



RCP2 ROBO Cylinder Actuator Slider Type Operating Manual

Motor Straight Type: SA5, SA6, SA7, SS, SM and HSM

Motor Reversing Type: SA5R, SA6R, SA7R, SSR SMR and HSMR

===== Fifth Edition =====



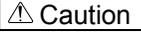
IAI America, Inc.

Safety Precautions (Please read before using the product.)

Before installing, operating, maintaining or inspecting this product, please peruse this operating manual as well as the operating manuals and other related documentations for all equipment and peripheral devices connected to this product in order to ensure the correct use of this product and connected equipment/devices. Those performing installation, operation, maintenance and inspection of the product must have sufficient knowledge of the relevant equipment and their safety. The precautions provided below are designed to help you use the product safely and avoid bodily injury and/or property damage.

In this operating manual, safety precautions are classified as “Danger,” “Warning,” “Caution” and “Note,” according to the degree of risk.

 Danger	Failure to observe the instruction will result in an imminent danger leading to death or serious injury.
 Warning	Failure to observe the instruction may result in death or serious injury.
 Caution	Failure to observe the instruction may result in injury or property damage.
 Note	The user should take heed of this information to ensure the proper use of the product, although failure to do so will not result in injury.

It should be noted that the instructions under the  **Caution** and  **Note** headings may also lead to serious consequences, if unheeded, depending on the situation.

All instructions contained herein provide vital information for ensuring safety. Please read the contents carefully and handle the product with due caution.

Please keep this operating manual in a convenient place for quick reference whenever needed, and also make sure that the manual will get to the end-user.



[General]

- Do not use this product for the following applications:
 1. Medical equipment used to maintain, control or otherwise affect human life or physical health
 2. Mechanisms and machinery designed for the purpose of moving or transporting people
 3. Important safety parts of machineryThis product has not been planned or designed for applications requiring high levels of safety. Use of this product in such applications may jeopardize the safety of human life. The warranty covers only the product as it is delivered.

[Installation]

- Do not use this product in a place exposed to ignitable, inflammable or explosive substances. The product may ignite, burn or explode.
- When installing the product, be sure to securely support and affix it (including the work). Failure to do so may cause the product to tip over, drop or malfunction, resulting in injury.

- Avoid using the product in a place where the main unit or controller may come in contact with water or oil droplets.
- Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Doing so may result in fire.

[Operation]

- Do not enter the machine's range of operation while the product is operating or standing by. The actuator may move suddenly, causing injury.
- If you are using a pace maker or other mechanical implant, do not come within one meter of the product. The strong magnetic field generated by the product may cause the pace maker, etc., to malfunction.
- Do not pour water onto the product. Spraying water over the product, washing it with water or using it in water may cause the product to malfunction, resulting in injury, electric shock, fire, etc.

[Maintenance, Inspection, Repair]

- Never modify the product. Unauthorized modification may cause the product to malfunction, resulting in injury, electric shock, fire, etc.
- Do not disassemble and reassemble the components relating to the basic structure of the product or its performance and function. Doing so may result in injury, electric shock, fire, etc.



Warning

[General]

- Do not use the product outside the specifications. Using the product outside the specifications may cause it to fail, stop functioning or sustain damage. It may also significantly reduce the service life of the product. In particular, observe the maximum loading capacity and speed.

[Installation]

- If the machine will stop in the case of system problem such as emergency stop or power failure, design a safety circuit or other device that will prevent equipment damage or injury.
- Be sure to provide Class D grounding for the controller and actuator (formerly Class 3 grounding: Grounding resistance at 100 Ω or less). Leakage current may cause electric shock or malfunction.
- Before supplying power to and operating the product, always check the operation area of the equipment to ensure safety. Supplying power to the product carelessly may cause electric shock or injury due to contact with the moving parts.
- Wire the product correctly by referring to the operation manual. Securely connect the cables and connectors so that they will not be disconnected or come loose. Failure to do so may cause the product to malfunction or cause fire.

[Operation]

- Before operating the moving parts of the product by hand (for the purpose of manual positioning, etc.), confirm that the servo is turned off (using the teaching pendant). Failure to observe this instruction may result in injury.
- The cables supplied with the product offer excellent flexibility, but they are not robot cables. If the cables are to be stored in a movable cable duct (cable bearer, etc.), use robot cables.
- Do not scratch the cables. Scratching, forcibly bending, pulling, winding, crushing with heavy object or pinching a cable may cause it to leak current or lose continuity, resulting in fire, electric shock, malfunction, etc.
- Turn off the power to the product in the event of power failure. Failure to do so may cause the product to suddenly start moving when the power is restored, thus resulting in injury or product damage.
- If the product is generating heat, smoke or a strange smell, turn off the power immediately. Continuing to use the product may result in product damage or fire.
- If noise or abnormally high vibration is detected, stop the operation immediately. Continuing to use the product may result in product damage, malfunction due to damage, runaway machine, etc.

[Operation]

- Turn on the power to individual equipment one by one, starting from the equipment at the highest level in the system hierarchy. Failure to do so may cause the product to start suddenly, resulting in injury or product damage.
- Do not insert a finger or object in the openings in the product. It may cause fire, electric shock or injury.
- Do not bring a floppy disk or other magnetic media within one meter of the product. The magnetic field generated by the magnet may destroy the data in the floppy disk, etc.
- Do not step on the product, use it as a footstool or place any object on it. It may cause scoring, dents or deformation of the driving part, resulting in product damage, unintended stopping due to damage, or performance drop.

[Maintenance, Inspection, Repair]

- Wear protective goggles when applying grease to the actuator. Failure to do so may result in eye inflammation due to spattered grease.



Note

[General]

- If you are planning to use the product under a condition or environment not specified in the catalogs or operation manual, or in an application requiring strict safety such as aircraft facility, combustion system, clean room, entertainment machine, safety device or other equipment having significant impact on human life or property, design operating ranges with ample margins from the ratings and design specifications or provide sufficient safety measures such as fail-safes. Whatever you do, always consult IAI's sales representatives.

[Installation]

- If the product is used in a vertical setup, be sure to use the vertical specification (with brake).
- Protection covers or other guards must be provided for the moving parts of the equipment to avoid direct contact with the operators.
- Do not configure a control circuit that will cause the work to drop in case of power failure. Configure a control circuit that will prevent the table or work from dropping when the power to the machine is cut off or an emergency stop is actuated.
- The following conditions must be met in order to improve the straightness of the table movement and ensure the smooth movement of the ball screw and linear guides:
 1. Flatness of the mounting surface must be within 0.05 mm.
 2. The mounting surface area must be large enough to ensure the rigidity of the actuator.

[Installation, Operation, Maintenance]

- When handling the product, wear protective gloves, protective goggles, safety shoes or other necessary gear to ensure safety.

[Maintenance, Inspection, Repair]

- When performing maintenance, apply the specified grease to the guides and ball screw. Pay special attention not to let fluoride grease mix with lithium grease. The machine may be damaged due to poor lubrication, increased resistance, etc.

[Disposal]

- When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste.

Others

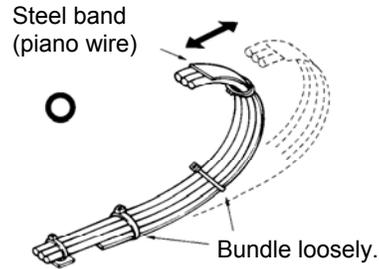
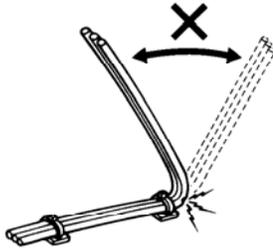
- IAI shall not be liable whatsoever for any loss or damage arising from a failure to observe the items specified in "Safety Precautions."
- If you have any questions regarding the product, please contact your nearest IAI sales office. The addresses and phone numbers of our sales offices are provided at the end of this operation manual.

Prohibited Handling of Cables

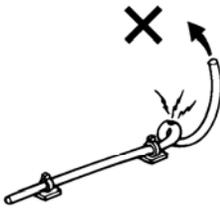
When designing an application system using IAI's actuators and controllers, incorrect wiring or connection of each cable may cause unexpected problems such as a disconnected cable or poor contact, or even a runaway system. This section explains prohibited handling of cables. Read the information carefully to connect the cables properly.

Ten Rules for Handling Cables (Must be Observed!)

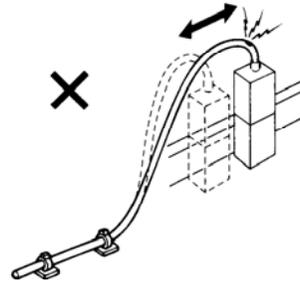
1. Do not let the cable flex at a single point.



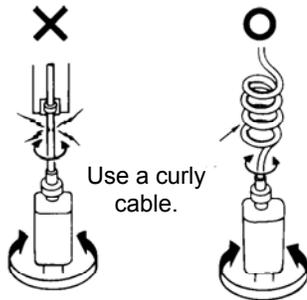
2. Do not let the cable bend, kink or twist.



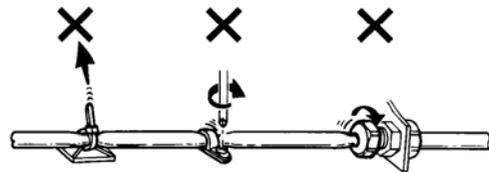
3. Do not pull the cable with a strong force.



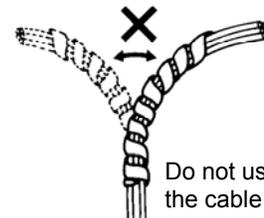
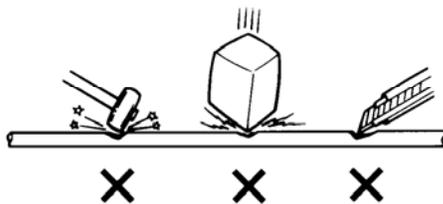
4. Do not let the cable receive a turning force at a single point.



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

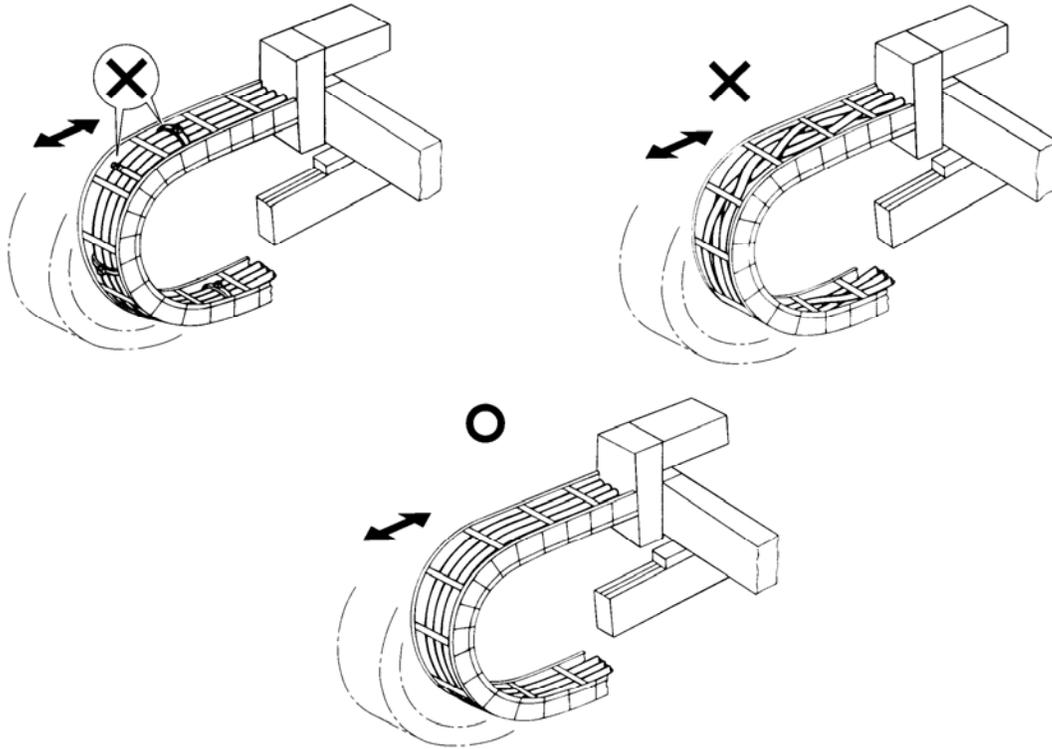


6. Do not pinch, drop a heavy object onto or cut the cable.

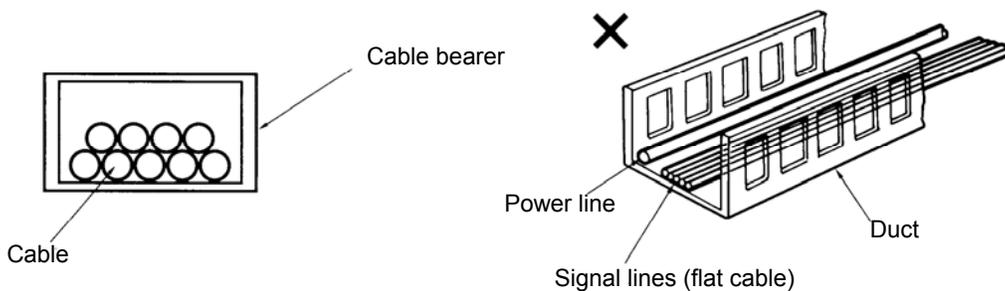


Do not use a spiral tube where the cable flexes frequently.

7. Do not let the cable get tangled or kinked in a cable bearer or flexible tube. When bundling the cable, keep a certain degree of flexibility (so that the cable will not become too taut when bent).

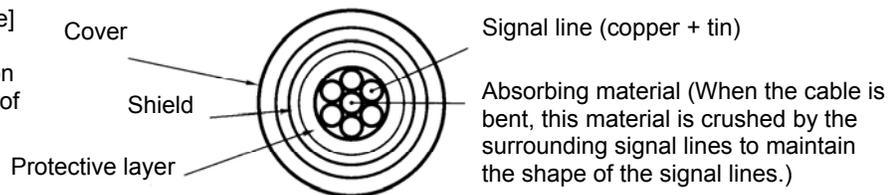


8. Do not cause the cables to occupy more than 60% of the space in the cable bearer. 9. Do not lay signal lines together with circuit lines that create a strong electric field.



10. Always use a robot cable if the cable is likely to flex significantly.

[Standard structure of cable]
The standard structure of cable will vary depending on the manufacturer and type of cable.



★ Need for Robot Cables

A cable connected to a moving part of an actuator system will inevitably receive repeated bending loads at the base of the cable. As a result, the cores in the cable may break over time. To minimize the risk of cable breakage, we strongly recommend that a robot cable offering significantly higher flexibility be used in this type of application.

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.

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1. Foreword

Thank you for purchasing the Robo Cylinder Actuator. This manual explains the structure, correct operation and maintenance of the Robo Cylinder Actuator. Please read this manual carefully before using the actuator. For more complete information on operating the actuator, please refer to the controller-operating manual.

2. Safety Precautions

2.1 Basic Operating Instructions

- Please do not attempt to use or operate the actuator in any manner not indicated in this manual or the controller manual.
- Please be sure to use only the cable provided by IAI to connect the actuator and controller.
- Please do not allow people within the moving range of the unit when it is in operation or when the power is ON since this is dangerous.

2.2 Maintenance and Inspection

- When doing maintenance and inspection work, always shut down the controller power first.
- When doing inspection, make sure that no one can inadvertently turn the power ON.
- Make sure that a sign indicating work in progress is clearly visible.
- If several persons are working, be sure to watch out for each other's safety. In particular, check before turning power ON or OFF and let others know if you are doing work involving axis movement.

(Note)

- The content of this manual is subject to change without notice for the purpose of improvement.
- This manual was created with utmost attention to accuracy. Should you find any error, however, or if you have any question, please contact IAI's Sales Engineering or Technical Service Section.

3. Warranty

3.1 Warranty Period

Warranty period shall be either of the following periods whichever ends first:

- 18 months after shipment from our factory
- 12 months after delivery to a specified location
- 2500 hours of operation time

3.2 Scope of Warranty

If a breakdown occurs within the period specified above and is due to the manufacturer's error, we will repair the unit at no cost. However, the following items are not covered by this warranty.

- ♦ Faded paint or other changes that occur naturally over time.
- ♦ Consumable components that wear out with use (stainless sheet, etc.).
- ♦ Unit seems to be noisy or similar impressions that do not affect machinery performance.
- ♦ Damage resulting from improper handling by the user or lack of proper maintenance.
- ♦ Any alterations made by other than IAI or its representatives.
- ♦ Breakdowns caused by using controllers made by other manufacturers.
- ♦ Any damages caused by fire and other natural disasters or accidents.

The warranty pertains to the purchased product itself and does not cover any damages that might arise from a breakdown of the supplied product.

Any repairs will be done at our factory. Even if the product is still covered under the warranty period, we will assess a separate charge for sending technicians to the customer's site.

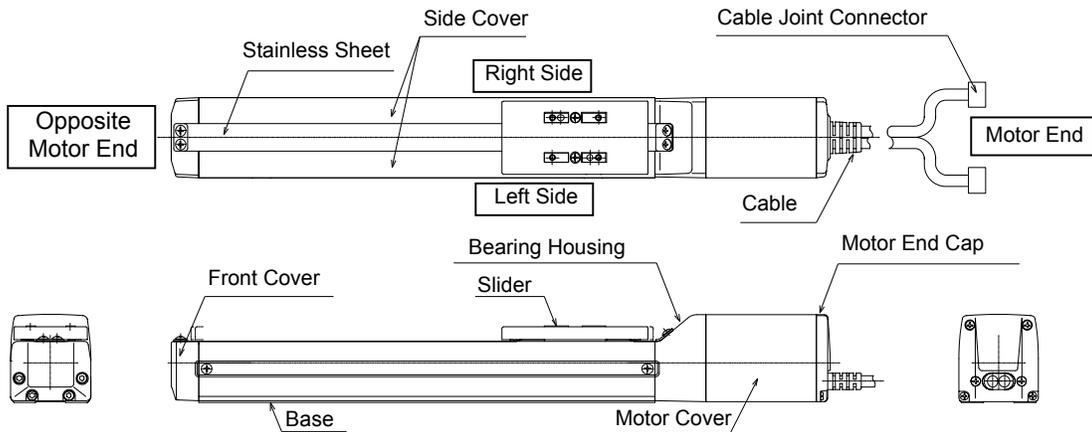
4. Names of the Parts

The names of the actuator parts are indicated below.

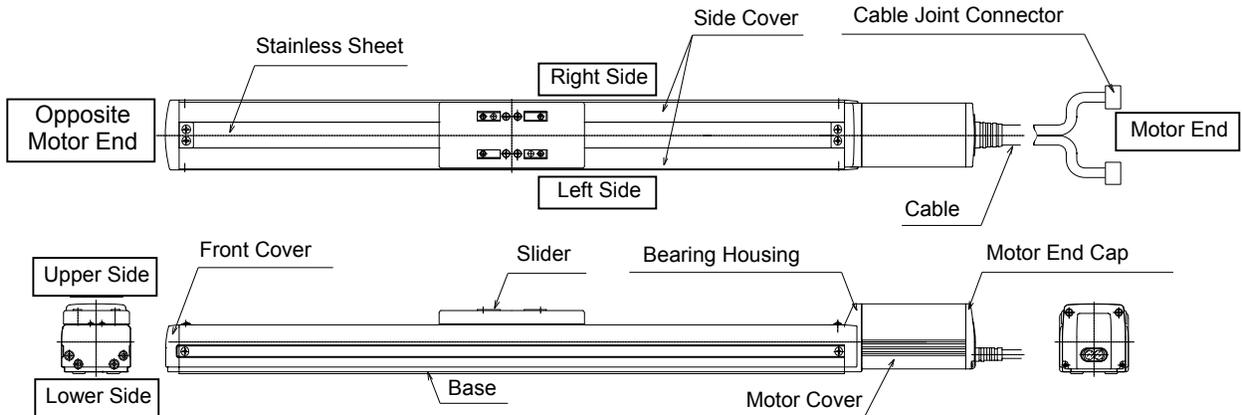
The left and right sides are indicated by looking at the actuator from the motor end with the actuator set down horizontally. Front end means the side opposite the motor end.

4.1 Motor Straight Type

- SA5/SA6/SA7 Type



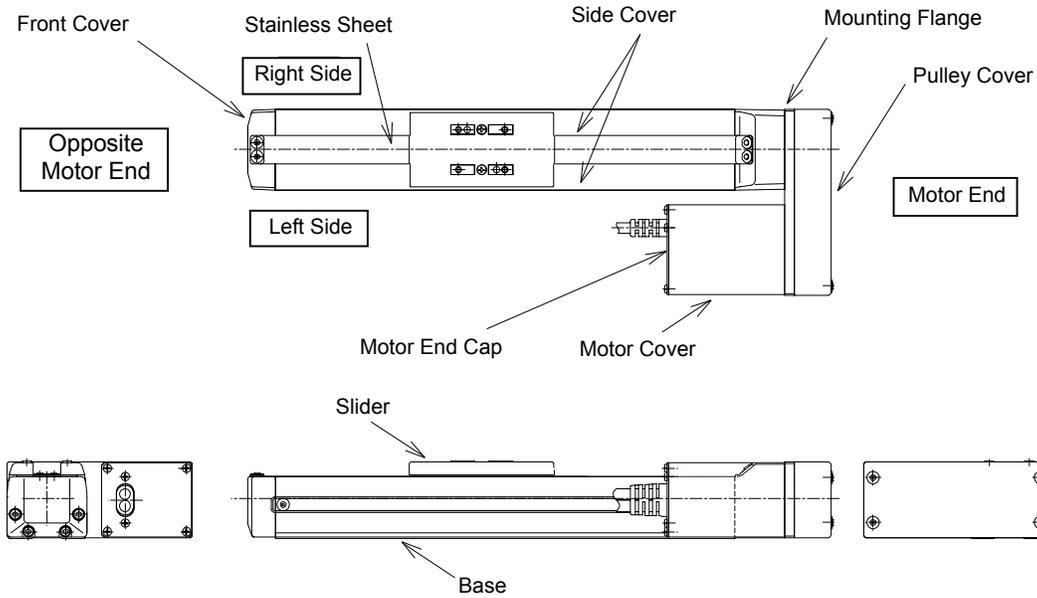
- SS/SM/HSM Type



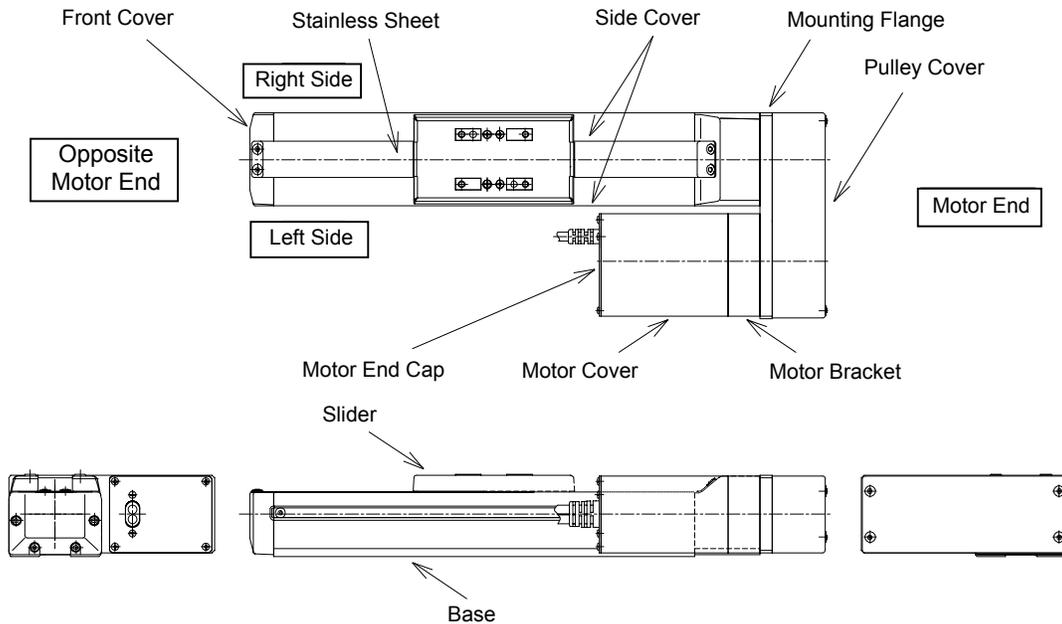
Caution: The cable directly connected to the actuator is not robot cable even when ordered with robot cable option. When designing, please be sure not to give repeated bending loads to this cable. The robot cable is applicable only to the connecting cables.

4.2 Motor Reversing Type

- SA5R/SA6R Type

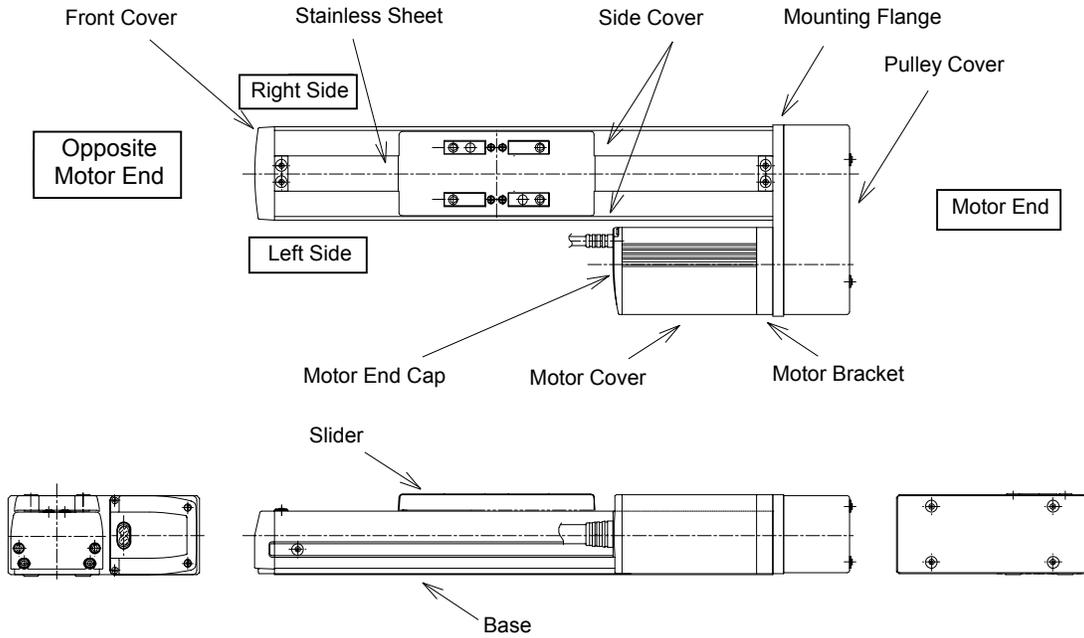


- SA7R Type



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.

- SSR/SMR/HSMR Type



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.

5. Transporting and Handling

5.1 Handling the Actuator

5.1.1 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.

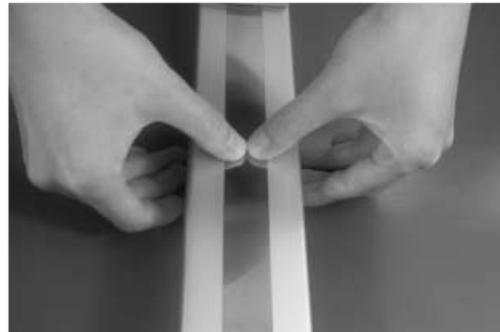
- The operator should not carry heavy shipping boxes by themselves.
- If the shipping box is left standing, it should be in a horizontal position.
- Do not climb on top of the shipping box.
- Do not place heavy objects on top of the shipping box.

5.1.2 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 Section 4 above for the names of the actuator parts.

5.2 Handling the Actuator Assembly

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

5.2.1 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.

5.2.2 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.

6. Operating and Storage Environment

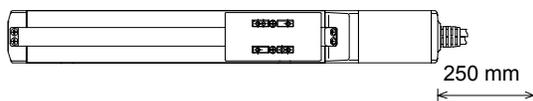
6.1 Operating Environment

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

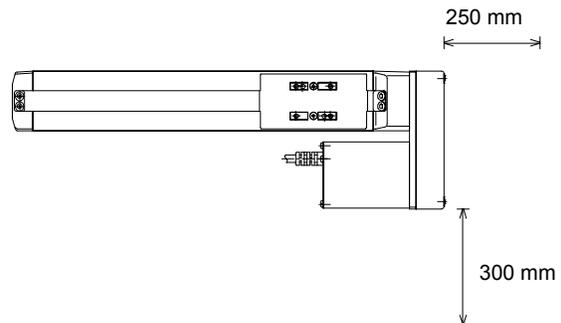
- Avoid direct sunlight.
- Avoid radiant heat from strong heat sources such as a furnace.
- Ambient temperature should be 0 ~ 40°C.
- The humidity should be less than 85% and there should be no condensation.
- Avoid exposure to corrosive or combustible gases.
- The area should have very little dust and be suitable for normal assembly operations.
- Avoid exposure to oil mist or fluids used in cutting.
- The unit should not be subject to vibrations greater than 0.3 G.
- 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]



6.2 Storage Environment

The storage environment should be similar to the operating environment. In addition, you must take precautions against condensation if the unit is to be stored 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 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 interval but only up to 50°C if the storage period is longer than one month.

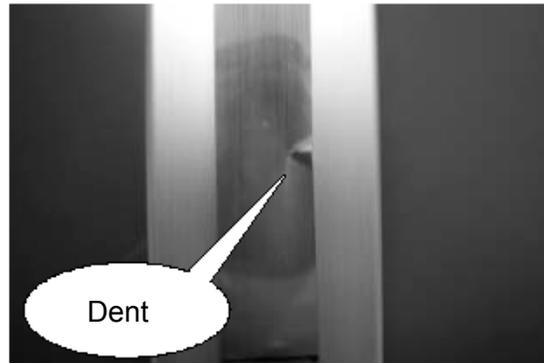
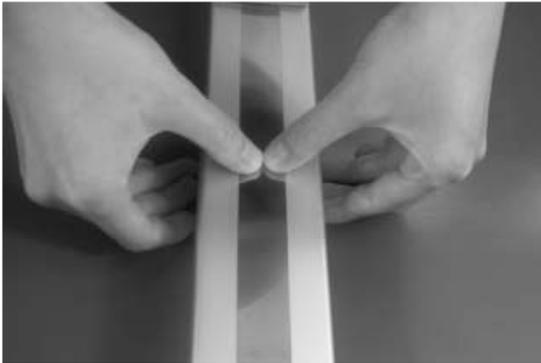
7. Installation

Notes 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 works 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.
With the SS/SM types, magnets for securing the stainless sheet are attached on the side covers.
Since these magnets also attract metal pieces, iron powder, etc., pay attention to the surrounding environment and ensure that there are no metal objects that will be attracted to the magnets.

7.1 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.

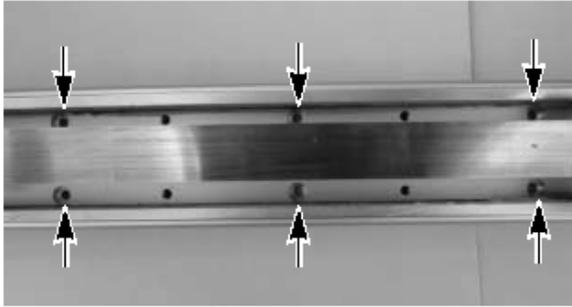
7.1.1 Using the Tapped Holes at Back of the Base (All Types)



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.

Model	Tap size	Depth of thread	Hole size
SA5	M4	4 mm ~ 7 mm	φ4 H10, depth 5 mm or less
SA6	M5	5 mm ~ 9 mm	φ4 H10, depth 5 mm or less
SA7	M5	5 mm ~ 9 mm	φ4 H10, depth 5 mm or less
SS	M5	5 mm ~ 8 mm	φ4 H10, depth 5 mm or less
SM	M8	8 mm ~ 10 mm	φ5 H10, depth 5 mm or less
HSM	M8	8 mm ~ 10 mm	φ5 H10, depth 5 mm or less

7.1.2 Installing from Above Using the Mounting Holes on Top of the Base (SA5/SA6/SA7)



The base has through holes for installation from above.
 Remove both side covers before installing the actuator.
 (Remove the two thin-head mounting screws (M3 x 6) using an Allen wrench of 1.5 mm across flats.)
 When securing the actuator with bolts, be careful not to drop the bolts or tools onto the stainless sheet or contact the sheet carelessly to cause damage or deformation.

Please use the socket bolt as shown below based on the frame material.

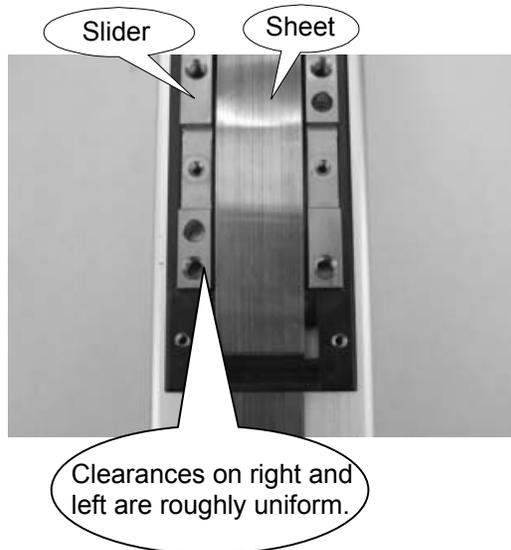
Model	Steel Frame	Aluminum Frame	Mounting hole (reference)
SA5	M4 X 10	M4 X 15	φ4.5 through; φ8 deep-counterbore, depth 4.5
SA6	M4 X 10	M4 X 15	φ4.5 through; φ8 deep-counterbore, depth 4.5
SA7	M5 X 10	M5 X 15	φ6 through; φ9.5 deep-counterbore, depth 5.5

(Note) When reinstalling 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, follow the steps below to install the side covers properly and check if the sheet is bent.

[1] Insert a shim (approx. 0.1 to 0.2 mm) between the sheet and each cover to provide an allowance so that the cover will not contact the end face of the sheet. Then, push in the cover gently.



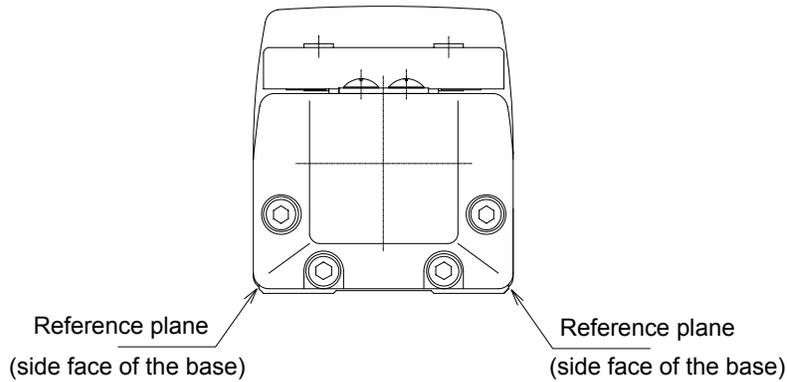
[2] Remove the slider covers and confirm that the clearances between the slider and sheet are roughly uniform on right and left and that the sheet is not meandering.



[3] Finally, move the slider back and forth along the entire stroke to confirm that the slider and sheet do not contact each other.

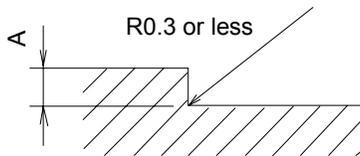
7.2 Mounting Surface

- 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.
- The slider traveling plane is the reference plane for the actuator base and the lower surface. When traveling precision is required, use this as the reference plane 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.



Model	Dimension A (mm)
SA5	2 ~ 3.5
SA6	2 ~ 3.5
SA7	2 ~ 5
SS	2 ~ 5
SM	2 ~ 5
HSM	2 ~ 5

7.3 Clamp Screws

- The male screws for mounting the base should be M4 for SA5, M5 for SS, SA6 and SA7 and M8 for SM (use hexagon sockets).
- 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.

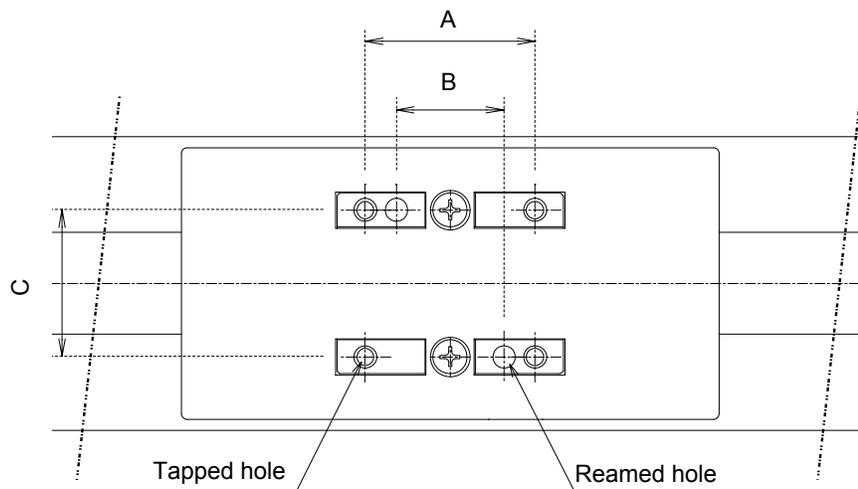
Screw nominal diameter	Screw Torque	
	When the bolt seating surface is steel	When the bolt seating surface is aluminum
M4	3.6 N·m (0.38 kgf·m)	1.8 N·m (0.23 kgf·m)
M5	7.3 N·m (0.77 kgf·m)	3.4 N·m (0.44 kgf·m)
M8	30.0 N·m (3.19 kgf·m)	11.5 N·m (1.43 kgf·m)

7.4 Installing the load to 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
SA5	M4	9 mm	30 mm	19 mm	26 mm	φ4 H10, depth 6 mm
SA6	M5	9 mm	50 mm	32 mm	31 mm	φ5 H10, depth 6 mm
SA7	M5	10 mm	50 mm	32 mm	39 mm	φ5 H10, depth 10 mm
SS	M5	10 mm	50 mm	32 mm	32 mm	φ5 H10, depth 10 mm
SM	M8	10 mm	75 mm	45 mm	45 mm	φ8 H10, depth 10 mm
HSM	M8	10 mm	75 mm	45 mm	45 mm	φ8 H10, depth 10 mm



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.

8. Wiring Cable

- In an application where the cable cannot be anchored, try to place the cable so that it sags only under its own weight or use self-standing type cable as large radial wire duct to limit the load on the cable.
- Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length.
- The cables supplied with the actuator offer excellent flexibility, but they are not robot cables. If the cables are to be stored in a movable cable duct (cable bearer, etc.), use robot cables.

For cable modification, please contact your IAI sales representative.

9. Load on the Actuator

Do not exceed the load shown in the load specification column. Please make note of the slider moment, allowable overhang length and the load weight.

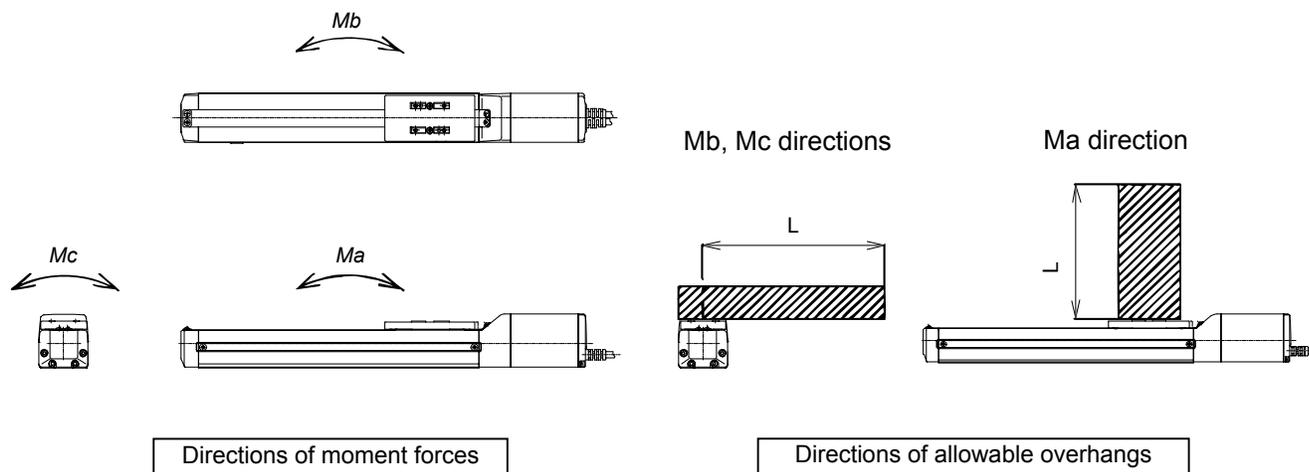
Allowable load moments

Model	Ma	Mb	Mc
SA5	4.9 N·m (0.5 kgf·m)	6.8 N·m (0.7 kgf·m)	Stroke: 50 to 300 mm – 11.7 N·m (1.2 kgf·m) Stroke: 350 to 500 mm – 7.8 N·m (0.8 kgf·m)
SA6	8.9 N·m (0.9 kgf·m)	12.7 N·m (1.3 kgf·m)	18.6 N·m (1.9 kgf·m)
SA7	13.9 N·m (1.4 kgf·m)	19.9 N·m (2.0 kgf·m)	38.3 N·m (3.9 kgf·m)
SS	14.7 N·m (1.5 kgf·m)	14.7 N·m (1.5 kgf·m)	33.3 N·m (3.4 kgf·m)
SM	36.3 N·m (3.7 kgf·m)	36.3 N·m (3.7 kgf·m)	77.4 N·m (7.9 kgf·m)
HSM	36.3 N·m (3.7 kgf·m)	36.3 N·m (3.7 kgf·m)	77.4 N·m (7.9 kgf·m)

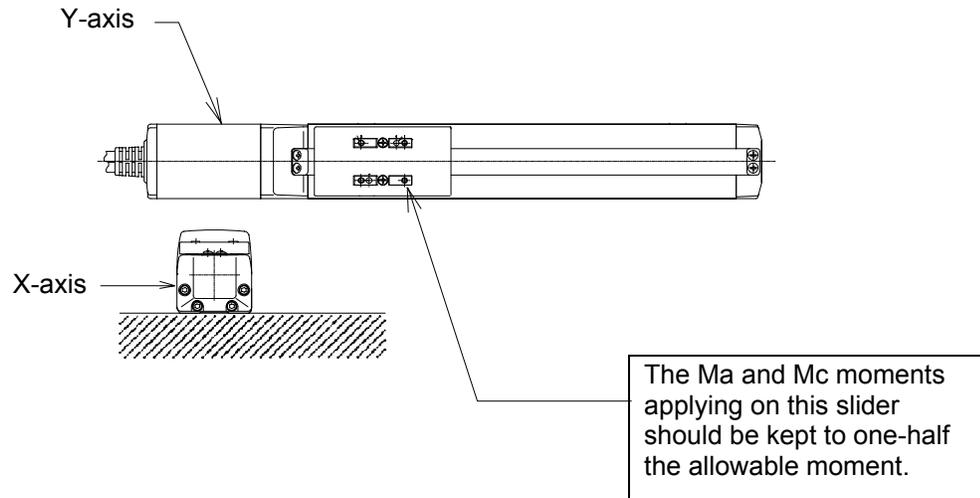
Allowable overhang lengths

Model	Ma direction	Mb direction	Mc direction
SA5	150 mm or less	150 mm or less	150 mm or less
SA6	220 mm or less	220 mm or less	220 mm or less
SA7	230 mm or less	230 mm or less	230 mm or less
SS	300 mm or less	300 mm or less	300 mm or less
SM	450 mm or less	450 mm or less	450 mm or less
HSM	450 mm or less	450 mm or less	450 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.



The body of the base warps easily when the actuator is used as the Y-axis in an X-Y overhang setup. In this case, use the actuator so that the M_a and M_c moments are kept to one-half the allowable moment or less (see the figure below).



Caution: Allowing the slider to receive an excessive load moment will shorten the service life of the guides. If the allowable overhang length is exceeded, vibration may generate or the service life of the guides may be reduced.

10. Maintenance

10.1 Maintenance Schedule

Perform maintenance work according to the schedule below.

The schedule is set assuming eight hours of operation a day. When the operation time is long such as 24-hour operation, shorten the maintenance intervals as needed.

	Visual inspection	Check interior	Grease supply
Start of operation	○		
After 1 month of operation	○		
After 6 months of operation	○	○	
After 1 year of operation	○	○	○
Every 6 months thereafter	○		
Every 1 year	○	○	○

10.2 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 or foreign deposit?
General	Unusual noise or vibrations?

10.3 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.

10.4 Interior Inspection

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

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

How to inspect the interior:

- 1) Remove both side covers.

With the SA5, SA6 SA7 or SS type, use an Allen wrench of 1.5 mm across flats. With the SM type, use an Allen wrench of 2 mm across flats.



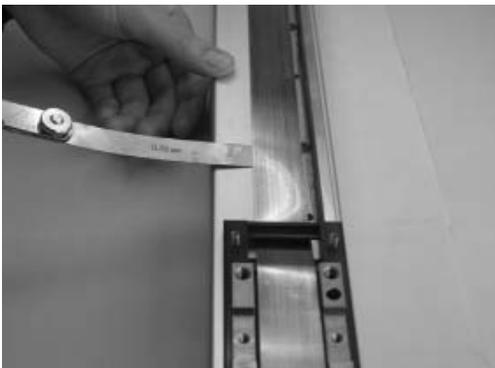
Make a visual check of the interior to see if there is any dust or foreign matter in the unit and check the lubrication. Even if the grease you see around the parts is brown, the lubrication is fine as long as the traveling surface appears shiny.

- 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 (SA5/SA6/SA7/SS): Thin-head screw M3 x 6 – 87.2 N-cm (8.90 kgf-cm)

Tightening torque (SM/HSM): Thin-head screw M4 x 6 – 204 N-cm (20.8 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.

10.5 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.

10.6 Lubricating the Guides and Ball Screw

10.6.1 What Grease to Use on the Guides

The following grease is used when we ship the unit.

Idemitsu Kosan	Daphne Eponex Grease No.2
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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 No. 2
Mobil Oil	Mobilux 2

10.6.2 What Grease to Use on the Ball Screw

The following grease is used when we ship the unit.

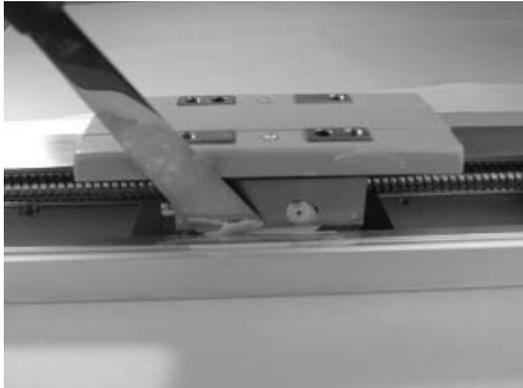
This grease offers excellent properties such as low heat generation, and is suitable for lubricating ball screws.

Kyodo Yushi	Multemp LRL3
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 **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.

10.6.3 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 (SA5/SA6/SA7/SS): Thin-head screw M3 x 6 – 87.2 N·cm (8.90 kgf·cm)
(SM/HSM): Thin-head screw M4 x 6 – 204 N·cm (20.8 kgf·cm)

Refer to 3) in 10.4, “Interior Inspection,” for notes on installing the side covers.

10.7 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]

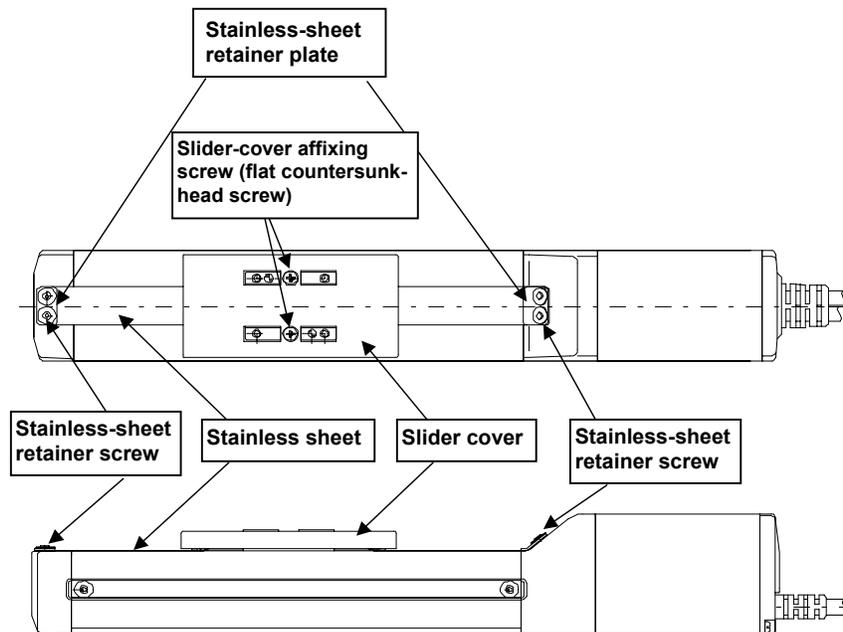
Deterioration and wear of the stainless sheet is affected by its tension.

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]



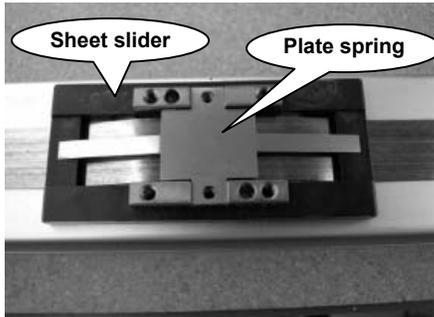
[Procedure]

- 1) Remove the slider-cover affixing screws and remove the covers.

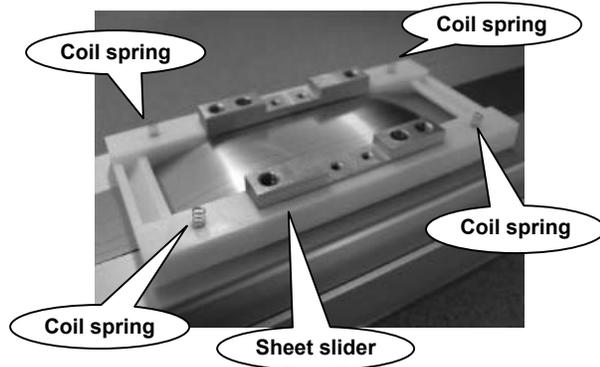
After the slider covers have been removed

[1] Standard specification (slider structure)

- SA5

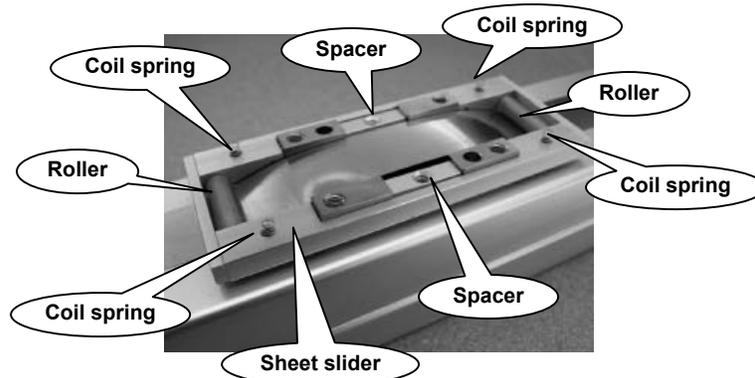


- SA6/SA7/SS/SM/HSM

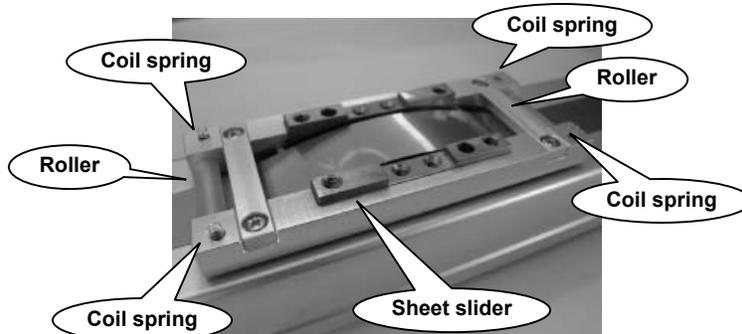


[2] SR specification (roller structure)

- SA5/SA6



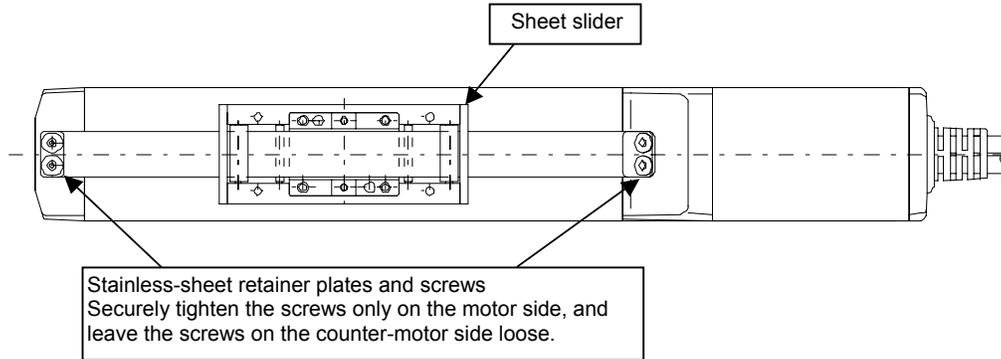
- SA7/SS/SM/HSM



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 and spacers in case they drop off.

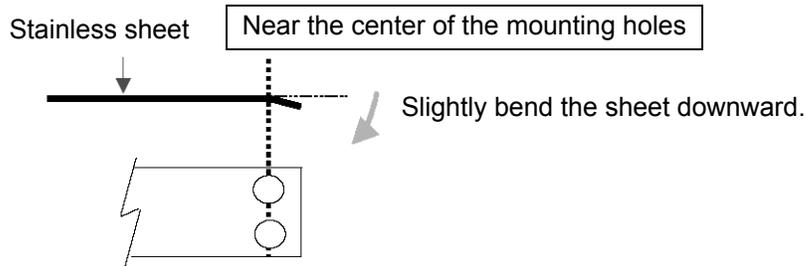
- 2) Remove the stainless-sheet retainer screws on both sides and pull out the stainless sheet.
- 3) Guide a new stainless sheet into the slider.
- 4) Hold the stainless sheet in place, and affix the retainer plates and screws.

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

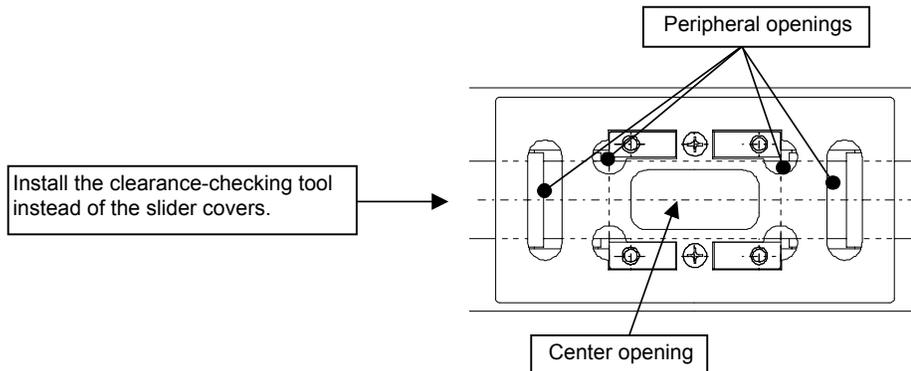


- How to prevent the stainless sheet from lifting (SA5/SA6/SA7)

Slightly bend the stainless sheet downward near the center of the mounting holes so that the sheet can be held securely.

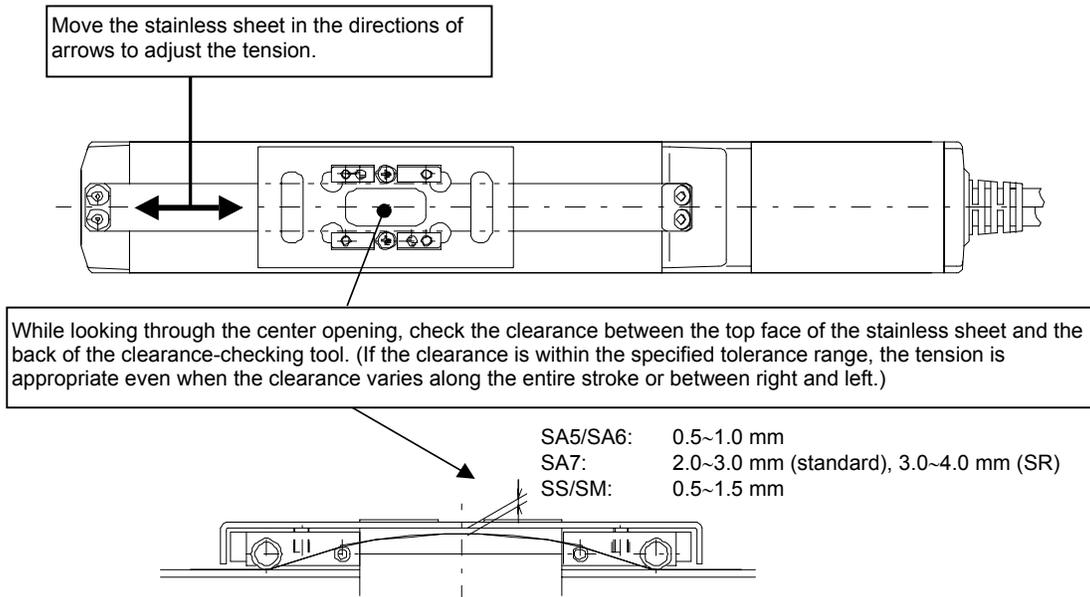


- 5) Install the clearance-checking tool.



6) Adjust the tension of the stainless sheet.

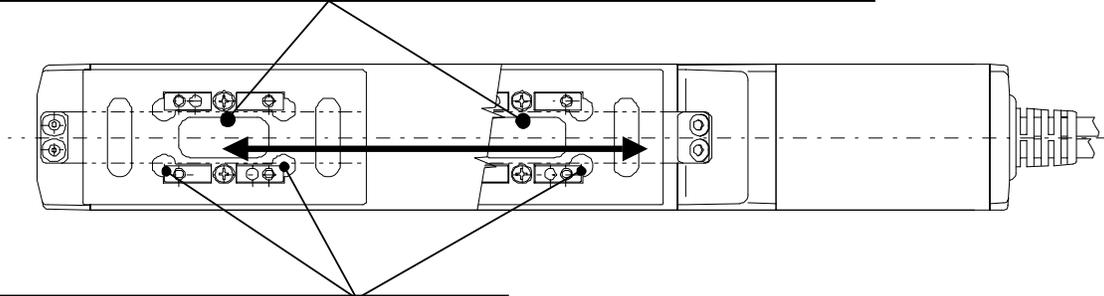
- [1] While looking through the center opening in the clearance-checking tool, move the stainless sheet on the loose end in the directions of arrows until the clearance between the top face of the stainless sheet and the back of the clearance-checking tool falls within the specified range.



- [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.

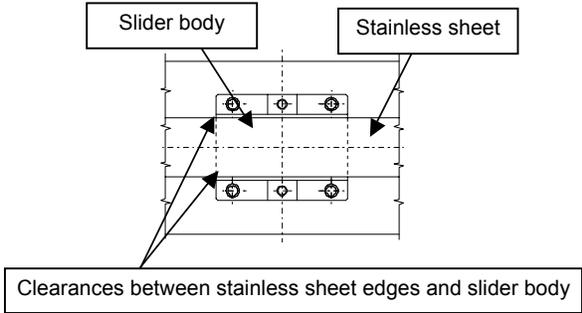
[3] Move the slider and check the tension of the stainless sheet along the entire stroke.

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].

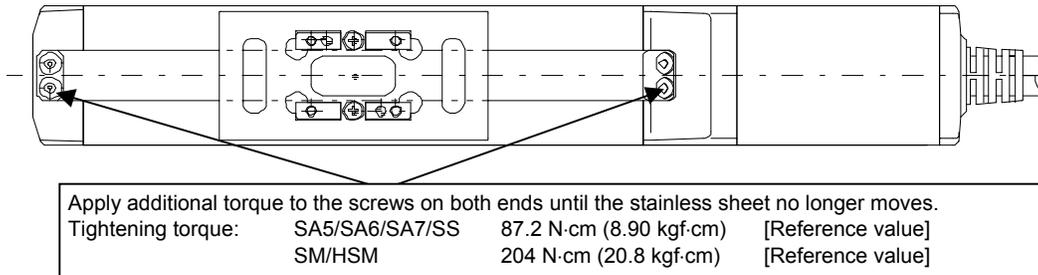
The stainless sheet is not perfectly straight, but it bends to right and left slightly. It is impossible to adjust the right and left clearances perfectly uniform. Slight variation in clearance in the stroke direction or between right and left is acceptable, as long as the stainless sheet edges do not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



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.



[5] Remove the clearance-checking tool and install the slider covers.
Note) Again, pay attention not to lose the coil springs and spacers.

10.8 Reduction Belt [Motor Reversing Type]

10.8.1 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.

10.8.2 Applicable Belt

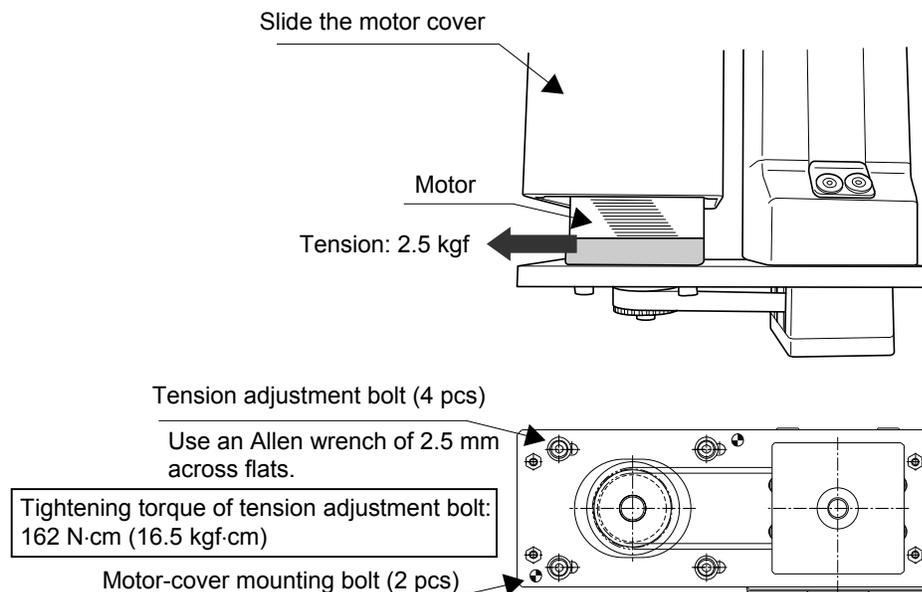
Manufacturer: Bando Chemical Industries

Model numbers: 60S2M184R, 6 mm wide: Rubber STS clean-type specification (SA5R/SA6R)
150S3M255U, 15 mm wide: Polyurethane rubber specification (SA7R)
100S3M219U, 10 mm wide: Polyurethane rubber specification (SSR)
150S3M252U, 15 mm wide: Polyurethane rubber specification (SMR/HSMR)

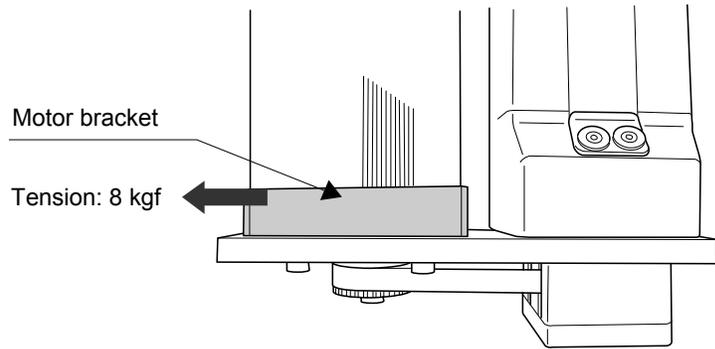
10.8.3 Adjusting the Belt Tension

Remove the pulley cover and loosen the four tension adjustment bolts. Slide the motor to the left to apply a tension to the belt, and then tighten the tension adjustment bolts.

- SA5R/SA6R



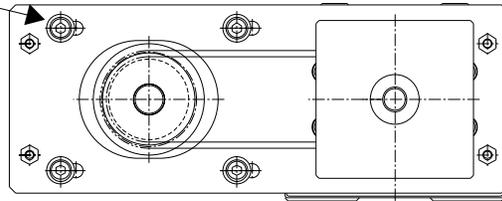
• SA7R



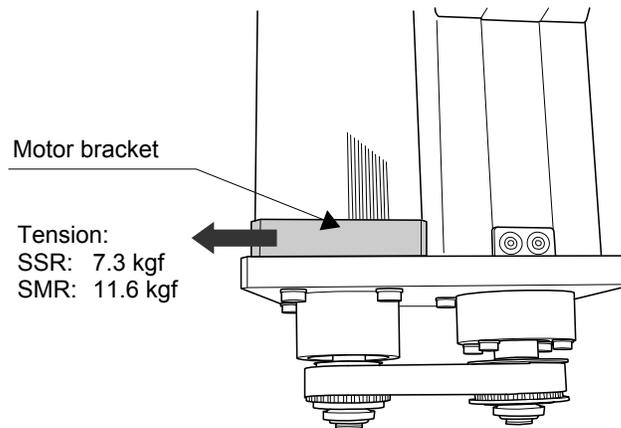
Tension adjustment bolt (4 pcs)

Use an Allen wrench of 3 mm across flats.

Tightening torque of tension adjustment bolt: 323 N·cm (33 kgf·cm)



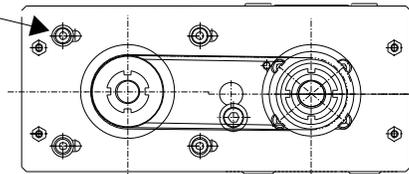
• SSR/SMR/HSMR



Tension adjustment bolt (4 pcs)

Use an Allen wrench of 3 mm across flats.

Tightening torque of tension adjustment bolt: 323 N·cm (33 kgf·cm)



10.8.4 Replacing the Belt

- SA5R/SA6R

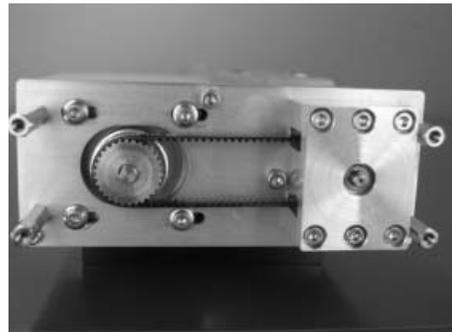
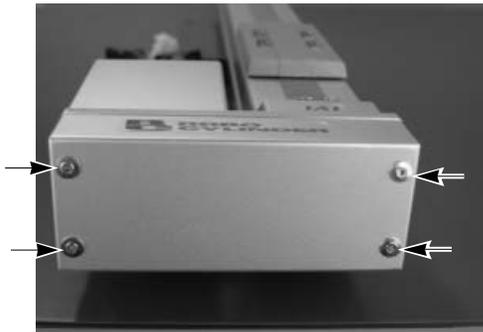
[Items Required for Replacement]

- Replacement reduction belt
- Allen wrench set
- Tension gauge (capable of applying a tensile load of 3 kgf or more)
- Strong string or long tie-band

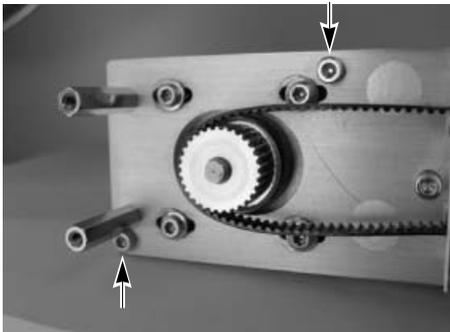
[Procedure]

- 1) Remove the pulley cover.

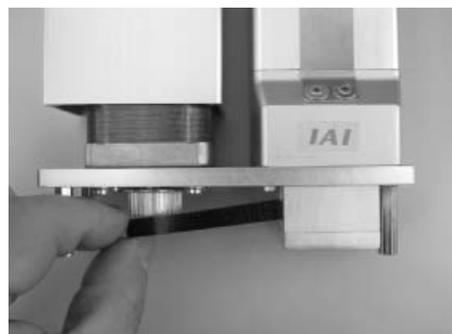
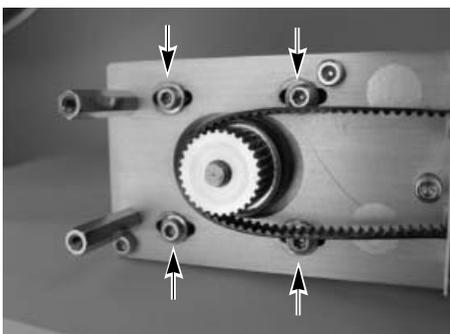
Remove the four thin-head mounting screws using an Allen wrench of 1.5 mm across flats.



- 2) Remove the two motor-cover mounting bolts and move the motor cover by approx. 20 mm. (Use an Allen wrench of 2.5 mm across flats.)

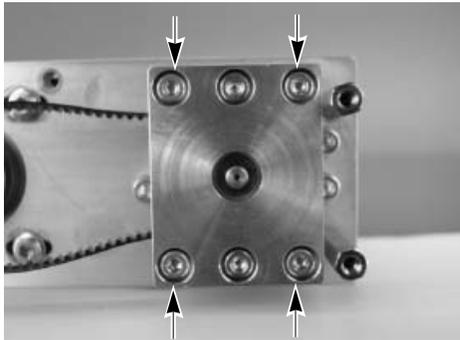


- 3) Loosen the four tension adjustment bolts to loosen the belt. (Use an Allen wrench of 2.5 mm across flats.)
- 4) Remove the belt from the pulleys.

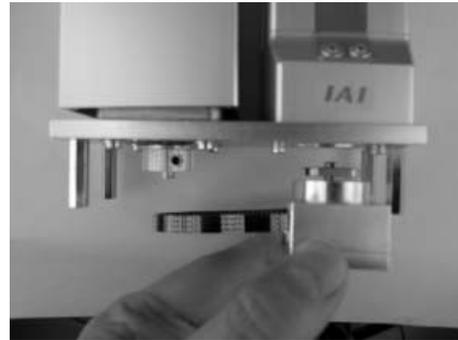


5) Remove the pulley assembly.

- Remove the four mounting bolts using an Allen wrench of 2.5 mm across flats.

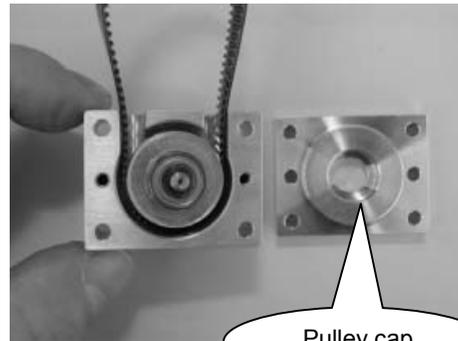
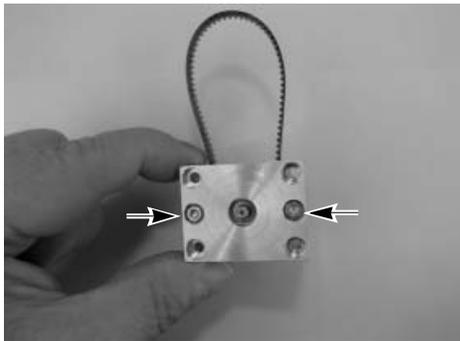


- Pull out the assembly by hand.

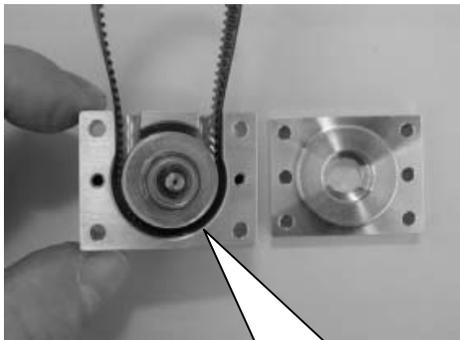


6) Remove the pulley cap.

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



7) Pull out the belt and insert a new belt.



Insert the new belt into the groove.

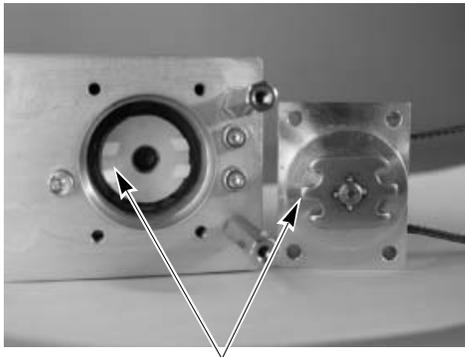
8) Install the pulley cap.

Tighten the hexagon socket-head bolts (M3 x 8, 2 pcs) using an Allen wrench of 2.5 mm across flats.

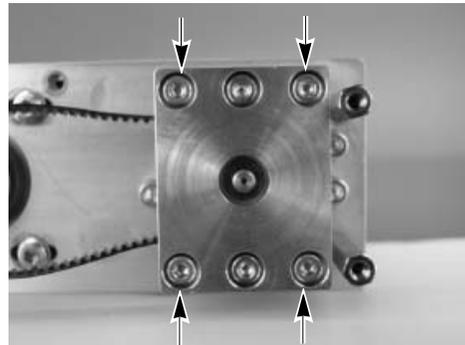
Tightening torque: 83 N-cm (8.47 kgf-cm)

9) Install the pulley assembly.

- Align the angles of projections and depressions on the couplings.
- Tighten the hexagon socket-head bolts (M3 x 22, 4 pcs) using an Allen wrench of 2.5 mm across flats.



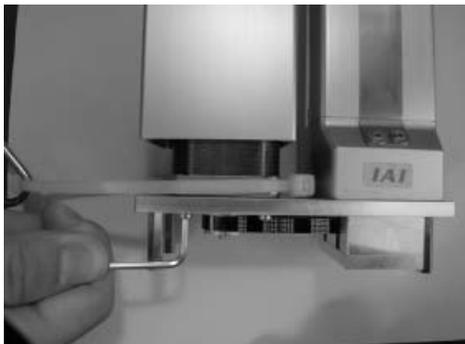
Align the angles of projections and depressions.



Tightening torque: 83 N-cm (8.47 kgf-cm)

10) Pass the belt around the pulleys.

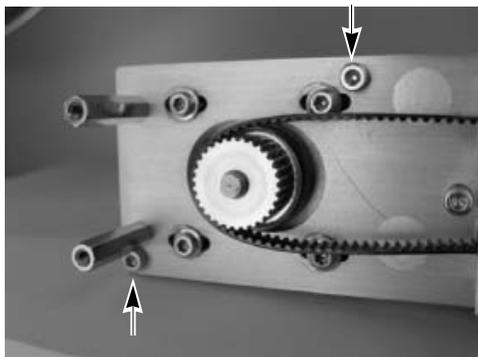
- 11) Hook a looped strong string (or long tie-band) on the flange at the base of the motor, pull the string with a tension gauge to the specified tension, and then securely and uniformly tighten the adjustment bolts (hexagon socket-head bolt with washer M3 x 10, 4 pcs). (Use an Allen wrench of 2.5 mm across flats.)



Tensile force: 2.5 kgf
Tightening torque of adjustment bolt:
162 N-cm (16.5 kgf-cm)

12) Install the motor cover.

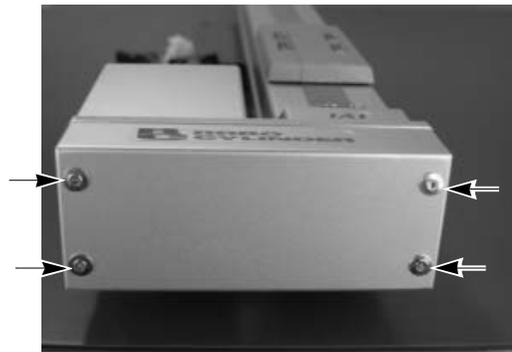
Tighten the hexagon socket-head bolts (M3 x 12, 2 pcs) using an Allen wrench of 2.5 mm across flats.



Tightening torque: 83 N-cm (8.47 kgf-cm)

13) Install the pulley cover.

Tighten the thin-head screws (M3 x 6, 4 pcs) using an Allen wrench of 1.5 mm across flats.



Tightening torque: 87.2 N-cm (8.90 kgf-cm)

- SA7R

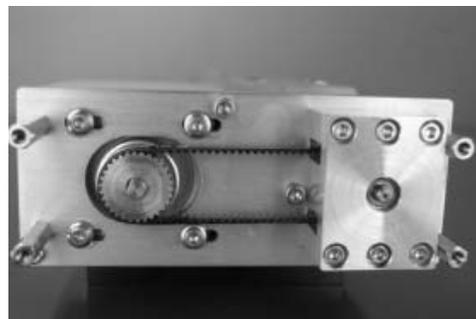
[Items Required for Replacement]

- Replacement reduction belt
- Allen wrench set
- Tension gauge (capable of applying a tensile load of 8 kgf or more)
- Strong string or long tie-band

[Procedure]

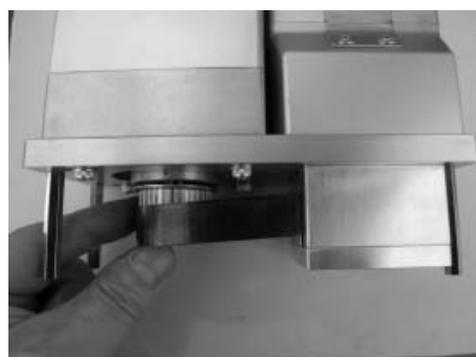
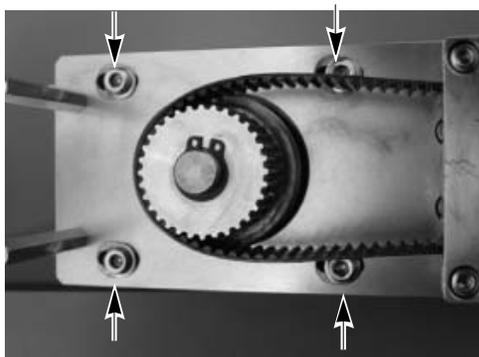
1) Remove the pulley cover.

Remove the four thin-head mounting screws using an Allen wrench of 1.5 mm across flats.



2) Loosen the four tension adjustment bolts to loosen the belt.

(Use an Allen wrench of 3 mm across flats.)

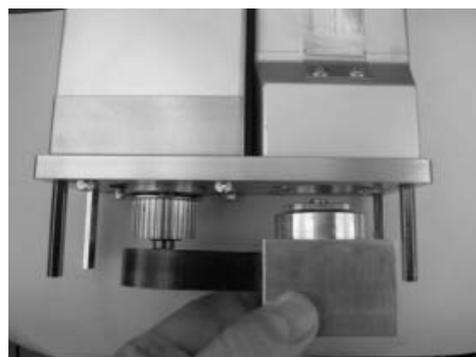
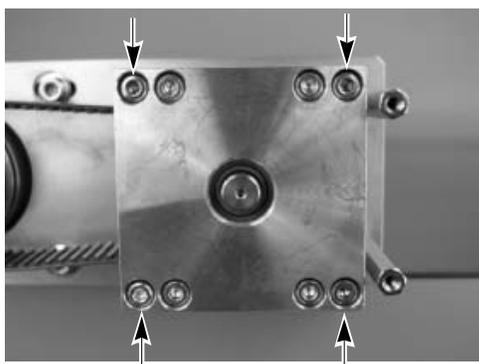


3) Remove the belt from the pulleys.

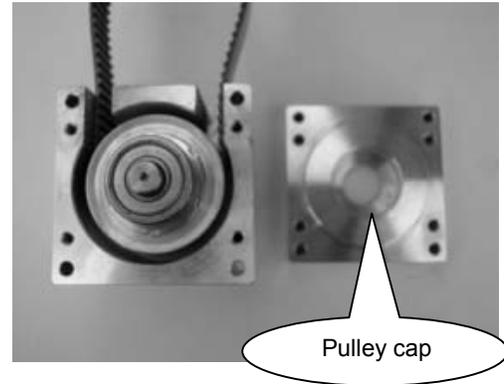
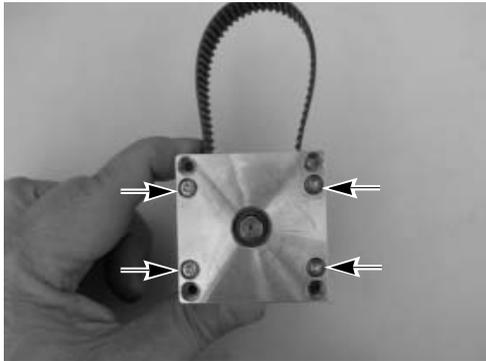
4) Remove the pulley assembly.

- Remove the four mounting bolts using an Allen wrench of 2.5 mm across flats.

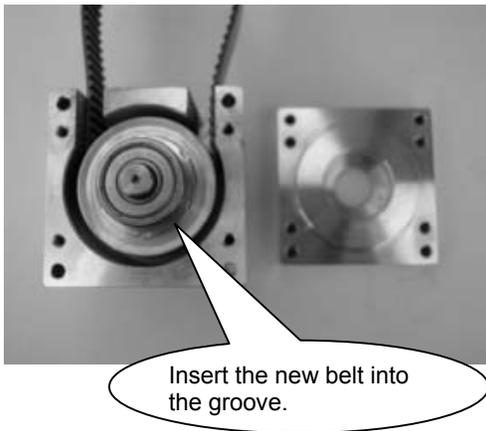
- Pull out the assembly by hand.



- 5) Remove the pulley cap.
- Remove the four mounting bolts using an Allen wrench of 2.5 mm across flats.



- 6) Pull out the belt and insert a new belt.

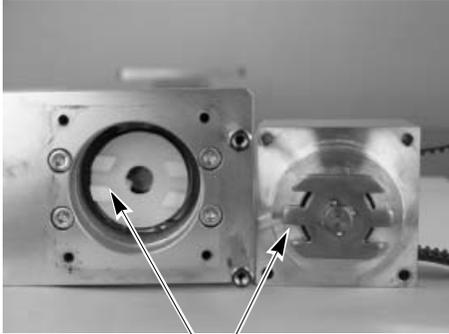


- 7) Install the pulley cap.
Tighten the hexagon socket-head bolts (M3 x 10, 4 pcs) using an Allen wrench of 2.5 mm across flats.

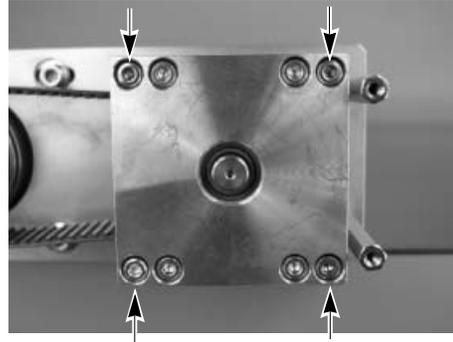
Tightening torque: 83 N-cm (8.47 kgf-cm)

8) Install the pulley assembly.

- Align the angles of projections and depressions on the couplings.
- Tighten the hexagon socket-head bolts (M3 x 40, 4 pcs) using an Allen wrench of 2.5 mm across flats.



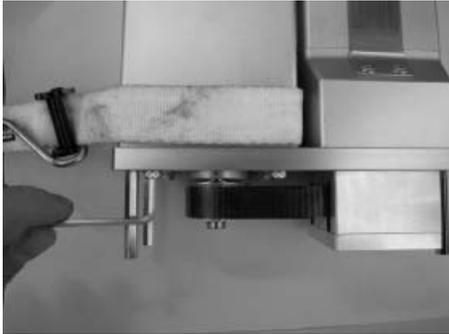
Align the angles of projections and depressions.



Tightening torque: 83 N-cm (8.47 kgf-cm)

9) Pass the belt around the pulleys.

- 10) Hook a looped strong string (or long tie-band) on the flange at the base of the motor, pull the string with a tension gauge to the specified tension, and then securely and uniformly tighten the adjustment bolts (hexagon socket-head bolt with washer M4 x 20, 4 pcs). (Use an Allen wrench of 3 mm across flats.)



Tensile force: 8 kgf
Tightening torque of adjustment bolt:
323 N-cm (33 kgf-cm)

11) Install the pulley cover.

Tighten the thin-head screws (M3 x 6, 4 pcs) using an Allen wrench of 1.5 mm across flats.



Tightening torque: 87.2 N-cm (8.90 kgf-cm)

- SSR/SMR/HSMR

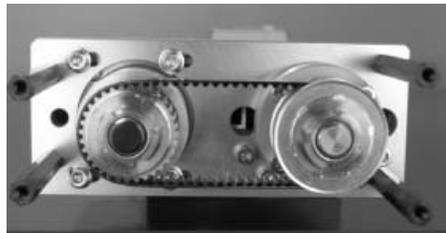
[Items Required for Replacement]

- Replacement reduction belt
- Allen wrench set
- Tension gauge (capable of applying a tensile load of 12 kgf or more)
- Strong string or long tie-band

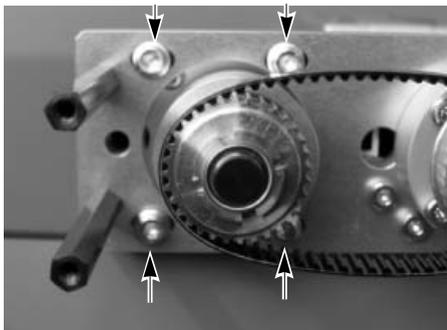
[Procedure]

- 1) Remove the pulley cover.

Remove the four thin-head mounting screws using an Allen wrench of 2 mm across flats.



- 2) Loosen the four tension adjustment bolts to loosen the belt.
(Use an Allen wrench of 3 mm across flats.)

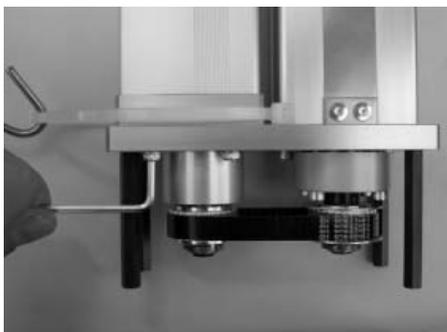


- 3) Remove the belt from the pulleys.



- 4) Pass a new belt around both pulleys.

- 5) Hook a looped strong string (or long tie-band) on the motor bracket, pull the string with a tension gauge to the specified tension, and then securely and uniformly tighten the adjustment bolts (hexagon socket-head bolt with washer M4 x 20, 4 pcs).



Tensile force: SSR	7.3 kgf,	SMR/HSMR	11.6 kgf
Tightening torque of adjustment bolt:			
323 N·cm (33 kgf·cm)			

- 6) Install the pulley cover.
Tighten the thin-head screws (M4 x 6, 4 pcs) using an Allen wrench of 2 mm across flats.



Tightening torque: 204 N·cm (20.8 kgf·cm)

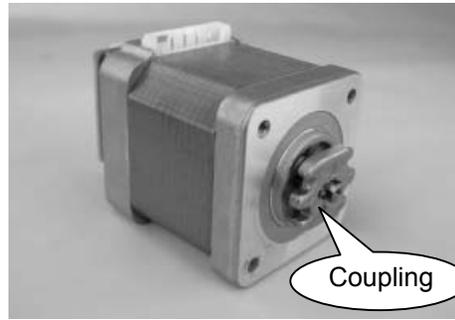
10.9 Replacing the Motor

10.9.1 Motor Straight Type

- SA5/SA6

[Items Required for Replacement]

- Replacement motor (with a coupling on the motor shaft; see the photograph at right)
- Allen wrench set ● Phillips screwdriver
- Grease (Kyodo Yushi's Multemp LRL3 or equivalent)

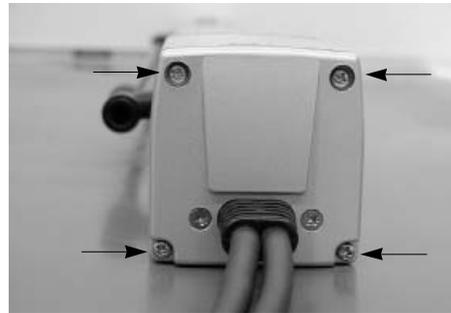
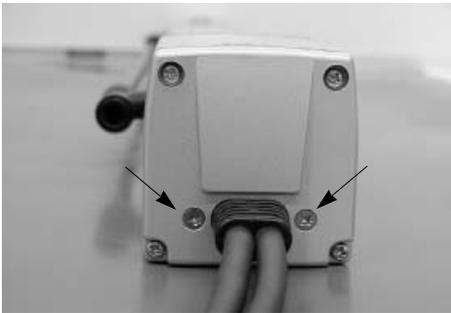


[Procedure]

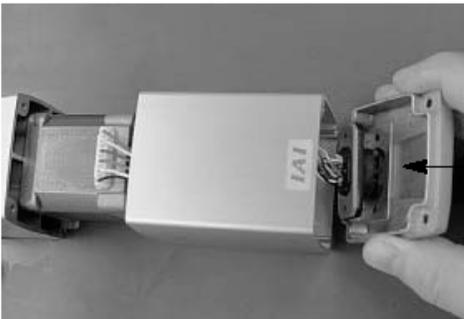
- 1) Remove the flat countersunk-head screws (M3 x 8, 2 pcs) affixing the cable ends on the motor-end cap, and then remove the pan-head screws (M3 x 80, 4 pcs) affixing the motor-end cap.

- Flat countersunk-head screws (M3 x 8, 2 pcs)

- Pan-head screws (M3 x 80, 4 pcs)

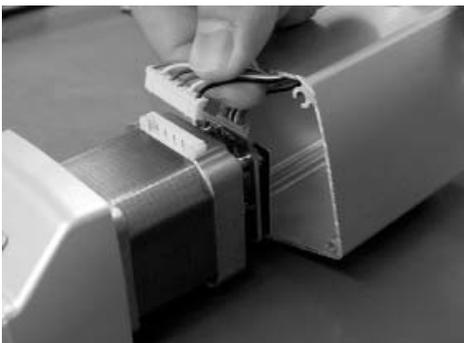


- 2) Push in the cable-end molding to create a slack along the inner cable.

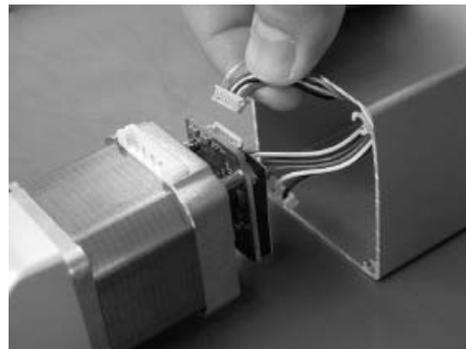


Push in the molding as much as possible.

- 3) Pull out the motor connector.



- 4) Pull out the encoder connector.

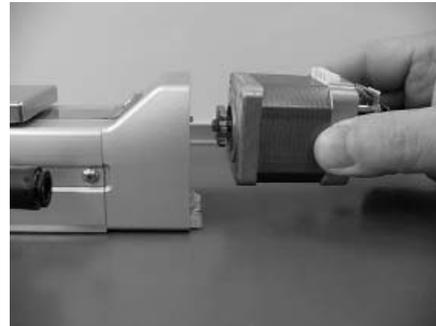
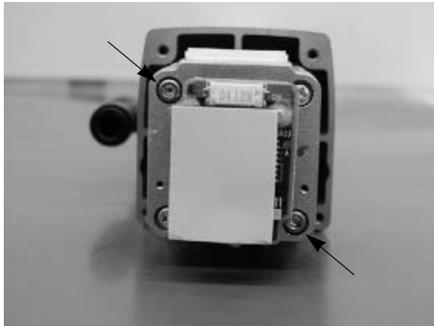


Caution: When applying the force, do not touch the encoder directly.

5) Remove the motor.

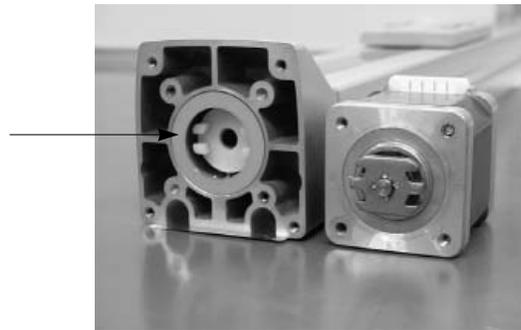
- Remove the affixing bolts (M3 x 50, 2 pcs) using an Allen wrench of 2.5 mm across flats.

- Pull out the motor by hand.



- Decoupled motor and actuator

Pilot alignment metal
If this metal is attached on the decoupled motor, put it back to the pilot on the actuator side.



6) Apply grease to the coupling on the actuator side.

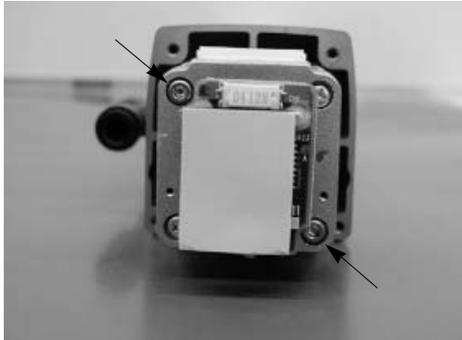


Kyodo Yushi's Multemp LRL3 has been applied before shipment.

Note: Never use fluoride grease. It will chemically react with lithium grease to cause damaging effects on the machine.

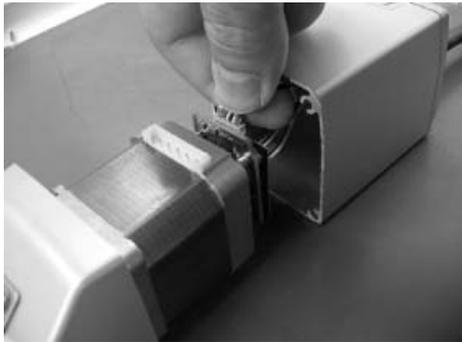
7) Install a new motor.

- After confirming that the angles of projections and depressions on the couplings are aligned, assemble the motor, and then tighten the affixing bolts (M3 x 50, 2 pcs). (Use an Allen wrench of 2.5 mm across flats.)



Tightening torque: 59 N·cm (6 kgf·cm)

8) Connect the encoder connector.

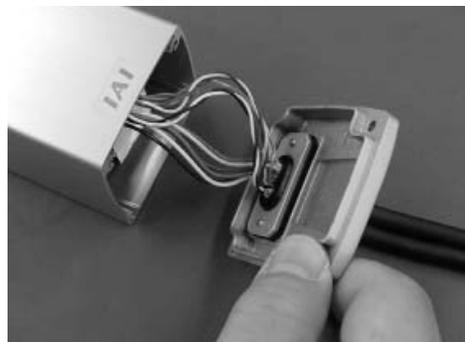


9) Connect the motor connector.

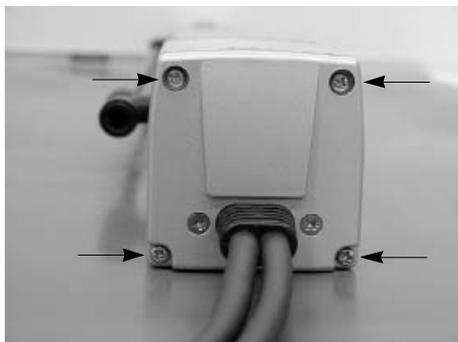


Caution: When applying the force, do not touch the encoder directly.

10) Replace the cable-end molding in the original position, and affix it with the flat countersunk-head screws (M3 x 8, 2 pcs).



- 11) Affix the motor-end cap with the pan-head screws (M3 x 80, 4 pcs). At this time, pay attention not to pinch the cables.



Tightening torque: 61.5 N-cm (6.3 kgf-cm)

- SA7

[Items Required for Replacement]

- Replacement motor (with a coupling on the motor shaft; see the photograph below)
- Allen wrench set • Phillips screwdriver
- Grease (Kyodo Yushi's Multemp LRL3 or equivalent)

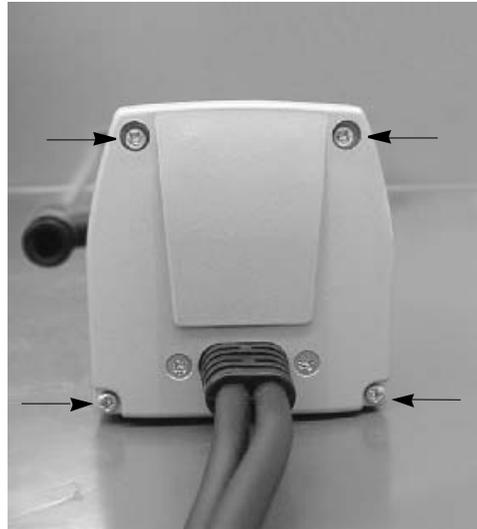


[Procedure]

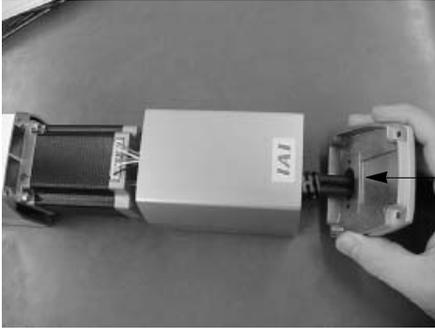
1) Remove the flat countersunk-head screws (M3 x 8, 2 pcs) affixing the cable ends on the motor-end cap, and then remove the pan-head screws (M3 x 105, 4 pcs) affixing the motor-end cap.

- Flat countersunk-head screws (M3 x 8, 2 pcs)

- Pan-head screws (M3 x 105, 4 pcs)

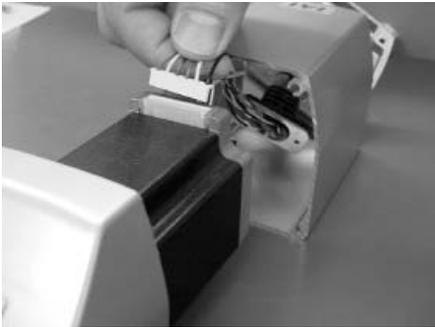


2) Push in the cable-end molding to create a slack along the inner cable.

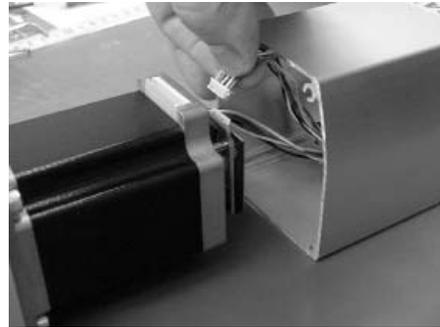


Push in the molding as much as possible.

3) Pull out the motor connector.



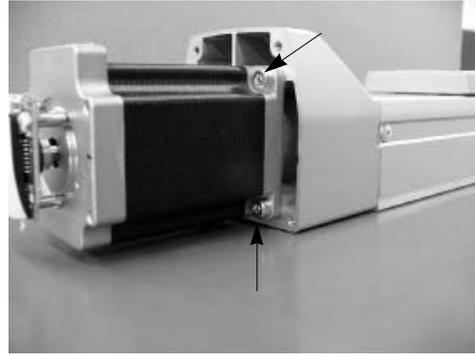
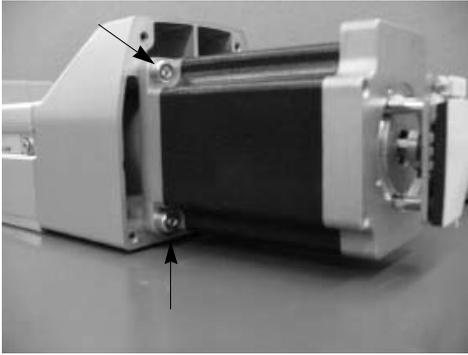
4) Pull out the encoder connector.



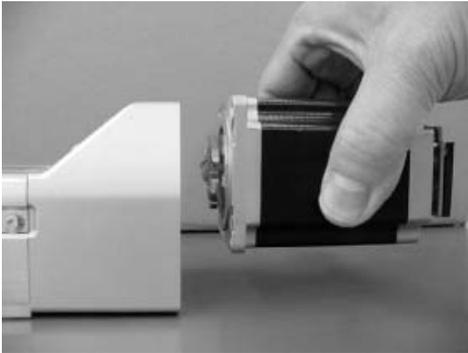
Caution: When applying the force, do not touch the encoder directly.

5) Remove the motor.

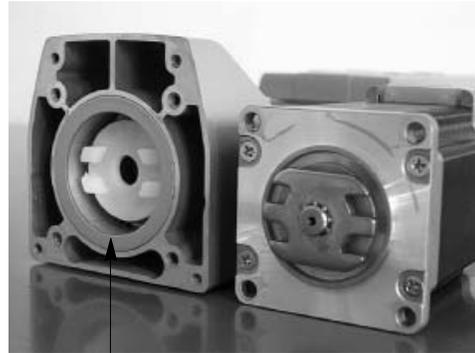
- Remove the affixing bolts (M4 x 15, 4 pcs) using an Allen wrench of 3 mm across flats.



- Pull out the motor by hand.

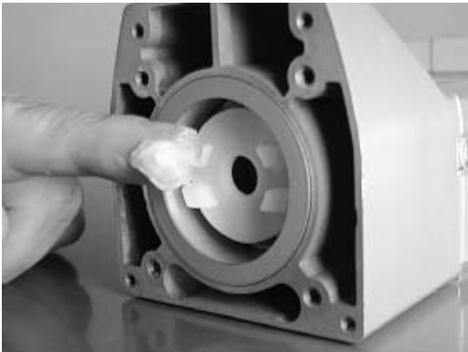


- Decoupled motor and actuator



Pilot alignment metal
If this metal is attached on the decoupled motor, put it back to the pilot on the actuator side.

6) Apply grease to the coupling on the actuator side.



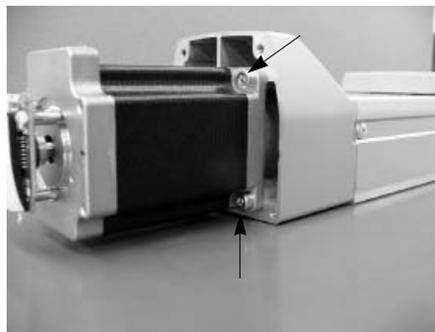
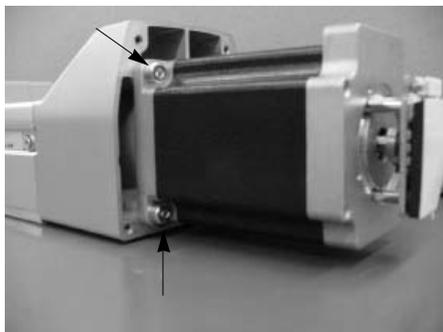
Kyodo Yushi's Multemp LRL3 has been applied before shipment.

Note: Never use fluoride grease. It will chemically react with lithium grease to cause damaging effects on the machine.

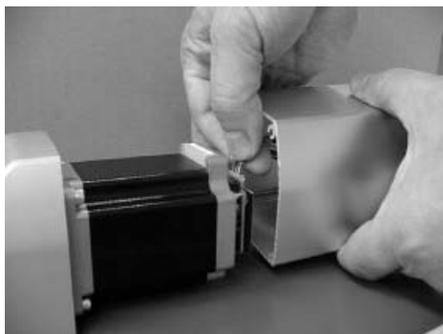
7) Install a new motor.

- After confirming that the angles of projections and depressions on the couplings are aligned, assemble the motor, and then tighten the affixing bolts (M4 x 15, 4 pcs). (Use an Allen wrench of 3 mm across flats.)

Tightening torque: 176 N-cm (18 kgf-cm)



8) Connect the encoder connector.

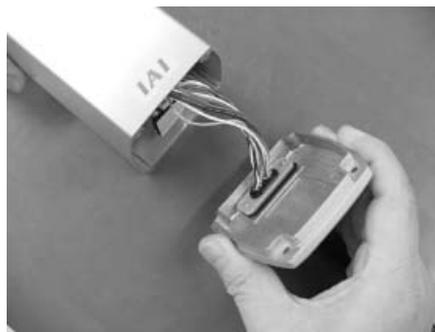
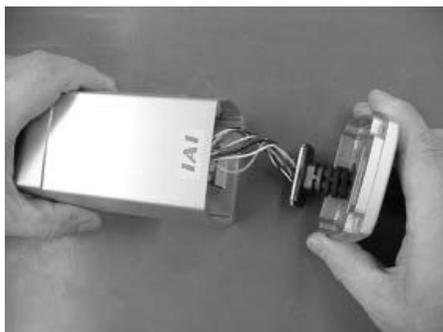


9) Connect the motor connector.

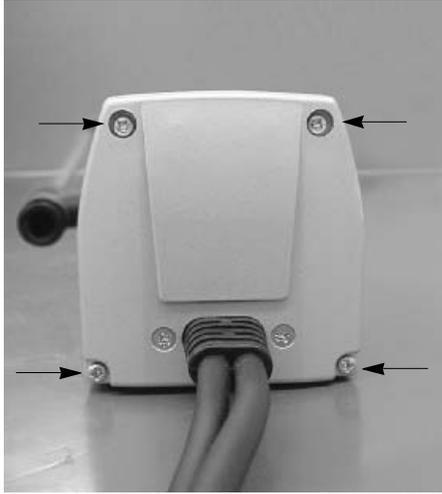


Caution: When applying the force, do not touch the encoder directly.

10) Replace the cable-end molding in the original position, and affix it with the flat countersunk-head screws (M3 x 8, 2 pcs).



- 11) Affix the motor-end cap with the pan-head screws (M3 x 105, 4 pcs). At this time, pay attention not to pinch the cables.

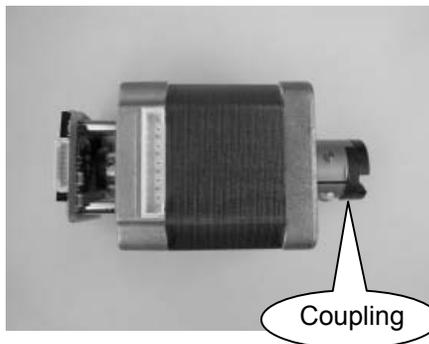


Tightening torque: 61.5 N·cm (6.3 kgf·cm)

- SS

[Items Required for Replacement]

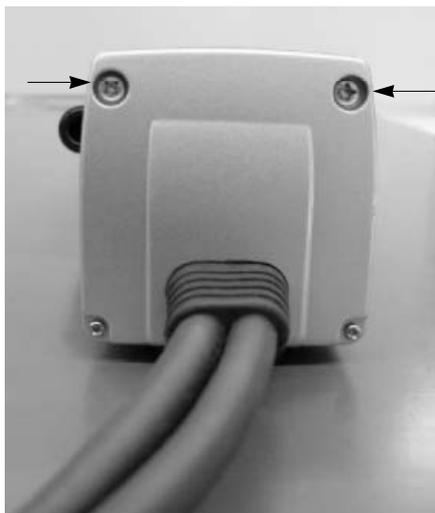
- Replacement motor (with a coupling on the motor shaft; see the photograph below)
- Allen wrench set • Phillips screwdriver
- Plastic hammer



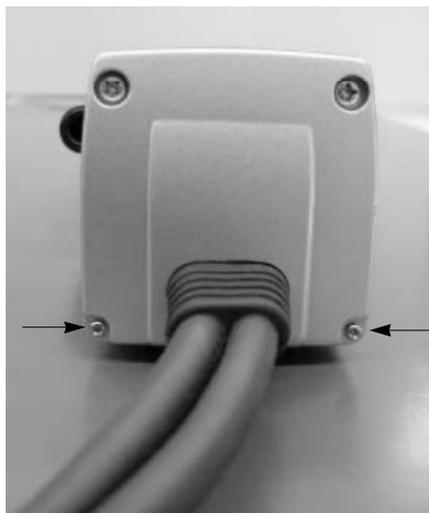
[Procedure]

1) Remove the pan-head screws affixing the motor-end cap.

- Pan-head screws (M3 x 95, 2 pcs)

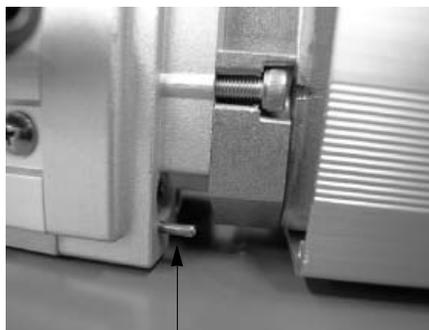
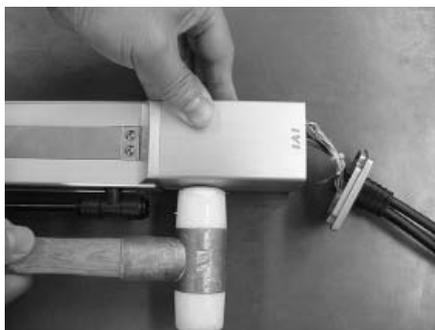


- Pan-head screws (M2 x 10, 2 pcs)



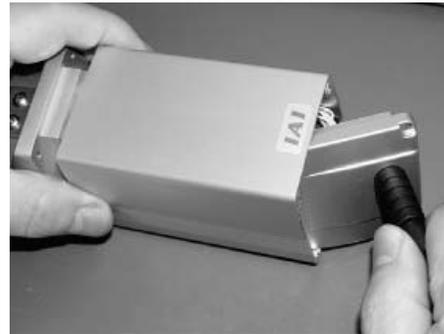
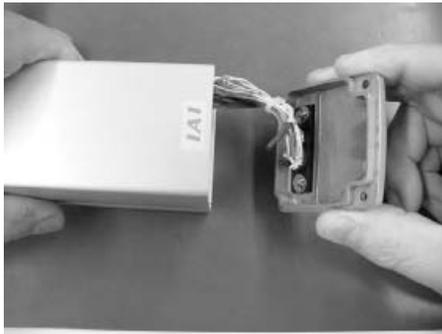
2) Remove the motor cover.

The motor cover is engaged with a positioning pin. If the cover does not come off easily, use a plastic hammer to gently tap the motor cover from side, and pull out the cover.

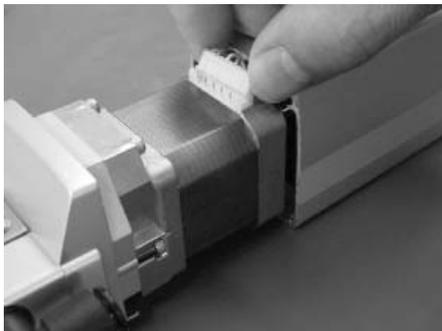


Positioning pin

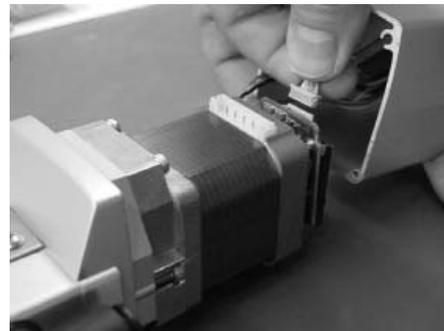
3) Push in the motor-end cap into the motor cover.



4) Pull out the motor connector.



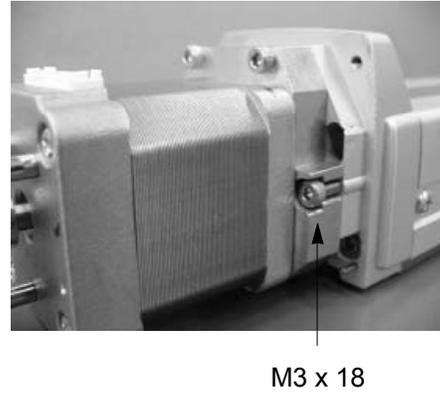
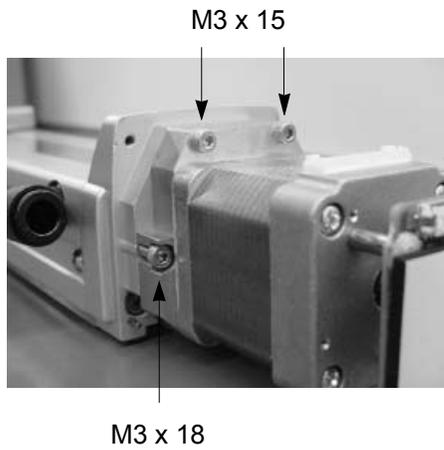
5) Pull out the encoder connector.



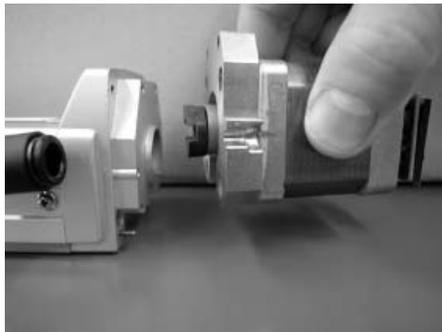
Caution: When applying the force, do not touch the encoder directly.

6) Remove the motor.

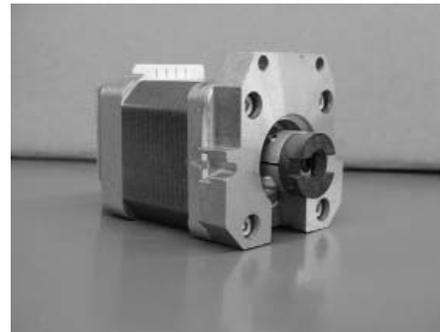
- Remove the affixing bolts (M3 x 15, 2 pcs/M3 x 18, 2 pcs) using an Allen wrench of 2.5 mm across flats.



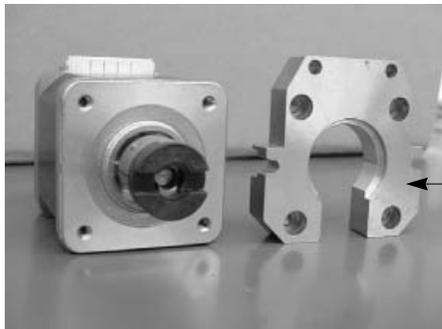
- Pull out the motor by hand.



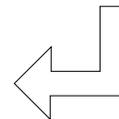
- Decoupled motor



- Remove the motor flange.
Remove the affixing bolts (M3 x 8, 4 pcs) using an Allen wrench of 2.5 mm across flats.

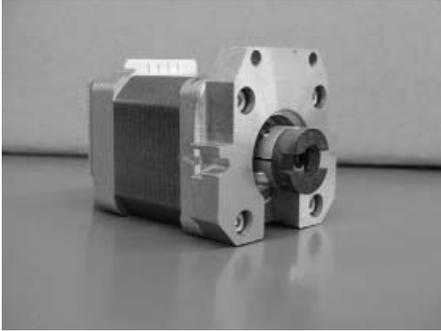


Motor flange

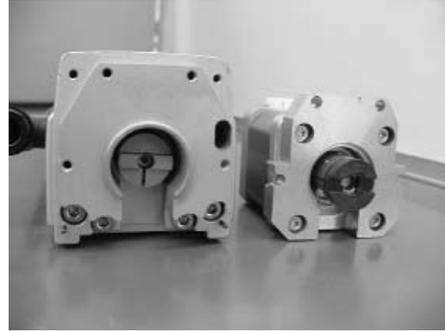


7) Install a new motor.

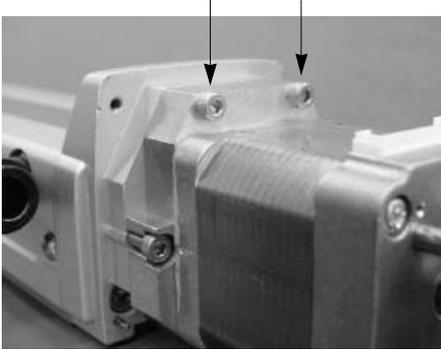
- Tighten the motor flange with the affixing bolts (M3 x 8, 4 pcs).



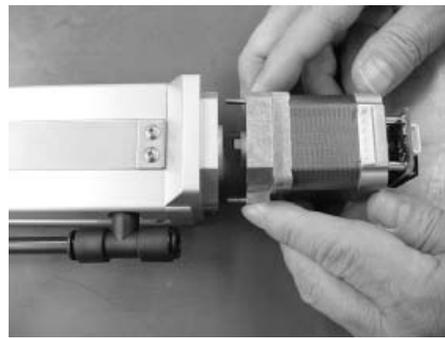
- Confirm that the angles of projections and depressions on the couplings are aligned.



- Next, tighten the upper affixing bolts (M3 x 15, 2 pcs) uniformly.

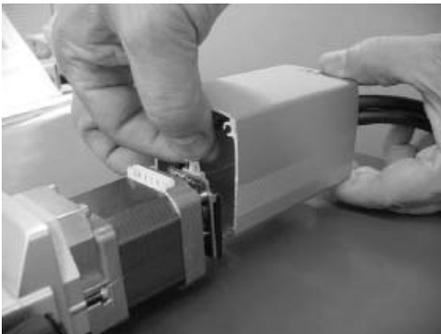


- First, tighten the right and left affixing bolts (M3 x 18, 2 pcs) uniformly.

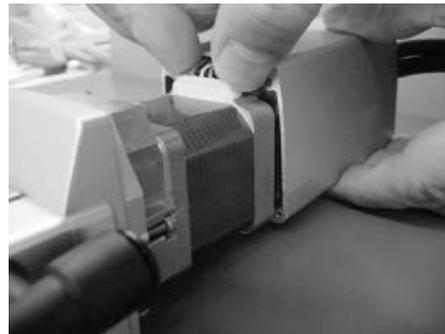


Tightening torque of M3 bolt: 83 N·cm (8.5 kgf·cm)

8) Connect the encoder connector.



9) Connect the motor connector.

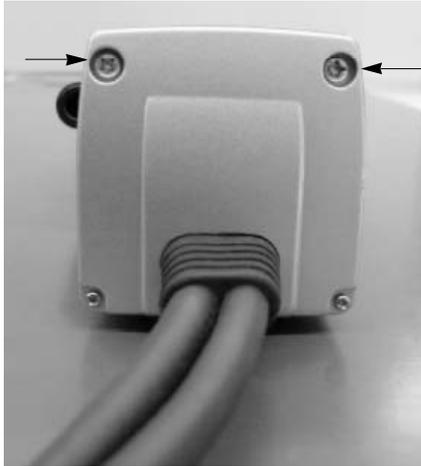


Caution: When applying the force, do not touch the encoder directly.

10) Pull out the motor-end cap from the motor cover and affix it with the pan-head screws. At this time, pay attention not to pinch the cables.

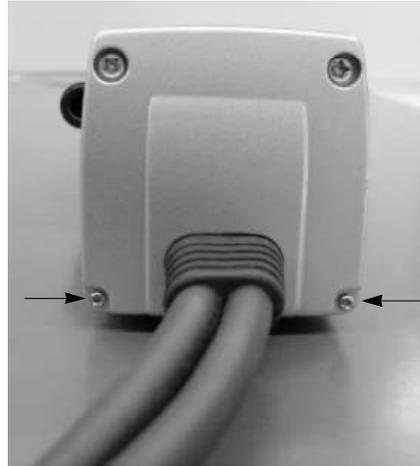
- Pan-head screws (M3 x 105, 2 pcs)

Tightening torque: 61.5 N·cm (6.3 kgf·cm)



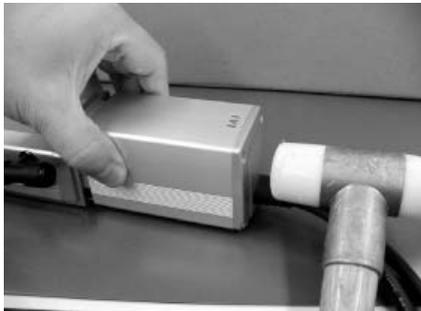
- Pan-head screws (M2 x 10, 2 pcs)

Tightening torque: 16.9 N·cm (1.7 kgf·cm)



11) Affix the motor cover.

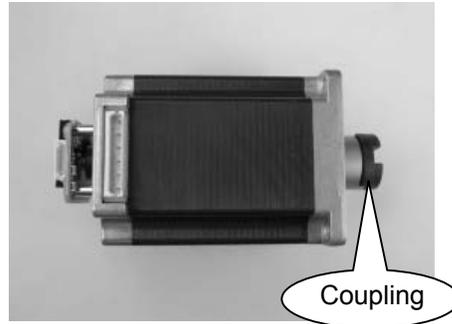
- If the positioning pin does not go in smoothly, gently tap the motor-end cap using a plastic hammer.



- SM/HSM

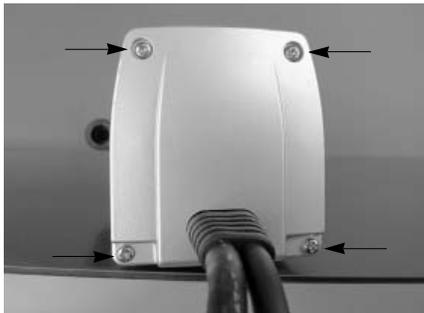
[Items Required for Replacement]

- Replacement motor (with a coupling on the motor shaft; see the photograph below)
- Allen wrench set • Phillips screwdriver
- Plastic hammer

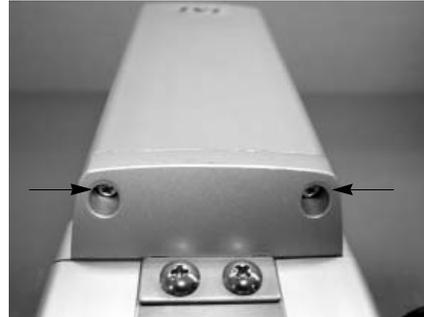


[Procedure]

- 1) Remove the pan-head screws (M3 x 10, 4 pcs) affixing the motor-end cap.

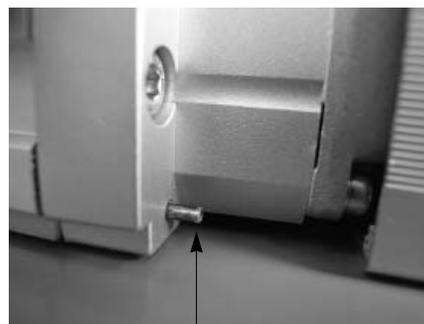


- 2) Remove the pan-head screws (M3 x 10, 2 pcs) affixing the motor cover.



- 3) Remove the motor cover.

The motor cover is engaged with a positioning pin. If the cover does not come off easily, use a plastic hammer to gently tap the motor cover from side, and pull out the cover.

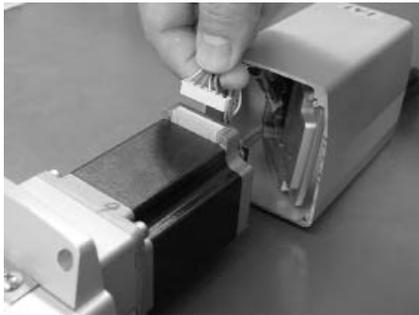


Positioning pin

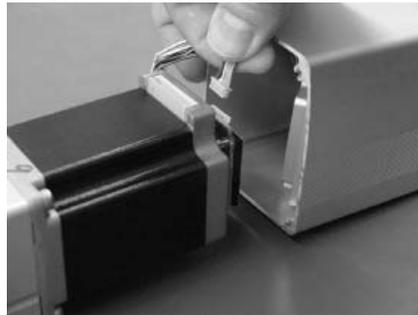
4) Push in the motor-end cap into the motor cover.



5) Pull out the motor connector.



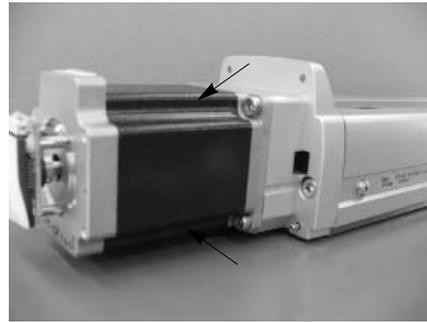
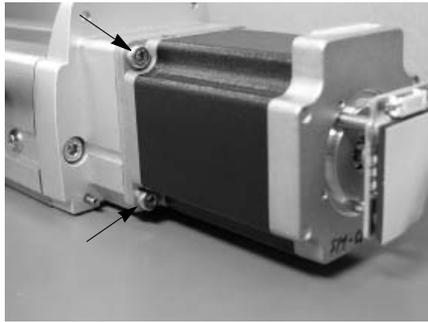
6) Pull out the encoder connector.



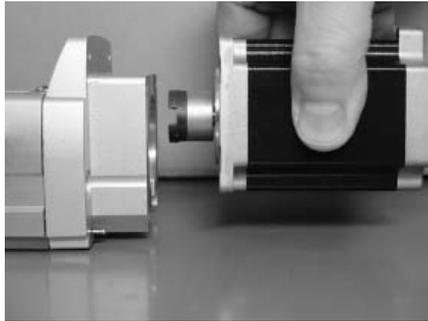
Caution: When applying the force, do not touch the encoder directly.

7) Remove the motor.

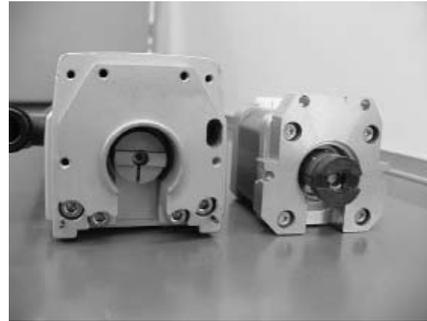
- Remove the affixing bolts (M4 x 15, 4 pcs) using an Allen wrench of 3 mm across flats.



- Pull out the motor by hand.



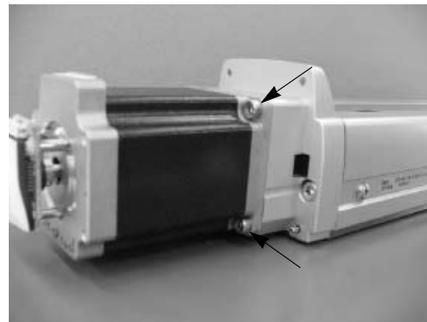
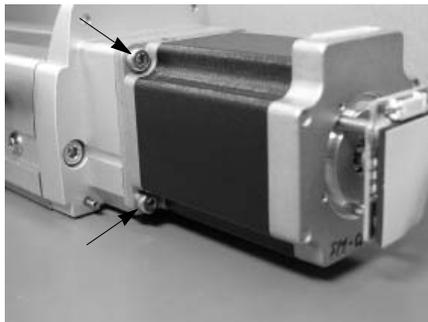
- Decoupled motor and actuator



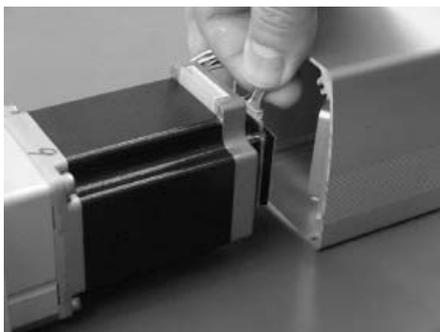
8) Install a new motor.

- After confirming that the angles of projections and depressions on the couplings are aligned, assemble the motor, and then tighten the affixing bolts (M4 x 15, 4 pcs). (Use an Allen wrench of 3 mm across flats.)

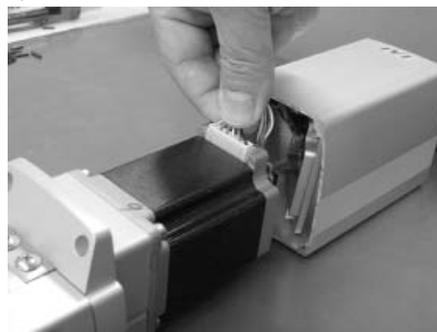
Tightening torque: 176 N·cm (18 kgf·cm)



9) Connect the encoder connector.

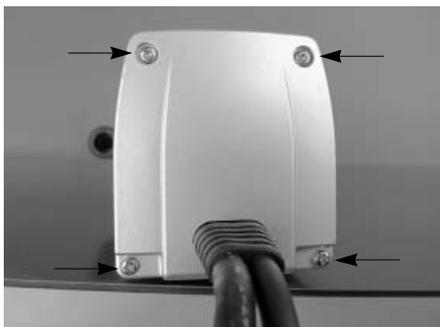


10) Connect the motor connector.



Caution: When applying the force, do not touch the encoder directly.

11) Pull out the motor-end cap from the motor cover and affix it with the pan-head screws (M3 x 105, 4 pcs). At this time, pay attention not to pinch the cables.



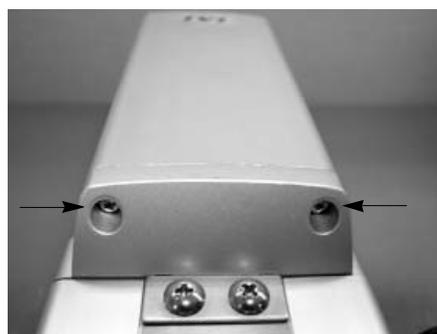
Tightening torque: 61.5 N·cm (6.3 kgf·cm)

12) Affix the motor cover.

- If the positioning pin does not go in smoothly, gently tap the motor-end cap using a plastic hammer.

- Tighten the pan-head screws (M3 x 10, 2 pcs).

Tightening torque: 61.5 N·cm (6.3 kgf·cm)

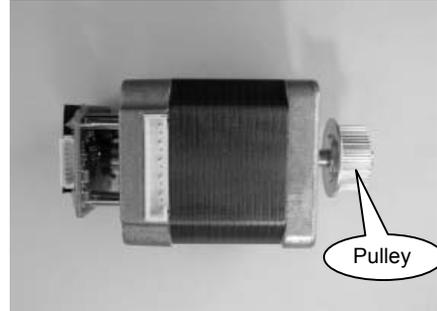


10.9.2 Motor Reversing Type

- SA5R/SA6R

[Items Required for Replacement]

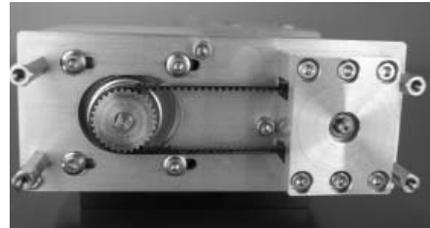
- Replacement motor (with a pulley on the motor shaft; see the photograph at right)
- Allen wrench set ● Phillips screwdriver
- Tension gauge
(capable of applying a tensile load of 3 kgf or more)
- Strong string or long tie-band



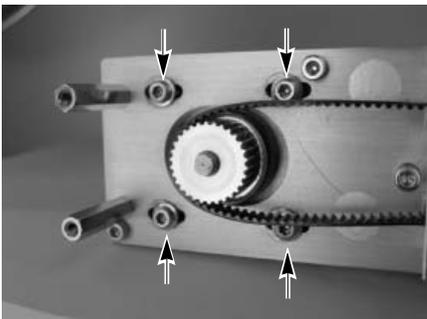
[Procedure]

- 1) Remove the pulley cover.

Remove the four thin-head mounting screws using an Allen wrench of 1.5 mm across flats.

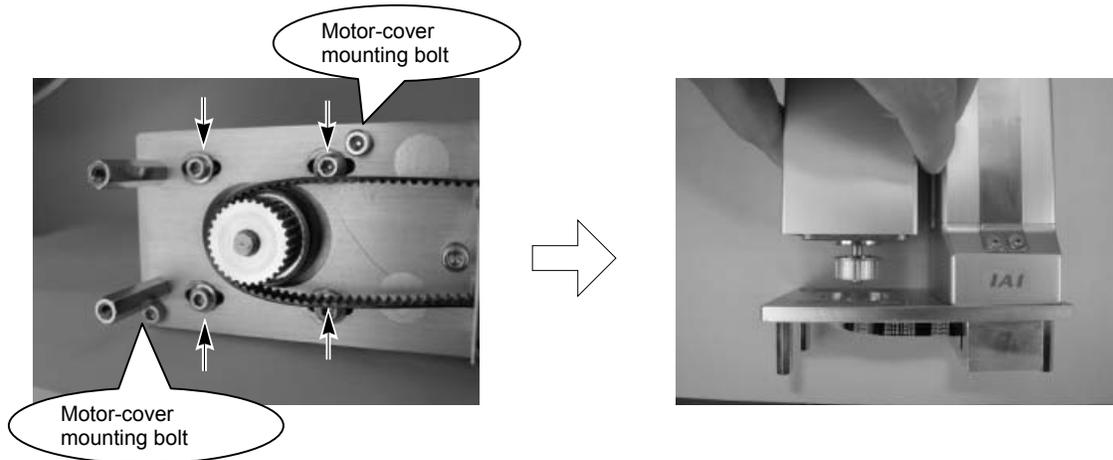


- 2) Loosen the tension adjustment bolts to loosen the belt. (Use an Allen wrench of 2.5 mm across flats.)

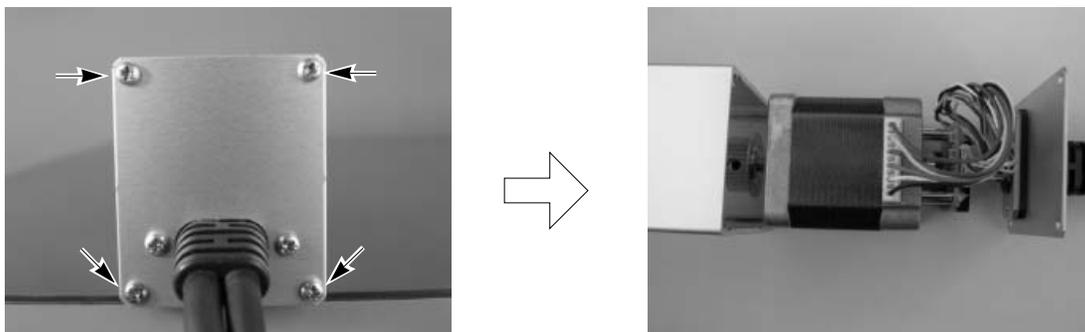


- 3) Remove the belt from the pulleys.

- 4) Pull out the four tension adjustment bolts and two motor-cover mounting bolts, and then remove the motor unit.



- 5) Remove the four pan-head screws mounting the motor-end cap on the motor unit, and then pull out the motor.



- 6) Pull out the motor connector.



- 7) Pull out the encoder connector.



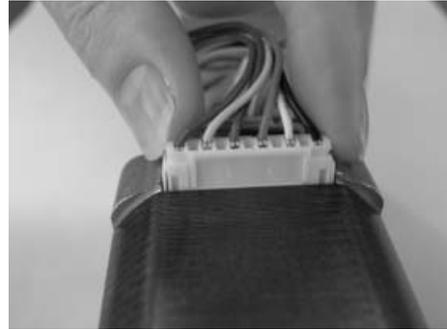
Caution: When applying the force, do not touch the encoder directly.

8) Connect the encoder connector and motor connector to a new motor.

- Connect the encoder connector.

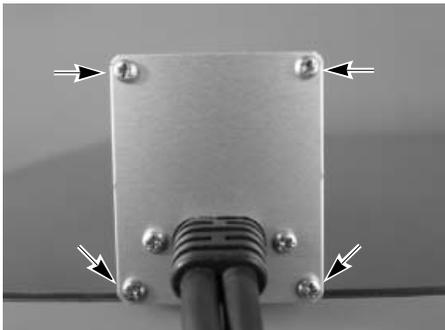


- Connect the motor connector.



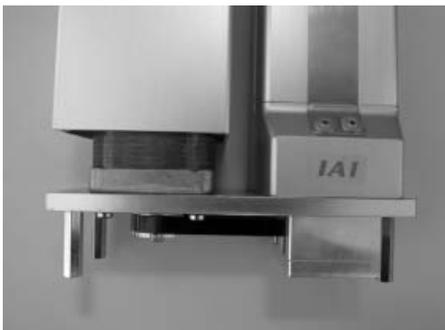
Caution: When applying the force, do not touch the encoder directly.

9) Connect the motor cover and motor-end cap using the pan-head mounting screws (M3 x 6, 4 pcs). At this time, pay attention not to pinch the cables.



Tightening torque: 61.5 N-cm (6.27 kgf-cm)

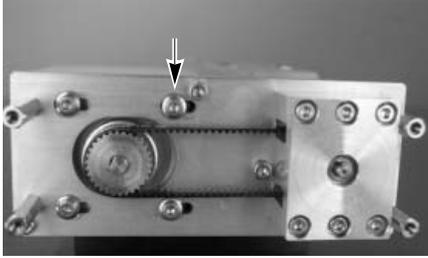
10) Loosely affix the motor in place using the tension adjustment bolts (hexagon socket-head bolt with washer M3 x 10, 4 pcs), and then pass the belt. In this condition, hook a looped strong string (or long tie-band) on the flange at the base of the motor, pull the string with a tension gauge to the specified tension, and then securely and uniformly tighten the adjustment bolts. (Use an Allen wrench of 2.5 mm across flats.)



Tensile force: 2.5 kgf
 Tightening torque of adjustment bolt:
 162 N-cm (16.5 kgf-cm)

11) Install the motor cover.

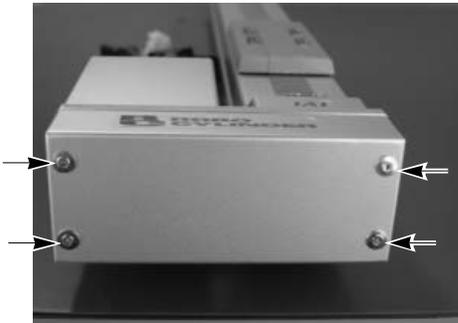
Tighten the hexagon socket-head bolts (M3 x 12, 2 pcs) using an Allen wrench of 2.5 mm across flats.



Tightening torque: 83 N-cm (8.47 kgf-cm)

12) Install the pulley cover.

Tighten the thin-head screws (M3 x 6, 4 pcs) using an Allen wrench of 1.5 mm across flats.



Tightening torque: 87.2 N-cm (8.90 kgf-cm)

● SA7R

[Items Required for Replacement]

- Replacement motor unit (see the photograph at right)
- Allen wrench set
- Tension gauge (capable of applying a tensile load of 8 kgf or more)
- Strong string or long tie-band



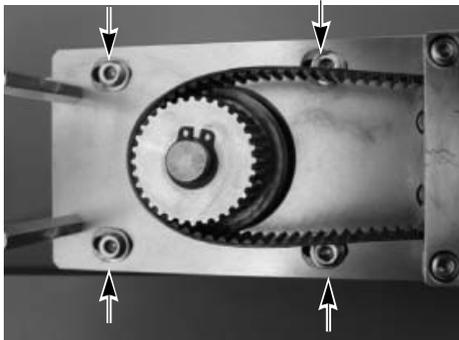
[Procedure]

1) Remove the pulley cover.

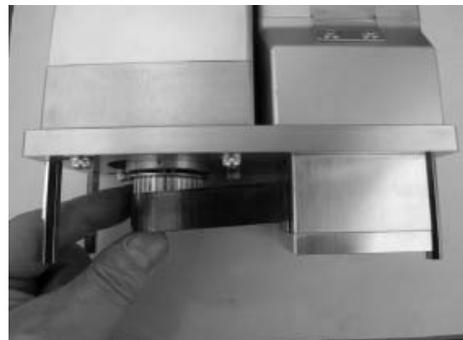
Remove the four thin-head mounting screws using an Allen wrench of 1.5 mm across flats.



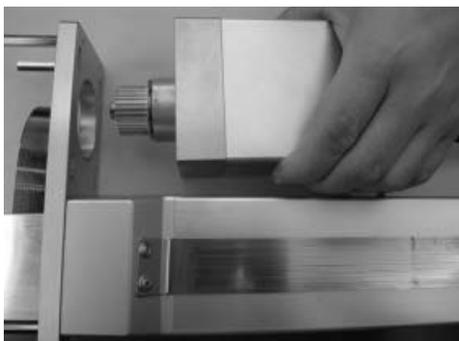
2) Loosen the tension adjustment bolts to loosen the belt. (Use an Allen wrench of 3 mm across flats.)



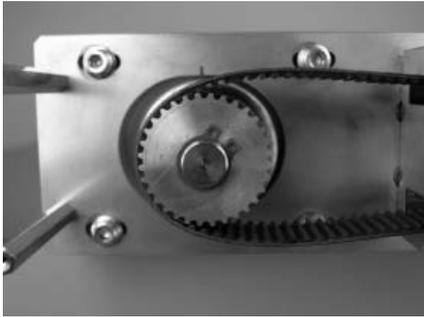
3) Remove the belt from the pulleys.



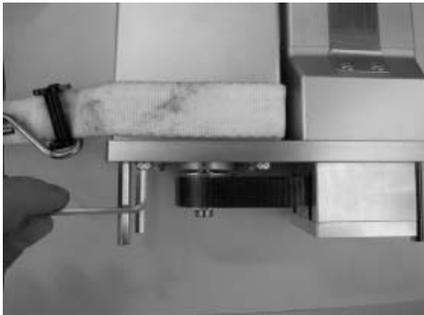
4) Pull out the tension adjustment bolts and remove the motor unit.



- 5) Install a new motor unit, and loosely tighten the tension adjustment bolts (hexagon socket-head bolt with washer M4 x 20, 4 pcs).
In this condition, pass the reduction belt around the pulleys.



- 6) Hook a looped strong string (or long tie-band) on the motor bracket, pull the string with a tension gauge to the specified tension, and then securely and uniformly tighten the adjustment bolts.



Tensile force: 8 kgf
Tightening torque of adjustment bolt:
323 N·cm (33 kgf·cm)

- 7) Install the pulley cover.
Tighten the thin-head screws (M3 x 6, 4 pcs) using an Allen wrench of 1.5 mm across flats.

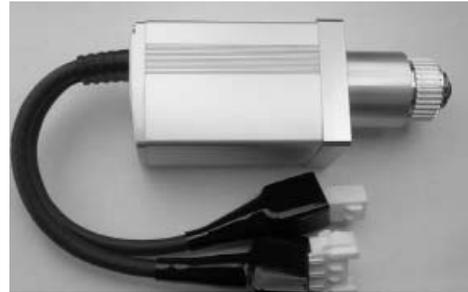


Tightening torque: 87.2 N·cm (8.90 kgf·cm)

● SSR/SMR/HSMR

[Items Required for Replacement]

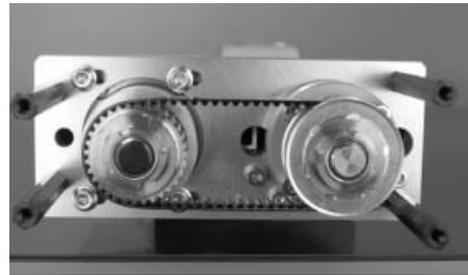
- Replacement motor unit (see the photograph at right)
- Allen wrench set
- Tension gauge (capable of applying a tensile load of 12 kgf or more)
- Strong string or long tie-band



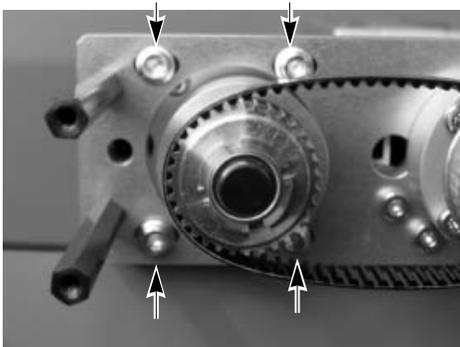
[Procedure]

1) Remove the pulley cover.

Remove the four thin-head mounting screws using an Allen wrench of 2 mm across flats.



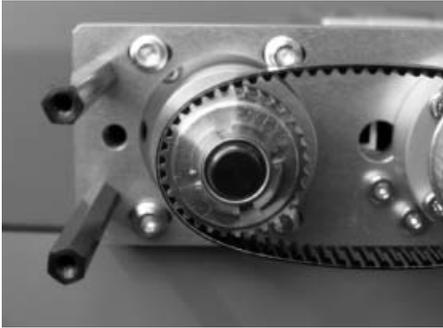
2) Loosen the tension adjustment bolts to loosen the belt. (Use an Allen wrench of 3 mm across flats.)



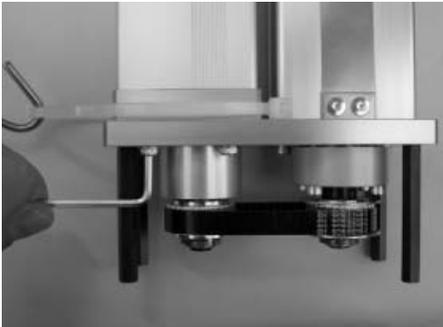
4) Pull out the tension adjustment bolts and remove the motor unit.



- 5) Install a new motor unit, and loosely tighten the tension adjustment bolts (hexagon socket-head bolt with washer M4 x 20, 4 pcs). In this condition, pass the reduction belt around the pulleys.



- 6) Hook a looped strong string (or long tie-band) on the motor bracket, pull the string with a tension gauge to the specified tension, and then securely and uniformly tighten the adjustment bolts.



Tensile force: SSR 7.3 kgf, SMR/HSMR 11.6 kgf
Tightening torque of adjustment bolt:
323 N·cm (33 kgf·cm)

- 7) Install the pulley cover.
Tighten the thin-head screws (M4 x 6, 4 pcs) using an Allen wrench of 2 mm across flats.

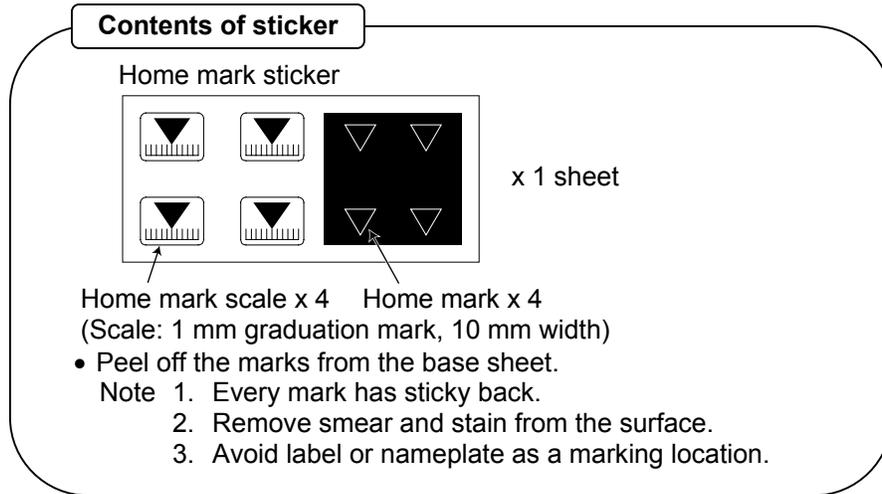


Tightening torque: 204 N·cm (20.8 kgf·cm)

Appendix

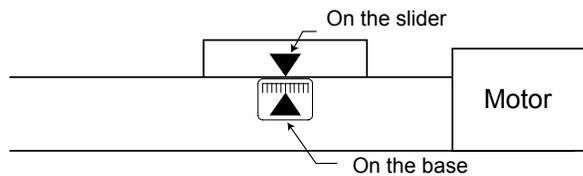
How to use the home mark

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



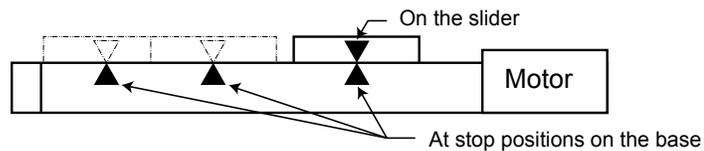
Example of Use

- [1] Used as home position



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

- [2] Used as stop positions





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