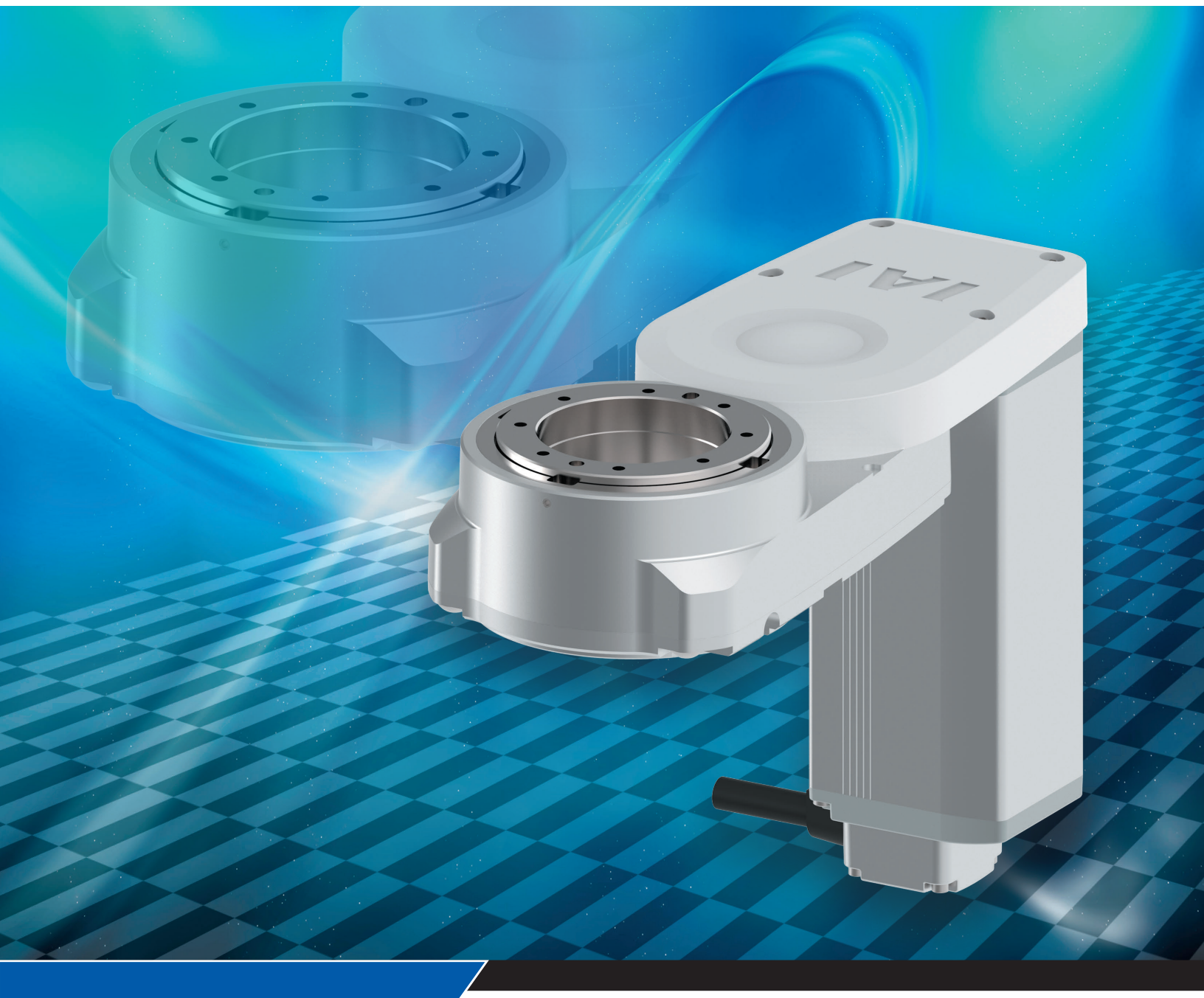
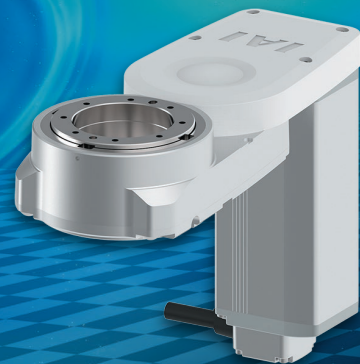


Hollow Rotary

RCP6-RTFML



Slim and lightweight RCP6-RTFML Rotary with large-diameter hollow shaft of $\phi 49$, suitable for combined axes, is now available

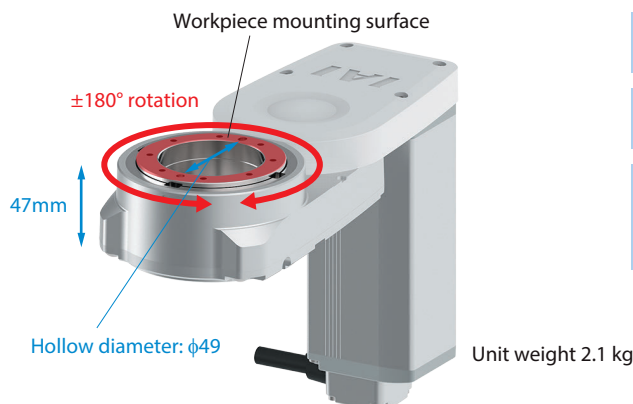


1

$\phi 49$ large-diameter hollow shaft

Thin type with rotation part 47mm thickness, with unit weight of 2.1 kg

Wiring can be passed through the hollow section, reducing the design and assembly processes.



Large-diameter hollow shaft

Slim and lightweight

Reduced design process
Reduced assembly process

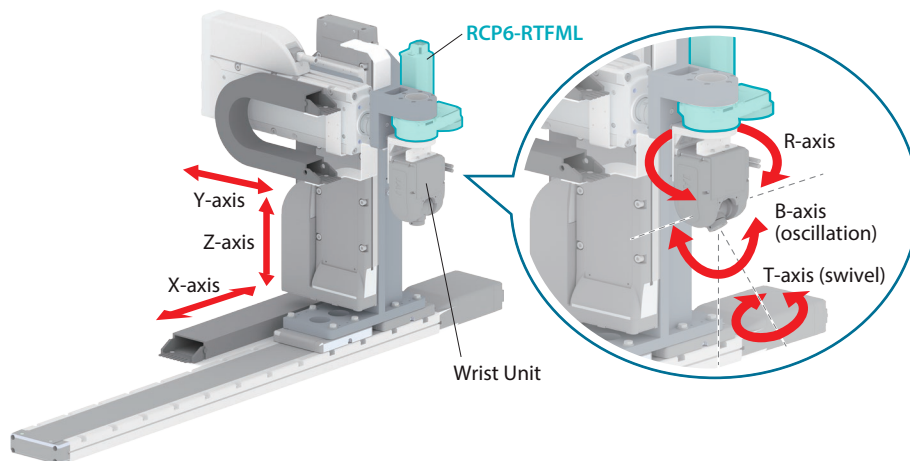
Unit weight 2.1 kg

2

Can be combined with Cartesian axis, Gripper or Wrist Unit

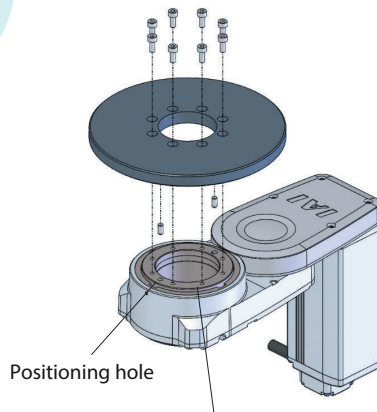
It can be used as a shaft for rotating grippers and Wrist Units.

It can be combined with Cartesian 3-axis and Wrist Unit rotational 2-axis to enable movement with 6 axes of freedom.

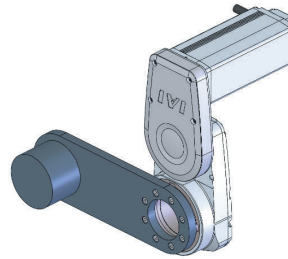


3

Tables and jigs can be directly mounted on the rotating section. Brake option can also be selected, and horizontal use is possible as well.



Positioning hole
Tapped mounting hole * The bolts, positioning pins, mounting brackets and the like should be prepared by the customer.



Reduced design process
Reduced parts
Reduced assembly process

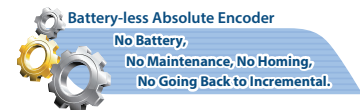
4

Cross roller bearings provide high rigidity and high load
Timing belt drive system produces no backlash

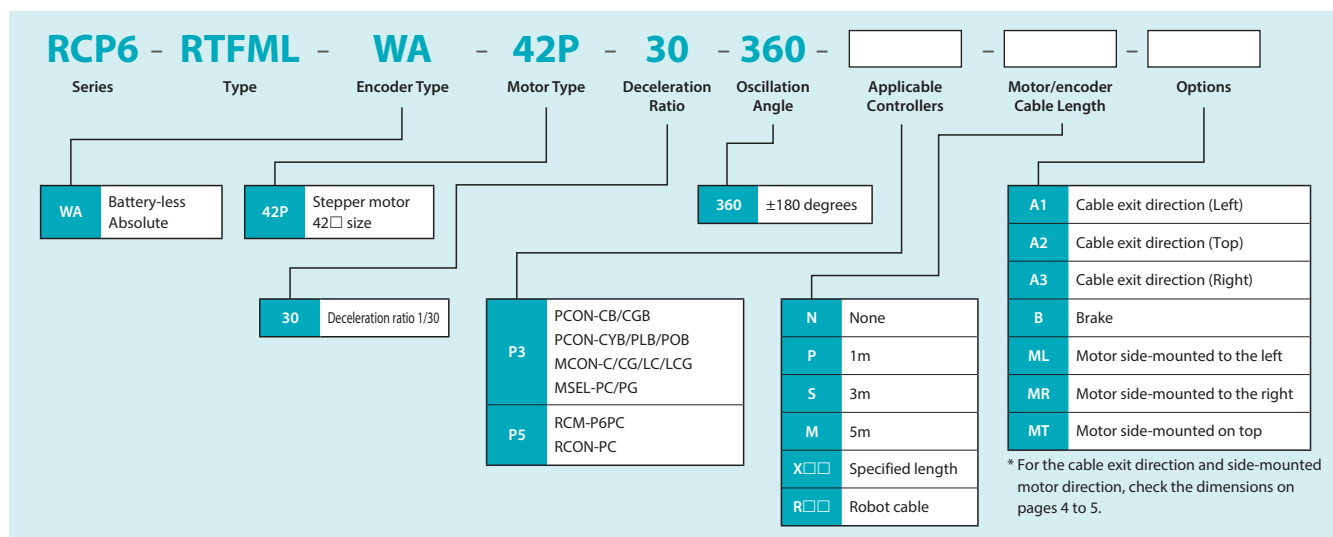
5

Equipped with a Battery-less Absolute Encoder as standard

No battery maintenance is required since there is no battery.
Homing operation is not required at startup or after emergency stop or malfunction.
This reduces your operation time, resulting in reduced production costs.



Model Specification Items



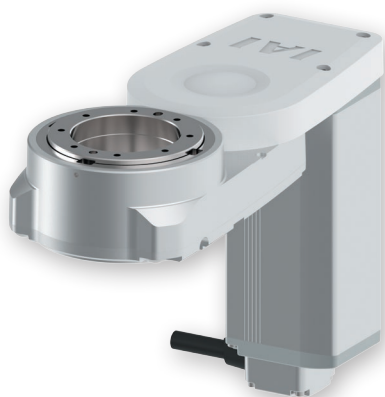
RCP6-RTFML

Battery-less
Absolute

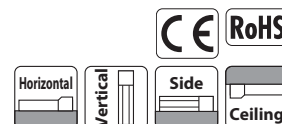
24V
Stepper
Motor

Model Specification Items

Series	Type	Encoder Type	Motor Type	Deceleration Ratio	Oscillation Angle	Applicable Controllers	Motor/encoder Cable Length	Options
RCP6	RTFML	WA Battery-less Absolute	42P Stepper motor 42□□ Size	30 Deceleration ratio 1/30	360 ±180 degrees	P3 PCON MCON MSEL P5 RCM-P6PC RCON	N None P 1m S 3m M 5m X□□ Specified length R□□ Robot cable	Refer to Options table below.



(Note) The photo above shows the motor side-mounted on top (MT).



- (1) The maximum torque is the value at low speed operation. The output torque varies with the speed. Please refer to "Output Torque by Speed (page 8)" for more information.
- (2) The maximum allowable moment of inertia indicates the maximum moment of inertia during rotation. Refer to "Allowable Moment of Inertia by Speed/Acceleration (page 9)" for details.
- (3) When making a selection, calculate according to the Selection Method (page 7) and check the operating conditions.

Option

Name	Option code	Reference page
Cable exit direction (Left) (Note 1)	A1	See P.6
Cable exit direction (Top) (Note 1)	A2	See P.6
Cable exit direction (Right) (Note 1)	A3	See P.6
Brake	B	See P.6
Motor side-mounted to left (Note 1) (Note 2)	ML	See P.6
Motor side-mounted to right (Note 1) (Note 2)	MR	See P.6
Motor side-mounted on top (Note 1) (Note 2)	MT	See P.6

(Note 1) For the direction, check the dimensions on pages 4 to 5.

(Note 2) Be sure to specify one of these options when determining the Model Specification Items.

Motor/encoder Cable Length (between pigtail and controller)

Type	Cable code	P3	P5
Standard type	P(1m)	○	○
	S(3m)	○	○
	M(5m)	○	○
	X06(6m) ~ X10(10m)	○	○
Specified length	X11(11m) ~ X15(15m)	○	○
	X16(16m) ~ X20(20m)	○	○
	R01(1m) ~ R03(3m)	○	○
	R04(4m) ~ R05(5m)	○	○
Robot cable	R06(6m) ~ R10(10m)	○	○
	R11(11m) ~ R15(15m)	○	○
	R16(16m) ~ R20(20m)	○	○

*CB-CAN-MPA□□□(-RB): P3(PCON/MCON/MSEL)

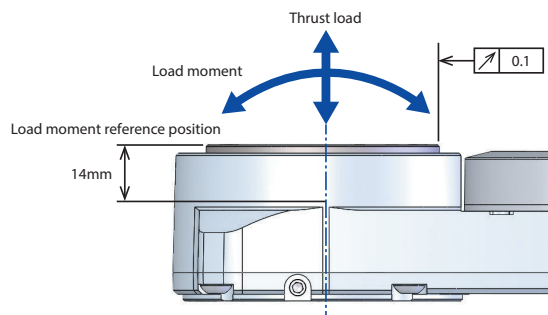
CB-ADPC-MPA□□□(-RB): P5(RCM-P6PC/RCON)

□□□ for length: ex. 030 for 3m

Add "-RB" for robot cable

Main Specifications

Item	Description
Deceleration ratio	1/30
Speed / acceleration/ deceleration	Max speed 800 deg/s
	Max. acceleration/deceleration 0.7G (6,865 deg/s²)
Brake	Brake specifications Non-excitation actuated electromagnetic brake
	Brake retaining torque 4.2N·m
Operation range	Oscillation angle ±180 degrees



Item	Description
Drive system	Stepper motor + timing belt
Positioning repeatability	±0.01 degrees
Lost motion	0.05 degrees
Maximum torque	5.2N·m
Maximum allowable moment of inertia	0.08kg·m²
Allowable dynamic thrust load	600N
Allowable dynamic load moment	30N·m
Output shaft runout	0.1mm
Ambient operating temp. & humidity	0~40°C, 85% RH or less (Non-condensing)
Degree of protection	IP40
International Standards compliance	CE marking, RoHS Directive
Motor type	Stepper motor
Encoder type	Battery-less Absolute
Encoder pulse count	8192 pulse/rev

Output Torque by Speed

Speed (deg/s)	Output torque (N·m)
0	5.2
100	5.2
200	4.3
300	3.7
400	3.0
500	2.6
600	2.1
700	1.7
800	1.4

Allowable Moment of Inertia by Speed/Acceleration

Speed (deg/s)	Acceleration/deceleration (G)	
	0.3	0.7
0	0.080	0.054
100	0.080	0.054
200	0.072	0.036
300	0.063	0.032
400	0.059	0.032
500	0.050	0.027
600	0.041	0.018
700	0.018	0.009
800	0.014	0.005

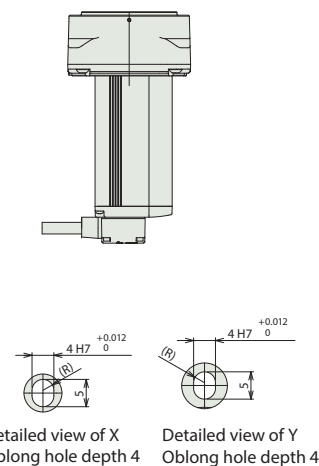
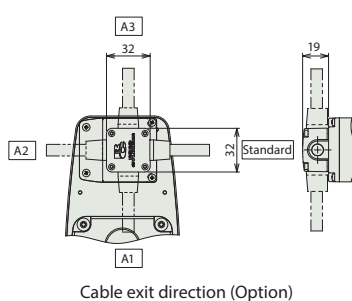
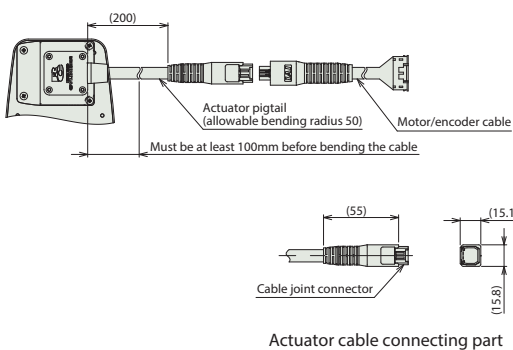
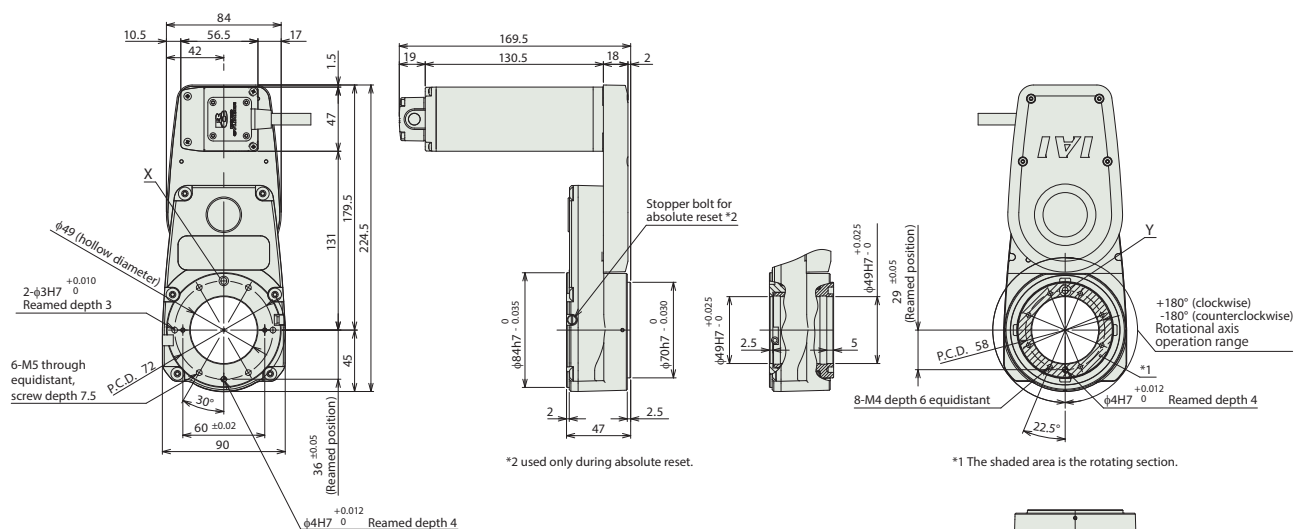
(Unit is $\text{kg}\cdot\text{m}^2$)

■ Dimensions

CAD drawings can be downloaded from our website.
www.intelligentactuator.com



■ Motor side-mounted on top (MT)



■ **Weight**

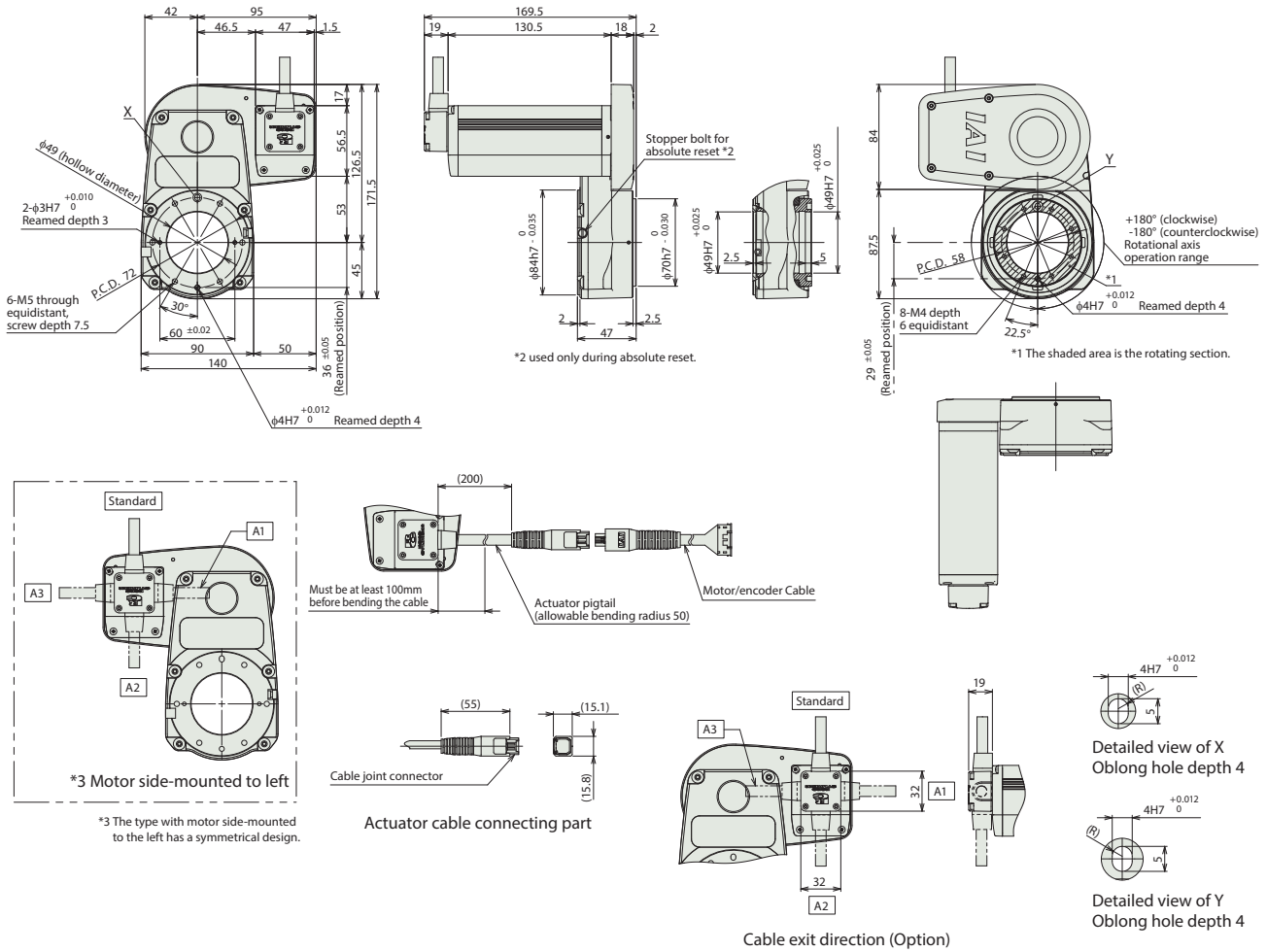
Type	RTFML
Mass (kg) W/o Brake	2.1
With Brake	2.2

■ Motor side-mounted to right (MR) (The type with motor side-mounted to left (ML) has a symmetrical design.)

CAD drawings can be downloaded from our website.
www.intelligentactuator.com

2D
CAD

3D
CAD










■ Weight

Mass (kg)	Type	RTFML
	W/o Brake	2.1
	With Brake	2.2

Applicable Controllers

The actuators on this page can be operated by the controllers indicated below. Please select the type depending on your intended use. Motor size of RCP6-RTFML: 42P

Name	External view	Max. number of connectable axes	Power supply voltage	Control method																Maximum number of positioning points	Reference page
				Positioner	Pulse-train	Program	Network option *														
DV	CC	CIE	PR				CN	ML	ML3	EC	EP	PRT	SSN	ECM							
MCON-C/CG		8 ^(Note 2)	24VDC	-	-	-	●	●	-	●	●	-	●	●	●	●	●	256	Please contact IAI for more information.		
MCON-LC/LCG		6 ^(Note 2)		-	-	●	●	●	-	●	●	-	-	●	●	●	-	-		256	
MSEL-PC/PG		4	Single phase 100~230VAC	-	-	●	●	●	-	●	-	-	-	●	●	●	-	-		30000	
PCON-CB/CGB		1	24VDC	^(Note 1) ●	^(Note 1) ●	-	●	●	-	●	●	●	●	●	●	●	-	-		512 (768 for network spec.)	
PCON-CYB/PLB/POB		1		^(Note 1) ●	^(Note 1) ●	-	-	-	-	-	-	-	-	-	-	-	-	-		64	
RCM-P6PC		1	Can be used within the RCP6S Gateway system.																768	RCON Pamphlet	
RCON		16	24VDC	-	-	-	●	●	●	●	-	-	-	●	●	●	-	-	128		

(Note 1) For network abbreviations such as DV and CC, please contact IAI.

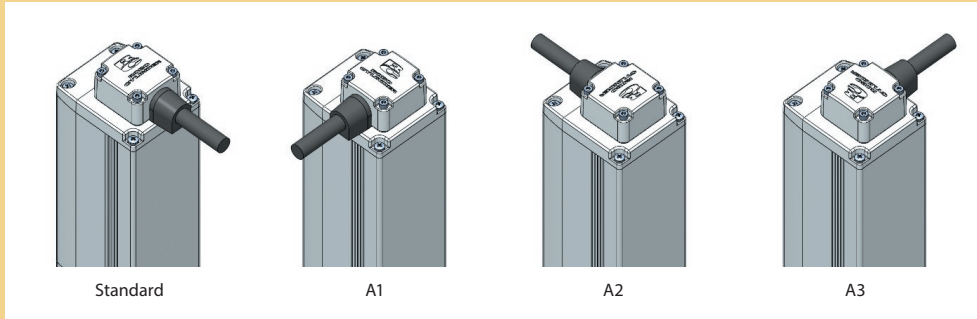
(Note 2) These values are the max no. of axes connectable with all non-high output axes. RCP6-RTFML does not support non-high output mode. The max no. of connectable axes with all high-output mode is 4 for C and 3 for LC.

Options

Cable Exit Direction

Model A1 / A2 / A3

Description Pigtail cable exit direction can be specified.
See pages 4 and 5 for details.



With Brake

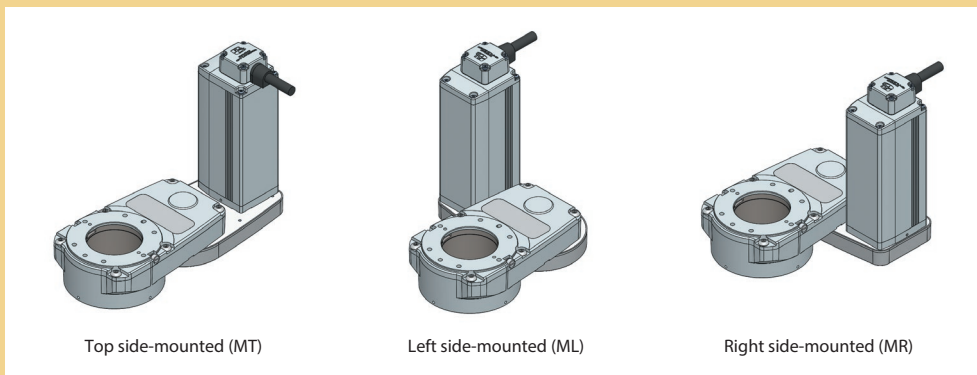
Model B

Description This is used to prevent the rotary motion due to gravity and/or external force during power outages or when the servo is OFF. When using the output shaft horizontally, it is possible to prevent workpieces and the like from falling due to the rotation of the output shaft.

Side-mounted Motor Direction

Model MT / ML / MR

Description The side-mounting direction of the motor unit can be specified. The top side-mounted direction is MT, left is ML and right is MR. Check the dimensions and details on pages 4 and 5.



Selection Method

The following conditions must be satisfied for operation. Calculate 1 and 2 to determine the conditions.

Condition 1

Check the moment of inertia

(1) Without load torque

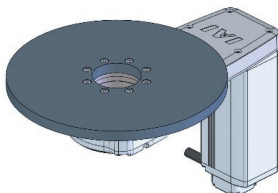
(2) With load torque

*The confirmation method for moment of inertia differs depending on whether load torque is present.

(1) Without load torque

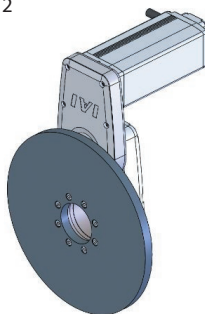
When used as shown in the images below, the unit will not be subject to load torque due to gravity. In this case, calculate only the moment of inertia of the loaded object and make sure that it does not exceed the allowable moment of inertia. Using the formulae of typical shapes (page 10), calculate the moment of inertia of the tool and workpiece to be used.

Example 1



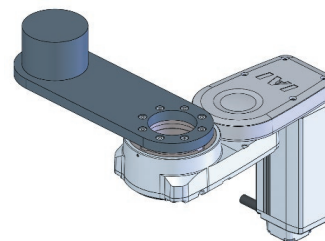
Load center mass location: Rotary shaft center
Body installation: Rotary shaft upward or downward

Example 2



Load center mass location: Rotary shaft center
Body installation: Rotary shaft horizontal

Example 3



Load center mass location: Offset from rotary shaft center
Body installation: Rotary shaft upward or downward

[Allowable Moment of Inertia by Speed/Acceleration]

Speed (deg/s)	Acceleration/deceleration	
	0.3G	0.7G
0	0.080	0.054
100	0.080	0.054
200	0.072	0.036
300	0.063	0.032
400	0.059	0.032
500	0.050	0.027
600	0.041	0.018
700	0.018	0.009
800	0.014	0.005

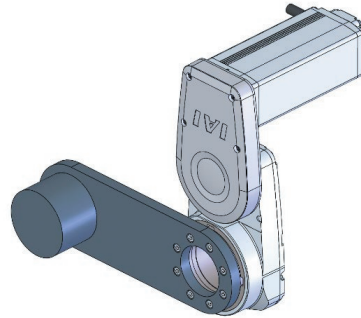
(Unit is kg·m²)

(2) With load torque

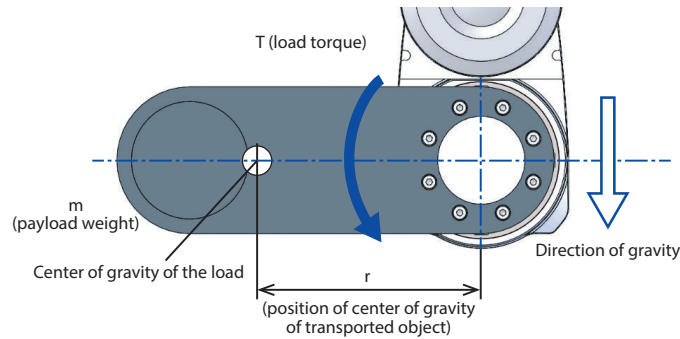
When used as shown in the image below, the unit will be subjected to load torque due to gravity, reducing the allowable moment of inertia accordingly.

First, calculate the load torque and obtain the corrected allowable moment of inertia. Then calculate the moment of inertia and check that it does not exceed the corrected allowable moment of inertia. A calculation example is shown below.

Example



Load: Offset from rotary shaft center
Body installation: Rotary shaft horizontal



(Step 1) Calculating the load torque T

$$T = mgr \times 10^{-3} \text{ [N}\cdot\text{m]}$$

m: Mass of transported object [kg]

g: Gravitational acceleration [m/s²]

r: Center of gravity of the transported object [mm]

(Step 2) Calculating the allowable moment of inertia correction factor C_j

$$C_j = \frac{T_{\max} - T}{T_{\max}}$$

T_{max}: Output torque [N·m]

* Refer to the table below for the value of output torque T_{max}.

[Output Torque by Speed T_{max}]

Speed (deg/s)	Output torque (N·m)
0	5.2
100	5.2
200	4.3
300	3.7
400	3.0
500	2.6
600	2.1
700	1.7
800	1.4

Operating Conditions

(Step 3) Calculating the corrected allowable moment of inertia J_{tl}

$$J_{tl} = J_{max} \times C_j \text{ [kg}\cdot\text{m}^2\text{]}$$

J_{max} : Allowable moment of inertia [kg·m²]

* Refer to the table below for the value of allowable moment of inertia J_{max} .

[Allowable Moment of Inertia by Speed/Acceleration J_{max}]

Speed (deg/s)	Acceleration/deceleration	
	0.3G	0.7G
0	0.080	0.054
100	0.080	0.054
200	0.072	0.036
300	0.063	0.032
400	0.059	0.032
500	0.050	0.027
600	0.041	0.018
700	0.018	0.009
800	0.014	0.005

(Unit is kg·m²)

(Step 4) Checking the moment of inertia of the transported object

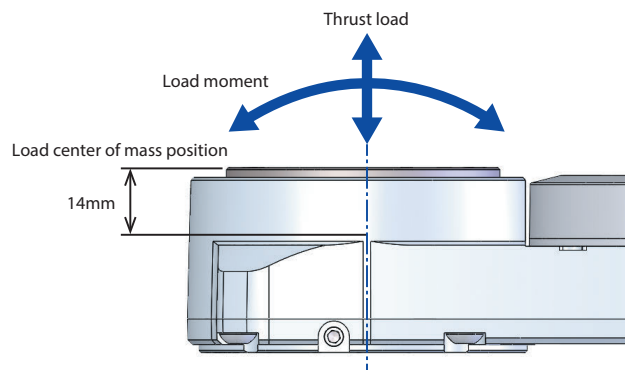
Using the "Formulae for calculating moment of inertia of typical shapes" on page 10, calculate the moment of inertia of the loaded object and make sure it does not exceed the corrected allowable moment of inertia obtained in step 3.

Condition 2

Check the load moment and thrust load

Make sure that the load moment and thrust load applied to the output shaft are within the allowable values.
If the allowable values are exceeded, this may lead to shortened product life or failure.

Item	Description
Allowable dynamic thrust load	600N
Allowable dynamic load moment	30N·m



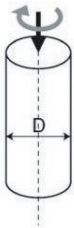
● Formulae for calculating moment of inertia of typical shapes

1. When the rotational 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 (also for circular plate)

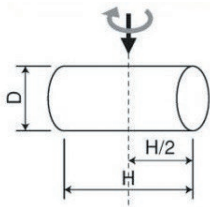
<Formula> $I = M \times (D \times 10^{-3})^2 / 8$ [kg·m²]



Moment of inertia of cylinder: I (kg·m²)
Cylinder mass: M (kg)
Cylinder diameter: D (mm)

(2) Moment of inertia of cylinder 2

<Formula> $I = M \times ((D \times 10^{-3})^2 / 4 + (H \times 10^{-3})^2 / 3) / 4$ [kg·m²]

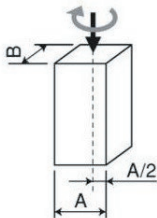


Moment of inertia of cylinder: I (kg·m²)
Cylinder mass: M (kg)
Cylinder diameter: D (mm)
Cylinder length: H (mm)

(3) Moment of inertia of prism 1

* The same formula can be applied irrespective of the height of the prism (also for rectangular plate)

<Formula> $I = M \times ((A \times 10^{-3})^2 + (B \times 10^{-3})^2) / 12$ [kg·m²]



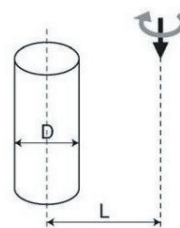
Moment of inertia of prism: I (kg·m²)
One side of prism: A (mm)
One side of prism: B (mm)
Prism mass: M (kg)

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

(4) Moment of inertia of cylinder 3

* The same formula can be applied irrespective of the height of the cylinder (also for circular plate)

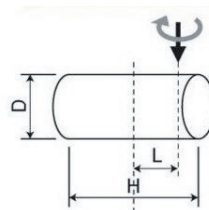
<Formula> $I = M \times (D \times 10^{-3})^2 / 8 + M \times (L \times 10^{-3})^2$ [kg·m²]



Moment of inertia of cylinder: I (kg·m²)
Cylinder mass: M (kg)
Cylinder diameter: D (mm)
Distance from rotational axis to center: L (mm)

(5) Moment of inertia of cylinder 4

<Formula> $I = M \times ((D \times 10^{-3})^2 / 4 + (H \times 10^{-3})^2 / 3) / 4 + M \times (L \times 10^{-3})^2$ [kg·m²]

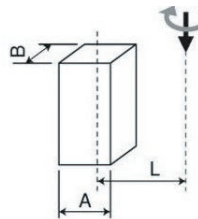


Moment of inertia of cylinder: I (kg·m²)
Cylinder mass: M (kg)
Cylinder diameter: D (mm)
Cylinder length: H (mm)
Distance from rotational axis to center: L (mm)

(6) Moment of inertia of prism 2

* The same formula can be applied irrespective of the height of the prism (also for rectangular plate)

<Formula> $I = M \times ((A \times 10^{-3})^2 + (B \times 10^{-3})^2) / 12 + M \times (L \times 10^{-3})^2$ [kg·m²]



Moment of inertia of prism: I (kg·m²)
Prism mass: M (kg)
One side of prism: A (mm)
One side of prism: B (mm)
Distance from rotational axis to center: L (mm)

IAI America, Inc.

US Headquarters: 2690 W. 237th Street, Torrance, CA 90505 (800) 736-1712

Chicago Office: 110 E. State Pkwy, Schaumburg, IL 60173 (800) 944-0333

Atlanta Office: 1220 Kennestone Circle, Suite 108, Marietta, GA 30066 (888) 354-9470

www.intelligentactuator.com

The information contained in this product brochure
may change without prior notice due to product improvements.
Please contact IAI for the latest information.

IAI Industrieroboter GmbH

Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany

IAI (Shanghai) Co., Ltd.

Shanghai Jiahua Business Center A8-303, 808,
Hongqiao Rd., Shanghai 200030, China

IAI Robot (Thailand) Co., Ltd.

825 Phairojkiija Tower 7th Floor, Bangna-Trad RD.,
Bangna, Bangna, Bangkok 10260, Thailand