How to Order

Size: 1, 2, 3, 7

Clean series

11	Vacuum suction type

A	High precision style
B	Basic style

Size

1
2
3
7

Nil	Side ported
E	Front ported

11 - MSQ B 1 A □ - M9B □

A	With adjustment bolt

Auto switch

Reed switch	A90
Solid state switch	M9B, M9N, F8B, F8N

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	n pcs.

Size: 10, 20, 30, 50

Clean series

11	Vacuum suction type

Size

10
20
30
50

11 - MSQ B 10 A - M9B □

22 - MSQ B 10 A - M9B □

Copper, fluorine and silicon-free + Low particle generation

22	Vacuum suction type

A	High precision style
B	Basic style

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	n pcs.

Auto switch

Reed switch	A90
Solid state switch	M9B, M9N

A	With adjustment bolt
R	With internal shock absorber

Auto switch specifications

Type		Auto switch model	Load voltage	Load current range	Indicator light	Applicable load
Reed switch		**D-A90**	24 VAC or less, 48 VAC or less, 100 VAC or less 24 VDC or less, 48 VDC or less, 100 VDC or less	50mA, 40mA, 20mA	No	IC circuit, Relay, PLC
Solid state switch	2-wire	**D-M9B, D-F8B**	24 VDC (10 to 28 VDC)	2.5 to 40 mA	Yes	24 VDC relay, PLC
	3-wire	**D-M9N, D-F8N**	24 VDC (4.5 to 28 VDC)	40 mA or less	Yes	24 VDC relay, PLC

Refer to page 212 for a list of applicable auto switches.

Specifications

Size		1	2	3	7	10	20	30	50
Fluid		Air (Non-lube)							
Maximum operating pressure	**With adjustment bolt**	0.7MPa				1MPa			
	With internal shock absorber	Not available				0.6MPa			
Minimum operating pressure	**Basic style**	0.1MPa							
	High precision style	0.1MPa				0.2MPa	0.1MPa		
Ambient and fluid temperature		0 to 60°C (No freezing)							
Cushion	**With adjustment bolt**	Not available	Rubber bumper						
	With internal shock absorber	Not available				Shock absorber			
Allowable kinetic energy (mJ)	**With adjustment bolt**	1	1.5	2	6	7	25	48	81
	With internal shock absorber	Not available				39	116	116	294
Angle adjustment range		0 to 190°C							
Maximum rotation		190°C							
Rotation time adjustment range	**With adjustment bolt**	0.2 to 0.7 s/90°			0.2 to 1.0 s/90°				
	With internal shock absorber	Not available				0.2 to 0.7 s/90°			
Port size		M3 x 0.5			M5 x 0.8			Rc 1/8, M5 x 0.8	
Grease		11-: Fluorine grease 22-: Lithium soap based grease							
Particle generation grade **(Refer to front matter pages 13 to 22 for details.)**		11-: Grade 1 22-: Grade 1							

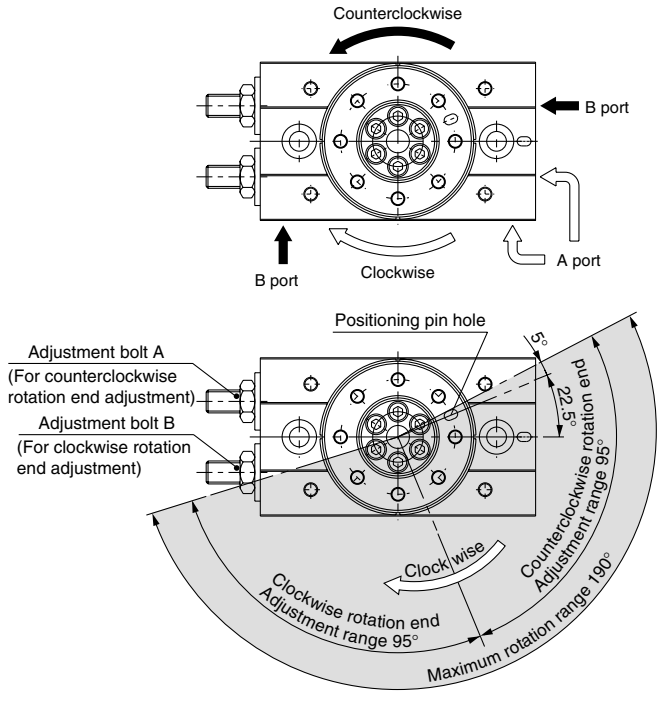
Suction flow rate of vacuum suction type (Reference values)

Size	Suction flow rate ℓ/min (ANR)
1/2/3/7 10/20/30/50	1

Rotation range example

· The rotary table turns in the clockwise direction when the A port is pressurized, and in the counterclockwise direction when the B port is pressurized.
· By adjusting the adjustment bolt, the rotation end can be set within the ranges shown in the drawing for the desired rotation angle.
· The rotation angle can also be set on a type with internal absorber.

Size: 1 to 7

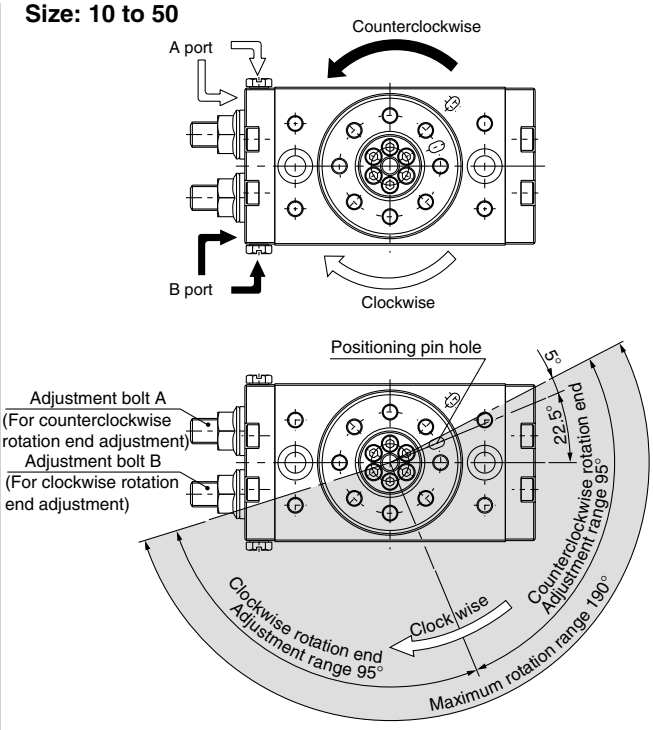


Note) · The drawing shows the rotation range of the positioning pin hole.
· The pin hole position in the drawing shows the counterclockwise rotation end when the adjustment bolts A and B are tightened equally and the rotation is adjusted 180°.

With adjustment bolt, internal shock absorber

Size	Adjustment angle per rotation of angle adjustment bolt
1	8.2°
2	10.0°
3	10.9°
7	10.2°

Size: 10 to 50



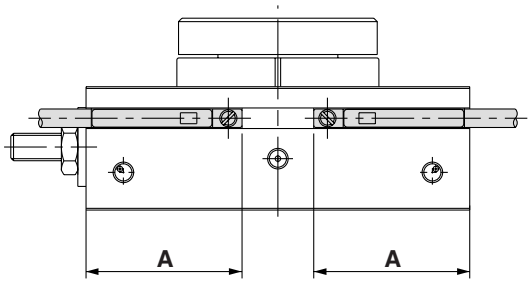
Note) · The drawing shows the rotation range of the positioning pin hole.
· The pin hole position in the drawing shows the counterclockwise rotation end when the adjustment bolts A and B are tightened equally and the rotation is adjusted 180°.

With adjustment bolt, internal shock absorber

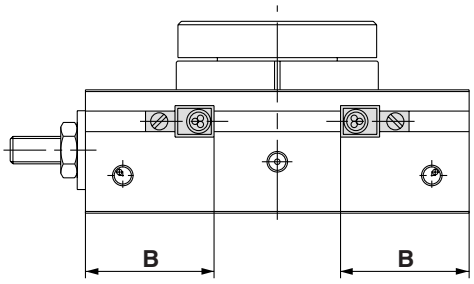
Size	Adjustment angle per rotation of angle adjustment bolt
10	10.2°
20	7.2°
30	6.5°
50	8.2°
70	7.0°
100	6.1°
200	4.9°

Proper auto switch mounting position at rotation end

Size: 1 to 7



D-F9, M9

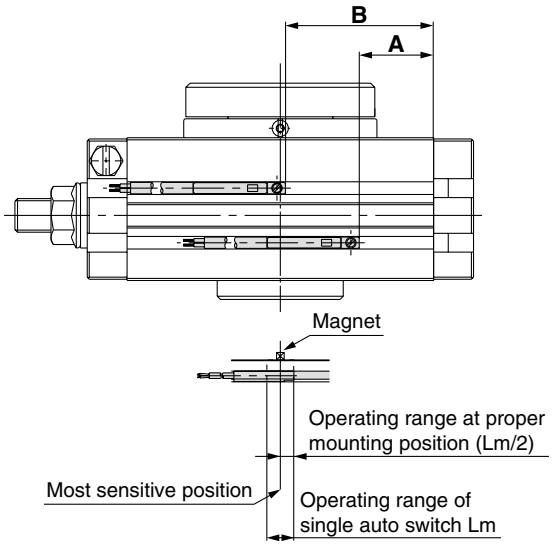


D-F8

Size	Rotating angle	Solid state switch					
		D–M9□			D–F8□		
		A	Operating angle θ m	Hysteresis angle	B	Operating angle θ m	Hysteresis angle
1	190°	20.9	55°	10°	16.9	20°	10°
2	190°	22.8	45°	10°	18.8	20°	10°
3	190°	24.4	40°	10°	20.4	15°	10°
7	190°	28.7	40°	10°	24.7	15°	10°

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

Size: 10 to 50

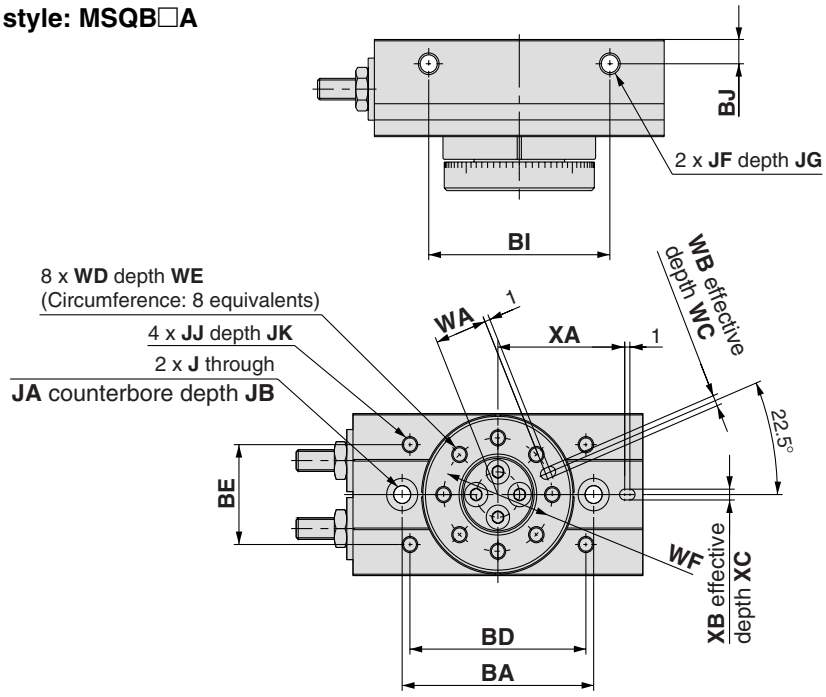


Size	Rotating angle	Reed switch				Solid state switch			
		D–A9□, D–A9□V				D–M9□			
		A	B	Operating angle θ m	Hysteresis angle	A	B	Operating angle θ m	Hysteresis angle
10	190°	17	36	90°	10°	21	40	60°	10°
20	190°	23	50	80°	10°	27	54	50°	10°
30	190°	27	66	65°	10°	31	60	50°	10°
50	190°	33	68	50°	10°	37	72	40°	10°

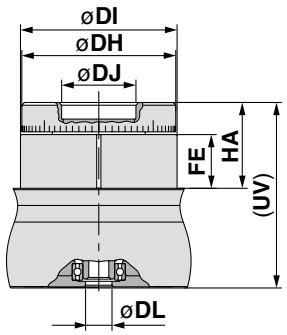
Operating angle θ m: Converts the operating range (Lm) of the auto switch into the rotation angle
Angle of hysteresis: The hysteresis of the auto switch is converted to degrees.

Dimensions: Size 1, 2, 3, 7

Basic style: MSQB□A

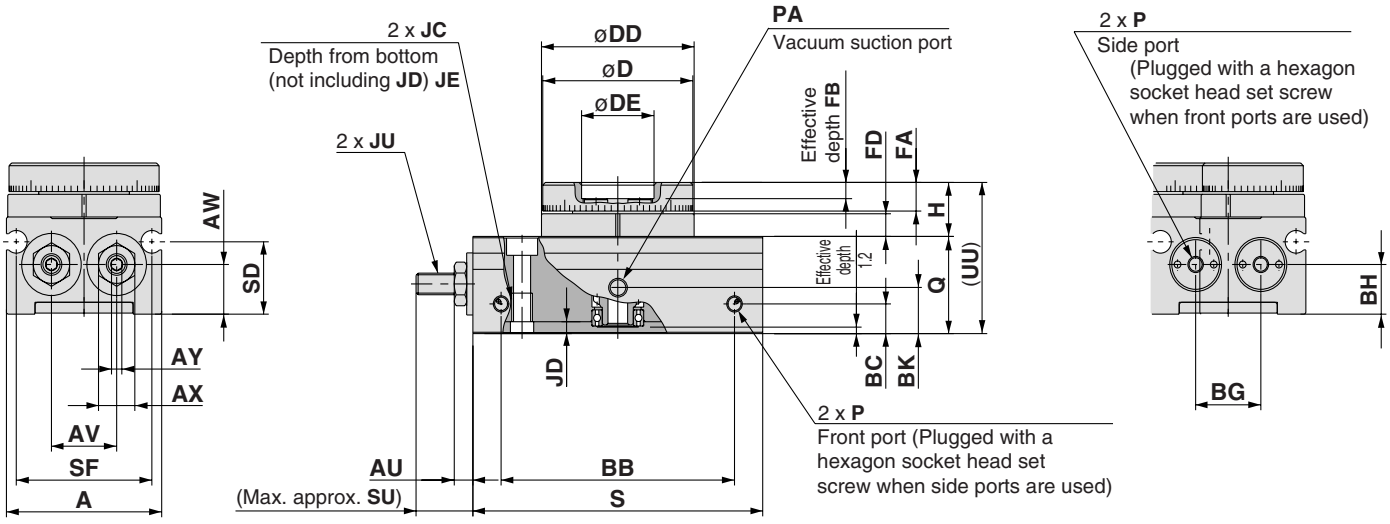


High precision style: MSQA□A



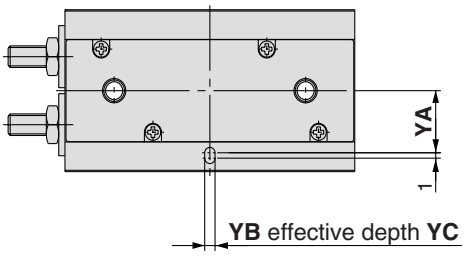
(mm)

Size	DH	DI	DJ	DL	FE	HA	UV
1	27h8	27.5h8	14H8	4.5H8	8.2	13.5	29.5
2	29h8	29.5h8	14H8	5 H8	9.7	15.5	33.5
3	33h8	34h8	17H8	6 H8	9.7	15.5	36
7	39h8	40h8	20H8	7 H8	9.5	16.5	39.5



(mm)

Size	A	AU	AV	AW	AX	AY	BA	BB
1	28	2.8	11	8.2	5.5	1.5	35	39.6
2	30	3.6	12.6	9.2	7	2	37	45.1
3	34.5	4.4	15.5	10.5	8	2.5	43	46.7
7	41	4.8	18.4	12.2	10	3	50	59.2



(mm)

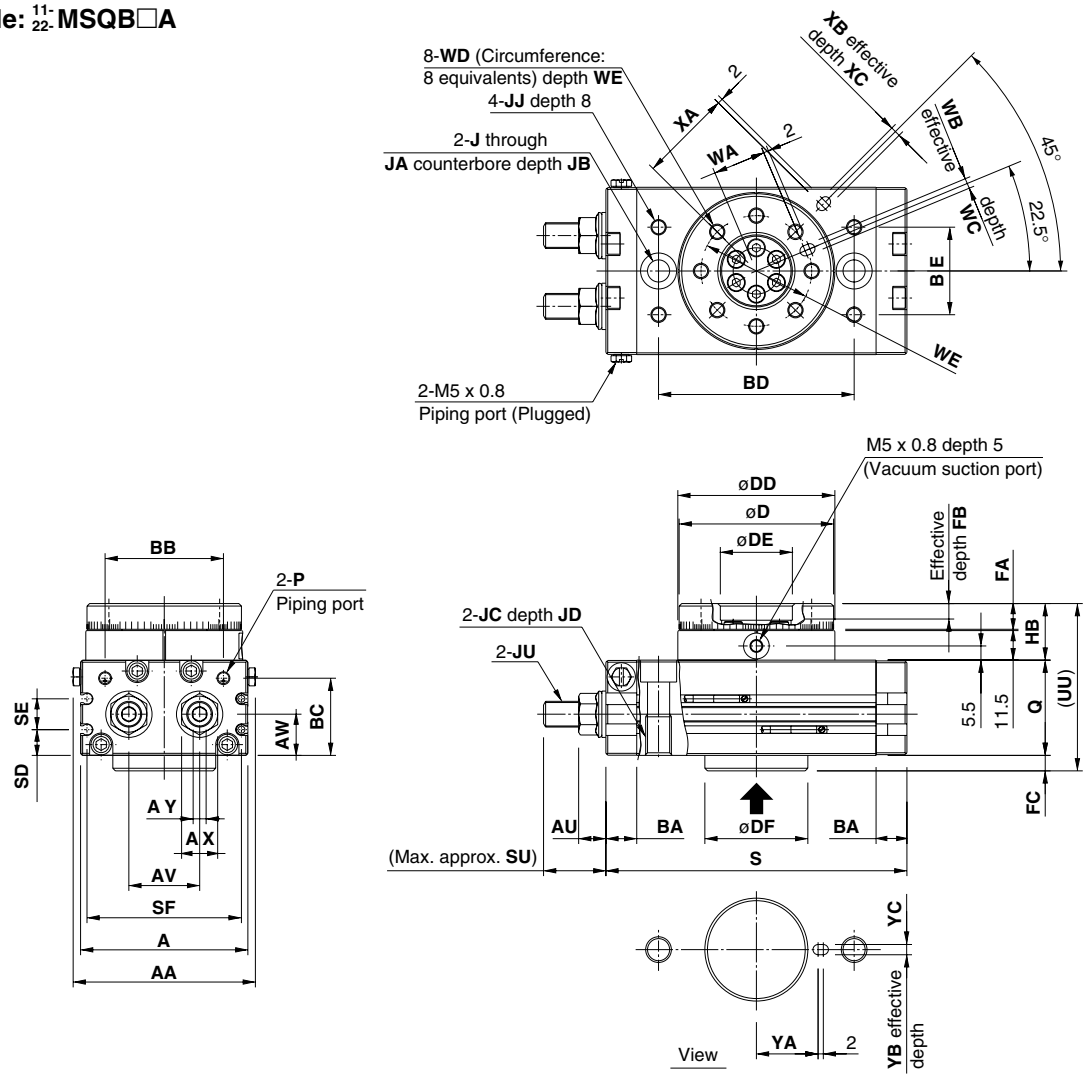
Size	BC	BD	BE	BG	BH	BI	BJ	BK	D	DD	DE	FA	FB	FD	H	J	JA	JB	JC	JD	JE	JF	JG
1	4.5	32	17	11	8.2	30	4.5	5.3	27h9	27.5h9	14H9	4.8	2	3.7	9	3.3	6	3.5	M4 x 0.7	2.2	5.3	M4 x 0.7	4
2	5.5	34	18.5	12.6	9.2	35	4.5	7.5	29h9	29.5h9	14H9	5.3	2.5	4.2	10	3.3	6	3.5	M4 x 0.7	2.2	5.3	M4 x 0.7	4
3	5.5	38	23	15.5	10.5	40	4.5	9.5	33h9	34 h9	17H9	5.3	2.5	4.2	10	4.2	7.5	4.5	M5 x 0.8	2.5	6	M4 x 0.7	4
7	5.5	45	30	18.4	12.2	50	5	7	39h9	40 h9	20H9	6.5	2.5	4.5	11.5	4.2	7.5	4.5	M5 x 0.8	2.5	6	M5 x 0.8	5

(mm)

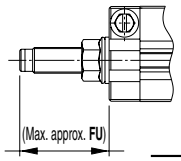
Size	JJ	JK	JU	P	PA	Q	S	SD	SF	SU	UU	WA	WB	WC	WD	WE	WF	XA	XB	XC	YA	YB	YC
1	M3 x 0.5	3.5	M3 x 0.5	M3 x 0.5	M3 x 0.5	16	50.5	10.8	24.4	9.4	25	9.5	2H9	2	M3 x 0.5	4.8	20	22.5	2H9	2	11	2H9	2
2	M3 x 0.5	3.5	M4 x 0.7	M3 x 0.5	M3 x 0.5	18	56	13.4	26.2	11.3	28	10	2H9	2	M3 x 0.5	5.3	21	24.5	2H9	2	11.5	2H9	2
3	M3 x 0.5	3.5	M5 x 0.8	M3 x 0.5	M3 x 0.5	20.5	60	15.2	31	11.8	30.5	12	2H9	2	M3 x 0.5	5.3	25	27	2H9	2	13.5	2H9	2
7	M4 x 0.7	4.5	M6 x 1	M5 x 0.8	M5 x 0.8	23	73.5	15.4	37.4	14.9	34.5	14	3H9	3	M4 x 0.7	6.5	29	32.5	3H9	3	15.5	3H9	3

Dimensions: Size 10, 20, 30, 50

Basic style: 11-22-MSQB□A



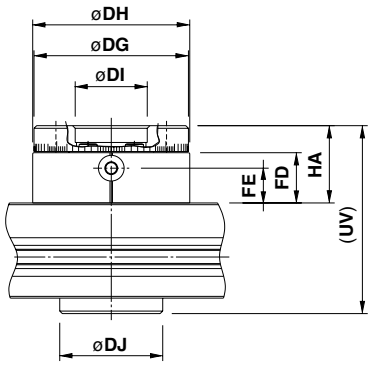
With internal shock absorber
11-22- **MSQA□□R**
11-22- **MSQB□□R**



(mm)

Size	FU
10	31.5
20	34.7
30	34.7
50	51.7

High precision style
11-22- **MSQA□□A**
11-22- **MSQA□□R**



(mm)

Size	DG	DH	DI	DJ	FD	FE	HA	UV
10	45h8	46h8	20H8	35h8	15.5	9.5	24	63
20	60h8	61h8	28H8	40h8	19.5	13.5	30	73
30	65h8	67h8	32H8	48h8	19.5	13.5	30	76
50	75h8	77h8	35H8	54h8	21.5	15.5	34	87

(mm)

Size	AA	A	AU	AV	AW	AX	AY	BA	BB	BC	BD	BE	D	DD	DE	DF	FA	FB	FC	HB	J	JA	JB	JC	JD
10	55.4	50	8.6	20	15.5	12	4	9.5	34.5	27.8	60	27	45h9	46h9	20H9	35h9	8	4	5	20	6.8	11	6.5	M8 x 1.25	12
20	70.8	65	10.6	27.5	16	14	5	12	46	30	76	34	60h9	61h9	28H9	40h9	10	6	6	22	8.6	14	8.5	M10 x 1.5	15
30	75.4	70	10.6	29	18.5	14	5	12	50	32	84	37	65h9	67h9	32H9	48h9	10	4.5	6	22	8.6	14	8.5	M10 x 1.5	15
50	85.4	80	14	38	22	19	6	15.5	63	37.5	100	50	75h9	77h9	35H9	54h9	12	5	7	24	10.5	18	10.5	M12 x 1.75	18

Size	JJ	JU	P	Q	S	SD	SE	SF	SU	UU	WA	WB	WC	WD	WE	WF	XA	XB	XC	YA	YB	YC
10	M5 x 0.8	M8 x 1	M5 x 0.8	34	92	9	13	45	17.7	59	15	3H9	3.5	M5 x 0.8	8	32	27	3H9	3.5	19	3H9	3.5
20	M6 x 1	M10 x 1	M5 x 0.8	37	117	10	12	60	25	65	20.5	4H9	4.5	M6 x 1	10	43	36	4H9	4.5	24	4H9	4.5
30	M6 x 1	M10 x 1	Rc 1/8	40	127	11.5	14	65	25	68	23	4H9	4.5	M6 x 1	10	48	39	4H9	4.5	28	4H9	4.5
50	M8 x 1.25	M14 x 1.5	Rc 1/8	46	152	14.5	15	75	31.4	77	26.5	5H9	5.5	M8 x 1.25	12	55	45	5H9	5.5	33	5H9	5.5

Rotary actuators: Precautions 1

Be sure to read before handling. Refer to main text for more detailed precautions on every series.

Caution on design

⚠Warning

1. If the operation involves load fluctuations, ascending / descending movements, or changes in frictional resistance, make sure to provide safety measures.
Operating speed will increase, and bodily injury may occur, or damage to the machinery itself may occur.

2. If there is a chance that it will pose a hazard to humans, install a protective cover.
If the moving portion of the product will pose a hazard to humans or will damage machinery or equipment, provide a construction that prevents direct contact with those areas.

3. Make sure that the secured portions will not loosen.
Be sure to adopt a reliable connecting method if the rotary actuator is used very frequently or if it is used in a location that is exposed to a large amount of vibrations.

4. There may be cases in which a speed reduction circuit or a shock absorber is required.
If the driven object moves at high speeds or has a large weight, it will be unfeasible for the rotary actuator's cushions alone to absorb shocks. Therefore, provide a speed-reduction circuit to reduce the rotary actuator's speed before the thrust is applied to the cushions, or an external shock absorber to dampen the shocks. If these countermeasures are taken, make sure to take the rigidity of the mechanical equipment into consideration.

5. Consider the possibility of a reduction in the circuit air pressure that could be caused by power outages.
When actuator is used as clamping mechanism, there is a danger of workpiece dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage. Therefore, safety equipment should be installed to prevent damage to machinery and bodily injury.

6. Consider the possibility of power source related malfunctions that could occur.
On the pieces of equipment that rely on power sources such as compressed air, electricity, or hydraulic pressure, adopt a countermeasure that will prevent these pieces of equipment from causing hazards to humans or damage to equipment in the event of a malfunction in these power sources.

7. If a speed controller is provided in the exhaust restrictor, implement a safety design taking the residual pressure into consideration.
If air pressure is applied to the air supply side without residual pressure in the exhaust side, the rotary actuator will operate at abnormally high speeds, which could pose a hazard to humans and damage the machinery and equipment.

8. Consider the behavior of the rotary actuator in the event of an emergency stop.
Devise a system that ensures safety so that if a person engages the emergency stop, or if a safety device is tripped during a system malfunction such as a power outage, the halting of the machine will not cause the movement of the rotary actuator to pose a hazard to humans or damage the equipment.

9. Consider the behavior of the rotary actuator when restarting after an emergency stop.
Devise a design that ensures safety so that the restarting of the rotary actuator will not pose a hazard to humans or damage the equipment.
When the actuator has to be reset at the starting position, install safe manual control equipment.

Caution on design

⚠Warning

10. Do not use the product as a shock absorber.
If an abnormal pressure or air leakage occurs, the rotary actuator's speed reduction capability could become severely effected, which could pose a hazard to humans and damage the machinery and equipment.

Selection

⚠Warning

1. Select a speed within the product's allowable energy value.
If the product is used in a state in which the kinetic energy of the load exceeds the allowable value, it could damage the product, which could pose a hazard to humans and damage the machinery and equipment.

2. Provide a shock absorber if the kinetic energy that is applied to the product exceeds the allowable value.
If the product is used in a state in which the kinetic energy exceeds the allowable value, it could damage the product, which could pose a hazard to humans and damage the machinery and equipment.

3. Do not stop or hold the product at midpoint by keeping air pressure in the product.
With the product lacking an external stopping mechanism, if the directional control valve is closed to keep the air pressure in the product in an attempt to stop the product at midpoint, it might not be possible to maintain that stopped position due to an air leakage. As a result, it could pose a hazard to humans and damage machinery and equipment.

⚠Caution

1. Do not operate the product in a low speed range below the speed adjustment range specified for the product.
If the product is used in the low speed range below the specified speed adjustment range, it could cause the product to stick, slip, or to stop its movement.

2. Do not apply an external torque to the product that exceeds the rated output.
If an external force that exceeds the product's rated output is applied to the product, it could damage the product.

3. The holding torque of the rotating end of the double piston style
With a double piston product, if the internal piston is stopped by coming into contact with the angle adjustment screw or the cover, the holding torque at the rotating end is one-half that of the actual output.

4. If it is necessary to provide repeatability of the rotation angle, directly stop the load externally.
Even with a product that is equipped with an angle adjuster, there are times in which the initial rotation angle could change.

5. Do not use the product under hydraulic pressure.
The product will be damaged if it is used by applying hydraulic pressure.

6. With the vane style product, if it is necessary to ensure a rotation angle, make sure to use a minimum pressure of 0.3 MPa.

Rotary actuators: Precautions 2

Be sure to read before handling. Refer to main text for more detailed precautions on every series.

Mounting

⚠Warning

1. Before adjusting the angle by supplying air pressure, take appropriate measures to prevent the equipment from rotating unnecessary.
When an adjustment is performed under air pressure, the equipment could rotate and fall during the adjustment, depending on the mounted posture of the equipment. As a result, it could pose a hazard to humans and damage the machinery and equipment.

2. Do not loosen the angle adjustment screw beyond the allowable adjustment range.
The angle adjustment screw could pull out if it is loosened beyond its allowable adjustment range, which could pose a hazard to humans and damage the machinery and equipment.

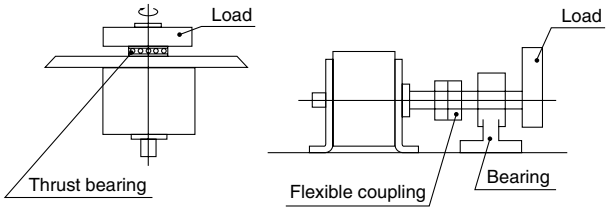
3. Do not place a magnetic object near the product.
The auto switch is a magnetic sensing type. If a magnetic object is placed close to it, the rotary actuator could operate suddenly, which could pose a hazard to humans and damage the machinery and equipment.

4. Do not modify the product.
By modifying the product, its strength could be affected, which could lead the product to break. As a result, it could pose a hazard to humans and damage the machinery and equipment.

5. Do not enlarge the fixed throttle by modifying the pipe connectors.
If the hole diameter is enlarged, the product's rotation speed increases, causing the shock force to increase and damage the product. As a result, it could pose a hazard to humans and damage the machinery and equipment.

6. If shaft couplings are to be used, use those with angular freedom.
If shaft couplings that lack angular freedom are used, they could scrape due to eccentricity, leading to equipment malfunction and product damage. As a result, it could pose a hazard to humans and damage the machinery and equipment.

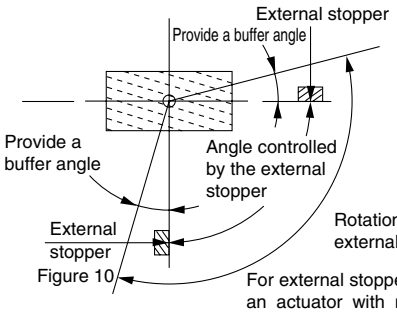
7. Do not apply to the shaft a load that exceeds the values given.
If a load that exceeds the allowable value is applied to the product, it could lead to equipment malfunction, which could pose a hazard to humans and damage the machinery and equipment.
Provided that a dynamic load is not generated, a load that is within the allowable radial/thrust load can be applied. However, applications in which the load is applied directly to the shaft should be avoided wherever possible. The methods such as those described below are recommended to prevent the load from being applied directly to the shaft in order to ensure a proper operating condition.



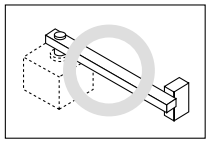
8. Place an external stopper in a position that is away from the rotating shaft.
If the stopper is placed near the rotating shaft, the torque that is generated by the product itself causes a reaction force that is directed to the stopper to be applied to the rotating shaft, thus leading the rotating shaft and the bearing to break. As a result, it could pose a hazard to humans and damage the machinery and equipment.

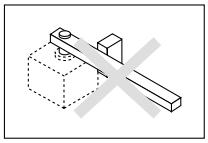
Precautions when using external stoppers

If the kinetic energy that is generated by the load exceeds the actuator's threshold value, an external dampening function must be provided to absorb the energy.
Furthermore, with the CRA1 series, which is a single rack pinion type, there is a backlash (within 1° at the rotation end) of the rack pinion mechanism. Thus, an external stopper is required in order to determine the correct angle.

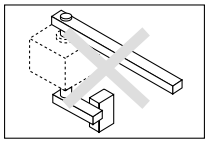


For external stopper use, some are provided with an actuator with rotation angles of 100°, 190° and 280°, depending on the model.





External stopper becomes a fulcrum, and the load's inertial force is applied to the shaft as a bending moment.



If an external stopper is installed on the shaft side opposite the load, the inertial force generated by the load is applied directly to the shaft.

⚠Caution

1. Do not use organic solvent to wipe the area of the nameplate that shows the model.
It will erase what is indicated on the nameplate.

2. Do not hit the rotating shaft by securing the body or hit the body by securing the rotating shaft.
These actions could cause the shaft to bend or damage the bearing. When a load must be coupled to the rotating shaft, secure the rotating shaft.

3. Do not place your foot directly on the shaft or on the equipment that is coupled to the shaft.
Placing one's weight directly onto the rotating shaft could cause the rotating shaft or the bearing to become damaged.

4. If a product is equipped with an angle adjustment function, use it within the specified adjustment range.
If the product is used outside the specified adjustment range, it could lead to equipment malfunction or product damage. Refer to the product specifications for details on the adjustment range of the products.

Rotary actuators: Precautions 3

Be sure to read before handling. Refer to main text for more detailed precautions on every series.

Air supply

⚠Warning

1. Use clean air.

Do not use compressed air that contains synthetic oil, salt, and corrosive gases in which chemicals and organic solvents are present, because it could cause equipment damage or malfunction.

⚠Caution

1. Install an air filter.

Install an air filter upstream, near the valve. Select an air filter with a filtration degree of 5 μm or finer.

2. Take countermeasures to ensure air quality, such as by installing an aftercooler, air dryer, or drain catch.

Compressed air that contains a large amount of drainage could cause the rotary actuator or other types of pneumatic equipment to malfunction. Therefore, take appropriate measures to ensure air quality, such as by proving an aftercooler, air dryer, or drain catch.

3. Ensure that the fluid and ambient temperature are within the specified range.

If the fluid temperature is less than 5°C, the moisture in the circuit could freeze, causing damage to the seals and leading to equipment malfunction. Therefore, take appropriate measures to prevent freezing.

Operating environment

⚠Warning

1. Do not use the rotary actuator in an environment or location that poses the risk of corrosion.

Refer to the respective construction diagram for details on the materials used in the rotary actuator.

Speed and bumper adjustment

⚠Warning

1. To make a speed adjustment, gradually adjust starting from the low speed end.

If the speed adjustment is performed from the high speed end, it could damage the product. As a result, it could pose a hazard to humans and damage the machinery and equipment.

2. The cushion needle is not adjusted at the time of shipment. Therefore, an adjustment must be made in accordance with the operating speed and the moment of inertia of the load.

The absorption of kinetic energy by the bumper is regulated by the adjustment of the needle. An improper adjustment could lead to damage of the equipment and the product. As a result, it could pose a hazard to humans and damage the machinery and equipment.

3. Do not use the rotary actuator with its cushion needle in the fully closed state.

This could tear the seal, which could pose a hazard to humans and damage the machinery and equipment.

4. Do not apply an excessive force to loosen the cushion needle.

The needle itself is provided with a pull stop; however the pull stop could be damaged if the needle is loosened through the application of excessive force. As a result, it could pose a hazard to humans and damage the machinery and equipment.

Maintenance

⚠Warning

1. Follow the procedures given in the operation manual to perform a maintenance inspection. Improper handling could lead to malfunction or damage the machinery and equipment.

2. During a maintenance inspection, do not disassemble the equipment with electrical power or with an air supply applied.

3. After the product has been disassembled for inspection, make sure to perform the appropriate functionality inspection.

The product specifications cannot be met unless a functionality inspection is performed.

⚠Caution

1. For lubrication, use the type of grease that is used for the respective product.

The use of a non-designated lubricant could damage the seals.

2. Series MSQ: Because sizes 1, 2, 3 and 7 require special tools, they cannot be disassembled. Because sizes 10, 20, 30 and 50 have the table press fit into an angular type bearing, they cannot be disassembled.