

4. Maintenance and Inspection

4.1 Inspection Items and Schedule

Follow the maintenance inspection schedule below.

It is assumed that the equipment is operating 8 hours per day.

If the equipment is running continuously night and day or otherwise running at a high operating rate, inspect more often as needed.

Period of Time	External Visual Inspection	Internal Inspection	Greasing ^(Note 1)
Start of work inspection	○		
1 month inspection	○		
3 month inspection			○
3 months after starting operation			Depends on grease supply timing (reference)
6 month inspection	○	○ ^(Note 2)	
Every 6 months thereafter	○	○ ^(Note 2)	

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

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

[Grease Supply Timing (Reference)]

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

Maximum Speed of Use [mm/s]	Grease Supply Timing (Reference)	
	Operated distance	Months
0 to 750 or less	1,250km	12 month
750 to 1440	2,500km	

4.2 External Visual Inspection

An external visual inspection should check the following things.

Main unit	Loose actuator mounting bolts, other loose items
Cables	Scratches, proper connections
Stainless steel sheet	Scratches, displacement, slack
Overall	Abnormal noise, vibration

- In the case that displacement or slack of stainless steel sheet is found, timely adjust it.
- As a rule of thumb, the stainless steel sheet should last for about 5000km of motion. However, depending on the usage, replace the stainless steel sheet appropriately. Sheet replacement can be done by the customer; make sure that there is no displacement or slack in the stainless steel sheet. This may lead to damage to the sheet. If you have any concerns regarding the work, we recommend that you bring the unit to our plant or have one of our technicians come to your plant to perform the replacement.
- If the actuator is installed vertically, certain conditions may cause grease to drip from the guide. Please ensure that proper cleaning is performed and grease is replenished.

4.3 Cleaning

- Clean exterior surfaces as necessary.
- Use a soft cloth to wipe away dirt and buildup.
- Do not blow too hard with compressed air as it may cause dust to get in through the gaps.
- Do not use oil-based solvents as they can harm lacquered and painted surfaces.
- To remove severe buildup, wipe gently with a soft cloth soaked in a neutral detergent or alcohol.

4.4 Internal Inspections

Turn OFF the power, remove the side cover and have a visual inspection. When inspecting the interior, check the following items.

Actuator	Loose mounting bolts, other loose items
Guide section	Lubrication, buildup

Visually inspect the interior of the equipment. Check whether dust or other foreign matter has gotten inside and check the lubrication state.

The lubrication may have turned brown. This is not a problem as long as the travel surfaces shine as though they are wet.

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

The procedure for internal inspections is outlined below.

- ① Loosen the screws on the side cover and detach the side cover.
- ② Check inside.
- ③ After finishing the inspection, assemble back in the reverse order. If you touch the edge of the stainless steel sheet in the attaching the side cover process, the sheet may get damaged or wavy which result in shortening life or earlier wear-out. To avoid touching the edge of the sheet, insert a spacer (approximately 0.1 to 0.2mm) between the sheet and cover to push up the sheet, and then push in the cover.

When affixing the side cover, tighten the screws with the tightening torque described below.

Screw Diameter	Tightening Torque
M5	41.4N·cm

- ④ Make sure that the slider and the side cover do not interfere, moving the slider backwards and forwards between the strokes.

 **Note:** Do not damage the stainless steel sheet by bending it forcefully during internal inspection. Do not tug on the stainless steel sheet or in any way attempt to reposition it. Change in the attached condition may cause the sheet to be mounted unevenly or impact the product life. In such cases, please contact IAI Sales Engineer Department. Keep in mind that the edges of the stainless steel sheet can cause injuries. Always wear gloves when working on it.

4.5 Internal Cleaning

- Use a soft cloth to wipe away dirt and buildup.
- Do not blow too hard with compressed air as it may cause dust to get in through the gaps.
- Do not use oil-based solvents, neutral detergent or alcohol.

4.6 Grease Supply

4.6.1 Standard Type Grease to Use

[1] Standard Type

IAI uses the following grease in our plant.

Guide Ball Screw	Kyodo Yushi	Multitemp LRL 3
---------------------	-------------	-----------------

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

[2] Cleanroom Type

For the cleanroom type, urea-based grease having superior low-dust emission, stable torque characteristics, superior lubricity, and antirust effects equivalent to lithium-based grease is used. IAI uses the following grease in our plant.

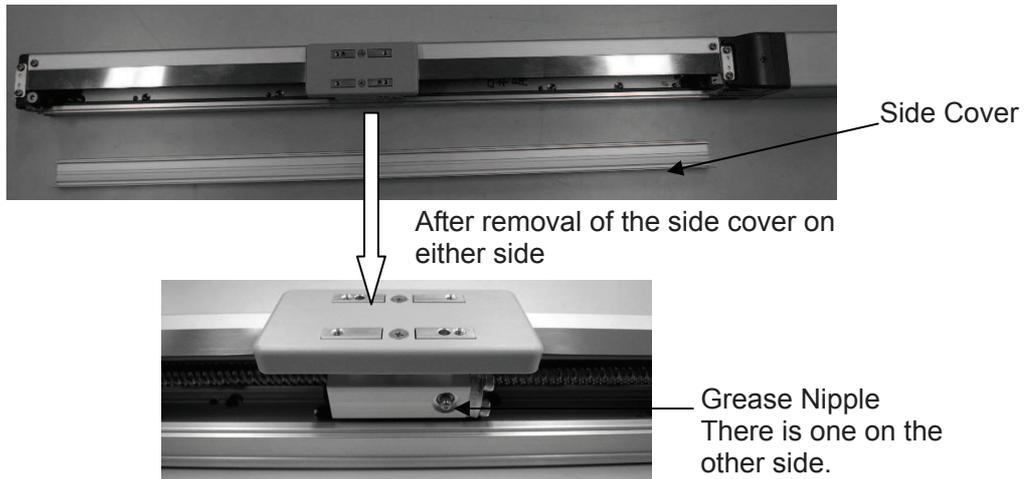
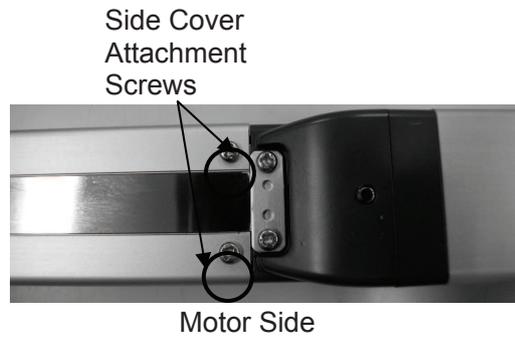
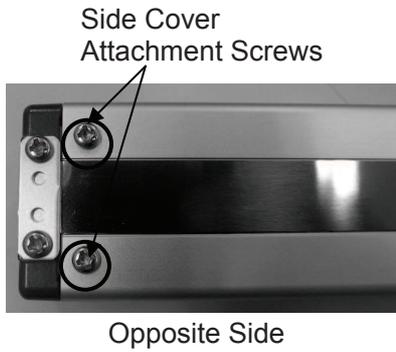
Guide/Ball Screw	Kuroda Precision Industries	C grease
------------------	-----------------------------------	----------

 Warning:

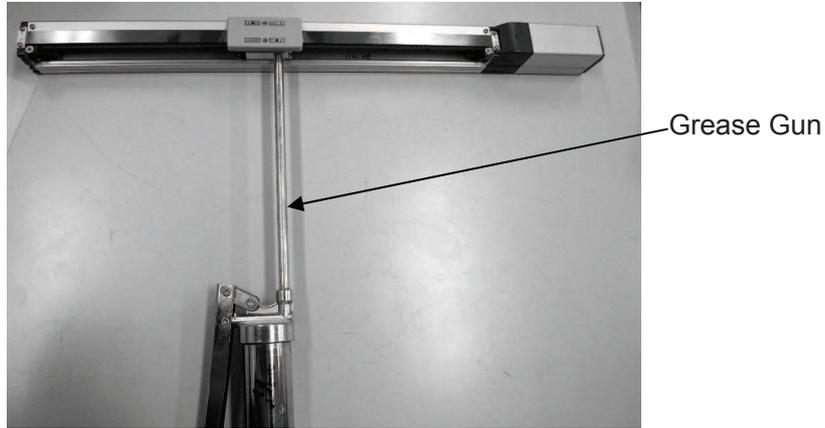
- For grease to be used with an actuator that has a cleanroom setting, please use a type of grease that emits a low amount of dust and is described for cleanroom use. When standard grease is used, dust may be emitted.
- Never use anything other than synthetic poly-olefin grease. When other types of grease are mixed with urea-based grease, degradation of the original lubricity may result in damage to the actuator or the clean performance may degrade.

4.6.2 How to Apply Grease

- 1) Remove the screw and detach the side cover on either side, right or left.
The grease nipple will appear.
(Note) When the side cover on the other side has been detached, the other grease nipple also appears.



- 2) Supply grease from the grease nipple on either side, using the grease gun.
Wipe off the grease before supplying new in case it is extremely dirty.
(Note) Grease can also be applied from the grease nipple on the other side.
When grease is applied from the grease nipple on either side, grease is supplied to the ball screw and the guides on both sides.



(Note) Make sure to use a grease gun that is applicable for the grease nipple inlet diameter shown below.

Grease Nipple Diameter
φ3.5

Grease Gun	Nozzle	Supplier of nozzle
Grease gun of mounting screw R1/8 (Example) GC-57K (Yamada Corporation)	NZ3	NSK

Model Name	Amount of Grease Supply (Reference)
SA4	0.5cc to 1.0cc
SA6	1.5cc to 2.0cc
SA7	2.0cc to 2.5cc
SA8	3.5cc to 4.0cc

Move the slider back and forth in the stroke range after supplying grease so it spreads out evenly in the area.

- Confirm that the ball tracks on the ball screw and guide look glossy with oil of grease. Supply grease again if it is not spread enough.
- Wipe off excess grease.

Caution: Supplying too much grease may increase sliding resistance and load to the motor, resulting in a drop of performance.
Also, excess grease on the ball screw may be splashed around in the ambience.

- 3) Attach the side covers after grease supply is finished.
If you touch the edge of the stainless steel sheet in the attaching process, the sheet may get damaged or wavy which result in shortening life or earlier wear-out.
To avoid touching the edge of the sheet, insert a spacer (approximately 0.1 to 0.2mm) between the sheet and cover to push up the sheet, and then push in the cover.
Also, make sure to follow the notice of caution when attaching side covers described in the next page when side covers are attached.

When affixing the side cover, tighten the screws with the tightening torque described below.

Screw Diameter	Tightening Torque
M3	41.4N·cm

- 3) Make sure that the slider and the side cover do not interfere, moving the slider backwards and forwards between the strokes.

 **Caution:**

- Do not damage the stainless steel sheet by bending it forcefully during work.
Keep in mind that the edges of the stainless steel sheet can cause injuries. Always wear gloves when working on it.
The front bracket is supporting the ball screw. Do not detach it.
If the front bracket loses its tuned condition, it may cause an increase of driving resistance, shortened life of each component or abnormal noise due to the center of the axis being off the right position.
- In case the grease got into your eye, immediately go see the doctor to get appropriate care. After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease OFF.

4.7 Procedure for Stainless Steel Sheet Replacement and Adjustment

In this section, explains how to replace and adjust the stainless steel sheet.

Prepare a storage box and keep there the parts such as screws that have been removed for replacement, for they will be necessary upon re-assembling.

4.7.1 Preparation

(1) Items required for replacing the stainless steel sheet

- Replacement stainless steel sheet
- Phillips screwdriver
- Scale

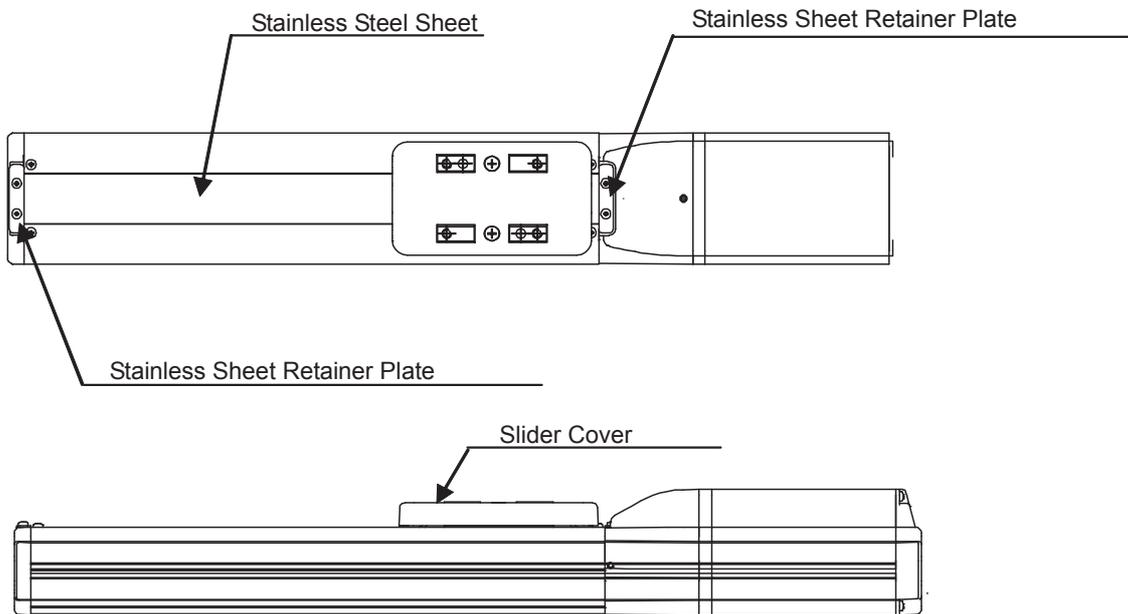
(2) Caution for the stainless steel sheet tension

Degradation and wear-out of the stainless steel sheet relies on its tension of attachment.

If the stainless steel sheet is pulled with a huge force and the gap between the sheet and the slider cover is large, there is a risk of metal fatigue.

On the other hand, if the tensile strength is too low, the stainless steel sheet would interfere with the back side of the slider cover and make dust to be generated. Therefore, adjust the tensile strength of the stainless sheet by the dedicated adjustment jig so as to the gap between the stainless sheet and the slider cover back will match the predetermined measurement.

(3) Names of the Parts



4.7.2 Procedure for Replacement and Tuning

Have a replacement and tuning in (1) Procedure 1 for SA7, SA8.

For SA4, SA6 have a replacement and tuning in either (1) Procedure 1 or (2) Procedure 2.

(1) Procedure 1

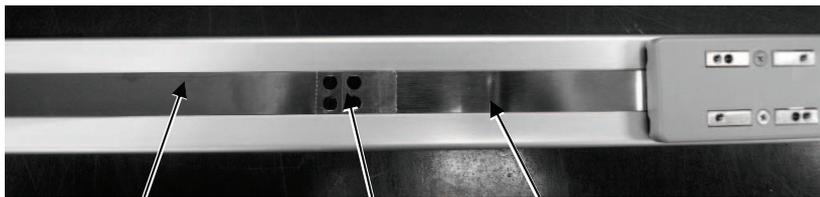
- 1) Remove the screws (4 places) holding the stainless steel sheet and stainless steel sheet retainer plates (2 pieces) with using a Phillips screwdriver.
- 2) Pull the old stainless steel sheet till in front of the slider.
Make sure not to pull it out completely off the slider.



Pull it till in front of the slider.

In front of Slider

- 3) Join a new stainless steel sheet to the old one with using cellophane tape.



New stainless steel sheet

Join with cellophane tape

Old stainless steel sheet

- 4) Pull the old stainless steel sheet so the new one goes through below the slider. Pull it till the new stainless steel sheet comes to the edge of the actuator.



Pull

New stainless steel sheet

Old stainless steel sheet



Pull till the edge

Edge

- 5) Remove the old stainless steel sheet.



- 6) Fix the two stainless steel sheet retainer plates using the screws (four locations). Use a Phillips screwdriver to attach it.



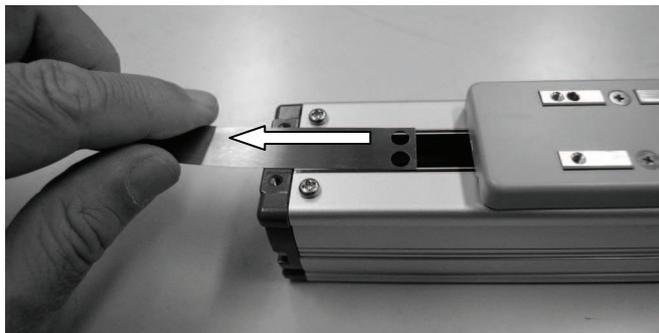
There are two grooves for stainless steel sheet attachment guides. Align so that the stainless steel sheet is positioned at the center between the two grooves. Attach the stainless steel sheet so that it is not bent.

Tightening Torque
41.4N·cm

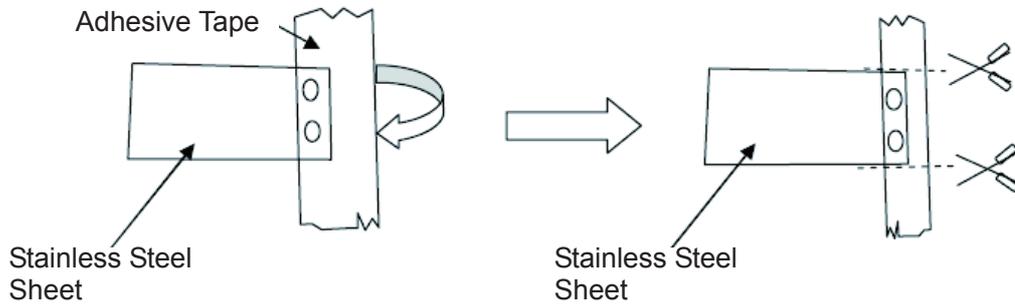
- 7) After the stainless steel sheet retainer plates have been fixed, move the slider from one side to the other side (full stroke) with your hand to check that there is no rise or slackness in the stainless steel sheet. If there is any problem, repeat from step 6).

(2) Procedure 2

- 1) Remove the screws (4 places) holding the stainless steel sheet and stainless steel sheet retainer plates (2 pieces) with using a Phillips screwdriver.
- 2) Pull out the old stainless steel sheet.

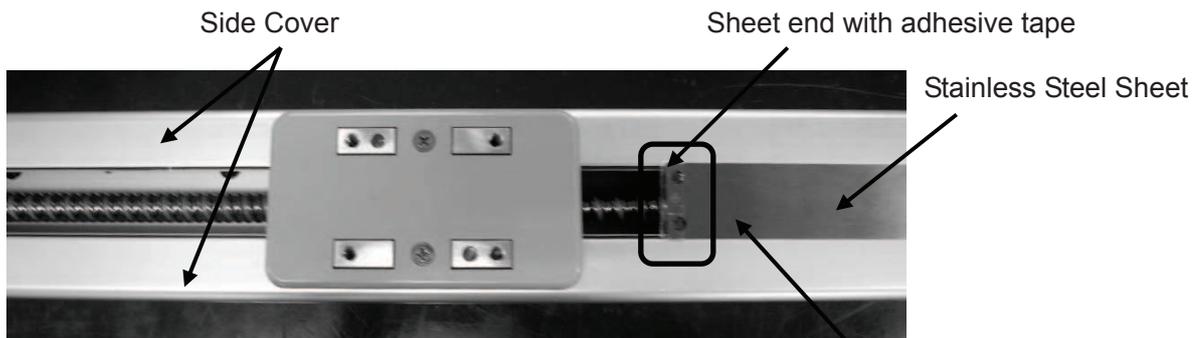


- 3) Attach adhesive tape on one side of new stainless steel sheet.



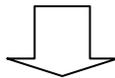
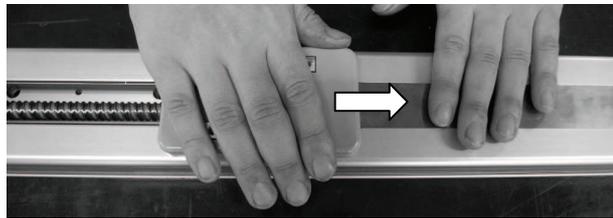
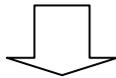
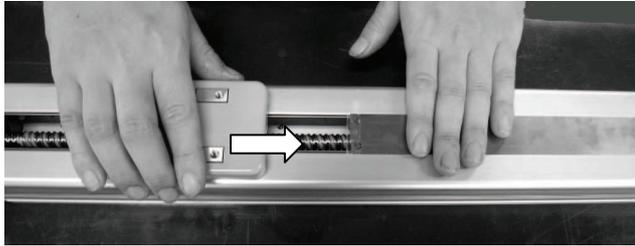
Attach adhesive tape so that it wraps around the end side of the stainless steel sheet. At that time, arrange it so that about 3mm of the end of the tape projects from the stainless steel sheet. Cut any tape excess.

- 4) Put the stainless steel sheet with an adhesive tape on the side cover.

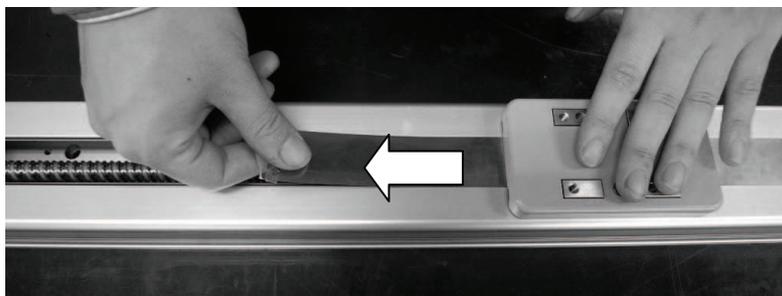


Take care not to drop the stainless steel sheet into the hole.

- 5) With the stainless steel sheet being held, move the slider to put through the stainless steel sheet.



- 6) After the stainless steel sheet passes through the slider, pull one end of the stainless steel sheet out to the position of the stainless steel retainer plate. Take off the adhesive tape once positioning is finished.



- 7) Fix the two stainless steel sheet retainer plates using the screws (four locations).
Use a Phillips screwdriver to attach it.



There are two grooves for stainless steel sheet attachment guides. Align so that the stainless steel sheet is positioned at the center between the two grooves. Attach the stainless steel sheet so that it is not bent.

Tightening Torque
41.4N·cm

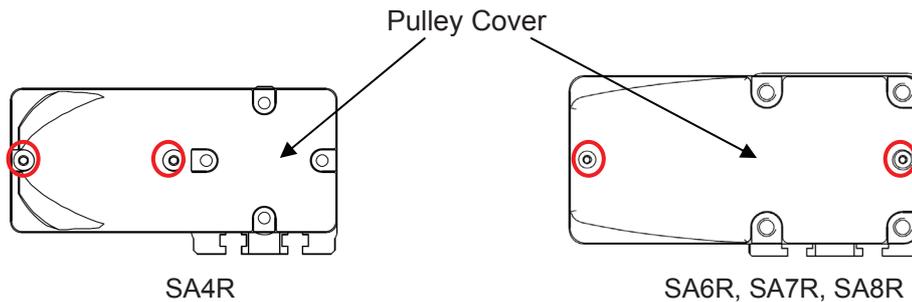
- 8) After the stainless steel sheet retainer plates have been fixed, move the slider from one side to the other side (full stroke) with your hand to check that there is no rise or slackness in the stainless steel sheet. If there is any problem, repeat from step 7).

4.8 Procedure for Belt Replacement and Tuning

Application : RA4R, RA6R, SA7R, SA8R

4.8.1 Inspection of the Belt

For inspection work, detach the pulley cover with hexagonal wrench and carry it out by visual. Remove two hexagonal socket flat-head bolts for SA4R, SA6R, SA7R, and SA8R (where marked with a circle).



The period of replacement for the belt cannot be clearly defined as the durability of it is impacted so much by the operational conditions.

In generally speaking, it possesses bending life of several million times.

The timing belt gets worn away as the time passes, and it is necessary to have replacement at regular intervals with the following conditions as reference.

- When the gear and belt area show obvious friction.
- When swelling occurs as a result of oil adhesion.
- When damages such as a crack occurs on the belt gear and back side.

Also, for the toothed belt, it is recommended to set the interval of regular replacement cycle when in use under high wire fatigue condition in high acceleration and deceleration because it is difficult to judge the right timing for replacement by checking appearance or looseness of the wires strengthening the belt.

4.8.2 Belt to Use

IAI uses the following belt in our plant

Model	IAI Maintenance Part Code	Manufacturer Model Code	
SA4R	TB-RCP6-STRA4R	60S2M148 GB	Rubber, Super torque G Bareback specification (Mitsuboshi Belting Ltd.)
SA6R	TB-RCP6-STRA6R	60S2M182 GB	Rubber, Super torque G Bareback specification (Mitsuboshi Belting Ltd.)
SA7R	TB-RCP6-STRA7R	100S3M225 GB	Rubber, Super torque G Bareback specification (Mitsuboshi Belting Ltd.)
SA8R	TB-RCP6-SA8R	100S3M243 GB	Rubber, Super torque G Bareback specification (Mitsuboshi Belting Ltd.)

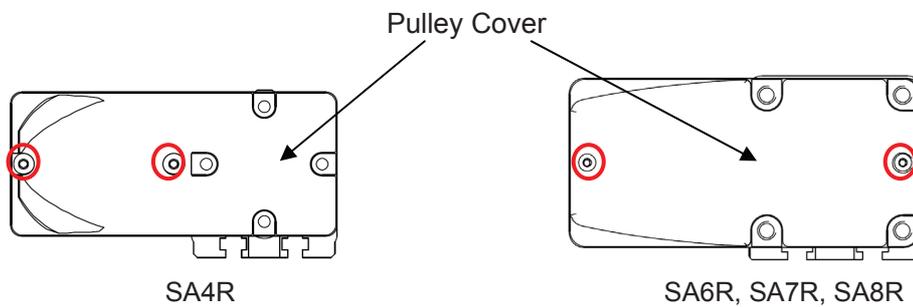
4.8.3 Belt Replacement

[Items required for replacing the motor]

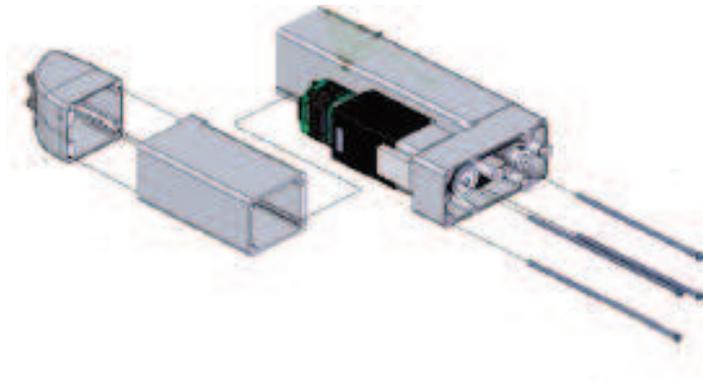
- Belt for Replacement
- Hexagon Wrench 2.5mm(SA4R), 3mm(SA6R/SA7R/SA8R)
2mm (for hexagonal socket flat-head cap screw)
- Phillips screwdriver
- Tension Gauge (that is available for pulling with 90N)
- Long Tie-Band (thin string)

[Procedure]

- 1) Remove two hexagonal socket flat-head bolts for SA4R, SA6R, SA7R, and SA8R (where marked with a circle) with a hexagonal wrench. Detach the pulley cover.

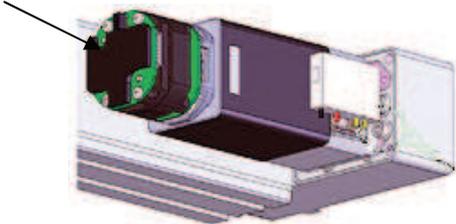


- 2) Remove the four Phillips screws by Phillips screwdriver and remove the motor cover.

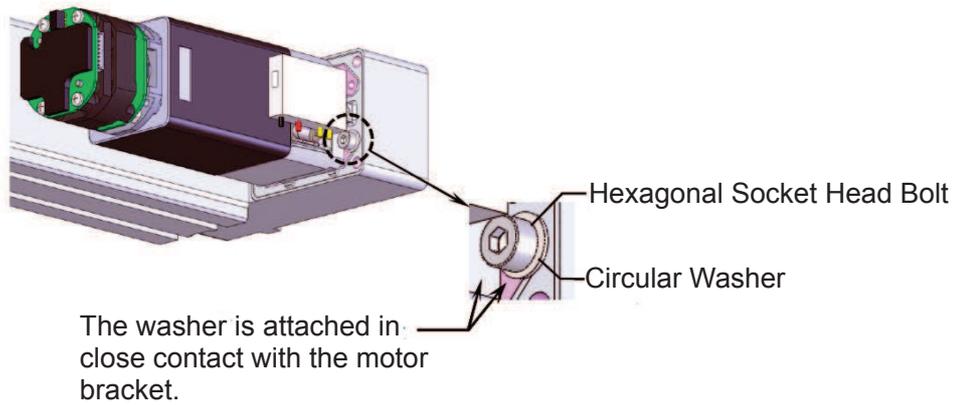


 Caution : Please be sure to follow the following precautions when replacing the belt.
When the motor cover is removed and the encoder is visible, do not touch the encoder part directly with hands.
If touched with hands, the encoder phase may change, resulting in an error.

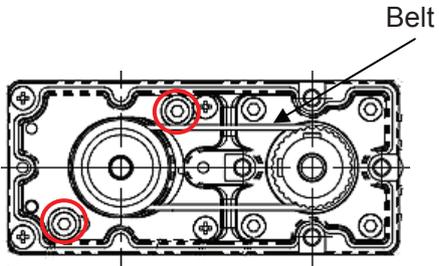
Encoder



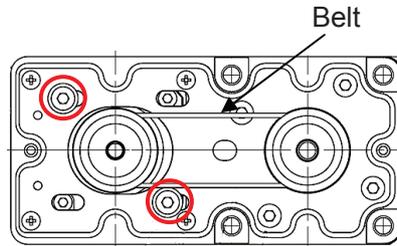
- 3) After tension adjustment of the belt, remove the following bolts and circular washers that are attached for position repeatability of the motor with 2.5mm-sized hexagonal wrench.



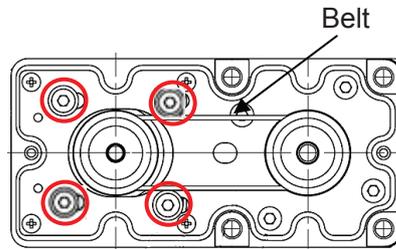
- 4) Loosen the bolts (where marked with a circle; two bolts for SA4R and SA6R, four bolts for SA7R, and SA8R) holding the motor with a 2.5mm-sized (SA4R) or 3mm-sized (SA6R/SA7R/SA8R) hexagonal wrench. Replace the belt if it is necessary.



SA4R
(× 2)

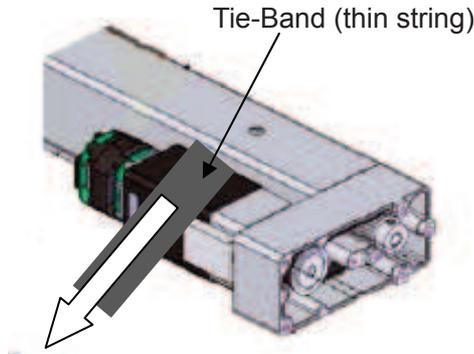


SA6R
(× 2)

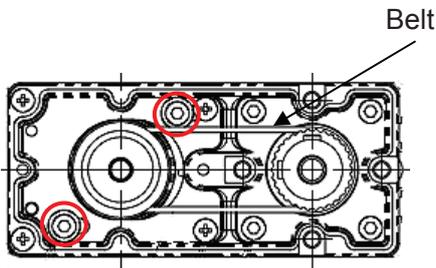


SA7R, SA8R
(× 4)

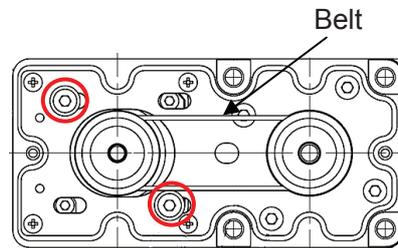
- 5) Adjust the belt tension.
 Hand a cable band (thin string) on the edge of the motor unit and pull it on a tension gauge with the specified load (specified value of the belt tension).
 When the load reached the specified, tighten the bolts (where marked with a circle) with a 2.5mm-sized (SA4R) or 3mm-sized (SA6R/SA7R/SA8R) hexagonal wrench to hold the unit in the place.



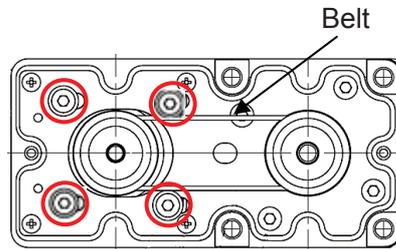
Model	Tension Force
SA4R	20 to 25N
SA6R	25 to 30N
SA7R	80 to 90N
SA8R	80 to 90N



SA4R
(× 2)



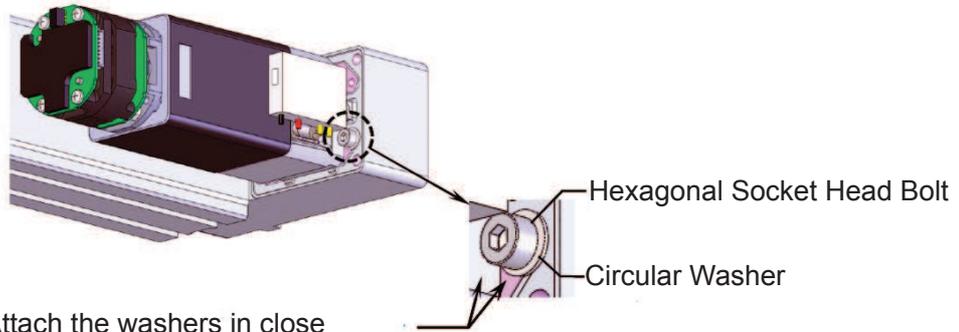
SA6R
(× 2)



SA7R, SA8R
(× 4)

Model	Tightening Torque
SA4R	162N cm
SA6R	323N cm
SA7R	323N cm
SA8R	323N cm

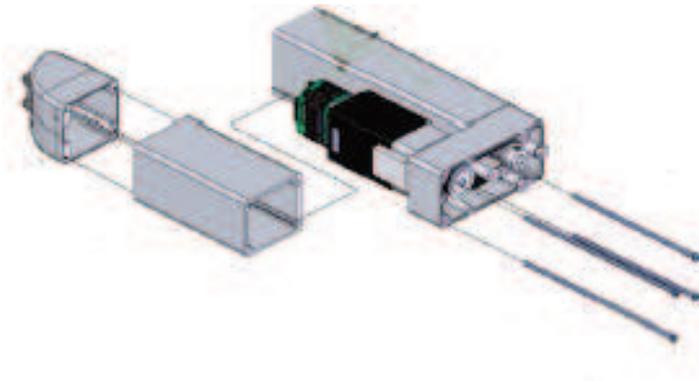
- 6) After tension adjustment of the belt, tighten the following bolts and circular washers attached for position repeatability of the motor in close contact with the motor bracket with 2.5mm-sized hexagonal wrench.



Attach the washers in close contact with the motor bracket.

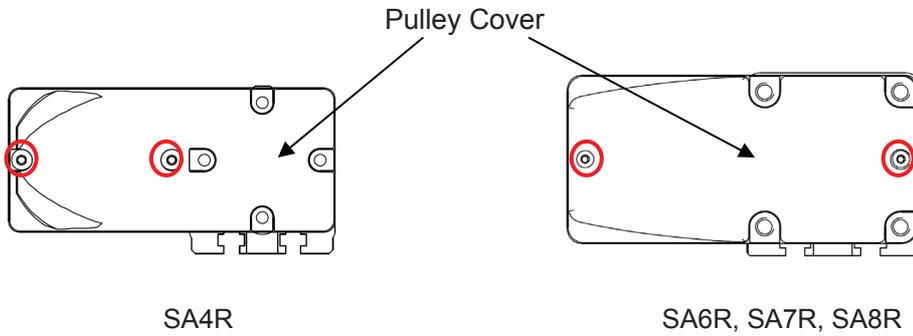
Tightening Torque
88.7N·cm

- 7) Attach the motor cover with four Phillips screws and tighten them with Phillips screwdriver.



Model	Tightening Torque
SA4R, SA6R, SA7R, SA8R	41.4N·cm

8) Attach the pulley cover with two hexagonal socket flat-head bolts for SA4R, SA6R, SA7R, and SA8R (where marked with a circle) and tighten with a hexagonal wrench.



SA4R

SA6R, SA7R, SA8R

Tightening Torque
47.9N·cm

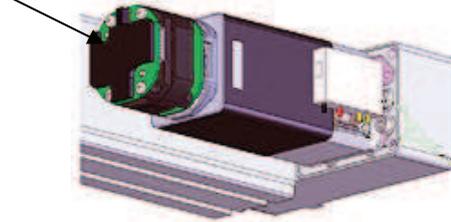
4.9 Motor Replacement Process



Caution: The encoder part of the motor for replacement and the control board of RCP6S may fail due to static electricity. Please be sure to follow the following precautions during work.

- Do not touch the encoder part of the motor for replacement directly with hands. If touched with hands, the encoder phase may change, resulting in an error.

Encoder

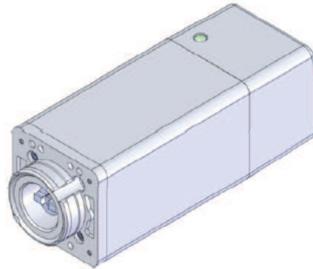


- Do not touch the control board directly with hands except when replacing the control board of RCP6S.
- Before replacement work, touch metal objects and the like to release any static electricity from body.
- Do not perform replacement work at the place where static electricity is likely to occur (carpet, etc).

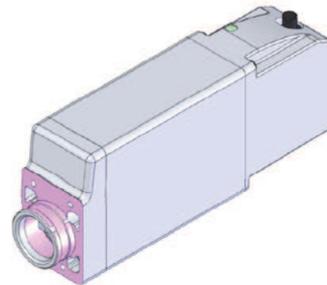
4.9.1 SA4C, SA6C, SA7C, SA8C

[Items required for replacing the motor]

- Motor Unit for Replacement



For RCP6

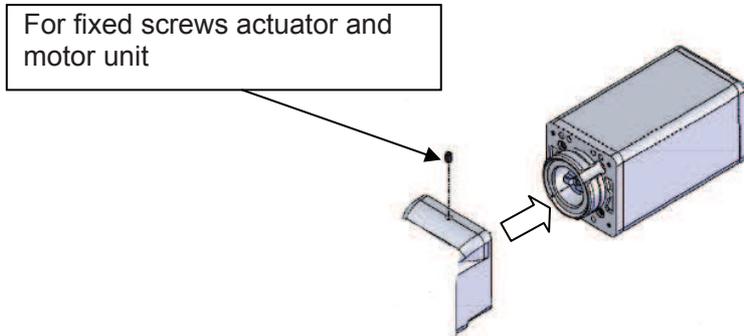


For RCP6S

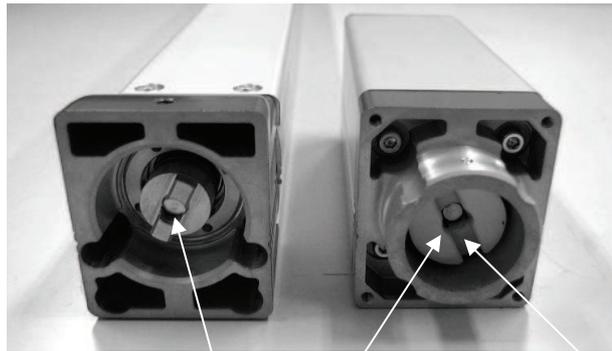
- Hexagonal wrench set 2mm or 2.5mm-sized

[Procedure]

- 1) Remove the fixing screw affixing the actuator and the motor unit with a 2mm-sized (SA4C, SA6C) or 2.5mm-sized (SA7C, SA8C) hexagonal wrench.
- 2) Detach the motor unit.



- 3) Make the profiles on the actuator side and motor unit side aligned so the projection matches to the slit.

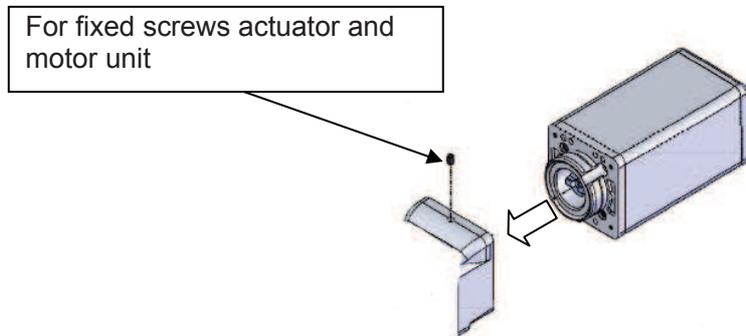


Make the projection and slit matched with each other.

Apply grease to the coupling part.
NOXLUB TL1010 grease made by NOK

- 4) Attach the motor unit for replacement with the projection being matched with the slit.

- 5) Tighten the fixing screw to affixing the motor unit to the actuator with 2mm-sized (SA4C, SA6C) or 2.5mm-sized (SA7C, SA8C) hexagonal wrench.



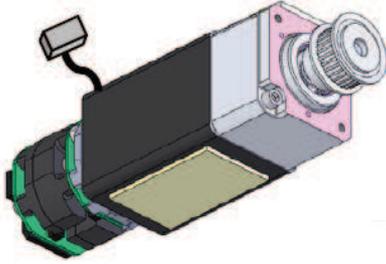
Model	Tightening Torque
SA4C, SA6C	167N·cm
SA7C, SA8C	353N·cm

- 6) Make sure to conduct a home return on a PC or a touch panel teaching after motor replacement.

4.9.2 SA4R, SA6R, SA7R, SA8R

[Items required for replacing the motor]

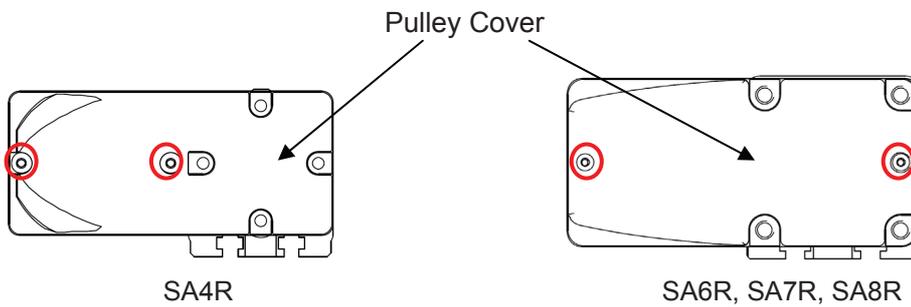
- Motor unit for replacement



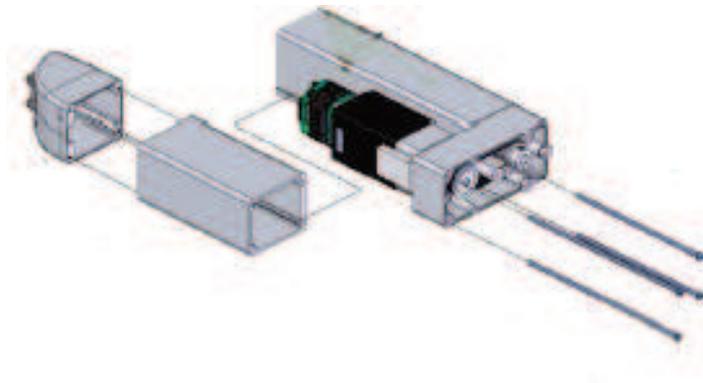
- Hexagon wrench set 2.5mm(SA4R), 3mm(SA6R/SA7R/SA8R)
2mm (for hexagonal socket bolt)
- Phillips screwdriver
- Tension gauge (capable thing of tensioning to 90N or greater)
- Strong string or long tie-band

[Procedure]

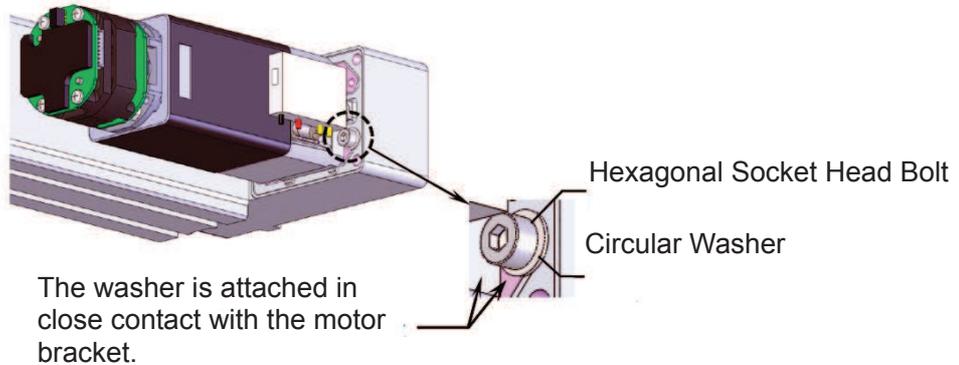
- 1) Remove two hexagonal socket flat-head bolts for SA4R, SA6R, SA7R, and SA8R (where marked with a circle) with a hexagonal wrench. Detach the pulley cover.



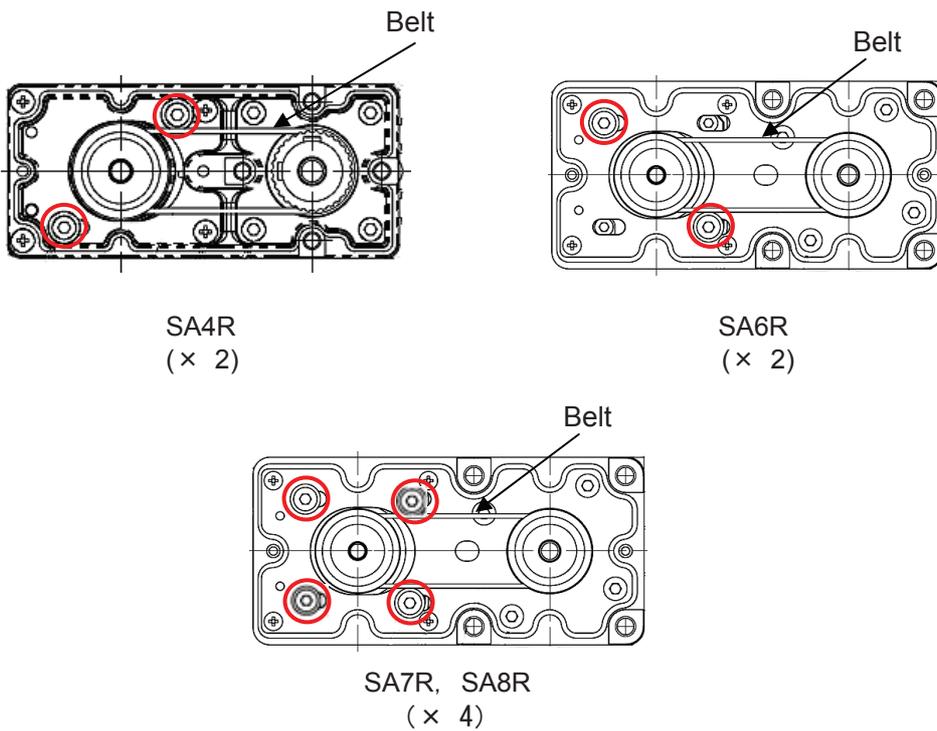
- 2) Remove the four Phillips screws by Phillips screwdriver and remove the motor cover.



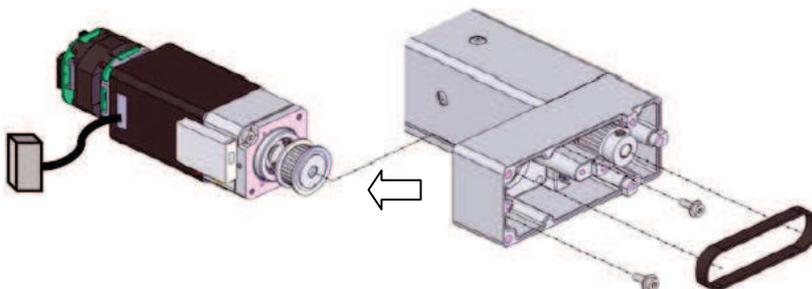
- 3) If the belt is to be replaced at the same time, remove the following bolts and circular washers that are mounted for position repeatability of the motor by 2.5mm-sized hexagonal wrench, after tension adjustment of the belt,



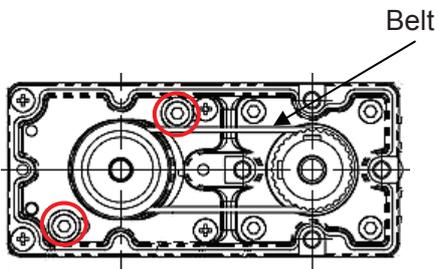
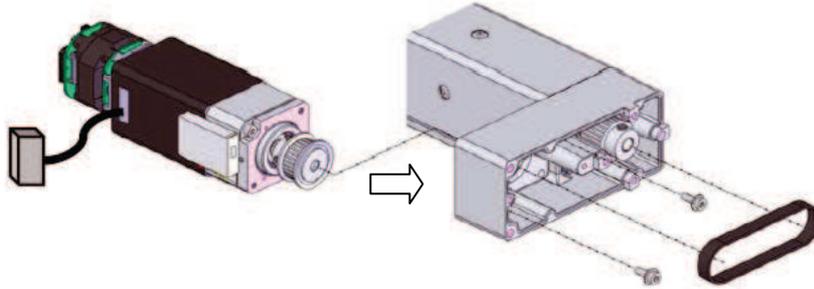
- 4) Loosen the bolts (where marked with a circle; two bolts for SA4R and SA6R, four bolts for SA7R, and SA8R) holding the motor with a 2.5mm-sized (SA4R) or 3mm-sized (SA6R/SA7R/SA8R) hexagonal wrench. Replace the belt if it is necessary.



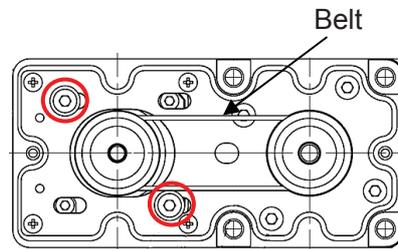
- 5) Detach the belt off the pulleys.
- 6) Pull out four bolts and remove the motor unit.



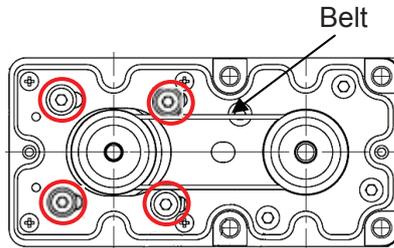
- 7) Install the new motor and temporarily tighten the tension adjustment bolts (encircled parts). Hang the timing belt.



SA4R
(× 2)



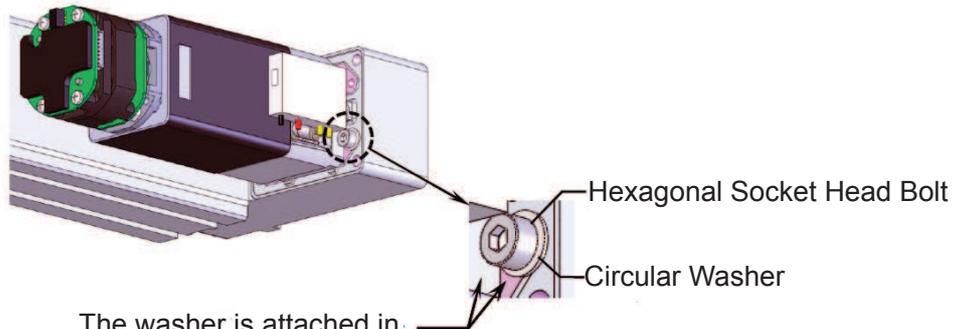
SA6R
(× 2)



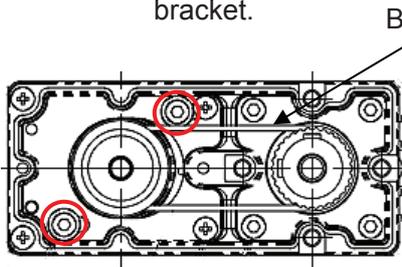
SA7R, SA8R
(× 4)

(Note) If the belt is not replaced at the same time and the following hexagonal socket bolts and circular washers are not removed, there is no need to adjust tension of the belt as prescribed in 8).

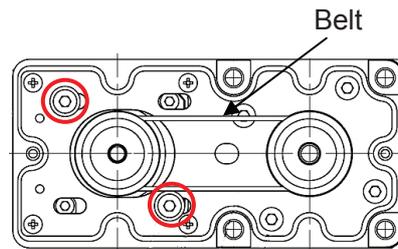
Hand a cable band (thin string) on the edge of the motor unit and pull it. When it is abutting against the hexagonal socket bolt, tighten the bolt (where marked with a circle) with 2.5mm-sized (SA4R) or 3mm-sized (SA6R/SA7R/SA8R) hexagonal wrench to hold the unit in the place.



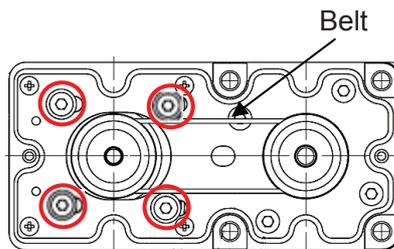
The washer is attached in close contact with the motor bracket.



SA4R
(× 2)



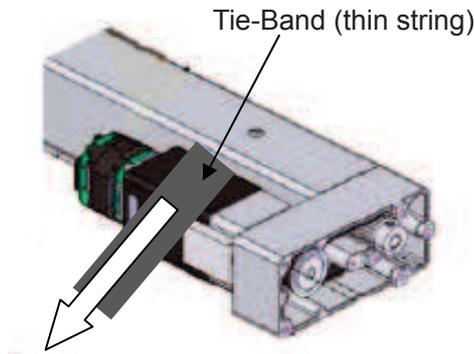
SA6R
(× 2)



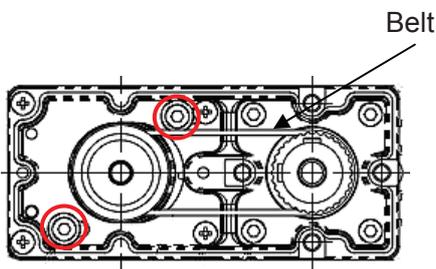
SA7R, SA8R
(× 4)

Model	Tightening Torque
SA4R	162N·cm
SA6R	323N·cm
SA7R	323N·cm
SA8R	323N·cm

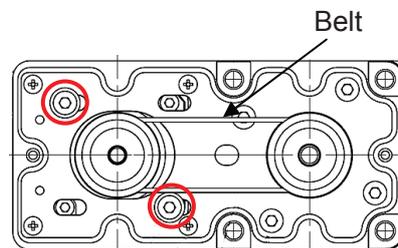
- 8) If the belt has been replaced at the same time, adjust the tension of the belt.
 Hand a cable band (thin string) on the edge of the motor unit and pull it on a tension gauge with the specified load (specified value of the belt tension).
 When the load reached the specified, tighten the bolts (where marked with a circle) with a 2.5mm-sized (SA4R) or 3mm-sized (SA6R/SA7R/SA8R) hexagonal wrench to hold the unit in the place.



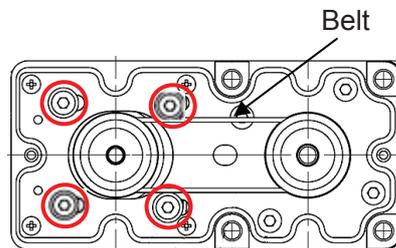
Model	Tension Force
SA4R	20 to 25N
SA6R	25 to 30N
SA7R	80 to 90N
SA8R	80 to 90N



SA4R
(× 2)



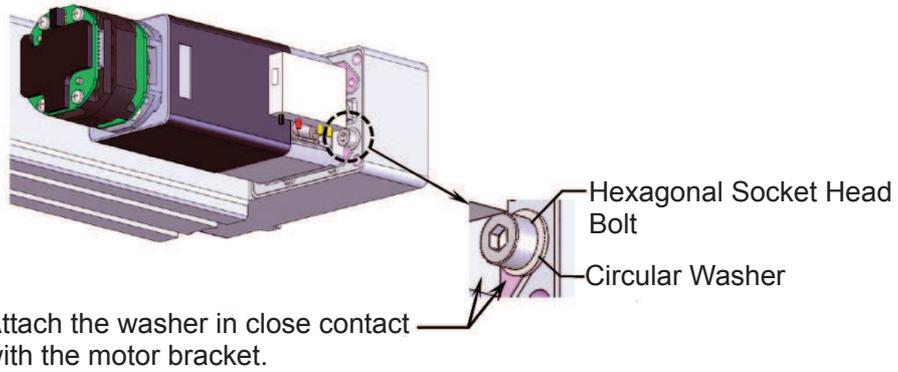
SA6R
(× 2)



SA7R, SA8R
(× 4)

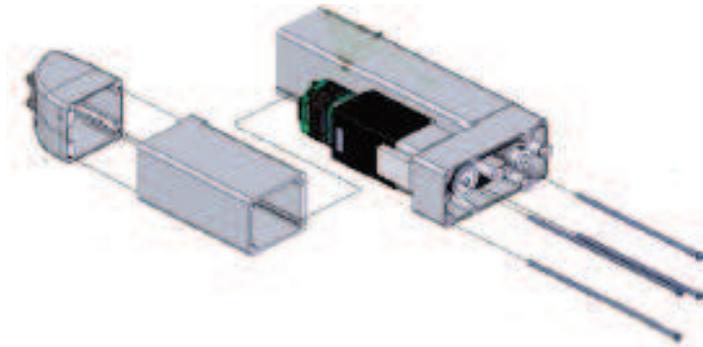
Model	Tightening Torque
SA4R	162N·cm
SA6R	323N·cm
SA7R	323N·cm
SA8R	323N·cm

- 9) If the belt has been replaced at the same time, tighten the following bolts and circular washers that are mounted for position repeatability of the motor with 2.5-mm sized hexagonal wrench after tension adjustment of the belt.



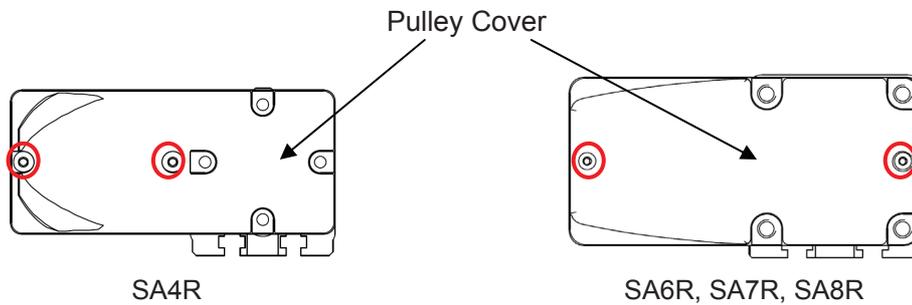
Tightening Torque
88.7N·cm

- 10) Attach the motor cover with four Phillips screws and tighten them with Phillips screwdriver.



Model	Tightening Torque
SA4R, SA6R, SA7R, SA8R	41.4N·cm

- 11) Attach the pulley cover with two hexagonal socket flat-head bolts for SA4R, SA6R, SA7R, and SA8R (where marked with a circle) and tighten with a hexagonal wrench.



Tightening Torque
47.9N·cm

- 12) Make sure to conduct a home return on a PC or a touch panel teaching after motor replacement.