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ROBO CYLINDER

Technical Reference/Information

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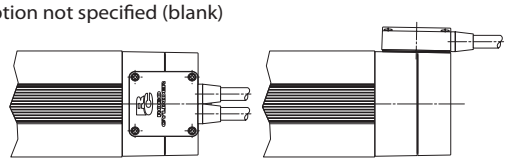
Explanation of Actuator Options

Cable Outlet Directional Changes

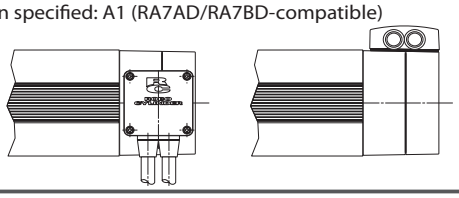
■ Models A1, A2, and A3

Applicable models	RCP2-RA10C RCS2-RA5C / RA5R / RA7AD / RA7BD
Description	Specify this option when you wish to change the direction from which the actuator cable is taken out.

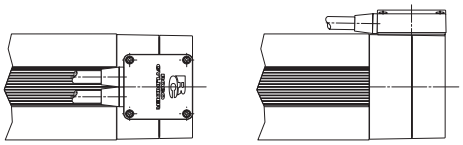
Actuator cable taken out from motor side (standard)
■ Option not specified (blank)



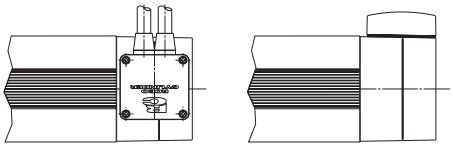
Actuator cable taken out from left
■Option specified: A1 (RA7AD/RA7BD-compatible)



Actuator cable taken out from rod side
■Option specifed: A2 (RA5C/RA5R/RA7AD/RA7BD-compatible)



Actuator cable taken out from right
■Option specified: A3 (RA7AD/RA7BD-compatible)



Brake

■ Models B, B E, B L, & B R

Applicable models	All slider-type models (*excluding RCP2-BA6/BA7) All rod-type models (*excluding RCP2-RA2C and RCA built-in types) All table-type, arm-type, and flat-type models (the arm type is a standard feature).
Description	A retention mechanism used on an actuator positioned vertically to prevent the slider from dropping and damaged the part, etc., when the power or servo is turned off.

Actuator Cover

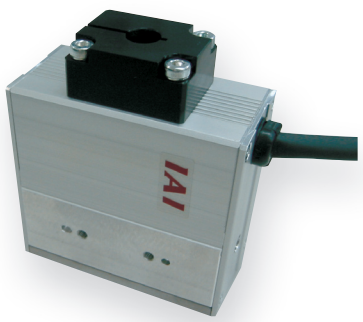
■ Models CO

Applicable models	RCP2W-SA16
Description	This cover protects the guide area and slider area on the waterproof slider type.

Flange Bracket

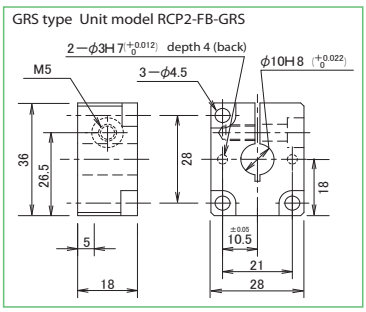
■ Models FB

Applicable models	RCP2-GRS / GRM / GR3LS / GR3LM / GR3SS / GR3SM
Description	A bracket for affixing the gripper body.

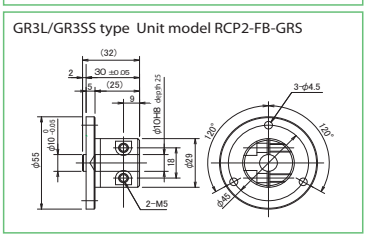


Standard Price -

GRS type Unit model RCP2-FB-GRS

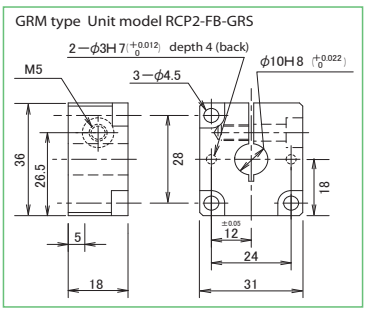


GR3L/GR3SS type Unit model RCP2-FB-GRS

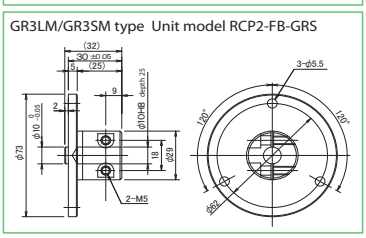


Standard Price -

GRM type Unit model RCP2-FB-GRS



GR3LM/GR3SM type Unit model RCP2-FB-GRS

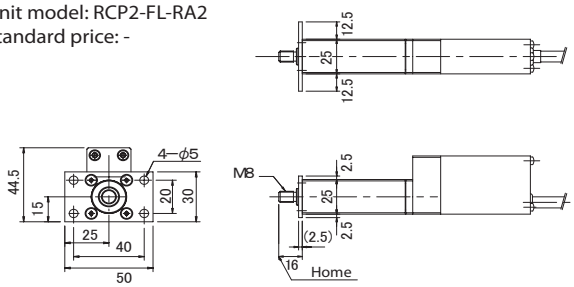


Front flange

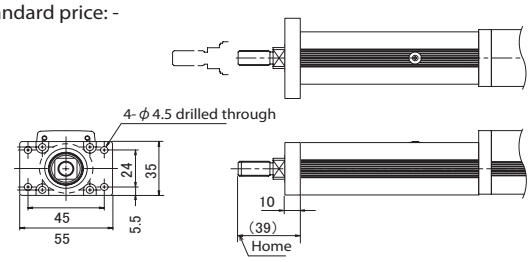
■ Models FL

Applicable models	All rod type models
Description	A bracket for affixing the actuator using bolts from the actuator side

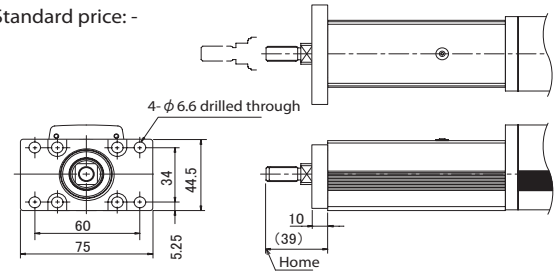
RCP2-RA2C
Unit model: RCP2-FL-RA2
Standard price: -



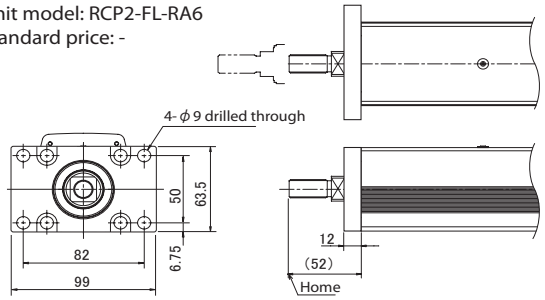
RCP2-RA3C
Unit model: RCP2-FL-RA3
Standard price: -



RCP2-RA4C
Unit model: RCP2-FL-RA4
Standard price: -

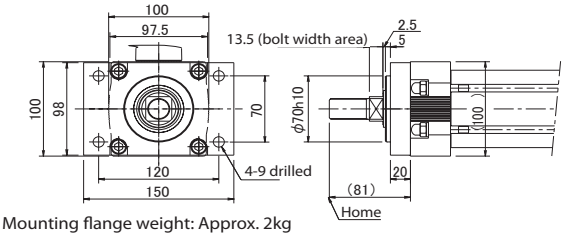


RCP2-RA6C
Unit model: RCP2-FL-RA6
Standard price: -



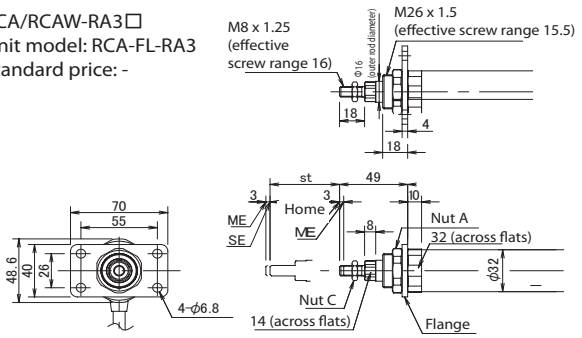
RCP2/RCP2W-RA10C
Unit model: RCP2-FL-RA10
Standard price: -

*Be careful not to apply any excessive external force on an actuator installed horizontally.

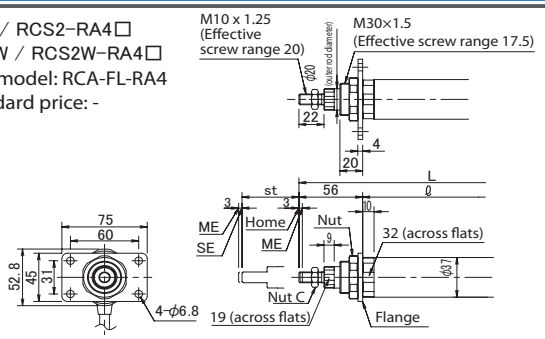


Mounting flange weight: Approx. 2kg

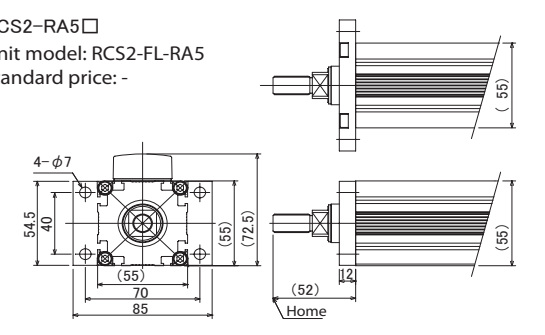
RCA/RCAW-RA3☐
Unit model: RCA-FL-RA3
Standard price: -



RCA / RCS2−RA4☐
RCAW / RCS2W−RA4☐
Unit model: RCA-FL-RA4
Standard price: -



RCS2−RA5☐
Unit model: RCS2-FL-RA5
Standard price: -



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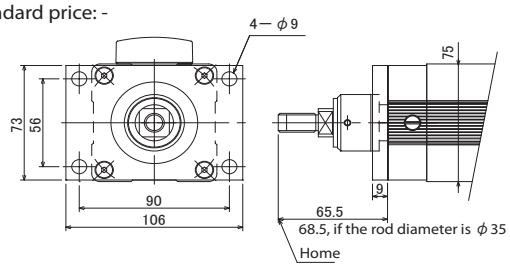
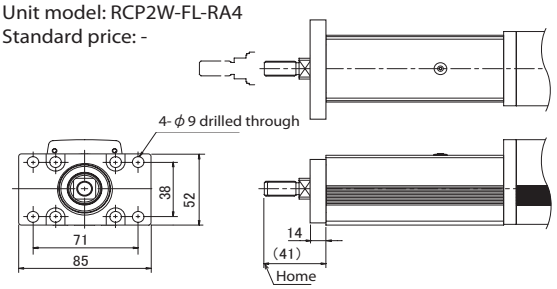
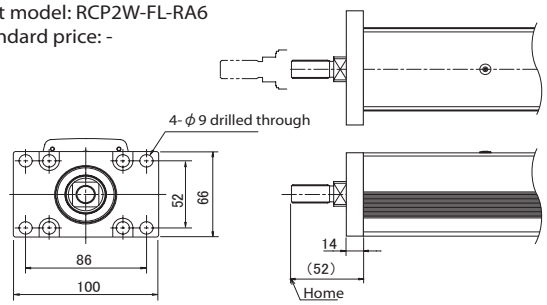
RCS2-RA7□D
Unit model: RCS2-FL-RA7
Standard price: -



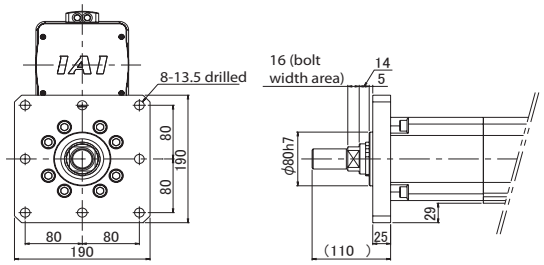
RCP2W-RA4C
Unit model: RCP2W-FL-RA4
Standard price: -



RCP2W-RA6C
Unit model: RCP2W-FL-RA6
Standard price: -



RCS2-RA13R
Unit model: RCS2-FL-RA13
Standard price: -

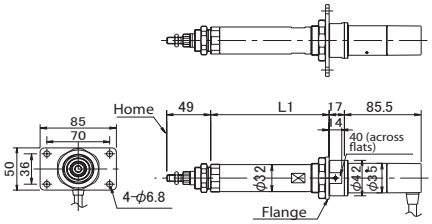


Rear flange

■ Models FLR

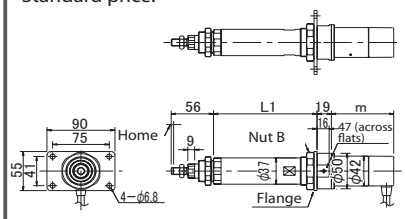
Applicable models	RCA (RCAW)−RA3C / RA3D / RA3R / RA4C / RA4D / RA4R RCS2 (RCS2W)−RA4C / RA4D / RA4R
Description	A bracket to fix a rod-type actuator on the rear (motor side)

RCA/RCAW-RA3C, RA3D
Unit model: RCA-FLR-RA3
Standard price: -



st	L1
50	132
100	182
150	232
200	282

RCA/RCAW-RA4C, RA4D
RCS2/RCS2W-RA4C/RA4D
Unit model: RCA-FLR-RA4
Standard price: -



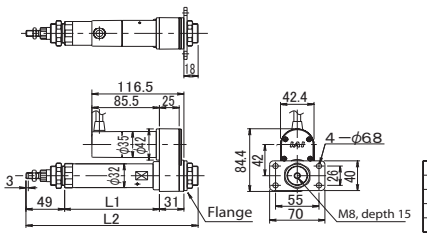
st	L1
50	137
100	187
150	237
200	287
250	337
300	487

m dimension

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

RCA/RCAW-RA3R
Unit model: RCA-FL-RA3
Standard price: -

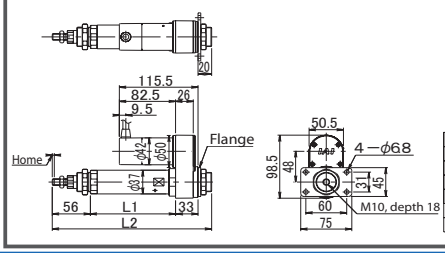
*On the motor-reversing type, the same flanges can be used on the front and rear.



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

RCA/RCAW-RA4C, RA4D
RCS2/RCS2W-RA4C/RA4D
Unit model: RCA-FLR-RA4
Standard price: -

*On the motor-reversing type, the same flanges can be used on the front and rear.



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

Foot

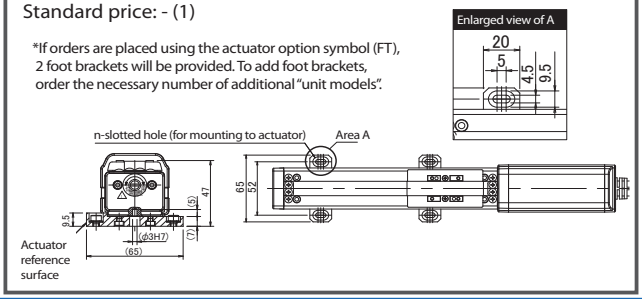
■ Models FT

*See the mounting pitch dimensions on the actuator drawing for mounting pitch dimensions between foot brackets.

Applicable models	Slider type RC (A RCACR)-SA4C/SA5C/SA6C/SA4D/SA5D/SA6D RCS2 (RCS2CR)-SA4C/SA5C/SA6C All rod-type models
Description	A bracket for affixing the actuator using bolts from the top side. With a slider type subject to large moment load, install foot brackets at all mounting holes in the actuator. If the number of foot brackets is not sufficient, the actuator may deflect, resulting in a shorter service life.

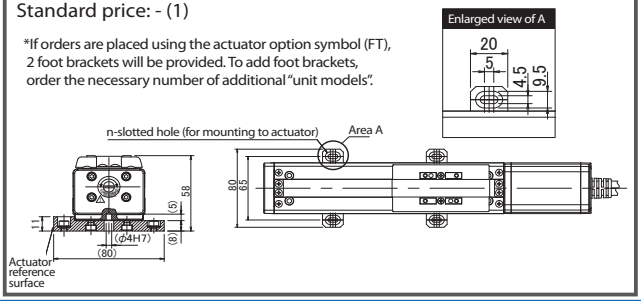
RCA/RCACR-SA4C RCS2/RCS2CR-SA4C
Unit model: RCA-FT-SA 4
Standard price: - (1)

*If orders are placed using the actuator option symbol (FT), 2 foot brackets will be provided. To add foot brackets, order the necessary number of additional "unit models".

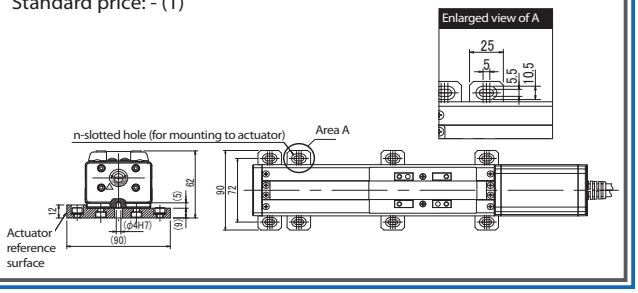


RCA/RCACR-SA5C RCS2/RCS2CR-SA5C
Unit model: RCA-FT-SA 5
Standard price: - (1)

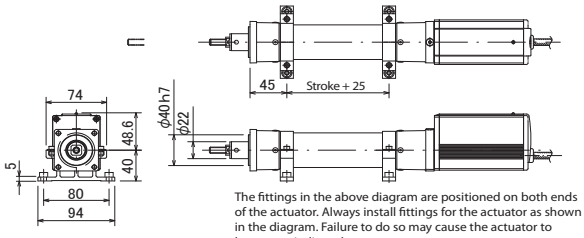
*If orders are placed using the actuator option symbol (FT), 2 foot brackets will be provided. To add foot brackets, order the necessary number of additional "unit models".



RCA/RCACR-SA6C RCS2/RCS2CR-SA6C
Unit model: RCA-FT-SA 6
Standard price: - (1)



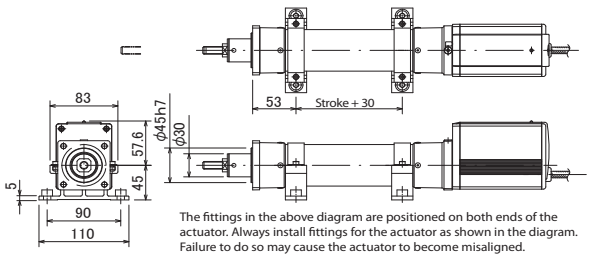
ERC2-RA6C/RGS6C/RGD6C
Unit model: ERC2-FT-RA 6
Standard price: - (2 per set)



The fittings in the above diagram are positioned on both ends of the actuator. Always install fittings for the actuator as shown in the diagram. Failure to do so may cause the actuator to become misaligned.

*Installation bolt (M6) is not provided.

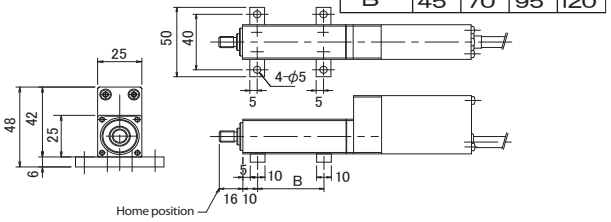
ERC2-RA7C/RGS7C/RGD7C
Unit model: ERC2-FT-RA 7
Standard price: - (2 per set)



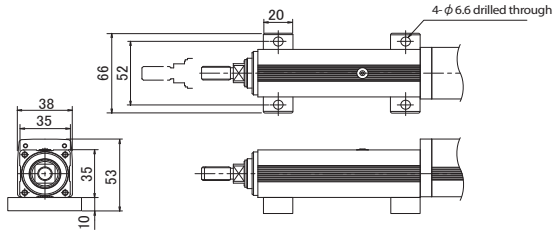
The fittings in the above diagram are positioned on both ends of the actuator. Always install fittings for the actuator as shown in the diagram. Failure to do so may cause the actuator to become misaligned.

RCP2-RA2C
Unit model: RCP2-FT-RA 2
Standard price: - (2 per set)

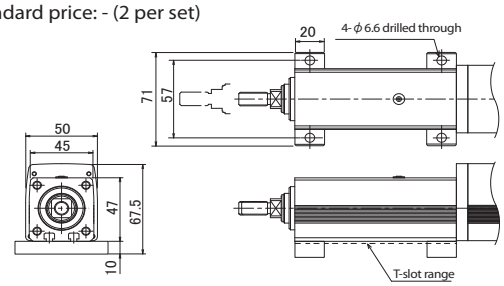
Dimension \ Stroke	25	50	75	100
B	45	70	95	120



RCP2-RA3C/RGD3C
Unit model: RCP2-FT-RA 3
Standard price: - (2 per set)



RCP2-RA4C/RGS4C/RGD4C/RCP2W-F
Unit model: RCP2-FT-RA 4
Standard price: - (2 per set)



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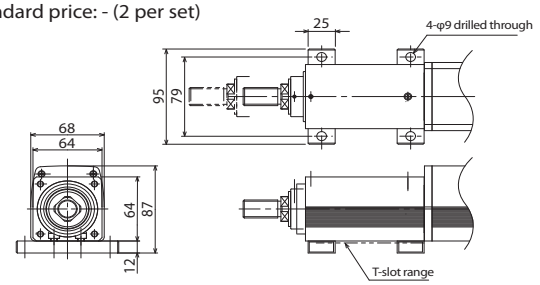
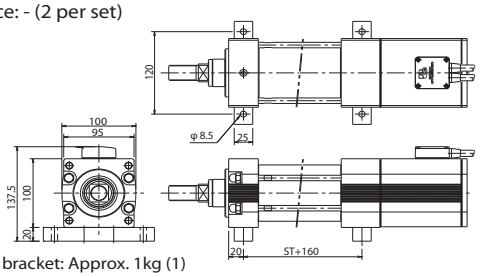
RCP2-RA6C/RGS6C/RGD6C/RCP2W-RA6C
Unit model: RCP2-FT-RA 6
Standard price: - (2 per set)

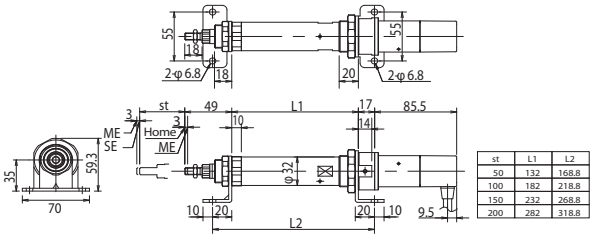


RCP2-RA10C/RCP2W-RA10C
Unit model: RCP2-FT-RA1 0
Standard price: - (2 per set)



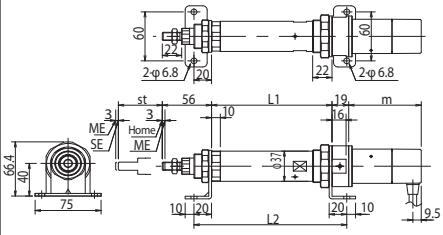
Weight of foot bracket: Approx. 1kg (1)

RCA-RA3C/RGS3C/RGD3C
Unit model: RCA-FT-RA 3
Standard price: - (2 per set)



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

RCA(RCS2)-RA4C/RGS4C/RGD4C
Unit model: RCA-FT-RA 4
Standard price: - (2 per set)

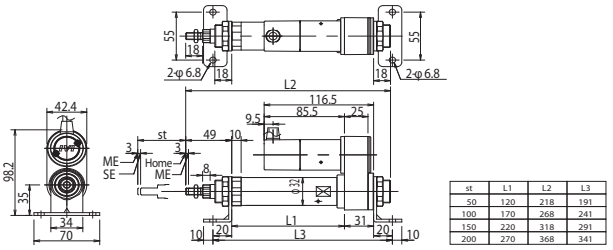


st	L1	L2
50	137	173.8
100	187	223.8
150	237	273.8
200	287	323.8
250	337	373.8
300	487	423.8

m dimension

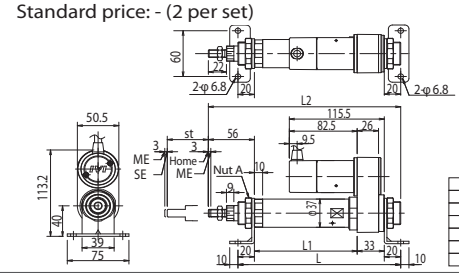
		m	
		20w	30w
RCA	Incremental	67.5	82.5
	Absolute	80.5	95.5
RCS2	Incremental/ absolute	80.5	95.5

RCA/RA3R/RGS3R/RGD3R
Unit model: RCA-FT-RA3R
Standard price: - (2 per set)



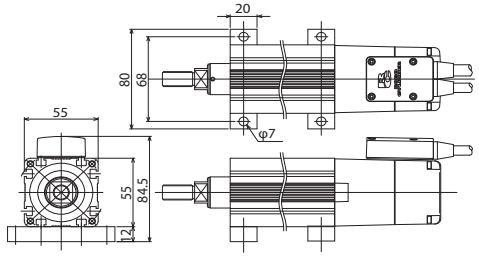
st	L1	L2	L3
50	120	218	191
100	170	268	241
150	220	318	291
200	270	368	341

RCA(RCS2)-RA4R/RGS4R/RGD4R
Unit model: RCA-FT-RA4R
Standard price: - (2 per set)

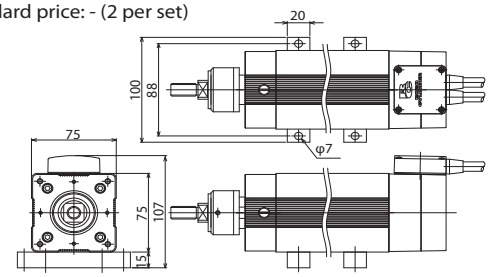


st	L1	L2	L3
50	125	234	198
100	175	284	248
150	225	334	298
200	275	384	348
250	325	434	398
300	375	484	448

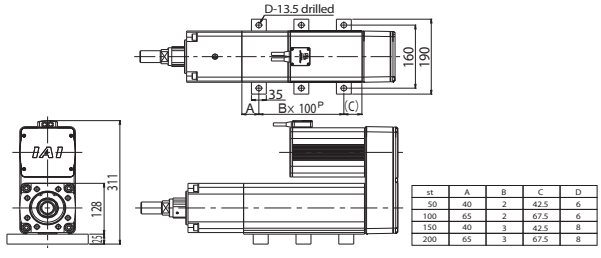
RCS2-RA5C/RA5R/RGS5C/RGD5C
Unit model: RCS2-FT-RA5
Standard price: - (2 per set)



RCS2-RA7☐D/RGS7☐D/RGD7☐D
Unit model: RCS2-FT-RA7
Standard price: - (2 per set)



RCS2-RA13R
Unit model: RCS2-FT-RA13
Standard price: -



st	A	B	C	D
50	40	2	42.5	6
100	65	2	67.5	6
150	40	3	42.5	8
200	65	3	67.5	8

High acceleration/deceleration

■ Models HA

Applicable models	RCA-SA4C / SA5C / SA6C / RA3C / RA4C RCS2-SA4C / SA5C / SA6C / SA7C / RA4C
Description	Option to increase by 1G the standard acceleration rate of 0.3G. An actuator with 1G of acceleration can be operated with the same load capacity as the 0.3G unit. The controller settings are different from the standard specification, so when operating with high acceleration, the controller also needs to be set to the high acceleration specification.

Home check sensor

■ Models HS

Applicable models	Slider types	RCA (RCACR)-SA4C / SA5C / SA6C, RCS2 (RCS2CR)-SA4C / SA5C / SA6C RCA-SA4R / SA5R / SA6R, RCS2-SA4R / SA5R / SA6R
	Rod types	RCA-RA3C / RA3R / RA4C / RA4R, RCS2-RA4C / RA4R
Description	When an actuator is instructed to return home, this sensor checks to make sure that the slider moves to the home position. * This cannot be used with the reversed-home specification for rod types.	

Limit switch

■ Models L

Applicable models	Rotary types RCS2-RT6/RT6R/RT7R
Description	When home return is performed, the home will be determined after the actuator reverses following contact with the mechanical end. This optional sensor is used to detect this reversing. (However, with the rotary type, all models will have the standard settings.)

Low power compatible

■ Models LA

Applicable models	RCA/RCACR/RCA W Series, all models
Description	This option decreases the power capacity of the controller. With the standard specification and high-speed acceleration specification, the maximum is 5.1A, but if the low-power specification is selected, the maximum decreases to 3.4A. (The maximum values differ for some models, so see the power capacities of the ACON/ASEL controllers for details.)

Reversed-home specification

■ Models NM

Applicable models	All slider-type models All rod-type, table-type, arm-type, and flat-type models (*excluding RCP2-RA2C/RA10C, RCS2-RA5C/RA5R/RA7AD/RA7BD)
Description	The normal home position is set by the slider and rod on the motor side, but there is the option for the home position to be on the other side to accomodate variations in device layout, etc. (Note: Home position settings are factory settings. Changes to these settings after product is delivered will require to ship product back to IAI for re-setting.)

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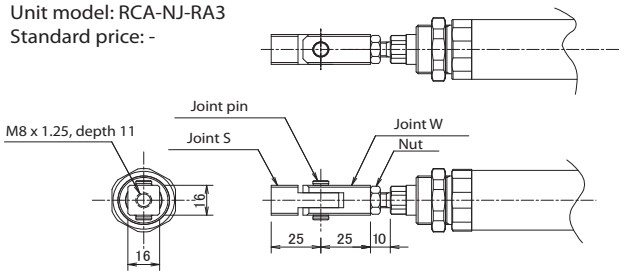
Knuckle joint

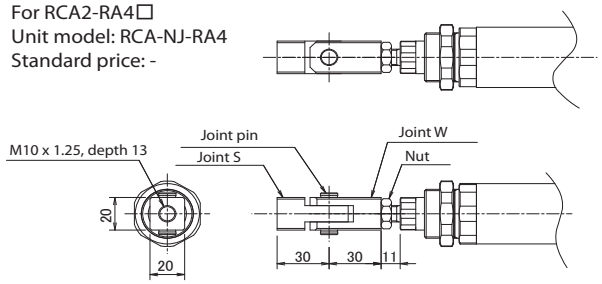
■ Model N J

Applicable models	Rod types	RCA–RA3C / RA3D / RA3R / RA4C / RA4D / RA4R RCS2–RA4C / RA4D / RA4R
Description	Clevis or trunnion fittings give rotational freedom of movement for the ends of the actuator rods.	

For RCA-RA3☐
Unit model: RCA-NJ-RA3
Standard price: -



For RCA2-RA4☐
Unit model: RCA-NJ-RA4
Standard price: -



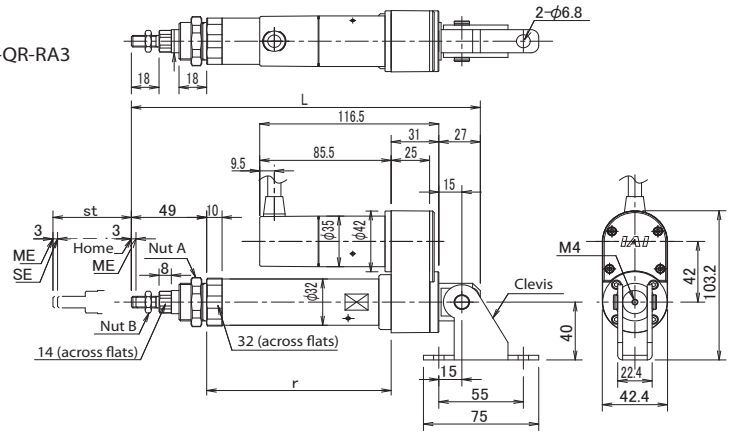
Clevis

■ Model QR

Applicable models	Rod types	RCA–RA3R / RA4R RCS2–RA4R
Description	A bracket for aligning the cylinder movement when the load installed at the tip of the rod moves in a direction different from the rod.	

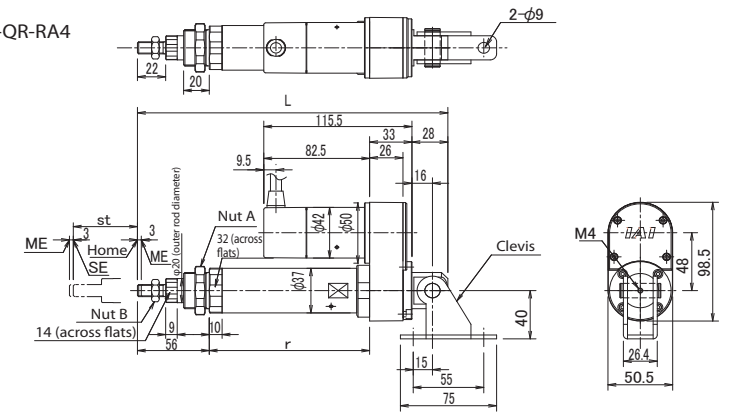
Caution If the rod is to be moved with a clevis bracket attached to it, use a guide type or install an external guide to prevent the rod from receiving any load other than from its moving direction.

RCA-RA3R
Unit model: RCA-QR-RA3
Standard price: -



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

RCA/RCS2-RA4R
Unit model: RCA-QR-RA4
Standard price: -



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

Motor reverse-mount orientation

■ Models MB, ML, MR, MT

T
(TOP)

L (LEFT) | Actuator | R (RIGHT)

B
(BOTTOM)

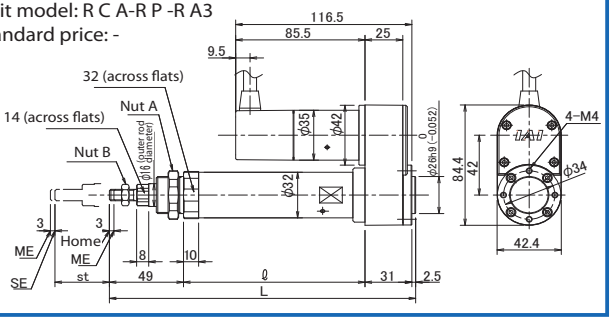
Applicable models	Motor reversing slider type	RCP2–SA5R / SA6R / SA7R / SS7R / SS8R / HS8R RCA–SA4R / SA5R / SA6R RCS2–SA4R / SA5R / SA6R / SA7R / SS7R / SS8R
	Motor reversing rod type	RCS2–RA5R
	Arm type	RCA–A4R / A5R / A6R RCS2–A4R / A5R / A6R
Description	These abbreviations specify the motor reversing direction of the motor reversing type. Viewed from the motor side, downward reversing is MB (arm type only), leftward reversing is ML (all models), rightward reversing is MR (all models), and upward reversing is MT (limited to RCS2-RA13R). The arm type is MB, but for other models, ML is standard. (MT has different criteria for RCS2-RA13R.)	

Rear mounting plate

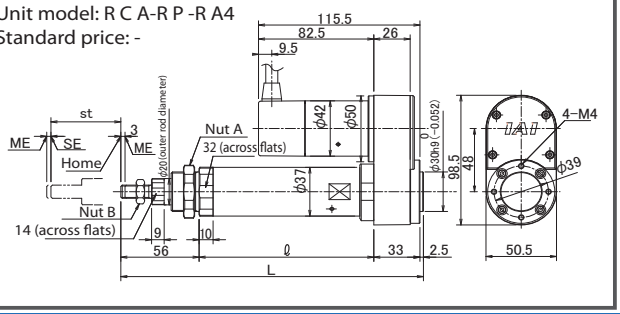
■ Models RP

Applicable models	Motor reversing rod types RCA-RA3R/RA4R, RCS2-RA4R
Description	A bracket (plate) for affixing the back of a motor-reversing rod type (RA3R/RA4R) to the system.

For RCA-RA3R
Unit model: R C A-R P -R A3
Standard price: -



For RCA/RCS2-RA4R
Unit model: R C A-R P -R A4
Standard price: -

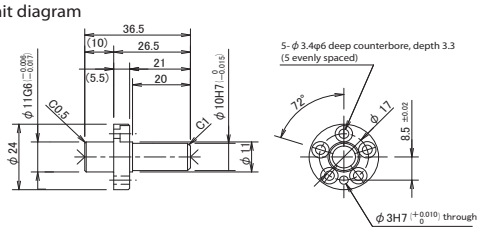


Shaft adapter

■ Models SA

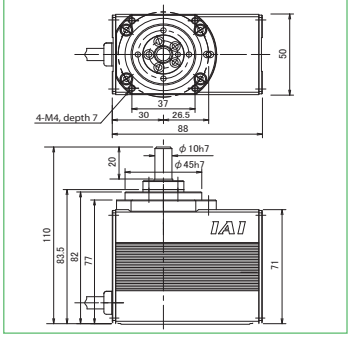
Applicable models	Rotary type
Description	An adapter for installing a jig, etc., onto the rotating part of a rotary type.

Unit diagram



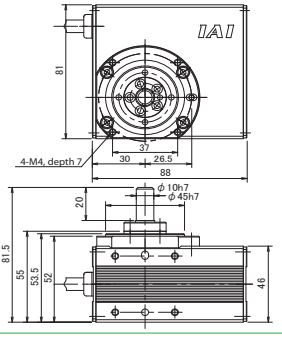
Standard price: -

RCP2-RTB combined drawing
Unit model: RCP2-SA-RT



Standard price: -

RCP2-RTC combined drawing
Unit model: RCP2-SA-RT



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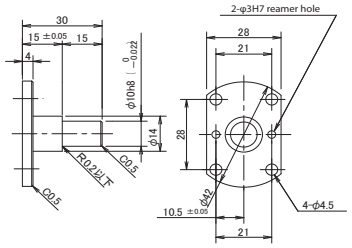
Axis bracket

■ Model S B

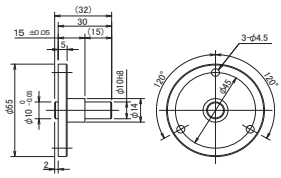
Applicable models	Gripper Type	RCP2-GRS / GRM / GR3LS GR3LM / GR3SS / GR3SM
Description	This bracket is for mounting the gripper unit.	

Standard price: -

Unit model for RCP2-GRS: RCP2-SB-GRS

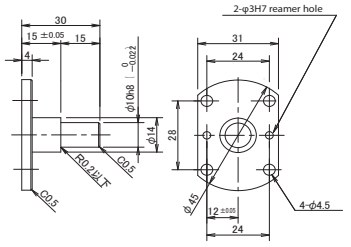


Unit model for RCP2-GRM: RCP2-SB-GRM

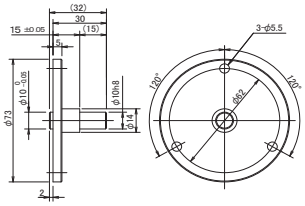


Standard price: -

Unit model for GR3LS/GR3SS: RCP2-SB-GR3S



Unit model for GR3LM/GR3SM: RCP2-SB-GR3M



Slider roller specification

■ Model SR

Applicable models	Slider type	RCA-SA4□ / SA5□ / SA6□ RCS2-SA4□ / SA5□ / SA6□ / SA7□ / SS7□ / SS8□
Description	This changes the structure of the standard slider type that similar to those found in cleanroom types.	

Slider Spacer

■ Model SS

Applicable models	Slider type	RCA-SA4C / SA4R RCS2-SA4C / SA4R
Description	A spacer for raising the top face of the slider on the SA4 type to above the motor. This spacer is not required for non-SA4 types because the top face of the slider is above the motor on these actuators.	

For RCA/RCS2-SA4□
Unit model: RCA-SS-SA4
Standard price: -

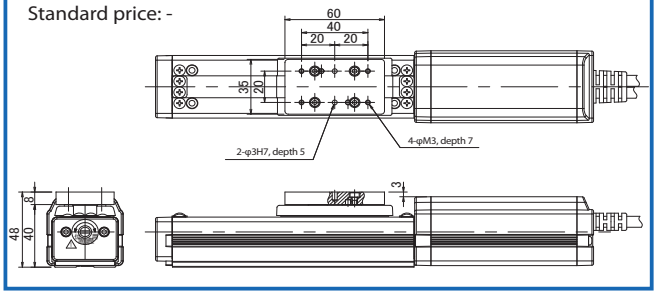
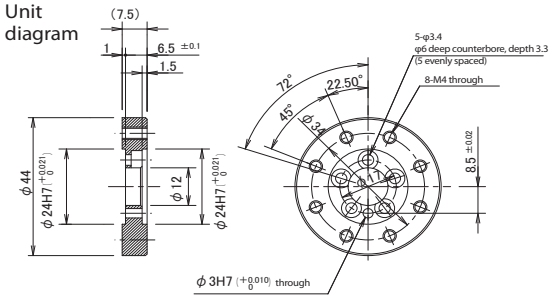


Table adapter

■ Model TA

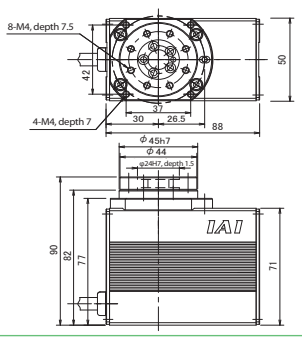
Applicable models	Rotary type	RCP2-RTB / RTC / RTBL / RTCL
Description	An adapter for installing a jig, etc., onto the rotating part of a rotary type.	

Unit diagram



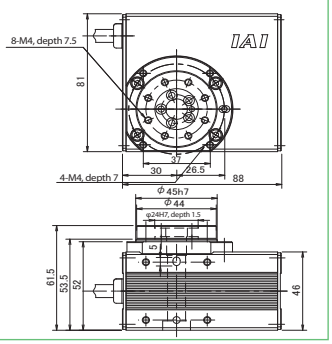
Standard price: -

RCP2-RTB
Unit model: RCP2-TA-RT



Standard price: -

RCP2-RTB
Unit model: RCP2-TA-RT



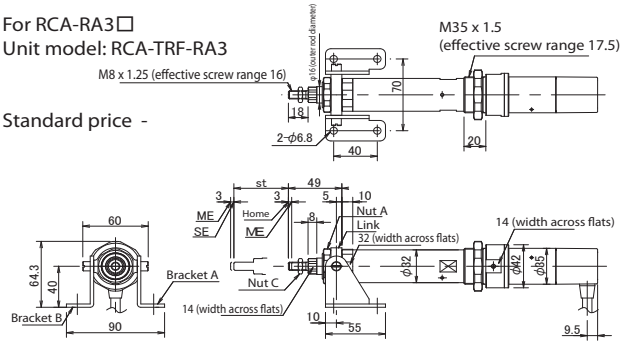
Front trunnion

■ Models TRF

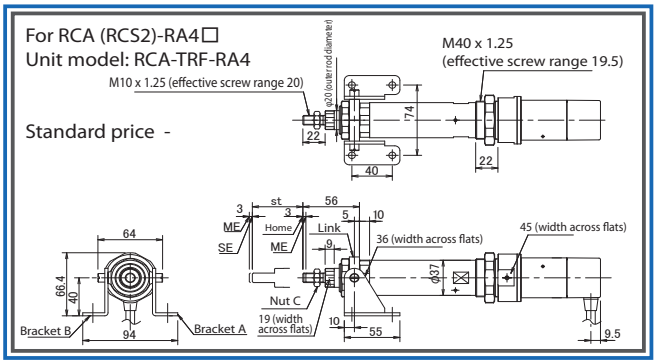
Applicable models	Rod type	RCA–RA3C / RA3D / RA3R / RA4C / RA4D / RA4R RCS2–RA4C / RA4D / RA4R
Description	A bracket for aligning the cylinder movement when the load installed at the tip of the rod moves in a direction different from the rod.	

Caution If a rod is moved with a trunnion bracket mounted to it, use a guide type or install an external guide so no load is applied to the rod in a direction other than the proper direction the rod travels.

For RCA-RA3☐
Unit model: RCA-TRF-RA3
Standard price -



For RCA (RCS2)-RA4☐
Unit model: RCA-TRF-RA4
Standard price -



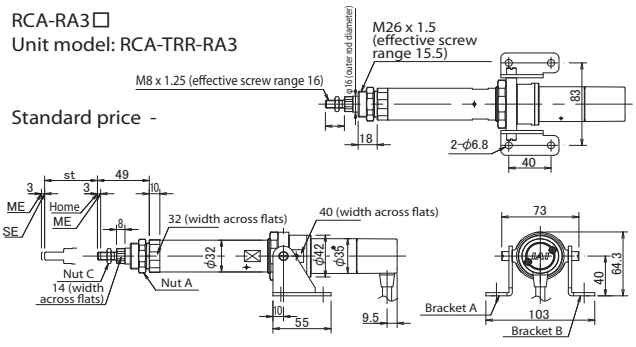
Rear trunnion

■ Models TRR

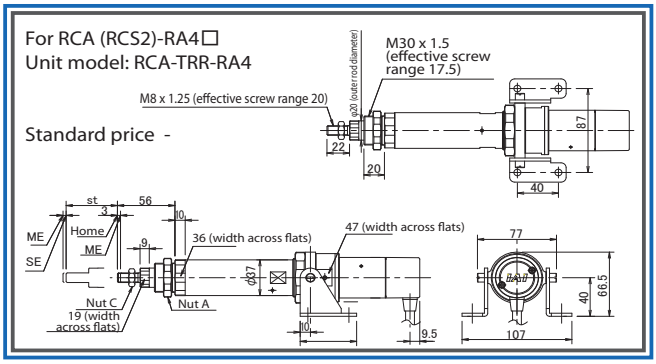
Applicable models	Rod type	RCA–RA3C / RA3D / RA4C / RA4D RCS2–RA4C / RA4D
Description	A bracket for aligning the cylinder movement when the load installed at the tip of the rod moves in a direction different form the rod.	

Caution If the road is to be moved with a trunnion bracket attached to it, use a guide type or install an external guide to prevent the rod form receiving any load other than from its moving direction

RCA-RA3☐
Unit model: RCA-TRR-RA3
Standard price -



For RCA (RCS2)-RA4☐
Unit model: RCA-TRR-RA4
Standard price -



Vacuum joint mounted on opposite side

■ Models VR

Applicable models	All cleanroom type models
Description	Looking from the motor side, the standard position for the vacuum joint is on the left side of the actuator, but this option allows users to change the position to the opposite side (right side).

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List of Replacement Parts by Part & Model

*The models in ( ) apply to robot cables.

<table>
<tr><th>Series</th><th>Type name</th><th>Stainless sheet model</th><th>Motor cable model
(Motor robot cable model)</th><th>Encoder cable model
(Encoder robot cable model)</th></tr>
<tr><td>ERC2
Slider type</td><td>SA6C</td><td rowspan="8">(Not available)</td><td colspan="2" rowspan="8">[Power-I/O cable (PIO specification)/ Power-I/O cable (SIO specification)]
CB-ERC-PWBIO□□□/CB-ERC2-PWBIO□□□
(CB-ERC-PWBIO□□□-RB/CB-ERC2-PWBIO□□□-RB)

[Power-I/O cable specification with connectors on both ends
(PIO specification)]
CB-ERC-PWBIO□□□-H6(CB-ERC-PWBIO□□□-RB-H6</td></tr>
<tr><td>SA7C</td></tr>
<tr><td>ERC2
Rod type</td><td>RA6C</td></tr>
<tr><td>RA7C</td></tr>
<tr><td>RGS6C</td></tr>
<tr><td>RGS7C</td></tr>
<tr><td>RGD6C</td></tr>
<tr><td>RGD7C</td></tr>
<tr><td>RCP3
Slider type</td><td>SA3C</td><td>ST-3A3- (stroke)</td><td colspan="2" rowspan="4">[Integrated motor/encoder cable]
CB-PCS-MPA□□□
*The robot cable is standard.</td></tr>
<tr><td></td><td>SA4C</td><td>ST-3A4- (stroke)</td></tr>
<tr><td></td><td>SA5C</td><td>ST-3A5- (stroke)</td></tr>
<tr><td></td><td>SA6C</td><td>ST-3A6- (stroke)</td></tr>
<tr><td rowspan="14">RCP2
Slider tpye</td><td>SA5C</td><td>ST-2A5- (stroke)</td><td rowspan="14">[Integrated motor/encoder cable]
CB-PCS-MPA□□□
*The standard motor cable for
RCP2 is the robot cable.</td><td rowspan="12">CB-RCP2-PB□□□
(CB-RCP2-PB□□□-RB)</td></tr>
<tr><td>SA6C</td><td>ST-2A6- (stroke)</td></tr>
<tr><td>SA7C</td><td>ST-2A7- (stroke)</td></tr>
<tr><td>SS7C</td><td>ST-SS1- (stroke)</td></tr>
<tr><td>SS8C</td><td>ST-SM1-(stroke)</td></tr>
<tr><td>SA5R</td><td>ST-2A5- (stroke)</td></tr>
<tr><td>SA6R</td><td>ST-2A6- (stroke)</td></tr>
<tr><td>SA7R</td><td>ST-2A7- (stroke)</td></tr>
<tr><td>SS7R</td><td>ST-SS1- (stroke)</td></tr>
<tr><td>SS8R</td><td>ST-SM1-(stroke)</td></tr>
<tr><td>BA6</td><td rowspan="2">(Not available)</td></tr>
<tr><td>BA7</td></tr>
<tr><td>HS8C</td><td>ST-SM1-(stroke)</td><td rowspan="2">CB-RFA-PA□□□
(CB-RFA-PA□□□-RB)</td></tr>
<tr><td>HS8R</td><td>ST-SM1-(stroke)</td></tr>
<tr><td rowspan="4">RCA2
Slider type</td><td>SA3C</td><td>ST-3A3- (stroke)</td><td colspan="2" rowspan="4">[Integrated motor/encoder cable]
CB-PCS-MPA□□□
*The standard motor cable for
RCP2 is the robot cable.</td></tr>
<tr><td>SA4C</td><td>ST-3A4- (stroke)</td></tr>
<tr><td>SA5C</td><td>ST-3A5- (stroke)</td></tr>
<tr><td>SA6C</td><td>ST-3A6- (stroke)</td></tr>
<tr><td rowspan="16">RCA
Slider type</td><td>SA4C</td><td>ST-SA4- (stroke)</td><td rowspan="16">CB-ACS-MA□□□
*The robot cable is the
standard motor cable for RCA</td><td rowspan="16">CB-ACS-PA□□□
(CB-ACS-PA□□□-RB)</td></tr>
<tr><td>SA5C</td><td>ST-SA5- (stroke)</td></tr>
<tr><td>SA6C</td><td>ST-SA6- (stroke)</td></tr>
<tr><td>SA4D</td><td>ST-SA4- (stroke)</td></tr>
<tr><td>SA5D</td><td>ST-SA5- (stroke)</td></tr>
<tr><td>SA6D</td><td>ST-SA6- (stroke)</td></tr>
<tr><td>SS4D</td><td>ST-SS4- (stroke)</td></tr>
<tr><td>SS5D</td><td>ST-SS5- (stroke)</td></tr>
<tr><td>SS6D</td><td>ST-SS6- (stroke)</td></tr>
<tr><td>SA4R</td><td>ST-SA4- (stroke)</td></tr>
<tr><td>SA5R</td><td>ST-SA5- (stroke)</td></tr>
<tr><td>SA6R</td><td>ST-SA6- (stroke)</td></tr>
</table>

Series	Type name	Stainless sheet model	Motor cable model (Motor robot cable model)	Encoder cable model (Encoder robot cable model)
RCS2 SLider type	SA4C	ST-SA4- (stroke)	CB-RCC-MA□□□ (CB-RCC-MA□□□-RB)	[SCON/SSEL/XSEL-P.Q] CB-RCS2-PA□□□ (CB-X3-PA□□□) [XSEL-J.K] CB-RCBC-PA□□□ (CB-RCBC-PA□□□-RB) CB-RCBC-PLA□□□ (CB-RCBC-PLA□□□-RB)
	SA5C	ST-SA5- (stroke)		
	SA6C	ST-SA6- (stroke)		
	SA7C	ST-SA7- (stroke)		
	SS7C	ST-SS1- (stroke)		
	SS8C	ST-SM1-(stroke)		
	SA4D	ST-SA4- (stroke)		
	SA5D	ST-SA5- (stroke)		
	SA6D	ST-SA6- (stroke)		
	SA4R	ST-SA4- (stroke)		
	SA5R	ST-SA5- (stroke)		
	SA6R	ST-SA6- (stroke)		
	SA7R	ST-SA7- (stroke)		
	SS7R	ST-SS1- (stroke)		
	SS8R	ST-SM1- (stroke)		
RCP2 Rod type	RA2C	(Not available)	CB-RCP2-MA□□□ *The standard motor cable for RCP2 is the robot cable.	CB-RCP2-PB□□□ (CB-RCP2-PB□□□-RB)
	RA3C			
	RA4C			
	RA6C			
	RGS4C			
	RGS6C			
	RGD3C			
	RGD4C			
	RGD6C			
	RA10C			CB-RFA-PA□□□(CB-RFA-PA□□□-RB)
RCA Rod type	RA3C		CB-ACS-MA□□□ *The robot cable is the standard motor cable for RCA.	CB-ACS-PA□□□ (CB-ACS-PA□□□-RB)
	RA4C			
	RA3D			
	RA4D			
	RA3R			
	RA4R			
	RGS3C			
	RGS4C			
	RGS3D			
	RGS4D			
	RGD3C			
	RGD4C			
	RGD3D			
	RGD4D			
	RGD3R			
	RGD4R			

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List of Replacement Parts by Part & Model

<table>
<tr><th>Series</th><th>Type name</th><th>Stainless sheet model</th><th>Motor cable model
(Motor robot cable model)</th><th>Encoder cable model
(Encoder robot cable model)</th></tr>
<tr><td rowspan="18">RCS2
Rod type</td><td>RA4C</td><td rowspan="39">(Not available)</td><td rowspan="18">CB-RCC-MA□□□
(CB-RCC-MA□□□-RB)</td><td rowspan="17">[SCON/SSEL/XSEL-P.Q]
CB-RCS2-PA□□□
(CB-X3-PA□□□)

[XSEL-J.K]
CB-RCBC-PA□□□
(CB-RCBC-PA□□□-RB)
CB-RCBC-PLA□□□
(CB-RCBC-PLA□□□-RB)
*When using the home confirmation sensor.</td></tr>
<tr><td>RA5C</td></tr>
<tr><td>RA4D</td></tr>
<tr><td>RA7AD</td></tr>
<tr><td>RA7BD</td></tr>
<tr><td>RA4R</td></tr>
<tr><td>RA5R</td></tr>
<tr><td>RGS4C</td></tr>
<tr><td>RGS5C</td></tr>
<tr><td>RGS4D</td></tr>
<tr><td>RGS7AD</td></tr>
<tr><td>RGS7BD</td></tr>
<tr><td>RGD4C</td></tr>
<tr><td>RGD5C</td></tr>
<tr><td>RGD4D</td></tr>
<tr><td>RGD7AD</td></tr>
<tr><td>RGD7BD</td></tr>
<tr><td>RGD4R</td></tr>
<tr><td>RA13R</td><td>CB-RCS2-PLA□□□(CB-X3-PLA□□□)</td></tr>
<tr><td rowspan="3">RCP3
Table type</td><td>TA5C</td><td colspan="2" rowspan="3">[Integrated motor-encoder cable]
CB-PCS-MPA□□□
*The robot cable specification is standard.</td></tr>
<tr><td>TA6C</td></tr>
<tr><td>TA7C</td></tr>
<tr><td rowspan="3">RCA2
Table type</td><td>TA5C</td><td colspan="2" rowspan="3">[Integrated motor-encoder cable]
CB-ACS-MPA□□□
*The robot cable specification is standard.</td></tr>
<tr><td>TA6C</td></tr>
<tr><td>TA7C</td></tr>
<tr><td rowspan="3">RCA
Arm type</td><td>A4R</td><td rowspan="3">CB-ACS-MA□□□
*The robot cable is the standard motor cable for RCA.</td><td rowspan="3">CB-ACS-PA□□□
(CB-ACS-PA□□□-RB)</td></tr>
<tr><td>A5R</td></tr>
<tr><td>A6R</td></tr>
<tr><td rowspan="3">RCS2
Arm type</td><td>A4R</td><td rowspan="3">CB-RCC-MA□□□
(CB-RCC-MA□□□-RB)</td><td rowspan="3">[SCON／SSEL／XSEL-P.Q]
CB-RCS2-PA□□□
(CB-X2-PA□□□)
[XSEL-J.K]
CB-RCBC-PA□□□
(CB-RCBC-PA□□□-RB)</td></tr>
<tr><td>A5R</td></tr>
<tr><td>A6R</td></tr>
<tr><td>RCS2 Flat type</td><td>F5D</td></tr>
<tr><td rowspan="6">RCP2
Gripper type</td><td>GRS</td><td rowspan="6">CB-RCP2-MA□□□
*The standard motor cable for RCP2 is the robot cable.</td><td rowspan="6">CB-RCP2-PB□□□
(CB-RCP2-PB□□□-RB)</td></tr>
<tr><td>GRM</td></tr>
<tr><td>GR3LS</td></tr>
<tr><td>GR3LM</td></tr>
<tr><td>GR3SS</td></tr>
<tr><td>GR3SM</td></tr>
<tr><td>RCS2
Gripper type</td><td>GR8</td><td>CB-RCC-MA□□□
(CB-RCC-MA□□□-RB)</td><td>CB-RCS2-PA□□□(CB-X2-PA□□□)
CB-RCBC-PA□□□(CB-RCBC-PA□□□-RB)</td></tr>
<tr><td rowspan="2">RCP2CP
Rotary type</td><td>RTB/RTBL</td><td rowspan="2">CB-RCP2-MA□□□
*The standard motor cable for RCP2 is the robot cable.</td><td rowspan="2">CB-RCP2-PB□□□
(CB-RCP2-PB□□□-RB)</td></tr>
<tr><td>RTC/RTCL</td></tr>
<tr><td rowspan="3">RCS2
Rotary type</td><td>RT6</td><td rowspan="3">CB-RCC-MA□□□
(CB-RCC-MA□□□-RB)</td><td rowspan="3">[SCON/SSEL/XSEL-P.Q]
CB-RCS2-PLA□□□
(CB-X2-P L A□□□)
[XSEL- J.K (set of 2)]
CB-RCBC-PA□□□(CB-RCBC-PA□□□-RB)
CB-X-LC□□□</td></tr>
<tr><td>RT6R</td></tr>
<tr><td>RT7R</td></tr>
</table>

Series	Type name	Stainless sheet model	Motor cable model (Motor robot cable model)	Encoder cable model (Encoder robot cable model)
RCP2CR Cleanroom type	SA5C	ST-2A5-(stroke)	CB-RCP2-MA□□□ *The standard motor cable for RCP2 is the robot cable.	CB-RCP2-PA□□□ (CB-RCP2-PA□□□-RB)
	SA6C	ST-2A6-(stroke)		
	SA7C	ST-2A7-(stroke)		
	SS7C	ST-SS2- (stroke)		
	SS8C	ST-SM2-(stroke)		
	HS8C	ST-SM2-(stroke)		
RCACR Cleanroom type	SA4C	ST-SA4-(stroke)	CB-ACS-MA□□□ *The robot cable is the standard motor cable for RCA.	CB-ACS-PA□□□ (CB-ACS-PA□□□-RB)
	SA5C	ST-SA5-(stroke)		
	SA6C	ST-SA6-(stroke)		
	SA5D	ST-SA5-(stroke)		
	SA6D	ST-SA6-(stroke)		
RCS2CR Cleanroom type	SA4C	ST-SA4-(stroke)	CB-RCC-MA□□□ (CB-RCC-MA□□□-RB)	[SCON/SSEL/XSEL-P,Q] CB-RCS2-PA□□□ (CB-X3-PA□□□) [XSEL- J,K] CB-RCBC-PA□□□ (CB-RCBC-PA□□□-RB)
	SA5C	ST-SA5-(stroke)		
	SA6C	ST-SA6-(stroke)		
	SA7C	ST-SA7-(stroke)		
	SS7C	ST-SS2- (stroke)		
	SS8C	ST-SM2-(stroke)		
	SA5D	ST-SA5-(stroke)		
	SA6D	ST-SA6-(stroke)		
RCP2W Splash-proof type	RA4C	(Not available)	CB-RCP2-MA□□□ *The standard motor cable for RCP2 is the robot cable.	CB-RCP2-PA□□□ (CB-RCP2-PA□□□-RB)
	RA6C			
	SA16C			CB-RFA-PA□□□ (CB-RFA-PA□□□-RB)
	RA10C			
RCAW Splash-proof type	RA3□		CB-ACS-MA□□□ *The robot cable is the standard motor cable for RCA.	CB-ACS-PA□□□ (CB-ACS-PA□□□-RB)
	RA4□			
RCS2W Splash-proof type	RA4□		CB-RCC-MA□□□ (CB-RCC-MA□□□-RB)	CB-RCS2-PA□□□(CB-X3-PA□□□) CB-RCBC-PA□□□(CB-RCBC-PA□□□-RB)

[Motor unit]

Series	Type name	Motor unit model	
		No brakes	Brake-equipped
RCP3	SA3C	RCP3-MU1A	RCP3-MU1A-B
	SA4C	RCP3-MU2A	RCP3-MU2A-B
	SA5C	RCP3-MU3A	RCP3-MU3A-B
	SA6C	RCP3-MU3A	RCP3-MU3A-B
	TA5C	RCP3-MU2A	RCP3-MU2A-B
	TA6C	RCP3-MU3A	RCP3-MU3A-B
	TA7C	RCP3-MU3A	RCP3-MU3A-B
RCA2	SA3C	RCA2-MU1A	RCA2-MU1A-B
	SA4C	RCA2-MU2A	RCA2-MU2A-B
	SA5C	RCA2-MU3A	RCA2-MU3A-B
	SA6C	RCA2-MU4A	RCA2-MU4A-B
	TA5C	RCA2-MU2A	RCA2-MU2A-B
	TA6C	RCA2-MU3A	RCA2-MU3A-B
	TA7C	RCA2-MU4A	RCA2-MU4A-B

*The following special brackets are required to replace the RCA2 motor. Please ask for details.
For SA3: Model RCA2-JG-1. For SA4/TA5: Model RCA2-JG-2. SA5/SA6/TA6/TA7: Model RCA2-JG-3

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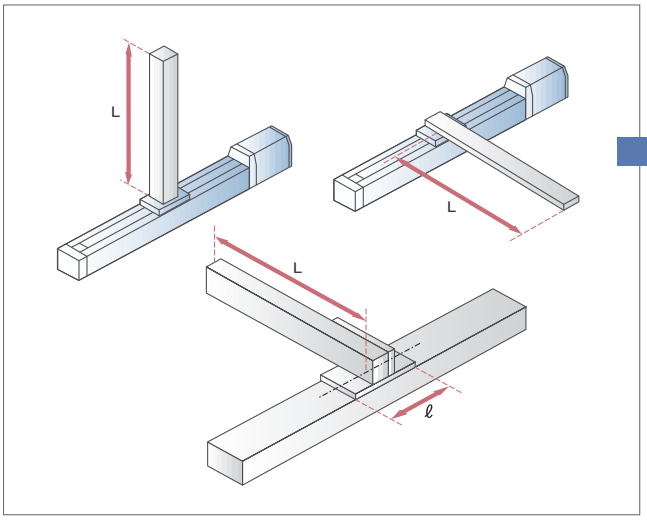
Precautions when selecting an actuator

When selecting an actuator, in addition to the stroke, speed, and load capacity, the overhang load length and moment also need to be taken into consideration.

Overhang load length

An overhang load length is specified for a slider-type actuator to indicate the length of overhang (offset) from the actuator.
Always use actuators within the allowable overhang length because, when the length of an object mounted to the slider actuator exceeds this length, it will generate vibration and increase the settling time.



The allowable overhang load length is determined by the slider length.

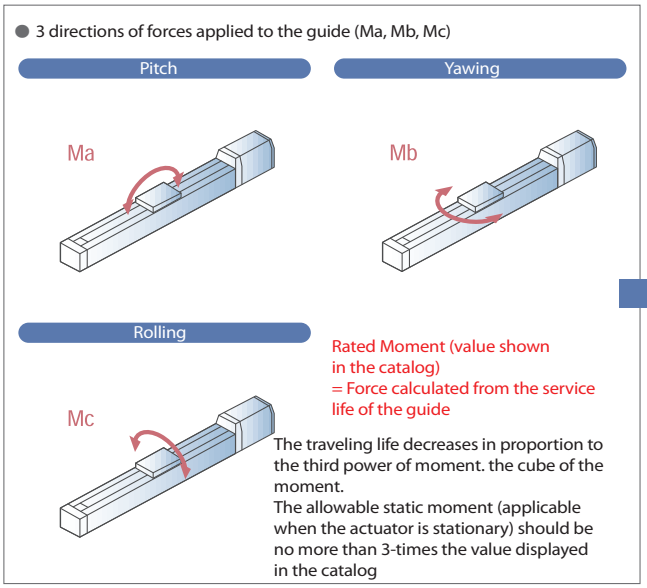
An overhang that exceeds the allowable overhang length will generate vibration and increase settling time.

L/l=5 or less
*Approx. 3 to 4 for measuring systems equipped with a camera.

Reference
L/l=1.2 Work mechanism
L/l=3 Measurement mechanism
L/l=5 Robot

Allowable load moment

The allowable load moment is the maximum offset load exerted on the slider, calculated from the guide service life.
The direction in which force is exerted on the guide is categorized into 3 directions – Ma (pitch), Mb (yaw), Mc (roll) – the tolerance for each of which are set for each actuator.
Applying a moment exceeding the allowable value will reduce the service life of the actuator. Use an auxiliary guide when working within or in excess of these tolerances.



See the next page to calculate the load moment weight in each direction.

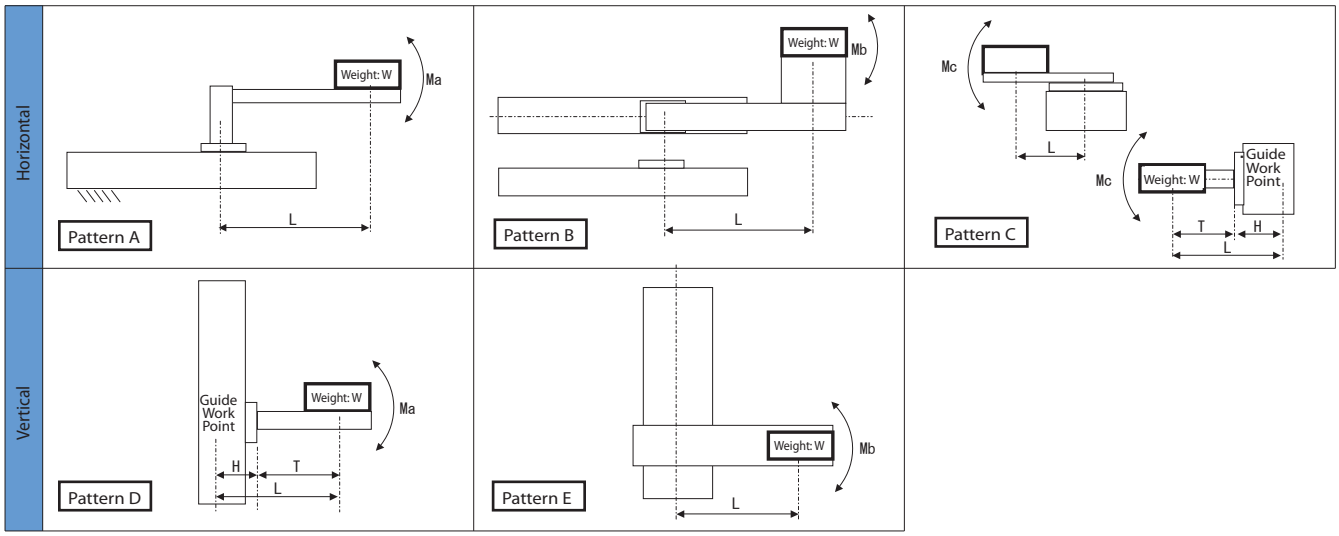
Calculating Moment Load

The service life varies greatly depending on the work mounting position, even when the selected type has sufficient load capacity and maximum acceleration.
Find the moment loads generated at rest and in motion from the following equations, then use the sum of both moment loads to check the allowable load moment for the selected type.
Please note that service life is vastly shortened when used in excess of the allowable load moment value.

Moment generated at rest

M1 (N • m) = W (kg) x L (mm) x 9.8/1000

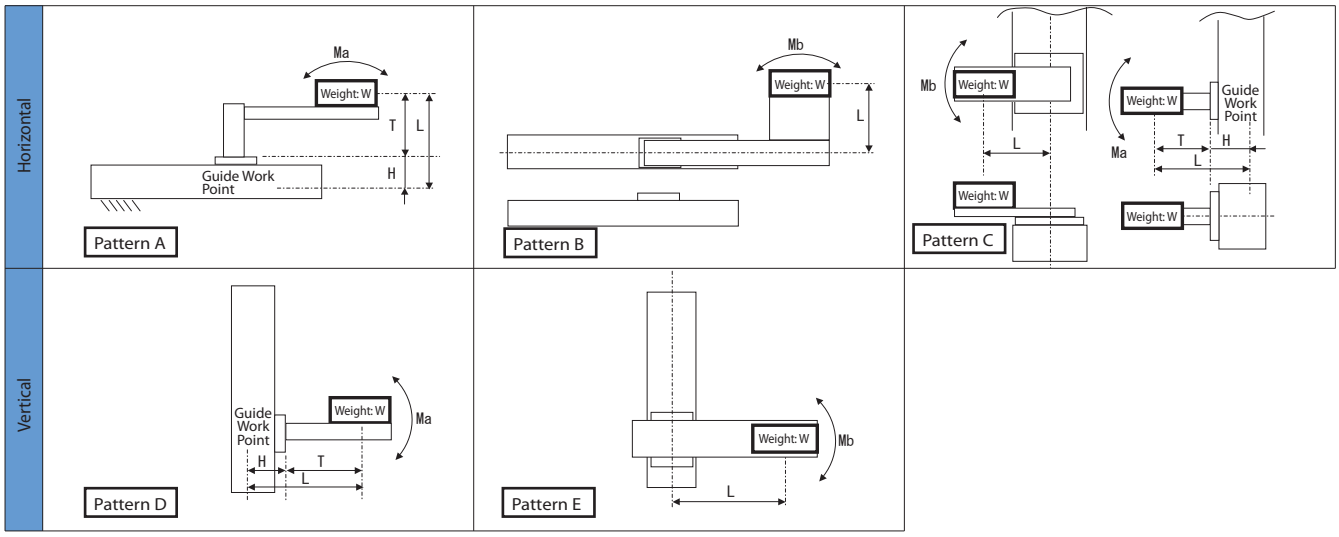
W: Weight, L: Distance from work point to center of gravity of the load (L=T+H)
T: Distance from top face of slider to center of gravity of the load
H: Distance from guide work point to top face of slider



Moment generated while in motion

M2 (N • m) = W (kg) x L (mm) x a(G) x 9.8/1000

W: Weight, L: Distance from work point to center of gravity of the load (L=T+H)
T: distance from top face of slider to center of gravity of the load
H: distance from guide work point to top face of slider
a: Designated acceleration



Confirm that the sum of the aforementioned M1 (moment generated at rest) and M2 (moment generated in motion) is within the allowable load moment value for the selected type. When the allowable load moment is exceeded, either use the next higher type that meets the moment value or install an auxiliary guide, etc.

M1 + M2 < Allowable load moment

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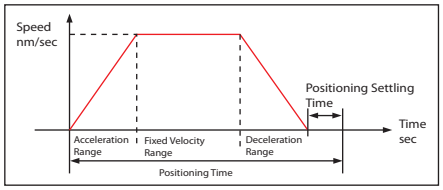
Technical Information

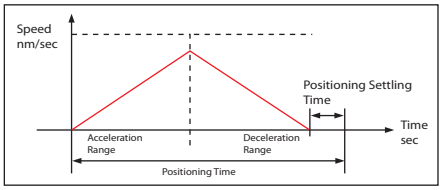
How to calculate positioning time

The actuator positioning time can be found from an equation.
The two motion patterns below are available, depending on the movement distance and acceleration/deceleration conditions.

A Trapezoid Pattern



B Triangle Pattern



First, make a calculation using one of the calculating methods after checking whether to use the trapezoid pattern or triangle pattern.

Checking the Movement Pattern

The trapezoid pattern or triangle pattern is selected by determining whether the operating velocity reached over a motion distance at a set acceleration is greater or less than a given velocity.

$$\text{Peak velocity (Vmax)} = \sqrt{\text{Motion distance (Smm)} \times \text{Set acceleration}}$$
$$= \sqrt{\text{Smm} \times 9{,}800\text{mm/sec}^2 \times \text{Acceleration setting (G)}}$$

As a result
Set velocity (V) < Peak velocity (Vmax)… Trapezoid pattern
Set velocity (V) > Peak velocity (Vmax)… Triangle pattern

Method of Calculating Positioning Time

A Trapezoid Pattern

$$\text{Positioning Time (T)} = \frac{\text{Distance (mm)}}{\text{Speed (mm/sec)}} + \frac{\text{Speed (mm/sec)}}{\text{Accel. (mm/sec}^2\text{)}} + \text{Positioning Settling Time}$$

B Triangle Pattern

$$\text{Positioning Time (T)} = 2\sqrt{\frac{\text{Distance (mm)}}{\text{Accel. (mm/sec}^2\text{)}}} + \text{Positioning Settling Time}$$

$$\text{Accel. Time} = \frac{\text{Speed* (mm/sec)}}{\text{Accel. (mm/sec}^2\text{)}}$$

$$\text{Acceleration movement distance} = \frac{\text{Accel. (mm/sec}^2\text{)} \times \text{(Acceleration time (sec}^2\text{))}}{2}$$

* This is the set velocity with the trapezoid pattern, and the peak velocity with the triangle pattern.

Note
- Acceleration is found by the controller acceleration/deceleration setting (G) (9,800mm/sec2. If the controller acceleration/deceleration setting is 0.3G this is 0.3 (9.800mm/sec2 = 2,940mm/sec2.
- Positioning settling time: Time needed to determine that an operation is completed at the reference position. This is 0.15 sec in a normal ball screw type, and around 0.2 sec for belt types.

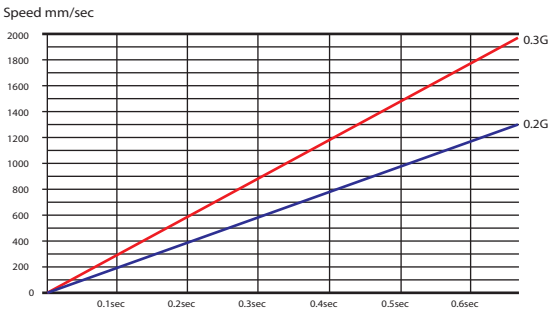
Positioning time (sec)

Accel. Setting	Velocity Setting (mm/sec)	Motion Distance (mm) 10	20	30	40	50	100	150	200	250	300	350	400	450	500	600	1000	1100	1300	1400
0.3G	100	0.13	0.23	0.33	0.43	0.53	1.03	1.53	2.03	2.53	3.03	3.53	4.03	4.53	5.03	6.03	10.03	11.03	13.03	14.03
	200	0.12	0.17	0.22	0.27	0.32	0.57	0.82	1.07	1.32	1.57	1.82	2.07	2.32	2.57	3.07	5.07	5.57	6.57	7.07
	300	0.12	0.16	0.2	0.24	0.27	0.44	0.6	0.77	0.94	1.1	1.27	1.44	1.6	1.77	2.1	3.44	3.77	4.44	4.77
	400	0.12	0.16	0.2	0.23	0.26	0.39	0.51	0.64	0.76	0.89	1.01	1.14	1.26	1.39	1.64	2.64	2.89	3.39	3.64
	500	0.12	0.16	0.2	0.23	0.26	0.37	0.47	0.57	0.67	0.77	0.87	0.97	1.07	1.17	1.37	2.17	2.37	2.77	2.97
	600	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.54	0.62	0.7	0.79	0.87	0.95	1.04	1.2	1.87	2.04	2.37	2.54
	700	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.6	0.67	0.74	0.81	0.88	0.95	1.1	1.67	1.81	2.1	2.24
	800	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.58	0.65	0.71	0.77	0.83	0.9	1.02	1.52	1.65	1.9	2.02
	900	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.58	0.64	0.7	0.75	0.81	0.86	0.97	1.42	1.53	1.75	1.86
	1000	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.58	0.64	0.69	0.74	0.79	0.84	0.94	1.34	1.44	1.64	1.74
	1750	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.58	0.64	0.69	0.74	0.78	0.82	0.9	1.17	1.37	1.56	1.65
	2000	0.12	0.16	0.2	0.23	0.26	0.37	0.45	0.52	0.58	0.64	0.69	0.74	0.78	0.82	0.9	1.17	1.22	1.33	1.48

(Note) Does not include positioning settling time (0.15sec for a ball screw, 0.2 sec for a belt)

Triangle pattern

Acceleration Time

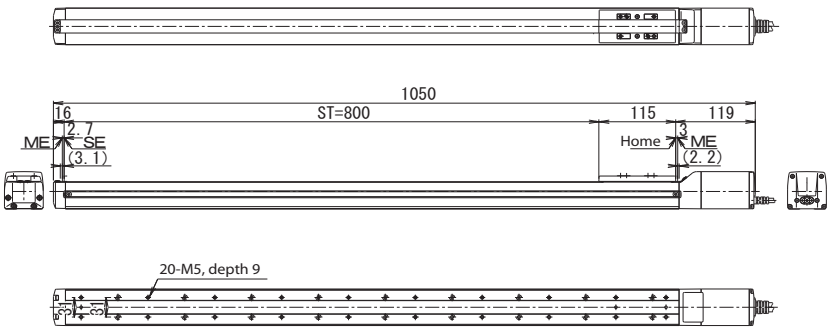


Information on special orders

If you don't find your desired product in this catalog, feel free to contact us, as we are able to fill special orders.
Some typical special orders are shown below for your reference.

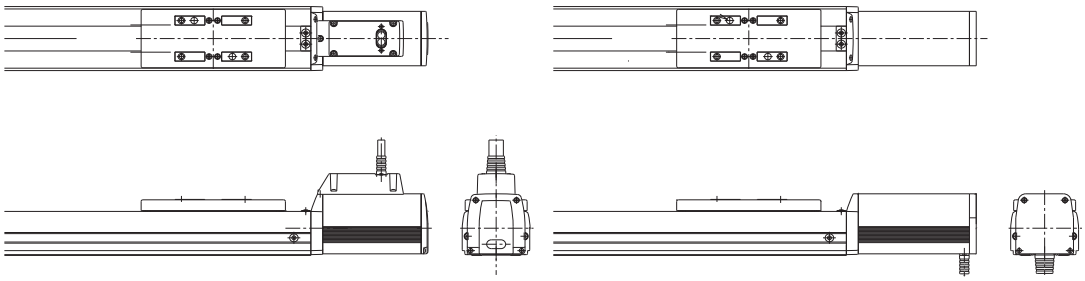
Special Stroke

Ex.) RCP2-SA6 800 Stroke (Non-standard stroke)



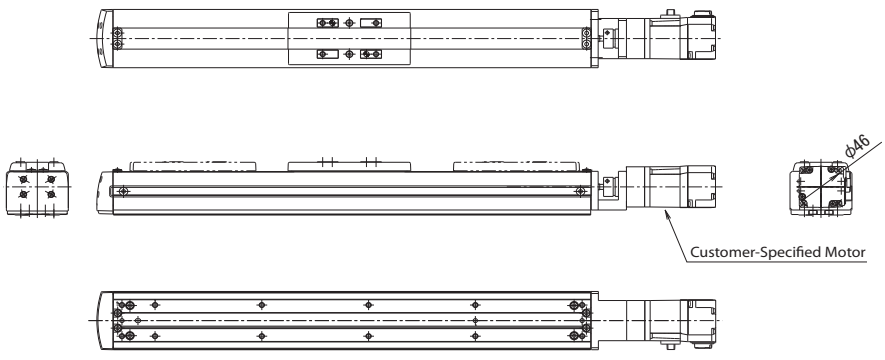
Cable Outlet Directional Changes

Ex.) Actuator cable outlet top/bottom



Special Motor

Ex.) Mount Customer-Specified Motor Specification



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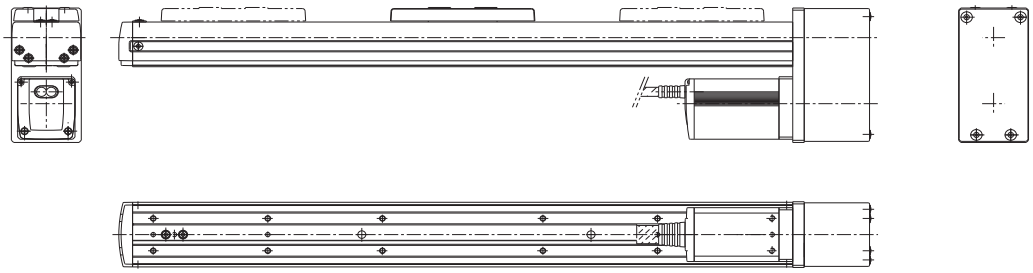
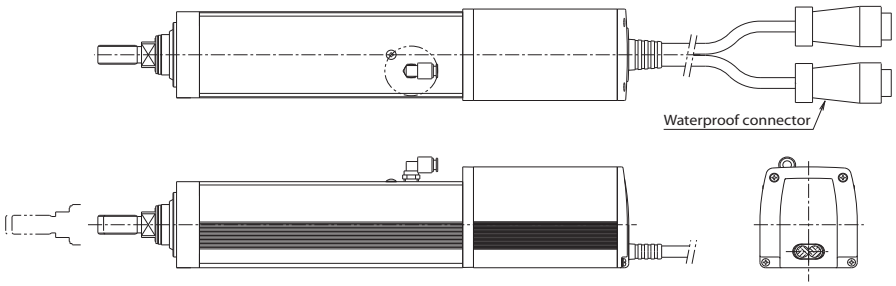
Reverse-Mount Motor Orientation

Ex.) Reverse-Mount Motor to the Bottom



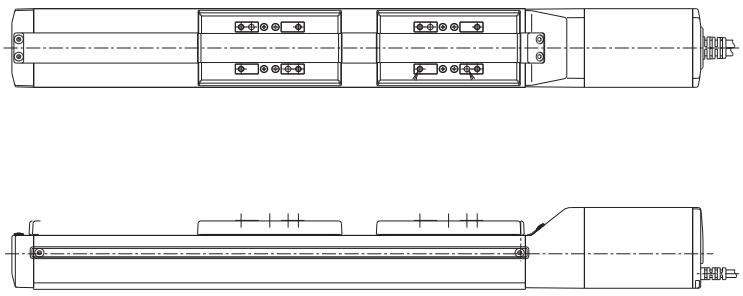
Special Connector

Ex.) Change motor-encoder connector to waterproof connector



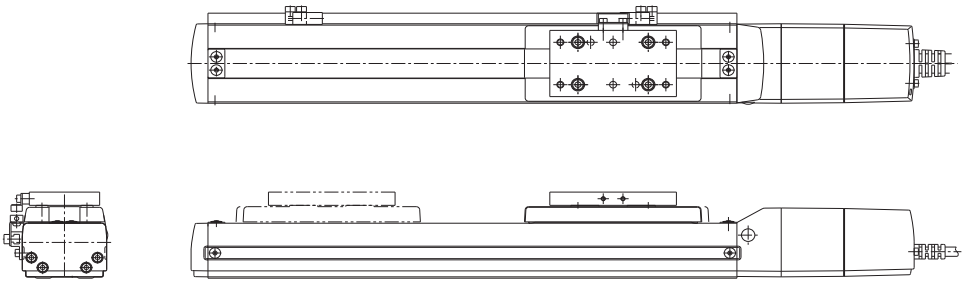
Special Slider

Double Slider Specification (Add non-driven slider)



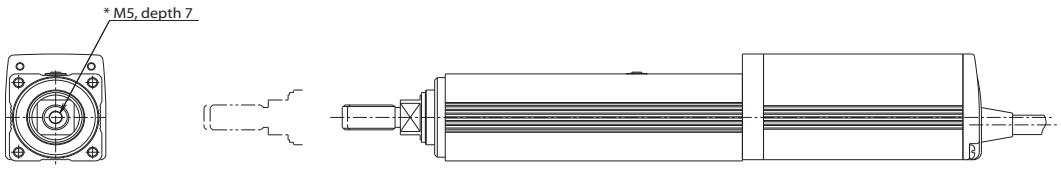
Sensor Specifications

Ex.) Sensor Mounting Specifications



Lead-End Tapped Hole Processing

Ex.) Add a tapped hole to the lead-end of the rod in a rod type



Other

- Special Ball Screw Lead
- Raydent Treated Ball Screw
- ESD (Electrostatic Discharge) Specification
- Assembly Unit

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Correlation Table by RoHS Order/CE Mark/UL Listed Models

◎ : Standard ○ : Option △ : Special Order × : Not Available

Product Configuration	Series Name	Type, Model		RoHS Compatible	CE Mark Compatible	UL Listing Compatible
Actuator	ERC2	Slider	SA6/SA7	◎	◎	
		Rod	RA6/RA7	◎	◎	
	RCP3	Slider	SA3C/SA4C/SA5C/SA6C	◎		
		Table	TA5C/TA6C/TA7C	◎		
	RCP2	Slider	SA5C/SA6C/SA7C/SS7C/SS8C SA5R/SA6R/SA7R/SS7R/SS8R	○		
		Rod	RA3C/RA4C/RA6C	○		
		Belt	BA6/BA7/BA6U/BA7U	○		
		Ultra-fine	RA2	○		
		Gripper	GRS/GRM/GR3L/GR3S	○		
		Rotary	RTB/RTC/RTBL/RTCL	○		
		High-thrust	RA10C	○		
		High-speed ball screw	HS8C/HS8R	○		
		Cleanroom (RCP2CR)	SA5/SA6/SA7/SS7/SS8	○		
		Dust-proof, Splash-proof (RCP2W Rod)	RA4/RA6	○		
		Waterproof (RCP2W Slider)	SA16C	○		
	RCA	Slider	SA4C/SA5C/SA6C SA4R/SA5R/SA6R	◎		
		Rod	RA3C/RA3D/RA3R RA4C/RA4D/RA4R	◎		
		Arm	A4R/A5R/A6R	◎		
		Cleanroom (RCACR)	SA4C/SA5C/SA6C	◎		
		Dust-proof, Splash-proof (Rod)	RCAW-RA3/4	◎		
		Absolute Type	All Models	◎		
	RCA2	Slider	SA3C/SA4C/SA5C/SA6C	◎		
		Table	TA5C/TA6C/TA7C	◎		
	RCS2	Slider (Reverse-Mount Motor)	SA4C/SA5C/SA6C/SA7C/SS7C/SS8C SA4R/SA5R/SA6R/SA7R/SS7R/SS8R	○		
		Rod (Reverse-Mount Motor)	RA4/RA5/RA7	○		
		Flat	F5	○		
		Gripper	GR8	○		
		Rotary	RT6/RT6R/RT7R	○		
		Arm	A4R/A5R/A6R	○		
		Clean (RCS2CR)	SA4C/SA5C/SA6C/SA7C/SS7C/SS8C	○		
		Ultra-high-thrust	RA13R	◎		
		Absolute Type	All Models	○		
Controller	PCON	Standard	C/CG	◎	◎	◎
		High-thrust	CF	◎	◎	◎
		Compact	CY/SE/PL/PO	◎	◎	◎
	ACON	Standard	C/CG	◎	◎	◎
		Compact	CY/SE/PL/PO	◎	◎	◎
	SCON			◎	◎	
	PSEL			◎		
	ASEL			◎		
	SSEL			△	◎	
	XSEL-J/K	Mini	J	△		
		General Purpose	K	△		
		CE	KE	△	◎	
		Global	KT	△		
		Scalar	JX/KX	△		
		General Purpose Expansion SIO	IA-105-X-MW-A/B/C	△		
	XSEL-P/Q	Standard	P	△	◎	
		Global	Q	△	◎	
		Scalar	PX, QX	△	◎	
	XSEL Option	CC-Link (256 Points)	IA-NT-3206/4-CC256	○		
		CC-Link (16 Points)	IA-NT-3204-CC16	○		
		DeviceNet	IA-NT-3206/4-DV	In Preparation		
		ProfiBus	IA-NT-3206/4-PR	In Preparation		
		EtherNet	IA-NT-3206/4-ET	In Preparation		
		Expansion PIO	IA-103-X-32/16	○		
		Multi-Point I/O	IA-IO-3204/5-NP/PN	○		

◎ : Standard ○ : Option △ : Special Order × : Not Available

Product Configuration	Series Name	Type, Model		RoHS Compatible	CE Mark Compatible	UL Listing Compatible
Teaching Pendant	RCP2, ERC, RCS, E-Con	Standard (with Deadman SW)	RCA-T(RCA-TD), RCM-T(RCM-TD)	×		
		Simple	RCA-E, RCM-E	△		
		Data Setting Unit	RCA-P, RCM-P	△		
	RCP2 ,ERC	Jog Teach	RCB-J	△		
	New RC		CON-T	◎	◎	
		Standard (with Deadman SW)	IA-T-X(IA-T-XD)	×		
		ANSI Compatible	IA-T-XA	In Preparation		
	New XSEL	Standard (with Deadman SW)	SEL-T(SEL-TD)	◎	◎	(◎)※
	DS		DS-S-T1	×		
	IH		IA-T-IH	×		
Multi-Point I/O Board Terminal Block			TU-MA96(-P)	○		
DC24V power supply			PS-241/PS-242	○		
Gateway Unit	RCM-GW	DV	RCM-GW-DV	○	◎	
		CC	RCM-GW-CC	○	◎	
Regenerative Resistance Unit		For E-Con, PDR, XSEL-J/K	REU-1	○		
		For SCON, SSEL, XSEL-P/Q	REU-2	○		
PIO Terminal Block			RCB-TU-PIO-A/B	○		
SIO converter			RCB-TU-SIO-A/B	○		
RS232 Converter Unit		New	RCB-CV-MW	○		
		Previous	RCA-ADP-MW	×		
Absolute Battery	HAB		IA-HAB	×		
	RCP		AB-2	×		
	RCP2		AB-4	○		
	RCS		AB-1	×		◎
	XSEL-J/K		IA-XAB	○		◎
	XSEL-P/Q		AB-5	○		◎
Brake Box	XSEL-J/K		IA-110-X-0	○		
ENC Converter Unit	XSEL-P/Q		IA-CV-ENC	×		
Filter Box	E-Con		PFB-1	×		
Pulse Converter	PDR		AK-04	◎		
M/PTG Cable	RCP/RCP2	Motor cable	CB-RCP2-MA	◎		
		Encoder cable	CB-RCP2-PA	◎		
			CB-RCP2-PA-**-RB	◎		
	RCP3	Motor-Encoder Cable	CB-PCS-MPA	◎		
	RCA	Motor cable	CB-ACS-MA	◎		
		Encoder cable	CB-ACS-PA	◎		
			CB-ACS-PA-**-RB	◎		
	RCA2	Motor-Encoder Cable	CB-ACS-MPA	◎		
	RCS2	Motor cable	CB-RCC-MA	◎		
			CB-RCC-MA-**-RB	◎		
		Encoder cable	CB-RCS2-PA	◎		
			CB-RCBC-PA	◎		
			CB-RCBC-PA-**-RB	◎		
	X-SEL	Motor cable	CB-X-MA	◎		
		Encoder cable	CB-X-PA	◎		
			CB-X1-PA/PLA	◎		
			CB-X2-PA/PLA	◎		
			CB-X1-PA-**-WC	◎		
		Limit Switch Cable	CB-X-LC	◎		
Other	RC	Computer software	RCM-101-MW	◎		
			RCM-101-USB	◎		
		External Communication Cable	CB-RCA-SIO020	◎		
		RS232C Converter Cable	RCB-CV-MW			
		USB cable	CB-SEL-USB010	◎		
		USB Converter Cable	RCB-CV-USB	◎		
		Link cable	CB-RCB-CTL002	◎		
	SCON	Pulse Train Control Cable	CB-SC-PIOS	◎		
	XSEL	Computer software (Cable+EMG BOX)	IA-101-X-MW	In Preparation		
			IA-101-XA-MW	In Preparation		
			EMG SW BOX	In Preparation		
		Connection Cable (Standalone)	CB-ST-E1MW050	◎		
			CB-ST-A1MW050	In Preparation		
			CB-SEL-USB010	◎		
		USB Converter Cable	IA-CV-USB	◎		
		I/O Flat Cable	CB-X-PIO	◎		

* Only compatible with dead man switch

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Previous Model Conversion Table [ERC, RCP2, RCP2CR, RCP2W]

Previous Product Model				New Product Model	Reference
Series	Type	Model		Model	
ERC	RA54	ERC-RA54-I-PM-③-④-⑤	→	ERC2-RA6C-I-PM-③-④-NP-⑤	
	RA54GD	ERC-RA54GD-I-PM-③-④-⑤	→	ERC2-RGD6C-I-PM-③-④-NP-⑤	
	RA54GS	ERC-RA54GS-I-PM-③-④-⑤	→	ERC2-RGS6C-I-PM-③-④-NP-⑤	
	RA64	ERC-RA64-I-PM-③-④-⑤	→	ERC2-RA7C-I-PM-③-④-NP-⑤	
	RA64GD	ERC-RA64GD-I-PM-③-④-⑤	→	ERC2-RGD7C-I-PM-③-④-NP-⑤	
	RA64GS	ERC-RA64GS-I-PM-③-④-⑤	→	ERC2-RGS7C-I-PM-③-④-NP-⑤	
	SA6	ERC-SA6-I-PM-③-④-⑤	→	ERC2-SA6C-I-PM-③-④-NP-⑤	
	SA7	ERC-SA7-I-PM-③-④-⑤	→	ERC2-SA7C-I-PM-③-④-NP-⑤	
RCP2	BA6	RCP2-BA6-I-PM-54-④-P1-⑤	→	RCP2-BA6-I-42P-54-④-P1-⑤	
		RCP2-BA6-A-PM-54-④-P1-⑤	→	RCP2-BA6-I-42P-54-④-P1-⑤	For use with simple absolute unit
	BA6U	RCP2-BA6U-I-PM-54-④-P1-⑤	→	RCP2-BA6U-I-42P-54-④-P1-⑤	
		RCP2-BA6U-A-PM-54-④-P1-⑤	→	RCP2-BA6U-I-42P-54-④-P1-⑤	For use with simple absolute unit
	BA7	RCP2-BA7-I-PM-54-④-P1-⑤	→	RCP2-BA7-I-42P-54-④-P1-⑤	
		RCP2-BA7-A-PM-54-④-P1-⑤	→	RCP2-BA7-I-42P-54-④-P1-⑤	For use with simple absolute unit
	BA7U	RCP2-BA7U-I-PM-54-④-P1-⑤	→	RCP2-BA7U-I-42P-54-④-P1-⑤	
		RCP2-BA7U-A-PM-54-④-P1-⑤	→	RCP2-BA7U-I-42P-54-④-P1-⑤	For use with simple absolute unit
	GRS	RCP2-GRS-I-PM-1-10-P1-⑤	→	RCP2-GRS-I-20P-1-10-P1-⑤	
	GRM	RCP2-GRM-I-PM-1-14-P1-⑤	→	RCP2-GRM-I-28P-1-14-P1-⑤	
	GR3LS	RCP2-GR3LS-I-PM-30-1X-P1-⑤	→	RCP2-GR3LS-I-28P-30-19-P1-⑤	
	GR3LM	RCP2-GR3LM-I-PM-30-1X-P1-⑤	→	RCP2-GR3LM-I-42P-30-19-P1-⑤	
	GR3SS	RCP2-GR3SS-I-PM-30-10-P1-⑤	→	RCP2-GR3SS-I-28P-30-10-P1-⑤	
	GR3SM	RCP2-GR3SM-I-PM-30-14-P1-⑤	→	RCP2-GR3SM-I-42P-30-14-P1-⑤	
	HSM	RCP2-HSM-I-PM-30-④-P1-⑤	→	RCP2-HS8C-I-86P-③-④-P2-⑤	
	HSMR	RCP2-HSMR-I-PM-30-④-P1-⑤	→	RCP2-HS8R-I-86P-③-④-P2-⑤	
	RFA	RCP2-RFA-I-PM-③-④-P1-⑤	→	RCP2-RA10C-I-86P-③-④-P2-⑤	
	RFW	RCP2-RFW -I-PM-③-④-P1-⑤	→	RCP2W-RA10C-I-86P-③-④-P2-⑤	
	RMA	RCP2-RMA-I-PM-③-④-P1-⑤	→	RCP2-RA6C-I-56P-③-④-P1-⑤	
		RCP2-RMA-A-PM-③-④-P1-⑤	→	RCP2-RA6C-I-56P-③-④-P1-⑤	For use with simple absolute unit
	RMGD	RCP2-RMGD-I-PM-③-④-P1-⑤	→	RCP2-RGD6C-I-56P-③-④-P1-⑤	
		RCP2-RMGD-A-PM-③-④-P1-⑤	→	RCP2-RGD6C-I-56P-③-④-P1-⑤	For use with simple absolute unit
	RMGS	RCP2-RMGS-I-PM-③-④-P1-⑤	→	RCP2-RGS6C-I-56P-③-④-P1-⑤	
		RCP2-RMGS-A-PM-③-④-P1-⑤	→	RCP2-RGS6C-I-56P-③-④-P1-⑤	For use with simple absolute unit
	RMW	RCP2-RMW-I-PM-③-④-P1-⑤	→	RCP2W-RA6C-I-56P-③-④-P1-⑤	
		RCP2-RMW-A-PM-③-④-P1-⑤	→	RCP2W-RA6C-I-56P-③-④-P1-⑤	For use with simple absolute unit
	RPA	RCP2-RPA-I-PM-1-④-P1-⑤	→	RCP2-RA2C-I-20P-1-④-P1-⑤	
	RSA	RCP2-RSA-I-PM-③-④-P1-⑤	→	RCP2-RA4C-I-42P-③-④-P1-⑤	
		RCP2-RSA-A-PM-③-④-P1-⑤	→	RCP2-RA4C-I-42P-③-④-P1-⑤	For use with simple absolute unit
	RSGD	RCP2-RSGD-I-PM-③-④-P1-⑤	→	RCP2-RGD4C-I-42P-③-④-P1-⑤	
		RCP2-RSGD-A-PM-③-④-P1-⑤	→	RCP2-RGD4C-I-42P-③-④-P1-⑤	For use with simple absolute unit
	RSGS	RCP2-RSGS-I-PM-③-④-P1-⑤	→	RCP2-RGS4C-I-42P-③-④-P1-⑤	
		RCP2-RSGS-A-PM-③-④-P1-⑤	→	RCP2-RGS4C-I-42P-③-④-P1-⑤	For use with simple absolute unit

* ③ above is the lead, ④ is the stroke, and ⑤ is the cable length.

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Previous Product Model				New Product Model	Reference
Series	Type	Model		Model	
RCP2	RSW	RCP2-RSW-I-PM-③-④-P1-⑤	→	RCP2W-RA4C-I-42P-③-④-P1-⑤	
		RCP2-RSW-A-PM-③-④-P1-⑤	→	RCP2W-RA4C-I-42P-③-④-P1-⑤	For use with simple absolute unit
	RTB	RCP2-RTB-I-PM-③-330-P1-⑤	→	RCP2-RTB-I-28P-③-330-P1-⑤	
	RTC	RCP2-RTC-I-PM-③-330-P1-⑤	→	RCP2-RTC-I-28P-③-330-P1-⑤	
	RXA	RCP2-RXA-I-PM-③-④-P1-⑤	→	RCP2-RA3C-I-28P-③-④-P1-⑤	
		RCP2-RXA-A-PM-③-④-P1-⑤	→	RCP2-RA3C-I-28P-③-④-P1-⑤	For use with simple absolute unit
	RXGD	RCP2-RXGD-I-PM-③-④-P1-⑤	→	RCP2-RGD3C-I-28P-③-④-P1-⑤	
		RCP2-RXGD-A-PM-③-④-P1-⑤	→	RCP2-RGD3C-I-28P-③-④-P1-⑤	For use with simple absolute unit
	SA5	RCP2-SA5-I-PM-③-④-P1-⑤	→	RCP2-SA5C-I-42P-③-④-P1-⑤	
		RCP2-SA5-A-PM-③-④-P1-⑤	→	RCP2-SA5C-I-42P-③-④-P1-⑤	For use with simple absolute unit
	SA5R	RCP2-SA5R-I-PM-③-④-P1-⑤	→	RCP2-SA5R-I-42P-③-④-P1-⑤	
		RCP2-SA5R-A-PM-③-④-P1-⑤	→	RCP2-SA5R-I-42P-③-④-P1-⑤	For use with simple absolute unit
	SA6	RCP2-SA6-I-PM-③-④-P1-⑤	→	RCP2-SA6C-I-42P-③-④-P1-⑤	
		RCP2-SA6-A-PM-③-④-P1-⑤	→	RCP2-SA6C-I-42P-③-④-P1-⑤	For use with simple absolute unit
	SA6R	RCP2-SA6R-I-PM-③-④-P1-⑤	→	RCP2-SA6R-I-42P-③-④-P1-⑤	
		RCP2-SA6R-A-PM-③-④-P1-⑤	→	RCP2-SA6R-I-42P-③-④-P1-⑤	For use with simple absolute unit
	SA7	RCP2-SA7-I-PM-③-④-P1-⑤	→	RCP2-SA7C-I-56P-③-④-P1-⑤	
		RCP2-SA7-A-PM-③-④-P1-⑤	→	RCP2-SA7C-I-56P-③-④-P1-⑤	For use with simple absolute unit
	SA7R	RCP2-SA7R-I-PM-③-④-P1-⑤	→	RCP2-SA7R-I-56P-③-④-P1-⑤	
		RCP2-SA7R-A-PM-③-④-P1-⑤	→	RCP2-SA7R-I-56P-③-④-P1-⑤	For use with simple absolute unit
	SS	RCP2-SS-I-PM-③-④-P1-⑤	→	RCP2-SS7C-I-42P-③-④-P1-⑤	
		RCP2-SS-A-PM-③-④-P1-⑤	→	RCP2-SS7C-I-42P-③-④-P1-⑤	For use with simple absolute unit
	SSR	RCP2-SSR-I-PM-③-④-P1-⑤	→	RCP2-SS7R-I-42P-③-④-P1-⑤	
		RCP2-SSR-A-PM-③-④-P1-⑤	→	RCP2-SS7R-I-42P-③-④-P1-⑤	For use with simple absolute unit
	SM	RCP2-SM-I-PM-③-④-P1-⑤	→	RCP2-SS8C-I-56P-③-④-P1-⑤	
		RCP2-SM-A-PM-③-④-P1-⑤	→	RCP2-SS8C-I-56P-③-④-P1-⑤	For use with simple absolute unit
	SMR	RCP2-SMR-I-PM-③-④-P1-⑤	→	RCP2-SS8R-I-56P-③-④-P1-⑤	
		RCP2-SMR-A-PM-③-④-P1-⑤	→	RCP2-SS8R-I-56P-③-④-P1-⑤	For use with simple absolute unit
RCP2 CR	HSM	RCP2CR-HSM-I-PM-30-④-P1-⑤	→	RCP2CR-HS8C-I-86P-30-④-P2-⑤	
	SA5	RCP2CR-SA5-I-PM-③-④-P1-⑤	→	RCP2CR-SA5C-I-42P-③-④-P1-⑤	
		RCP2CR-SA5-A-PM-③-④-P1-⑤	→	RCP2CR-SA5C-I-42P-③-④-P1-⑤	For use with simple absolute unit
	SA6	RCP2CR-SA6-I-PM-③-④-P1-⑤	→	RCP2CR-SA6C-I-42P-③-④-P1-⑤	
		RCP2CR-SA6-A-PM-③-④-P1-⑤	→	RCP2CR-SA6C-I-42P-③-④-P1-⑤	For use with simple absolute unit
	SA7	RCP2CR-SA7-I-PM-③-④-P1-⑤	→	RCP2CR-SA7C-I-56P-③-④-P1-⑤	
		RCP2CR-SA7-A-PM-③-④-P1-⑤	→	RCP2CR-SA7C-I-56P-③-④-P1-⑤	For use with simple absolute unit
	SS	RCP2CR-SS-I-PM-③-④-P1-⑤	→	RCP2CR-SS7C-I-42P-③-④-P1-⑤	
		RCP2CR-SS-A-PM-③-④-P1-⑤	→	RCP2CR-SS7C-I-42P-③-④-P1-⑤	For use with simple absolute unit
	SM	RCP2CR-SM-I-PM-③-④-P1-⑤	→	RCP2CR-SS8C-I-56P-③-④-P1-⑤	
		RCP2CR-SM-A-PM-③-④-P1-⑤	→	RCP2CR-SS8C-I-56P-③-④-P1-⑤	For use with simple absolute unit
RCP2W	SA16	RCP2W-SA16-I-PM-③-④-P1-⑤	→	RCP2W-SA16C-I-86P-③-④-P2-⑤	

* ③ above is the lead, ④ is the stroke, and ⑤ is the cable length.

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Previous Model Conversion Table [RCS]

Previous Product Model				New Product Model	Reference
Series	Type	Model		Model	
RCS	F45	RCS-F45-①-30-H-④-⑤	→	N/A	
		RCS-F45-①-30-M-④-⑤	→	N/A	
		RCS-F45-①-30-L-④-⑤	→	N/A	
	F55	RCS-F55-①-②-H-④-⑤	→	RCS2-F5D-①-②-16-④-T2(T1)-⑤	
		RCS-F55-①-②-M-④-⑤	→	RCS2-F5D-①-②-8-④-T2(T1)-⑤	
		RCS-F55-①-②-L-④-⑤	→	RCS2-F5D-①-②-4-④-T2(T1)-⑤	
	G20	RCS-G20-I-60-5-④-⑤	→	RCS2-GR8-I-60-5-④-T2(T1)-⑤	
	RA35	RCS-RA35-I-20-GN-H-④-⑤	→	(RCA-RA3C-I-20-10-④-A1-⑤)	Mount is not interchangeable
		RCS-RA35-I-20-GN-M-④-⑤	→	(RCA-RA3C-I-20-5-④-A1-⑤)	Mount is not interchangeable
		RCS-RA35-I-20-GN-L-④-⑤	→	(RCA-RA3C-I-20-2.5-④-A1-⑤)	Mount is not interchangeable
		RCS-RA35-I-20-GS-H-④-⑤	→	(RCA-RGS3C-I-20-10-④-A1-⑤)	Mount is not interchangeable
		RCS-RA35-I-20-GS-M-④-⑤	→	(RCA-RGS3C-I-20-5-④-A1-⑤)	Mount is not interchangeable
		RCS-RA35-I-20-GS-L-④-⑤	→	(RCA-RGS3C-I-20-2.5-④-A1-⑤)	Mount is not interchangeable
		RCS-RA35-I-20-GD-H-④-⑤	→	(RCA-RGD3C-I-20-10-④-A1-⑤)	Mount is not interchangeable
		RCS-RA35-I-20-GD-M-④-⑤	→	(RCA-RGD3C-I-20-5-④-A1-⑤)	Mount is not interchangeable
		RCS-RA35-I-20-GD-L-④-⑤	→	(RCA-RGD3C-I-20-2.5-④-A1-⑤)	Mount is not interchangeable
	RA35R	RCS-RA35R-I-20-GN-H-④-⑤	→	(RCA-RA3R-I-20-10-④-A1-⑤)	Mount is not interchangeable
		RCS-RA35R-I-20-GN-M-④-⑤	→	(RCA-RA3R-I-20-5-④-A1-⑤)	Mount is not interchangeable
		RCS-RA35R-I-20-GN-L-④-⑤	→	(RCA-RA3R-I-20-2.5-④-A1-⑤)	Mount is not interchangeable
	RA45	RCS-RA45-①-30-GN-H-④-⑤	→	(RCA-RA4C-①-30-12-④-A1-⑤)	Mount is not interchangeable
		RCS-RA45-①-30-GN-M-④-⑤	→	(RCA-RA4C-①-30-6-④-A1-⑤)	Mount is not interchangeable
		RCS-RA45-①-30-GN-L-④-⑤	→	(RCA-RA4C-①-30-3-④-A1-⑤)	Mount is not interchangeable
		RCS-RA45-①-30-GS-H-④-⑤	→	(RCA-RG3SC-①-30-12-④-A1-⑤)	Mount is not interchangeable
		RCS-RA45-①-30-GS-M-④-⑤	→	(RCA-RG3SC-①-30-6-④-A1-⑤)	Mount is not interchangeable
		RCS-RA45-①-30-GS-L-④-⑤	→	(RCA-RG3SC-①-30-3-④-A1-⑤)	Mount is not interchangeable
		RCS-RA45-①-30-GD-H-④-⑤	→	(RCA-RGD4C-①-30-12-④-A1-⑤)	Mount is not interchangeable
		RCS-RA45-①-30-GD-M-④-⑤	→	(RCA-RGD4C-①-30-6-④-A1-⑤)	Mount is not interchangeable
		RCS-RA45-①-30-GD-L-④-⑤	→	(RCA-RGD4C-①-30-3-④-A1-⑤)	Mount is not interchangeable
	RA45R	RCS-RA45R-①-30-GN-H-④-⑤	→	(RCA-RA4R-①-30-12-④-A1-⑤)	Mount is not interchangeable
		RCS-RA45R-①-30-GN-M-④-⑤	→	(RCA-RA4R-①-30-6-④-A1-⑤)	Mount is not interchangeable
		RCS-RA45R-①-30-GN-L-④-⑤	→	(RCA-RA4R-①-30-3-④-A1-⑤)	Mount is not interchangeable
	RA55	RCS-RA55-①-②-GN-H-④-⑤	→	(RCS2-RA5C-①-②-16-④-T2(T1)-⑤)	Mount is not interchangeable
		RCS-RA55-①-②-GN-M-④-⑤	→	(RCS2-RA5C-①-②-8-④-T2(T1)-⑤)	Mount is not interchangeable
		RCS-RA55-①-②-GN-L-④-⑤	→	(RCS2-RA5C-①-②-4-④-T2(T1)-⑤)	Mount is not interchangeable
		RCS-RA55-①-②-GS-H-④-⑤	→	(RCS2-RGS5C-①-②-16-④-T2(T1)-⑤)	Mount is not interchangeable
		RCS-RA55-①-②-GS-M-④-⑤	→	(RCS2-RGS5C-①-②-8-④-T2(T1)-⑤)	Mount is not interchangeable
		RCS-RA55-①-②-GS-L-④-⑤	→	(RCS2-RGS5C-①-②-4-④-T2(T1)-⑤)	Mount is not interchangeable
		RCS-RA55-①-②-GD-H-④-⑤	→	(RCS2-RGD5C-①-②-16-④-T2(T1)-⑤)	Mount is not interchangeable
		RCS-RA55-①-②-GD-M-④-⑤	→	(RCS2-RGD5C-①-②-8-④-T2(T1)-⑤)	Mount is not interchangeable
		RCS-RA55-①-②-GD-L-④-⑤	→	(RCS2-RGD5C-①-②-4-④-T2(T1)-⑤)	Mount is not interchangeable
	RA55R	RCS-RA55R-①-60-GN-H-④-⑤	→	(RCS2-RA5R-①-60-16-④-T2(T1)-⑤)	Mount is not interchangeable
		RCS-RA55R-①-60-GN-M-④-⑤	→	(RCS2-RA5R-①-60-8-④-T2(T1)-⑤)	Mount is not interchangeable
		RCS-RA55R-①-60-GN-L-④-⑤	→	(RCS2-RA5R-①-60-4-④-T2(T1)-⑤)	Mount is not interchangeable

* ① above is the encoder type, ② is motor type, ③ is the lead, ④ is stroke, ⑤ is cable length.

Previous Product Model				New Product Model	Reference
Series	Type	Model		Model	
RCS	RB7525	RCS-RB7525-I-60-□-H-④-⑤	→	N/A	
		RCS-RB7525-I-60-□-M-④-⑤	→	N/A	
	RB7530	RCS-RB7530-I-②-GN-H-④-⑤	→	RCS2-RA7AD-I-②-12-④-T2(T1)-⑤	
		RCS-RB7530-I-②-GN-M-④-⑤	→	RCS2-RA7AD-I-②-6-④-T2(T1)-⑤	
		RCS-RB7530-I-②-GN-L-④-⑤	→	RCS2-RA7AD-I-②-3-④-T2(T1)-⑤	
		RCS-RB7530-I-②-GS-H-④-⑤	→	RCS2-RGS7AD-I-②-12-④-T2(T1)-⑤	
		RCS-RB7530-I-②-GS-M-④-⑤	→	RCS2-RGS7AD-I-②-6-④-T2(T1)-⑤	
		RCS-RB7530-I-②-GS-L-④-⑤	→	RCS2-RGS7AD-I-②-3-④-T2(T1)-⑤	
		RCS-RB7530-I-②-GD-H-④-⑤	→	RCS2-RGD7AD-I-②-12-④-T2(T1)-⑤	
		RCS-RB7530-I-②-GD-M-④-⑤	→	RCS2-RGD7AD-I-②-6-④-T2(T1)-⑤	
		RCS-RB7530-I-②-GD-L-④-⑤	→	RCS2-RGD7AD-I-②-3-④-T2(T1)-⑤	
	RB7535	RCS-RB7535-I-②-GN-H-④-⑤	→	RCS2-RA7BD-I-②-16-④-T2(T1)-⑤	
		RCS-RB7535-I-②-GN-M-④-⑤	→	RCS2-RA7BD-I-②-8-④-T2(T1)-⑤	
		RCS-RB7535-I-②-GN-L-④-⑤	→	RCS2-RA7BD-I-②-4-④-T2(T1)-⑤	
		RCS-RB7535-I-②-GS-H-④-⑤	→	RCS2-RGS7BD-I-②-16-④-T2(T1)-⑤	
		RCS-RB7535-I-②-GS-M-④-⑤	→	RCS2-RGS7BD-I-②-8-④-T2(T1)-⑤	
		RCS-RB7535-I-②-GS-L-④-⑤	→	RCS2-RGS7BD-I-②-4-④-T2(T1)-⑤	
		RCS-RB7535-I-②-GD-H-④-⑤	→	RCS2-RGD7BD-I-②-16-④-T2(T1)-⑤	
		RCS-RB7535-I-②-GD-M-④-⑤	→	RCS2-RGD7BD-I-②-8-④-T2(T1)-⑤	
		RCS-RB7535-I-②-GD-L-④-⑤	→	RCS2-RGD7BD-I-②-4-④-T2(T1)-⑤	
	R10	RCS-R10-I-60-18-300-⑤	→	RCS2-RT6-I-60-18-300-T2(T1)-⑤-L	
	R20	RCS-R20-I-60-18-300-⑤	→	RCS2-RT6R-I-60-18-300-T2(T1)-⑤-L	
	R30	RCS-R30-I-60-4-300-⑤	→	RCS2-RT7R-I-60-4-300-T2(T1)-⑤-L	
	SA4	RCS-SA4-①-20-H-④-⑤	→	RCA-SA4D-①-20-10-④-A1-⑤	
		RCS-SA4-①-20-M-④-⑤	→	RCA-SA4D-①-20-5-④-A1-⑤	
		RCS-SA4-①-20-L-④-⑤	→	RCA-SA4D-①-20-2.5-④-A1-⑤	
	SA5	RCS-SA5-①-20-H-④-⑤	→	RCA-SA5D-①-20-12-④-A1-⑤	
		RCS-SA5-①-20-M-④-⑤	→	RCA-SA5D-①-20-6-④-A1-⑤	
		RCS-SA5-①-20-L-④-⑤	→	RCA-SA5D-①-20-3-④-A1-⑤	
	SA6	RCS-SA6-①-20-H-④-⑤	→	RCA-SA6D-①-20-12-④-A1-⑤	
		RCS-SA6-①-20-M-④-⑤	→	RCA-SA6D-①-20-6-④-A1-⑤	
		RCS-SA6-①-20-L-④-⑤	→	RCA-SA6D-①-20-3-④-A1-⑤	
	SS	RCS-SS-①-60-H-④-⑤	→	RCS2-SS7C-①-60-12-④-T2(T1)-⑤	
		RCS-SS-①-60-M-④-⑤	→	RCS2-SS7C-①-60-6-④-T2(T1)-⑤	
	SSR	RCS-SSR-①-60-H-④-⑤	→	RCS2-SS7R-①-60-12-④-T2(T1)-⑤	
		RCS-SSR-①-60-M-④-⑤	→	RCS2-SS7R-①-60-6-④-T2(T1)-⑤	
	SM	RCS-SM-①-②-H-④-⑤	→	RCS2-SS8C-①-②-20-④-T2(T1)-⑤	
		RCS-SM-①-②-M-④-⑤	→	RCS2-SS8C-①-②-10-④-T2(T1)-⑤	
	SMR	RCS-SMR-①-②-H-④-⑤	→	RCS2-SS8R-①-②-20-④-T2(T1)-⑤	
		RCS-SMR-①-②-M-④-⑤	→	RCS2-SS8R-①-②-10-④-T2(T1)-⑤	

* ① above is the encoder type, ② is motor type, ③ is the lead, ④ is stroke, ⑤ is cable length.

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Points to Consider When Switching From Air Cylinder

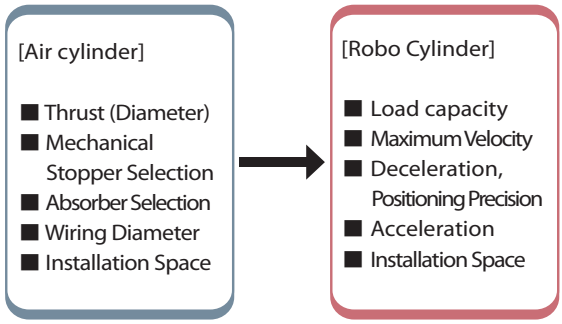
Air Cylinder and ROBO Cylinder

Air cylinders are devices used to push and grasp objects by means of supplying and releasing compressed air.
Air cylinders are used widely in all industries, mainly for transfer equipment, assembly systems, various automation systems, etc. Air cylinders generally have diameters of between 4mm and 320mm, and their lengths (strokes) can also be set in fine steps. There are several tens to hundreds of thousands of different air cylinder products, which makes it easy to select optimal models for a variety of applications. However, since product lines are overly complex, many with identical specs, it can be difficult to select the best model for your specifications.

For this reason, there are many cases where air cylinders are selected largely out of past experience and familiarity. ROBO Cylinders are easy-to-use electric cylinders offering a variety of functions not achievable with air cylinders. The ROBO Cylinder product family makes it easy for you to select the model that best suits the needsof you application. However, the controls and configuartion possibilities of ROBO Cylinders are completely different from air cylinders.
This section explains some of the key points to consider when switching from air cylinders to ROBO Cylinders.

Overview of Switching

The following explains the differences in the basic items to be checked when selecting ROBO Cylinders and air cylinders.
Since both are linear motion actuators, there are some common matters that must be taken into consideration. However, the different configurations and controls described above result in different designations for adjustments and check items between the two. A comparison of these various items is shown at left.



The above diagram shows that the two have different mechanical viewpoints to consider.

Installation Space

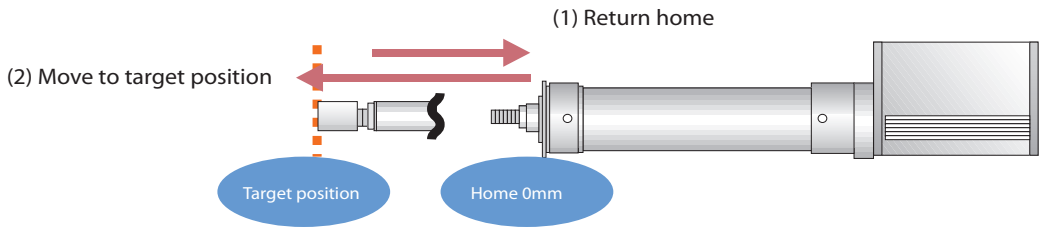
ROBO Cylinders are driven by a motor. Compared with air cylinders, simply from a size perspective, the ROBO Cylinder requires more attention paid to space requirements for installation.

Home Return

Unlike air cylinders, ROBO Cylinder operation is based on a "coordinates" concept. A home return operation is necessary at the beginning of operation because operations are controlled in movement quantities that are always referenced against a home point (0 point).

Specifically, in the case of incremental specifications, bear in mind that a pushing operation to the actuator stroke end will be performed as the initial operation when the power is turned ON.

■ Incremental Specification: Return home operation after power is turned ON
■ Absolute Specification: Absolute reset operation during initialization



Critical Rotating Speed

The ball screw inevitably deflects due to bending and its own deadweight. The ROBO Cylinder operates at high speeds causing the ball screw to rotate faster, and as the rotations increase the screw deflection also increases until the rotating axis is ultimately damaged. Hazardous rotational speeds that may damage the rotary axis are referred to as "critical speeds," "whirling speeds," or "whipping speeds." Ball screw type ROBO Cylinders operate linearly as the ball screw is rotated with the end of the ball screw supported by a bearing. Although the maximum speed is specified for each ROBO Cylinder in accordance with the actuator type, some models with certain strokes have their maximum speed set in consideration of the aforementioned critical rotating speeds.

General Purpose (Types, Modes, Parameters)

ROBO Cylinders offer the "air-cylinder specification (or air cylinder mode)" that allows the ROBO Cylinder to be used just like an air cylinder. When using these, it is possible to operate the actuator by simple ON/OFF control by an external signal in exactly the same way as an air cylinder. This type or mode may be sufficient in the case of a simple swap-out, but a variety of types and parameters have been introduced for customers who desire higher value-added uses.
Feel free to contact our Customer Center (Toll free 0800-888-008 8) to discuss features to match your use conditions and needs when the equipment is actually installed.

Maintenance

The key maintenance points of air cylinders and ROBO Cylinders are compared. Air cylinders require periodic maintenance performed according to the frequency and conditions of use. Although air cylinders offer a certain level of flexibility in that minor damage or malfunction can be ignored by means of increasing the source air pressure and moving the cylinder with a greater force, ignoring maintenance will inevitably shorten the service life of the air cylinder. On the other hand, ROBO Cylinders have a more complex structure and use a greater number of parts and are therefore seen as requiring cumbersome maintenance work. This is wrong.
ROBO Cylinders are clearly easier to use and offer longer life than air cylinders.

Of course, ROBO Cylinders also require lubrication of sliding parts just as air cylinders do.
However, ROBO Cylinders are equipped with a lubrication unit (AQ Seal) for ball screw and the sliding parts of the guides. This ensures a long maintenance-free period (5,000 km of traveled distance, or three years). After 5,000km or travel or 3 years, greasing every 6 months to 1 year as instructed in the Operating Manual will vastly prolong the service life of the product. In addition, absolute type controllers are currently equipped with a position retention battery. Since this is a consumable part, it must be periodically replaced (for periods that vary with the product).

[Primary Maintenance]

[Air cylinder]
- Lubricating sliding parts
- Gasket Replacement
- Draining
- Absorber replacement

[Robo Cylinder]
- Lubricating ball screw, guides (After AQ seals have worn out)
- Replacement battery (Absolute specification only)

Operation

Air cylinders are generally operated with the use of a direction control valve to determine the direction of reciprocating motion, as well as a flow control valve (speed controller) to determine the speed. Immediately after their system is started up, many users operate the air cylinder at low speed by restricting the flow control valve.

The same procedure is also recommended for ROBO Cylinders after the system is started up. With ROBO Cylinders, "speed setting" replaces the flow control valve. Operate your ROBO Cylinder at speeds where safety is ensured, and then change to the desired speed after safety is confirmed.

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SuperSEL Language

Our PSEL/ASEL/SSEL/XSEL controllers control actuator operation and communications, etc. using programs that have been prepared using the SuperSEL language.

The SuperSEL language is the simplest of the numerous robotic languages.
SuperSEL adeptly solves the difficult question of "realizing a high level of control with a simple language."

SuperSEL has a step-wise structure in which commands are entered in operation sequence, which are then executed in sequence from step 1, making it extremely easy to understand, even for a novice.

The SuperSEL language has two types of data: "program data," which runs commands to move the various axis and commands to performed external communications, and "position data," which records the positions to which the various axes are moved.

Program data can be entered as up to 6,000 command steps, which can be divided into 64 programs.
Position data can be registered for up to 3,000 positions, with 3-axes worth of position data for each position.

When each of the axis is moved, the motion command in the program data designates the number of position data, and it is moved to the position registered in the position data.

●Program Data

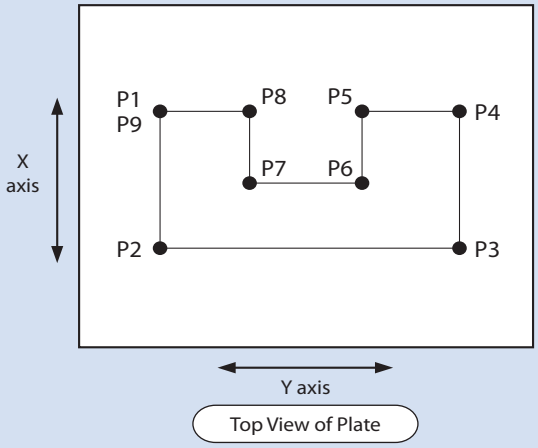
No.	B	E	N	Cnd	Cmnd	Operand 1	Operand 2
1					HOME	100	
2					HOME	11	
3					VEL	200	
4					WTON	1	
5					MOVL	1	
6					BTON	301	
7					WTON	2	
8					BTOF	301	
9					MOVL	2	
10					BTON	302	

●Position data

No.	Axis1	Axis2	Axis3	Ve
1	10.000	150.000	50.000	
2	20.000	140.000	50.000	
3	30.000	150.000	50.000	
4	40.000	140.000	50.000	
5	40.000	110.000	50.000	
6	30.000	100.000	50.000	

Operation Summary

Apply sealant to a plate along the path shown in the figure below.
Continuous movement is performed along a path from position 1 to position 9, without stopping.



Top View of Plate

Operation Sequence

P10 → P1 → P2 → P3 → P2 → P4 → P5 → P6 → P7 → P8 → P9

* Move from P1 to P9 without stopping

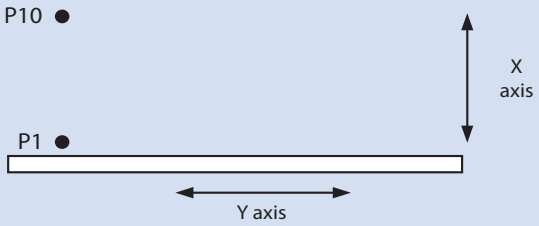


Plate Side View

Position data

	X axis	Y axis	Z axis
P1	10	150	50
P2	40	150	50
P3	40	70	50
P4	10	70	50
P5	10	90	50
P6	20	90	50
P7	20	130	50
P8	10	130	50
P9	10	150	50
P10	10	150	0

Program

Step	Extension Conditions	Input Conditions	Command	Operation 1	Operation 2	Output Conditions	Comment
1			HOME	100			Return home on Z axis only
2			HOME	11			Return home on XY axes
3			VEL	100			Set velocity to 100mm/sec
4			ACC	0.3			Set acceleration to 0.3G
5			TAG	1			Skip GOTO1 destination at Step 11
6			WTON	16			Stop until start button INPUT 16 is input
7			MOVP	10			Move to space above position 1 (position 10)
8			MOVP	1			Move (down) to position 1
9			PATH	2	9		With position 1 as base point, move continuously to position 9
10			MOVP	10			Move to space above position 1 (position 10)
11			GOTO	1			Jump to TAG1

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Explanation of Terms

This terminology is related to IAI products, and so the definitions are more limited than usual.

10,000km of travel service life

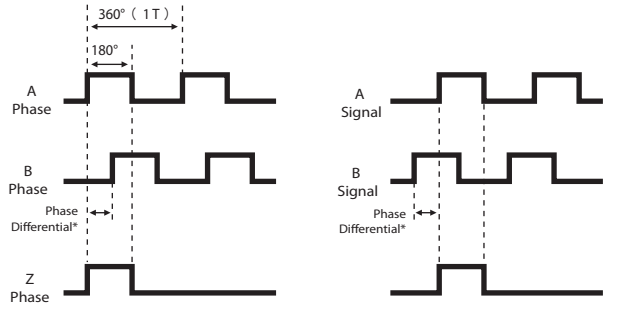
Around 10,000 hours must be guaranteed for actual use in the field. When converted to distance traveled, considering the motion velocity and work ratio, etc. at the time, this becomes 5,000km to 10,000km. While there is more than enough guide life for radial loads, uneven loads due to moment loads are problematic to the service life.
Therefore, the dynamic rated load moment is indicated at which we are able to guarantee 10,000km of travel, and the service life is 10,000km of travel.

50km Travel Service Life

The guide maker has proposed a method of expression as one of the ways of expressing the allowable load capacity. This is the value at which there is a 90% probability that it will not break when operated with this allowable radial load (basic dynamic rated load) exerted (survival probability). Calculating the actual distance of travel, considering the motion velocity and work rate, etc. an actual industrial equipment, it is necessary to ensure 5,000km to 10,000km of travel. From that viewpoint, this data is difficult to understand and difficult to utilize.

A phase (signal) output, B phase (signal) output

As shown in the diagram, clockwise and counterclockwise rotation of the axis is determined by the A-phase and B-phase phase differential in incremental output. For clockwise rotation, A-phase is directed toward B-phase.



Note: 360° (1T) is the electrical angle, not mechanical angle.

C10

The lower the ball screw grade, the higher the precision.
Rolled: C10 is rated at a typical motion error of ±0.21mm at 300mm stroke. See P451 for ball screw precision.

CCW (Counter Clockwise Rotation)

Abbreviation for Counter Clockwise Rotation.
Left rotation when viewed from the axis, i.e., rotation in the direction opposite that of the hands on a clock.

CW (Clockwise Rotation)

Abbreviation for Clockwise Rotation.
Right rotation when viewed from the axis, i.e., rotation in the direction of the hands on a clock.

PLC

Abbreviation for Programmable Logic Control.
(Refers both to sequencers and programmable controllers)
Controller that can be programmed to control production facilities and equipment.

SEL Language

Abbreviation for Shimizu Kiden Ecology Language, the name of our proprietary programming language.

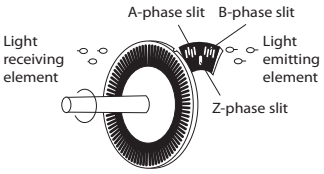
Z-phase

The phase (signal) that detects the incremental encoder reference point, used to detect home during return-home operation.
Searching for the Z-phase signal for reference during return-home is called a "Z-phase search."

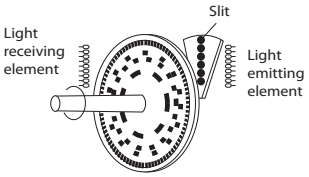
Encoder

Device to sense RPMs and direction of rotation by shining a light on a disk with slits and using a sensor to detect whether the light is ON or OFF by rotating the disk. (Device to convert rotation to pulses) The controller detects the slider position and velocity by the signal from this encoder.

● Incremental



● Absolute



An incremental encoder
detects the rotational angle or RPMS on an axis by the number of output pulses. Therefore, a counter is necessary to cumulatively add the number of output pulses in order to detect rotational angle and RPMs. Meanwhile, this has the advantage of being able to electrically increase resolution by utilizing the rise and fall points in the pulse waveform to double or quadruple the pulse generation frequency.

An absolute encoder
is able to find the absolute position of an axis at all times, even when the rotating slit is static, in order to detect the rotational angle of the axis from the state of the rotating slit. Consequently, the rotational position of the axis can always be checked even without a counter. In addition, since the home point of the input rotation axis is determined at the time it is assembled into the machine, the number of rotations from home can always be accurately expressed, even when turning the power ON during startup or after a power interruption or emergency stop.

Overhang

The extension of something mounted on the actuator to the front or rear, left or right, above or below.

Override

Set to a % of the running speed. (Ex.: If VEL is set to 100mm/sec, the override is 30mm/sec when set to 30.)

Overload check

To check for overload. (One of the protection functions)

Open collector output

In a system that has no overload resistance in the voltage output circuit, signal is output in a form that is synched to the load current Since this circuit can turn the load current ON/OFF regardless of voltage potential to which the current is connect, it is useful for switching an external load and is widely used as a relay or ramp circuit or the like for switching external loads, etc.

Open loop system

One type of control system. A system that operates only on commands, without any feedback.
A typical example is a stepping motor, where a loss of synchronization (signal error) cannot be corrected by the controller because the command value and the actual value are not compared.

Offset

Shift from a position.

Offline

The state when PC compatible software is started without a RS232 cable connected to the controller.

Operation

Operation.

Online mode

The state when PC compatible software is started with a RS232 cable connected to the controller.

Guide

A mechanism for guiding (supporting) the actuator slider.
A bearing mechanism that supports linear operations.

Guide module

An axis in a two-shaft assembly that is used in parallel with the X-shaft to assist at the tip of the Y-shaft when the Y-shaft overhang is great. Typical models are the FS-12WO and FS-12NO types.

Coupling

A component to form a joint between two axes.
Ex.: The joint between the ball screw and the motor.

Gantry

A type of assembly in which a Y-axist support guide is mounted in a two-axes XY assembly, so that heavy objects can be carried by the Y-axis.

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Explanation of Terms

Key slotted

A rotary shaft or mounting component is machined with a slot for key mounting.
(Key: One means of preventing positional slip in the rotation direction of the rotary axis and the mounting component)

Creep sensor

An optional sensor to allow high-speed home-return operation.

Cleanliness

Class 100 and Class 10, etc. are units for expressing cleanliness. Class 10 (0.1µm) indicates an environment in which there are fewer than 10 pieces of debris 0.1µm or smaller per cubic foot.

Grease

High-viscosity oil applied to contact surfaces to make guide or ball screw movement smooth.

Greasing

Injection or application of grease to sliding parts.

Gain

The numeric value of an adjustment of the controller's reaction (response) when controlling the servo motor. Generally, the higher the gain the faster the response, and the lower it is the slower the response.

Servo-free (Servo OFF)

The state in which the motor power is OFF. The slider can be moved freely.

Servo-lock (Servo ON)

The state in which, opposite to the above, the motor power is turned ON. The slider is continually held at a determined position.

Cycle time

Time taken by one process.

Bellows

A sheet to prevent the infiltration of dust or debris from outside.

SCARA

SCARA is an acronym for Selective Compliance Assembly Robot Arm, and refers to a robot that has the feature of maintaining compliance (tracking) only in a specified direction (horizontal), and being highly rigid in the vertical direction.

Skipping motor

A motor that performs angular positioning in proportion to an input pulse signal by means of open loop control.

Stainless sheet

A dust-proof sheet used in ISD, DS, RC, etc. slider types.

Slider mounting weight [kg]

The maximum mounting weight of the slider when operating normally, without major distortion in the velocity waveform or current waveform, when operated at the specified acceleration/deceleration factor (factory settings).

Thrust load

The load exerted in the axial direction.

Semi-closed loop system

A system for controlling the position information or velocity information sent from the encoder with constant feedback to the controller.

Software limit

A limit in the software beyond which a given set stroke will not advance.

Dynamic brake

A brake that uses the motors regenerative energy.

Dispenser

A device that controls the flow rate of a liquid. Incorporated into devices for applying adhesives and sealants, etc.

Duty

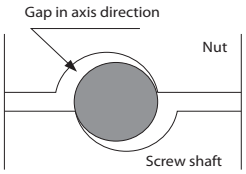
Indicates the work ratio in the equipment industry.
(Ex.: The time that the actuator operates in one cycle.)

Screw type

The types of screws at right are available for converting rotary motion of the motor to linear motion. IAI single-axis robots and electric cylinders basically use rolled ball screws.

		Characteristics
Ball screw	Polished	Expensive screw with good precision because it has been polished
	Rolled	High-volume production is possible because the screw has been rolled.
Slip screw		Inexpensive, but poor precision and short service life. Also not good for high-speed operation.

Backlash



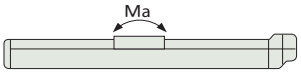
As shown in the figure on the right, there is a gap between the nut and the ball (steel ball) and the screw shaft. Even if the screw shaft moves, the nut will not move the extent of the gap. The mechanical play in the direction of this slider movement is called the backlash. The measurement method used is to feed the slider, then use the reading for the slight amount of movement time shown on a test indicator as a standard. Also, in that condition, without using the feed device, move the slider in the same direction with a fixed load, then without the load. Then find the difference between the standard value and the time when the load was removed. This measurement is conducted at the midpoint of the distance of movement and at points nearly at the two ends. The maximum value obtained among the values is used as the measurement value.

Pitch error [pitch deviation or lead deviation]

Due to problems in the manufacturing, such as the heat treatment process used, it cannot be assumed that there are only a few deviations in the screws/ball screws; a key mechanical element for the actuator, might be found under close examination. A JIS rating is used to indicate the qualitative accuracy of these items. These items made for the market must meet tolerance values set as Class C10.
The accuracy required to meet the C10 standard is to be within a margin of error of ±0.21mm for every 300mm of length. Generally the screw pitch error deviation accumulates in a plus or minus direction. One method of improving these items is to grind them in a finishing process.
(Example:) When the positioning is 300mm from home. The machine accepts a set position of 300 ±0.21. Here, in a case in which the actual stop position is 300.21, and using a method in accordance with JIS6201, if the 300.21 position is repeatable and maintained at that position (±0.02), then the repeatability standard for accuracy is met.

Pitch

Forward-backward movement along the slider movement axis. (Ma direction)



Brake

Mainly, a vertical axis is used. When the servo is off, slider drop is prevented.
With power cut the brake is ON.

Flexible hose

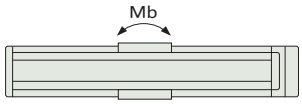
Tube for SCALAR Robot MPG cable that user passes wiring through.

Mechanical end

Position where actuator slider comes to mechanical stop.
Mechanical stopper. (Example: Urethane rubber)

Yawing

Motion at an angle in a left-right direction along slider movement axis. (Mb direction)
Along with pitching, laser angle measurement system is used for measurement, and the reading is the indication of maximum difference.



Radial load

Load up to down in a direction 90° to horizontal slider.

Lead

This indicates the distance moved when the feed screw lead and motor turn over once (in other words, feed screw rotates once).

View of lead value

The lead value is used to change the actuator speed and thrust.

- With AC servo motor IS speed, the rated rotation is 3000 rpm. In other words, this is 50 rotations per second. In this case, with the screw lead at 20mm, speed is 50 rotations/s × 20mm/rotations = 1000mm/s.
- Thrust If lead is great, then thrust is small and if lead is small, then thrust is great.

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Explanation of Terms

Rolling

Movement at angle to rotation around axis that occurs along slider movement axis. (Mc direction)

Backlash (mm)

First, for one position, run with positioning straight in front and then measure that position. Next, make a movement in the same direction by issuing a command. Then, issue the same command for movement in a negative direction from the position. Conduct positioning in the negative direction and measure that position. Again, issue a command for a movement in the negative direction, and issue the same command for a positioning movement straight ahead from that position. Then measure that position.
Using this method, repeat measurements straight ahead and in negative directions-seven times each. Conduct positioning for each and obtain the deviation from the average value for each stop position. Determine the position for the center of the movements in these measurements and positions nearly at both ends. The measurement value will be the maximum value among those obtained.
(Conforming to JIS B6201)

Positioning band

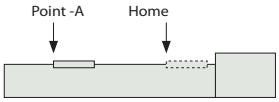
This is viewed as the in position band for positioning at an expected point. Setting with parameters. (PEND BAND)

Positioning Settling Time

The gap between the actual movement time and the ideal calculated value for movement. (Positioning operation time; processing time for internal controller operations.)The broader meaning includes the time for convergence of the mechanical swing.

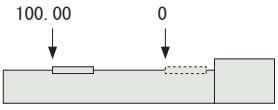
Positioning Repeatability

The variation in stop position accuracy for repeated positioning toward the same point.



Absolute positioning accuracy

When arbitrary positioning point is specified with coordinate values, the difference between coordinate values and actual measured values.



Recovery energy

The energy generated when the motor turns over that returns to the motor driver (controller) during motor deceleration. This energy is called recovery energy.

Recovery resistance

Resistance to recovery current.
The recovery resistance needed in our company's controllers is noted in each page on controllers.

External operation mode

This is the operation mode started by a start signal from an external device (PLC, etc.).
This is also called automatic operation.

Excess voltage

Voltage applied to motor that exceeds regulation value when order speed is too rapid.

Work rate

The time the actuator actually works (operates) divided by the time stopped. This is also called duty.

Load capacity

The weight of things that can be moved by the actuator slider/rod.

Critical speed

Ball screw resonation with slider speed (No. of ball screw rotations). The maximum physical speed limit that can be utilized.

Home

Reference point for actuator operation.
The pulse counts are determined and recorded for all positions the actuator moves to from home.

Home accuracy

The amount of variation among the positions when home return is performed (if home varies, all positions vary).

MEMO

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Selection Standard (Speed vs. Load Capacity Graph)

ERC2 Series **Slider type**

Horizontal setting or vertical setting

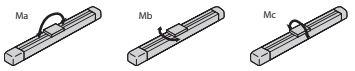
Select speed type from device cycle time

Please use the speed vs. load capacity graph below to select type for your purpose.

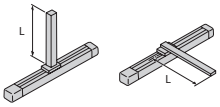
Caution for Use

- When you use a slider type, if the overhang from the center of the object mounted on the slider is great, please consider the load moment and the overhang load length.

Use load moments
within the range of each load moment Ma, Mb, Mc.

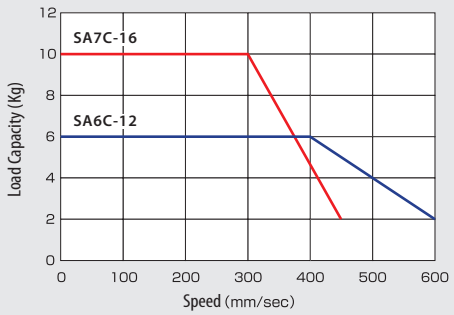
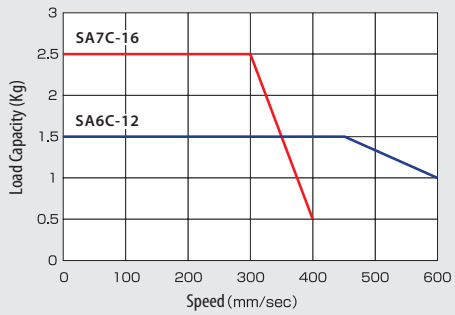
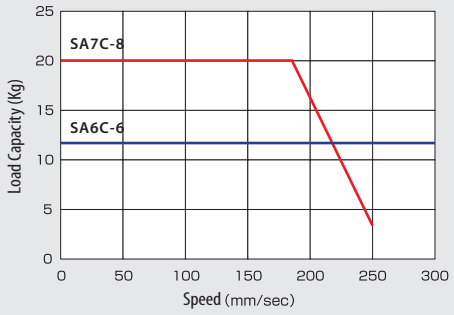
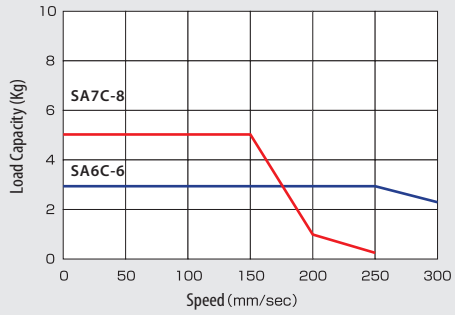
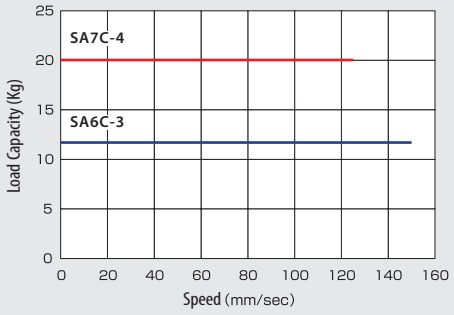
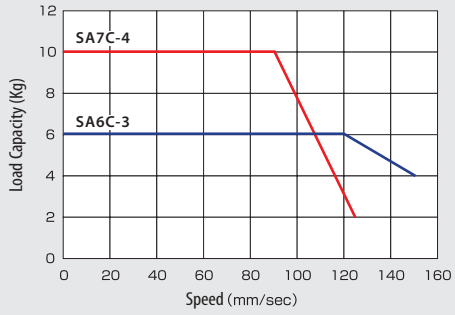


Overhang load length
The value when the mounted object's center of gravity is L/2. When an object mounted in the direction of either Ma, Mb, or Mc overhangs, please use the product in a range within this value



- **Note that the maximum speed for the SA6 type's 600 strokes is limited by the relation to the critical number of rotations.**
600 stroke (Lead 12:515mm/sec., Lead 3:125mm/sec.)

Maximum speed 600 mm/sec
300 mm/sec
150 mm/sec

	Horizontal setting	Vertical setting
High-speed type		
Medium-speed type		
Low-speed type		

Note: In the graph above, the number after the type is the lead number.

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ERC2 Series **Rod type standard model**

Horizontal setting or vertical setting

Select speed type from device cycle time

Please use the speed vs. load capacity graph below to select type for your purpose.

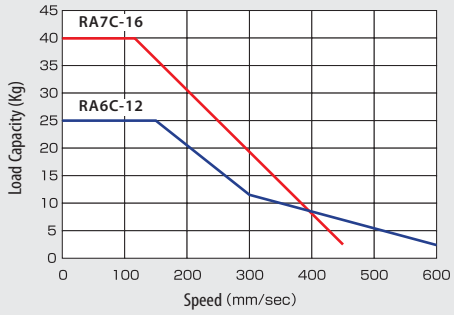
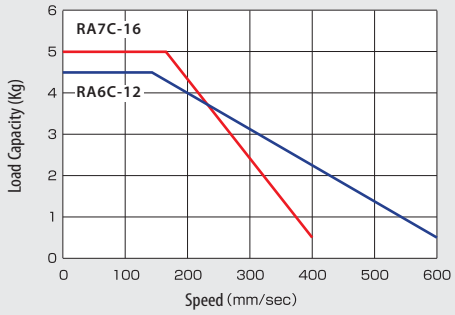
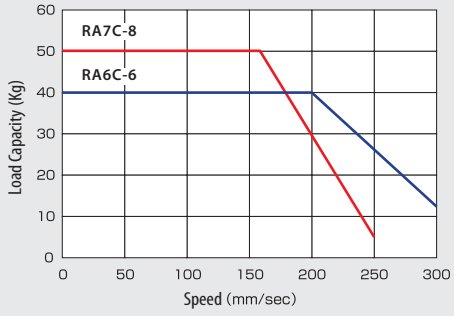
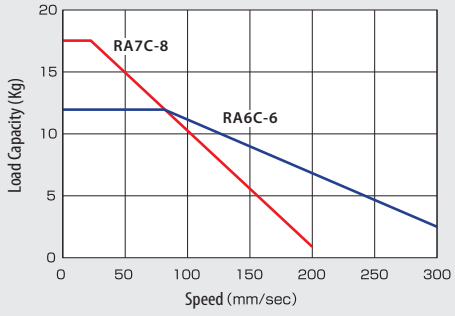
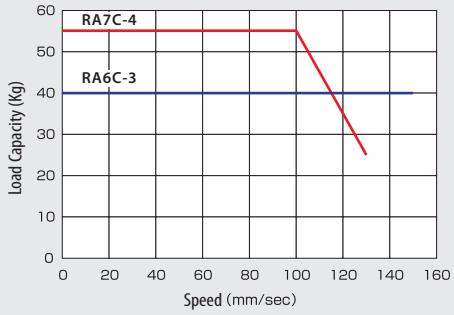
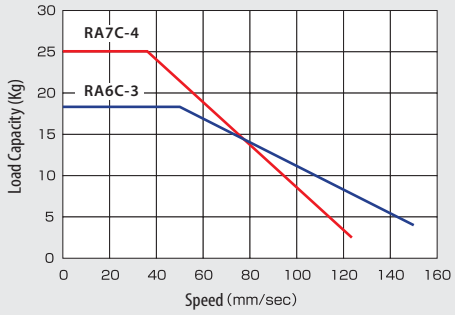
Caution for Use

- Absolutely no external force is considered for the rod type, other than that coming from the direction of the rod's advance. We advise you to add a guide when an external force at a right angle to the rod direction and in the direction of the rotation is applied.
- The standard value in the table below is the value when an external guide is added.
- Note that the maximum speed for the SA6 type's 300 strokes is limited by the relation to the critical number of rotations.
  300 stroke (Lead 12:500mm/sec., Lead 6:250mm/sec., Lead 3:125mm/sec)

Maximum speed 600 mm/sec

300 mm/sec

150 mm/sec

	Horizontal setting	Vertical setting
High-speed type		
Medium-speed type		
Low-speed type		

Note: In the graph above, the number after the type is the lead number.

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Selection Standard (Speed vs. Load Capacity Graph)

RCP3 Series **Slider type**

Horizontal setting or vertical setting

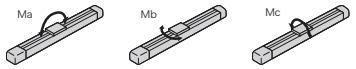
Select speed type from device cycle time

Please use the speed vs. load capacity graph below to select type for your purpose.

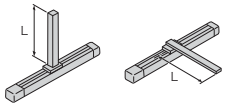
Caution for Use

When you use a slider type, if the overhang from the center of the object mounted on the slider is great, please consider the load moment and the overhang load length.

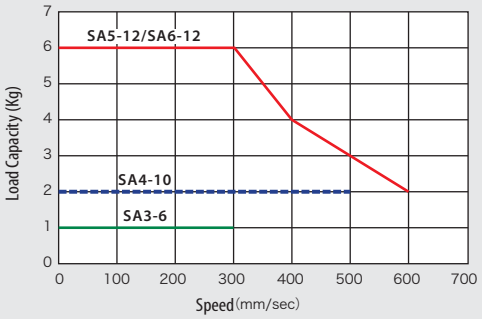
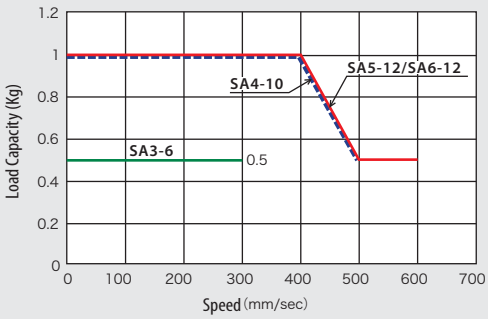
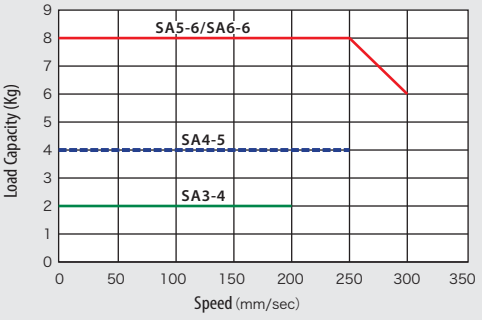
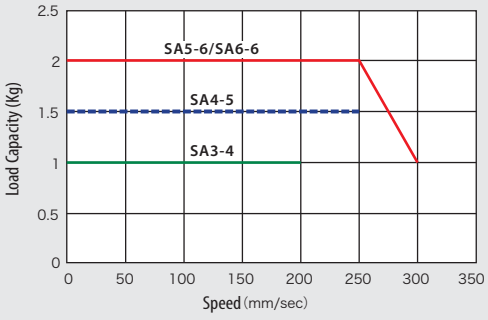
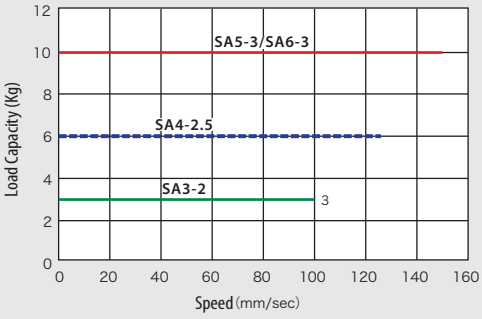
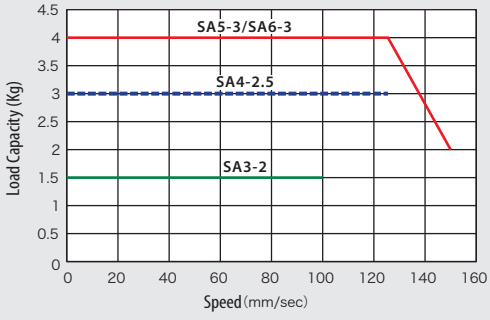
Use load moments
within the range of each load moment Ma, Mb, Mc.



Overhang load length
The value when the mounted object's center of gravity is L/2. When an object mounted in the direction of either Ma, Mb, or Mc overhangs, please use the product in a range within this value



Maximum speed 600 mm/sec

	Horizontal setting	Vertical setting
High-speed type (300 mm/sec)		
Medium-speed type (150 mm/sec)		
Low-speed type		

Note: In the graph above, the number after the type is the lead number.

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RCP3 Series **Table type**

Select horizontal use or vertical use

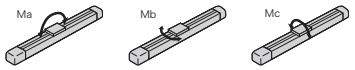
Select speed type from device cycle time

Please use the speed vs. load capacity graph below to select type for your purpose.

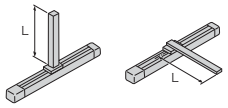
Caution for Use

When you use a slider type, if the overhang from the center of the object mounted on the slider is great, please consider the load moment and the overhang load length.

Use load moments
within the range of each load moment Ma, Mb, Mc.



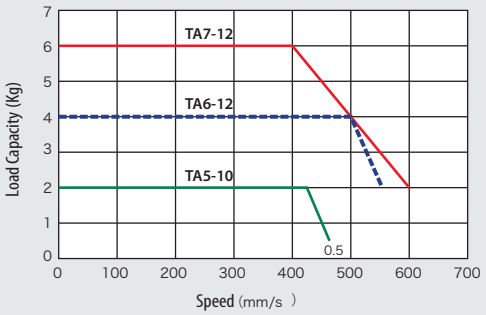
Overhang load length
The value when the mounted object's center of gravity is L/2. When an object mounted in the direction of either Ma, Mb, or Mc overhangs, please use the product in a range within this value



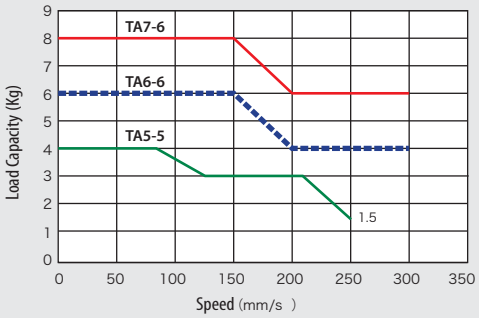
Maximum speed
600 mm/sec
300 mm/sec
150 mm/sec

Horizontal setting

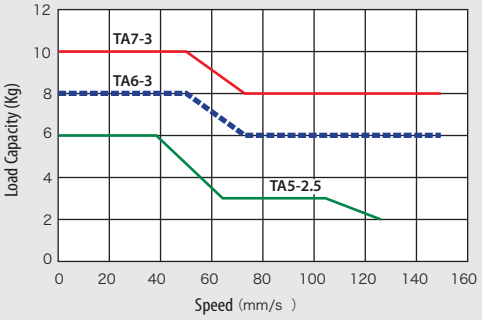
High-speed type



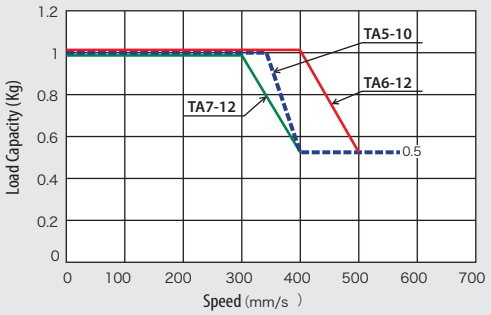
Medium-speed type

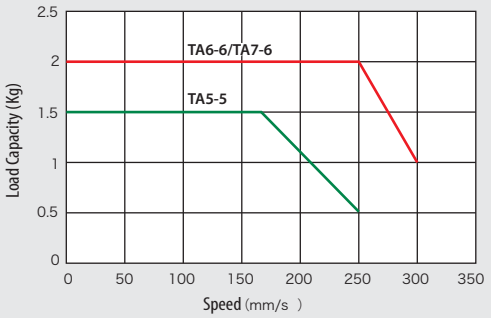


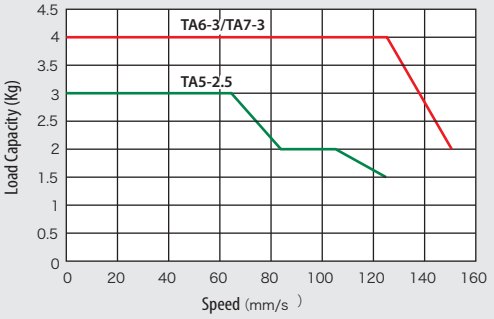
Low-speed type



Vertical setting







Note: In the graph above, the number after the type is the lead number.

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Selection Standard (Speed vs. Load Capacity Graph)

RCP2 Series | Slider type (motor straight type)

Horizontal setting or vertical setting

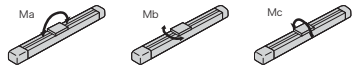
Select speed type from device cycle time

Please use the speed vs. load capacity graph below to select type for your purpose.

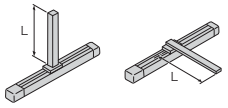
Caution for Use

When you use a slider type, if the overhang from the center of the object mounted on the slider is great, please consider the load moment and the overhang load length.

Use load moments
within the range of each load moment Ma, Mb, Mc.



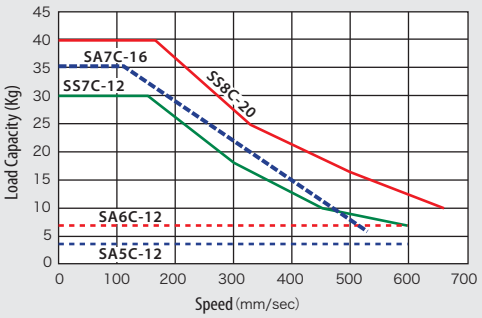
Overhang load length
The value when the mounted object's center of gravity is L/2. When an object mounted in the direction of either Ma, Mb, or Mc overhangs, please use the product in a range within this value



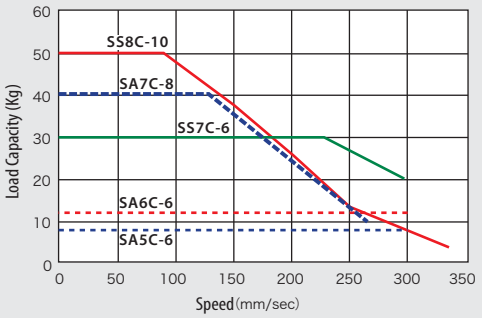
Maximum speed
600 mm/sec
300 mm/sec
150 mm/sec

Horizontal setting

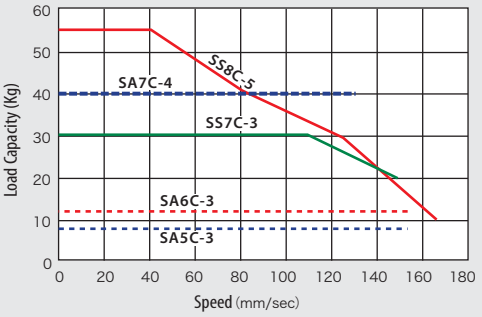
High-speed type



Medium-speed type

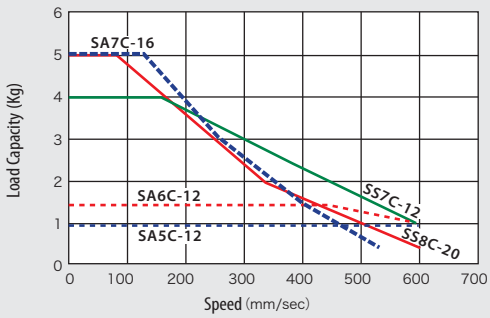


Low-speed type

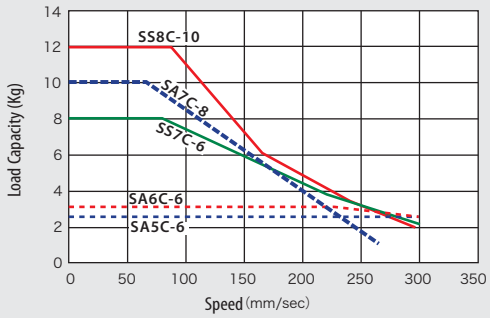


Vertical setting

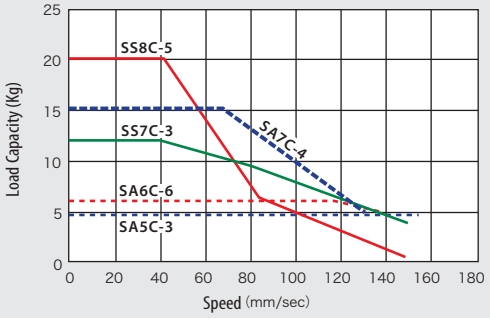
High-speed type



Medium-speed type



Low-speed type



Note: In the graph above, the number after the type is the lead number.

RCP2 Series **Slider type (motor reversing type)**

Select horizontal use or vertical use

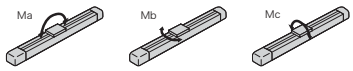
Select speed type from device cycle time

Please use the speed vs. load capacity graph below to select type for your purpose.

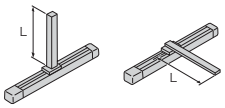
Caution for Use

When you use a slider type, if the overhang from the center of the object mounted on the slider is great, please consider the load moment and the overhang load length.

Use load moments
within the range of each load moment Ma, Mb, Mc.



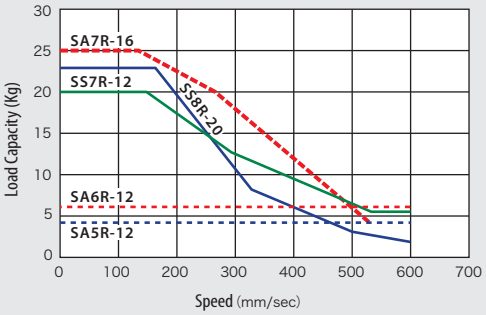
Overhang load length
The value when the mounted object's center of gravity is L/2. When an object mounted in the direction of either Ma, Mb, or Mc overhangs, please use the product in a range within this value

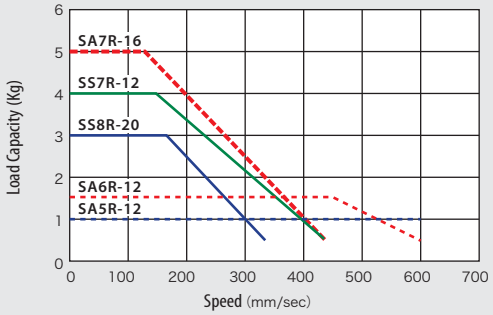


Maximum speed
600 mm/sec
300 mm/sec
150 mm/sec

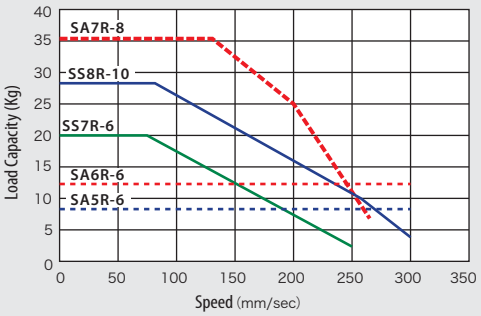
Horizontal setting | **Vertical setting**

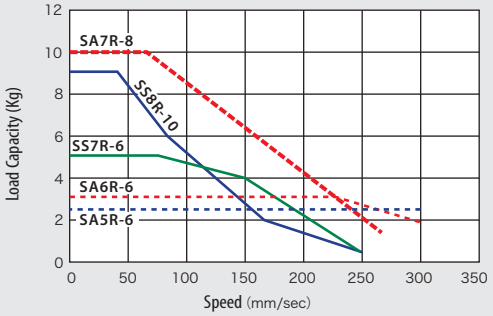
High-speed type



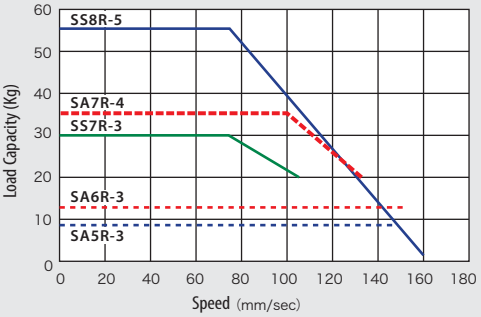


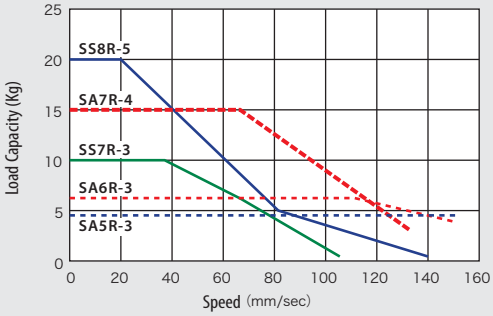
Medium-speed type





Low-speed type





Note: In the graph above, the number after the type is the lead number.

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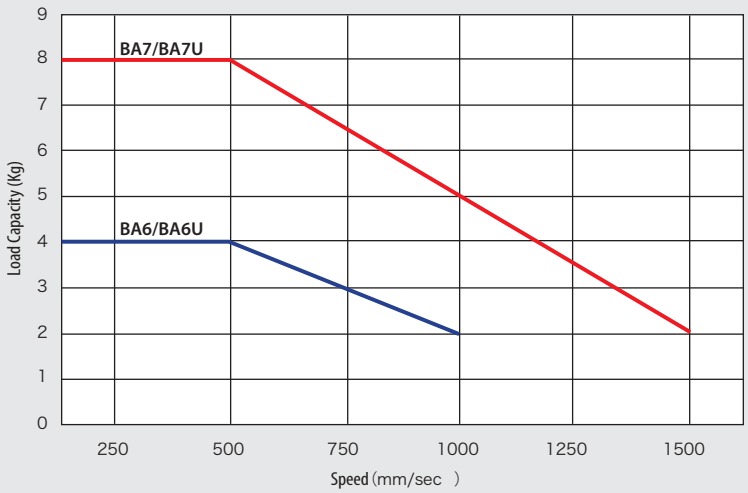
Selection Standard (Speed vs. Load Capacity Graph)

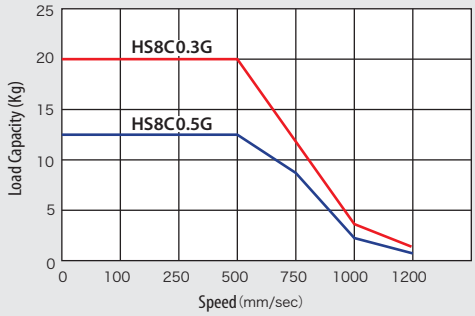
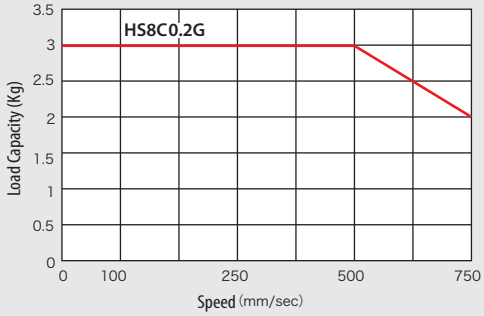
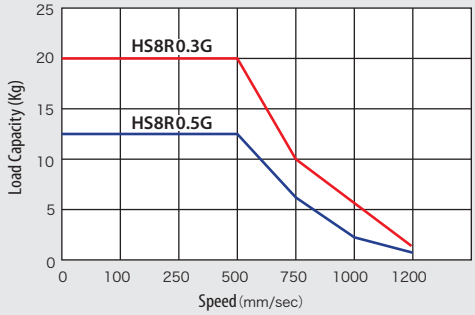
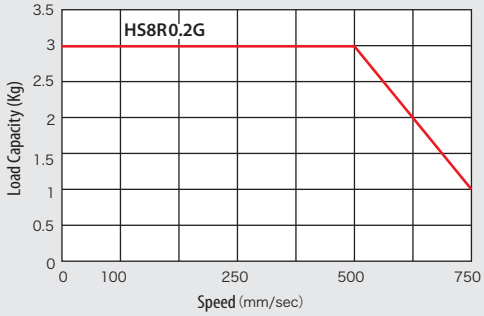
RCP2 Series Slider belt type

Refer to the Speed vs. Load Capacity Graph below to select a type for your purpose.

Horizontal setting



RCP2 Series Slider high-speed ball-screw type

	Horizontal setting	Vertical setting
RCP2-HS8C		
RCP2-HS8R		

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RCP2 Series **Rod standard type**

Select horizontal use or vertical use

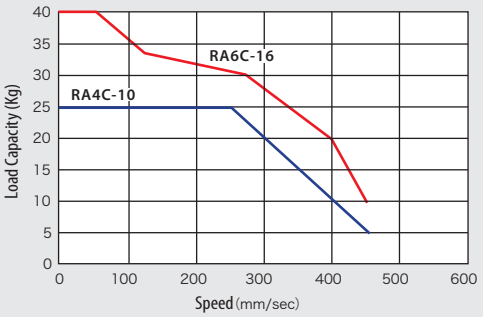
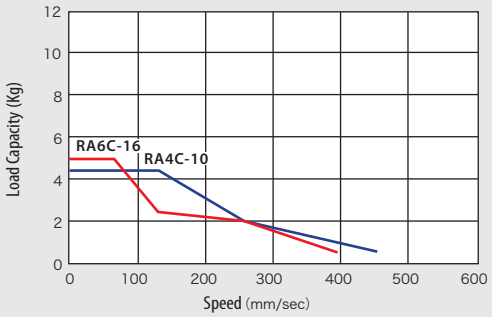
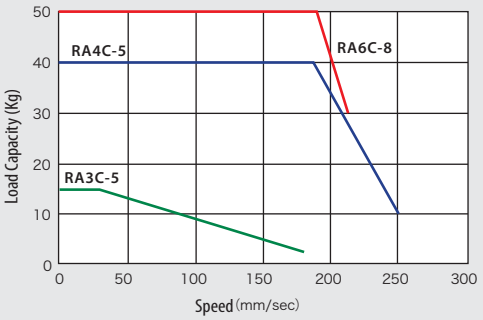
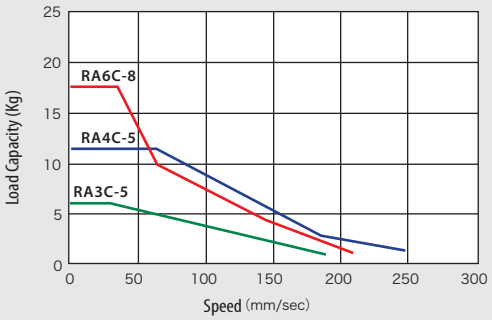
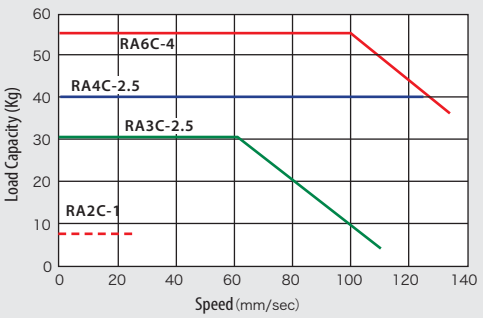
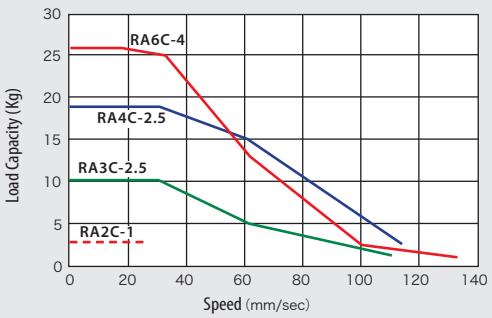
Select speed type from device cycle time

Please use the speed vs. load capacity graph below to select type for your purpose.

Caution for Use

- Absolutely no external force is considered for the rod type, other than that coming from the direction of the rod's advance.
  We advise that you add a guide or use a highly rigid type when an external force is applied at a right angle to the rod and in the rotation direction

Maximum speed
500 mm/sec
250 mm/sec
125 mm/sec

	Horizontal setting (Note 1)	Vertical setting
High-speed type		
Medium-speed type		
Low-speed type		

Note: In the graph above, the number after the type is the lead number.
Note 1: This is the number in the case of horizontal specification, when an external guide is attached.

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Selection Standard (Speed vs. Load Capacity Graph)

RCP2 Series **Single guide type**

Horizontal setting or vertical setting

Select speed type from device cycle time

Please use the speed vs. load capacity graph below to select type for your purpose.

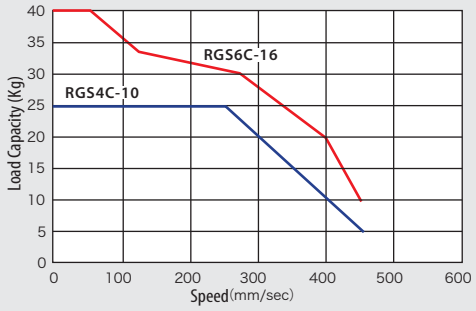
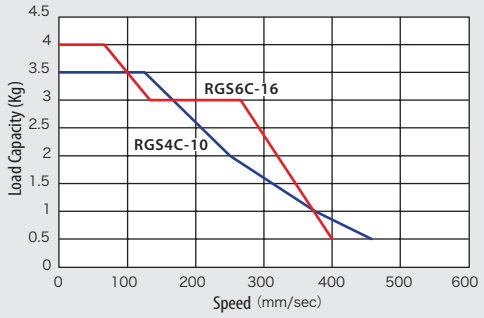
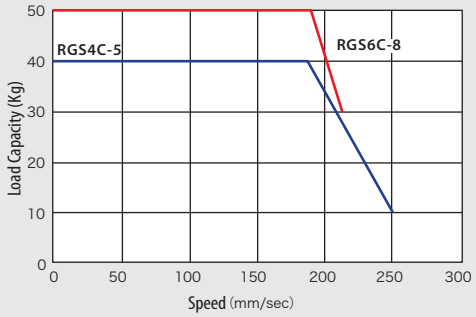
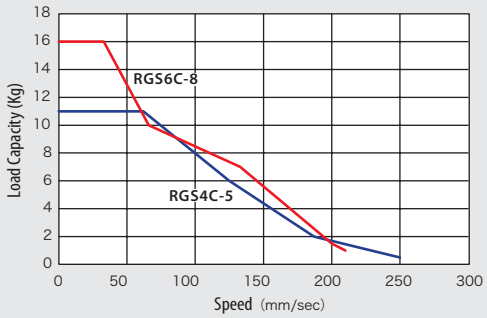
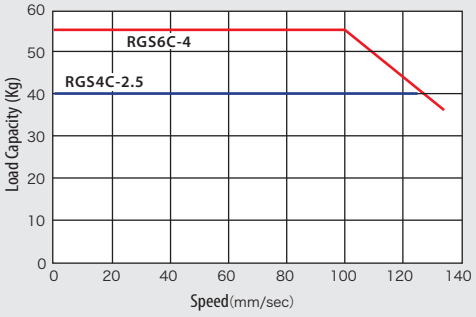
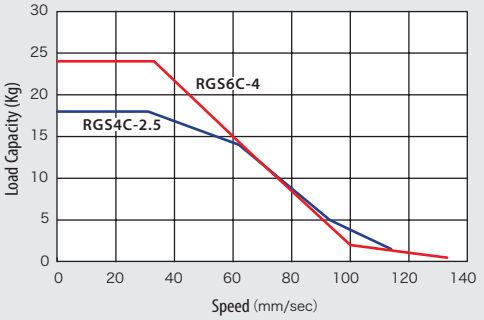
Caution for Use

● This is the number in the horizontal setting graph in the table below when an external guide is attached.

Maximum speed 500 mm/sec

250 mm/sec

125 mm/sec

	Horizontal setting (Note 1)	Vertical setting
High-speed type		
Medium-speed type		
Low-speed type		

Note: In the graph above, the number after the type is the lead number.
Note 1: This is the number in the case of horizontal specification, when an external guide is attached.

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RCP2 Series **Double-guide type**

Horizontal setting or vertical setting

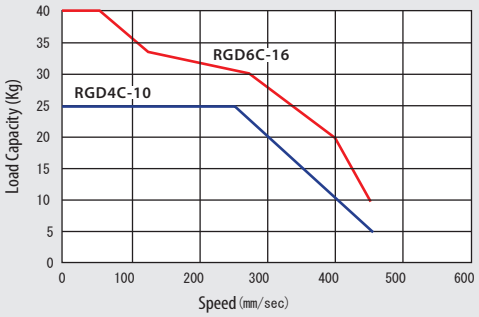
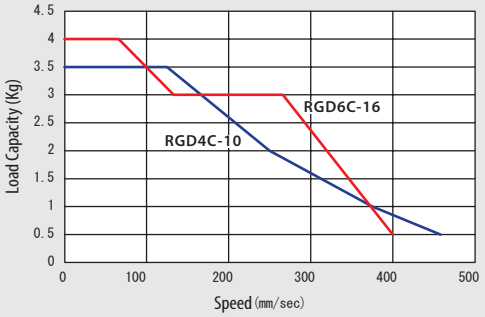
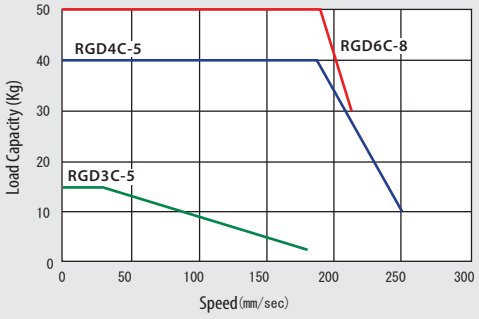
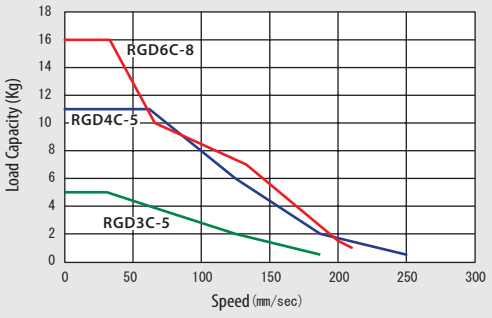
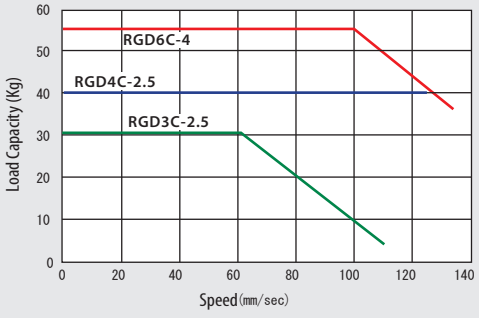
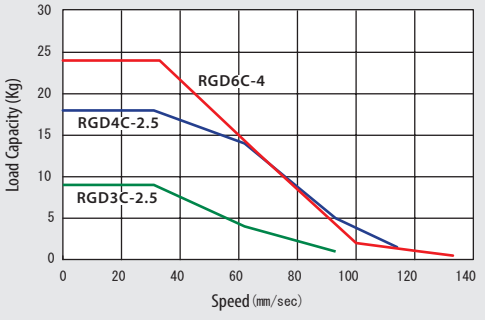
Select speed type from device cycle time

Please use the speed vs. load capacity graph below to select type for your purpose.

Caution for Use

● This is the number in the horizontal setting graph in the table below when an external guide is attached.

Maximum speed
500 mm/sec
250 mm/sec
125 mm/sec

	Horizontal setting (Note 1)	Vertical setting
High-speed type		
Medium-speed type		
Low-speed type		

Note: In the graph above, the number after the type is the lead number.
Note 1: This is the number in the case of horizontal specification, when an external guide is attached.

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Selection Standard (Speed vs. Load Capacity Graph)

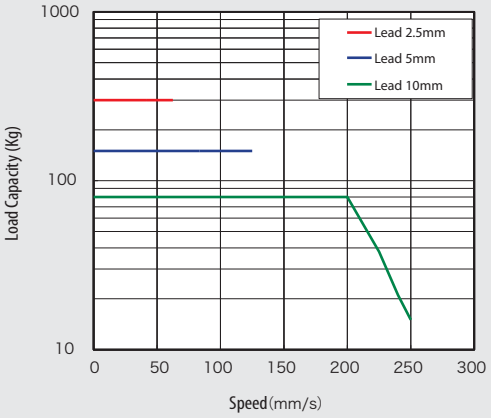
RCP2 Series **High-thrust type**

Caution for Use

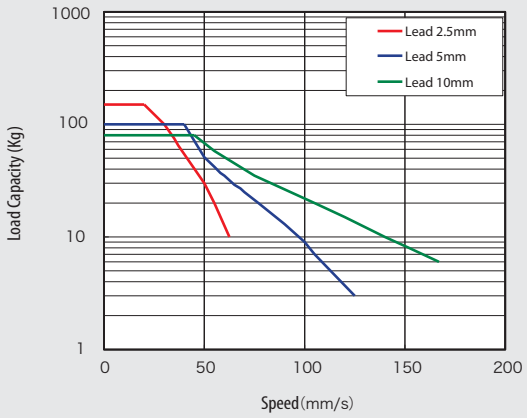
- Absolutely no external force is considered for the rod type, other than that coming from the direction of the rod's advance. We advise you to add a guide when an external force is applied at a right angle to the rod and in the rotation direction.
- This is the number in the horizontal setting graph in the table below when an external guide is attached.

Refer to the Speed vs. Load Capacity Graph below to select a type for your purpose.

Horizontal setting



Vertical setting



Note: In the graph above, the number after the type is the lead number.

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RCP2CR Series **Slider type (motor reversing type)**

Horizontal setting or vertical setting

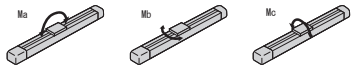
Select speed type from device cycle time

Please use the speed vs. load capacity graph below to select type for your purpose.

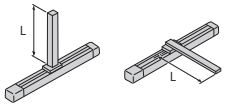
Caution for Use

When you use a slider type, if the overhang from the center of the object mounted on the slider is great, please consider the load moment and the overhang load length.

Use load moments
within the range of each load moment Ma, Mb, Mc.



Overhang load length
The value when the mounted object's center of gravity is L/2. When an object mounted in the direction of either Ma, Mb, or Mc overhangs, please use the product in a range within this value



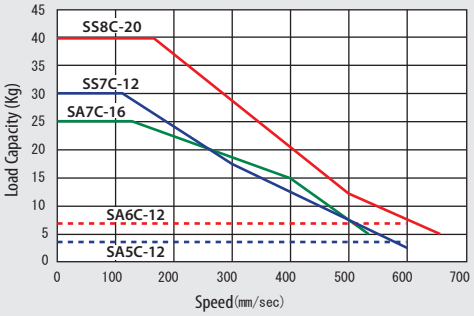
Maximum speed 600 mm/sec

300 mm/sec

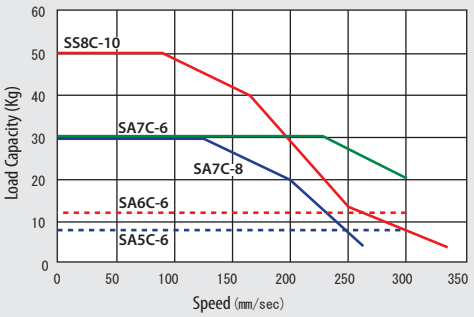
150 mm/sec

Horizontal setting

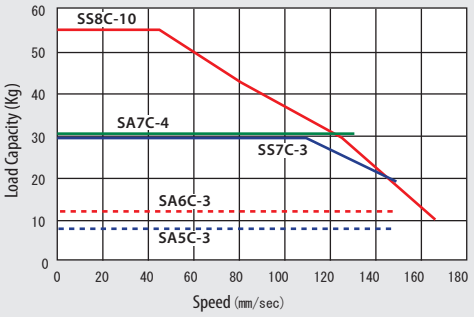
High-speed type



Medium-speed type

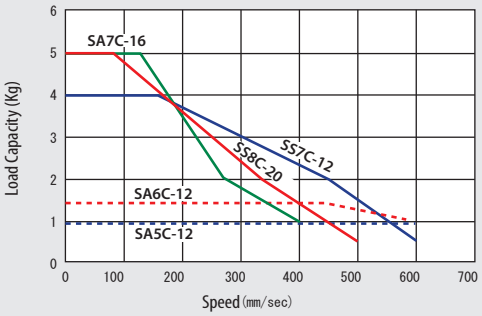


Low-speed type

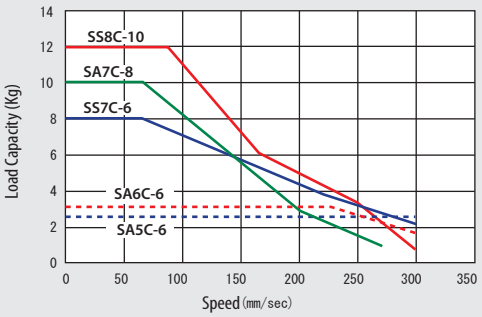


Vertical setting

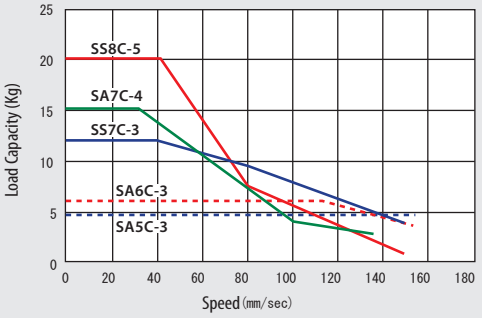
High-speed type



Medium-speed type



Low-speed type



Note: In the graph above, the number after the type is the lead number.
(Note 1:) Vibration overshoot may occur if the maximum load capacity relative to the speed is used. Please consider a margin up to 70% when making a selection.

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Selection Standard (Speed vs. Load Capacity Graph)

RCP2W Series **Rod type**

Select horizontal use or vertical use

Select speed type from device cycle time

Please use the speed vs. load capacity graph below to select type for your purpose.

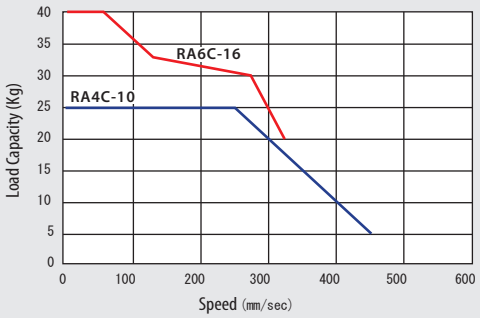
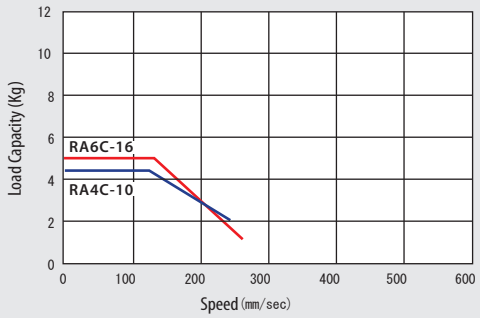
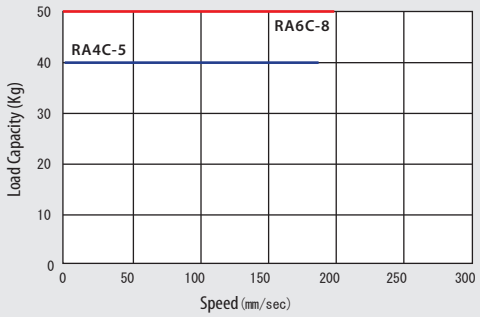
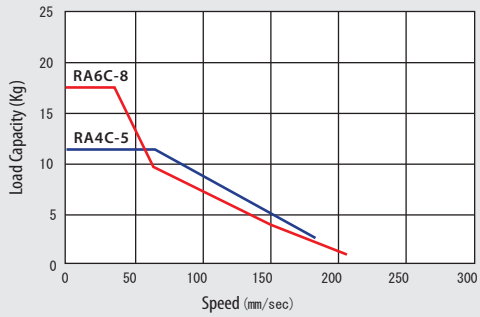
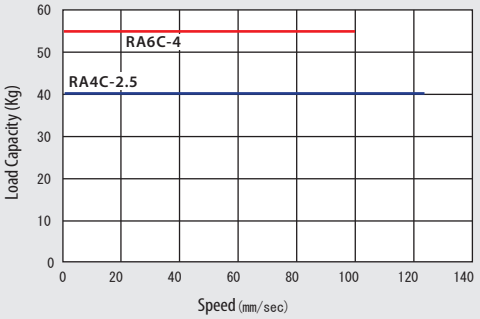
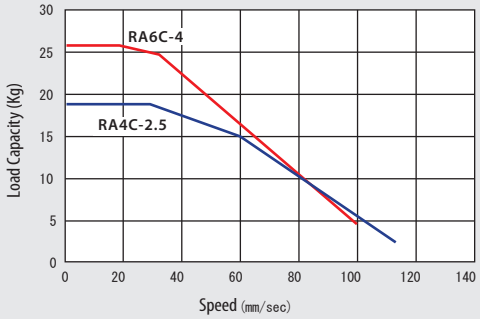
Caution for Use

- With the rod type, absolutely no external force is considered other than that coming from the direction of the rod's advance.
  We ask that the customer add a guide or use a highly rigid type when an external force is applied at a right angle to the rod and in the rotation direction

Maximum speed 500 mm/sec

250 mm/sec

125 mm/sec

	Horizontal setting (Note 1)	Vertical setting
High-speed type		
Medium-speed type		
Low-speed type		

(Note 1:) Vibration overshoot may occur if the maximum load capacity relative to the speed is used. Please consider a margin up to 70% when making a selection.

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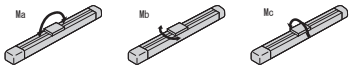
RCP2W Series Slider type, Waterproof type

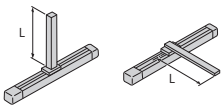
Caution for Use

When you use a slider type, if the overhang from the center of the object mounted on the slider is great, please consider the load moment and the overhang load length.

Use load moments
within the range of each load moment Ma, Mb, Mc.

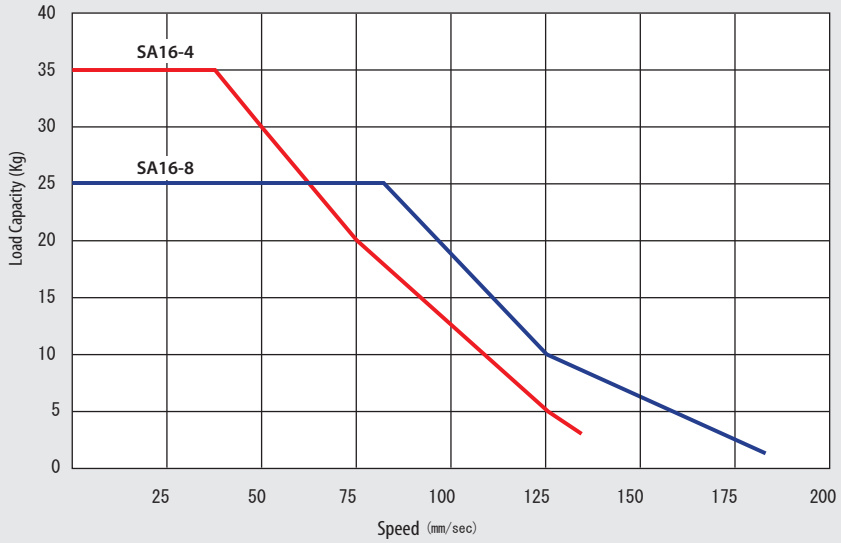


Overhang load length
The value when the mounted object's center of gravity is L/2. When an object mounted in the direction of either Ma, Mb, or Mc overhangs, please use the product in a range within this value



Refer to the Speed and Load Capacity Correlation Graph below to select a type for your purpose.

Horizontal setting



Note: RCP2W-SA16 has no brake setting, which means vertical use cannot be handled.
Note: In the graph above, the number after the type is the lead number.
Note 1: Vibration overshoot may occur if the maximum load capacity relative to the speed is used. Please consider a margin up to 70% when making a selection.

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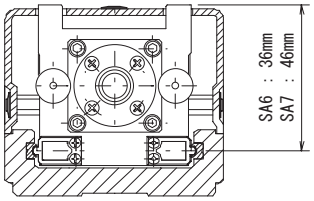
Selection Guide (Push Force and Electric Current Limitation Correlation Graph)

ERC2 Series Slider type

When using slider type for pressing operation, limit pressing current to prevent anti moment generated by push force from exceeding 80% of catalog spec rating for moment (Ma, Mb).
To calculate moment, use the guide moment action position shown in the figure below, and consider the amount of offset at the push force action position. Be aware that, if excess force above the rated moment is applied, the guide can be damaged and its use life can be shortened. Therefore, carefully set current with safety in mind.

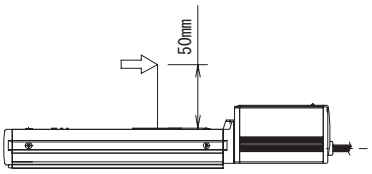


Moment operation position

Caution
Be aware that the movement speed during pressing operation is fixed at 20mm/s.

Example of calculation:

With this type, at the position shown in figure at right, when there is 100N of pressing the moment received by the guide is Ma = (46 + 50) x 100
= 9600 (N•mm)
= 9.6 (N•m).

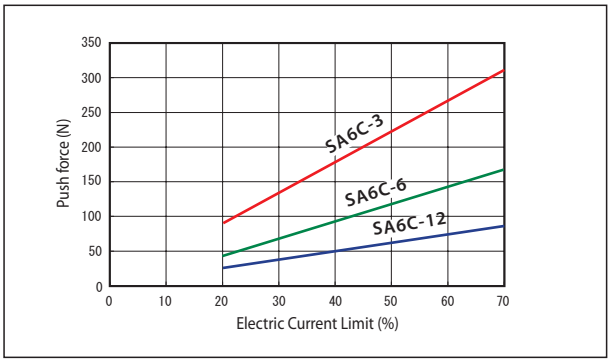


The SA 7 rated moment is Ma = 13.8 (N•m),
which means it is OK because 3.8 x 0.8 = 11.04 > 9.6.
Also, when pressing generates moment Mb, use the overhang calculation to similarly confirm that the moment is within 80% of the rated moment.

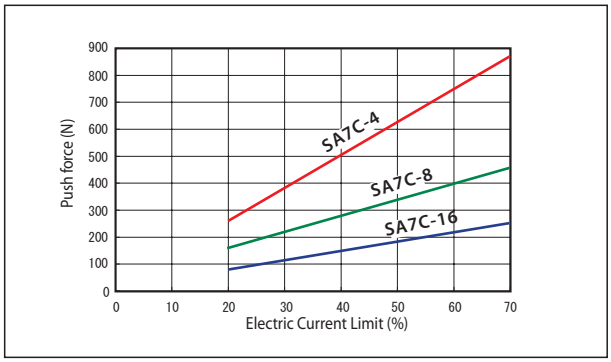
Push force and current limit correlation graph

* In the table below, standard figures are shown. Actual figures will differ slightly.

SA6C type



SA7C type

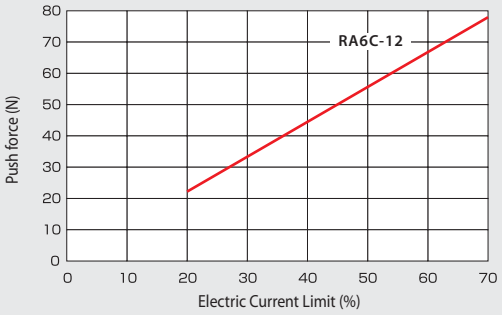
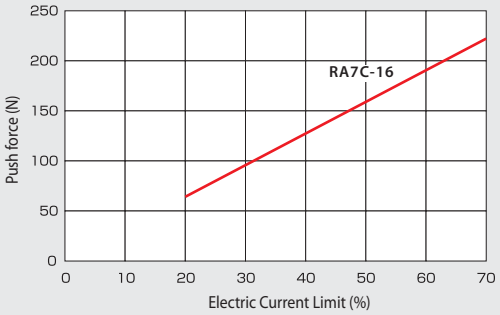
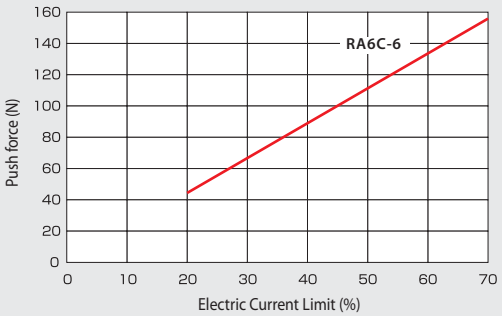
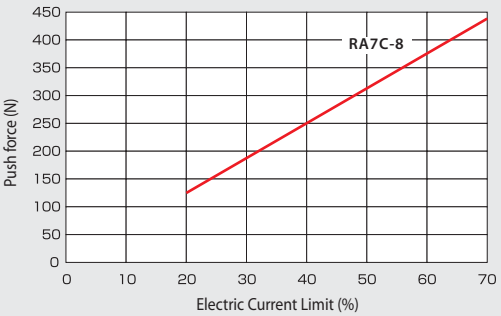
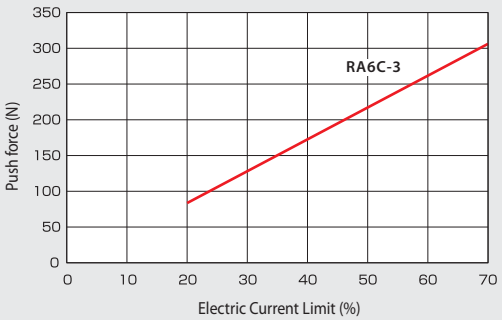
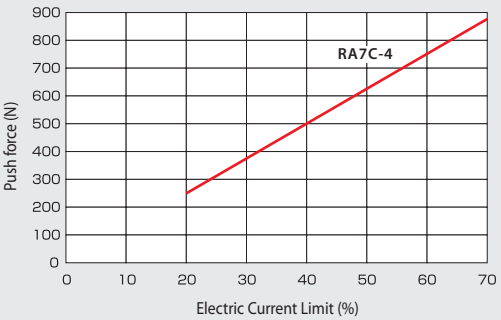


ERC2 Series Rod type

The push force during pressing operation can be freely changed by changing the controller current limit value.
The maximum push force changes according to the type of device, so please select the push force you need from the table below.

Caution for Use

- The push force and current limit correlation figures are given as standard. Actual figures will slightly differ.
- When the current limit is less than 20%, the push force may vary. Therefore use a current limitation that is 20% or higher.
- Movement speed during pressing operation is fixed at 20mm/s.

	RA6C type	RA7C type
High-speed type		
Medium-speed type		
Low-speed type		

Note: In the graph above, the number after the type is the lead number.

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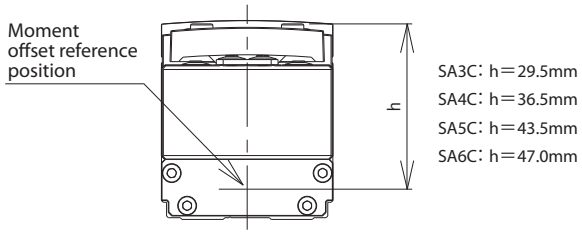
Selection Guide (Push Force and Electric Current Limitation Correlation Graph)

RCP3 Series Slider type

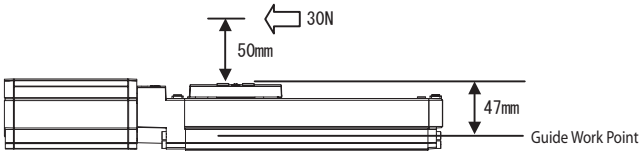
When using slider type for pressing operation, limit pressing current to prevent anti moment generated by push force from exceeding 80% of catalog spec rating for moment (Ma, Mb).
To calculate moment, use the guide moment action position shown in the figure below, and consider the amount of offset at the push force action position. Be aware that, if excess force above the rated moment is applied, the guide can be damaged and its use life can be shortened. Therefore, carefully set current with safety in mind.



SA3C: h=29.5mm
SA4C: h=36.5mm
SA5C: h=43.5mm
SA6C: h=47.0mm

When using slider type for pressing operation, use setting to ensure that anti moment generated by push force does not exceed **80% of catalog spec moment tolerance**.

Example of calculation:
When executing 30N pressing with RCP-3SA6 C (Lead 12) type, at position 50mm from slider upper surface
the moment received by the guide is Ma = (47+50) x 30
= 2910 (N•mm)
= 2.91 (N•m).

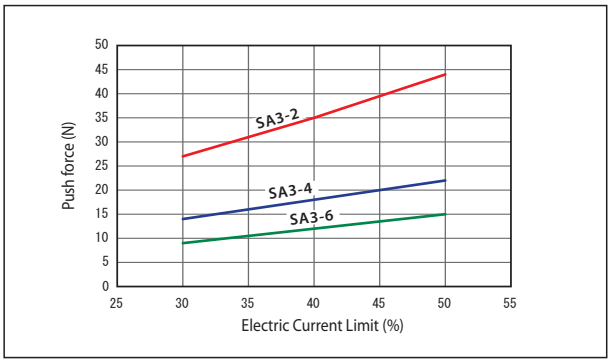


The SA6C allowable moment (Ma) is 4.31 (N•m),
which means 80% is 3.48. Therefore, it can be decided that a moment load greater than that actually received by the guide (2.91) can be used.

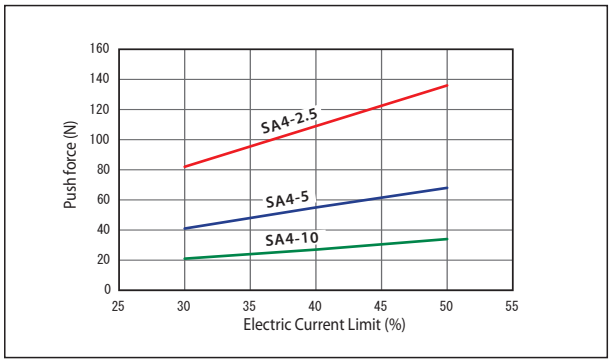
Push force and current limit correlation graph

* In the table below, standard figures are shown. Actual figures will differ slightly.

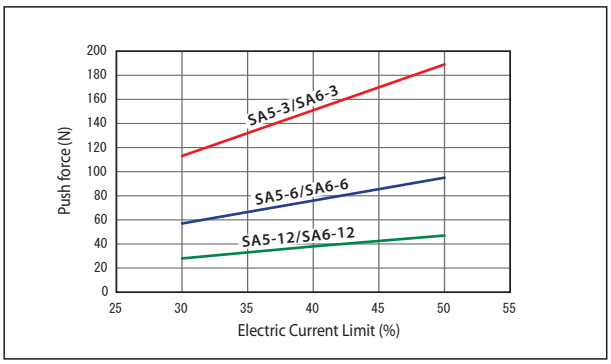
SA3C type



SA4C type



SA5C/SA6C type



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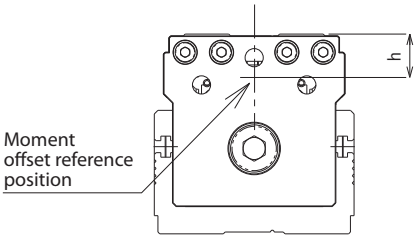
RCP3 Series **Table type**

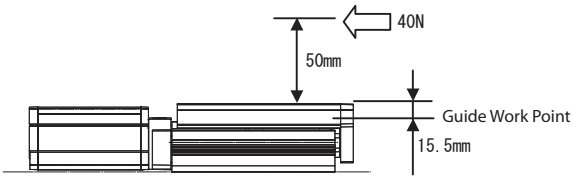
When using a table type for pressing operation, limit pressing current to ensure that anti moment generated by push force does not exceed 80% of catalog spec rated moment (Ma, Mb). To calculate moment, use the guide moment action position shown in the figure below, and consider the amount of offset at the push force action position.
Be aware that, if excess force above the rated moment is applied, the guide can be damaged and its use life can be shortened. Therefore, carefully set current with safety in mind.



TA5C :h= 13.5mm
TA6C :h= 15.5mm
TA7C :h= 17.5mm

When using a table type for a pressing operation, use setting in which the anti moment generated by push force does not exceed **80% of catalog spec moment tolerance**.

Example of calculation:
With the RCP3-TA6 C (Lead 12) type, using the position shown in figure at right, and performing pressing at 40N,
the moment received by the guide becomes Ma = (15.5 + 50) x 40
= 262 0 (N•mm)
= 2.62 (N•m).

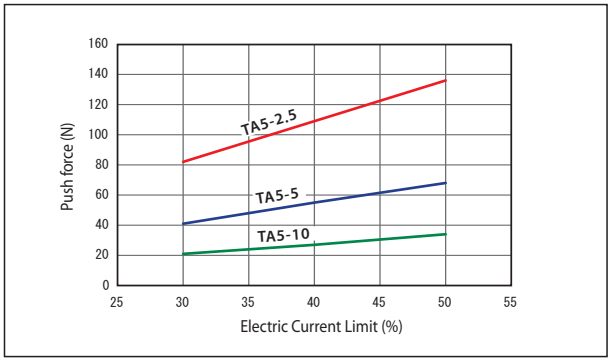


The TA6C allowable load moment (Ma) is 7.26(N•m)
80% of which is 5.968, which is greater than the actual moment load received by the guide (2.62). Therefore, it can be decided that this moment load can be used.

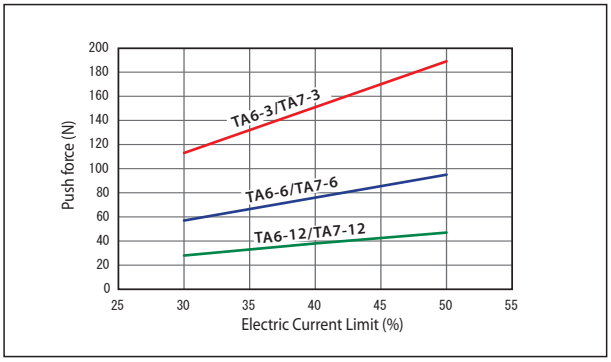
Push force and current limit correlation graph

* In the table below, standard figures are shown. Actual figures will differ slightly.

TA5C type



TA6C/TA7C type



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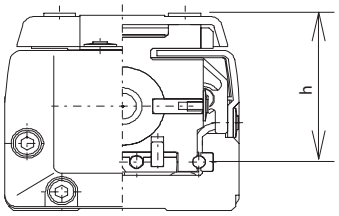
Selection Guide (Push Force and Electric Current Limitation Correlation Graph)

RCP2 Series Slider type

When using slider type for pressing operation, limit pressing current to prevent anti moment generated by push force from exceeding 80% of catalog spec rating for moment (Ma, Mb).
To calculate moment, use the guide moment action position shown in the figure below, and consider the amount of offset at the push force action position. Be aware that, if excess force above the rated moment is applied, the guide can be damaged and its use life can be shortened. Therefore, carefully set current with safety in mind.

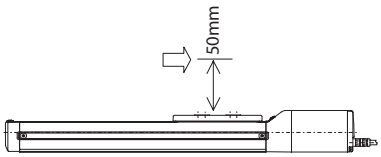


SA5C: h=39mm
SA6C: h=40mm
SA7C: h=43mm
SS7C: h=36mm
SS8C: h=48mm

Caution
- Pressing operations cannot be perfomed for Belt type (BA6/BA 7).
- Note: the movement speed during pressing is fixed at 20mm/s.

Example of calculation:

With the RCP2-S S 7C type, and using the position in the figure at right for 100N pressing, the moment received by the guide is Ma = (36 + 50) x 100
= 8600 (N•mm)
= 8.6 (N•m).

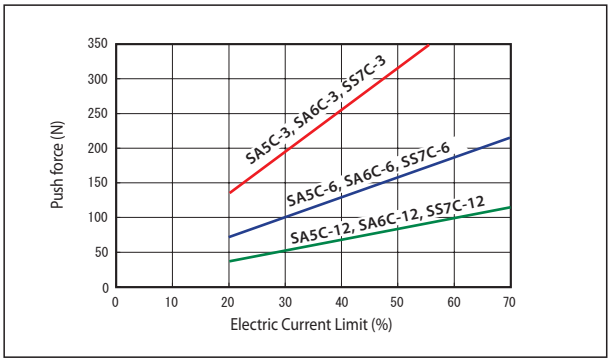


The SS rated moment Ma = 14.7 (N•m)
and 14.7 x 0.8 = 11.76>8.6, which means it is OK.
Also, when pressing generates moment Mb, use the overhang calculation to similarly confirm that the moment is within 80% of the rated moment.

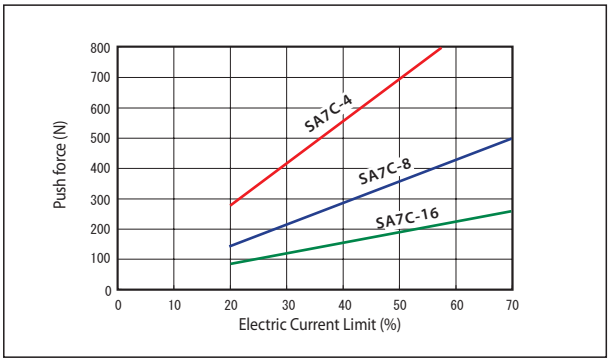
Push force and current limit correlation graph

* In the table below, standard figures are shown. Actual figures will differ slightly.

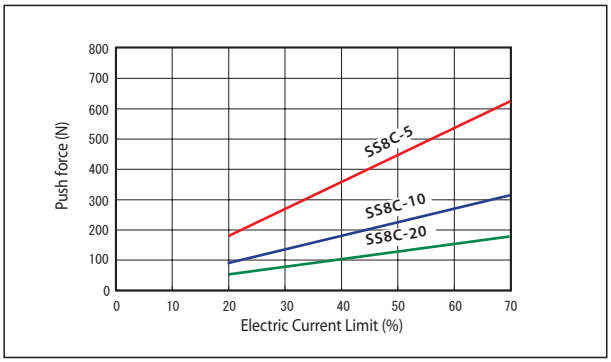
SA5C/SA6C/SS7C type



SA7C type



SS8C type



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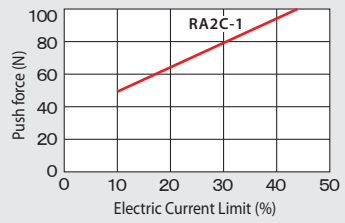
RCP2 Series **Rod type**

The push force applied in a pressing operation can be freely changed by changing the current limit value in the controller.
The maximum push force will differ with type of device. Therefore select the type that suits your purpose after confirming the necessary push force.

RA2C type

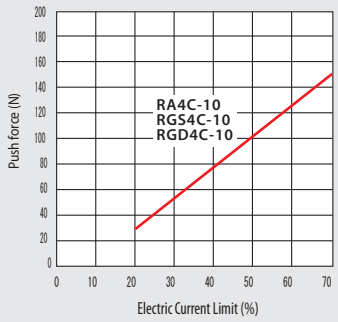
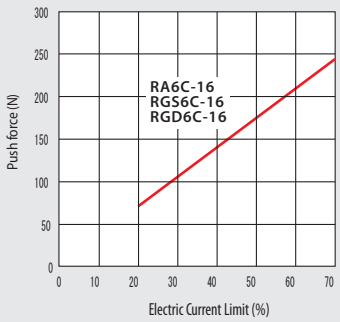
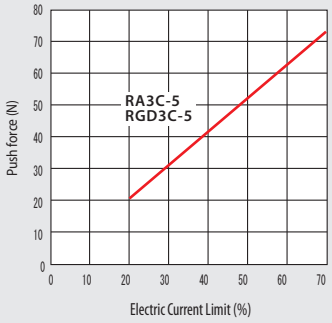
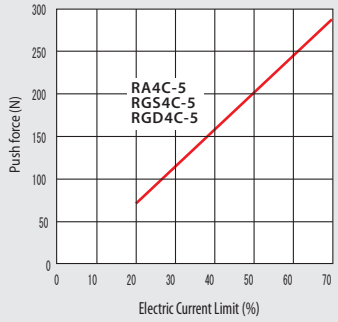
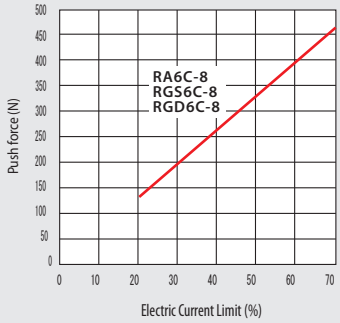
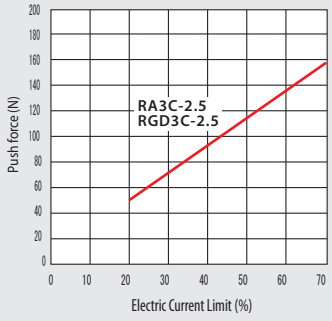
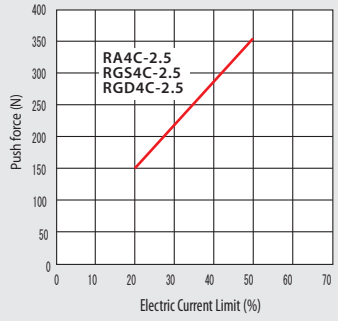
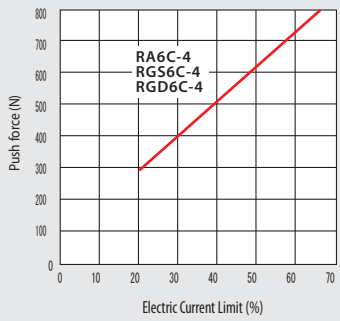


*With the RPA type, the maximum push force limit is set according to the stroke.

25・50 stroke : 100N
75 stroke : 70N
100 stroke : 55N

Caution for Use

- The push force and current limit correlation figures are given as standard. Actual figures will slightly differ.
- When the current limit is less than 20%, the push force may vary. Therefore use a current limitation that is 20% or higher.
- Movement speed during pressing operation is fixed at 20mm/s. (RA2C only 3mm/s)

	RA3C/RGD3C	RA4C/RGS4C/RGD4C	RA6C/RGS6C/RGD6C
High-speed type			
Medium-speed type			
Low-speed type			

Note: In the graph above, the number after the type is the lead number.

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Selection Guide (Push Force and Electric Current Limitation Correlation Graph)

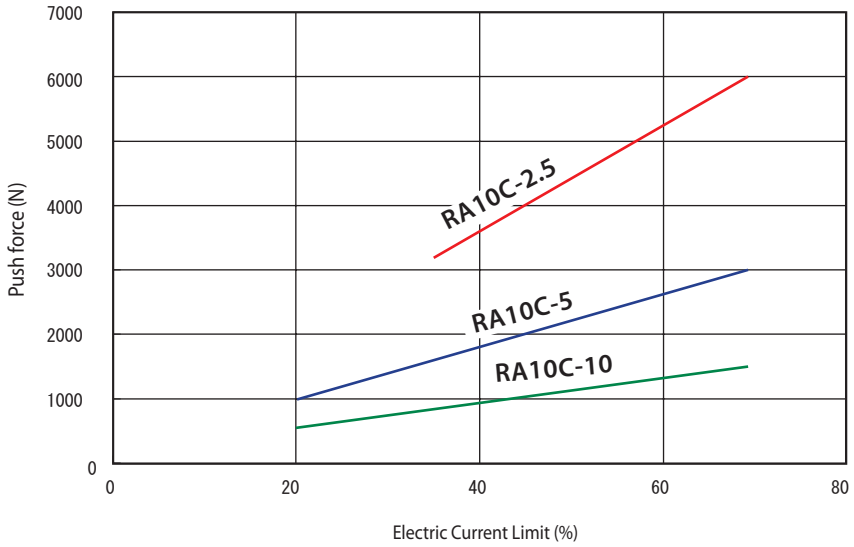
RCP2 Series **Rod Thrust type**

The push force during pressing operation can be freely changed by changing the controller current limit value.
The maximum push force changes according to the type of device, so please select the push force you need from the table below.

Caution for Use

- The correlations between push force and current limit values are standard figures. Actual figures may differ slightly.
- If the current limit is low, the push force may vary. Therefore, for Lead 10 and Lead 5, make the force 20% or more higher; 35% or more higher for Lead 2.5.
- The movement speed in a pressing operation is fixed at 10mm/s. Note that in the graph below, 10mm/s was the speed in the pressing operation. So , if the speed changes, the push force will drop. (Consult with us if you need to change the pressing speed.)

RA10C type



Caution:
Use the standards in the table below for the maximum number of pressing operations for each type of lead, for maximum push force, and (each) 1-mm pressing movement.

Lead (type)	2.5	5	10
No. of pressing operations	1.4 million	25 million	157.6 million

* The maximum number of pressing operations will vary according to shock, vibration and other operating conditions.
The figures shown at left are for conditions with no shock or vibration.

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Selection Guide (Push Force / Continuous Operation Thrust)

RCS2 Series | **Rod Ultra-high thrust type**

The following 3 conditions must be met when using this device.
Condition 1: The pressing time must be less than the time determined.
Condition 2: 1 cycle of continuous thrust must be less than the rated thrust for a super-high thrust actuator.
Condition 3: 1 pressing operation must be in 1 cycle.

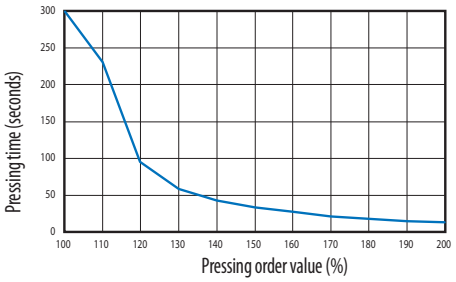
Selection method

Condition 1 Pressing time

The maximum pressing time for each pressing order must be determined as shown in the table below. The pressing time used must be less than the time indicated in the table below. Actuator malfunction could result if the process is used without adhering to the table below.

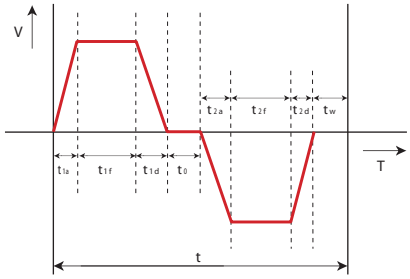
Pressing order value (%)	Max. pressing time (sec)
70 or less	(continuous pressing possible)
80～100	300
110	230
120	95
130	58
140	43
150	33
160	27
170	21
180	18
190	15
200	13

[Pressing time]

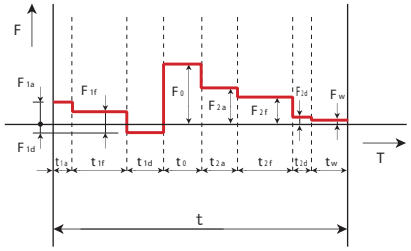


Condition 2 Continuous operation thrust

Confirm that 1 cycle of continuous operation thrust Ft, based on a consideration of load and duty, is less than that of the rated thrust for a super-high-thrust actuator. Note that 1 pressing operation must be within 1 cycle.



For the operating pattern entered at left, rewrite with thrust in vertical axis. Then,



t	: 1 cycle of operation time (s)	t_{2a}	: acceleration time 2
t_{1a}	: acceleration time 1	t_{2f}	: fixed movement time 2
t_{1f}	: fixed speed movement time 1	t_{2d}	: deceleration time 2
t_{1d}	: deceleration time 1	t_w	: wait time
t_0	: push force time		

F_{1a}	: thrust needed for acceleration 1	F_{2a}	: thrust needed for acceleration 2
F_{1f}	: thrust needed for fixed speed movement 1	F_{2f}	: thrust needed for fixed speed movement 2
F_{1d}	: thrust needed for deceleration 1	F_{2d}	: thrust needed for deceleration 2
F_0	: thrust needed for push force	F_w	: thrust needed for wait

Use the formula in the table below to calculate 1 cycle of continuous operation thrust Ft.

$$F_t = \sqrt{\frac{F_{1a}^2 \times t_{1a} + F_{1f}^2 \times t_{1f} + F_{1d}^2 \times t_{1d} + F_0^2 \times t_0 + F_{2a}^2 \times t_{2a} + F_{2f}^2 \times t_{2f} + F_{2d}^2 \times t_{2d} + F_w^2 \times t_w}{t}}$$

* For horizontal use, it is not necessary to calculate necessary thrust for fixed speed movement and wait

● F1a/F2a/F1d/F2d will change with operation direction. Therefore, use the calculation equations below.

When in horizontal use (for both acceleration/deceleration)	$F_{1a} = F_{1d} = F_{2a} = F_{2d} = (M+m) \times d$
Vertical use, when accelerating during descent	$F_{1a} = (M+m) \times 9.8 - (M+m) \times d$
Vertical use, when at fixed speed during descent	$F_{1f} = (M+m) \times 9.8 + \alpha$ (*1)
Vertical use, when decelerating during descent	$F_{1d} = (M+m) \times 9.8 + (M+m) \times d$
Vertical use, when accelerating while rising	$F_{2a} = (M+m) \times 9.8 + (M+m) \times d$
Vertical use, when rising at fixed speed	$F_{2f} = (M+m) \times 9.8 + \alpha$ (*1)
Vertical use, when decelerating while rising	$F_{2d} = (M+m) \times 9.8 - (M+m) \cdot d$
Vertical use, when in wait condition	$F_w = (M+m) \times 9.8$

M : Moveable weight (kg)
m : Loaded weight (kg)
d : Degree of acceleration/deceleration (m/s2)
α : External guide
Thrust based on consideration of running resistance

*1 When a device such as an external guide is attached, it is necessary to consider running resistance.

Super-high thrust actuator
Moveable weight : 9 kg

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Selection Guide (Push Force / Continuous Operation Thrust)

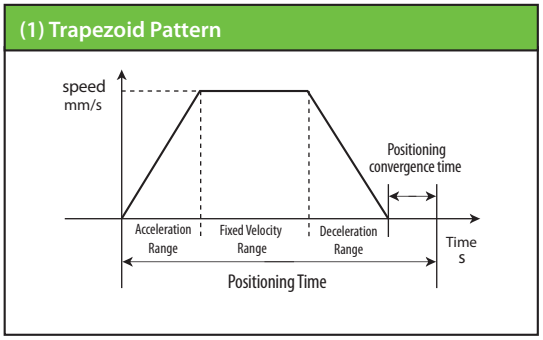
- t□a becomes acceleration time, but for operating pattern in platform shape, the calculation method differs from that used with a triangle shape pattern.

Attained speed (Vmax) = $\sqrt{\text{movement distance (m)} \times \text{set degree of acceleration (m/s}^2\text{)}}$

Set speed < attained speed → (1) platform shape pattern
Set speed > attained speed → (2) triangle pattern

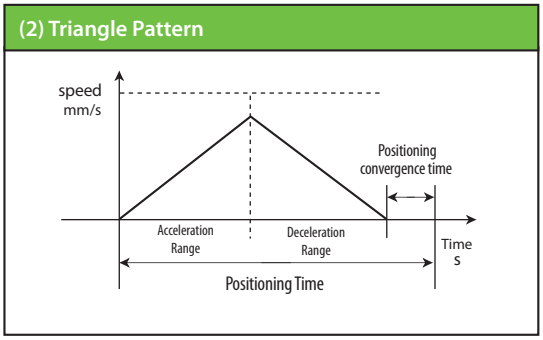
(1) Trapezoid Pattern

t□a = Vs/a Vs : set speed (m/s) a: order degree of acceleration (m/s²)



(2) Triangle Pattern

t□a = Vt/a Vt : attained speed (m/s) a: order degree of acceleration (m/s²)



- t□f becomes fixed speed movement time. Calculate the fixed speed movement distance.
  t□f = Lc/V Lc : Fixed speed movement distance (m) V: Order speed (m/s)
  * Fixed speed movement distance = movement distance - acceleration distance - deceleration distance Acceleration distance (deceleration distance) = $V^2/2a$

- t□d becomes deceleration time, and if the degree of acceleration and deceleration are the same, it will be the same as acceleration time.
  t□d = V/a V: Set speed (paltform shape pattern) or attained speed (triangle pattern) (m/s) a: order deceleration (m/s²)

Operation is possible if the continuous operation thrust Ft being sought in this way is less than the rated thrust.

Ultra thrust actuator lead 2.5-type rated thrust : 5100N	**Ultra-high thrust actuator lead 1.25-type rated thrust** : 10200N

Operation becomes possible if operating Condition 1 and Condition 2 above are met at the same time.
If one of the two conditions cannot be met, take countermeasures such as shortening pressing operation time or lowering the duty.

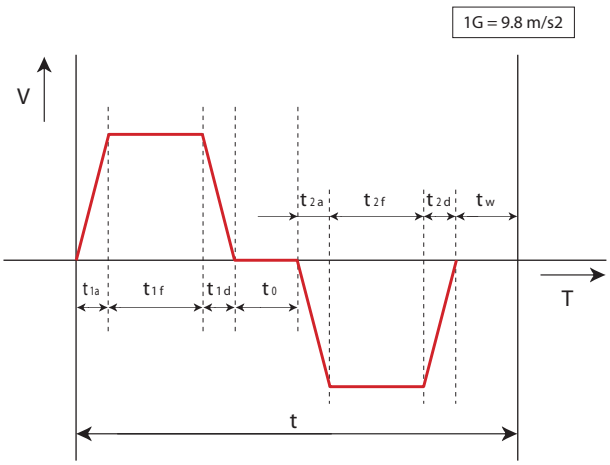
Sample problem

■ Try to select an operation pattern by using the selection method described above.

Operating conditions

- Type of device used : Super-high thrust actuator lead 1.25 type
- Mounting positions : Vertical
- Speed : 62mm/s
- Acceleration : 0.098m/s² (0.01G, same values for deceleration.)
- Movement distance : 50mm
- Loaded weight : 100kg
- Pressing command value : 200% (2000kgf)
- Pressing time : 3 seconds
- Wait time : 2 seconds
- For pressing operation after 50mm descent, use 2-second wait for 50mm rise. Also, the rise and descent operating conditions are the same.

A graph of the above operating patterns would look like the one shown on the right.



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Here we will use the selection method and do the calculations.

Condition 1 Confirm pressing operation time.

Using Table 1 on page 12, for a pressing command value of 200% of the maximum pressing time (13 seconds), we have a pressing time of 3 seconds.
Therefore, we can see that the pressing time is OK.

Condition 2 Find continuous operation thrust

Using the equation for continuous operation thrust given above, we do the substitutions for the above operating pattern

$$Ft = \sqrt{\frac{F_{1a}^2 \times t_{1a} + F_{1f}^2 \times t_{1f} + F_{1d}^2 \times t_{1d} + F_0^2 \times t_0 + F_{2a}^2 \times t_{2a} + F_{2f}^2 \times t_{2f} + F_{2d}^2 \times t_{2d} + F_w^2 \times t_w}{t}}$$

Here, we confirm the operating pattern, t1a/t1d/t2a/t2d, with attained speed (Vmax) = 0.05×0.098 → 0.07m/s, which is greater than the set speed, 62mm/s (0.06m/s). Therefore, we obtain a platform shape pattern.

From this we obtain t1a/t1d/t2a/t2d = 0.062÷0.098 → 0.63s.

Next, if we calculate t1f/t 2f,
we have fixed speed movement distance = 0.05 –({ 0.062×0.062} ÷ (2×0.098)} × 2 → 0.011m. Therefore, t1f/t2f = 0.011÷0.062 → 0.17s.
Also, if we apply the calculation equation for F1a/F1f/F1d/F2a/F2f/F2d, we obtain
F1a = F2d = (9 + 100) × 9.8 – (9 + 100) × 0.098 →1058N
F1d = F2a = (9+100) × 9.8 + (9 + 100) × 0.098 →1079N
F1f = F2f = fw = (9＋100)×9.8 →1068N.

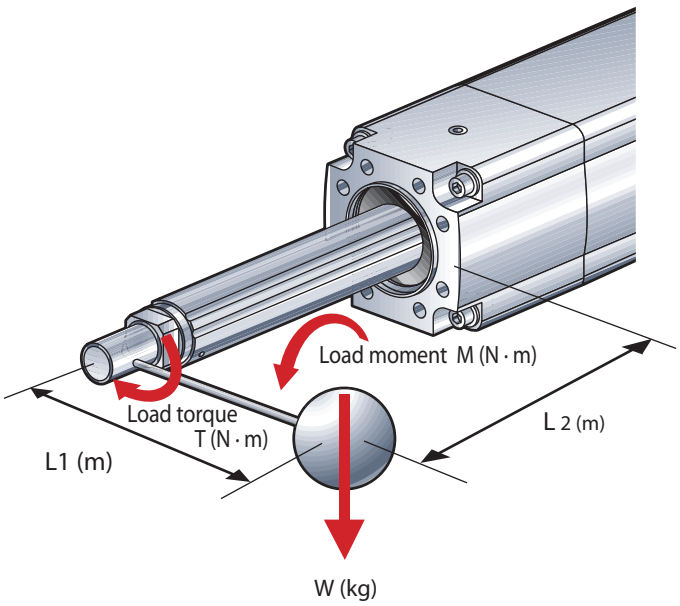
Making the substitutions to apply the continuous operation thrust equation, we have

$$Ft = \sqrt{\{(1058\times1058)\times0.63+(1068\times1068)\times0.17+(1079\times1079)\times0.63+(19600\times19600)\times3+(1079\times1079)\times0.63}$$
$$\overline{+(1068\times1068)\times0.17+(1058\times1058)\times0.63+(1068\times1068)\times2\}\div(0.63+0.17+0.63+3+0.63+0.17+0.63+2)} \rightarrow 12113N$$

Here, the 10200N rated thrust of the 2-ton type super-high thrust actuator is exceeded, which means this operation pattern cannot be used.

Here we will try to extend the wait time. (Lowering the duty)
Here, tw = 6.12s (t = 12s) , and if we recalculate, we obtain Ft = 9814N, which means operation becomes possible.

Material on moment selection



With the super-high thrust actuator, within the scope of the conditions in the calculation equation shown below, we can place the load on the rod.

M+T ≦120 (N · m)
Load moment M = Wg × L2
Load torque T = Wg × L1

* g = vertical acceleration 9.8
* L1 = distance from the center of the rod to the work center of gravity
* L2 = Distance from actuator mounting face to center of gravity of work + 0.07

If the above condition is not met, consider installing an external guide, or the like, so that the load is not exerted on the rod.

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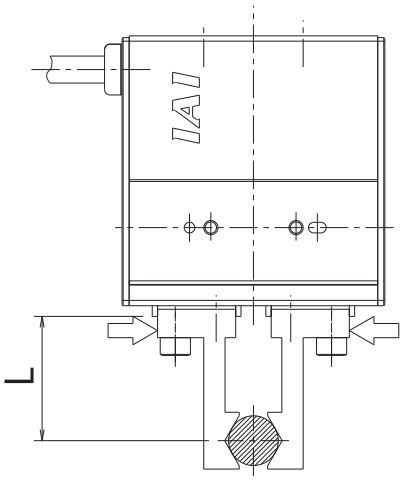
Selection Guide (Push Force and Electric Current Limitation Correlation Graph)

RCP2 Series **Gripper**

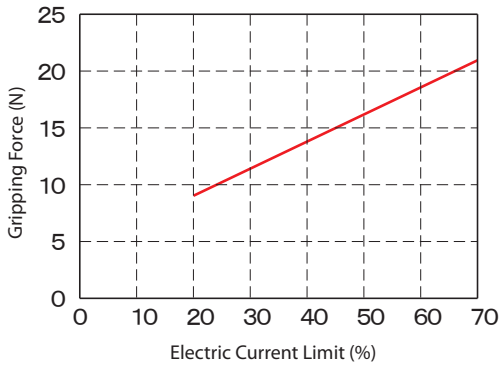
Gripping Force Adjustment

The gripping force can be freely adjusted within the range of 20 to 70% of the current limiting value of the controller, according to the pushing operation. Since the gripping force differs with the model, check the gripping force needed from the graph below and select the required type.

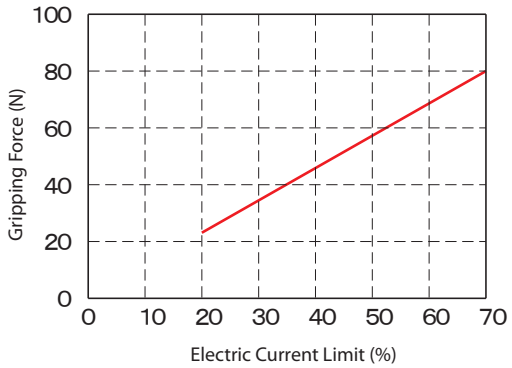
* The gripping forces in the table below indicate the sums of gripping forces of both fingers.



RCP2-GRS



RCP2-GRM



Guide for Selecting Model vs. Work Weight

The work weight that can be carried differs with the friction coefficient between the claw and work, according to their materials, and to their layout. 1/20 to 1/20 or less is normally a guide for gripping force.
In addition, it will be necessary to estimate additional surplus if substantial acceleration/deceleration or impact will be exerted while work is carried. (1/30 to 1/50)

Finger Attachment (Claw) Layout

Keep the distance (L) from the claw mounting surface to the gripping point to the following dimensions or less.

RCP2-GRS → 50mm or less
RCP2-GRM → 80mm or less

Keep the fingers mounted to the actuator as small and light as possible. There are cases in which performance will be decreased or the guides will be adversely affected by inertial forces or bending moment if the finger is too long or too heavy.

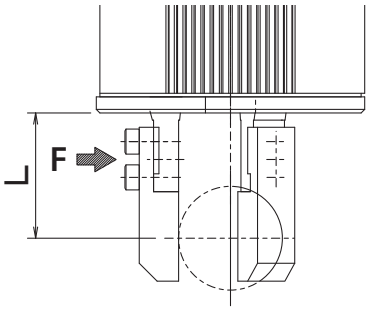
Caution

- The relationship between the pushing force (gripping force) and current limiting value is a guideline value. Some error is possible.
- Please note that variations in pushing force and malfunction are possible due to sliding resistance, etc., if the pushing force is too low. Use a value that is above 20% of the current limiting value.
- Keep the fingers as small and light as possible. There are cases in which performance will be decreased or the guides will be adversely affected if the finger length is long or the weight is great.

RCP2 Series **3-Finger Gripper**

Grip force vs. Current Limit Graph

Lever type (GR3LS/GR3LM)



*The values in the graph below are the grip strength at a gripping point 10mm from the base.
The actual gripping force decreases in inverse proportion to the distance from the opening/closing fulcrum.

Calculate the actual gripping force using the formulas below:

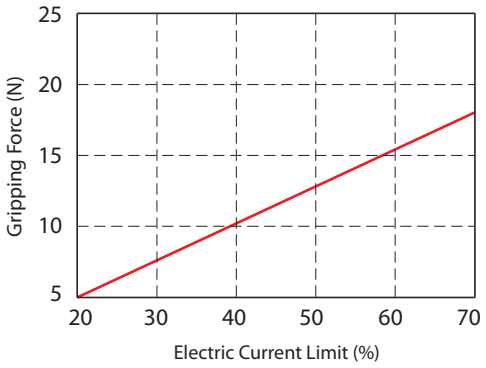
Effective gripping force (S type) = P x 24 / (L + 14)

Effective gripping force (M type) = P x 28.5 / (L + 18.5)

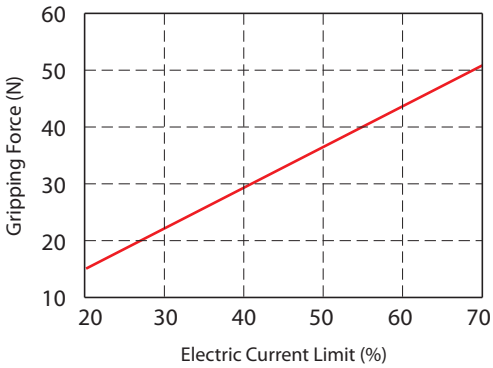
P = Gripping force determined from the graph

L = Distance from the finger mounting surface to the gripping point

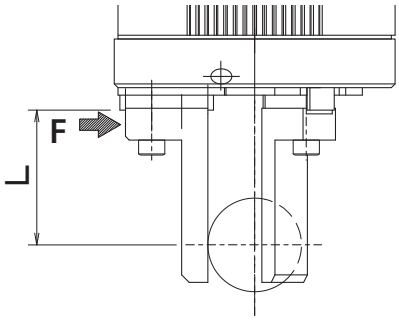
RCP2-GR3LS



RCP2-GR3LM



Slide type (GR3SS/GR3SM)

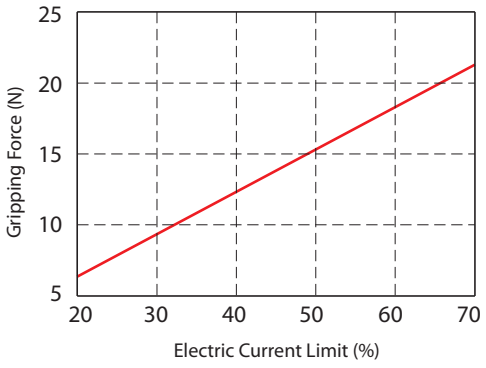


*Keep the distance (L) from the finger mounting surface to the gripping point to the following dimensions or less.
Calculate the actual gripping force using the formulas below:

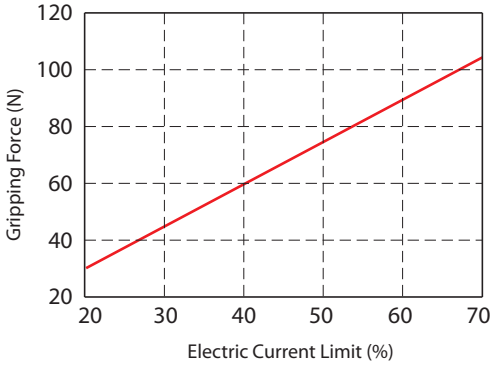
GR3SS → 50mm or less

GR3SM → 80mm or less

RCP2-GR3SS



RCP2-GR3SM



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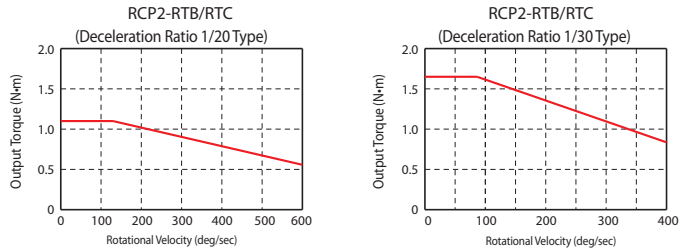
Selection Guide (Push Force and Electric Current Limitation Correlation Graph)

RCP2 Series **Rotary**

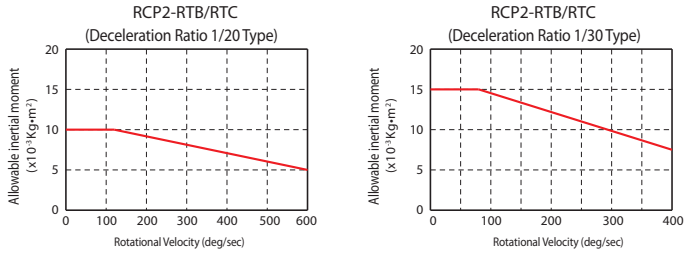
Output torque

Output torque decreases as rotational speed increases.
Please use the bottom graph to verify whether the necessary velocity and torque for the operation.



Allowable inertial moment

The allowable inertial moment of a rotatable work varies depending on the rotational velocity.
Select the model after checking the operating conditions and inertial moment of rotatable work (See P16).

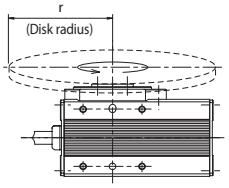


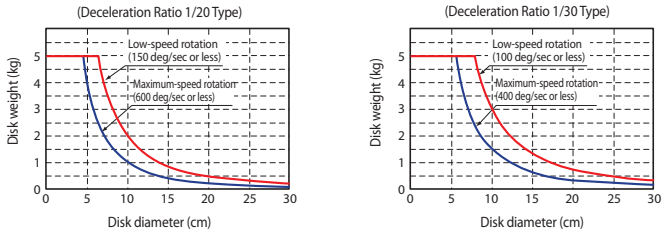
When using a rotating shaft in the horizontal direction, load torque is generated by gravity when the center of gravity of the work is located away from the center of rotation. Either the rotational velocity must be decreased, or the work inertial moment must be ameliorated.

Model Selection Guide

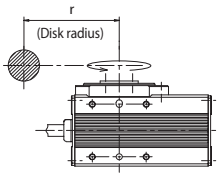
Select the model according to the following figure, according to the shape and weight of the objected mounted on the output axis
* The weight that can be rotated differs depending on the rotational velocity. (The higher the rotational velocity, the lower the weight that can be rotated)

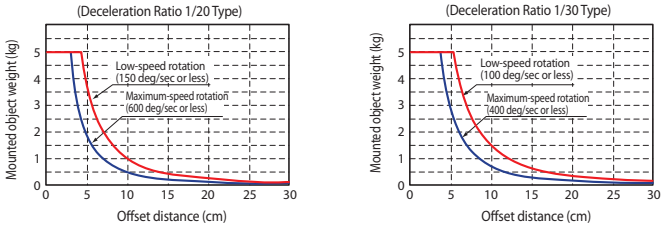
A. Disk-shaped object mounted at the center of the output shaft





B. Object mounted offset from center of output axis





* When using a rotating shaft in the horizontal direction, load torque is generated by gravity when the center of gravity of the work is located away from the center of rotation. Either the rotational velocity must be decreased, or the mounted weight must be decreased.

Caution

- Using loads greater than allowable value may cause malfunction, or damage or shorten the lifespan of the unit. The load must be set below the allowable value.
- When using a rotating axis in the horizontal direction, construct the work so that at little load torque as possible is exerted.

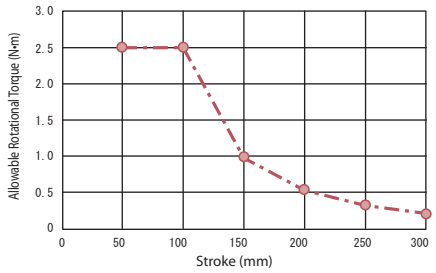
Guide-Equipped Type ERC2/RCP2/RCA/RCS2

Allowable Rotating Torque

The allowable torque for each model is as shown below.
When rotational torque is exerted, use within the range of the values below. Further, single-guide types cannot be subjected to rotational torque.

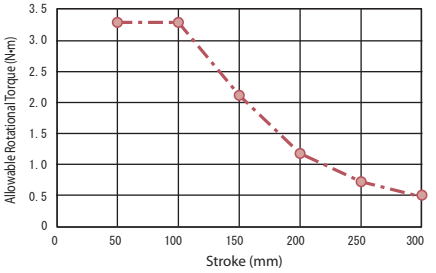
ERC2-RGD6C Type

■Double-guide



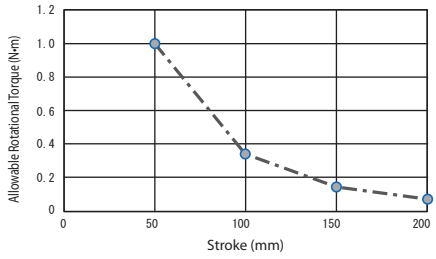
ERC2-RGD7C Type

■Double-guide



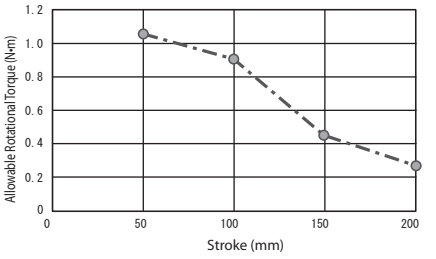
RCA / RCS2-RGD3□Type

■Double-guide



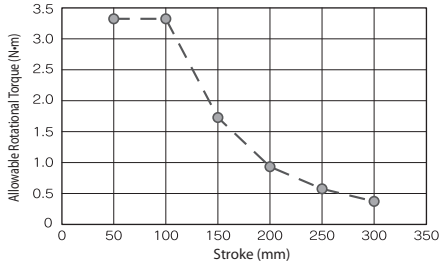
RCS2-RGD4□Type

■Double-guide



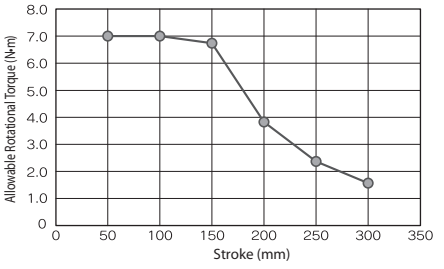
RCS2-RGD5C Type (double-guide Specification)

■Double-guide

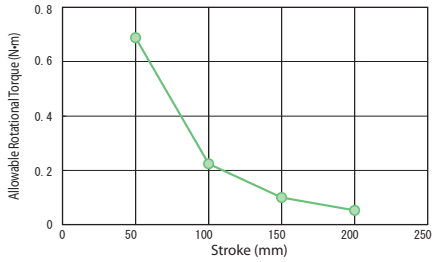


RCS2-RGD7AD / RGD7BD Type

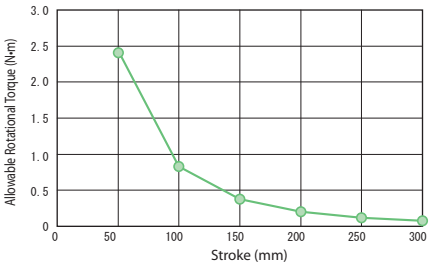
■Double-guide



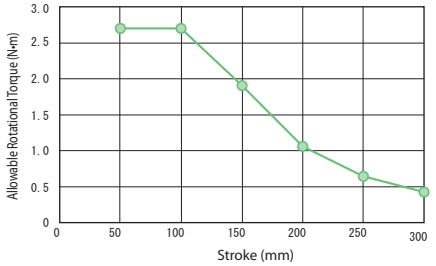
RCP2-RGD3C Type



RCP2-RGD4C Type



RCP2-RGD6C Type



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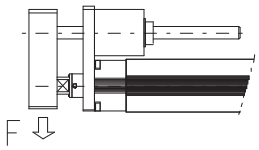
Relationship Between Allowable Load at Tip & Running Service Life

The greater the load at the guide tip, the shorter the running service life.
Select the appropriate model, considering balance between load and service life.

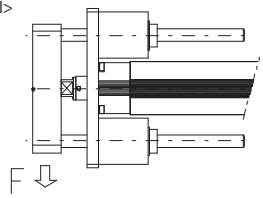
■Single-guide type



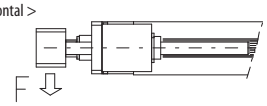
* The single-guide specification can only be used with vertical loads.

■Double-Guide Type

<Vertical>

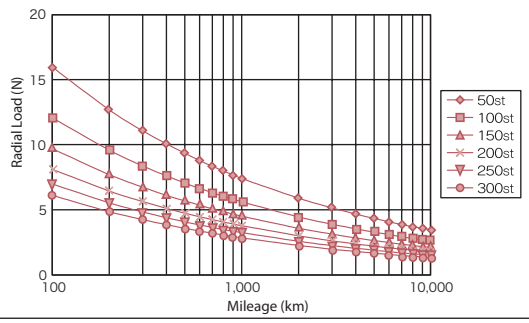


<Horizontal >

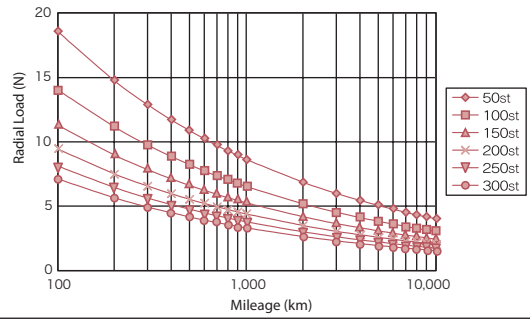


Single-guide

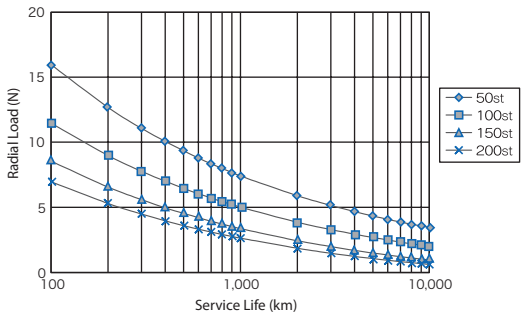
ERC2-RGS6C Type



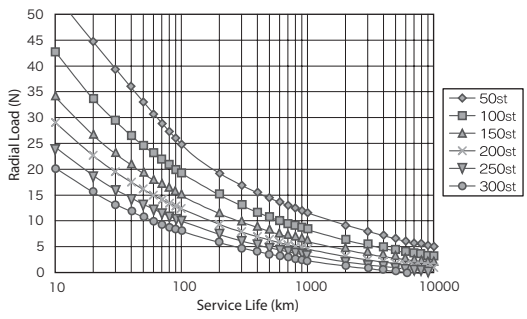
ERC2-RGS7C Type



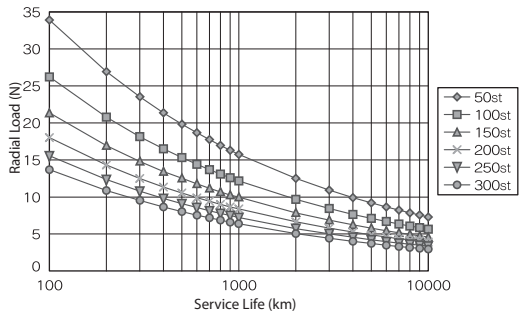
RCA / RCS2-RGS3C Type



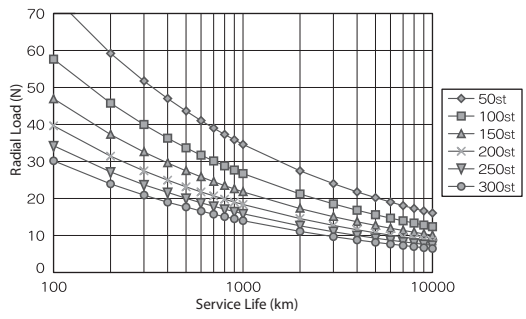
RCS2-RGS4C Type



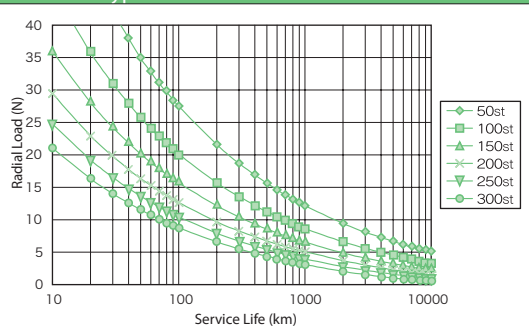
RCS2-RGS5C Type



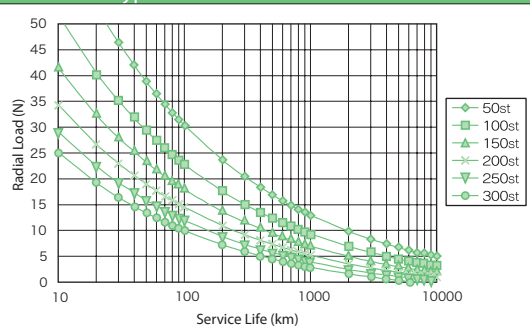
RCS2-RGS7AD / RGS7BD Type



RCP2-RGS4C Type



RCP2-RGS6C Type



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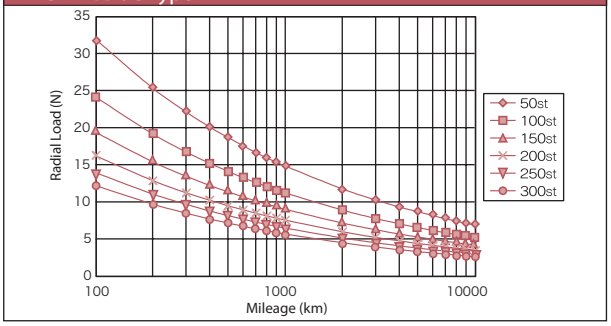
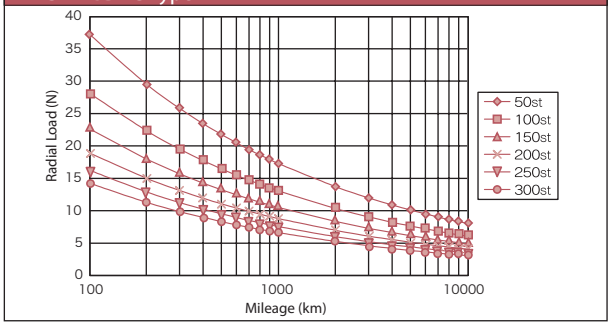
Double-guide

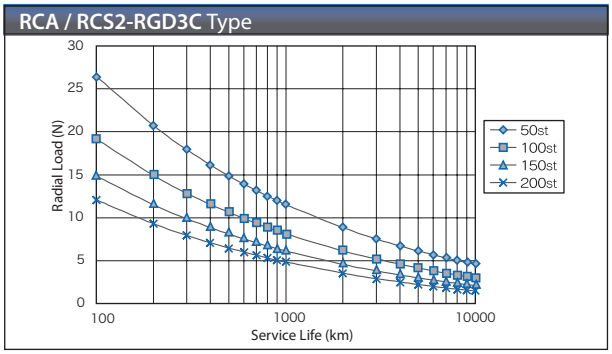
ERC2-RGD6C Type



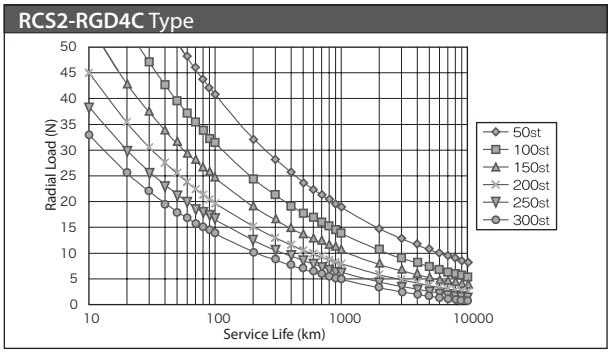
ERC2-RGD7C Type



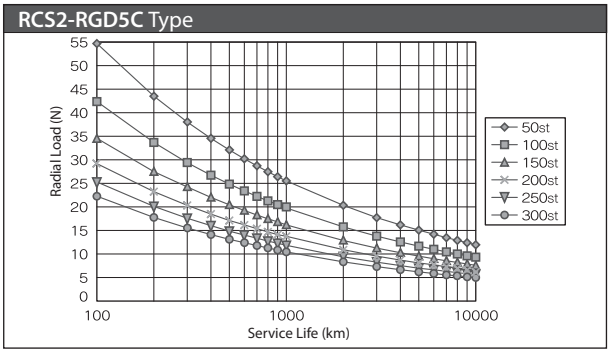
RCA / RCS2-RGD3C Type



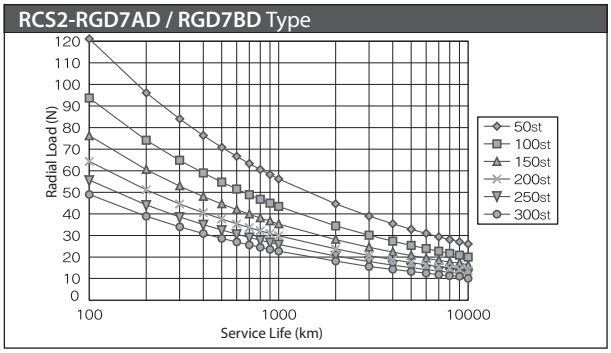
RCS2-RGD4C Type



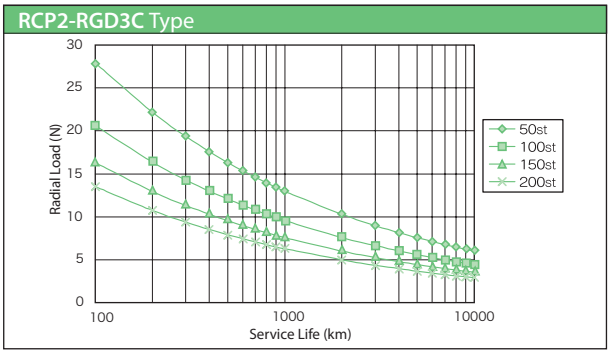
RCS2-RGD5C Type



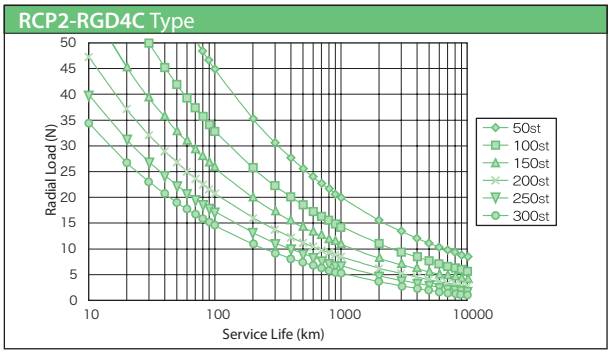
RCS2-RGD7AD / RGD7BD Type



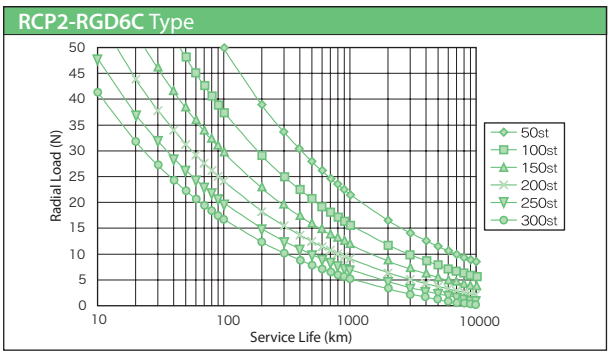
RCP2-RGD3C Type



RCP2-RGD4C Type



RCP2-RGD6C Type



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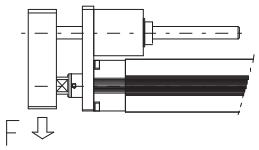
Radial Load & Tip Deflection

The graph below shows the correlation between the load exerted at the guide tip and the amount of deflection generated.

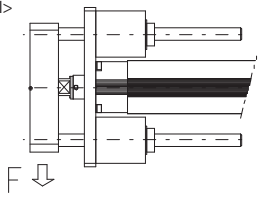
■Single-guide type



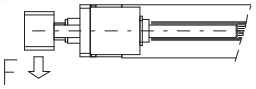
* The single-guide specification can only be used with vertical loads.

■Double-Guide Type

<Vertical>

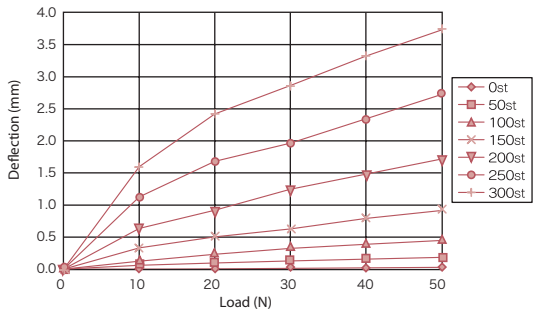


<Horizontal >

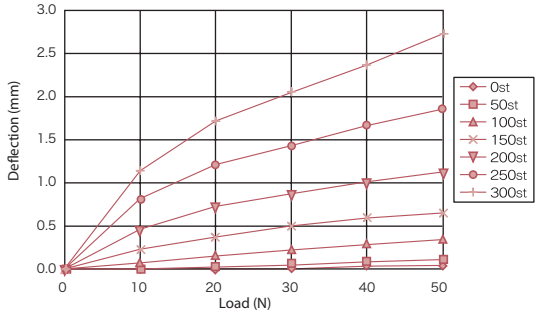


Single-guide

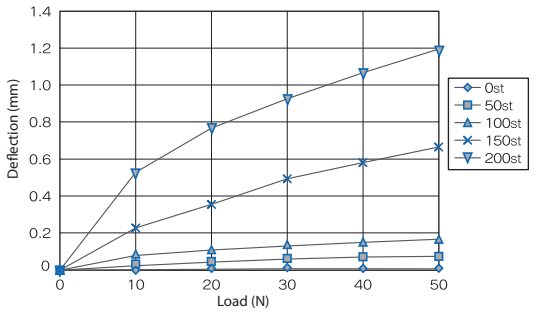
ERC2-RGS6C Type



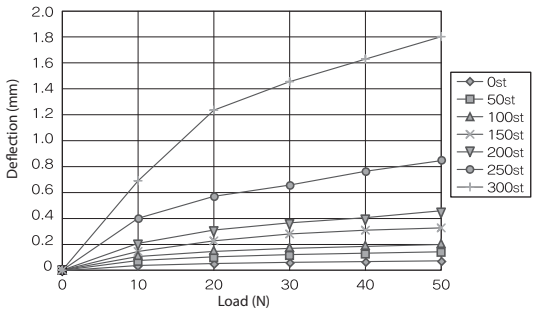
ERC2-RGS7C Type



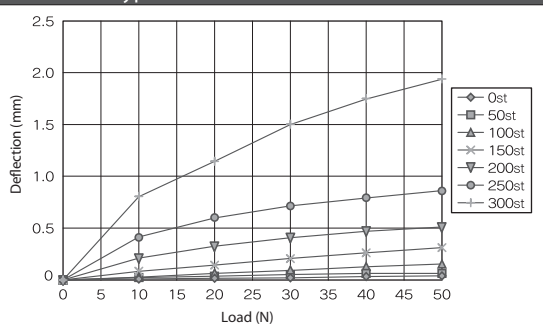
RCA / RCS2-RGS3 □Type



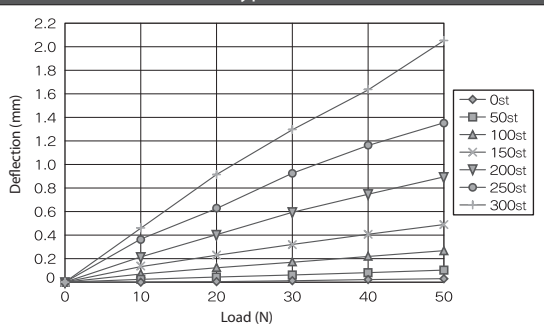
RCS2-RGS4 □Type



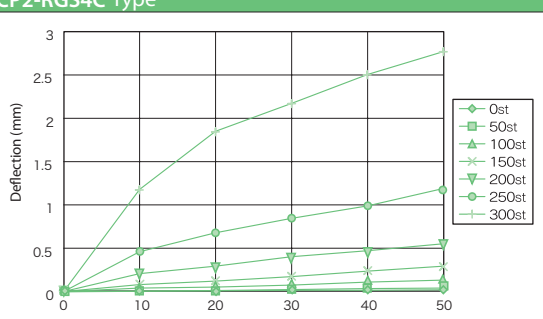
RCS2-RGS5C Type



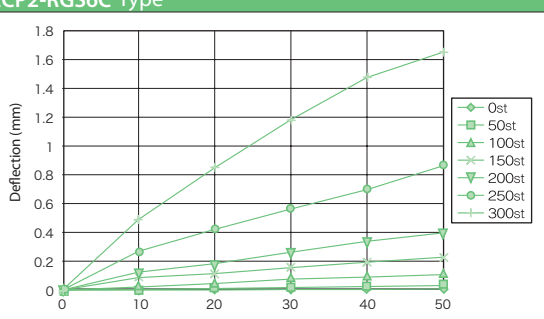
RCS2-RGS7AD / RGS7BD Type



RCP2-RGS4C Type



RCP2-RGS6C Type



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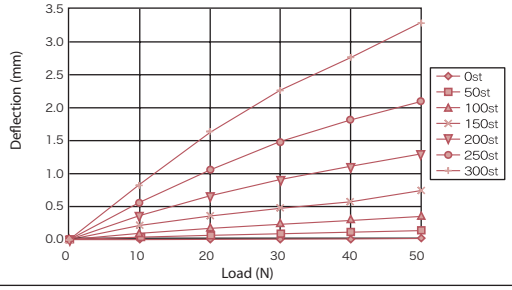
Double-guide

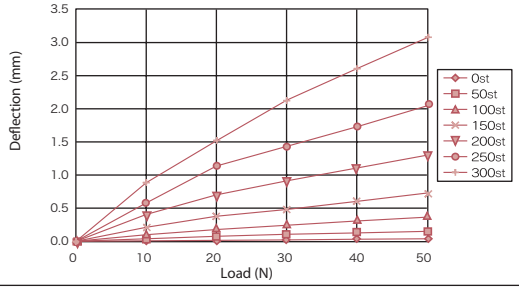
ERC2-RGD6C Type

■Double-Guide <Horizontal> Specification



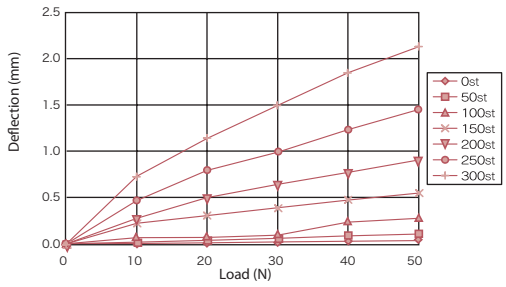
ERC2-RGD6C Type

■Double-Guide <Vertical> Specification



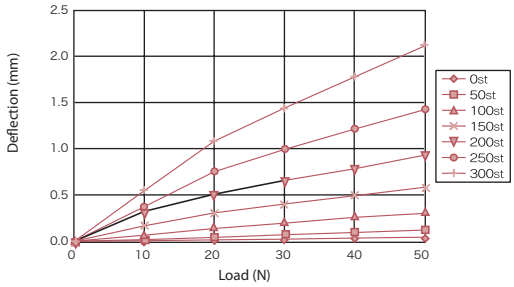
ERC2-RGD7C Type

■Double-Guide <Horizontal> Specification



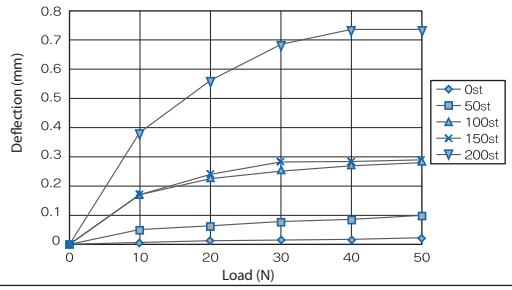
ERC2-RGD7C Type

■Double-Guide <Vertical> Specification



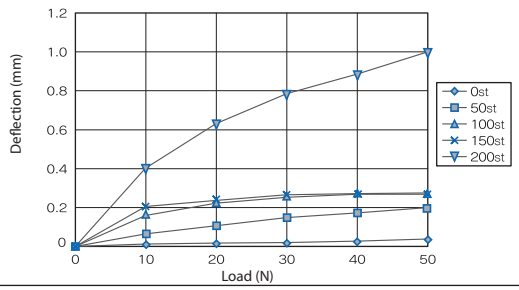
RCA / RCS-RGD3 □Type

■Double-Guide <Horizontal> Specification



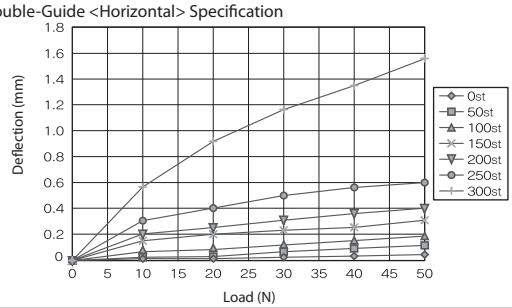
RCA / RCS-RGD3 □Type

■Double-Guide <Vertical> Specification



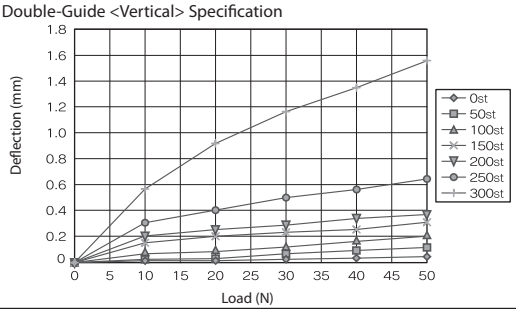
RCS2-RGD4 □Type

■Double-Guide <Horizontal> Specification



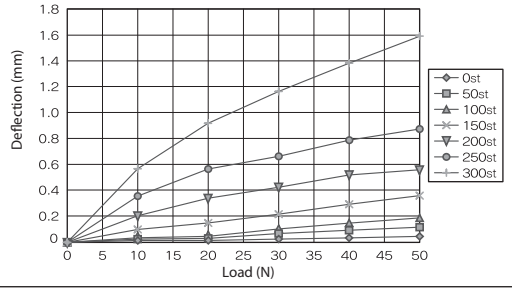
RCS2-RGD4 □Type

■Double-Guide <Vertical> Specification



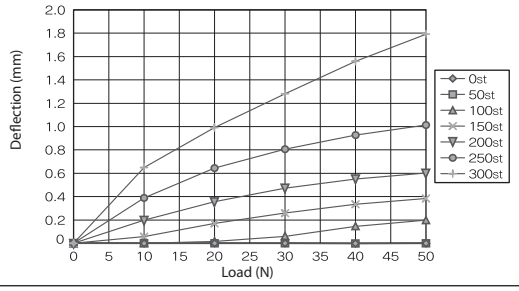
RCS2-RGD5C Type

■Double-Guide <Horizontal> Specification



RCS2-RGD5C Type

■Double-Guide <Vertical> Specification



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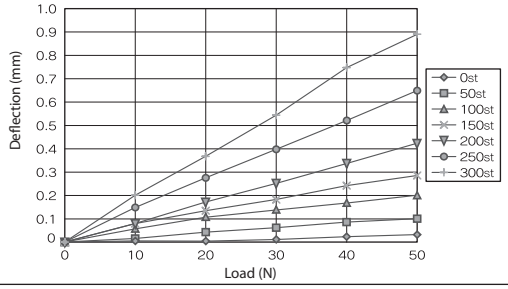
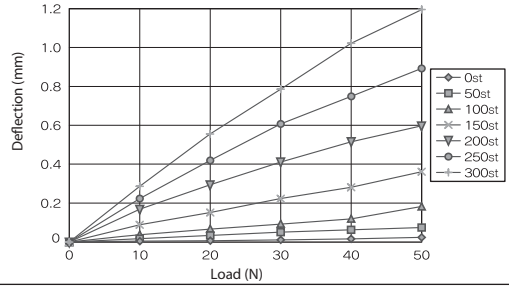
RCS2-RGD7AD / RGD7BD Type

■Double-Guide <Horizontal> Specification



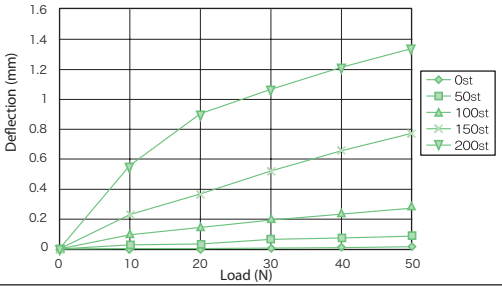
RCS2-RGD7AD / RGD7BD Type

■Double-Guide <Vertical> Specification



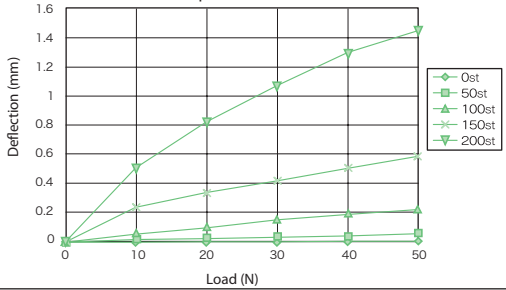
RCP2-RGD3C Type

■Double-Guide <Horizontal> Specification



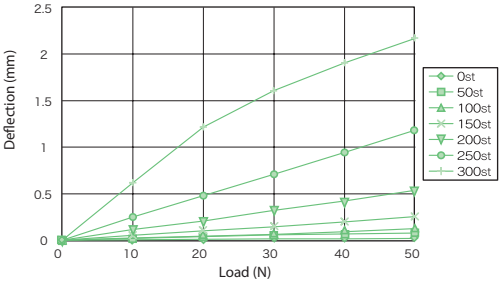
RCP2-RGD3C Type

■Double-Guide <Vertical> Specification



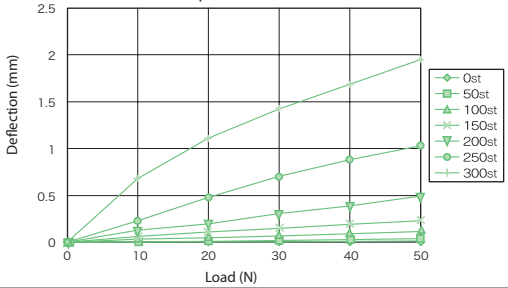
RCP2-RGD4C Type

■Double-Guide <Horizontal> Specification



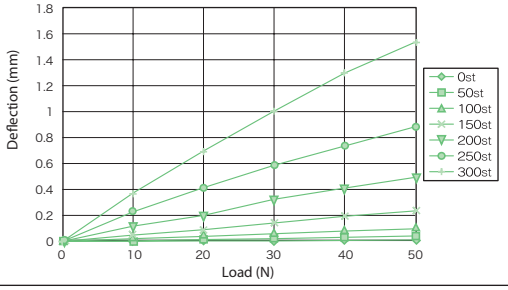
RCP2-RGD4C Type

■Double-Guide <Vertical> Specification



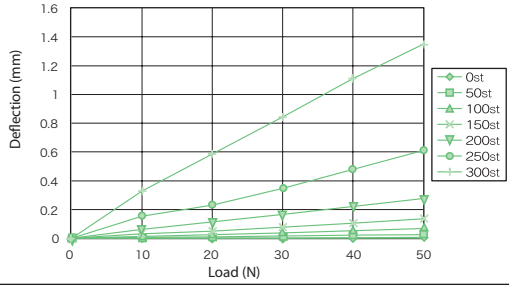
RCP2-RGD6C Type

■Double-Guide <Horizontal> Specification



RCP2-RGD6C Type

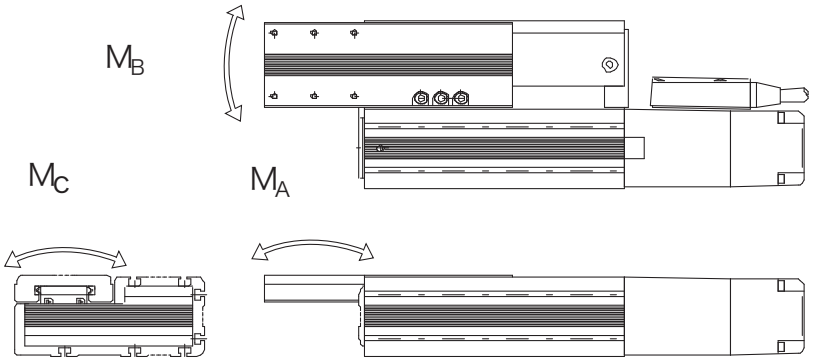
■Double-Guide <Vertical> Specification



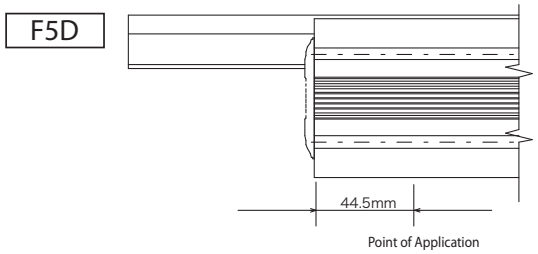
Flat Type F5D Technical Materials

Flat Type (F5D) Moment, load capacity

The direction of the moment in the flat type is as shown in the figure below.



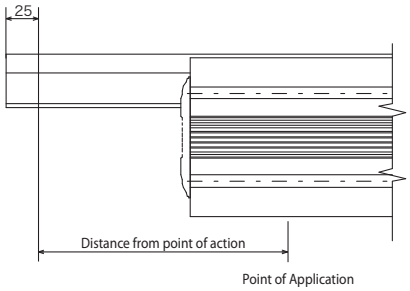
The points of moment application in the Ma and Mb directions are as shown below.



Be careful that the load exerted on the plate tip does not exceed the Ma moment when using a flat type horizontally.

Refer to the table below for the allowable tip loads calculated from the Ma moment for each stroke.

Stroke		50	100	150	200	250	300
F5D Type	Distance from point of action (m)	0.07	0.12	0.17	0.22	0.27	0.32
	N	64.3	37.5	26.5	20.5	16.7	14.1
	(kgf)	6.56	3.83	2.70	2.09	1.70	1.43



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Rotary Type RT6/RT6R/RT7R Technical Materials

Selection Guide

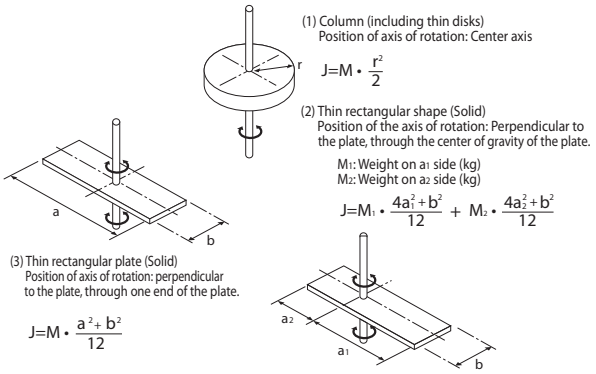
Check the following two points to confirm whether the ROBO Cylinder is compatible with your desired service conditions.

1 Inertial Moment

Inertial moment expresses the amount of inertia in a rotational motion, and corresponds to weight for linear motion.
The greater the inertial moment, the more difficult it is for that object to move and stop.
In other words, when choosing a rotary-type unit, a factor in that selection is whether or not it is possible to control the inertial moment of the object being rotated.
Inertial moment differs with the weight and shape of the object, but refer to the calculation formula in the typical example illustrated at right.

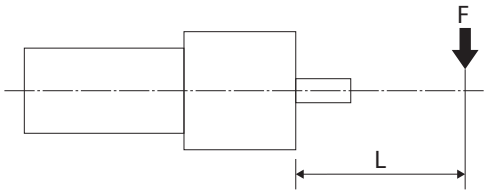
The allowable inertial moment value for a ROBO Rotary is expressed as load inertia.
A ROBO Rotary can be used if the calculated inertial moment is less than its load inertia.

● Inertial moment calculation methods for typical shapes
J: Inertial moment (kg•m²)/M: Weight (kg)/r: Radius (m)/a. B: Surrounding length (m)



2 Load Moment

If the inertial moment is a controllable (electrical) guide, the load moment is a guide for the limit to forced (mechanical) use.
Using the actuator body end of the output shaft mounting base as the reference position for moment, check whether the load moment exerted on the output axis is within the load moment tolerances in the catalog.
Use in excess of the allowable load moment may cause damage and s hortened service life.



Load moment (N•m)=F(N)L(m)

Precautions regarding range of motion and home-return

Please note that, when a ROBO Rotor performs home-return, there are cases in which the direction or rotation in the return-home operation will differ depending on the stopping position of the axis.

In the ROBO Rotor home-return operation, the axis turns and the home-return sensor detects, and the home-return is completed at the position where the Z-phase is detected as inverted. At this time, the axis rotates in **the counter-clockwise direction** (1), seen from the direction of the axis, and rotation stops when the sensor detection is inverted (2) and the Z-phase is detected (3). (See Figure 1)
However, if **the axis is detected by the sensor** when home-return begins, it **rotates in the clockwise direction** from that position (4) and stops when the Z-phase is detected (5). (Figure 2)

The range of operation of the ROBO Rotary is 300 degress, but since there is no stopper, there are cases in which the range of operation is exceeded when the axis is manually turned with the servo OFF, etc.
Please note that there are cases where the sensor will detected when the range of operation has been exceeded.

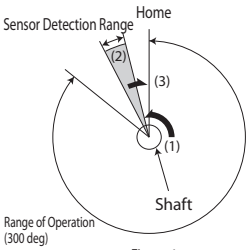


Figure 1

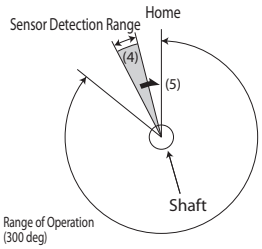


Figure 2

MEMO

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