



ROBO Cylinder Arm Type

RCA Actuators

[RCA-A4R
RCA-A5R
RCA-A6R]

RCS2 Actuators

[RCS2-A4R
RCS2-A5R
RCS2-A6R]

Operating Manual

First Edition



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.

Danger

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 machinery

This 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.
- 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.
- 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.
- If any of the product's protective functions (alarms) has actuated, turn off the power immediately. Continuing to use the product may result in injury due to product malfunction, or cause product breakdown or damage. After the power has been cut off, identify and remove the cause of the problem, and then reconnect the power.
- Do not step on the product, use it as a footstool or place any object on it. You may slip and fall or the product may tip over or drop, resulting in injury. Malfunction, runaway product, etc., may also result due to product breakdown or damage.

Maintenance, Inspection, Repair

- Before commencing maintenance/inspection, servicing, replacement or any other work on the product, be sure to completely cut off the power supply to the product. Also take heed of the following precautions:
 1. Put up a sign bearing "WORK IN PROGRESS. DO NOT TURN ON POWER" or other warning statement to that effect, to prevent a bystander from accidentally turning on the power.
 2. If multiple operators work together to perform maintenance/inspection work, the operators should always give verbal cues to one another to ensure safety before turning on/off the power or moving any axis.

Disposal

- Do not throw the product into flames. The product may explode or toxic gases may generate.

Caution

Installation

- Do not use the product in a place exposed to direct sunlight (ultraviolet ray), dusty place or place where air contains salt or iron powder, humid place, or in any ambience where the product may come in contact with organic solvent, hydraulic oil containing phosphate ester, etc. If used in these places/ambiences, the product may lose its function over a short period of time or suffer rapid performance deterioration, or the service life of the product may be reduced.
- Do not use the product in an ambience area where it may come in contact with corrosive gases (sulfuric acid, hydrochloric acid, etc.). The product may lose its strength due to rust.
- Provide sufficient shielding measures if the product is used in any of the following places. If proper measures are not taken, the product may malfunction:
 1. Place where large current or strong magnetic field generates
 2. Place where arc discharge occurs due to welding work, etc.
 3. Place where noise generates due to electrostatic, etc.
 4. Place where the product may come in contact with radiation

- Do not install the product in a place subject to vibration or shock.
- Provide an emergency stop device in an easily accessible position so the device can be immediately actuated should danger occur during operation. Failure to do so may result in injury.
- Provide sufficient maintenance space when installing the product. If sufficient space is not available, daily inspection, maintenance and other necessary work cannot be carried out, resulting in system shutdown or product damage.
- When transporting or installing the product, support the product using a lift or suspension equipment or carry it with multiple operators working together, and exercise due caution to ensure safety.
- When installing the product, do not hold the moving parts or cables of the product. Doing so may result in injury.
- Use IAI's genuine cables to connect the actuator and controller. Also use IAI's genuine components for the actuator, controller, teaching pendant, etc.
- The brake mechanism is designed to prevent the slider from dropping upon turning off the power when the actuator is installed vertically. Do not use the brake mechanism as a safety brake.
- When installing, adjusting or carrying out any other work on the actuator, put up a sign bearing "WORK IN PROGRESS. DO NOT TURN ON POWER" or other warning statement to that effect, to prevent the product from being powered on accidentally. If the power is turned on accidentally, injury may result due to electric shock or sudden movement of the actuator.

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 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

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 0.05mm.
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.

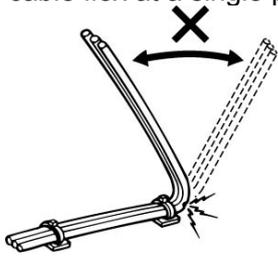
Others

- IAI shall not be liable whatsoever for any loss or damage arising from a failure to observe the items specified in "Safety Precautions."

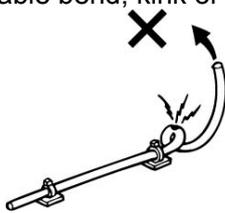
Prohibited Handling of Cables

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.

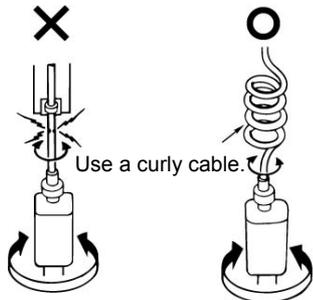
1. Do not let the cable flex at a single point.



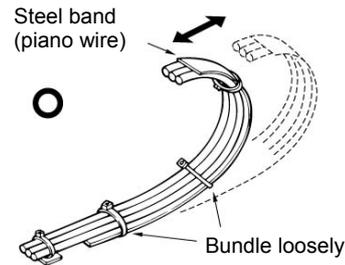
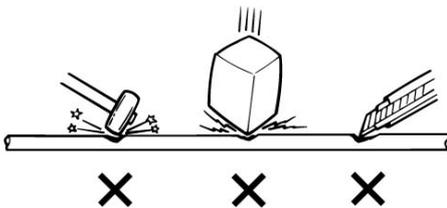
2. Do not let the cable bend, kink or twist.



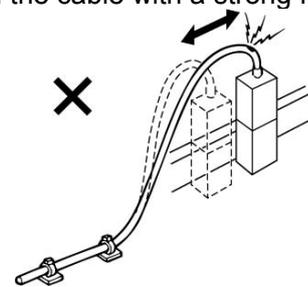
4. Do not let the cable receive a turning force at a single point.



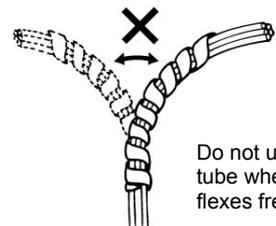
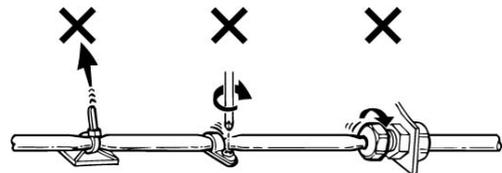
6. Do not pinch, drop a heavy object onto or cut the cable.



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



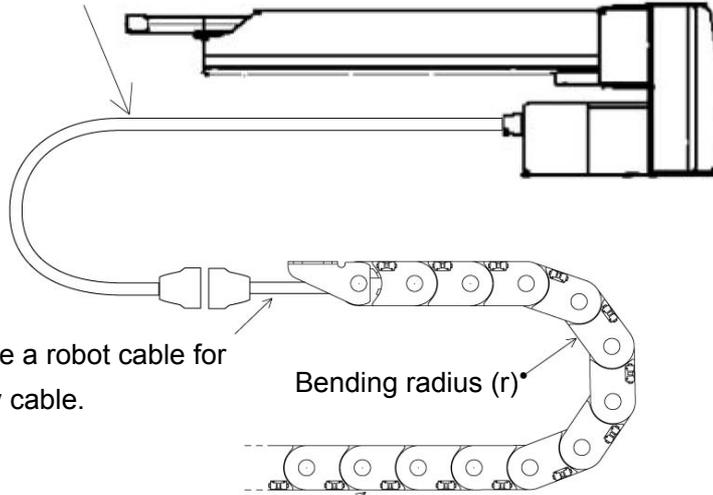
5. When fixing the cable, provide a moderate slack and do not tension it too tight.



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

7. Notes on using cable bearers

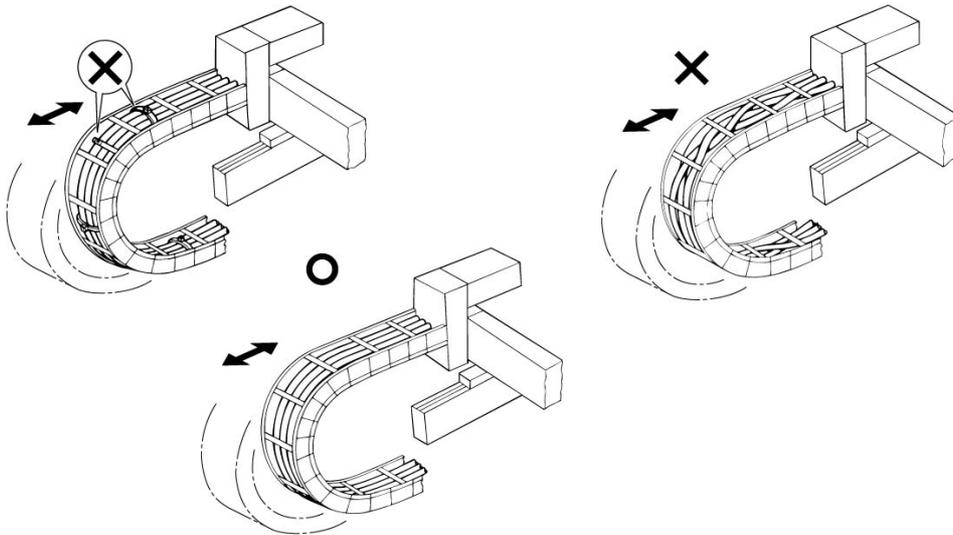
- The supplied cables are not robot cables. Accordingly, never store the cables in a cable bearer.



- Always use a robot cable for each relay cable.

- Use a cable bearer with a bending radius (r) of 50mm or greater.

- 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).



- Do not cause the cables to occupy more than 60% of the space in the cable bearer.

- Do not lay signal lines together with circuit lines that create a strong electric field.

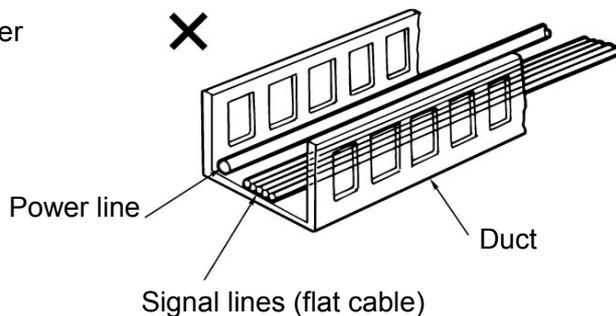
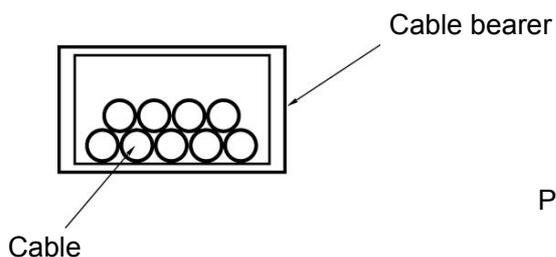


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1. Foreword

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.

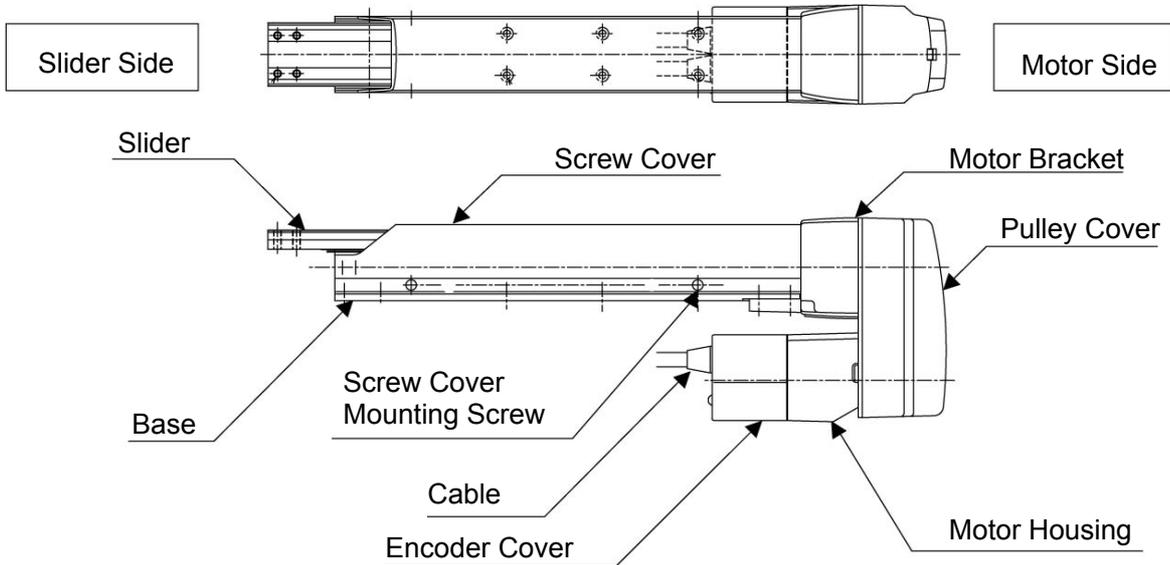
The warranty pertains to the purchased product itself and does not cover any damages that might arise from a breakdown of the supplied product.

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.

●A4R, A5R, A6R



Caution: The cable directly connected to the actuator is not a robot cable even when ordered with a 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 operators 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 which may deform the shipping box or objects with concentrated loads on top of the 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 pulley cover, motor housing and encoder cover.
- Do not exert excessive force on any part of the actuator.
- Be careful not to cause the cables to receive a tensile force.

*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 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 at 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 0.3G during transportation.
- When suspending the actuator-assembled peripheral equipment using ropes, etc., make sure that 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 directly 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

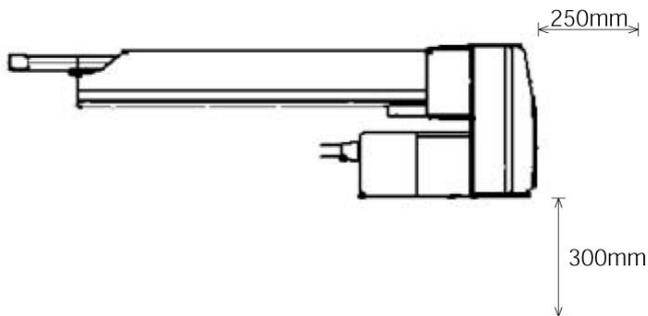
6.1 Operating Environment

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 operation.
- Avoid exposure to oil mist or fluids used in cutting.
- The unit should not be subject to impact or vibrations.
- 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 equipment or protective clothing.

Work space needed for maintenance/inspection



6.2 Storage Environment

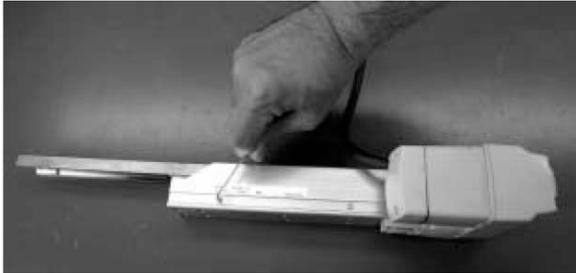
The storage environment should be similar to the operating environment. In addition, you must take precautions against condensation if the unit is to be stored for a long period of time. Unless there are special instructions, we do not include moisture absorption agents when shipping the unit. If you are storing the unit where condensation might occur, then you must treat the entire package from outside of the 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

7.1 Installing the Main Body

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

Install the main body as follows:



Pull out the slider to the stroke end. Remove four screw cover mounting screws with an Allen wrench of 1.5mm across flats to remove the screw cover.

If the actuator has a brake, connect this machine to the controller and pull out the slider to the stroke end after the brake has been released with the brake release switch. Then, turn off the controller power for safety.



Check to see that a 0.1mm thick gauge cannot be inserted at the mounting holes while this machine is left standing on the mounting surface.



Secure the main body with the mounting holes on the base of this machine.

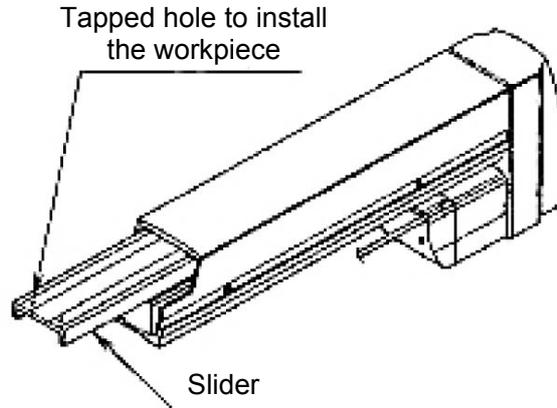
Use the hexagon socket head bolts shown below.

After securing the main body, reinstall the screw cover.

Type	When the bolt seating surface is steel	When the bolt seating surface is aluminum
A6R	M5 × 10	M5 × 15
A5R	M4 × 8	M4 × 12
A4R	M3 × 8	M3 × 12

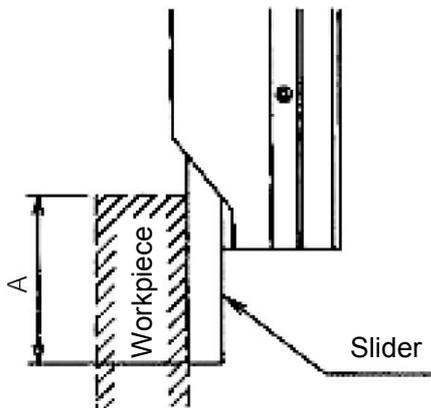
7.2 Installing the Workpiece

Use four M4 screws to install the workpiece to the slider.



Check to see that the workpiece seating surface is flat to prevent the slider from becoming deformed when the workpiece is installed.

Slider deformation may cause it to move rigidly or shorter its life.



Set the dimension of an overhang above the workpiece to the value shown below to prevent interference with the screw cover and workpiece.

Type	Dimension
A6R	A = 70mm
A5R	A = 65mm
A4R	A = 53mm

Do not exceed the maximum mass capacity.

Please make note of the slider moment, allowable overhang length and load weight.

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 a self-standing type cable as a 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 representatives.

9. Maximum Speed

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

Observe the maximum speed limits specified below.

Maximum speed limits

Type	Lead	Maximum Speed
A6R	6mm	200mm/sec.
	12mm	400mm/sec.
A5R	6mm	200mm/sec.
	12mm	400mm/sec.
A4R	5mm	165mm/sec.
	10mm	330mm/sec.

Caution: If the maximum speed limit is exceeded, noise may increase or vibration may occur due to resonance of the ball screw shaft, in which case the service life of the actuator may be significantly reduced.

If multiple actuators are used together, with each actuator operating independently, create programs where each actuator does not exceed the applicable maximum speed (see the table above). If operations of multiple actuators are synchronized, programs should be based on the lowest maximum speed among the combined actuators.

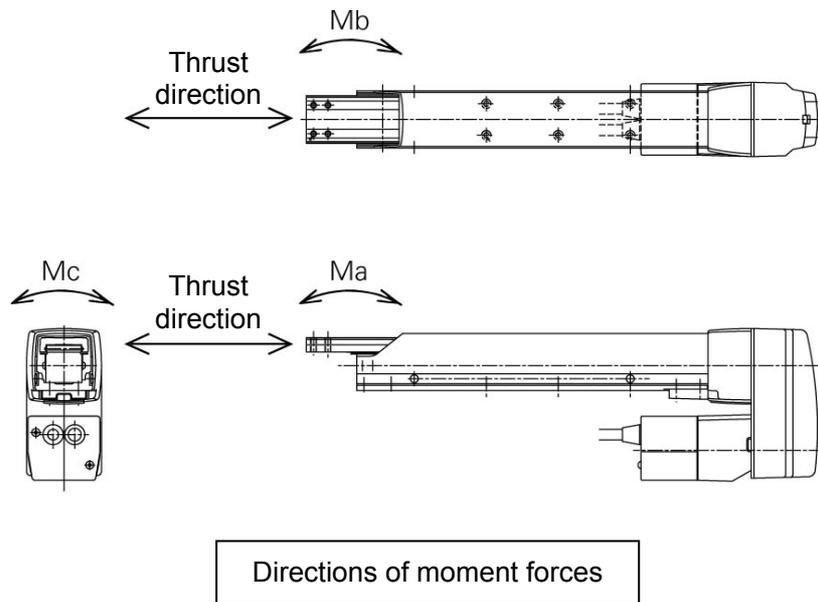
Create an appropriate program by checking the maximum speed of each actuator.

10. Load on the Actuator

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

Allowable load moments

Type	Ma	Mb	Mc
A6R	8.1N·m (0.83kgf·m)	10.0N·m (1.02kgf·m)	6.5N·m (0.66kgf·m)
A5R	4.5N·m (0.46kgf·m)	5.4N·m (0.55kgf·m)	4.1N·m (0.42kgf·m)
A4R	2.7N·m (0.28kgf·m)	3.1N·m (0.32kgf·m)	2.9N·m (0.30kgf·m)



Caution: Loads on the slider must be uniformly distributed. Securely hold the base to the flat frame.

11. Maintenance

11.1 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 a 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	○	○	○

11.2 Visual Inspection of the Machine Exterior

Check the following items when carrying out visual inspection.

Body	Loose mounting bolts?
Cables	Damage to cables or connection to connector box?
General	Unusual noise or vibrations?

11.3 Cleaning

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

11.4 Interior Inspection

Turn off the power, remove the side covers, and then visually inspect the interior.

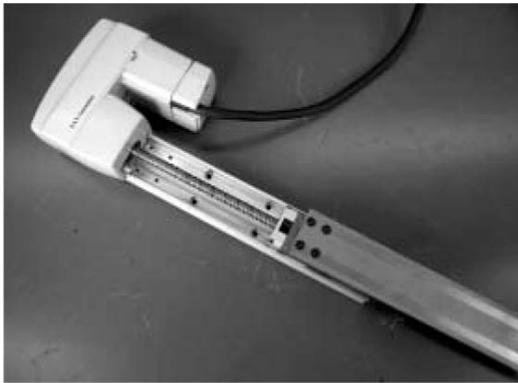
Check the following items during interior inspection.

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

How to inspect the interior:

- 1) Remove both side covers.

Use an Allen wrench of 1.5mm across flats.



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

- 2) If the grease becomes dirty and dull or if the grease has worn away due to extended operating time, lubricate the parts after cleaning them.

- 3) When the inspection/maintenance work is complete, install the side covers.

Tightening torque: Thin-head screw M3 × 6 87.2N·cm (8.90kgf·cm)

11.5 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 a large amount of foreign substances, wipe off the dirty grease and then apply new grease.

11.6 Lubricating the Guides and Ball Screw

11.6.1 What Grease to Use

(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

(2) What Grease to Use on the Ball Screw

The following grease is used when we ship the unit.

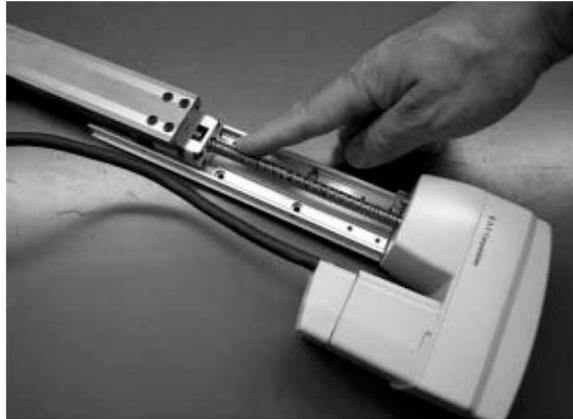
This grease offers excellent properties such as low heat generation, and is suitable for lubricating ball screws.

Kyodo Yushi	Multemp LRL3
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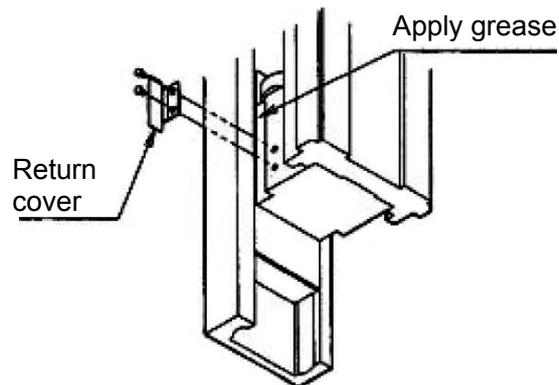
 Warning: Never use any fluorine-based grease. It will cause a chemical reaction when mixed with a lithium-based grease and may cause damage to the actuator.

11.6.2 How to Apply Grease

- 1) When greasing the ball screw, apply grease using a finger and then move the slider back and forth several times to let the grease spread evenly.



- 2) When greasing the slider, apply grease directly on the bearing while the return cover is removed from the guides.



- 3) Install the side covers.

Tightening torque: Thin-head screw M3 × 6 87.2N·cm (8.90kgf·cm)

11.7 Reduction Belt

11.7.1 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 are observed:

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

11.7.2 Applicable Belt

A4R, A5R, A6R

…60S2M180R

Rubber cleanroom type (Bando Chemical Industries)

6mm wide

11.7.3 Adjusting the Belt Tension

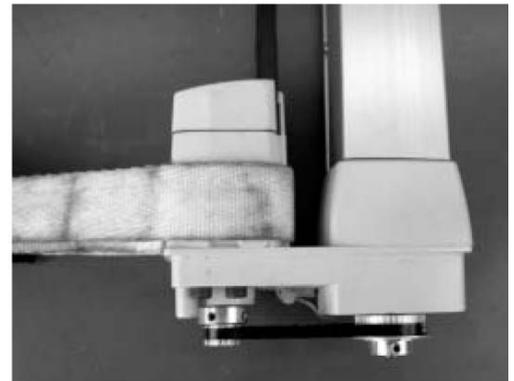
Remove the pulley cover and loosen the four motor-unit affixing bolts.

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

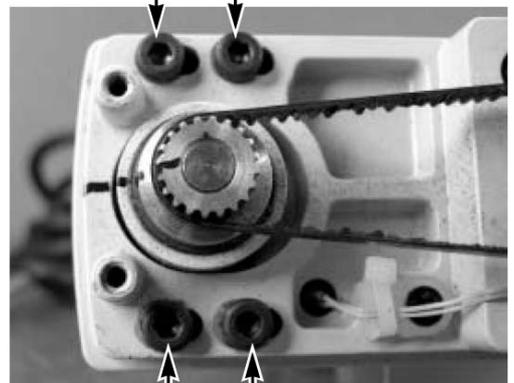
[Recommended tightening force for adjusting bolts]

162N·cm (16.5kgf·cm)

Tension: 2.5Kgf



Motor-unit affixing bolts
(Use an Allen wrench of 3 mm across flats.)



Motor-unit affixing bolts
(Use an Allen wrench of 3 mm across flats.)

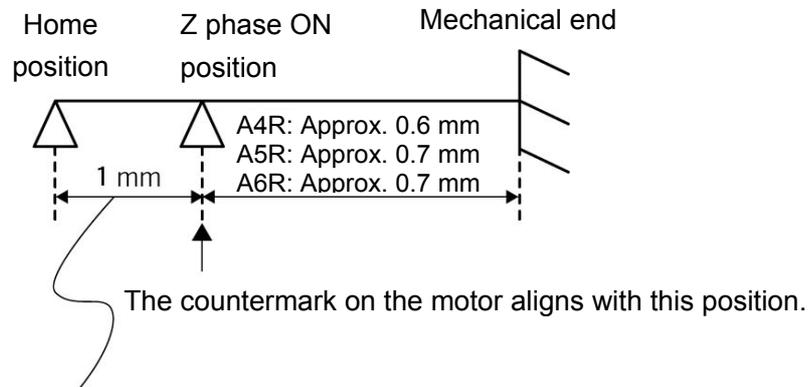
11.7.4 Replacing the Belt of the Motor Reversing Type: A4R, A5R, A6R

[Items Required for Replacement]

- Replacement belt
 - A4R, A5R, A6R
 - 60S2M180R Rubber cleanroom type (Bando Chemical Industries) 6mm wide
- Allen wrenches
- Tension gauge (Capable of tensioning to 7kgf or greater)
- Strong string, looped (or long tie-band)
- Scale · Oil-based marker pen
- PC or teaching pendant

[Overview of Replacement]

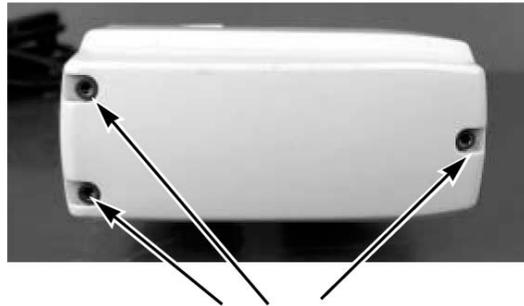
- 1) Move the slider to a position where Z phase turns on (home position) (0.6mm from the mechanical end for A4R or 0.7mm for A5R and A6R. Loosen the motor-unit affixing bolts and replace the belt in this position.
- 2) Restore the home position.
Affix the slider at a position 0.6mm from the mechanical end on the home side for A4R or 0.7mm for A5R and A6R, pass the belt, and adjust the belt to the specified tension.
- 3) Perform homing using a PC or teaching pendant and check for deviation from the initial home position.
If there is a deviation, adjust the home offset parameter.



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

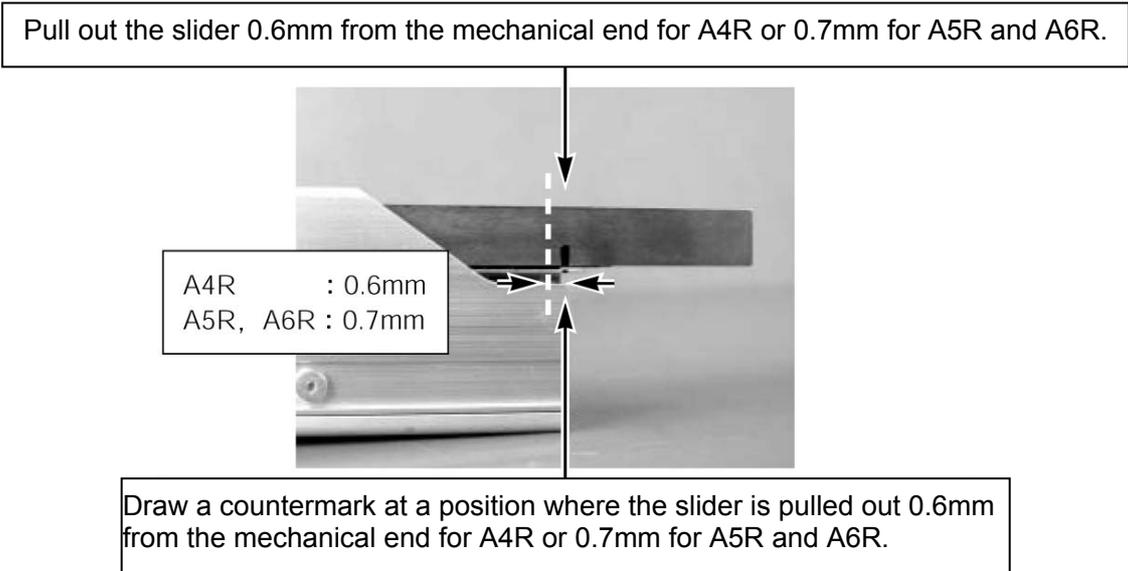
[Procedure]

- 1) Remove the pulley cover using an Allen wrench of 2.5mm across flats.



Hexagon socket head screws: M3

- 2) Move the slider to a position where Z phase turns on (home position).
The slider is placed at a position 0.6mm from the mechanical end for A4R or 0.7mm for A5R and A6R.
Draw a countermark at the slider pulled-out position.

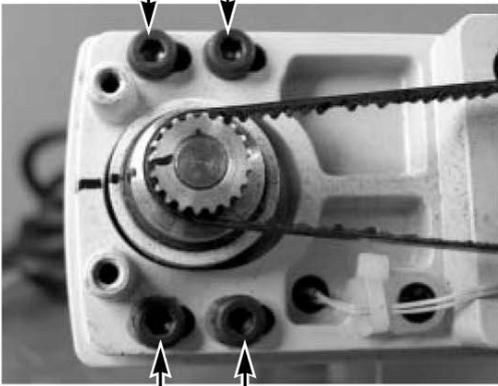


If the actuator has a brake, connect this machine to the controller and pull out the slider to the stroke end after the brake has been released with the brake release switch. Then, turn off the controller power for safety.

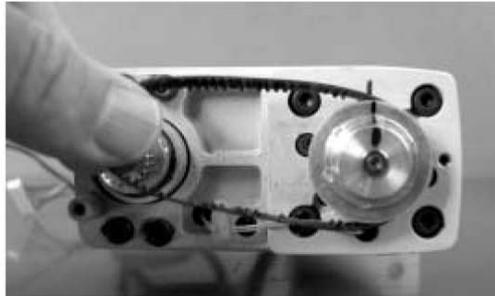
Warning: If the actuator is installed vertically, move it after turning on the controller power and forcibly releasing the brake. At this time, beware of danger as the actuator may drop suddenly. Always provide a support to brace the hand part and to prevent a sudden drop, so as not to pinch fingers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

3) Loosen the motor-unit affixing bolts using an Allen wrench of 3mm across flats. Slide the motor, and loosen and remove the belt.

Motor-unit affixing bolts
(Use an Allen wrench of 3mm across flats.)



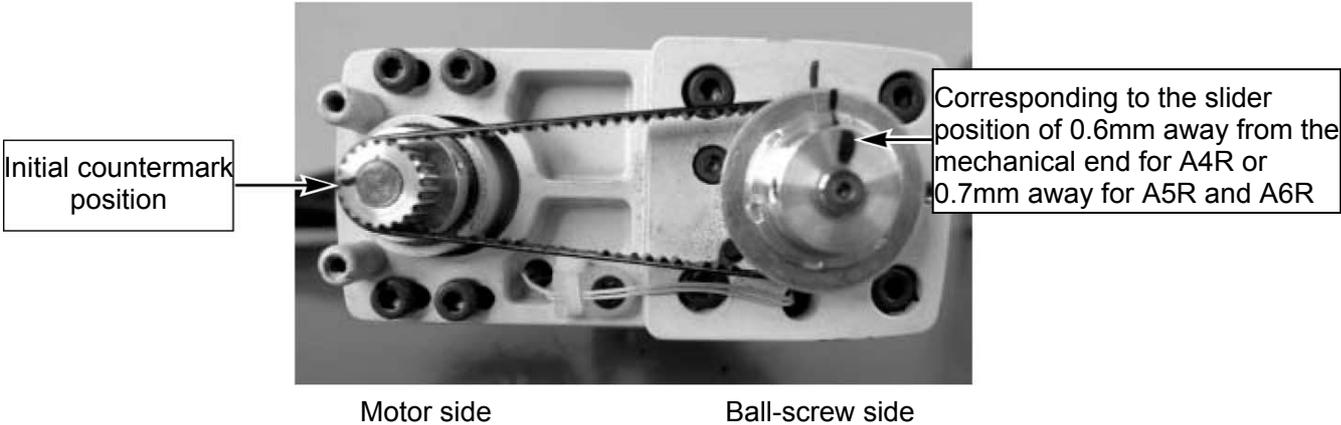
Motor-unit affixing bolts
(Use an Allen wrench of 3mm across flats.)



4) Check the following points before restoring the home position:

- The motor side should be aligned with the initial countermark. If the position is offset, adjust it to achieve proper alignment.
- The ball-screw side should be in a location corresponding to the slide position of 0.6mm away from the mechanical end for A4R or 0.7mm away for A5R and A6R.

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



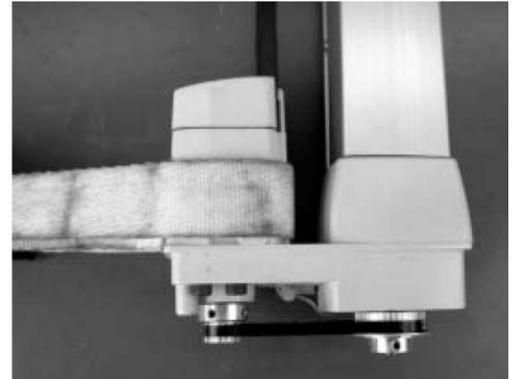
5) Adjust the belt tension.

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

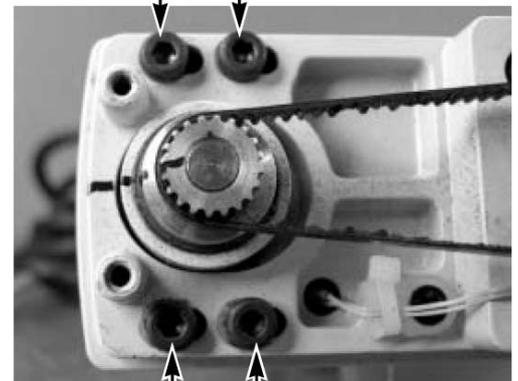
[Recommended tightening torque for adjusting bolts]

162N·cm (16.5kgf·cm)

Tension: 2.5Kgf ←

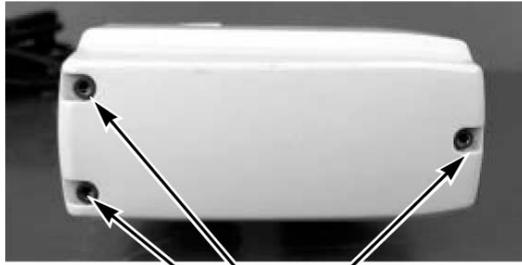


Motor-unit affixing bolts
(Use an Allen wrench of 3mm across flats.)



Motor-unit affixing bolts
(Use an Allen wrench of 3mm across flats.)

6) Install the pulley cover using an Allen wrench of 2.5mm across flats.



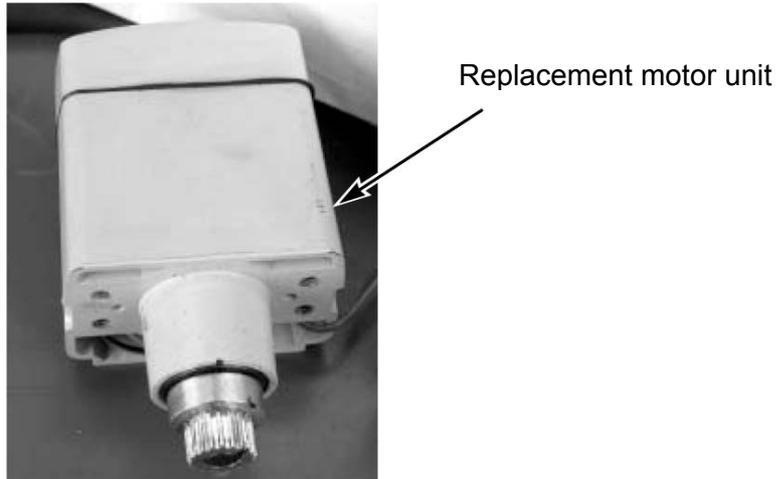
Hexagon socket head screws: M3

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

11.8 Replacing the Motor: A4R, A5R, A6R

[Items Required for Replacement]

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

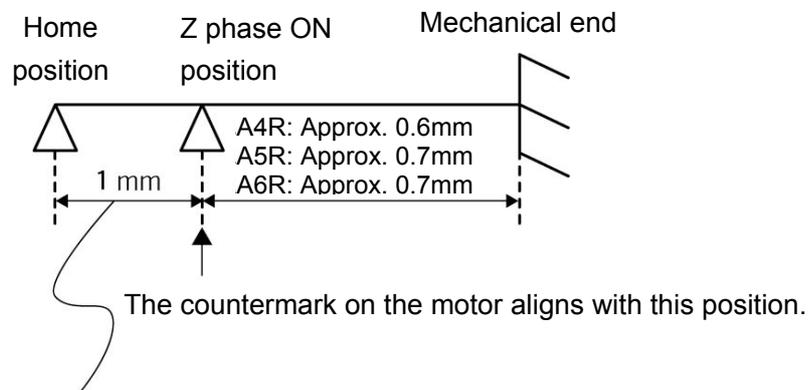


[Overview of Replacement]

- 1) Loosen the motor-unit affixing bolts to remove the belt, and replace the motor.
- 2) Restore the home position.

Affix the slider at a position 0.6mm from the mechanical end on the home side for A4R or 0.7mm for A5R and A6R, pass the belt, and adjust the belt to the specified tension.

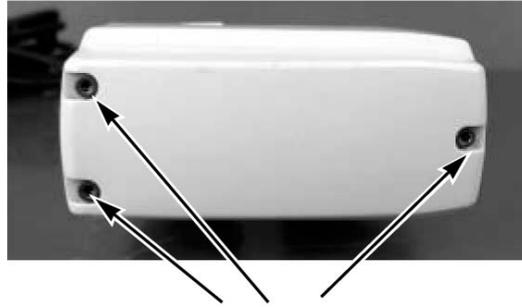
- 3) Perform homing using a PC or teaching pendant and check for deviation from the initial home position. If there is a deviation, adjust the home offset parameter.



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

[Procedure]

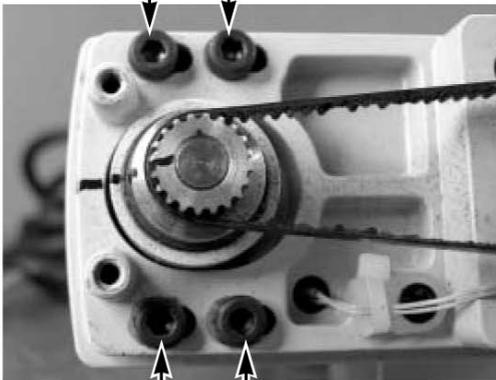
- 1) Remove the pulley cover using an Allen wrench of 2.5mm across flats.



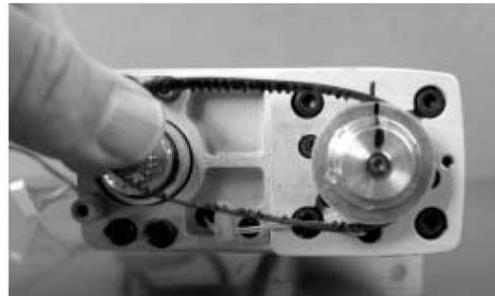
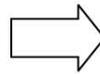
Hexagon socket head screws: M3

- 2) Loosen the motor-unit affixing bolts using an Allen wrench of 3mm across the flats. Slide the motor, and loosen and remove the belt. After the belt has been removed, remove the motor-unit affixing bolts.

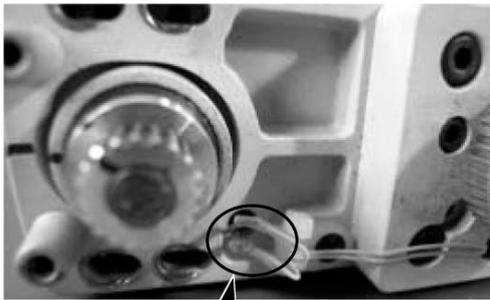
Motor-unit affixing bolts
(Use an Allen wrench of 3mm across flats.)



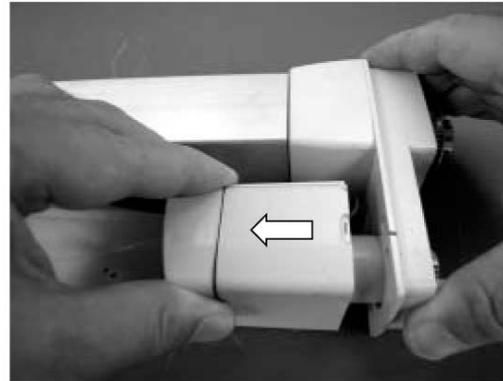
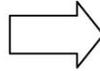
Motor-unit affixing bolts
(Use an Allen wrench of 3mm across flats.)



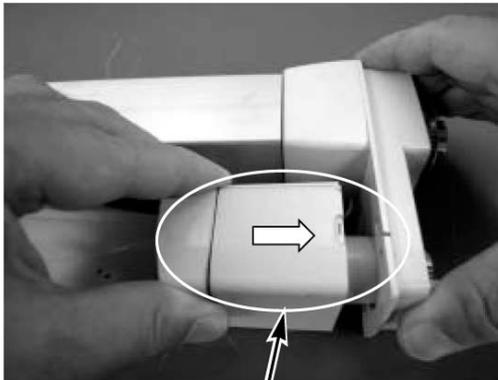
3) If the actuator has a brake, disconnect the brake cable and remove the motor.



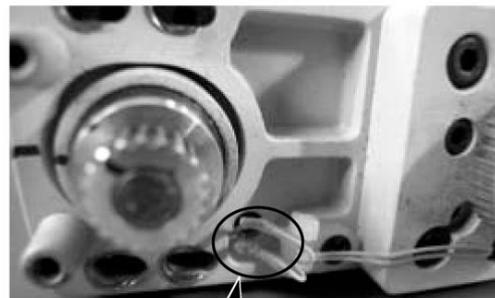
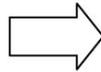
Disconnect the brake cable.



4) Install the replacement motor unit. If the actuator has a brake, solder and connect the brake cable. Cover the soldered portion of the cable with a vinyl tube and then temporarily secure it with the motor-unit affixing bolts.



Replacement motor

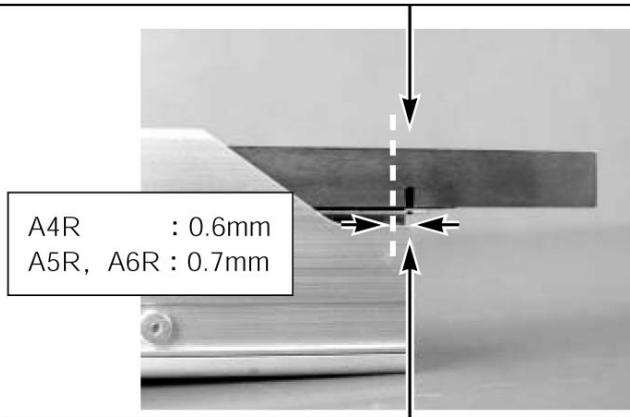


Solder and connect the brake cable

5) Move the slider to a position where Z phase turns on (home position).

The slider is placed at a position 0.6mm from the mechanical end for A4R or 0.7mm for A5R and A6R.
Draw a countermark at the slider pulled-out position.

Pull out the slider 0.6mm from the mechanical end for A4R or 0.7mm for A5R and A6R.



Draw a countermark at a position where the slider is pulled out 0.6mm from the mechanical end for A4R or 0.7mm for A5R and A6R.

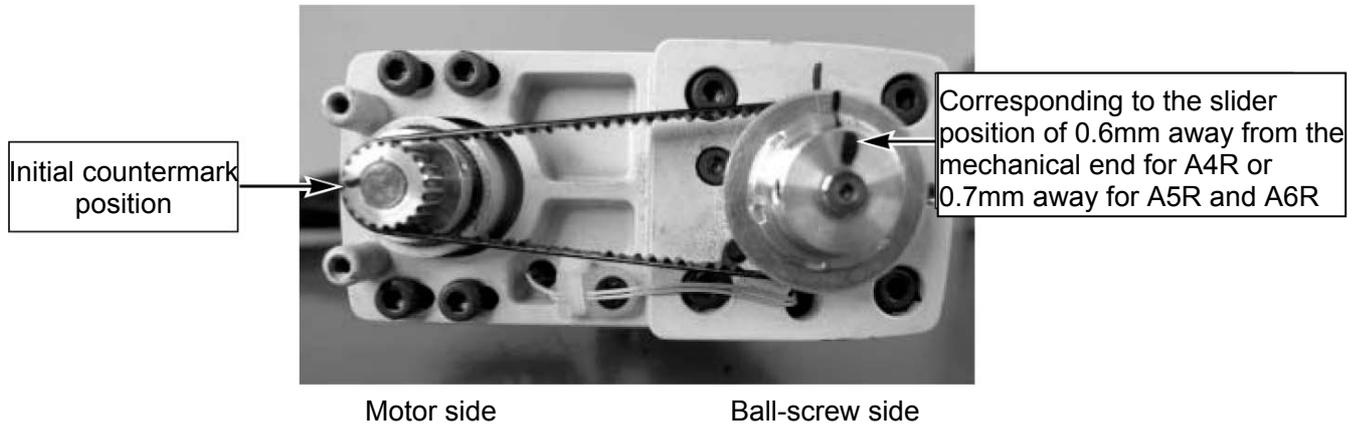
If the actuator has a brake, connect this machine to the controller and pull out the slider to the stroke end after the brake has been released with the brake release switch. Then, turn off the controller power for safety.

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

6) Check the following points before restoring the home position:

- The motor side should be aligned with the initial countermark.
- The ball-screw side should be in a location corresponding to the slide position of 0.6mm away from the mechanical end for A4R or 0.7mm away for A5R and A6R.

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



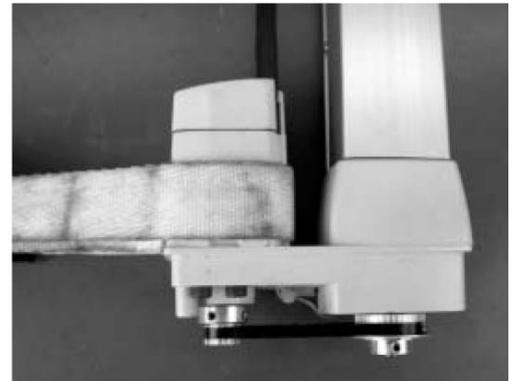
7) Adjust the belt tension.

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

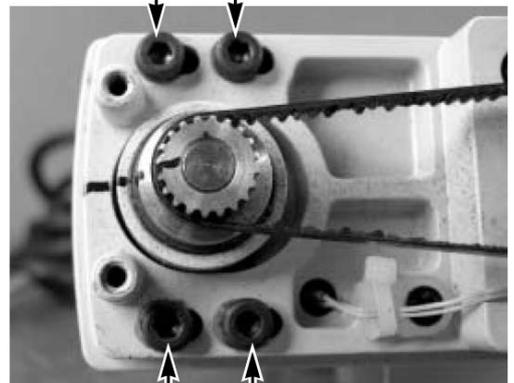
[Recommended tightening torque for adjusting bolts]

162N·cm (16.5kgf·cm)

Tension: 2.5Kgf

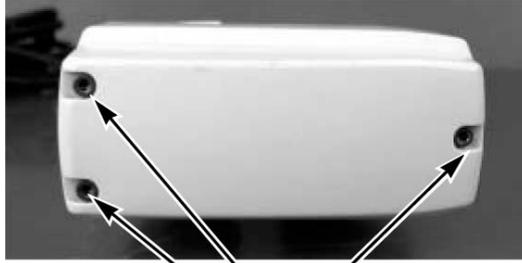


Motor-unit affixing bolts
(Use an Allen wrench of 3 mm across flats.)



Motor-unit affixing bolts
(Use an Allen wrench of 3 mm across flats.)

8) Install the pulley cover using an Allen wrench of 2.5mm across flats.



Hexagon socket head screws: M3

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



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