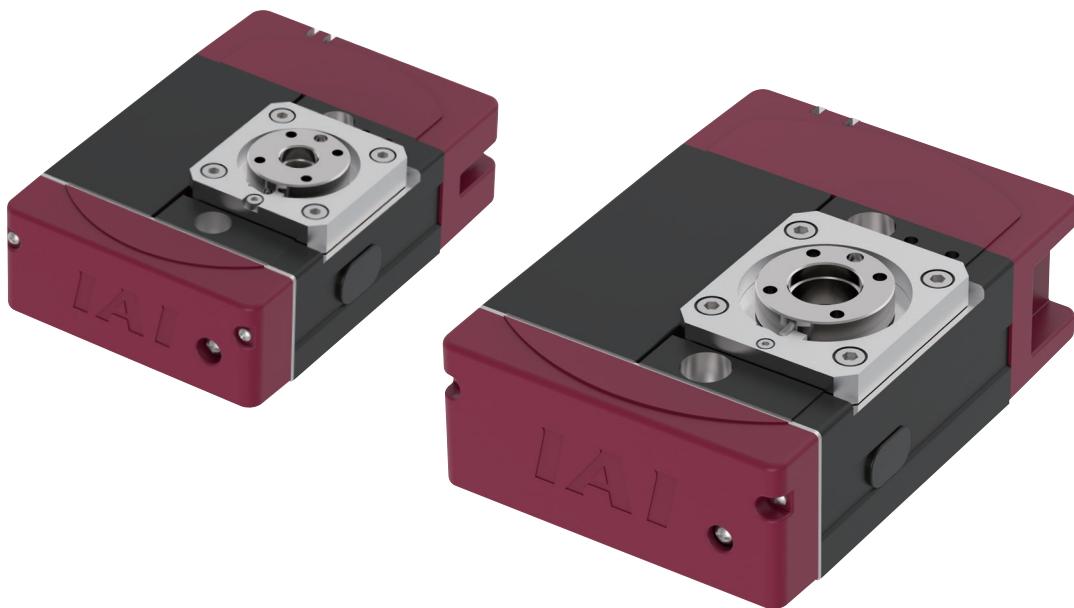


ELECYLINDER® Rotary Type

EC-RTC9 EC-RTC12



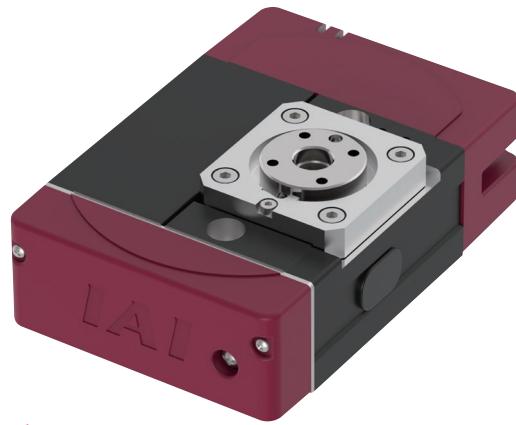
Simple & Wireless Operation
2 Position Actuator



2-point positioning

Built-in controller

ELECYLINDER® EC-RTC9/RTC12 Rotary type

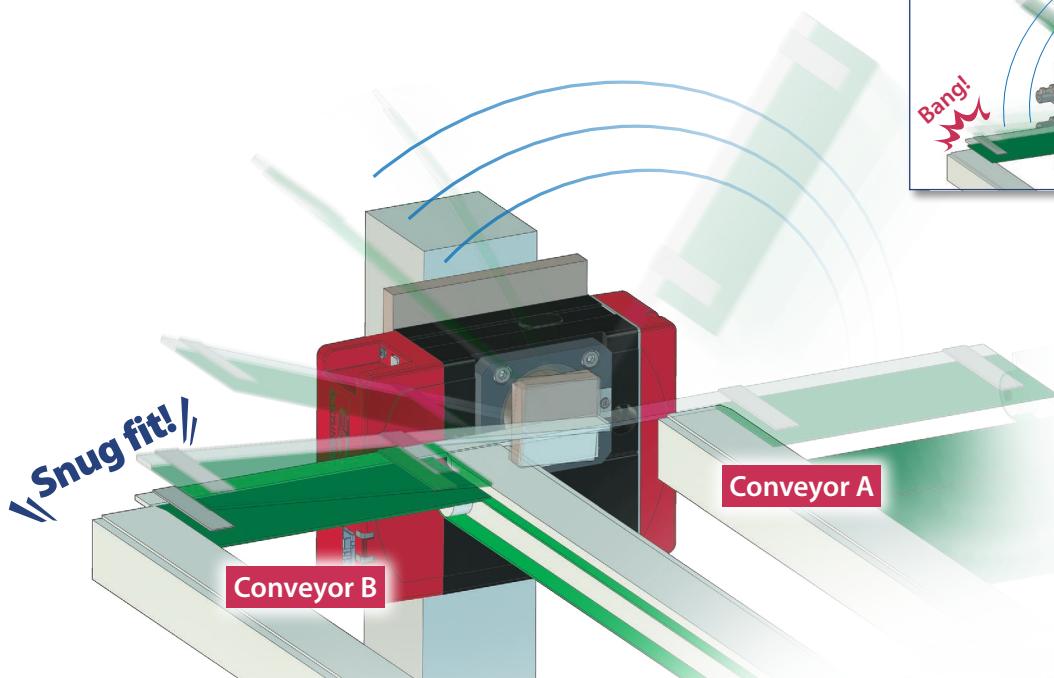


Smooth stopping without impact

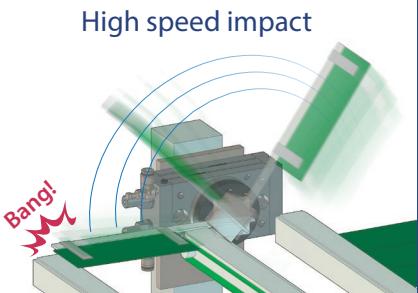
ELECYLINDER allows the acceleration (A), velocity (V), and deceleration (D) to be set using numeric values. This allows the deceleration speed to be adjusted for smooth stopping without impact.

Circuit board turnover system

The **rotary cylinder** turns over circuit boards carried by **conveyor A**, and loads them on **conveyor B**



Conventional system (air rotary)



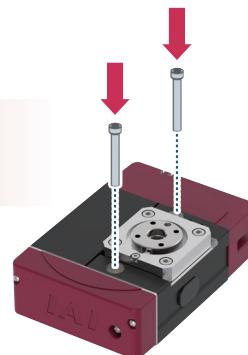
Can be bolted from the top

Installation bolt size

RTC9: M6

RTC12: M8

*Bolts should be prepared by the customer.



Wireless connection (option) eliminates annoying cable connections!

Touch Panel
Teaching Pendant
TB-03



Wireless
(Approx. 5m (guideline))



ELECYLINDER



Model Specification Items

ELECYLINDER®

EC - [] - **M** - **330** - [] - ([])

Series

Type

Deceleration ratio

Oscillation angle

Cable length

Options

RTC9	Flat type S size 90mm wide
RTC12	Flat type L size 117mm wide

M 1/45

330 330 degrees

0	0m
1	1m
10	10m

Cable length
· 0: With power / I/O connector
· 1 ~ 10: Power I/O cable included

Left blank	Incremental encoder specification, NPN specification, no option
B	With brake
NM	Non-motor end specification
PN	PNP specification
SA	Shaft adapter
TA	Table adapter
TMD2	Twin power supply specification
WA	Battery-less Absolute Encoder specification
WL	Wireless communication specification
WL2	Wireless axis operation specification

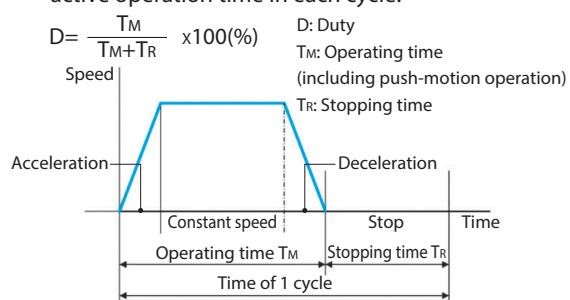
Duty Ratio

EC-RTC9/RTC12 can be operated at 100% of its duty cycle.
(Ambient temperature 0~40°C.)

[Duty Cycle]

Duty cycle is the percentage of the actuator's active operation time in each cycle.

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



Model Selection

Selection Method

The following conditions must be satisfied for use. Calculate and check the following values (procedures 1 and 2).

Procedure 1

Check the moment of inertia

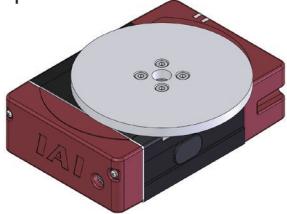
- (1) If there is no load torque
- (2) If there is load torque

*The method for checking the moment of inertia differs depending on whether or not there is a load torque.

(1) If there is no load torque

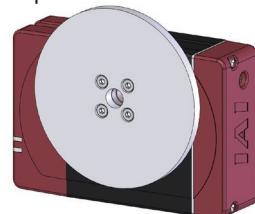
When used as shown in the figure below, there will be no load torque due to gravity. Therefore, calculate the moment of inertia of the load only, and then confirm that it does not exceed the allowable inertia moment. Use the calculation method for the applicable typical shape (P. 4) to calculate the moment of inertia for the tooling or workpiece that will be used.

Example 1



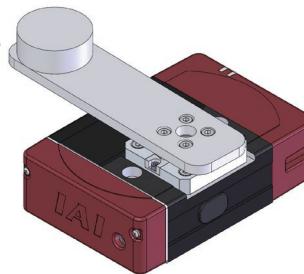
Center mass location of load: Output shaft center
Installation orientation: Horizontal on flat surface/suspended

Example 2



Center mass location of load: Output shaft center
Installation orientation: On side/vertical

Example 3



Center mass location of load: Offset from output shaft center
Installation orientation: Horizontal on flat surface/suspended

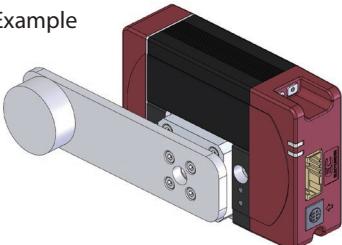
(2) If there is load torque

When used as shown in the figure below, there will be load torque due to gravity.

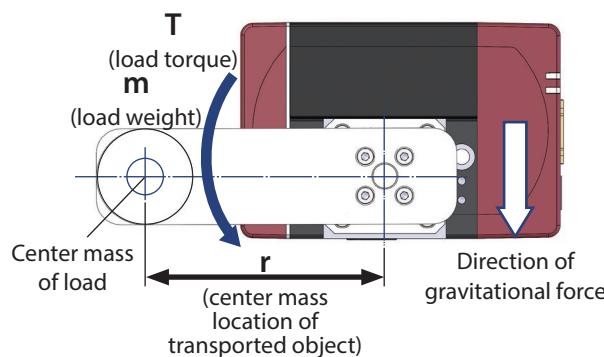
This will cause the allowable moment of inertia to decrease by that amount.

First, calculate the load torque and obtain the corrected allowable moment of inertia. Then, calculate the moment of inertia and confirm that it does not exceed the corrected allowable moment of inertia.

Example



Center mass location of load: Offset from output shaft center
Installation orientation: On side/vertical



Step 1 Calculate load torque T

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

m : Weight of transported object

[kg]

g : Gravitational acceleration

[m/s²]

r : Center mass location of transported object [mm]

Step 2 Calculate allowable moment of inertia correction factor Cj

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

T_{max}: Output torque [N·m]

*See the individual product pages for the value of output torque T_{max}.

Step 3 Calculate corrected allowable moment of inertia J_{tl}

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

J_{max} : Allowable inertia moment ($\text{kg}\cdot\text{m}^2$)

*See the individual product pages for the value of allowable moment of inertia J_{max} .

Step 4 Check moment of inertia of transported object

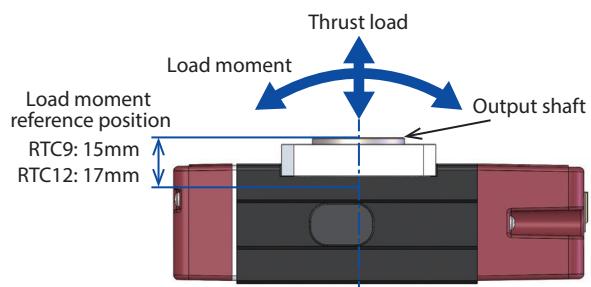
Use the "formulas for calculating moment of inertia of typical shapes" below to calculate the moment of inertia of the load, and confirm that it does not exceed the corrected moment of inertia calculated during Step 3.

Procedure 2

Check the moment load and thrust load

Confirm that the moment load and thrust load on the output shaft are within the allowable range. If used in excess of the allowable range, it could shorten product life or cause failure.

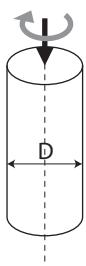
*See the individual product pages for the values of the allowable dynamic thrust load and allowable dynamic load moment.

**Formulas 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)

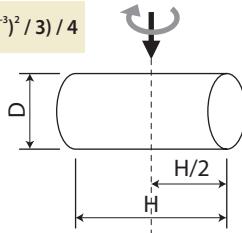
$$\text{Formula: } J = M \times (D \times 10^{-3})^2 / 8$$

Moment of inertia of cylinder: J ($\text{kg}\cdot\text{m}^2$)
Cylinder weight: M (unit: kg)
Cylinder diameter: D (mm)

**(2) Moment of inertia of cylinder 2**

$$\text{Formula: } J = M \times ((D \times 10^{-3})^2 / 4 + (H \times 10^{-3})^2 / 3) / 4$$

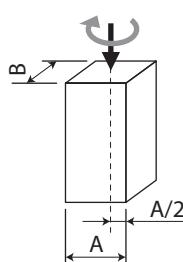
Moment of inertia of cylinder: J ($\text{kg}\cdot\text{m}^2$)
Cylinder weight: M (kg)
Cylinder diameter: D (m)
Cylinder length: H (mm)

**(3) Moment of inertia of prism 1**

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

$$\text{Formula: } J = M \times ((A \times 10^{-3})^2 + (B \times 10^{-3})^2) / 12$$

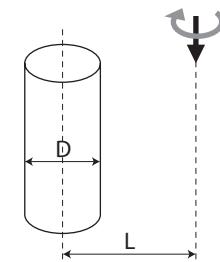
Moment of inertia of prism: J ($\text{kg}\cdot\text{m}^2$)
One side of prism: A (mm)
One side of prism: B (mm)

**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)

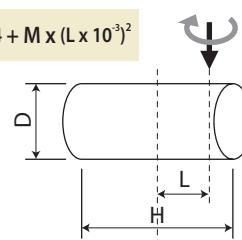
$$\text{Formula: } J = M \times (D \times 10^{-3})^2 / 8 + M \times (L \times 10^{-3})^2$$

Moment of inertia of cylinder: J ($\text{kg}\cdot\text{m}^2$)
Cylinder weight: M (kg)
Cylinder diameter: D (m)
Distance from rotational axis to center: L (mm)

**(5) Moment of inertia of cylinder 4**

$$\text{Formula: } J = M \times ((D \times 10^{-3})^2 / 4 + (H \times 10^{-3})^2 / 3) / 4 + M \times (L \times 10^{-3})^2$$

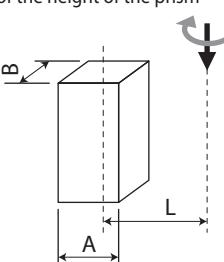
Moment of inertia of cylinder: J ($\text{kg}\cdot\text{m}^2$)
Cylinder weight: M (kg)
Cylinder diameter: D (m)
Cylinder length: H (mm)
Distance from rotational axis to center: L (mm)

**(6) Moment of inertia of prism 2**

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

$$\text{Formula: } J = M \times ((A \times 10^{-3})^2 + (B \times 10^{-3})^2) / 12 + M \times (L \times 10^{-3})^2$$

Moment of inertia of prism: J ($\text{kg}\cdot\text{m}^2$)
Prism weight: M (kg)
One side of prism: A (mm)
One side of prism: B (mm)
Distance from rotational axis to center: L (mm)

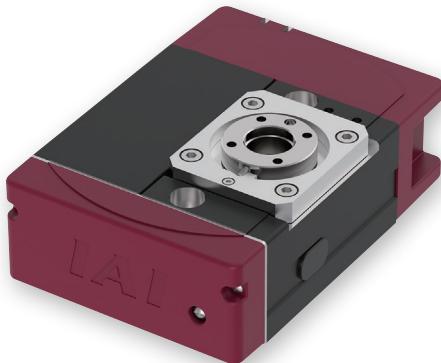


EC-RTC12

Body Width
120 mm
24v
Stepper motor

Model Specification Items

EC	RTC12	M	330		
Series	Type	Deceleration ratio	Oscillation angle	Cable length	Options
	M Deceleration ratio 1/45		330 330-degree rotation	0 Terminal block type With connector 1 1m 10 10m	Refer to Options table below.



CE RoHS



Products

Oscillation angle (°)	EC-RTC12
330	○

Options

* Please check the Options reference pages to confirm each option.

Name	Option code	Reference page
Brake	B	13
Non-motor end specification	NM	13
PNP specification	PN	13
Shaft adapter	SA	13
Table adapter	TA	13
Twin power supply specification	TMD2	13
Battery-less absolute encoder specification	WA	13
Wireless communication specification	WL	13
Wireless axis operation specification	WL2	13

Cable length

Cable code	Cable length
0	No cable (with connector)
1 ~ 3	1 ~ 3m
4 ~ 5	4 ~ 5m
6 ~ 10	6 ~ 10m

(Note) Robot cable.

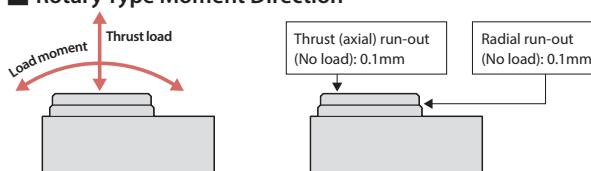
Main Specifications

Item	Description
Deceleration ratio	1/45
Max. torque (N·m)	8.0
Speed / acceleration/ deceleration	Max. speed (degrees/s) Min. speed (degrees/s)
(Note 1)	600 20
Brake	Rated acceleration/deceleration (G) Max. acceleration/deceleration (G) (Note 2)
(Note 1)	0.3 0.7
Braking specification	Non-excitation actuating solenoid brake
Brake	Brake retaining torque (N·m) (Note 3)
Operation range (degrees)	5.3
	330

(Note 1) $1G=9807/s^2$

(Note 2) Horizontal only. The maximum acceleration/deceleration will be 0.5G when on side/vertical.
(Note 3) Both the allowable moment of inertia and brake retaining torque will not necessarily be established. Confirm that the load torque does not exceed the retaining torque.

Rotary Type Moment Direction



EC-RTC12

- POINT** 選定上の注意
- (1) Output torque decreases as rotation speed increases. Refer to the "correlation diagram between rotation speed and output torque" for details.
 - (2) The allowable moment of inertia of a workpiece being rotated will vary depending on the rotation speed. Refer to the "correlation diagram between rotation speed and allowable moment of inertia" for details.
 - (3) The brake is used for retention purposes only. Do not use it for braking or emergency stopping.
 - (4) When selecting, calculate values as described in "Selection Method (from P. 3)" and check the usage conditions.
 - (5) If performing push-motion operations, refer to the "correlation diagrams between push force and current limit". The push forces listed are for reference only.
 - (6) The maximum acceleration/deceleration is 0.7G when horizontal/suspended or 0.5G when on side/vertical with the energy-saving setting disabled, or 0.5G when horizontal/suspended or 0.3G on side/vertical with the energy-saving setting enabled.

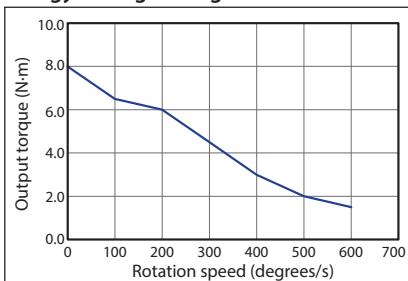
Item	Description
Drive system	Hypoid gear + timing belt
Positioning repeatability	±0.01 degrees
Homing method	Mechanical stopper method
Homing precision	±0.01 degrees
Backlash	0.2° or less
Allowable thrust load	400N
Allowable load moment (Note 4)	18N·m
Allowable moment of inertia	0.13kg·m²
Radial run-out	0.1mm or less
Thrust run-out	0.1mm or less
Ambient operating temperature/humidity	0 ~ 40°C, 85% RH or less (Non-condensing)
Degree of protection	IP20
Vibration & shock resistance	4.9m/s²
Overseas standards	CE marking, RoHS directive
Motor type	Stepper motor
Encoder Type	Incremental
Number of encoder pulses	800 pulse/rev
Delivery time	Listed on website [Check lead times]

(Note 4) 12N·m when on side/vertical.

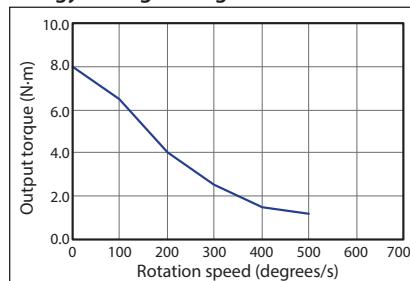
■ Correlation diagram between speed and output torque, allowable moment of inertia

■ Correlation diagram between rotation speed and output torque

Energy-saving setting disabled

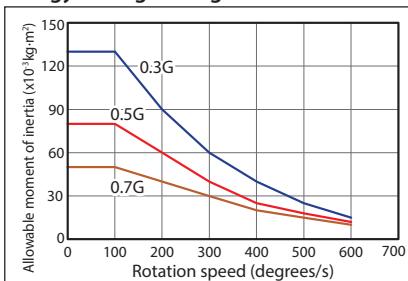


Energy-saving setting enabled

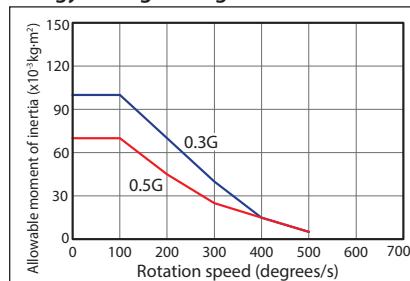


■ Correlation diagram between rotation speed and allowable moment of inertia

Energy-saving setting disabled



Energy-saving setting enabled

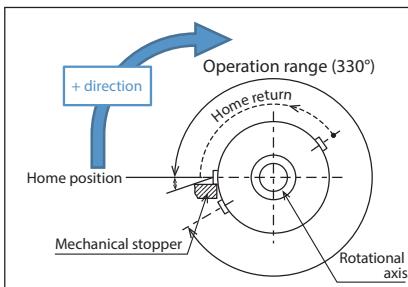


(Note) 0.7G can be used only when horizontal/suspended.

(Note) 0.5G can be used only when horizontal/suspended.

■ Homing method and positive rotation direction

■ 330-degree rotation specification



The positive rotation direction will be clockwise when viewing the rotating part from above.

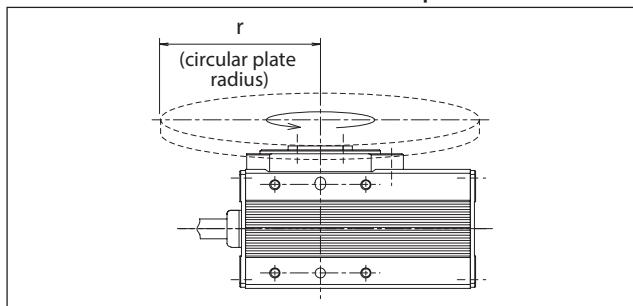
During home return motion, it rotates counterclockwise.

It detects the mechanical stopper position, moves in reverse, and then stops.

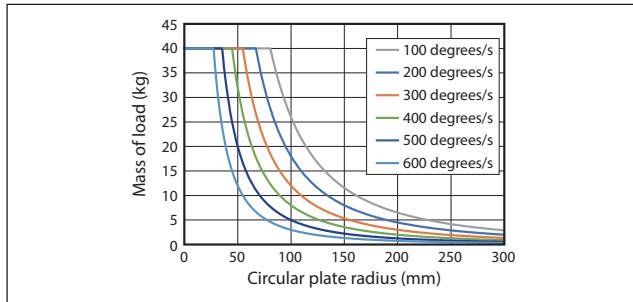
It cannot rotate to the home return motion in the clockwise direction.

(Note) For the non-motor end specification, all movement directions are in reverse.

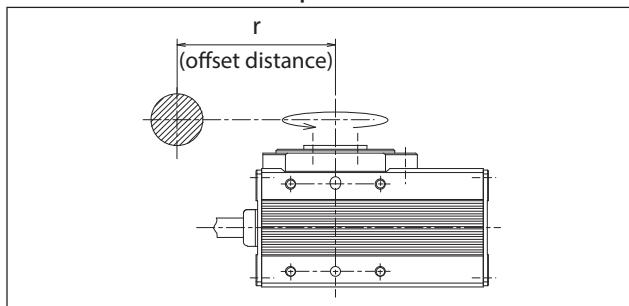
■ When the center of gravity of a circular plate load is the same as the rotational center of the output shaft



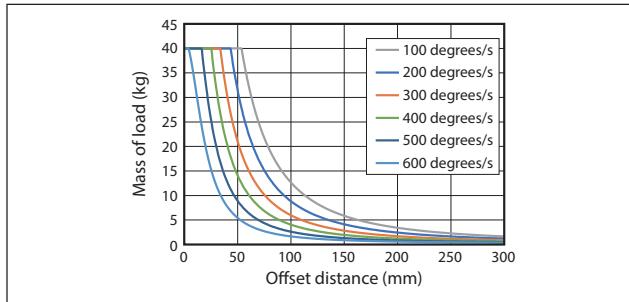
Acceleration 0.3G (energy-saving setting disabled)



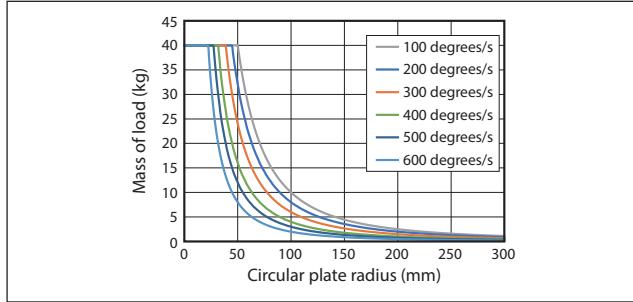
■ When the center of gravity of the load is offset from the rotational center of the output shaft



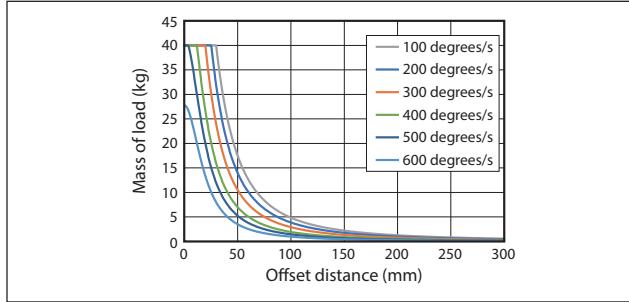
Acceleration 0.3G (energy-saving setting disabled)



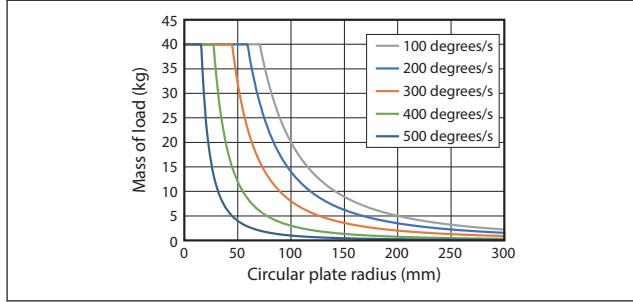
Acceleration 0.7G (energy-saving setting disabled)



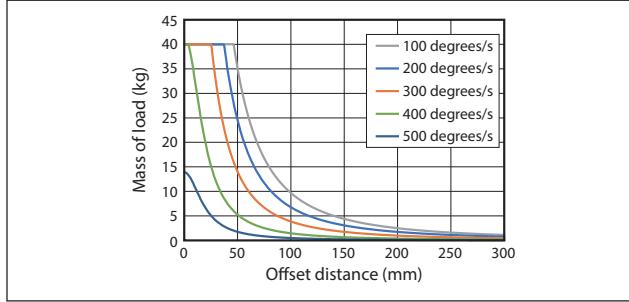
Acceleration 0.7G (energy-saving setting disabled)



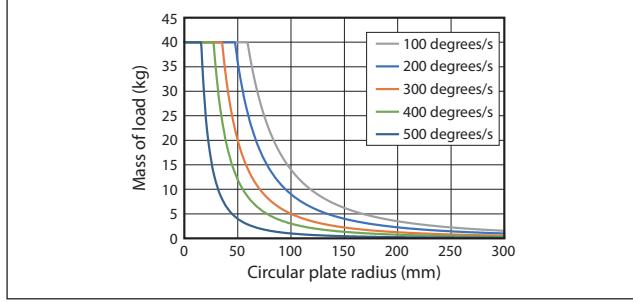
Acceleration 0.3G (energy-saving setting enabled)



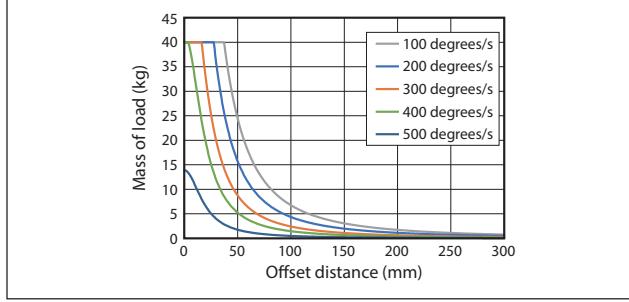
Acceleration 0.3G (energy-saving setting enabled)



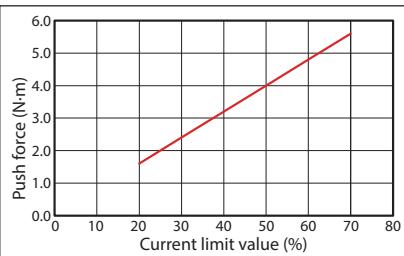
Acceleration 0.5G (energy-saving setting enabled)



Acceleration 0.5G (energy-saving setting enabled)



Correlation of push force and current limit value



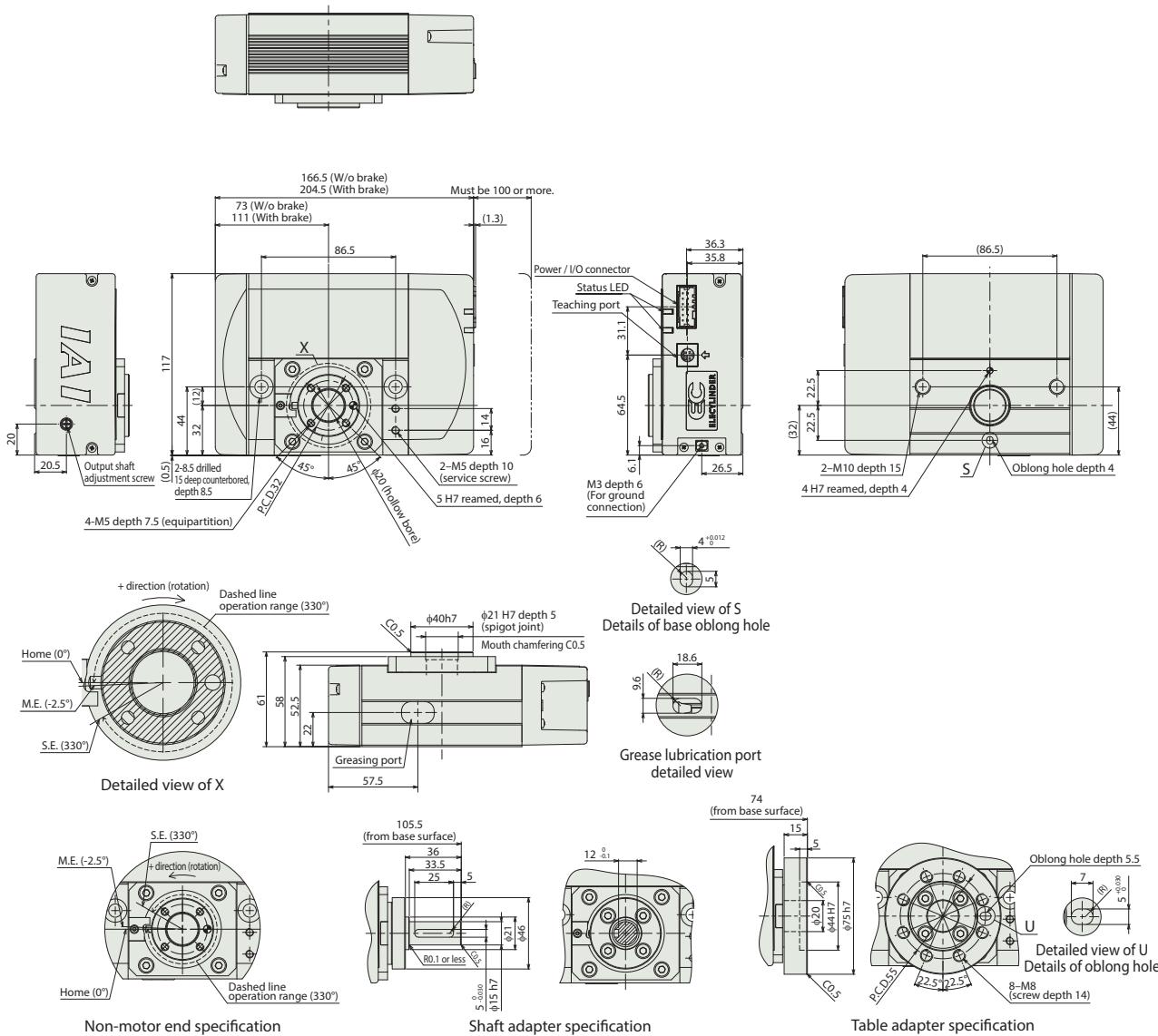
Dimensions

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



(Note) Rotating parts are shown shaded in the plane figures below.

M.E: Mechanical end
S.E: Stroke end



Mass

	Item	Description
Mass	Without brake	1.74kg
	With brake	1.90kg

Applicable controllers

(Note) The EC series is equipped with a built-in controller. Please refer to P14 for more information on built-in controllers.

ELEYCILINDER Series Options

Brake

Model **B**

Description When using the rotary on its side or vertically, this holding mechanism prevents the output shaft from accidentally rotating due to the weight of the attached object, and damaging the attached object when the power or servo is turned off.

Non-motor end specification

Model **NM**

Description The positive rotation direction will normally be clockwise when viewing the rotating part from above. Counterclockwise can optionally be set as the positive rotation direction. Contact IAI if you would like to change the rotation direction after shipment.

PNP specification

Model **PN**

Description The EC series offers NPN specification input/output for connecting external devices as standard. Specifying this option changes input/output to PNP specification.

Shaft adapter

Model **SA**

Description This adapter is used to mount jigs, etc., to rotating parts. Refer to the dimensions on the individual product page for detailed dimensions.

Table adapter

Model **TA**

Description This adapter is used to mount jigs, etc., to rotating parts. Refer to the dimensions on the individual product page for detailed dimensions.

Twin power supply specification

Model **TMD2**

Description This option provides a separate motor power supply and control power supply. Please refer to P.16 for more information on wiring.

Battery-less Absolute Encoder specification

Model **WA**

Description The EC series offers incremental encoder specification as standard. Specifying this option installs a built-in battery-less absolute encoder.

Wireless communication specification

Model **WL**

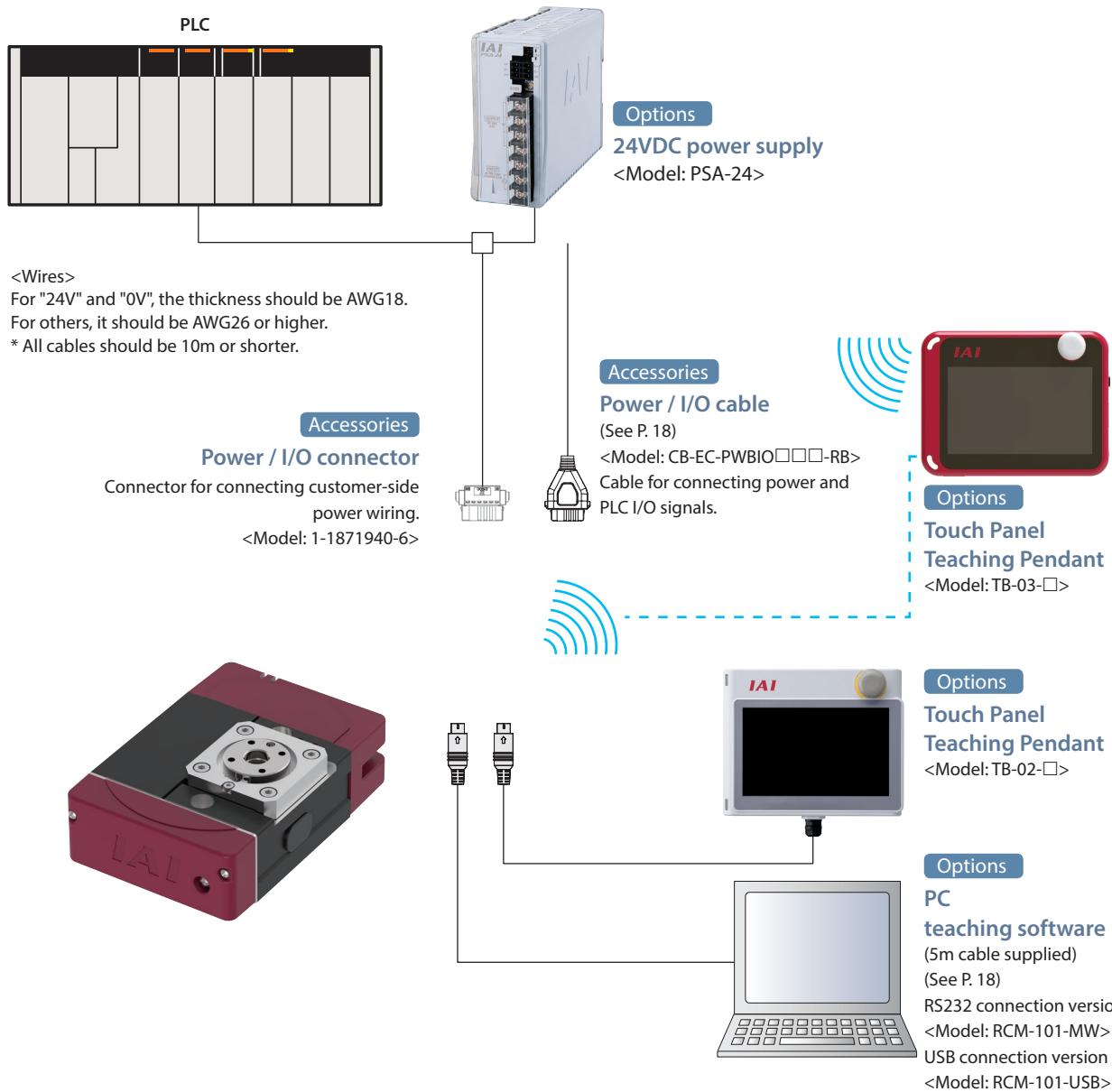
Description This option supports wireless communication. Specifying this option enables wireless connection with the TB-03 teaching pendant. The start point, end point, and AVD can be adjusted by wireless communication.

Wireless axis operation specification

Model **WL2**

Description Specifying WL2 allows for the product to operate wirelessly as with WL (start point, end point, and AVD adjustment), and to also perform axis travel operation tests (forward end/backward end movement, jog, and inching). However, this function is not meant to perform automatic operation. Refer to P. 7-310 of the General Catalog 2019 for precautions on axis operations using a wireless connection. (Note) WL cannot be changed to WL2, or WL2 to WL, by the customer. Please contact IAI for this.

System Configuration



List of accessories

Product category	Accessories
Without EC power / I/O cable (when "0" is selected for the cable length for an actuator model)	Power / I/O connector (1-1871940-6)
With EC power / I/O cable (when "1" to "10" is selected for the cable length for an actuator model)	Power / I/O cable (CB-EC-PWBIO□□□-RB)

Basic Controller Specifications

Specification item		Specification content	
Number of controlled axes		1 axis	
Power supply voltage		24VDC ±10%	
Power capacity	RTC9	Max. 2A (with energy-saving setting enabled only)	
	RTC12	With energy-saving setting disabled: Rated 3.5A, max. 4.2A With energy-saving setting enabled: Max. 2.2A	
Brake release power supply		24VDC ±10%, 200mA (only for external brake release)	
Generated heat		8W (at 100% duty)	
Inrush current (Note 1)	RTC9	2A	
	RTC12	8.3A (with inrush current limit circuit)	
Momentary power failure resistance		Max 500μs	
Motor size		□28, □42	
Motor rated current		1.2A	
Motor control system		Weak field-magnet vector control	
Supported encoders		Incremental (800 pulse/rev), battery-less absolute encoder (800 pulse/rev)	
SIO		RS485 1ch (Modbus protocol compliant)	
PIO	Input specification	Number of input	3 points (forward, backward, alarm clear)
		Input voltage	24VDC ±10%
		Input current	5mA per circuit
		Leakage current	Max 1mA/1 point
		Isolation method	Non-isolated
	Output specification	No. of output	3 points (forward complete, backward complete, alarm)
		Output voltage	24VDC ±10%
		Output current	50mA/1 point
		Residual voltage	2V or less
		Isolation method	Non-isolated
Data setting and input methods		Teaching software for PC, touch panel teaching pendant	
Data retention memory		Position and parameters are saved in non-volatile memory. (No limit to rewrite)	
LED display	Controller status display	Servo ON (green light ON) / Alarm (red light ON) / Initializing when power comes ON (orange light ON) / Minor failure alarm (green/red alternately blinking) / Operation from teaching: Stop from teaching (red light ON) / Servo OFF (light OFF)	
	Wireless status display	Initializing wireless hardware, without wireless connection, or connecting from TP board (light OFF) Connecting through wireless (green blinking) / Wireless hardware error (red blinking) / Initializing when power comes ON (orange light ON)	
Predictive maintenance/Preventative maintenance		When the number of movements or operation distance has exceeded the set value and when the LED (right side) blinks alternately green and red at overload warning * Only when configured in advance	
Ambient operating temperature		0 ~ 40°C	
Ambient operating humidity		85% RH or less (no condensation or freezing)	
Operating ambience		Avoid corrosive gas and excessive dust	
Insulation resistance		500VDC 10MΩ	
Electric shock protection mechanism		Class 1 basic insulation	
Cooling method		Natural air cooling	

(Note 1) Inrush current flows for approximately 5ms after the power is input. (At 40°C.) Inrush current value differs depending on the impedance on the power supply line.

I/O (Input/Output) Specifications

I/O	Input		Output	
Specifications	Input voltage	24VDC ± 10%	Load voltage	24VDC ± 10%
	Input current	5mA per circuit	Maximum load current	50mA/1 point
	ON/OFF Voltage	ON voltage: MIN. 18VDC OFF voltage: MAX. 6VDC	Residual voltage	2V or less
	Leakage current	MAX. 1mA/1 point	Leakage current	MAX. 0.1mA/1 point
Isolation method	Non-isolated from external circuit		Non-isolated from external circuit	
NPN				
PNP				

(Note) Isolation method is non-isolated. When connecting an external device (such as a PLC) to ELECYLINDER, use the same ground as ELECYLINDER.

I/O Signal Wiring Diagram

I/O	Standard specification	Twin power supply specification (option model: TMD2)
Power / I/O connector		Drive power and control power are separate for the TMD2 specification.
I/O logic	<p>NPN</p>	
	<p>PNP</p>	

I/O Signal Table

Power / I/O connector pin assignment			
Pin No.	Connector nameplate name	Signal abbreviation	Function overview
B3	Backward	ST0	Backward command
B4	Forward	ST1	Forward command
B5	Alarm cancel	RES	Alarm cancel
A3	Backward complete	LS0/PE0	Backward complete/push complete
A4	Forward complete	LS1/PE1	Forward complete/push complete
A5	Alarm	* ALM	Alarm detection (b-contact)
B2	Brake release	BKRLS	Brake forced release (for brake equipped specification)
B1 (Note)	24V	24V	24V input
A1	0V	0V	0V input
A2 (Note)	(24V)	(24V)	24V input

(Note) For the twin power supply specification (TMD2), B1 is 24V (drive) and A2 is 24V (control).

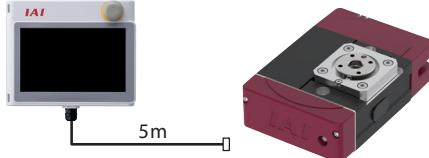
Options**Touch Panel Teaching Pendant**

■ **Features** A teaching device equipped with functions such as position teaching, trial operation, and monitoring.

■ **Model TB-02-**□

Please contact IAI for the current supported versions.

■ **Configuration** Wireless connection

**Specifications**

Rated voltage	DC24V
Power consumption	3.6W or less (150mA or less)
Ambient operating temperature	0 to 40°C
Ambient operating humidity	20~85% RH (Non-condensing)
Environmental resistance	IP20
Mass	470g (TB-02 unit only)

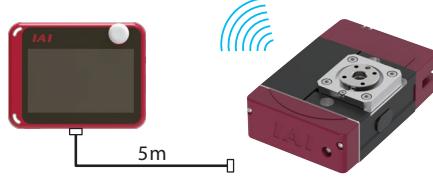
Touch Panel Teaching Pendant

■ **Features** A teaching device that supports wireless connection. Start point/end point/AVD input and axis operation can be performed with wireless connection.

■ **Model TB-03-**□

Please contact IAI for the current supported versions.

■ **Configuration** Wireless or wired connection

**Specifications**

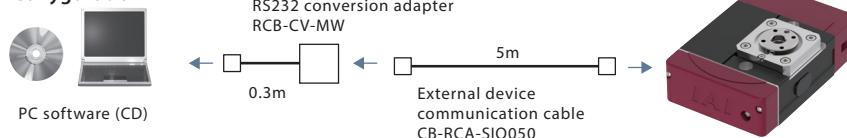
Rated voltage	DC24V
Power consumption	3.6W or less (150mA or less)
Ambient operating temperature	0 to 40°C
Ambient operating humidity	20~85% RH (Non-condensing)
Environmental resistance	IPX0
Mass	Approx. 485g (body) + approx. 175g (battery)
Charging method	Wired connection with dedicated adapter/controller
Wireless connection	Bluetooth 4.2 class2

Teaching software for PC (Windows only)

- **Features** The start-up support software which comes equipped with functions such as position teaching, trial operation, and monitoring.
A complete range of functions needed for making adjustments contributes to shortened start-up time.

- **Model RCM-101-MW** (with an external device communication cable + RS232 conversion unit) Please contact IAI for the current supported versions.

■ **Configuration**

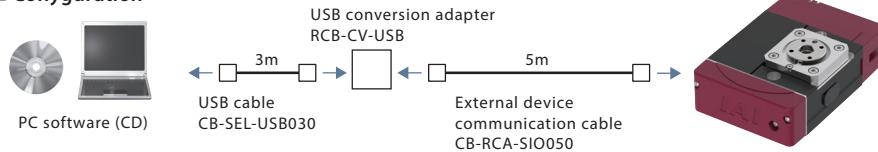


Supported Windows versions: 7/8/10



- **Model RCM-101-USB** (with an external device communication cable + USB conversion adapter + USB cable) Please contact IAI for the current supported versions.

■ **Configuration**



Maintenance Parts

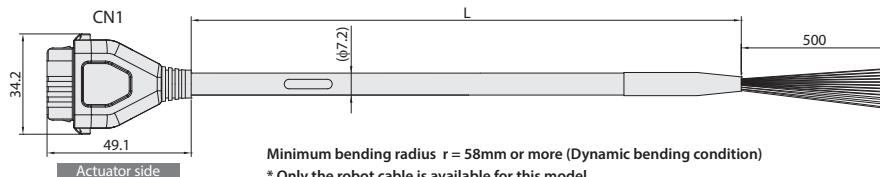
When placing an order for a replacement cable, please use the model name shown below.

■ **Table of compatible cables**

Model name	Power / I/O cable
EC	CB-EC-PWBIO□□□-RB

Model **CB-EC-PWBIO□□□-RB**

*Please indicate the cable length (L) in □□□, e.g. 030 = 3m



Color	Signal name	Pin No.
Black (AWG18)	0V	A1
Red (AWG18)	24V	B1
Light blue (AWG22) (Reserved) (Note 1)		A2
Orange (AWG26)	IN0	B3
Yellow (AWG26)	IN1	B4
Green (AWG26)	IN2	B5
Pink (AWG26)	(reserve)	B6
Blue (AWG26)	OUT0	A3
Purple (AWG26)	OUT1	A4
Gray (AWG26)	OUT2	A5
White (AWG26) (reserve)		A6
Brown (AWG26)	BKRLS	B2

(Note 1) 24V (control) when twin power supply specification (TMD2) selected.