Rotary Actuator
Vane Type
Size: 10, 15, 20, 30, 40

RoHS

New **A double vane type has been added for sizes 10 to 40.**

Overall length
44 % shorter
100 mm ➡ **55.6 mm**
(Compared with the CDRB2☐WU, Size 20)

Weight
48 % lighter
222 g ➡ **115 g**
(Compared with the CDRB2☐WU, Size 20, Rotating angle 90°)

Features a compact body with a built-in
angle adjustment unit
and
auto switch unit
(Size: 20, 30, 40)

CDRBS20

CDRB2BWU20

Angle adjuster 10° (±5°)

With auto switch

55.6 mm

Angle adjustment unit

Auto switch unit

■ **A rotation time of 0.5 s/90° is possible.**
(CRB2: 0.3 s/90° ∗ Excludes size 40)

Reduced by 44.4 mm
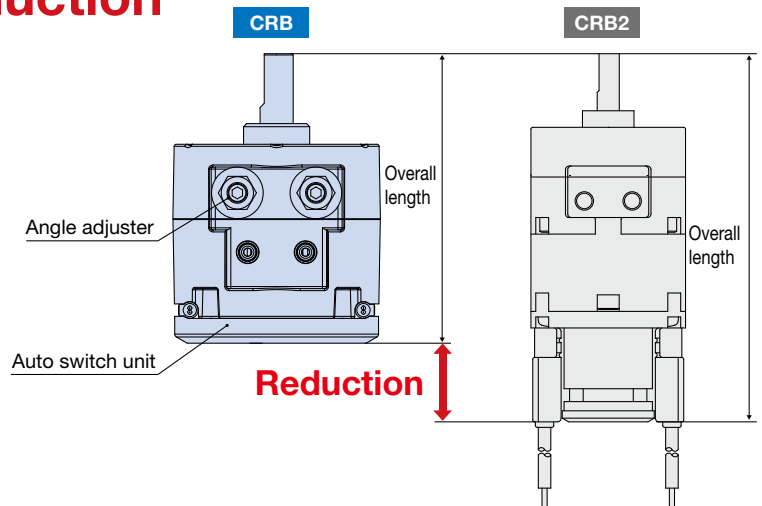

CRB Series

SMC®

CAT.EUS20-253D-UK

Vane Type Rotary Actuator *CRB* Series

Overall length 44 % reduction

[mm]

Size	CRB	CRB2	Reduction rate
10	46	58	21 %
15	54.8	67	18 %
20	55.6	100	44 %
30	70	117.5	40 %
40	84.2	137.2	39 %

∗ Compared with the CRB2 with an angle adjustment unit and an auto switch

Weight 48 % reduction

[g]

Size	CRB	CRB2	Reduction rate
10	39	42	7 %
15	62	68	9 %
20	115	222	48 %
30	216	387	44 %
40	380	631	40 %

∗ Compared with the CRB2 (Rotating angle: 90° with an angle adjustment unit and an auto switch unit)
∗ Sizes 10 and 15 have been compared without an angle adjustment unit.

CRB

CRB2

Angle adjuster

Overall length

Overall length

Auto switch unit

Reduction

Easy-to-adjust start and end positions with the angle adjustment bolts (as standard)

Rotating angle: 90°±10°
                 180°±10°
(Size: 20, 30, 40)
Excludes the 270° rotating angle type and the double vane type

Piping, wiring, and angle adjustment can be performed on the same side for easier mounting.

Piping

Hexagon wrench

Compact solid state auto switch
D-M9□

Rotating angle

Chamfered portion of the shaft

The position of the chamfered portion of the shaft can be easily checked using the rotating angle indicator.
(Only for the CDRB with auto switch)
Excludes the 270° rotating angle type and the double vane type

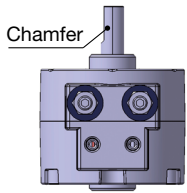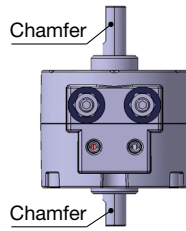|	0°	90° rotation	180° rotation
The position of the chamfered portion of the shaft	Chamfered portion	Chamfered portion	Chamfered portion
Rotating angle indicator	Direction of the rotating angle	Direction of the rotating angle	Direction of the rotating angle

SMC
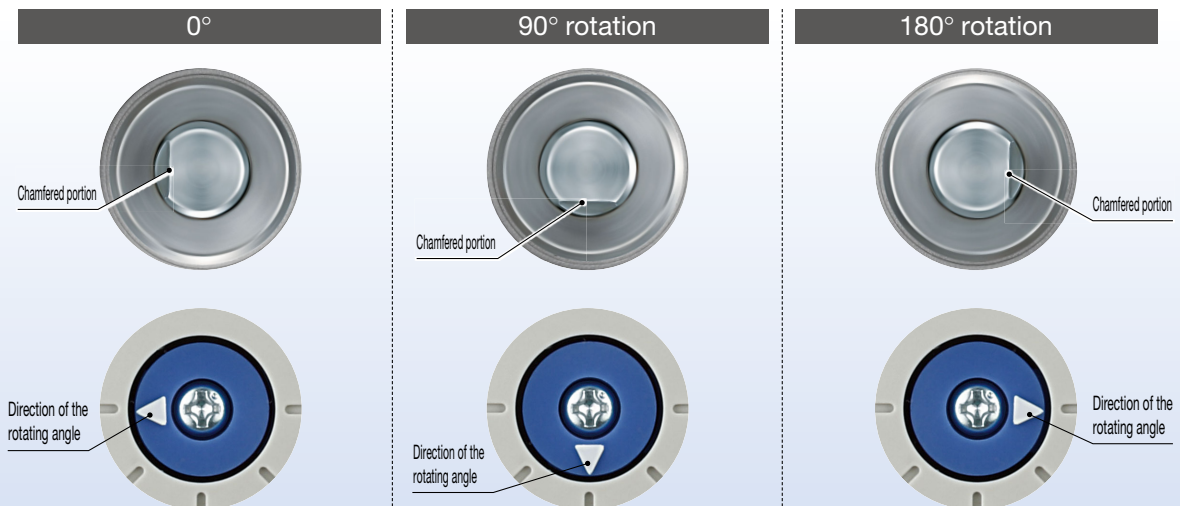
■ Shaft type variations

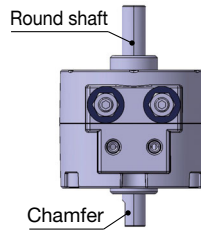∗ If an auto switch is to be mounted, choose a single shaft (options ① and ⑤).
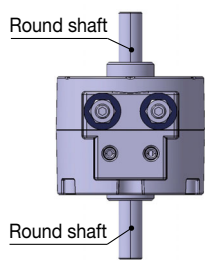
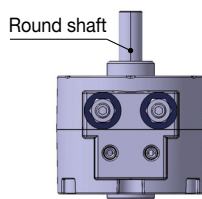**①Single shaft: CRBS**

Chamfer

②Double shaft: CRBW

Chamfer

Chamfer

③Double shaft: CRBJ

Round shaft

Chamfer

④Double shaft: CRBK

Round shaft

Round shaft

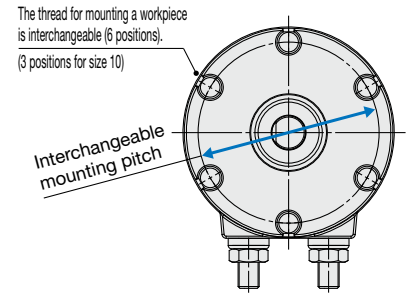**⑤Single shaft: CRBT**

Round shaft

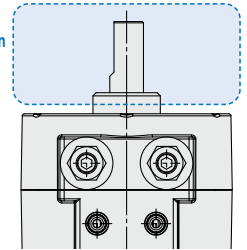**⑥Double shaft: CRBY**

Chamfer

Chamfer
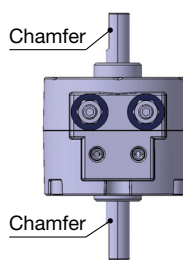
■ Interchangeable mounting

The mounting pitch and shaft configuration are the same as those for the CRB2.

The thread for mounting a workpiece is interchangeable (6 positions).
(3 positions for size 10)

Interchangeable mounting pitch

The shaft configuration is interchangeable.
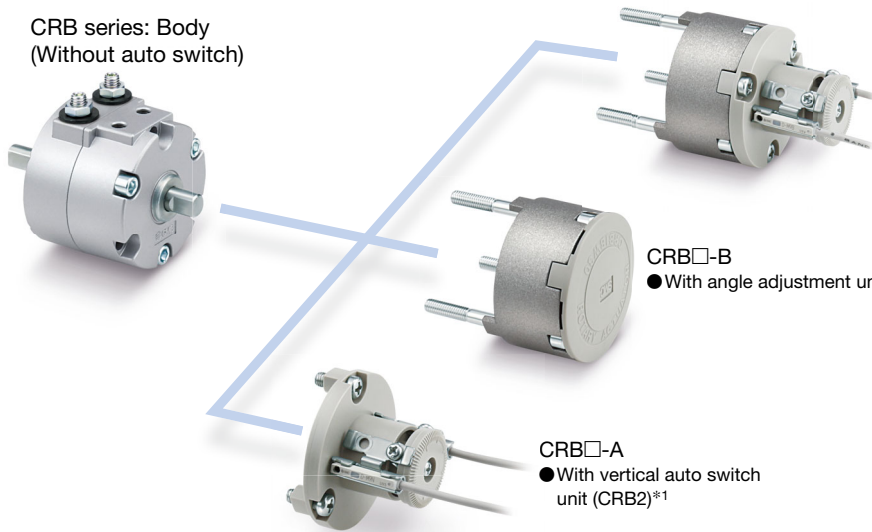
■ Mounting

Mounting type	Standard (Without auto switch) **CRB**	Standard (With auto switch) **CDRB**	With vertical auto switch unit **CRB□-A**	With angle adjustment unit **CRB□-B**	With vertical auto switch unit and angle adjustment unit **CRB□-C**
Body tapped	Plate — Body tapped — Plate	Auto switch	Vertical auto switch unit	Angle adjustment unit	Angle adjustment unit — Vertical auto switch unit
Body through-hole	Plate				

∗ A flange mounting bracket assembly is available as an option. For details, refer to page 56.

Vane Type Rotary Actuator *CRB* *Series*

■ Each of the units below for the CRB2 series can be mounted to the CRB series.

- The vertical auto switch unit and the angle adjustment unit are the same as those of the CRB2 series. Replacement of just the CRB body can be done during maintenance.
- Each of the units for the CRB2 series can be mounted to the CRB without an auto switch (CRBW).

CRB series: Body
(Without auto switch)

CRB□-C
● With vertical auto switch unit (CRB2) +
angle adjustment unit (CRB2)*1

CRB□-B
● With angle adjustment unit (CRB2)

CRB□-A
● With vertical auto switch
unit (CRB2)*1

Refer to pages 42 and 58 to 61 for details on the angle adjustment method, auto switch mounting, and adjustment.

*1 **Applicable Auto Switches for the Vertical Auto Switch Unit**

Size	Solid state auto switch	Reed auto switch
10	D-M9□(V) D-S99(V)/S9P(V) D-T99(V)	D-97/93A D-90/90A
15		
20	D-M9□(V) D-S79/S7P D-T79□	D-R73□ D-R80□
30		
40		

Series Variations

Model	Type	Applicable auto switch	Vane type	Size					Rotating angle	Output shaft	
				10	15	20	30	40		Single shaft	Double shaft
CRB	Standard (Without auto switch)	–	Single vane	●	●	●	●	●	90°	●	●
				●	●	●	●	●	180°		
				●	●	●	●	●	270°		
			Double vane (New)	●	●	●	●	●	90°		
				●	●	●	●	●	100°		
CDRB	Standard (With auto switch)	D-M9□	Single vane	●	●	●	●	●	90°	●	–
				●	●	●	●	●	180°		
CRB□-A	With vertical auto switch unit (CRB2)	Refer to the applicable auto switches shown in the table above.*1	Single vane	●	●	●	●	●	90°	●	–
				●	●	●	●	●	180°		
				●	●	●	●	●	270°		
			Double vane (New)	●	●	●	●	●	90°		
				●	●	●	●	●	100°		
CRB□-B	With angle adjustment unit (CRB2)	–	Single vane	●	●	●	●	●	90°	●	–
				●	●	●	●	●	180°		
				●	●	●	●	●	270°		
			Double vane (New)	●	●	●	●	●	90°		
				●	●	●	●	●	100°		
CRB□-C	With vertical auto switch unit (CRB2) With angle adjustment unit (CRB2)	Refer to the applicable auto switches shown in the table above.*1	Single vane	●	●	●	●	●	90°	●	–
				●	●	●	●	●	180°		
				●	●	●	●	●	270°		
			Double vane (New)	●	●	●	●	●	90°		
				●	●	●	●	●	100°		

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Vane Type Rotary Actuator *CRB* Series

Rotary Actuator
Model Selection

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Rotary Actuator Model Selection

Selection Procedures	Note	Selection Example

◆ List of Operating Conditions

· Initially selected models
· Operating pressure [MPa]
· Mounting orientation
· Load type
   Static load
   Resistance load
   Inertial load
· Load dimensions [m]
· Load mass [kg]
· Rotation time [s]
· Rotating angle [rad]
	The unit for the rotating angle is radian.
	$180° = \pi$ rad
	$90° = \pi/2$ rad
		
		Initially selected model: CRBS30-180
		Operating pressure: 0.4 MPa
		Mounting orientation: Vertical Load type: Inertial load
		Rotation time: t = 0.6 s Rotating angle: $\theta = \pi$ rad (180°)

❶ Calculation of Moment of Inertia

Calculate the inertial moment of load.	Loads are generated from multiple parts. The inertial moment of each load is calculated, and then totaled.	**Inertial moment of load 1: I_1** $I_1 = 0.15 \times \dfrac{0.06^2 + 0.03^2}{12} + 0.15 \times 0.025^2 = 0.00015$ **Inertial moment of load 2: I_2** $I_2 = 0.1 \times \dfrac{0.01^2}{2} + 0.1 \times 0.04^2 = 0.000165$ **Total inertial moment: I** $I = I_1 + I_2 = 0.000315$ [kg·m²]

❷ Calculation of Required Torque

Calculate the required torque for each load type and confirm whether the values fall in the effective torque range.
 	
· Static load (Ts)
  Required torque T = Ts
· Resistance load (Tf)
  Required torque T = Tf x (3 to 5)
· Inertial load (Ta)
  Required torque T = Ta x 10
	When the resistance load is rotated, the required torque calculated from the inertial load must be added.
	
	Required torque T = Tf x (3 to 5) + Ta x 10
		Inertial load: Ta
		$Ta = I \cdot \dot{\omega}$
		$\dot{\omega} = \dfrac{2\theta}{t^2}$ [rad/s²]
		Required torque: T
		$T = Ta \times 10$
		$= 0.000315 \times \dfrac{2 \times \pi}{0.6^2} \times 10 = 0.055$ [N·m]
		0.055 N·m < Effective torque OK

❸ Confirmation of Rotation Time

Confirm whether the time falls in the rotation time adjustment range.	Consider the time after converted in the time per 90°. (0.6 s/180° is converted in 0.3 s/90°.)	$0.04 \leq t \leq 0.5$ t = 0.3 s/90° OK

❹ Calculation of Kinetic Energy

Calculate the kinetic energy of the load and confirm whether the energy is below the allowable range.	If the energy exceeds the allowable range, a suitable cushioning mechanism such as a shock absorber must be externally installed.	**Kinetic energy: E** $E = \dfrac{1}{2} \cdot I \cdot \omega^2$ $\omega = \dfrac{2 \cdot \theta}{t}$ $E = \dfrac{1}{2} \times 0.000315 \times \left(\dfrac{2 \times \pi}{0.6}\right)^2 = 0.01725$ [J] 0.01725 [J] < Allowable energy OK

❺ Confirmation of Allowable Load

Confirm whether the load applied to the product is within the allowable range.	If the load exceeds the allowable range, a bearing or similar must be externally installed.	**Thrust load: M** 0.15 x 9.8 + 0.1 x 9.8 = 2.45 [N] 2.45 [N] < Allowable thrust load OK

❻ Calculation of Air Consumption and Required Air Flow Capacity

Air consumption and required air flow capacity are calculated when necessary.		

Rotary Actuator **Model Selection**

1 Calculation of Moment of Inertia

The moment of inertia is a value indicating the inertia of a rotating body, and expresses the degree to which the body is difficult to rotate, or difficult to stop.

It is necessary to know the moment of inertia of the load in order to determine the value of required torque or kinetic energy when selecting a rotary actuator.

Moving the load with the actuator creates kinetic energy in the load. When stopping the moving load, it is necessary to absorb the kinetic energy of the load with a stopper or a shock absorber.

The kinetic energy of the load can be calculated using the formulas shown in **Fig. 1** (for linear motion) and **Fig. 2** (for rotation motion).
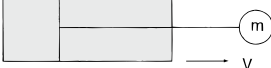
In the case of the kinetic energy for linear motion, the formula (1) shows that when the velocity **V** is constant, it is proportional to the mass **m**. In the case of rotation motion, the formula (2) shows that when the angular velocity ω is constant, it is proportional to the moment of inertia.

Linear motion

Fig. 1 Linear motion

$$E = \frac{1}{2} \cdot m \cdot V^2 \quad \cdots\cdots\cdots\cdots\cdots (1)$$

E: Kinetic energy
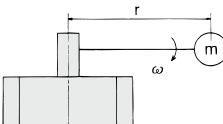**m**: Load mass
V: Velocity

Rotation motion

Fig. 2 Rotation motion

$$E = \frac{1}{2} \cdot I \cdot \omega^2 = \frac{1}{2} \cdot m \cdot r^2 \cdot \omega^2 \cdots\cdots\cdots (2)$$

E: Kinetic energy
I : Moment of inertia (= m·r²)
ω: Angular velocity
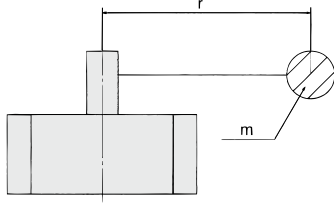**m**: Mass
r : Radius of rotation

As the moment of inertia is proportional to the squares of the mass and the radius of rotation, even when the load mass is the same, the moment of inertia will be squared as the radius of rotation grows bigger. This will create greater kinetic energy, which may result in damage to the product.

When there is rotation motion, product selection should be based not on the load mass of the load, but on the moment of inertia.

Moment of Inertia Formula

The basic formula for finding a moment of inertia is shown below.

$$I = m \cdot r^2$$

m: Mass
r : Radius of rotation

This formula represents the moment of inertia for the shaft with mass **m**, which is located at distance **r** from the shaft.

For actual loads, the values of the moment of inertia are calculated depending on configurations, as shown below.

⇒ p. 8 Calculation example of moment of inertia
⇒ p. 9 Graph for calculating the moment of inertia

● Equation Table of Moment of Inertia

I: Moment of inertia   **m**: Load mass

1. Thin shaft

Position of rotational axis: Perpendicular to the shaft through the centre of gravity
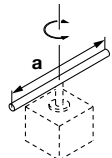
$$I = m \cdot \frac{a^2}{12}$$

2. Thin rectangular plate

Position of rotational axis: Parallel to side b and through the centre of gravity

$$I = m \cdot \frac{a^2}{12}$$
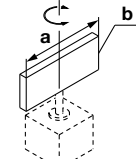
3. Thin rectangular plate (Including rectangular parallelepiped)

Position of rotational axis: Perpendicular to the plate through the centre of gravity

$$I = m \cdot \frac{a^2 + b^2}{12}$$
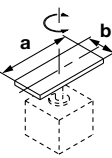
4. Round plate (Including column)

Position of rotational axis: Through the centre axis

$$I = m \cdot \frac{r^2}{2}$$
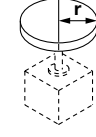
5. Solid sphere

Position of rotational axis: Through the centre of diameter

$$I = m \cdot \frac{2r^2}{5}$$
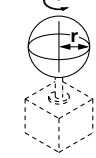
6. Thin round plate

Position of rotational axis: Through the centre of diameter

$$I = m \cdot \frac{r^2}{4}$$
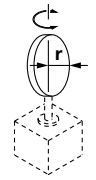
7. Cylinder

Position of rotational axis: Through the centre of diameter and gravity

$$I = m \cdot \frac{3r^2 + a^2}{12}$$
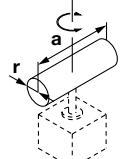
8. When the rotational axis and load centre of gravity are not consistent

$$I = K + m \cdot L^2$$

K: Moment of inertia around the load centre of gravity

4. Round plate $K = m \cdot \dfrac{r^2}{2}$
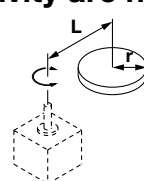
9. Gear transmission

(B) (A) No. of teeth = **a**

No. of teeth = **b**
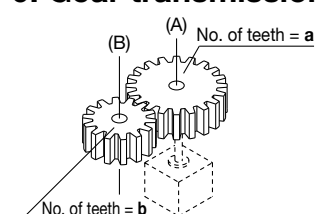
1. Find the moment of inertia I$_B$ for the rotation of shaft (B).

2. I$_B$ is converted to the moment of inertia I$_A$ for the rotation of the shaft (A).

$$I_A = \left(\frac{a}{b}\right)^2 \cdot I_B$$

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● Calculation Example of Moment of Inertia

■ If the shaft is located at a desired point of the load:
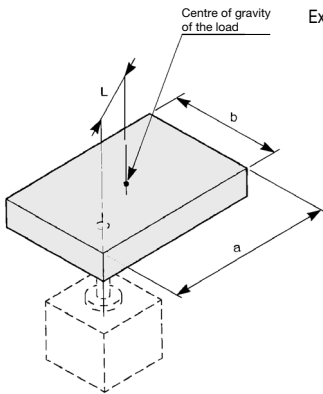
Example: ① If the load is the thin rectangular plate: Find the centre of gravity of the load as I_1, a provisional shaft.

$$I_1 = m \cdot \frac{a^2 + b^2}{12}$$

② Find the actual moment of inertia I_2 around the shaft, with the premise that the mass of the load itself is concentrated in the load's centre of gravity point.

$$I_2 = m \cdot L^2$$

③ Find the actual moment of inertia I.

$$I = I_1 + I_2$$

$\binom{m: \text{Load mass}}{L: \text{Distance from the shaft to the load's centre of gravity}}$

Calculation Example

a = 0.2 m, b = 0.1 m, L = 0.05 m, m = 1.5 kg

$I_1 = 1.5 \times \dfrac{0.2^2 + 0.1^2}{12} = 6.25 \times 10^{-3}$ kg·m²

$I_2 = 1.5 \times 0.05^2 = 3.75 \times 10^{-3}$ kg·m²

$I = (6.25 + 3.75) \times 10^{-3} = 0.01$ kg·m²

■ If the load is divided into multiple loads:
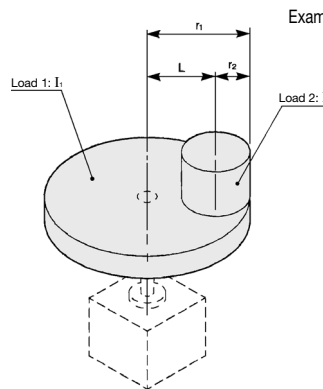
Example: ① If the load is divided into the 2 cylinders:

[The centre of gravity of load 1 matches the shaft]
[The centre of gravity of load 2 differs from the shaft]

Find the moment of inertia of load 1:

$$I_1 = m_1 \cdot \frac{r_1^2}{2}$$

② Find the moment of inertia of load 2:

$$I_2 = m_2 \cdot \frac{r_2^2}{2} + m_2 \cdot L^2$$

③ Find the actual moment of inertia I:

$$I = I_1 + I_2$$

$\binom{m_1, m_2: \text{Mass of loads 1 and 2}}{r_1, r_2: \text{Radius of loads 1 and 2} \atop L: \text{Distance from the shaft to the centre of gravity of load 2}}$

Calculation Example

m₁ = 2.5 kg, m₂ = 0.5 kg, r₁ = 0.1 m, r₂ = 0.02 m, L = 0.08 m

$I_1 = 2.5 \times \dfrac{0.1^2}{2} = 1.25 \times 10^{-2}$ kg·m²

$I_2 = 0.5 \times \dfrac{0.02^2}{2} + 0.5 \times 0.08^2 = 0.33 \times 10^{-2}$ kg·m²

$I = (1.25 + 0.33) \times 10^{-2} = 1.58 \times 10^{-2}$ kg·m²

■ If a lever is attached to the shaft and a cylinder and a gripper are mounted to the tip of the lever:
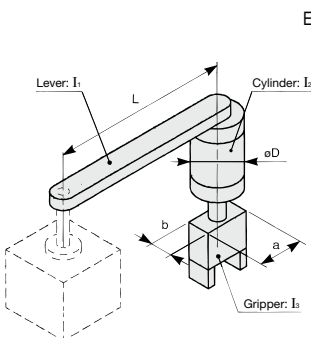
Example: ① Find the lever's moment of inertia:

$$I_1 = m_1 \cdot \frac{L^2}{3}$$

② Find the cylinder's moment of inertia:

$$I_2 = m_2 \cdot \frac{(D/2)^2}{2} + m_2 \cdot L^2$$

③ Find the gripper's moment of inertia:

$$I_3 = m_3 \cdot \frac{a^2 + b^2}{12} + m_3 \cdot L^2$$

④ Find the actual moment of inertia:

$$I = I_1 + I_2 + I_3$$

$\binom{m_1: \text{Mass of lever}}{m_2: \text{Mass of cylinder} \atop m_3: \text{Mass of gripper}}$

Calculation Example

L = 0.2 m, Ø D = 0.06 m, a = 0.06 m, b = 0.03 m
m₁ = 0.5 kg, m₂ = 0.4 kg, m₃ = 0.2 kg

$I_1 = 0.5 \times \dfrac{0.2^2}{3} = 0.67 \times 10^{-2}$ kg·m²

$I_2 = 0.4 \times \dfrac{(0.06/2)^2}{2} + 0.4 \times 0.2^2 = 1.62 \times 10^{-2}$ kg·m²

$I_3 = 0.2 \times \dfrac{0.06^2 + 0.03^2}{12} + 0.2 \times 0.2^2 = 0.81 \times 10^{-2}$ kg·m²

$I = (0.67 + 1.62 + 0.81) \times 10^{-2} = 3.1 \times 10^{-2}$ kg·m²

■ If a load is rotated through the gears:
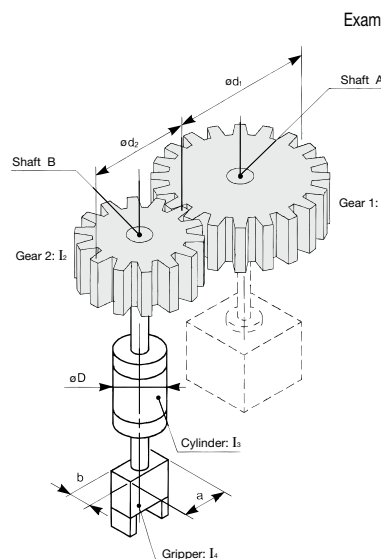
Example: ① Find the moment of inertia I_1 around shaft A:

$$I_1 = m_1 \cdot \frac{(d_1/2)^2}{2}$$

② Find moment of inertias I_2, I_3, and I_4 around shaft B:

$$I_2 = m_2 \cdot \frac{(d_2/2)^2}{2}$$

$$I_3 = m_3 \cdot \frac{(D/2)^2}{2}$$

$$I_4 = m_4 \cdot \frac{a^2 + b^2}{12}$$

$$I_B = I_2 + I_3 + I_4$$

③ Replace the moment of inertia I_B around shaft B with the moment of inertia I_A around shaft A.

$$I_A = (A/B)^2 \cdot I_B$$
[A/B: Ratio of the number of teeth]

④ Find the actual moment of inertia:

$$I = I_1 + I_A$$

$\binom{m_1: \text{Mass of gear 1}}{m_2: \text{Mass of gear 2} \atop m_3: \text{Mass of cylinder} \atop m_4: \text{Mass of gripper}}$

Calculation Example

d₁ = 0.1 m, d₂ = 0.05 m, D = 0.04 m, a = 0.04 m, b = 0.02 m
m₁ = 1 kg, m₂ = 0.4 kg, m₃ = 0.5 kg, m₄ = 0.2 kg, Ratio of the number of teeth = 2

$I_1 = 1 \times \dfrac{(0.1/2)^2}{2} = 1.25 \times 10^{-3}$ kg·m²

$I_2 = 0.4 \times \dfrac{(0.05/2)^2}{2} = 0.13 \times 10^{-3}$ kg·m²

$I_3 = 0.5 \times \dfrac{(0.04/2)^2}{2} = 0.1 \times 10^{-3}$ kg·m²

$I_4 = 0.2 \times \dfrac{0.04^2 + 0.02^2}{12} = 0.03 \times 10^{-3}$ kg·m²

$I_B = (0.13 + 0.1 + 0.03) \times 10^{-3} = 0.26 \times 10^{-3}$ kg·m²

$I_A = 2^2 \times 0.26 \times 10^{-3} = 1.04 \times 10^{-3}$ kg·m²

$I = (1.25 + 1.04) \times 10^{-3} = 2.29 \times 10^{-3}$ kg·m²

Rotary Actuator **Model Selection**

●Graph for Calculating the Moment of Inertia

Load Shapes

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

Graph 1   **Graph 2**

⑥ ⑦ ①④ ⑧ ②③⑤

Moment of inertia x 10^{-3} based on a 1 kg load mass [kg·m²]

a or r [mm]

Moment of inertia x 10^{-3} based on a 1 kg load mass [kg·m²] ②

b = 0 mm

b=10 15 20 25 30 40 50 60 70 80 90 100 120 140 160 180 200 250 300 400 500 750
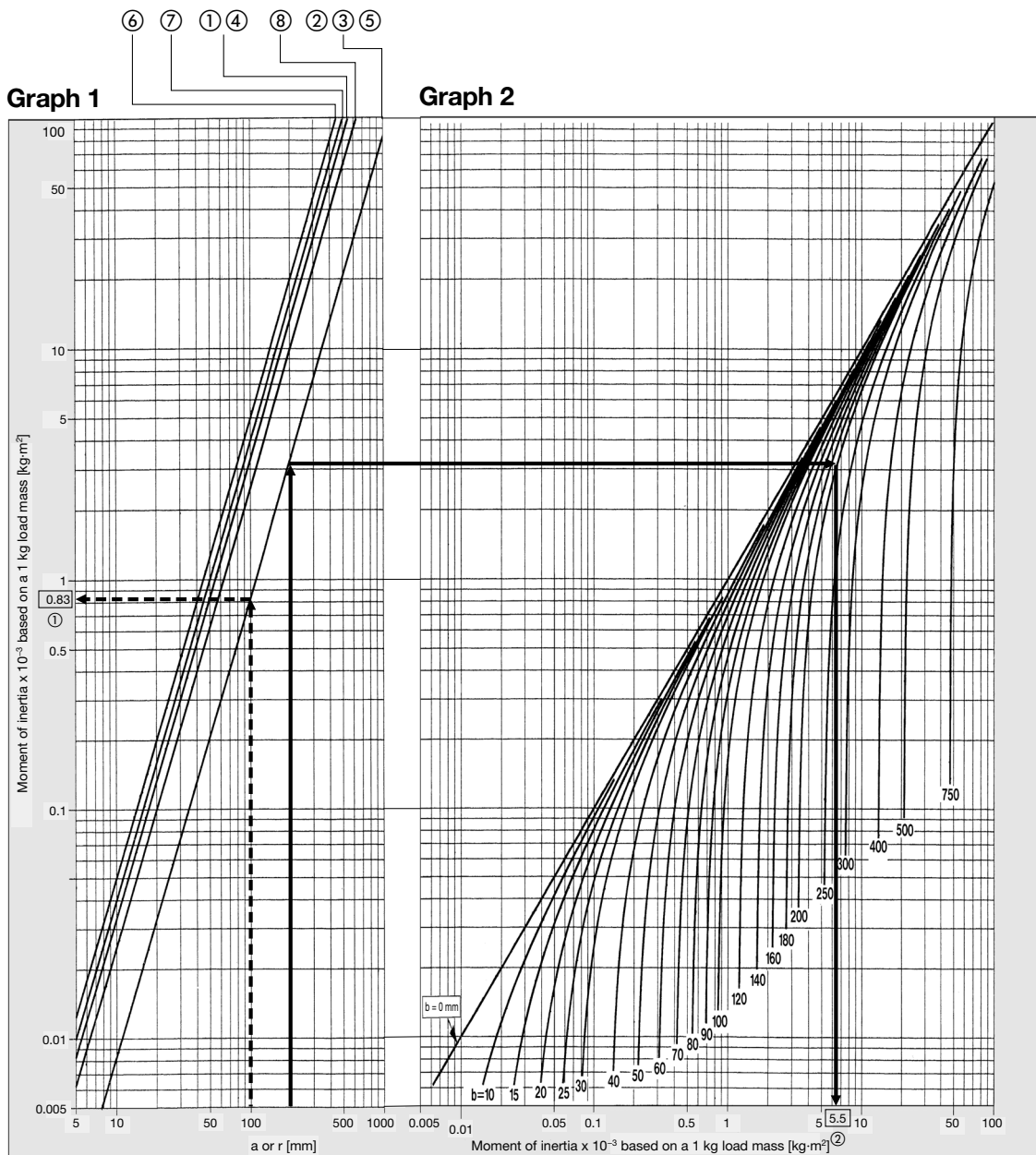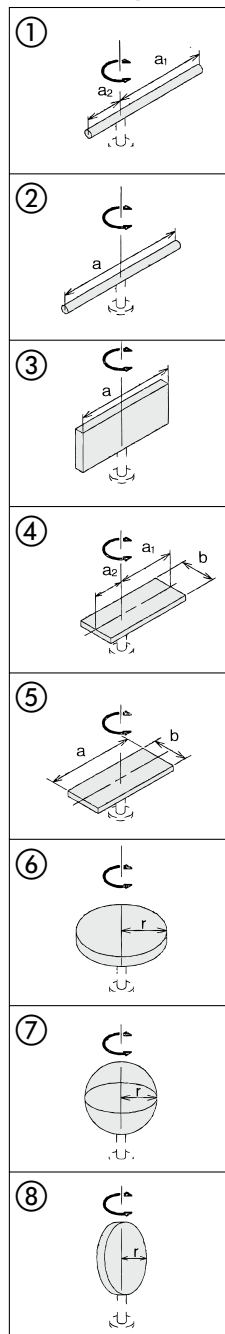
1. How to read the graph: Only when the dimension of the load is "a" or "r"

[Example] When the load shape is ②, a = 100 mm, and the load mass is 0.1 kg

In graph 1, the point at which the vertical line of a = 100 mm and the line of the load shape ② intersect indicates that the moment of inertia of the 1 kg mass is 0.83 x 10^{-3} kg·m².

Since the load mass is 0.1 kg, the actual moment of inertia is
0.83 x 10^{-3} x 0.1 = 0.083 x 10^{-3} kg·m²
(Note: If "a" is divided into "$a_1 a_2$", the moment of inertia can be found by calculating them separately.)

0.83 x 10^{-3}

100
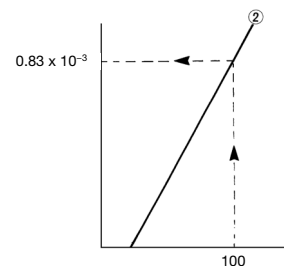
2. How to read the graph: When the dimension of the load contains both "a" and "b"

[Example] When the load shape is ⑤, a = 200 mm, b = 200 mm, and the load mass is 0.5 kg

In graph 1, find the point at which the vertical line of a = 200 mm and the line of the load shape ⑤ intersect. Move this intersection point to graph 2, and the point at which it intersects with the curve of b = 200 mm indicates that the moment of inertia of the 1 kg mass is 5.5 x 10^{-3} kg·m².
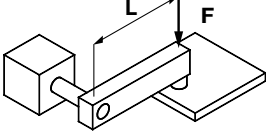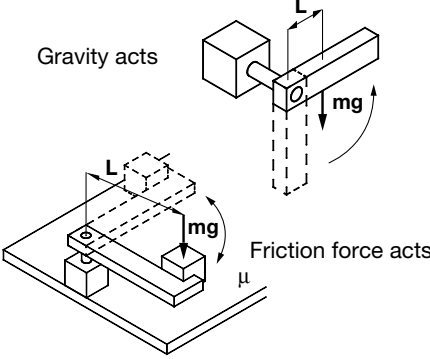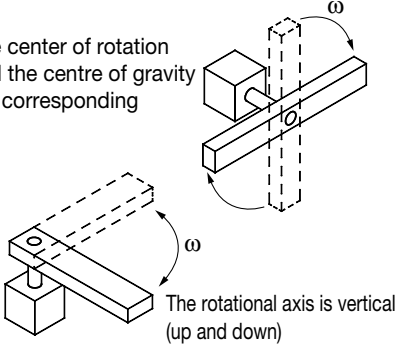
Since the load mass is 0.5 kg, the actual moment of inertia is
5.5 x 10^{-3} x 0.5 = 2.75 x 10^{-3} kg·m²

200

b = 200

5.5 x 10^{-3}

9

SMC
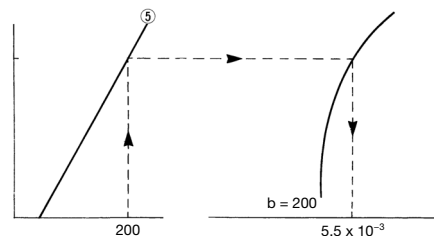
2 Calculation of Required Torque

● Load Type

The calculation method of required torque varies depending on the load type. Find the required torque referring to the table below.

Load type		
Static load: Ts	**Resistance load: Tf**	**Inertial load: Ta**
When the pressing force is necessary (clamp, etc.)	When friction force or gravity is applied to the rotation direction	When the load with inertia is rotated
	Gravity acts / Friction force acts μ	The center of rotation and the centre of gravity are corresponding / The rotational axis is vertical (up and down)
Ts = **F·L** **Ts**: Static load [N·m] **F** : Clamp force [N] **L** : Distance from the centre of rotation to clamp [m]	When gravity acts to the rotation direction: **Tf = m·g·L** When friction force acts to the rotation direction: **Tf = μ·m·g·L** **Tf**: Resistance load [N·m] **m**: Load mass [kg] **g** : Gravitational acceleration 9.8 [m/s²] **L** : Distance from the centre of rotation to the gravity or friction force acting point [m] **μ** : Coefficient of friction	$\mathbf{Ta} = \mathrm{I} \cdot \dot{\omega} = \mathrm{I} \cdot \dfrac{2\theta}{t^2}$ **Ta**: Inertial load [N·m] I : Moment of inertia [kg·m²] $\dot{\omega}$: Angular acceleration [rad/s²] θ : Rotating angle [rad] **t** : Rotation time [s]
Required torque **T** = **Ts**	Required torque **T** = **Tf** x (3 to 5)[*1]	Required torque **T** = **Ta** x 10[*1]

· Resistance loads → Gravity or friction applies in the rotation direction.
  Example 1) The axis of rotation is in a horizontal (lateral) direction, and the centre of rotation and centre of gravity of the load are not the same.
  Example 2) The load slips against the floor while rotating.
  ∗ The required torque equals the total of the resistance load and inertial load.
  T = **Tf** x (3 to 5) + **Ta** x 10

· Non-resistance loads → Gravity or friction does not apply in the rotation direction.
  Example 1) The axis of rotation is in a perpendicular (vertical) direction.
  Example 2) The axis of rotation is in a horizontal (lateral) direction, and the centre of rotation and centre of gravity of the load are the same.
  ∗ The required torque equals the inertial load only.
  T = **Ta** x 10

∗1 In order to adjust the velocity, it is necessary to have a margin of adjustment for **Tf** and **Ta**.

● Effective Torque

[N·m]

Size	Vane type	Operating pressure [MPa]								
		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
10	Single vane	0.03	0.06	0.09	0.12	0.15	0.18	–	–	–
	Double vane	0.07	0.13	0.19	0.25	0.31	0.37	–	–	–
15	Single vane	0.10	0.17	0.24	0.32	0.39	0.46	–	–	–
	Double vane	0.20	0.34	0.48	0.65	0.79	0.93	–	–	–
20	Single vane	0.23	0.39	0.54	0.70	0.84	0.99	–	–	–
	Double vane	0.47	0.81	1.13	1.45	1.76	2.06	–	–	–
30	Single vane	0.62	1.04	1.39	1.83	2.19	2.58	3.03	3.40	3.73
	Double vane	1.26	2.10	2.80	3.70	4.40	5.20	6.09	6.83	7.49
40	Single vane	1.21	2.07	2.90	3.73	4.55	5.38	6.20	7.03	7.86
	Double vane	2.58	4.30	5.94	7.59	9.24	10.89	12.50	14.10	15.80

3 Confirmation of Rotation Time

Rotation time adjustment range is specified for each product for stable operation. Set the rotation time within the range shown in the table on the right.

If the product is used in a low speed range which is outside the adjustment range, it may cause the stick-slip phenomenon, or the product to stick or stop.

Vane type	Size	Rotation time adjustment range [s/90°]
		0.02 0.03 0.04 0.05 0.07 0.1 0.2 0.5
Single vane	10, 15, 20	0.03 to 0.5
	30	0.04 to 0.5
	40	0.07 to 0.5
Double vane	10, 15, 20	0.05 to 0.5
	30, 40	0.1 to 0.5

Rotary Actuator Model Selection

4 Calculation of Kinetic Energy

Kinetic energy is generated when the load rotates. Kinetic energy applies on the product at the operating end as inertial force, and may cause the product to damage. In order to avoid this, the value of allowable kinetic energy is determined for each product.
Find the kinetic energy of the load, and verify that it is within the allowable range for the product in use.

Kinetic Energy

Use the following formula to calculate the kinetic energy of the load.

$$E = \frac{1}{2} \cdot I \cdot \omega^2$$

E: Kinetic energy [J]
I: Moment of inertia [kg·m²]
ω: Angular velocity [rad/s]

⇒Below Allowable kinetic energy and rotation time adjustment range
⇒p. 12 Moment of inertia and rotation time

To find the rotation time when kinetic energy is within the allowable range for the product, use the following formula.

When the angular velocity is $\omega = \dfrac{2\theta}{t}$

$$t \geq \sqrt{\frac{2 \cdot I \cdot \theta^2}{E}}$$

t : Rotation time [s]
I : Moment of inertia [kg·m²]
θ: Rotating angle [rad]
E: Allowable kinetic energy [J]

Angular Velocity

$$\omega = \frac{2\theta}{t}$$

ω: Angular velocity [rad/s]
θ : Rotating angle [rad]
t : Rotation time [s]

● Allowable Kinetic Energy and Rotation Time Adjustment Range

Single vane

Size	Allowable kinetic energy [J]	Adjustable range of rotation time safe in operation [s/90°]
10	0.00015	
15	0.001	0.03 to 0.5
20	0.003	
30	0.020	0.04 to 0.5
40	0.040	0.07 to 0.5

Double vane

Size	Allowable kinetic energy [J]	Adjustable range of rotation time safe in operation [s/90°]
10	0.0003	
15	0.0012	0.05 to 0.5
20	0.0033	
30	0.020	0.1 to 0.5
40	0.040	

Calculation Example

Load form: Round rod
Length of **a₁** part : 0.12 m Rotating angle: 90°
Length of **a₂** part : 0.04 m Rotation time : 0.9 s/90°
Mass of **a₁** part (= m₁): 0.09 kg
Mass of **a₂** part (= m₂): 0.03 kg

$$I = m_1 \cdot \frac{a_1^2}{3} + m_2 \cdot \frac{a_2^2}{3}$$
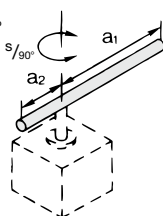
(Step 1) Find the angular velocity ω.

$$\omega = \frac{2\theta}{t} = \frac{2}{0.9}\left(\frac{\pi}{2}\right)$$
$$= 3.489 \text{ rad/s}$$

(Step 2) Find the moment of inertia I.

$$I = \frac{m_1 \cdot a_1^2}{3} + \frac{m_2 \cdot a_2^2}{3}$$
$$= \frac{0.09 \times 0.12^2}{3} + \frac{0.03 \times 0.04^2}{3}$$
$$= 4.48 \times 10^{-4} \text{ kg·m}^2$$

(Step 3) Find the kinetic energy E.

$$E = \frac{1}{2} \cdot I \cdot \omega^2 = \frac{1}{2} \times 4.48 \times 10^{-4} \times 3.489^2$$
$$= 0.00273 \text{ J}$$

Calculation Example

If the model to be used has been determined, find the threshold rotation time in which the rotary actuator can be used in accordance with the allowable kinetic energy of that model.
Model used : CRB30
Allowable kinetic energy: 0.02 J (Refer to the table above.)
Load form : Refer to the figure below.
Rotating angle : 90°

$$I = m_1 \cdot \frac{a_1^2}{3} + m_2 \cdot a_2^2 + m_2 \cdot \frac{2r^2}{5}$$
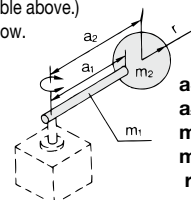
a_1 : 0.1 m
a_2 : 0.12 m
m_1: 0.02 kg
m_2: 0.02 kg
r : 0.03 m

(Step 1) Find the moment of inertia.

$$I = \frac{m_1 \cdot a_1^2}{3} + m_2 \cdot a_2^2 + \frac{m_2 \cdot 2r^2}{5}$$
$$= \frac{0.02 \times 0.1^2}{3} + 0.02 \times 0.12^2 + \frac{0.02 \times 2 \times 0.03^2}{5}$$
$$= 3.6 \times 10^{-4} \text{ kg·m}^2$$

(Step 2) Find the rotation time.

$$t \geq \sqrt{\frac{2 \cdot I \cdot \theta^2}{E}} = \sqrt{\frac{2 \times 3.6 \times 10^{-4} \times (\pi/2)^2}{0.02}} = 0.30 \text{ s}$$

It is therefore evident that there will be no problem if it is used with a rotation time of less than 0.30 s. However, according to the table above, the maximum value of rotation time for stable operation is 0.5 s. Thus, the rotation time should be within the range of $0.30 \leq t \leq 0.50$.

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● Moment of Inertia and Rotation Time

How to read the graph

Example 1) When there are constraints on the moment of inertia of the load and the rotation time:
We can see from graph 3 that to operate the load at a 1×10^{-4} kg·m² moment of inertia and at the rotation time setting of 0.3 $^S/_{90°}$, the model will be CRB□30.

Example 2) When there are constraints on the moment of inertia of the load but not the rotation time:
We can see from graph 3 that to operate the load at a 1×10^{-5} kg·m² moment of inertia:
(CRB15 will be 0.22 to 0.5 $^S/_{90°}$.)
(CRB20 will be 0.13 to 0.5 $^S/_{90°}$.)

[Remarks] As for the rotation times in graph 3, the lines in the graph indicate the adjustable speed ranges. However, if the speed is adjusted toward the low-speed end beyond the range of the line, the actuator may stick, or, in the case of the vane type, the operation may stop.

Graph 3 Size: 10 to 40
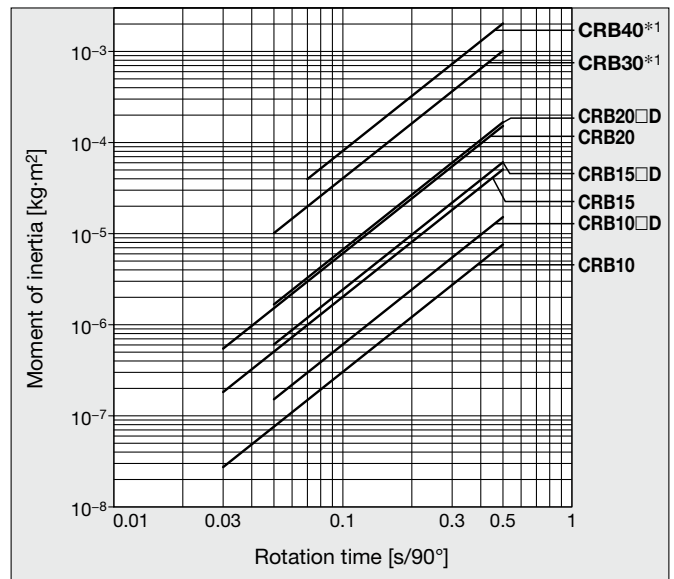
*1 For the double vane type CRB30 and CRB40, the rotation time range is from 0.1 to 0.5 [s/90°].

5	**Confirmation of Allowable Load**

Provided that a dynamic load is not generated, a load in the axial direction can be applied up to the value that is indicated in the table below. However, applications in which the load is applied directly to the shaft should be avoided as much as possible.
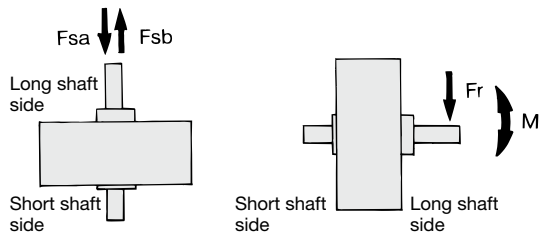
Vane Type

Series	Size	Load direction			
		Fsa [N]	Fsb [N]	Fr [N]	M [N·m]
CRB	**10**	9.8	9.8	14.7	0.13
	15	9.8	9.8	14.7	0.17
	20	19.6	19.6	24.5	0.33
	30	24.5	24.5	29.4	0.42
	40	40	40	60	1.02
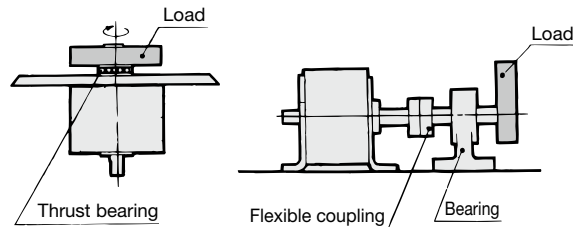
Rotary Actuator **Model Selection**

6 Calculation of Air Consumption and Required Air Flow Capacity

Air consumption is the volume of air which is expended by the rotary actuator's reciprocal operation inside the actuator and in the piping between the actuator and the switching valve, etc. This is necessary for selection of a compressor and for calculation of its running cost. Required air volume is the air volume necessary to make a rotary actuator operate at a required speed. It requires calculation when selecting the upstream piping diameter from the switching valve and air line equipment.

∗ To facilitate your calculation, the table below provide the air consumption volume (Q_{CR}) that is required each time an individual rotary actuator makes a reciprocal movement.

① Air consumption volume

Formula

Regarding QCR: With vane type, use formula (1) because the inner volume varies when ports A and B are pressurised.

$$Q_{CR} = (V_A + V_B) \times \left(\frac{P+0.1}{0.1}\right) \times 10^{-3} \cdots\cdots\cdots (1)$$

$$Q_{CP} = 2 \times a \times L \times \left(\frac{P}{0.1}\right) \times 10^{-6} \cdots\cdots\cdots (2)$$

$$Q_C = Q_{CR} + Q_{CP} \cdots\cdots\cdots\cdots\cdots (3)$$

Q_{CR} = Amount of air consumption of rotary actuator   [L (ANR)]

Q_{CP} = Amount of air consumption of tube or piping   [L (ANR)]

V_A = Inner volume of the rotary actuator (when pressurised from A port)   [cm³]

V_B = Inner volume of the rotary actuator (when pressurised from B port)   [cm³]

P = Operating pressure   [MPa]

L = Length of piping   [mm]

a = Inner sectional area of piping   [mm²]

Q_C = Amount of air consumption required for one cycle of the rotary actuator   [L (ANR)]

To select a compressor, it is important to select one that has plenty of margin to accommodate the total air volume that is consumed by the pneumatic actuators that are located downstream. The total air consumption volume is affected by the leakage in the tube, the consumption in the drain valves and pilot valves, as well as by the reduction in air volume due to reduced temperature.

Formula

$$Q_{C2} = Q_C \times n \times \text{No. of actuators} \times \text{Safety factor} \cdots (4)$$

Q_{C2} = Amount of air from a compressor   [L/min (ANR)]

n = Actuator reciprocations per minute

Safety factor: From 1.5

② Required air flow capacity

Formula

$$Q_r = \left\{ V_B \times \left(\frac{P+0.1}{0.1}\right) \times 10^{-3} + a \times L \times \left(\frac{P}{0.1}\right) \times 10^{-6} \right\} \times \frac{60}{t} \cdots (5)$$

$$Q_r = \left\{ V_A \times \left(\frac{P+0.1}{0.1}\right) \times 10^{-3} + a \times L \times \left(\frac{P}{0.1}\right) \times 10^{-6} \right\} \times \frac{60}{t} \cdots (6)$$

Q_r = Consumed air volume for rotary actuator   [L/min (ANR)]

V_A = Inner volume of the rotary actuator (when pressurised from A port)   [cm³]

V_B = Inner volume of the rotary actuator (when pressurised from B port)   [cm³]

P = Operating pressure   [MPa]

L = Length of piping   [mm]

a = Inner sectional area of piping   [mm²]

t = Total time for rotation   [S]

Internal Cross Section of Tubing and Steel Tube

Nominal	O.D. [mm]	I.D. [mm]	Internal cross section a [mm²]
T□ 0425	4	2.5	4.9
T□ 0604	6	4	12.6
TU 0805	8	5	19.6
T□ 0806	8	6	28.3
1/8B	—	6.5	33.2
T□ 1075	10	7.5	44.2
TU 1208	12	8	50.3
T□ 1209	12	9	63.6
1/4B	—	9.2	66.5
TS 1612	16	12	113
3/8B	—	12.7	127
T□ 1613	16	13	133
1/2B	—	16.1	204
3/4B	—	21.6	366
1B	—	27.6	598

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● Inner Volume and Air Consumption

Single vane [L (ANR)]

Size	Rotating angle (degree)	Inner volume [cm³]		Operating pressure [MPa]								
		Press. **V**A port	Press. **V**B port	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
10	90	0.5	0.8	0.004	0.005	0.007	0.008	0.009	0.010	—	—	—
	180	1.1	1.1	0.007	0.009	0.011	0.013	0.015	0.018	—	—	—
	270	1.5	1.5	0.009	0.012	0.015	0.018	0.021	0.024	—	—	—
15	90	1.4	2.1	0.011	0.014	0.018	0.021	0.025	0.028	—	—	—
	180	2.8	2.8	0.017	0.022	0.028	0.034	0.039	0.045	—	—	—
	270	3.8	3.8	0.023	0.030	0.038	0.046	0.053	0.061	—	—	—
20	90	3.6	5	0.026	0.034	0.043	0.052	0.060	0.069	—	—	—
	180	6.5	6.5	0.039	0.052	0.065	0.078	0.091	0.104	—	—	—
	270	7.9	7.9	0.047	0.063	0.079	0.095	0.111	0.126	—	—	—
30	90	10.1	13.3	0.070	0.094	0.117	0.140	0.164	0.187	0.211	0.234	0.257
	180	17.4	17.4	0.104	0.139	0.174	0.209	0.244	0.278	0.313	0.348	0.383
	270	19	19	0.114	0.152	0.190	0.228	0.266	0.304	0.342	0.380	0.418
40	90	21.9	30	0.156	0.208	0.260	0.311	0.363	0.415	0.467	0.519	0.571
	180	37.5	37.5	0.225	0.300	0.375	0.450	0.525	0.600	0.675	0.750	0.825
	270	41.6	41.6	0.250	0.333	0.416	0.499	0.582	0.666	0.749	0.832	0.915

Double vane [L (ANR)]

Size	Rotating angle (degree)	Inner volume [cm³]		Operating pressure [MPa]								
		Press. **V**A port	Press. **V**B port	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
10	90	0.9	0.9	0.005	0.007	0.009	0.011	0.013	0.014	—	—	—
	100	1.0	1.0	0.006	0.008	0.010	0.012	0.014	0.016	—	—	—
15	90	2.6	2.6	0.016	0.021	0.026	0.031	0.036	0.042	—	—	—
	100	2.7	2.7	0.016	0.022	0.027	0.032	0.038	0.043	—	—	—
20	90	5.5	5.5	0.033	0.044	0.055	0.066	0.077	0.088	—	—	—
	100	5.6	5.6	0.034	0.045	0.056	0.067	0.078	0.090	—	—	—
30	90	13.0	13.0	0.078	0.104	0.130	0.156	0.182	0.208	0.234	0.260	0.286
	100	14.0	14.0	0.084	0.112	0.140	0.168	0.196	0.224	0.252	0.280	0.308
40	90	29.2	29.2	0.175	0.234	0.292	0.350	0.409	0.467	0.526	0.584	0.642
	100	30.0	30.0	0.180	0.240	0.300	0.360	0.420	0.480	0.540	0.600	0.660

Rotary Actuator Model Selection

● Air Consumption Calculation Graph

Step 1 Using graph 4 , air consumption volume of the rotary actuator is found. From the point of intersection between the inner volume and the operating pressure (slanted line) and then looking to the side (left side) direction, the air consumption volume for 1 cycle operation of a rotary actuator is found.

Step 2 Using graph 5 , air consumption volume of tubing or steel tube is found.

(1) First determine the point of intersection between the operating pressure (slanted line) and the piping length, and then go up the vertical line perpendicularly from there.

(2) From the point of intersection of an operating piping tube inside diameter (slanted line), then look to the side (left or right) to find the required air consumption volume for piping.

Step 3 Total air consumption volume per minute is found as follows:

(Air consumption volume of a rotary actuator [unit: L (ANR)] + Tubing or steel tube's air consumption volume) x Cycle times per minute x Number of rotary actuators = Total air consumption volume

Example) When 10 units of a CRBS30-180 are used at a pressure of 0.5 MPa, what is the air consumption of their 5 cycles per minute? (Piping between the actuator and switching valve is a tube with an inside diameter of 6 mm and length of 2 m.)

1. Operating pressure 0.5 MPa → Inner volume of CRBS30-180 34.8 cm^3 → Air consumption volume 0.21 L (ANR)

2. Operating pressure 0.5 MPa→ Piping length 2 m → Inside diameter 6 mm → Air consumption volume 0.56 L (ANR)

3. Total air consumption volume = (0.21 + 0.56) x 5 x 10 = 38.5 L/min (ANR)
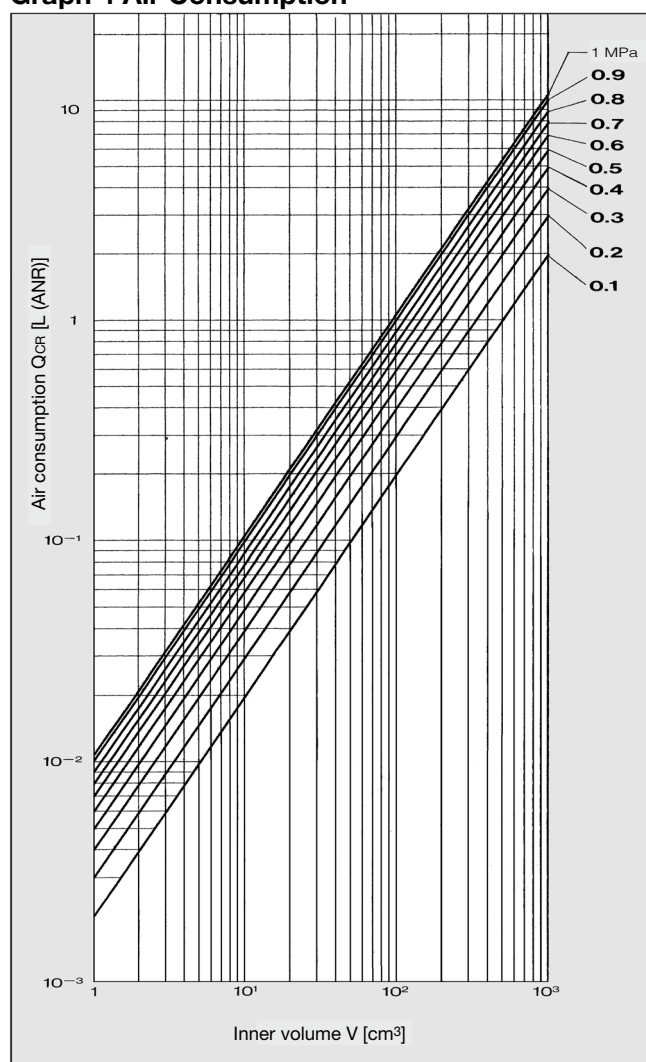
Air Consumption Table

Single vane
1 cycle [cm^3]

Size	Rotating angle		
	90°	180°	270°
10	1.3	2.2	3
15	3.5	5.6	7.6
20	8.6	13	15.8
30	23.4	34.8	38
40	51.9	75	83.2

Double vane
1 cycle [cm^3]

Size	Rotating angle	
	90°	100°
10	1.8	2
15	5.2	5.4
20	11	11.2
30	26	28
40	58.4	60

Graph 4 Air Consumption

Graph 5 Air Consumption of Tubing, Steel Tube (1 cycle)
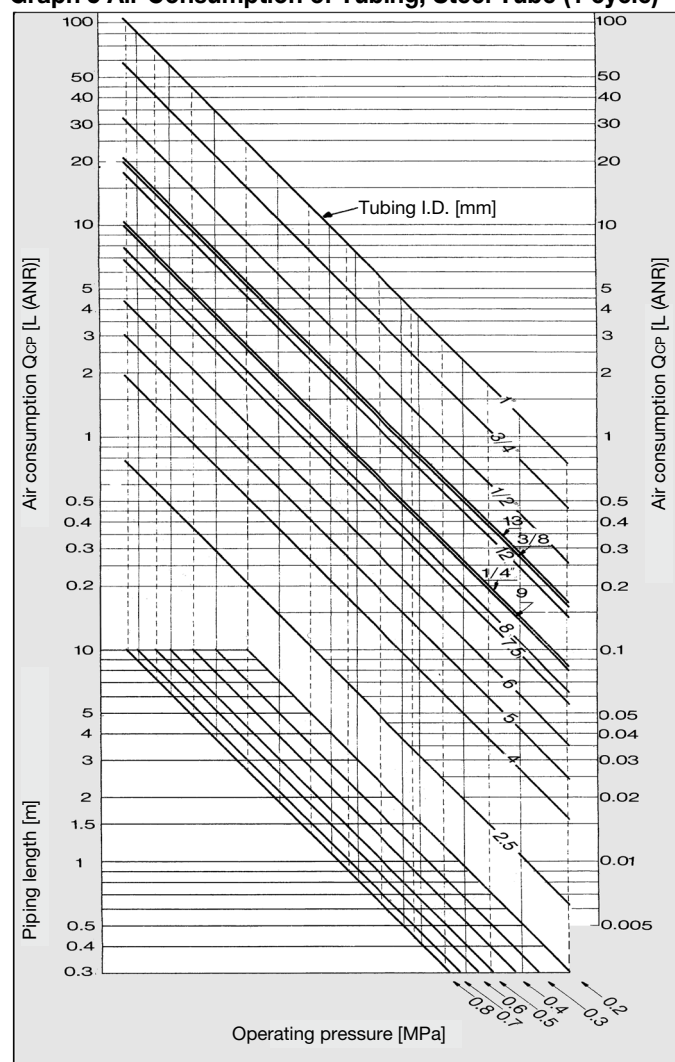
∗ "Piping length" indicates the length of steel tube or tubing which connects rotary actuator and switching valves (solenoid valves, etc.).

∗ Refer to page 13 for the size of tubing and steel tube (inside diameter and outside diameter).

SMC

Vane Type Rotary Actuator
CRB Series
Size: 10, 15, 20, 30, 40

RoHS

How to Order

```
        C   RB S 30 – 90 □
```

With auto switch
```
        C D RB S 30 – 90 □  – M9B □ □
```

Built-in auto switch magnet

① ② ③ ④ ⑤ ⑥ ⑦

Long shaft
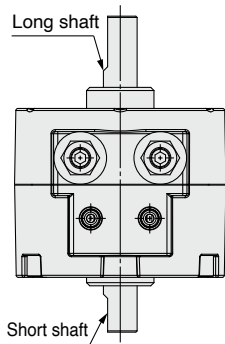
Short shaft

❶ Shaft type

Sym-bol	Shaft type	Shaft-end shape	
		Long shaft	Short shaft
S	Single shaft*1	Single flat*2	—
W	Double shaft	Single flat*2	Single flat
J*3	Double shaft	For details, refer to page 29.	
K*3	Double shaft		
T*3	Single shaft*1		
Y*3	Double shaft		

*1 When an auto switch is mounted to the rotary actuator, only options "S" and "T" are available.
*2 Size 40 has a parallel key instead of a chamfered portion.
*3 Options "J," "K," "T," and "Y" are produced upon receipt of order.

❷ Size

10
15
20
30
40

❸ Rotating angle

	90	90°
Single vane	180	180°
	270	270°
Double vane	90	90°
	100	100°

* For the type with an auto switch, only the 90° or 180° single vane type is available.

❹ Vane type

—	Single vane
D	Double vane

❺ Auto switch

—	Without auto switch (Built-in magnet)

* For applicable auto switches, refer to the table below.

❻ Lead wire length

—	Grommet/Lead wire: 0.5 m
M	Grommet/Lead wire: 1 m
L	Grommet/Lead wire: 3 m
Z*1	Grommet/Lead wire: 5 m

*1 The 5 m lead wire is produced upon receipt of order.

❼ Number of auto switches

—	2
S	1

Refer to pages 58 to 61 for actuators with auto switches.

· Auto Switch Proper Mounting Position (at Rotation End Detection)
· Operating Angle and Hysteresis Angle
· Operating Range and Hysteresis
· How to Change the Auto Switch Detecting Position
· Auto Switch Mounting
· Auto Switch Adjustment

A flange mounting bracket assembly is available as an option. For details, refer to page 56.

Applicable Auto Switches / Refer to the **catalogue on www.smc.eu** for further information on auto switches.

Type	Electrical entry	Indicator light	Wiring (Output)	Load voltage [DC]		Auto switch model	Lead wire type	Lead wire length [m]				Pre-wired connector	Applicable load
								0.5 (—)	1 (M)	3 (L)	5 (Z)		
Solid state auto switch	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	M9N	Oilproof heavy-duty cord	●	●	●	○	○	IC circuit	Relay, PLC
			3-wire (PNP)			M9P		●	●	●	○	○		
			2-wire		12 V	M9B		●	●	●	○	○	—	

* Auto switches are shipped together with the product but do not come assembled.
* Auto switches marked with a "○" are produced upon receipt of order.

CRB Series

Symbol

Specifications

Single vane

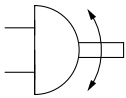| Size	10	15	20	30	40
Rotating angle range	$90°^{+5°}_{0}$ $180°^{+5°}_{0}$ $270°^{+5°}_{0}$	$90°^{+4°}_{0}$ $180°^{+4°}_{0}$ $270°^{+4°}_{0}$	$90°\pm10°$ $180°\pm10°$ $270°^{+4°}_{0}$		
Fluid	Air (Non-lube)				
Proof pressure [MPa]	1.05			1.5	
Ambient and fluid temperatures	5 to 60 °C				
Max. operating pressure [MPa]	0.7			1.0	
Min. operating pressure [MPa]	0.2				
Rotation time adjustment range [s/90°][*1]	0.03 to 0.5			0.04 to 0.5	0.07 to 0.5
Allowable kinetic energy [J]	0.00015	0.001	0.003	0.02	0.04
Shaft load [N] **Allowable radial load**	15	15	25	30	60
Allowable thrust load	10	10	20	25	40
Port size	M5 x 0.8 (90° and 180° specifications) M3 x 0.5 (270° specification)		M5 x 0.8		

∗1 Operate within the specified rotation time range. Operation below 0.5 s/90° may cause stick slip or operation failure.
　It is difficult to make adjustments during use if rotation time is changed to 0.5 s/90° or lower.
　Size 10 requires at least 0.35 MPa of operating pressure to reach the minimum rotation time (0.03 s/90°).

Double vane

Size	10	15	20	30	40
Rotating angle range	$90°^{+5°}_{0}$ $100°\pm2.5°$	$90°^{+4°}_{0}$ $100°\pm2°$			
Fluid	Air (Non-lube)				
Proof pressure [MPa]	1.05			1.5	
Ambient and fluid temperatures	5 to 60 °C				
Max. operating pressure [MPa]	0.7			1.0	
Min. operating pressure [MPa]	0.2				
Rotation time adjustment range [s/90°][*2]	0.05 to 0.5			0.1 to 0.5	
Allowable kinetic energy [J]	0.0003	0.0012	0.0033	0.02	0.04
Shaft load [N] **Allowable radial load**	15	15	25	30	60
Allowable thrust load	10	10	20	25	40
Port size	M3 x 0.5		M5 x 0.8		

∗2 Operate within the specified rotation time range. Operation at a speed lower than 0.5 s may cause stick-slip or operation failure.
　An operating pressure of at least 0.5 MPa is required to operate at the fastest rotation time.
　It is difficult to make adjustments during operation if the rotation time is changed to the low-speed range (0.5 s or lower).

Inner Volume

Single vane
[cm³]

Size	10			15			20			30			40		
Rotating angle	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°
Inner Volume	0.8 (0.5)	1.1	1.5	2.1 (1.4)	2.8	3.8	5 (3.6)	6.5	7.9	13.3 (10.1)	17.4	19	30 (21.9)	37.5	41.6

∗ Values inside ( ) are inner volume of the supply side when A port is pressurised.

Double vane
[cm³]

Size	10		15		20		30		40	
Rotating angle	90°	100°	90°	100°	90°	100°	90°	100°	90°	100°
Inner Volume	0.9	1.0	2.6	2.7	5.5	5.6	13.0	14.0	29.2	30.0

Weight

Single vane
[g]

Size	10			15			20			30			40		
Rotating angle	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°
Basic type (S shaft)	26 (27)	25 (26)	25 (26)	46 (47)	45 (46)	45 (46)	107 (110)	105 (107)	103 (106)	198 (203)	192 (197)	190 (195)	366 (378)	354 (360)	360 (366)
With auto switch	39	38	—	62	61	—	115	112	—	216	209	—	380	367	—

( ): For W shaft

Double vane
[g]

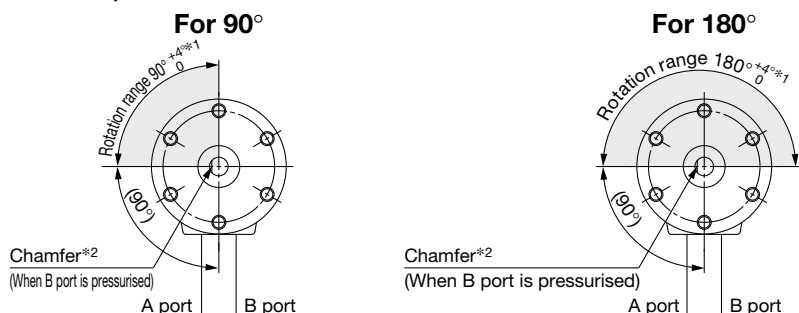| Size	10		15		20		30		40	
Rotating angle	90°	100°	90°	100°	90°	100°	90°	100°	90°	100°
Basic type (S shaft)	44 (43)	44 (43)	55 (54)	55 (54)	116 (114)	116 (114)	218 (214)	218 (214)	415 (409)	414 (408)

( ): For W shaft

SMC

Chamfered Portion and Rotation Range: Top View from Long Shaft Side (The positions of the chamfered portion shown below illustrate the conditions of actuators when B port is pressurised.)

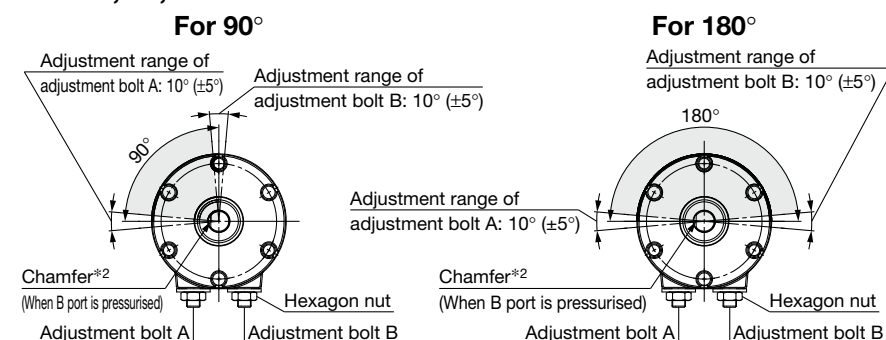• Operate within the adjustment range shown below.

Single vane
Size: 10, 15

For 90°

Rotation range 90°⁺⁴°*1 ₀

(90°)

Chamfer*2
(When B port is pressurised)

A port | B port

For 180°

Rotation range 180°⁺⁴°*1 ₀

(90°)

Chamfer*2
(When B port is pressurised)

A port | B port

*1 For size 10, the tolerance of rotating angle of 90° and 180° will be $^{+5°}_{0}$.

Size: 20, 30, 40

For 90°

Adjustment range of
adjustment bolt A: 10° (±5°)

Adjustment range of
adjustment bolt B: 10° (±5°)

90°

Chamfer*2
(When B port is pressurised)

Hexagon nut

Adjustment bolt A | Adjustment bolt B

For 90° rotation: 80° to 100° adjustable

For 180°

Adjustment range of
adjustment bolt B: 10° (±5°)

180°

Adjustment range of
adjustment bolt A: 10° (±5°)

Chamfer*2
(When B port is pressurised)

Hexagon nut

Adjustment bolt A | Adjustment bolt B

For 180° rotation: 170° to 190° adjustable

Size: 10, 15, 20, 30, 40

For 270°

Rotation range 270°⁺⁴°*3 ₀

(45°)

Chamfer
(When B port is pressurised)

A port | B port

*3 For size 10, the tolerance of rotating angle
of 270° will be $^{+5°}_{0}$.

*2 For size 40 actuators, a parallel key will be used instead of a chamfer.

* The angle adjusting screw (adjustment bolt) is set at random within the adjustable rotating range.
Therefore, it must be readjusted to obtain the angle that suits your application. (Refer to page 62.)

☆ **Recommended tightening torque for hexagon nut to fix the adjustment bolt**
Size 20: 1.5 N·m Sizes 30, 40: 3 N·m

Single vane

The position of the chamfered portion when A port is pressurised
(when shipped from the factory)

Size: 10, 15, 20, 30, 40

For 90°

Chamfer

A port | B port

For 180°

Chamfer

A port | B port

For 270°

Chamfer

A port | B port

Double vane

For 90°

90° ⁺⁴° ₀

(45°)

A port | B port

For 100°

100° ±2°

(40°)

A port | B port

Double vane

The position of the chamfered portion when A port is pressurised (when shipped from the factory)

Size: 10, 15, 20, 30, 40

Chamfer

A port | B port
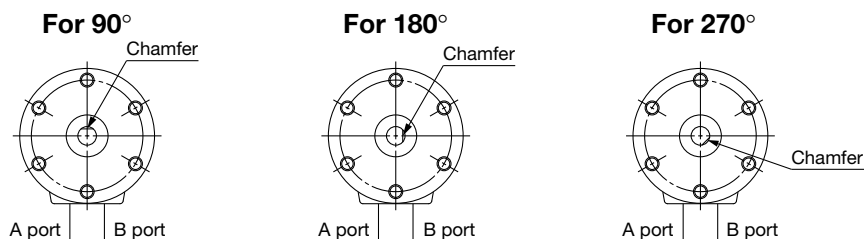
* For size 10, the rotating angle tolerance for 90° is $^{+5°}_{0}$, and the tolerance for 100° is ±2.5°.

Refer to page 10 for details on the effective torque.

CRB *Series*

Construction: Single Vane Type Standard Type (Without Auto Switch)

• Following figures show actuators when B port is pressurised.

Size: 10, 15

For 90°
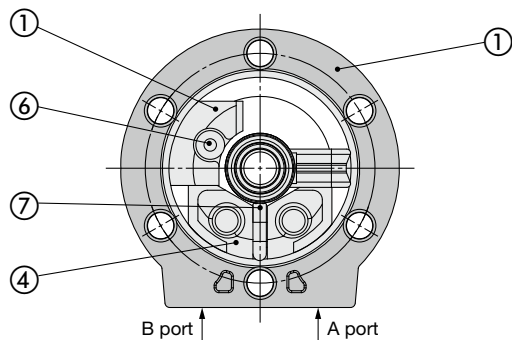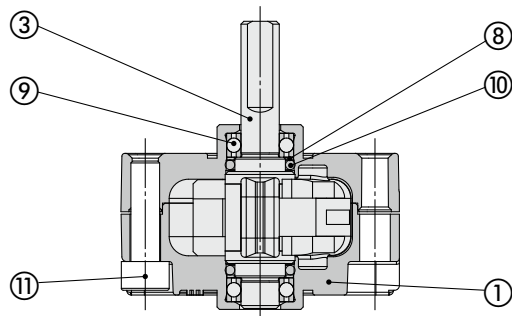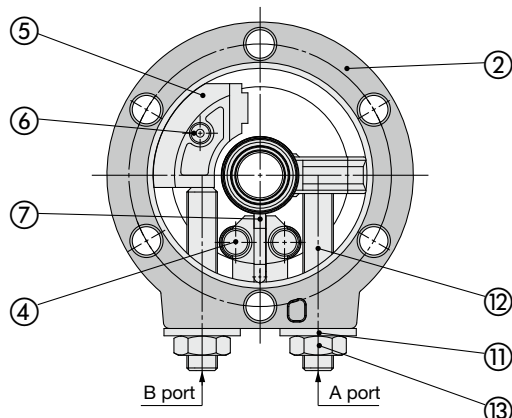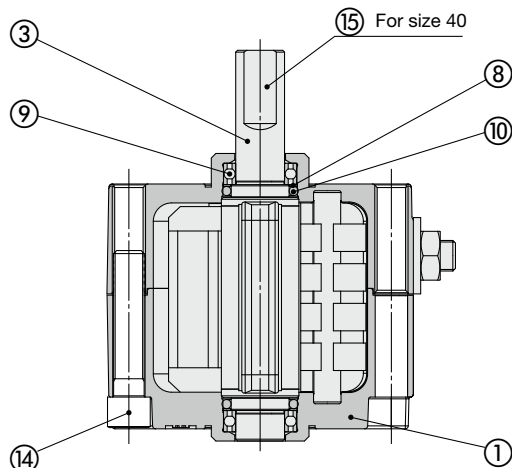
B port   A port

For 180°

B port   A port

Component Parts

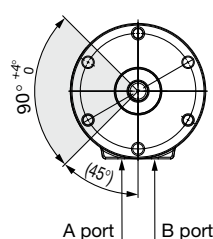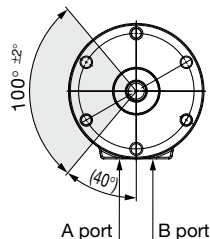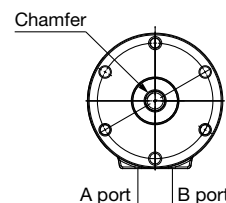| No.	Description	Material	Note
1	**Body (A)**	Aluminium alloy	Painted
2	**Body (B)**	Aluminium alloy	Painted
3	**Vane shaft**	Stainless steel	
4	**Stopper**	Resin	
5	**Stopper for 90°**	Resin	For 90°
6	**Holding rubber**	NBR	For 90°
7	**Stopper seal**	NBR	Special seal
8	**Back-up ring**	Stainless steel	
9	**Bearing**	Bearing steel	
10	**O-ring**	NBR	
11	**Hexagon socket head cap screw**	Chrome molybdenum steel	Special screw

Size: 20, 30, 40

For 90°

⑮ For size 40

B port   A port

For 180°

B port   A port

Component Parts

No.	Description	Material	Note
1	**Body (A)**	Aluminium alloy	Painted
2	**Body (B)**	Aluminium alloy	Painted
3	**Vane shaft**	Stainless steel*1	
4	**Stopper**	Resin	
5	**Stopper for 90°**	Resin	For 90°
6	**Holding rubber**	NBR	For 90°
7	**Stopper seal**	NBR	Special seal
8	**Back-up ring**	Stainless steel	
9	**Bearing**	Bearing steel	
10	**O-ring**	NBR	
11	**Seal washer**	NBR	
12	**Adjustment bolt**	Chrome molybdenum steel	
13	**Hexagon nut**	Steel wire	
14	**Hexagon socket head cap screw**	Chrome molybdenum steel	Special screw
15	**Parallel key**	Carbon steel	Size 40 only

∗1 The material is chrome molybdenum steel for sizes 30 and 40.

SMC
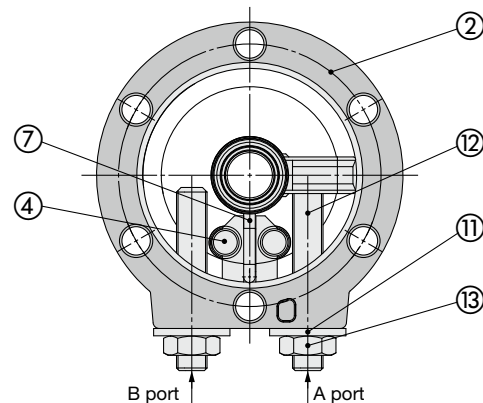
Construction: Single Vane Type Standard Type (Without Auto Switch)

• Following figures show the position of the ports during rotation.

Size: 10, 15, 20, 30, 40

For 270°
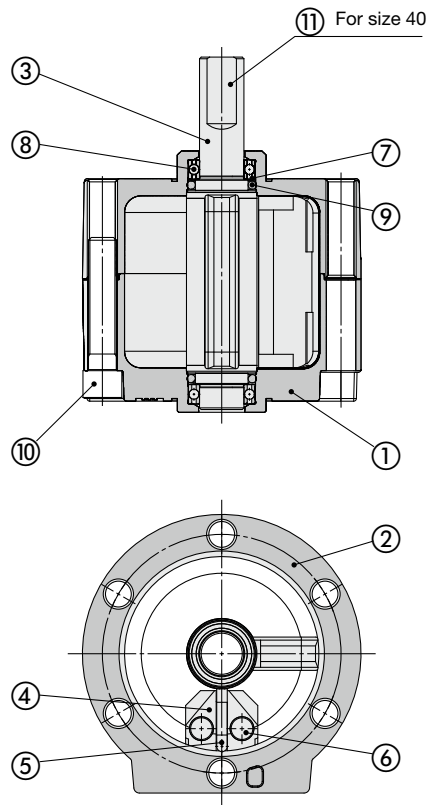
Component Parts

No.	Description	Material	Note
1	**Body (A)**	Aluminium alloy	Painted
2	**Body (B)**	Aluminium alloy	Painted
3	**Vane shaft**	Stainless steel*1	
4	**Stopper**	Resin	
5	**Stopper seal**	NBR	Special seal
6	**Stopper pin**	Bearing steel	
7	**Back-up ring**	Stainless steel	
8	**Bearing**	Bearing steel	
9	**O-ring**	NBR	
10	**Hexagon socket head cap screw**	Chrome molybdenum steel	Special screw
11	**Parallel key**	Carbon steel	Size 40 only

*1 The material is chrome molybdenum steel for sizes 30 and 40.

CRB *Series*

Construction: Single Vane Type Standard Type (With Auto Switch)

• Following figures show actuators when B port is pressurised.

Size: 10, 15
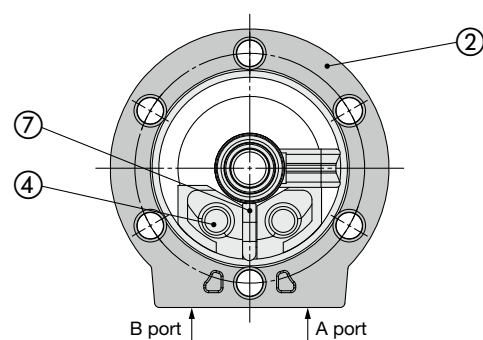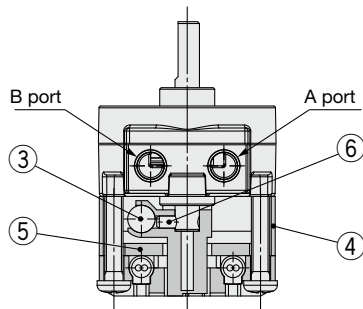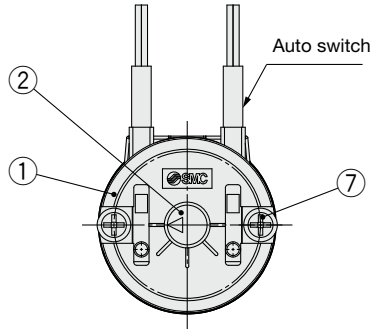
Size: 20, 30, 40
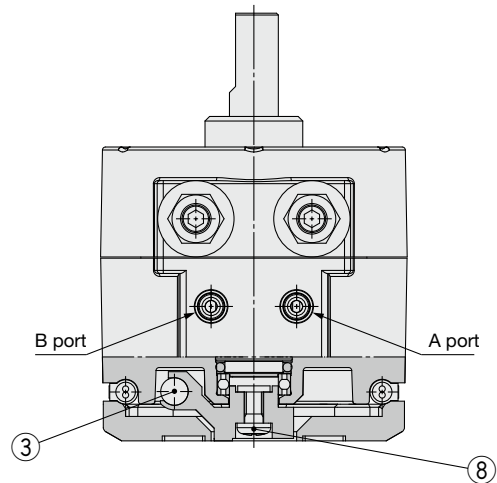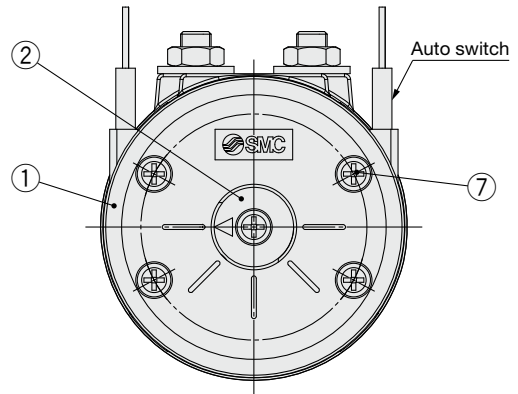
Component Parts

No.	Description	Material
1	**Cover**	Resin
2	**Magnet holder**	Resin
3	**Magnet**	Magnetic material
4	**Body C**	Resin
5	**Switch plate**	Aluminium alloy
6	**Spring pin**	Stainless steel
7	**Cross recessed round head screw**	Chrome molybdenum steel*1
8	**Cross recessed round head screw**	Chrome molybdenum steel

*1 The material is stainless steel for sizes 10 and 15.

Construction: Double Vane Type Standard Type

• Figures below show the intermediate rotation position when A or B port is pressurised.

Size: 10

For 90°
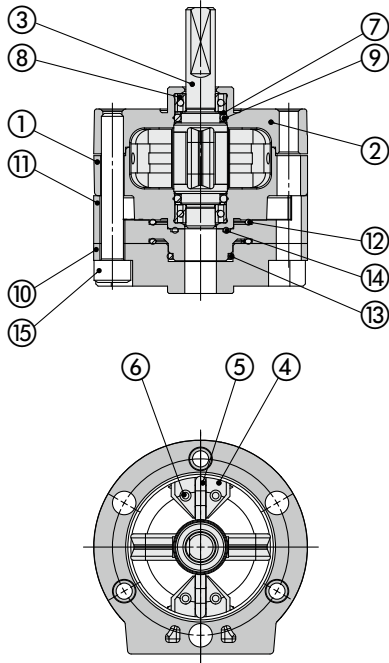
For 100°
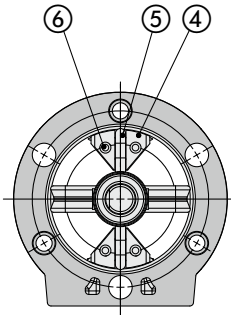
Component Parts (Size: 10)

No.	Description	Material	Note
1	**Body (A)**	Aluminium alloy	Painted
2	**Body (B)**	Aluminium alloy	Painted
3	**Vane shaft**	Chrome molybdenum steel	
4	**Stopper**	Resin	For 90°
4	**Stopper**	Resin	For 100°
5	**Stopper seal**	NBR	Special seal
6	**Stopper pin**	Bearing steel	
7	**Back-up ring**	Stainless steel	
8	**Bearing**	Bearing steel	
9	**O-ring**	NBR	
10	**Cover (D)**	Aluminium alloy	
11	**Plate**	Resin	
12	**Gasket**	NBR	
13	**O-ring**	NBR	
14	**O-ring**	NBR	
15	**Hexagon socket head cap screw**	Chrome molybdenum steel	Special screw

Size: 15, 20, 30, 40

For 90°
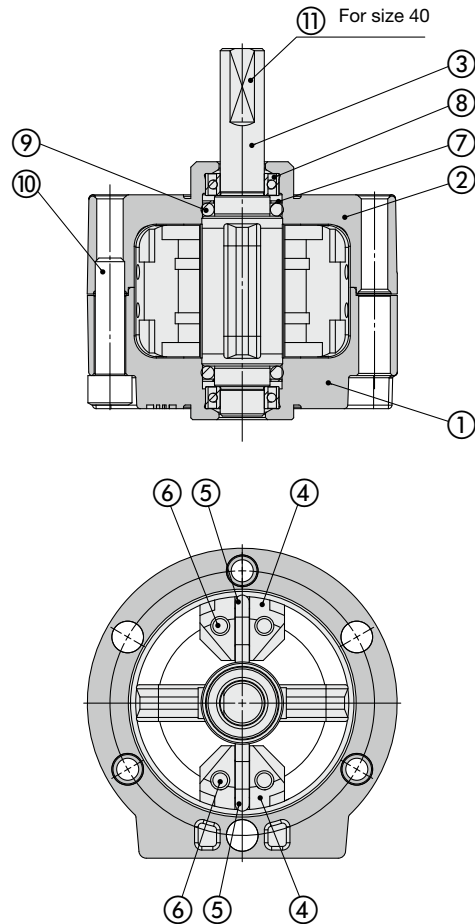
For 100°
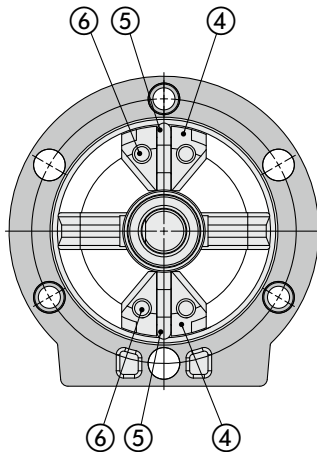
Component Parts (Size: 15 to 40)

No.	Description	Material	Note
1	**Body (A)**	Aluminium alloy	Painted
2	**Body (B)**	Aluminium alloy	Painted
3	**Vane shaft**	Chrome molybdenum steel	
4	**Stopper**	Resin	For 90°
4	**Stopper**	Resin	For 100°
5	**Stopper seal**	NBR	Special seal
6	**Stopper pin**	Bearing steel	
7	**Back-up ring**	Stainless steel	
8	**Bearing**	Bearing steel	
9	**O-ring**	NBR	
10	**Hexagon socket head cap screw**	Chrome molybdenum steel	Special screw
11	**Parallel key**	Carbon steel	Size 40 only

SMC

22

CRB Series

Dimensions: Single Vane Type Standard Type (Without Auto Switch) 10, 15

Single shaft: CRBS (For 90° and 180°)

• Following figures show actuators when B port is pressurised.

For unit mounting

Double shaft: CRBW

Chamfer

Chamfer

Chamfer

2 x **F3**

Chamfer
(Refer to page 18
for the rotation range.)

★3 x **Q3**

◆3 x **Q1**

◆Q1 (Thread)   3 x ◆Q2 (Through-hole)

(3 mounting holes with the ★ marks are for tightening the actuator
and not to be used for external mounting for size 10.)

[mm]

Size	A			B	D						E			F			K
	A1	A2	A3		D1(g7)	D2	D3	D4	D5	D6	E1(h9)	E2	E3	F1	F2	F3	
10	29	30	37	15	$4_{-0.015}^{-0.004}$	14	0.5	9	8	5	$9_{-0.036}^{0}$	3	1	12	9.8	M5 x 0.8	3.6
15	34	39.5	47	20	$5_{-0.016}^{-0.004}$	18	0.5	10	9	6	$12_{-0.043}^{0}$	4	1.5	14	14.3	M5 x 0.8	7.6

Size	L	M	P	Q		
				◆Q1	◆Q2	★Q3
10	19.8	14.6	24	M3 x 0.5 depth 6	6	—
15	24	17.1	29	M3 x 0.5 depth 10	6	M3 x 0.5 depth 5

23

Dimensions: Single Vane Type Standard Type (Without Auto Switch) 10, 15

Single shaft: CRBS (For 270°)

• Following figures show the position of the ports during rotation.

For unit mounting

Double shaft: CRBW

Chamfer

Chamfer

Chamfer
(Refer to page 18
for the rotation range.)

◆Q1 (Thread)   3 x ◆Q2 (Through-hole)

◆3 x Q1   ★3 x Q3

2 x F3

$\left(\begin{array}{l}\text{3 mounting holes with the ★ marks are for tightening the actuator}\\\text{and not to be used for external mounting for size 10.}\end{array}\right)$

[mm]

Size	A			B	D						E			F			K
	A1	A2	A3		D1(g7)	D2	D3	D4	D5	D6	E1(h9)	E2	E3	F1	F2	F3	
10	29	30	37	15	$4^{-0.004}_{-0.015}$	14	0.5	9	8	5	$9^{0}_{-0.036}$	3	1	9.5	9.8	M3 x 0.5	3.6
15	34	39.5	47	20	$5^{-0.005}_{-0.016}$	18	0.5	10	9	6	$12^{0}_{-0.043}$	4	1.5	10	14.3	M3 x 0.5	7.6

Size	L	M	P	Q		
				◆Q1	◆Q2	★Q3
10	19.8	14.6	24	M3 x 0.5 depth 6	6	—
15	24	17.1	29	M3 x 0.5 depth 10	6	M3 x 0.5 depth 5

CRB Series

Dimensions: Single Vane Type Standard Type (Without Auto Switch) 20, 30, 40

Single shaft: CRBS (For 90° and 180°)

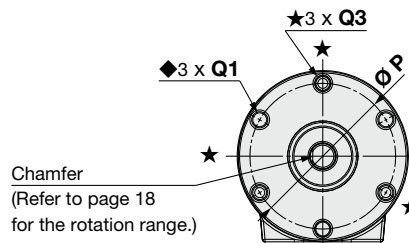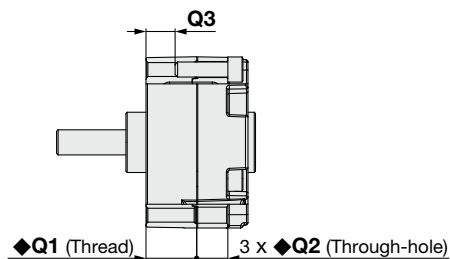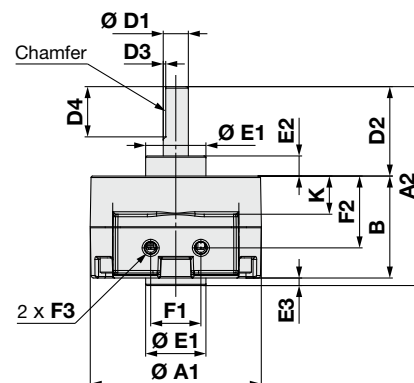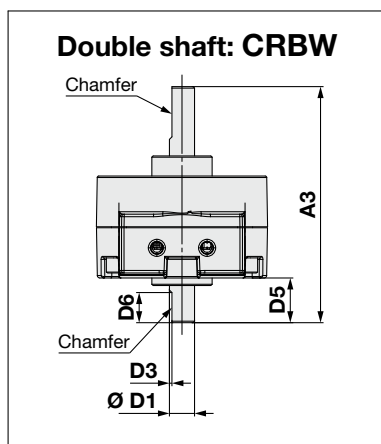• Following figures show actuators when B port is pressurised.

For size 40

Parallel key dimensions

b(h9)	h(h9)	L1
$4_{-0.030}^{0}$	$4_{-0.030}^{0}$	20

Double shaft: CRBW

A parallel key is used instead of a chamfer for size 40.

2 x F3

★3 x Q3

◆3 x Q1

Chamfer
(Refer to page 18 for the rotation range.)

★Q3 (Thread)

◆Q1 (Thread)   3 x ◆Q2 (Through-hole)

[mm]

Size	A			B	D						E			F		
	A1	A2	A3		D1(g7)	D2	D3	D4	D5	D6	E1(h9)	E2	E3	F1	F2	F3
20	42	50.5	59	29	$6_{-0.016}^{-0.004}$	20	0.5	10	10	7	$14_{-0.043}^{0}$	4.5	1.5	13	18.3	M5 x 0.8
30	50	64	75	40	$8_{-0.020}^{-0.005}$	22	1	12	13	8	$16_{-0.043}^{0}$	5	2	14	26	M5 x 0.8
40	63	79.5	90	45	$10_{-0.020}^{-0.005}$	30	1	—	15	9	$25_{-0.052}^{0}$	6.5	4.5	20	31.1	M5 x 0.8

Size	J			K	L	P	Q		
	J1	J2	J3				◆Q1	◆Q2	★Q3
20	16	7.1	27.4	—	28	36	M4 x 0.7 depth 10	11	M4 x 0.7 depth 7.5
30	19	11.8	32.7	5.5	31.5	43	M5 x 0.8 depth 15	16.5	M5 x 0.8 depth 10
40	28	15.8	44.1	9.5	40	56	M5 x 0.8 depth 20	17.5	M5 x 0.8 depth 10

∗1 J3-dimension is not the dimension at the time of shipment, since its dimension is for adjustment parts.

SMC

Dimensions: Single Vane Type Standard Type (Without Auto Switch) 20, 30, 40

Single shaft: CRBS (For 270°)

• Following figures show the position of the ports during rotation.

For size 40

Parallel key dimensions

b (h9)	h (h9)	L1
$4_{-0.030}^{0}$	$4_{-0.030}^{0}$	20

Double shaft

[mm]

Size	A			B	D						E			F		
	A1	A2	A3		D1 (g7)	D2	D3	D4	D5	D6	E1 (h9)	E2	E3	F1	F2	F3
20	42	50.5	59	29	$6_{-0.016}^{-0.004}$	20	0.5	10	10	7	$14_{-0.043}^{0}$	4.5	1.5	13	18.3	M5 x 0.8
30	50	64	75	40	$8_{-0.020}^{-0.005}$	22	1	12	13	8	$16_{-0.043}^{0}$	5	2	14	26	M5 x 0.8
40	63	79.5	90	45	$10_{-0.020}^{-0.005}$	30	1	—	15	9	$25_{-0.052}^{0}$	6.5	4.5	20	31.1	M5 x 0.8

Size	K	L	M	P	Q		
					◆Q1	◆Q2	★Q3
20	10.5	28	21	36	M4 x 0.7 depth 10	11	M4 x 0.7 depth 7.5
30	14	31.5	25	43	M5 x 0.8 depth 15	16.5	M5 x 0.8 depth 10
40	17	40	31.6	56	M5 x 0.8 depth 20	17.5	M5 x 0.8 depth 10

CRB Series

Dimensions: Single Vane Type Standard Type (With Auto Switch) 10, 15
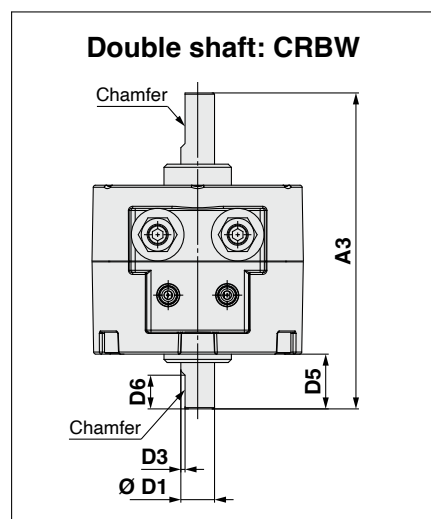
Single shaft: CDRBS (For 90° and 180°)

• Following figures show actuators when B port is pressurised.

When auto switches are mounted

Auto switch

Chamfer
(Refer to page 18 for the rotation range.)

3 x **Q1**

Ø **P**

★3 x **Q2** (Size 15 only)

(3 mounting holes with the ★ marks are for tightening the actuator and not to be used for external mounting for size 10.)

[mm]

Size	A		B	D				E		F			K	L	M	P
	A1	A2		D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3				
10	29	46	32	$4^{-0.004}_{-0.015}$	14	0.5	9	$9^{\ 0}_{-0.036}$	3	12	9.8	M5 x 0.8	3.6	19.8	14.6	24
15	34	54.8	36.8	$5^{-0.004}_{-0.016}$	18	0.5	10	$12^{\ 0}_{-0.043}$	4	14	14.3	M5 x 0.8	7.6	24	17.1	29

Size	Q		S	
	◆Q1	★Q2	S1	S2
10	M3 x 0.5 depth 6	—	15	27
15	M3 x 0.5 depth 10	M3 x 0.5 depth 5	19	32.2

SMC

Dimensions: Single Vane Type Standard Type (With Auto Switch) 20, 30, 40

Single shaft: CDRBS (For 90° and 180°)

• Following figures show actuators when B port is pressurised.

For size 40

$4^{0}_{-0.030}$

Parallel key dimensions

b(h9)	h(h9)	L1
$4^{0}_{-0.030}$	$4^{0}_{-0.030}$	20

A parallel key is used instead of a chamfer for size 40.

Chamfer

2 x **F3**

6 x **Q**

Chamfer
(Refer to page 16 for the rotation range.)

Ø **P**

When auto switches are mounted

Auto switch

[mm]
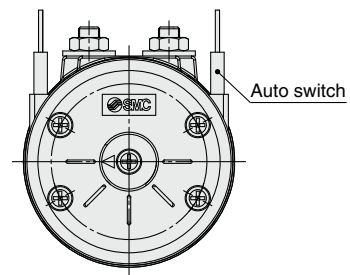
Size	A		B	D				E		F			J			K
	A1	A2		D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3	J1	J2	J3	
20	42	55.6	35.6	$6^{-0.004}_{-0.016}$	20	0.5	10	$14^{0}_{-0.043}$	4.5	13	18.3	M5 x 0.8	16	7.1	27.4	—
30	50	70	48	$8^{-0.005}_{-0.020}$	22	1	12	$16^{0}_{-0.043}$	5	14	26	M5 x 0.8	19	11.8	32.7	5.5
40	63	84.2	54.2	$10^{-0.005}_{-0.020}$	30	—	—	$25^{0}_{-0.052}$	6.5	20	31.1	M5 x 0.8	28	15.8	44.1	9.5

Size	L	P	Q	S	
				S1	S2
20	28	36	M4 x 0.7 depth 10	37	28.6
30	31.5	43	M5 x 0.8 depth 15	42	40.1
40	40	56	M5 x 0.8 depth 20	52	45.2

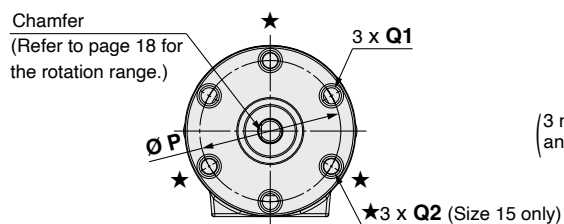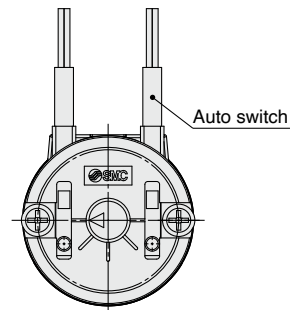∗1 J3-dimension is not the dimension at the time of shipment, since its dimension is for adjustment parts.

CRB *Series*

Shaft Type Dimensions (Dimensions other than specified below are the same as those of the standard type.)

Size: 10, 15
Standard type

Double shaft: CRBJ□
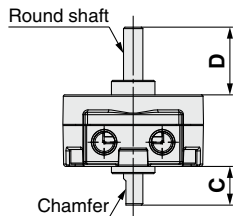
Round shaft

D

Chamfer

C

Double shaft: CRBK□

Round shaft

D

Round shaft

D

Single shaft: CRBT□

Round shaft

D

Double shaft: CRBY□

Chamfer

D

D

Chamfer

With auto switch

Single shaft: CDRBT□

Round shaft

D
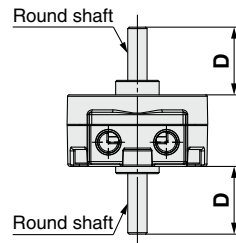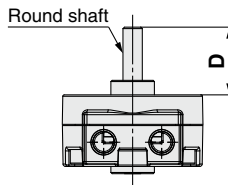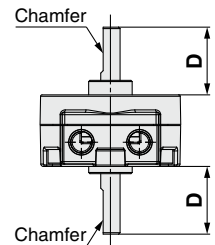
Auto switch
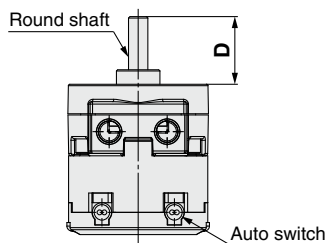
[mm]

Size	10	15
C	8	9
D	14	18

∗ The dimensions of the shaft and chamfer are the same as those of the standard type. Dimensions of parts different from the standard type conform to the general tolerance.

Size: 20, 30, 40
Standard type

Double shaft: CRBJ□
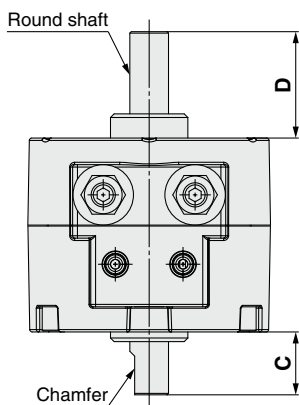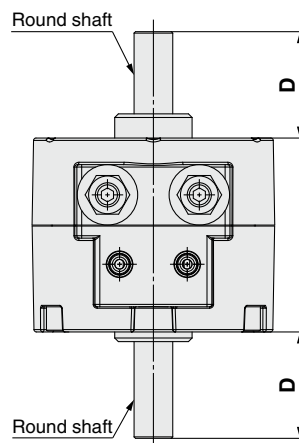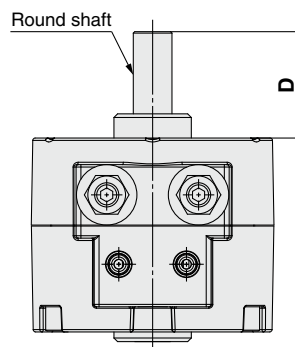
Round shaft

D

Chamfer

C

Double shaft: CRBK□

Round shaft

D

Round shaft

D

Single shaft: CRBT□

Round shaft

D

Double shaft: CRBY□

Chamfer

D

Chamfer

D

With auto switch

Single shaft: CDRBT□

Round shaft

D
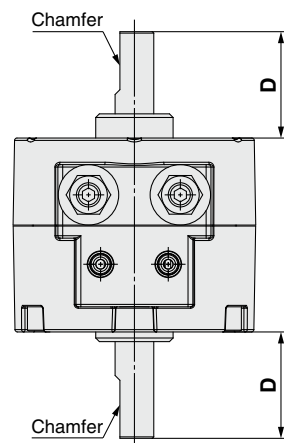
Auto switch
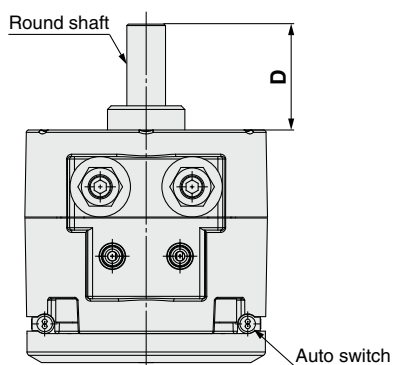
A parallel key is used instead of a chamfer for size 40.

[mm]

Size	20	30	40
C	10	13	15
D	20	22	30

∗ The dimensions of the shaft and chamfer (a parallel key for size 40) are the same as those of the standard type. Dimensions of parts different from the standard type conform to the general tolerance.

SMC

Dimensions: Double Vane Type Standard Type (Without Auto Switch) 10

Single shaft: CRBS10-☐D (For 90° and 100°)

19.8

14.6

6 x M3 x 0.8 depth 3
(For unit mounting)

Goes through on Body (B)
◆ marked thread

Double shaft: CRBW

46

5

8

0.5

Ø 4g7 $_{-0.016}^{-0.004}$

6   14.5

Ø 9h9 $_{-0.036}^{0}$
Ø 4g7 $_{-0.004}^{-0.016}$

0.5

9

2 x M3 x 0.5
Body (B)

9.5

Body (A)

A port

3

14

3.6
9.8

14

39

24

B port

1

Ø 9h9 $_{-0.036}^{0}$

Ø 29

The 3 mounting holes marked with a ★ are for tightening
the actuator and are not to be used for external mounting.

◆3 x M3 x 0.5 depth 6

Ø 24

Chamfer
(Refer to page 18 for the rotation range.)

A port   B port
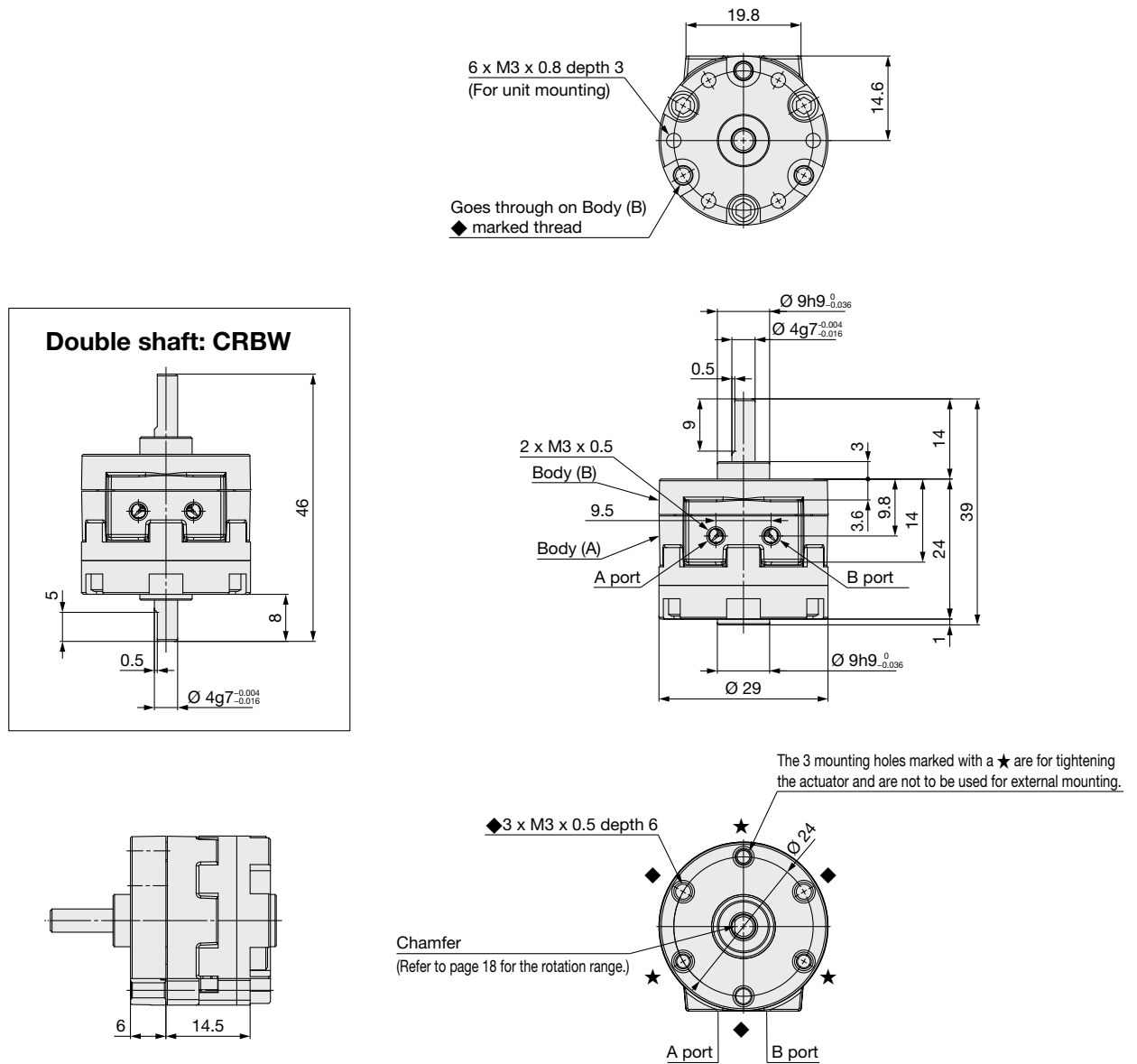
CRB Series

Dimensions: Double Vane Type Standard Type (Without Auto Switch) 15, 20, 30, 40

Single shaft: CRBS-□D (For 90° and 100°)

• Following figures show the position of the ports during rotation.

For size 40

Size 15

For unit mounting

Parallel key dimensions

b(h9)	h(h9)	L1
$4_{-0.030}^{0}$	$4_{-0.030}^{0}$	20

Double shaft

[mm]
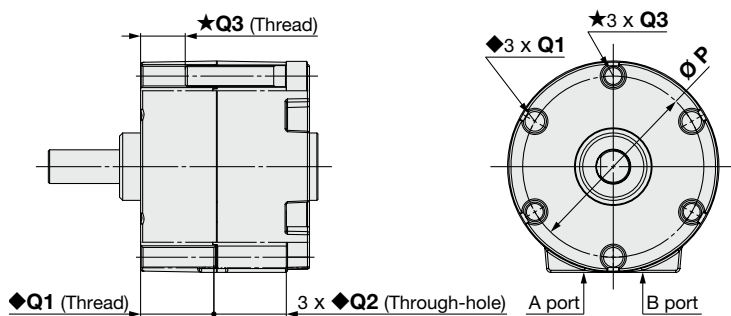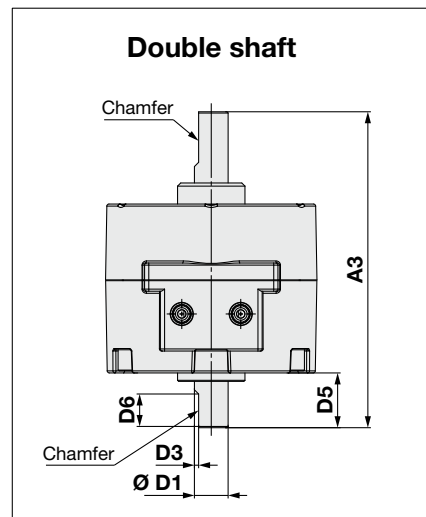
Size	A			B	D						E			F		
	A1	A2	A3		D1(g7)	D2	D3	D4	D5	D6	E1(h9)	E2	E3	F1	F2	F3
15	34	39.5	47	20	$5_{-0.016}^{-0.004}$	18	0.5	10	9	6	$12_{-0.043}^{0}$	4	1.5	10	14.3	M3 x 0.5
20	42	50.5	59	29	$6_{-0.016}^{-0.004}$	20	0.5	10	10	7	$14_{-0.043}^{0}$	4.5	1.5	13	18.3	M5 x 0.8
30	50	64	75	40	$8_{-0.020}^{-0.005}$	22	1	12	13	8	$16_{-0.043}^{0}$	5	2	14	26	M5 x 0.8
40	63	79.5	90	45	$10_{-0.020}^{-0.005}$	30	1	—	15	9	$25_{-0.052}^{0}$	6.5	4.5	20	31.1	M5 x 0.8

Size	K	L	M	P	Q		
					◆Q1	◆Q2	◆Q3
15	7.6	24	17.1	29	M3 x 0.5 depth 10	6	M3 x 0.5 depth 5
20	10.5	28	21	36	M4 x 0.7 depth 10	11	M4 x 0.7 depth 7.5
30	14	31.5	25	43	M5 x 0.8 depth 15	16.5	M5 x 0.8 depth 10
40	17	40	31.6	56	M5 x 0.8 depth 20	17.5	M5 x 0.8 depth 10

SMC

Vane Type Rotary Actuator
With Vertical Auto Switch Unit
CRB□-A Series
Size: 10, 15, 20, 30, 40

RoHS

How to Order

CRB **W** **30** – **90** **□** – **M9B** **□** **□** – **AM**

❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽

❶ Shaft type

Symbol	Shaft type	Shaft-end shape	
		Long shaft	Short shaft
W	Double shaft	Single flat*1	Single flat*3
J*2	Double shaft	Round shaft	Single flat*3

*1 Size 40 has a parallel key instead of a chamfered portion.
*2 Option "J" is produced upon receipt of order.
*3 A vertical auto switch unit can be mounted to the short shaft side.

Long shaft

Short shaft

❷ Size

10
15
20
30
40

❸ Rotating angle

Single vane	**90**	90°
	180	180°
	270	270°
Double vane	**90**	90°
	100	100°

❹ Vane type

—	Single vane
D	Double vane

❺ Auto switch

* For applicable auto switches, refer to the table below.

❼ Number of auto switches

—	2
S	1

❻ Lead wire length

—	Grommet/Lead wire: 0.5 m
M	Grommet/Lead wire: 1 m
L	Grommet/Lead wire: 3 m
CN	Connector/Without lead wire
C	Connector/Lead wire: 0.5 m
CL	Connector/Lead wire: 3 m
Z*1	Grommet/Lead wire: 5 m

*1 The 5 m lead wire is produced upon receipt of order.
* Connectors are only available for the R73, R80, and T79.
* Lead wire with connector part nos.
  D-LC05: Lead wire 0.5 m
  D-LC30: Lead wire 3 m
  D-LC50: Lead wire 5 m

❽ Auto switch unit

Symbol	Description	Applicable auto switch
A	With vertical auto switch unit (Built-in magnet)	Other than the D-M9□(V) → Refer to pages 60 and 61.
AM	With vertical auto switch unit for the D-M9 (Built-in magnet)	D-M9□(V) → Refer to page 59.

* Refer to page 57 if the auto switch unit is needed separately.

Applicable Auto Switches / Refer to the **catalogue on www.smc.eu** for further information on auto switches.

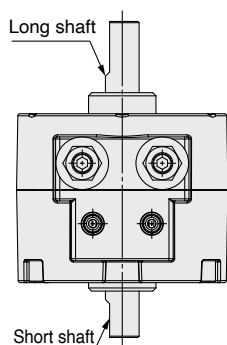| Appli-cable size	Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model		Lead wire type	Lead wire length [m]					Pre-wired connector	Applicable load
						DC	AC	Perpendicular	In-line		0.5 (—)	1 (M)	3 (L)	5 (Z)	None (N)		
For 10, 15	**Solid state auto switch**	—	Grommet	Yes	3-wire (NPN)	5 V, 12 V	—	**M9NV**	**M9N**	Oilproof heavy-duty cord	●	●	●	○	—	○	IC circuit	Relay, PLC
					3-wire (PNP)			**M9PV**	**M9P**		●	●	●	○	—	○	IC circuit	
					2-wire	12 V		**M9BV**	**M9B**		●	●	●	○	—	○	—	
					3-wire (NPN)	5 V, 12 V		**S99V**	**S99**		●	—	●	○	—	○	IC circuit	
					3-wire (PNP)			**S9PV**	**S9P**		●	—	●	○	—	○	IC circuit	
					2-wire	12 V	24 V	**T99V**	**T99**		●	—	●	○	—	○	—	
	Reed auto switch	—		No	2-wire	5 V, 12 V	5 V, 12 V, 24 V	—	**90**	Vinyl parallel cord	●	—	●	●	—		IC circuit	
						5 V, 12 V, 100 V	5 V, 12 V, 24 V, 100 V	—	**90A**	Oilproof heavy-duty cord	●	—	●	●	—		IC circuit	
				Yes		—	—	—	**97**	Vinyl parallel cord	●	—	●	●	—		—	
							100 V	—	**93A**	Oilproof heavy-duty cord	●	—	●	●	—		—	
For 20, 30, 40	**Solid state auto switch**	—	Grommet	Yes	3-wire (NPN)	5 V, 12 V	—	**M9NV**	**M9N**	Oilproof heavy-duty cord	●	●	●	○	—	○	IC circuit	Relay, PLC
					3-wire (PNP)			**M9PV**	**M9P**		●	●	●	○	—	○	IC circuit	
					2-wire	12 V		**M9BV**	**M9B**		●	●	●	○	—	○	—	
					3-wire (NPN)	5 V, 12 V		—	**S79**		●	—	●	○	—	○	IC circuit	
					3-wire (PNP)			—	**S7P**		●	—	●	○	—	○	IC circuit	
			Connector		2-wire	12 V		—	**T79**		●	—	●	○	—	○	—	
								—	**T79C**		●	—	●	●	●	—	—	
	Reed auto switch	—	Grommet	Yes	2-wire	—	100 V	—	**R73**		●	—	●	○	—		—	
			Connector			—	—	—	**R73C**		●	—	●	●	●	—	—	
			Grommet	No		48 V, 100 V	100 V	—	**R80**		●	—	●	○	—		IC circuit	
			Connector			—	24 V or less	—	**R80C**		●	—	●	●	●	—	—	

* Auto switches are shipped together with the product but do not come assembled.
* Auto switches marked with a "○" are produced upon receipt of order.

CRB□-A *Series*

The specifications, inner volume, and rotation range are the same as those of the standard type. (→pp. 17, 18)

Weight

[g]

Vane type	Single vane type															Double vane type									
Size	10			15			20			30			40			10		15		20		30		40	
Rotating angle	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	100°	90°	100°	90°	100°	90°	100°	90°	100°
Basic type	27	26	26	47	46	46	110	107	106	203	197	195	378	360	366	43	43	55	55	116	116	218	218	415	414
Vertical auto switch unit	15			20			28			38			43			15		20		28		38		43	

A flange mounting bracket assembly is available as an option. For details, refer to page 56.

Construction: With Vertical Auto Switch Unit

• Components other than those specified below are the same as those of the standard type.

D-M9□

Size: 10, 15

Size: 20, 30

Size: 40

A port B port
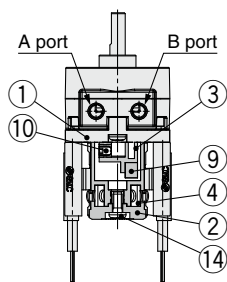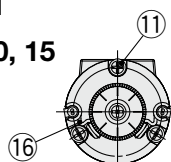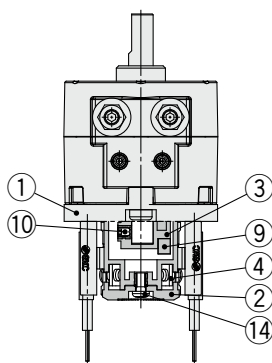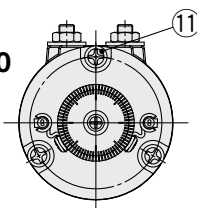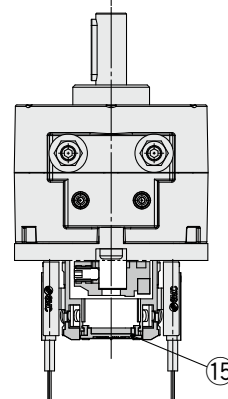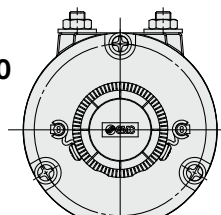
D-S/T99(V) D-S7P D-90/90A
D-S9P(V) D-97/93A D-R73/80□
D-S/T79□

Size: 10, 15
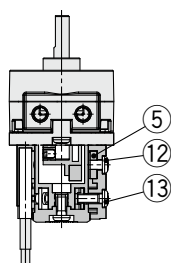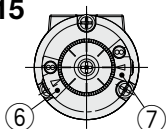
Size: 20, 30
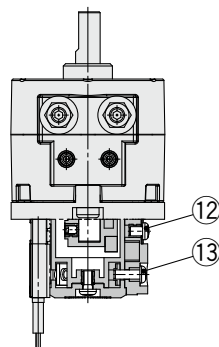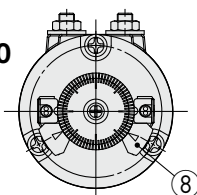
Size: 40
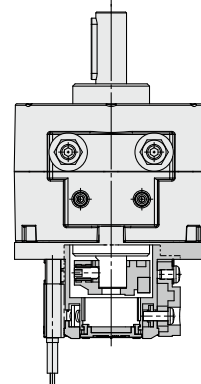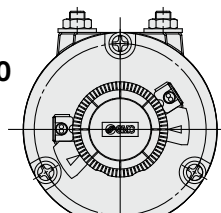
Component Parts

No.	Description	Material
1	**Cover (A)**	Resin
2	**Cover (B)**	Resin
3	**Magnet lever**	Resin
4	**Holding block**	Stainless steel
5	**Holding block (B)**	Aluminium alloy
6	**Switch block (A)**	Resin

Component Parts

No.	Description	Material
7	**Switch block (B)**	Resin
8	**Switch block**	Resin
9	**Magnet**	
10	Hexagon socket set screw	Stainless steel
11	Cross recessed round head screw	Stainless steel
12	Cross recessed round head screw	Stainless steel

Component Parts

No.	Description	Material
13	Cross recessed round head screw	Stainless steel
14	Cross recessed round head screw	Stainless steel
15	**Rubber cap**	NBR
16	**Switch holder**	Stainless steel

∗ For size 10, there are 2 pcs. of ⑪ cross recessed round head screws.

SMC

Dimensions: Single Vane Type With Vertical Auto Switch Unit (10, 15)

CRBW-A (For 90° and 180°)

• Following figures show actuators when B port is pressurised.

D-S/T99(V), S9P(V), D-97/93A, 90/90A

D-M9□

3 mounting holes with the ★ marks are for tightening the actuator and not to be used for external mounting for size 10.

3 x **Q** (Size 10)
6 x **Q** (Size 15)

2 x **F3**

Auto switch

A port   B port

∗1 The angle is 60° when any of the following are used: D-90/90A/97/93A
The angle is 69° when any of the following are used: D-S99(V)/T99(V)/S9P(V)

[mm]

Size	A		B	C	D				E		F			K	L	M	P
	A1	A2			D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3				
10	29	58	15	29	$4^{-0.004}_{-0.015}$	14	0.5	9	$9^{\ 0}_{-0.036}$	3	12	9.8	M5 x 0.8	3.6	19.8	14.6	24
15	34	67	20	29	$5^{-0.004}_{-0.016}$	18	0.5	10	$12^{\ 0}_{-0.043}$	4	14	14.3	M5 x 0.8	7.6	24	17.1	29

Size	Q	W	Y
10	M3 x 0.5 depth 6	35	18.5
15	M3 x 0.5 depth 5	35	18.5

Dimensions: Single Vane Type With Vertical Auto Switch Unit (10, 15)

CRBW-A (For 270°)

• Following figures show the position of the ports during rotation.

D-S/T99(V), S9P(V), D-97/93A, 90/90A

D-M9☐

60°(69°)*1

67°

≈15

Ø A1
Ø E1
Ø D1

E2
D2
B
A2
C

D3
D4
K
F2

2 x F3

Auto switch

F1
Ø Y

(3 mounting holes with the ★ marks are for tightening the actuator and not to be used for external mounting for size 10.)

3 x **Q** (Size 10)
6 x **Q** (Size 15)

Ø P

A port   B port

*1 The angle is 60° when any of the following are used: D-90/90A/97/93A
The angle is 69° when any of the following are used: D-S99(V)/T99(V)/S9P(V)

[mm]

Size	A		B	C	D				E		F			K	L	M	P
	A1	A2			D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3				
10	29	58	15	29	$4^{-0.004}_{-0.015}$	14	0.5	9	$9^{0}_{-0.036}$	3	9.5	9.8	M3 x 0.5	3.6	19.8	14.6	24
15	34	67	20	29	$5^{-0.004}_{-0.016}$	18	0.5	10	$12^{0}_{-0.043}$	4	10	14.3	M3 x 0.5	7.6	24	17.1	29

Size	Q	W	Y
10	M3 x 0.5 depth 6	35	18.5
15	M3 x 0.5 depth 5	35	18.5

☉SMC

Dimensions: Single Vane Type With Vertical Auto Switch Unit (20, 30, 40)

CRBW-A (For 90° and 180°)

• Following figures show actuators when B port is pressurised.

◆6 x **Q**

ø**P**

A port   B port

A parallel key is used instead of a chamfer for size 40.

D3
D4

K
J2
F2

2 x **F3**

Auto switch

F1
ø**Y**

ø**A1**
ø**E1**
ø**D1**

E2
D2

B
A2

C

For size 40

1.5
2
20
4 $^{0}_{-0.030}$

Parallel key dimensions

[mm]

b(h9)	**h**(h9)	**L1**
4 $^{0}_{-0.030}$	4 $^{0}_{-0.030}$	20

L
J1
(**J3**) Max.

D-M9□

W

D-S/T79□, S7P, R73/80□

[mm]

Size	A		B	C	D				E		F			J			K
	A1	**A2**			**D1**(g7)	**D2**	**D3**	**D4**	**E1**(h9)	**E2**	**F1**	**F2**	**F3**	**J1**	**J2**	**J3**	
20	42	79	29	30	6 $^{-0.004}_{-0.016}$	20	0.5	10	14 $^{0}_{-0.043}$	4.5	13	18.3	M5 x 0.8	16	7.1	27.4	—
30	50	93	40	31	8 $^{-0.005}_{-0.020}$	22	1	12	16 $^{0}_{-0.043}$	5	14	26	M5 x 0.8	19	11.8	32.7	5.5
40	63	106	45	31	10 $^{-0.005}_{-0.020}$	30	—	—	25 $^{0}_{-0.052}$	6.5	20	31.1	M5 x 0.8	28	15.8	44.1	9.5

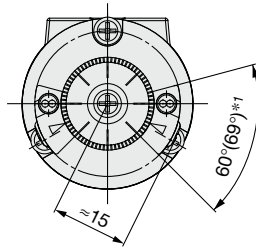| Size	**L**	**P**	**Q**	**W**	**Y**
20	28	36	M4 x 0.7 depth 7	19.5	25
30	31.5	43	M5 x 0.8 depth 10	19.5	25
40	40	56	M5 x 0.8 depth 10	22.5	31

CRB□-A *Series*

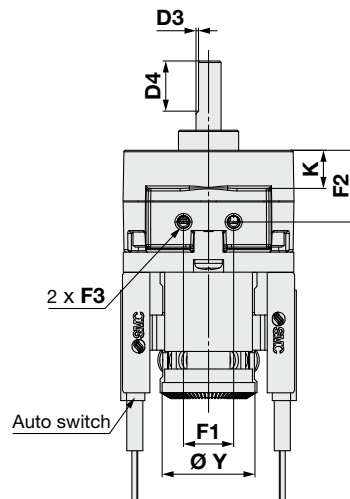## Dimensions: Single Vane Type With Vertical Auto Switch Unit (20, 30, 40)

CRBW-A (For 270°)
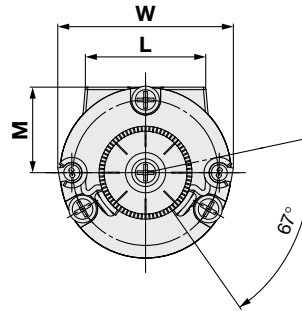
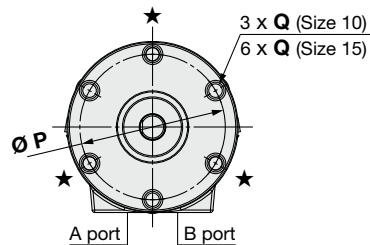• Following figures show the position of the ports during rotation.

For size 40

Parallel key dimensions

b(h9)	h(h9)	L1
$4_{-0.030}^{0}$	$4_{-0.030}^{0}$	20

2 x **F3**

Auto switch

◆6 x **Q**

A port   B port

[mm]

Size	A		B	C	D				E		F		
	A1	A2			D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3
20	42	79	29	30	$6_{-0.016}^{-0.004}$	20	0.5	10	$14_{-0.043}^{0}$	4.5	13	18.3	M5 x 0.8
30	50	93	40	31	$8_{-0.020}^{-0.005}$	22	1	12	$16_{-0.043}^{0}$	5	14	26	M5 x 0.8
40	63	106	45	31	$10_{-0.020}^{-0.005}$	30	—	—	$25_{-0.052}^{0}$	6.5	20	31.1	M5 x 0.8

Size	K	L	M	P	Q	W	Y
20	10.5	28	21	36	M4 x 0.7 depth 7	19.5	25
30	14	31.5	25	43	M5 x 0.8 depth 10	19.5	25
40	17	40	31.6	56	M5 x 0.8 depth 10	22.5	31

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Dimensions: Double Vane Type With Vertical Auto Switch Unit 10

CRBW10-□D-A (For 90° and 100°)

• The following figures show the position of the ports during rotation when the A or B port is pressurised.

**D-S/T99(V), S9P(V),
D-97/93A, 90/90A**

The 3 mounting holes marked with a ★ are for tightening the actuator
and are not to be used for external mounting.

∗1 The angle is 60° when any of the following are used: D-90/90A/97/93A
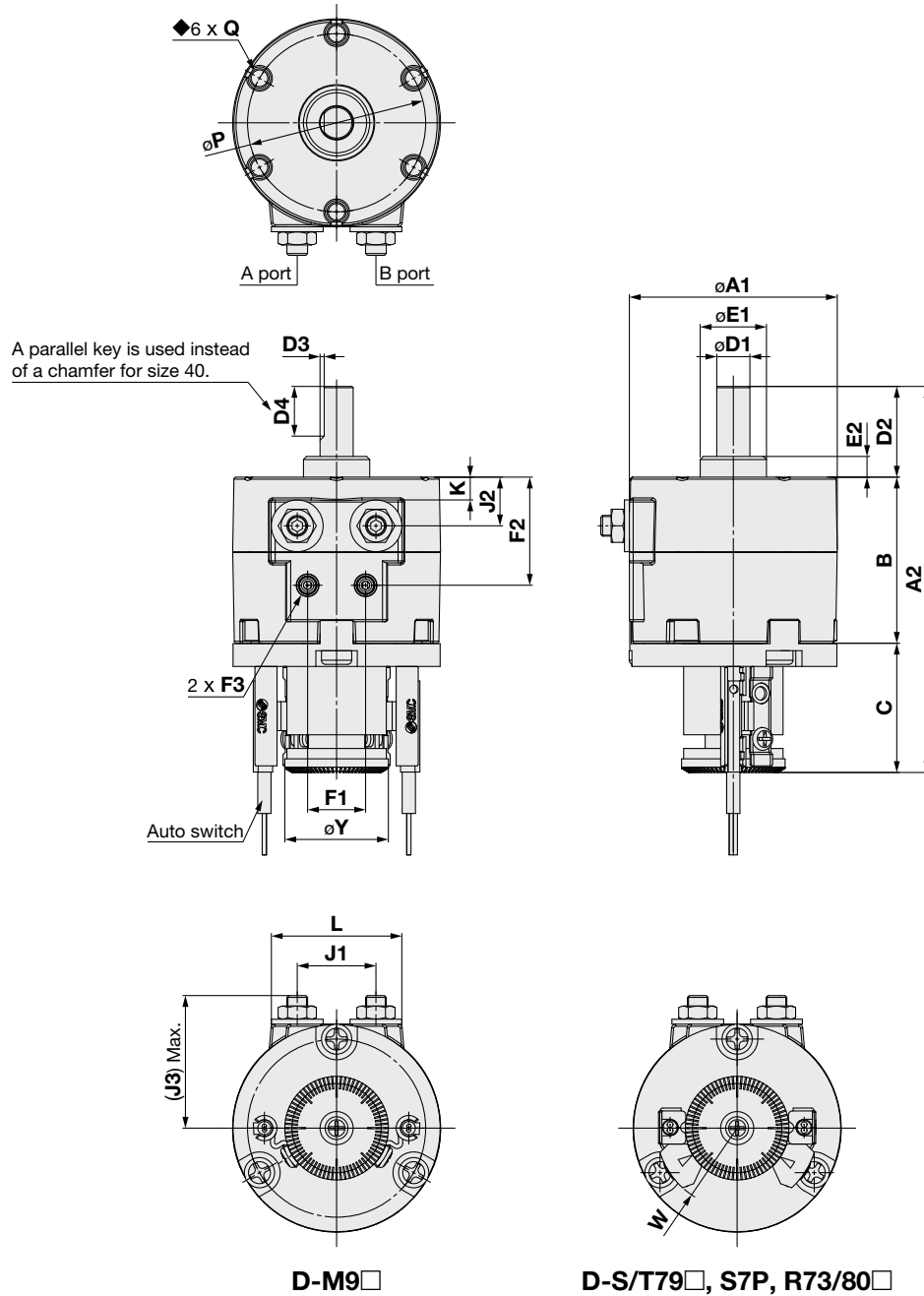   The angle is 69° when any of the following are used: D-S99(V)/T99(V)/S9P(V)

A port   B port

3 x M3 x 0.5

3 x M3 x 0.5 depth 6

CRB☐-A Series

Dimensions: Double Vane Type With Vertical Auto Switch Unit (15, 20, 30, 40)

CRBW-☐D-A (For 90° and 100°)

• The following figures show the position of the ports during rotation when the A or B port is pressurised.

For size 15

D-M9☐

D-S/T99(V), S9P(V), D-97/93A, 90/90A

D-S/T79☐, S7P, D-R73/80☐

D-M9☐

For size 40

Parallel key dimensions

b(h9)	h(h9)	L1
$4_{-0.030}^{0}$	$4_{-0.030}^{0}$	20
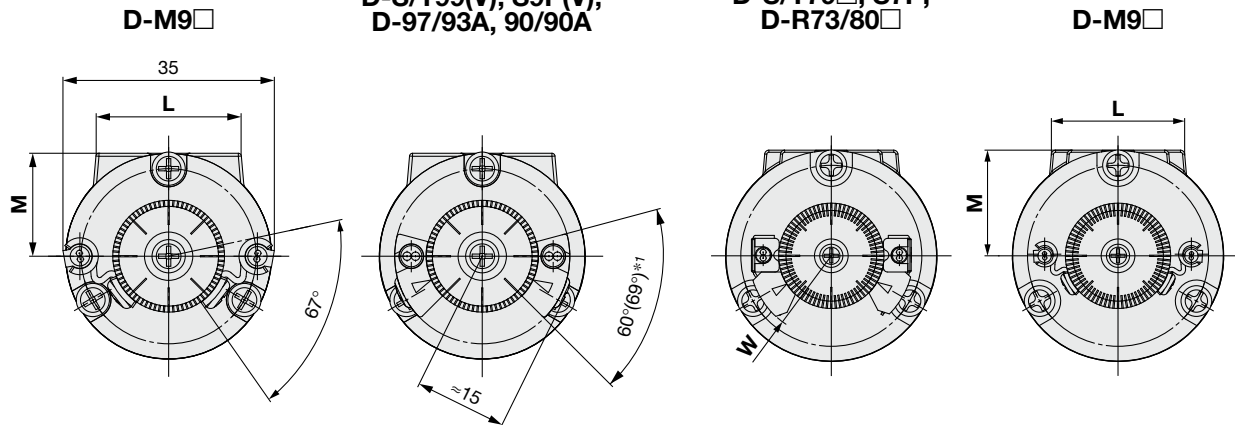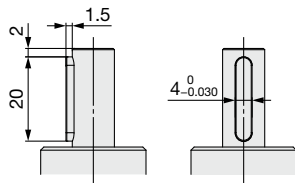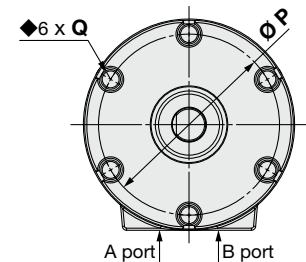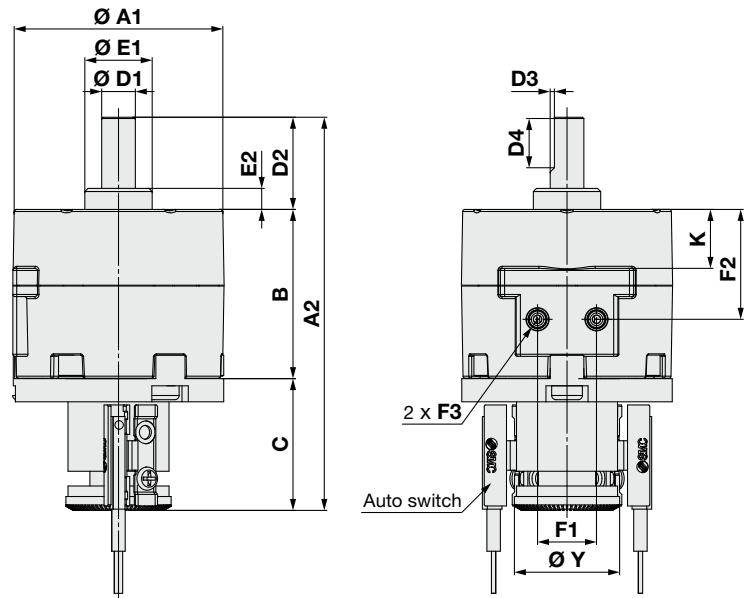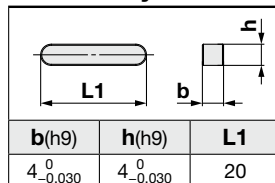
*1 The angle is 60° when any of the following are used: D-90/90A/97/93A
The angle is 69° when any of the following are used: D-S99(V)/T99(V)/S9P(V)

[mm]

Size	A		B	C	D				E		F		
	A1	A2			D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3
15	34	67	20	29	$5_{-0.016}^{-0.004}$	18	0.5	10	$12_{-0.043}^{0}$	4	10	14.3	M3 x 0.5
20	42	79	29	30	$6_{-0.016}^{-0.004}$	20	0.5	10	$14_{-0.043}^{0}$	4.5	13	18.3	M5 x 0.8
30	50	93	40	31	$8_{-0.020}^{-0.005}$	22	1	12	$16_{-0.043}^{0}$	5	14	26	M5 x 0.8
40	63	106	45	31	$10_{-0.020}^{-0.005}$	30	—	—	$25_{-0.052}^{0}$	6.5	20	31.1	M5 x 0.8

Size	K	L	M	P	Q	W	Y
15	7.6	24	17.1	29	M3 x 0.5 depth 5	—	18.5
20	10.5	28	21	36	M4 x 0.7 depth 7	19.5	25
30	14	31.5	25	43	M5 x 0.8 depth 10	19.5	25
40	17	40	31.6	56	M5 x 0.8 depth 10	22.5	31

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Vane Type Rotary Actuator

With Angle Adjustment Unit/With Vertical Auto Switch Unit and Angle Adjustment Unit

CRB□-B/CRB□-C Series

Size: 10, 15, 20, 30, 40

RoHS

How to Order
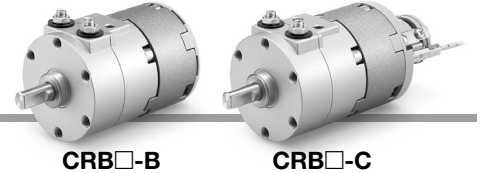
CRB□-B   **CRB□-C**

With angle adjustment unit	**CRB** **W** **30** – **90** **□** – **B**

With angle adjustment unit

With vertical auto switch unit and angle adjustment unit	**CRB** **W** **30** – **90** **□** – **M9B** **L** **□** – **CM**

❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽

❶ Shaft type

Symbol	Shaft type	Shaft-end shape	
		Long shaft	Short shaft
W	Double shaft	Single flat*1	Single flat*3
J*2	Double shaft	Round shaft	Single flat*3

∗1 Size 40 has a parallel key instead of a chamfered portion.
∗2 Option "J" is produced upon receipt of order.
∗3 An angle adjustment unit can be mounted to the short shaft side.

Long shaft

Short shaft

❷ Size

| 10 |
| 15 |
| 20 |
| 30 |
| 40 |

❸ Rotating angle

	90	90°
Single vane	180	180°
	270	270°
Double vane	90	90°
	100	100°

❹ Vane type

—	Single vane
D	Double vane

❺ Auto switch

∗ For applicable auto switches, refer to the table below.

❻ Lead wire length

—	Grommet/Lead wire: 0.5 m
M	Grommet/Lead wire: 1 m
L	Grommet/Lead wire: 3 m
CN	Connector/Without lead wire
C	Connector/Lead wire: 0.5 m
CL	Connector/Lead wire: 3 m
Z*1	Grommet/Lead wire: 5 m

∗1 The 5 m lead wire is produced upon receipt of order.
∗ Connectors are only available for the R73, R80, and T79.
∗ Lead wire with connector part nos.
 D-LC05: Lead wire 0.5 m
 D-LC30: Lead wire 3 m
 D-LC50: Lead wire 5 m

❼ Number of auto switches

—	2
S	1

❽ With vertical auto switch unit and angle adjustment unit

Symbol	Description	Applicable auto switch
C	With vertical auto switch unit and angle adjustment unit (Built-in magnet)	Other than the D-M9□(V) → Refer to pages 60 and 61.
CM	With vertical auto switch unit for the D-M9 and angle adjustment unit (Built-in magnet)	D-M9□(V) → Refer to page 59.

∗ Refer to page 57 if either unit is needed separately.

Applicable Auto Switches / Refer to the **catalogue on www.smc.eu** for further information on auto switches.

Appli-cable size	Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model		Lead wire type	Lead wire length [m]					Pre-wired connector	Applicable load
						DC	AC	Perpendicular	In-line		0.5 (—)	1 (M)	3 (L)	5 (Z)	None (N)		
For 10, 15	**Solid state auto switch**	—	Grommet	Yes	3-wire (NPN)	5 V, 12 V	—	M9NV	M9N	Oilproof heavy-duty cord	●	●	●	○	—	○	IC circuit	Relay, PLC
					3-wire (PNP)			M9PV	M9P		●	●	●	○	—	○	IC circuit	
					2-wire	12 V		M9BV	M9B		●	●	●	○	—	○	—	
					3-wire (NPN)	5 V, 12 V		S99V	S99		●	—	●	○	—	○	IC circuit	
					3-wire (PNP)			S9PV	S9P		●	—	●	○	—	○	IC circuit	
					2-wire	12 V	24 V	T99V	T99		●	—	●	○	—	○	—	
	Reed auto switch	—		No	2-wire	5 V, 12 V	5 V, 12 V, 24 V	—	90	Vinyl parallel cord	●	—	●	●	—		IC circuit	
						5 V, 12 V, 100 V	5 V, 12 V, 24 V, 100 V	—	90A	Oilproof heavy-duty cord	●	—	●	●	—	—	—	
				Yes		—	—	—	97	Vinyl parallel cord	●	—	●	●	—		—	
							100 V	—	93A	Oilproof heavy-duty cord	●	—	●	●	—		—	
For 20, 30, 40	**Solid state auto switch**	—	Grommet	Yes	3-wire (NPN)	5 V, 12 V	—	M9NV	M9N	Oilproof heavy-duty cord	●	●	●	○	—	○	IC circuit	Relay, PLC
					3-wire (PNP)			M9PV	M9P		●	●	●	○	—	○	IC circuit	
					2-wire	12 V		M9BV	M9B		●	●	●	○	—	○	—	
					3-wire (NPN)	5 V, 12 V		—	S79		●	—	●	○	—	○	IC circuit	
					3-wire (PNP)			—	S7P	Oilproof heavy-duty cord	●	—	●	○	—	○	IC circuit	
			Connector		2-wire	12 V		—	T79		●	—	●	○	—	○	—	
								—	T79C		●	—	●	●	●	—	—	
	Reed auto switch	—	Grommet	Yes	2-wire	—	100 V	—	R73		●	—	●	●	—		—	
			Connector					—	R73C		●	—	●	●	●	—	—	
			Grommet	No		48 V, 100 V	100 V	—	R80		●	—	●	○	—		IC circuit	
			Connector				24 V or less	—	R80C		●	—	●	●	●	—	—	

∗ Auto switches are shipped together with the product but do not come assembled.
∗ Auto switches marked with a "○" are produced upon receipt of order.

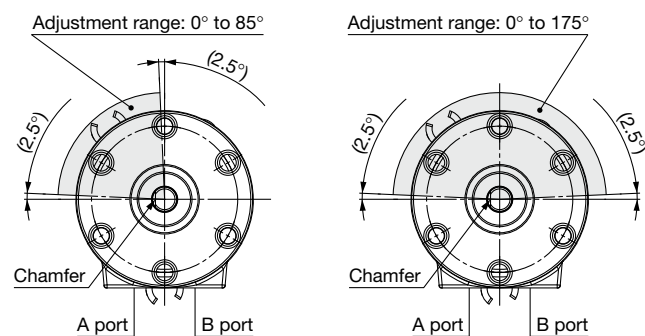**SMC**

CRB□-B/CRB□-C *Series*

Rotating Angle with Angle Adjustment Unit

- Drawings below are viewed from the long shaft side.
- The position of the chamfered portion illustrates the conditions of actuators when B port is pressurised.
- Operate within the adjustment range.

Rotating Angle with Angle Adjustment Unit

Single vane for 90°/180°

Size: 10, 15

Adjustment range: 0° to 85°

(2.5°)

(2.5°)

Chamfer

A port   B port

Adjustment range: 0° to 175°

(2.5°)

(2.5°)

Chamfer

A port   B port

Size: 20, 30, 40

Adjustment range: 0° to 80°

90°

①

②

②

Chamfer

A port   B port

Adjustment range: 0° to 170°

180°

①

②

②

Chamfer

A port   B port
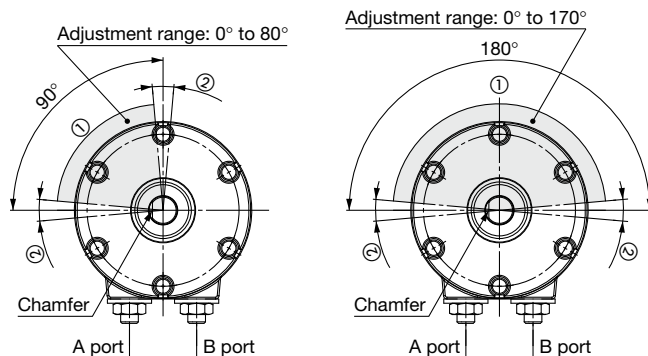
① shows the angle adjustment unit adjustment range.
② shows the adjustment bolt adjustment range.

Single vane for 270°

Size: 10, 40

0 to 230°

Chamfer

(65°)

A port   B port

Size: 15, 20, 30

0 to 240°

Chamfer   (60°)

A port   B port

Double vane

For 90°

0 to 85°

Chamfer   (45°)

A port   B port

For 100°

0 to 95°

Chamfer   (40°)

A port   B port
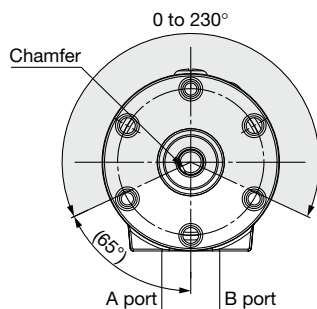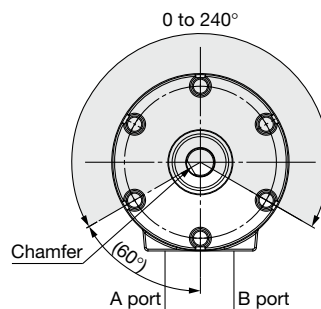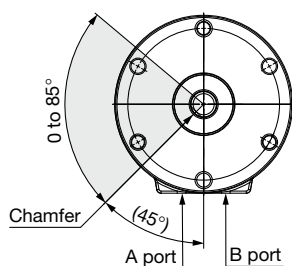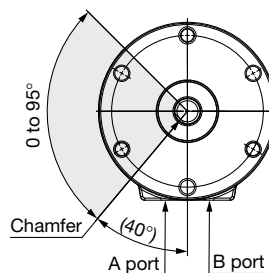
Vane type	Rotating angle (Body)	Size				
		10	15	20	30	40
Single vane	90°	0 to 85°		① 0 to 80° ② 90°±10°		
	180°	0 to 175°		① 0 to 170° ② 180°±10°		
	270°	0 to 230°	0 to 240°			0 to 230°
Double vane	90°	0 to 85°				
	100°	0 to 95°				

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Rotating Angle Adjustment Method

● The figures below show the default position of the angle adjustment unit.
● The rotating angle can be adjusted by moving stopper blocks (A) and (B), which are shown in the figures below.
● The figures below show size 20.
∗ Make adjustments when pressure is not being applied.
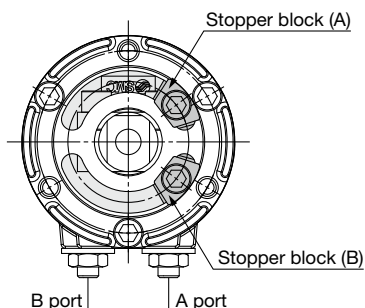
Fig. Default position (Single vane)
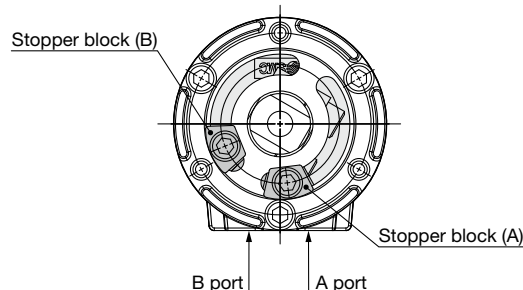
Fig. Default position (Double vane)

> The specifications and inner volume are the same as those of the standard type. (→p. 17)

Recommended Torque for Securing the Stopper Blocks

Size	Tightening torque [N·m]
10	1.0 to 1.2
15	
20	2.5 to 2.9
30	3.4 to 3.9
40	

Weight

[g]

Vane type	Single vane type															Double vane type									
Size	**10**			**15**			**20**			**30**			**40**			**10**		**15**		**20**		**30**		**40**	
Rotating angle	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	100°	90°	100°	90°	100°	90°	100°	90°	100°
Basic type	27	26	26	47	46	46	110	107	106	203	197	195	378	360	366	43	43	55	55	116	116	218	218	415	414
Vertical auto switch unit	15			20			28			38			43			15		20		28		38		43	
Angle adjustment unit	30			47			90			150			203			30		47		90		150		203	

> A flange mounting bracket assembly is available as an option.
> For details, refer to page 56.

CRB☐-B/CRB☐-C *Series*

Construction: With Angle Adjustment Unit, With Vertical Auto Switch Unit and Angle Adjustment Unit

• Components other than those specified below are the same as those of the standard type.

With angle adjustment unit

Size: 10, 15, 20, 30, 40

With vertical auto switch unit and angle adjustment unit

Size: 10, 15

Size: 20, 30, 40

A parallel key is used instead of a chamfer for size 40.

A parallel key is used instead of a chamfer for size 40.
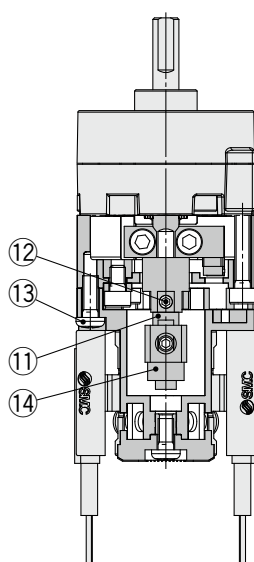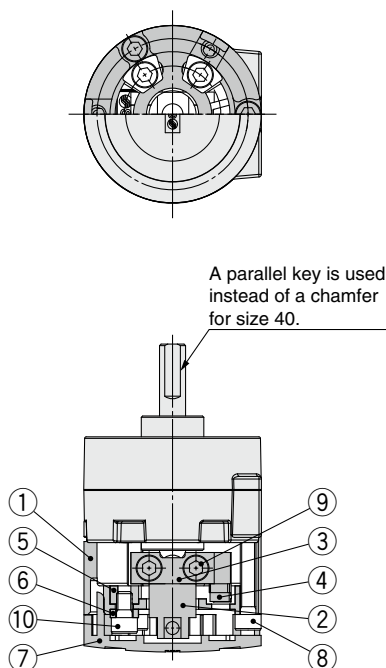
Size: 10
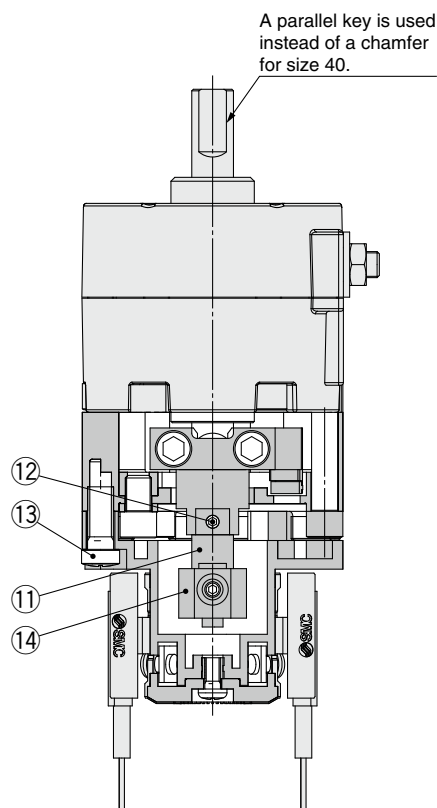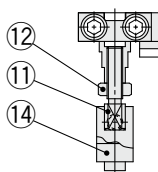
Component Parts

No.	Description	Material	Note
1	**Stopper ring**	Aluminium alloy	
2	**Stopper lever**	Chrome molybdenum steel	
3	**Lever retainer**	Rolled steel	Zinc chromating
4	**Rubber bumper**	NBR	
5	**Stopper block**	Chrome molybdenum steel	Zinc chromating
6	**Block retainer**	Rolled steel	Zinc chromating
7	**Cap**	Resin	
8	**Hexagon socket head cap screw**	Stainless steel	Special screw
9	**Hexagon socket head cap screw**	Stainless steel	Special screw
10	**Hexagon socket head cap screw**	Stainless steel	Special screw
11	**Joint**		
12	**Hexagon socket set screw**	Stainless steel	Hexagon nut will be used for size 10 only.
12	**Hexagon nut**	Stainless steel	
13	**Cross recessed round head screw**	Stainless steel	
14	**Magnet lever**	—	

SMC

Dimensions: Single Vane Type With Angle Adjustment Unit (10, 15)

CRBW-B (For 90° and 180°)
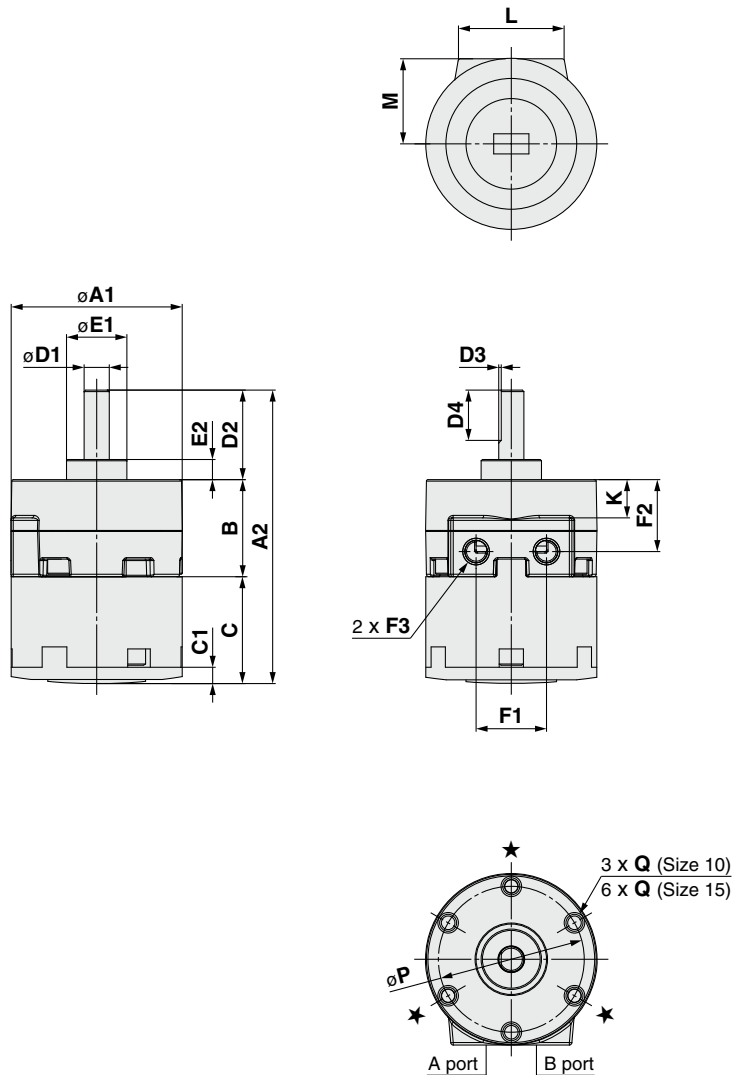
• Following figures show actuators when B port is pressurised.

(3 mounting holes with the ★ marks are for tightening the actuator and not to be used for external mounting for size 10.)

[mm]

Size	A		B	C		D				E		F			K	L	M
	A1	A2		C	C1	D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3			
10	29	48.5	15	19.5	3	$4^{-0.004}_{-0.015}$	14	0.5	9	$9^{0}_{-0.036}$	3	12	9.8	M5 x 0.8	3.6	19.8	14.6
15	34	59	20	21	3	$5^{-0.004}_{-0.016}$	18	0.5	10	$12^{0}_{-0.043}$	4	14	14.3	M5 x 0.8	7.6	24	17.1

Size	P	Q
10	24	M3 x 0.5 depth 6
15	29	M3 x 0.5 depth 5

Dimensions: Single Vane Type With Angle Adjustment Unit (10, 15)

CRBW-B (For 270°)

• Following figures show the position of the ports during rotation.

(3 mounting holes with the ★ marks are for tightening the actuator
and not to be used for external mounting for size 10.)

A port   B port

[mm]

Size	A		B	C		D				E		F			K	L	M
	A1	A2		C	C1	D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3			
10	29	48.5	15	19.5	3	$4_{-0.015}^{-0.004}$	14	0.5	9	$9_{-0.036}^{0}$	3	9.5	9.8	M3 x 0.5	3.6	19.8	14.6
15	34	59	20	21	3	$5_{-0.016}^{-0.004}$	18	0.5	10	$12_{-0.043}^{0}$	4	10	14.3	M3 x 0.5	7.6	24	17.1

Size	P	Q
10	24	M3 x 0.5 depth 6
15	29	M3 x 0.5 depth 5

SMC

Dimensions: Single Vane Type With Angle Adjustment Unit (20, 30, 40)

CRBW-B (For 90° and 180°)

• Following figures show actuators when B port is pressurised.

For size 40

Parallel key dimensions

b (h9)	h (h9)	L1
$4_{-0.030}^{0}$	$4_{-0.030}^{0}$	20

A parallel key is used instead of a chamfer for size 40.

2 x **F3**

◆6 x **Q**

Ø **P**

A port   B port

[mm]
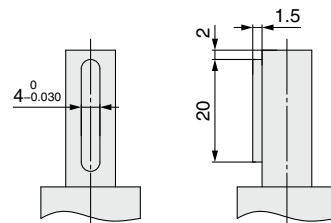
Size	A		B	C		D				E		F			J		
	A1	A2		C	C1	D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3	J1	J2	J3
20	42	74	29	25	4	$6_{-0.016}^{-0.004}$	20	0.5	10	$14_{-0.043}^{0}$	4.5	13	18.3	M5 x 0.8	16	7.1	27.4
30	50	91	40	29	4.5	$8_{-0.020}^{-0.005}$	22	1	12	$16_{-0.043}^{0}$	5	14	26	M5 x 0.8	19	11.8	32.7
40	63	111.3	45	36.3	5	$10_{-0.020}^{-0.005}$	30	—	—	$25_{-0.052}^{0}$	6.5	20	31.1	M5 x 0.8	28	15.8	44.1

Size	K	L	P	Q
20	—	28	36	M4 x 0.7 depth 7
30	5.5	31.5	43	M5 x 0.8 depth 10
40	9.5	40	56	M5 x 0.8 depth 10

CRB□-B Series

Dimensions: Single Vane Type With Angle Adjustment Unit (20, 30, 40)

CRBW-B (For 270°)

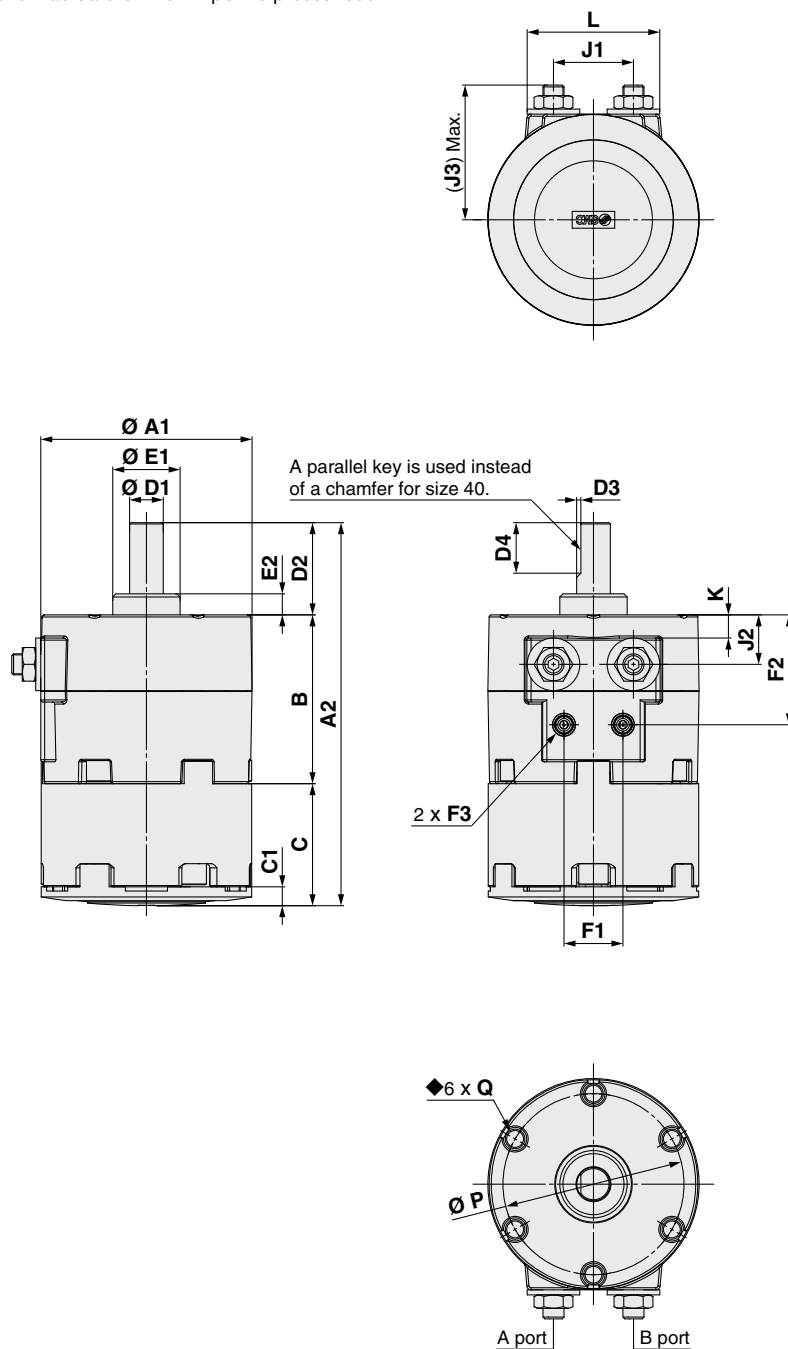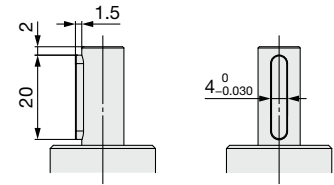• Following figures show the position of the ports during rotation.

For size 40

Parallel key dimensions

b(h9)	h(h9)	L1
$4_{-0.030}^{0}$	$4_{-0.030}^{0}$	20

A port   B port

[mm]
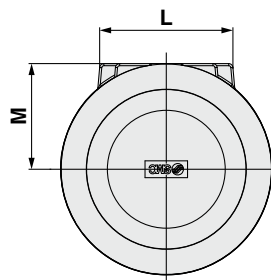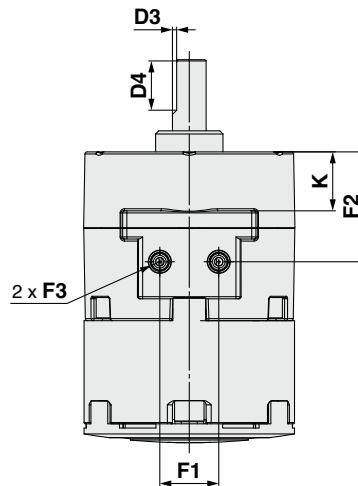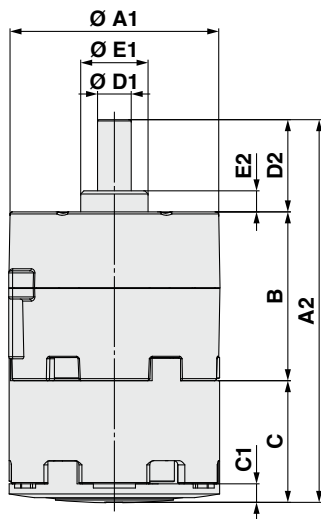
Size	A		B	C		D				E		F		
	A1	A2		C	C1	D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3
20	42	74	29	25	4	$6_{-0.016}^{-0.004}$	20	0.5	10	$14_{-0.043}^{0}$	4.5	13	18.3	M5 x 0.8
30	50	91	40	29	4.5	$8_{-0.020}^{-0.005}$	22	1	12	$16_{-0.043}^{0}$	5	14	26	M5 x 0.8
40	63	111.3	45	36.3	5	$10_{-0.020}^{-0.005}$	30	—	—	$25_{-0.052}^{0}$	6.5	20	31.1	M5 x 0.8

Size	K	L	M	P	Q
20	10.5	28	21	36	M4 x 0.7 depth 7
30	14	31.5	25	43	M5 x 0.8 depth 10
40	17	40	31.6	56	M5 x 0.8 depth 10

SMC

Dimensions: Double Vane Type With Angle Adjustment Unit 10

CRBW10-□D-B (For 90° and 100°)

• The following figures show the position of the ports during rotation when the A or B port is pressurised.

19.8

14.6

Ø 29

Ø 9h9 $_{-0.036}^{0}$

Ø 4g7 $_{-0.016}^{-0.004}$

3

14

24

57.5

19.5

3

0.5

9

3.6

9.8

2 x M3 x 0.5

9.5

◆ 3 x M3 x 0.5 depth 6
Body A side Ø 3.4 through

Ø 24

(The 3 mounting holes marked with a ★ are for tightening the actuator
and are not to be used for external mounting.)

A port   B port

CRB☐-B Series

Dimensions: Double Vane Type With Angle Adjustment Unit (15, 20, 30, 40)

CRBW-☐D-B (For 90° and 100°)

• The following figures show the position of the ports during rotation when the A or B port is pressurised.
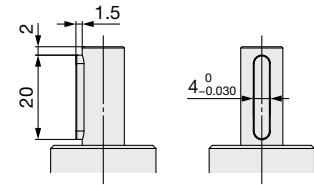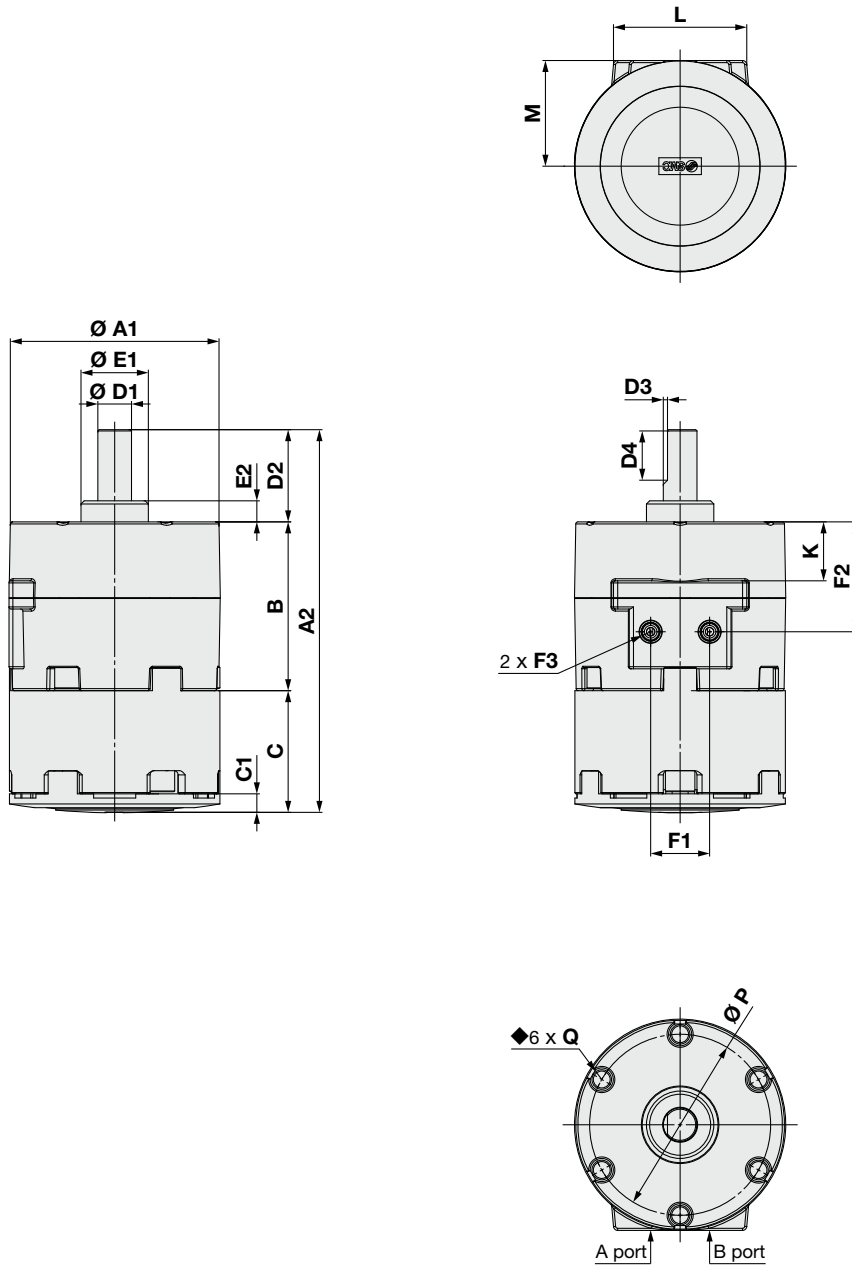
For size 40

Parallel key dimensions

b(h9)	h(h9)	L1
$4_{-0.030}^{0}$	$4_{-0.030}^{0}$	20

[mm]

Size	A		B	C		D				E		F			K
	A1	A2		C	C1	D1(g7)	D2	D3	D4	E1(h7)	E2	F1	F2	F3	
15	34	59	20	21	3	$5_{-0.016}^{-0.004}$	18	0.5	10	$12_{-0.043}^{0}$	4	10	14.3	M3 x 0.5	7.6
20	42	74	29	25	4	$6_{-0.016}^{-0.004}$	20	0.5	10	$14_{-0.043}^{0}$	4.5	13	18.3	M5 x 0.8	10.5
30	50	91	40	29	4.5	$8_{-0.020}^{-0.005}$	22	1	12	$16_{-0.043}^{0}$	5	14	26	M5 x 0.8	14
40	63	111.3	45	36.3	5	$10_{-0.020}^{-0.005}$	30	—	—	$25_{-0.052}^{0}$	6.5	20	31.1	M5 x 0.8	17

Size	L	M	P	Q
15	24	17.1	29	M3 x 0.5 depth 5
20	28	21	36	M4 x 0.7 depth 7
30	31.5	25	43	M5 x 0.8 depth 10
40	40	31.6	56	M5 x 0.8 depth 10

SMC

Dimensions: Single Vane Type With Vertical Auto Switch Unit and Angle Adjustment Unit (10, 15)

CRBW-C (For 90° and 180°)

• Following figures show actuators when B port is pressurised.

D-S/T99(V), S9P(V),
D-97/93A, 90/90A

D-M9□

3 mounting holes with the ★ marks are for tightening the actuator and not to be used for external mounting for size 10.

3 x **Q** (Size 10)
6 x **Q** (Size 15)

A port   B port

*1 The angle is 60° when any of the following are used: D-90/90A/97/93A
     The angle is 69° when any of the following are used: D-S99(V)/T99(V)/S9P(V)

[mm]

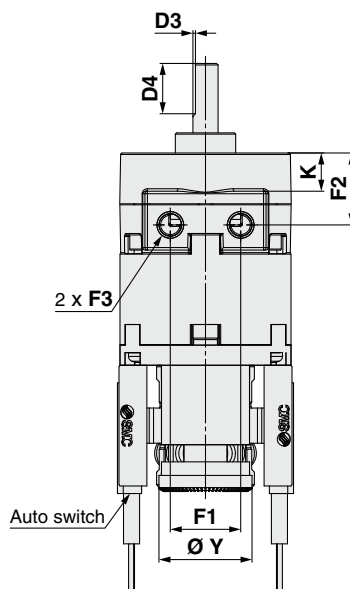| Size	A		B	C	D				E		F			K	L
	A1	A2			D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3		
10	29	74.5	15	45.5	$4^{-0.004}_{-0.015}$	14	0.5	9	$9^{0}_{-0.036}$	3	12	9.8	M5 x 0.8	3.6	19.8
15	34	85	20	47	$5^{-0.004}_{-0.016}$	18	0.5	10	$12^{0}_{-0.043}$	4	14	14.3	M5 x 0.8	7.6	24

Size	M	P	Q	W	Y
10	14.6	24	M3 x 0.5 depth 6	35	18.5
15	17.1	29	M3 x 0.5 depth 5	35	18.5

CRB☐-C *Series*

Dimensions: Single Vane Type With Vertical Auto Switch Unit and Angle Adjustment Unit (10, 15)

CRBW-C (For 270°)

• Following figures show the position of the ports during rotation.

D-S/T99(V), S9P(V), D-97/93A, 90/90A

D-M9☐

(3 mounting holes with the ★ marks are for tightening the actuator
and not to be used for external mounting for size 10.)

3 x **Q** (Size 10)
6 x **Q** (Size 15)

A port   B port

∗1 The angle is 60° when any of the following are used: D-90/90A/97/93A
The angle is 69° when any of the following are used: D-S99(V)/T99(V)/S9P(V)

[mm]

Size	A		B	C	D				E		F			K	L
	A1	A2			D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3		
10	29	74.5	15	45.5	$4^{-0.004}_{-0.015}$	14	0.5	9	$9^{0}_{-0.036}$	3	9.5	9.8	M3 x 0.5	3.6	19.8
15	34	85	20	47	$5^{-0.004}_{-0.016}$	18	0.5	10	$12^{0}_{-0.043}$	4	10	14.3	M3 x 0.5	7.6	24

Size	M	P	Q	W	Y
10	14.6	24	M3 x 0.5 depth 6	35	18.5
15	17.1	29	M3 x 0.5 depth 5	35	18.5

⊘SMC

Dimensions: Single Vane Type With Vertical Auto Switch Unit and Angle Adjustment Unit (20, 30, 40)

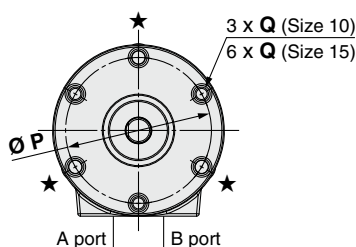### CRBW-C (For 90° and 180°)

• Following figures show actuators when B port is pressurised.

D-S/T79□, S7P, R73/80□

D-M9□

For size 40

A parallel key is used instead of a chamfer for size 40.

Parallel key dimensions

b(h9)	**h**(h9)	**L1**
$4_{-0.030}^{0}$	$4_{-0.030}^{0}$	20

2 x **F3**

Auto switch

◆6 x **Q**

A port   B port
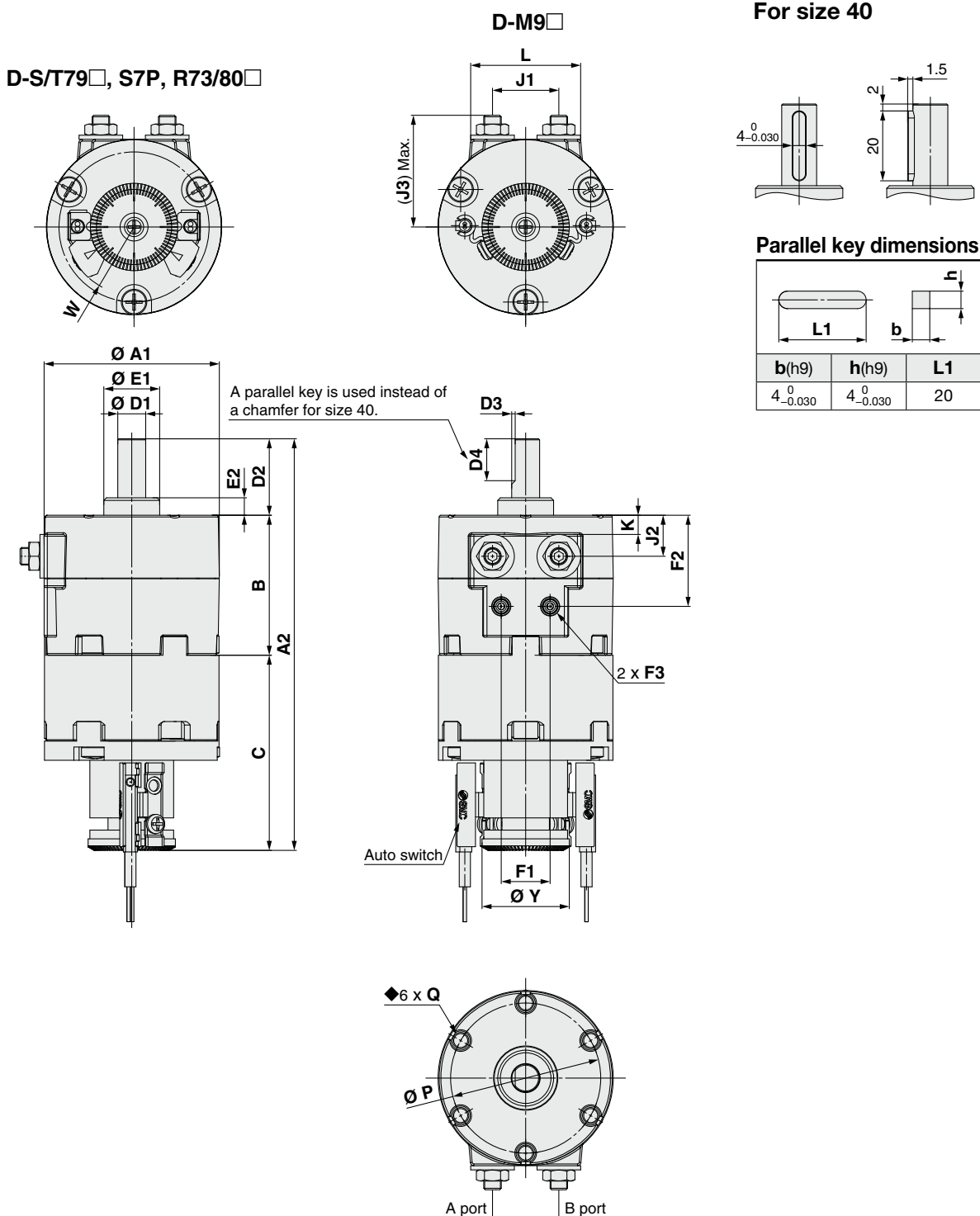
[mm]

Size	A		B	C	D				E		F			J			K	L	P	Q	W	Y
	A1	A2			D1(g7)	D2	D3	D4	E1(h9)	E2	F1	F2	F3	J1	J2	J3						
20	42	100	29	51	$6_{-0.016}^{-0.004}$	20	0.5	10	$14_{-0.043}^{0}$	4.5	13	18.3	M5 x 0.8	16	7.1	27.4	—	28	36	M4 x 0.7 depth 7	19.5	25
30	50	117.5	40	55.5	$8_{-0.020}^{-0.005}$	22	1	12	$16_{-0.043}^{0}$	5	14	26	M5 x 0.8	19	11.8	32.7	5.5	31.5	43	M5 x 0.8 depth 10	19.5	25
40	63	137.2	45	62.2	$10_{-0.020}^{-0.005}$	30	—	—	$25_{-0.052}^{0}$	6.5	20	31.1	M5 x 0.8	28	15.8	44.1	9.5	40	56	M5 x 0.8 depth 10	22.5	31

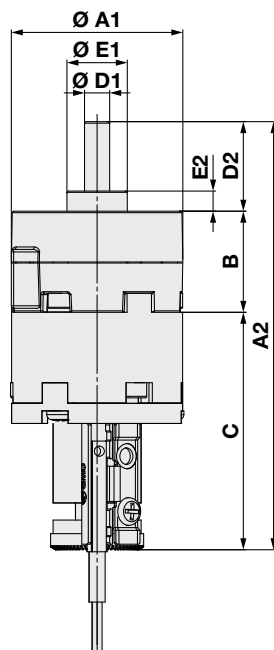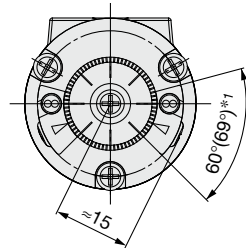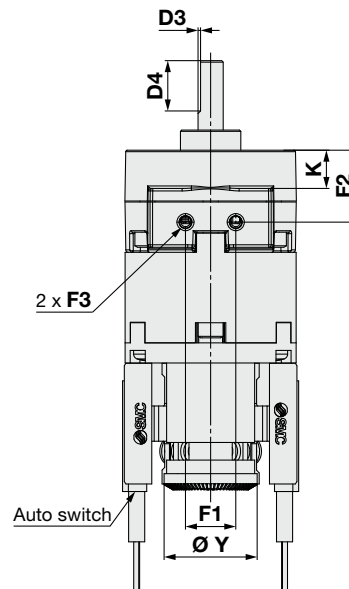# CRB☐-C *Series*

Dimensions: Single Vane Type With Vertical Auto Switch Unit and Angle Adjustment Unit (20, 30, 40)
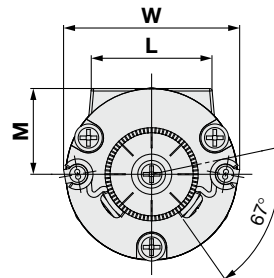
CRBW-C (For 270°)

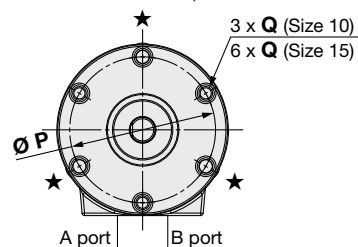• Following figures show the position of the ports during rotation.

For size 40

Parallel key dimensions

b(h9)	**h**(h9)	**L1**
$4_{-0.030}^{0}$	$4_{-0.030}^{0}$	20

A port   B port

[mm]
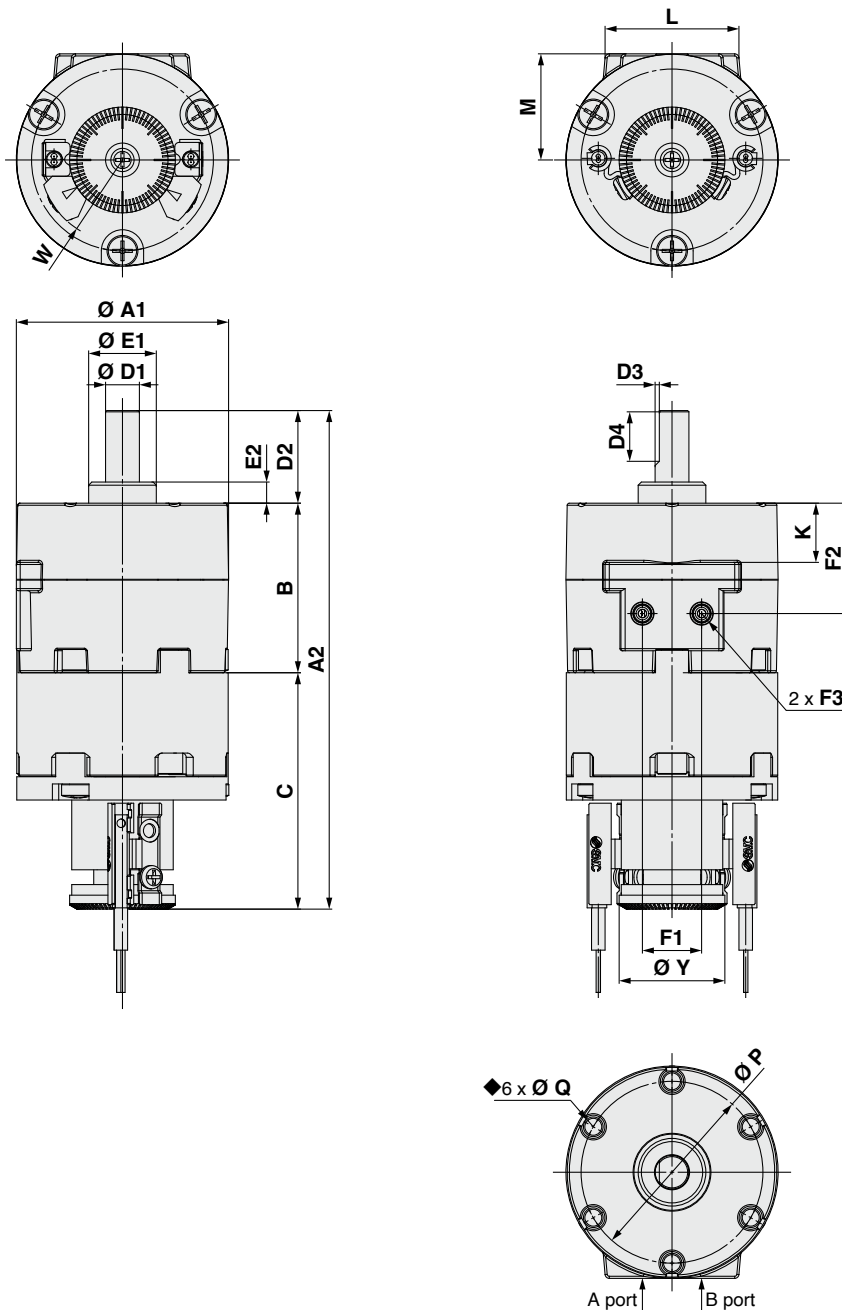
Size	A		B	C	D				E		F		
	A1	**A2**			**D1**(g7)	**D2**	**D3**	**D4**	**E1**(h9)	**E2**	**F1**	**F2**	**F3**
20	42	100	29	51	$6_{-0.016}^{-0.004}$	20	0.5	10	$14_{-0.043}^{0}$	4.5	13	18.3	M5 x 0.8
30	50	117.5	40	55.5	$8_{-0.020}^{-0.005}$	22	1	12	$16_{-0.043}^{0}$	5	14	26	M5 x 0.8
40	63	137.2	45	62.2	$10_{-0.020}^{-0.005}$	30	—	—	$25_{-0.052}^{0}$	6.5	20	31.1	M5 x 0.8

Size	**K**	**L**	**M**	**P**	**Q**	**W**	**Y**
20	10.5	28	21	36	M4 x 0.7 depth 7	19.5	25
30	14	31.5	25	43	M5 x 0.8 depth 10	19.5	25
40	17	31.5	31.6	56	M5 x 0.8 depth 10	22.5	31

SMC

Dimensions: Double Vane Type With Vertical Auto Switch Unit and Angle Adjustment Unit 10

CRBW10-□D-C (For 90° and 100°)

• The following figures show the position of the ports during rotation when the A or B port is pressurised.

*1 The angle is 60° when any of the following are used: D-90/90A/97/93A
   The angle is 69° when any of the following are used: D-S99(V)/T99(V)/S9P(V)

D-S/T99(V), S9P(V),
D-97/93A, 90/90A

60°(69°)*1

≈15

Ø 29

Ø 9h9 $_{-0.036}^{0}$

Ø 4g7 $_{-0.016}^{-0.004}$

14
3
24
83.5
45.5

35
19.8
14.6
67°

0.5
9
3.6
9.8
2 x M3 x 0.5
9.5
Ø 18.5

(The 3 mounting holes marked with a ★ are for tightening the actuator
and are not to be used for external mounting.)

3 x M3 x 0.5 depth 6
Ø 24

A port   B port

CRB□-C Series

Dimensions: Double Vane Type With Vertical Auto Switch Unit and Angle Adjustment Unit (15, 20, 30, 40)

CRBW-□D-B (For 90° and 100°)

• The following figures show the position of the ports during rotation when the A or B port is pressurised.

For size 15

D-M9□

D-S/T99(V), S9P(V), D-97/93A, 90/90A

D-S/T79□, S7P, D-R73/80□

D-M9□

For size 40

Parallel key dimensions

b(h9)	h(h9)	L1
$4_{-0.030}^{0}$	$4_{-0.030}^{0}$	20

∗1 The angle is 60° when any of the following are used: D-90/90A/97/93A
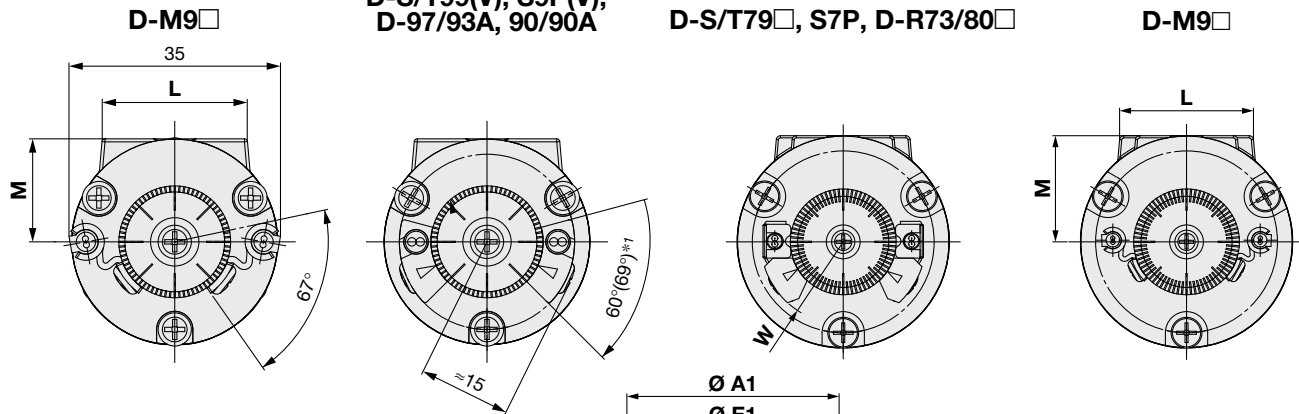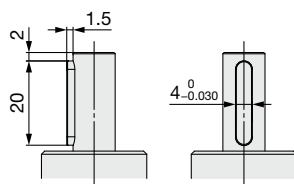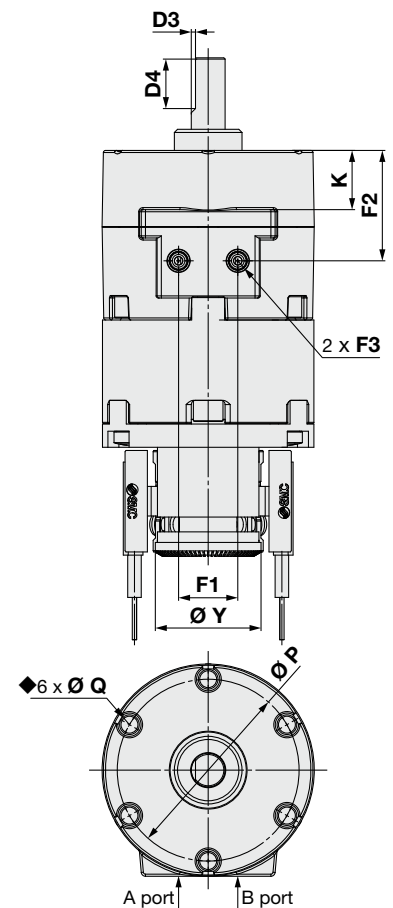The angle is 69° when any of the following are used: D-S99(V)/T99(V)/S9P(V)

[mm]

Size	A		B	C	D				E		F			K	L
	A1	A2			D1(g7)	D2	D3	D4	E1(h7)	E2	F1	F2	F3		
15	34	85	20	47	$5_{-0.016}^{-0.004}$	18	0.5	10	$12_{-0.043}^{0}$	4	10	14.3	M3 x 0.5	7.6	24
20	42	100	29	51	$6_{-0.016}^{-0.004}$	20	0.5	10	$14_{-0.043}^{0}$	4.5	13	18.3	M5 x 0.8	10.5	28
30	50	117.5	40	55.5	$8_{-0.020}^{-0.005}$	22	1	12	$16_{-0.043}^{0}$	5	14	26	M5 x 0.8	14	31.5
40	63	137.2	45	62.2	$10_{-0.020}^{-0.005}$	30	—	—	$25_{-0.052}^{0}$	6.5	20	31.1	M5 x 0.8	17	40

Size	M	P	Q	W	Y
15	17.1	29	M3 x 0.5 depth 5	—	18.5
20	21	36	M4 x 0.7 depth 7	19.5	25
30	25	43	M5 x 0.8 depth 10	19.5	25
40	31.6	56	M5 x 0.8 depth 10	22.5	31

SMC

Flange Dimensions/Part Nos.

Flange assembly for size 10
Part no.: P211070-2

Flange

0.5
11.5
2.5

Rotary actuator

6 x Countersunk head screw for M3
conical seat and through-hole

4x Ø3.5

Ø9

Ø24

□25
□33

M3 countersunk
head screw (3 pcs.)
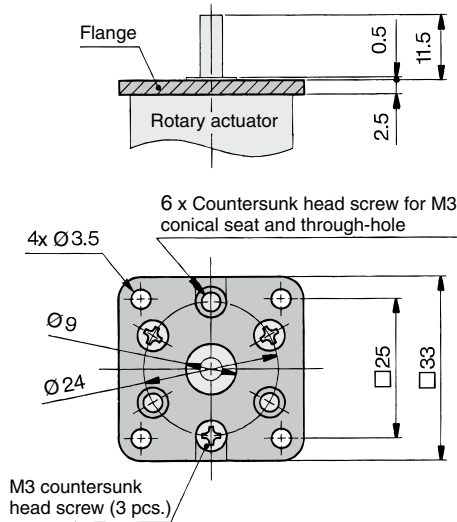
Flange assembly for size 15
Part no.: P211090-2

Flange

1.5
15.5
2.5

Rotary actuator

6 x Countersunk head screw for M3
conical seat and through-hole

4x Ø3.5

Ø12

Ø29

□29
□37

M3 countersunk
head screw (3 pcs.)
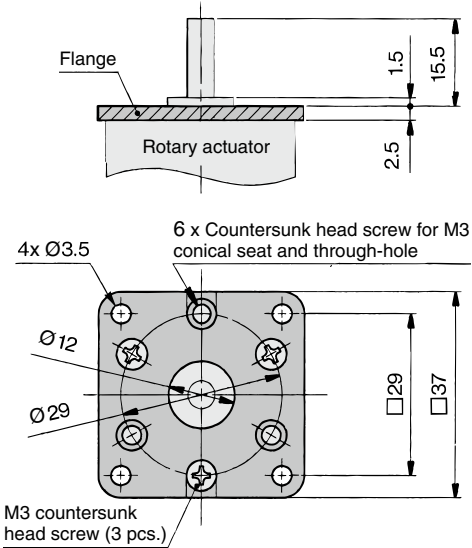
Flange assembly for size 20
Part no.: P211060-2

Flange

1.3
16.8
3.2

Rotary actuator

6 x Countersunk head screw for M4
conical seat and through-hole

4x Ø4.5

Ø14

Ø36

□36
□46

M4 countersunk
head screw (3 pcs.)
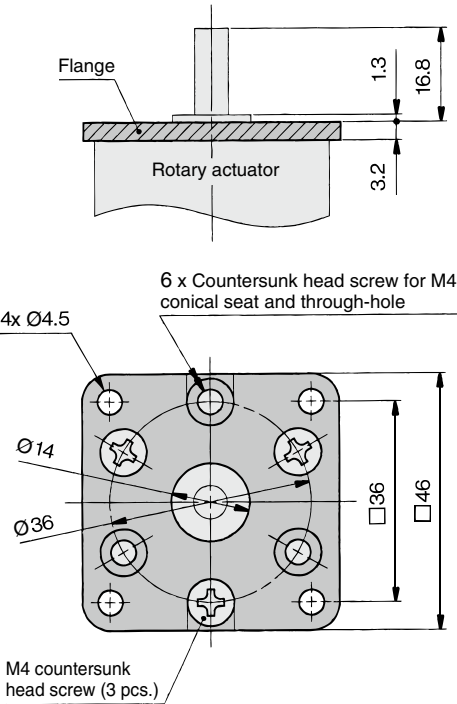
Flange assembly for size 30
Part no.: P211080-2

Flange

1.8
18.8
3.2

Rotary actuator

6 x Countersunk head screw for M5
conical seat and through-hole

4x Ø5.5

Ø16

Ø43

□44
□55

M5 countersunk
head screw (3 pcs.)
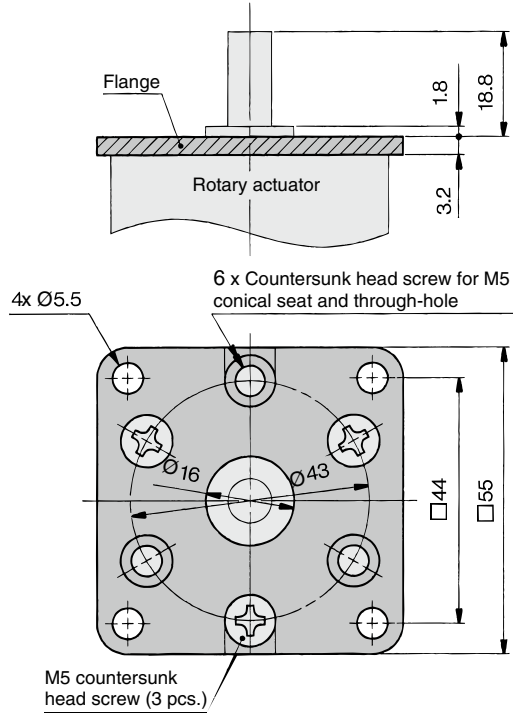
Weight
[g]

Size	10	15	20	30
Flange assembly	9	10	19	25

Component Unit
With Vertical Auto Switch Unit, Angle Adjustment Unit

With Vertical Auto Switch Unit and Angle Adjustment Unit

CRB Series Various units can be mounted to a vane type rotary actuator.

Rotary actuator with vertical auto switch unit
CRBW□-□-□-A

Chamfer (key)   ◆Round head screw

| Retrofit unit | Vertical auto switch unit |

Rotary actuator with angle adjustment unit
CRBW□-□-□-B

Chamfer (key)   ◆Cap

| Retrofit unit | Angle adjustment unit |

Rotary actuator with vertical auto switch unit and angle adjustment unit
CRBW□-□-□-C

★Set screw   ★Joint
Chamfer (key)
★Round head screw

| Retrofit unit | With vertical auto switch unit and angle adjustment unit |

* The combination of the auto switch unit and angle adjustment unit is available as standard.
  The items marked with ★ are additional parts required for connection (joint unit parts), and the items marked with ◆ are unnecessary.
* Use a unit part number when ordering joint unit separately.

Part Number for Vertical Auto Switch Unit

Size	For D-M9□		Excluding D-M9□		
	Vertical auto switch unit*1	Switch block unit	Vertical auto switch unit	Switch block unit*2	
		Common to right-hand and left-hand		Right-hand	Left-hand
10	P611070-1M	P811010-8M	P611070-1	P611070-8	P611070-9
15	P611090-1M		P611090-1		
20	P611060-1M	P811030-8M	P611060-1	P611060-8	
30	P611080-1M		P611080-1		
40	P611010-1M	P811010-8M	P611010-1	P611010-8	P611010-9

Part Number for Angle Adjustment Unit

Size	Angle adjustment unit	Vertical auto switch unit, Angle adjustment unit*1		Joint unit*3
		For D-M9□	Excluding D-M9□	
10	P811010-3	P811010-4M	P811010-4	P211070-10
15	P811020-3	P811020-4M	P811020-4	P211090-10
20	P811030-3	P811030-4M	P811030-4	P211060-10
30	P811040-3	P811040-4M	P811040-4	P211080-10
40	P811050-3	P811050-4M	P811050-4	P211010-10

*1 An auto switch will not be included, please order it separately.
*2 Auto switch unit comes with one right-hand and one left-hand switch blocks that are used for addition or when the switch block is damaged.
  Since the solid state auto switch for sizes 10 and 15 requires no switch block, the unit part number will be the P211070-13.
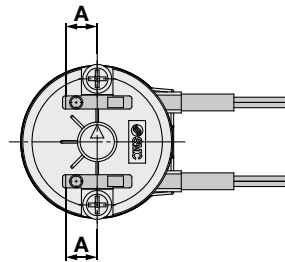*3 The joint unit is necessary when adding an angle adjustment unit to a vertical auto switch unit, or when adding a vertical auto switch unit to an angle adjustment unit.

SMC

Auto Switch Mounting

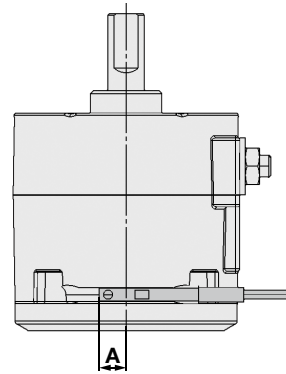## Auto Switch Proper Mounting Position (at Rotation End Detection)

CDRB10, 15
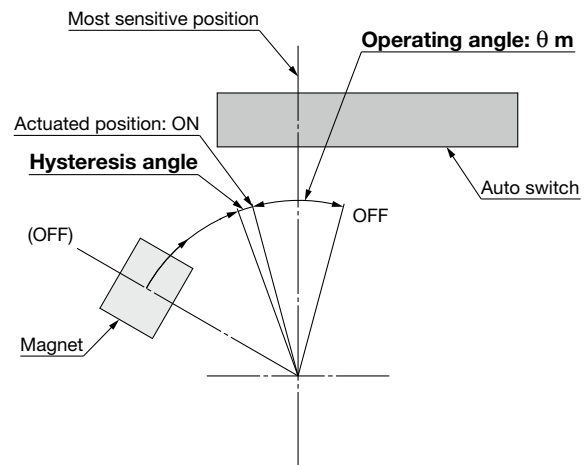### Size: 10, 15

CDRB20, 30
Size: 20, 30, 40

[mm]

Size	Solid state auto switch D-M9☐
	A
10	6
15	6
20	6
30	6
40	6

∗ Since the figures in the table on the left are provided as a guideline only, they cannot be guaranteed. Adjust the auto switch after confirming the operating conditions in the actual setting.
Proper tightening torque: 0.05 to 0.15 [N·m]

Operating Angle and Hysteresis Angle

Size	Solid state auto switch D-M9☐	
	Operating angle [θ m]	Hysteresis angle
10	36°	5°
15	36°	5°
20	20°	5°
30	20°	5°
40	20°	5°

∗ Since the figures in the table on the left are provided as a guideline only, they cannot be guaranteed. Adjust the auto switch after confirming the operating conditions in the actual setting.
Proper tightening torque: 0.05 to 0.15 [N·m]

Operating Range and Hysteresis

∗ **Operating range: θ m**
The range is between the position where the auto switch turns ON as the magnet inside the auto switch unit moves rotationally and the position where the auto switch turns OFF as the magnet moves rotationally in the same direction.

∗ **Hysteresis range: θ d**
The range is between the position where the auto switch turns ON as the magnet inside the auto switch unit moves rotationally and the position where the auto switch turns OFF as the magnet moves rotationally in the opposite direction.
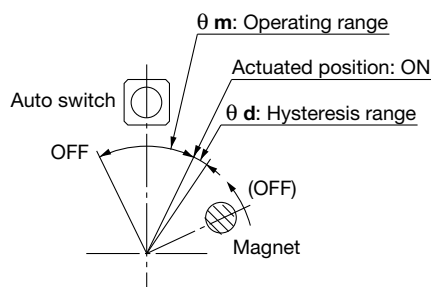
D-M9☐

Size	θ m: Operating range	θ d: Hysteresis range
10, 15	170°	20°
20, 30	100°	15°
40	86°	10°

D-S/T99(V), S9P(V), S/T79☐, S7P, D-97/93A, 90/90A, R73/80☐

| Size	θ m: Operating range	θ d: Hysteresis range
10, 15	110°	10°
20, 30	90°	10°
40	52°	8°

∗ Since the figures in the table above are provided as a guideline only, they cannot be guaranteed. Adjust the auto switch after confirming the operating conditions in the actual setting.

How to Change the Auto Switch Detecting Position

∗ When setting the detecting position, loosen the cross recessed round head screw a bit and move the auto switch to the preferred position and then tighten again and fix it. At this time, if tightened too much, screw can become damaged and unable to fix position.
Proper tightening torque: 0.4 to 0.6 [N·m]
When tightening the cross recessed round head screw, take care that the auto switch does not tilt.

Cross recessed round head screw
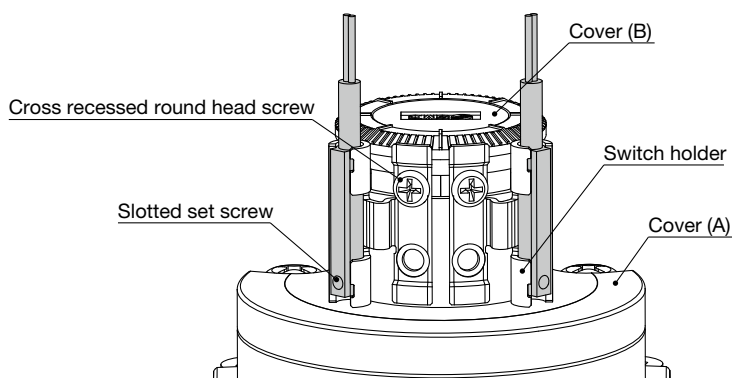
Size: 10 to 40
D-M9☐

Cross recessed round head screw
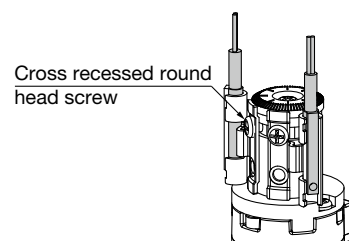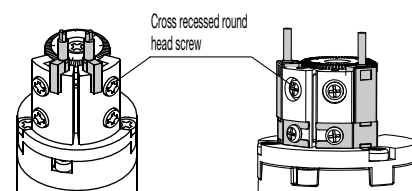
Size: 10, 15   **Size: 20 to 40**

D-S/T99(V), S9P(V), S/T79☐, S7P, D-97/93A, 90/90A, R73/80☐

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CRB□-A/C *Series*

Auto Switch Mounting: Sizes 10 to 40 (D-M9□)

External view and descriptions of auto switch unit

Cross recessed round head screw

Cover (B)

Switch holder

Slotted set screw

Cover (A)

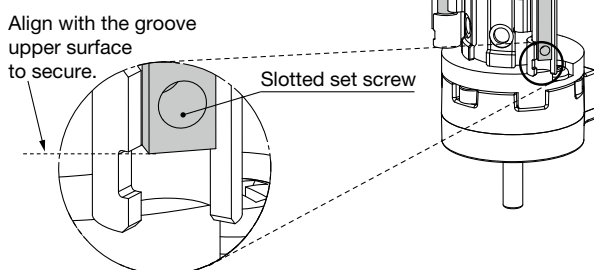### For sizes 10, 15

1. Auto switch mounting
Insert the auto switch into the groove of the switch holder.
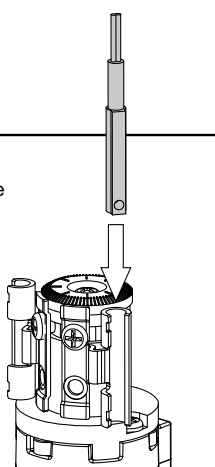
2. Auto switch securing
Align the auto switch with the upper surface of the groove on the side of the switch holder, and secure the slotted set screw. (Refer to the enlarged view.)

∗ Proper tightening torque: 0.05 to 0.1 [N·m]

Align with the groove upper surface to secure.

Slotted set screw
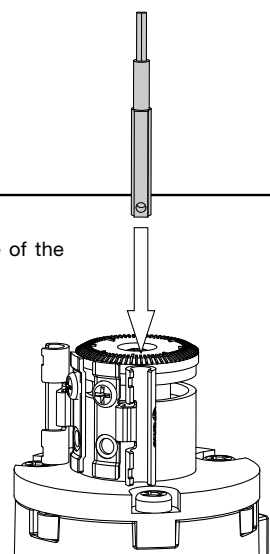
Enlarged view

3. Switch holder securing
After the actuated position has been adjusted with the cross recessed round head screw, use the auto switch.
∗ When tightening the screw, take care that the auto switch does not tilt.

### For sizes 20 to 40

1. Auto switch mounting
Insert the auto switch into the groove of the switch holder.

2. Auto switch securing
Align the auto switch with the lower surface of the groove on the side of the switch holder, and secure the slotted set screw. (Refer to the enlarged view.)

∗ Proper tightening torque: 0.05 to 0.1 [N·m]

Align with the groove lower surface to secure.

Slotted set screw

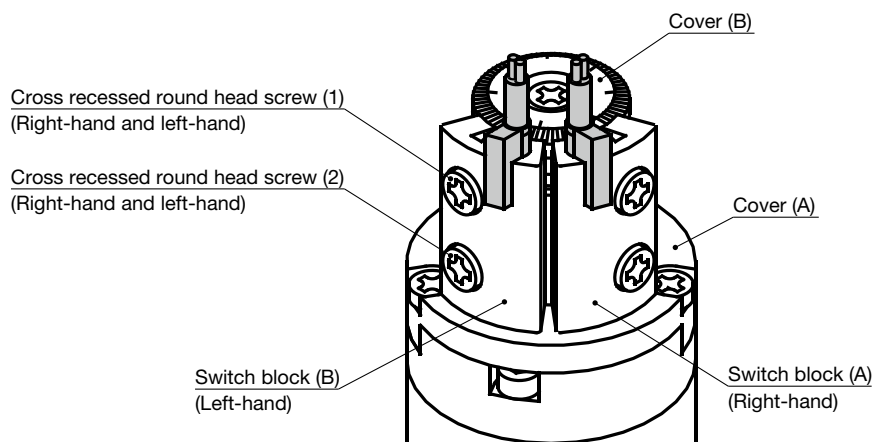**Enlarged view**

3. Switch holder securing
After the actuated position has been adjusted with the cross recessed round head screw, use the auto switch.
∗ When tightening the screw, take care that the auto switch does not tilt.

SMC
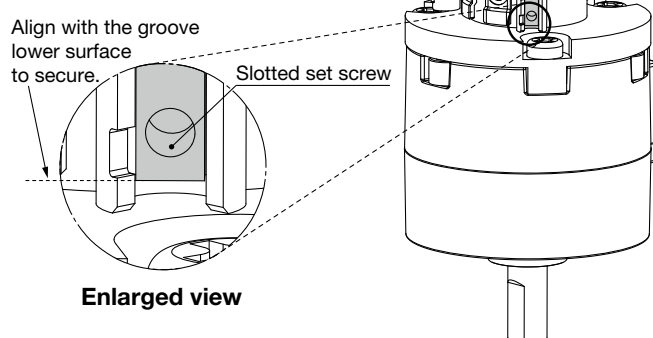
Auto Switch Mounting: Sizes 10, 15 (D-S/T99(V), S9P(V), 97/93A, 90/90A)

External view and descriptions of auto switch unit

The following shows the external view and typical descriptions of the auto switch unit.

Cover (B)

Cross recessed round head screw (1)
(Right-hand and left-hand)

Cross recessed round head screw (2)
(Right-hand and left-hand)

Cover (A)

Switch block (B)
(Left-hand)

Switch block (A)
(Right-hand)

Solid state auto switch

<Applicable auto switch>

3-wire type……D-S99(V), S9P(V)
2-wire type……D-T99(V)

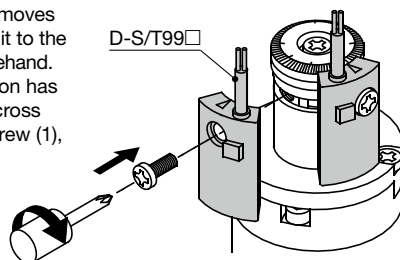#### 1. Switch block detaching

Remove the cross recessed round head screw (1) to detach the switch block.
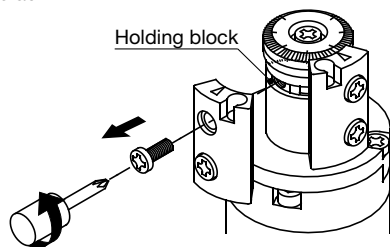
Holding block

2. Auto switch mounting

Secure the auto switch with the cross recessed round head screw (1) and holding block.
Proper tightening torque: 0.4 to 0.6 [N·m]

∗ Since the holding block moves inside the groove, move it to the mounting position beforehand.
· After the actuated position has been adjusted with the cross recessed round head screw (1), use the auto switch.

D-S/T99☐

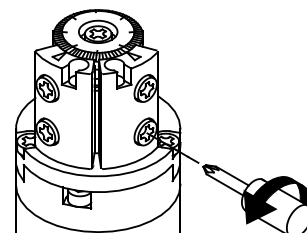### Reed auto switch

<Applicable auto switch>

D-97/93A (With indicator light)
D-90/90A (Without indicator light)

1. Preparations

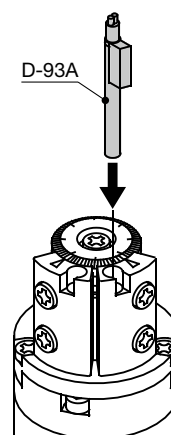Loosen the cross recessed round head screw (2) (About 2 to 3 turns).

∗ This screw has been secured temporarily at shipment.

2. Auto switch mounting

Insert the auto switch until it is in contact with the switch block hole.

∗ For the D-97/93A, insert the auto switch in the direction shown in the figure on the right.
∗ Since the D-90/90A is a round type, it has no directionality.
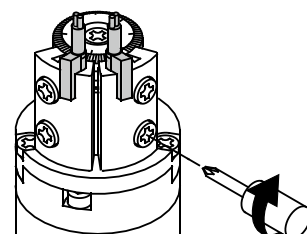
D-93A

3. Auto switch securing

Tighten the cross recessed round head screw (2) to secure the auto switch.
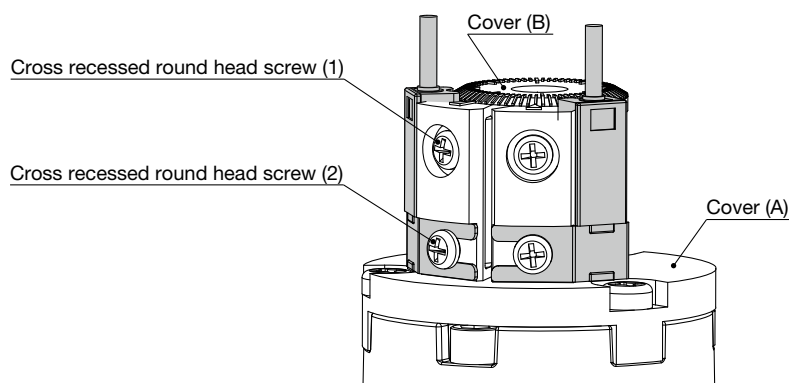Proper tightening torque: 0.4 to 0.6 [N·m]

· After the actuated position has been adjusted with the cross recessed round head screw (1), use the auto switch.

CRB□-A/C Series

Auto Switch Mounting: Sizes 20 to 40 (D-S/T79□, S7P, R73/80□)

External view and descriptions of auto switch unit

Cover (B)
Cross recessed round head screw (1)
Cross recessed round head screw (2)
Cover (A)

Mounting Procedure

\<Applicable auto switch\>

Solid state auto switch	Reed auto switch
D-S79, S7P	**D-R73, R73C**
D-T79, T79C	**D-R80, R80C**

1. Auto switch mounting
Loosen the cross recessed round head screw (2), and insert the arm of the auto switch.

2. Auto switch securing
Set the auto switch so that it is in contact with the switch block, and tighten the cross recessed round head screw (2).

∗ Proper tightening torque: 0.4 to 0.6 [N·m]

3. Switch holder securing
After the actuated position has been adjusted with the cross recessed round head screw (1), use the auto switch.
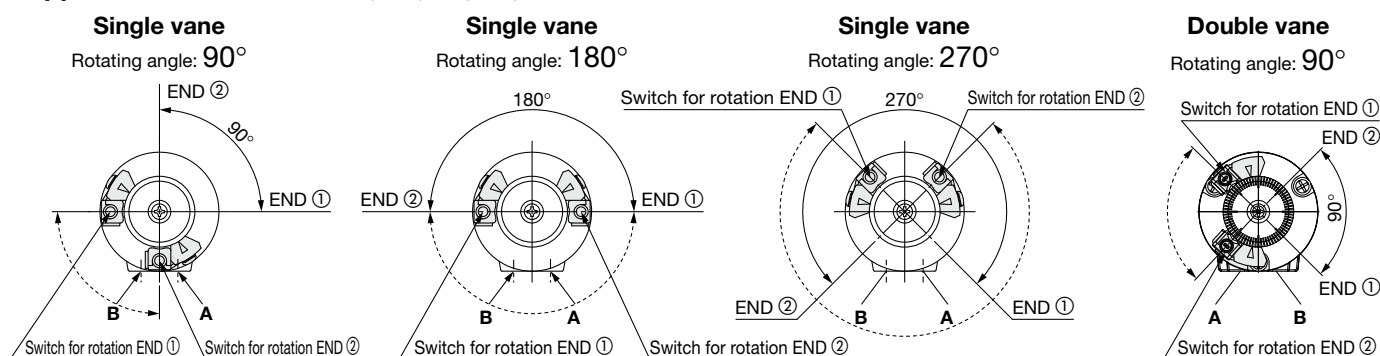
∗ Proper tightening torque: 0.4 to 0.6 [N·m]

Arm

Cross recessed round head screw (2)
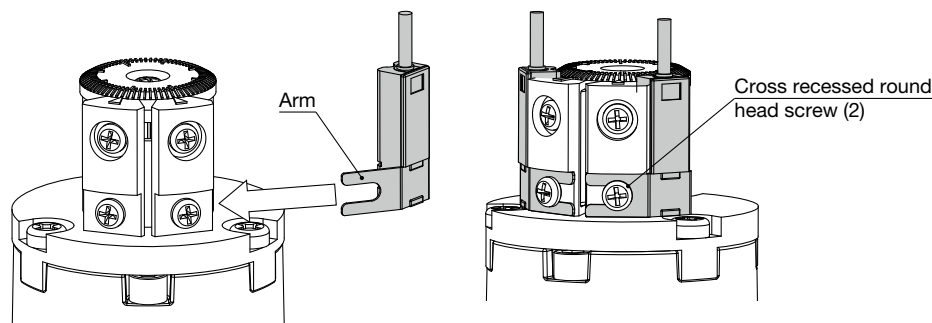
Auto Switch Adjustment

Rotation range of the output shaft with single flat (key for size 40 only) and auto switch mounting position
\<Applicable models/Size: 10, 15, 20, 30, 40\>

Single vane	Single vane	Single vane	Double vane
Rotating angle: 90°	Rotating angle: 180°	Rotating angle: 270°	Rotating angle: 90°

END ②
90°
END ①
B   A
Switch for rotation END ①   Switch for rotation END ②

180°
END ②   END ①
B   A
Switch for rotation END ①   Switch for rotation END ②

Switch for rotation END ①   270°   Switch for rotation END ②
END ②   B   A   END ①

Switch for rotation END ①
END ②
90°
END ①
A   B
Switch for rotation END ②

∗ Solid-lined curves indicate the rotation range of the output shaft with single flat (key). When the single flat (key) is pointing to the END ① direction, the switch for rotation END ① will operate, and when the single flat (key) is pointing to the END ② direction, the switch for rotation END ② will operate.
∗ Broken-lined curves indicate the rotation range of the built-in magnet. Operating angle of the switch can be decreased by either moving the switch for rotation END ① clockwise or moving the switch for rotation END ② counterclockwise. Auto switch in the figures above is at the most sensitive position.
∗ Each auto switch unit comes with one right-hand and one left-hand switches.

SMC

How to Mount Loads

How to connect a load directly to a single flat shaft

To secure the load, select a bolt of an appropriate size from those listed in tables 1 and 2 by taking the shaft's single flat bearing stress strength into consideration.

Table 1 Directly Fixed with Bolts (Refer to Fig. 1.)

Size	Shaft dia.	Bolt size
10	4	M4 or larger
15	5	M5 or larger
20	6	
30	8	M6 or larger

Table 2 Fixed with a Holding Block (Refer to Fig. 2.)

| Size	Shaft dia.	Bolt size	Plate thickness (t)
10	4	M3 or larger	2 or wider
15	5		2.3 or wider
20	6	M4 or larger	3.6 or wider
30	8	M5 or larger	4 or wider

The plate thickness (t) in the table above indicates a reference value when a carbon steel is used. Besides, we do not manufacture a holding block.
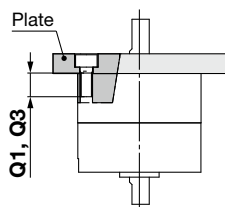

Single flat

(Fig. 1)

Bolt for fixing a load

(Fig. 2)

Hexagon socket head cap screw

Holding block

t
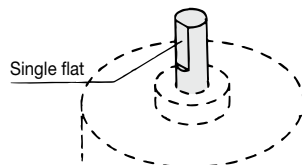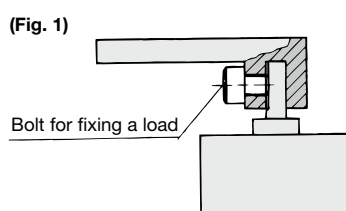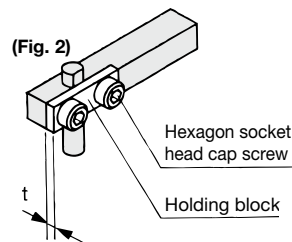
Mounting

Refer to the table below when tightening the mounting bolts.

Mounting 1

Body mounting 1 (Body tapped)

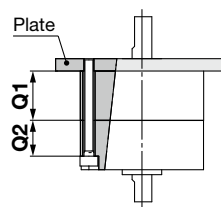Plate

Q1, Q3

Size	Bolt	Recommended tightening torque [N·m]
10	M3	0.63
15	M3	0.63
20	M4	1.50
30	M5	3.0
40	M5	3.0

∗ Refer to the Dimensions for Q1 and Q3 dimensions.

Mounting 2

Body mounting 2 (Body through-hole)

Plate

Q2, Q1

Size	Bolt	Recommended tightening torque [N·m]
10	M2.5	0.36
15	M2.5	0.36
20	M3	0.63
30	M4	1.50
40	M4	1.50

∗ Refer to the Dimensions for Q1 and Q2 dimensions.
∗ Only for standard CRB without auto switch

Adjustment

Do not apply a load when adjusting the rotating angle.

Example) For 180 degrees

1. Set the adjustment bolt B while supplying pressure from the A port.

2. Set the adjustment bolt A while supplying pressure from the B port.
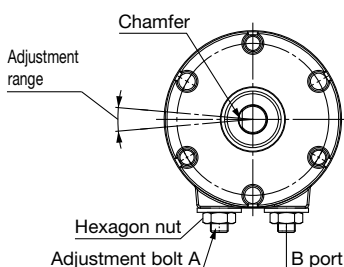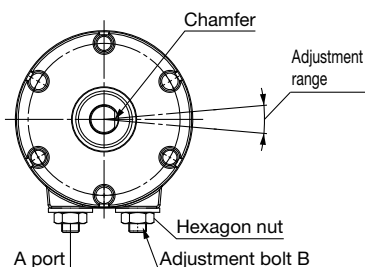
Chamfer

Adjustment range

A port

Adjustment bolt B

Hexagon nut

Chamfer

Adjustment range

Hexagon nut

Adjustment bolt A

B port

☆ **Recommended tightening torque for hexagon nut to fix the adjustment bolt**
Size 20: 1.5 N·m
Sizes 30, 40: 3 N·m

⚠ Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of **"Caution**,**" "Warning"** or **"Danger**.**"** They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)[1], and other safety regulations.

⚠	**Danger:**	**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠	**Warning:**	**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠	**Caution:**	**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

1) ISO 4414: Pneumatic fluid power – General rules and safety requirements for systems and their components.
ISO 4413: Hydraulic fluid power – General rules and safety requirements for systems and their components.
IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.
etc.

⚠ Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.
Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/ equipment until safety is confirmed.
1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.
1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogues and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

⚠ Caution

**We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries.
Use in non-manufacturing industries is not covered.**
Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.
The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.[2] Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided. This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

2) Vacuum pads are excluded from this 1 year warranty.
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

⚠ **Safety Instructions** Be sure to read "Handling Precautions for SMC Products" (M-E03-3) before using.

SMC Corporation (Europe)

Country	Phone	Website	Email
Austria	+43 (0)2262622800	www.smc.at	office.at@smc.com
Belgium	+32 (0)33551464	www.smc.be	info@smc.be
Bulgaria	+359 (0)2807670	www.smc.bg	sales.bg@smc.com
Croatia	+385 (0)13707288	www.smc.hr	sales.hr@smc.com
Czech Republic	+420 541424611	www.smc.cz	office.at@smc.com
Denmark	+45 70252900	www.smcdk.com	smc.dk@smc.com
Estonia	+372 651 0370	www.smcee.ee	info.ee@smc.com
Finland	+358 207513513	www.smc.fi	smc.fi@smc.com
France	+33 (0)164761000	www.smc-france.fr	supportclient.fr@smc.com
Germany	+49 (0)61034020	www.smc.de	info.de@smc.com
Greece	+30 210 2717265	www.smchellas.gr	sales@smchellas.gr
Hungary	+36 23513000	www.smc.hu	office.hu@smc.com
Ireland	+353 (0)14039000	www.smcautomation.ie	technical.ie@smc.com
Italy	+39 03990691	www.smcitalia.it	mailbox.it@smc.com
Latvia	+371 67817700	www.smc.lv	info.lv@smc.com
Lithuania	+370 5 2308118	www.smclt.lt	info.lt@smc.com
Netherlands	+31 (0)205318888	www.smc.nl	info@smc.nl
Norway	+47 67129020	www.smc-norge.no	post.no@smc.com
Poland	+48 22 344 40 00	www.smc.pl	office.pl@smc.com
Portugal	+351 214724500	www.smc.eu	apoiocliente.pt@smc.com
Romania	+40 213205111	www.smcromania.ro	office.ro@smc.com
Russia	+7 (812)3036600	www.smc.eu	sales@smcru.com
Slovakia	+421 (0)413213212	www.smc.sk	sales.sk@smc.com
Slovenia	+386 (0)73885412	www.smc.si	office.si@smc.com
Spain	+34 945184100	www.smc.eu	post.es@smc.com
Sweden	+46 (0)86031240	www.smc.nu	order.se@smc.com
Switzerland	+41 (0)523963131	www.smc.ch	helpcenter.ch@smc.com
Turkey	+90 212 489 0 440	www.smcturkey.com.tr	satis.tr@smc.com
UK	+44 (0)845 121 5122	www.smc.uk	sales.gb@smc.com
South Africa	+27 10 900 1233	www.smcza.co.za	Sales.za@smc.com