

# A Simple Guide to ROBO Cylinder Applications

## Examples of Application Benefits

**ROBO  
CYLINDER**

Featuring Many Cost-saving Examples



# List of Applications & Benefits of Introducing ROBO Cylinder (by Industry)

Automobile	Page	Application	Topic	Useful ROBO Cylinder functions				
			Benefit of introducing ROBO Cylinder	Multi-point positioning	Push motion	Zone output	Setting of speed & acc/dec	Current limiting during move
1		Acceptability judgment of machined holes in engine block	Reduction of initial cost					
			€39,83 → €32,25 Reduction of €7,58		●			
2		Press-fitting of AT shift knob into shaft	Reduction of initial cost					
			€1.346 → €492 Reduction of €854		●			
3		Clamping of metal part during machining	Improvement of production efficiency Reduction of machining time [49 seconds → 34 seconds] This resulted in a 43% increase in production efficiency.		●			
4		Heating, positioning and joining/pressuring on duct heater	Reduction of defect rate					
			Reduction of defective parts [10% → 3%] This resulted in cost savings of €25.846 a year.	●	●			
5		Horizontal transfer of automotive parts between processes	Ensuring of operator safety					
			Lowering of current-limiting value during movement eliminated the risk of injury even if the operator's hand gets stuck in the machine. As a result, industrial accidents dropped to zero.	●				

Electronic parts	Page	Application	Topic	Useful ROBO Cylinder functions				
			Benefit of introducing ROBO Cylinder	Multi-point positioning	Push motion	Zone output	Setting of speed & acc/dec	Low-speed move at 0.1 mm/s
6		Transfer system for electrical control parts	Reduction of initial cost	●				
			€923 → €615 Reduction of €308					
7		Up/down movement of air nozzle for removing dust from parts	Reduction of initial cost	●				
			€2000 → €708 Reduction of €1292				●	
8		Up/down movement of cutting tool on board splitting system	Reduction of running cost					
			By setting four cutting-tool heights, the cutting tool life increased by four times, thus saving €16.615 a year in cutting tool cost.	●	●			
9		Press-fitting of camera parts	Improvement of production efficiency					
			Elimination of adjustment time resulted in an 8% increase in production efficiency.		●		●	
10		Up/down movement of motorized screwdriver for fine-pitch screws	Reduction of defect rate					
			Reduction of percent defective [1% → 0%] This resulted in cost savings of €5.538 a year.	●			●	●

## Food

Page	Application	Topic	Useful ROBO Cylinder functions			
		Benefit of introducing ROBO Cylinder	Multi-point positioning 	Push motion 	Zone output 	Setting of speed & acc/dec 
11	System for removing hoses from beer barrels	Improvement of production efficiency	●			●
		Elimination of setup change-over time, resulting in a 7% increase in production efficiency.				
12	Food stacker	Reduction of labor cost	●			●
		Manual work became automated. This saved €3.615 a month in labor cost.				

## Drug & cosmetic

Page	Application	Topic	Useful ROBO Cylinder functions			
		Benefit of introducing ROBO Cylinder	Multi-point positioning 	Push motion 	Zone output 	Setting of speed & acc/dec 
13	Up/down movement of rubber sheet cutter	Improvement of production efficiency	●			●
		Elimination of adjustment time resulted in a 7% increase in production efficiency.				

## General manufacturing

Page	Application	Topic	Useful ROBO Cylinder functions				
		Benefit of introducing ROBO Cylinder	Multi-point positioning 	Push motion 	Zone output 	Setting of speed & acc/dec 	Hold 
14	Transfer system for small motor parts	Improvement of production efficiency	●			●	
		Reduction of transfer time [4 seconds → 3.2 seconds] This resulted in a 25% increase in production efficiency.					
15	Parts feeder	Improvement of production efficiency			●	●	●
		30% increase in production efficiency					
16	Stocker on DVD-R/RW production line	Improvement of production efficiency	●			●	
		Expansion of the buffer area in the stock mechanism resulted in a 20% increase in production efficiency.					
17	Holding of multiple types of construction materials	Improvement of production efficiency	●				
		Setup changeover time [1 hour] was eliminated. This resulted in a 8% increase in production efficiency.					
18	Card sheet material feeder	Improvement of production efficiency				●	
		Adjustment time [30 minutes] was eliminated. This resulted in a 7% increase in production efficiency.					

## Benefits of Introducing ROBO Cylinder

Amazing benefits achieved by ROBO Cylinders

1 Improvement of Productivity		Production efficiency
● Clamping part during machining		<b>43% up</b> P.3
● Press-fitting of camera parts		<b>8% up</b> P.9
● Hose removal system		<b>7% up</b> P.11
● Up/down movement of rubber sheet cutter		<b>7% up</b> P.13
● Transfer system for small motor parts		<b>25% up</b> P.14
● Stocker in production line		<b>20% up</b> P.16
● Holding of multiple types of construction materials		<b>8% up</b> P.17
● Card sheet material feeder		<b>7% up</b> P.18
2 Reduction of Initial Cost		Initial cost
● Acceptability judgment of machined holes		<b>€7.583 lower</b> P.1
● Press-fitting into shaft		<b>€346 lower</b> P.2
● Transfer system for electrical control parts		<b>€308 lower</b> P.6
● Up/down movement of air nozzle		<b>€1.231 lower</b> P.7
● Parts feeder		<b>€308 lower</b> P.15
3 Reduction of Loss		Loss
● Positioning on duct heater		<b>Reduction of €2.585 a year</b> P.4
● Up/down movement of motorized screwdriver		<b>Reduction of €5.538 a year</b> P.10
4 Other		
● Horizontal transfer of parts		<b>Ensuring operator safety</b> P.5
● Up/down movement of cutting tool		<b>Reduction of running cost by €16.615 a year</b> P.8
● Food stacker		<b>Reduction of labor cost by €3.615 a month</b> P.12

# 1

## Acceptability Judgment of Machined Holes in Engine Block

Benefit of Introduction

Reduction of initial cost from **€43.615** to **€35.308**

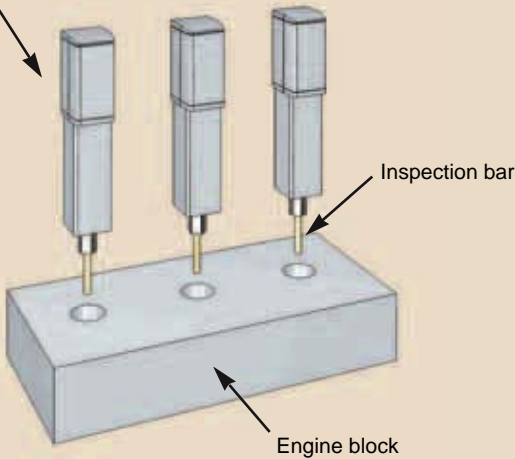
### Application

System inserts an inspection bar into a machined hole in an engine block to determine acceptability of machining.

The inspection bar is inserted into a machined hole using a ROBO Cylinder's push-motion operation. This operation is combined with a zone signal to determine "normal," "less than specified depth" or "more than specified depth" at the position where a push-motion completion signal is output.

ROBO Cylinder, rod type  
45-mm wide, dust-proof/splash-proof specification,  
with brake

**RCP2-RSW-□-B**



### ● Signal statuses and judgments

Signal output	Normal	Less than specified depth	More than specified depth
Zone signal	ON	OFF	OFF
Push-motion completion signal	ON	ON	OFF

### ROBO Cylinder function(s) used

Push motion



Zone output



### Explanation

#### Air Cylinder

- **Air cylinder price: €692 (with length measuring function)**  
(Inclusive of costs of brake, valve and other accessories)
  - **Required quantity**  
9 air cylinders per system
  - **Number of systems**  
7 sets throughout the factory
- Total cost of air cylinder system**  
€692 x 9 units x 7 systems = **€43.596**

#### ROBO Cylinder

- **ROBO Cylinder price: 72,900 yen**  
(Inclusive of costs of brake, controller and cables)
  - **Required quantity**  
9 ROBO Cylinders per system
  - **Number of systems**  
7 sets throughout the factory
- Total cost of ROBO Cylinder system**  
€561 x 9 units x 7 systems = **€35.343**

### Explanation

The initial cost of the ROBO Cylinder system is €35.343 compared to €43.596 required by the air cylinder system. This resulted in cost savings of 1,077,300 yen.

The ROBO Cylinder system also provides the following benefits:

#### Water-proofing:

The air cylinder with length measuring function is not water-proof, but the ROBO Cylinder series has a splash-proof type.

#### Improved accuracy:

While the encoder resolution is roughly the same between the air cylinder and ROBO Cylinder, the ROBO Cylinder allows for finer position adjustment. This improved the overall accuracy of the system.

#### Improved quality:

(Note) The ROBO Cylinder achieves a positioning accuracy of  $\pm 0.02$  mm with respect to the target position. With the ROBO Cylinder, the thrust with which to push the inspection bar can be adjusted easily. As a result, work damage was eliminated.

# 2

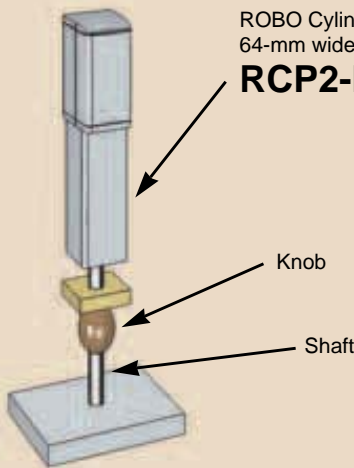
## Press-fitting of AT Shift Knob into Shaft

Benefit of Introduction

**Reduction of initial cost from €1.346 to €492**

### Application

System press-fits a knob onto a shaft in an AT shift knob assembly process. The rod comes down quickly and then slowly pushes the knob onto the shaft. Once the knob is press-fit, the rod rises quickly. The press-fit condition is checked using a zone output signal.



ROBO Cylinder, rod type  
64-mm wide, 150-mm stroke, with flange  
**RCP2-RMA-I-PM-4-150-P1-M-FL**

ROBO Cylinder function(s) used

Push motion



Zone output



### Explanation

#### Air Cylinder

<b>Initial cost</b>	
Cylinder (φ50, 150-mm stroke, with auto switch; custom specification)	€162
Distance measuring sensor	
Contact-type displacement sensor	€335
Counter	€423
Valve, etc.	€38
Other	€385
Sensor installation jig, counter installation box, wiring man-hours	
<b>Total</b>	<b>€1.343</b>

#### ROBO Cylinder

<b>Initial cost</b>	
RCP2-RMA-I-PM-4-150-P1-M-FL	€299
Controller RCP2-C-RMA-I-PM-0	€128
Cables	€62
<b>Total</b>	<b>€489</b>

### Explanation

The initial cost of the ROBO Cylinder system is €489 compared to €1.343 required by the air cylinder system. This resulted in cost savings of €854.

The ROBO Cylinder system also provides the following benefits:

**Shorter tact time:**

The ROBO Cylinder can be moved slowly when press-fitting and quickly during approach and retreat. This resulted in a shorter tact time.

**Improved accuracy:**

With the ROBO Cylinder, the press-fit stroke can be set directly. This improved the accuracy of insertion depth.

**Easy changeover of setup:**

Changing the setup upon switchover of production models became easy.

# 3

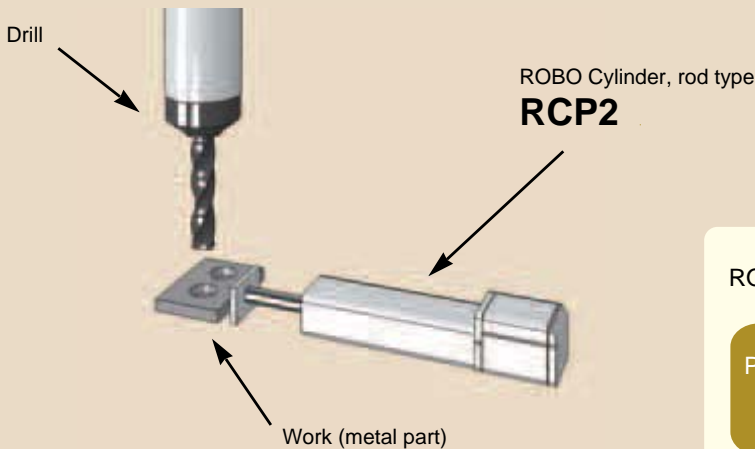
## Clamping of Metal Part during Machining

Benefit of Introduction

**43% increase in production efficiency**

### Application

Clamping machine is used for machining metal automotive parts. The work is clamped at 30 N in the initial rough-shaving stage where the work must be held securely. In the fine-machining stage after rough shaving, the push force is reduced to prevent the work from deforming.



ROBO Cylinder function(s) used

Push motion



### Explanation

#### Air Cylinder

With the air cylinder system, it takes 15 seconds to change the push force from 30 N to 10 N due to residual pressure. The work cannot be machined during this period.

- **Machining time**  
(Rough shaving: 13 seconds) + (Pressure change: 15 seconds) + (Fine machining: 13 seconds) + (Installation/removal: 8 seconds) = 49 seconds
- **Production volume**  
Tact time (49 seconds) = 73 pieces/hour (3,600 seconds) = 1,763 pieces/day (24 hours) = 52,890 pieces/month (30 days)

#### ROBO Cylinder

With the ROBO Cylinder system, the push force can be changed instantly by changing the position number.

- **Machining time**  
(Rough shaving: 13 seconds) + (Fine machining: 13 seconds) + (Installation/removal: 8 seconds) = 34 seconds
- **Production volume**  
Tact time (34 seconds) = 105 pieces/hour (3,600 seconds) = 2,520 pieces/day (24 hours) = 75,600 pieces/month (30 days)

### Explanation

$(75,600 \text{ pieces} - 52,890 \text{ pieces}) \div 52,890 \text{ pieces} = 0.429 \rightarrow$  Approx. 43% increase in production efficiency.

### (Note) How to change ROBO Cylinder push force

The push force can be changed even during push-motion operation by simply changing the position number to one corresponding to a desired push force, as shown in the table to the right.

Position No.	Position mm	Speed mm/s	Acceleration G	Push force %	Push band mm
1	100	200	0.3	30	10
2	100	200	0.3	70	10

# 4

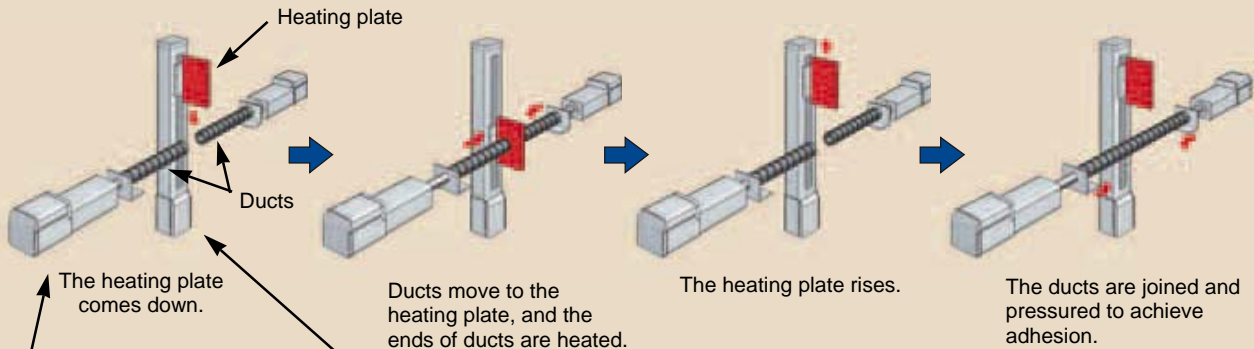
## Positioning and Joining/Pressuring on Duct Heater

Benefit of Introduction

Reduction of loss by €25.846 a year

### Application

System heats and then adheres automotive ducts (resin pipes). ROBO Cylinders are used for moving the heating plate and ducts. The heating position, joining position and other settings must be finely adjusted to achieve proper connection.



ROBO Cylinder, rod type  
64-mm wide, 150-mm stroke

**RCP2-RMA-I-PM-4-150-P1-M**

ROBO Cylinder, slider type  
73-mm wide, 600-mm stroke

**RCP2-SA7-I-PM-1-600-P1-M**

ROBO Cylinder function(s) used

Multi-point positioning



Push motion



Zone output



### Explanation

#### Air Cylinder

With the air cylinder system, adjusting the speed and push force at the time of joining ducts is difficult. This caused adhesion problems, and the defect rate was approx. 10%.

- Initial cost: €2.308
- Defect rate: 10%
- Production volume: 1,000 pieces/day  
= 20,000 pieces/month (20 days)  
= 240,000 pieces/year
- Unit price of part: €1,54

#### Annual loss of air cylinder system due to joining problems

€1,54 x 240,000 pieces/year x 10%  
= **€36.960**

#### ROBO Cylinder

With the ROBO Cylinder system, the speed and push force can be adjusted easily. As a result, the defect rate dropped to 3%.

- Initial cost: €2.308
- defect rate: 3%
- Production volume: 1,000 pieces/day  
= 20,000 pieces/month (20 days)  
= 240,000 pieces/year
- Unit price of part: €1,54

#### Annual loss of air cylinder system due to joining problems

€1,54 x 240,000 pieces/year x 3%  
= **€11.088**

### Explanation

While the air cylinder system generated an annual loss of €36.960, it is €11.088 with the ROBO Cylinder system. The effective savings are €25.872.

The initial cost is €2.308 for both the air cylinder system and ROBO Cylinder system. According to the manufacturer, it cost them 1 million yen to produce a servo motor system in-house.



# 5

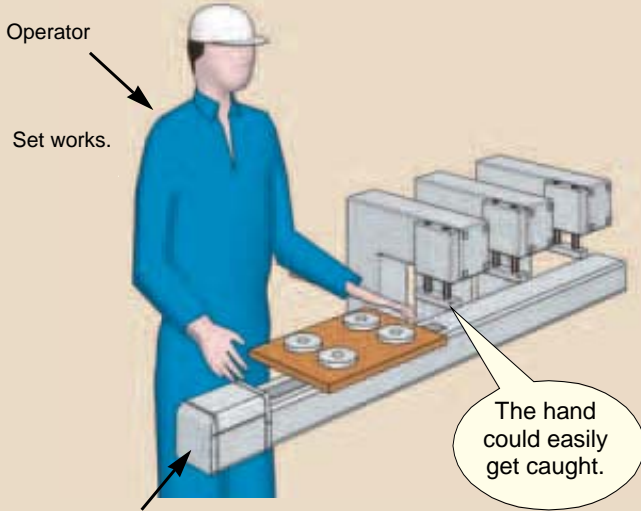
## Horizontal Transfer of Automotive Parts between Processes

Benefit of Introduction

### Ensuring operator safety

#### Application

Production line positioning automotive parts (horizontal transfer). Safety is critical because the operator's hand could easily get caught.



ROBO Cylinder, slider type  
73-mm wide, 800-mm stroke

**RCP2-SA7-I-PM-16-800-P1-M**

#### ROBO Cylinder function(s) used

Multi-point positioning



Current limiting during move



#### Explanation

##### Air Cylinder

Since actuating an emergency stop is difficult, the system will not stop even when the operator's hand gets caught. This presented risk of injury.

##### ROBO Cylinder

The push force can be reduced by lowering the moving torque. If the operator's hand gets caught in this condition, no injury will result because the push force is small. In the meantime, an error will generate and the system will stop.

(Note) The ROBO Cylinder can no longer guarantee the loading capacity, speed and other specifications listed in the catalog if the moving torque is lowered. Therefore, the above function is disabled in normal conditions of use. Please contact IAI if your system is subject to a special circumstance and this function must be enabled.

# 6

## Transfer System for Electrical Control Parts

Benefit of Introduction

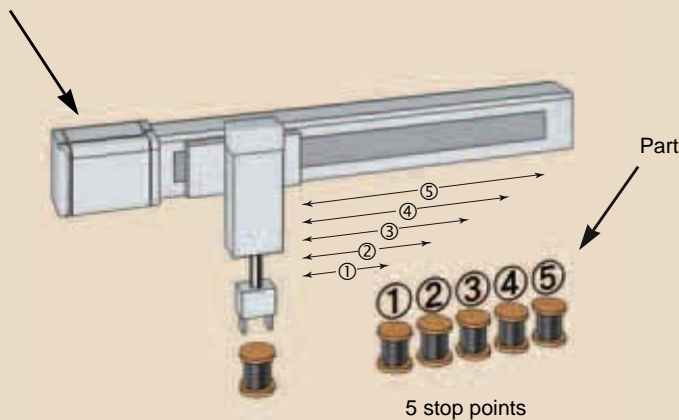
**Reduction of initial cost from €923 to €626**

### Application

A ROBO Cylinder system that transfers electrical control parts in an assembly line having five stop points.

ROBO Cylinder, slider type  
58-mm wide, 550-mm stroke

**RCP2-SA6-A-PM-6-550-P1-S**



ROBO Cylinder function(s) used

Multi-point positioning



### Explanation

#### Air Cylinder

The air cylinder system required five cylinders, because a cylinder with a different stroke must be used to implement each stop.

##### ● Cost of air cylinder parts

- Rod-less air cylinder
- Linear guide
- Positioning cylinder x 5
- Valve, etc.

Initial cost of air cylinder system: €923

#### ROBO Cylinder

The ROBO Cylinder system requires only one cylinder, because it can perform multi-point positioning to respective stop points.

##### ● Cost of ROBO Cylinder parts

- |                     |      |
|---------------------|------|
| • ROBO Cylinder x 1 | €411 |
| • Controller        | €169 |
| • Cables            | €46  |

Initial cost of ROBO Cylinder system: €626

### Explanation

Compared to the cost of air cylinder parts amounting to €923, the ROBO Cylinder system only costs €626 for parts. The cost savings are €297.

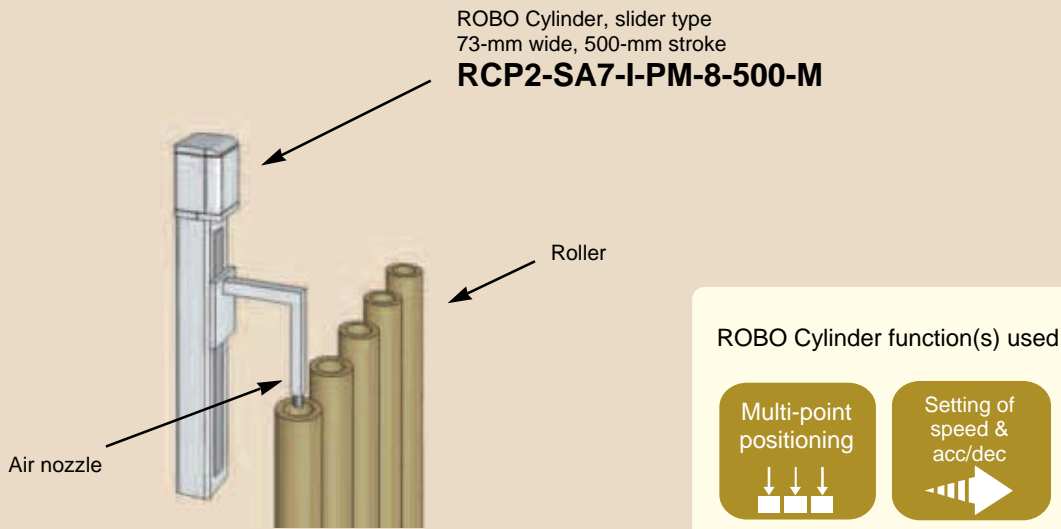
In addition to costing more on parts, the air cylinder system also requires higher costs associated with assembly jigs, air piping man-hours, and so on. When all savings are considered, the initial cost of the ROBO Cylinder system becomes much lower.

Benefit of Introduction

**Reduction of initial cost from €2.000 to €705**

### Application

System removes dust from inside rollers used in office equipment. An air nozzle is installed at the tip of a ROBO Cylinder. This nozzle is inserted into a roller, and then the nozzle is moved to blow dust out of the roller. Different types of rollers are involved in the process, all varying in length and other dimensions.



### Explanation

#### Air Cylinder

Four types of air cylinders had to be used to accommodate rollers of different strokes.

- **Air cylinder cost**  
€500 per set

**Total purchase cost of air cylinders**  
€500 x 4 types = €2.000



#### ROBO Cylinder

Since the ROBO Cylinder is capable of multi-point positioning, one unit can accommodate all rollers.

- **Total purchase cost of ROBO Cylinder**
  - ROBO Cylinder €585
  - Controller €58
  - Cables €62

**Purchase cost of ROBO Cylinder €705**

### Explanation

The air cylinder system had an initial cost of €2.000, whereas the ROBO Cylinder system costs only €705 initially. This is a cost reduction of €1.295.

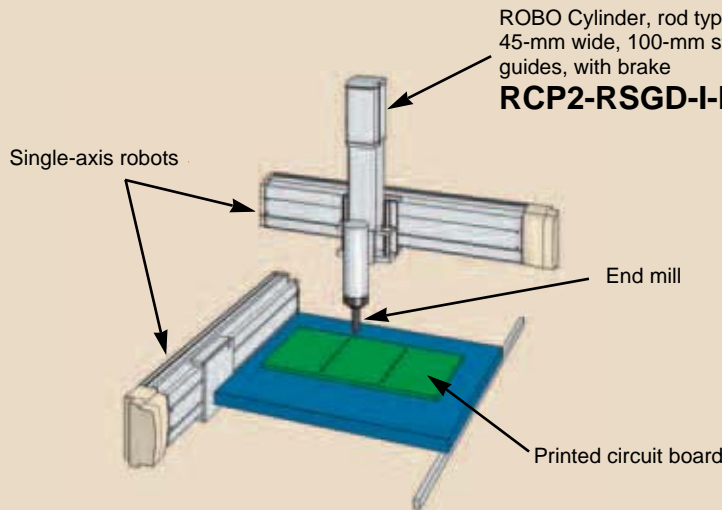
With the air cylinder system, the setup had to be changed for each roller type. This is no longer necessary on the ROBO Cylinder system. The ROBO Cylinder system also eliminated the need for stopper adjustment and speed control adjustment.

Benefit of Introduction

Reduction of running cost by €16.610 a year

Application

System cuts printed circuit boards. ROBO Cylinders are used to move an end-mill up and down to cut circuit boards. Since the blade becomes dull after 1,000 boards, the end mill is lowered after 1,000 boards so as to cut boards using an unused, sharp blade face.



With the ROBO Cylinder, one blade can be used at four positions.

ROBO Cylinder function(s) used

Multi-point positioning



Push motion



Explanation

Air Cylinder

Since the position of the cutting blade cannot be changed, the blade had to be changed after 1,000 boards.

- Unit price of end mill: €9,23
- End mill life: 1.000 boards
- Machining quantity per day: 1.000 boards
- End mill cost  
€9,23 /day = €184,60 /month (20 days)  
= €2.215 /year

Annual cost of air cylinder system €2.215

ROBO Cylinder

Since the position of the cutting blade can be changed to four locations, 4,000 boards can be cut with each blade.

- Unit price of end mill: €9,23
- End mill life: 4.000 boards
- Machining quantity per day: 1.000 boards
- End mill cost  
€2,31 /day = €46,20 /month (20 days)  
= €554,40 /year

Annual cost of ROBO Cylinder system €554

Explanation

The running cost of the air cylinder system is €2.215 /year, while that of the ROBO Cylinder system is €554 /year. The associated cost savings is €1.661 /year.

This factory uses 10 of these systems. The total cost reduction thus amounted to €1.661 x 10 units = €16.610 /year.

# 9

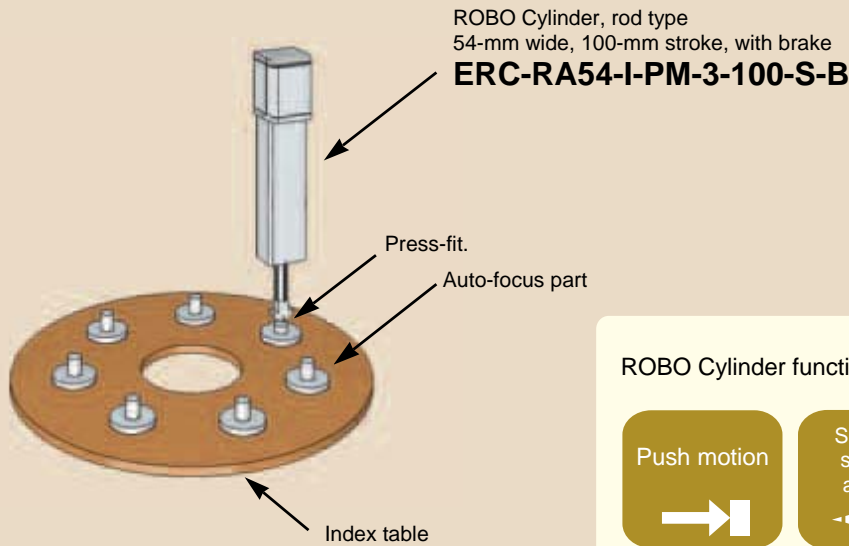
## Press-fitting of Camera Parts

Benefit of Introduction

**8% increase in production efficiency**

### Application

A system that assembles auto-focus parts for cameras. A ROBO Cylinder is used in the press-fitting of parts on an index table.



ROBO Cylinder function(s) used

Push motion



Setting of speed & acc/dec



### Explanation

#### Air Cylinder

Since the press-fit part is very small, adjustment of press-fit height is very difficult. Approximately one-half day was wasted three times a month for adjustment.

- **Adjustment time:** Half day = 4 hours
- **Adjustment interval:** 3 times/month
- **Monthly adjustment time**  
= 4 hours x 3 times = 12 hours
- **Monthly operation time**  
= 8 hours x 20 days – 12 hours  
= 148 hours

#### ROBO Cylinder

Since the ROBO Cylinder allows for numerical control, adjustment and setup change require little time.

- **Monthly adjustment time**  
= 0 hour
- **Monthly operation time**  
= 8 hours x 20 days = 160 hours

### Explanation

$(160 \text{ hours} - 148 \text{ hours}) \div 148 \text{ hours} = 0.08 \rightarrow$  Approx. 8% increase in production efficiency.

The ROBO Cylinder system also provides the following benefits:

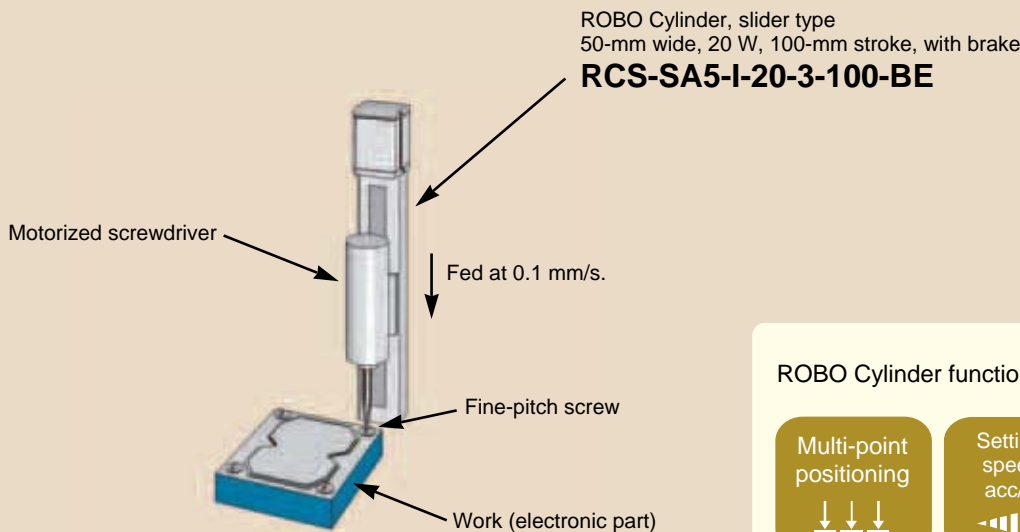
- Shorter assembly time:** The actuator can be moved at high speed until immediately before press-fitting and during the subsequent retreat, with the speed reduced only when the part is press-fit. This reduced the assembly time.
- Improved quality:** Auto-focus parts are becoming increasingly smaller. With the air cylinder system, the parts may be damaged due to impact.

Benefit of Introduction

Reduction of loss by €5.538 a year

## Application

System assembles electronic parts. A ROBO Cylinder is used in the mechanism for moving up and down a motorized screwdriver that tightens fine-pitch screws. Stable up/down movement at a low speed of 0.1 mm/s is required.



## ROBO Cylinder function(s) used

Multi-point positioning



Setting of speed &amp; acc/dec



Low-speed move at 0.1 mm/s



## Explanation

## Air Cylinder

- Since the speed cannot be finely adjusted, screw tightening problems occurred.
- Defect rate: 1 to 2%  
1 or 2 out of 100 products were defective.  
1 or 2 out of 400 screws had tightening problems (each part has 4 screws).
- Scrapping and rework of defective products cost approx. €462 a month.

## ROBO Cylinder

- Stable movement is possible at a low speed of 0.1 mm/s.
- Defect rate dropped to nearly zero.
- Scrapping/rework cost of defective products was virtually eliminated.

## Explanation

While the air cylinder system incurred a loss of €462 /month, the ROBO Cylinder system generates virtually no loss.

With the ROBO Cylinder system, it also takes less time to change the setup upon switchover of works, which contributed to productivity increase.

(Note) The minimum speed of the ROBO Cylinder is normally 1 mm/s. If you must operate your ROBO Cylinder at 0.1 mm/s, we provide PC software that supports the lower speed. Please contact IAI for details.

# 11

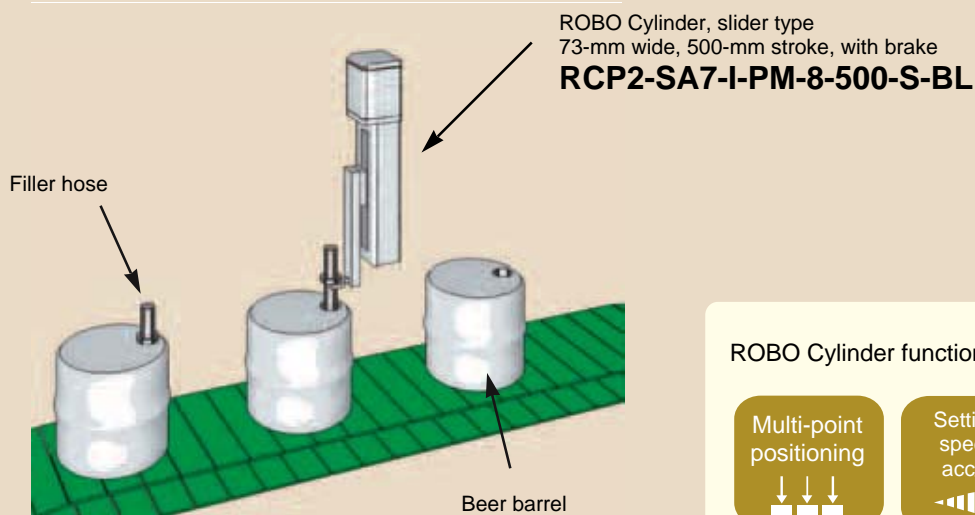
## System for Removing Hoses from Beer Barrels

Benefit of Introduction

**7% increase in production efficiency**

### Application

A ROBO Cylinder system that removes filler hoses from industrial beer barrels after the barrels have been filled with beer at a brewery.



ROBO Cylinder function(s) used

Multi-point positioning



Setting of speed & acc/dec



### Explanation

#### Air Cylinder

The stopper position must be changed every time the beer barrel size is changed. The line had to be stopped 10 minutes for this change.

- **Setup change time:** 10 minutes
- **Setup change frequency:** 3 times/day
- **Monthly production time**
  - Stop time = 10 minutes x 3 times/day = 30 minutes/day = 10 hours/month
  - Production time = 8 hours x 20 days – 10 hours = 150 hours

#### ROBO Cylinder

Since the ROBO Cylinder allows for quick setup change using a single switch, the line no longer needs to be stopped.

- **Setup change time:** 0 minute
- **Monthly production time**
  - Stop time = 0 hour
  - Production time = 8 hours x 20 days = 160 hours

### Explanation

$(160 \text{ hours} - 150 \text{ hours}) \div 150 \text{ hours} = 0.07 \rightarrow$  Approx. 7% increase in production efficiency.

# 12

## Food Stacker

Benefit of Introduction

### Reduction of labor cost by €3.660 a month

#### Application

A system consisting of two ROBO Cylinder axes, used for stacking two food products traveling on a line in a food processing factory.

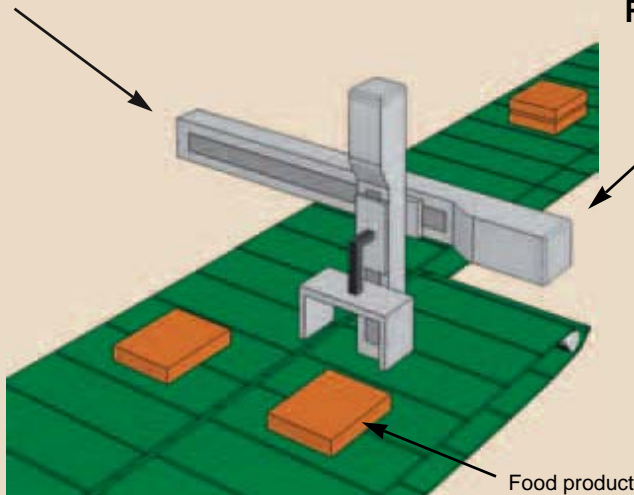
ROBO Cylinder, slider type  
73-mm wide, 300-mm stroke

**RCP2-SA7-I-PM-16-300-P1-M**

ROBO Cylinder, slider type

58-mm wide, 100-mm stroke, robot cables, with brake

**RCP2-SA6-I-PM-12-100-P1-R05-B**



#### ROBO Cylinder function(s) used

Multi-point  
positioning



Setting of  
speed &  
acc/dec



#### Explanation

#### Manual Operation

##### Cost of manual operation

- Line operation time: 21 hours/day

- Labor cost

9:00 ~ 18:00	8 hours	€49
18:00 ~ 1:00	7 hours	€65
1:00 ~ 7:00	6 hours	€69

-----  
Daily cost      21 hours      €183

##### Monthly cost of manual operation

23,800 yen/day x 20 days = €3.660

#### ROBO Cylinder

##### Initial cost of ROBO Cylinder system

- ROBO Cylinder
- Controller, cables
- Vision sensor
- PLC, etc.

-----  
Total                      €6462

**Labor cost became virtually zero.**

#### Explanation

Introduction of the ROBO Cylinder system eliminated the labor cost of €3.660 /month required when the line was operated manually.

Automation also improved quality, because on the manual line errors occurred frequently, especially during 2<sup>nd</sup> and 3<sup>rd</sup> shifts.

(Note) Another reason that to the factory adopted the ROBO Cylinder system is that they didn't want to increase the amount air equipment due to "unstable speed of the air cylinder system," "difficulty finding space for extra compressors," and "need to save energy."



# 13

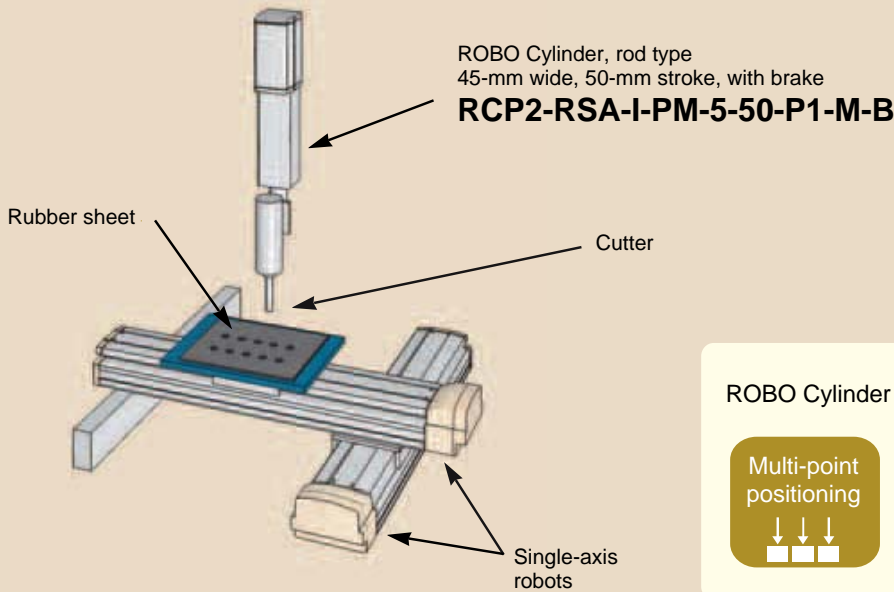
## Up/Down Movement of Rubber Sheet Cutter

Benefit of Introduction

### 7% increase in production efficiency

#### Application

A system that cuts rubber sheets of 1 mm in thickness (using a round blade) to produce rubber caps for drug containers. A ROBO Cylinder is used for moving the cutter up and down.



#### ROBO Cylinder function(s) used

Multi-point positioning



Setting of speed & acc/dec



#### Explanation

#### Air Cylinder

Because of the difficulty setting speed, around 30 minutes had to be spent on adjustment every day.

- Low speed: The rubber sheet elongates and cannot be cut.
- High speed: Rubber breaks.

If broken rubber caps are found in the receiving inspection, the whole lot will be determined "out of specification" (all caps must be scrapped).

- **Adjustment time:** 30 minutes/day = 0.5 hour/day
- **Monthly production time**
  - Stop time = 0.5 hour/day x 20 days = 10 hours/month
  - Production time = 8 hours x 20 days – 10 hours = 150 hours

#### ROBO Cylinder

Speed setting became easy, and adjustment time is no longer required.

- **Adjustment time:** 0 minute
- **Monthly production time**
  - Stop time = 0 hour
  - Production time = 8 hours x 20 days = 160 hours

#### Explanation

$(160 \text{ hours} - 150 \text{ hours}) \div 150 \text{ hours} = 0.07 \rightarrow$  Approx. 7% increase in production efficiency.

Benefit of Introduction

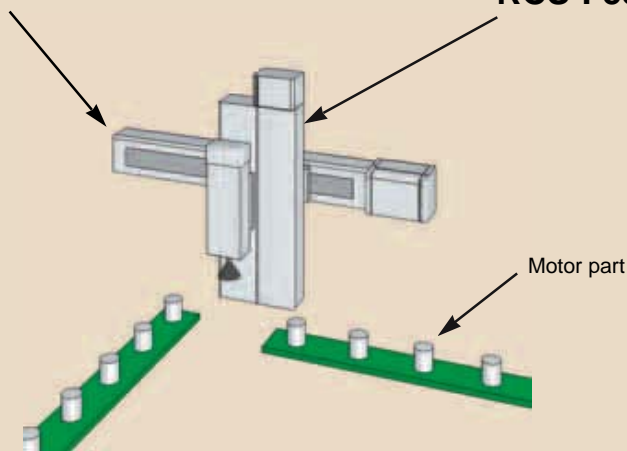
### 25% increase in production efficiency

#### Application

System picks up and places parts in an assembly line of small motor parts.

ROBO Cylinder, slider type  
68-mm wide, 200-mm stroke  
**RCS-SM-A-150-H-200**

ROBO Cylinder, flat type  
100 W, 150-mm stroke, with brake  
**RCS-F55-A-100-M-150-B**



ROBO Cylinder function(s) used

Multi-point positioning



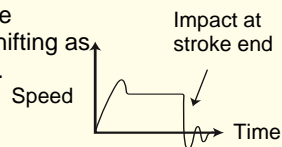
Setting of speed & acc/dec



#### Explanation

##### Air Cylinder

With the air cylinder system, the speed could not be increased due to the possibility of parts dropping or shifting as a result of impact upon stopping.

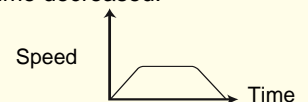


● **Production volume:**

Tact time (4 seconds) = 900 pieces/hour (3,600 seconds) = 18,000 pieces/day (20 hours) = 360,000 pieces/month (20 days)

##### ROBO Cylinder

The ROBO Cylinder allows for a smooth adjustment of speed, acceleration and deceleration. Since optimal values can be set with ease, the tact time decreased.



● **Production volume:**

Tact time (3.2 seconds) = 1,125 pieces/hour (3,600 seconds) = 22,500 pieces/day (20 hours) = 450,000 pieces/month (20 days)

#### Explanation

$(450,000 \text{ pieces} - 360,000 \text{ pieces}) \div 360,000 \text{ pieces} = 0.25 \rightarrow 25\% \text{ increase in production efficiency.}$  Other benefits include virtual elimination of cylinder replacement and facility downtime for maintenance, which was necessary with the air cylinder system. This further increased the production efficiency of the ROBO Cylinder system.

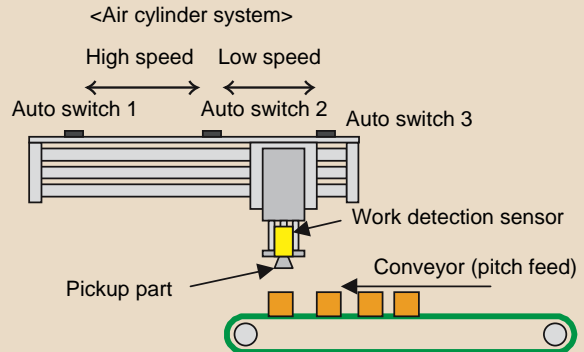
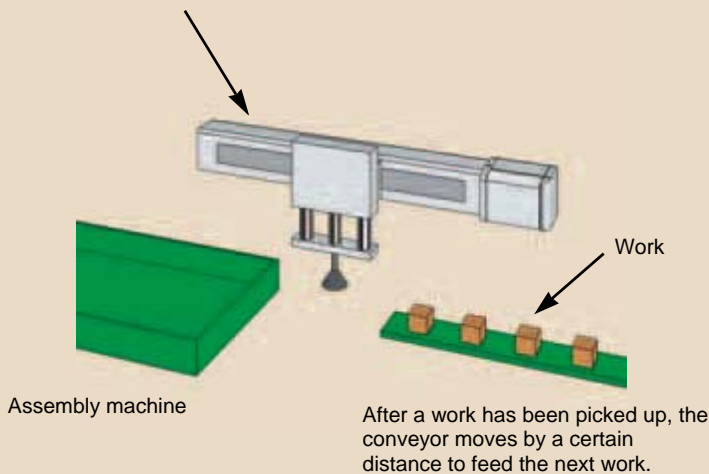
Benefit of Introduction

### 30% increase in production efficiency

#### Application

A ROBO Cylinder is used in the horizontal transfer of parts of a pick & place mechanism in a parts feeder that feeds parts to an assembly machine.

ROBO Cylinder, slider type, 58-mm wide  
**RCP2-SA6-I-PM-12-600-P1-S**



ROBO Cylinder function(s) used



#### Explanation

##### Air Cylinder

- The horizontal cylinder was of rod-less type.
- The cylinder moves at high speed from auto switch 1 to auto switch 2, after which the solenoid valve is switched and the cylinder moves at low speed up to auto switch 3 (2-stage speed control).
- When the work detection sensor turns on, the horizontal cylinder will stop and the up/down cylinder will be lowered to pick up the work.
- With the air cylinder system, the cylinder stop position fluctuated and pickup errors occurred frequently because stopping of the cylinder depended on sensor detection.

##### ROBO Cylinder

- The ROBO Cylinder moves at high speed for the section corresponding from auto switch 1 to auto switch 2, after which the speed is switched to low for the section up to auto switch 3.
- When the work detection sensor turns on, the ROBO Cylinder will hold and the up/down cylinder will be lowered to pick up the work.
- Since the ROBO Cylinder allows for easy speed control and accurate stopping, pickup errors were virtually eliminated.

#### Explanation

With the air cylinder, work efficiency was low because a pickup error necessitated a repeat operation of “horizontal movement → work detection by the sensor → pickup.” With the ROBO Cylinder system, on the other hand, there are virtually no pickup errors. As a result, work efficiency increased and the processing capacity rose by approx. 30%.

By using the ROBO Cylinder’s zone signal, the peripheral equipment can be reliably interlocked when the head is on the conveyor.

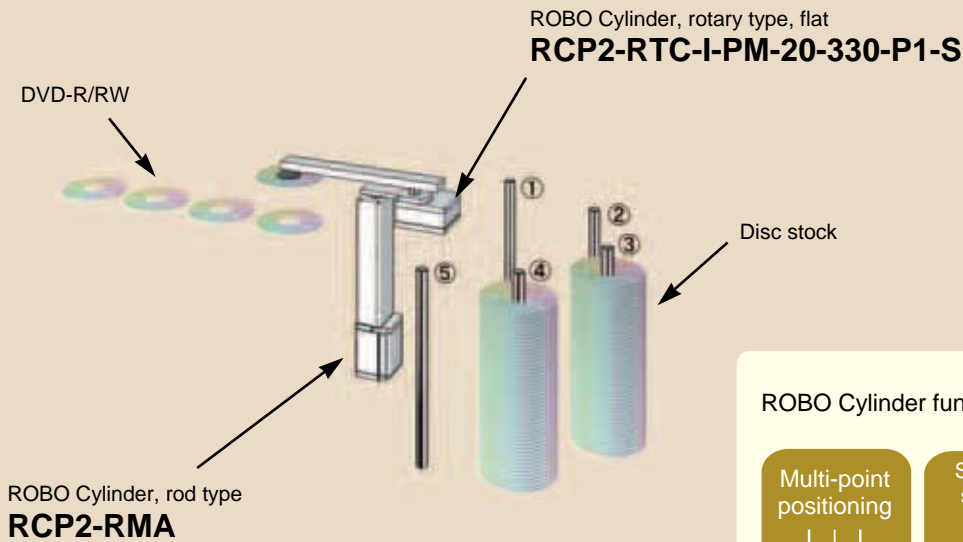
(With the air cylinder system, check using an auto switch presented a reliability issue.)

Benefit of Introduction

### 20% increase in production efficiency

#### Application

ROBO Cylinders are used in a mechanism that places DVD-R/RWs in the buffer area after completion of one process until they are fed to the next process of a DVD-R/RW production line.



#### Explanation

##### Air Cylinder

Only three stocks could be created.  
If the speed was raised, sometimes an increased impact upon stopping caused discs to fall.  
The production volume was 30,000 discs/day.

- **Production volume:**
  - Production volume = 30,000 discs/day

##### ROBO Cylinder

With the ROBO Rotary system, five stocks are now maintained and the production capacity increased by 6,000 discs/day.

- **Production volume:**
  - Production volume = 30,000 discs/day + 6,000/day = 36,000 discs/day

#### Explanation

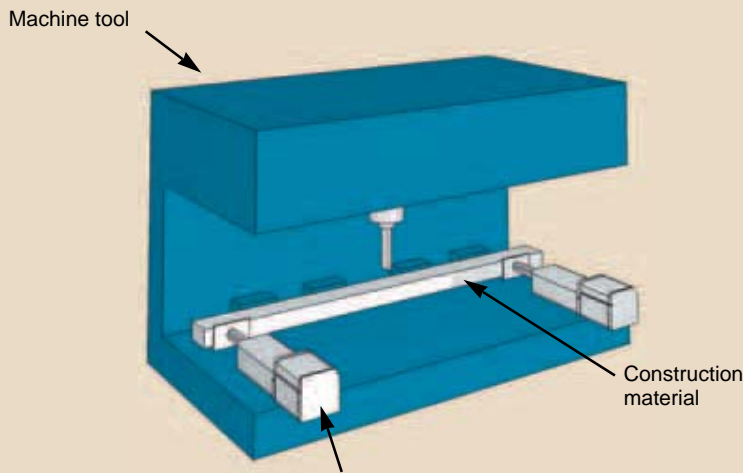
$(36,000 \text{ discs} - 30,000 \text{ discs}) \div 30,000 \text{ discs} = 0.2 \rightarrow 20\% \text{ increase in production efficiency.}$

Benefit of Introduction

### 8% increase in production efficiency

#### Application

A ROBO Cylinder is used in the material-holding device of a machine tool that machines aluminum construction materials of various types.



ROBO Cylinder, rod type  
64-mm wide, 200-mm stroke, 8-m cable

**RCP2-RMA-I-PM-4-200-P1-X08**

ROBO Cylinder function(s) used

Multi-point positioning



#### Explanation

##### Air Cylinder

The stopper position had to be changed every time the material type was changed.

- Setup change time: 1 hour
- Setup change frequency: 3 times/week = 12 times/month
- Monthly production time
  - Stop time = 1 hour x 12 = 12 hours/month
  - Production time = 8 hours x 20 days – 12 hours = 148 hours

##### ROBO Cylinder

Since the type can be switched easily by changing the registered position number, the setup change time was virtually eliminated.

- Setup change time: 0 hour
- Monthly production time
  - Stop time = 0 hour/month
  - Production time = 8 hours x 20 days = 160 hours

#### Explanation

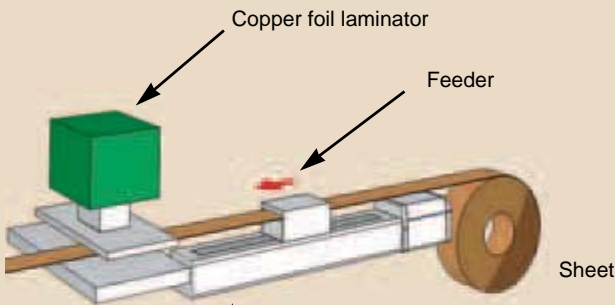
$(160 \text{ hours} - 148 \text{ hours}) \div 148 \text{ hours} = 0.08 \rightarrow$  Approx. 8% increase in production efficiency.

Benefit of Introduction

### 7% increase in production efficiency

#### Application

A ROBO Cylinder is used in the feeder mechanism of a system that laminates copper foil over a material IC card sheet and then cuts the laminated sheet.



ROBO Cylinder, slider type  
58-mm wide, 400-mm stroke

**RCP2-SA6-I-PM-3-400-P1-P**

ROBO Cylinder function(s) used

Setting of speed & acc/dec



#### Explanation

##### Air Cylinder

On the air cylinder system, the pulled sheet was sometimes elongated and caused an offset in the copper foil laminating position or a broken sheet. Adjustment also took time.

- Adjustment time: 30 minutes = 0.5 hour
- Adjustment frequency: Once/day
- Monthly production time
  - Stop time = 0.5 hour/day x 20 days = 10 hours/month
  - Production time = 8 hours x 20 days – 10 hours = 150 hours

##### ROBO Cylinder

With the ROBO Cylinder system that allows for easy speed/acceleration control, adjustment time is no longer required.

- Adjustment time: 0 minute
- Monthly production time
  - Stop time = 0 hour/month
  - Production time = 8 hours x 20 days = 160 hours

#### Explanation

$(160 \text{ hours} - 150 \text{ hours}) \div 150 \text{ hours} = 0.07 \rightarrow$  Approx. 7% increase in production efficiency.

# Explanation of Key ROBO Cylinder Functions

## Multi-point positioning

## Setting of speed & acc/dec

**A load installed on the actuator slider or rod can be moved and positioned at a repeatability of  $\pm 0.02$  mm (ERC:  $\pm 0.05$  mm). (See Note below)**

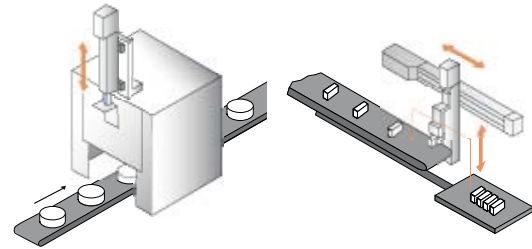
### Features

- A maximum of 64 positioning points
- Desired speed and acceleration/deceleration can be set for each position.
- By setting a positioning band, a position completion signal can be output at a desired position before the specified position.
- Acceleration and deceleration can be set separately.
- The traveling speed can be changed during operation without stopping the actuator.

(Note: Belt type:  $\pm 0.1$  mm)

### Opening/closing a gate

### For a pick & place unit



Application ● Transferring/moving works, etc.

## Push motion

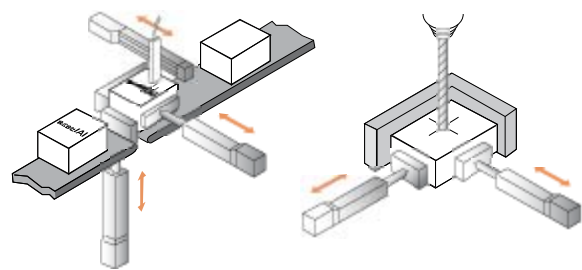
**The rod can be held in contact with a work, etc., just like an air cylinder.**

### Features

- Since a position completion signal is output when the rod contacts the work, this function can be combined with a zone signal to implement work classification, etc.
- The force at which the work is pushed (= push force) can be changed in a range of several Ns up to 6,000 N by changing the setting in the position data table.

### Pushing works

### Holding works



Application ● Detecting, press-fitting or clamping works, etc.

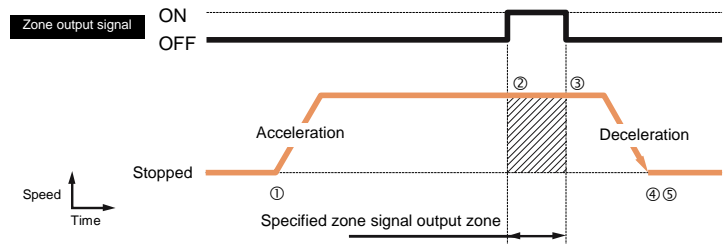
## Zone output

**A signal is output when the slider enters the specified zone.**

### Features

- Since a signal can be output at a desired position while the actuator is moving (the zone is set by parameters), a dangerous area can be set. This function also helps reduce tact time.

### Operation example



## Pitch feed

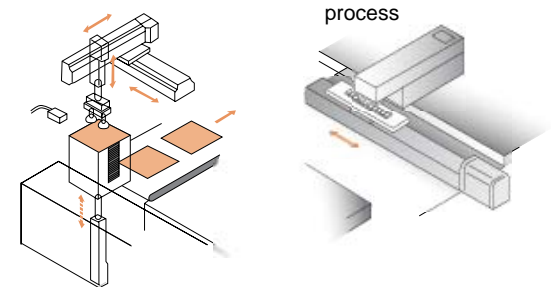
**In addition to moving to the specified coordinate with respect to home, the actuator can also move by the specified distance from the current position.**

### Features

- By issuing a movement command repeatedly, the actuator can implement repeated positioning at an equal pitch. (The actuator can move as many times as required within the stroke range.)
- A desired pitch can be set simply by specifying the value in the position data table.

### Moving up/down a stocker

### Feeding works in a marking process



Application ● Moving up/down a stocker, moving pallets, etc.

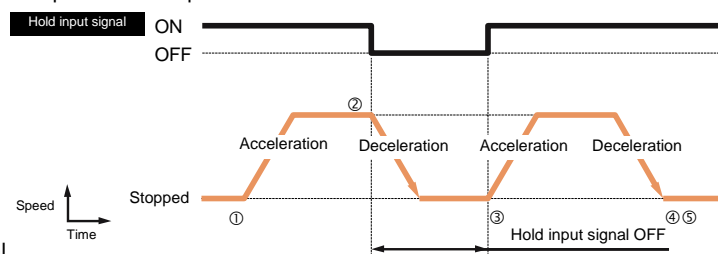
## Hold

**The slider can be decelerated to a stop using an external signal.**

### Features

- If an interlock with peripheral equipment is set, the actuator will decelerate to a stop once the hold input turns off. When the hold input becomes on again, the actuator will resume operation and complete the remaining movement. To ensure safety, the hold signal is provided as a contact-B signal (= enabled when the signal is OFF).

### Operation example



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No.1105-E**



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