



Subject: Motor characteristic difference between Stepper Motor and Servo Motor

Please note the following motor characteristic difference between Stepper Motor and Servo Motor are as follows:

	Push Motion	High Speed Motion
Stepper Motor	○ (Better)	△ (not ideal)
Servo Motor	△ (not ideal)	○ (Better)

Before we introduced the Mini Robo Cylinder actuator, the widest variety of actuators were the stepper motor series and we are familiar with the “Push Motion” function concept. However, we recently debuted the Mini Robo Cylinder actuator and the most of this series’ actuators utilize a servo motor.

When you are selecting an actuator for the “Push Motion” oriented application, please select from the Stepper motor family actuators first.

Please see the next page (attachment 1 & 2) from the Mini Robo Cylinder catalog as an example for the Stepper motor actuators and the corresponding graphs depicting PUSH forces.

Please see the fourth page (attachment 3) from the Mini Robo Cylinder catalog as example for Servo motor actuators.

If you are selecting from the Servo motor family actuators, please understand the following conditions which affect the forces and the repeatability of that force.

1. Max Push Force setting: (Rated Max Thrust) x 70%
2. Push Force repeatability:

	Push Force repeatability
Servo Motor	Max ± 40%
Stepper Motor	Max ± 10%

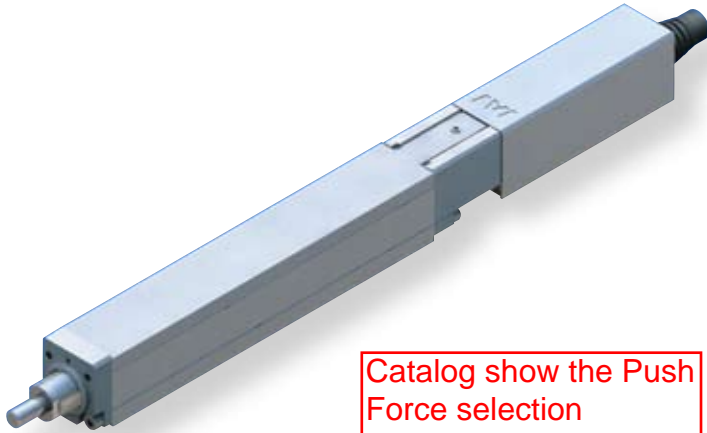
Revision History	Issue Date	Note
TIPS-100080	March 29, 2010	Initial Issue by Harry Takahashi

RCP3-RA2AC

ROBO Cylinder Mini Rod type Motor Unit Coupling type Actuator Width 22mm Pulse Motor Lead Screw Specification

Model Description	RCP3	RA2AC	I	20P					
	Series	Type	Encoder type	Motor type	Lead	Stroke	Compatible Controllers	Cable Length	Option
			I: Incremental specification * Model number is "I" when used with simple absolute unit.	20P: Pulse Motor 20 □ Size	4S: Lead screw 4mm 2S: Lead screw 2mm 1S: Lead screw 1mm	25: 25 mm 100: 100 mm (every 25mm)	P1: PCON RPCON PSEL P3: PSEP	N: None P: 1m S: 3m M: 5m X □ □: Length Designation	Following options Refer to price table

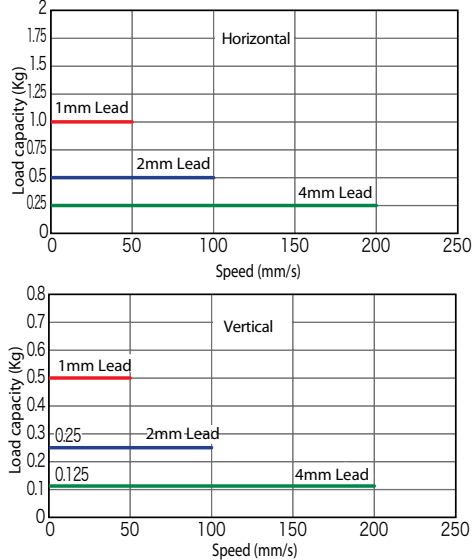
*See page 11 for details on the model descriptions.



Catalog show the Push Force selection

- POINT**
Notes on selection
- (1) The load capacity is the value when operated at 0.2G acceleration. The acceleration limit is the value indicated above.
 - (2) The horizontal payload is the value when used in combination with an external guide. Please note that if an external force is applied to the rod in a direction other than the proper direction the rod travels, the detent may get damaged.
 - (3) The maximum pushing force when the speed is 5mm/s.
 - (4) Service life decreases significantly if used in a dusty environment.

Correlation Diagrams of Speed and Load Capacity
With the RCP3 series, due to the characteristics of the pulse motor, load capacity decreases as the speed increases. Use the chart below to confirm that the desired speed and load capacity requirements are met.



Actuator Specification Table							
Leads and Payloads							
Model	Feed screw	Lead (mm)	Maximum payload		Maximum pushing force (N)	Positioning Repeatability (mm)	Stroke (mm)
			Horizontal (kg)	Vertical (kg)			
RCP3-RA2AC-I-20P-4S-①-②-③-④	Lead Screw	4	0.25	0.125	See page 97.	±0.05	25 to 100
RCP3-RA2AC-I-20P-2S-①-②-③-④		2	0.5	0.25			
RCP3-RA2AC-I-20P-1S-①-②-③-④		1	1	0.5			

Legend ① Stroke ② Compatible Controllers ③ Cable length ④ Option

Stroke and Maximum Speed			
Lead	Stroke	Maximum Speed	
		25 (mm)	50 to 100 (mm)
Lead screw	4	180	200
	2	100	
	1	50	

(Unit = mm/s)

(1) Price list (by stroke)

(1) Stroke (mm)	Type code
	RA2AC
	Encoder type
	Incremental
	Feed screw
	Lead screw
25	-
50	-
75	-
100	-

(3) Cable length (price chart)

Type	Cable symbol	Standard price
Standard type (Robot cable)	P (1m)	-
	S (3m)	-
	M (5m)	-
Special length	X06 (6m) to X10 (10m)	-
	X11 (11m) to X15 (15m)	-
	X16 (16m) to X20 (20m)	-
		-

* Robot cable type comes standard on RCA3 actuator.
* See page 113 for maintenance cables.

(4) Option price list (standard price)

Title	Option code	See page	Standard price
Brake	B	→P22	-
Reversed - home specification	NM	-	-

Actuator Specification

Item	Description
Drive System	Lead screw φ4mm rolled C10
Backlash	0.3mm or less (initial value)
Base	Material: Aluminum, white alumite treated
Guide	Slide Guide
Ambient operating temperature, humidity	0 to 40 °C, 85% RH or less (no condensation)
Service life	Horizontal: 10 million (number of cycles) Vertical: 5 million (number of cycles)

Selection Guide (Push force and current limiting value correlation graph)

Use the following models for push-motion operation.

The push force applied in push-motion operation can be freely set by changing the current-limiting value in the controller. (*1)

The push force setting ranges differ according to type. Use the following chart to verify.

RCL Series Micro Cylinder

● Setting the current limiting value in push-motion operation

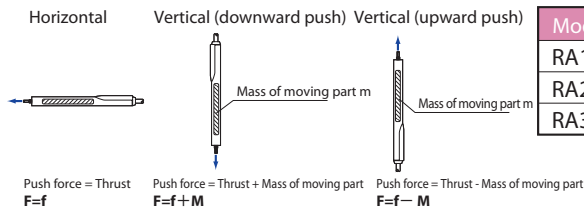
For push-motion operation, set the current limiting values that determine push force. *The push force is an approximate standard, so it will vary somewhat.

*The push time is not limited. Continuous pushing is possible.

Standard for push force [N]

Current limiting value	30 %	40 %	50 %	60 %	70 %	80 %
RA1L	0.75	1	1.25	1.5	1.75	2
RA2L	1.5	2	2.5	3	3.5	4
RA3L	3	4	5	6	7	8

Effect by push direction



Mass of moving part

Model	Mass of moving part [N]
RA1L	0.5
RA2L	1
RA3L	1.8

Caution

- Depending on teaching pendant version or PC software, the current limiting value can be set within 71% to 80%. Be sure to read the "Caution" section shown at the beginning of the manual.
- Movement speed during push operation is fixed at 20mm/s.

RCP3 Series Mini Rod type

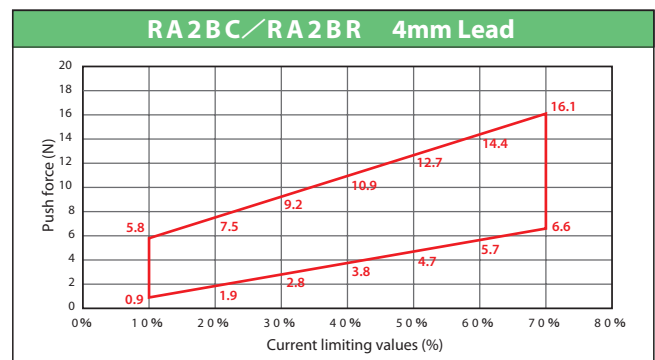
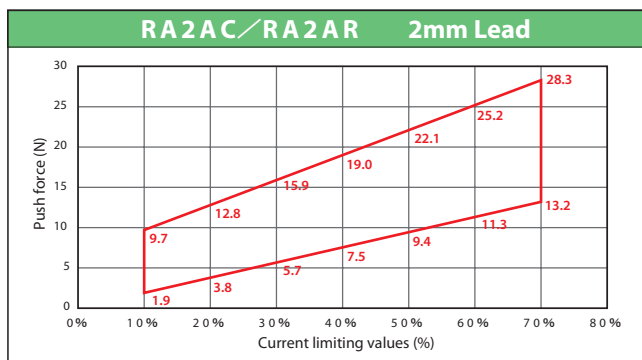
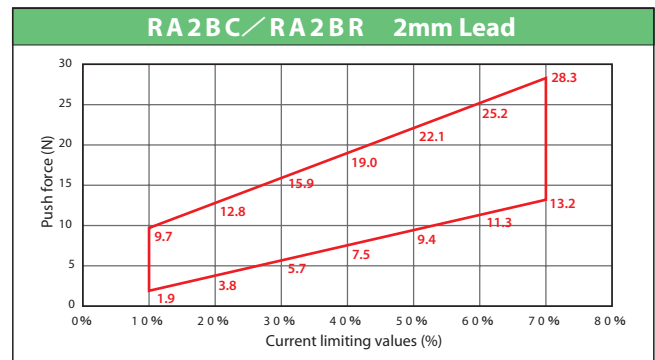
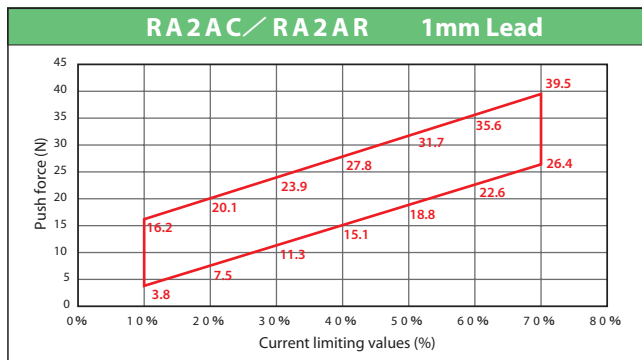
* The red line ranges are specification values.

For push-motion operation, select the model with the desired push force that falls within the range of the red line in the graph below.

(The graph is extended to accommodate performance decrease in the slide screws due to wear.)

Caution

- Movement speed during push operation is fixed at 5mm/s.



Refer to these graphs when setting the PUSH % for the stepper products for PUSH moves. Note valid range from 10 to 70% in these units.

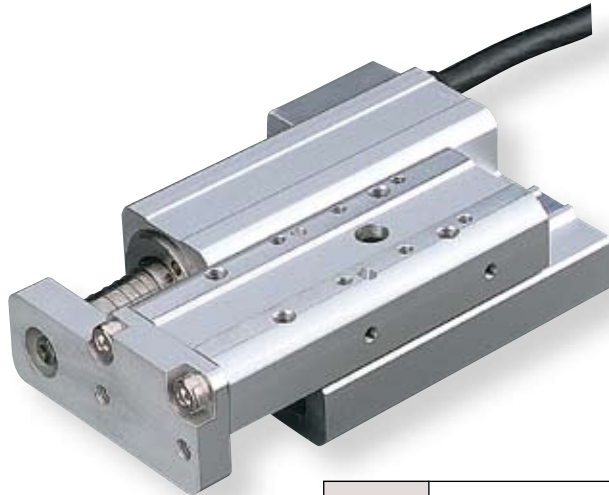
RCA2-TF3N

ROBO Cylinder Mini Table type Short Length Flat type Actuator Width 61mm
24V servo motor Lead screw specification

■ Model Description **RCA2** – **TF3N** – **I** – **10** – – **30** – – –

Series	Type	Encoder type	Motor type	Lead	Stroke	Compatible Controllers	Cable length	Option
		I: Incremental specification * Model number is "I" when used with simple absolute unit.	10: Servo Motor 10W	4S: Lead screw 4mm 2S: Lead screw 2mm 1S: Lead screw 1mm	30: 30mm	A1: ACON RACON ASEL A3: ASEP	N: None P: 1m S: 3m M: 5m X□□: Length Designation	Following options Refer to price table

*See page 11 for details on the model descriptions.



Only shows Rated thrust (applicable for positioning calc's). For PUSH, only 70% of this value MAX can be specified.

POINT
Notes on selection

(1) The payload is the value when operated at 0.2G acceleration. Acceleration limit is value indicated above.

Actuator Specification Table								
Leads and Payloads						Stroke and Maximum Speed		
Model	Motor output (W)	Feed screw	Lead (mm)	Maximum payload		Rated thrust (N)	Positioning Repeatability (mm)	Stroke (mm)
				Horizontal (kg)	Vertical (kg)			
RCA2-TF3N-I-10-4S-30-①-②-③	10	Lead screw	4	0.25	0.125	25.1	±0.05	30 (Fixed)
RCA2-TF3N-I-10-2S-30-①-②-③			2	0.5	0.25	50.3		
RCA2-TF3N-I-10-1S-30-①-②-③			1	1	0.5	100.5		

Lead	Stroke 30 (mm)	
	4	2
Lead screw	200	100
	50	

Legend ① Compatible Controllers ② Cable length ③ Option (Unit = mm/s)

(1) Price list (by stroke)

Stroke (mm)	Type code
	TF3N
	Encoder type
	Incremental
	Feed screw
Lead screw	
25	–

(2) Cable length (price chart)

Type	Cable symbol	Standard price
Standard type (Robot cable)	P (1m)	–
	S (3m)	–
	M (5m)	–
Special length	X06 (6m) to X10 (10m)	–
	X11 (11m) to X15 (15m)	–
	X16 (16m) to X20 (20m)	–

* Robot type cable comes as standard with the RCA2 actuator.
* See page 113 for maintenance cables.

(3) Option price list (standard price)

Title	Option code	See page	Standard price
Change the cable connector outlet direction	K2	→P32	–

Actuator Specification

Item	Description
Drive System	Lead screw, φ4mm, rolled C10
Backlash	0.3mm or less (initial value)
Frame	Material: Aluminum, white alumite treated
Dynamic allowable moment (see note)	Ma : 9.9 N m Mb : 9.9 N m Mc : 3.3 N m
Ambient operating temperature, humidity	0 to 40 °C, 85% RH or less (no condensation)
Service life	Horizontal specification: 10 million cycles, Vertical specification: 5 million cycles

(Note) For cases when the guide service life has been set to 5,000km.