•)
18	LS+	Pink (Red•)
17	LS-	Pink (Blue•)
14	A+	White (Red•)
13	A-	White (Blue•)
12	B+	Orange (Red•)
11	B-	Orange (Blue•)
10	Z+	Gray (Red•)
9	Z-	Gray (Blue•)
8	-	Orange (Red• continuous)
7	/PS	Orange (Blue• continuous)
6	VCC	Gray (Red• continuous)
5	GND	Gray (Blue• continuous)
	NC	-
1	Shield, FG	-

## 2. Installation

### 2.1 Transportation

#### [1] Handling of the Actuator

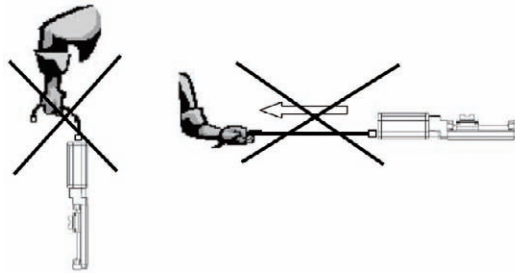
Unless otherwise specified, the actuator is shipped with 1 axis unit packaged separately.

##### (1) Handling the Packed Unit

- Do not damage or drop. The package is not applied with any special treatment that enables it to resist an impact caused by a drop or crash.
- Transport a heavy package with at least more than two operators. Consider an appropriate method for transportation.
- Keep the unit in a horizontal orientation when placing it on the ground or transporting. Follow the instruction if there is any for the packaging condition.
- Do not step or sit on the package.
- Do not put any load that may cause a deformation or breakage of the package.

##### (2) Handling the Actuator After Unpacking

- Do not carry the actuator by its motor unit or its cable or attempt to move it by pulling the cable.



- Hold the base part or bracket part of the body when transporting the actuator main body.
- Do not hit or drop the actuator during transportation. Especially, pay attention to the side cover.
- Do not attempt to force any part of the actuator. Do not apply force especially on the stainless steel sheet.



## [2] Handling in the Assembled Condition

This is the case when the product is delivered from our factory under a condition that it is assembled with other actuators. The combined axes are delivered in a package that the frame is nailed on the lumber base. The sliders are fixed so they would not accidentally move. The actuators are also fixed so the tip of it would not shake due to the external vibration.

### (1) How to Handle the Package

- Do not hit or drop the package. No special treatment is conducted on this package to endure a drop or impact on it.
- Do not attempt to carry a heavy package with only one worker. Also, have an appropriate method for transportation.
- When hanging up with ropes, support on the reinforcement frame on the bottom of the lumber base. When bringing up the package with a forklift, also support on the bottom of the lumber base.
- Handle with care when putting the package down to avoid impact or bounce.
- Do not step on the package.
- Do not put anything on the package that could deform or damage it.

### (2) How to Handle after Unpackaged

- Fix the slider so they would not accidentally move during transportation.
- If the tip of an actuator is overhanging, have an appropriate way to fix it to avoid shake due to the external vibration. In the transportation without the tip being fixed, do not apply any impact with 0.3G or more.
- When hanging up with ropes, have appropriate cushioning to avoid any deformation of the actuator body. Also keep it in stable horizontal orientation. Make a fixture utilizing the attachment holes and the tapped holes on the actuator body if necessary.
- Do not attempt to apply load on the actuators or the connector box. Also pay attention not to pinch cables and bend or deform them forcefully.

## [3] Handling in Condition of being assembled in Machinery Equipment (System)

There are some caution notes for when transporting the actuator being assembled in the machinery equipment (system):

- Fix the slider so it would not move during transportation.
- If the tip of an actuator is overhanging, have an appropriate way to fix it to avoid shake due to the external vibration. In the transportation without the tip being fixed, do not apply any impact with 0.3G or more.
- When hanging up the machinery equipment (system) with ropes, do not attempt to apply load on the actuators or the connector box. Also pay attention not to pinch cables and bend or deform them forcefully.

## 2.2 Installation and Storage • Preservation Environment

### [1] Installation Environment

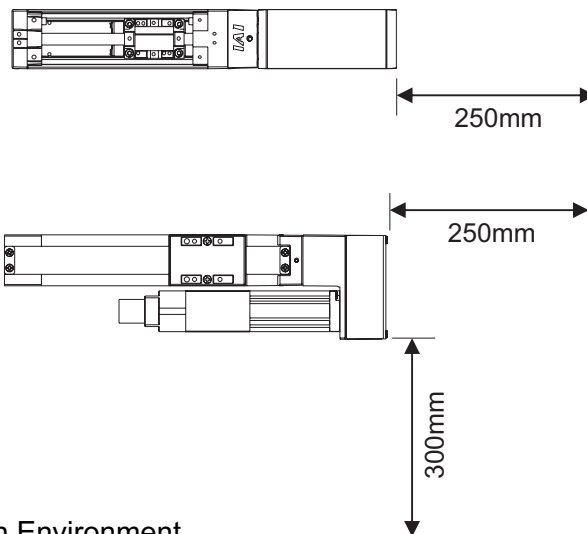
The actuator should be installed in a location other than those specified below. Also provide sufficient work space required for maintenance inspection.

- Where the actuator receives radiant heat from strong heat sources such as heat treatment furnaces
- Where the ambient temperature exceeds the range of 0 to 40°C
- Where the temperature changes rapidly and condensation occurs
- Where the relative humidity exceeds 85% RH
- Where the actuator receives direct sunlight
- Where the actuator is exposed to corrosive or combustible gases
- Where the ambient air contains a large amount of powder dust, salt or iron (at level exceeding what is normally expected in an assembly plant)
- Where the actuator is subject to splashed water, oil (including oil mist or cutting fluid) or chemical solutions
- Where the actuator receives impact or vibration

If the actuator is used in any of the following locations, provide sufficient shielding measures:

- Where noise generates due to static electricity, etc.
- Where the actuator is subject to a strong electric or magnetic field
- Where the actuator is subject to ultraviolet ray or radiation

Open space required for maintenance inspection



### [2] Storage • Preservation Environment

- The storage and preservation environment should comply with the same standards as those for the installation environment. In particular, when the machine is to be stored for a long time, pay close attention to environmental conditions so that no dew condensation forms.
- Unless specially specified, moisture absorbency protection is not included in the package when the machine is delivered. In the case that the machine is to be stored and preserved in an environment where dew condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.
- For storage and preservation temperature, the machine withstands temperatures up to 60°C for a short time, but in the case of the storage and preservation period of 1 month or more, control the temperature to 50°C or less.
- Storage and preservation should be performed in the horizontal condition. In the case it is stored in the packaged condition, follow the posture instruction if any displayed on the package.

## 2.3 How to Install

This chapter explains how to install the actuator on your mechanical system.

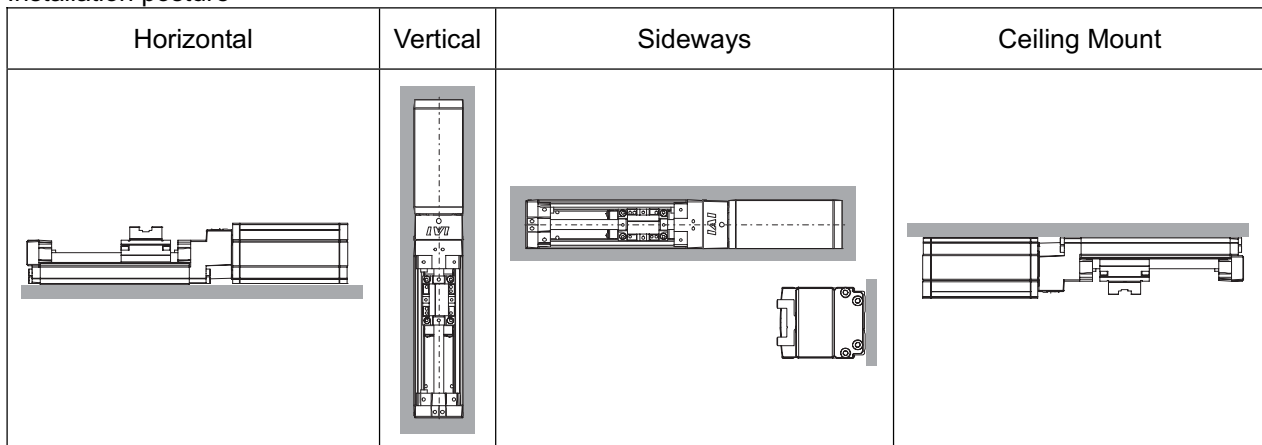
### 2.3.1 Installation

Follow the information below when installing the actuator, as a rule. Do pay attention to these items (except with custom-order models).

○ : Possible    △ : Daily inspection is mandatory    × : Not possible

Model	Horizontal installation	Vertical installation	Sideway installation	Ceiling Mount installation
SA2A	○	○	○	○
SA3	○	○	○	△
SA4	○	○	△	△
SA5	○	○	△	△
SA6	○	○	△	△

#### Installation posture



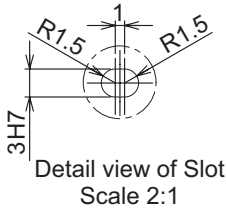
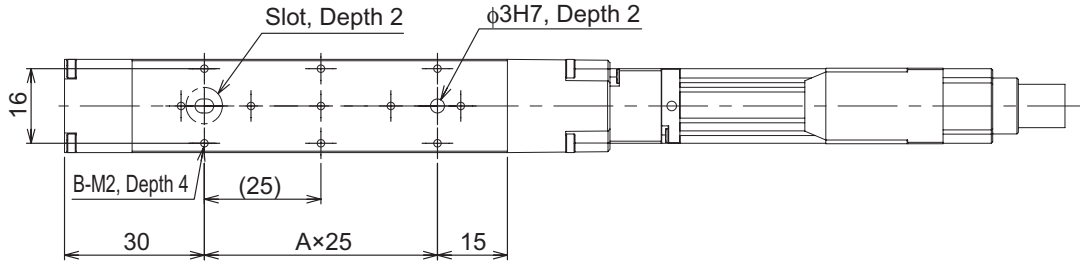
**Caution:** 1. When the unit is installed vertically oriented, attempt to put the motor up unless there is a special reason. Putting the motor on the lower side would not cause a problem in an ordinary operation. However, it may rarely cause a problem, when it is not operated for a long period, depending on the surrounding environment (especially high temperature), caused by the grease being separated and the base oil flowing into the motor unit.

2. Can be installed sideways or ceiling mount, but the actuators must be checked daily. If the actuator is installed sideways or ceiling mount, the stainless steel sheet may be slacked or displaced. If the actuator is used continuously while the stainless steel sheet is slacked or displaced, the stainless steel sheet may break or other problems may occur. Check the actuator daily and if the stainless steel sheet is found slacked or displaced, make installation adjustment of the stainless steel sheet. [Refer to 5.9 "Procedures for Replacement and Adjustment of Stainless Steel Sheet."]

## 2.3.2 Installation of Actuator

### [1] Installation of RCA2-SA2AC and SA2AR

This actuator has the screw holes for mounting so it can be fixed from the rear side. Also, there are a reamed hole and a slotted hole for positioning pins.



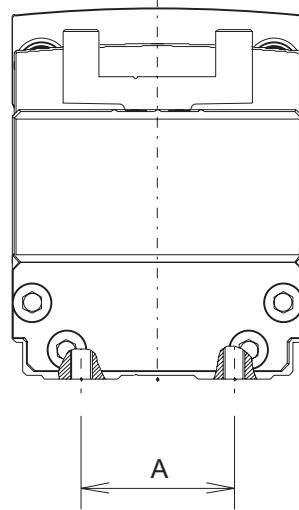
ST	L1	L2	A	B
25	174	92	1	4
50	199	117	2	6
75	224	142	3	8
100	249	167	4	10

Screw diameter and max. screw mating depth	Mounting bolt	Tightening Torque		Reamed Hole [mm]	Slot
		In the case that steel is used for the bolt seating surface:	In the case that aluminum is used for the bolt seating surface:		
M2, Depth 4	M2	0.42N·m (0.043kgf·m)	0.25N·m (0.026kgf·m)	φ3H7, depth 2 from bottom face of base	Refer to the diagram

## [2] Installation of RCA2-SA3C, SA4C, SA5C, SA6C, SA3R, SA4R, SA5R and SA6R

The surface to mount the main unit should be a machined surface or a plane that possesses an equivalent accuracy and the flatness should be within 0.05mm/m. Also, the platform should have a structure stiff enough to install the unit so it would not generate vibration or other abnormality.

This actuator has the screw holes for mounting so it can be fixed from the rear side.  
 (Note that tap hole size depends on model. Please see diagrams below and 7. "External Dimensions")  
 The actuator also contains reamed holes for use with positioning pins.



Slider type

Model	Screw diameter and max. screw mating depth	Mounting bolt	Tightening Torque		A [mm]	Reamed Hole [mm]
			In the case that steel is used for the bolt seating surface:	In the case that aluminum is used for the bolt seating surface:		
SA3	M3, depth 5	M3	1.54N·m (0.16kgf·m)	0.83N·m (0.085kgf·m)	17	φ2H7, depth 4 from bottom face of base
SA4	M3, depth 5	M3	1.54N·m (0.16kgf·m)	0.83N·m (0.085kgf·m)	21	φ2.5H7, depth 5 from bottom face of base
SA5	M4, depth 7	M4	3.59N·m (0.37kgf·m)	1.76N·m (0.18kgf·m)	26	φ2.5H7, depth 5 from bottom face of base
SA6	M5, depth 8	M5	7.27N·m (0.74kgf·m)	3.42N·m (0.35kgf·m)	31	φ3H7, depth 5 from bottom face of base



## About Tightening Screws

- Use a hex socket head cap bolt for the attachment to the base.
- It is recommended to use high-tensile bolts with ISO-10.9 or more.
- The length of thread engagement should be 1.8 times more than the nominal diameter, and pay attention not to stick the screw out inside the actuator.

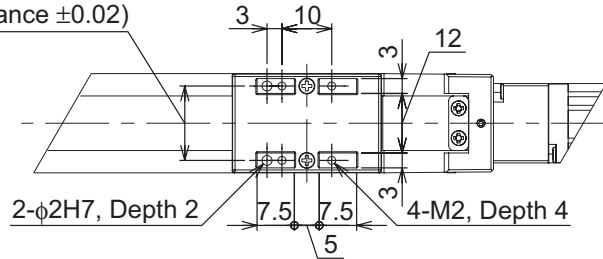


**Caution:** Be careful when selecting the bolt length. If bolts of inappropriate lengths are used, the tapped holes may be damaged, actuator mounting strength may become insufficient, or contact with driving parts may occur, resulting in lower precision or unexpected accidents.

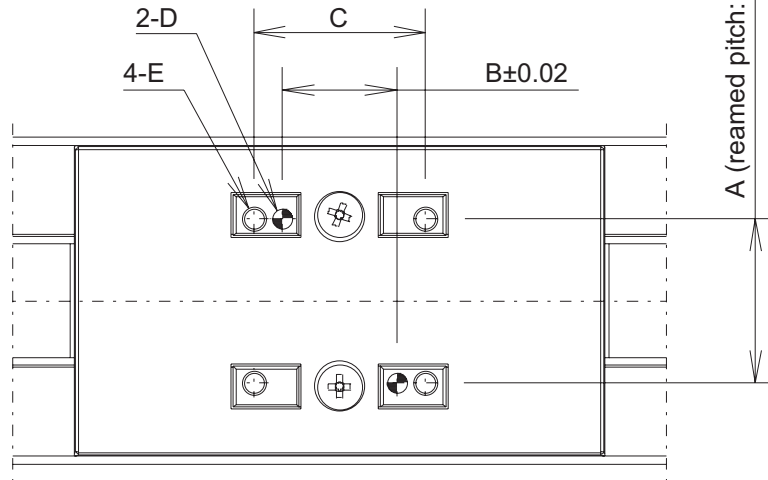
## 2.3.3 Installation of the Load

- Please attach the load to the device using the tap holes in the slider.
- The process for attaching these to the main unit is similar to the installation process of the main unit. Use of high-tension bolts meeting at least ISO-10.9 standard is recommended for mounting. The table below shows the recommended tightening torque.
- There are two reamed holes on the slider, so if you need to be able to secure and detach the load multiple times, please use these holes. Also, if you require precision in your attachment, such as a right angle, use one of the reamed holes to make fine adjustments.
  - \* When using reamed holes, we recommend using an H7 pin. Also, do not force the pin into the hole. Instead, press it gently in until it fits.
- For exact thread depth and reamed hole depth, please see the table below. In case that a screw is tightened with a value more than what is stated below, it may cause damage on the tapped holes or insufficiency in the strength of transported object attachment, which may result in a drop in the operation accuracy or an unexpected accident. Do not tighten the mounting screws to a torque beyond the applicable torque specified in the table below. Doing so may damage the tapped holes.

● RCA2-SA2AC/SA2AR  
15 (Reamer pitch tolerance  $\pm 0.02$ )



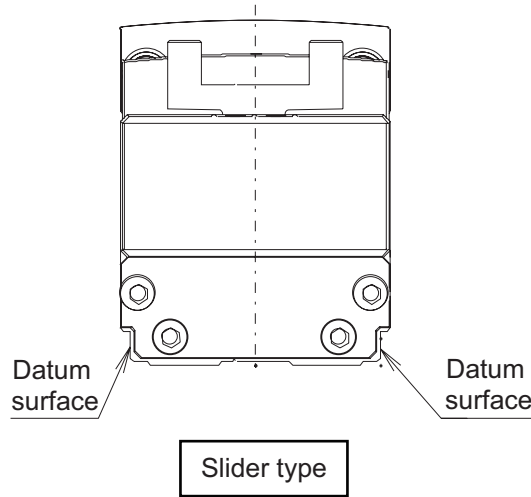
● RCA2-SA3C/SA4C/SA5C/SA6C/SA3R/SA4R/SA5R/SA6R



Model	A	B	C	D	E	Mounting bolt	
						Nominal thread size	Tightening torque
SA3	17	11	17	$\phi 2H7$ , depth 5	M3 D6	M3	0.83N·m (0.085kgf·m)
SA4	20	14	21	$\phi 2.5H7$ , depth 5	M3 D6	M3	0.83N·m (0.085kgf·m)
SA5	26	14	22	$\phi 2.5H7$ , depth 5	M4 D8	M4	1.76N·m (0.18kgf·m)
SA6	31	26	25	$\phi 3H7$ , depth 5	M5 D10	M5	3.42N·m (0.35kgf·m)

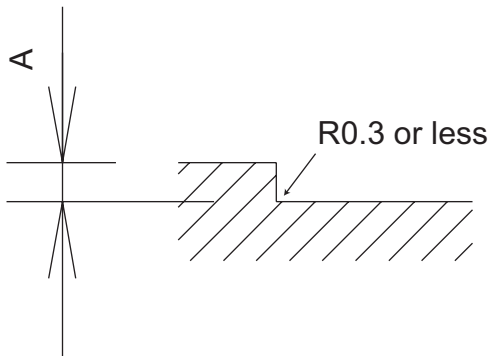
## 2.3.4 Installation Surface

- For the platform to install the actuator, ensure the structure that possesses enough stiffness to avoid vibration being generated.
- SA3C, SA4C, SA5C, SA6C, SA3R, SA4R, SA5R, SA6R  
The side and bottom faces of the base provide datum surfaces for slider travel. When it is necessary that the slider moves in a highly precise fashion, ensure that the device is installed at the direction that is based on the position of these surfaces.



**Caution:** Because the side and bottom faces of the base provide datum surfaces for slider travel as shown in the above diagram, conduct installation based on the position of this side when precision is required.

When installing the actuator on the frame using the base datum surfaces, provide the necessary machining by following the drawing below.



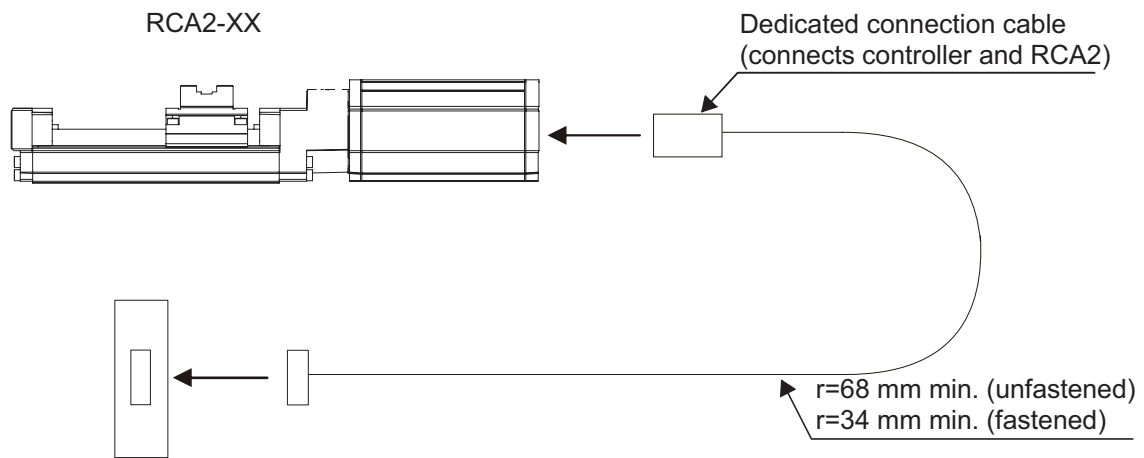
Model	Dimension A (mm)
Slider type	2 to 4 or less

## 3. Connecting with the Controller

Use the IAI dedicated connection cable for the connection of the actuator to the controller.

- If the dedicated connection cable cannot be secured, reduce the load on the cable by allowing it to deflect only by the weight of the cable or wire it in a self-standing cable hose, etc., having a large radius.
- Do not cut and reconnect the dedicated connection cable for extension or shorten the cable.
- Do not pull on the dedicated connection cable or bend it forcibly.
- The actuator cable coming out of the motor unit is not meant to be bent. Fix the cable so it would not be bent repeatedly.

Please consult with IAI if you require a different kind of cable than the one supplied.



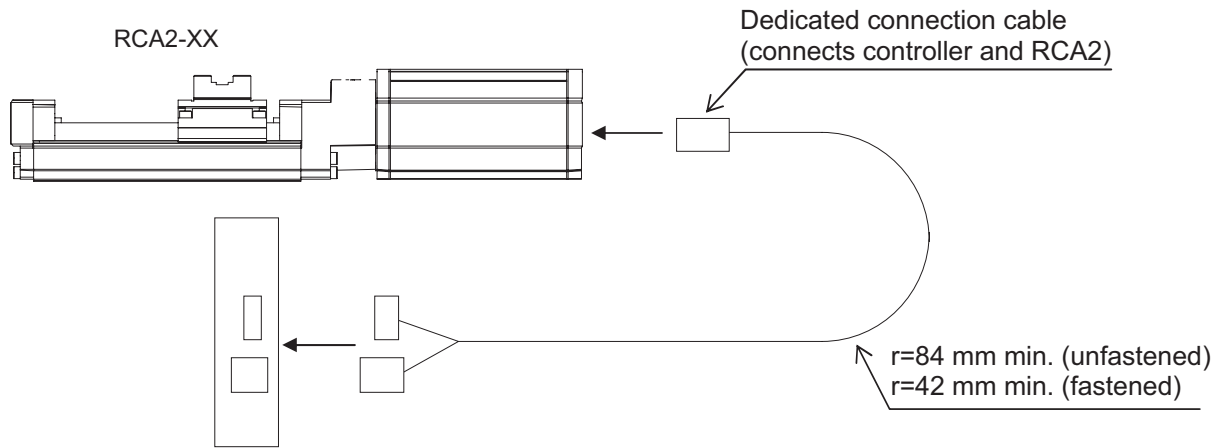
Dedicated controller

- ACON-CA
- AMEC
- ASEP
- MSEP

Dedicated connection cable

- Servo motor cable: CB-APSEP-MPA□□□

\*) □□□ indicates the cable length. Up to 20m can be specified.  
Example) 080 = 8m



**Dedicated controller**

- ASEL
- ACON (Other than ACON-CA)

**Dedicated connection cable**

- Servo motor cable: CB-ACS-MPA□□□

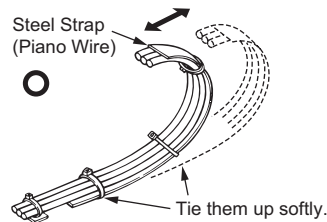
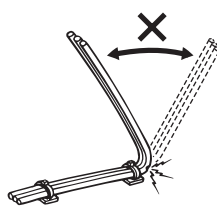
\*) □□□ indicates the cable length. Up to 20m can be specified.  
Example) 080 = 8m

(Note) RCA2-SA2AC and SA2AR cannot be moved with ASEL, ACON controller except for ACON-CA controller.

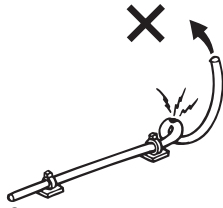


Warning: For wiring, please follow the warnings stated below. When constructing a system as the machinery equipment, pay attention to the wiring and connection of each cable so they are conducted properly. Not following them may cause not only a malfunction such as cable breakage or connection failure, or an operation error, but also electric shock or electric leakage, or may even cause a fire.

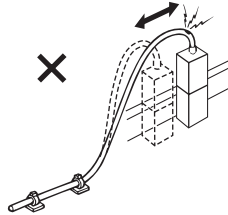
- Use dedicated cables of IAI indicated in this operating manual. Contact us if you wish to have a change to the specifications of the dedicated cables.
- Make sure to turn the power off in the process of power line or cable connection or disconnection.
- Do not attempt to cut a dedicated cable with connectors on both ends to extend, shorten or re-joint it.
- Hold the dedicated cable to avoid mechanical force being applied to the terminals and connectors.
- Use a cable pipe or duct to have an appropriate protection when there is a possibility of mechanical damage on a dedicated cable.
- In case a dedicated cable is to be used at a moving part, make sure to lay out the cable without applying any force to pull the connector or extreme bend on the cable. Do not attempt to use the cable with a bending radius below the allowable value.
- Make certain that the connectors are plugged properly. Insufficient connection may cause an operation error, thus it is extremely risky.
- Do not lay out the cables to where the machine runs over them.
- Pay attention to the cable layout so it would not hit peripherals during an operation. In case it does, have an appropriate protection such as a cable track.
- When a cable is used hanging on the ceiling, prevent an environment that the cable swings with acceleration or wind velocity.
- Make sure there is not too much friction inside the cable storage equipment.
- Do not apply radiated heat to power line or cables.
- Have a sufficient radius for bending, and avoid a bend concentrating on one point.



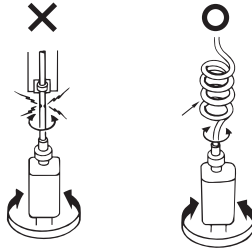
- Do not let the cable bend, kink or twist.



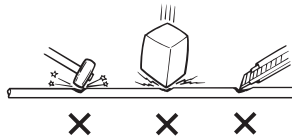
- Do not pull the cable with a strong force.



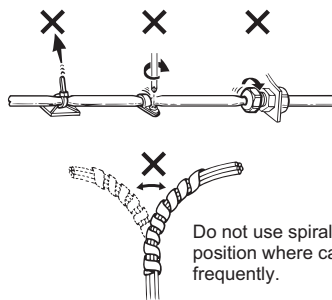
- Pay attention not to concentrate the twisting force to one point on a cable.



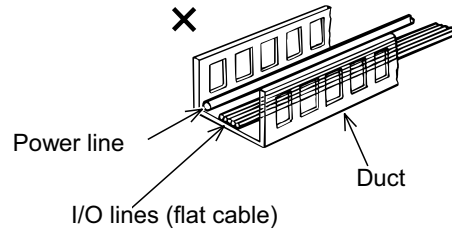
- Do not pinch, drop a heavy object onto or cut the cable.



- When a cable is fastened to affix, make sure to have an appropriate force and do not tighten too much.



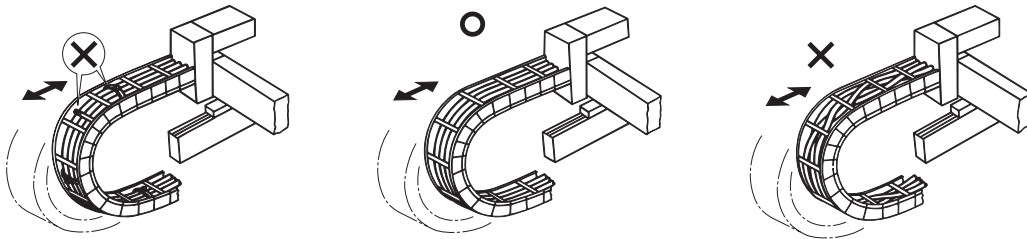
- PIO line, communication line, power and driving lines are to be put separately from each other and do not tie them together. Arrange so that such lines are independently routed in the duct.



Follow the instructions below when using a cable track.

- If there is an indication to the cable for the space factor in a cable track, refer to the wiring instruction given by the supplier when storing the cable in the cable track.
- Avoid the cables to get twined or twisted in the cable track, and also to have the cables move freely and do not tie them up. (Avoid tension being applied when the cables are bent.)

Do not pile up cables. It may cause faster abrasion of the sheaths or cable breakage.





## 4. Operations

### 4.1 Duty Ratio in Continuous Operation

The duty ratio is the ratio of operation expressed in % to show the duration when the actuator is operating in 1 cycle.

Perform an operation with the duty ratio below the allowable range.

**Caution:** If the overload error occurs, try either to reduce the duty by extending the stop time or to reduce the acceleration/deceleration speed.

[How to Calculation Duty]

Figure out the load ratio and acceleration/deceleration time ratio, and read the duty ratio from the graph. If the load ratio is less than 50%, operation with 100% of the duty ratio (continuous operation) is available.

1) Duty ratio LF

The maximum transportable weight at the rated acceleration and the rated acceleration/deceleration speed are described in 1.2 "Specifications."

$$\text{Duty ratio: LF} = \frac{M \times \alpha}{M_r \times \alpha_r} \quad [\%]$$

Max. Transportable Weight at Rated Acceleration :  $M_r$  [kg]  
 Rated Acceleration/Deceleration Speed :  $\alpha_r$  [G]  
 Transported Weight during Operation :  $M$  [kg]  
 Acceleration/Deceleration Speed during Operation :  $\alpha$  [G]

2) Acceleration/Deceleration Time Ratio  $t_{od}$

$$\text{Acceleration/Deceleration Time Ratio } t_{od} = \frac{\text{Acceleration Time during Operation} + \text{Deceleration Time during Operation}}{\text{Deceleration time}} \quad [\%]$$

$$\text{Acceleration time} = \frac{\text{Speed during Operation} [\text{mm/s}]}{\text{Acceleration during Operation} [\text{mm/s}^2]} \quad [\text{Sec}]$$

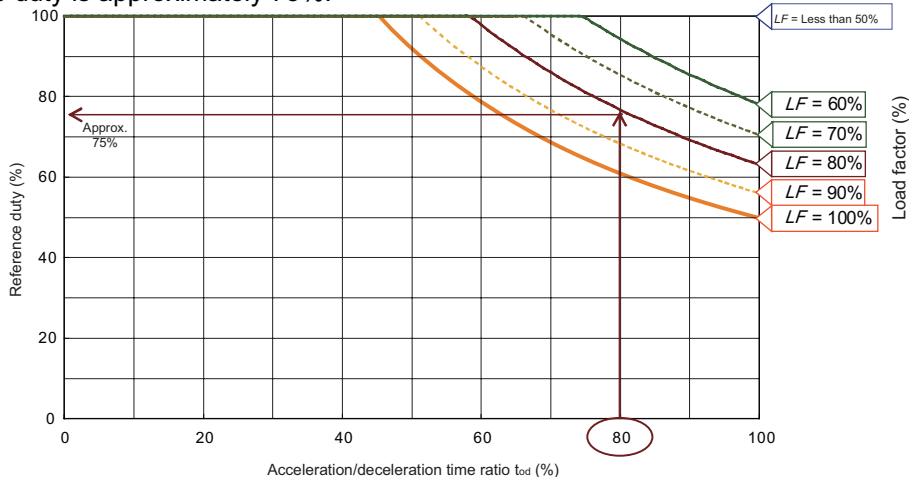
$$\text{Deceleration time} = \frac{\text{Speed during Operation} [\text{mm/s}]}{\text{Deceleration during Operation} [\text{mm/s}^2]} \quad [\text{Sec}]$$

$$\text{Acceleration} [\text{mm/s}^2] = \text{Acceleration} [\text{G}] \times 9,800 \text{mm/s}^2$$

$$\text{Deceleration} [\text{mm/s}^2] = \text{Deceleration} [\text{G}] \times 9,800 \text{mm/s}^2$$

3) From the load ratio LF and the acceleration/deceleration time ratio  $t_{od}$  that were used to figure out the duty ratio, read the duty ratio.

e.g.) When the load ratio LF = 80% and the acceleration/deceleration time ratio  $t_{od}$  = 80%, the reference for the duty is approximately 75%.



## 4.2 Home Return

### 4.2.1 Fine-tuning the Home Position

The actuator home position can be adjusted by changing parameter <sup>(Note 1)</sup> In order to make adjustments, please do the following.

- 1) Perform home return to check the home.
- 2) Thereafter, move the actuator to a desired home. Check the difference and correct the parameter accordingly. The parameter accepts a positive value to set an offset in the moving direction of the actuator. (Negative values cannot be set.)
- 3) Increasing the offset reduces the moving range by the amount incremented. If you have specified an offset exceeding 1mm, also adjust the soft limits.

Note1 The items to set up in the parameters differ depending on the controller.

ACON controller: No.22, home return offset distance

ASEL controller: Parameter No.12 for each axis, home preset value

ASEP controller: No.16, home return offset distance

AMEC controller: No.16, home return offset distance

MSEP controller: No.16, home return offset distance

### 4.2.2 Changing the Home Direction

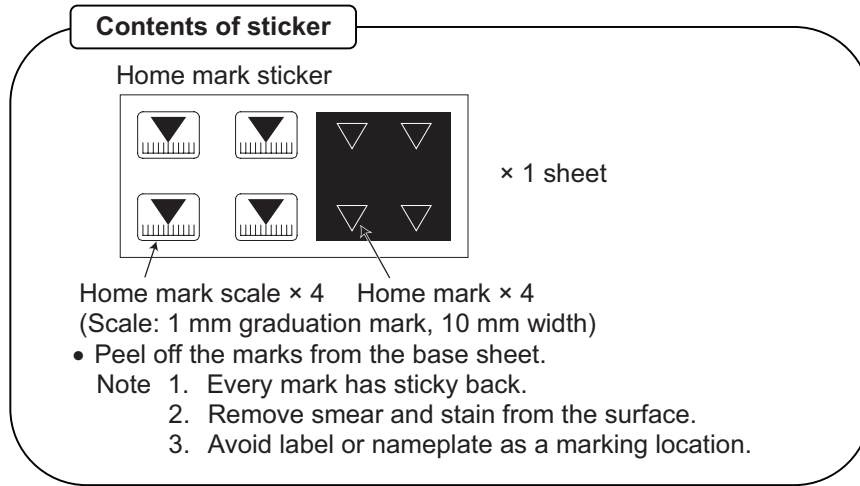
To change the home position direction after delivery, it is necessary to change the movement direction parameter. Please contact with IAI if you need to do this.



**Warning:** The encoder not only detects position and home signals, but it also plays an important role in the switching of AC-servo power phases. Since the AC-servo power phases have been adjusted precisely, never touch the encoder to change the home.

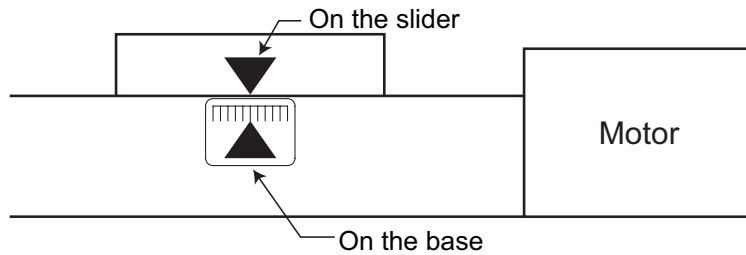
## 4.2.3 How to use the home mark

- ◆ Please affix these marks to the actuator as home markers as needed.



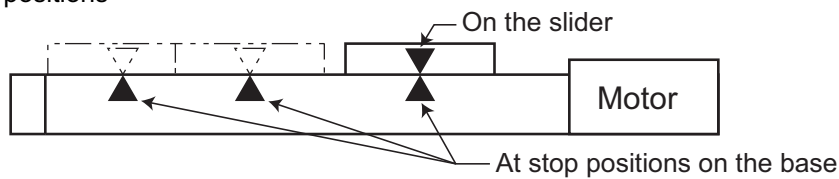
**Example of Use**

- 1) Used to indicate the direction of actuator home



- Attach both stickers when actuator is stopped in home position

- 2) Used as stop positions



## 5. Maintenance and Inspection

### 5.1 Inspection Items and Schedule

Perform maintenance and inspection at the intervals specified below.

This schedule assumes that the actuator is operated eight hours a day.

If the actuator is operated at a higher utilization, such as when the machine is used continuously day and night, reduce the inspection intervals accordingly.

Schedule	External visual inspection	Internal inspection	Greasing <sup>(Note 1)</sup>
Start of work inspection	○		
1 month inspection	○		
3 month inspection			○
3 months after starting operation			Depends on grease supply timing (reference)
6 months inspection	○	○ <sup>(Note 2)</sup>	
Every 6 month inspection	○	○ <sup>(Note 2)</sup>	

**Note 1** Grease film may run out if the actuator is moved back and forth continuously over a distance of 30mm or less. As a guide, perform a back-and-forth operation five times or so over a distance of 50mm or more after a back-and-forth operation over such short distance has been repeated 5,000 to 10,000 times. This will restore oil film.

**Note 2** Check the condition of grease and wipe it off in case it is extremely dirty before supplying new grease.

[Period of Grease Supply (reference)]

Perform grease supply when it has reached to either the operation distance or spent months described in the table below.

Maximum Speed of Use [mm/s]	Grease Supply Timing (Reference)	
	Operated distance	Months
0 to 750 or less	1,250 km	12-month
750 to 1,000	2,500 km	



**Caution:**

- An actuator after 6 months of storage may have caused a degradation of the grease. Supply grease before start using. [Refer to 5.7 "Grease Supply"]
- Degradation speed of grease may differ depending on the environment of use (temperature, humidity and ambient conditions). It is recommended to shorten the grease supply period if the actuator is used under a bad condition such as in high temperature, high humidity or in dusty ambience. Also, it is recommended to improve the environment conditions in case the grease changes its color due to the bad condition of use.

## 5.2 Visually Inspecting the Exterior

Visually check the exterior of the following items.

Actuator	Loosening of actuator mounting bolts, other loose items
Cables	Scratches, connector engagement
Stainless steel sheet	Scratches, slacked
Overall	Noise, vibration

- If the stainless steel sheet is slacked, make adjustment to remove the slack as necessary.
- As a rule of thumb, the stainless steel sheet should last for about 5000km of slider motion. However, under certain conditions, the stainless steel sheet may need to be replaced earlier.  
Generally, replacing the stainless steel sheet will require that you bring the unit to our plant or have one of our technicians come to your plant to perform the replacement.
- If the actuator is installed vertically, certain conditions may cause grease to drip from the guide. Please ensure that proper cleaning is performed and grease is replenished.

## 5.3 Cleaning

- Clean the exterior surface as necessary.
- Wipe dirty areas using a soft cloth, etc.
- Do not blow highly compressed air onto the actuator, as it may cause dust to enter the actuator through gaps between parts.
- Do not use petroleum-based solvent as it damages resin and coated surfaces.
- To remove stubborn stains, take neutral detergent or alcohol into a soft cloth, etc., and wipe the area gently.

## 5.4 Adjusting the Stainless Steel Sheet

If the actuator stroke is 400mm or more, check the stainless steel sheet for slacking, etc., as necessary. If the stainless steel sheet is found slacked, adjust the stainless steel sheet.

[For the stainless steel sheet adjustment procedure, refer to 5.9 “Procedures for Replacement and Adjustment of Stainless Steel Sheet.”]

## 5.5 Interior Inspections

Turn off the power and inspect visually after turning up or removing the stainless steel sheet in the case of stainless steel sheet types. With reversing types, inspect visually after removing the reversing bracket. When inspecting the interior, check the following items.

Actuator	Loosening of actuator mounting bolts, etc.
Guide	Lubrication condition, soiling
Belt (Reversing type)	Lubrication condition, damage

Visually check the interior condition. Focus on entry of dust and other foreign matters and the lubrication condition.

Even if grease has turned brown, the actuator is lubricated properly if its traveling surface is glossy.

If the grease is mixed with dust and does not have a shiny appearance, or if the grease has lost its efficacy due to prolonged use, then clean each section and reapply grease.

The procedure for internal inspections is outlined below. Refer to 5.8, for inspection and adjustment of the belt.

Slider type --- Procedure 2) through 5) are only necessary if the side cover is attached. If you do not have a side cover, only do Procedure 1).

- 1) Move the slider toward the home side.
- 2) Remove the cover.
- 3) Remove the sheet retainer screws.
- 4) Turn up the sheet and check the interior.
- 5) After the check, assemble the parts by following the same steps in the reverse order.

### Cautions for attached side cover:

When checking inside the equipment, be careful not to forcibly bend the stainless steel sheet or scratch it. Do not tug on the stainless steel sheet or in any way attempt to reposition it.

If the sheet is repositioned, it may not be even which may shorten its service life. Should this happen, adjust the stainless steel sheet by referring to the replacement instructions.

Keep in mind that the edges of the stainless steel sheet can cause injuries. Always wear gloves when working on it.

## 5.6 Cleaning the Interior

- Wipe dirty areas using a soft cloth, etc.
- Do not blow highly compressed air onto the actuator, as it may cause dust to enter the actuator through gaps between parts.
- Do not use petroleum-based solvent, neutral detergent or alcohol.

## 5.7 Greasing Guides


### 5.7.1 Applicable greases for guide

The grease initially used is lithium-based grease.  
IAI uses the following grease in our plant.

Idemitsu Kosan	Daphne Eponex Grease No. 2
----------------	----------------------------

Other companies also sell similar types of grease. For details, give the above grease name to the manufacturer you want to purchase from and ask what corresponding product they have available. Here are some examples of similar products.

Showa Shell Oil	Albania Grease S2
Mobil Oil	Unirex N2

 **Warning:** Never use anything other than synthetic poly- $\alpha$  olefin grease. Mixing poly- $\alpha$  grease with other grease not only reduces the performance of the grease, it may even cause damage to the actuator.

### 5.7.2 Applicable greases for ball screw

The grease initially used is lithium-based grease.  
IAI uses the following grease in our plant. (Excludes SA3C type)

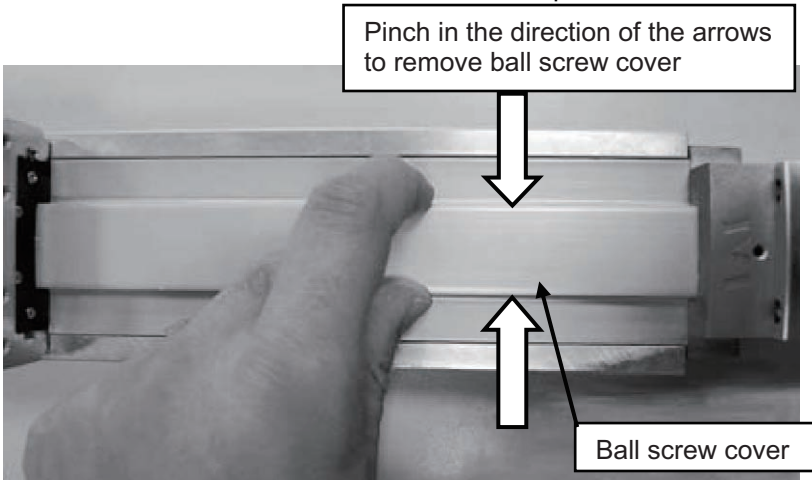
Kyodo Yushi	Multitemp LRL 3
-------------	-----------------

\* RCA2-SA2AC, SA2AR, SA3C types uses the following grease.

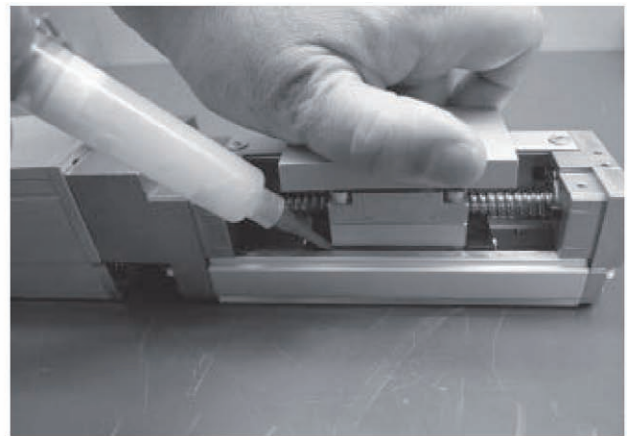
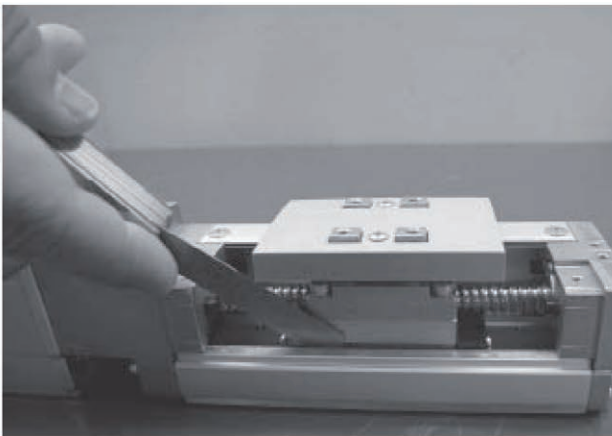
Idemitsu Kosan	Daphne Eponex Grease No. 2
----------------	----------------------------

## 5.7.3 How to apply grease

When side cover and stainless steel sheet are present, remove these before beginning.



- (1) For the guide section, apply the grease by moving the slider back and forth and spreading it out, either by pushing a scraper between the slider and base or by lubricating with a grease injector. Grease the guides on both sides. When complete, wipe away any excess grease.  
(Note) There is no side cover for RA2AC and RA2AR.  
Remove the stainless steel sheet and apply grease to the guide from upper side.



**Caution:** In case the grease got into your eye, immediately go to see the doctor to get an appropriate care. After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease off.



- (2) To grease ball screws, first clean, then put some grease on your finger and apply while moving the slider back and forth.

When finished, wipe off excess grease.

(Note) There is no side cover for RA2AC and RA2AR.

Remove the stainless steel sheet and apply grease to the guide from upper side.



If the side cover and stainless steel sheet are present, put them back on.



**Caution:**

- When having the slider moved back and forth manually by hand, make sure not to apply external force to the thrust directions that exceeds the value stated in Caution in Handling. (If the slider will not move, operate it using a jog function.)
- In case the grease got into your eye, immediately go to see the doctor to get an appropriate care. After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease off.

## 5.8 Belt

### 5.8.1 Inspection of belt

When inspecting the belt, remove the pulley cover and check the belt visually.

Although the durability of the belt is affected significantly by the operating conditions, generally a belt has a flex line of several million times.

As a reference for determining when to actually replace the belt, replace the belt if any of the following conditions is found:

- Significant wear of the teeth or end face of the belt
- Swelling of the belt due to attached oil, etc.
- Cracking or other damage of the teeth or back of the belt
- Breaking of the belt

### 5.8.2 Applicable belt

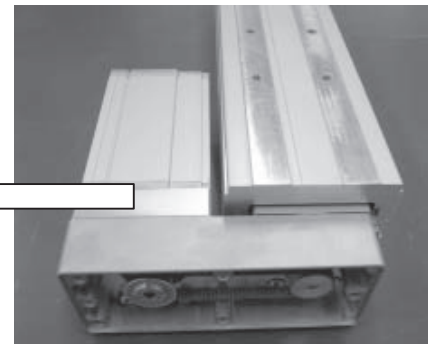
Manufacturer: Bando Chemical Industries, Ltd.

Belt model (type)	Model
40S2M138R, 4-mm wide (clean rubber type)	SA3R
60S2M152R, 6-mm wide (clean rubber type)	SA4R
60S2M180R, 6-mm wide (clean rubber type)	SA5R
60S2M180R, 6-mm wide (clean rubber type)	SA6R

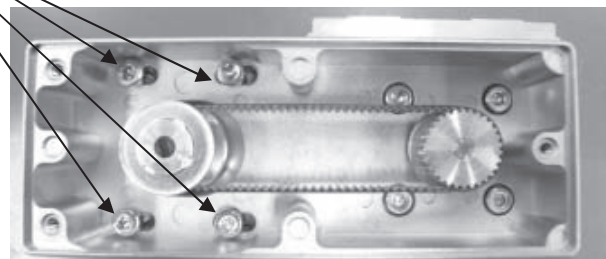
### 5.8.3 Adjustment of belt tension

Remove the pulley cover, loosen the tension adjustment bolts (4 locations), and shift the motor as shown below to tension the belt. When finished, tighten the tension adjustment bolts.

Tension  
 SA3R:  $1.5 \pm 0.1 \text{ kgf}$   
 Other than SA3R:  $2.5 \pm 0.1 \text{ kgf}$



Tension adjustment bolt		
Model	Nominal thread size	Tightening torque
SA3R	M2.6	0.46N•m (0.047kgf•m)
SA4R	M3	0.83N•m (0.085kgf•m)
SA5R/SA6R	M4	1.76N•m (0.18kgf•m)



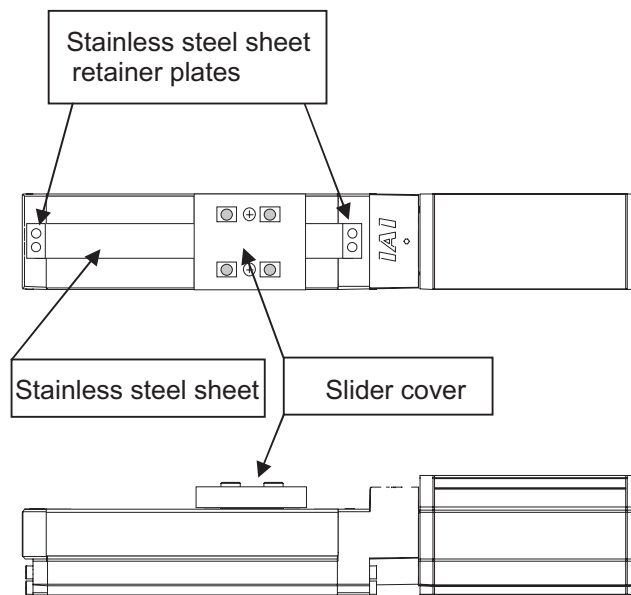
## 5.9 Procedures for Replacement and Adjustment of Stainless Steel Sheet! (for models with slider cover)

It is possible to replace the stainless steel sheet without removing the slider cover.

[Required Items]

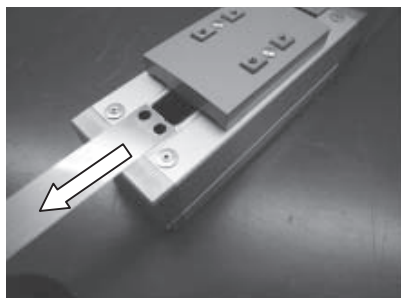
- Replacement stainless steel sheet
- Hex wrench set
- Adhesive tape

[Name of each part]

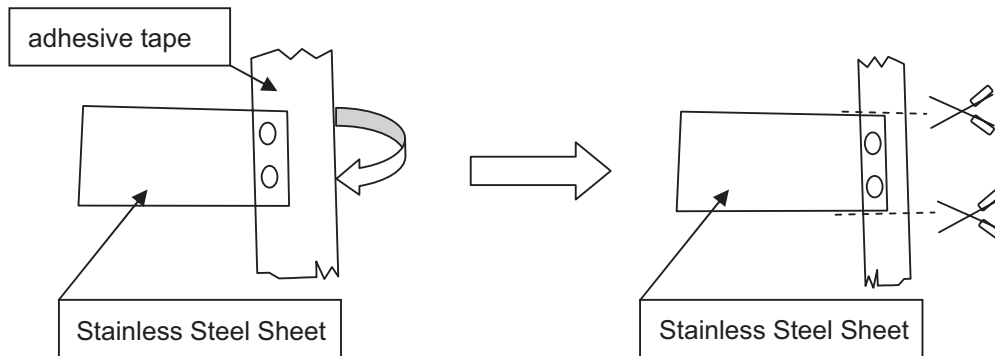


[Procedure]

- 1) With a 1.5mm hex wrench, remove the four screws securing the stainless steel sheet and the two stainless steel sheet retainer plates.
- 2) Pull out the old stainless steel sheet.

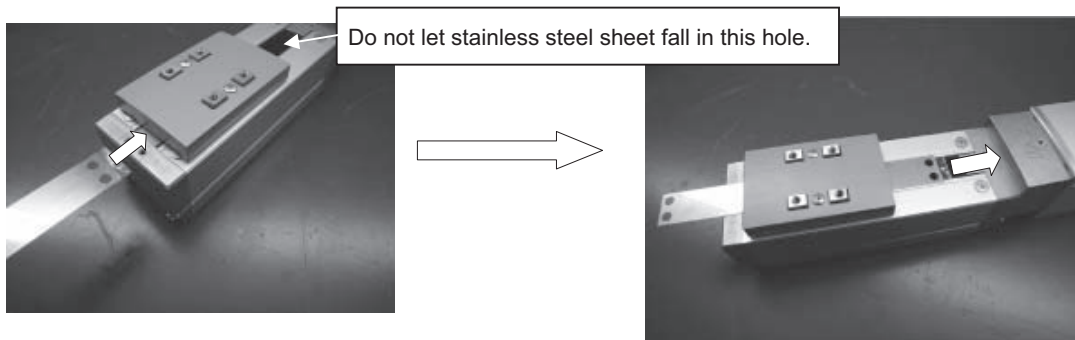


- 3) Apply adhesive tape to one side of the new stainless steel sheet.

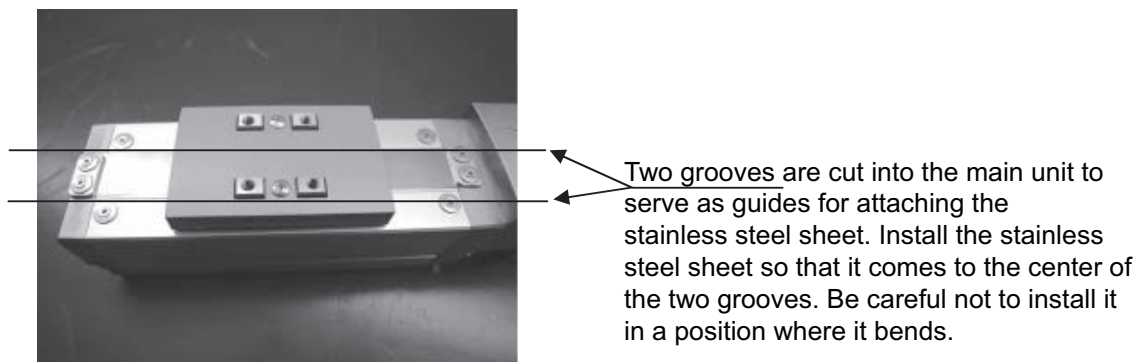


Apply the adhesive tape as though sandwiching the stainless steel sheet, leaving about 3mm of tape sticking out from the stainless steel sheet. Cut off the excess tape.

- 4) Slide the stainless steel sheet, taped end first, in through the gap under the slider cover.



- 5) Fasten the two stainless steel sheet retainer plates with the four screws. Use a 1.5mm hex wrench.



- 6) After fastening the stainless steel sheet retainer plate, move the slider by hand a full stroke and ensure that the stainless steel sheet neither floats up nor is warped. If there is a problem, go back to Procedure 5).

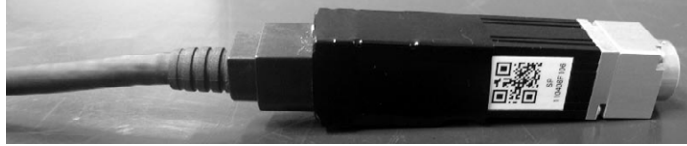
**Caution:** When having the slider moved back and forth manually by hand, make sure not to apply external force to the thrust directions that exceeds the value stated in Caution in Handling. (If the slider will not move, operate it using a jog function.)

## 5.10 Procedures for Replacement of Motor

### 5.10.1 SA2AC

[Required Items]

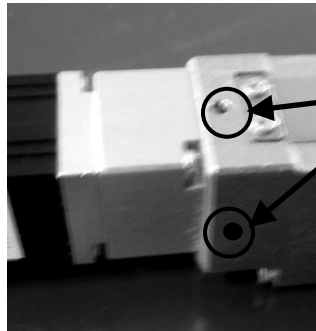
- Replacement motor unit



- Phillips Screwdriver No. 0 and No. 1
- Hex wrench Across flats 0.89mm, 1.5mm

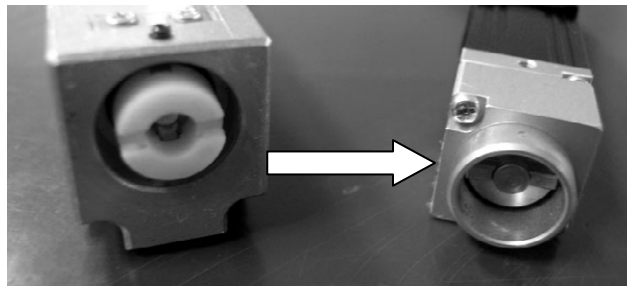
[Procedure]

- 1) Remove the M2 × 2 set screws holding on the slider side of the actuator and the motor unit with a hex wrench. (2 places)

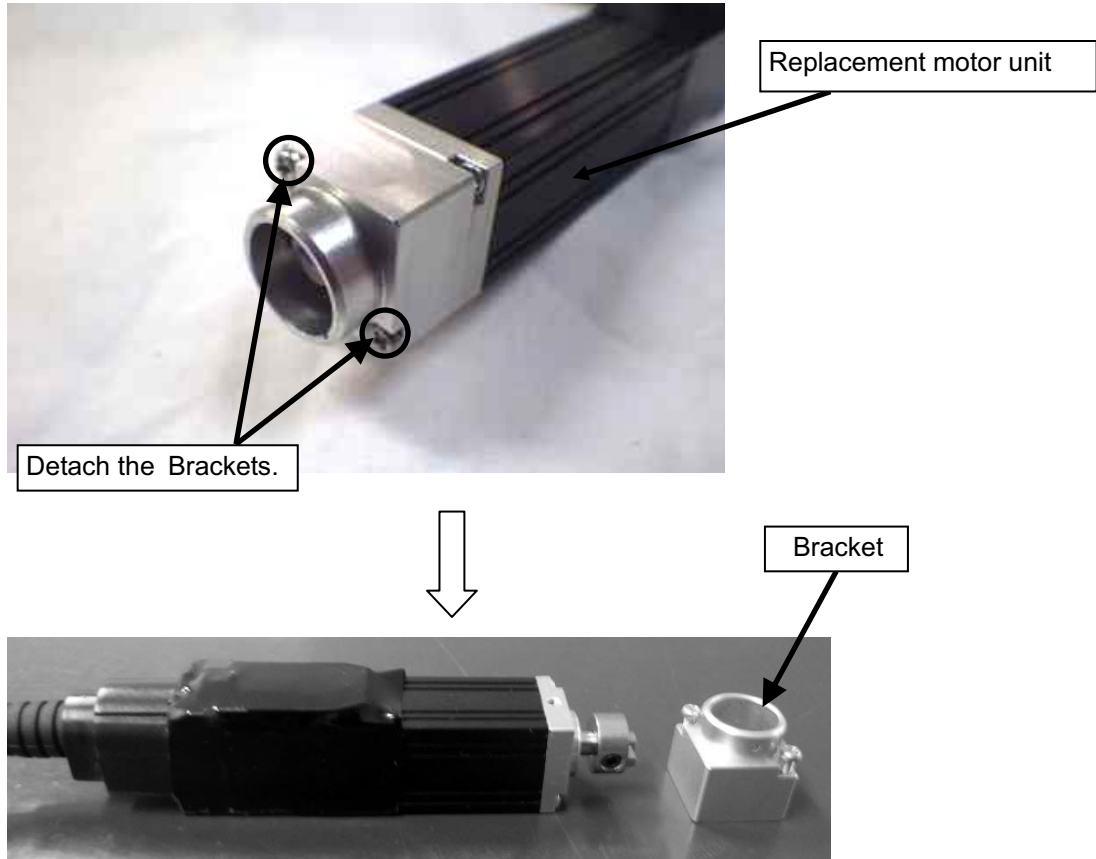


Slider side and motor unit fixing screws

- 2) Detach the motor unit.



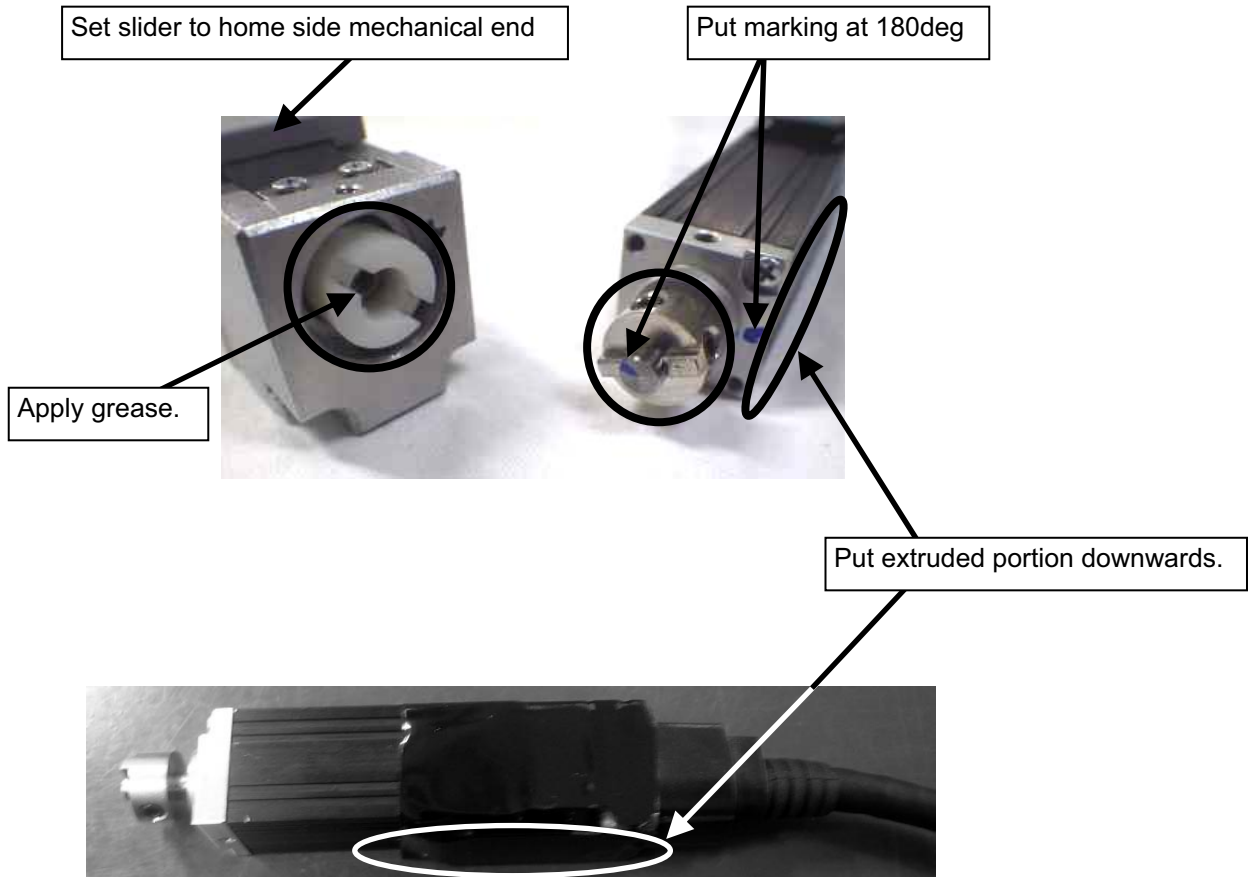
- 3) Remove the M2 × 12 screws with a Philips screwdriver to take off the bracket attached on the replacement motor.



4) Put the extruded portion on the replacement motor unit downwards with the following procedure to align the coupling orientations.

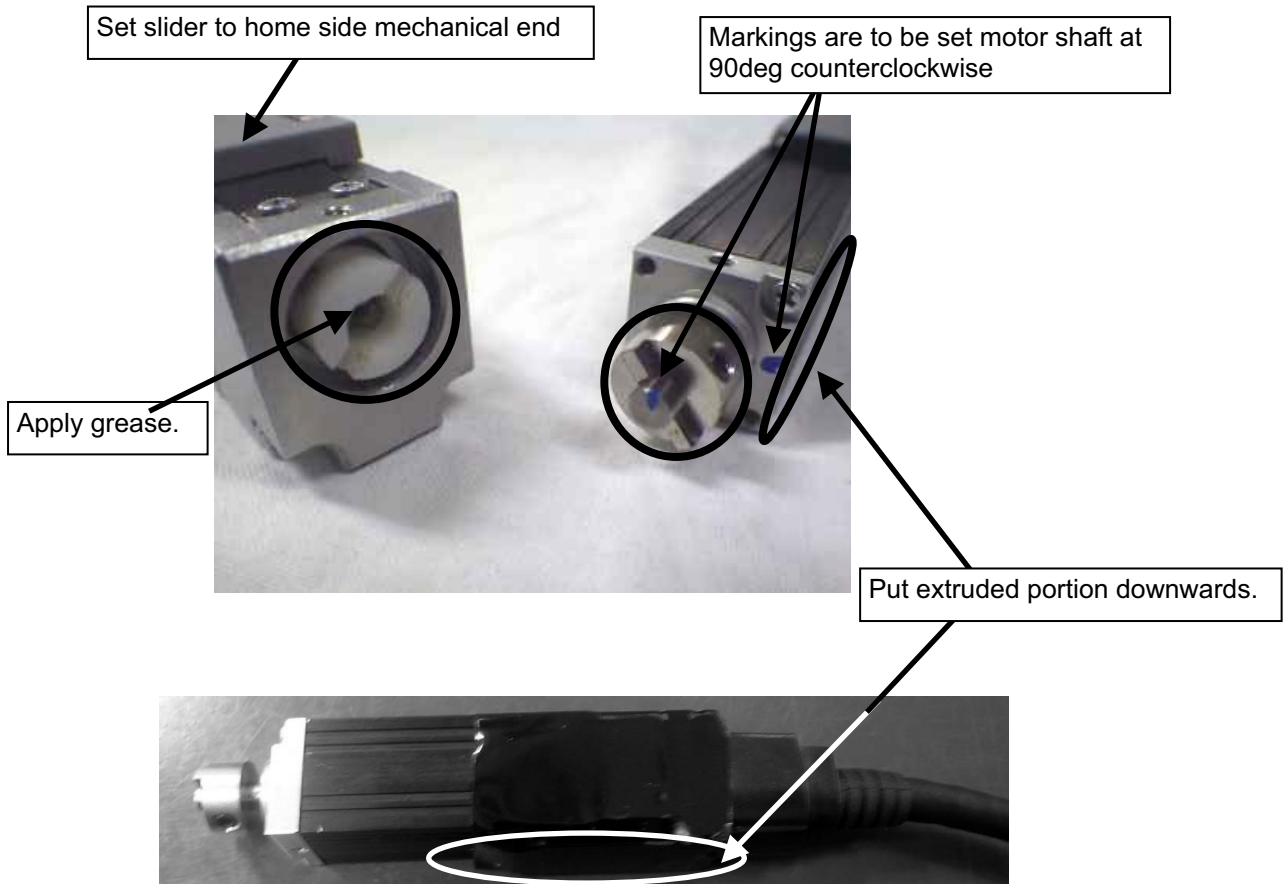
[For Lead 1 and Lead 2]

- Set the marking on the motor 180deg away from the marking on the motor and motor shaft.
- Apply grease on the coupling on the slider side.  
Manufactured by Idemitsu Kosan Daphne Eponex Grease No. 2
- Push the slider against the mechanical end.



[For Lead 4]

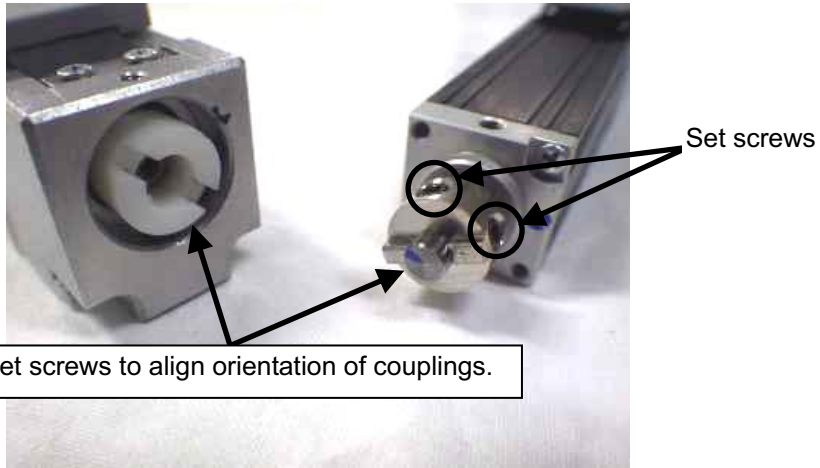
- Rotate the motor shaft counterclockwise so the marking on it is placed at 90deg to the marking on the motor.  
(Note) Rotate it clockwise to set the marking at 90deg (reversed direction to the figures below) for the home reversed type.
- Apply grease on the coupling on the slider side.  
Manufactured by Idemitsu Kosan Daphne Eponex Grease No. 2
- Push the slider against the mechanical end.





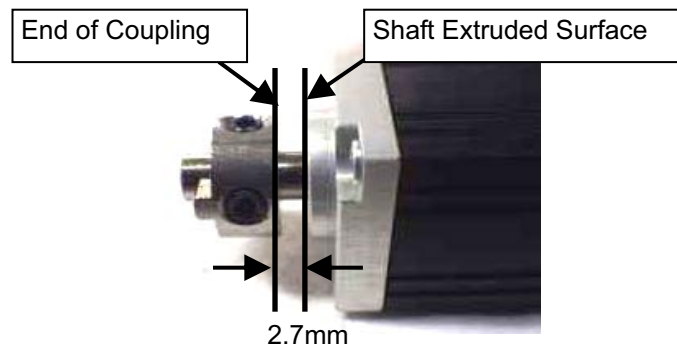
[Common procedure for Lead 1, Lead 2 and Lead 4]

Keeping the markings on the motor and the motor shaft at the positions set in Procedure 4), loosen the set screws with a 1.5mm hex wrench to align the orientation of the couplings.

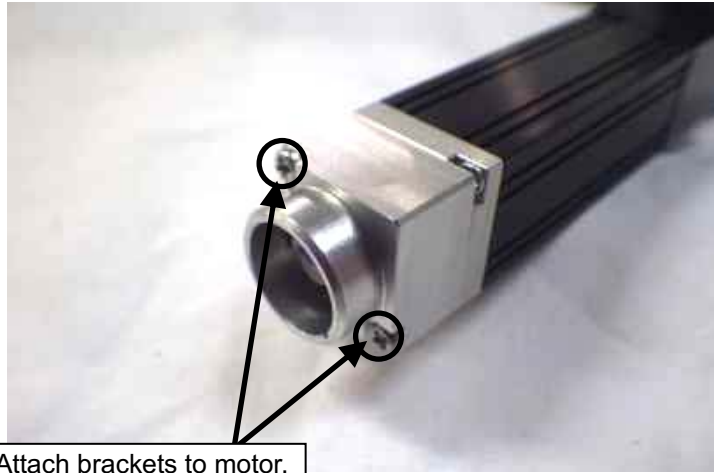


Set the end of the coupling to the position shown in the figure below, and tighten the set screws.

Tightening Torque	69N • cm
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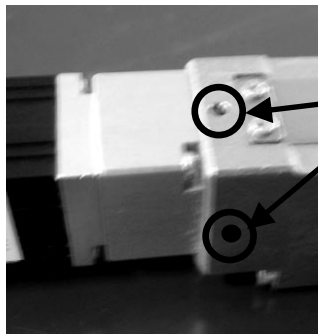
5) Attach the bracket to the motor with the M2 × 12 screws. (2 places).



Attach brackets to motor.

Tightening Torque	17N • cm
-------------------	----------

6) Keeping the markings on the motor and the motor shaft at the positions set in Procedure 4), attach the motor unit on the slider side, and affix it with the M2 × 2 set screws. (2 places)



Slider side and motor unit fixing screws

7) Connect a PC or teaching pendant to the controller and perform a home return. Check for displacement with the original home position and if there is a displacement, make correction using the following parameter:

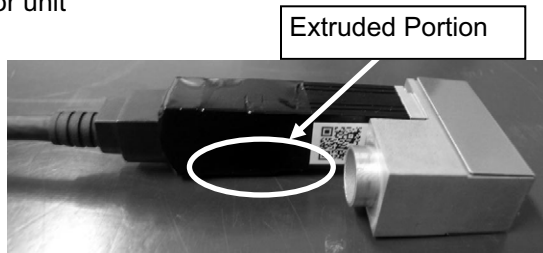
- ACON controller : No.22, home return offset distance
- ASEL controller : Parameter No.12 for each axis, home preset value
- ASEP controller : No.16, home return offset distance
- AMEC controller : No.16, home return offset distance
- MSEP controller : No.16, home return offset distance

If your actuator is of the absolute encoder specification, perform a home return after the parameter has been changed, and then execute an absolute reset.

## 5.10.2 SA2AR

### [Required Items]

- Replacement motor unit

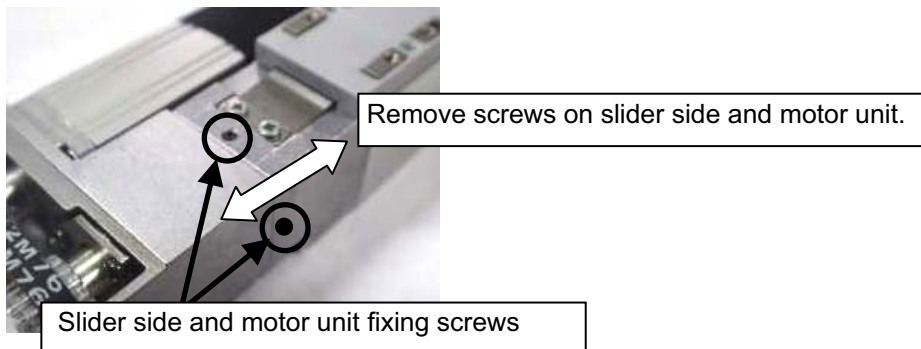


(Note) For the slider type, when attaching a motor unit for replacement, make sure to set the extruded portion downwards. This is the reason the motor unit for replacement differs depending on the direction to reverse. Pay attention to this difference. [Refer to Procedure 2)]

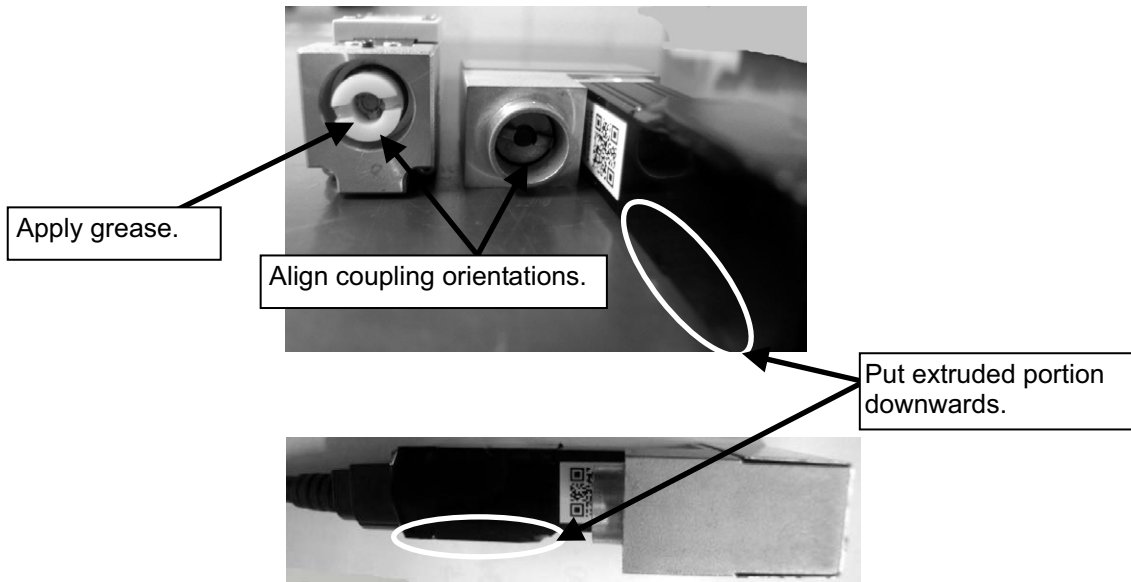
- Tension gauge
- Strong string shaped in a ring (or a long tie-band)
- Phillips Screwdriver No. 0 and No. 1
- Hex wrench Across flats 0.89mm

### [Procedure]

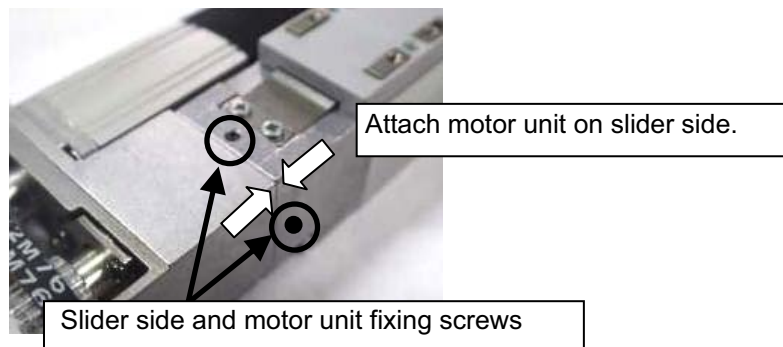
- 1) Remove the M2 × 2 set screws holding on the slider side of the actuator and the motor unit with a hex wrench. (2 places)  
After removing the set screws, detach the motor unit off the actuator.



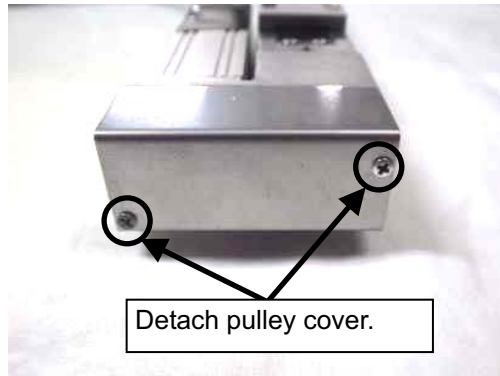
- 2) Apply grease on the coupling on the slider side.  
Manufactured by Idemitsu Kosan Daphne Eponex Grease No. 2  
Put the extruded portion on the replacement motor unit downwards to align the orientation of the couplings on the slider side and the motor unit for replacement.



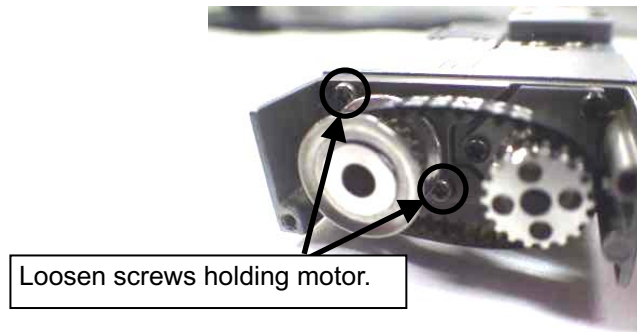
- 3) Attach the motor unit for replacement on the slider side, and affix it with the M2 × 2 set screws.



- 4) Detach the pulley cover.  
Remove the screws (M2 × 2). (2 places)



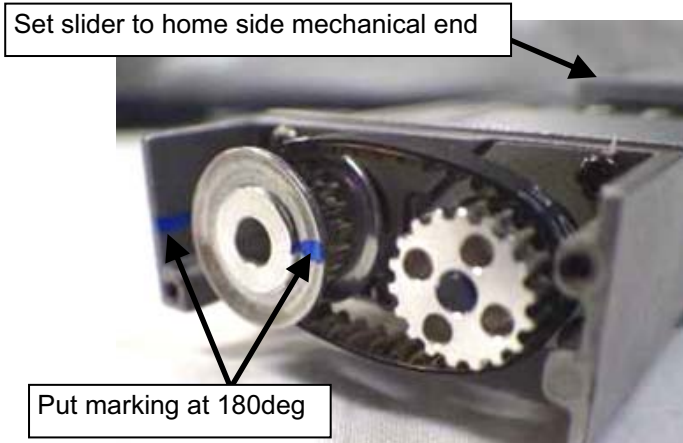
- 5) Loosen the screws (M2 × 8) holding the motor on the reversing unit to loosen the belt. (2 places)



6) Adjust the pulley position following the process below.

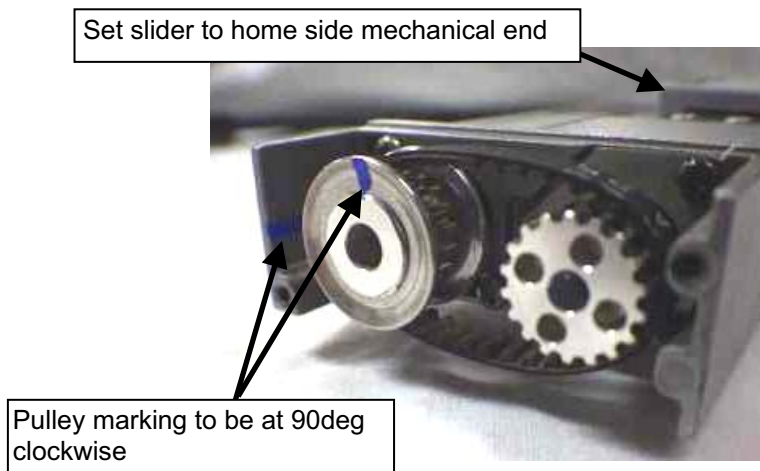
[For Lead 1 and Lead 2]

- a. Set the marking on the motor 180deg away from the marking on the pulley and braket.
- b. Push the slider against the mechanical end.
- c. Adjust the belt hang.

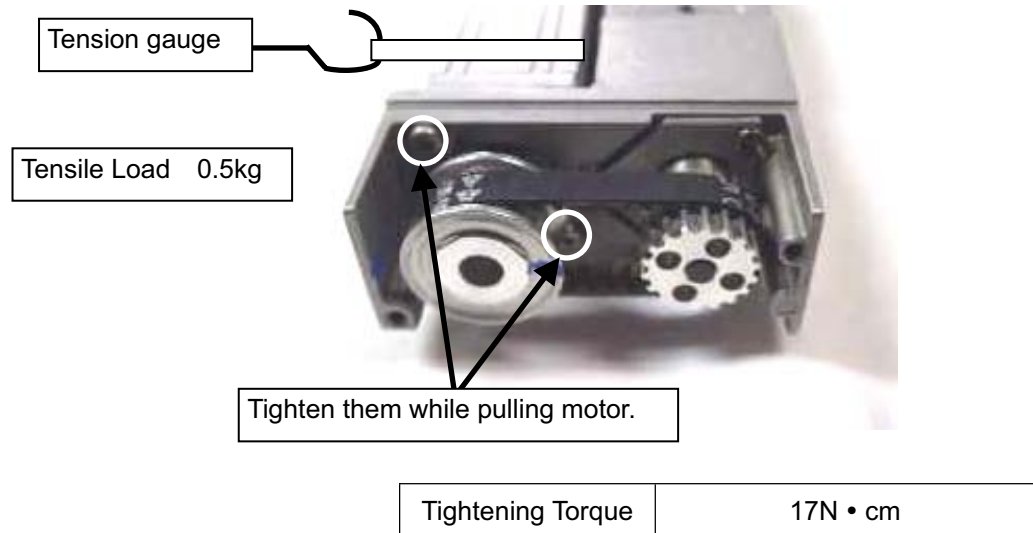


[For Lead 4]

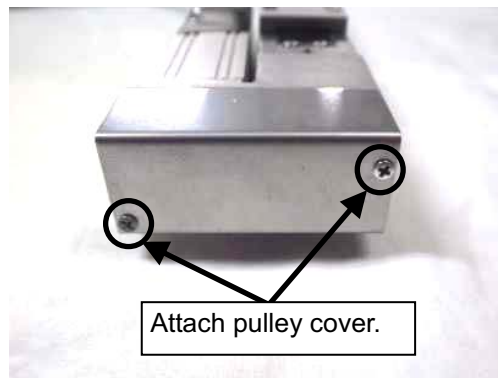
- a. Rotate the pulley to set the marking at 90deg clockwise to the marking on the motor bracket.  
(Note) Rotate it clockwise to set the marking at 90deg (reversed direction to the figures below) for the home reversed type.
- b. Push the slider against the mechanical end.
- c. Adjust the belt hang.



- 7) Keeping the pulley and the slider at the positions set in Procedure 6), have a strong string (or a long cable band) in loop hanged at the root of the motor unit, and pull the motor unit with a tension gauge to maintain the tensile at the specified to tighten screws (M2 × 8) evenly. (2 places)



- 8) Attach the pulley cover with the attachment screws (M2 × 2). (2 places)



- 9) Connect a PC or teaching pendant to the controller and perform a home return. Check for displacement with the original home position and if there is a displacement, make correction using the following parameter:

- ACON controller : No.22, home return offset distance
- ASEL controller : Parameter No.12 for each axis, home preset value
- ASEP controller : No.16, home return offset distance
- AMEC controller : No.16, home return offset distance
- MSEP controller : No.16, home return offset distance

If your actuator is of the absolute encoder specification, perform a home return after the parameter has been changed, and then execute an absolute reset.

## 5.10.3 SA3C, SA4C, SA5C and SA6C

[Refer to 5.10.4 for the reversing type.]

[Required Items]

- Replacement motor unit

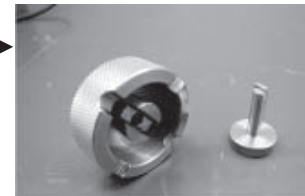
Axis type		Model number		
		Without brake		With brake
RCA2 (brown encoder cable connector)	Slider type	SA3C	RCA2-MU1A	RCA2-MU1A-B
		SA4C	RCA2-MU2A	RCA2-MU2A-B
		SA5C	RCA2-MU3A	RCA2-MU3A-B
		SA6C	RCA2-MU4A	RCA2-MU4A-B



- Hex wrench set

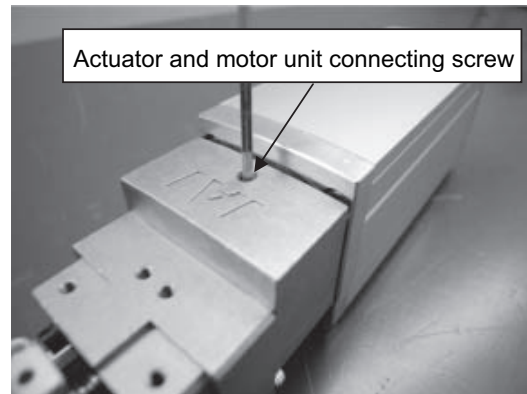
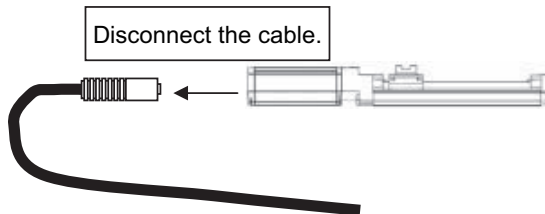
- Dedicated replacement jig (Optional)

Model number	Applicable mode
RCA2-JG-1	RCA2-SA3
RCA2-JG-2	RCA2-SA4
RCA2-JG-3	RCA2-SA5/SA6

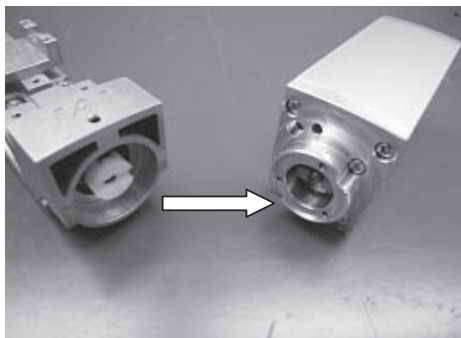


[Procedure]

- 1) Disconnect the cable from the motor unit, then use a 2mm hex wrench to remove the screw which holds together the actuator unit and the motor unit.

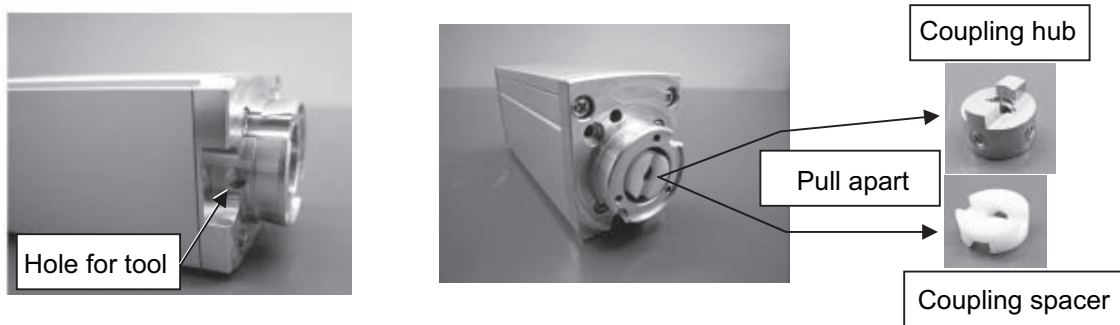


- 2) Detach the motor unit.

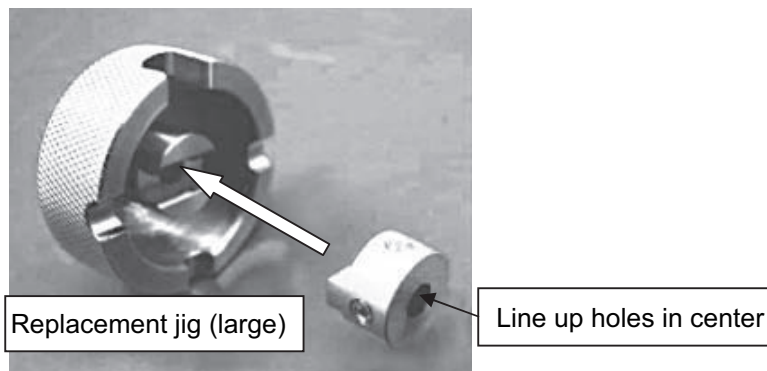




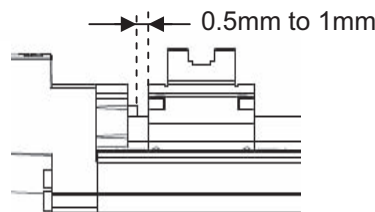
- 3) Take out the coupling hub and coupling spacer from the detached motor unit. Twist the coupling hub or coupling spacer on the motor side to align the screw holes with the hole for the tool to go through. Then remove two screws with a 2mm hex wrench.
  - \* If there is only a coupling hub on the motor unit side, then there is a coupling spacer on the actuator side which can be removed by pulling.
  - \* If both coupling hub and coupling spacer are present, pull them apart.
 (They should separate with a gentle pull.)



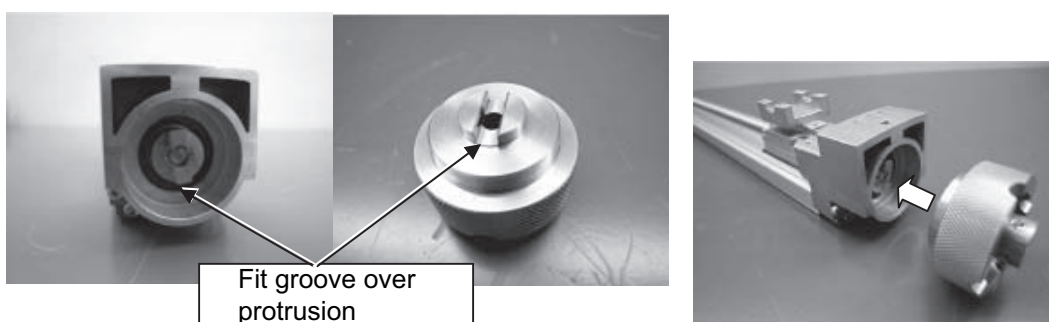
- 4) Fit the protruding part of the coupling hub into the groove of the replacement jig (large), and temporarily hold them together with two M 3 × 3 Allen screws (tighten just enough so that the coupling hub does not fall off).



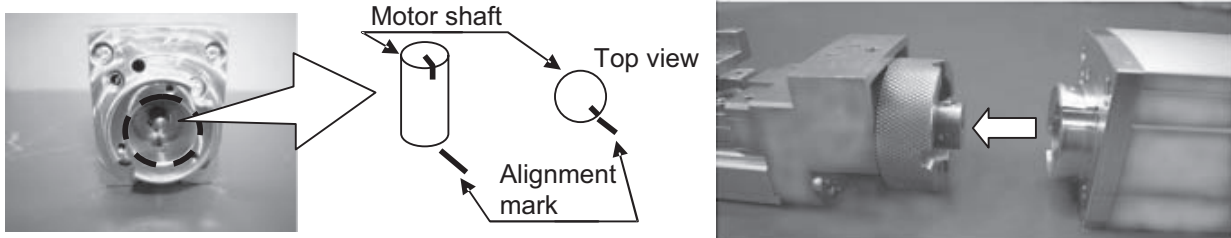
- 5) Turn the shaft to move the slider about 0.5mm to 1mm from the mechanical end on the home position side.



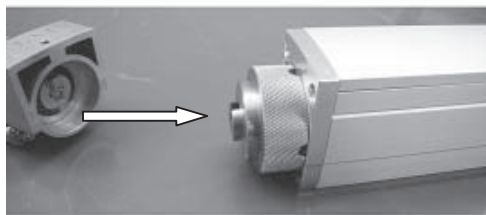
- 6) Fit the groove of the replacement jig (large) assembled in 4) over the protrusion of the actuator.



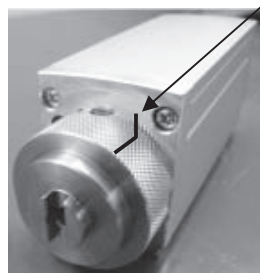
- 7) Align the marking on the motor shaft with the point indicated and insert the replacement motor unit into the actuator.



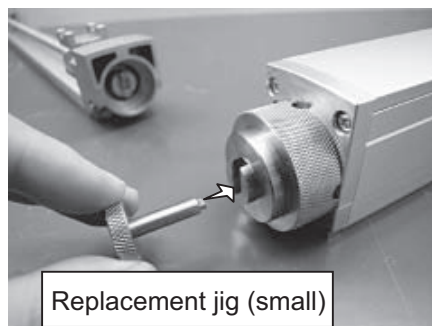
- 8) Take out the motor unit and the replacement jig (large). (Do not allow the jig to turn.)



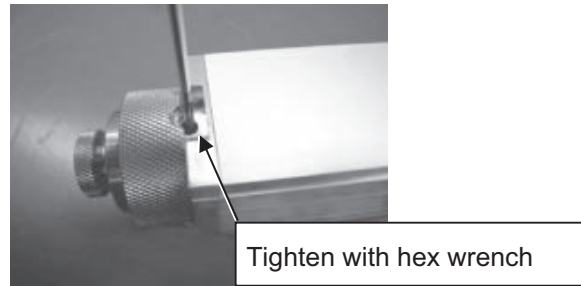
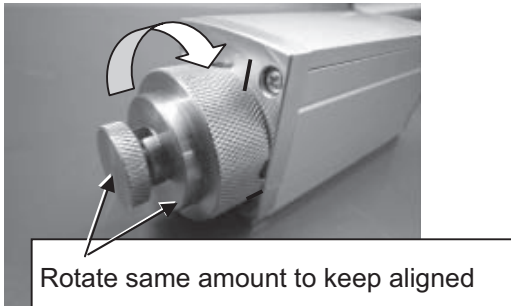
- 9) In order to keep the jig from turning, draw a mark using a pen or marker.



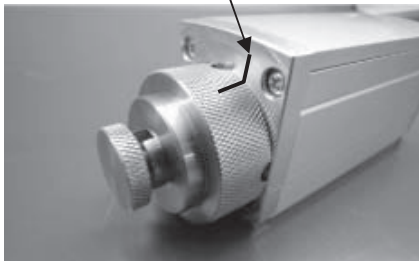
- 10) Insert the replacement jig (small) in such a way that its protrusion is aligned with the groove in the motor shaft.



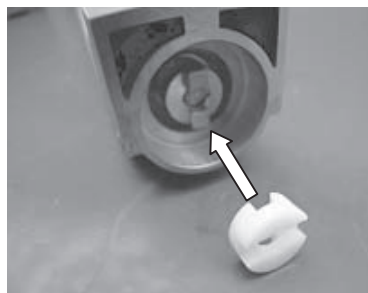
- 11) Turn the replacement jig (large) and the replacement jig (small) by the same amount. When the coupling fastening screws appear through the tool holes, tighten them with a 2mm hex wrench.  
(There are two fastening screws.)



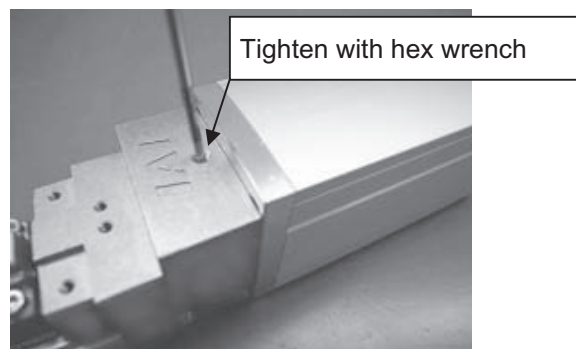
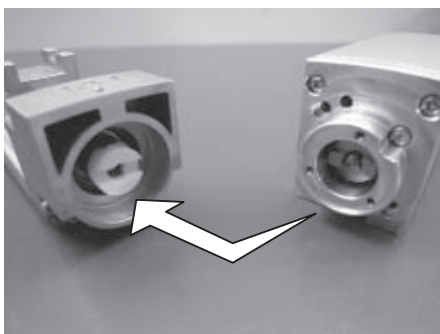
- 12) Align the marks made in 9). After the marks are aligned, remove the replacement jig (large) and the replacement jig (small).



- 13) Apply the specified grease (TL 101Y grease made by NOK) to the coupling spacer (front and rear), then install the coupling spacer on the actuator side.



- 14) Install the replacement motor unit on the actuator side, then tighten the fastening screws with a 2mm hex wrench.  
(The actuator side groove and replacement motor unit protrusion should have been aligned in 12), but if not, align them here.)



## 5.10.4 Procedures for Replacement of Belt and Motor for Reversing Type of the SA3R, SA4R, SA5R and SA6R

[Required Items]

- Replacement motor unit of reversing type

Axis type			Model number	
			Without brake	With brake
RCA2 (brown encoder cable connector)	Slider type	SA3R	RCA2-MU1B	RCA2-MU1B-B
		SA4R	RCA2-MU2B	RCA2-MU2B-B
		SA5R	RCA2-MU3B	RCA2-MU3B-B
		SA6R	RCA2-MU4B	RCA2-MU4B-B



- Belt

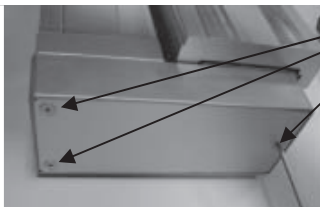
Manufacturer: Bando Chemical Industries, Ltd.

Belt model (type)	Model number
40S2M138R, 4-mm wide (clean rubber type)	SA3R
60S2M152R, 6-mm wide (clean rubber type)	SA4R
60S2M180R, 6-mm wide (clean rubber type)	SA5R
60S2M180R, 6-mm wide (clean rubber type)	SA6R

- Tension gauge
- Hex wrench set

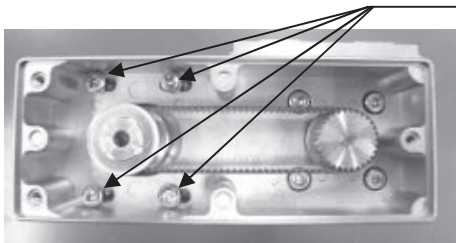
[Procedure]

- 1) Remove the pulley cover.  
Remove the mounting screws. (2pcs for the SA3R, 3pcs for other models)



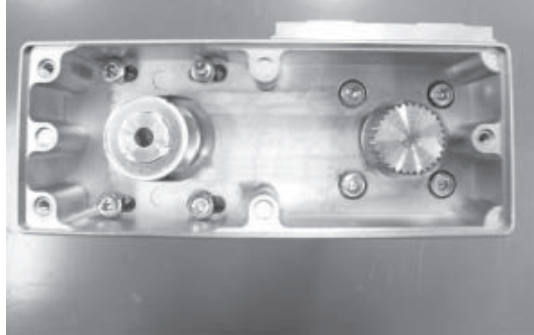
Mounting screw		
Model	Nominal thread size	Applicable Allen wrench
SA3R/SA4R	M2.5	1.5mm across flats
SA5R/SA6R	M3	2mm across flats

- 2) Loosen the tension adjustment bolts (4pcs) and slack the belt.

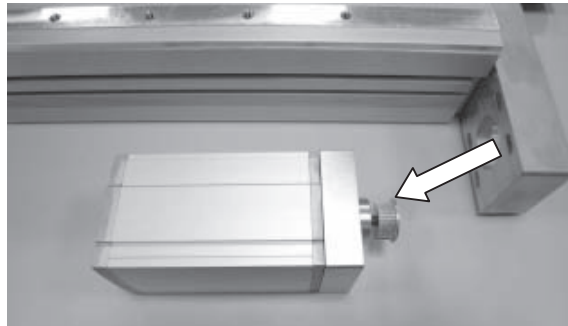


Tightening adjustment bolt		
Model	Nominal thread size	Applicable hex wrench
SA3R	M2.6	2mm across flats
SA4R	M3	2.5mm across flats
SA5R/SA6R	M4	3mm across flats

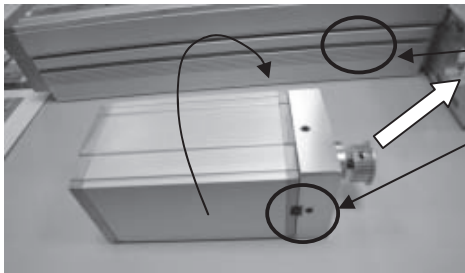
- 3) Remove the belt from the pulleys. When replacing the belt, proceed to Procedure 7).



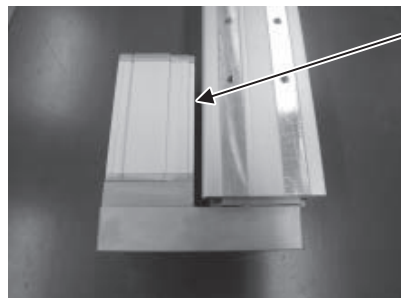
- 4) Remove the tension adjustment bolts and pull out the motor unit.



- 5) Install the replacement motor unit.  
As shown below, install the motor unit by making sure its specified surface faces the actuator base. Loosely secure the motor unit using the tension adjustment bolts.

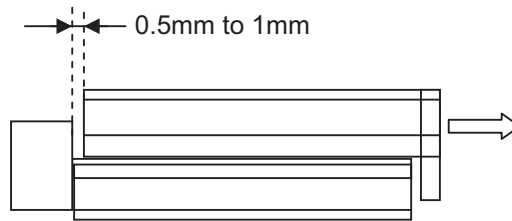


Install the motor unit by making sure the base surface of the actuator faces the motor unit surface with two holes.

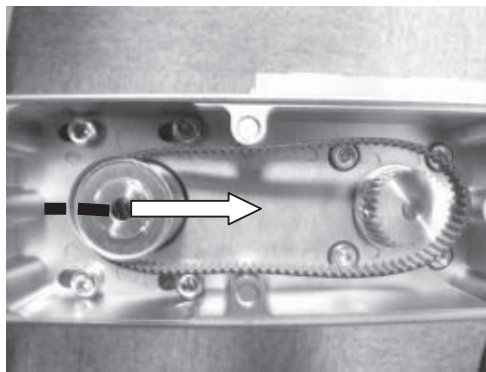


The surface with no gaps should face the motor unit surface with two holes.

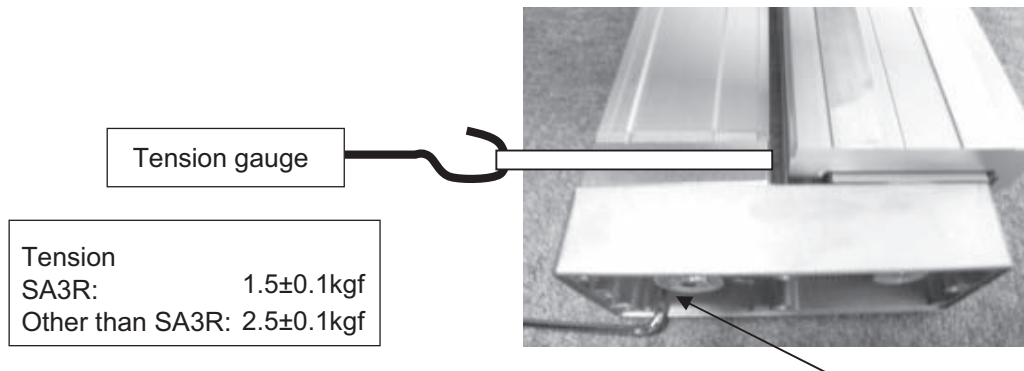
- 6) Move the slider or table by 0.5 to 1mm from the mechanical end on the home side.



- 7) Move the motor unit in the direction of the arrow shown below, and then install the belt. Align the motor unit with the countermark on the actuator. When replacing the belt, install the replacement belt.

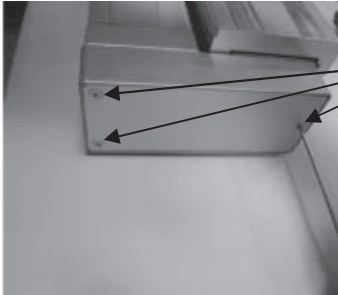


- 8) Pass around the base of the motor unit a strong string (or long tie band) that has been looped, and pull the loop with a tension gauge. When the specified tension is achieved, tighten the tension adjustment bolts uniformly.



Tension adjustment bolt		
Model	Nominal thread size	Tightening torque
SA3R	M2.6	0.46N·m (0.047kgf·m)
SA4R	M3	0.83N·m (0.085kgf·m)
SA5R/SA6R	M4	1.76N·m (0.18kgf·m)

- 9) Install the pulley cover.



Mounting screws  
(2pcs for the SA3R, 3pcs for other models)

- 10) Connect a PC or teaching pendant to the controller and perform a home return.  
Check for displacement with the original home position and if there is a displacement, make correction using the following parameter:
- ACON controller: No.22, home return offset distance
  - ASEL controller: Parameter No.12 for each axis, home preset value
  - ASEP controller: No.16, home return offset distance
  - AMEC controller: No.16, home return offset distance
  - MSEP controller: No.16, home return offset distance
- If your actuator is of the absolute encoder specification, perform a home return after the parameter has been changed, and then execute an absolute reset.

## 6. Life

The mechanical life of the actuator is represented by that of the guide receiving the greatest moment load. Operation life of the linear guide is to be determined by the total driving distance which can reach without having 90% flaking (peeling on rail surface). Operation life can be figured out with the calculation method shown below.

### 6.1 How to Calculate Operation Life

For the operation life of the linear guide, use the dynamic allowable moment stated in 1.2 Specifications, and figure out with the formula below.

$$L = \left( \frac{C_M}{M} \right)^3 \cdot 5000\text{km}$$

L : Operation life (km)     $C_M$  : Dynamic allowable moment (N·m)  
M : Moment to work (N·m)    5000km : Standard rated life of ROBO Cylinder

In addition, have a calculation for the drop of life with the formula below if there is a concern that the life could drop due to the condition of vibration or way to be attached.

$$L = \left( \frac{C_M}{M} \cdot \frac{f_{ws}}{f_w} \cdot \frac{1}{f_\alpha} \right)^3 \cdot 5000\text{km}$$

L : Operation life (km)     $C_M$  : Dynamic allowable moment (N·m)  
M : Moment to work (N·m)     $f_{ws}$  : Standard operational coefficient  
 $f_w$  : Load coefficient     $f_\alpha$  : Attachment coefficient  
5000km : Standard rated life of ROBO Cylinder

Explained below is regarding the standard operational coefficient  $f_{ws}$ , load coefficient  $f_w$  and attachment coefficient  $f_\alpha$ .

Refer to the contents below to set them up.

[Standard operational coefficient  $f_{ws}$ ]

For ROBO Cylinders described in this manual,  $f_{ws} = 1.2$ . It is a coefficient defined for each model, some models such as RCS3 high-speed type is 1.35.




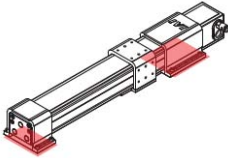
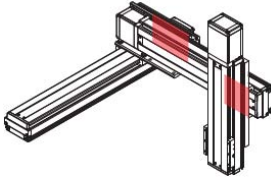
[Load coefficient  $f_w$ ]

It is a coefficient to consider the life drop due to operational conditions.

Load coefficient $f_w$	Operation Condition	Reference for acceleration/deceleration
1.0 to 1.5	Small vibration or impact in slow operation	0.3G or less

[Attachment coefficient  $f_\alpha$ ]

Attachment coefficient  $f_\alpha$  is a coefficient to consider the life drop due to the condition of actuator attachment.

Attachment coefficient $f_\alpha$	1.0	1.2	1.5
	Attachment in whole area	Attachment on both ends	Attachment on spots
Attached condition			

\* As the figures are those in common for each manual, they are not for RCA2 slider type.

Replace to figures for RCA2 slider type. and select the attachment coefficient.

\* Even when in attachment in whole area, and the actuator is seated in the whole length of the product, select 1.2 or 1.5 for the attachment coefficient depending on the position of screw fixing.

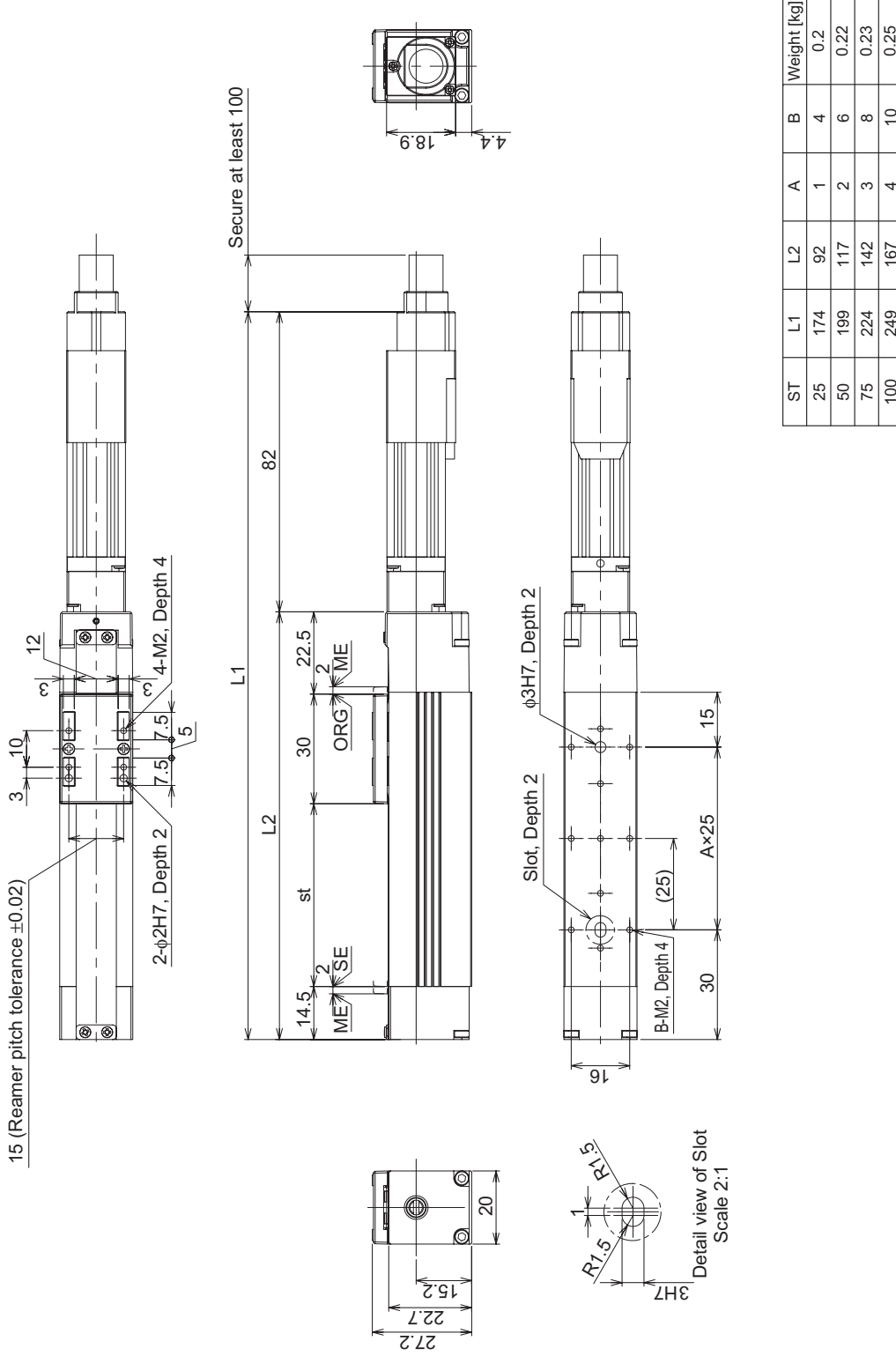
\* For attachment in whole area, use all of the tapped holes (counterbored holes) on the seat surface to fix.

## 6.2 Operation Life

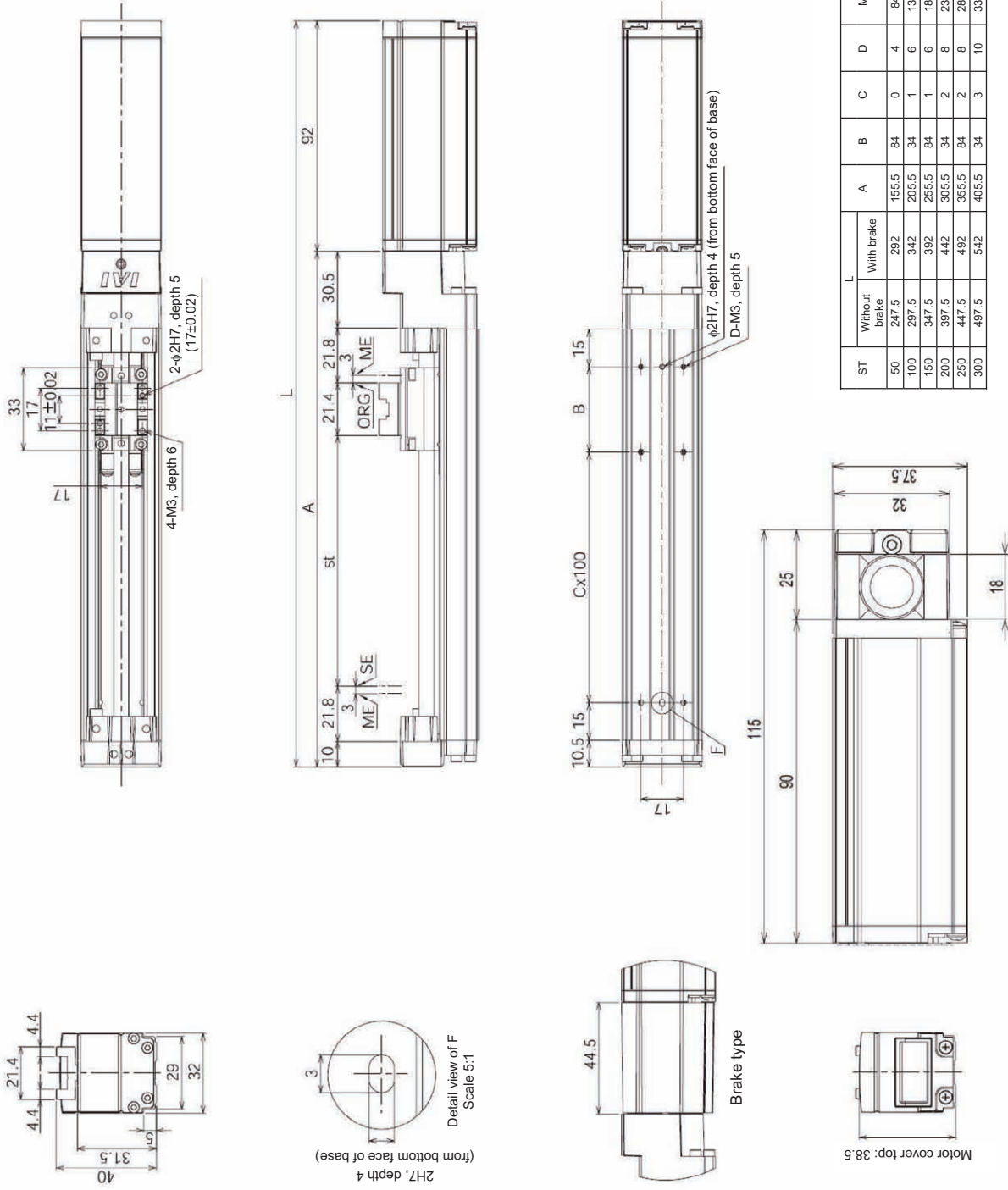
The operation life depends on the moment to work. With light load, it will be longer than 5,000km, the standard rated life. With no consideration of vibration and attachment condition, the operation life is 40,000km according to the calculation with formula in the previous page under assumption that 0.5  $C_M$  (half of dynamic allowable moment) of moment is applied on. It shows that it can be 8 times longer than the standard rated life, which is 5,000km.

## 7. External Dimensions

### 7.1 RCA2-SA2AC

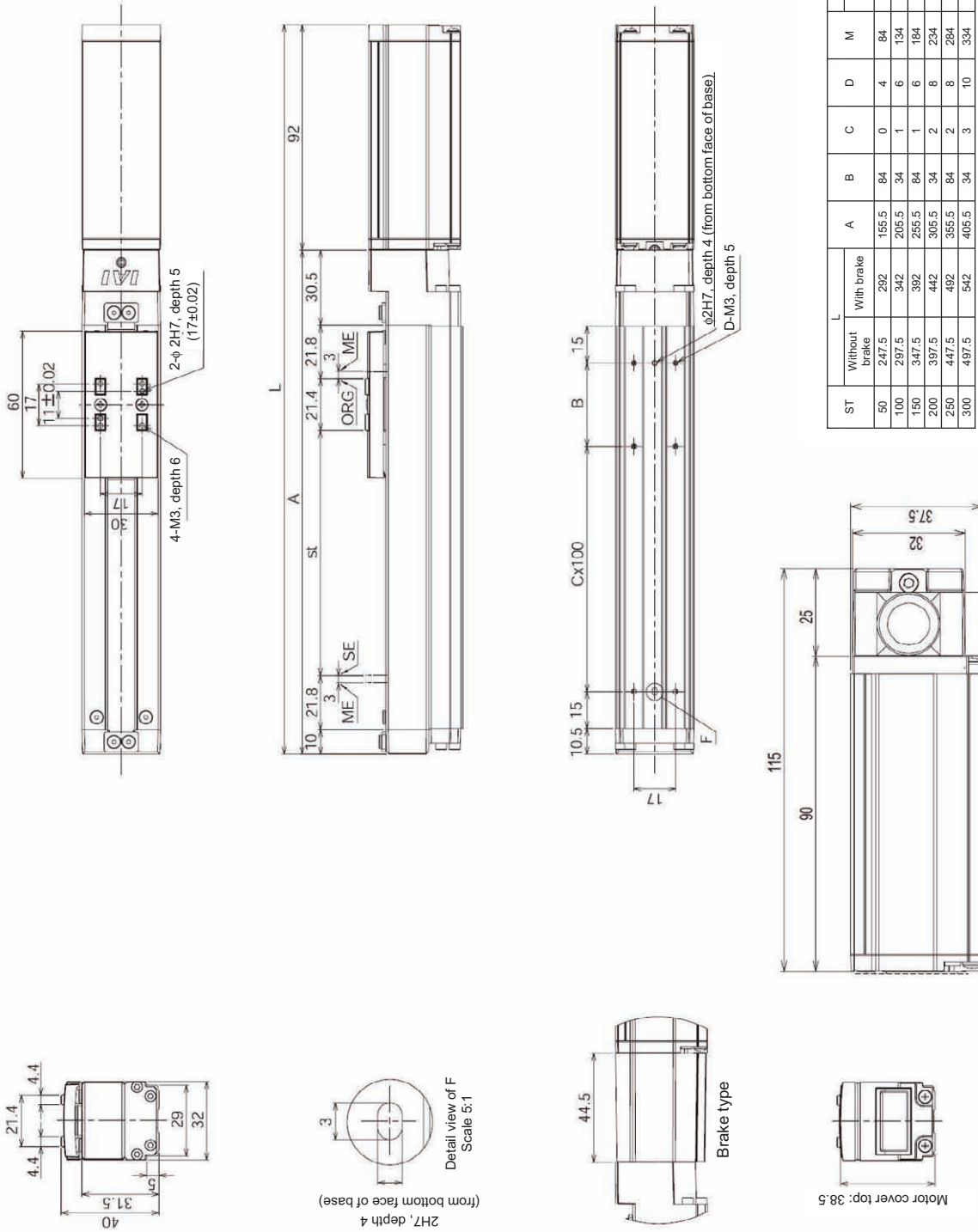


## 7.2 RCA2-SA3C



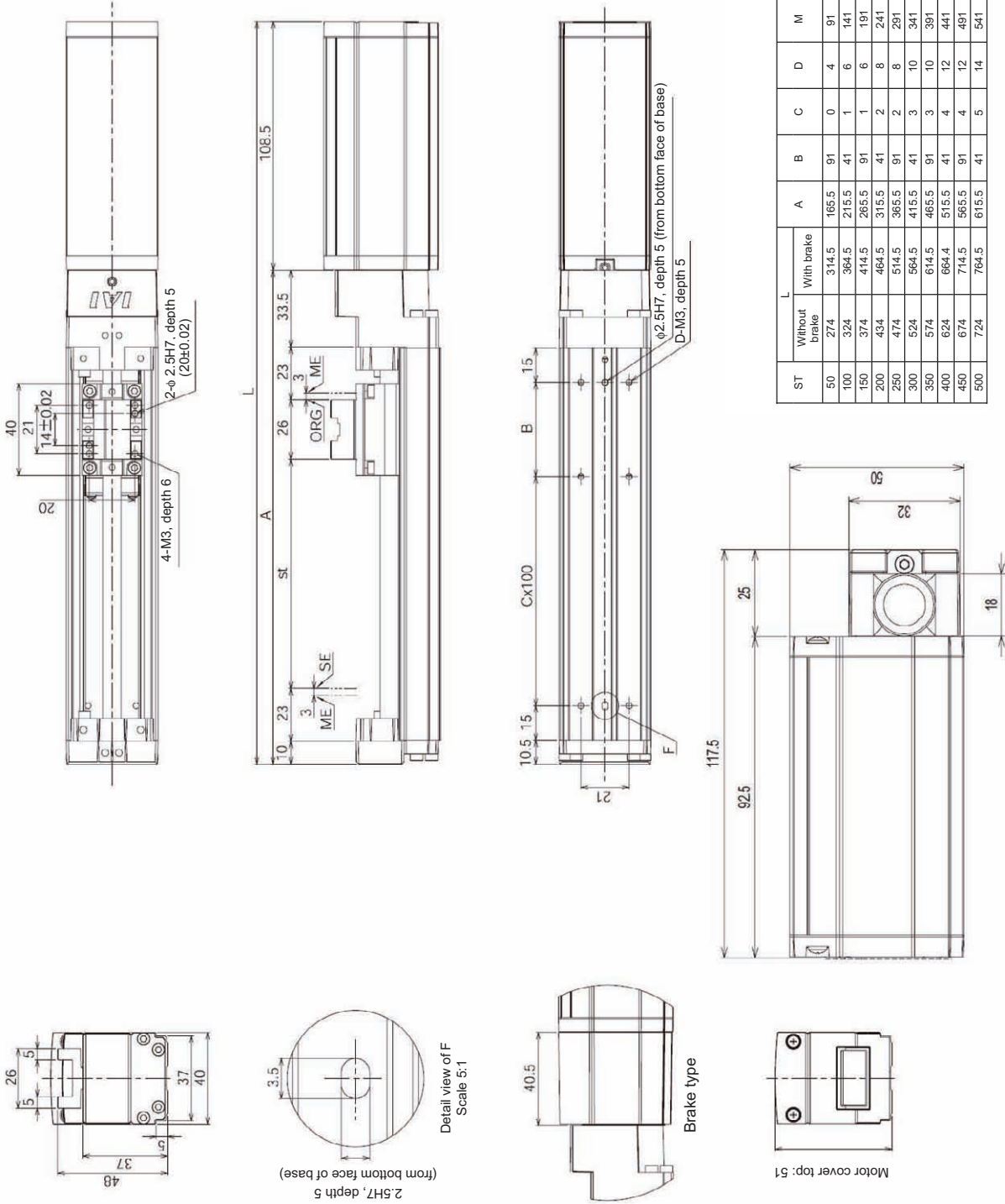
(Side view of the motor when the cable exit direction has been changed (optional))

## 7.3 RCA2-SA3C with Side Cover



(Side view of the motor when the cable exit direction has been changed (optional))

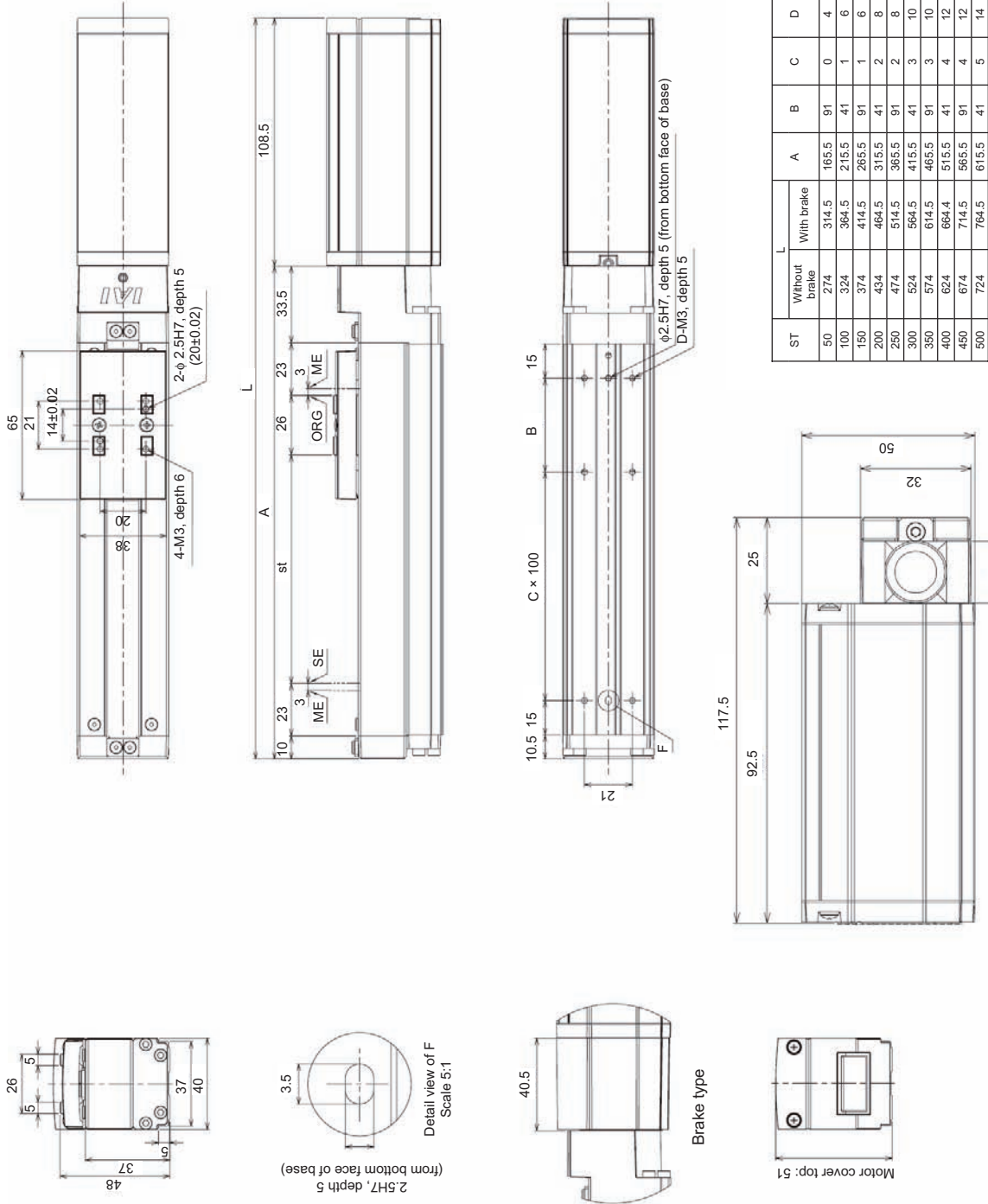
## 7.4 RCA2-SA4C



(Side view of the motor when the cable exit direction has been changed (optional))

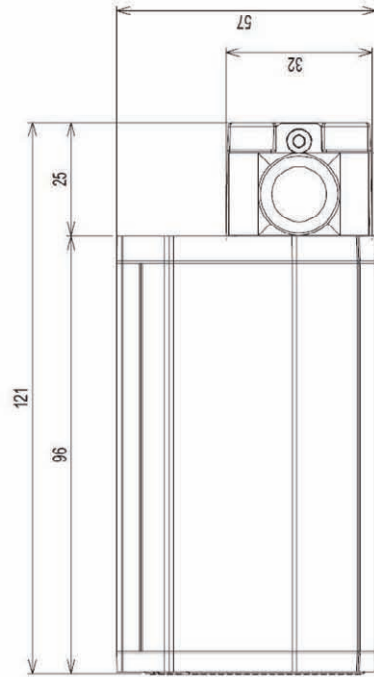
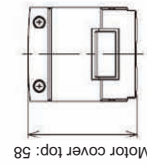
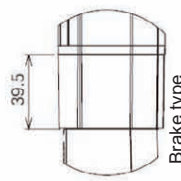
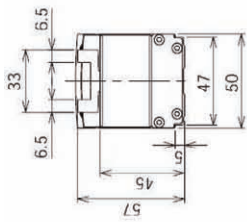
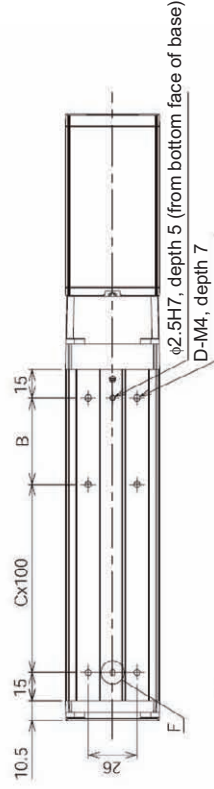
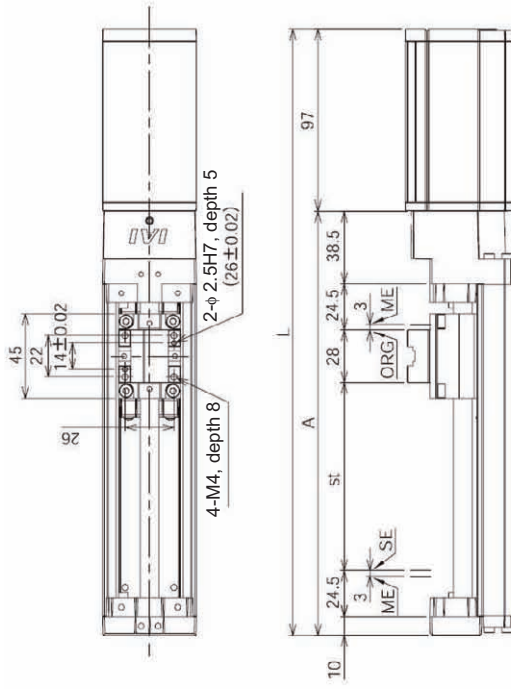
## 7.5 RCA2-SA4C with Side Cover

### 7. External Dimensions



(Side view of the motor when the cable exit direction has been changed (optional))

## 7.6 RCA2-SA5C

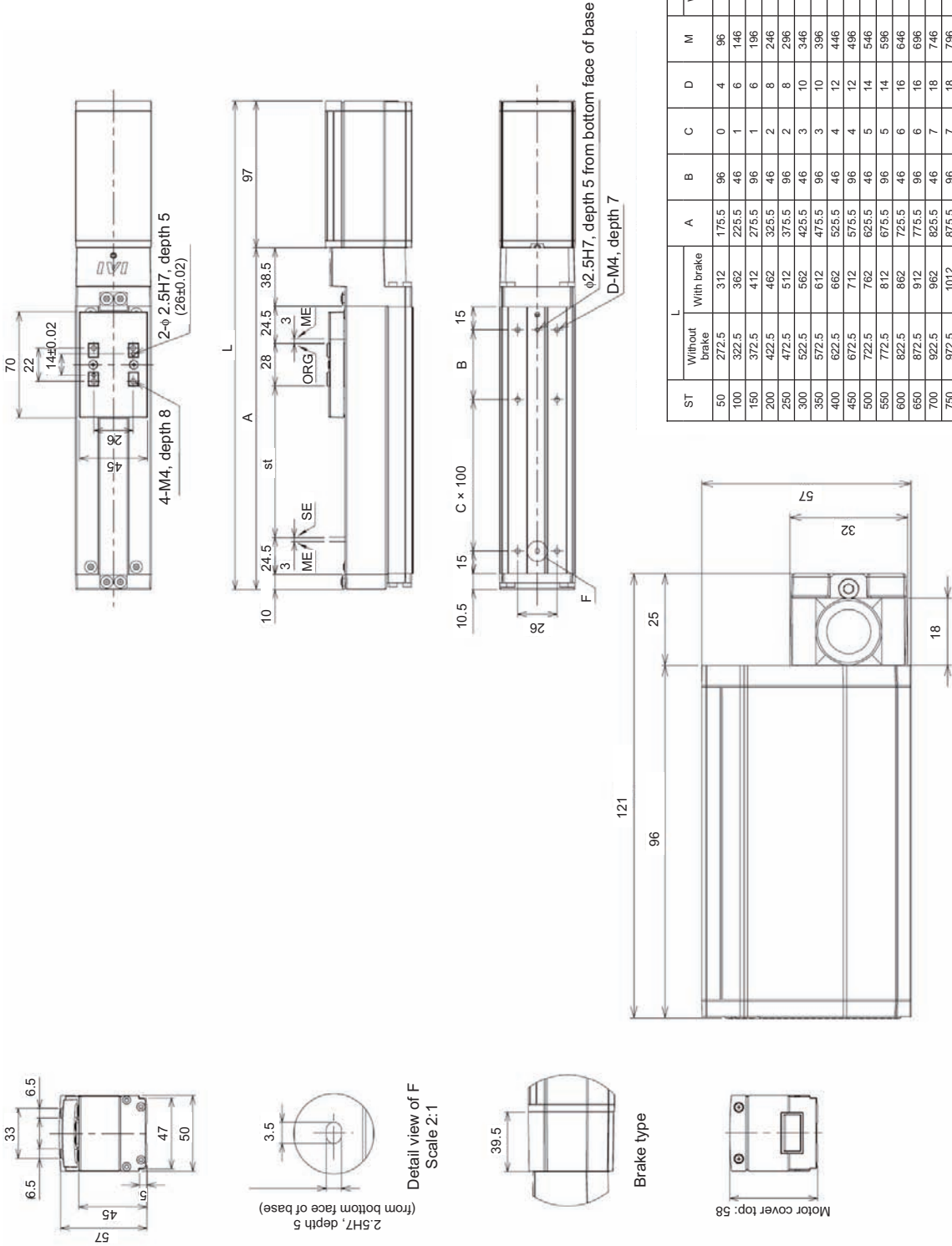


(Side view of the motor when the cable exit direction has been changed (optional))

ST	L		A	B	C	D	M	Weight [kg]	
	Without brake	With brake						Without brake	With brake
50	272.5	312	175.5	96	0	4	96	1.1	1.5
100	322.5	362	225.5	46	1	6	146	1.3	1.7
150	372.5	412	275.5	96	1	6	196	1.4	1.8
200	422.5	462	325.5	46	2	8	246	1.5	1.9
250	472.5	512	375.5	96	2	8	296	1.6	2.0
300	522.5	562	425.5	46	3	10	346	1.7	2.1
350	572.5	612	475.5	96	3	10	396	1.8	2.2
400	622.5	662	525.5	46	4	12	446	1.9	2.3
450	672.5	712	575.5	96	4	12	496	2.0	2.4
500	722.5	762	625.5	46	5	14	546	2.1	2.5
550	772.5	812	675.5	96	5	14	596	2.2	2.6
600	822.5	862	725.5	46	6	16	646	2.3	2.7
650	872.5	912	775.5	96	6	16	696	2.4	2.8
700	922.5	962	825.5	46	7	18	746	2.5	2.9
750	972.5	1012	875.5	96	7	18	796	2.6	3.0
800	1022.5	1062	925.5	46	8	20	846	2.7	3.1

## 7.7 RCA2-SA5C with Side Cover

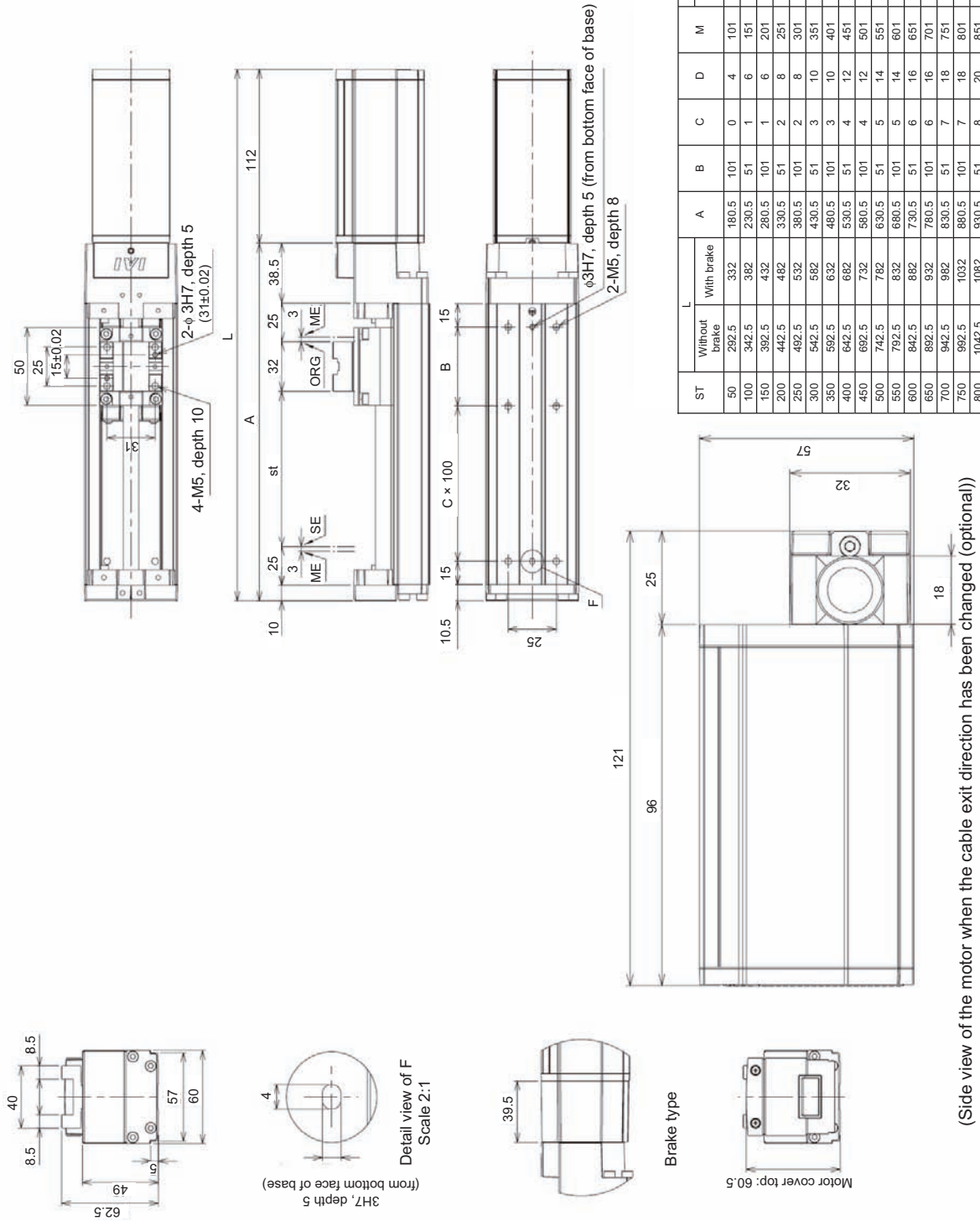
### 7. External Dimensions



(Side view of the motor when the cable exit direction has been changed (optional))

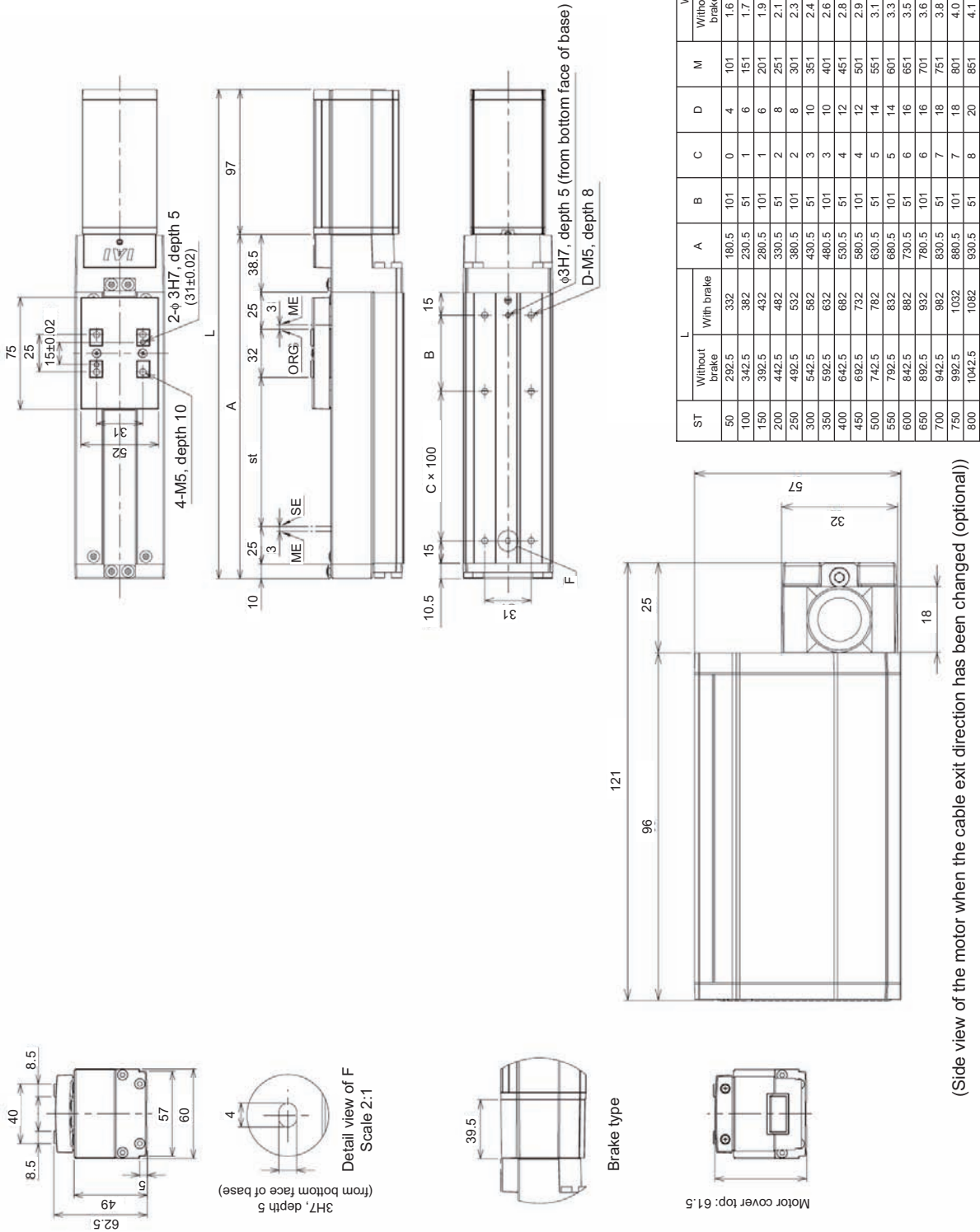


## 7.8 RCA2-SA6C

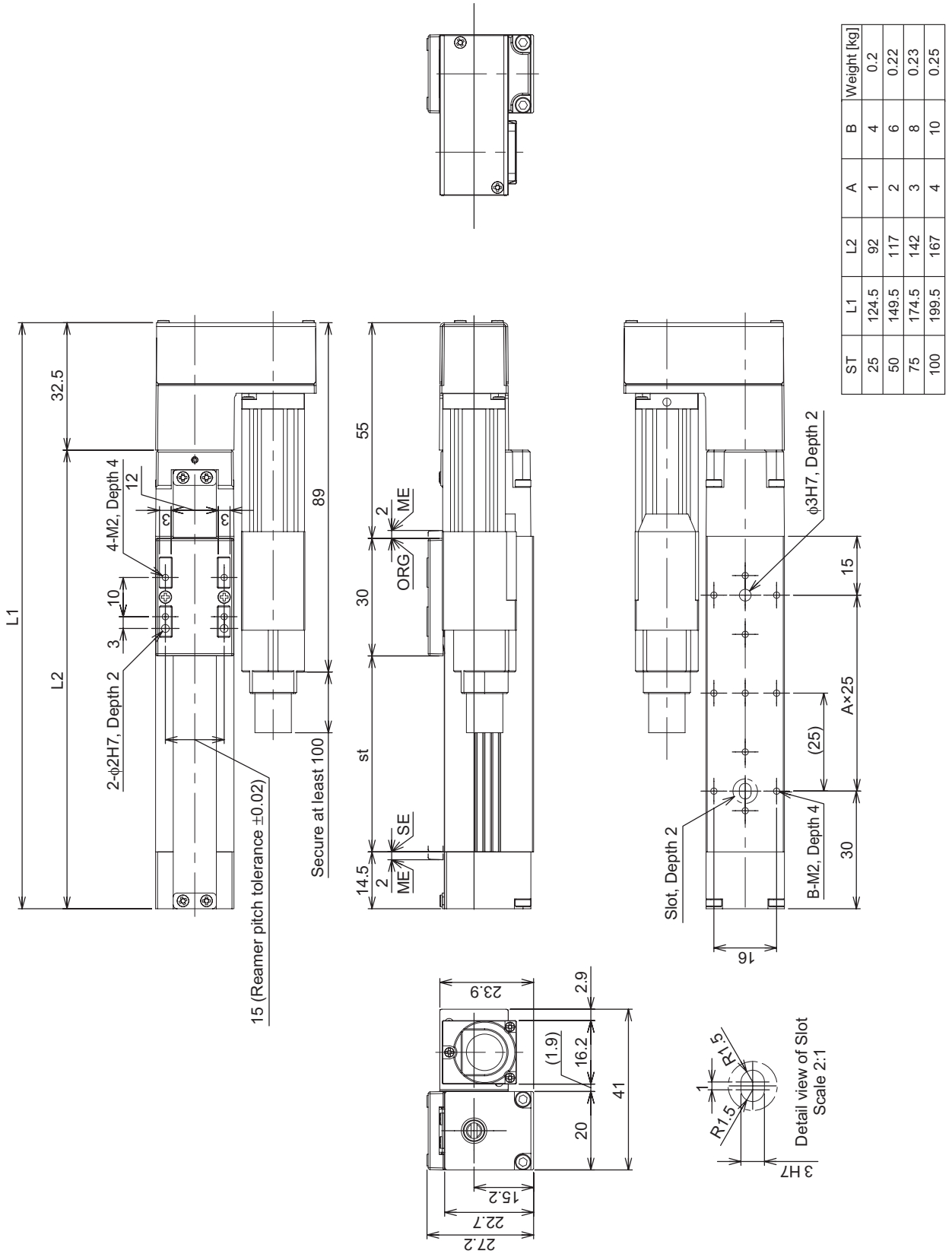


## 7.9 RCA2-SA6C with Side Cover

### 7. External Dimensions

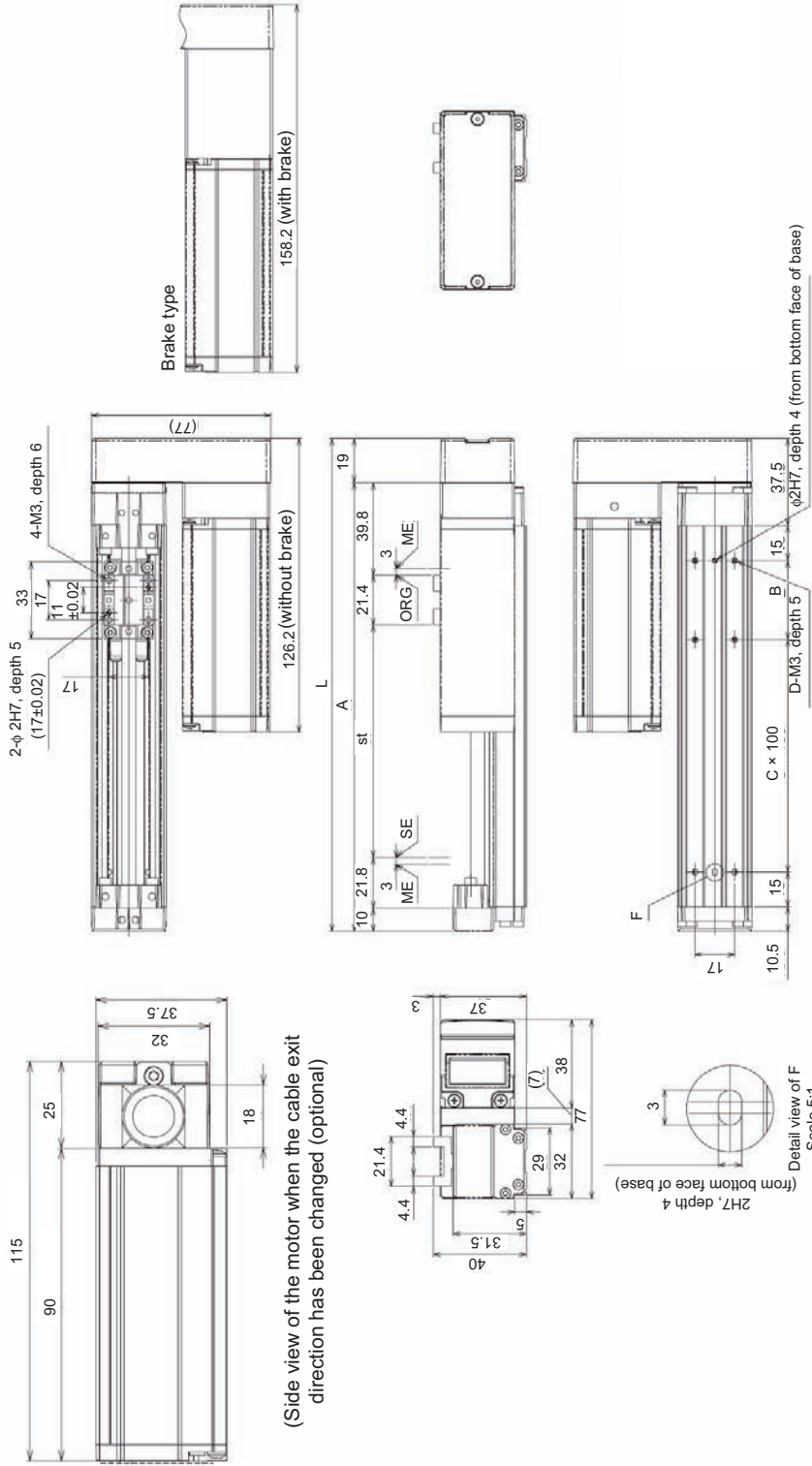


## 7.10 RCA2-SA2AR



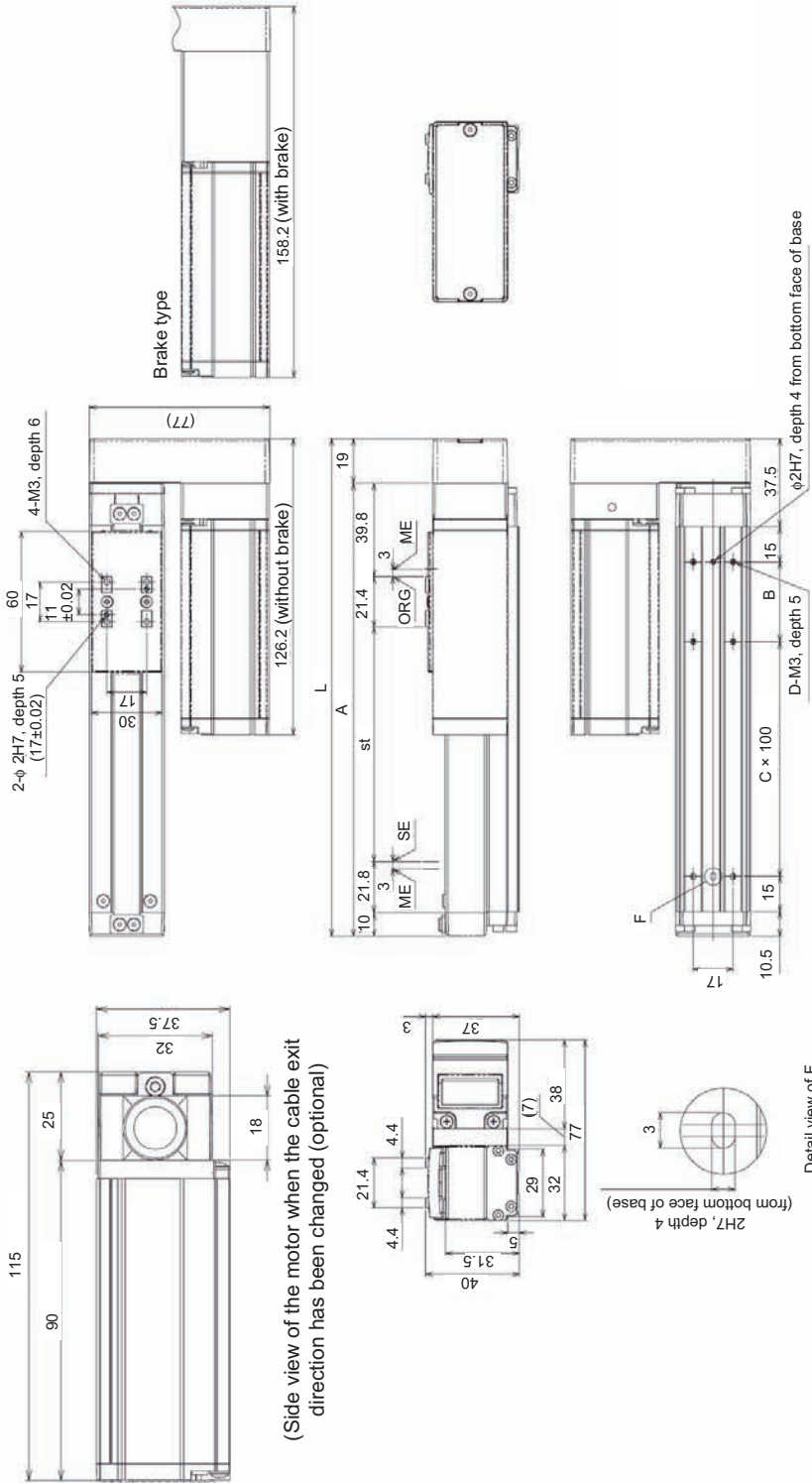
## 7.11 RCA2-SA3R Reversing to Left (Right)

### 7. External Dimensions



ST	L	A	B	C	D	Weight [kg]	
						Without brake	With brake
50	162	143	84	0	4	0.6	0.8
100	212	193	34	1	6	0.7	0.9
150	262	243	84	1	6	0.7	0.9
200	312	293	34	2	8	0.8	1.0
250	362	343	84	2	8	0.8	1.0
300	412	393	34	3	10	0.9	1.1

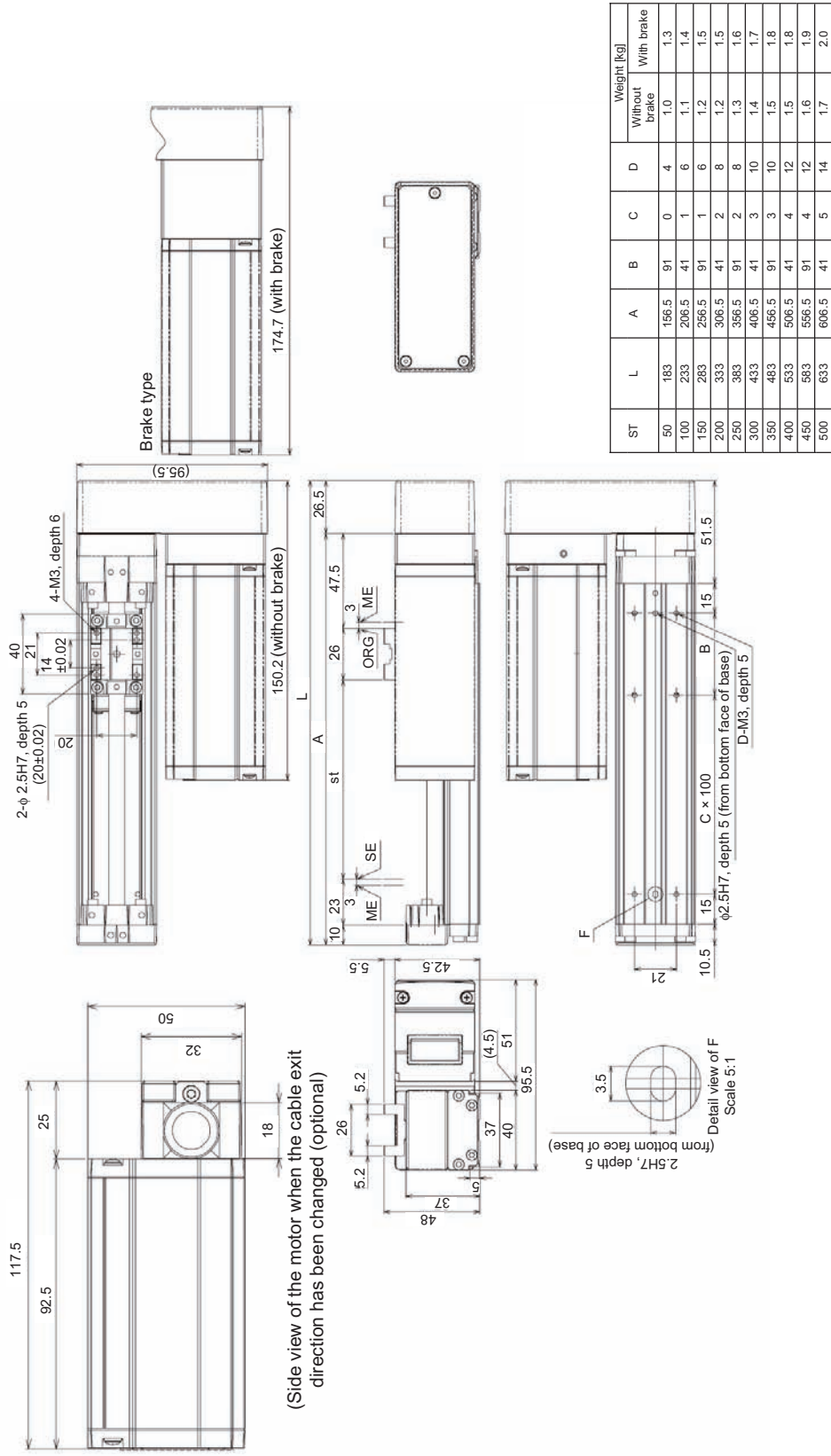
## 7.12 RCA2-SA3R with Side Cover, Reversing to Left (Right)



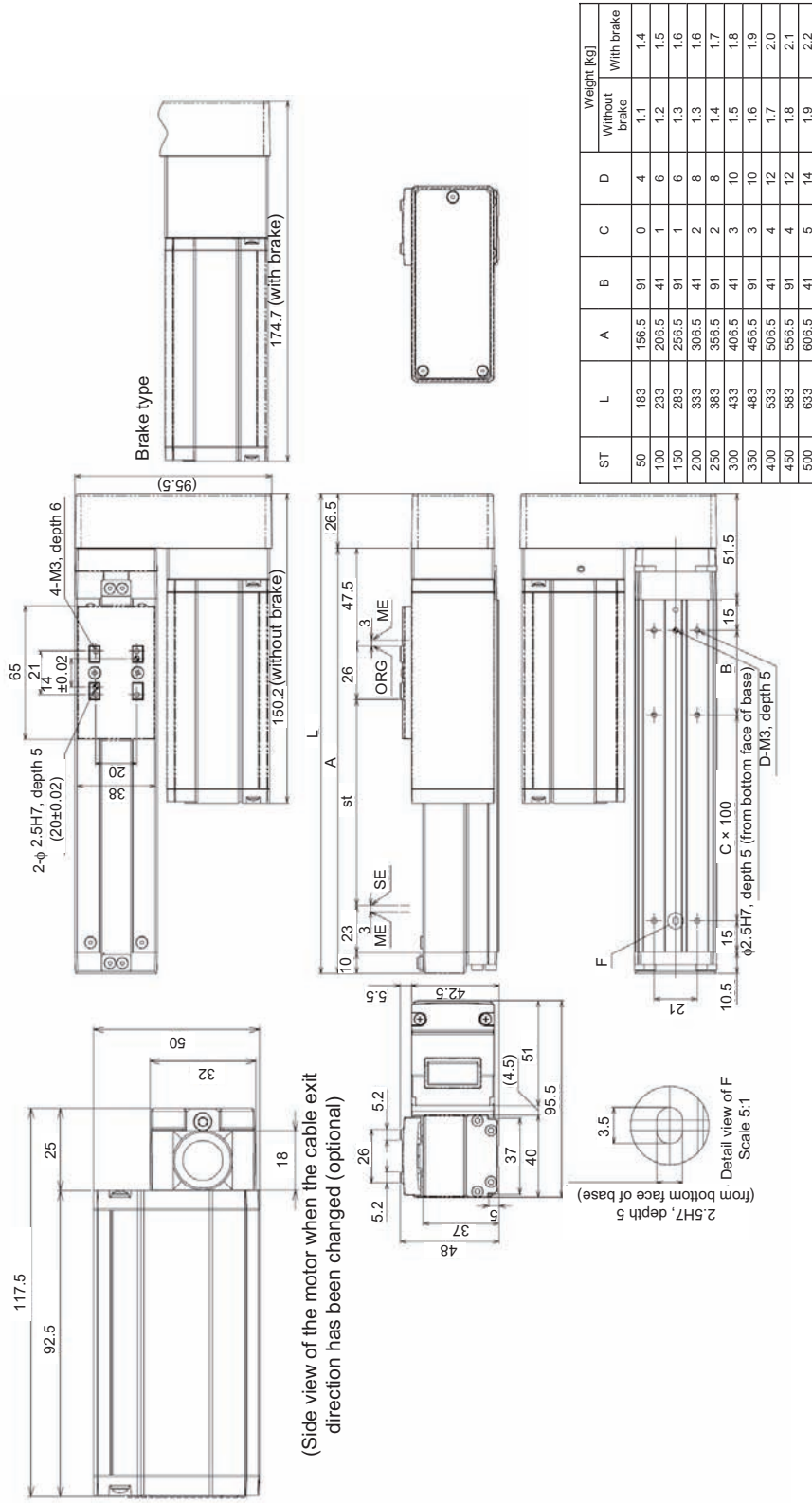
(Side view of the motor when the cable exit direction has been changed (optional))

ST	L	A	B	C	D	Weight [kg]	
						Without brake	With brake
50	162	143	84	0	4	0.7	0.9
100	212	193	34	1	6	0.7	0.9
150	262	243	84	1	6	0.8	1.0
200	312	293	34	2	8	0.9	1.1
250	362	343	84	2	8	0.9	1.1
300	412	393	34	3	10	1.0	1.2

## 7.13 RCA2-SA4R Reversing to Left (Right)

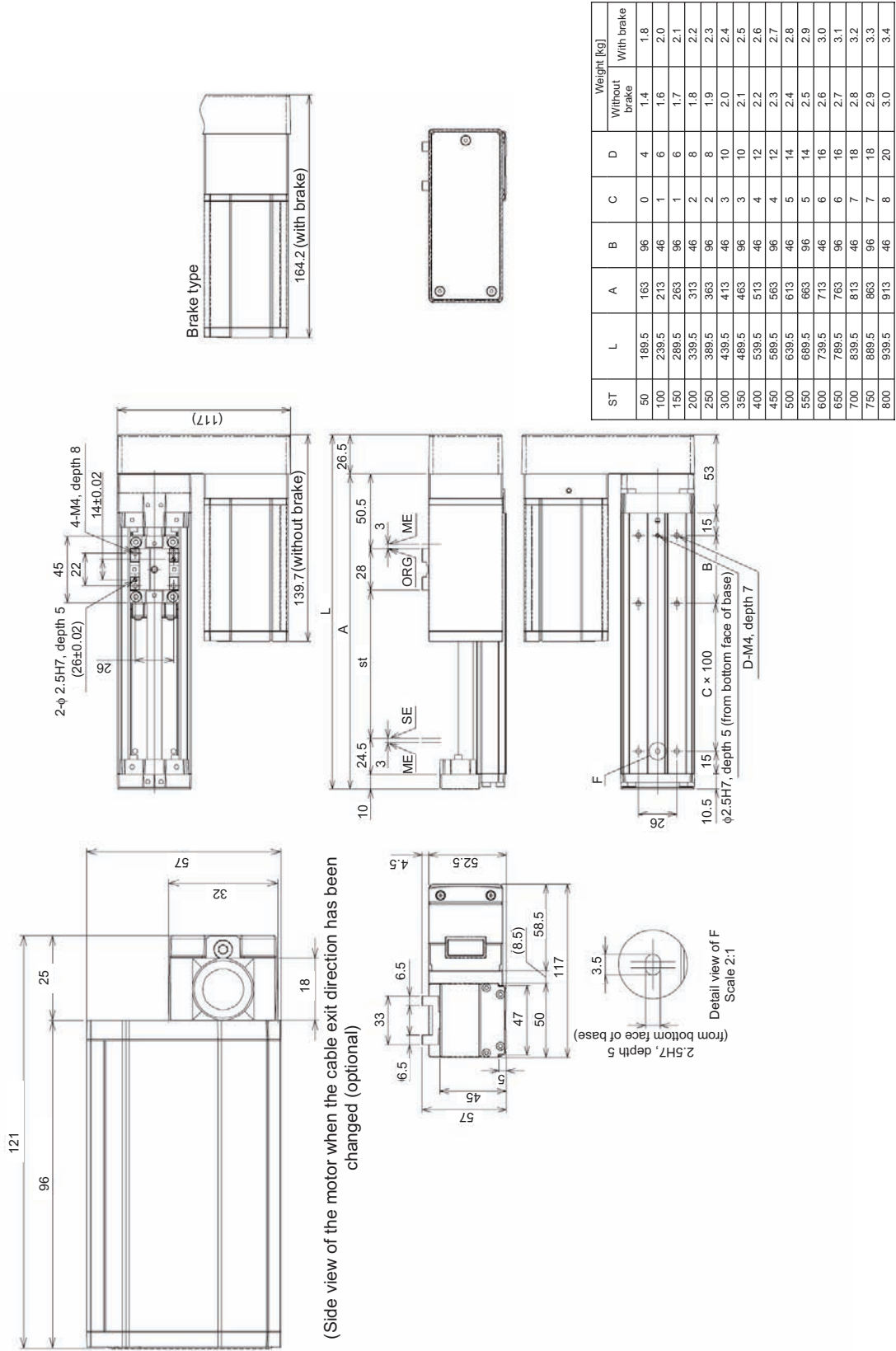


## 7.14 RCA2-SA4R with Side Cover, Reversing to Left (Right)



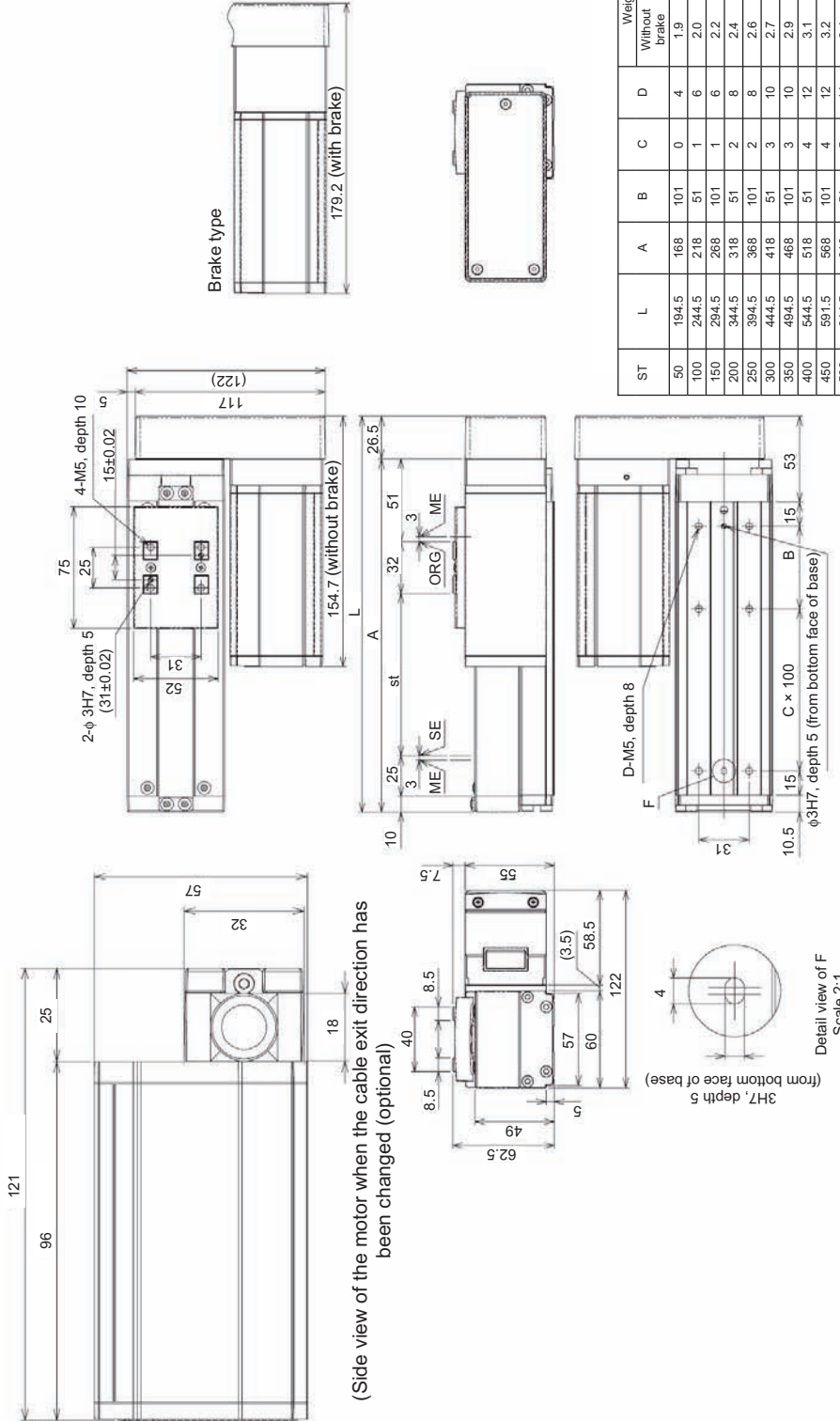


## 7.15 RCA2-SA5R Reversing to Left (Right)



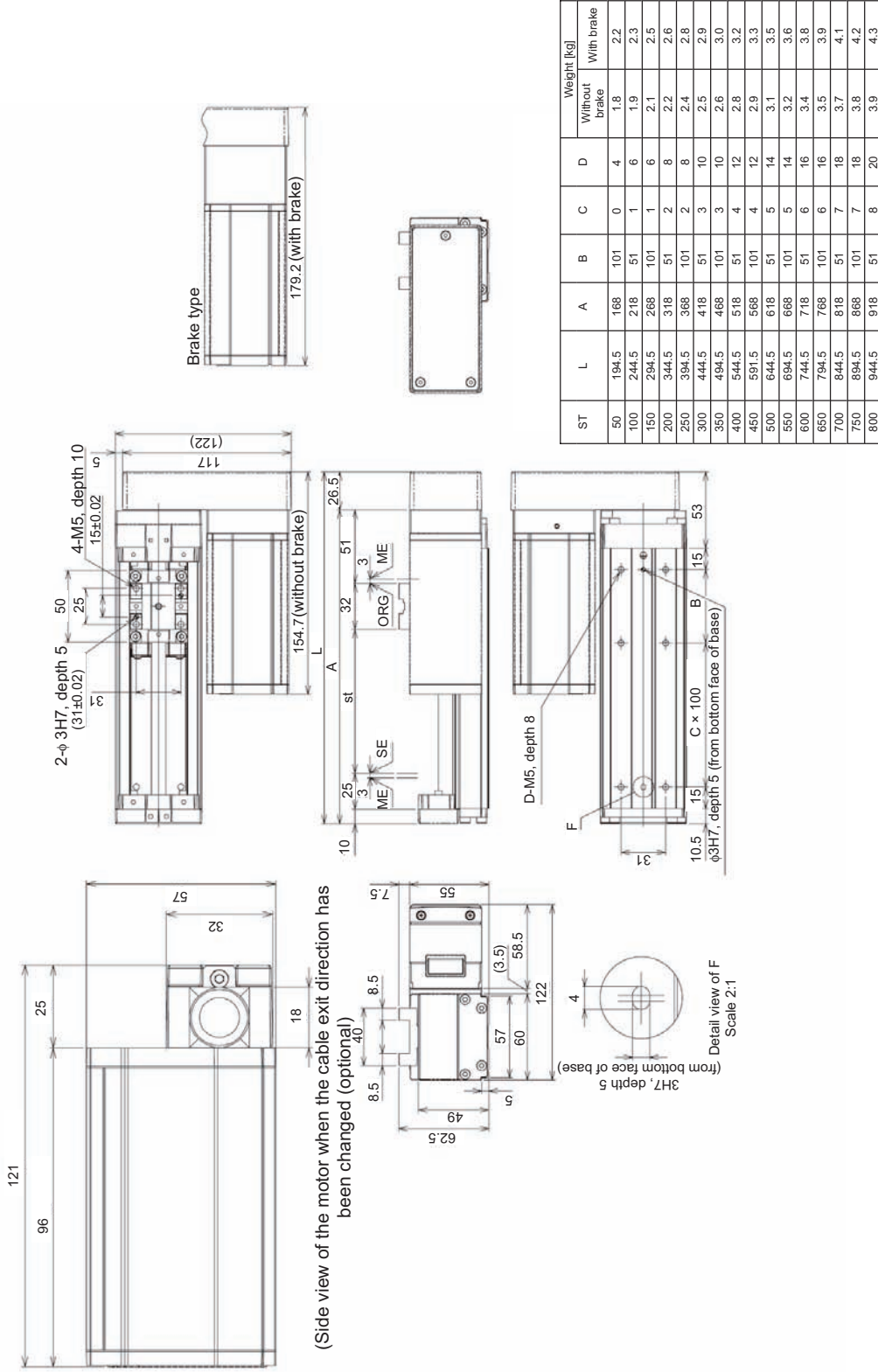


## 7.16 RCA2-SA5R with Side Cover, Reversing to Left (Right)

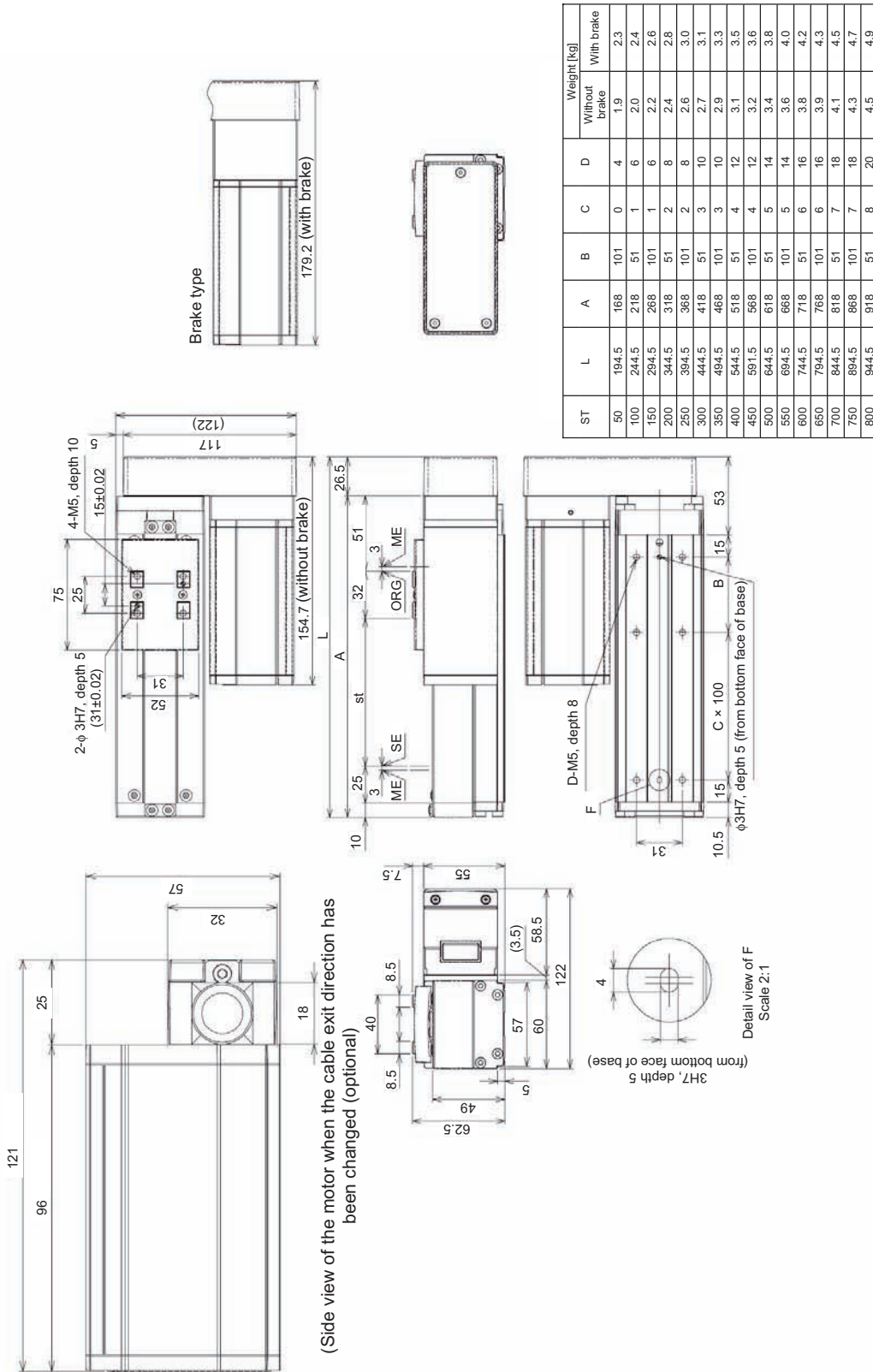


ST	L	A	B	C	D	Weight [kg]	
						Without brake	With brake
50	194.5	168	101	0	4	1.9	2.3
100	244.5	218	51	1	6	2.0	2.4
150	294.5	268	101	1	6	2.2	2.6
200	344.5	318	51	2	8	2.4	2.8
250	394.5	368	101	2	8	2.6	3.0
300	444.5	418	51	3	10	2.7	3.1
350	494.5	468	101	3	10	2.9	3.3
400	544.5	518	51	4	12	3.1	3.5
450	594.5	568	101	4	12	3.2	3.6
500	644.5	618	51	5	14	3.4	3.8
550	694.5	668	101	5	14	3.6	4.0
600	744.5	718	51	6	16	3.8	4.2
650	794.5	768	101	6	16	3.9	4.3
700	844.5	818	51	7	18	4.1	4.5
750	894.5	868	101	7	18	4.3	4.7
800	944.5	918	51	8	20	4.5	4.9

## 7.17 RCA2-SA6R Reversing to Left (Right)



## 7.18 RCA2-SA6R with Side Cover, Reversing to Left (Right)



## 8. Warranty

### 8.1 Warranty Period

One of the following periods, whichever is shorter:

- 18 months after shipment from IAI
- 12 months after delivery to the specified location
- 2,500 hours of operation

### 8.2 Scope of the Warranty

Our products are covered by warranty when all of the following conditions are met. Faulty products covered by warranty will be replaced or repaired free of charge:

- (1) The breakdown or problem in question pertains to our product as delivered by us or our authorized dealer.
- (2) The breakdown or problem in question occurred during the warranty period.
- (3) The breakdown or problem in question occurred while the product was in use for an appropriate purpose under the conditions and environment of use specified in the instruction manual and catalog.
- (4) The breakdown of problem in question was caused by a specification defect or problem, or by a quality issue with our product.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:

- [1] Anything other than our product
- [2] Modification or repair performed by a party other than us (unless we have approved such modification or repair)
- [3] Anything that could not be easily predicted with the level of science and technology available at the time of shipment from our company
- [4] A natural disaster, man-made disaster, incident or accident for which we are not liable
- [5] Natural fading of paint or other symptoms of aging
- [6] Wear, depletion or other expected result of use
- [7] Operation noise, vibration or other subjective sensation not affecting function or maintenance

Note that the warranty only covers our product as delivered and that any secondary loss arising from a breakdown of our product is excluded from the scope of warranty.

### 8.3 Honoring the Warranty

As a rule, the product must be brought to us for repair under warranty.

### 8.4 Limited Liability

- (1) We shall assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
- (2) We shall not be liable for any program or control method created by the customer to operate our product or for the result of such program or control method.

## 8.5 Conditions of Conformance with Applicable Standards/Regulations, Etc., and Applications

- (1) If our product is combined with another product or any system, device, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc. In such a case we will not be liable for the conformance of our product with the applicable standards, etc.
- (2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications. Contact us if you must use our product for any of these applications:
  - [1] Medical equipment pertaining to maintenance or management of human life or health
  - [2] A mechanism or mechanical equipment intended to move or transport people (such as a vehicle, railway facility or aviation facility)
  - [3] Important safety parts of mechanical equipment (such as safety devices)
  - [4] Equipment used to handle cultural assets, art or other irreplaceable items
- (3) Contact us at the earliest opportunity if our product is to be used in any condition or environment that differs from what is specified in the catalog or instruction manual.

## 8.6 Other Items Excluded from Warranty

The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:

- [1] Guidance for installation/adjustment and witnessing of test operation
- [2] Maintenance and inspection
- [3] Technical guidance and education on operating/wiring methods, etc.
- [4] Technical guidance and education on programming and other items related to programs

## Change History

Revision Date	Description of Revision	
	First edition	
March 2007	Second edition	Corrected clerical errors.
March 2010	Third edition	P. 25, 26: Added "High-acceleration/deceleration specification."
September 2010	Forth edition	P. 9: Added an "item to note regarding the position when the servo is turned on" under "Handling Precautions."
November 2010	Fifth edition	<p>P. 30~31: Longest cable length: 10m → 20m</p> <p>P. 34: Added "Operation Manual for MEC Controller" and "Operation Manual for MEC PC Software" under "Operation Manuals Relating to This Product."</p> <p>P. 35~39: Added "SA5C, SA6C – Lead 20 mm" under 5.4, "How to Read the Model Number" and 6, Specifications."</p> <p>P. 41: Added lines for SA5C/SA6C of lead 20 mm to the graphs under 7, "Notes on Use Regarding Maximum Speed and Loading Mass."</p> <p>P. 43: Changed the text of "Caution."</p> <p>P. 56: Added 11.2, "Fine-tuning the Home Position" and "AMEC Controller."</p> <p>P. 58: Added 12, "Life."</p> <p>P. 60: Added 13.4, "Adjusting the Stainless Sheet."</p>
April 2011	Sixth edition	A page for CE Marking added
June 2011	Seventh edition	P.43: Contents of caution for vertically oriented mount changed.
July 2011	Eighth edition	<p>P.46: Change in ceiling installation availability (×: Not possible → : ΔDaily inspection is required)</p> <p>P.76~77: Contents changed. in 14. Warranty</p>
July 2011	Ninth edition	Added SA2AC and SA2AR
March 2012	Tenth edition	<p>Contents changed in Safety Guide</p> <p>Caution notes added for when working with two or more persons</p> <p>P.46: Note added to tell platform should have a structure with enough stiffness</p> <p>P.47: Note changed to 1.8 times more of the nominal diameter for the length of thread engagement on aluminum</p>

Revision Date	Description of Revision	
March 2012	Eleventh edition	P.1~7: Contents added and changed in Safety Guide P.8: Note "Make sure to attach the actuator properly by following this operation manual." added in Caution in Handling  P.13~30: Weight added to external dimensions P.64~66: Warning notes added such as in case the grease got into your eye, immediately go to see the doctor for an appropriate care.
May 2013	Twelfth edition	Revised overall
April 2014	Thirteenth edition	SA2AC and SA2AR of procedures for replacement of Motor added
November 2014	Fourteenth edition	P.14, 32, 33: Contents revised for RCA2-SA2A and SA2AR to apply to AMEC and ACON-CA
March 2015	14B Edition!	Correction made P.16: Rated acceleration changed from 0.3G to 0.2G for horizontal orientation of SA4 Lead 2.5 P.21: Pin number of controller side signal name W changed from 3 to 5
April 2015	Fifteenth edition	P.18: ! Dynamic allowable moment value changed P.21~22: Dedicated controller added P.40: Change made to inspection schedule P.68: Change made about life
June 2016	15B Edition	P.43: Grease change due to production stop Albania Grease No.2 → Albania Grease S2 Mobilux 2 → Unirex N2









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