ROBO CYLINDER

ROBO Cylinder
RCA2 Actuator
Slider Type

Operating Manual

Twelfth Edition

Motor coupling types: [Slim Small ROBO Cylinder] SA2AC
SA3C • SA4C • SA5C • SA6C
Motor reversing types: [Slim Small ROBO Cylinder] SA2AR
SA3R • SA4R • SA5R • SA6R

IAI America, Inc.

ROBO CYLINDER

Please Read Before Use

Thank you for purchasing our product.

This operating 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 DVD that comes with the product contains operating manuals for IAI products.
When using the product, refer to the necessary portions of the applicable instruction manual by printing them out or displaying them on a PC.

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

[Important]

- This operating manual is original.
- This product is not to be used for any other purpose from what is noted in this operating manual. IAI shall not be liable whatsoever for any loss or damage arising from the result of using the product for any other purpose from what is noted in the manual.
- The information contained in this operating manual is subject to change without notice for the purpose of production improvement.
- If you have any question or finding regarding the information contained in this operating manual, contact our customer center or our sales office near you.
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- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.

Table of Contents

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 1before 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 0.5mm2 (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 100□ or below).
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.

No.	Operation Description	Description
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.
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

Caution in Handling

1. Make sure to follow the usage condition, environment and specification range of the product.
   Operation out of the guarantee could cause a drop in performance or malfunction of the product.

2. Do not set a speed or acceleration/deceleration exceeding the applicable rating.
   Do not set a speed or acceleration/deceleration exceeding the applicable rating. Doing so may result in vibration, failure or shorter life. If an acceleration/deceleration exceeding the rating is set, creep may occur or the coupling may slip.

3. Keep the load moments to within the allowable value.
   Keep the load moments to within the allowable value. If a load exceeding the allowable load moment is applied, the life of the actuator may be reduced. In an extreme case, even flaking may occur.

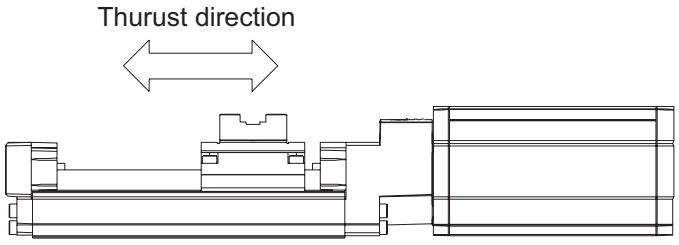
4. Keep the overhang length to within the allowable value.
   Keep the overhang length of the load to within the allowable value. If the overhang length exceeds the allowable value, vibration or noise may occur.

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

6. Turn on the servo after confirming that the slider or rod is away from the mechanical end.
   If the servo is turned on when the slider or rod is near the mechanical end, pole phase detection may not be performed correctly and an pole non-confirmation error or excitation detection error may occur. Move the slider or rod away from the mechanical end before turning on the servo.

7. Be careful not to subject the actuator to an external force or an impact load in the axial or thrust direction in excess of allowable capacity.
   Subjecting the actuator to an external force or an impact load at levels above the allowable capacity may damage or destroy internal components.

Model	Allowable external force in thrust direction [N (kgf)]
SA3	50 (5.1)
SA4	160 (16.3)
SA5	220 (22.4)
SA6	220 (22.4)



8. Sometimes the slider may not move even when an external force is applied. In this case, do not forcibly move the slider, but use the PC software or teaching pendant to jog the slider.
   actuator damage may occur such as broken nut.

9. Handle the stainless steel sheet with special care.
   - The stainless steel sheet is attached by absorption to the side cover. If the environment contains high levels of iron filings or other magnetic matter, this may become absorbed between the stainless steel sheet and the rubber and cause malfunction. For that reason, avoid usage in such an environment.
   - Keep adhesive, paint, and other viscous material off the stainless steel sheet. Such material sticking to the stainless steel sheet can lead to defective slider operation and stainless steel sheet damage.
   - Be careful to avoid localized force on the stainless steel sheet. Such force could deform the stainless steel sheet and cause malfunctions.
     Also, during installation and transport, do not hold on to or press on the stainless steel sheet. Doing so could damage the stainless steel sheet.

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

International Standards Compliances

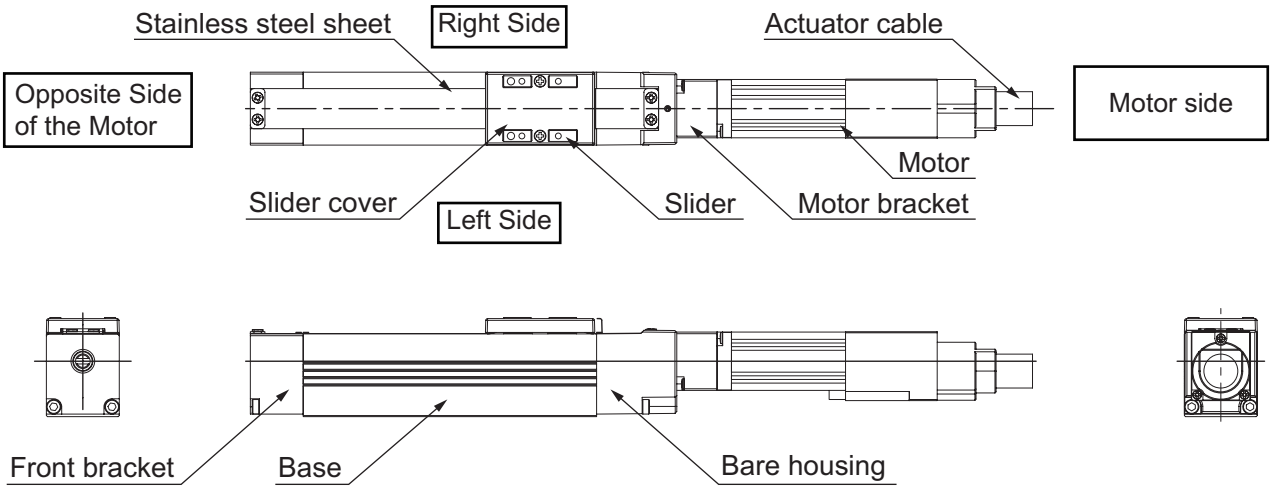
This actuator complies with the following overseas standard.
Refer to Overseas Standard Compliance Manual (ME0287) for more detailed information.

RoHS Directive	CE Marking
○	○

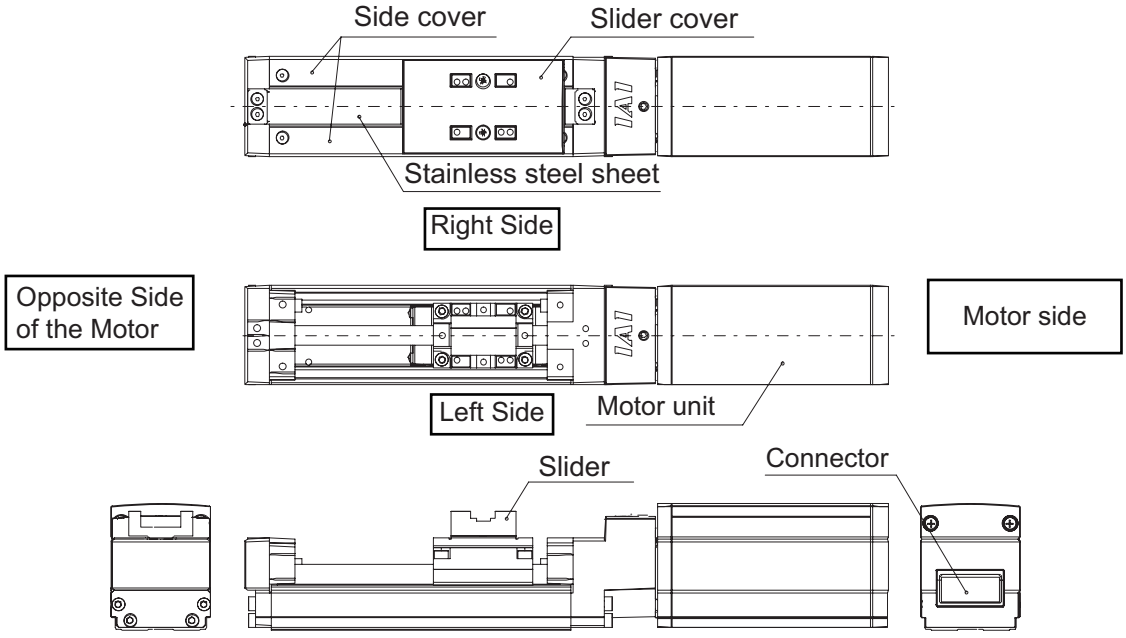
Names of the Parts

In this 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.

• Motor coupling types: RCA2-SA2AC

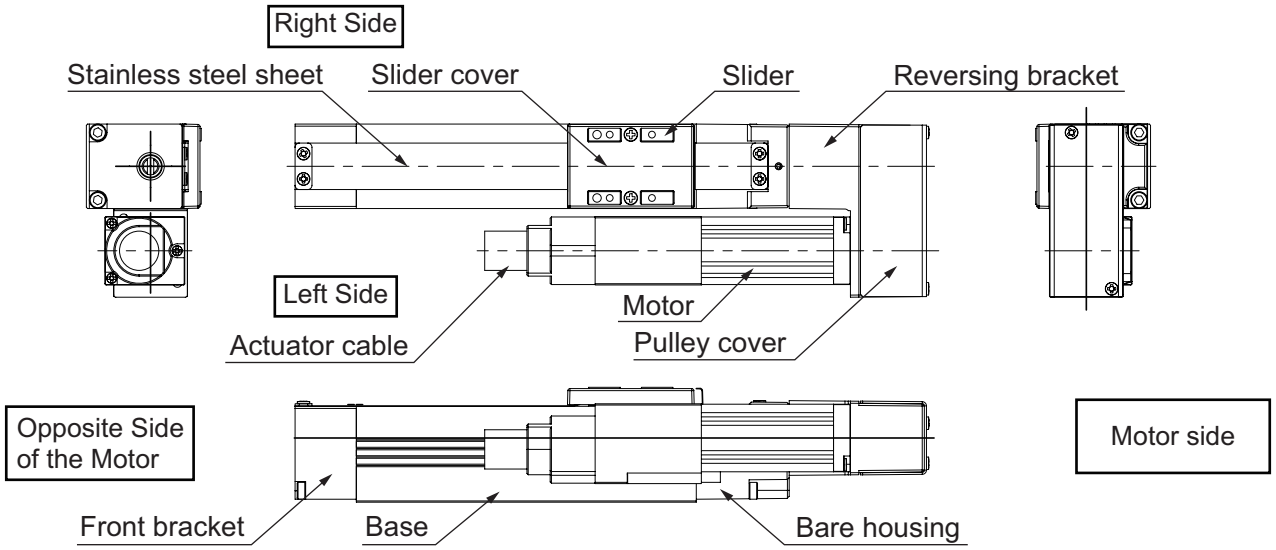


• Motor coupling types: RCA2-SA3C/SA4C/SA5C/SA6C

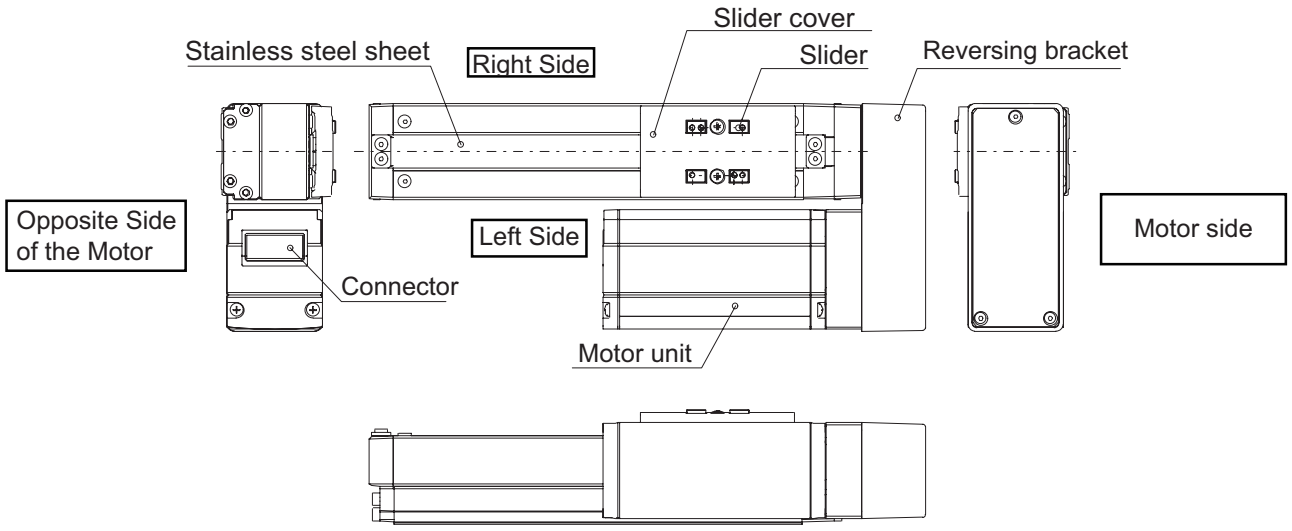


The connector position shown above assumes that the cable exit direction has not been changed.

• Motor reversing types: RCA2-SA2AR



• Motor reversing types: RCA2-SA3R/SA4R/SA5R/SA6R



The connector position shown above assumes that the cable exit direction has not been changed.

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

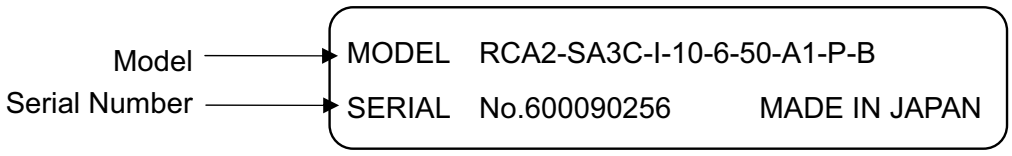
No.	Name	Model number	Quantity	Remarks
1	Actuator	Refer to “How to Read the Model Nameplate” and “How to Read the Model Number.”	1	
Accessories				
2	Motor • encoder cables (Note1)		1	
3	First Step Guide		1	
4	Operating Manual (DVD)		1	
5	Safety Guide		1	

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

1.1.2 Operating Manuals for the Controllers Related to this Product

No.	Name	Control No.
1	Operating Manual for ASEL Controller	ME0165
2	Operating Manual for ACON-C/CG/CF Controller	ME0176
3	Operating Manual for ACON-CY Controller	ME0167
4	Operating Manual for ACON-SE Controller	ME0171
5	Operating Manual for ACON-PL/PO Controller	ME0166
6	Operating Manual for MEC Controller	ME0245
7	Operating Manual for PSEP/ASEP/DSEP Controller	ME0267
8	Operating Manual for MSEP Controller	ME0299
9	Operating Manual for PC Software IA-101-X-MW/IA-101-X-USBMW	ME0154
10	Operating Manual for ROBONET	ME0208
11	Operating Manual for Software RCM-101-MW/RCM-101-USB	ME0155
12	Operating Manual for MEC PC Software	ME0248
13	Operating Manual for Teaching Pendant SEL-T/TD	ME0183
14	Operating Manual for Teaching Pendant CON-T/TG	ME0178
15	Operating Manual for Touch Panel Teaching Pendant CON-PT/PD/PG	ME 0227
16	Operating Manual for Touch Panel Teaching CON-PTA/PDA/PGA	ME0295
17	Operating Manual for Dedicated ASEP/PSEP Touch Panel Teaching SEP-PT	ME0217
18	Operating Manual for Simple Teaching Pendant RCM-E	ME0174
19	Operating Manual for Data Setter RCM-P	ME0175
20	Operating Manual for Touch Panel Display RCM-PM-01	ME0182

1.1.3 How to Read the Model Nameplate



1.1.4 How to Read the Model Number

RCA2-SA3C-I-10-6-50-A1-P-B-**

Series Name

<Type>
Motor coupling
SA2AC
SA3C
SA4C
SA5C
SA6C
Motor reversing
SA2AR
SA3R
SA4R
SA5R
SA6R

<Encoder Type>
I: Incremental

<Motor Type>
5 (5W): SA2AC, SA2AR
10 (10W): SA3C, SA3R
20 (20W): SA4C, SA4R
SA5C, SA5R
30 (30W): SA6C, SA6R

Identification for IAI use only(Note1)

<Options>
B: With brake
CJT: Different cable exit direction (top)
CJR: Different cable exit direction (right)
CJL: Different cable exit direction (left)
CJB: Different cable exit direction (bottom)
CJO: Different cable exit direction (outer)
ML: Motor left reversing type
MR: Motor right reversing type
LA: Power-saving measure
NCO: No-cover specification
NM: Reversed-home specification

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

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

<Stroke>
[Refer to 1.2 “Specifications”]

<Lead>
SA2AC, SA2AR
1/2/4
SA3C, SA3R
2/4/6
SA4C, SA4R
2.5/5/10
SA5C, SA5R
3/6/12
SA5C
20
SA6C, SA6R
3/6/12
SA6C
20

Note 1 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)

Model	Motor Type	Lead [mm]	Minimum Speed	Stroke [mm]																	
				25	50	75	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
SA2A	5W	1	1.25	50				–	–	–	–	–	–	–	–	–	–	–	–	–	–
		2	2.5	100				–	–	–	–	–	–	–	–	–	–	–	–	–	–
		4	5	180	200			–	–	–	–	–	–	–	–	–	–	–	–	–	–
SA3	10W	2	2.5	–	100	–	100					–	–	–	–	–	–	–	–	–	–
		4	5	–	200	–	200					–	–	–	–	–	–	–	–	–	–
		6	7.5	–	300	–	300					–	–	–	–	–	–	–	–	–	–
SA4	20W	2.5	3.12	–	125	–	125									–	–	–	–	–	–
		5	6.25	–	250	–	250									–	–	–	–	–	–
		10	12.5	–	380	–	500									–	–	–	–	–	–
SA5	20W	3	3.75	–	150	–	150										140	120	105	90	80
		6	7.5	–	300	–	300										285	245	210	185	165
		12	15	–	380	–	540	600									570	490	425	370	330
SA5C	20W	20	25	–	380	–	540	660	770	860	940	1000						910	790	690	610
				–	380	–	540	660	770	800 (stroke 250 to 650, installed vertically)									790	690	610
SA6	30W	3	3.75	–	150	–	150										140	120	105	90	80
		6	7.5	–	300	–	300										285	245	210	185	165
		12	15	–	380	–	540	600									570	490	425	370	330
SA6C	30W	20	25	–	380	–	540	660	770	860	940	1000						910	790	690	610
				–	380	–	540	660	770	800 (stroke 250 to 650, installed vertically)									790	690	610

The maximum speed may not be reached depending on the acceleration/deceleration setting.

1.2.2 Acceleration and payload

Model	Motor Type	Lead [mm]	Rated acceleration (G)		Payload (Kg)	Rated thrust (N)
SA2A	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	
SA3	10W	2	Horizontal	0.2	3	85
			Vertical	0.2	1.5	
		4	Horizontal	0.3	2	43
			Vertical	0.2	1	
		6	Horizontal	0.3	1	28
			Vertical	0.2	0.5	
SA4	20W	2.5	Horizontal	0.3	6	136
			Vertical	0.2	3	
		5	Horizontal	0.3	4	68
			Vertical	0.2	1.5	
		10	Horizontal	0.3	2	34
			Vertical	0.2	1	
SA5	20W	3	Horizontal	0.3	9	68
			Vertical	0.2	3	
		6	Horizontal	0.3	6	34
			Vertical	0.2	1.5	
		12	Horizontal	0.3	3	17
			Vertical	0.2	1	
SA5C	20W	20	Horizontal	0.3	2	10.1
			Vertical	0.2	0.5	
SA6	30W	3	Horizontal	0.3	10	10.5
			Vertical	0.2	4	
		6	Horizontal	0.3	7	53
			Vertical	0.2	2	
		12	Horizontal	0.3	4	26
			Vertical	0.2	1.5	
SA6C	30W	20	Horizontal	0.3	2	16
			Vertical	0.2	0.5	

⚠ Caution: Do not set speeds and accelerations/decelerations equal to or greater than the respective ratings. Doing so may result in vibration, failure or shorter life.
If any acceleration/deceleration equal to or greater than the rated acceleration/deceleration is set, a creep phenomenon or slipped coupling may occur.

1.2.3 Drive method

Type	Motor Type	Lead	No. of Encoder Pulses	Ball Screw Type		
				Type	Diameter	Accuracy
SA2A	5W	1	800	Rolled	ϕ4mm	C10
		2				
		4				
SA3	10W	2		Rolled	ϕ6mm	C10
		4				
		6				
SA4	20W	2.5		Rolled	ϕ8mm	C10
		5				
		10				
SA5	20W	3		Rolled	ϕ10mm	C10
		6				
		12				
SA5C		20				
SA6	30W	3		Rolled	ϕ10mm	C10
		6				
		12				
SA6C		20				

1.2.4 Common specifications

Item	Specifications	
	SA5C, SA6C – Lead other than 20mm	SA5C, SA6C – Lead 20mm
Positioning Repeatability(Note1)	±0.02mm	±0.03mm
Backlash(Note1)	0.1mm or less	
Base	SA2AC, SA2AR	Other than SA2AC, SA2AR
	Material: Aluminum with white alumite treatment	Material: Aluminum with special 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 Ratio in Continuous Operation

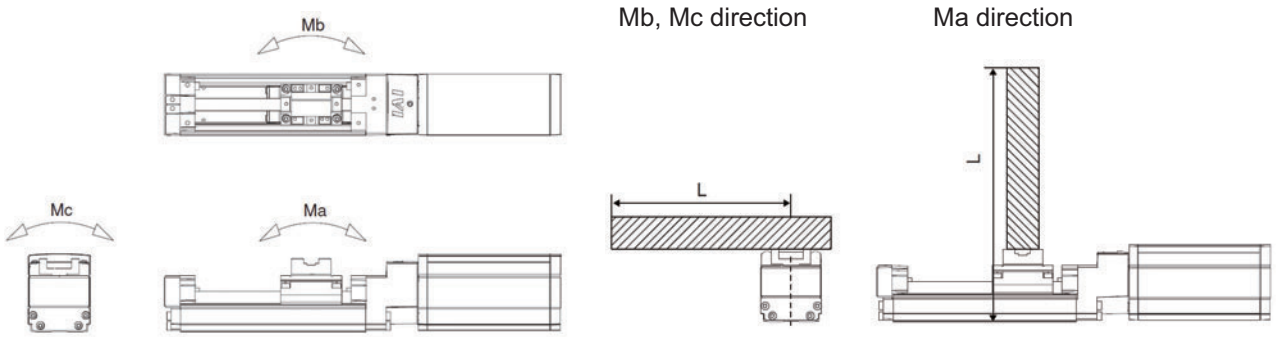
The duty ratio is the ratio of operation expressed in % to show the duration when the actuator is operating in 1 cycle.
The duty ratio may differ depending on the load ratio and the acceleration/deceleration time ratio.
[Refer to 4.1 “Duty Ratio in Continuous Operation”]

1.2.6 Allowable Load Moments of the Actuator

Type	Allowable Dynamic Load Moment [N·m]			Allowable Static Load Moment [N·m]			Allowable Overhang Load Length (L)
	Ma	Mb	Mc	Ma	Mb	Mc	
SA2A	0.18 (0.018)	0.16 (0.016)	0.23 (0.023)	2.3 (0.23)	1.9 (0.19)	2.9 (0.30)	Ma direction: 40mm or less Mb, Mc direction: 40mm or less
SA3	1.96 (0.2)	2.84 (0.29)	3.14 (0.32)	5.0 (0.51)	7.1 (0.72)	7.9 (0.81)	Ma direction: 100mm or less Mb, Mc direction: 100mm or less
SA4	3.04 (0.31)	4.31 (0.44)	5.00 (0.51)	6.8 (0.69)	9.7 (0.99)	13.3 (1.36)	Ma direction: 120mm or less Mb, Mc direction: 120mm or less
SA5	3.92 (0.40)	5.58 (0.57)	8.53 (0.87)	10.2 (1.04)	14.6 (1.49)	22.4 (2.29)	Ma direction: 130mm or less Mb, Mc direction: 130mm or less
SA6	4.31 (0.44)	6.17 (0.63)	10.98 (1.12)	17.6 (1.80)	25.2 (2.57)	44.5 (4.54)	Ma direction: 150mm or less Mb, Mc direction: 150mm or less

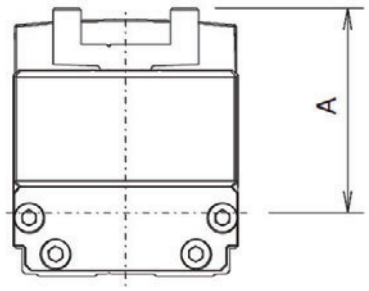
Load moment direction

Overhang load length direction



When calculating the moment in Ma or Mc direction, offset the reference position by A mm from the top surface of the slider, as shown in the figure below.

"Slider type"



Ma, Mc moment guide offset distance

Model	SA2A	SA3	SA4	SA5	SA6
A (mm)	23.5	29.5	36.5	43.5	47

⚠ Caution: An operation beyond the allowable moment and overhang load length would not only generate abnormal noise and vibration, but also may shorten the life of actuator extremely.

1.3 Options

1.3.1 Brake Types (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.

1.3.2 Power-saving Measure (Model: LA)

As shown in the table below, the maximum load current of the standard specification and high acceleration/deceleration specification can be lowered.
For details, refer to the section on power capacity in the manual for your ACON/ASEL controller.

Model	Standard specification / High acceleration/deceleration specification Maximum load current	Energy-saving measure Maximum load current
SA3, SA5	4.4A	2.5A
SA6	4.0A	2.2A
SA4	5.1A	3.4A

1.3.3 No-cover Specification (Model: NCO)

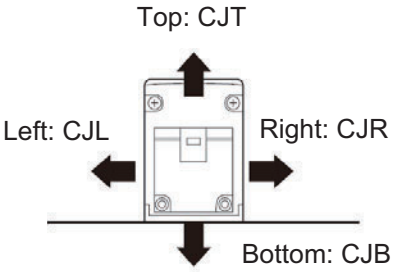
Actuators of the no-cover specification have no side covers.
(For the external dimensions of actuators with/without side covers, refer to 7. “External Dimensions.”)

1.3.4 Reversed-home Specification (Model: NM)

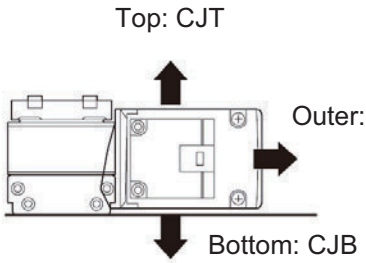
The standard home position is on the motor side. However, the motor position will be reversed if it is desirable in view of the layout of the system, etc.
(Note) The home position is adjusted at the factory before shipment. If you wish to change the home after the delivery of your actuator, you must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

1.3.5 Changing the Cable Exit Direction (Model: CJT, CJR, CJL, CJO, CJB)

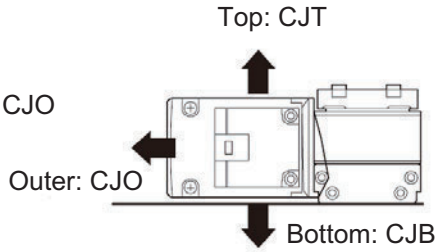
If the cable exit direction is changed, the applicable part of the model number must also be changed.
A desired direction can be selected from among the five options of top (CJT in the model number), right (CJR), left (CJL), bottom (CJB) and outer (CJO).



Coupling type



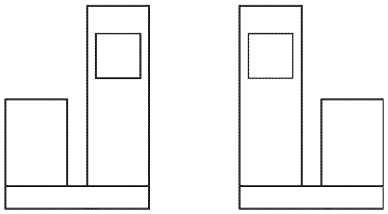
Motor-reversing type,
reversed to left (ML)



Motor-reversing type,
reversed to Right (MR)

1.3.6 Motor Reversing to Left, Motor Reversing to Right (Model: ML, MR)

The reversing direction changes in each model code for the motor reversing types SA2AR, SA3R, SA4R, SA5R and SA6R.
From the view of motor side, reversing to the left is ML and reversing to the right is MR.



ML
(Left)

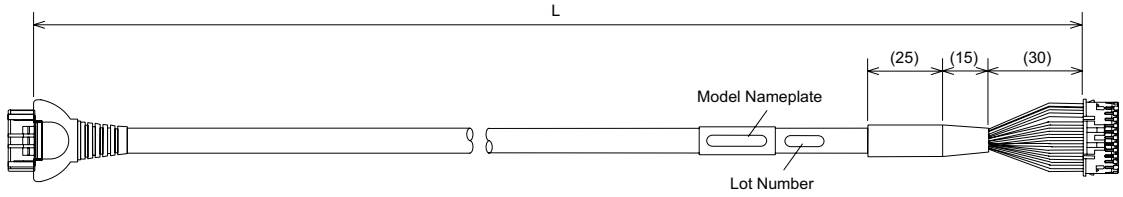
MR
(Right)

1.4 Motor • Encoder Cables

1.4.1 AMEC, ASEP and MSEP Controller Cables

Motor • Encoder Integrated Cables
(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

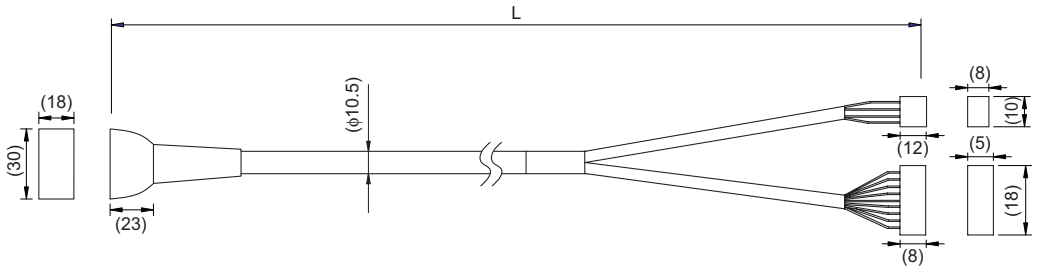
Controller Side

Pin No.	Symbol	Electric Wire Color
1	U	Black
2	V	White
3	W	Brown
4	-	Green
5	-	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, 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

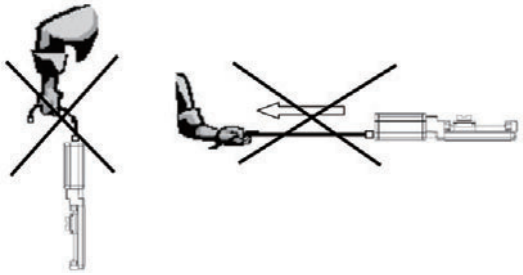
Unless otherwise specified, the actuator is shipped with 1 axis unit packaged separately.

(1) Handling the Packed Unit

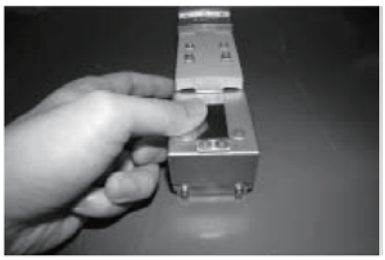
- Do not damage or drop. The package is not applied with any special treatment that enables it to resist an impact caused by a drop or crash.
- Transport a heavy package with at least more than two operators. Consider an appropriate method for transportation.
- Keep the unit in a horizontal orientation 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. Especially, pay attention to the side cover.
- Do not attempt to force any part of the actuator. Do not apply force especially on the stainless steel sheet.



[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 sliders 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 slider 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)

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

- Fix the slider 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 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

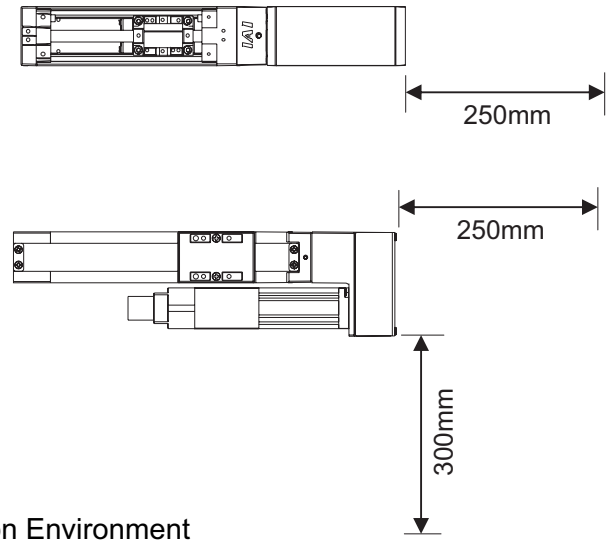
The actuator should be installed in a location other than those specified below.
Also provide sufficient work space required for maintenance inspection.

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

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

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

Open space required for maintenance inspection



[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

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

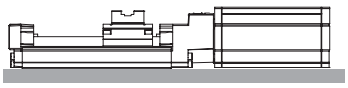
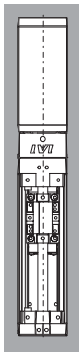
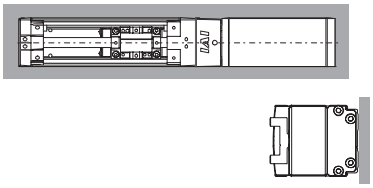
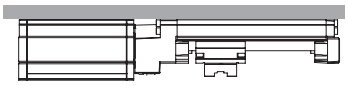
2.3.1 Installation

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

○ : Possible △ : Daily inspection is mandatory × : Not possible

Model	Horizontal installation	Vertical installation	Sideway installation	Ceiling Mount installation
SA2A	○	○	○	○
SA3	○	○	○	△
SA4	○	○	△	△
SA5	○	○	△	△
SA6	○	○	△	△

Installation posture

Horizontal	Vertical	Sideways	Ceiling Mount
			

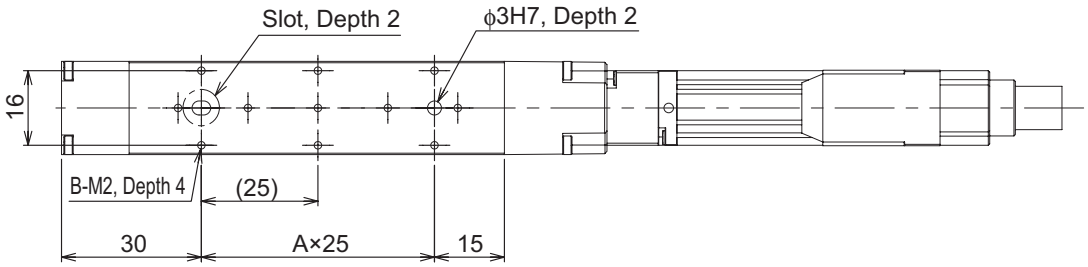
⚠ Caution: 1. When the unit is installed vertically oriented, attempt to put the motor up unless there is a special reason. Putting the motor on the lower side would not cause a problem in an ordinary operation. However, it may rarely cause a problem, when it is not operated for a long period, depending on the surrounding environment (especially high temperature), caused by the grease being separated and the base oil flowing into the motor unit.

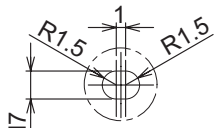
2. Can be installed sideways or ceiling mount, but the actuators must be checked daily. If the actuator is installed sideways or ceiling mount, the stainless steel sheet may be slacked or displaced. If the actuator is used continuously while the stainless steel sheet is slacked or displaced, the stainless steel sheet may break or other problems may occur. Check the actuator daily and if the stainless steel sheet is found slacked or displaced, make installation adjustment of the stainless steel sheet. [Refer to 5.9 “Procedures for Replacement and Adjustment of Stainless Steel Sheet.”]

2.3.2 Installation of Actuator

[1] Installation of RCA2-SA2AC and SA2AR

This actuator has the screw holes for mounting so it can be fixed from the rear side.
Also, there are a reamed hole and a slotted hole for positioning pins.





Detail view of Slot
Scale 2:1

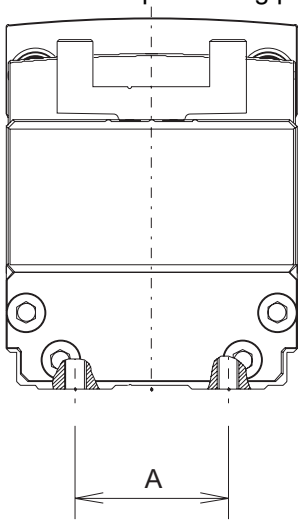
ST	L1	L2	A	B
25	174	92	1	4
50	199	117	2	6
75	224	142	3	8
100	249	167	4	10

Screw diameter and max. screw mating depth	Mounting bolt	Tightening Torque		Reamed Hole [mm]	Slot
		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, Depth 4	M2	0.42N·m (0.043kgf·m)	0.25N·m (0.026kgf·m)	ϕ3H7, depth 2 from bottom face of base	Refer to the diagram

[2] Installation of RCA2-SA3C, SA4C, SA5C, SA6C, SA3R, SA4R, SA5R and SA6R

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

This actuator has the screw holes for mounting so it can be fixed from the rear side.
(Note that tap hole size depends on model. Please see diagrams below and 7. "External Dimensions")
The actuator also contains reamed holes for use with positioning pins.



Slider type

Model	Screw diameter and max. screw mating depth	Mounting bolt	Tightening Torque		A [mm]	Reamed Hole [mm]
			In the case that steel is used for the bolt seating surface:	In the case that aluminum is used for the bolt seating surface:		
SA3	M3, depth 5	M3	1.54N·m (0.16kgf·m)	0.83N·m (0.085kgf·m)	17	ϕ2H7, depth 4 from bottom face of base
SA4	M3, depth 5	M3	1.54N·m (0.16kgf·m)	0.83N·m (0.085kgf·m)	21	ϕ2.5H7, depth 5 from bottom face of base
SA5	M4, depth 7	M4	3.59N·m (0.37kgf·m)	1.76N·m (0.18kgf·m)	26	ϕ2.5H7, depth 5 from bottom face of base
SA6	M5, depth 8	M5	7.27N·m (0.74kgf·m)	3.42N·m (0.35kgf·m)	31	ϕ3H7, depth 5 from bottom face of base

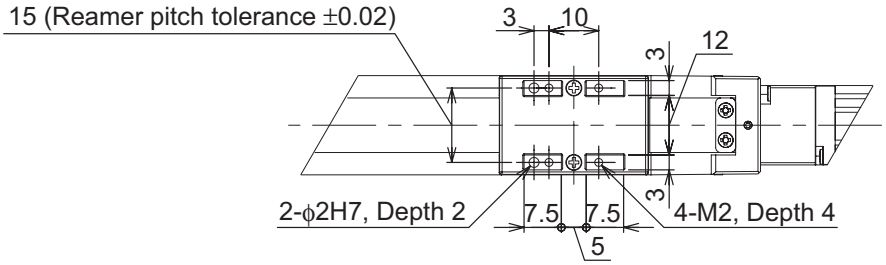
About Tightening Screws
- Use a hex socket head cap bolt for the attachment to the base.
- It is recommended to use high-tensile bolts with ISO-10.9 or more.
- The length of thread engagement should be 1.8 times more than the nominal diameter, and pay attention not to stick the screw out inside the actuator.

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

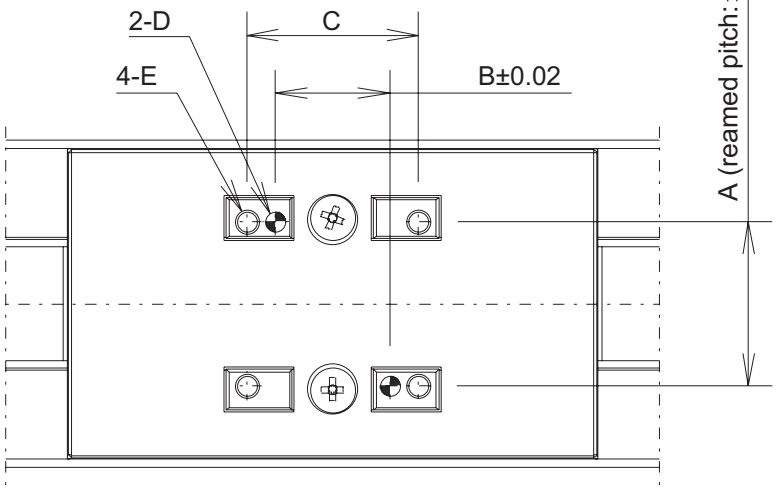
2.3.3 Installation of the Load

- Please attach the load to the device using the tap holes in the slider.
- The process for attaching these to the main unit is similar to the installation process of the main unit. Use of high-tension bolts meeting at least ISO-10.9 standard is recommended for mounting.
  The table below shows the recommended tightening torque.
- There are two reamed holes on the slider, so if you need to be able to secure and detach the load multiple times, please use these holes. Also, if you require precision in your attachment, such as a right angle, use one of the reamed holes to make fine adjustments.
  * When using reamed holes, we recommend using an H7 pin. Also, do not force the pin into the hole. Instead, press it gently in until it fits.
- For exact thread depth and reamed hole depth, please see the table below.
  In case that a screw is tightened with a value more than what is stated below, it may cause damage on the tapped holes or insufficiency in the strength of transported object attachment, which may result in a drop in the operation accuracy or an unexpected accident.
  Do not tighten the mounting screws to a torque beyond the applicable torque specified in the table below. Doing so may damage the tapped holes.

● RCA2-SA2AC/SA2AR



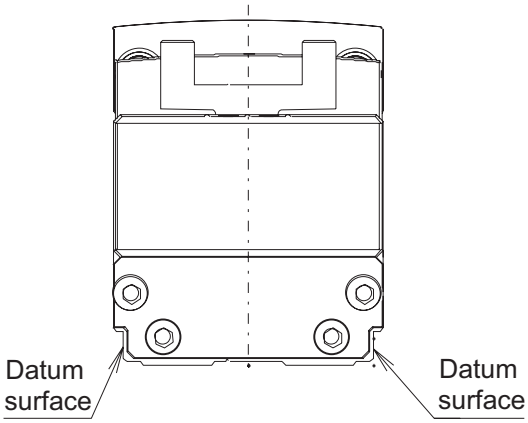
● RCA2-SA3C/SA4C/SA5C/SA6C/SA3R/SA4R/SA5R/SA6R



Model	A	B	C	D	E	Mounting bolt	
						Nominal thread size	Tightening torque
SA3	17	11	17	ϕ2H7, depth 5	M3 D6	M3	0.83N·m (0.085kgf·m)
SA4	20	14	21	ϕ2.5H7, depth 5	M3 D6	M3	0.83N·m (0.085kgf·m)
SA5	26	14	22	ϕ2.5H7, depth 5	M4 D8	M4	1.76N·m (0.18kgf·m)
SA6	31	26	25	ϕ3H7, depth 5	M5 D10	M5	3.42N·m (0.35kgf·m)

2.3.4 Installation Surface

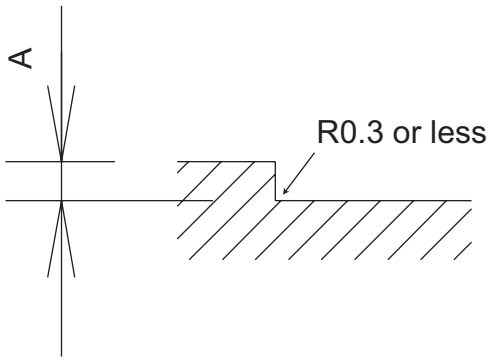
- For the platform to install the actuator, ensure the structure that possesses enough stiffness to avoid vibration being generated.
- SA3C, SA4C, SA5C, SA6C, SA3R, SA4R, SA5R, SA6R
  The side and bottom faces of the base provide datum surfaces for slider travel. When it is necessary that the slider moves in a highly precise fashion, ensure that the device is installed at the direction that is based on the position of these surfaces.



Slider type

⚠ Caution: Because the side and bottom faces of the base provide datum surfaces for slider travel as shown in the above diagram, conduct installation based on the position of this side when precision is required.

When installing the actuator on the frame using the base datum surfaces, provide the necessary machining by following the drawing below.



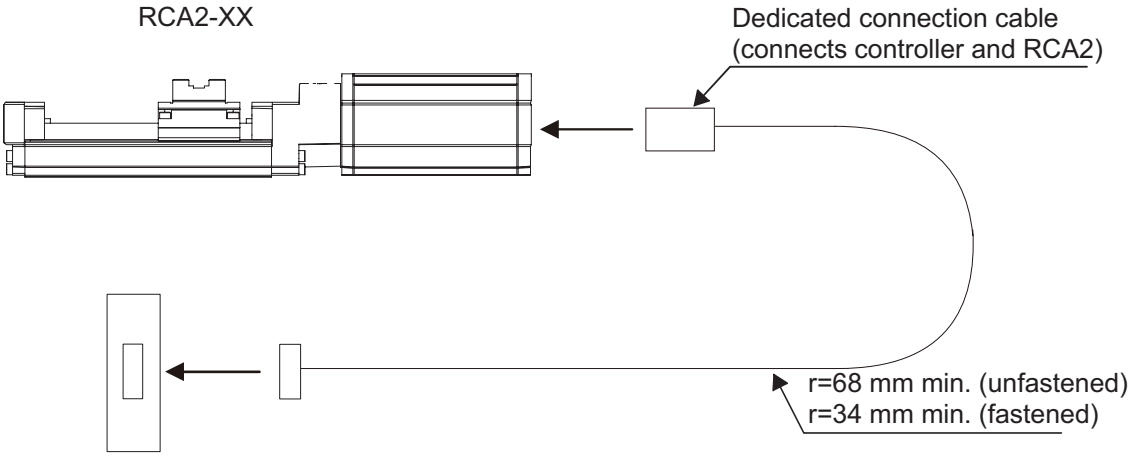
Model	Dimension A (mm)
Slider type	2 to 4 or less

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 coming out of the motor unit is not meant to be bent. Fix the cable so it would not be bent repeatedly.

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

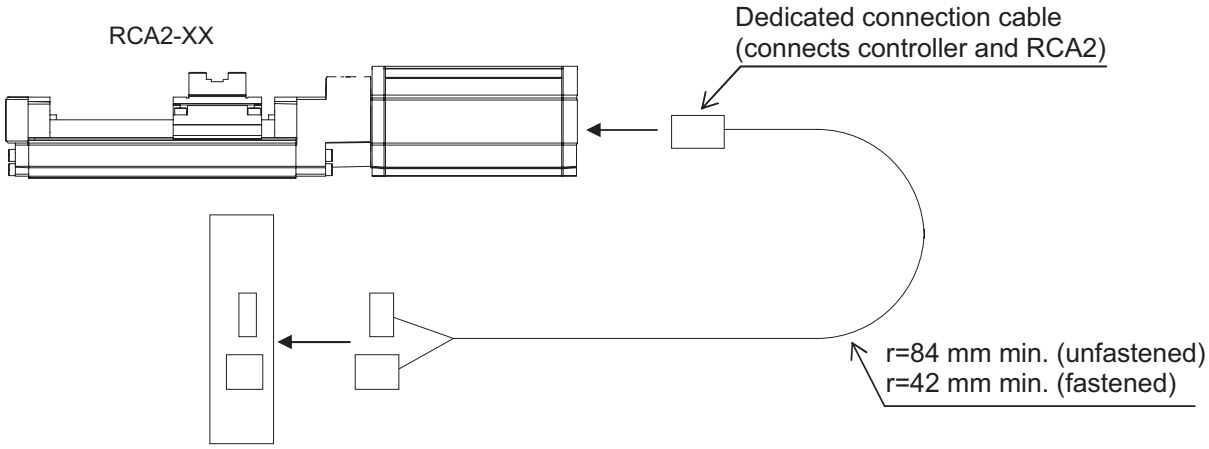


Dedicated controller
- AMEC
- ASEP
- MSEP

Dedicated connection cable
- Servo motor cable: CB-APSEP-MPA□□□

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

(Note) RCA2-SA2AC and SA2AR cannot be moved with AMEC controller.
Only ASEP and MSEP Controller can be moved.



Dedicated controller
- ASEL
- ACON

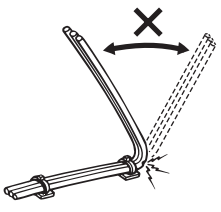
Dedicated connection cable
- Servo motor cable: CB-ACS-MPA□□□

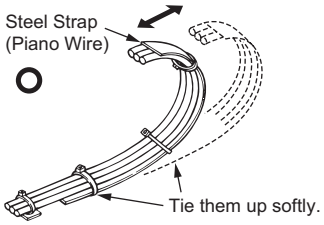
*) □□□ indicates the cable length. Up to 20m can be specified.
Example) 080 = 8m

(Note) RCA2-SA2AC and SA2AR cannot be moved with ASEL or ACON controller.
Only ASEP and MSEP Controller can be moved.

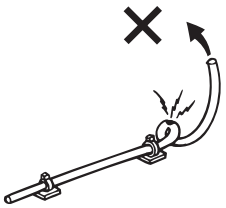
⚠ Warning: For wiring, please follow the warnings stated below. When constructing a system as the machinery equipment, pay attention to the wiring and connection of each cable so they are conducted properly. Not following them may cause not only a malfunction such as cable breakage or connection failure, 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 operating 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.

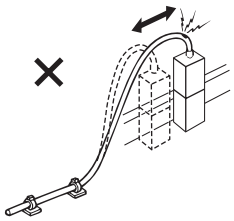




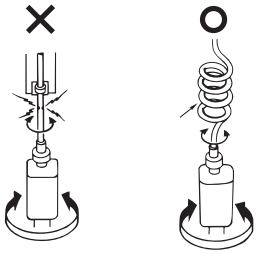
- Do not let the cable bend, kink or twist.



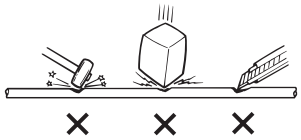
- Do not pull the cable with a strong force.



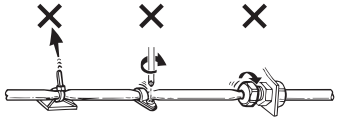
- Pay attention not to concentrate the twisting force to one point on a cable.

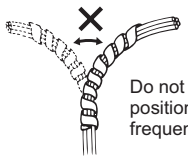


- Do not pinch, drop a heavy object onto or cut the cable.



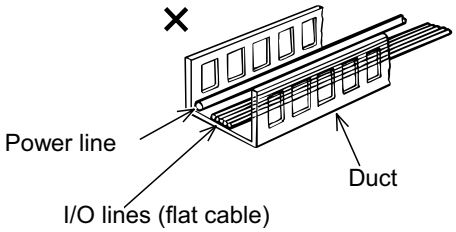
- When a cable is fastened to affix, make sure to have an appropriate force and do not tighten too much.





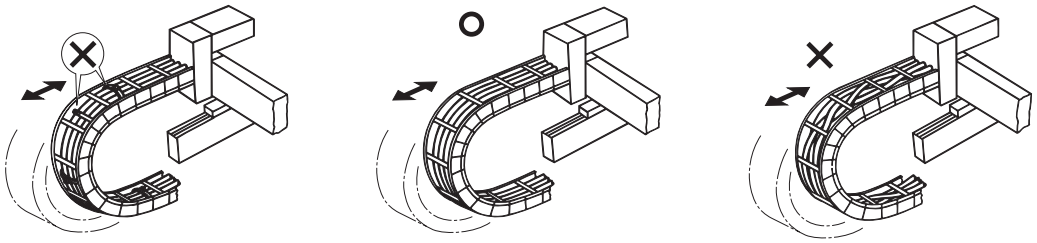
Do not use spiral tube in any position where cables are bent frequently.

• 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. Operations

4.1 Duty Ratio in Continuous Operation

The duty ratio is the ratio of operation expressed in % to show the duration when the actuator is operating in 1 cycle.

Perform an operation with the duty ratio 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 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.”

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

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}

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

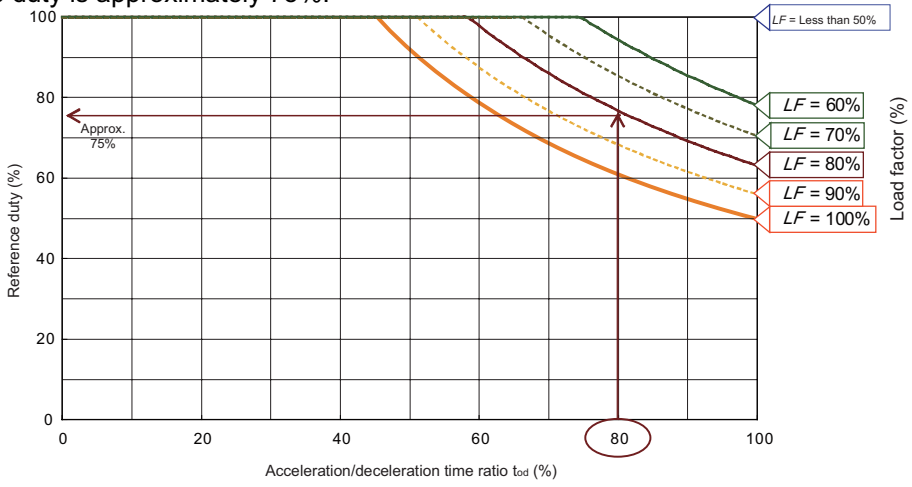
$$\text{Acceleration time} = \frac{\text{Speed during Operation[mm/s]}}{\text{Acceleration during Operation[mm/s}^2\text{]}} \quad [\text{Sec}]$$

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

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

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

3) 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%.



4.2 Home Return

4.2.1 Fine-tuning the Home Position

The actuator home position can be adjusted by changing parameter (Note 1) In order to make adjustments, please do the following.

1) Perform home return to check the home.
2) Thereafter, move the actuator to a desired home. Check the difference and correct the parameter accordingly. The parameter accepts a positive value to set an offset in the moving direction of the actuator. (Negative values cannot be set.)
3) Increasing the offset reduces the moving range by the amount incremented. If you have specified an offset exceeding 1mm, also adjust the soft limits.

Note1 The items to set up in the parameters differ depending on the controller.
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

4.2.2 Changing the Home Direction

To change the home position direction after delivery, it is necessary to change the movement direction parameter. Please contact with IAI if you need to do this.

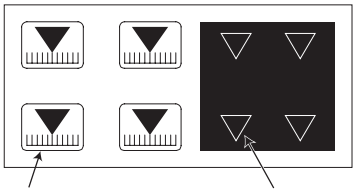
⚠ Warning: The encoder not only detects position and home signals, but it also plays an important role in the switching of AC-servo power phases. Since the AC-servo power phases have been adjusted precisely, never touch the encoder to change the home.

4.2.3 How to use the home mark

◆ Please affix these marks to the actuator as home markers as needed.

Contents of sticker

Home mark sticker



× 1 sheet

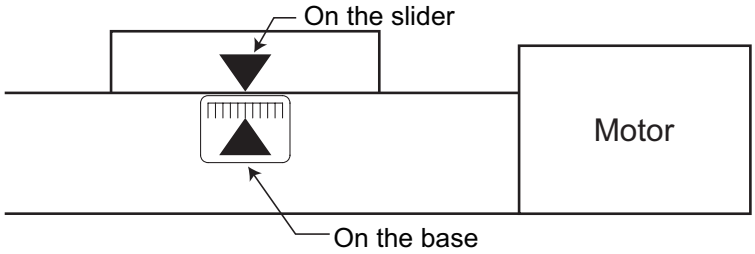
Home mark scale × 4 Home mark × 4
(Scale: 1 mm graduation mark, 10 mm width)

- Peel off the marks from the base sheet.

Note 1. Every mark has sticky back.
2. Remove smear and stain from the surface.
3. Avoid label or nameplate as a marking location.

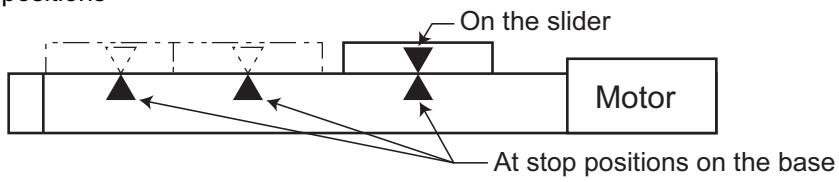
Example of Use

1) Used to indicate the direction of actuator home



- Attach both stickers when actuator is stopped in home position

2) Used as stop positions



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.

	Visual inspection of exterior	Inspection of interior	Greasing (Note 2)
Start-up inspection	○		
After 1 month of operation	○		
After 6 months of operation	○	○	○(Note 1)
After 1 year of operation	○	○	○
Every 6 months thereafter	○		
Every 1 year	○	○	○

Note 1 If grease is found degraded as a result of interior check, add grease
Note 2 Grease film may run out if the actuator is moved back and forth continuously over a distance of 30mm or less. As a guide, perform a back-and-forth operation five times or so over a distance of 50mm or more after a back-and-forth operation over such short distance has been repeated 5,000 to 10,000 times. This will restore oil film.

5.2 Visually Inspecting the Exterior

Visually check the exterior of the following items.

Actuator	Loosening of actuator mounting bolts, other loose items
Cables	Scratches, connector engagement
Stainless steel sheet	Scratches, slacked
Overall	Noise, vibration

- If the stainless steel sheet is slacked, make adjustment to remove the slack as necessary.
- As a rule of thumb, the stainless steel sheet should last for about 5000km of slider motion. However, under certain conditions, the stainless steel sheet may need to be replaced earlier.
  Generally, replacing the stainless steel sheet will require that you bring the unit to our plant or have one of our technicians come to your plant to perform the replacement.
- If the actuator is installed vertically, certain conditions may cause grease to drip from the guide. Please ensure that proper cleaning is performed and grease is replenished.

5.3 Cleaning

- Clean the exterior surface as necessary.
- Wipe dirty areas using a soft cloth, etc.
- Do not blow highly compressed air onto the actuator, as it may cause dust to enter the actuator through gaps between parts.
- Do not use petroleum-based solvent as it damages resin and coated surfaces.
- To remove stubborn stains, take neutral detergent or alcohol into a soft cloth, etc., and wipe the area gently.

5.4 Adjusting the Stainless Steel Sheet

If the actuator stroke is 400mm or more, check the stainless steel sheet for slacking, etc., as necessary. If the stainless steel sheet is found slacked, adjust the stainless steel sheet.
[For the stainless steel sheet adjustment procedure, refer to 5.9 “Procedures for Replacement and Adjustment of Stainless Steel Sheet.”]

5.5 Interior Inspections

Turn off the power and inspect visually after turning up or removing the stainless steel sheet in the case of stainless steel sheet types. With reversing types, inspect visually after removing the reversing bracket.
When inspecting the interior, check the following items.

Actuator	Loosening of actuator mounting bolts, etc.
Guide	Lubrication condition, soiling
Belt (Reversing type)	Lubrication condition, damage

Visually check the interior condition. Focus on entry of dust and other foreign matters and the lubrication condition.
Even if grease has turned brown, the actuator is lubricated properly if its traveling surface is glossy.
If the grease is mixed with dust and does not have a shiny appearance, or if the grease has lost its efficacy due to prolonged use, then clean each section and reapply grease.
The procedure for internal inspections is outlined below. Refer to 5.8, for inspection and adjustment of the belt.

Slider type --- Steps 2) through 5) are only necessary if the side cover is attached. If you do not have a side cover, only do step 1).

1) Move the slider toward the home side.
2) Remove the cover.
3) Remove the sheet retainer screws.
4) Turn up the sheet and check the interior.
5) After the check, assemble the parts by following the same steps in the reverse order.

Cautions for attached side cover:

When checking inside the equipment, be careful not to forcibly bend the stainless steel sheet or scratch it. Do not tug on the stainless steel sheet or in any way attempt to reposition it.
If the sheet is repositioned, it may not be even which may shorten its service life. Should this happen, adjust the stainless steel sheet by referring to the replacement instructions.
Keep in mind that the edges of the stainless steel sheet can cause injuries. Always wear gloves when working on it.

5.6 Cleaning the Interior

- Wipe dirty areas using a soft cloth, etc.
- Do not blow highly compressed air onto the actuator, as it may cause dust to enter the actuator through gaps between parts.
- Do not use petroleum-based solvent, neutral detergent or alcohol.

5.7 Greasing Guides

5.7.1 Applicable greases for guide

The grease initially used is lithium-based grease.
IAI uses the following grease in our plant.

Idemitsu Kosan	Daphne Eponex Grease No. 2

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

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

⚠ Warning: Never use anything other than synthetic poly-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.

5.7.2 Applicable greases for ball screw

The grease initially used is lithium-based grease.
IAI uses the following grease in our plant. (Excludes SA3C type)

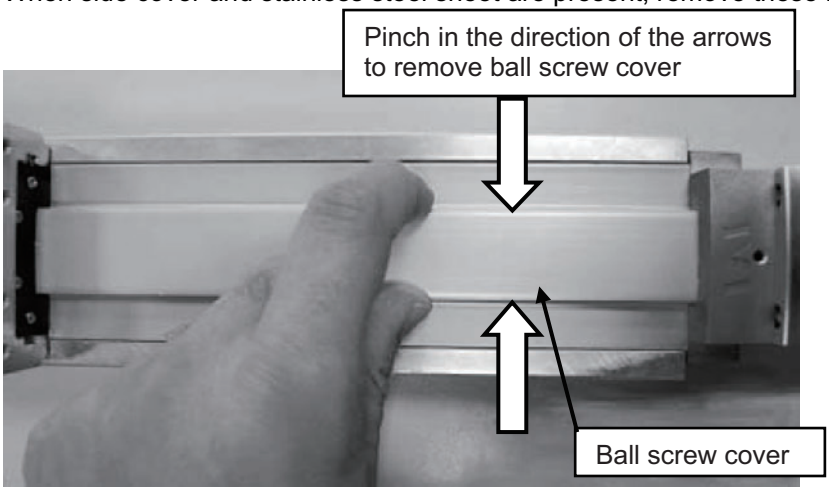
Kyodo Yushi	Multitemp LRL 3

* RCA2-SA2AC, SA2AR, SA3C types uses the following grease.

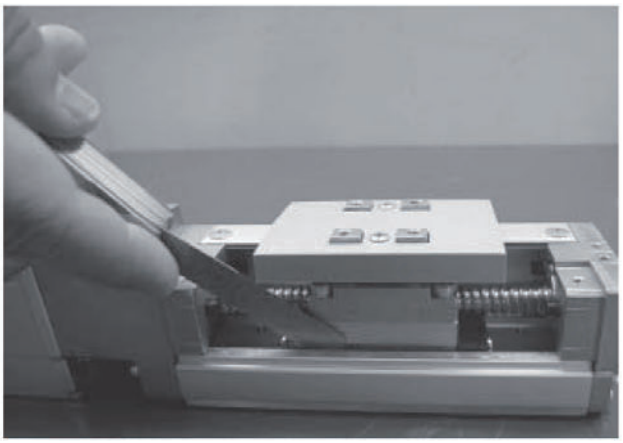
Idemitsu Kosan	Daphne Eponex Grease No. 2

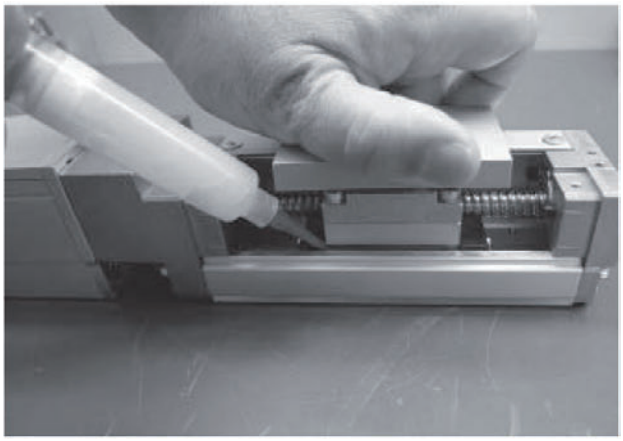
5.7.3 How to apply grease

When side cover and stainless steel sheet are present, remove these before beginning.



(1) For the guide section, apply the grease by moving the slider back and forth and spreading it out, either by pushing a scraper between the slider and base or by lubricating with a grease injector.
Grease the guides on both sides.
When complete, wipe away any excess grease.
(Note) There is no side cover for RA2AC and RA2AR.
Remove the stainless steel sheet and apply grease to the guide from upper side.





⚠ 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.

(2) To grease ball screws, first clean, then put some grease on your finger and apply while moving the slider back and forth.
When finished, wipe off excess grease.
(Note) There is no side cover for RA2AC and RA2AR.
Remove the stainless steel sheet and apply grease to the guide from upper side.

If the side cover and stainless steel sheet are present, put them back on.

⚠ Caution: •When having the slider moved back and forth manually by hand, make sure not to apply external force to the thrust directions that exceeds the value stated in Caution in Handling. (If the slider will not move, operate it using a jog function.)
• 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.

5.8 Belt

5.8.1 Inspection of belt

When inspecting the belt, remove the pulley cover and check the belt visually.
Although the durability of the belt is affected significantly by the operating conditions, generally a belt has a flex line of several million times.
As a reference for determining when to actually replace the belt, replace the belt if any of the following conditions is found:

- Significant wear of the teeth or end face of the belt
- Swelling of the belt due to attached oil, etc.
- Cracking or other damage of the teeth or back of the belt
- Breaking of the belt

5.8.2 Applicable belt

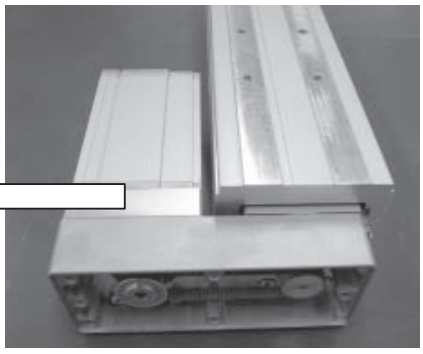
Manufacturer: Bando Chemical Industries, Ltd.

Belt model (type)	Model
40S2M138R, 4-mm wide (clean rubber type)	SA3R
60S2M152R, 6-mm wide (clean rubber type)	SA4R
60S2M180R, 6-mm wide (clean rubber type)	SA5R
60S2M180R, 6-mm wide (clean rubber type)	SA6R

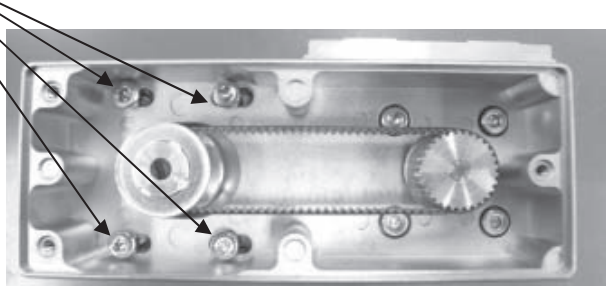
5.8.3 Adjustment of belt tension

Remove the pulley cover, loosen the tension adjustment bolts (4 locations), and shift the motor as shown below to tension the belt. When finished, tighten the tension adjustment bolts.

Tension
SA3R: 1.5 ± 0.1kgf
Other than SA3R: 2.5 ± 0.1kgf



Tension adjustment bolt		
Model	Nominal thread size	Tightening torque
SA3R	M2.6	0.46N•m (0.047kgf•m)
SA4R	M3	0.83N•m (0.085kgf•m)
SA5R/SA6R	M4	1.76N•m (0.18kgf•m)

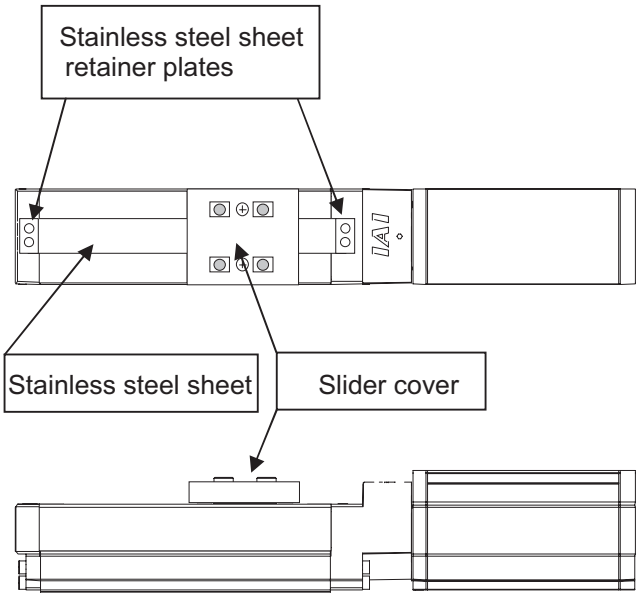


5.9 Procedures for Replacement and Adjustment of Stainless Steel Sheet (for models with slider cover)

It is possible to replace the stainless steel sheet without removing the slider cover.

[Required Items]
- Replacement stainless steel sheet
- Hex wrench set
- Adhesive tape

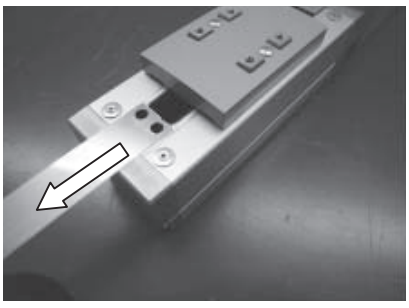
[Name of each part]



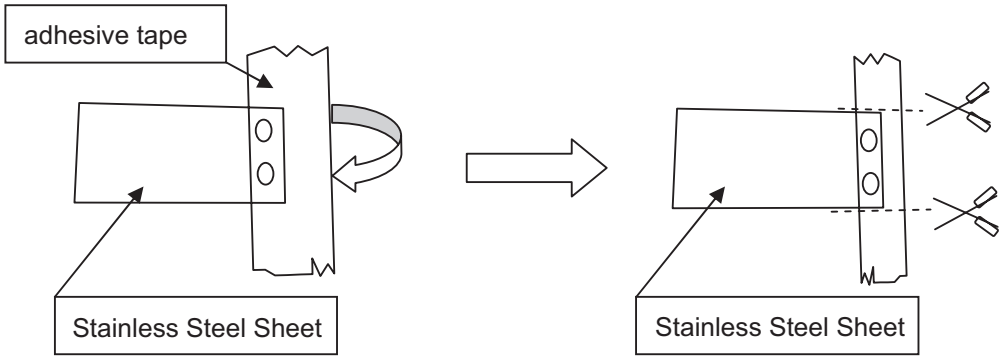
[Procedure]

1) With a 1.5mm hex wrench, remove the four screws securing the stainless steel sheet and the two stainless steel sheet retainer plates.

2) Pull out the old stainless steel sheet.

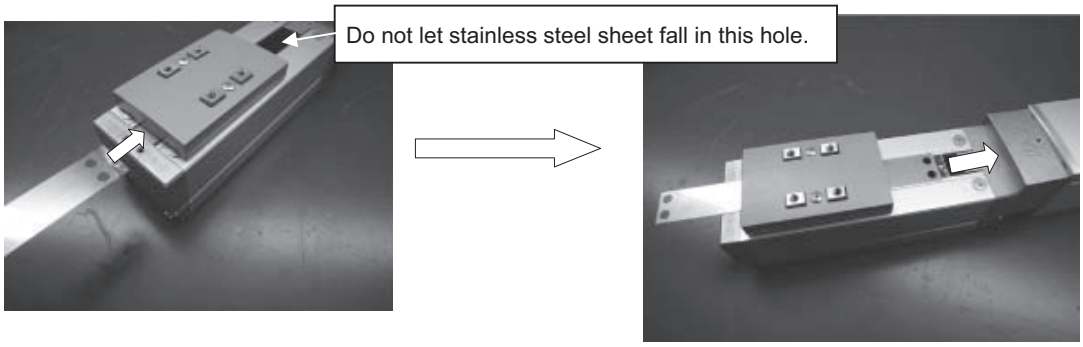


3) Apply adhesive tape to one side of the new stainless steel sheet.

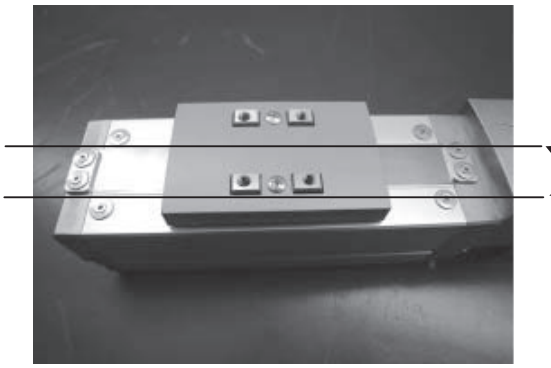


Apply the adhesive tape as though sandwiching the stainless steel sheet, leaving about 3mm of tape sticking out from the stainless steel sheet. Cut off the excess tape.

4) Slide the stainless steel sheet, taped end first, in through the gap under the slider cover.



5) Fasten the two stainless steel sheet retainer plates with the four screws. Use a 1.5mm hex wrench.



Two grooves are cut into the main unit to serve as guides for attaching the stainless steel sheet. Install the stainless steel sheet so that it comes to the center of the two grooves. Be careful not to install it in a position where it bends.

6) After fastening the stainless steel sheet retainer plate, move the slider by hand a full stroke and ensure that the stainless steel sheet neither floats up nor is warped. If there is a problem, go back to step 5).

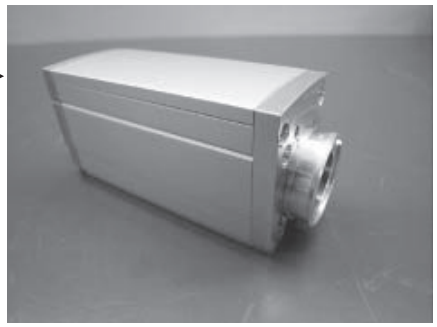
⚠ Caution: When having the slider moved back and forth manually by hand, make sure not to apply external force to the thrust directions that exceeds the value stated in Caution in Handling. (If the slider will not move, operate it using a jog function.)

5.10 Procedures for Replacement of Motor

[Refer to 5.11 for the reversing type.]

[Required Items]

• Replacement motor unit



Axis type			Model number	
			Without brake	With brake
RCA2 (brown encoder cable connector)	Slider type	SA3C	RCA2-MU1A	RCA2-MU1A-B
		SA4C	RCA2-MU2A	RCA2-MU2A-B
		SA5C	RCA2-MU3A	RCA2-MU3A-B
		SA6C	RCA2-MU4A	RCA2-MU4A-B

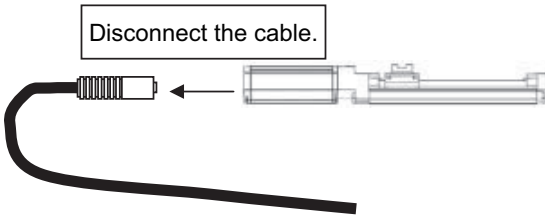
• Hex wrench set

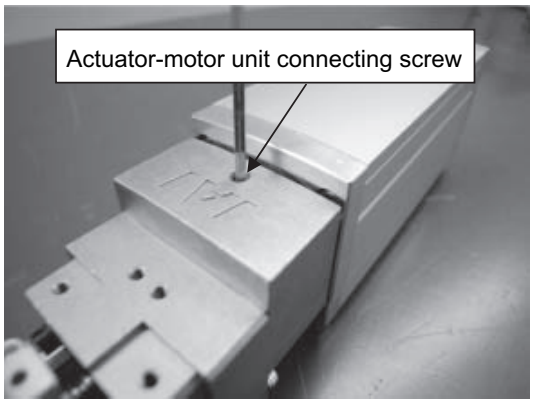
• Dedicated replacement jig (Optional)

Model number	Applicable mode
RCA2-JG-1	RCA2-SA3
RCA2-JG-2	RCA2-SA4
RCA2-JG-3	RCA2-SA5/SA6

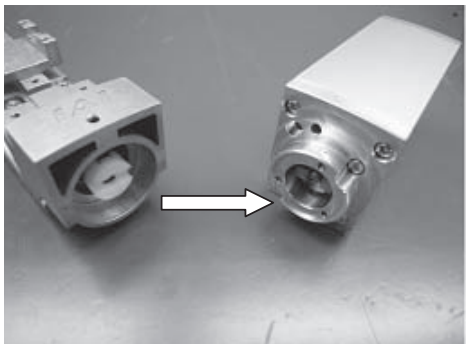
[Procedure]

1) Disconnect the cable from the motor unit, then use a 2mm hex wrench to remove the screw which holds together the actuator unit and the motor unit.

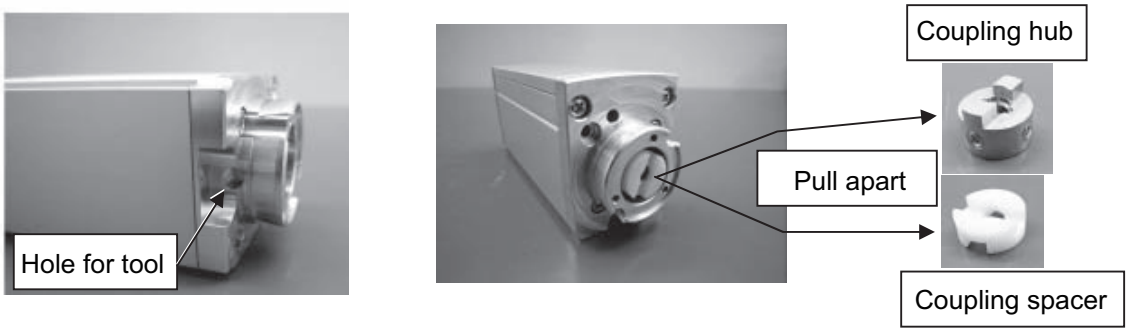




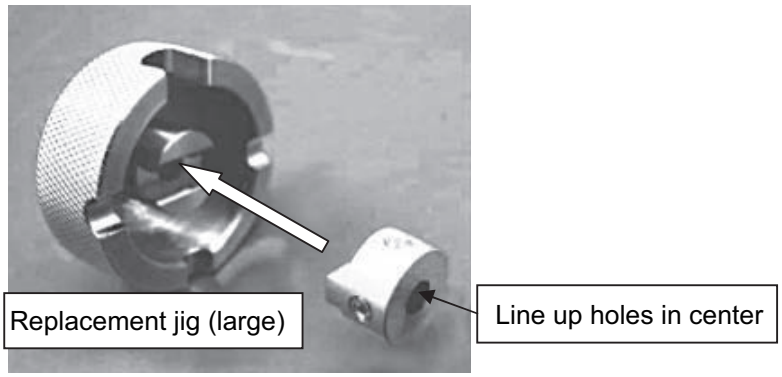
2) Detach the motor unit.



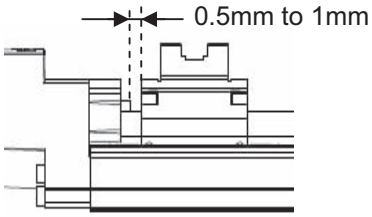
3) Take out the coupling hub and coupling spacer from the detached motor unit. Twist the coupling hub or coupling spacer on the motor side to align the screw holes with the hole for the tool to go through. Then remove two screws with a 2mm hex wrench.
   * If there is only a coupling hub on the motor unit side, then there is a coupling spacer on the actuator side which can be removed by pulling.
   * If both coupling hub and coupling spacer are present, pull them apart. (They should separate with a gentle pull.)



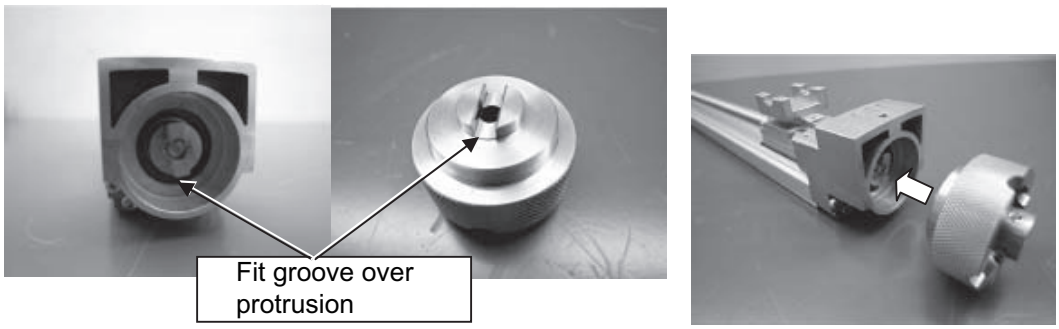
4) Fit the protruding part of the coupling hub into the groove of the replacement jig (large), and temporarily hold them together with two M 3 × 3 Allen screws (tighten just enough so that the coupling hub does not fall off).



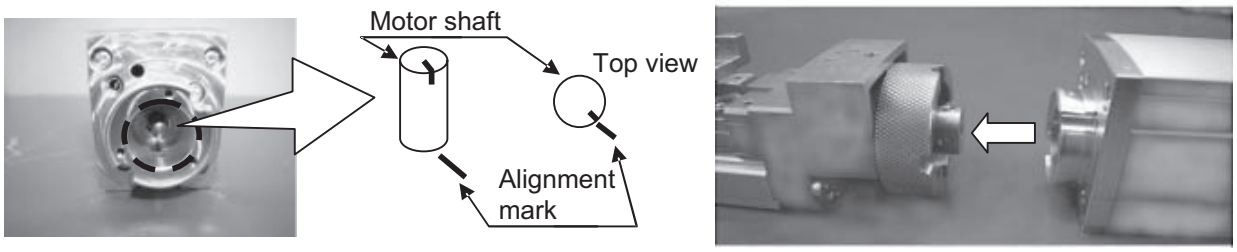
5) Turn the shaft to move the slider about 0.5mm to 1mm from the mechanical end on the home position side.



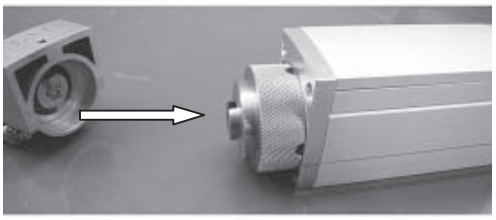
6) Fit the groove of the replacement jig (large) assembled in 4) over the protrusion of the actuator.



7) Align the marking on the motor shaft with the point indicated and insert the replacement motor unit into the actuator.

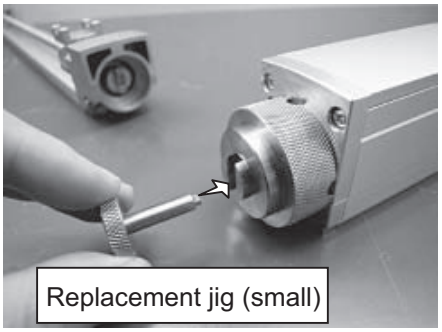


8) Take out the motor unit and the replacement jig (large). (Do not allow the jig to turn.)

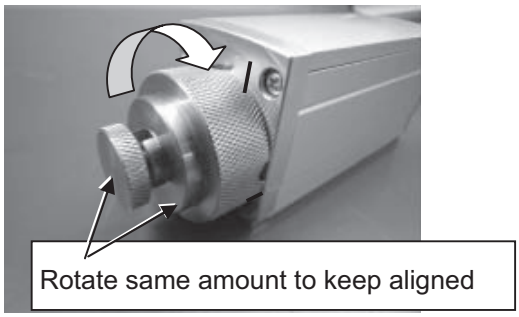


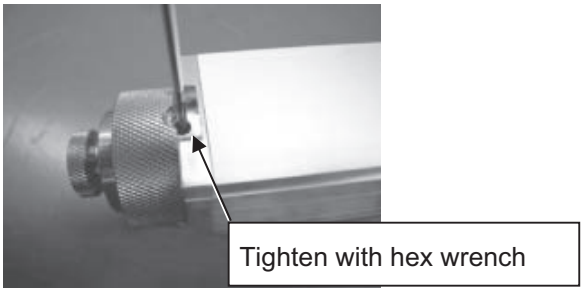
9) In order to keep the jig from turning, draw a mark using a pen or marker.

10) Insert the replacement jig (small) in such a way that its protrusion is aligned with the groove in the motor shaft.

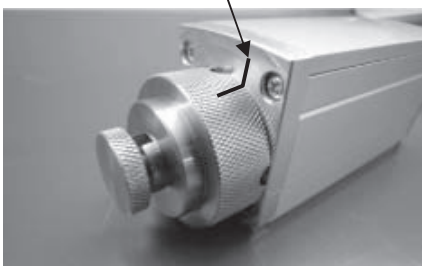


11) Turn the replacement jig (large) and the replacement jig (small) by the same amount. When the coupling fastening screws appear through the tool holes, tighten them with a 2mm hex wrench.
(There are two fastening screws.)

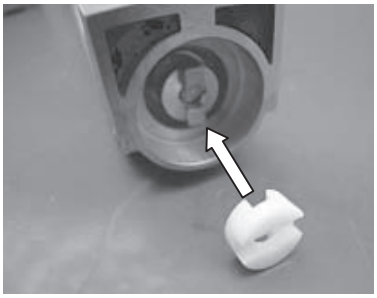




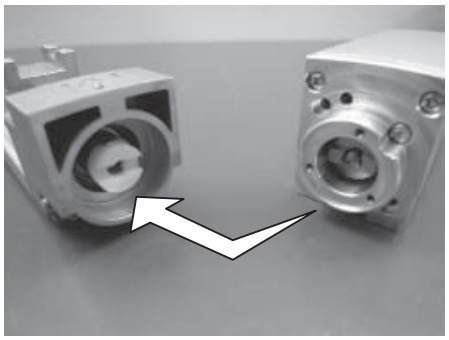
12) Align the marks made in 9). After the marks are aligned, remove the replacement jig (large) and the replacement jig (small).

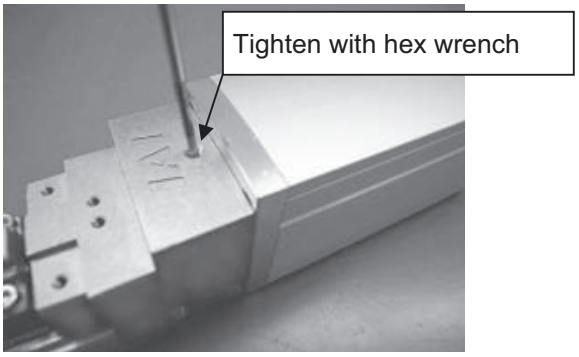


13) Apply the specified grease (TL 101Y grease made by NOK) to the coupling spacer (front and rear), then install the coupling spacer on the actuator side.



14) Install the replacement motor unit on the actuator side, then tighten the fastening screws with a 2mm hex wrench.
(The actuator side groove and replacement motor unit protrusion should have been aligned in 12), but if not, align them here.)





5.11 Procedures for Replacement of Belt and Motor for Reversing Type

[Required Items]

• Replacement motor unit of reversing type

Axis type			Model number	
			Without brake	With brake
RCA2 (brown encoder cable connector)	Slider type	SA3R	RCA2-MU1B	RCA2-MU1B-B
		SA4R	RCA2-MU2B	RCA2-MU2B-B
		SA5R	RCA2-MU3B	RCA2-MU3B-B
		SA6R	RCA2-MU4B	RCA2-MU4B-B

• Belt

Manufacturer: Bando Chemical Industries, Ltd.

Belt model (type)	Model number
40S2M138R, 4-mm wide (clean rubber type)	SA3R
60S2M152R, 6-mm wide (clean rubber type)	SA4R
60S2M180R, 6-mm wide (clean rubber type)	SA5R
60S2M180R, 6-mm wide (clean rubber type)	SA6R

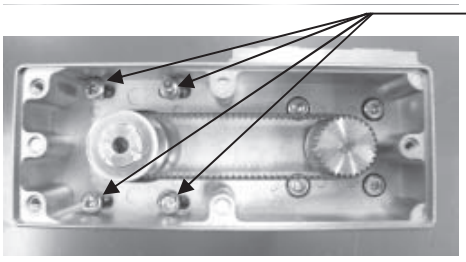
• Tension gauge
• Hex wrench set

[Procedure]

1) Remove the pulley cover.
   Remove the mounting screws. (2pcs for the SA3R, 3pcs for other models)

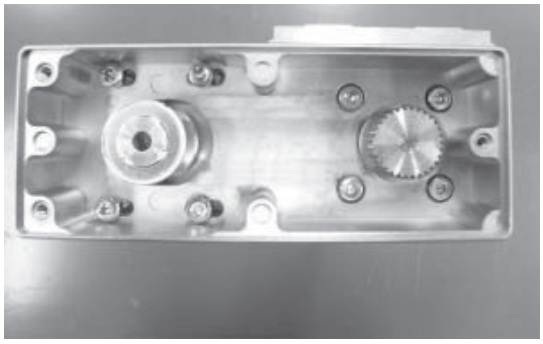
Mounting screw		
Model	Nominal thread size	Applicable Allen wrench
SA3R/SA4R	M2.5	1.5mm across flats
SA5R/SA6R	M3	2mm across flats

2) Loosen the tension adjustment bolts (4pcs) and slack the belt.

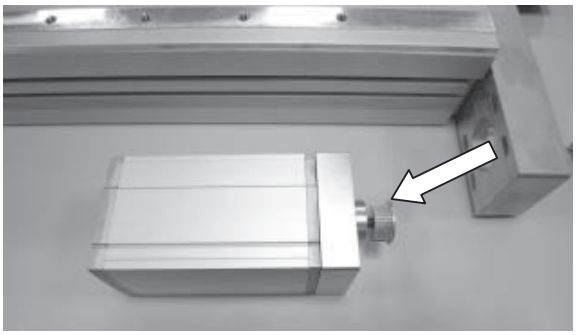


Tightening adjustment bolt		
Model	Nominal thread size	Applicable hex wrench
SA3R	M2.6	2mm across flats
SA4R	M3	2.5mm across flats
SA5R/SA6R	M4	3mm across flats

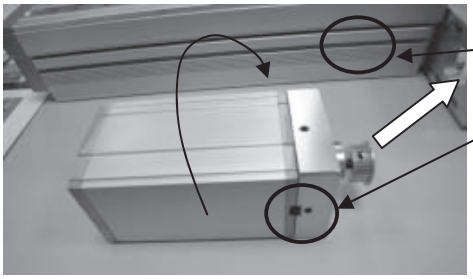
3) Remove the belt from the pulleys. When replacing the belt, proceed to step 7).



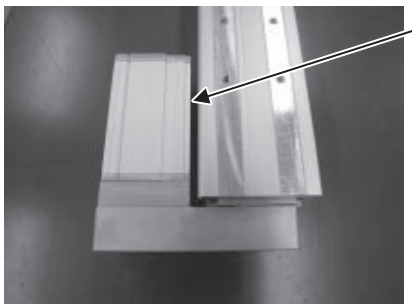
4) Remove the tension adjustment bolts and pull out the motor unit.



5) Install the replacement motor unit.
As shown below, install the motor unit by making sure its specified surface faces the actuator base.
Loosely secure the motor unit using the tension adjustment bolts.

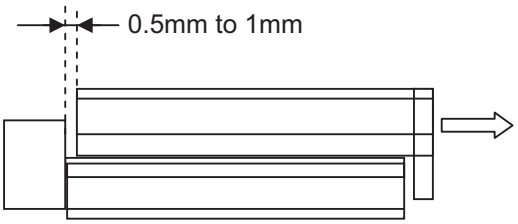


Install the motor unit by making sure the base surface of the actuator faces the motor unit surface with two holes.

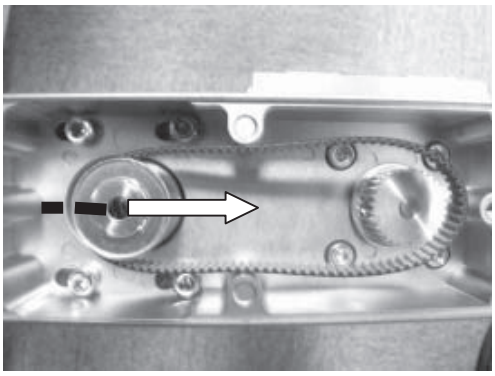


The surface with no gaps should face the motor unit surface with two holes.

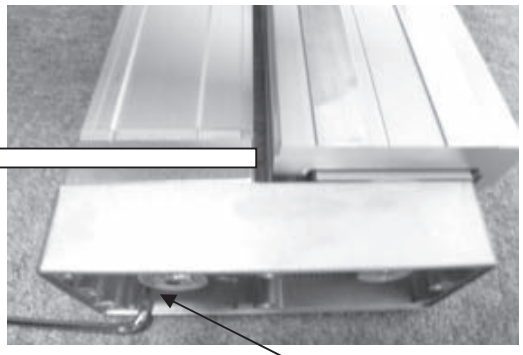
6) Move the slider or table by 0.5 to 1mm from the mechanical end on the home side.



7) Move the motor unit in the direction of the arrow shown below, and then install the belt.
Align the motor unit with the countermark on the actuator.
When replacing the belt, install the replacement belt.

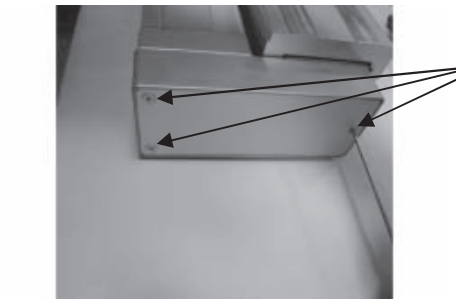


8) Pass around the base of the motor unit a strong string (or long tie band) that has been looped, and pull the loop with a tension gauge. When the specified tension is achieved, tighten the tension adjustment bolts uniformly.



Model	Nominal thread size	Tightening torque
SA3R	M2.6	0.46N·m (0.047kgf·m)
SA4R	M3	0.83N·m (0.085kgf·m)
SA5R/SA6R	M4	1.76N·m (0.18kgf·m)

9) Install the pulley cover.



10) 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

One factor that affects the traveling life of an actuator is “Rated Load.”
There are two types of rated loads: “Static Rated Load” and “Dynamic Rated Load.”

- “Static Rated Load”: Load applied while the actuator is stopped, as a result of which minor pressure marks are left on the contact surface
- “Dynamic Rated Load”: Load under which the actuator can travel for a specified distance and still meet a specified probability of survival defined by no damage to its guide.

Manufacturers of guides indicate the life of each guide by a dynamic rated load based on a probability of survival (no damage to the guide) of 0% after 50km of traveling.
With industrial equipment, however, dynamic rated loads must be defined based on longer traveling distance of 5,000km to 10,000km given the moving speed, operating ratios and other operating conditions of these equipment.
Also note that guides are generally designed with a sufficient life against radial loads. Moment loads that are applied at positions away from the guide center are most damaging to guides.

The traveling life is calculated by assuming that the actuator travels 5,000km while receiving the allowable load moment, based on a load coefficient of 1.2.
[For the allowable dynamic load moment, refer to 1.2 “Specifications.”]
The formula for calculating the allowable dynamic load moment corresponding to a traveling life of 5,000km is shown below.

$$C_{IA}=\frac{M_{50}}{fW}\times\left(\frac{50km}{5000km}\right)^{\frac{1}{3}}$$

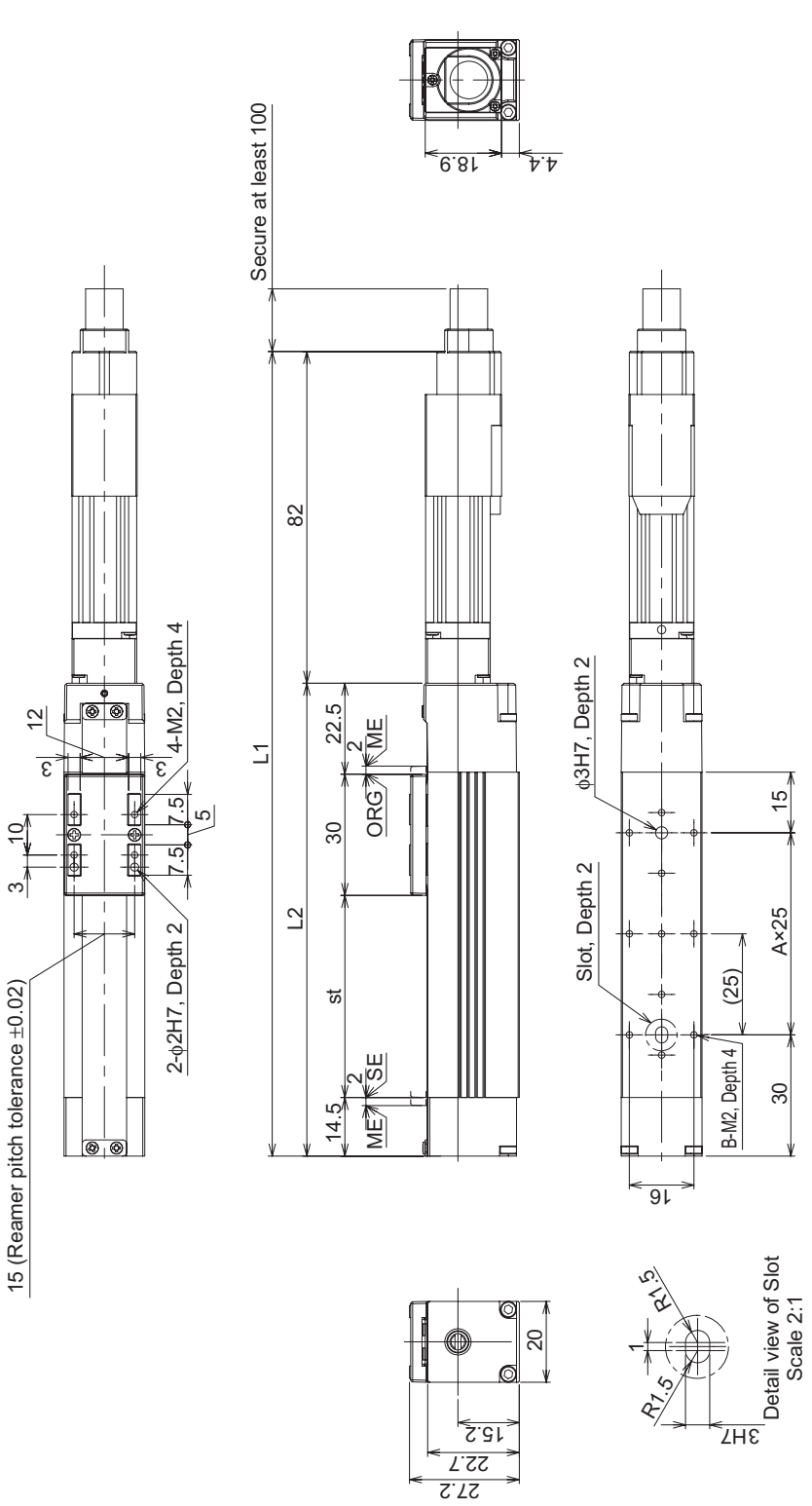
C_{IA} : Allowable dynamic load moment
fW : Load factor (=1.2)
M_{50} : Rated dynamic moment based on a survival probability of 50% after 50km of traveling Calculate the life at the applicable moment using the formula below:

$$L=\left(\frac{C_{IA}}{P}\right)^{3}\times 5000km$$

L : Traveling life (survival probability of 90%)
C_{IA} : Allowable dynamic moment
P : Applicable moment

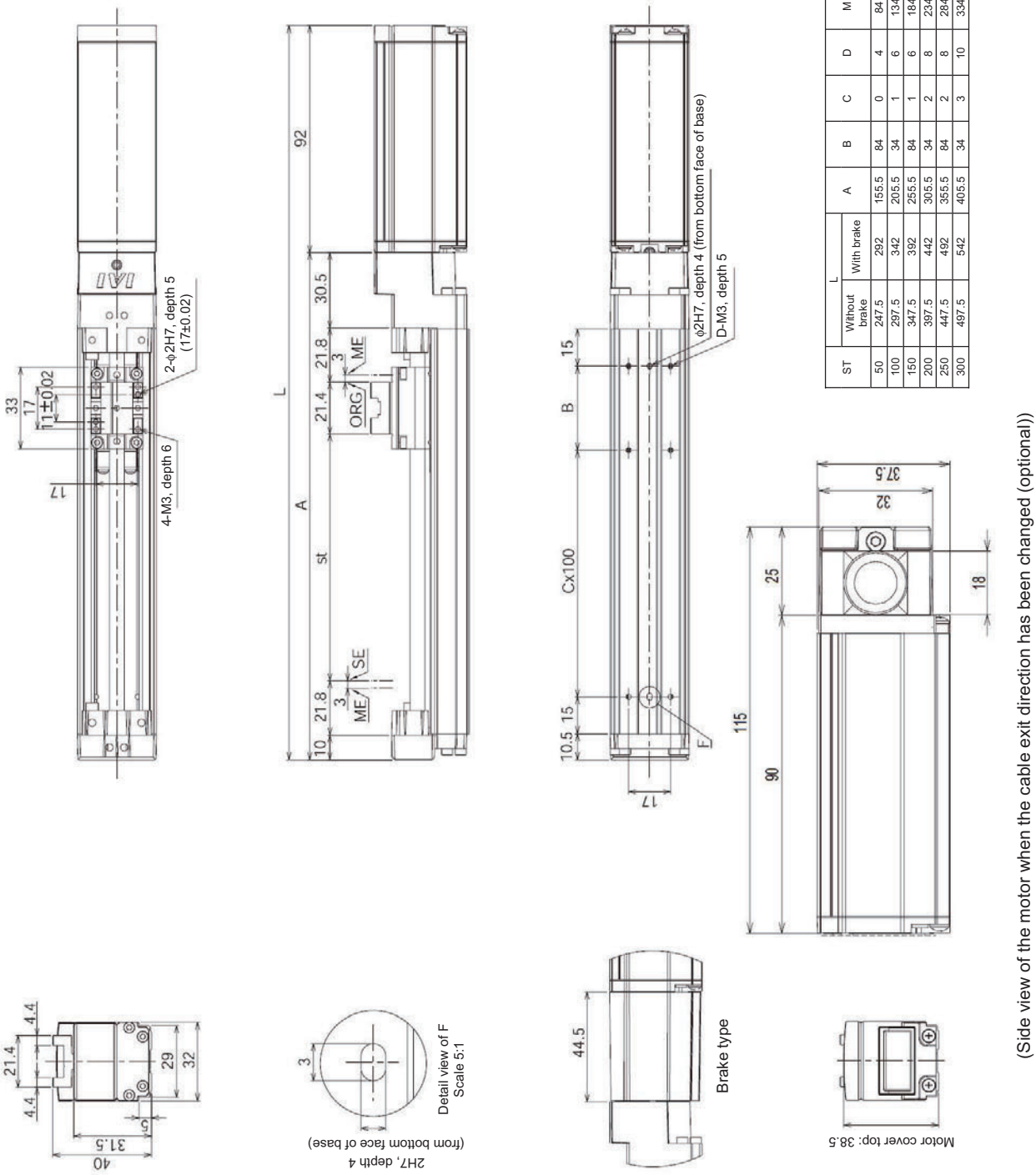
7. External Dimensions

7.1 RCA2-SA2AC



ST	L1	L2	A	B	Weight [kg]
25	174	92	1	4	0.2
50	199	117	2	6	0.22
75	224	142	3	8	0.23
100	249	167	4	10	0.25

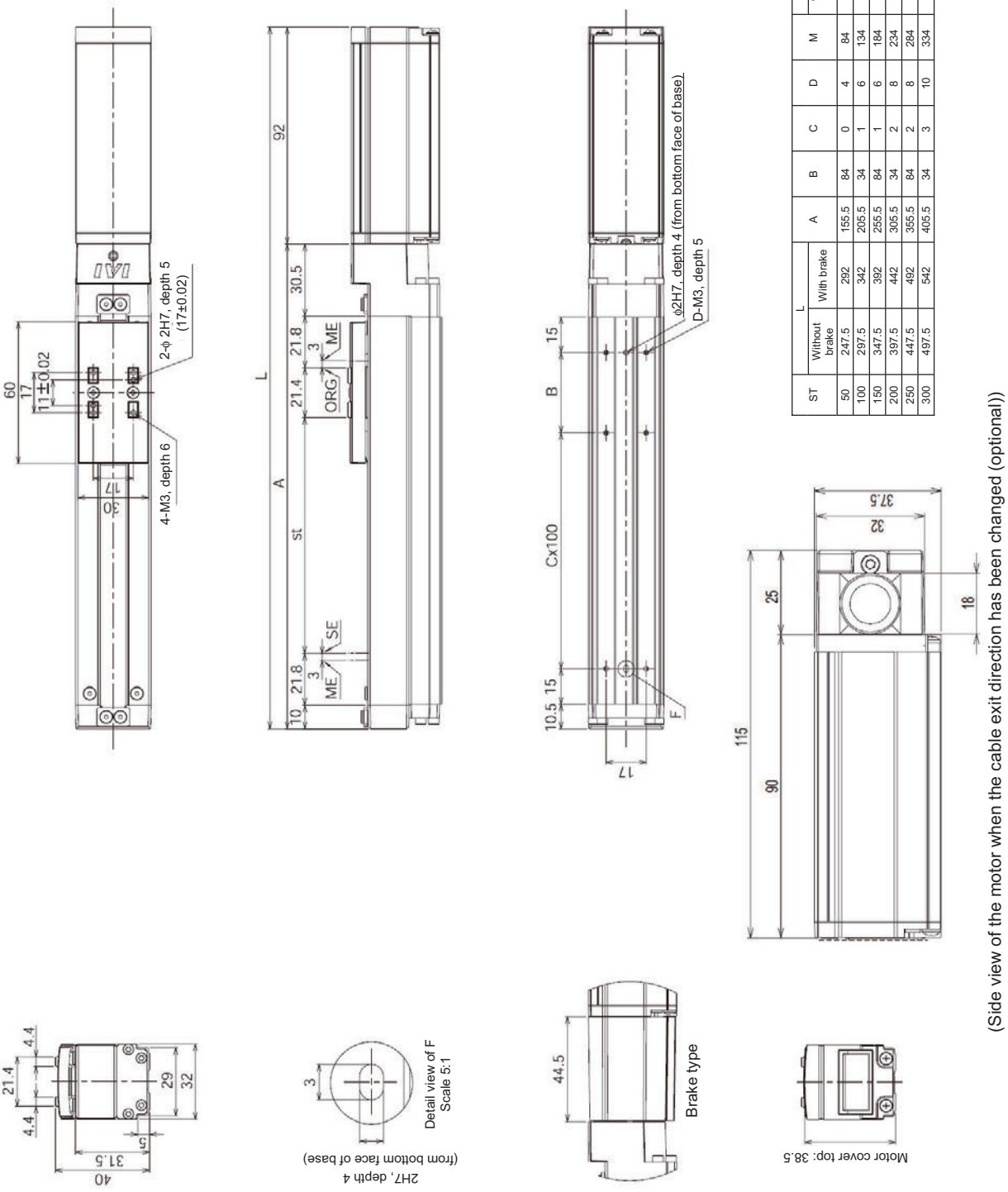
7.2 RCA2-SA3C



ST	L		A	B	C	D	M	Weight [kg]	
	Without brake	With brake						Without brake	With brake
50	247.5	292	155.5	84	0	4	84	0.5	0.7
100	297.5	342	205.5	34	1	6	134	0.6	0.8
150	347.5	392	255.5	84	1	6	184	0.6	0.8
200	397.5	442	305.5	34	2	8	234	0.7	0.9
250	447.5	492	355.5	84	2	8	284	0.7	0.9
300	497.5	542	405.5	34	3	10	334	0.8	1.0

(Side view of the motor when the cable exit direction has been changed (optional))

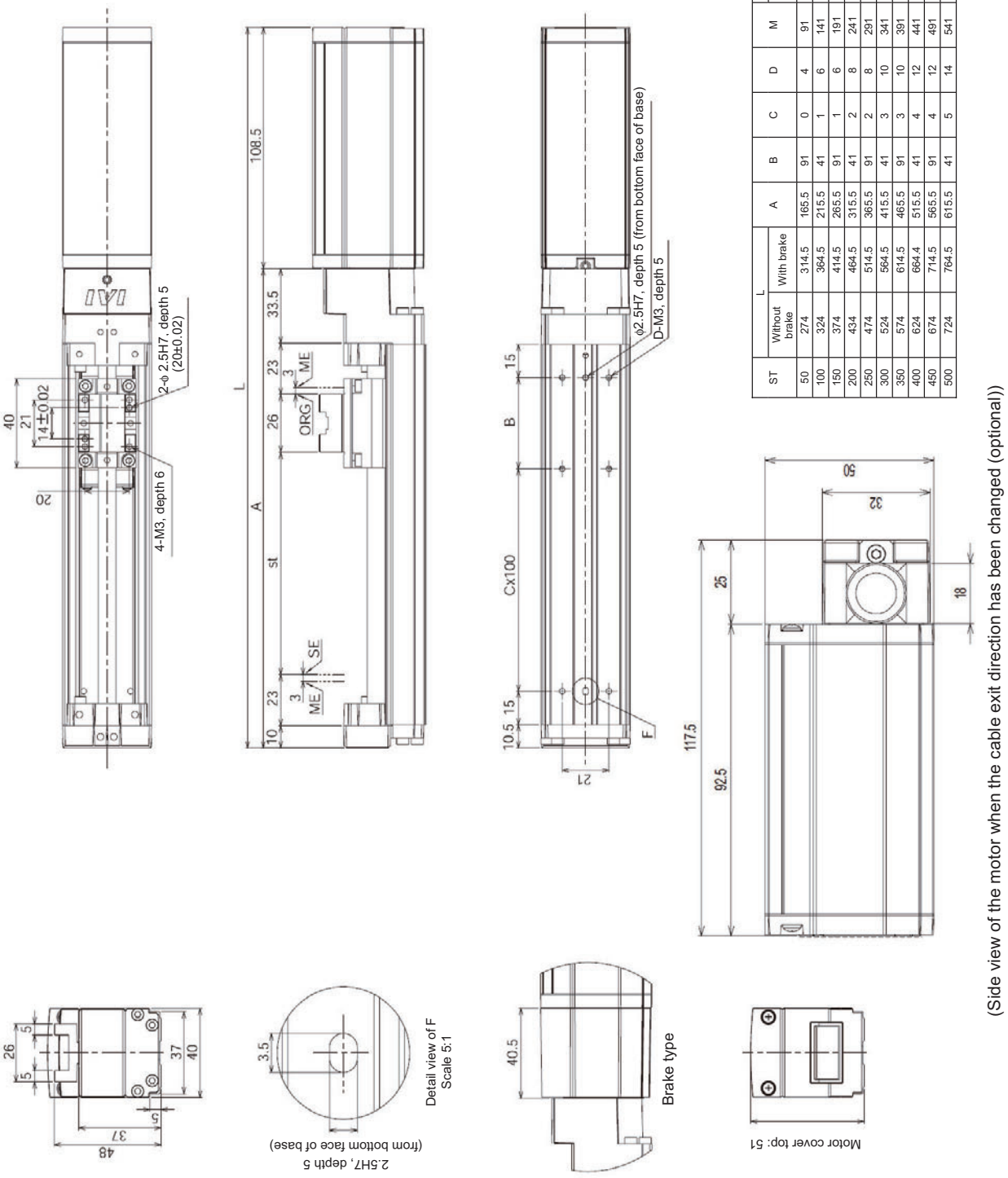
7.3 RCA2-SA3C with Side Cover



ST	L		A	B	C	D	M	Weight [kg]	
	Without brake	With brake						Without brake	With brake
50	247.5	292	155.5	84	0	4	84	0.6	0.8
100	297.5	342	205.5	34	1	6	134	0.6	0.8
150	347.5	392	255.5	84	1	6	184	0.7	0.9
200	397.5	442	305.5	34	2	8	234	0.8	1.0
250	447.5	492	355.5	84	2	8	284	0.8	1.0
300	497.5	542	405.5	34	3	10	334	0.9	1.1

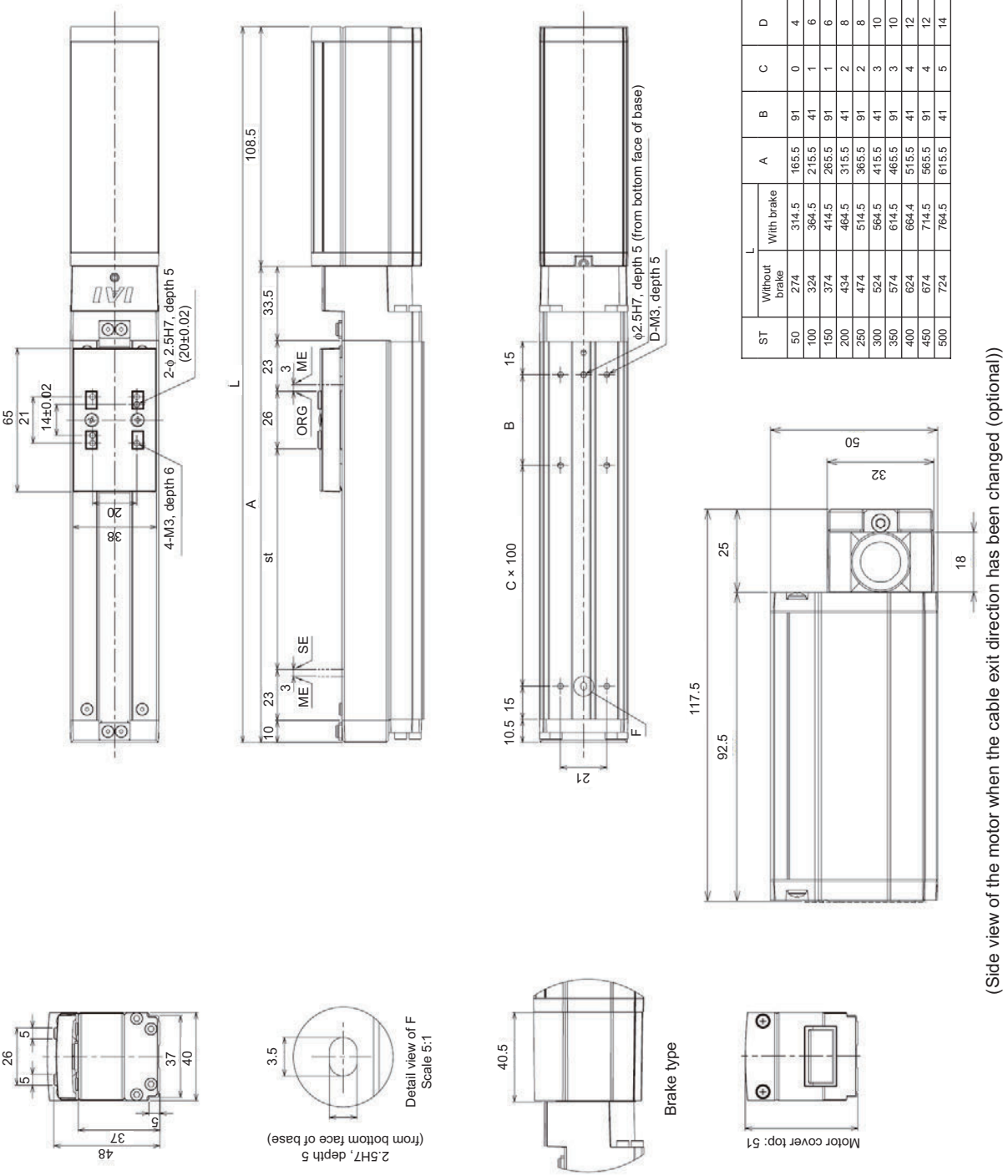
(Side view of the motor when the cable exit direction has been changed (optional))

7.4 RCA2-SA4C



ST	L		A	B	C	D	M	Weight [kg]	
	Without brake	With brake						Without brake	With brake
50	274	314.5	165.5	91	0	4	91	0.8	1.1
100	324	364.5	215.5	41	1	6	141	0.9	1.2
150	374	414.5	265.5	91	1	6	191	1	1.3
200	434	464.5	315.5	41	2	8	241	1	1.3
250	474	514.5	365.5	91	2	8	291	1.1	1.4
300	524	564.5	415.5	41	3	10	341	1.2	1.5
350	574	614.5	465.5	91	3	10	391	1.3	1.6
400	624	664.4	515.5	41	4	12	441	1.3	1.6
450	674	714.5	565.5	91	4	12	491	1.4	1.7
500	724	764.5	615.5	41	5	14	541	1.5	1.8

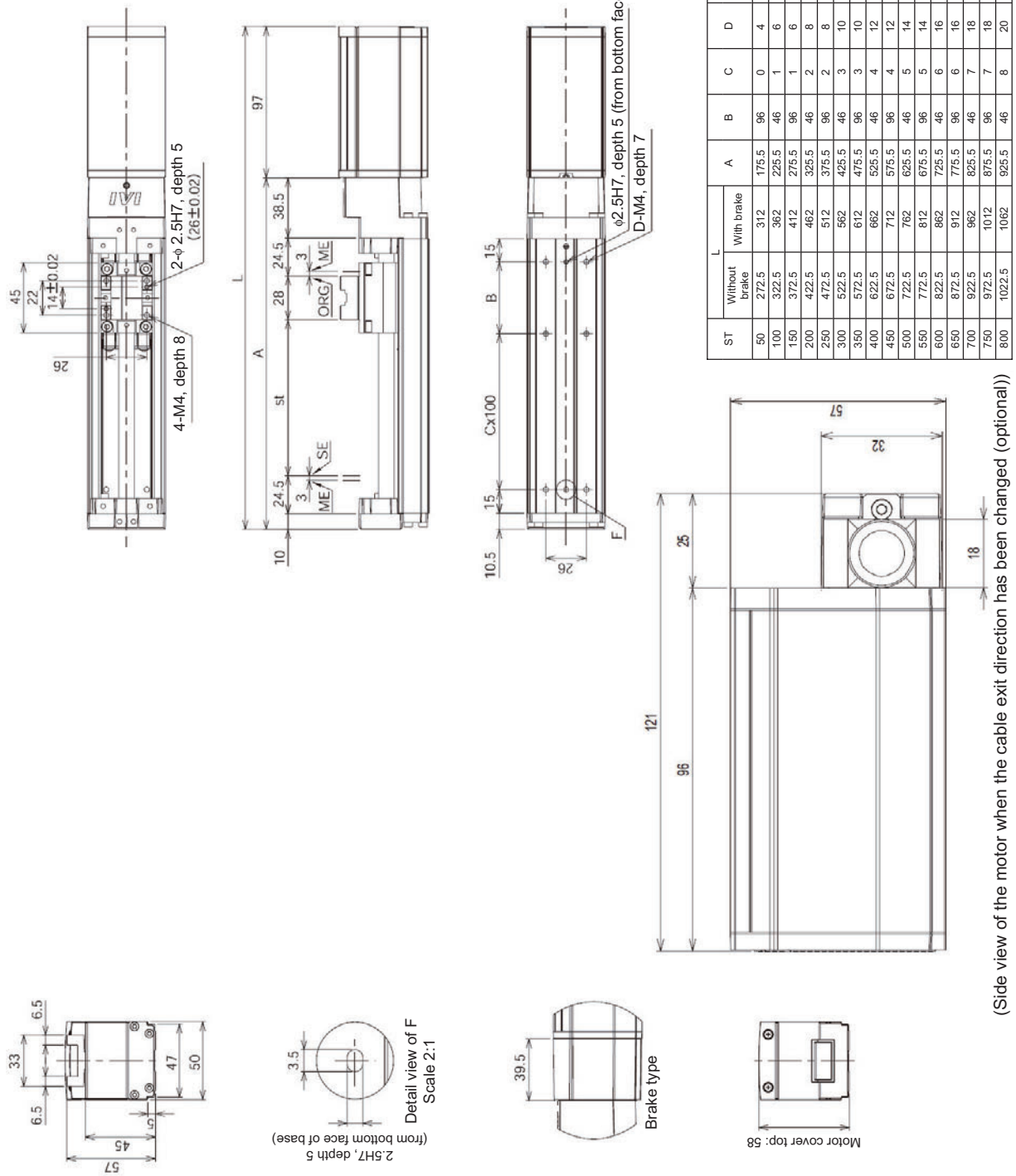
7.5 RCA2-SA4C with Side Cover



ST	L		A	B	C	D	M	Weight [kg]	
	Without brake	With brake						Without brake	With brake
50	274	314.5	165.5	91	0	4	91	0.9	1.2
100	324	364.5	215.5	41	1	6	141	1	1.3
150	374	414.5	265.5	91	1	6	191	1.1	1.4
200	434	464.5	315.5	41	2	8	241	1.1	1.4
250	474	514.5	365.5	91	2	8	291	1.2	1.5
300	524	564.5	415.5	41	3	10	341	1.3	1.6
350	574	614.5	465.5	91	3	10	391	1.4	1.7
400	624	664.4	515.5	41	4	12	441	1.5	1.8
450	674	714.5	565.5	91	4	12	491	1.5	1.8
500	724	764.5	615.5	41	5	14	541	1.6	1.9

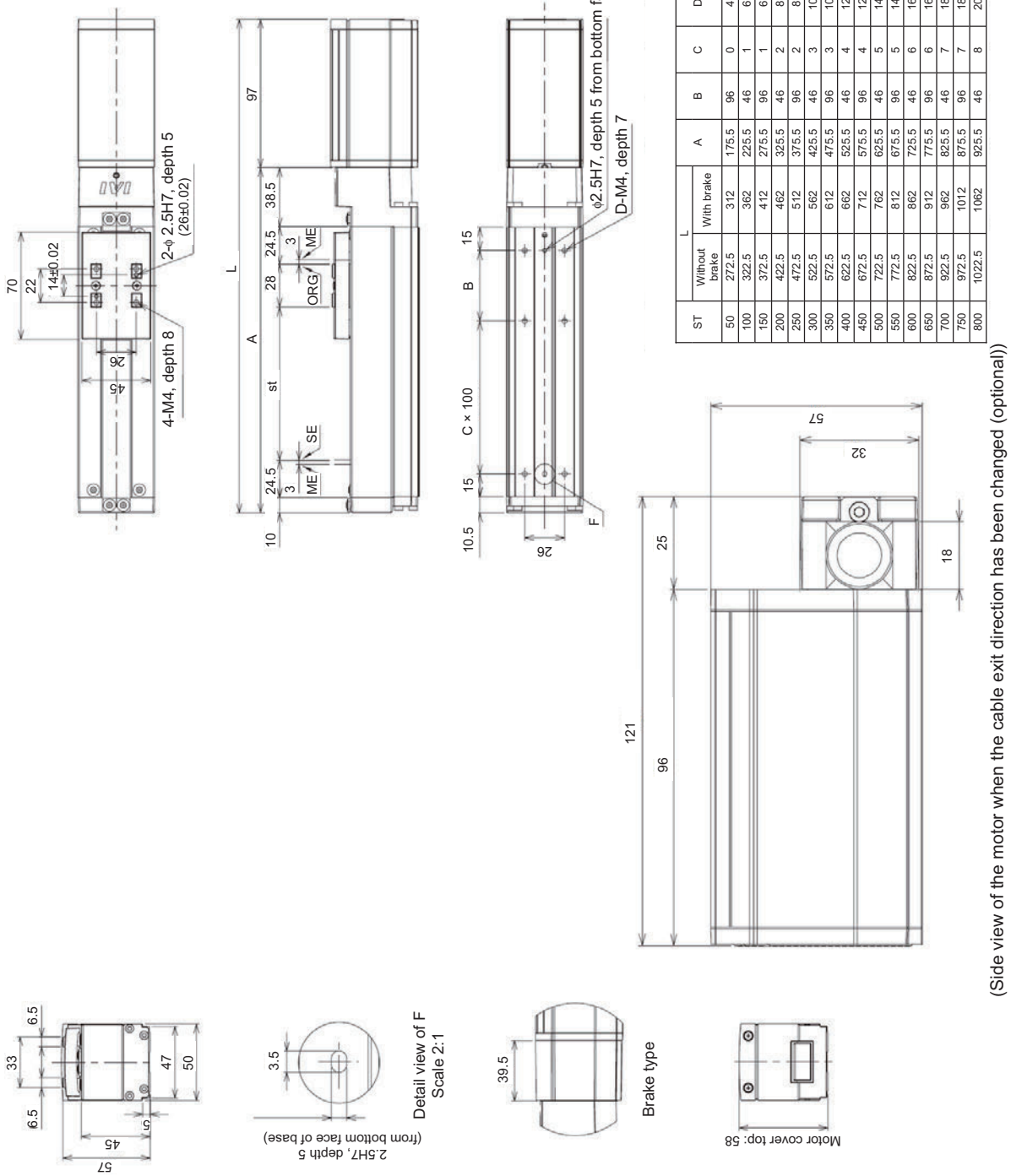
(Side view of the motor when the cable exit direction has been changed (optional))

7.6 RCA2-SA5C



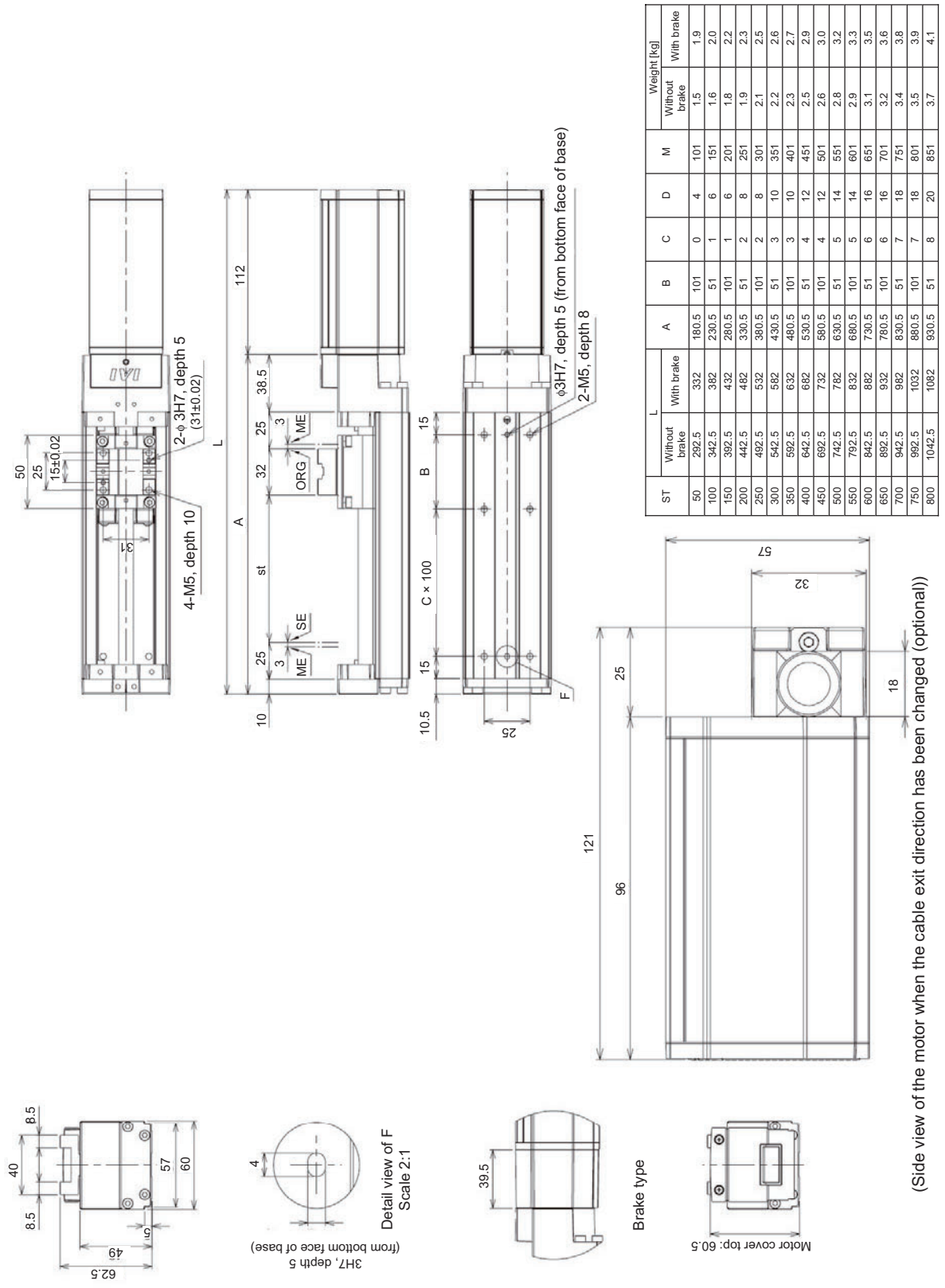
ST	L		A	B	C	D	M	Weight [kg]	
	Without brake	With brake						Without brake	With brake
50	272.5	312	175.5	96	0	4	96	1.1	1.5
100	322.5	362	225.5	46	1	6	146	1.3	1.7
150	372.5	412	275.5	96	1	6	196	1.4	1.8
200	422.5	462	325.5	46	2	8	246	1.5	1.9
250	472.5	512	375.5	96	2	8	296	1.6	2.0
300	522.5	562	425.5	46	3	10	346	1.7	2.1
350	572.5	612	475.5	96	3	10	396	1.8	2.2
400	622.5	662	525.5	46	4	12	446	1.9	2.3
450	672.5	712	575.5	96	4	12	496	2.0	2.4
500	722.5	762	625.5	46	5	14	546	2.1	2.5
550	772.5	812	675.5	96	5	14	596	2.2	2.6
600	822.5	862	725.5	46	6	16	646	2.3	2.7
650	872.5	912	775.5	96	6	16	696	2.4	2.8
700	922.5	962	825.5	46	7	18	746	2.5	2.9
750	972.5	1012	875.5	96	7	18	796	2.6	3.0
800	1022.5	1062	925.5	46	8	20	846	2.7	3.1

7.7 RCA2-SA5C with Side Cover



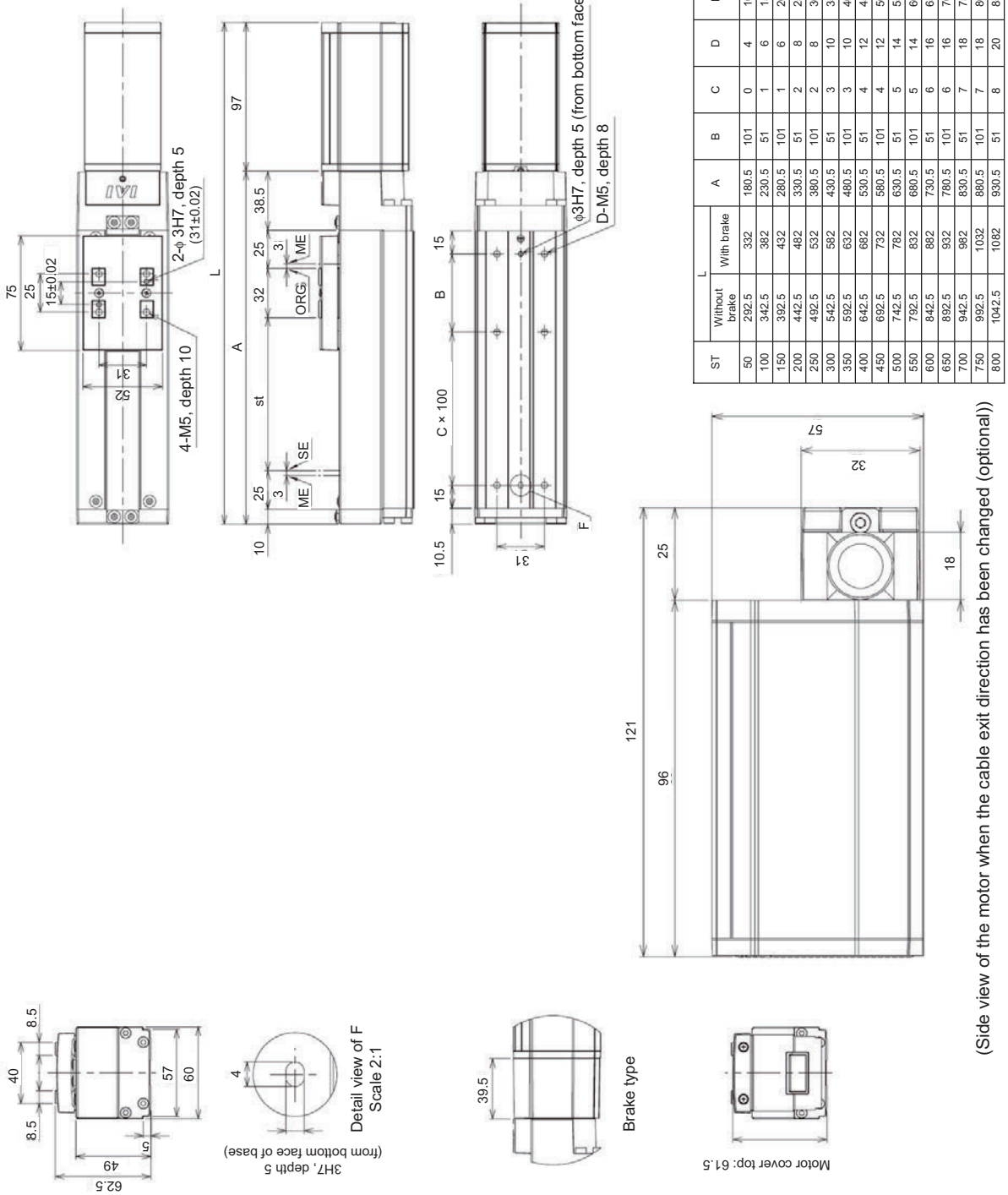
ST	L		A	B	C	D	M	Weight [kg]	
	Without brake	With brake						Without brake	With brake
50	272.5	312	175.5	96	0	4	96	1.2	1.6
100	322.5	362	225.5	46	1	6	146	1.4	1.8
150	372.5	412	275.5	96	1	6	196	1.5	1.9
200	422.5	462	325.5	46	2	8	246	1.6	2.0
250	472.5	512	375.5	96	2	8	296	1.8	2.2
300	522.5	562	425.5	46	3	10	346	1.9	2.3
350	572.5	612	475.5	96	3	10	396	2.0	2.4
400	622.5	662	525.5	46	4	12	446	2.2	2.6
450	672.5	712	575.5	96	4	12	496	2.3	2.7
500	722.5	762	625.5	46	5	14	546	2.4	2.8
550	772.5	812	675.5	96	5	14	596	2.6	3.0
600	822.5	862	725.5	46	6	16	646	2.7	3.1
650	872.5	912	775.5	96	6	16	696	2.8	3.2
700	922.5	962	825.5	46	7	18	746	3.0	3.4
750	972.5	1012	875.5	96	7	18	796	3.1	3.5
800	1022.5	1062	925.5	46	8	20	846	3.2	3.6

7.8 RCA2-SA6C



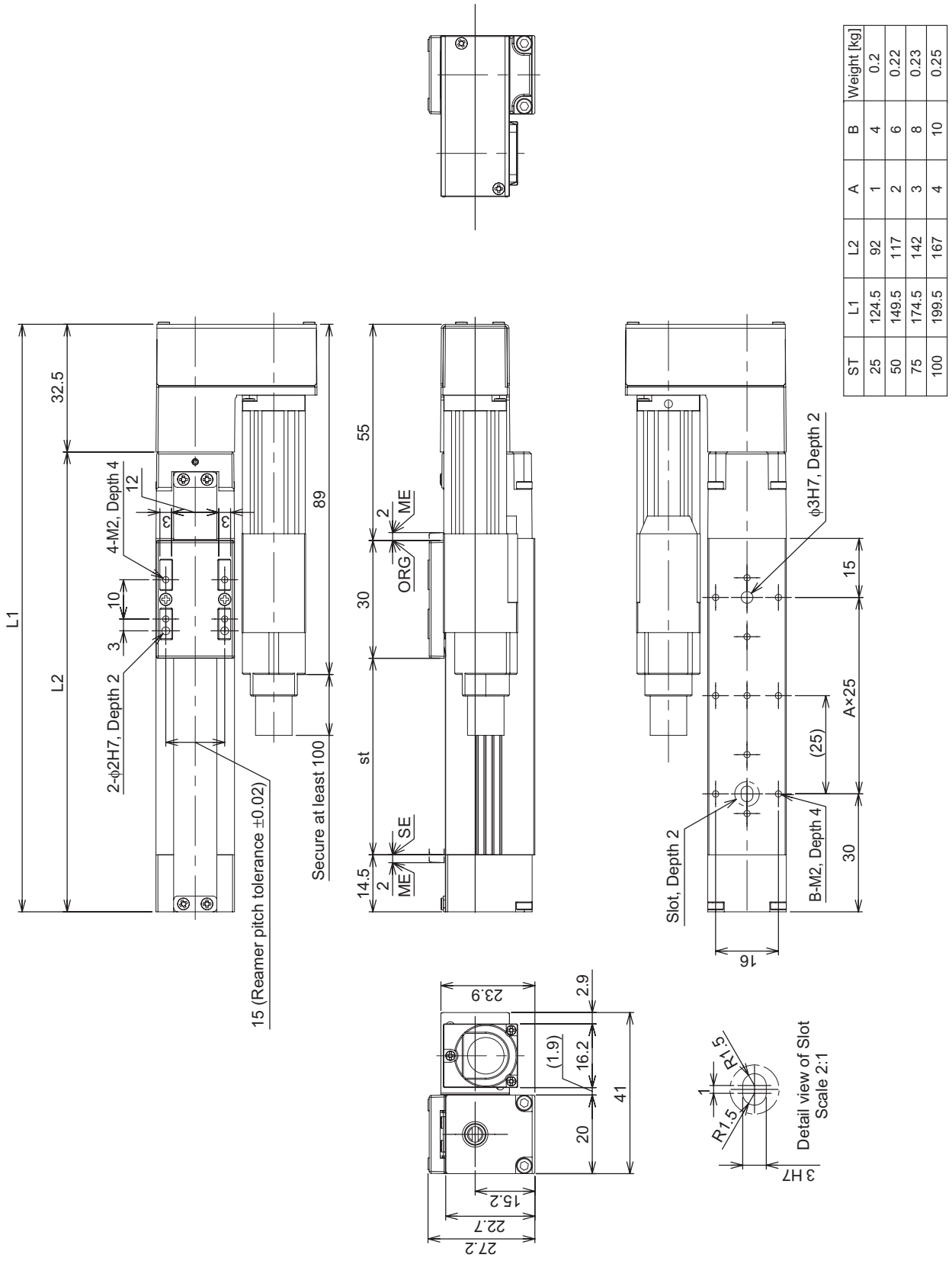
ST	L		A	B	C	D	M	Weight [kg]	
	Without brake	With brake						Without brake	With brake
50	292.5	332	180.5	101	0	4	101	1.5	1.9
100	342.5	382	230.5	51	1	6	151	1.6	2.0
150	392.5	432	280.5	101	1	6	201	1.8	2.2
200	442.5	482	330.5	51	2	8	251	1.9	2.3
250	492.5	532	380.5	101	2	8	301	2.1	2.5
300	542.5	582	430.5	51	3	10	351	2.2	2.6
350	592.5	632	480.5	101	3	10	401	2.3	2.7
400	642.5	682	530.5	51	4	12	451	2.5	2.9
450	692.5	732	580.5	101	4	12	501	2.6	3.0
500	742.5	782	630.5	51	5	14	551	2.8	3.2
550	792.5	832	680.5	101	5	14	601	2.9	3.3
600	842.5	882	730.5	51	6	16	651	3.1	3.5
650	892.5	932	780.5	101	6	16	701	3.2	3.6
700	942.5	982	830.5	51	7	18	751	3.4	3.8
750	992.5	1032	880.5	101	7	18	801	3.5	3.9
800	1042.5	1082	930.5	51	8	20	851	3.7	4.1

7.9 RCA2-SA6C with Side Cover



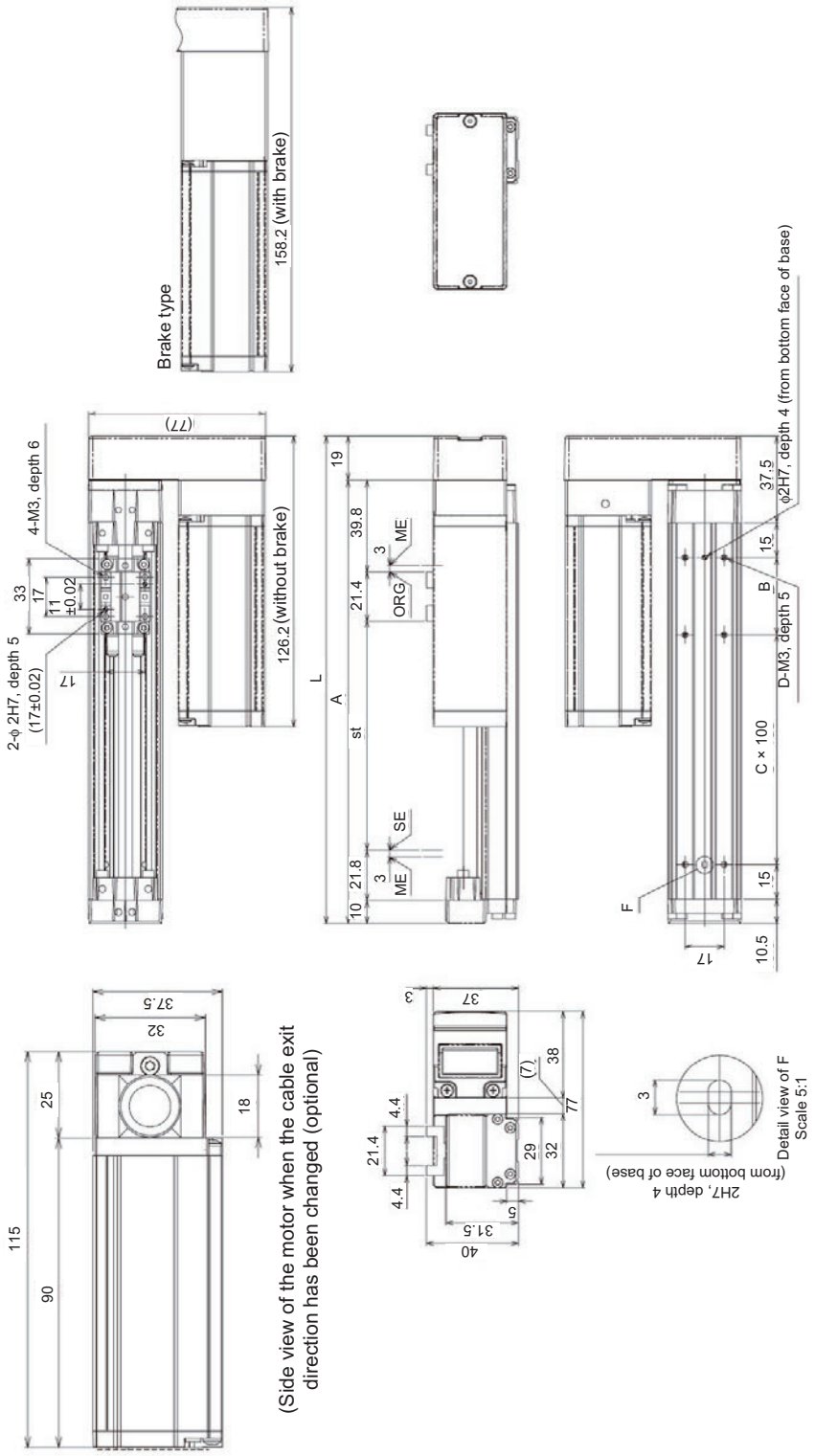
ST	L		A	B	C	D	M	Weight [kg]	
	Without brake	With brake						Without brake	With brake
50	292.5	332	180.5	101	0	4	101	1.6	2.0
100	342.5	382	230.5	51	1	6	151	1.7	2.1
150	392.5	432	280.5	101	1	6	201	1.9	2.3
200	442.5	482	330.5	51	2	8	251	2.1	2.5
250	492.5	532	380.5	101	2	8	301	2.3	2.7
300	542.5	582	430.5	51	3	10	351	2.4	2.8
350	592.5	632	480.5	101	3	10	401	2.6	3.0
400	642.5	682	530.5	51	4	12	451	2.8	3.2
450	692.5	732	580.5	101	4	12	501	2.9	3.3
500	742.5	782	630.5	51	5	14	551	3.1	3.5
550	792.5	832	680.5	101	5	14	601	3.3	3.7
600	842.5	882	730.5	51	6	16	651	3.5	3.9
650	892.5	932	780.5	101	6	16	701	3.6	4.0
700	942.5	982	830.5	51	7	18	751	3.8	4.2
750	992.5	1032	880.5	101	7	18	801	4.0	4.4
800	1042.5	1082	930.5	51	8	20	851	4.1	4.5

7.10 RCA2-SA2AR



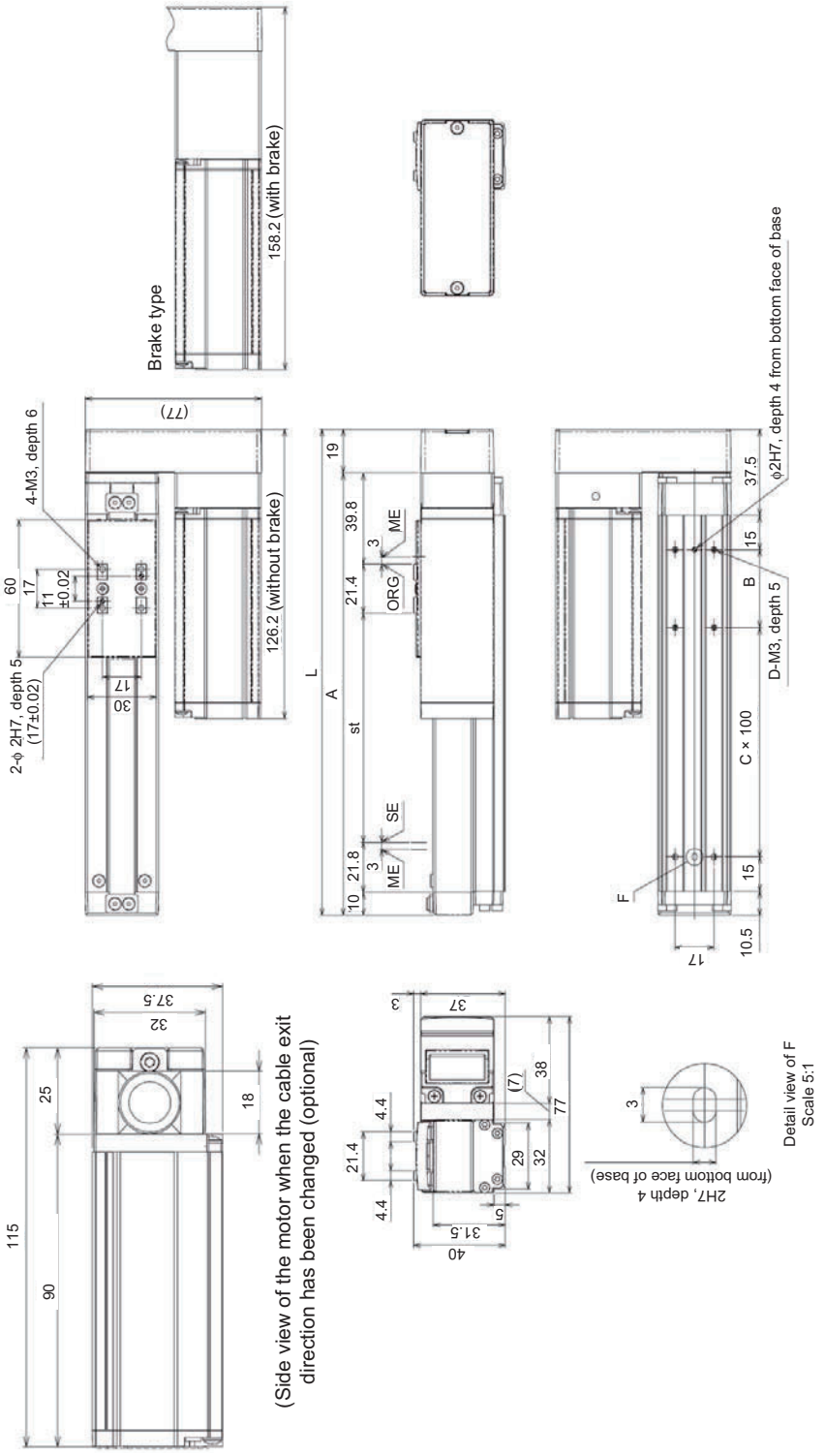
ST	L1	L2	A	B	Weight [kg]
25	124.5	92	1	4	0.2
50	149.5	117	2	6	0.22
75	174.5	142	3	8	0.23
100	199.5	167	4	10	0.25

7.11 RCA2-SA3R Reversing to Left (Right)



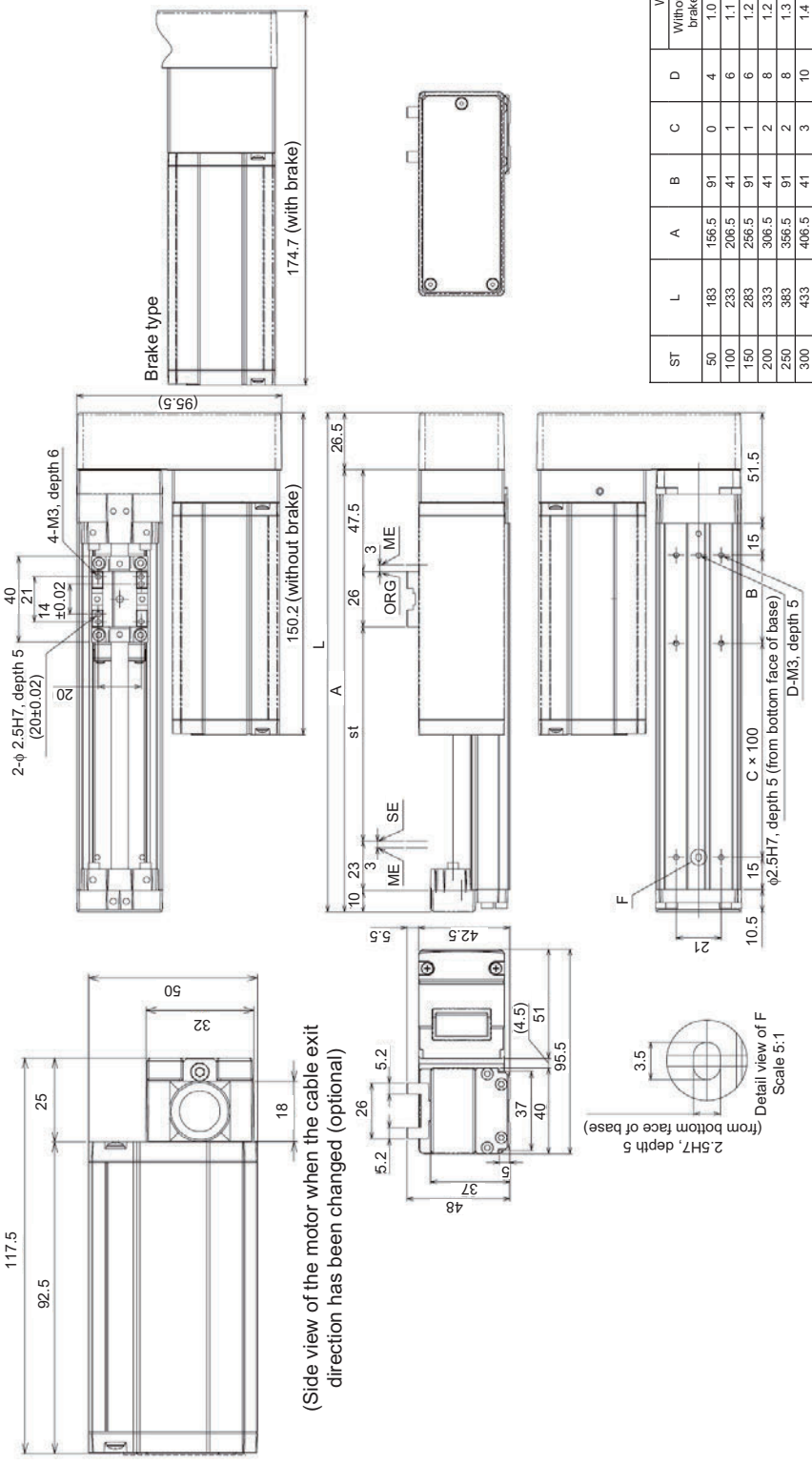
ST	L	A	B	C	D	Weight [kg]	
						Without brake	With brake
50	162	143	84	0	4	0.6	0.8
100	212	193	34	1	6	0.7	0.9
150	262	243	84	1	6	0.7	0.9
200	312	293	34	2	8	0.8	1.0
250	362	343	84	2	8	0.8	1.0
300	412	393	34	3	10	0.9	1.1

7.12 RCA2-SA3R with Side Cover, Reversing to Left (Right)



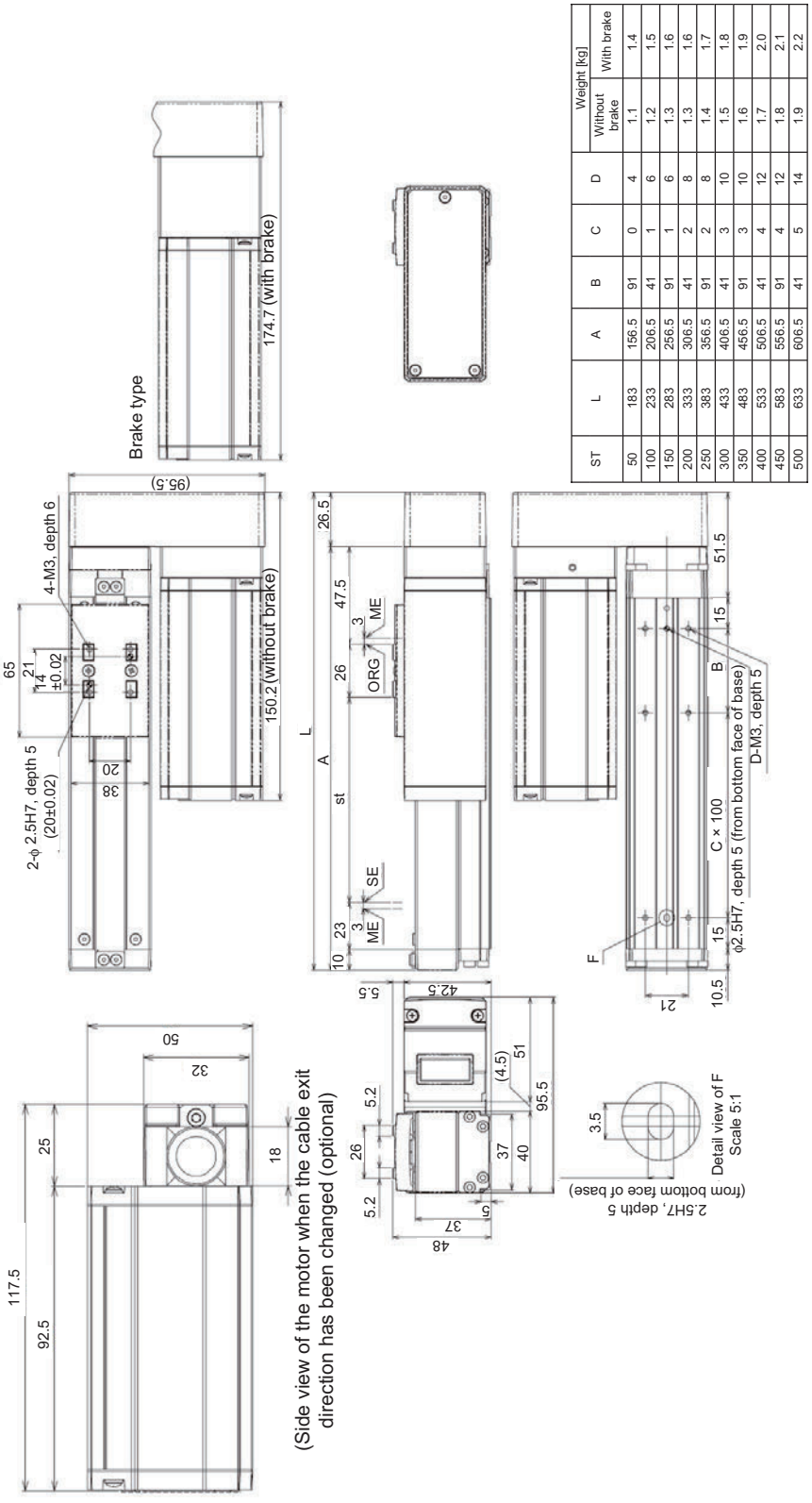
ST	L	A	B	C	D	Weight [kg]	
						Without brake	With brake
50	162	143	84	0	4	0.7	0.9
100	212	193	34	1	6	0.7	0.9
150	262	243	84	1	6	0.8	1.0
200	312	293	34	2	8	0.9	1.1
250	362	343	84	2	8	0.9	1.1
300	412	393	34	3	10	1.0	1.2

7.13 RCA2-SA4R Reversing to Left (Right)



ST	L	A	B	C	D	Weight [kg]	
						Without brake	With brake
50	183	156.5	91	0	4	1.0	1.3
100	233	206.5	41	1	6	1.1	1.4
150	283	256.5	91	1	6	1.2	1.5
200	333	306.5	41	2	8	1.2	1.5
250	383	356.5	91	2	8	1.3	1.6
300	433	406.5	41	3	10	1.4	1.7
350	483	456.5	91	3	10	1.5	1.8
400	533	506.5	41	4	12	1.5	1.8
450	583	556.5	91	4	12	1.6	1.9
500	633	606.5	41	5	14	1.7	2.0

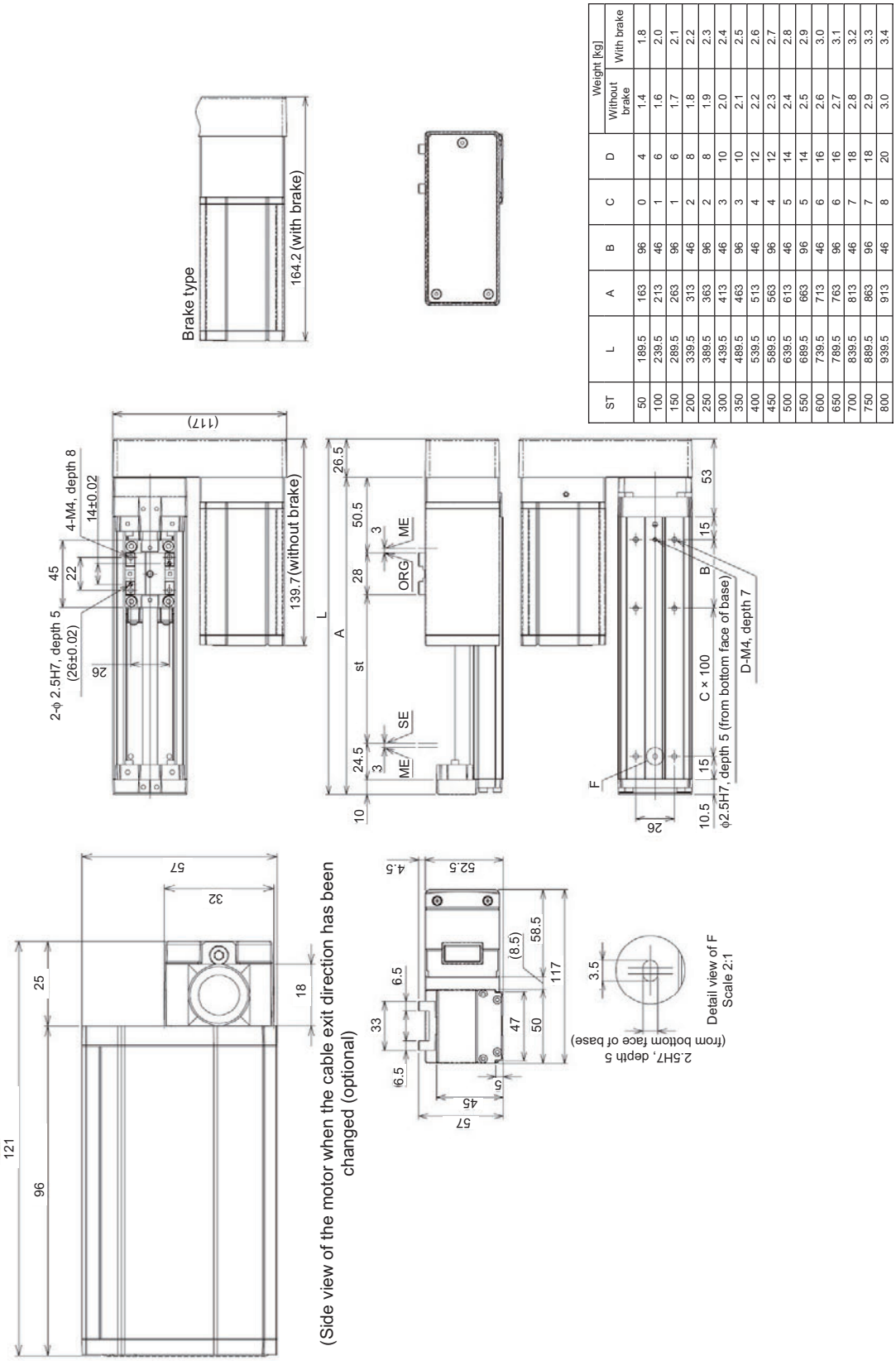
7.14 RCA2-SA4R with Side Cover, Reversing to Left (Right)



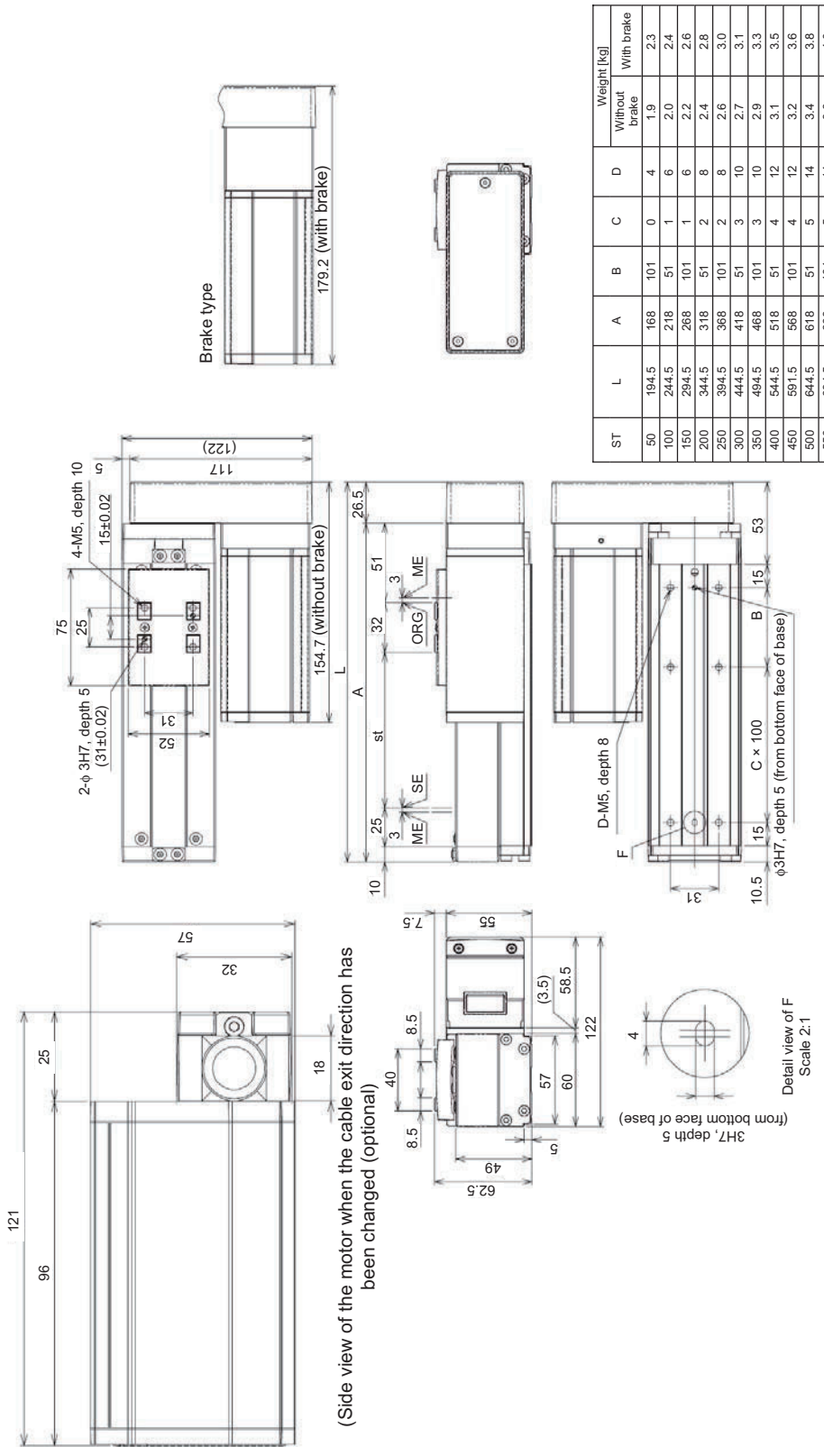
ST	L	A	B	C	D	Weight [kg]	
						Without brake	With brake
50	183	166.5	91	0	4	1.1	1.4
100	233	206.5	41	1	6	1.2	1.5
150	283	256.5	91	1	6	1.3	1.6
200	333	306.5	41	2	8	1.3	1.6
250	383	356.5	91	2	8	1.4	1.7
300	433	406.5	41	3	10	1.5	1.8
350	483	456.5	91	3	10	1.6	1.9
400	533	506.5	41	4	12	1.7	2.0
450	583	556.5	91	4	12	1.8	2.1
500	633	606.5	41	5	14	1.9	2.2

7.15 RCA2-SA5R Reversing to Left (Right)

ST	L	A	B	C	D	Weight [kg]	
						Without brake	With brake
50	189.5	163	96	0	4	1.4	1.8
100	239.5	213	46	1	6	1.6	2.0
150	289.5	263	96	1	6	1.7	2.1
200	339.5	313	46	2	8	1.8	2.2
250	389.5	363	96	2	8	1.9	2.3
300	439.5	413	46	3	10	2.0	2.4
350	489.5	463	96	3	10	2.1	2.5
400	539.5	513	46	4	12	2.2	2.6
450	589.5	563	96	4	12	2.3	2.7
500	639.5	613	46	5	14	2.4	2.8
550	689.5	663	96	5	14	2.5	2.9
600	739.5	713	46	6	16	2.6	3.0
650	789.5	763	96	6	16	2.7	3.1
700	839.5	813	46	7	18	2.8	3.2
750	889.5	863	96	7	18	2.9	3.3
800	939.5	913	46	8	20	3.0	3.4

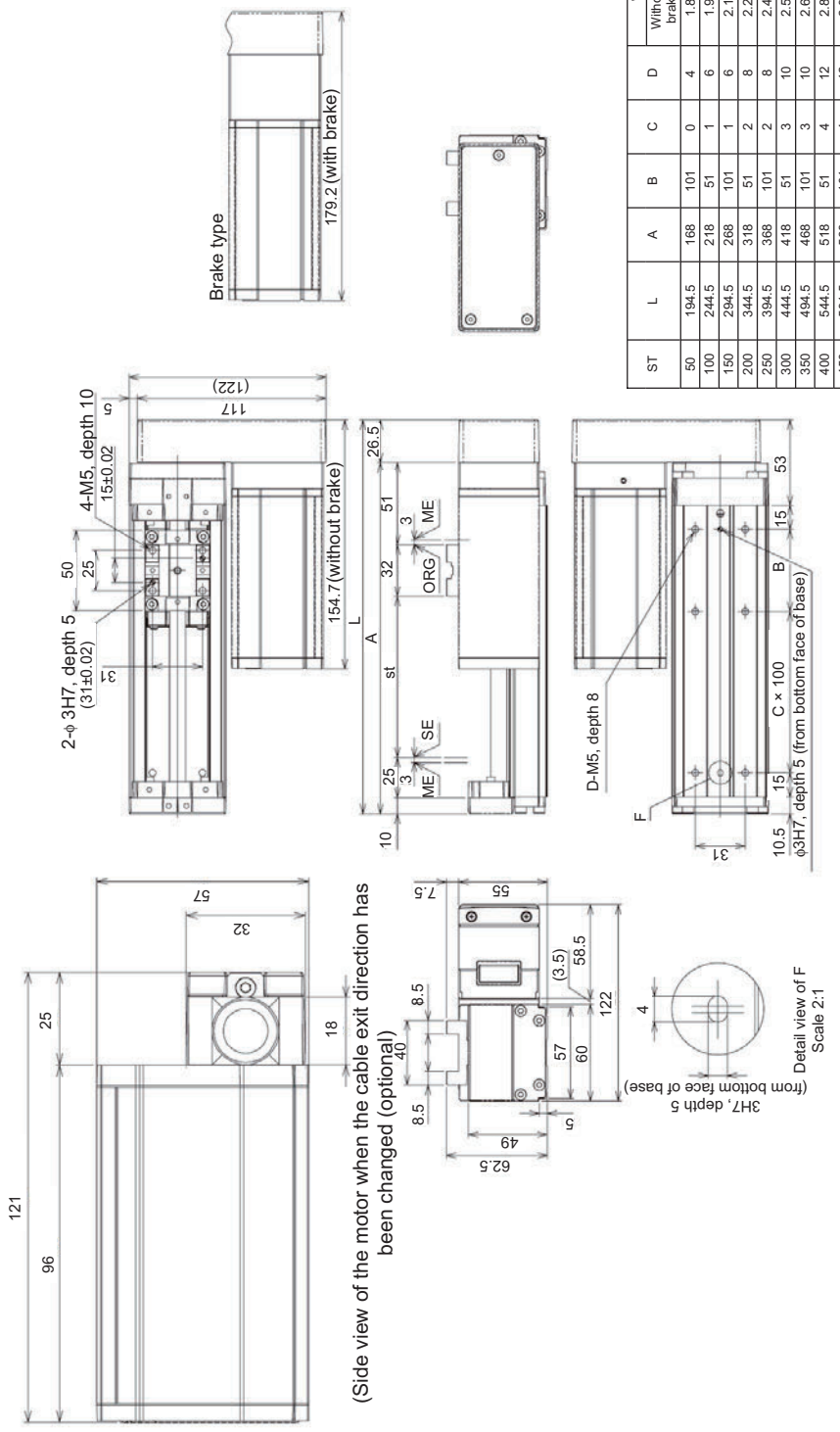


7.16 RCA2-SA5R with Side Cover, Reversing to Left (Right)



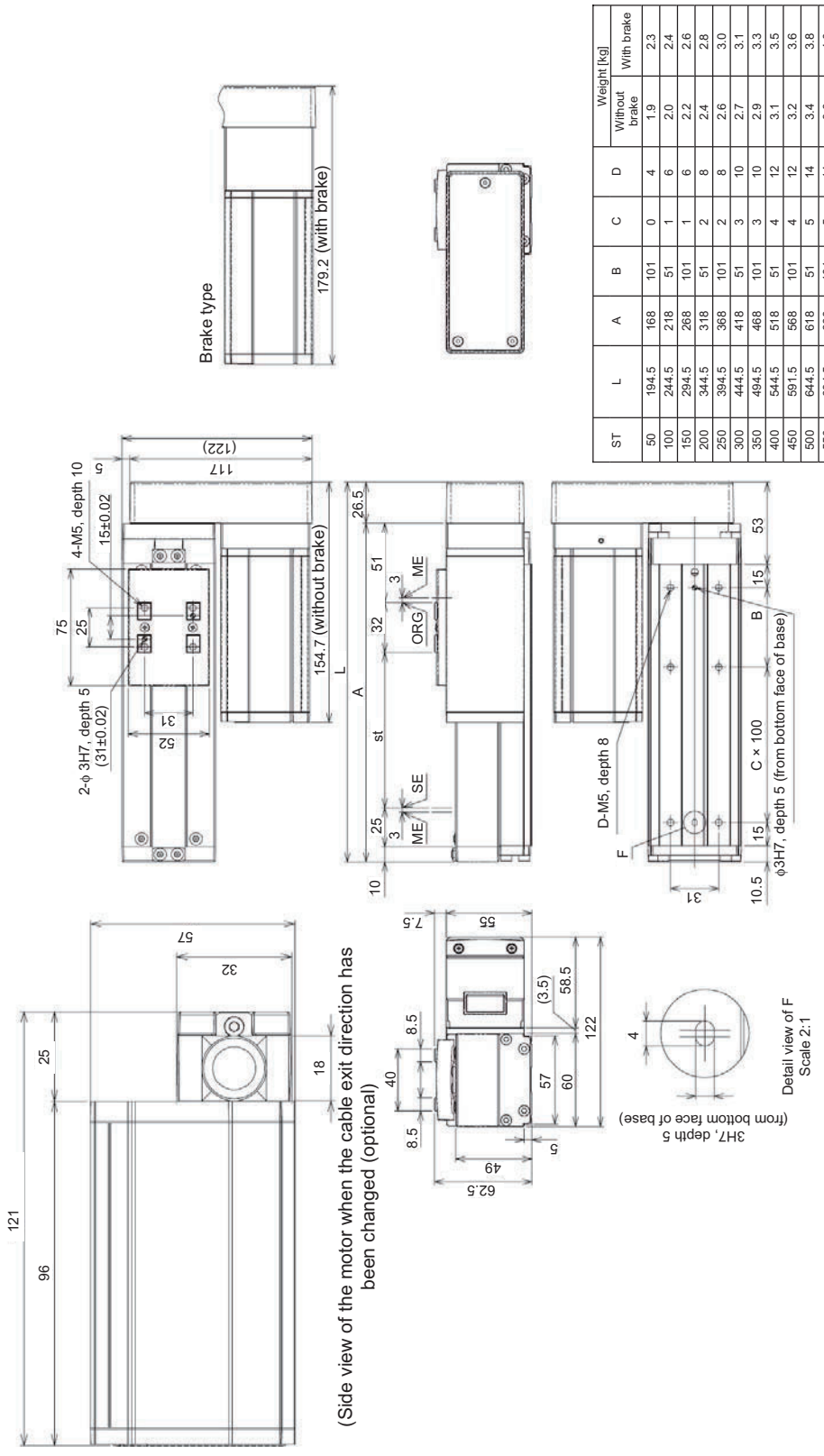
ST	L	A	B	C	D	Weight [kg]	
						Without brake	With brake
50	194.5	168	101	0	4	1.9	2.3
100	244.5	218	51	1	6	2.0	2.4
150	294.5	268	101	1	6	2.2	2.6
200	344.5	318	51	2	8	2.4	2.8
250	394.5	368	101	2	8	2.6	3.0
300	444.5	418	51	3	10	2.7	3.1
350	494.5	468	101	3	10	2.9	3.3
400	544.5	518	51	4	12	3.1	3.5
450	591.5	568	101	4	12	3.2	3.6
500	644.5	618	51	5	14	3.4	3.8
550	694.5	668	101	5	14	3.6	4.0
600	744.5	718	51	6	16	3.8	4.2
650	794.5	768	101	6	16	3.9	4.3
700	844.5	818	51	7	18	4.1	4.5
750	894.5	868	101	7	18	4.3	4.7
800	944.5	918	51	8	20	4.5	4.9

7.17 RCA2-SA6R Reversing to Left (Right)



ST	L	A	B	C	D	Weight [kg]	
						Without brake	With brake
50	194.5	168	101	0	4	1.8	2.2
100	244.5	218	51	1	6	1.9	2.3
150	294.5	268	101	1	6	2.1	2.5
200	344.5	318	51	2	8	2.2	2.6
250	394.5	368	101	2	8	2.4	2.8
300	444.5	418	51	3	10	2.5	2.9
350	494.5	468	101	3	10	2.6	3.0
400	544.5	518	51	4	12	2.8	3.2
450	591.5	568	101	4	12	2.9	3.3
500	644.5	618	51	5	14	3.1	3.5
550	694.5	668	101	5	14	3.2	3.6
600	744.5	718	51	6	16	3.4	3.8
650	794.5	768	101	6	16	3.5	3.9
700	844.5	818	51	7	18	3.7	4.1
750	894.5	868	101	7	18	3.8	4.2
800	944.5	918	51	8	20	3.9	4.3

7.18 RCA2-SA6R with Side Cover, Reversing to Left (Right)



ST	L	A	B	C	D	Weight [kg]	
						Without brake	With brake
50	194.5	168	101	0	4	1.9	2.3
100	244.5	218	51	1	6	2.0	2.4
150	294.5	268	101	1	6	2.2	2.6
200	344.5	318	51	2	8	2.4	2.8
250	394.5	368	101	2	8	2.6	3.0
300	444.5	418	51	3	10	2.7	3.1
350	494.5	468	101	3	10	2.9	3.3
400	544.5	518	51	4	12	3.1	3.5
450	591.5	568	101	4	12	3.2	3.6
500	644.5	618	51	5	14	3.4	3.8
550	694.5	668	101	5	14	3.6	4.0
600	744.5	718	51	6	16	3.8	4.2
650	794.5	768	101	6	16	3.9	4.3
700	844.5	818	51	7	18	4.1	4.5
750	894.5	868	101	7	18	4.3	4.7
800	944.5	918	51	8	20	4.5	4.9

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
- 2,500 hours of operation

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 of problem in question was caused by a specification defect or problem, or by a quality issue with 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		
	First edition		
March 2007	Second edition	Corrected clerical errors.	
March 2010	Third edition	P. 25, 26:	Added “High-acceleration/deceleration specification.”
September 2010	Forth edition	P. 9:	Added an “item to note regarding the position when the servo is turned on” under “Handling Precautions.”
November 2010	Fifth edition	P. 30~31:	Longest cable length: 10m → 20m
		P. 34:	Added “Operation Manual for MEC Controller” and “Operation Manual for MEC PC Software” under “Operation Manuals Relating to This Product.”
		P. 35~39:	Added “SA5C, SA6C – Lead 20 mm” under 5.4, “How to Read the Model Number” and 6, Specifications.”
		P. 41:	Added lines for SA5C/SA6C of lead 20 mm to the graphs under 7, “Notes on Use Regarding Maximum Speed and Loading Mass.”
		P. 43:	Changed the text of “Caution.”
		P. 56:	Added 11.2, “Fine-tuning the Home Position” and “AMEC Controller.”
		P. 58:	Added 12, “Life.”
		P. 60:	Added 13.4, “Adjusting the Stainless Sheet.”
April 2011	Sixth edition	A page for CE Marking added	
June 2011	Seventh edition	P.43:	Contents of caution for vertically oriented mount changed.
July 2011	Eighth edition	P.46:	Change in ceiling installation availability (×: Not possible → : △Daily inspection is required)
		P.76~77:	Contents changed. in 14. Warranty
July 2011	Ninth edition	Added SA2AC and SA2AR	
March 2012	Tenth edition	Contents changed in Safety Guide Caution notes added for when working with two or more persons	
		P.46:	Note added to tell platform should have a structure with enough stiffness
		P.47:	Note changed to 1.8 times more of the nominal diameter for the length of thread engagement on aluminum

Revision Date	Description of Revision		
March 2012	Eleventh edition	P.1~7: P.8:	Contents added and changed in Safety Guide Note “Make sure to attach the actuator properly by following this operation manual.” added in Caution in Handling
		P.13~30: P.64~66:	Weight added to external dimensions Warning notes added such as in case the grease got into your eye, immediately go to see the doctor for an appropriate care.
May 2013	Twelfth edition	Revised overall	

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