ROBO CYLINDER

ROBO Cylinder
Radial Cylinder
RCP4 Actuator
Rod Type
Operation Manual

Fourth Edition

Motor straight type	RA5C, RA6C

IAI America, Inc.

ROBO CYLINDER

Please Read Before Use

Thank you for purchasing our product.

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

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.
The CD or DVD that comes with the product contains Operation Manuals for IAI products.
When using the product, refer to the necessary portions of the applicable Operation manual by printing them out or displaying them on a PC.

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

[Important]

- This Operation Manual is original.
- The product cannot be operated in any way unless expressly specified in this Operation Manual. IAI shall assume no responsibility for the outcome of any operation not specified herein.
- Information contained in this Operation Manual is subject to change without notice for the purpose of product improvement.
- If you have any question or comment regarding the content of this manual, please contact the IAI sales office near you.
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Table of Contents

Safety Guide 1
Precautions 7
Names of the Parts 8
1. Checking the Product 9
1.1 Parts 9
1.2 Related Operation Manuals for the Each Controller Supported by this Product 9
1.3 How to Read the Model Nameplate 9
1.4 How to Read the Model Number 10
2. Specification 11
3. Life 24
4. Installation and Storage • Preservation Environment 25
4.1 Installation Environment 25
4.2 Storage • Preservation Environment 25
5. Transportation 26
5.1 Handling of Robot 26
5.1.1 Handling the Packed Unit 26
5.1.2 Handling the Actuator After Unpacking 26
5.2 Handling in Assembled Condition 27
6. Installation 28
6.1 Installation of Main Unit 28
6.1.1 Using the Tapped Holes on the Bottom of the Base 28
6.1.2 Using the Mounting Holes on the Top of the Base 29
6.1.3 When using Tapped Holes on Front Housing 31
6.1.4 When using Front Flange (Option) 32
6.1.5 Caution for Installation using Front Housing and Front Flange 33
6.1.6 Attachment of Work Part (Transported Object) 34
6.1.7 Mounting Surface 34
7. Connecting with Controller 35
8. Caution for Operation 38
9. Options 40
9.1 Brake Type 40
9.2 Reversed-home Specification 40
9.3 Flange Bracket (Front) 40
9.4 Scraper 40
10. Motor • Encoder Cables 41
10.1 Motor • Encoder Integrated Cables 41
10.2 Motor • Encoder Integrated Cables Robot Type 42

11. Maintenance Inspection 43
11.1 Inspection Items and Schedule 43
11.2 External Visual Inspection 43
11.3 Cleaning 43
11.4 Internal Inspections 44
11.5 Internal Cleaning 45
11.6 Grease Supply 45
11.6.1 What Grease to Use on the Guides 45
11.6.2 What Grease to Use on the Ball Screw 45
11.6.3 Grease to be applied on the Rod (Sliding Surface) 46
11.6.4 How to apply grease 47
12. Motor Replacement Process 50
13. Procedure to Replace Scraper (Option) 52
14. Appendix 54
14.1 External Dimensions 54
14.1.1 RA5C 54
14.1.2 RA6C 55
15. Warranty 56
15.1 Warranty Period 56
15.2 Scope of Warranty 56
15.3 Honoring the Warranty 56
15.4 Limited Liability 56
15.5 Conditions of Conformance with Applicable Standards/Regulations, Etc., and Applications 57
15.6 Other Items Excluded from Warranty 57
Change History 58

Safety Guide

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

Safety Precautions for Our Products

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

No.	Operation Description	Description
1	Model Selection	● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications. 1) Medical equipment used to maintain, control or otherwise affect human life or physical health. 2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility) 3) Important safety parts of machinery (Safety device, etc.) ● Do not use it in any of the following environments. 1) Location where there is any inflammable gas, inflammable object or explosive 2) Place with potential exposure to radiation 3) Location with the ambient temperature or relative humidity exceeding the specification range 4) Location where radiant heat is added from direct sunlight or other large heat source 5) Location where condensation occurs due to abrupt temperature changes 6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid) 7) Location exposed to significant amount of dust, salt or iron powder 8) Location subject to direct vibration or impact ● Do not use the product outside the specifications. Failure to do so may considerably shorten
2	Transportation	● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● Consider well so that it is not bumped against anything or dropped during the transportation. ● Transport it using an appropriate transportation measure. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment's capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation.

No.	Operation Description	Description
4	Installation and Start	(1) Installation of Robot Main Body and Controller, etc. ● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets
		(2) Cable Wiring ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.
		(3) Grounding ● Make sure to perform the grounding of type D (Former Type 3) for the controller. The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation.

No.	Operation Description	Description
4	Installation and Start	(4) Safety Measures ● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot's movable range. When the robot under operation is touched, it may result in death or serious injury. ● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. ● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. ● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. ● When the installation or adjustment operation is to be performed, give clear warnings such as "Under Operation; Do not turn ON the power!" etc. Sudden power input may cause an electric shock or injury. ● Take the measure so that the work part is not dropped in power failure or emergency stop. ● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. ● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the "Stipulations for the Operation" and make sure that all the workers acknowledge and understand them well. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign "Under Operation" at the position easy to see. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.

No.	Operation Description	Description
6	Trial Operation	● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation. ● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation. ● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc. ● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.
7	Automatic Operation	● Before the automatic operation is started up, make sure that there is nobody inside the safety protection fence. ● Before the automatic operation is started up, make sure that all the related peripheral machines are ready for the automatic operation and there is no error indication. ● Make sure to perform the startup operation for the automatic operation, out of the safety protection fence. ● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.
8	Maintenance and Inspection	● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● For the grease for the guide or ball screw, use appropriate grease according to the Instruction Manual for each model. ● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.

No.	Operation Description	Description
9	Modification and Dismantle	● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.

Alert Indication

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

Precautions

1. Do not set speeds and accelerations/decelerations equal to or greater than the respective ratings.
   If the actuator is operated at a speed or acceleration/deceleration exceeding the allowable value, abnormal noise or vibration, failure, or shorter life may result.
   In the case of interpolated operation of combined axes, the speed and acceleration/deceleration settings should correspond to the minimum values among all combined axes.

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

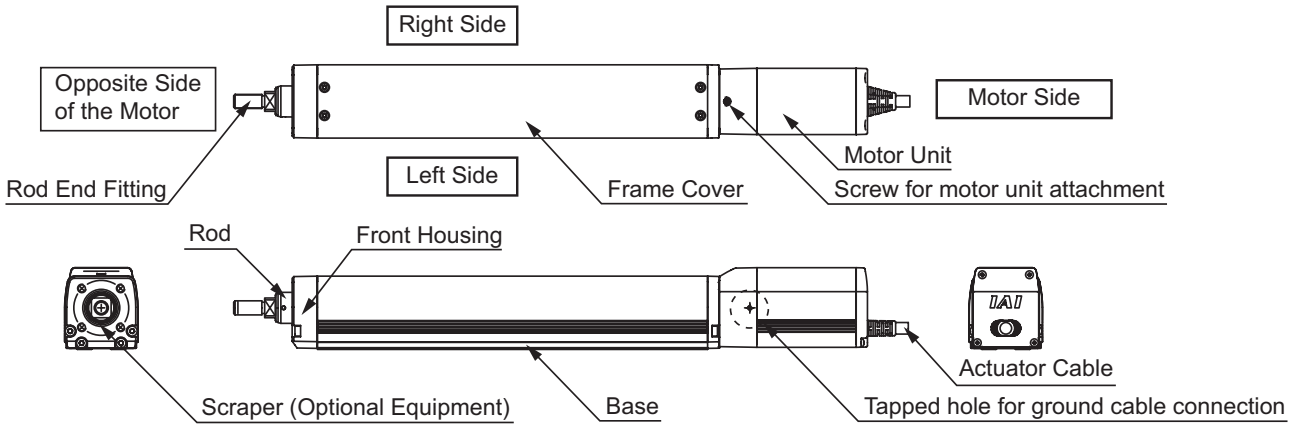
3. Keep the overhang length to within the allowable value.
   If the overhang length is equal to or greater than the allowable value, vibration or abnormal noise may occur.

4. Back and forth operation in a short distance may cause wear of grease.
   If the actuator is moved back and forth continuously over a short distance of 30 mm or less, grease film may run out. As a guide, move the actuator back and forth repeatedly for around 5 cycles over a distance of 50 mm or more after every 5,000 to 10,000 cycles.

5. Do not attempt to hit the slider or rod against an obstacle with high speed.
   It may destroy the coupling.

Names of the Parts

In this Operation Manual, the left and right sides are indicated by looking at the actuator from the motor end, with the actuator placed horizontally, as shown in the figure below.



1. Checking the Product

If based on a standard configuration, this product consists of the items listed below.

⚠ Caution: Check the packed items against the packing specification. Should you find a wrong model or any missing item, please contact your IAI dealer or IAI.

1.1 Parts

No.	Name	Model number	Remarks
1	Actuator	Refer to “How to Read the Model Nameplate” and “How to Read the Model Number.”	
Accessories			
2	Motor • encoder cables *1		
3	Homing stickers		
4	Nut		Refer to list below
5	First Step Guide		
6	Operation Manual (CD/DVD)		
7	Safety Guide		

*1 The motor • encoder cables supplied vary depending on the controller used. [Refer to 10, "Motor • Encoder Cables."]

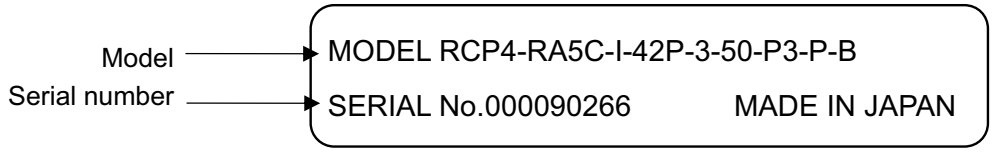
(List of Included Nut Type)

Model No.	Nut M10×1.25	Nut M14×1.5
RCP4-RA5C	1	
RCP4-RA6C		1

1.2 Related Operation Manuals for the Each Controller Supported by this Product

No.	Name	Control No.
1	Operation Manual for PCON-CA Controller	ME0289
2	Operation Manual for RC PC Software RCM-101-MW/RCM-101-USB	ME0155
3	Operation Manual for CON-PTA/PDA/PGA	ME0295

1.3 How to Read the Model Nameplate



1.4 How to Read the Model Number

RCP4 – RA5C – I – 42P – 3 – 50 – P3 – P – B – **

<Series>

<Type>
RA5C
RA6C

<Encoder type>
I : Incremental

<Motor type>
42P : 42□
56P : 56□

<Lead>
RA5C
3/6/12/20
RA6C
4/8/16/24

<Stroke>

<Controller>
P3 : PCON-CA

<Cable length>
N : None
P : 1m
S : 3m
M : 5m
X□□: Length specification
R□□: Robot cable

<Options>
B : Brake
NM : Reversed-home specification
FL : Flange bracket (Front)
SC : Scraper

Identification for IAI use only*1

*1 This may be displayed for the manufacturing reason.
(This is not to indicate the manufacturing model code.)

2. Specification

(1) Maximum Speed
The maximum speed of the actuator is limited to prevent resonance of the ball screw shaft by the motor speed limit.
Be sure to observe the applicable maximum speed shown in the table below.

[When high-output setting is effective]

Strokes and maximum speed limits (Unit: mm/s)

Size	Motor Type	Lead [mm]	Horizontal / Vertical	Stroke [mm]									
				50	100	150	200	250	300	350	400	450	500
RA5C	42P	3	Horizontal	225									
			Vertical	225									
		6	Horizontal	450									
			Vertical	450									
		12	Horizontal	700									
			Vertical	700									
		20	Horizontal	800									
			Vertical	800									
RA6C	42P	4	Horizontal	210									
			Vertical	210									
		8	Horizontal	420									
			Vertical	420									
		16	Horizontal	700									
			Vertical	560									
		24	Horizontal	800									
			Vertical	600									

[When high-output setting is ineffective]

Strokes and maximum speed limits (Unit: mm/s)

Size	Motor Type	Lead [mm]	Horizontal / Vertical	Stroke [mm]									
				50	100	150	200	250	300	350	400	450	500
RA5C	42P	3	Horizontal	125									
			Vertical	125									
		6	Horizontal	250									
			Vertical	250									
		12	Horizontal	500									
			Vertical	500									
		20	Horizontal	640									
			Vertical	640									
RA6C	42P	4	Horizontal	140									
			Vertical	140									
		8	Horizontal	210									
			Vertical	210									
		16	Horizontal	420									
			Vertical	420									
		24	Horizontal	600									
			Vertical	400									

⚠ Caution: (1) Do not set speeds and accelerations/decelerations equal to or greater than the respective ratings. Doing so may result in vibration, failure or shorter life.

(2) In the case of interpolated operation of two or more orthogonal axes, make sure the command values (settings) of speed and acceleration/deceleration do not exceed the smallest values of all speeds and accelerations/decelerations of the applicable axes.
Even if any speed or acceleration/deceleration is set that exceeds the smallest speed or acceleration/deceleration among all applicable axes, the actual speed or acceleration/deceleration will be limited to the smallest speed or acceleration/deceleration.

(3) If any acceleration/deceleration equal to or greater than the rated acceleration/deceleration is set, a creep phenomenon or slipped coupling may occur.

(2) Maximum Acceleration and Transportable Weight

If the transportable weight is smaller than as specified, the acceleration/deceleration can be raised beyond the applicable level.

[When high-output setting is effective]

Type	Motor Type	Lead [mm]	Horizontal / Vertical	Payload capacity by acceleration/deceleration [kg]					
				Velocity [mm/s]	0.1G	0.3G	0.5G	0.7G	1.0G
RA5C	42P	3	Horizontal	0	60	60	50	45	40
				25	60	60	50	45	40
				50	60	60	50	45	40
				75	60	60	50	45	40
				100	60	60	50	45	40
				125	60	60	50	40	30
				150	60	50	40	30	25
				175	60	40	35	25	20
				200	60	35	30	20	14
				225	40	16	16	10	6
			Vertical	0	20	20	20	–	–
				25	20	20	20	–	–
				50	20	20	20	–	–
				75	20	20	20	–	–
				100	20	20	20	–	–
				125	18	14	10	–	–
				150	14	10	6	–	–
				175	12	6	5	–	–
				200	8	5	4.5	–	–
				225	5	5	4	–	–
		6	Horizontal	0	40	40	35	30	25
				50	40	40	35	30	25
				100	40	40	35	30	25
				150	40	40	35	25	25
				200	40	40	30	25	20
				250	40	40	27.5	22.5	18
				300	40	35	25	20	14
				350	40	30	14	12	10
				400	30	18	10	6	5
				450	25	8	3	–	–
			Vertical	0	10	10	10	–	–
				50	10	10	10	–	–
				100	10	10	10	–	–
				150	10	10	10	–	–
				200	10	10	10	–	–
				250	10	9	8	–	–
				300	6	6	6	–	–
				350	5	5	5	–	–
				400	4	3	3	–	–
				450	2	2	1	–	–

Type	Motor Type	Lead [mm]	Horizontal / Vertical	Payload capacity by acceleration/deceleration [kg]					
				Velocity [mm/s]	0.1G	0.3G	0.5G	0.7G	1.0G
RA5C	42P	12	Horizontal	0	25	25	18	16	12
				100	25	25	18	16	12
				200	25	25	18	16	10
				300	25	25	18	12	8
				400	20	20	14	10	6
				500	15	15	8	6	4
				600	10	10	6	3	2
				700	–	6	2	–	–
			Vertical	0	4	4	4	–	–
				100	4	4	4	–	–
				200	4	4	4	–	–
				300	4	4	4	–	–
				400	4	4	4	–	–
				500	4	3.5	3	–	–
				600	4	3	2	–	–
				700	–	2	1	–	–
		20	Horizontal	0	6	6	6	5	5
				160	6	6	6	5	5
				320	6	6	6	5	3
				480	6	6	6	5	3
				640	–	6	4	3	2
				800	–	4	3	–	–
			Vertical	0	1.5	1.5	1.5	–	–
				160	1.5	1.5	1.5	–	–
				320	1.5	1.5	1.5	–	–
				480	1.5	1.5	1.5	–	–
				640	–	1.5	1.5	–	–
				800	–	1	1	–	–

Type	Motor Type	Lead [mm]	Horizontal / Vertical	Payload capacity by acceleration/deceleration [kg]					
				Velocity [mm/s]	0.1G	0.3G	0.5G	0.7G	1.0G
RA6C	56P	4	Horizontal	0	80	80	70	65	60
				35	80	80	70	65	60
				70	80	80	70	65	60
				105	80	80	60	50	40
				140	80	50	30	20	15
				175	50	15	–	–	–
				210	20	–	–	–	–
			Vertical	0	28	28	28	–	–
				35	28	28	28	–	–
				70	28	28	28	–	–
				105	22	20	18	–	–
				140	16	12	10	–	–
				175	9	4	–	–	–
				210	2	–	–	–	–
		8	Horizontal	0	60	60	50	45	40
				70	60	60	50	45	40
				140	60	60	50	45	40
				210	60	60	40	31	26
				280	60	34	22	15	11
				350	60	14	5	1	–
				420	15	1	–	–	–
			Vertical	0	18	18	18	–	–
				70	18	18	18	–	–
				140	16	16	12	–	–
				210	10	10	9	–	–
				280	8	7	6	–	–
				350	3	3	2	–	–
				420	2	–	–	–	–

Type	Motor Type	Lead [mm]	Horizontal / Vertical	Payload capacity by acceleration/deceleration [kg]					
				Velocity [mm/s]	0.1G	0.3G	0.5G	0.7G	1.0G
RA6C	56P	16	Horizontal	0	50	50	40	35	30
				140	50	50	40	35	30
				280	50	50	35	25	20
				420	50	25	18	14	10
				560	12	10	5	3	2
				700	3	2	–	–	–
			Vertical	0	8	8	8	–	–
				140	8	8	8	–	–
				280	8	7	7	–	–
				420	6	4.5	4	–	–
				560	4	2	1	–	–
				700	–	–	–	–	–
		24	Horizontal	0	20	20	18	15	12
				200	20	20	18	15	12
				400	20	20	18	15	10
				600	15	14	9	7	4
				800	–	5	1	1	–
			Vertical	0	3	3	3	–	–
				200	3	3	3	–	–
				400	3	3	3	–	–
				600	3	3	2	–	–
				800	–	–	–	–	–

[When high-output setting is ineffective]

Type	Motor Type	Lead [mm]	Horizontal / Vertical	Payload capacity by acceleration/deceleration [kg]					
				Velocity [mm/s]	0.1G	0.2G	0.3G	0.5G	0.7G
RA5C	42P	3	Horizontal	0	–	40	–	–	–
				25	–	40	–	–	–
				50	–	40	–	–	–
				75	–	40	–	–	–
				100	–	40	–	–	–
				125	–	40	–	–	–
			Vertical	0	–	20	–	–	–
				25	–	20	–	–	–
				50	–	16	–	–	–
				75	–	12	–	–	–
				100	–	9	–	–	–
				125	–	5	–	–	–
		6	Horizontal	0	–	40	–	–	–
				50	–	40	–	–	–
				100	–	40	–	–	–
				150	–	40	–	–	–
				200	–	35	–	–	–
				250	–	10	–	–	–
			Vertical	0	–	10	–	–	–
				50	–	10	–	–	–
				100	–	10	–	–	–
				150	–	8	–	–	–
				200	–	5	–	–	–
				250	–	3	–	–	–
		12	Horizontal	0	–	25	–	–	–
				100	–	25	–	–	–
				200	–	25	–	–	–
				300	–	20	–	–	–
				400	–	10	–	–	–
				500	–	5	–	–	–
			Vertical	0	–	4	–	–	–
				100	–	4	–	–	–
				200	–	4	–	–	–
				300	–	3	–	–	–
				400	–	2	–	–	–
				500	–	1	–	–	–
		20	Horizontal	0	–	–	6	–	–
				160	–	–	6	–	–
				320	–	–	6	–	–
				480	–	–	4	–	–
				640	–	–	3	–	–
			Vertical	0	–	1.5	–	–	–
				160	–	1.5	–	–	–
				320	–	1.5	–	–	–
				480	–	1	–	–	–
				640	–	0.5	–	–	–

Type	Motor Type	Lead [mm]	Horizontal / Vertical	Payload capacity by acceleration/deceleration [kg]					
				Velocity [mm/s]	0.1G	0.2G	0.3G	0.5G	0.7G
RA6C	56P	4	Horizontal	0	–	55	–	–	–
				35	–	55	–	–	–
				70	–	55	–	–	–
				105	–	55	–	–	–
				140	–	35	–	–	–
			Vertical	0	–	26	–	–	–
				35	–	26	–	–	–
				70	–	15	–	–	–
				105	–	4	–	–	–
				140	–	2	–	–	–
		8	Horizontal	0	–	50	–	–	–
				70	–	50	–	–	–
				140	–	50	–	–	–
				210	–	30	–	–	–
			Vertical	0	–	17.5	–	–	–
				70	–	17.5	–	–	–
				140	–	7	–	–	–
				210	–	2	–	–	–
		16	Horizontal	0	–	40	–	–	–
				140	–	40	–	–	–
				280	–	30	–	–	–
				420	–	15	–	–	–
			Vertical	0	–	5	–	–	–
				140	–	5	–	–	–
				280	–	3	–	–	–
				420	–	1	–	–	–
		24	Horizontal	0	–	–	18	–	–
				200	–	–	18	–	–
				400	–	–	10	–	–
				600	–	–	1	–	–
			Vertical	0	–	3	–	–	–
				200	–	3	–	–	–
				400	–	2	–	–	–
				600	–	–	–	–	–

⚠ Caution: (1) Do not set speeds and accelerations/decelerations equal to or greater than the respective ratings. Doing so may result in vibration, failure or shorter life.

(2) In the case of interpolated operation of two or more orthogonal axes, make sure the command values (settings) of speed and acceleration/deceleration do not exceed the smallest values of all speeds and accelerations/decelerations of the applicable axes.
Even if any speed or acceleration/deceleration is set that exceeds the smallest speed or acceleration/deceleration among all applicable axes, the actual speed or acceleration/deceleration will be limited to the smallest speed or acceleration/deceleration.

(3) If any acceleration/deceleration equal to or greater than the rated acceleration/deceleration is set, a creep phenomenon or slipped coupling may occur.

(3) Driving System • Position Detector

Type	Motor Type	Lead	No. of Encoder Pulses *1	Ball Screw Type		
				Type	Diameter	Accuracy
RA5C	42P	3	800	Rolled	ϕ10mm	C10
		6				
		12				
		20				
RA6C	56P	4		Rolled	ϕ10mm	C10
		8				
		16				
		24				

*1 This is the number of pulses entered in the controller.

(4) Positioning Precision

Type	lead	Item	Tolerance
RA5C	3, 6, 12	Positioning repeatability *1	±0.02mm
		Backlash *1	0.1mm or less
	20	Positioning repeatability *1	±0.03mm
		Backlash *1	0.1mm or less
RA6C	4, 8, 16	Positioning repeatability *1	±0.02mm
		Backlash *1	0.1mm or less
	24	Positioning repeatability *1	±0.03mm
		Backlash *1	0.1mm or less

*1 Initial value

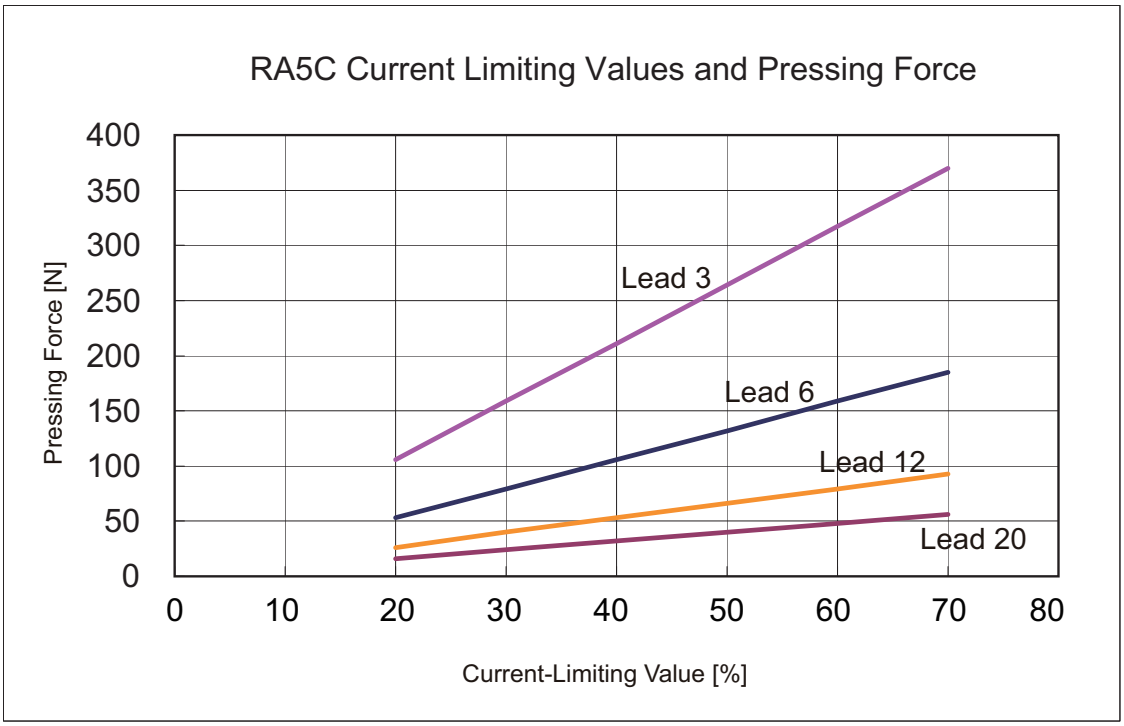
(5) Current Limit Value and Pressing Force

● RA5C

[N]

Current Limit Value	Lead 3	Lead 6	Lead 12	Lead 20
20%	106	53	26	16
30%	159	79	40	24
40%	211	106	53	32
50%	264	132	66	40
60%	317	159	79	48
70%	370	185	93	56

* These are the reference values at 20mm/s of pressing speed.

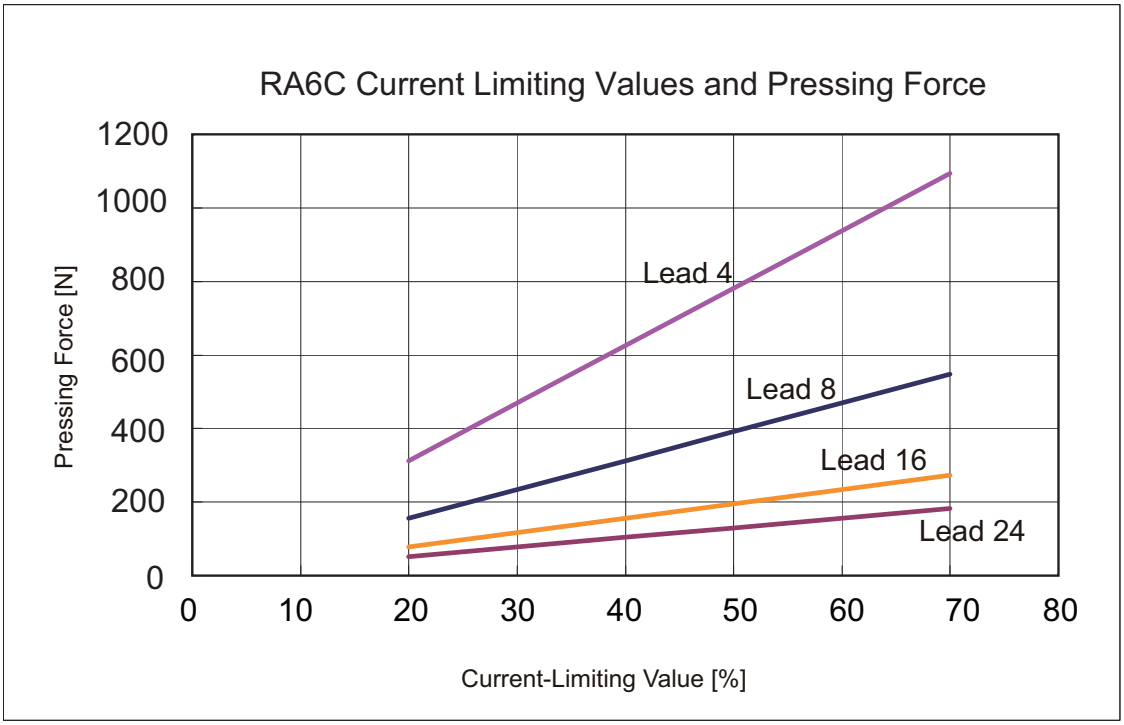


● RA6C

[N]

Current Limit Value	Lead 4	Lead 8	Lead 16	Lead 24
20%	312	156	78	52
30%	469	234	117	78
40%	625	312	156	104
50%	781	391	195	130
60%	937	469	234	156
70%	1094	547	273	182

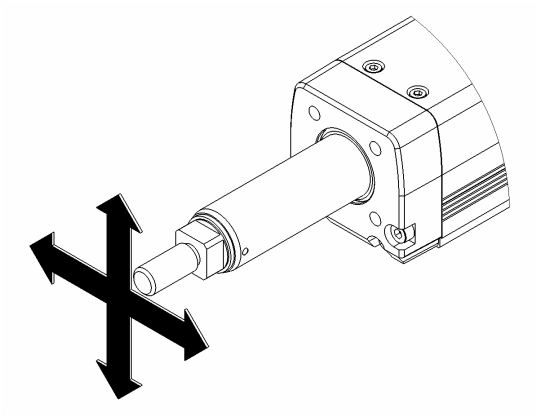
* These are the reference values at 20mm/s of pressing speed.



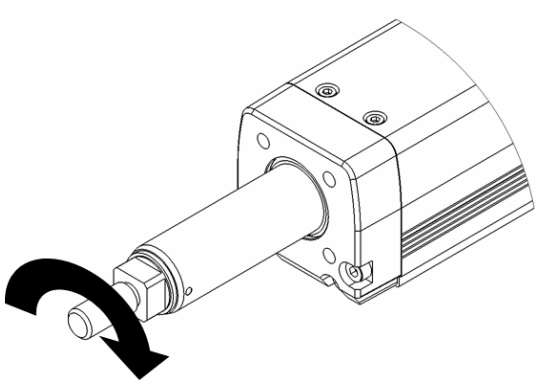
⚠ Caution: (1) The relation of the pressing force and current limiting value is a reference. There will be a little variance in the actual pressing force.
(2) If the current limiting value is low, the pressing force may largely vary.
(3) The movement speed at the pressing operation is fixed to 20mm/s.
The graph shows the values when pressing with 20mm/s, and it differs if the speed changes.

(6) Allowable Load and Torque on Rod Tip

● RCP4-RA5C/6C actuator possesses a built-in guide structure that enables it to apply a side-way load (radial load) and torque. Make sure not to exceed the load indicated in the specification table. Applying excess load may cause an operation failure, parts malfunction and shortened life.



Should be below allowable load
Do not attempt to apply impact load



Should be below allowable torque

RCP4-RA5C

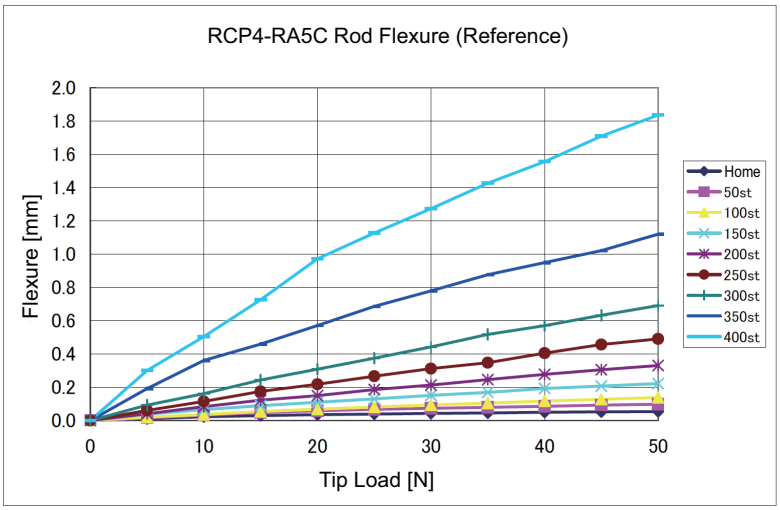
Item		Stroke	50	100	150	200	250	300	350	400
Rod Tip Allowable Static Load	[N]		65.6	51.2	41.7	34.9	29.8	25.7	22.4	19.7
Rod Tip Dynamic Static Load (Operating life 5000km Remaining Probability 90%)	[N]	Load Offset Distance 0 mm	32.4	23.6	18.1	14.4	11.6	9.5	7.7	6.2
	[N]	Load Offset Distance 0 mm	35.6	19.7	15.7	12.7	10.4	8.6	7.1	5.7
Load Offset Distance (Center of overhang load gravity)	[mm]		100 or less							
Rod Tip Allowable Static Torque	[N•m]		6.6	5.2	4.3	3.7	3.2	2.8	2.6	2.3
Rod Tip Dynamic Static Torque	[N•m]		2.6	2.0	1.6	1.3	1.0	0.9	0.7	0.6
Rod Non-Rotation Accuracy (Torque ± 1N•m, Origin standard position)	[deg]		±0.1							

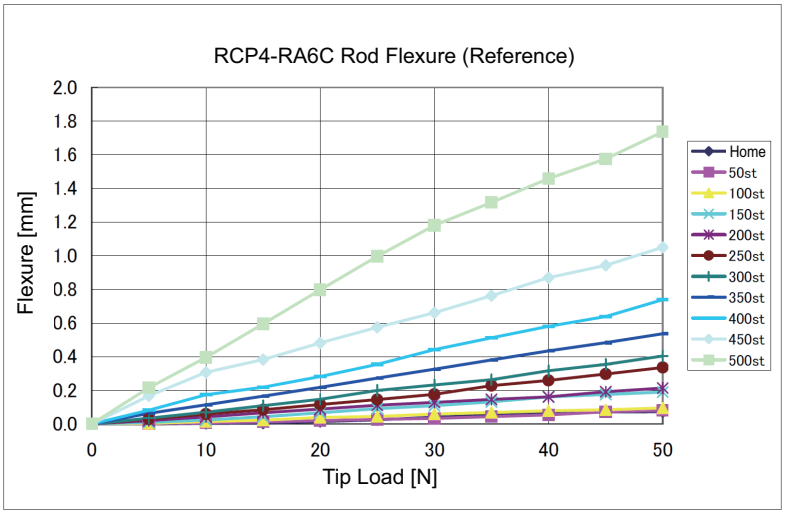
RCP4-RA6C

Item		Stroke	50	100	150	200	250	300	350	400	450	500
Rod Tip Allowable Static Load	[N]		112.7	91.5	76.7	65.7	57.25	50.4	44.8	40.2	36.2	32.7
Rod Tip Dynamic Static Load (Operating life 5000km Remaining Probability 90%)	[N]	Load Offset Distance 0 mm	49.0	37.4	29.9	24.5	20.4	17.1	14.5	12.3	10.3	8.6
	[N]	Load Offset Distance 0 mm	38.7	31.0	25.5	21.4	18.1	15.4	13.2	11.2	9.5	8.0
Load Offset Distance (Center of overhang load gravity)	[mm]		100 or less									
Rod Tip Allowable Static Torque	[N•m]		11.4	9.3	7.9	6.8	6.0	5.4	4.9	4.5	4.1	3.8
Rod Tip Dynamic Static Torque	[N•m]		3.9	3.1	2.5	2.1	1.8	1.5	1.3	1.1	1.0	0.8
Rod Non-Rotation Accuracy (Torque ± 1N•m, Origin standard position)	[deg]		±0.1									

(7) Rod Flexure (Reference)

(Note) This is the flexure of the rod when the actuator is installed vertically.
It does not include the flexure caused by the weight of itself.





3. Life

The product life is estimated as 5000km (reference) under the condition that it is operated with maximum transportable weight, maximum acceleration and deceleration.

4. Installation and Storage • Preservation Environment

4.1 Installation Environment

The actuator should be installed in a location other than those specified below.
In general, the installation environment should be one in which an operator can work without protective gear.
Also provide sufficient work space required for maintenance inspection.

- Where the actuator 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 actuator receives direct sunlight
- Where the actuator is exposed to corrosive or combustible gases
- Where the ambient air contains a large amount of powder dust, salt or iron (at level exceeding what is normally expected in an assembly plant)
- Where the actuator is subject to splashed water, oil (including oil mist or cutting fluid) or chemical solutions
- Where the actuator receives impact or vibration

If the actuator is used in any of the following locations, provide sufficient shielding measures:
- Where noise generates due to static electricity, etc.
- Where the actuator is subject to a strong electric or magnetic field
- Where the actuator is subject to ultraviolet ray or radiation

4.2 Storage • Preservation Environment

The storage • preservation environment should be similar to the installation environment. In addition, make sure condensation will not occur when the actuator is to be stored or preserved for a long period of time. Unless specified, we do not include drying agents when shipping the actuator. If you are storing the actuator in an environment where condensation might occur, you must treat the entire shipping box, or treat the actuator itself after unpacking, to prevent condensation. The unit can withstand temperatures up to 60ºC during a short storage/preservation period, but only up to 50ºC if the storage/preservation period is longer than one month.

The actuator should be lying flat during storage • preservation.
If the actuator is to be stored in a packed state, follow the specified actuator position if indicated.

5. Transportation

5.1 Handling of Robot

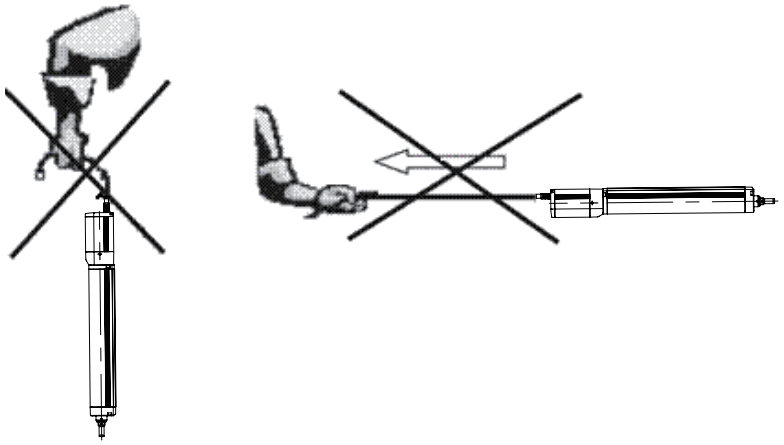
5.1.1 Handling the Packed Unit

Unless otherwise specified, the actuator is shipped with each axis packaged separately.

- Do not damage or drop. The package is not applied with any special treatment that enables it to resist an impact caused by a drop or crash.
- Transport a heavy package with at least more than two operators. Consider an appropriate method for transportation.
- Keep the unit in horizontal orientation when placing it on the ground or transporting. Follow the instruction if there is any for the packaging condition.
- Do not step or sit on the package.
- Do not put any load that may cause a deformation or breakage of the package.

5.1.2 Handling the Actuator After Unpacking

Do not carry an actuator by motor unit and a cable or attempt to move it by pulling the cable.



- Hold the body base when transporting the actuator.
- Be careful not to bump the actuator into anything when moving it.
- Do not apply an excessive force to each part of the actuator.Inparticular, prevent the motor unit and rear bracket from receiving an unnecessary force.

Supplement) For the names of each part of the actuator, refer to "Names of the Parts"

5.2 Handling in Assembled Condition

- When carrying the actuator, exercise caution not to bump it against nearby objects or structures.
- Secure the sliders to prevent sudden movement during transport.
- If any end of the actuator is overhanging, secure it properly to avoid significant movement due to external vibration.
- When transporting the assembly without the ends of the actuators fastened, do not subject the assembly to an impact of 0.3 G or more.
- When suspending the mechanical equipment (system) with ropes, avoid applying force to actuator, connector box, etc. Also, avoid the cables being pinched or caused an excessive deformation.

6. Installation

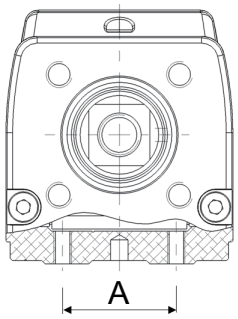
6.1 Installation of Main Unit

The surface to mount the main unit should be a machined surface or a plane that possesses an equivalent accuracy and the flatness should be within 0.05mm. Also, the platform should have a structure stiff enough to install the unit so it would not generate vibration or other abnormality.

The side and bottom faces of the base of the main body are parallel to the guide. When the accuracy is required for the operation, utilize these surfaces.

6.1.1 Using the Tapped Holes on the Bottom of the Base

This actuator has tapped holes for mounting so it can be fixed from the bottom of the base.
(Note that the tapped hole size depends on the model. Please see the diagrams below and 14,1 "External Dimensions.")
Also, there are reamed holes and a slotted hole for positioning pins.



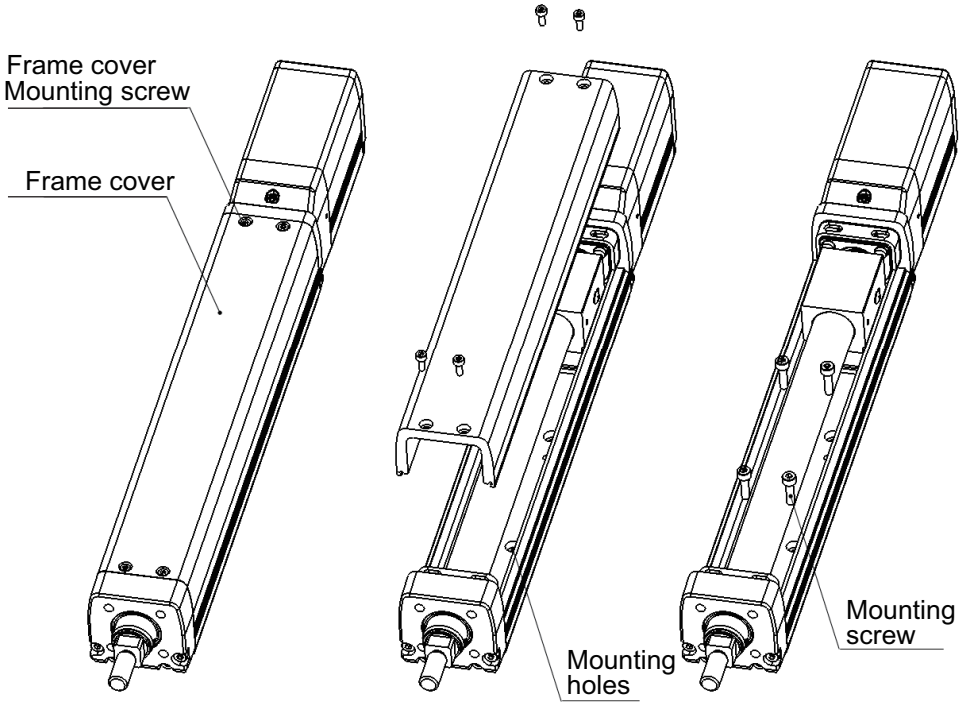
Model Name	Tapped Hole Size	Tapped Holes Depth	Tightening Torque		Pitch (A) [mm]	Reamer Hole [mm]
			In the case that steel is used for the bolt seating surface:	In the case that aluminum is used for the bolt seating surface:		
RA5C	M4	7mm	3.59N・m (0.37kgf・m)	1.76N・m (0.18kgf・m)	26	ϕ4H7 Depth 5.5
RA6C	M5	9mm	7.27N・m (0.74kgf・m)	3.42N・m (0.35kgf・m)	31	ϕ4H7 Depth 5.5

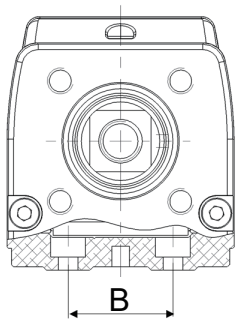
Tightening screws
- Use hexagonal socket head bolts for the male threads for installing the base.
- Use of high-tension bolts meeting at least ISO 10.9 is recommended.
- The length of thread engagement should be 1.8 times more than the nominal diameter, and pay attention not to stick the screw out inside the actuator.

⚠ 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.

6.1.2 Using the Mounting Holes on the Top of the Base

There are through holes equipped on the base so the unit can be attached from the top of the base.
Detach the side covers on both sides when installing.
(Remove 4 hex socket head cap screws.)





Apply the socket head cap screw indicated in the table below suitable for the platform material.

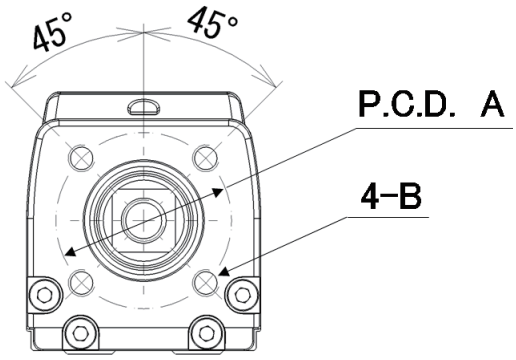
Model Name	Mounting Holes	Mounting Screw	Tightening Torque	Pitch (B) [mm]
RA5C	ϕ4.5 drilled hole, ϕ8 counter boring depth 4.5	M4	1.76N·m (0.18kgf·m)	24
RA6C	ϕ4.5 drilled hole, ϕ8 counter boring depth 4.5	M4	1.76N·m (0.18kgf·m)	31

Tightening screws
- Use hexagonal socket head bolts for the male threads for installing the base.
- Use of high-tension bolts meeting at least ISO 10.9 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 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.

6.1.3 When using Tapped Holes on Front Housing

There are tapped holes equipped on the front housing.
Utilize these tapped holes for installation.
The effective depth for the attachment screws is as shown below;



Model Name	Tapped Hole Size B	A	Screw Effective Depth	Tightening Torque	
				In the case that steel is used for the bolt seating surface:	In the case that aluminum is used for the bolt seating surface:
RA5C	M6	39	12	12.3N·m (1.26kgf·m)	5.4N·m (0.55kgf·m)
RA6C	M8	43	16	30N·m (3.1kgf·m)	11.5N·m (1.2kgf·m)

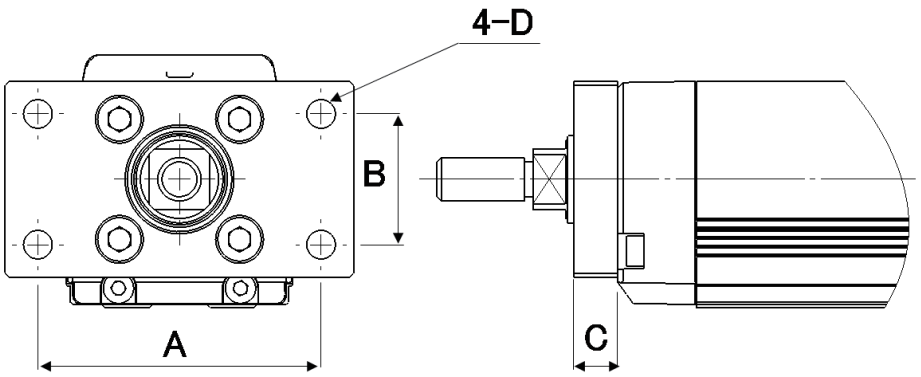
Make sure to follow “6.1.5 Caution for Installation using Front Housing and Front Flange”

Tightening screws
- Use hexagonal socket head bolts for the male threads for installing the base.
- Use of high-tension bolts meeting at least ISO 10.9 is recommended.
- Have the length of thread engagement approximately 1.8 times of the nominal diameter.

⚠ 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.

6.1.4 When using Front Flange (Option)

There are holes for attachment on the front flange. Utilize these holes for the installation.
The attachment holes are located as shown below;



Model Name	Applicable Screw Diameter	A	B	C	D
RA5C Front Flange	M6	65	30	10	Φ6.6
RA6C Front Flange	M8	76	33	12	Φ9

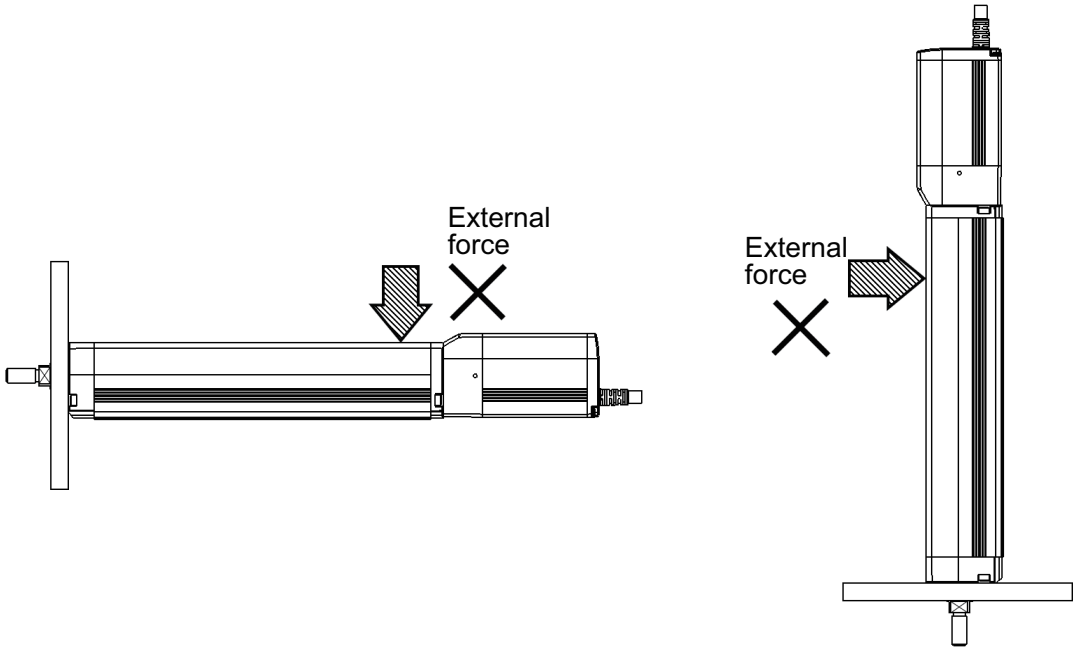
Make sure to follow “6.1.5 Caution for Installation using Front Housing and Front Flange”

Tightening screws
- Use hexagonal socket head bolts for the male threads for installing the base.
- Use of high-tension bolts meeting at least ISO 10.9 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

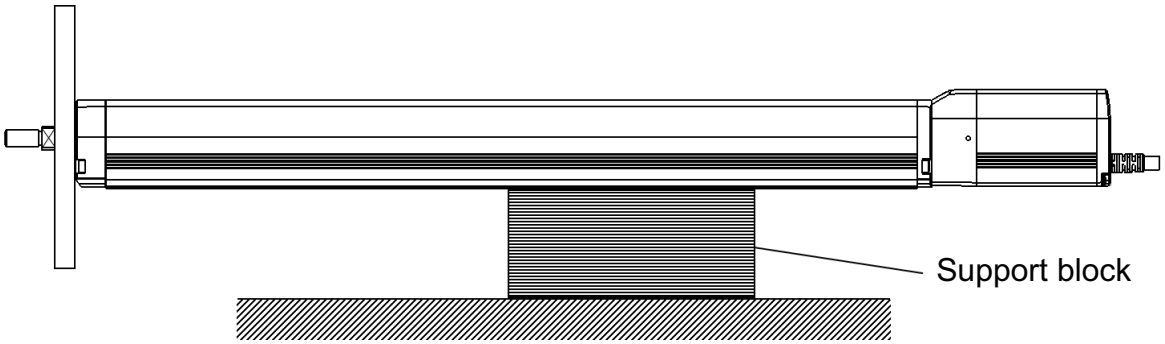
⚠ Caution: Be careful when selecting the bolt length. If bolts of inappropriate lengths are used, the tapped holes may be damaged, actuator mounting strength may become insufficient, or contact with driving parts may occur, resulting in lower precision or unexpected accidents.

6.1.5 Caution for Installation using Front Housing and Front Flange

Do not attempt to apply any external force to the body when installing with front housing or front flange (option). External force may cause an operation failure or parts malfunction.



Prepare a support block as shown in the figure below for the horizontal installation of the unit with its stroke more than 150 even if there is no external force applied on the body. Even for those with the stroke less than 150, it is recommended to have a support block to avoid vibration being generated due to the operation condition or installation environment, which may cause an operation failure or parts malfunction.

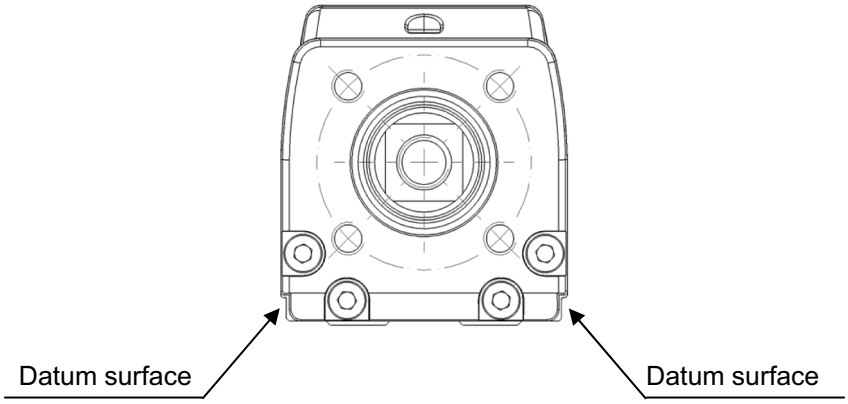


6.1.6 Attachment of Work Part (Transported Object)

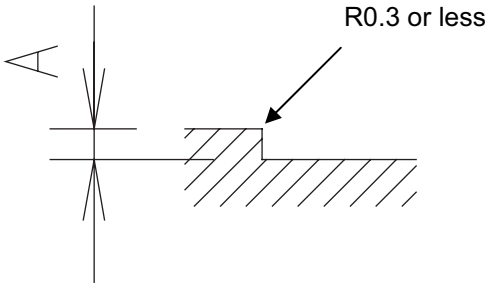
Utilize the threaded part on the rod tip to attach the work part (transported object). In the installation process, make sure to hold 2 faces on the tip with a wrench so the tightening torque would not be applied to the rod.

6.1.7 Mounting Surface

- The platform to install the actuator should possess a structure that ensures enough stiffness, and should be free from vibration.
- The surface where the actuator will be mounted should be a machined surface or that with an accuracy equivalent to it, and the flatness should be 0.05mm/m or below.
- Ensure a room for maintenance work.
- The side and bottom surfaces of the base on the actuator work as the datum surfaces for the side of the rod.
- Use these surfaces as the datum surfaces for mounting.



Follow the diagram below when installing the device using the reference surface.



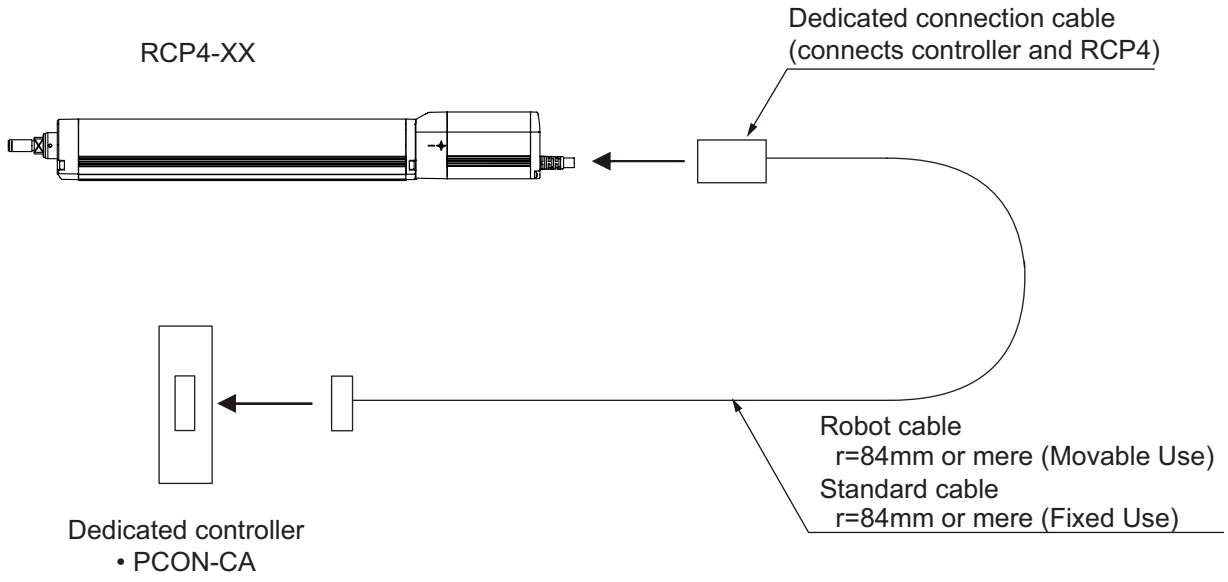
Model Name	A Dimensions (mm)
RA5/6	2 to 4 or less

7. Connecting with Controller

This section explains the wiring method for a single axis.

- 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.

Please consult with IAI if you require a different kind of cable than the one supplied.

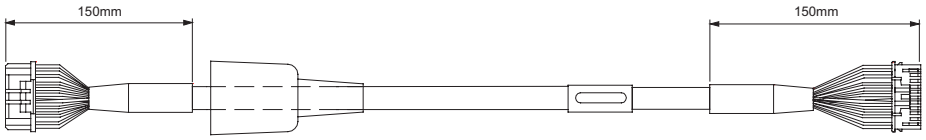


Dedicated connection cable
- Motor-encoder cable: CB-CA-MPA***
- Motor-encoder cable robot cable: CB-CA-MPA***- RB

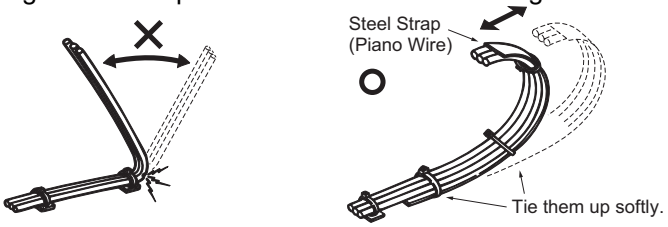
*) *** indicates the cable length. Up to 20m can be specified.
Example) 080 = 8 m

When designing an application system, incorrect wiring or connection of each cable may cause unexpected problems such as a disconnected cable or poor contact. The following explains examples of prohibited handling of cables.

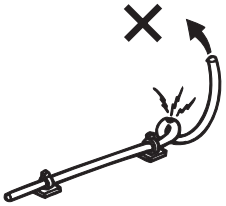
- Do not cut and reconnect the cable to extend or shorten the cable.
- Use a robot cable for any section where the cable will flex. [For the bending radius, refer to 10, “Motor • Encoder Cable.”]
- Do not bend the cable in the area from the connector tip inward to 150mm on both ends.
  CB-CA-MPA□□□, CB-CA-MPA□□□-RB



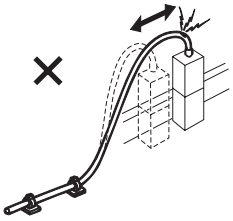
- Provide a sufficient bending radius and prevent the cable from bending at the same point.



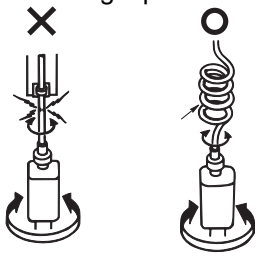
- Do not let the cable bend, kink or twist.



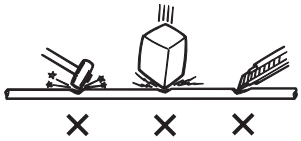
- Do not pull the cable with a strong force.



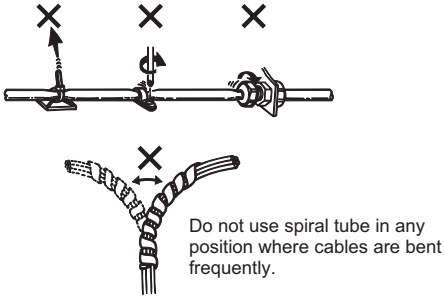
- Do not let the cable receive a turning force at a single point.



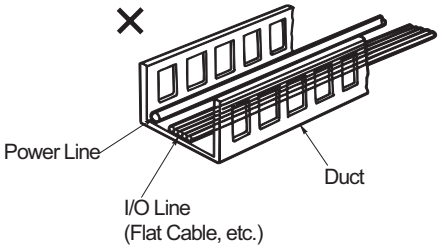
- Do not pinch, drop a heavy object onto or cut the cable.



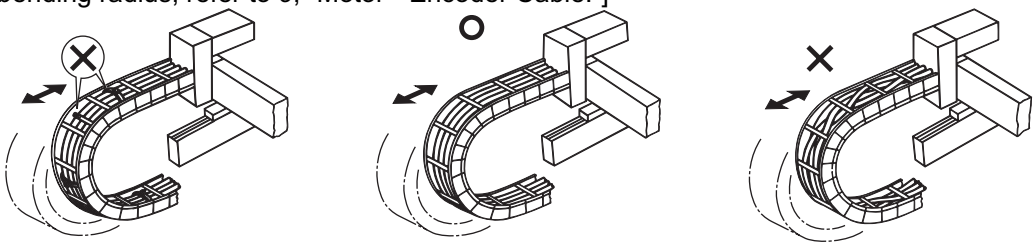
- When fixing the cable, provide a moderate slack and do not tension it too tight.



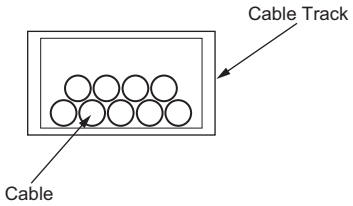
- Separate the I/O and communication lines from the power and drive lines. Do not wire them together in the same duct.



- If a cable track is used, use a robot cable and prevent the cable from getting tangled or kinked in the cable track or flexible tube. Also make sure the cable retains a certain degree of flexibility (so that the cable will not become too taut when bent).
  [For the bending radius, refer to 9, “Motor • Encoder Cable.”]



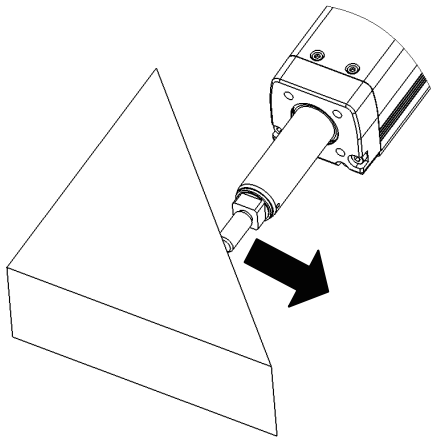
- Do not cause the cables to occupy more than 60% of the space in the cable track.



⚠ Warning:
- Always turn off the controller power before connecting/disconnecting cables. If cables are connected/ disconnected while the power is still supplied, the actuator may malfunction and serious injury or equipment damage may occur.
- Loose connectors may cause the actuator to malfunction and create a dangerous situation.
  Be sure to confirm that all connectors are securely connected.

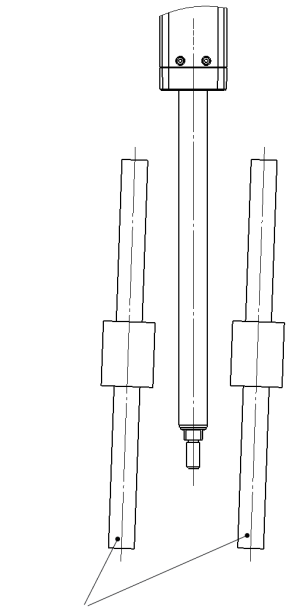
8. Caution for Operation

- When the reaction force against the pressing operation is the side-way force, make sure it would not exceed the allowable load.

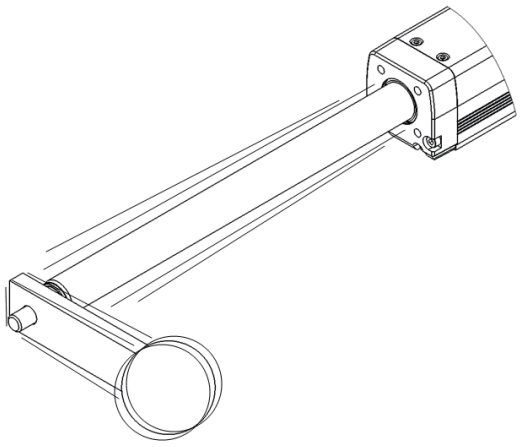


Be careful on the direction of the reaction force against the pressing operation.

- 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. For the connection of the rod and guides, have a component such as a free joint to accept the assembly variation.



- When using a stroke of more than 200 and the load is eccentric (offset), the rod may generate vibration in some operation conditions. Apply guides to control the vibration.



9. Options

9.1 Brake Type

The brake is a mechanism designed to prevent the rod from dropping on a vertically installed actuator when the power or servo is turned off.
Use the brake to prevent the installed load, etc., from being damaged due to the falling rod.
The applicable model number for this option is “B.”

9.2 Reversed-home Specification

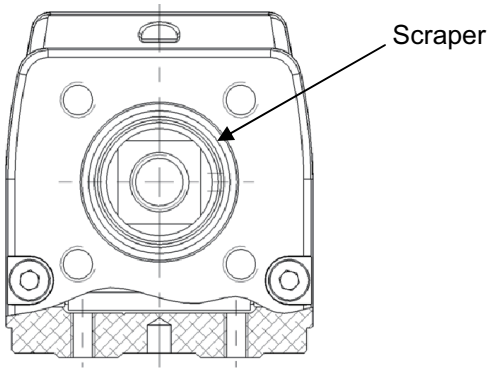
The standard home position is on the motor side. However, the motor position will be reversed if it is desirable in view of the layout of the system, etc.
(Note) The home position is adjusted at the factory before shipment. If you wish to change the home after the delivery of your actuator, you must return the actuator to IAI for adjustment.

9.3 Flange Bracket (Front)

This is the flange bracket to attach on the front of the main unit. The model code is indicated with FL.

9.4 Scraper

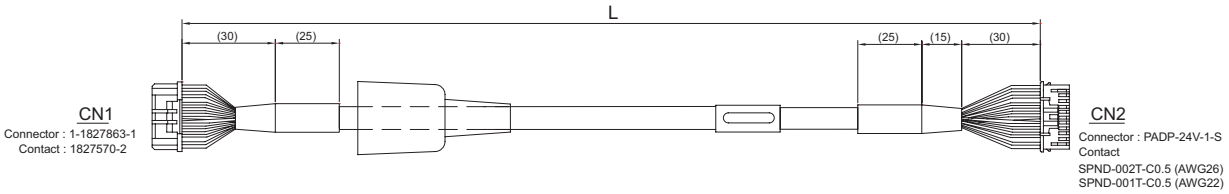
It is attached on the part where the rod moves in and out to prevent dust from getting inside the unit from the outside. The model code is indicated with SC. (This is an option already attached when it is shipped out from the factory. It is necessary to dismantle and assemble back if it is required to be attached afterwards.)



10. Motor • Encoder Cables

10.1 Motor • Encoder Integrated Cables

CB-CA-MPA□□□



Connection diagram

CN1
1-1827863-1(AMP)

Pin No.	Symbol	Color
A1	ϕA/U	BL(AWG22/19)
B1	VMM/V	OR(AWG22/19)
A2	ϕ_A/W	GN(AWG22/19)
B2	ϕB/-	BR(AWG22/19)
A3	VMM/-	GY(AWG22/19)
B3	ϕ_B/-	RD(AWG22/19)
A4	LS+/BK+	BK(AWG26)
B4	LS-/BK-	YW(AWG26)
A6	-/A+	BL(AWG26)
B6	-/A-	OR(AWG26)
A7	A+/B+	GN(AWG26)
B7	A-/B-	BR(AWG26)
A8	B+/Z+	GY(AWG26)
B8	B-/Z-	RD(AWG26)
A5	BK+/LS+	BL(AWG26)
B5	BK-/LS-	OR(AWG26)
A9	LS_GND	GN(AWG26)
B9	VPS	BR(AWG26)
A10	VCC	GY(AWG26)
B10	GND	RD(AWG26)
A11	—	—
B11	FG	BK

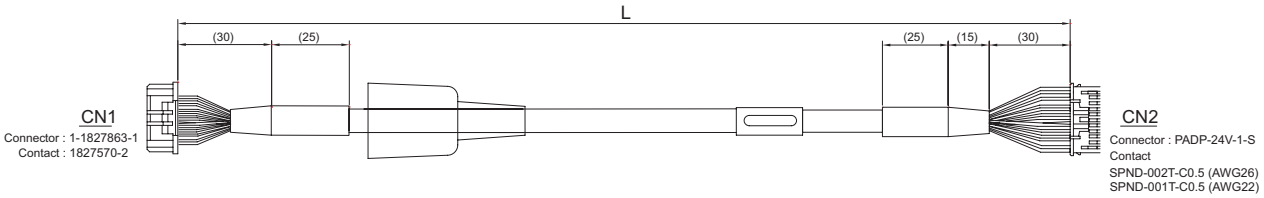
Center Intervention

CN2
PADP-24V-1-S(JST)

Pin No.	Symbol	Color
1	ϕA/U	BL(AWG22/19)
2	VMM/V	OR(AWG22/19)
5	ϕ_A/W	GN(AWG22/19)
3	ϕB/-	BR(AWG22/19)
4	VMM/-	GY(AWG22/19)
6	ϕ_B/-	RD(AWG22/19)
7	LS+/BK+	BK(AWG26)
8	LS-/BK-	YW(AWG26)
11	-/A+	BL(AWG26)
12	-/A-	OR(AWG26)
13	A+/B+	GN(AWG26)
14	A-/B-	BR(AWG26)
15	B+/Z+	GY(AWG26)
16	B-/Z-	RD(AWG26)
9	BK+/LS+	BL(AWG26)
10	BK-/LS-	OR(AWG26)
20	LS_GND	GN(AWG26)
18	VPS	BR(AWG26)
17	VCC	GY(AWG26)
19	GND	RD(AWG26)
21	—	—
22	—	—
23	—	—
24	FG	BK

10.2 Motor • Encoder Integrated Cables Robot Type

CB-CA-MPA□□□-RB



Connection diagram

CN1
1-1827863-1(AMP)

Pin No.	Symbol	Color
A1	ϕA/U	BK(AWG22/19)
B1	VMM/V	WT(AWG22/19)
A2	ϕ_A/W	BR(AWG22/19)
B2	ϕB/-	GN(AWG22/19)
A3	VMM/-	YW(AWG22/19)
B3	ϕ_B/-	RD(AWG22/19)
A4	LS+/BK+	OR(AWG25)
B4	LS-/BK-	GY(AWG25)
A6	-/A+	WT(AWG25)
B6	-/A-	YW(AWG25)
A7	A+/B+	RD(AWG25)
B7	A-/B-	GN(AWG25)
A8	B+/Z+	BK(AWG25)
B8	B-/Z-	BR(AWG25)
A5	BK+/LS+	BK(AWG25)
B5	BK-/LS-	BRAWG25)
A9	LS_GND	GN(AWG25)
B9	VPS	RD(AWG25)
A10	VCC	WT(AWG25)
B10	GND	YW(AWG25)
A11	—	—
B11	FG	

CN2
PADP-24V-1-S (JST)

Pin No.	Symbol	Color
1	ϕA/U	BK(AWG22/19)
2	VMM/V	WT(AWG22/19)
5	ϕ_A/W	BR(AWG22/19)
3	ϕB/-	GN(AWG22/19)
4	VMM/-	YW(AWG22/19)
6	ϕ_B/-	RD(AWG22/19)
7	LS+/BK+	OR(AWG25)
8	LS-/BK-	GY(AWG25)
11	-/A+	WT(AWG25)
12	-/A-	YW(AWG25)
13	A+/B+	RD(AWG25)
14	A-/B-	GN(AWG25)
15	B+/Z+	BK(AWG25)
16	B-/Z-	BR(AWG25)
9	BK+/LS+	BK(AWG25)
10	BK-/LS-	BR(AWG25)
20	LS_GND	GN(AWG25)
18	VPS	RD(AWG25)
17	VCC	WT(AWG25)
19	GND	YW(AWG25)
21	—	—
22	—	—
23	—	—
24	FG	Shield

Center Intervention

11. Maintenance Inspection

11.1 Inspection Items and Schedule

Follow the maintenance inspection schedule below.
It is assumed that the equipment is operating 8 hours per day.
If the equipment is running continuously night and day or otherwise running at a high operating rate, inspect more often as needed.

	External visual inspection	Internal inspection	Greasing*1
Start of work inspection	○		
1-month inspection	○		
3-month inspection	○		○ (Rod sliding surface)
Every 3 months since	○		○ (Rod sliding surface)
6-month inspection or every 5000km of operated distance	○	○	○(Ball Screw/Guide)
Every 1 year since	○	○	○(Ball Screw/Guide)

11.2 External Visual Inspection

An external visual inspection should check the following things.

Main unit	Loose actuator mounting bolts, other loose items
Rod	Lubrication, dust, foreign object on sliding surfaces
Scraper (optional equipment)	Damage, crack, scratch, wear-out
Cables	Scratches, proper connections
Overall	Irregular noise, vibration

* Scraper (optional equipment) is an expendable part. It may be shortened depending on the use environment or operating condition, thus replace the scraper as soon as an abnormality is found.

11.3 Cleaning

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

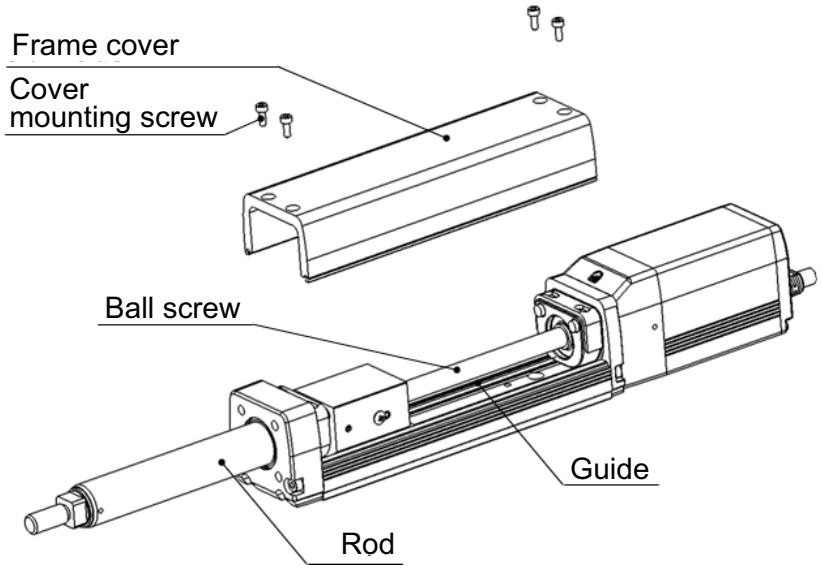
11.4 Internal Inspections

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

Main unit	Loose mounting bolts, other loose items
Guide section	Lubrication, buildup
Ball screw	Lubrication, buildup

Visually inspect the interior of the equipment. Check whether dust or other foreign matter has gotten inside and check the lubrication state.
The lubrication may have turned brown. This is not a problem as long as the travel surfaces shine as though they are wet.
If the grease is mixed with dust and does not have a shiny appearance, or if the grease has lost its efficacy due to prolonged use, then clean each section and reapply grease.
The procedure for internal inspections is outlined below.

1) With 2.5mm (RA5C) or with 3mm (RA6C) hex wrench, loosen the screws holding the frame cover, and detach the frame cover.
2) Check inside.
   Extend the rod when checking the ball screw. The ball screw will appear. Slide the rod manually with hand or move it with JOG operation of the controller.
3) After finishing the inspection, assemble back in the reverse order.



11.5 Internal Cleaning

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

11.6 Grease Supply

11.6.1 What Grease to Use on the Guides

IAI uses the following grease in our plant.

Guide	Idemitsu Kosan	Daphne Eponex Grease No. 2

Other companies also sell similar types of grease. For details, give the above grease name to the manufacturer you want to purchase from and ask what corresponding product they have available.
Here are some examples of similar products.

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

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

11.6.2 What Grease to Use on the Ball Screw

IAI uses the following grease in our plant.

Ball Screw	Kyodo Yushi	Multitemp LRL 3

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

11.6.3 Grease to be applied on the Rod (Sliding Surface)

The following grease is applied when the product is shipped out from IAI factory.

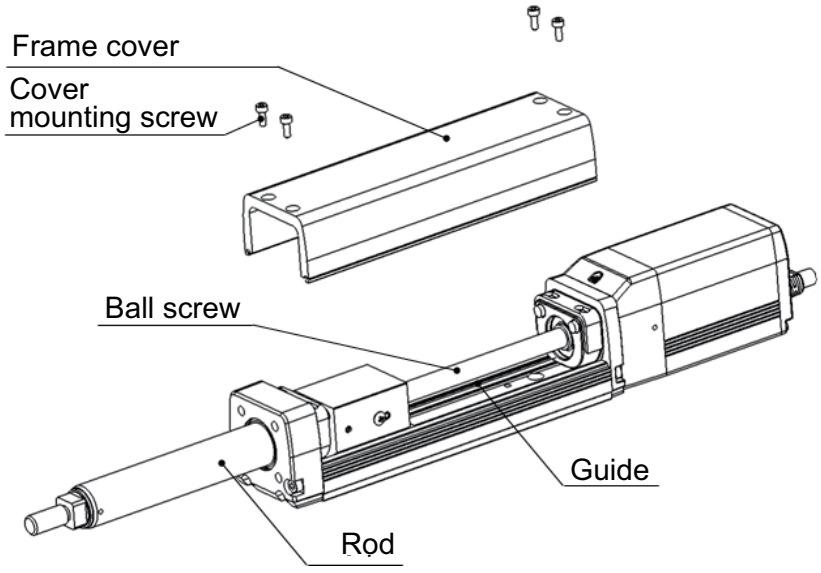
Rod (sliding surface)	Kyodo Yushi	Multitemp LRL 3

When supplying the grease, use the lithium-based all-around grease (consistency class: NLGI 2 to 0).

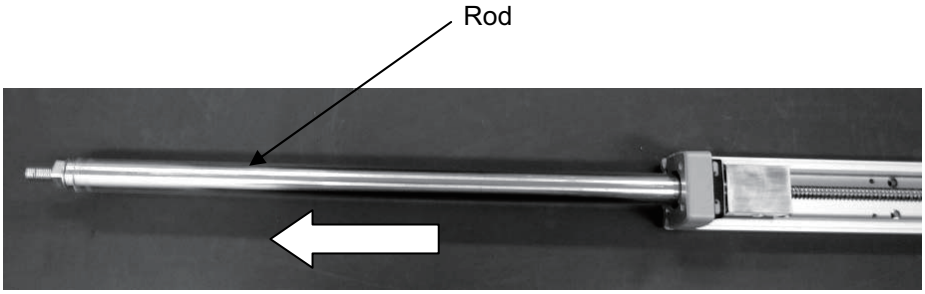
⚠ Caution: If the unit is equipped with the scraper (optional equipment), apply the grease on the rod sliding surface inside the main unit.
Even if the grease is applied on the rod sliding surface outside the main unit, the scraper sweeps out the grease, thus the grease would not be applied evenly throughout the whole area of the shaft holder or the sliding surface.

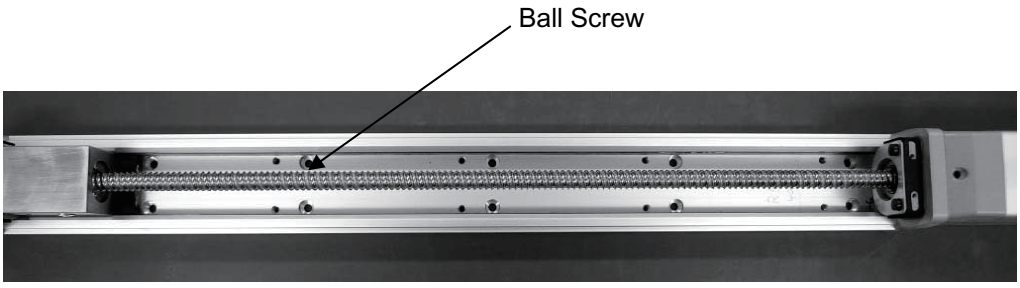
11.6.4 How to apply grease

(1) With 2.5mm (RA5C) or with 3mm (RA6C) hex wrench, loosen the screws holding the frame cover, and detach the frame cover.

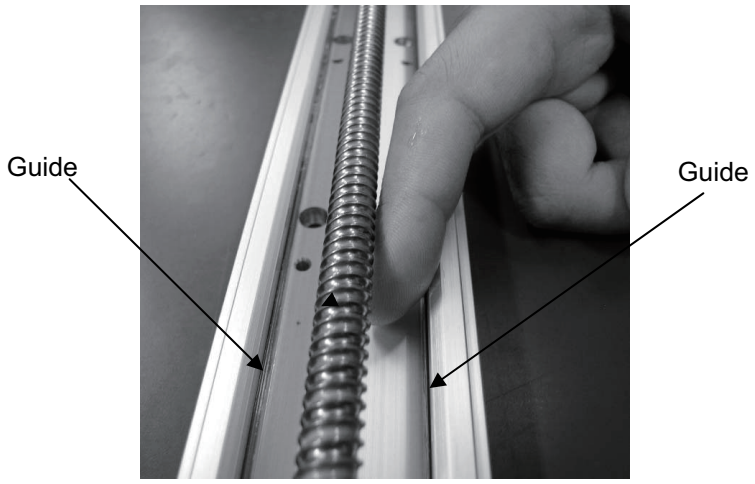


(2) Pull out the rod. The ball screw will appear.
For some of the low lead actuators, the rod would not move manually with hand.
Move it with JOG operation of the controller.

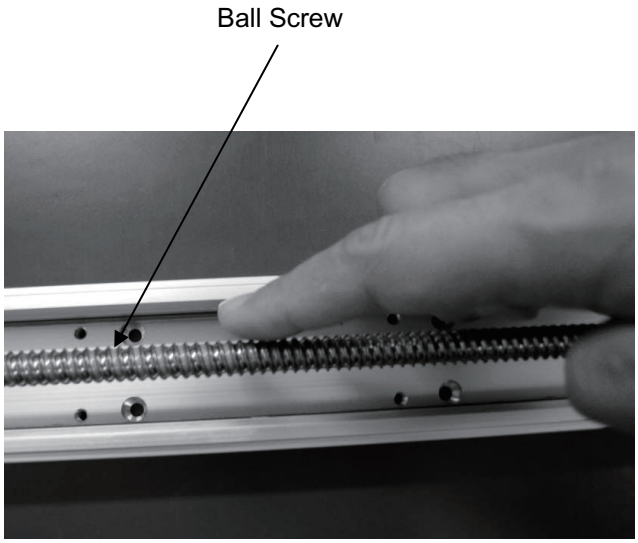




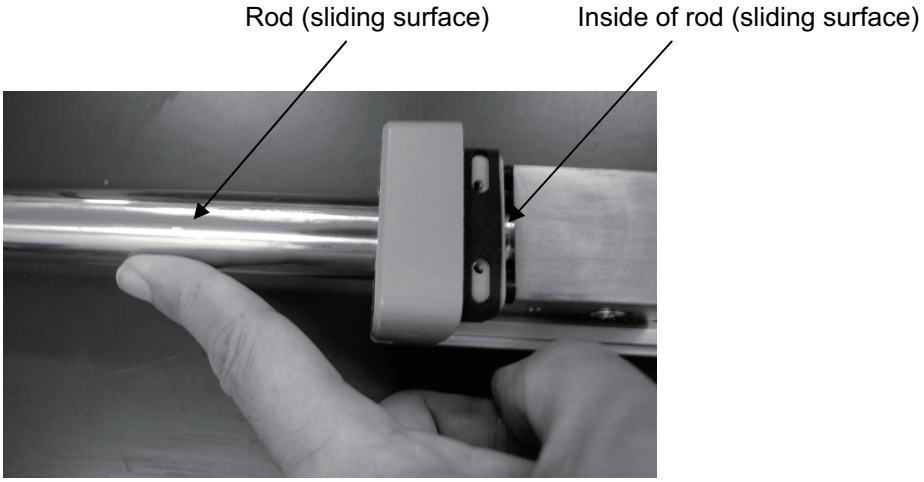
(3) After cleaning up the guide on both sides, apply the grease. Slide the rod back and forth to evenly apply the grease. Wipe off the excess grease at last.



(4) After cleaning up the ball screw, apply the grease with hand.
Move the rod back and forth to evenly apply the grease.
For some of the low lead actuators, the rod would not move manually with hand.
Move it it with JOG operation of the controller.
Wipe off the excess grease at last.



(5) If the unit is not equipped with the scraper (option), clean up the rod (sliding surface) and apply the grease with hands.
Move the rod back and forth to evenly apply the grease.
For some of the low lead actuators, the rod would not move manually with hand.
Move it with JOG operation of the controller.
Wipe off the excess grease at last.



If the unit is equipped with the scraper (optional equipment), apply the grease on the rod sliding surface inside the main unit.
Even if the grease is applied on the rod sliding surface outside the main unit, the scraper sweeps out the grease, thus the grease would not be applied evenly throughout the whole area of the shaft holder or the sliding surface.

(6) After supplying the grease, attach the frame cover.

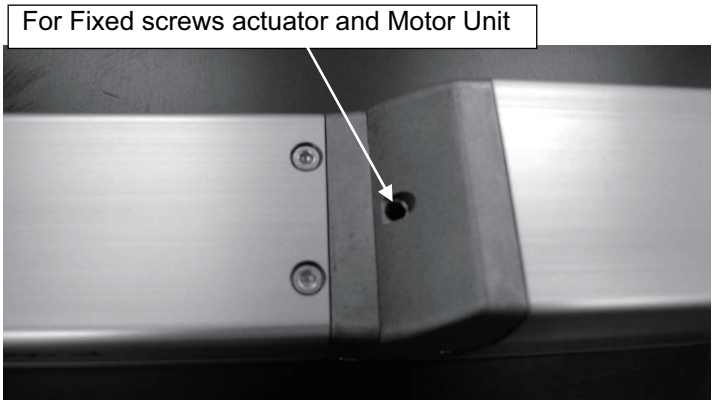
12. Motor Replacement Process

[Items required for replacing the motor]

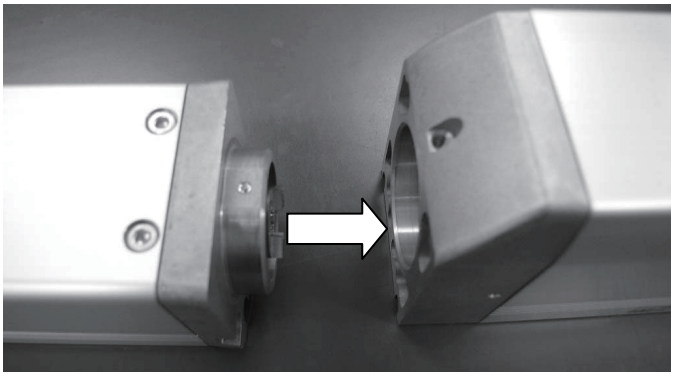
- Motor Unit for Replacement
- Hex wrench set

[Procedure]

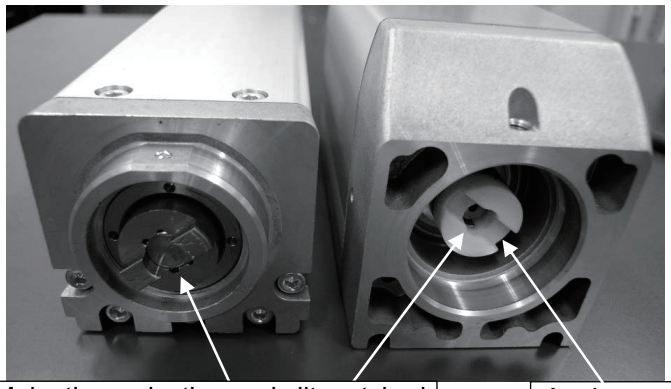
1) Remove the screw affixing the actuator and the motor unit with a 2.5mm hex wrench.



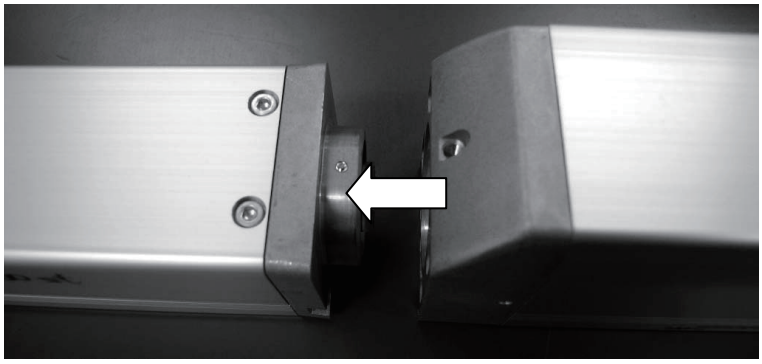
2) Detach the motor unit.



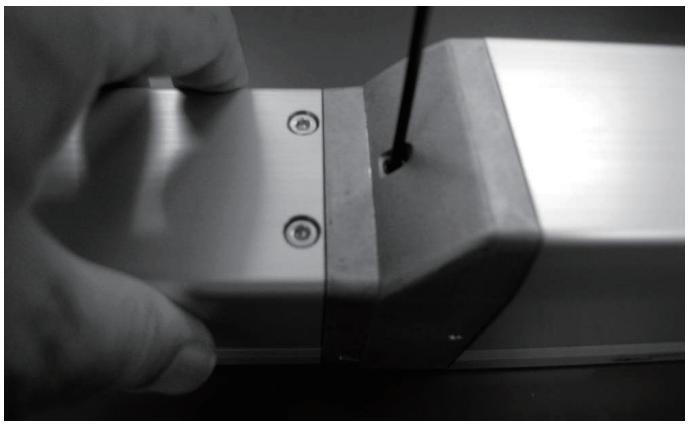
3) Make the profiles on the actuator side and motor unit side aligned so the projection matches to the slit.



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



5) Tighten the screw to affix the motor unit to the actuator with 2.5mm hex wrench.



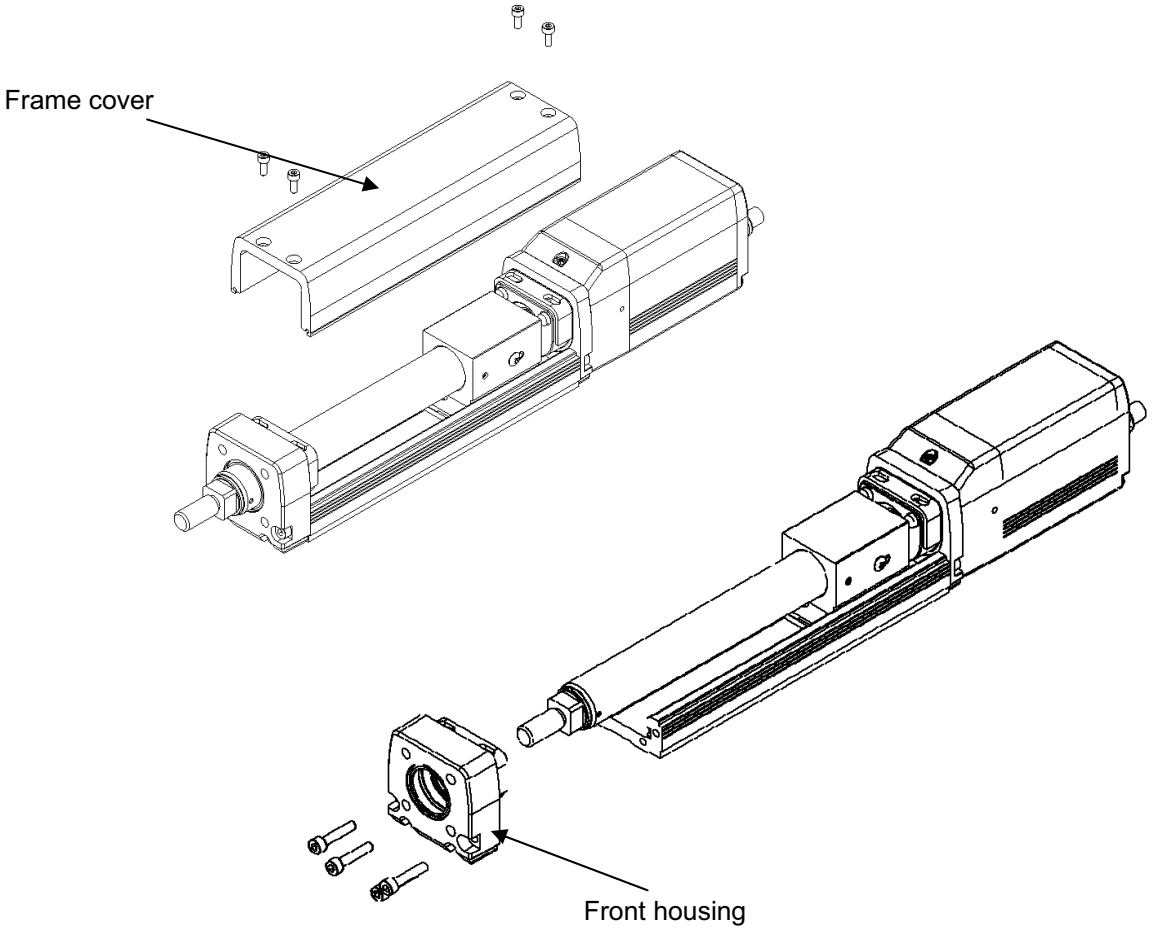
13. Procedure to Replace Scraper (Option)

[Items required for replacing the motor]
- Hex wrench set
- Replacement Scraper

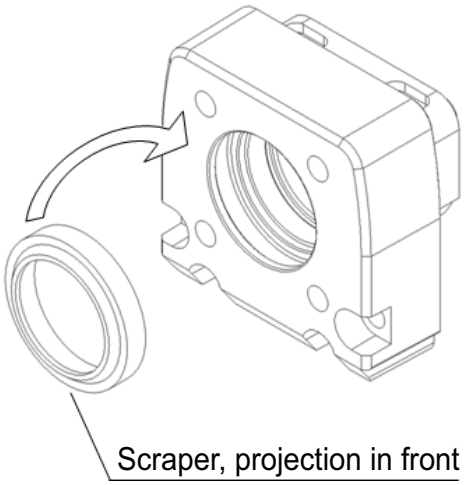
Model Name	Model No.	Supplier
RA5C	SFR-22K	Sakagami Seisakusho, Ltd.
RA6C	SFR-25K	Sakagami Seisakusho, Ltd.

1) Remove the actuator from the device temporarily, and place it on the work bench horizontally to ensure the safety.
   Working with it in vertical orientation has a risk of the rod dropping down. Never attempt to do so.

2) Detach the frame cover with a 2.5mm (RA5C) or 3mm (RA6C) hex wrench.
   Detach the front housing with a 3mm hex wrench. Be careful not to extend the rod. In the case the rod is extended and pulled out of the main body, it would not be put back to the unit.



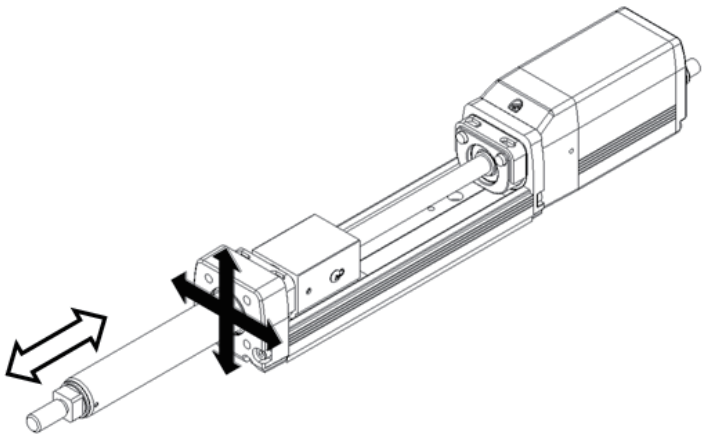
3) Detach the scraper.
Attach the scraper for replacement. Pay attention to the orientation of the scraper.



4) Affix the front housing temporarily. To tune the center of the front housing, pull out the rod as much as possible and tighten the screws to hold the front housing.
Check if any abnormal resistance to the rod move. If there is, redo the center tuning process.

Screws to Hold Front Housing

Model Name	Screw Diameter × Length	Tightening Torque
RA5C	M4×20	2.07 N·m(0.21 kgf·m)
RA6C	M4×25	



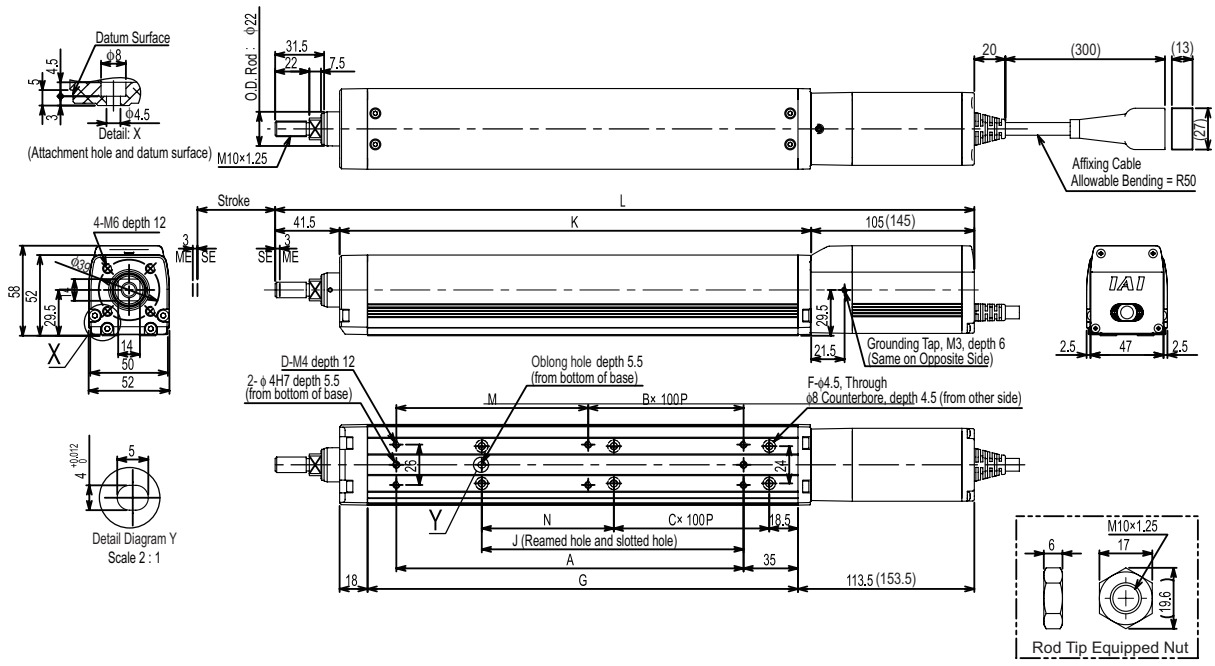
5) Apply the grease to the rod sliding surfaces (inside of main body).
[Refer to 11.6 Grease Supply for the grease to be used.]

6) Attach the frame cover and put the actuator back to the original condition.

14. Appendix

14.1 External Dimensions

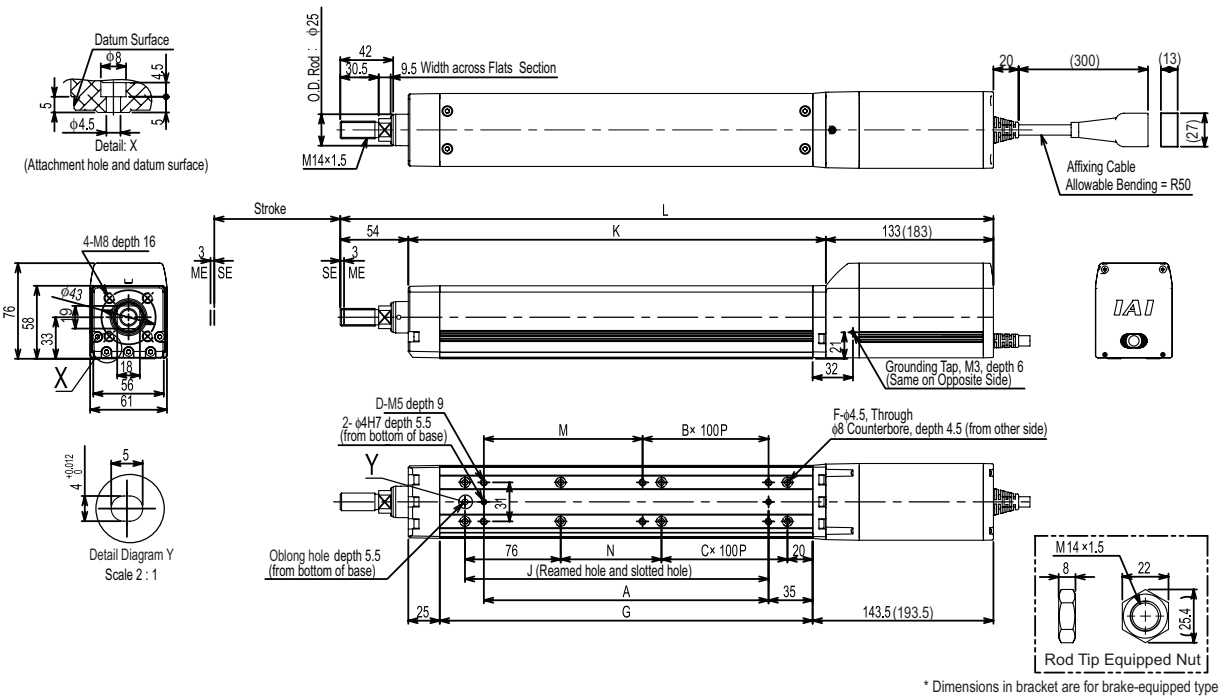
14.1.1 RA5C



* Dimensions in bracket are for brake-equipped type

Stroke	L		A	B	C	D	F	G	J	K	M	N	Mass [kg]	
	w/o Brake	With Brake											w/o Brake	With Brake
50	300	340	73.5	0	0	4	4	127	18.5	153.5	73.5	35	1.9	2.1
100	350	390	123.5	0	0	4	4	177	68.5	203.5	123.5	85	2.1	2.4
150	400	440	173.5	1	0	6	4	227	118.5	253.5	73.5	135	2.4	2.6
200	450	490	223.5	1	1	6	6	277	168.5	303.5	123.5	85	2.7	2.9
250	500	540	273.5	2	1	8	6	327	218.5	353.5	73.5	135	2.9	3.1
300	550	590	323.5	2	2	8	8	377	268.5	403.5	123.5	85	3.2	3.4
350	600	640	373.5	3	2	10	8	427	318.5	453.5	73.5	135	3.4	3.7
400	650	690	423.5	3	3	10	10	477	368.5	503.5	123.5	85	3.7	3.9

14.1.2 RA6C



* Dimensions in bracket are for brake-equipped type

Stroke	L		A	B	C	D	F	G	J	K	M	N	Mass [kg]	
	w/o Brake	With Brake											w/o Brake	With Brake
50	368.5	418.5	76	0	0	4	6	146	91	181.5	76	30	3.4	3.9
100	418.5	468.5	126	0	0	4	6	196	141	231.5	126	80	3.7	4.2
150	468.5	518.5	176	1	0	6	6	246	191	281.5	76	130	4.1	4.6
200	518.5	568.5	226	1	1	6	8	296	241	331.5	126	80	4.4	4.9
250	568.5	618.5	276	2	1	8	8	346	291	381.5	76	130	4.7	5.2
300	618.5	668.5	326	2	2	8	10	396	341	431.5	126	80	5.0	5.5
350	668.5	718.5	376	3	2	10	10	446	391	481.5	76	130	5.4	5.9
400	718.5	768.5	426	3	3	10	12	496	441	531.5	126	80	5.7	6.2
450	768.5	818.5	476	4	3	12	12	546	491	581.5	76	130	6.0	6.5
500	818.5	868.5	526	4	4	12	14	596	541	631.5	126	80	6.3	6.8

15. Warranty

15.1 Warranty Period

One of the following periods, whichever is shorter:
- 18 months after shipment from our company
- 12 months after delivery to the specified location
- 2,500 hours of operation

15.2 Scope of Warranty

Our products are covered by warranty when all of the following conditions are met. Faulty products covered by warranty will be replaced or repaired free of charge:
(1) The breakdown or problem in question pertains to our product as delivered by us or our authorized dealer.
(2) The breakdown or problem in question occurred during the warranty period.
(3) The breakdown or problem in question occurred while the product was in use for an appropriate purpose under the conditions and environment of use specified in the Operation Manual and catalog.
(4) The breakdown or problem in question was caused by a specification defect or problem, or by the poor quality of our product.

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

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

15.3 Honoring the Warranty

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

15.4 Limited Liability

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

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

(1) If our product is combined with another product or any system, device, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc. In such a case we will not be liable for the conformance of our product with the applicable standards, etc.

(2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications. Contact us if you must use our product for any of these applications:
   [1] Medical equipment pertaining to maintenance or management of human life or health
   [2] A mechanism or mechanical equipment intended to move or transport people (such as a vehicle, railway facility or aviation facility)
   [3] Important safety parts of mechanical equipment (such as safety devices)
   [4] Equipment used to handle cultural assets, art or other irreplaceable items

(3) Contact us at the earliest opportunity if our product is to be used in any condition or environment that differs from what is specified in the catalog or Operation Manual.

15.6 Other Items Excluded from Warranty

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

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

Change History

Revision Date	Description of Revision
September 2011	First edition
November 2011	Second edition Pg. 32 Caution note added regarding cable
February 2012	Third edition Pg. 11 Graph added for stroke and maximum speed limits when high-output setting is ineffective Pg. 17 to 18 Graph added for maximum acceleration and transportable weight when high-output setting is ineffective Pg. 54, 55 Mass added
March 2012	Fourth edition Pg. 7 Caution note added saying “Do not crash the rod to an obstacle with high speed” Pg. 28 Note added to tell platform should have a structure with enough stiffness Pg. 28, 30, 31, 32 Note changed to 1.8 times more of the nominal diameter for the length of thread engagement on aluminum

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