IAI
Quality and Innovation

GB

Introduction to RoboCylinder

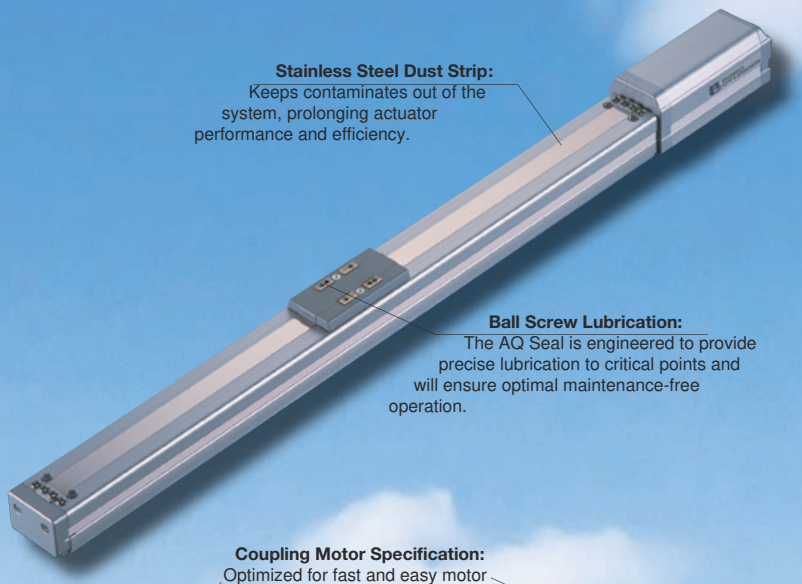
4th Revised Edition

ROBO CYLINDER

Easy Programming:
Acceleration and deceleration can be set independent of each other, providing excellent control of work. Dramatically reduce work damage and error.

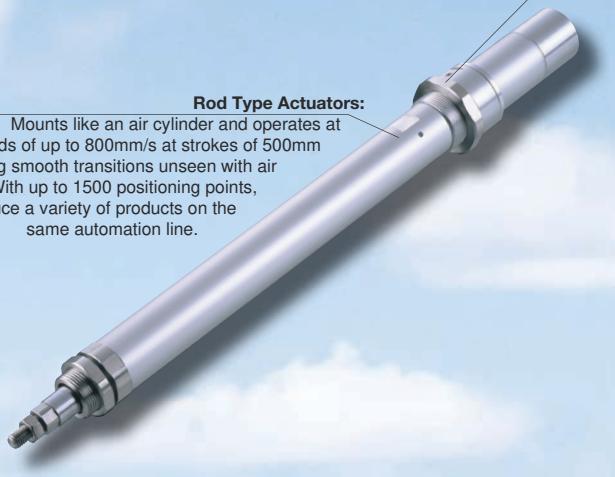
Stainless Steel Dust Strip:
Keeps contaminates out of the system, prolonging actuator performance and efficiency.

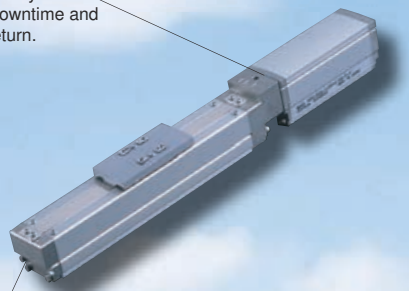
Ball Screw Lubrication:
The AQ Seal is engineered to provide precise lubrication to critical points and will ensure optimal maintenance-free operation.



Coupling Motor Specification:
Optimized for fast and easy motor change-outs. Reduce downtime and maximize your return.

Rod Type Actuators:
Mounts like an air cylinder and operates at speeds of up to 800mm/s at strokes of 500mm offering smooth transitions unseen with air cylinders. With up to 1500 positioning points, you can produce a variety of products on the same automation line.





Slider Type Actuators:
Speeds of up to 1800mm/s and stroke lengths of 1200mm, the slider type actuator performs flawlessly in many applications.

green automation
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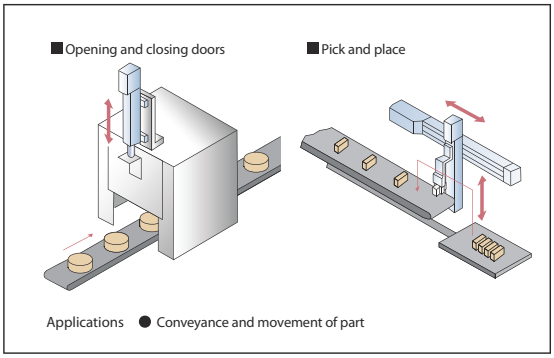
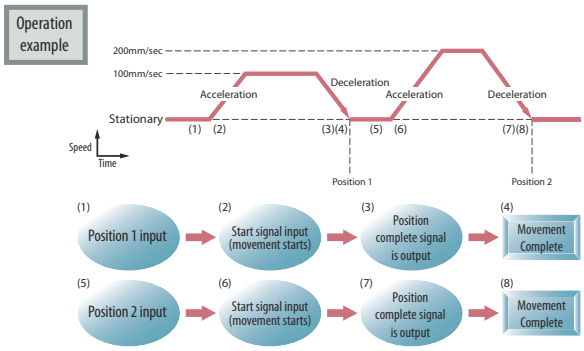
The 7 Benefits of RoboCylinder

1

Multiple Positioning – With the RoboCylinder, you can achieve positioning of up to 1500 points and a repeatability of +/- 0.02mm. Use one assembly line to produce a variety of products.





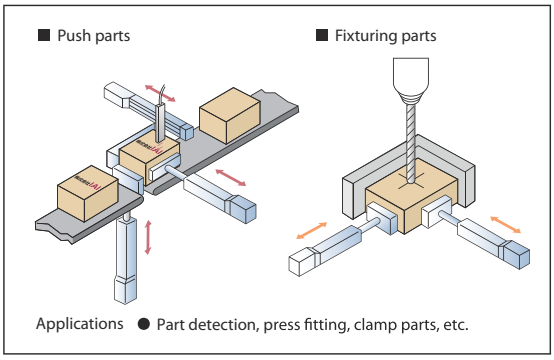
Position Data Table

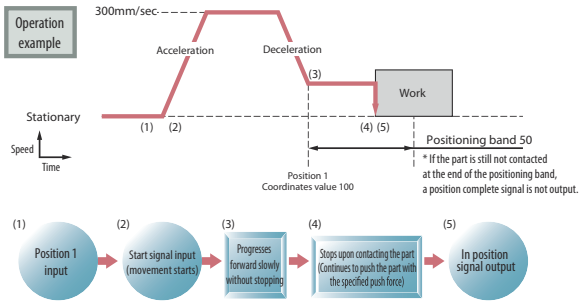
(Set on a teaching pendant or using PC software)

No.	Position (mm)	Speed (mm/sec)	Acceleration (G)	Deceleration (G)	Push (%)	Positioning band (mm)
1	100	100	0.3	0.3	0	10
2	200	200	0.3	0.3	0	20

2

Push and Hold – The push force (pressing force) can be easily adjusted by changing the position data values. The push force can be set to be constant. This function is perfectly suited for holding parts and press fitting. Easy adjustment of force equals higher quality production.





Position Data Table

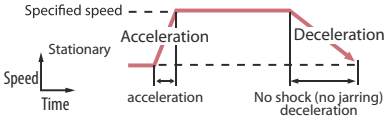
(Set on a teaching pendant or using PC software)

No.	Position (mm)	Speed (mm/sec)	Acceleration G	Deceleration G)	Push (%)	Positioning band (mm)
1	100	300	0.3	0.3	50	50

Caution Push force precision when stopped is not guaranteed. This is merely a rough estimate. Caution: If the push force is even slightly excessive, pressing errors may occur due to sliding resistance etc.

3

Acceleration/Deceleration Settings – Set the acceleration and deceleration inde - pendently on the RoboCylinder. This helps improve cycle time and drastically reduce part damage.



Position data table

(Set on a teaching pendant or using PC software)

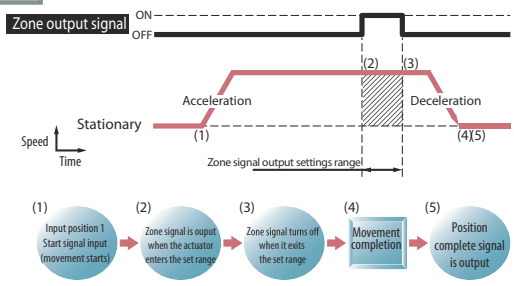
No.	Position (mm)	Speed (mm/sec)	Acceleration (G)	Deceleration (G)	Push (%)	Positioning band (mm)
1	300	100	0.3	0.01	0	0.1
2			0.3	0.01	0	0.1

ROBO CYLINDER

4

Zone Output – Output a signal when the RoboCylinder reaches a preset range, all without a need for external sensors. The zone output function allows the RoboCylinder to shorten cycle time, output a danger area signal and can be used for a variety of applications. Save yourself time, money and effort of adding external cumbersome sensors.

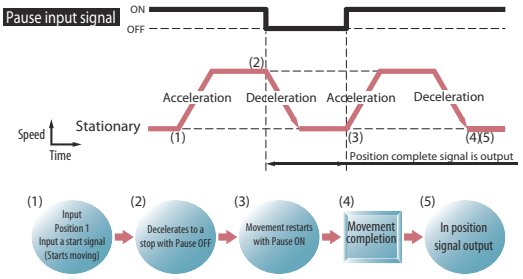
Operation example



5

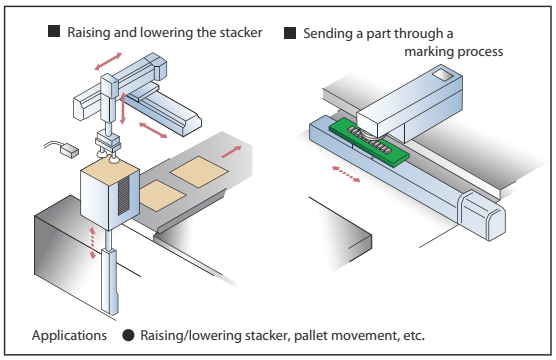
Pause Input – Unlike pneumatic systems, RoboCylinders are capable of stopping at any point of the stroke during operation. This allows for collision prevention and greater safety for operators and equipment.

Operation example

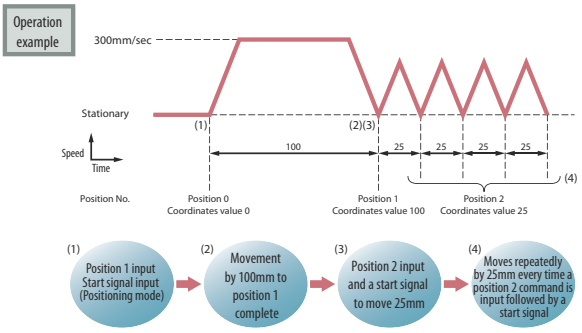


6

Incremental/Decremental Moves – When performing continuous movement with uniform pitch, repetitive movement is possible with data of a single position. Using this function can speed up programming and reduce I/O count.



Operation example



Position Data Table

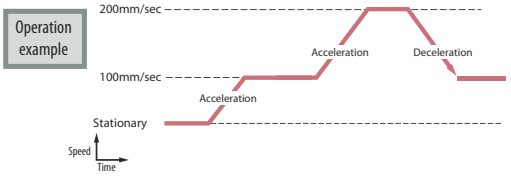
(Set on a teaching pendant or using PC software)

No.	Position (mm)	Speed (mm/sec)	Acceleration (G)	Deceleration (G)	Push (%)	Positioning band (mm)
1	100	300	0.3	0.3	0	0.1
2	25	300	0.3	0.3	0	0.1

7

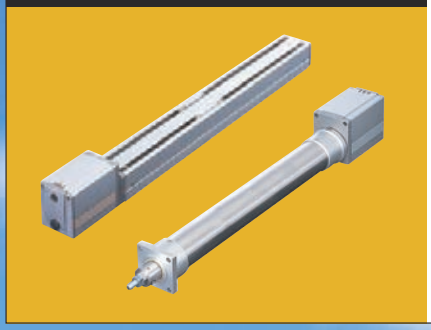
Speed Change During Movement – Speed can be changed easily during movement. Set a position band and change your speed during movement to improve cycle time and minimize part defects.

Operation example



Model Categories

Controller-integrated Type

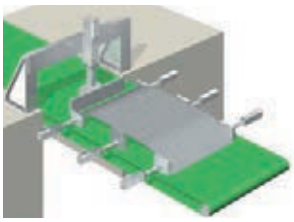


Features

ERC2 electric actuators are low-cost, controller-integrated actuators with a built-in controller. You do not need extra space for a separate controller minimizing the control area. These electric actuators are available at affordable prices similar to those of air cylinders, and thus are great economical, high-quality candidates for replacing air cylinders.

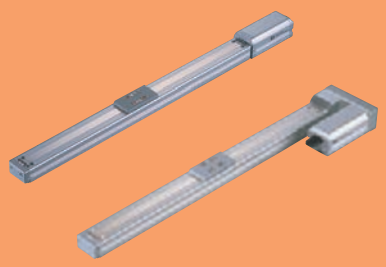
Applications

Use of multiple actuators in one system.
Transfer, raising/lowering, push-out, push-motion.



Example: Positioning of automobile rear panels

Slider Type

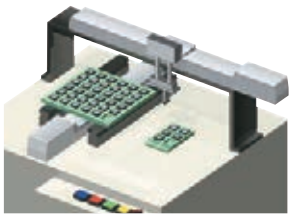


Features

The slider on the actuator moves forward and backward to perform positioning operations. The built-in linear guide helps achieve excellent linearity and also enables handling of an uneven load. Slide-type actuators are available in one of three motor-installation specifications including the coupling type, built-in (direct connection) type and reversing type.

Applications

Transfer and positioning along a straight line
Product picking & placement systems consisting of multiple axes



Example: Picking & placement of products

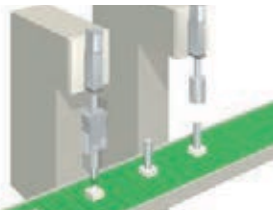
Rod Type

Features

The rod extends and contracts from/into the actuator to perform positioning and push-motion operations. You can select one of three guide options including “no guide,” “single guide” and “double guides.” Rod-type actuators are available in one of three motor-installation specifications including the coupling type, built-in (direct connection) type and reversing type.

Applications

Raising/lowering of loads and stockers
Pushing-out of products (pushers)
Press-fitting of loads, crimping



Example: Press-fitting and assembly of resin parts

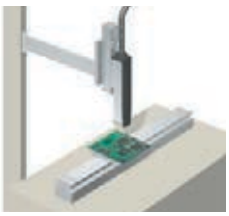
Table type/ Arm type/Flat type

Features

The table or arm on the actuator slides to perform positioning and push-motion operations. The built-in linear guide helps achieve excellent linearity and also enables handling of an uneven load. Compared to rod-type actuators, these actuators allow for easy installation of devices.

Applications

Raising/lowering of loads and stockers (Effective for devices and loads having many overhangs)
Pushing-out of products (pushers)



Example: Raising/lowering of inkjet heads

ROBO CYLINDER

Gripper type/ Rotary type

Features

Gripper-type actuators allow for adjustment of gripping force to hold even fragile loads with soft gripping action. Rotary-type actuators offer versatility, functioning both as an index station to perform 360-degree positioning operations, and as a conveyor that rotates infinitely in the same direction.

Applications

Gripper - Gripping and centering of loads
Rotary - Indexing and rotation/movement of loads

Example: Palletizing of loads using a SCARA robot

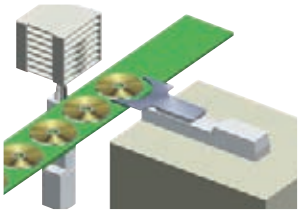
Cleanroom specification

Features

These actuators are designed for the cleanroom environment and achieve cleanliness of ISO class 4 (0.1 μm).
The stainless sheet prevents dust from being raised inside the actuator, which helps achieve high cleanliness with a light vacuum.

Applications

Transfer and positioning inside a clean room



Example: Stacking of discs

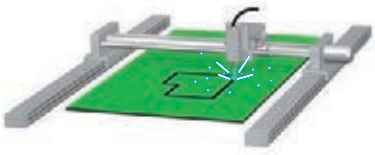
Dust-proof/ Splash-proof specification

Features

These actuators have an IP54, IP65 or IP67 protective structure to withstand use in a harsh environment where the actuator comes in contact with powder dust, water splashes, etc.

Applications

Transfer & positioning structure in machine tools, food processing machines and cleaning systems



Example: Feeding of water jets

Controller

Features

Our controllers support various control methods including positioner control, solenoid-valve control, pulse-train control, serial communication, field network (ProfiBus, DeviceNet, CC-Link, EtherCAT, Ethernet-IP/ProfiNet) and program operation.

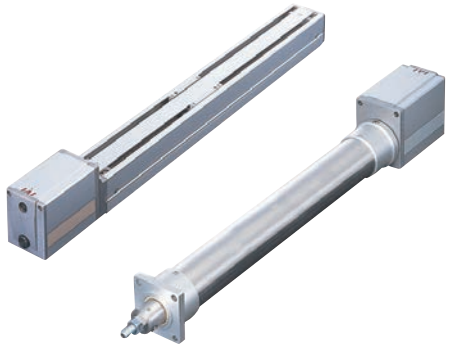
Applications

Simple positioning - Positioner control, solenoid-valve control
At-will control - Pulse-train control, serial communication
Simultaneous control with peripherals - Field network
Independent control - Program control

RoboCylinder Series

Pulse & Linear Motor Actuators

ERC 213 Series



The ERC series actuators are the affordable SOLUTION and benefit from a built-in controller improving usability.

Features

1. The built-in controller offers simple wiring.
2. No need for extra installation space for controllers.
3. Exceptional value; actuator price includes the controller.

Controller	(Built-in)	Input Power	DC24V

RCP 21314 Series

The RCP series actuators are high-value and driven by a pulse motor capable of generating high FORCE at low speed.

Features

1. Vast variety of unique electric actuators.
2. The characteristics of a pulse motor are utilized to generate strong push force.
3. The table type of RCP3 series is comstructed with a high-rigidity slide mechanism for greater moment leads.

Controller	PSEP PCON PSEL	Input Power	DC24V

RCL 1 Series

Slim RCL linear motor actuators are designed for high-speed operation with an acceleration up to 2 G.

Features

1. The sine-wave drive using 3-phase coil ensures quiet and smooth motion.
2. A magnetic leakage is prevented to outside.
3. Extremely compact body by adopting the linear motor technology without rotating speed-reducer.

Controller	ASEP ACON ASEL	Input Power	DC24V

ROBO CYLINDER

BLDC & Servo Motor Actuators

RCD 1 Series

Ultra-compact RCD micro cylinders continue the miniaturization level of RCL series with low costs of a brushless DC servo motor.

Features

1. Minimal size with a cross-section of only 12 mm with a body length as short as 60 mm.
2. Drive with permanent magnet motor allows a maximum speed of 300 mm/s and a maximum acceleration of 1 G.
3. 3-point positioning with acceleration rate and push force adjustment for replacing compact air cylinders.

Controller	DSEP	Input Power	DC24V

RCA 1I2 Series

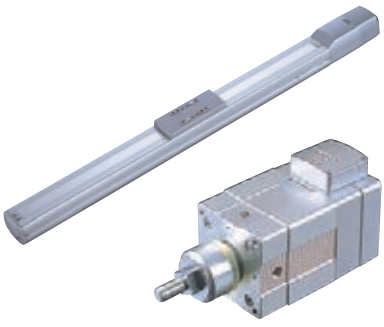
The RCA series is powered by a 24 V servo motor that can be installed in the same manner as air cylinders.

Features

1. Various mounting brackets similar to what you normally use with air cylinders are supported.
2. Available in one of three motor-installation specifications including the coupling type, built-in (direct connection) type and reversing type.
3. Home check sensor (optional)
4. Optional high acceleration/deceleration function that enables operations at 1 G. A power-saving option that lowers power consumptionis also offered.

Controller	ASEP ACON ASEL	Input Power	DC24V

RCS 2I3 Series



Mini/Small/Medium/Large size actuators can be operated with a 230 V power supply.

Features

1. Max speed of 1800 mm/s, max load capacity of 80 kg, and max stroke of 1100 mm.
2. With the XSEL controller, 3 or more axes can be combined as cartesian systems.
3. Available in one of three motor-installation specifications including the coupling type, built-in (direct connection) type and reversing type.
4. Optional high acceleration/deceleration function that enables operations at 1 G.

Controller	SCON SSEL XSEL	Input Power	AC230V

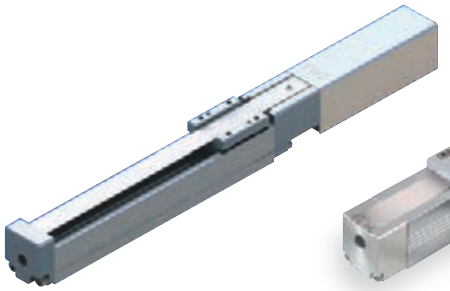
Mini RoboCylinder Models

Mini Slider type RCP3|RCA2

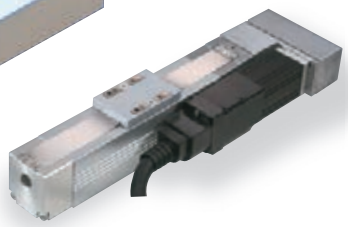
The slider on the main body moves back and forth until it is positioned.

Features
- The motor can easily perform switching operations for the unit model.
- Select from Reversing type with a reduced total length and Slim Straight type (Coupling type).

Usage
Used for jig and workpiece positioning, table travel, etc



Motor Unit Coupling type



Motor Unit Reversing type

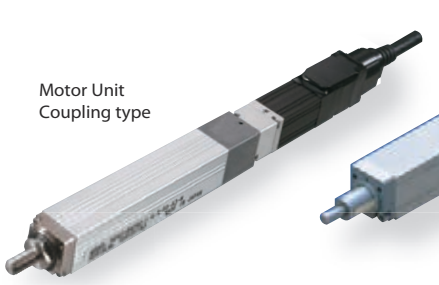
Mini Rod type RCP3|RCD|RCA2|RCS2

The rod extends and retracts from the main body, gets into position and presses.

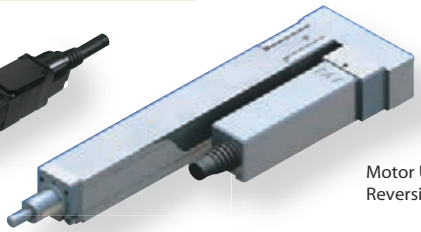
Features
- Select from Slim Motor Unit types and Short Length types having greatly reduced overall length.
- Select from Guide types with highly rigid/linear built-in guides and Non-Guide types having drastically miniaturized main body sizes.

Usage
Used for raising/lowering products and jigs, pushing, clamping, etc.

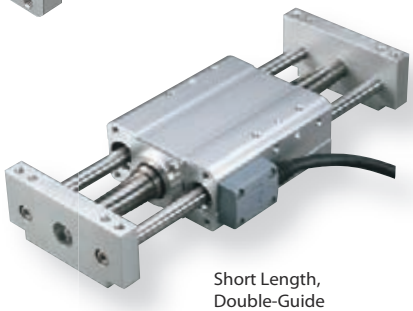
Short Length, Double-Guide Free Mount type



Motor Unit Coupling type

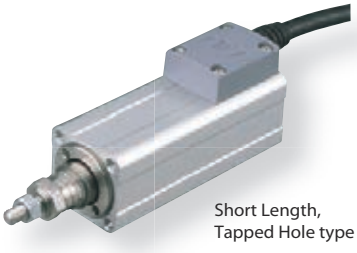


Motor Unit Reversing type

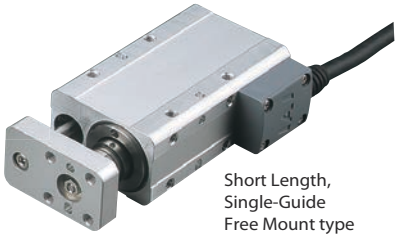


Short Length, Double-Guide Double-Acting type

Slim BLDC Motor type



Short Length, Tapped Hole type



Short Length, Single-Guide Free Mount type

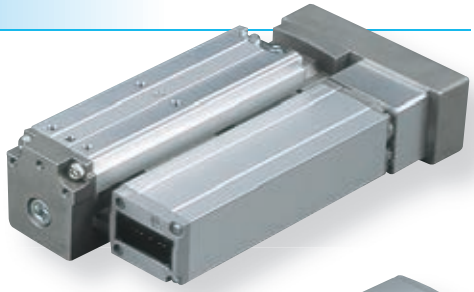
ROBO CYLINDER

Mini Table type RCP3|RCA2|RCS2

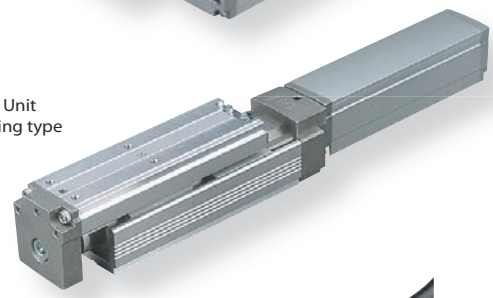
The table on the main body slides until it is positioned.

Features
- Comes equipped with an integrated guide that keeps overhung loads balanced.
- Select from Compact, Short Length types and Long Stroke Motor Unit types.

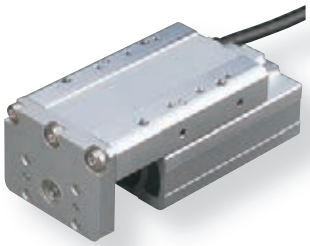
Usage
Used for raising/lowering products and jigs, horizontal moving, and pushing (handles overhung loads from the main unit).



Motor Unit
Reversing type



Motor Unit
Coupling type



Short Length
Wide type

Short Length
Flat type

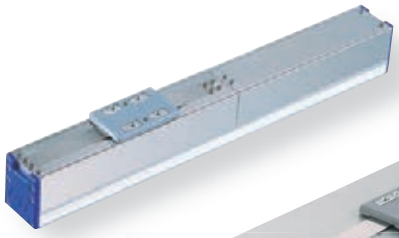
Short Length
Compact type

Mini Linear Motor type RCL

High speed, lightweight parts transfer.

Features
- Equipped with a high acceleration/deceleration linear motor capable of operation at up to 2G.
- Available in Slider type and Rod type. Slider type comes in six different models for each size and stroke.
- The Multi-slider type comes with two sliders on one axis that can be independently operated.

Usage
Used for transfers requiring short cycle times, etc.



Micro Slider
Slim type

Micro Slider
Long Stroke Type
Multi-slider

Micro Slider
Long Stroke Type
single slider

Micro Cylinder
Slim type

Quasi-pneumatic Controllers

PMEC/PSEP/ASEP/DSEP controllers designed exclusively for 2-point and 3-point positioning

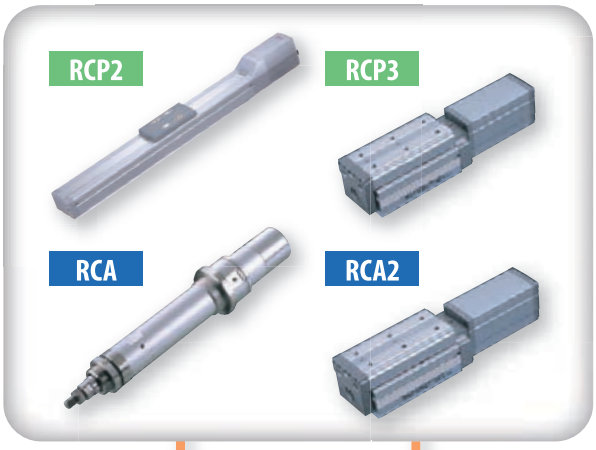
Unlike conventional controllers, the PMEC/PSEP/ASEP/DSEP require only a few movement positions. These 230 VAC MEC ("Mechanical Engineer Control") and 24 VDC SEP ("Simple Easy Positioner") controllers are for applications where the actuator only travels between 2 or 3 points, which is usually the case with air cylinders.

If you have been using air cylinders and are unhappy with the long time needed to change movement positions or want to stop actuator movement between 2 points, you can use the RoboCylinder with MEC and SEP controllers.

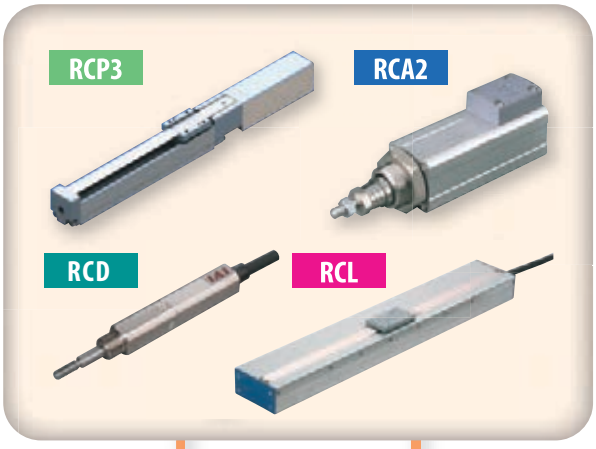
We also have an IP53 rated dustproof SEP type that can be placed near the actuator for operation as is done with solenoid valves.

MEC & SEP controllers are not just for the Mini RoboCylinder lineup. They can also be used with Standard RoboCylinders with P3 or A3 encoder. Conventional controllers can also be used with the Mini RoboCylinders (except RCD series) with P1 or A1 encoder.

Standard RoboCylinder Models

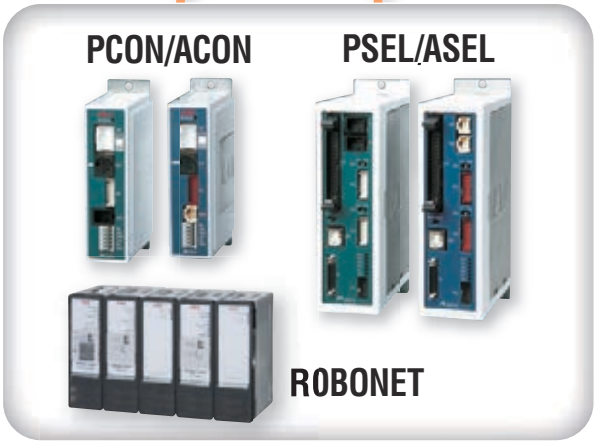


Mini RoboCylinder Models



P1/A1 Encoder

P3/A3/D3 Encoder



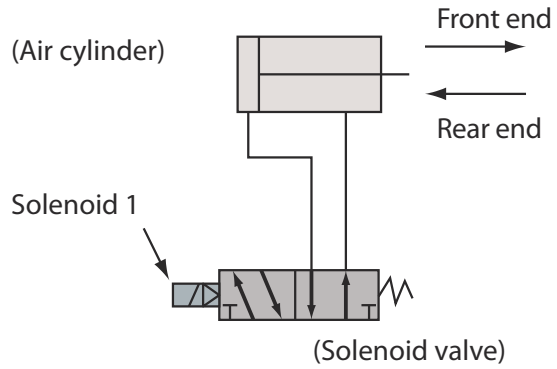
MEC & SEP Operating Methods

Operates using the same signals used for air cylinder solenoid valves

MEC and SEP controllers (24VDC/230VAC) can be operated with the same signals used for air cylinder solenoid valves.
Solenoid valves come in two types: Single solenoids and Double solenoids. The PMEC and PSEP/ASEP/DSEP support signals for both.

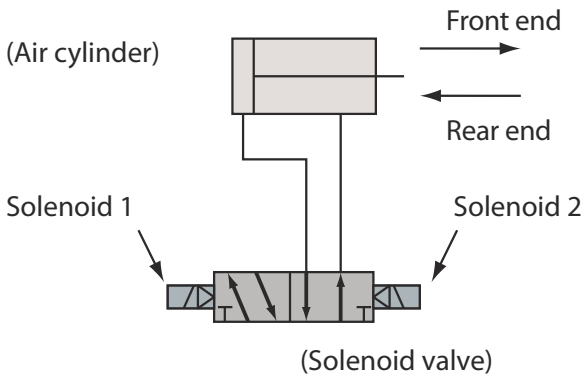
■ When using an air cylinder solenoid valve:

<Single solenoid>



Signal to solenoid 1	Rod movement
ON	Front end
OFF	Rear end

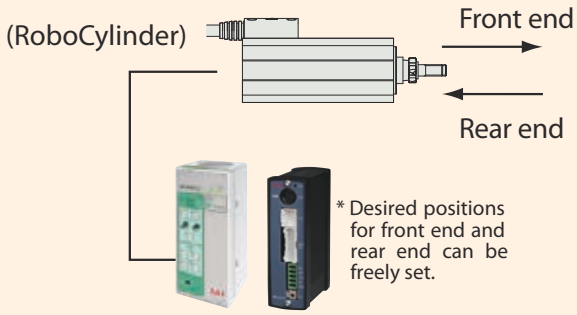
<Double solenoid>



Signal to solenoid 1	Signal to solenoid 2	Rod movement
ON	OFF	Front end
OFF	ON	Rear end

■ PMEC/PSEP/ASEP/DSEP:

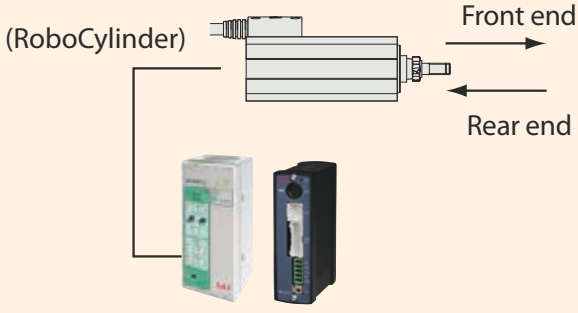
<Replacement of single solenoid>



(PMEC/PSEP/ASEP/DSEP)

Signal to controller Input 0	Rod movement
ON	Front end
OFF	Rear end

<Replacement of double solenoid>



(PMEC/PSEP/ASEP/DSEP)

Signal to controller Input 1	Signal to controller Input 0	Rod movement
ON	OFF	Front end
OFF	ON	Rear end

* The main body moves between the same two points listed above, but it can also travel between three points by switching the parameters.

Cartesian RoboCylinder Systems

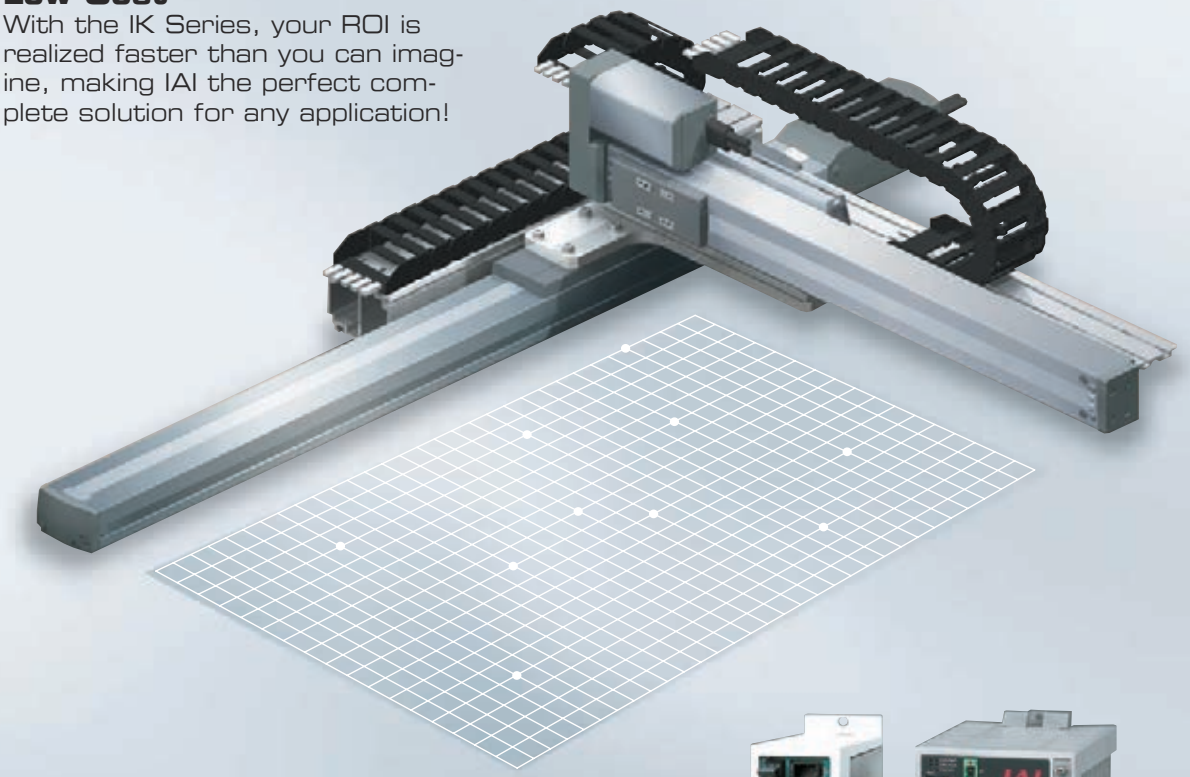
Multi-Axes System | IK Series

RoboCylinder IK Series

Your Multi-Axes Solution!

Easy Assembly
The complete kit includes everything needed for fast and easy assembly

Low Cost
With the IK Series, your ROI is realized faster than you can imagine, making IAI the perfect complete solution for any application!



Motor Options
The IK Series is offered in both pulse and servo motors. Choose the pulse motor for applications requiring high thrust at low speeds. Choose the servo motor for applications requiring constant thrust regardless of the operating speed.

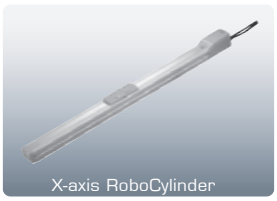
High Functionality
Combined with the PCON/PSEL/SCON/SSEL/XSEL controllers, complex programming is made easy.

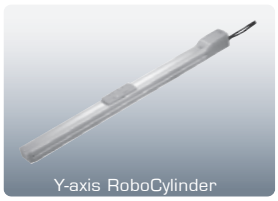
ROBO CYLINDER

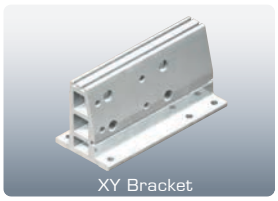
Multi-Axes System

IK Series Parts

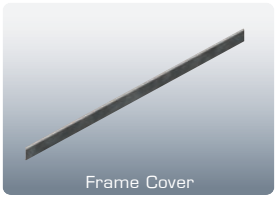
The IK Series offers the easy cost effective SOLUTION tailored to your needs.
The kit comprises the following components needed to assemble a cartesian robot

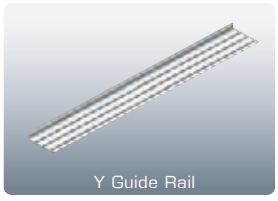

X-axis RoboCylinder

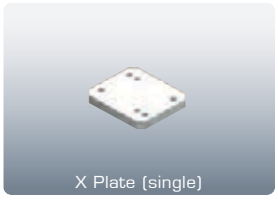

Y-axis RoboCylinder

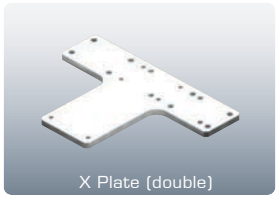

XY Bracket

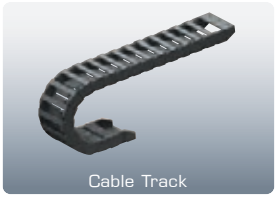

X Guide Rail

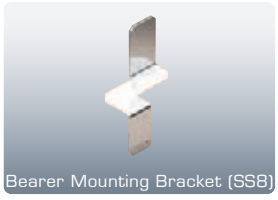

Frame Cover

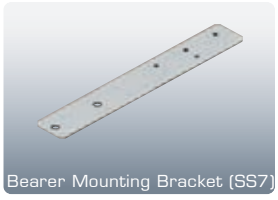

Y Guide Rail

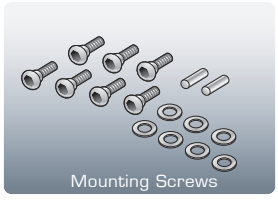

X Plate (single)


X Plate (double)

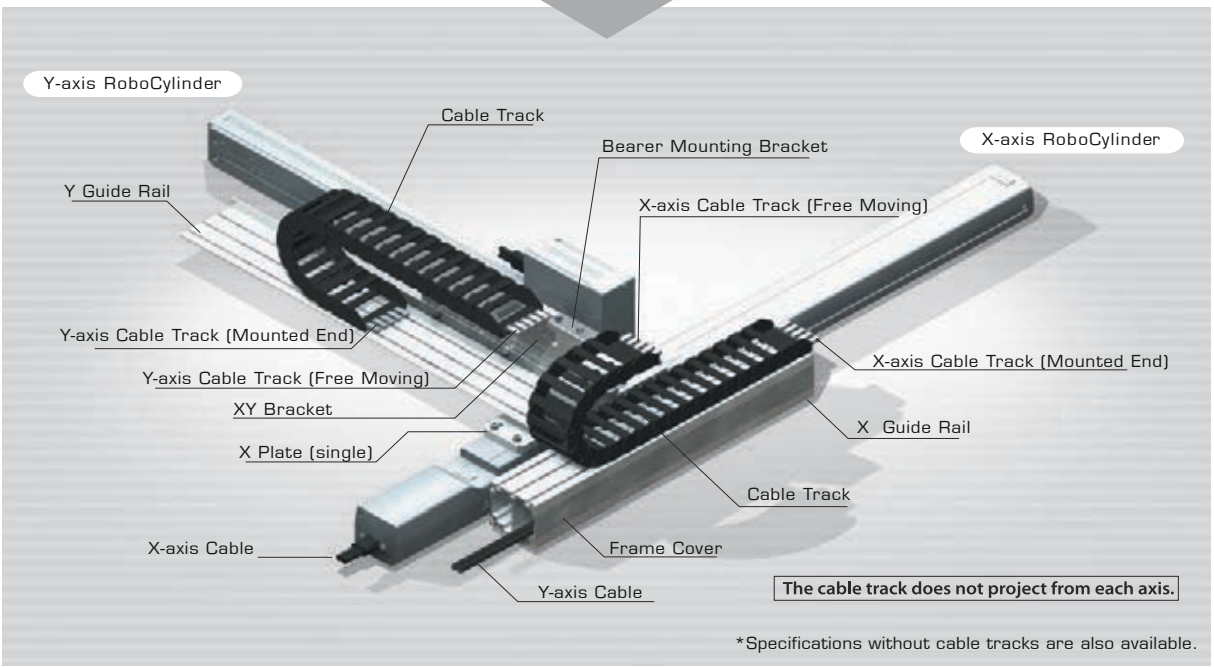

Cable Track


Bearer Mounting Bracket (SSB)


Bearer Mounting Bracket (SS7)


Mounting Screws

Note: The above images are provided for reference purposes only.
The actual components may vary depending on the combination type, direction, etc.



The cable track does not project from each axis.

*Specifications without cable tracks are also available.

Controllers

Supported Controllers — Controllers

Position controller

Positioner Type
These controllers support a maximum of 512 positioning points. You can also use it as a solenoid valve controller or serial communications controller, simply by changing the mode setting.

Solenoid Valve Type
Controls are made easy with effortless 3-point positioning. You can use the same solenoid-valve control operations you are already familiar with on your air cylinders.

Pulse-Train Input Type
These controllers eliminate the need to input positions in advance. They are ideal in applications require many or complex operation patterns, or where flexibility is required in changing speed and other settings.

Serial Communication Type
These controllers are used to connect to ProfiBus, DeviceNet, CC-Link, EtherCAT, Ethernet/IP or ProfiNet. Their compact, low-cost construction is perfect for multi-axis operations.

RoboNet
Reduce wiring and installation headaches with RoboNet. Operate via field network and connect up to 16 axes and register up to 768 points in Positioner mode and Simple Direct Value Mode. There is no limit on the number of positioning points when in Direct Numeric Value Mode. DIN rail installation means that the controller can be fastened and removed with ease.

Program controller

Program Type
Program controllers can operate 1, 2 and up to 8 axes. Since interpolation operation is possible, they are ideal for coating and palletizing operations requiring synchronized movements of 2 axes. You can set a maximum of 1500 positions and 20000 positions on the newly improved SSEL and XSEL controller. The XSEL controller was further improved with the RoboCylinder gateway function, which added the capacity to control a total of 22 axes.

RCP2 / RCP3 / RCP4 Series	RCL / RCA / RCA2 Series	RCS2 / RCS3 Series
24 VDC pulse motor type	24 VDC servo motor type	230 VAC servo motor type

PMEC / PSEP

Solenoid Valve Type
PMEC-C
PSEP-C/CW

MSEP

1~8-Axis Type
MSEP-C

ASEP

Solenoid Valve Type
ASEP-C/CW

SCON

SCON-C(A)

PCON

PCON-C(A)/CG/CF(A)
PCON-CY
PCON-PL/PO
PCON-SE

ACON

ACON-C/CG
ACON-CY
ACON-PL/PO
ACON-SE

MSCON

1~6-Axis Type
MSCON-C

ROBO NET

Network Type
RPCON

ROBO NET

Network Type
RACON

X-SEL

1~8-Axis Type
XSEL-KE/KET/P/Q/R/S

PSEL

1~2-Axis Type
PSEL-C

ASEL

1~2-Axis Type
ASEL-C

SSEL

1~2-Axis Type
SSEL-C

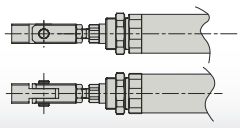
* Refer to RoboCylinder General Catalogue for more information.

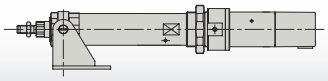
Mounting

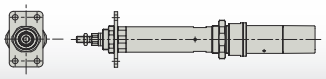
Various Mounting Methods

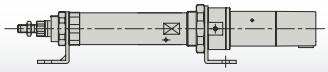
Mounting

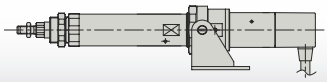
ENERGY EFFICIENT RoboCylinder RCA/RCS2 actuators are available with optional MOUNTING BRACKETS similar to those normally used with air cylinders, such as the foot, TRUNNION and clevis. The rod tip accepts a knuckle joint, floating joint or other mounting brackets, so you can quickly and COST-EFFECTIVELY convert your existing air cylinder to a RoboCylinder to maximize ROI.

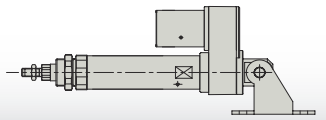

[Knuckle joint]


[Front trunnion]


[Flange]


[Foot]


[Rear trunnion]

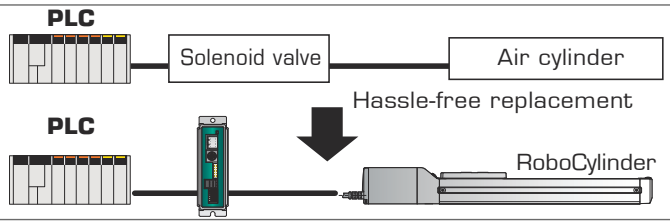

[Clevis]

Application Examples

Want to replace an existing air cylinder without hassle

Solenoid valve type

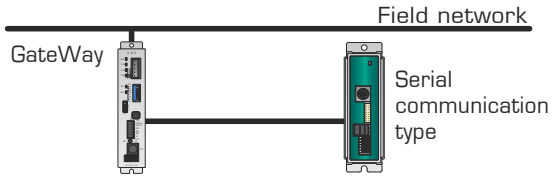
The PMEC, PSEP or PCON-CY and the ASEP or ACON-CY are recommended.
(You can also use the PCON-CA/CFA, MSEP, SCON or MSCON in the PIO mode.)
Your RoboCylinder can be controlled just like an air cylinder.



Want to connect to ProfiBus, DeviceNet and CC-Link

Serial communication type

You can connect the PCON-SE or ACON-SE to a gateway unit or network interface card.
The PCON-CA/CFA, MSEP, SCON and MSCON connect directly to fieldbus or industrial ethernet network.



Number of connectable units: ProfiBus/DeviceNet/CC-Link - 16 units

Want to operate it using a PLC based on pulse trains

Pulse-train input type

You can use the PCON-PL/PO, PCON-CA/CFA, ACON-PL/PO or SCON.

Want to operate multiple axes

The PSEL, ASEL and SSEL have 2-axis types, the XSEL 2~8-axis types. They can perform synchronized and interpolation operation.

Want to install it based on clevis/trunnion mount

Select either the rod-type RA3 or RA4 in the RCA/RCS2 series.

Way Out of Cost Trap Pneumatics

Green Automation by IAI: Higher Quality, Lower Running Costs, Sustainability

Using energy in an efficient manner will cut running costs and benefit the environment and as a result can significantly boost the image of a business in the public eye. With this said, it is essential and clear that we see the convergence of environmental and business needs are indeed in sync.
We at IAI see this and are working hard to build energy efficient products so both businesses and our environment can benefit each and every day.

How much money is leaking out of your system?

The Industry, Research and Energy (ITRE) Comitee of the European Parliament has reported that many facilities have no idea how much their compressed air systems cost on an annual basis, or how much money they could be saving by improving the performance of these systems. Do you know how much money is leaking out of your system?

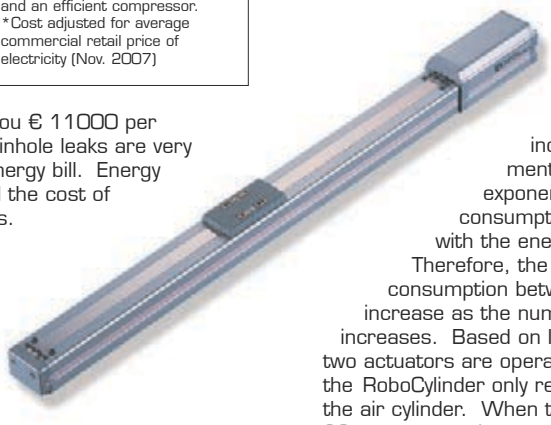
The excessive cost of leaks

An example of how expensive one small leak can cost, consider the figure below:

Size	Cost per Year
1/16"	€ 688
1/8"	€ 2750
1/4"	€ 11000

Costs calculated using electricity rate of € 0,1 per kWh*, assuming constant operation and an efficient compressor. *Cost adjusted for average commercial retail price of electricity (Nov. 2007)

Just one small ¼" hole can cost you € 11000 per year! Even without a visible hole, pinhole leaks are very common and add up to a costly energy bill. Energy costs are skyrocketing and so will the cost of air leaks that plague most systems. Leaks can also be a significant source of wasted energy in an industrial compressed air system, sometimes wasting 20-30% of a compressor's output. Leaks will drop system pressure and make air tools function less efficiently, adversely affecting production.



Eliminate your problems with RoboCylinder

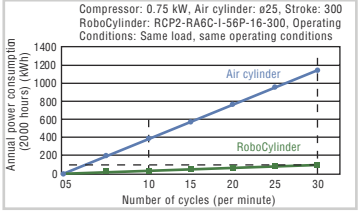
You can eliminate costly losses with IAI's RoboCylinder electric actuator today! RoboCylinder offers you easy to use software and all of the benefits of a high-quality electric actuator. Did you know that the effective energy efficiency of IAI's RoboCylinder line is 80-90%, while a typical overall efficiency is around 10% for a compressed air system?

Power Consumption Test: RoboCylinder vs Air Cylinder

IAI devised a precision power consumption test procedure to measure energy efficiency. Both the air cylinder and RoboCylinder were tested with identical variables. Variables included dwell time, cost of electricity, cost of compressed air, speed, payload, stroke, ambient temp and operating time.

RoboCylinder Running Costs only 1/3 to 1/10 of an Air Cylinder

As the operation frequency increases, the energy requirements of air cylinders increase exponentially, while the power consumption rate remains constant with the energy efficient RoboCylinder. Therefore, the differentials in power consumption between the two actuators increase as the number of cycles per minute increases. Based on IAI's calculations, when the two actuators are operating at 10 cycles per minute, the RoboCylinder only requires 1/3 the power of the air cylinder. When the actuators are operating at 30 cycles per minute, the difference is even more profound, with the RoboCylinder only requiring 1/10 the power of the air cylinder! Keep in mind that no industrial plant uses just one actuator; the more actuators your plant requires, the more savings and ROI with energy efficient RoboCylinders.



Example for Improvement Pneumatic

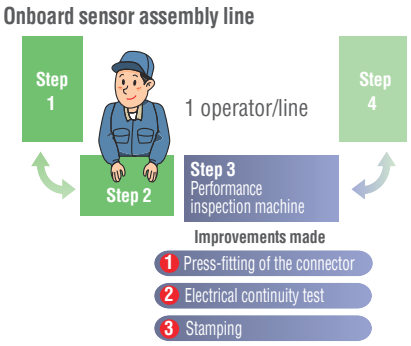
Overview of System

The system we worked on is a simple semi-automatic system that assembles onboard sensors and conducts an electrical continuity test on sensor assemblies. The operator sets the work part and presses the start switch, then the work part setting table moves toward the back of the system to perform assembly (press-fitting of the connector) and inspect the assembled work part, after which the table returns to the forward position.

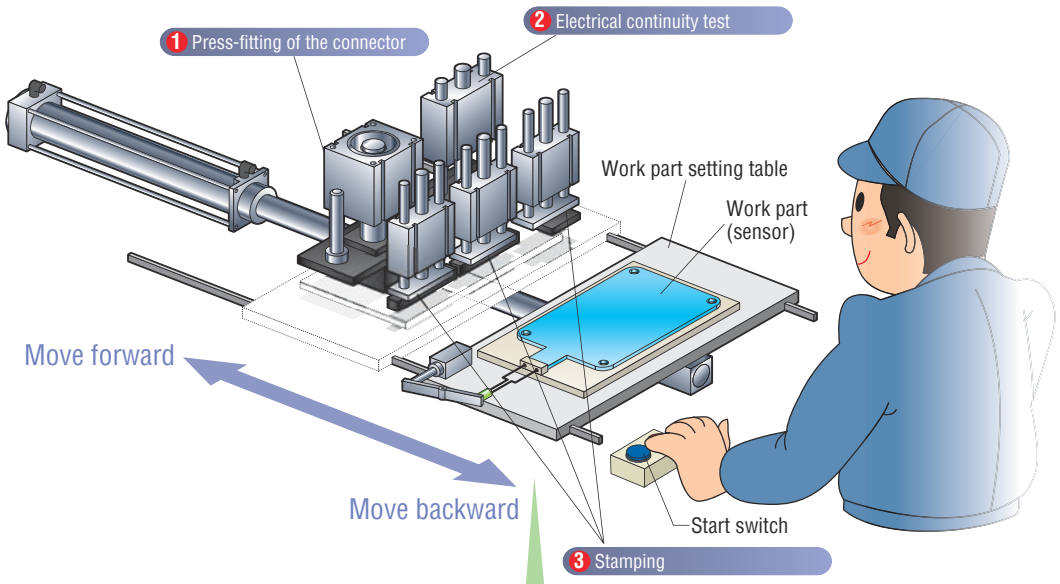
System Specifications

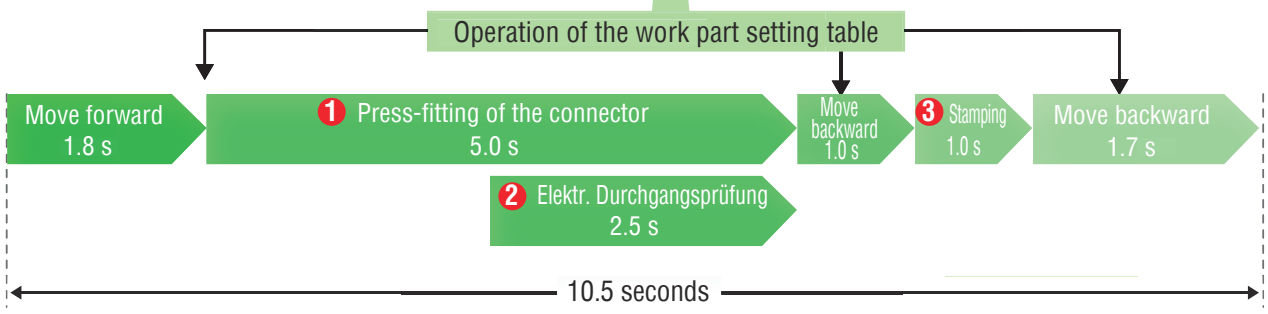
- **Number of air cylinders = 8 units**
- **Product types supported = 10 types**
  (25 types can be supported with 3 lines.)
- **Setup hours = 10 hours/year**
- **Cycle time = 10.5 seconds**

Positioning of the System in the Line



Onboard sensor performance inspection machine (using air cylinders)



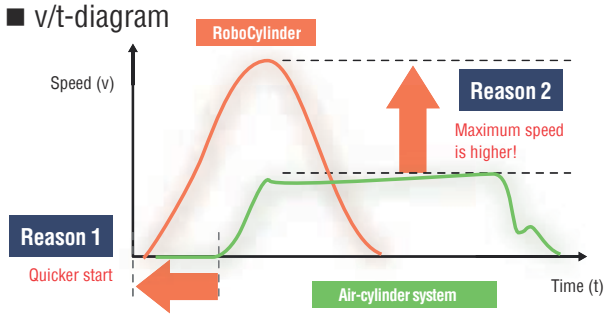


Transformation by RoboCylinder

Improvement 1 Cycle Time Reduction for "Work Part Setting Table" Operation

With the air-cylinder system, the "work part setting table" could not be operated faster because it would have increased the shock upon stopping. With the RoboCylinder system, on the other hand, the maximum speed can be increased because the actuator stops without generating shock.
In addition, the RoboCylinder system starts quicker than the air-cylinder system, which enabled significant reduction of the cycle time.

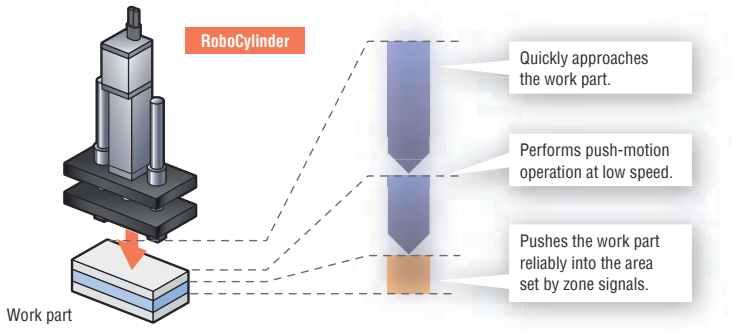
■ v/t-diagram



"Work part setting table" operation takes **1.8 seconds less**.

Improvement 2 Cycle Time Reduction for "Connector Press-fitting" Operation

With the air-cylinder system, an automatic switch was used to determine whether the work part had been pressed to the specified position, which made the operation unstable and required 4 seconds for the press-fitting action to ensure quality. With the RoboCylinder system, on the other hand, push-motion operation can be performed using the zone function and consequently the press-fitting time was successfully reduced by 2 seconds.

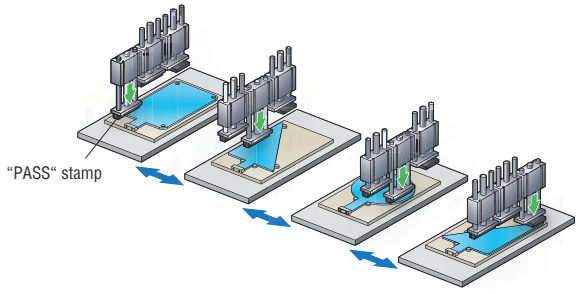


Push-motion operation takes **2 seconds less**.

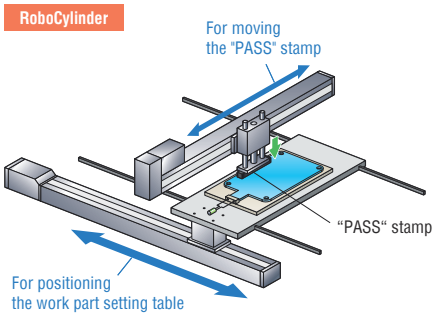
Improvement 3 Supporting more product types

With the air-cylinder system, multiple product types (10 types) were supported by switching the three air cylinders at the stamping location of the work part inspection "PASS" stamp.
By motorizing the system, 25 product types are now supported. With the motorization of the "connector press-fitting" and "electrical continuity test," these steps can now support 25 product types, as well. (The time spent on setup went down from 150 seconds per day to 0 seconds.)

Air-cylinder system Changes the stamping position by switching the 3 air cylinders.



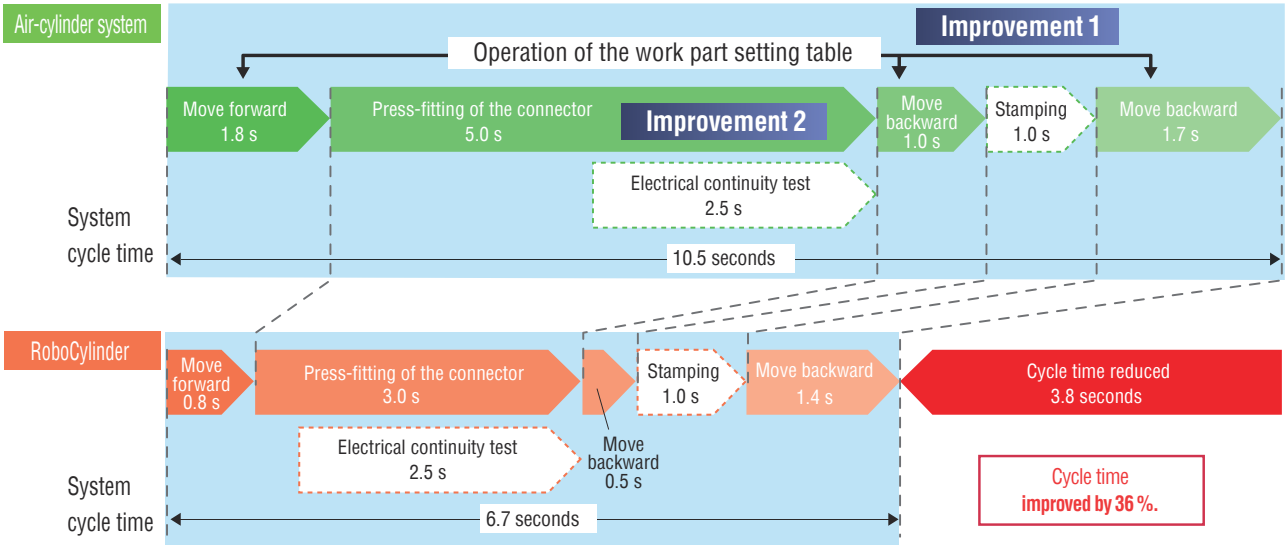
RoboCylinder



Setup time = **0 seconds** Number of product types supported: 10 → **25 types**

Transformation by RoboCylinder

Improvement 1 & Improvement 2 : led to reduce the cycle time by 3.8 seconds.



Summary

		Air-cylinder equipment	RoboCylinder equipment
Improvement of production efficiency		1 line: 1918 pcs/day 3 lines: 5754 pcs/day = 1403976 pcs/year (244 days)	1 line: 2647 pcs/day (38% improved) 2 lines: 5294 pcs/day =1291736 pcs/year (244 days)
Number of production lines required		3 lines	2 lines
Number of product types supported		10 types (Requires 3 lines to support 25 types)	25 types + x (1 line supports 25 types or more)
Step 3: Performance inspection machine	Cost of equipment	50040 €	54990 €
	Electric power consumption (a)/system	142.51 kWh/year	429.32 kWh/year
	Air compressor power consumption (b)/system	1113.16 kWh/year	0 kWh/year
	Total power consumption (a+b)/system	1255.67 kWh/year	429.32 kWh/year
	Step 3 total power consumption	1255.67 kWh x 3 lines = 3767 kWh/year	429.32 kWh x 2 lines = 858.6 kWh/year
	Step 3 total power cost (0.153 €/kWh)	540 €/year	90 €/year
	Step 3 power consumption/piece	3767 kWh : 1403976 pcs = 2.683 Wh	858.6 kWh : 1291736 pcs = 0.6647 Wh (Electric power consumption 75% decreased)

Production capability: Air-cylinder equipment x 3 lines is equivalent to RoboCylinder equipment x 2 lines

● Cost saved in 3 years after switching to RoboCylinder equipment at Step 3

	① Air-cylinder equipment	② RoboCylinder equipment	Difference (② - ①)
Equipment cost	50040 € x 3 lines = 150120 €	54990 € x 2 lines = 109980 €	- 40140 €
Labor cost	64980 € x 3 operators x 3 years = 584820 €	64980 € x 2 operators x 3 years = 389880 €	- 194940 €
Energy cost	540 € x 3 years = 1620 €	90 € x 3 years = 270 €	- 1350 €
Total	**736560 €**	**500130 €**	**- 236430 €**

Exchange rate: 100 yen = 1 €, Euro amounts rounded to the nearest 100 €

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IAI is RoHS compliant and recognizes the responsibility in reducing hazardous substances to better serve our customers and our environment.

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