IAI
Quality and Innovation

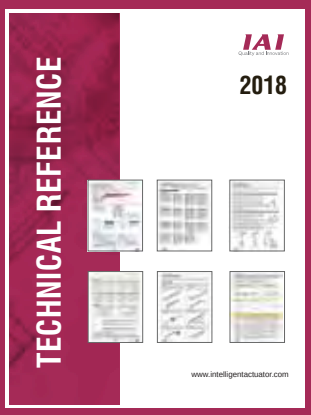
GB

Technical Reference

IAI General Catalogue Volume 1

Catalogue Extract

Cat. No. CE00304
Edition 1.5A

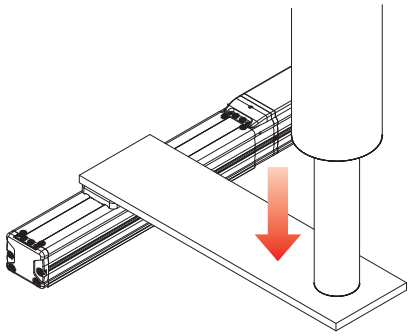


Allowable Moment

The allowable moment of a single-axis actuator represents the load capability of the built-in linear guide, and there are the 2 types indicated below, the allowable static moment and the allowable dynamic moment.

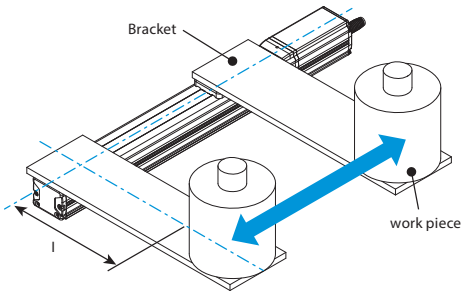
Static allowable moment

The allowable static moment is an index for damage and is the maximum moment that can be applied to a single-axis actuator at rest.
This index is calculated based on the durability of used parts and on the condition where a dent is made on the track of the built-in linear guide by a basic rated static load.
If a moment greater than this value acts on the actuator, movement defects and damages can occur. Since our allowable static moment also takes into account the durability of the parts, it cannot be compared to a moment that is calculated only based on the basic rated static load (static rated moment). The durability of the parts is inspected by testing and analyzing them, so the product can be used safely if the allowable value is not exceeded.
However, please avoid excessive vibrations and impacts to the product.



Dynamic allowable moment

The allowable dynamic moment is an index for service life and is the value through which our standard rated life of a single-axis actuator is calculated. Our company has set the standard rated life of a RoboCylinder as 5000 km and the standard rated life of a single-axis robot as 10000 km (excludes some models).
This index is calculated based on the condition where the track of the built-in linear guide flakes due to wear (basic rated dynamic load). If a moment greater than this value acts on the actuator, service life can become less than the standard value.
Since our allowable dynamic moment also takes into account the decrease in life due to operating conditions (standard load coefficient), it cannot be compared to a moment that is calculated only based on the basic rated dynamic load (dynamic rated moment). Under normal usage environment, the life can be calculated with a simple formula.
There are 3 directions, Ma (pitching), Mb (yawing), Mc (rolling), on which moments act on a single-axis actuator, and allowable moments are calculated for each direction.

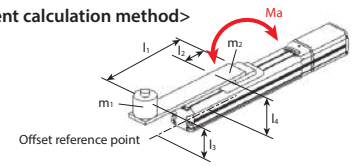


Moment M= m x l

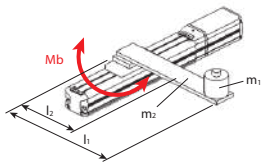
m : Load weight (include work piece and bracket)

l : Load length (he center of gravity including work piece and length)

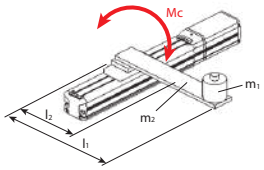
<Moment calculation method>



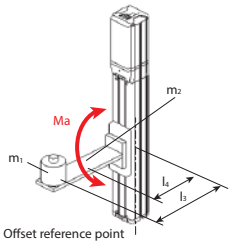
$Ma = (m_1 \times 9.8 \times l_1/1000) + (m_2 \times 9.8 \times l_2/1000) + a\{(m_1 \times 9.8 \times l_3/1000) + (m_2 \times 9.8 \times l_4/1000)\}$



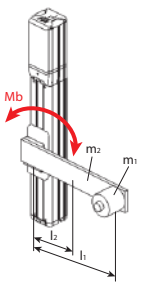
$Mb = a\{(m_1 \times 9.8 \times l_1/1000) + (m_2 \times 9.8 \times l_2/1000)\}$



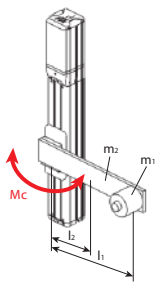
$Mc = (m_1 \times 9.8 \times l_1/1000) + (m_2 \times 9.8 \times l_2/1000)$



$Ma = (m_1 \times 9.8 \times l_3/1000) + (m_2 \times 9.8 \times l_4/1000) + a\{(m_1 \times 9.8 \times l_3/1000) + (m_2 \times 9.8 \times l_4/1000)\}$



$Mb = (m_1 \times 9.8 \times l_1/1000) + (m_2 \times 9.8 \times l_2/1000) + a\{(m_1 \times 9.8 \times l_1/1000) + (m_2 \times 9.8 \times l_2/1000)\}$



a : acceleration (G)
m_1 : mass of work (kg)
m_2 : mass of bracket (kg)
l_1 : Distance from center of slider to center of gravity of work (mm)
l_2 : Distance from center of slider to center of gravity of bracket (mm)
l_3 : Distance from offset reference point to center of gravity of work (mm)
l_4 : Distance from offset reference point to center of gravity of bracket (mm)

Operational Life

Operational life of a linear guide represents the total distance that can be traveled, without flaking, by 90% of a group of products that are operated separately under the same conditions. The operational life calculation method is as follows.

Operational life calculation method

Operational life of a linear guide can be calculated with the following formula using the allowable dynamic moment that is determined for each model.

$$L = \left(\frac{C_M}{M}\right)^3 \cdot URL$$

L: Operational Life (km), C_M: Allowable Dynamic Moment (N·m),
M: Acting moment (N·m), URL: Standard rated life (km)

For applications where the operational life may be decreased from vibrations and installation conditions, the operational life is calculated with the following formula.

$$L = \left(\frac{C_M}{M} \cdot \frac{f_{WS}}{f_W} \cdot \frac{1}{f_\alpha}\right)^3 \cdot URL$$

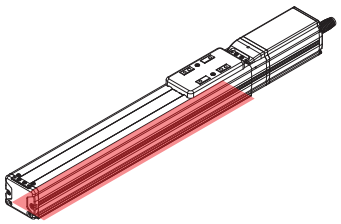
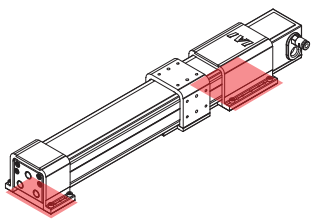
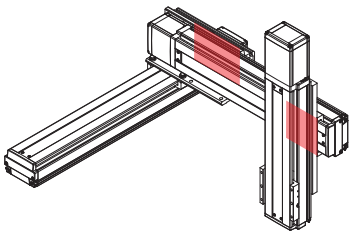
L: Service Life (km), C_M: Allowable Dynamic Moment (N·m), M: Acting moment (N·m),
f_{WS}: Standard load coefficient, f_W: Load coefficient, f_α: Attachment coefficient, URL: Standard rated life

The load coefficient f_W is a coefficient for taking into account the decrease in life from operating conditions. The standard load coefficient f_{WS} is a standard value of the load coefficient that is determined for each model. This coefficient is generally 1.2, but in the case that it is not 1.2, it is indicated in the specification of that model. The attachment coefficient fα is a coefficient for taking into account the decrease in life from the attachment condition of the actuator.

Load Coefficient

Operating Condition	Load coefficient f_W	Acceleration/Deceleration Guideline
Little vibration/impact, slow operatio	1.0 - 1.5	(Less than 1.0G)
Moderate vibration/impact, sudden braking/acceleratio	1.5 - 2.0	1.0G - 2.0G
Large vibration/impact with sudden acceleration/deceleratio	2.0 - 3.0	(Greater than 2.0G)

Attachment Coefficient

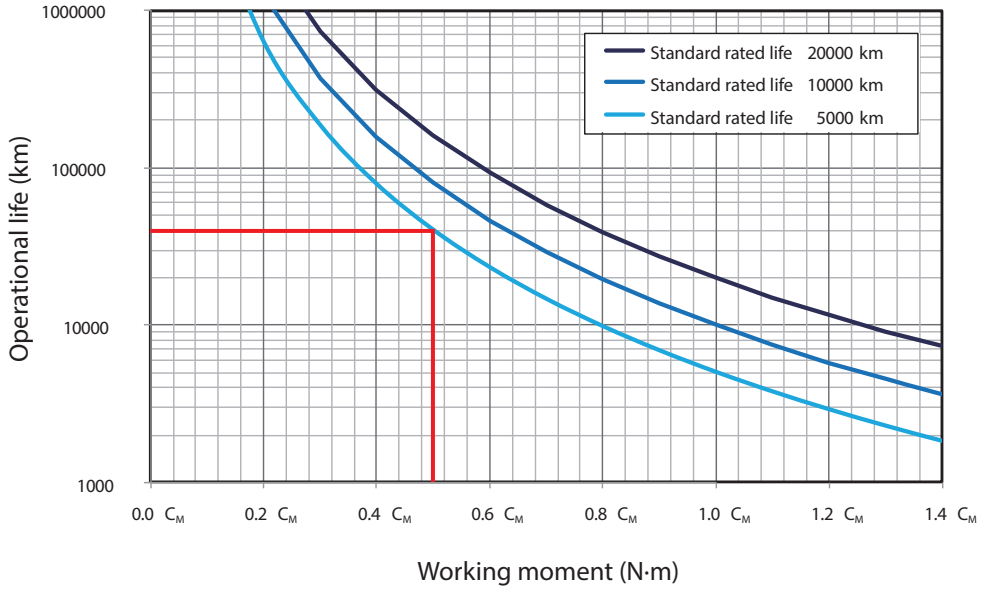
Attachment Condition	 Fixing entire surface	 Fixing at both ends	 Fixing sections
Attachment coefficient Fα	1.0	1.2	1.5

* As a general rule, please use every tapped hole on the mounting surface.
* Even when mounting the entire surface, please use the attachment coefficients of 1.2 or 1.5 depending on the length of the bolt for fixing.

Operational Life

The previous formula shows that the service life depends on the acting moment. With a light load, the service life will be longer than the standard rated life. For example, when a moment of 0.5C_M (half of the allowable dynamic moment) acts on a model with a standard rated life of 5000 km, the diagram below shows that the service life becomes 40000 km, which is 8 times the standard rated life.

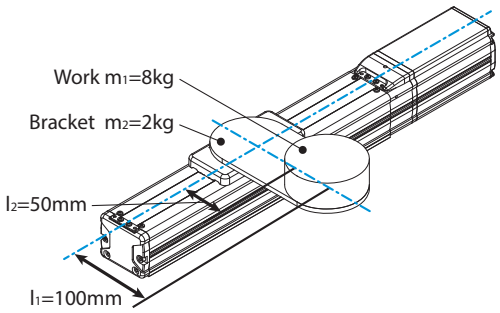
Relationship between working moment and operational life



* It is assumed that f_{WS}=f_W and $f\alpha$=1.0, and C_M indicates allowable dynamic moment.

Example calculation of service life

An example service life will be calculated using the operation conditions below.



Model	RCP5-SA6C-WA-42P-6
Installation Condition	Horizontal Installation
Attachment Condition	Fixing entire surface
Controller	PowerCON specification
Acceleration/Deceleration	0.5G

m_1: mass of work
m_2: mass of bracket
l_1: Distance to the center of gravity of the work
l_2: Distance to the center of gravity of the bracket

Since moment acting in the Mc direction of the actuator is the dominant one, calculation will be made using the moment acting in the Mc direction. Moment acting in the Mc direction is calculated as follows.

$$M = \left(m_1 \times 9.8 \times \frac{l_1}{1\,000} \right) + \left(m_2 \times 9.8 \times \frac{l_2}{1\,000} \right) = \left(8 \times 9.8 \times \frac{100}{1\,000} \right) + \left(2 \times 9.8 \times \frac{50}{1\,000} \right) = 8.82 \text{ N·m}$$

The load coefficient will be 1.25 since acceleration/deceleration is 0.5G. The attachment coefficient will be 1.0 since the attachment condition is fixing the entire surface. For this model, the allowable dynamic moment in the Mc direction is 24.6 N·m, the standard rated life is 5000km, and the standard load coefficient is 1.2, so the service life is calculated as follows.

$$L = \left(\frac{C_M}{M} \cdot \frac{f_{WS}}{f_W} \cdot \frac{1}{f_\alpha} \right)^3 \cdot URL = \left(\frac{24.6 \text{ N·m}}{8.82 \text{ N·m}} \times \frac{1.2}{1.25} \times \frac{1}{1} \right)^3 \times 5000 \text{ km} = 95980 \text{ km}$$

This shows that the service life for the above operation conditions is 95980 km.

Caution when Using a Guide with a Rod Type

Rod type actuators are classified into two main categories of "Radial cylinder type" and "Anti-rotation" type. Depending on the type, methods for dealing with radial loads and cautionary notes will be different, as indicated below.

Radial Cylinder Type

· A ball-rotating linear guide mechanism is built inside the actuator.
It can manage radial load without an external guide.
<Applicable Models>
· EC-RR☐(AH) · RCP6-RRA☐
· RCP4(W)-RA☐ · RCS3-RA15R/RA20R
· RCP5(W)-RA☐ · RCS4-RRA☐

Radial load

Radial load < Allowable radial load
External guide unnecessary

Radial load > Allowable radial load
Use an external guide

Anti-rotation rod type

· An anti-rotation mechanism is built inside the actuator. An external guide needs to be used if radial load is to be applied.
<Applicable models>
· EC-R☐ · RCA-RA☐
· RCP6(W)-RA☐ · RCS4-RA☐
· RCP3-RA☐ · RCS2-RA☐
· RCP2-RA10 · RCD-RA1DA

Radial load

Use an external guide

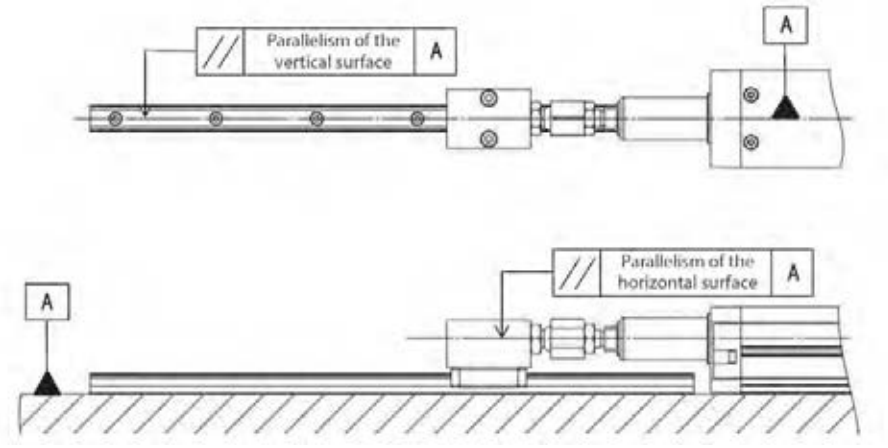
[Caution when using an external guide with a rod type]

· Parallelism of the actuator and the external guide

When using an external guide, if there is a deviation in the level of parallelism between the actuator and the external guide (either the horizontal or vertical surfaces), operation defects or early actuator damage may occur.

When the external guide is attached, adjustments have to be made to align the actuators and the guides. Then the uniformity of the sliding resistance throughout the entire stroke has to be checked.

This is done by checking the uniformity of the current value through the current monitoring function of the controller.



Caution when Using a Guide with a Rod Type

· External guide mounting method

The method for mounting the external guide differs by type.

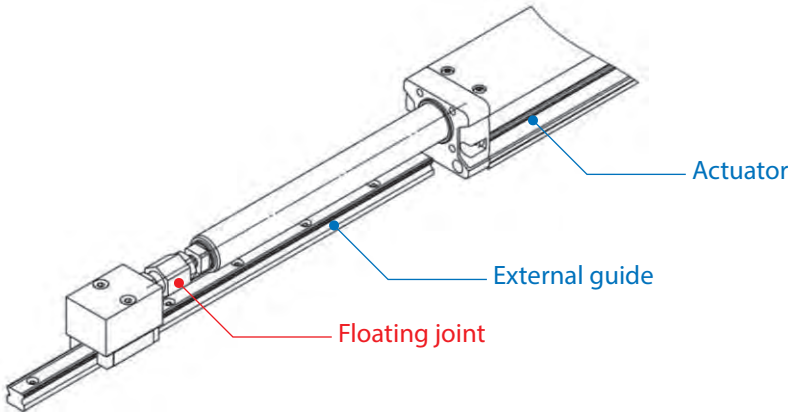
Even if the parallelism between the guide and the actuator could be adjusted, please be careful as there is a danger of accidental damage of the actuator with the incorrect mounting method.

Radial Cylinder type

For mounting the external guide for a radial cylinder type, a floating joint mount is recommended.

The floating joint compensates for the deviation in the parallelism of the built-in guide and the external guide, and this makes adjustments easy.

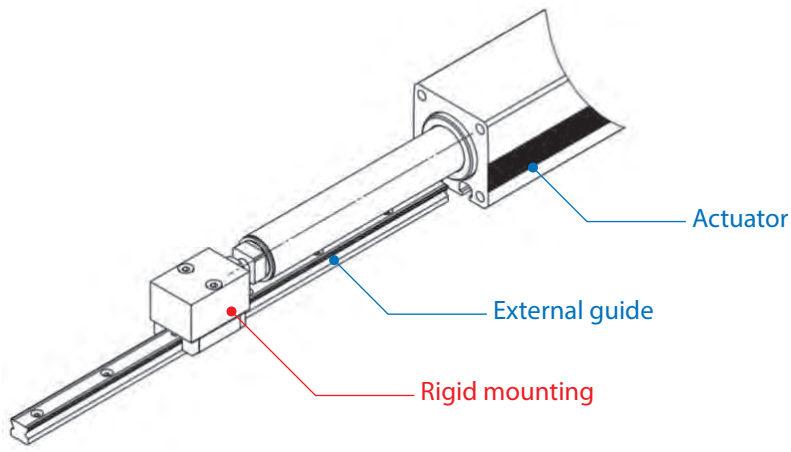
With rigid mounting, adjusting the parallelism of the built-in guide and the external guide is difficult, and even a slight deviation causes stress on the guide and can lead to early damaging.



Anti-rotation rod type

For mounting the external guide for an anti-rotation rod type, rigid mounting is recommended. Since the anti-rotation rod type cannot handle force in the rod rotation direction, it is necessary to regulate the rod rotation direction.

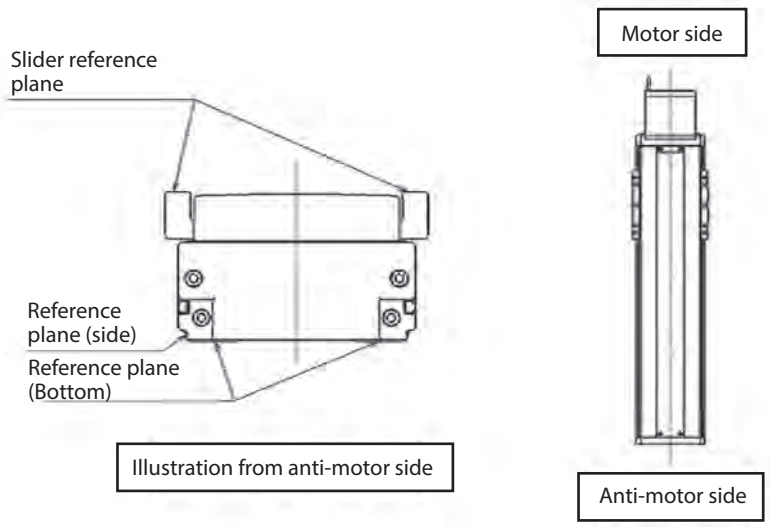
The rod rotation direction is not regulated with the floating joint, so force in the rod rotation direction could be applied to the anti-rotation mechanism during actuator operation, and this could cause early wearing of the anti-rotation mechanism. (There is no problem if it is a floating joint whose direction of rotation is regulated.)



Caution when Using a Guide with a Slider Type

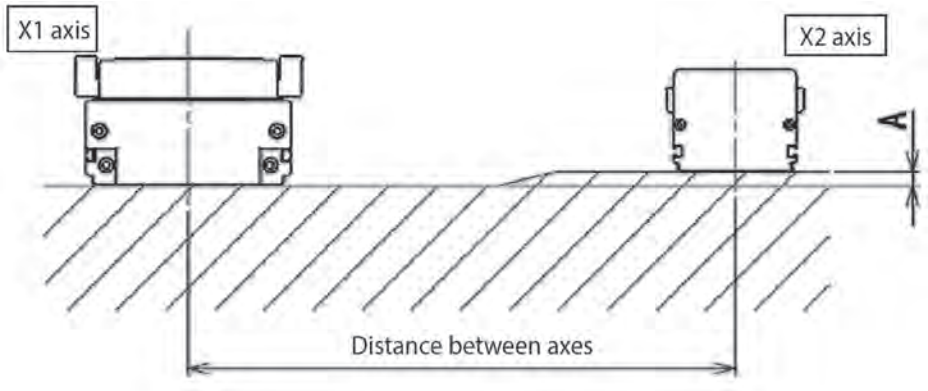
Installation reference surface of X-axis

When installing an actuator, please mount by using the reference surface below.



Height of the attaching surface of the X1 and X2 axes

Please keep the height difference of the mounting surfaces for the X1 and X2 axes below 0.05mm per 500mm distance between the axes (measurement A on the diagram below).

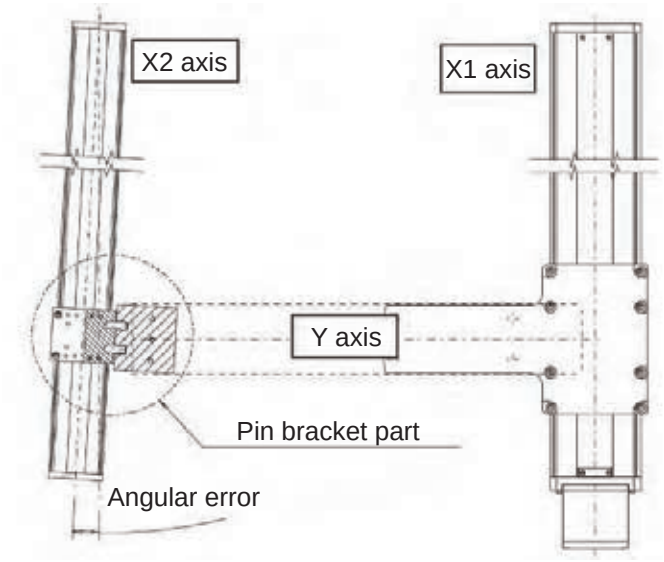


Caution when Using a Guide with a Slider Type

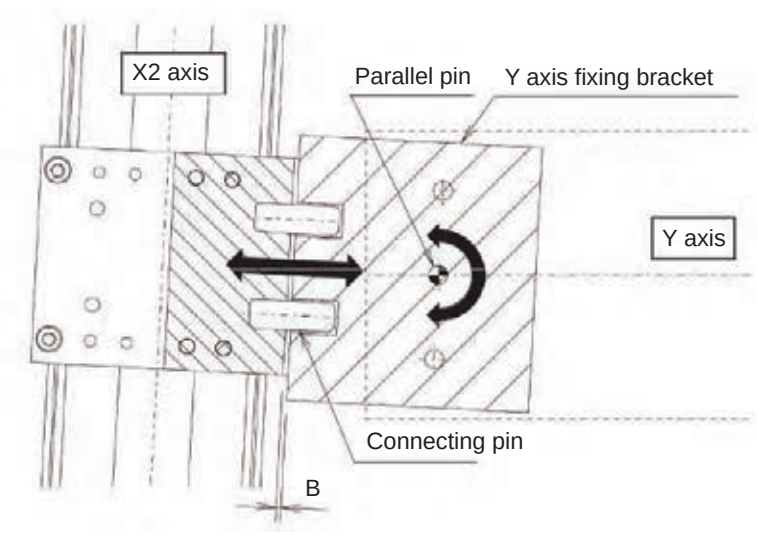
Parallelism when X1 and X2 axes are installed

The connection between the X2 axis and the Y axis is a pin bracket structure (*1). The base-installing parallelism of the X1 and X2 axes should be within 2+/-1mm over the entire stroke (measurement B on the diagram below).

<Gantry assembly top view>



<Pin bracket section details>



*1 Pin bracket structure

This structure absorbs any parallelism errors between the X1 axis and X2 axis.

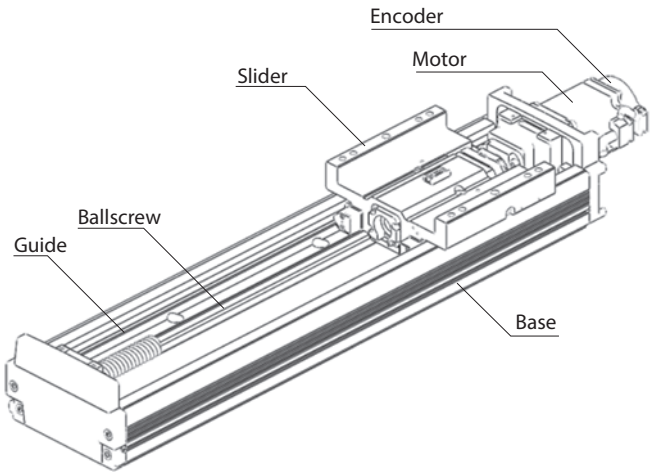
- X1 axis and Y axis are rigidly fixed.
- The Y axis mounting bracket is positioned with the center of the Y-axis using 1 parallel pin, and this allows adjustment in the rotation direction, which makes it possible to absorb the angle deviation between the X1 and X2 axes.
- The Y-axis and the X2-axis are linked with 2 connecting pins, and this allows sliding in the direction of the axes, which absorbs the variations in the distance between the X1-axis slider and the X2-axis slider.

Structure and Principles of Movement of a Single-Axis Robot

The actuator basically has the structure as shown in the figure below.

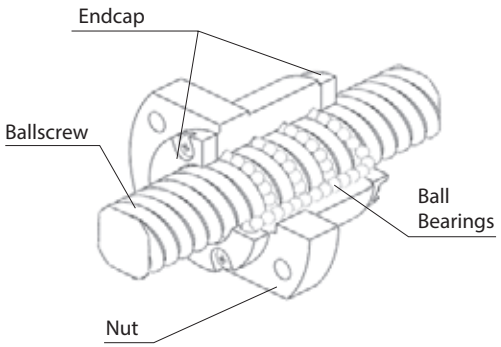
The ballscrew rotates when the motor rotates, and this causes the slider to move.

The amount of movement and speed are detected by the encoder, positioning is performed by controlling the rotation of the motor (ballscrew).



■ Ballscrew

Since the screw and the slider are in contact with the ball bearings as shown in the figure below, the ballscrew can rotate with less frictional resistance like a bearing.



Ballscrew Accuracy

The lead accuracy of our company's ball screw is equivalent to the accuracy class C5 or C10 of JIS standard (JIS B 1192).

The accuracy of C10 is defined as ± 210 µm for the typical transfer amount error (see figure below) for 300mm.

The accuracy of the C5 (the typical transfer amount error and the allowance value of the variation) is as follows.

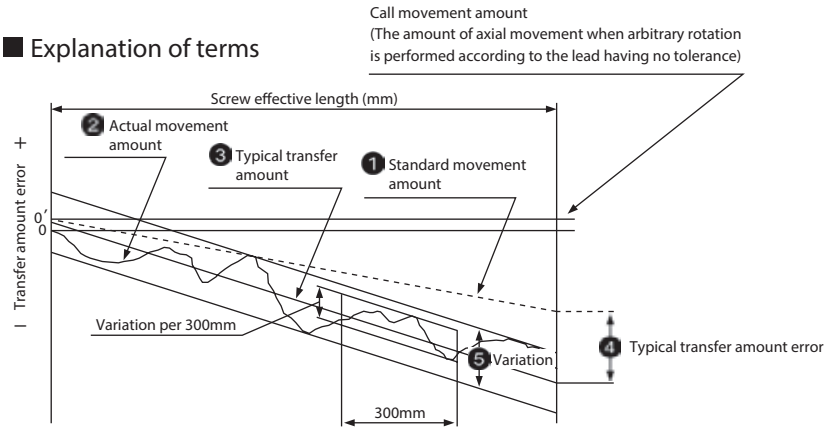
Note: The numbers in the table below are reference values, and absolute positioning accuracy is not guaranteed.

■ Typical transfer amount error

Units: µm

Items		Typical transfer amount error	Variation
Screw effective length (mm)			
Over	Below		
—	315	23	18
31 5	400	25	20
40 0	500	27	20
50 0	630	30	23
63 0	800	35	25
80 0	1000	40	27
1000	1250	46	30
1250	1600	54	35
1600	2000	65	40
2000	2500	77	46
2500	3150	93	54

■ Explanation of terms



1 Standard movement amount: The amount of movement in the axis direction when a standard lead (lead without tolerance) is rotated an arbitrary number of times.

2 Actual movement amount: The measured value of actual movement in the axis direction.

3 Typical transfer amount: A straight line representing the trend of the actual movement amount. It is determined by the least squares method from the curve showing the actual moving amount.

4 Typical transfer amount error: Difference between the typical movement amount and the standard movement amount.

5 Variation: The maximum width of the actual movement amount curve between two straight lines parallel to the typical movement amount line.

Intermediate Support Structure (Patented)

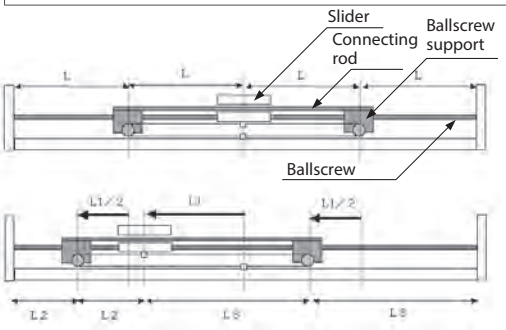
The intermediate support is an innovative structure that significantly improves the maximum speed of a long stroke type by adding a ballscrew support system that moves with the slider in order to limit the swinging of the ballscrew and increase the critical speed of the actuator.

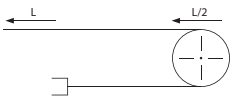
The structure of the intermediate support is fixed with the ball screw supports fixed at the connecting rod (half the length of the stroke) penetrating the slider through a wire as shown in the right figure.

One end of the wire is fixed on the middle section of the stroke of the base, and is fixed to the slider with the pulley of ball screw support.

This mechanism moves the ball screw support by only 1/2 of the slider movement, and the ball screw support always supports the ball screw halfway between the position of the slider and the stroke end, resulting in suppressing the deflection of the ball screw.

Intermediate support models
ISB/ISPB-MXMX/LXMX/LXUWX
ISA/ISPA-MXMX/LXMX/LXUWX/WXMX
ISDB/ISPDB-MX/LX
NS-MXMXS/LXMXS





(Note) Horizontal installation is standard. If you install the main unit vertically or vertically, the wire may come off. Install vertically only.

Types of Robot Feedback Control

Commanding to do operations in order to check whether the robot is moving as commanded and to correct if there are deviations is called feedback control, and there are a few methods to do this.

The single-axis robots, ROBO Cylinders, SCARA robots, and Cartesian robots of IAI use the semi-closed loop control.

This is a general servo control method, and the actuator movement is detected by the encoder and fed back.

In contrast to this, the open loop control and the full closed loop control have the following characteristics.

Open loop control

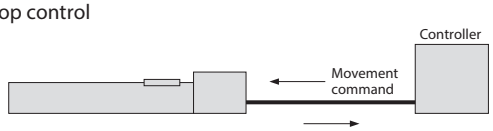
This is a general stepper motor method, and is inexpensive since there is no encoder, but cannot make corrections when there are deviations between the operation commands and the movement because it is not a feedback control.

Full closed loop control

The slider position can be determined accurately because the absolute position of the slider is measured and fed back. (Due to actuator accuracy errors, for semi-closed loop, there will be errors within a set range between the actual actuator position and the position information that is fed back from the encoder.)

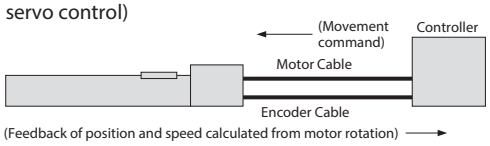
Types of feedbacks

■ Open loop control

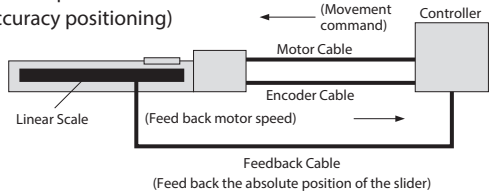


No signals that are returned to the controller
(It can not be corrected even if the position is shifted.)

■ Semi-closed control
(General servo control)



■ Full closed loop control
(High accuracy positioning)



Protection Structure

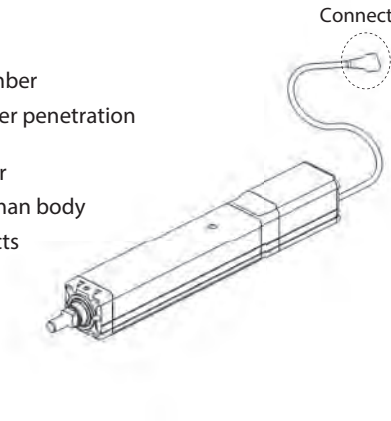
Protection structure refers to the level of protection from water, human body, and solid foreign objects. The the levels indicated below are based on the standards of IEC (International Electrotechnical Commission), JIS (Japanese Industrial Standards), and JEMA (Japan Electrical Manufacturers' Association).

IEC standard

IP□□

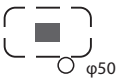
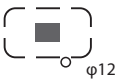
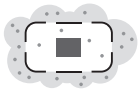
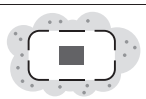
Second indicating number
Protection against water penetration

First indicating number
Protection against human body
and solid foreign objects

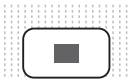
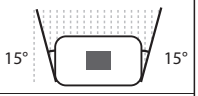
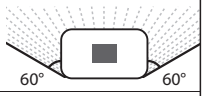
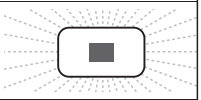
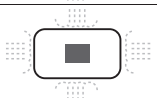
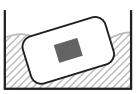
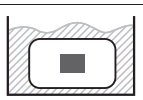


Caution:
Although the protection structure is designed to include cables, the cable end connector is not subjected to splash proof treatment, so it is not subject to the protection structure. Therefore, please avoid mounting the actuator in such a way that water may come in contact with the connector.

■ Level of protection indicated by the first indicating number

First indicating number	Details
0	Unprotected
1	Things like human hands do not touch the internal charging section. (φ50mm) 
2	Things like human fingertips do not touch the internal charging section. (φ12mm) 
3	Solids such as tools and wires exceeding 2.5 mm in diameter or thickness do not enter. 
4	Solids such as tools and wires exceeding 1.0 mm in diameter or thickness do not enter. 
5	No harmful effects from dust that enters the inside. 
6	Dust does not enter the inside. (Completely prevented) 

■ Level of protection indicated by the second indicating number

Second indicating number	JIS standard	Details
0		Unprotected
1	Drip-resistant 1 type	No harmful effect from vertical drips of water 
2	Drip-resistant 2 type	No harmful effects from drips of water from angles within 15 degrees of the vertical 
3	Rain-resistant type	No harmful effects from drips of water from angles within 60 degrees of the vertical 
4	Splash-resistant type	No harmful effects from splashes of water from any direction 
5	Jet-resistant type	No harmful effects from direct jets of water from any direction 
6	Water-resistant type	No water enters the inside when direct jets of water from any direction hits 
7	Immersion type	No water enters the inside when immersed in water under certain conditions 
8	Submersion type	It can be used at all times by submerging into water of specified pressure. 

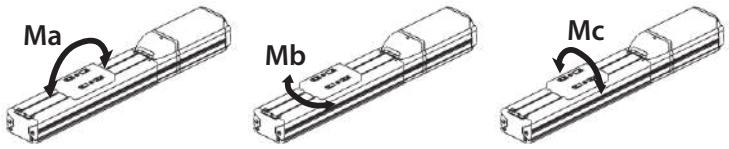
Double Slider Allowable Dynamic Moment/Overhang Load Length

Double slider (addition of a free slider carriage) can be chosen as an option for the following models.
The allowable dynamic moment and the overhang load length vary depending on the span between the sliders.
A representative example follows after the specifications tables, so please use it for reference.

Allowable dynamic moment direction diagram

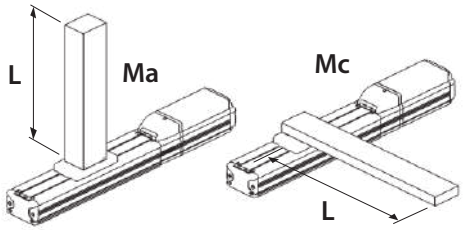
■ The value of the allowable dynamic moment assumes a standard rated life.
Please note that when using beyond the moment specification value, the life of the guide will decrease.

Moment direction



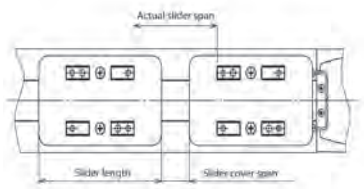
Overhang load length diagram

■ When using beyond the overhanging allowance value of each model, vibration may occur, so please be sure to use within the allowable value.

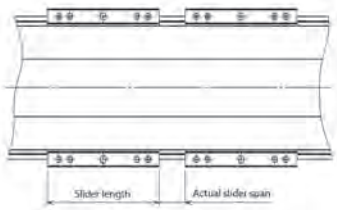


Double slider diagram

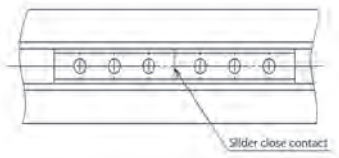
■ With slider cover



■ Without slider cover



■ IF Series



[Double slider specification table]

Series name	Type name	Allowable dynamic moment						Overhang load length (mm)	Cleanroom specification maximum speed (mm/sec)	Cleanroom specification suction volume (Nℓ/min)	Slider mass (kg)	Slider length (mm)	Minimum stroke with double slider (mm)
		Standard rated life (km)	Slider span (mm)		Ma direction (N·m)	Mb direction (N·m)	Mc direction (N·m)	Ma direction Mb·Mc direction					
			Actual slider span	Slider cover span									
RCP4	SA5C(R)	5000	60	6	52.6	75.2	24.1	450	–	–	0.6	94	50
RCP4CR	SA5C	5000	60	10	52.6	75.2	24.1	450	1000	80	0.6	90	50
RCA	SA5C(R)	5000	60	6	52.6	75.2	24.1	450	–	–	0.6	94	50
	SA6C(R)		90	35	106	152	40.0	660	–	–	1	115	
RCACR	SA5C	5000	60	10	52.6	75.2	24.1	450	1000	85	0.6	90	50
	SA6C		90	35	106	152	40.0	660	1000	90	1	115	
RCS3(P)	SA8C(R)	10000	72		174	249	103	1140	–	–	1.5	78	50
	SS8C(R)		110	30	342	342	148	1350	–	–	2.5	170	
RCS3(P)CR	SA8C	10000	84	18	174	249	103	1140	1000	200	1.5	132	50
	SS8C		110	30	342	342	148	1350	1000	165	2.5	170	
RCS2	SA5C(R)	5000	60	6	52.6	75.2	24.1	450	–	–	0.6	94	50
	SA6C(R)		90	35	106	152	40.0	660	–	–	1	115	
	SA7C(R)		90	24	187	268	92.1	690	–	–	1	126	
RCS2CR	SA5C	5000	60	10	52.6	75.2	24.1	450	1000	85	0.6	90	50
	SA6C		90	35	106	152	40.0	660	1000	90	1	115	
	SA7C		90	22	187	268	92.1	690	800	110	1	128	

[Double slider specification table]

Series name	Type name	Allowable dynamic moment						Overhang load length (mm)	Cleanroom specification maximum speed (mm/sec)	Cleanroom specification suction volume (Nℓ/min)	Slider mass (kg)	Slider length (mm)	Minimum stroke with double slider (mm)
		Standard rated life (km)	Slider span (mm)		Ma direction (N·m)	Mb direction (N·m)	Mc direction (N·m)	Ma direction Mb·Mc direction					
			Actual slider span	Slider cover span									
ISB ISPB	SXM	10000	minimum 30	–	140	200	125	1050	–	–	1.5	90	100
			maximum 90	–	228	325	125	1350	–	–			
	SXL		minimum 30	–	188	269	145	1250	–	–		110	130
			maximum 90	–	286	409	145	1550	–	–			
	MXM	10000	minimum 35	–	332	475	307	1375	–	–	2.5	120	100
			maximum 120	–	561	801	307	1800	–	–			
	MXL		minimum 35	–	481	687	368	1675	–	–		150	120
			maximum 120	–	743	1060	368	2100	–	–			
	LXM	10000	minimum 35	–	481	687	473	1675	–	–	3.5	150	100
			maximum 150	–	845	1210	473	2250	–	–			
	LXL		minimum 35	–	616	880	532	1975	–	–		180	120
			maximum 150	–	1010	1450	532	2550	–	–			
ISA ISPA	WXM	10000	minimum 35	–	616	880	739	1975	–	–	4	180	100
			maximum 180	–	1130	1610	739	2700	–	–			
IS(P)DB IS(P)DBCR IS(P)DBCR-ESD	S	10000	110	46	259	370	125	1050	960	110	1.5	154	100
	M		minimum 80	6	448	640	307	1375	1000	180	2.5	194	100
			maximum 120	46	561	801	307	1800					
	L		minimum 100	26	678	968	473	1675	1000	200	3.5	224	100
			maximum 150	76	845	1210	473	2250					
IS(P)DACR	W	10000	minimum 90	30	683	976	678	2050	1000	100	4.0	220	100
			maximum 160	100	922	1320	678	2250					
IF-SA-60 IF-SA-100		10000	minimum 45	–	160	229	125	1125	–	–	1.5	90	100
			maximum 60	–	182	260	125	1200	–	–			
IF-MA-200 IF-MA-400		10000	minimum 55	–	382	546	307	1475	–	–	2.5	120	100
			maximum 80	–	448	640	307	1600	–	–			
FS-12NM FS-12NO		20000	When slider is in close contact	–	20.5	18.6	9.1	500	–	–	–	60	–
				–									
FS-12WM FS-12WO		20000	When slider is in close contact	–	27.4	25.4	11.7	600	–	–	–	70	–
				–									
FS-12LM FS-12LO FS12HM		20000	When slider is in close contact	–	51.9	47	25.4	750	–	–	–	85	–
				–									
				–									

■Caution when using double slider

(1) When the double slider option is specified, please calculate the required stroke length by subtracting the slider length and the slider actual span from the stroke in the model number. When specifying a model number, please specify the total stroke of the actuator, including the extra slider length and slider actual span. Please make sure that the total stroke is greater than the minimum effective stroke with the double slider specification.

NO.	Actuator form	Stroke length specified in model number
①	Model with slider cover	Greater than "required stroke" + "slider cover span" + "slider length"
②	Model without slider cover	Greater than "required stroke" + "actual slider span" + "slider length"

Example① RCP4-SA5C (Model with slider cover)
Required stroke: 200mm Slider cover span: 6mm Slider length: 94mm
200mm + 6mm + 94mm = 300mm or greater should be specified

Example② RCS3-SA8C (Model without slider cover)
Required stroke: 200mm Actual slider span: 72mm Slider length: 78mm
200mm + 72mm + 78mm = 350mm or greater should be specified

(2) The double slider payload quantity is the maximum value obtained by subtracting the slider mass to be added from the catalog specification value.
However, this does not need to be considered for FS.

(3) Please note that the maximum speed can not be set depending on the stroke.

(4) For the clean (CR) type double slider specification, the suction amount does not include the influence of piping resistance. Please note that piping resistance is caused by piping length and piping diameter, causing loss of flow rate.

Double Slider Allowable Dynamic Moment/Overhang Load Length

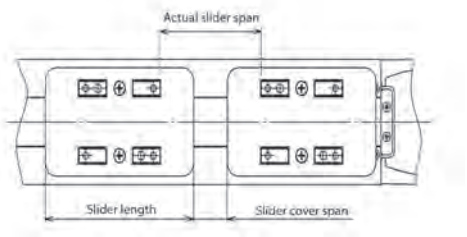
[RCP6 (CR) Double slider specification table]

Series name	Type name	Lead (mm)	Allowable dynamic moment						Overhang load length (mm)	Cleanroom suction volume (Nℓ/min)	*1 Conveying mass Compensation value A (kg)	*1 Conveying mass Compensation value B (kg)	*1 Conveying mass Compensation speed (mm/s)	Slider length (mm)	Minimum stroke with double slider (mm)
			Standard rated life (km)	Slider span (mm)		Ma direction (N·m)	Mb direction (N·m)	Mc direction (N·m)	Ma direction Mb·Mc direction						
				Actual slider span	Slider cover span										
RCP6(S)	SA4C(R)	10	5000	60	24	44.6	63.6	15.7	420	–	0.6	2	350	76	50
		5											215		
		2.5											105		
	SA6C(R)	12	5000	90	40	106	152	40	630	–	1.2	2	320	110	50
		6											280		
		3											140		
	SA7C(R)	16	5000	70	20	285	285	145	810	–	1.7	5	280	130	50
		8											140		
		4											70		
	SA8C(R)	20	5000	120	35	565	565	237	1200	–	7 (*2)	–	–	165	50
		10											–		
		5											–		
RCP6(S) CR	SA4C	10	5000	60	24	44.6	63.6	15.7	420	60	0.6	2	350	76	50
		5								30			215		
		2.5								20			105		
	SA6C	12	5000	90	40	106	152	40	630	110	1.2	2	320	110	50
		6								60			280		
		3								35			140		
	SA7C	16	5000	70	20	285	285	145	810	100	1.7	5	280	130	50
		8								50			140		
		4								40			70		
	SA8C	20	5000	120	35	565	565	237	1200	170	7 (*2)	–	–	165	50
		10								90			–		
		5								40			–		

[Double slider unavailable list]

Series name	Type name	Lead (mm)	Double slider can not be selected	
			Horizontal installation	Vertical installation
RCP6(S)	SA4C(R)	16	×	×
		10		×
	SA6C(R)	20	×	×
		12		×
	SA7C(R)	24	×	×
		16		×
	SA8C(R)	30	×	×
		20		×
RCP6(S)CR	SA4C	16	×	×
		10		×
	SA6C	20	×	×
		12		×
	SA7C	24	×	×
		16		×
	SA8C	30	×	×
		20		×

[Double slider Span diagram]



*1 In the double slider specification (other than RCP6(CR)-SA8), to obtain the allowable payload of the actuator when traveling at speeds up to the transport mass compensation speed, subtract the value in transport mass compensation weight A from the standard payload rating of the actuator.
When traveling at speeds that exceed the conveying mass compensation speed, subtract the value in transport mass compensation weight B from the standard payload rating of the actuator in order to obtain the allowable payload of the actuator.
In addition, please refer to the maximum speed specification for the actuator's total stroke (stroke specified in the model number).

*2 In the double slider specification of RCP6(CR)-SA8, to obtain the allowable payload of the actuator when traveling at any speed within the allowable range, subtract the value in transport mass compensation weight A from the standard payload rating of the actuator.
Please refer to the maximum speed specification for the actuator's total stroke (stroke specified in the model number).

Note
- Please calculate the double slider load capacity in the specification table above and "Payload mass table by speed / acceleration" (P. 1-457) Please check the maximum speed from calculated payload quantity. (Refer to the instruction manual for details)
- Double sliders can not be selected depending on the lead. Please check "Double slider unavailable list".
- When selecting double slider specification and reverse homing specification at the same time, please be sure to perform the home return operation after connecting the drive slider and the free slider.

[RCPS4 (CR) Double slider specification table]

Series name	Type name	Lead (mm)	Allowable dynamic moment						Overhang load length (mm)	Cleanroom suction volume (Nℓ/min)	*1 Conveying mass Compensation value (kg)	Slider length (mm)	Minimum stroke with double slider (mm)
			Standard rated life (km)	Slider span (mm)		Ma direction (N·m)	Mb direction (N·m)	Mc direction (N·m)	Ma direction Mb·Mc direction				
				Actual slider span	Slider cover span								
RCS4	SA4C(R)	16	5000	60	24	44.6	63.6	15.7	420	–	1	76	50
		10											
		5											
		2.5											
	SA6C(R)	20	5000	90	40	106	152	40	630	–	2	110	50
		12											
		6											
		3											
	SA7C(R)	24	5000	70	20	285	285	145	810	–	2	130	50
		16											
		8											
		4											
	SA8C(R)	30	5000	120	35	565	565	237	1200	–	2.5	165	50
		20											
		10											
		5											
RCS4CR	SA4C	10	5000	60	24	44.6	63.6	15.7	420	60	1	76	50
		5								30			
		2.5								20			
	SA6C	12	5000	90	40	106	152	40	630	110	2	110	50
		6								60			
		3								35			
	SA7C	16	5000	70	20	285	285	145	810	100	2	130	50
		8								50			
		4								40			
	SA8C	10	5000	120	35	565	565	237	1200	120	2.5	165	50
		5								50			

*1 IIn the double slider specification, the transport mass specification value is the value obtained by subtracting the transport mass compensation value from the standard specification transport mass.

Note • The lead not listed in the table does not have a double slider setting.

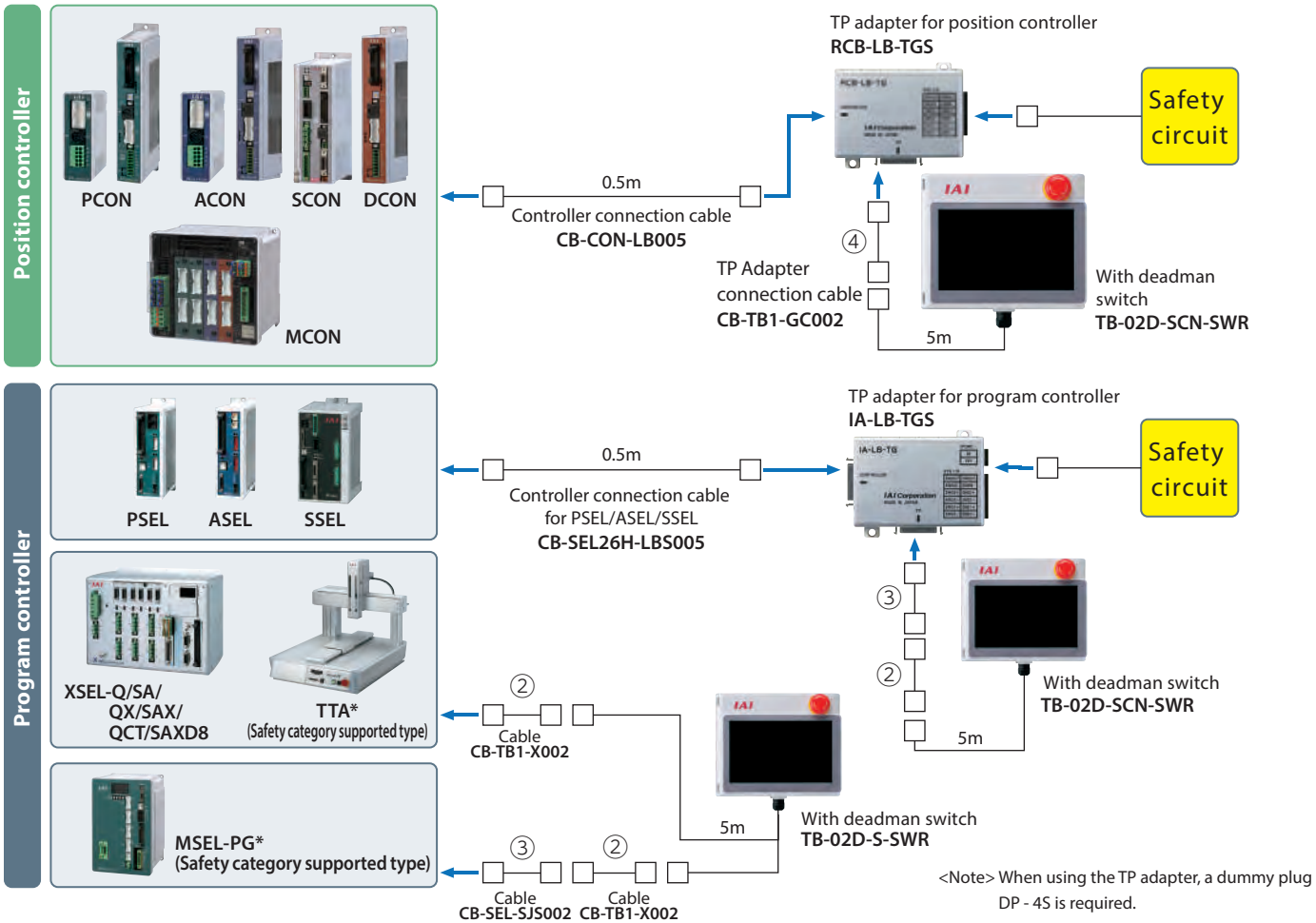
Safety Category Supported Type

<Response to safety category for each controller>

Please use the touch panel teaching pendant (TB - 02D) and the TP adapter (RCB - LB - TGS) to configure the system to be compliant with the safety category (ISO 13849-1).
By changing the wiring of the system I / O connector, it is possible to handle safety category B ~ 4 (B~3 for some controllers).

Controller type	Safety category	ISO standard
MCON-C/CG/LC/LCG	B ~ 4	ISO13849-1
PCON-CB/CGB/CFB/CGFB	B ~ 4	
ACON-CB/CGB	B ~ 4	
DCON-CB/CGB	B ~ 4	
SCON-CB/CGB/CAL/CGAL/LC/LCG	B ~ 4	
PSEL-CS	B ~ 4	
ASEL-CS	B ~ 4	
SSEL-CS	B ~ 4	
MSEL-PG	B ~ 3	
XSEL-Q/SA/QX/SAX/QCT/SAXD8	B ~ 4	
TTA	B ~ 3	

■The response to the safety category is as follows. Safety categories B to 4 are compatible. * For MSEL and TTA up to Category 3



<Note> When using the TP adapter, a dummy plug DP - 4S is required.

Actuator Installation Method

The mounting method varies depending on the model of the actuator. The following table shows the mounting methods for each model.
* For mounting using options, refer to each product page.

Classification	Series	Type	Threaded mounting holes on the bottom of the base	Counterbored through holes on the base	T-slot mounting	Fixed the motorpart	Fixed rod end	Fixed the main unit side
Slider Type	EC	S6/S7	—	—	○	—	—	—
	RCP6(S)	SA4/SA6/SA7	○	○	—	○	—	—
		SA8	○	—	—	○	—	—
		WSA	—	○	—	○	—	—
	RCP5	SA	○	○	—	○	—	—
		BA	—	○	—	—	—	—
	RCP4	SA	○	○	—	○	—	—
	RCP3	SA	○	—	—	—	—	—
	RCA2	SA	○	—	—	—	—	—
	RCA	SA4/SA5	○	△ (*1)	—	—	—	—
		SA6	○	—	—	—	—	—
	RCS3/RCS3P	SA8/SS8	○	—	—	○	—	—
		CT8	○	—	—	○	—	—
	RCS2	SA4/SA5	○	△ (*1)	—	○	—	—
		SA6	○	—	—	—	—	—
		SA7	○	○	—	—	—	—
	ISB/ISPB	SXM/SXL/MXM/ MXL/LXM/LXL	○	○	—	—	—	—
		MXMX/LXMX/ LXUWX	—	○	—	—	—	—
	SSPA	S/M/L	○	○	—	—	—	—
	ISA	WXM	○	—	—	—	—	—
		WXMX	○	—	—	—	—	—
	ISDB/IDPDB	S/M/L	○	—	—	—	—	—
		MX/LX	○	—	—	—	—	—
	NS	All models	—	○	—	—	—	—
	IF	SA/MA	—	○	—	—	—	—
	FS	All models	—	—	—	—	—	—
Rod Type	EC	R6/R7	—	—	—	—	○	—
	RCP6(S)	RA	—	—	○	○	○	—
		RRA	○	○	—	○	○	—
		WRA	—	○	○(Side)	○	○	—
	RCP5	RA4/RA6/RA7	○	○(*2)	—	○	○	—
		RA8/RA10	○	—	—	○	○	—
	RCP4	RA(*14)	○	○	—	○	○	—
	RCP3	RA2	○	—	—	—	—	—
	RCP2	RA2	○	—	—	—	○	—
		RA3/RA8	○	—	—	○	○	—
		RA10	○	—	—	—	○	—
		SR	○*	—	—	—	○	—
	RCD	RA	—	—	—	1-388	—	—
	RCA2	RN/RP	—	—	—	1-387	—	—
		GS/GD	—	—	—	—	—	○(4 faces)
		SD	—	—	—	—	—	○(3 faces)
	RCA	RA	—	—	—	○	—	—
		RGD	—	—	—	—	○	—
		SRA/SRGD/SRGS	—	—	—	○	○	—
	RCP6(S)	RA	—	—	○	○	○	—
		RRA	○	○	—	○	○	—
		WRA	—	○	○(Side)	○	○	—
	RCS2	RA4	—	—	—	○	—	—
		RA5	—	—	○	—	○	—
		RN/RP	—	—	—	1-387	—	—
		GS/GD	—	—	—	—	—	○(4 faces)
		SD	—	—	—	—	—	○(3 faces)
		RGS/RGD	—	—	—	—	○	—
		SRA/SRGD/SRGS	—	—	—	○	○	—
Table type	RCP6(S)	TA	○	○	—	○	—	—
	RCP3	TA	○	—	—	—	—	—
	RCA2	TA/TCA/TWA/TFA	○	—	—	—	—	—
	RCS4	TA	○	○	—	○	—	—
	RCS3	CTZ5C	○	—	—	—	—	—
	RCS2	TCA/TWA/TFA	○	—	—	—	—	—

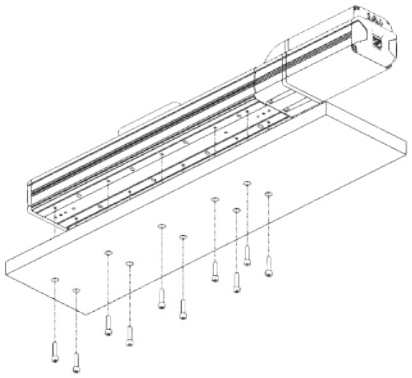
Classification	Series	Type	Threaded mounting holes on the bottom of the base	Counterbored through holes on the base	T-slot mounting	Fixed the motorpart	Fixed rod end	Fixed the main unit side
Linear servo	LSA	S6/S8/S10	○	—	—	—	—	—
		N10/N15	○	—	—	—	—	—
		W21	○	○	—	—	—	—
	LSAS	N10/N15	○	—	—	—	—	—
Servo press	RCS3	RA4/RA6/RA7	○	○	—	○	○	—
		RA8/RA10	○	—	—	—	○	—
		RA15/RA20	—	—	—	—	○	—
	RCS2	RA13	○	—	—	—	○	—
Gripper	RCP6	GR7T	—	—	○	—	—	—
	RCP4	GR	○	—	—	—	—	○
	RCP2	GR	○	—	—	—	—	○
	RCD	GRSNA	○	○	—	—	—	—
	RCS2	GR8	—	—	○	—	—	—
Rotary	RCP2	RT	○	—	—	—	○	○(2 faces)
	RCS2	RTC	○	—	—	—	○	○
		RT6	○	—	—	—	○	—
Direct drive motor	DDA	LT/LH	○	—	—	—	—	—
	DD	LT/LH	—	○	—	—	—	—
Rotation	RS		—	—	—	1-378	—	—
Stopper cylinder	RCP4	ST	△(Using option)	○	—	—	—	—
Vertical/ Rotation	ZR	S/M	—	—	—	1-378	—	—
Cleanroom	RCP6CR(S)	SA	○	○	—	—	—	—
		WSA	—	○	—	—	—	—
	RCP5CR	SA	○	○	—	—	—	—
	RCP4CR	SA	○	○	—	—	—	—
	RCP2CR	GR	○	—	—	—	—	—
		RT	○	—	—	—	—	—
	RCACR	SA	○	—	—	—	—	—
	RCS4CR	SA	○	○	—	—	—	—
		WSA	—	○	—	—	—	—
	RCS3CR	SA/SS	○	—	—	—	—	—
	RCS2CR	SA/SS	○	—	—	—	—	—
	DDACR	LT/LH	○	—	—	—	—	—
	ISDBCR/ ISPDACR	S/M/L	○	—	—	—	—	—
	SSPDACR	S/M/L	○	—	—	—	—	—
	ISDACR/ ISPDACR	W	○	—	—	—	—	—
Dust-proof and splash-proof	RCP6W	RA	—	—	○	—	○	—
		RRA	○(RRA8 only Side)	—	○	—	○	—
		WRA	—	○	○(Side)	—	—	—
	RCP5W	RA6/RA7	○	—	○	—	○	—
		RA8/RA10	○	—	—	—	○	—
	RCP4W	SA	○ (Using option)	○ (Using option)	—	—	—	—
		RA	○	—	○	—	○	—
	RCP2W	SA16	—	○	—	—	—	—
		RA4/RA6	○	—	○	—	○	—
		RA10	○	—	—	—	○	—
		GR	○	—	—	—	—	○
		RT	○	—	—	—	○	○
	RCA2W	RN/RP	—	—	—	1-387	—	—
		GS/GD	—	—	—	—	—	○(4 faces)
		SD	—	—	—	—	—	○(3 faces)
	RCAW	RA	—	—	—	○	○	—
	RCS2W	RN/RP	—	—	—	1-387	—	—
		GS/GD	—	—	—	—	—	○(4 faces)
		SD	—	—	—	—	—	○(3 faces)
	ISWA/ISPWA	S/M/L	○	—	—	—	—	—

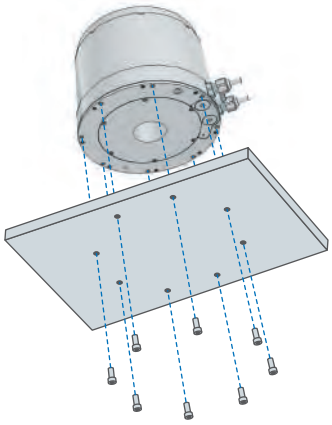
*1 SA4 should be less than 200mm stroke, SA5 should be less than 300mm stroke.

*2 Two mounting holes closest to the rod of RA4 can not be used for installation.

Actuator Installation Method

Threaded mounting holes on the bottom of the base

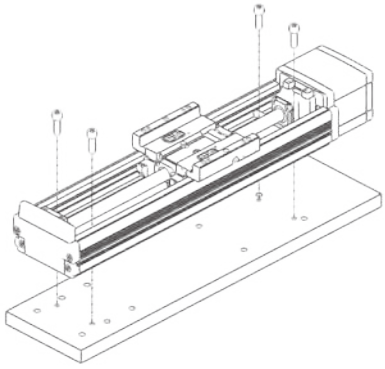




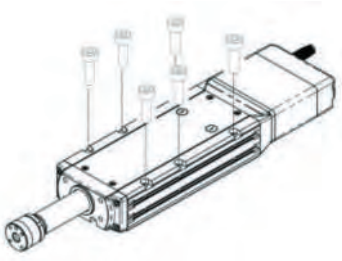
*Refer to the dimensions diagram of the product page for the sizes of the screw holes.

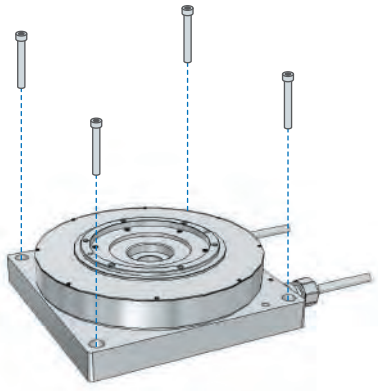
Mounted using the counterbored through holes on the top of the base

Installing from the top removing the cover



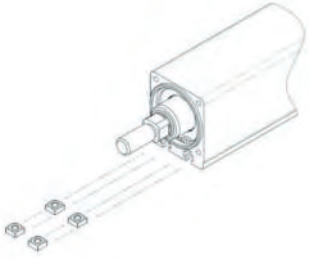
Installing from the top without removing the cover

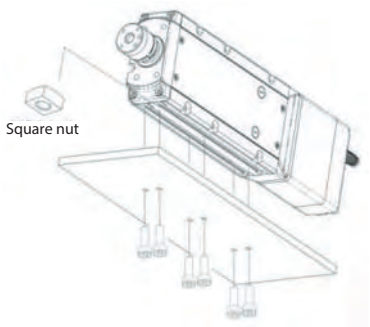


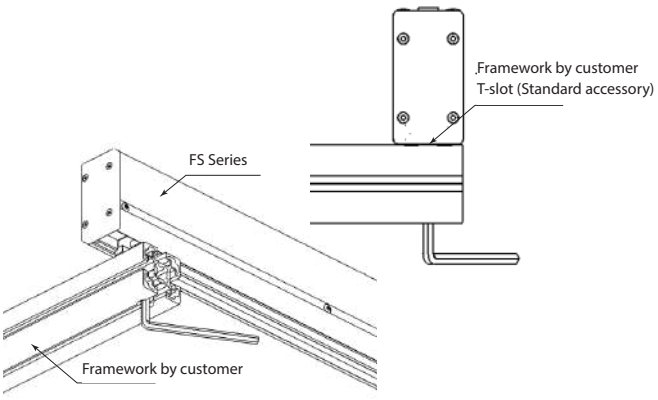


*Refer to the dimensions diagram of the product page for the sizes of the screw holes.

Mounted using the T-slot



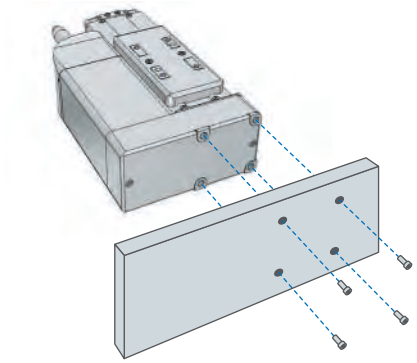




*Refer to the dimensions diagram of the product page for the sizes of the T-slots.

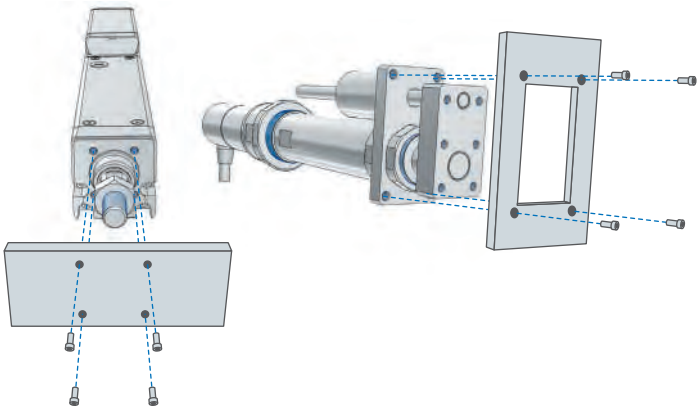
Fixed the motor part

In the case of motor turning back, it is possible to install using the tapped hole of the bracket part.



Fixed rod end

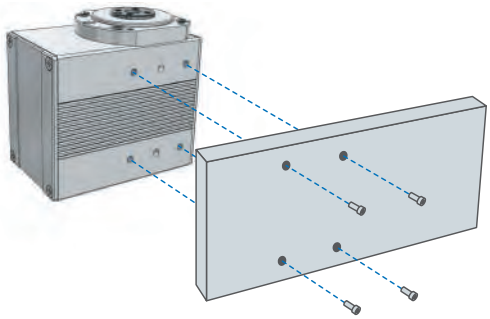
It is possible to install using the tapped hole of the front bracket part of the rod tip.

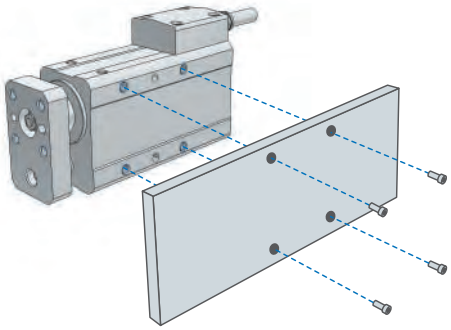


*Refer to the dimensions diagram of the product page for the sizes of the screw holes.

Fixed the main unit side

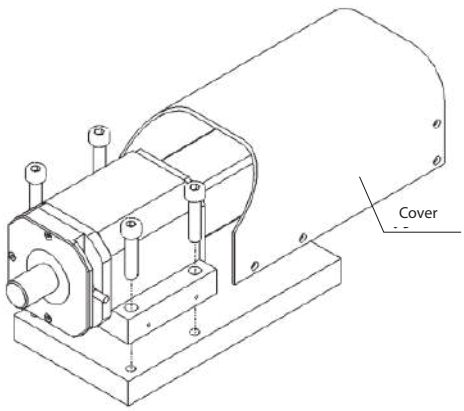
Actuator side mounting is possible.

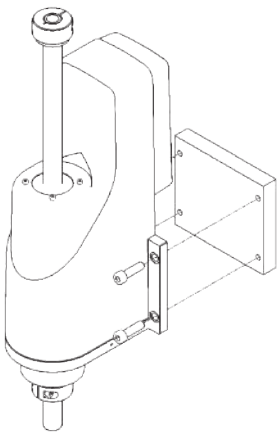




*Refer to the dimensions diagram of the product page for the sizes of the screw holes.

Fixed the main unit rear



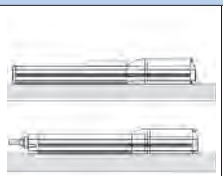
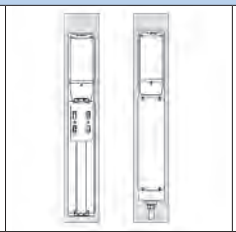
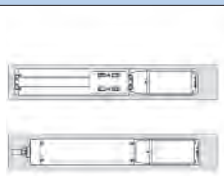
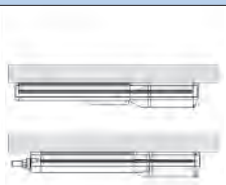


*Refer to the dimensions diagram of the product page for the sizes of the through holes.

Actuator Installation Orientation

Depending on the actuator model, there are Installation orientations that cannot be used or require caution.
Please check the details of the Installation orientations of each model on the table below before using.

○: Can be installed △:Required daily checking ×:Can not install

			Installation Orientation			
						
Classification	Series	Type	Horizontal flat plane installation	Vertical installation (*1)	Sideways installation	Ceiling installation
Slider Type	EC	S6/S7	○	○	△ (*2)	△ (*2)
	RCP6(S)	SA/WSA	○	○	△ (*2)	△ (*2)
	RCP5	SA	○	○	△ (*2)	△ (*2)
		BA	○	×	△ (*2) (*3) (Only for strokes less than 1000mm)	△ (*2) (*3) (Only for strokes less than 1000mm)
	RCP4	SA	○	○	△ (*2)	△ (*2)
	RCP3	SA2	○	×	×	×
		SA3	○	○	○	△ (*2)
		SA4/SA5/SA6	○	○	△ (*2)	△ (*2)
	RCA2	SA3	○	○	○	△ (*2)
		SA4/SA5/SA6	○	○	△ (*2)	△ (*2)
	RCA	SA	○	○	△ (*2)	△ (*2)
	RCS3	SA	○	○	○ (*4)	○ (*4)
		SS	○	○	△ (*2)	△ (*2)
		CT8	○	×	×	○
	RCS2	SA4	○	○	○	△ (*2)
		SA5/SA6/SA7	○	○	△ (*2)	△ (*2)
	ISB/ISPB	SXM/SXL/MXM/ MXL/LXM/LXL	○	○	○ (*6)	○ (*7)
		MXMX/LXMX/ LXUWX	○	×	×	△ (*7) (Only for strokes less than 1300mm)
	SSPA	S/M/L	○	○	○ (*6)	○ (*7)
	ISA	WXM	○	○	○ (*6)	△ (*7) (Only for strokes less than 1300mm)
		WXMX	○	×	×	△ (*7) (Only for strokes less than 1300mm)
	ISDB/IDPDB	S/M/L	○	○	△ (*2)	△ (*2)
		MX/LX	○	×	×	×
	NS	SXMX/SXMM/ MXMS/MXMM/ LXMS/LXMM	○	×	×	○ (*8) (Only for strokes less than 1600mm)
		SZMS/SZMM/ MZMS/MZMM/ LZMS/LZMM	×	○	×	×
		MXMXS/LXMXS	○	×	×	×
	IF	SA/MA	○	×	×	○ (*7)
	FS	All models	○	×	×	○ (*10)
Rod Type	EC	R6/R7	○		○	○
	RCP6(S)	RA/RRA/WRA	○	○	○	○
	RCP5	RA	○	○	○	○
	RCP4	RA (*11)	○	○	○	○
	RCP3	RA2	○	○	○	○
	RCP2	RA/SR	○	○	○	○
	RCD	RA	○	○	○	○
	RCA2	RN/RP/GS/GD	○	○	○	○
		SD	○	○ (*13)	○	○
	RCA	RA/RFS/RGS/RGD/ SRA/SRGS/SRGD	○	○	○	○
	RCS2	RA/RN/RP/GS/GD/ SR/RG	○	○	○	○
		SD	○	○ (*14)	○	○

○: Can be installed △:Required daily checking ×:Can not install

Classification	Series	Type	Horizontal flat plane installation	Vertical installation (*1)	Sideways installation	Ceiling installation
Table Type	RCP6(S)	TA (*15)	○	○	○	○
	RCP3	TA	○	○	○	○
	RCA2	TA/TCS/TWA/TFA	○	○	○	○
	RCS3	CTZ5C	○	○	×	×
	RCS2	TCA/TWA/TFA	○	○	○	○
Linear motor	LSA	S6/S8/S10	○	×	○	×
		N10/N15	○	×	×	×
		W21	○	×	×	×
	LSAS	N10/N15	○	×	×	×
Servo press	RCS3	RA4/RA6/RA7/R8/R10	○	○	○	×
		RA15/RA20	○	○	×	×
	RCS2	RA13	○	○	○	○
Gripper	RCP4	GR	○	○	○	○
	RCP2	GR	○	○	○	○
	RCD	GRSNA	○	○	○	○
	RCS2	GR8	○	○	○	○
Rotary	RCP2	RT	○	○	○	○
	RCS2	RTC	○	○	○	○
		RT6	○	○	○	○
Direct drive motor	DDA	LT/LH	○	○	○	○
	DD	LT/LH	○	○	○	○
Rotation	RS		○	○	○	○
Stopper cylinder	RCP4	ST	×	○ (Only rod up)	×	×
Vertical/Rotation	ZR	S/M	×	○(Refer to 1-382)	×	×
Cleanroom	RCP6CR(S)	SA/WSA	○	○	△ (*2) (*9)	△ (*2) (*9)
	RCP5CR	SA	○	○	△ (*2) (*9)	△ (*2) (*9)
	RCP4CR	SA	○	○	△ (*2) (*9)	△ (*2) (*9)
	RCP2CR	GR	○	○	○	○
		RT	○	○	○	○
	RCACR	SA	○	○	△ (*2) (*9)	△ (*2) (*9)
	RCS3CR	SA/SS	○	○	△ (*2) (*9)	△ (*2) (*9)
	RCS2CR	SA/SS	○	○	△ (*2) (*9)	△ (*2) (*9)
	DDACR	LT/LH	○	○	○	○
	ISDBCR/ISPDACR	S/M/L	○	○	△ (*2) (Only for strokes less than 400mm)	△ (*2) (Only for strokes less than 400mm)
		MX/LX	○	○	×	×
	SSPDACR	S/M/L	○	○	×	×
	ISDACR/ISPDACR	W	○	○	△ (*2) (Only for strokes less than 400mm)	△ (*2) (Only for strokes less than 400mm)
		WX	○	×	×	×
Dust-proof and splash-proof	RCP6W	GRT7	○	○	○	○
	RCP5W	RA	○	○	○	○
	RCP4W	SA	○	×	○(*5)	○(*5)
		RA (*11)	○	○	○	○
	RCP2W	SA16	○	×	×	×
		RA	○	○	○	○
		GR	○	○	○	○
		RT	○	○	○	○
	RCA2W	RN/RP/GS/GD	○	○	○	○
		SD (*12)	○	○(*13)	○	○
	RCAW	RA	○	○	○	○
	RCS2W	RN/RP/GS/GD/RA	○	○	○	○
		SD	○	○(*14)	○	○
	ISWA/ISPWA	S/M/L	○	×	×	×
	DDW	LH	○	○	○	×

Regarding Actuator Installation Orientation

Cautions about installation orientation

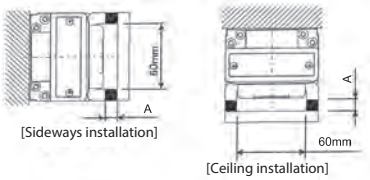
(*1) In the case of vertical installation, please install so that the motor is on top, if possible.
During normal operation, there is no problem when mounting the actuator with the motor on the bottom, but when the motor stops for a long period of time, the grease can separate chemically and the base oil can flow into the motor unit, causing malfunctions on rare occasions.

(*2) Although it is possible to install the actuator sideways, in that case there is a possibility of slack and slippage in the stainless sheet. When continuing to be used this way, malfunctions like broken stainless sheets may occur. Therefore, please perform daily inspections, and make adjustments if the stainless sheet is slack or displaced.

(*3) Sideways and ceiling installation for the RCP5 belt types are options.
It is not possible to install the horizontal/ceiling specifications in a sideways orientation.
It is not possible to install the sideways specification in the horizontal or ceiling orientations.
Please do not install in a slanted or vertical orientation since it will cause operation failures.

(*4) If RCS3 - SA8C / SA8R is used in a sideways / ceiling installation, the screw cover may bend and interfere with the slider installation. Therefore, please keep the distance between the slider mounting surface and the work as shown in the table below.

Stroke	Distance between slider mounting surface and work
At least 400mm, less than 800 mm	At least 5mm
At least 800mm, less than 1100 mm	At least 7mm
At least 1100mm (for custom order)	At least 10mm

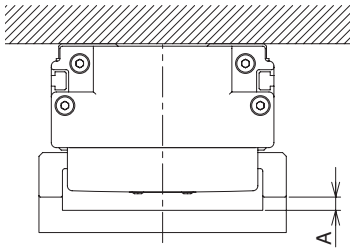


(*5) Optional mounting bracket is required when RCP4W slider type is used in a sideways and ceiling orientation.
When installing ceiling-mounted and sideways with a different bracket, splash-proof performance can not be guaranteed, so please be sure to use the correct optional bracket.
Refer to page1-384 for installing orientation when option bracket is installed.

(*6) Oil separated from the grease may drip from the opening on the side of the actuator.
There is a possibility that a foreign part is dropped from other equipment, and it may enter the open space of the actuator side face. If necessary, please attach protective parts.

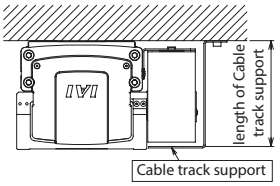
(*7) Since ceiling mounting a screw cover type actuator may cause the screw cover to bend and interfere with the work, please install the work away from the top of the slider.
The distance A from the slider mounting surface is as follows.

Series	Stroke	Distance A
ISB/ISPB ISA/ISPA	At least 600mm, less than 1000mm	At least 5mm
	At least 1000mm, less than 1300mm	At least 10mm
SSPA	At least 800mm, less than 1500mm	At least 5mm
IF	At least 900mm, less than 1400mm	At least 5mm
	At least 1400mm, less than 2100mm	At least 10mm
	At least 2100mm, less than 2400mm	At least 15mm
	At least 2400mm, less than 2500mm	At least 20mm



(*8) When the NS actuators are suspended from the ceilings, the cable track may hang and become damaged. If a cable track support is installed, ceiling mounting becomes possible. For the standard cable track specifications for the LXMS and LXMM, ceiling mounting is not possible, because the cable wiring box sticks out about the cable track. When using the LXMS or LXMM with ceiling mounting, please use the extended cable track option.

Type	Cable track support size (units: mm)
SXMS, SXMM	89
MXMS, MXMM	109
LXMS, LXMM (Expanded bare OP)	155



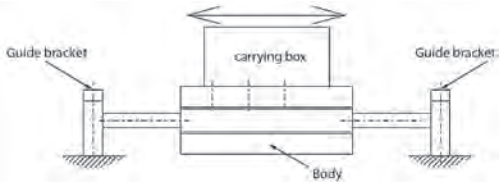
(*9) There may be cases where maintaining ISO cleanliness class 4 can not be maintained if slack or slippage occurs in the stainless sheet, when installing in a in sideways and ceiling mount. Therefore, please perform daily inspections, and make adjustments if the stainless sheet is slack or displaced.

(*10) Please note that ceiling mount is not possible when the option "Stainless sheet specification (D1/D2)" is selected.

(*11) Motor types 42SP, 56SP are models for vertical installation only.

(*12) There are two ways to mount the slide unit type: mounting the main unit and mounting the guide bracket. (In the case of bracket mounting, the payload capacity will be reduced by 1.5 kg.)

<Installing the guide bracket>



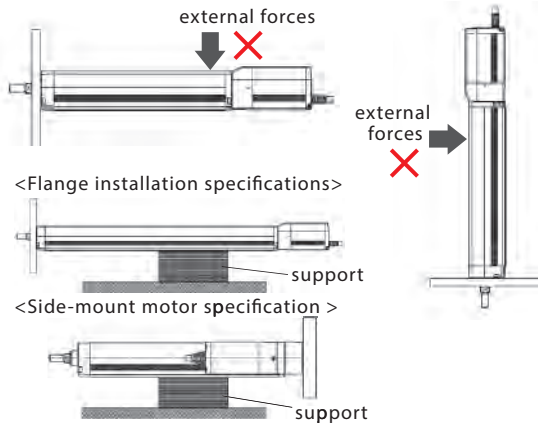
(*13) There are two ways to mount the slide unit type: mounting the main unit and mounting the guide bracket. Please note that vertical mounting is not possible when mounting the bracket.

(*14) Slide unit type lead 10 can not be installed vertically.

(*15) When using the reversing bracket mounting holes, damages or malfunctions of parts may occur due to external force, bending moment and vibration under certain conditions of installations and operations. Please secure the main body with a supporting base etc.

<Caution when installing a rod type>

When installing a front housing and a flange (option), please make sure no external force acts on the actuator . (malfunctions and parts damages can occur from external force). When there will be external forces or if the actuator is going to be combined with something like a Cartesian robot, please use the mounting holes on the actuator to secure it.
Please install a support block when front installing or back installing an actuator in a horizontal orientation. Depending on the installation condition and operating conditions, it may cause damage to the actuator due to vibration.When external force is applied to the actuator or when using the actuator in combination with an orthogonal robot etc, please use the mounting holes on the actuator to secure it.

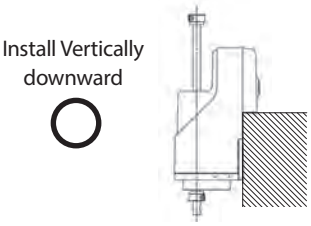


<Caution when installing a RCS3 rod type>

Customer's tooling is to be installed on the load cell.
Please provide guides to the outside so that radial load and moment load will not be applied to the load cell.
When using the reversing bracket mounting holes, depending on the installation condition and operating conditions, damage or malfunction of parts may occur due to external force, bending moment, vibration. Please secure the base frame main body with a supporting base etc.

<ZR mounting orientation>

The ZR series can only be used for vertical downward installation.



IF Series Motor Installation Orientation

Depending on the installation condition of the actuator, the positions of the motor and sensors can be changed to 6 types as shown below.

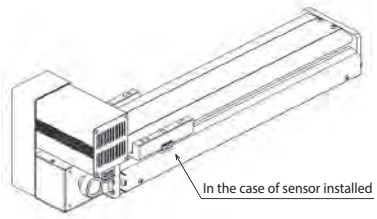
This makes it possible to change the motor position according to the installation environment.

Where the motor is installed horizontally or below, the position of the motor will be lower than the slider so there is no work interference.

In addition, when attaching the creep sensor (C) and the origin limit switch (L) as an option, when the motor installing direction is L, they are mounted as standard (on the right side as viewed from the motor side, symbols C and L). R they are mounted to the reverse side (on the left side as viewed from the motor side, symbols CL and LL).

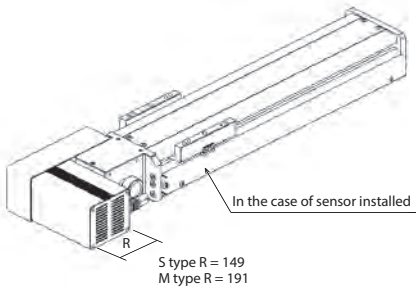
Standard type

■Type: 1L



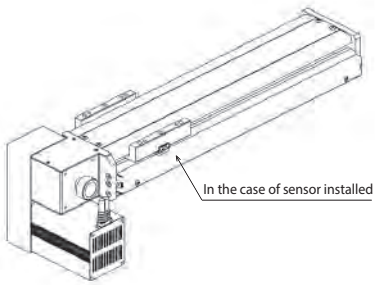
Installing motor horizontally

■Type: 2L



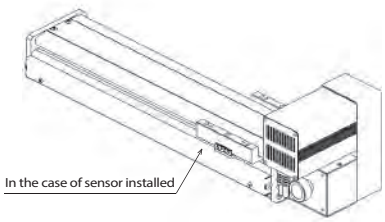
Installing motor below

■Type: 3L



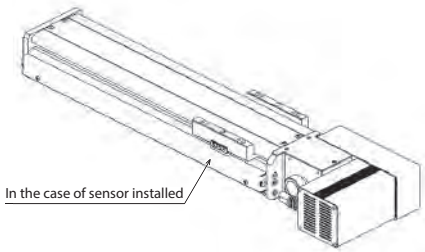
Standard type

■Type: 1R



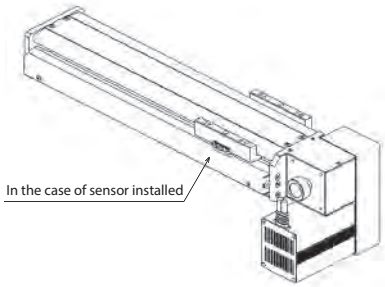
Installing motor horizontally

■Type: 2R



Installing motor below

■Type: 3R



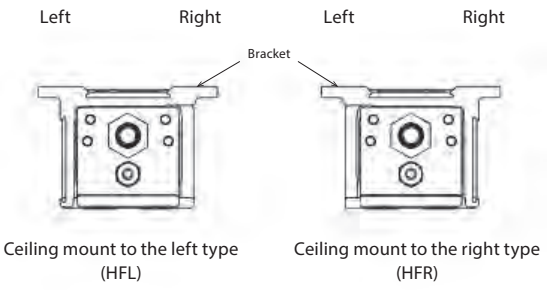
RCP4W-SA Installation Orientation

Illustration when optional ceiling mounting is selected (Model TFL/HFR).

When the optional ceiling installation (Model HFL / HFR) is selected, or when lateral wall installation (Model TFL / TFR) is selected, the direction of the actuator body is horizontal. Please refer to the following for installation orientation.

RCP4W-SA Ceiling installation specification

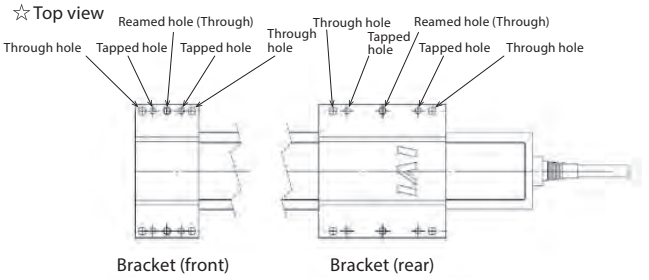
Installing with the bracket option for ceiling mounting (Model HFL/HFR).

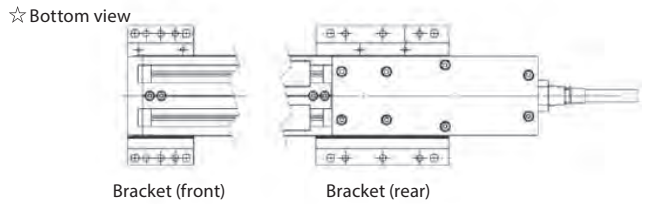


Ceiling mount to the left type (HFL)

Ceiling mount to the right type (HFR)

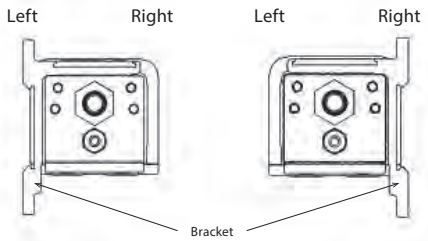
(View from motor side shaft end)





RCP4W-SA Wall installation specification

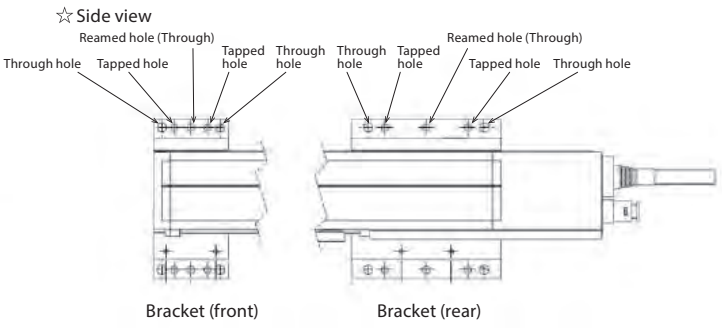
Installing with the bracket option for wall mounting (Model TFL / TFR).



Left wall mounting specification (TFL)

Right wall mounting specification (TFR)

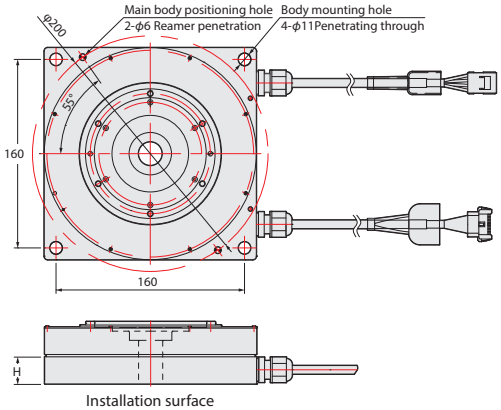
(View from motor side shaft end)



Caution for Installation (DD·DDA·DDW·RCS3-CT8C·CT4)

Direct drive motor

■DD

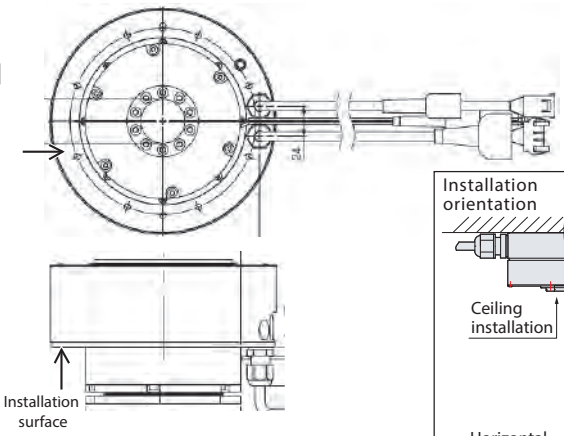


Installation surface height (H measurement)

	T18	LT18	H18	LH18
H measurement	23	33	31	31

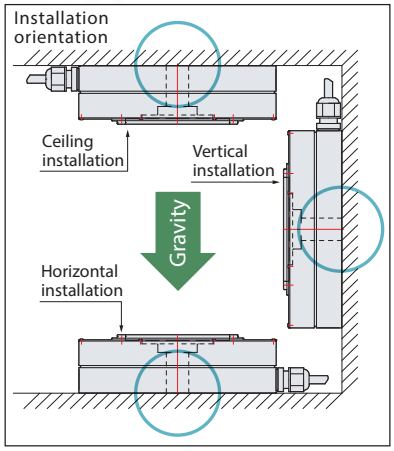
Note) Please use this product by mounting it to a surface that has heat dissipation characteristics equivalent to w400 x d400 x t10 aluminum plate. Please contact us if the installation conditions have poor heat dissipation.

■DDA·DDW



* For brake option and cable exit downward direction option, a hole or holes for the room for those items.

Note) Please use this product by mounting it to a surface that has heat dissipation characteristics equivalent to w450 x d450 x t12 aluminum plate. Please contact us if the installation conditions have poor heat dissipation.



■RCS3-CT8C

Secure the high-speed type RoboCylinder by preparing a sufficiently rigid rack and mount it so that the gantry does not move when operating the RoboCylinder.

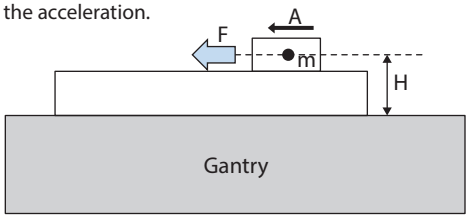
- The reaction force during RoboCylinder operation is determined by the mass of the moving part and the acceleration.

Reaction force: F = mA m: Mass of moving part A: Acceleration

- Moment load due to the above reaction force and the height H to the center of gravity position is added to the mount.

Moment load: M = FH = mAH H: Distance from gantry to movable part center of gravity

Consider the rigidity against this load moment.



■CT4

■Installation gantry

- The mounting surface shall be a machined plane or flat plane of equivalent accuracy. The flatness shall be within 0.05 mm/m.
- The frame shall have a structure that allows the robot to be installed horizontally.
- The frame on which the robot is installed receives a large reactive force. The table to the right shows the maximum instantaneous reactive force (rough guide) received by each axis when the axis moves at the maximum speed and maximum acceleration carrying 1 kg of load. Provide a frame of sufficient rigidity. Secure the frame to the floor, etc., using anchor bolts, etc., so that the CT4 will not move as a result of robot operation.
- Make sure the natural frequency of the frame is 75 Hz or more.

Axis	Reactive force
X axis	660N
Y axis	235N
Z axis	85N

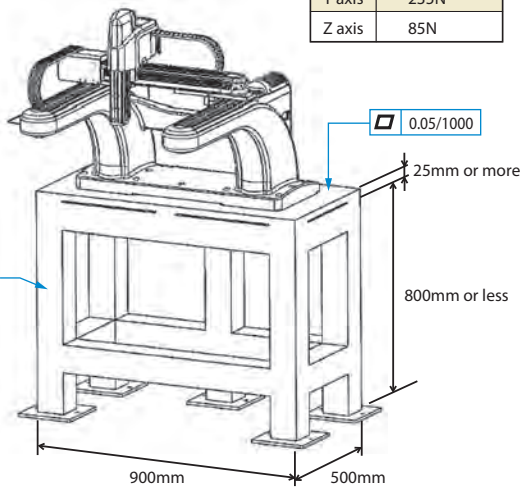
■Example of the Installation gantry

An example of the installation frame is shown to the right. Fabricate the installation frame by referring to this example.

Use the hexagonal head bolt, as described below, for the mounting bolts, depending on the installation frame material. Use high-strength bolts of ISO-10.9 or more.

<When the gantry base material is steel>
Applicable bolt: M10 x 40
(effective engagement length: 10 or more), Applicable washer: M10 (10.5 x 18 x 2)
Tightening torque: 60 N·m

<When the gantry base material is aluminum>
Applicable bolt: M10 x 50
(effective engagement length: 20 or more), Applicable washer: M10 (10.5 x 18 x 2)
Tightening torque: 60 N·m



Danger

Please use the specified bolt. Please be careful in selecting the bolt length. Using bolts that are not specified or bolts of inappropriate length will cause the tapped holes to break and insufficient mounting strength, which will cause abnormal noise / vibration, breakdown and shortened life, but also the CT4 body will move. There is a danger of causing serious accidents such as breaking occurring in the CT4 and peripheral parts, including the payload, as well as the possibility for death or serious injury to occur.

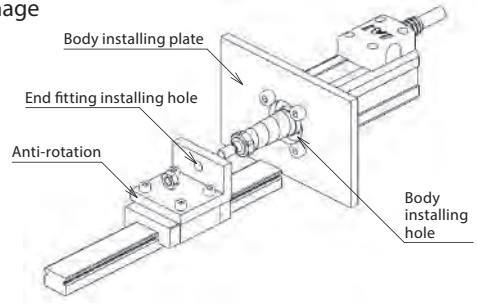
Mini Rod Type Anti-Rotation Installation Method

■ Thin and small rod type anti-rotation

In the following models, there is no anti-rotation of the ball screw inside the main body, so be sure to set the anti-rotation on the outside when using. When installing the anti-rotation, please install according to the following installation conditions. If you operate in a state where the anti-rotation mechanism is not installed, the ball screw idles, the rod does not move back and forth, and the rotation speed of the encoder and the actual movement distance can not be matched and the position may be misaligned.

Applicable model **RCA2 - RN3NA / RN4NA / RP3NA / RP4NA // RCA2CR/W - RN3NB / RN4NB / RP3NB / RP4NB // RCS2 - RN5N / RP5N // RCS2CR/W - RN5NB / RP5NB**

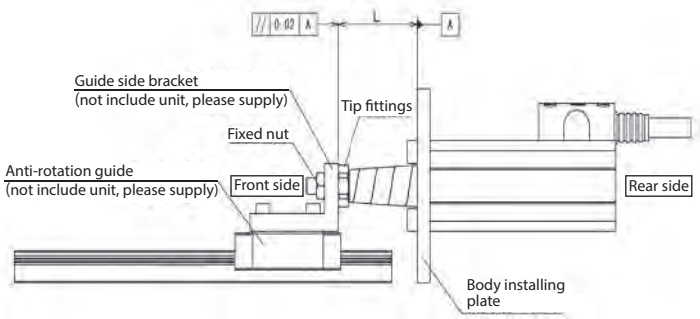
Installation image



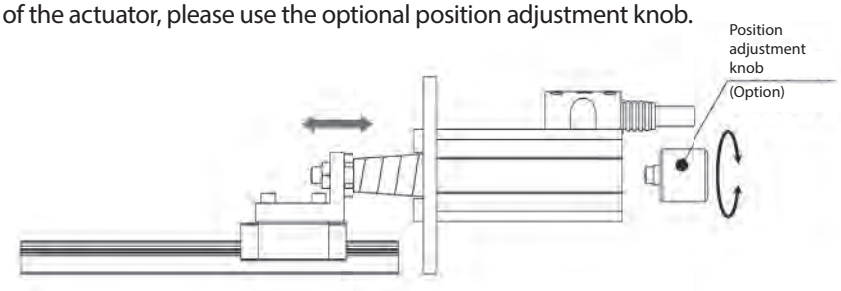
Please do not connect the tip of the actuator rod and the anti-rotation with the floating joint.
Radial load due to eccentricity is applied to the screw shaft, leading to malfunction of the actuator and premature failure.

Installation method, condition

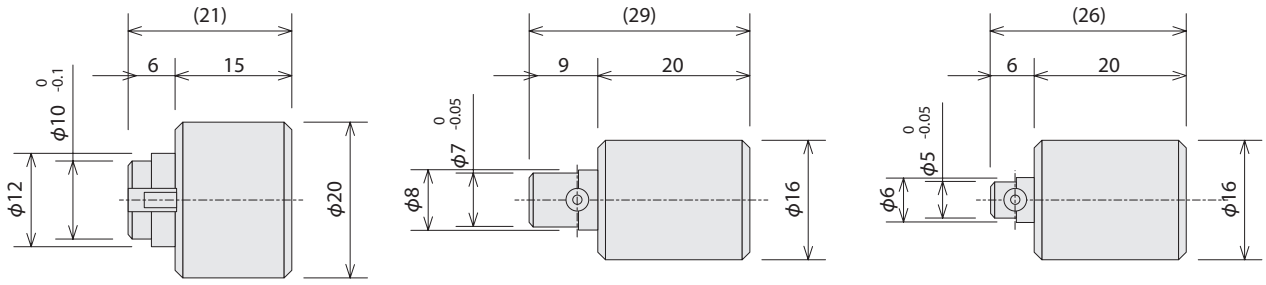
the body installing hole of the fixed plate and the coaxial level of the tip bracket installing hole of the guide side brackets should be within 0.05 mm. The degree of parallelism should be within 0.02 mm.



When moving the rod part of the actuator, please use the optional position adjustment knob.



<Position adjustment knob>



For 5 Series
Model number: RCS2-AK-R5

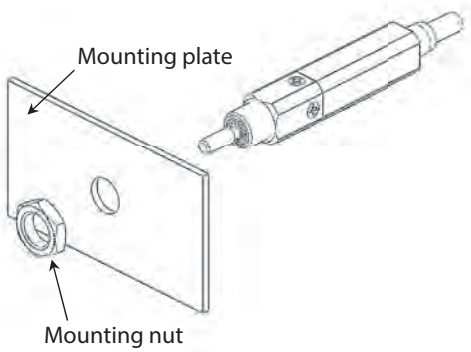
For 4 Series
Model number: RCA2-AK-R4

For 3 Series
Model number: RCA2-AK-R3

RCD Rod Type Installation Method/Other Installation Methods

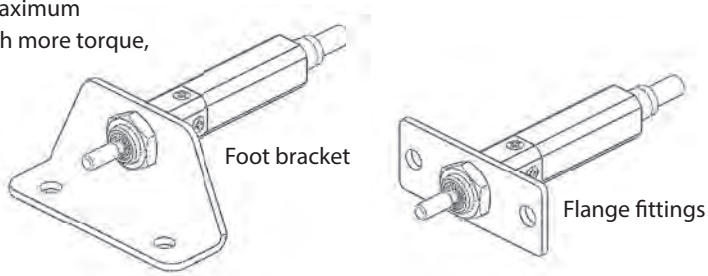
■ RCD series Installation method

- The installation hardware is a structure with sufficient rigidity so that vibration exceeding 0.3 G is not transmitted.
- Please set up a space where maintenance work can be done.
  Fit and fix the main body into the through hole (φ10) of a smooth plate with a thickness of 1 to 3 mm. The installation posture can be either horizontal installation or vertical installation.
- The base of the body of the male thread (m10×1.0) is a tolerance h8, so please use it as an in-row.
- When tightening with the attached mount nut etc., the maximum tightening torque should be 9.0 N · m. If it is tightened with more torque, breakage may occur.



The following general-purpose products can be used for foot brackets and flange fittings.

For foot brackets and flange fittings, please contact the manufacturer directly.



■ The method for mounting EC side block

Because the position in the width direction is not determined, when mounting in the side block (Foot bracket: FT), please use the positioning pin.

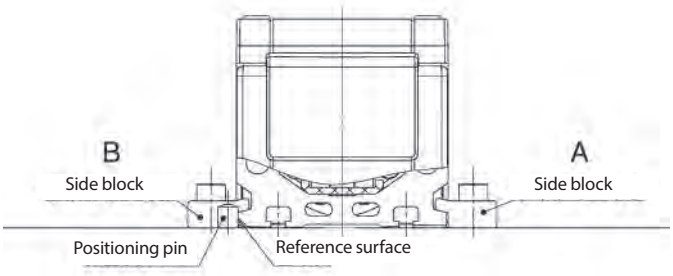
The installation procedure

(1) The reference surface is pressed against the positioning pin, etc.

(2) Fix the side block A on the opposite side while pressing it.

(3) Finally fix the side block B on the pin side.

* Please note that the fastening force may not be sufficient when mounting by other than the procedure described above.



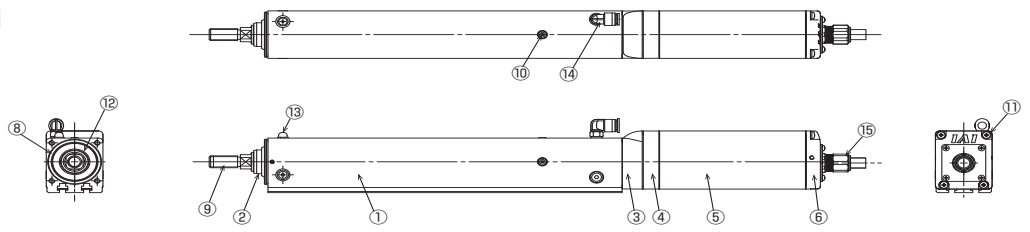
RCP6W Exterior Components Material of each part

RCP6W-RA4

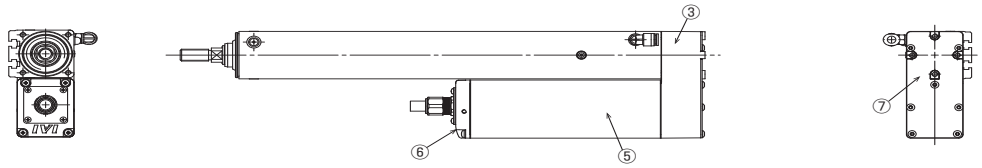
	Name		Material	Processing	Finishing	RA4C	RA4R
Exterior components	① Body frame		Aluminum extruded material	White alumite		○	○
	② Rod		Aluminum drawing material	Hard alumite	Buffing finish	○	○
	③ Rear bracket		Aluminum die cast	Design surface coating		○	○
	④ Motor bracket		Aluminum die cast	Design surface coating		○	
	⑤ Motor cover		Aluminum extruded material	White alumite		○	○
	⑥ End cover		Aluminum die cast	Design surface coating		○	○
	⑦ Pulley cover		Stainless steel				○
	⑧ Rod seal housing IP		Aluminum	White alumite		○	○
	⑨ Tip bracket		Stainless steel			○	○
	⑩ Cap		Stainless steel			○	○
	⑪ Bolts and screws of the exterior part		Stainless steel			○	○
	⑫ Dust seal		Rubber (NBR)			○	○
	⑬ Grease nipple		Brass (C3604)	Electroless nickel plating		○	○
	⑭ Intake and exhaust port		Resin (PBT, POM), Brass Nickel plating processing			○	○
	⑮Actuator cable	Cable ground	Rubber (NBR) Resin (PBT, POM), Brass Nickel plating processing			○	○
		Cable Sheath	Vinyl chloride (PVC)			○	○
	Hexagon nut		Stainless steel			○	○
	Square nut		Stainless steel			○	○
	Each part gasket		Rubber (NBR)			○	○

RA4

[Coupling type]

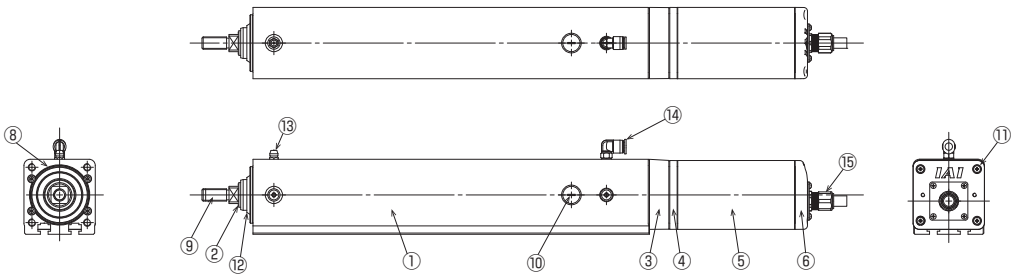


[Reverse type]

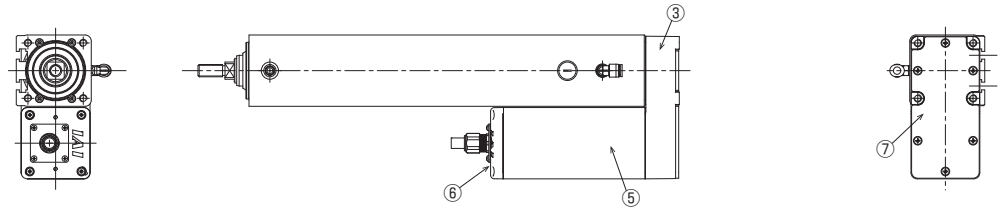


RA6

[Coupling type]



[Reverse type]

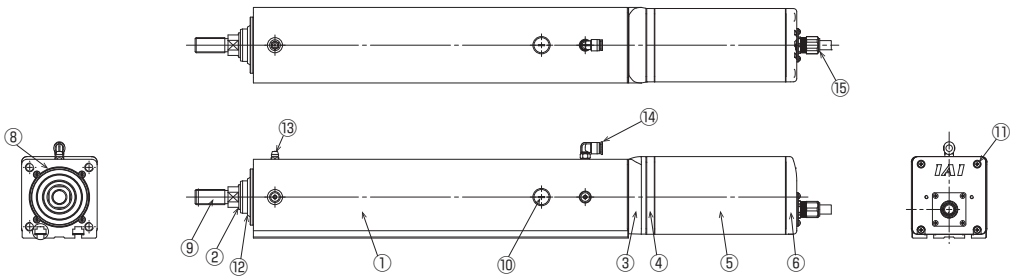


RCP6W-RA6/RA7/RA8

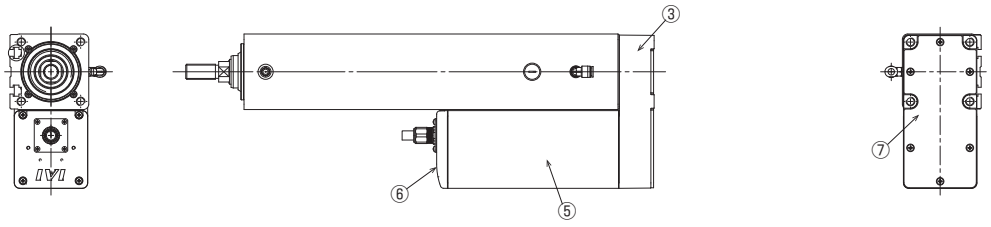
	Name		Material	Processing	Finishing	RA6C	RA6R	RA7C	RA7R	RA8C	RA8R
Exterior components	① Body frame		Aluminum extruded material	White alumite		○	○	○	○	○	○
	② Rod		Aluminum drawing material	Hard alumite	Buffing finish	○	○	○	○	○	○
	③ Rear bracket		Aluminum die cast	Design surface coating		○	○	○	○	○	○
	④ Motor bracket		Aluminum die cast	Design surface coating		○		○			
	⑤ Motor cover		Aluminum extruded material	White alumite		○	○	○	○	○	○
	⑥ End cover		Aluminum die cast	Design surface coating		○	○	○	○	○	○
	⑦ Pulley cover		Stainless steel				○		○		○
	⑧ Rod seal housing IP		Aluminum	White alumite		○	○	○	○	○	○
	⑨ Tip bracket		Stainless steel			○	○	○	○	○	○
	⑩ Cap		Stainless steel			○	○	○	○	○	○
	⑪ Bolts and screws of the exterior part		Stainless steel			○	○	○	○	○	○
	⑫ Dust seal		Rubber (NBR)			○	○	○	○	○	○
	⑬ Grease nipple		Brass (C3604)	Electroless nickel plating		○	○	○	○	○	○
	⑭ Intake and exhaust port		Resin (PBT, POM), Brass Nickel plating processing			○	○	○	○	○	○
	⑮Actuator cable	Cable ground	Rubber (NBR) Resin (PBT, POM), Brass Nickel plating processing			○	○	○	○	○	○
		Cable Sheath	Vinyl chloride (PVC)			○	○	○	○	○	○
	Hexagon nut		Stainless steel			○	○	○	○	○	○
	Square nut		Stainless steel			○	○	○	○	○	○
	Each part gasket		Rubber (NBR)			○	○	○	○	○	○

RA7

[Coupling type]

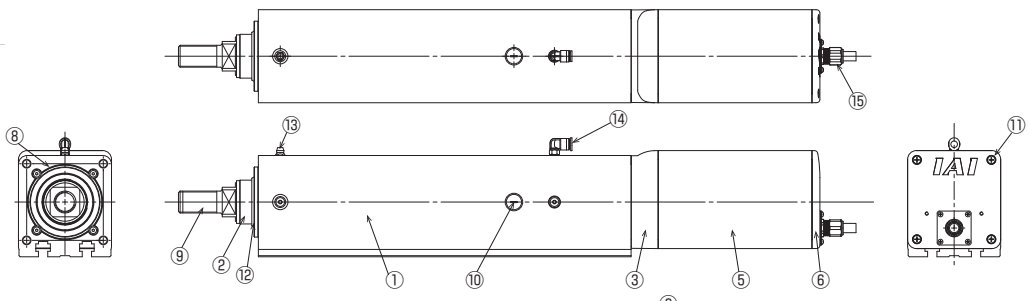


[Reverse type]



RA8

[Coupling type]



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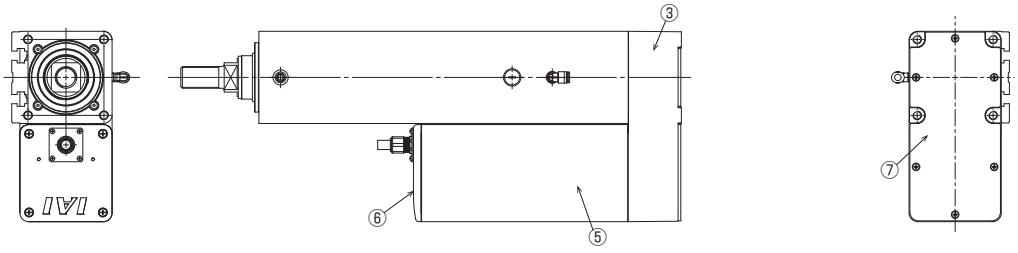


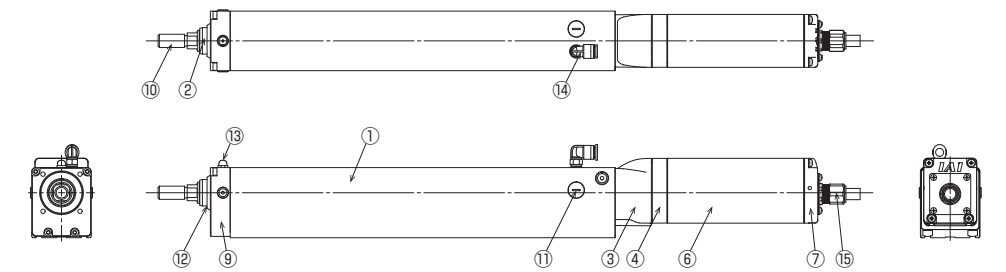
RCP6W Exterior Components Material of each part

RCP6W-RRA4/RRA6/RRA7

	Name		Material	Processing	Finishing	RRA4C	RRA4R	RRA6C	RRA6R	RRA7C	RRA7R
Exterior components	① Frame		Aluminum extruded material	White alumite		○	○	○	○	○	○
	② Rod		Aluminum drawing material	Hard alumite	Buffing finish	○	○	○	○	○	○
	③ Rear bracket		Aluminum die cast	Design surface coating		○	○	○	○	○	○
	④ Motor bracket		Aluminum die cast	Design surface coating		○		○		○	
	⑤ Reverse Bracket		Aluminum die cast	Design surface coating			○		○		○
	⑥ Motor cover		Aluminum extruded material	White alumite		○	○	○	○	○	○
	⑦ End cover		Aluminum die cast	Design surface coating		○	○	○	○	○	○
	⑧ Pulley cover		Stainless steel				○		○		○
	⑨ Front bracket IP		Aluminum	White alumite		○	○	○	○	○	○
	⑩ Rod tip bracket		Stainless steel			○	○	○	○	○	○
	⑪ Hole cap (Filler port)		Rubber (NBR)			○	○	○	○	○	○
	⑫ Dust seal		Rubber (NBR)			○	○	○	○	○	○
	⑬ Grease nipple		Brass (C3604)	Electroless nickel plating		○	○	○	○	○	○
	⑭ Intake and exhaust port		Resin (PBT, POM), Brass Nickel plating processing			○	○	○	○	○	○
	⑮ Actuator cable	Cable ground	Rubber (NBR) Resin (PBT, POM), Brass Nickel plating processing			○	○	○	○	○	○
		Cable Sheath	Vinyl chloride (PVC)			○	○	○	○	○	○
	Bolts and screws of the exterior part Stainless steel		Stainless steel			○	○	○	○	○	○
	Hexagon nut		Stainless steel			○	○	○	○	○	○
	Square nut		Stainless steel			○	○	○	○	○	○
	Each part gasket		Rubber (NBR)			○	○	○	○	○	○

RRA4

[Coupling type]



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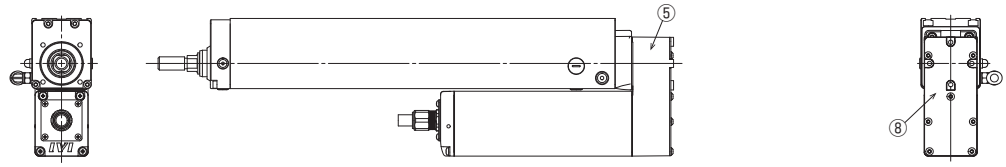
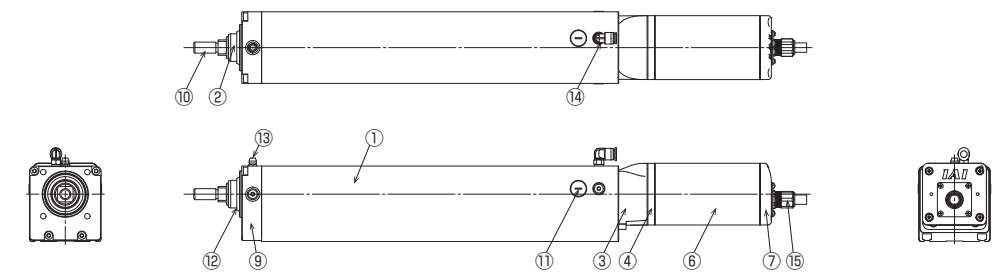


RRA6

[Coupling type]



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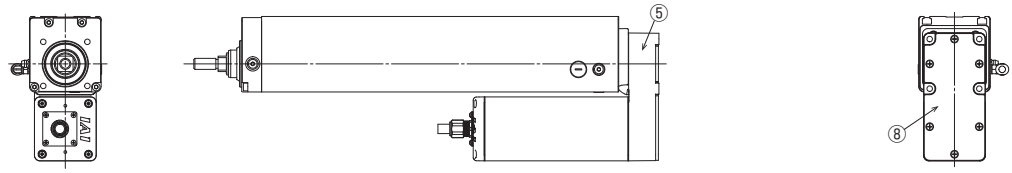
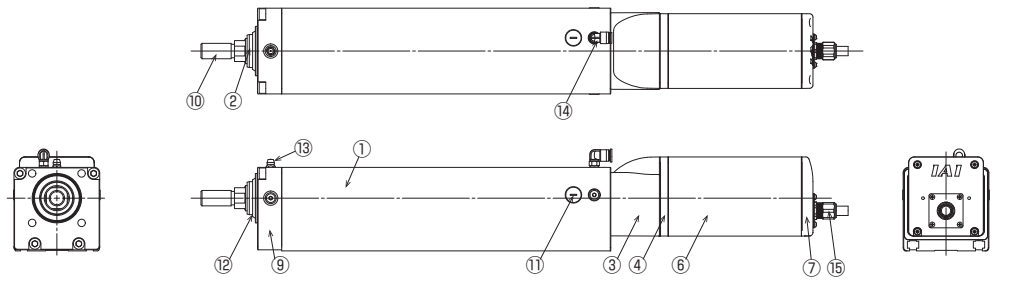


RCP6W-RRA8

	Name		Material	Processing	Finishing	RRA8C	RRA8R
Exterior components	① Frame		Aluminum extruded material	White alumite		○	○
	② Rod		Aluminum drawing material	Hard alumite	Buffing finish	○	○
	③ Rear bracket		Aluminum die cast	Design surface coating		○	○
	④ Motor bracket		Aluminum die cast	Design surface coating		○	○
	⑤ Reverse Bracket		Aluminum die cast	Design surface coating			○
	⑥ Motor cover		Aluminum extruded material	White alumite		○	○
	⑦ End cover		Aluminum die cast	Design surface coating		○	○
	⑧ Pulley cover		Stainless steel				○
	⑨ Front bracket IP		Aluminum die cast	Design surface coating		○	○
	⑩ Rod tip bracket		Stainless steel			○	○
	⑪ Hole cap (Filler port)		Rubber (NBR)			○	○
	⑫ Dust seal		Rubber (NBR)			○	○
	⑬ Grease nipple		Brass (C3604)	Electroless nickel plating		○	○
	⑭ Intake and exhaust port		Resin (PBT, POM), Brass Nickel plating processing			○	○
	⑮Actuator cable	Cable ground	Rubber (NBR) Resin (PBT, POM), Brass Nickel plating processing			○	○
		Cable Sheath	Vinyl chloride (PVC)			○	○
	Bolts and screws of the exterior part Stainless steel		Stainless steel			○	○
	Hexagon nut		Stainless steel			○	○
	Each part gasket		Rubber (NBR)			○	○

RRA7

[Coupling type]



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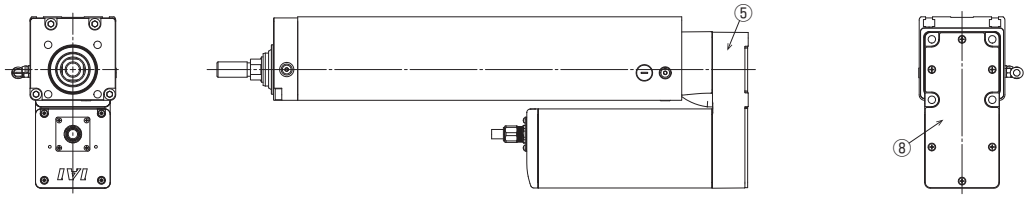
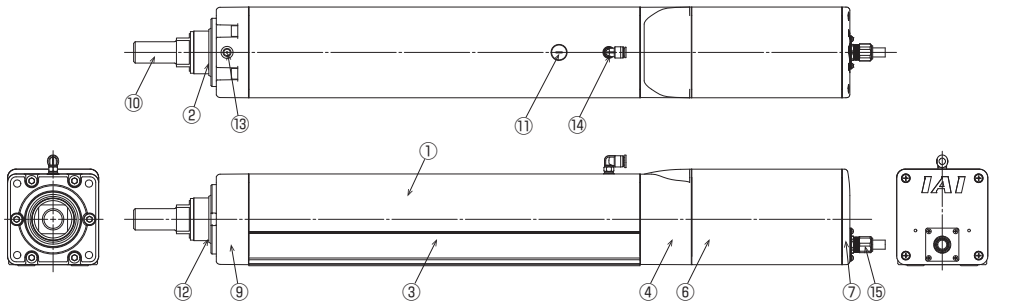


RRA8

[Coupling type]



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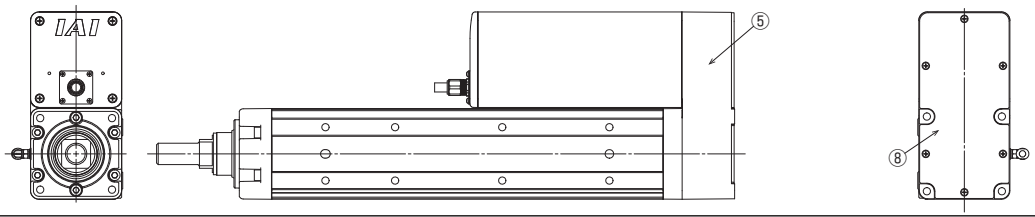


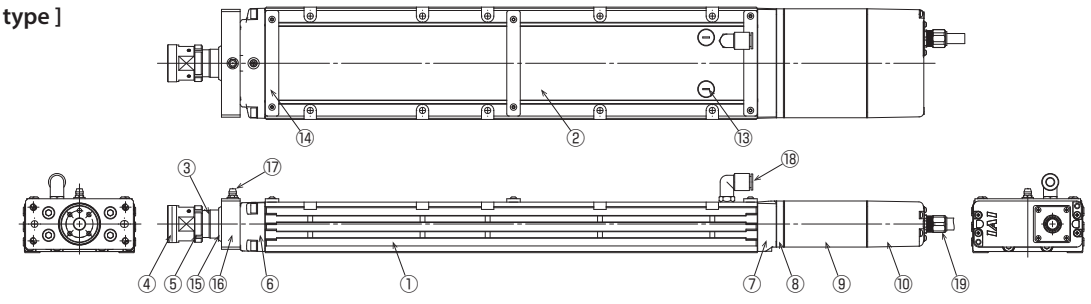
RCP6W Exterior Components Material of each part

■ RCP6W-WRA10

	Name		Material	Processing	Finishing	WRA10C	WRA10R
Exterior components	① Base		Aluminum extruded material	White alumite		○	○
	② Frame cover		Aluminum extruded material	White alumite		○	○
	③ Rod		Stainless steel pipe	Hard chrome plating	Buffing finish	○	○
	④ Tip bracket		Stainless steel			○	○
	⑤ Lock nut		Stainless steel			○	○
	⑥ Front bracket		Aluminum die cast	Design surface coating		○	○
	⑦ Rear bracket		Aluminum die cast	Design surface coating		○	○
	⑧ Motor bracket		Aluminum die cast	Design surface coating		○	
	⑨ Motor cover		Aluminum extruded material	White alumite		○	○
	⑩ Motor end cover		Aluminum die cast	Design surface coating		○	○
	⑪ Reverse Bracket		Aluminum die cast	Design surface coating			○
	⑫ Pulley cover		Stainless steel				○
	⑬ Cap		Rubber (NBR)			○	○
	⑭ Frame cover holder		Aluminum	White alumite		○	○
	⑮ Dust seal		Rubber (NBR)			○	○
	⑯ Dust seal housing		Aluminum	White alumite		○	○
	⑰ Grease nipple		Brass (C3604)	Electroless nickel plating		○	○
	⑱ Intake and exhaust port		Resin (PBT, POM), Brass Nickel plating processing			○	○
	⑲ Actuator cable	Cable ground	Rubber (NBR) Resin (PBT, POM), Brass Nickel plating processing			○	○
		Cable Sheath	Vinyl chloride (PVC)			○	○
	Bolts and screws of the exterior part Stainless steel		Stainless steel			○	○
	Each part gasket		Rubber (NBR)			○	○

WRA10

[Coupling type]



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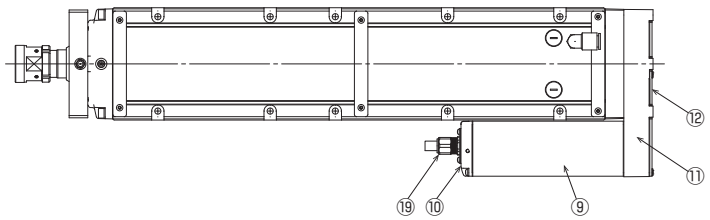


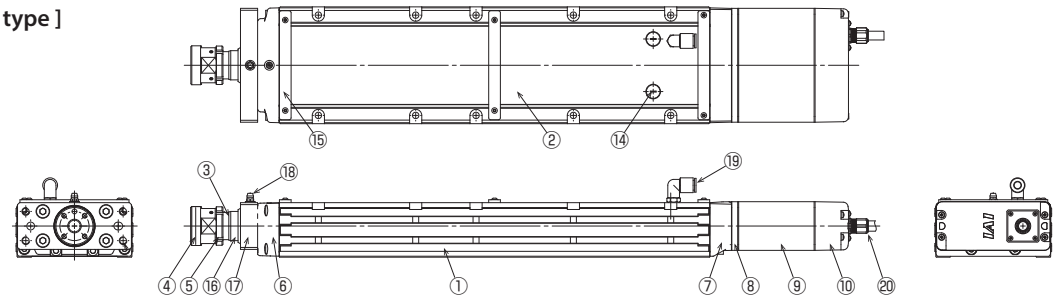
■ RCP6W-WRA12/WRA14/WRA16

Exterior components

Name		Material	Processing	Finishing	WRA12C	WRA12R	WRA14C	WRA14R	WRA16C	WRA16R
① Base		Aluminum extruded material	White alumite		○	○	○	○	○	○
② Frame cover		Aluminum extruded material	White alumite		○	○	○	○	○	○
③ Rod		Stainless steel pipe	Hard chrome plating	Buffing finish	○	○	○	○	○	○
④ Tip bracket		Stainless steel			○	○	○	○	○	○
⑤ Lock nut		Stainless steel			○	○	○	○	○	○
⑥ Front bracket		Aluminum die cast	Design surface coating		○	○	○	○	○	○
⑦ Rear bracket		Aluminum die cast	Design surface coating		○	○	○	○	○	○
⑧ Motor bracket		Aluminum die cast	Design surface coating		○		○		○	
⑨ Motor cover		Aluminum extruded material	White alumite		○	○	○	○	○	○
⑩ Motor end cover(Coupling)		Aluminum die cast	Design surface coating		○		○		○	
⑪ Reverse Bracket		Aluminum die cast	Design surface coating			○		○		○
⑫ Pulley cover		Stainless steel				○		○		○
⑬ Motor end cover (Folded)		Aluminum	White alumite			○		○		○
⑭ Cap		Rubber (NBR)			○	○	○	○	○	○
⑮ Frame cover holder		Aluminum	White alumite		○	○	○	○	○	○
⑯ Dust seal		Rubber (NBR)			○	○	○	○	○	○
⑰ Dust seal housing		Aluminum	White alumite		○	○	○	○	○	○
⑱ Grease nipple		Brass (C3604)	Electroless nickel plating		○	○	○	○	○	○
⑲ Intake and exhaust port		Resin (PBT, POM), Brass Nickel plating processing			○	○	○	○	○	○
⑳ Actuator cable	Cable ground	Rubber (NBR) Resin (PBT, POM), Brass Nickel plating processing			○	○	○	○	○	○
	Cable Sheath	Vinyl chloride (PVC)			○	○	○	○	○	○
Bolts and screws of the exterior part Stainless steel		Stainless steel			○	○	○	○	○	○
Each part gasket		Rubber (NBR)			○	○	○	○	○	○

WRA 12/14/16

[Coupling type]



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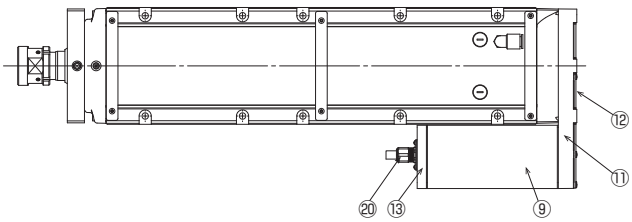


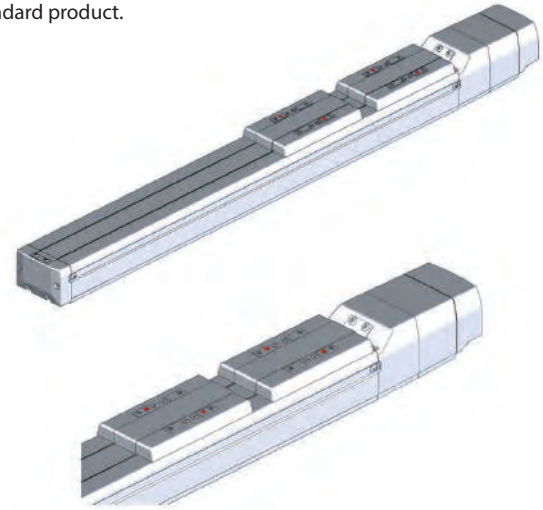
Special Specification

In addition to the standard products that are listed in the catalog, I have been dealing with various special specification products.
If you do not have your desired product, please feel free to contact our local distributor or head office (see the back cover).

Special Product Examples

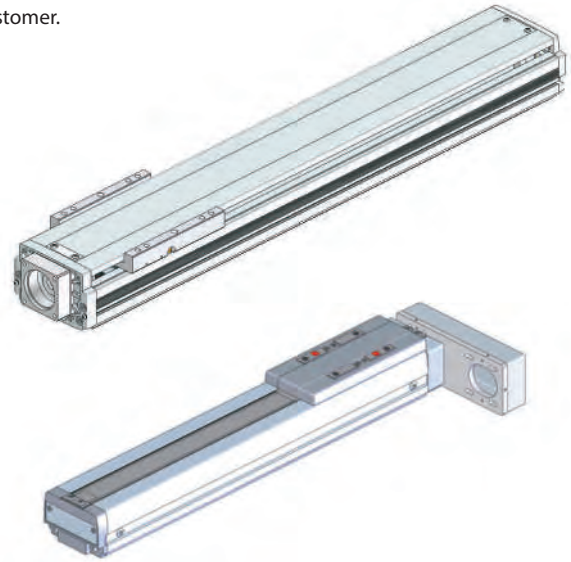
Double Slider

It is effective when the actuator protrudes from the slider a lot and it exceeds the overhang load length or when it exceeds the allowable load moment.
By adding a free slider, the effective stroke will be shorter than the standard product.



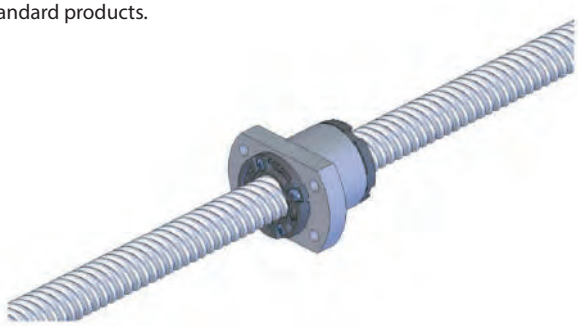
No motor / Special motor

When customer prepares motor and driver, only actuator without motor can be shipped.
In addition, we can ship it by installing the motor specified by the customer.



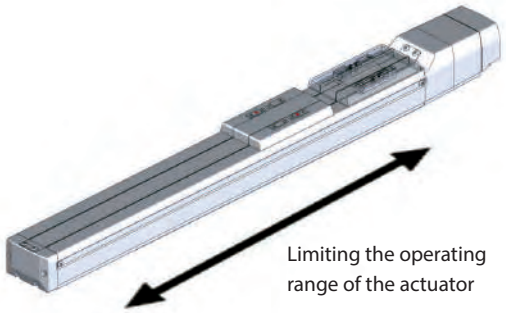
Special ball screw lead

It is possible to use lead screw ball screws not available in standard products.



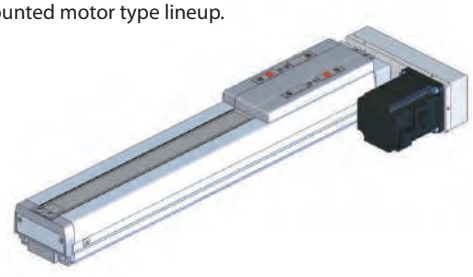
Special home position

It is possible to change the home position.(mechanical end)



Side-mounted motor

Side-mounted motor can be prepared even for models that do not have side-mounted motor type lineup.



Special Stroke

We can correspond strokes not found in standard products.

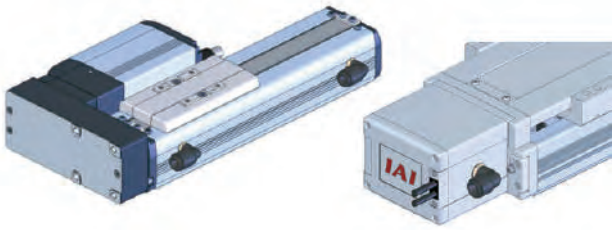
Special Product Examples

Surface treatment

Surface treatment can be changed by black alumite treatment or hard alumite treatment.

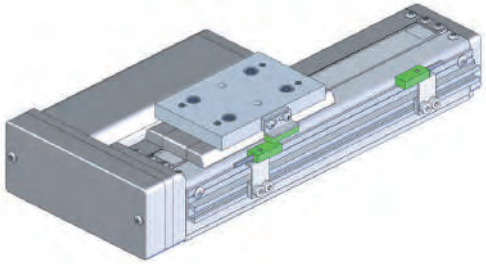
Air purge specification

By air purge, it is possible to make it harder for foreign matter to enter the inside of the actuator and the motor part than standard parts.



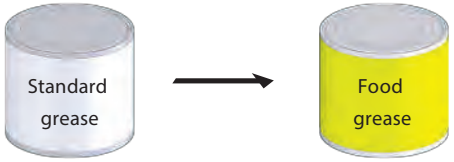
Sensor specifications

Sensors can be installed on models that do not have sensor options.

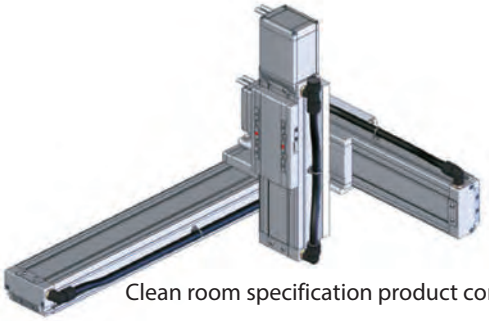


Grease

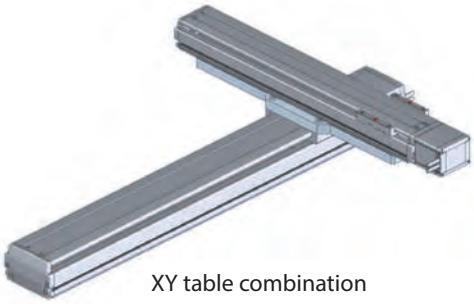
It is possible to change grease such as food grease, low dust grease, and customer specified grease.



Special cartesian robot combination

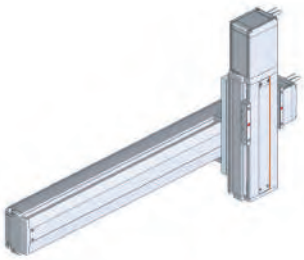


Clean room specification product combination

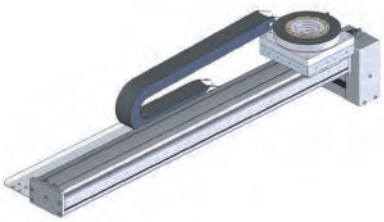


XY table combination

Special cartesian robot combination



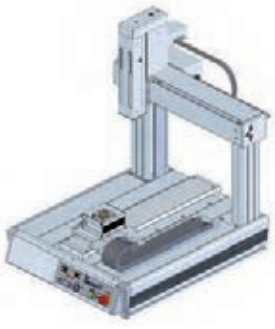
XY table combination



Xθ combination

Special table top type robot combination

Table top robot + rotary shaft



European and Overseas Standard

1. RoHS Directive

The RoHS Directive is a directive by the European Union on the "restriction on the use of certain hazardous substances contained in electrical and electronic equipment" and is called RoHS taking the initials of Restriction of Hazardous Substances .

The purpose of RoHS is to prescribe hazardous substances contained in electrical and electronic equipment and to minimize the impact on people and the environment by prohibiting the use of substances. Beginning in July 2006, the use of the following six substances are prohibited or restricted.

1. Lead
2. Mercury
3. Cadmium
4. Hexavalent chromium
5. Polybrominated biphenyl (PBB)
6. Polybrominated diphenyl ether (PBDE)

We are promoting efforts towards the complete elimination of RoHS-restricted substances, and in January 2006, except for some exceptions, we are switching to RoHS compliant parts sequentially.

Please refer to the correspondence table below for the current situation.

2. CE Marking

Products sold in the European Union (EU) area are obliged to indicate CE marking.

The CE marking indicates compliance with the EU (EC) Directive's mandatory safety requirements, and the manufacturer will display it at its own risk.

The essential safety requirements are specified by the adoption of the New Approach Directive in 1985, such as "EMC Directive", "Low Voltage Directive", "Machine Directive", etc. are stipulated.

These directives stipulate the essential requirements that each product must observe and embody the consist provisions.

(1) EMC Directive

It is a directive concerning products that emit electromagnetic waves or that may be affected by functions by external electromagnetic waves.
A design that does not emit strong electromagnetic waves to the outside or is not affected by external electromagnetic waves is required.
Our products decide wiring / installation model (condition) of controller, actuator, and peripheral equipment and conform to the relevant standards of EMC directive.

(2) Low Voltage Directive

It is a directive on the safety of electrical machinery driven by a power supply of AC 50 to 1000 V, DC 75 to 1500 V.
The actuators of ISA / ISPA, ISB / ISPB, ISDA / ISPDA, ISDB / ISPDB, ISDACR / ISPDACR, ISDBCR / ISPDBCR, ISWA / ISPWA, IX and TT series are designed to conform to the low voltage command in combination with the controller. (TT series integrated controller type)
This command is not applicable for 24 V series RoboCylinder.

(3) Machinery Directive

For general products, especially industrial machinery, those for which moving parts are recognized as dangerous are targeted.
In the machine directive, IX, IXP, TT and TTA (Safety Category Correspondence specification) series are supported.
All other products are not supported by the machine directive (as of 15.01.2018).

(4) Concept of EU directive by IAI Corporation

Our actuator and controllers (hereinafter referred to as our components) are treated as parts (embedded devices) to be incorporated in customer's equipment.
Our components are declared as "Partly Completed Machinery" of the machine Directive "machine Directive 2006/42/EC". However, this does not guarantee that your device conforms to the EU Directive.
When customers complete the equipment incorporating our components and ship them to Europe or use them within Europe as final products, always make sure that your products comply with the EU Directive by yourself.

As requisite conditions that your products comply with EN60204-1, which is one of the harmonization standards of the machine directives and defines the safety of industrial equipment, our components need to comply with low voltage directive "Voltage Directive 2014/35/EU" and EMC Directive "EMC Directive 2014/30/EU".

For Low Voltage Directive "Low Voltage Directive 2014/35 / EU", our components are roughly divided into those operating only with 24 VDC power supply and those operating on AC 230 V power supply. The former is lower than the voltage of the low voltage Directive (AC50 ~ 1000V or DC75 ~ 1500V), hence it is out of the scope. The latter is considered as complying with low voltage Directive, with the condition that it follows the manual for overseas standards (mj0287-8a 1.3.1 Note 1).

We declare the compliance with the EMC Directive "EMC Directive 2014/30/EU" as long as radio interference is handled under this european standard with our limited terms of use. However, it is necessary to attach it to the customer's device in the end and confirm it.

Directive 2011/65 / EU, as known as RoHS Directive, which our components need to comply under EC Directive, requires that specified hazardous substances be below specified values.
The revised RoHS directive (Directive 2011/65/EU), which was published in the 2011.7.1 Gazette, requires the declaration of the conformity to the non-inclusion of six hazardous substances and pasting the CE marking, for products marketed after 2013.1.2 (After 2017.7.22 for the controller).

By the above, the CE marks attached to our individual components indicate that they comply with the RoHS directive/EMC directive (DC24V) or the RoHS directive/ EMC directive and the low voltage directive (230V) under limited operation conditions.
English is the original language used for the instruction manuals and warning labels of our components.
Customers who need support in other languages should contact our sales representatives.
In some warning/caution labels, in cases where notes are written, Japanese may be added occasionally.
If the customers are to make their equipment CE compliant, they should select products (such as safety relays) that correspond to the safety category demanded for the equipments, and should make sure to construct external safety circuits themselves.

3. UL standard

UL (Underwriters Laboratories Inc American Insurer Safety Test Laboratory) was a non-profit organization founded by the American fire insurance association in 1984 and was established to conduct research, testing and inspection for protecting human life and property from fire, disaster, theft and other accidents.
The UL standard is a product safety standard relating to functions and safety. Products, which UL tested and evaluated the samples and approved the compliance to the UL requirement, can be shipped with UL certification mark attached.
Some of our models are certified. For details, please contact our sales representative.

4. KCs marking

From 03/01/2013, industrial robots have become part of the self-regulatory safety confirmation declaration program in Korea, and products used in Korea or shipped from Japan to Korea are regulated.
The KCs definition of industrial robots is “robots that have controllers of 3 axes or more”, and products that we have declared and registered with the KCs are as follows:

- Some of the IX/IXP SCARA robot series (high-speed specification)
- Some of the single-axis combinations (please contact our sales representatives for details)
- TTA table top robot series

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

(as of December, 2017)

Actuator

◎: Standard/ ○: Option △: Special order/ ×: No plan

Product structure	Series name	Type, model		RoHS Directive Compatible	CE mark	UL standard
EleCylinder Actuator	EC	Slider (standard)	S6/S7	◎	◎	
		Rod (standard)	R6/R7	◎	◎	
RoboCylinder Actuator	RCP6 RCP6S	Slider (standard)	SA4C/SA6C/SA7C/SA8C	◎	◎	
			SA4R/SA6R/SA7R/SA8R	◎	◎	
		Slider (wide)	WSA10C/WSA12C/WSA14C/WSA16C	◎	◎	
			WSA10R/WSA12R/WSA14R/WSA16R	◎	◎	
		Rod (standard)	RA4C/RA6C/RA7C/RA8C	◎	◎	
			RA4R/RA6R/RA7R/RA8R	◎	◎	
		Rod (radial cylinder)	RRA4C/RRA6C/RRA7C/RRA8C	◎	◎	
			RRA4R/RRA6R/RRA7R/RRA8R	◎	◎	
		Rod (wide)	WRA10C/WRA12C/WRA14C/WRA16C	◎	◎	
			WRA10R/WRA12R/WRA14R/WRA16R	◎	◎	
		Table (coupled motor)	TA4C/TA6C/TA7C	◎	◎	
		Table (side-mounted motor)	TA4R/TA6R/TA7R	◎	◎	
	RCP5	Slider (coupled motor)	SA4C/SA6C/SA7C	◎	◎	
		Slider (side-mounted motor)	SA4R/SA6R/SA7R	◎	◎	
		Slider (belt drive)	BA4/BA6/BA7/BA4U/BA6U/BA7U	◎	◎	
		Rod (coupled motor)	RA4C/RA6C/RA7C/RA8C/RA10C	◎	◎	
		Rod (side-mounted motor)	RA4R/RA6R/RA7R/RA8R/RA10R	◎	◎	
	RCP5CR	Slider	SA4C/SA6C/SA7C	◎	◎	
	RCP5W	Rod	RA6C/RA7C/RA8C/RA10C	◎	◎	
	RCP4	Slider (coupled motor)	SA3C/SA5C/SA6C/SA7C	◎	◎	
		Slider (side-mounted motor)	SA3R/SA5R/SA6R/SA7R	◎	◎	
		Rod (coupled motor)	RA3C/RA5C/RA6C	◎	◎	
		Rod (side-mounted motor)	RA3R/RA5R/RA6R	◎	◎	
		Gripper	GRSML/GRSLL/GRSWL/GRLM/GRLL/GRLW	◎	◎	
		Stopper cylinder	ST68E/ST615E/ST4525E	◎	◎	
	RCP4CR	Slider	SA3C/SA5C/SA6C/SA7C	◎	◎	
	RCP4W	Slider	SA5C/SA6C/SA7C	◎	◎	
		Rod	RA6C/RA7C	◎	◎	
	RCP3	Slider (coupled motor)	SA2AC/SA2BC/SA3C/SA4C/SA5C/SA6C	◎	◎	
		Slider (side-mounted motor)	SA2AR/SA2BR/SA3R/SA4R/SA5R/SA6R	◎	◎	
		Rod (standard)	RA2AC/RA2BC/RA2AR/RA2BR	◎	◎	
		Table (coupled motor)	TA3C/TA4C/TA5C/TA6C/TA7C	◎	◎	
		Table (side-mounted motor)	TA3R/TA4R/TA5R/TA6R/TA7R	◎	◎	
	RCP2	Slider (coupled motor)	SA5C/SA6C/SA7C/SS7C/SS8C	◎	◎	
		Slider (side-mounted motor)	SA5R/SA6R/SA7R/SS7R/SS8R	◎	◎	
		Slider (belt drive)	BA6/BA7/BA6U/BA7U	◎	◎	
		High speed slider type	HS8C/HS8R	◎	◎	
		Rod (standard)	RA2C/RA3C/RA4C/RA6C/RA8C/RA10C	◎	◎	
			RA3R/RA4R/RA6R/RA8R/SRA4R	◎	◎	
		Rod (with guide)	RGS4C/RGS6C/RGD3C/RGD4C/RGD6C	◎	◎	
			SRGS4R/SRGD4R	◎	◎	
		Gripper	GRLS/GRSS/GRS/GRM/GRHM/GRHB	◎	◎	
			GR3LM/GR3LS/GR3SM/GR3SS	◎	◎	
		Gripper (long stroke)	GRST	◎	◎	
		Rotary	RTBS/RTBSL/RTB/RTBL/RTBB/RTBBL	◎	◎	
			RTCS/RTCSL/RTC/RTCL/RTCB/RTCBL	◎	◎	
		Simple absolute type	Simple absolute supported model	◎	◎	
	RCP2CR	Slider	SA5C/SA6C/SA7C/SS7C/SS8C/HS8C	◎	◎	
		Gripper	GRSS/GRLS/GRS/GRM/GR3SS/GR3SM	◎	◎	
		Rotary	RTBS/RTBSL/RTCS/RTCSL/RTB/RTBL/RTC/RTCL/RTBB/RTBBL/RTCB/RTCBL	◎	◎	
	RCP2W	Slider	SA16C	◎	◎	
		Rod	RA4C/RA6C	◎	◎	
		Rod (High thrust)	RA10C	◎	◎	
		Gripper	GRSS/GRLS/GRS/GRM/GR3SS/GR3SM	◎	◎	
		Rotary	RTBS/RTBSL/RTCS/RTCSL/RTB/RTBL/RTC/RTCL/RTBB/RTBBL/RTCB/RTCBL	◎	◎	
	RCP	Slider	SA5/SA6/SS/SM/SSR/SMR	×		
		Rod	RS/RM	×		
	ERC3	Slider	SA5C/SA7C	◎	◎	
		Rod	RA4C/RA6C	◎	◎	
	ERC3D	Slider	SA5C/SA7C	◎	◎	
	ERC3CR	Slider	SA5C/SA7C	◎	◎	
	ERC2	Slider	SA6C/SA7C	◎	◎	
		Rod (standard)	RA6C/RA7C	◎	◎	
		Rod (with guide)	RGS6C/RGS7C/RGD6C/RGD7C	◎	◎	
	ERC	Slider	SA6/SA7	◎	◎	
		Rod	RA54GS/RD54GD/RA64GS/RA64GD	◎	◎	

◎: Standard/ ○: Option △: Special order/ × : No plan

Product structure	Series name	Type, model		RoHS Directive Compatible	CE mark	UL standard
RoboCylinder Actuator	RCD	Rod	RA1DA/RA1D	◎	◎	
		Gripper	GRSNA/GRSN	◎	◎	
	RCA2	Slider	SA2AC/SA3C/SA4C/SA5C/SA6C	◎	◎	
			SA2AR/SA3R/SA4R/SA5R/SA6R	◎	◎	
		Rod	RA2AC/RA2AR/RN3N/RN4N/RP3N/RP4N	◎	◎	
			GS3N/GS4N/GD3N/GD4N/SD3N/SD4N	◎	◎	
			RN3NA/RN4NA/RP3NA/RP4NA/GS3NA/GS4NA	◎	◎	
			GD3NA/GD4NA/SD3NA/SD4NA	◎	◎	
		Table (short length type)	TCA3N/TCA4N/TWA3N/TWA4N/TFA3N/TFA4N	◎	◎	
			TCA3NA/TCA4NA/TWA3NA/TWA4NA/TFA3NA/TFA4NA	◎	◎	
		Table (coupled motor)	TA4C/TA5C/TA6C/TA7C	◎	◎	
		Table (side-mounted motor)	TA4R/TA5R/TA6R/TA7R	◎	◎	
		Gripper	GRKS	◎	◎	
	RCA2CR	Rod	RN3NA/RN4NA/RP3NA/RP4NA/GS3NA/GS4NA	◎	◎	
			GD3NA/GD4NA/SD3NA/SD4NA	◎	◎	
	RCA2W	Rod	RN3NA/RN4NA/RP3NA/RP4NA/GS3NA/GS4NA	◎	◎	
			GD3NA/GD4NA/SD3NA/SD4NA	◎	◎	
	RCA	Slider (coupled motor)	SA4C/SA5C/SA6C	◎	◎	
		Slider (direct-coupled motor)	SA4D/SA5D/SA6D/SS4D/SS5D/SS6D	◎	◎	
		Slider (side-mounted motor)	SA4R/SA5R/SA6R	◎	◎	
		Rod (standard)	RA3C/RA4C/RA3D/RA4D/RA3R/RA4R	◎	◎	
			SRA4R	◎	◎	
		Rod (with guide)	RGS3C/RGS4C/RGS3D/RGS4D/SRGS4R	◎	◎	
			RGD3C/RGD4C/RGD3D/RGD4D	◎	◎	
			RGD3R/RGD4R/SRGD4R	◎	◎	
		Arm	A4R/A5R/A6R	◎	◎	
		Absolute type	All models	◎	◎	
	RCACR	Slider (coupled motor)	SA4C/SA5C/SA6C	◎	◎	
		Slider (direct-coupled motor)	SA5D/SA6D	◎	◎	
	RCAW	Rod	RA3C/RA3D/RA3R/RA4C/RA4D/RA4R	◎	◎	
	RCS4	Slider (standard)	SA4C/SA6C/SA7C/SA8C SA4R/SA6R/SA7R/SA8R	◎	◎	
		Slider (Wide)	WSA10C/WSA12C/WSA14C/WSA16C WSA10R/WSA12R/WSA14R/WSA16R	◎	◎	
		Rod (standard)	RA4C/RA6C/RA7C/RA8C RA4R/RA6R/RA7R/RA8R	◎	◎	
		Rod (Radial cylinder)	RRA4C/RRA6C/RRA7C/RRA8C RRA4R/RRA6R/RRA7R/RRA8R	◎	◎	
		Rod (Wide)	WRA10C/WRA12C/WRA14C/WRA16C WRA10R/WRA12R/WRA14R/WRA16R	◎	◎	
		Table	TA4C/TA6C/TA7C TA4R/TA6R/TA7R	◎	◎	
	RCS4CR	Slider (standard)	SA4C/SA6C/SA7C/SA8C	◎	◎	
		Slider (Wide)	WSA10C/WSA12C/WSA14C/WSA16C	◎	◎	
	RCS3	High speed slider type	CT8C	◎	◎	
		Rod (servo press)	RA4R	◎	◎	
			RA6R/RA7R/RA8R/RA10R/RA15R/RA20R	◎	◎	
		High speed table type	CTZ5C	◎	◎	
	RCS3/RCS3P	Slider (coupled motor)	SA8C/SS8C	◎	◎	
		Slider (side-mounted motor)	SA8R/SS8R	◎	◎	
	RCS3CR/RCS3PCR	Slider (coupled motor)	SA8C/SS8C	◎	◎	
	RCS2	Slider (coupled motor)	SA4C/SA5C/SA6C/SA7C/SS7C/SS8C	◎	◎	
		Slider (direct-coupled motor)	SA4D/SA5D/SA6D	◎	◎	
		Slider (side-mounted motor)	SA4R/SA5R/SA6R/SA7R/SS7R/SS8R	◎	◎	
		Rod (standard)	RN5N/RP5N/RA4C/RA5C/RA4D/RA4R/RA5R	◎	◎	
			SRA7BD	◎		
		Rod (servo press)	RA13R	◎	◎	
		Rod (with guide)	GS5N/GD5N/SD5N	◎	◎	
			RGS4C/RGS5C/RGS4D/RGD4C/RGD5C	◎	◎	
			RGD4D/RGD4R	◎	◎	
			SRGS7BD/SRGD7BD	◎		
		Table	TCA5N/TWA5N/TFA5N	◎	◎	
		Arm	A4R/A5R/A6R	◎	◎	
		Flat	F5D	◎	◎	
		Gripper	GR8/GRKL	◎	◎	
		Rotary	RT6/RT6R/RT7R/RTC8L/RTC10L/RTC12L	◎	◎	
		Absolute type	All models	◎	◎	
	RCS2CR	Slider (coupled motor)	SA4C/SA5C/SA6C/SA7C/SS7C/SS8C	◎	◎	
		Slider (direct-coupled motor)	SA5D/SA6D	◎	◎	
		Rod	RN5N/RP5N/GS5N/GD5N/SD5N	◎	◎	
	RCS2W	Rod	RN5N/RP5N/GS5N/GD5N/SD5N	◎	◎	
			RA4C/RA4D/RA4R	◎	◎	
	RCS	Slider	SA4/SA5/SA6/SS/SM/SSR/SMR	×		
		Rod	RA/RB	×		
		Flat	F	×		
		Gripper	G	×		
		Rotary	R10/R20/R30	×		
		Absolute type	—	×		

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

◎: Standard/ ○: Option △: Special order/ ×: No plan

Product structure	Series name	Type, model		RoHS Directive Compatible	CE mark	UL standard
Single axis robot	ISB/ISPB	Standard	SXM/SXL/MXM/MXL/MXMX/LXM/LXL/LXMX/LXUWX	◎	◎	
	ISDB/ISPDB	Simple dust protection	S/M/MX/L/LX	◎	◎	
	ISDBCR/ISPDBCR	Clean	S/M/MX/L/LX	◎	◎	
	SSPA	High rigidity (iron base)	SXM/MXM/LXM	◎	◎	
	SSPDACR	Clean high rigidity (iron base)	S/M/L	◎		
	ISA/ISPA	Standard	SXM/SYM/SZM/MXM/MYM/MZM/MXMXLXM/LYM/LZM/LXMX/LXUWX/WXM/WXMX	◎	◎	
	ISDA/ISPDA	Simple dust protection	S/M/MX/L/LX	◎	◎	
	ISDACR/ISPDACR	Clean	S/M/MX/L/LX/W/WX	◎	◎	
	ISWA/ISPWA	Dust-proof and drip-proof	S/M/L	◎	◎	
	IS	Standard	S/M/L/T	×		
	ISP	Standard	S/M/L/W	×		
	ISD/ISPD	Simple dust protection	S/M/L	×		
	SS	Standard	S/M	×		
	SSCR	Clean	—	×		
	NS	Standard	SXMS/SXMM/SZMS/SZMM	◎	◎	
			MXMS/MXMM/MXMXS/MZMS/MZMM	◎	◎	
			LXMS/LXMM/LXMXS/LZMS/LZMM	◎	◎	
	IF	Standard	SA/MA	◎	△	
	FS	Standard	N/W/L/H	◎	△	
		Guide module	NO/WO/LO	◎		
	RS	Axis of rotation	30/60	◎	△	
	ZR	Vertical/rotation integrated type	S/M	◎		
	DS	Slider	SA4/SA5/SA6	×		
		Arm	A4/A5/A6	×		
		Clean	—	×		
		Absolute type	—	×		
Direct drive motor	DDA	Standard	LT18□/LH18□	◎	◎ (*4)	
	DDACR	Clean	LT18□/LH18□	◎	◎	
	DD	Standard	T18□/LT18□/H18□/LH18□	◎	◎	
	DDCR	Clean	T18C□/LT18C□/H18C□/LH18C□	◎	◎	
	DDW	Dust-proof and drip-proof	LH18C□	◎	◎	
Linear motor	RCL	Slider (single slider)	SA1L/SA2L/SA3L/SA4L/SA5L/SA6L	◎		
		Slider (multi slider)	SM4L/SM5L/SM6L	◎		
		Rod	RA1L/RA2L/RA3L	◎		
	LSA LSAS	Small size	H	◎		
		Medium size	N	◎		
		Large size	W	◎		
		Shaft	S	◎		
		Flatness	L	◎		
	LS	Small size/Large size	S/L	×		
High-speed cartesian robot	CT4	Standard	G1	◎		
		Specification with rotary shaft	G1RT	◎		
		Pick & rotary specification	G1PR	◎		
Cartesian robot	ICSA/ICSPA	—	—	◎		
	ICSB/ICSPB	—	—	◎		
	IK	—	—			
Tabletop robot	TT	Old	TT-300	×		
		New	TT-A2/A3/C2/C3	◎	◎	
	TTA	—	TTA-A2□/A3□/A4□/C2□/C3□/C4□	◎	◎ (*3)	
Scara robot	IH	—	—	×	◎	
	IXP	Standard	3N1808/3N2508/4N1808/4N2508	◎	◎	
			3N3515/3N4515/4N3515/4N4515	◎	◎	
			3N5520/4N5520/3N6520/4N6520	◎	◎	
		With gripper	3N2508GM/3N3515GM/3N4515GM/ 3N3510GL/3N4510GL	◎	◎	
			3N5515GL/3N5515GW/3N6515GL/3N6515GW	◎	◎	
		Clean	3C3515/4C3515/3C4515/4C4515/	◎	◎	
			3C5520/4C5520/3C6520/4C6520	◎	◎	
		Dust-proof and drip-proof	3W3515/4W3515/3W4515/4W4515	◎	◎	
			3W5520/4W5520/3W6520/4W6520	◎	◎	
	IX	Standard (NNN)	1205/1505/1805	◎	◎	
			2515H/3515H	◎	◎	
			50□□H/60□□H/70□□H/80□□H	◎	◎	
			10040/12040	◎		
		Clean/Dust-proof and drip-proof Ceiling mounted, high speed, wall hanging	1205/1505/1805/2515H/3515H/3015H 50□□H/60□□H/70□□H/80□□H	◎	◎	
Wrist unit	WU	—	S/M	◎	◎	
Other	TX	—	—	◎		
	Motor unit	ISAC	200W/400W	◎		
		ISAC High rigidity (T1)	60W(RS)/100W/150W	◎		

(* 1) 230 V specification limited.
(* 2) Mechatronical link specification of field network is not supported.
(* 3) Safety category supported specifications limited.
(* 4) Brake option is excluded.
(* 5) When connecting with NNN10040/12040 is not supported.

Controller

◎: Standard/ ○: Option　△: Special order/ ×: No plan

Product structure	Series name	Type, model		RoHS Directive Compatible	CE mark	UL standard
Controller for RoboCylinder	PMEC	Incremental	C	◎	◎ (*1)	
	AMEC	Incremental	C	◎		
	PSEP	Incremental	C/CW	◎	◎	◎
		Simple Absolute	C/CW-ABU	◎	◎	◎
	ASEP	Incremental	C/CW	◎	◎	◎
		Simple Absolute	C/CW-ABU	◎	◎	◎
	DSEP	Incremental	C/CW	◎	◎	
	MSEP	Incremental	C/LC	◎	◎	◎
		Simple Absolute	C-ABB/LC-ABB	◎	◎	◎
	PSEP/ASEP	Absolute battery unit	SEP-ABUM/SEP-ABUM-W	◎	◎	◎
	MCON	—	C/CG/LC/LCG	◎	◎ (*2)	◎
	PCON	—	CB/CGB/CFB/CGFB	◎	◎ (*2)	◎
		—	CA/CF/CFA	◎	◎	◎
		—	C/CG	◎	◎ (*2)	◎
		—	CY/SE/PL/PO	◎	◎	◎
		—	CYB/PLB/POB	◎	◎	◎
	ACON	—	CB/CGB	◎	◎ (*2)	◎
		—	CA	◎	◎ (*2)	◎
		—	C/CG	◎	◎ (*2)	◎
		—	CY/SE/PL/PO	◎	◎	◎
		—	CYB/PLB/POB	◎	◎	◎
	DCON	—	CB/CGB	◎	◎ (*2)	◎
		—	CA	◎	◎ (*2)	◎
		—	CYB/PLB/POB	◎	◎	◎
	SCON	—	CB/LC	◎	◎ (*2)	◎ (*2)
		—	CB-F (Servo press only)/LC-F	◎	◎ (*2) (*4)	◎ (*2)
		—	CA	◎	◎ (*2)	◎
		—	C	◎	◎	◎
		—	CAL/CGAL	◎	◎	×
	MSCON	—	C	◎	×	
	RCM-P6	RCM-P6PC	—	◎	◎	◎
		RCM-P6AC	—	◎	◎	◎
		RCM-P6DC	—	◎	◎	◎
	PSEL	—	—	◎	◎	
	ASEL	—	—	◎	◎	
	SSEL	—	—	◎	◎	
	MSEL	Standard	PC	◎	◎	
		Safety category supported type	PG	◎	◎	
		56SP/60P/86P motor-compatible type	PCF	◎	◎	
		Safety Category Supported Type 56SP/60P/86P motor-compatible type	PGF	◎	◎	
	ROBONET	Gateway R unit	RGW-DV/RGW-CC	◎	◎	◎
			RGW-PR/RGW-SIO	◎	◎	◎
		Controller Unit	RACON/RPCON	◎	◎	◎
		Simple Absolute R Unit	RABU	◎	◎	◎
		Expansion Unit	REXT	◎	◎	◎
		Expansion Unit (unit turn back)	REXT-SIO	◎	◎	◎
		Expansion unit (controller connection)	REXT-CTL	◎	◎	◎
	RCP2	Standard	C/CG	◎	◎	◎
		High thrust	CF	◎	◎	◎
		Absolute	—	◎		
	RCS	230V	C	×		
		24V (general purpose)		×		
		24V (low price)	E	×		
		EU	—	×		
		CC-Link (256)	—	×		
		DeviceNet	—	×		
		ProfiBus	—	×		
Controller for single axis robot for cartesian robot for scara robot	E-Con	Standard	—	×		
		EU	—	×		
		CC-Link (256)	—	×		
		DeviceNet	—	×		
		ProfiBus	—	×		
		Absolute encoder type	—	×		
	P-Driver	—	—	×		
	TX	TX-C1	—	◎		
	MSEL	Standard	PCX3/PCX4	◎		
		Safety category supported type	PGX3/PGX4	◎	◎	
	XSEL-RA/SA	Standard	RA/RAX/RAXD8	◎(* 5)	◎(* 5)	
		Safety category supported type	SA/SAX/SAXD8	◎(* 5)	◎(* 5)	
	XSEL-R/S	Standard	R/RX/RXD8			
		Safety category supported type	S/SX/SXD8			
	XSEL-J/K	Small type	J	△		
		General purpose	K	△		
		Safety category supported type	KT	△	◎	
		EU type	KE/KET	△	◎	
		Scara type	JX/KX	△		
		General purpose extension SIO	IA-105-X-MW-A/B/C	◎		
	XSEL-P/Q	Standard	P	◎	◎	
		Safety category supported type	Q	◎	◎	
		Scara type	PX/QX	◎	◎	
		CT4	PCT/QCT	◎	◎	
	XSEL-J/K Option	CC-Link (256)	IA-NT-3206/4-CC256	◎		
		CC-Link (16)	IA-NT-3204-CC16	◎		
		DeviceNet	IA-NT-3206/4-DV	◎		
		ProfiBus	IA-NT-3206/4-PR	◎		
		EtherNet	IA-NT-3206/4-ET	◎		
		Extended PIO	IA-103-X-32/16	◎		
		Multipoint I /O	IA-IO-3204/5-NP/PN	◎		
	DS-S-C1	Standard	—	×		
		EU type	—	×		
	SEL-E/G	Standard	—	×		
		EU type	—	×		
	SEL-F	—	—	×		
	IH	—	—	×		

(*1) 230V only. (*2) MECHATROLINK-I/II field network option is not supported.
(*3) Safety category only. (*4) Brake option is not supported. (*5) Not supported for connecting with IX-NNN10040/12040.

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

■ Option

◎: Standard/ ○: Option △: Special order/ ×: No plan

Product structure	Series name	Type, model		RoHS Directive Compatible	CE mark	UL standard
Teaching box	Position controller/ Program controller dual use	Standard	TB-01	◎	◎	×
			TB-02	◎	◎	×
		With deadman switch	TB-01D/DR	◎	◎	×
			TB-02D	◎	◎	×
		Standard	TB-03	◎	◎	×
	New RC System	Standard	CON-T	◎	◎	
		Safety category 4 supported type	CON-TGS	◎	◎	◎
		SEP controller only Touch panel teaching	SEP-PT	◎	◎	
		Universal touch panel teaching Standard type (color liquid crystal type)	CON-PTA-C	◎	◎	
		Universal Touch Panel Teaching Type with enable switch (same as above)	CON-PDA-C	◎	◎	
		Universal Touch Panel Teaching Safety category supported type (same as above)	CON-PGAS-C	◎	◎	
		Universal Touch Panel Teaching Standard type (monochrome liquid crystal type)	CON-PT-M	◎	◎	
		Universal Touch Panel Teaching Type with enable switch (same as above)	CON-PD-M	◎	◎	
		Universal Touch Panel Teaching Safety category supported type (same as above)	CON-PG-M	◎	◎	
	RCP2	Standard (With deadman switch)	RCA-T/TD	×		
	ERC		RCM-T/TD	×		
	RCS	Simple type	RCA-E	△		
	E-Con		RCM-E	◎		
	RC	Data setting device	RCA-P	△		
			RCM-P	△		
	RCP2	Jog teach	RCB-J	△		
	ERC					
	New SEL System	Standard	SEL-T	◎	◎	
		With deadman switch	SEL-TD	◎	◎	◎
		Safety category 4 supported type	SEL-TG	◎	◎	◎
	XSEL	Standard (With deadman switch)	IA-T-X(IA-T-XD)	×		
	DS	DS-S-T1	—	×		
	E/G,F	NE-T-SS	—	×		
	IH	IA-T-IH	—	×		
	TX	TX-JB	—	◎		
Quick teach	ERC3	RCM-PST	—	◎	×	×
Touch panel	—	RCM-PM-01	—	◎		
M/PG Cable	IXP/RCP6/RCP5/ RCP4-SA3·RA3/ RCP2/RCD	Motor/Encoder integrated cable	CB-CAN-MPA	◎	◎	
			CB-CAN-MPA-**-RB	◎	◎	
			CB-ADPC-MPA-**	◎	◎	◎
			CB-ADPC-MPA-**-RB	◎	◎	◎
	RCP6/RCP5	Motor/Encoder integrated cable	CB-CFA3-MPA	◎	◎	
	RCP4/RCD	Motor/Encoder integrated cable	CB-CA-MPA	◎	◎	
			CB-CA-MPA-**-RB	◎	◎	
	RCP3/RCP2/ RCA2/RCA/RCL	Motor/Encoder integrated cable	CB-APSEP-MPA	◎	◎	
	RCP3/RCP2	Motor/Encoder integrated cable	CB-PCS-MPA	◎	◎	
	RCP/RCP2	Motor/Encoder integrated cable	CB-PSEP-MPA	◎	◎	
		Motor/Encoder integrated cable (Small rotary type only)	CB-RPSEP-MPA	◎	◎	
		Motor cable	CB-RCP2-MA	◎	◎	
		Encoder cable	CB-RCP2-PB	◎	◎	
			CB-RFA-PA	◎	◎	
			CB-RCP2-PB-**-RB	◎	◎	
			CB-RFA-PA-**-RB	◎	◎	
	RCA2	Motor/Encoder integrated cable	CB-ACS-MPA	◎	◎	
	RCA2/RCA/RCL	Motor/Encoder integrated cable	CB-ASEP-MPA	◎		
			CB-ASEP2-MPA	◎	◎	
		Motor cable	CB-ACS-MA	◎	◎	
		Encoder cable	CB-ACS-PA	◎	◎	
			CB-ACS-PA-**-RB	◎	◎	
	RCS3-RA15R/20R	Motor cable	CB-RCS3-MA**-RB	◎	◎	×
		Encoder cable	CB-RCS3-PLA**-RB	◎	◎	×
	RCS3/RCS2	Motor cable	CB-RCC-MA	◎	◎	
			CB-RCC-MA-**-RB	◎	◎	
		Encoder cable	CB-RCS2-PA	◎	◎	
			CB-RCS2-PLA	◎	◎	×
			CB-RCBC-PA	◎	◎	
			CB-RCS2-PLLA (RA13R/with load cell)	◎	◎	×
			CB-RCBC-PA-**-RB	◎	◎	

◎: Standard/ ○: Option △: Special order/ × : No plan

Product structure	Series name	Type, model		RoHS Directive Compatible	CE mark	UL standard
M/PG Cable	XSEL	Motor cable	CB-X-MA	◎	◎	
			CB-XMC-MA	◎	◎	
			CB-XEU-MA	◎	◎	
		Encoder cable	CB-X-PA	◎	◎	
			CB-X1-PA/PLA	◎	◎	
			CB-X2-PA/PLA	◎	◎	
			CB-X1-PA-**-WC	◎	◎	
			CB-X3-PA	◎	◎	
		Limit switch cable	CB-X-LC	◎	◎	
	XSEL-PCT/QCT	Motor cable	CB-CT4-MA	◎	◎	
			CB-CT4R-MA	◎	◎	
		Encoder cable	CB-CT4-PA	◎	◎	
			CB-CT4R-PA	◎	◎	
			CB-CT4PR-PA	◎	◎	
	TX	Motor cable	CB-TX-ML050-RB	◎		
I/O Cable	PMEC/AMEC	For standard	CB-APMEC-PIO***-NC	◎	◎	
	PSEP/ASEP/DSEP	For Standard/Dust-proof	CB-APSEP-PIO/CB-APSEPW-PIO	◎	◎	
	MSEP	For standard	CB-MSEP-PIO	◎	◎	
		For LC	CB-PAC-PIO	◎	◎	
	PCON/ACON/ DCON	For standard (C/CA/CB/CG/CGB type)	CB-PAC-PIO	◎	◎	
		For solenoid valve type (CY type)	CB-PACY-PIO	◎	◎	
		For solenoid valve type (CYB type)	CB-PAD-PIO	◎	◎	
		For pulse train control (PL/PO type)	CB-PACPU-PIO	◎	◎	
		For pulse train control (PLB/POB type)	CB-PAD-PIOS	◎	◎	
	SCON	For standard	CB-PAC-PIO	◎	◎	
	MSEL	Standard	CB-PAC-PIO	◎	◎	
	PSEL/ASEL/SSEL	For standard	CB-DS-PIO	◎	◎	
	XSEL	For standard	CB-X-PIO	◎	◎	
	ERC3	Power supply for PIO type	CB-ERC3P-PWBIO	◎	×	×
		Power supply for SIO type	CB-ERC3S-PWBIO	◎	×	×
	ERC/ERC2	Power supply for PIO type	CB-ERC-PWBIO***(-RB)	◎	◎	
		Power supply/I/O cable	CB-ERC-PWBIO***-H6	◎	◎	
			CB-ERC-PWBIO***-RB-H6	◎	◎	×
		Power supply for SIO type	CB-ERC2-PWBIO***(-RB)	◎	◎	
Communication cable for SIO	ERC3	—	CB-PST-SIO050	◎	×	×
Others	RC	Software for PC	RCM-101-MW	◎		
			RCM-101-USB	◎		
		External communication cable	CB-RCA-SIO***	◎	◎	
		RS232C conversion cable	RCB-CV-MW	◎		
		USB cable	CB-SEL-USB***	◎	◎	
			CB-SEL-USB030	◎		
		USB conversion adapter	CB-CV-USB	◎		
		Link cable	CB-RCB-CTL***	◎	◎	
		Unit link cable	CB-REXT-SIO***	◎	◎	
		Controller connection cable	CB-REXT-CTL***	◎	◎	
		Adapter for CON-TG	RCB-LB-TGS	◎		
	SCON			◎		
		Pulse train control cable	CB-SC-PIOS	◎	◎	
	RCP6S	Connection cable (between actuator - gateway unit/hub unit)	CB-RCP6S-PWBIO□□□(-RB)	To be acquired	To be acquired	
		Connection cable (between gateway unit and hub unit)	CB-RCP6S-PLY□□□(-RB)	To be acquired	To be acquired	
	ERC2	PC connection cable	CB-ERC2-SIO***	◎	◎	×
		Cable for network connection	CB-ERC2-CTL***	◎	◎	×
	MSEL (included with MSEL-ABB)	Connection cable	CB-MSEL-AB***	◎	◎	×
	XSEL	Software for PC (Cable + EMG BOX)	IA-101-X-MW	◎		
			IA-101-XA-MW	◎		
			IA-101-X-USBS	◎		
			IA-101-X-USBMW	◎		
			EMG SW BOX	◎		
		Insulated cable (single item)	CB-ST-E1MW***	◎	◎	
			CB-ST-A2MW***	◎	◎	
			CB-SEL-USB010	◎		
		USB conversion adapter	IA-CV-USB	◎		
		Adapter for SEL-TG	IA-LB-TGS	◎		
		Joint cable	CB-ST-232J001/CB-ST-422J010	◎	◎	
		SEL-TG connection cable	CB-SEL25-LBS***	◎	◎	
		Brake box ~controller connection cable	CB-XBB-PA030/050-CS	◎	×	×
		Cable for brake box release switch	CB-XBB-SW020	◎	×	×
		Connection cable (included with EIOU - 4)	CB-RS-IAN020	◎	×	×
	A/P/SSEL	SEL-TG connection cable	CB-SEL26H-LBS***	◎	◎	
	DDA	Brake box · Mechanical connection cable	CB-DDB-BK***	◎	×	×

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

◎: Standard/ ○: Option △: Special order/ × : No plan

Product structure	Series name	Type, model		RoHS Directive Compatible	CE mark	UL standard
Others	SEL	Panel unit	PU-1	◎		
		Connector conversion cable	CB-SEL-SJS***	◎	◎	
	TX	Connection cable	CB-TX-P1MW020	◎		
	TTA	Software for PC	IA-101-TTA-USB	◎		
Simple absolute unit	PCON/ACON	PCON-ABU ACON-ABU	—	◎	◎	◎
Simple Absolute Battery Unit	ACON-CB/CGB	SEP-ABU/ABUS	—	◎	◎	◎
Dc24V Power supply	—	PS-241/PS-242	—	◎		
PLC connection unit	RCP6S	RCB-P6PLC	—	◎	◎	
Hub unit	RCP6S	RCM-P6HUB	—	◎	◎	
Gateway unit	RCP6S	RCM-P6GW	—	◎	◎	
	ERC3	RCM-EGW	—	◎	×	×
	RCM-GW	DV	RCM-GW-DV	◎		
		CC	RCM-GW-CC	◎		
		PR	RCM-GW-PR	◎		
RC gateway (dedicated cable for communication port connection)	XSEL-P/Q	Communication cable	CB-RCB-SIO***	◎	◎	×
	XSEL-R/S	Controller link cable	CB-RCB-CTL***	◎	◎	×
Expansion I / O unit	SSEL MSEL TTA	EIOU-1	—	◎	×	×
	XSEL	EIOU-4	—	◎	×	×
Regenerative resistance unit	SCON (for RCS3-RA20R)	RESU-35T	—	◎	◎	×
	MSCON XSEL	RESU-1/RESUD-1	—	◎	×	×
	SCON MSCON SSEL	RESU-2/RESUD-2	—	◎	×	×
	E-Con PDR XSEL	REU-1	—	◎		
	SCON SSEL XSEL-P/Q	REU-2	—	◎		
	MSEP MCON	RER-1	—	◎	×	×
Absolute battery	HAB	IA-HAB	—	*1		
	RCP	AB-2	—			
	XSEL-J/K	IA-XAB-BT	—	◎		
	RCS E-Con P-Driver	AB-1	—	*1 EU battery command (2006/66/E) is applicable. When RoSH command, it is not applicable.		
	IX Scalar (for 250-800)	AB-3	—			
	RCP2	AB-4	—			
	XSEL-P/Q/R/S ASEL ACON SCON MSCON SSEL	AB-5	—			
	IX Scalar (for 120-180)	AB-6	—			
	PCON-ABU ACON-ABU MCON MSEL	AB-7	—			
Absolute battery box	MSEP MCON	MSEP-ABB	—	◎	◎	◎
	MSEL	MSEL-ABB	—	◎	◎	×
Dummy plug	XSEL	DP-2	—	◎	×	×
	PSEL ASEL SSEL MSEL	DP-4S	—	◎		
	MCON ACON-CGB DCON-CGB SCON-CGB/ CGBL/CAL	DP-5	—	◎	×	×

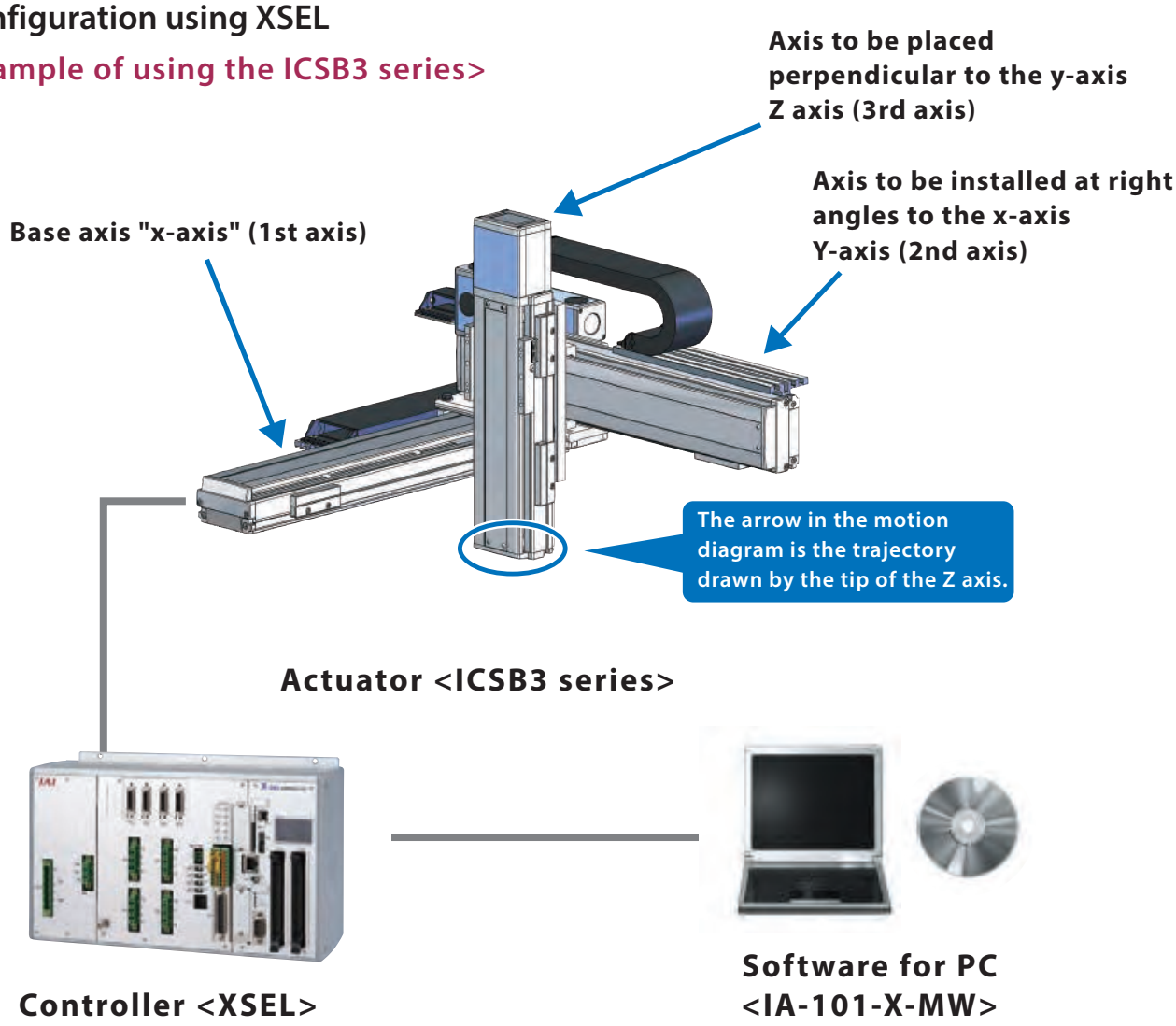
◎: Standard/ ○: Option △: Special order/ × : No plan

Product structure	Series name	Type, model		RoHS Directive Compatible	CE mark	UL standard
Brake box	E/G	1-Axis AC	H-109-□A	×		
		1-axis DC	H-109-□D	×		
		Brake Box	H-110-□A	×		
		2-axis DC	H-110-□D	×		
		Coil	H-500	×		
	GDS	1-Axis	H-401	×		
		2-Axis	H-402	×		
	RCS2-RA13R	RCB-110-RA13R-0	—	◎	×	×
	XSEL-J/K	IA-110-X-0	—	◎		
Driver board	MSEP (for pulse motors)	MSEP-PPD1/PD1/PD2	—	◎	×	×
	MSEP (for AC Servomotor)	MSEP-AD1/AD2	—	◎	×	×
	MSEP (for DC brushless motor)	MSEP-DD1/DD2	—	◎	×	×
	MCON (for pulse motors)	MCON-PPD1/PD1/PD2	—	◎	×	×
	MCON (for AC Servomotor)	MCON-AD1/AD2	—	◎	×	×
	MCON (for DC brushless motor)	MCON-DD1/DD2	—	◎	×	×
Replacement fan unit	MSEP	MSEP-FU	—	◎	×	×
	SCON	SCON-FU	—	◎	×	×
PIO converter	ERC3	RCB-CV	—	◎	×	×
PIO terminal block	—	RCB-TU-PIO-A/B	—	◎		
SIO converter	—	RCB-TU-SIO-A/B	—	◎		
RS232 conversion uni	RCS	New	RCB-CV-MW	◎		
	ERC	Old	RCA-ADP-MW	×		
	XSEL	RCB-CV-GW	—	◎		
Multipoint I/O board Terminal block	XSEL-K	TU-MA96(-P)	—	◎		
Filter box	E-Con	PFB-1	—	×		
Pulse converter	PDR/ACON/SCON	AK-04	—	◎		
	SCON-CB	JM-08	—	◎	×	×
I/O expansion box	E/G	H-107-4	—	×		

Introduction to SEL Language

Configuration using XSEL

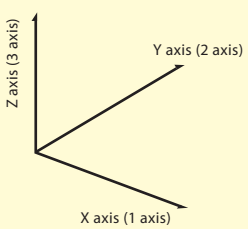
<Example of using the ICSB3 series>



* SEL language is used in XSEL controller, PSEL controller, ASEL controller, SSEL controller, table top robot TTA series.

The above actuator combines three linear actuators.

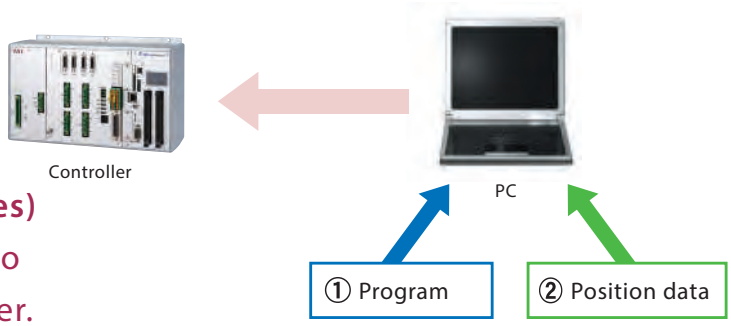
1. The three actuators are expressed as "1 axis, 2 axis, 3 axis", respectively.
2. This actuator is called "3 axis orthogonal robot" which uses 3 axes in combination orthogonally.
3. Each axis is classified into X axis, Y axis, Z axis from its installation status.
   - Base axis → <X axis>
   - Axis installed at right angles to the X axis → <Y axis>
   - Axis installed perpendicular to the Y axis → <Z axis>



4. In program data and position data, it is expressed as follows.
   - X axis (first axis) = Axis 1
   - Y axis (second axis) = Axis 2
   - Z axis (third axis) = Axis 3

■ What is necessary for robot operation

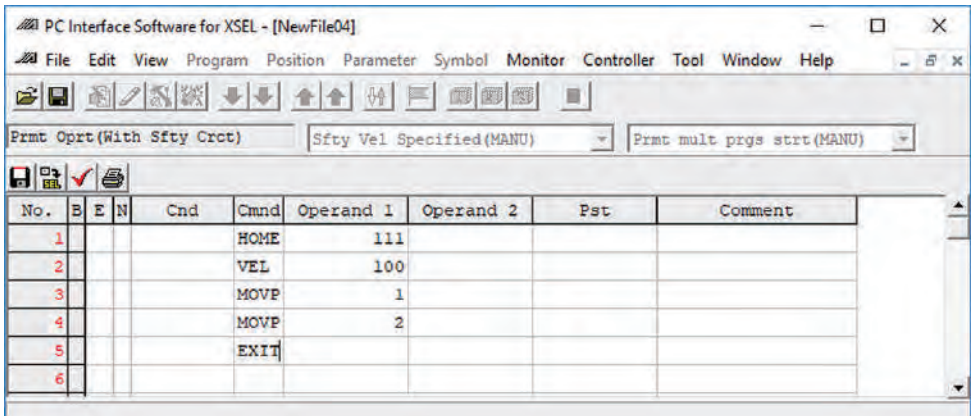
In order to operate the robot,
① **Program**
② **Position data**
(The position where the robot moves)
It is necessary to enter these two data to
the controller using a personal computer.



① Program

Enter "SEL language" (our company's original language) which instructs the contents and order of action in the program data sheet in PC software.

* The program actually entered is displayed as follows.

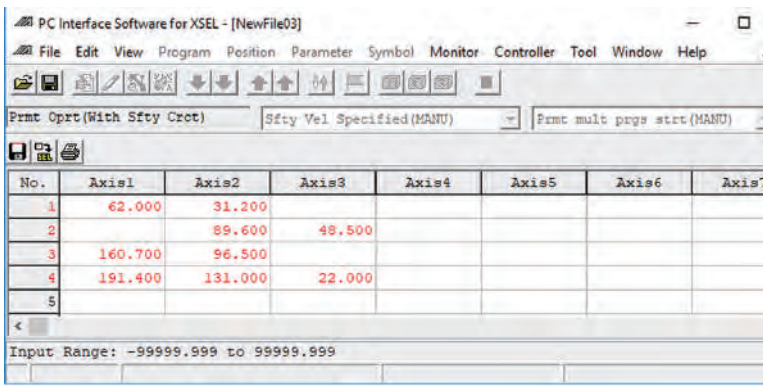


Software for PC IA-101-X-MW Program Input screen

② Position data (position where the robot moves)

The position to move the actuator is indicated by coordinates and entered in the position data sheet in the personal computer software.

* The position data actually entered is displayed as follows.
Data not transferred to the controller will be displayed in red and will be black after transfer.



Software for PC IA-101-X-MW Position Input screen

Introduction to SEL Language

Basics of program

Basics of program creation

① Use the instruction word "Super SEL language" (hereinafter "SEL language") to instruct the operation.
② "SEL language" basically executes instructions one by one in order from the top.
③ Enter the command word in the [Cmnd] field of the program data sheet.
* [Cmnd] stands for Command.
④ In the [Operand 1] [Operand 2] field, enter various numerical values following the command word on the same line. Numeric values are various types, such as position number, axis number, axis pattern, speed, number of seconds.
* [Operand] is a computer term and is "numerical value and variable to be calculated". In SEL language, Operand 1 is called "operation 1" and operand 2 is called "operation 2".
⑤ The basic program configurations are "move to reference point", "speed specification", "operation designation", and "end declaration".

- Move to reference point ... Return to origin and use the command word "HOME".
- Speed specification ... Specify the moving speed with the command word "VEL (abbreviation for speed translation English)".
  It will not work unless speed is specified. The maximum speed depends on the actuator used.
- Operation specification ... Set various actions.
- End declaration ... Ends the operation. At the end of the program, enter the instruction word "EXIT".
  If this is not entered, repeat the program.

<Example of program>

The following program shows
The X, Y and Z axes return to the reference point of motion and then move from the reference point to position No. 1 at a speed of 100 mm / s. After that, it moves to No. 2 and end the operation.

No.	B	E	N	Cnd	Cmnd	Operand 1	Operand 2	Pst	Comment
1					HOME	111			
2					VEL	100			
3					MOVL	1			
4					MOVL	2			
5					EXIT				
6									

Step No. Column for command Column for comment

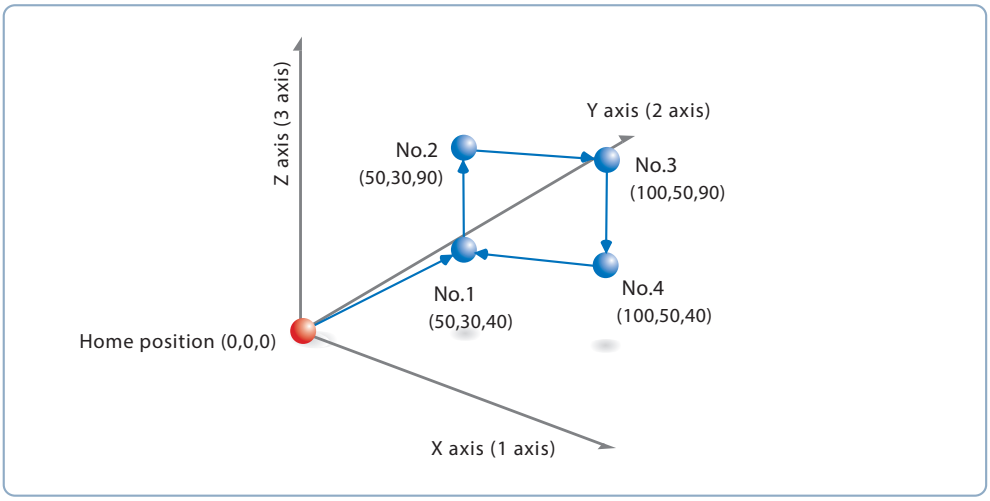
■ Basics of position data

Basics of creating position data

① In the position data sheet, enter the "coordinates" of the position to move.
② Axis is the axis, Axis 1 = first axis, Axis 2 = second axis, Axis 3 = third axis respectively.
In ICSB 3, Axis 1 = X axis, Axis 2 = Y axis, Axis 3 = Z axis.
③ Even if position data is entered, it will not operate unless a move is instructed by the program.
④ Since the order of moving is set by the program, the order of the position numbers is not related to the moving order.

<Example of Position Data>

Move from No. 1 to No. 4 by setting the target position to 4 points.



The four three-dimensional coordinates (distance from the origin) are set from position No. 1 to No. 4.

* The unit is mm.

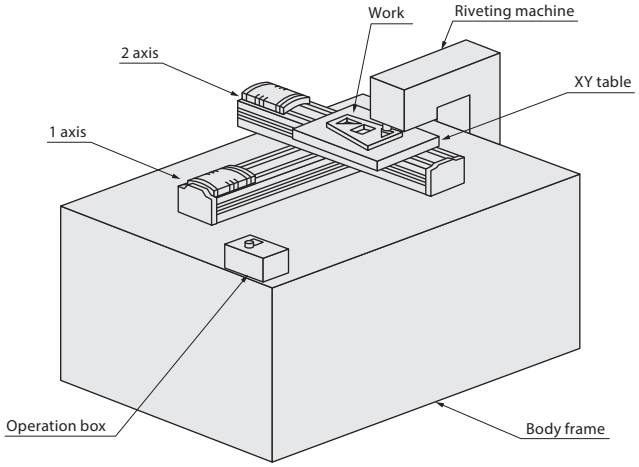
No.	Axis1	Axis2	Axis3
1	50.000	30.000	40.000
2	50.000	30.000	90.000
3	100.000	50.000	90.000
4	100.000	50.000	40.000
5			
6			

Position No.

Sample Program 1: Rivet Stopping Device

Device outline

This device consists of X Y table and riveting machine by 1 axis / 2 axis actuator. This is a rivet stop device that sets a work on the X Y table at the work home position and makes the rivet stop to the specified three points on the work by turning on the start switch.



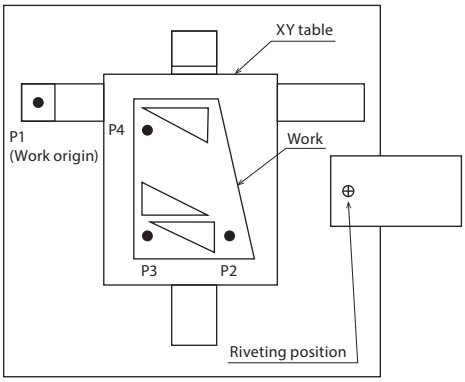
Operation explanation

Describe the operation of this device.

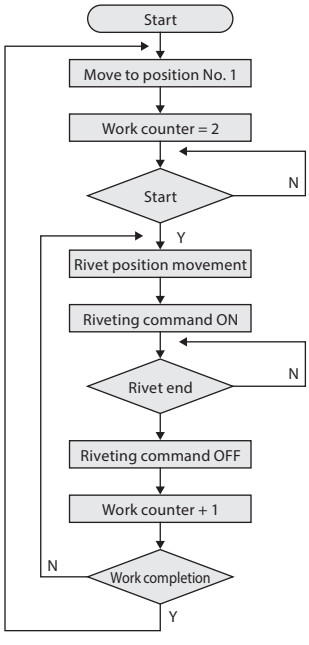
① The XY table moves to the work origin (P1) and waits.
② The operator sets the work on the XY table and turns on the start SW.
③ In the XY table, riveting position No.1 (P2) of the work moves to riveting position and riveting command is outputted to the riveting machine.
④ Riveting operation is completed, the rivet position No. 2 (P3), No. 3 (P4) is moved to the riveting position in the same operation after the completion signal is entered.
⑤ After returning to riveting on all 3 points, return to the work origin (P1).

Operation position, input / output allocation of external input / output, and operation flowchart are shown below.

Operating position



Operation flowchart



I / O allocation

Classification		I / O No.	Signal name	Specification
XSEL	Enter	16	Start command	Pushbutton SW
		17	Riveting complete	Contact signal
	Output	309	Rivet Command	24v DC
	* Flag used more than 600			

Application Program

Step	Extended condition	Input condition	Cnd	Command	Operation 1	Operation 2	Output condition	Comment
1				HOME	11			XY table home return (servo ON)
2				VEL	400			Speed 400 mm / s setting
3				TAG	1			
4				MOVL	1			Move to position No. 1 (work origin)
5				LET	1	2		Set 2 to work counter
6				BTOF	600			Clear completion flag
7				WTON	16			Waiting for start command
8				TAG	2			
9				MOVL	*1			Work counter position movement
10				BTON	309			Riveting command ON
11				WTON	17			Waiting for riveting completion
12				BTOF	309			Riveting command OFF
13				ADD	1	1		Work counter + 1
14				CPEQ	1	5	600	Flag ON when work is completed
15		N	600	GOTO	2			If it is not completed jump TAG 2
16				GOTO	1			If it is completed jump TAG 1
17								
18								
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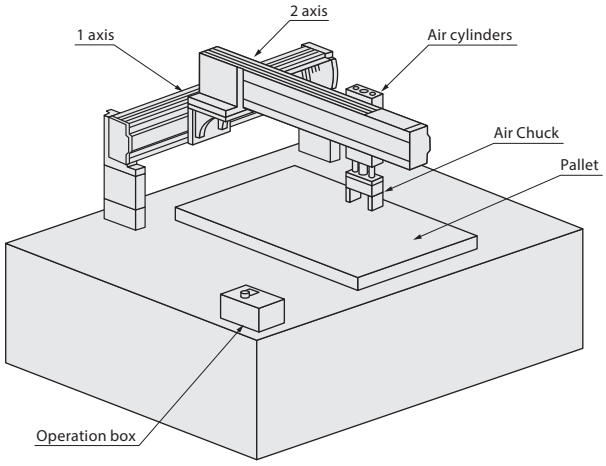
32								

Sample Program 2: Palletizing Device

Device outline

This device is a palletizing device that consists of a single axis / two axis actuator and Z-axis air cylinder, grips workpieces from the work supply point and transfers them sequentially on the pallet (using the offset instruction instead of using the palletizing function).



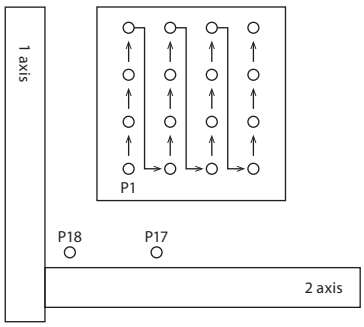
Operation explanation

Describe the operation of this device.

① Move to standby point and wait for start input.
② After starting input, move to the work supply point.
③ The Z-axis descends and the air chuck grips the workpiece.
④ The Z-axis rises and moves onto the pallet.
⑤ The Z-axis descends and the air chuck releases the work.
⑥ The Z-axis rises and moves to the work supply point.
⑦ At the end of the pallet, the pallet completion indication is outputted, after waiting for restart after moving to P18.

Operation position, input / output allocation of external input / output, and operation flowchart are shown below.

Operating position

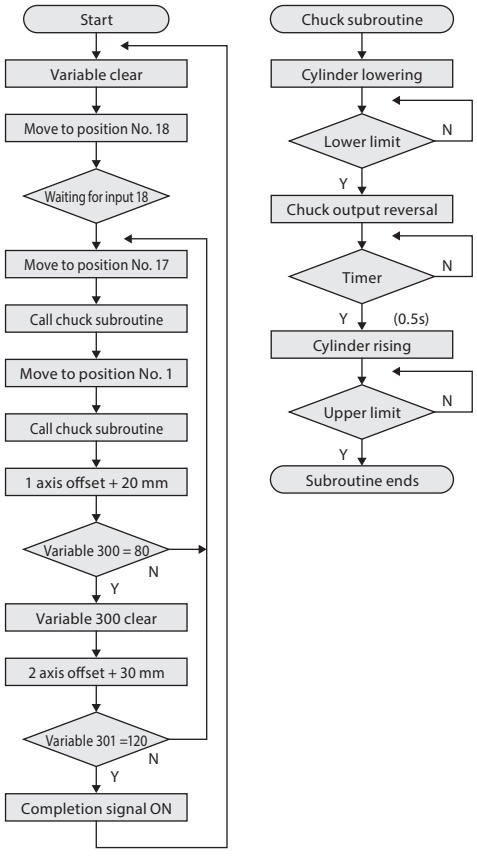


I / O allocation

Classification		I / O No.	Signal name	Specification
XSEL	Enter	16	Z-axis cylinder upper limit	Proximity SW
		17	Z-axis cylinder lower limit	Proximity SW
		18	Start	Pushbutton SW
	Output	309	Z-axis cylinder SV	DC24V
		310	Z axis chuck SV	DC24V
		311	Pallet completion	DC24V
	* Flag used more than 600			

Pallet specification 1 axis direction: 20 mm pitch 2 axial direction: 30 mm pitch

Operation flowchart



Application Program

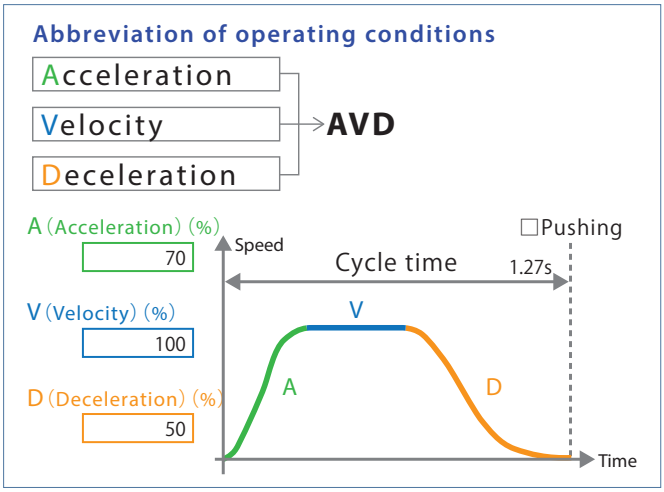
Step	Extended condition	Input condition	Cnd	Command	Operation 1	Operation 2	Output condition	Comment
1				HOME	11			1 · 2 axes home return
2				VEL	100			2 VEL 100 speed 100 mm / s setting
3				ACC	0.2			3 ACC 0.2 Acceleration / Deceleration 0.2 G
4				TAG	1			
5				LET	300	0		Variable clear
6				LET	301	0		Variable clear
7				OFST	11	0		Offset value clear
8				MOVL	18			Move to position No. 18
9				WTON	18			Wait for start input
10				BTOF	311			Output 311 off
11				TAG	2			
12				OFST	11	0		Offset value clear
13				MOVL	17			Move to position No. 17
14				EXSR	1			Call chuck subroutine (chuck)
15				OFST	1	* 300		1 axis, value offset for variable 300
16				OFST	10	* 301		2 axis, value offset for variable 301
17				MOVL	1			Move to position No. 1 + offset value
18				EXSR	1			Call chuck subroutine (unchuck)
19				ADD	300	20		Add 20 to variable 300
20				CPEQ	300	80	600	If variable 300 = 80, flag 600 on
21		N	600	GOTO	2			If flag 600 is off, jump to TAG 2
22				LET	300	0		Variable 300 clear
23				ADD	301	30		Add 30 to variable 301
24				CPEQ	301	120	601	If variable 301 = 120, flag 601 is on
25		N	601	GOTO	2			If flag 601 is off, jump to TAG 2
26				BTON	311			Output 311 ON
27				GOTO	1			Jump to TAG 1
28				BGSR	1			Start of chuck subroutine
29				BTON	309			Z-axis cylinder descent
30				WTON	17			Wait for lower limit input
31				BTNT	310			Air chuck output reversal
32				TIMW	0.5			Timer 0.5 seconds
33				BTOF	309			Z-axis rising cylinder
34				WTON	16			Wait for upper limit input
35				EDSR				Chuck subroutine ends
36								
37								
38								
39								

Explanation of Terms

(This terminology is related to IAI products, and so the definitions are more limited than general meaning.)

AVD

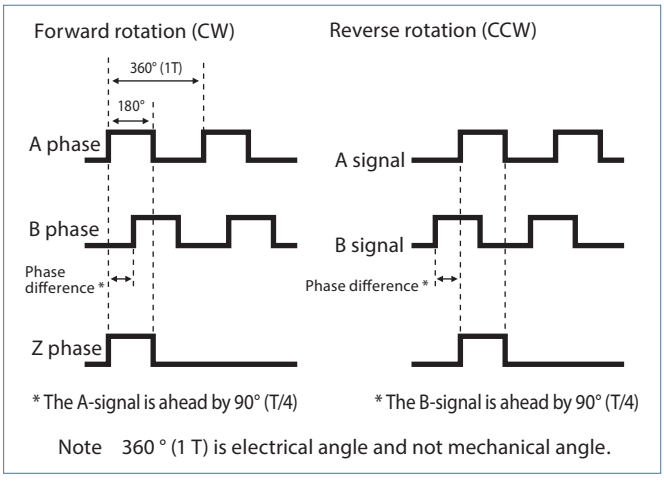
When moving an object, the object will accelerate from the stopped state, reach a constant speed, decelerate from that constant speed, and stop. The operating conditions of acceleration, speed, and deceleration at that time are abbreviated as AVD, with the initial letters of each English word. IAI uses it as an abbreviation of operating conditions. The IAI electric actuator can set the AVD individually to an arbitrary value.



A phase (signal) output · B phase (signal) output

The incremental type output judges the forward and reverse rotation of the axis with the phase difference between A phase and B phase. In the case of forward rotation (CW), the A phase precedes the B phase.

■ **Output mode diagram**



A transistor

When a small amount of current is passed through the base (B) part, current flows between the collector (C) and the emitter (E), and it functions as a switching element. There are two types, PNP type and NPN type.

Absolute battery

Battery to hold encoder information when power is cut off.

Absolute encoder

Encoder with absolute position detection function. Since absolute position can always be grasped, return to home is not required every time power is turned on.

Air purge

To ensure dust-proof and drip-proof properties in dust-proof and drip-proof type actuators, apply air pressure inside the actuator to prevent dust and other substances from entering the inside of the actuator.

Allowable Dynamic Moment

Indicator for guide life. In our company, the moment where the mileage is 5,000 km for ROBO Cylinder and 10,000 km for Single Axis Robot shall be the standard rated life.

Allowable Static Moment

Calculated based on the static load rating (N) * 1 that can be added to the slider while the slider is stopped.

*1 When a certain load is applied, a small indentation (the total permanent deformation amount of the guide ball becomes about 1/10000 times the ball diameter) remains on the contact surface between the guide and the ball (steel ball)).

AQ seal

Lubricating components obtained by solidifying lubricating oil with resin. Lubricating oil seeps out to the surface due to capillary phenomenon, the optimal amount of oil is secured on the raceway surface of the ball screw / linear guide, and lubricating performance is maintained.

Backlash

Gaps between the mechanical elements that move together.

Backup memory

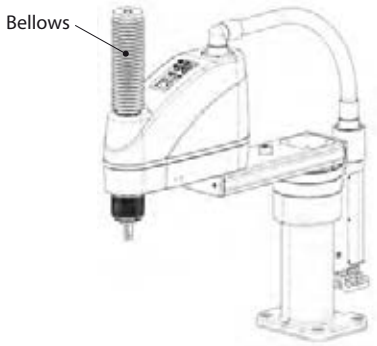
A storage device for storing information necessary for moving the actuator in the controller.

Ball screw

Machine parts where the screw shaft and nut operate through the ball.

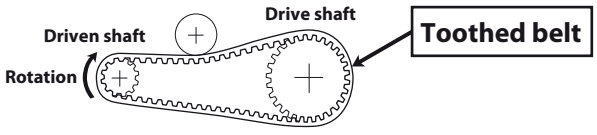
Bellows

A stretched sheet that is mounted for dust-proof or drip-proof purposes.



Belt drive

Drive system that transmits power from drive shaft to driven shaft (driven shaft) with belt. IAI mainly uses toothed belts.



Bit

Unit of information amount in the network. In addition, there are byte and word.
The amount of transferring information can be expressed as a bit, byte or word.
Concept: 8 bits = 1 byte 16 bits = 2 bytes = 1 word

Brake box

A device to be connected between the brake controller.

CCW

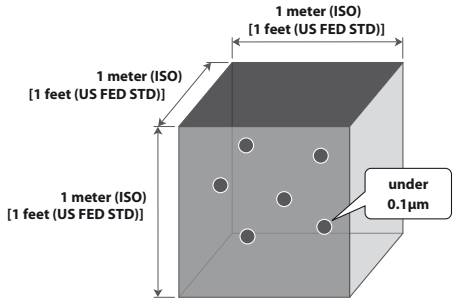
Counter clock wise.
It is used to indicate the direction of rotation of the motor.

Circuit

It is defined as "the one to operate the contact mechanism by using the electromagnetic suction force caused when the current more than the value in the electromagnet is flowed" composed of the electromagnet and the contact mechanism. The contacts are opened and closed by voltage and current (input signal) applied to the coil.

Cleanliness

An index showing the cleanliness in a clean room.



Coil

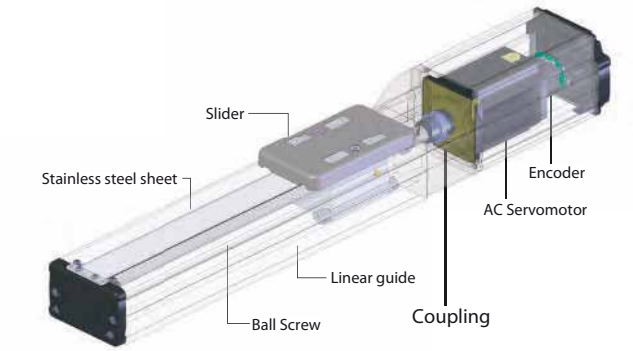
A component that generates an electromotive force proportional to a change in current per unit time when the flowing current changes. There is a property that only high-frequency electric signals are passed through, and only direct current or low-frequency alternating current is passed.

Condenser

Passive element that acts to store electric charge. Also referred to as electrostatic capacity or capacitor.

Coupling

Shaft coupling. Machine element for fastening shaft and shaft.



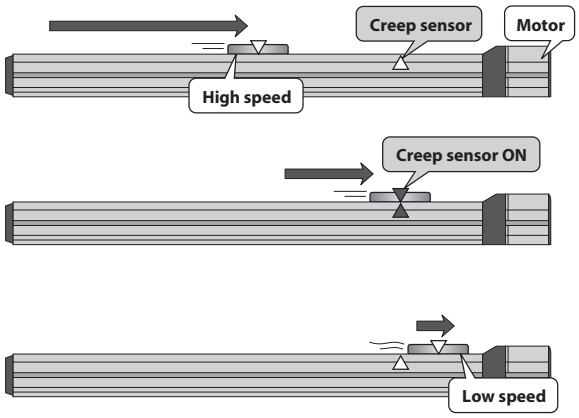
CP control

Control with all orbits or all routes specified. (Continuous Path)

Explanation of Terms

Creep sensor

Sensor for returning to home at high speed.



Critical speed

The speed of the slider where the ball screw resonates. (Ball screw rotation speed)

CT effect

By replacing the air cylinder of the facility with an electric actuator, it is possible to shorten the cycle time and reduce Choco Tei. As a result of improved productivity, capital investment and personnel expenses can be suppressed and the benefit of increasing customer profits. CT is an abbreviation for Cycle Time and Choco Tei (jap. kaizen term for short production stop).

CW

Clockwise (Clock Wise). It is used to indicate the direction of rotation of the motor.

Cycle time

The time taken for one process.

Differential line driver

It is one of the input / output method of the pulse train signal, and has the feature that it is more resistant to noise than the "open collector" method of the same input / output method. On the other hand, it is more expensive than the open collector type.

Diode

A part that makes the flow of electricity one way.

<Type of diode>

1. Switching diode
   It is used most frequently for small signal diodes.
   The shape is also small and it is sealed with glass.
2. Light emitting diode
   LED. It is used for display, infrared remote control etc.

Direct numerical designation control

A control method in which a numerical value is entered from a touch panel and is directly reflected on the target position even if the target position is not memorized in the controller in advance.

Dispenser

Equipment that restricts the flow of liquids. It is incorporated into adhesive and sealant coating equipment.

Double slider

A free slider (slider not connected to the ball screw/drive belt) is added separately from the drive slider.

Duty

The ratio between the time the actuator is operating and the elapsed time.

Earth

Connect the equipment casing, the reference potential wiring of the electronic equipment, etc. to the reference potential point. Or the reference potential point itself. It is connected for the purpose of noise countermeasure, electric shock prevention, etc. (Ground, ground)

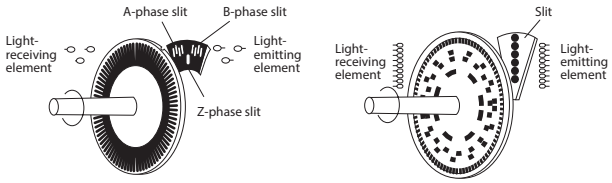
Emergency stop circuit

Circuit that stops the device either artificially or automatically if the device is in a hazardous state.

Encoder

Sensor that detects the position of the motor.

●Incremental ●Absolute



An incremental encoder

detects the rotational angle and the RPM of the axis from the number of output pulses. To detect the rotational angle and the RPM, a counter is needed to cumulatively add the number of output pulses. An incremental encoder allows you to electrically increase the resolution by using the rise and fall points on the pulse aveform to double or quadruple the pulse generation frequency.

An absolute encoder

detects the rotation angle of the axis from the state of the rotation slit, enabling you to know the absolute position at all times, even when the rotating slit is at rest. Consequently, the rotational position of the axis can always be checked even without a counter.

In addition, since the home position 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 outage or an emergency stop.

External operation mode

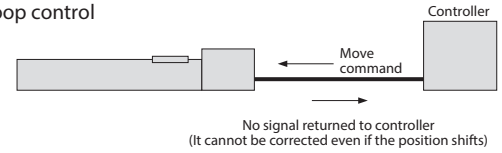
An operation mode activated by a start signal of an external device (PLC etc.). (self-driving)

Feedback control

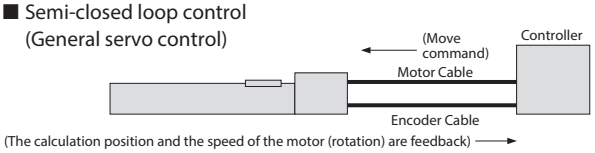
A mechanism to control so that the control results from the controller and the command from the encoder can match.

There are the following types of control of the actuator.

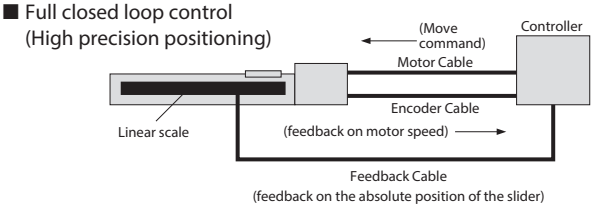
■ Open loop control



■ Semi-closed loop control
(General servo control)

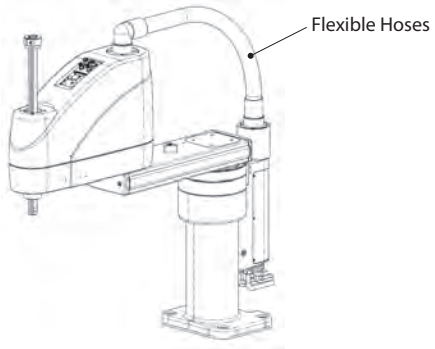


■ Full closed loop control
(High precision positioning)



Flexible Hoses

A pipe that is through the motor, encoder cables and user wiring of SCARA robot. Flexible hose, flexible tube and so on.



Frame ground

A place with a stable electric potential consisting of a large conductor such as the frame of the equipment.

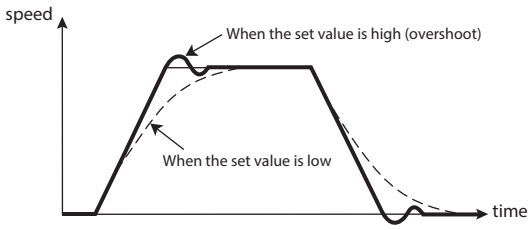
G

A unit representing the magnitude of acceleration. Non SI unit.

Acceleration is indicated based on standard gravity acceleration. 1 G = 9.807 m/s^2

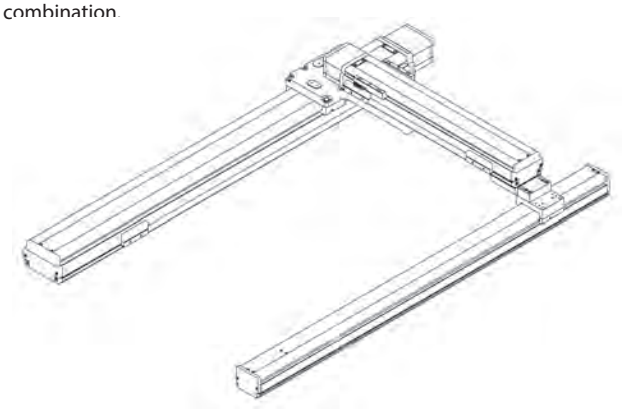
Gain

A numerical value that adjusts the response when the controller controls the servomotor. Generally, the higher the gain, the more quick response is improved.



Gantry

Combination type with a guide for Y axis support attached to XY 2 axis combination.



Explanation of Terms

Global specification

Type of controller and teaching box equipped with functions such as duplex emergency stop circuit and 3 position enable switch so that it can correspond to safety category.

Grease

Suspended thickener in lubricating oil to make it semisolid or solid.

Grease up

Injecting and applying grease to sliding parts.

Ground

A place that becomes a reference potential that is installed in the earth and used for security.

<Ground sign>

Frame ground

Earth (ground)

Guide module

Guide mechanism with drive mechanism removed from direct acting actuator.

Home

Reference point of actuator operation.

Hunting

The phenomenon in which the response is vibrating near the target value.

I/O

Input / Output (Input / Output). An interface used for input and output information (signal) with devices connected to the outside of the device.

Incremental encoder

Encoder with the function to detect the relative position. Since only the relative position can be grasped, return to home is required every time the power is turned on.

Inertia

As long as no external force acts on the object, it is a property to sustain the current state.
(Inertia)

Inertia ratio

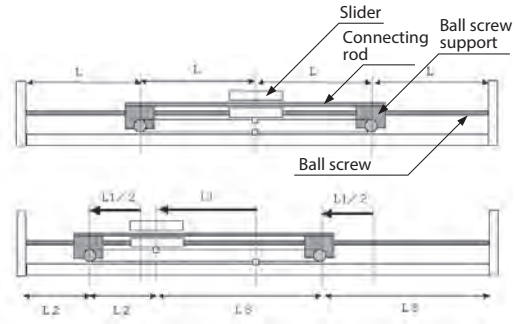
Ratio of load inertia moment to moment of inertia of motor shaft.

Inrush current

Current flowing to charge the capacitor at the moment of power-on. It is much larger than the steady state current.

Intermediate support mechanism

A ball screw support mechanism that moves in conjunction with a slider. A mechanism that greatly improves the maximum speed of the long stroke type, suppressing the runout of the ball screw in the case of long stroke, increasing the band of critical revolution number.



Jog feed

Send it manually at a predetermined feed speed.

Key Grooves

The grooves to be machined into the shaft or mounting parts for key mounting. (Key: The part to prevent the position shift in the rotation direction of the shaft and the mounting part.)

Lead

Distance at which the slider moves when the feed screw rotates once. When the lead is large, the speed of the slider is fast, but the thrust is small.

Leak current

It is a small current flowing from a part etc. used in a device using a high voltage power supply (AC 100 V etc.) to a surrounding conductor (mainly a frame).

Linear encoder

Encoder to detect linear distance.

Linear guide

Mechanism for guiding the slider of the actuator.

Linear motor

Motor that performs linear motion.

Load cell

Sensor that detects the magnitude of force.

Load Coefficient

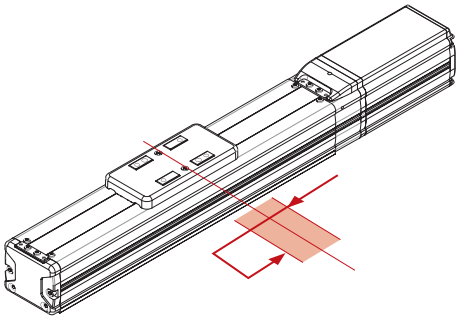
Coefficient to consider lifetime reduction due to operating conditions in lifetime calculation.

Load Rating

The ratio of the load to the rated output of the motor.

Lost motion

Difference between both stopping positions by positioning in a positive direction to a certain position and positioning in a negative direction. Repeat positioning from positive and negative directions seven times at an arbitrary point, measure the stop position, and find the average difference between the positive and negative measured values. This measurement is performed at the center of the moving distance and almost at both ends, and the largest one of the obtained average differences is taken as the measured value.

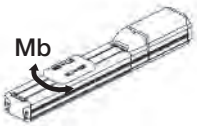


Ma direction

Front-to-rear direction with respect to the traveling direction.

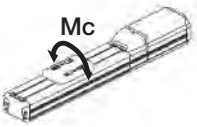
Mb direction

Horizontal direction with respect to the traveling direction.



Mc direction

Rotational direction with respect to the direction of travel.



Mechanical end

Mechanical movable limit position of the slider.

Moment

The power to try to rotate the object.

Moment of inertia

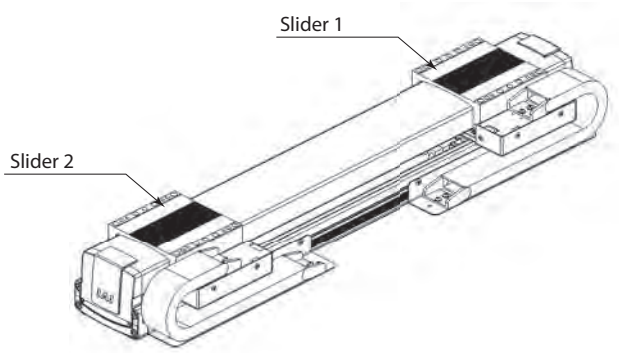
The amount that indicates the degree of difficulty of rotation (difficulty of stopping).

Motor / encoder cable

Cable connecting the actuator and the controller.

Multi Slider

Specifications equipped with multiple sliders that can be operated individually.



N

Unit of force in SI unit system. It shows the force to accelerate an object with a mass of 1 kg at 1 m/s^2. 1 kgf = 9.807 N

N·m

Unit of force moment (torque) in SI unit system. The moment of force around the center point is 1 N·m when 1 N force is applied in the direction perpendicular to the center point to the point 1 m away from the center point.

Noise

Distortion of electrical signal caused by unnecessary electromagnetic wave leaked from equipment.

Noise filter

Equipment that prevents leakage or intrusion of noise in power supplies, signals, etc.

Explanation of Terms

Open collector output

A system with no overload resistance in the voltage output circuit, that outputs signals by sinking the load current. Since this circuit can turn the load current ON/OFF regardless of voltage potential to which the current is connected, 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

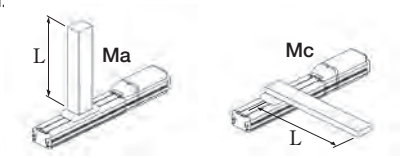
A type of control system. This system only outputs commands and does not take feedback.

A typical example of this is the stepping motor. Since it does not compare each actual value against the commanded value, even if a loss of synchronization (i.e signal error) occurs, the controller would

not be able to correct it.

Overhang

The object to be mounted on the actuator protrudes in either front, back, left, right, up or down.



Overhang load length

Estimated maximum length that can be extended from the slider.

Overload check

Check overload. (One of protection functions)

Overshoot

The response goes over the target value too much.

Overvoltage

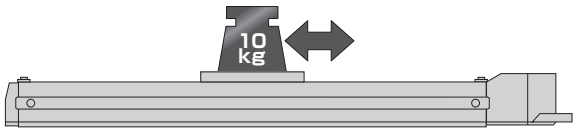
Voltage above the specified value will be applied to the motor.

Parameter

The data that the controller holds to operate the actuator, such as setting the input and output of the signal and how the voltage and current for rotating the motor are changed.

Payload quantity

Mass which can be conveyed by actuator slider / rod / table.



Pitching

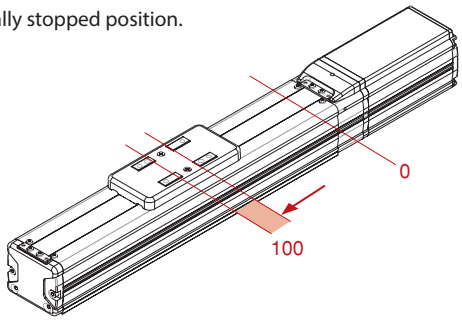
It is an angle that shows how far it is inclined in the fore-and-aft direction (Ma direction) with respect to the traveling direction.

PLC

Abbreviation for Programmable Logic Controller. Programmable controller for controlling production facilities / equipment.

Positioning accuracy

The degree of coincidence between the commanded stop position and the actually stopped position.



Positioning complete width

Width regarded as positioning completion with respect to the coordinates to be positioned. (Pend Band)

Protective structure (IP□□□)

The degree of protection from water, human body and solid foreign matter.

It is based on the standards of IEC (International Electrotechnical Commission), JIS (Japan Industrial Standard) and JEMA (Japan Electric Industry Association).

Protocol

Conventions stipulated mainly when communicating. It decided how to arrange the data and give meaning.

PTP control

Control where pass points on the route are specified intermittently. (Point to Point)

Pulse Train Control

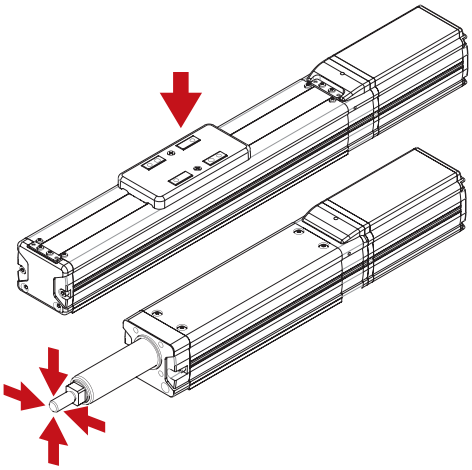
A method that controls the operation of the motor by modulating the pulse train output by the driver.

Push and return to origin

A method of determining the hime position by pushing against a stopper. Return to home is possible without using the home sensor.

Radial load

Load acting perpendicularly to the direction of motion of the direct acting actuator.



Rated thrust

Thrust that can be generated continuously.

Rated torque

Torque that can be generated continuously.

Reference rated life

Standard value of running life. We have set the standard rated life of ROBO Cylinder to 5,000 km and the standard rated life of single axis robot to 10,000 km. (Except some models)

Regenerative brake

It is a brake that uses the rotational resistance generated when the motor decelerates as a braking force.

Regenerative energy

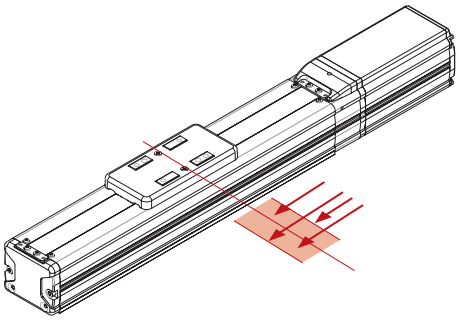
Energy generated by itself when the motor rotates.

Regenerative resistor

Resistance to discharge regenerative current.

Repetitive positioning accuracy

Reproducibility when repeatedly positioned by the same command under the same condition.
Repeat positioning from the same direction to an arbitrary point seven times, measure the stop position, and find the maximum difference in reading. This measurement is performed at the center of the moving distance and almost at both ends, and the maximum one of the obtained values is taken as the measured value, and 1/2 of the value is displayed with a sign of ±.



Return to home

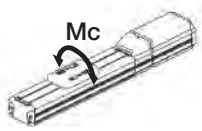
Go back to the point that is the basis of the movement of the actuator.

Robot cable

A cable excellent in resistance to bending and twisting.

Rolling

It is an angle that shows how tilted in the direction of rotation (Mc direction) with respect to the direction of travel.

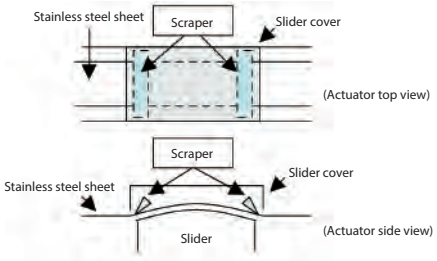


Safety category

It is prescribed by ISO 13849-1 of the international standard and classified as a function (safety function) to ensure safety. Classification is divided into 5 stages of B, 1, 2, 3, and 4 according to safety standards, and the standard (category) 4 indicates the standard with the highest safety.

Scraper

A part for removing foreign objects on the sliding surface and preventing intrusion into the inside of the main body.



Explanation of Terms

SEL language

Abbreviation for Shimizukiden Ecology Language. Our proprietary programming language.

Serial communication

Use one or two transmission lines to send and receive data.
1bit is a communication method that transmits and receives continuously.

Servo control

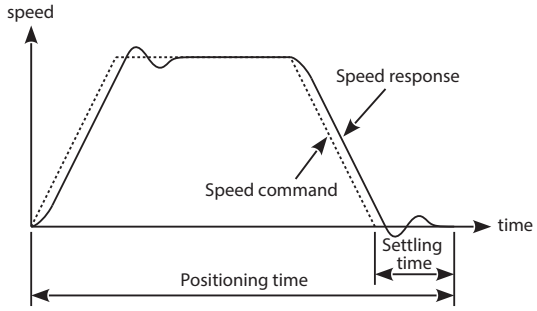
A control method that detects the current speed and position from the motor and compares the actual result against the command value by feeding back the result to the upper side to make the difference as small as possible.

Servomotor

Motor operated by giving feedback.

Settling time

In the positioning operation, it means the time until the speed command value becomes zero and then stops.



Shielded wire

An electric wire structured by covering the core wire with an electrostatic shield (aluminum tape, netting etc). It is less sensitive to noise.

Single phase AC

AC consisting of one phase. It is used for household power supply etc.

Software limit

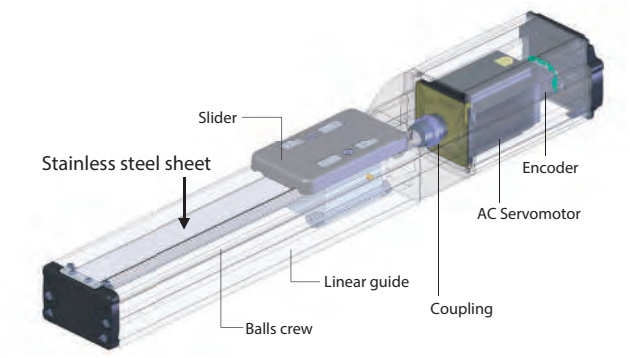
Limit of operating range set on software.

Solenoid valve type

The type of controller that made it possible to operate with the same signal as the signal operating the solenoid valve of the air cylinder.

Stainless steel sheet

Dust-proof sheet used for slider type.



Standard load factor

The standard value of the load factor set for each model.

Step-out

Synchronization between input pulse signal (command position) and motor rotation (position after movement) is lost due to shock, overload, etc. In the open-loop control, it is impossible to detect step-out, so the operation is continued with the position shift.

Stepping motor

Motor for angular positioning by input pulse signal. Also called a pulse motor.

Stroke

Operating range of the actuator.

Switch

It is made possible to connect and shut off the path of electricity by lever or push button.
<Types of representative switches>

1 Toggle switch (snap switch)
Switch to turn ON / OFF by tilting the lever. There are 2P, 3P, 6P depending on the pin pin number.

2 Momentary switch
A switch that turns ON when the operation part is pushed, and returns to the original when you release the hand.

3 Alternate switch
A switch that holds the ON state even when you release your hand and turns it OFF when you press it again.

Tact time

In the production line, within a certain time, the working time per piece allocated to produce target production quantity. (Planned value)

Teaching

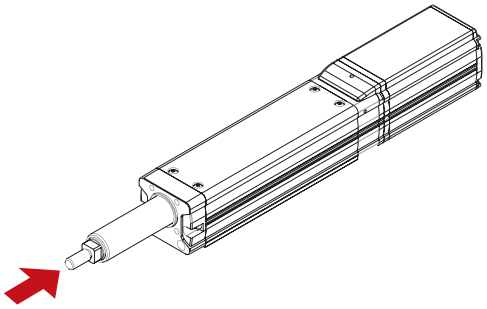
Make the controller store the information necessary for the required work. (Teaching)

Three phase AC

Exchange consisting of three phases. Since it can transmit with less current compared with single phase, it is widely used for power supply.

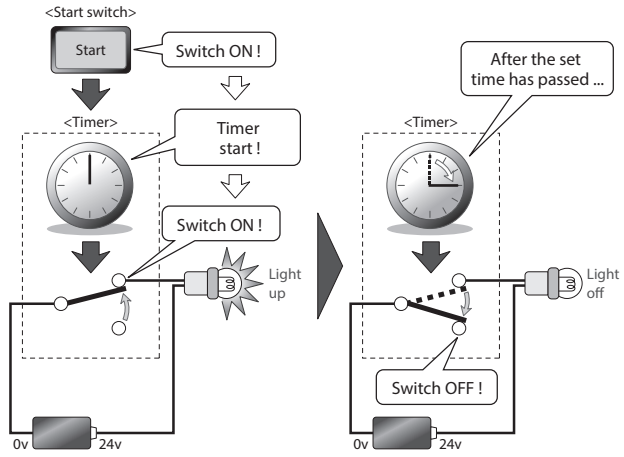
Thrust load

Load applied in the axial direction. (Axial load)



Timer

An electronic component that can be activated after an electrical start signal is given, and can switch circuits after a predetermined time has passed.

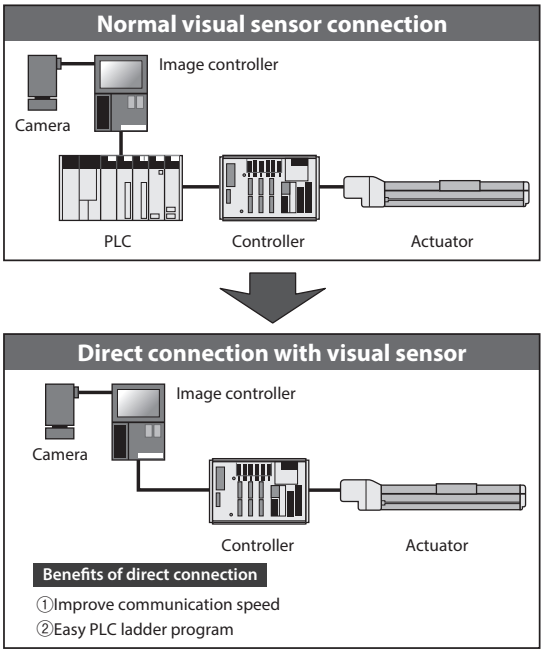


Trance

Electrical equipment or parts that convert AC voltage or current.

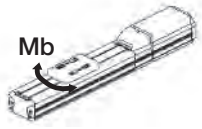
Vision Sensor

A device that uses a camera to capture an object (a workpiece), read a position or contour, and send data to a control device.



Yawing

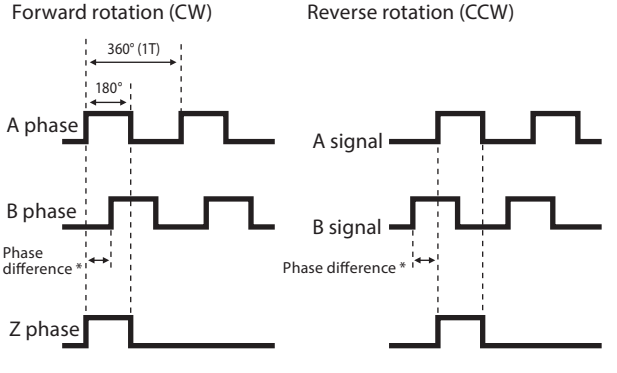
It is an angle that shows how much it tilts in the left-right direction (Mb direction) with respect to the traveling direction.



Z phase

It is a phase (signal) that detects the reference point of the incremental encoder and is used to detect the origin during home return operation. Searching the Z phase signal serving as a reference during the homing operation is called Z phase search.

■**Output mode diagram**



Note 360 ° (1 T) is electrical angle and not mechanical angle.

Pressing Operation

As with pneumatic cylinders, push motion is a function to keep holding rods and sliders pressed against workpiece etc. Some models may not be used depending on the model of the actuator, so please make sure the following usage instructions and notes.

[Compatible with push motion]

Motor type	Series	Model	Availability	Notes
Pulse motor	EC/RCP6/ RCP5/RCP4 RCP3/RCP2	Slider type	○	Push motion is possible. (See note 1 below)
		Rod type	◎	It is suitable for pushing operation. (See note 2 below)
	RCP2/RCP5	Belt type	×	Since the pushing force of the belt is not stable, it can not be pushed.
Servo motor (DC24V)	RCA2/RCA	All model	△	See notes 2 below
Servo motor (AC230V)	RCS4	All model	△	See notes 2 below
	RCS3	RA4R/RA6R/RA7R/ RA8R/RA10R/ RA15R/RA20R	◎	It is suitable for pushing operation.
		Other models	△	See notes 2 below
	RCS2	RA13R	◎	It is suitable for pushing operation.
		Other models	△	See notes 2 below

[Notes]

1. When pushing with the slider type, it is necessary to consider the allowable dynamic moment of the guide.
   For details, please refer to the correlation diagram page of push force and current limit value of each slider type.

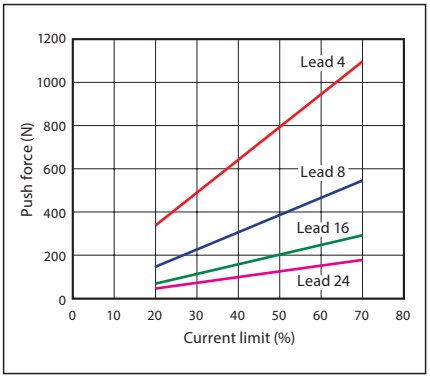
2. RCP6 / RCP5 / RCP4 / RCP3 / RCP2 series are recommended for pushing applications.
   The RCP6 / RCP5 / RCP4 / RCP3 / RCP2 series are excellent in stopping stability at the time of pushing, and when compared with the RCA2 / RCA / RCS2 series of equivalent product cross section, a large pushing force can be obtained. Please contact our company for pressing on the RCA2 / RCA / RCS2 series.

[Adjustment of pressing force]

- The pushing force (pushing force) can be adjusted by changing the current limit value of the controller.
- Check the pushing force of each model on the dedicacted product catalogue page: "Correlation diagram of pushing force and current limit value"
  Select the model that suits the condition.

(Example selection diagram)

RA6C



<Correlation diagram of pressing force and current limit value>

Caution

The correlation diagram between the pushing force and the current limit value shows the lower limit of the pushing force at each current limit value. Even if the current limit value is the same, depending on the aircraft, due to the individual differences of the motor and the variation of the mechanical efficiency, the pushing force lower limit value may be about 40% higher.

Except for the force control function, pushing force is not controlled by thrusting operation but by feedback control of current value. As a result, individual differences and variations may occur in the pressing force due to variations in the holding torque of the motor, individual differences such as ball screws and bearings, and changes in lubrication conditions. It is assumed that the holding torque of the motor itself has variations of about 30% due to the difference of the lot.

When accurate pushing force is required, please use actuator and controller which can use force control function. (See the right page)

Force Control Function

The force control function enables highly accurate push control compared to conventional push motion by taking feedback of pushing force with a dedicated load cell attached to the actuator.
All eight models are available, and you can choose from a wide range of products.

● The corresponding thrust is from 2kg to 5t (50000N). We have a variety of lineup.

RCS3–RA20R (Note)	5000~50000N
RCS3–RA15R (Note)	5000~30000N
RCS2–RA13R(Note)	2,000~19,600N — 1t, 2t type
RCS3–RA10R	600~6000N
RCS3–RA8R	200~2000N
RCS3–RA7R	200~1200N
RCS3–RA6R	60~600N
RCS3–RA4R	20~200N

Note: For servo press type.

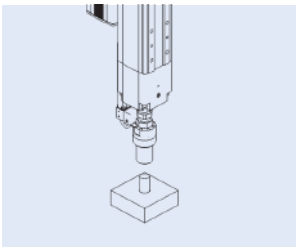
● It can operate by entering 4 steps the position, speed, acceleration, load etc. in the press operation on the press program sheet of the software for PC.

STEP 1 Operation mode selection
STEP 2 Home position input
STEP 3 Position, load, speed input
STEP 4 Pressurization determination condition input

Caution

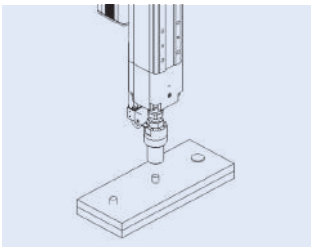
· It is only for pressing. It is not possible to control the force in the tensile direction.
· When operating in pulse train mode, force control function can not be used.

■ Use applications



Used for press-fitting pins

It is possible to manage accurate pressing power.Even when the pin to be press-fitted is thin and loose, it is possible to confirm the failure judgment by setting the threshold value.

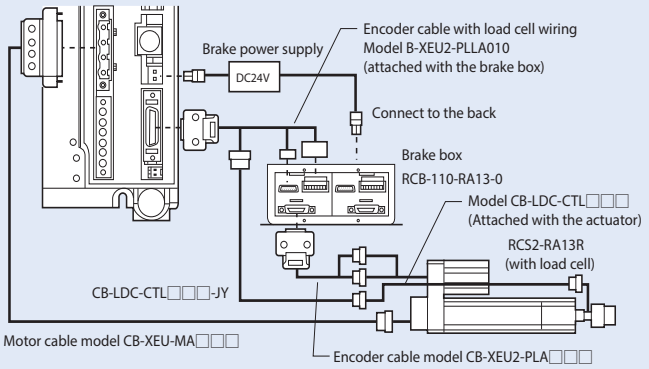


Riveting Work

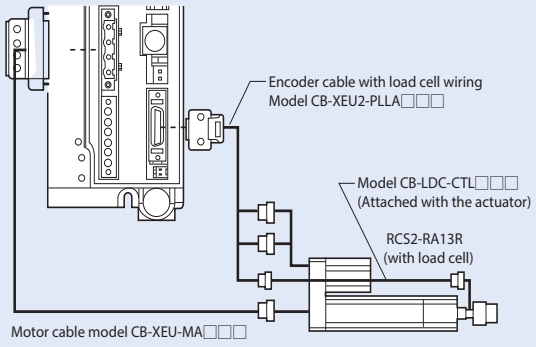
A detailed push force setting is possible for each product, and it is also possible to check whether the riveting completion position has been reache

■ RCS3-RA13R wiring

With brake



Without brake



* Option for RCS2-RA13R: When "BN" is selected for the brake option (no brake) and is used for the 2nd axis of the brake box, separate purchase of "CB-LDC-CTL□□□-JY" and "CB-XEU2-PLLA010" is necessary.

Duty

Duty refers to the operating rate of the actuator (the time during which the actuator is operating during one cycle).

Please note that the calculation method of the duty is different between the pulse motor type and the AC servo motor type actuator.

<Pulse motor>

Regarding the pulse motor specification, the duty can be operated at 100%.

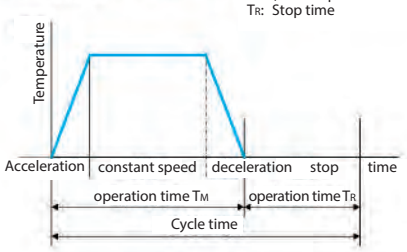
For models that require duty restrictions, please check the following.

[Duty ratio]

The duty ratio is the operating rate in% of the time the actuator is operating in one cycle.

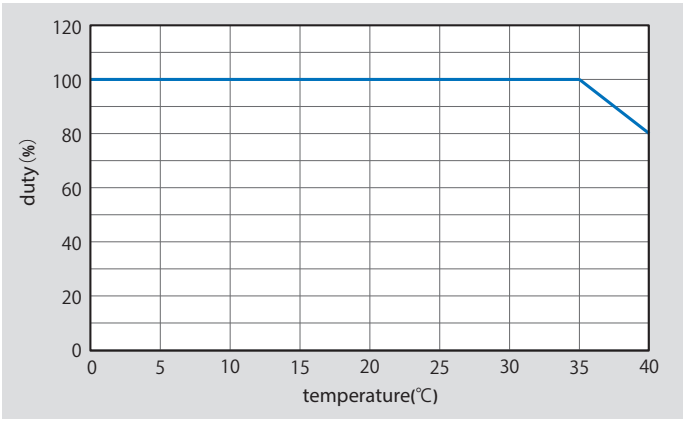
$$D=\frac{T_M}{T_M+T_R}\times 100\ (\%)$$

D: Duty
T_M: operating time (include push force time)
T_R: Stop time



In the case of EC

■ Relationship between ambient temperature and duty ratio

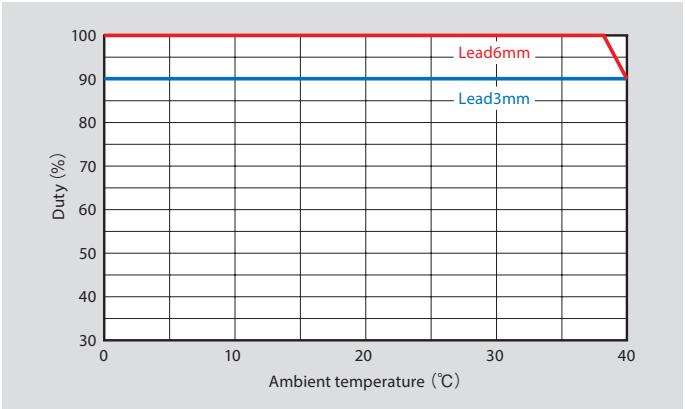


In the case of RCP6S(CR/W)

Duty ratio by type

RCP6S series	Duty ratio
□35 pulse motor type SA4 / RRA4 / RA4 / TA4 / WSA10 / WRA10 (Both motor straight and motor reverse types)	100%
□42 pulse motor type SA6 / RRA6 / RA6 / TA6 / WSA12 / WRA12 (Both motor straight and motor reverse types)	Refer to graph below
□56 pulse motor type SA7 / RRA7 / RA7 / TA7 / WSA14 / WRA14 (Both motor straight and motor reverse types)	Refer to graph below
□56 High Thrust Pulse Motor Type SA8 / WSA 16 (Both motor straight and motor reverse types)	100%
□60 High Thrust Pulse Motor Type RRA8 / RA8 / WRA16 (Both motor straight and motor reverse types)	70%

■ Relationship between ambient temperature and duty ratio of 42 pulse motor type



□42 Pulse motor type

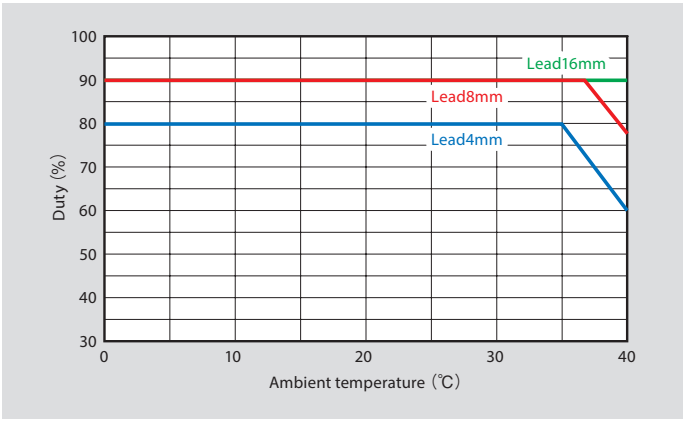
SA6 / RRA6 / RA6 / TA6 / WSA12 / WRA12

(Both motor straight and motor reverse types)

Lead	3mm	6mm	12mm/20mm
Duty ratio Restriction	90% or less	38 ℃ or less 100% 40 ℃ 90% or less	100%

(Note) RCP6W has no lead 20mm.

■ Relationship between ambient temperature and duty ratio of 56 pulse motor type (excluding high thrust motor)



□56 Pulse motor type

SA7/RRA7/RA7/TA7/WSA14/WRA14

(Both motor straight and motor reverse types)

Lead	4mm	8mm	16mm	24mm
Duty ratio Restriction	35℃ or less 80% 40℃ 60% or less	37℃ or less 90% 40℃ 78% or less	90% or less	100%

(Note) RCP6W has no lead 24 mm.

<AC servomotor>

Since the standard of the usable duty varies depending on the operating conditions (conveying mass, acceleration / deceleration etc.), calculate the load factor LF and the acceleration / deceleration time ratio tod from the following calculation formula and obtain it from the graph.

❶ Calculate the load factor LF from the following formula.

The load factor LF calculation formula varies depending on the model. Please check the target model and calculate the load factor.

1 IF / FS / RCA / RCA2 / RCS2 series

$$\text{Ⓐ Load factor: } LF① = \frac{M \times \alpha}{M_1 \times \alpha_1} \quad (\%)$$

- Payload capacity at rated acceleration : M1
- Rated acceleration / deceleration : α1
- Actual carrying mass : M (M ≦ M 1)
- Command acceleration / deceleration : α (α≦α1)

(Note) Please refer to model / spec table of each model for payload capacity and rated acceleration / deceleration at rated acceleration / deceleration.

When operating under the following operating conditions, the load factor is as follows.

<Example 1>

Actual conveying mass	: 5 kg
Command acceleration / deceleration	: 0.3 G
Load capacity at rated acceleration / deceleration	: 5 kg
Rated acceleration / deceleration	: 0.3 G
Load factor: LF ①	= 100%

<Example 2>

Actual conveying mass	: 2.5 kg
Command acceleration / deceleration	: 0.3 G
Load capacity at rated acceleration / deceleration	: 5 kg
Rated acceleration / deceleration	: 0.3 G
Load factor: LF ①	= 50%

<Example 3>

Actual conveying mass	: 5 kg
Command acceleration / deceleration	: 0.15 G
Load capacity at rated acceleration / deceleration	: 5 kg
Rated acceleration / deceleration	: 0.3 G
Load factor: LF ①	= 50%

Duty

2 IS(P)B/SSPA/IS(P)A/IS(P)DB/NS/IS(P)DBCR/SSPDACR/IS(P)DACR/RCS4/RCS3/TTA Series

Acceleration / deceleration above the rating is set for the above compatible models.

Depending on command acceleration / deceleration, the calculation formula to be used is different.

(1) When command acceleration / deceleration is less than rated acceleration / deceleration, please use calculation formula Ⓐ (Page 1-448).

(2) When the command acceleration / deceleration is not less than the rated acceleration / deceleration, please use calculation formula Ⓑ.

$$\text{Ⓑ Load factor: LF②} = \frac{M \times \alpha}{M_2 \times \alpha} = \frac{M}{M_2} \ (\%)$$

- Actual conveying mass : M
- Command command acceleration / deceleration : α
- Payload quantity of command acceleration / deceleration : M 2 (M ≦ M 2)

(Note) For payload capacity corresponding to acceleration / deceleration and acceleration / deceleration of each model, please refer to the acceleration weighted payload quantity table of each model.

When operating under the following operating conditions, the load factor is as follows.

As an example, we will use the acceleration weighted payload table of "RCS3 - SA8C 150W Lead 30".

Model	Type	Motor output	Lead [mm]	Payload quantity by acceleration [kg]			
				0.3G	0.5G	0.7G	1G
RCS3	SA8C	150W	30	12	10	6	2

(Note) When horizontal use, Low speed acceleration / deceleration 0.3G

<Example 1>

Actual conveying mass	: 2 kg
Command acceleration / deceleration	: 1.0 G
Payload quantity of command acceleration / deceleration	: 2 kg
Load factor: LF ②	= 100%

<Example 2>

Actual conveying mass	: 5 kg
Command acceleration / deceleration	: 0.5 G
Payload quantity of command acceleration / deceleration	: 10 kg
Load factor: LF ②	= 50%

<Example 2>

Actual conveying mass	: 5 kg
Command acceleration / deceleration	: 0.5 G
Payload quantity of command acceleration / deceleration	: 10 kg
Load factor: LF ②	= 50%

3 RCA, RCS2 For high acceleration / deceleration option use model

Calculate the load factor LF ③ from the calculation formula Ⓒ. Even in case of high acceleration / deceleration specification, the rated acceleration is the same value as the standard specification.

$$\text{Ⓒ Load factor: LF③} = \frac{M \times \alpha_2}{M_1 \times \alpha_1} \ \%$$

- Actual conveying mass : M
- Command acceleration / deceleration : $\alpha 2$
- Payload quantity at rated acceleration / deceleration : M1
- Rated acceleration / deceleration : $\alpha 1$ (0.3G)

<Example 1>

Actual conveying mass	: 2 kg
Command acceleration / deceleration	: 0.6 G
Load capacity at rated acceleration / deceleration	: 2 kg
Rated acceleration / deceleration	: 0.3 G
Load factor: LF ③	= 200%

<Example 2>

Actual conveying mass	: 1 kg
Command acceleration / deceleration	: 0.9 G
Load capacity at rated acceleration / deceleration	: 2 kg
Rated acceleration / deceleration	: 0.3 G
Load factor: LF ③	= 150%

Maximum acceleration / deceleration by model: α max
(M≦M1, $\alpha_1 < \alpha_2 \leqq \alpha$ max)

α max list (max. acceleration / deceleration by model lead)

RCA/RCS2-SA4C	10	1
	5	1
RCA/RCS2-SA5C	12	0.8
	6	0.8
RCA/RCS2-SA6C	12	1
	6	1
RCS2-SA7C	16	1
	8	0.8
RCA-RA3C	10	1
	5	1
RCA-RA4C 30W	12	1
	6	1
RCS2-RA4C 30W	12	1
	6	1
RCS2-RA5C 100W	16	1
	8	1

❷ Calculate the acceleration / deceleration time ratio tod from the following calculation formula.

$$\text{Acceleration / deceleration time ratio: } t_{od} = \frac{\text{Acceleration time + deceleration time}}{\text{Operating time}} \%$$

$$\text{Acceleration time} = \frac{\text{Speed (mm / s)}}{\text{Acceleration (mm/s}^2\text{)}} \text{ (sec)} \qquad \text{Deceleration time} = \frac{\text{Speed (mm/s)}}{\text{Deceleration (mm/s}^2\text{)}} \text{ (sec)}$$

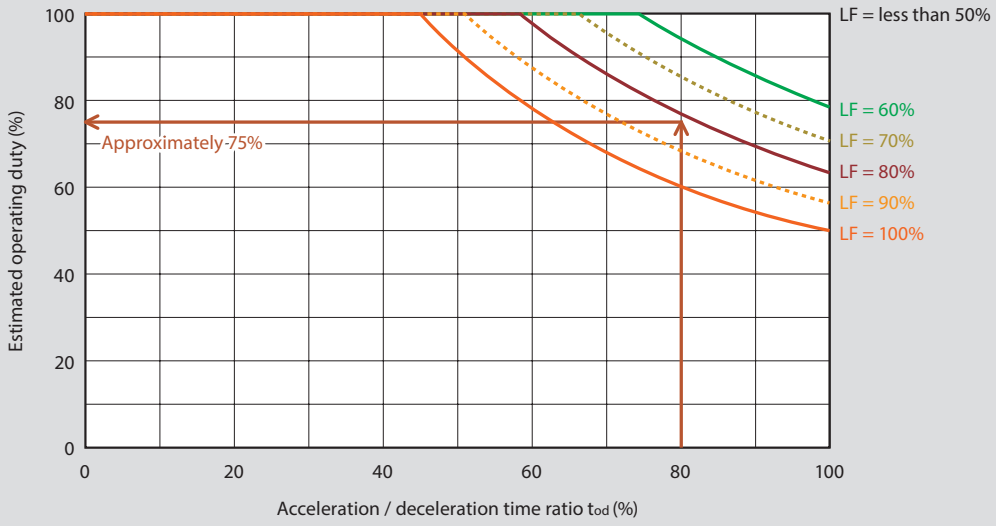
Acceleration (mm/s²) =Acceleration (G) × 9800mm/s² Deceleration (mm/s²) = Deceleration (G) × 9800mm/s²

❸ Read the standard of duty from the calculated "load factor" and "acceleration / deceleration time ratio".

For RCA, RCS2 high acceleration / deceleration option use model, please use "Duty guide 2 (for high acceleration / deceleration specification)").

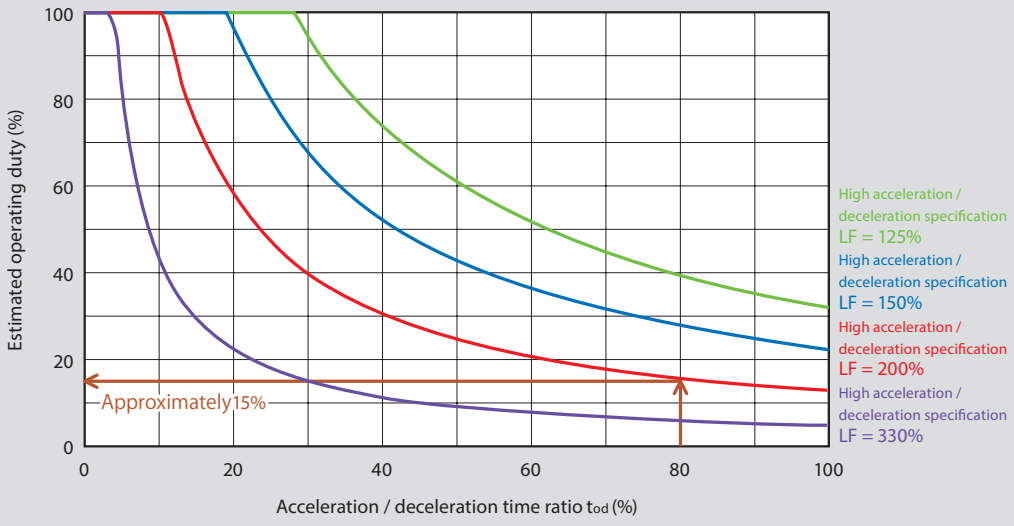
Duty measure guide 1 (for standard use)

Example: When the load factor is 80% and the acceleration / deceleration time ratio is 80%, the guideline for the duty is approximately 75%.



Duty guide 2 (for high acceleration / deceleration specification)

Example: When the load factor is 200% and the acceleration / deceleration time ratio is 80%, the guideline for the duty is approximately 15%.



Off-board Tuning Function

Increase conveying capacity of actuator

Supported software
ver.8.05.00.00 or later

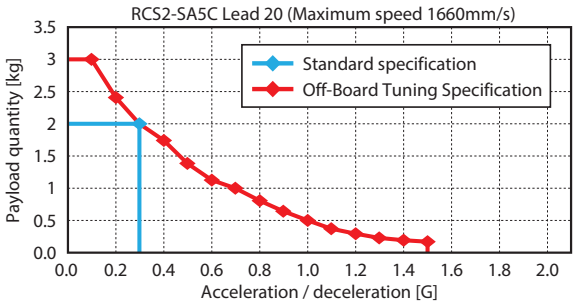
The off-board tuning function improves the general mass and acceleration / deceleration by automatically setting the optimum gain according to the conveying load, enabling to increase the payload quantity and shorten the takt time.

By performing off-boat tuning, the following three effects can be obtained.

①By setting the acceleration / deceleration speed low, it is possible to convey more than the rated payload quantity.
②If the conveying mass is smaller than the rated payload quantity, acceleration / deceleration can be increased.
③It is possible to increase the maximum speed.

Example) The graph on the right shows the off-board tuning effect of RCS2-SA5C lead 20.

①When lowering the acceleration / deceleration from the rated acceleration 0.3 G to 0.1 G, the maximum payload quantity will increase from 2 kg to 3 kg.
②If the convey mass is low, acceleration / deceleration can be increased up to 1.5 G.
③The maximum speed can be increased from the standard 1300 mm/s to 1660 mm/s.



Offboard tuning is effective for combinations of ACON-CB / SCON-CB / MCON / MSCON controller and actuators listed in the table below.
(Actuators with high acceleration / deceleration specification are not supported off-board tuning.)
The contents of the effect will differ depending on the model of the actuator. (See table below)
For detailed data on each model, please check our website (-> area support/manuals).

Models to be Upgraded with Off-board Tuning Spec List

RCA series ~ Horizontal installation

: Standard specification : Offboard tuning specification

Series	Type	Motor [W]	Lead	Payload per lead acceleration / deceleration [kg]																		Maximum speed [mm/s]	
				0.1G	0.2G	0.3G	0.4G	0.5G	0.6G	0.7G	0.8G	0.9G	1.0G	1.1G	1.2G	1.3G	1.4G	1.5G	1.6G	1.7G	1.8G	1.9G	2.0G	Standard	After tuning
RCA	SA4C	20	2.5	11	8	5	2.5	1																165	165
			5	8.5	7.2	6	5	4	3.25	2.5	2	1.5	1	0.7	0.4									330	330
			10	5.5	4.8	4	3.25	2.5	2	1.5	1.2	0.9	0.8	0.7	0.65	0.6	0.55	0.5						665	665
	SA5C	20	3	17	12	3																		200	200
			6	11	9.6	8	6	4.5	3.3	2.5	1.9	1.4	1											400	400
			12	5.5	4.8	4	3	2.5	2	1.75	1.5	1.25	1	0.85	0.75	0.65	0.55	0.5						800	800
			20	3	2.4	2	1.75	1.4	1.15	1	0.8	0.6	0.5	0.4	0.35	0.3	0.25	0.2						1300	1300
	SA6C	30	3	25	18	7	1																	200	200
			6	16.5	14.5	12	10	8	6.2	5	3.5	2.5	1.5											400	400
			12	8.5	7.2	6	4.5	3.5	2.75	2	1.6	1.25	1	0.85	0.75	0.65	0.55	0.5	0.45	0.4	0.35	0.3	0.25	800	800
			20	4.2	3.6	3	2.5	2	1.5	1.25	1	0.85	0.75	0.65	0.5	0.4	0.3	0.25						1300	1300
	SA4R	20	2.5	10.5	8	3.5	1.75																	165	165
			5	8	7	6	4.5	3.5	2.5															330	330
			10	5.2	4.6	4	3	2.5	2	1.5	1													665	665
	SA5R	20	3	15.5	12	2.5																		200	200
			6	10.5	9.2	8	6	4	2.5															400	400
			12	5.2	4.6	4	3	2.5	2	1.5	1													800	800
	SA6R	30	3	23.5	18	5.5																		200	200
			6	15.5	13.8	12	9	7	5.5															400	400
			12	7.8	6.9	6	4	3	2	1.5	1													800	800
	RA3C	20	2.5	23.5	18	9																		125	125
			5	12	11	9	6.5	4.5	3.5	2.8	2.3	2.1	2											250	250
			10	5.2	4.8	4	3.4	2.9	2.4	2	1.7	1.5	1.4	1.3	1.2	1.1	1.05	1						500	500
	RA4C	20	3	15.5	12	3																		150	150
			6	8	7.2	6	4.2	3	2.2	1.5	1	0.75	0.5											300	300
			12	4	3.6	3	2.1	1.5	1	0.75	0.5	0.35	0.25											600	600
		30	3	23.5	18	5																		150	150
			6	12	10.8	9	6.5	4.5	3.2	2.5	1.8	1.4	1											300	300
			12	5.2	4.8	4	2.8	2	1.55	1.25	1	0.85	0.7	0.6	0.5	0.4	0.3	0.25						600	600

RCA series ~ Vertical installation ~

Series	Type	Motor [W]	Lead	Payload per lead acceleration / deceleration [kg]																		Maximum speed [mm/s]	
				0.1G	0.2G	0.3G	0.4G	0.5G	0.6G	0.7G	0.8G	0.9G	1.0G	1.1G	1.2G	1.3G	1.4G	1.5G	1.6G	1.7G	1.8G	1.9G	2.0G	Standard	After tuning
RCA	SA4C	20	2.5	4.5	4.5	2																		165	165
			5	2.5	2.5	2.5	1.9	1.5	1.2	1	0.8	0.6	0.5											330	330
			10	1	1	1	0.85	0.7	0.6	0.5	0.4	0.32	0.25	0.21	0.17	0.14	0.12	0.1						665	665
	SA5C	20	3	4	4	2																		200	200
			6	2	2	2	1.6	1.25	1	0.8	0.65	0.55	0.5											400	400
			12	1	1	1	0.8	0.6	0.45	0.35	0.3	0.25	0.2	0.15	0.1									800	800
			20	0.5	0.5	0.5	0.35	0.25	0.16	0.1														800	1300
	SA6C	30	3	6	6	2																		200	200
			6	3	3	3	2.1	1.5	1.25	1	0.8	0.65	0.5											400	400
			12	1.5	1.5	1.5	1.2	0.85	0.65	0.5	0.4	0.3	0.22	0.15	0.1									800	800
			20	0.5	0.5	0.5	0.35	0.2	0.1															800	1300
	SA4R	20	2.5	4.5	4.5	1.5																		165	165
			5	2.5	2.5	2.5	1.7	1.25	1															330	330
			10	1	1	1	0.7	0.5	0.4	0.35	0.3													665	665
	SA5R	20	3	4	4	2																		200	200
			6	2	2	2	1.5	1.1	0.8															400	400
			12	1	1	1	0.7	0.55	0.4	0.3	0.25													800	800
	SA6R	30	3	6	6	1.6																		200	200
			6	3	3	3	2	1.5	1															400	400
			12	1.5	1.5	1.5	1	0.7	0.55	0.45	0.35													800	800
	RA3C	20	2.5	6.5	6.5	3.5																		125	125
			5	3	3	3	2.5	2	1.7	1.5														250	250
			10	1.5	1.5	1.5	1.2	0.9	0.7	0.6	0.5													500	500
	RA4C	20	3	4	4	2																		150	150
			6	2	2	2	1.4	1	0.7	0.5														300	300
			12	1	1	1	0.7	0.5	0.35	0.2	0.1													600	600
		30	3	6.5	6.5	3.5																		150	150
			6	3	3	3	2.1	1.5	1.1	0.75	0.55	0.4	0.25											300	300
			12	1.5	1.5	1.5	1	0.7	0.5	0.35	0.25	0.15	0.1											600	600

Models to be Upgraded with Off-board Tuning Spec List

RCS series ~ Horizontal installation ~

: Standard specification : Offboard tuning specification

Series	Type	Motor [W]	Lead	Payload per lead acceleration / deceleration [kg]																		Maximum speed [mm/s]	
				0.1G	0.2G	0.3G	0.4G	0.5G	0.6G	0.7G	0.8G	0.9G	1.0G	1.1G	1.2G	1.3G	1.4G	1.5G	1.6G	1.7G	1.8G	1.9G	2.0G	Standard	After tuning
RCS2	SA4C	20	2.5	11	8	5	2.5	1																165	165
			5	8.5	7.2	6	5	4	3.25	2.5	2	1.5	1	0.7	0.4									330	330
			10	5.5	4.8	4	3.25	2.5	2	1.5	1.2	0.9	0.8	0.7	0.65	0.6	0.55	0.5						665	665
			16	3.5	3	2.5	2	1.5	1.2	1	0.8	0.65	0.5	0.44	0.4	0.36	0.32	0.3	0.27	0.25	0.23	0.22	0.2	1060	1330
	SA5C	20	3	17	12	3																		200	200
			6	11	9.6	8	6	4.5	3.3	2.5	1.9	1.4	1											400	400
			12	5.5	4.8	4	3	2.5	2	1.75	1.5	1.25	1	0.85	0.75	0.65	0.55	0.5						800	1000
			20	3	2.4	2	1.75	1.4	1.15	1	0.8	0.6	0.5	0.4	0.35	0.3	0.25	0.2						1300	1660
	SA6C	30	3	25	18	7	1																	200	200
			6	16.5	14.5	12	10	8	6.2	5	3.5	2.5	1.5											400	400
			12	8.5	7.2	6	4.5	3.5	2.75	2	1.6	1.25	1	0.85	0.75	0.65	0.55	0.5	0.45	0.4	0.35	0.3	0.25	800	1000
			20	4.2	3.6	3	2.5	2	1.5	1.25	1	0.85	0.75	0.65	0.5	0.4	0.3	0.25						1300	1660
	SA7C	60	4	60	40	20	10	3																200	200
			8	37.5	30	25	20	15	12.2	10	7.5	5.5	4	3.2	2.5	2	1.5	1						400	400
			16	18	14.5	12	9	7	5.9	5	4.4	3.9	3.5	3.1	2.75	2.45	2.2	2	1.75	1.55	1.35	1.15	1	800	1060
			24	12	9.5	8	6	4.5	3.6	3	2.6	2.25	2	1.75	1.5	1.3	1.15	1	0.85	0.75	0.65	0.55	0.5	1200	1600
	SS7C	60	6	45	36	30	22	15	9	5														300	300
			12	22.5	18	15	12	9	7.3	6	5.2	4.5	4	3.5	3	2.8	2.6	2.5	2.4	2.3	2.2	2.1	2	600	800
			20	13.5	11	9	7	5.4	4.4	3.7	3.2	2.8	2.5	2.2	2	1.8	1.65	1.5	1.4	1.3	1.2	1.1	1	1000	1330
	SA4R	20	2.5	10.5	8	3.5	1.75																	165	165
			5	8	7	6	4.5	3.5	2.5															330	330
			10	5.2	4.6	4	3	2.5	2	1.5	1													665	665
	SA5R	20	3	15.5	12	2.5																		200	200
			6	10.5	9.2	8	6	4	2.5															400	400
			12	5.2	4.6	4	3	2.5	2	1.5	1													800	800
	SA6R	30	3	23.5	18	5.5																		200	200
			6	15.5	13.8	12	9	7	5.5															400	400
			12	7.8	6.9	6	4	3	2	1.5	1													800	800
	SA7R	60	4	52	40	16	8																	200	200
			8	32.5	28.8	25	18	13	10															400	400
			16	15.6	13.8	12	8	6	5	4	3.5													800	800
	SS7R	60	6	39	34.5	30	18	11																300	300
			12	20	17.3	15	11	8	6	5	4													600	600
	RA4C	20	3	15.5	12	3																		150	150
			6	8	7.2	6	4.2	3	2.2	1.5	1	0.75	0.5											300	300
			12	4	3.6	3	2.1	1.5	1	0.75	0.5	0.35	0.25											600	600
		30	3	23.5	18	5																		150	150
			6	12	10.8	9	6.5	4.5	3.2	2.5	1.8	1.4	1											300	300
			12	5.2	4.8	4	2.8	2	1.55	1.25	1	0.85	0.7	0.6	0.5	0.4	0.3	0.25						600	600
	RA5C	60	4	65	50	25	10	3																200	200
			8	32.5	30	25	20	15	12.2	10	7.5	5.5	4	3.2	2.5									400	400
			16	15.5	14.4	12	9	7	5.9	5	4.4	3.9	3.5	3.1	2.75	2.45	2.2	2						800	800
		100	4	78	60	30	15	5																200	200
			8	39	36	30	22	17	13.5	11	8.5	6.5	5	4	3									400	400
			16	19.5	18	15	11	8.6	7.1	6	5	4.4	4	3.6	3.2	2.9	2.7	2.5						800	800
RCS2 CR	SA4C	20	2.5	10.5	8																			165	165
			5	8	7	6																		330	330
			10	5	4.5	4																		665	665
	SA5C	20	3	15.5	12																			200	200
			6	10.5	9	8																		400	400
			12	5	4.5	4																		800	800
			20	2.6	2.3	2																		1300	1330
	SA6C	30	3	23.5	18																			200	200
			6	15.5	14	12																		400	400
			12	8	7	6																		800	800
			20	4	3.5	3																		1300	1330
	SA7C	60	4	52	40																			200	200
			8	32.5	29	25																		400	400
			16	15.5	14	12																		800	800
	SS7C	60	6	39	34.5	30																		300	300
			12	19.5	17.5	15																		600	600
RCS3	SA8C/ SS8C	100	5	120	80	65																		300	300
			10	60	48	40	28	20	13	8														600	600
			20	30	24	20	14	10	7	5	4.2	3.5	3	2.55	2.15	1.9	1.7	1.5						1200	1330
			30	12	10	8	7	6	5	4	3	2	1	0.8	0.7	0.6	0.55	0.5	0.45	0.4	0.35	0.3	0.25	1800	2000
		150	10	90	72	60	42	30	20	15	10	5	2											600	600
			20	45	36	30	21	15	11	7.5	6	4.8	4	3.6	3.2	2.9	2.7	2.5	2.3	2.1	1.9	1.7	1.5	1200	1330
			30	18	14	12	11	10	8	6	4.5	3	2	1.7	1.5	1.3	1.15	1	0.9	0.8	0.7	0.6	0.5	1800	2000
	SA8R/ SS8R	100	5	104	80	65																		300	300
			10	52	46	40	28	20	10	5.5														600	600
			20	26	23	20	14	10	7	5	3	2.5	2											1200	1200
			30	10.5	9	8	7	6	5	4	3	2	1	0.5	0.25									1800	1800
		150	10	78	69	60	42	30	15	8														600	600
			20	39	34.5	30	21	15	11	7.5	4.5	3.5	2.5											1200	1200
			30	15.5	13.8	12	11	10	8	6	4.5	3	2	1.5	1									1800	1800
RCS3 CR	SA8C/ SS8C	100	5	104	80	65																		300	300
			10	52	46	40	28	20																600	600
			20	26	23	20	14	10	7	5														1200	1200
			30	10.5	10	8	7	6	5	4	3	2	1											1800	1800
		150	10	78	69	60	42	30																600	600
			20	39	35	30	21	15	11	7.5														1200	1200
			30	16	14	12	11	10	8	6	4.5	3	2											1800	1800

RCS series ~ Vertical installation ~

: Standard specification : Offboard tuning specification

Series	Type	Motor [W]	Lead	Payload per lead acceleration / deceleration [kg]																		Maximum speed [mm/s]	
				0.1G	0.2G	0.3G	0.4G	0.5G	0.6G	0.7G	0.8G	0.9G	1.0G	1.1G	1.2G	1.3G	1.4G	1.5G	1.6G	1.7G	1.8G	1.9G	2.0G	Standard	After tuning
RCS2	SA4C	20	2.5	4.5	4.5	2																		165	165
			5	2.5	2.5	2.5	1.9	1.5	1.2	1	0.8	0.6	0.5											330	330
			10	1	1	1	0.85	0.7	0.6	0.5	0.4	0.32	0.25	0.21	0.17	0.14	0.12	0.1						665	665
			16	0.6	0.6	0.6	0.4	0.3	0.25	0.2	0.15	0.12	0.1											1060	1330
	SA5C	20	3	4	4	2																		200	200
			6	2	2	2	1.6	1.25	1	0.8	0.65	0.55	0.5											400	400
			12	1	1	1	0.8	0.6	0.45	0.35	0.3	0.25	0.2	0.15	0.1									800	1000
			20	0.5	0.5	0.5	0.35	0.25	0.16	0.1														800	1660
	SA6C	30	3	6	6	2																		200	200
			6	3	3	3	2.1	1.5	1.25	1	0.8	0.65	0.5											400	400
			12	1.5	1.5	1.5	1.2	0.85	0.65	0.5	0.4	0.3	0.22	0.15	0.1									800	1000
			20	0.5	0.5	0.5	0.35	0.2	0.1															800	1660
	SA7C	60	4	12	12	6																		200	200
			8	6	6	6	4.2	3	2.4	2	1.6	1.3	1	0.8	0.7	0.6	0.55	0.5						400	400
			16	3	3	3	2	1.5	1.2	1	0.8	0.65	0.55	0.45	0.4	0.3	0.27	0.25						800	1060
			24	1.4	1.4	1.4	1.1	0.9	0.75	0.6	0.5	0.4	0.3	0.25	0.2	0.16	0.13	0.1						1200	1600
	SS7C	60	6	8	8	8	5.5	4																300	300
			12	4	4	4	2.8	2	1.5	1.25	1	0.85	0.75	0.6	0.5	0.4	0.3	0.25						600	800
			20	2.4	2.4	2.4	1.7	1.2	0.95	0.75	0.6	0.5	0.4	0.3	0.25	0.2	0.15	0.1						1200	1330
	SA4R	20	2.5	4.5	4.5	1.5																		165	165
			5	2.5	2.5	2.5	1.7	1.25	1															330	330
			10	1	1	1	0.7	0.5	0.4	0.35	0.3													665	665
	SA5R	20	3	4	4	2																		200	200
			6	2	2	2	1.5	1.1	0.8															400	400
			12	1	1	1	0.7	0.55	0.4	0.3	0.25													800	800
	SA6R	30	3	6	6	1.6																		200	200
			6	3	3	3	2	1.5	1															400	400
			12	1.5	1.5	1.5	1	0.7	0.55	0.45	0.35													800	800
	SA7R	60	4	12	12	5																		200	200
			8	6	6	6	3.5	2.5	2															400	400
			16	3	3	3	1.6	1.2	1	0.8	0.65													800	800
	SS7R	60	6	8	8	8	4.5	3																300	300
			12	4	4	4	2.5	1.8	1.3	1	0.8													600	600
	RA4C	20	3	4	4	2																		150	150
			6	2	2	2	1.4	1	0.7	0.5														300	300
			12	1	1	1	0.7	0.5	0.35	0.2	0.1													600	600
		30	3	6.5	6.5	3.5																		150	150
			6	3	3	3	2.1	1.5	1.1	0.75	0.55	0.4	0.25											300	300
			12	1.5	1.5	1.5	1	0.7	0.5	0.35	0.25	0.15	0.1											600	600
	RA5C	60	4	11.5	11.5	6	4	3																200	200
			8	5	5	5	3.5	2.5	1.9	1.5	1.1	0.8	0.5											400	400
			16	2	2	2	1.5	1	0.7	0.5	0.3	0.15	0.1											800	800
		100	4	18	18	10	7	5																200	200
			8	9	9	9	6	4.5	3.5	2.5	2	1.5	1											400	400
			16	3.5	3.5	3.5	2.4	1.75	1.3	1	0.8	0.65	0.5	0.35	0.25									800	800
RCS3	SA8C/ SS8C	100	5	16	16	12																		300	300
			10	8	8	8	5.5	4	3	2.5														600	600
			20	4	4	4	3	2	1.75	1.5	1.25	1	0.75	0.55	0.4	0.35	0.3	0.25						1200	1330
			30	2	2	2	1.75	1.5	1.2	1	0.75	0.6	0.5	0.4	0.3	0.2	0.15	0.1						1800	2000
		150	10	12	12	12	8.5	6	4	3	2.3	1.8	1.5											600	600
			20	6	6	6	4	3	2.4	2	1.65	1.4	1.2	1	0.85	0.75	0.65	0.55	0.45	0.4	0.35	0.3	0.25	1200	1330
			30	3	3	3	2.5	2	1.75	1.5	1.25	1.05	0.9	0.75	0.6	0.5	0.4	0.35	0.3	0.25	0.2	0.15	0.1	1800	2000
	SA8R/ SS8R	100	5	16	16	12																		300	300
			10	8	8	8	5.5	4	2	1.5														600	600
			20	4	4	4	3	2	1.75	1.5	1	0.75	0.5											1200	1200
			30	2	2	2	1.75	1.5	1.2	1	0.7	0.5	0.4	0.3	0.2									1800	1800
		150	10	12	12	12	8.5	6	3	2														600	600
			20	6	6	6	4	3	2.4	2	1.5	1	0.8											1200	1200
			30	3	3	3	2.5	2	1.75	1.5	1.1	0.8	0.6	0.5	0.4									1800	1800

Models to be Upgraded with Off-board Tuning Spec List

IS series ~ Horizontal installation ~

: Standard specification : Offboard tuning specification

Series	Type	Motor [W]	Lead	Payload per lead acceleration / deceleration [kg]																													Maximum speed [mm/s]	
				0.1G	0.2G	0.3G	0.4G	0.5G	0.6G	0.7G	0.8G	0.9G	1.0G	1.1G	1.2G	1.3G	1.4G	1.5G	1.6G	1.7G	1.8G	1.9G	2.0G	2.1G	2.2G	2.3G	2.4G	2.5G	2.6G	2.7G	2.8G	2.9G	3.0G	Standard	After tuning
ISB	SXM/ SXL	60	4	77	55	50	38	30																										240	240
			8	40.5	35	31	27	20	15	12	10.2	8	4																					480	480
			16	19.5	16.9	15	13	10.5	8.5	7	6	5.5	4.5	4	3.5	3.1	2.8	2.5	2.2	2	1.8	1.6	1.5											960	960
		100	36				10.0	9.0	8.2	7.5	6.7	6.0	5.5	5.0	4.5	4.3	4.1	4.0	3.9	3.8	3.7	3.6	3.5	3.2	2.9	2.6	2.3	2.0	1.9	1.8	1.7	1.6	1.5	2160	2160
	MXM/ MXL	100	5	119	85	80	60	45																										300	300
			10	67.5	58.5	52	45	30	23	20																								600	600
			20	34.5	30	26.5	23	18	15	13	11	9	8	7	6	5	4	3	2.5	2	1.5	1	0.5											1200	1200
			30	22.5	19.5	17.5	15	11	9	7	6	5	4	3.5	3	2.5	2.25	2	1.75	1.5	1.25	1	0.75											1800	1800
		200	5	154	110	100	90	80																										300	300
			10	135	117	104	90	66	51	40																								600	600
			20	67.5	58.5	52	45	35	28	23	20	17	15	13	12	11	10	9	8	7	6	5	4											1200	1200
			30	45	39	34.5	30	24	20	17	15	13	12	10	9	8	7.5	7	6.5	6	5.5	5	4.5											1800	1800
		400	48				20.0	19.1	18.2	17.3	16.4	15.5	14.6	13.8	13.0	12.6	12.2	11.8	11.4	11.0	10.8	10.4	10.0	9.4	8.8	8.2	7.6	7.0	6.6	6.2	5.8	5.4	5.0	2500	2500
	MXMX	400	48				20.0																											2200	2200
	LXM/ LXL	200	10	135	117	104	90	66	51	40																								600	600
			20	67.5	58.5	52	45	35	28	23	20	17	15	13	12	10	8	6	4.5	3	1.5													1200	1200
			40	22.5	19.5	17.5	15	12	10.5	9	8	7.5	7	6.5	6	5.5	5	4.5	4	3.5	3	2.5	2											2400	2400
		400	10	180	156	138	120	92	73	60																								600	600
			20	135	117	104	90	70	57	47	40	35	30	27	24	21	18	15	12	9	7	6	5											1200	1200
			40	60	52	46	40	32	27	23	21	19	17	16	15	13.5	12	11	10	9	8	7	6.5											2400	2400
ISDB	S	60	4	77	55	50	38	30																										240	240
			8	40.5	35	31	27	20	15	12	10.2	8	4																					480	480
			16	19.5	16.9	15	13	10.5	8.5	7	6	5.5	4.5	4	3.5	3.1	2.8	2.5	2.2	2	1.8													960	960
		100	36				10.0	9.0	8.1	7.2	6.3	5.4	4.5	4.3	4.1	4.0	3.9	3.8	3.7	3.6	3.5	3.2	2.9	2.6	2.4	2.2	2.0	1.9	1.8	1.7	1.6	1.5	1.4	2000	2000
	M	100	5	119	85	80	60	45																										300	300
			10	67.5	58.5	52	45	30	23	20																								600	600
			20	34.5	30	26.5	23	18	15	13	11	9	8	7	6	5	4	3	2.5	2	1.5													1200	1200
			30	22.5	19.5	17.5	15	11	9	7	6	5	4	3.5	3	2.5	2.25	2	1.75	1.5	1.25													1800	1800
		200	5	154	110	100	90	80																										300	300
			10	135	117	104	90	66	51	40																								600	600
			20	67.5	58.5	52	45	35	28	23	20	18	16	13	12	11	10	9	8	7	6													1200	1200
			30	45	39	34.5	30	24	20	17	15	13	12	10	9	8	7.5	7	6.5	6	5.5													1800	1800
		400	48				20.0	18.8	17.6	16.4	15.2	14.0	13.0	12.6	12.2	11.8	11.4	11.0	10.6	10.3	10.0	9.5	9.0	8.5	8.0	7.5	7.0	6.6	6.2	5.9	5.6	5.3	5.0	2200	2200
	MX	400	48				20.0																											2200	2200
	L	200	10	135	117	104	90	66	51	40																								600	600
			20	67.5	58.5	52	45	35	28	23	20	17	15	13	12	10	8	6	4.5	3	1.5													1200	1200
			40	22.5	19.5	17.5	15	12	10.5	9	8	7.5	7	6.5	6	5.5	5	4	3.5	3	2.5													2400	2400
		400	10	180	156	138	120	92	73	60																								600	600
			20	135	117	104	90	70	57	47	40	35	30	27	24	21	18	15	12	9	7													1200	1200
			40	60	52	46	40	32	27	23	21	19	17	15	13	12	11	10	9	8	7													2400	2400
ISDB CR	S	60	4	71	55	50	38	30																										240	240
			8	35	32.5	30	27	20	15	12																								480	480
			16	17	14.5	15.5	13	10.5	8.5	7	6	5.5	4.5																					960	960
	M	100	5	110	85	80	60	45																										300	300
			10	58.5	54	49.5	45	30	23	20																								600	600
			20	30	27.5	25	23	18	15	13	11	9	8																					1200	1200
			30	19.5	18	16.5	15	11	9	7	6	5	4																					1800	1800
		200	5	143	110	100	90	80																										300	300
			10	117	108	99	90	66	51	40																								600	600
			20	58.5	54	49.5	45	35	28	23	20	18	16																					1200	1200
			30	39	36	33	30	24	20	17	15	13	12																					1800	1800
	L	200	10	117	108	99	90	66	51	40																								600	600
			20	58.5	54	49.5	45	35	28	23	20	17	15																					1200	1200
			40	19.5	18	16.5	15	12	10.5	9	8	7.5	7																					1800	1800
		400	10	156	144	132	120	92	73	60																								600	600
			20	117	108	99	90	70	57	47	40	35	30																					1200	1200
			40	52	48	44	40	32	27	23	21	19	17																					1800	1800
SSPA	SXM	200	10	135	117	103	90	72	60	50																								600	600
			20	67.5	58.5	52	45	36	30	26	22.5	19.5	17	15.5	14	12.5	11.5	10.5	9.5	9	8.5	8	7.5											1200	1200
			30	45	39	34.5	30	24	20	17	15	13	12	11	10	9	8	7	6.5	6	5.5	5	4.5											1800	1800
	MXM	400	10	180	156	138	120	96	80	70																								600	600
			20	135	117	104	90	72	60	51	45	39	34	30	26	23	20	18	16	15	14	13	12											1200	1200
			40	67.5	58.5	52	45	36	30	25.5	22.5	19.5	17	15	13.5	11.5	10	9	8	7	6.5	6	5.5											2400	2400
	LXM	750	25	180	156	138	120	96	80	69	60	53	48	44	40	36	32	28	25	22	19	17	15											1250	1250
			50	90	78	69	60	48	40	34	30	27	24	22	20	18	16	14	12	11	10	9	8											2500	2500
SSP DACR	S	200	10	117	108	99	90	72	60	50																								600	600
			20	58.5	54	49.5	45	36	30	26	22.5	19.5	17																					1200	1100
			30	39	36	33	30	24	20	17	15	13	12	11	10																			1800	1600
	M	400	10	156	144	132	120	96	80	70																								600	600
			20	117	108	99	90	72	60	51	45	39	34																					1100	1100
			40	58.5	54	49.5	45	36	30	25.5	22.5	19.5	17	15	13.5																			1600	1600
	L	750	25	156	144	132	120	96	80	69	60	53	48	44	40																			1100	1100
			50	78	72	66	60	48	40	34	30	27	24	22	20																			1600	1600

IS series ~ Vertical installation ~

: Standard specification : Offboard tuning specification

Series	Type	Motor [W]	Lead	Payload per lead acceleration / deceleration [kg]																		Maximum speed [mm/s]	
				0.1G	0.2G	0.3G	0.4G	0.5G	0.6G	0.7G	0.8G	0.9G	1.0G	1.1G	1.2G	1.3G	1.4G	1.5G	1.6G	1.7G	1.8G	1.9G	2.0G	Standard	After tuning
ISB	SXM/SXL	60	4	14	14	13	12																	240	240
			8	7	7	7	7	6	5	4	2													480	480
			16	3.5	3.5	3.5	3.5	3	2.6	2.3	2	1.8	1.6	1.4	1.2	1	0.8	0.6	0.5					960	960
		100	36				2	2	2	2	2	2	2	2	2	2	2	2	2					2160	2160
	MXM/MXL	100	5	20	20	17	15																	300	300
			10	10	10	10	10	8	7															600	600
			20	5	5	5	5	4.5	4	3.5	3	2.8	2.5											1200	1200
			30	2.5	2.5	2.5	2.5	2.2	1.9	1.7	1.5	1.4	1.2	1.1	1									1800	1800
		200	5	40	40	34	30																	300	300
			10	20	20	20	20	17	15															600	600
			20	10	10	10	10	8.5	7.5	7	6	5.5	5											1200	1200
			30	6	6	6	6	5.5	5	4.5	4	3.5	3	2.5	2									1800	1800
		400	48				6	6	6	6	6	6	6	6	6	6	6	6	6					2500	2500
	MXMX	400	48				– (Note)																	–	–
	LXM/LXL	200	10	20	20	20	20	16	14															600	600
			20	10	10	10	10	8.5	7.5	7	6	5.5	5	4	3	2.5	2	1.5						1200	1200
			40	4	4	4	4	3.5	3.1	2.8	2.5	2.2	2	1.8	1.6									2400	2400
		400	10	40	40	40	40	34	30															600	600
			20	20	20	20	20	17	15	14	12	11	10	9	8	7	6	5						1200	1200
			40	10	10	10	10	8.5	7.5	7	6	5.5	5	4.5	4									2400	2400
ISDB	S	60	4	14	14	13	12																	240	240
			8	6	6	6	6	5.5	5	4	2													480	480
			16	3	3	3	3	2.8	2.5	2.3	2	1.8	1.6	1.4	1.2	1	0.8	0.6	0.5					960	960
		100	36				2	2	2	2	2	2	2	2	2	2	2	2	2					2000	2000
	M	100	5	20	20	17	15																	300	300
			10	10	10	10	10	8	7															600	600
			20	4	4	4	4	3.8	3.5	3.3	3	2.8	2.5											1200	1200
			30	2	2	2	2	1.8	1.6	1.5	1.4	1.3	1.2											1800	1800
		200	5	40	40	34	30																	300	300
			10	20	20	20	20	17	15															600	600
			20	10	10	10	10	8.5	7.5	7	6	5.5	5											1200	1200
			30	6	6	6	6	5.5	5	4.5	4	3.5	3											1800	1800
		400	48				6	6	6	6	6	6	6	6	6	6	6	6	6					2200	2200
	MX	400	48				– (Note)																	–	–
	L	200	10	20	20	20	20	16	14															600	600
			20	9	9	9	9	8.5	7.5	7	6	5.5	5	4	3	2.5	2	1.5						1200	1200
			40	2.5	2.5	2.5	2.5	2.4	2.3	2.2	2.1	2	2											2400	2400
		400	10	40	40	40	40	35	30															600	600
			20	20	20	20	20	17	15	14	12	11	10	9	8	7	6	5						1200	1200
			40	8	8	8	8	7.5	7	6.5	6	5.5	5											2400	2400

(Note) Can not use vertical installation.

Gripper Selection Method

Slide type

Step 1
Check necessary gripping force and transportable work part weight

Step 2
Check distance to gripping point

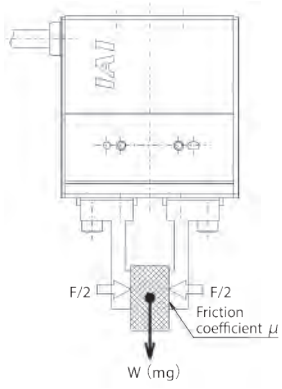
Step 3
Check external force applied to the finger attachment

Step 1 Check necessary gripping force and transportable work part weight

When gripping with frictional force, calculate the necessary gripping force as shown below.

① Normal transportation

F : Gripping force [N] …… Sum of push forces
μ : Coefficient of static friction between the finger attachment and the work part
m : Work part weight [kg]
g : Gravitational acceleration [= 9.8m/s²]



● A condition in which a work part does not drop when the work part is

$$F\mu > W \qquad F > \frac{mg}{\mu}$$

● Necessary gripping force as the recommended safety factor of 2 in normal transportation:

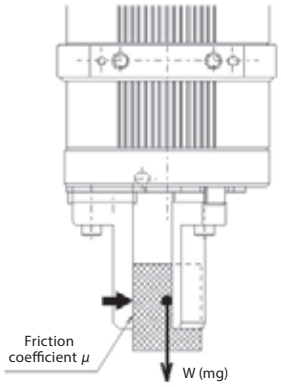
$$F > \frac{mg}{\mu} \times 2 \text{ (safety factor)}$$

● When the friction coefficient μ is between 0.1 and 0.2:

$$F > \frac{mg}{0.1 \sim 0.2} \times 2 = (10 \sim 20) \times mg$$

Normal work part transportation

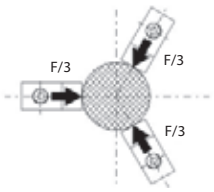
Necessary gripping force ▶ **10 to 20 times** the work part weight **or more**
Transportable work part weight ▶ **One-tenth to one-twentieth or less** of gripping force



* As the Coefficient of static friction increases, the work part weight also increases. Select a model which can achieve the gripping force of 10 to 20 times or more.
* Please refer to page 1-531 for an estimate of the shape and mass of the load.

② When remarkable acceleration, deceleration and/or impact occur

at work part transportation Stronger inertial force is applied to a work part by gravity. In this case, consider the sufficient safety rate when selecting a model.



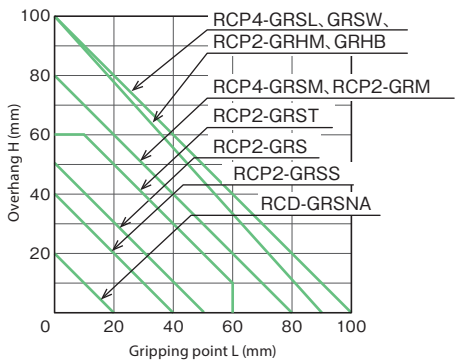
When remarkable acceleration, deceleration and/or impact occur

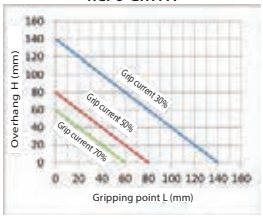
Necessary gripping force ▶ **30 to 50 times** the work part weight or **more**
Transportable work part weight ▶ **One-thirtieth to one-fiftieth or less** of gripping force

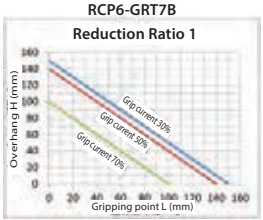
Step 2 Distance between finger attachment (claw) to gripping point

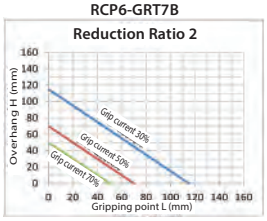
Keep the distance (L, H) from the finger (claw) mounting surface to the gripping point within the following range.
If such distance does not fall within such range, excessive moment applies to the finger sliding parts and internal mechanism and the service life may be affected.

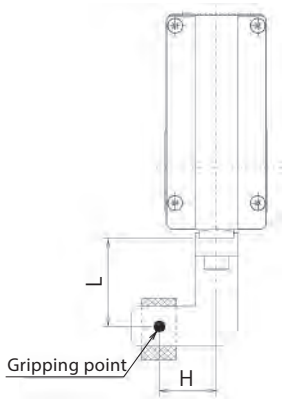
◆ For 2-finger gripper





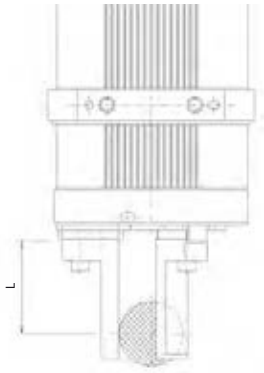






◆ For 3-finger gripper

RCP2-GR3SS	⇒	L = 50mm or less
RCP2-GR3SM	⇒	L = 80mm or less



Keep the fingers mounted to the actuator as small and light as possible, even if the distance to the gripping point falls within a restricted range.
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.

Step 3 Checking external force applied to finger

① Allowable vertical load

Confirm that the vertical load applied to each finger is the allowable load or less.

② Allowable load moment

Calculate Ma and Mc using L1 and Mb using L2.
Confirm that the moment applied to each finger is the maximum allowable load moment or less.

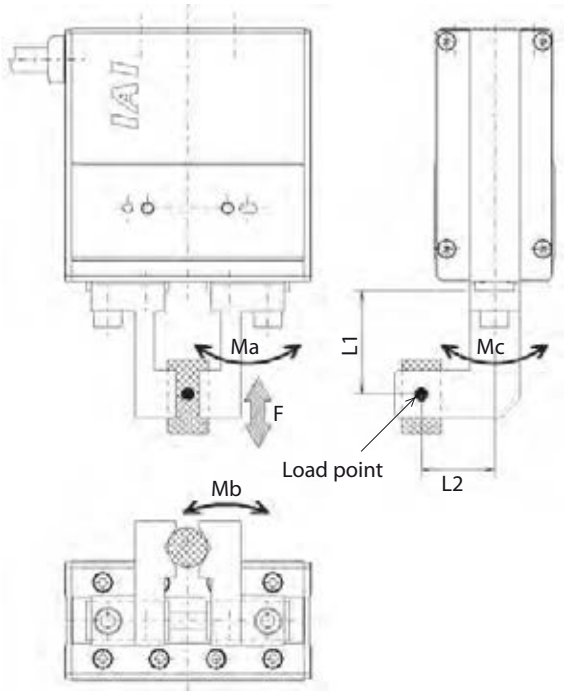
Allowable external force when the moment load is applied to each claw:

$$\text{Allowable load F (N)} > \frac{\text{M (Maximum allowable moment (N•m)}}{\text{L (mm)} \times 10^{-3}}$$

Calculate the allowable load F (N) using both of L1 and L2.
Confirm that the external force applied to finger is the calculated allowable load F (N) (L1 or L2, whichever is smaller) or less.

Model	Allowable vertical load F (N)	Max. allowable load moment (N•m)		
		Ma	Mb	Mc
RCD-GRSNA	14	0.04	0.04	0.07
RCP4-GRSML	356	1.9	2.7	4.6
RCP4-GRSLL	558	3.8	5.5	9.5
RCP4-GRSWL	651	5.1	7.2	12.4
RCP2-GRSS	60	0.5	0.5	1.5
RCP2-GRS	253	6.3	6.3	7.0
RCP2-GRM	253	6.3	6.3	8.3
RCP2-GRHM	390	11.7	16.7	46.5
RCP2-GRHB	502	15.7	26.4	59.8
RCP2-GRST	275	2.93	2.93	5.0
RCP2-GR3SS	169	3.8	3.8	3.0
RCP2-GR3SM	253	6.3	6.3	5.7
RCP6-GRT7A	598	3.6	3.6	10.2
RCP6-GRT7B	898	7.5	7.5	15.3
RCP(S)-GRST6	1080	48.5	69.3	103
RCP(S)-GRST7	1400	115	115	229
GRS-SEG/SIG	150	0.62	0.62	0.99
GRS-MEG/MIG	240	1.08	1.08	2.64

1. The allowable value above shows a static value. 2. The allowable value per finger is shown.



* The above load point indicates the load position on the fingers.
The position varies depending on the type of load.
· Load due to grasping force: Grasping point
· Gravity load: Center of gravity position
· Inertial force during movement, centrifugal force during turning: Center of gravity position
The load moment is the total value calculated for each type of load.

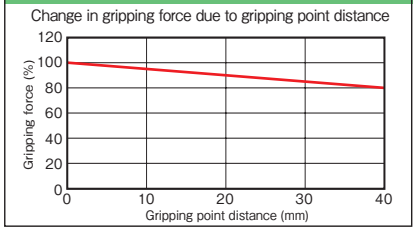
* Finger weight and work part weight are also a part of the external force. Centrifugal force when the gripper rotated gripping a work part and inertial force due to acceleration or deceleration when moving are also the external force applied to the finger.

Gripper Selection Method

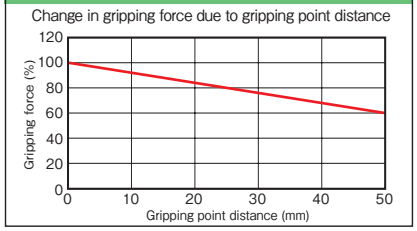
Approximate grip point distance and grip force

1. The graph shows the gripping force according to the gripping point distance when the maximum gripping force is taken as 100%.
2. The gripping point distance indicates the vertical distance from the finger attachment mounting surface to the gripping point.
3. Gripping force has variations due to individual differences. Please refer as a guide.

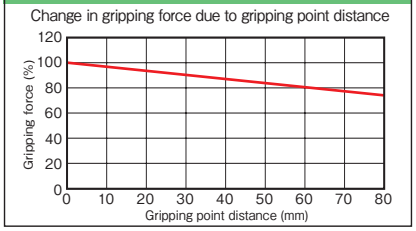
RCP2-GRSS



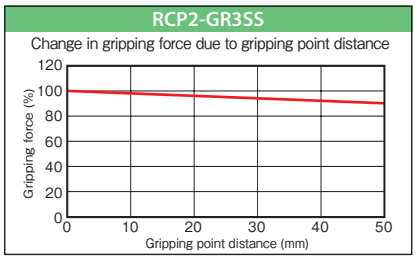
RCP2-GRS



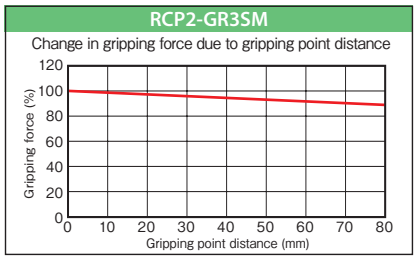
RCP2-GRM



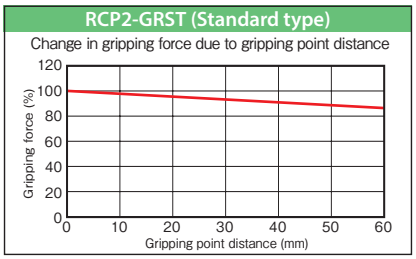
RCP2-GR3SS



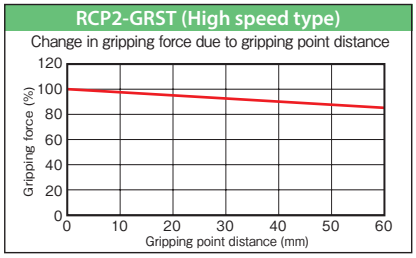
RCP2-GR3SM



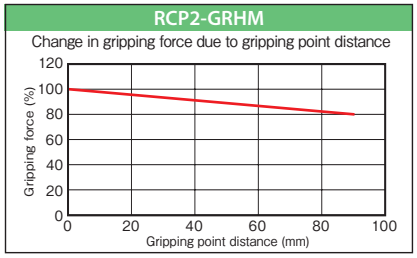
RCP2-GRST (Standard type)



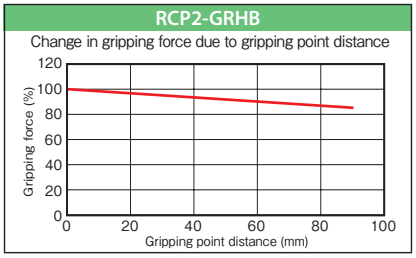
RCP2-GRST (High speed type)



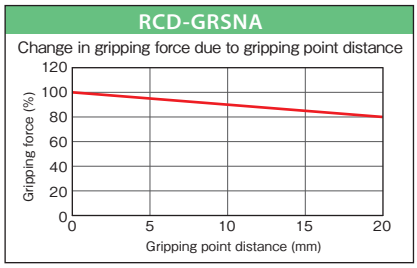
RCP2-GRHM



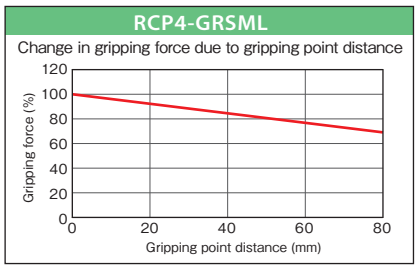
RCP2-GRHB



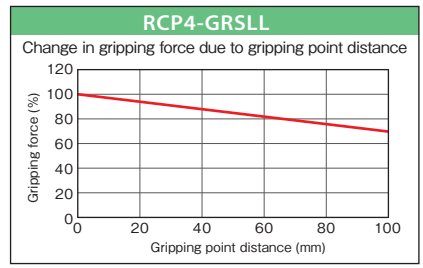
RCD-GRSNA



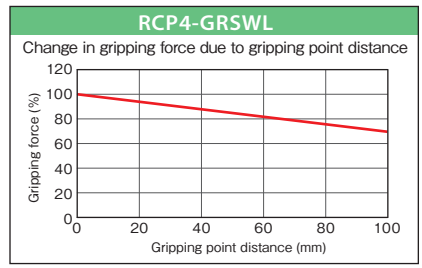
RCP4-GRSML



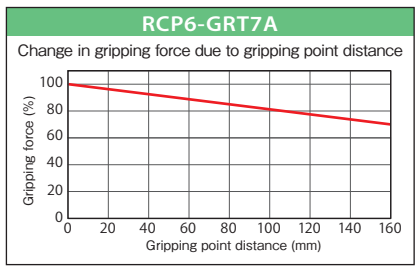
RCP4-GRSLL



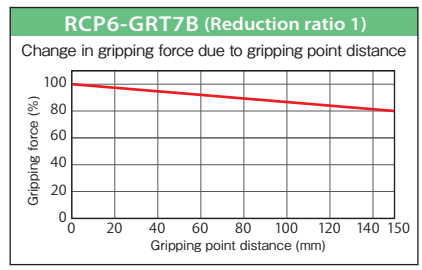
RCP4-GRSWL



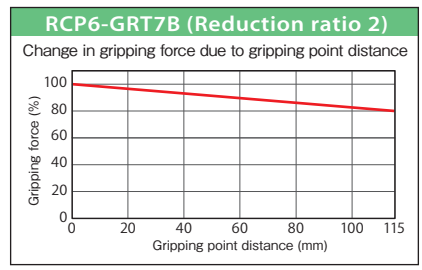
RCP6-GRT7A



RCP6-GRT7B (Reduction ratio 1)



RCP6-GRT7B (Reduction ratio 2)



Gripper Selection Method

Gripper Lever Type

Step 1
Check necessary gripping force and transportable work part weight

Step 2
Check moment of inertia of the finger attachment (claw)

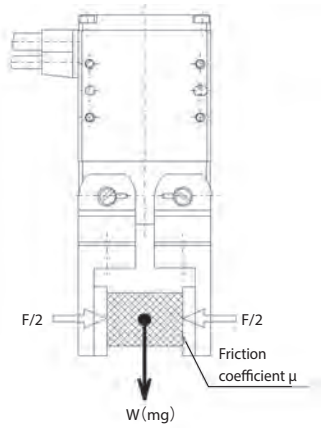
Step 3
Check external force applied to the finger

Step 1 Check necessary gripping force and transportable work part weight

Like Step 1 of Slide type, calculate the necessary gripping force and confirm that the gripping force meets conditions.

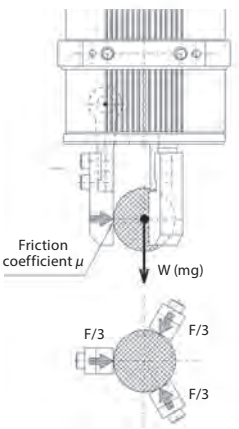
Normal work transportation	
Necessary gripping force	▶ 10 to 20 times the work part weight or more
Transportable work part weight	▶ One-tenth to one-twentieth or less of gripping force

When remarkable acceleration, deceleration and/or impact occur	
Necessary gripping force	▶ 30 to 50 times the work part weight or more
Transportable work part weight	▶ One-thirtieth to one-fiftieth or less of gripping force



Step 2 Check moment of inertia of the finger attachment (claw)

Confirm that all moments of inertia around the Z axis (fulcrum) of the finger attachment (claw) fall within an allowable area. Depending on the configuration and/or shape of the finger, divide it into several elements when calculating. For your reference, an example of calculation by dividing into two elements is shown below.

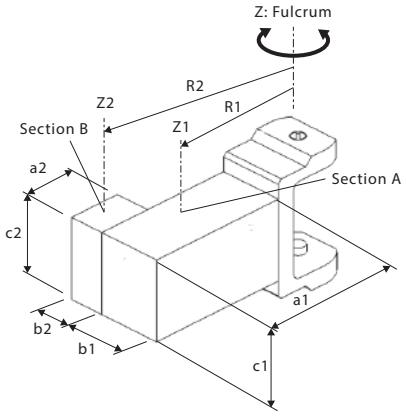


① Moment of inertia around Z1 axis (the center of gravity of A) (section A)

m1: Weight of A [kg]
a1, b1, c1: Dimension of Section A [mm]

$$m1\ [kg] = a1 \times b1 \times c1 \times \text{specific gravity} \times 10^{-6}$$

$$IZ1\ (kg.m^2) = \frac{m1\,(a1^2+b1^2) \times 10^{-6}}{12}$$

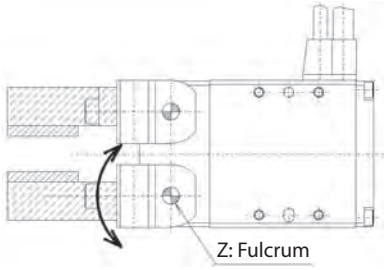


② Moment of inertia around the Z2 axis (the center of gravity of B) (section B)

m2: Weight of B [kg]
a2, b2, c2: Dimension of Section B [mm]

$$m2\ [kg] = a2 \times b2 \times c2 \times \text{specific gravity} \times 10^{-6}$$

$$IZ2\ (kg.m^2) = \frac{m2\,(a2^2+b2^2) \times 10^{-6}}{12}$$

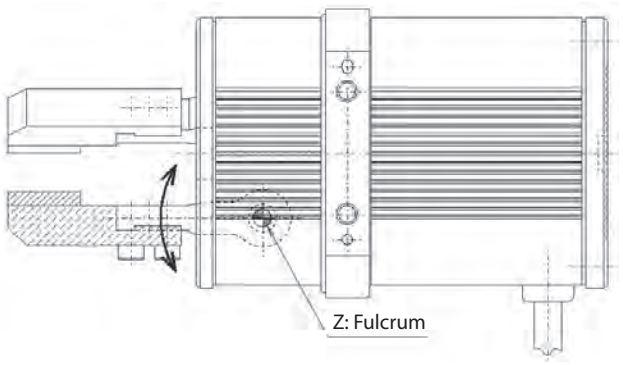


③ All moments of inertia around the Z axis (fulcrum)

R1 : Distance from the center of gravity of A to the finger opening/closing fulcrum [mm]
R2 : Distance from the center of gravity of B to the finger [mm]

$$I\ (kg.m^2) = (IZ1+m1R1^2\times10^{-6}) + (IZ2+m2R2^2\times10^{-6})$$

Model	Allowable moment of inertia [kg•m²]	Weight (Reference) [kg]
RCD-GRLS RCP2-GRLS	1.5×10^{-4}	0.07
RCP4-GRLM	6.0×10^{-4}	0.15
RCP4-GRLL	1.3×10^{-3}	0.25
RCP4-GRLW	3.0×10^{-3}	0.4
RCP2-GR3LS	3.0×10^{-4}	0.15
RCP2-GR3LM	9.0×10^{-4}	0.5

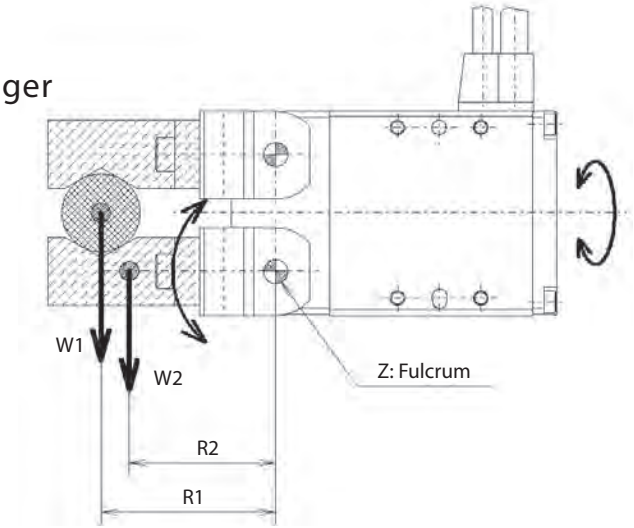


Step 3 Check external force applied to the finger

① Allowable load torque

Confirm that the load torque applied to the finger is the maximum allowable load torque or less.
The load torque is calculated by finger and work part weight as stated below.

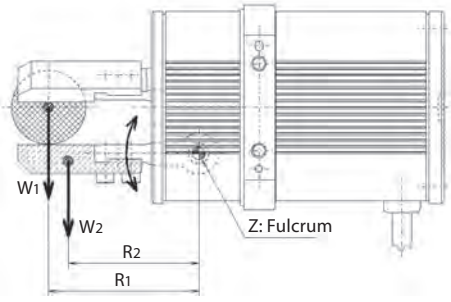
m1 : Work part weight
R1 : Distance from the center of gravity of work part to the finger opening/closing fulcrum
m2 : Claw weight
R2 : Distance from the center of gravity of the claw to the finger opening/closing fulcrum
g : gravitational acceleration (9.8 m / s²)



$$T = (W1\times R1\times10^{-3}) + (W2\times R2\times10^{-3}) + (\text{other load torque})$$
$$= (m1g\times R1\times10^{-3}) + (m2g\times R2\times10^{-3}) + (\text{other load torque})$$

* Centrifugal force when the gripper rotated gripping a work part and inertial force due to acceleration or deceleration when moving horizontally are also the load torque applied to the finger.
If applicable, confirm that the total torque including the torque above is the maximum allowable load torque or less.

Model	Maximum allowable load torque T [N•m]
RCP2-GRLS	0.05
RCP4-GRLM	0.35
RCP4-GRLL	0.70
RCP4-GRLW	1.50
RCP2-GR3LS	0.15
RCP2-GR3LM	0.4

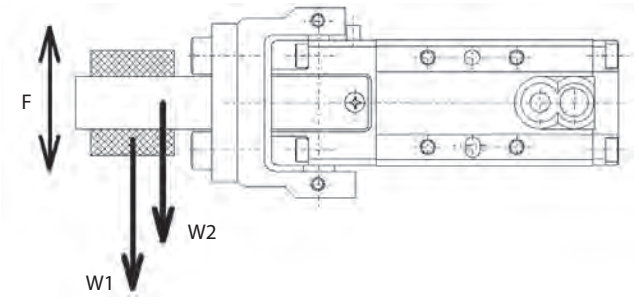


② Allowable thrust load

Confirm that the thrust load of finger opening/closing the axis is the allowable load or less.

$$F = W1+W2+(\text{other thrust load})$$
$$= m1g+m2g+(\text{other thrust load})$$

Model	Allowable thrust load F [N]
RCP2-GRLS	15
RCP4-GRLM	20
RCP4-GRLL	25
RCP4-GRLW	30
RCP2-GR3LS	–
RCP2-GR3LM	–



Rotary Selection Method

When selecting a rotation axis, it is necessary to calculate the moment of inertia of the condition to be used and to use a model that allows the moment of inertia.
Please calculate the moment of inertia of the work to be used and the mounting jig by calculating the moment of inertia of the representative shape shown below. (Please refer to the correlation diagram of the shape and mass of the attached item is posted on the next page.)
In addition to the allowable moment of inertia, it is also necessary to check the load moment. Please select the model that can tolerate the moment generated from the shape and size.

■ Inertial Moment

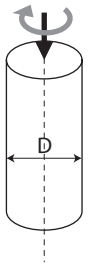
Inertial moment represents the amount of inertia in a rotational motion, and corresponds to weight for linear motion.
The greater the inertial moment, the more difficult it is for that object to move and stop.
Inertial moment differs with the weight and shape of the object, but refer to the calculation formula in the typical example illustrated below.
The allowable inertial moment value for a rotary actuator is shown as load inertia.
A rotary actuator can be used if the calculated inertial moment is less than its load inertia.

● Calculating the Moment of Inertia for Typical Shapes

1. When the rotation axis passes through the center of the object

(1) Moment of inertia of cylinder 1
* The same formula can be applied irrespective of the height of the cylinder (even on a circular plate)

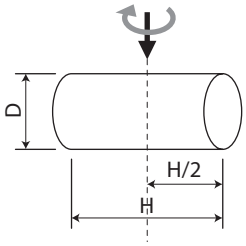
<Calculation formula> $I = M \times D^2 / 8$



Moment of inertia of cylinder: I (kg · m²)
Mass of cylinder: M (unit kg)
Diameter of cylinder: D (m)

(2) Moment of inertia of cylinder 2

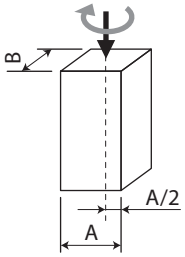
<Calculation formula> $I = M \times (D^2/4 + H^2/3) / 4$



Moment of inertia of cylinder: I (kg · m²)
Mass of cylinder: M (unit kg)
Diameter of cylinder: D (m)
Cylinder length: H (m)

(3) Moment of inertia of prisms 1
* The same formula can be applied irrespective of the height of the cylinder (even on a circular plate)

<Calculation formula> $I = M \times (A^2 + B^2) / 12$

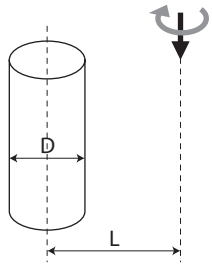


Moment of inertia of prisms: I (kg · m²)
One side of a rectangular column: A (m)
One side of the rectangular column: B (m)

2. When the center of the object is offset from the rotation axis

(4) Moment of inertia of cylinder 3
* The same formula can be applied irrespective of the height of the cylinder (even on a circular plate)

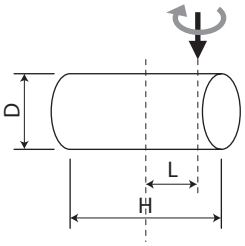
<Calculation formula> $I = M \times D^2 / 8 + M \times L^2$



Moment of inertia of cylinder: I (kg · m²)
Mass of cylinder: M (unit kg)
Diameter of cylinder: D (m)
Distance from rotation axis to center: L (m)

(5) Moment of inertia of cylinder 4

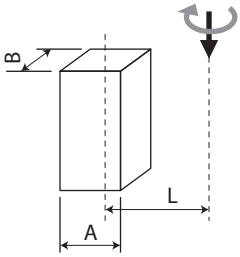
<Calculation formula> $I = M \times (D^2/4 + H^2/3) / 4 + M \times L^2$



Moment of inertia of cylinder: I (kg · m²)
Mass of cylinder: M (unit kg)
Diameter of cylinder: D (m)
Cylinder length: H (m)
Distance from rotation axis to center: L (m)

(6) Moment of inertia of prisms 2
* The same formula can be applied irrespective of the height of the cylinder (even on a circular plate)

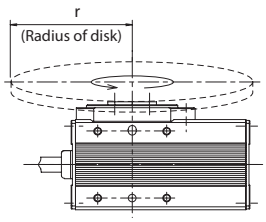
<Calculation formula> $I = M \times (A^2 + B^2) / 12 + M \times L^2$



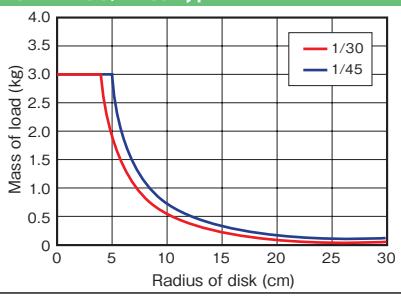
Moment of inertia of prisms: I (kg · m²)
Mass of prism: M (kg)
One side of a rectangular column: A (m)
One side of the rectangular column: B (m)
Distance from rotation axis to center: L (m)

■ Estimate of load shape and mass

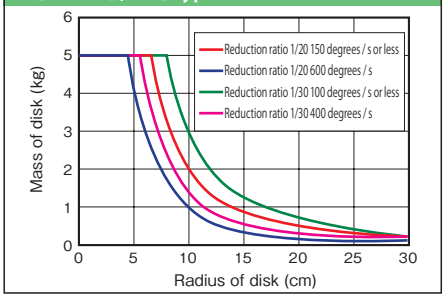
A. In the case of disc shaped loads centered on the output shaft



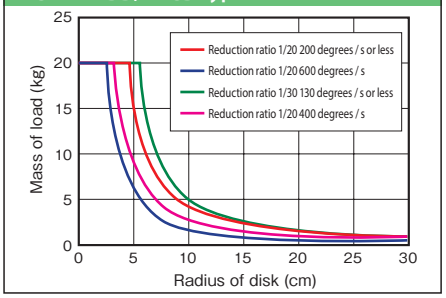
RCP2-RTBS/RTCS Type



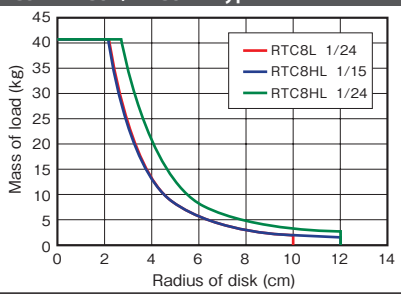
RCP2-RTB/RTC Type



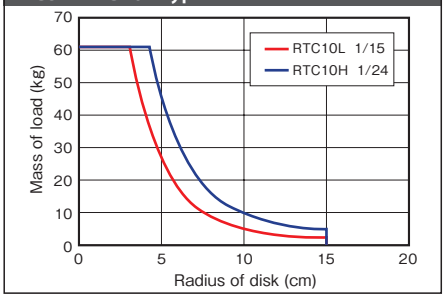
RCP2-RTBB/RTCB Type



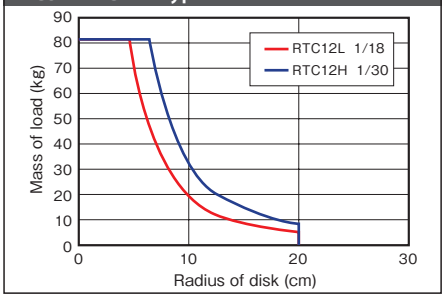
RCS2-RTC8L/RTC8HL Type



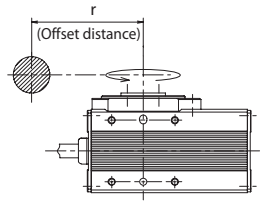
RCS2-RTC10L Type



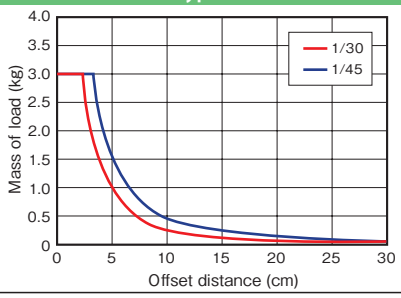
RCS2-RTC12L Type



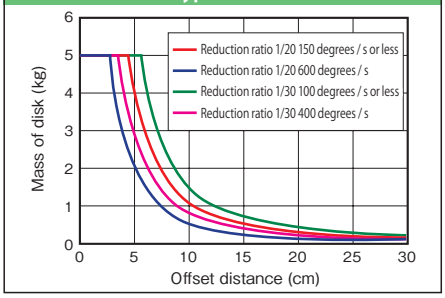
B. In the case of a load that is offset from the center of the output shaft



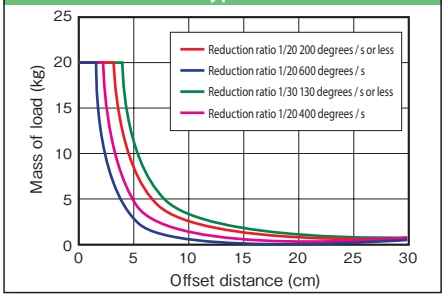
RCP2-RTBS/RTCS Type



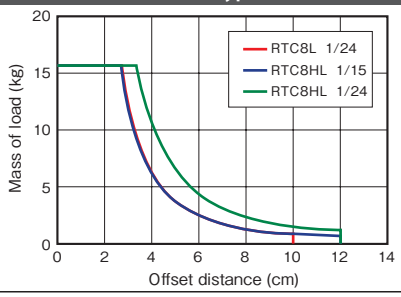
RCP2-RTB/RTC Type



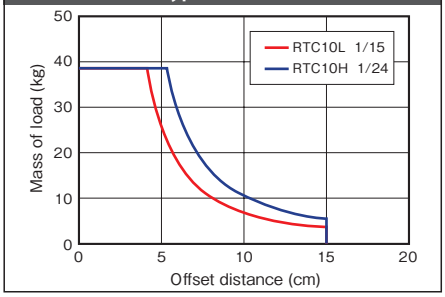
RCP2-RTBB/RTCB Type



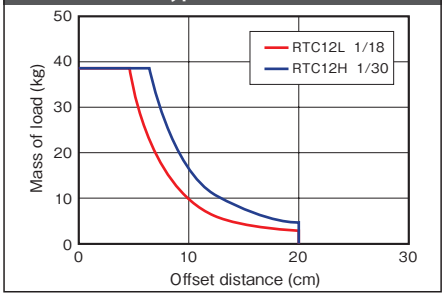
RCS2-RTC8L/RTC8HL Type



RCS2-RTC10L Type



RCS2-RTC12L Type



Rotary Selection Method

■ Calculation method for sideways installation

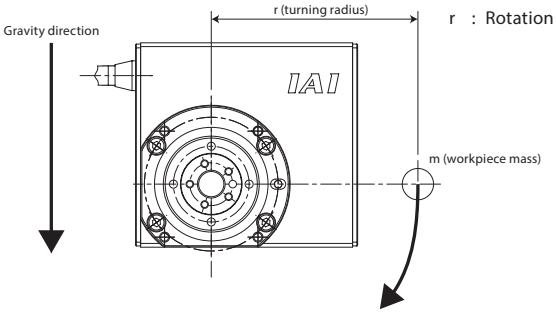
When using the rotary part of the rotary perpendicular to the floor surface,
please check whether it can be used by the following formula.

1. Calculate the differential torque. * The difference torque is the difference between the maximum torque of the main unit and the torque calculated in ①.

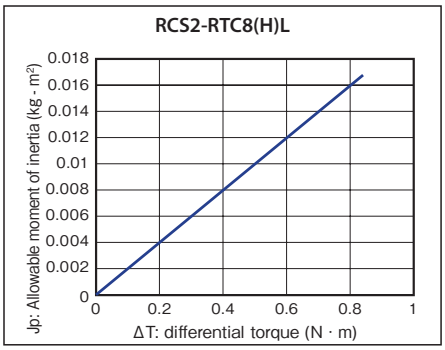
$\Delta T = (Tmax - Wg)$ ・・・・・②

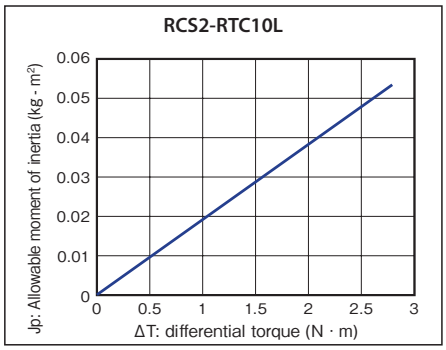
$Wg = mgr\ [N \cdot m]$ ・・・・・①

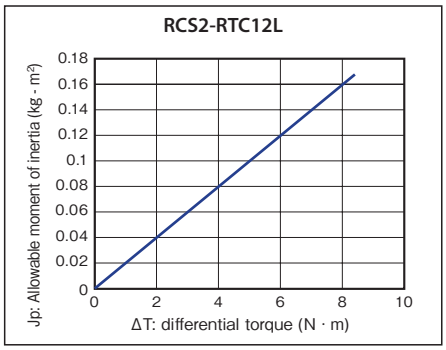
Tmax: Output shaft maximum torque [N · m]
m : Work mass [kg]
g : gravitational acceleration [m/s²]
r : Rotation radius [m]



Model	Reduction ratio	Maximum torque
RTBS, RTBSL, RTCS, RTCSL	1/30	0.24
	1/45	0.36
RTB, RTBL, RTC, RTCL	1/20	1.1
	1/30	1.7
RTBB, RTBBL, RTCB, RTCBL	1/20	3.0
	1/30	4.6
RTC8L	1/24	0.55
RTC8HL	1/15	0.53
	1/24	0.85
RTC10L	1/15	1.7
	1/24	2.8
RTC12L	1/18	5.2
	1/30	8.6







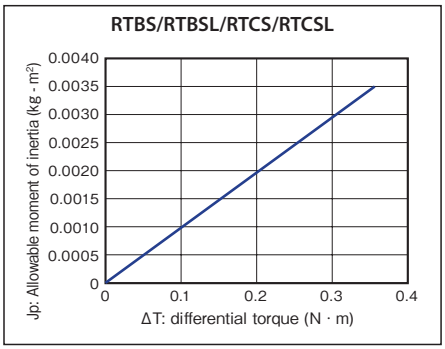
2. Check the difference torque to see if the desired model meets the torque.

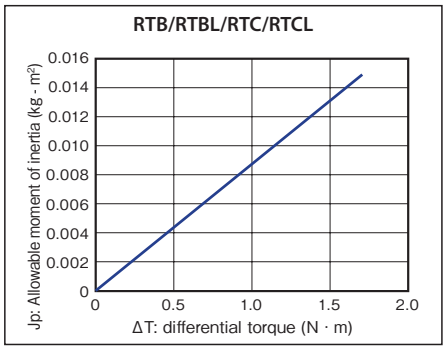
$\Delta T \leqq 0$ ・・・・・ Unusable. It is necessary to change to a high torque model or reduce the mass and turning radius.

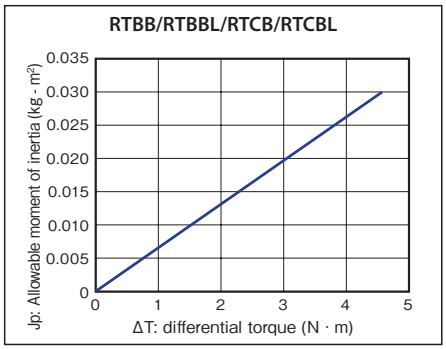
$\Delta T > 0$ ・・・・・ Available. Proceed to the next confirmation.

3. Calculate the allowable moment of inertia (Jp) when installing in sideways from the differential torque (ΔT) calculated in ②.
Since the allowable moment of inertia varies depending on the model, calculate from the graph below.
There is no difference depending on the speed reduction ratio of each model.

Example) When the differential torque is 0.6 N · m at RTB, the allowable moment of inertia is 0.005 kg · m².







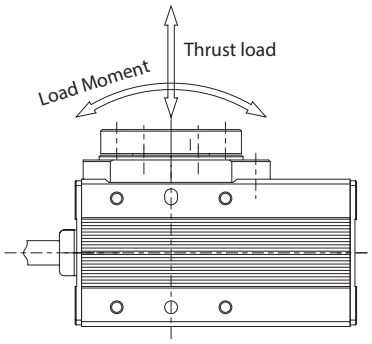
4. Determination of allowable moment of inertia

It can be used if the calculated allowable moment of inertia (Jp) is larger than the moment of inertia (Jw) of the workpiece.

Allowable moment of inertia Jp> Moment of inertia Jw ・・・・・・ It is available.
Allowable moment of inertia Jp ≤ moment of inertia Jw ・・・・・ It is unusable.
(It is necessary to change to a high torque model or reduce the mass and turning radius.)

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 shortened service life.

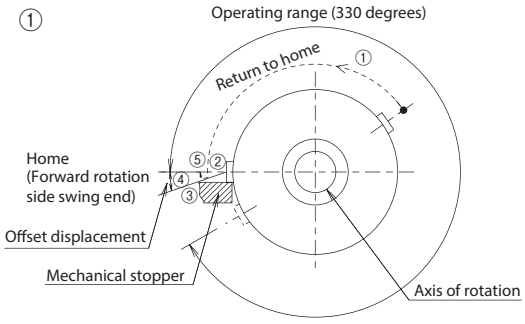


■ Notes on the origin of the RCP 2 rotary type

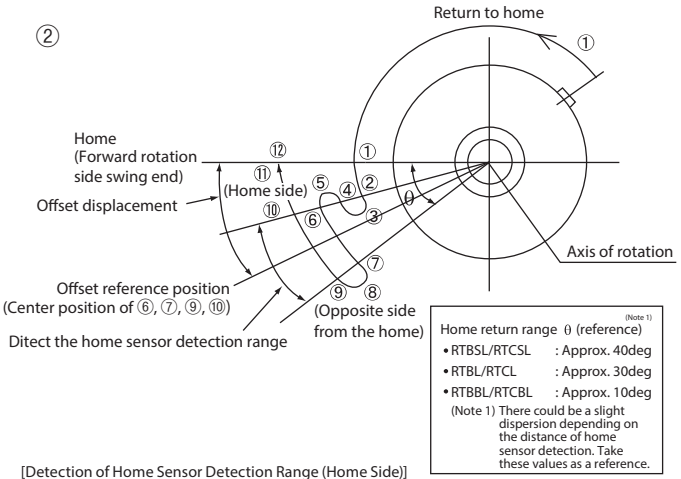
There are two types of "330 degree type" and "360 degree type" with different operating ranges for rotary type.
Both have the same home position, but please be careful about the following points when you change the home return operation and the operation (rotation) direction.

		330 degree type	360 degree type
Home return method (standard specification)		It rotates counterclockwise from the current position, pushes to the stopper, and reverses and becomes home. (See ① below)	It rotates counterclockwise from the current position, it becomes the home after confirming the position by reciprocating the home sensor detection range after sensing the sensor. (See ② below)
Reverse home specification (reverse rotation specification)		When returning to the home position, rotate clockwise from the current position, push to the stopper reverses and becomes home. In addition, the position of the stopper is different from the standard specification. Therefore, please note that the standard specification can not be reversed to the home origin later.	When returning to the home position, it rotates clockwise from the current position, it is the home after confirming the position by reciprocating the home detection range after sensing the sensor. Since there is no stopper, it is possible to change the standard specification later to the reverse home specification later.
Home return accuracy	Small size	within ±0.05°	within ±0.05°
	Medium size	within ±0.01°	within ±0.05°
	Large size	within ±0.01°	within ±0.03°

330 degree rotation specification



Multi-turn specification RTBSL/RTCSL, RTBL/RTCL, RTBBL/RTCBL



[Detection of Home Sensor Detection Range (Home Side)]
① Home return start (search for the Home sensor detection range)
② Home sensor detection range (Home side) detected (B contact: falling signal or detection of signal OFF)
③ Inversion (Search for non-detection range of Home sensor)
④ Home sensor non-detection range (Detects the Home (rise of signal at B contact or detection of signal ON)
⑤ Inversion
[Detection of four points ⑥, ⑦, ⑨, ⑩ of the origin sensor detection range. Set the center position of ⑥, ⑦, ⑨, ⑩ to the offset reference position.]
⑥ Home sensor detection range (Home side) detected (B contact: falling signal or signal OFF detected), move to the home sensor non-detection range (anti-origin side)
⑦ Detection of home sensor non-detection range (The opposite side from home) (at B Contact: signal rise or signal on detection)
⑧ Move to the detection range of the inversion and origin (The opposite side from the home)
⑨ Ditect the home sensor detection range (The opposite side from the home)(At B contact: falling edge of signal or detection of signal OFF), and move to the home sensor non-detection range (the home side)
⑩ Ditect home sensor Detects non-detection range (home side) (B contact: rising of signal or detection of signal ON)
[Offset Movement Operation]
⑪ Determine the offset reference position from the center of ⑥, ⑦, ⑨, ⑩.
The position moved from the offset reference position by the offset movement amount is the home. Move from the current position to the home.
⑫ Home position

Rotary Selection Method

■ Notice on selection of rotary actuator

Please note that it can not be operated in the index mode when used in combination with the following table. *1

Combinations that can not operate in index mode		
Actuator	Encoder	Controller
RCP2(CR)(W)-RTBBL	I	PCON-CB/CGB PCON-PLB/POB MCON-C/CG * 2 The above pulse train control
RCP2(CR)(W)-RTBL		
RCP2(CR)(W)-RTBSL		
RCP2(CR)(W)-RTCBL		
RCP2(CR)(W)-RTCL		
RCP2(CR)(W)-RTCSL		
RCS2-RTC10L	I	SCON-CB/CGB * 2 The above pulse train control
RCS2-RTC12L		
RCS2-RTC8HL		
RCS2-RTC8L		
RS All models		
DD/DDA(CR)(W) All models	AI	
RCS2-RTC10L	A	SCON-CB/CGB
RCS2-RTC12L		
RCS2-RTC8HL		
RCS2-RTC8L		
RS All models		
DD/DDA(CR)(W) All models	AM	

* 1 Operation in normal mode is possible.
For DD / DDA, please select the encoder type "AM" (multi-rotation absolute type).
* 2 The network that can be selected differs depending on the controller.

RS Series Selection Method

When selecting a model, decide from the following points, taking into consideration the operation, the load of loads to be installed, etc.

●Speed and load inertia of each model

For the required operation speed by the use method, the load inertia is obtained from the weight and the shape such as the arm chuck to attach to the spindle tip, and the value indicated by the catalog load inertia, please use the model that is larger than this load inertia demanded.

Model	RS-30W		RS-60W	
Reduction ratio	1/50	1/100	1/50	1/100
Rated speed (degrees/s)	360	180	360	180
Load inertia (kg · m^2)	0.058	0.23	0.11	0.42

●Motor load capacity and load inertia

The load inertia is determined by the intrinsic value of the object determined by mass and shape, $J = \int r^2 dM$, and those with simple shape are represented by $J = MK^2$.

The RS series (rotary actuator) is an actuator that provides rotational power to the loading, resulting in rotational motion of the loaded object. The torque is used to represent the rotational force, and the torque is also called the moment of force. When the linear motion is compared with the rotational motion, the force is applied to the mass (inertia), and the acceleration is generated in the direction of the force.

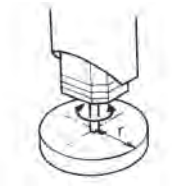
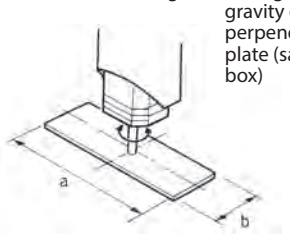
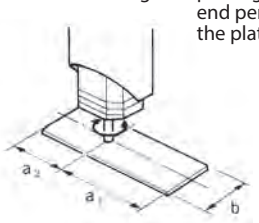
$F = M \cdot \alpha$ F : force N
M : Mass kg
α : Acceleration cm/s^2

In the rotational force, the relationship between this force, mass and acceleration becomes torque, load inertia, angular acceleration. When torque is applied to an object with load inertia, angular acceleration is generated. Therefore, the load capacity is expressed in rotary with this load inertia.

$T = J \cdot \omega$ T : Torque N・m
J : Load inertia kg・m^2
ω : Angular acceleration rad rad/s^2

●Calculation method of load inertia of typical shape

Calculation of Load Inertia J / J: Load inertia [kg/m^2] M: Load weight [kg] r, a, a$_1$, A$_2$, B: Distance [m]

① Cylindrical (including thin circular plate)	② Thin rectangle (rectangular box)	③ Thin rectangular plate (rectangular box)
Position of rotating axis: central axis	Position of of rotating axis: through the center of gravity of the board, perpendicular to the plate (same as the thick box)	Position of rotating axis: passing through one end perpendicular to the plate
		
$J = M \cdot \frac{r^2}{2}$	$J = M \cdot \frac{a^2+b^2}{12}$	$J = M_1 \cdot \frac{4a_1^2+b^2}{12} + M_2 \cdot \frac{4a_2^2+b^2}{12}$

RS Series Lineup

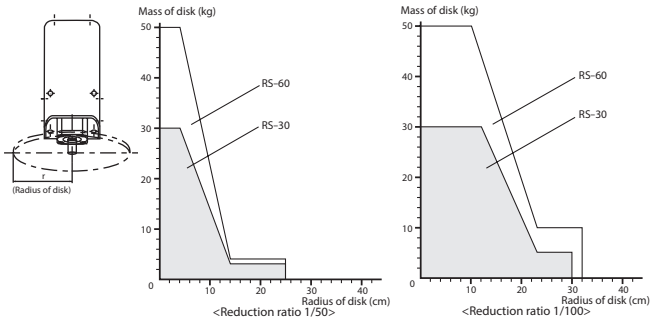
RS-60W

RS-30W

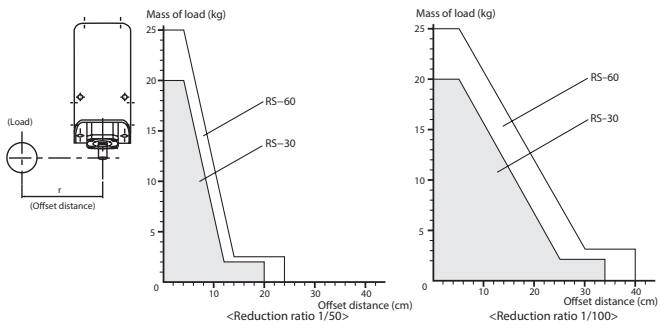
●Reference for model selection

Depending on the state of the load of the load on the rotary shaft output shaft, select the model based on the following chart as a reference.

A In the case of disc shaped load directly under rotating shaft



B In the case of loads offset from the rotating shaft



Discontinued and Replacement Models

Classification	Series			Discontinued time	Successor models (REPLACEMENTS) *
Actuator	Single axis robot	DS	SA4 SA5 SA6 A4R A5R A6R	October 2008	RCA, RCS2
		EX	12EX	August 2007	RCP5-BA
		AS	12L 12G2 12R2 12H2 12V CS-DC 12AR	October 2003	ISB
		E/F	12E 12ED 12F 12FD	October 2003	ISB, RCA
		Old AS	12G 02G 02W 12GR 12R 02R GSJ RP MR CR	December 2001	ISB
		IS	T-X-S S-X-M S-Y-M S-Z-M M-X-S M-X-M M-X-MX M-Y-S M-Y-M M-Z-S M-Z-M L-X-S L-X-M L-X-MX L-X-UWX L-Y-S L-Y-M L-Z-S L-Z-M	August 2014	ISB
		ISP	S-X-M S-Y-M S-Z-M M-X-S M-X-M M-X-MX M-Y-S M-Y-M M-Z-S M-Z-M L-X-S L-X-M L-X-MX L-X-UWX L-Y-S L-Y-M L-Z-S L-Z-M W-X-M W-X-MX	September 2015	ISPB

* The successor model is not compatible with shape, mounting dimensions, wiring etc. Please contact us for more details.

Classification	Series			Discontinued time	Successor models (REPLACEMENTS) *
Actuator	Single axis robot	ISD	S M MX L LX	September 2015	ISDB ISPDB ISDBCR ISPDBCR
		ISPD	S M MX L LX		
		ISDCR	S M MX L LX		
		ISPDCR	S M MX L LX W WX		
	Cartesian robot	ICSP2		September 2015	ICSB2
		ICSP3			ICSB3
		ICS2		August 2014	ICSB2
		ICS3			ICSB3
	Tabletop robot	T-300		August 2007	TTA
	RoboCylinder	RCP	SA5 SA6 SS SM SSR SMR RSA RMA RSW RMW RSI RMI RSIW RMIW RSGS RMGS RSGD RMGD RSGB RMGB G10	October 2004	RCP6
	Mini actuator	TA	28 35	December 2003	RCP3, RCP6
		TX	20 28 35	February 2016	RCP3, RCP6

* The successor model is not compatible with shape, mounting dimensions, wiring etc. Please contact us for more details.

Discontinued and Replacement Models

Classification	Series		Discontinued time	Successor models (REPLACEMENTS) *
Controller	DS controller	DS-S-C1	October 2008	ASEL
		SA-C1, C2, C3, C4	December 2001	ASEL
		DS-C1, C2, C3, C4		
	Super SEL Controller	S-SEL-F	August 2007	SSEL
		S-SEL-ES-1	October 2004	SSEL
		M-SEL-GS-2~4		SSEL XSEL-P/RA
		S-SEL-E-1-□ S-SEL-EDS-1-□		SSEL
		M-SEL-G-2~8 M-SEL-GDS-2~8 M-SEL-GID-2~8 M-SEL-GX-2~9		SSEL XSEL-P/RA
		SEL-A-1 A-3 A-2 A-4	October 2003	SSEL XSEL-P/RA
		SEL-B-2 B-7 B-3 B-8 B-4	October 2003	XSEL-P/RA
		SEL-H-2, 4 SEL-HAB-2, 4	October 2003	XSEL-P/RA
		SEL-D-2	December 2001	SSEL
	Multi-controller	SEL-2~4	December 2001	SSEL XSEL-P/RA
	Single controller	S-SEL-35/60/100/200	October 2003	SSEL
		S C-S	December 2001	SCON-CB
	Controller for Robo-Cylinder	RCP2-C/CF	May 2014	PCON-CB/CFB
		RCS-C		SCON-CB(115V,230V) ACON-CB(24V)
		RCS-E	June 2014	ACON-CB
		ECON	May 2014	SCON-CB
		PDR		SCON-CB
		RCP-C-□ RCP-C-□-EU	October 2004	PCON-CB
	Controller for TA	TA-C1	December 2003	PCON-CB
	Controller for TX	TX-C1	February 2016	PCON-CB
	XSEL Controller	J, JX	December 2017	XSEL-P, PX XSEL-Q, QX XSEL-RA, RAX, RAXD8 XSEL-SA, SAX, SAXD8
		K, KE, KET, KETX KEX, KT, KX	December 2016	XSEL-P, PX XSEL-Q, QX XSEL-RA, RAX, RAXD8 XSEL-SA, SAX, SAXD8
Integr. controller	Tabletop controller	TT-300	August 2007	TTA
Display	Built-in touch panel for RC	RCM-PM-01	December 2013	-
Teaching box	Simple teaching for RC	RCM-E	March 2014	TB-02
	Data setting device for RC	RCM-P		–
	Standard teaching for RC	RCM-T	August 2008	TB-02
	Teaching for XSEL	IA-T-X IA-T-X-J IA-T-X-JS IA-T-XD IA-T-XD-J IA-T-XD-JS	October 2015	TB-02

* The successor model is not compatible with shape, mounting dimensions, wiring etc. Please contact us for more details.

Technical Reference
IAI Products
Extract Cat. No. 0519-E

The information contained in this catalog is subject to change without notice for the purpose of product improvement

ISO 9001
BUREAU VERITAS
Certification

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