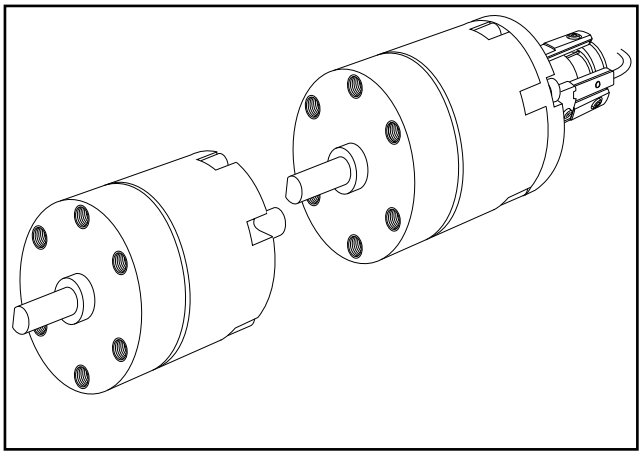
Data Sheet

Rotary actuators

RS stock numbers 726-364 to 726-493



Technical specification

Actuator		10mm dia.	20mm dia.	30mm dia.
Rotation		90°/180°/270°		
Medium		Air		
Proof pressure kgf/cm²		10.5	10.5	15
Operating pressure range kgf/cm²		2-7	1.5-7	1-99
Max. operating cycle (Hz)	90°	5	4	4
	180°	3.5	3	3
	270°	2.5	2	2
Operating temperature		5-60°C		
Lubrication		Not required		

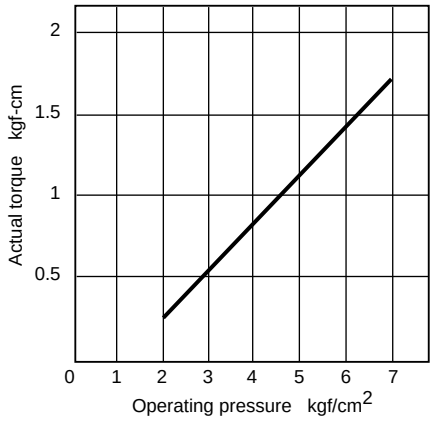
Autoswitch specification

RS stock no.	Type	Operating voltage	Max. current or operating current range
726-459	10mm	24Vac, dc or less	50mA
726-465	20 and 30mm	24Vdc	5-40mA

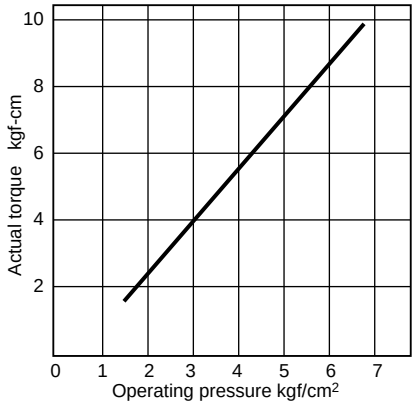
Activator	**RS** stock no.	Kinetic energy kgf/cm	Volume cm^3	Port size	Weight (g)
10mm 90°	726-364	0.0015	1.0	M3	26.3
10mm 180°	726-370	0.0015	1.2	M3	26.0
10mm 270°	726-386	0.0015	1.5	M3	25.7
20mm 90°	726-392	0.004	4.8	M5	106
20mm 180°	726-409	0.004	6.1	M5	105
20mm 270°	726-415	0.004	7.9	M5	103
30mm 90°	726-421	0.15	11.3	M5	203
30mm 180°	726-437	0.15	15.0	M5	198
30mm 270°	726-443	0.15	20.2	M5	193

Actual torque

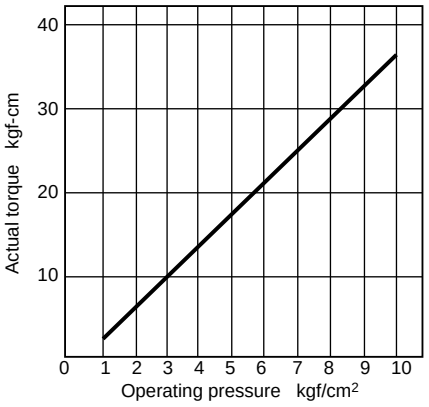
Actuator 10mm bore



Actuator 20mm bore



Actuator 30mm bore



Rotation time setting

Even a small torque generated by the rotary actuator, due to inertia, can cause damage.

Therefore, please control rotation time taking the moment of inertia of the load and kinetic energy into consideration. Further details are given at the end of this data sheet.

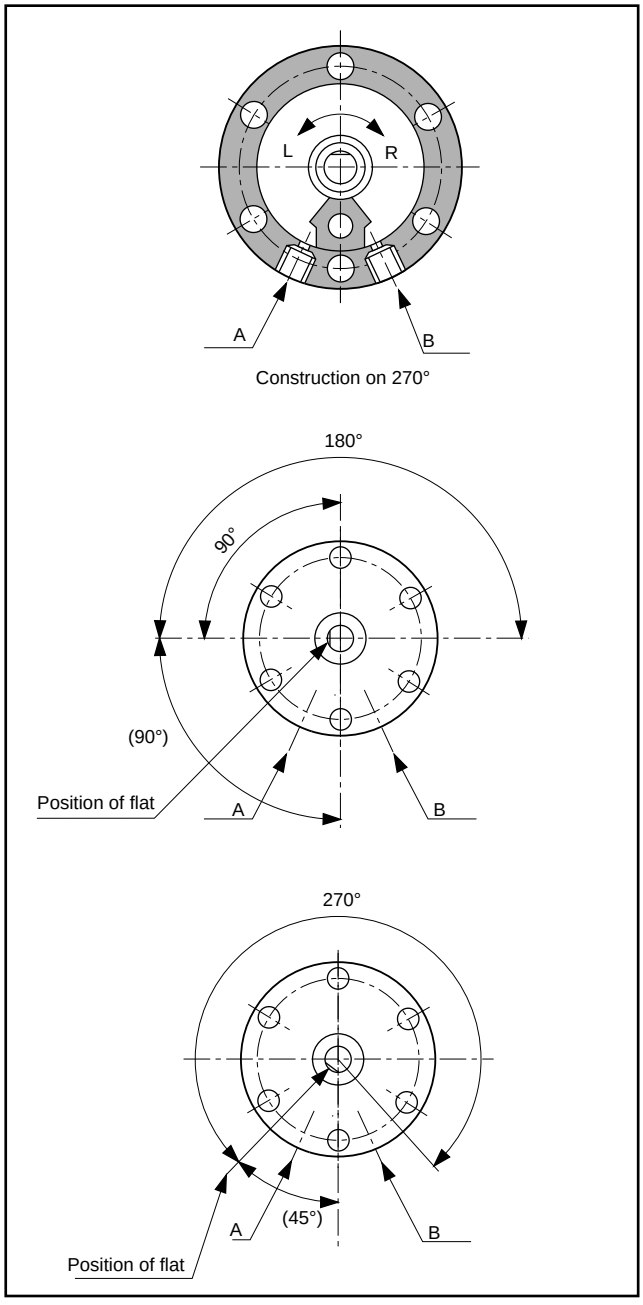
Rotation speed range

If a rotation speed is used slower than 0.3 sec/90° sticking may occur.

Model	Rotation time (sec/90°)
10mm actuator	0.03~0.3
20mm actuator	0.03~0.3
30mm actuator	0.04~0.3

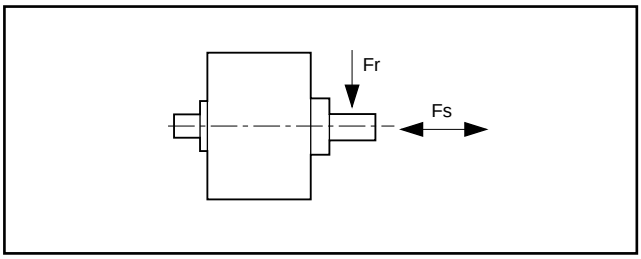
Mounting and travel index

When pressure is applied to the A side, the shaft will rotate clockwise. When applied to the B side, the shaft will rotate counter-clockwise.



Precautions

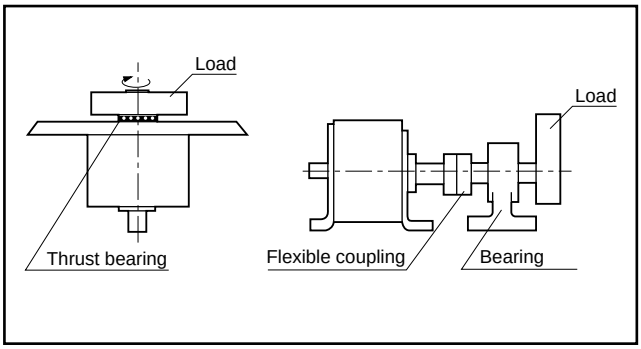
1. Use clean air.
2. Lubrication is not required.
3. If the kinetic energy of the load exceeds the permissible range, use external stops to absorb load.
4. Connect the piping after thoroughly flushing it.
5. Avoid using hydraulic fluid.
6. Shaft load: – If a static (ie. non-dynamic) load only is applied to the actuator, it is possible to apply the load values shown in the table below. In order to obtain the proper operating conditions, it is recommended that the load need not be applied directly to the shaft.



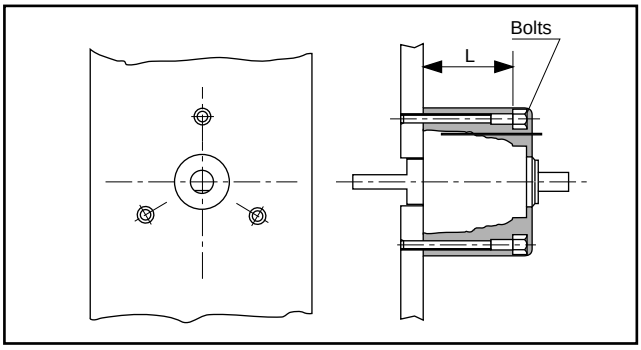
Model	Fr	Fs
10mm actuator	1.5	1.0
20mm actuator	2.5	2.0
30mm actuator	3.0	2.5

Recommended mounting methods

The values given in the above are the maximum values when actuator is not operating (ie. static loading). If your application requires greater load bearing capacity please use other means of support (ie. thrust bearing).



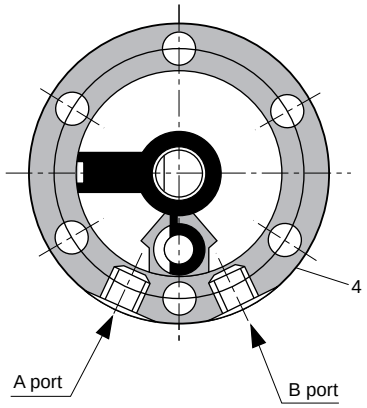
Body to be used as a flange



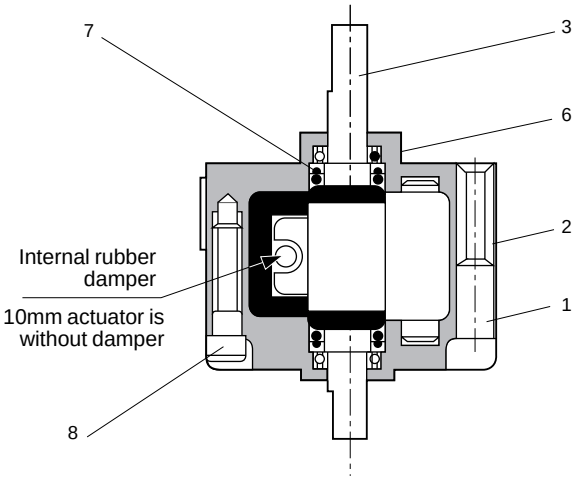
Model	L	Bolts
10mm actuator	11.5	M2.5
20mm actuator	24.5	M3
30mm actuator	34.5	M4

Construction/Parts list

Rotation 270°
View from long shaft end

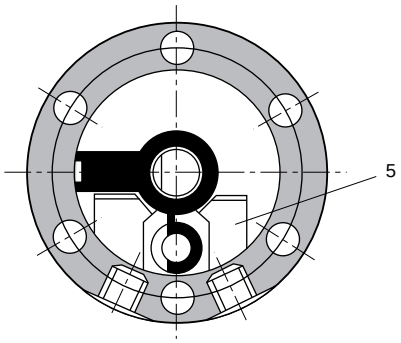


Long shaft end

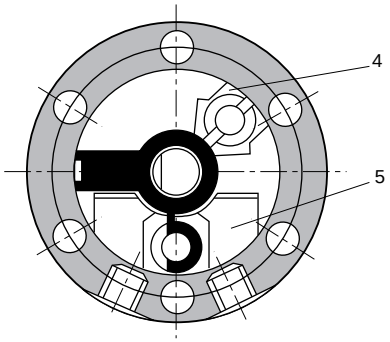


Short shaft end

Rotation 180°
View from long shaft end



Rotation 90°
View from long shaft



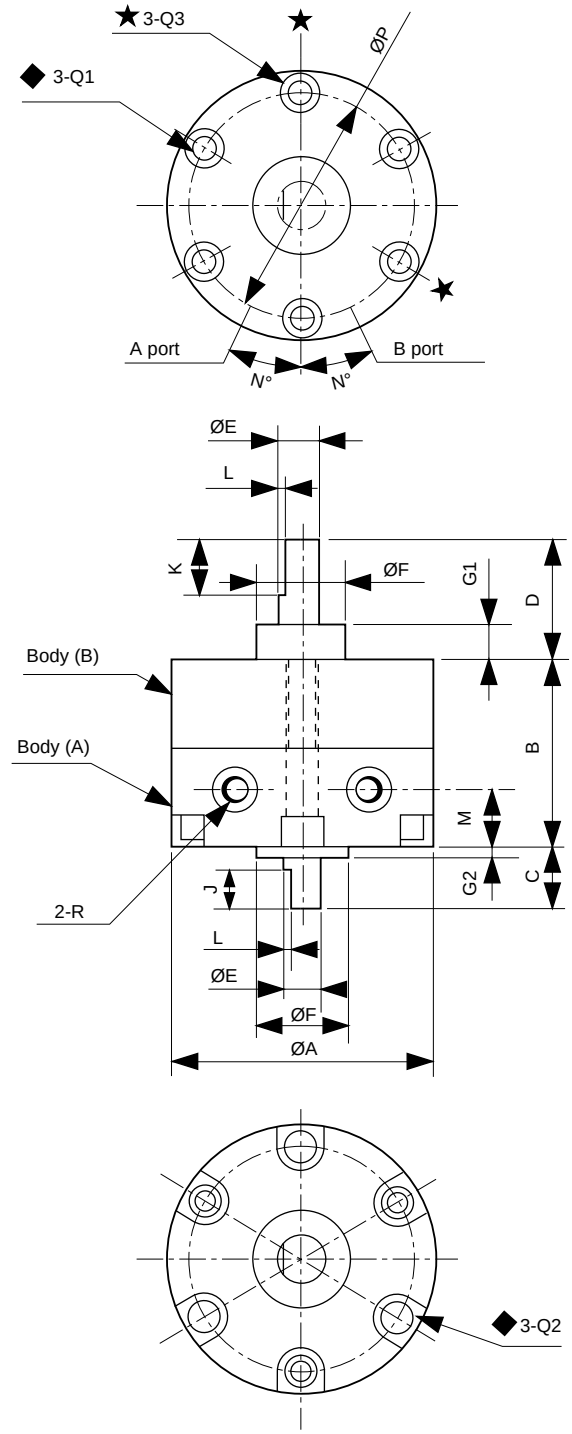
Materials

No.	Description	Material	Note
1	Body (A)	Aluminium alloy	Black alumite
2	Body (B)	Aluminium alloy	Black alumite
3	Vane shaft	Stainless steel*	NBR (lining)
4	Stopper	Resin	Rotation 90 and 270°
5	Stopper	Resin	Rotation 90 and 180°
6	Bearing	Carbon steel	
7	Back up ring	Stainless steel	
8	Hexagon socket head cap screw	Stainless steel	Special bolts

*Except 30mm Ø actuators which are carbon steel

Dimensions

Actuator



Note: Holes of Q1 and Q2 with mark ◆ are drilled through.

Actuator alone

Model	A	B	C	D	E	F	G1	G2	J	K
10mm	29	15	8	14	$4^{-0.004}_{-0.012}$	$9^{0}_{-0.036}$	3	1	5	9
20mm	42	29	10	20	$6^{-0.004}_{-0.012}$	$14^{0}_{-0.043}$	4.5	1.5	7	10
30mm	50	40	13	22	$8^{-0.005}_{-0.014}$	$16^{0}_{-0.043}$	5	2	8	12

Model	L	M	N	P	Depth Q1	Depth Q2	Depth Q3	R90°	R180°	R270°
10mm	0.5	5	25	24	M3	3.4	–	M5	M5	M3
20mm	0.5	9	25	36	M4	4.5	M4	M5	M5	M5
30mm	10	10	25	43	M5	5.5	M5	M5	M5	M5

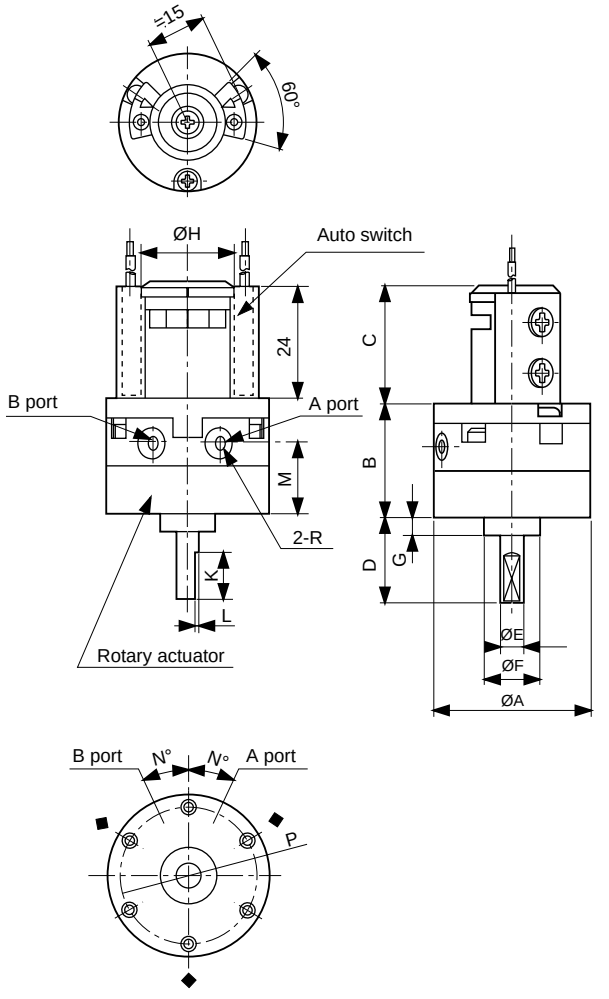
Actuator with autoswitch and case

Model	A	B	C	D	E (g6)	F (h9)	G	H	K	L	M
10mm	29	19	25	14	4	9	3	18.5	9	0.5	10
20mm	42	33.5	25.5	20	6	14	4.5	25	10	0.5	20
30mm	50	45.5	25.5	22	8	16	5	25	12	1	30

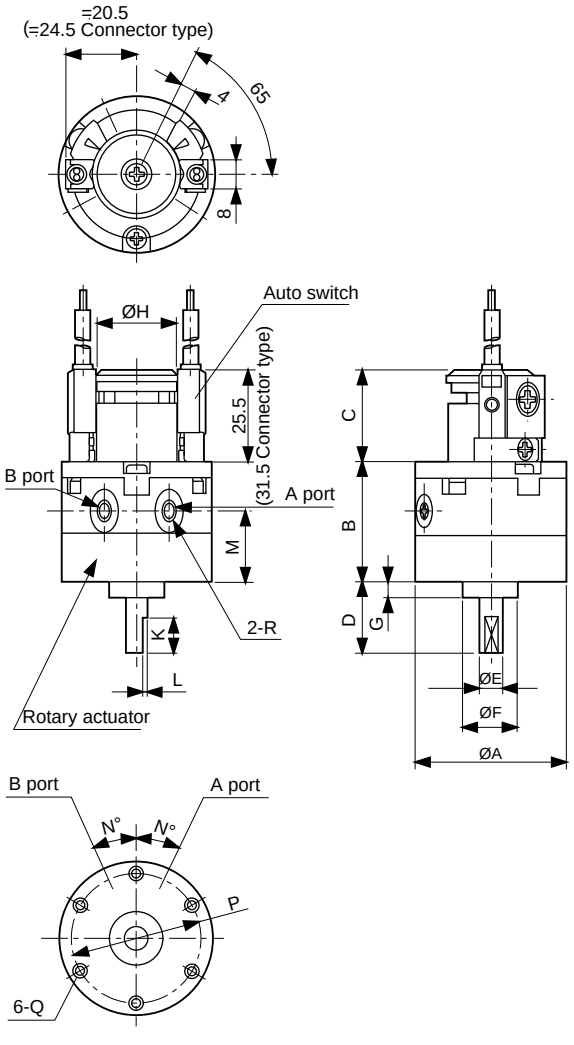
*With each one switch with right hand and left hand mounting.

Model	N	P	Q	R		
				90°	180°	270°
10mm	25	24	M3 × 0.5 (Depth 5)	M5 × 0.8		M3 × 0.5
20mm	25	36	M4 × 0.7 (Depth 7)	M5 × 0.8		
30mm	25	43	M5 × 0.8 (Depth 10)	M5 × 0.8		

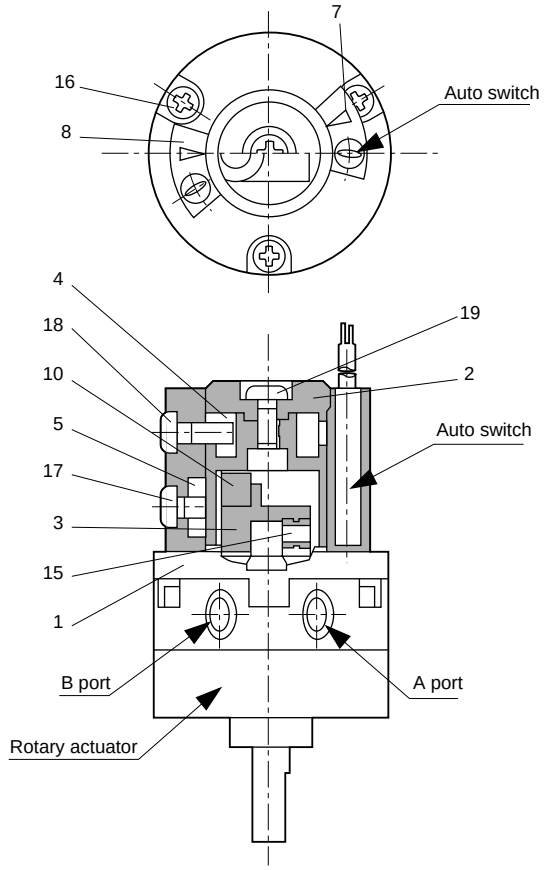
10mm actuator with autoswitch and case



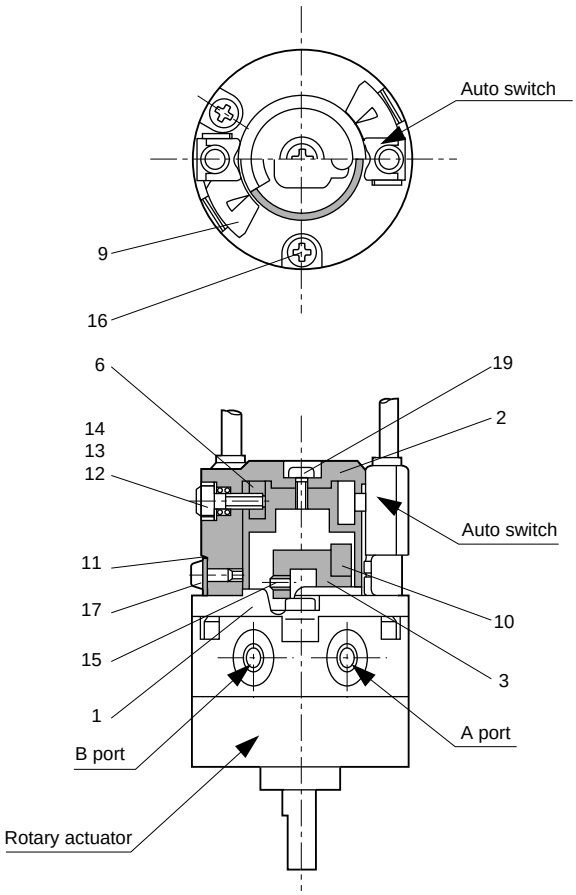
20 and 30mm actuator with autoswitch and case



10mm actuators



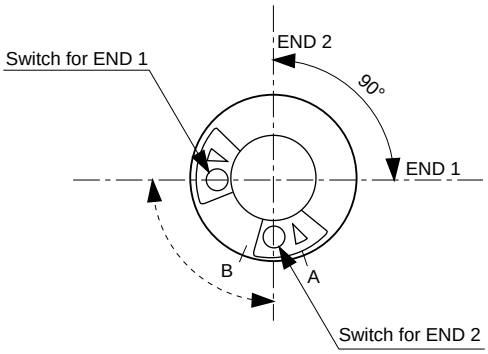
Part list 20-30mm actuators



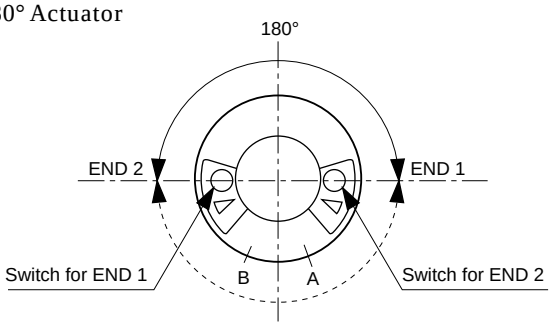
No.	Description	Material	Note
1	Cover 'A'	Resin	Black
2	Cover 'B'	Resin	Black
3	Magnet lever	Resin	Black
4	Fixed block 'A'	Aluminium alloy	Black
5	Fixed block 'B'	Aluminium alloy	
6	Fixed block	Aluminium alloy	Black
7	Switch block 'A'	Resin	Black
8	Switch block 'B'	Resin	Black
9	Switch block	Resin	Black
10	Magnet	Magnetic substance	
11	Arm	Stainless steel	
12	Screw	Stainless steel	
13	Plain washer	Stainless steel	
14	Spring	Stainless steel	
15	Screw	Stainless steel	
16	Screw	Stainless steel	
17	Screw	Stainless steel	
18	Screw	Stainless steel	
19	Screw	Stainless steel	

Range of rotation for output shaft with single spanner flat and position for auto switch

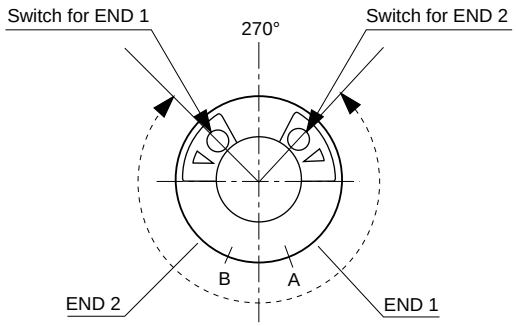
90° Actuator



180° Actuator



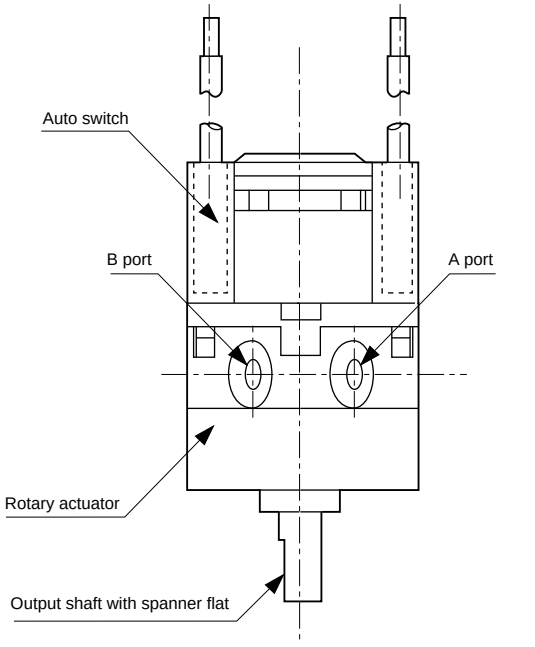
270° Actuator

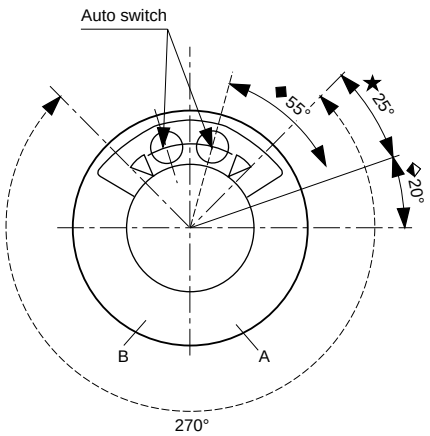


a) In the diagram showing rotation range, the arrowed mark of a solid line shows the range in which output shaft with spanner flat rotates. When single spanner flat indicates the way to END 1, switch for END 1 will operate. When it indicates the way to END 2, switch for END 2 will operate.

b) The arrowed mark of the dotted line shows the range in which built-in magnet rotates, it is possible to make rotation of switch smaller by shifting switch for END 1 clockwise and switch for END 2, counterclockwise.

Note: In the 270 (degree) rotation case





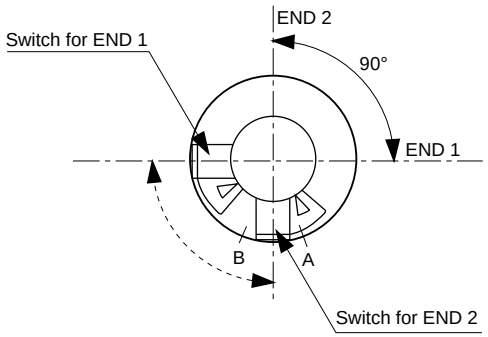
a) There is a ◆55° span between the auto switch set screw and the position indicator.

b) The auto switch will be activated once the rotating magnet approaches within ★25°of the indicator arrow.

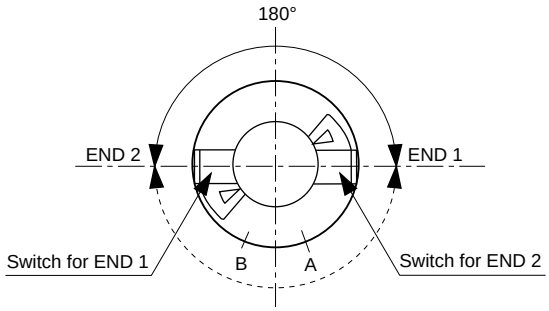
c) The switch will become deactivated when the magnet has moved away from the switch and then entered the span of ⬙25°-45°.

20mm and 30mm actuator

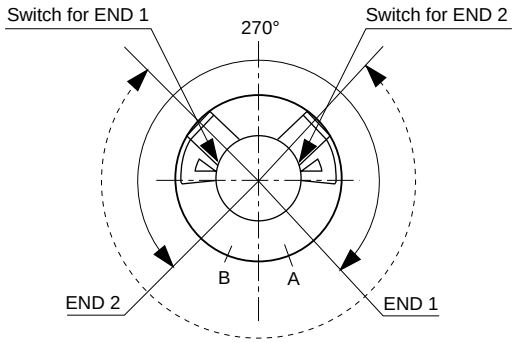
90° – with two switches with right hand mounting



180° – with two switches for right hand mounting



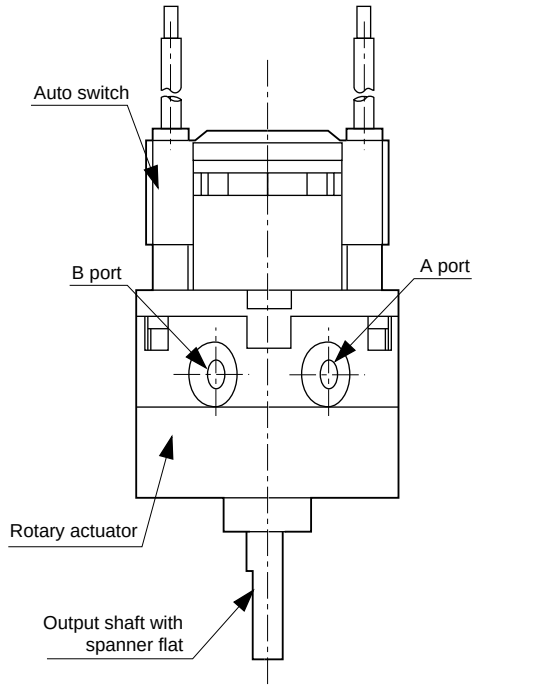
270° – with each switch with right hand and left hand mounting

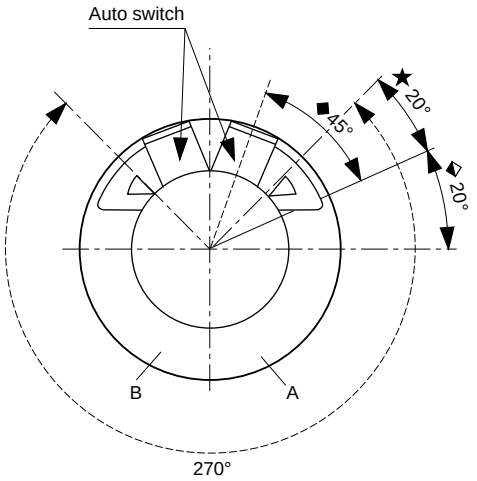


a) In the diagram showing rotation range, the arrowed mark of a solid line shows the range in which output shaft with spanner flat rotates. When single spanner flat indicates the way to END 1, switch for END 1 will operate. When it indicates the way to END 2, switch for END 2 will operate.

b) The arrowed mark of the dotted line shows the range in which built-in magnet rotates, it is possible to make rotation of switch smaller by shifting switch for END 1 clockwise and switch for END 2 counterclockwise.

Note: In the 270 (degree) rotation case





a) There is a ◆45° span between the auto switch set screw and the position indicator.

b) The auto switch will be activated once the rotating magnet approaches within ★20° of the indicator arrow.

c) The switch will become deactivated when the magnet has moved away from the switch and entered the span of ◆ 20°-40°.

How to set rotation time

Even a small torque generated by the rotary actuator, due to inertia of the load, can cause damage to the shaft and internal parts.

Therefore, please set rotation time taking the inertia of the load and kinetic energy into consideration. (The values of kinetic energy in Tables 1 and 2, and Figure 1 will be very helpful in setting the rotation time.)

Table 1: Allowable dynamic load

	Kinetic energy (kgf × cm)	
Model	Use of an internal rubber damper	No use of an internal rubber damper
10mm actuator	0.0015	0.0015
20mm actuator	0.03	0.004
30mm actuator	0.2	0.15

Note 1: For use with internal rubber damper, you should use an actuator for 90°, 180°, or 270° at respective end of rotation 90°, 180° or 270°.
Note 2: For use without internal rubber damper, you should use an actuator for 270° (Figure b) at 90° or 180° by external stopper making use of a single shaft instead of using end of the rotation.

Figure a (90° and 180°)

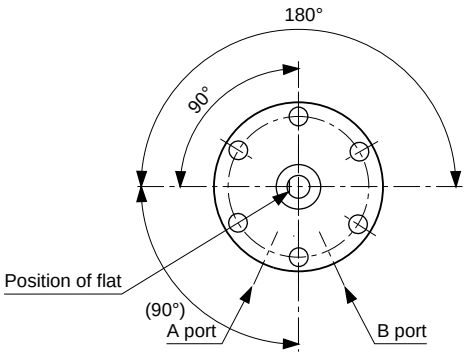


Figure b (270°)

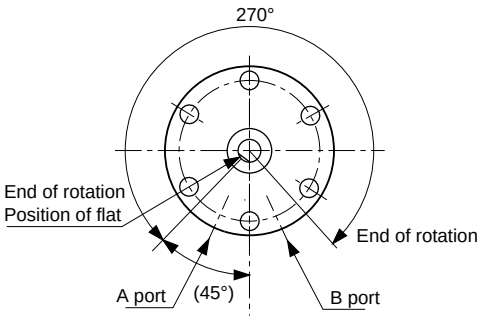


Table 2: Stable rotation time regulation range

Model	Rotation timer (sec/90°)
10mm actuator	0.03~0.3
20mm actuator	0.03~0.3
30mm actuator	0.04~0.3

How to calculate energy of the load:

$$E = \frac{1}{2} \times J \times \omega 2$$

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

E: Kinetic energy (kgf/cm)
J: Moment of inertia (kgf/cm/s^2)
ω: Rotation speed (rad/s)
θ: Rotation (rad) 180° = 3.14 rad
t: Rotation time (s)

If a rotation speed is used slower than 0.3sec/90°, sticking may occur.

Moment of inertia and rotation time

Figure1a 10mm actuators

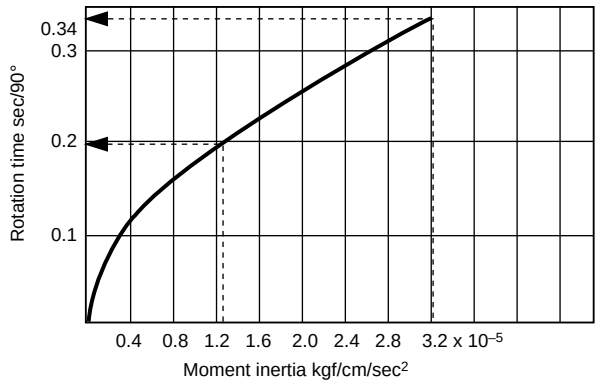


Figure1b 20mm actuators

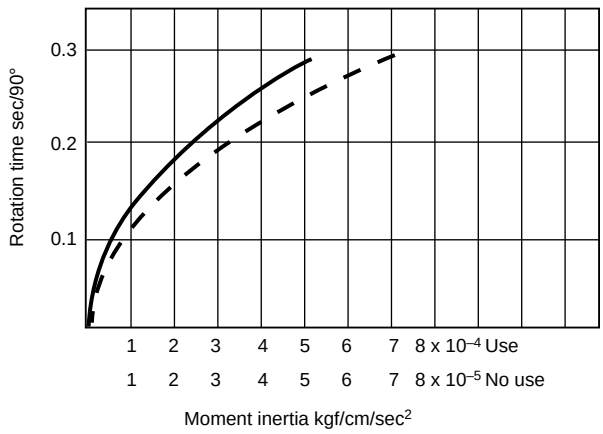
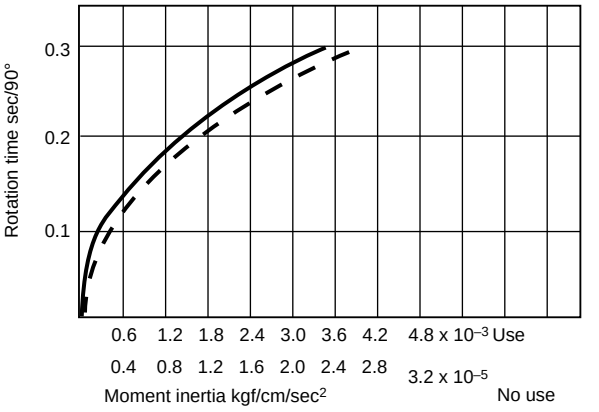


Figure1c 30mm actuators



———:No use of an internal rubber damper (no using at end of rotation)
— — —:Use of an internal rubber damper (using at end of rotation) (with auto-switch)
Note: No internal damper used on 10mm actuator.

How to read diagram

1. **Setting rotation time on load moment of inertia, 1.2×10^{-5}kgf/cm/s²**

   For 10mm actuator (Figure 1a), with moment of inertia 1.2×10^{-5}kgf/cm/s² and rotation time 0.15/90° and stable rotation time regulation range 0.03~0.3/90° (max.) the rotation time will be 0.15~0.3ˢ/90°.

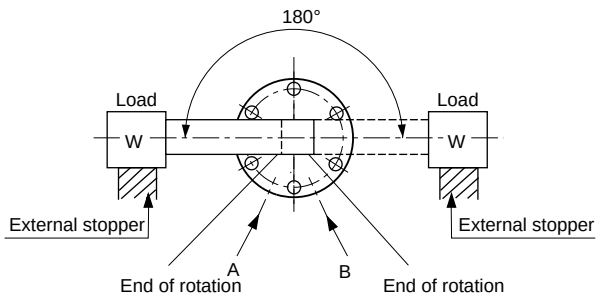
2. **Setting rotation time on load moment of inertia, 3.2×10^{-5} kgf/cm/s²**

   For 10mm actuator (Figure 1a) the rotation time will be 0.3ˢ/90°.

   If rotation time of over 0.03~0.3ˢ/90° (max.) needed it's possible to use within 0.03~0.3ˢ/90° by using an external stopper as shown in Figure 2 below and stopping the rotation force of the load.

   *Please use a shock absorber at the end of the rotation for 270°.

Figure 2 (For 270°)

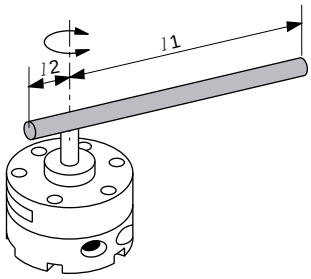


How to calculate a moment of inertia

Calculating a moment of inertia

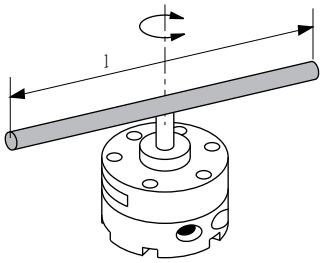
J: Moment of inertia (kgf/cm/s^2) Weight: Weight of load (kgf) g: Acceleration due to gravity (980cm/s^3)

1. Thin rod
   Position of pivot: Passes through one end perpendicular to the rod.



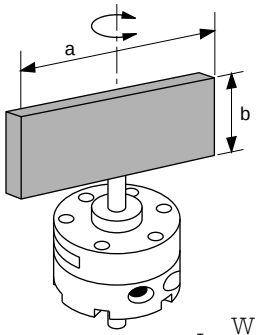
$$J = \frac{W_1}{g} \times \frac{l_1^2}{3} \quad \frac{W_2}{g} \times \frac{l_2^2}{3}$$

2. Thin rod
   Position of pivot: Passes through the centre of gravity perpendicular to the rod.



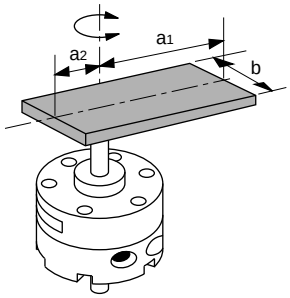
$$J = \frac{W}{g} \times \frac{l^2}{12}$$

3. Thin rectangular plate (rectangular parallel piped)
   Position of pivot: Passes through the centre of gravity, parallel to side b.



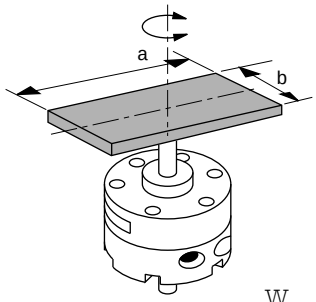
$$J = \frac{W}{g} \times \frac{a^2}{12}$$

4. Thin rectangular plate (rectangular parallel piped)
   Position of pivot: Passes through one end perpendicular to the plate.



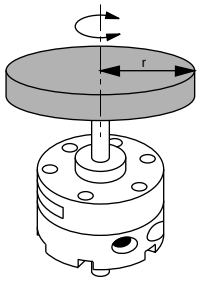
$$J = \frac{W_1}{g} \times \frac{4a_1^2 + b^2}{12} + \frac{W_2}{g} \times \frac{4a_2^2 + b^2}{12}$$

5. Thin rectangular plate (rectangular parallel piped)
   Position of pivot: Passes through the centre of gravity, perpendicular to the plate (inclusive of rectangular parallel piped)



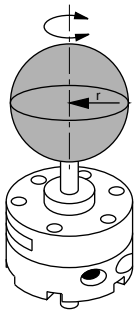
$$J = \frac{W}{g} \times \frac{a^2 + b^2}{12}$$

6. Column (inclusive of thin disk)
   Position of pivot: Axis.



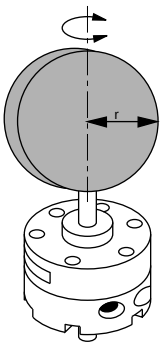
$$J = \frac{W}{g} \times \frac{r^2}{2}$$

7. Solid globe
Position of pivot: Diameter.



$$J = \frac{W}{g} \times \frac{2r^2}{5}$$

8. Thin disk
Position of pivot: Diameter.

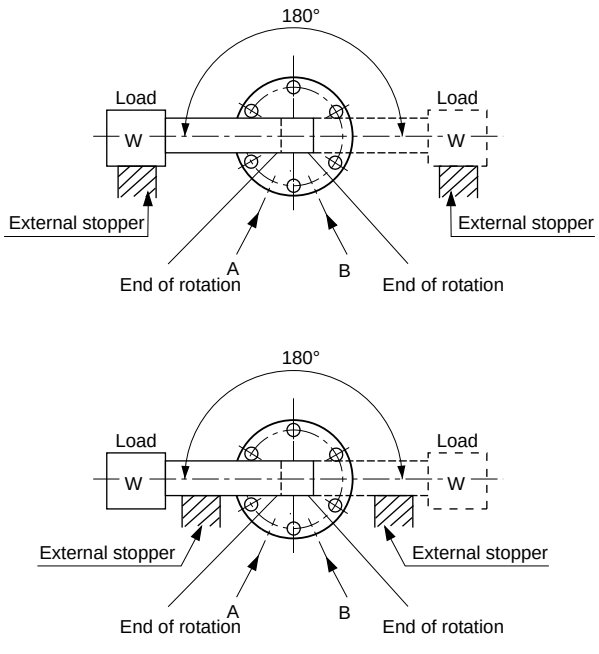


$$J = \frac{W}{g} \times \frac{r^2}{2}$$

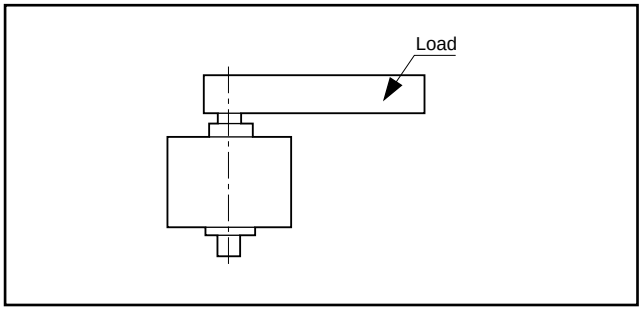
Installation of external stop

Since the shaft and bearings of the actuator could be damaged depending on the shape of load and installation, install an external stop at the mass point of the work or at the load location furthest away from the actuator.

When the load exceeds the allowable energy and the external stop has no shock absorption capability, avoid using the single flat shaft, also avoid installation of external stop anywhere along the length of the actuator.



1. Stop of load movement via external stop
Never use a single flat shaft when the external stop has no ability to absorb the shock.



2. Movement stop by using the single flat shaft and external stop
When the external stop has the ability to absorb the shock, and the load is within the allowable energy limit, the single flat shaft can be used for stopping.