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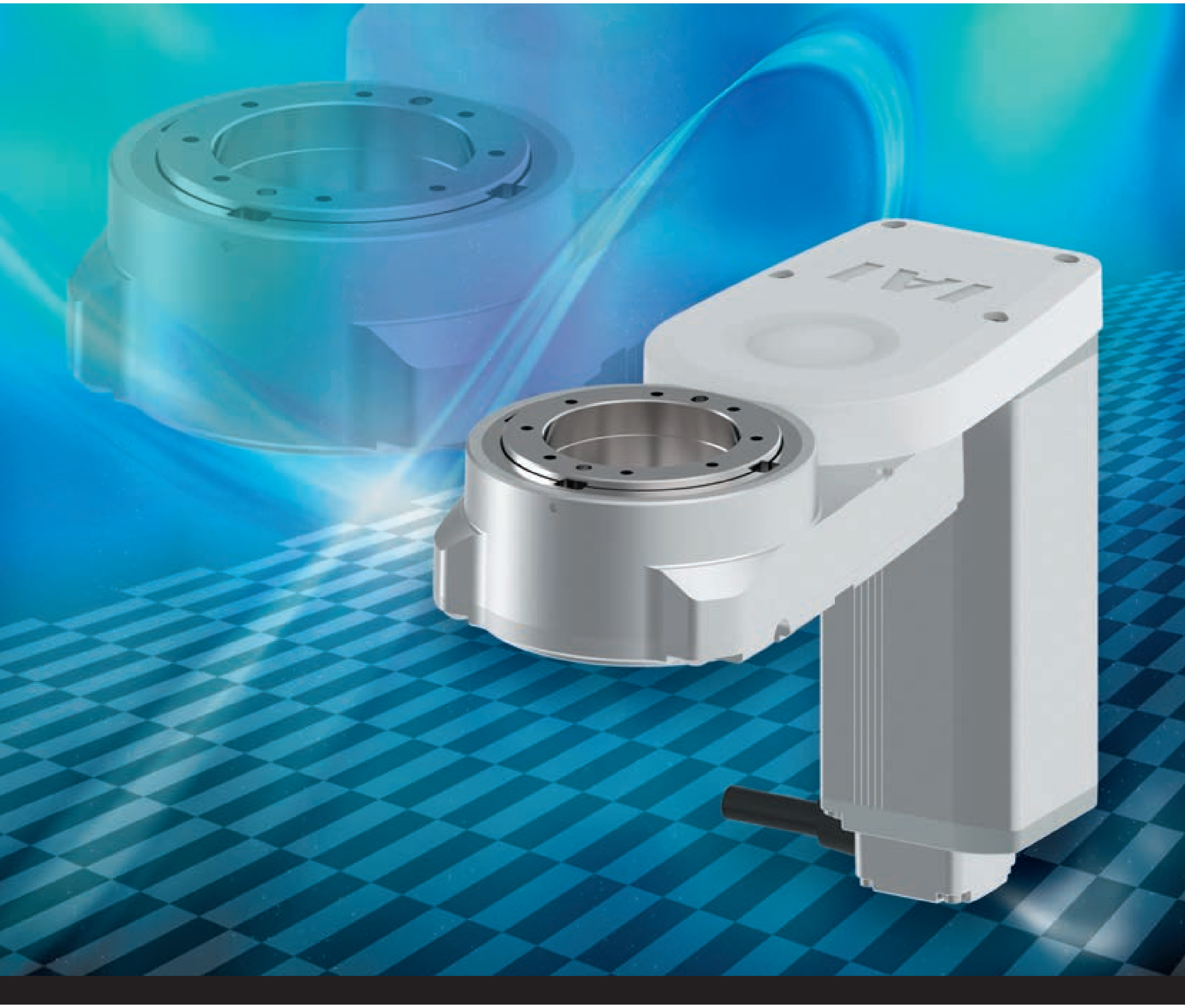
GB

Hollow Shaft Rotary Type RCP6-RTFML



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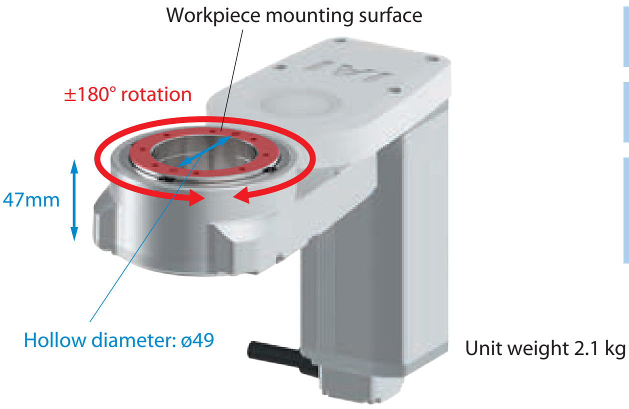
Slim and lightweight RCP6-RTFML Rotary with large-diameter hollow shaft of ø49, suitable for combined axes, is now available

1

ø49 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.

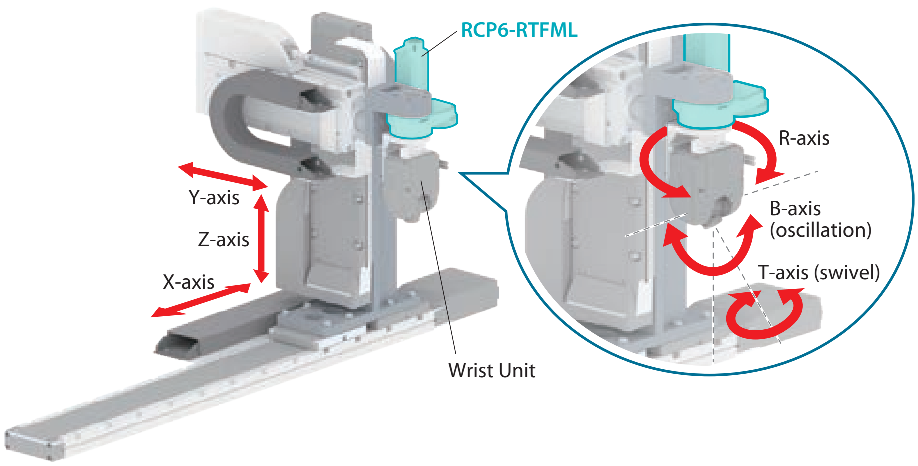


- Large-diameter hollow shaft
- Slim and lightweight
- Reduced design process
  Reduced assembly process

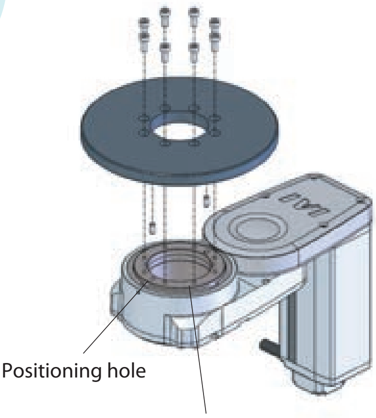
2

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.



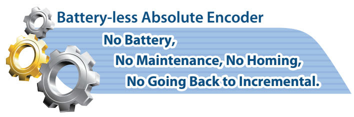
Reduced design process
Reduced parts
Reduced assembly process

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

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 – WA – 42P – 30 – 360 – □ – □ – □

Series	Type	Encoder Type	Motor Type	Deceleration Ratio	Oscillation Angle	Applicable Controllers	Cable Length	Options
RCP6	RTFML	WA	42P	30	360	□	□	□

Encoder Type

WA	Battery-less Absolute

Motor Type

42P	Pulse motor 42□ size

Deceleration Ratio

30	Deceleration ratio 1/30

Oscillation Angle

360	±180 degrees

Applicable Controllers

P3	PCON-CB/CGB PCON-CYB/PLB/POB (*) MCON-C/CG MCON-LC/LCG (*) MSEL-PC/PG
P5	RCM-P6PC (*) RCON-PC (*)

(*) Coming soon

Cable Length

N	None
P	1m
S	3m
M	5m
X□□	Specified length
R□□	Robot cable

Options

A1	Cable exit direction (Left)
A2	Cable exit direction (Top)
A3	Cable exit direction (Right)
B	Brake
ML	Motor side-mounted to the left
MR	Motor side-mounted to the right
MT	Motor side-mounted on top

* For the cable exit direction and side-mounted motor direction, check the dimensions on pages 4 to 5.

RCP6-RTFML

Simple Dustproof | Battery-less Absolute | Hollow Rotary | Body Width 90* mm | 24v Pulse Motor

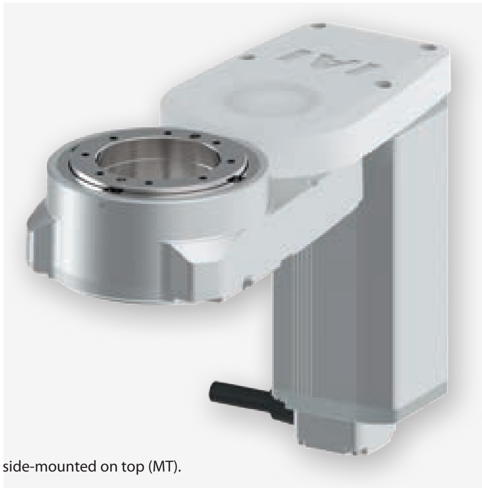
■ Model Specification Items

RCP6	—	RTFML	—	WA	—	42P	—	☐	—	☐	—	☐	—	☐	—	☐
Series		Type		Encoder Type		Motor Type		Deceleration Ratio		Oscillation Angle		Applicable Controllers		Cable Length		Options
				WA: Battery-less Absolute		42P: Pulse Motor 42☐ Size		30: 1/30		360: ±180deg		P3: PCON MCON MSEL P5: RCM-P6PC (Coming soon) RCON (Coming soon)		N: None P: 1m S: 3m M: 5m X☐☐: Specified Length R☐☐: Robot Cable		Please refer to the options table below.

* Body width does not include the width of the parallel mounted motor.

CE RoHS

Horizontal | Vertical | Side | Ceiling



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

POINT Selection Notes

(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.

Actuator Specifications

Item		Description
Deceleration ratio		1/30
Speed / acceleration/ deceleration	Max speed	800 deg/s
	Max. acceleration/deceleration	0.7G (6865 deg/s²)
Brake	Brake specifications	Non-excitation actuated electromagnetic brake
	Brake retaining torque	4.2N·m
Operation range	Oscillation angle	±180 degrees

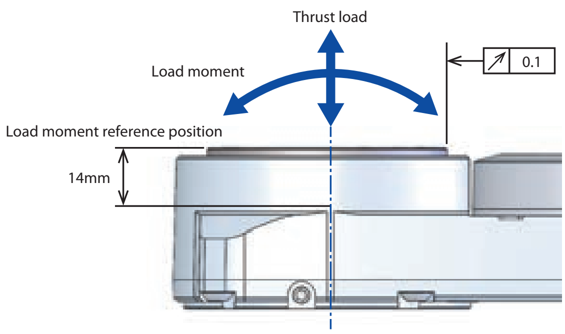
Actuator Specifications

Item	Description
Drive system	Pulse 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
Compliant international standards	CE marking, RoHS Directive
Motor type	Pulse motor
Encoder type	Battery-less Absolute
Encoder pulse count	8192 pulse/rev

Cable Length

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

* Please contact IAI for more information regarding the maintenance cables.



Options

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

(*1) For the direction, check the dimensions on pages 4 to 5.
(*2) Be sure to specify one of these options when determining the Model Specification Items.

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

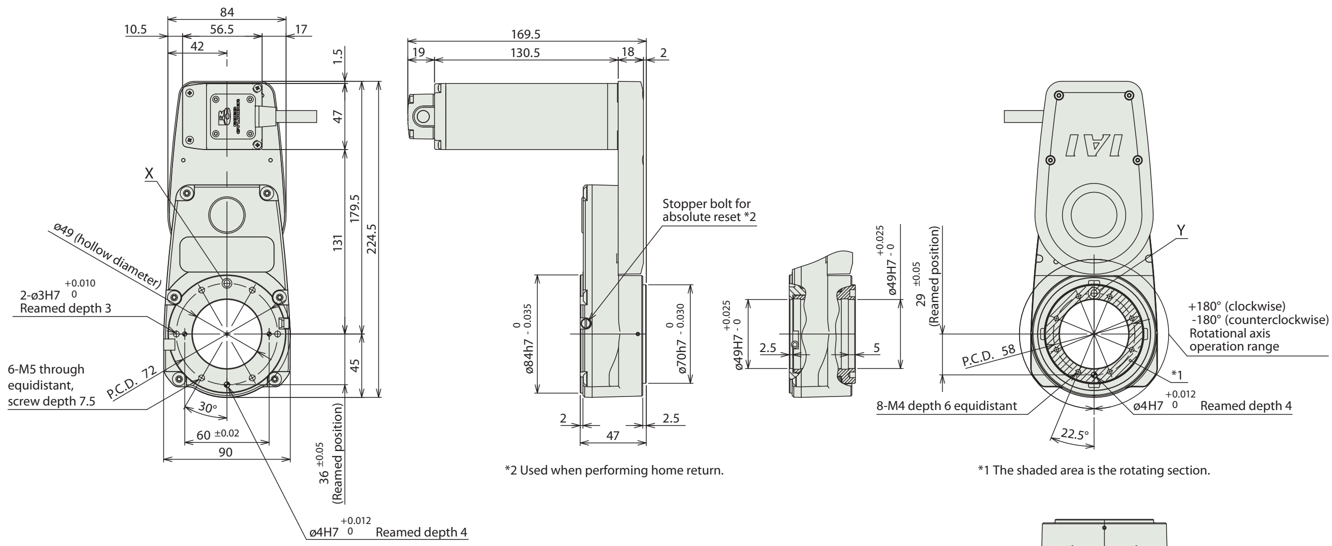
(Unit is kg·m²)

Dimensions

CAD drawings can be downloaded from our website.
www.robocylinder.de

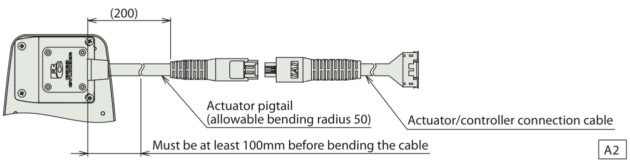
2D CAD 3D CAD

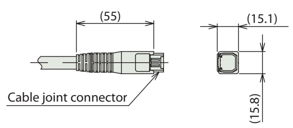
■ Motor side-mounted on top (MT)



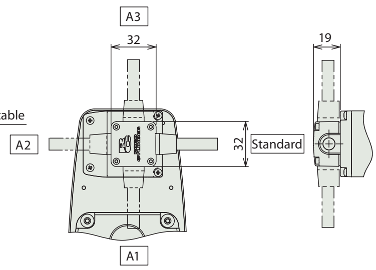
*2 Used when performing home return.

*1 The shaded area is the rotating section.

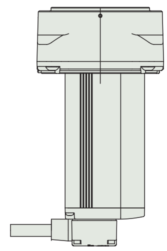


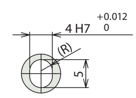


Actuator cable connecting part

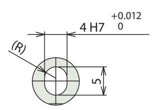


Cable exit direction (Option)





Detailed view of X
Oblong hole depth 4



Detailed view of Y
Oblong hole depth 4

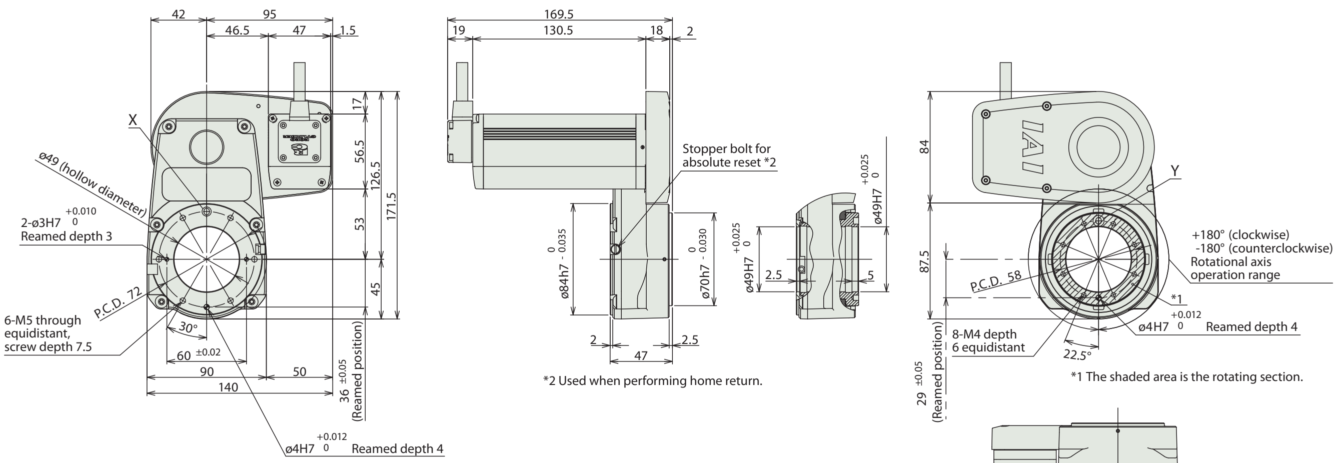
■ Weight

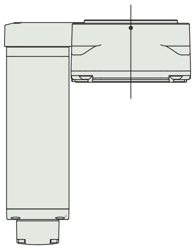
Type		RTFML
Mass (kg)	W/o Brake	2.1
	With Brake	2.2

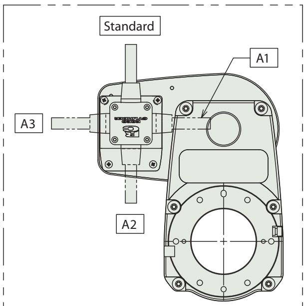
Dimensions

CAD drawings can be downloaded from our website.
www.robocylinder.de
2D CAD 3D CAD

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

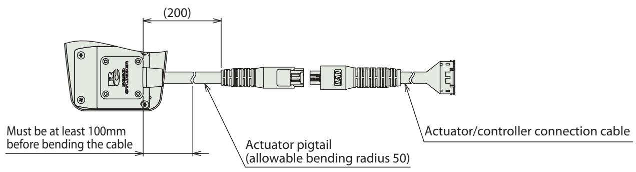


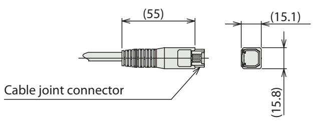




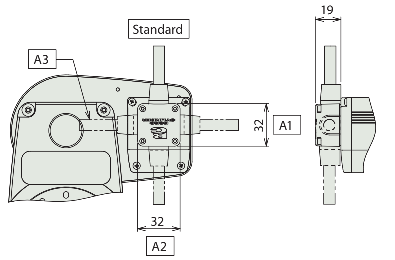
*3 Motor side-mounted to left

*3 The type with motor side-mounted to the left has a symmetrical design.

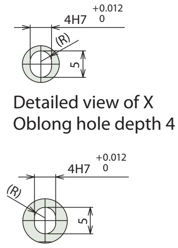




Actuator cable connecting part



Cable exit direction (Option)



Detailed view of X
Oblong hole depth 4

Detailed view of Y
Oblong hole depth 4

■ Weight

Type		RTFML
Mass (kg)	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.

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 **	24VDC	-	-	-	●	●	-	●	●	-	○ ***	●	●	●	○ ***	○ ***	256	Please see the dedicated catalog or manual.
MCON-LC/LCG (Coming soon)		6 **	24VDC	-	-	●	●	●	-	●	●	-	-	●	●	●	-	-	256	
MSEL-PC/PG		4	Single phase 100~230VAC	-	-	●	●	●	-	●	-	-	-	●	●	●	-	-	30000	
PCON-CB/CGB		1	24VDC	● Option	● Option	-	●	●	-	●	●	○ ***	○ ***	●	●	●	-	-	512 (768 for network spec.)	
PCON-CYB/PLB/POB (Coming soon)		1	24VDC	● Option	● Option	-	-	-	-	-	-	-	-	-	-	-	-	-	64	
RCM-P6PC (Coming soon)		1	Can be used within the RCP6S Gateway system.																768	Refer to the RCP6S fieldnetwork manual.
RCON (Coming soon)		16	24VDC	-	-	-	●	●	○ ***	●	-	-	-	●	●	●	-	-	128	Please see the RCON brochure or manual.

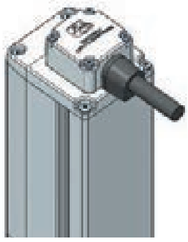
* Network abbreviations: DV - DeviceNet | CC - CC-Link | CIE - CC-Link IE | PR - Profibus-DP | CN - CompoNet | ML - Mechatrolink | ML3 - Mechatrolink-III | EC - EtherCAT | EP - Ethernet/IP | PRT - Profinet-IO | SSN - SSCNET III/H | ECM - EtherCAT Motion
** Please select "high-output setting specification" as an option for the MCON. When high output is enabled the max. number of connectable axes is 4 (MCON-C) or 3 (MCON-LC). *** Not yet available in Europe. For additional information, please ask IAI.

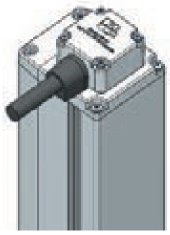
Options

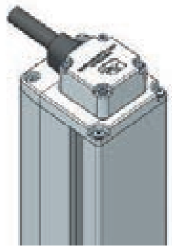
Cable Exit Direction

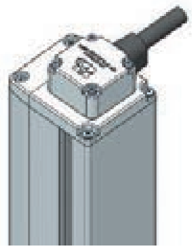
Model **A1 / A2 / A3**

Description The mounting direction of the actuator pigtail to be mounted on the actuator body can be specified.
For the direction, check the dimensions on pages 4 to 5.


Standard


A1


A2


A3

With Brake

Model **B**

Description This is used to prevent the output shaft from moving 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.

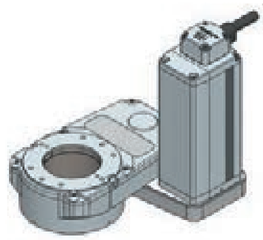
Side-mounted Motor Direction

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.
For the direction, check the dimensions on pages 4 to 5.


Top side-mounted (MT)


Left side-mounted (ML)


Right side-mounted (MR)

Selection Method

The following conditions must be satisfied before operating the unit. Determine the compatibility by calculating Conditions 1 and 2.

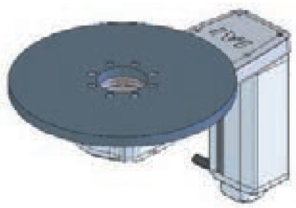
Condition 1

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

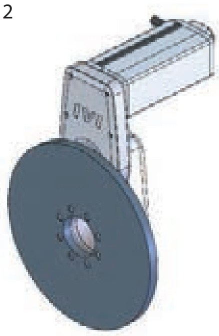
When used as shown in the images below, the unit will not be subject to load torque due to gravity. In this case, calculate only the moment of inertia of the loaded object and make sure that it does not exceed the allowable moment of inertia. Using the formulae of typical shapes (page 10), calculate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

Example 1



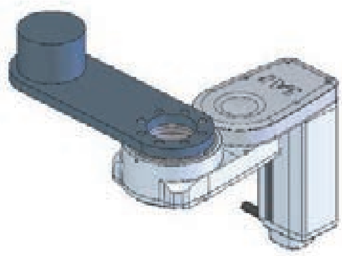
Load center mass location: Rotary shaft center
Body installation: Rotary shaft upward or downward

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

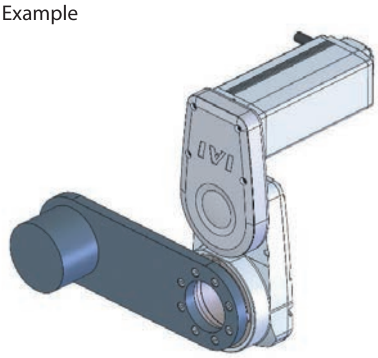
(Unit is kg·m^2)

(2) With load torque

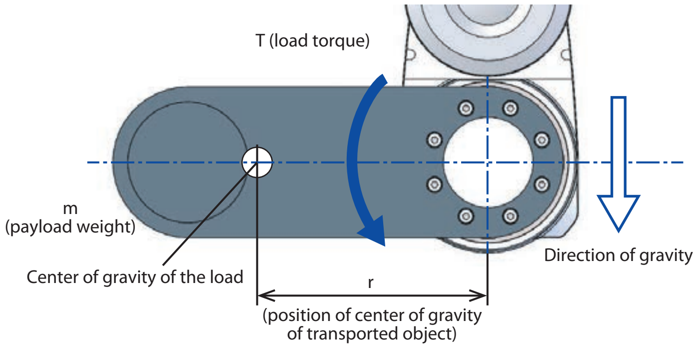
When used as shown in the image below, the unit will be subjected to load torque due to gravity, reducing the allowable moment of inertia accordingly.

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

$T = mgr \times 10^{-3}$ [N·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 Cj

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

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}

$J_{tl} = J_{max} \times C_j$ [kg·m²]

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

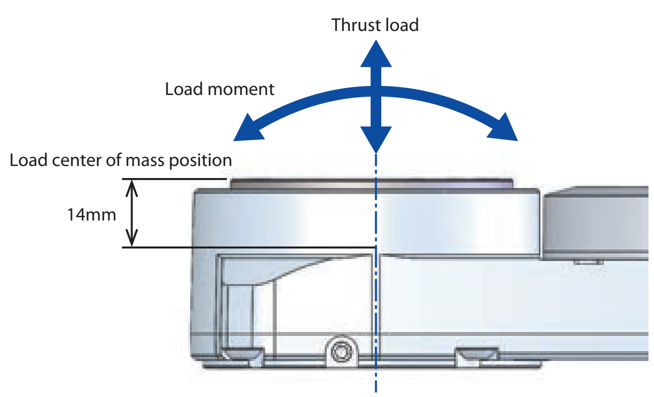
Using the "Formulae for calculating moment of inertia of typical shapes" on page 10, calculate the moment of inertia of the loaded object and make sure it does not exceed the corrected allowable moment of inertia obtained in step 3.

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



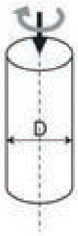
● Formulae for calculating moment of inertia of typical shapes

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)

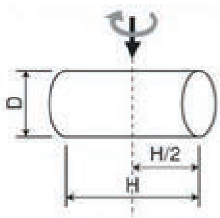
<Formula> $I = M \times (D \times 10^{-3})^2 / 8$ [kg·m²]



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]

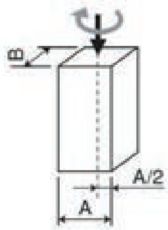


Moment of inertia of cylinder: I (kg·m²)
Cylinder mass: M (kg)
Cylinder diameter: D (mm)
Cylinder length: H (mm)

(3) Moment of inertia of cuboid 1

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

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



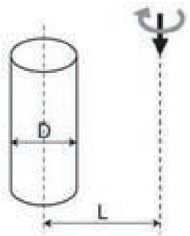
Moment of inertia of cuboid: I (kg·m²)
Cuboid mass: M (kg)
One side of cuboid: A (mm)
Second side of cuboid: B (mm)

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)

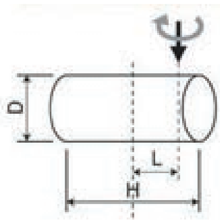
<Formula> $I = M \times (D \times 10^{-3})^2 / 8 + M \times (L \times 10^{-3})^2$ [kg·m²]



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]

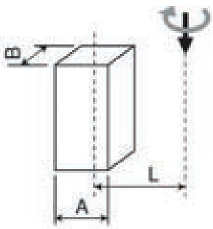


Moment of inertia of cylinder: I (kg·m²)
Cylinder mass: M (kg)
Cylinder diameter: D (mm)
Cylinder length: H (mm)
Distance from rotational axis to center: L (mm)

(6) Moment of inertia of cuboid 2

* The same formula can be applied irrespective of the height of the cuboid (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 cuboid: I (kg·m²)
Cuboid mass: M (kg)
One side of cuboid: A (mm)
Second side of cuboid: B (mm)
Distance from rotational axis to center L (mm)

RCP6 Series
Hollow Rotary Type
Catalogue No. 0219-E

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

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