

ROBO Cylinder Series Cautionary Notes

■ Notes on Specifications in this Catalog (All Models)

1. Speed

This refers to the set speed when moving the slider (or rod, arm, output axis) of the actuator.
The slider accelerates from rest to the specified speed, and continues to move at that speed until it decelerates to a stop at the specified target position.

<Note>

- ① For models equipped with a pulse motor (ERC2, RCP3, and RCP2), the maximum speed changes with the weight of the load being transported.
When selecting an actuator, refer to the "Speed vs. Load Capacity" (on each product page).
- ② If the axis has a short stroke, or if it has a long stroke but the travel distance is short, the specified speed may not be reached.
- ③ As the stroke becomes longer, the maximum speed decreases, due to hazardous RPMs.
For details, see "■ Stroke vs. Maximum Speed" on each product page.
- ④ For the RCP2 high-speed slider type (HS8C/HS8R) and belt type, vibration and/or resonance may occur when operated at low speeds. Therefore, use these models at 100mm/s or faster.
- ⑤ For PMEC/AMEC controllers, a minimum speed is set for each actuator.
See the instructions manual for the PMEC/AMEC controllers.
- ⑥ When calculating the time travelled, take into account the time taken to accelerate, decelerate, and converge, as opposed to only the time travelled at the specific speed.

2. Acceleration/Deceleration

Acceleration is the rate of change in speed from rest until a specified speed is reached.

Deceleration is the rate of change in speed from the specified speed to a state of rest.

Both are specified in "G" in programs ($0.3G = 2940\text{mm/sec}^2$).

* For rotary type, $0.3G = 2940 \text{ degrees/sec}^2$

<Note>

- ① Increasing the acceleration (deceleration) speeds up acceleration (deceleration), shortening the travel time.
However, caution should be exercised, as excessively high acceleration/deceleration may cause an error or a malfunction.
- ② The rated acceleration (deceleration) is 0.3G (2.0G, if the lead is 2.5, 3, or 4, or if used vertically)
With the exception of the high-acceleration/deceleration model, use the actuators at or below the rated acceleration.
- ③ For models such as RCS2-SRA7 and RCS2-RA13R, use the actuator at or below the acceleration (deceleration) mentioned in "Notes on Selection" on the respective product page.

3. Duty

IAI's actuators should be used at a duty of 50% or below.

If used at over 50% duty, an excessive load error may occur depending on the load, speed, or acceleration.

4. Positioning Repeatability

A JIS B6192-compliant method for evaluating performance.

In this method, a positioning operation (stopping of the actuator at target point) is repeated seven times from the same direction, each time measuring the end position. Then the difference between the maximum and minimum values is calculated.

By using this measuring method for both end-points and the mid-point of the maximum stroke, the largest calculated value is multiplied by 1/2 and expressed with a \pm .

5. Lead Screw

When using a lead screw type actuator, note the following:

<Note>

- ❶ This type is suited for applications with low frequency of use. (As a point of reference, one motion per 10 seconds, 24 hours per day, 240 days per year = approximately 5 years)
- ❷ This is suited for applications in which the load capacity and load requirements are low. (1kg or less)
- ❸ Use for applications that do not require a positioning repeatability smaller than $\pm 0.05\text{mm}$.
- ❹ Set up in a place that allows for easy maintenance.

6. Home Position

The home position is the reference point from which the actuator determines the target position.

Note that if the home position becomes misaligned, the target position also shifts by the same amount.

<Note>

- ❶ Actuators with an incremental encoder must be homed upon power-on.
- ❷ During homing operation, the slider (rod, table) moves to actuator's mechanical end, and then reverses. Therefore, watch for any interference with its surroundings.
- ❸ By default, the home position is on the motor-side (i.e. the open side on the gripper type, or the left side on the rotary type (looking down at the output shaft.)) Optionally, the home position can be moved to the opposite side (i.e. away from the motor). To change the home position after the actuator has been delivered, it must be sent back to IAI for adjustment.
- ❹ Models without the option code "NM" do not support reversed home position.

7. Encoder Type (Incremental/Absolute/Simple Absolute)

There are two types of encoders that can be used in an actuator, "incremental" and "absolute" encoders.

Incremental encoderWhen an incremental encoder is powered off, its coordinate data is erased. Therefore, homing is necessary each time it is powered back on.

Absolute encoderWhen an absolute encoder is powered off, it uses a battery to store its coordinate data. Therefore, homing is not necessary when it is powered back on. However, note that it cannot be operated once the battery for storing data runs out.

<Note>

In addition to the above two types of encoders, there is the "simple absolute" type, which is an incremental encoder with a dedicated simple absolute unit connected to the actuator's controller, for storing its coordinate data. This eliminates the need for homing upon power-on. Note that the simple absolute actuators (encoders) fall under the incremental type and not the absolute type.

8. Encoder Pulse Number

The pulse number of the encoder varies depending on the actuator. See the table below for the pulse number of each actuator.

Series	Type	Encoder Pulse Number	Series	Type	Encoder Pulse Number
RCP3	All models	800	RCA	All models	800
RCP2	All models	800	RCL	SA1L/RA1L	715
RCA2	RN□N/RP□N/GS□N/ GD□N/SD□N/TC□N/ TW□N/TF□N	1048	RCL	SA2L/RA2L	855
				SA3L/RA3L	1145
			RCS2	SRA7BD	3072
	All other models	800		All other models	16384

9. Motor

Different motors are used depending on the series.

- ERC2/RCP2 (CR)/RCP3: Pulse motor
- RCA (CR)/RCA2: Servo motor (24V)
- RCS2 (CR): Servo motor (200V)

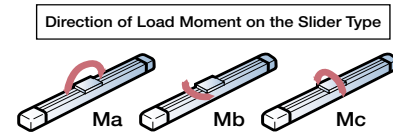
Pulse motors and 24V servo motors may exhibit slight vibration when the motor is excited while the servo is on.

ROBO Cylinder Series Cautionary Notes

■ Notes on Specifications in this Catalog (All Models)

10. Allowable Load Moment (M_a , M_b , M_c)

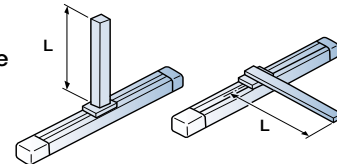
Models with a built-in linear guide have static and dynamic allowable moments. Please note that using the guide with a load moment that exceeds specification will result in shorter service life of the guide.
(See page A-5 for details on load moment and its calculation method)



11. Overhang Load Length (L)

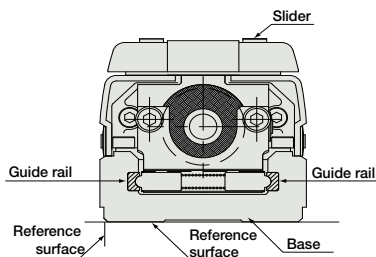
When mounting a workpiece or a bracket at an offset distance from the center of actuator/slider, the overhang load length indicates the maximum offset at which the actuator can operate smoothly.

Please make sure to keep the overhang load length within the allowable value, as exceeding the allowable value for each model may cause vibration or shorten the service life.



12. Actuator Body Precision

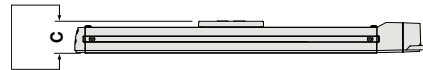
Below are the measures of precision for the body of the slider-type ROBO Cylinder. Moreover, the side and bottom surfaces of the actuator's base provide references for the run of the slider, and hence can be used as a guide to ensure parallel mounting of the actuator.



* Parallelism does not apply to RCP2W-SA16C, due to its sliding guide.

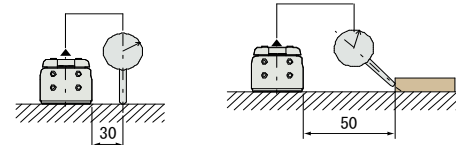
Parallelism: Base Underside & Load Surface (Top Side)

ERC2: within $\pm 0.1\text{mm/m}$
RCP2/RCA/RCS2: within $\pm 0.05\text{mm/m}$



Parallelism When Mounted onto a Frame (Fixed onto a Smooth Surface*1)

ERC2: within $\pm 0.1\text{mm/m}$
RCP2/RCA/RCS2: within $\pm 0.05\text{mm/m}$



Condition: The above values were measured at 20°C. *1: 0.05mm or less deviation from flatness.

13. Rod Type (Rod End vibration)

The standard rod-type actuators do not take into account any vibration or load resistance (The non-rotational accuracy values documented in the actuator specifications are initial values, and the backlash will increase with operation). If the rod vibrates or if the non-rotational accuracy fluctuates, or if there is a force being applied from any direction other than the actuator's linear movement, use the guide-equipped actuator type, or use an external guide.

14. Vertical Setup and Use

When using the actuator in a vertical setup, add the optional brake to prevent the slider (or rod) from falling and breaking the machine when the power is turned off or an emergency stop is activated.

However, when mounting a brake-equipped ROBO Cylinder, be aware that the slider (or rod) will not move unless it is connected to the controller and the brake is released.

15. Moving the Slider Manually

For ball screws with a low (1, 2.5, 3, 4) lead, the actuator's slider cannot be moved by hand, even if the power and/or servo is off, due to high sliding resistance.

To move the slider on a low-lead actuator, use the teaching box or the JOG function of the computer software.

16. Actuator Cable

The actuator cable is the cable that extends from the rear of the actuator's motor.

Secure the actuator cable in place so that it does not move, as any force exerted on the actuator cable may cause a malfunction. If the cable must support bending motion, use a motor-encoder cable, designed for robots.

17. Motor-Encoder Cable

The motor-encoder cable is the cable that connects the actuator and the controller.

Depending on the actuator type, some models use a motor-encoder cable that is split into a separate motor cable and an encoder cable, and other models use an integrated motor-encoder cable.

Moreover, there are two different specifications of this cable: The standard cable specification and the robot cable specification, which has an outstanding flex resistance.

To use in a cable track, be sure to use the robot cable, using caution not to bend beyond the minimum bend radius R for the cable. (The minimum bend radius R is specified for each cable on the respective pages.)

To check the cable type for each model, see "Table of Actuator-Controller Connection Cable Types" on page A-39.

18. About the Splash-Proof Actuator Cable

Although the scope of protective construction of the splash-proof type includes the cable, the connector at the end of the actuator cable is not splash proof. Therefore, secure the end of the actuator cable in a place that is not prone to water spills. (For this reason, the actuator cable for a splash-proof model is 2m long)

19. Service Life

The service life of the actuator is directly related to the service life of the components that make up the actuator (guide, ball screw, motor, etc.).

Moreover, the service life for these components changes significantly depending on the usage requirements. For example, each guide has an allowable load moment (see page A-5). If the guide is hypothetically used at half the moment of the allowable moment, its service life is eight times more than the specified service life. If used conservatively, it can be used for 10 years or more.

Therefore, when selecting a model, it is recommended that you select a model with more head room.

20. Warranty

The warranty period expires upon elapse of one of the following periods, whichever occurs first.

- 18 months after shipment from IAI factory in Japan
- 12 months after delivery to the location specified
- 2,500 hours after start of operation

IAI will repair free of charge any actuator defects due to craftsmanship or material that may occur during the above warranty period despite use under appropriate conditions. Note, however, that defects resulting from handling or use in any condition or environment not specified in the catalog, operation manual are excluded from the scope of warranty. The warranty covers only the actuator delivered by IAI, and any secondary losses arising from a failure of the delivered product is excluded from the scope of warranty.

The defective actuator must be sent in for repair.