ROBO CYLINDER

ROBO Cylinder
RCA2/RCA2CR/RCA2W Actuator
Rod Type
Instruction Manual

Eighteenth Edition

Standard type RCA2

Slim types:	[Slim Small ROBO Cylinders] RC2AC, RA2AR
Short types (nut affixing types):	[Slim Small ROBO Cylinders] RN3NA, RN4NA RN3N, RN4N
Short types (tapped-hole mounting types):	[Slim Small ROBO Cylinders] RP3NA, RP4NA RP3N, RP4N
Single guide types:	[Slim Small ROBO Cylinders] GS3NA, GS4NA GS3N, GS4N
Double guide types:	[Slim Small ROBO Cylinders] GD3NA, GD4ND GD3N, GD4N
Slide unit types:	[Slim Small ROBO Cylinders] SD3NA, SD4NA SD3N, SD4N

Cleanroom type RCA2CR Dust-proof type RCA2W

Short types (nut affixing types):	[Slim Small ROBO Cylinders] RN3NA, RN4NA
Short types (tapped-hole mounting types):	[Slim Small ROBO Cylinders] RP3NA, RP4NA
Single guide types:	[Slim Small ROBO Cylinders] GS3NA, GS4NA
Double guide types:	[Slim Small ROBO Cylinders] GD3NA, GD4ND
Slide unit types:	[Slim Small ROBO Cylinders] SD3NA, SD4NA

RCA Size 3 and 4 >> see page 157

IAI America, Inc.

ROBO CYLINDER

Please Read Before Use

Thank you for purchasing our product.

This Instruction Manual describes all necessary information items to operate this product safely such as the operation procedure, structure and maintenance procedure.

Before the operation, read this manual carefully and fully understand it to operate this product safely. The enclosed DVD in this product package includes the Instruction Manual for this product. For the operation of this product, print out the necessary sections in the Instruction Manual or display them using the personal computer.

After reading through this manual, keep this Instruction Manual at hand so that the operator of this product can read it whenever necessary.

[Important]

- This Instruction Manual is original.
- The product cannot be operated in any way unless expressly specified in this Instruction Manual. IAI shall assume no responsibility for the outcome of any operation not specified herein.
- Information contained in this Instruction 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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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 the product outside the specifications. Failure to do so may considerably shorten the life of the product. ● Do not use it in any of the following environments. 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 ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

No.	Operation Description	Description
2	Transportation	● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. ● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the instruction manual for each model. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment's capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	(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. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	(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 ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm^2 (AWG20 or equivalent) or more for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).

No.	Operation Description	Description
4	Installation and Start	(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	● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. ● Make sure to operate automatic operation start from outside of the safety protection fence. ● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

No.	Operation Description	Description
8	Maintenance and Inspection	● 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. ● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation. ● Pay attention not to lose the cover or untightened screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.
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. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure the safety.

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the 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

Caution in Handling

1. Make sure to follow the usage condition, environment and specification range of the product.
   In case it is not secured, it may cause a drop in performance or malfunction of the product.

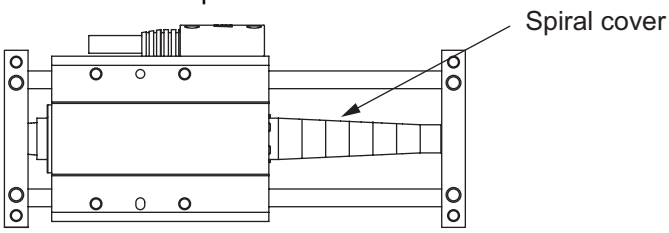
2. Do not conduct any treatment or operation that is not stated in this instruction manual.

3. It is recommended to apply our products for the wiring between the actuator and the controller.

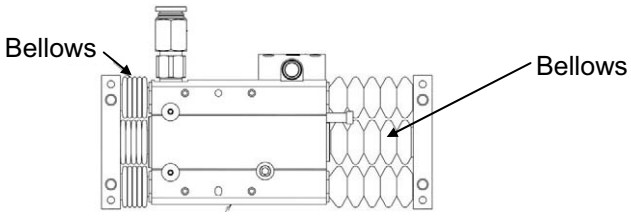
4. Do not attempt to establish the settings for the speed and acceleration/deceleration above the maximum specification.
   An operation with speed and acceleration/deceleration beyond the allowable range may cause an abnormal noise, vibration, malfunction or shortened life.
   Setting the acceleration/deceleration exceeding the applicable rating may also cause creep.

5. Grease film may run out after back-and-forth operations over a short distance.
   Grease film may run out if the actuator is moved back and forth continuously over a distance of 20 mm or less. For reference, have 5 cycles of back and forth operation in full-stroke range after 5,000 to 10,000 cycles of short-distanced back and forth operation.

6. Do not apply impact to the spiral cover with tools or push it hard with fingers. Do not apply high load on the bellows.
   Spiral cover is a thin plate rolled in spiral form. Hitting it with tools or pushing it with fingers may deform the cover. Do not attempt to do so.



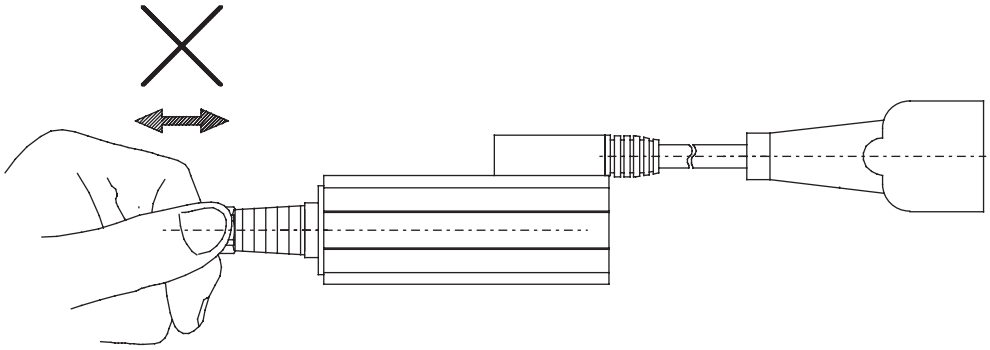
   The bellows are made of rubber. High load on them may cause breakage.



7. Do not apply any external force to the rod from the directions other than the rod operating directions.
   Please do not apply any external force from other than rod moving direction (radial load) to the rod. Any perpendicular or radial force to the rod may cause damage to the actuator or operation problem. Equip an actuator with a guide or an external guide if any external force from other direction than the rod moving direction is applied.

8. For Short Type (RP*N(A)/RN*N(A)), do not attempt to operate the rod back and forth without the guide.

> ⚠ Caution: Operating back and forth from the rod side without the guide would apply unbalanced load to the feed screw shaft, which may result in a bend of the screw shaft or damage to the internal mechanism.



9. Even after attaching the guide, do not move back and forth from the load side (rod side) for the low lead types (Lead 1mm and 2mm).

> ⚠ Caution: You will feel high resistance if you hold the rod and try to slide it with hand for Low Lead Type. Moving it forcefully would apply too much load to the feed screw and may result in the cause of operational failure or destruction of the product. For the types with no brake, twist the rotation shaft with a screwdriver from the back side to move the actuator.
> [Refer to 4.4 “How to Move Rod by Hand”]
> For the standard type equipped with a brake, cleanroom type and dust-proof type there is no slit on the shaft. Connect the controller and move the table.

10. For the brake-equipped (option), there is a risk of the body temperature getting high during operation.
    The surface temperature on the aluminum frame rises in approximately 30degC to the ambient temperature.

> ⚠ Caution: Be careful not to get burnt when touching the actuator.

11. If it is necessary to change the orientation of cable ejection of the connector after the product has already been delivered, please contact IAI.
    In case that you change the orientation of cable ejection by your own, we will not be able to guarantee the product as there is a concern of malfunction due to a reason such as pinching of wire inside the motor unit.

12. Make sure to attach the actuator properly by following this instruction manual.
    Using the product with the actuator not being certainly retained or affixed may cause abnormal noise, vibration, malfunction or shorten the product life.

13. Make sure to attach the guides on cleanroom type and dust-proof type with short length specification (RP*NA/RN*NA).
    Make sure to attach the guides when using cleanroom type and dust-proof type with short length specification (RP*NA/RN*NA) even though the bellows function as a simple guides and operation can be conducted without attaching the guides. Performing operation without guides has to be limited to the first operation check only, and should be restricted to 10 times at maximum of home-return operation and 100 times at maximum of back and forth operation. Keeping operation can cause looseness to the bellows attachment.

14. Do not attempt to conduct air purging for dust-proof type.
    Conducting air purging may cause to break the bellows or drop the life of them remarkably.

International Standards Compliances

This actuator complies with the following overseas standard.
Refer to Overseas Standard Compliance Manual (ME0287) for more detailed information.

RoHS Directive	CE Marking
○	○

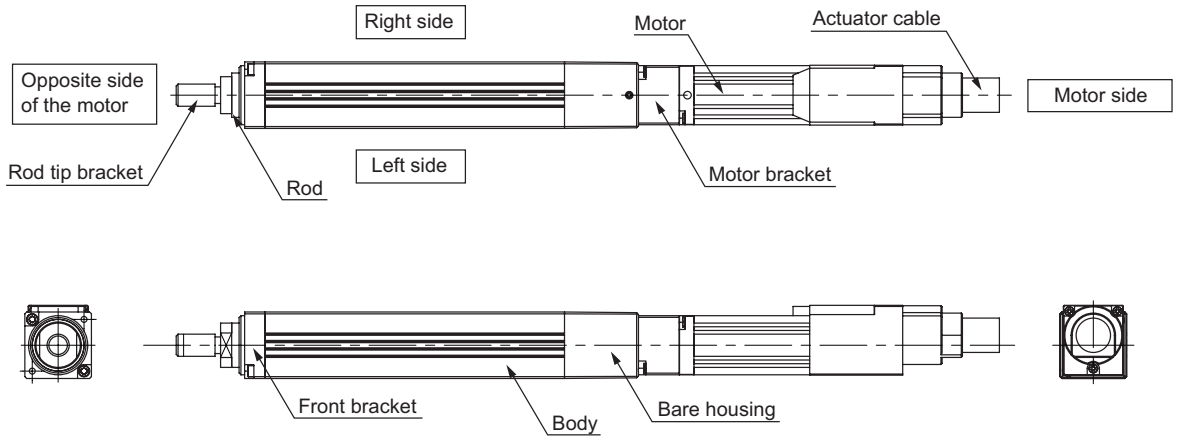
Names of the Parts

In this Instruction 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.

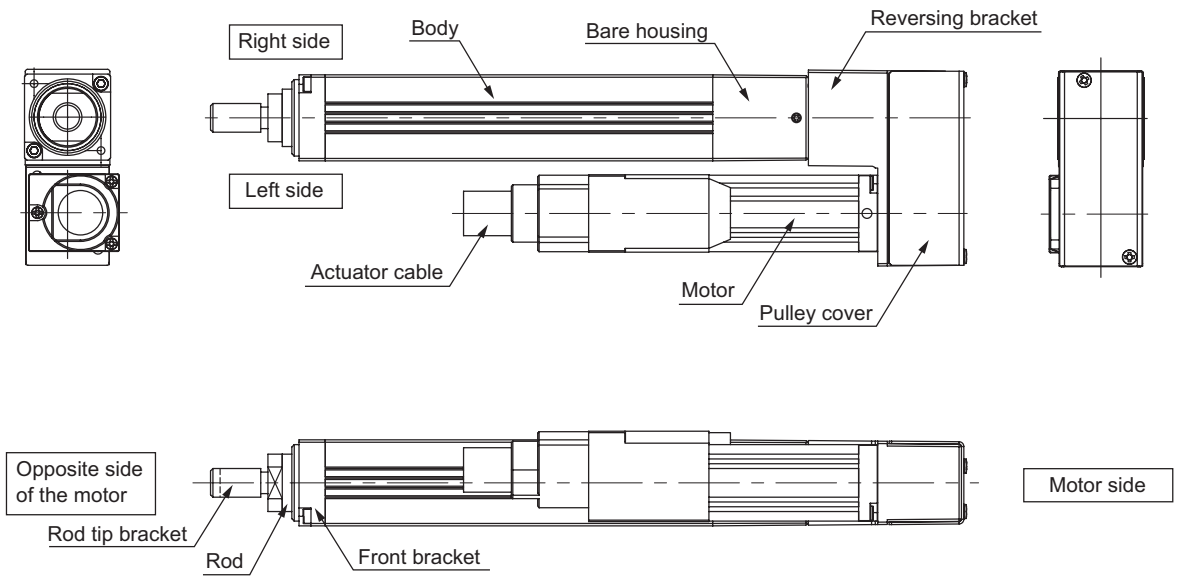
1. Slim Types

RCA2-RA2AC (Motor coupling types),
RA2AR (Motor reversing types)

• RA2AC

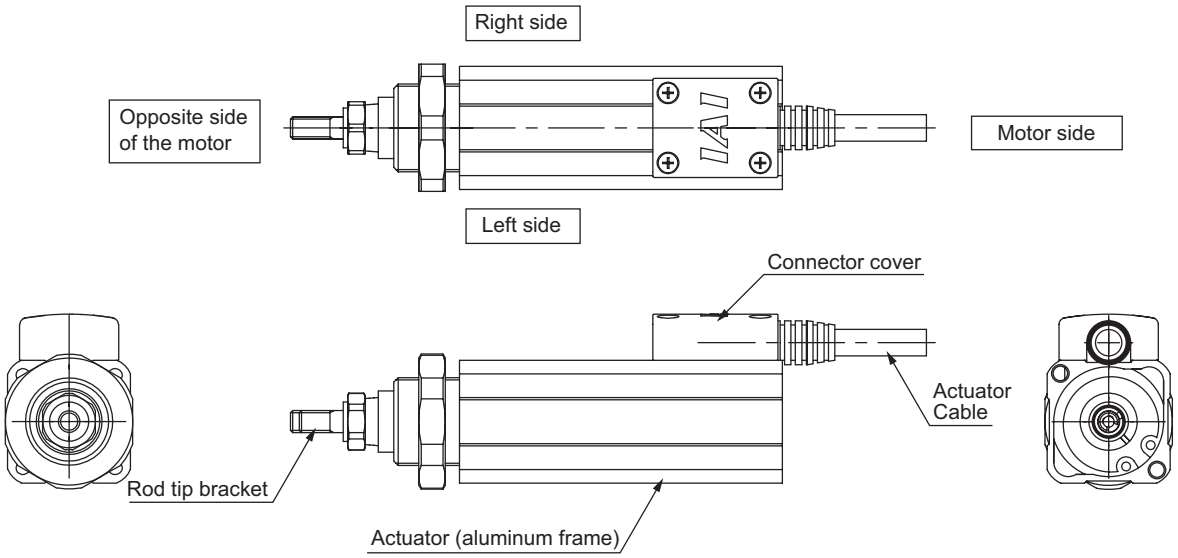


• RA2AR

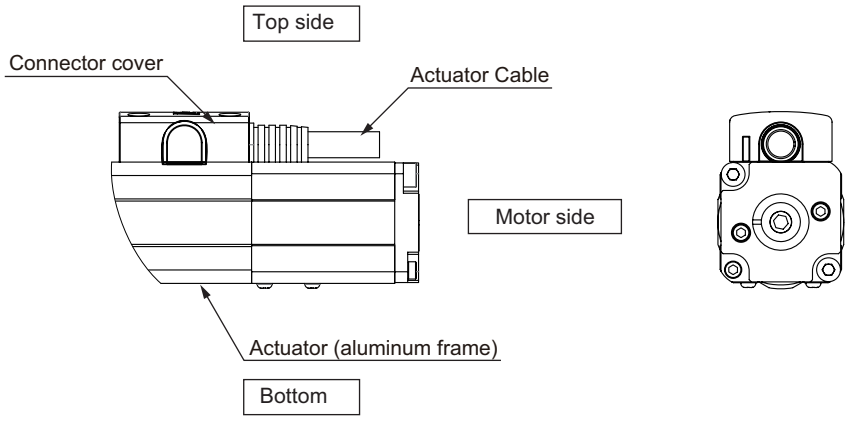


2. Short Types (Nut Affixing Types)

• Without brake
RCA2-RN3NA/RN3N (Lead screw, ball screw),
RCA2-RN4NA/RN4N (Lead screw, ball screw)

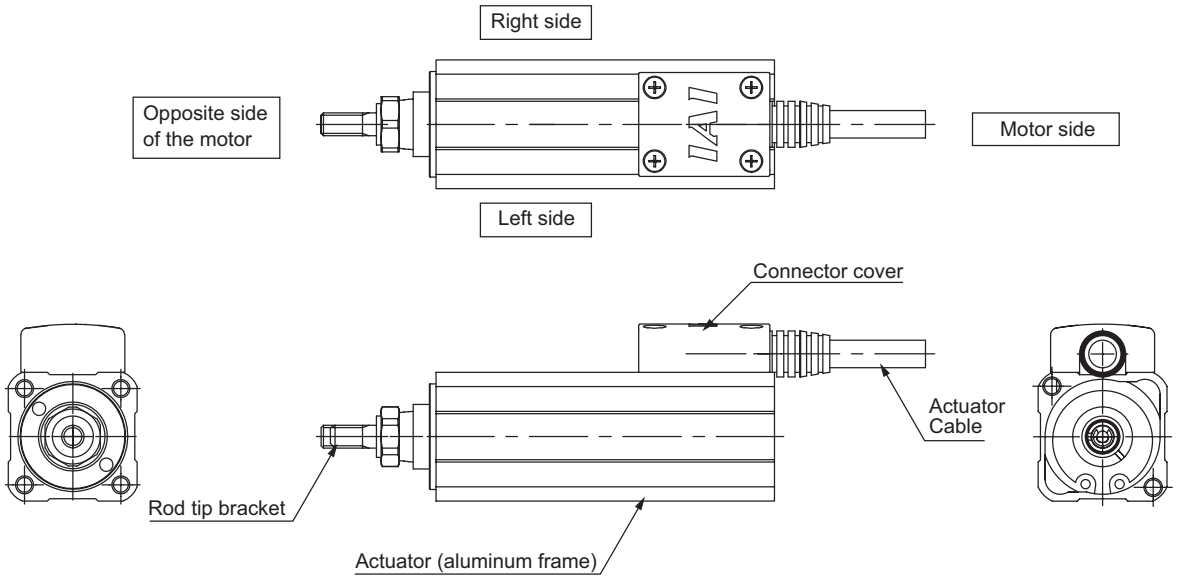


• Brake-equipped type
RCA2-RN3NA (Lead screw, ball screw)
RCA2-RN4NA (Lead screw, ball screw)

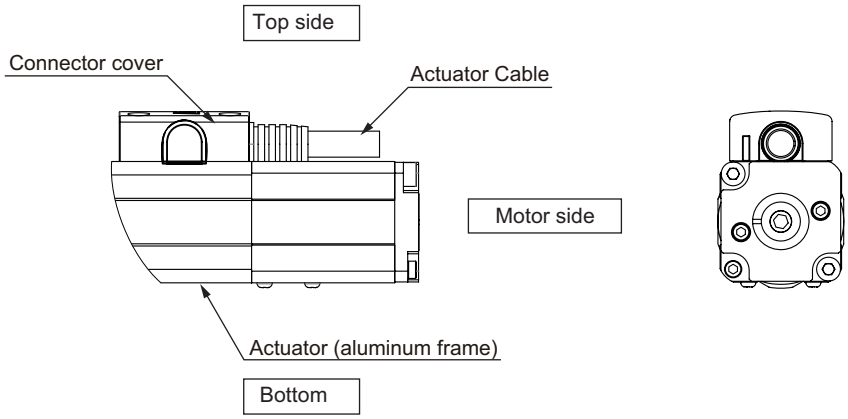


3. Short Types (Tapped-hole Mounting Types)

• Without brake
RCA2-RP3NA/RP3N (Lead screw, ball screw),
RCA2-RP4NA/RP4N (Lead screw, ball screw)

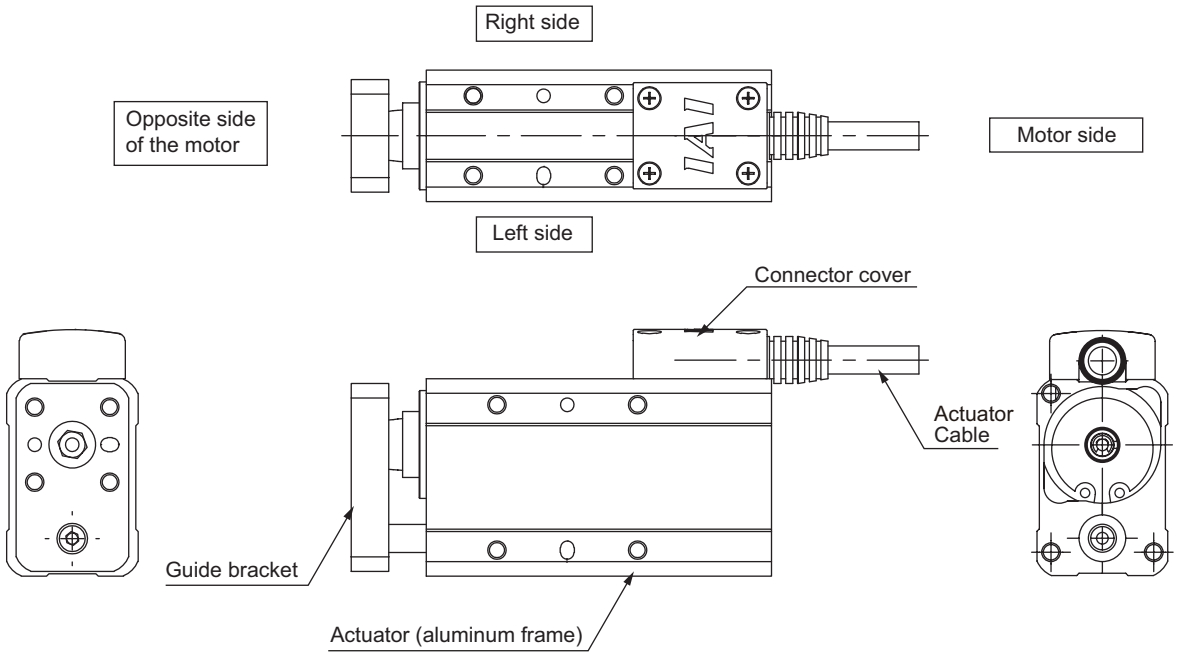


• Brake-equipped type
RCA2-RP3NA (Lead screw, ball screw),
RCA2-RP4NA (Lead screw, ball screw)

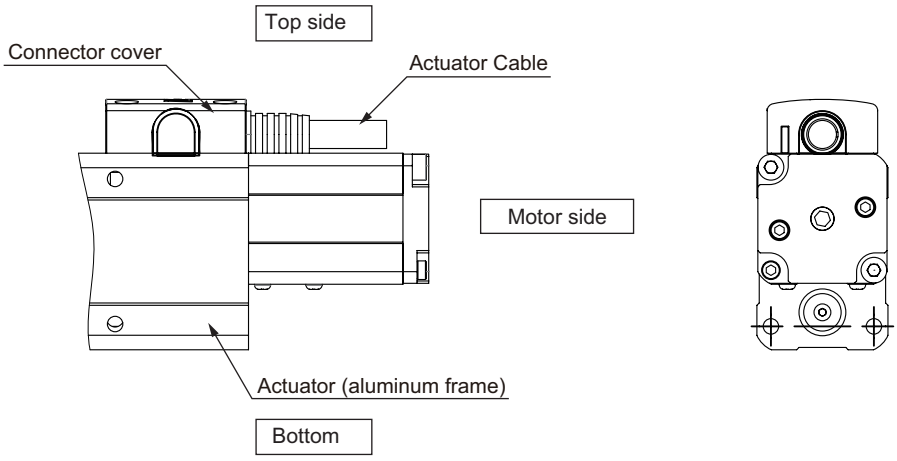


4. Single Guide Types

• Without brake
RCA2-GS3NA/GS3N (Lead screw, ball screw),
RCA2-GS4NA/GS4N (Lead screw, ball screw)

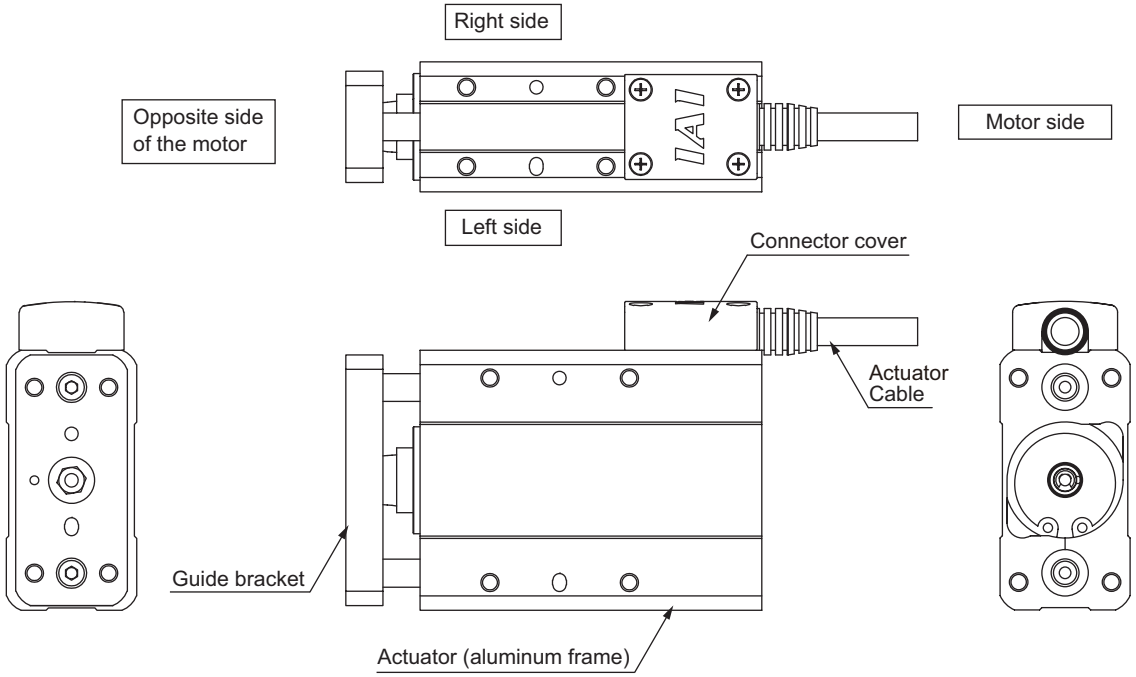


• Brake-equipped type
RCA2-GS3NA (Lead screw, ball screw),
RCA2-GS4NA (Lead screw, ball screw)

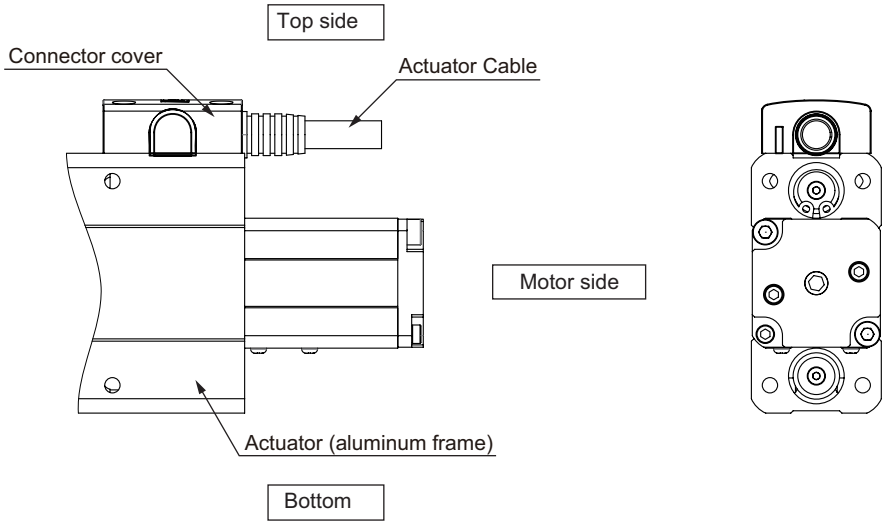


5. Double Guide Types

• Without brake
RCA2-GD3NA/GD3N (Lead screw, ball screw),
RCA2-GD4NA/GD4N (Lead screw, ball screw)

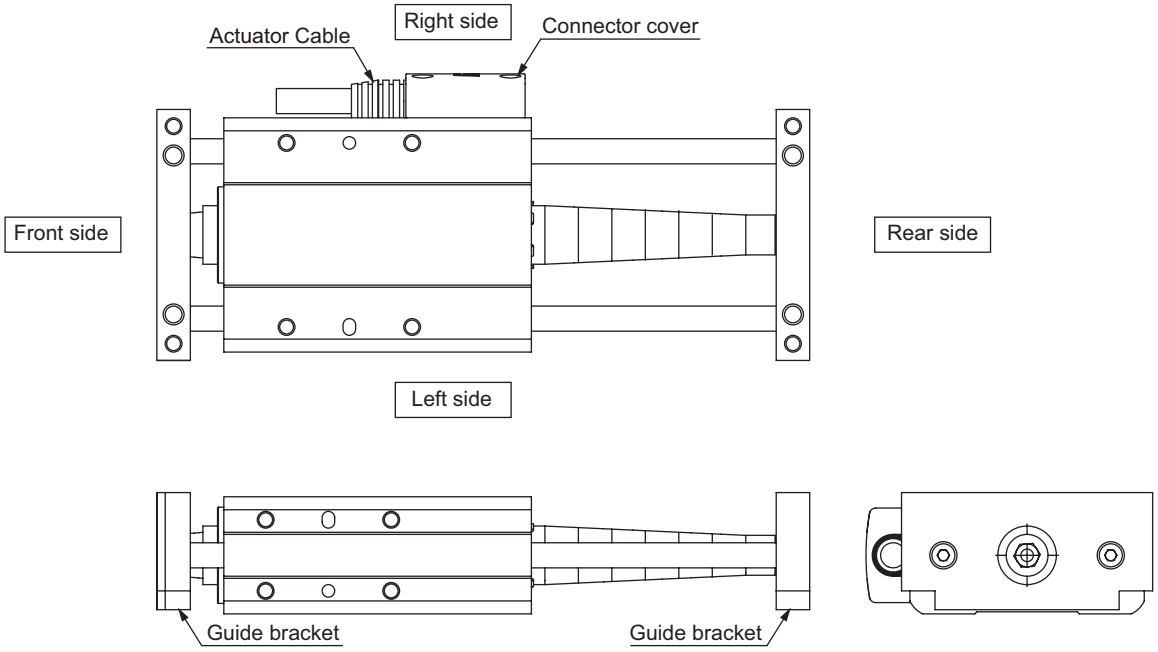


• Brake-equipped type
RCA2-GD3NA (Lead screw, ball screw),
RCA2-GD4NA (Lead screw, ball screw)



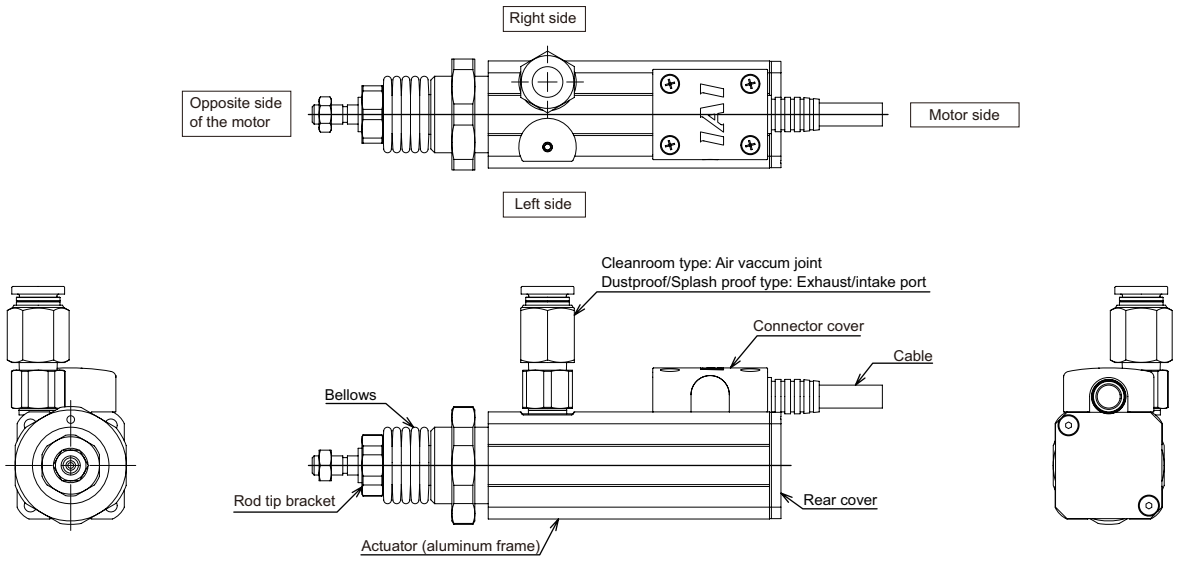
6. Slide Unit Types

• Without brake
RCA2-SD3NA/SD3N (Lead screw, ball screw),
RCA2-SD4NA/SD4N (Lead screw, ball screw)



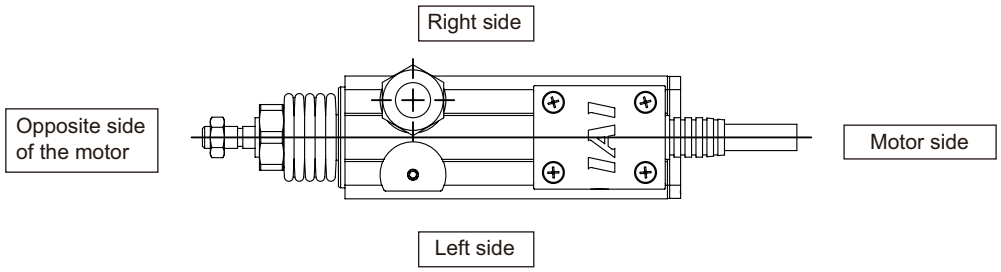
7. Cleanroom Type, Dust-proof Type Short Types (Nut Affixing Types)

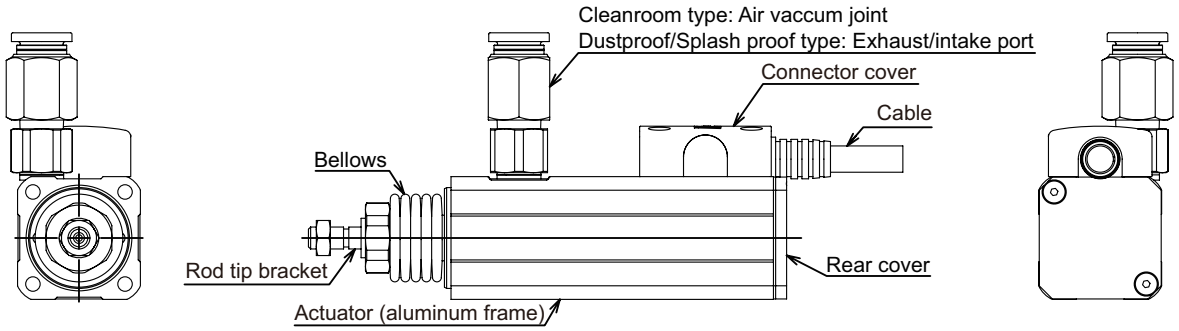
• Without brake
RCA2CR, RCA2W-RN3NA (Ball screw),
RN4NA (Ball screw)



8. Cleanroom Type, Dust-proof Type Short Types (Tapped-hole Mounting Types)

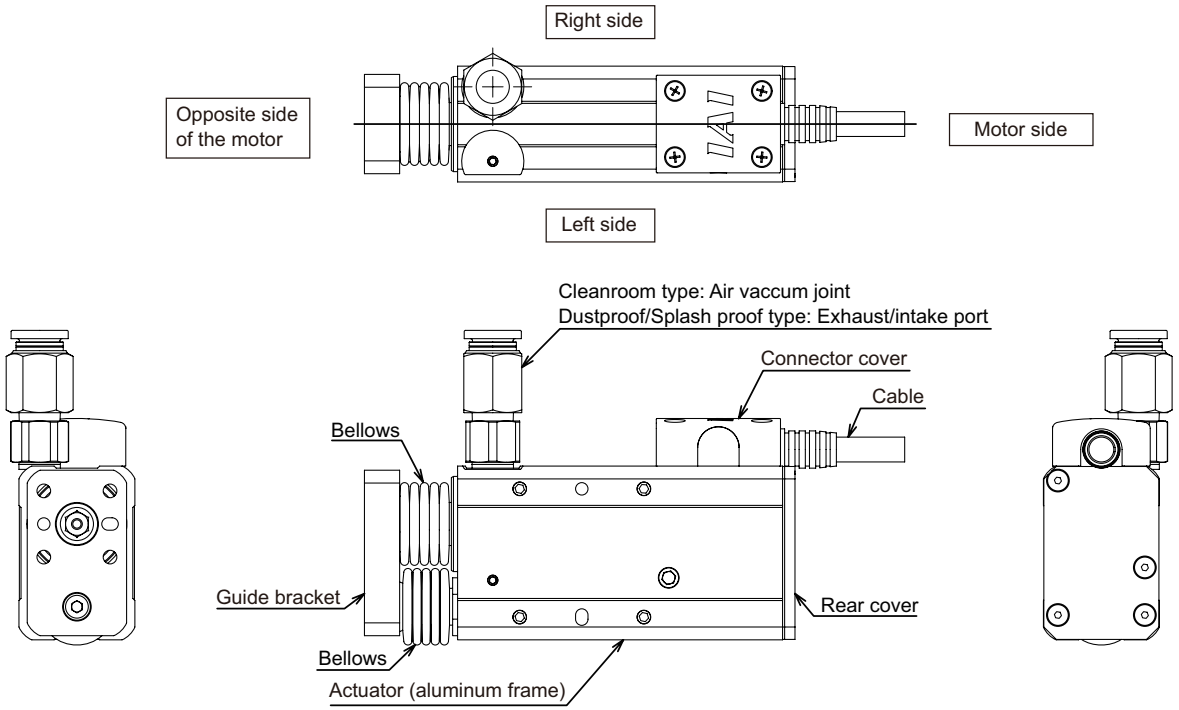
• Without brake
RCA2CR, RCA2W-RP3NA (Ball screw),
RP4NA (Ball screw)





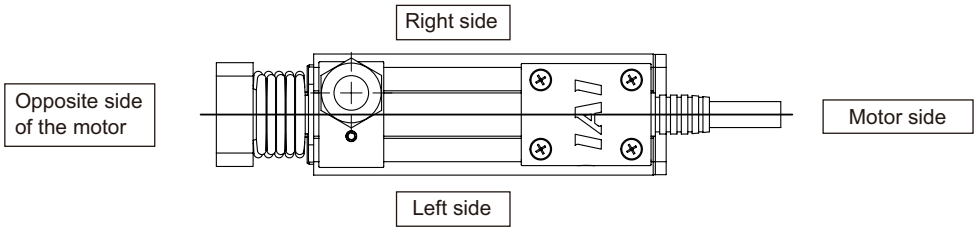
9. Cleanroom Type, Dust-proof Type Single Guide Types

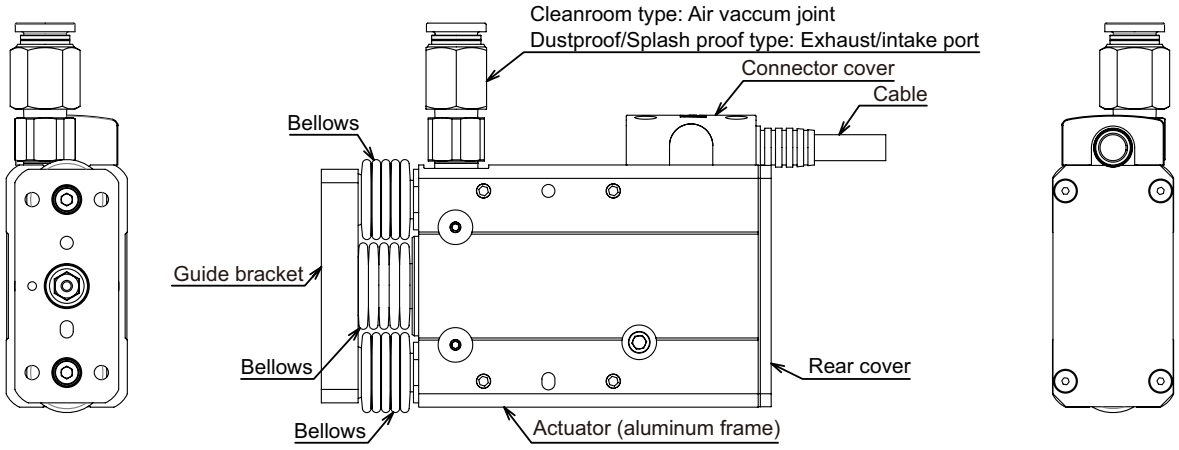
• Without brake
RCA2CR, RCA2W-GS3NA (Ball screw),
GS4NA (Ball screw)



10. Cleanroom Type, Dust-proof Type Double Guide Types

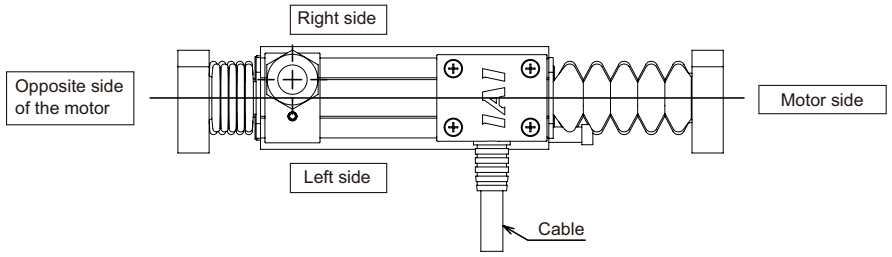
• Without brake
RCA2CR, RCA2W-GD3NA (Ball screw),
GD4NA (Ball screw)

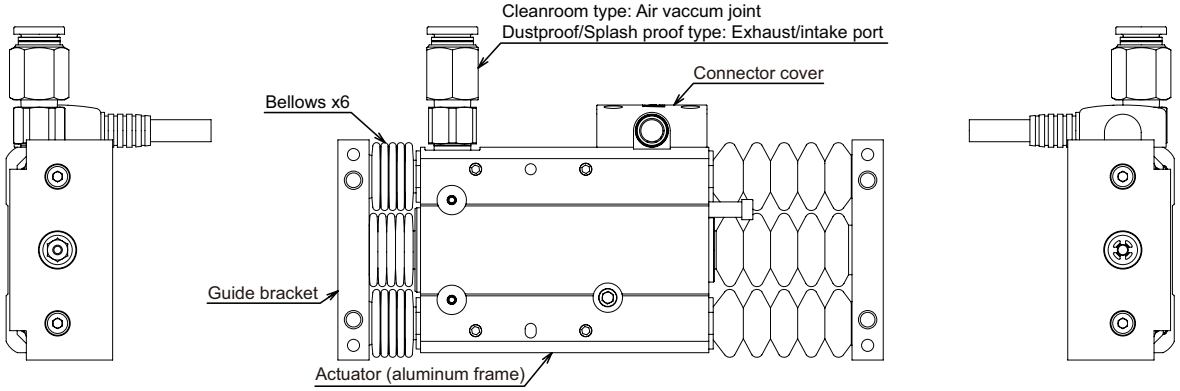




11. Cleanroom Type, Dust-proof Type Slide Unit Types

• Without brake
RCA2CR, RCA2W-SD3NA (Ball screw),
RCA2CR, RCA2W-SD4NA (Ball screw)





1. Specifications Check

1.1 Checking the Product

The standard configuration of this product is comprised of the following parts.
See the component list for the details of the enclosed components. If you find any faulty or missing parts, contact your local IAI distributor.

1.1.1 Parts

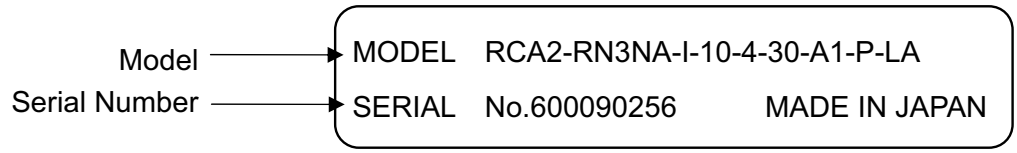
No.	Name	Model number	Quantity	Remarks
1	Actuator	Refer to “How to Read the Model Nameplate” and “How to Read the Model Number.”	1	
Accessories				
2	Motor • encoder cables (Note1)		1	
3	First Step Guide		1	
4	Instruction Manual (DVD)		1	
5	Safety Guide		1	

Note1 The motor • encoder cables differ between the standard model and robot cable.
[Refer to 1.4 “Motor • Encoder Cables.”]

1.1.2 Instruction Manuals for the Controllers Related to this Product

No.	Name	Control No.
1	Instruction Manual for ASEL Controller	ME0165
2	Instruction Manual for ACON-CA Controller	ME0326
3	Instruction Manual for ACON-C/CG/CF Controller	ME0176
4	Instruction Manual for ACON-CY Controller	ME0167
5	Instruction Manual for ACON-SE Controller	ME0171
6	Instruction Manual for ACON-PL/PO Controller	ME0166
7	Instruction Manual for MEC Controller	ME0245
8	Instruction Manual for PSEP/ASEP/DSEP Controller	ME0267
9	Instruction Manual for MSEP Controller	ME0299
10	Instruction Manual for ROBONET	ME0208
11	Instruction Manual for PC Software IA-101-X-MW/IA-101-X-USBMW	ME0154
12	Instruction Manual for Software RCM-101-MW/RCM-101-USB	ME0155
13	Instruction Manual for MEC PC Software	ME0248
14	Instruction Manual for Teaching Pendant SEL-T/TD	ME0183
15	Instruction Manual for Teaching Pendant CON-T/TG	ME0178
16	Instruction Manual for Touch Panel Teaching Pendant CON-PT/PD/PG	ME 0227
17	Instruction Manual for Touch Panel Teaching CON-PTA/PDA/PGA	ME0295
18	Instruction Manual for Touch Panel Teaching TB-01, TB-01D, TB-01DR Applicable for Program Controller	ME0325
19	Instruction Manual for Touch Panel Teaching TB-01, TB-01D, TB-01DR Applicable for Position Controller	ME0324
20	Instruction Manual for Dedicated ASEP/PSEP Touch Panel Teaching SEP-PT	ME0217
21	Instruction Manual for Touch Panel Display RCM-PM-01	ME0182

1.1.3 How to Read Model Nameplate



1.1.4 How to Read Model

RCA2 - RN3NA – I – 10 – 4 – 30 - A1 – P – LA – **

<Series name>
Standard type RCA2
Cleanroom type RCA2CR
Dust-proof type RCA2W

<Type>
Slim types
RA2AC (Motor coupling types)
RA2AR (Motor reversing types)
Short types
(Nut affixing types)
RN3NA, RN3N
RN4NA, RN4N
Short types
(Tapped-hole mounting types)
RP3NA, RP3N
RP4NA, RP4N
Single guide types
GS3NA, GS3N
GS4NA, GS4N
Double guide types
GD3NA, GD3N
GD4NA, GD4N
Slide unit types
SD3NA, SD3N
SD4NA, SD4N

<Encoder type>
I: Incremental

<Motor type>
5 (5W) : RA2AC, RA2AR
10 (10W) : RN3NA, RP3NA, GS3NA, GD3NA, SD3NA, RN3N, RP3N, GS3N, GD3N, SD3N
20 (20W) : RN4NA, RP4NA, GS4NA, GD4NA, SD4NA, RN4N, RP4N, GS4N, GD4N, SD4N

Identification for IAI use only (Note 1)

<Option>
B : Brake-equipped
A2 : Connector cable exit direction changed
LA : Low power consumption type
ML : Motor left reversing type
MR : Motor right reversing type
MT : Motor top reversing type
NM : Reversed-home specification
VL : L-Shaped Type Vacuum Joint
WP : IP52 Applicable Type

<Cable length>
N : None
P : 1m
S : 3m
M : 5m
X□□ : Specified length

<Applicable controller>
A1 : ASEL, ACON-C/CG , ACON-CY, ACON-SE, ACON-PL/PO
A3 : AMEC, ASEP, MSEP
A5 : ACON-CA

<Stroke>
[Refer to 1.2 “Specifications”]

<Lead>
RA2AC, RA2AR
1/2/4
RN3NA, RP3NA, GS3NA, GD3NA, SD3NA, RN3N, RP3N, GS3N, GD3N
SD3N (Lead screw)
1S/2S/4S
RN3NA, RP3NA, GS3NA, GD3NA, SD3NA, RN3N, RP3N, GS3N, GD3N
SD3N (Ball screw)
1/2/4
RN4NA, RP4NA, GS4NA, GD4NA, SD4NA, RN4N, RP4N, GS4N, GD4N
SD4N (Lead screw)
2S/4S/6S
RN4NA, RP4NA, GS4NA, GD4NA, SD4NA, RN4N, RP4N, GS4N, GD4N
SD4N (Ball screw)
2/4/6

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

1.2 Specification

1.2.1 Speed

Speed limits (Unit: mm/s)

Model	Motor Type	Lead [mm]	Minimum Speed	Stroke [mm]				
				25	30	50	75	100
RA2AC	5W	1	1.25	50	-	50		
		2	2.5	100	-	100		
		4	5	180	-	200		
RA2AR	5W	1	1.25	50	-	50		
		2	2.5	100	-	100		
		4	5	180	-	200		
RN3NA (Lead screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
RN3NA (Ball screw)	10W	1	0.95	-	50	50	-	-
		2	1.90	-	100	100	-	-
		4	3.81	-	200	200	-	-
RN4NA (Lead screw)	20W	2	0.95	-	100	-	-	-
		4	1.90	-	200	-	-	-
		6	3.81	-	220	-	-	-
RN4NA (Ball screw)	20W	2	0.95	-	100	100	-	-
		4	1.90	-	200	200	-	-
		6	3.81	-	270<220>	300	-	-
RP3NA (Lead screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
RP3NA (Ball screw)	10W	1	1.90	-	50	50	-	-
		2	3.81	-	100	100	-	-
		4	3.81	-	200	200	-	-
PR4NA (Lead screw)	20W	2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
		6	5.72	-	220	-	-	-
RP4NA (Ball screw)	20W	2	1.90	-	100	100	-	-
		4	3.81	-	200	200	-	-
		6	5.72	-	270<220>	300	-	-
GS3NA (Lead screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
GS3NA (Ball screw)	10W	1	0.95	-	50	50	-	-
		2	1.90	-	100	100	-	-
		4	3.81	-	200	200	-	-
GS4NA (Lead screw)	20W	2	0.95	-	100	-	-	-
		4	1.90	-	200	-	-	-
		6	3.81	-	220	-	-	-
GS4NA (Ball screw)	20W	2	0.95	-	100	100	-	-
		4	1.90	-	200	200	-	-
		6	3.81	-	270<220>	300	-	-
GD3NA (Lead screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-

The maximum speed may not be reached depending on the acceleration/deceleration setting.
Values in < > are for when mounted vertically.

Model	Motor Type	Lead [mm]	Minimum Speed	Stroke [mm]				
				25	30	50	75	100
GD3NA (Ball screw)	10W	1	0.95	-	50	50	-	-
		2	1.90	-	100	100	-	-
		4	3.81	-	200	200	-	-
GD4NA (Lead screw)	20W	2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
		6	5.72	-	220	-	-	-
GD4NA (Ball screw)	20W	2	1.90	-	100	100	-	-
		4	3.81	-	200	200	-	-
		6	5.72	-	270<220>	300	-	-
RN3N (Lead screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
RN3N (Ball screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
RN4N (Lead screw)	20W	2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
		6	5.72	-	220	-	-	-
RN4N (Ball screw)	20W	2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
		6	5.72	-	270<220>	-	-	-
RP3N (Lead screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
RP3N (Ball screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
RP4N (Lead screw)	20W	2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
		6	5.72	-	220	-	-	-
RP4N (Ball screw)	20W	2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
		6	5.72	-	270<220>	-	-	-
GS3N (Lead screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
GS3N (Ball screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
GS4N (Lead screw)	20W	2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
		6	5.72	-	220	-	-	-
GS4N (Ball screw)	20W	2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
		6	5.72	-	270<220>	-	-	-
GD3N (Lead screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
GD3N (Ball screw)	10W	1	0.95	-	50	-	-	-
		2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-

The maximum speed may not be reached depending on the acceleration/deceleration setting.
Values in < > are for when mounted vertically.

Model	Motor Type	Lead [mm]	Minimum Speed	Stroke [mm]				
				25	30	50	75	100
GD4N (Lead screw)	20W	2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
		6	5.72	-	220	-	-	-
GD4N (Ball screw)	20W	2	1.90	-	100	-	-	-
		4	3.81	-	200	-	-	-
		6	5.72	-	270<220>	-	-	-
SD3NA SD3N (Lead screw)	10W	1	0.95	50	-	50	-	-
		2	1.90	100	-	100	-	-
		4	3.81	200	-	200	-	-
SD3NA SD3N (Ball screw)	10W	1	0.95	50	-	50	-	-
		2	1.90	100	-	100	-	-
		4	3.81	200	-	200	-	-
SD4NA SD4N (Lead screw)	20W	2	0.95	100	-	100	100	-
		4	1.90	200	-	200	200	-
		6	3.81	200	-	300	300	-
SD4NA SD4N (Ball screw)	20W	2	0.95	100	-	100	100	-
		4	1.90	200	-	200	200	-
		6	3.81	240<200>	-	300	300	-

The maximum speed may not be reached depending on the acceleration/deceleration setting.
Values in < > are for when mounted vertically.

⚠ Caution: Do not set a speed or acceleration/deceleration exceeding the applicable rating. Doing so may result in vibration, failure or shorter life.
Setting the acceleration/deceleration exceeding the applicable rating may also cause creep.

1.2.2 Acceleration and Payloads

Model	Motor type	Lead [mm]	Rated acceleration [G]		Payload [kg]	Rated thrust [N]
RA2AC	5W	1	Horizontal	0.3	2	85.5
			Vertical	0.3	1	
		2	Horizontal	0.3	1	42.3
			Vertical	0.3	0.5	
		4	Horizontal	0.3	0.5	21.4
			Vertical	0.3	0.25	
RA2AR	5W	1	Horizontal	0.3	2	85.5
			Vertical	0.3	1	
		2	Horizontal	0.3	1	42.3
			Vertical	0.3	0.5	
		4	Horizontal	0.3	0.5	21.4
			Vertical	0.3	0.25	
RN3NA RN3N (Lead screw)	10W	1	Horizontal	0.2	1	100.5
			Vertical	0.2	0.5	
		2	Horizontal	0.2	0.5	50.3
			Vertical	0.2	0.25	
		4	Horizontal	0.2	0.25	25.1
			Vertical	0.2	0.125	
RN3NA RN3N (Ball screw)	10W	1	Horizontal	0.2	3	170.9
			Vertical	0.2	1	
		2	Horizontal	0.3	1.5	85.5
			Vertical	0.2	0.5	
		4	Horizontal	0.3	0.75	42.7
			Vertical	0.2	0.25	
RN4NA RN4N (Lead screw)	20W	2	Horizontal	0.2	1	59.7
			Vertical	0.2	0.5	
		4	Horizontal	0.2	0.5	29.8
			Vertical	0.2	0.25	
		6	Horizontal	0.2	0.25	19.9
			Vertical	0.2	0.125	
RN4NA RN4N (Ball screw)	20W	2	Horizontal	0.2	6	101.5
			Vertical	0.2	1.5	
		4	Horizontal	0.3	3	50.7
			Vertical	0.2	0.75	
		6	Horizontal	0.3	2	33.8
			Vertical	0.2	0.5	

Model	Motor type	Lead [mm]	Rated acceleration [G]		Payload [kg]	Rated thrust [N]
RP3NA RP3N (Lead screw)	10W	1	Horizontal	0.2	1	100.5
			Vertical	0.2	0.5	
		2	Horizontal	0.2	0.5	50.3
			Vertical	0.2	0.25	
		4	Horizontal	0.2	0.25	25.1
			Vertical	0.2	0.125	
RP3NA RP3N (Ball screw)	10W	1	Horizontal	0.2	3	170.9
			Vertical	0.2	1	
		2	Horizontal	0.3	1.5	85.5
			Vertical	0.2	0.5	
		4	Horizontal	0.3	0.75	42.7
			Vertical	0.2	0.25	
RP4NA RP4N (Lead screw)	20W	2	Horizontal	0.2	1	59.7
			Vertical	0.2	0.5	
		4	Horizontal	0.2	0.5	29.8
			Vertical	0.2	0.25	
		6	Horizontal	0.2	0.25	19.9
			Vertical	0.2	0.125	
RP4NA RP4N (Ball screw)	20W	2	Horizontal	0.2	6	101.5
			Vertical	0.2	1.5	
		4	Horizontal	0.3	3	50.7
			Vertical	0.2	0.75	
		6	Horizontal	0.3	2	33.8
			Vertical	0.2	0.5	
GS3NA GS3N (Lead screw)	10W	1	Horizontal	0.2	1	100.5
			Vertical	0.2	0.5	
		2	Horizontal	0.2	0.5	50.3
			Vertical	0.2	0.25	
		4	Horizontal	0.2	0.25	25.1
			Vertical	0.2	0.125	
GS3NA GS3N (Ball screw)	10W	1	Horizontal	0.2	3	170.9
			Vertical	0.2	1	
		2	Horizontal	0.3	1.5	85.5
			Vertical	0.2	0.5	
		4	Horizontal	0.3	0.75	42.7
			Vertical	0.2	0.25	
GS4NA GS4N (Lead screw)	20W	2	Horizontal	0.2	1	59.7
			Vertical	0.2	0.5	
		4	Horizontal	0.2	0.5	29.8
			Vertical	0.2	0.25	
		6	Horizontal	0.2	0.25	19.9
			Vertical	0.2	0.125	
GS4NA GS4N (Ball screw)	20W	2	Horizontal	0.2	6	101.5
			Vertical	0.2	1.5	
		4	Horizontal	0.3	3	50.7
			Vertical	0.2	0.75	
		6	Horizontal	0.3	2	33.8
			Vertical	0.2	0.5	

Model	Motor type	Lead [mm]	Rated acceleration [G]		Payload [kg]	Rated thrust [N]
GD3NA GD3N (Lead screw)	10W	1	Horizontal	0.2	1	100.5
			Vertical	0.2	0.5	
		2	Horizontal	0.2	0.5	50.3
			Vertical	0.2	0.25	
		4	Horizontal	0.2	0.25	25.1
			Vertical	0.2	0.125	
GD3NA GD3N (Ball screw)	10W	1	Horizontal	0.2	3	170.9
			Vertical	0.2	1	
		2	Horizontal	0.3	1.5	85.5
			Vertical	0.2	0.5	
		4	Horizontal	0.3	0.75	42.7
			Vertical	0.2	0.25	
GD4NA GD4N (Lead screw)	20W	2	Horizontal	0.2	1	59.7
			Vertical	0.2	0.5	
		4	Horizontal	0.2	0.5	29.8
			Vertical	0.2	0.25	
		6	Horizontal	0.2	0.25	19.9
			Vertical	0.2	0.125	
GD4NA GD4N (Ball screw)	20W	2	Horizontal	0.2	6	101.5
			Vertical	0.2	1.5	
		4	Horizontal	0.3	3	50.7
			Vertical	0.2	0.75	
		6	Horizontal	0.3	2	33.8
			Vertical	0.2	0.5	
SD3NA SD3N (Lead screw)	10W	1	Horizontal	0.2	1	100.5
			Vertical	0.2	0.5	
		2	Horizontal	0.2	0.5	50.3
			Vertical	0.2	0.25	
		4	Horizontal	0.2	0.25	25.1
			Vertical	0.2	0.125	
SD3NA SD3N (Ball screw)	10W	1	Horizontal	0.2	3	170.9
			Vertical	0.2	1	
		2	Horizontal	0.3	1.5	85.5
			Vertical	0.2	0.5	
		4	Horizontal	0.3	0.75	42.7
			Vertical	0.2	0.25	
SD4NA SD4N (Lead screw)	20W	2	Horizontal	0.2	1	59.7
			Vertical	0.2	0.5	
		4	Horizontal	0.2	0.5	29.8
			Vertical	0.2	0.25	
		6	Horizontal	0.2	0.25	19.9
			Vertical	0.2	0.125	
SD4NA SD4N (Ball screw)	20W	2	Horizontal	0.2	6	101.5
			Vertical	0.2	1.5	
		4	Horizontal	0.3	3	50.7
			Vertical	0.2	0.75	
		6	Horizontal	0.3	2	33.8
			Vertical	0.2	0.5	

1.2.3 Driving System • Position Detector

Model	Motor type	Lead	Encoder pulses	Boll screw and lead screw type		
				Type	Diameter	Accuracy
RA2AC	5W	1	800	Ball screw Rolled	ϕ4mm	C10
		2				
		4				
RA2AR	10W	1		Ball screw Rolled	ϕ6mm	C10
		2				
		4				
RN3NA RN3N (Lead screw)	10W	1	1048	Lead screw Rolled	ϕ4mm	C10
		2				
		4				
RN3NA RN3N (Ball screw)	10W	1		Ball screw Rolled	ϕ4mm	C10
		2				
		4				
RN4NA RN4N (Lead screw)	20W	2		Lead screw Rolled	ϕ6mm	C10
		4				
		6				
RN4NA RN4N (Ball screw)	20W	2		Ball screw Rolled	ϕ6mm	C10
		4				
		6				
RP3NA RP3N (Lead screw)	10W	1		Lead screw Rolled	ϕ4mm	C10
		2				
		4				
RP3NA RP3N (Ball screw)	10W	1		Ball screw Rolled	ϕ4mm	C10
		2				
		4				
RP4NA RP4N (Lead screw)	20W	2		Lead screw Rolled	ϕ6mm	C10
		4				
		6				
RP4NA RP4N (Ball screw)	20W	2		Ball screw Rolled	ϕ6mm	C10
		4				
		6				
GS3NA GS3N (Lead screw)	10W	1		Lead screw Rolled	ϕ4mm	C10
		2				
		4				
GS3NA GS3N (Ball screw)	10W	1		Ball screw Rolled	ϕ4mm	C10
		2				
		4				
GS4NA GS4N (Lead screw)	20W	2		Lead screw Rolled	ϕ6mm	C10
		4				
		6				
GS4NA GS4N (Ball screw)	20W	2		Ball screw Rolled	ϕ6mm	C10
		4				
		6				
GD3NA GD3N (Lead screw)	10W	1		Lead screw Rolled	ϕ4mm	C10
		2				
		4				
GD3NA GD3N (Ball screw)	10W	1		Ball screw Rolled	ϕ4mm	C10
		2				
		4				
GD4NA GD4N (Lead screw)	20W	2		Lead screw Rolled	ϕ6mm	C10
		4				
		6				
GD4NA GD4N (Ball screw)	20W	2		Ball screw Rolled	ϕ6mm	C10
		4				
		6				

Model	Motor type	Lead	Encoder pulses	Boll screw and lead screw type		
				Type	Diameter	Accuracy
SD3NA SD3N (Lead screw)	10W	1	1048	Lead screw Rolled	ϕ4mm	C10
		2				
		4				
SD3NA SD3N (Ball screw)	10W	1		Ball screw Rolled	ϕ4mm	C10
		2				
		4				
SD4NA SD4N (Lead screw)	20W	2		Lead screw Rolled	ϕ6mm	C10
		4				
		6				
SD4NA SD4N (Ball screw)	20W	2		Ball screw Rolled	ϕ6mm	C10
		4				
		6				

1.2.4 Common Specifications

Item	Specification	
	Lead screw	Ball screw
Positioning repeatability (Note1) [mm]	±0.05	±0.02
Backlash (Note1) [mm]	0.3 or less	0.1 or less
Base	Material: Aluminum with white alumite treatment	

Note 1 The values shown above are the accuracy at the delivery from the factory.
It does not include the consideration of time-dependent change as it is used.

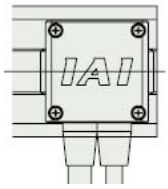
1.2.5 Duty in Continuous Operation

Duty is the rate of operation expressed in % that presents the time of the actuator being operated in 1 cycle of operation.
The duty may differ depending on the load ratio and the acceleration/deceleration time ratio.
[Refer to 4.1 “Duty in Continuous Operation”]

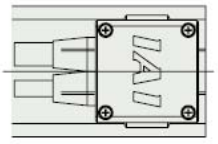
1.3 Options

1.3.1 Connector Cable Exit Direction Changed (Model: K1, K2 and K3)

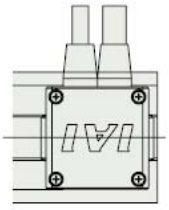
The standard specification is to take out the cable from the opposite side of the rod and guide bracket. If a change in the cable ejection direction is made, the direction of cable ejection will be changed.
There are three types for the direction change, left side (model: K1), front side (model: K2) and right side (model: K3).
Note that selection of front side (Model: K2) cannot be made for the cleanroom type and dust-proof type. Selection of front side (Model: K2) cannot be made for the standard slide unit types RCA2-SD3N and SD4N. Also, the cleanroom and dust-proof slide unit types RCA2CR, RCA2W-SD3N and SD4N are left oriented ejection in standard.



Model: K1
(Left oriented ejection)



Model: K2
(Front oriented ejection)



Model: K3
(Right oriented ejection)

1.3.2 Low Power Consumption Type (Model: LA)

This type of actuator decreases the maximum current consumption of the controller compared with the standard actuator.
For the details, refer to the power capacity described in the catalog or the instruction manuals of ACON/ASEL/ASEP/AMEC/MSEP Controllers.

Model Name	Standard specification / High acceleration/deceleration specification Maximum load current	Energy-saving measure Maximum load current
RN3NA, RP3NA, GS3NA, GD3NA, SD3NA, RN3N, RP3N, GS3N, GD3N, SD3N	4.4A	2.5A
RN4NA, RP4NA, GS4NA, GD4NA, SD4NA, RN4N, RP4N, GS4N, GD4N, SD4N	4.4A	2.5A

1.3.3 Brake-equipped (Model: B)

The brake is a mechanism designed to prevent the slider 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 slider.
Applicable Unit: RN3NA, RN4NA, RP3NA, RP4NA, GS3NA, GS4NA, GD3NA, GD4NA
(Brake-equipped type cannot be selected for the cleanroom type and dust-proof type.)

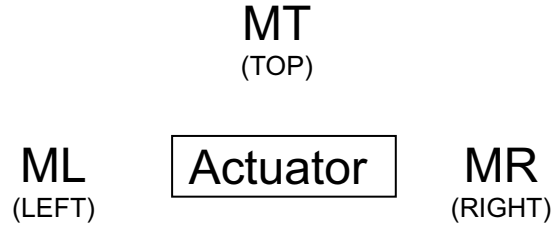
1.3.4 Reversed-home Specification (Model: NM)

The home position is set on the motor side in standard for Slim Types RA2AC and RA2AR. 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.

1.3.5 Reversed-home Specification (Model: ML, MR, MT)

For Slim Type RA2AR, the reverse to the left side from the view of motor end is ML, reverse to the right is MR, and to the upper side is MT.



(Figure viewed from motor side)

1.3.6 L-Shaped Type Vacuum Joint (Model: VL)

The vacuum joint for Cleanroom Type has changed from straight type to L-shaped type.

1.3.7 IP52 Applicable Type (Model: WP)

Waterproof type applicable for IP52 is added in the lineup.

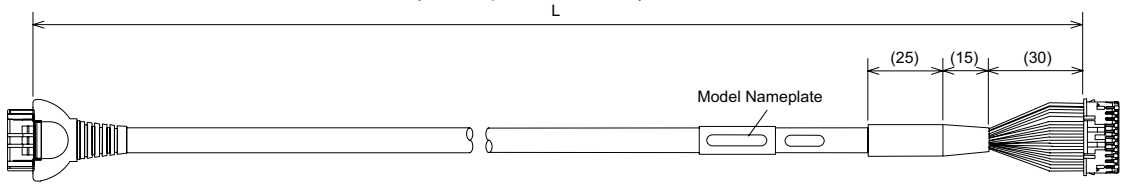
*2: JIS Standards Waterproof Type II - Vertically dripping water shall have no harmful effect when the enclosure is tilted at an angle up to 15deg from its normal position.

1.4 Motor • Encoder Cables

1.4.1 ACON-CA, AMEC, ASEP, MSEP Controller Cables

Motor • Encoder Integrated Cables For RCA2
(CB-APSEP-MPA□□□)

□□□ indicates the cable length L. Up to 20m can be specified.
(Example: 080=8m)



Actuator Side

Electric Wire Color	Symbol	Pin No.
Black	U	A1
White	V	B1
Brown	W	A2
Green	-	B2
Yellow	-	A3
Red	-	B3
Orange	BK+	A4
Gray	BK-	B4
White	A+	A6
Yellow	A-	B6
Red	B+	A7
Green	B-	B7
Black	Z+	A8
Brown	Z-	B8
Black (Identification tape)	LS+	A5
Brown (Identification tape)	LS-	B5
Green (Identification tape)	GND_{LS}	A9
Red (Identification tape)	VPS	B9
White (Identification tape)	VCC	A10
Yellow (Identification tape)	GND	B10
-	NC	A11
-	Shield, FG	B11

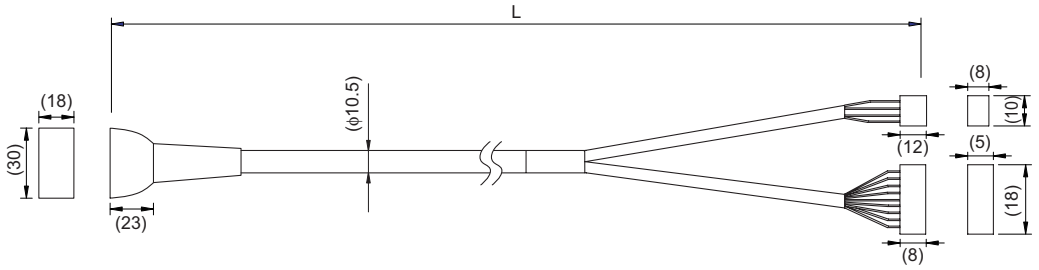
Controller Side

Pin No.	Symbol	Electric Wire Color
1	U	Black
2	V	White
5	W	Brown
3	-	Green
4	-	Yellow
6	-	Red
7	BK+	Orange
8	BK-	Gray
11	A+	White
12	A-	Yellow
13	B+	Red
14	B-	Green
15	Z+	Black
16	Z-	Brown
9	LS+	Black (Identification tape)
10	LS-	Brown (Identification tape)
20	GND_{LS}	Green (Identification tape)
18	VPS	Red (Identification tape)
17	VCC	White (Identification tape)
19	GND	Yellow (Identification tape)
21	NC	-
24	Shield, FG	-
22	-	-
23	-	-

1.4.2 ACON (Other than ACON-CA), RACON, ASEL Controller Cables

Motor • Encoder Integrated Cables For RCA2
(CB-ACS-MPA□□□)

□□□ indicates the cable length L. Up to 20m can be specified.
(Example: 080=8m)



Actuator Side

Electric Wire Color	Symbol	Pin No.
Red	U	A1
Yellow	V	B1
Black	W	A2
-	NC	B2
-	NC	A3
-	NC	B3
Yellow (Red•)	BK+	A4
Yellow (Blue•)	BK-	B4
Pink (Red•)	LS+	A5
Pink (Blue•)	LS-	B5
White (Red•)	A+	A6
White (Blue•)	A-	B6
Orange (Red•)	B+	A7
Orange (Blue•)	B-	B7
Gray (Red•)	Z+	A8
Gray (Blue•)	Z-	B8
Orange (Red• continuous)	-	A9
Orange (Blue• continuous	/PS	B9
Gray (Red• continuous)	VCC	A10
Gray (Blue• continuous)	GND	B10
-	NC	A11
-	Shield, FG	B11

Controller Side

Pin No.	Symbol	Electric Wire Color
1	U	Red
2	V	Yellow
3	W	Black
4	NC	-
3	NC	-
2	NC	-
16	BK+	Yellow (Red•)
15	BK-	Yellow (Blue•)
18	LS+	Pink (Red•)
17	LS-	Pink (Blue•)
14	A+	White (Red•)
13	A-	White (Blue•)
12	B+	Orange (Red•)
11	B-	Orange (Blue•)
10	Z+	Gray (Red•)
9	Z-	Gray (Blue•)
8	-	Orange (Red• continuous)
7	/PS	Orange (Blue• continuous)
6	VCC	Gray (Red• continuous)
5	GND	Gray (Blue• continuous)
	NC	-
1	Shield, FG	-

2. Installation

2.1 Transportation

[1] Handling of the Actuator

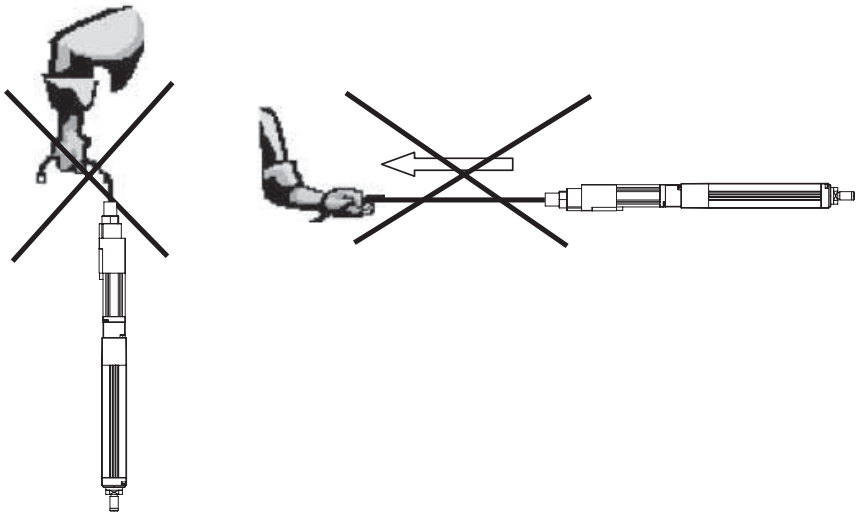
Unless otherwise specified, the actuator is shipped with 1 axis unit packaged separately.

(1) Handling the Packed Unit

- 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 a 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.

(2) Handling the Actuator After Unpacking

- Do not carry the actuator by its motor unit or its cable or attempt to move it by pulling the cable.



- Hold the base part or bracket part of the body when transporting the actuator main body.
- Do not hit or drop the actuator during transportation.
- Do not attempt to force any part of the actuator.

[2] Handling in the Assembled Condition

This is the case when the product is delivered from our factory under a condition that it is assembled with other actuators. The combined axes are delivered in a package that the frame is nailed on the lumber base. The rods are fixed so they would not accidently move. The actuators are also fixed so the tip of it would not shake due to the external vibration.

(1) How to Handle the Package

- Do not hit or drop the package. No special treatment is conducted on this package to endure a drop or impact on it.
- Do not attempt to carry a heavy package with only one worker. Also, have an appropriate method for transportation.
- When hanging up with ropes, support on the reinforcement frame on the bottom of the lumber base. When bringing up the package with a forklift, also support on the bottom of the lumber base.
- Handle with care when putting the package down to avoid impact or bounce.
- Do not step on the package.
- Do not put anything on the package that could deform or damage it.

(2) How to Handle after Unpackaged

- Fix the rod so they would not accidently move during transportation.
- If the tip of an actuator is overhanging, have an appropriate way to fix it to avoid shake due to the external vibration. In the transportation without the tip being fixed, do not apply any impact with 0.3G or more.
- When hanging up with ropes, have appropriate cushioning to avoid any deformation of the actuator body. Also keep it in stable horizontal orientation. Make a fixture utilizing the attachment holes and the tapped holes on the actuator body if necessary.
- Do not attempt to apply load on the actuators. Also pay attention not to pinch cables and bend or deform them forcefully.

[3] Handling in Condition of being Assembled in Machinery Equipment (System)

There are some caution notes for when transporting the actuator being assembled in the machinery equipment (system):

- Fix the rod so it would not move during transportation.
- If the tip of an actuator is overhanging, have an appropriate way to fix it to avoid shake due to the external vibration. In the transportation without the tip being fixed, do not apply any impact with 0.3G or more.
- When hanging up the machinery equipment (system) with ropes, do not attempt to apply load on the actuators. Also pay attention not to pinch cables and bend or deform them forcefully.

2.2 Installation and Storage • Preservation Environment

[1] Installation Environment

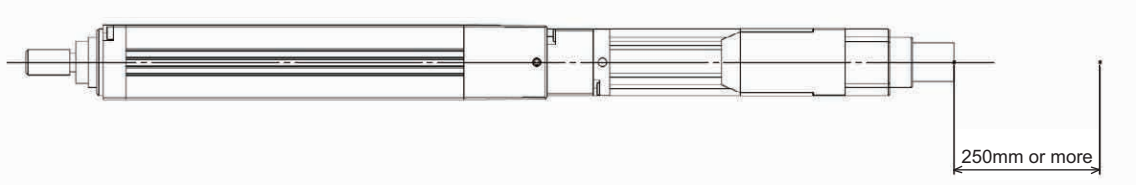
The actuator should be installed in a location other than those specified below.
Also provide sufficient work space required for maintenance inspection.

- 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
- It possesses the dust-proof performance of IP50 protection structure. (Dust-proof type)
- 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) (excludes dust for Dust-proof type)
- 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

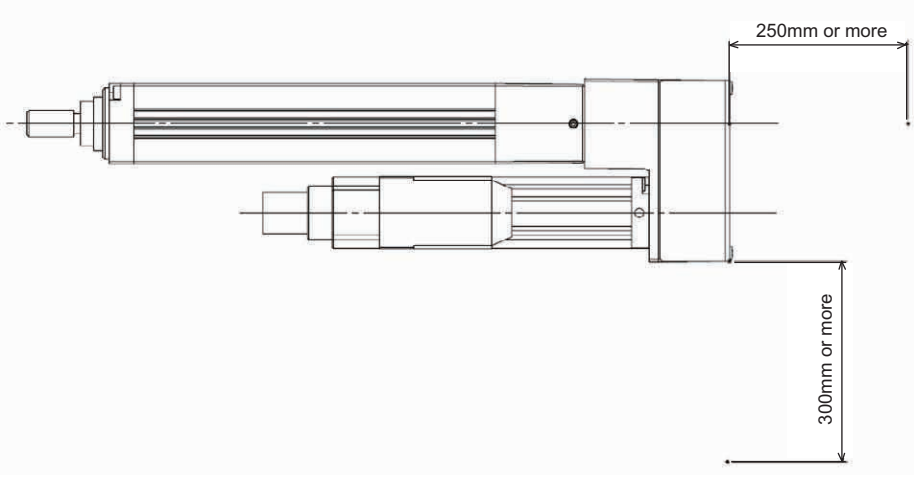
If the actuator is used in any of the following locations, provide sufficient shielding measures:
- Where noise generates due to static electricity, etc.
- Where the actuator is subject to a strong electric or magnetic field
- Where the actuator is subject to ultraviolet ray or radiation

Open space required for maintenance inspection

● Motor coupling types



● Motor reversing types



[2] Storage • Preservation Environment

- The storage and preservation environment should comply with the same standards as those for the installation environment. In particular, when the machine is to be stored for a long time, pay close attention to environmental conditions so that no dew condensation forms.
  Unless specially specified, moisture absorbency protection is not included in the package when the machine is delivered. In the case that the machine is to be stored and preserved in an environment where dew condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.
- For storage and preservation temperature, the machine withstands temperatures up to 60°C for a short time, but in the case of the storage and preservation period of 1 month or more, control the temperature to 50°C or less.
- Storage and preservation should be performed in the horizontal condition. In the case it is stored in the packaged condition, follow the posture instruction if any displayed on the package.

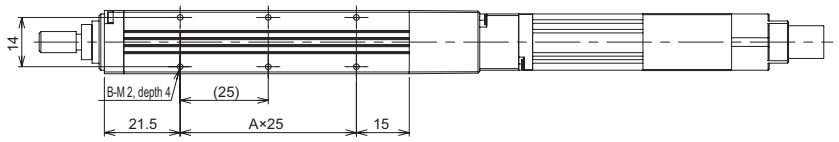
2.3 How to Install

2.3.1 How to Attach Slim Types RA2AC (Motor Coupling Types), RA2AR (Motor Reversing Types)

[1] Installation of the Actuator

At the back, there are tapped holes and a reamed hole provided for positioning. The locations of these holes are as shown in the figure below.

(In common for coupling type and reversing type)



ST	L1	L2	A	B
25	163.5	81.5	1	4
50	188.5	106.5	2	6
75	213.5	131.5	3	8
100	238.5	156.5	4	10

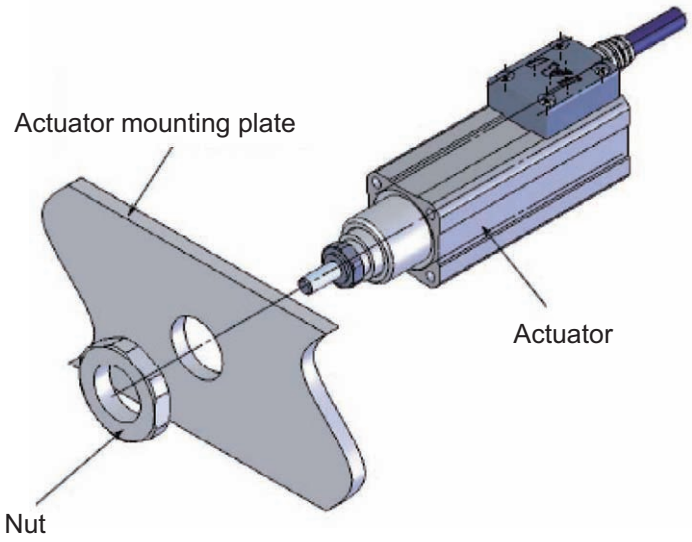
The recommended tightening torque is as indicated below:

Mounting bolt	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:
M2	0.42N·m (0.043kgf·m)	0.25N·m (0.026kgf·m)

2.3.2 How to Attach Short Types (Nut Affixing Types) RN3NA, RN3N (Lead Screw, Ball Screw), RN4NA, RN4N (Lead Screw, Ball Screw)

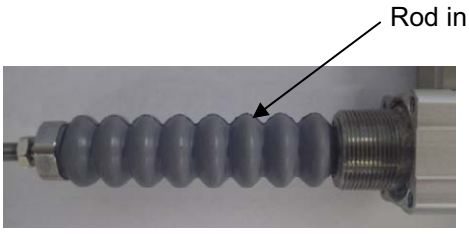
[1] Installation of the Actuator

Install the actuator by guiding it through a hole of approx. 5 to 10mm provided in a smooth plate.
- Use the nut on the actuator rod to install the actuator onto the actuator mounting plate.
- The base of the male thread on the actuator side has a tolerance of h8. Use this part as a pilot section.



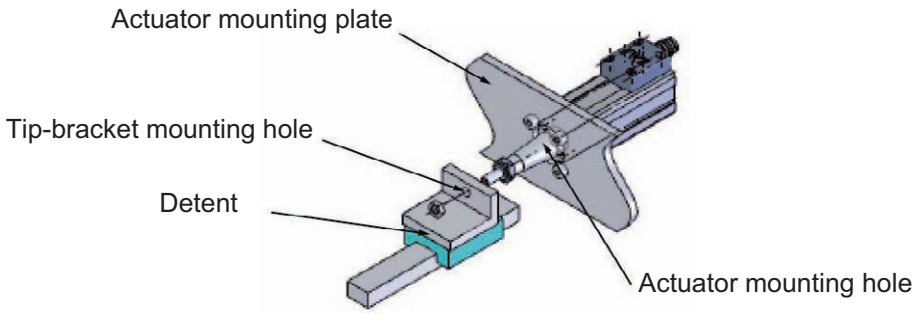
Type	M	Width across flats	Maximum tightening torque
RN3NA, RN3N (Lead screw, ball screw)	M20 × 1.0	29	49.4N·m
RN4NA, RN4N (Lead screw, ball screw)	M24 × 1.0	32	76.8N·m

⚠ Caution:
- Do not tighten excessively beyond the maximum tightening torque. The actuator may be damaged.
- For Cleanroom Type and Dust-Proof Type RN3NA, pull out the rod to the maximum stroke before inserting to the through hole on the plate. Pull it out in full stroke or the bellows would not go through the hole as they could interfere at the hole.



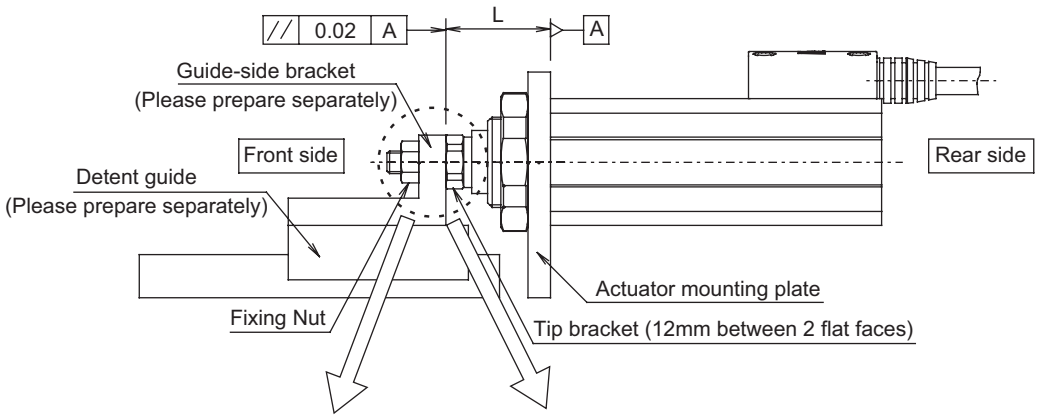
[2] Installation of the Detent

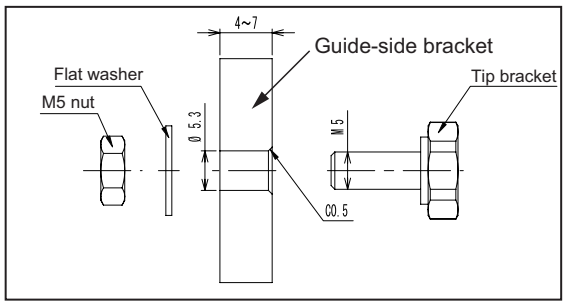
The short types (nut affixing types) have no detent on the rod.
If you are using the RN3NA, RN3N (Lead screw, ball screw), RN4NA, RN4N (Lead screw, ball screw) without guide, install a detent, if necessary, by referring to the figure below.



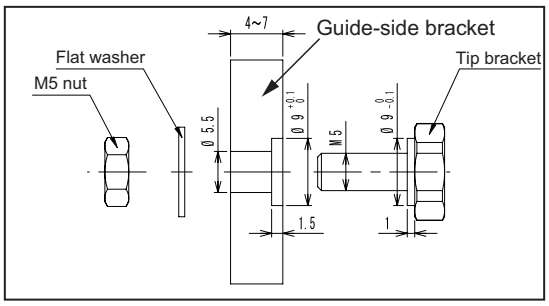
⚠ Caution: If you hear any abnormal noise from the actuator or find the grease on the screw darker within several weeks after the start of operation, the coaxiality or parallelism between the actuator mounting hole in the actuator mounting plate and tip-bracket mounting hole in the guide-side bracket may not be appropriate. Make sure the coaxiality is within 0.05 and parallelism, within 0.02. Wipe off darkened grease and apply new grease. [Refer to 5.5, “Greasing”.]

Keep the coaxiality between the actuator mounting hole in the actuator mounting hole and tip-bracket mounting hole in the guide-side bracket, to within 0.05. Also keep the parallelism to within 0.02.

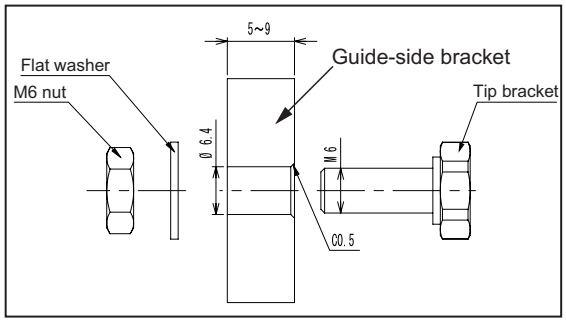




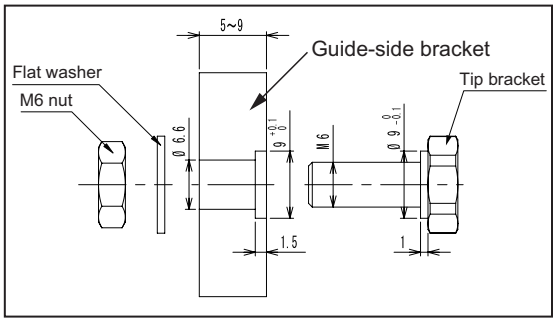
RN3 Guide-side bracket (without counterbore)



RN3 Guide-side bracket (with counterbore)



RN4 Guide-side bracket (without counterbore)



RN4 Guide-side bracket (with counterbore)

The dimensions of Position L to attach the guide-side bracket for the standard type are as shown below.
The position to attach the guide-side bracket for Cleanroom Type and Dust-proof Type is approximately 1mm from the mechanical end. (It should be the home position when moving by using the controller)

Type	Lead	Guide-side bracket	L
Standard type RCA2-RN3NA/RN3N (Lead screw, ball screw)	1	Without counterbore	25.0 ±0.1
		With counterbore	24.0 ±0.1
	2, 4	Without counterbore	25.3 ±0.1
		With counterbore	24.3 ±0.1
Standard type RCA2-RN4NA/RN4N (Lead screw, ball screw)	1	Without counterbore	27.0 ±0.1
		With counterbore	26.0 ±0.1
	2, 4, 6	Without counterbore	27.3 ±0.1
		With counterbore	26.3 ±0.1

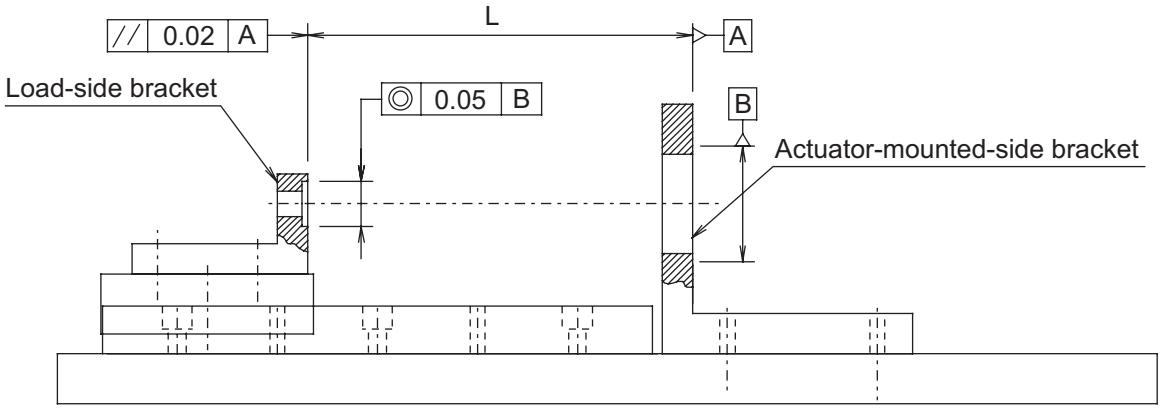
Tightening torque for tip clasp

Type	Tightening torque
RN3NA/RN3N (lead screw) RN3NA/RN3N (ball screw)	2.8N·m
RN4NA/RN4N (lead screw) RN4NA/RN4N (ball screw)	4.2N·m

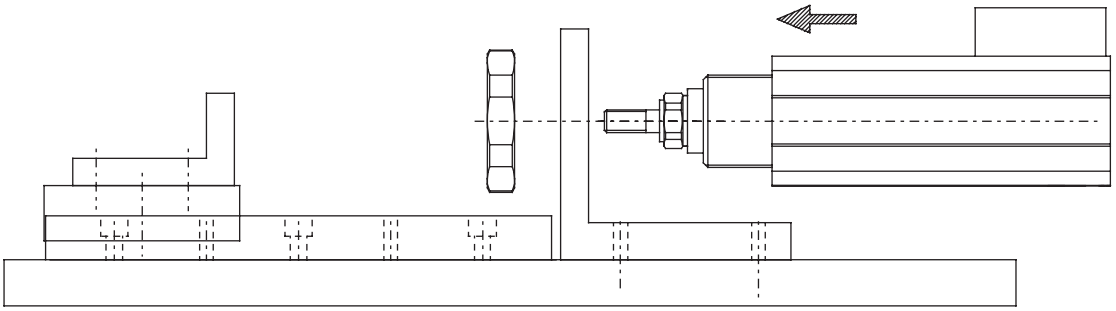
⚠ Caution: Do not join the actuator detent using a floating joint.
A radial load will be applied due to an eccentricity of the screw shaft, resulting in actuator malfunction or premature damage.

[Mounting procedure]

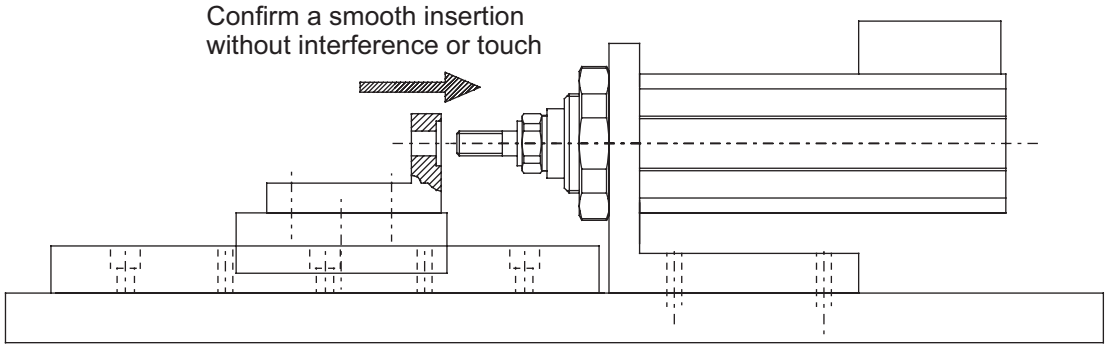
1) Check the accuracy on the actuator side and load side.
   Adjust the position so the accuracy can be maintained at the value shown below or less in the whole range of the load side movement.
   For the brake-equipped types, connect a controller and release the brake before start working.



2) Mount the main unit of the actuator.



3) Move the load-side bracket to confirm that there is no problem in the precision of the position to the shaft of the rod.
   Confirm that the shaft of the rod can be inserted without a touch to the inside face of the mating hole on the bracket.

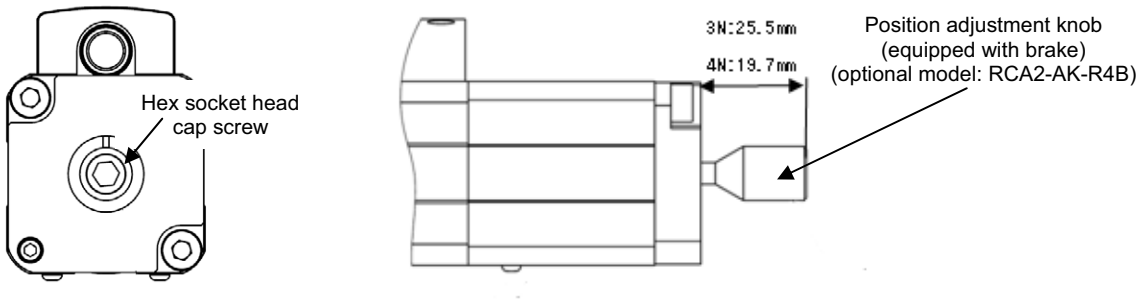


⚠ Caution: Make sure to have the position accuracy for the actuator and the load side as indicated.
Failure to do so may cause abnormal noise, vibration, operational failure or shorter product life.

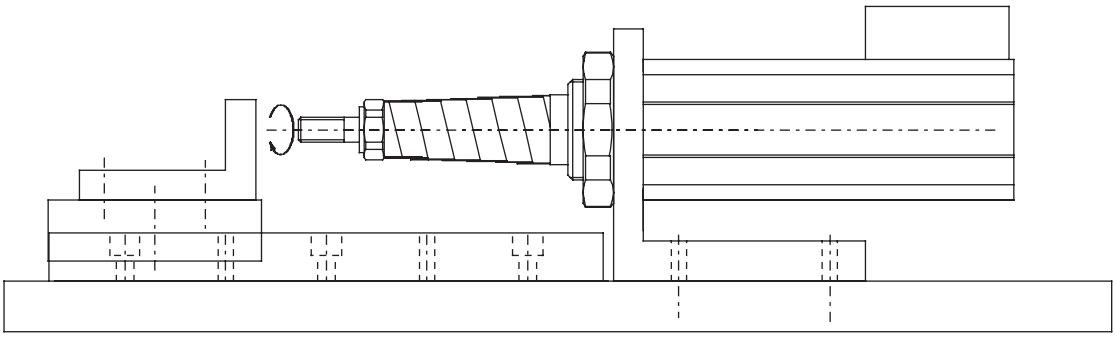
4) For the standard types with no brake, turn the shaft clockwise until the overall actuator dimension becomes the shortest and the mechanical stopper is contacted. When the shaft is turned at the mechanical end, the cutout groove provided in the shaft on the rear side also turns.
For the standard types equipped with a brake, remove the hex socket head cap screw (3N: M6 (width between two parallel faces = 3.0), 4N: M8 (width between two parallel faces = 4.0)) at the back side, and insert the optional “Position Adjustment Knob (for brake-equipped type)” until the shaft can be turned.
After inserting the knob, turn the shaft clockwise until it hits the mechanical stopper. If you turn the shaft at the mechanical end, the knob also turns.
For Cleanroom Type and Dust-proof Type, the axis will not rotate. For Lead 4, push the rod by hand to hit to the mechanical stopper, and then pull out for approximately 1mm. For Lead 1 and 2, connect the controller to perform the home-return operation.

⚠ Caution: Do not attempt to push the rod by hand for the low load type (Lead 1 and 2). Pushing it forcefully could allow applying load on the feed screw, which may cause operation error or malfunction.

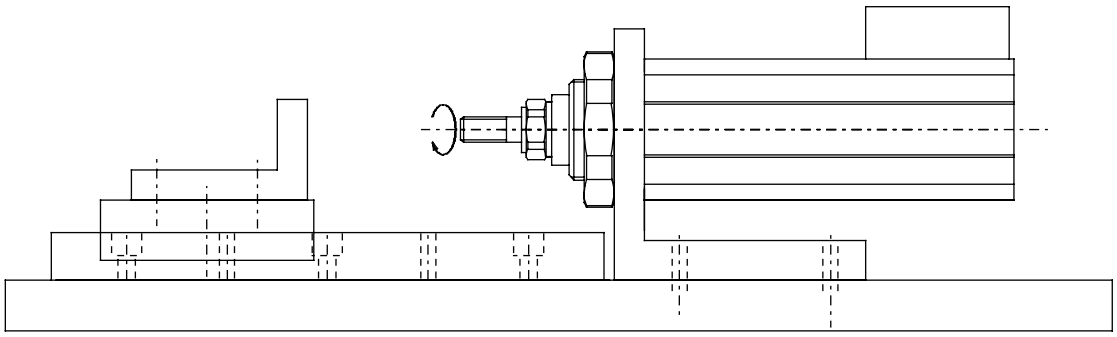
It is not necessary to conduct 5) and 6) work processes for Cleanroom Type and Dust-proof Type. Proceed to Step (7) and fix the guide-side bracket.



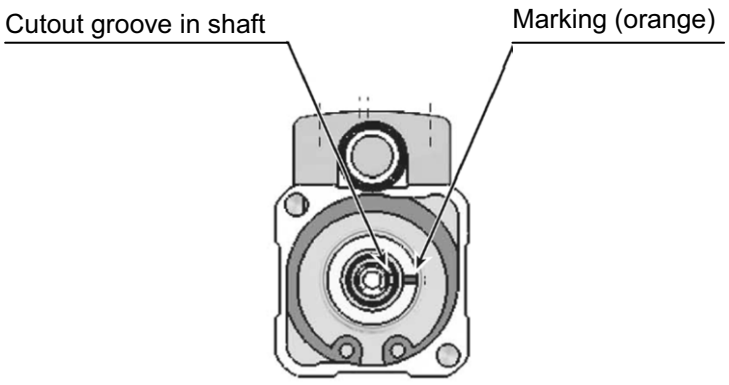
Brake-equipped type



5) For the types with no brake, turn the shaft clockwise until the cutout groove provided in the shaft on the rear side aligns with the marking (positioning) sticker.
For the brake-equipped types, make the cutout groove provided in the position adjustment knob aligned with the marking sticker.

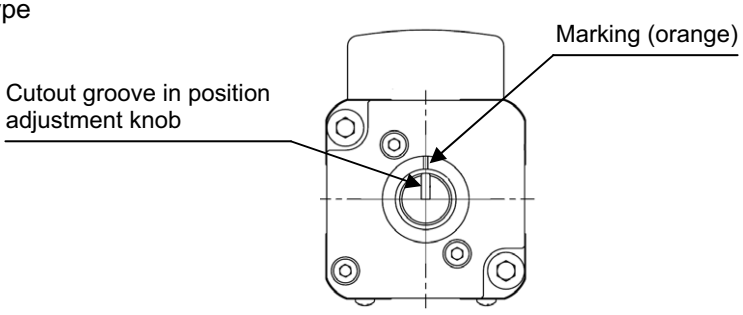


- Without Brake



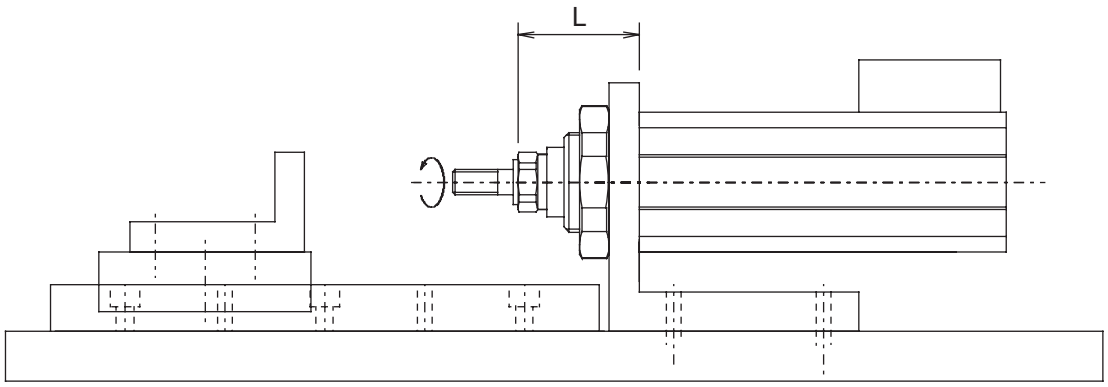
Shaft position at detent installation

- Brake-equipped Type

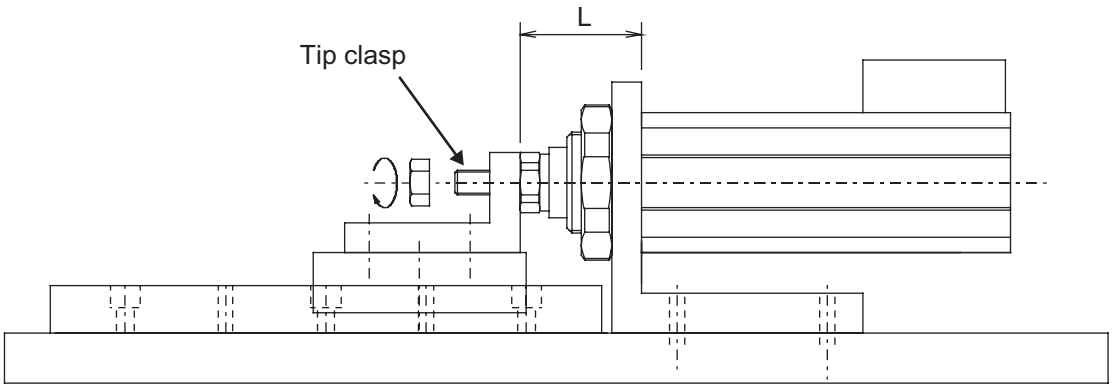


Shaft Position When Stopper Attached

6) While keeping this positioning relationship (= the cutout groove provided in the shaft on the rear side is aligned with the marking sticker), turn the shaft counterclockwise to adjust L to the specified dimension.



7) Use a spanner, etc., to hold the width across flats of the tip clasp in place and affix it with the guide-side bracket. (When affixing with the bracket, turn the nut while locking the spanner applied to the tip clasp. If the tip clasp turns, the home position becomes offset.)



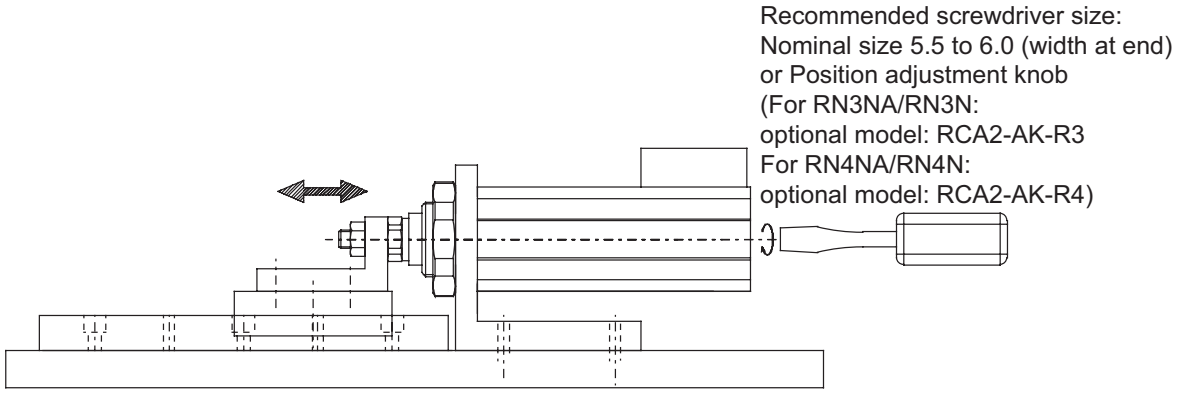
Tightening torque for tip clasp

Type	Tightening torque
RN3NA, RN3N (Lead screw, ball screw)	2.8N·m
RN4NA, RN4N (Lead screw, ball screw)	4.2N·m

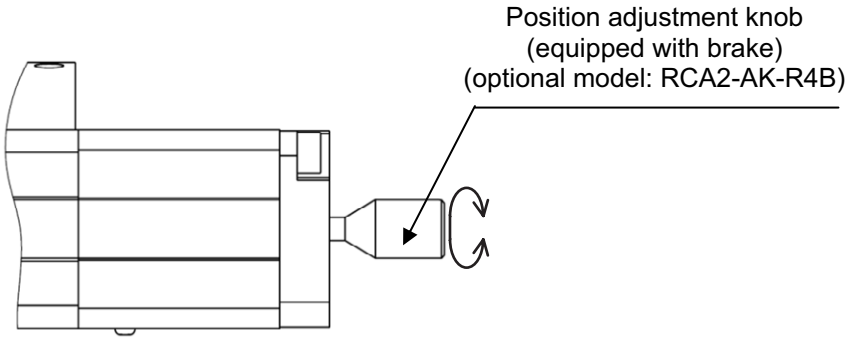
⚠ Caution: Pay attention not to get the bellows twisted for Cleanroom Type and Dust-proof Type. Bellows being twisted may cause misalignment of the home position or drop of production life.

8) Confirm that the bracket moves smoothly in the whole range of its stroke. Readjust the position if it is confirmed the bracket gets heavy or stuck at any point in the stroke range.
   - For the low lead types (Lead 1 and 2) in the standard type, move the bracket by turning the rear of the rotary shaft with a screwdriver or position adjustment knob for the types with no brake, or the position adjustment knob (dedicated for brake-equipped types) for the brake-equipped types.
   - For Cleanroom Type and Dust-proof Type, the axis will not rotate. Move the rod by hand for Lead 4. For the low lead types (Lead 1 and 2), connect a controller to move it by JOG operation.

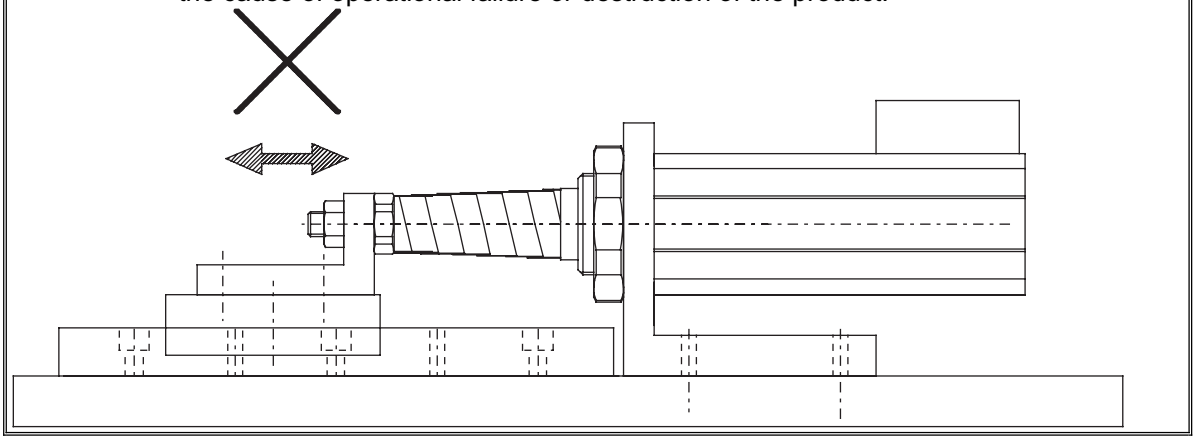
- Without Brake



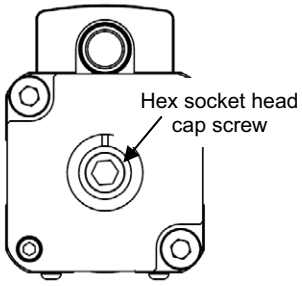
- Brake-equipped Type



⚠ Caution: Do not attempt to move back and forth from the load side (rod side) for the low lead types (Lead 1 and 2).
Moving it forcefully would apply too much load to the feed screw and may result in the cause of operational failure or destruction of the product.



9) For the standard types equipped with a brake, attach the hex socket head cap screw (3N: M6, 4N: M8) so it faces to the actuator.



Tightening torque (reference): RN3NA 0.2N•m
RN4NA 0.4N•m

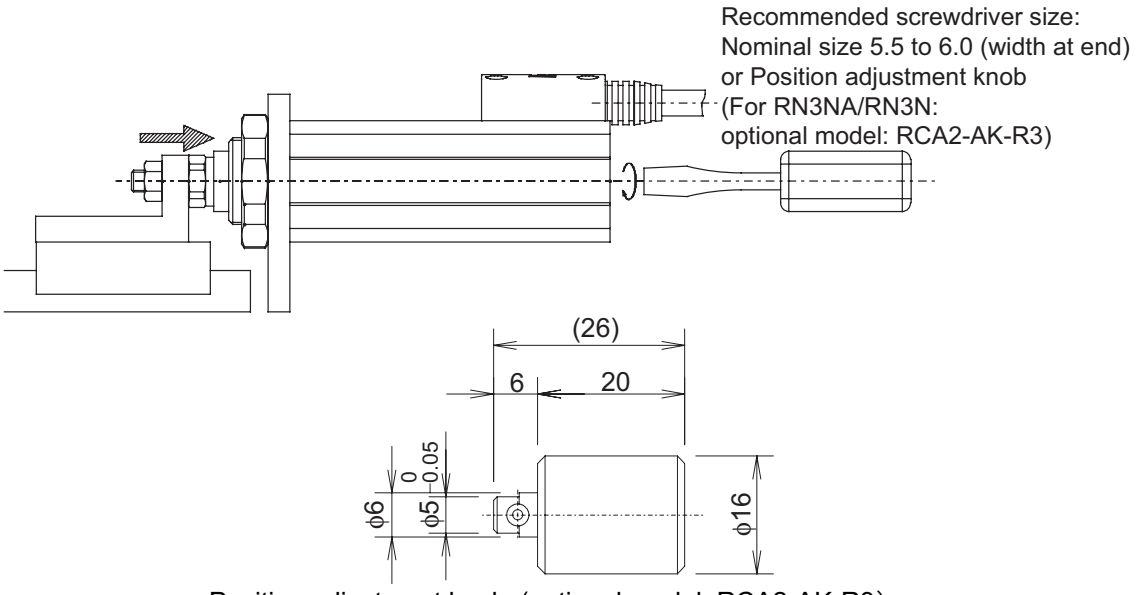
⚠ Caution: Do not push in too much. If the screw is turned with it hitting the brake, it may damage the brake.

[How to check and adjust the position of encoder phase Z]
It is required only for the standard type RCA2-RP3NA/RP3N (slide screw) actuators with a lead of 1mm to confirm that the encoder Z-phase is in the appropriate position by the following procedures.

[Procedure 1] Checking the position of encoder phase Z

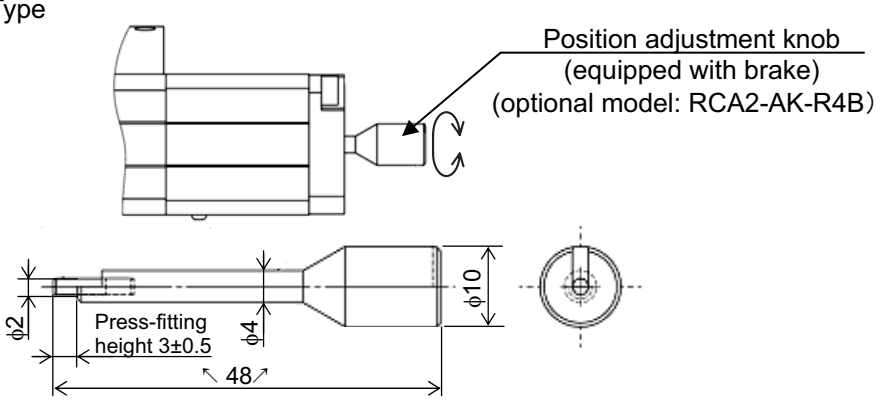
1) Turn the shaft clockwise from the rear until the rod contacts the rear end.

- Without Brake



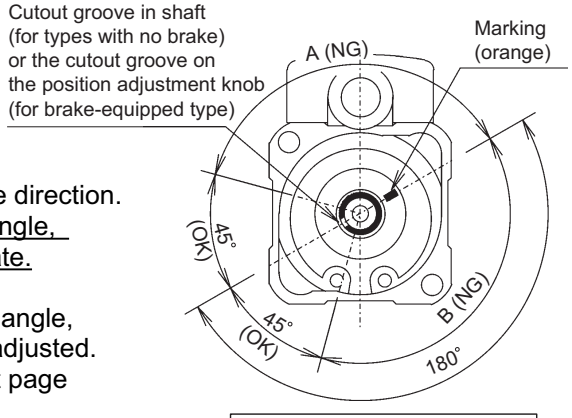
Position adjustment knob (optional model: RCA2-AK-R3)

- Brake-equipped Type



Position adjustment knob (equipped with brake) (optional model: RCA2-AK-R4B)

2) In rear view, confirm that the cutout groove in the shaft (for types with no brake) or the cutout groove on the position adjustment knob (for brake-equipped type) is located within ±45 degrees of the line extending from the marking in the 180-degree opposite direction. If the cutout groove is within the allowable angle, the position of encoder phase Z is appropriate.

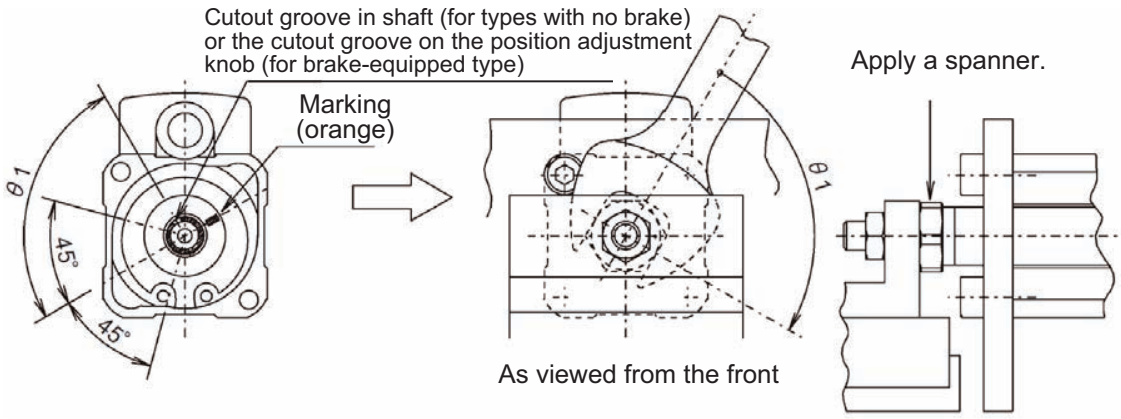


* The marking position varies depending on the actuator.

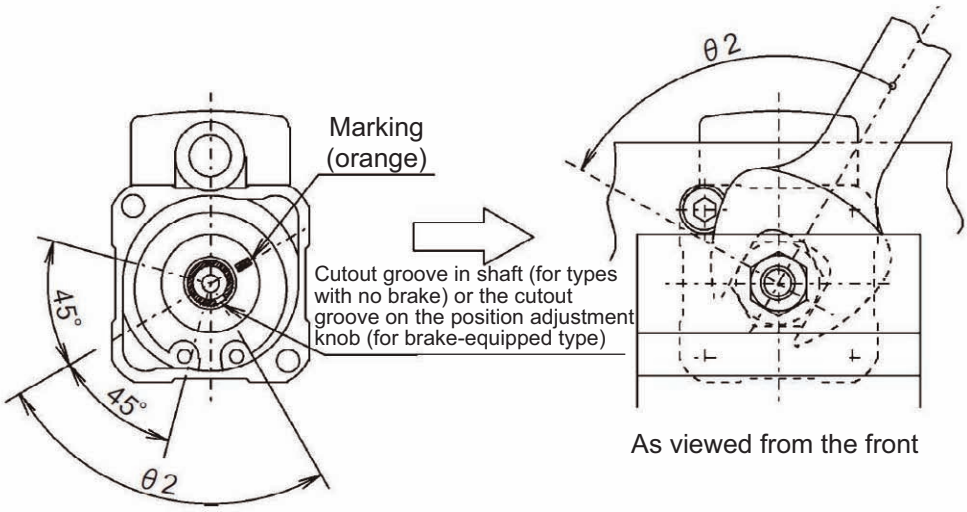
If the cutout groove is outside the allowable angle, the position of encoder phase Z must be readjusted. Correct the position as specified on the next page [procedure 2].

[Procedure 2] Correcting the position of encoder phase Z
If the cutout groove in the shaft is outside the allowable angle range, make correction by following the procedure below:

1) Use a spanner to hold the width across flats on the clasp at the tip to keep it in position, and loosen the lock nut slightly.
2) Move the clasp at the tip slightly in the rotating direction to correct the position.
   • If the cutout groove in the shaft is deviated in the A (NG) direction:
   Move the clasp at the tip clockwise roughly by the correction angle θ1 (as viewed from the front).



   • If the cutout groove in the shaft is deviated in the B (NG) direction:
   Move the clasp at the tip counterclockwise roughly by the correction angle θ2 (as viewed from the front).



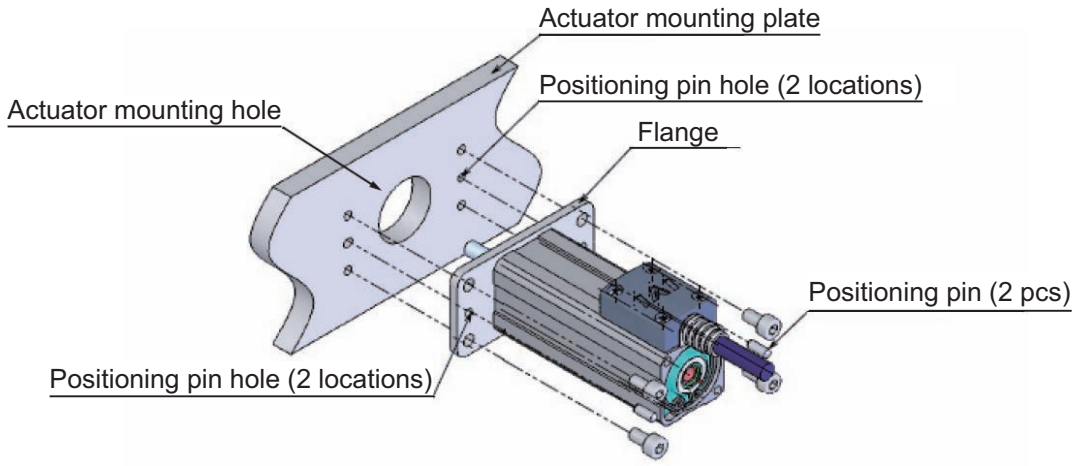
3) After the correction, tighten the lock nut with the clasp at the tip still held in position.

[Procedure 3] Confirming the phase Z position again
Finally, repeat [Procedure 1] to confirm the position of phase Z again.
If the position is inside the allowable angle, phase Z has been corrected properly.

[3] Installation of the Flange

Provide a flange-shaped sheet and install the actuator onto this sheet from the back.
- Use the nut on the actuator rod to install the actuator onto the flange.
- Secure the flange with the actuator mounting plate using screws.
  If positioning is required, insert positioning pins.
  (Note) For the actuator mounting hole in the actuator mounting plate, provide a hole larger than the dimension of the nut so as to provide a clearance for the nut.

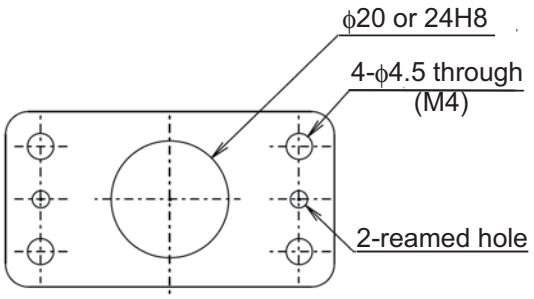
Type	Nut diameter
RN3NA, RN3N (Lead screw, ball screw)	ϕ34
RN4NA, RN4N (Lead screw, ball screw)	ϕ30.8



Installation of actuator and flange

Type	M	Width across flats	Maximum tightening torque
RN3NA, RN3N (Lead screw, ball screw)	M20 × 1.0	29	49.4N·m
RN4NA, RN4N (Lead screw, ball screw)	M24 × 1.0	32	76.8N·m

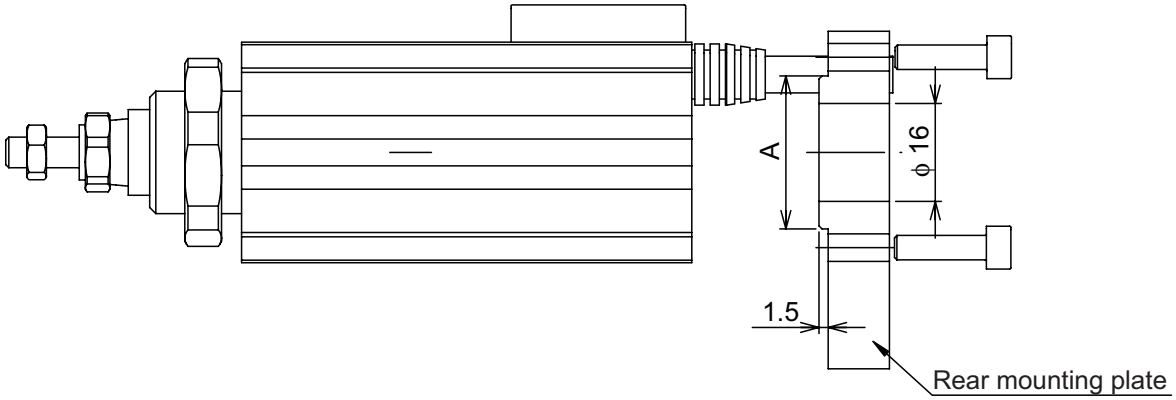
(Reference drawing of flange)



[4] Installation from the Rear Side

For the types with no brake, when installing the actuator from the rear side, provide a rear mounting plate of a slightly-projected circular column shape as shown below, to facilitate the positioning.

(Note) For the standard types equipped with a brake, Cleanroom Type and Dust-proof Type, it is not available to attach from the rear side.

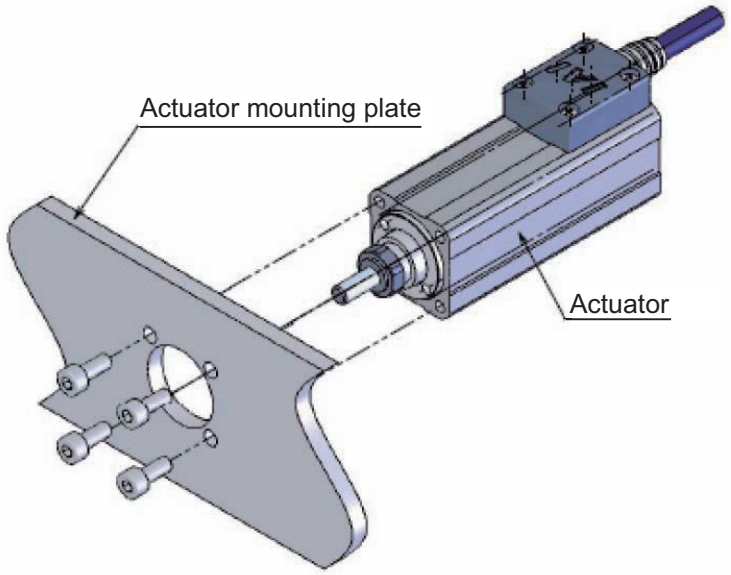


	RN3NA, RN3N (Lead screw, ball screw)	RN4NA, RN4N (Lead screw, ball screw)
A	ϕ25 $^{-0.2}_{-0.3}$	ϕ30 $^{-0.2}_{-0.3}$

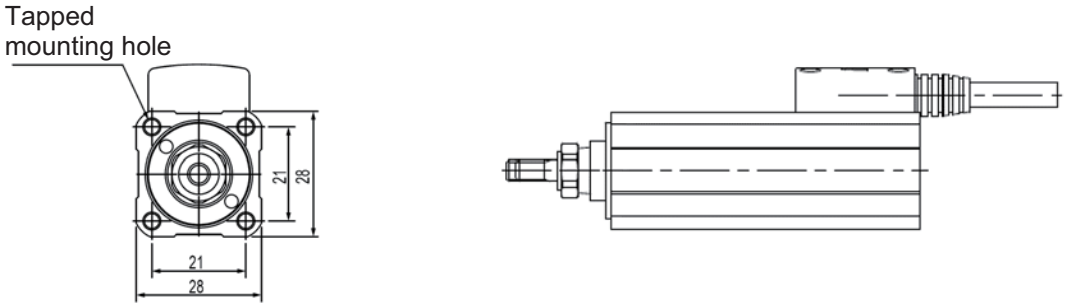
2.3.3 How to Attach Short Types (Tapped-hole Mounting Types) RP3NA, RP3N (Lead Screw, Ball Screw), RP4NA, RP4N (Lead Screw, Ball Screw)

[1] Installation of the Actuator

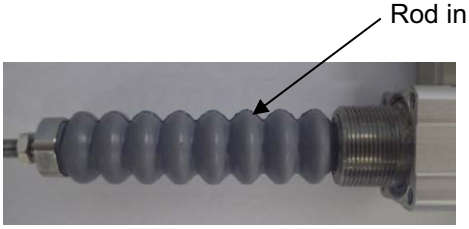
Install the actuator by guiding it through a hole of approx. 5 to 10mm provided in a smooth plate.
- Use the tapped hole on the actuator to install the actuator onto the actuator mounting plate.
- The base of the male thread on the actuator side has a tolerance of h8. Use this part as a pilot section.



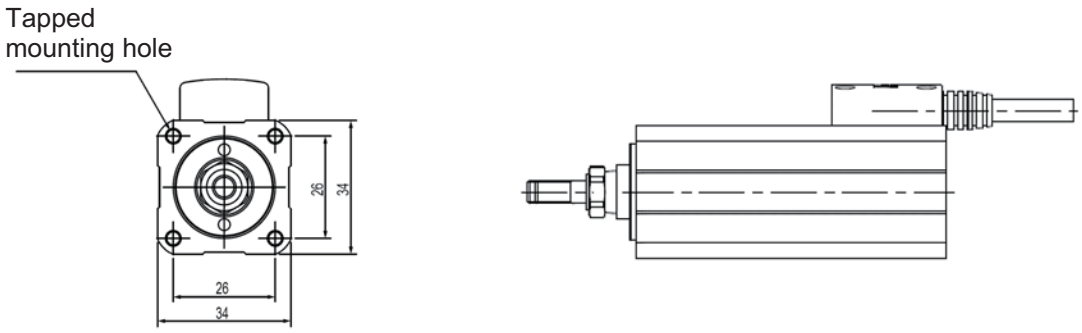
● RP3NA, RP3N (Lead screw, ball screw)



⚠ Caution: For Cleanroom Type and Dust-Proof Type RN3NA, pull out the rod to the maximum stroke before inserting to the through hole on the plate.
Pull it out in full stroke or the bellows would not go through the hole as they could interfere at the hole.



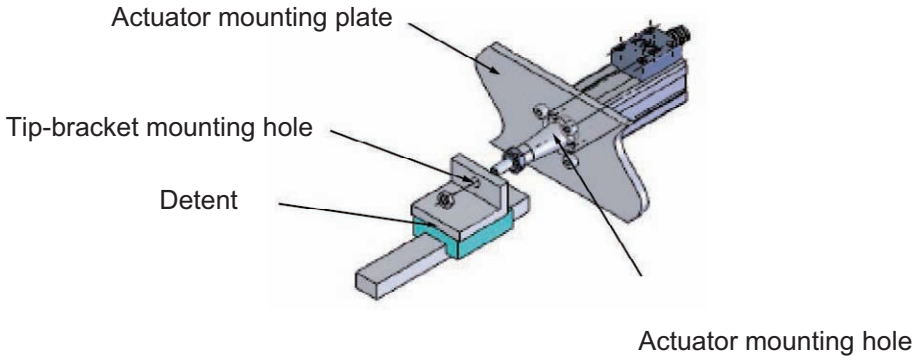
● RP4NA, RP4N (Lead screw, ball screw)



Type	Tapped hole size	Tightening torque	
		Plate is made of steel material	Plate is made of aluminum material
RP3NA, RP3N (Lead screw, ball screw) RP4NA, RP4N (Lead screw, ball screw)	M4, depth 8	3.6N·m	1.8N·m

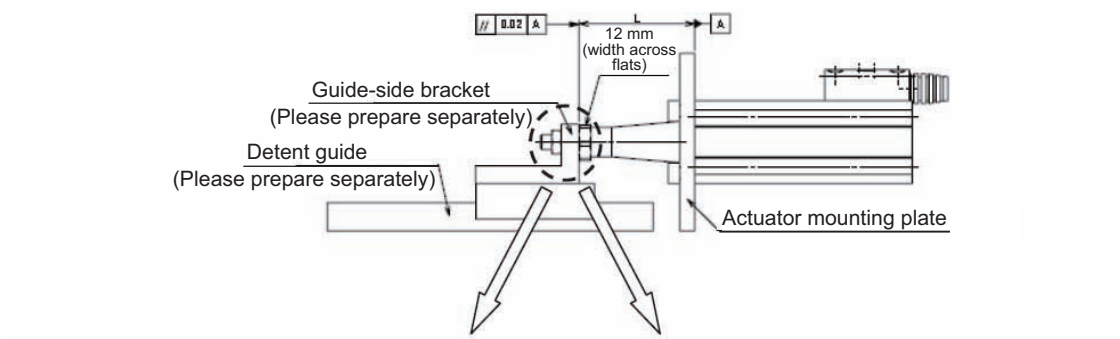
[2] Installation of the Detent

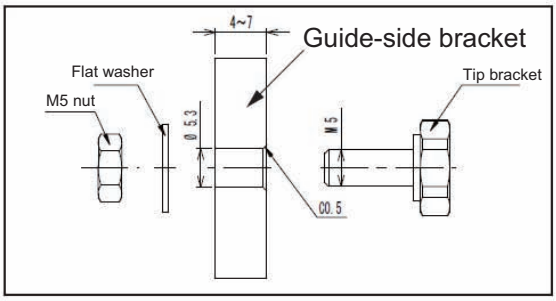
The short types (nut affixing types) have no detent on the rod.
If you are using the RP3NA, RP3N (Lead screw, ball screw), RP4NA, RP4N (Lead screw, ball screw) without guide, install a detent, if necessary, by referring to the figure below.



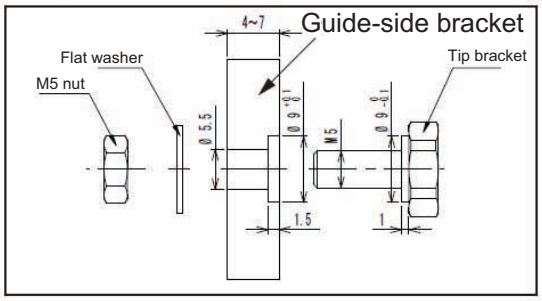
⚠ Caution: If you hear any abnormal noise from the actuator or find the grease on the screw darker within several weeks after the start of operation, the coaxiality or parallelism between the actuator mounting hole in the actuator mounting plate and tip-bracket mounting hole in the guide-side bracket may not be appropriate. Make sure the coaxiality is within 0.05 and parallelism, within 0.02. Wipe off darkened grease and apply new grease. [Refer to 5.5, “Greasing”.]

Keep the coaxiality between the actuator mounting hole in the actuator mounting hole and tip-bracket mounting hole in the guide-side bracket, to within 0.05. Also keep the parallelism to within 0.02.

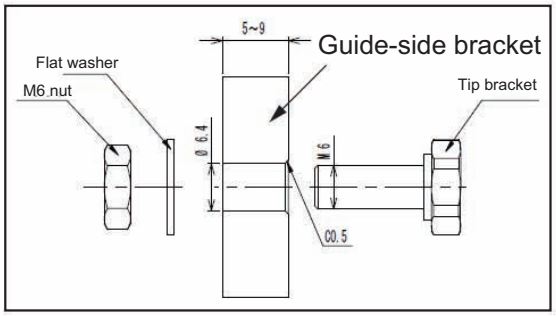




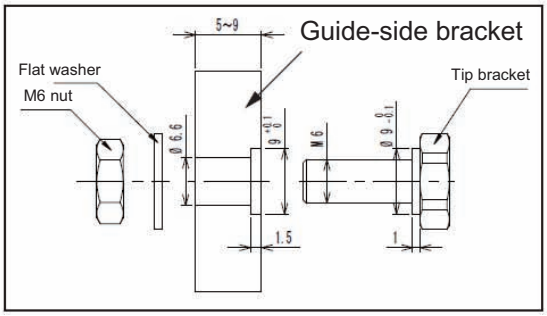
RP3 Guide-side bracket (without counterbore)



RP3 Guide-side bracket (with counterbore)



RP4 Guide-side bracket (without counterbore)



RP4 Guide-side bracket (with counterbore)

The dimensions of Position L to attach the guide-side bracket for the standard type are as shown below.
The position to attach the guide-side bracket for Cleanroom Type and Dust-proof Type is approximately 1mm from the mechanical end. (It should be the home position when moving by using the controller)

Type	Lead	Guide-side bracket	L
Standard type RCA2-RP3NA, RP3N (Lead screw, ball screw) RCA2-RP4NA, RP4N (Lead screw, ball screw)	1	Without counterbore	11.5 ±0.1
		With counterbore	10.5 ±0.1
Standard type RCA2-RP3NA, RP3N (Lead screw, ball screw) RCA2-RP4NA, RP4N (Lead screw, ball screw)	2, 4, 6	Without counterbore	11.8 ±0.1
		With counterbore	10.8 ±0.1

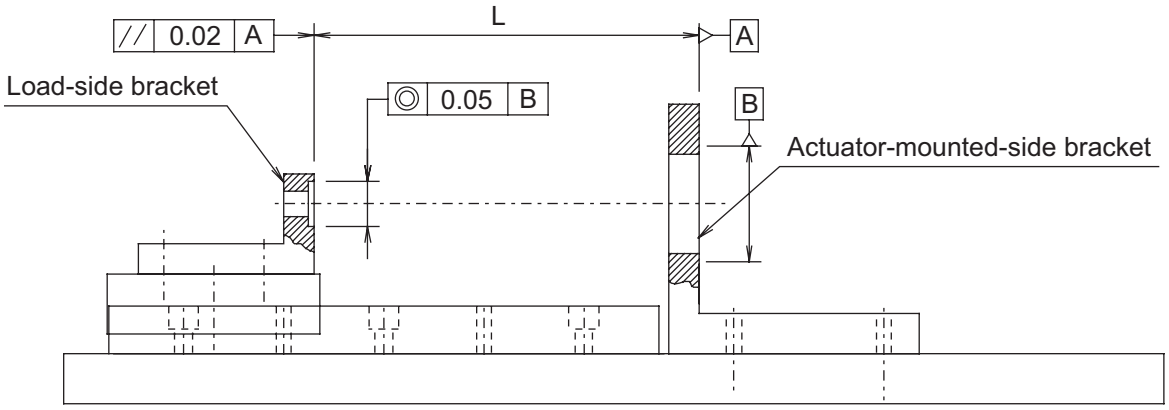
Tightening torque for tip clasp

Type	Tightening torque
RP3NA, RP3N (lead screw) RP3NA, RP3N (ball screw)	2.8N·m
RP4NA, RP4N (lead screw, RP4NA, RP4N (ball screw)	4.2N·m

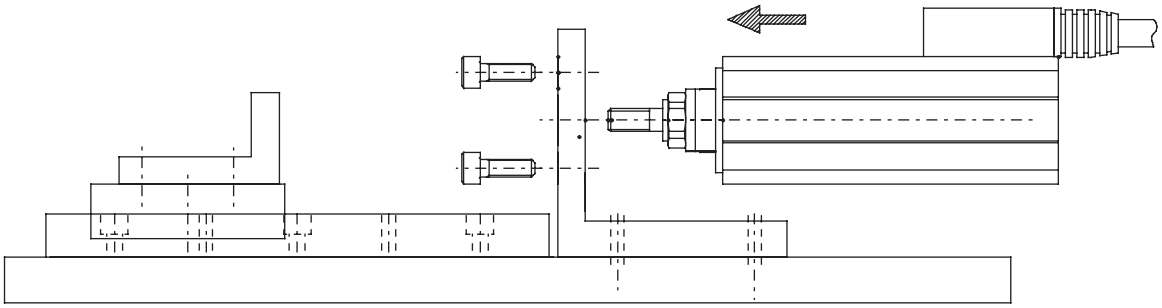
⚠ Caution: Do not join the actuator detent using a floating joint.
A radial load will be applied due to an eccentricity of the screw shaft, resulting in actuator malfunction or premature damage.

[Mounting procedure]

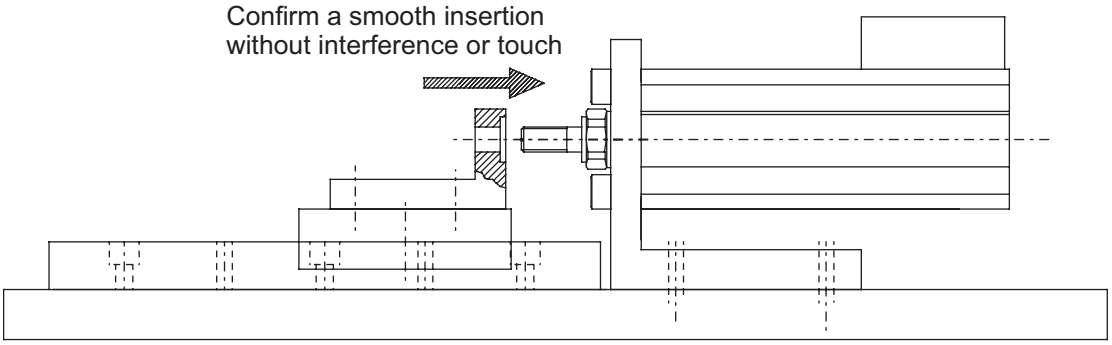
1) Check the accuracy on the actuator side and load side.
   Adjust the position so the accuracy can be maintained at the value shown below or less in the whole range of the load side movement.
   For the brake-equipped types, connect a controller and release the brake before start working.



2) Mount the main unit of the actuator.



3) Move the load-side bracket to confirm that there is no problem in the precision of the position to the shaft of the rod.
   Confirm that the shaft of the rod can be inserted without a touch to the inside face of the mating hole on the bracket.

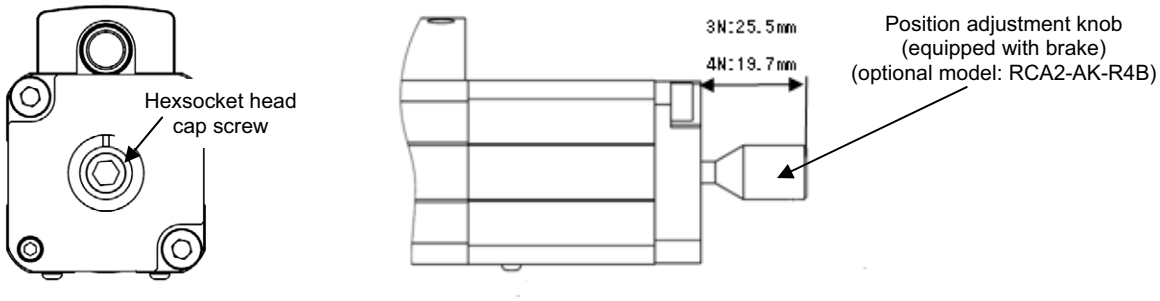


⚠ Caution: Make sure to have the position accuracy for the actuator and the load side as indicated.
Failure to do so may cause abnormal noise, vibration, operational failure or shorter product life.

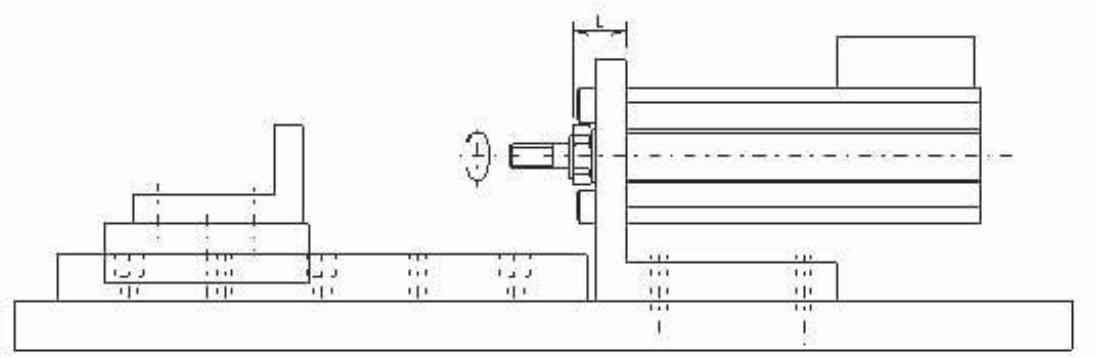
4) For the standard types with no brake, turn the shaft clockwise until the overall actuator dimension becomes the shortest and the mechanical stopper is contacted. When the shaft is turned at the mechanical end, the cutout groove provided in the shaft on the rear side also turns.
For the standard types equipped with a brake, remove the hex socket head cap screw (3N: M6 (width between two parallel faces = 3.0), 4N: M8 (width between two parallel faces = 4.0)) at the back side, and insert the optional “Position Adjustment Knob (for brake-equipped type)” until the shaft can be turned.
After inserting the knob, turn the shaft clockwise until it hits the mechanical stopper. If you turn the shaft at the mechanical end, the knob also turns.
For Cleanroom Type and Dust-proof Type, the axis will not rotate. For Lead 4, push the rod by hand to hit to the mechanical stopper, and then pull out for approximately 1mm. For Lead 1 and 2, connect the controller to perform the home-return operation.

⚠ Caution: Do not attempt to push the rod by hand for the low load type (Lead 1 and 2). Pushing it forcefully could allow applying load on the feed screw, which may cause operation error or malfunction.

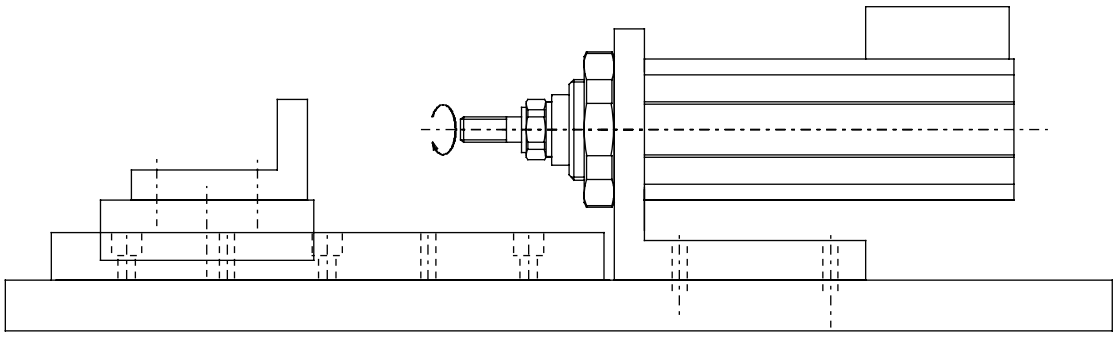
It is not necessary to conduct (5) and (6) work processes for Cleanroom Type and Dust-proof Type. Proceed to Step (7) and fix the guide-side bracket.



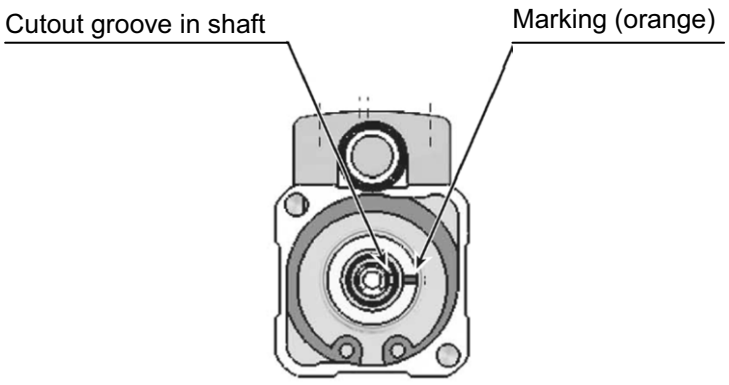
Brake-equipped type



5) For the types with no brake, turn the shaft clockwise until the cutout groove provided in the shaft on the rear side aligns with the marking (positioning) sticker.
For the brake-equipped types, make the cutout groove provided in the position adjustment knob aligned with the marking sticker.

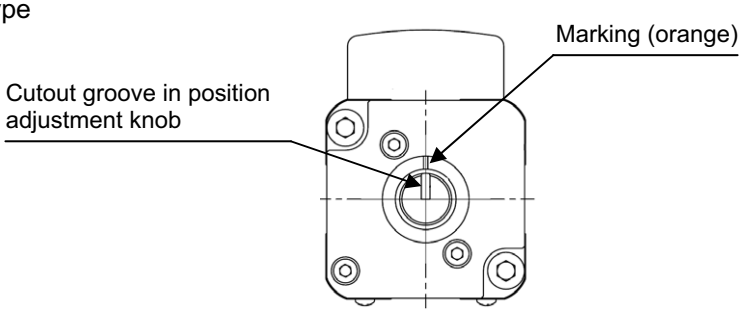


- Without Brake



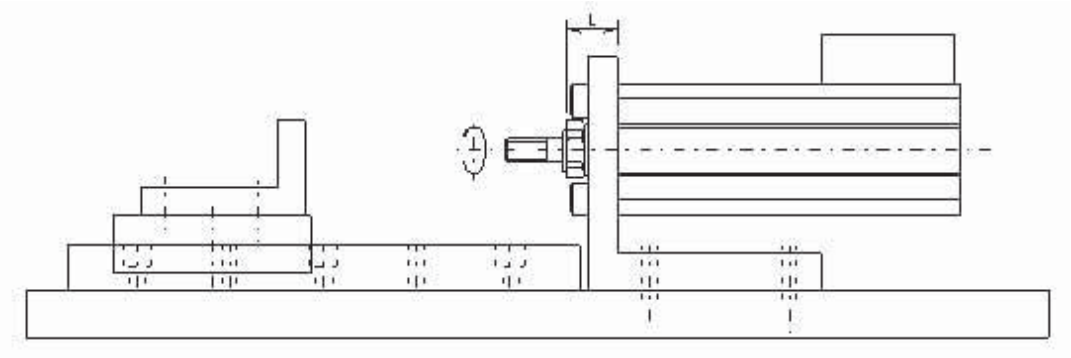
Shaft position at detent installation

- Brake-equipped Type

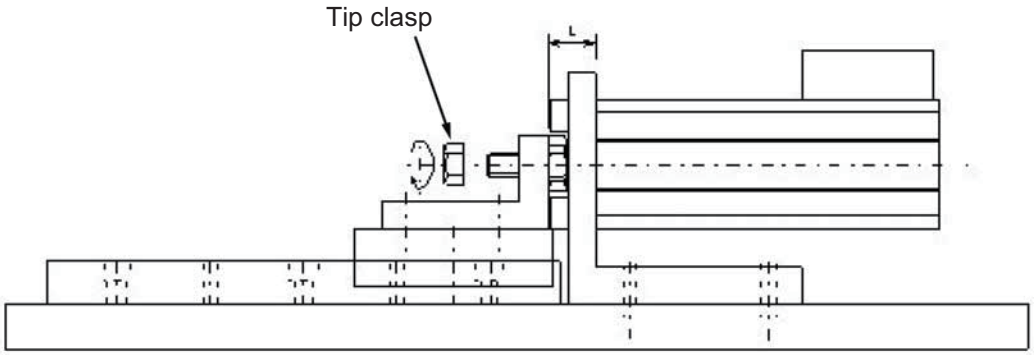


Shaft Position When Stopper Attached

6) While keeping this positioning relationship (= the cutout groove provided in the shaft on the rear side is aligned with the marking sticker), turn the shaft counterclockwise to adjust L to the specified dimension.



7) Use a spanner, etc., to hold the width across flats of the tip clasp in place and affix it with the guide-side bracket. (When affixing with the bracket, turn the nut while locking the spanner applied to the tip clasp. If the tip clasp turns, the home position becomes offset.)



Tightening torque for tip clasp

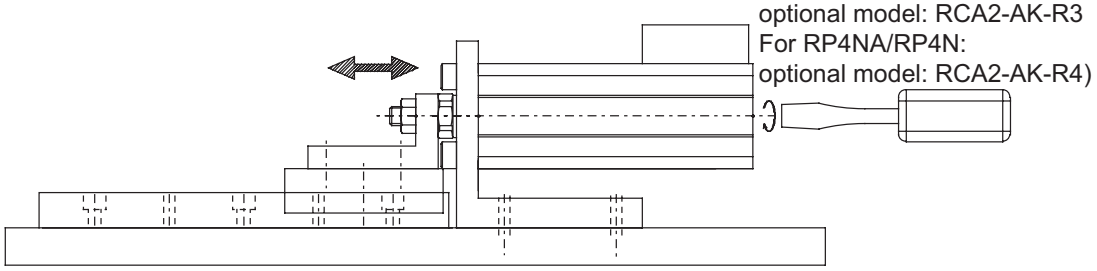
Type	Tightening torque
RP3NA, RP3N (Lead screw, ball screw)	2.8N·m
RP4NA, RP4N (Lead screw, ball screw)	4.2N·m

⚠ Caution: Pay attention not to get the bellows twisted for Cleanroom Type and Dust-proof Type. Bellows being twisted may cause misalignment of the home position or drop of production life.

8) Confirm that the bracket moves smoothly in the whole range of its stroke. Readjust the position if it is confirmed the bracket gets heavy or stuck at any point in the stroke range.
   - For the low lead types (Lead 1 and 2) in the standard type, move the bracket by turning the rear of the rotary shaft with a screwdriver or position adjustment knob for the types with no brake, or the position adjustment knob (dedicated for brake-equipped types) for the brake-equipped types.
   - For Cleanroom Type and Dust-proof Type, the axis will not rotate. Move the rod by hand for Lead 4. For the low lead types (Lead 1 and 2), connect a controller to move it by JOG operation.

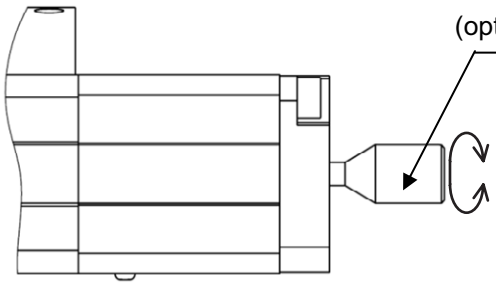
- Without Brake

Recommended screwdriver size:
Nominal size 5.5 to 6.0 (width at end)
or Position adjustment knob
(For RP3NA/RP3N:
optional model: RCA2-AK-R3
For RP4NA/RP4N:
optional model: RCA2-AK-R4)

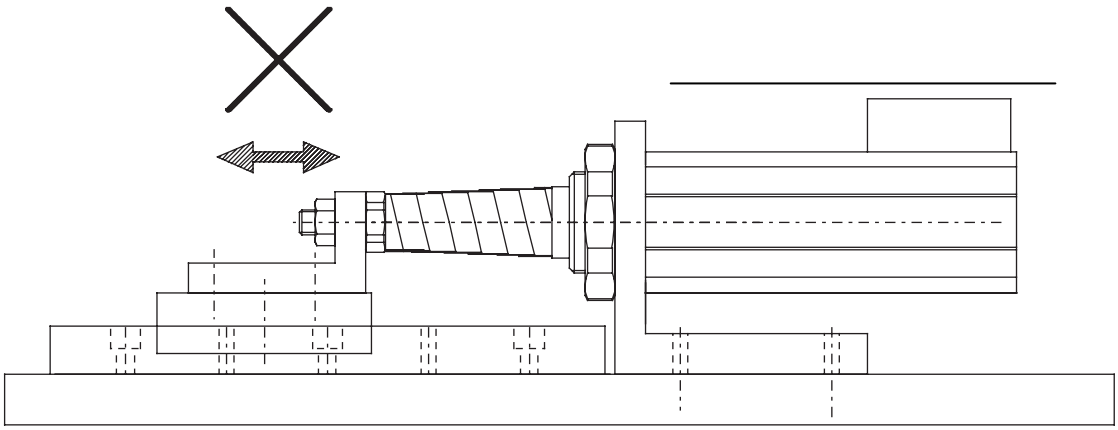


- Brake-equipped Type

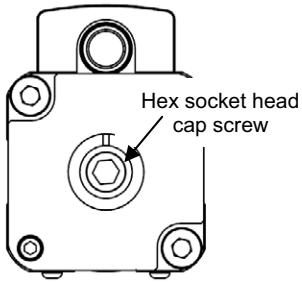
Position adjustment knob
(equipped with brake)
(optional model: RCA2-AK-R4B)



⚠ Caution: Do not attempt to move back and forth from the load side (rod side) for the low lead types (Lead 1 and 2).
Moving it forcefully would apply too much load to the feed screw and may result in the cause of operational failure or destruction of the product.



9) For the standard types equipped with a brake, attach the hex socket head cap screw (3N: M6, 4N: M8) so it faces to the actuator.



Tightening torque (reference): RN3NA 0.2N•m
RN4NA 0.4N•m

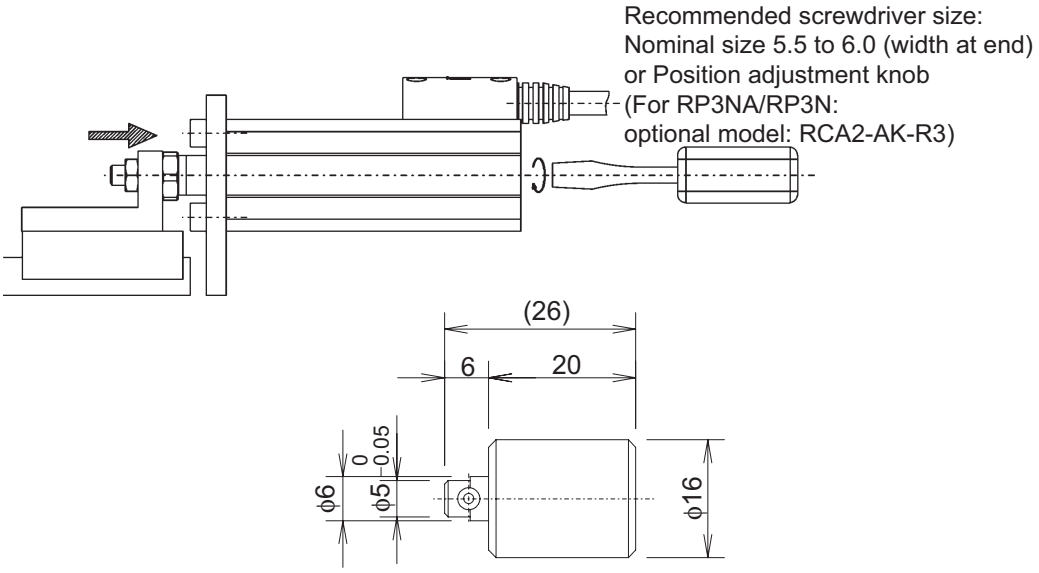
⚠ Caution: Do not push in too much. If the screw is turned with it hitting the brake, it may damage the brake.

[How to check and adjust the position of encoder phase Z]
Follow the procedures below to check if encoder phase Z is at an appropriate position. It is required only for the standard type RCA2-RP3NA/RP3N (slide screw) actuators with a lead of 1mm to confirm that the encoder Z-phase is in the appropriate position by the following procedures.

[Procedure 1] Checking the position of encoder phase Z

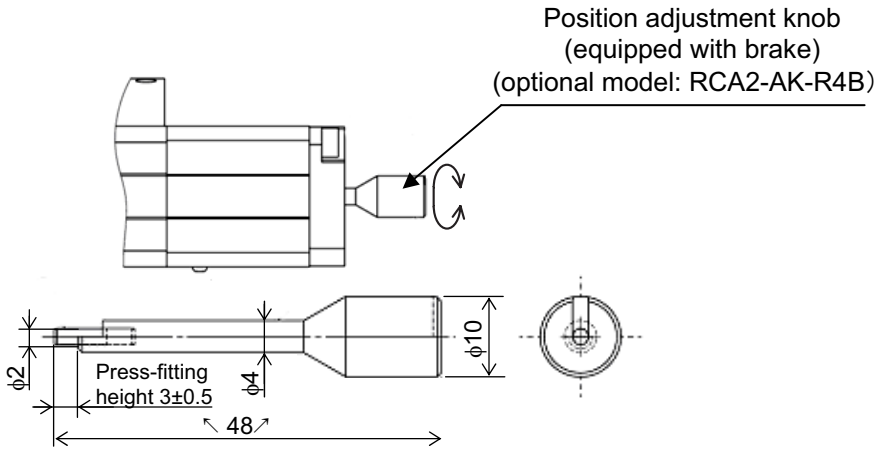
1) Turn the shaft clockwise from the rear until the rod contacts the rear end.

- Without Brake



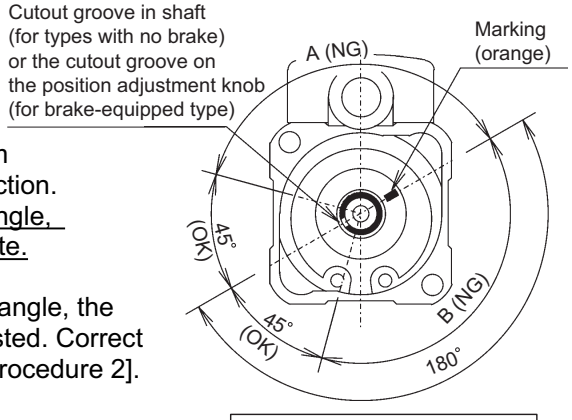
Position adjustment knob (optional model: RCA2-AK-R3)

- Brake-equipped Type



Position adjustment knob (equipped with brake) (optional model: RCA2-AK-R4B)

2) In rear view, confirm that the cutout groove in the shaft (for types with no brake) or the cutout groove on the position adjustment knob (for brake-equipped type) is located within ±45 degrees of the line extending from the marking in the 180-degree opposite direction. If the cutout groove is within the allowable angle, the position of encoder phase Z is appropriate.



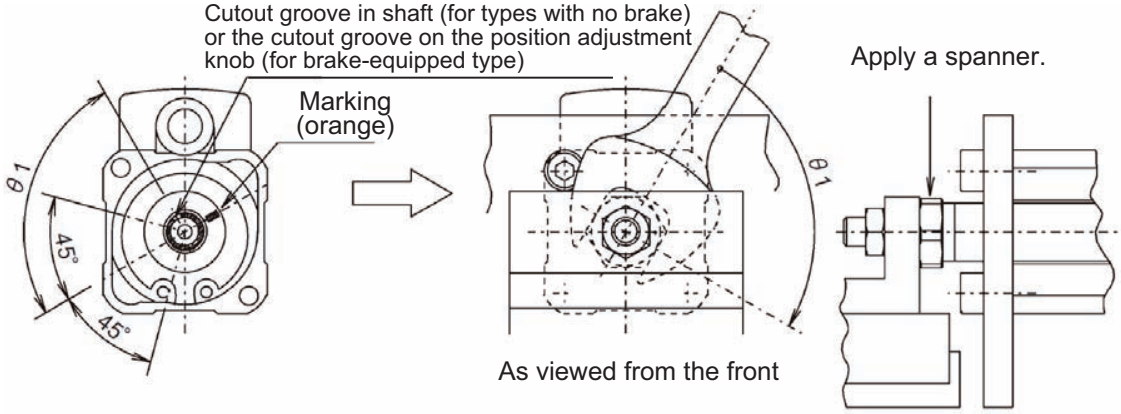
* The marking position varies depending on the actuator.

If the cutout groove is outside the allowable angle, the position of encoder phase Z must be readjusted. Correct the position as specified on the next page [procedure 2].

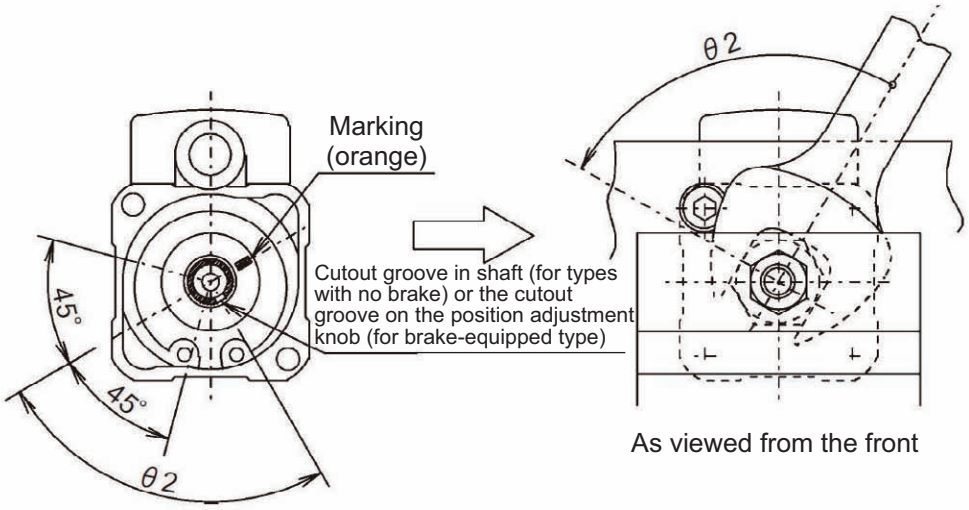
[Procedure 2] Correcting the position of encoder phase Z

If the cutout groove in the shaft is outside the allowable angle range, make correction by following the procedure below:

1) Use a spanner to hold the width across flats on the clasp at the tip to keep it in position, and loosen the lock nut slightly.
2) Move the clasp at the tip slightly in the rotating direction to correct the position.
   - If the cutout groove in the shaft is deviated in the A (NG) direction:
     Move the clasp at the tip clockwise roughly by the correction angle θ1 (as viewed from the front).



   - If the cutout groove in the shaft is deviated in the B (NG) direction:
     Move the clasp at the tip counterclockwise roughly by the correction angle θ2 (as viewed from the front).



3) After the correction, tighten the lock nut with the clasp at the tip still held in position.

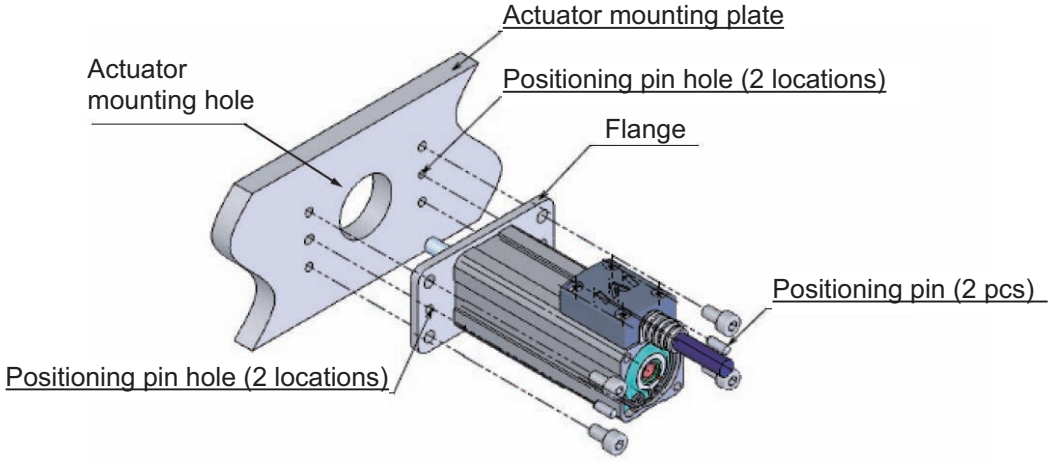
[Procedure 3] Confirming the phase Z position again

Finally, repeat [Procedure 1] to confirm the position of phase Z again.
If the position is inside the allowable angle, phase Z has been corrected properly.

[3] Installation of the Flange

Provide a flange-shaped sheet and install the actuator onto this sheet from the back.

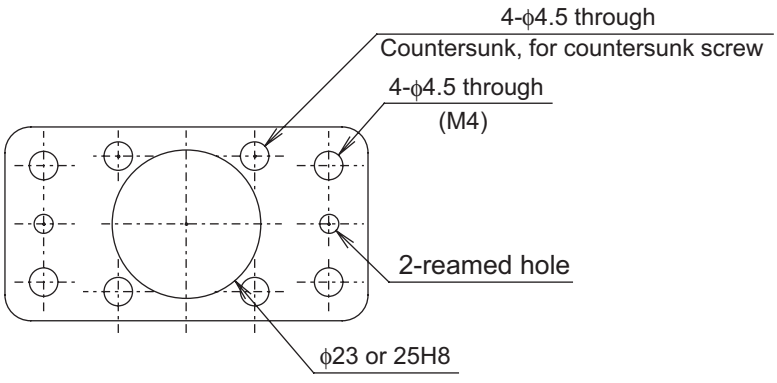
- Use the tapped hole on the actuator to install the actuator onto the flange using the M4 countersunk screw.
- Secure the flange with the actuator mounting plate using screws.
  If positioning is required, insert positioning pins.



Installation of actuator and flange

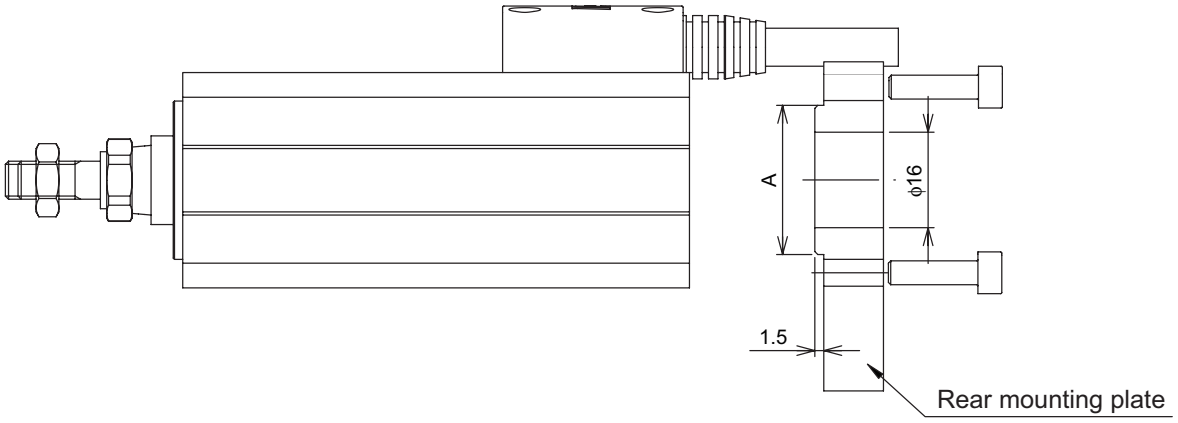
Type	Tapped hole size	Tightening torque	
		Plate is made of steel material	Plate is made of aluminum material
RP3NA, RP3N (Lead screw, ball screw) RP4NA, RP4N (Lead screw, ball screw)	M4, depth 8	3.6N·m	1.8N·m

(Reference drawing of flange)



[4] Installation from the Rear Side

For the types with no brake, when installing the actuator from the rear side, provide a rear mounting plate of a slightly-projected
circular column shape as shown below, to facilitate the positioning.
(Note) For the standard types equipped with a brake, Cleanroom Type and Dust-proof Type, it is not available to attach from the rear side.



	RP3NA, RP3N (Lead screw, ball screw)	RP4NA, RP4N (Lead screw, ball screw)
A	ϕ25 $^{-0.2}_{-0.3}$	ϕ30 $^{-0.2}_{-0.3}$

2.3.4 How to Attach Single Guide Types GS3NA, GS3N (Lead Screw, Ball Screw), GS4NA, GS4N (Lead Screw, Ball Screw)

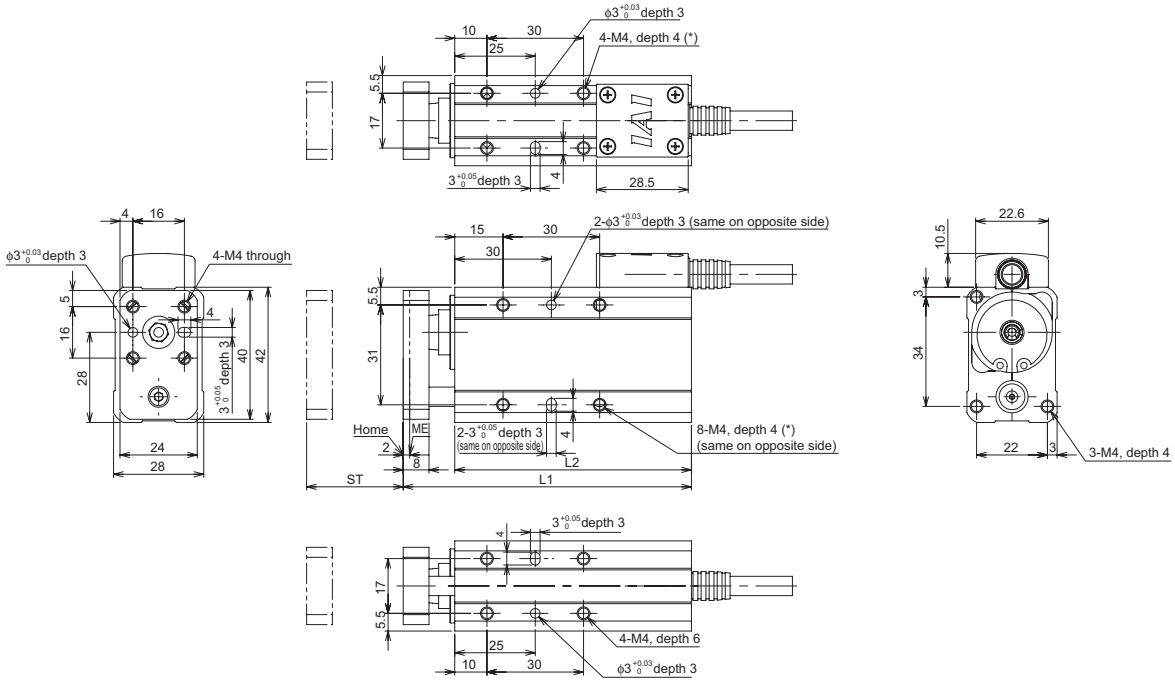
The actuator mounting surface should be machined or otherwise processed to a smooth surface of equivalent precision.

- The effective depth varies depending on the actuator model and mounting surface. Determine an appropriate length for the screws to be used by referring to the figure below.
- Circular and long positioning pin holes are provided in each mounting surface. Use these holes if necessary.

(Note) In the tapped holes of Cleanroom Type and Dust-proof Type, there are set screws attached. Remove the set screw when attaching.
Caulking treatment is conducted on the set screws. If the caulking agent is remained on the body after the screw is removed, make sure to clean up to get rid of it.

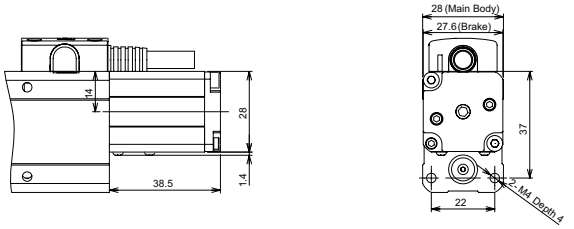
(Note) When installing Dust-proof Type with IP52 applicable specification (Model: WP), apply either caulking agent or sealing tape on the thread of the screws to be used.
㋓Recommended caulking agent: KE-4898 (Shin-Ethu Silicone)

● RCA2-GS3NA/GS3N (Lead screw, ball screw)
The actuator is structured in such a way that it can be affixed on any of its four sides. The load can be installed only one side.



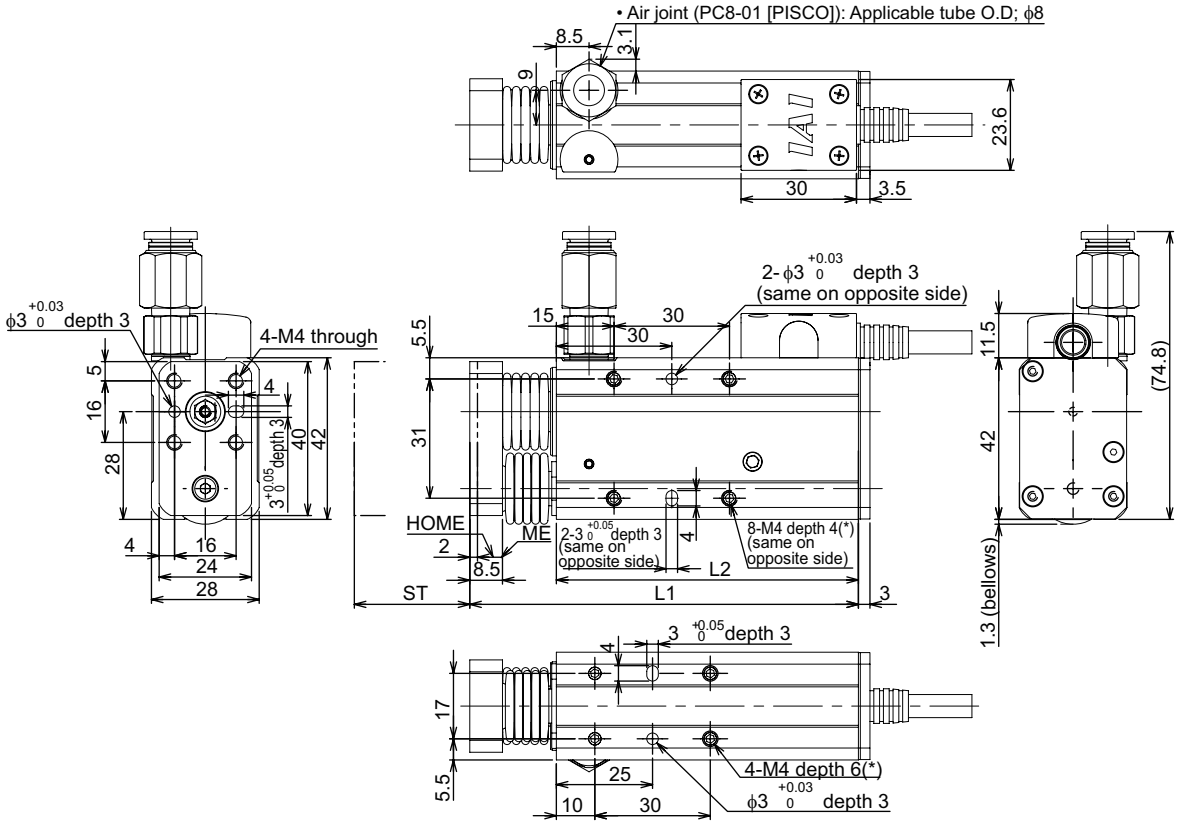
ST	L1	L2
30	89.5	73.5
50	109.5	93.5

Brake-equipped type (GS3NA (lead screw, ball screw)) external diagrams (reference)



⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

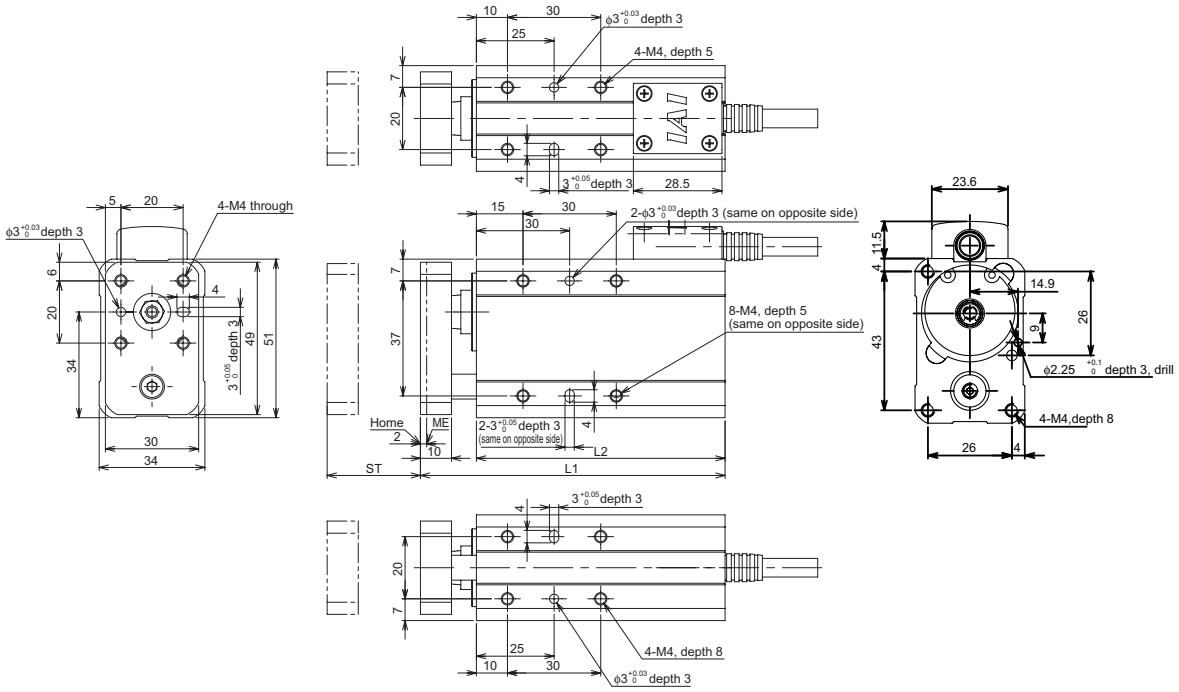
● RCA2CR, RCA2W-GS3NA (Ball screw) Cleanroom type, Dust-proof type
The actuator is structured in such a way that it can be affixed on any of its three sides. The load can be installed only one side.



ST	L1	L2
30	101	78.5
50	127	98.5

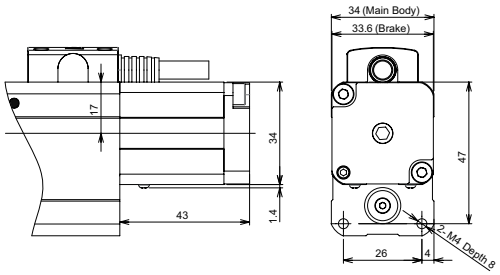
⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

● RCA2-GS4NA/GS4N (Lead screw, ball screw)
The actuator is structured in such a way that it can be affixed on any of its four sides. The load can be installed only one side.



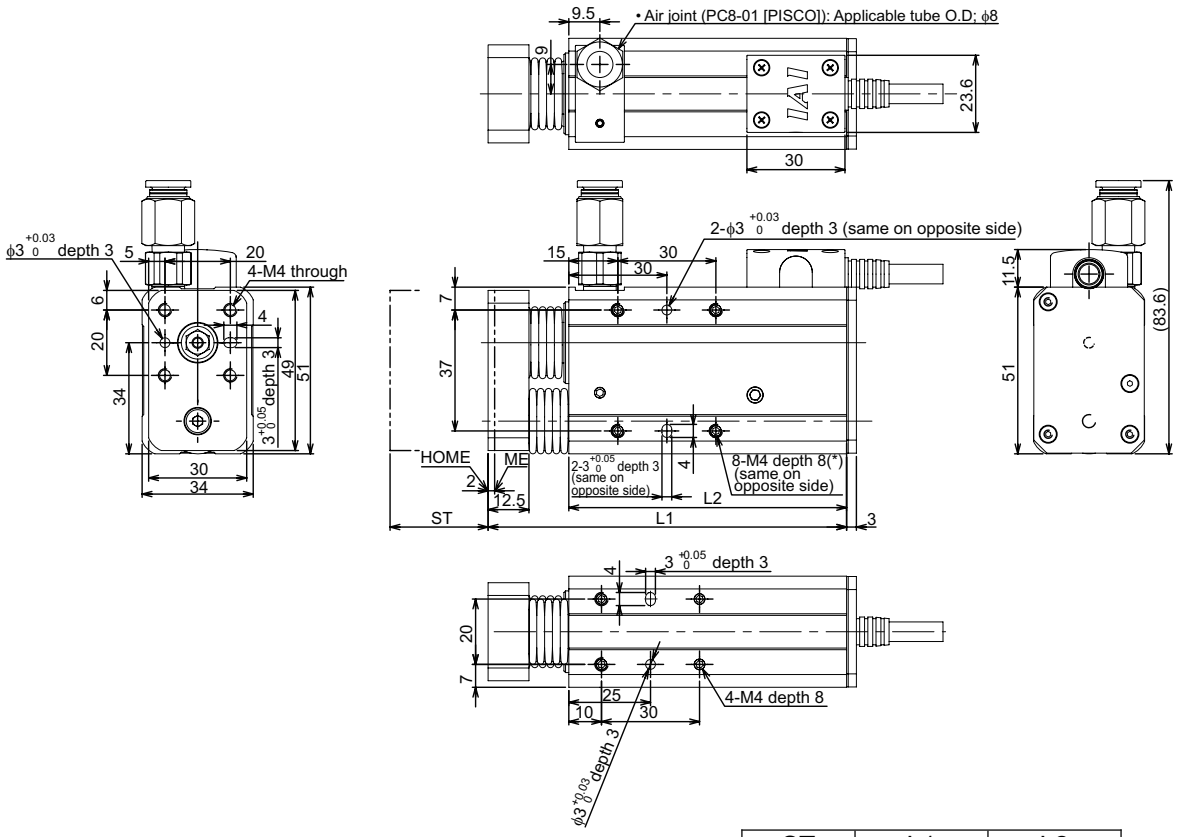
ST	L1	L2
30	89	80
50	118	100

Brake-equipped type (GS4NA (lead screw, ball screw)) external diagrams (reference)



⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

● RCA2CR, RCA2W-GS4NA (Ball screw) Cleanroom type, Dust-proof type
The actuator is structured in such a way that it can be affixed on any of its three sides. The load can be installed only one side.



ST	L1	L2
30	132	80
50	158	100

⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

2.3.5 How to Attach Double Guide Types GD3NA, GD3N (Lead Screw, Ball Screw), GD4NA, GD4N (Lead Screw, Ball Screw)

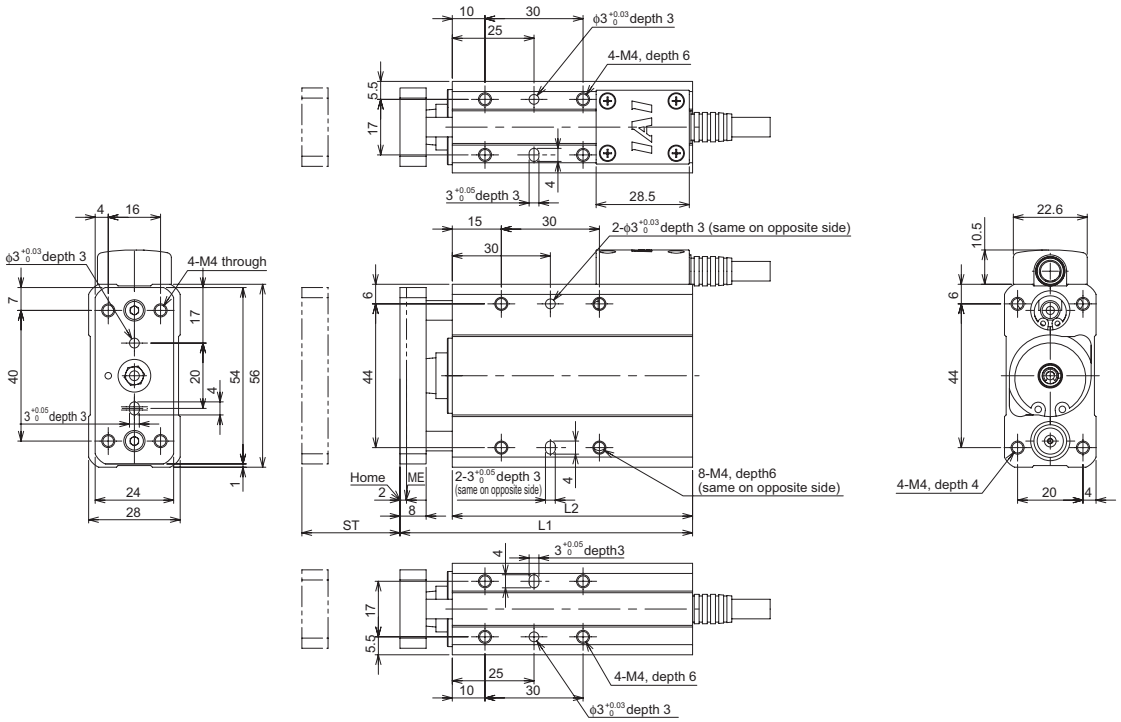
The actuator mounting surface should be machined or otherwise processed to a smooth surface of equivalent precision.

- The effective depth varies depending on the actuator model and mounting surface. Determine an appropriate length for the screws to be used by referring to the figure below.
- Circular and long positioning pin holes are provided in each mounting surface. Use these holes if necessary.

(Note) In the tapped holes of Cleanroom Type and Dust-proof Type, there are set screws attached. Remove the set screw when attaching.
Caulking treatment is conducted on the set screws. If the caulking agent is remained on the body after the screw is removed, make sure to clean up to get rid of it.

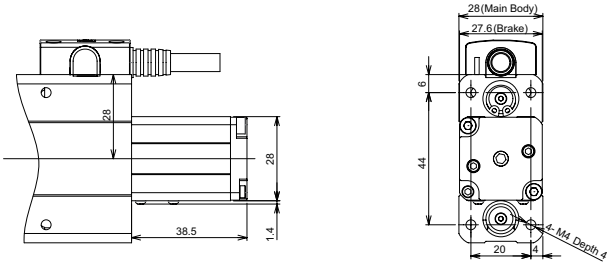
(Note) When installing Dust-proof Type with IP52 applicable specification (Model: WP), apply either caulking agent or sealing tape on the thread of the screws to be used.
㋓Recommended caulking agent: KE-4898 (Shin-Ethu Silicone)

● RCA2-GD3NA/GD3N (Lead screw, ball screw)
The actuator is structured in such a way that it can be affixed on any of its four sides. The load can be installed only one side.
The actuator mounting surface should be machined or otherwise processed to a smooth surface of equivalent precision.



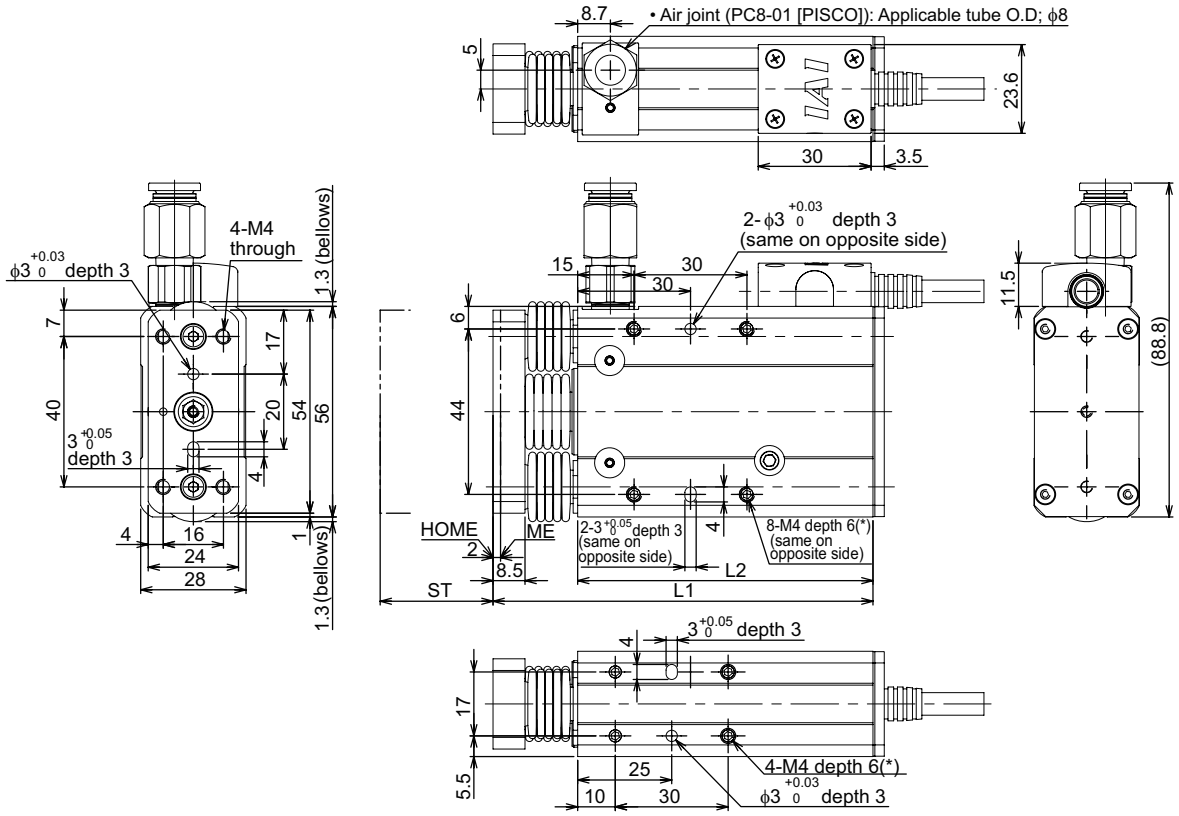
ST	L1	L2
30	89.5	73.5
50	109.5	93.5

Brake-equipped type (GD3NA (lead screw, ball screw)) external diagrams (reference)



⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

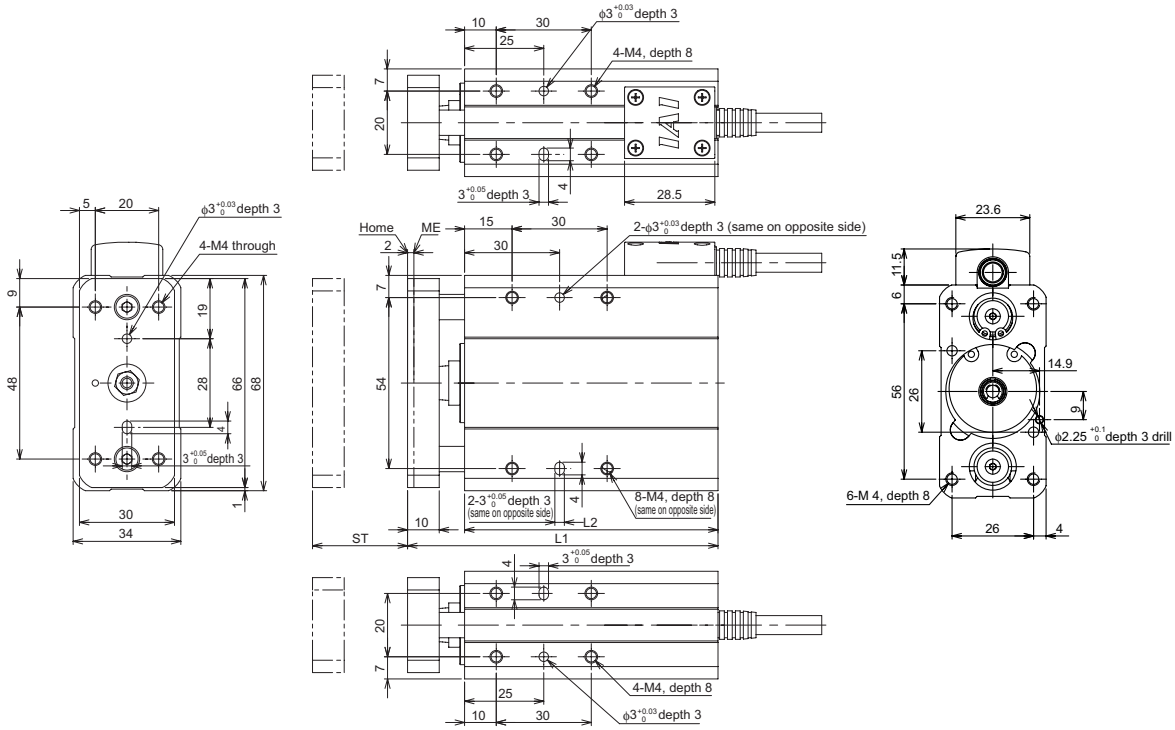
● RCA2CR, RCA2W-GD3NA (Ball screw) Cleanroom type, Dust-proof type
The actuator is structured in such a way that it can be affixed on any of its three sides. The load can be installed only one side.



ST	L1	L2
30	101	78.5
50	127	98.5

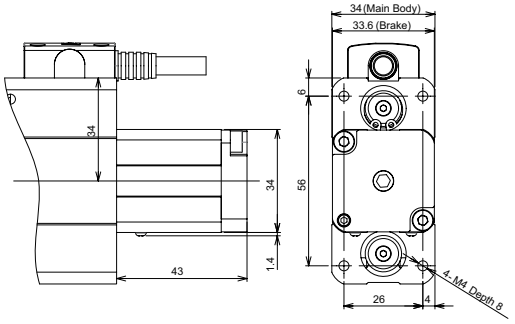
⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

● RCA2-GD4NA/GD4N (Lead screw, ball screw)
The actuator is structured in such a way that it can be affixed on any of its four sides. The load can be installed only one side.



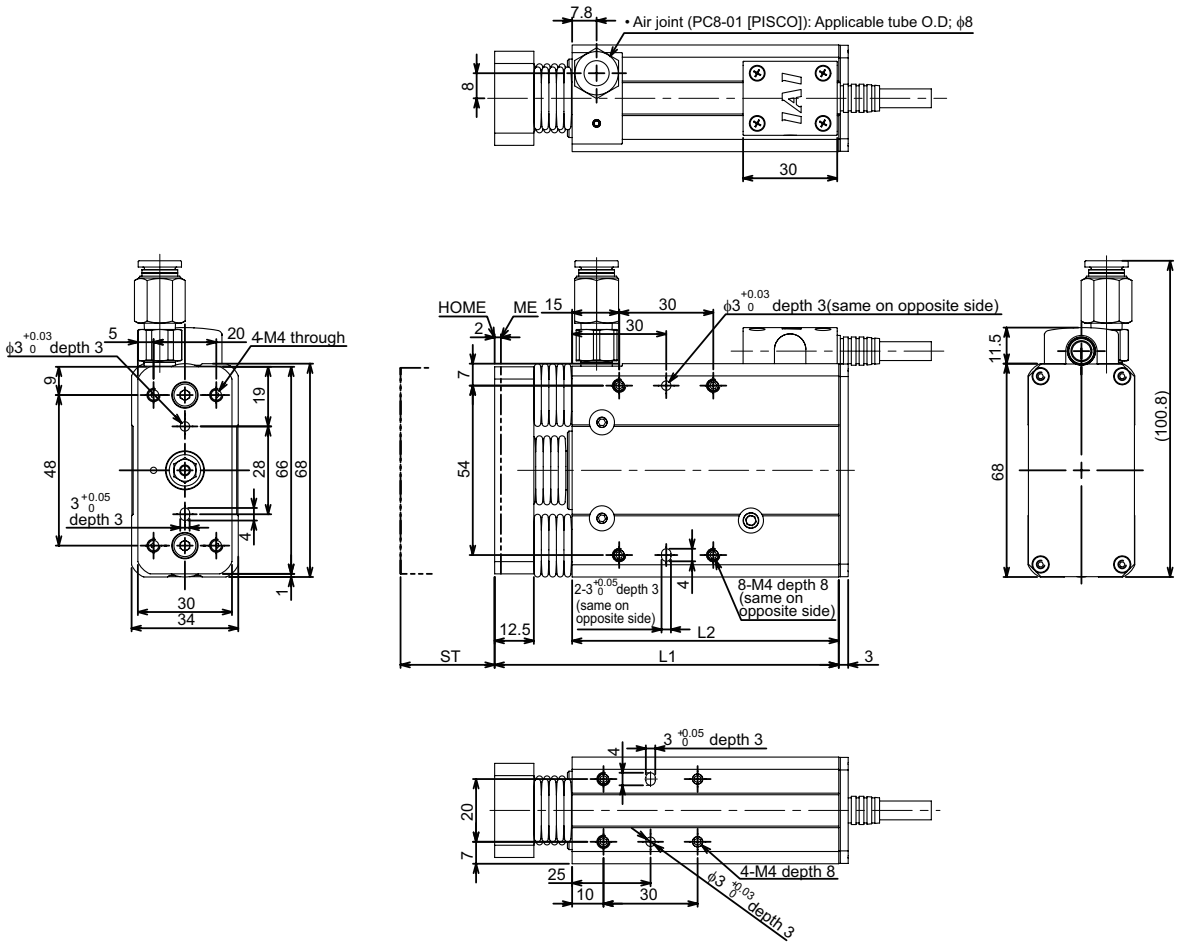
ST	L1	L2
30	98	80
50	118	100

Brake-equipped type (GD4NA (lead screw, ball screw)) external diagrams (reference)



⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

● RCA2CR, RCA2W-GD4NA (Ball screw) Cleanroom type, Dust-proof type
The actuator is structured in such a way that it can be affixed on any of its three sides. The load can be installed only one side.



ST	L1	L2
30	109.7	85
50	135.7	105

⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

2.3.6 How to Attach Slide Unit Types SD3NA/SD3N (Lead Screw, Ball Screw), SD4NA/SD4N (Lead Screw, Ball Screw)

The actuator or guide bracket mounting surface should be machined or otherwise processed to a smooth surface of equivalent precision.

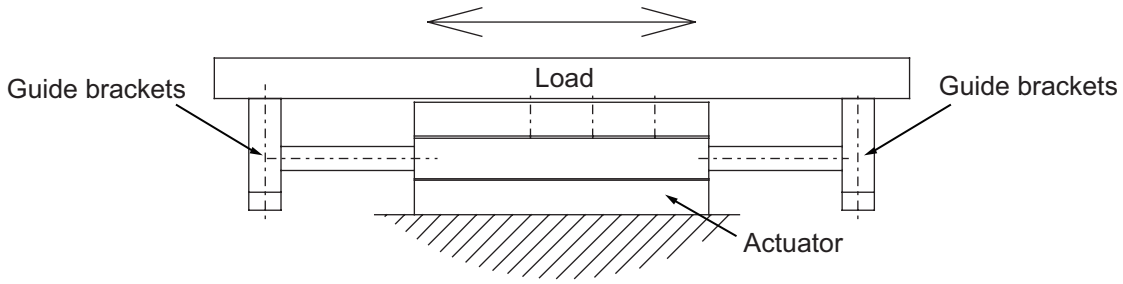
- The effective depth varies depending on the actuator model and mounting surface. Determine an appropriate length for the screws to be used by referring to the figure below.
- Circular and long positioning pin holes are provided in each mounting surface. Use these holes if necessary.

(Note) In the tapped holes of Cleanroom Type and Dust-proof Type, there are set screws attached. Remove the set screw when attaching.
Caulking treatment is conducted on the set screws. If the caulking agent is remained on the body after the screw is removed, make sure to clean up to get rid of it.

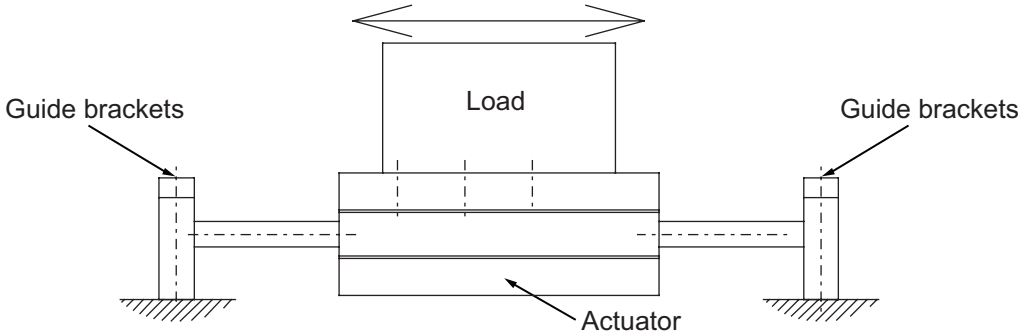
(Note) When installing Dust-proof Type with IP52 applicable specification (Model: WP), apply either caulking agent or sealing tape on the thread of the screws to be used.
㋓Recommended caulking agent: KE-4898 (Shin-Ethu Silicone)

The slide unit types can be installed in one of two ways: by affixing the actuator or affixing the guide brackets.

[Affixing the actuator]

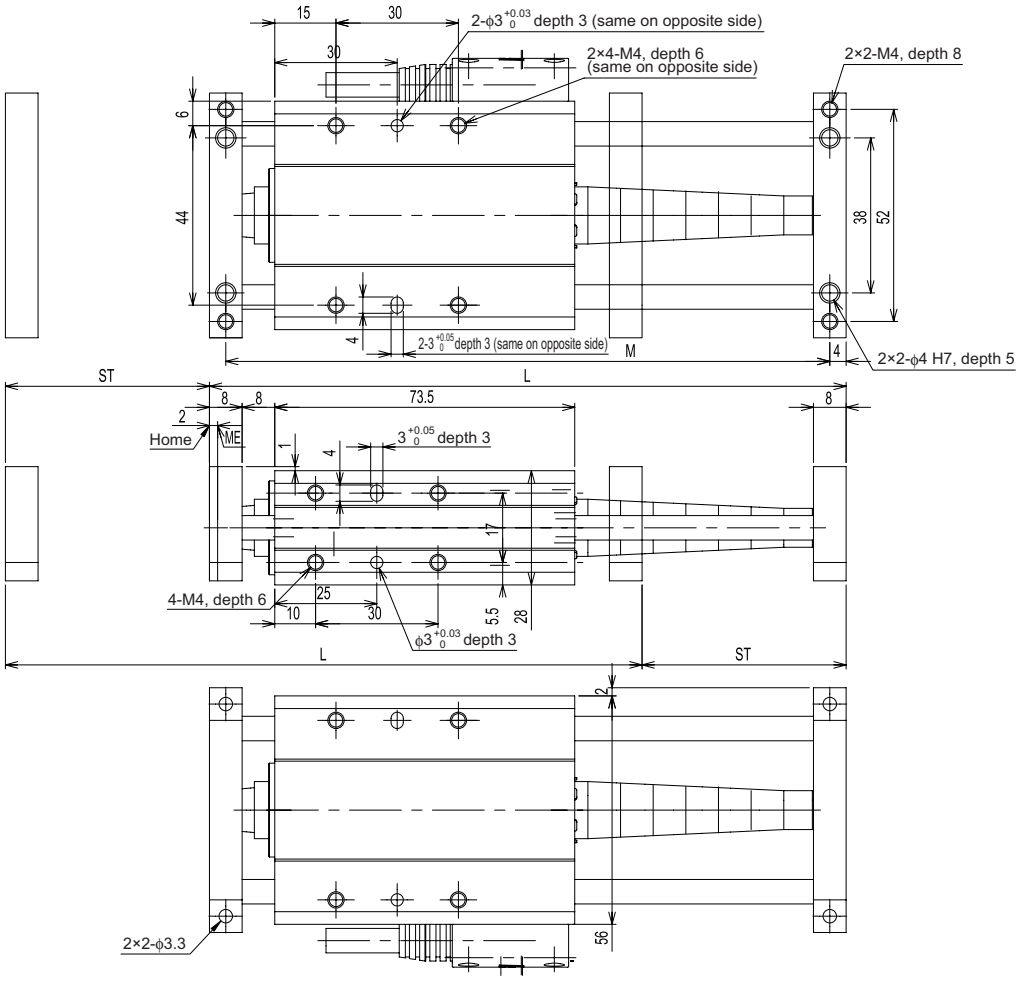


[Affixing the brackets]



⚠ Caution: If the brackets are to be affixed, the actuator cannot be installed vertically.

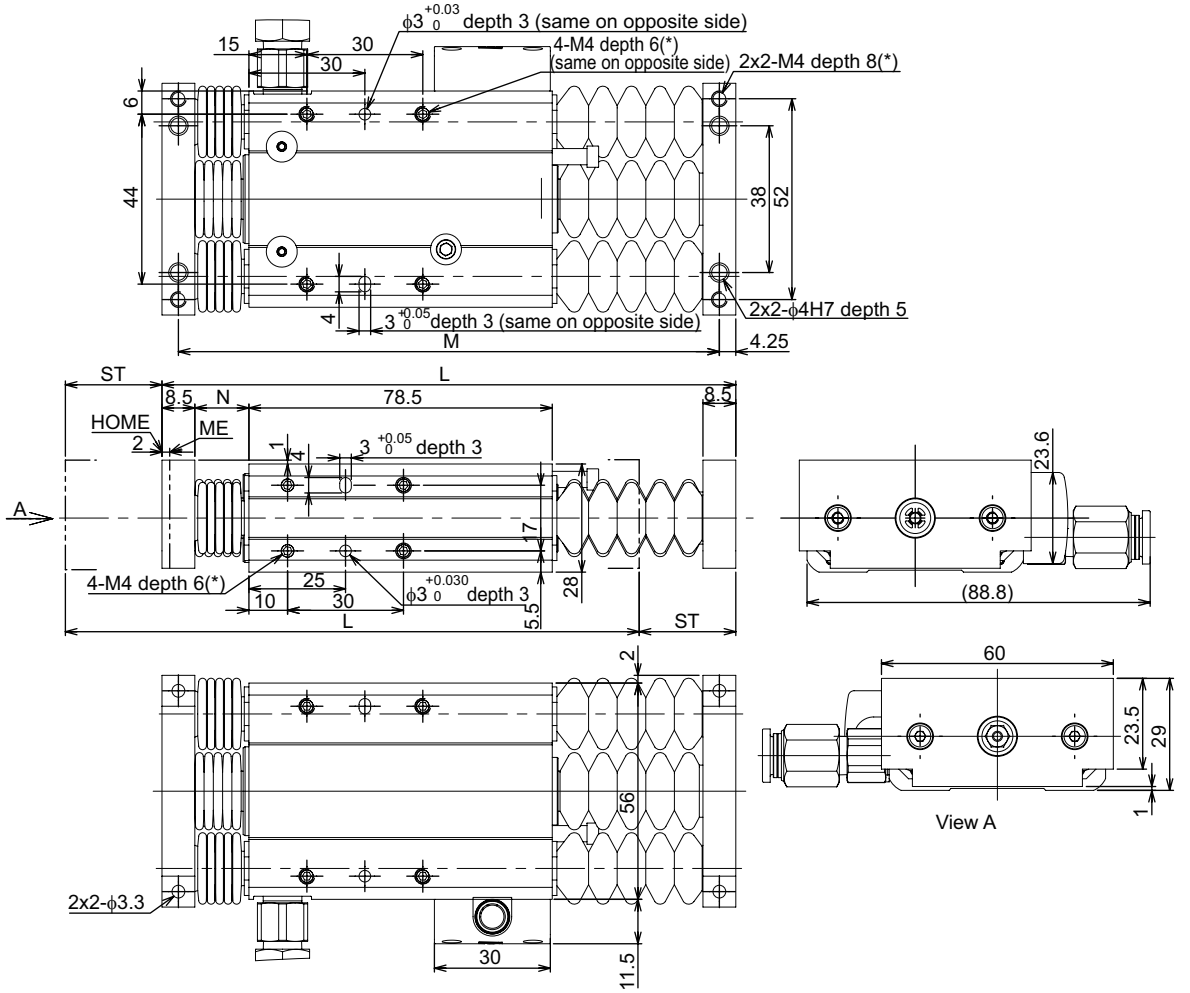
● RCA2-SD3NA/ SD3N (Lead screw, ball screw)
The actuator is structured in such a way that it can be affixed on any of its three sides.



ST	L	M
25	131	123
50	156	148

⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

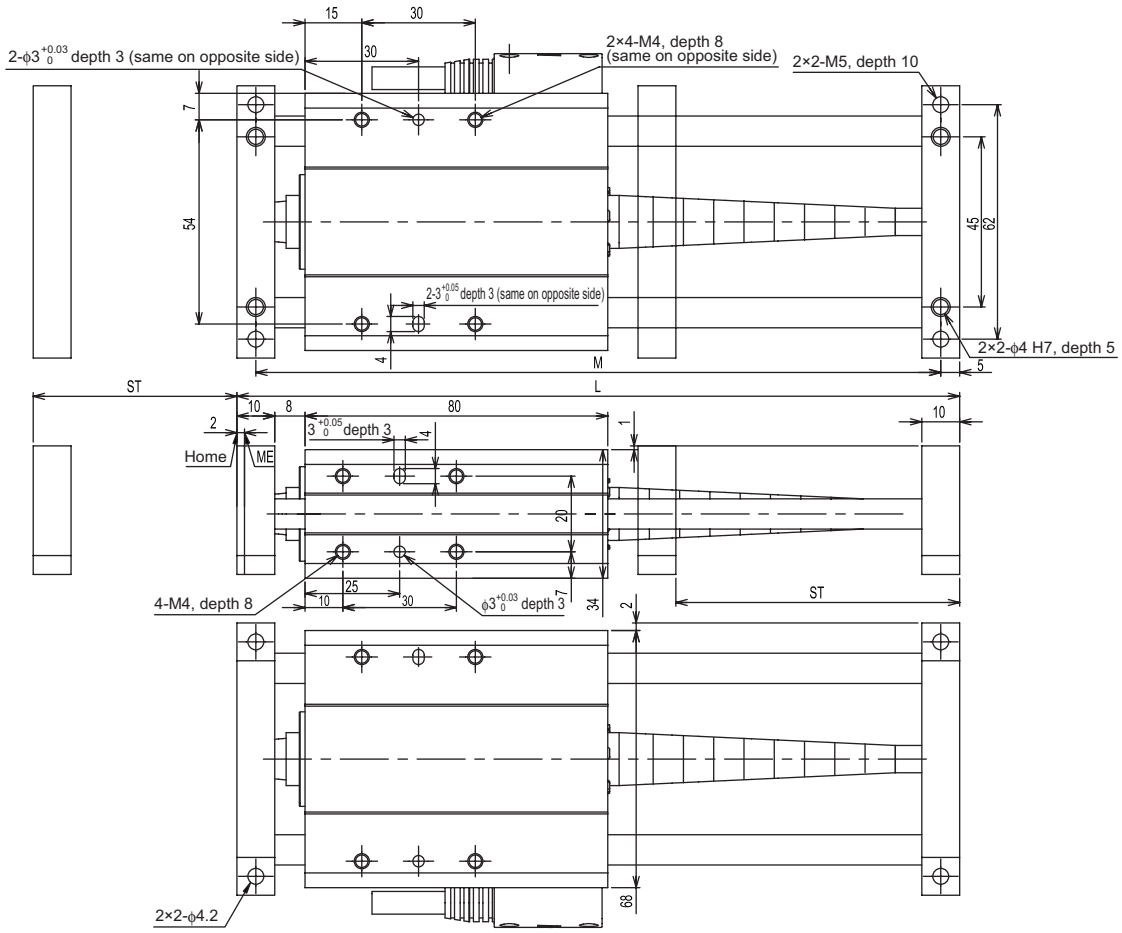
● RCA2CRわRCA2W-SD3NA (Ball screw) Cleanroom type, Dust-proof type
The actuator is structured in such a way that it can be affixed on any of its three sides.



ST	L	M	N
25	148.5	140	14
50	185.5	177	20

⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

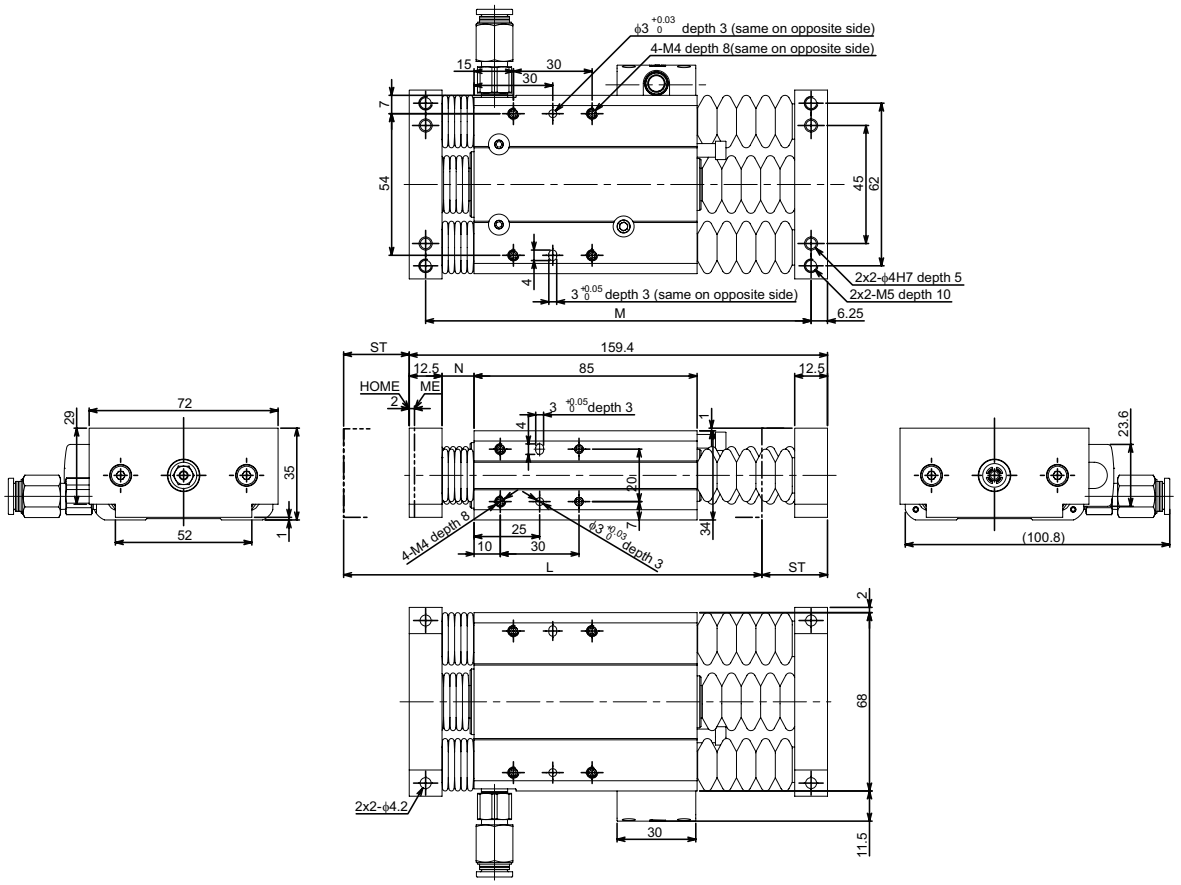
● RCA2-SD4NA/SD4N (Lead screw, ball screw),
The actuator is structured in such a way that it can be affixed on any of its three sides.



ST	L	M
25	141	131
50	166	156
75	191	181

⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

● RCA2CR, RCA2W-SD4NA (Ball screw) Cleanroom type, Dust-proof type
The actuator is structured in such a way that it can be affixed on any of its three sides.



ST	L	M	N
25	159.4	146.9	12.2
50	196.4	183.9	18.2

⚠ Caution: Some tapped mounting holes are through holes. Never use long screws exceeding the effective thread length. Such long screws may damage the internal mechanism or electrical parts.

2.4 About the Cleanroom Specification

2.4.1 About Vacuuming Flow

It is mandatory to perform vacuuming inside the body when using as Cleanliness Class 100. Connect an air tube that you have prepared to the quick joint with its outer diameter ϕ8 equipped on the vacuum, and perform vacuuming with the specific flow rate described in the table with using a vacuum pump, blower or ejector.

[3N type]

Vacuum flow rate should be the same no matter of the lead or stroke.

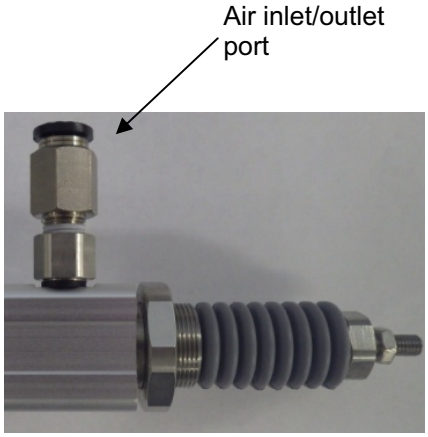
Model	Vacuum Flow Rate [NL/mm]
RCA2CR-RN3NA RCA2CR-RP3NA RCA2CR-GS3NA RCA2CR-GD3NA RCA2CR-SD3NA	15

[4N type]

Vacuum flow rate should be the same no matter of the lead.

Model	Stroke	Vacuum Flow Rate [NL/mm]
RCA2CR-RN4NA	30	20
	50	
RCA2CR-RP4NA	30	20
	50	
RCA2CR-GS4NA	30	15
	50	
RCA2CR-GD4NA	30	20
	50	
RCA2CR-SD4NA	25	15
	50	20

2.5 Connection of Air Tube on Dust-proof Type



Attach an air tube (O.D.: 8mm, I.D.: 5mm) to the air inlet/outlet port and conduct air piping to the external environment with no dust or water dripping.

(Applicable Tube)

Shown below is a model code of an air tube representative to be applicable.

- TU0805: Material polyurethane (Manufacturer: SMC)

⚠ Caution:
- Keep the air tube 3m or less.
- Do not attempt to lay out the pipes to accept excess bend or fold on the air tube.

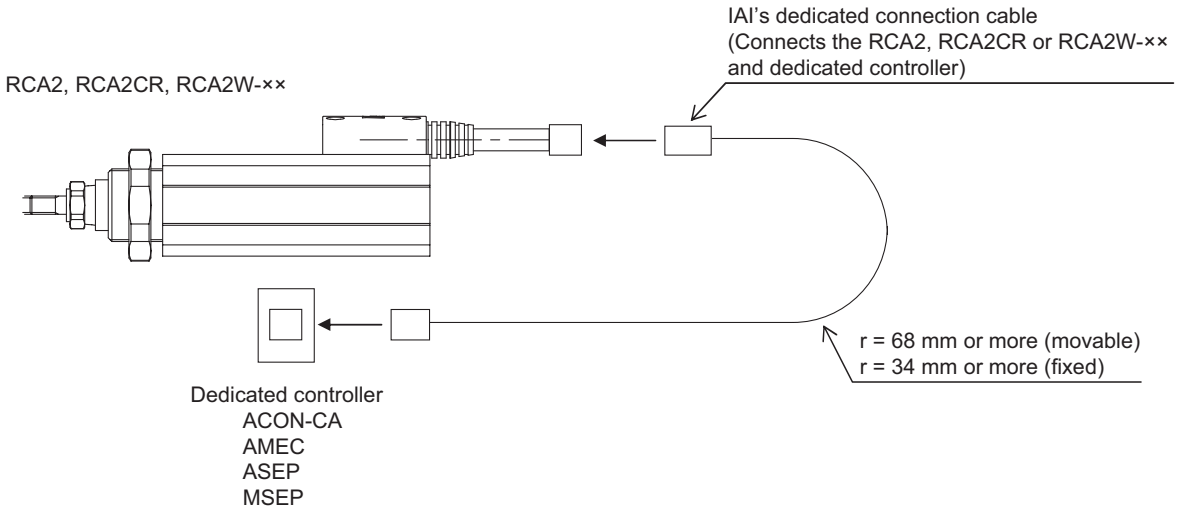
3. Connecting with the Controller

Use the IAI dedicated connection cable for the connection of the actuator to the controller.

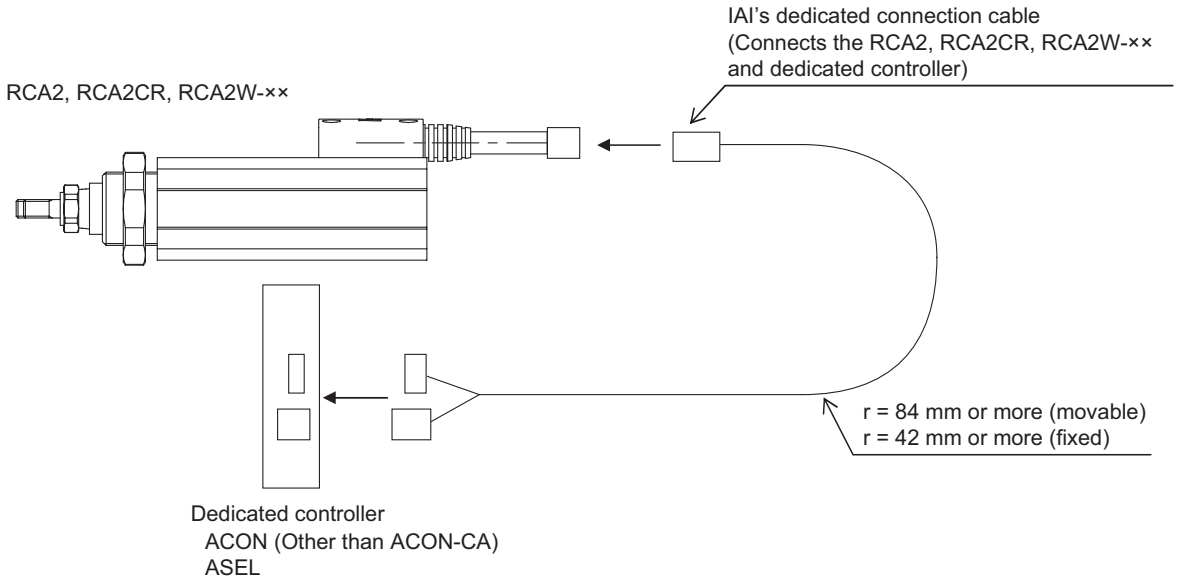
- If the dedicated connection cable cannot be secured, reduce the load on the cable by allowing it to deflect only by the weight of the cable or wire it in a self-standing cable hose, etc., having a large radius.
- Do not cut and reconnect the dedicated connection cable for extension or shorten the cable.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

> ⚠ Caution: The connector on the actuator cable for Dust-proof Type is not treated for dust and water-proof. Conduct the connection of the connectors to the motor/encoder cables in an environment with no dust or water. (Actuator cable length of Dust-proof Type: 2m)

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



Dedicated connection cable
• Servo motor cable : CB-APSEP-MPA□□□
*) □□□ indicates the cable length. Up to 20m can be specified.
Example) 080 = 8m

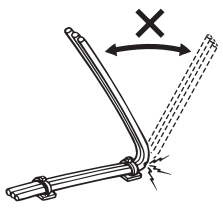


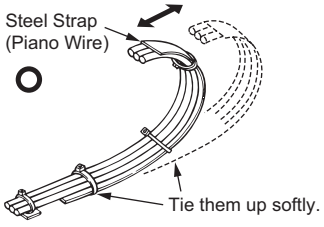
Dedicated connection cable
• Servo motor cable : CB-ACS-MPA□□□
*) □□□ indicates the cable length. Up to 20m can be specified.
Example) 080 = 8m

(Note) RA2AC and RA2AR cannot be operated with ASEL Controllers and ACON Controllers except for ACON-CA.

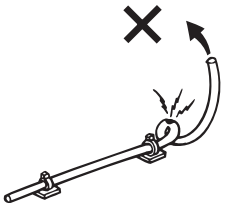
⚠ Warning: For wiring, please follow the warnings stated below. When constructing a system as the machinery equipment, pay attention to the wiring and connection of each cable so they are conducted properly. Not following them may cause not only a malfunction such as cable breakage or connection failure, 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.
- Have a sufficient radius for bending, and avoid a bend concentrating on one point.

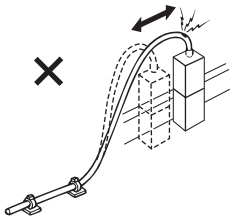




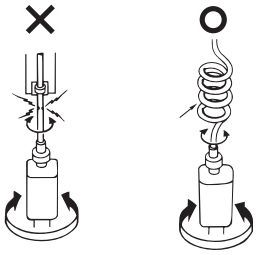
- Do not let the cable bend, kink or twist.



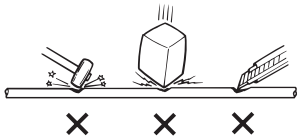
- Do not pull the cable with a strong force.



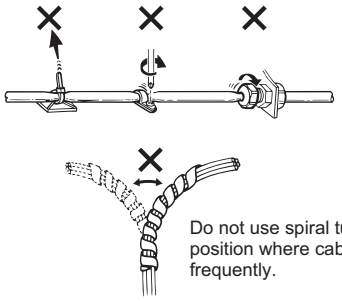
- Pay attention not to concentrate the twisting force to one point on a cable.



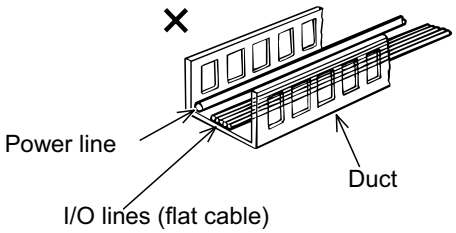
- Do not pinch, drop a heavy object onto or cut the cable.



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

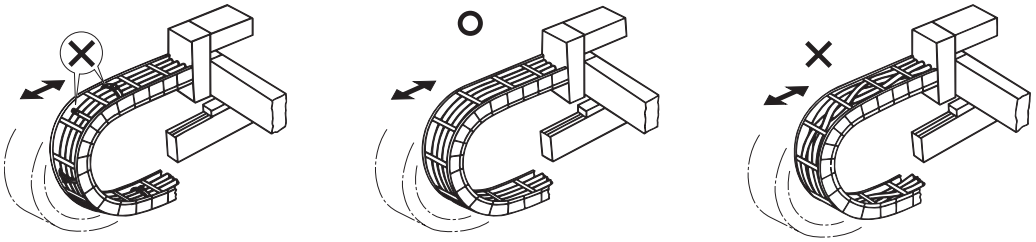


• PIO line, communication line, power and driving lines are to be put separately from each other and do not tie them together. Arrange so that such lines are independently routed in the duct.



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.



4. Operation

4.1 Duty in Continuous Operation

Duty is the rate of operation expressed in % that presents the time of the actuator being operated in 1 cycle of operation.
Perform an operation with the duty below the allowable range.

> ⚠ Caution: If the overload error occurs, try either to reduce the duty by extending the stop time or to reduce the acceleration/deceleration speed.

[How to Calculation Duty]
Figure out the load ratio and acceleration/deceleration time ratio, and read the duty from the graph. If the load ratio if less than 50%, operation with 100% of the duty (continuous operation) is available.

1) Duty ratio LF
The maximum transportable weight at the rated acceleration and the rated acceleration/deceleration speed are described in 1.2 “Specifications.”

$$\text{Duty ratio:LF} = \frac{M \times \alpha}{Mr \times \alpha r} \quad [\%]$$

Max. Transportable Weight at Rated Acceleration : Mr [kg]
Rated Acceleration/Deceleration Speed : αr [G]
Transported Weight during Operation : M [kg]
Acceleration/Deceleration Speed during Operation : α [G]

2) Acceleration/Deceleration Time Ratio t_{od}

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

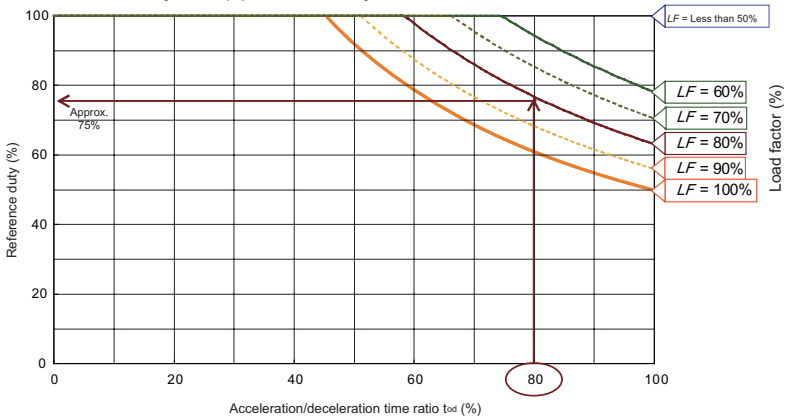
$$\text{Acceleration time} = \frac{\text{Speed during Operation[mm/s]}}{\text{Acceleration during Operation[mm/s}^2\text{]}} \quad [\text{Sec}]$$

$$\text{Deceleration time} = \frac{\text{Speed during Operation [mm/s]}}{\text{Deceleration during Operation [mm/s}^2\text{]}} \quad [\text{Sec}]$$

$$\text{Acceleration [mm/s}^2\text{]} = \text{Acceleration [G]} \times 9{,}800\text{mm/s}^2$$

$$\text{Deceleration [mm/s}^2\text{]} = \text{Deceleration [G]} \times 9{,}800\text{mm/s}^2$$

3) Duty: It is read out from the load ratio LF and the acceleration time ratio t_{od} that were used to figure it out.
e.g.) When the load ratio LF = 80% and the acceleration/deceleration time ratio t_{od} = 80%, the reference for the duty is approximately 75%.



4.2 Home Return

4.2.1 Home Return Operation

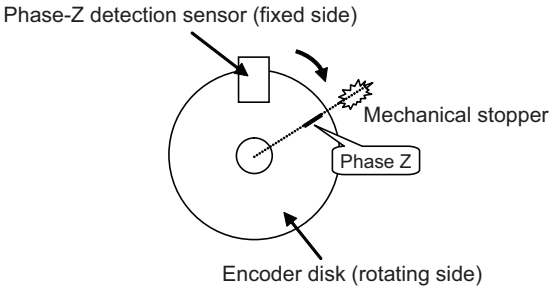
[1] RA2AC, RA2AR

1) The actuator moves to the parameter direction set as the operational direction in the home return command.
2) It detects the mechanical end with the software in the home return operation.
3) After reversed at the end point, determines the point where Z-phase signal is detected as the datum point.
4) Furthermore, it moves in the offset amount set in the parameter and this point becomes the origin point.

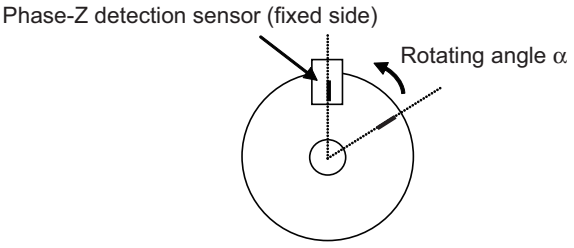
The number of motor revolutions after the actuator hits the stopper till Z-phase signal is generated is already adjusted before the shipment.
The distance where it stops at the origin point after the rod hit the stopper then start reversing is 2mm in standard.

[2] RN3NA, RN3N, RN4NA, RN4N, RP3NA, RP3N, RP4NA, RP4N, GS3NA, GS3N, GS4NA, GS4N, GD3NA, GD3N, GD4NA, GD4N, SD3NA, SD3N, SD4NA, SD4N

1) As the motor turns, the rod returns to the negative side (actuator frame side) and contacts the mechanical stopper.



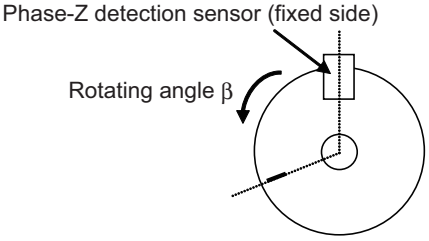
2) The rod reverses and turns by rotating angle α to find encoder phase Z.



The distance from the mechanical stopper to the position where phase Z is detected is as follows.

Lead	1mm	2mm, 4mm, 6mm
Distance	0.5mm	0.8mm

3) The rod turns by rotating angle β from the position where phase Z was detected, and the attained offset position (the offset conform to an applicable parameter value) is set as the home (points zero).



The offset from the position where phase Z is detected to the home is 1.2 mm.

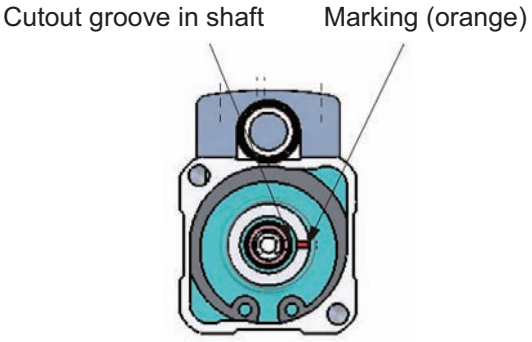
4.3 Placing a Load on the Actuator

- Do not exceed the load ratings given in the specification table below.
- Align the shaft center of the rod with the moving direction of the load.

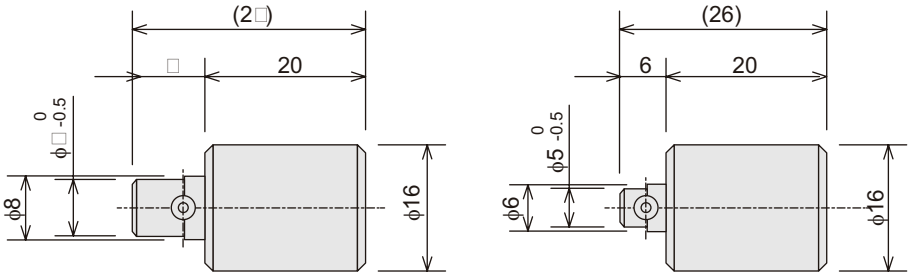
4.4 How to Move Rod (Bracket) by Hand

[1] Standard Type with Without Brake (Other than Slide Unit Type)

In the case of the low lead types such as Lead 1 and 2 of RN3NA, RN3N, RN4NA, RN4N, RP3NA, RP3N, RP4NA, RP4N, GS3NA, GS3N, GS4NA, GS4N, GD3NA, GD3N, GD4NA and GD4N the rod (Bracket) would not move even if trying to move manually because it is heavy.
When moving the rod (Bracket), make sure to insert the position adjustment knob to the slit groove on the shaft on the rear end no matter of the lead.
A slotted screw is also available when you do not have a position adjustment knob.



[Position Adjustment Knob]



For four series
Model : RCA2-AK-R4

For three series
Model : RCA2-AK-R3

[2] Slide Unit Type, Standard Types Equipped with a Brake, Cleanroom Type, Dust-proof Type

For the slide unit type SD3NA, SD3N, SD4NA, SD4N, standard types equipped with a brake, cleanroom Type and dust-proof Type there is no cutout groove in the shaft.
The connect the controller and move the actuator.
If the actuator is moved forcibly with hand, the brake might be worn out and its life might be shortened.

⚠ Caution : Do not attempt to have a back and forth operation by hand from the rod (Bracket) end. Moving it forcefully would apply too much load to the feed screw and may result in the cause of operational failure or destruction of the product.

5. Maintenance and Inspection

5.1 Inspection Items and Schedule

Perform maintenance and inspection at the intervals specified below.
This schedule assumes that the actuator is operated eight hours a day.

If the actuator is operated at a higher utilization, such as when the machine is used continuously day and night, reduce the inspection intervals accordingly.

(Standard Lead Screw Type)

	Visual inspection of exterior	Inspection of interior	Greasing
Startup inspection	○		
1 month after startup	○		
3 months after startup	○	○	
6 months after startup	○	○	○
Every 6 months thereafter	○	○	○

(Standard Ball Screw Type)

	Visual inspection of exterior	Inspection of interior	Greasing
Startup inspection	○		
1 month after startup	○		
6 months after startup	○	○	
12 months after startup	○	○	○
Every 6 months thereafter	○		
Every 12 months	○	○	○

(Cleanroom Type, Dust-proof Type)

	Visual inspection of exterior
Startup inspection	○
1 month after startup	○
3 months after startup	○
6 months after startup	○
Every 6 months thereafter	○

(Note) For cleanroom type and dust proof type, supply grease when replacing the bellows. Replacement of the bellows cannot be conducted by the user. Please contact IAI.

5.2 Visually Inspecting the Exterior

In the visual inspection of exterior, check the following items.

Actuator	Loose actuator mounting bolts, etc.
Cables	Scratches, connection at connectors
Spiral Cover (Standard type)	Scratches, dents, foreign object attached on cover
Bellows (Cleanroom type, Dust-proof type)	Scratches, foreign object attached on cover
Caulking (Dust-proof type)	Existence of damage and peeling
Overall	Abnormal noise, vibration

- If the actuator is installed vertically, certain conditions may cause grease to drip from the guide. Please ensure that proper cleaning is performed and grease is replenished.
- The spiral cover is a consumable part. Its life is 2,000,000 cycles of back and forth operation as a reference.
  Refer to 5.6, “How to Replace Spiral Cover” when replacing the spiral cover.
- Bellows are expendable part. The life of the bellows may vary due to the environment of use and operational conditions, however, it is around several million times of back and forth operation (reference) in standard. Contact IAI if you confirmed any damage. IAI will apply grease and replace.
- Apply additional caulking agent when any damage or peeling is confirmed on the caulking areas.
  ㋓Recommended caulking agent: KE-4898 (Shin-Etsu Silicone) Shin

(Note) The life of the spiral cover varies due to the environment of use. Foreign object (dust, high-viscosity oil) attached on the surface could disturb the expansion and contraction operation, which leads to a shorter life. To obtain a longer life, clean the surface regularly.

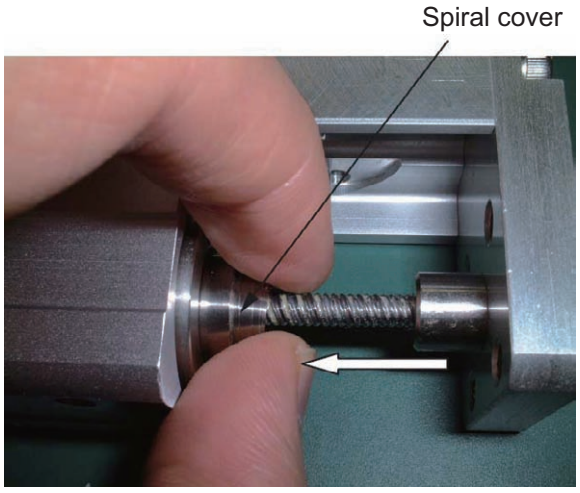
5.3 Cleaning

- Clean exterior surfaces as necessary.
- Use a soft cloth to wipe away dirt and buildup.
- To clean the spiral cover, use a soft cloth, etc., to wipe off soiling by working from the large diameter side toward the small diameter side.
- Do not blow too hard with compressed air as it may cause dust to get in through the gaps.
- Do not use oil-based solvents as they can harm lacquered and painted surfaces.
- To remove severe buildup, wipe gently with a soft cloth soaked in a neutral detergent or alcohol.

5.4 Inspection of Interior

When inspecting the interior, check the items specified below.

Main unit	Loose actuator mounting bolts, other loose items
Lead screw	Lubrication, buildup



To check the Lead screw or ball screw, turn off the power, extend the rod, and pull the narrower end of the spiral cover toward the wider end (in the direction of the arrow) to expose the screw shaft and inspect the shaft visually.
If the lead is too small and the rod does not move, insert a slotted screwdriver, etc., into the cutout groove provided in the shaft on the rear side and turn. [Refer to 4.4, “How to Move Rod by Hand.”]

Visually check the lubrication condition of the Lead screw or ball screw.
Even when the grease is brown, the screw is lubricated property as long as the traveling surface looks wet and shining. If the grease is mixed with dust and dirty or has no shiny appearance, or if the grease has lost its efficacy due to prolonged use, clean the applicable area and then replenish grease.

5.5 Greasing

5.5.1 Applicable Grease

[Lead screw types]
All Lead screw products have been shipped with synthetic poly-□α olefin grease applied to the Lead screw.
IAI uses the following grease in our plant.

Location	Manufacturer	Model number
Lead screw	Sumico Lubricant Co., Ltd.	Sumitec 308

Equivalent greases are also available from other manufacturers, but exercise caution when selecting the grease because the life of the product may be affected.

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

[Ball screw types]
All ball screw products have been shipped with lithium grease applied to the ball screw.
IAI uses the following grease in our plant.

Location	Manufacturer	Model number
Ball screw	Idemitsu Kosan Co., Ltd.	Daphne Eponex Grease No. 2

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

5.5.2 Greasing Method

For the ball screws of RA2AC and RA2AR, apply grease directly. For those equipped with spiral cover, follow the instruction below to apply grease.

1) Turn off the power and check the surface of the spiral cover for shavings, powder dust, etc. Use a waste cloth, etc., to wipe off shavings, powder dust, if any.

2) Extend the rod and pull the narrower end of the spiral cover toward the wider end (in the direction of the arrow) to expose the screw shaft. If the lead is too small and the rod does not move, insert a slotted screwdriver, etc., into the cutout groove provided in the shaft on the rear side and turn. [Refer to 4.4, “How to Move Rod by Hand”.]

3) Wipe off grease attached to the lead screw or ball screw and then apply the specified grease.

4) Install the spiral cover in the original condition and move the rod to spread the grease evenly.

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

5.6 How to Replace Spiral Cover

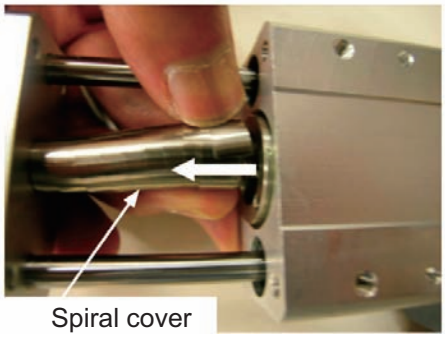
[Item required for replacement]

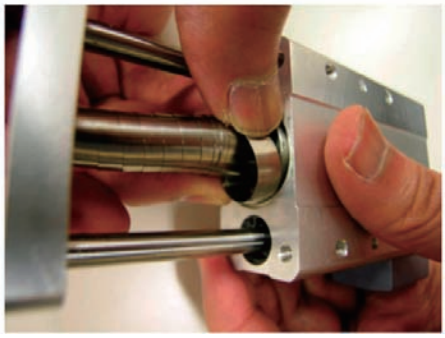
- Replacement spiral cover

Stroke	Model
25mm, 30mm	RCA-SPC-30
50mm	RCA-SPC-50
75mm	RCA-SPC-75

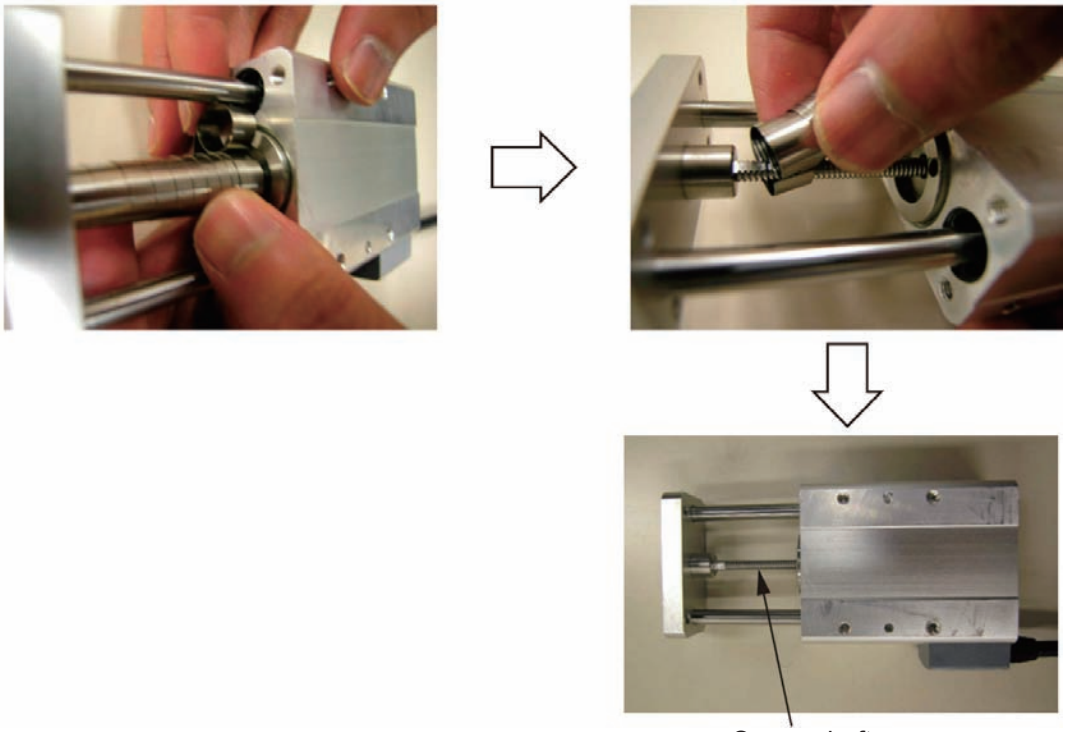
[Procedure]

1) Remove the spiral cover.
   Pull out the base of the spiral cover toward you and roll the edge of the cover.

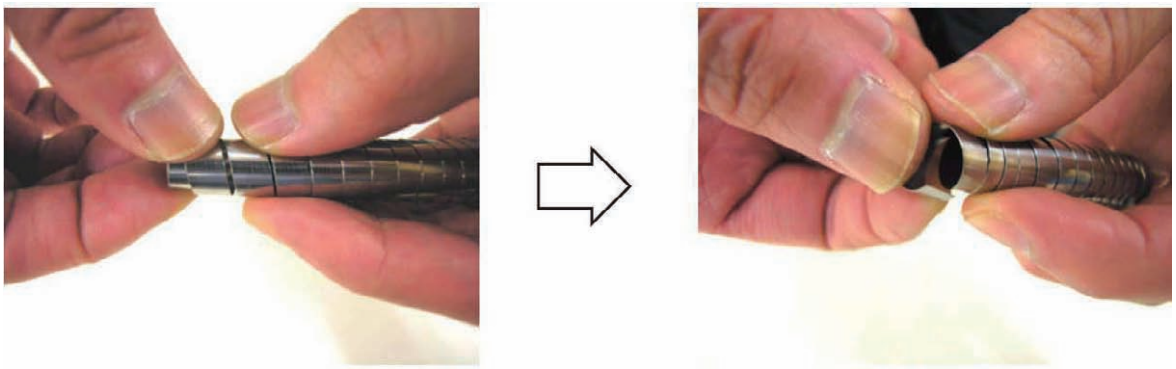




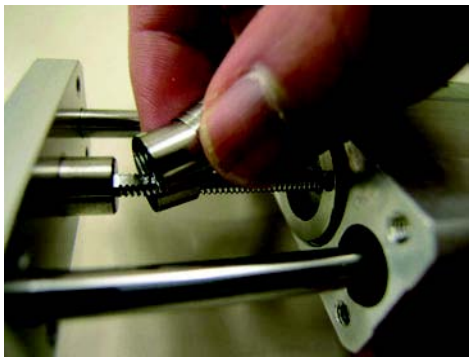
2) Gradually roll the spiral cover to remove it.

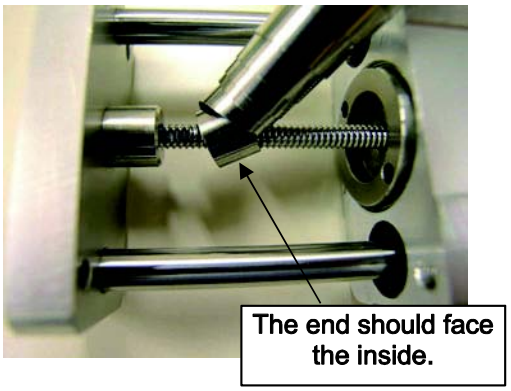


3) Pull out the thin side of the replacement spiral cover and take out the end hidden inside.

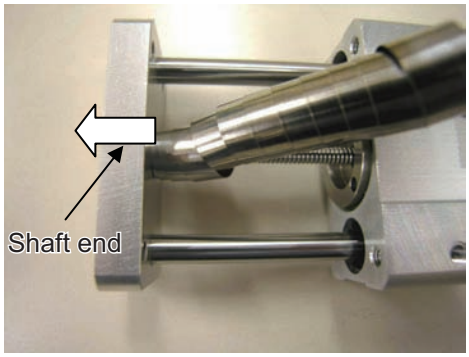


4) Install the replacement spiral cove.
Hook the end of the replacement spiral cover you have taken out. Once the end is hooked, orient the cover so that the end faces the inside.

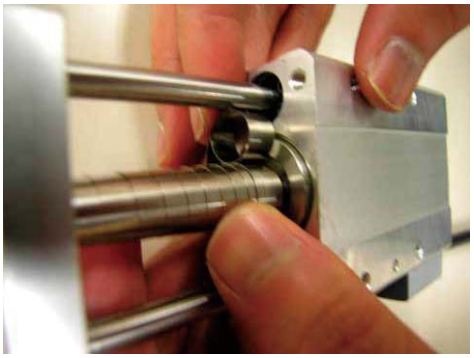




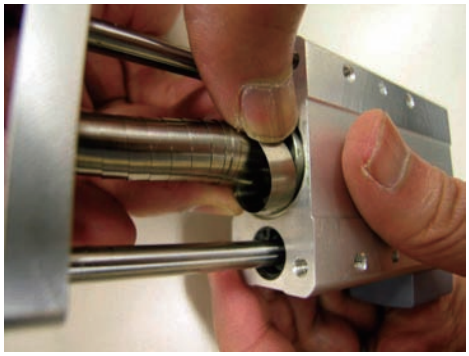
5) Push the end toward the shaft end while winding the cover a little.

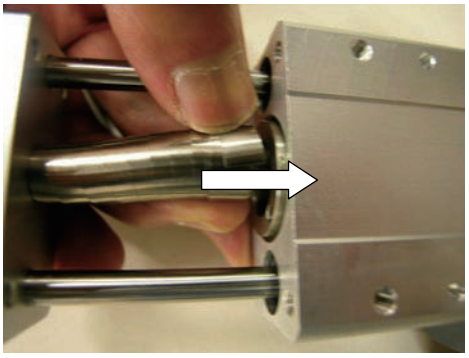


6) Continue to wind the replacement spiral cover.



7) Finally, orient the cover so that the end faces the outside, and push the cover into the actuator groove.





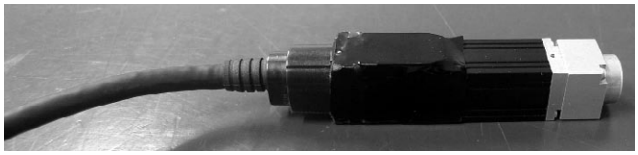
8) Grease the screw shaft. [Refer to 5.5.2, “Greasing Method”.]

5.7 Procedures for Replacement of Motor

5.7.1 SA2AC

[Required Items]

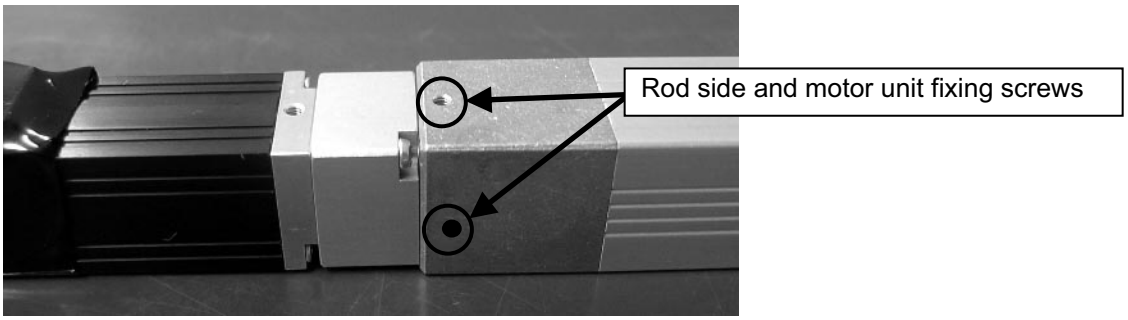
- Replacement motor unit



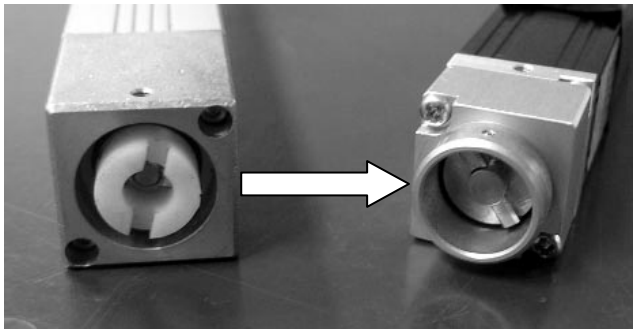
- Phillips Screwdriver No. 0 and No. 1
- Hex wrench Across flats 0.89mm, 1.5mm

[Procedure]

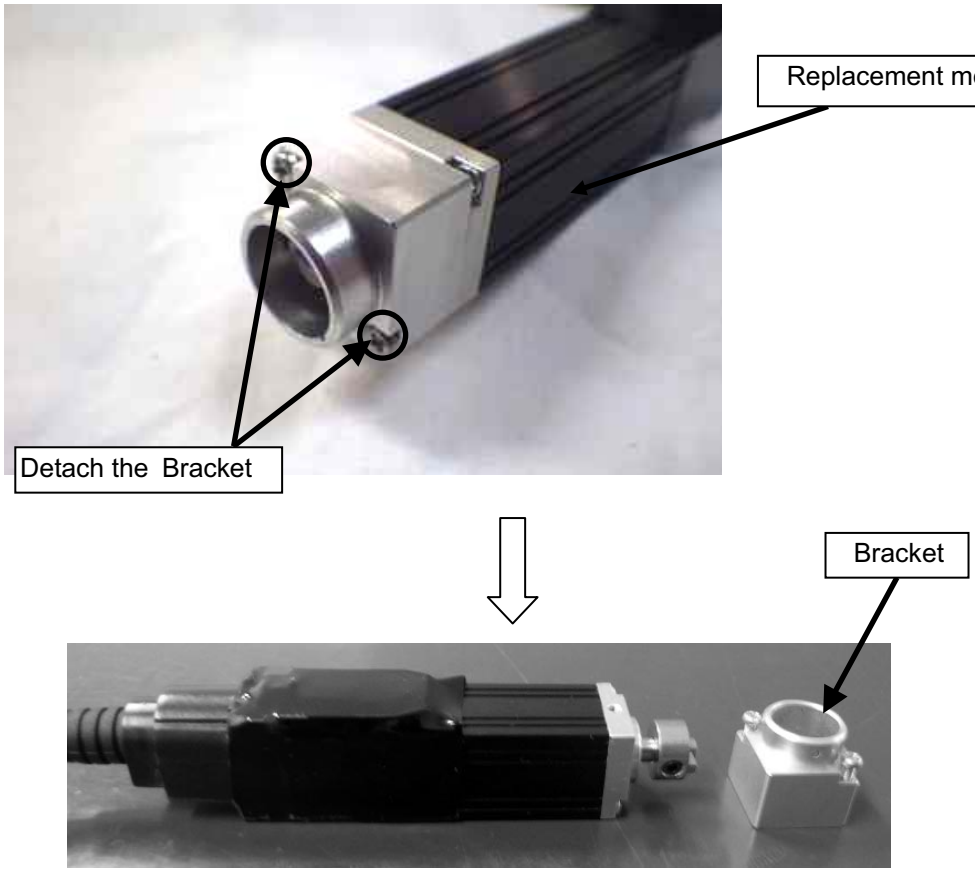
1) Remove the M2 × 2 set screws holding on the rod side of the actuator and the motor unit with a hex wrench. (2 places)



2) Detach the motor unit.



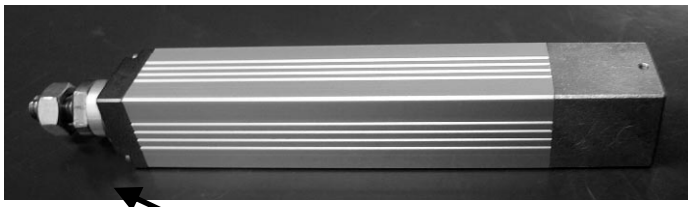
3) Remove the M2 × 12 screws with a Philips screwdriver to take off the bracket attached on the replacement motor.



4) Put the extruded portion on the replacement motor unit upwards with the following procedure to align the coupling orientations.

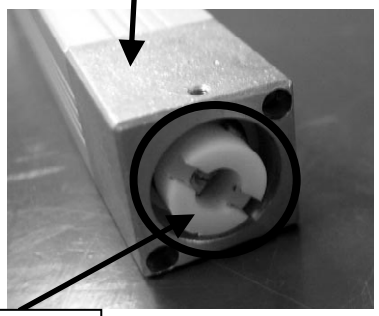
[For Lead 1 and Lead 2]

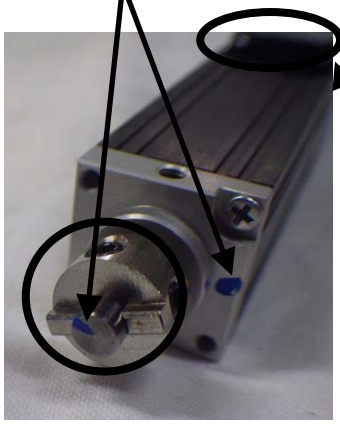
- Set the marking on the motor 180deg away from the marking on the motor and motor shaft.
- Apply grease on the coupling on the rod side.
  Manufactured by Idemitsu Kosan Daphne Eponex Grease No. 2
- Push the rod against the mechanical end.



Set rod to home side mechanical end

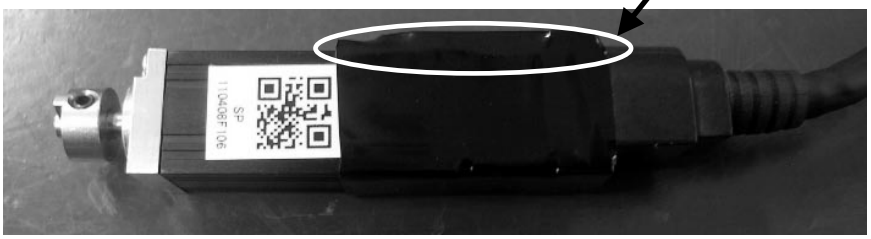
Put marking at 180deg





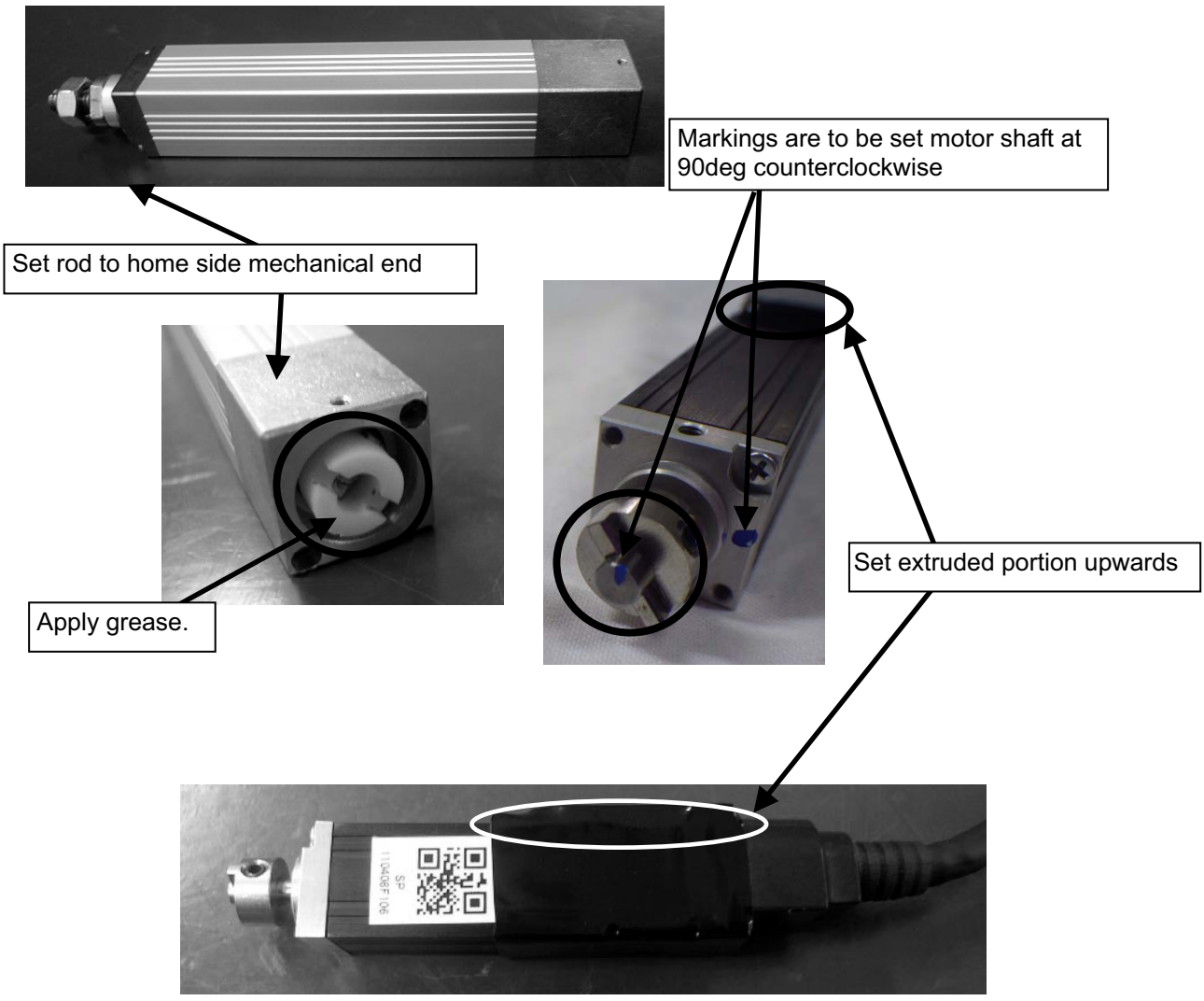
Apply grease.

Set extruded portion upwards



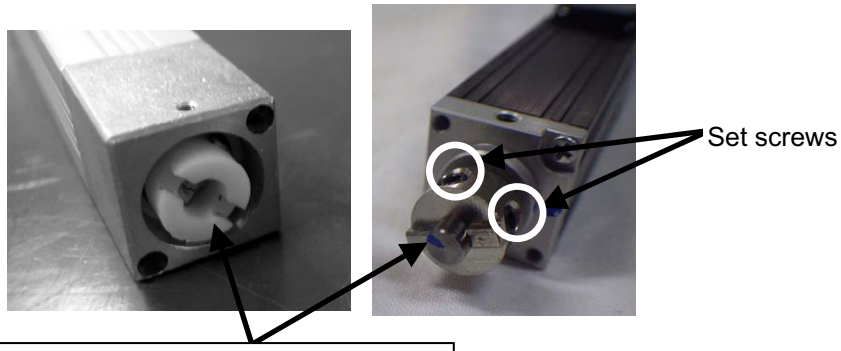
[For Lead 4]

- Rotate the motor shaft counterclockwise so the marking on it is placed at 90deg to the marking on the motor.
  (Note) Rotate it clockwise to set the marking at 90deg (reversed direction to the figures below) for the home reversed type.
- Apply grease on the coupling on the rod side.
  Manufactured by Idemitsu Kosan Daphne Eponex Grease No. 2
- Push the rod against the mechanical end.



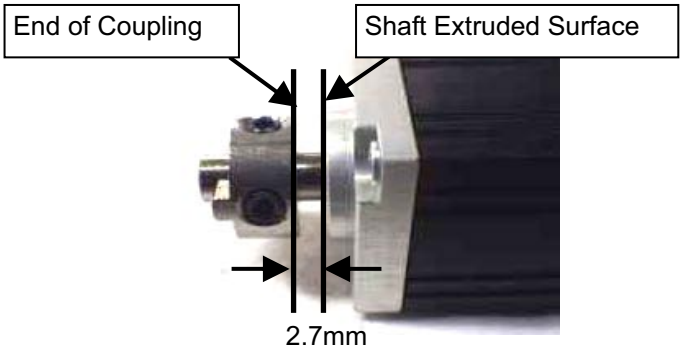
[Common procedure for Lead 1, Lead 2 and Lead 4]

Keeping the markings on the motor and the motor shaft at the positions set in Procedure 4), loosen the set screws with a 1.5mm hex wrench to align the orientation of the couplings.

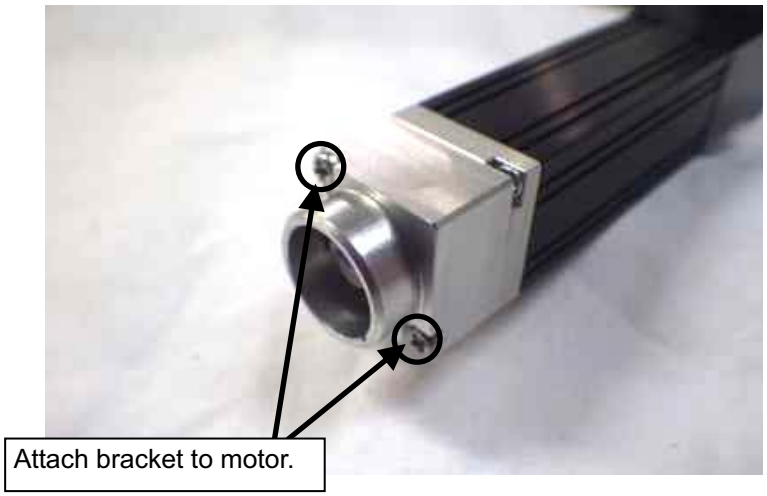


Set the end of the coupling to the position shown in the figure below, and tighten the set screws.

Tightening Torque	69N • cm

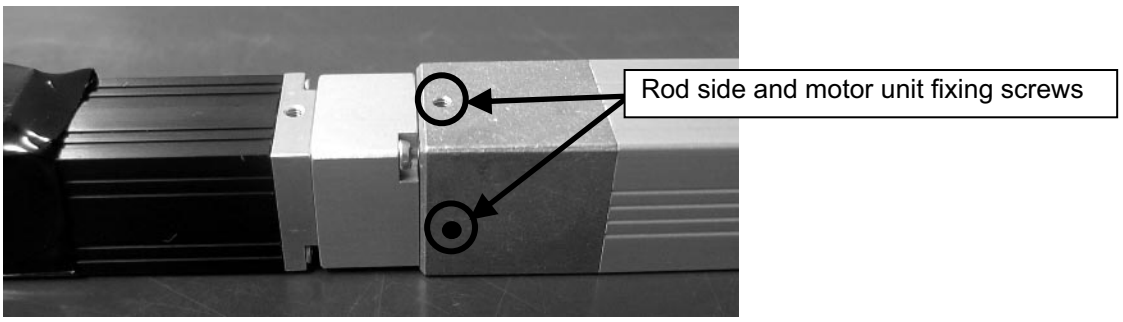


5) Attach the bracket to the motor with the M2 × 12 screws. (2 places).



Tightening Torque	17N • cm

6) Keeping the markings on the motor and the motor shaft at the positions set in Procedure 4), attach the motor unit on the rod side, and affix it with the M2 × 2 set screws. (2 places)

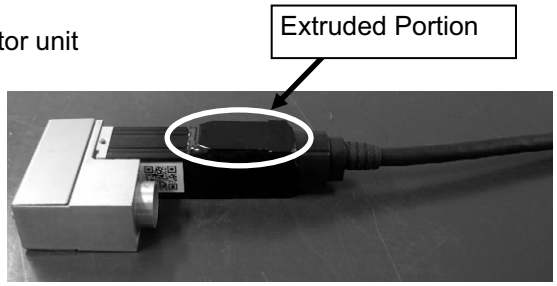


7) Connect a PC or teaching pendant to the controller and perform a home return.
Check for displacement with the original home position and if there is a displacement, make correction using the following parameter:
   - ACON controller : No.22, home return offset distance
   - ASEL controller : Parameter No.12 for each axis, home preset value
   - ASEP controller : No.16, home return offset distance
   - AMEC controller : No.16, home return offset distance
   - MSEP controller : No.16, home return offset distance

   If your actuator is of the absolute encoder specification, perform a home return after the parameter has been changed, and then execute an absolute reset.

5.7.2 SA2AR

[Required Items]
- Replacement motor unit

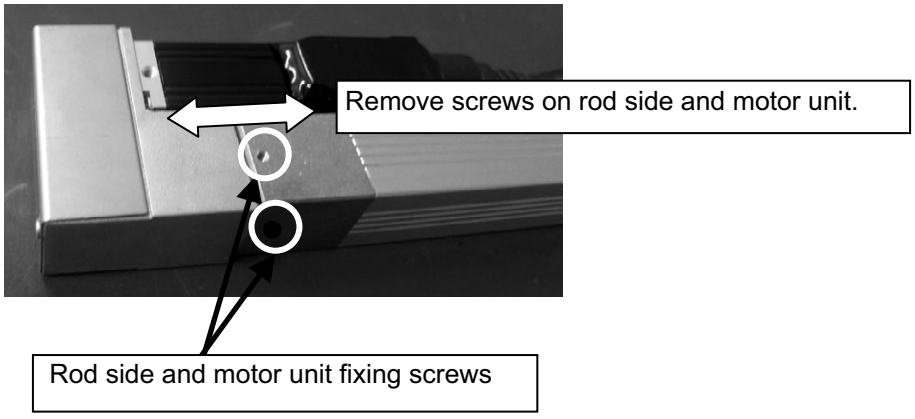


(Note) For the rod type, when attaching a motor unit for replacement, make sure to set the extruded portion upwards. This is the reason the motor unit for replacement differs depending on the direction to reverse.
Pay attention to this difference. [Refer to Procedure 2)]

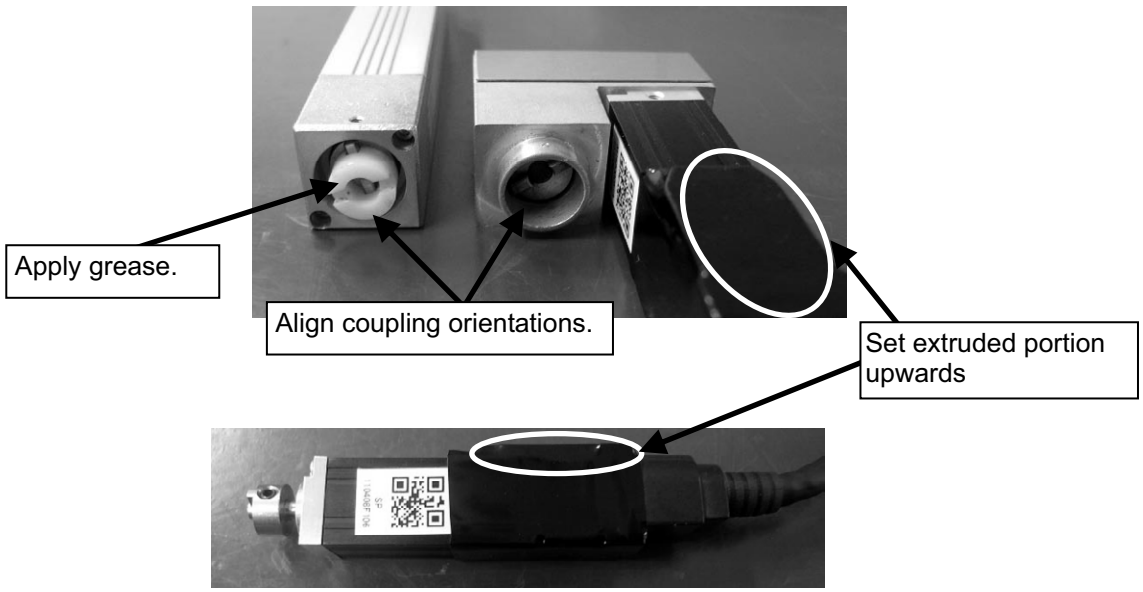
- Tension gauge
- Strong string shaped in a ring (or a long tie-band)
- Phillips Screwdriver No. 0 and No. 1
- Hex wrench Across flats 0.89mm

[Procedure]

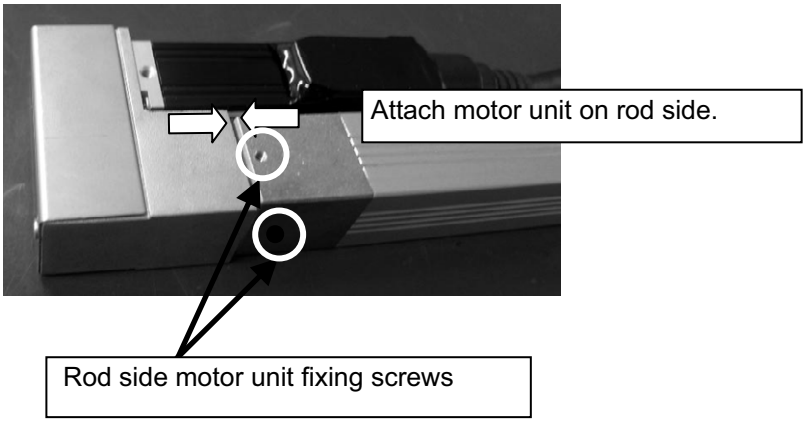
1) Remove the M2 × 2 set screws holding on the rod side of the actuator and the motor unit with a hex wrench. (2 places)
After removing the set screws, detach the motor unit off the actuator.



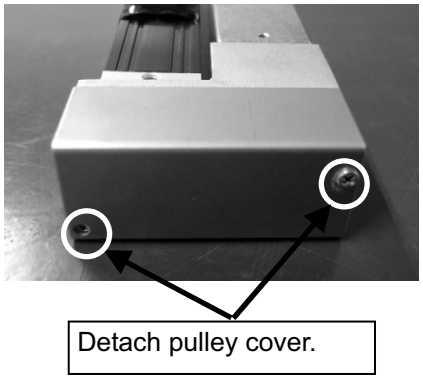
2) Apply grease on the coupling on the rod side.
Manufactured by Idemitsu Kosan Daphne Eponex Grease No. 2
Put the extruded portion on the replacement motor unit upwards to align the orientation of the couplings on the rod side and the motor unit for replacement.



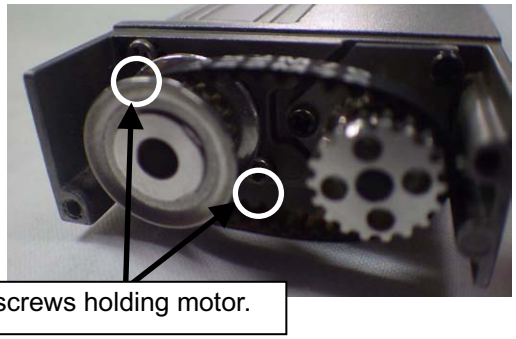
3) Attach the motor unit for replacement on the rod side, and affix it with the M2 × 2 set screws.



4) Detach the pulley cover.
Remove the screws (M2 × 2). (2 places)



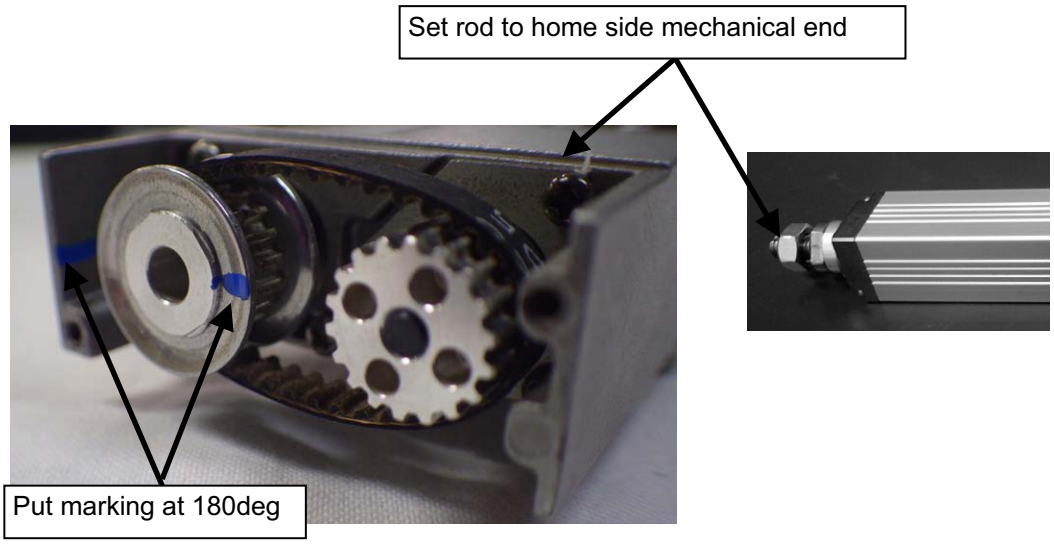
5) Loosen the screws (M2 × 8) holding the motor on the reversing unit to loosen the belt. (2 places)



6) Adjust the pulley position following the process below.

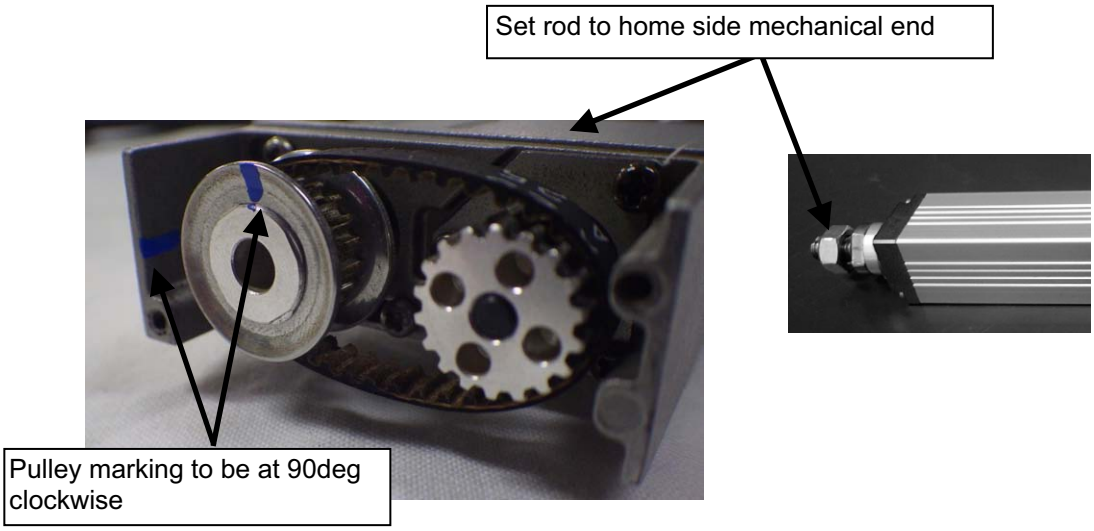
[For Lead 1 and Lead 2]

a. Set the marking on the motor 180deg away from the marking on the motor and motor shaft.
b Push the rod against the mechanical end.
c Adjust the belt hang.

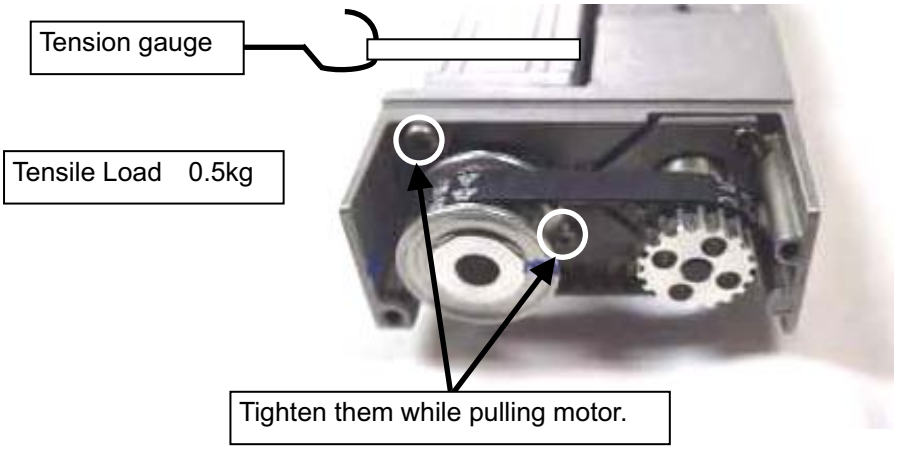


[For Lead 4]

a. Rotate the pulley to set the marking at 90deg clockwise to the marking on the motor bracket.
(Note) Rotate it counterclockwise to set the marking at 90deg (reversed direction to the figures below) for the home reversed type.
b Push the rod against the mechanical end.
c Adjust the belt hang.

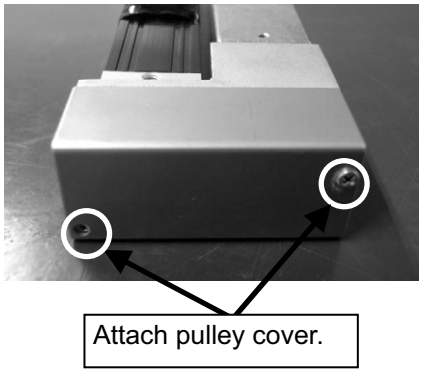


7) Keeping the pulley and the rod at the positions set in Procedure 6), have a strong string (or a long cable band) in loop hanged at the root of the motor unit, and pull the motor unit with a tension gauge to maintain the tensile at the specified to tighten screws (M2 × 8) evenly. (2 places)



Tightening Torque	17N • cm

8) Attach the pulley cover with the attachment screws (M2 × 2). (2 places)



9) Connect a PC or teaching pendant to the controller and perform a home return.
Check for displacement with the original home position and if there is a displacement, make correction using the following parameter:
- ACON controller : No.22, home return offset distance
- ASEL controller : Parameter No.12 for each axis, home preset value
- ASEP controller : No.16, home return offset distance
- AMEC controller : No.16, home return offset distance
- MSEP controller : No.16, home return offset distance

If your actuator is of the absolute encoder specification, perform a home return after the parameter has been changed, and then execute an absolute reset.

6. Life

6.1 Life of Actuator Using Ball Screws

Refer to the following for the product life of the ball screw type actuator assuming it was operated under the condition of maximum transportable weight, maximum acceleration and deceleration.

Model		Product Life (Reference)
RA2AC, RA2AR		5000km
RN3NA, RP3NA, GS3NA, GD3NA, SD3NA, RN3N, RP3N, GS3N, GD3N, SD3N	Lead 1mm	3000km
RN3NA, RP3NA, GS3NA, GD3NA, SD3NA, RN3N, RP3N, GS3N, GD3N, SD3N	Lead 2mm, 4mm	5000km
RN4NA, RP4NA, GS4NA, GD4NA, SD4NA, RN4N, RP4N, GS4N, GD4N, SD4N		5000km

6.2 Life of Actuator Using Lead Screws

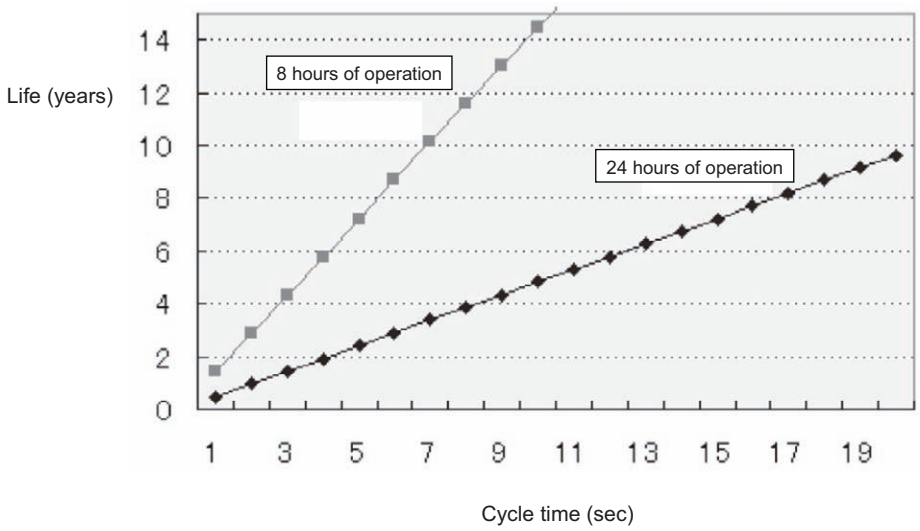
The lead screw actuators adopt a lead screw and their nut wears over time.
A reference for product life is presented based on the wear amount of the nut.
The positioning precision of this product, such as lost motion, will drop as the wear of the nut progresses.

(Reference product life of lead screw types)
Horizontal application 10 million back-and-forth operations
Vertical application 5 million back-and-forth operations

6.3 Relationship of Cycle Time and Product Life

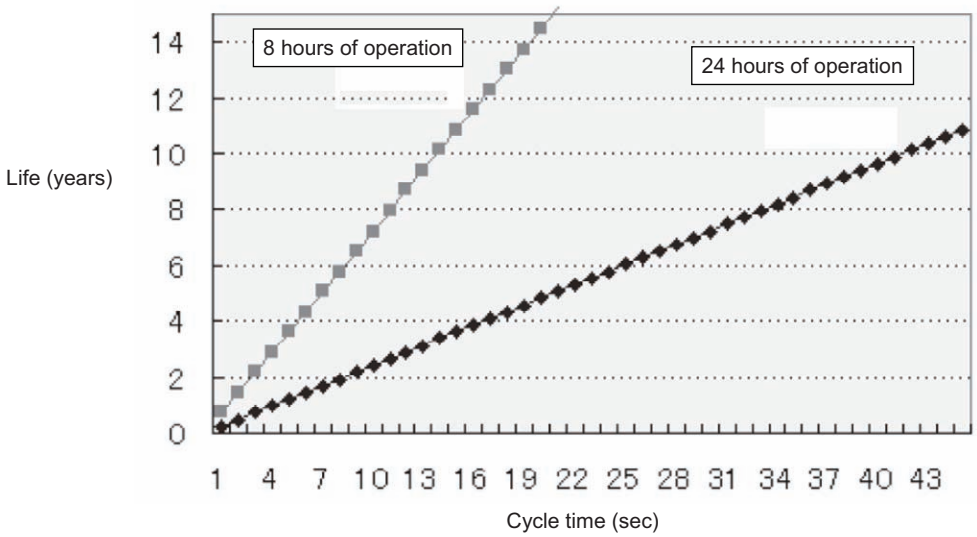
[1] Horizontal application

The graph below shows the relationship between the cycle time for one back-and-forth operation and the life of the product in a horizontal application (product life: 10 million back-and-forth operations).
The lines based on 8 hours of operation and 24 hours operations a day, for 240 days a year, are shown. Use this graph as a reference when determining the product life.



[2] Vertical application

The graph below shows the relationship between the cycle time for one back-and-forth operation and the life of the product in a vertical application (product life: 5 million back-and-forth operations).
The lines based on 8 hours of operation and 24 hours operations a day, for 240 days a year, are shown. Use this graph as a reference when determining the product life.

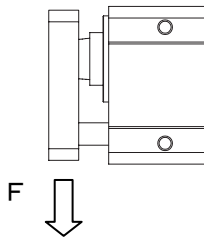


6.4 Correlation between Tip Radial Load and Operation Life

As the radial load on the tip gets larger, the more the operation life will decrease.

[Load Direction]

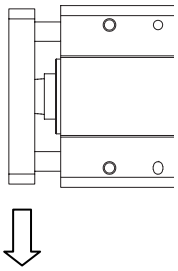
Single guide



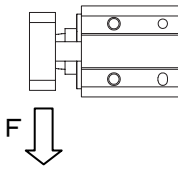
(Note) Single guide type is not capable for any load except for those from the top and bottom

Double guide

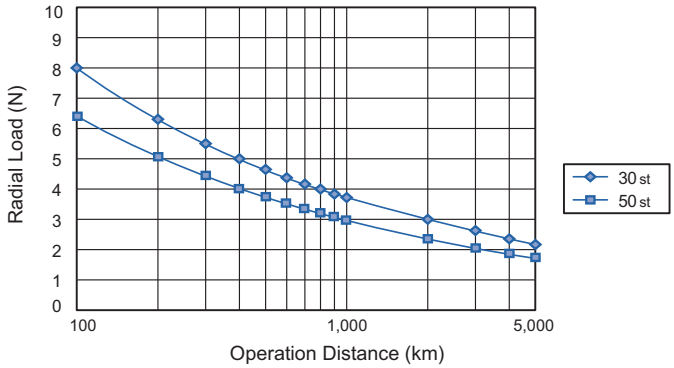
View from Side



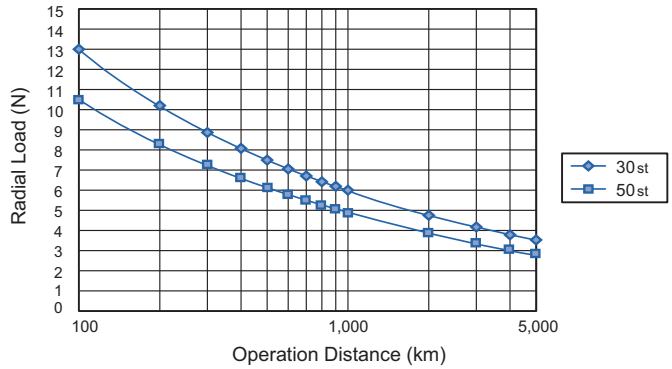
View from Top



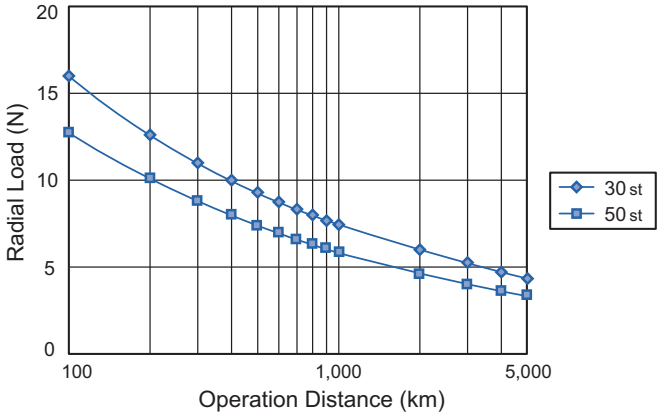
●RCA2-GS3NA



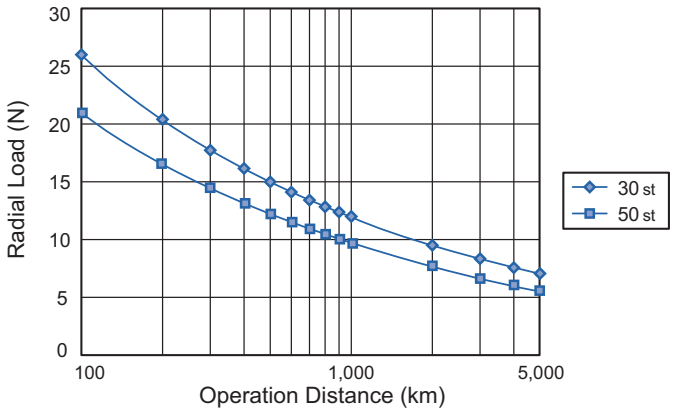
●RCA2-GS4NA



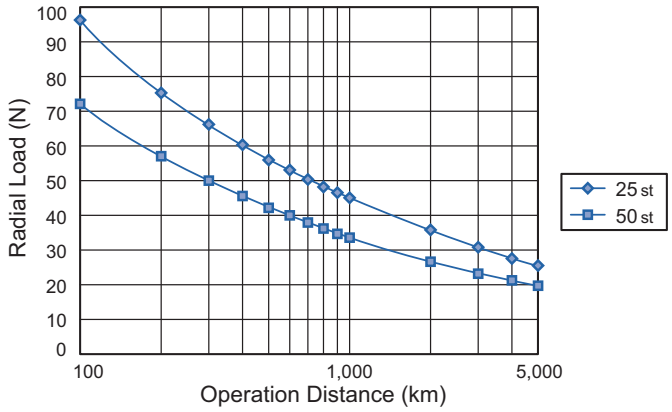
●RCA2-GD3NA



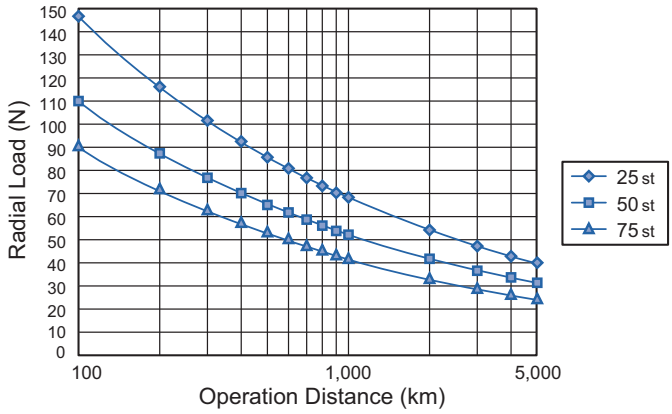
●RCA2-GD4NA



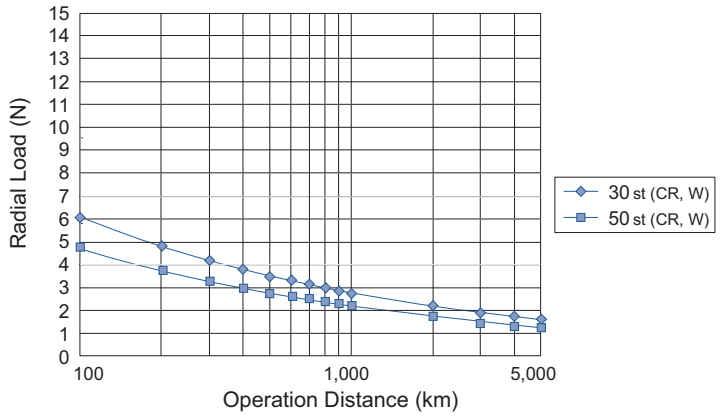
●RCA2-SD3NA



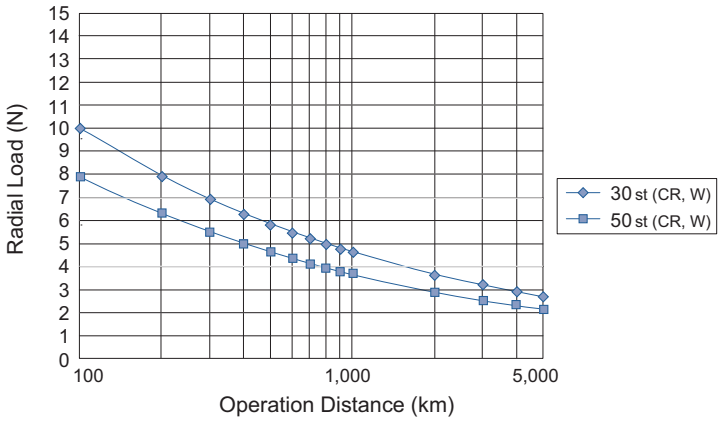
●RCA2-SD4NA



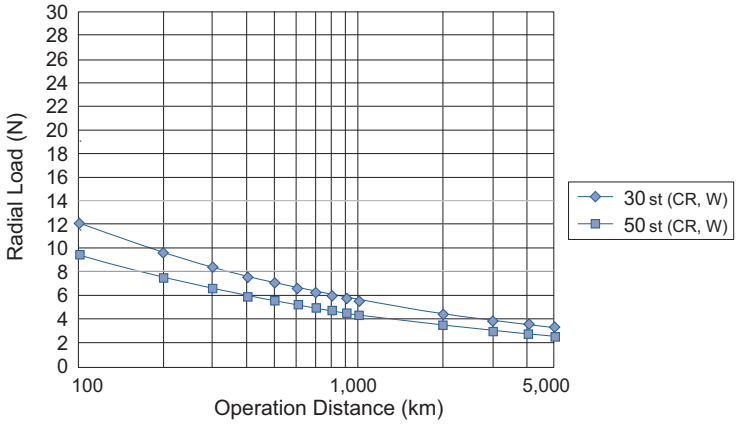
●RCA2CR、RCA2W-GS3NA (Cleanroom Type, Dustproof Type)



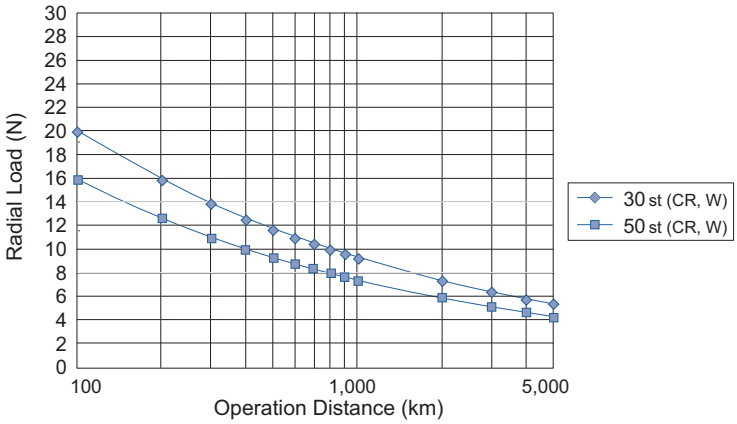
●RCA2CR、RCA2W-GS4NA (Cleanroom Type, Dustproof Type)



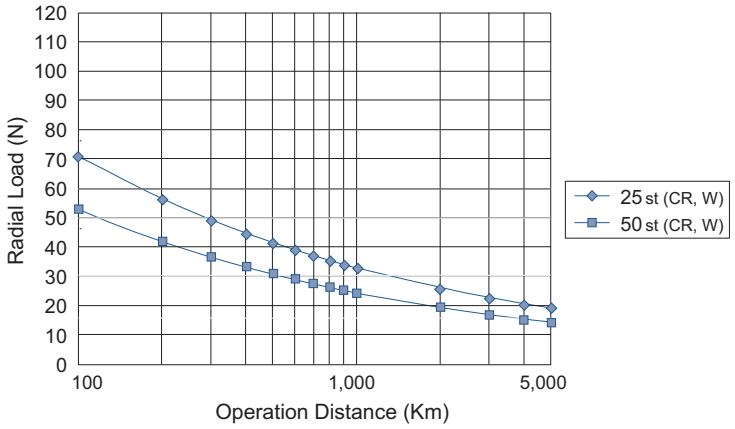
●RCA2CR、RCA2W-GD3NA (Cleanroom Type, Dustproof Type)



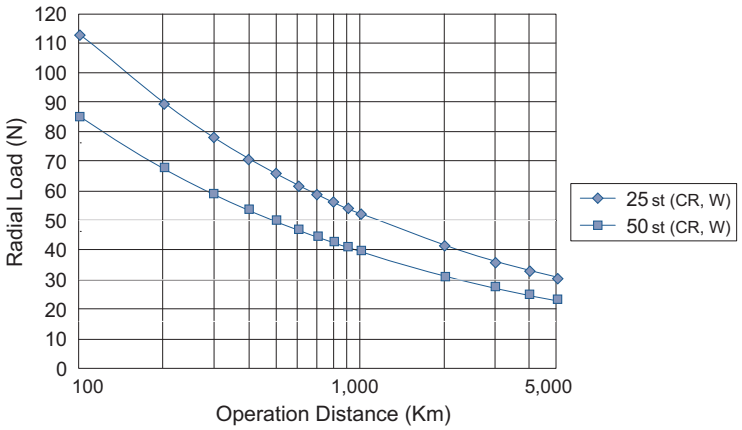
●RCA2CR、RCA2W-GD4NA (Cleanroom Type, Dustproof Type)



●RCA2CR、RCA2W-SD3NA (Cleanroom Type, Dustproof Type)



●RCA2CR、RCA2W-SD4NA (Cleanroom Type, Dustproof Type)

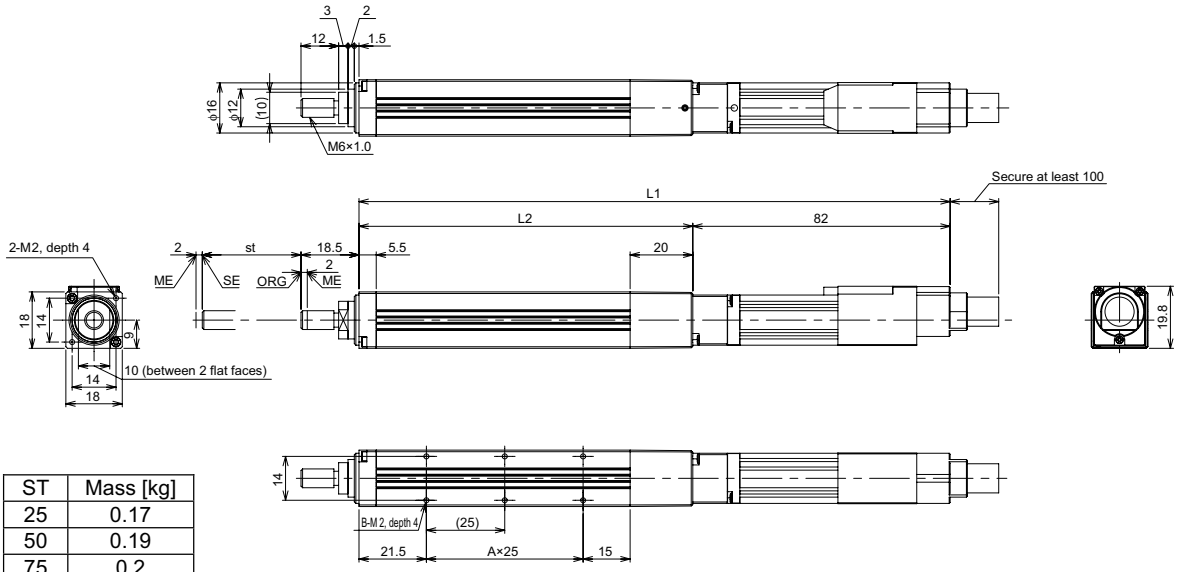


6.5 Life of Bellows on Cleanroom Type and Dust Proof Type

It may vary due to the environment of use and operational conditions, however, it is around several million times of back and forth operation (reference) in standard.

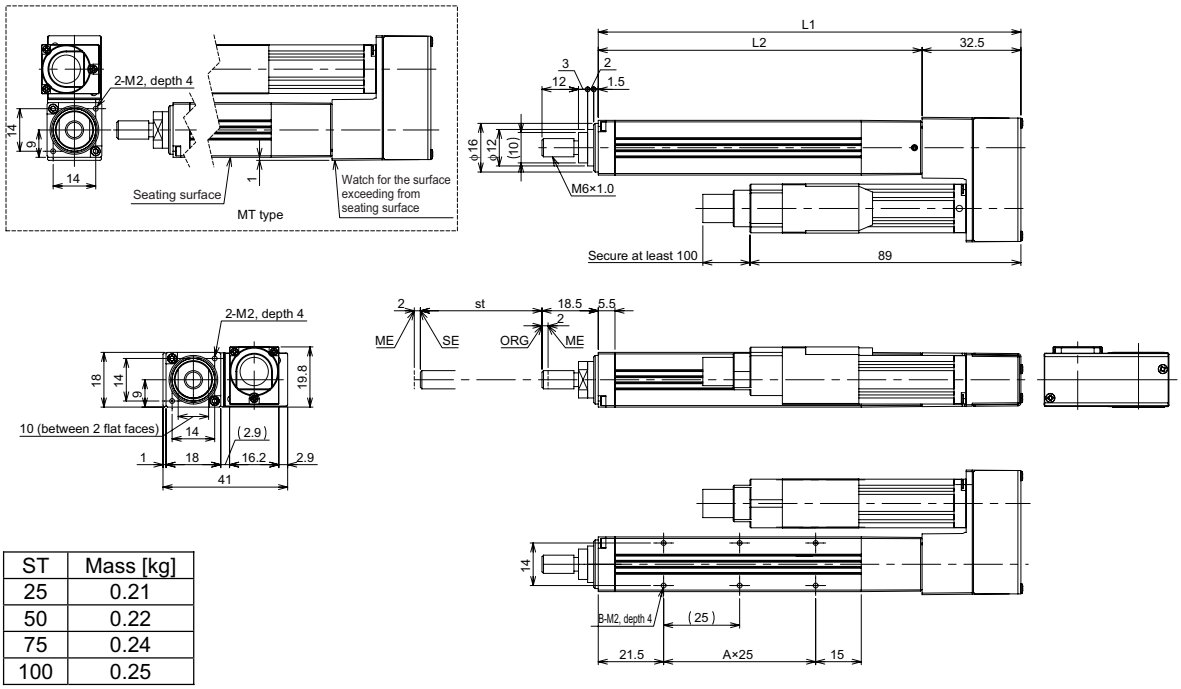
7. External Diagrams

7.1 Slim Type (Motor Coupling Type) RCA2-RA2AC



ST	Mass [kg]
25	0.17
50	0.19
75	0.2
100	0.22

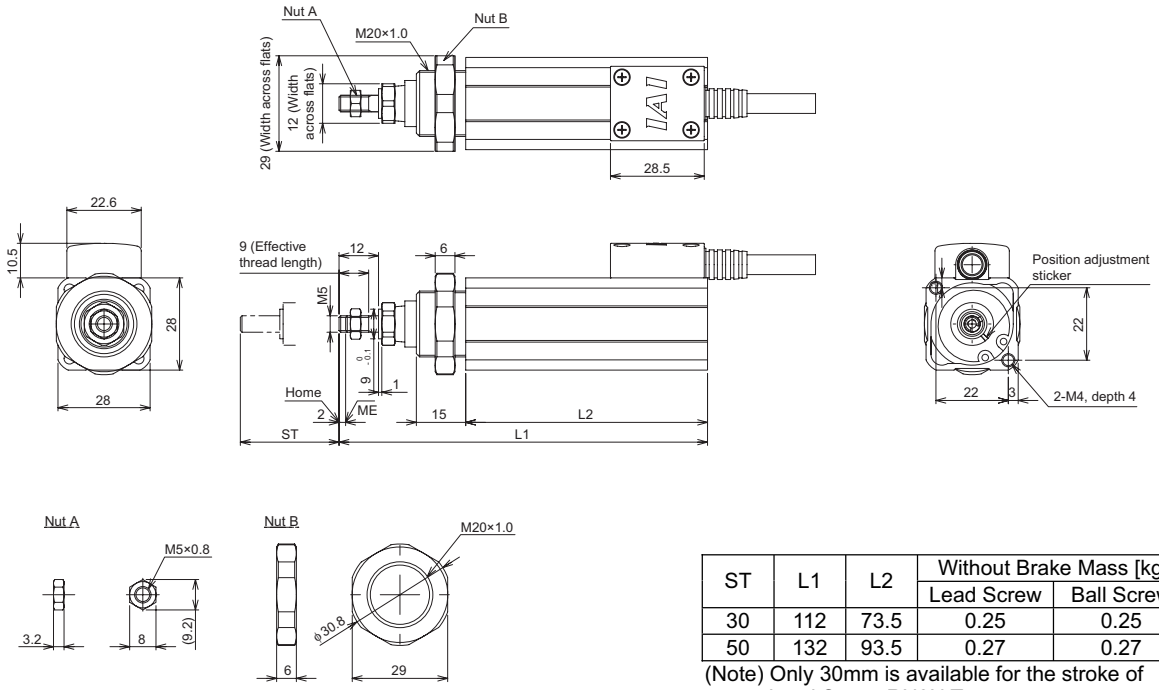
7.2 Slim Type (Motor Reversing Type) RCA2-RA2AR



ST	Mass [kg]
25	0.21
50	0.22
75	0.24
100	0.25

7.3 Short Types (Nut Affixing Types) RCA2-RN3NA/RN3N (Lead Screw, Ball Screw)

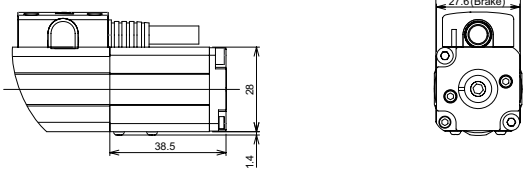
- Without Brake



ST	L1	L2	Without Brake Mass [kg]	
			Lead Screw	Ball Screw
30	112	73.5	0.25	0.25
50	132	93.5	0.27	0.27

(Note) Only 30mm is available for the stroke of Lead Screw RN3N Type.

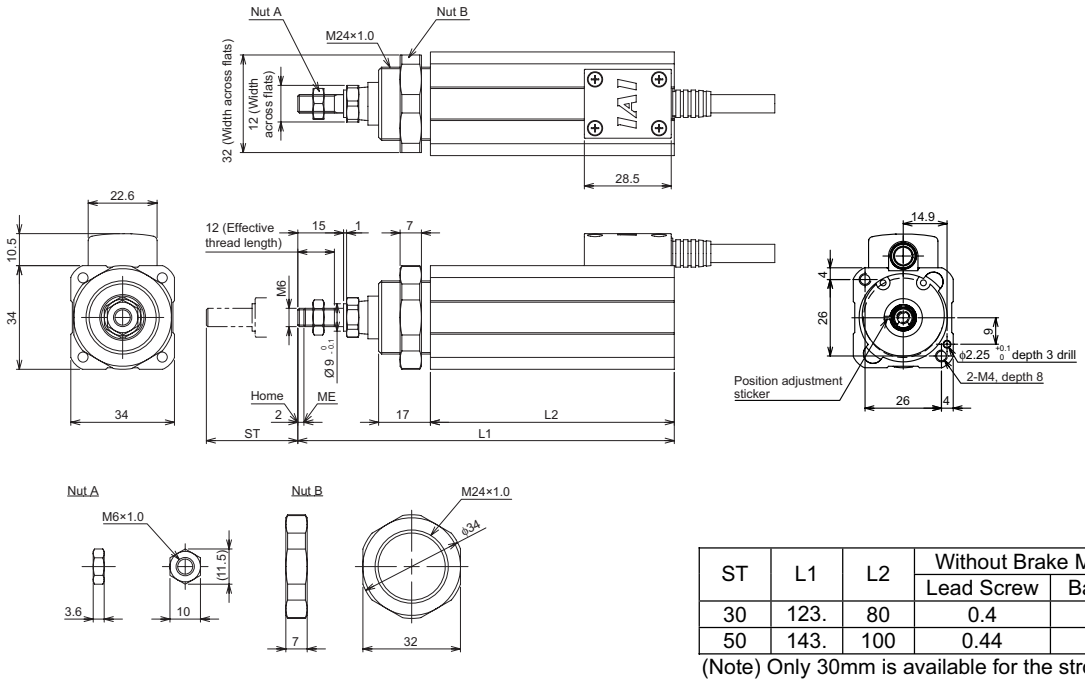
- Brake-equipped Type



ST	Brake-equipped Type Mass [kg]	
	Lead Screw	Ball Screw
30	0.35	0.35
50	0.37	0.37

7.4 Short Types (Nut Affixing Types)
RCA2-RN4NA/RN4N (Lead Screw, Ball Screw)

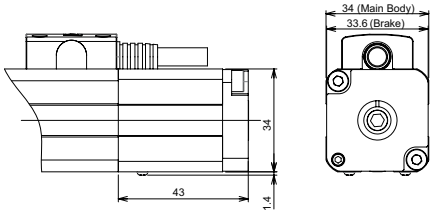
- Without Brake



ST	L1	L2	Without Brake Mass [kg]	
			Lead Screw	Ball Screw
30	123.	80	0.4	0.4
50	143.	100	0.44	0.44

(Note) Only 30mm is available for the stroke of Lead Screw RN4N Type.

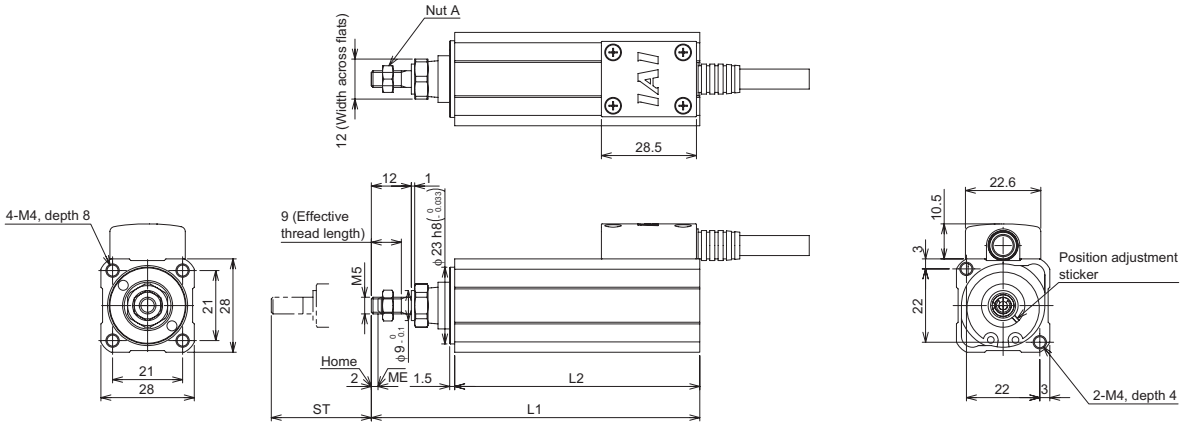
- Brake-equipped Type



ST	Brake-equipped Type Mass[kg]	
	Lead Screw	Ball Screw
30	0.55	0.55
50	0.59	0.59

7.5 Short Types (Tapped-hole Mounting Types) RCA2-RP3NA/RP3N (Lead Screw, Ball Screw)

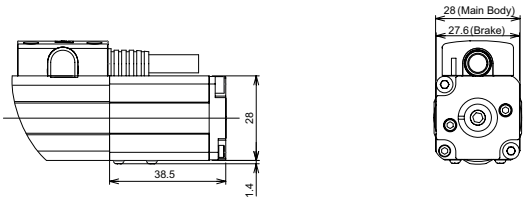
- Without Brake



ST	L1	L2	Without Brake Mass [[kg]	
			Lead Screw	Ball Screw
30	98.5	73.5	0.2	0.2
50	118.5	93.5	0.22	0.22

(Note) Only 30mm is available for the stroke of Lead Screw RP3N Type.

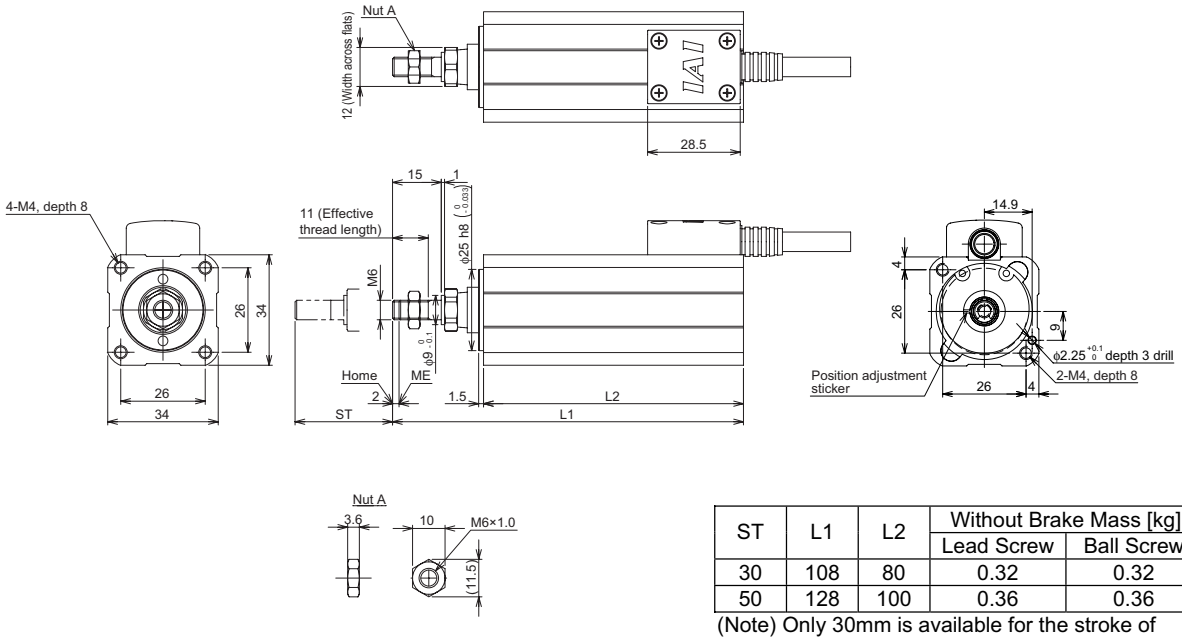
- Brake-equipped Type



	Brake-equipped Type Mass [[kg]	
	Lead Screw	Ball Screw
30	0.3	0.3
50	0.32	0.32

7.6 Short Types (Tapped-hole Mounting Types) RCA2-RP4NA/RP4N (Lead Screw, Ball Screw)

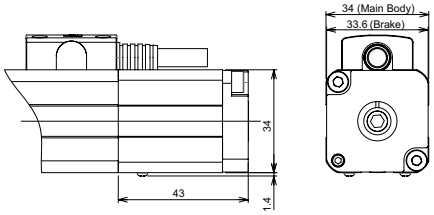
- Without Brake



ST	L1	L2	Without Brake Mass [kg]	
			Lead Screw	Ball Screw
30	108	80	0.32	0.32
50	128	100	0.36	0.36

(Note) Only 30mm is available for the stroke of Lead Screw RP4N Type.

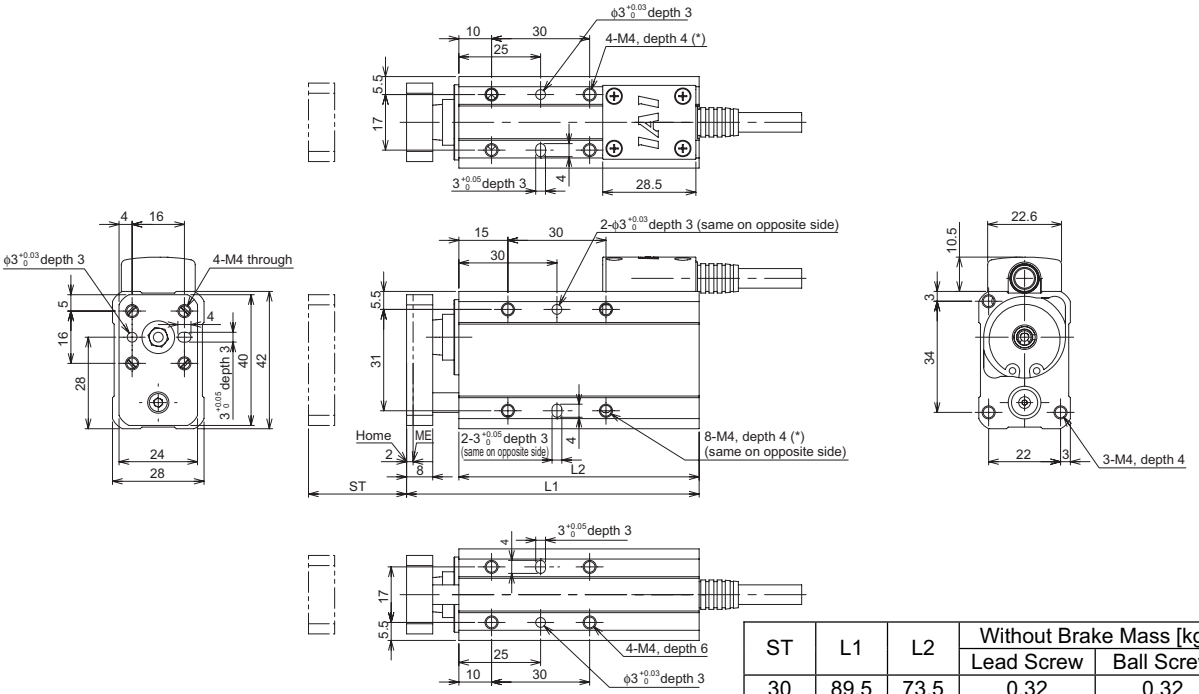
- Brake-equipped Type



ST	Brake-equipped Type Mass [kg]	
	Lead Screw	Ball Screw
30	0.47	0.47
50	0.51	0.51

7.7 Single Guide Types
RCA2-GS3NA/GS3N (Lead Screw, Ball Screw)

- Without Brake

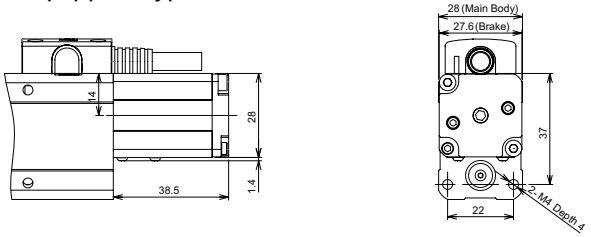


ST	L1	L2	Without Brake Mass [kg]	
			Lead Screw	Ball Screw
30	89.5	73.5	0.32	0.32
50	109.	93.5	0.36	0.36

(Note) Only 30mm is available for the stroke of Lead Screw GS3N Type.

* Screw-in depths shall not exceed the dimensions shown above.

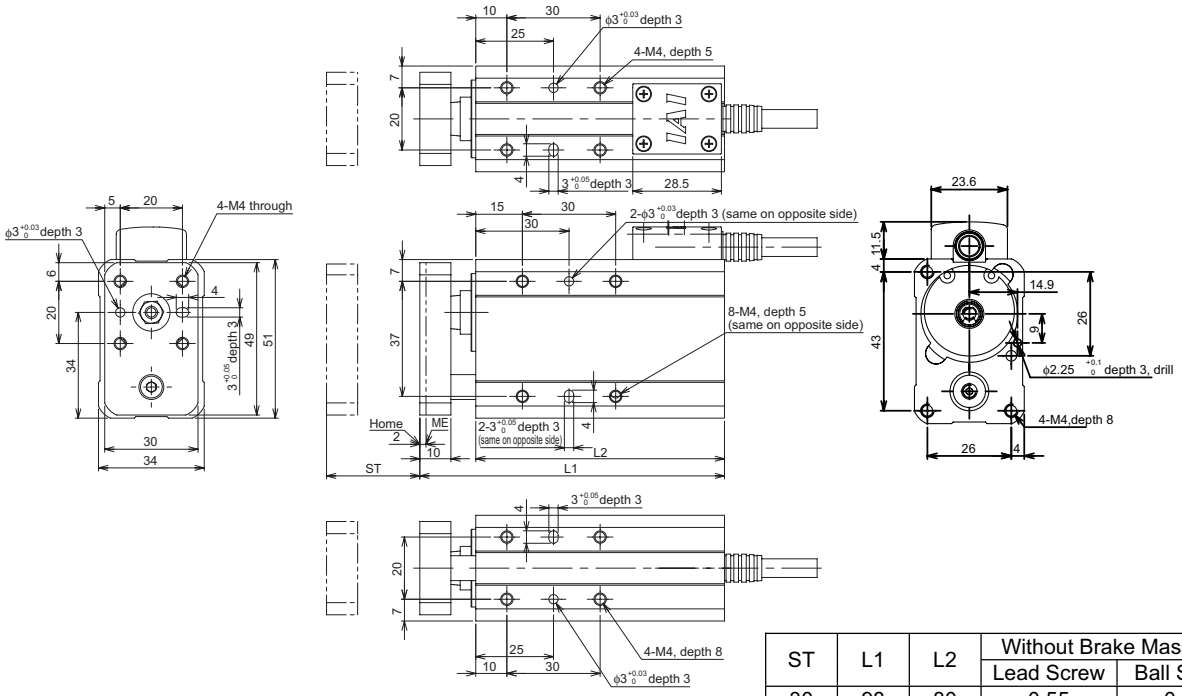
- Brake-equipped Type



ST	Brake-equipped Type Mass [kg]	
	Lead Screw	Ball Screw
30	0.42	0.42
50	0.46	0.46

7.8 Single Guide Types
RCA2-GS4NA/GS4N (Lead Screw, Ball Screw)

- Without Brake



ST	L1	L2	Without Brake Mass [kg]	
			Lead Screw	Ball Screw
30	98	80	0.55	0.57
50	118	100	0.62	0.63

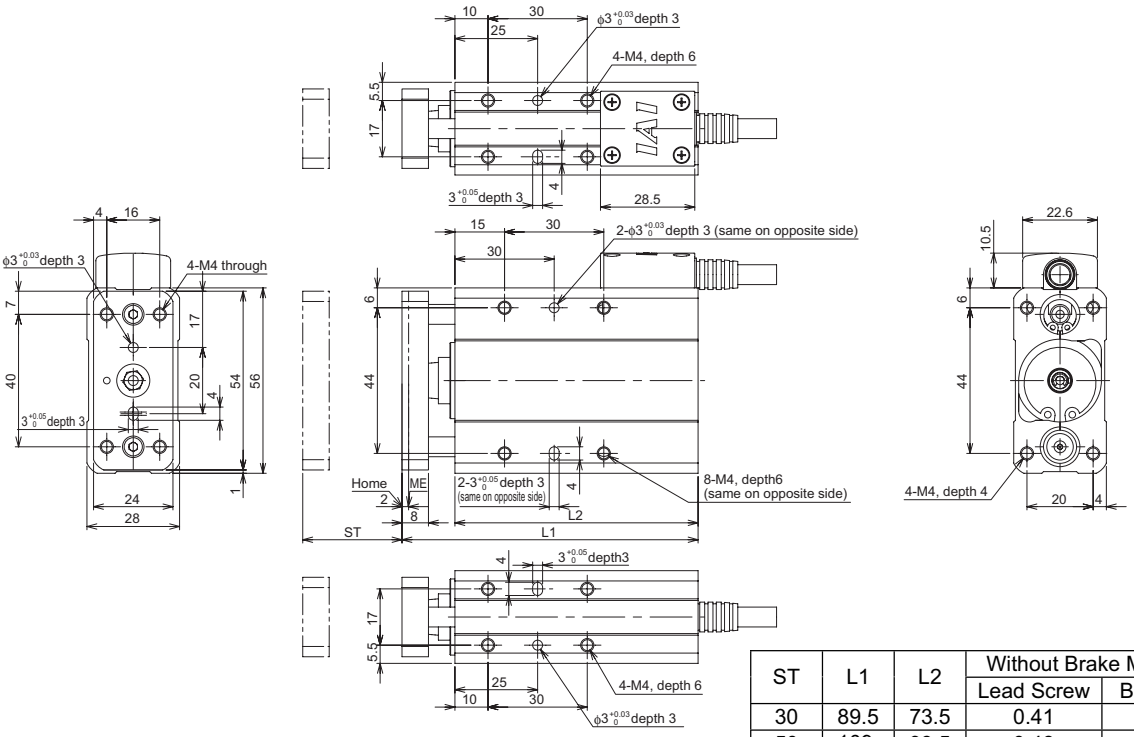
(Note) Only 30mm is available for the stroke of Lead Screw GS4N Type.

- Brake-equipped Type

ST	Brake-equipped Type Mass [kg]	
	Lead Screw	Ball Screw
30	0.7	0.72
50	0.77	0.78

7.9 Double Guide Types RCA2-GD3NA/GD3N (Lead Screw, Ball Screw)

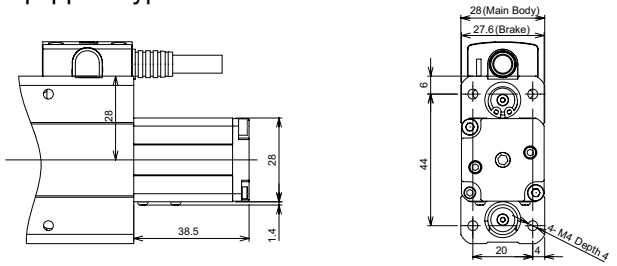
- Without Brake



ST	L1	L2	Without Brake Mass [kg]	
			Lead Screw	Ball Screw
30	89.5	73.5	0.41	0.41
50	109.	93.5	0.48	0.48

(Note) Only 30mm is available for the stroke of Lead Screw GD3N Type.

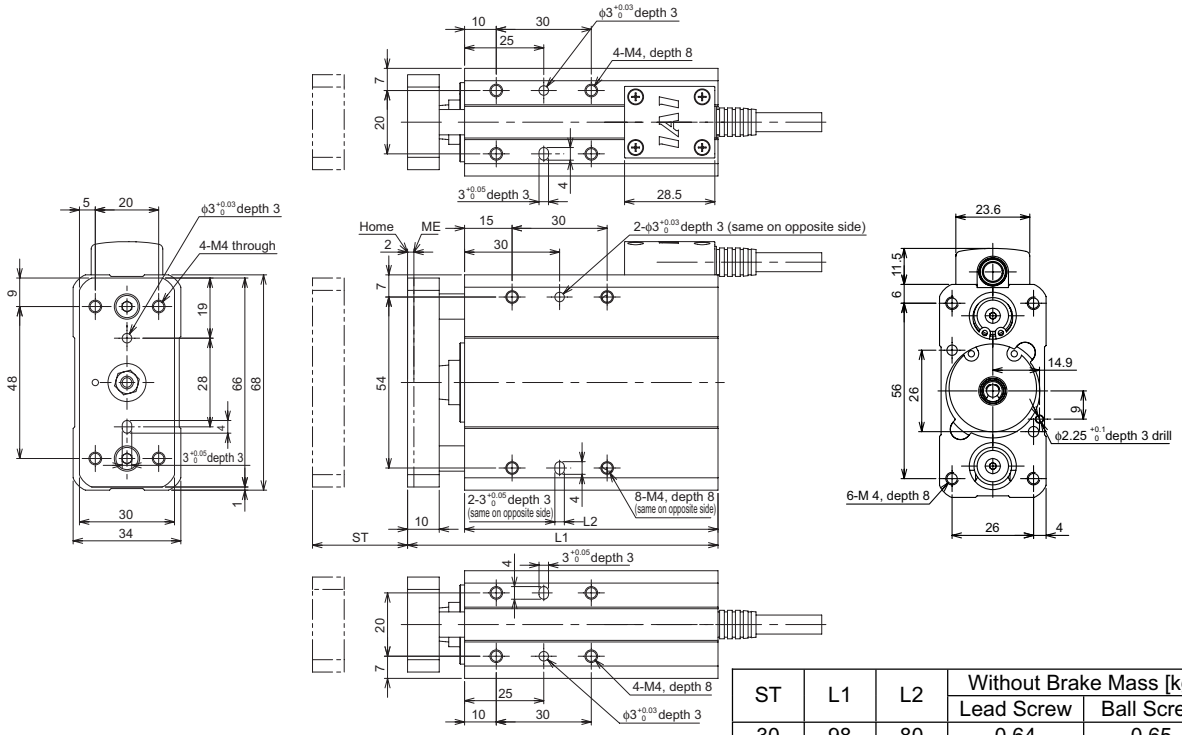
- Brake-equipped Type



ST	Brake-equipped Type Mass [kg]	
	Lead Screw	Ball Screw
30	0.51	0.51
50	0.58	0.58

7.10 Double Guide Types
RCA2-GD4NA/GD4N (Lead Screw, Ball Screw)

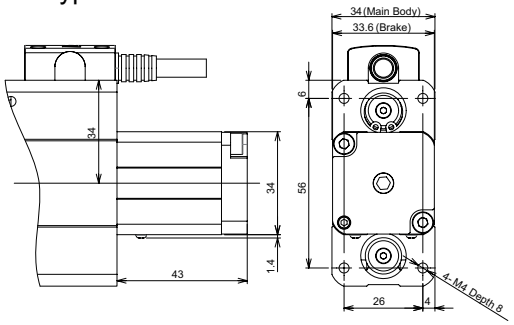
- Without Brake



ST	L1	L2	Without Brake Mass [kg]	
			Lead Screw	Ball Screw
30	98	80	0.64	0.65
50	118	100	0.76	0.76

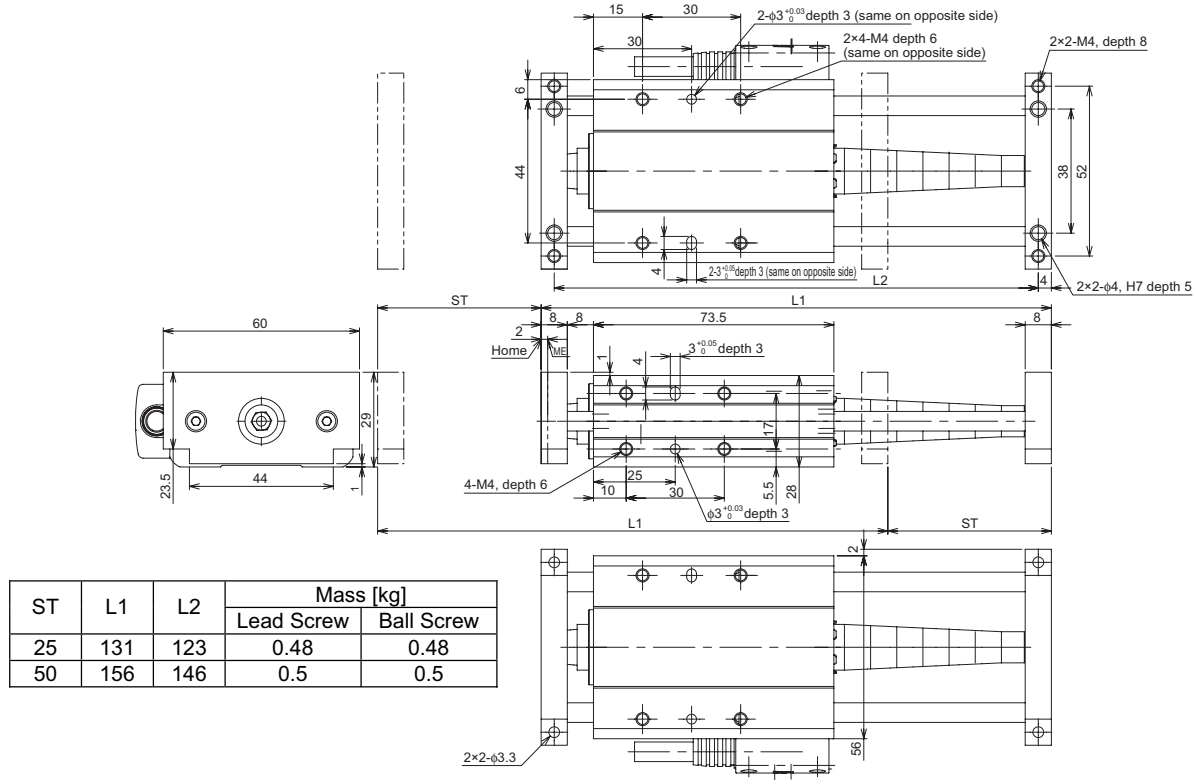
(Note) Only 30mm is available for the stroke of Lead Screw GD4N Type.

- Brake-equipped Type



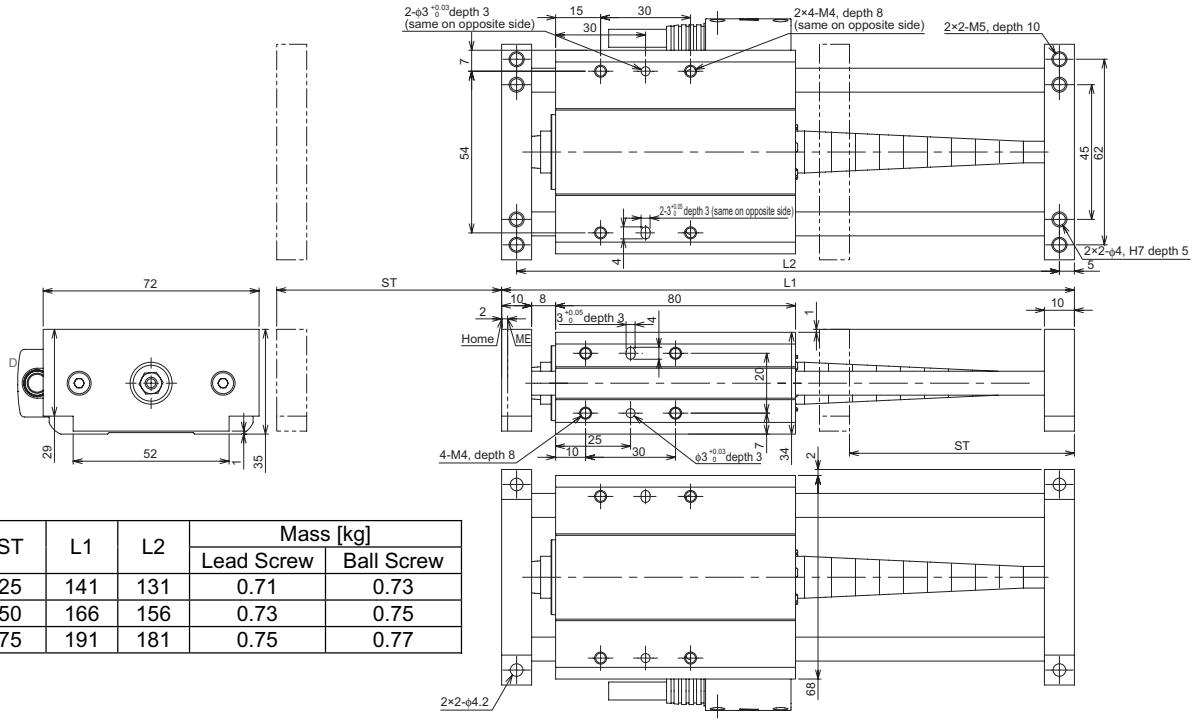
ST	Brake-equipped Type Mass [kg]	
	Lead Screw	Ball Screw
30	0.79	0.8
50	0.91	0.91

7.11 Slide Unit Types
RCA2-SD3NA/SD3N (Lead Screw, Ball Screw)



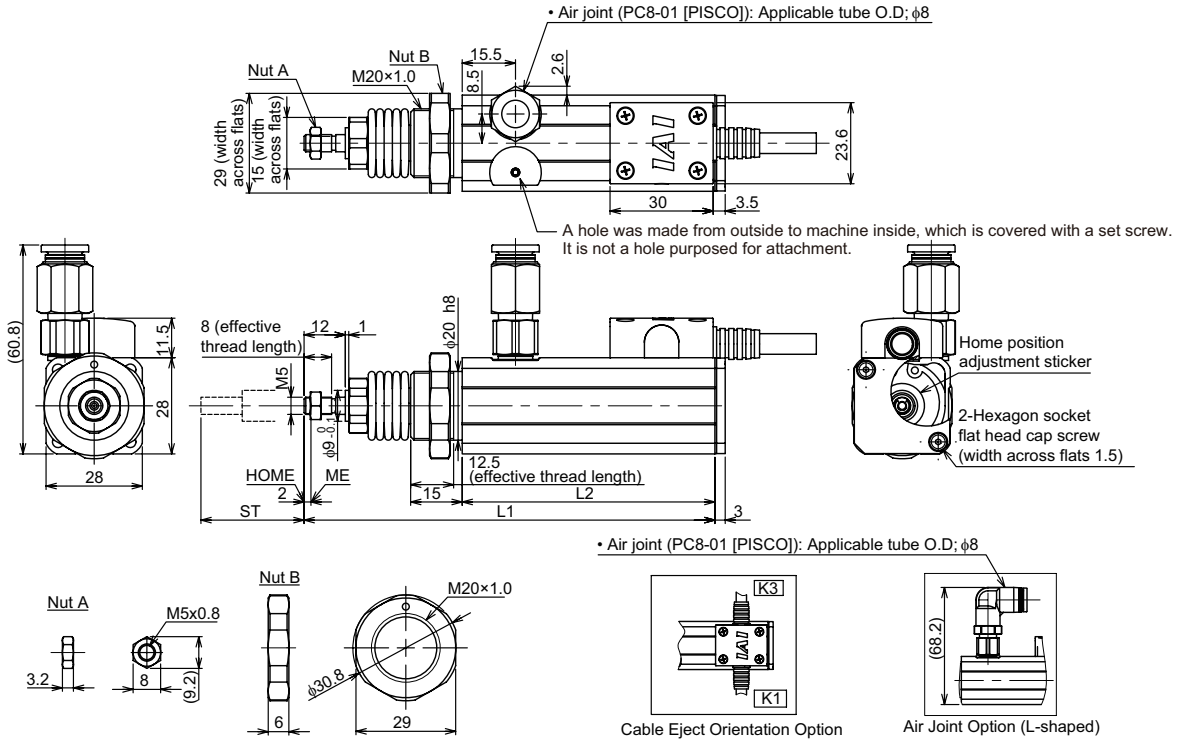
ST	L1	L2	Mass [kg]	
			Lead Screw	Ball Screw
25	131	123	0.48	0.48
50	156	146	0.5	0.5

7.12 Slide Unit Types
RCA2-SD4NA/SD4N (Lead Screw, Ball Screw)



ST	L1	L2	Mass [kg]	
			Lead Screw	Ball Screw
25	141	131	0.71	0.73
50	166	156	0.73	0.75
75	191	181	0.75	0.77

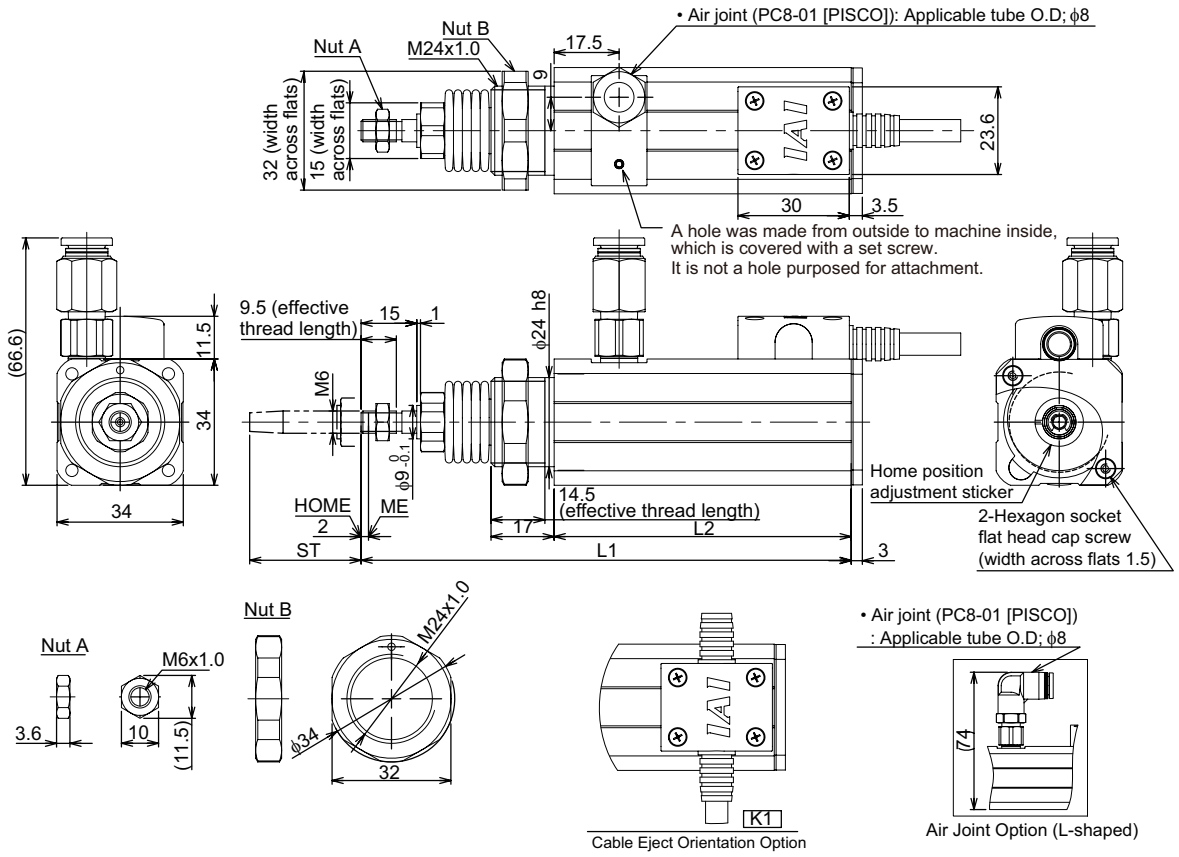
7.13 Short Types (Nut Affixing Types) (Cleanroom Type, Dustproof Type) RCA2CR, CA2W-RN3NA (Ball Screw)



ST	L1	L2	Without brake Mass [kg]
			Ball Screw
30	119.5	73.5	0.3
50	145.5	93.5	0.34

(Note) The length of dust-proof type actuator cable is 2m. Cleanroom Type RCA2CR is 300mm.

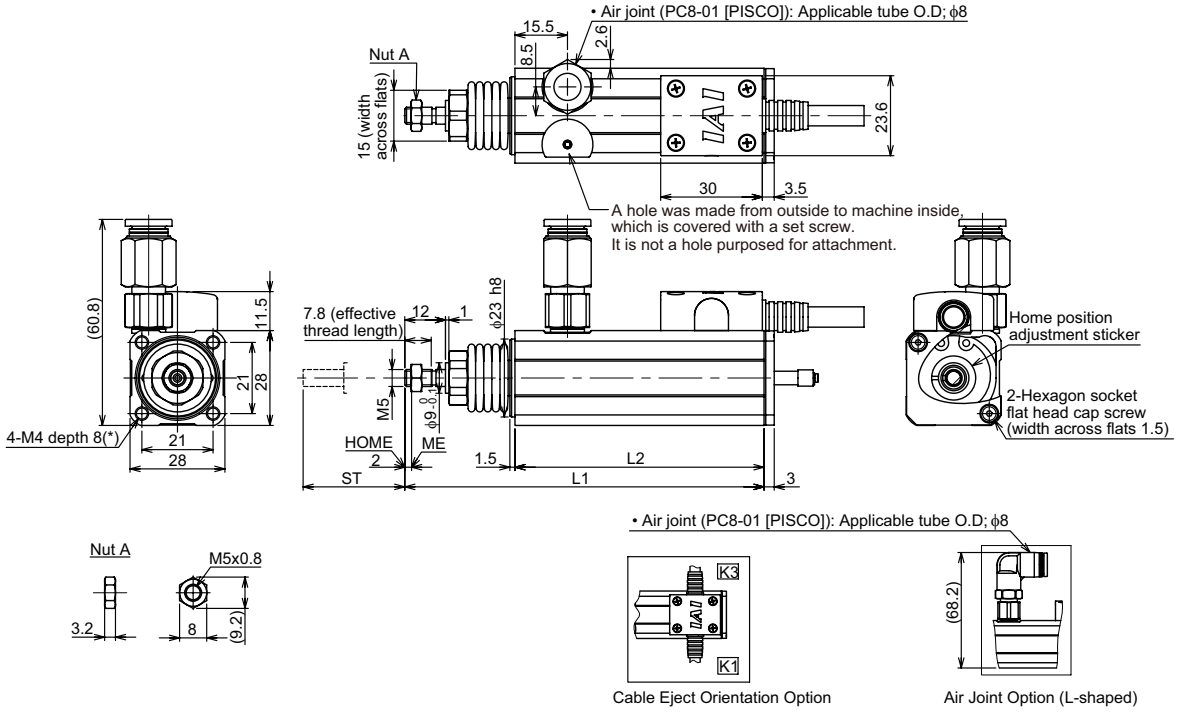
7.14 Short Types (Nut Affixing Types) (Cleanroom Type, Dustproof Type) RCA2CR, RCA2W-RN4NA (Ball Screw)



ST	L1	L2	Without brake Mass [kg]
			Ball Screw
30	132	80	0.44
50	158	100	0.50

(Note) The length of dust-proof type actuator cable is 2m. Cleanroom Type RCA2CR is 300mm.

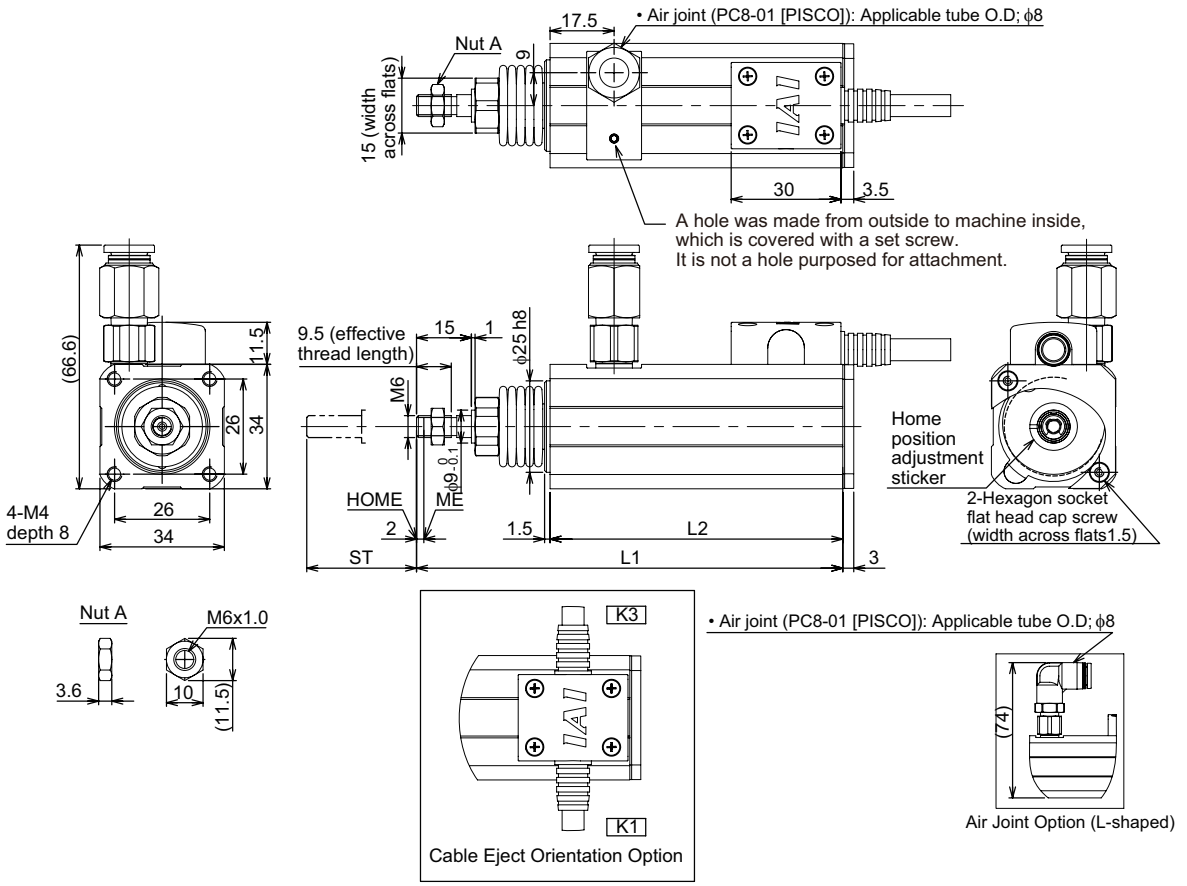
7.15 Short Types (Tapped-hole Mounting Types) (Cleanroom Type, Dustproof Type) RCA2CR, RCA2W-RP3NA (Ball Screw)



ST	L1	L2	Without brake Mass [kg]
			Ball Screw
30	106	73.5	0.25
50	132	93.5	0.29

(Note) The length of dust-proof type actuator cable is 2m. Cleanroom Type RCA2CR is 300mm.

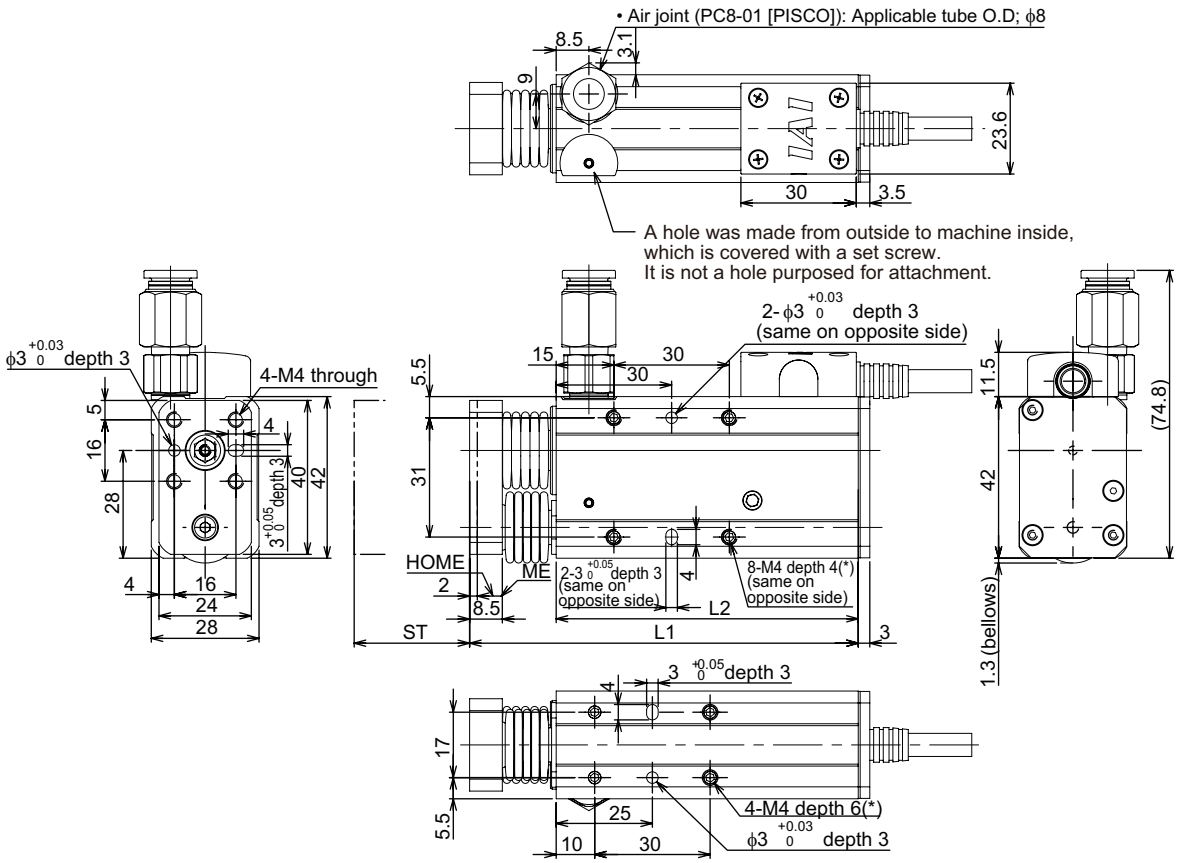
7.16 Short Types (Tapped-hole Mounting Types) (Cleanroom Type, Dustproof Type) RCA2CR, RCA2W-RP4NA (Ball Screw)

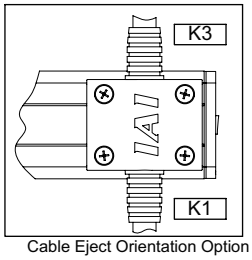


ST	L1	L2	Without brake Mass [kg]
			Ball Screw
30	116.5	80	0.36
50	142.5	100	0.42

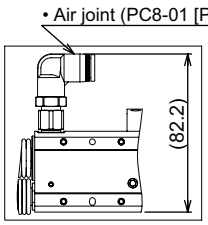
(Note) The length of dust-proof type actuator cable is 2m. Cleanroom Type RCA2CR is 300mm.

7.17 Single Guide Types (Cleanroom Type, Dustproof Type) RCA2CR, RCA2W-GS3NA (Ball Screw)





Cable Eject Orientation Option

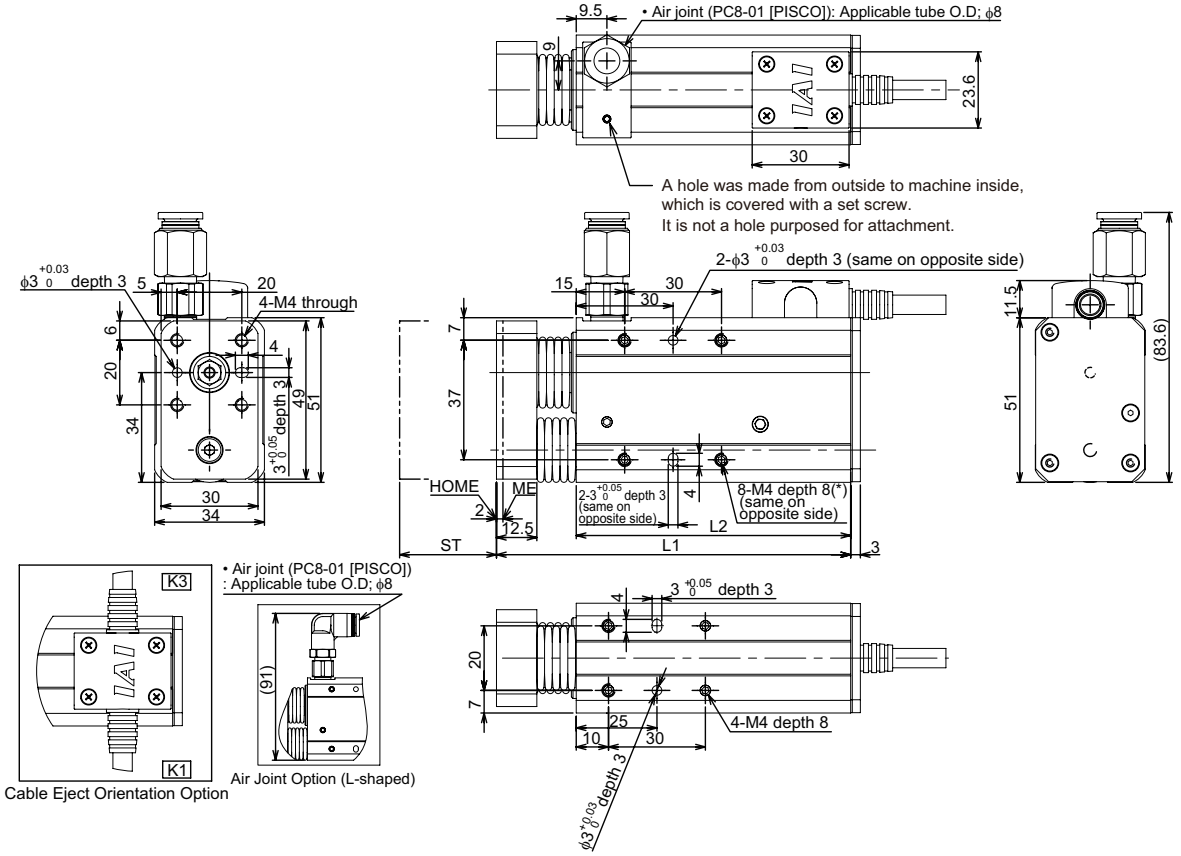


Air Joint Option (L-shaped)

ST	L1	L2	Without brake Mass [kg]
			Ball Screw
30	101	78.5	0.34
50	127	98.5	0.39

(Note) The length of dust-proof type actuator cable is 2m. Cleanroom Type RCA2CR is 300mm.

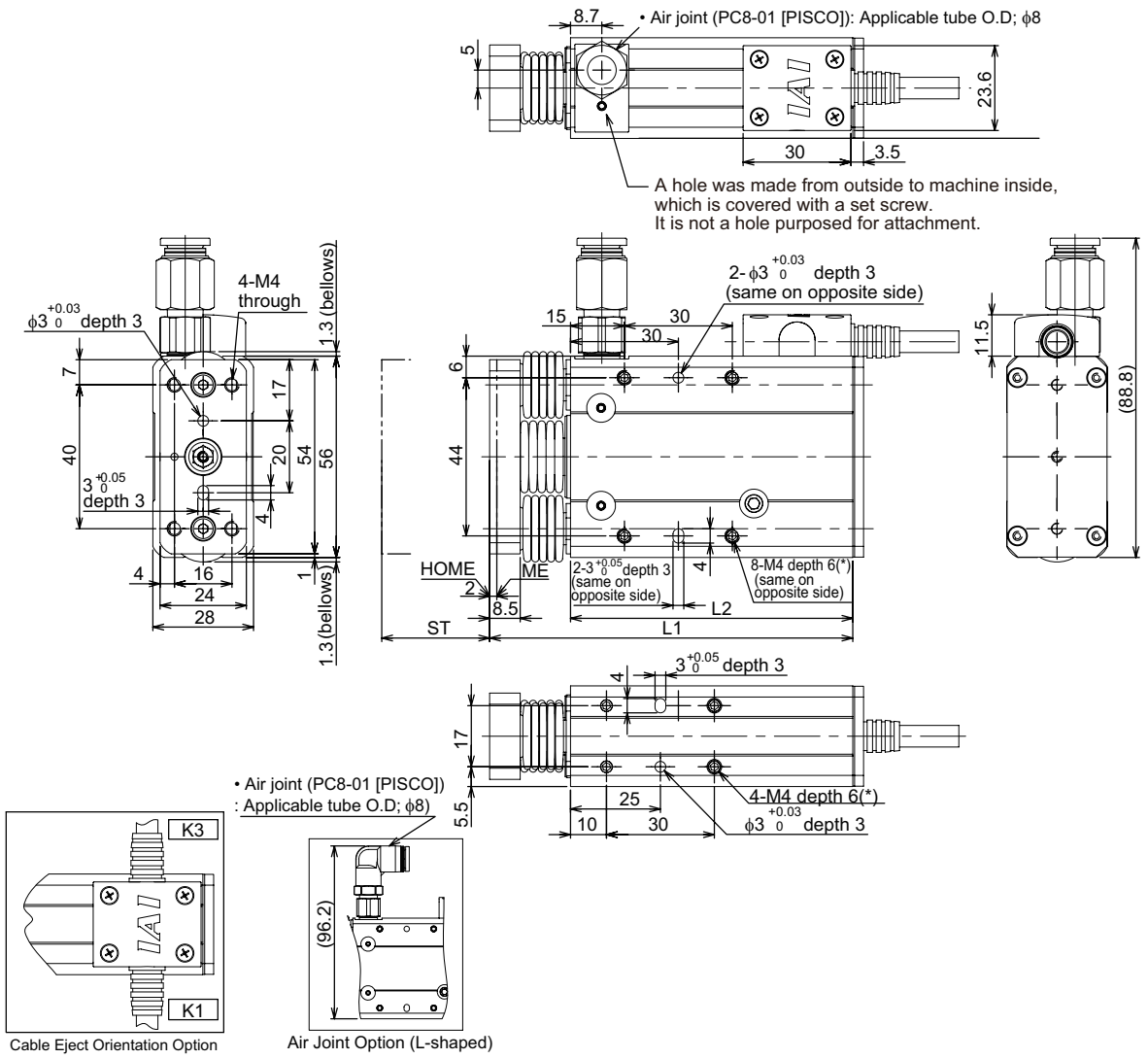
7.18 Single Guide Types (Cleanroom Type, Dustproof Type) RCA2CR, RCA2W-GS4NA (Ball Screw)



ST	L1	L2	Without brake Mass [kg]
			Ball Screw
30	109.7	85	0.64
50	135.7	105	0.70

(Note) The length of dust-proof type actuator cable is 2m. Cleanroom Type RCA2CR is 300mm.

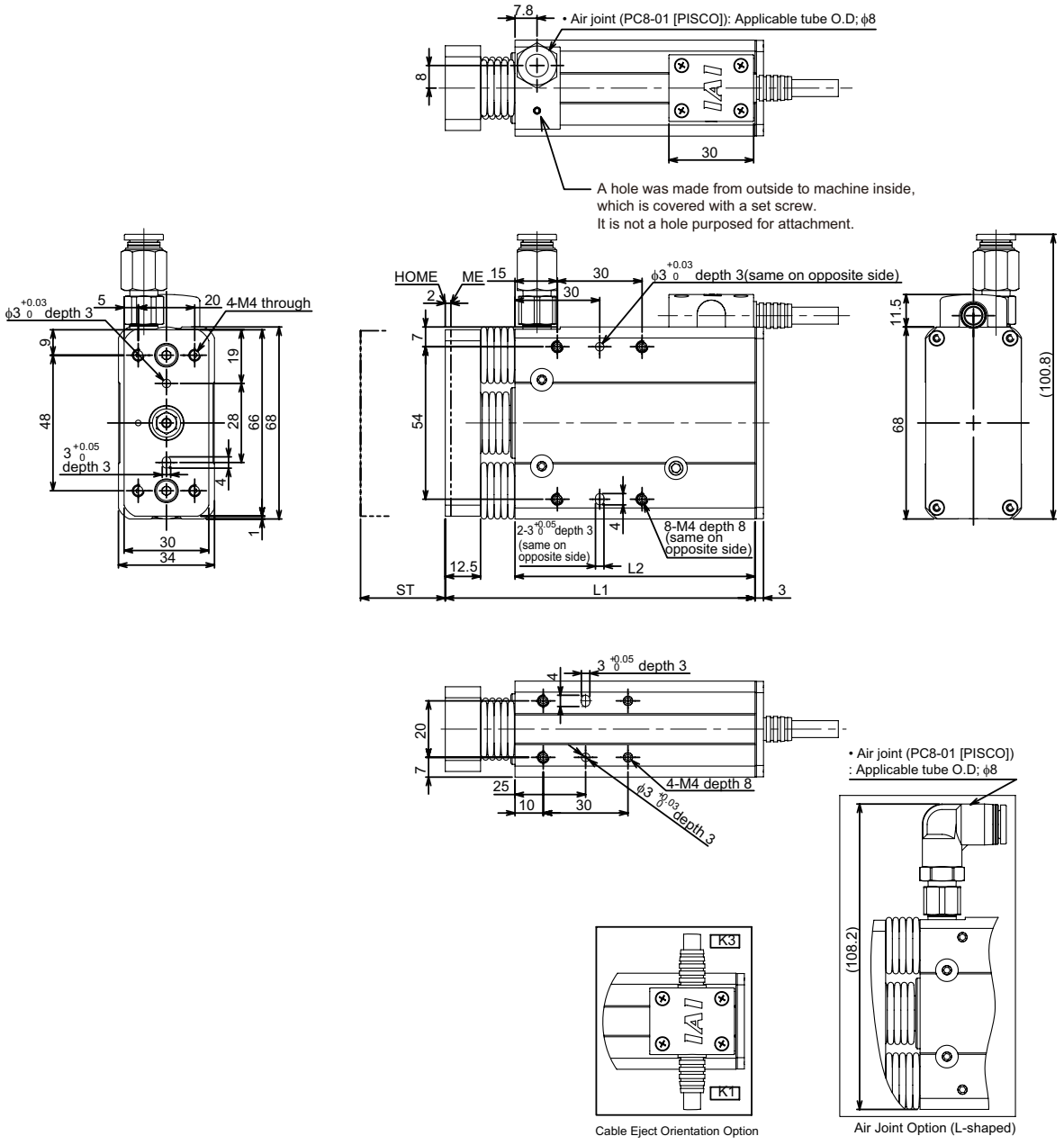
7.19 Double Guide Types (Cleanroom Type, Dustproof Type) RCA2CR, RCA2W-GD3NA (Ball Screw)



ST	L1	L2	Without brake Mass [kg]
			Ball Screw
30	101	78.5	0.44
50	127	98.5	0.54

(Note) The length of dust-proof type actuator cable is 2m. Cleanroom Type RCA2CR is 300mm.

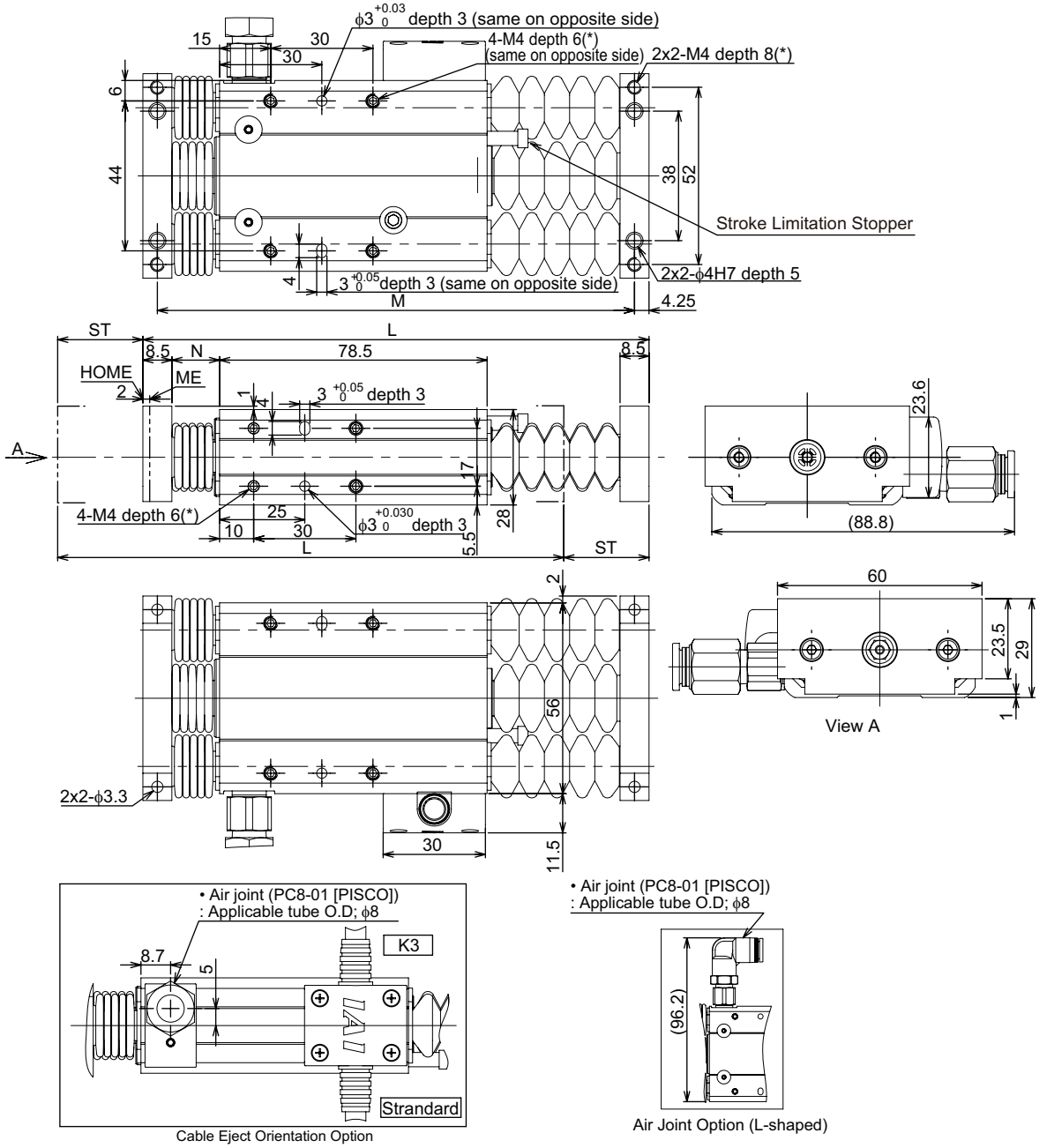
7.20 Double Guide Types (Cleanroom Type, Dustproof Type) RCA2CR, RCA2W-GD4NA (Ball Screw)



ST	L1	L2	Without brake Mass [kg]
			Ball Screw
30	109.7	85	0.72
50	135.7	105	0.86

(Note) The length of dust-proof type actuator cable is 2m. Cleanroom Type RCA2CR is 300mm.

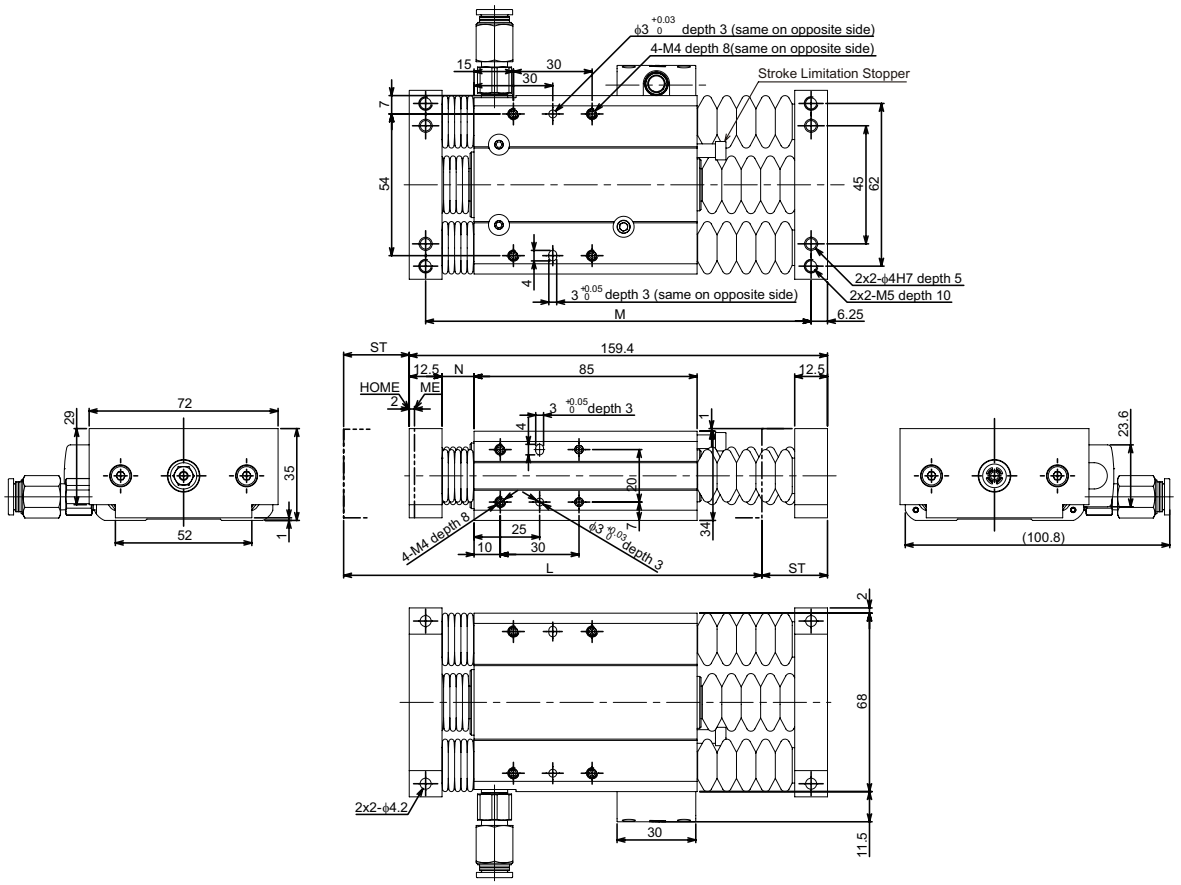
7.21 Slide Unit Types(Cleanroom Type, Dustproof Type) RCA2CR, RCA2W-SD3NA (Ball Screw)

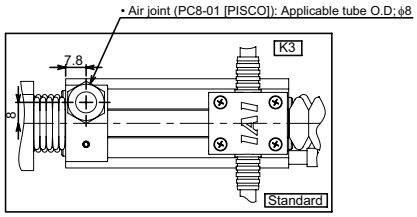


ST	L	M	N	Without brake Mass [kg]
				Ball Screw
25	148.5	140	14	0.52
50	185.5	177	20	0.54

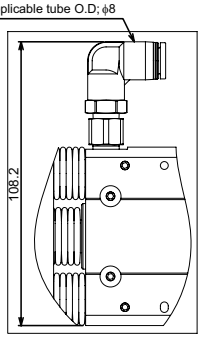
(Note) The length of dust-proof type actuator cable is 2m. Cleanroom Type RCA2CR is 300mm.

7.22 Slide Unit Types(Cleanroom Type, Dustproof Type) RCA2CR, RCA2W-SD4NA (Ball Screw)





Cable Eject Orientation Option



Air Joint Option (L-shaped)

ST	L	M	N	Without brake Mass [kg]
				Ball Screw
25	159.4	146.9	12.2	0.86
50	196.4	183.9	18.2	0.88

(Note) The length of dust-proof type actuator cable is 2m. Cleanroom Type RCA2CR is 300mm.

8. Warranty

8.1 Warranty Period

One of the following periods, whichever is shorter:

- 18 months after shipment from IAI
- 12 months after delivery to the specified location
- 1,500 hours of operation RN3NA, RN3N (Lead screw), RN4NA, RN4N (Lead screw)
  RP3NA, RP3N (Lead screw), RP4NA, RP4N (Lead screw)
  GS3NA, GS3N (Lead screw), GS4NA, GS4N (Lead screw)
  GD3NA, GD3N (Lead screw), GD4NA, GD4N (Lead screw)
  SD3NA, SD3N (Lead screw), SD4NA, SD4N (Lead screw)
- 2,500 hours of operation RN3NA, RN3N (Ball screw), RN4NA, RN4N (Ball screw)
  RP3NA, RP3N (Ball screw), RP4NA, RP4N (Ball screw)
  GS3NA, GS3N (Ball screw), GS4NA, GS4N (Ball screw)
  GD3NA, GD3N (Ball screw), GD4NA, GD4N (Ball screw)
  SD3NA, SD3N (Ball screw), SD4NA, SD4N (Ball screw)

8.2 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 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 instruction 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.

8.3 Honoring the Warranty

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

8.4 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.

8.5 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 instruction manual.

8.6 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	
May 2009	First edition	
October 2009	Second edition	Added 12.7, “How to Replace Spiral Cover”
March 2010	Third edition	Added [How to check and adjust the position of encoder phase Z] on p. 39 and 40. Added [How to check and adjust the position of encoder phase Z] on p. 49 and 50.
March 2010	Fourth edition	Changed the tolerance of dimension L to 0.1 mm on p. 36 and 46.
April 2011	Fifth edition	A page for CE Marking added Slim Type RA2A added
July 2011	Sixth edition	Contents changed in 7. Transportation in p. 9 to p. 10 Added RN3N (ball screw), RP3N (ball screw), GS3N (ball screw), and SD3N (ball screw) to Type on p. 31, Specification on p. 32 to 39, and Warranty on p. 91 p. 84 Spiral Cover added to 12.2 Visual Inspection of Exterior Contents changed in 13. Warranty in p. 89 to p. 90
August 2011	Seventh edition	Load capacity changed : RN3N (Ball screw) in p. 32 RP3N (Ball screw) and GS3N (Ball screw) in p. 33 GD3N (Ball screw) and SD3N (Ball screw) in p. 34 Lead 1 4kg → 3kg Lead 2 2kg → 1.5kg Lead 4 1kg → 0.75kg
January 2012	Eighth edition	Contents changed in Safety Guide in p. 1 to p. 5. Caution notes added for when working with two or more persons Weight added to external diagrams in p. 15 to p. 20 Change made to Dimension L for RN4N in p. 41
March 2012	Ninth edition	Model codes RN3NA, RN4NA, RP3NA, RP4NA, GS3NA, GS4NA, GD3NA, GD4NA, SD3NA, and SD4NA are added 50mm stroke ball screw type added to short type and single-guided type.
March 2012	Tenth edition	Contents added and changed in Safety Guide on p. 1 to p. 7 Note “Make sure to attach the actuator properly by following this instruction manual.” added in Handling Precautions in p. 8 Warning notes added such as in case the grease got into your eye, immediately go to see the doctor for an appropriate care in p. 84

Revision Date	Description of Revision	
May 2013	Eleventh edition	Revised overall
July 2013	Twelfth edition	Equipped with brake type added
April 2014	Thirteenth edition	SA2AC and SA2AR of procedures for replacement of Motor added
October 2014	Fourteenth edition	Caution note added for when changing orientation of cable ejection of connector in P. 13
December 2014	Fifteenth edition	Contents corrected as RCA2-RA2AC and RA2AR are applicable for AMEC and ACON-CA in P. 22 and P. 75 to P. 76
January 2015	Sixteenth edition	Cleanroom type and Dust-proof type added
March 2015	16B edition	Correction made Pin number of controller side signal name W changed from 3 to 5 in P. 35
May 2015	Seventeenth edition	Note added to state that grease supply is to be conducted when replacing bellows for Cleanroom Type and Dust Proof Type in P.94 Life of bellows added in P. 95, 120 Explanation added for hole near joint in P.132 to 139 Projection deleted at the back of main body on P. 134 Note added to state that the projection between main body and rear slider is a stroke limitation stopper in P.140, 141
June 2015	Eighteenth edition	Contents changed for how to move rod (Bracket) manually on P. 93

Manual No.: ME3671-18A (June 2015)

IAI
Quality and Innovation

IAI Corporation

Head Office: 577-1 Obane Shimizu-KU Shizuoka City Shizuoka 424-0103, Japan
TEL +81-54-364-5105 FAX +81-54-364-2589
website: www.iai-robot.co.jp/

Technical Support available in USA, Europe and China

IAI America, Inc.

Head Office: 2690 W. 237th Street, Torrance, CA 90505
TEL (310) 891-6015 FAX (310) 891-0815
Chicago Office: 110 East State Parkway, Schaumburg, IL 60173
TEL(847) 908-1400 FAX (847) 908-1399
Atlanta Office: 1220 Kennestone Circle, Suite 108, Marietta, GA 30066
TEL (678) 354-9470 FAX (678) 354-9471
website: www.intelligentactuator.com

IAI Industrieroboter GmbH

Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany
TEL 06196-88950 FAX 06196-889524

IAI (Shanghai) Co., Ltd.

SHANGHAI JIAHUA BUSINESS CENTER A8-303, 808, Hongqiao Rd. Shanghai 200030, China
TEL 021-6448-4753 FAX 021-6448-3992
website: www.iai-robot.com

IAI Robot (Thailand) Co., Ltd.

825, PhairojKijja Tower 12th Floor, Bangna-Trad RD., Bangna, Bangna, Bangkok 10260, Thailand
TEL +66-2-361-4458 FAX +66-2-361-4456

15.06.000

ROBO CYLINDER

ROBO Cylinder
Rod Type
RCA Actuators
RCAW Actuators, Dustproof/Splash-proof Type
Operating Manual
Eighth Edition

Motor Straight Type (Coupling Type)	RA3C,RGS3C,RGD3C,RA4C,RGS4C,RGD4C
Motor Straight Type (Built-in Type)	RA3D,RGS3D,RGD3D,RA4D,RGS4D,RGD4D
Motor Reversing Type	RA3R,RGD3R,RA4R,RGD4R

Motor Straight Type (Coupling Type)	RA3C,RA4C
Motor Straight Type (Built-in Type)	RA3D,RA4D
Motor Reversing Type	RA3R,RA4R

IAI America, Inc.

Please Read Before Use

Thank you for purchasing our product.

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

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

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

[Important]

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

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Safety Guide

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

Safety Precautions for Our Products

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

No.	Operation Description	Description
1	Model Selection	● 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 the product outside the specifications. Failure to do so may considerably shorten the life of the product. ● Do not use it in any of the following environments. 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 ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

No.	Operation Description	Description
2	Transportation	● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. ● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the Operating manual for each model. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment's capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	(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. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	(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 ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm^2 (AWG20 or equivalent) or more for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).

No.	Operation Description	Description
4	Installation and Start	(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	● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. ● Make sure to operate automatic operation start from outside of the safety protection fence. ● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

No.	Operation Description	Description
8	Maintenance and Inspection	● 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 Operating manual for each model. ● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. ● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation. ● Pay attention not to lose the cover or untightened screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.
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. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated Operating manual of each unit to ensure the safety.

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the Operating 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. Ensure use of the product in the specified conditions, environments and ranges.
   Operation out of the specified conditions could cause a drop in performance or malfunction of the product.

2. Set the allowable load of the move on rod tip within the allowable range.
   An operation with the load beyond the allowable load of the move on rod tip may cause an abnormal noise, vibration, malfunction or shortened life. If it is extreme, flaking may occur on the guide.

3. If back and forth operations are performed repeatedly in short distance, it may wear out the film of grease.
   Continuous back and forth operation within a distance less than 30mm may cause wear of grease.
   As a reference, have approximately 5 cycles of back and forth operation in a distance more than 50mm in every 5,000 to 10,000 cycles to regenerate the oil film. Keep using the actuator with the grease worn out may cause malfunction. If it is extreme, flaking may occur on the guide.

4. Do not apply any rotation torque on the rod.
   Doing so may damage the internal component such as the rod stopper, and may result in an operation failure.

International Standards Compliances

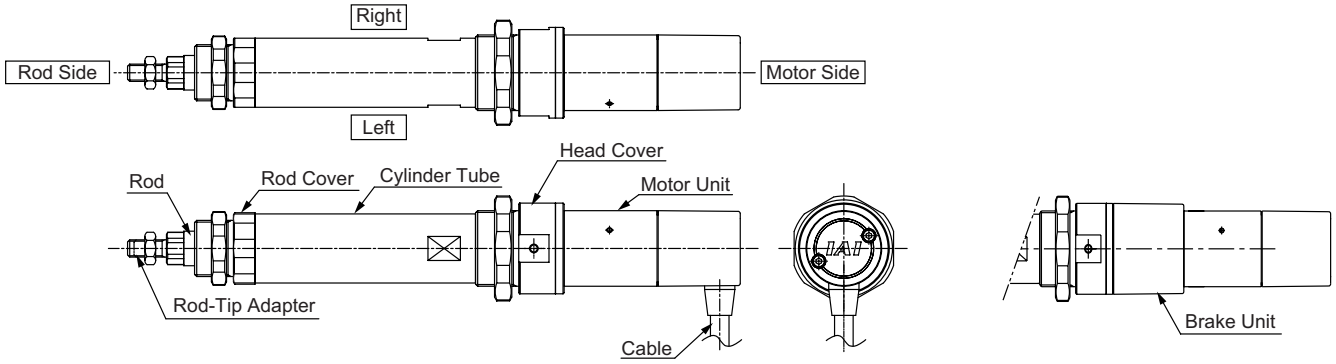
This actuator complies with the following overseas standard.
Refer to Overseas Standard Compliance Manual (ME0287) for more detailed information.

RoHS	CE Marking
○	○

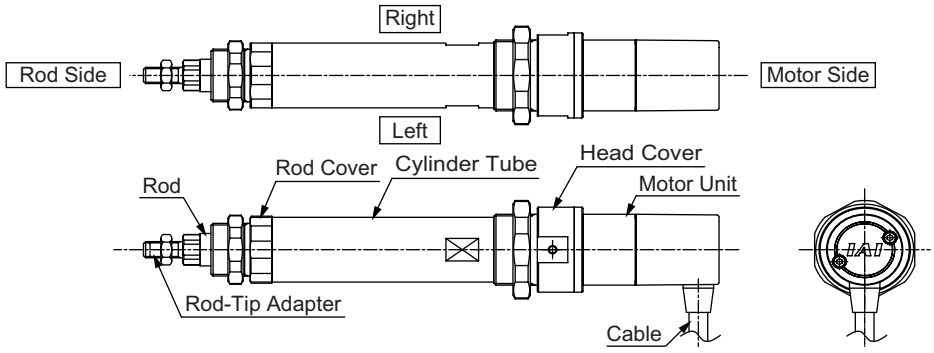
Names of the Parts

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.

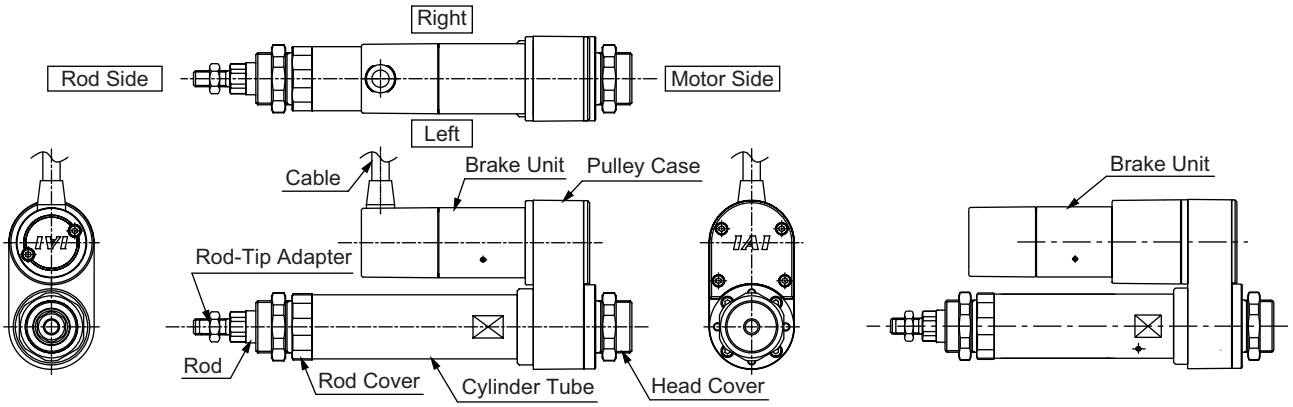
[RA3C, RA4C]



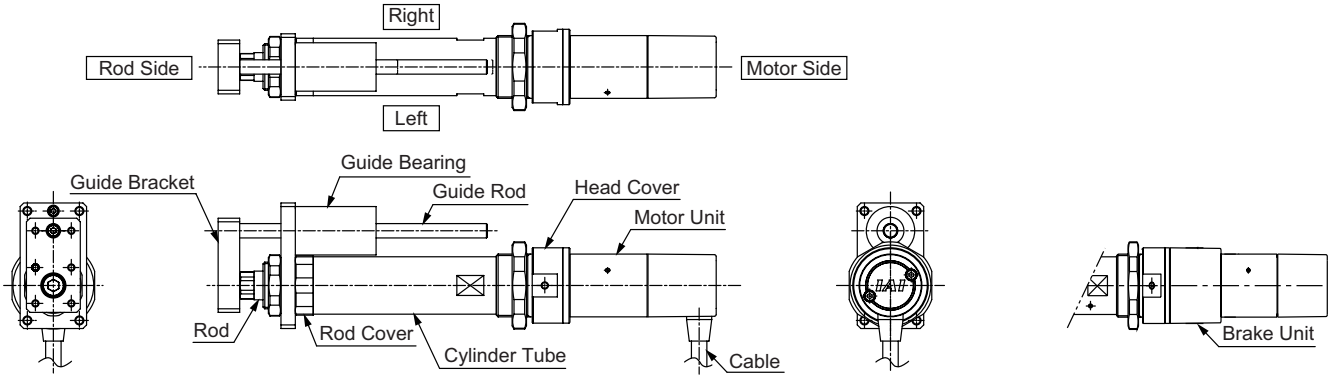
[RA3D, RA4D]



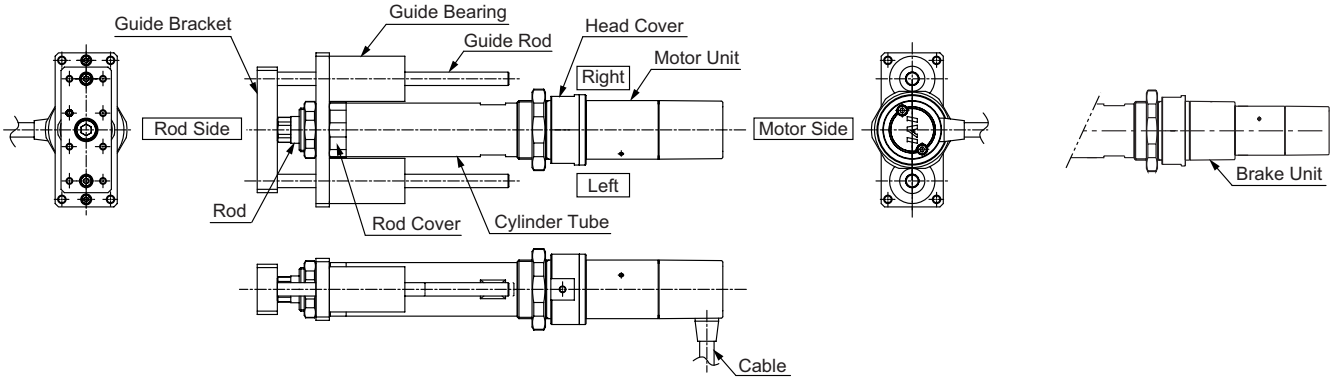
[RA3R, RA4R]



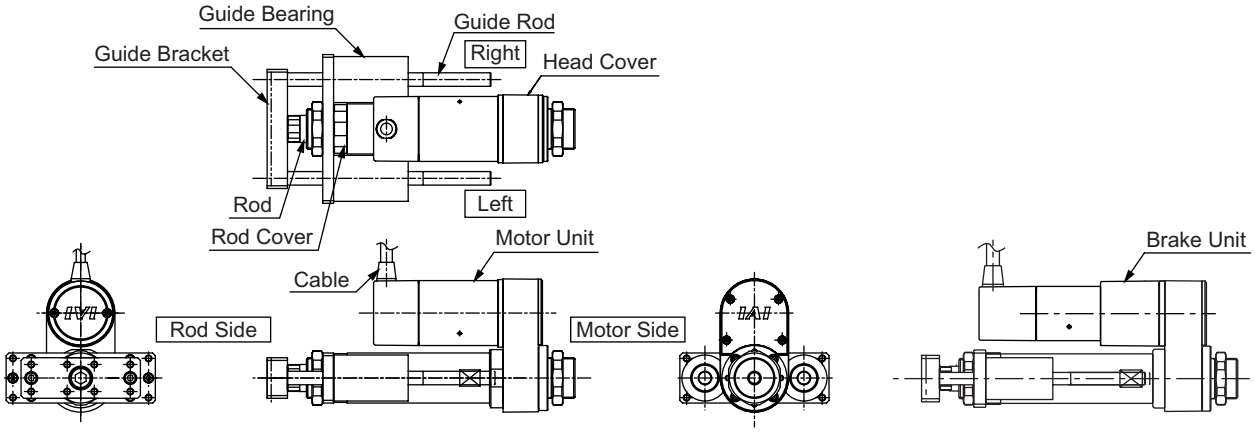
[RGS3C, RGS3D, RGS4C, RGS4D]
RGS3D and RGS4C are non-brake-equipped types.



[RGD3C, RGD3D, RGD4C, RGD4D]
RGD3D and RGD4C are non-brake-equipped types.

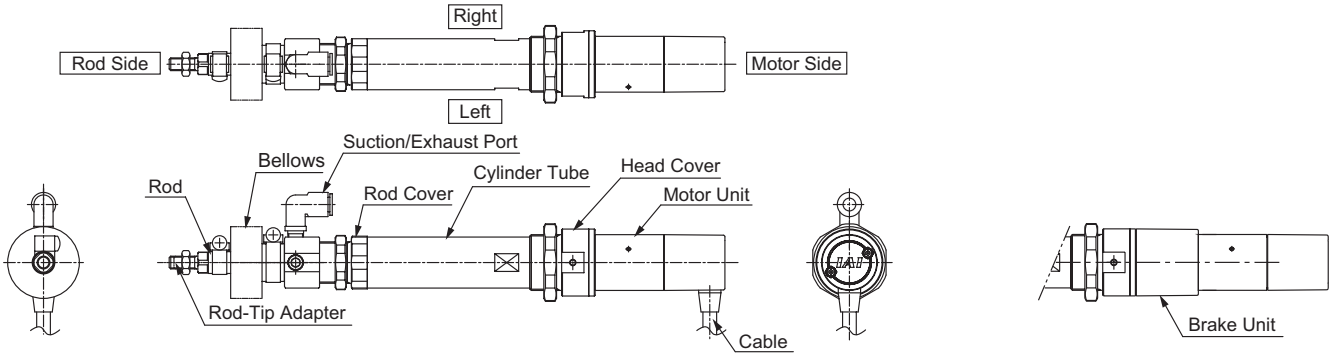


[RGD3R, RGD4R]

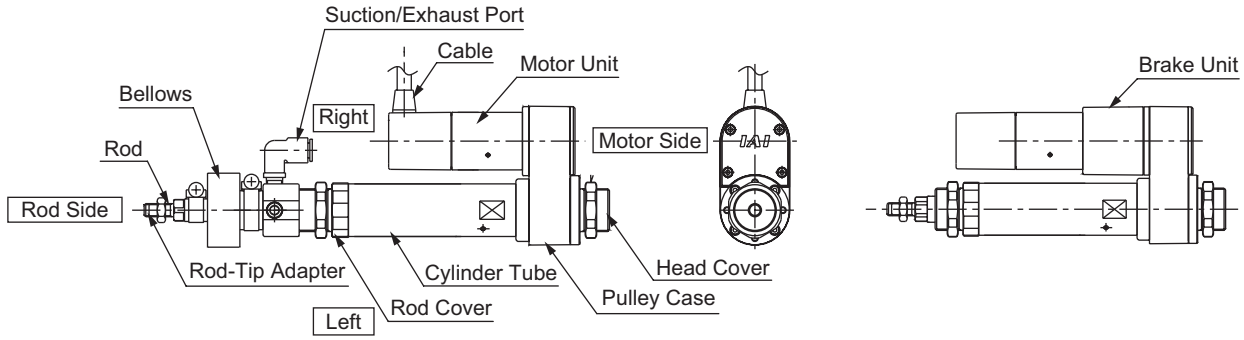


Dust and Splash-Proof Type

[RA3C, RA3D, RA4C, RA4D]
RA3D and RA4D are non-brake-equipped types.



[RA3R, RA4R]



1. Specifications Check

1.1 Checking the Product

The standard configuration of this product is comprised of the following parts.

⚠ Caution: Check for the enclosed components referring to the component list. If you find any fault or missing part, contact your local IAI distributor or our company.

1.1.1 Parts

No.	Part Name	Model	Quantity	Remarks
1	Actuator Main Body	Refer to “1.1.3 How to Read the Model Nameplate”, “1.1.4 How to Read the Model Number”	1	
Accessories				
2	Motor • Encoder Cable[Note1]		1	
3	Nut		Refer to list below	
4	First Step Guide		1	
5	Instruction Manual (CD/DVD)		1	
6	Safety Guide		1	

Model No.	Nut A M26•1.5	Nut B M35•1.5	Nut C M8•1.5	Nut A M30•1.5	Nut B M40•1.5	Nut C M10•1.5
RCA-RA3C	1	1	1			
RCA-RA4C				1	1	1
RCA-RA3D	1	1	1			
RCA-RA4D				1	1	1
RCA-RA3R	2		1			
RCA-RA4R				2		1
RCA-RGS3C	1	1				
RCA-RGS4C				1	1	
RCA-RGS3D	1	1				
RCA-RGS4D				1	1	
RCA-RGD3C	1	1				
RCA-RGD4C				1	1	
RCA-RGD3D	1	1				
RCA-RGD4D				1	1	
RCA-RGD3R	2					
RCA-RGD4R				2		

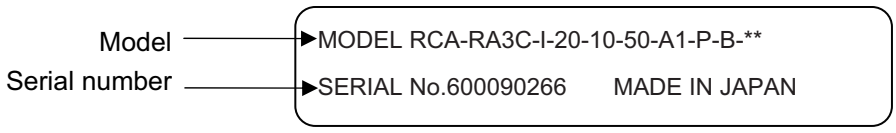
Note1 The motor • encoder cables supplied vary depending on the controller used.
[Refer to 1.4, “Motor • Encoder Cables.”]

1.1.2 Instruction Manuals related to this product, which are contained in the CD/DVD.

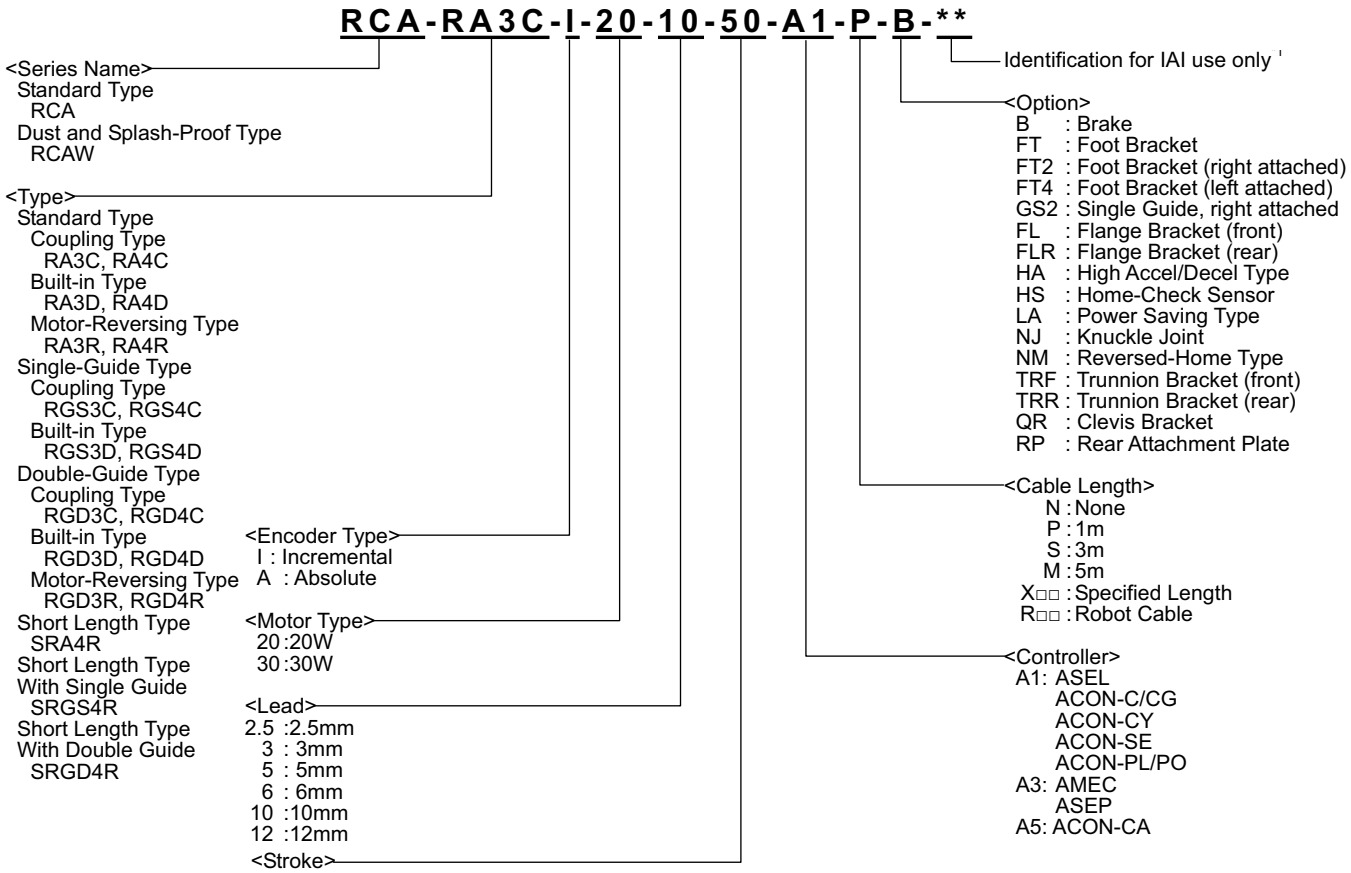
Shown below is a list of the instruction manuals for the controllers related to this product which is recorded in Instruction Manual (CD/DVD).

No.	Name	Control No.
1	ASEL Controller Operation Manual	ME0165
2	ACON-C/CG Controller Operation Manual	ME0176
3	ACON-CY Controller Operation Manual	ME0167
4	ACON-SE Controller Operation Manual	ME0171
5	ACON-PL/OP Controller Operation Manual	ME0166
6	AMEC Controller Operation Manual	ME0245
7	ASEP/PSEP Controller Operation Manual	ME0216
8	MSEP Controller Operation Manual	ME0299
9	PC software IA-101-X-MX/ IA-101-X-USBMW Operation Manual	ME0154
10	PC software RCM-101MW/RCM-101-USB Operation Manual	ME0155
11	MEC PC Software Operation Manual	ME0248
12	Teaching pendant SEL-T/TD Operation Manual	ME0183
13	Teaching pendant CON-T/TD Operation Manual	ME0178
14	Touch Panel Teaching CON-PT/PD/PG Operation Manual	ME0227
15	Touch Panel Teaching CON-PTA/PDA/PGA Operation Manual	ME0295
16	Touch Panel Teaching SEP-PT Operation Manual	ME0217
17	Simplified Teaching pendant RCM-E Operation Manual	ME0174
18	Data setter RCM-P Operation Manual	ME0175
19	Data setter RCM-PM-01 Operation Manual	ME0182

1.1.3 How to Read the Model Nameplate



1.1.4 How to Read the Model Number



Note 1 Identification for IAI use only : It may be displayed for IAI use. It is not a code to show the model type.

1.2 Specification

1.2.1 Speed

Speed limits (Unit: mm/s)

Size	Motor Type	Lead [mm]	Stroke [mm]					
			50	100	150	200	250	300
RA3C RA3D RA3R RGD3C RGD3D RGD3R RGS3C RGS3D	20W	2.5	125					
		5	250					
		10	500					
RA4C RA4D RA4R RGD4C RGD4D RGD4R RGS4C RGS4D	20W	3	150					
		6	300					
		12	600					
RA4C RA4D RA4R RGD4C RGD4D RGD4R RGS4C RGS4D	30W	3	150					
		6	300					
		12	600					

(Note) The speed may not reach the maximum in some ways of the acceleration/deceleration settings.

1.2.2 Maximum Acceleration and Transportable Weight

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

Type	Motor Type	Lead [mm]	Rated Acceleration [G]		Transportable Weight [kg]	Rated Thrust [N]
RA3C	20W	2.5	Horizontal	0.2	18	144.8
			Vertical	0.2	6.5	
		5	Horizontal	1	9	72.4
			Vertical	1	3	
		10	Horizontal	1	4	36.2
			Vertical	1	1.5	
RA3D RA3R	20W	2.5	Horizontal	0.2	18	144.8
			Vertical	0.2	6.5	
		5	Horizontal	0.3	9	72.4
			Vertical	0.3	3	
		10	Horizontal	0.3	4	36.2
			Vertical	0.3	1.5	
RGD3C RGS3C	20W	2.5	Horizontal	0.2	18	144.8
			Vertical	0.2	6.2	
		5	Horizontal	1	9	72.4
			Vertical	1	2.7	
		10	Horizontal	1	4	36.2
			Vertical	1	1.2	
RGD3D RGD3R RGS3D	20W	2.5	Horizontal	0.2	18	144.8
			Vertical	0.2	6.2	
		5	Horizontal	0.3	9	72.4
			Vertical	0.3	2.7	
		10	Horizontal	0.3	4	36.2
			Vertical	0.3	1.2	
RA4C RA4D RA4R	20W	3	Horizontal	0.2	12	75.4
			Vertical	0.2	4	
		6	Horizontal	0.3	6	37.7
			Vertical	0.3	2	
		12	Horizontal	0.3	3	18.9
			Vertical	0.3	1	
RGD4C RGD4D RGD4R RGS4C RGS4D	20W	3	Horizontal	0.2	12	75.4
			Vertical	0.2	3.5	
		6	Horizontal	0.3	6	37.7
			Vertical	0.3	1.5	
		12	Horizontal	0.3	3	18.9
			Vertical	0.3	0.5	

Type	Motor Type	Lead [mm]	Rated Acceleration [G]		Transportable Weight [kg]	Rated Thrust〔N〕
RA4C	30W	3	Horizontal	0.2	18	113.1
			Vertical	0.2	6.5	
		6	Horizontal	1	9	56.6
			Vertical	1	3	
		12	Horizontal	1	4	28.3
			Vertical	1	1.5	
RA4D RA4R	30W	3	Horizontal	0.2	18	113.1
			Vertical	0.2	6.5	
		6	Horizontal	0.3	9	56.6
			Vertical	0.3	3	
		12	Horizontal	0.3	4	28.3
			Vertical	0.3	1.5	
RGD4C RGS4C	30W	3	Horizontal	0.2	18	113.1
			Vertical	0.2	6	
		6	Horizontal	1	9	56.6
			Vertical	1	2.5	
		12	Horizontal	1	4	28.3
			Vertical	1	1	
RGD4D RGD4R RGS4D	30W	3	Horizontal	0.2	18	113.1
			Vertical	0.2	6	
		6	Horizontal	0.3	9	56.6
			Vertical	0.3	2.5	
		12	Horizontal	0.3	4	28.3
			Vertical	0.3	1	

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

1.2.3 Driving System • Position Detector

Type	Motor Type	Lead [mm]	No. of Encoder Pulses [P/R]	Drive System	
RA3C RA3D RA3R RGD3C RGD3D RGD3R RGS3C RGS3D	20W	2.5	800	Ball Screw ϕ8	Rolled C10
		5	800		
		10	800		
RA4C RA4D RA4R RGD4C RGD4D RGD4R RGS4C RGS4D	20W	3	800	Ball Screw ϕ10	Rolled C10
		6	800		
		12	800		
	30W	3	800		
		6	800		
		12	800		

1.2.4 Positioning Precision

Item	Tolerance
Positioning repeatability	±0.02mm
Backlash	0.1mm or less
Base	Material : Aluminum Anodizing treatment

This is an option already attached when it is shipped out from the factory.
It does not include the consideration of time-dependent change as it is used.

1.2.5 Rod Non-Rotation Accuracy

● Standard

Model Name	Motor Type	Lead [mm]	Rod Diameter	Rod Non-Rotation Accuracy
RA3C	20W	2.5	ϕ8mm	±1.0°
		5		
		10		
RA3D	20W	2.5	ϕ8mm	±1.0°
		5		
		10		
RA4C RA4D	20W	3	ϕ10mm	±1.0°
		6		
		12		
RA4C	30W	3	ϕ10mm	±1.0°
		6		
		12		
RA4D	30W	3	ϕ10mm	±1.0°
		6		
		12		

● Motor Reversing

Model Name	Motor Type	Lead [mm]	Rod Diameter	Rod Non-Rotation Accuracy
RA3R	20W	2.5	ϕ8mm	±1.0°
		5		
		10		
RA4R	20W	3	ϕ10mm	±1.0°
		6		
		12		
RA4R	30W	3	ϕ10mm	±1.0°
		6		
		12		

● With single guide

Model Name	Motor Type	Lead [mm]	Rod Diameter	Rod Non-Rotation Accuracy
RGS3C	20W	2.5	ϕ8mm	±0.05°
		5		
		10		
RGS3D	20W	2.5	ϕ8mm	±0.05°
		5		
		10		
RGS4C RGS4D	20W	3	ϕ10mm	±0.05°
		6		
		12		
RGS4C	30W	3	ϕ10mm	±0.05°
		6		
		12		
RGS4D	30W	3	ϕ10mm	±0.05°
		6		
		12		

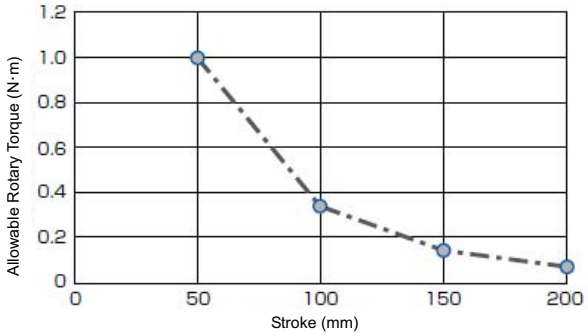
● With double guide

Model Name	Motor Type	Lead [mm]	Rod Diameter	Rod Non-Rotation Accuracy
RGD3C	20W	2.5	ϕ8mm	±0.05°
		5		
		10		
RGD3D RGD3R	20W	2.5	ϕ8mm	±0.05°
		5		
		10		
RGD4C RGD4D RGD4R	20W	3	ϕ10mm	±0.05°
		6		
		12		
RGD4C	30W	3	ϕ10mm	±0.05°
		6		
		12		
RGD4D RGD4R	30W	3	ϕ10mm	±0.05°
		6		
		12		

1.2.6 Allowable Running Torque

The allowable torque for each model is as shown below.
Make sure to use the product within the range specified below when applying running torque to the product.
Also, please note that the single guide type is not capable to receive any running torque.

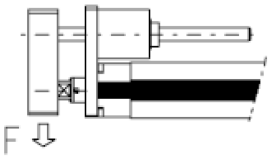
(1) Double guide



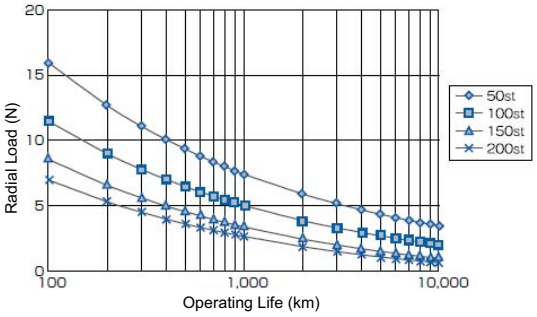
1.2.7 Relation of Allowable Tip Load and Running Life

The bigger the load on the tip of the guide gets, the shorter the life becomes.

(1) Single guide

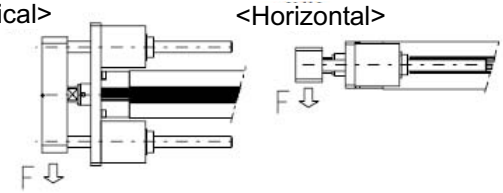


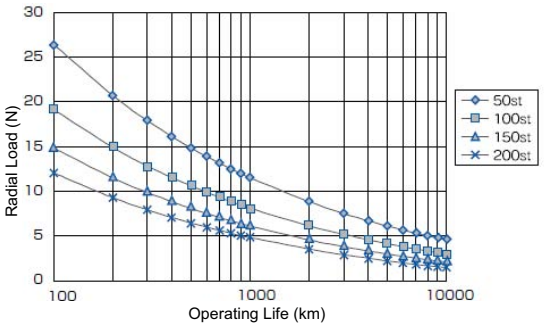
* Single guide type is not capable for any load except for those from the top and bottom.



(2) Double guide

<Vertical> <Horizontal>

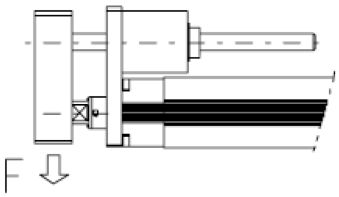




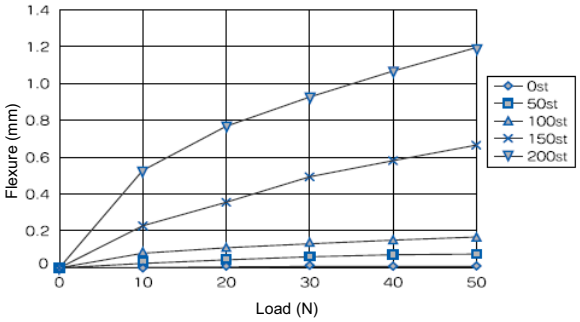
1.2.8 Radial load and Tip Flexure

Shown below is the correlation graph of the load applied to the guide tip and the flexure at that time.

(1) Single guide

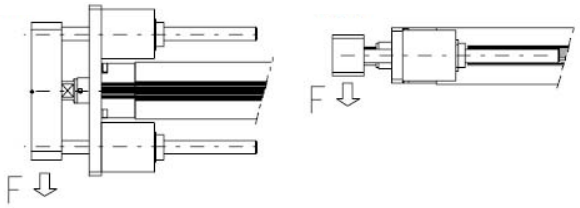


* Single guide type is not capable for any load except for those from the top and bottom.

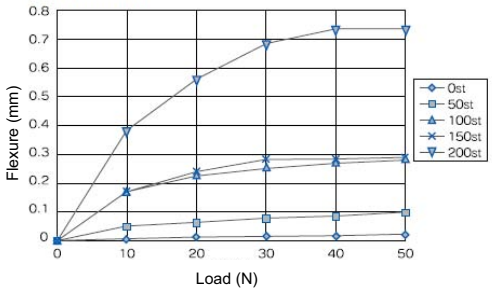


(2) Double guide

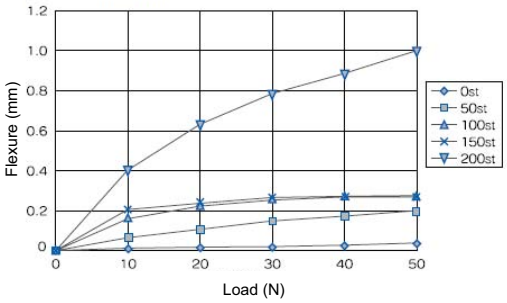
<Vertical> <Horizontal>



Double guide <Vertical> type



Double guide <Horizontal> type



1.2.9 Duty Ratio in Continuous Operation

Perform an operation with the duty ratio below the allowable range.

Duty ratio is the rate of operation expressed in % that presents the time of the actuator being operated in 1 cycle of operation.

⚠ Caution: If the overload error occurs, try either to reduce the duty by extending the stop time or to reduce the acceleration/deceleration speed.

[How to Calculation Duty]

Figure out the load ratio and acceleration/deceleration time ratio, and read the duty ratio from the graph.

If the load ratio if less than 50%, operation with 100% of the duty ratio (continuous operation) is available.

1) Duty ratio LF

The maximum transportable weight at the rated acceleration and the rated acceleration/deceleration speed are described in 1.2 Specifications.

$$\text{Duty ratio:LF} = \frac{M \times \alpha}{Mr \times \alpha} \quad [\%]$$

Max. Transportable Weight at Rated Acceleration	: Mr [kg]
Rated Acceleration/Deceleration Speed	: αr [G]
Transported Weight during Operation	: M [kg]
Acceleration/Deceleration Speed during Operation	: α [G]

2) Acceleration/Deceleration Time Ratio t_{od}

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

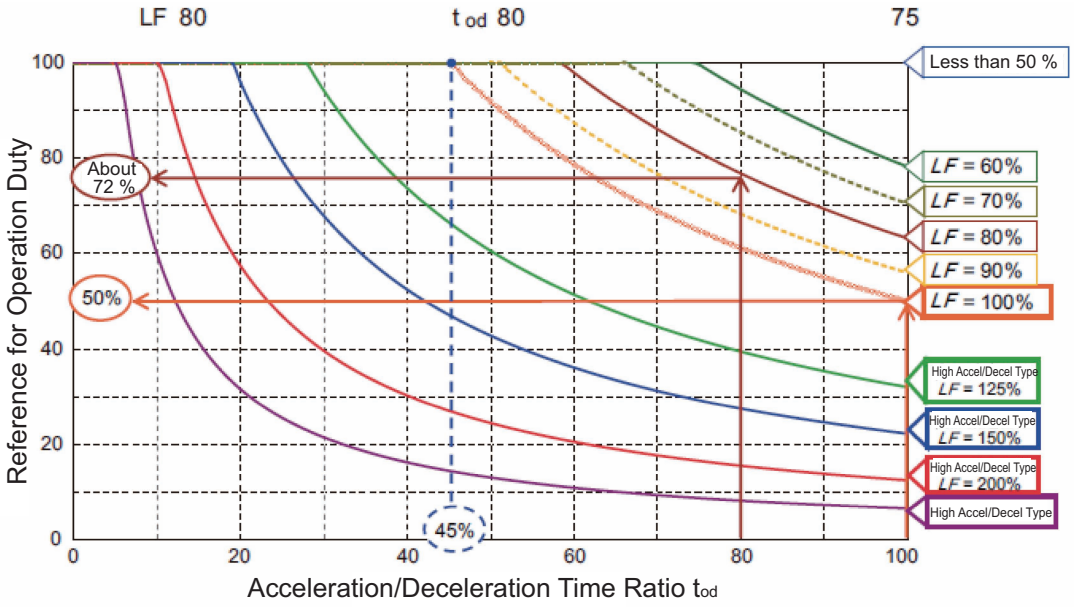
$$\text{Acceleration time} = \frac{\text{Speed during Operation[mm/s]}}{\text{Acceleration during Operation[mm/s}^2\text{]}} \quad [\text{Sec}]$$

$$\text{Deceleration time} = \frac{\text{Speed during Operation [mm/s]}}{\text{Deceleration during Operation [mm/s}^2\text{]}} \quad [\text{Sec}]$$

$$\text{Acceleration [mm/s}^2\text{]} = \text{Acceleration [G]} \times 9{,}800\text{mm/s}^2$$

$$\text{Deceleration [mm/s}^2\text{]} = \text{Deceleration [G]} \times 9{,}800\text{mm/s}^2$$

3) From the load ratio LF and the acceleration/deceleration time ratio t_{od} that were used to figure out the duty ratio, read the duty ratio.
e.g.) When the load ratio LF = 80% and the acceleration/deceleration time ratio t_{od} = 80%, the reference for the duty is approximately 75%.



1.2.10 Protection class

RCAW-RA3C/RA3D/RA3R/RA4C/RA4D/RA4R ＝ IP54

1.3 Options

1.3.1 Brake Type (Model No.: B)

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 model code should be expressed with B.

1.3.2 High Acceleration/Deceleration Type (Model No.: HA)

This is an option to upgrade the rated acceleration (0.3G) of the standard type to 1G.
This enables the operation with the transported weight same as at 0.3G even with 1G of the acceleration.
Since the setting of the controller is different from that for the standard type, it is necessary also to have the controller made applicable for the high acceleration/deceleration type when operating with high acceleration/deceleration.
The model code should be expressed with HA.

1.3.3 Home-Position Check Sensor (Model No.: HS)

This is a sensor to monitor the rod to see if it is certainly moved to the home position when a home-return is executed.
* This cannot be used for the home reversed type.
The model code should be expressed with HS.

1.3.4 Power Saving Type (Model No.: LA)

This is an option to reduce the power domain in the controller.
For standard type / high acceleration/deceleration type, if the power saving type is selected, the power consumption can be dropped down to 3.4A at maximum, which the maximum is 5.1A in normal use. (The maximum value may differ depending on the model. Refer to the power capacity of ACON/ASEL Controller for the detail.)
The model code should be expressed with LA.

1.3.5 Motor Left Reversed, Motor Right Reversed (Model No.: NM)

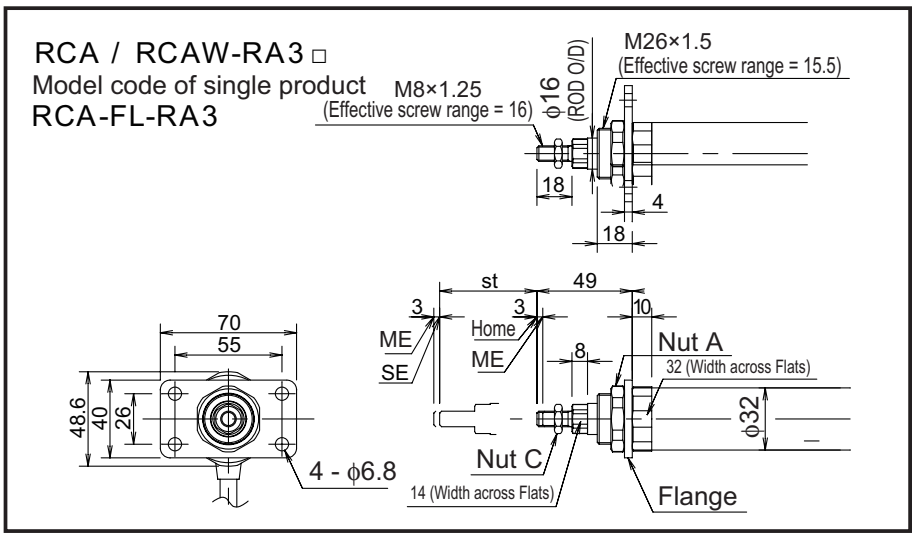
From the view of the motor side, the type with the motor reversed to the left is ML, and the motor reversed to the right is MR.
The model code should be expressed with NM.

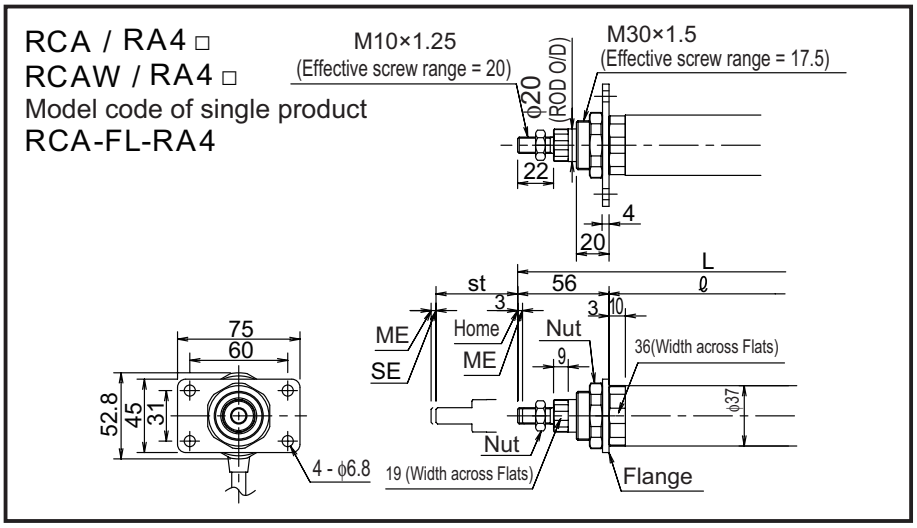
1.3.6 Guide Attachment Directions (Only for Single guide type) (Model No. : Attached on the right (GS2), attached on the bottom (GS3) and attached on the left (GS4).)

The rod attachment position for the Single Guide type, can be selected from “Attachment on the Right”, “Attachment on the Bottom” and “Attachment on the Left”.

1.3.7 Front Flange (Model No. : FL)

This metal part is used for fixing the actuator from the actuator body side using the bolts.

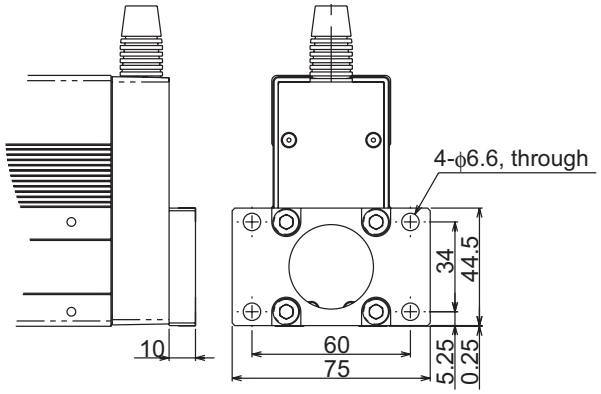




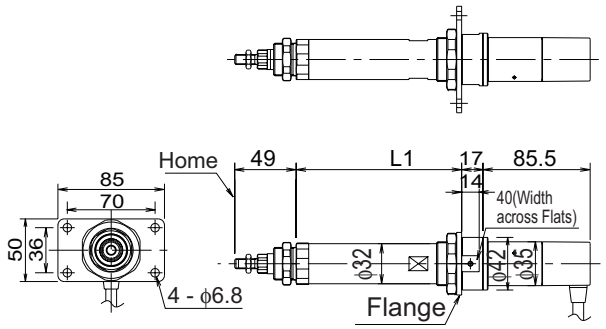
1.3.8 Rear Flange (Model No. : FLR)

This metal fitting is used for fixing the actuator from the actuator rear side.

RCA-SRA4 R
Model code of single product RCA-FL-SRA4

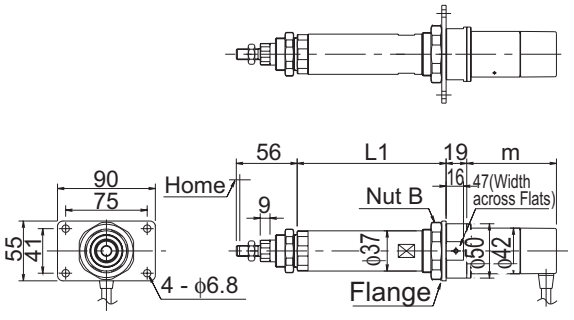


RCA / RCAW-RA3C, RA3D
Model code of single product RCA-FLR-RA3



st	L1
50	132
100	182
150	232
200	282

RCA / RCAW-RA4C, RA4D
Model code of single product RCA-FLR-RA4



st	L1
50	137
100	187
150	237
200	287
250	337
300	487

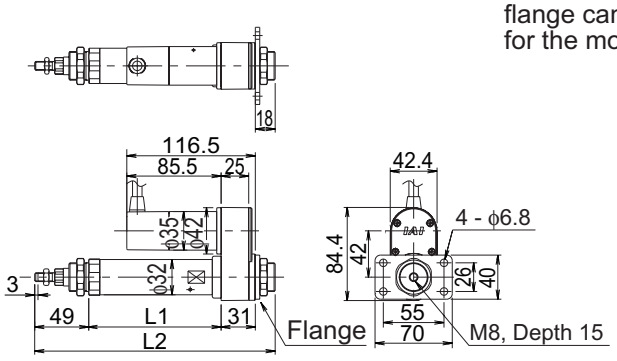
m Dimensions

		m	
		20w	30w
RCA	Incremental	67.5	82.5
	Absolute	80.5	95.5
RCS2	Incremental• Absolute	80.5	95.5

RCA / RCAW-RA3R

Model code of single product RCA-FL-RA3

*The front flange and the rear flange can be used in common for the motor reversing type.

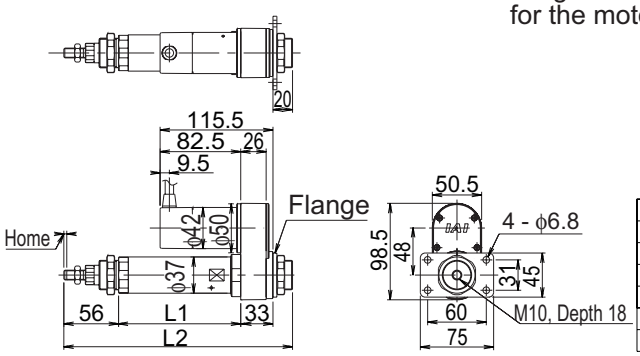


st	L1	L2
50	120	218
100	170	268
150	220	318
200	270	368

RCA / RCAW-RA4R

Model code of single product RCA-FL-RA4

*The front flange and the rear flange can be used in common for the motor reversing type.



st	L1	L2
50	125	234
100	175	284
150	225	334
200	275	384
250	325	434
300	375	484

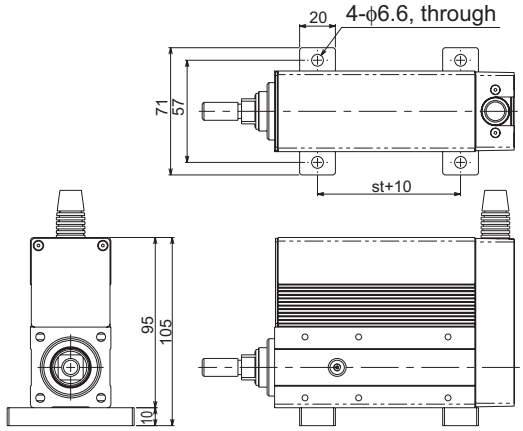
1.3.9 Foot (Model No. : FT)

This metal part is used for fixing the actuator from the top side using the bolts.

* Refer to the attachment pitch size in the drawing for each actuator, for the attachment pitch between the foot metal parts.

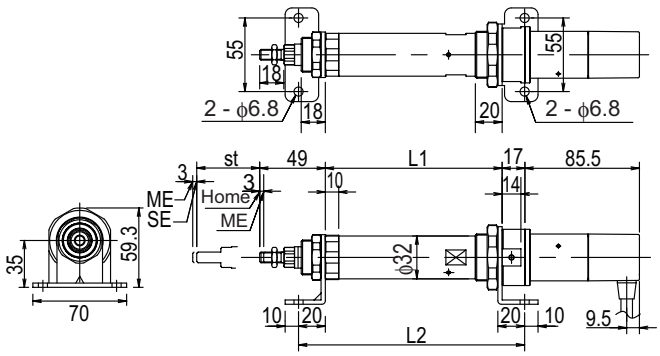
RCA-SRA4R

Model code of single product RCA-FT-SRA4



RCA-RA3C / RGS3C / RGD3C

Model code of single product RCA-FT-RA3



<RA3C>

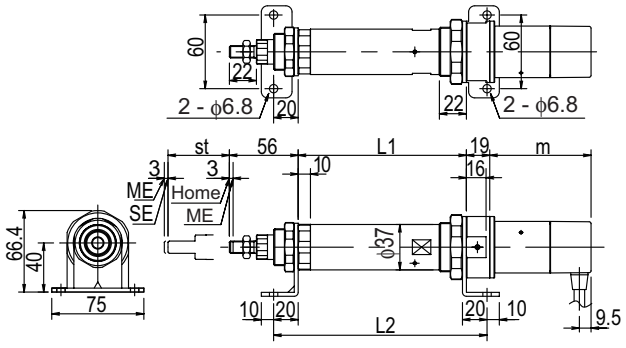
st	L1	L2
50	132	168.8
100	182	218.8
150	232	268.8
200	282	318.8

<RGS3C/RGD3C>

st	L1	L2
50	140	176.8
100	190	226.8
150	240	276.8
200	290	326.8

RCA-RA4C / RGS4C / RGD4C

Model code of single product RCA-FT-RA4



<RA4C>

st	L1	L2
50	137	173.8
100	187	223.8
150	237	273.8
200	287	323.8
250	337	373.8
300	487	423.8

<RGS4C/RGD4C>

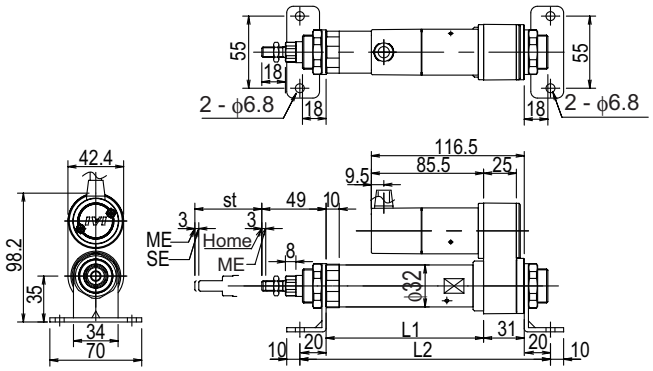
st	L1	L2
50	145	181.8
100	195	231.8
150	245	281.8
200	295	331.8
250	345	381.8
300	495	431.8

m Dimensions

		m	
		20w	30w
RCA	Incremental	67.5	82.5
	Absolute	80.5	95.5
RCS2	Incremental• Absolute	80.5	95.5

RCA / RA3R / RGS3R / RGD3R

Model code of single product RCA-FT-RA3R



<RA3R>

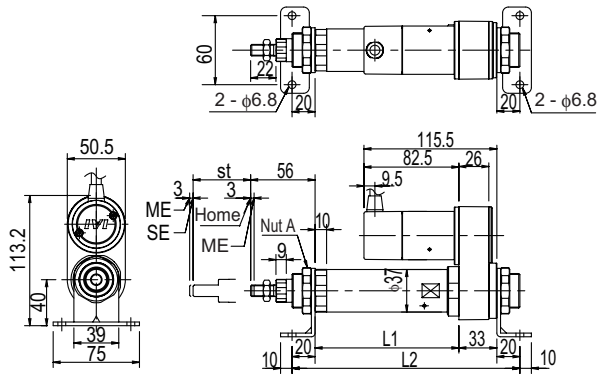
st	L1	L2
50	120	191
100	170	241
150	220	291
200	270	341

<RGS3R/RGD3R>

st	L1	L2
50	128	199
100	178	249
150	228	299
200	278	349

RCA-RA4R / RGS4R / RGD4R

Model code of single product RCA-FT-RA4R



<RA4R>

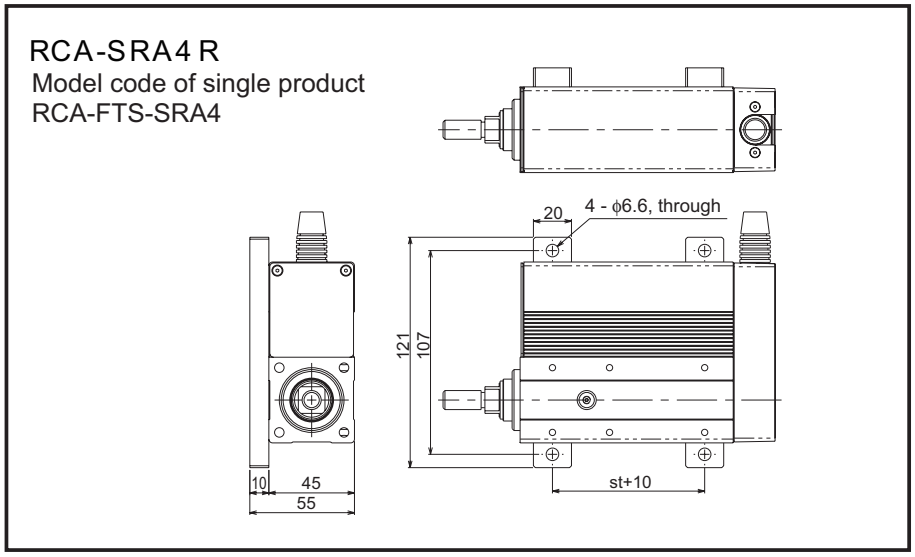
st	L1	L2
50	125	198
100	175	248
150	225	298
200	275	348
250	325	398
300	375	448

<RGS4R/RGD4R>

st	L1	L2
50	133	206
100	183	256
150	233	306
200	283	356
250	333	406
300	383	456

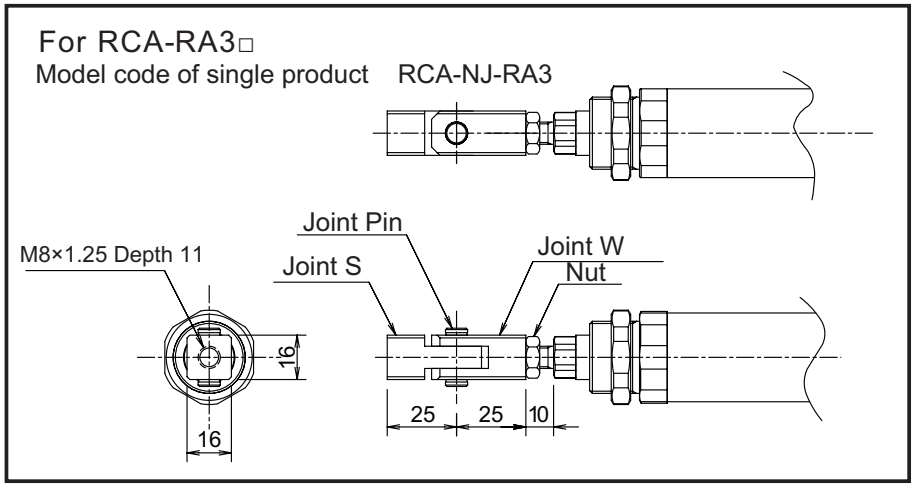
1.3.10 Foot (Attached on the Right Side/Left Side)
(Model No.: FT2 (Attached on the Right Side), FT4 (Attached on the Left Side)

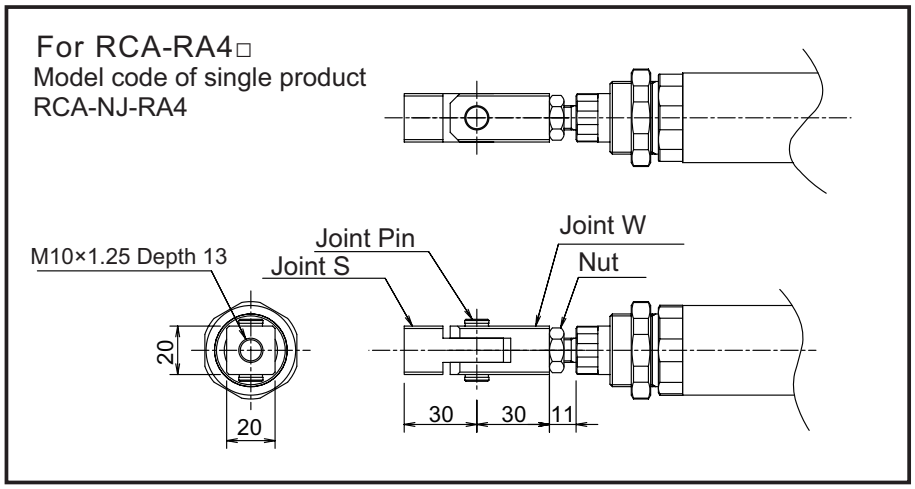
This metal part is used for fixing the actuator from the top side using the bolts. For RCA-SRA4R, the actuator can be attached also to the side.



1.3.11 Knuckle Joint (Model No. : NJ)

This metal part is used to give some degree of freedom (rotation) in the movement at the rod end of the actuator when Clevis or trunnion part is used.

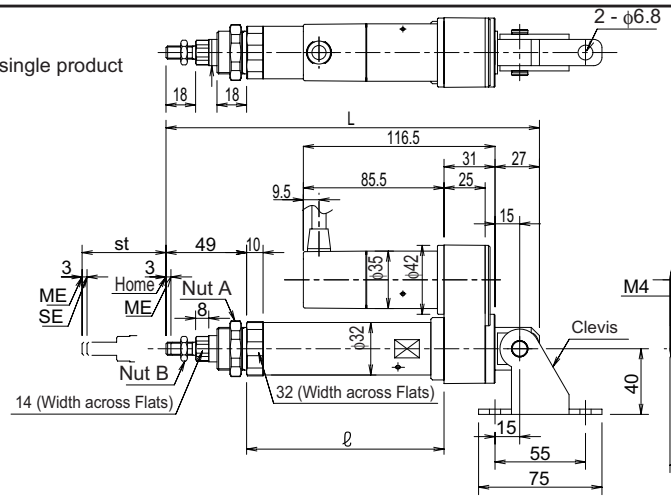




1.3.12 Clevis (Model No. : QR)

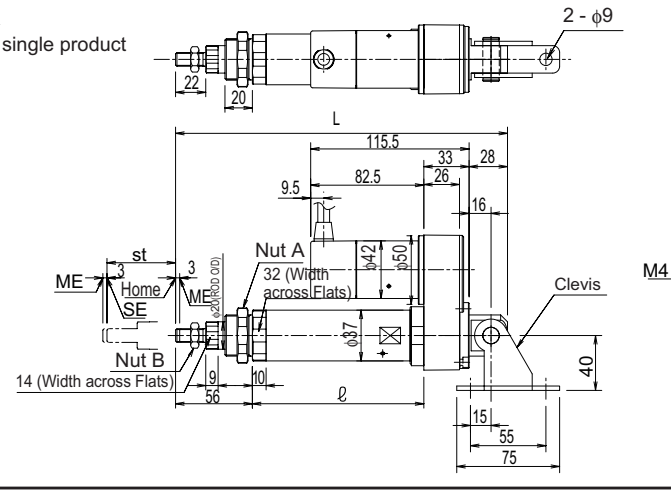
This bracket is used to make the cylinder follow up when the movement of an object attached on the tip of the rod is different from the direction of rod movement. Attach on the rod.

RCA-RA3R
Model code of single product
RCA-QR-RA3



st	ℓ	L
50	120	227
100	170	277
150	220	327
200	270	377

RCA-RA4R
Model code of single product
RCA-QR-RA4



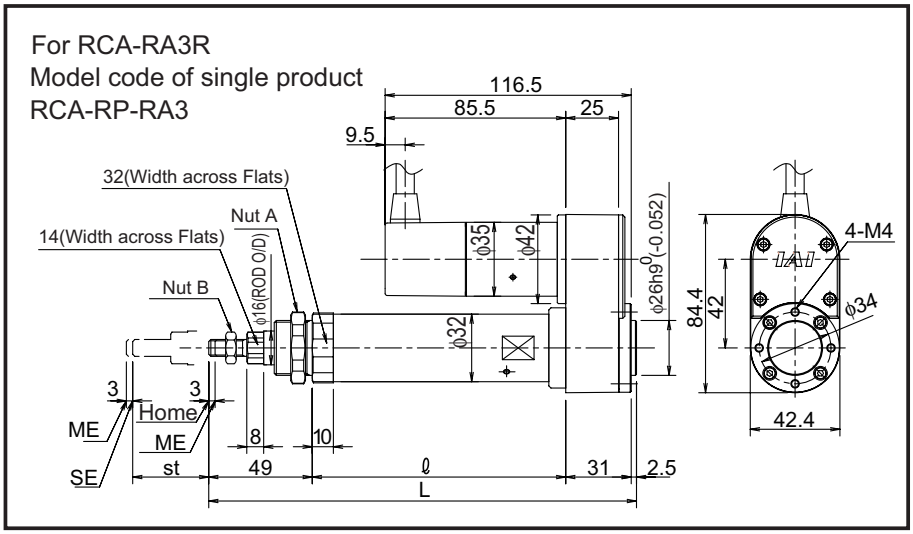
st	ℓ	L
50	125	242
100	175	292
150	225	342
200	275	392
250	325	442
300	375	492

⚠ Caution: Attach the external guide so that any load is not given to the rod other than in the forward direction, when the Clevis bracket is attached and rod is moved.

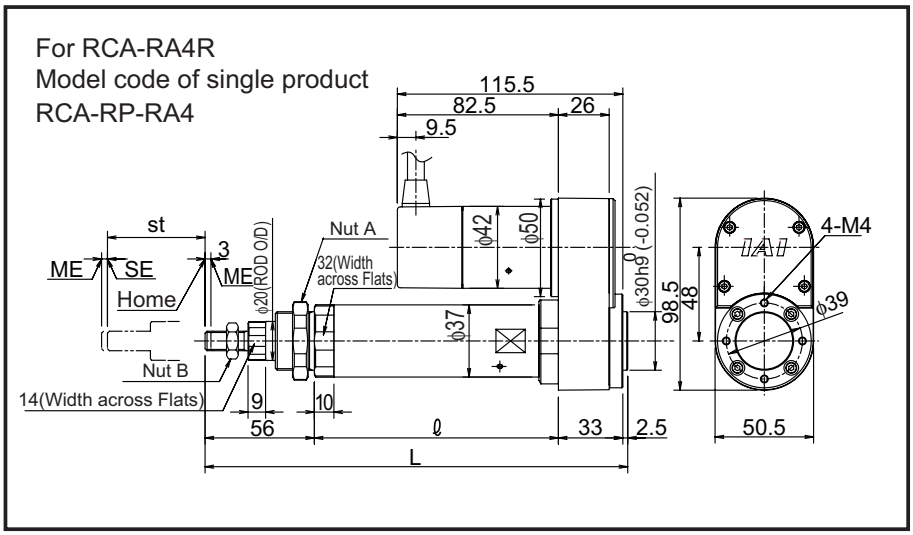
1.3.13 Rear Attachment Plate (Model No. : RP)

This plate is used to fix the rear side of the motor reversing rod type (RA3R/RA4R) onto the system.

For RCA-RA3R
Model code of single product
RCA-RP-RA3

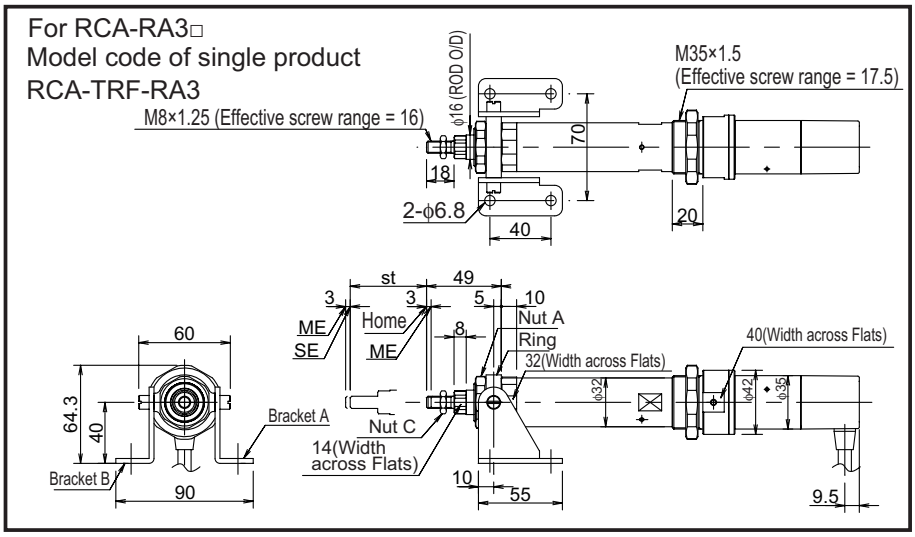


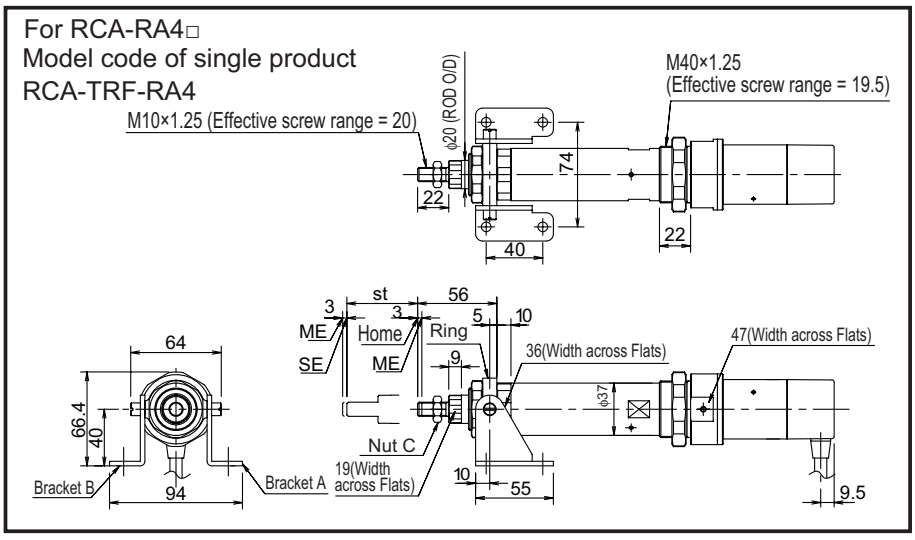
For RCA-RA4R
Model code of single product
RCA-RP-RA4



1.3.14 Front Trunnion (Model No. : TRF)

This bracket is used to make the cylinder follow up when the movement of an object attached on the tip of the rod is different from the direction of rod movement. Attach on the rod.

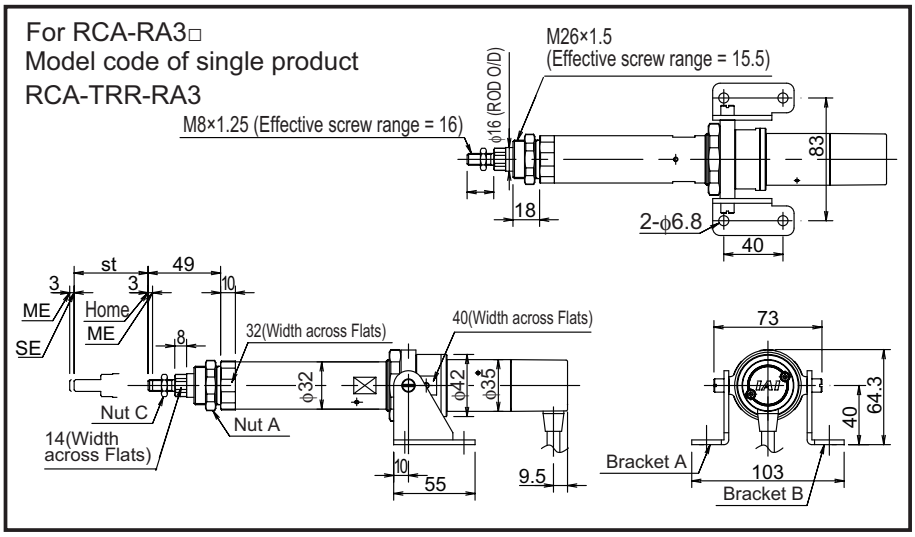


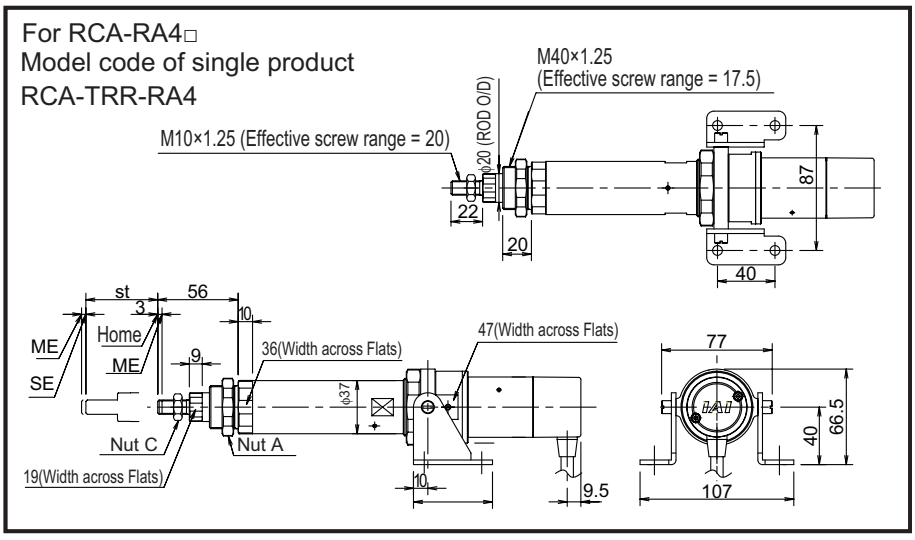


⚠ Caution: Use the guide equipped type or attach the external guide so that any load is given to the rod other than in the forward direction, when the trunnion is attached and the rod is moved.

1.3.15 Rear Trunnion (Model No. : TRR)

This bracket is used to make the cylinder follow up when the movement of an object attached on the tip of the rod is different from the direction of rod movement. Attach on the rod.



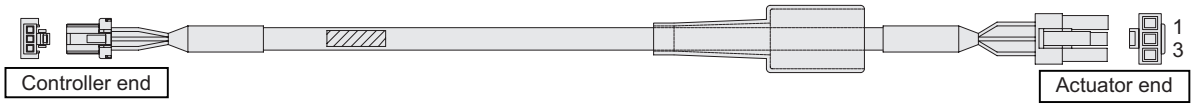


⚠ Caution: Use the guide equipped type or attach the external guide so that any load is given to the rod other than in the forward direction, when the trunnion is attached and the rod is moved.

1.4 Motor • Encoder Cables

1.4.1 Motor cable

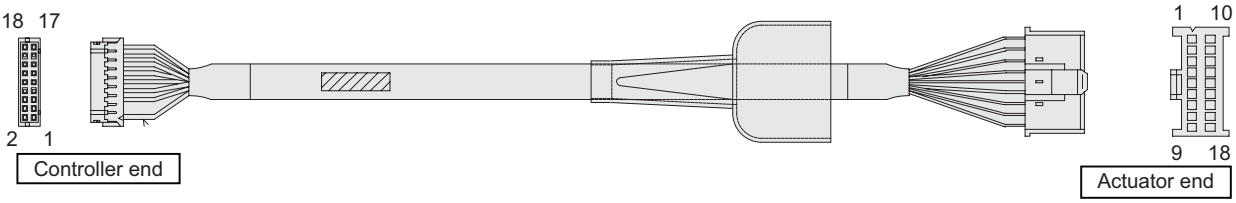
CB-ACS-MA □□□



Width	Cable Color	Signal Name	Pin No.		Pin No.	Signal Name	Cable Color	Width
AWG22 (crimped)	Red	U	1		1	U	Red	AWG22 (crimped)
	White	V	2		2	V	White	
	Black	W	3		3	W	Black	

1.4.2 Encoder cable/robot encoder cable

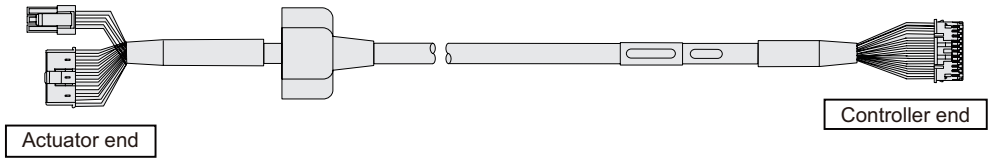
CB-ACS-PA □□□/CB-ACS-PA □□□-RB



Width	Cable Color	Signal Name	Pin No.		Pin No.	Signal Name		Cable Color	Width
						For ABZ	For Serial		
AWG26 (crimped)	White/purple	LS +	18		1	A +	-	White/blue	AWG26 (crimped)
	White/gray	LS -	17		2	A -	-	White/yellow	
	Yellow	BK +	16		3	B +	-	White/red	
	Blue	BK -	15		4	B -	-	White/black	
	White/blue	A +	14		5	-	-	-	
	White/yellow	A -	13		6	-	-	-	
	White/red	B +	12		7	LS +	LS +	White/purple	
	White/black	B -	11		8	-	-	-	
	Orange	SD/Z +	10		9	FG	FG	Drain	
	Green	SD/Z -	9		10	Z +	SD +	Orange	
	Purple	BAT +	8		11	Z -	SD -	Green	
	Gray	BAT -	7		12	-	BAT +	Purple	
	Red	VCC	6		13	/PS	BAT -	Gray	
	Black	GND	5		14	VCC	VCC	Red	
	-	-	4		15	GND	GND	Black	
	-	-	3		16	LS -	LS -	White/gray	
	-	-	2		17	BK -	BK -	Blue	
	Drain	FG	1		18	BK +	BK +	Yellow	

1.4.3 Motor/Encoder Integrated Robot Cable for ACON-CA/AMEC/ASEP

CB-ASEP2-MPA □□□



Width	Cable Color		Signal Name	Pin No.
AWG22 (crimped)	Red		U	1
	Yellow		V	2
			NC	
			NC	
	Black		W	3
AWG25 (crimped)			NC	
	Orange		BK+	18
	Gray		BK-	17
	Black		LS+	7
	Brown		LS-	16
	White		A+	1
	Yellow		A-	2
	Red		B+	3
	Green		B-	4
	Black	Identification Tape	Z+/SD+	10
	Brown		Z-/SD-	11
	White		VCC	14
	Yellow		VPS/BAT-	13
	Red		GND	15
	Green		Spare	6
			NC	5
			NC	8
AWG22	White		BAT+	12
			FG	9

Pin No.	Signal Name	Cable Color		Width
1	U	Red		AWG22 (crimped)
2	V	Yellow		
3	NC			
4	NC			
5	W	Black		
6	NC			AWG25 (crimped)
7	BK+	Orange		
8	BK-	Gray		
9	LS+	Black		
10	LS-	Brown		
11	A+	White		
12	A-	Yellow		
13	B+	Red		
14	B-	Green		
15	Z+/SD+	Black	Identification Tape	
16	Z-/SD-	Brown		
17	VCC	White		
18	VPS/BAT-	Yellow		
19	GND	Red		
20	Spare	Green		
21	BAT+	White		AWG22
22	NC			
23	NC			
24	FG			

2. Installation

2.1 Transportation

[1] Handling of Robot

Unless otherwise specified, the actuators are packaged individually.

(1) Handling the Packed Unit

- 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.

(2) Handling the Actuator After Unpacking

- Do not attempt to carry the actuator with holding a cable or move it by pulling a cable.
- Hold either the base part or the bracket part when transporting the actuator main body.
- Do not hit or drop the actuator during transportation.
- Do not carry an actuator by motor unit and a cable or attempt to move it by pulling the cable.

[2] Handling in Assembled Condition

This is the case when the product is delivered from our factory under a condition that it is assembled with other actuators. The combined axes are delivered in a package that the frame is nailed on the lumber base. The rods are fixed so they would not accidently move. The actuators are also fixed so the tip of it would not shake due to the external vibration.

(1) How to Handle in Package

- Do not hit or drop the package. No special treatment is conducted on this package to endure a drop or impact on it.
- Do not attempt to carry a heavy package with only one worker. Also, have an appropriate method for transportation.
- When hanging up with ropes, support on the reinforcement frame on the bottom of the lumber base. When bringing up the package with a forklift, also support on the bottom of the lumber base.
- Handle with care when putting the package down to avoid impact or bounce.
- Do not step on the package.
- Do not put anything on the package that could deform or damage it.

(2) How to Handle after Unpackaged

- Fix the rod so they would not accidently move during transportation.
- If the tip of an actuator is overhanging, have an appropriate way to fix it to avoid shake due to the external vibration. In the transportation without the tip being fixed, do not apply any impact with 0.3G or more.
- When hanging up with ropes, have appropriate cushioning to avoid any deformation of the actuator body. Also keep it in stable horizontal orientation. Make a fixture utilizing the attachment holes and the tapped holes on the actuator body if necessary.
- Do not attempt to apply load on the actuators or the connector box. Also pay attention not to pinch cables and bend or deform them forcefully.

[3] Handling in Condition of being assembled in Machinery Equipment (System)

This is some caution notes for when transporting the actuator being assembled in the machinery equipment (system).

- Fix the cables so they would not move during transportation.
- If the tip of an actuator is overhanging, have an appropriate way to fix it to avoid shake due to the external vibration. In the transportation without the tip being fixed, do not apply any impact with 0.3G or more.
- When hanging up the machinery equipment (system) with ropes, do not attempt to apply load on the actuators or the connector box. Also pay attention not to pinch cables and bend or deform them forcefully.

2.2 Installation and Storage • Preservation Environment

[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
- The product will possess water-proof performance of the protection structure of IP65 if air purge is conducted.
- 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

[2] Storage • Preservation Environment

- The storage and preservation environment should comply with the same standards as those for the installation environment. In particular, when the machine is to be stored for a long time, pay close attention to environmental conditions so that no dew condensation forms.
- Unless specially specified, moisture absorbency protection is not included in the package when the machine is delivered. In the case that the machine is to be stored and preserved in an environment where dew condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.
- For storage and preservation temperature, the machine withstands temperatures up to 60°C for a short time, but in the case of the storage and preservation period of 1 month or more, control the temperature to 50°C or less.
- Storage and preservation should be performed in the horizontal condition. In the case it is stored in the packaged condition, follow the posture instruction if any displayed on the package.

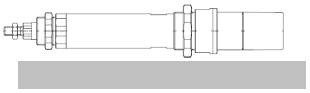
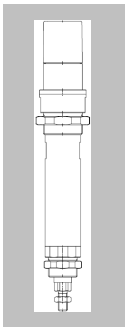
2.3 How to Installation

This chapter explains how to install the actuator on your mechanical system.

2.3.1 General Rules on Installation

Follow the information below when installing the actuator, as a rule.
Do pay attention to these items (except with custom-order models).

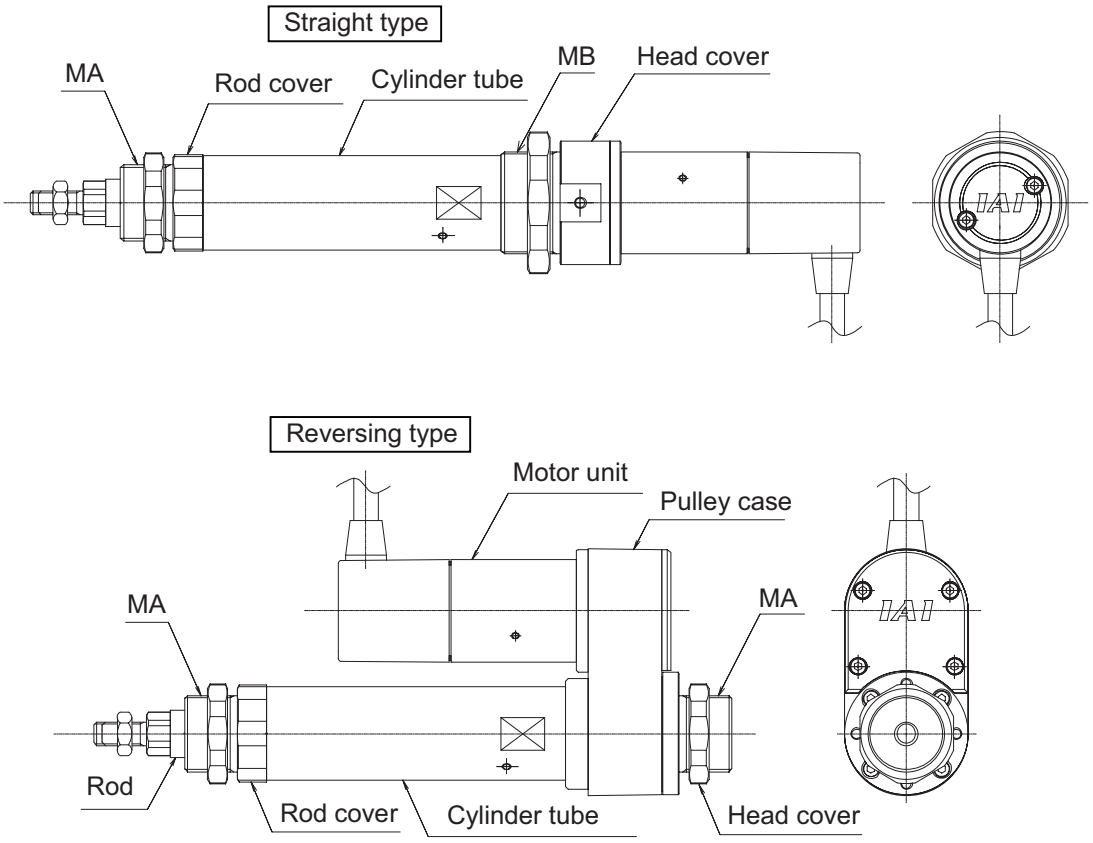
○: Available × : Not available

Horizontally Oriented Mount	Vertical Mount
	
○	○

⚠ Caution: When the unit is installed vertically oriented, attempt to put the motor up unless there is a special reason. Putting the motor on the lower side would not cause a problem in an ordinary operation. However, it may rarely cause a problem, when it is not operated for a long period, depending on the surrounding environment (especially high temperature), caused by the grease being separated and the base oil flowing into the motor unit.

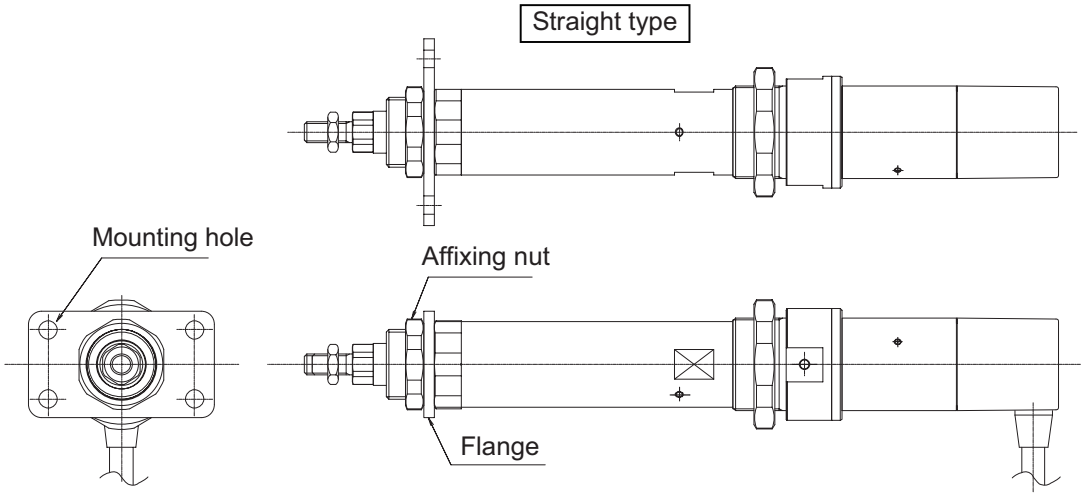
2.3.2 Installation

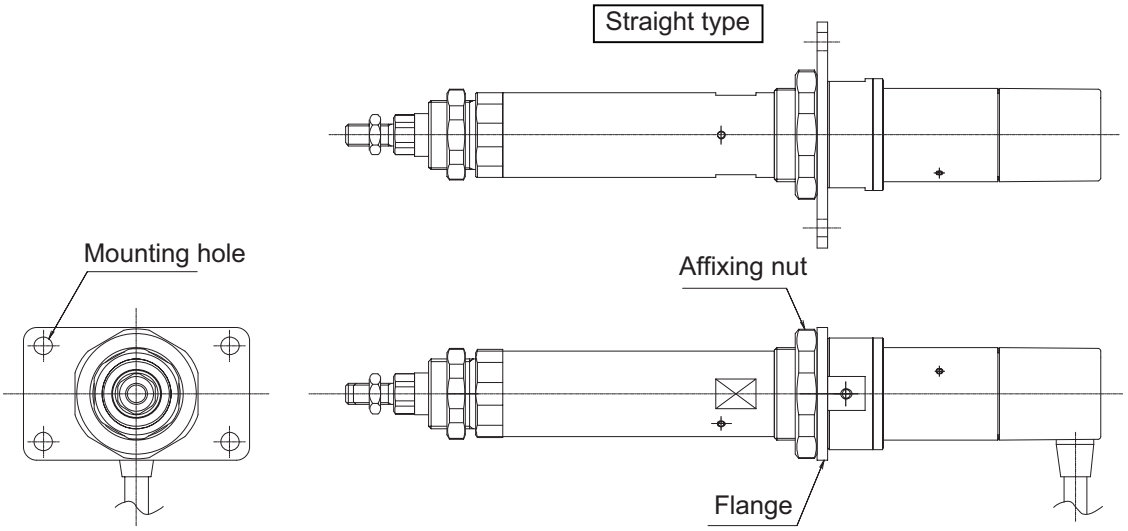
(1) Using screws on the rod or head side
Install the actuator using screws set on the rod or head side of the actuator.
● Applicable models: All models



Type	MA	MB
RA3 type	M26×1.5	M35×1.5
RA4 type	M30×1.5	M40×1.5

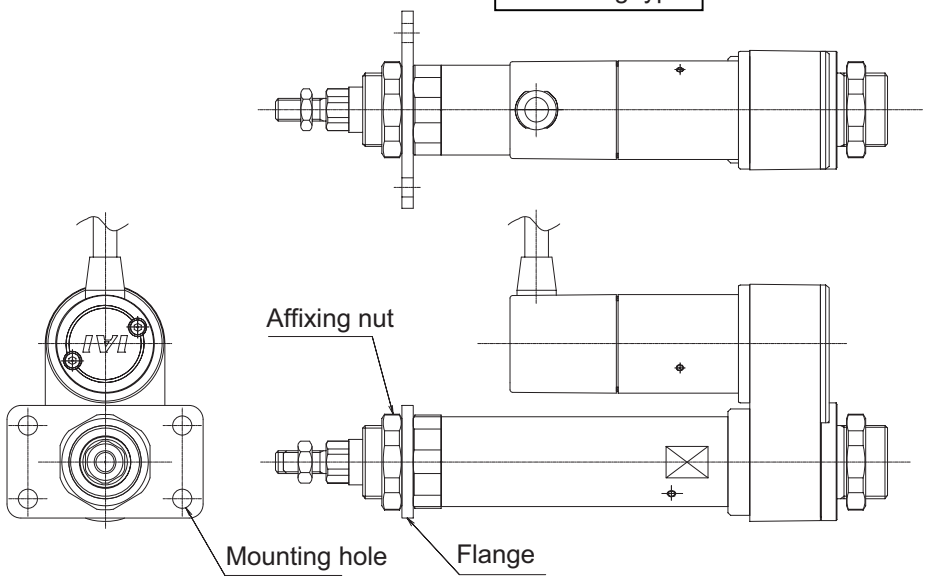
(2) Using screws on a flange (optional)
An optional flange is available for installing the actuator. Use this flange, if necessary.
● Applicable models: All models



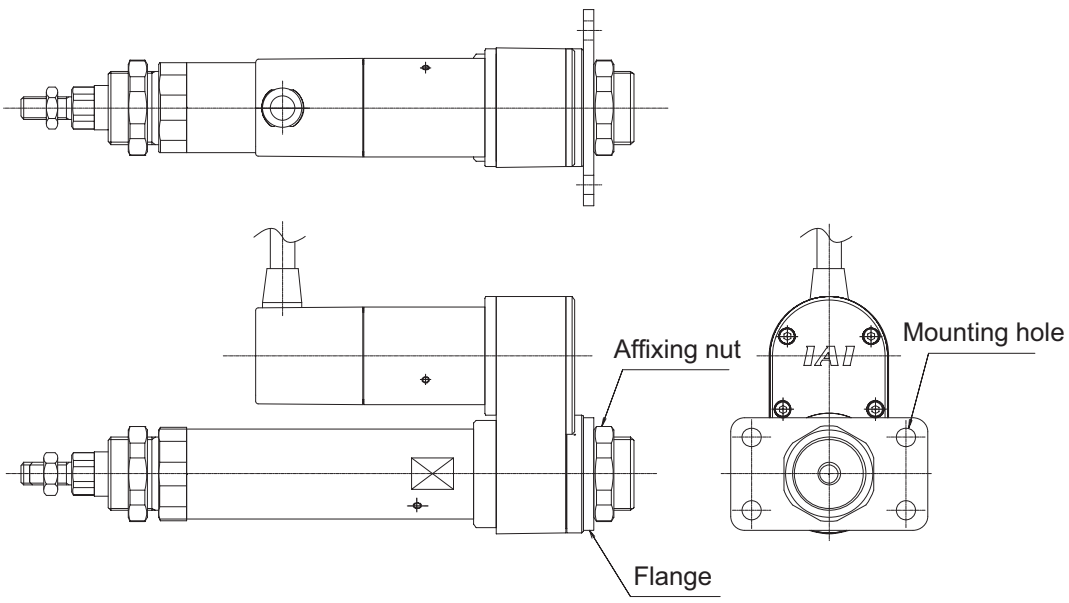


	Mating material is steel	Mating material is aluminum
Screw size	M6	M6
Tightening torque	12.3 N•m	5.4 N•m

Reversing type

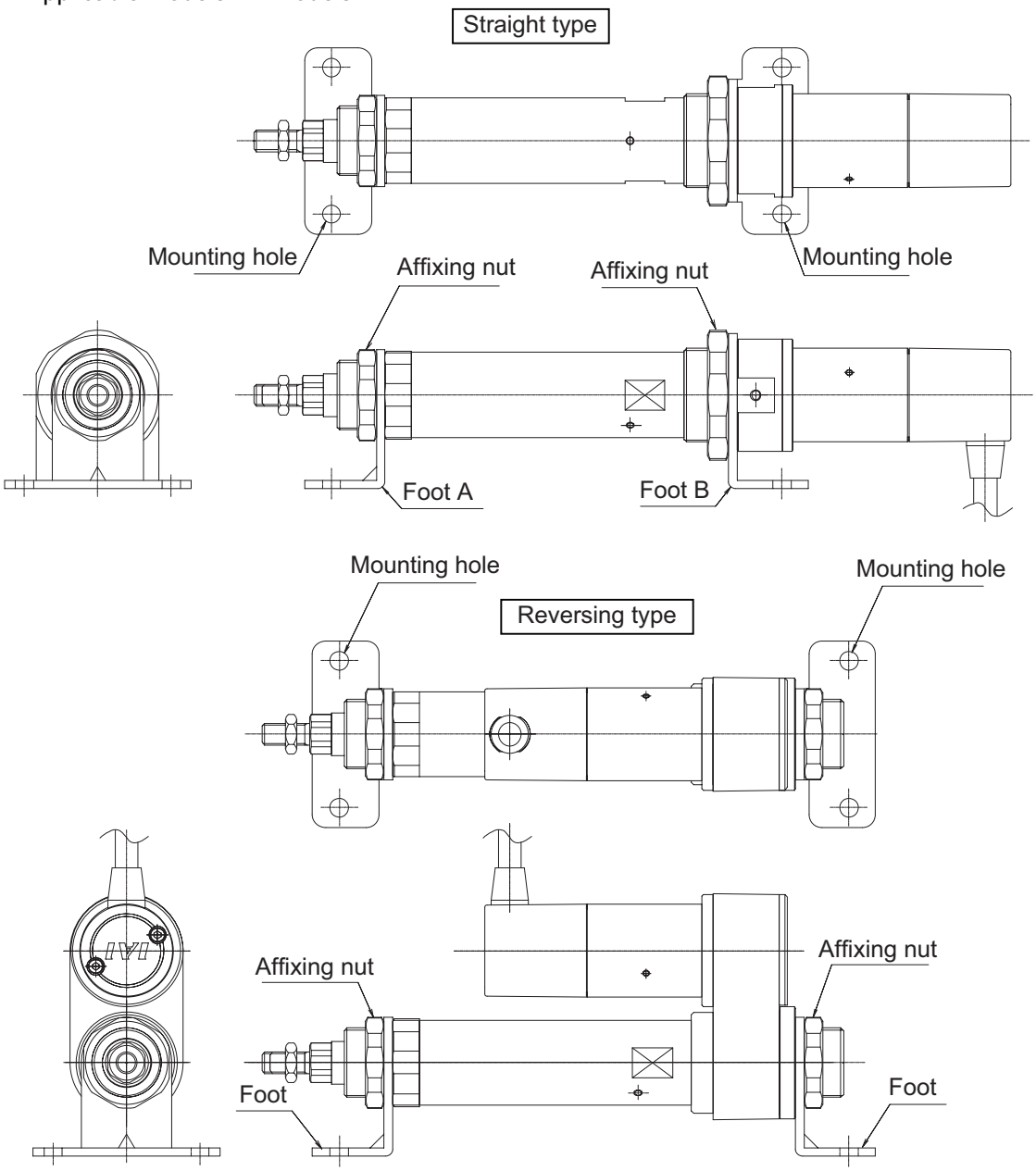


Reversing type



	Mating material is steel	Mating material is aluminum
Screw size	M6	M6
Tightening torque	12.3 N•m	5.4 N•m

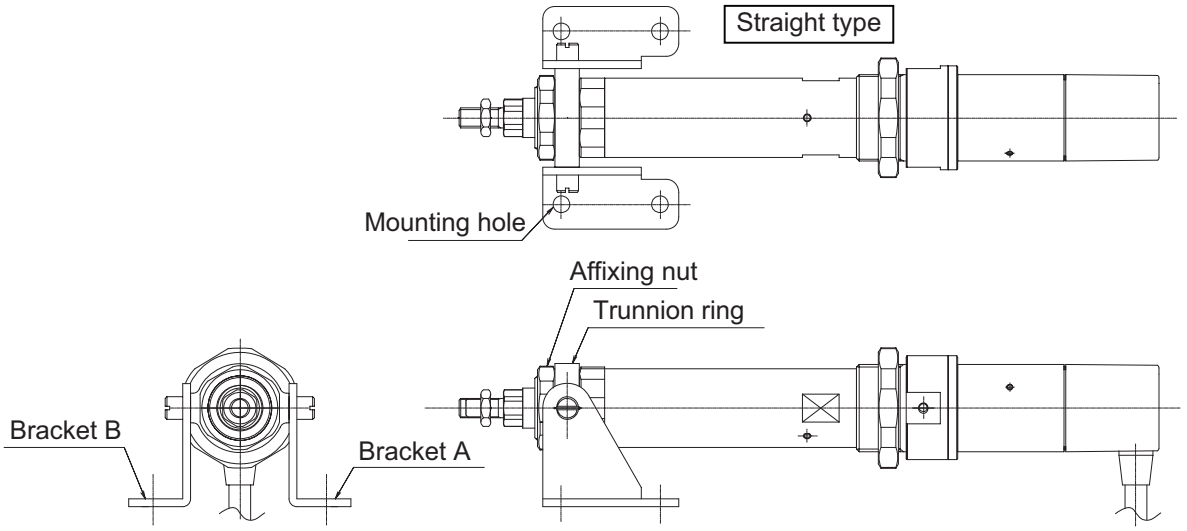
(3) Using screws on feet (optional)
Optional feet are available for installing the actuator. Use these feet, if necessary.
● Applicable models: All models

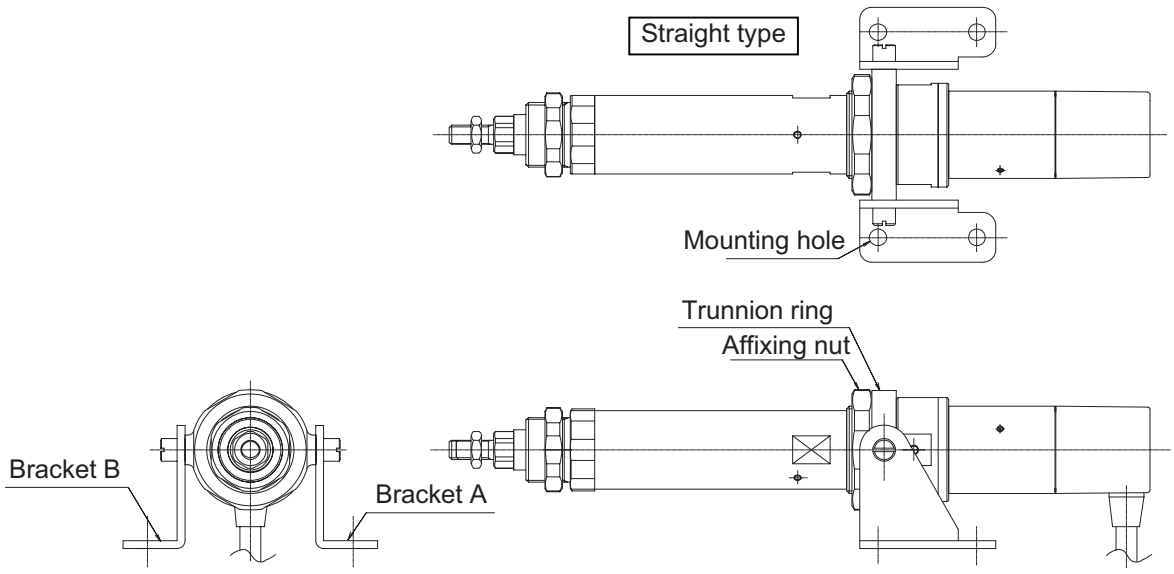


	Mating material is steel	Mating material is aluminum
Screw size	M6	M6
Tightening torque	12.3 N•m	5.4 N•m

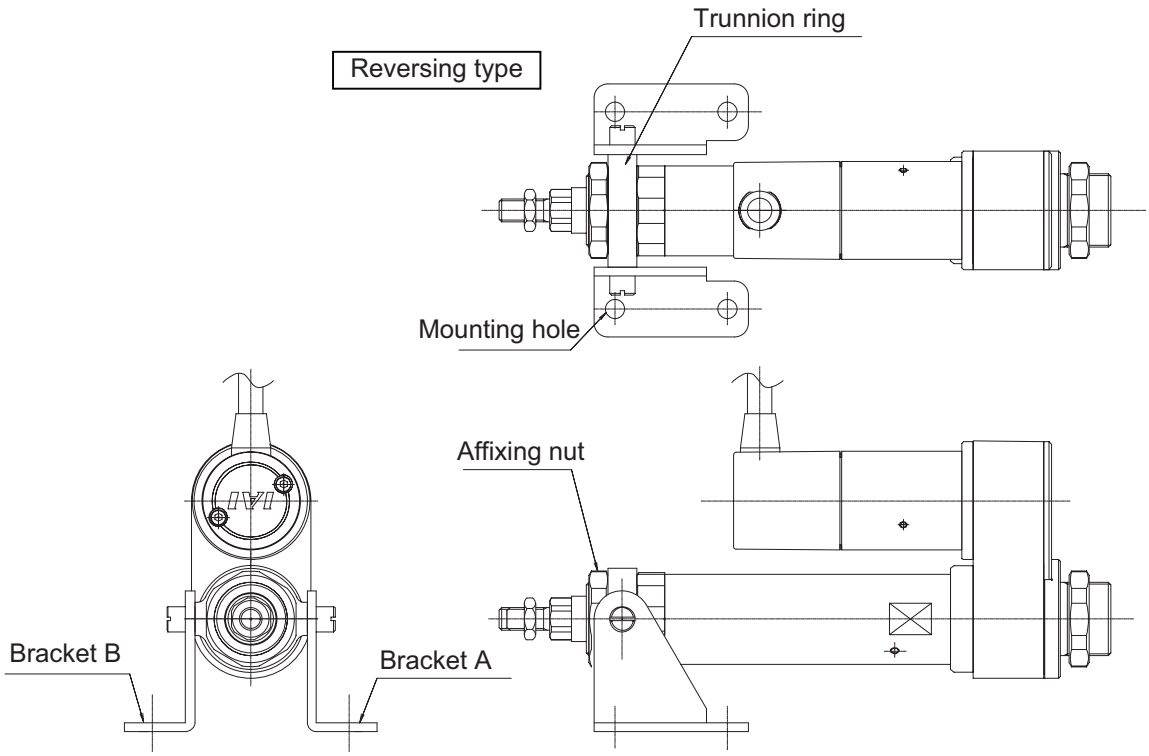
⚠ Caution: Affix the actuator using two feet (optional), one in the front and the other in the back. If affixed using only one foot in the front or back, the actuator may be negatively affected due to insufficient rigidity.

(4) Using screws on a trunnion (optional)
An optional trunnion is available for installing the actuator. Use this trunnion, if necessary.
● Applicable models: RA3C, RA3D, RA4C, RA4D





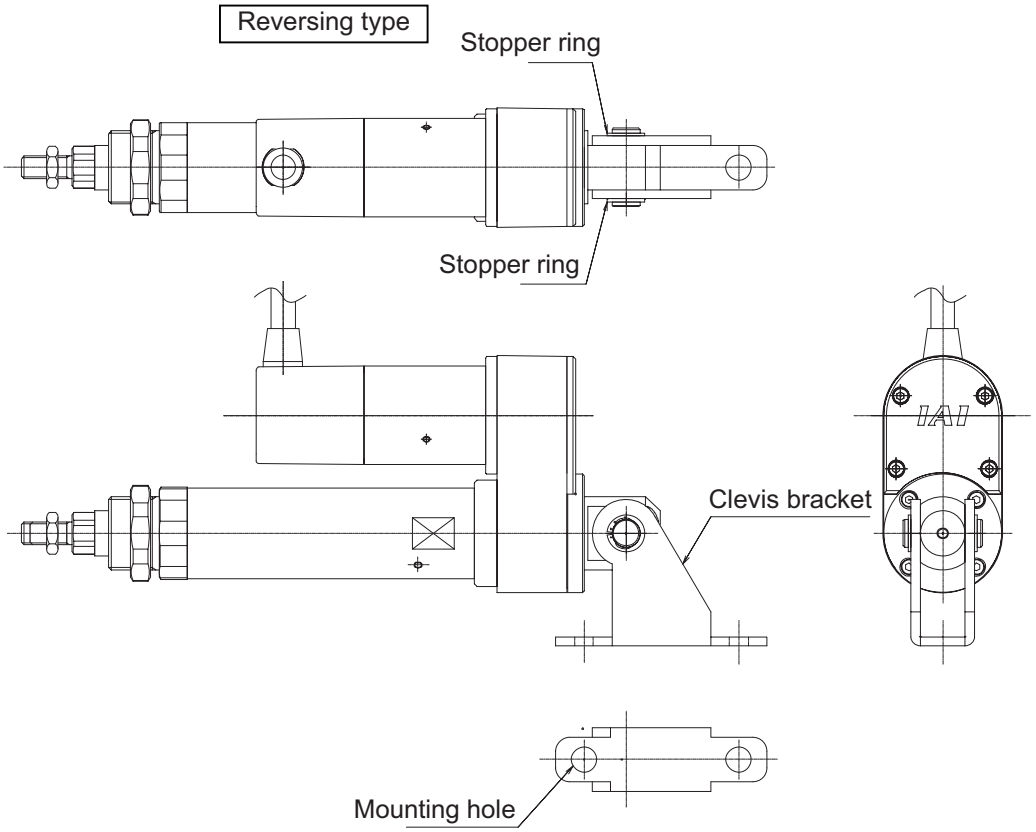
	Mating material is steel	Mating material is aluminum
Screw size	M6	M6
Tightening torque	12.3 N•m	5.4 N•m



	Mating material is steel	Mating material is aluminum
Screw size	M6	M6
Tightening torque	12.3 N•m	5.4 N•m

⚠ Caution:
- When the optional Clevis, Trunnion or commercially available free joint is attached and the actuator is installed horizontally, take the greatest care because the weight of the actuator is given to the rod. Otherwise, the bush might be worn out earlier or inside mechanism might be damaged.
  Add the guide mechanism, etc., so that the weight of the actuator is not given to the rod.
- For the load given to the optional Clevis or Trunnion fulcrum shaft, only the radial load is allowed. In the case of the conditions that the backlash is not allowed or thrust load is given, the user should design the bearing structure.
- The optional Clevis or Trunnion has the structure that the bearing selects the fulcrum shaft. Apply grease onto the fulcrum shaft.

(5) Using screws on a clevis (optional)
An optional clevis is available for installing the actuator. Use this clevis, if necessary.
● Applicable models: Motor reversing type RCA-RA3R, RCA-RA4R



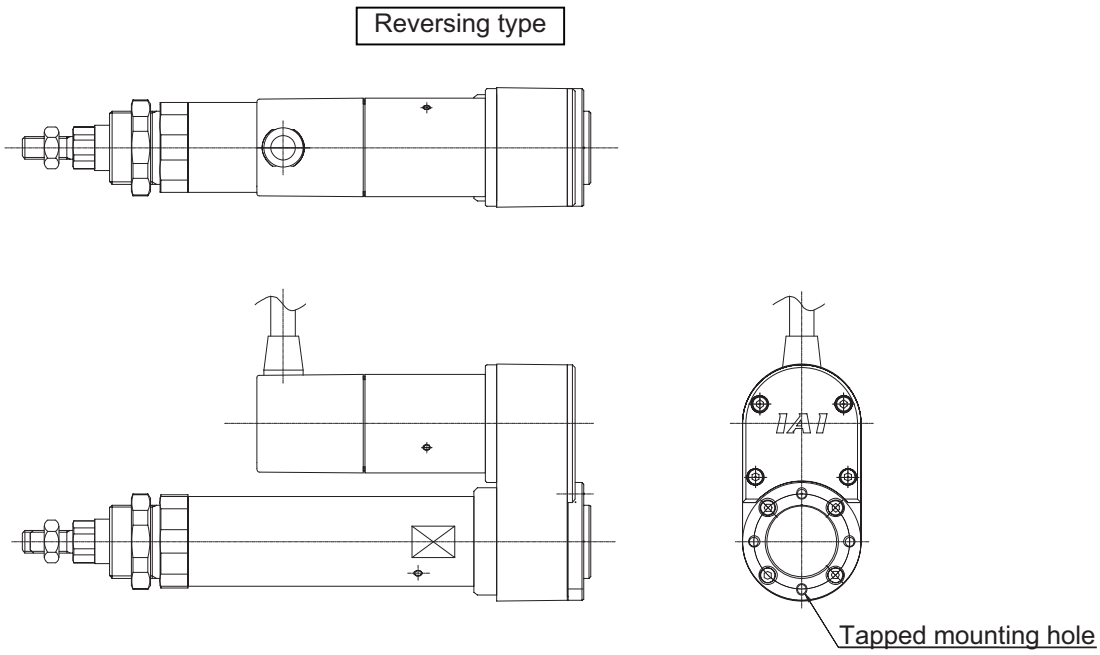
	Mating material is steel	Mating material is aluminum
Screw size	M8	M8
Tightening torque	30 N•m	12 N•m

⚠ Caution:
- When the optional Clevis, Trunnion or commercially available free joint is attached and the actuator is installed horizontally, take the greatest care because the weight of the actuator is given to the rod. Otherwise, the bush might be worn out earlier or inside mechanism might be damaged.
  Add the guide mechanism, etc., so that the weight of the actuator is not given to the rod.
- For the load given to the optional Clevis or Trunnion fulcrum shaft, only the radial load is allowed. In the case of the conditions that the backlash is not allowed or thrust load is given, the user should design the bearing structure.
- The optional Clevis or Trunnion has the structure that the bearing selects the fulcrum shaft. Apply grease onto the fulcrum shaft.

(6) Using screws on a rear mounting bracket (optional)

An optional rear mounting bracket is available for installing the actuator. Use this rear mounting bracket, if necessary.

● Applicable models: Motor reversing type RCA-RA3R, RCA-RA4R

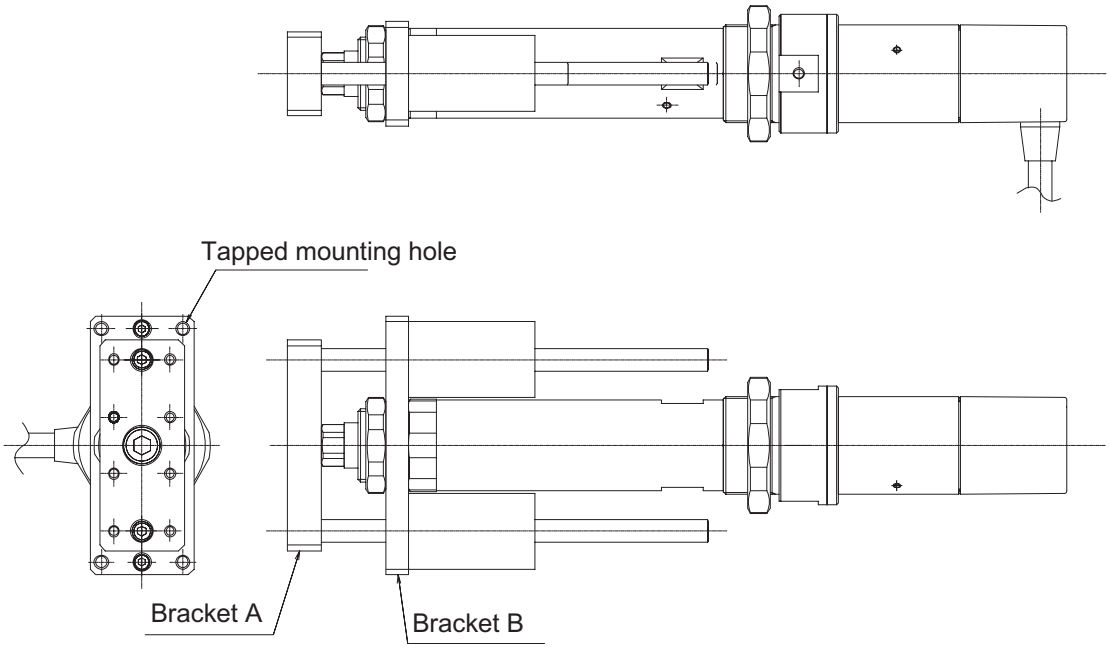


Type	Tapped hole diameter	Tapped depth	Tightening torque
RA3 type	M4	6 mm	1.8 N•m
RA4 type	M4	7 mm	1.8 N•m

(7) Double-guide type

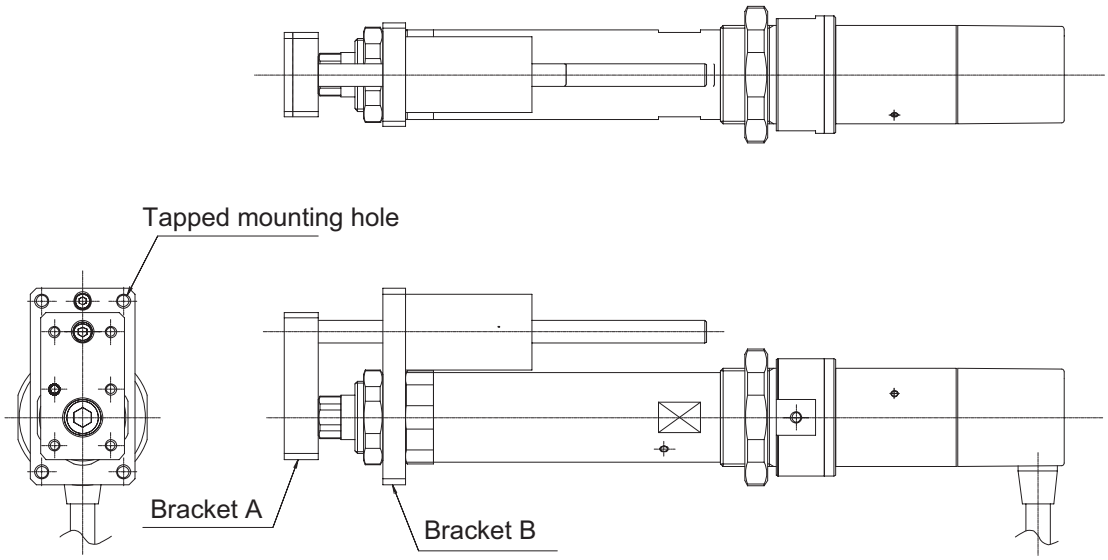
Use the tapped holes in the bracket for installing an actuator of the double-guide type.

● Applicable models: Double-guide type RGD3, RGD4



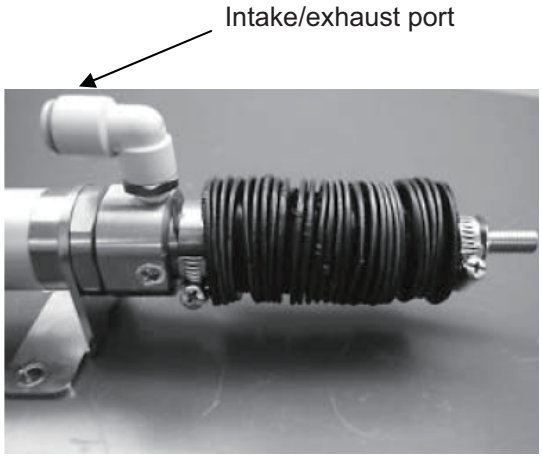
Type	Tapped hole diameter	Tapped depth	Tightening torque
RA3 type	M5	8 mm	3.4 N•m
RA4 type	M5	8 mm	3.4 N•m

(8) Single-guide type
Use the tapped holes in the bracket for installing an actuator of the single-guide type.
● Applicable models: Double-guide type RGD3, RGD4



Type	Tapped hole diameter	Tapped depth	Tightening torque
RA3 type	M5	8 mm	3.4 N•m
RA4 type	M5	8 mm	3.4 N•m

2.3.3 Connecting the Air Tube of the RCAW Dustproof/Splash-proof Type



Install the air tube (outer diameter: 10 mm, inner diameter: 6.5 mm) on the intake/exhaust port and guide the air tube to a location where the external environment assures the tube will not come in contact with water.

(Applicable tube)
Shown below is a representative model of air tube that can be installed on the RCAW:

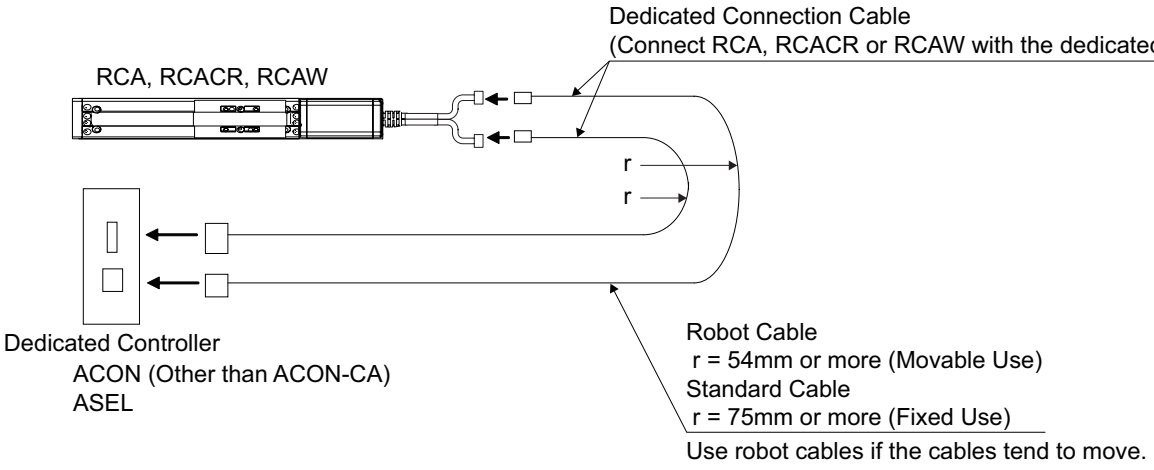
- TU1065: Polyurethane tube (Manufacturer: SMC)

⚠ Caution: The air tube should not be more than 3 m long.

3. Connecting with Controller

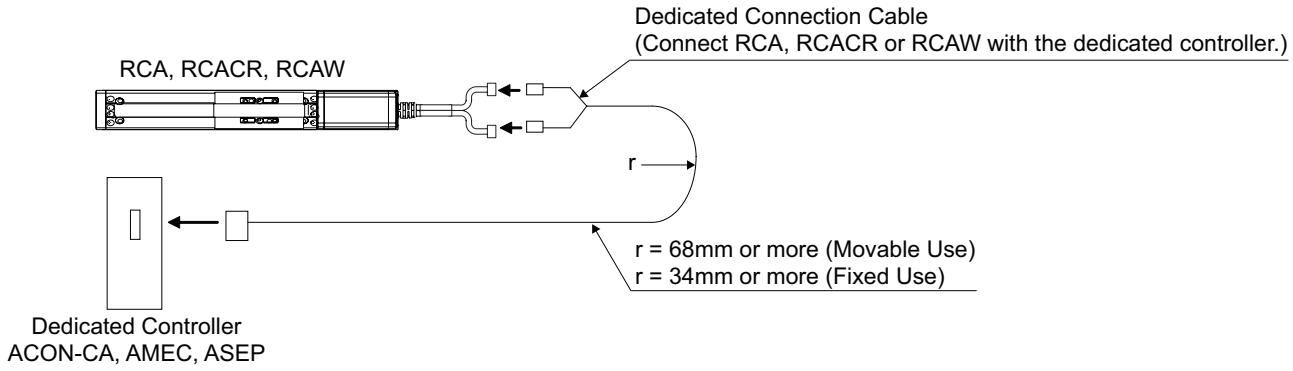
For the controller, only the dedicated controller manufactured by our company can be used.
Usage of an undedicated controller may cause accidents such as burnout, ignition or heat generation.
For the connection between the actuator and controller, use the attached dedicated connection cable.

[Connection to the ACON (Other than ACON-CA), ASEL controller]



Dedicated Connection Cable
- Motor Cable (Robot Cable) CB-RCP2-MA***
- Encoder Cable CB-RCP2-PB***/Encoder Cable Robot Cable CB-RCP2-PB***-RB
  *** shows the cable length. The max. length should be 20m.
  Example) 080=8m

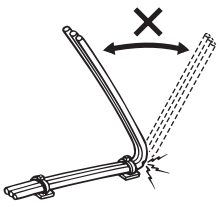
[Connection to the ACON-CA, AMEC, ASEP controller]

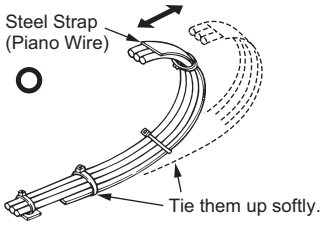


Dedicated Connection Cable
- Motor Encoder Cable (Robot Cable) CB-ASEP2-MPA***
  *** shows the cable length. The max. length should be 20m.
  Example) 080=8m

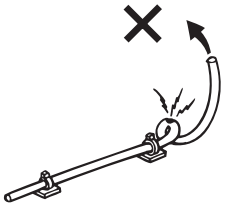
⚠ Warning: For wiring, please follow the warnings stated below. When constructing a system as the machinery equipment, pay attention to the wiring and connection of each cable so they are conducted properly. Not following them may cause not only a malfunction such as cable breakage or connection failure, 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.
- Have a sufficient radius for bending, and avoid a bend concentrating on one point.

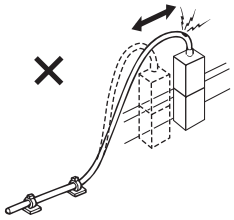




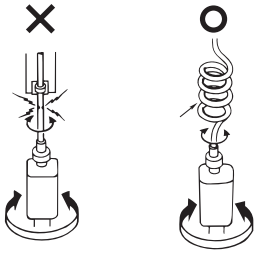
- Do not let the cable bend, kink or twist.



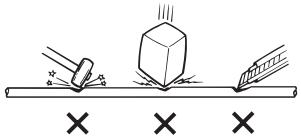
- Do not pull the cable with a strong force.



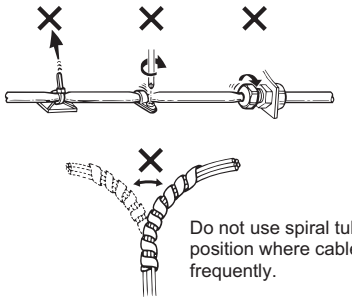
- Pay attention not to concentrate the twisting force to one point on a cable.



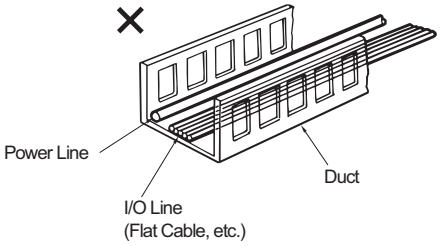
- Do not pinch, drop a heavy object onto or cut the cable.



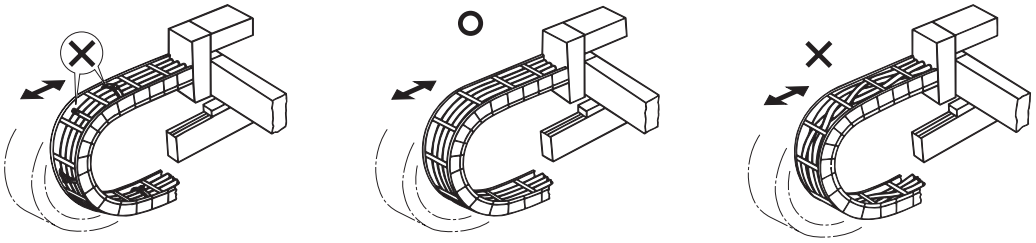
- When a cable is fastened to affix, make sure to have an appropriate force and do not tighten too much.



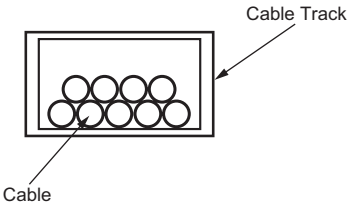
- PIO line, communication line, power and driving lines are to be put separately from each other and do not tie them together. Arrange so that such lines are independently routed in the duct.



- If using a cable track, arrange the wiring so that there is no entanglement or kink of the cables in the cable carrier or flexible tube, and do not bind the cables so that the cables are relatively free. (Arrange the wiring so the cables are not to be pulled when bent.)



- The occupied volume rate for the cables, etc., inside the cable track should be 60% or less.



4. Maintenance

4.1 Maintenance Schedule

Perform maintenance work according to the schedule below.
The schedule is set assuming eight hours of operation a day. When the operation time is long such as 24-hour operation, shorten the maintenance intervals as needed.

	Visual inspection	Grease supply*1
Start of operation	○	
After 1 month of operation	○	
After 3 months of operation	○	
Every 3 months thereafter	○	○ (Sliding surface of the rod) *1
After 3 years of operation, or upon reaching 5,000 km in traveled distance	○	○ (Sliding surface of the rod) *1
Every year thereafter	○	

*1 Apply grease to the sliding surface of the rod at the startup check if grease has been consumed, or every three months.
For the RCAW dustproof/splash-proof type, apply grease when the bellows is changed.

4.2 Visual Inspection of the Machine

Exterior Check the following items visually.

Body	Loose mounting bolts?
Cables	Damage to cables or connection to connector box?
General	Unusual noise or vibrations?

4.3 Cleaning

- Clean the exterior as needed.
- Wipe off dirt with a soft cloth.
- Do not use strong compressed air on the actuator as this may force dust into the crevices.
- Do not use petroleum-based solvent on plastic parts or painted surfaces.
- If the unit is badly soiled, apply a neutral detergent or alcohol to a soft cloth, and wipe gently.

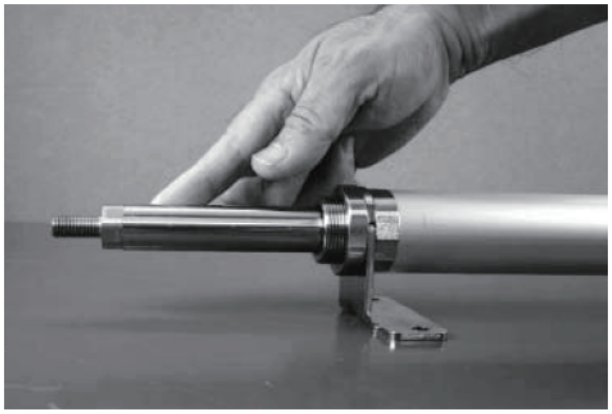
4.4 Applying Grease to the Sliding Surface of the Rod

(1) Applicable grease

KyodoYushi	MultempLRL3

> ⚠ Warning: Never use any fluorine-based grease.
> It will cause a chemical reaction when mixed with a lithium-based grease and may cause damage to the actuator.

(2) How to apply grease
Apply grease over the entire surface of the rod.



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

4.5 Reduction Belt [Motor Reversing Type]

4.5.1 Inspecting the Belt

Remove the pulley cover and visually inspect the belt.
Durability of the reduction belt is affected significantly by the operating condition, and there is no standard guideline as to when the belt should be replaced.
Generally, the belt is designed to withstand several millions of flexing loads.
As a practical guideline, replace the reduction belt when any of the conditions listed below is observed:

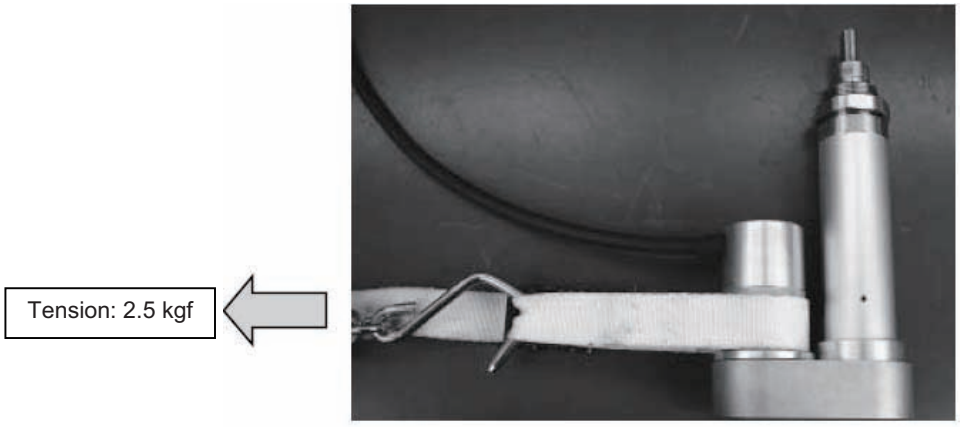
- The teeth and end faces of the belt have worn significantly.
- The belt has swollen due to deposits of oil, etc.
- Cracks and other damages are found on the teeth or back of the belt.
- The belt has broken.

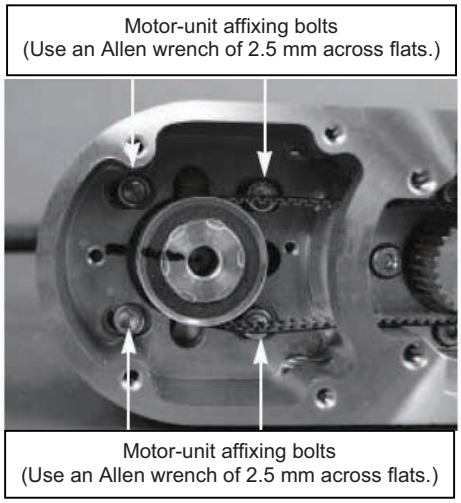
4.5.2 Applicable Belt

- RA3R·····60S2M124R Rubber, cleanroom type (Bando Chemical Industries) 6 mm wide
- RA4R·····60S2M154R Rubber, cleanroom type (Bando Chemical Industries) 6 mm wide

4.5.3 Adjusting the Belt Tension

Remove the pulley case cover and loosen the four motor-unit affixing bolts.
Pass a looped string (or long tie-band) around the motor unit, and pull the string to the specified tension using a tension gauge. In this condition, uniformly tighten the motor-unit affixing bolts.
[Recommended tightening torque of adjustment bolts]
162 N•cm (16.5 kgf•cm)





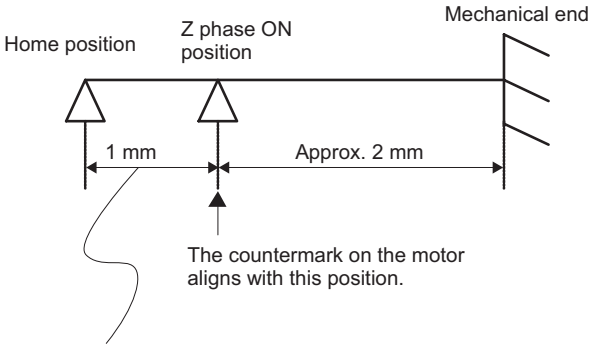
4.5.4 Replacing the Belt of the Motor Reversing Type: RA3R/RA4R Types

[Items Required for Replacement]

- Replacement belt
  RA3R……60S2M124R Rubber, cleanroom type (Bando Chemical Industries) 6 mm wide
  RA4R……60S2M152R Rubber, cleanroom type (Bando Chemical Industries) 6 mm wide
- Allen wrenches
- Tension gauge (capable of tensioning to 7 kgf or greater)
- Strong string, looped (or long tie-band)
- Scale
- Oil-based marker pen
- PC or teaching pendant

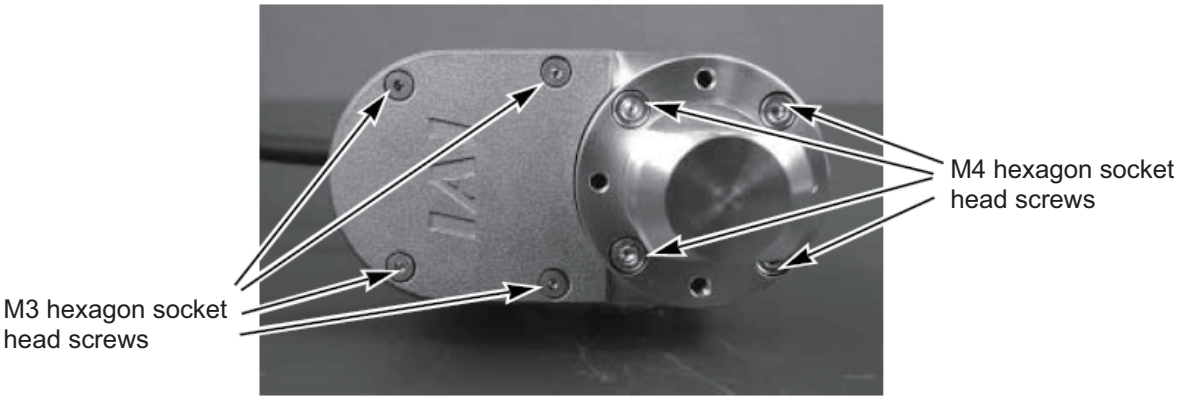
[Overview of Replacement]

1) Move the rod to a position where Z phase turns on (home position) (2 mm from the mechanical end). In this position, loosen the motor-unit affixing bolts and replace the belt.
2) Restore the home position.
   Affix the rod at a position 2 mm from the mechanical end on the home side, pass the belt, and adjust the belt to the specified tension.
3) Perform homing using a PC or teaching pendant and check for deviation from the initial home position.
   If there is a deviation, adjust the home offset if you are using an ACON controller. If you are using an ASEL controller, adjust the home preset.

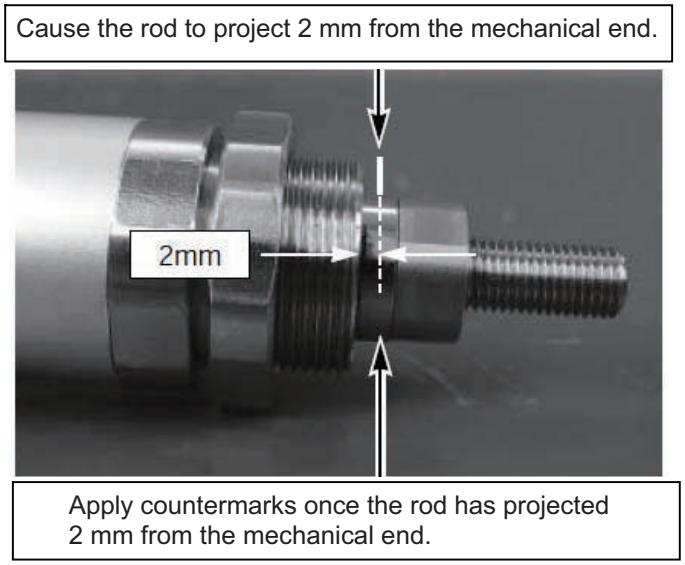


[Procedure]

1) Remove the pulley case cover using two Allen wrenches, one of 2 mm across flats and the other of 3 mm across flats.

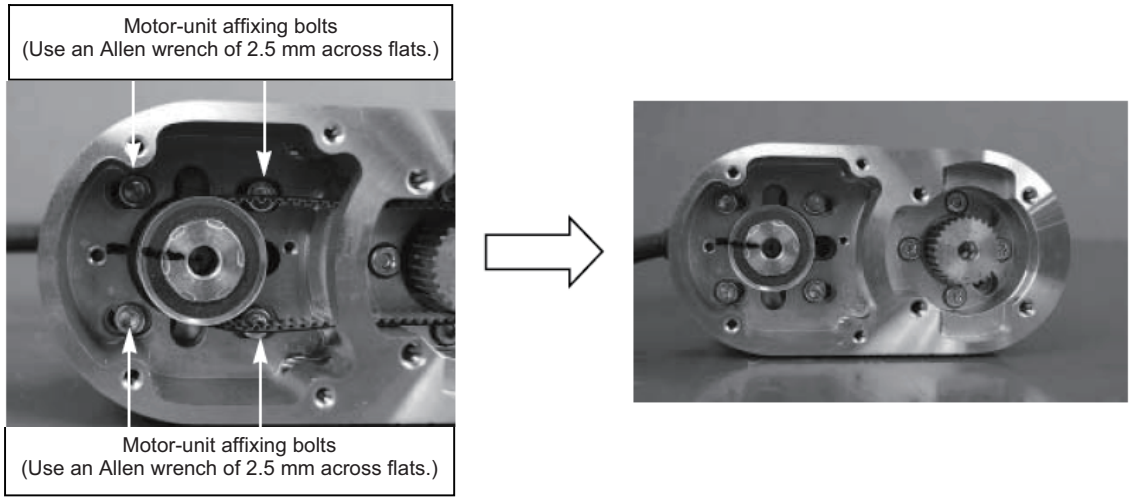


2) Move the rod to a position where Z phase turns on (home position).
This corresponds to a position where the rod projects 2 mm from the mechanical end.
Apply countermarks in this position.

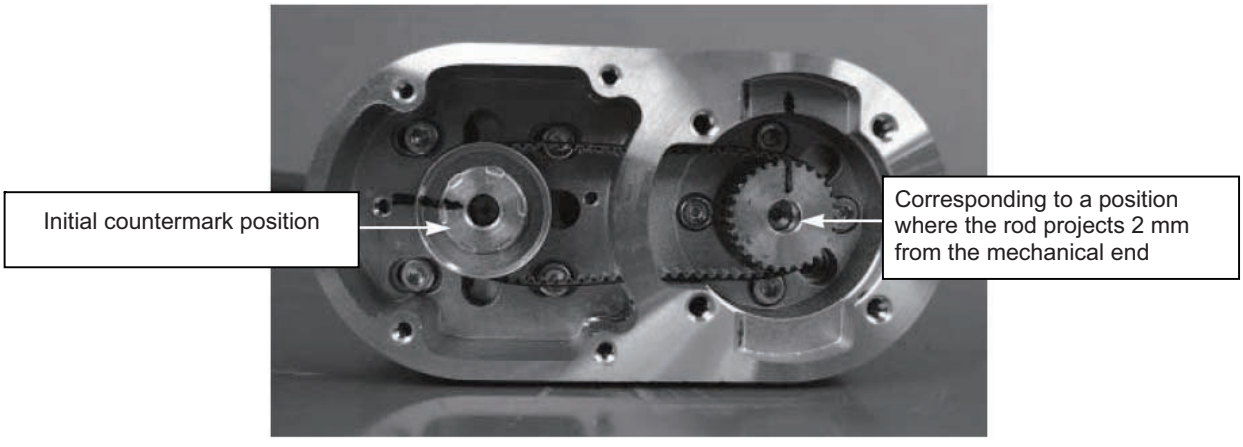


⚠ Warning: If the actuator is installed vertically, move it after turning on the controller power and forcibly releasing the brake. At this time, beware of danger as the actuator may drop suddenly.
Always provide a support to brace the actuator hand to prevent sudden drop, so as not to pinch fingers or damage the load.

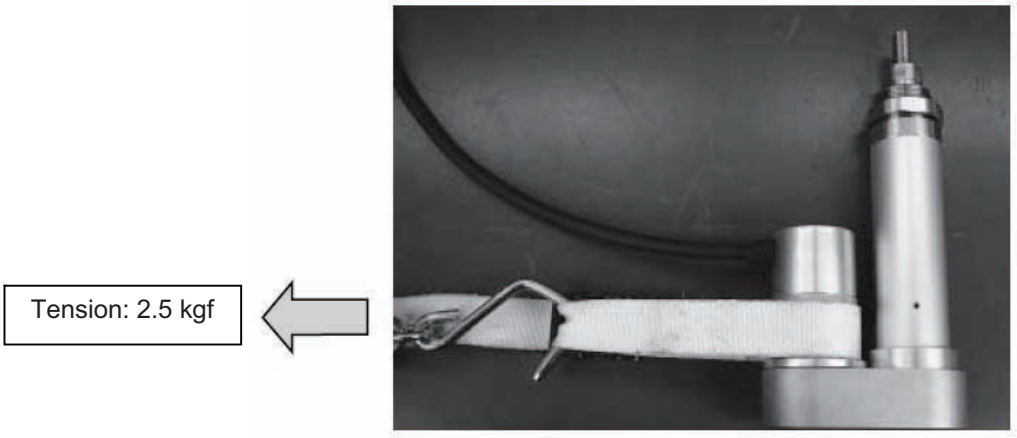
3) Loosen the motor-unit affixing bolts using an Allen wrench of 2.5 mm across flats. Slide the motor, and loosen and remove the belt.

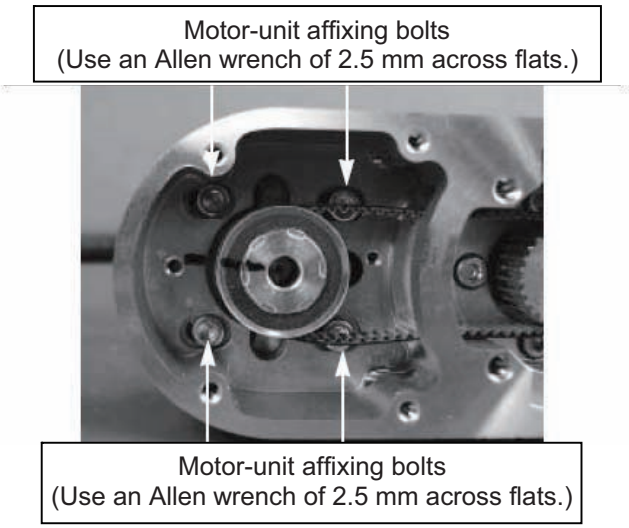


4) Check the following points before restoring the home position:
   - The motor side should be aligned with the initial countermark. If the position is offset, adjust it to achieve proper alignment.
   - The ball-screw side should be at a position where the rod projects 2 mm from the mechanical end. After the check, attach a new belt while holding the pulleys on both sides in position.

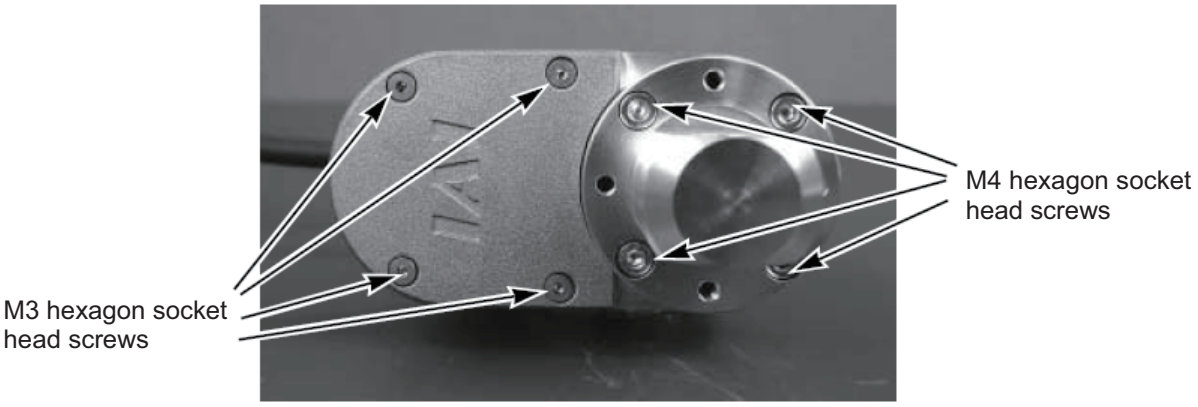


5) Adjust the belt tension.
Pass a looped strong string (or long tie-band) around the motor cover and pull it with a tension gauge to the specified tension. In this condition, uniformly tighten the motor-unit affixing bolts.
[Recommended tightening torque for adjustment bolts]
162 N•cm (16.5 kgf•cm)





6) Install the pulley case cover using two Allen wrenches, one of 2 mm across flats and the other of 3 mm across flats.



7) Connect a PC or teaching pendant to the controller to perform homing. (If the actuator is of absolute encoder specification, an absolute reset must be performed.) Check for deviation from the initial home position.
If there is a deviation, adjust parameter No. 22, "Home offset" if you are using an ACON controller. If you are using an ASEL controller, adjust axis-specific parameter No. 12, "Home preset." If your controller is of absolute encoder specification, perform homing after changing the parameter, and then perform an absolute reset.

4.6 Replacing the Motor

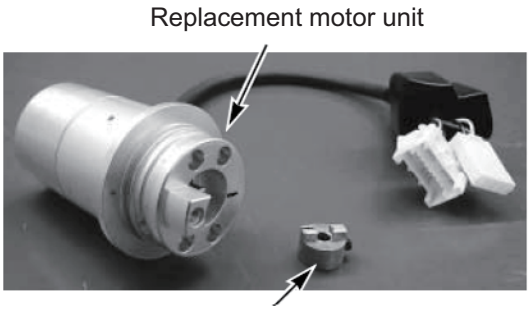
4.6.1 Replacing the Motor of the Motor Straight Type (Coupling Type): RA3C/RA4C Types

[Items Required for Replacement]

- Replacement motor unit
- Coupling (with screws)
- Allen wrenches
- Scale
- Oil-based marker pen
- Grease

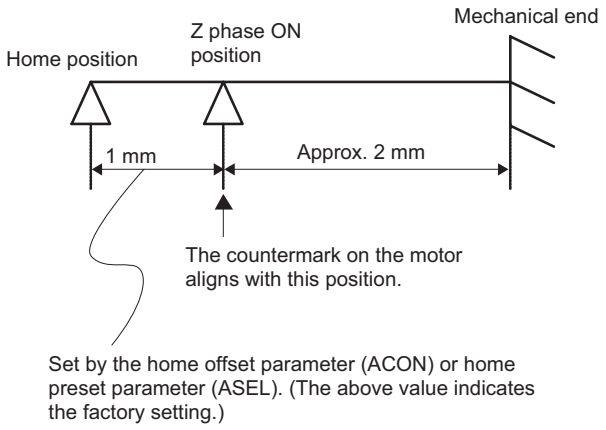
Idemitsu Kosan	Daphne Eponex Grease No.2

- PC or teaching pendant



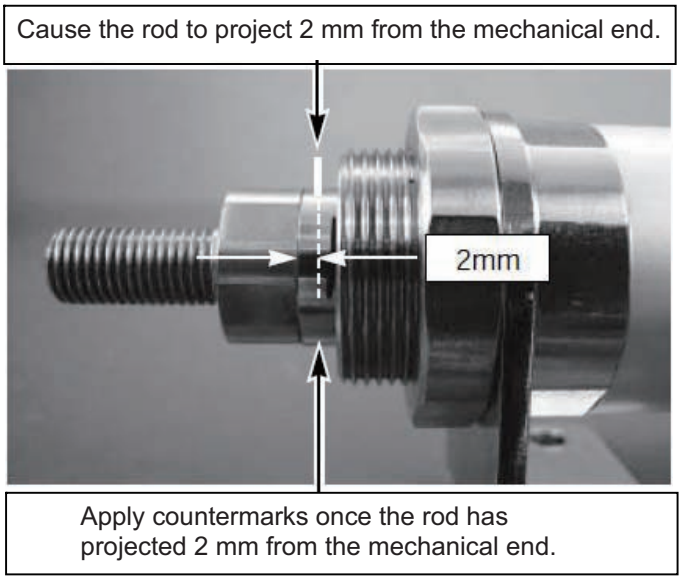
[Overview of Replacement]

1) Move the rod to a position where Z phase turns on (home position) (2 mm from the mechanical end). In this position, replace the motor.
2) Perform homing using a PC or teaching pendant and check for deviation from the initial home position.
   If there is a deviation, adjust the home offset if you are using an ACON controller. If you are using an ASEL controller, adjust the home preset.



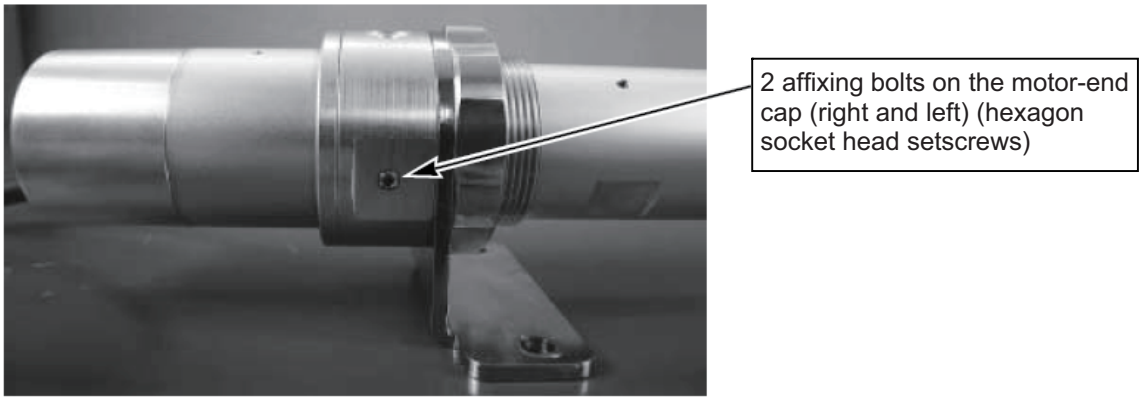
[Procedure]

1) Move the rod to a position where Z phase turns on (home position).
   This corresponds to a position where the rod projects 2 mm from the mechanical end.
   Apply countermarks in this position.

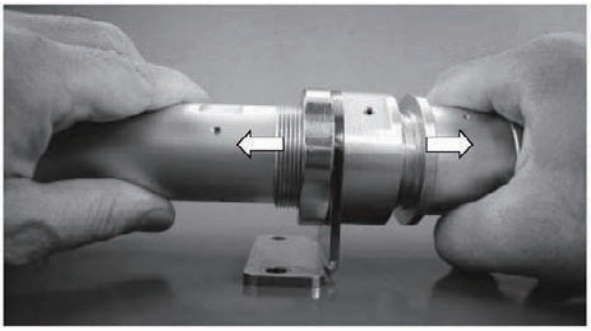


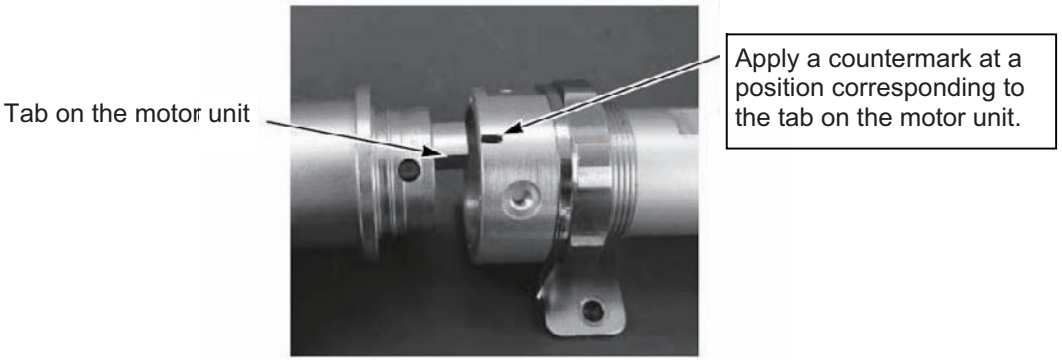
⚠ Warning: If the actuator is installed vertically, move it after turning on the controller power and forcibly releasing the brake. At this time, beware of danger as the actuator may drop suddenly.
Always provide a support to brace the actuator hand to prevent sudden drop, so as not to pinch fingers or damage the load.

2) Using an Allen wench of 2 mm across flats, remove the two motor-unit affixing bolts on the right and left.

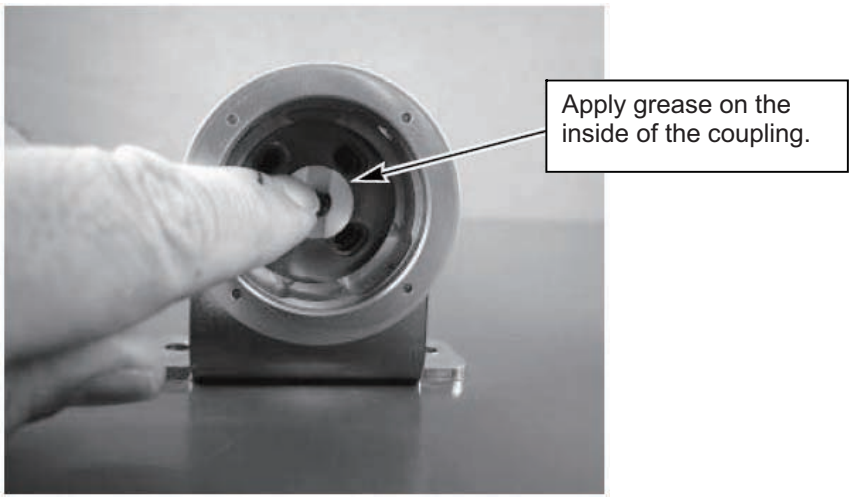


3) Pull out the motor unit.
Before pulling out the motor unit, apply a countermark on the cylinder tube at a position corresponding to the tab on the motor unit, so that the motor unit and cylinder can be aligned in the correct position later on.

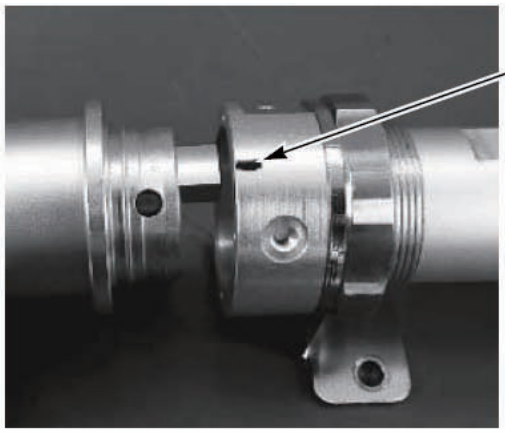


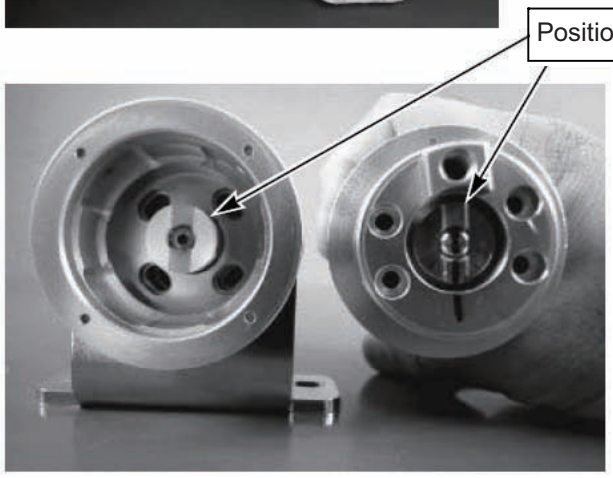


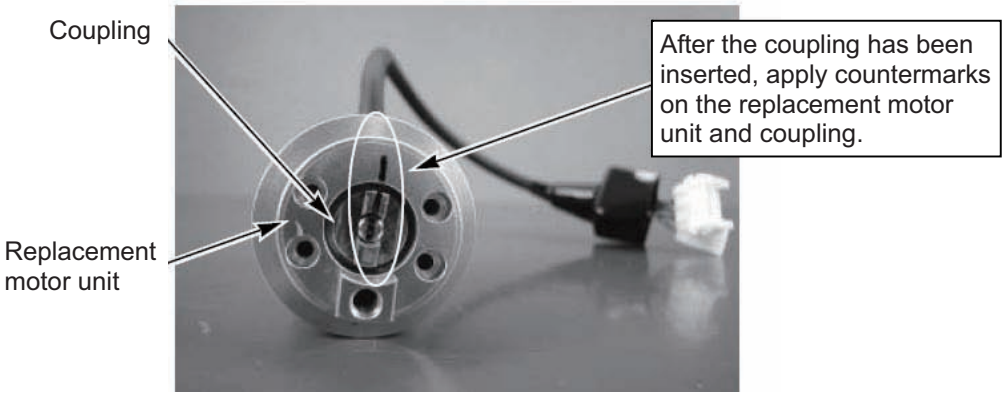
4) Apply grease on the actuator coupling.



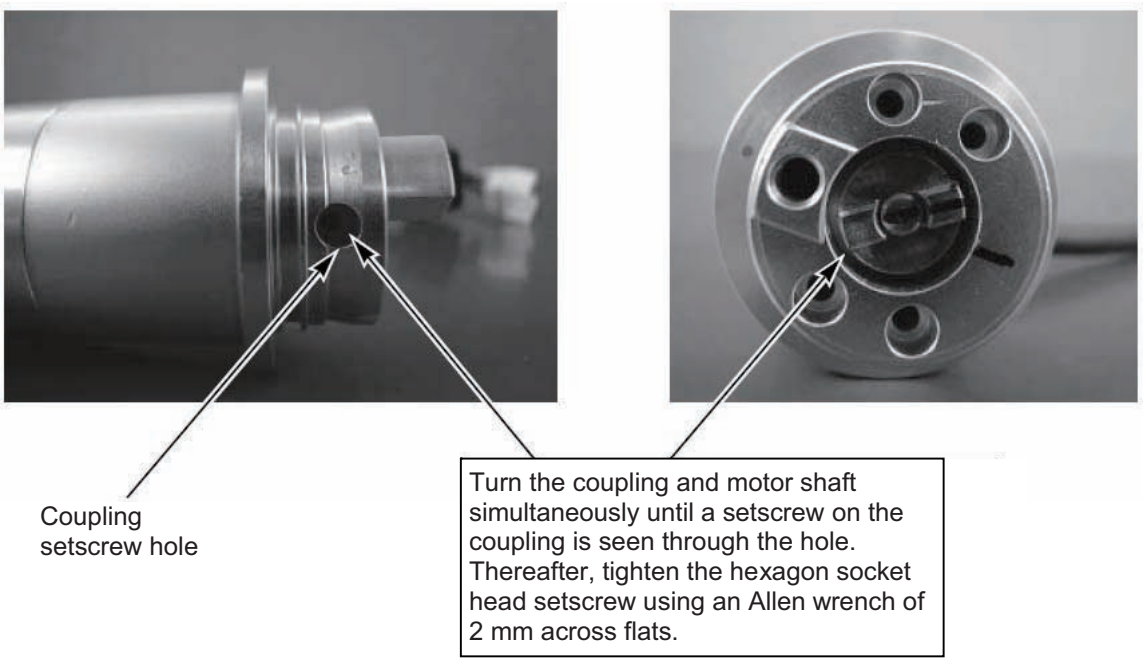
5) Align the tab on the replacement motor unit with the countermark on the cylinder.
With the motor unit and cylinder aligned properly, insert the coupling into the replacement motor unit by aligning the orientation of this coupling with that of the actuator coupling (adjusted to a position corresponding to a rod projection of 2 mm from the mechanical end). Apply countermarks to identify the current motor position (phase Z position) and coupling.



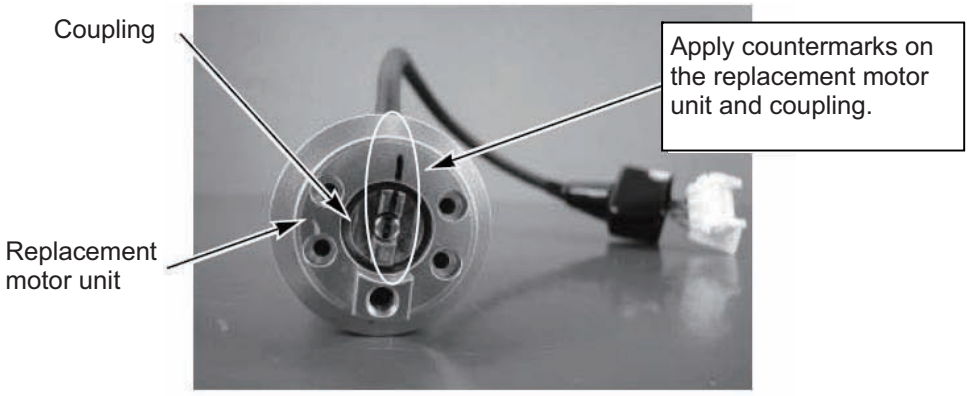


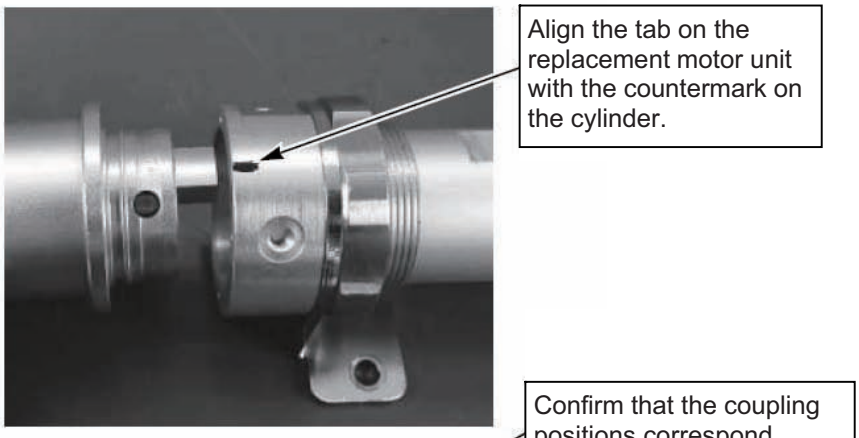


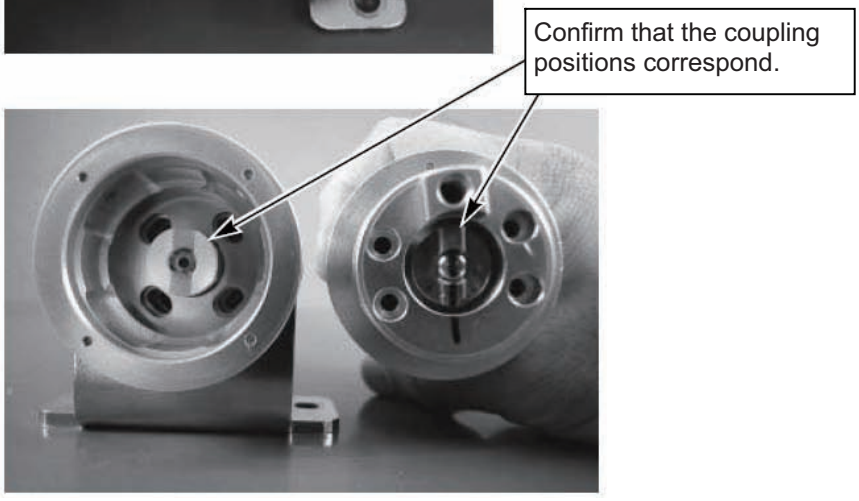
6) Turn the coupling and motor shaft simultaneously until a setscrew on the coupling is seen through the hole.
Thereafter, tighten the hexagon socket head setscrew using an Allen wrench of 2 mm across flats.
Similarly, turn the coupling and motor shaft simultaneously until the other screw is seen through the hole, and tighten the setscrew.



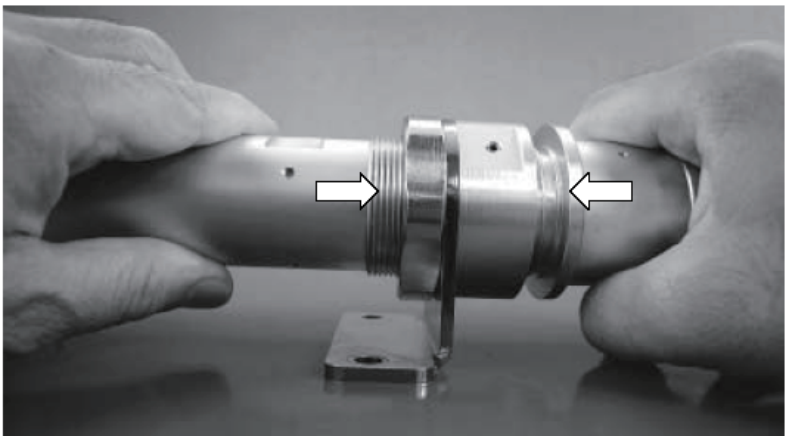
7) Return the coupling in the replacement motor unit to the initial motor position (Z phase position). Align the tab on the replacement motor unit with the countermark on the cylinder. With the motor unit and cylinder positioned this way, confirm that the orientation of the actuator coupling (adjusted to a position corresponding to a rod projection of 2 mm from the mechanical end) corresponds to the position of the coupling in the replacement motor unit.



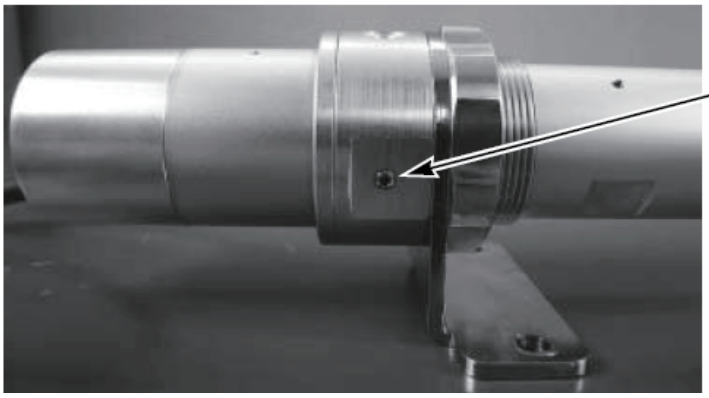




8) Carefully insert the replacement motor unit into the cylinder by ensuring that the couplings do not lose their alignment.



9) Using an Allen wench of 2 mm across flats, tighten the two motor-unit affixing bolts on the right and left.



10) Connect a PC or teaching pendant to the controller to perform homing. (If the actuator is of absolute encoder specification, an absolute reset must be performed). Check for deviation from the initial home position.
If there is a deviation, adjust parameter No. 22, "Home offset" if you are using an ACON controller. If you are using an ASEL controller, adjust axis-specific parameter No. 12, "Home preset." If your controller is of absolute encoder specification, perform homing after changing the parameter, and then perform an absolute reset.

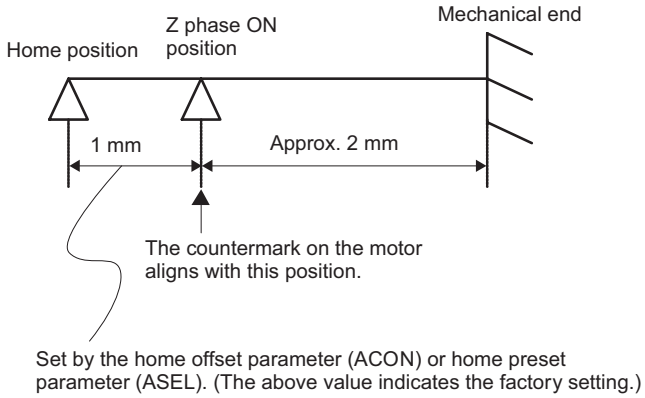
4.6.2 Replacing the Motor of the Motor Reversing Type: RA3R/RA4R Types

[Items Required for Replacement]

- Replacement motor unit
- Allen wrenches
- Tension gauge (capable of tensioning to 7 kgf or greater)
- Strong string, looped (or long tie-band)
- Scale
- Oil-based marker pen
- PC or teaching pendant

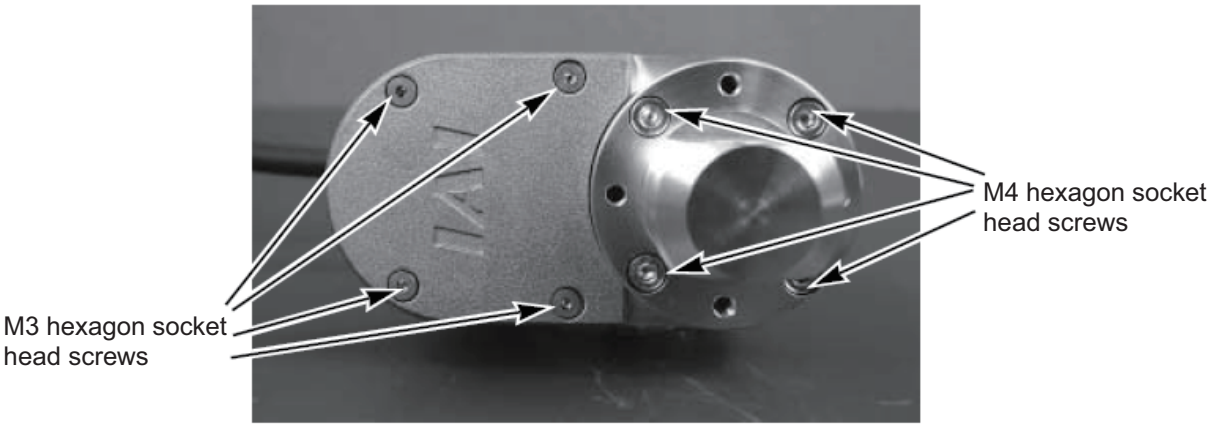
[Overview of Replacement]

1) Loosen the motor-unit affixing bolts to remove the belt, and replace the motor.
2) Restore the home position.
   Affix the rod at a position 2 mm from the mechanical end on the home side, pass the belt, and adjust the belt to the specified tension.
3) Perform homing using a PC or teaching pendant and check for deviation from the initial home position.
   If there is a deviation, adjust the home offset if you are using an ACON controller. If you are using an ASEL controller, adjust the home preset.

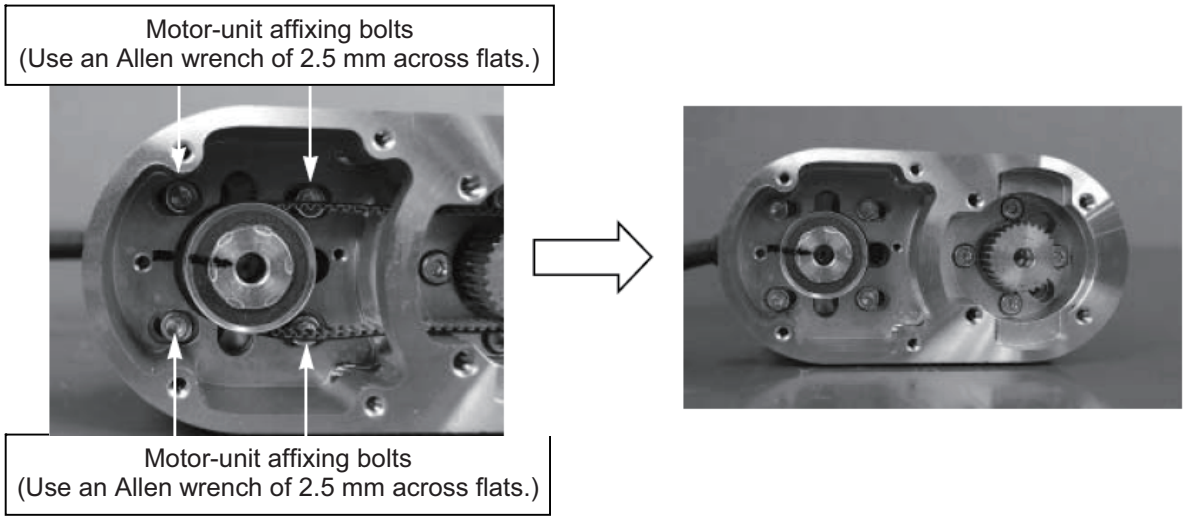


[Procedure]

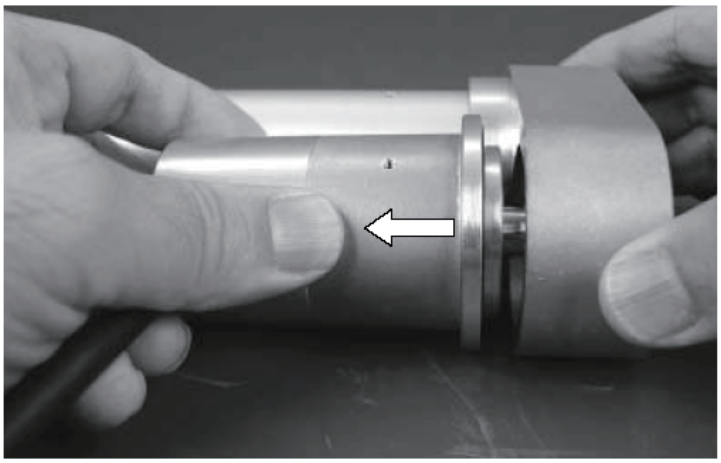
1) Remove the pulley case cover using two Allen wrenches, one of 2 mm across flats and the other of 3 mm across flats.



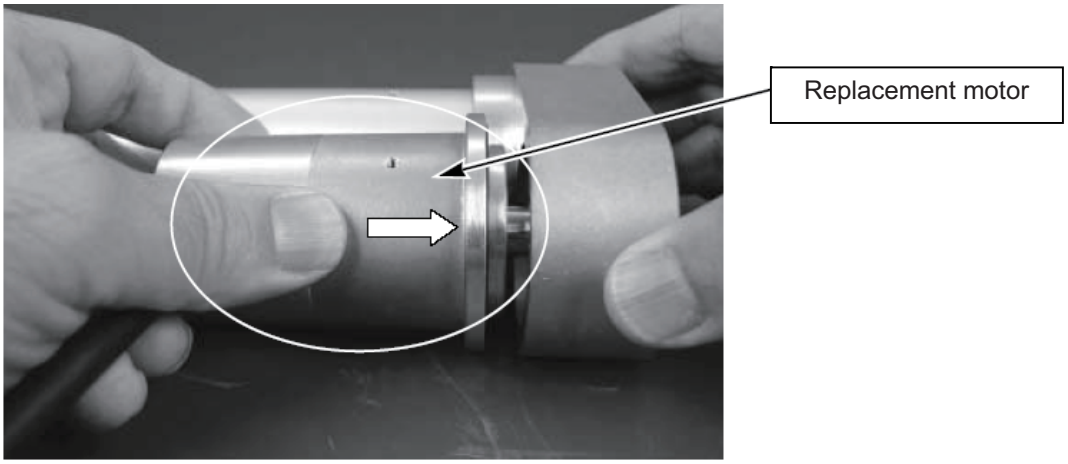
2) Loosen the motor-unit affixing bolts using an Allen wrench of 2.5 mm across flats. Slide the motor, and loosen and remove the belt. After the belt has been removed, remove the motor-unit affixing bolts.



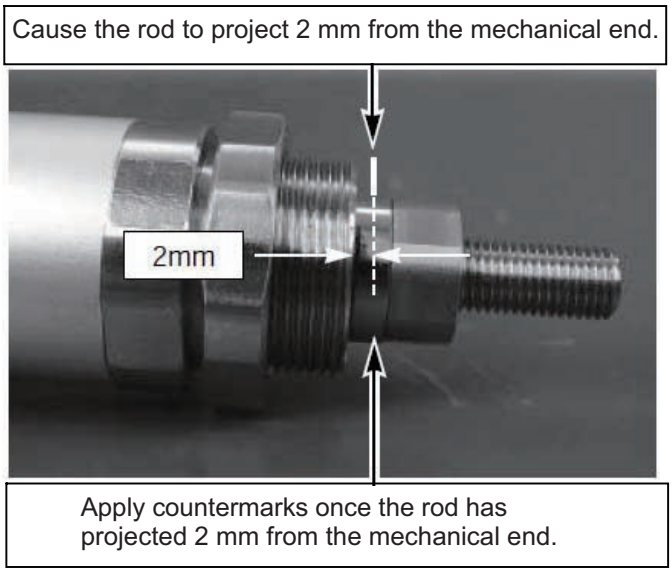
3) Take out the motor.



4) Install the replacement motor. Loosely tighten the motor-unit affixing bolts.



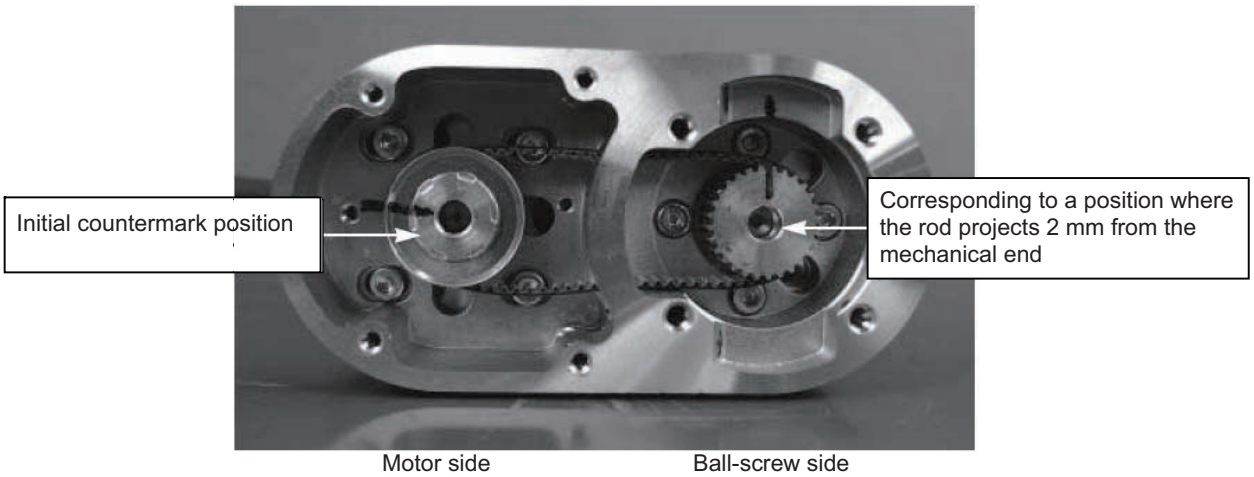
5) Move the rod to a position where Z phase turns on (home position).
This corresponds to a position where the rod projects 2 mm from the mechanical end.
Apply countermarks in this position.



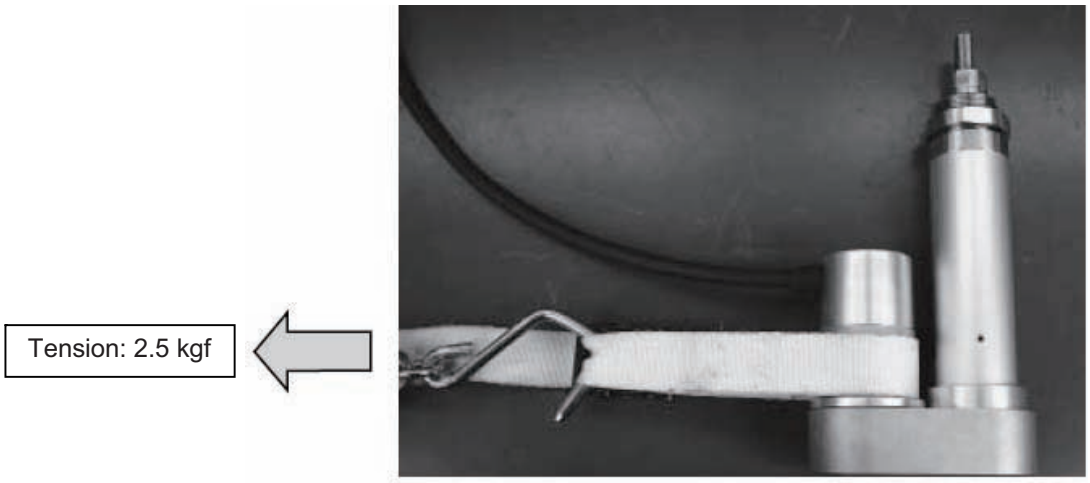
⚠ Warning: If the actuator is installed vertically, move it after turning on the controller power and forcibly releasing the brake. At this time, beware of danger as the actuator may drop suddenly.
Always provide a support to brace the actuator hand to prevent sudden drop, so as not to pinch fingers or damage the load.

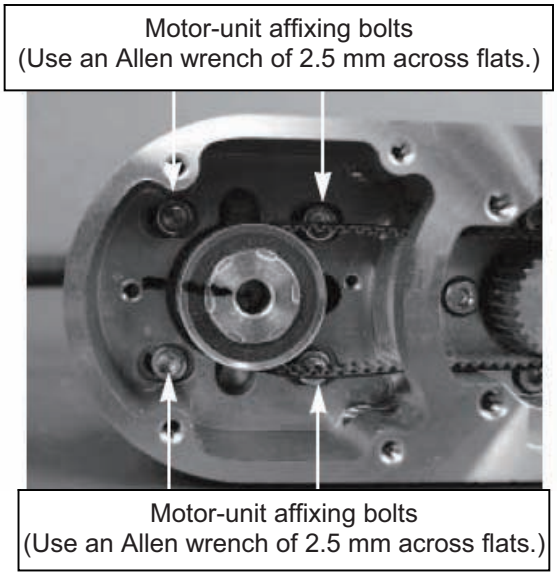
6) Check the following points before restoring the home position:
- The motor side should be aligned with the initial countermark. If the position is offset, adjust it to achieve proper alignment.
- The ball-screw side should be at a position where the rod projects 2 mm from the mechanical end.

After the check, attach a new belt while holding the pulleys on both sides in position.

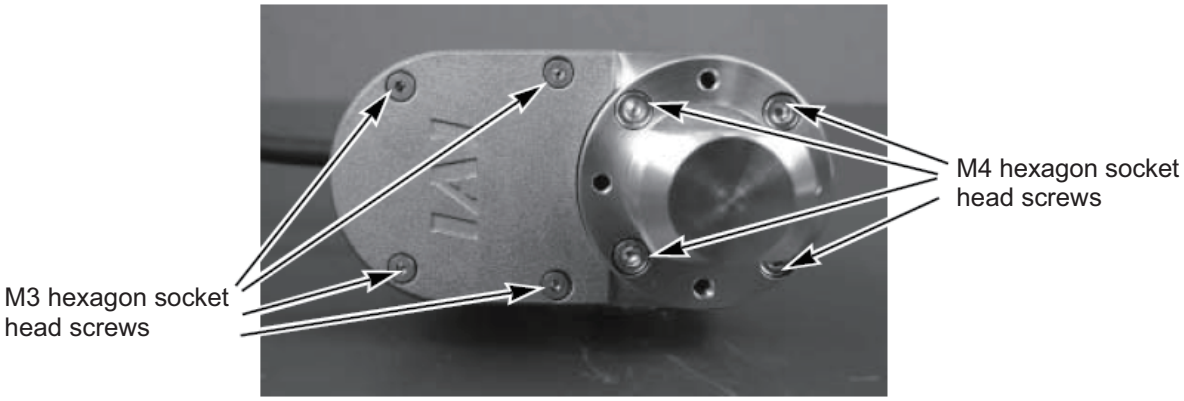


7) Adjust the belt tension.
Pass a looped strong string (or long tie-band) around the motor cover and pull it with a tension gauge to the specified tension. In this condition, uniformly tighten the motor-unit affixing bolts.
[Recommended tightening torque for adjustment bolts]
162 N•cm (16.5 kgf•cm)





8) Remove the pulley case cover using two Allen wrenches, one of 2 mm across flats and the other of 3 mm across flats.

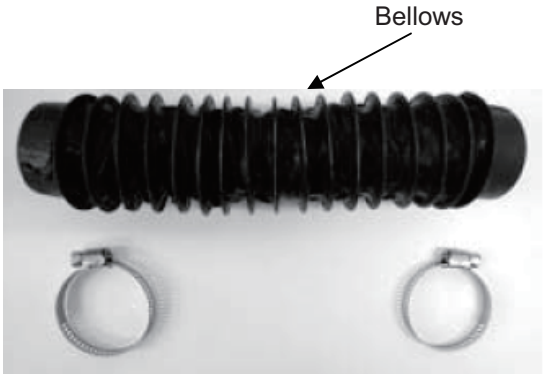


9) Connect a PC or teaching pendant to the controller to perform homing. (If the actuator is of absolute encoder specification, an absolute reset must be performed.) Check for deviation from the initial home position.
If there is a deviation, adjust parameter No. 22, "Home offset" if you are using an ACON controller. If you are using an ASEL controller, adjust axis-specific parameter No. 12, "Home preset." If your controller is of absolute encoder specification, perform homing after changing the parameter, and then perform an absolute reset.

4.7 Replacing the Bellows of the RCAW Dustproof/Splash-proof Type

[Items Required for Replacement]
- Replacement bellows unit
  : RA3 ····· JB-RA3- (stroke)
  : RA4 ····· JB-RA4- (stroke)
- Phillips screwdriver
- Torque driver
- Grease

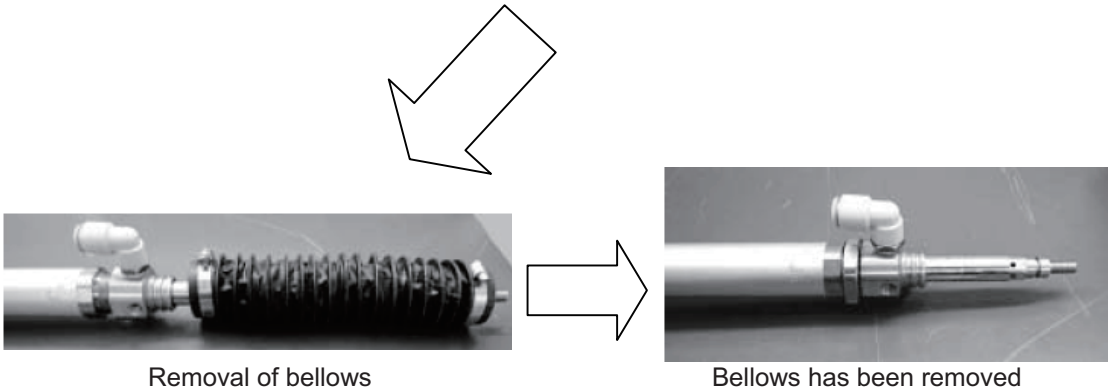
Kyodo Yushi	Multemp LRL3



[Procedure]
1) Loosen the front and rear metal fittings affixing the bellows and remove the bellows.

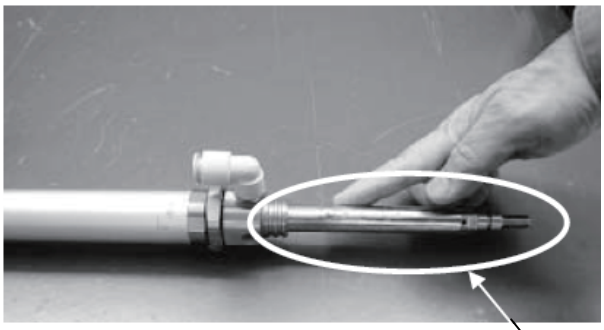

Loosening of front metal fitting


Loosening of rear metal fitting


Removal of bellows

Bellows has been removed

2) Apply grease evenly over the entire cylinder surface.

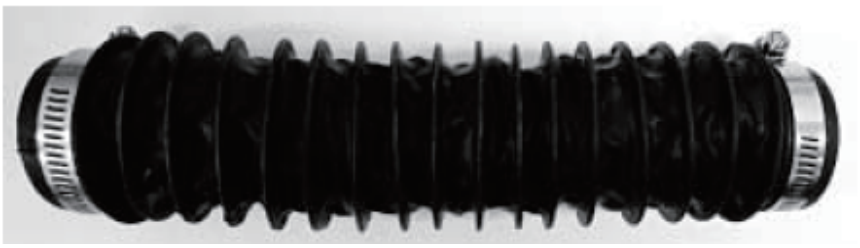


Apply grease evenly over the entire surface.

3) Install a metal fitting on the bellows.

Install a metal fitting on the bellows.

Bellows



4) Install the replacement (new) bellows and tighten the screws of the front and rear metal fittings affixing the bellows. Tighten the screws to the specified torque using a torque driver.

Installation of bellows

Tightening of rear metal fitting

Tightening torque: 2 N-m

Tightening of front metal fitting

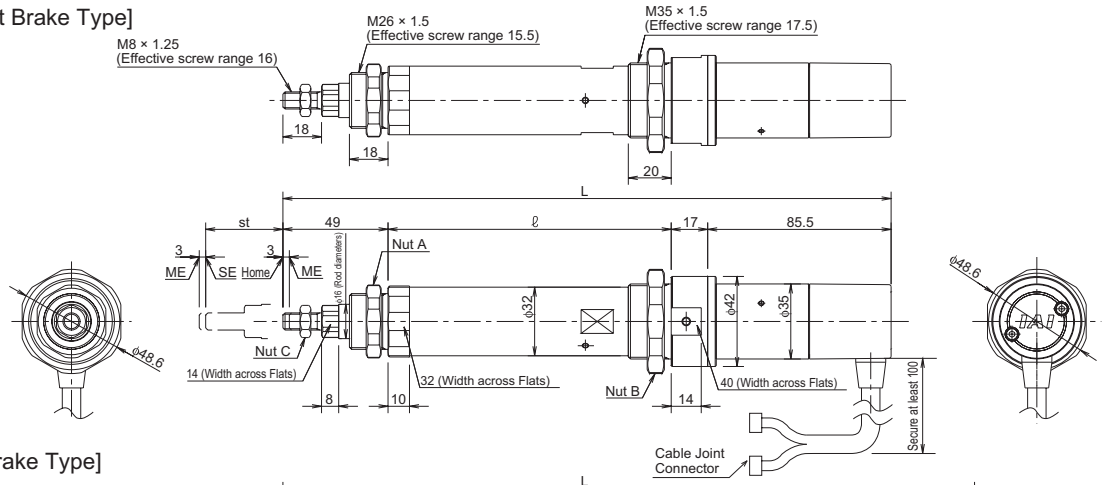
Tightening torque: 2 N-m

5. Appendix

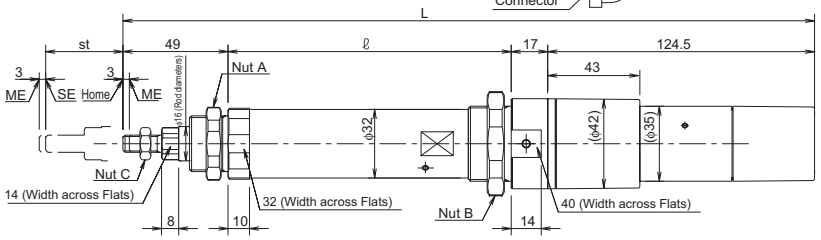
5.1 RCA-RA3C

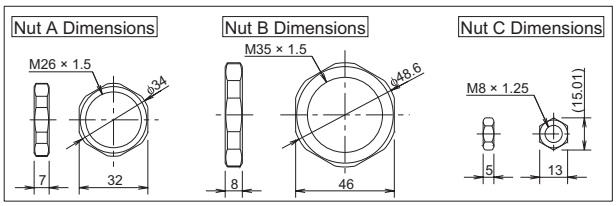
ME: Mechanical End SE: Stroke End

[Without Brake Type]



[With Brake Type]





Caution

Do not apply any external force to the rod from the directions other than the rod operating directions.
The force in the vertical or rotational direction of the rod may damage the stopper.

■ Dimensions and Weight by Stroke

RCA-RA3C (Without brake)

Stroke	50	100	150	200
L	283.5	333.5	383.5	433.5
ℓ	132	182	232	282
Weight [kg]	0.7	0.8	0.9	1.0

RCA-RA3C (With brake)

Stroke	50	100	150	200
L	322.5	372.5	422.5	472.5
ℓ	132	182	232	282
Weight [kg]	0.9	1.0	1.1	1.2

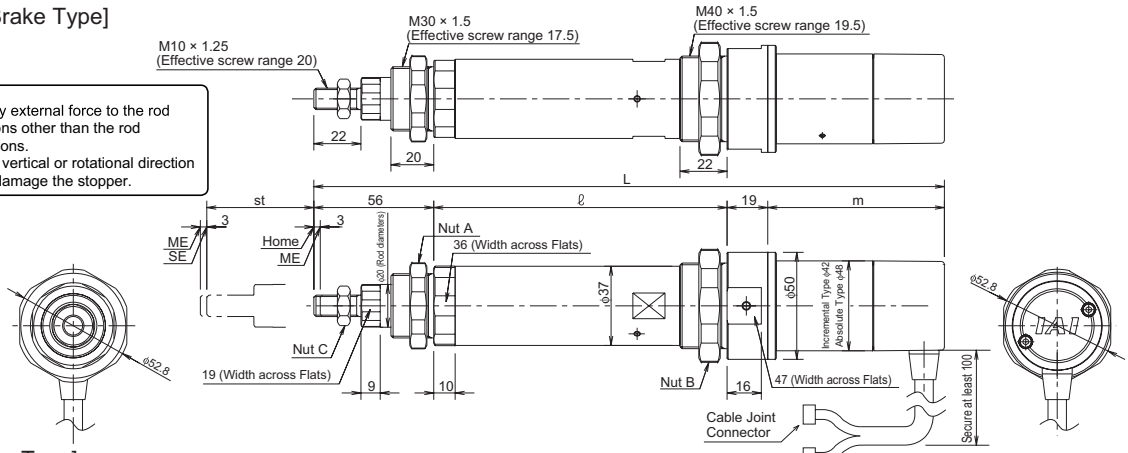
5.2 RCA-RA4C

ME: Mechanical End SE: Stroke End

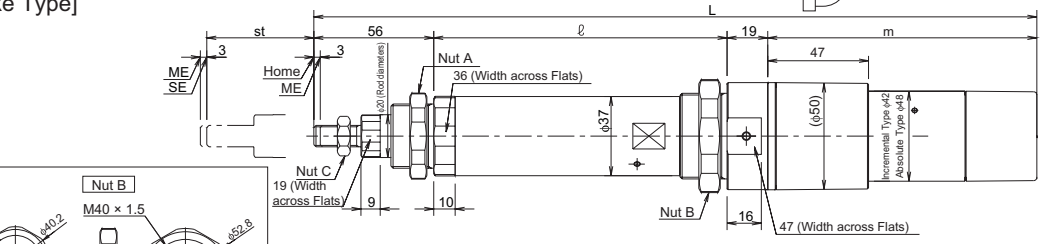
[Without Brake Type]

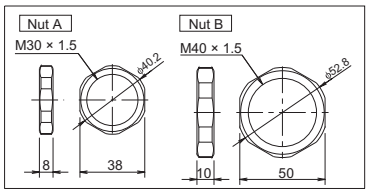
Caution

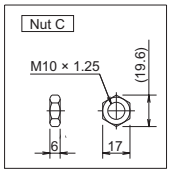
Do not apply any external force to the rod from the directions other than the rod operating directions.
The force in the vertical or rotational direction of the rod may damage the stopper.



[With Brake Type]







■ Dimensions and Weight by Stroke

RCA-RA4C (Without brake)

Stroke			50	100	150	200	250	300
L	20W	Incremental	279.5	329.5	379.5	429.5	479.5	529.5
		Absolute	292.5	342.5	392.5	442.5	492.5	542.5
	30W	Incremental	294.5	344.5	394.5	444.5	494.5	544.5
		Absolute	307.5	357.5	407.5	457.5	507.5	557.5
ℓ			137	187	237	287	337	387
m	20W	Incremental	67.5					
		Absolute	80.5					
	30W	Incremental	82.5					
		Absolute	95.5					
Weight [kg]			1.1	1.2	1.4	1.5	1.7	1.8

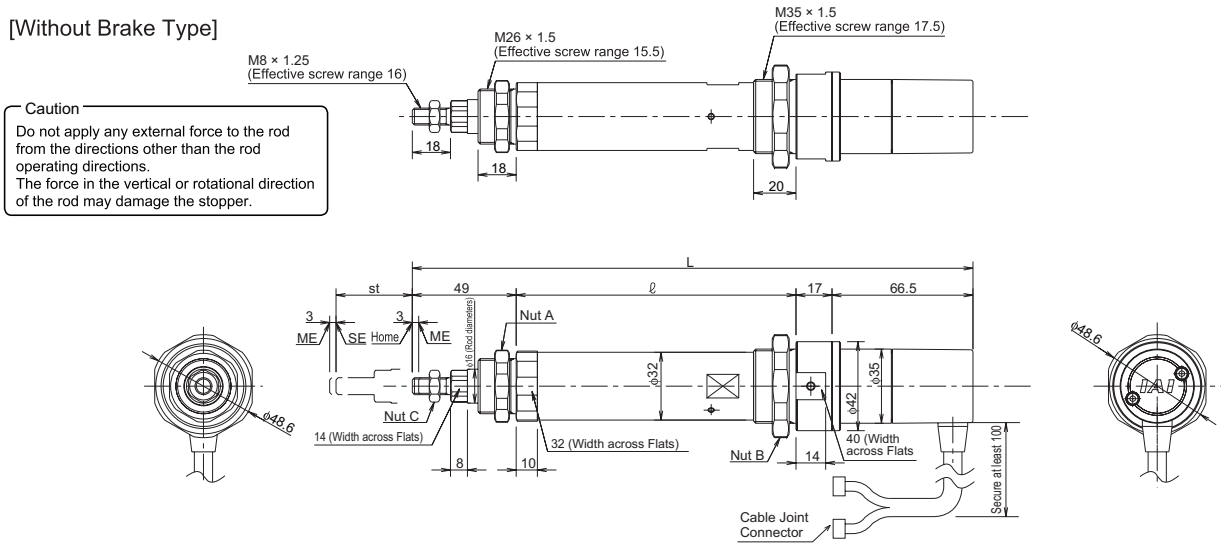
RCA-RA4C (With brake)

Stroke			50	100	150	200	250	300
L	20W	Incremental	322.5	372.5	422.5	472.5	522.5	572.5
		Absolute	335.5	385.5	435.5	485.5	535.5	585.5
	30W	Incremental	337.5	387.5	437.5	487.5	537.5	587.5
		Absolute	350.5	400.5	450.5	500.5	550.5	600.5
ℓ			137	187	237	287	337	387
m	20W	Incremental	110.5					
		Absolute	123.5					
	30W	Incremental	125.5					
		Absolute	138.5					
Weight [kg]			1.3	1.4	1.6	1.7	1.9	2.0

5.3 RCA-RA3D

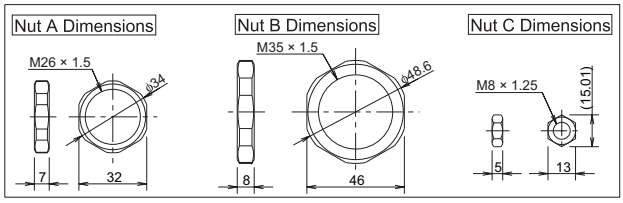
ME: Mechanical End SE: Stroke End

[Without Brake Type]



Caution

Do not apply any external force to the rod from the directions other than the rod operating directions.
The force in the vertical or rotational direction of the rod may damage the stopper.



■ Dimensions and Weight by Stroke

RCA-RA3D (Without brake)

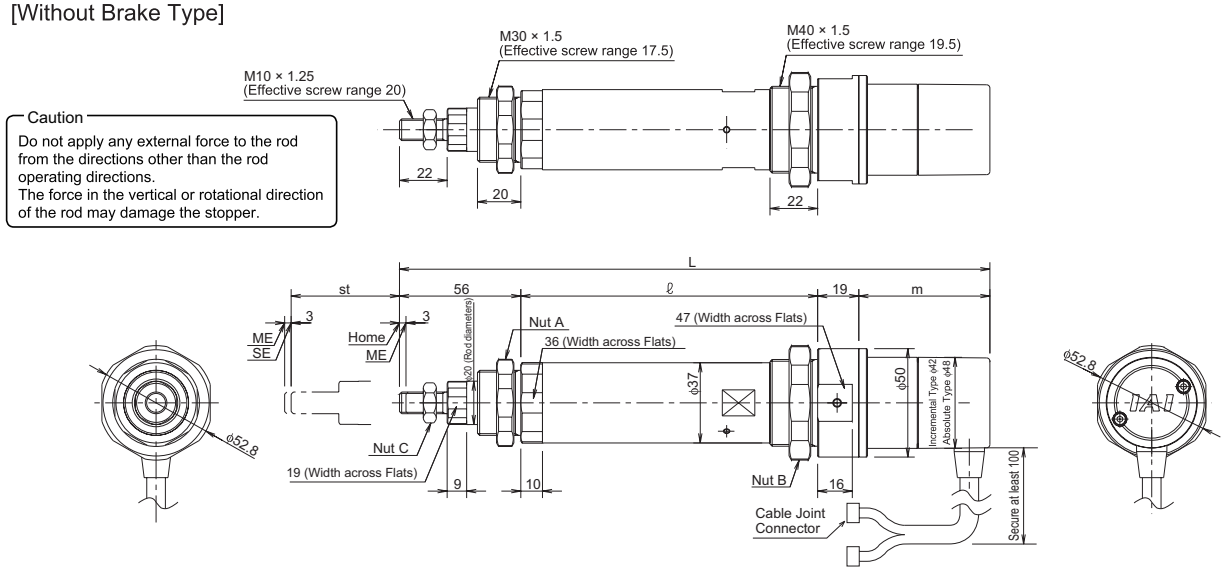
Stroke	50	100	150	200
L	264.5	314.5	364.5	414.5
ℓ	132	182	232	282
Weight [kg]	0.7	0.8	0.9	1.0

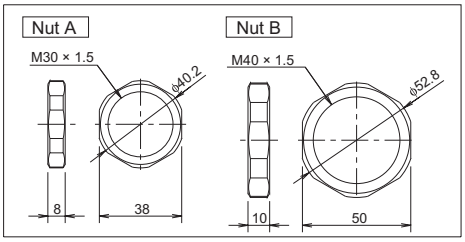
RCA-RA3D type is no breake-equipped type.

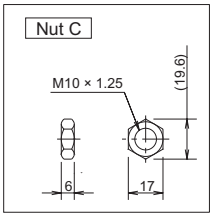
5.4 RCA-RA4D

ME: Mechanical End　SE: Stroke End

[Without Brake Type]







■ Dimensions and Weight by Stroke

RCA-RA4D (Without brake)

Stroke			50	100	150	200	250	300
L	20W	Incremental	257.5	307.5	357.5	407.5	457.5	507.5
		Absolute	270.5	320.5	370.5	420.5	470.5	520.5
	30W	Incremental	272.5	322.5	372.5	422.5	472.5	522.5
		Absolute	285.5	335.5	385.5	435.5	485.5	535.5
ℓ			137	187	237	287	337	387
m	20W	Incremental	45.5					
		Absolute	58.5					
	30W	Incremental	60.5					
		Absolute	73.5					
Weight [kg]			1.0	1.2	1.3	1.5	1.6	1.8

RCA-RA4D type is no breake-equipped type.

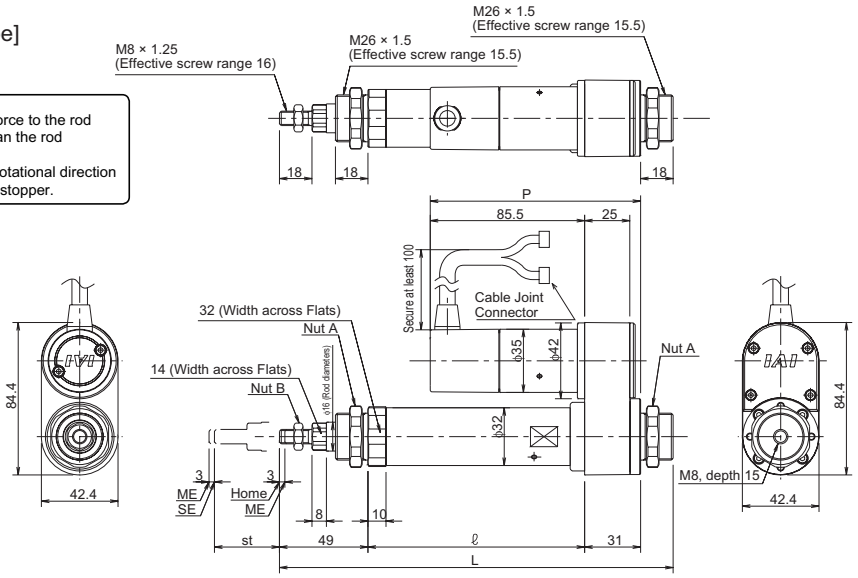
5.5 RCA-RA3R

ME: Mechanical End　SE: Stroke End

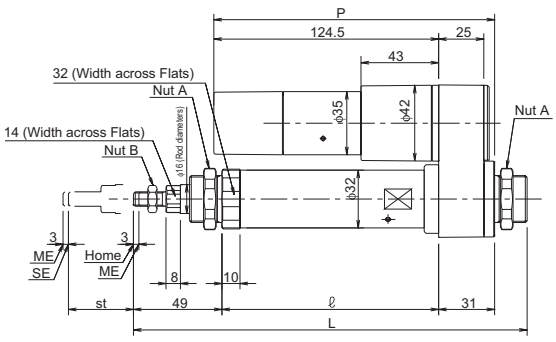
[Without Brake Type]

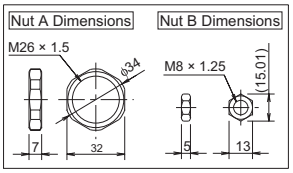
Caution

Do not apply any external force to the rod from the directions other than the rod operating directions.
The force in the vertical or rotational direction of the rod may damage the stopper.



[With Brake Type]





■ Dimensions and Weight by Stroke

RCA-RA3R (Without brake)

Stroke	50	100	150	200
L	218	268	318	368
ℓ	120	170	220	270
P	116.5			
Weight [kg]	0.8	0.9	1.0	1.1

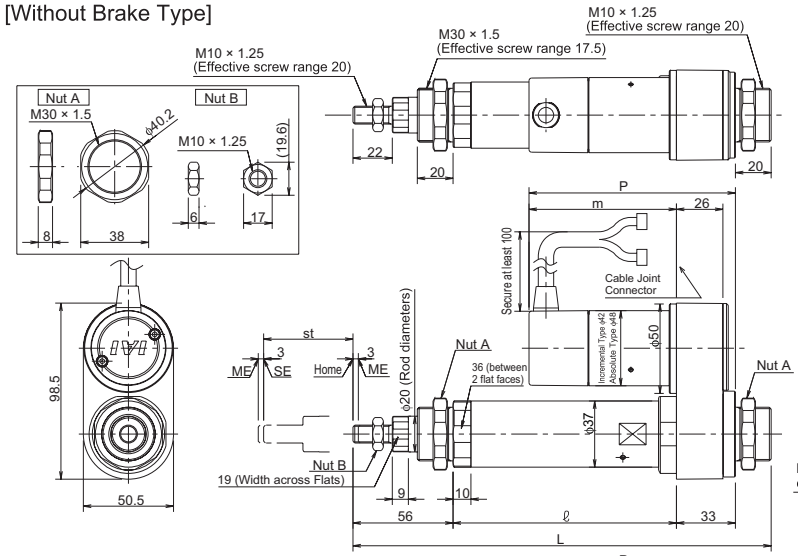
RCA-RA3R (With brake)

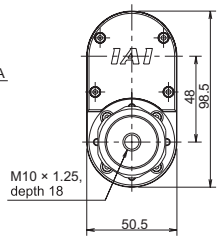
Stroke	50	100	150	200
L	218	268	318	368
ℓ	120	170	220	270
P	155.5			
Weight [kg]	1.0	1.1	1.2	1.3

5.6 RCA-RA4R

ME: Mechanical End　SE: Stroke End

[Without Brake Type]





Caution

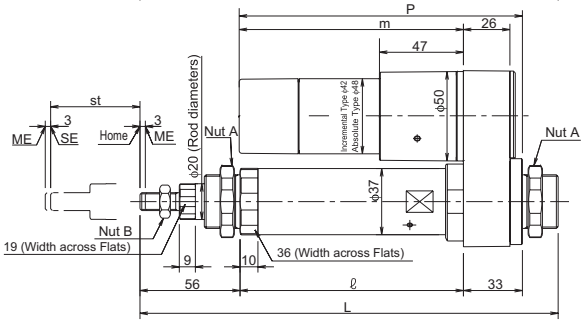
Do not apply any external force to the rod from the directions other than the rod operating directions.
The force in the vertical or rotational direction of the rod may damage the stopper.

■ Dimensions and Weight by Stroke

RCA-RA4R (Without brake)

Stroke			50	100	150	200	250	300
L	20W	Incremental	234	284	334	384	434	484
		Absolute	234	284	334	384	434	484
	30W	Incremental	234	284	334	384	434	484
		Absolute	234	284	334	384	434	484
ℓ			125	175	225	275	325	375
m	20W	Incremental	67.5					
		Absolute	80.5					
	30W	Incremental	82.5					
		Absolute	95.5					
P	20W	Incremental	100.5					
		Absolute	113.5					
	30W	Incremental	115.5					
		Absolute	128.5					
Weight [kg]			1.2	1.4	1.5	1.7	1.8	2.0

[With Brake Type]



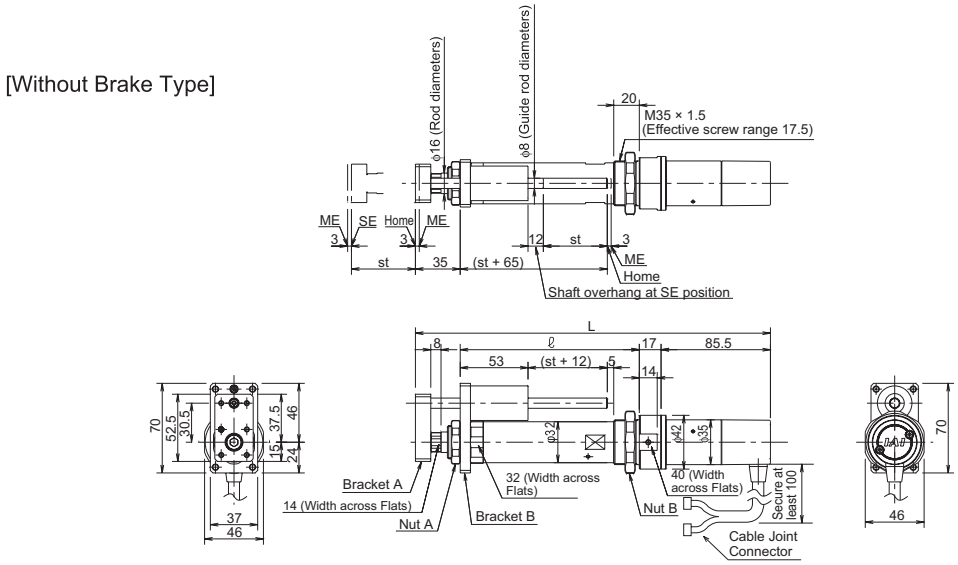
RCA-RA4R (With brake)

Stroke			50	100	150	200	250	300
L	20W	Incremental	234	284	334	384	434	484
		Absolute	234	284	334	384	434	484
	30W	Incremental	234	284	334	384	434	484
		Absolute	234	284	334	384	434	484
ℓ			125	175	225	275	325	375
m	20W	Incremental	110.5					
		Absolute	123.5					
	30W	Incremental	125.5					
		Absolute	138.5					
P	20W	Incremental	143.5					
		Absolute	156.5					
	30W	Incremental	158.5					
		Absolute	171.5					
Weight [kg]			1.4	1.6	1.7	1.9	2.0	2.2

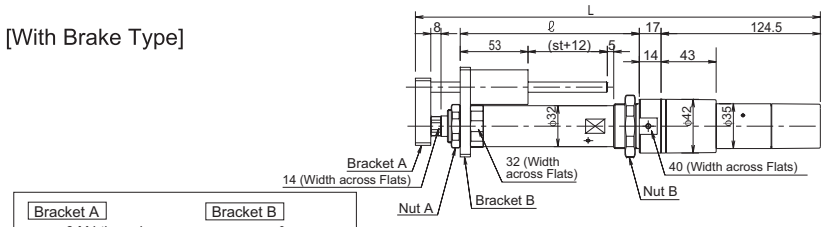
5.7 RCA-RGS3C

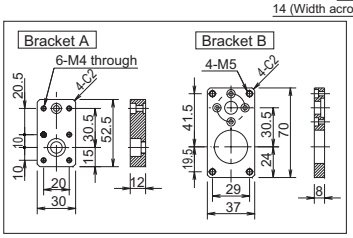
ME: Mechanical End SE: Stroke End

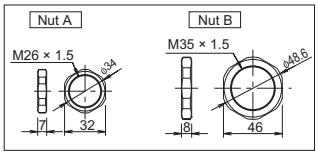
[Without Brake Type]



[With Brake Type]







■ Dimensions and Weight by Stroke

RCA-RGS3C (Without brake)

Stroke	50	100	150	200
L	277.5	327.5	377.5	427.5
ℓ	140	190	240	290
Weight [kg]	0.9	1.1	1.2	1.3

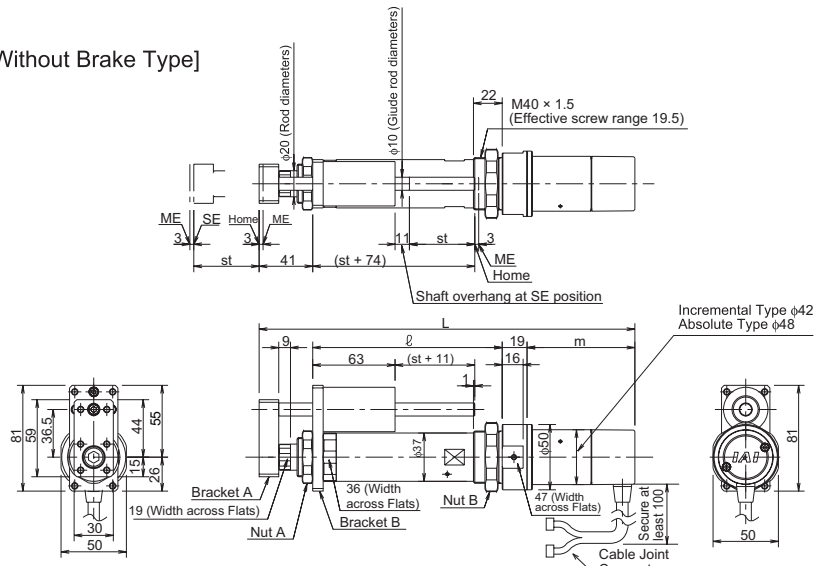
RCA-RGS3C (With brake)

Stroke	50	100	150	200
L	316.5	366.5	416.5	466.5
ℓ	140	190	240	290
Weight [kg]	1.1	1.3	1.4	1.5

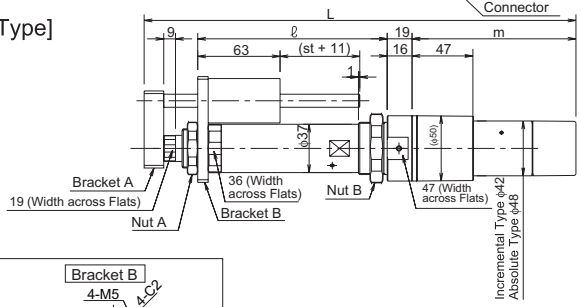
5.8 RCA-RGS4C

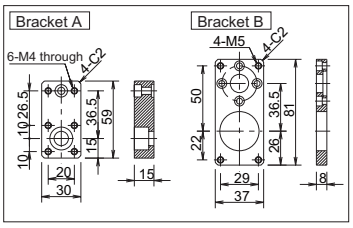
ME: Mechanical End SE: Stroke End

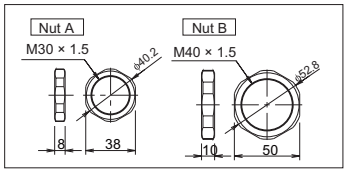
[Without Brake Type]



[With Brake Type]







Caution

Do not apply any external force to the rod from the directions other than the rod operating directions.
The force in the vertical or rotational direction of the rod may damage the stopper.

■ Dimensions and Weight by Stroke

RCA-RGS4C (Without brake)

Stroke			50	100	150	200	250	300
L	20W	Incremental	272.5	322.5	372.5	422.5	472.5	522.5
		Absolute	285.5	335.5	385.5	435.5	485.5	535.5
	30W	Incremental	287.5	337.5	387.5	437.5	487.5	537.5
		Absolute	300.5	350.5	400.5	450.5	500.5	550.5
ℓ			145	195	245	295	345	395
m	20W	Incremental	67.5					
		Absolute	80.5					
	30W	Incremental	82.5					
		Absolute	95.5					
Weight [kg]			1.5	1.6	1.8	2.0	2.2	2.4

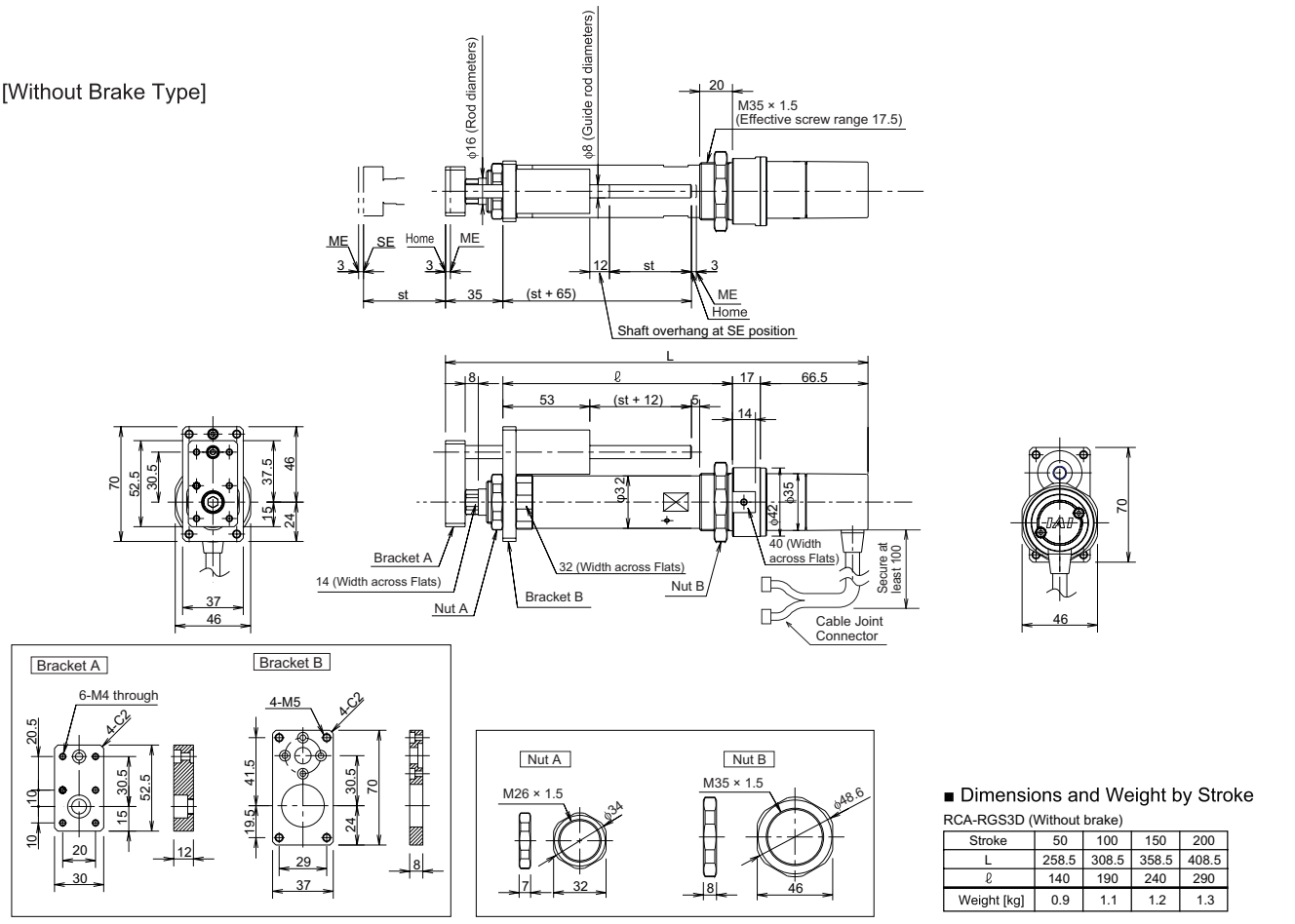
RCA-RGS4C (With brake)

Stroke			50	100	150	200	250	300
L	20W	Incremental	315.5	365.5	415.5	465.5	515.5	565.5
		Absolute	328.5	378.5	428.5	478.5	528.5	578.5
	30W	Incremental	330.5	380.5	430.5	480.5	530.5	580.5
		Absolute	343.5	393.5	443.5	493.5	543.5	593.5
ℓ			145	195	245	295	345	395
m	20W	Incremental	110.5					
		Absolute	123.5					
	30W	Incremental	125.5					
		Absolute	138.5					
Weight [kg]			1.7	1.8	2.0	2.2	2.4	2.6

5.9 RCA-RGS3D

ME: Mechanical End SE: Stroke End

[Without Brake Type]



■ Dimensions and Weight by Stroke

RCA-RGS3D (Without brake)

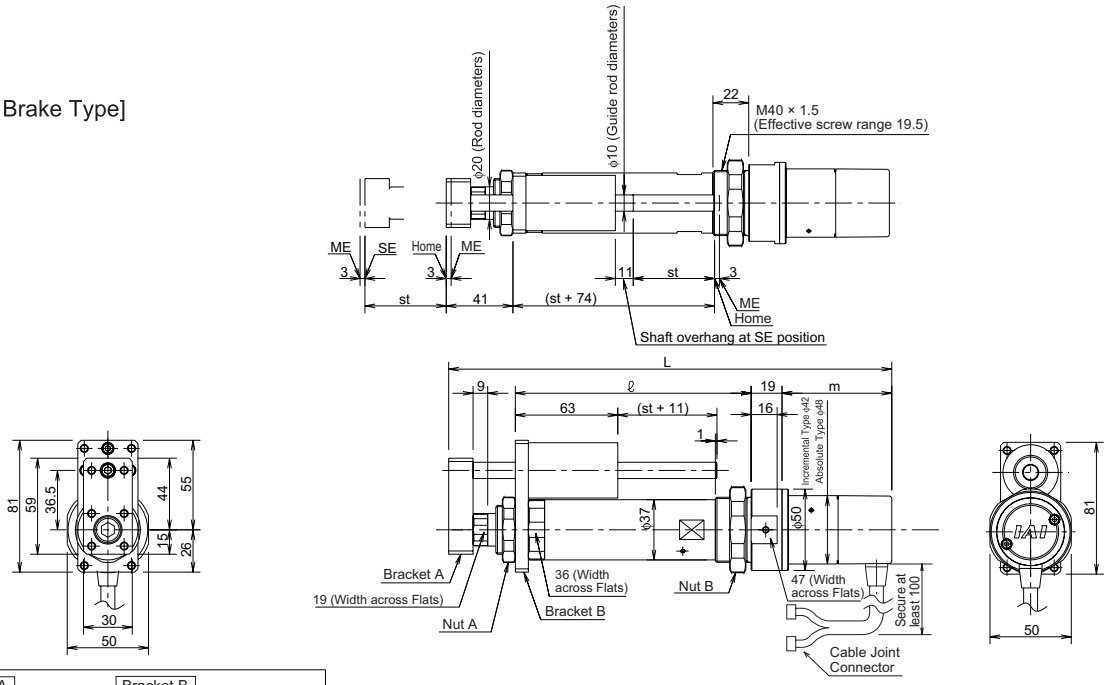
Stroke	50	100	150	200
L	258.5	308.5	358.5	408.5
ℓ	140	190	240	290
Weight [kg]	0.9	1.1	1.2	1.3

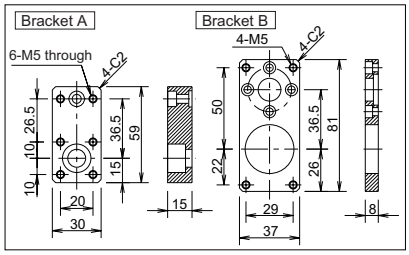
RCA-RGS3D type is no breake-equipped type.

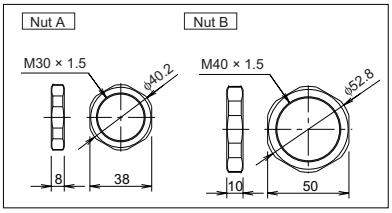
5.10 RCA-RGS4D

ME: Mechanical End SE: Stroke End

[Without Brake Type]







■ Dimensions and Weight by Stroke

RCA-RGS4D (Without brake)

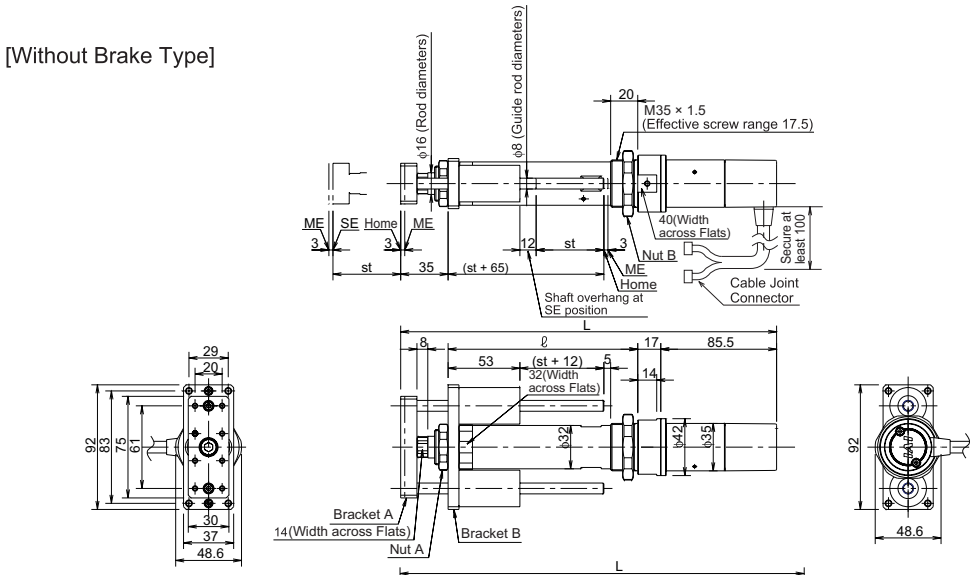
Stroke			50	100	150	200	250	300
L	20W	Incremental	250.5	300.5	350.5	400.5	450.5	500.5
		Absolute	263.5	313.5	363.5	413.5	463.5	513.5
	30W	Incremental	265.5	315.5	365.5	415.5	465.5	515.5
		Absolute	278.5	328.5	378.5	428.5	478.5	528.5
ℓ			145	195	245	295	345	395
m	20W	Incremental	45.5					
		Absolute	58.5					
	30W	Incremental	60.5					
		Absolute	73.5					
Weight [kg]			1.3	1.5	1.7	1.9	2.1	2.3

RCA-RGS4D type is no breake-equipped type.

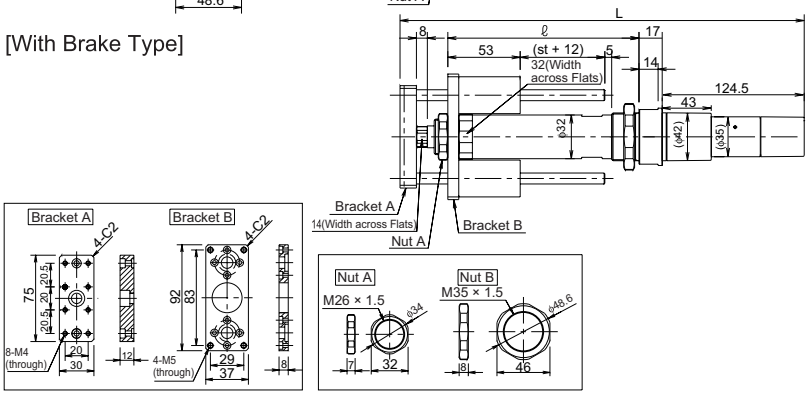
5.11 RCA-RGD3C

ME: Mechanical End SE: Stroke End

[Without Brake Type]



[With Brake Type]



■ Dimensions and Weight by Stroke

RCA-RGD3C (Without brake)

Stroke	50	100	150	200
L	277.5	327.5	377.5	427.5
ℓ	140	190	240	290
Weight [kg]	1.1	1.2	1.4	1.5

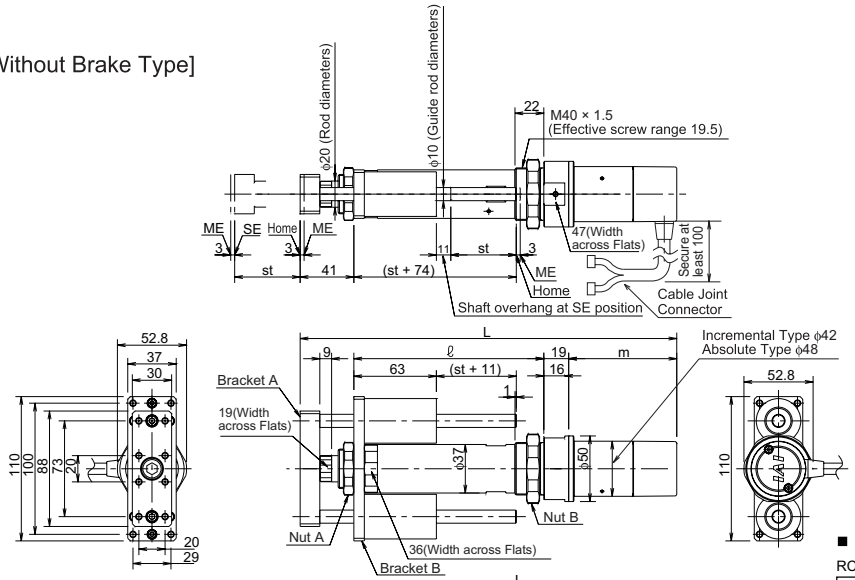
RCA-RGD3C (With brake)

Stroke	50	100	150	200
L	316.5	366.5	416.5	466.5
ℓ	140	190	240	290
Weight [kg]	1.3	1.4	1.6	1.7

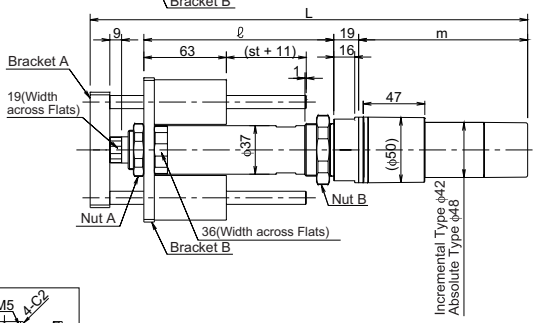
5.12 RCA-RGD4C

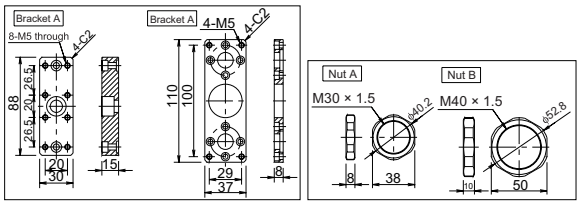
ME: Mechanical End SE: Stroke End

[Without Brake Type]



[With Brake Type]





■ Dimensions and Weight by Stroke

RCA-RGD4C (Without brake)

Stroke			50	100	150	200	250	300
L	20W	Incremental	272.5	322.5	372.5	422.5	472.5	522.5
		Absolute	285.5	335.5	385.5	435.5	485.5	535.5
	30W	Incremental	287.5	337.5	387.5	437.5	487.5	537.5
		Absolute	300.5	350.5	400.5	450.5	500.5	550.5
ℓ			145	195	245	295	345	395
m	20W	Incremental	67.5					
		Absolute	80.5					
	30W	Incremental	82.5					
		Absolute	95.5					
Weight [kg]			1.8	2.0	2.2	2.4	2.6	2.8

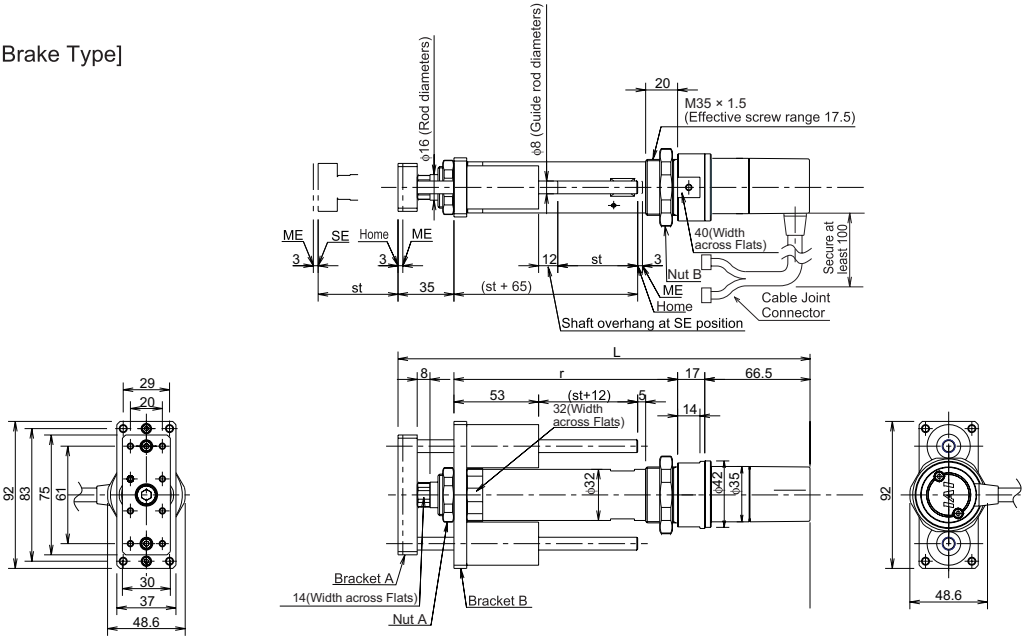
RCA-RGD4C (With brake)

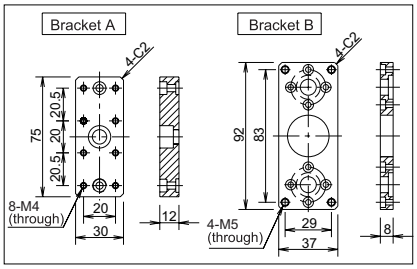
Stroke			50	100	150	200	250	300
L	20W	Incremental	315.5	365.5	415.5	465.5	515.5	565.5
		Absolute	328.5	378.5	428.5	478.5	528.5	578.5
	30W	Incremental	330.5	380.5	430.5	480.5	530.5	580.5
		Absolute	343.5	393.5	443.5	493.5	543.5	593.5
ℓ			145	195	245	295	345	395
m	20W	Incremental	110.5					
		Absolute	123.5					
	30W	Incremental	125.5					
		Absolute	138.5					
Weight [kg]			2.0	2.2	2.4	2.6	2.8	3.0

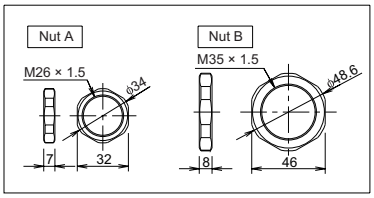
5.13 RCA-RGD3D

ME: Mechanical End SE: Stroke End

[Without Brake Type]







■ Dimensions and Weight by Stroke

RCA-RGD3D (Without brake)

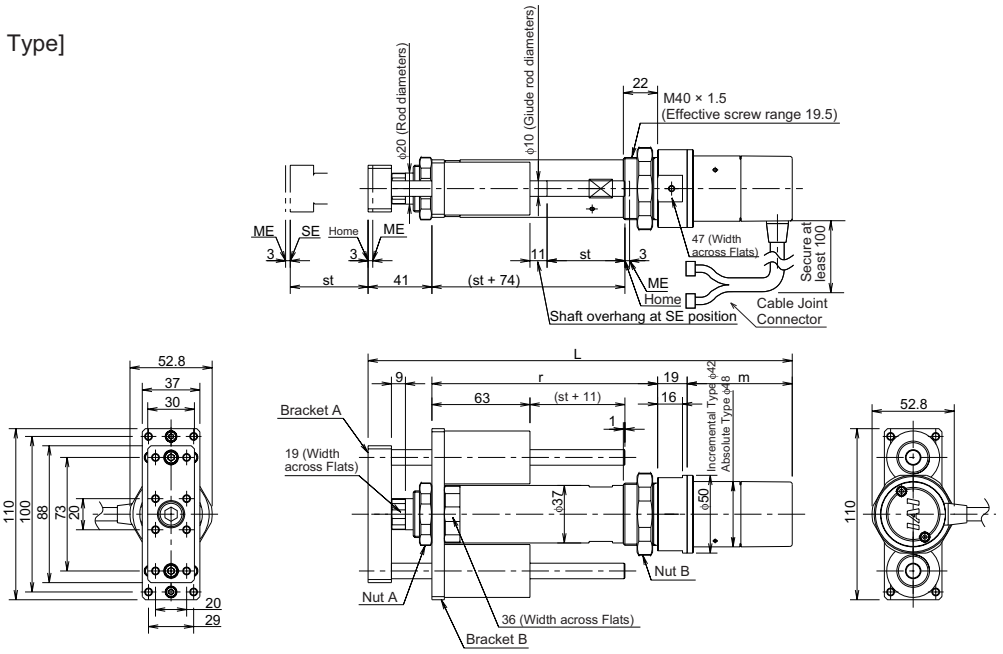
Stroke	50	100	150	200
L	258.5	308.5	358.5	408.5
ℓ	140	190	240	290
Weight [kg]	1.1	1.2	1.4	1.5

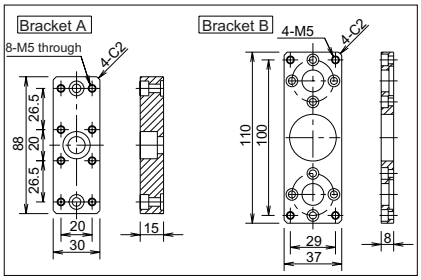
RCA-RGD3D type is no breake-equipped type.

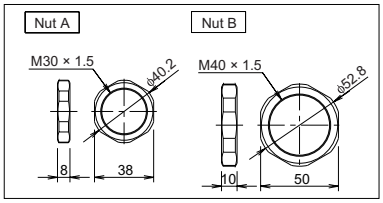
5.14 RCA-RGD4D

ME: Mechanical End SE: Stroke End

[Without Brake Type]







■ Dimensions and Weight by Stroke

RCA-RGD4D (Without brake)

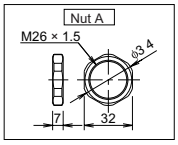
Stroke			50	100	150	200	250	300
L	20W	Incremental	250.5	300.5	350.5	400.5	450.5	500.5
		Absolute	263.5	313.5	363.5	413.5	463.5	513.5
	30W	Incremental	265.5	315.5	365.5	415.5	465.5	515.5
		Absolute	278.5	328.5	378.5	428.5	478.5	528.5
ℓ			145	195	245	295	345	395
m	20W	Incremental	45.5					
		Absolute	58.5					
	30W	Incremental	60.5					
		Absolute	73.5					
Weight [kg]			1.6	1.8	2.1	2.3	2.5	2.7

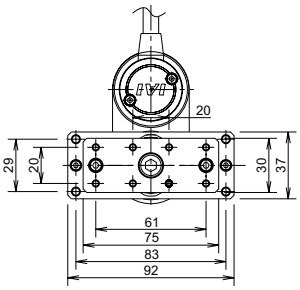
RCA-RGD4D type is no breake-equipped type.

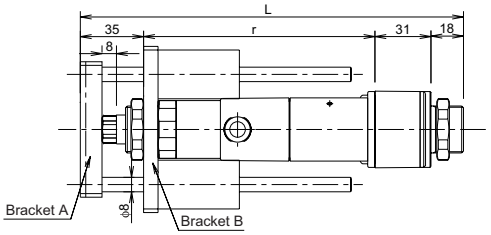
5.15 RCA-RGD3R

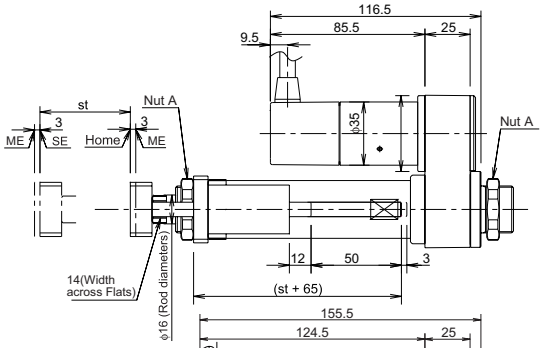
ME: Mechanical End SE: Stroke End

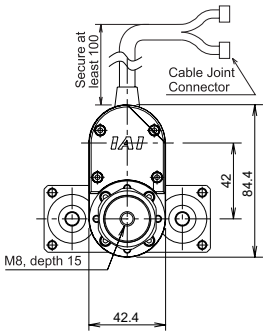
[Without Brake Type]



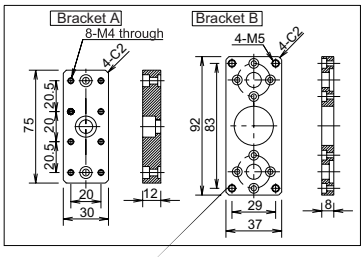


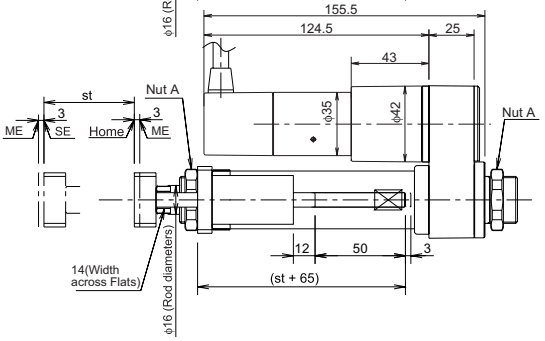






[With Brake Type]





■ Dimensions and Weight by Stroke

RCA-RGD3R (Without brake)

Stroke	50	100	150	200
L	212	262	312	362
ℓ	128	178	228	278
Weight [kg]	1.2	1.3	1.5	1.6

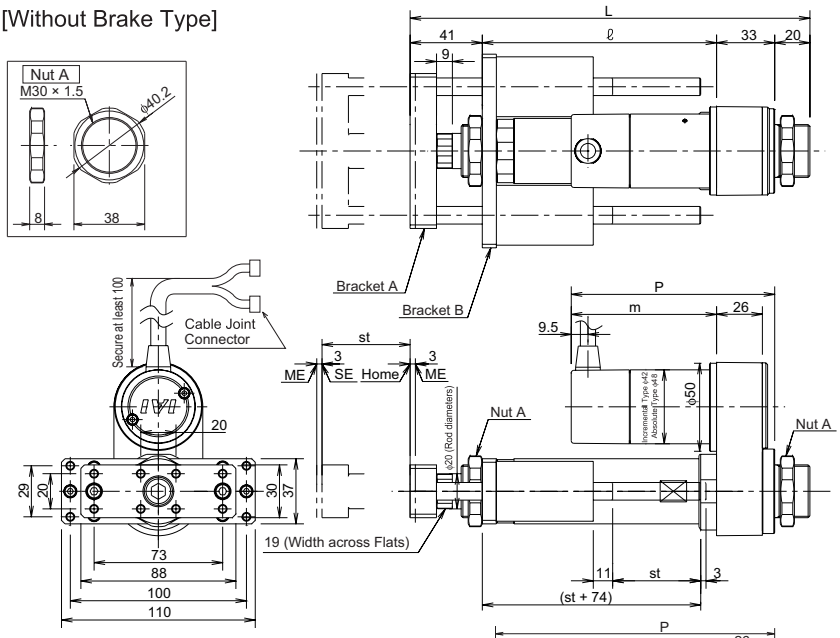
RCA-RGD3R (With brake)

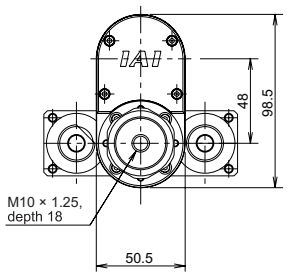
Stroke	50	100	150	200
L	212	262	312	362
ℓ	128	178	228	278
Weight [kg]	1.4	1.5	1.7	1.8

5.16 RCA-RGD4R

ME: Mechanical End SE: Stroke End

[Without Brake Type]



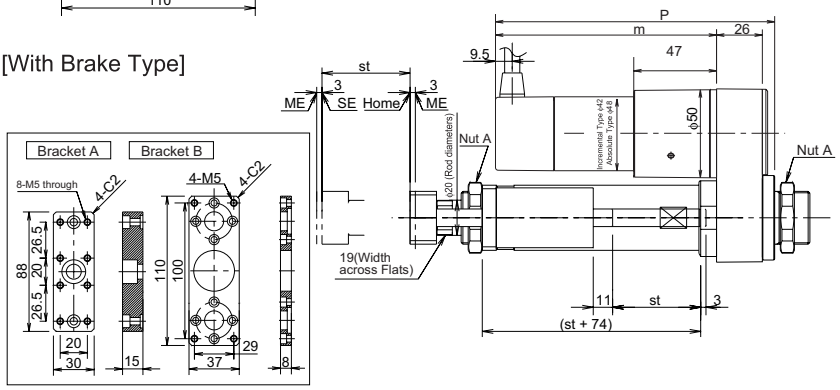


■ Dimensions and Weight by Stroke

RCA-RGD4R (Without brake)

Stroke			50	100	150	200	250	300
L	20W	Incremental	227	277	327	377	427	477
		Absolute	227	277	327	377	427	477
	30W	Incremental	227	277	327	377	427	477
		Absolute	227	277	327	377	427	477
ℓ			133	183	233	283	333	383
m	20W	Incremental	67.5					
		Absolute	80.5					
	30W	Incremental	82.5					
		Absolute	95.5					
P	20W	Incremental	100.5					
		Absolute	113.5					
	30W	Incremental	115.5					
		Absolute	128.5					
Weight [kg]			1.9	2.2	2.3	2.6	2.7	3.0

[With Brake Type]



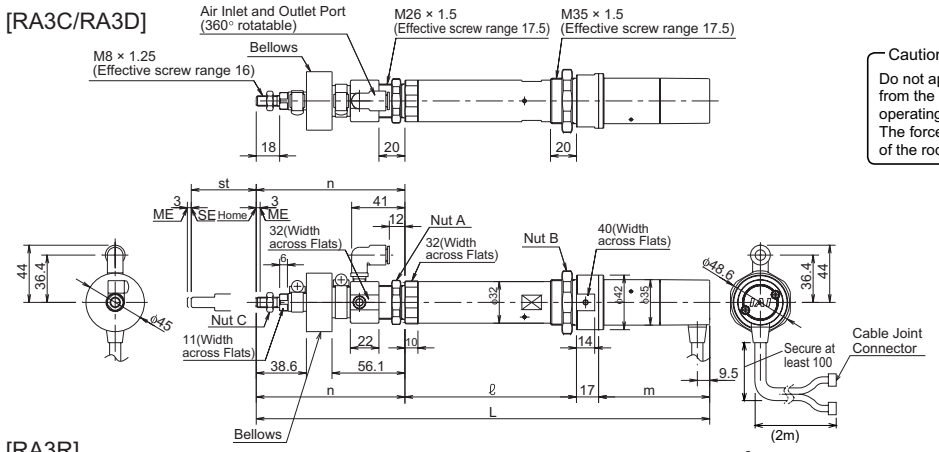
RCA-RGD4R (With brake)

Stroke			50	100	150	200	250	300
L	20W	Incremental	227	277	327	377	427	477
		Absolute	227	277	327	377	427	477
	30W	Incremental	227	277	327	377	427	477
		Absolute	227	277	327	377	427	477
ℓ			133	183	233	283	333	383
m	20W	Incremental	110.5					
		Absolute	123.5					
	30W	Incremental	125.5					
		Absolute	138.5					
P	20W	Incremental	143.5					
		Absolute	156.5					
	30W	Incremental	158.5					
		Absolute	171.5					
Weight [kg]			2.1	2.4	2.5	2.8	2.9	3.2

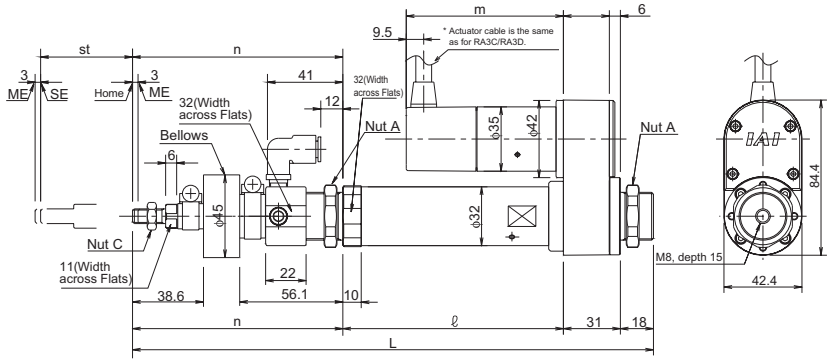
5.17 RCAW-RA3C/RA3D/RA3R

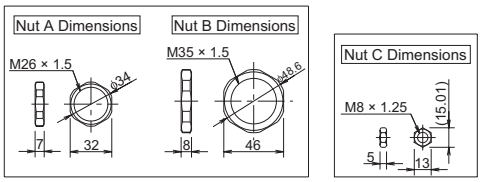
ME: Mechanical End SE: Stroke End

[RA3C/RA3D]



[RA3R]





Caution

Do not apply any external force to the rod from the directions other than the rod operating directions.
The force in the vertical or rotational direction of the rod may damage the stopper.

■ Dimensions and Weight by Stroke

RCAW-RA3C/RA3D/RA3R (Without brake)

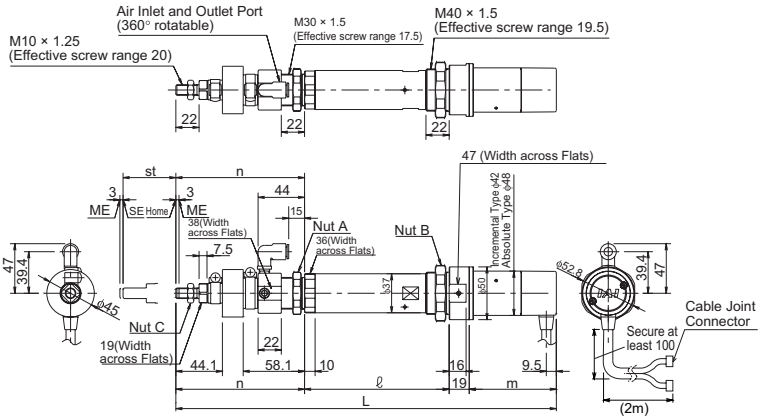
Stroke		50	100	150	200
L	RA3C	348.9	408.9	468.9	528.9
	RA3D	329.9	389.9	449.9	509.9
	RA3R	283.4	343.4	403.4	463.4
ℓ	RA3C	132	182	232	282
	RA3D	132	182	232	282
	RA3R	120	170	220	270
m	RA3C	85.5			
	RA3D	66.5			
	RA3R	85.5			
n	RA3C	114.4	124.4	134.4	144.4
	RA3D	114.4	124.4	134.4	144.4
	RA3R	114.4	124.4	134.4	144.4
Weight [kg]	RA3C	1.0	1.1	1.2	1.3
	RA3D	1.0	1.1	1.2	1.3
	RA3R	1.1	1.2	1.3	1.4

RCAW-RA3C/RA3D/RA3R (With brake)

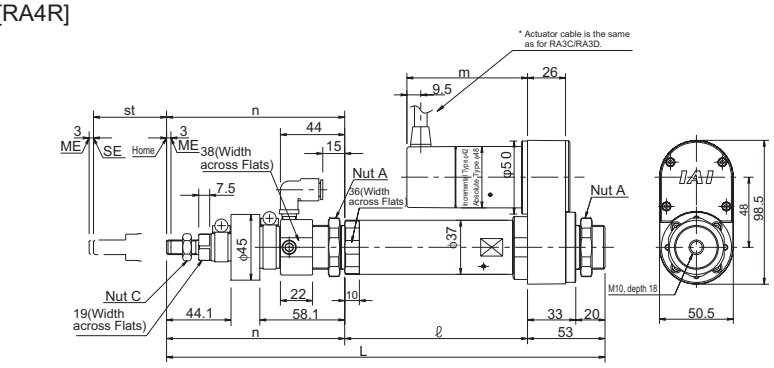
Stroke		50	100	150	200
L	RA3C	387.9	447.9	507.9	567.9
	RA3D	There is no brake-equipped type.			
	RA3R	283.4	343.4	403.4	463.4
ℓ	RA3C	132	182	232	282
	RA3D	There is no brake-equipped type.			
	RA3R	120	170	220	270
m	RA3C	124.5			
	RA3D	There is no brake-equipped type.			
	RA3R	124.5			
n	RA3C	114.4	124.4	134.4	144.4
	RA3D	There is no brake-equipped type.			
	RA3R	114.4	124.4	134.4	144.4
Weight [kg]	RA3C	1.2	1.3	1.4	1.5
	RA3D	1.2	1.3	1.4	1.5
	RA3R	1.3	1.4	1.5	1.6

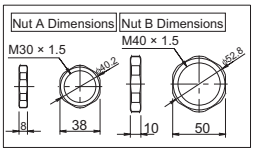
5.18 RCAW-RA4C/RA4D/RA4R

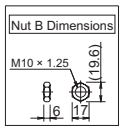
[RA4C/RA4D]



[RA4R]







Caution

Do not apply any external force to the rod from the directions other than the rod operating directions.
The force in the vertical or rotational direction of the rod may damage the stopper.

■ Dimensions and Weight by Stroke

RCAW-RA4C/RA4D/RA4R (Without brake)

Stroke				50	100	150	200	250	300
L	RA4C	20W	Incremental	345.4	405.4	465.4	525.4	586.4	647.4
			Absolute	358.4	418.4	478.4	538.4	599.4	660.4
		30W	Incremental	360.4	420.4	480.4	540.4	601.4	662.4
			Absolute	373.4	433.4	493.4	553.4	614.4	675.4
	RA4D	20W	Incremental	323.4	383.4	443.4	503.4	564.4	625.4
			Absolute	336.4	396.4	456.4	516.4	577.4	638.4
		30W	Incremental	338.4	398.4	458.4	518.4	579.4	640.4
			Absolute	351.4	411.4	471.4	531.4	592.4	653.4
	RA4R	20W	Incremental	299.9	359.9	419.9	479.9	540.9	601.9
			Absolute	299.9	359.9	419.9	479.9	540.9	601.9
		30W	Incremental	299.9	359.9	419.9	479.9	540.9	601.9
			Absolute	299.9	359.9	419.9	479.9	540.9	601.9
ℓ	RA4C	20W	Common to Incremental Absolute	137	187	237	287	337	387
		30W		137	187	237	287	337	387
	RA4D	20W		137	187	237	287	337	387
		30W		137	187	237	287	337	387
	RA4R	20W		125	175	225	275	325	375
		30W		125	175	225	275	325	375
m	RA4C	20W	Incremental	67.5					
			Absolute	80.5					
		30W	Incremental	82.5					
			Absolute	95.5					
	RA4D	20W	Incremental	45.5					
			Absolute	58.5					
		30W	Incremental	60.5					
			Absolute	73.5					
	RA4R	20W	Incremental	67.5					
			Absolute	80.5					
		30W	Incremental	82.5					
			Absolute	95.5					
n	RA4C	20W	Common to Incremental Absolute	121.9	131.9	141.9	151.9	162.9	173.9
		30W		121.9	131.9	141.9	151.9	162.9	173.9
	RA4D	20W		121.9	131.9	141.9	151.9	162.9	173.9
		30W		121.9	131.9	141.9	151.9	162.9	173.9
	RA4R	20W		121.9	131.9	141.9	151.9	162.9	173.9
		30W		121.9	131.9	141.9	151.9	162.9	173.9
Weight [kg]	RA4C	20W/30W		1.4	1.5	1.7	1.8	2.0	2.1
	RA4D	20W/30W		1.3	1.5	1.6	1.8	1.9	2.1
	RA4R	20W/30W		1.5	1.7	1.8	2.0	2.1	2.3

* The total length of RA4C Type is extended to 43mm if it is equipped with a brake. Although the motor part is extended to 43mm also for RA4R Type, since it is the reversed type, the total length does not change. Also, the weight increases in 0.2kg for all the models.

6. Life

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

7. Warranty

7.1 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

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 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.

7.3 Honoring the Warranty

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

7.4 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.

7.5 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.

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 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
April 2011	Fifth edition A page for CE Marking added
March 2012	Sixth edition CAUTION deleted Pg. 1 to 7 Contents added and changed in Safety Guide Pg. 8 Caution in Handling added Pg. 10, 11 Contents changed in 3. Warranty Pg. 38 Warning notes added such as in case the grease got into your eye, Pg. 64 to 81 immediately go to see the doctor for an appropriate care. External Dimensions added
September 2012	Seventh edition Revised overall Contents added in Motor reversing type
October 2012	Edition 7B Note corrected
November 2012	Eighth edition Pg. 54 Connecting the Air Tube of the RCAW Dustproof Splash-proof Type is added to 2.3.3.
December 2014	Edition 8C Pg. 15 P5: ACON-CA added in applicable controllers Pg. 19 No. of Encoder Pulses 200 → 800 Pg. 39, 55 Cable changed to CB-ASEP2-MPA□□□

Manual No.: ME3653-8C (December 2014)

IAI
Quality and Innovation

IAI Corporation

Head Office: 577-1 Obane Shimizu-KU Shizuoka City Shizuoka 424-0103, Japan
TEL +81-54-364-5105 FAX +81-54-364-2589
website: www.iai-robot.co.jp/

Technical Support available in USA, Europe and China

IAI America, Inc.

Head Office: 2690 W. 237th Street, Torrance, CA 90505
TEL (310) 891-6015 FAX (310) 891-0815
Chicago Office: 110 East State Parkway, Schaumburg, IL 60173
TEL (847) 908-1400 FAX (847) 908-1399
Atlanta Office: 1220 Kennestone Circle, Suite 108, Marietta, GA 30066
TEL (678) 354-9470 FAX (678) 354-9471
website: www.intelligentactuator.com

IAI Industrieroboter GmbH

Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany
TEL 06196-88950 FAX 06196-889524

IAI (Shanghai) Co., Ltd.

SHANGHAI JIAHUA BUSINESS CENTER A8-303, 808, Hongqiao Rd. Shanghai 200030, China
TEL 021-6448-4753 FAX 021-6448-3992
website: www.iai-robot.com

IAI Robot (Thailand) Co., Ltd.

825, PhairojKijja Tower 12th Floor, Bangna-Trad RD., Bangna, Bangna, Bangkok 10260, Thailand
TEL +66-2-361-4458 FAX +66-2-361-4456

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