IAI
Quality and Innovation

ROBO CYLINDER

ROBO Cylinder ®

Rod Type

RCS4-RA4C/RA6C/RA7C/RA8C
RA4R/RA6R/RA7R/RA8R

Instruction Manual

First Edition **ME3771-1B**

IAI Corporation

Please Read Before Use

Thank you for purchasing our product.

This instruction manual explains the handling methods, structure and maintenance of this product, providing the information you need in order 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 DVD enclosed with the product contains instruction manuals for IAI products.
When using the product, refer to the necessary sections of the applicable instruction manual by printing them out or displaying them on a PC.

After reading the instruction manual, keep it in a convenient place so that whoever is handling the product can refer to it quickly when necessary.

[Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
-
- The company names, names of products and trademarks of each company shown in the text are registered trademarks.

RCS4 Rod Type Instruction Manual Configuration

Product name	Instruction manual name	Control number
RCS4	First Step Guide	ME3775
RCS4 Rod Type	Instruction Manual (this document)	ME3771
SCON-CB/CFB Controller	SCON-CB/CFB Controller Instruction Manual	ME0340
SCON-CAL/CGAL Controller	SCON-CAL/CGAL Controller Instruction Manual	ME0243
MSCON-C Controller	MSCON-C Controller Instruction Manual	ME0306
SSEL-CS Controller	SSEL-CS Controller Instruction Manual	ME0157
XSEL-P/Q Controller	XSEL-P/Q Controller Instruction Manual	ME0148
XSEL-R/S Controller	XSEL-R/S Controller Instruction Manual	ME0313
XSEL-RA/SA Controller	XSEL-RA/SA Controller Instruction Manual	ME0359
PC Compatible Software for RC/EC	RCM-101-MW/RCM-101-USB Instruction Manual	ME0155
PC Compatible Software for XSEL	IA-101-X-MW/IA-101-X-USBMW Instruction Manual	ME0154
Touch Panel Teaching Pendant	TB-01/01D/01DR Applicable for Position Controller Instruction Manual	ME0324
Touch Panel Teaching Pendant	TB-02/02D Applicable for Position Controller Instruction Manual	ME0355
Data Setter	TB-03 Applicable for Position Controller	ME0376
Touch Panel Teaching Pendant	TB-01/01D/01DR Applicable for Program Controller Instruction Manual	ME0325
Touch Panel Teaching Pendant	TB-02/02D Applicable for Program Controller Instruction Manual	ME0356
Data Setter	TB-03 Applicable for Program Controller	ME0377

Contents

Safety Guide

The Safety Guide is intended to permit safe use of the product and thus to prevent risks and property damage. Be sure to read it before handling the product.

Safety Precautions for Our Products

Common safety precautions for the use of robots in various operations are indicated here.

No.	Operation	Precautions
1	Model Selection	● This product is not intended or designed for applications where high levels of safety are required, and so cannot guarantee that human lives will be protected. Accordingly, do not use it in any of the following applications. (1) Medical equipment used to maintain, control or otherwise affect human life or physical health (2) Mechanisms or machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.) (3) Machinery components essential for safety (safety devices etc.) ● Do not use the product outside the range of the specifications. Otherwise, the product life may be drastically shortened, and product damage or facilities stoppage may occur. ● Do not use it in any of the following environments. (1) Locations with flammable gases, ignitable objects or explosives (2) Locations with potential exposure to radiation (3) Locations with ambient temperature or relative humidity exceeding the specifications range (4) Locations where radiant heat is applied by direct sunlight or other large heat source (5) Locations where condensation occurs due to abrupt temperature changes (6) Locations with corrosive gases (sulfuric acid, hydrochloric acid, etc.) (7) Locations exposed to significant amounts of dust, salt or iron powder (8) Locations subject to direct vibration or impact ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If a model without brake is selected, the moving parts may fall when the power is turned OFF, causing accidents such as injury or workpiece damage.

No.	Operation	Precautions
2	Transportation	● When transporting heavy objects, do the work with two or more persons or utilize equipment such as a crane. ● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● During transportation, carefully consider the carrying positions, weight, and weight balance, and be careful to avoid collisions or dropping. ● Use appropriate transportation measures for transport. The actuators available for transportation with a crane have eyebolts attached or tapped holes to attach bolts. Follow the instructions in the instruction manual for each model. ● Do not climb onto the package. ● Do not put anything heavy that could deform the package on it. ● When using a crane with capacity of 1t or more, have an operator qualified for crane operation and sling work. ● When using a crane or equivalent equipment, make sure not to suspend loads exceeding the equipment's rated load. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. Also, check to make sure that the hook is free of damage. ● Do not climb on loads suspended from cranes. ● Do not leave loads suspended from cranes for long periods. ● Do not stand under loads suspended from cranes.
3	Storage and Preservation	● For the storage and preservation environment, see the installation environment. However, give especial consideration to the prevention of condensation. ● Store the products so as to prevent them from falling over or down in the case of natural disasters such as earthquakes.

No.	Operation	Precautions
4	Installation and Startup	(1) Installation of robot body and controller, etc. ● Be sure to securely hold and fix the product (including the workpiece). If the product falls over, is dropped, or operates abnormally, it may lead to damage and injury. Also, be equipped for falls over or down due to natural disasters such as earthquakes. ● Do not climb on or put anything on the product. Otherwise, this may lead to accidental falling, injury or damage to the product due to falling objects, product loss of function or performance degradation, or shortening of product life. ● When using the product in any of the places specified below, provide sufficient shielding. (1) Locations where electrical noise is generated (2) Locations with strong electrical or magnetic fields (3) Locations with mains or power lines passing nearby (4) Locations where the product may come in contact with water, oil or chemical spray
		(2) Cable wiring ● Use IAI genuine cables for connecting the actuator and controller, and for the teaching tools. ● Do not scratch cables, bend them forcibly, pull them, coil them, snag them, or place heavy objects on them. Otherwise, this may lead to fire, electric shock, or abnormal operation due to leakage or conduction malfunction. ● Perform the wiring for the product after turning OFF the power to the unit, and avoid miswiring. ● When wiring DC power (+24V), be careful with the positive/negative polarity. Incorrect connections may lead to fire, product breakdown or abnormal operation. ● Connect the cable connector securely so that there is no disconnection or looseness. Otherwise, this may lead to fire, electric shock, or abnormal operation of the product. ● Never cut or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Otherwise, this may lead to fire or abnormal operation of the product.
		(3) Grounding ● Grounding must be performed, in order to prevent electric shocks or electrostatic charge, enhance noise-resistant performance and control unnecessary electromagnetic radiation. ● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, be sure to use a twisted pair cable with wire thickness 0.5mm^2 (AWG20 or equivalent) or more for grounding work. For safeguard grounding, it is necessary to select an appropriate wire diameter 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	Precautions
4	Installation and Startup	(4) Safety measures ● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● When the product is operating or in the ready mode, take safety measures (such as the installation of safety/protection fences) so that nobody can enter the area within the robot's movable range. Contact with an operating robot may lead to death or serious injury. ● Be sure to install an emergency stop circuit so that the unit can be stopped immediately in an emergency during operation. ● Take safety measures such that turning the power ON alone will not start up the unit. Otherwise, this may cause the product to start unexpectedly, leading to injury or product damage. ● Take safety measures such that emergency stop cancel or recovery after power failure alone will not start up the unit. Otherwise, this may lead to injury or equipment damage. ● When installation or adjustment operation is to be performed, display signs such as "Operating: No Power ON!" etc. Sudden power input may cause electric shock or injury. ● Take measures to prevent workpieces, etc. from falling during power failures or emergency stop. ● Wear protection gloves, goggles and safety shoes, as necessary, to secure safety. ● Do not insert fingers or objects into the openings in the product. Otherwise, this may lead to injury, electric shock, product damage, or fire. ● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces.
5	Teaching	● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● Perform teaching operation from outside the safety/protection fence, if possible. If operation must be performed within the safety/protection fence, prepare "Work Regulations" and make sure that all the workers acknowledge and understand them well. ● When operation is to be performed inside the safety/protection fence, operators should have emergency stop switches available at hand so that the unit can be stopped at any time if abnormalities occur. ● When operation is to be performed inside the safety/protection fence, have a monitor standing by in addition to the operator(s) so that the unit can be stopped at any time if abnormalities occur. Also, keep watch on the operation so that a third party cannot operate the switches carelessly. ● Place a sign indicating "Operating" where it can be seen easily. ● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces. * Safety/protection fence: If there is no safety/protection fence, the movable range should be indicated.

No.	Operation	Precautions
6	Trial Operation	● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● After teaching or programming, carry out trial operation step by step before switching to automatic operation. ● When trial operation is to be performed inside the safety/protection fence, use the same work procedure, determined in advance, as teaching operation. ● Be sure to confirm program operation at safe speeds. Otherwise, this may lead to accidents due to unexpected motion caused by program error, etc. ● Do not touch the terminal block or any of the various setting switches while the equipment is live. Otherwise, this may lead to electric shock or abnormal operation.
7	Automatic Operation	● Check before starting automatic operation or restarting after operation stop that there is nobody within the safety/protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is ready for automatic operation and that there is no alarm indication. ● Be sure to start automatic operation from outside the safety/protection fence. ● If the product produces abnormal heat, smoke, odor, or noise, immediately stop it and turn OFF the power switch. Otherwise, this may lead to fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Otherwise, this may lead to injury or product damage due to unexpected product motion during recovery from the power failure.
8	Maintenance and Inspection	● When working with two or more persons, make it clear who is to be in charge and communicate well with each other to ensure safety. ● Perform the work outside the safety/protection fence, if possible. If operation must be performed within the safety/protection fence, prepare "Work Regulations" and make sure that all the workers acknowledge and understand them well. ● When work is to be performed inside the safety/protection fence, turn OFF the power switch as a rule. ● When operation is to be performed inside the safety/protection fence, operators should have emergency stop switches available at hand so that the unit can be stopped at any time if abnormalities occur. ● When operation is to be performed inside the safety/protection fence, have a monitor standing by in addition to the operator(s) so that the unit can be stopped at any time if abnormalities occur. Also, keep watch on the operation so that a third party cannot operate the switches carelessly. ● Place a sign indicating "Operating" where it can be seen easily. ● For the grease for the guide or ball screw, use appropriate grease according to the Instruction Manual for each model. ● Do not perform dielectric strength testing. Otherwise, this may lead to damage to the product.

No.	Operation	Precautions
8	Maintenance and Inspection	● When releasing the brake on a vertically oriented actuator, be careful that it does not fall under its own weight, catching the operator's hand or damaging workpieces. ● The slider or rod may be misaligned from the stop position if the servo is turned OFF. Avoid injury or damage due to unnecessary operation. ● Be careful not to lose the cover or any removed screws, and be sure to return the product to the original condition after maintenance and inspection work. Otherwise, this may lead to product damage or injury due to incomplete mounting. * Safety/protection fence: If there is no safety/protection fence, the movable range should be indicated.
9	Modification and Disassembly	● Do not modify, disassemble/assemble, or use maintenance parts not specified on your own discretion.
10	Disposal	● When the product exceeds its useful life or is no longer needed, dispose of it properly as industrial waste. ● When removing the actuator for disposal, avoid dropping components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may rupture or generate toxic gases.
11	Other	● If you are equipped with a medical device such as a pacemaker, do not approach the product or its wiring, as the device may be affected. ● See the Overseas Specifications Compliance Manual to check compliance with overseas standards if necessary. ● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure safety.

Precaution Indications

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

Level	Degree of risk to persons and property	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 a situation in which, while injury is not a likely result, the precautions should be observed in order to use the product appropriately.	 Notice

Precautions for Handling

1. The Safety Guide attached with the product is intended to permit safe use of the product and thus to prevent risks and property damage. Be sure to read it before handling the product.

2. Do not attempt any handling or operation that is not indicated in this instruction manual.

3. Make sure to secure the actuator properly in accordance with this instruction manual.
   If the actuator is not securely fixed, this may lead to abnormal noise, vibration, breakdown or shortened product life.

4. Make sure to observe the usage conditions and environment of the product.
   Operation outside the warranty could cause decreased performance or product breakdown.
   Use within the allowable range for each item.

Item	Cautions for use	Problems or breakdowns which may occur if the allowable range is exceeded
Speed and acceleration/deceleration	Use within the allowable range	May lead to abnormal noise, vibration, breakdown, or shortened product life.
Radial load	Must not operate	Loads can only be applied in the axial direction matching the rod axis.
Load moment		

5. If return operations are continued over a short distance, they may rapidly degrade the film of grease.
   Continuous return operation within a distance less than 30mm may cause the grease film to degrade rapidly.
   As a guideline, in every 5,000 to 10,000 cycles, have approximately 5 cycles of return operation over a 50mm distance or more to regenerate the oil film. Continued use of the actuator in that state may lead to breakdown.
   In extreme cases, flaking may occur on the guide or ball screw.

6. Do not attempt to have rods collide with an obstacle at high speed.
   This may damage the coupling or other mechanical parts.

7. Grease has been applied to the outer periphery of the rod for the rod type.
   Protect the peripheral equipment if grease adhesion negatively affects them.

8. In some conditions of environment of use, postures of installation and conditions of operation, the base oil separated from the grease may come out of ROBO Cylinder.
   It is recommended to have a protection in case the peripheral devices could get influence of the base oil.

International Standard Compliance

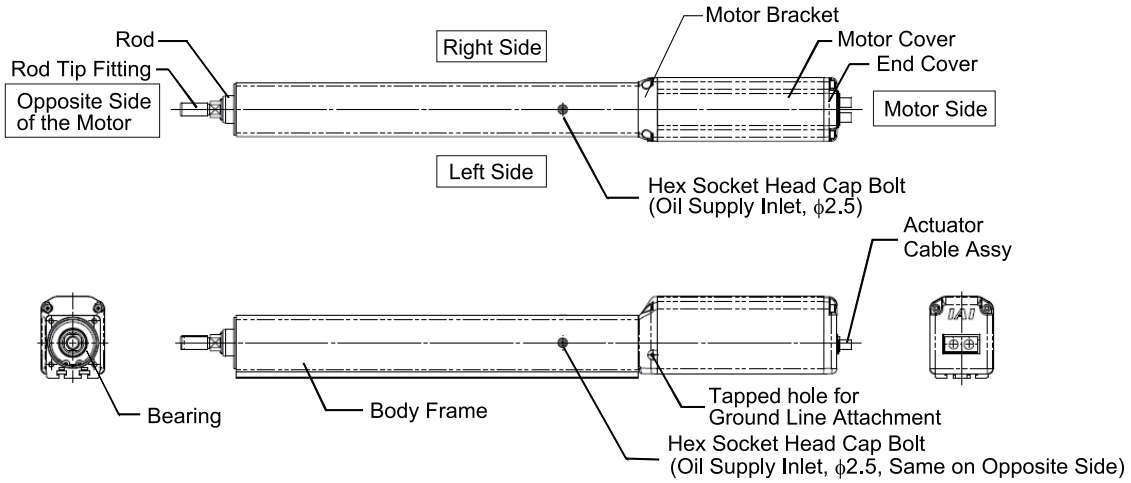
The ROBO Cylinder complies with the following overseas standards.
Refer to the Overseas Standard Compliance Manual (ME0287) for more detailed information.

CE Marking	RoHS Directive
○	○

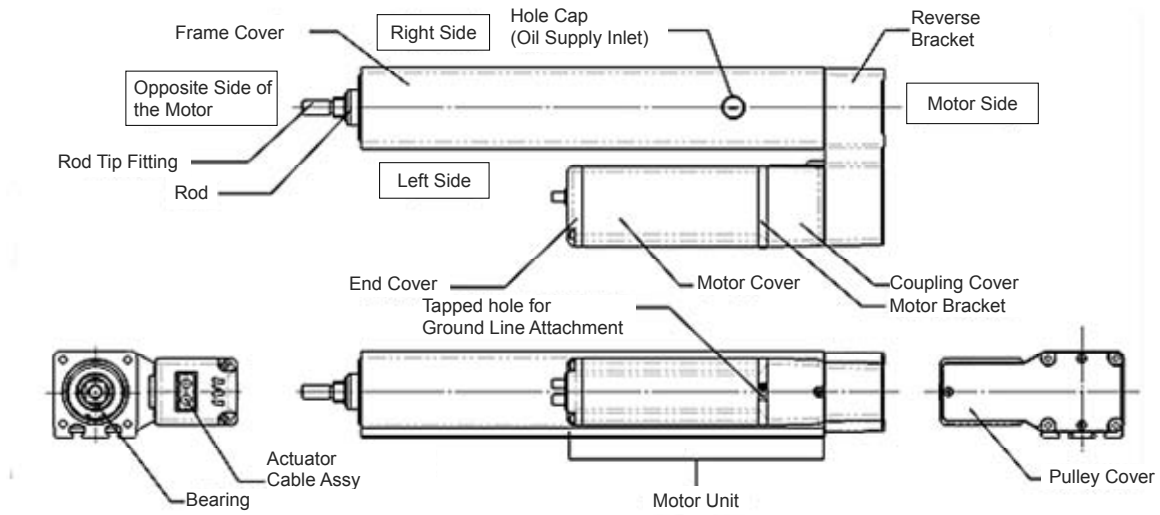
Names of the Parts

In this manual, the actuator left/right sides and motor/opposite sides are shown as in the figure below.

Motor Straight Type



Motor Reversing Type



ROBO Cylinder

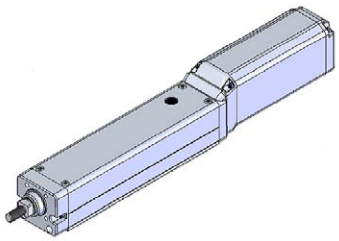
Chapter 1

Specifications

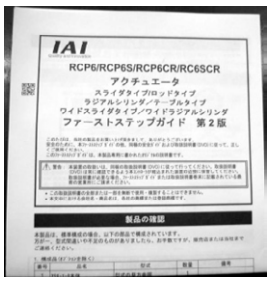
1.1 Checking the product

Components

The following table shows the product configuration for the standard specification.
See the packing list for the details of the enclosed components. In the unlikely case that any model number errors or missing parts come to light, contact your local IAI distributor.

<table>
<tr><th colspan="2">Body</th><th colspan="2">Accessories</th></tr>
<tr><td colspan="2">Actuator
Quantity: 1
  </td><td>Motor Cable
Quantity: 1
  </td><td>Encoder Cable
Quantity: 1
  </td></tr>
<tr><th colspan="4">Accessories</th></tr>
<tr><td colspan="2">Cross Recessed Pan Head Screw with Captive Washer M3 × 6
Quantity: 2

For affixing ground cable
  </td><td colspan="2">Cable Band
Quantity: 2

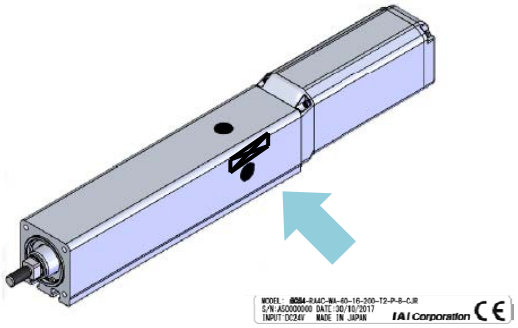
For clamping connector cover
 
* Refer to International Application Manual (ME0287) for how to use it.</td></tr>
<tr><th colspan="4">Accessories (Documents/DVD)</th></tr>
<tr><td>First Step Guide
Quantity: 1
 
</td><td>Safety Guide
Quantity: 1
 
</td><td colspan="2">Instruction Manual DVD
Quantity: 1
 
</td></tr>
</table>

How to read the model nameplate

Model number →
Serial number →

MODEL: RCS4-RA4C-WA-60-16-200-T2-P-B-CJR
S/N:A50000000 DATE:30/10/2017
INPUT:DC24V MADE IN JAPAN
IAI Corporation CE

[Nameplate position]



How to read the model number

RCS4 — [Type] — WA — [Motor Wattage] — [Ball Screw Lead] — [Stroke] — [Applicable Controller] — [Cable Length] — [Options]

Series: RCS4

Type

RA4C	Body Width 40mm Coupling Type
RA6C	Body Width 60mm Coupling Type
RA7C	Body Width 70mm Coupling Type
RA8C	Body Width 90mm Coupling Type
RA4R	Body Width 40mm Motor-Reversed Type
RA6R	Body Width 60mm Motor-Reversed Type
RA7R	Body Width 70mm Motor-Reversed Type
RA8R	Body Width 90mm Motor-Reversed Type

Encoder Type

WA	Battery-less Absolute

Motor Wattage

60	60W
100	100W
200	200W
400	400W

Ball Screw Lead

2.5	Lead 2.5mm
3	Lead 3mm
4	Lead 4mm
5	Lead 5mm
6	Lead 6mm
8	Lead 8mm
10	Lead 10mm
12	Lead 12mm
16	Lead 16mm
20	Lead 20mm
24	Lead 24mm

Stroke

50	50mm
to	to
300	300mm

(Setting available in every 50mm for pitch)

Applicable Controller

T2	SCON MSCON SSEL XSEL-P/Q XSEL-RA/SA

Cable Length

N	None
P	1m
S	3m
M	5m
X□□	Length Specification
R□□	Robot Cable

Options

B	With brake
CJT	Cable Exit Direction Changed (Top)
CJR	Cable Exit Direction Changed (Right)
CJL	Cable Exit Direction Changed (Left)
CJO	Cable Exit Direction Changed (Outward)
CJB	Cable Exit Direction Changed (Bottom)
FL	Flange
FT	Foot bracket
ML	Motor Left Reversed Direction
MR	Motor Right Reversed Direction
NFA	Tip Adapter (Internal Thread)
NM	Home reverse specification
NTB	T-slot Nut Bar
RP	Rear Attachment Plate

* Please note that the available range of ball screw lead, stroke and options will differ depending on the actuator type.

Product list

Category	Type	Appearance	Body Width (mm)	Motor Wattage (W)	Lead (mm)	Positioning Repeatability (mm)	Stroke (mm)	Max. Speed (mm/s)	Rated Thrust (N)	Max. Payload (kg)	
										Horizontal	Vertical
Motor Straight Type	RA4C		 40mm	60	16	±0.01	50 to 200 (Every 50 st)	800	53	8	2
					10			500	85	18	4
					5			250	170	30	6
					2.5			125	340	40	10
	RA6C		 60mm	100	20	±0.01	50 to 300 (Every 50 st)	1000	85	15	4
					12			600	142	25	10
					6			300	283	50	20
					3			150	566	60	20
	RA7C		 70mm	200	24	±0.01	50 to 300 (Every 50 st)	1200	142	20	6
					16			800	214	45	12
					8			400	427	60	25
					4			200	855	80	35
	RA8C		 90mm	400	20	±0.01	50 to 300 (Every 50 st)	1000	399	60	20
					10			500	678	80	40
					5			250	1357	100	72
Motor Reversing Type	RA4R		 40mm	60	16	±0.01	50 to 200 (Every 50 st)	800	53	8	2
					10			500	85	18	4
					5			250	170	30	6
					2.5			125	340	40	10
	RA6R		 60mm	100	20	±0.01	50 to 300 (Every 50 st)	1000	85	15	4
					12			600	142	25	9
					6			300	283	50	19
					3			150	566	60	20
	RA7R		 70mm	200	24	±0.01	50 to 300 (Every 50 st)	1200	142	20	6
					16			800	214	45	12
					8			400	427	60	25
					4			200	855	80	35
	RA8R		 90mm	400	20	±0.01	50 to 300 (Every 50 st)	1000	339	60	20
					10			500	678	80	40
					5			250	1357	100	72

1.2 Specifications

Specifications

[1] RCS4 - RA4C

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
16	8	2	53
10	18	4	85
5	30	6	170
2.5	40	10	340

[Stroke and Max. Speed] Unit: mm/s

Lead (mm)	50 to 200 (Every 50mm)
16	800
10	500
5	250
2.5	125

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

Lead 16

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
8	8	6	5	4	2	2	2	2	1

Lead 10

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
18	15	12	12	8	4	4	4	4	3

Lead 5

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
30	30	25	20	–	6	6	6	6	–

Lead 2.5

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
40	40	35	-	-	10	10	10	-	-

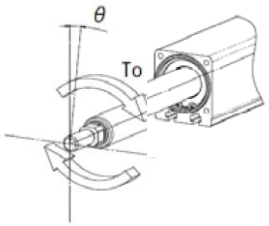
Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

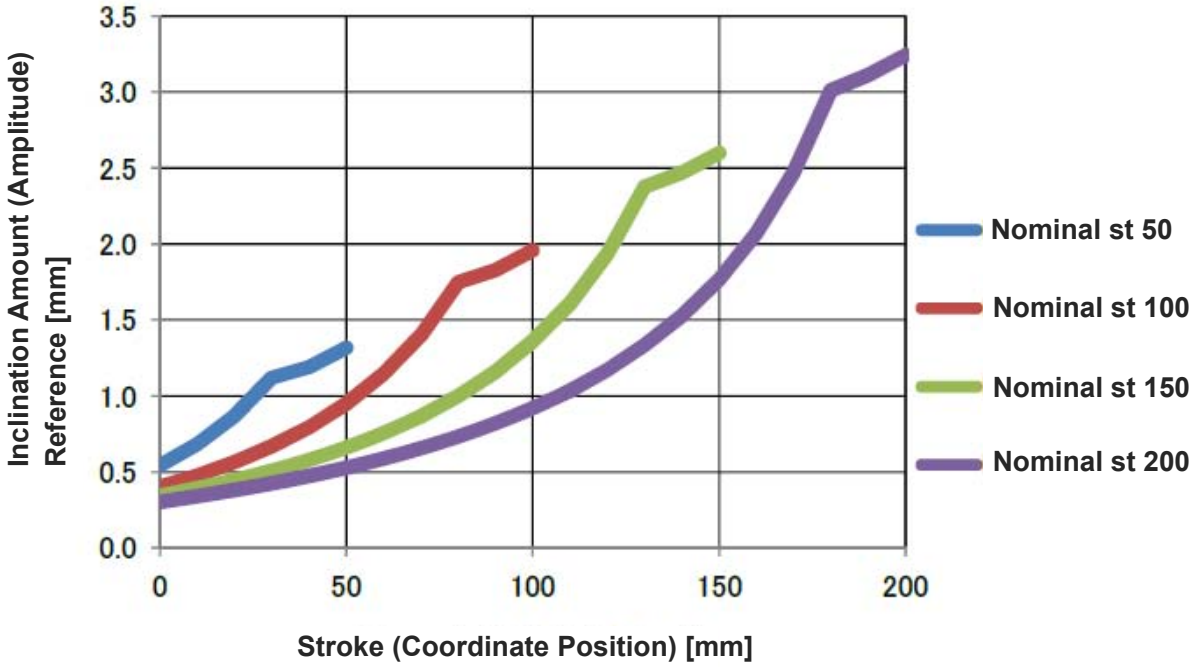
Item	Content
Drive System	Ball screw ϕ8mm, rolled C10
Positioning repeatability	±0.01mm
Lost motion	0.1mm or less
Rod	ϕ20mm, Material: Aluminum, hard alumite treatment
Rod tip static allowable torque	1.0N·m
Rod tip maximum angular displacement (*1)	±1.0 degrees
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

(*1) The rod tip angular displacement (initial value guideline) when the rod tip static allowable torque is applied with the rod fully within the body.



[Rod Tip Inclination Amount (reference)]

This is a calculated value from the clearances of bearing gaps and whirl-stops.



[2] RCS4 - RA6C

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
20	15	4	85
12	25	10	142
6	50	20	283
3	60	20	566

[Stroke and Max. Speed] Unit: mm/s

Lead (mm)	50 to 300 (Every 50mm)
20	1000
12	600
6	300
3	150

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

Lead 20

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
15	10	8	6	4	4	4	3	3	2

Lead 12

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
20	20	20	12	12	10	8	8	6	6

Lead 6

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
50	45	30	25	-	20	15	12	12	-

Lead 3

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
60	50	40	-	-	20	20	20	-	-

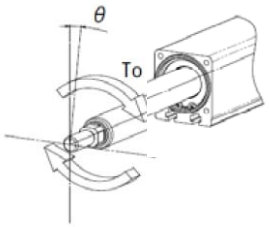
Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

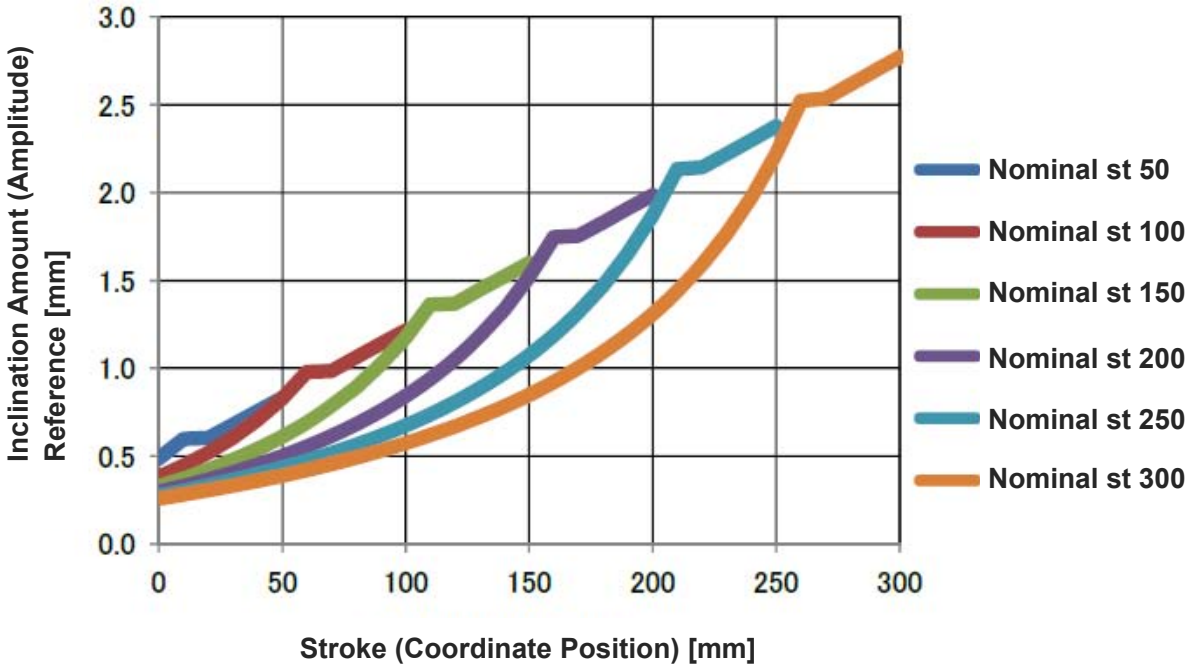
Item	Content
Drive System	Ball screw ϕ10mm, rolled C10
Positioning repeatability	±0.01mm
Lost motion	0.1mm or less
Rod	ϕ25mm, Material: Aluminum, hard alumite treatment
Rod tip static allowable torque	1.5N·m
Rod tip maximum angular displacement (*1)	±1.0 degree
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

(*1) The rod tip angular displacement (initial value guideline) when the rod tip static allowable torque is applied with the rod fully within the body.



[Rod Tip Inclination Amount (reference)]

This is a calculated value from the clearances of bearing gaps and whirl-stops.



[3] RCS4 - RA7C

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
24	20	6	142
16	45	12	214
8	60	25	427
4	80	35	855

[Stroke and Max. Speed] Unit: mm/s

Lead (mm)	50 to 300 (Every 50mm)
24	1200
16	800
8	400
4	200

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

Lead 24

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
20	15	10	10	8	6	6	6	4	4

Lead 16

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
45	30	25	20	15	12	12	10	8	8

Lead 8

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
60	50	40	40	-	25	25	20	20	-

Lead 4

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
80	70	60	-	-	35	35	30	-	-

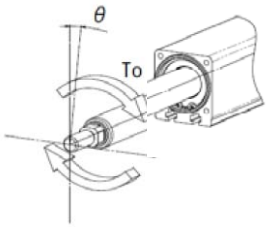
Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

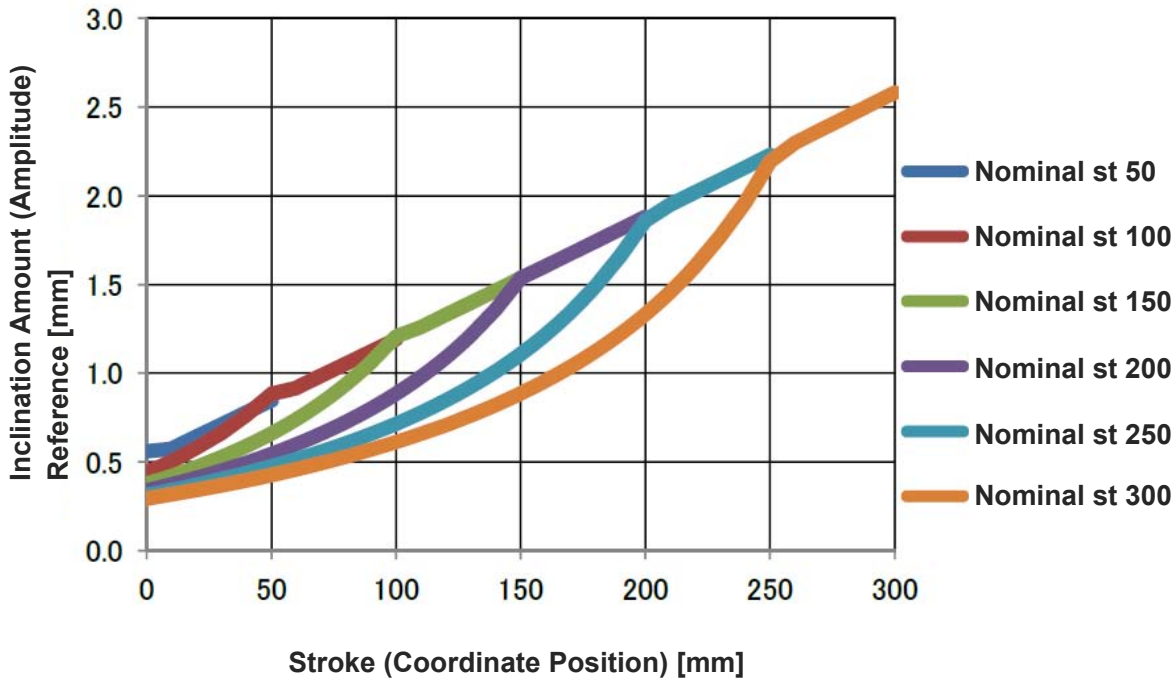
Item	Content
Drive System	Ball screw ϕ12mm, rolled C10
Positioning repeatability	±0.01mm
Lost motion	0.1mm or less
Rod	ϕ30mm, Material: Aluminum, hard alumite treatment
Rod tip static allowable torque	2.5N·m
Rod tip maximum angular displacement (*1)	±0.8 degrees
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

(*1) The rod tip angular displacement (initial value guideline) when the rod tip static allowable torque is applied with the rod fully within the body.



[Rod Tip Inclination Amount (reference)]

This is a calculated value from the clearances of bearing gaps and whirl-stops.



[4] RCS4 - RA8C

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
20	60	20	339
10	80	40	678
5	100	72	1357

[Stroke and Max. Speed] Unit: mm/s

Lead (mm)	50 to 300 (Every 50mm)
20	1000
10	500
5	250

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

Lead 20

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
60	40	25	20	15	20	20	15	12	12

Lead 10

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
80	80	70	60	-	40	30	30	20	-

Lead 5

Horizontal					Vertical				
0.2	0.3	0.5	0.7	1.0	0.2	0.3	0.5	0.7	1.0
100	100	80	60	-	72	55	40	25	-

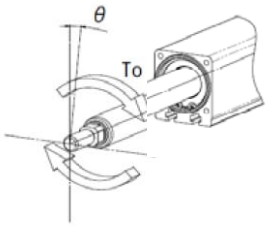
Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

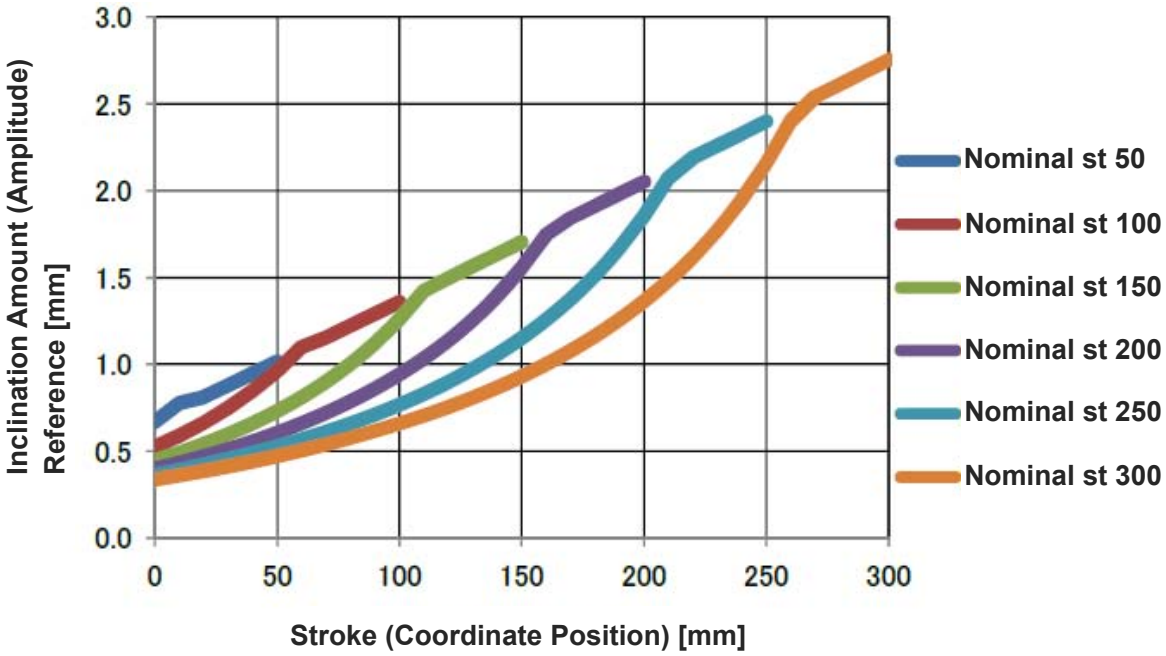
Item	Content
Drive System	Ball screw ϕ16mm, rolled C10
Positioning repeatability	±0.01mm
Lost motion	0.1mm or less
Rod	ϕ40mm, Material: Aluminum, hard alumite treatment
Rod tip static allowable torque	5.0N·m
Rod tip maximum angular displacement (*1)	±0.8 degrees
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

(*1) The rod tip angular displacement (initial value guideline) when the rod tip static allowable torque is applied with the rod fully within the body.



[Rod Tip Inclination Amount (reference)]

This is a calculated value from the clearances of bearing gaps and whirl-stops.



[5] RCS4 - RA4R

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
16	8	2	53
10	18	4	85
5	30	6	170
2.5	40	10	340

[Stroke and Max. Speed] Unit: mm/s

Lead (mm)	50 to 200 (Every 50mm)
16	800
10	500
5	250
2.5	125

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

Lead 16

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
8	8	6	5	-	2	2	2	2	-

Lead 10

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
18	15	12	12	-	4	4	4	4	-

Lead 5

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
30	30	25	20	-	6	6	6	6	-

Lead 2.5

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
40	40	35	-	-	10	10	10	-	-

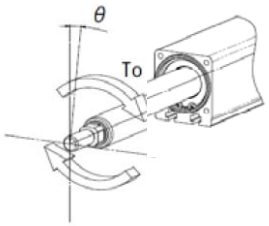
Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

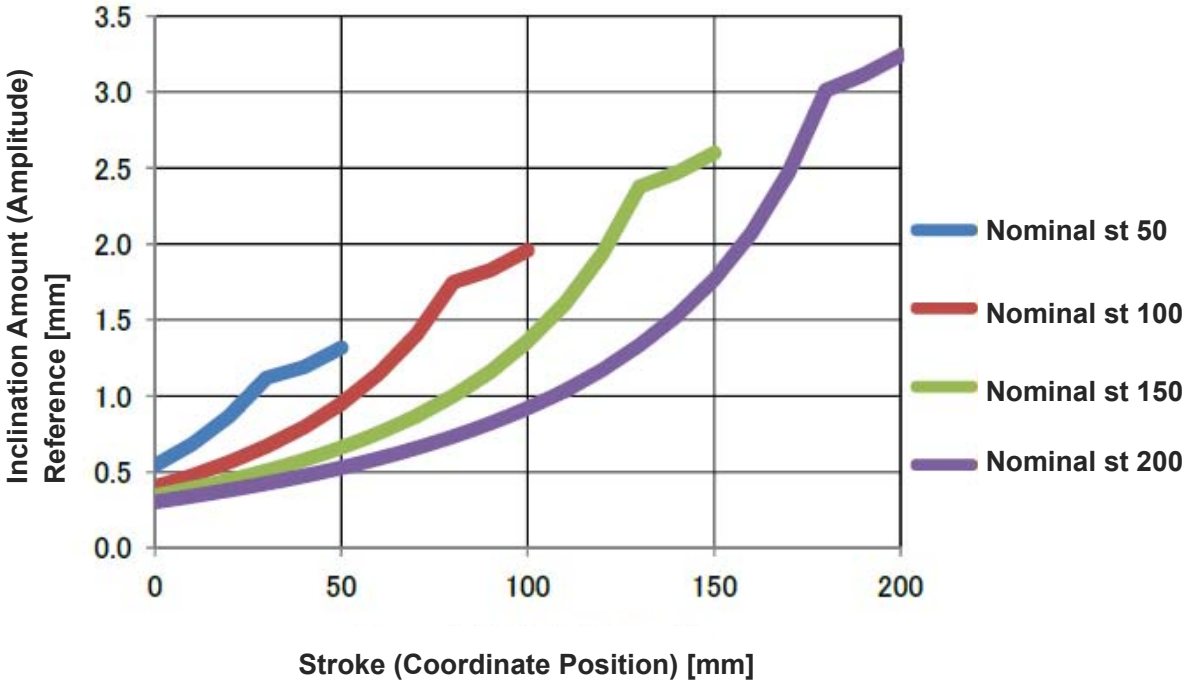
Item	Content
Drive System	Ball screw ϕ8mm, rolled C10
Positioning repeatability	±0.01mm
Lost motion	0.1mm or less
Rod	ϕ20mm, Material: Aluminum, hard alumite treatment
Rod tip static allowable torque	1.0N·m
Rod tip maximum angular displacement (*1)	±1.0 degrees
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

(*1) The rod tip angular displacement (initial value guideline) when the rod tip static allowable torque is applied with the rod fully within the body.



[Rod Tip Inclination Amount (reference)]

This is a calculated value from the clearances of bearing gaps and whirl-stops.



[6] RCS4 - RA6R

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
20	15	4	85
12	25	9	142
6	50	19	283
3	60	20	566

[Stroke and Max. Speed] Unit: mm/s

Lead (mm)	50 to 300 (Every 50mm)
20	1000
12	600
6	300
3	150

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

Lead 20

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
15	10	8	6	-	4	4	3	3	-

Lead 12

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
25	20	20	12	-	9	8	8	6	-

Lead 6

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
50	45	30	25	-	19	15	12	12	-

Lead 3

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
60	50	40	-	-	20	20	20	-	-

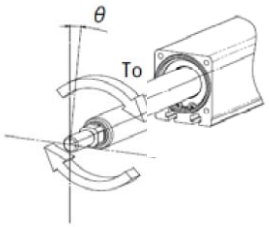
Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

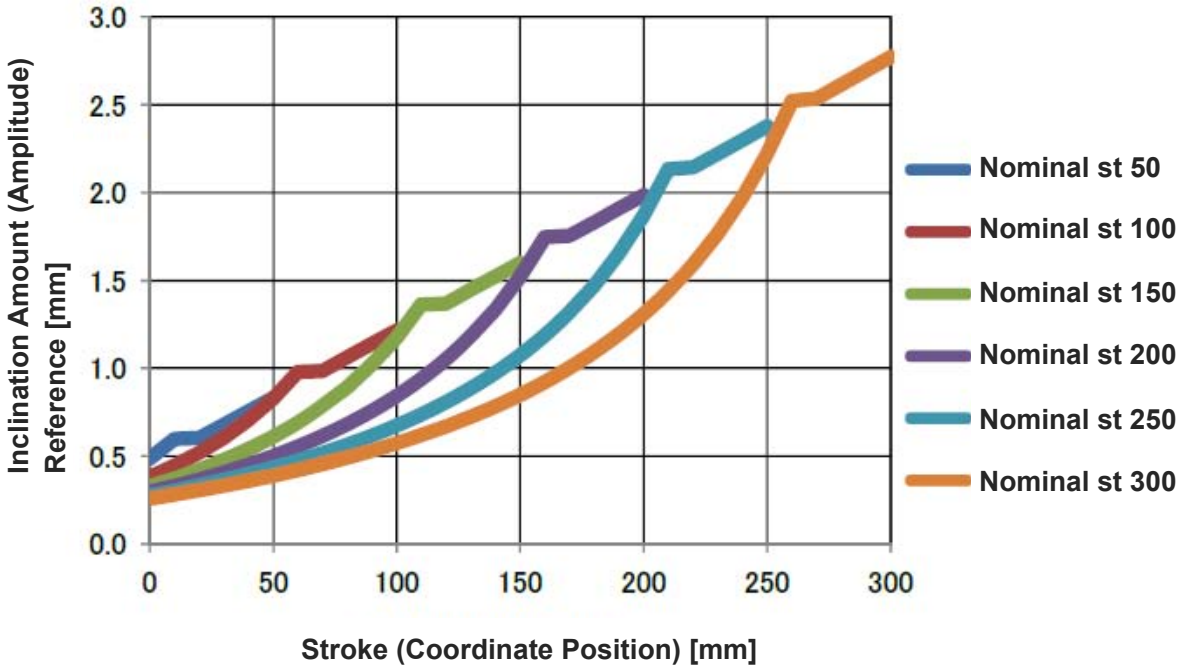
Item	Content
Drive System	Ball screw ϕ10mm, rolled C10
Positioning repeatability	±0.01mm
Lost motion	0.1mm or less
Rod	ϕ25mm, Material: Aluminum, hard alumite treatment
Rod tip static allowable torque	1.5N·m
Rod tip maximum angular displacement (*1)	±1.0 degree
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

(*1) The rod tip angular displacement (initial value guideline) when the rod tip static allowable torque is applied with the rod fully within the body.



[Rod Tip Inclination Amount (reference)]

This is a calculated value from the clearances of bearing gaps and whirl-stops.



[7] RCS4 - RA7R

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
24	20	6	142
16	45	12	214
8	60	25	427
4	80	35	855

[Stroke and Max. Speed] Unit: mm/s

Lead (mm)	50 to 300 (Every 50mm)
24	1200
16	800
8	400
4	200

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

Lead 24

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
20	15	10	10	-	6	6	6	4	-

Lead 16

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
45	30	25	20	-	12	12	10	8	-

Lead 8

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
60	50	40	40	-	25	25	20	20	-

Lead 4

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
80	70	60	-	-	35	35	30	-	-

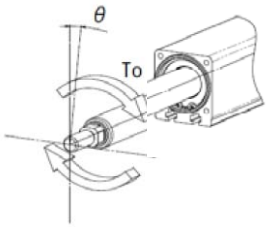
Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

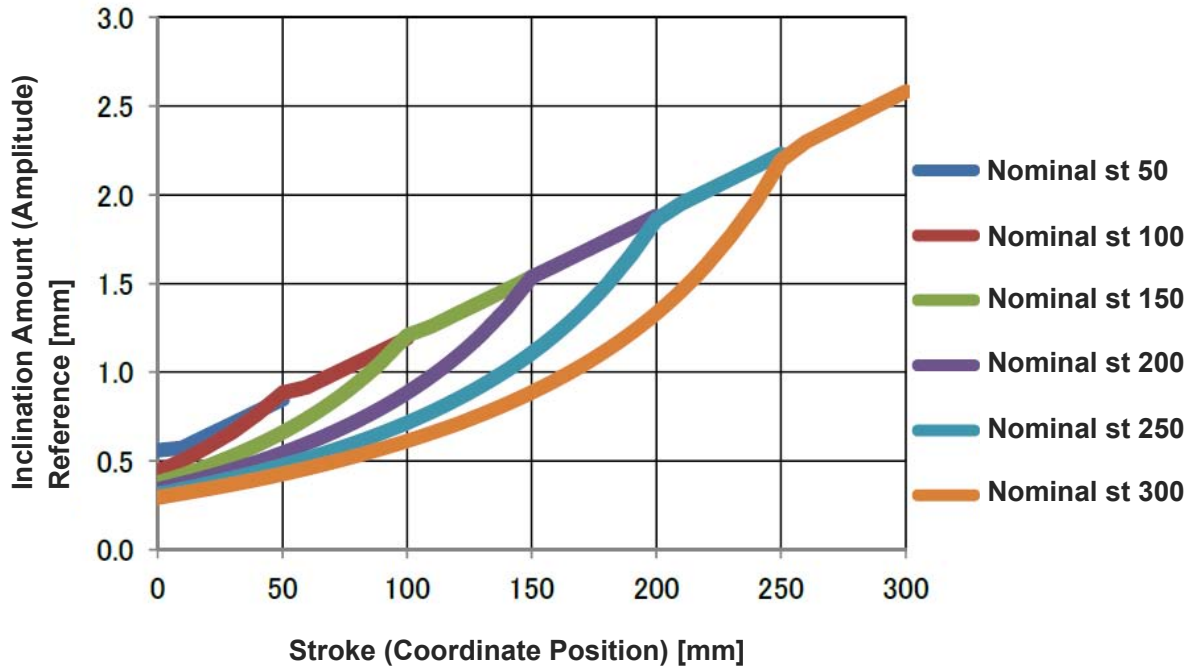
Item	Content
Drive System	Ball screw ϕ12mm, rolled C10
Positioning repeatability	±0.01mm
Lost motion	0.1mm or less
Rod	ϕ30mm, Material: Aluminum, hard alumite treatment
Rod tip static allowable torque	2.5N·m
Rod tip maximum angular displacement (* 1)	±0.8 degrees
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

(*1) The rod tip angular displacement (initial value guideline) when the rod tip static allowable torque is applied with the rod fully within the body.



[Rod Tip Inclination Amount (reference)]

This is a calculated value from the clearances of bearing gaps and whirl-stops.



[8] RCS4 - RA8R

[Lead and Payload]

Lead (mm)	Max. payload		Rated thrust (N)
	Horizontal (kg)	Vertical (kg)	
20	60	20	339
10	80	40	678
5	100	72	1357

[Stroke and Max. Speed] Unit: mm/s

Lead (mm)	50 to 300 (Every 50mm)
20	1000
10	500
5	250

Caution

- The maximum speed may not be achieved when the stroke or movement distance is short or when acceleration/deceleration is set low.
- Setting at or below the minimum speed may lead to abnormal noise or unstable speeds. Do not attempt to set below the minimum speed.
- The minimum speed can be calculated with the equation below.

  Minimum speed [mm/s] = ball screw lead [mm/r] ÷ 16384 [p/r] × 1000 [1/s]

  (mm/r: movement per 1 motor revolution, p/r: pulse per 1 motor revolution)

[Payload by Acceleration]

At low load capacity, the acceleration/deceleration can be increased.

Lead 20

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
60	40	25	20	-	20	20	15	12	-

Lead 10

Horizontal					Vertical				
0.3	0.5	0.7	1.0	1.2	0.3	0.5	0.7	1.0	1.2
80	80	70	60	-	40	30	30	20	-

Lead 5

Horizontal					Vertical				
0.2	0.3	0.5	0.7	1.0	0.2	0.3	0.5	0.7	1.0
100	100	80	60	-	72	55	40	25	-

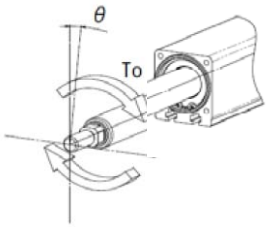
Caution

- Do not attempt to configure settings for acceleration/deceleration above the specifications.
  This may lead to vibration, breakdown, or shortened product life.

[Actuator Specifications]

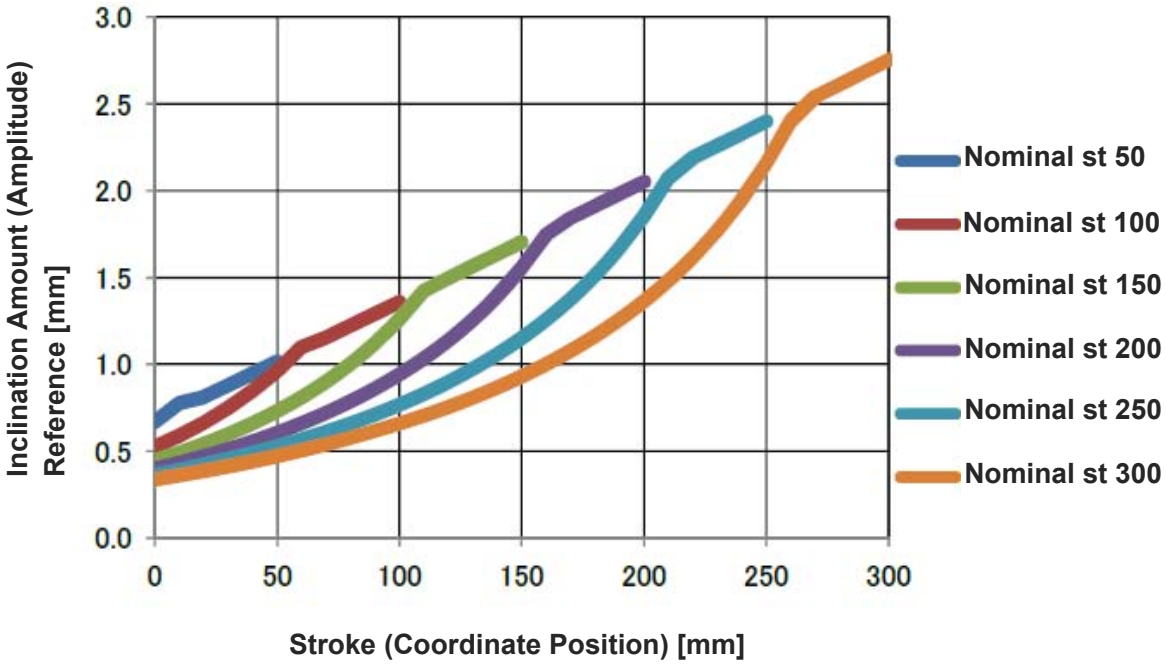
Item	Content
Drive System	Ball screw ϕ16mm, rolled C10
Positioning repeatability	±0.01mm
Lost motion	0.1mm or less
Rod	ϕ40mm, Material: Aluminum, hard alumite treatment
Rod tip static allowable torque	5.0N·m
Rod tip maximum angular displacement (* 1)	±0.8 degrees
Number of encoder pulse	16384
Ambient operating temperature/humidity	0 to 40°C, 85% RH or less (Non-condensing)

(*1) The rod tip angular displacement (initial value guideline) when the rod tip static allowable torque is applied with the rod fully within the body.



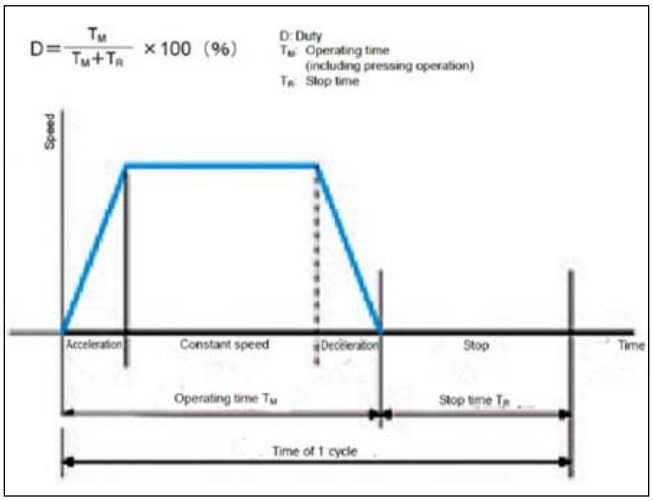
[Rod Tip Inclination Amount (reference)]

This is a calculated value from the clearances of bearing gaps and whirl-stops.



Duty ratio

The duty ratio is the operating rate, shown in %, of the actuator operating time within one cycle.



As the reference for duty available to use may differ depending on the operation conditions (payload, acceleration / deceleration, etc.), it is necessary to figure out the load factor LF and acceleration / deceleration time ratio t_{od} using the calculation formulae below and find it out from the graph.

1) Figure out the load factor LF using the calculation formulae below.

Maximum payload at the acceleration 0.3G is described in 1.2 Specifications.

[When indicated acceleration / deceleration is at acceleration / deceleration 0.3G or below]

$$\text{Load Factor LF} = \frac{M \times \alpha}{M_r \times 0.3}\ [\%]$$

Max. Payload at Acceleration 0.3G : M_r [kg]
Acceleration / Deceleration 0.3G : 0.3 [G]
Payload during Operation : M [kg]
Acceleration during Operation : α [G]

[When indicated acceleration / deceleration is at acceleration / deceleration 0.3G or above]

$$\text{Load Factor LF} = \frac{M \times \alpha}{M_d \times \alpha} = \frac{M}{M_d}\ [\%]$$

Payload at Indicated Acceleration : M_d [kg]
Payload during Operation : M [kg]
Acceleration during Operation : α [G]

2) Figure out the acceleration / deceleration time ratio t_{od} using the calculation formulae below.

$$\text{Acceleration / Deceleration Time Ratio } t_{od} = \frac{\text{Acceleration Time during Operation} + \text{Deceleration Time during Operation}}{\text{Duration of Operation}}\ [\%]$$

$$\text{Acceleration Time} = \frac{\text{Velocity during Operation [mm/s]}}{\text{Acceleration during Operation [mm/s}^2\text{]}}\ [\text{sec}]$$

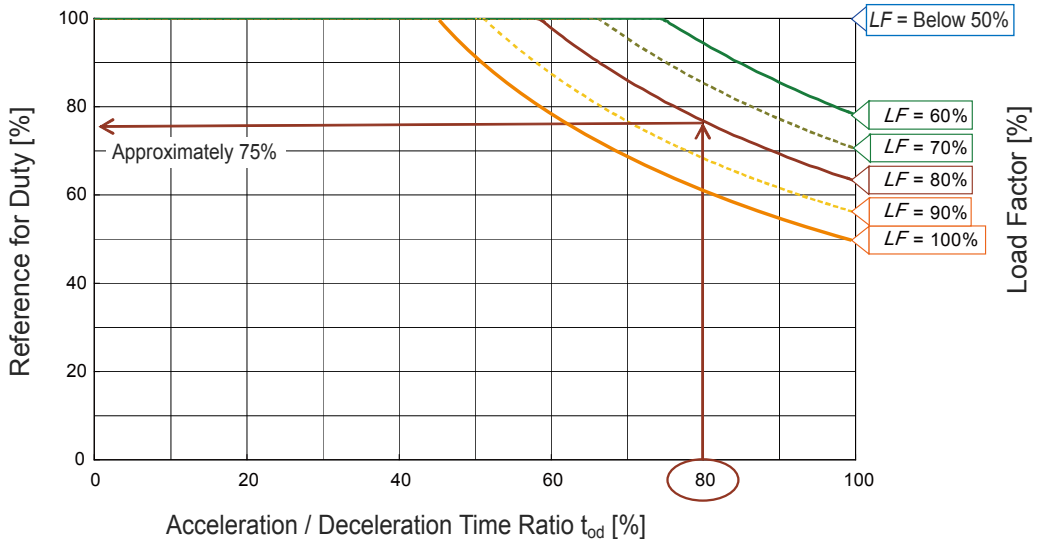
$$\text{Deceleration Time} = \frac{\text{Velocity during Operation [mm/s]}}{\text{Deceleration during Operation [mm/s}^2\text{]}}\ [\text{sec}]$$

Acceleration [mm/s^2] = Acceleration [G]×9,800mm/s^2

Deceleration [mm/s^2] = Deceleration [G]×9,800mm/s^2

3) Read a reference for duty with the figured out “Load Factor” and “Acceleration / Deceleration Time Ratio”.

e.g.) The reference for duty when the load factor LF is 80% and the acceleration / deceleration time ratio t_{od} is 80% should be approximately 75%.



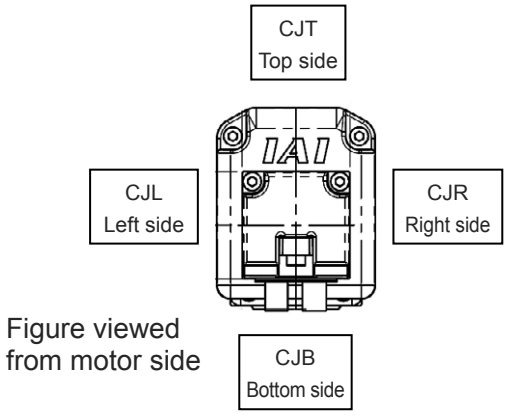
1.3 Options

With brake (Model Code: B)

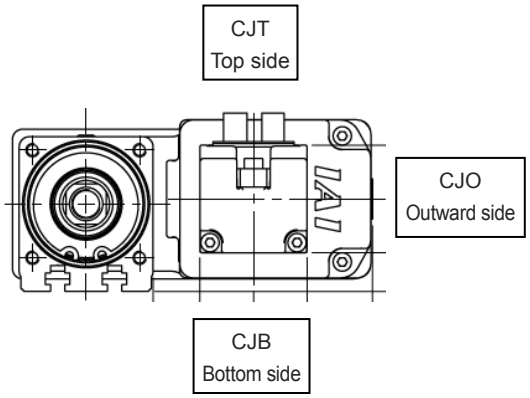
This is used to prevent the rod from moving during power outages or when the servo is OFF.
It can also be used to prevent the slider from falling when mounted vertically.

Cable Exit Direction Changed (Model Code: CJT, CJR, CJL, CJB and CJO)

The orientation of the motor / encoder cable to be installed on the actuator unit can be changed to top/bottom/right/left.



Motor straight type



Motor reversing type

Motor Reversed Direction (Model Code: ML and MR)

It is the code to indicate the direction of motor reversed when selecting the motor reversed type.
ML shows reversed to left and MR to right.

Home reverse specification (Model Code: NM)

The standard home position is on the motor side.
However, the opposite side specification is selected if the home position direction is reversed in accordance with equipment layout or assembly direction.

Rear Attachment Plate (Model Code: RP)

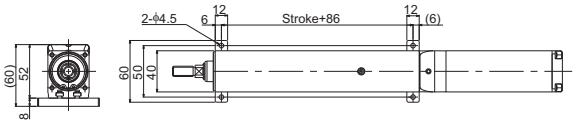
It is a bracket (plate) to affix the motor reversed type (RA4R) at the back to a device.

Foot bracket (Model Code: FT)

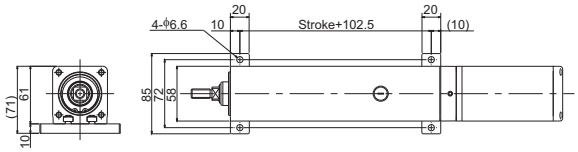
This is a bracket for fixing the actuator body from the top with the bolts. In case that the moment load is high in the slider type, make sure to attach foot brackets to all the attachment holes on the main body. With small number of brackets, the main body may get warped, which would make the product life short.

* For the dimension of attachment pitch among brackets, refer to attachment pitch dimensions in the actuator drawing.

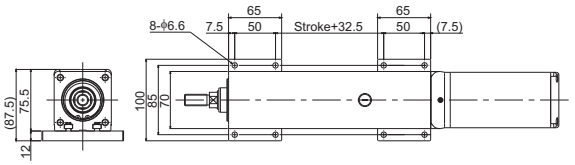
RCS4-RA4C
Model number of single product: RCP6-FT-RA4C



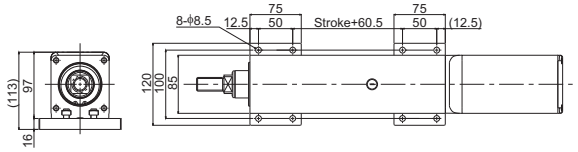
RCS4-RA6C
Model number of single product: RCP6-FT-RA6C



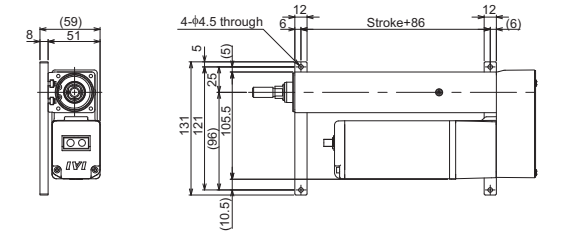
RCS4-RA7C
Model number of single product: RCP6-FT-RA7C



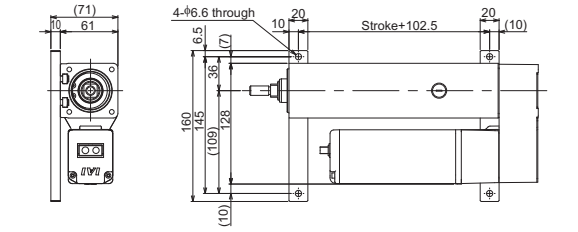
RCS4-RA8C
Model number of single product: RCP6-FT-RA8C



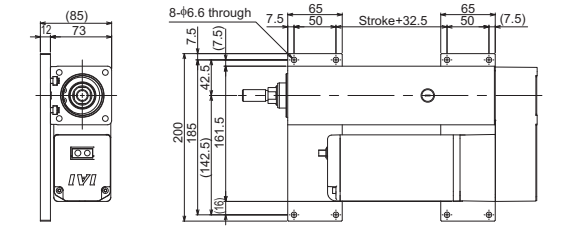
RCS4-RA4R
Model number of single product: RCP6-FT-RA4R-3 (for motor right / left reversed)



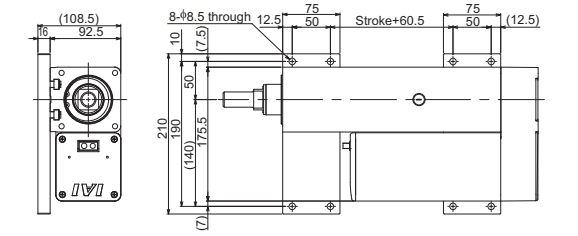
RCS4-RA6R
Model number of single product: RCS4-FT-RA6R (for motor right / left reversed)



RCS4-RA7R
Model number of single product: RCS4-FT-RA7R (for motor right / left reversed)



RCS4-RA8R
Model number of single product: RCP6-FT-RA8R-2 (for motor right / left reversed)

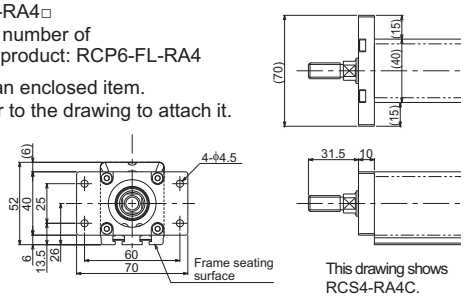


Flange (Model Code: FL)

It is a bracket to affix the actuator from the main body side with screws.

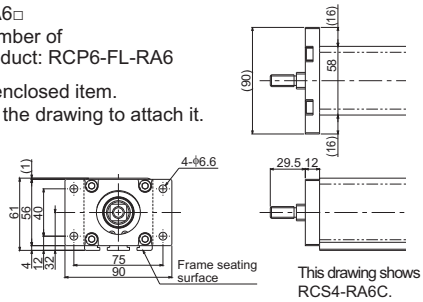
RCS4-RA4□
Model number of
single product: RCP6-FL-RA4

* It is an enclosed item.
  Refer to the drawing to attach it.



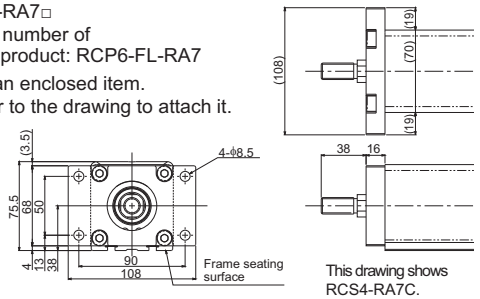
RCS4-RA6□
Model number of
single product: RCP6-FL-RA6

* It is an enclosed item.
  Refer to the drawing to attach it.



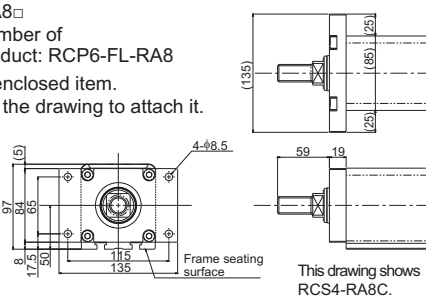
RCS4-RA7□
Model number of
single product: RCP6-FL-RA7

* It is an enclosed item.
  Refer to the drawing to attach it.



RCS4-RA8□
Model number of
single product: RCP6-FL-RA8

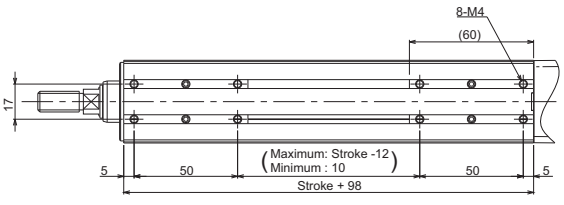
* It is an enclosed item.
  Refer to the drawing to attach it.



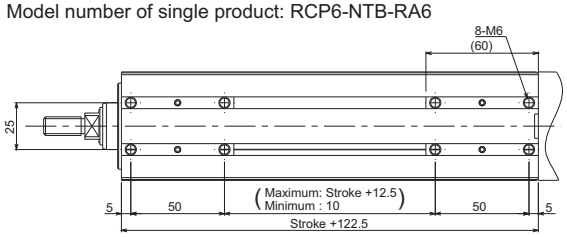
T-slot Nut Bar (Model Code: NTB)

These are bar-shaped brackets that plug into the actuator's T-slots.
There is a tapped hole in the predetermined position on the T-slot nut bar.

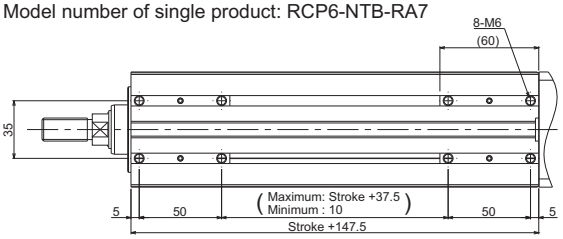
RCS4-RA4□
Model number of single product: RCP6-NTB-RA4



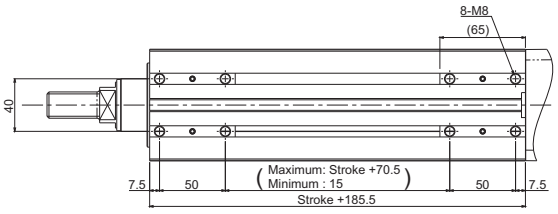
RCS4-RA6□
Model number of single product: RCP6-NTB-RA6



RCS4-RA7□
Model number of single product: RCP6-NTB-RA7



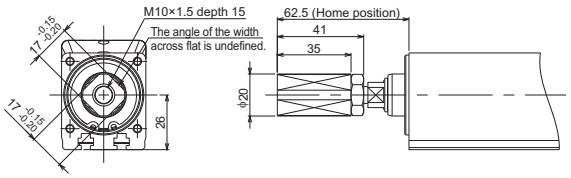
RCS4-RA8□
Model number of single product: RCP6-NTB-RA8



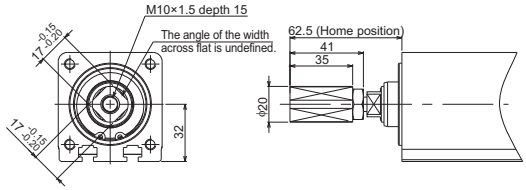
Tip Adapter (Internal Thread) (Model Code: NFA)

This is an adapter to attach on the rod end an object such as a fixture with one screw.

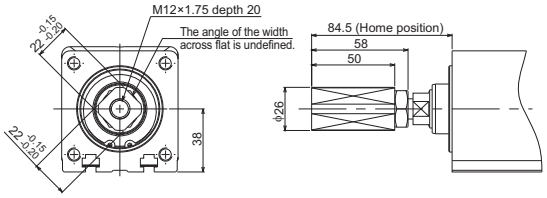
RCS4-RA4□
Model number of single product: RCP6-NFA-RA4



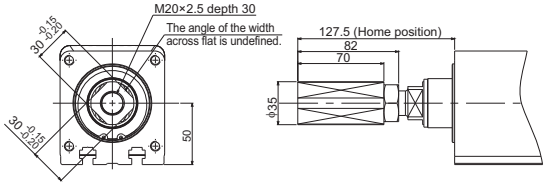
RCS4-RA6□
Model number of single product: RCP6-NFA-RA6



RCS4-RA7□
Model number of single product: RCP6-NFA-RA7



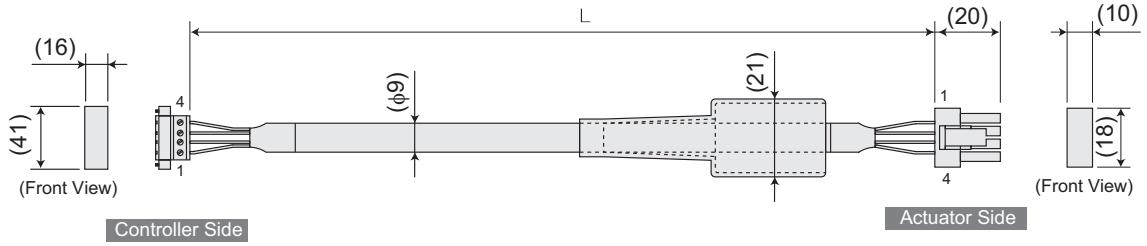
RCS4-RA8□
Model number of single product: RCP6-NFA-RA8



1.4 Accessories

Motor cable

Model Code: CB-RCC-MA□□□ / CB-RCC-MA□□□-RB



Minimum bending radius r = 51mm or more (for movable use)
* It is only robot cable available to use inside the cable track

Wire Size	Color	Signal	No.
0.75sq	Green	PE	1
	Red	U	2
	White	V	3
	Black	W	4

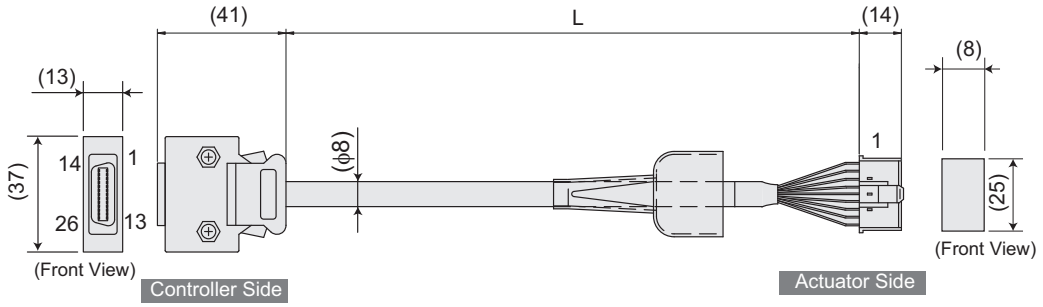
No.	Signal	Color	Wire Size
1	U	Red	0.75sq (Crimped)
2	V	White	
3	W	Black	
4	PE	Green	

- The cable length is available from 1m to 20m.
  Specify the length in increments of 1m.
- The following shows a sample model number.

  Cable length **1**m → CB-RCC-MA**010** (-RB)
  Cable length **3**m → CB-RCC-MA**030** (-RB)
  Cable length **10**m → CB-RCC-MA**100** (-RB)

Encoder cable

Model code: CB-X1-PA□□□



Minimum bending radius r = 44mm or more (for movable use)
*Robot cable is standard for this model.

Wire Size	Color	Signal	No.
AWG26 (Soldered)	—	—	10
	—	—	11
	—	E24V	12
	—	0V	13
	—	LS	26
	—	CREEP	25
	—	OT	24
	—	RSV	23
	—	—	9
	—	—	18
	—	—	19
	—	A+	1
	—	A−	2
	—	B+	3
	—	B−	4
	—	Z+	5
	—	Z−	6
	Orange	SRD+	7
	Green	SRD−	8
	Purple	BAT+	14
	Gray	BAT−	15
	Red	VCC	16
	Black	GND	17
	Blue	BKR−	20
	Yellow	BKR+	21
	—	—	22
Clamp the shield to the hood.			

No.	Signal	Color	Wire Size
1	BAT+	Purple	AWG26 (Crimped)
2	BAT−	Gray	
3	SD	Orange	
4	SD	Green	
5	VCC	Red	
6	GND	Black	
7	FG	Drain	
8	BK−	Blue	
9	BK+	Yellow	

Ground wire or braided shield wire

- The cable length is available from 1m to 20m.
  Specify the length in increments of 1m.
- The following shows a sample model number.

  Cable length **1**m → CB-X1-PA**010**
  Cable length **3**m → CB-X1-PA**030**
  Cable length **10**m → CB-X1-PA**100**

ROBO Cylinder

Chapter 2

Installation

2.1 Precautions for transportation

[Handling the package]

- Do not damage or drop the package.
  The package is not specially designed to withstand dropping or shock due to collision.
- Keep the unit in horizontal orientation for stationary positioning or transportation.
- Do not climb onto the package.
- Do not put anything that could deform the package on it.

[Handling after unpacking]

●Hold the base part when you carry the unit.

● Do not carry the unit by its motor cover.

● Do not damage or drop the package during transportation.

● Do not apply excessive force to any part.

→ For the names of each part, refer to “Names of the Parts” on page Intro-11.

[Handling when assembled into machinery (system)]

● Secure rods to prevent sudden movement during transport.

● If the body or any moving part is overhanging, fix it appropriately to avoid large wobbles due to external vibration. When transporting without fixing the tip, do not apply impact of 0.3G or more.

● When suspending machinery (system) with ropes, be careful not to catch the rope on the body or cable.

2.2 Installation and storage/preservation environment

Usage is possible in environments of pollution degree 2 or equivalent.

Pollution degree 2:	Environment in which generally only nonconductive pollution occurs, but temporary conductive pollution may occur due to condensation (IEC 60664-1)

Installation environment

Avoid the following locations for installation.
In general, the installation environment should be one in which an operator can work without protective gear.

- Where the unit receives radiant heat from strong heat sources such as heat treatment furnaces
- Where the ambient temperature exceeds the range of 0 to 40°C
- Where the temperature changes rapidly and condensation occurs
- Where the relative humidity exceeds 85% RH
- Where the unit receives direct sunlight
- Where the unit is exposed to corrosive or combustible gases
- Where the ambient air contains a large amount of dust, salt or iron (at levels exceeding those typical of an assembly plant)
- Where the unit is subject to splashed water or oil (including oil mist or cutting fluid) or chemical solutions
- Where the body receives impact or vibration
- Where the altitude is more than 2000m

Also, provide sufficient work space for the following maintenance and inspection:

- Space to replenish grease
- Space to replace the motor

If the unit is used in any of the following locations, provide sufficient shielding measures:

- Where noise is generated due to static electricity, etc.
- Where the unit is subject to a strong electric or magnetic field
- Where the unit is subject to ultraviolet or radiation

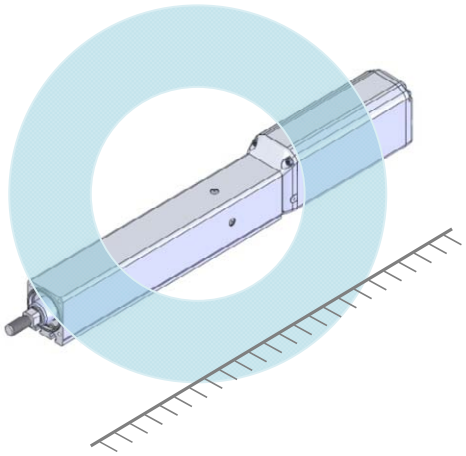
Storage/preservation environment

- For the storage and preservation environment, see the installation environment.
  However, give especial consideration to the prevention of condensation during long-term storage/preservation.
- Unless especially specified, desiccant is not included in the package at shipping.
  If the product is to be stored/preserved in an environment where condensation is anticipated, take condensation preventive measures.
- For short-term storage, it can be stored at 60°C or below.
  For storage of one month or more, make sure that the temperature does not exceed 50°C.
- The product should be placed horizontally for storage and preservation.
  If storing in the packaged condition, observe the conditions, if any, regarding storage orientation.

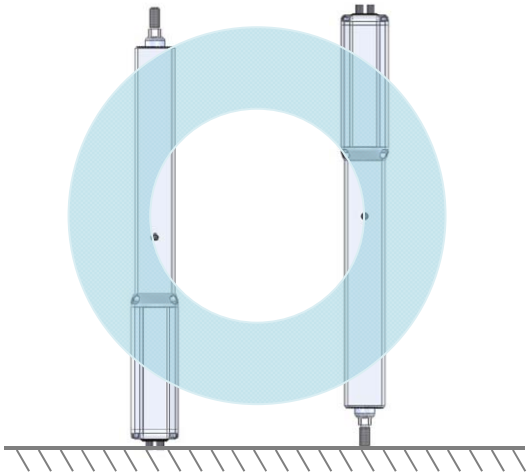
2.3 Installation

Mounting orientation Type: RCS4-RA4/RA6/RA7/RA8

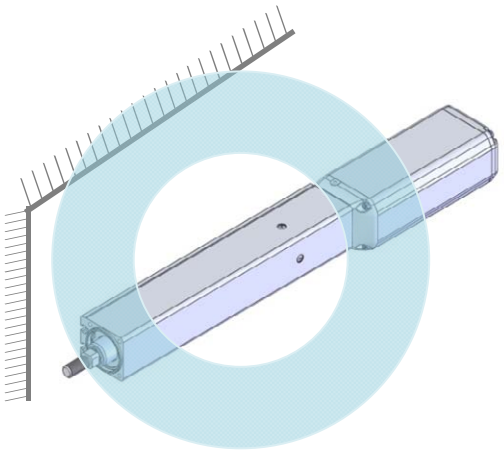
Horizontal installation



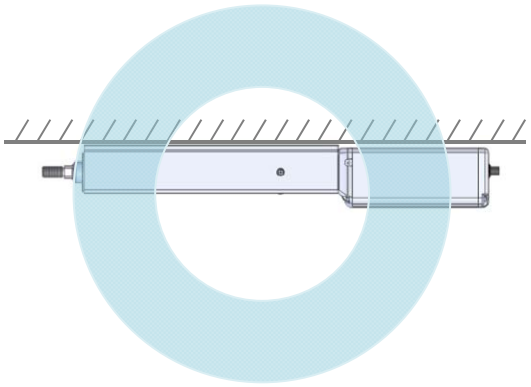
Vertical installation



Lateral installation



Ceiling mount installation



Caution

- When installing the unit vertically, keep the motor on top to the greatest extent possible.
- If the motor is installed on the bottom, the grease may separate due to long-term disuse, causing the base oil to flow into the motor part. The controller and motor/encoder may break down due to the entry of the base oil.

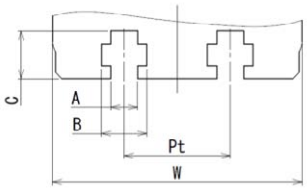
Installation surface

- The body mounting surface should be a machined surface or a plane with similar accuracy, with flatness within 0.05mm/m.
- The mounting frame should have a structure rigid enough to prevent the generation of vibration, etc.
- Also consider the necessary space for maintenance work such as actuator replacement and inspection.

Body mounting

[Using the T-slot on the Bottom of the Base]

Tapped Hole Position Dimensions

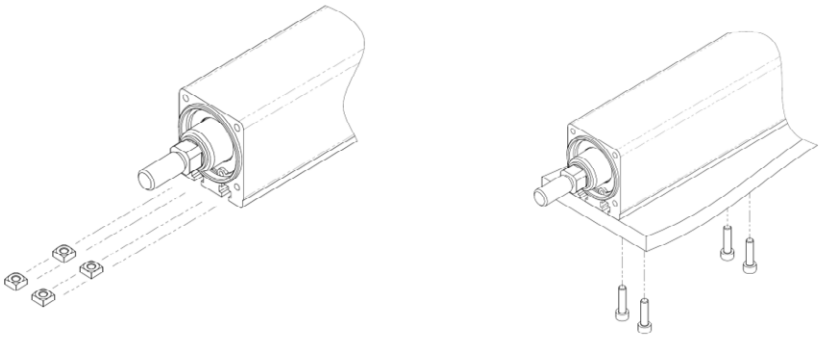


	RA4	RA6	RA7	RA8
W [mm]	40	58	70	85
Pt [mm]	17	25	35	40
A [mm]	4.3	6.3	6.3	8.5
B [mm]	7.3	10.3	10.3	13.3
C [mm]	7.7	9	10.5	14

[Using the Tapped Hole on the Back of the Base: Installation by Square Nuts]

The unit has a T-slot at the bottom of the base for mounting.
Insert a square nut into the T-slot and fix it from the back.
Use the square nuts prescribed in JIS B 1163 for the T-slots.

→ For details regarding the position and dimensions, refer to "Chapter 5 External Dimensions".



[Quantities of the Square Nuts at the time of Shipment]
(Note) When optional T-slot nut bars (model: NTB) are selected, the square nuts are not enclosed.

	RA4	RA6	RA7	RA8
Quantities Enclosed	4	4	8	8
Attachment Bolts	M4	M6	M6	M8

[Screw Length from the Base Bottom]
Adjust the screw length from the base bottom according to the following table to ensure the fitting length of the nut and the screw.

	RA4	RA6	RA7	RA8
Screw Length from the Base Bottom [mm]	5 to 7	7.5 to 8.5	8 to 10	11 to 13

[Minimum Fixing Number of Bolts and the Tightening Torque]
Install them according to the minimum fixing number of bolts and the tightening torque in the following table.

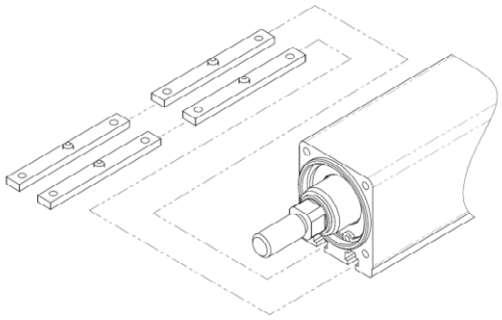
	RA4	RA6	RA7	RA8
Minimum Fixing Number [Bolts]	4	4	6	8
Tightening Torque [N·m]	1.76	5.36	5.36	11.48

Caution

- Be careful when selecting the bolt length. If bolts of inappropriate lengths are used, the tapped holes may be damaged, actuator mounting strength may become insufficient, or contact with driving parts may occur, resulting in lower precision or unexpected accidents.

**[Using the Tapped Hole on the Back of the Base:
Installation by T-Slot Nut Bar (Option Model: NTB)]**

Four T-slot nut bars (option model: NTB) are shipped in a built-in-state in all sizes. Before you use them, loosen the hexagonal socket head fixing screws in the center of the nuts to move them to the desired positions. Do not overly tighten the hexagonal socket head fixing screws, for they are used only for positioning. Use the nut bars in a pitch as wide as possible to stabilize the mounting.



[Screw Length from the Base Bottom]
Adjust the screw length from the base bottom according to the following table to ensure the fitting length of the nut and the screw.

	RA4	RA6	RA7	RA8
Screw Length from the Base Bottom [mm]	5 to 7	7.5 to 8.5	8 to 10	11 to 13

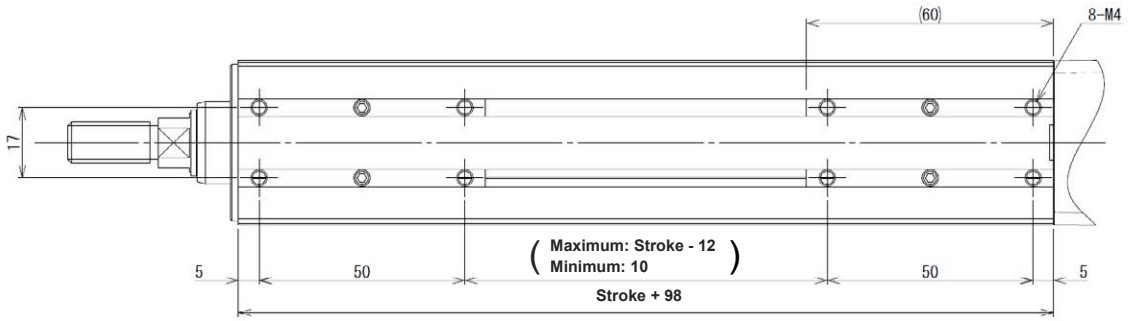
[Minimum fixing number of bolts and the tightening torque]
Install them according to the minimum fixing number of bolts and the tightening torque in the following table.

	RA4	RA6	RA7	RA8
Minimum Fixing Number [Bolts]	4	4	6	8
Tightening Torque [N·m]	1.76	5.36	5.36	11.48

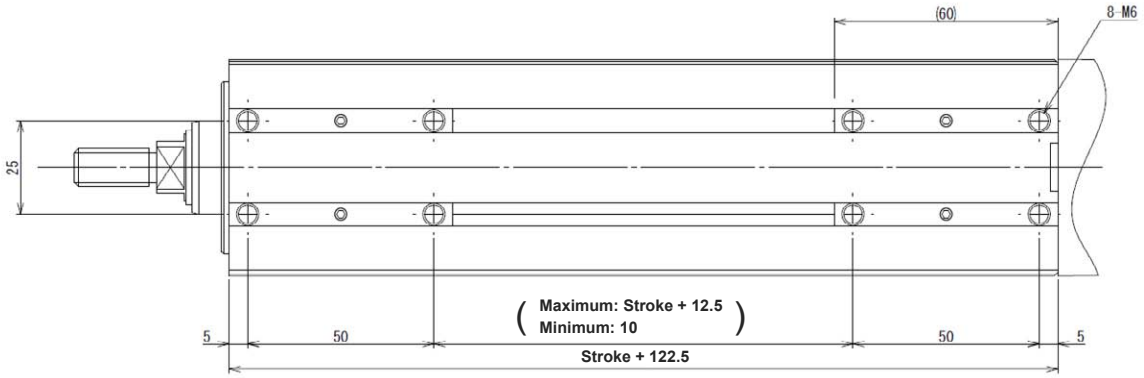
Caution

Be careful when selecting the bolt length. If bolts of inappropriate lengths are used, the tapped holes may be damaged, actuator mounting strength may become insufficient, or contact with driving parts may occur, resulting in lower precision or unexpected accidents.

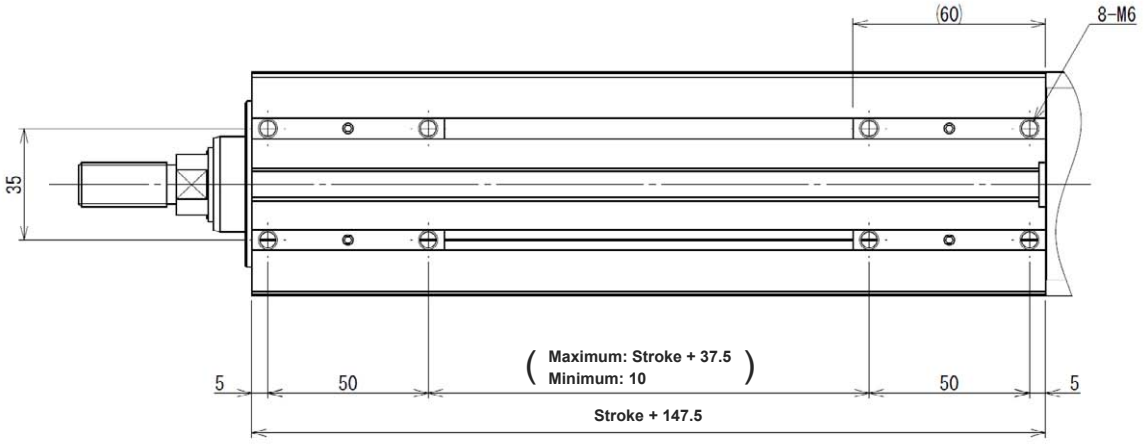
The attachment positions of T-Slot nut bars (model: NTB)



RA4

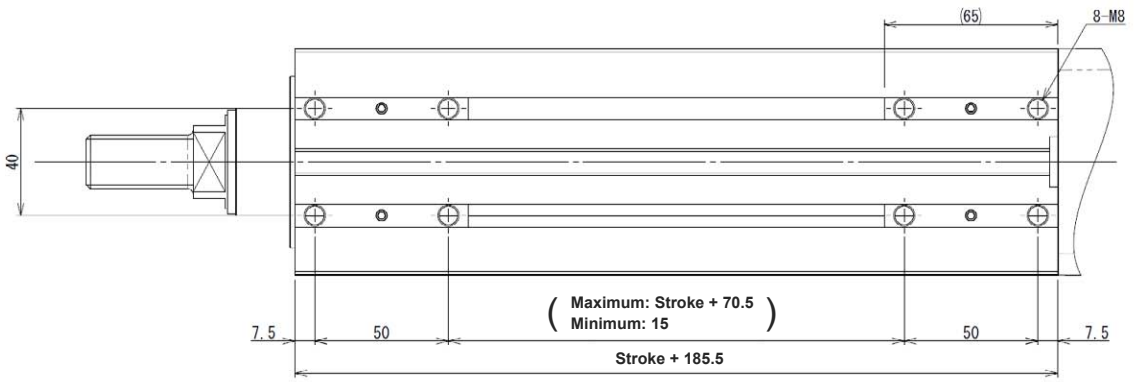


RA6



RA7

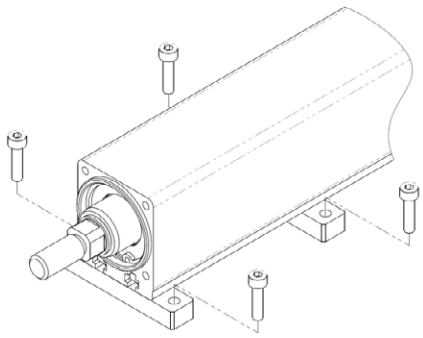
The attachment positions of T-Slot nut bars (model: NTB)



RA8

[When Utilizing Foot Brackets for Installation]

Actuators can be installed by using the foot brackets (option: model FT).
Foot bases are shipped in the state fixed to the both ends of the actuator frame.
Before use, loosen the bolts fixing the foot bases and move them to the desired positions.



[Width direction pitch of foot bracket, attachment bolts and others]
Straight type and Motor top reversed type (model: MT)

	RA4	RA6	RA7	RA8
Width direction hole pitch [mm]	50	72	85	100
Thickness [mm]	8	10	12	16
Material	Steel	Steel	Steel	Steel
Attachment bolts	M4	M6	M6	M8

Motor left reversed (model: ML) and Motor right reversed (model: MR) except RCP6S-RA4R

	RA4	RA6	RA7	RA8
Width direction hole pitch [mm]	100	132	160	190
Thickness [mm]	8	10	12	16
Material	Steel	Steel	Steel	Steel
Attachment bolts	M4	M6	M6	M8

Motor left reversed (model: ML) and Motor right reversed (model: MR) of RA6S-RA4R

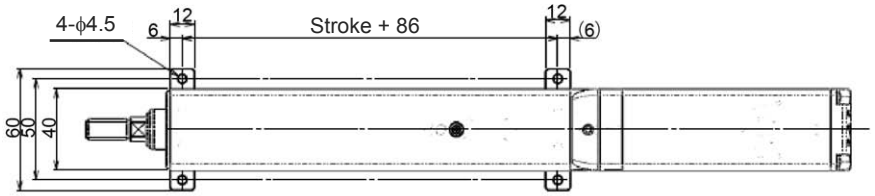
	RA4	RA6	RA7	RA8
Width direction hole pitch [mm]	121			
Thickness [mm]	8			
Material	Steel			
Attachment bolts	M4			

[Tightening Torque]

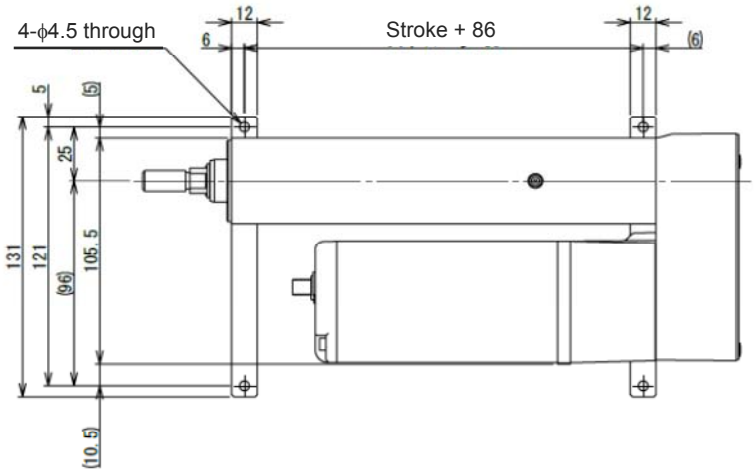
Install them according to the minimum fixing number of bolts and the tightening torque in the following table.

	RA4	RA6	RA7	RA8
Screw nominal diameter	M4	M6	M6	M8
Tightening torque [N·m]	3.59	12.3	12.3	30

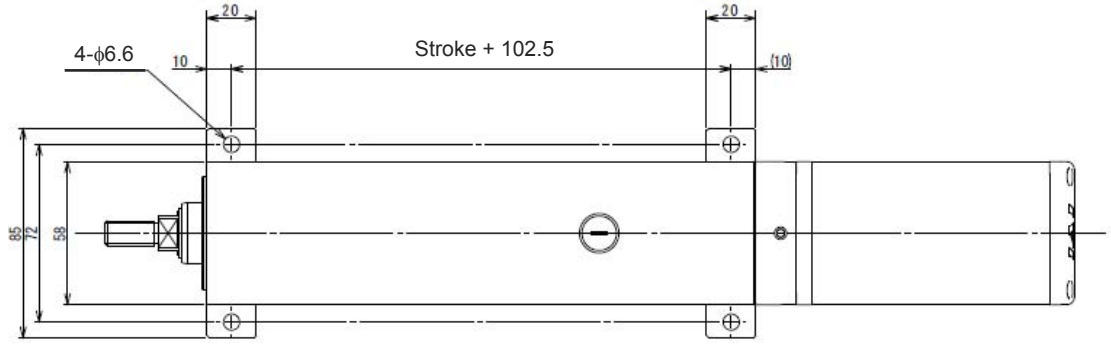
The attachment positions of foot brackets (model: FT) at the shipment are as follows.



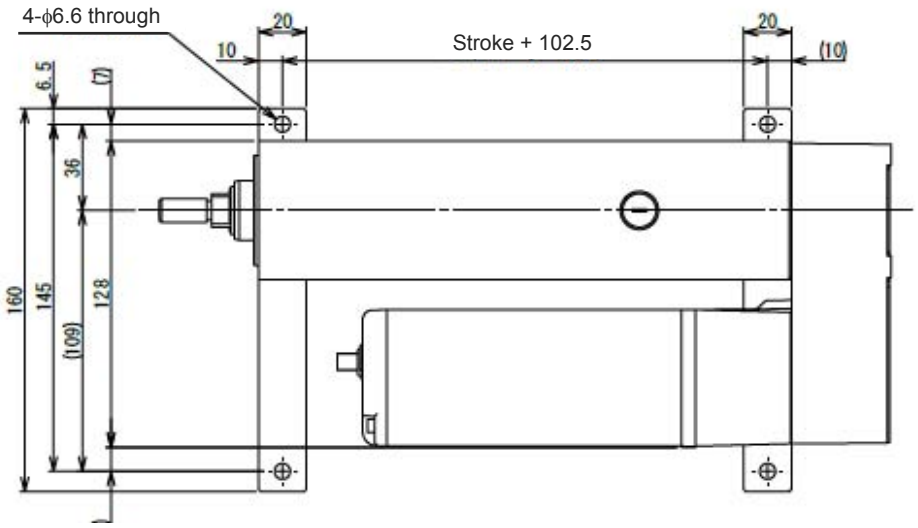
RCS4-RA4C



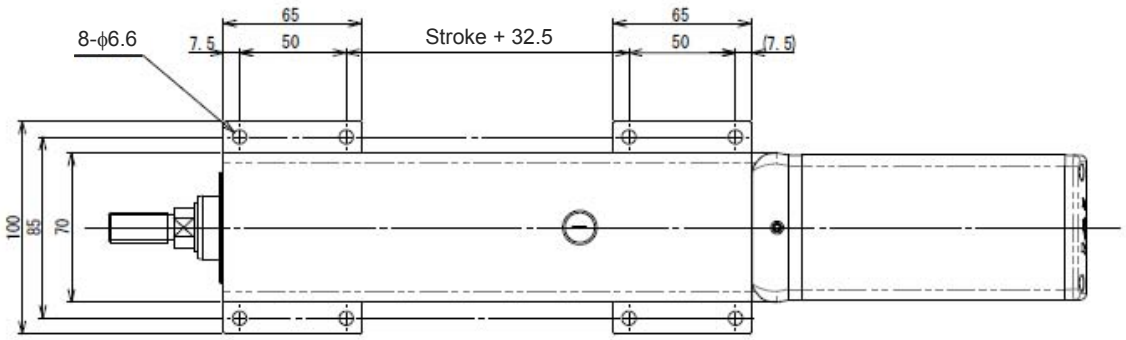
RCS4-RA4R Motor left reversed (ML) and Motor right reversed (MR)



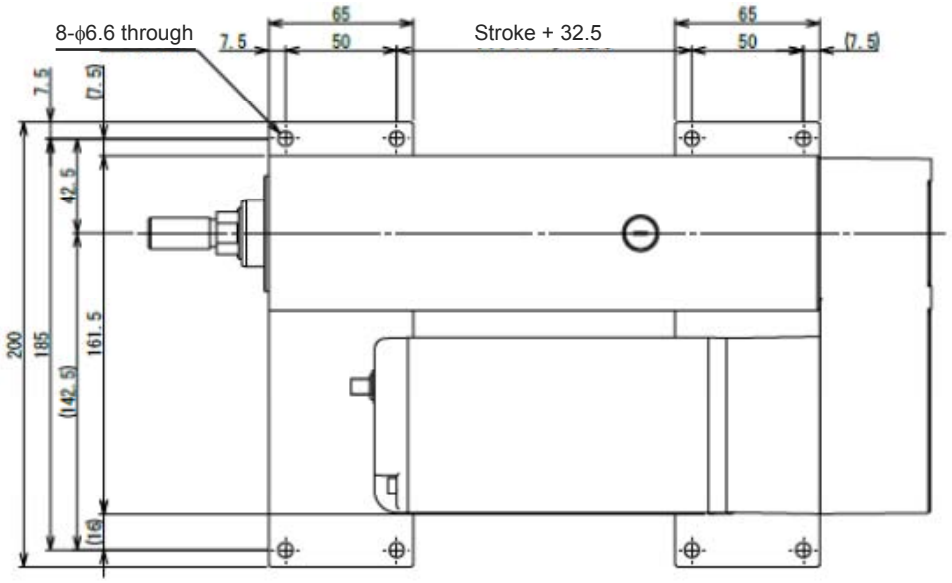
RCS4-RA6C



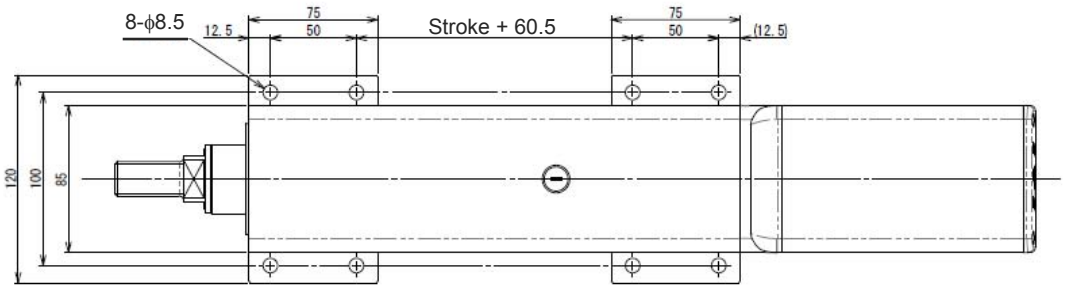
RCS4-RA6R Motor left reversed (ML) and Motor right reversed (MR)



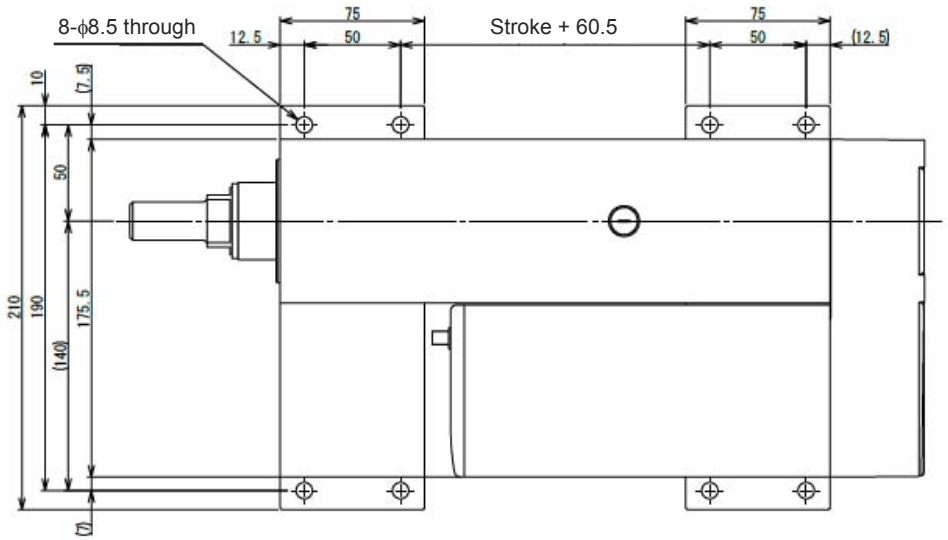
RCS4-RA7C



RCS4-RA7R Motor left reversed (ML) and Motor right reversed (MR)



RCS4-RA8C



RCS4-RA8R Motor left reversed (ML) and Motor right reversed (MR)

Notice

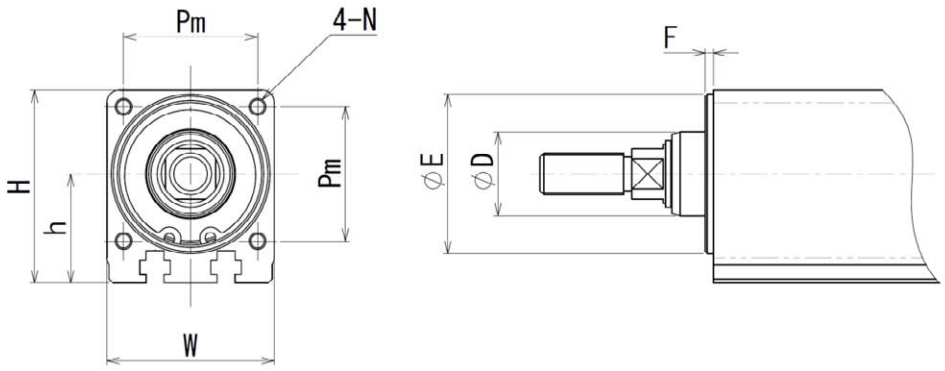
- The use of high-strength bolts of ISO-10.9 or higher is recommended.
- For the effective engagement length between the bolt and female thread, provide at least the applicable value specified below:
  Female thread is made of steel material → Same length as the nominal diameter
  Female thread is made of aluminum → 1.8 times of nominal diameter

Caution

- Be careful with regard to the length of the mounting bolt.
- If bolts of inappropriate lengths are used, the tapped holes may be damaged, actuator mounting strength may become insufficient, or contact with driving parts may occur, resulting in lower precision or unexpected accidents.

[When using Tapped Holes on Front Bracket]

There are tapped holes equipped on the front bracket.
Utilize these tapped holes for installation.



	RA4	RA6	RA7	RA8
W [mm]	40	58	70	85
h [mm]	26	32	38	50
H [mm]	46	61	73	92.5
Pm [mm]	32	45	55	70
N	M4 depth 8	M6 depth 12	M8 depth 16	M8 depth 16
D [mm]	ϕ20	ϕ25	ϕ30	ϕ40
E [mm]	ϕ38h7	ϕ46h7	ϕ52h7	ϕ64h7
F [mm]	2	2	2	2

[Tightening Torque]
Install them according to the minimum fixing number of bolts and the tightening torque in the following table.

	RA4	RA6	RA7	RA8
Screw nominal diameter	M4	M6	M8	M8
In the case that steel is used for the bolt seating surface [N·m]:	3.59	12.3	30	30
In the case that steel is used for the bolt seating surface [N·m]:	1.76	5.4	11.5	11.5

Notice

- The use of high-strength bolts of ISO-10.9 or higher is recommended.
- For the effective length of engagement for a screw and a threaded hole, make sure to secure 1.8 times of the nominal diameter.

Caution

- Be careful with regard to the length of the mounting bolt.
- If bolts of inappropriate lengths are used, the tapped holes may be damaged, actuator mounting strength may become insufficient, or contact with driving parts may occur, resulting in lower precision or unexpected accidents.

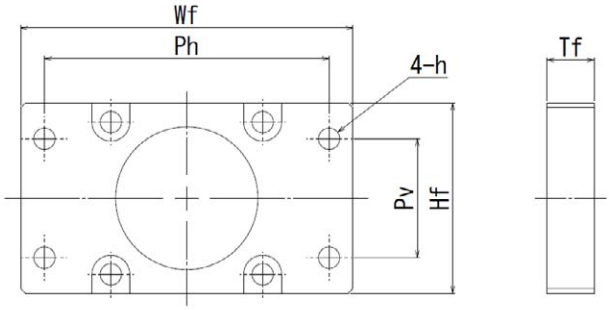
[When using Front Flange (Option)]

There are tapped holes equipped on the front housing (Option).
Utilize these tapped holes for installation.
Although this option is ordered along with an actuator, they will be shipped as accessories (not assembled parts). Attach the flange to the actuator using the enclosed bolts with prescribed torque.

(Note) The front flange cannot be installed in the horizontal direction (width direction) because motor left reversed (ML) and motor right reversed (MR) of reversed motor types RA4R, RA6R, RA7R, and RA8R with the following strokes will interfere with the motor unit.

	Stroke [mm]
RA4R, RA6R, RA7R	100 or less
RA8R	50

Flatness of the mounting surface should be less than 0.05mm.
The dimensions of the front flange are as follows.



	RA4	RA6	RA7	RA8
Wf [mm]	70	90	108	135
Hf	40	56	68	84
Ph	60	75	90	115
Pv	25	40	50	65
h	4.5	6.6	8.5	8.5
Tf	10	12	16	19
Material	Steel	Steel	Steel	Steel
Enclosed Bolts	M4 × 12	M6 × 15	M8 × 20	M8 × 25
Tightening torque of the front flange to the main unit [N·m]	2.1	4.2	7.1	17.2

[Tightening Torque]
Install them according to the minimum fixing number of bolts and the tightening torque in the following table.

	RA4	RA6	RA7	RA8
Screw nominal diameter	M4	M6	M8	M8
In the case that steel is used for the bolt seating surface [N·m]:	3.59	12.3	30	30

Notice

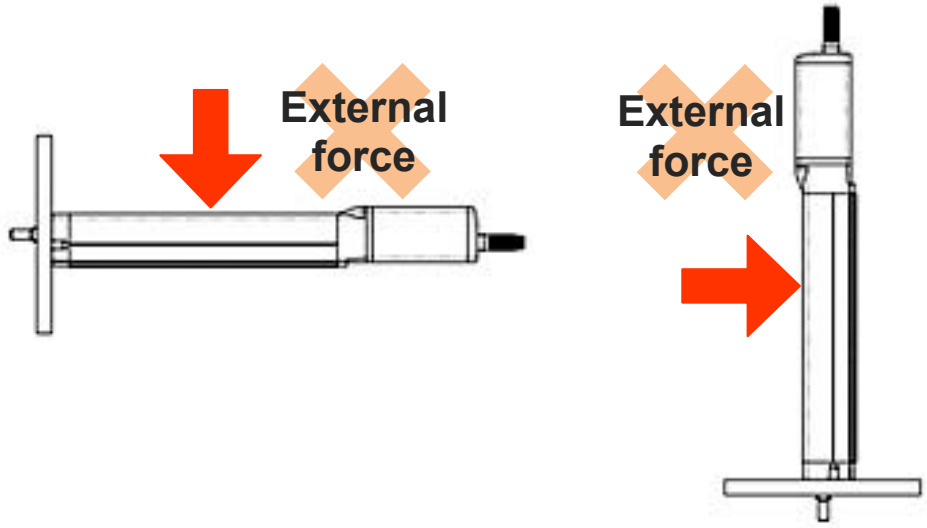
- The use of high-strength bolts of ISO-10.9 or higher is recommended.
- For the effective engagement length between the bolt and female thread, provide at least the applicable value specified below:
  Female thread is made of steel material → Same length as the nominal diameter
  Female thread is made of aluminum → 1.8 times of nominal diameter

Caution

- Be careful with regard to the length of the mounting bolt.
- If bolts of inappropriate lengths are used, the tapped holes may be damaged, actuator mounting strength may become insufficient, or contact with driving parts may occur, resulting in lower precision or unexpected accidents.

[Precautions when using front brackets/flanges]

- Do not apply external force to the actuator body.

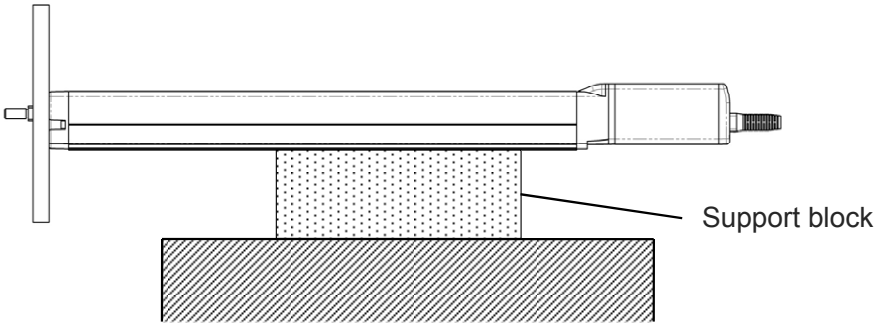


Caution

Do not apply external force to the actuator body after installation.
External force may cause malfunctions or damage to parts.

[Precautions for horizontal mounting using front brackets/flanges]

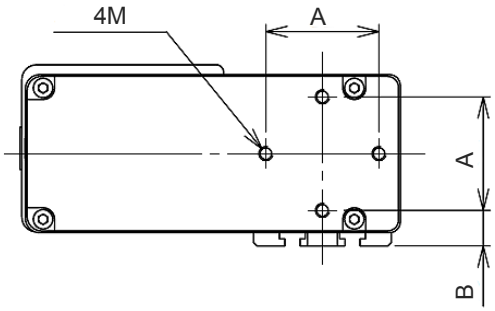
● Prepare a support block for the body, as shown in the figure below.



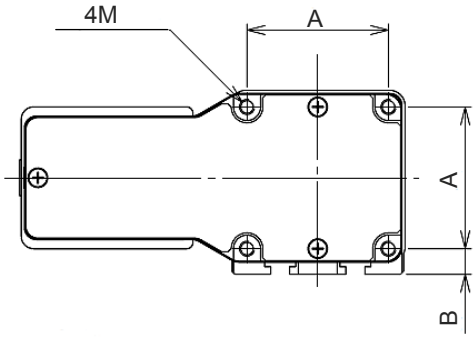
[When using attachment holes on the reversed bracket for motor reversing type]

As the reversing bracket is equipped with tapped holes, it is available for attachment at the back of it.
It should be an option (Model Code: RP) for RA4R.

● For RA4R (Option)

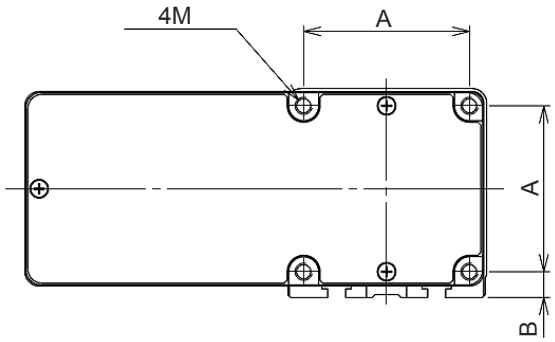


● For RA6R



Model	A	B	Attachment hole diameter	Attachment hole depth	Tightening torque
RA4R	32	10	M4	8mm	1.76N·m (0.18kgf·m)
RA6R	47	8.5	M5	10mm	3.42N·m (0.35kgf·m)

● For RA7R and RA8R



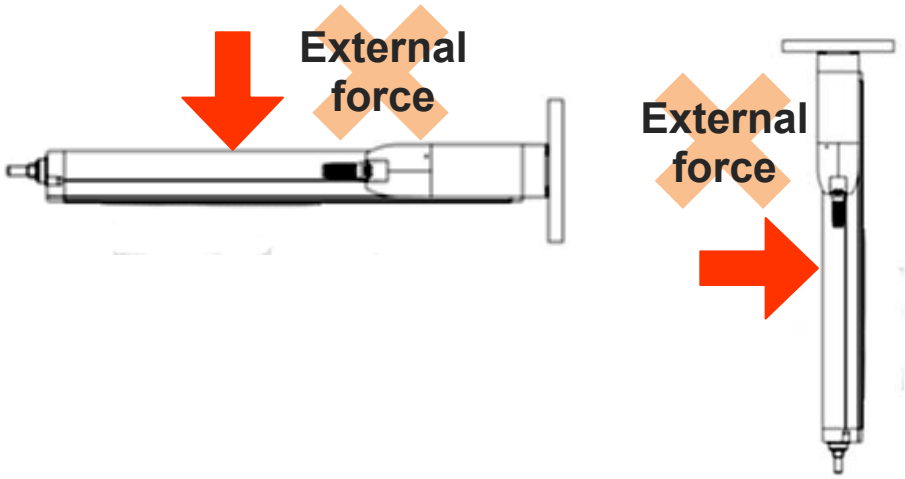
Model	A	B	Attachment hole diameter	Attachment hole depth	Tightening torque
RA7R	58	9	M6	12mm	5.4N·m (0.55kgf·m)
RA8R	70	15	M6	12mm	5.4N·m (0.55kgf·m)

Notice

- The use of high-strength bolts of ISO-10.9 or higher is recommended.
- Make sure the internal thread and bolt effective engagement length is approximately 1.8 times the nominal diameter or more.

[Precautions when using attachment holes on the reversed bracket for motor reversing type]

● Do not apply external force to the actuator body.

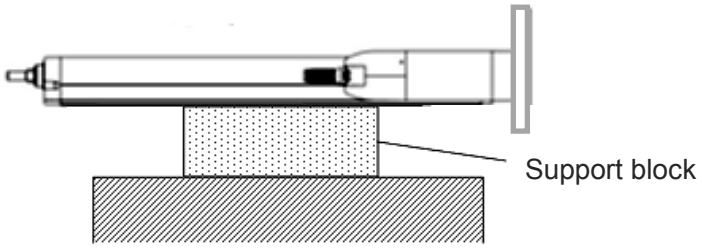


Caution

Do not apply external force to the actuator body after installation.
External force may cause malfunctions or damage to parts.

[Precautions for horizontal mounting using attachment holes on the reversed bracket for motor reversing type]

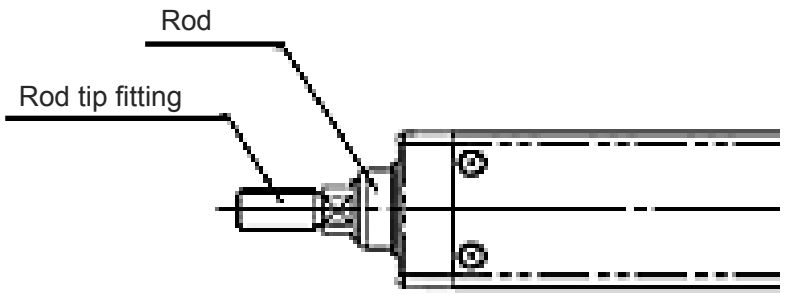
● Prepare a support block for the body, as shown in the figure below.



Mounting transported objects

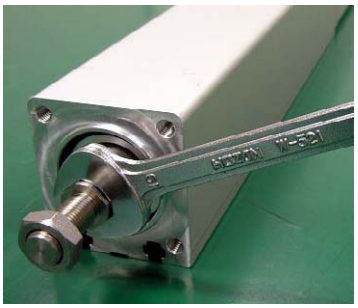
[When using the rod tip fitting male thread]

Transported objects can be secured using the male thread of the rod tip fitting.

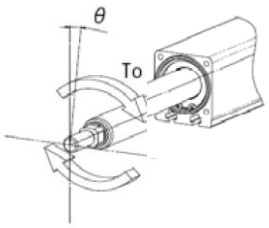


Caution

- When fastening a nut onto the tip bracket thread, make sure that the rod does not rotate. Use a wrench to fix the width across flat of the tip bracket with the rod in the maximum retraction position.



- It cannot be used to apply a torque to the rod tip. Statically acceptable values and the rod tip maximum displacement angles (initial value reference) expected at that time are shown below. When the reaction force against the pressing operation is the side-way force, make sure it would not exceed the allowable load.

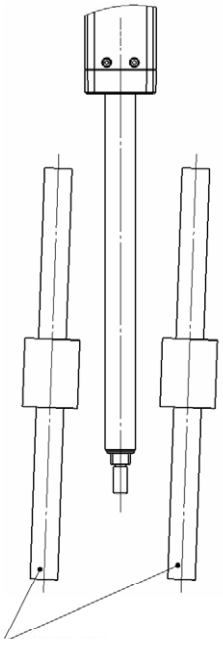


	RA4	RA6	RA7	RA8
To [N·m]	1.0	1.5	2.5	5.0
θ [deg]	±1.0	±1.0	±0.8	±0.8

Precautions regarding the rod

- Do not apply radial load and load moment to the rod. Only the radial direction load that aligns with the rod axis can be applied.
  In the case that radial load and load moment cannot be avoided, attach an external guide (such as a linear guide) in order not to apply any load other than radial direction load to the rod.
  When the workpiece center of gravity is on the rod axis during vertical operation, vibration may be generated by the clearance of the internal rotation-stopper. Attachment of an external guide is recommended to suppress such vibration.

- When connecting the rod to external guides, be careful on the parallelism of the guides to the rod. When connecting and fixing the rod to external guides, be careful not to apply excess side-way load to the rod because of the assembly variation.



External guide

ROBO Cylinder

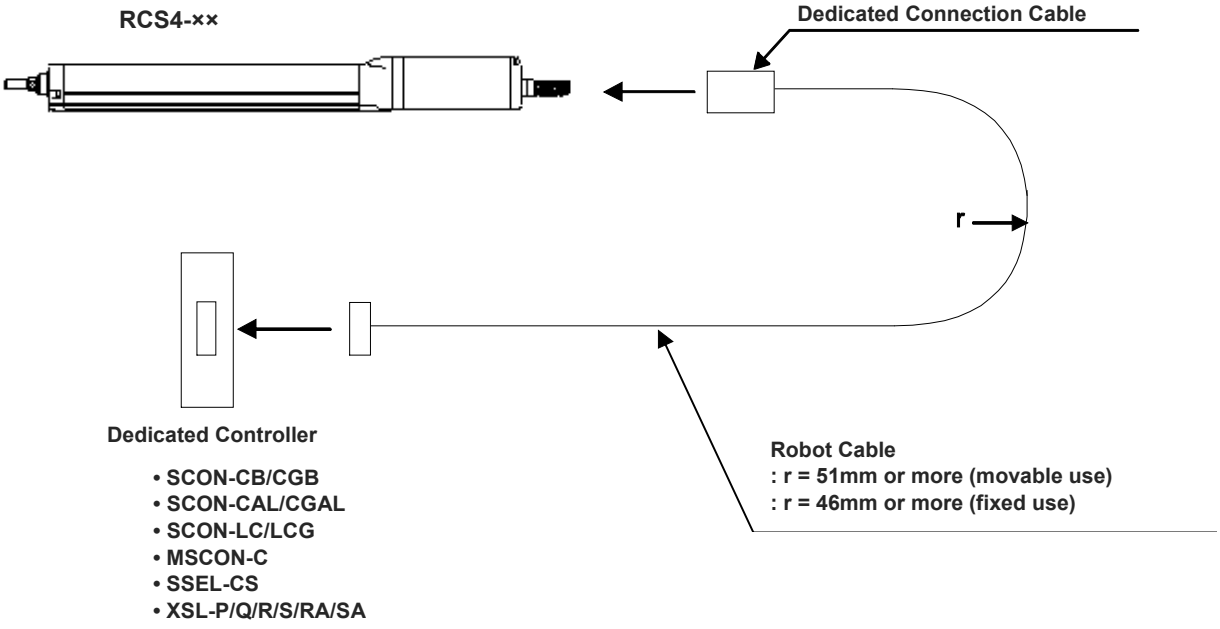
Chapter 3

Connecting with the Controller

3.1 Connecting with the Controller

As the connection cable for the controller and the actuator, use the IAI-dedicated connection cable. Please consult with IAI if you require a different kind of cable than the one supplied.

- If the dedicated connection cable cannot be secured, reduce the load on the cable by allowing it to deflect only by the weight of the cable or wire it in a self-standing cable hose, etc., having a large radius.
- Do not cut and reconnect the dedicated connection cable for extension or shorten the cable.
- Do not pull on the dedicated connection cable or bend it forcibly.
- The actuator cable coming out of the motor unit is not meant to be bent. Fix the cable so it would not be bent repeatedly.



Dedicated Cable
• Motor Cable: CB-RCC-MA□□□
• Motor Robot Cable: CB-RCC-MA□□□-RB
• Encoder Robot Cable: CB-X1-PA□□□
*** □□□ represents the cable length. The longest corresponds to 20m.**
e.g.) 080 = 8m

Caution

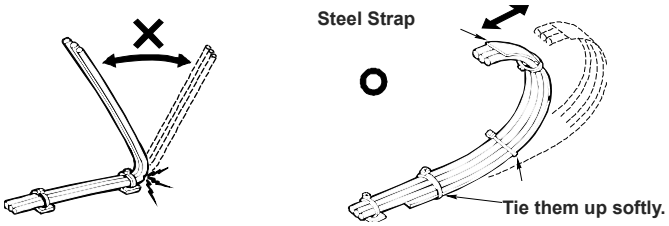
- For wiring, please follow the warnings stated below. When constructing a system as the machinery equipment, pay attention to the wiring and connection of each cable so they are conducted properly. Not following them may cause not only a malfunction such as cable breakage or connection failure, or an operation error, but also electric shock or electric leakage, or may even cause a fire.
- Use dedicated cables of IAI indicated in this instruction manual. Contact us if you wish to have a change to the specifications of the dedicated cables.
- Make sure to turn the power off in the process of power line or cable connection or disconnection.

  Do not attempt to cut a dedicated cable with connectors on both ends to extend, shorten or re-joint it.
- Hold the dedicated cable to avoid mechanical force being applied to the terminals and connectors.

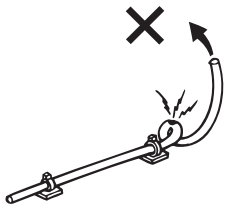
  Use a cable pipe or duct to have an appropriate protection when there is a possibility of mechanical damage on a dedicated cable.
- In case a dedicated cable is to be used at a moving part, make sure to lay out the cable without applying any force to pull the connector or extreme bend on the cable. Do not attempt to use the cable with a bending radius below the allowable value.
- Make certain that the connectors are plugged properly. Insufficient connection may cause an operation error, thus it is extremely risky.
- Do not lay out the cables to where the machine runs over them.
- Pay attention to the cable layout so it would not hit peripherals during an operation. In case it does, have an appropriate protection such as a cable track.
- When a cable is used hanging on the ceiling, prevent an environment that the cable swings with acceleration or wind velocity.
- Make sure there is not too much friction inside the cable storage equipment.
- Do not apply radiated heat to power line or cables.

Caution

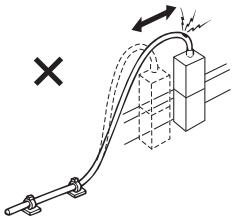
- Have a sufficient radius for bending, and avoid a bend concentrating on one point.



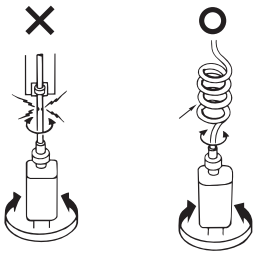
- Do not let the cable bend, kink or twist.



- Do not pull the cable with a strong force.

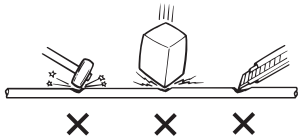


- Pay attention not to concentrate the twisting force to one point on a cable.

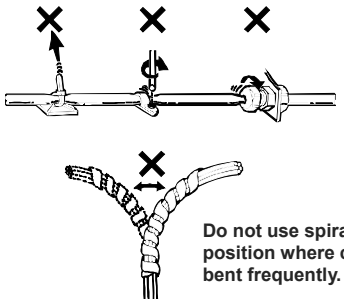


Caution

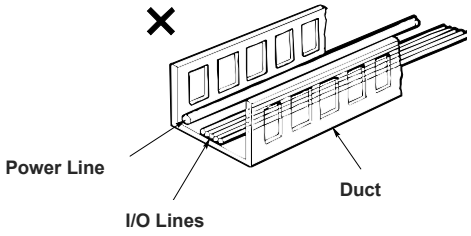
- Do not pinch, drop a heavy object onto or cut the cable.



- When a cable is fastened to affix, make sure to have an appropriate force and do not tighten too much.



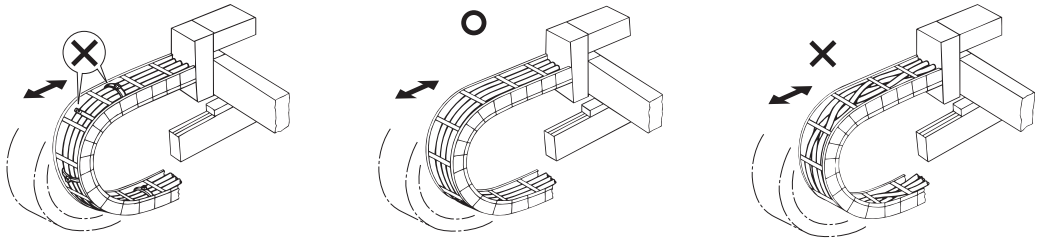
- PIO line, communication line, power and driving lines are to be put separately from each other and do not tie them together. Arrange so that such lines are independently routed in the duct.



Caution

Follow the instructions below when using a cable track.

- If there is an indication to the cable for the space factor in a cable track, refer to the wiring instruction given by the supplier when storing the cable in the cable track.
- Avoid the cables to get twined or twisted in the cable track, and also to have the cables move freely and do not tie them up. (Avoid tension being applied when the cables are bent.)
- Do not pile up cables. It may cause faster abrasion of the sheaths or cable breakage.



ROBO Cylinder

Chapter 4

Maintenance and Inspection

4.1 Precautions for maintenance and inspection work

Make sure to read the following precautions before conducting any maintenance or inspection work.

Caution

- Do not climb on or put anything on the actuator.
  Otherwise, this may lead to accidental falling, injury or damage to the product due to falling objects, product loss of function or performance degradation, or shortening of product life.
- Before releasing the brake, make sure to check there is nothing that will interfere with moving parts within the operation range.
- The rod may fall, possibly injuring the operator or people nearby and damaging the actuator, workpiece or equipment.

Caution

- Check that the power to the actuator is OFF before conducting any maintenance or inspections.
- Be careful not to lose the cover or any removed screws.
  Be sure to return the product to the original condition after maintenance and inspection work.
  Mounting in an incomplete state may cause injuries or damage to the product.
- Do not modify, disassemble/assemble, or use maintenance parts not specified on your own discretion under any circumstances.

Caution

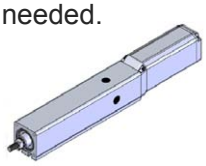
The grease film may run out if the actuator performs return operation continuously over a distance of 30mm or less. As a guideline, every 5,000 to 10,000 cycles, have approximately 5 cycles of return operation over a 50mm distance or more to regenerate the oil film.
The ball screw or guide may be damaged if the oil film runs out.

Notice

- First, be sure to wipe off the old grease, and then supply new grease.
- The degradation speed of grease may differ depending on the operating environment (temperature, humidity and ambient atmosphere).
  It is recommended to shorten the grease supply period if the actuator is used under poor environmental conditions such as high temperatures, high humidity or dusty atmospheres.
- Also, it is recommended to improve the environmental conditions in case the grease changes color notably due to poor operating conditions.
- Base oil may separate from the grease due to the mounting orientation or operating conditions.
  Base oil may also leak from the inside of the actuator to the exterior through gaps.
  Check visually for oil drips when supplying grease.
- An actuator stored for 6 months or more may suffer from grease degradation.
  Supply grease before the start of use.
  → For details, refer to “4.5 Greasing method”.

4.2 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.



Rod type

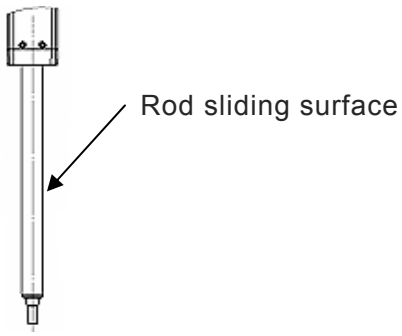
Inspection period	External inspection	Greasing	
		Rod sliding surface	Ball screw, Guide
Start of work inspection	○	-	-
1-month inspection	○	-	-
3-month inspection	-	○	○
Every 3 months thereafter	○	○	-
3-month inspection on	-		
6-month inspection	○	-	○
Every 6 months thereafter	○		

4.3 Visual inspection items

Refer to “4.6 How to replace components” for detailed information about specific component replacement and adjustment methods.

External visual inspection

Inspection items	Maintenance work
Is abnormal noise or vibration generated?	Take an action by referring to “Troubleshooting in Controller Instruction Manual”.
Are actuator mounting bolts loose?	Tighten them further.
Is the cable scratched?	Replace if the damage is severe.
Is the connector loose?	Re-insert correctly.
Is the rod sliding surface grease not lubricating well? (Even if the grease is brown, lubrication is adequate if the running surface is shiny)	Wipe away the old grease, then replenish with new grease.
Is there foreign matter or dust adhered to the rod sliding surface?	Replenish with new grease after cleaning.
Is grease dripping out? (especially if vertically mounted)	Clean up any drips. Replenish the grease.



4.4 Cleaning

External 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 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 gaps.
- Do not use petroleum-based solvents as they can harm resin and painted surfaces.
- To remove severe buildup, wipe gently with a soft cloth soaked in a neutral detergent or alcohol.

4.5 Greasing method

[1] Grease used: Use an equivalent product

Use lithium-based spray grease for maintenance.

Application location	**During maintenance** (recommended product)	Default (reference)
Ball screw	Spray grease No. A161 or equivalents	Kyodo Yushi/Multemp LRL No. 3
Rotation stopper		
Rod (sliding surface)		

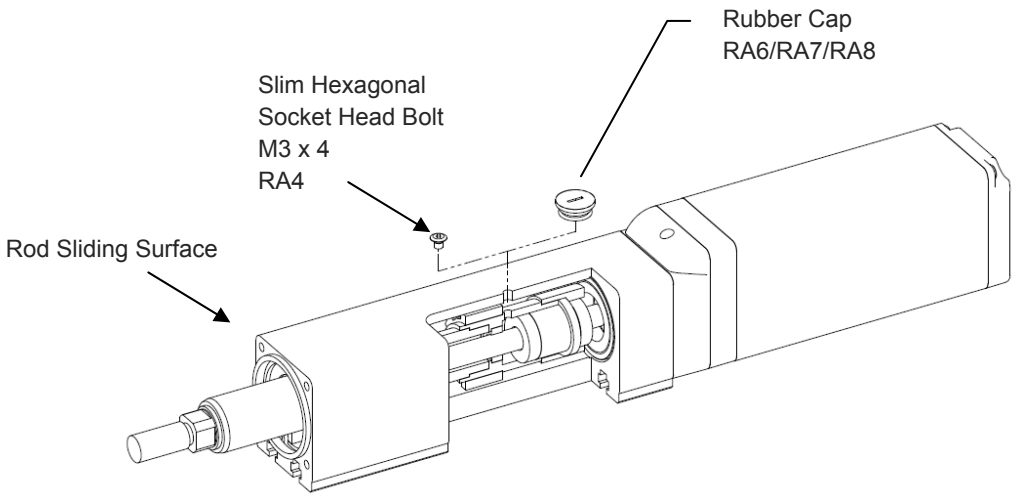
Caution

Never use fluorine-based or urea-based grease.
Mixing with lithium-based grease not only reduces the performance of the grease, it may even cause damage to the actuator.

[2] Greasing method: Ball screw/guide

Greasing method

1) For RA4, remove the slim hexagonal socket head bolt (M3 x 4) blocking the greasing ports with an Allen wrench.
   For RA6/RA7/RA8, remove one of the rubber caps blocking the greasing ports.
2) Grease the ball screws and the rotation stopper 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.
   [Rotation Stopper]
   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.



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.

4) Clean up the rod (sliding surface) and apply the grease with hands.
5) Slide the rod back and forth manually with hand or by the controller with JOG operation to spread out the grease evenly.
6) Attach the cap.

Caution

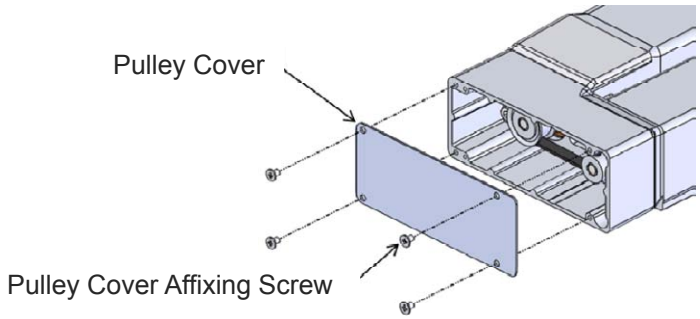
- In case the grease got into your eye, wash it with clean water for 15 minutes and immediately go see the doctor to get appropriate care.
- After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease OFF.

4.6 How to replace components

Belt Replacement and Tuning

[Belt Inspection]

1) Detach the pulley cover affixing screws and take off the pulley cover.



2) Check the condition of the belt visually.

Judgment

- In generally speaking, it possesses bending life of several million times. However, the period of replacement for the belt cannot be clearly defined as the durability of it is impacted so much by the operational conditions.
- 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
- 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.

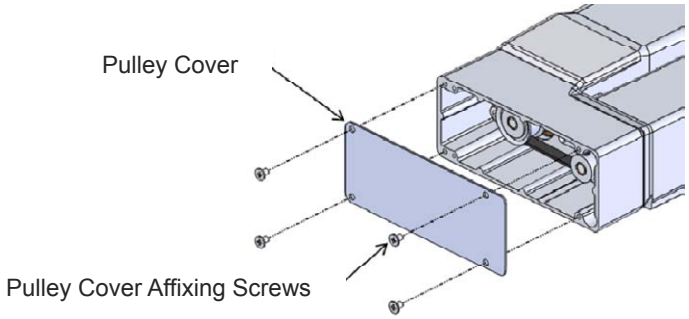
[Belt to Use]

IAI uses the following belt in our plant

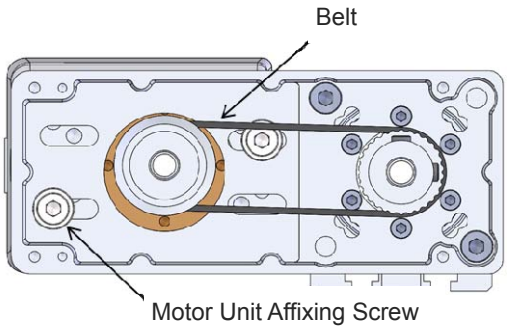
Model	Belt to Use	Supplier
RA4R	60S2M162R	Bando Chemical Industries, Ltd.
RA6R	60S3M207GB	Mitsuboshi belting Ltd.
RA7R	100S3M249R	Bando Chemical Industries, Ltd.
RA8R	275-EV5GT-15	Gates Unitta Asia Ltd.

[Belt Replacement: RA4R, RA6R and RA7R]

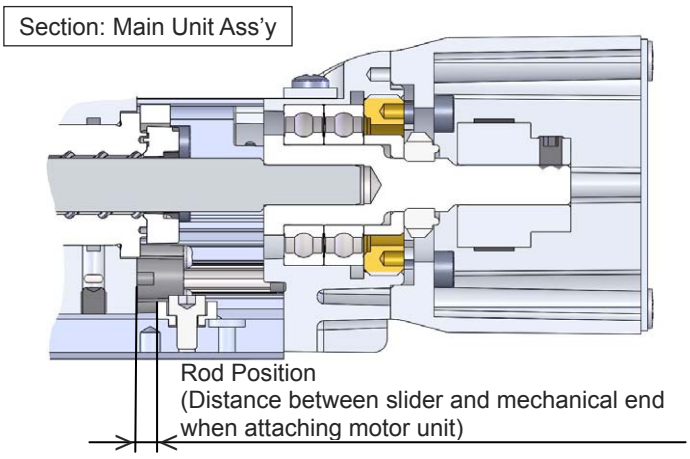
1) Detach the pulley cover affixing screws and take off the pulley cover.



2) Loosen the motor unit affixing screw and take off the belt.



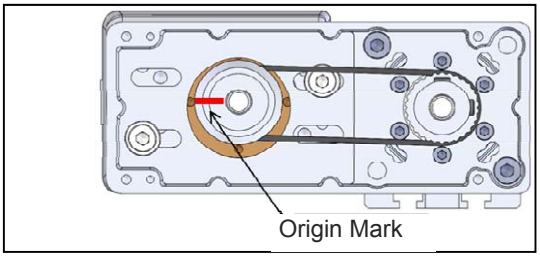
3) Keep the rod at the distance shown in the table below from the mechanical end.



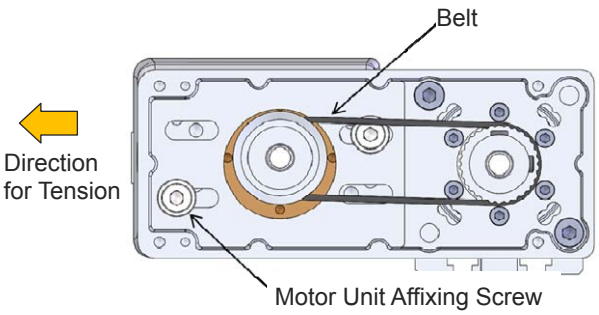
Rod Position

Model	Rod Position [mm]
RA4R, RA6R, RA7R	2

4) With the origin mark marked on the motor end pulley facing outwards, hang the belt on the pulleys.



5) Apply tension in the force shown in the table below to the motor unit, and tighten the motor unit affixing screw in the tightening torque shown in the table below.



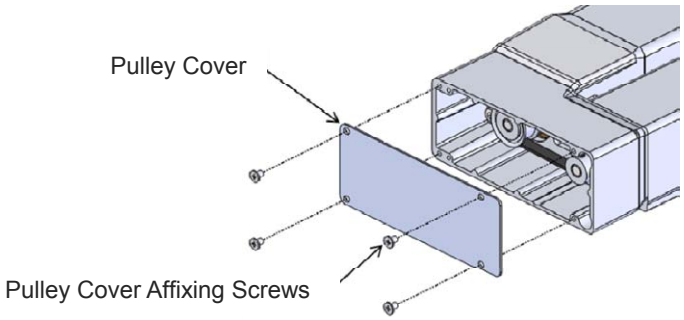
Tensile Force when Attaching Motor Unit

Model	Tension Force [N]
RA4R	20 to 25
RA6R	40 to 45
RA7R	70 to 80

Motor Unit Affixing Screw Tightening Torque

Model	Tightening Torque [N·m]
RA4R, RA6R	2.1
RA7R	4.1

7) Tighten up the pulley cover with the pulley cover affixing screws in the specified torque.

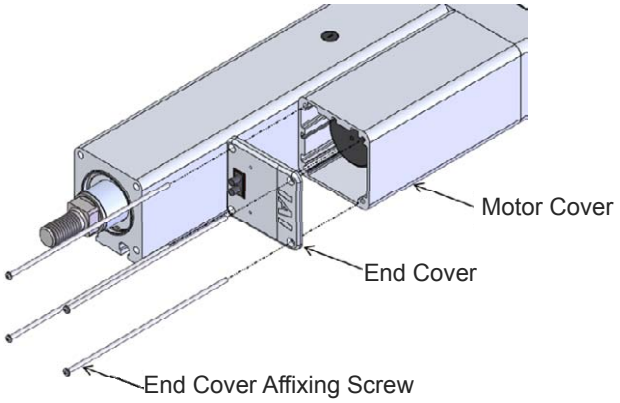


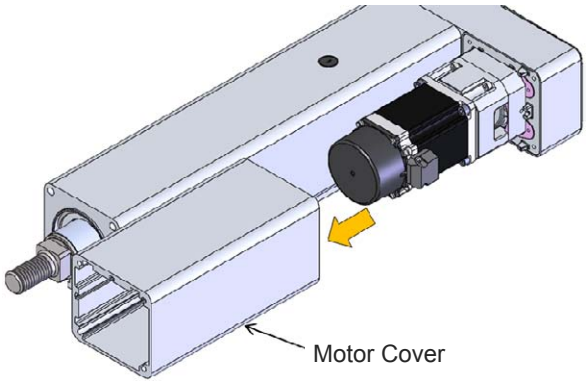
Pulley Cover Affixing Screw Tightening Torque

Model	Type of Screws	Tightening Torque [N·m]
RA4R	Cross recessed slim-head screw (SUS) : M3	0.4
RA6R, RA7R	Cross recessed flat-head screw (SUS) : M3	0.4

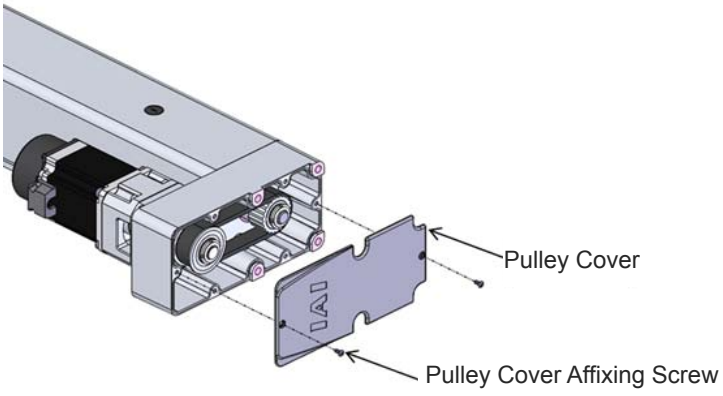
[Belt Replacement: RA8R]

1) Detach the end cover affixing screws and take off the end cover and motor cover.

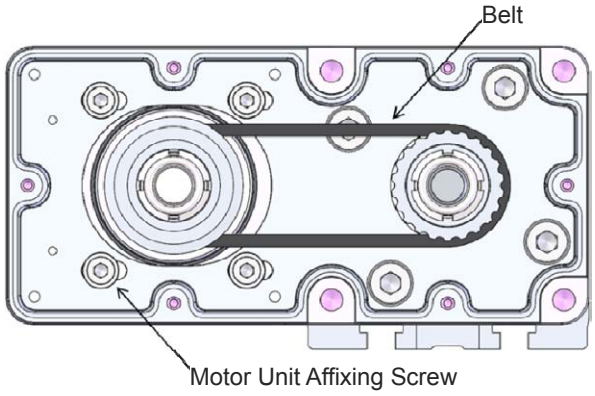




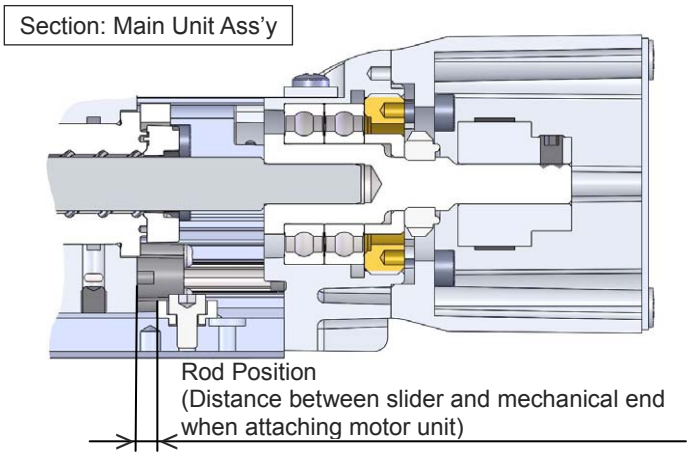
2) Detach the pulley cover affixing screws and take off the pulley cover.



3) Loosen the motor unit affixing screw and take off the belt.



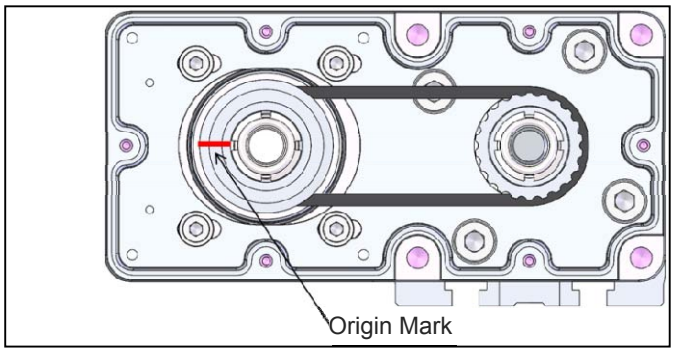
4) Keep the rod at the distance shown in the table below from the mechanical end.



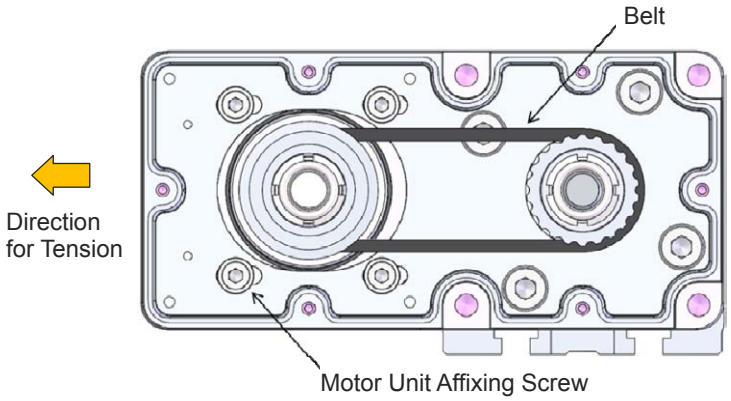
Rod Position

Model	Rod Position [mm]
RA8R	2

5) With the origin mark marked on the motor end pulley facing outwards, hang the belt on the pulleys.



6) Apply tension in the force shown in the table below to the motor unit, and tighten the motor unit affixing screw in the tightening torque shown in the table below.



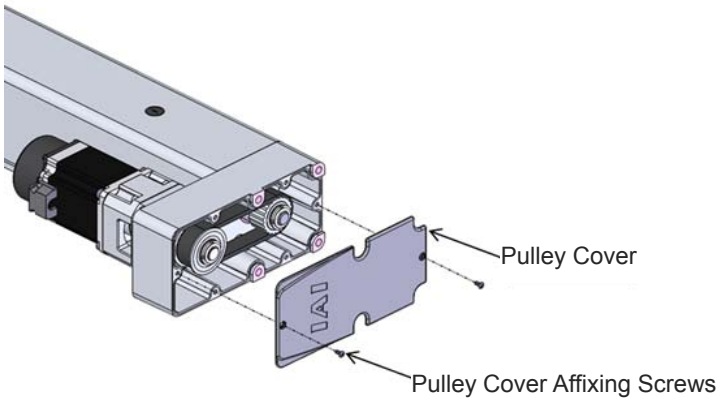
Tensile Force when Attaching Motor Unit

Model	Tension Force [N]
RA8R	180 to 200

Motor Unit Affixing Screw Tightening Torque

Model	Tightening Torque [N·m]
RA8R	4.1

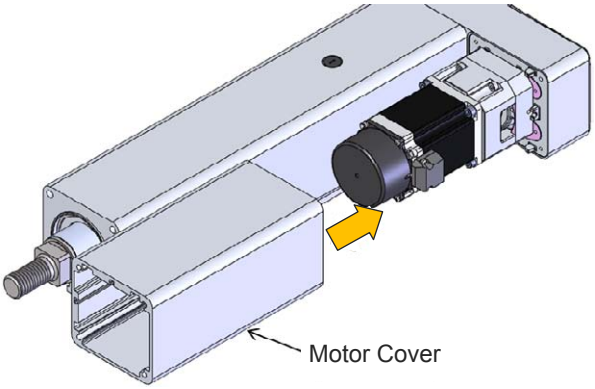
7) Tighten up the pulley cover with the pulley cover affixing screws in the specified torque.

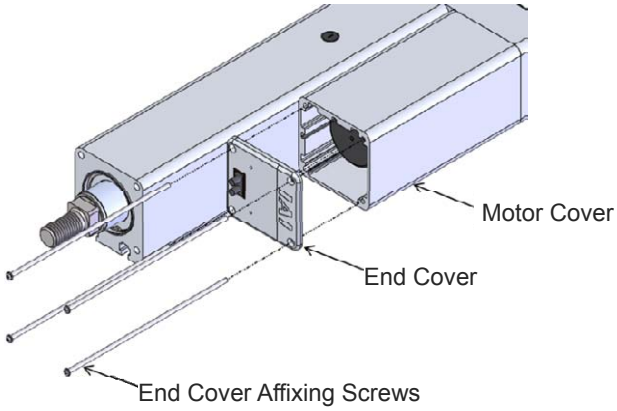


Pulley Cover Affixing Screw Tightening Torque

Model	Type of Screws	Tightening Torque [N·m]
RA8R	Hex socket button head screw : M3	0.4

8) Affix the end cover and motor cover with the end cover affixing screws, and tighten them up with the specified tightening torque.





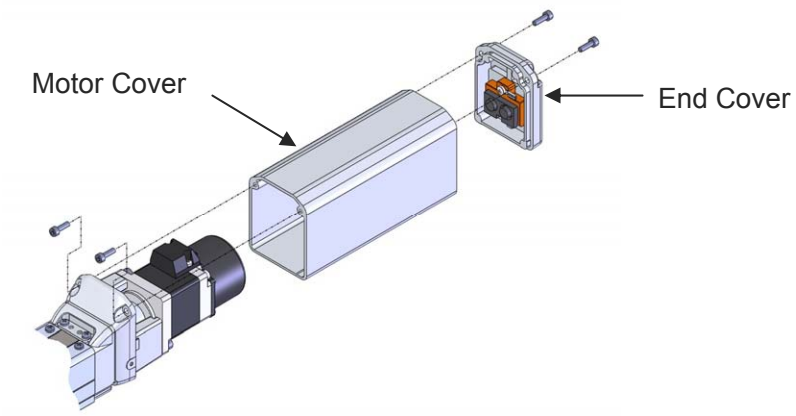
End Cover Affixing Screw Tightening Torque

Model	Type of Screws	Tightening Torque [N·m]
RA8R	Cross recessed pan head machine screw: M4	1.0

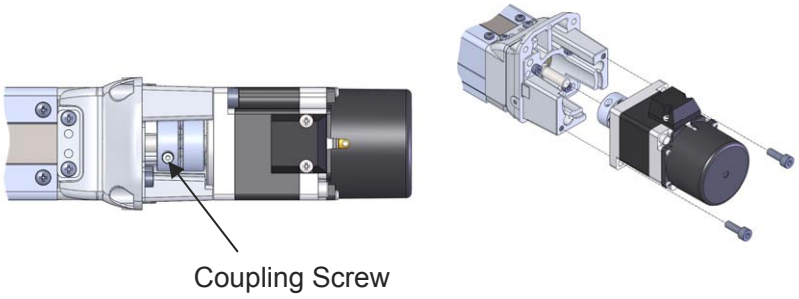
Motor replacement

[Motor Straight Type]

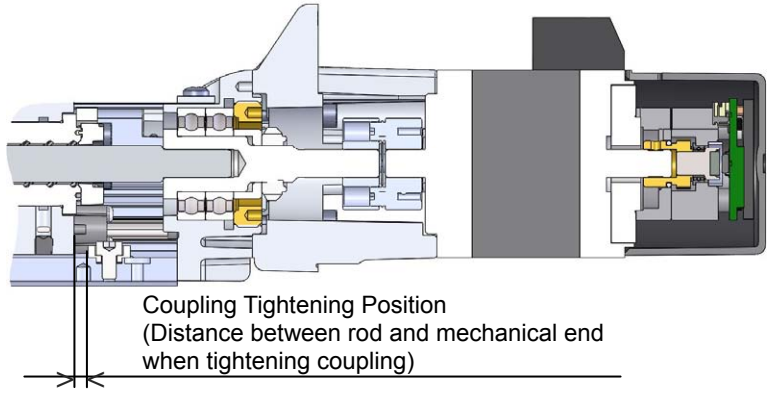
1) Detach the motor cover affixing screws.
2) Take off the end cover and motor cover.



3) Move the rod to the position where the coupling screw on the actuator side can be seen.
4) Loosen the coupling screw, detach the motor affixing screws and take off the motor.

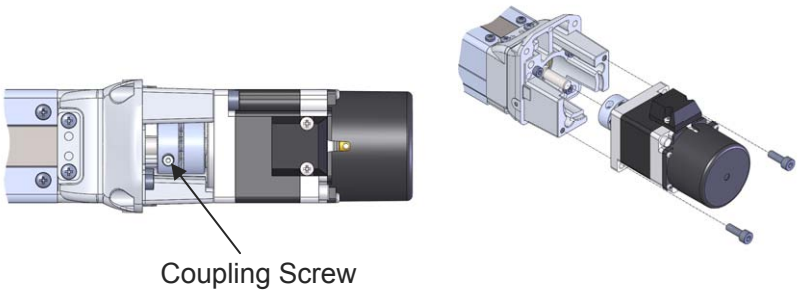


5) Keep the slider at the distance shown in the table below from the mechanical end.



Model	Coupling Tightening Position [mm] (Distance between Rod and Mechanical End)
RA4	2
RA6	2
RA7	2
RA8	2

6) Hold the new motor loosely with the motor affixing screws, and then tighten the coupling screw in the tightening torque shown in the table.

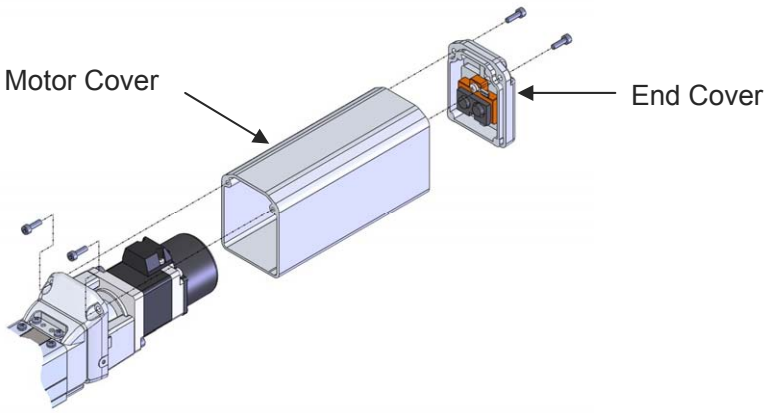


Model	Tightening Torque [N·m]
RA4	0.4
RA6	0.9
RA7	1.5
RA8	1.5

7) Fully tighten the motor affixing screws in the tightening torque shown in the table.

Model	Tightening Torque [N·m]
RA4	2.1
RA6	2.1
RA7	4.1
RA8	4.1

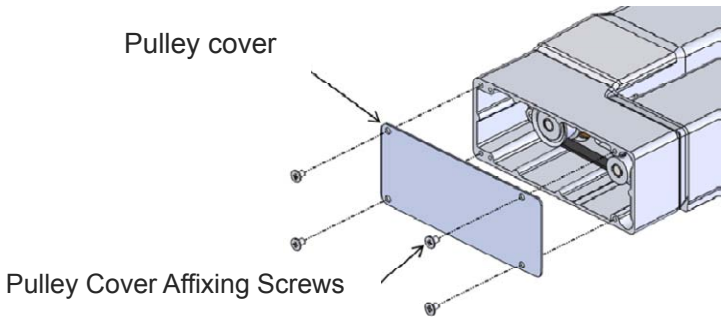
8) Attach the motor cover and end cover.
Tighten the motor cover affixing screws in the tightening torque shown in the table.
Pay attention not to get the cable pinched.



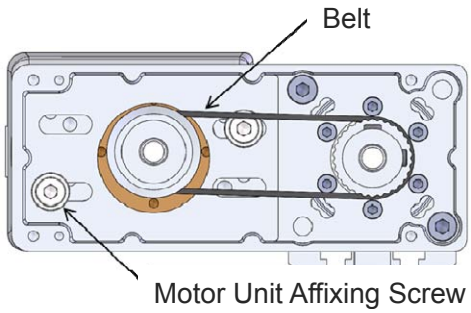
Model	Type of Screws	Tightening Torque [N·m]
RA4	Hexagonal socket head bolt: M3	0.9
RA6	Hexagonal socket head bolt: M3	0.9
RA7	Hexagonal socket head bolt: M4	2.1
RA8	Hex socket pan head screw: M4	1.0

[Motor Reversing Type: RA4R, RA6R and RA7R When Replacing Motor Unit]

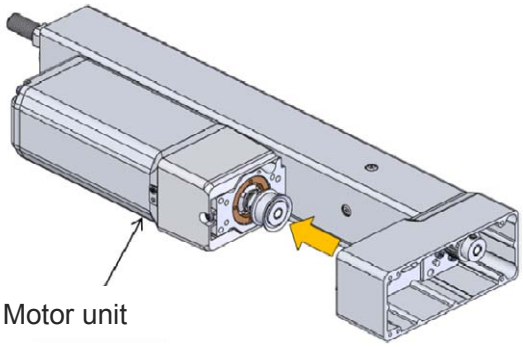
1) Detach the pulley cover affixing screws and take off the pulley cover.



2) Detach the motor unit affixing screw and take off the belt.

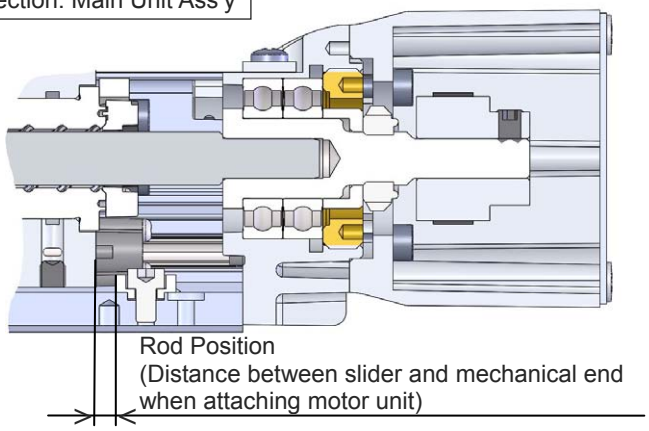


3) Take off the motor unit.



4) Attach the motor unit for replacement.
5) Keep the rod at the distance shown in the table below from the mechanical end.

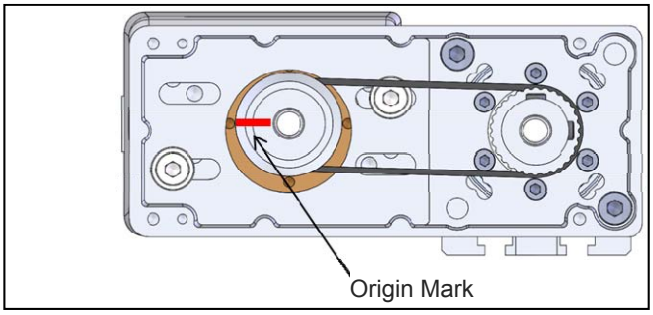
Section: Main Unit Ass'y



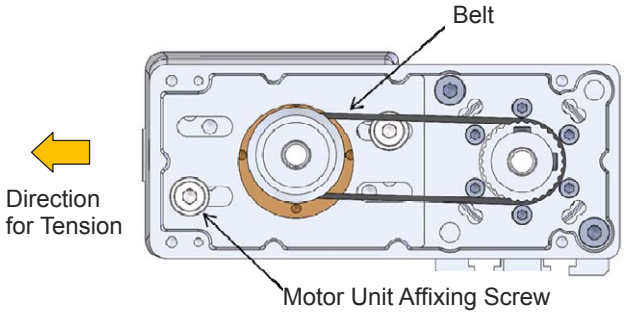
Rod Position

Model	Rod Position [mm]
RA4R, RA6R, RA7R	2

6) With the origin mark marked on the motor end pulley facing outwards, hang the belt on the pulleys.



7) Apply tension in the force shown in the table below to the motor unit, and tighten the motor unit affixing screw in the tightening torque shown in the table below.



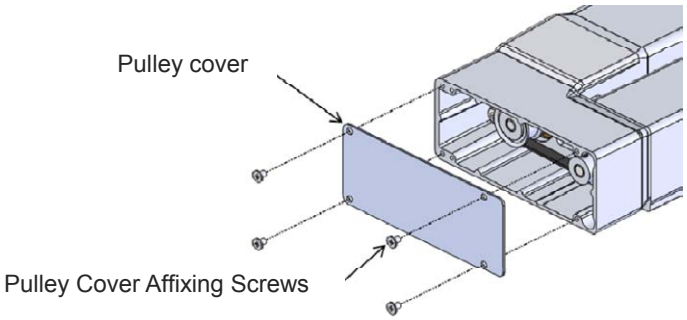
Tensile Force when Attaching Motor Unit

Model	Tension Force [N]
RA4R	20 to 25
RA6R	40 to 45
RA7R	70 to 80

Motor Unit Affixing Screw Tightening Torque

Model	Tightening Torque [N·m]
RA4R, RA6R	2.1
RA7R	4.1

8) Tighten up the pulley cover with the pulley cover affixing screws in the specified torque.

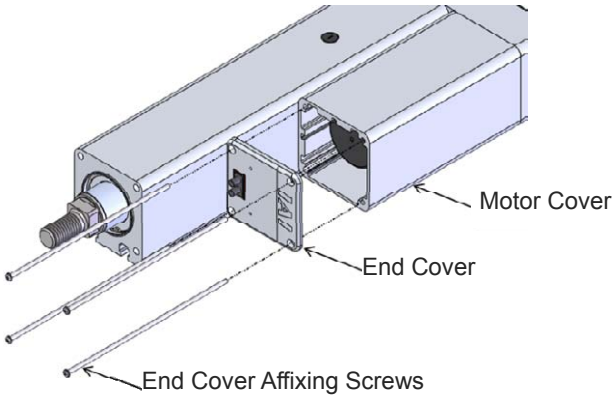


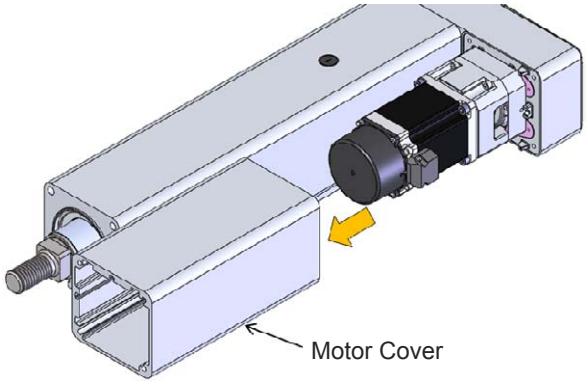
Pulley Cover Affixing Screw Tightening Torque

Model	Type of Screws	Tightening Torque [N·m]
RA4R	Cross recessed slim-head screw (SUS): M3	0.4
RA6R, RA7R	Cross recessed flat-head screw (SUS): M3	0.4

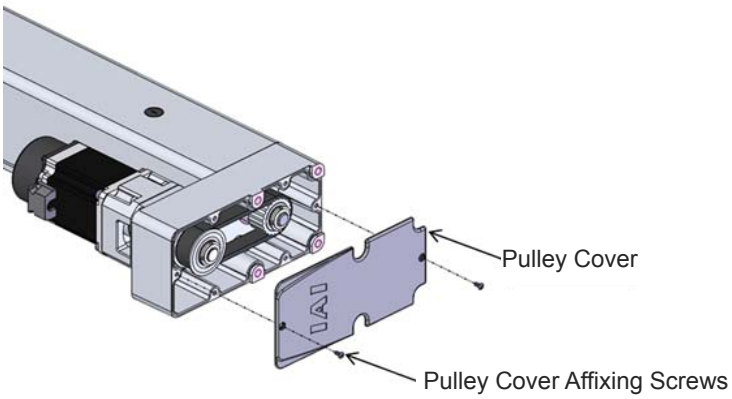
[Motor Reversing Type: RA8R when Replacing Motor Equipped with Pulley]

1) Detach the end cover affixing screws and take off the end cover and motor cover.

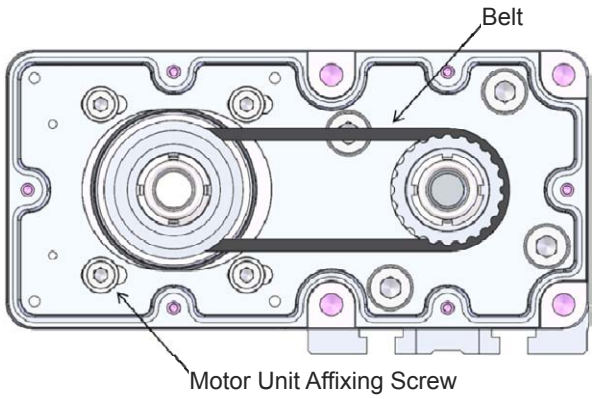




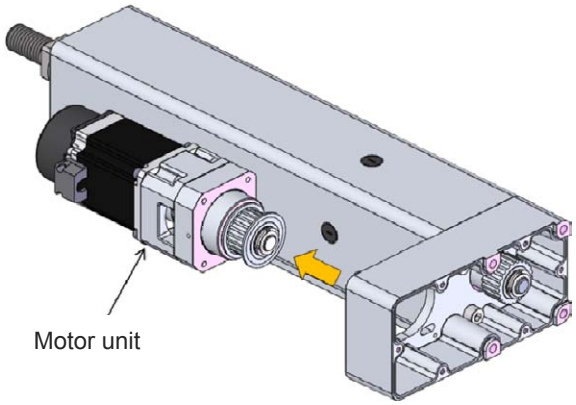
2) Detach the pulley cover affixing screws and take off the pulley cover.



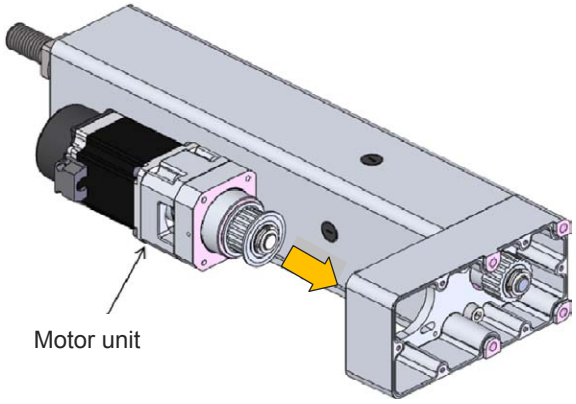
3) Detach the motor unit affixing screw and take off the belt.



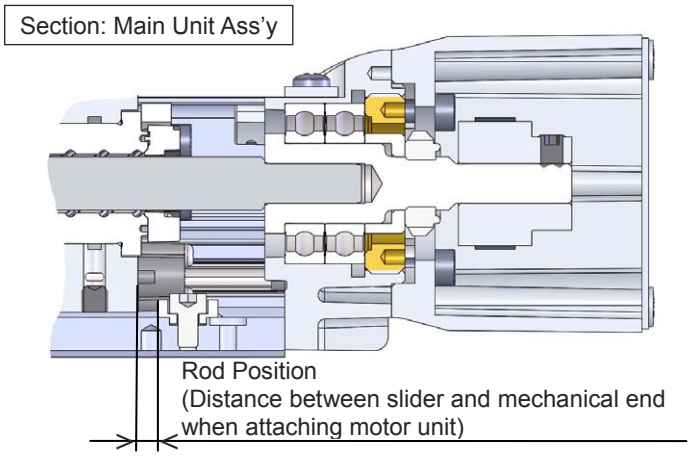
4) Take off the motor unit.



5) Attach the motor unit for replacement and hang the belt.



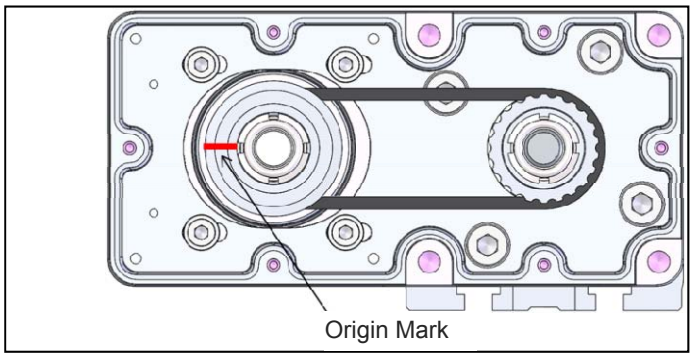
6) Keep the rod at the distance shown in the table below from the mechanical end.



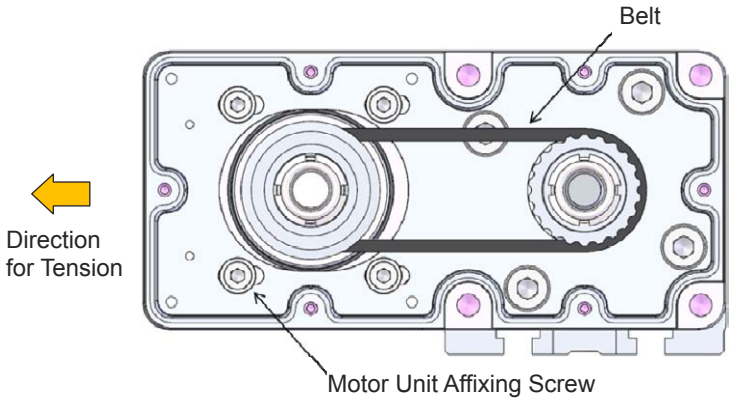
Rod Position

Model	Rod Position [mm]
RA8R	2

7) With the origin mark marked on the motor end pulley facing outwards, hang the belt on the pulleys.



8) Apply tension in the force shown in the table below to the motor unit, and tighten the motor unit affixing screw in the tightening torque shown in the table below.



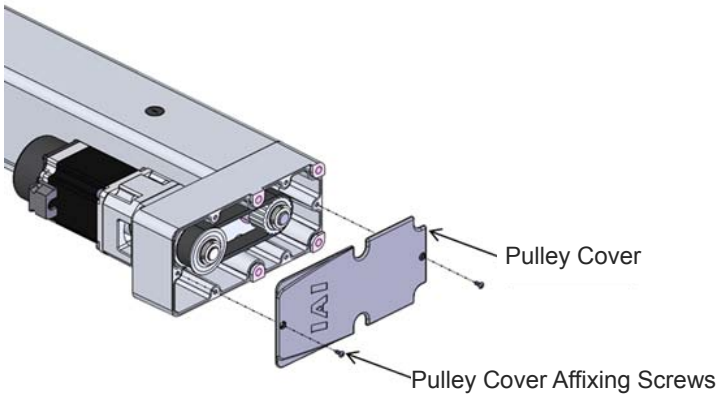
Tensile Force when Attaching Motor Unit

Model	Tension Force [N]
RA8R	180 to 200

Motor Unit Affixing Screw Tightening Torque

Model	Tightening Torque [N·m]
RA8R	4.1

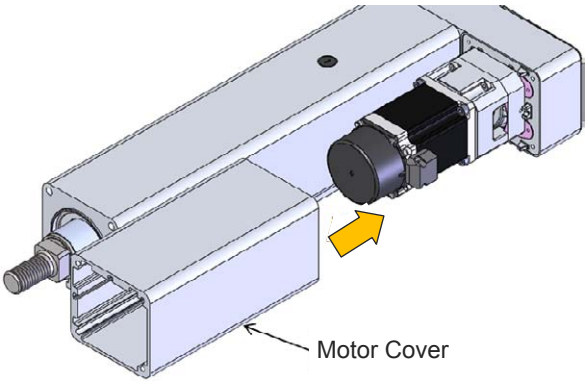
9) Tighten up the pulley cover with the pulley cover affixing screws in the specified torque.

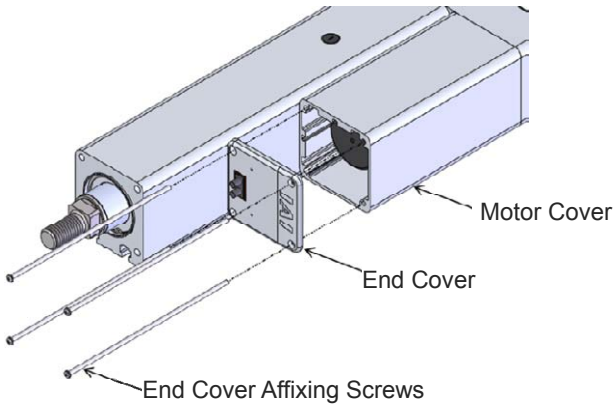


Pulley Cover Affixing Screw Tightening Torque

Model	Type of Screws	Tightening Torque [N·m]
RA8R	Hex socket button head screw: M3	0.4

10) Affix the end cover and motor cover with the end cover affixing screws, and tighten them up with the specified tightening torque.





End Cover Affixing Screw Tightening Torque

Model	Type of Screws	Tightening Torque [N·m]
RA8R	Cross recessed pan head machine screw: M4	1.0

Caution

Make sure to hold the rod so it would not move in case of replacing a motor in vertical installation which is not equipped with a brake. It will be dangerous as the rod will be dropped, if it is not held, as soon as the motor gets taken off.

Notice

- Pay attention not to get the cable pinched when attaching the motor cover and end cover.
- When the actuator is not equipped with a brake, make sure that the motor is magnetized when attaching it so the shaft and the origin point get aligned.

ROBO Cylinder

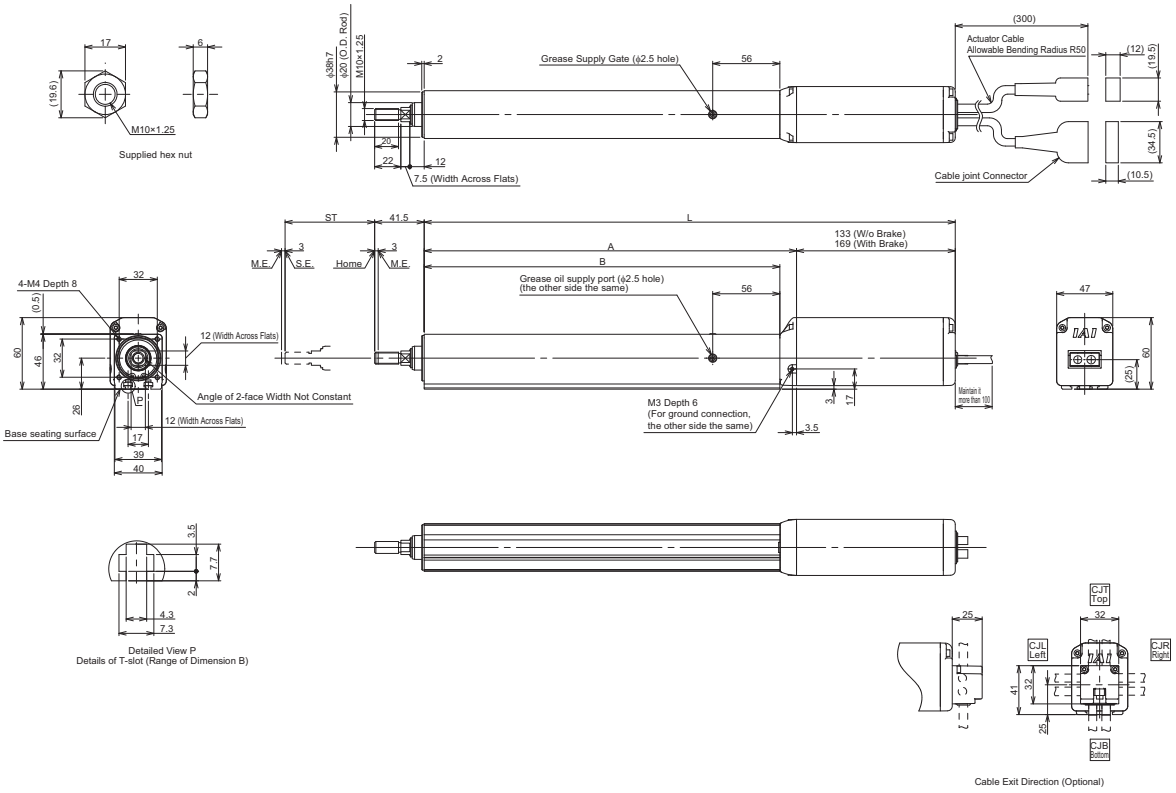
Chapter 5

External Dimensions

5.1 External Dimensions

RCS4-RA4C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end

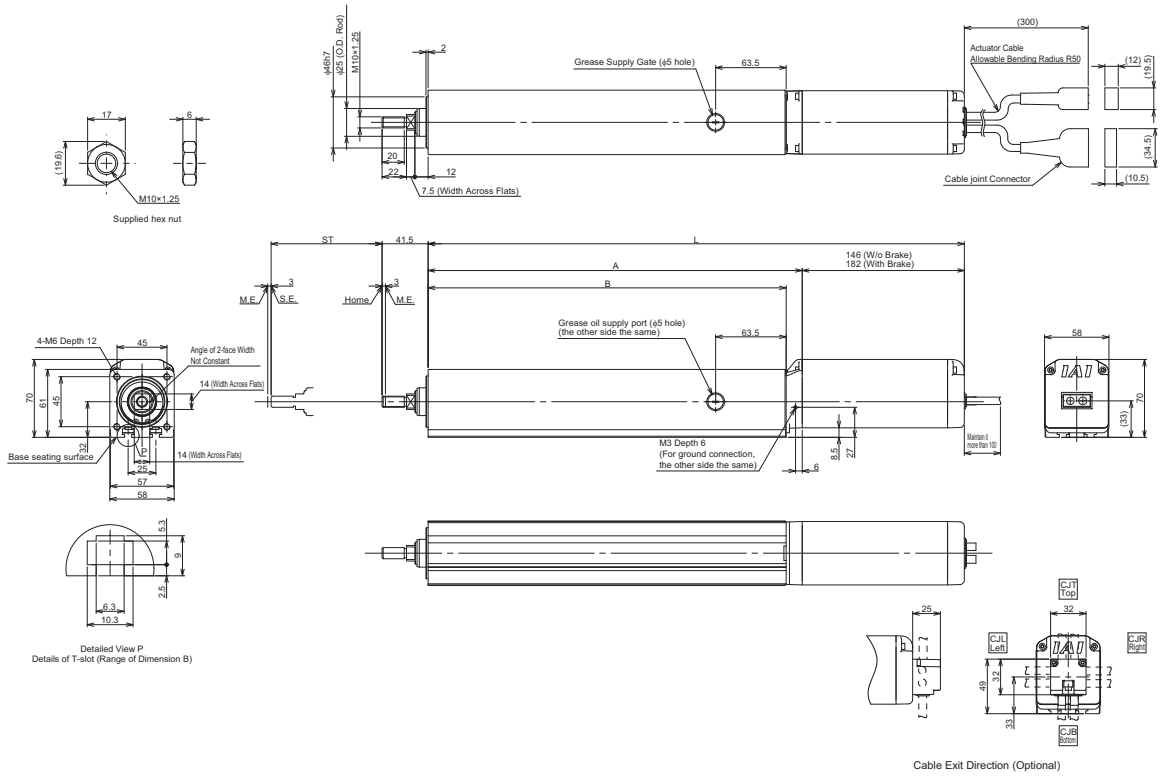


■ Dimensions and Mass by Stroke Unite: mm

Stroke	L		A	B	Mass [kg]	
	W/o Brake	With Brake			W/o Brake	With Brake
50	295	331	162	148	1.5	1.7
100	345	381	212	198	1.7	1.9
150	395	431	262	248	1.9	2.1
200	445	481	312	298	2.0	2.2

RCS4-RA6C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end

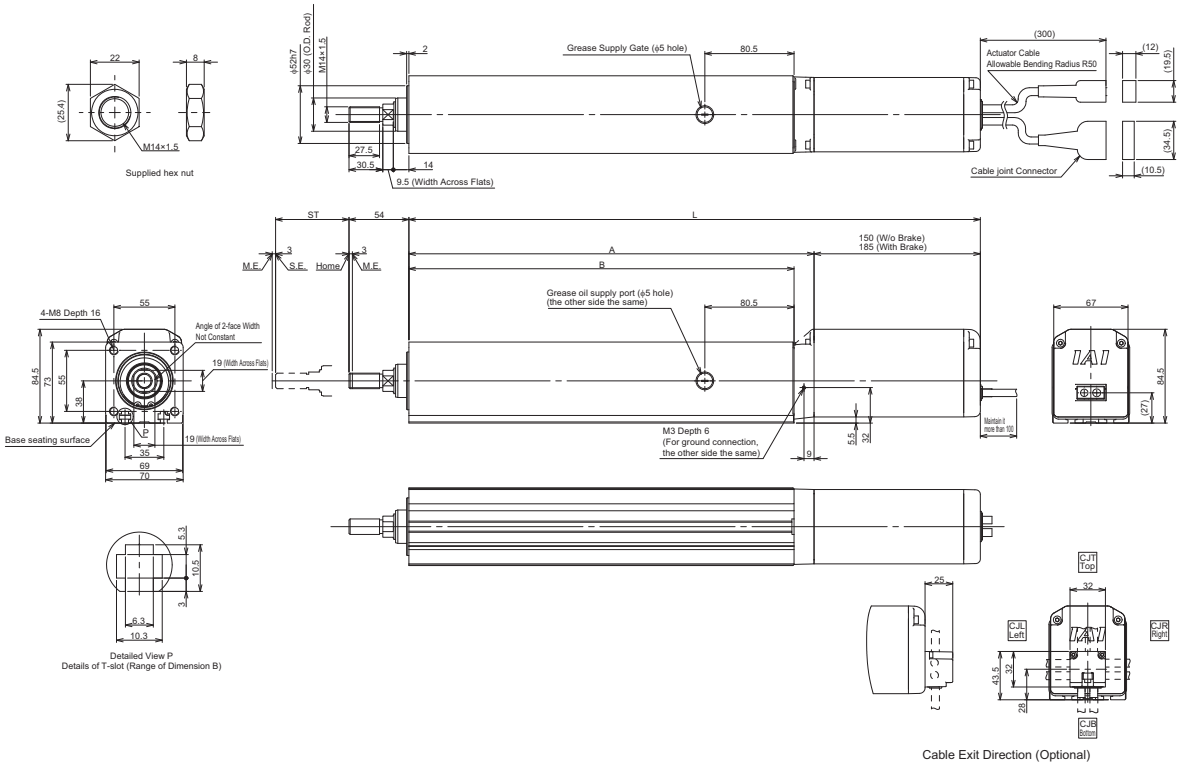


■ Dimensions and Mass by Stroke Unite: mm

Stroke	L		A	B	Mass [kg]	
	W/o Brake	With Brake			W/o Brake	With Brake
50	333	369	187	172.5	2.6	2.9
100	383	419	237	222.5	3.0	3.3
150	433	469	287	272.5	3.4	3.7
200	483	519	337	322.5	3.8	4.1
250	533	569	387	372.5	4.1	4.4
300	583	619	437	422.5	4.5	4.8

RCS4-RA7C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end

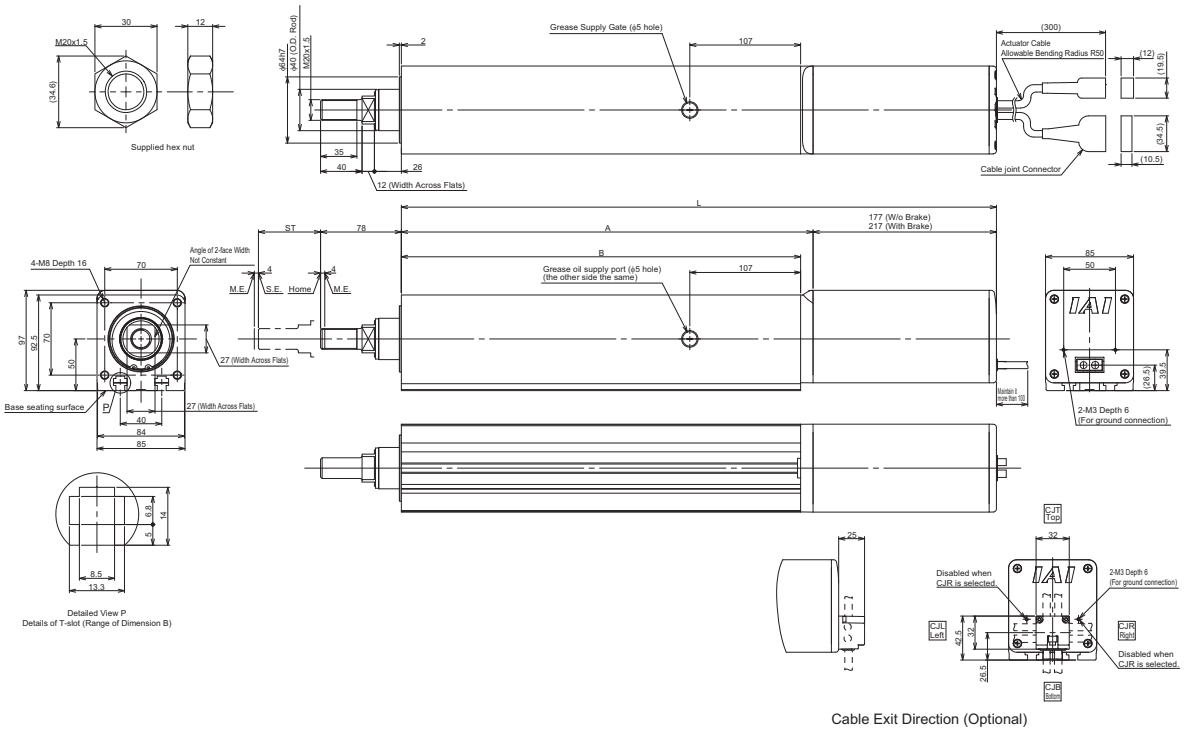


■ Dimensions and Mass by Stroke Unite: mm

Stroke	L		A	B	Mass [kg]	
	W/o Brake	With Brake			W/o Brake	With Brake
50	365.5	400.5	215.5	197.5	4.6	5.1
100	415.5	450.5	265.5	247.5	5.2	5.7
150	465.5	500.5	315.5	297.5	5.7	6.2
200	515.5	550.5	365.5	347.5	6.3	6.8
250	565.5	600.5	415.5	397.5	6.9	7.4
300	615.5	650.5	465.5	447.5	7.5	8.0

RCS4-RA8C

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



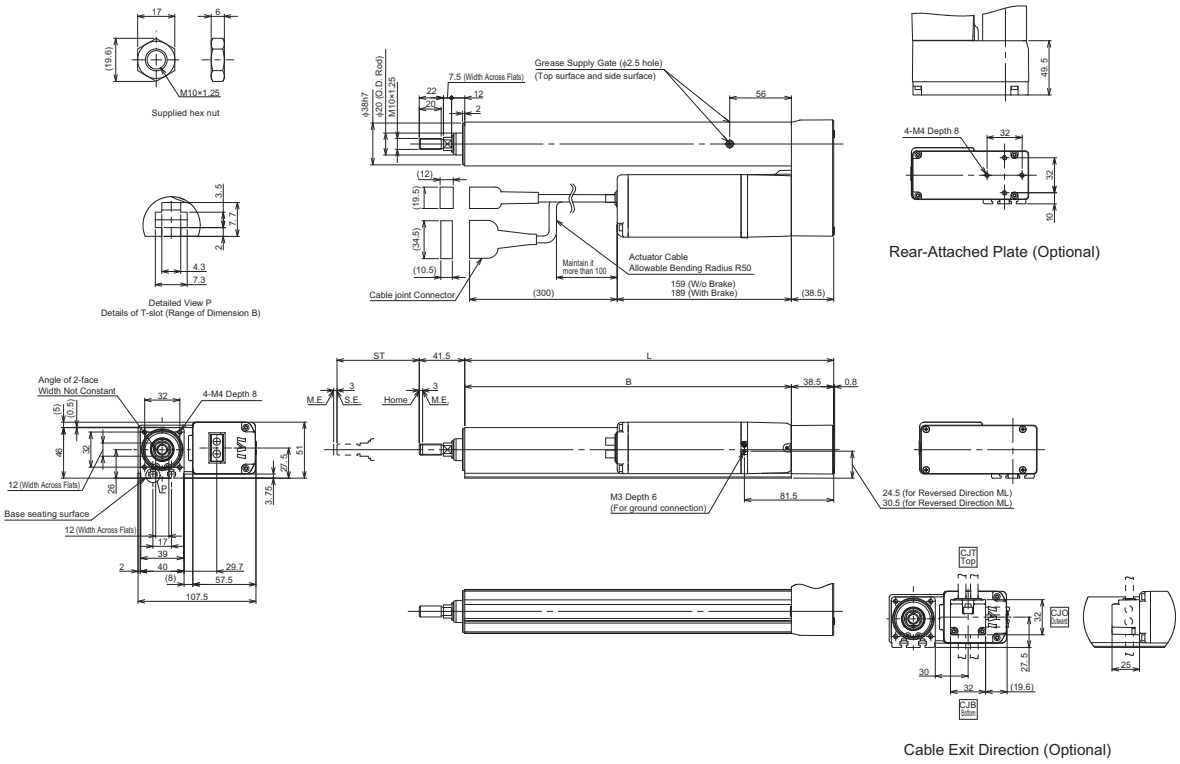
Cable Exit Direction (Optional)

■ Dimensions and Mass by Stroke Unite: mm

Stroke	L		A	B	Mass [kg]	
	W/o Brake	With Brake			W/o Brake	With Brake
50	424.5	464.5	247.5	235.5	8.3	8.9
100	474.5	514.5	297.5	285.5	9.2	9.8
150	524.5	564.5	347.5	335.5	10.0	10.6
200	574.5	614.5	397.5	385.5	10.8	11.4
250	624.5	664.5	447.5	435.5	11.7	12.3
300	674.5	714.5	497.5	485.5	12.5	13.1

RCS4-RA4R

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end

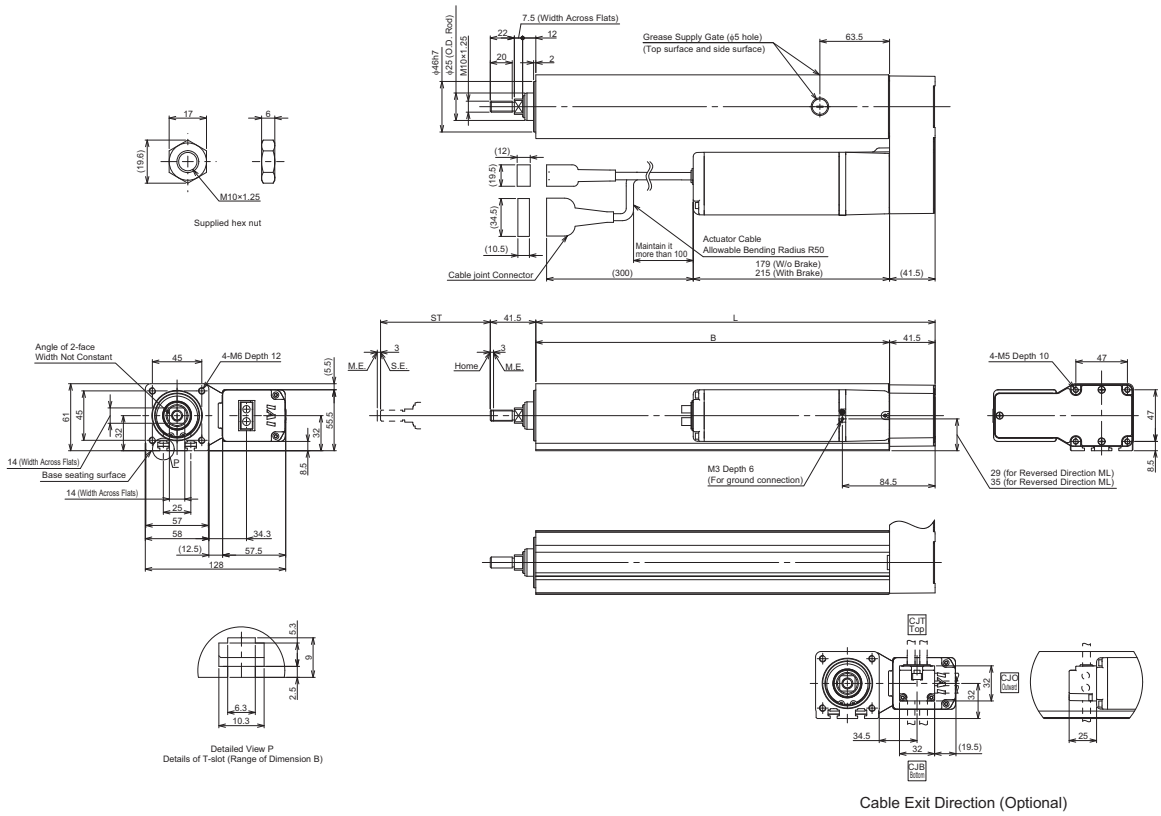


■ Dimensions and Mass by Stroke Unite: mm

Stroke	L	B	Mass [kg]	
			W/o Brake	With Brake
50	186.5	148	1.8	2.0
100	236.5	198	2.0	2.2
150	286.5	248	2.1	2.3
200	336.5	298	2.3	2.5

RCS4-RA6R

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end

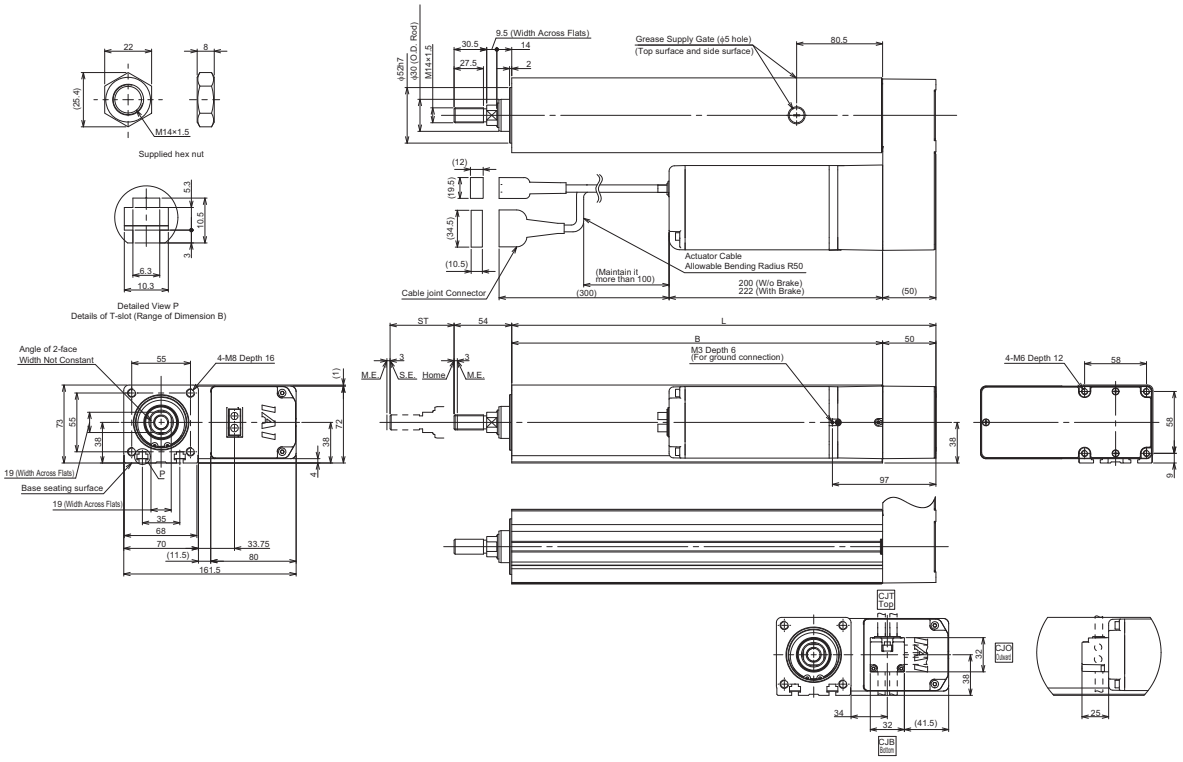


■ Dimensions and Mass by Stroke Unite: mm

Stroke	L	B	Mass [kg]	
			W/o Brake	With Brake
50	214	172.5	2.9	3.2
100	264	222.5	3.3	3.6
150	314	272.5	3.7	4.0
200	364	322.5	4.1	4.4
250	414	372.5	4.5	4.8
300	464	422.5	4.9	5.2

RCS4-RA7R

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end

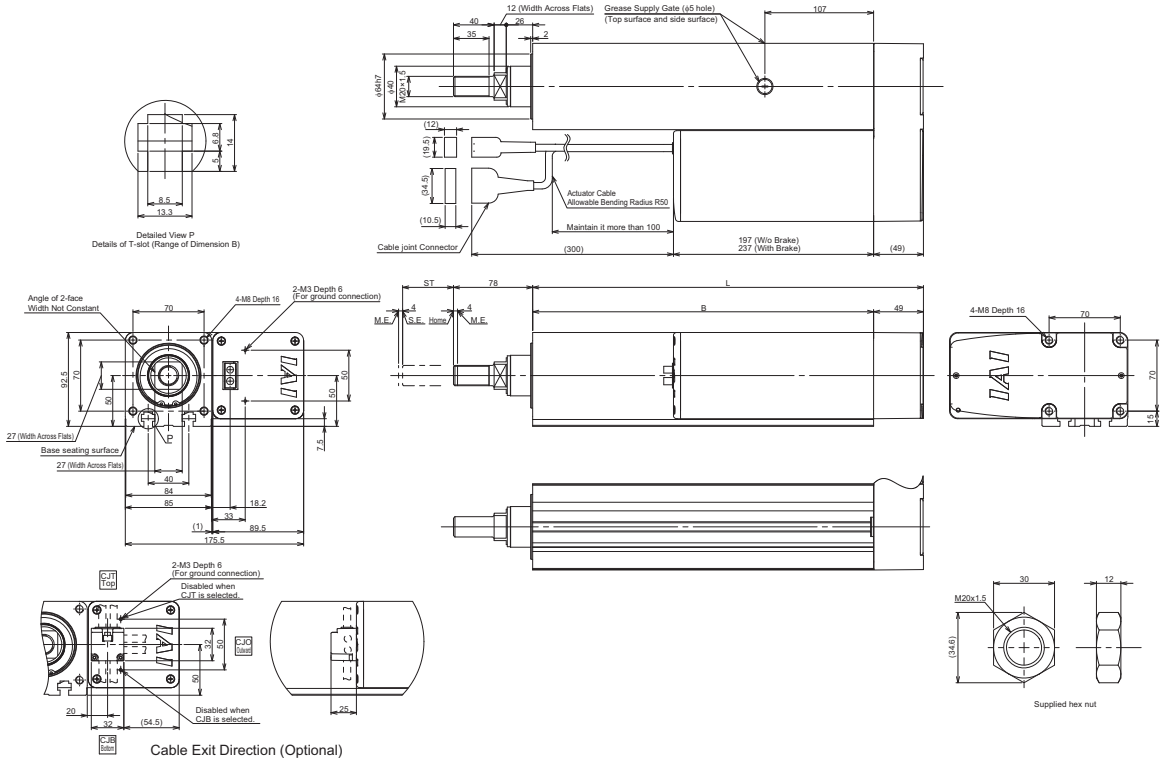


■ Dimensions and Mass by Stroke Unite: mm

Stroke	L	B	Mass [kg]	
			W/o Brake	With Brake
50	247.5	197.5	5.4	5.9
100	297.5	247.5	6.0	6.5
150	347.5	297.5	6.5	7.0
200	397.5	347.5	7.1	7.6
250	447.5	397.5	7.7	8.2
300	497.5	447.5	8.3	8.8

RCS4-RA8R

ST: Stroke, M.E.: Mechanical end, S.E.: Stroke end



■ Dimensions and Mass by Stroke Unite: mm

Stroke	L	B	Mass [kg]	
			W/o Brake	With Brake
50	284.5	235.5	9.6	10.2
100	334.5	285.5	10.4	11.0
150	384.5	335.5	11.2	11.8
200	434.5	385.5	12.1	12.7
250	484.5	435.5	12.9	13.5
300	534.5	485.5	13.8	14.4

ROBO Cylinder

Chapter 6

Life

6.1 Concept of life

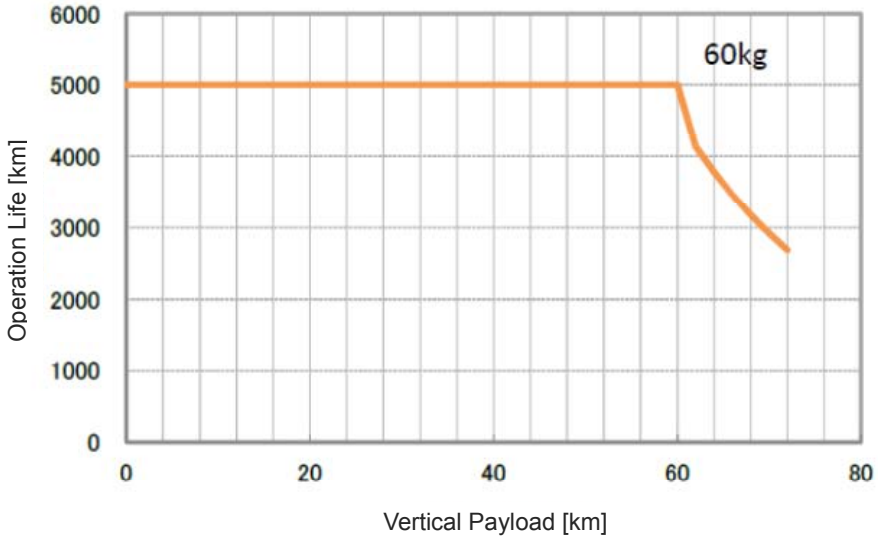
[RA4C, RA4R, RA6C, RA6R, RA7C and RA7R]

The service life is about 5,000 km (guideline) when it is operated under maximum payload and acceleration/deceleration.

[RA8C and RA8R]

The life of Lead 10 and 20 is assumed 5,000km (reference) under the condition of maximum payload, maximum acceleration and deceleration.

The graph below shows the relation of payload and life.



ROBO Cylinder

Chapter 7

Warranty

7.1 Warranty period

Whichever of the following periods is shorter:

- 18 months after shipment from IAI
- 12 months after delivery to the specified location
- 2,500 hours of operation

7.2 Scope of the 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 malfunction in question pertains to our product as delivered by IAI or our authorized dealer.
(2) The breakdown or malfunction in question occurred during the warranty period.
(3) The breakdown or malfunction in question occurred while the product was in use for an appropriate purpose under the operating conditions and operating environment specified in the instruction manual and catalog.
(4) The breakdown or malfunction in question was caused by a specification defect, malfunction, or poor product quality.

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

(a) Anything other than our product
(b) Modification or repair performed by a party other than IAI (unless approved by IAI)
(c) Anything that could not be easily predicted with the level of science and technology available at the time of shipment from IAI
(d) Natural disaster, unnatural disaster, incident or accident for which we are not liable
(e) Natural fading of paint or other symptoms of aging
(f) Wear, depletion or other expected result of use
(g) Operation noise, vibration or other subjective sensations 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.

7.3 Honoring the warranty

As a rule, the product must be consigned to IAI for repair under warranty.

7.4 Limited liability

(1) We 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 assume no liability for any program or control method created by the customer to operate our product or for the results of any such program or control method.

7.5 Conformance with applicable standards/regulations,etc., and application conditions

(1) If our product is combined with another product or any system, equipment, 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 assume no liability 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 IAI if you must use our product for any of these applications:
    (a) Medical equipment used to maintain, control or otherwise affect human life or physical health
    (b) Mechanisms and machinery designed for the purpose of moving or transporting people (vehicles, railway facilities, aviation facilities etc.)
    (c) Machinery components essential for safety (safety devices etc.)
    (d) Equipment used to handle cultural assets, art or other irreplaceable items
(3) Contact IAI in advance if our product is to be used in any condition or environment that differs from that specified in the catalog or instruction manual.

7.6 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 mounting/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

ROBO Cylinder

Chapter 8

Appendix

8.1 Index

8.2 Revision history

Revision Date	Revision Description
October 2017	First Edition
April 2018	1B Edition Pg. 2-5 Installation posture: Horizontally Oriented Wall Mount and Ceiling Mount △→ ○

Manual No.: ME3771-1B (April 2018)

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