



# Rotary Actuator Rack & Pinion Style Series *CRA1*

Size: 30, 50, 63, 80, 100

## How to Order

**Mounting style**

<b>B</b>	Basic style
<b>L</b>	Foot style

**Rotating angle**

<b>90</b>	90°
<b>180</b>	180°

**Rod end shape**  
Double shaft

**Size 30**

**CRA1** **B** **W** **30** — **90**

**Size 50 to 100**

**CRA1** **B** **S** [ ] **50** — **90** [ ]

**Mounting style**

<b>B</b>	Basic style
<b>L*</b>	Foot style
<b>F</b>	Flange style

\* For part numbers, refer to the tables below.

**Air cushion**

<b>Nil</b>	None
<b>C</b>	With air cushion

**Shaft type**

Standard	<b>S</b>	Single shaft
	<b>W</b>	Double shaft
Option	<b>X</b>	Single shaft with four chamfers
	<b>Y</b>	Double shaft key
	<b>Z</b>	Double shaft with four chamfers

**Rotating angle**

Standard	<b>90</b>	90°
	<b>180</b>	180°
Option	<b>100</b>	100°
	<b>190</b>	190°

**Type**

<b>Nil</b>	Pneumatic
<b>H</b>	Air-hydro

**Size**

<b>50</b>
<b>63</b>
<b>80</b>
<b>100</b>

## Foot Bracket Part No.



Size	Foot bracket	Mounting screws included in foot bracket
<b>30</b>	CRA1L30-Y-1	M5 x 0.8 x 25
<b>50</b>	CRA1L50-Y-1	M8 x 1.25 x 35
<b>63</b>	CRA1L63-Y-1	M10 x 1.5 x 40
<b>80</b>	CRA1L80-Y-1	M12 x 1.75 x 50
<b>100</b>	CRA1L100-Y-1	M12 x 1.75 x 50



Note 1) The part numbers shown above include mounting screw.

Note 2) As ordering foot bracket, write "1 piece" for the bracket for one rotary actuator.

# Rotary Actuator Rack & Pinion Series CRA1



## Specifications

Type	Pneumatic					Air-hydro			
	30	50	63	80	100	50	63	80	100
Fluid	Air (Non-lube)					Hydraulic oil			
Max. operating pressure	1 MPa								
Min. operating pressure	0.1 MPa								
Ambient and fluid temperature	0 to 60°C (No freezing)								
Cushion	None	Not attached, Air cushion				None			
Output (N·m) <sup>(1)</sup>	1.9	9.3	17	32	74	9.3	17	32	74
Allowable surge pressure	—					1.5 MPa			
Backlash	<sup>(2)</sup>	Within 1°							
Tolerance in rotating angle	—				+ 4° 0				



Note 1) Output under the operating pressure of 0.5 MPa. Refer to page 11-1-29 for further information.

Note 2) Since CRA1□30 has a stopper installed, there is no backlash produced under pressure.

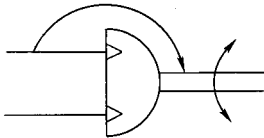
## Allowable Kinetic Energy/Safe Range of Rotation Time

Model	Allowable kinetic energy			Adjustable range of rotation time safe in operation
	Allowable kinetic energy (mJ)		Cushion angle	
	Without cushion	With cushion <sup>(Note)</sup>		Rotation time (s/90°)
CRA1□W30	10	—	—	0.2 to 1
CRA1□□50	50	980	35°	0.2 to 2
CRA1□□63	120	1500	35°	0.2 to 3
CRA1□□80	160	2000	35°	0.2 to 4
CRA1□□100	540	2900	35°	0.2 to 5



Note) Allowable kinetic energy of the bumpers equipped model  
The maximum absorbed energy under proper adjustment of the cushion needle.

## JIS Symbol



P. 11-7-32 to 11-7-51

## Caution

Be sure to read before handling.  
Refer to pages 11-13-3 to 11-13-4 for Safety Instructions and Common Precautions on the products mentioned in this catalog, and refer to pages 11-1-4 to 11-1-6 for Precautions on every series.

## Weight/Standard

(kg)

Model	Standard weight		Additional weight	
	90°	180°	Foot bracket	Flange bracket
CRA1BW30	0.3	0.4	0.1	—
CRA1BW50	1.5	1.7	0.3	0.5
CRA1BW63	2.5	3	0.5	0.9
CRA1BW80	4.3	5	0.9	1.5
CRA1BW100	8.5	9.5	1.2	2

## Weight/With Auto Switches and Solenoid Valves

(kg)

Size	Additional weight	
	With 2 auto switches	With solenoid valve*
30	0.1	—
50	0.2	0.2
63	0.4	0.2
80	0.6	0.2
100	0.9	0.2



\* Weight of the solenoid valve is not included. Refer to page 11-7-19 concerning weight of the solenoid valve.

CRB2

CRBU2

CRB1

MSU

CRJ

CRA1

CRQ2

MSQ

MRQ

D-

20-

# Series CRA1

## With One-touch Fittings

CRA1    F    
 ↓  
 With One-touch fittings



Piping steps and installation space are saved by One-touch fittings built in the connection ports.

### Specifications

Applicable size	30, 50, 63
Type	Pneumatic
Max. operating pressure	1 MPa
Min. operating pressure	0.1 MPa
Auto switch	Mountable

Refer to pages 11-7-10 to 11-7-12 for dimensions.

### Applicable Tubing Specifications

Size	30	50	63
Applicable tubing O.D.	ø4	ø6	
Applicable tubing material	Nylon, Soft nylon, Polyurethane		

## Clean Series

11-CRA1       
 ↓  
 Clean Series

Vacuum ports are equipped to prevent dust from being produced from the rod part of the rotary actuators.

### Specifications

Type	Pneumatic
Applicable size	30, 50
Max. operating pressure	1 MPa
Min. operating pressure	0.1 MPa
Auto switch	Mountable

For further specifications, refer to "Pneumatic Clean Series" catalog.

## Copper-free

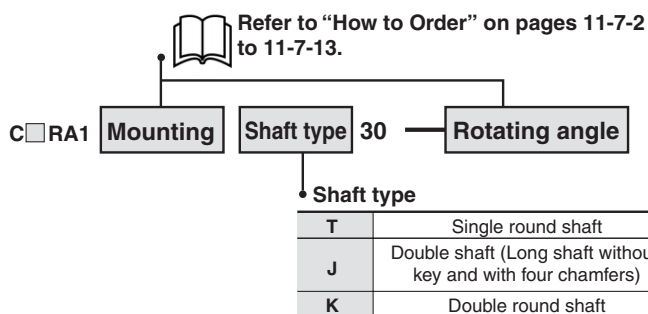
No influence on cathode ray tubes by copper ion and fluorine resin. As standard models are already made applicable to copper free styles, they can be applied as they are.

### Specifications

Type	Pneumatic
Applicable size	30, 50, 63, 80, 100
Max. operating pressure	1 MPa
Min. operating pressure	0.1 MPa
Auto switch	Mountable

## Shaft Type Variations/Without Key Grooves (Size 30)

## Shaft Type: T, J, K



### Specifications

Type	Pneumatic
Size	30
Shaft type	Single round shaft (T), Double round shaft (K), Double shaft/(Long shaft without key and with four chamfers) (J)
Cushion	None
Auto switch	Mountable
Mounting	Basic style, Foot style

\* Refer to page 11-7-3 for other specifications.

### Dimensions

Shaft type	T (Single round shaft)	J (Double shaft/Long shaft without key and with four chamfers)	K (Double round shaft)
Configuration			

# Series CRA1

## Shaft Variations (Size 30)

Shaft Type: S, X, Y, Z

C□RA1 **Mounting** **Shaft type** 30 — **Rotating angle**



Refer to "How to Order" on pages 11-7-2 to 11-7-13.

### Shaft type

<b>S</b>	Single shaft key
<b>X</b>	Single shaft with four chamfers
<b>Y</b>	Double shaft key
<b>Z</b>	Double shaft with four chamfers

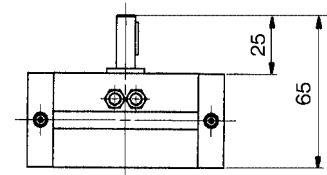
### Specifications

Type	Pneumatic
Size	<b>30</b>
Max. operating pressure (MPa)	1 MPa
Min. operating pressure (MPa)	0.1 MPa
Shaft type	Single shaft key (S), Double shaft with four chamfers (X), Double shaft key (Y), Double shaft with four chamfers (Z)
Mounting	Basic style, Foot style
Auto switch	Mountable

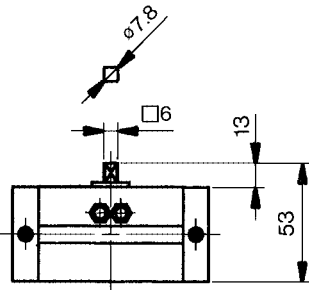


\* Refer to page 11-7-3 for other specifications.

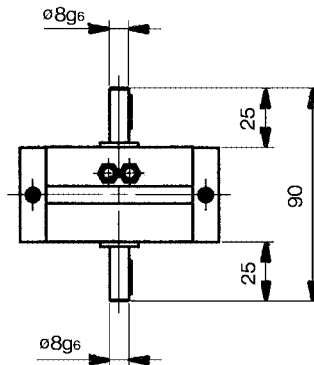
### S (Single shaft key)



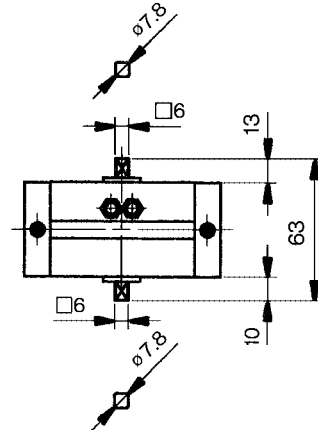
### X (Single shaft with four chamfers)



### Y (Double shaft key)



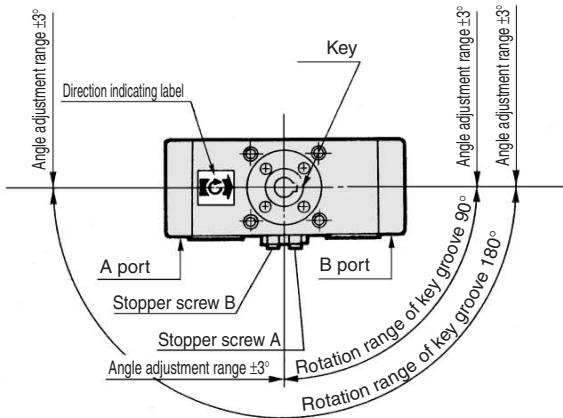
### Z (Double shaft with four chamfers)



## Rotation Range of Key Groove

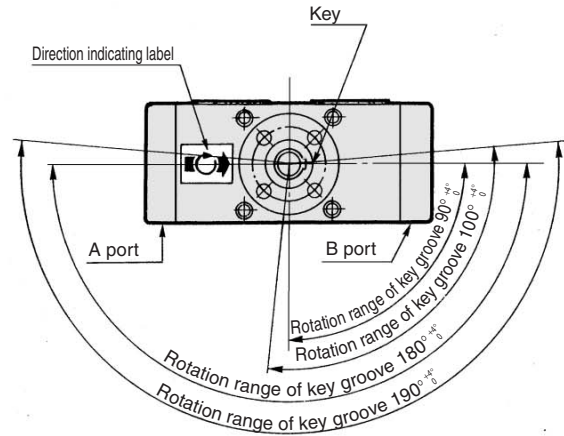
If air pressure is applied from the A side of the direction indication label, the shaft rotates clockwise. If air pressure is applied from the B side, the shaft rotates counterclockwise.

### Size: 30



- Stopper screw A: For end adjustment in clockwise direction
- Stopper screw B: For end adjustment in counter clockwise direction

### Size: 50 to 100



## How to Set Rotation Time

Even if the torque that is generated by the rotary actuator is small, the parts could become damaged depending on the inertia of the load. Therefore, the rotation time should be determined by calculating the load's inertial moment and kinetic energy. Refer to pages 11-1-34 to 35 for details on how to set the rotation time.

### Allowable load on the shaft

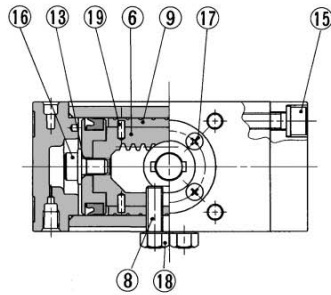
Refer to the model selecting order step 3 for rotary actuators on page 11-1-20 concerning allowable loads on the shafts of Series CRA1.

CRB2
CRBU2
CRB1
MSU
CRJ
CRA1
CRQ2
MSQ
MRQ
D-
20-

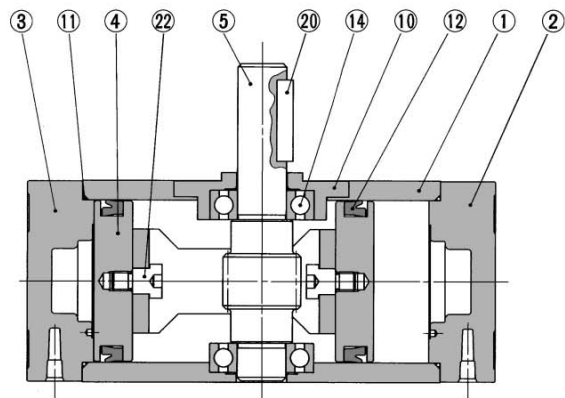
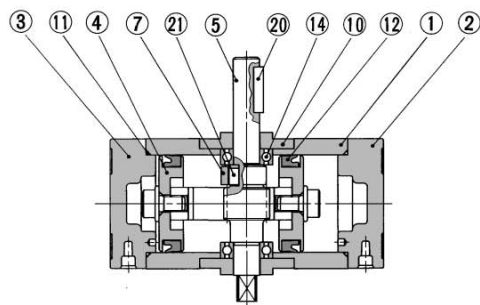
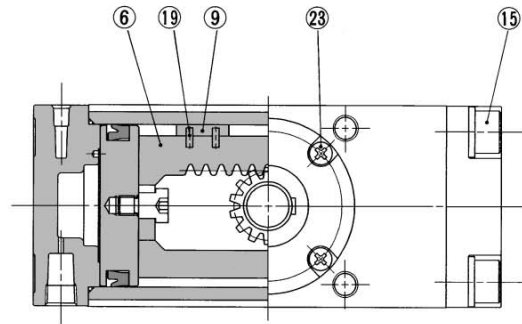
# Series CRA1

## Construction

Without air cushion  
Size: 30




Without air cushion  
Size: 50 to 100



## Component Parts

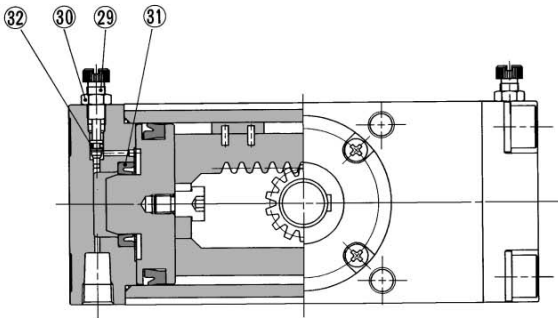
No.	Description	Material	Note
①	Body	Aluminum alloy	Hard anodized
②	Right cover	Aluminum alloy	Black anodized
③	Left cover	Aluminum alloy	Black anodized
④	Piston	Aluminum alloy	Chromated
⑤	Shaft	Chrome molybdenum steel	
⑥	Rack	Carbon steel	Nitrided
⑦	Stopper	Chrome molybdenum steel	
⑧	Stopper screw	Chrome molybdenum steel	Black dyed
⑨	Slider	Resin	
⑩	Bearing retainer	Zinc alloy <sup>Note)</sup>	Black painted
⑪	Tube gasket	NBR	

 Note) Size 50 to 100: Aluminum alloy (Black anodized)

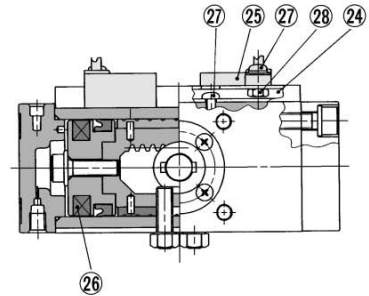
No.	Description	Material	Note
⑫	Piston seal	NBR	
⑬	O-ring	NBR	
⑭	Bearing	Bearing steel	
⑮	Hexagon socket head cap screw with spring washer	Chrome molybdenum steel	Black zinc chromated
⑯	Hexagon socket head cap flange screw	Chrome molybdenum steel	Zinc chromated
⑰	Cross-recessed countersunk head screw	Steel wire	Black dyed
⑱	Hexagon nut	Steel wire	Black dyed
⑲	Spring pin	Steel wire	
⑳	Parallel keyway	Carbon steel	
㉑	Parallel keyway	Carbon steel	
㉒	Connecting screw	Carbon steel	Zinc chromated
㉓	Round head Phillips screw	Steel wire	Black zinc chromated

# Rotary Actuator Rack & Pinion Style **Series CRA1**

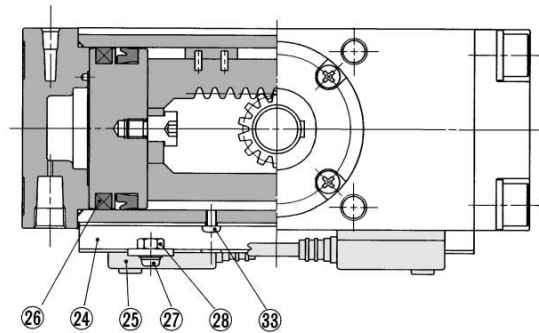
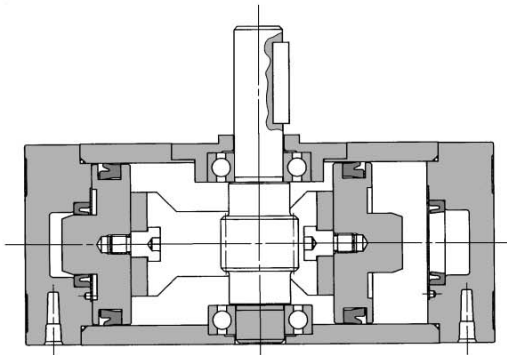
## With air cushion



## With auto switch Size: 30



## Size: 50 to 100




- CRB2
- CRBU2
- CRB1
- MSU
- CRJ
- CRA1**
- CRQ2
- MSQ
- MRQ
- D-
- 20-

## Component Parts

No.	Description	Material	Note
24	Auto switch mounting rail	Aluminum alloy	
25	Auto switch	—	
26	Plastic magnet	Magnetic material	
27	Round head Phillips screw	Steel wire	Nickel plated
28	Hexagon nut	Steel wire	Nickel plated
29	Needle valve	Steel wire	Nickel plated
30	Lock nut	Steel wire	Nickel plated
31	Cushion seal	NBR	
32	O-ring	NBR	
33	Round head Phillips screw	Steel wire	Nickel plated

## Replacement Parts (Corresponding parts shown below are set.)

Size	Replacement parts			
	Standard	With air cushion	With auto switch	Air-hydro
CRA1□W30-90	P294010-20	—	P294010-20	—
CRA1□W30-180	P294010-21	—	P294010-21	—
CRA1□□50	P294020-20A	P294020-20A	P294020-20A	P294020-23A
CRA1□□63	P294030-20A	P294030-20A	P294030-20A	P294030-23A
CRA1□□80	P294040-20	P294040-20	P294040-20	P294040-23
CRA1□□100	P294050-20A	P294050-20A	P294050-20A	P294050-23A
Corresponding parts	⑨, ⑩, ⑫, and ⑰ are set.			

 Note) When ordering spare parts, write "1 piece" for 1 set of the parts for one actuator.

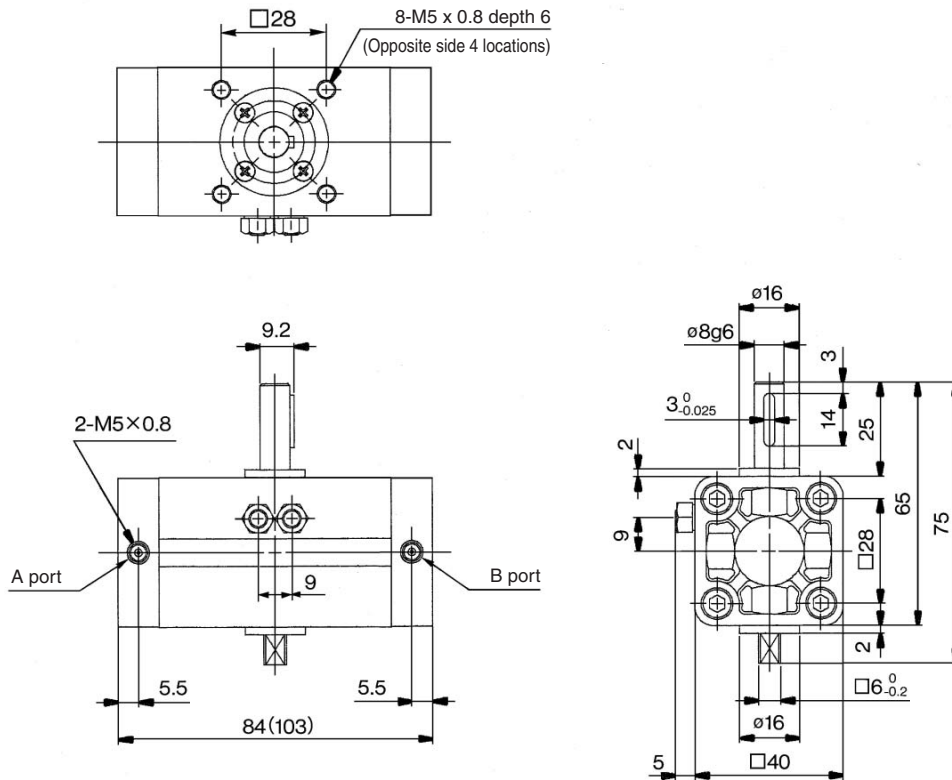
# Series CRA1

Size 30/Basic Style: CRA1BW, Foot Style: CRA1LW

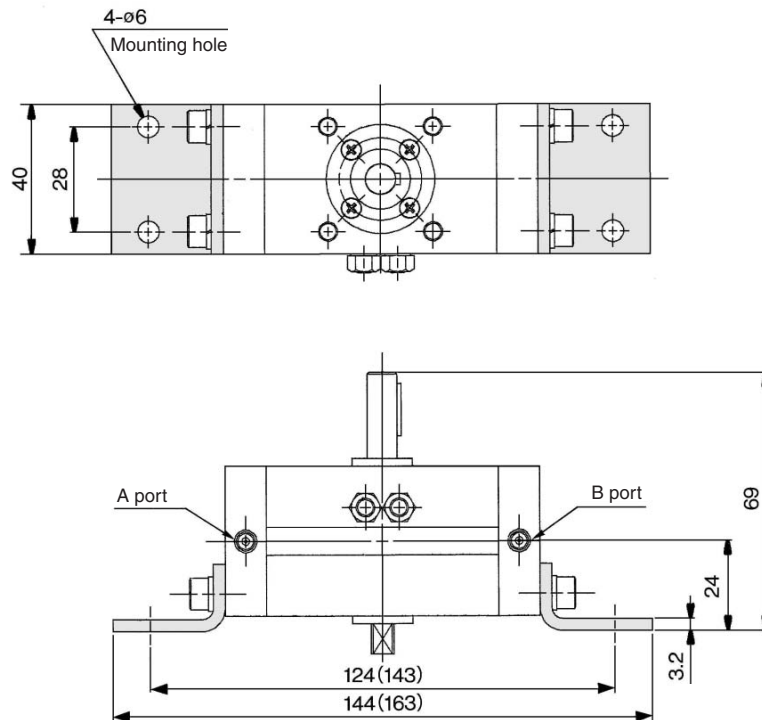
Basic style: CRA1BW30



This drawing is for 90° specifications.



Foot style: CRA1LW30



\* ( ) are the dimensions for rotation of 180°.

★The dimensions below show pressurization to B port.





# Rotary Actuator with Auto Switch Rack & Pinion Style

## Series *CDRA1*

Size: 30, 50, 63, 80, 100

### How to Order

**Mounting style**

B	Basic style
L	Foot style

**Rotating angle**

90	90°
180	180°

**Size**

50
63
80
100

**Number of auto switches**

S	1 pc.
Nil	2 pcs.

Note) Maximum number of auto switches mountable is two.

**Auto switch**

\* For the applicable auto switch model, refer to the table below.  
\* Auto switches are shipped together, (but not assembled).

**Cushion**

Nil	None
C	With cushion

**Rotating angle**

Standard	90	90°
	180	180°
Option	100	100°
	190	190°

**Mounting style**

B	Basic style
L*	Foot style
F	Flange style

\* For part numbers of foot bracket, refer to page 11-7-2.

**Shaft type**

Standard	S	Single shaft
	W	Double shaft
Option	X	Single shaft with four chamfers
	Y	Double shaft key
	Z	Double shaft with four chamfers

**Type**

Nil	Pneumatic
H	Air-hydro

CRB2

CRBU2

CRB1

MSU

CRJ

CRA1

CRQ2

MSQ

MRQ

D-

20-

### Applicable Auto Switch/Refer to page 11-11-1 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model				Lead wire * length (m)				Pre-wire connector	Applicable load			
					DC	AC	Size 30		Size 50 to 100		0.5 (Nil)	3 (L)	5 (Z)	None (N)					
							Perpendicular	In-line	In-line	In-line									
Reed switch	—	Grommet	Yes	3-wire (NPN equiv.)	—	5 V	—	—	A76H	A56	●	●	—	—	—	IC circuit	—		
				2-wire	—	200 V	A72	A72H	—	●	●	—	—	—	—	Relay, PLC			
		Connector		24 V	12 V	—	—	A53	●	●	●	—	—						
				—	100 V, 200 V	—	—	A73C	—	—	●	●	●	●					
Grommet	—	—	—	—	—	—	A54	●	●	●	—	—	—	—	—				
	—	—	—	—	—	—	A79W	—	A59W	●	●	—	—	—	—				
Solid state switch	—	Grommet	Yes	3-wire (NPN)	5 V, 12 V	—	—	F7NV	F79	F59	●	●	○	—	○	IC circuit	PLC		
				3-wire (PNP)				F7PV	F7P	F5P	●	●	○	—	○				
		Connector		2-wire	—	100 V, 200 V	—	—	J51	●	●	○	—	—	—	—			
				—	12 V	—	—	J79C	—	—	●	●	●	●	—	—			
		Grommet		3-wire (NPN)	5 V, 12 V	—	—	F7NWW	F79W	F59W	●	●	○	—	○	—		○	IC circuit
				3-wire (PNP)				—	F7PW	F5PW	●	●	○	—	○	—		○	
		Grommet		2-wire	24 V	—	—	F7BWV	J79W	J59W	●	●	○	—	○	—		○	—
				—				—	F7BA**	F5BA**	—	●	○	—	○	—		○	—
		Grommet		2-wire	24 V	—	—	F7BAV**	—	—	—	●	○	—	—	—		—	—
				4-wire (NPN)				5 V, 12 V	—	—	F79F	F59F	●	●	○	—		○	—

\*\* Although it is possible to mount water resistant type auto switches, note that the rotary actuator itself is not of water resistant construction.

\* Lead wire length symbols: 0.5 m ..... Nil (Example) A73C

3 m ..... L (Example) A73CL

5 m ..... Z (Example) A73CZ

None ..... N (Example) A73CN

\* Auto switches marked with "○" are made to order specifications.



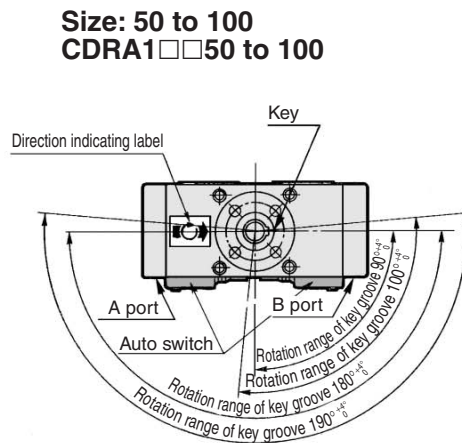
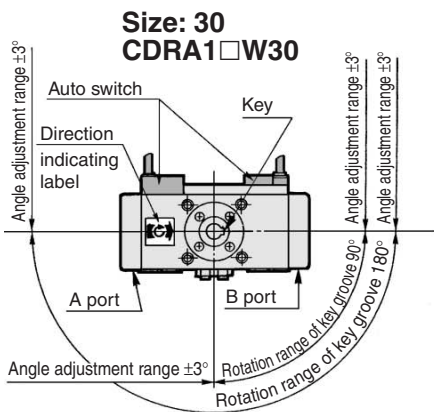
Refer to page 11-11-36 for detailed solid state switches with pre-wire connectors.

• Refer to page 11-7-14 for applicable switches other than those indicated above.

• For F7NWW, F7BWV switch types, refer to Best Pneumatics Vol. 8.

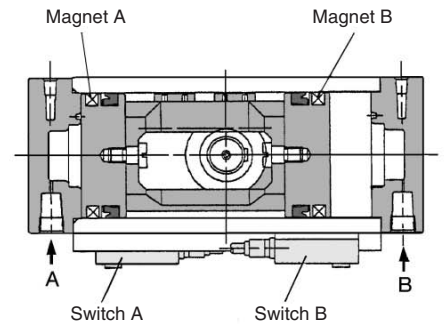
# Series CDRA1

## Rotation Range of Key Groove/Switch Mounting Position

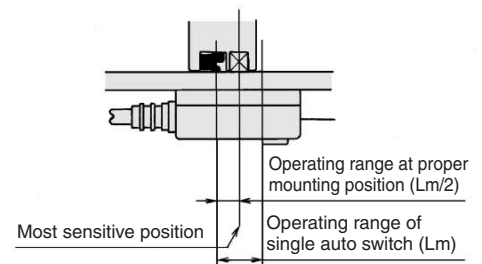
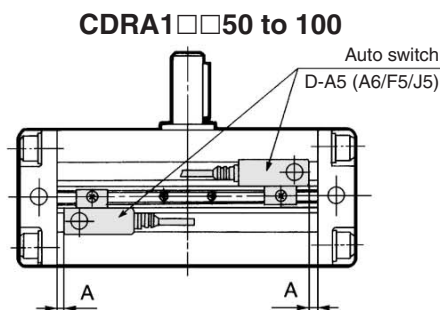
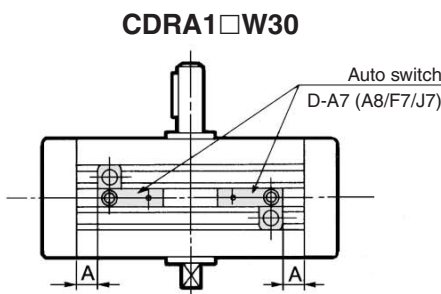


## Working Principle

In the diagram below, switch B is ON. When pressure is applied from A, the piston moves to B, causing the shaft to rotate clockwise. At this time, magnet B goes out of the movement range of switch B, causing switch B to turn OFF. Furthermore, the piston moves to the right, causing magnet A to enter the movement range of switch A. As a result, switch A turns ON.



## Proper Auto Switch Mounting Position at Rotation End



Operating angle  $\theta$  m: Converts the operating range ( $Lm$ ) of the auto switch into the rotation angle.  
 Angle of hysteresis: The hysteresis of the auto switch is converted to degrees.

Model	A (mm)	Operating angle $\theta$ m	Hysteresis angle (°)
CDRA1□W30-90	9 (19)	$95^\circ$	$20^\circ$
CDRA1□□50-90	9 (26)	$65^\circ$	$20^\circ$
CDRA1□□63-90	11 (30)	$60^\circ$	$10^\circ$
CDRA1□□80-90	15 (37)	$45^\circ$	$7^\circ$
CDRA1□□100-90	27 (60)	$35^\circ$	$5^\circ$

- \* The dimensions inside ( ) are for  $180^\circ$ .
- \*\* Up to 2 auto switches can be mounted per actuator. The dimensions in the table are the values that represent the most sensitive positions of the auto switches. Thus, they are not the dimensions that represent the mounting position at the time of shipment.
- ★ Please consult with SMC concerning the angles for the auto switches other than the models D-A73 and D-A53.

## Auto Switch Specifications/Refer to page 11-11-1 for further information on auto switch single body.

Type	Model	Electrical entry	Features	Applicable size
Reed switch	D-A80	Grommet (Perpendicular)	Without indicator light	30
	D-A80H	Grommet (In-line)		
	D-A80C	Connector (In-line)		
	D-A64	Grommet (In-line)	Without indicator light, built-in contact protection circuit	50 to 100
	D-A67	Grommet (In-line)	Without indicator light	
Solid state switch	D-F7NTL	Grommet (In-line)	With timer	30
	D-F5NTL	Grommet (In-line)		50 to 100

\* With pre-wire connector is also available for D-F5NTL, D-F7NTL. For details, refer to pages 11-11-34 to 35.

## Sets of Mounting Screws for Auto Switch (Round head Phillips screw, Hexagon nut)

Model	Part no.
CDRA1□W30	P294010-24
CDRA1□□50 to 100	P294020-24

- Note 1) The above part numbers include 2 pieces of mounting screws and 2 pieces of nuts.
- Note 2) To order a set for 1 unit, the ordering quantity should be "1".

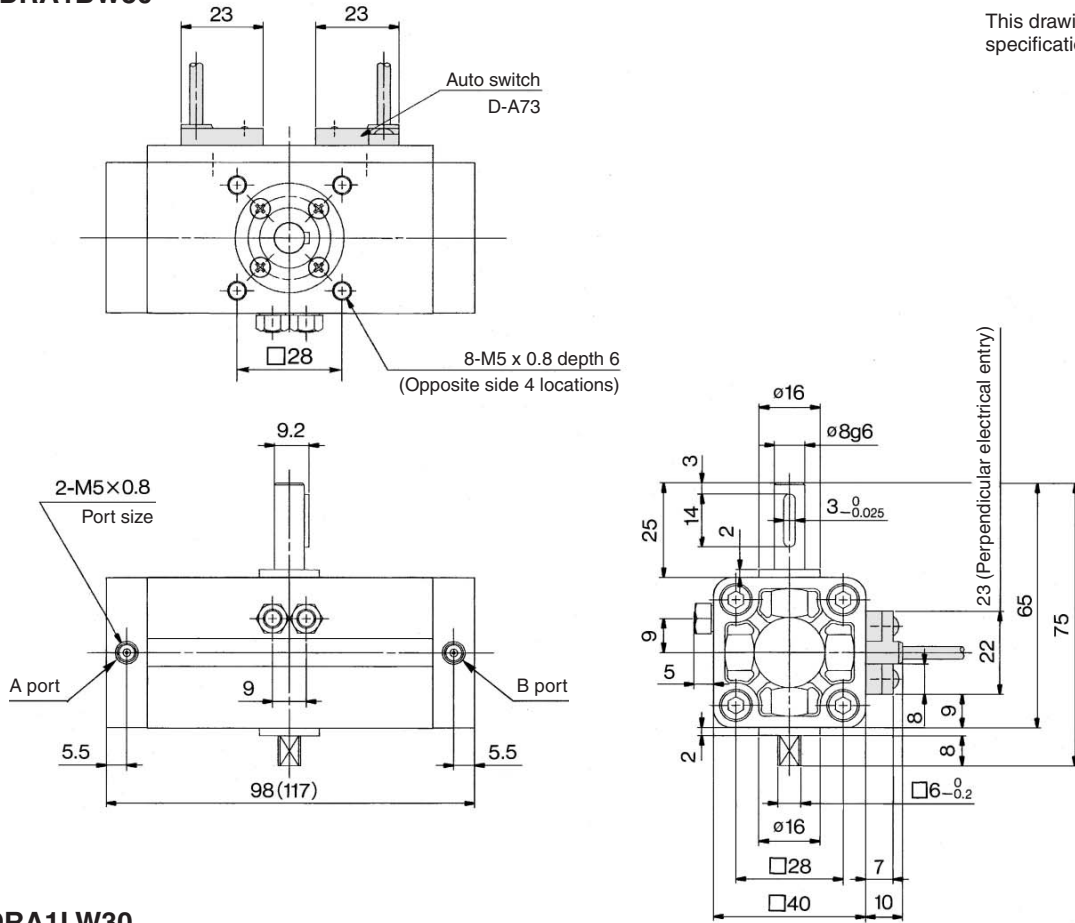
# Rotary Actuator with Auto Switch Rack & Pinion Style **Series CDRA1**

## Size 30/Basic Style: CDRA1BW, Foot Style: CDRA1LW

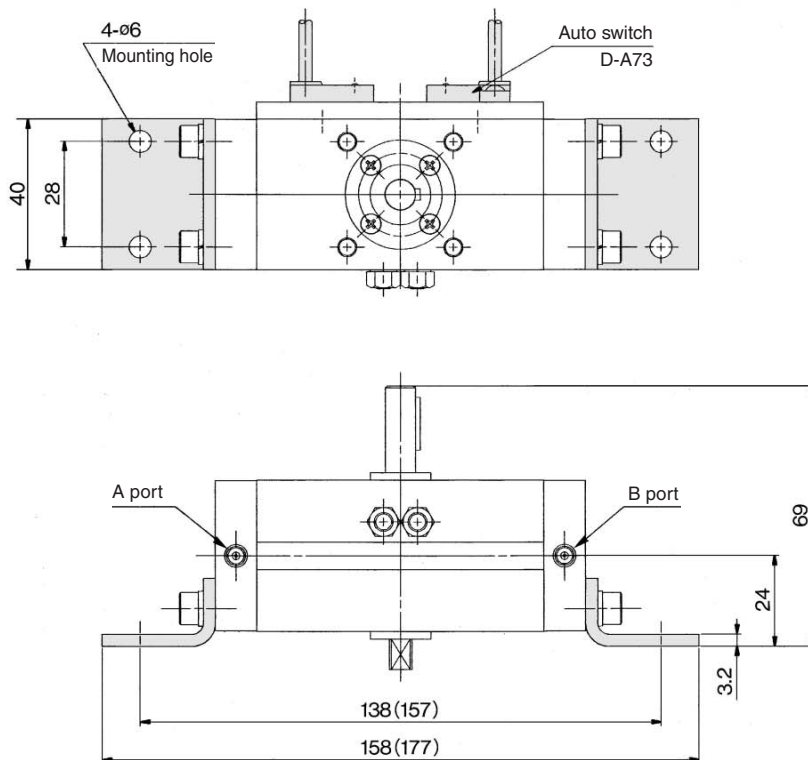


This drawing is for 90° specifications.

With auto switch  
Basic style: CDRA1BW30



## Foot style: CDRA1LW30



\* ( ) are the dimensions for rotation of 180°.  
\* The dimensions below show pressurization to B port.

- CRB2
- CRBU2
- CRB1
- MSU
- CRJ
- CRA1**
- CRQ2
- MSQ
- MRQ
- D-
- 20-