

5. Maintenance and Inspection

5.1 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.

	External visual inspection	Greasing
Start of work inspection	○	
1 month inspection	○	
3 month inspection	○	○(Rod sliding surface, Ball screw, Whirl-stop)
Every 3 months thereafter	○	○ (Rod sliding surface)
6 month inspection	○	○(Ball screw, Whirl-stop)
Every 6 months thereafter	○	○(Ball screw, Whirl-stop)

- *1 Grease the rod sliding surface when grease is insufficient at start of work inspection, or every three month. When greasing, always wipe off old grease before supplying new one.
The base oil may be separated from grease, depending on the installation orientation and operating conditions. Perform visual inspection for any occurrence of drip.



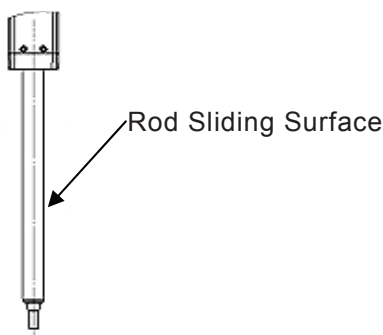
Caution:

- An actuator after 6 months of storage may have caused a degradation of the grease.
Supply grease before start using. [Refer to 5.6 "Grease Supply"]
- Degradation speed of grease may differ depending on the environment of use (temperature, humidity and ambient conditions). It is recommended to shorten the grease supply period if the actuator is used under a bad condition such as in high temperature, high humidity or in dusty ambience.
Also, it is recommended to improve the environment conditions in case the grease changes its color due to the bad condition of use.

5.2 External Visual Inspection

An external visual inspection should check the following things.

Main unit	Loose actuator mounting bolts, other loose items
Rod sliding surface	Lubrication state of grease Drip of grease base oil or other oils Adhesion of dust and other foreign objects
Cables	Scratches, proper connections
Overall	Irregular noise, vibration



5.3 Cleaning

- Clean exterior surfaces as necessary.
- If there are drips of grease base oil or other oils on the rod sliding surface and the surrounding area, wipe off with a soft cloth.
- 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.

5.4 Grease Supply

5.4.1 What Grease to Use

IAI uses the following grease in our plant.

Ball screw	Kyodo Yushi	Multitemp LRL No.3
Whirl-stop	Kyodo Yushi	Multitemp LRL No.3
Rod (sliding surface)	Kyodo Yushi	Multitemp LRL No.3

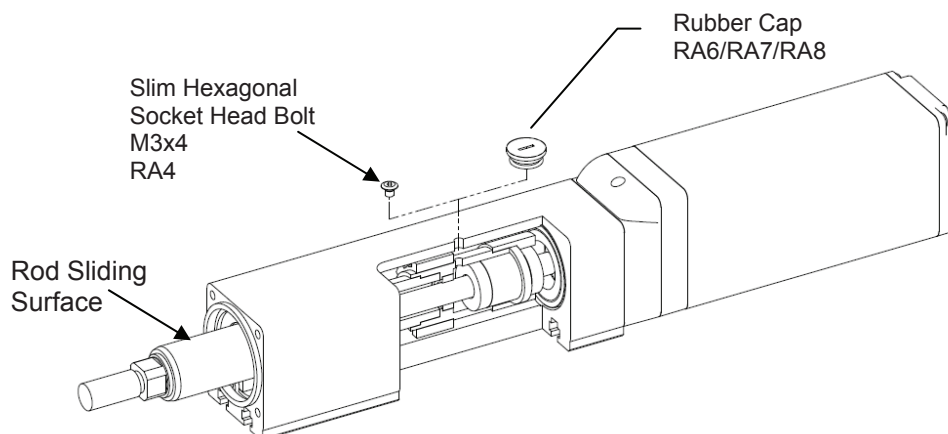
Use lithium-based spray grease for maintenance.

Wako Chemical	Spray grease No.A161 or equivalents
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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.

5.4.2 How to Apply Grease

- (1) For RA4, remove slim hexagonal socket head bolts (M3 × 4) blocking the greasing port by Allen wrench.
For RA6/RA7/RA8, remove the rubber cap blocking the greasing port.
- (2) Grease the ball screws and the whirl-stop according to the following instructions.
[Ball Screw]
Adjust the rod to the home position.
By adjusting it to the home position, the greasing port and the port for ball screws will match inside the main unit.
Connect the controller and adjust it to the home position.
Insert the tip of the spray grease in greasing port and inject it for one second.
One injection time should not exceed one second.
[Whirl-stop]
Adjust the rod position above 40mm.
Insert the tip of the spray grease in greasing port and inject it for one second.
One injection time should not exceed one second.



- (3) Clean up the rod (sliding surface) and apply the grease with hands.
- (4) After greasing, move the rod full-stroke to apply the grease thoroughly.

Caution: Supplying too much grease may increase sliding resistance and load to the motor, resulting in a drop of performance.

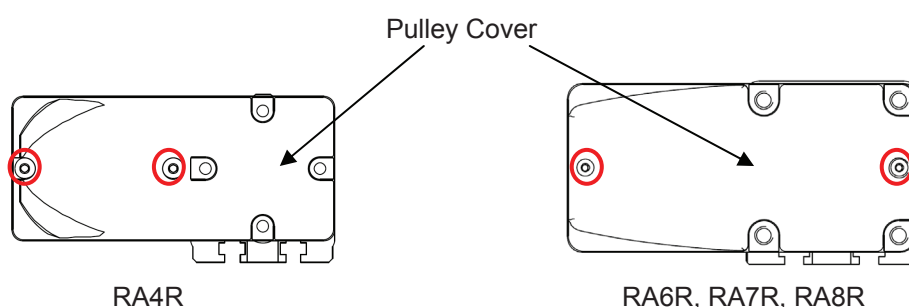
- In case the grease got into your eye, immediately go see the doctor to get appropriate care. After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease OFF.

5.5 Procedure for Belt Replacement and Tuning

Applicable Units : RA4R, RA6R, RA7R, RA8R

5.5.1 Inspection of the Belt

For inspection work, detach the pulley cover with hexagonal wrench and carry it out by visual.
For RA4R, RA6R, RA7R, and RA8R, remove two hexagonal socket flat-head bolts (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.

5.5.2 Belt to Use

IAI uses the following belt in our plant

Model	IAI Maintenance Part Code	Manufacturer Model Code	
RA4R	TB-RCP6-STRA4R	60S2M148 GB	Rubber, Super torque G Bareback specification (Mitsuboshi Belting Ltd.)
RA6R	TB-RCP6-STRA6R	60S2M182GB	Rubber, Super torque G Bareback specification (Mitsuboshi Belting Ltd.)
RA7R	TB-RCP6-STRA7R	100S3M225 GB	Rubber, Super torque G Bareback specification (Mitsuboshi Belting Ltd.)
RA8R	TB-RCP6-RA8R	275-EV5GT-15	Rubber, EV belt (Gates Unitta Asia)

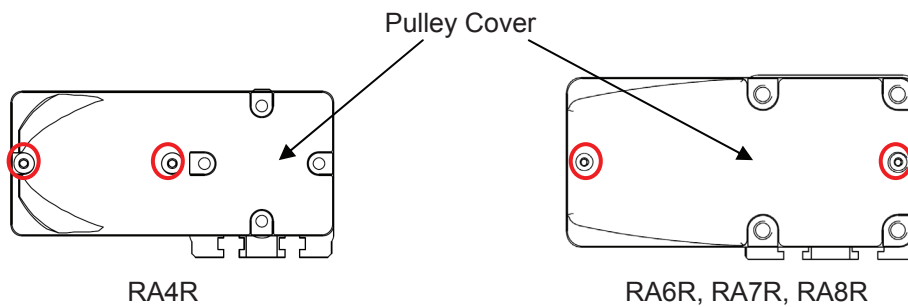
5.5.3 Belt Replacement

[Items required for replacing the motor]

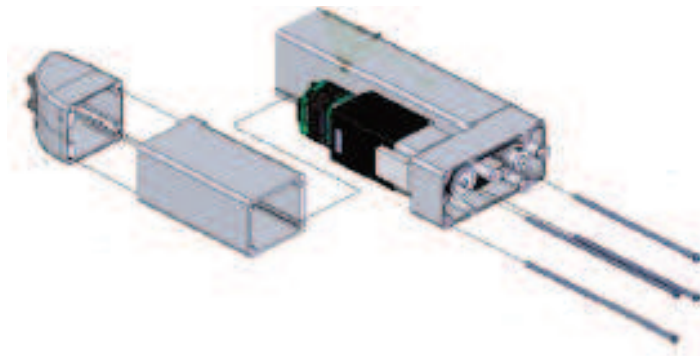
- Belt for Replacement
- Hexagon Wrench 2.5mm(RA4R), 3mm(RA6R/RA7R)
4mm (RA8R), 2mm (for hexagonal socket flat-head cap screw)
- Phillips screwdriver
- Tension Gauge (that is available for pulling with 200N)
- Long Tie-Band (thin string)

[Procedure]

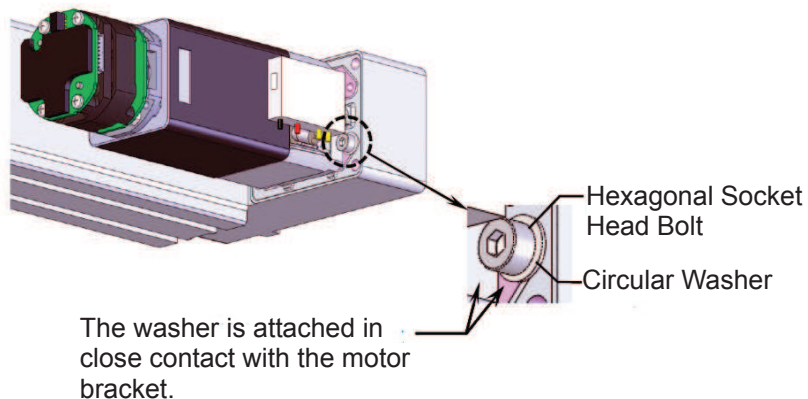
- 1) For RA4R, RA6R, RA7R, and RA8R, remove two hexagonal socket flat-head bolts (where marked with a circle) with a hexagonal wrench. Detach the pulley cover.



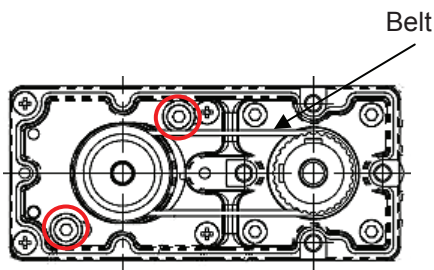
- 2) Remove the four Phillips screws by Phillips screwdriver and remove the motor cover.



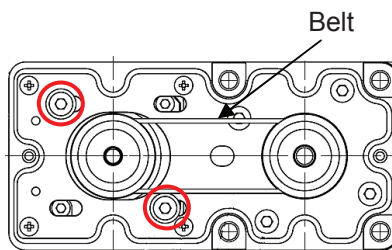
- 3) After tension adjustment of the belt, remove the following bolts and circular washers that are attached for position repeatability of the motor with 2.5mm-sized hexagonal wrench.



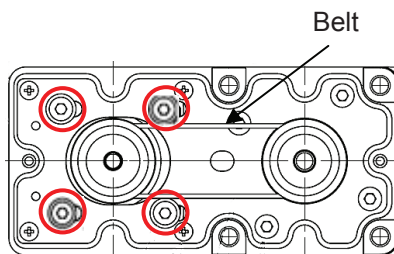
- 4) Loosen the bolts (where marked with a circle; two bolts for RA4R and RA6R, four bolts for RA7R, and RA8R) holding the motor with a 2.5mm-sized (RA4R), 3mm-sized (RA6R/RA7R) or 4 mm-sized (RA8R) hexagonal wrench. Replace the belt if it is necessary.



RA4R
(× 2)

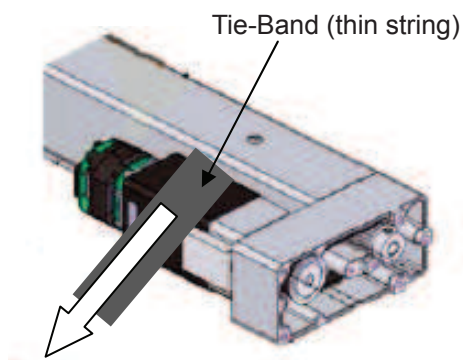


RA6R
(× 2)

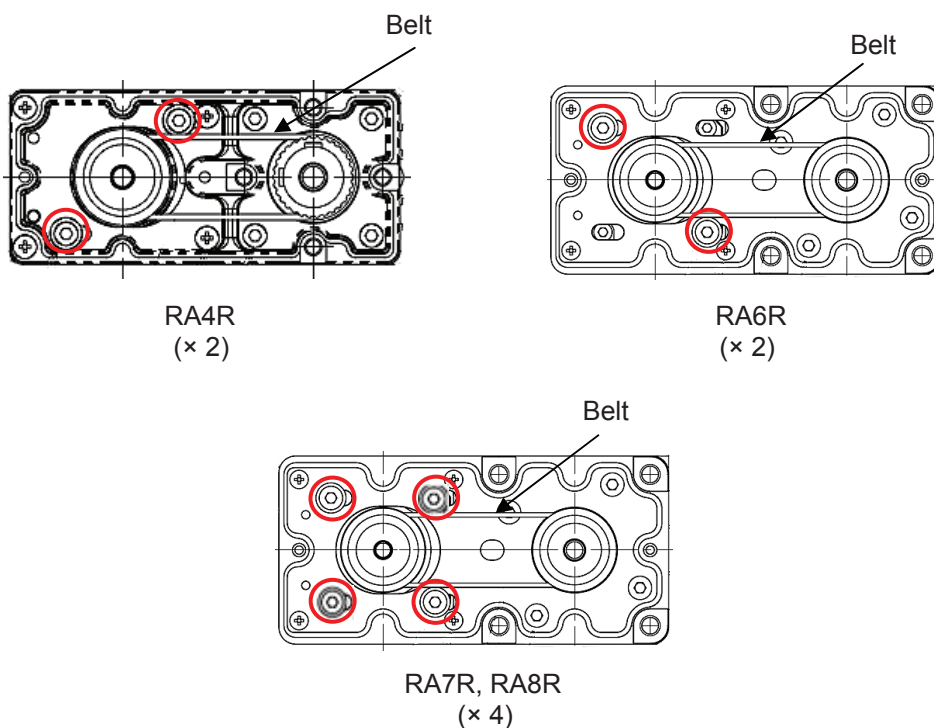


RA7R, RA8R
(× 4)

- 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 (RA4R), 3mm-sized (RA6R/RA7R), or 4mm-sized (RA8R) hexagonal wrench to hold the unit in the place.

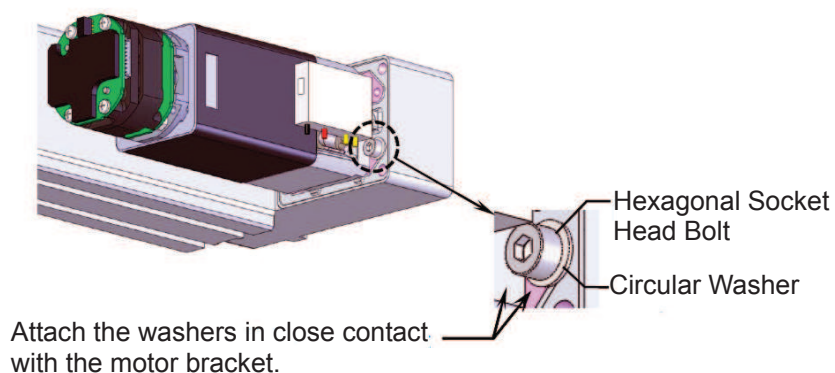


Model	Tension Force
RA4R	20 to 25N
RA6R	25 to 30N
RA7R	80 to 90N
RA8R	180 to 200N



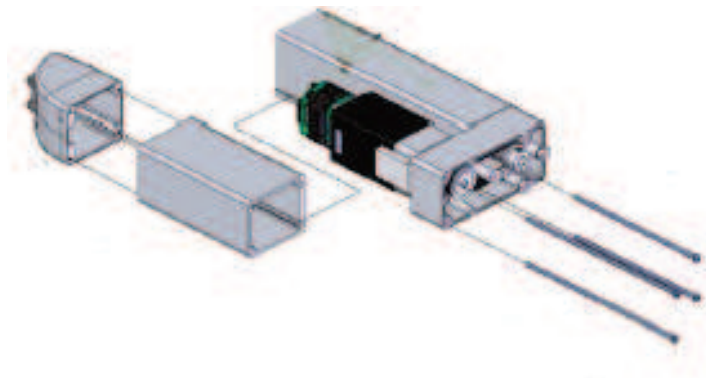
Model	Tightening Torque
RA4R	162N cm
RA6R	323N cm
RA7R	323N cm
RA8R	631N cm

- 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.



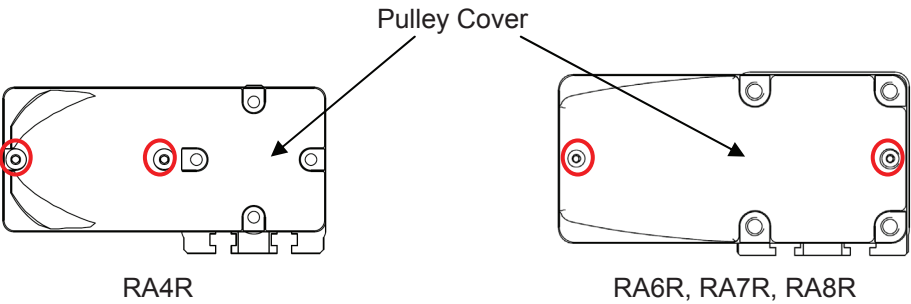
Tightening Torque
88.7N cm

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



Model	Tightening Torque
RA4R, RA6R, RA7R	41.4N cm
RA8R	96.4N cm

8) Attach the pulley cover with two hexagonal socket flat-head bolts for RA4R, RA6R, RA7R, and RA8R (where marked with a circle) and tighten with a hexagonal wrench.



Tightening Torque
47.9N cm

5.6 Motor Replacement Process



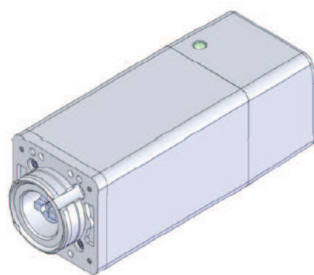
Caution: The encoder part of the motor for replacement and the control board of RCP6S may fail due to static electricity. Please be sure to follow the following precautions during work.

- Do not touch the encoder part of the motor for replacement directly with hands.
- 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).

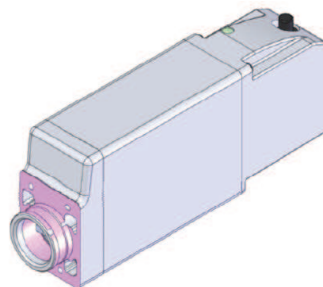
5.6.1 RA4C, RA6C, RA7C

[Items required for replacing the motor]

- Motor Unit for Replacement



For RCP6



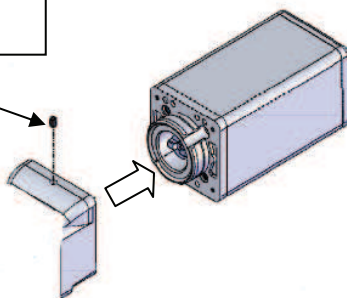
For RCP6S

- Hexagonal wrench set 2mm or 2.5mm-sized

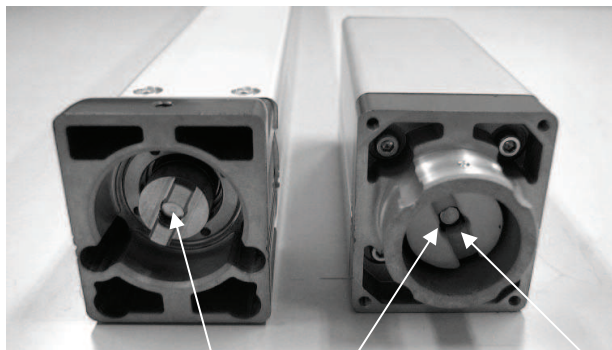
[Procedure]

- 1) Remove the fixing screw affixing the actuator and the motor unit with a 2mm-sized (RA4C, RA6C) or 2.5mm-sized (RA7C) hexagonal wrench.
- 2) Detach the motor unit.

For Fixed screws actuator and Motor Unit



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

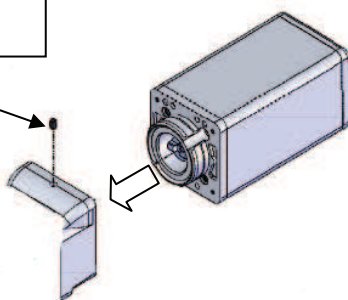


Make the projection and slit matched with each other.

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 (RA4C, RA6C) or 2.5mm-sized (RA7C) hexagonal wrench.

For Fixed screws actuator and Motor Unit



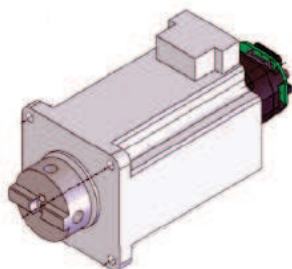
Model	Tightening Torque
RA4C, RA6C	167N cm
RA7C	353N cm

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

5.6.2 RA8C

[Items required for replacing the motor]

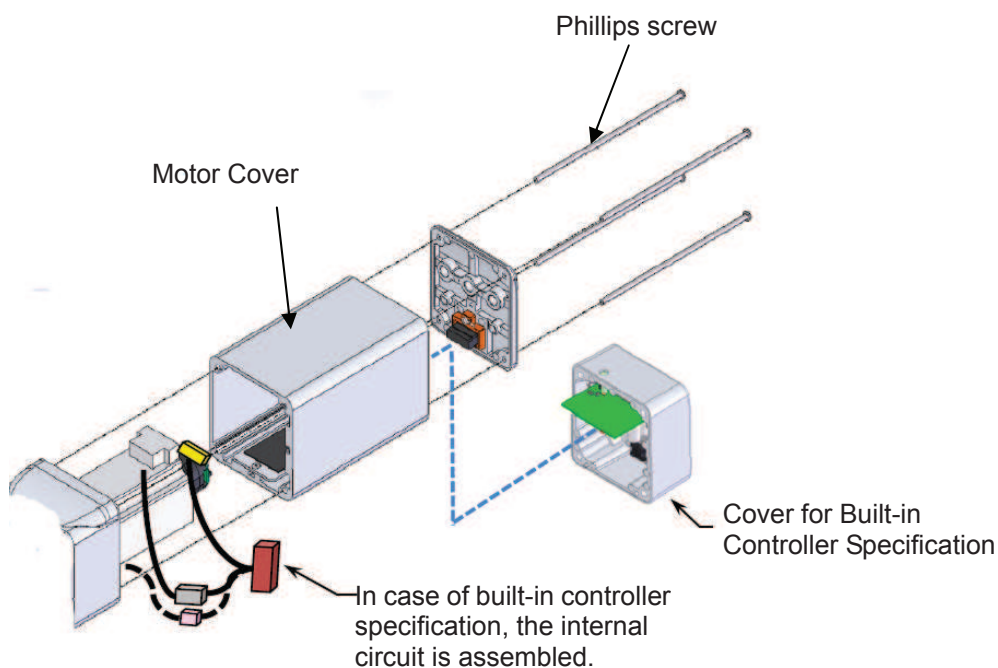
- Hexagonal wrench set
- Phillips screwdriver
- Motor for Replacement



Replacement Motor

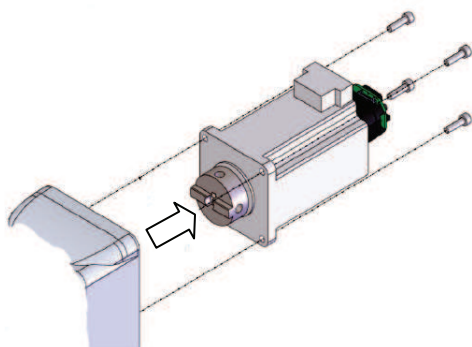
[Procedure]

- 1) Remove the four Phillips screws holding the motor cover with Phillips screwdriver. The motor cover can be detached.
- 2) Disconnect the motor • encoder connector.
- 3) Detach the motor cover.

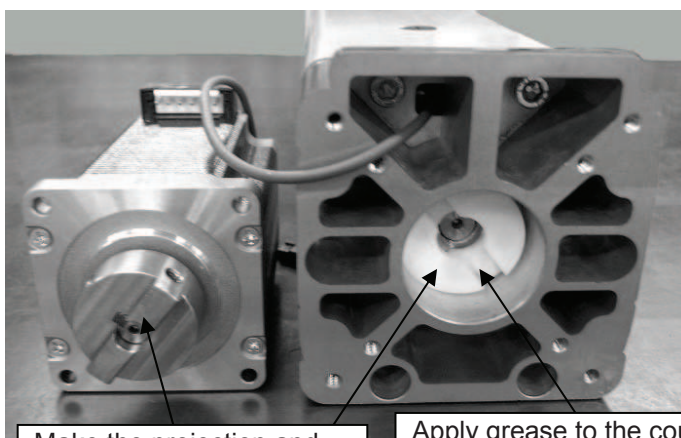


- 4) Remove the four hexagonal socket head cap bolts (M4 ×15 w/o brake, M4 ×12 with brake) holding the motor with using a 3mm-sized hexagonal wrench.

- 5) Pull out the motor.



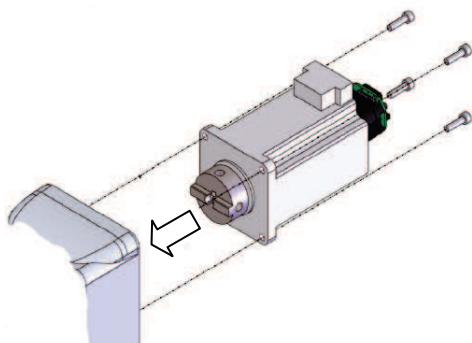
- 6) Make the profiles on the actuator side and motor unit side aligned so the projection matches to the slit.



Make the projection and slit matched with each other.

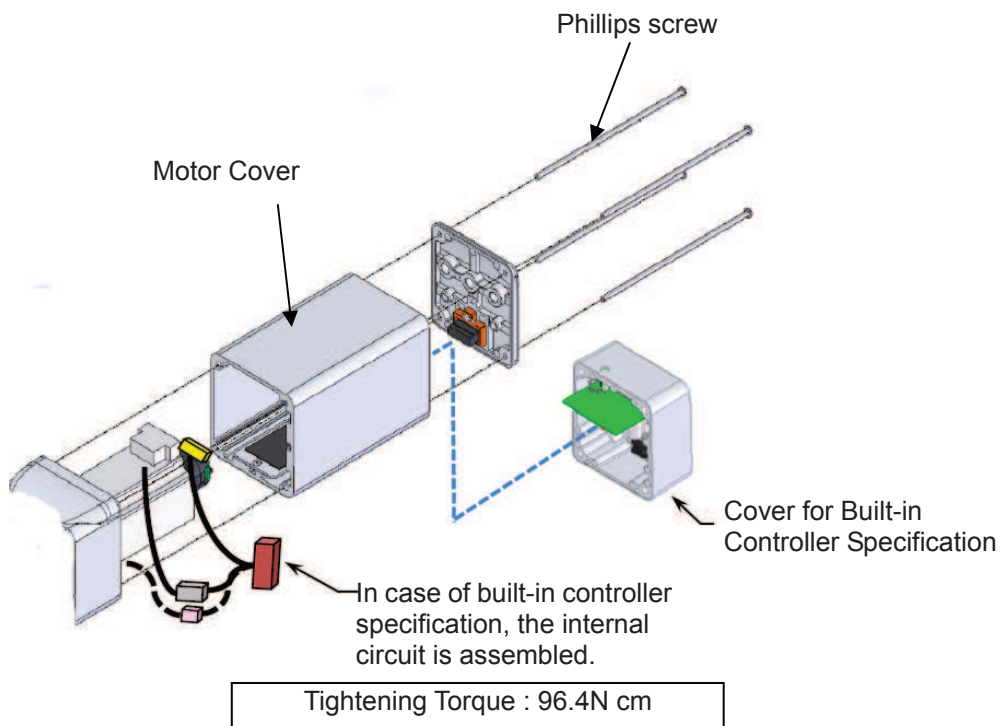
Apply grease to the coupling part.
TL101Y grease made by NOK

- 7) Insert the motor to the main body.
- 8) Affix the motor with the four bolt (M4 ×15 w/o brake, M4 ×12 with brake) and tighten them with using a 3mm-sized hexagonal wrench.



Tightening Torque : 176N cm

- 9) Attach the motor cover and plug in the motor connector.
Pay attention not to involve the wires to the bolt guilds when attaching the motor cover.
- 10) Plug in the motor • encoder connector.
- 11) Affix the motor cover with four Phillips screws and tighten them with Phillips screwdriver.

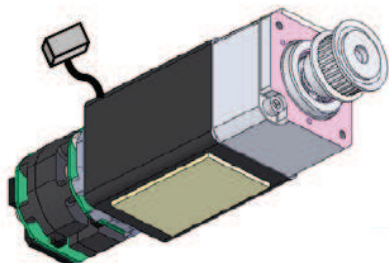


- 12) Make sure to conduct a home return on a PC or a touch panel teaching after motor replacement.

5.6.3 RA4R, RA6R, RA7R, RA8R

[Items required for replacing the motor]

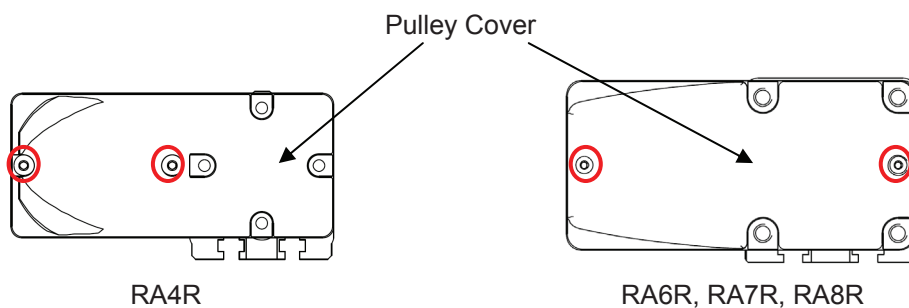
- Motor unit for replacement



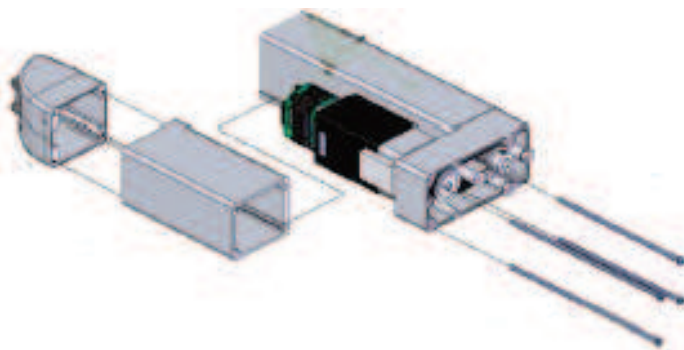
- Hexagon wrench set 2.5mm(RA4R), 3mm(RA6R/RA7R)
4mm(RA8R), 2mm(for hexagonal socket bolts)
- Phillips screwdriver
- Tension gauge (capable thing of tensioning to 200N or greater)
- Strong string or long tie-band

[Procedure]

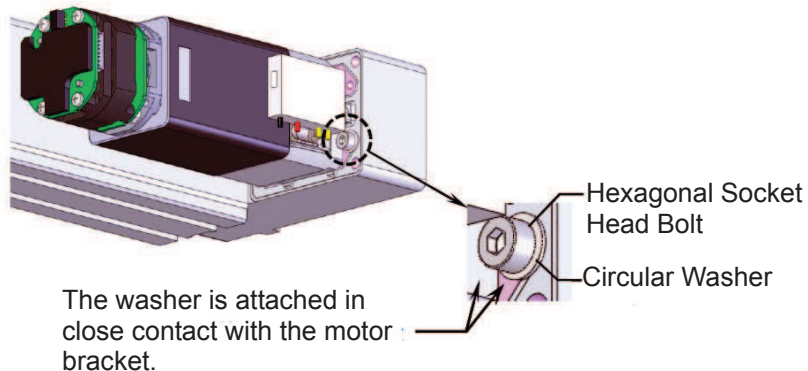
- 1) For RA4R, RA6R, RA7R, and RA8R, remove two hexagonal socket flat-head bolts (where marked with a circle) with a hexagonal wrench. Detach the pulley cover.



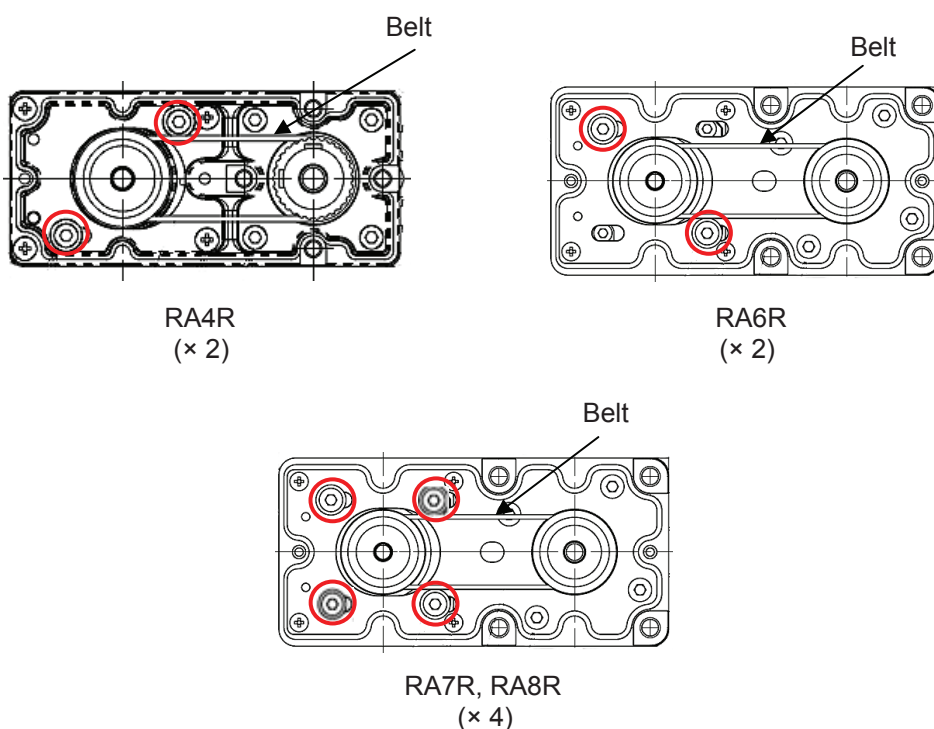
- 2) Remove the four Phillips screws by Phillips screwdriver and remove the motor cover.



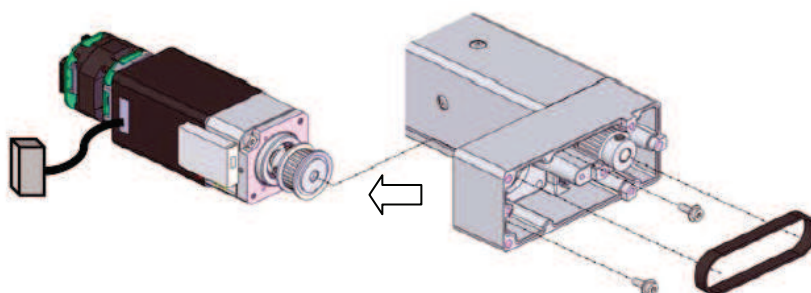
- 3) If the belt is to be replaced at the same time, remove the following bolts and circular washers that are mounted for position repeatability of the motor by 2.5mm-sized hexagonal wrench, after tension adjustment of the belt,



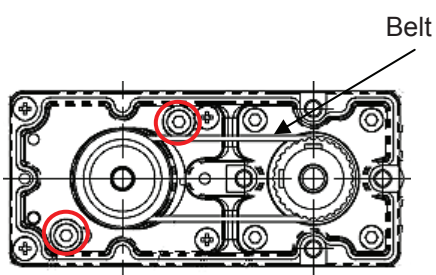
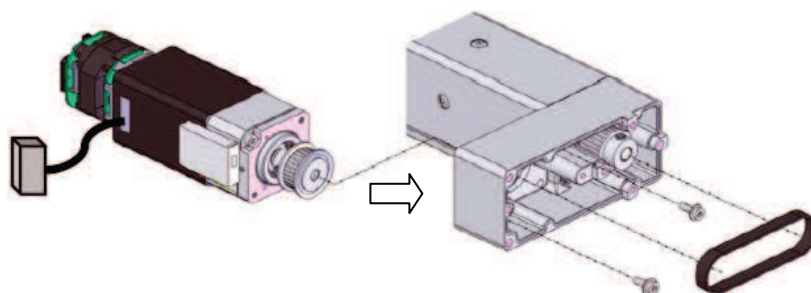
- 4) Loosen the bolts (where marked with a circle; two bolts for RA4R and RA6R, four bolts for RA7R, and RA8R) holding the motor with a 2.5mm-sized (RA4R), 3mm-sized (RA6R/RA7R) or 4mm-sized (RA8R) hexagonal wrench. Replace the belt if it is necessary.



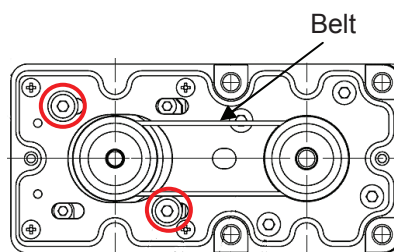
- 5) Detach the belt off the pulleys.
- 6) Pull out four bolts and remove the motor unit.



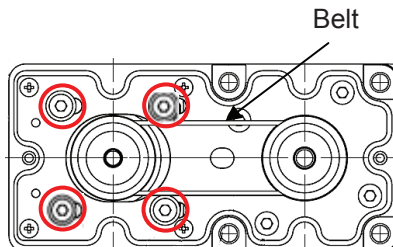
- 7) Install the new motor and temporarily tighten the tension adjustment bolts (encircled parts). Hang the timing belt.



RA4R
(× 2)



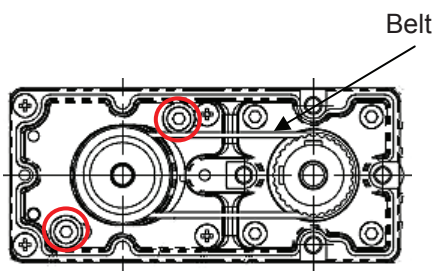
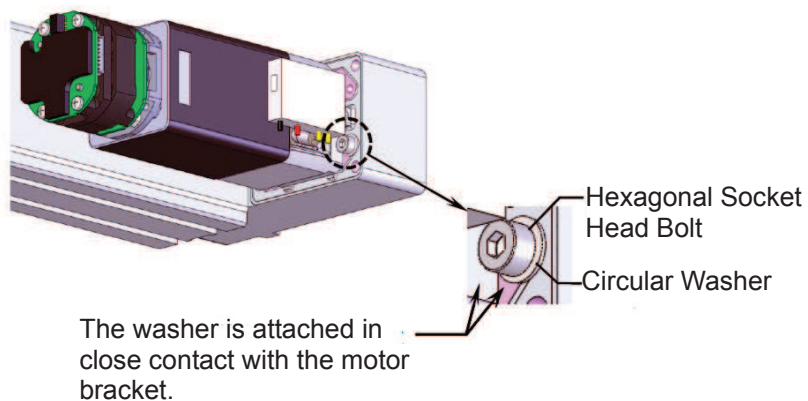
RA6R
(× 2)



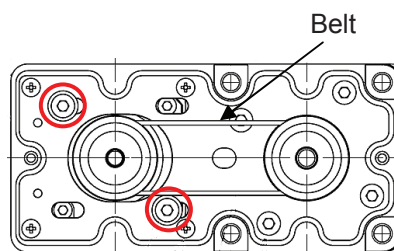
RA7R, RA8R
(× 4)

(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).

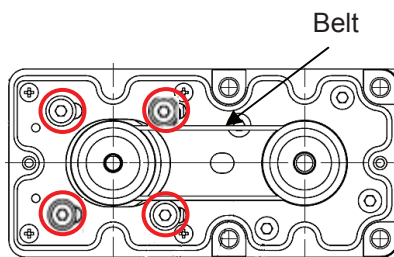
Hand a cable band (thin string) on the edge of the motor unit and pull it. When it is abutting against the hexagonal socket bolt, tighten the bolt (where marked with a circle) with 2.5mm-sized (RA4R), 3mm-sized (RA6R/RA7R), or 4mm-sized (RA8R) hexagonal wrench to hold the unit in the place.



RA4R
(× 2)



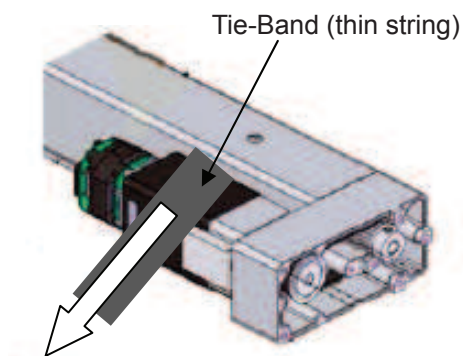
RA6R
(× 2)



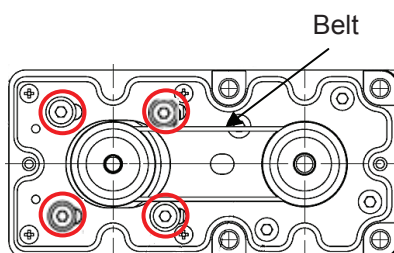
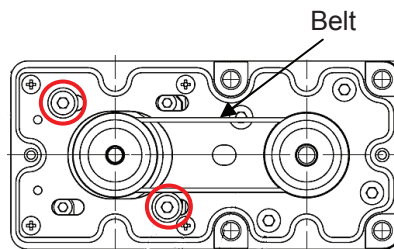
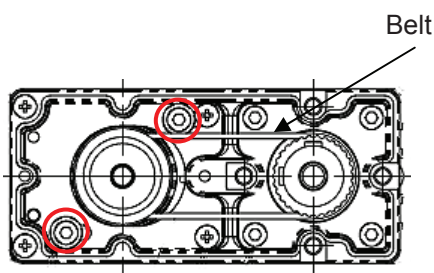
RA7R, RA8R
(× 4)

Model	Tightening Torque
RA4R	162N cm
RA6R	323N cm
RA7R	323N cm
RA8R	631N 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 (RA4R), 3mm-sized (RA6R/RA7R), or 4mm-sized (RA8R) hexagonal wrench to hold the unit in the place.

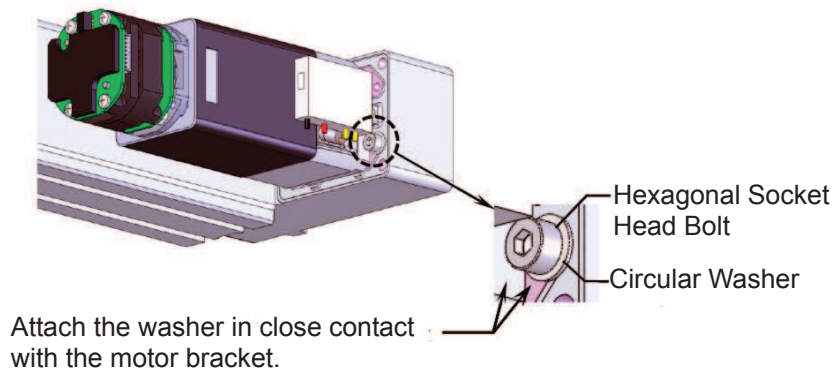


Model	Tension Force
RA4R	20 to 25N
RA6R	25 to 30N
RA7R	80 to 90N
RA8R	180 to 200N



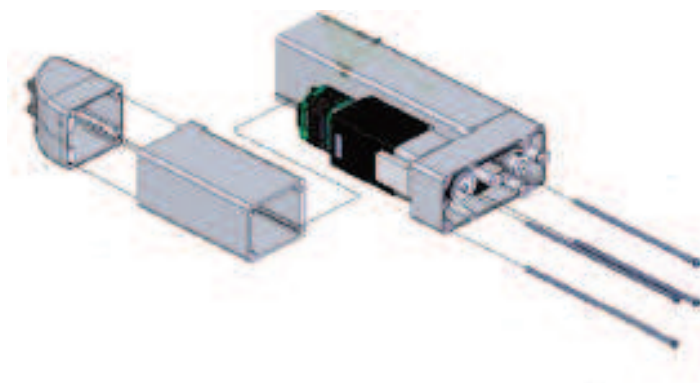
Model	Tightening Torque
RA4R	162N cm
RA6R	323N cm
RA7R	323N cm
RA8R	631N cm

- 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.



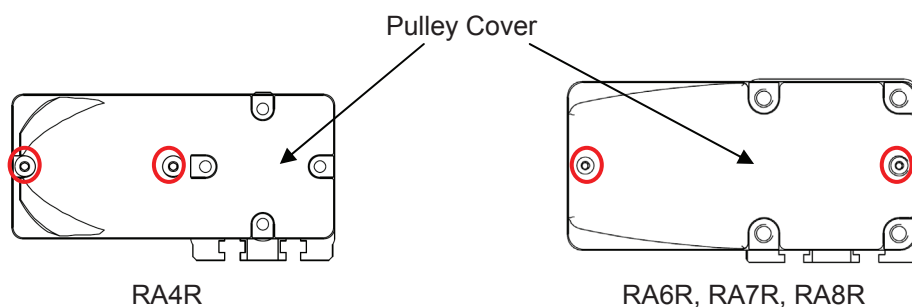
Tightening Torque
88.7N cm

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



Model	Tightening Torque
RA4R, RA6R, RA7R	41.4N cm
RA8R	96.4N cm

- 11) Attach the pulley cover with two hexagonal socket flat-head bolts for RA4R, RA6R, RA7R, and RA8R (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.