



ROBO Cylinder RCP3 Actuator Slider Type Operating Manual

Tenth Edition

Motor straight types	[Slim Small ROBO Cylinders] SA2AC/SA2BC
	SA3C/SA4C/SA5C/SA6C
Motor reversing types	[Slim Small ROBO Cylinders] SA2AR/SA2BR
	SA3R/SA4R/SA5R/SA6R

IAI America, Inc.

Please Read Before Use

Thank you for purchasing our product.

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

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

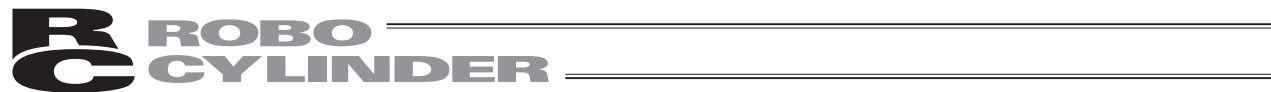
The CD or DVD that comes with the product contains operation manuals for IAI products.

When using the product, refer to the necessary portions of the applicable operation manual by printing them out or displaying them on a PC.

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

[Important]

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



CE Marking

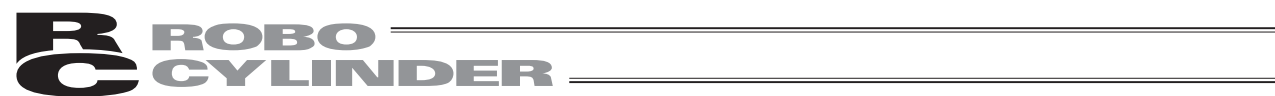
If a compliance with the CE Marking is required, please follow Overseas Standards Compliance Manual (ME0287) that is provided separately.

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Safety Guide

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

Safety Precautions for Our Products

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

No.	Operation Description	Description
1	Model Selection	<ul style="list-style-type: none">• 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.<ol style="list-style-type: none">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.<ol style="list-style-type: none">1) Location where there is any inflammable gas, inflammable object or explosive2) Place with potential exposure to radiation3) Location with the ambient temperature or relative humidity exceeding the specification range4) Location where radiant heat is added from direct sunlight or other large heat source5) Location where condensation occurs due to abrupt temperature changes6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid)7) Location exposed to significant amount of dust, salt or iron powder8) 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	<ul style="list-style-type: none"> • 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 operation 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	<ul style="list-style-type: none"> • 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	<p>(1) Installation of Robot Main Body and Controller, etc.</p> <ul style="list-style-type: none"> • 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. <ol style="list-style-type: none"> 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	<p>(2) Cable Wiring</p> <ul style="list-style-type: none"> ● 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. <p>(3) Grounding</p> <ul style="list-style-type: none"> ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm^2 (AWG20 or equivalent) or more for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).





No.	Operation Description	Description
4	Installation and Start	<p>(4) Safety Measures</p> <ul style="list-style-type: none"> • When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. • When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot's movable range. When the robot under operation is touched, it may result in death or serious injury. • Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. • Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. • Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. • When the installation or adjustment operation is to be performed, give clear warnings such as "Under Operation; Do not turn ON the power!" etc. Sudden power input may cause an electric shock or injury. • Take the measure so that the work part is not dropped in power failure or emergency stop. • Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. • Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. • When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	<ul style="list-style-type: none"> • 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. <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>

No.	Operation Description	Description
6	Trial Operation	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 Operation 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. <p>Use in incomplete condition may cause damage to the product or an injury.</p> <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>
9	Modification and Dismantle	<ul style="list-style-type: none"> • Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	<ul style="list-style-type: none"> • 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. <p>The product may burst or generate toxic gases.</p>
11	Other	<ul style="list-style-type: none"> • 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 operation 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 Operation 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. 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.

2. 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.

3. 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.

4. Grease film may run out after back-and-forth operations over a short distance.

Grease film may run out if the actuator is moved back and forth continuously over a distance of 30 mm or less. As a guide, perform a back-and-forth operation five times or over a distance of 50 mm 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. Turn on the servo after making sure the slider or rod is away from the mechanical end.

If the servo is turned on when the slider or rod is positioned near the mechanical end, the pole phase may not be detected and a pole non-confirmation error or excitation detection error may occur. Accordingly, turn on the servo after making sure the slider or rod is away from the mechanical end.

6. Make sure to attach the actuator properly by following this operation manual.

Using the product with the actuator not being certainly retained or affixed may cause abnormal noise, vibration, malfunction or shorten the product life.

7. Handling Precautions

7.1 Handling a Single Actuator

Please adhere to the following when handling a single actuator.

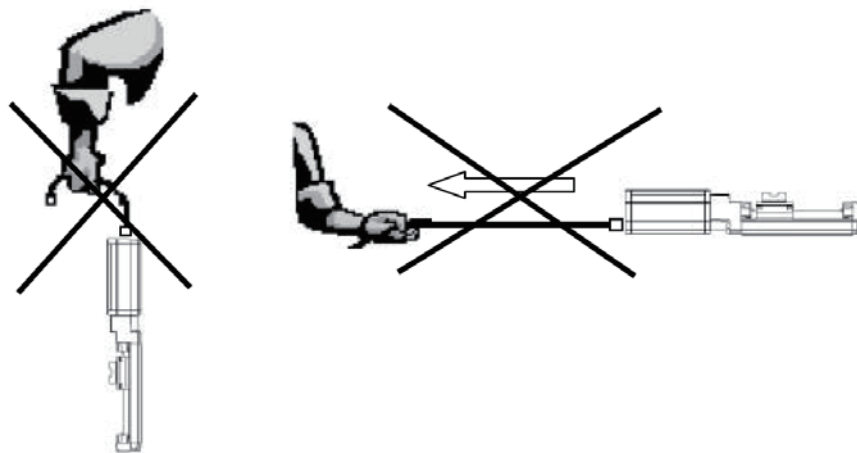
7.1.1 Handling the Packed Unit

Unless otherwise specified, single-axis actuators are shipped in individual packaging. Please handle packages carefully during transport to ensure that product is not damaged by bumping or dropping.

- Never attempt to move heavy packages by yourself.
- Always set packages down on a level surface.
- Never climb on top of packages.
- Never place heavy objects or objects where the load is concentrated in one place on top of packages, as this may cause deformation.

7.1.2 Handling the Actuator After Unpacking

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



When transporting the unassembled actuator, pay attention to the items specified below.

When unpacking the actuator and handling it thereafter, always hold it by the base.

Never hold an actuator by the stainless sheet.

- Be careful not to bump the actuator into anything when moving it, paying particular care to the side covers.
- Do not attempt to force any part of the actuator. Take particular care not to force the stainless sheet.



Warning: Never hold the actuator by the stainless sheet.

Supplement) For the names of each part of the actuator, see 1, "Part Names."



7.2 Handling the Actuator Assembly

When transporting the actuator with its axes already assembled, take note of the following items.

7.2.1 Shipping from IAI Already Assembled

After assembly at IAI, your machine undergoes a shipping inspection, is packed in a crate with skids, and finally shipped.

If any of the combined actuators is a slider, the slider is securely fastened in place to prevent unexpected movement during shipping. Combined units have the ends of their actuators fastened so as to prevent them from moving significantly due to external vibration.

- The crate is not designed to withstand dropping or collision. Please handle it carefully. It is also not built to have items stacked on it, so please avoid placing heavy objects on top of the crate.
- When lifting the package using belts or the like, be sure to pass the belts around the reinforcement frames under the skids. The same applies for lifting the package with a forklift; please ensure that the forks are placed under the skids.
- When setting the package down, do not let the package receive an impact upon contacting the floor.

7.2.2 Handling After Unpacking

Please adhere to the following instructions when handling the assembled unit, whether it was shipped pre-assembled at IAI or assembled on your site.

- Secure the slider so that it does not move unexpectedly during transport.
- If the end of the actuator is protruding, fasten it down properly so that it does not move significantly due to external vibration. When transporting the assembly without the ends of the actuators fastened, do not subject the assembly to an impact of 0.3 G or more.
- When using belts or the like to lift an assembly consisting of an actuator and peripheral equipment, make sure the belts are not passed around the actuator itself or otherwise do not touch the actuator.
- Make sure the belts support the actuator load by its base by using appropriate cushioning materials.
- Lift the end of the Y-axis with a separate belt, ensuring that the assembly remains level. At this time, also make sure the load is not placed on the screw cover.
- Make sure the load is not placed on the brackets, covers, or connector box.
Also make sure the cables are not pinched or deformed excessively.

7.3 Handling after Assembly with Peripheral Equipment

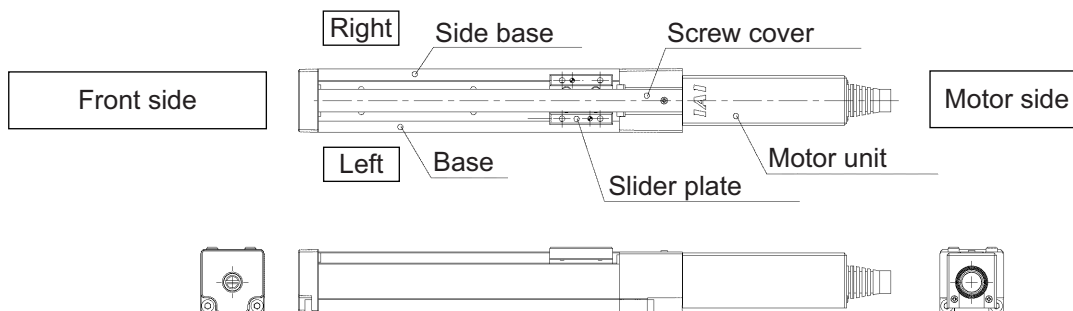
When the machine assembled at IAI is transported as an assembly, also follow the handling precautions in 6.2.2, “Handling after Unpacking.”

1. Part Names

The names of the actuator parts are indicated below.

In this manual, the left and right directions are indicated by viewing the horizontally placed actuator from the motor in a top view.

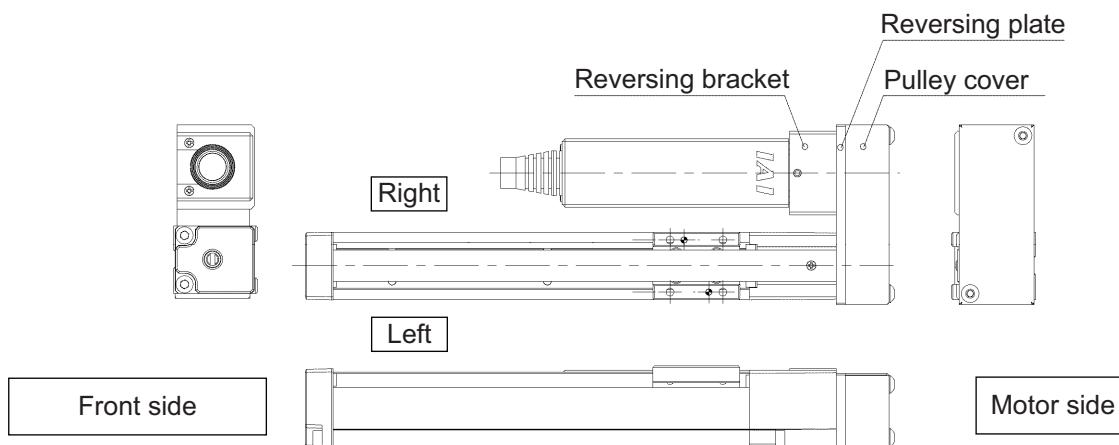
- “Motor coupling types” : SA2AC/SA2BC



* Refer to 2, “External Dimensions” for details.

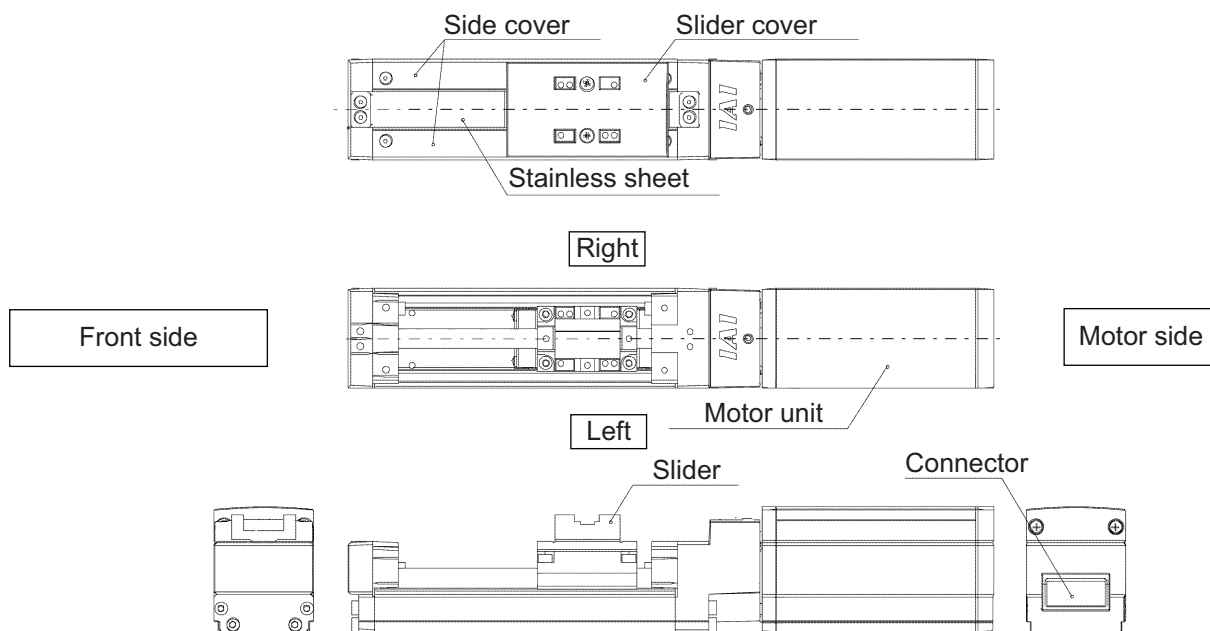
* The connector position shown above assumes that the cable exit direction has not been changed.

- “Motor reversing types” : SA2AR/SA2BR



* Refer to 2, “External Dimensions” for details.

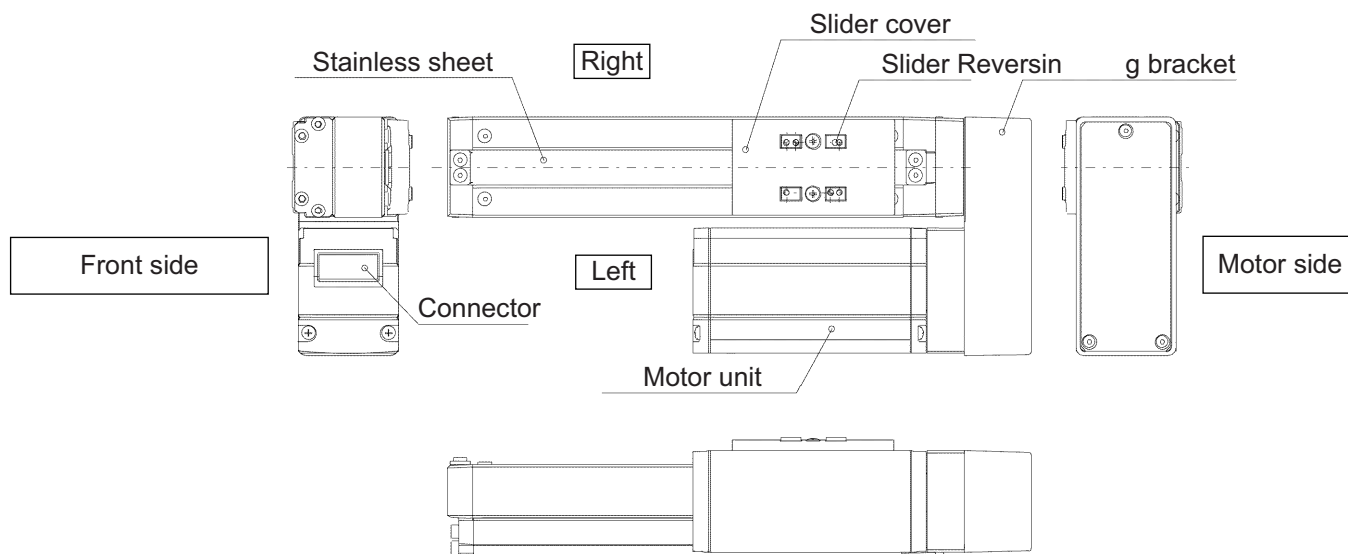
- “Motor coupling types” : RCP3-SA3C/SA4C/SA5C/SA6C



* Refer to 2, “External Dimensions” for details.

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

- “Motor reversing types” : RCP3-SA3R/SA4R/SA5R/SA6R

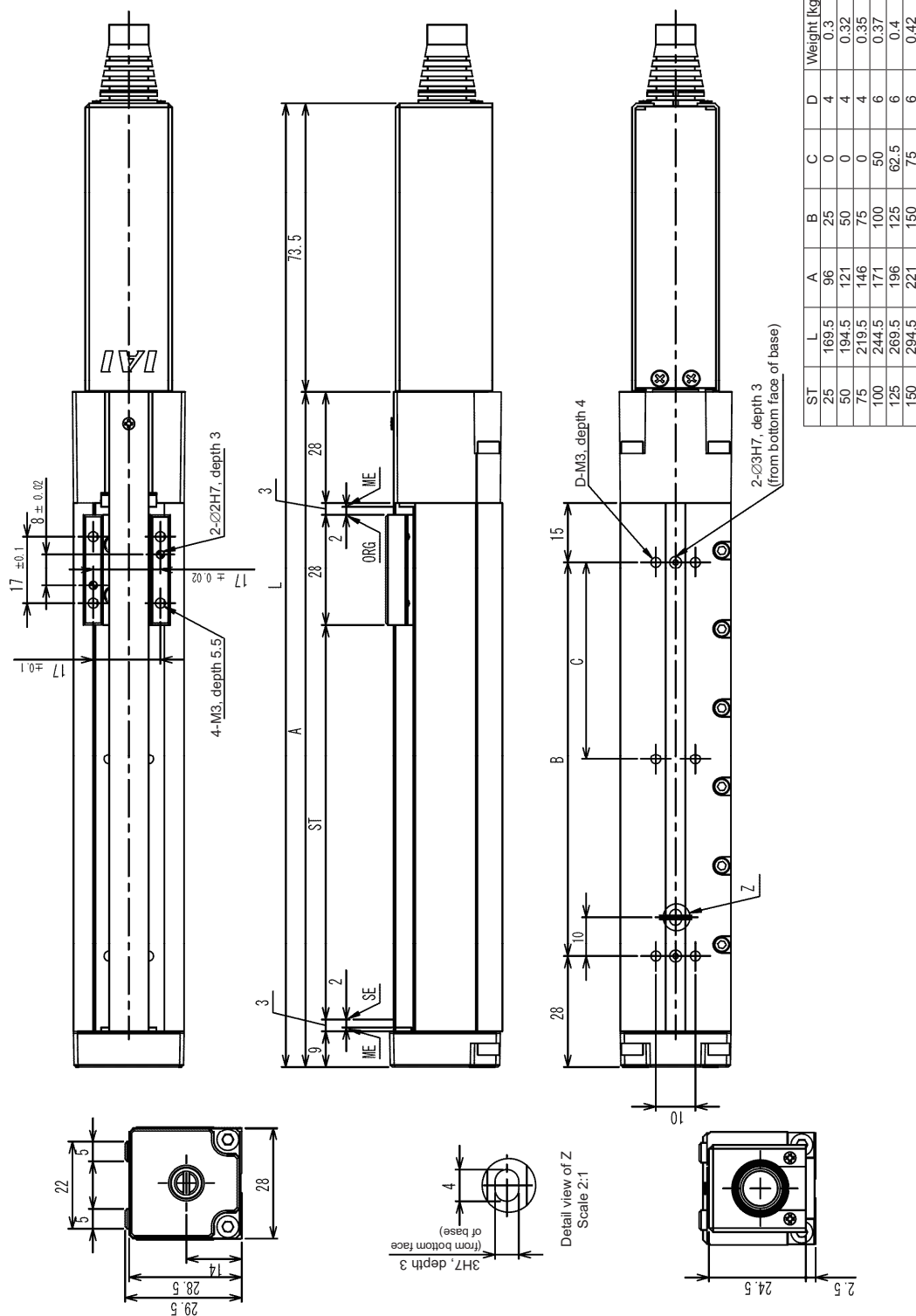


* Refer to 2, “External Dimensions” for details.

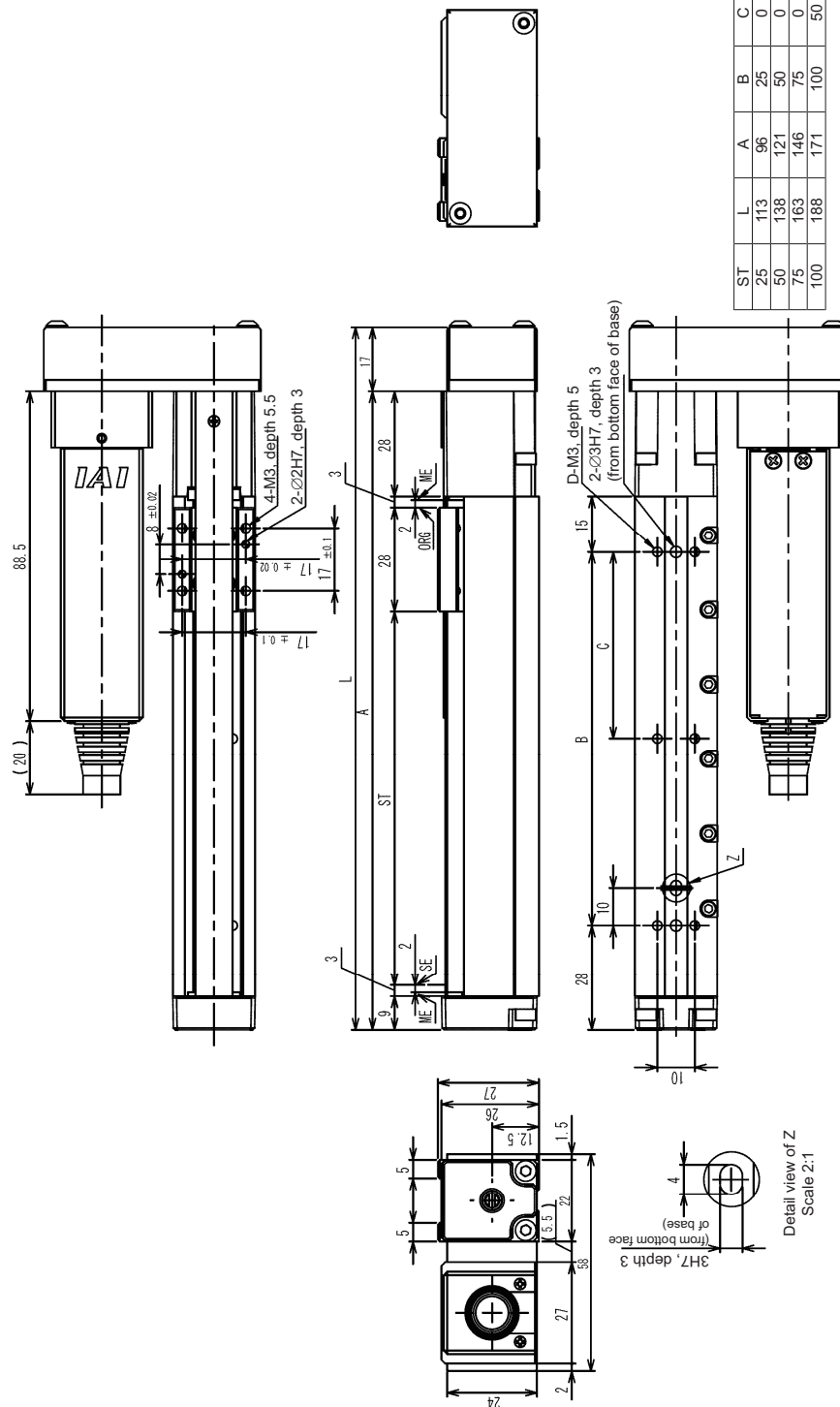
2.1 RCP3-SA2AC



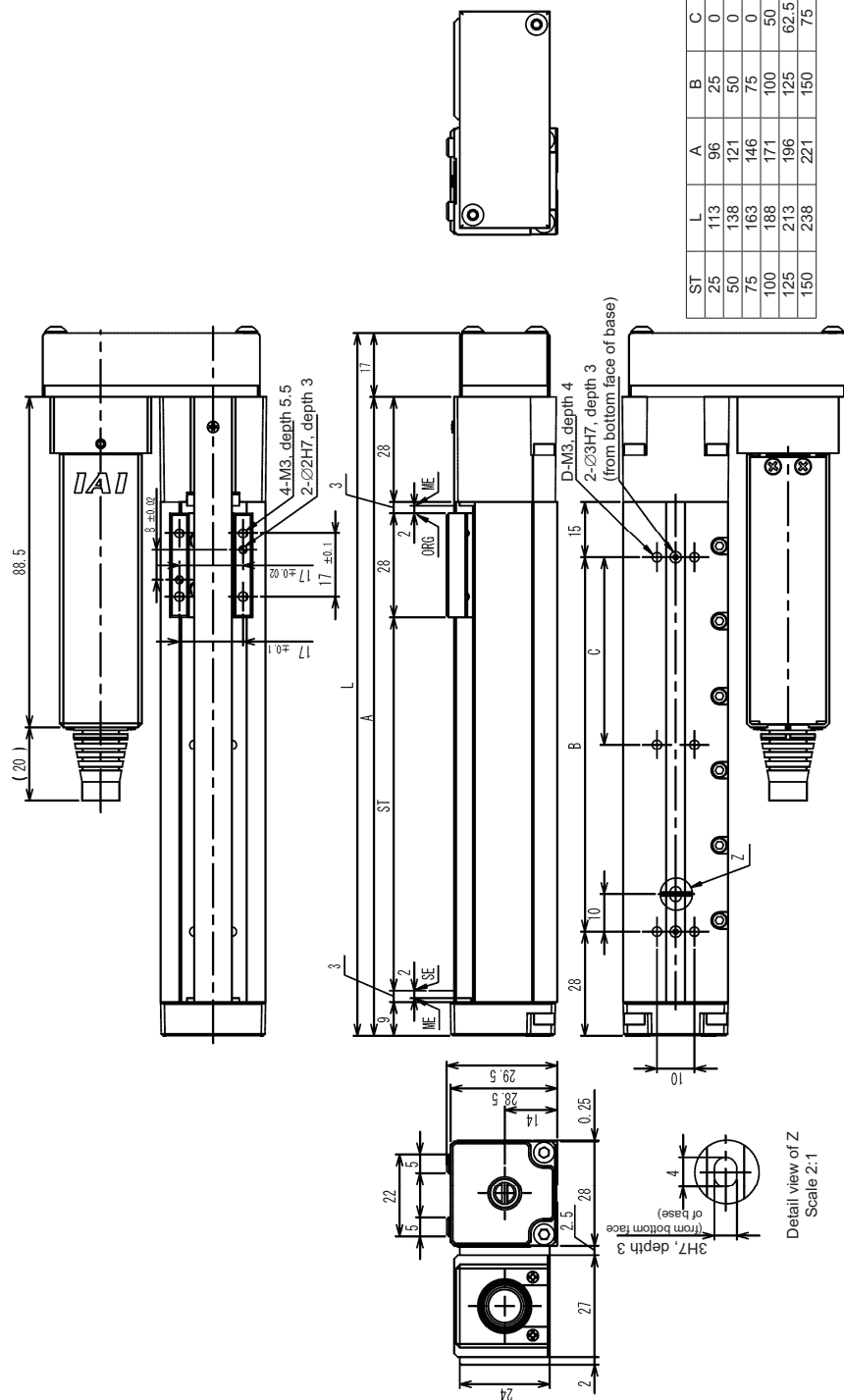
2.2 RCP3-SA2BC



2.3 RCP3-SA2AR, Reversing to Right



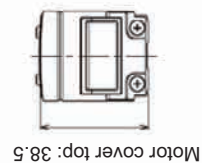
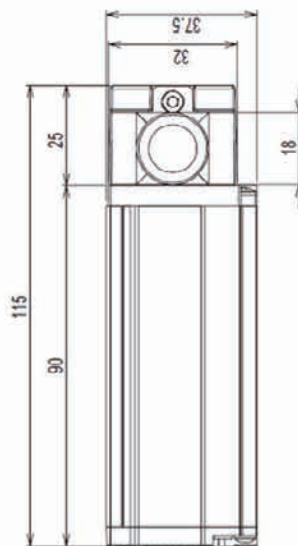
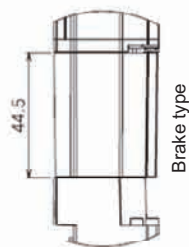
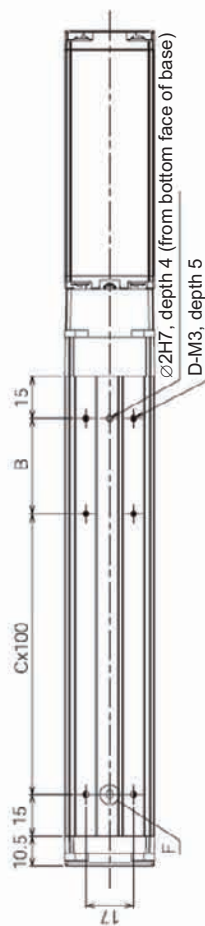
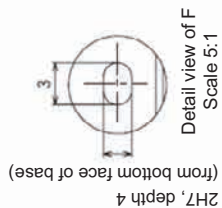
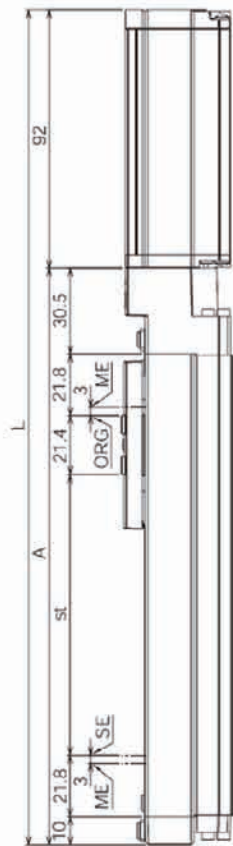
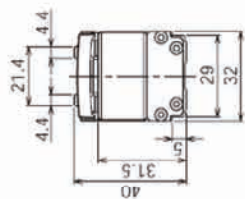
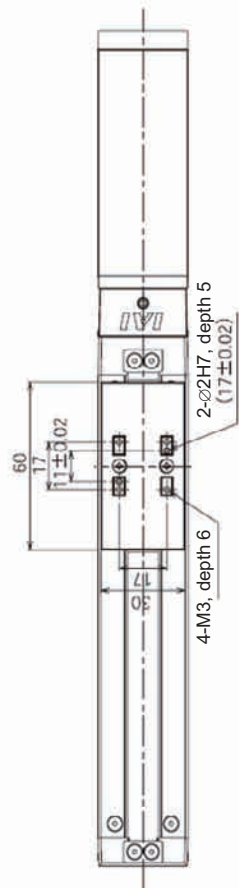
2.4 RCP3-SA2BR, Reversing to Right



18



2.6 RCP3-SA3C with Slider 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	0.7	0.9
100	297.5	342	205.5	34	1	6	134	0.7	0.9
150	347.5	392	255.5	84	1	6	184	0.8	1
200	397.5	442	305.5	34	2	8	234	0.9	1.1
250	447.5	492	355.5	84	2	8	284	0.9	1.1
300	497.5	542	405.5	34	3	10	334	1	1.2

(Side view of the motor when the cable pull-out direction has been changed (optional))

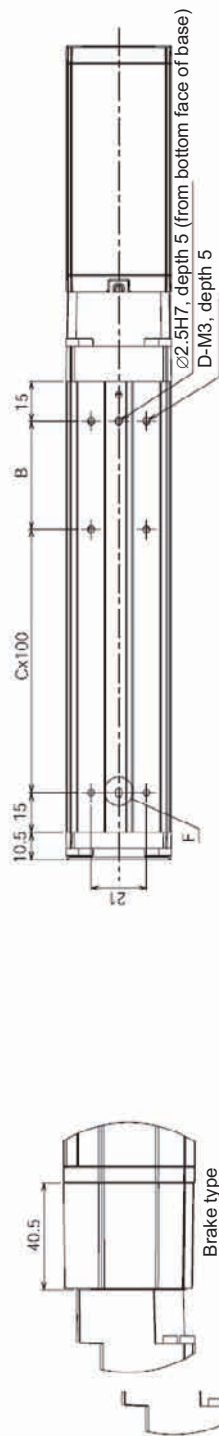
Technical drawing of the 5H7, depth 5, showing front, side, and top views with dimensions.

Front View: Dimensions include 48 (total width), 37 (inner width), 48 (total width), 37 (inner width), 40 (total height), 37 (inner height), 5 (flange thickness), 5 (flange thickness), 26 (total height), 5 (flange thickness), 5 (flange thickness).

Side View: Dimensions include 40 (total width), 21 (inner width), 14 ± 0.02 (inner width), 20 (total height), 26 (inner height), 23 (inner height), 33.5 (total height), 93.5 (total height).

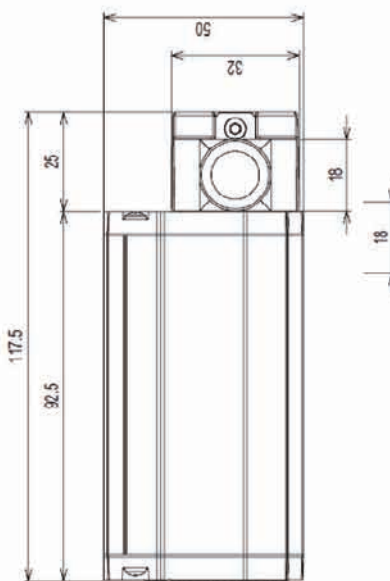
Top View: Dimensions include 48 (total width), 37 (inner width), 40 (total height), 37 (inner height), 5 (flange thickness), 5 (flange thickness), 26 (total height), 5 (flange thickness), 5 (flange thickness).

Annotations: 4-M3, depth 6; 2-Ø2.5H7, depth 5 (20 ± 0.02); ME; SE; ORG; ME.



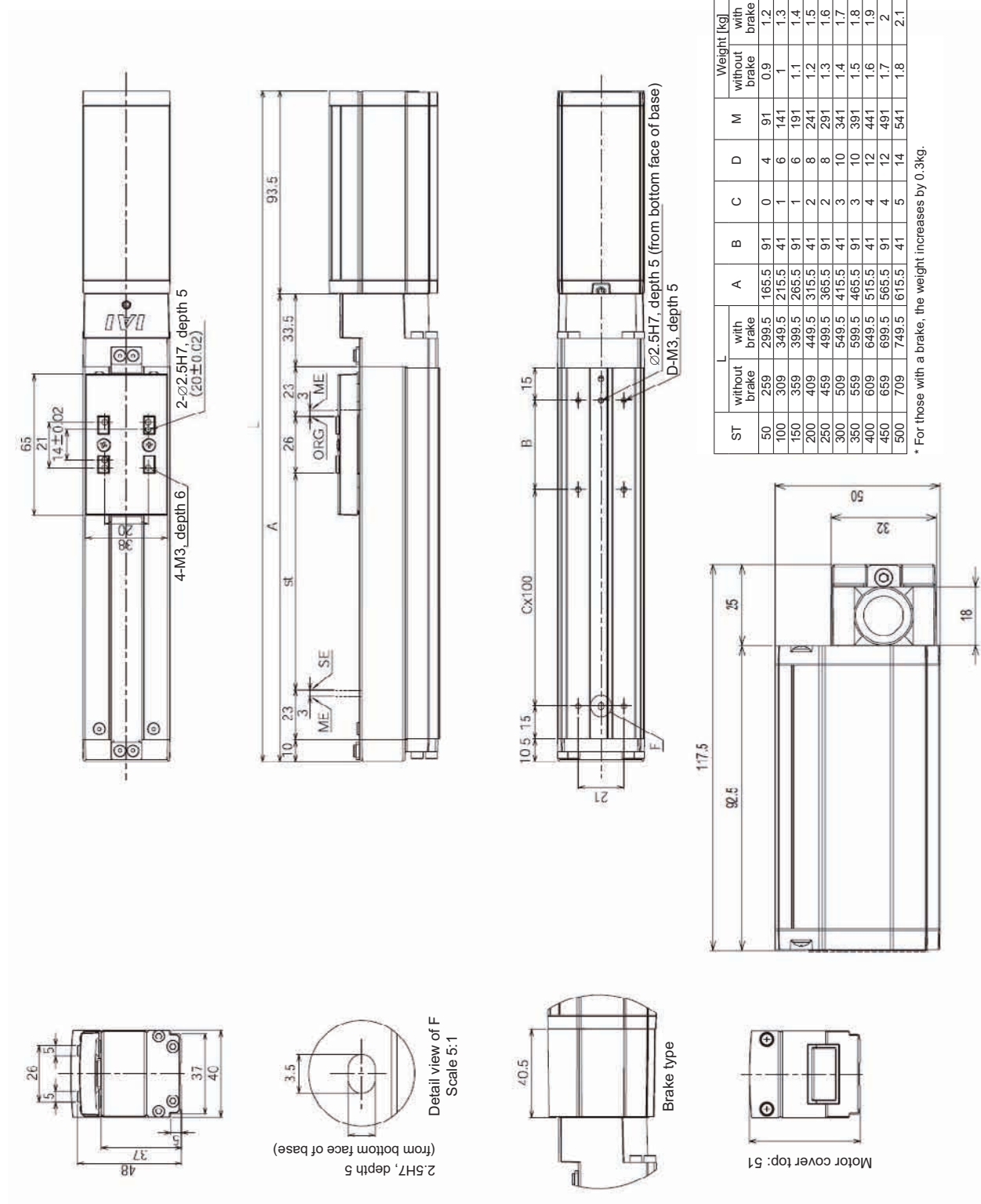
ST	L		A	B	C	D	M	Weight [kg]	
	without brake	with brake						without brake	with brake
50	259	299.5	165.5	91	0	4	91	0.9	1.2
100	309	349.5	215.5	41	1	6	141	0.9	1.2
150	359	399.5	265.5	91	1	6	191	1	1.3
200	409	449.5	315.5	41	2	8	241	1.2	1.4
250	459	499.5	365.5	91	2	8	291	1.2	1.5
300	509	549.5	415.5	41	3	10	341	1.2	1.5
350	559	599.5	465.5	91	3	10	391	1.3	1.6
400	609	649.5	515.5	41	4	12	441	1.4	1.7
450	659	699.5	565.5	91	4	12	491	1.5	1.8
500	709	749.5	615.5	41	5	14	541	1.5	1.8

For those with a brake, the weight increases by 0.3kg.



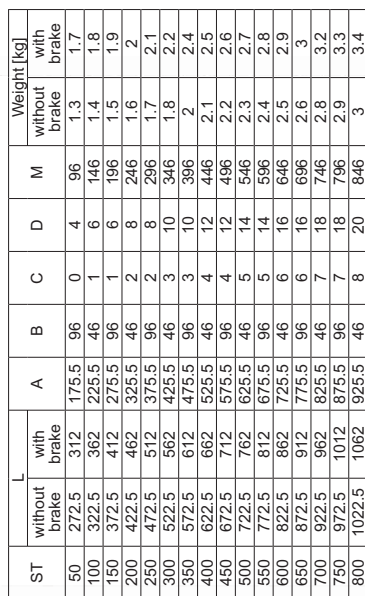
(Side view of the motor when the cable pull-out direction has been changed (optional))

2.8 RCP3-SA4C with Slider Cover



(Side view of the motor when the cable pull-out direction has been changed (optional))

22



* For those with a brake, the weight increases by 0.4kg.



Side view of the motor when the cable pull-out direction has been changed (optional))

3H7, depth 5 (from bottom face of base)
Scale 2:1

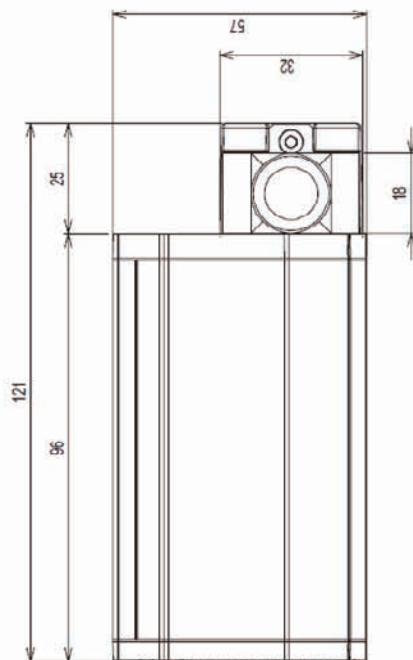
40
8.5
62.5
49
5
57
60

10
25
3
32
25
38.5
97
ME
SE
ORG
VE

39.5

ST	L		A	B	C	D	M	Weight [kg]	
	without brake	with brake						without brake	with brake
50	277.5	317	180.5	101	0	4	101	1.5	1.9
100	327.5	367	230.5	51	1	6	151	1.7	2.1
150	377.5	417	280.5	101	1	6	201	1.8	2.2
200	427.5	467	330.5	51	2	8	251	2	2.4
250	477.5	517	380.5	101	2	8	301	2.1	2.5
300	527.5	567	430.5	51	3	10	351	2.3	2.7
350	577.5	617	480.5	101	3	10	401	2.4	2.8
400	627.5	667	530.5	51	4	12	451	2.6	3
450	677.5	717	580.5	101	4	12	501	2.7	3.1
500	727.5	767	630.5	51	5	14	551	2.8	3.2
550	777.5	817	680.5	101	5	14	601	3	3.4
600	827.5	867	730.5	51	6	16	651	3.1	3.5
650	877.5	917	780.5	101	6	16	701	3.3	3.7
700	927.5	967	830.5	51	7	18	751	3.4	3.8
750	977.5	1017	880.5	101	7	18	801	3.6	4
800	1027.5	1067	930.5	51	8	20	851	3.7	4.1

* For those with a brake, the weight increases by 0.4kg.



(Side view of the motor when the cable pull-out direction has been changed (optional))

Technical drawing of a mechanical part, showing multiple views and dimensions:

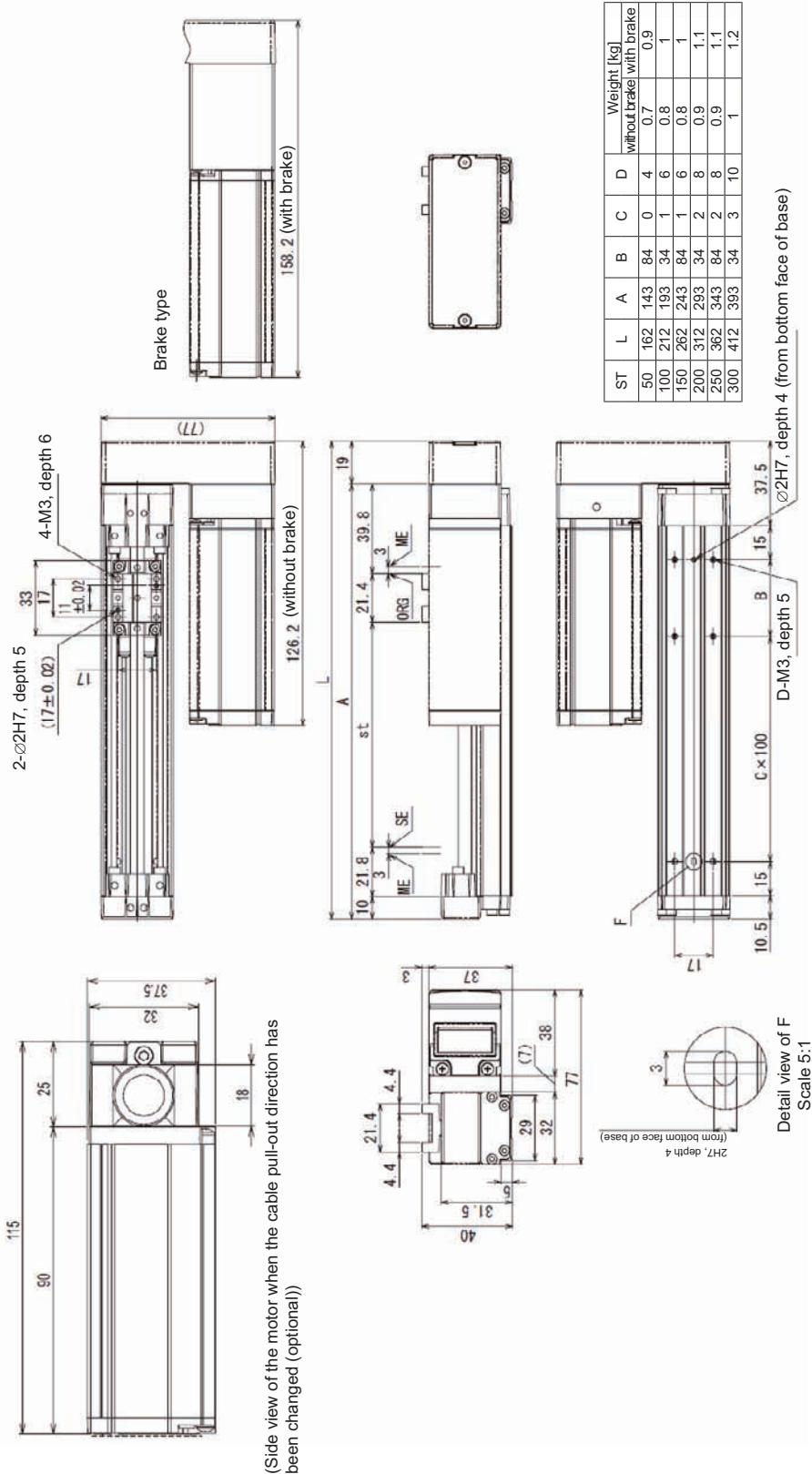
- Front View (Top):** Shows a rectangular part with a central slot. Dimensions include 75, 25, 5 ± 0.02 , 21, 92, 4-M5, depth 10, 2- $\varnothing 3H7$, depth 5 (31 ± 0.02).
- Top View (Left):** Shows a rectangular part with a central slot. Dimensions include 8.5, 4.0, 8.5, 62.5, 49, 57, 60.
- Side View (Middle):** Shows a rectangular part with a central slot. Dimensions include 10, 25, 3, ME/SE, 32, 25, 38.5, 112, A, 5t, 10.
- Detail View of F (Bottom):** Shows a detail view of the base. Dimensions include 10.5, 15, Cx100, B, 15, F, 39.5, 3H7, depth 5 (from bottom face of base), $\varnothing 3H7$, depth 5 from bottom face of base, D-M5, depth 8.

ST	L		A	B	C	D	M	Weight [kg]	
	without brake	with brake						without brake	with brake
50	277.5	367	180.5	101	0	4	101	1.6	2
100	327.5	317	230.5	51	1	6	151	1.8	2.2
150	377.5	417	280.5	101	1	6	201	2	2.4
200	427.5	467	330.5	51	2	8	251	2.1	2.5
250	477.5	517	380.5	101	2	8	301	2.3	2.7
300	527.5	567	430.5	51	3	10	351	2.5	2.9
350	577.5	617	480.5	101	3	10	401	2.7	3.1
400	627.5	667	530.5	51	4	12	451	2.8	3.2
450	677.5	717	580.5	101	4	12	501	3	3.4
500	727.5	767	630.5	51	5	14	551	3.2	3.6
550	777.5	817	680.5	101	5	14	601	3.3	3.7
600	827.5	867	730.5	51	6	16	651	3.5	3.9
650	877.5	917	780.5	101	6	16	701	3.7	4.1
700	927.5	967	830.5	51	7	18	751	3.9	4.3
750	977.5	1017	880.5	101	7	18	801	4	4.4
800	1027.5	1067	930.5	51	8	20	851	4	4.6

* For those with a brake, the weight increases by 0.4kg.

(Side view of the motor when the cable pull-out direction has been changed (optional))

2.13 RCP3-SA3R, Reversing to Left (Right)



Top View: Overall width 115, mounting hole distance 90. Mounting holes are spaced 25 apart. The central motor housing has a diameter of 37.5 and a height of 32. A cable pull-out direction indicator shows a distance of 18 from the side edge.

Side View (Left): Shows the motor's profile with dimensions 60, 17, 11, and 17. It features 4-M3 screws at depth 6 and 2-Ø2H7 holes at depth 5 (with a tolerance of ±0.02).

Side View (Right): Shows the motor's length with dimensions 126.2 (without brake) and 158.2 (with brake). The total length is labeled as L.

Front View: Shows the motor's front face with dimensions 10, 21.8, 3, ME, SE, 21.4, 39.8, 19, and 16. It includes a cable pull-out direction indicator pointing towards the SE (Stop End).

Detail View of F: A circular view showing the bottom face of the base with a diameter of 37.5 and a height of 32. It includes a cable pull-out direction indicator pointing towards the SE.

Brake Type: A detailed view of the brake mechanism showing its internal components and dimensions.

ST	L	A	B	C	D	Weight [kg]	
						without brake	with brake
50	162	143	84	0	4	0.8	1
100	212	193	34	1	6	0.8	1
150	262	243	84	1	6	0.9	1.1
200	312	293	34	2	8	1	1.2
250	362	343	84	2	8	1	1.2
300	412	393	34	3	10	1.1	1.3

(Side view of the motor when the cable pull-out direction has been changed (optional))

Detail view of F
Scale 5:1

Technical drawing of the motor assembly, showing side, front, and detail views with dimensions and labels.

Side view of the motor when the cable pull-out direction has been changed (optional)

Dimensions (mm): 117.5, 92.5, 25, 50, 32, 18.

Front view (Top):

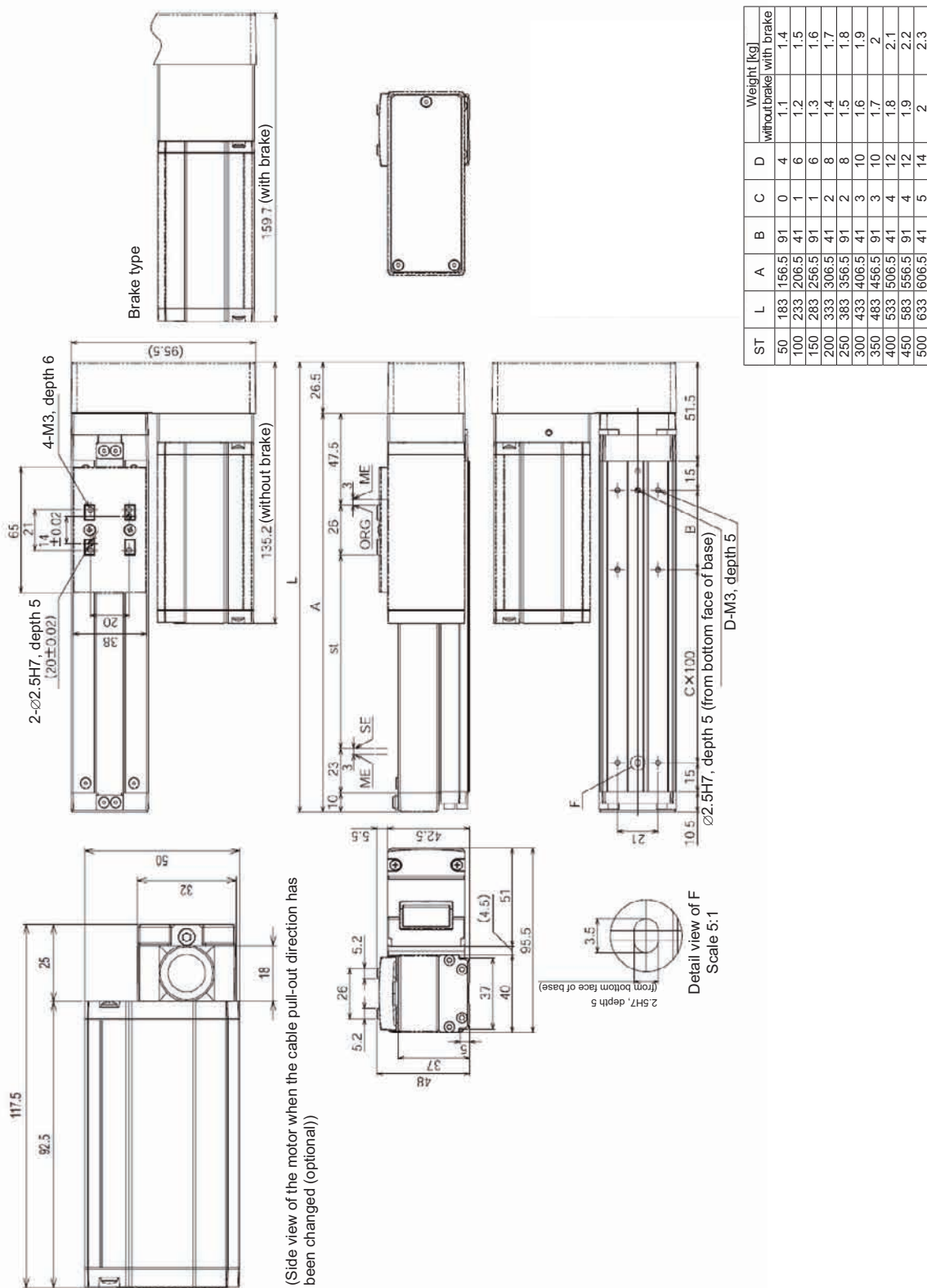
Dimensions (mm): 10, 23, 3, 26, 47.5, 26.5, 51, 42.5, 5.5, 37, 40, 95.5, 48, 3.7, 5.2, 26, 5.2, 3.5, 21, 10.5, 15, 15, 51.5.

Labels: ME, SE, DRG, ME, F, B, C X 100, 2- $\varnothing 2.5H7$, depth 5, 4-M3, depth 6, 135, 2 (without brake), 159.7 (with brake), Brake type.

Detail view of F
Scale 5:1
2.5H7, depth 5 (from bottom face of base)

ST	L	A	B	C	D	Weight [kg]	
						without brake	with brake
50	183	156.5	91	0	4	1.1	1.4
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	1.3	1.6
250	383	356.5	91	2	8	1.4	1.7
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	1.6	1.9
450	583	556.5	91	4	12	1.7	2
500	633	606.5	41	5	14	1.7	2

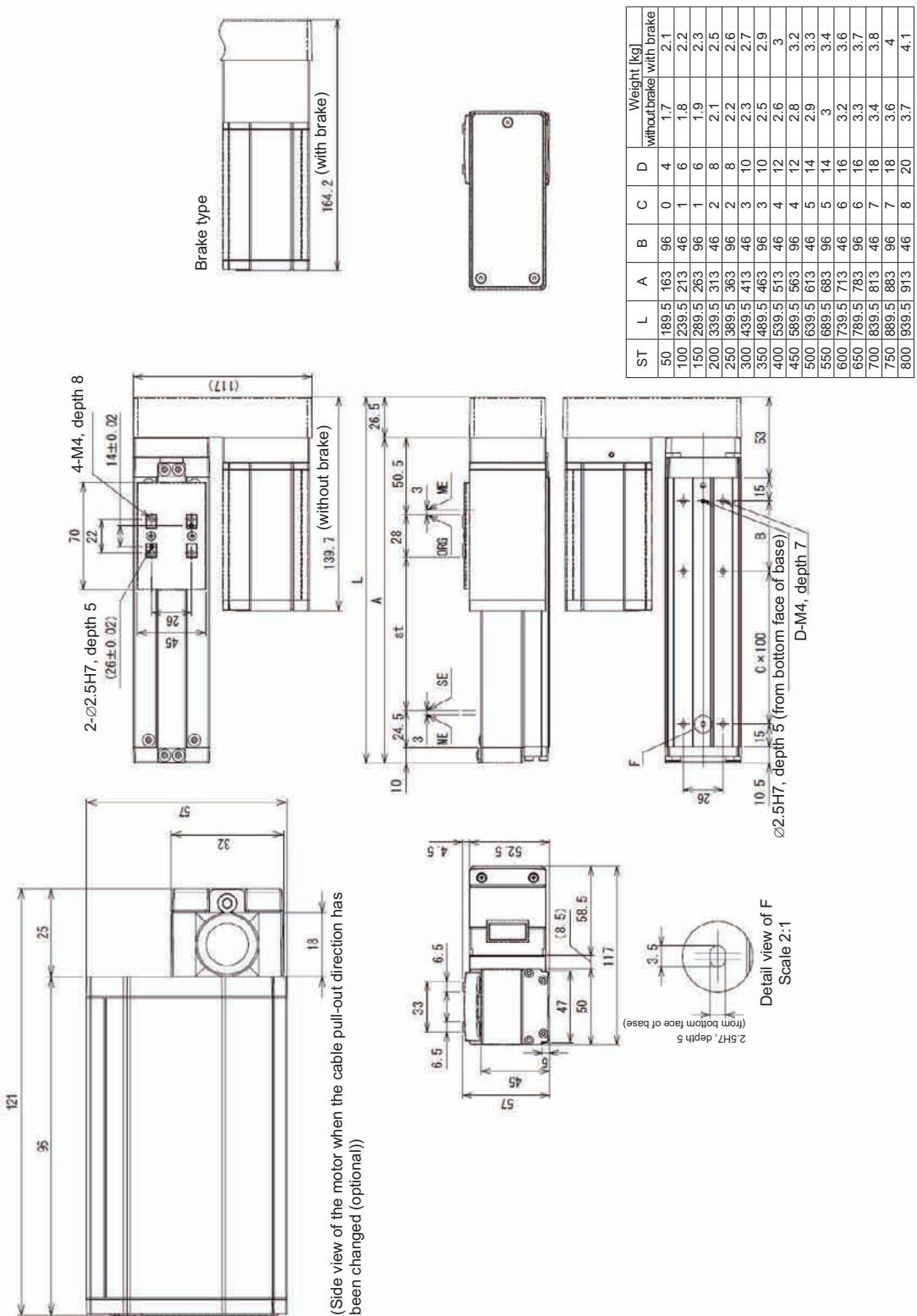
2.16 RCP3-SA4R with Slider Cover, Reversing to Left (Right)



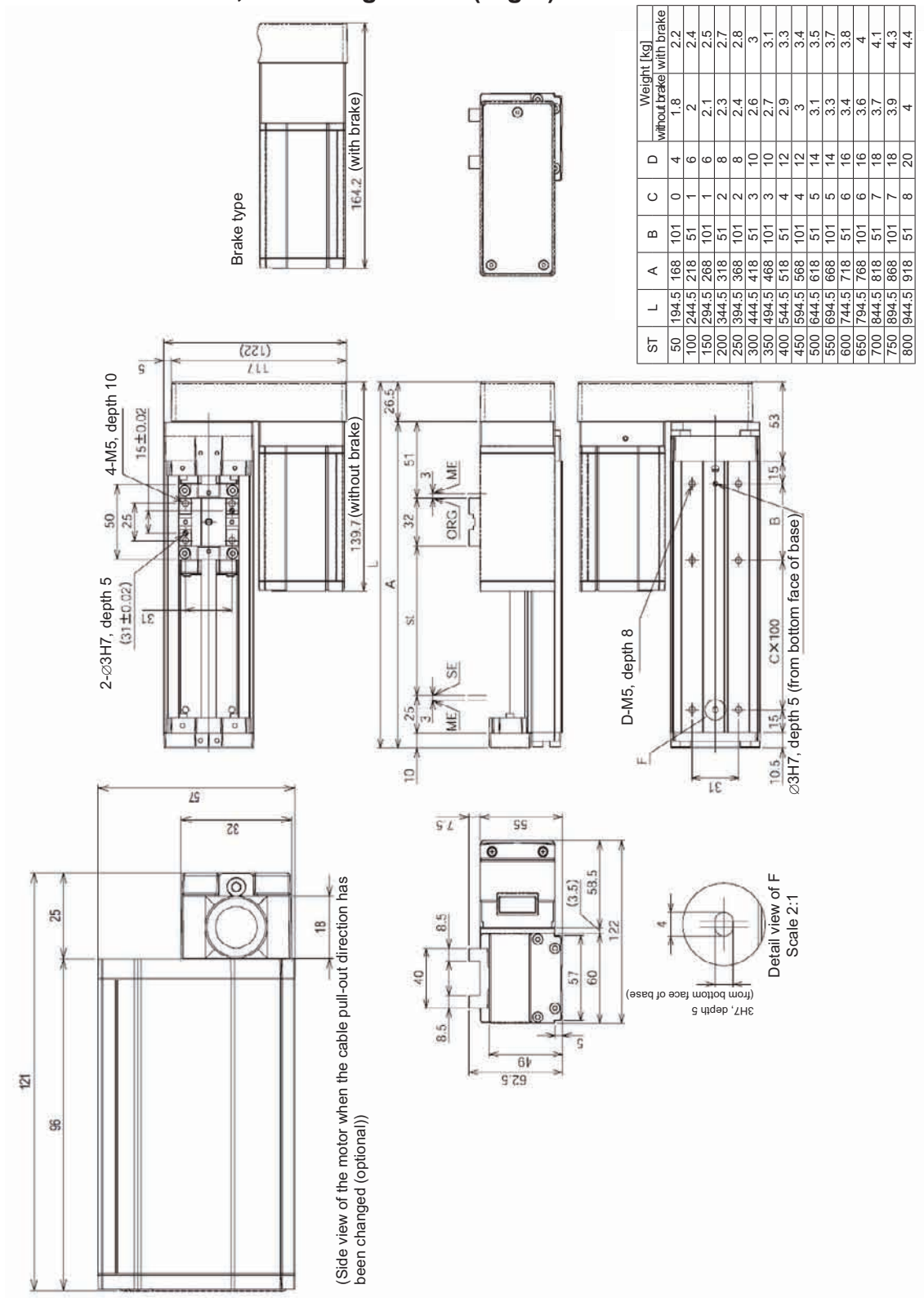
[illegible]

ST	L	A	B	C	D	Weight [kg] without brake with brake
50	189.5	163	96	0	4	1.6
100	239.5	213	46	1	6	1.7
150	289.5	263	96	1	6	1.8
200	339.5	313	46	2	8	1.9
250	389.5	363	96	2	8	2
300	439.5	413	46	3	10	2.1
350	489.5	463	96	3	10	2.3
400	539.5	513	46	4	12	2.4
450	589.5	563	96	4	12	2.5
500	639.5	613	46	5	14	2.6
550	689.5	663	96	5	14	2.7
600	739.5	713	46	6	16	2.8
650	789.5	763	96	6	16	2.9
700	839.5	813	46	7	18	3.1
750	889.5	863	96	7	18	3.2
800	939.5	913	46	8	20	3.3
850	989.5	963	96	8	20	3.6

2.18 RCP3-SA5R with Slider Cover, Reversing to Left (Right)



2.19 RCP3-SA6R, Reversing to Left (Right)



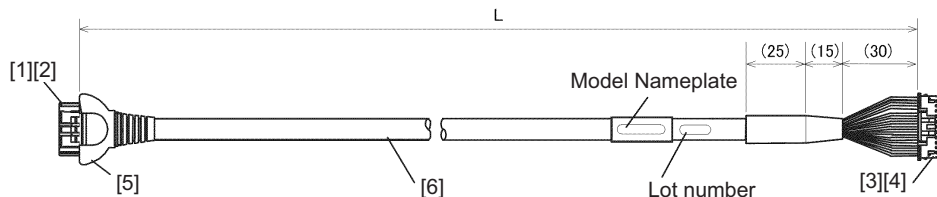
33

3. Motor/Encoder Cable

3.1 P MEC, PSEP Controller Cables

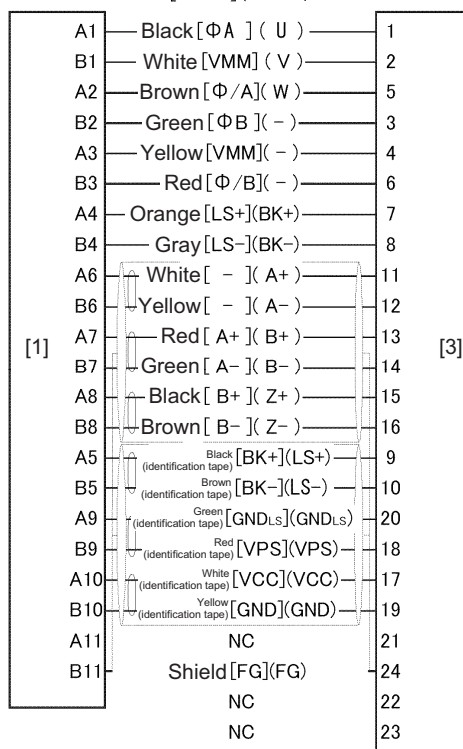
Integrated motor/encoder cable
(CB-APSEP-MPA***)

*** indicates the cable length (L). Up to 10 m can be specified.
Example) 080 = 8 m



No.	Item	Model number	Manufacturer
1	Housing	D-1100D 1-1827863-1 (black, 2.0-mm pitch, 22 poles)	AMP
2	Contact	D-1 1827570-2 (AWG 22 to 18, 1.08 to 1.6 Ø)	
3	Housing	PADP-24V-1-S (white, 2.0-mm pitch, 24 poles)	JST
4	Contact	SPND-001T-C0.5 (AWG 26 to 22, 1.0 to 1.5 Ø)	
5	Coupler cover	TMS-4ZB008	TATSUTA ELECTRIC WIRE & CABLE
6	ZUL2854-OHFRPCVVSW	25AWG x 6P + 25AWG x 2C + 22AWG x 6C, TS08V0350	TATSUTA ELECTRIC WIRE & CABLE

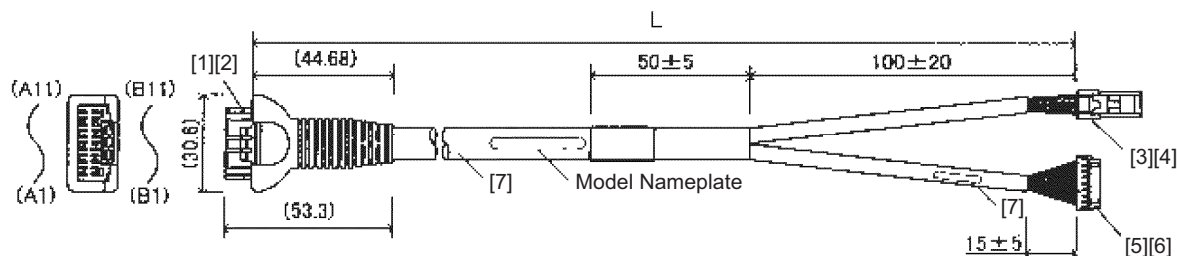
Terminal number on actuator side Wiring diagram [PCON] (ACON) Terminal number on controller side



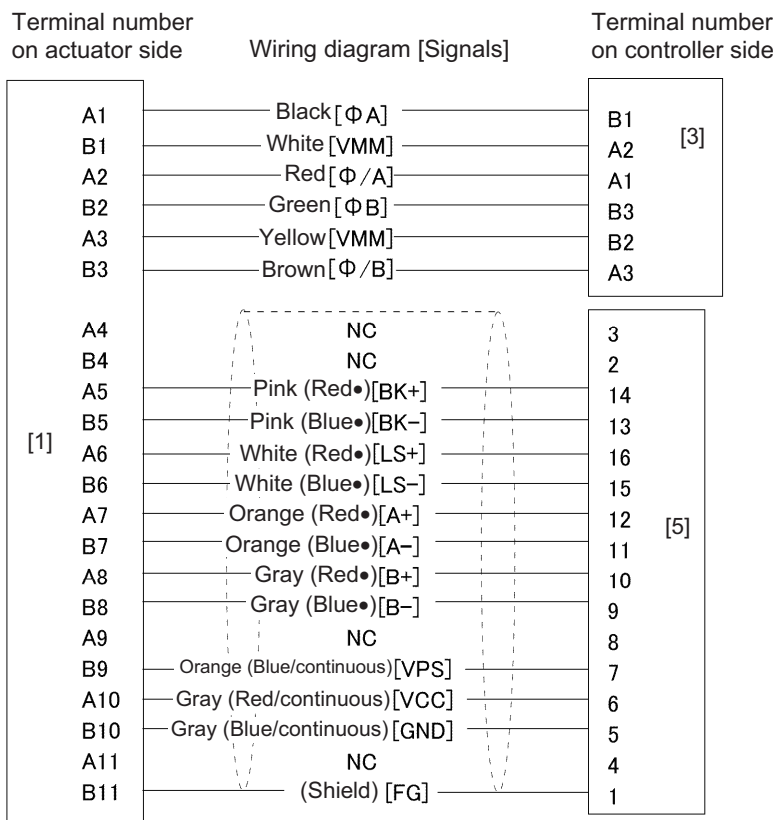
3.2 PCON, PSEL Controller Cables

RCP3 Integrated motor/encoder cable
(CB-PCS-MPA***)

*** indicates the cable length (L). Up to 10 m can be specified.
Example) 080 = 8 m



No.	Item	Model number	Manufacturer
[1]	Receptacle housing	D-1100D 1-1827863-1	AMP
[2]	Receptacle contact	D-1 1827570-2	AMP
[3]	Socket	D-2100D 1-1318119-3	Hirose
[4]	Socket contact	D-2 1318105-1	Hirose
[5]	Housing	PHDR-16VS	JST
[6]	Contact	SPHD-001T-P0.5	JST
[7]	UL2854-VVSWKA	TS06V1200 (25AWG x 7P + 22AWG x 6C)	TATSUTA ELECTRIC WIRE & CABLE



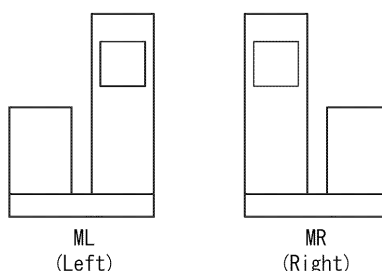
4. Options

4.1 Brake Type

This option can be specified for the SA3C, SA4C, SA5C, SA6C, SA3R, SA4R, SA5R and SA6R. 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.

4.2 Motor Reversing to Left, Motor Reversing to Right

This option can be specified for the motor reversing types SA2AR, SA2BR, SA3R, SA4R, SA5R and SA6R. "ML" indicates reversing to the left, while "MR" indicates reversing to the right, as viewed from the motor side.

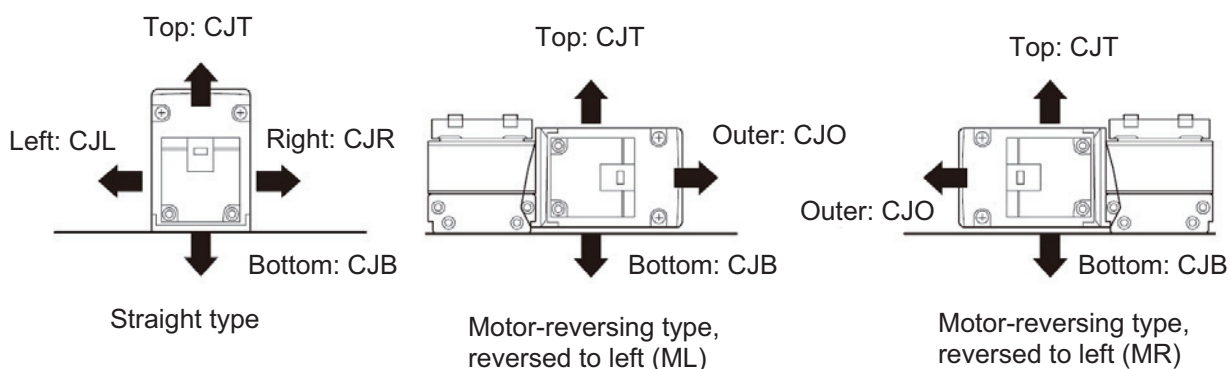


4.3 No-cover Type

This option can be specified for the SA3C, SA4C, SA5C, SA6C, SA3R, SA4R, SA5R and SA6R. With this option, the actuator can be specified without side cover. (Refer to 2, "External Dimensions" for the external dimensions with and without side cover.)

4.4 Changing the Cable Exit Direction

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).



5. Checking after Unpacking

After unpacking, check the product condition and the included items.

5.1 Included Items

No.	Item	Model number	Remarks
1	Actuator	Refer to "How to Read Model Nameplate" and "How to Read Model Number."	
Accessories			
2	RCP3 integrated motor/encoder cable	CB-APSEP-MPA□□□ : PMEC, PSEP type CB-PCS-MPA□□□ : PCON, PSEL type	
3	First Step Guide		
4	Operating Manual (CD/DVD)		
5	Safety Guide		

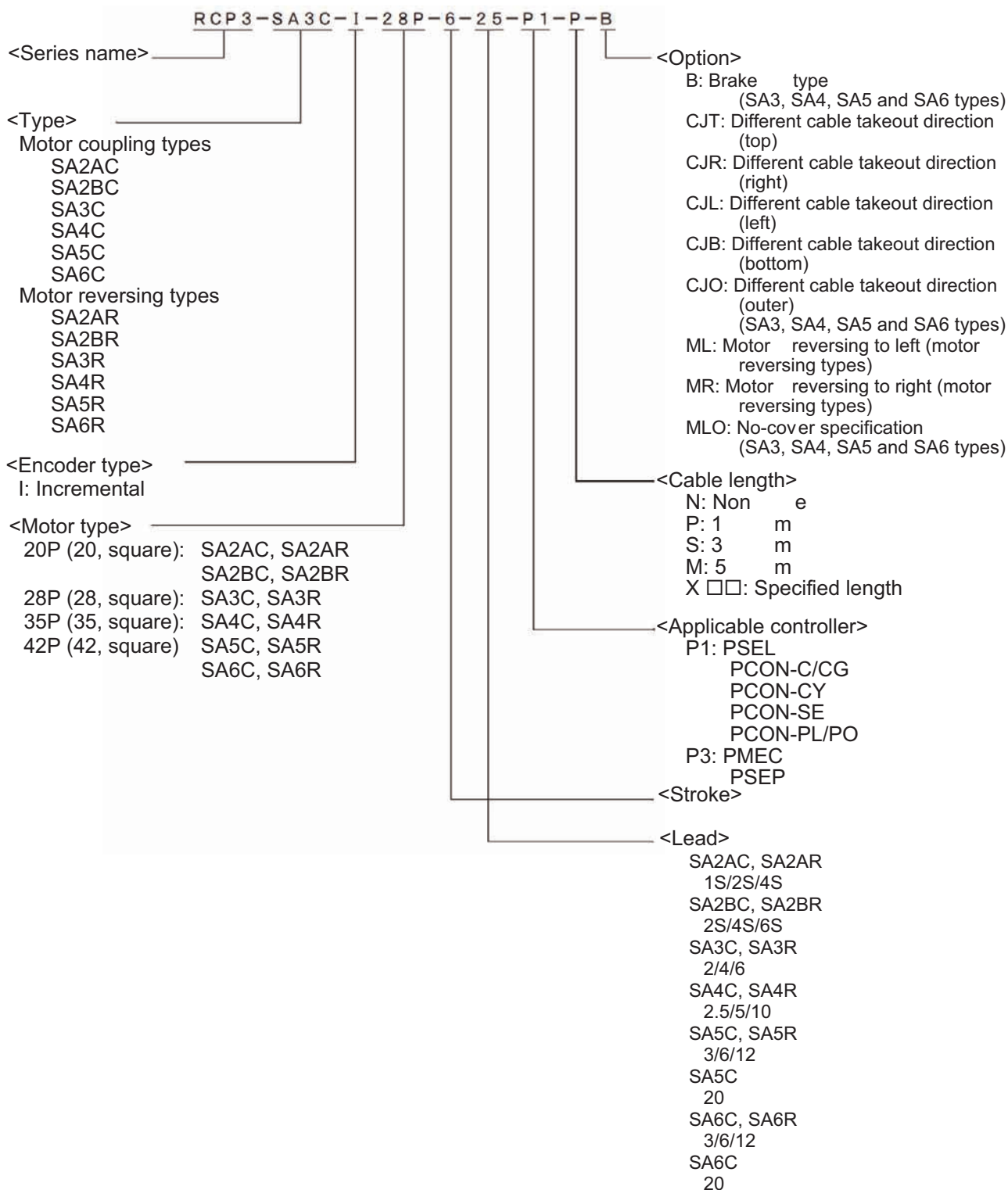
5.2 Operation Manuals Relating to This Product

No.	Name	Control No.
1	Operation Manual for PSEL Controller	ME0172
2	Operation Manual for PCON-C/CG/CF Controller	ME0170
3	Operation Manual for PCON-CY Controller	ME0156
4	Operation Manual for PCON-SE Controller	ME0163
5	Operation Manual for PCON-PL/PO Controller	ME0164
6	Operation Manual for MEC Controller	ME0245
7	Operation Manual for PSEP/ASEP Controller	ME0216
8	Operation Manual for PC Software IA-101-X-X-MW/ZA-101-X-USBMW	ME0154
9	Operation Manual for RCM-101MW/RCM-101-USB	ME0155
10	Operation Manual for MEC PC Software	ME0248
11	Operation Manual for Teaching Pendant SEL-T/TD	ME0183
12	Operation Manual for Teaching Pendant CON-T/TG	ME0178
13	Operation Manual for Touch Panel Teaching Pendant CON-PT/PD/PG	ME0227
14	Operation Manual for Dedicated PSEP/ASEP Touch Panel SEP-PT	ME0217
15	Operation Manual for Simple Teaching Pendant RCM-E	ME0174
16	Operation Manual for Data Setter RCM-P	ME0175
17	Operation Manual for Touch Panel Display RCM-PM-01	ME0182

5.3 How to Read Model Nameplate

Model	→	MODEL RCP3-SA3C-I-28P-6-50-P1-P-B
Serial number	→	SERIAL No. 600090255
		MADE IN JAPAN

5.4 How to Read Model Number



6. Specifications

(1) Maximum speed

The maximum speed of this ROBO Cylinder is limited to prevent resonance of the ball screw shaft and also due to limitation of the motor speed. Observe the maximum speed limits specified in the table.

Strokes and Maximum Speed Limits (Unit: mm/s)

Model	Motor type	Lead (mm)	Stroke (mm)					
			25	50	75	100	125	150
SA2A	20P	1	50				-	-
		2	100				-	-
		4	180	200				
SA2B	20P	2	100					
		4	180	200				
		6	180	200	300			

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

Strokes and Maximum Speed Limits (Unit: mm/s)

Model	Motor type	Lead (mm)	Stroke (mm)											
			50	100	150	200	250	300	350	400	450	500	550	600
SA3	28P	2	100						-	-	-	-	-	-
		4	200						-	-	-	-	-	-
		6	300						-	-	-	-	-	-

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

Strokes and Maximum Speed Limits (Unit: mm/s)

Mode	Motor Type	Lead (mm)	Stroke (mm)															
			50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
SA4C, R	35P	2.5	125										-	-	-	-	-	-
		5	250										-	-	-	-	-	-
		10	380	500								-	-	-	-	-	-	
SA5C, R	42P	3	150											140	120	105	90	80
		6	300										-	285	245	210	185	165
		12	380	540	600								-	570	490	425	370	330
SA5C		20	380	540	660	770	860	940	1000						910	790	690	610
			380	540	660	770	800 (Stroke 250 to 650, vertically installed)									790	690	610
SA6C, R	42P	3	150											140	120	105	90	80
		6	300											285	245	210	185	165
		12	12	540	600									570	490	425	370	330
SA6C		20	380	540	660	770	860	940	1000						910	790	690	610
			380	540	660	770	800 (Stroke 250 to 650, vertically installed)									790	690	610

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

⚠ Caution: 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.

(2) Acceleration and payloads

Model	Motor type	Lead (mm)	Rated acceleration (G)		Maximum speed (mm/s)	Payloads (kg)
SA2A	20P	1	Horizontal	0.2	50	1
		2	Horizontal	0.2	100	0.5
		4	Horizontal	0.2	200	0.25
SA2B	20P	2	Horizontal	0.2	100	1
		4	Horizontal	0.2	200	0.5
		6	Horizontal	0.2	300	0.25
SA3	28P	2	Horizontal	0.2	100	3
			Vertical	0.2		1.5
		4	Horizontal	0.3	200	2
			Vertical	0.2		1
		6	Horizontal	0.3	300	1
			Vertical	0.2		0.5

[Controllers (without "H" at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)		Speed*1 (mm/s)	Payloads (kg)
SA4C SA4R	35P	2.5	Horizontal	0.2	20.8	6
					41.7	
					62.5	
					83.3	
					104.2	
					125	
			Vertical	0.2	20.8	3
					41.7	
					62.5	
					83.3	
					104.2	
					125	
		5	Horizontal	0.3	41.7	4
					83.3	
					125	
					166.7	
					108.3	
					250	
			Vertical	0.2	41.7	1.5
					83.3	
					125	
					166.7	
					108.3	
					250	
		10	Horizontal	0.3	83.3	2
					166.7	
					250	
					333.3	
					416.7	
					500	
			Vertical	0.2	83.3	1
					166.7	
					250	
					333.3	
					416.7	
					500	
						0.5

*1 If the stroke is long, the maximum speed may be lower than the applicable speed shown in the table.
[Refer to (1), "Maximum speed."]

[Controllers (with “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)	Acceleration (G)		Speed (mm/s)	Payloads (kg)
SA4C	35P	2.5	0.2	Horizontal	0.2	20.8	11
						41.7	
						62.5	
						83.3	9
						104.2	
						125	
					0.3	20.8	10
						41.7	
						62.5	
						83.3	8
						104.2	
						125	
					0.5	20.8	9
						41.7	
						62.5	
						83.3	7
						104.2	
						125	
					0.7	20.8	8
						41.7	
						62.5	
						83.3	6
						104.2	
						125	
			0.2	Vertical	0.1	20.8	8
						41.7	
						62.5	
						83.3	5
						104.2	
						125	
					0.2	20.8	8
						41.7	
						62.5	
						83.3	6
						104.2	
						125	
					0.3	20.8	8
						41.7	
						62.5	
						83.3	6
						104.2	
						125	

[Controllers (with "H" at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)	Acceleration (G)		Speed (mm/s)	Payloads (kg)
SA4C	35P	5	0.3	Horizontal	0.2	41.7	10
						83.3	
						125	
						166.7	
						108.3	9
						250	8
					0.3	41.7	9
						83.3	
						125	
						166.7	
						108.3	8
						250	7
					0.5	41.7	8
						83.3	
						125	
						166.7	
						108.3	7
						250	6
					0.7	41.7	7
						83.3	
						125	
						166.7	
						108.3	6
						250	5
			0.2	Vertical	0.1	41.7	4
						83.3	
						125	
						166.7	
						108.3	3
						250	
					0.2	41.7	4
						83.3	
						125	
						166.7	
						108.3	2.5
						250	
					0.3	41.7	4
						83.3	
						125	
						166.7	
						108.3	2
						250	

[Controllers (with “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)	Acceleration (G)		Speed (mm/s)	Payloads (kg)
SA4C	35P	10	0.3	Horizontal	0.2	83.3	9
						166.7	
						250	7
						333.3	6
						416.7	5
						500	4
					0.3	83.3	7.5
						166.7	
						250	6
						333.3	5
						416.7	4
						500	3
					0.5	83.3	6.5
						166.7	
						250	5
						333.3	4
						416.7	3
						500	2
					0.7	83.3	5.5
						166.7	
						250	4
						333.3	3
						416.7	2
						500	1
			0.2	Vertical	0.1	83.3	1.5
						166.7	
						250	
						333.3	
						416.7	
						500	1
					0.2	83.3	1.5
						166.7	
						250	
						333.3	
						416.7	
						500	0.5
					0.3	83.3	1.5
						166.7	
						250	
						333.3	
						416.7	
						500	0.5

[Controllers (without “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)		Speed (mm/s)	Payloads (kg)
SA5C SA5R	42P	3	Horizontal	0.2	25	10
					50	
					75	
					100	
					125	
					150	
			Vertical	0.2	25	4
					50	
					75	
					100	
					125	
					150	
		6	Horizontal	0.3	50	8
					100	
					150	
					200	
					250	
					300	
			Vertical	0.2	50	2
					100	
					150	
					200	
					250	
					300	
		12	Horizontal	0.3	100	6
					200	
					300	
					400	
					500	
					600	
			Vertical	0.2	100	1
					200	
					300	
					400	
					500	
					600	
						0.5

[Controllers (with “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)	Acceleration (G)		Speed* ¹ (mm/s)	Payloads (kg)
SA5C	42P	3	0.2	Horizontal	0.2	25	19
						50	
						75	
						100	
						125	16
						150	12
					0.3	25	14
						50	
						75	
						100	
						125	11
						150	8
					0.5	25	9
						50	
						75	
						100	
						125	7
						150	5
					0.7	25	7
						50	
						75	
						100	
						125	5
						150	3
			0.2	Vertical	0.1	25	10
						50	
						75	
						100	
						125	7
						150	4
					0.2	25	10
						50	
						75	
						100	9
						125	6
						150	3
					0.3	25	10
						50	
						75	
						100	8
						125	5
						150	2

*1 If the stroke is long, the maximum speed may be lower than the applicable speed shown in the table.
[Refer to (1), “Maximum speed.”]

[Controllers (with “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)	Acceleration (G)		Speed* ¹ (mm/s)	Payloads (kg)
SA5C	42P	6	0.3	Horizontal	0.2	50	12
						100	
						150	
						200	
						250	10
						300	7
					0.3	50	10
						100	
						150	
						200	
						250	8.5
						300	6
					0.5	50	8
						100	
						150	
						200	
						250	6
						300	3
					0.7	50	6
						100	
						150	
						200	
						250	4.5
						300	1
			0.2	Vertical	0.1	50	5
						100	
						150	
						200	
						250	3.5
						300	2
					0.2	50	5
						100	
						150	
						200	
						250	4.5
						300	3
					0.3	50	5
						100	
						150	
						200	
						250	3.5
						300	2
						300	0.5

*1 If the stroke is long, the maximum speed may be lower than the applicable speed shown in the table.
[Refer to (1), “Maximum speed.”]

[Controllers (with “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)	Acceleration (G)		Speed*1 (mm/s)	Payloads (kg)
SA5C	42P	12	0.3	Horizontal	0.2	100	8
						200	
						300	6
						400	5
						500	4
						600	3
					0.3	100	6
						200	
						300	4
						400	3
						500	2
						600	1
					0.5	100	4
						200	
						300	3
						400	2
						500	1
						600	0.5
					0.7	100	3
						200	
						300	2.5
						400	1.5
						500	1
						600	0.5
			0.2	Vertical	0.1	100	2
						200	
						300	1
						400	0.5
						500	0.5
						600	0.5
					0.2	100	2
						200	
						300	1
						400	0.5
						500	0.5
						600	0.5
					0.3	100	2
						200	
						300	1
						400	0.5
						500	0.5
						600	0.5

*1 If the stroke is long, the maximum speed may be lower than the applicable speed shown in the table.
[Refer to (1), “Maximum speed.”]

[Controllers (without “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)	Acceleration (G)		Speed* ¹ (mm/s)	Payloads (kg)
SA5C	42P	20	0.3	Horizontal	0.2	166	4
						333	
						500	3
						666	
						833	2
						1000	
					0.3	166	4
						333	
						500	3
						666	
						833	2
						1000	
					0.5	166	2
						333	
						500	1.5
						666	
						833	1
						1000	0.5
			0.2	Vertical	0.7	166	2
						333	
						500	1.5
						666	
						833	1
						1000	0.3
					0.1	166	0.5
						333	
						500	
						666	
						833	-
						1000	-
					0.2	166	0.5
						333	
						500	
						666	
						833	-
						1000	-

*1 If the stroke is long, the maximum speed may be lower than the applicable speed shown in the table.
 When the stroke is between 250 and 600 mm and the actuator is installed vertically, the maximum speed is 800 mm/s or below.
 [Refer to (1), “Maximum speed.”]

[Controllers (without “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)		Speed* ¹ (mm/s)	Payloads (kg)
SA6C SA6R	42P	3	Horizontal	0.2	25	10
					50	
					75	
					100	
					125	
					150	
		3	Vertical	0.2	25	4
					50	
					75	
					100	
					125	
					150	
		6	Horizontal	0.3	50	8
					100	
					150	
					200	
					250	
					300	
			Vertical	0.2	50	2
					100	
					150	
					200	
					250	
					300	
		12	Horizontal	0.3	100	6
					200	
					300	
					400	
					500	
					600	
			Vertical	0.2	100	1
					200	
					300	
					400	
					500	
					600	

*1 If the stroke is long, the maximum speed may be lower than the applicable speed shown in the table.
[Refer to (1), “Maximum speed.”]

[Controllers (with “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)	Acceleration (G)		Speed* ¹ (mm/s)	Payloads (kg)
SA6C	42P	3	0.2	Horizontal	0.2	25	19
						50	
						75	
						100	16
						125	
						150	
					0.3	25	14
						50	
						75	
						100	11
						125	
						150	
					0.5	25	9
						50	
						75	
						100	7
						125	
						150	
					0.7	25	7
						50	
						75	
						100	5
						125	
						150	
			0.2	Vertical	0.1	25	10
						50	
						75	
						100	7
						125	
						150	
					0.2	25	10
						50	
						75	
						100	9
						125	
						150	
					0.3	25	10
						50	
						75	
						100	8
						125	
						150	

*1 If the stroke is long, the maximum speed may be lower than the applicable speed shown in the table.
[Refer to (1), “Maximum speed.”]

[Controllers (with “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)	Acceleration (G)		Speed* ¹ (mm/s)	Payloads (kg)
SA6C	42P	6	0.3	Horizontal	0.2	50	12
						100	
						150	
						200	10
						250	
						300	
					0.3	50	10
						100	
						150	
						200	8.5
						250	
						300	
					0.5	50	8
						100	
						150	
						200	6
						250	
						300	
					0.7	50	6
						100	
						150	
						200	4.5
						250	
						300	
			0.2	Vertical	0.1	50	5
						100	
						150	
						200	3.5
						250	
						300	
					0.2	50	5
						100	
						150	
						200	4.5
						250	
						300	
					0.3	50	5
						100	
						150	
						200	3.5
						250	
						300	

*1 If the stroke is long, the maximum speed may be lower than the applicable speed shown in the table.
[Refer to (1), “Maximum speed.”]

[Controllers (with “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)	Acceleration (G)		Speed* ¹ (mm/s)	Payloads (kg)
SA6C	42P	12	0.3	Horizontal	0.2	100	8
						200	
						300	6
						400	5
						500	4
						600	3
					0.3	100	6
						200	
						300	4
						400	
						500	
						600	
					0.5	100	4
						200	
						300	3
						400	
						500	
						600	
					0.7	100	3
						200	
						300	2.5
						400	
						500	
						600	
			0.2	Vertical	0.1	100	2
						200	
						300	1
						400	
						500	
						600	
					0.2	100	2
						200	
						300	1
						400	
						500	
						600	
					0.3	100	2
						200	
						300	1
						400	
						500	
						600	

*1 If the stroke is long, the maximum speed may be lower than the applicable speed shown in the table.
[Refer to (1), “Maximum speed.”]

[Controllers (with “H” at the end of the model number)]

Model	Motor type	Lead (mm)	Rated acceleration (G)	Acceleration (G)		Speed* ¹ (mm/s)	Payloads (kg)
SA6C	42P	20	0.3	Horizontal	0.2	166	4
						333	
						500	3
						666	
						833	2
						1000	
					0.3	166	4
						333	
						500	3
						666	
						833	2
						1000	
					0.5	166	2
						333	
						500	1.5
						666	
						833	1
						1000	0.5
					0.7	166	2
						333	
						500	1.5
						666	
						833	1
						1000	0.3
			0.2	Vertical	0.1	166	0.5
						333	
						500	
						666	
						800	
						833	
						1000	-
						166	0.5
					0.2	333	
						500	
						666	
						800	
						833	
						1000	-

*1 If the stroke is long, the maximum speed may be lower than the applicable speed shown in the table.
 When the stroke is between 250 and 600 mm and the actuator is installed vertically, the maximum speed is 800 mm/s or below.
 [Refer to (1), “Maximum speed.”]

(3) Maximum thrust

Model	Motor type	Lead (mm)	Maximum thrust ^{*1} (N)
SA2A	20P	1	37.7
		2	18.8
		4	9.4
SA2B	20P	2	18.8
		4	9.4
		6	6.3

*1 Calculated values based on the motor output specifications with a lead screw efficiency of 0.5.

(4) Drive method

Model	Motor type	Lead	Encoder pulses ^{*1}	Drive method	
SA2A	20P	1	800	Lead screw Ø10 mm	Rolled, C10
		2			
		4			
SA2B	20P	2		Lead screw Ø10 mm	Rolled, C10
		4			
		6			
SA3	28P	2		Ball screw Ø6 mm	Rolled, C10
		4			
		6			
SA4	35P	2.5		Ball screw Ø8 mm	Rolled, C10
		5			
		10			
SA5	42P	3		Ball screw Ø10 mm	Rolled, C10
		6			
		12			
		20			
SA6	42P	3		Ball screw Ø10 mm	Rolled, C10
		6			
		12			
		20			

*1 Number of pulses input to the controller.

(5) Common specifications

Model	Item	Specification
SA2A, SA2B	Positioning repeatability ^{*1}	±0.05 mm
	Backlash ^{*1}	0.3 mm or less
	Base	Aluminum with white alumite treatment

*1 Default value

Model	Item	Specification	
		SA5C, SA6C – Lead other than 20 mm	SA5C, SA6C – Lead 20 mm
SA3, SA4, SA5, SA6	Positioning repeatability ^{*2}	±0.02 mm	±0.03 mm
	Backlash ^{*2}	0.1 mm or less	
	Base	Material: Aluminum with special alumite treatment	

*2 Default value

7. Notes on Use

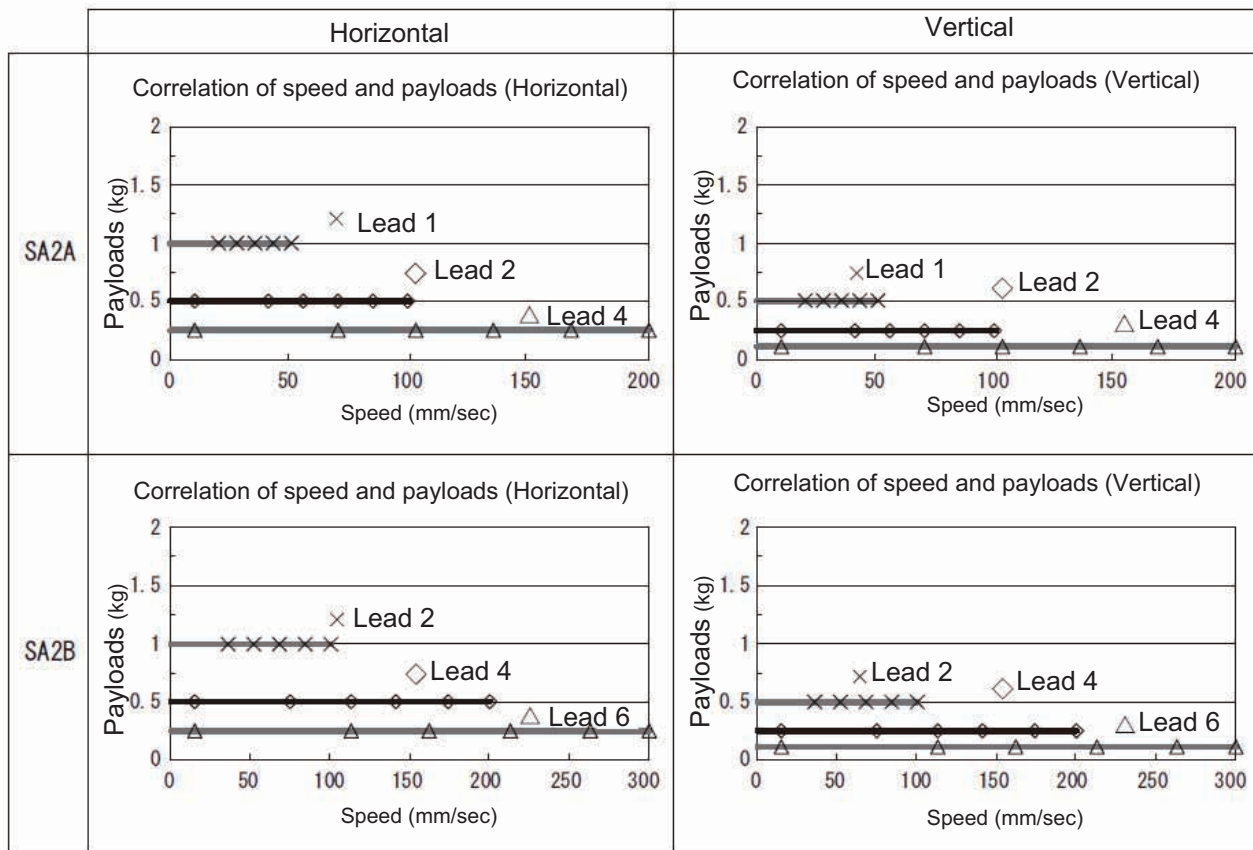
7.1 Notes on Use Regarding Maximum Speed and Load Mass

Determine which models you can choose from by the maximum speed and payload capacity.

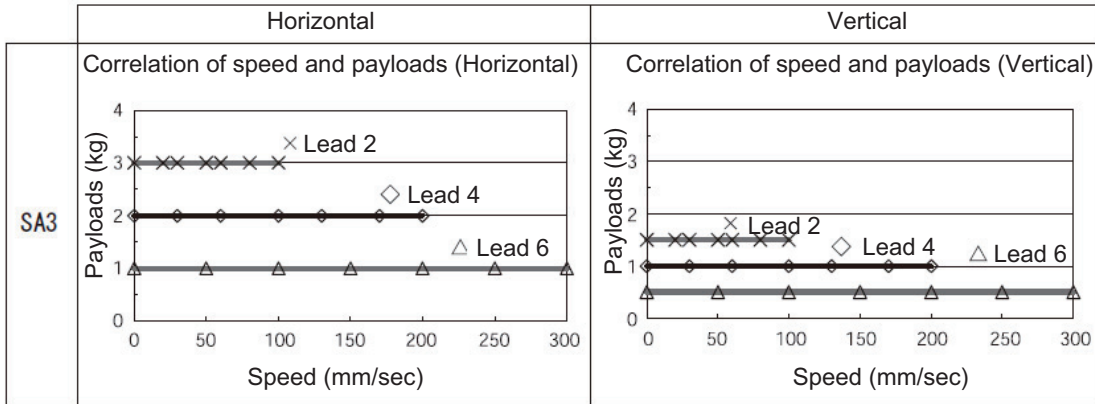
- Pulse motor (Graph 1)

How to decide: If your maximum speed and payloads are within the usage range in the graph, you can use the model.

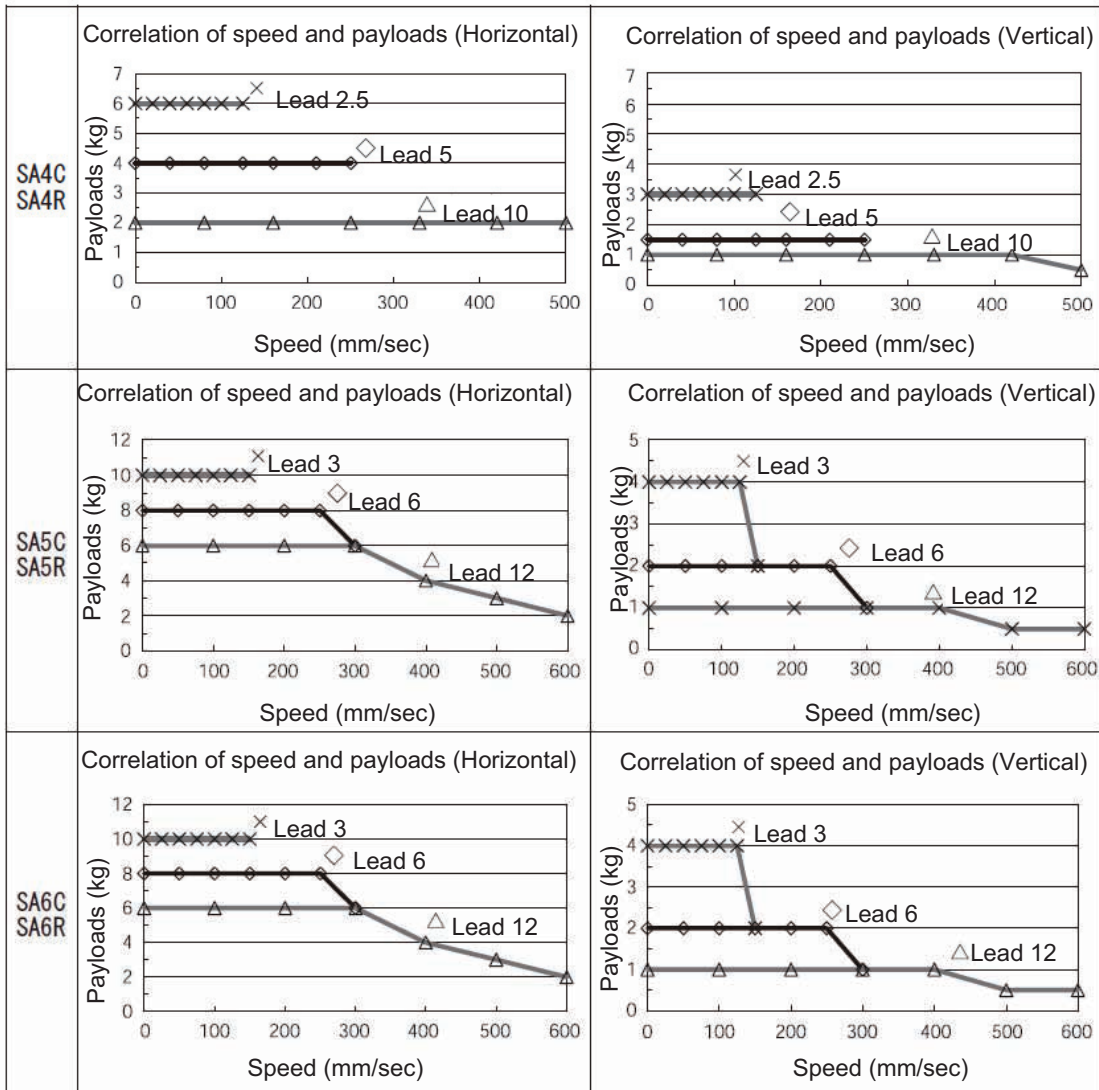
Graph 1 Pulse Motor: RCP3



Graph 1 Pulse Motor: RCP3

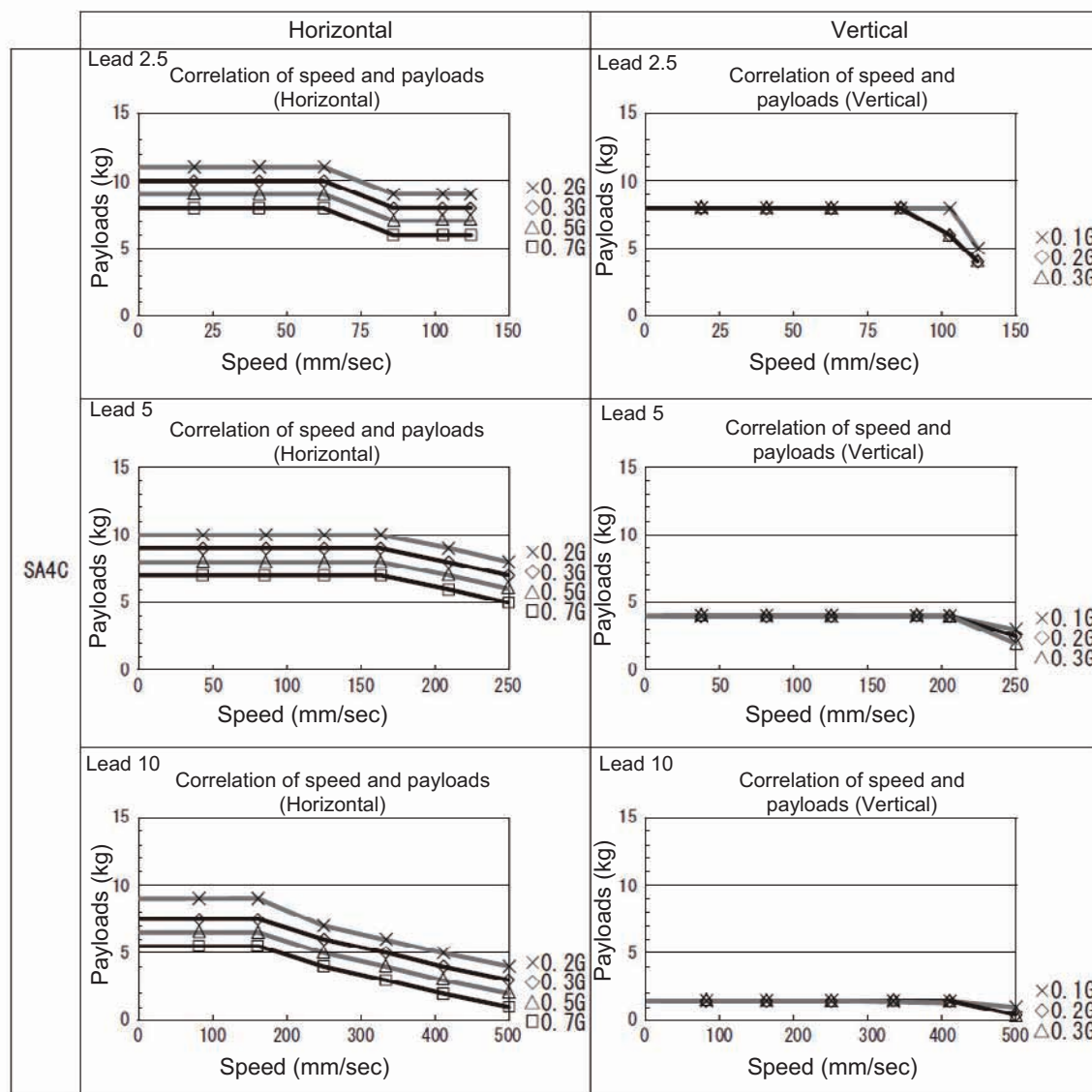


[Controllers (without "H" at the end of the model number)]



(Note) The values of payload capacity are values when operated at the acceleration of 0.3G (low lead (lead 2, 2.5, 3) and vertical use are at 0.2G).

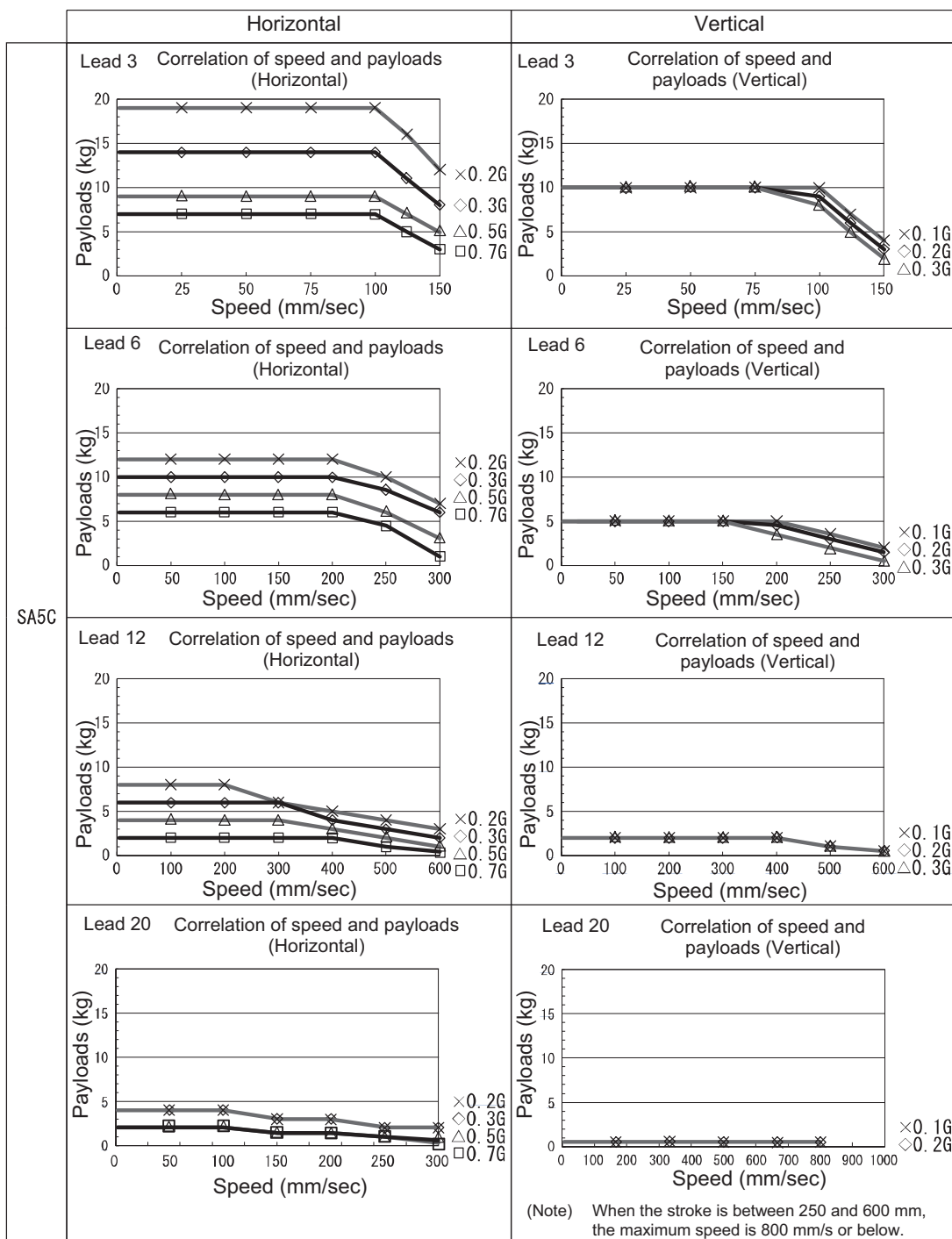
[Controllers (with "H" at the end of the model number)]



*1 If the stroke is long, the maximum speed specified in the graph may not be reached.
[6. Specification Refer to (1), "Maximum speed."]

Caution: The loading capacities at respective accelerations other than the rated acceleration of 0.3 G are reference values and not guaranteed. Use these values only as a guide.

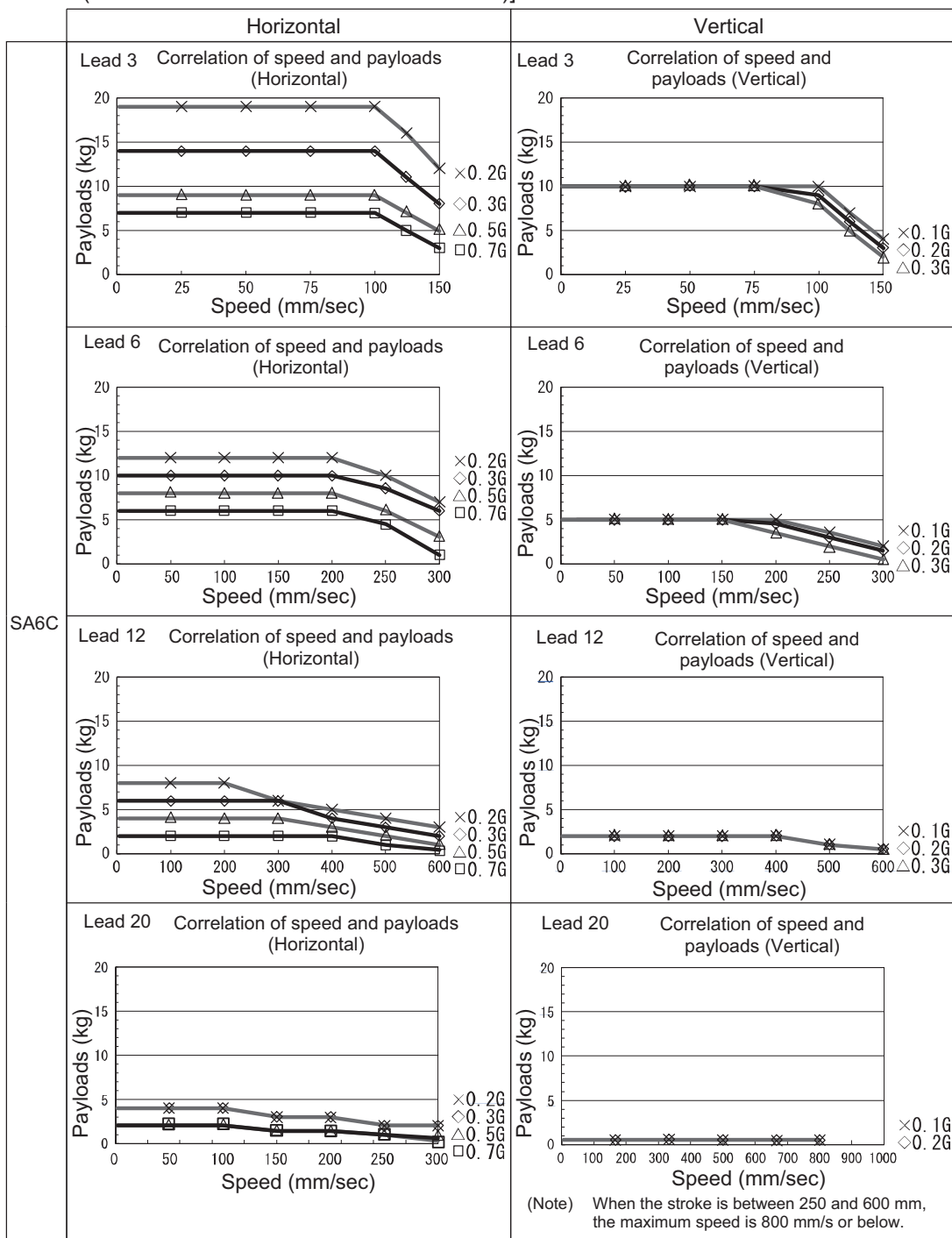
[Controllers (with "H" at the end of the model number)]



*1 If the stroke is long, the maximum speed specified in the graph may not be reached.
 [6. Specification Refer to (1), "Maximum speed."]

Caution: The loading capacities at respective accelerations other than the rated acceleration of 0.3 G are reference values and not guaranteed. Use these values only as a guide.

[Controllers (with "H" at the end of the model number)]



*1 If the stroke is long, the maximum speed specified in the graph may not be reached.
[6. Specification Refer to (1), "Maximum speed."]

Caution: The loading capacities at respective accelerations other than the rated acceleration of 0.3 G are reference values and not guaranteed. Use these values only as a guide.

7.2 Notes on Use Regarding Push-motion Operation

Applicable models: SA3C, SA4C, SA5C, SA6C, SA3R, SA4R, SA5R, SA6R

(The SA2AC, SA2BC, SA2AR and SA2BR cannot perform push & hold operation.)

[1] Usage conditions

Verify the proper usage conditions for a given push force F (N).

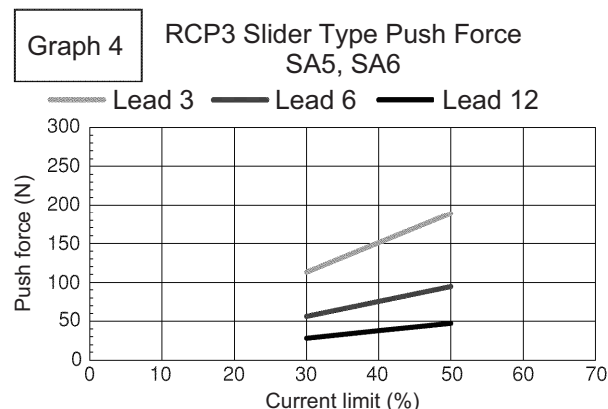
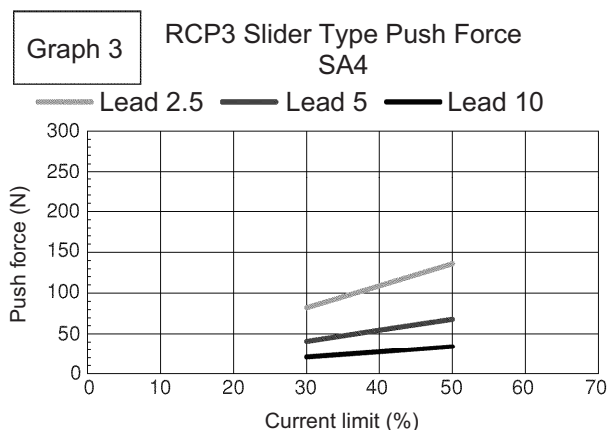
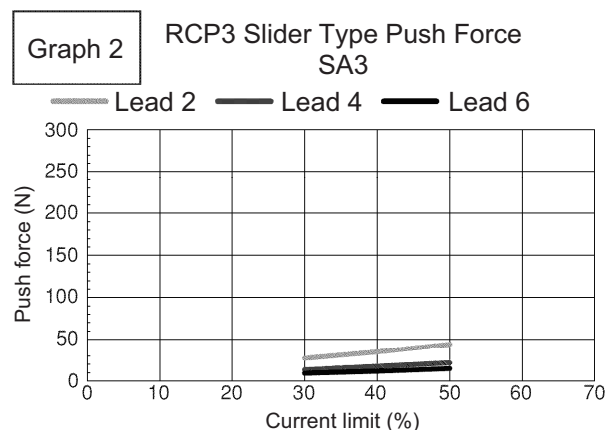
* For push & hold operations, movement speed is set at 20 mm/s.

[2] Push force

Determine which models you can choose based on the push force. The range of current-limiting values is 30% to 50%.

How to decide: If your desired push force is within the usage range in Graph 2, 3, or 4 below, you can select the model.

Current Limit (%)	RCP3 SA3			RCP3 SA4			RCP3 SA5, 6		
	Push force Lead 2 (N)	Push force Lead 4 (N)	Push force Lead 6 (N)	Push force Lead 2.5 (N)	Push force Lead 5 (N)	Push force Lead 10 (N)	Push force Lead 3 (N)	Push force Lead 6 (N)	Push force Lead 12 (N)
30	27	14	9	82	41	21	113	57	28
40	35	18	12	109	55	27	151	76	38
50	44	22	15	136	68	34	189	95	47



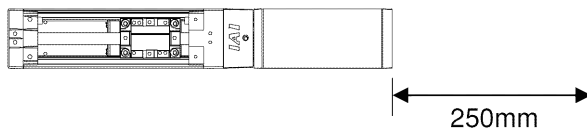
8. Installation and Storage/Preservation Environment

8.1 Installation Environment

Install the actuator in an environment meeting the following conditions:

- Is a normal environment for assembly work where there is not much dust. (If the SA2A or SA2B type is used in an environment where dust is floating in air, the life of the actuator will become significantly shorter.)
 - Not exposed to direct sunlight
 - The machine does not receive radiated heat from large heat sources such as heat treatment furnaces.
 - Ambient temperature of 0 to 40°C
 - Humidity of 85% or below, non-condensing
 - Not subject to corrosive or flammable gases
 - Not subject to oil mist or cutting fluid
 - Not subject to impact or vibration
 - Not subject to significant electromagnetic waves, ultraviolet light or radiation
 - This product is not designed to provide chemical resistance.
- In general, the environment shall be one where the operator can work without wearing protective gears.

Open space required for maintenance inspection



8.2 Storage/Preservation Environment

The storage/preservation environment should conform to the installation environment. Particularly when the actuator is stored/preserved for a long period of time, give consideration to prevent condensation. Unless specified, the actuator is shipped without any drying agent placed in the package. If the actuator is stored/preserved in an environment subject to condensation, implement anti-condensation measures over the entire package or directly on the actuator after unpacking.

The maximum storage/preservation temperature is 60°C for a short period. If the storage/preservation period exceeds 1 month, make sure the storage/preservation temperature does not exceed 50°C.

9. Installation

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

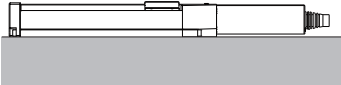
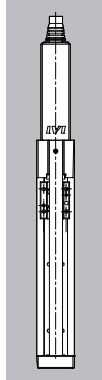
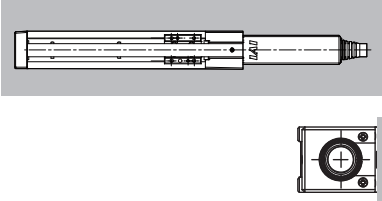

9.1 General Rules on Installation

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

○: Possible △: Daily inspection is required x: Not possible

Model	Horizontal installation	Vertical installation	Sideway installation	Ceiling mount installation
SA2A, SA2B	○	x	x	x
SA3	○	○	○	△
SA4	○	○	△	△
SA5	○	○	△	△
SA6	○	○	△	△

Installation posture

Horizontal	Vertical	Sideways	Ceiling mount
			



- Caution:**
- When the unit is installed vertically oriented, attempt to put the motor up unless there is a special reason. Putting the motor on the lower side would not cause a problem in an ordinary operation. However, it may rarely cause a problem, when it is not operated for a long period, depending on the surrounding environment (especially high temperature), caused by the grease being separated and the base oil flowing into the motor unit.
 - Excluding SA2A and SA2B 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 sheet may be slacked or displaced. If the actuator is used continuously while the stainless sheet is slacked or displaced, the stainless sheet may break or other problems may occur. Check the actuator daily and if the stainless sheet is found slacked or displaced, make installation adjustment of the stainless sheet.
[Refer to 13.11 Stainless Sheet Replacement/Adjustment (SA3, SA4, SA5 and SA6 types with slider cover).]

9.2 Installation of Actuator

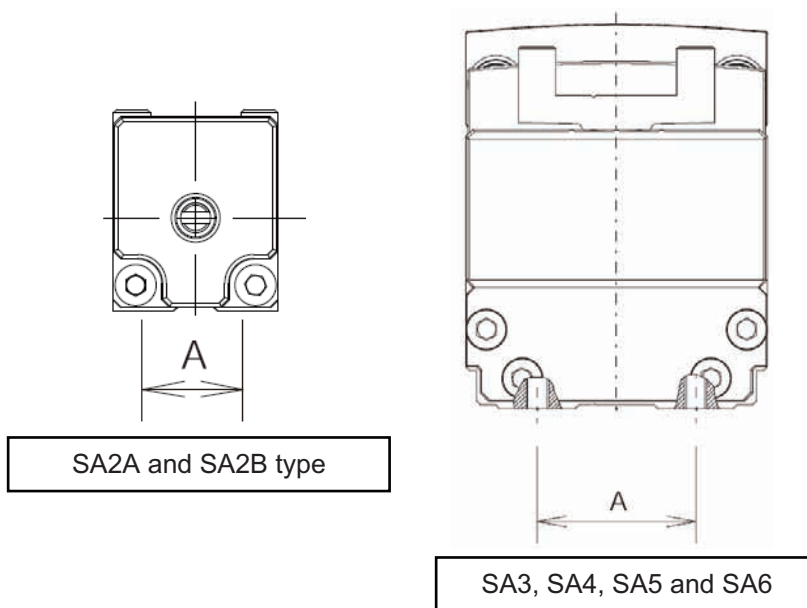
The actuator mounting surface should be machined or otherwise processed to a smooth surface of equivalent precision.

The platform should have a structure stiff enough to install the unit so it would not generate vibration or other abnormality.

This actuator contains installation tap holes which allow it to be secured from the rear.

(Note that tap hole size depends on model. Please see diagrams below and 2. External Dimensions.)


The actuator also contains reamed holes for use with positioning pins.



Model	Tap size and maximum screw-in depth	Applicable bolt	Tightening torque		A (mm)	Reamed hole (mm)
			Bolt bearing surface is steel	Bolt bearing surface is aluminum		
SA2A	M3, depth 5	M3	1.54 N-m (0.16 kgf-m)	0.83 N-m (0.085 kgf-m)	10	φ2H7, depth 3 from bottom face of base
SA2B	M3, depth 4	M3				
SA3	M3, depth 5	M3	1.54 N-m (0.16 kgf-m)	0.83 N-m (0.085 kgf-m)	17	φ2H7, depth 4 from bottom face of base
SA4	M3, depth 5	M3	1.54 N-m (0.16 kgf-m)	0.83 N-m (0.085 kgf-m)	21	φ2.5H7, depth 5 from bottom face of base
SA5	M4, depth 7	M4	3.59 N-m (0.37 kgf-m)	1.76 N-m (0.18 kgf-m)	26	φ2.5H7, depth 5 from bottom face of base
SA6	M5, depth 8	M5	7.27 N-m (0.74 kgf-m)	3.42 N-m (0.35 kgf-m)	31	φ3H7, depth 5 from bottom face of base

Tightening screws

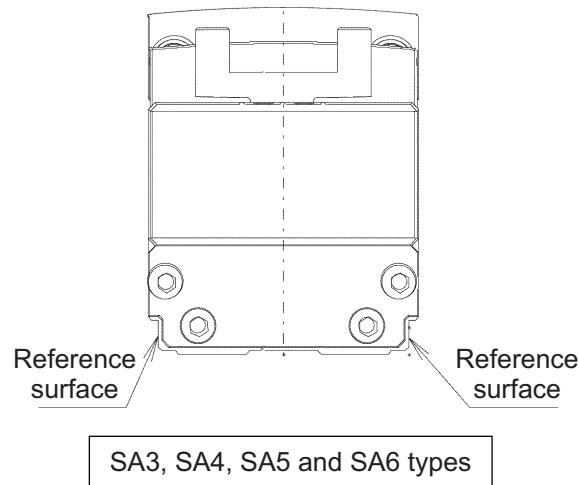
- Use hexagonal socket head bolts for the male threads for installing the base.
- Use of high-tension bolts meeting at least ISO 10.9 is recommended.
- The length of thread engagement should be 1.8 times more than the nominal diameter, and pay attention not to stick the screw out inside the actuator.

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

9.3 Mounting Surface

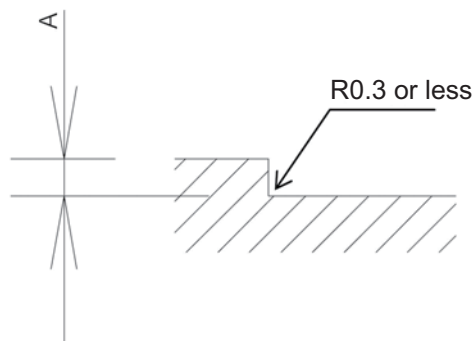
- Mount on a strong, rigid structure to prevent vibration.
- The actuator mounting surface should be machined or otherwise processed to a smooth surface of equivalent precision, within ± 0.05 mm/m.
- Provide adequate space around the device to allow for future maintenance.
- On SA3, SA4, SA5 and SA6-type actuators, the side and bottom faces of the base provide reference surfaces for slider travel.

When it is necessary that the slider or table move in a highly precise fashion, please ensure that the device is installed at the direction that is based on the position of these surfaces.



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

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

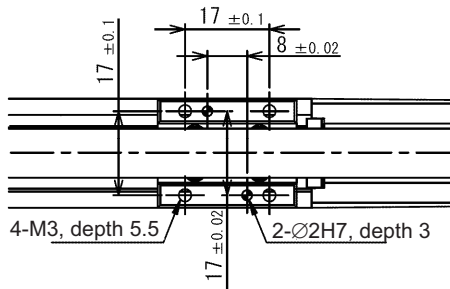


Model	Length of A (mm)
SA3, SA4, SA5 and SA6 types	2 to 4 or less

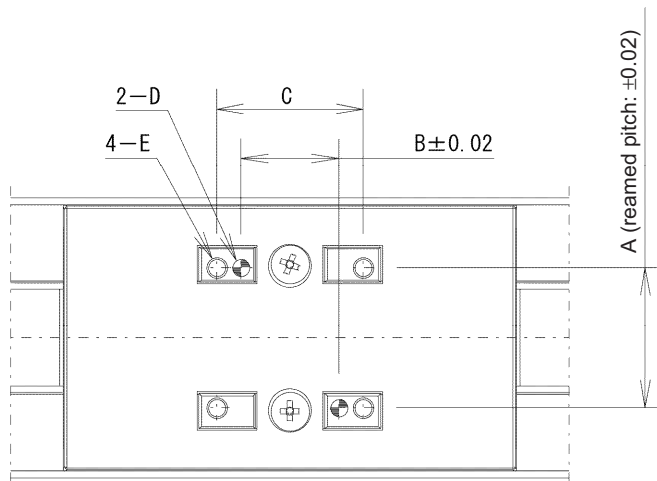
9.4 Installation of the Load

- 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. 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.

Do not screw in pins deeper than indicated in the table below, as this can damage the tap holes, resulting in insecure installation of the load, reduced precision of device, and possible accidents.
Do not tighten the mounting screws to torques exceeding the applicable value shown in the table below. Doing so may damage the tapped holes.



SA2A and SA2B types



SA3, SA4, SA5 and SA6 types

Model	A	B	C	D	E	Mounting screws	
						Nominal thread size	Tightening torque
SA2A SA2B						M3	0.83 N-m (0.085 kgf-m)
SA3	17	11	17	Ø2H7, depth 5	M3, depth 6	M3	0.83 N-m (0.085 kgf-m)
SA4	20	14	21	Ø2.5H7, depth 5	M3, depth 6	M3	0.83 N-m (0.085 kgf-m)
SA5	26	14	22	Ø2.5H7, depth 5	M4, depth 8	M4	1.76 N-m (0.18 kgf-m)
SA6	31	15	25	Ø3H7, depth 5	M5, depth 10	M5	3.42 N-m (0.35 kgf-m)

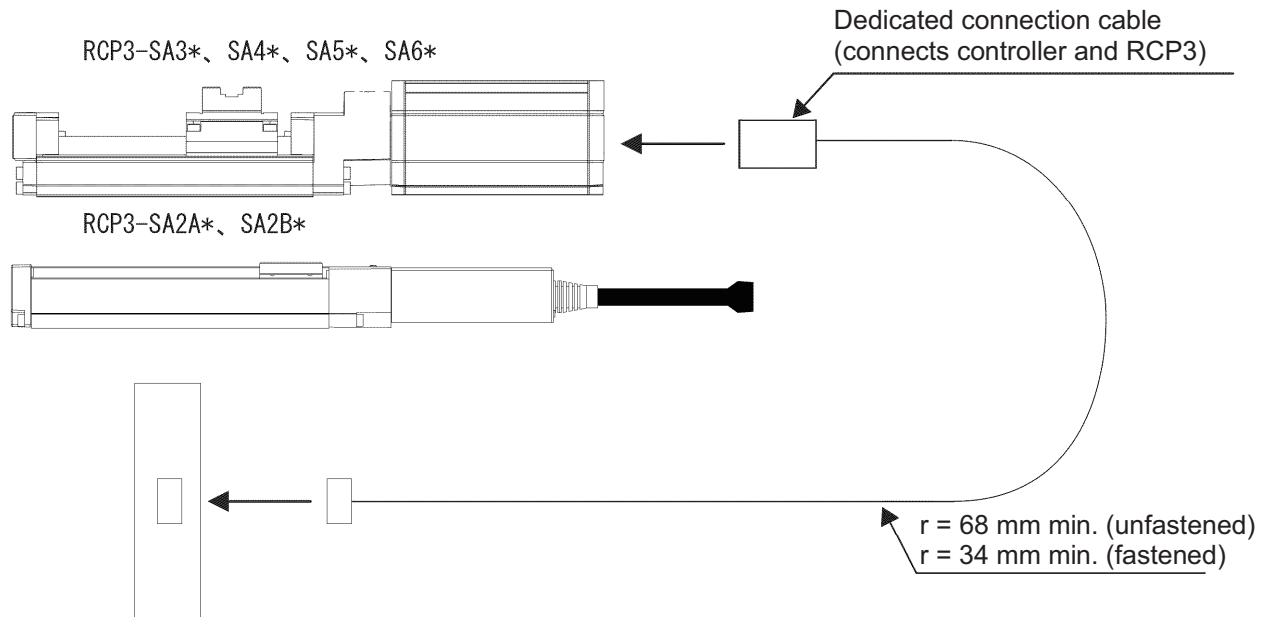
10. Connecting with Controller

Both for the controller itself and for the connection cable between the controller and actuator (RCP3), use a dedicated IAI controller and dedicated connection cable.

This section explains the wiring method for a single axis.

- If the dedicated connection cable cannot be secured, reduce the load on the cable by allowing it to deflect only by the weight of the cable or wire it in a self-standing cable hose, etc., having a large radius.
- Do not cut and reconnect the dedicated connection cable for extension or shorten the cable.
- Do not pull on the dedicated connection cable or bend it forcibly.

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



Dedicated controller

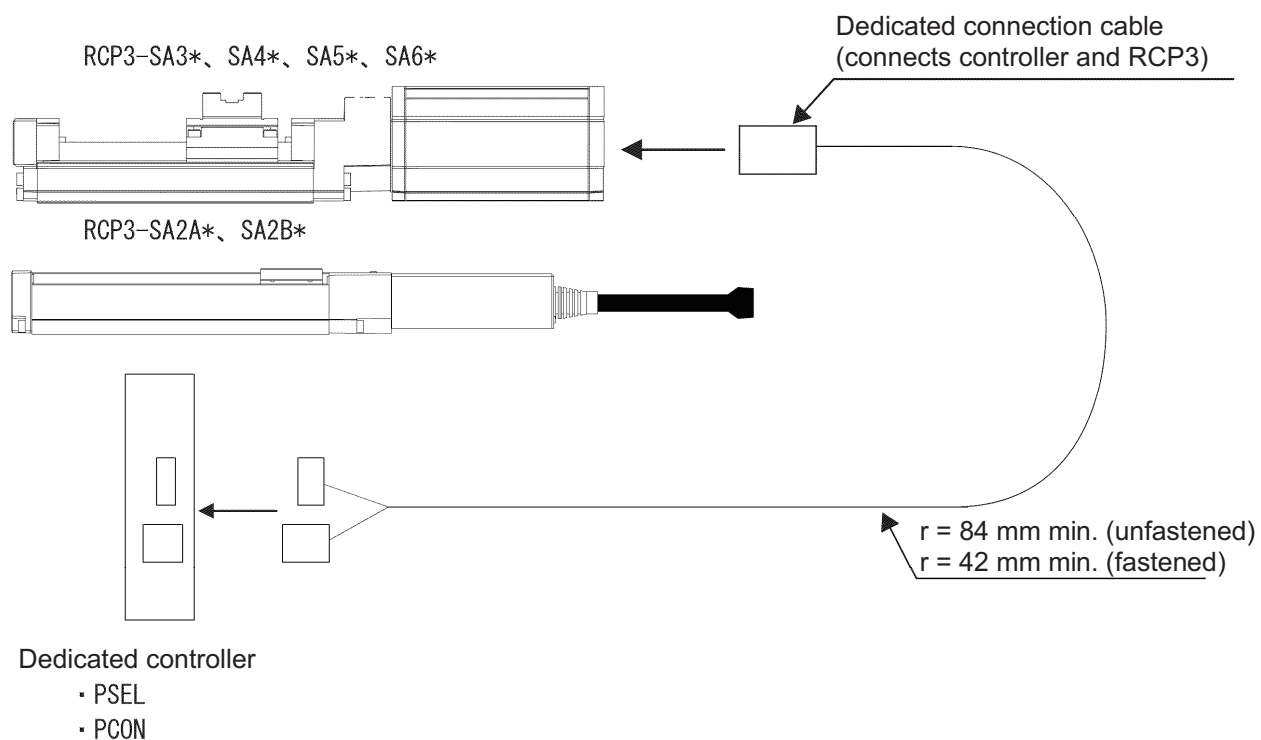
- P MEC
- P SEP

Dedicated connection cable

- Pulse motor cable: CB-APSEP-MPA***

* *** indicates the cable length (L). Up to 20 m can be specified.

Example) 080 = 8 m



Dedicated connection cable

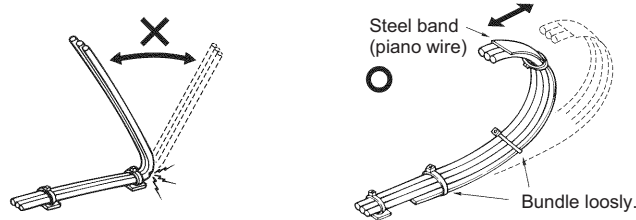
- Pulse motor cable: CB-PCS-MPA***

* *** indicates the cable length (L). Up to 20 m can be specified.

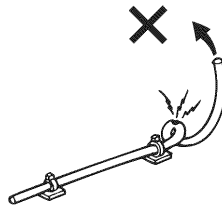
Example) 080 = 8 m

When building an application system using the actuator and controller, incorrect wiring or connection of each cable may cause broken wire, poor contact or other unexpected problem. The prohibited items relating to cable wiring are explained below.

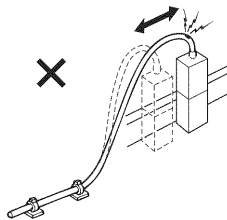
- Do not cut and reconnect the cable to extend or shorten the cable.
- If the cable cannot be secured, reduce the load on the cable by allowing it to deflect only by the weight of the cable or wire it in a self-standing cable hose, etc., having a large radius.
- Prevent the cable from bending at the same point.



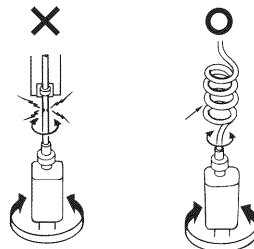
- Do not let the cable bend, kink or twist.



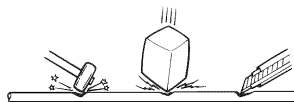
- Do not pull the cable with a strong force.



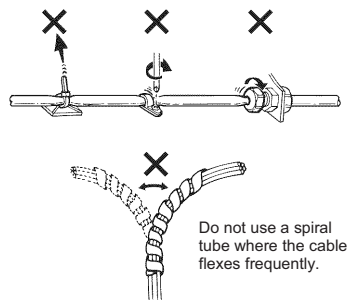
- Do not let the cable receive a turning force at a single point.



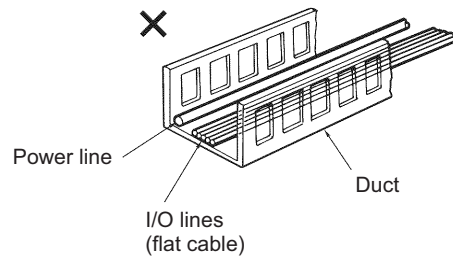
- Do not pinch, drop a heavy object onto or cut the cable.



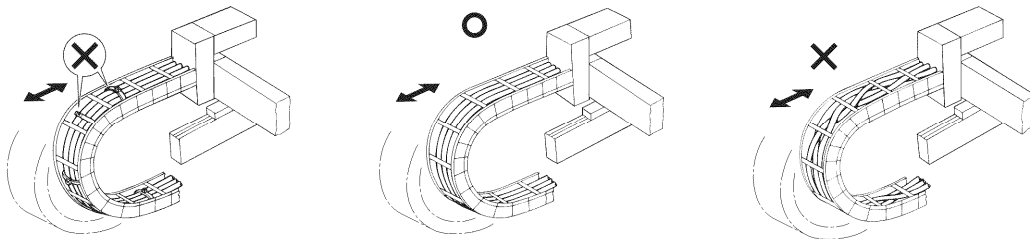
- When fixing the cable, provide a moderate slack and do not tension it too tight.



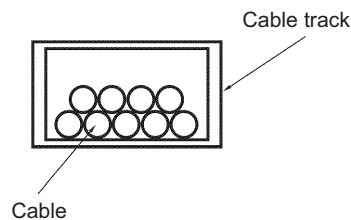
- Separate the I/O and communication lines from the power and drive lines. Do not wire them in the same duct.



- Pay attention to the following points when using a cable track.
- Do not let the cable get tangled or kinked in a cable track or flexible tube. When bundling the cable, keep a certain degree of flexibility (so that the cable will not become too taut when bent).



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



Warning:

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

11. Notes on Operation

11.1 Placing a Load on the Actuator

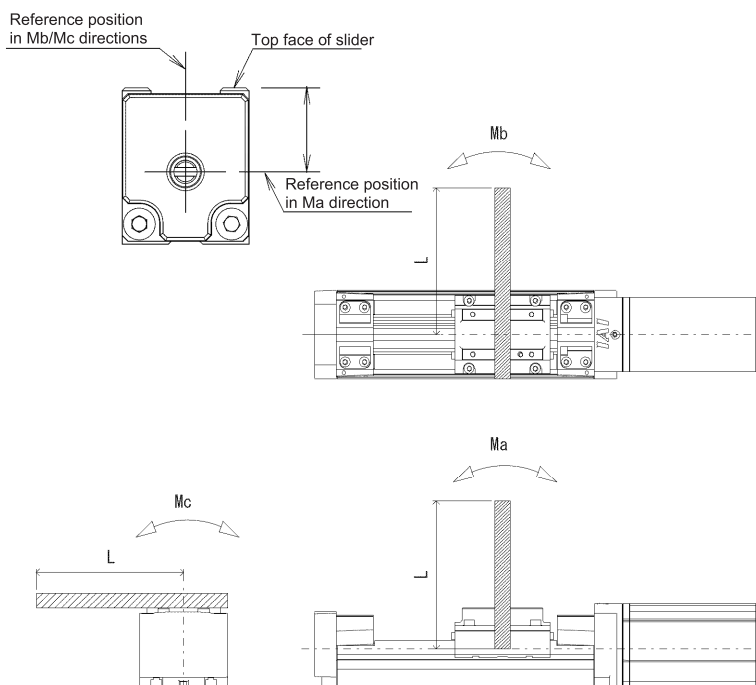
11.1.1 Loads on SA2A and SA2B types

- Do not exceed the load ratings given in the specification table below.
- Be careful not to exceed the load moment, maximum payloads and overhang load length for the slider.
(See diagram below.)

Loads moment must not apply in Ma or Mb direction other than during acceleration/deceleration.

Item	Unit	SA2A	SA2B
Dynamic allowable load moment	N(kgf-mm)	Ma: 74 (7.5)	Ma: 198 (20.2)
		Mb: 74 (7.5)	Mb: 198 (20.2)
		Mc: 43 (4.4)	Mc: 143 (14.6)
Extension load length	(mm)	50 mm	50 mm

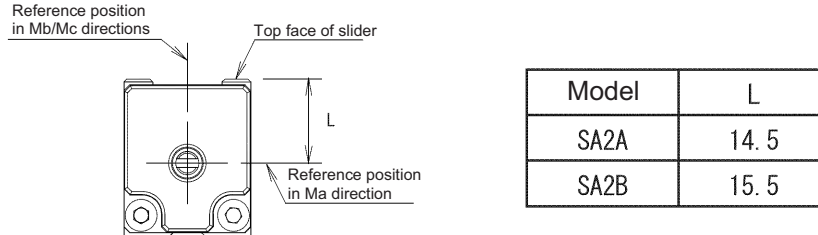
[Load moment directions and overhang load directions]



⚠ Caution: Application of an excessive load moment may produce unwanted results such as a shorter life of the guide. Also note that using the actuator with an overhang load exceeding the allowable limit may generate vibration or negatively affect the life of the guide.

11.1.2 Positioning the guide to calculate the load moment (SA2A and SA2B)

When calculating moments, consider the position of action shown below.

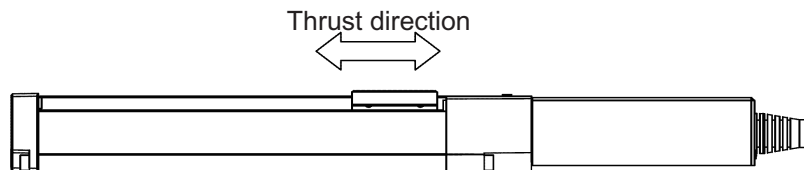


11.1.3 Thrust direction external force

- Do not apply an excessive external force to the slider.
With low-lead types, the slider will not move even when an external force is applied.
If an excessive external force is applied, the nut may be damaged.
To move the slider, use the jog function or turn the slit at the shaft end using a screwdriver, etc.
- Exercise caution not to apply in thrust directions any external force or impact load exceeding the allowable value.
Subjecting the actuator to levels of external force or impact load above the allowable capacity may damage or destroy internal components.

<External forces in thrust directions>

External forces applied in thrust directions must not exceed the static allowable moments.



Move the slider by observing the cautionary items specified below.

[Lead screw, low-lead type]

The slider will not move even when an external force is applied. Use the PC software or teaching pendant to jog the slider. Or, put a screwdriver, etc., in the slit at the end of the shaft, to move the slider.

[Lead screw, medium or high-lead type]

Use the PC software or teaching pendant to jog the slider whenever possible. Or, put a screwdriver, etc., in the slit at the end of the shaft, to move the slider.

[Ball screw, low-lead type]

The slider may not move even when an external force is applied. In this case, do not move the slider forcibly, but use the PC software or teaching pendant to jog the slider.

⚠ Caution: If the slider does not move, do not move it forcibly.
With medium or high-lead actuators of the lead screw type, avoid moving the slider directly with hand whenever possible. This may apply an excessive force and cause actuator damage such as broken nut.

11.2 Placing a Load on the Actuator

11.2.1 Loads on SA3, SA4, SA5 and SA6 types

- Do not exceed the load ratings given in the specification table below.
In particular, be careful not to exceed the load moment, overhang load length, and maximum payloads for the slider.
(See diagram below.)

- Allowable dynamic moments Unit: N-m (kgf-m)

	Ma	Mb	Mc
SA3	1.96 (0.2)	2.84 (0.29)	3.14 (0.32)
SA4	3.04 (0.31)	4.31 (0.44)	5.00 (0.51)
SA5	3.92 (0.40)	5.58 (0.57)	8.53 (0.87)
SA6	4.31 (0.44)	6.17 (0.63)	10.98 (1.12)

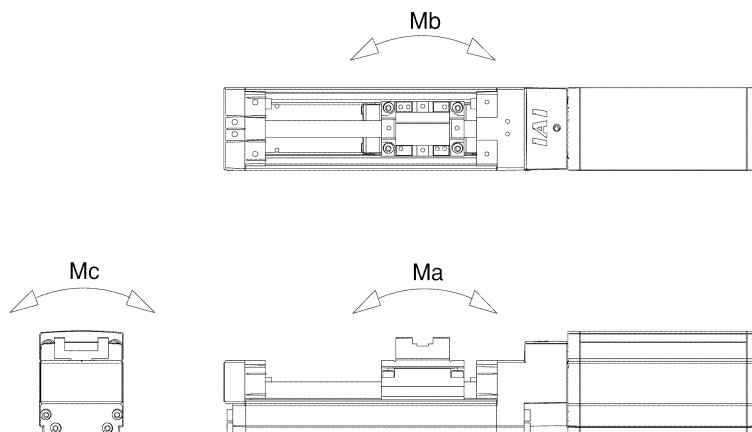
- Allowable static moments Unit: N-m (kgf-m)

	Ma	Mb	Mc
SA3	5.0 (0.51)	7.1 (7.24)	7.9 (0.81)
SA4	6.8 (0.69)	9.7 (0.99)	13.3 (1.36)
SA5	10.2 (1.04)	14.6 (1.49)	22.4 (2.29)
SA6	17.6 (1.80)	25.2 (2.57)	44.5 (4.54)

When calculating the load moments, refer to 11.2.2, “Positioning the guide to calculate the load moment” shown below.

Directions of load moments

“Slider types”

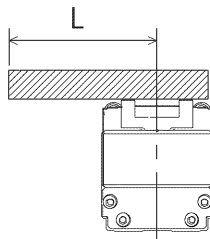


Allowable extension lengths

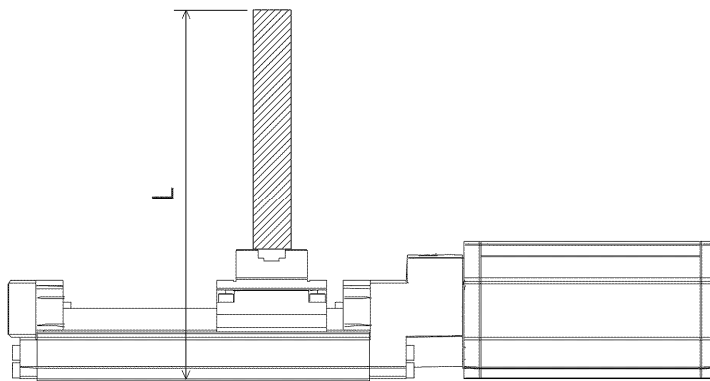
Model	Ma direction	Mb direction	Mc direction
SA3	100 mm or less	100 mm or less	100 mm or less
SA4	120 mm or less	120 mm or less	120 mm or less
SA5	130 mm or less	130 mm or less	130 mm or less
SA6	150 mm or less	150 mm or less	150 mm or less

Overhang load length direction

Mb and Mc directions



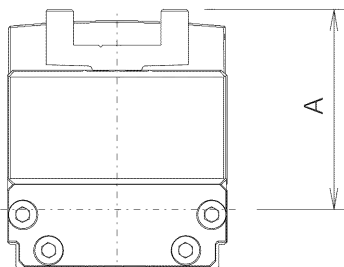
Ma direction



⚠ Caution: Application of an excessive load moment may produce unwanted results such as a shorter life of the guide. Also note that using the actuator with an overhang load exceeding the allowable limit may generate vibration or negatively affect the life of the guide.

11.2.2 Positioning the guide to calculate the load moment (SA3, SA4, SA5 and SA6 types)

When calculating load moments, consider the position of action shown below.



Offset reference positions for
Ma and Mc moments

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

11.2.3 Thrust direction external force (SA3, SA4, SA5 and SA6 types)

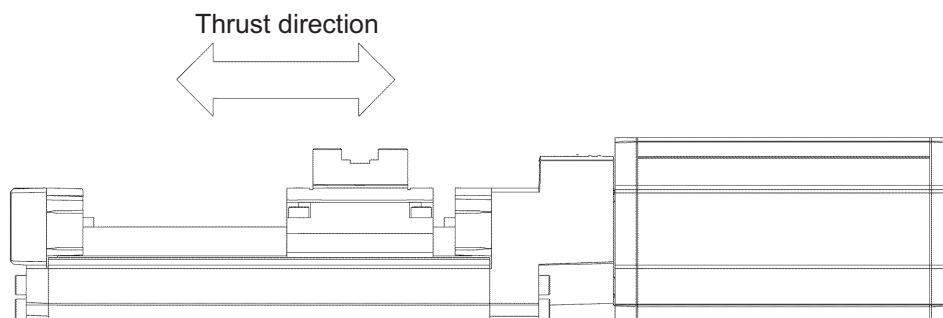
Be careful not to subject the actuator to external force or impact load in the thrust direction in excess of allowable capacity.

Subjecting the actuator to levels of external force or impact load above the allowable capacity may damage or destroy internal components.

Thrust direction external force capacity Unit: N (kgf)

SA3	50	(5.1)
SA4	160	(16.3)
SA5	220	(22.4)
SA6	220	(22.4)

"Slider type"



11.3 Adjusting the Home Position

The actuator home position can be adjusted by changing parameter ^{*1}. In order to make adjustments, please do the following.

- [1] Verify the home position by performing a home return operation.
- [2] Move the actuator to the desired position, verify the distance between the old and new positions, and adjust the parameter accordingly. The parameter can be set to a positive value in the direction of movement. (It cannot be set to a negative value.)
- [3] Increasing the offset amount restricts the movement range by the amount of the increase. If you set an offset greater than 1 mm, please reset the stroke soft limit.

^{*1} PCON controller: No. 22, home return offset distance
PSEL controller: Parameter No. 12 for each axis, home preset value
PSEP controller: No. 16, home return preset value
PMEC controller: No. 16, home return preset value

11.4 Changing the Home Position 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 plays an important role in the detection of position and home signals, and its phase is adjusted precisely. Never touch the encoder to change the home position.

11.5 Stainless Sheet Section

- The stainless sheet is attached by adsorption to the side cover. If the environment contains high levels of iron filings or other magnetic matter, this may become adsorbed between the stainless 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 sheet. Such material sticking to the stainless sheet can lead to defective slider operation and stainless sheet damage.
- Be careful to avoid localized force on the stainless sheet. Such force could deform the stainless sheet and cause malfunctions.
Also, during installation and transport, do not hold on to or press on the stainless sheet. Doing so could damage the stainless sheet.

12. Life

12.1 Life of Ball Screw Actuator

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 90% after 50 km of traveling.

With industrial equipment, however, dynamic rated loads must be defined based on longer traveling distance of 5,000 km to 10,000 km 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 5,000 km while receiving the allowable load moment, based on a load coefficient of 1.2.

[For the allowable dynamic load moment, refer to 6, "Specifications."]

The formula for calculating the allowable dynamic load moment corresponding to a traveling life of 5,000 km is shown below.

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

C_{IA} : Allowable dynamic load moment
 fW : Load factor (= 1.2)
 M_{50} : Rated dynamic moment based on a survival probability of 50% after 50 km of traveling

Calculate the life at the applicable moment using the formula below:

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

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

12.2 Life of Slip Screw Actuator

This type of actuator adopts a slip screw and its nut wears.

The life of a slip screw actuator is calculated roughly based on the wear amount of the nut.

As the nut wears, the positioning precision of the actuator drops due to increased backlash, etc.

(Rough guide for actuator life)

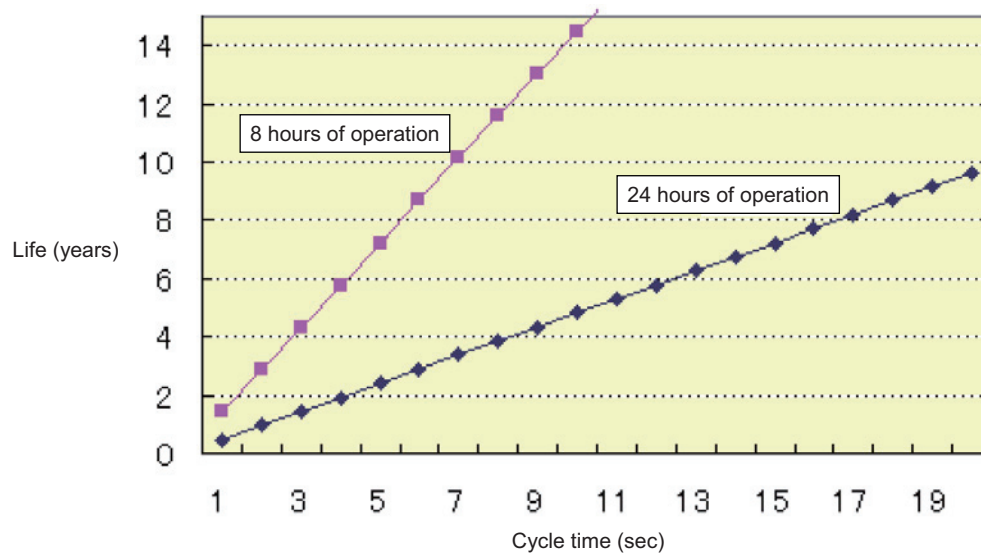
10 million cycles when used horizontally

12.3 Relationship of Cycle Time and Product Life

12.3.1 Horizontal application

The graph below shows the relationship between the cycle time for one back-and-forth operation and the life of the product in a horizontal application (product life: 10 million cycles).

The lines for product life based on 8 hours of operation and 24 hours of operation a day, for 240 days a year, are shown. Use this graph as a reference when determining the product life.



13. Maintenance Inspection

13.1 Inspection Items and Schedule

Follow the maintenance inspection schedule below.

It is assumed that the equipment is operating 8 hours per day.

If the equipment is running continuously night and day or otherwise running at a high operating rate, inspect more often as needed.

(SA2A and SA2B types)

	External visual inspection	Internal inspection	Greasing ^{*2}
Start of work inspection	○		
1-month inspection	○		
3-month inspection	○	○	
6-month inspection	○	○	○
Every 6 months thereafter	○	○	○

(SA3, SA4, SA5 and SA6 types)

	External visual inspection	Internal inspection	Greasing ^{*2}
Start of work inspection	○		
1-month inspection	○		
6-month inspection	○	○	○ ^{*1}
12-month inspection	○	○	○
Every 6 months thereafter	○		
Every 12 months thereafter	○	○	○

^{*1} If grease is found degraded as a result of interior check, add grease.

^{*2} Grease film may run out if the actuator is moved back and forth continuously over a distance of 30 mm or less. As a guide, perform a back-and-forth operation five times or so over a distance of 50 mm or more after a back-and-forth operation over such short distance has been repeated 5,000 to 10,000 times. (If the stroke of the ROBO Cylinder is less than 50 mm, move the actuator back and force over the entire stroke.) This will restore oil film.

13.2 External Visual Inspection

An external visual inspection should check the following things.

Main unit	Loose actuator mounting bolts, other loose items, buildup	
Cables	Scratches, proper connections	
Stainless sheet	Scratches	Check this item on SA3, SA4, SA5 and SA6 types with stainless sheet.
Overall	Irregular noise, vibration	

- If the stainless sheet is slacked, make adjustment to remove slacks as necessary.
- As a rule of thumb, the stainless sheet should last for about 5000 km of slider motion. However, under certain conditions, the stainless sheet may need to be replaced earlier. Generally, replacing the stainless 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.

13.3 Cleaning

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

13.4 Adjusting the Stainless Sheet

If the actuator stroke is 400 mm or more, check the stainless sheet for slacking, etc., as necessary.

If the stainless sheet is found slacked, etc., adjust the stainless sheet.

[For the stainless sheet adjustment procedure, refer to 13.11, "Replacing/Adjusting the Stainless Sheet."]

13.5 Internal Inspections (SA2A and SA2B types)

Turn off the power and inspect visually after removing the screw cover in the case of slider types, or after removing the pulley cover in the case of reversing types.

An internal inspection should check the following things.

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

Visually inspect the interior of the machine. Check whether dust or other foreign matter has gotten inside and check the lubrication state.

The lubrication may have turned brown. This is not a problem as long as the travel surfaces shine as though they are wet.

If the grease is mixed with dust and does not have a shiny appearance, or if the grease has lost its efficacy due to prolonged use, then clean each section and reapply grease.

13.6 Internal Inspections (SA3, SA4, SA5 and SA6 types)

Turn off the power and inspect visually after turning up or removing the stainless sheet in the case of stainless sheet types. With reversing types, inspect visually after removing the reversing bracket.

An internal inspection should check the following things.

Main unit	Loose actuator mounting bolts, other loose items
Guide section	Lubrication, buildup
Belt (reversing types)	Belt wear and damage

Visually inspect the interior of the equipment. Check whether dust or other foreign matter has gotten inside and check the lubrication state.

The lubrication may have turned brown. This is not a problem as long as the travel surfaces shine as though they are wet.

If the grease is mixed with dust and does not have a shiny appearance, or if the grease has lost its efficacy due to prolonged use, then clean each section and reapply grease.

The procedure for internal inspections is outlined below. For inspection and adjustment of the belt, refer to 13.10.

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

- [1] Move the slider to the home position side.
- [2] Remove the cover.
- [3] Remove the sheet retainer screws.
- [4] Peek under the stainless sheet and check the interior.
- [5] When the checks are completed, reassemble the parts by following the same procedure in reverse.

Cautions for attached cover:

When checking inside the equipment, be careful not to forcibly bend the stainless sheet or scratch it. Do not tug on the stainless 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 sheet by referring to the replacement instructions.

Keep in mind that the edges of the stainless sheet can cause injuries. Always wear gloves when working on it.

13.7 Internal Cleaning

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

13.8 Greasing Guides (SA2A and SA2B types)

13.8.1 Applicable greases (SA2A and SA2B types)

This product has been shipped with synthetic poly- α olefin grease applied to both the lead screw and slide guide.

IAI uses the following grease in our plant.

Applicable location	Manufacturer	Model number
Lead screw/slide guide	Sumico Lubricant Co., Ltd.	Sumitec 308

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



Warning:

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

13.8.2 How to apply grease (SA2A and SA2B types)

When greasing the guide, use a grease syringe to apply grease between the slider and base (guide-piece retention groove) and then move the slider back and forth to spread the grease evenly.

When greasing the lead screw, clean the screw, manually apply grease, and then move the slider back and forth to spread the grease evenly.

(Caution) When moving the slider back and forth, do not move the slider directly by hand, but operate it using the jog function, etc.

13.9 Greasing Guides (SA3, SA4, SA5 and SA6 types)

13.9.1 Applicable greases

[Applicable greases for guide (SA3, SA4, SA5 and SA6 types)]

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 fluorine-based grease. Mixing fluorine-based grease with lithium-based grease not only reduces the performance of the grease, it may even cause damage to the actuator.

[Applicable greases for ball screw (SA3, SA4, SA5 and SA6 types)]

The grease initially used is lithium-based grease.

IAI uses the following grease in our plant. (Excludes SA3C type)

Kyodo Yushi	Multitemp LRL 3
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* RCP3 SA3C type uses the following grease.

Idemitsu Kosan	Daphne Eponex Grease No. 2
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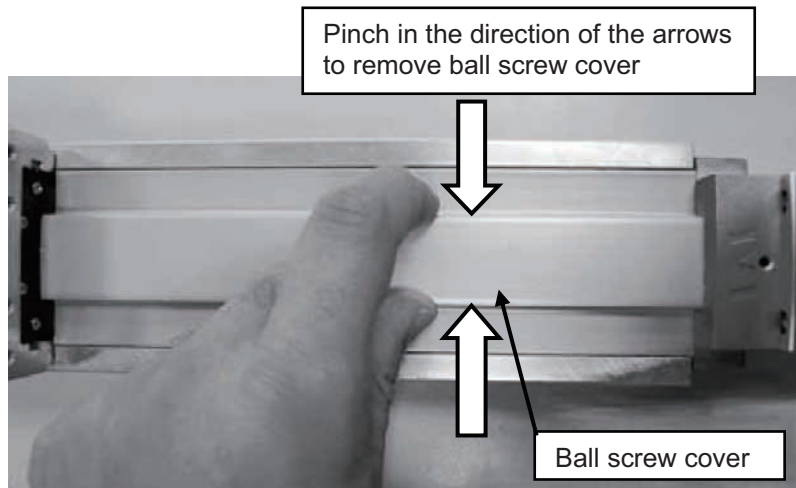


Warning:

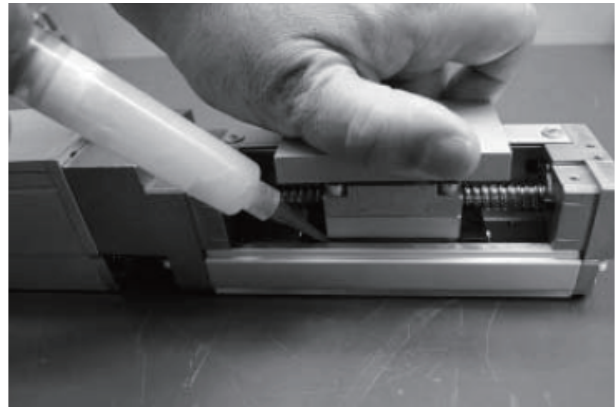
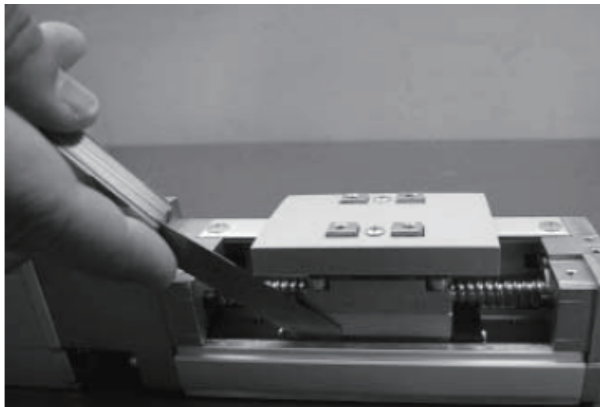
Never use fluorine-based grease. Mixing fluorine-based grease with lithium-based grease not only reduces the performance of the grease, it may even cause damage to the actuator.

13.9.2 How to apply grease (SA3, SA4, SA5 and SA6 types)

When side cover and stainless 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.



- (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.



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

- Note:
- 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.
 - When moving the slider back and forth by hand, be certain never to apply force in excess of the thrust direction external force capacity (see 11.1.3). (If the slider will not move, operate it using a jog function.)

13.10 Belt

13.10.1 Inspection of belt

Visually inspect the belt after removing the pulley cover.

Although the durability of the belt is affected significantly by the operating conditions, generally the belt has a flex life of several million times.

As a reference of when the belt should be actually replaced, replace the belt if any of the following conditions is observed:

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

13.10.2 Applicable belt

[1] Applicable belt for SA2A and SA2B

Manufacturer: Mitsubishi Belting Ltd.

Belt model number (type)
40S2M104G (clean rubber type)

[2] Applicable belt for SA3, SA4, SA5 and SA6

Manufacturer: Bando Chemical Industries, Ltd.

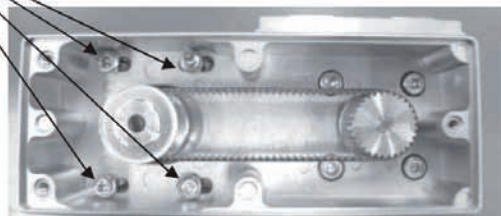
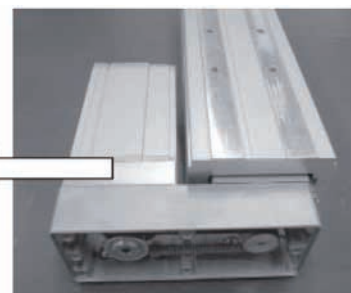
Belt model number (type)	Model
40S2M138R, 4-mm wide (clean rubber type)	SA3R
60S2M152R, 6-mm wide (clean rubber type)	SA4R
60S2M180R, 6-mm wide (clean rubber type)	SA5R
60S2M180R, 6-mm wide (clean rubber type)	SA6R

13.10.3 Adjustment of belt tension

Remove the pulley cover, loosen the tension adjustment bolts (4 locations) (2 pcs on the SA2A and SA2B), and move the motor to the left as shown below to tension the belt. After the adjustment is finished, tighten the tension adjustment bolts.

Tension
SA2A and SA2B: 0.51 kgf
SA3R: 1.5 ± 0.1 kgf
Other than SA3R: 2.5 ± 0.1 kgf

Tension adjustment bolt		
Model	Nominal thread size	Tightening torque
SA2A/SA2B	M3	0.83 N-m (0.085 kgf-m)
SA3R	M2.6	0.46 N-m (0.047 kgf-m)
SA4R	M3	0.83 N-m (0.085 kgf-m)
SA5R/SA6R	M4	1.76 N-m (0.18 kgf-m)



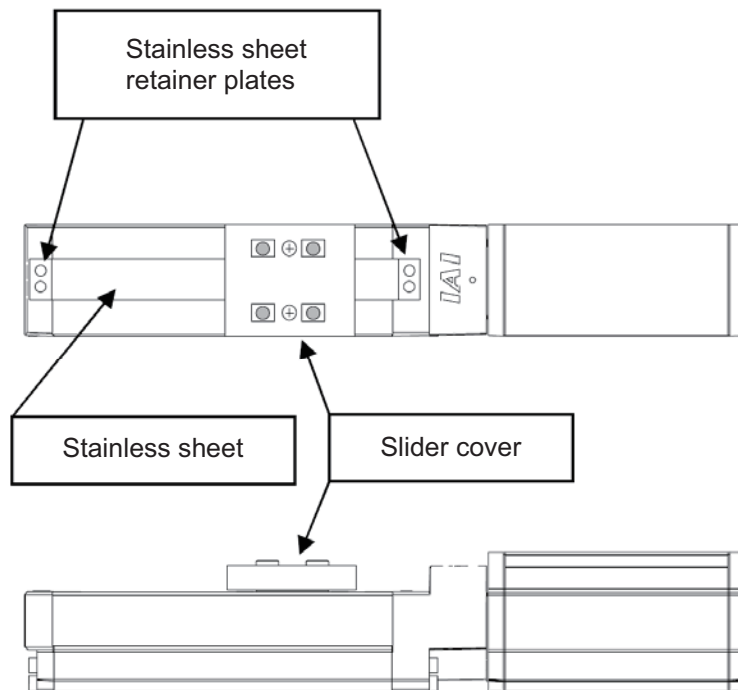
13.11 Stainless Sheet Replacement/Adjustment (SA3, SA4, SA5 and SA6 types with slider cover)

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

[Items required for replacing the stainless sheet]

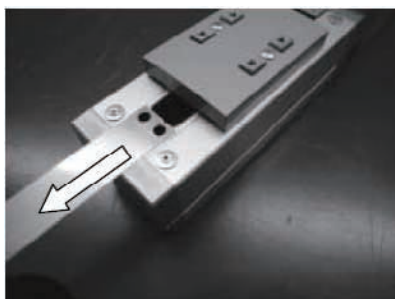
- Replacement stainless sheet
- Hex wrench set
- Cellophane tape

[Part names]

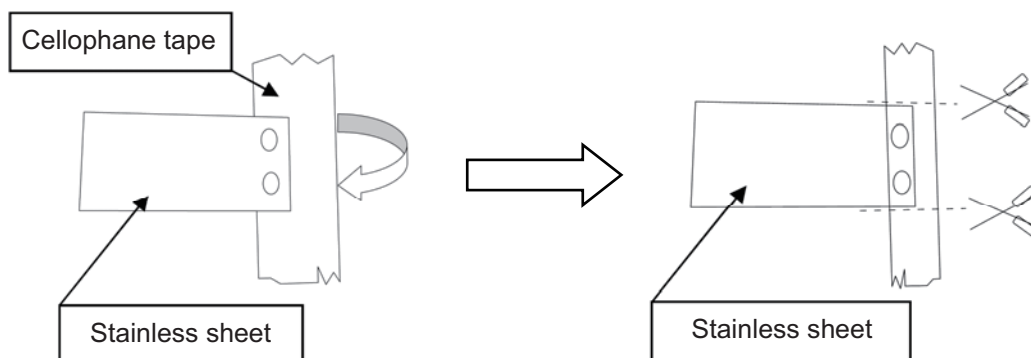


[Procedure]

- [1] With a 1.5 mm hex wrench, remove the four screws securing the stainless sheet and the two stainless sheet retainer plates.
- [2] Pull out the old stainless sheet.

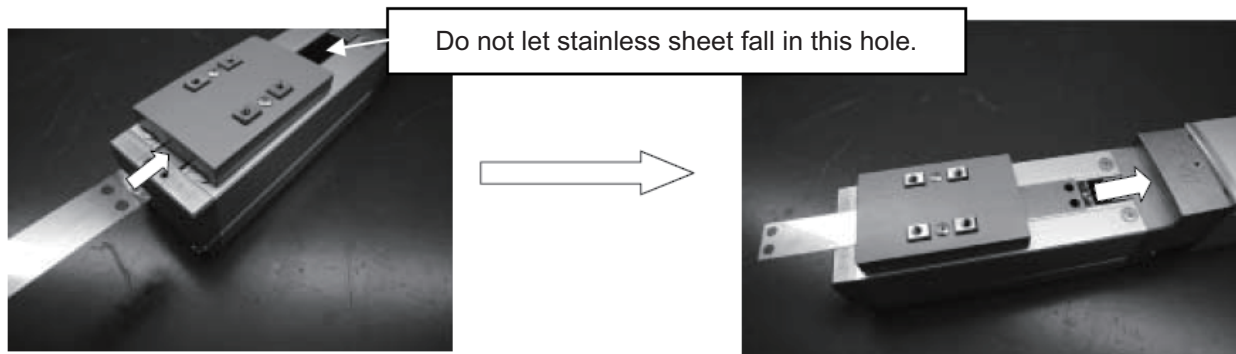


- [3] Apply cellophane tape to one side of the new stainless sheet.

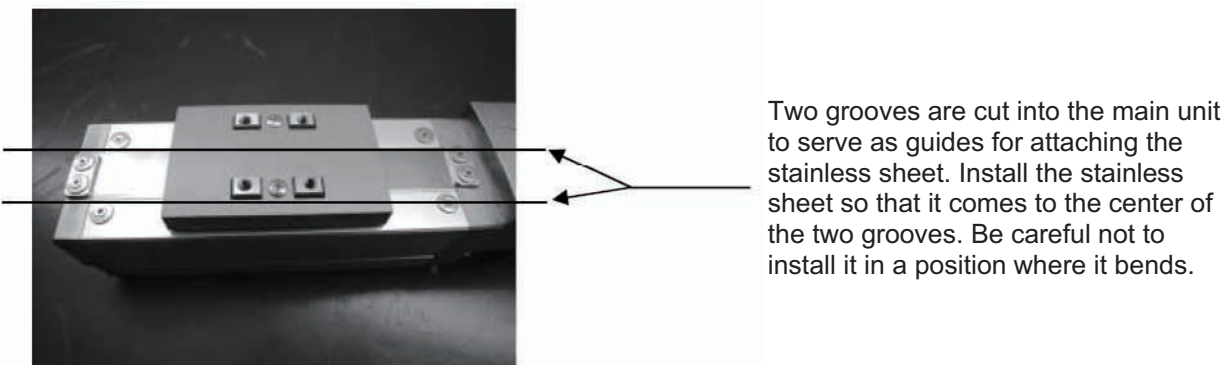


Apply the cellophane tape as though sandwiching the stainless sheet, leaving about 3 mm of tape sticking out from the stainless sheet. Cut off the excess tape.

- [4] Slide the stainless sheet, taped end first, in through the gap under the slider cover.



- [5] Fasten the two stainless sheet retainer plates with the four screws. Use a 1.5 mm hex wrench.



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

⚠ Caution: When moving the slider back and forth by hand, be certain never to apply force in excess of the thrust direction external force capacity (see 11.1.3). (If the slider will not move, operate it using a jog function.)

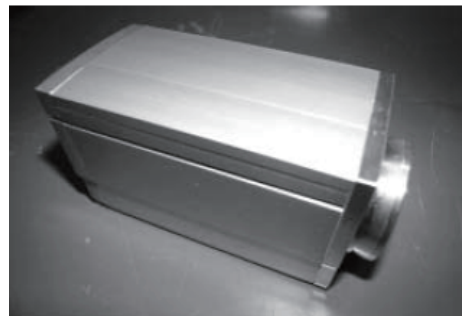
13.12 Motor Replacement (Pulse Motor: RCP3)

* Refer to 13.13 for reversing types.

[Items required for replacing the stainless sheet]

- Replacement motor unit

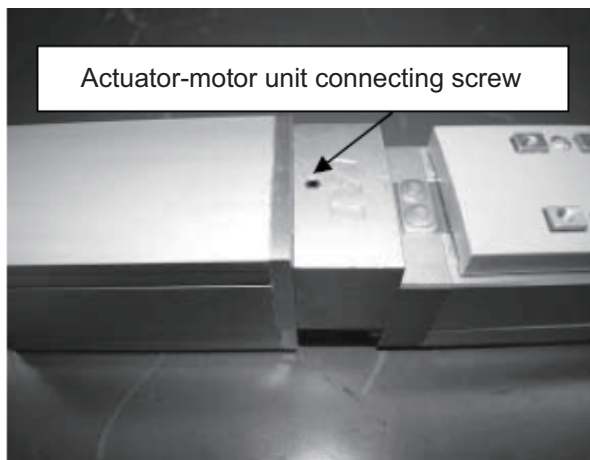
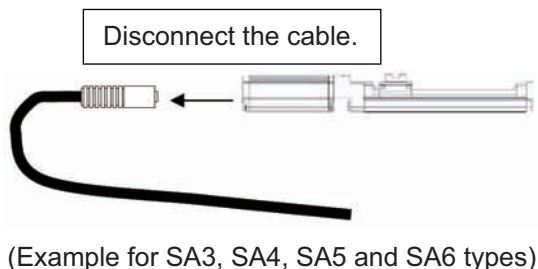
Axis type			Model number	
			Without brake	With brake
RCP3 (black encoder cable connector)	Slider type	SA2A	RCP3-MU00A	RCP3-MU00A-B
		SA2B		
		SA3C	RCP3-MU1A	RCP3-MU1A-B
		SA4C	RCP3-MU2A	RCP3-MU2A-B
		SA5C	RCP3-MU3A	RCP3-MU3A-B
		SA6C		



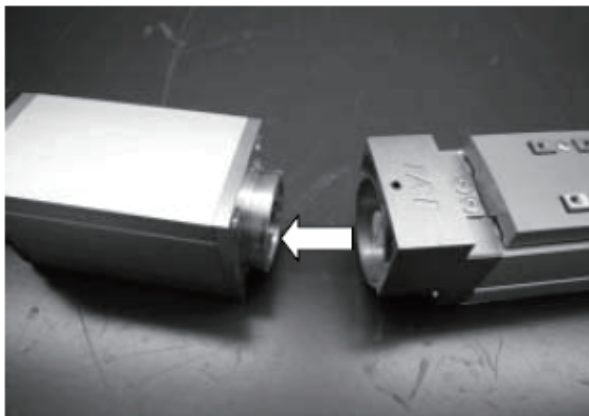
- Hex wrench set

[Procedure]

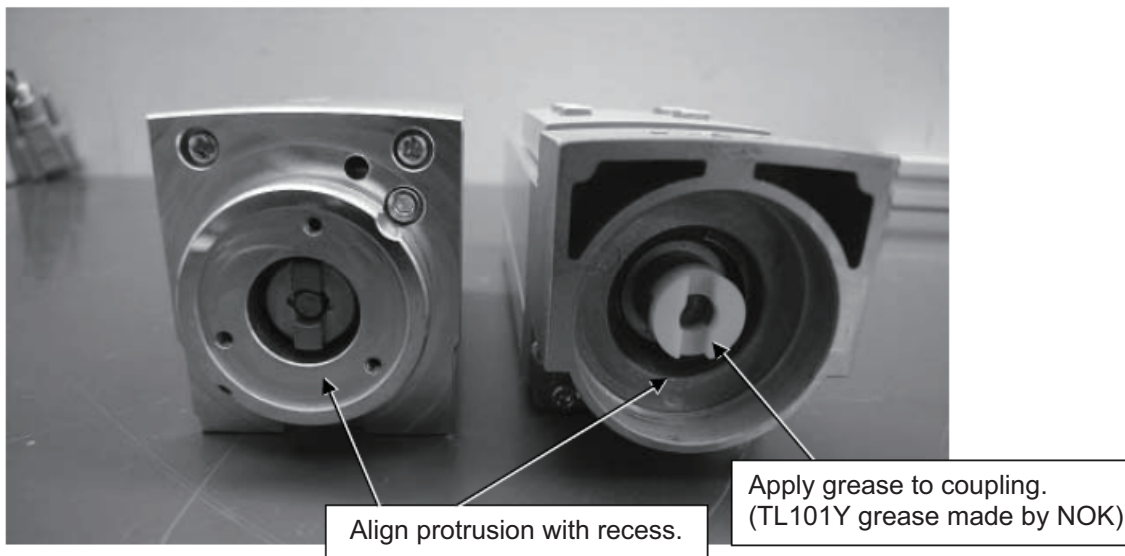
- [1] Disconnect the cable from the motor unit, then use a 2 mm hex wrench to remove the screw which holds together the actuator unit and the motor unit. (Cross-recessed cap screws M2 are used on the SA2A and SA2B.)



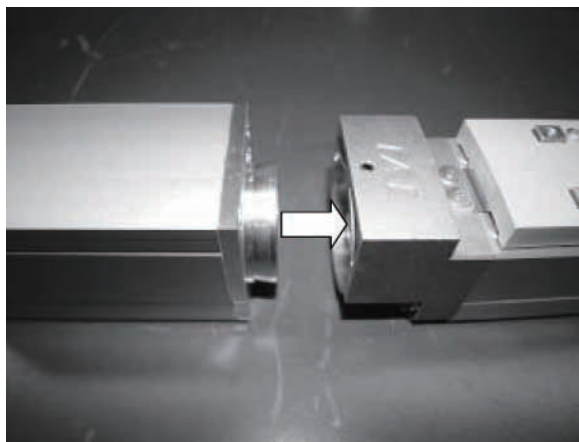
- [2] Detach the motor unit.



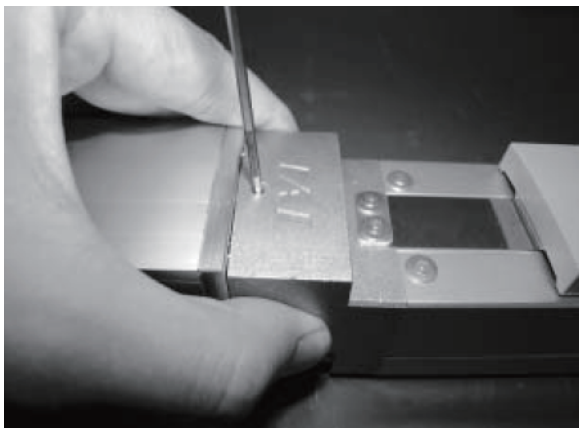
- [3] Align the actuator side and replacement motor unit side projection section and the slit orientation.



- [4] Install the replacement motor by fitting the protrusion of one unit in the recess of the other.



- [5] Use a 2 mm hex wrench to remove the screw fastening the motor unit and the actuator. (Cross-recessed cap screws M2 are used on the SA2A and SA2B.)



13.13 Replacement of Belt and Motor for Reversing Types (Pulse Motor: RCP3)

[Items required for replacing the stainless sheet]

- Replacement motor unit for reversing type

Axis type			Model number	
			Without brake	With brake
RCP3 (black encoder cable connector)	Slider type	SA2A	RCP3-MU00B	RCP3-MU00B-B
		SA2B		
		SA3R	RCP3-MU1B	RCP3-MU1B-B
		SA4R	RCP3-MU2B	RCP3-MU2B-B
		SA5R	RCP3-MU3B	RCP3-MU3B-B
		SA6R		



- Belt
- Applicable belt for SA2A and SA2B

Manufacturer: Mitsuboshi Belting Ltd.

Belt model number (type)
40S2M104G (clean rubber type)

- Applicable belt for SA3, SA4, SA5 and SA6

Manufacturer: Bando Chemical Industries, Ltd.

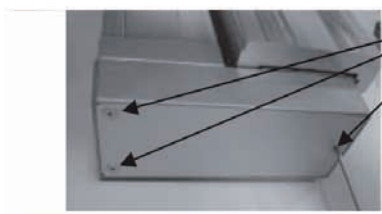
Belt model number (type)	Model
40S2M138R, 4-mm wide (clean rubber type)	SA3R
60S2M152R, 6-mm wide (clean rubber type)	SA4R
60S2M180R, 6-mm wide (clean rubber type)	SA5R
60S2M180R, 6-mm wide (clean rubber type)	SA6R

- Tension gauge
- Hex wrench set

[Procedure]

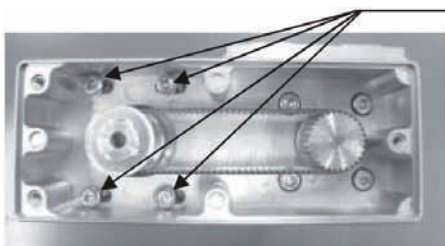
[1] Remove the pulley cover.

Remove the mounting screws (2 pcs on the SA2A, SA2B and SA3R, or 3 pcs on all other models).



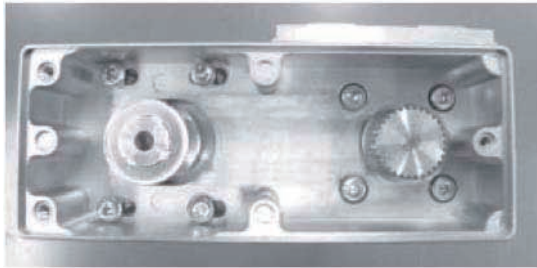
Mounting screw		
Model	Nominal thread size	Applicable hex wrench
SA2A/SA2B	M3	2.5 mm across flats
SA3R/SA4R	M2.5	1.5 mm across flats
SA5R/SA6R	M3	2.5 mm across flats

[2] Loosen the tension adjustment bolts (4 locations) (2 pcs on the SA2A and SA2B) and slack the belt.

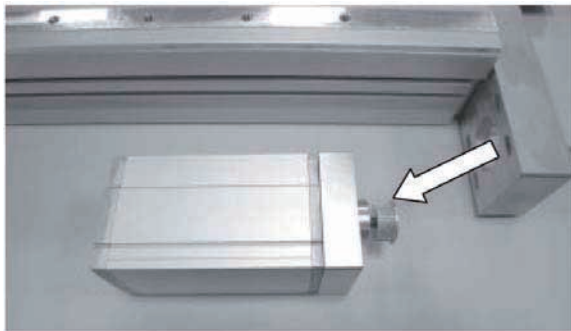


Tension adjustment bolts		
Model	Nominal thread size	Applicable hex wrench
SA2A/SA2B	M3	2.5 mm across flats
SA3R	M2.6	2 mm across flats
SA4R	M3	2.5 mm across flats
SA5R/SA6R	M4	3 mm across flats

[3] Remove the belt from the pulleys. When replacing the belt, proceed to step [6].



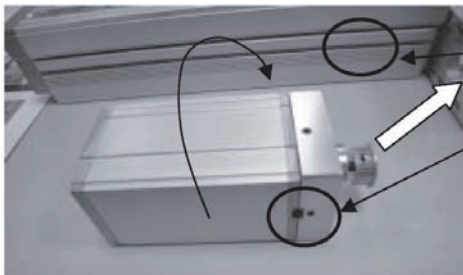
[4] Remove the tension adjustment bolts and pull out the motor unit.



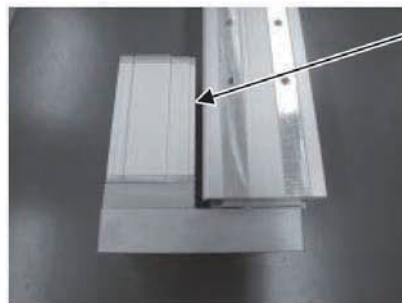
[5] Install the replacement motor unit.

As shown below, install the motor unit by making sure the specified surface of the motor unit faces the base of the actuator.

Loosely secure the motor unit using the tension adjustment bolts.

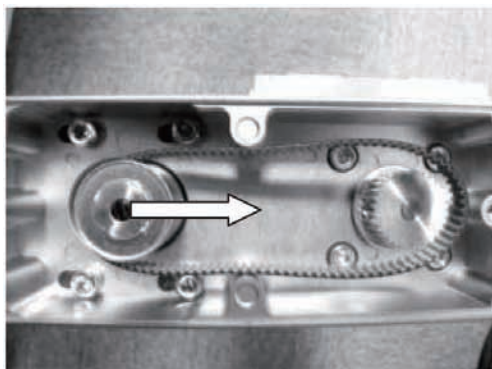


Install the motor unit by making sure the base surface of the actuator faces the motor unit surface with two holes.

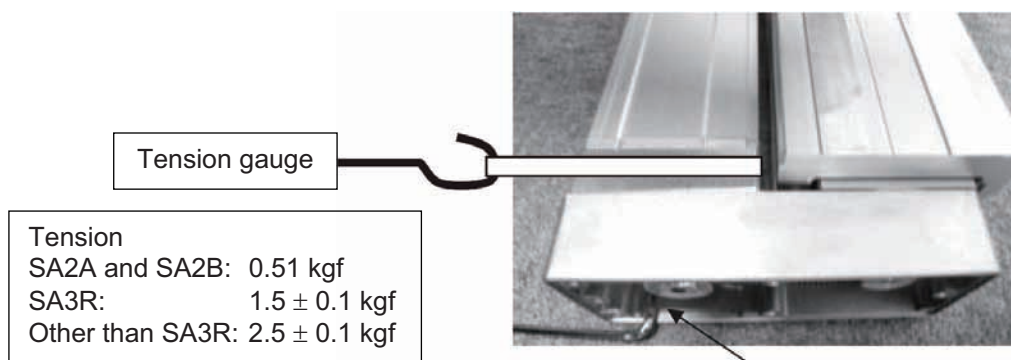


The surface with no gaps must face the motor unit surface with two holes.

- [6] Move the motor unit in the direction of the arrow shown below, and then install the belt. When replacing the belt, install the replacement belt.

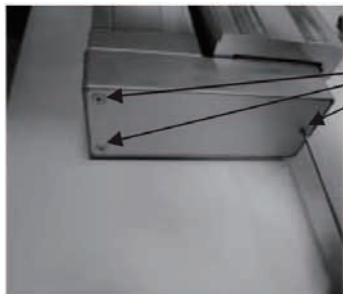


- [7] Pass around the base of the motor unit a strong string (or long tie band) that has been looped into a ring, and pull the ring with a tension gauge. After confirming the specified tension, tighten the tension adjustment bolts uniformly.



Tension adjustment bolt		
Model	Nominal thread size	Tightening torque
SA2A/SA2B	M3	0.83 N-m (0.085 kgf-m)
SA3R	M2.6	0.46 N-m (0.047 kgf-m)
SA4R	M3	0.83 N-m (0.085 kgf-m)
SA5R/SA6R	M4	1.76 N-m (0.18 kgf-m)

- [8] Install the pulley cover.



Mounting screws (2 pcs on the SA2A, SA2B and SA3R, or 3 pcs on all other models).

14 Warranty

14.1 Warranty Period

One of the following periods, whichever is shorter:

- 18 months after shipment from our company
- 12 months after delivery to the specified location

14.2 Scope of Warranty

Our products are covered by warranty when all of the following conditions are met. Faulty products covered by warranty will be replaced or repaired free of charge:

- (1) The breakdown or problem in question pertains to our product as delivered by us or our authorized dealer.
- (2) The breakdown or problem in question occurred during the warranty period.
- (3) The breakdown or problem in question occurred while the product was in use for an appropriate purpose under the conditions and environment of use specified in the operation manual and catalog.
- (4) The breakdown 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.

14.3 Honoring the Warranty

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

14.4 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.

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

- (1) If our product is combined with another product or any system, device, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc. In such a case we will not be liable for the conformance of our product with the applicable standards, etc.
- (2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications. Contact us if you must use our product for any of these applications:
 - [1] Medical equipment pertaining to maintenance or management of human life or health
 - [2] A mechanism or mechanical equipment intended to move or transport people (such as a vehicle, railway facility or aviation facility)
 - [3] Important safety parts of mechanical equipment (such as safety devices)
 - [4] Equipment used to handle cultural assets, art or other irreplaceable items
- (3) Contact us at the earliest opportunity if our product is to be used in any condition or environment that differs from what is specified in the catalog or operation manual.

14.6 Other Items Excluded from Warranty

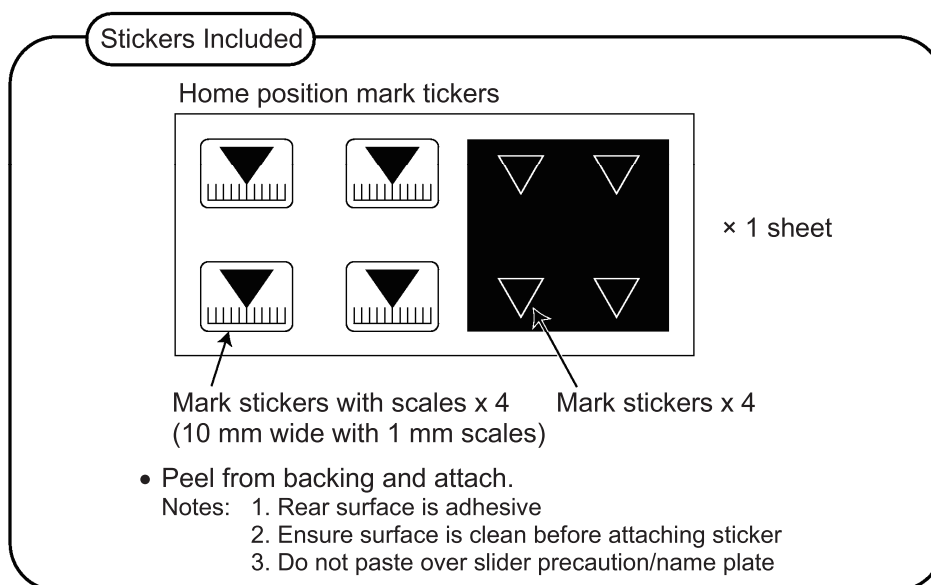
The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:

- [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

Appendix

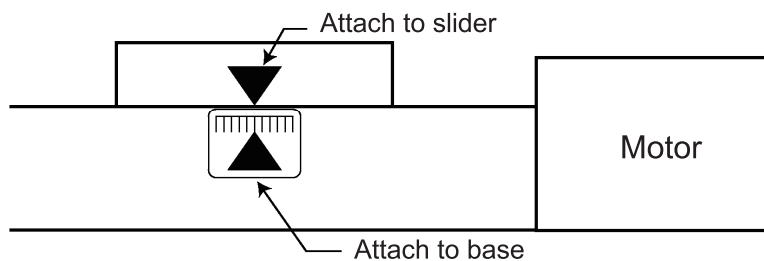
Using the home position marks

- ◆ As necessary, affix these marks to the product to mark the home position of the actuator.



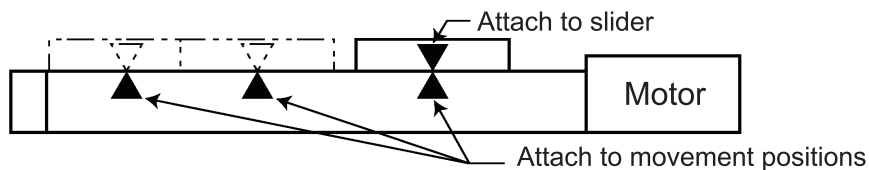
Example

[1] To mark the home position



- Attach both stickers when actuator is stopped in home position

[2] To show different movement positions



Change History

Revision Date	Description of Revision
May 2009	First edition
December 2009	Second edition Added allowable static moments in 11.2.1, "Loads on SA3, SA4, SA5 and SA6 types." Added details on the cable exit direction (options).
March 2010	Third edition Added the strokes of SA4C, SA5C, SA6C, SA4A, SA5R and SA6R in 2, "External Dimensions." Added details on the performance improvements made to SA4C, SA5C, SA6C, SA4A, SA5R and SA6R as a result of improvements to controller functions, in 6, "Specifications."
July 2010	Fourth edition Page 9 Added a "caution regarding the position to turn on the servo" under "Handling Precautions."
November 2010	Fifth edition Page 72, 73 Cable length: 10 m → 20 m Page 38 Added "Operation Manual for MEC Controller" and "Operation Manual for MEC PC Software" under "Operation Manuals Relating to This Product." Page 39, 40 Added information on SA5C and SA6C actuators of lead 20 mm under 5.4, "How to Read the Model Number" and 6, "Specifications." Page 63, 64 Added information on SA5C and SA6C actuators of lead 20 mm in the graphs of 7.1, "Notes on Use Regarding Maximum Speed and Load Mass." Page 65 Added information on SA5C and SA6C actuators of lead 20 mm in the graphs of 7.2, "Notes on Use Regarding Push-motion Operation." Page 66 Changed the title of Chapter 8 from "Installation Environment and Preservation Environment" to "...Storage/Preservation Environment." Page 67 Corrected the figure of vertical installation in 9, "Installation" by turning it upside down. Install the motor so that it faces down. → Install the motor so that it comes to the top side. If the installed motor faces up... → If the motor is installed at the bottom side... Page 82 Added P MEC controller in 11.3, "Adjusting the Home Position." Page 84 Added 12.1, "Life of Ball Screw Actuator." Page 87 Added 13.4, "Adjusting the Stainless Sheet."
April 2011	Sixth edition A page for CE Marking added
June 2011	Seventh edition Page 66 Contents of caution for vertically oriented mount changed.

Revision Date	Description of Revision
July 2011	<p>Eighth edition</p> <p>Page 66 Change in ceiling installation availability (×: Not possible → Δ: Daily inspection is required)</p> <p>Page 101, 102 Contents changed in 14. Warranty</p>
March 2012	<p>Ninth edition</p> <p>Contents changed in Safety Guide</p> <p>Caution notes added for when working with two or more persons</p> <p>Page 65 Note added to tell platform should have a structure with enough stiffness</p> <p>Page 66 Note changed to 1.8 times more of the nominal diameter for the length of thread engagement on aluminum</p>
March 2012	<p>Tenth edition</p> <p>Contents added and changed in Safety Guide</p> <p>Page 8 Caution in Handling added</p> <p>Pages 14 to 33 Weight added to appearance drawing</p> <p>Page 74 Static rated load and Dynamic rated load are deleted.</p> <p>Pages 91 Warning notes added such as in case the grease got into your eye, immediately go to see the doctor for an appropriate care.</p> <p>Pages 100, 101 Contents changed in 14 Warranty</p>



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