



ROBO Cylinder RCP2 Actuator Belt-Drive Type

[BA6. BA6U. BA7. BA7U]

Operating Manual

Seventh Edition



IAI America, Inc.

Please Read Before Use

Thank you for purchasing our product.

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

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

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

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

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

[Important]

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

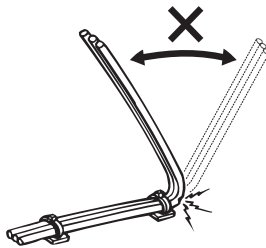
CE Marking

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

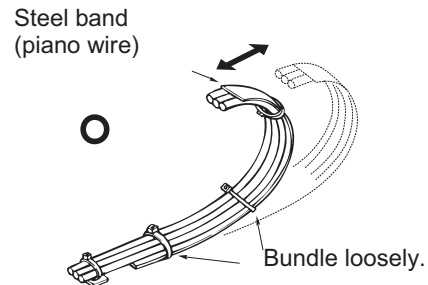
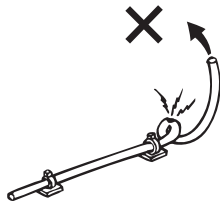
Prohibited Handling of Cables

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.

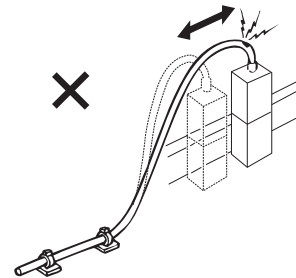
1. Do not let the cable flex at a single point.



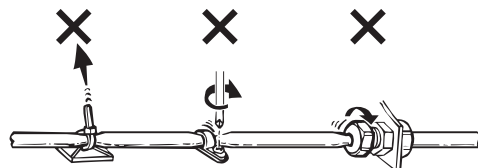
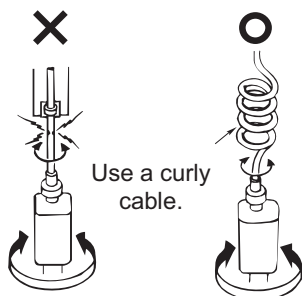
2. Do not let the cable bend, kink or twist.



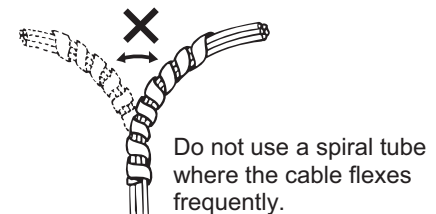
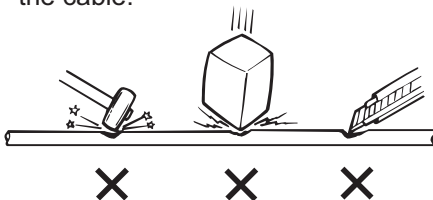
3. Do not pull the cable with a strong force.



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.

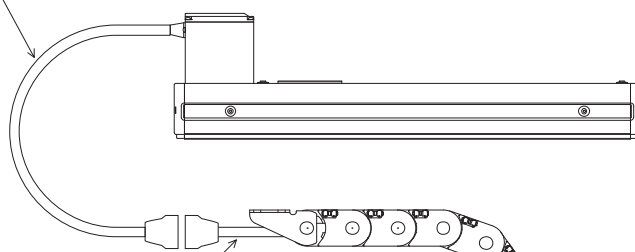


6. Do not pinch, drop a heavy object onto or cut the cable.

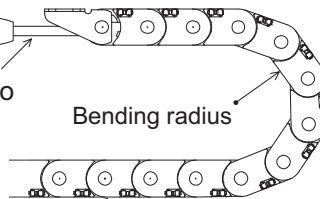


7. Notes on use of cable tracks.

- The supplied cable is not a robot cable, so never store it in a cable track.



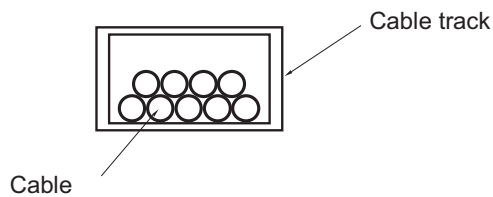
- For a extension cable, be sure to use a robot cable.



- Use a cable track with a bending radius r of 50 mm or more.

- Do not let the cable get tangled or kinked in a cable track 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 track.



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

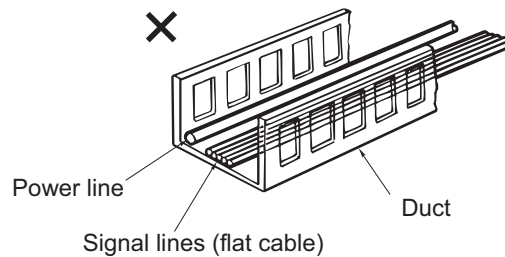


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Safety Guide

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

Safety Precautions for Our Products

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

No.	Operation Description	Description
1	Model Selection	<ul style="list-style-type: none">• This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications.<ol style="list-style-type: none">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 (For vehicle, railway facility or air navigation facility)3) Important safety parts of machinery (Safety device, etc.)• Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product.• Do not use it in any of the following environments.<ol style="list-style-type: none">1) Location where there is any inflammable gas, inflammable object or explosive2) Place with potential exposure to radiation3) Location with the ambient temperature or relative humidity exceeding the specification range4) Location where radiant heat is added from direct sunlight or other large heat source5) Location where condensation occurs due to abrupt temperature changes6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid)7) Location exposed to significant amount of dust, salt or iron powder8) Location subject to direct vibration or impact• For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

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

No.	Operation Description	Description
4	Installation and Start	<p>(2) Cable Wiring</p> <ul style="list-style-type: none"> ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire. <p>(3) Grounding</p> <ul style="list-style-type: none"> ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm² (AWG20 or equivalent) or more for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).





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

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

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

Alert Indication

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

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

Caution in Handling

1. Do not set speeds and accelerations/decelerations equal to or greater than the respective ratings.

If the actuator is operated at a speed or acceleration/deceleration exceeding the allowable value, abnormal noise or vibration, failure, or shorter life may result.

In the case of interpolated operation of combined axes, the speed and acceleration/deceleration settings should correspond to the minimum values among all combined axes.

2. Keep the load moment within the allowable value.

If the actuator is operated under a load equal to or greater than the allowable load moment, abnormal noise or vibration, failure, or shorter life may result. In an extreme case, flaking may occur.

3. Turn the servo ON after separating the slider, rod, etc. from the mechanical end.

If the servo is turned ON near the mechanical end, the polar phases cannot be normally detected, leading to a pole indefinite error or excitation detection error occurs.

Turn the servo ON after separating the slider, rod, etc. from the mechanical end.

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

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

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 precision. 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

One of the following periods, whichever is shorter:

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

3.2 Scope of Warranty

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

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

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

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

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

3.3 Honoring the Warranty

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

3.4 Limited Liability

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

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

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

3.6 Other Items Excluded from Warranty

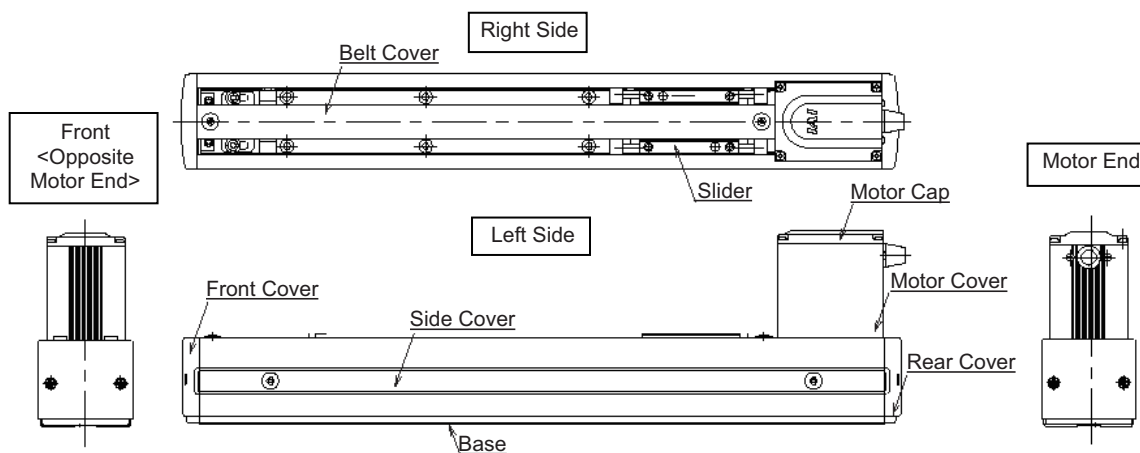
The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:

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

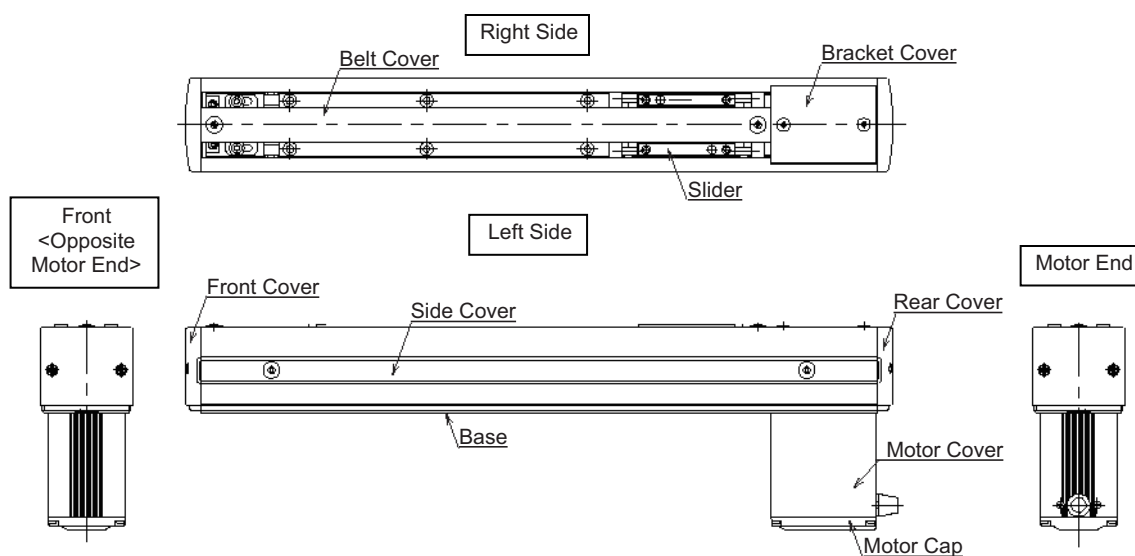
4. Names of the Parts

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.

- BA6/BA7 (Motor on Top)



- BA6U/BA7U (Motor at Bottom)



5. Transporting and Handling

5.1 Handling the Actuator

Pay attention to the following instructions when transporting the actuator alone.

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.

* Please refer to Section 4, "Name of the Parts" 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

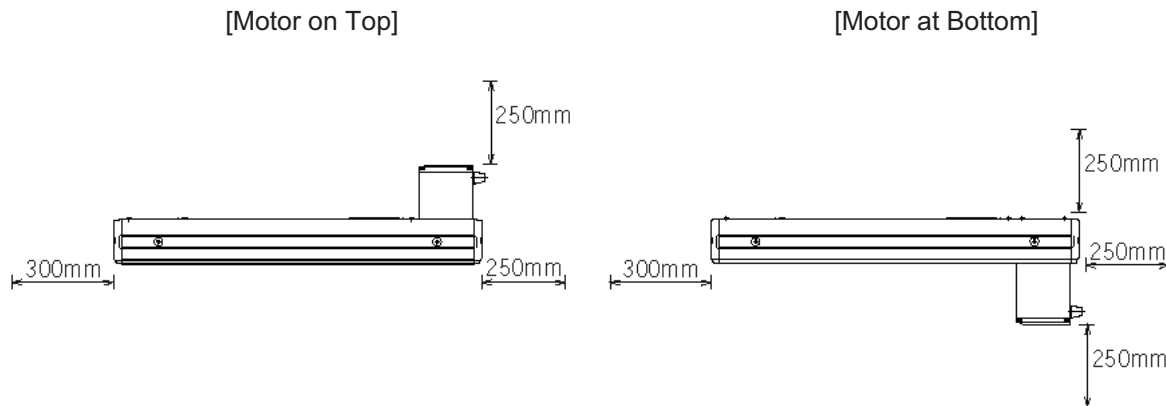
6.1 Operating Environment

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

- Avoid direct sunlight.
- Avoid radiant heat from strong heat sources such as a furnace.
- Surrounding air 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 using in cutting.
- The unit should not be subject to vibrations or shocks.
- 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



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

This chapter explains how to install the actuator in a single-axis setup.


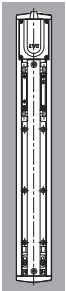
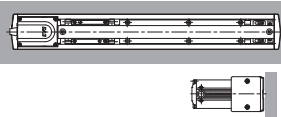
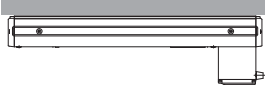
7.1 Installation posture

There is a restriction on how to install the actuator.

○ : Available × : Not available

Type	Horizontally installation	Vertical installation	Sideway installation	Ceiling mount installation
BA6, BA6U, BA7, BA7U	○	×	×	○

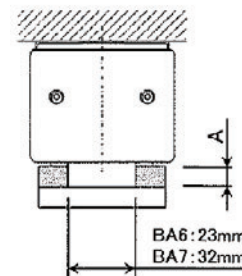
Installation posture

Horizontally installation	Vertical installation	Sideway installation	Ceiling mount installation
			

The figures above are motor on top side.

⚠ Caution: In the Ceiling mount installation, the belt cover may bend, and it will be likely to interfere with the work part. When the stroke is more than 500mm for SA6 or SA6U, or the stroke more than 600mm for SA7 or SA7U, make a gap to the slider seat to attach a work piece.

Type	Stroke	Distance A
BA6, BA6U	500 mm to 1000 mm	5 mm or more
BA7, BA7U	600 mm to 1200 mm	5 mm or more



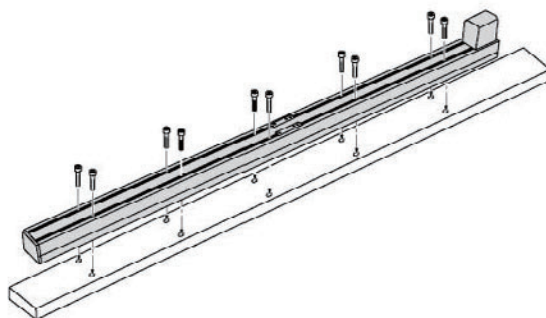
7.2 Installing the Main Body

The actuator base has mounting holes. Affix the actuator with M4 hexagon socket-head bolts using these holes. Use of high strength bolts of ISO-10.9 or higher is recommended.

The length of mounting bolts varies depending on the material of the machine frame.

- Steel frame: M4 x 10
- Aluminum frame: M4 x 15

Tightening torque: 2.3 N·m (0.23 kgf·m)



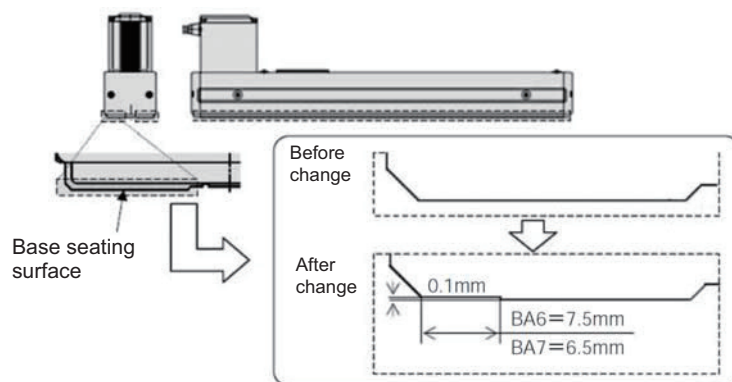
Reamed positioning pin holes are provided in the back face of the base. Use these holes as necessary.

- Reamed hole: $\varnothing 4H7$, depth 5 mm or less

[Base seating surface]

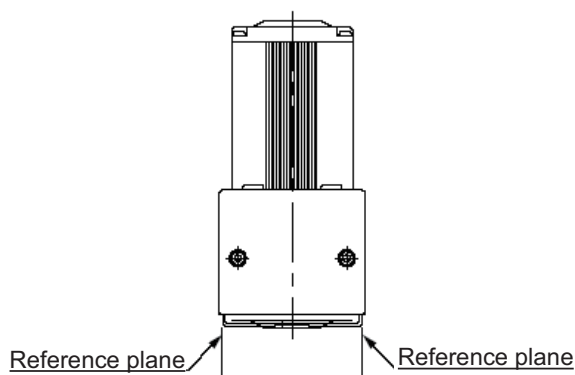
The base seating surface was changed and the width was reduced in order to minimize base deformation caused by the installation surface shape when fixing the actuator with bolts (from August 2010).

The installation dimensions stay the same.



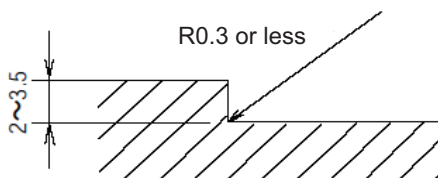
7.3 Mounting Surface

- The mounting table should have sufficient rigidity to suppress 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.



7.4 Installing the Load to the Slider

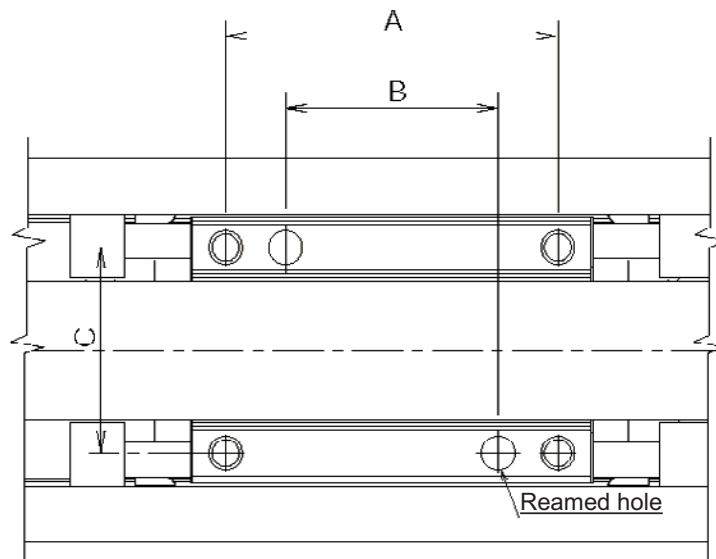
- Tapped holes are provided on the slider for installing the load.
- In case of moving actuator instead of slider, use the same tapped holes on the slider.
- Please use two reamed holes on the slider when repeatability of mounting and dismounting is required.
When fine adjustment of the squareness is 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	Hole depth
BA6/BA6U	M5	10 mm	50 mm	32 mm	31 mm	Ø5 H7	10 mm
BA7/BA7U	M5	10 mm	65 mm	47 mm	40 mm	Ø5 H7	10 mm

The tightening torque is as follows.

- When the bolt-bearing surface is steel: 7.5 N·m (0.77 kgf·m)
- When the bolt-bearing surface is aluminum: 4.3 N·m (0.44 kgf·m)



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 track, 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.
- 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).

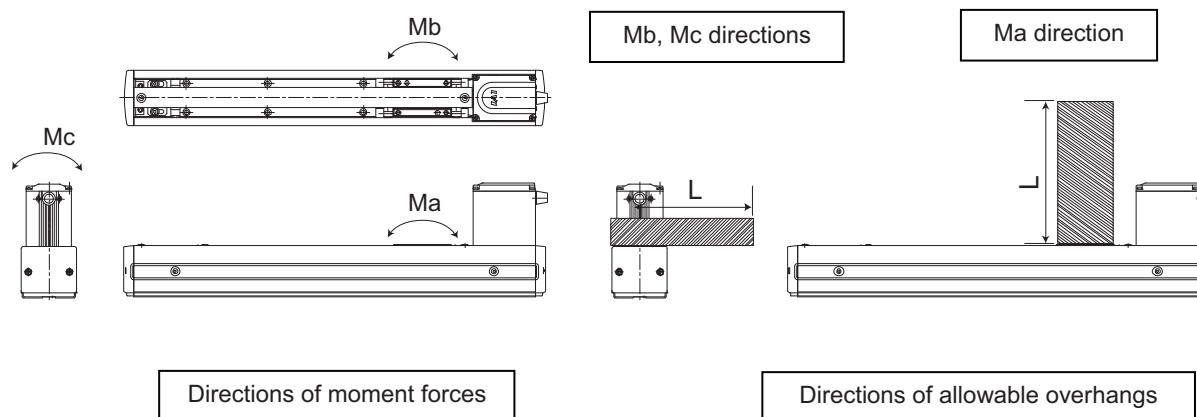
Allowable load moments

Model	M_a	M_b	M_c
BA6/BA6U	8.9 N·m (0.91 kgf·m)	12.7 N·m (1.29 kgf·m)	18.6 N·m (1.9 kgf·m)
BA7/BA7U	13.8 N·m (1.41 kgf·m)	19.7 N·m (2.01 kgf·m)	29.0 N·m (2.96 kgf·m)

Allowable overhang lengths

Model	M_a direction	M_b direction	M_c direction
BA6/BA6U	150 mm or less	150 mm or less	150 mm or less
BA7/BA7U	150 mm or less	150 mm or less	150 mm or less

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



Note) Allowing the actuator 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. Relation of Speed and Maximum Transportable Weight

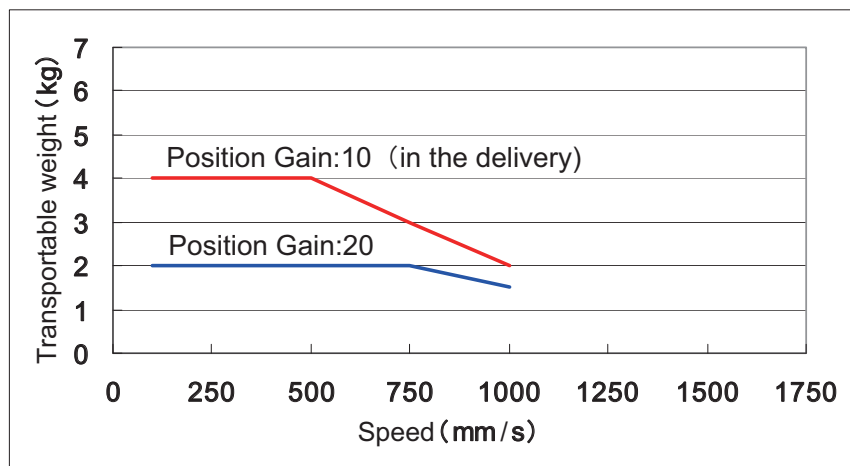
Shown below is the graph for the maximum transportable weight at each speed when the unit is installed in horizontal orientation.

- The load capacity is the value when the actuator is operated at the Max. Acceleration/Deceleration Speed 0.5G.
- The position gain in the parameters at the delivery is 10.

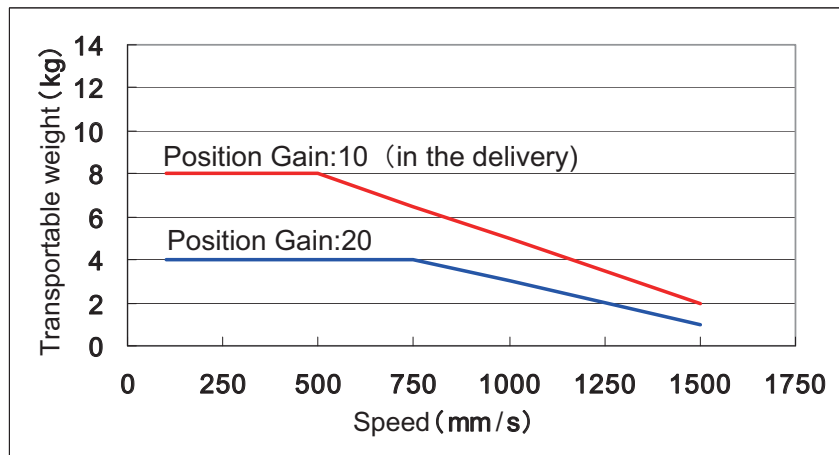
If setting the position gain to 20, even though the maximum transportable weight is decreased, the cycle time will be shortened by 0.3 seconds.

In the next page, describes how to change the position gain.

RCP2-BA6/BA6U



RCP2-BA7/BA7U



The way to change the position gain differs depending on the controller.
Shown below is how to change it with using the PC software for example.
For the details of how to change with using the teaching pendant, refer to the operating manual of the teaching pendant corresponding to the controller.

(1) PCON, RPCON, PSEP Controller

Change is to be made using RC PC Software.

- 1) Select [Parameter (P)] → [Edit (E)] in the main menu.
- 2) Input the password. The password set at the delivery is [5119].
- 3) Select the axis number in the axis select window and click [OK].
- 4) For PCON and RPCON, change the setting in User Parameter No. 7: Servo gain selection from [1] to [3].

User		
No	Name	Value
5	Home direction [0:opposite/1:default]	0
6	Push recognition time [msec]	255
7	Servo gain selection	3
8	Default speed [mm/sec]	1000
9	Default ACC [G]	0.50

For PSEP, change the setting in User Parameter No. 3: Servo gain selection from [1] to [3].

(Note) For PCON, RPCON and PSEP Controllers, Servo gain selection: 3 is equivalent to Position Gain: 20.

- 5) Select [Parameter (P)] → [Transmits to a controller (L)] in the main menu.
- 6) Select the axis number in the axis select window and click [OK].
The parameters are sent to the controller.

(2) P MEC Controller

Change is to be made using MEC PC Software.

- 1) Click [Maintenance] in the main menu.
- 2) Select [Parameter] in Maintenance window.
- 3) Change the setting in User Parameter No. 3: Servo gain selection from [1] to [3].

No	Name	Value
1	Position band [mm]	0.10
2	(For future expansion)	10000
3	Servo gain selection	3
4	Torque filter constant	0

(Note) Servo gain selection: 3 is equivalent to Position Gain: 20.

- 4) Click [Store to MEC].


The parameters are sent to the controller.

(3) PSEL Controller

Change is to be made using X-SEL PC Software.

- 1) Select [Parameter (P)] → [Edit (E)] in the main menu.
- 2) Change Axis Parameter No. 60: Position Gain [1/s] from [10] to [20].

I/O	Common to All Axes	Specific Axis	Driver	Encoder	I/O device	Other
No	Parameter Name	1th Axis				
56	Homing:DirCRat	2000				
57	ForceDevStpPos	5000				
58	Pend Band	100				
59	Error Range	332				
60	PPG(Pos Gain)	20				
61	PFAg	0				
62	L-Sync FB Gain	77				

- 3)  click (Transfer to Controller).

The parameters are sent to the controller.

- 4) Once the parameter transfer is complete, a confirmation message saying [Do you want to write to Flash ROM?] comes up. Click [Yes (Y)].
- 5) After writing to flash ROM, a confirmation message saying [Do you want to reboot the controller?] comes up. Click [Yes (Y)].

The controller will be restarted.

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 24-hour operation, shorten the maintenance intervals as needed.

	Visual inspection	Check interior	Grease supply	Belt loosening
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 solvent on plastic parts or painted surfaces.
- If the unit is badly soiled, apply a neutral detergent or alcohol to a soft cloth, and wipe gently.

11.4 Interior Inspection

After turning off the power, remove the side covers and belt cover to conduct visual checks. Check the following items during interior inspection.

Body	Loose mounting bolts?
Guides	Lubrication appropriate? Soiling?
Drive belt	Scratches? Loose?
Backside of belt cover	Lubrication appropriate?

The side covers and belt cover can be removed using an Allen wrench of 2 mm across flats.

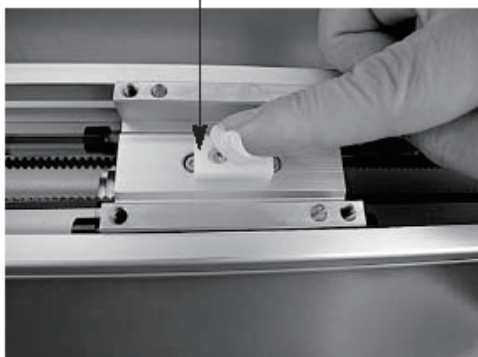
Make a visual check of the interior to see if there is any dust or foreign matter in the unit and also check the lubrication condition. Even if the grease you see around the parts is brown, the lubrication is fine as long as the traveling surface appears shiny.

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.

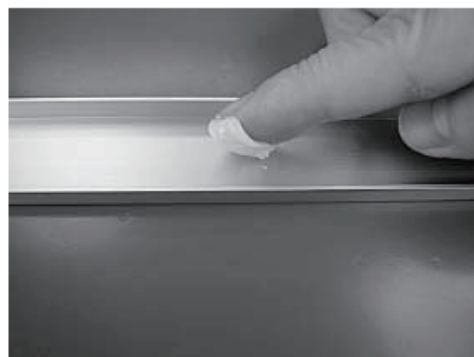
For details on how to check the drive belt, refer to the check items listed in 10.7.

- Checking the lubrication of the backside of the belt cover
Check the lubrication condition of the backside of the belt cover and the belt-cover support (made of resin) at the center of the slider to make sure the frictional resistance between the slider and belt cover is minimized and the slider can move smoothly.
If lubrication is not enough, apply grease.
Grease: Kyodo Yushi's Multemp LRL3 or equivalent

Belt-cover support



Backside of belt cover



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 on the belt.

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

11.6 Lubricating the Guides

11.6.1 What Grease to Use on the Guides

Lithium grease No. 2 is used on the guides.
The following grease is applied when we ship the unit.

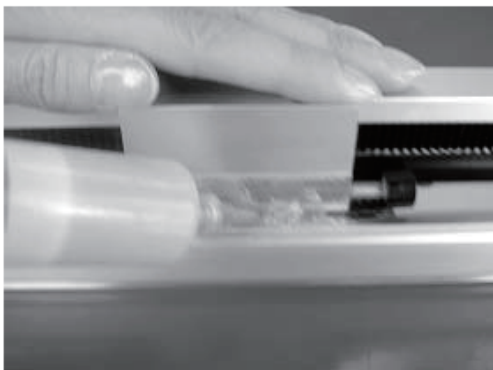
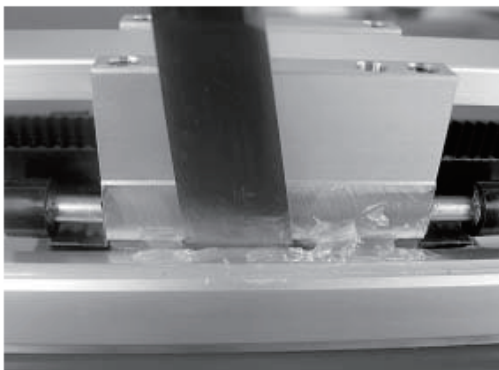
Idemitsu Kosan	Daphne Eponex Grease No.2
----------------	---------------------------

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

Showa Shell Oil	Albania Grease No. 2
Mobil Oil	Mobilux 2

11.6.2 How to Apply Grease

- 1) Remove the side covers on both sides.
- 2) 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. Remove excess grease.



- 3) Follow the same steps to apply grease on the other guide.
- 4) Install the side covers.



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



Warning: Never use fluorine grease. Fluorine grease will chemically react with lithium grease to damage the machine.

11.7 Drive Belt

11.7.1 Inspecting the Belt

Remove the side covers and visually inspect the belt.

Durability of the drive 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 million cycles of flexing loads.

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

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

11.7.2 Applicable Belt

Manufacturer: Mitsuboshi Belting

Model number, material: Long Belt OTG100S3M, 10 mm wide: Urethane specification

11.7.3 Checking and Adjusting the Belt Tension

[Checking the Tension]

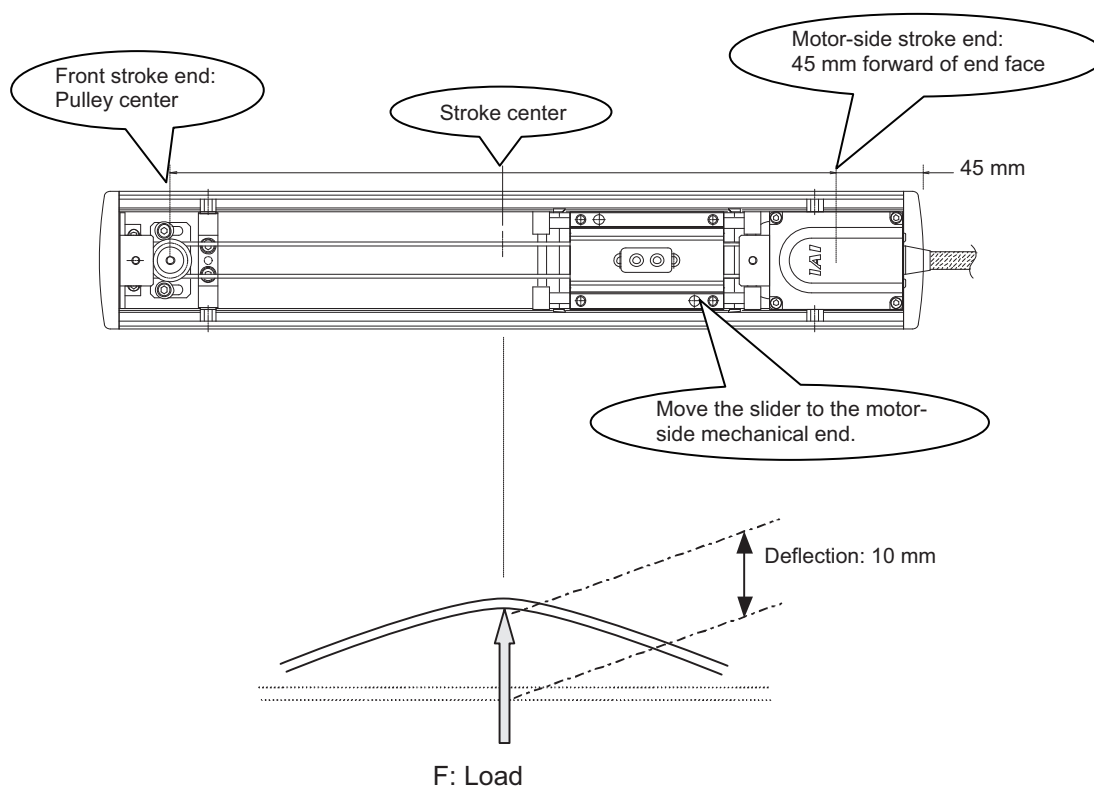
As a guideline, belt tension is evaluated by the load needed to deflect the belt by 10 mm when the belt is pushed near the stroke center.

The table below lists the appropriate loads needed to achieve a 10-mm deflection on each belt used at different strokes.

If the measured load is less than the applicable value by approx. 20% or more, the belt is loose and its tension must be adjusted.

Appropriate loads to achieve 10-mm deflection

Model	Top: Stroke (mm) Bottom: Load (kgf)												
	500	550	600	650	700	750	800	850	900	950	1000	–	–
BA6 BA6U	0.32	0.31	0.31	0.30	0.35	0.35	0.34	0.34	0.40	0.40	0.39	–	–
BA7 BA7U	600	650	700	750	800	850	900	950	1000	1050	1100	1150	1200
	0.37	0.36	0.35	0.35	0.41	0.40	0.40	0.39	0.39	0.45	0.45	0.44	0.44



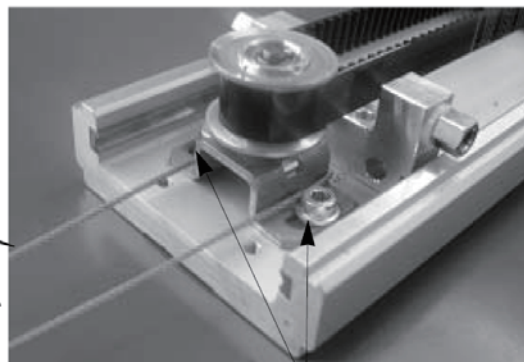
[Adjusting the Tension]

Adjust the tension using the affixing bolts in the pulley bracket on the counter-motor side.

- [1] Move the slider to the motor-side mechanical end.
- [2] Loosen the affixing bolts (using an Allen wrench of 3 mm across flats).
- [3] Guide a wire around the bracket and pull the wire uniformly from both ends using tension gauges.
- [4] With the wire pulled to a specified tension from both ends, tighten the affixing bolts carefully by making sure the bracket does not deform. The appropriate tension varies depending on the stroke.

Model	Tension		
	Stroke: 500 to 650 mm	Stroke: 700 to 850 mm	Stroke: 900 to 1000 mm
BA6 / BA6U	6 kgf	8 kgf	10 kgf
BA7 / BA7U	Stroke: 600 to 750 mm	Stroke: 800 to 950 mm	Stroke: 1000 to 1200 mm
	8 kgf	10 kgf	12 kgf

Wire



Pull both ends uniformly using tension gauges by making sure the pulley bracket does not deform.

M4 hexagon socket-head bolts for adjustment
Tightening torque: 360 N·cm (36.7 kgf·cm)

(Note) The user must provide an appropriate wire available on the market.

11.7.4 Replacing the Belt

[Items Required for Replacement]

- Replacement drive belt
- Tension adjustment wire (provide a commercially available wire like the one shown in the photograph at right)
- Phillips screwdriver set and Allen wrench set
- Tension gauge (capable of applying a tensile load of 12 kgf or more)
- Grease (Kyodo Yushi's Multemp LRL3 or equivalent)

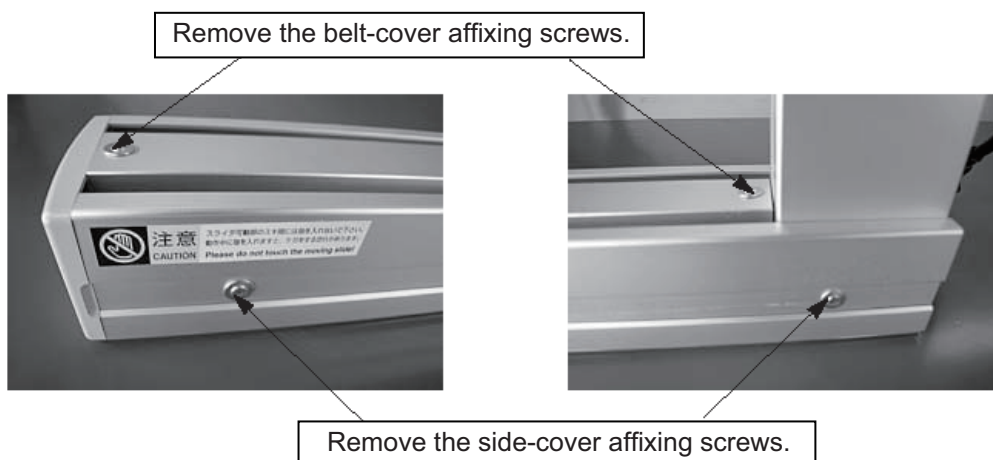


[Procedure]

- 1) Remove the load from the slider.
- 2) Remove the belt cover and one of the side covers (using an Allen wrench of 2 mm across flats).

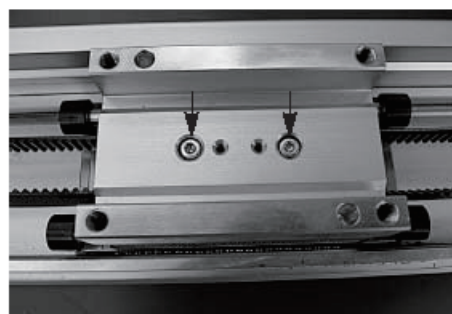
[Counter-motor side]

[Motor side]

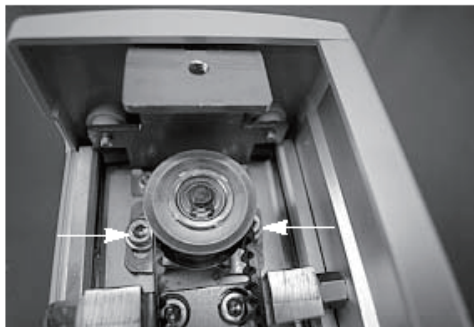


- 3) Remove the belt-cover support (resin) (using an Allen wrench of 2.5 mm across flats). Wipe off grease attached on the support.

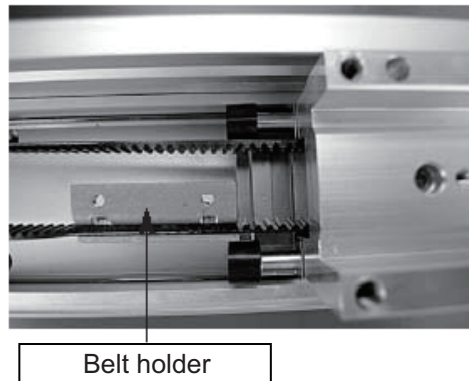
- 4) Remove the belt-holder affixing bolts (using an Allen wrench of 2.5 mm across flats).



- 5) Loosen the tension adjustment bolts (using an Allen wrench of 3 mm across flats). If the bolts are not readily accessible, remove the other side cover.



- 6) Move the slider to expose the belt holder.

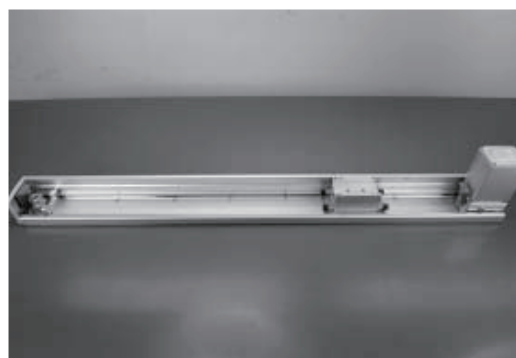
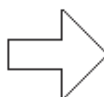


- 7) Separate the belt and pull it out of the actuator.
 [1] Remove the belt-affixing bolts (using an Allen wrench of 2.5 mm across flats).



[2] Removed belt

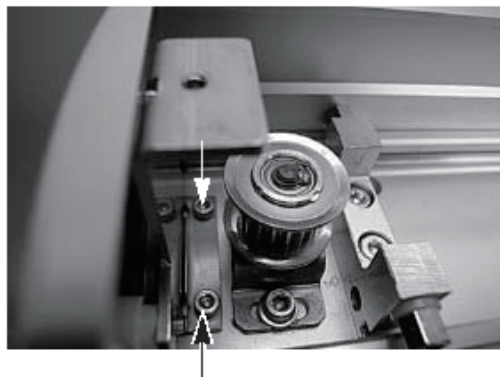
[3] Actuator without belt



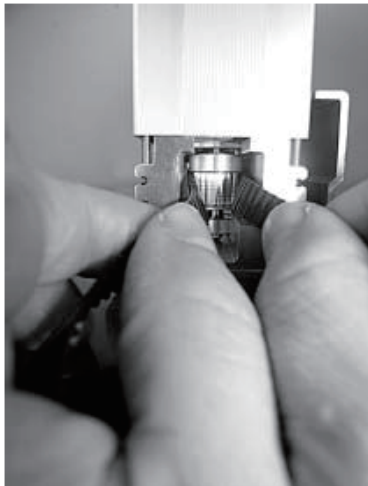
- 8) Remove the rear cover (using an Allen wrench of 2.5 mm across flats).



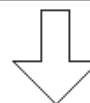
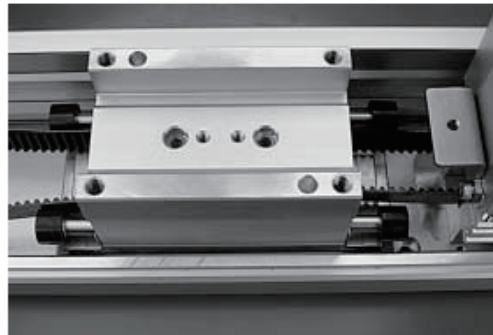
- 9) Remove the front-cover affixing bracket (using an Allen wrench of 2.5 mm across flats).



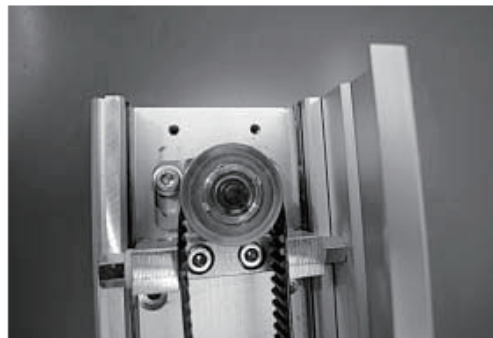
- 10) Install a new belt by guiding it around the pulleys.
[1] Insert the belt from the spaces provided on both sides of the motor-side pulley.



- [2] Guide the belt through the slider.

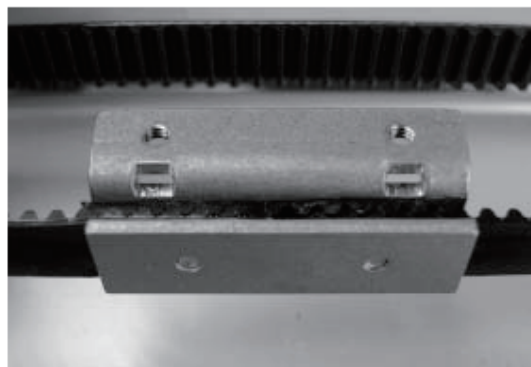


- [3] Guide the belt around the counter-motor side pulley (front side).



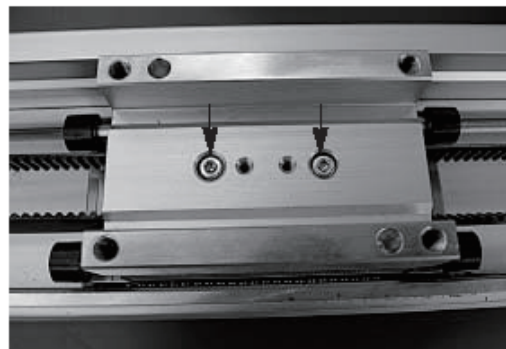
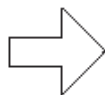
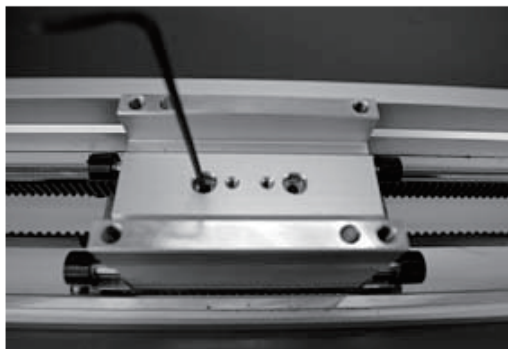
- 11) Affix the belt to the belt holder.

Align the belt teeth on the belt holder with the teeth on the drive belt, and tighten the bolts (M3 x 6).



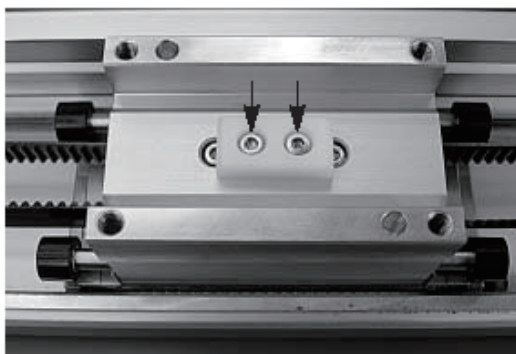
Tightening torque: 154 N·cm (15.7 kgf·cm)

- 12) Move the slider to a position where it aligns with the mounting holes in the belt holder, and tighten the bolts (BA6: M3 x 6 / BA7: M3 x 12).



Tightening torque: 83 N·cm (8.5 kgf·cm)

- 13) Affix the belt-cover support (resin) using the bolts (M3 x 6).



14) Adjust the belt to the specified tension.

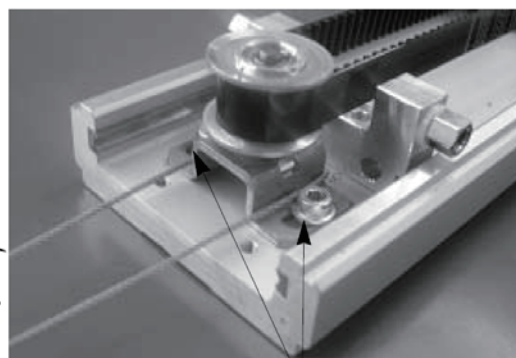
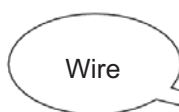
Move the slider to the motor-side mechanical end, guide a wire around the counter-motor side pulley bracket, and then pull the wire uniformly from both ends using tension gauges.

With the wire pulled to a specified tension from both ends, tighten the adjustment bolts.

(Refer to the table below to find the tension appropriate for your actuator and the stroke.)

When the tension has been adjusted, remove the wire.

Model	Tension		
	Stroke: 500 to 650 mm	Stroke: 700 to 850 mm	Stroke: 900 to 1000 mm
BA6 / BA6U	6 kgf	8 kgf	10 kgf
	Stroke: 600 to 750 mm	Stroke: 800 to 950 mm	Stroke: 1000 to 1200 mm
BA7 / BA7U	8 kgf	10 kgf	12 kgf



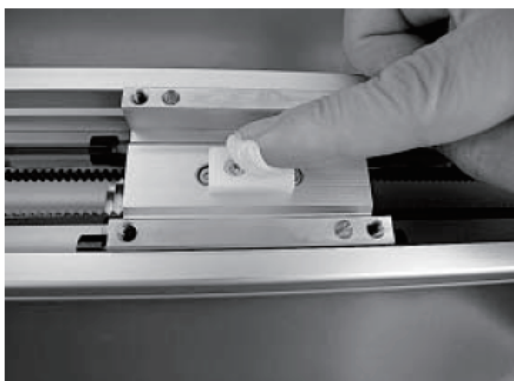
Pull both ends uniformly using tension gauges by making sure the pulley bracket does not deform.

M4 hexagon socket-head bolts for adjustment
Tightening torque: 360 N·cm (36.7 kgf·cm)

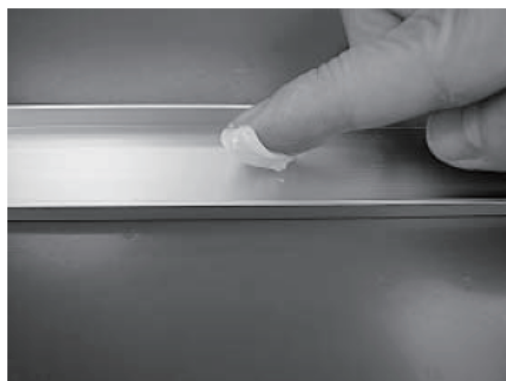
15) Apply grease on the belt-cover support and the backside of the belt cover.

Grease: Kyodo Yushi's Multemp LRL3 or equivalent

[Belt-cover support]



[Back of belt cover]



16) Install the side cover (thin-head screw M4 x 6, 2 pcs), front cover (hexagon socket-head bolt M3 x 8, 2 pcs) and rear cover (hexagon socket-head bolt M3 x 8, 2 pcs).

If the motor is installed at the bottom of the actuator, also install the bracket cover (thin-head screw M3 x 4, 2 pcs).

- 17) Install the belt cover (thin-head screw M4 x 6, 2 pcs). Move the slider back and forth over the entire stroke to make sure it does not contact the belt cover.



Check if the clearance
is sufficient.

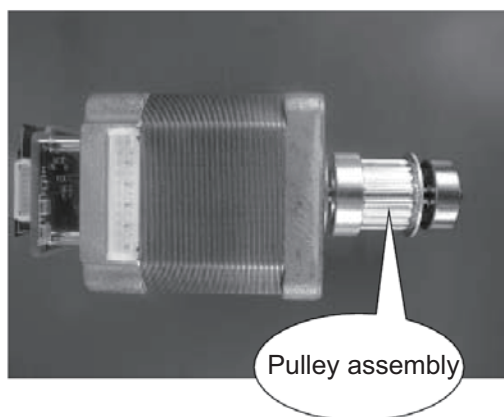
11.8 Replacing the Motor

11.8.1 BA6/BA7 (Motor on Top)

[Items Required for Replacement]

- Replacement motor (with the motor shaft preassembled with a pulley assembly: see photograph [1])
- Tension adjustment wire (provide a commercially available wire like the one shown in photograph [2])
- Phillips screwdriver set and Allen wrench set
- Tension gauge (capable of applying a tensile load of 12 kgf or more)
- Grease (Kyodo Yushi's Multemp LRL3 or equivalent)

[Photograph [1]]

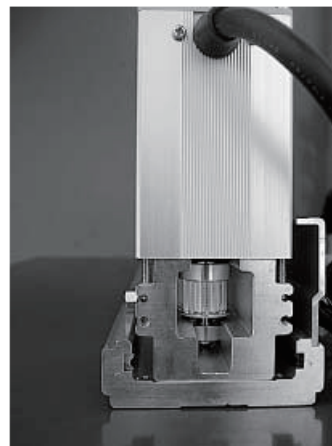


[Photograph [2]]

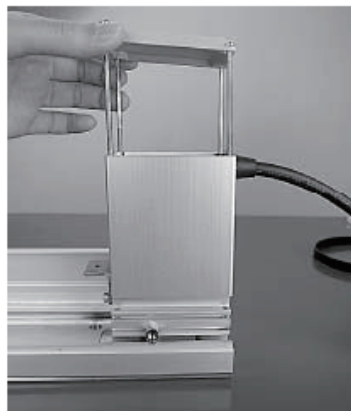


[Procedure]

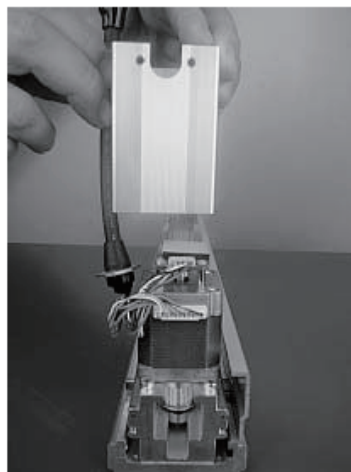
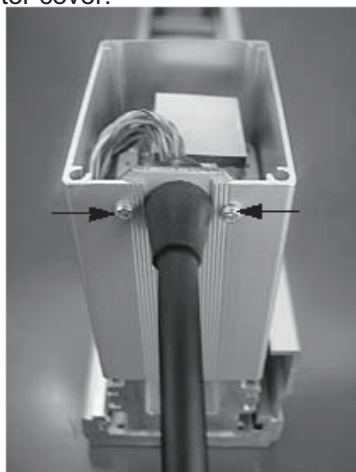
- 1) First, remove the drive belt.
Remove the load from the slider and follow steps 1) to 7) in 10.7.4, "Replacing the Belt," to remove the belt.
- 2) Remove the rear cover
(using an Allen wrench of 2.5 mm across flats).



- 3) Loosen the four pan-head screws affixing the motor cap, and pull out the motor cap.



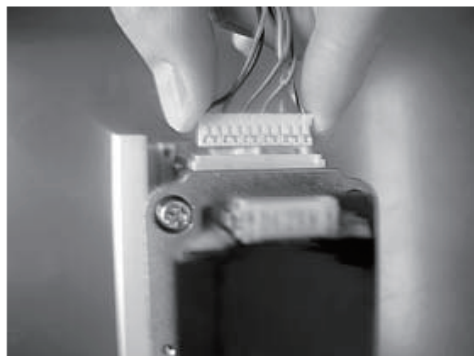
- 4) Remove the two pan-head screws affixing the cable-mounting plate, and separate the plate from the motor cover.



- 5) Pull out the encoder connector.



- 6) Pull out the motor connector.



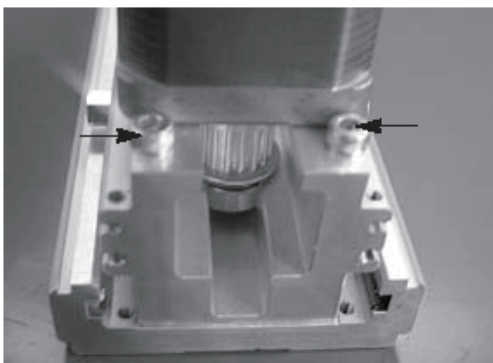
Caution: When applying the force, do not touch the encoder directly.

- 7) Remove the other side cover.

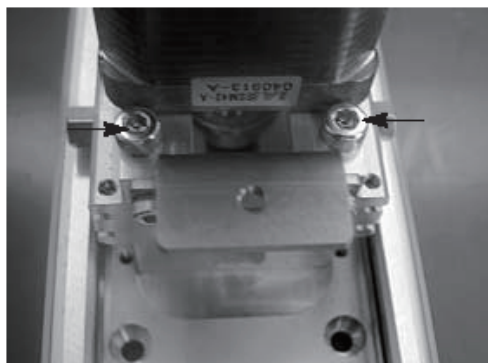
8) Remove the motor bracket.

[1] Remove the affixing bolts (M4 x 45, 4 pcs) using an Allen wrench of 3 mm across flats.

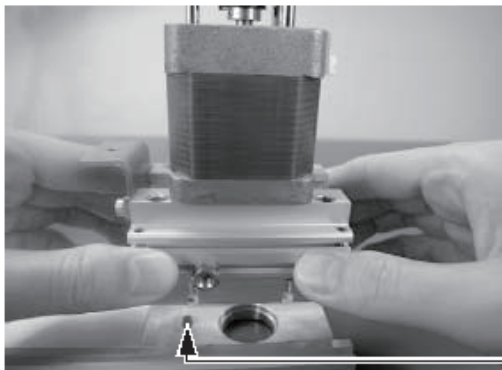
[Rear-cover side]



[Slider side]



[2] Pull out the motor bracket by hand.

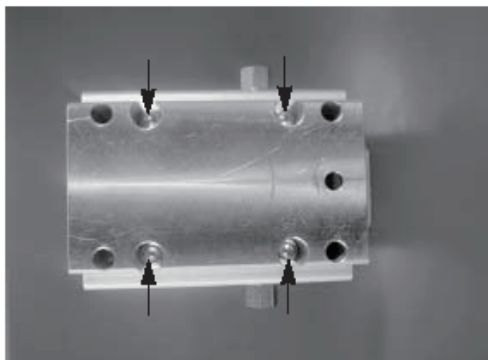


Caution: A parallel pin is pressed into the base. If the motor bracket does not come off easily, slowly turn the motor bracket by hand and pull it out.

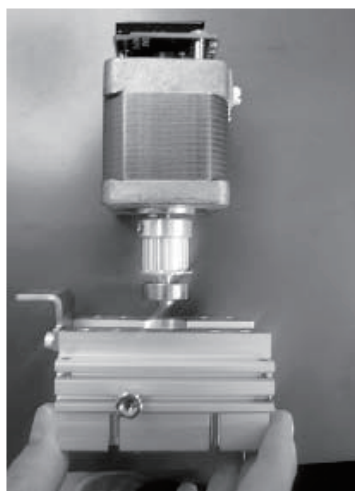
Parallel pin

9) Remove the motor from the motor bracket.

- Remove the affixing bolts (M3 x 28, 4 pcs) using an Allen wrench of 2.5 mm across flats.



- After the motor has been removed



10) Install a new motor to the motor bracket.

When installing the motor, be careful not to damage the bearing at the end of the motor shaft.

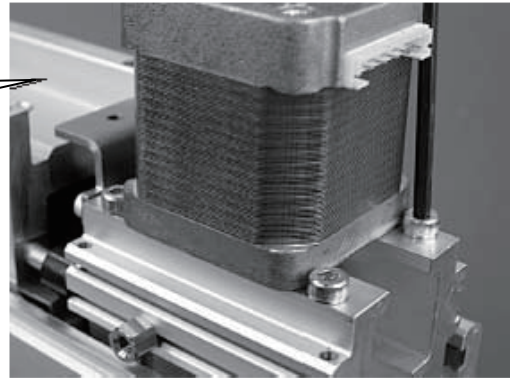
Tightening torque: 90 N·cm (9.2 kgf·cm)

- 11) Affix the motor bracket on the base.

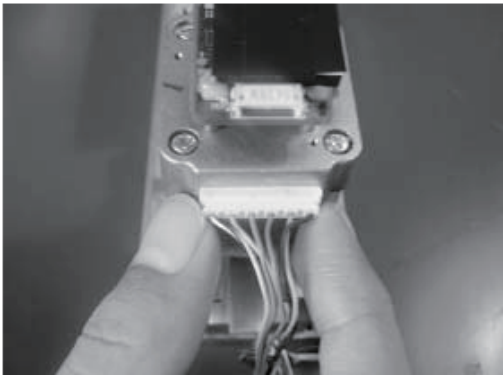
Tighten the affixing bolts (M4 x 45, 4 pcs) using an Allen wrench of 3 mm across flats.

Securely tighten the bolts with the slider firmly pressed against the motor bracket.

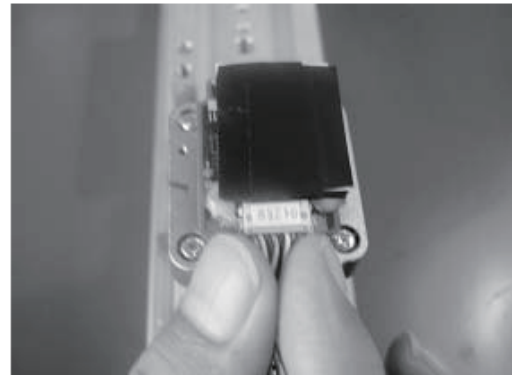
Tightening torque: 176 N·cm (18 kgf·cm)



- 12) Plug in the motor connector.

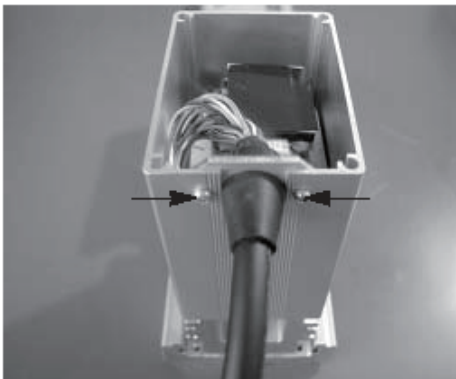


- 13) Plug in the encoder connector.

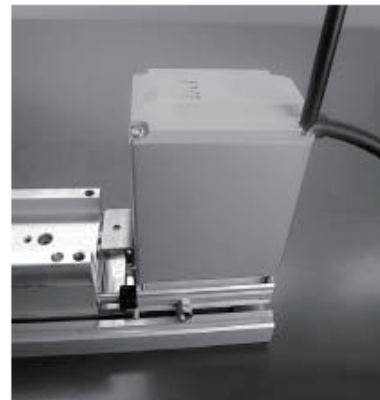


Caution: When applying the force, do not touch the encoder directly.

- 14) Store the cables into the motor cover and affix the cable-mounting plate using the pan-head screws (M2.6 x 5, 2 pcs)



- 15) Tighten the motor cap and motor cover together using the pan-head screws (4 pcs). Applicable screws (BA6: M3 x 80 / BA7: M3 x 90)



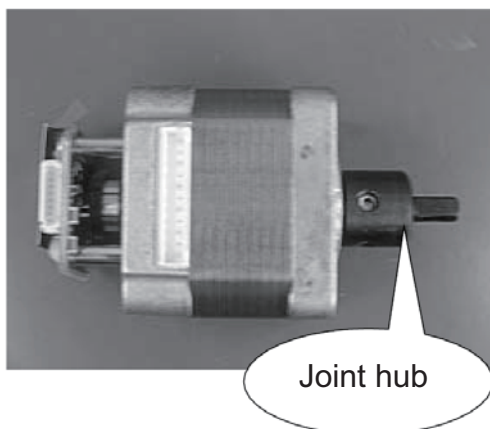
- 16) Install the drive belt, adjust it to the specified tension, and then install the covers. Follow steps 9) to 17) in 10.7.4, "Replacing the Belt."

11.8.2 BA6U/BA7U (Motor at Bottom)

[Items Required for Replacement]

- Replacement motor (with the motor shaft preassembled with a joint hub: see photograph [1])
- Tension adjustment wire (provide a commercially available wire like the one shown in photograph [2])
- Setscrew (M4 x 5, flat-tip, precoated)
- Setscrew (M4 x 5, recessed-tip, precoated)
- 1.5-mm thick spacer (or thickness gauge)
- Phillips screwdriver set and Allen wrench set
- Tension gauge (capable of applying a tensile load of 12 kgf or more)
- Grease (Kyodo Yushi's Multemp LRL3 or equivalent)
- Hot gun (used if the setscrews do not come off)

[Photograph [1]]

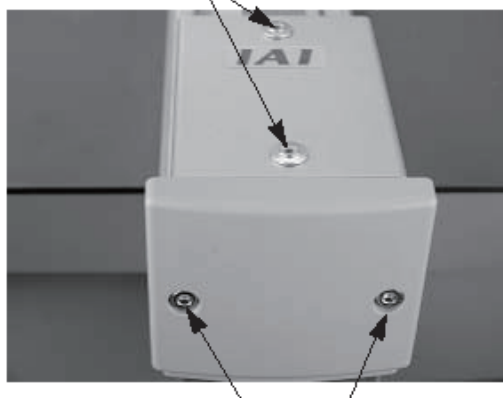


[Photograph [2]]

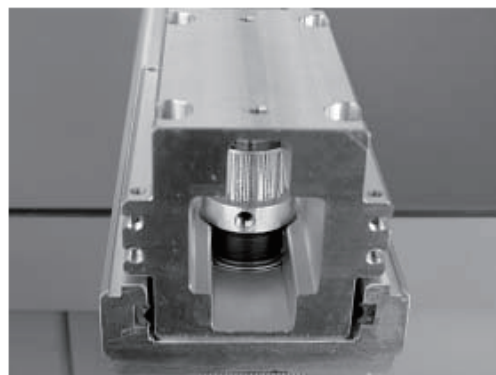


[Procedure]

- 1) First, remove the drive belt.
Remove the load from the slider and follow steps 1) to 7) in 10.7.4, "Replacing the Belt," to remove the belt.
- 2) Remove the bracket and rear cover.
Use an Allen wrench of 1.5 mm across flats.

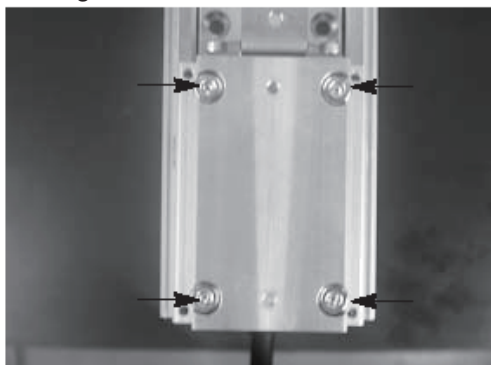


Use an Allen wrench of 2.5 mm across flats.

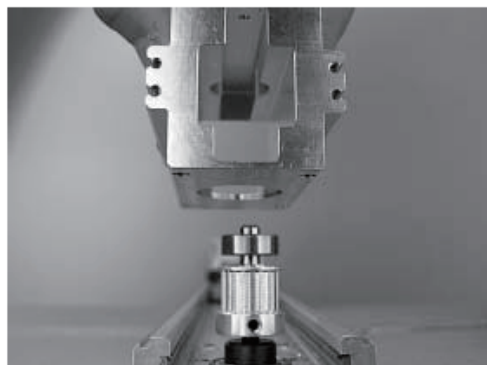


3) Remove the motor bracket.

[1] Remove the affixing bolts (M4 x 45, 4 pcs) using an Allen wrench of 3 mm across flats.

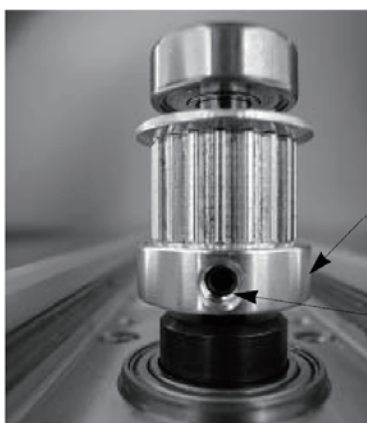


[2] Pull out the motor bracket by hand.



4) Remove the two setscrews (M4 x 5, precoated) affixing the pulley assembly (using an Allen wrench of 2 mm across flats), and pull out the pulley assembly. If the setscrews do not come off, use a hot gun to heat the adhesive attached at the screw ends.

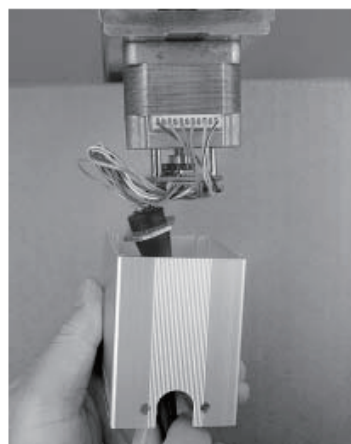
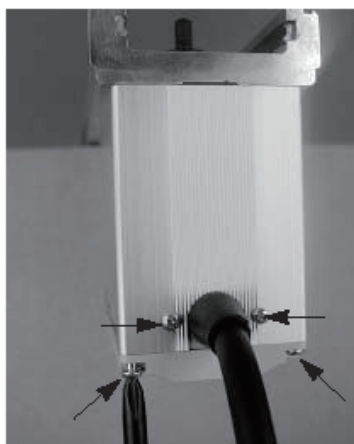
Caution: Remove the setsc carefully so as not to misplace the set pieces.



Set screw (M4 x 5, recessed-tip, precoated) and set piece (opposite side of the joint hub's D-cut face)

Set screw (M4 x 5, flat-tip, precoated) (joint hub's D-cut face)

5) Remove the four pan-head screws affixing the motor cap and two pan-head screws affixing the cable-mounting plate, and separate the motor cap and cable-mounting plate from the motor cover.



6) Pull out the motor connector.



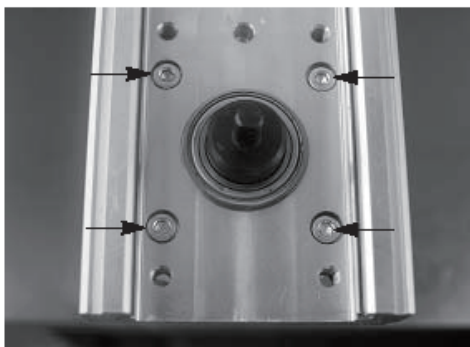
7) Pull out the encoder connector.



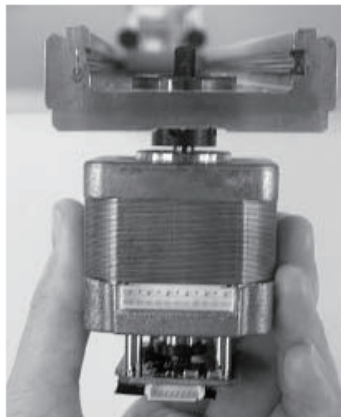
Caution: When applying the force, do not touch the encoder directly.

8) Remove the motor.

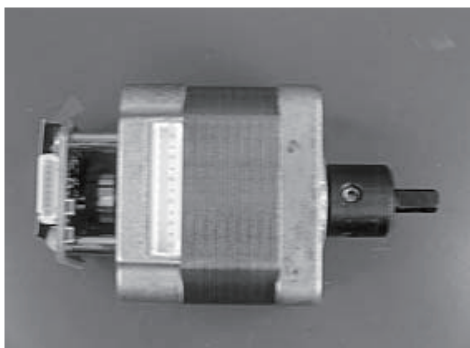
[1] Remove the affixing bolts (M3 x 8, 4 pcs) using an Allen wrench of 2.5 mm across flats.



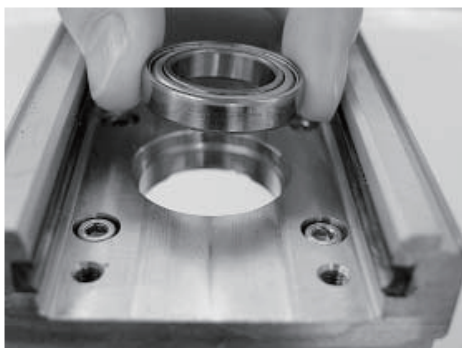
[2] Pull out the motor downward by slightly tilting it to right and left.



[4] After the motor has been removed

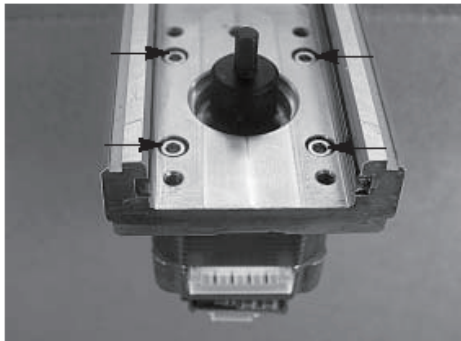


[3] Pull out the bearing by hand.



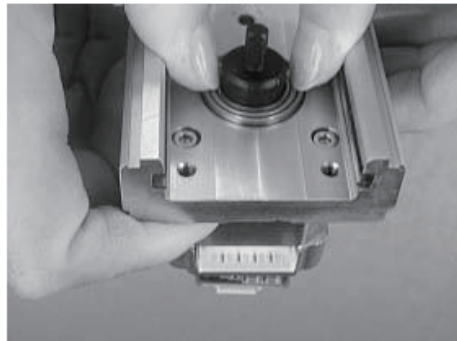
9) Install a new motor on the base and insert the bearing.

[1] Tighten the affixing bolts (M3 x 8, 4 pcs) using an Allen wrench of 2.5 mm across flats.

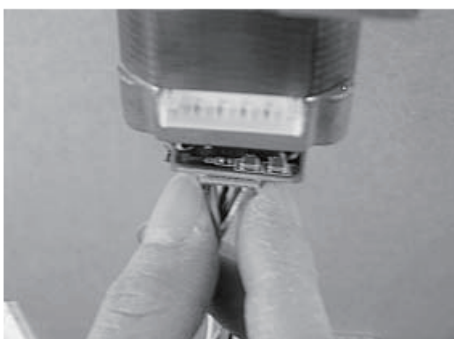


Tightening torque: 90 N·cm (9.2 kgf·cm)

[2] Insert the bearing by hand.



10) Plug in the encoder connector.



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

11) Plug in the motor connector.



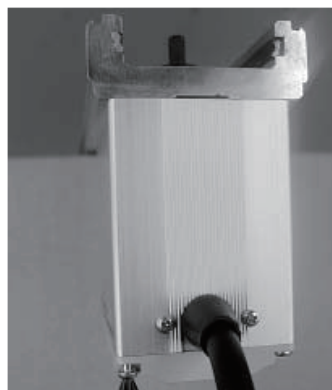
12) Store the cables into the motor cover and affix the cable-mounting plate using the pan-head screws (M2.6 x 5, 2 pcs).



13) Tighten the motor cap and motor cover together using the pan-head screws (4 pcs).

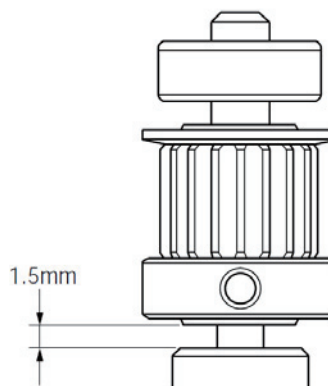
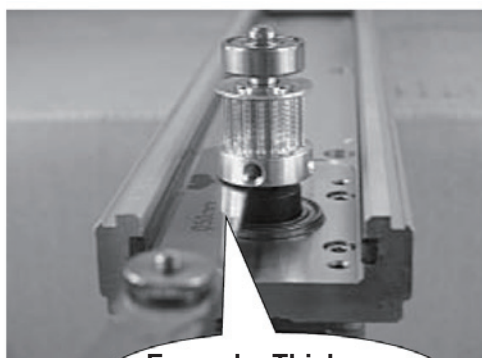
Applicable screws

(BA6U: M3 x 73/BA7U: M3 x 85)

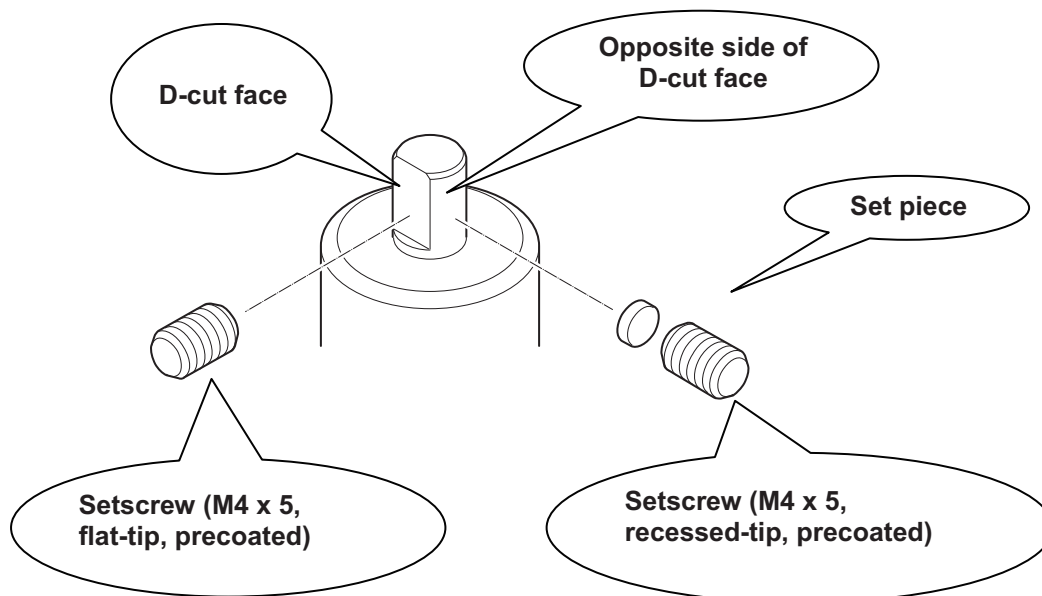


14) Affix the pulley assembly to the joint hub.

[1] Provide a 1.5-mm clearance between the joint hub and pulley assembly.



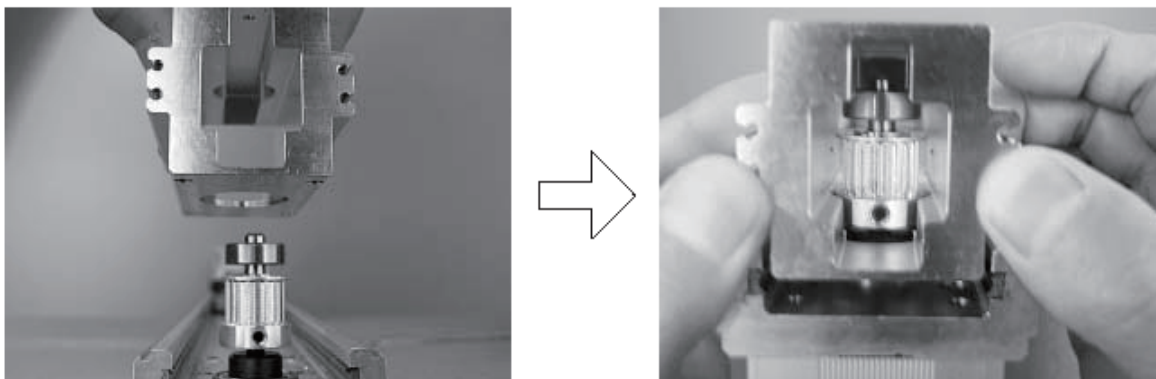
[2] Install new setscrews at two locations and tighten the screws (using an Allen wrench of 2 mm across flats).



Caution: Always use new setscrews with a new motor.

15) Install the motor bracket.

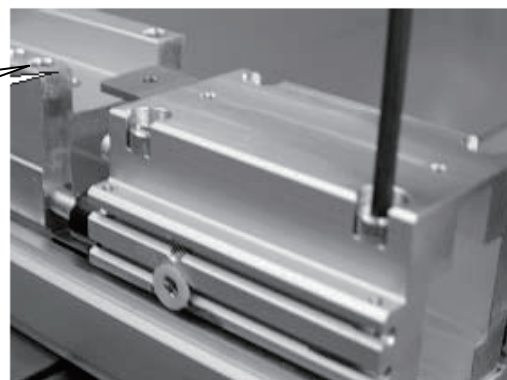
[1] Align the motor bracket with the pilot section of the bearing and insert the bracket carefully so as not to damage the outer periphery of the bearing.



[2] Tighten the affixing bolts (M4 x 45, 4 pcs) using an Allen wrench of 3 mm across flats.

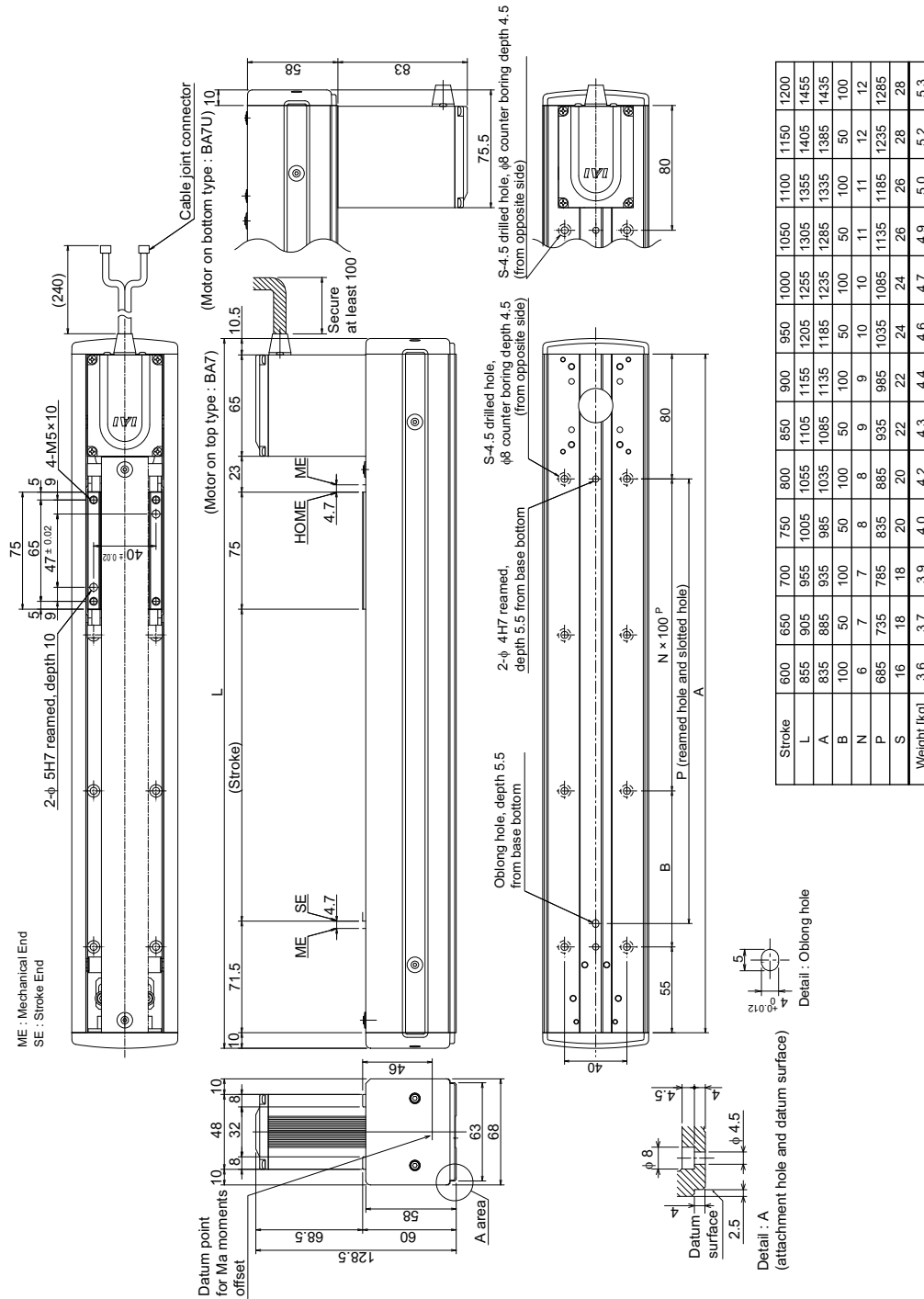
Securely tighten the bolts with the slider firmly pressed against the motor bracket.

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



16) Install the drive belt, adjust it to the specified tension, and then install the covers. Follow steps 9) to 17) in 10.7.4, "Replacing the Belt."

12.1.2 RCP2-BA7/BA7U



Change History

Revision Date	Description of Revision
June 2008	First edition
	Second edition
	Third edition
	<ul style="list-style-type: none"> Changed the logo at the top of page "IA" to "RC" for all pages. Danger, Operation Deleted "● If you are using a pace maker ... (snip) ... to malfunction." Warning, Installation Deleted "Be sure to provide Class D grounding ... (snip) ... or malfunction." Warning, Operation Deleted "● The cable supplied with the product... (snip) ... use robot cables." Caution, Installation Changed "● Do not install the product in a place subject to large vibration or impact (4.9 m/s^2 or more). Doing so may result in the manufacturing of the product." to "Do not install it in a place subject to large vibration or impact." Caution, Operation Deleted "● Do not bring a floppy disk... (snip) ... may destroy the data in the floppy disk, etc." Deleted Note "General" Deleted Others "● If you have any question... (snip) ... at the end of this operation manual." Prohibited Handling of Cables Deleted "The Rules for Handling Cables (Must be Observed!)." Prohibited Handling of Cables, 7. Notes on use of cable tracks Added "● The supplied cable is not a robot cable... (snip) ... in a cable track." Added an explanation drawing. Deleted item 10 in Prohibited Handling of Cables Changed the content of the operating environment on page 6. "● The unit should not be subject to vibrations greater than 0.3G." → "● Impact and vibration must not be transmitted." Added "A reamed positioning pin holes ... (snip) ... as necessary." "Reamed hole: $\varnothing 4\text{H7}$, depth 5 mm or less." on page 7. Reamed hole in the table on page 9, two locations "$\varnothing 5\text{H10}$" → "$\varnothing 5\text{H7}$" Added Warning, "Never use fluorine grease. ... (snip) ... damage the machine." on page 15. Added Contact address: IAI Customer Center Eight on the back cover.
	September 2010
	Fourth edition
	<ul style="list-style-type: none"> Added "Precautions" at the top. Added change of base seating surface on page 7.
April 2011	Fifth edition
	<ul style="list-style-type: none"> A page for CE Marking added

Revision Date	Description of Revision
January 2012	<p>Sixth edition</p> <ul style="list-style-type: none"> • Contents changed in 3. Warranty • Relation of Speed and Maximum Transportable Weight added
March 2012	<p>Seventh edition</p> <ul style="list-style-type: none"> • CAUTION deleted • Please Read Before Use added • Contents added and changed in Safety Guide on pages 1 to 7 • Caution in Handling added in page 8 • Note added to describe availability of installation for each installation posture in page 16 • Warning notes added such as in case the grease got into your eye, immediately go to see the doctor for an appropriate care in page 26 • External Dimensions added in pages 47 and 48



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