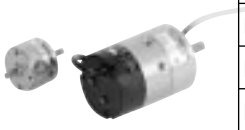
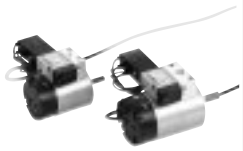
Series variation

Rotary actuator (vane mechanism) RV3* Series

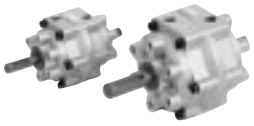
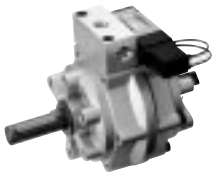
● Compact (RV3*1 to RV3*30)

●: Standard, ◎: Option, : Not available

Variation	Model no.		Vane mechanism	Effective torque (0.5MPa) (N·m)	Oscillating angle 90°	100°	180°	270°	280°	With switch	Axial port position (Not available for types with switch) S	With flange bracket FA	With foot bracket LS	With shock absorber C	Page
Standard type		RV3S1	Single	0.12	●		●	●			◎	◎	◎		64
		RV3D1	Double	0.28	●						◎	◎	◎		
		RV3S3	Single	0.31	●		●	●		●	◎	◎	◎		
		RV3D3	Double	0.71	●					●	◎	◎	◎		
		RV3S10	Single	0.98	●		●	●		●	◎	◎	◎		
		RV3D10	Double	2.11	●					●	◎	◎	◎		
		RV3S20	Single	1.70	●		●	●		●	◎	◎	◎		
		RV3D20	Double	3.88	●					●	◎	◎	◎		
		RV3S30	Single	3.19	●		●	●		●		◎	◎		
		RV3D30	Double	7.70	●					●		◎	◎		
With valve		RV3S$^{V}_{W}$10	Single	0.98	●		●	●		●		◎	◎		74
		RV3D$^{V}_{W}$10	Double	2.11	●					●		◎	◎		
		RV3S$^{V}_{W}$20	Single	1.70	●		●	●		●		◎	◎		
		RV3D$^{V}_{W}$20	Double	3.88	●					●		◎	◎		
		RV3S$^{V}_{W}$30	Single	3.19	●		●	●		●		◎	◎		
		RV3D$^{V}_{W}$30	Double	7.70	●					●		◎	◎		
Angle variable type		RV3SA3	Single	0.31			● (30° to 180° variable)			●		◎	◎		78
		RV3DA3	Double	0.71	● (30° to 90° variable)					●		◎	◎		
		RV3SA10	Single	0.98			● (30° to 180° variable)			●		◎	◎		
		RV3DA10	Double	2.11	● (30° to 90° variable)					●		◎	◎		
		RV3SA20	Single	1.70			● (30° to 180° variable)			●		◎	◎		
		RV3DA20	Double	3.88	● (30° to 90° variable)					●		◎	◎		
		RV3SA30	Single	3.19				● (30° to 270° variable)		●		◎	◎		
		RV3DA30	Double	7.70	● (30° to 90° variable)					●		◎	◎		

● Large (RV3*50 to RV3*300)

●: Standard, ◎: Option, : Not available

Variation	Model no.		Vane mechanism	Effective torque (0.5MPa) (N·m)	Oscillating angle 90°	100°	180°	270°	280°	With switch	Axial port position S	With flange bracket FA	With foot bracket LS	With shock absorber C	Page
Standard type		RV3S50	Single	4.7	●		●	●	●	●		◎	◎	◎	88
		RV3D50	Double	10.1	●	●				●		◎	◎	◎	
		RV3S150	Single	14.7	●		●	●	●	●		◎	◎	◎	
		RV3D150	Double	34.3	●	●				●		◎	◎	◎	
		RV3S300	Single	27.9	●		●	●	●	●			◎	◎	
		RV3D300	Double	66.6	●	●				●			◎	◎	
With valve		RV3S$^{V}_{W}$50	Single	4.7	●		●	●	●	●		◎	◎	◎	94
		RV3D$^{V}_{W}$50	Double	10.1	●	●				●		◎	◎	◎	
		RV3S$^{V}_{W}$150	Single	14.7	●		●	●	●	●		◎	◎	◎	
		RV3D$^{V}_{W}$150	Double	34.3	●	●				●		◎	◎	◎	
		RV3S$^{V}_{W}$300	Single	27.9	●		●	●	●	●			◎	◎	
		RV3D$^{V}_{W}$300	Double	66.6	●	●				●			◎	◎	
Low hydraulic type		RV3SH50	Single	4.7	●		●	●	●	●		◎	◎	◎	100
		RV3DH50	Double	10.1	●	●				●		◎	◎	◎	
		RV3SH150	Single	14.7	●		●	●	●	●		◎	◎	◎	
		RV3DH150	Double	34.3	●	●				●		◎	◎	◎	
		RV3SH300	Single	27.9	●		●	●	●	●			◎	◎	
		RV3DH300	Double	66.6	●	●				●			◎	◎	
Shock absorber		RVC50			●	●	●	●	●	———					106
		RVC150			●	●	●	●	●	———					
		RVC300			●	●	●	●	●	———					

Pneumatic components

Safety precautions

Always read this section before starting use.
Refer to Ending 69 for cylinders and to Ending 78 for cylinder switches.

Rotary actuator with vane mechanism RV3* Series

Design & Selection

1. COMMON

⚠ WARNING

■ Do not brake or hold by sealing pneumatics into the product.

If there is no stopping device outside the product and braking is applied by sealing air in with the directional control valve, the stop position may not be held due to air leakage, etc., leading operator, component, or device to injury or damage.

■ If the load fluctuation, vertical movement or frictional resistance varies, take the variation into consideration to ensure a safe design.

The rotary actuator's operation speed could increase, and could lead to physical or property damage.

■ Do not use the rotary actuator as a shock absorber.

If abnormal pressure is applied or if air leaks, the deceleration effect will be lost, and could lead to physical or property damage.

■ Provide a tight connection at fixed sections and couplings.

Always use a secure tightening method when the operation frequency is high or when using the high rotor at places with high levels of vibration.

■ Modifying the rotary actuator

Never modify the rotary actuator.

⚠ CAUTION

■ Do not apply torque exceeding rated output to the product.

If force exceeding rated output is applied, the product could be damaged.

■ If a repeated accuracy is required for the oscillating angle, provide an external stopper to directly stop the load.

If the movement is stopped with the stopper provided on the rotary actuator, the oscillating angle could vary from the initial setting.

■ Use the rotary actuator within the specified oscillating time range.

Use in low-speed areas less than this range will prevent smooth movement because of stick-slip symptoms.

■ Provide a speed control valve to control the rotary actuator's oscillation speed.

Adjust the speed gradually from the low speed to the required speed.

■ Precautions for rotary actuator switch

Pay attention to the proximity of rotary actuators.

When using two or more rotary actuators with switches in proximity or if a magnetic body moves very close to the rotary actuator, the magnetic interference could cause the switch to malfunction.
Design the system with a clearance of 40mm or more between the rotary actuators.
(If an allowable clearance is indicated for each rotary actuator, observe the indicated value.)

Pay attention to the switch ON time at the oscillating angle's middle position

When the switch is set at the middle position of the oscillating angle and the load is driven when the magnet is passed, if the oscillating speed is too fast, the operation time will be short when the switch turns ON and the load may not finish the required movement.
The oscillation speed in this case is,

$$V = \frac{\text{Switch operation range (deg.)}}{\text{Load operation time (ms)}} \times 1000 \text{ (deg./s)}$$

Installation & Adjustment

1. COMMON

⚠ WARNING

■ When adjusting the angle by supplying pressure, do not rotate the device more than necessary beforehand.
When adjusting while supplying pressure, the device could rotate and drop during adjustment, depending on how it is installed, possibly resulting in operator, component, or device injury or damage.

■ Confirm that the devices operate correctly before starting.
After installing the devices, connect the compressed air and power. Carry out appropriate functional inspections and leakage inspections to confirm that the devices are correctly installed and operating safety before starting the system.

■ Painting
If the resin sections are painted, the resin could be adversely affected by the paint or solvent. Contact CKD to confirm whether painting is possible.
Never remove or cross out the writing on the nameplate attached to the rotary actuator.

■ When adjusting the rotary actuator's oscillating angle with the pressure supplied, take measures to prevent the rotary actuator from rotating more than necessary.
A hazardous state could result if the rotary actuator rotates more than necessary.

■ When using an axial joint, select a free-moving axial joint.
If a stationary axial joint is selected, the eccentricity could cause the joint to twist and lead to operation faults, product damage, or to physical or property damage.

■ Secure sufficient space for maintenance and inspection.

■ Do not apply load (thrust load) axially to the vane shaft or a malfunction may occur. If this is unavoidable, use a structure with a thrust bearing as shown in Fig. 1. If such a load is unavoidable, use a structure with thrust bearing as shown in Fig. 1.

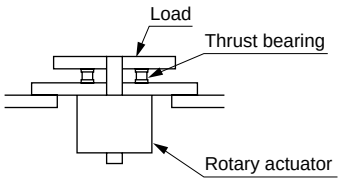


Fig.1

■ Avoid bending the end of the rotary actuator shaft or a malfunction may occur.
If such a load is unavoidable, use a structure conveying only rotation as shown in Fig. 2.
When connecting the vane shaft end and load at any position in the oscillating range, use a flexible coupling, etc., that does not twist off to prevent the vane shaft from breaking and bearings from wearing or seizing, etc.

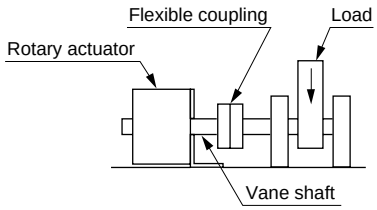


Fig.2 Radial load

■ Install the external stopper away from the rotary shaft.
If the stopper is installed near the rotary shaft, a torque generated by the product could be applied on the rotary shaft. This reaction on the stopper may cause damaging the rotary shaft or bearings, and possibly resulting in injury or damage to operator, equipment, or device.

⚠ CAUTION

■ When installing a load or jig, etc., on the rotary actuator vane shaft, check that load is not applied as shown in Fig. 3.

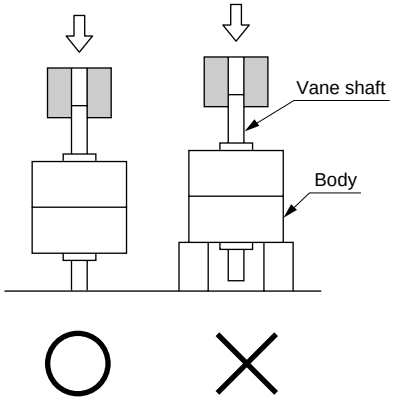


Fig.3

■ Do not wipe the model indications, such as nameplate, with organic solvent, etc.
The indicated information could come off.

■ Do not put feet directly onto shaft or devices mounted onto shaft.
The shaft or bearings could be damaged if worker gets onto the shaft.

■ If the load weight is large and oscillation is fast, shock generated due to inertia cannot be absorbed by the internal shock absorber, this may lead to damaging the rotary actuator.
Install a shock absorber to absorb inertia.

Installation & Adjustment

2. Oscillating angle variable type RV3 S D A

⚠ WARNING

■ When using the rotary actuator with variable oscillating angle, do not loosen the angle adjust screw further than the adjustment range.

If the angle adjust screw is loosened past the adjustment range it could come off, and could lead to physical or property damage.

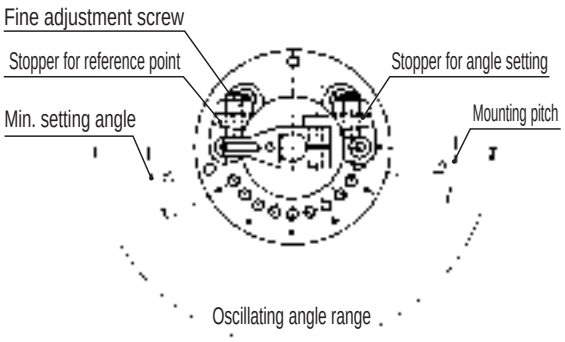
⚠ CAUTION

■ Stopper

- Always install the reference point stopper and angle setting stopper before operating the rotary actuator.
- When the stopper is set to the oscillating origin or maximum oscillating angle, if the stopper is set to the plus side from the adjustment range the vane could hit the internal stopper and cause damage to the internal stopper, etc. Always adjust the angle so that the jaw stops at the external stopper.
- The reference point stopper is fixed and cannot be moved.

■ Oscillating angle variable mechanism structure

An external stopper is installed to the tap hole provided on the rotary actuator's body. There is a reference point stopper and angle setting stopper. The reference stopper is fixed at a set point (oscillating origin), and the angle setting stopper is fixed at a position where the required setting angle can be attained. The rotating actuator stops at the set angle when the jaw attached to the shaft contacts the stopper. The position can be finely adjusted with the adjust screw provided on the stopper.



■ Setting the oscillating angle

Without setting angle designation (standard)

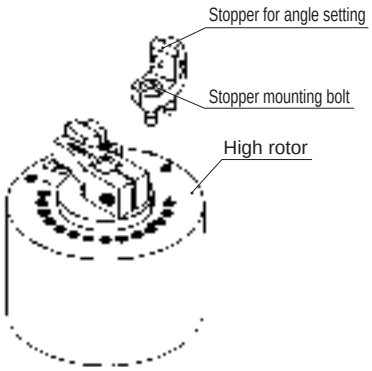
The product is shipped with only the reference point stopper fixed. The angle setting stopper is enclosed. Before starting use, the angle setting stopper must be installed at a position calculated from the setting angle.

The installation pitch is 15°. Refer to the oscillating angle setting methods for details on installation.

With setting angle designation (custom order)

The reference point and angle setting stoppers are installed at the designated angle before the product is shipped.

Before starting use, each stopper must be finely adjusted to the accurate angle by turning the fine adjust screw.



■ Oscillating angle setting method

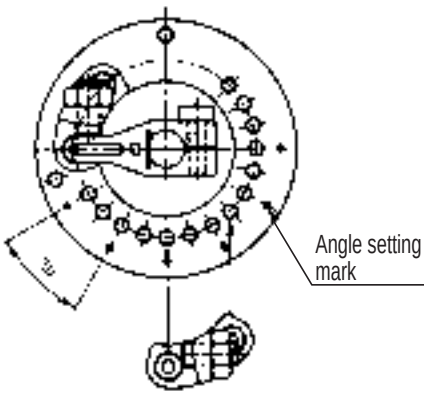
When setting angle is at integer-fold of stopper installation pitch (15°)

(1) Fix the stopper at the tap hole corresponding to the set angle. When installing the stopper, use the 30° pitch angle setting mark provided near the tap hole as a guide.

Setting angle

Series	Setting angle (integer time of mounting pitch 15°)
RV3 S D A3	30°, 45°, 60°, 75°, 90°, 105°, 120°, 135°, 150°, 165°, 180°
RV3 S D A10	
RV3 S D A20	
RV3 S D A30	30°, 45°, 60°, 75°, 90°, 105°, 120°, 135°, 150°, 165°, 180°, 195°, 210°, 225°, 240°, 255°, 270°

Example for 90°



(2) Next, turn and finely adjust the fine adjust screw on the reference point stopper and angle setting stopper to set the correct angle. Always tighten the lock nut after setting.

Adjustable angle depth

Stopper fine adjustment depth for reference point	±3° Note 1
Stopper fine adjustment depth for angle setting	-9° to + 6°
Stopper fine adjustment depth for setting angle when maximum angle	-9° to + 3° Note 2

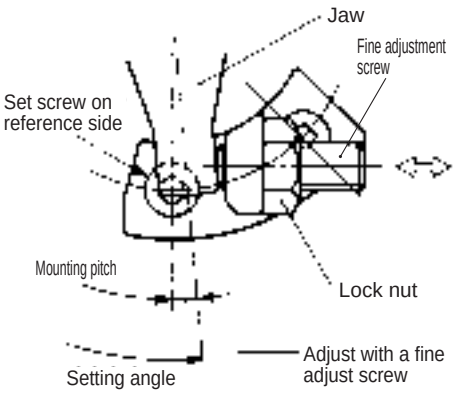
Note 1: RV3DA3 is -1° to + 3°.
Note 2: RV3DA3 is -9° to + 1°.

When setting angle is at the middle of a stopper installation pitch (15°) integer-fold

(1) If the setting angle is at the middle of the stopper's installation pitch (15°) integer-fold, install and fix the stopper at the tap hole shown with the arrow below.

In the front 6° range of the stopper installation pitch (15°), install so that the stopper is positioned on the side where the stopper reference comes to the front mounting screw. In the back 9° range, use the back mounting screw for the reference.

(2) Next, turn and finely adjust the fine adjust screw on the stopper and set the correct angle. Always tighten the lock nut after setting.



3. Shock absorber RVC

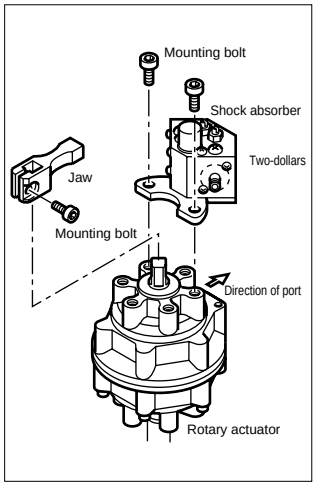
⚠ WARNING

■ Precautions for handling shock absorbers

- Do not loosen or disassemble sections other than the adjustment needle. Otherwise this may lead to oil leakage.
- The hexagon nut at the base of the adjustment needle is not a lock nut, and must not be turned. Otherwise this may lead to oil leakage.
- Avoid using this product where it may be subject to powder dust, cutting chips, or liquids such as oil or water. Otherwise this may lead to shortened product life or faults.
- If oil leaks, refer to the Technical Manual (CT-N-217) for details on replacement.

⚠ CAUTION

■ Installing the shock absorber Installation drawing



1. Use the installation holes on the main unit, install the shock absorber on the rotary actuator square shaft.
2. Install the shock absorber so it is above the rotary actuator port.
   Confirm that the shock absorber is accurately installed.
3. Jaws for the shock absorber are provided. Confirm that the rotary actuator shaft is at the original point of oscillation. (Refer to the original point of oscillation)
4. When at the original point of oscillation, shock absorber claws will contact the shock absorber piston and will not fit. Turn the square shaft counterclockwise to where jaws fit.
5. The shock absorber cannot be used as a stopper.

During Use & Maintenance

1. COMMON

⚠ CAUTION

■ This rotary actuator is an oil-free actuator.

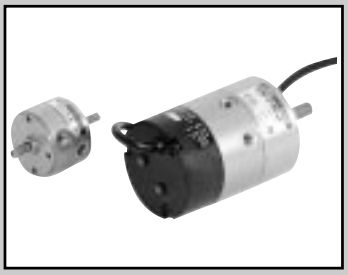
The actuator can be oiled, but once it has been oiled, it must be maintained in an oiled state. The lubricant which has been applied beforehand could run out with oiling, so operation faults could result if the oil is spent.
Use Class 1 turbine oil (non-additive) ISO VG32 when oiling.
Never use other oils (spindle oil, machine oil, etc.), as they could damage the seal section.
Refer to recommended lubricants indicated in the table below.

Maker	Name
Idemitsu Kosan Co.,Ltd.	Diana Fresia S-32
Fuji-kosan	Fucoal Turbine 32
Nippon Oil Corporation	MITSUBISHI turbine oil 32
Showa Shell Sekiyu	Shell Vitrea 32
Mitsui Oil Co., Ltd.	Mitsui Turbine Oil 32
Japan Energy corporation	Turbine 32
Nippon Oil Corporation	Turbine oil 32
Cosmo Oil Company	Cosmo Turbine Oil 32
Exxon Mobil Corporation	Stanol 43N
KYGNUS	Turbine oil 32

2. Oscillating angle variable type RV3 $^{S}_{D}$ A

■ The stopping angle is set where the jaw contacts each stopper's fine adjust screw.

The stop angle accuracy does not include wear caused by operation. If the stop angle has changed because of wear, adjust the angle again with the fine adjust screw.



Compact rotary actuator with vane mechanism standard type

RV3S/D Series

- Torque: 1, 3, 10, 20, 30
- Oscillating angle: 90°, 180°, 270°

JIS symbol

RoHS CAD

Specifications

● Single vane mechanism

Descriptions		RV3S														
Size		1			3			10			20			30		
Effective torque	N·m	0.12			0.31			0.98			1.70			3.19		
Actuation		Single vane														
Working fluid		Compressed air														
Max. working pressure	MPa	0.7									1.0					
Min. working pressure	MPa	0.2														
Withstanding pressure	MPa	1.05									1.5					
Ambient temperature	°C	-5 to 80 Note 3												-5 to 60		
Port size		M5												Rc1/8		
Oscillating angle tolerance	degree	90^{+4}_{0}	180^{+4}_{0}	270^{+4}_{0}	90^{+4}_{0}	180^{+4}_{0}	270^{+4}_{0}	90^{+4}_{0}	180^{+4}_{0}	270^{+4}_{0}	90^{+4}_{0}	180^{+4}_{0}	270^{+4}_{0}	90^{+3}_{0}	180^{+3}_{0}	270^{+3}_{0}
Oscillating origin	degree	45, 90		45	45, 90		45	45, 90		45	45, 90		45	45		
Allowable energy absorption Note 1	mJ	0.6			1.5			3			15			25		
Maximum cycle rate Note 2	cycle/min	300	180	96	240	150	60	240	150	90	210	120	84	180	90	60
Volumetric capacity	cm^3	1.4	1.4	1.5	3.4		4	9.8		12	17		21	37		43
Allowable radial load	N	30			40			50			300			400		
Allowable thrust load	N	3			4						25			30		
Weight	kg	0.036			0.07			0.14			0.25			0.47		0.46
Lubrication		Not required (when lubricating, use turbine oil Class 1 ISO VG32.)														

● Double vane mechanism

Descriptions		RV3D				
Size		1	3	10	20	30
Effective torque	N·m	0.28	0.71	2.11	3.88	7.70
Actuation		Double vane				
Working fluid		Compressed air				
Max. working pressure	MPa	0.7			1.0	
Min. working pressure	MPa	0.2				
Withstanding pressure	MPa	1.05			1.5	
Ambient temperature	°C	-5 to 80 Note 3				-5 to 60
Port size		M5				Rc1/8
Oscillating angle tolerance	degree	90^{+4}_{0}				90^{+3}_{0}
Oscillating origin	degree	45				
Allowable energy absorption Note 1	mJ	0.6	1.5	3	15	25
Maximum cycle rate Note 2	cycle/min	300	240		210	180
Volumetric capacity	cm^3	1.1	2.8	8.1	15	34
Allowable radial load	N	30	40	50	300	400
Allowable thrust load	N	3	4		25	30
Weight	kg	0.037	0.072	0.14	0.26	0.48
Lubrication		Not required (when lubricating, use turbine oil ISO VG32.)				

Note 1: Calculate allowable energy with allowable inertia energy of shaft of rotary actuator as following.
Allowable energy ≧ $1/2I\omega^2 \times 10^3$ (refer to Page 121 for detail.)
Note 2: The maximum working frequency is at supply pressure 0.5MPa <in no load state>.
Note 3: 5 to 60°C when switch is provided.
Note 4: A key is enclosed with the rotary actuator with keyway.
Note 5: Consult with CKD for products other than standard specifications.

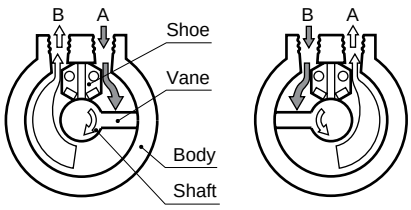
Switch specifications

Descriptions	Proximity switch
	SR-* (-U)
Applications	Programmable controller, relay, IC circuit, small solenoid valve
Power voltage	5 to 30 VDC
Load voltage / current	5 to 30 VDC, 200mA or less
Current consumption	20mA or less with 24 VDC
Internal voltage drop	1.5V or less
Light	LED (ON lighting)
Leakage current	10 μA or less
Lead wire length	1m (oil resistant vinyl cabtire cable 4-conductor 0.2mm^2)
Maximum shock resistance	490m/s^2
Insulation resistance	100MΩ and over with 500V mega
Withstand voltage	No failure when 1000 VAC is applied for one minute
Ambient temperature	5 to 60°C
Protective structure	IEC standards IP67, JIS C0920 (water tight type)

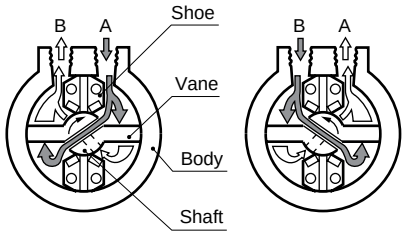
*mark indicates a rotary actuator size. (3, 10, 20, 30)

Operational principle

● Single vane
1. Configured with vane sliding inside of body, shaft, and shoe (stopper).
2. Air from port A pushes vane rotates shaft, and generates torque.
3. Air in opposite room is exhausted from port B, and shaft rotates clockwise.
4. Vane stops when it contacts to shoe.
5. Air supply from port B causes counterclockwise rotation in the same manner.



● Double vane
1. Configured with two vanes sliding inside of body, integrated shaft, and shoe (stopper).
2. Air from port A pushes vane, and goes through passage in shaft, pushes another vane, turns shaft, and finally generates torque.
3. Rotating in the same manner of single vane.



How to order

● Compact rotary actuator (standard type) RV3*

RV3S 3 - 90 - 45 - SR-U - FA

Ⓐ Model no.
Ⓑ Nominal size
Ⓒ Oscillating angle
Ⓓ Oscillating origin
Ⓔ Switch type
Ⓕ Option (Note 1, Note 2)

Symbol	Descriptions	Ⓐ Model no. Single vane mechanism: RV3S	Ⓐ Model no. Double vane mechanism: RV3D
Ⓑ Nominal size			
1	Effective torque 0.5MPa	0.12N·m	0.27N·m
3		0.31N·m	0.71N·m
10		0.98N·m	2.11N·m
20		1.70N·m	3.88N·m
30		3.19N·m	7.7N·m

Symbol	Descriptions	1	3	10	20	30	1	3	10	20	30
Ⓒ Oscillating angle	Nominal size										
90	90°	●					●				
180	180°	●									
270	270°	●									
Ⓓ Oscillating origin	Nominal size	1	3	10	20	30	1	3	10	20	30
45	45°	●	●	●	●	●	●	●	●	●	●
90	90° (excluding oscillating angle 270°)	●	●	●	●						
Ⓔ Switch type	Nominal size	1	3	10	20	30	1	3	10	20	30
Blank	Without switch	●	●	●	●	●	●	●	●	●	●
SR	Axial lead wire with switch		●	●	●	●		●	●	●	●
SR-U	Radial lead wire with switch		●	●	●	●		●	●	●	●
Ⓕ Option	Nominal size	1	3	10	20	30	1	3	10	20	30
Blank	No option	●	●	●	●	●	●	●	●	●	●
S	Axial port position	●	●	●	●		●	●	●	●	
FA	With flange bracket	●	●	●	●	●	●	●	●	●	●
LS	With foot bracket	●	●	●	●	●	●	●	●	●	●

⚠ Note on model no. selection

Note 1: The type with switch is not available for the port position axial direction "S".
Note 2: The mounting bracket (FA and LS) is attached when shipping. Refer to Page 104 for dimensions.

<Example of model number>

RV3S3-90-45-SR-U-FA

Model: Compact rotary actuator
Ⓐ Model no. : Single vane mechanism RV3S
Ⓑ Nominal size : 3
Ⓒ Oscillating angle : 90°
Ⓓ Oscillating origin : 45°
Ⓔ Switch type : Radial lead wire with switch
Ⓕ Option : With flange bracket

● How to order switch unit

RV3S - SR-3 - 90 - 45 - U

Ⓐ Model
Ⓑ Oscillating angle
Ⓒ Oscillating origin
Ⓓ Lead wire outlet direction

Symbol	Descriptions
Ⓐ Model	
SR-3	Applicable actuator: RV3S/D3
SR-10	Applicable actuator: RV3S/D10
SR-20	Applicable actuator: RV3S/D20
SR-30	Applicable actuator: RV3S/D30
Ⓑ Oscillating angle	
90	90°
180	180°
270	270°

Ⓒ Oscillating origin — Model	SR-3	SR-10	SR-20	SR-30
45 45°	●	●	●	●
90 90°	●	●	●	

Symbol	Descriptions
Ⓓ Lead wire outlet direction	
Blank	Axial lead wire with switch
U	Radial lead wire with switch

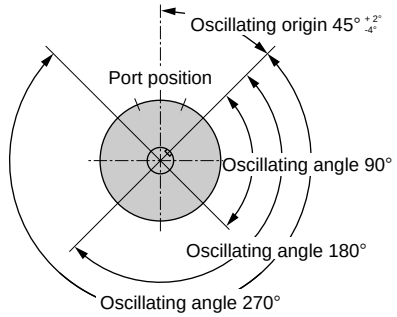
<Example of model number>

RV3S-SR-3-90-45-U

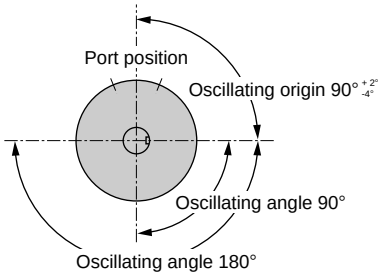
Model: Switch unit
Ⓐ Model : RV3S3
Ⓑ Oscillating angle : 90°
Ⓒ Oscillating origin : 45°
Ⓓ Lead wire outlet direction : Radial lead wire

Oscillating origin position

● Oscillating origin 45°
RV3S/D1 to 30



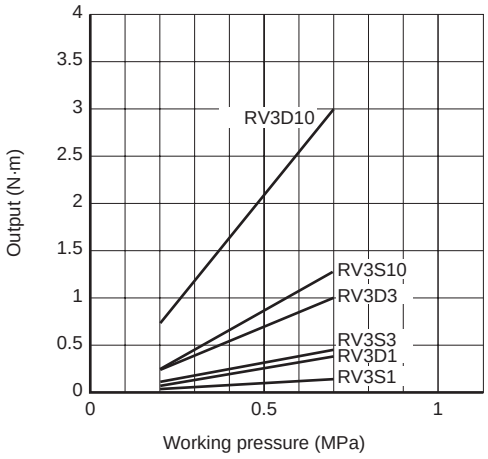
● Oscillating origin 90°
RV3S1 to 20



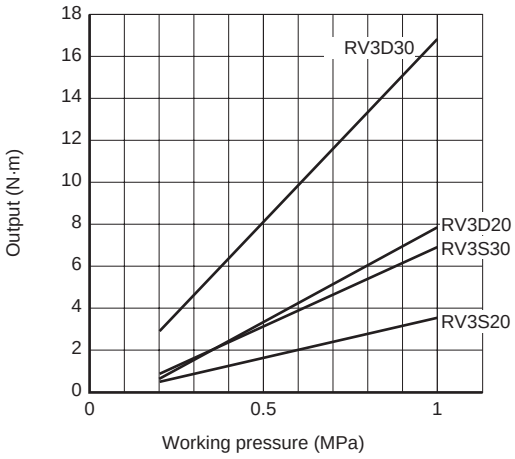
Note 1: Tolerance of oscillating origin is based on set screw position.
Note 2: Deflection of torsion angle between keyway on longer axis side (or cut plane) and square on shorter axis side to be within 1.5°.

Output characteristics graph (effective torque)

● RV3S/D1 to 10



● RV3S/D20, 30



Output table (effective torque) (N·m)

Working pressure (MPa) / Model no.		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Single vane	RV3S1	0.04	0.07	0.10	0.12	0.15	0.18	-	-	-
	RV3S3	0.1	0.17	0.24	0.31	0.38	0.45	-	-	-
	RV3S10	0.35	0.56	0.75	0.98	1.2	1.39	-	-	-
	RV3S20	0.59	0.95	1.33	1.7	2.1	2.49	2.87	3.26	3.68
	RV3S30	1.1	1.8	2.5	3.19	4.1	4.8	5.8	6.5	7.2
Double vane	RV3D1	0.10	0.16	0.22	0.28	0.34	0.40	-	-	-
	RV3D3	0.25	0.39	0.54	0.71	0.86	1.01	-	-	-
	RV3D10	0.76	1.17	1.62	2.11	2.54	3.03	-	-	-
	RV3D20	1.4	2.22	3.06	3.88	4.7	5.53	6.33	7.17	8.07
	RV3D30	2.7	4.4	6	7.7	9.5	11.2	12.99	14.8	16.6

Oscillating time setting

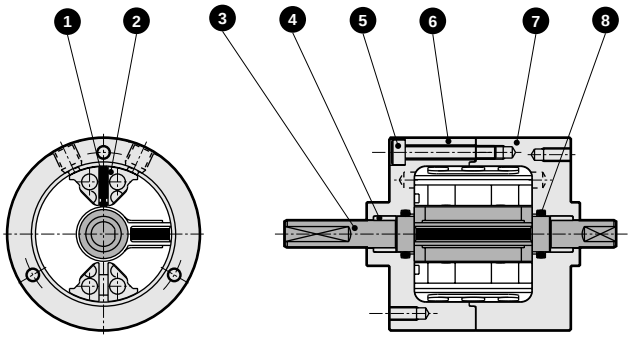
1. Use oscillating time within range of below table. If used with exceeding this range, smooth operation can not be obtained due to stick and slip, etc.

Compact rotary actuator

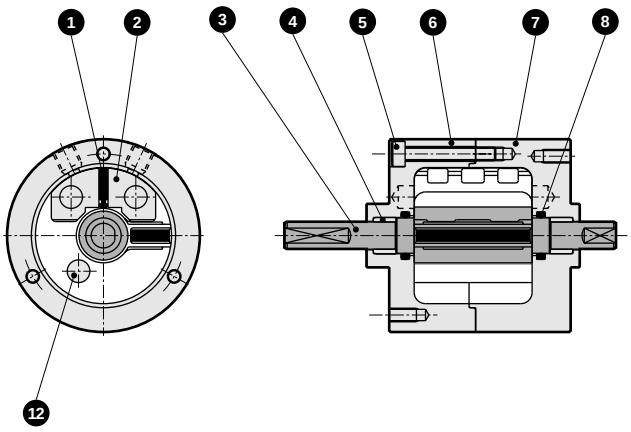
Model no.	Oscillating angle		
	90°	180°	270°
RV3S/D1	0.03 to 0.6	0.06 to 1.2	0.09 to 1.8
RV3S/D3	0.04 to 0.8	0.08 to 1.6	0.12 to 2.4
RV3S/D10	0.045 to 0.9	0.09 to 1.8	0.135 to 2.7
RV3S/D20	0.05 to 1.0	0.10 to 2	0.15 to 3
RV3S/D30	0.07 to 0.7	0.14 to 1.4	0.21 to 2.1

Internal structure and parts list

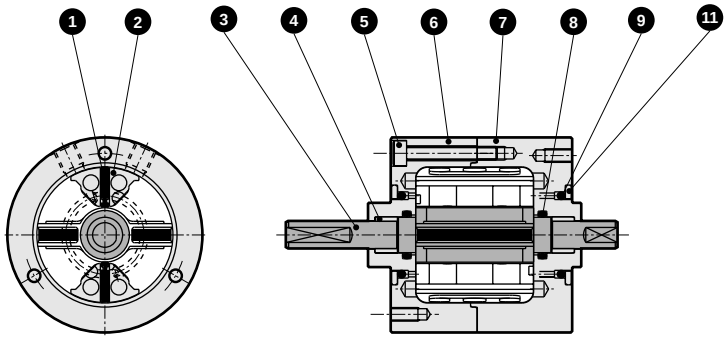
● RV3S1 to 30
Oscillating origin 45°



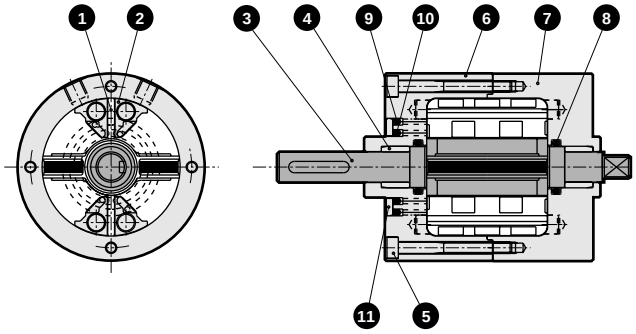
● RV3S1 to 30
Oscillating origin 90°



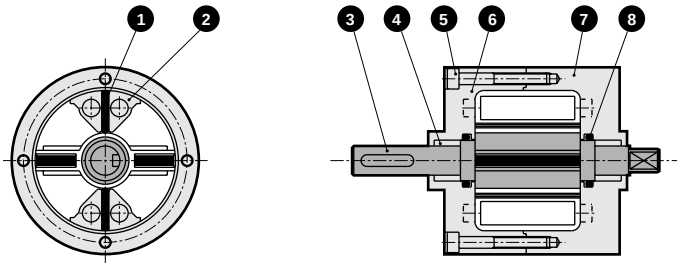
● RV3D1 to 10



● RV3D20



● RV3D30



No.	Parts name	Material	No.	Parts name	Material
1	Shoe sealant	Nitrile rubber	7	Body B	Aluminum alloy
2	Shoe	Resin	8	O ring	Nitrile rubber
3	Vane shaft	Iron steel + resin + nitrile rubber	9	O ring	Nitrile rubber
4	Bearing	Sintering oil impregnated material	10	O ring	Nitrile rubber
5	Mounting bolt	Iron steel	11	Plate	Iron steel
6	Body A	Aluminum alloy	12	Stop pin	Iron steel

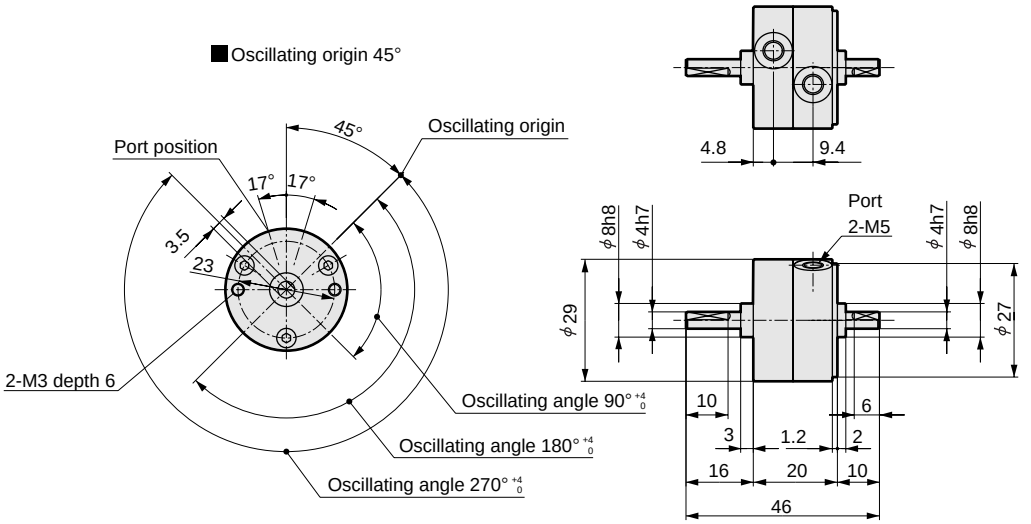
Refer to page 116 for the repair parts list.

Dimensions

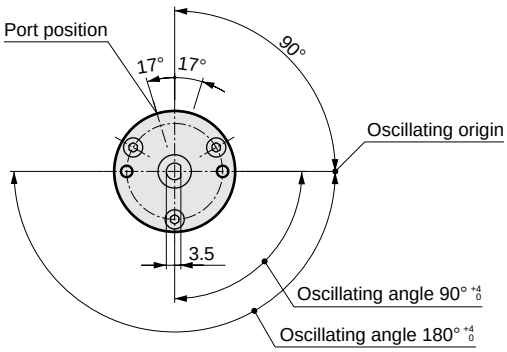
CAD

● RV3S/D1

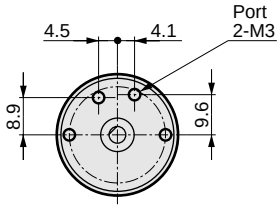
■ Oscillating origin 45°



■ Oscillating origin 90°



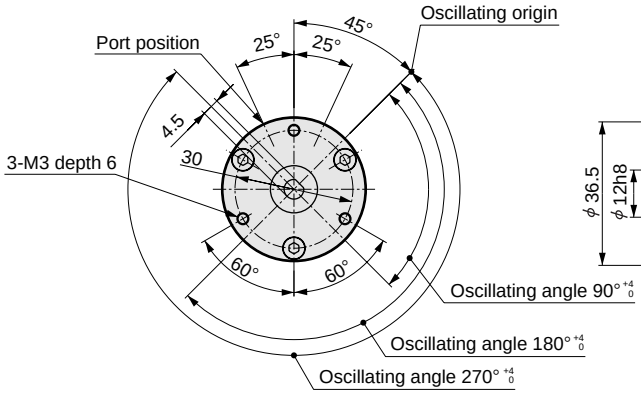
● S type
(Axial port position)

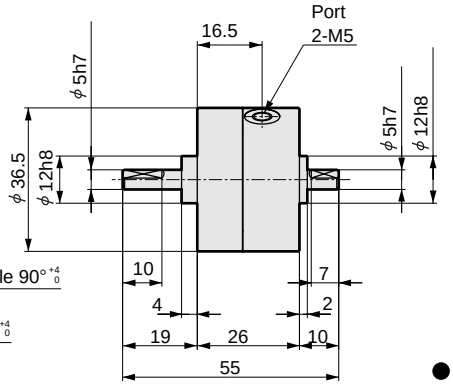


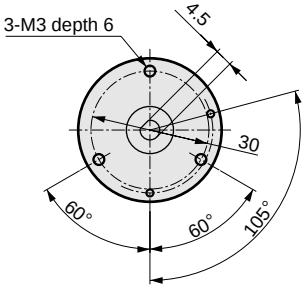
Dimensions

● RV3S/D3 CAD

■ Oscillating origin 45°

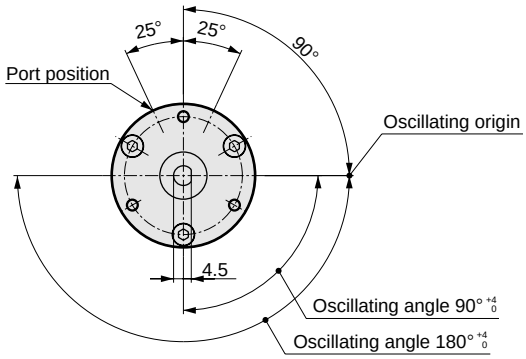


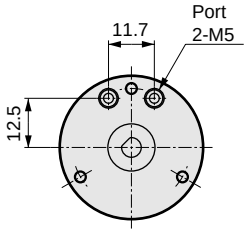




● S type
(Axial port position)

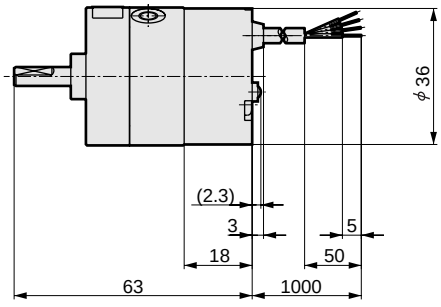
■ Oscillating origin 90°

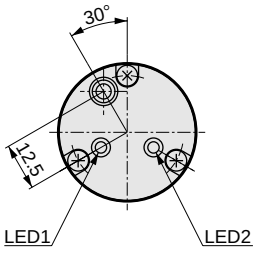




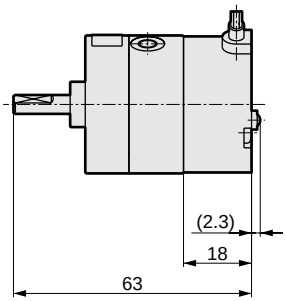
● RV3S/D3-*-SR (U)

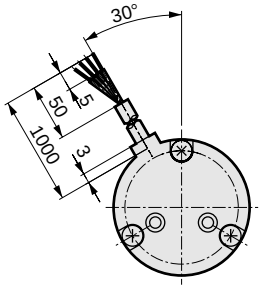
■ Axial lead wire





■ Radial lead wire

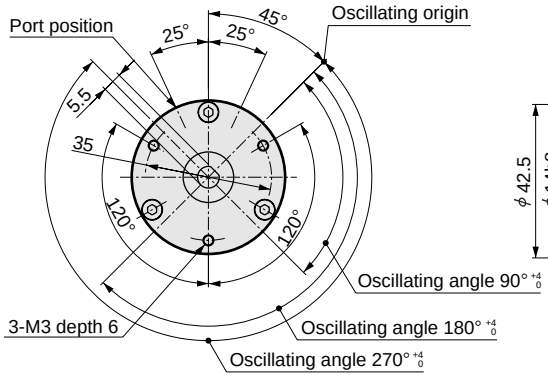


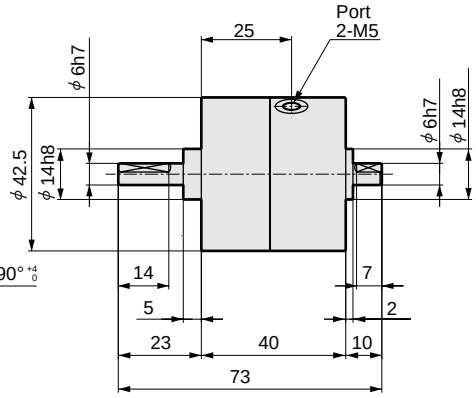


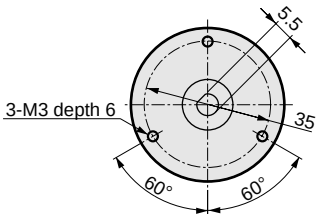
Dimensions

● RV3S D 10

■ Oscillating origin 45°

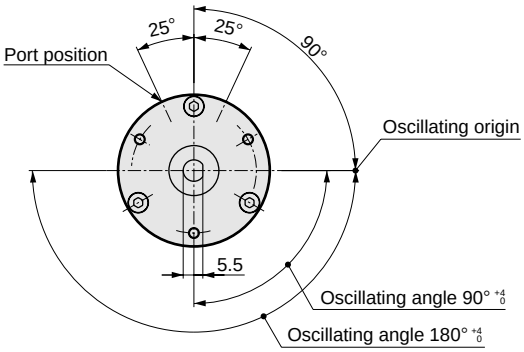


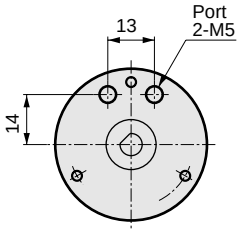




● S type
(Axial port position)

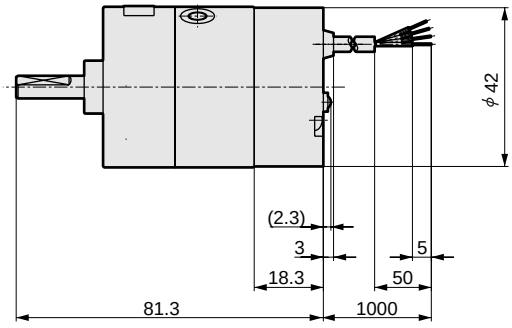
■ Oscillating origin 90°

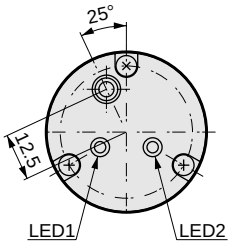




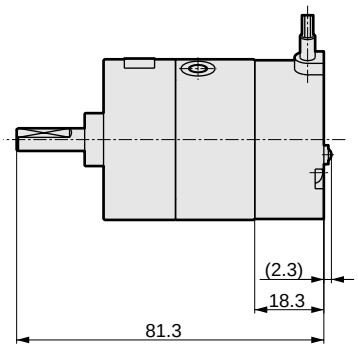
● RV3S D 10-*-SR (U)

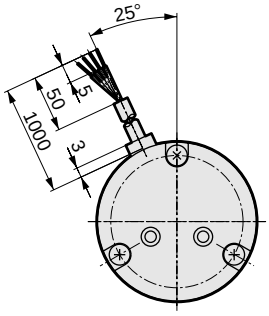
■ Axial lead wire





■ Radial lead wire

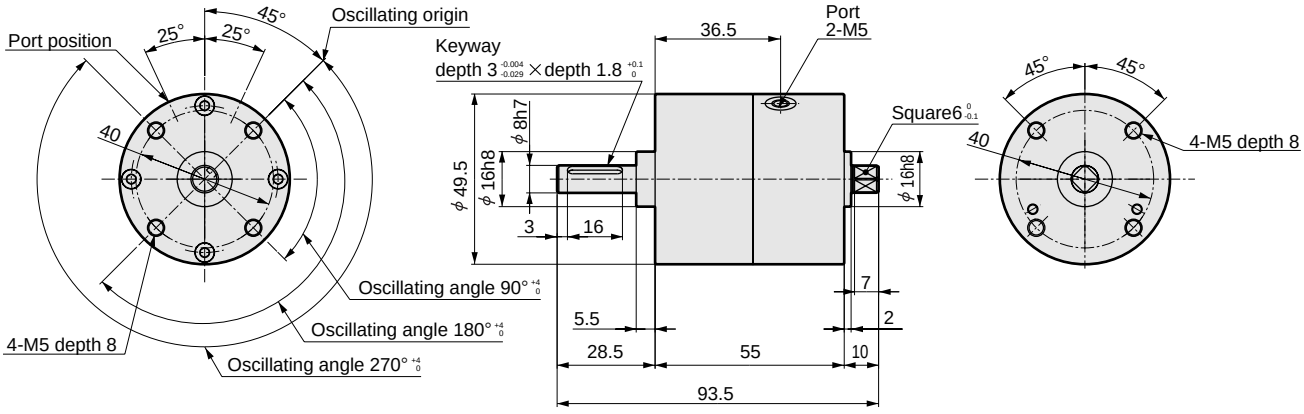




Dimensions

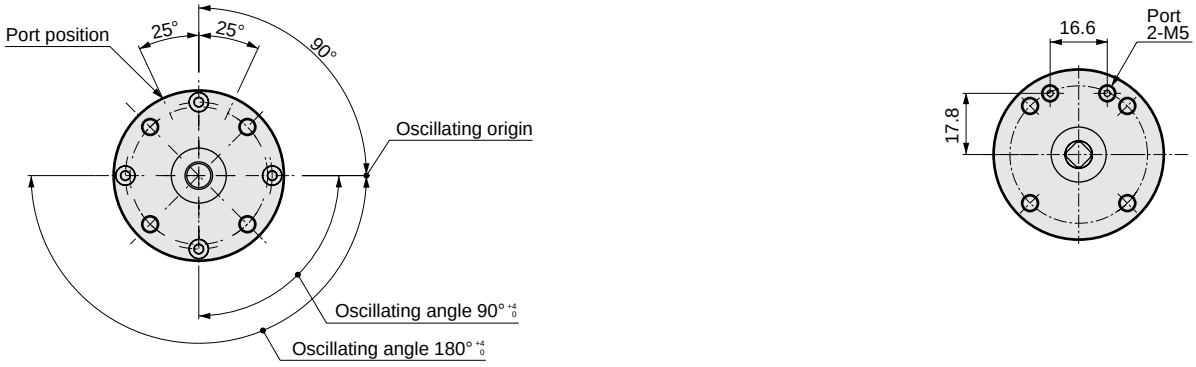
● RV3S/D20 CAD

■ Oscillating origin 45°



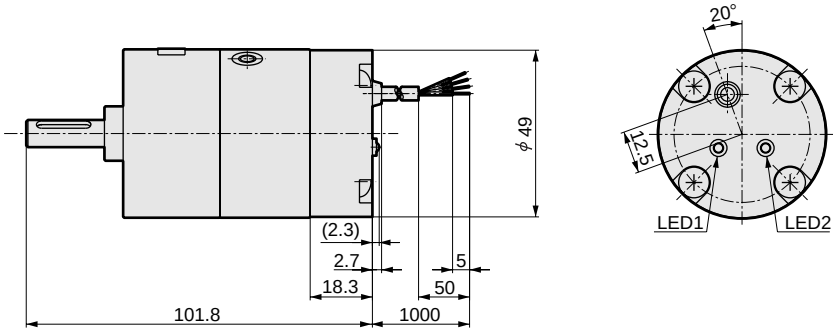
● S type
(Axial port position)

■ Oscillating origin 90°

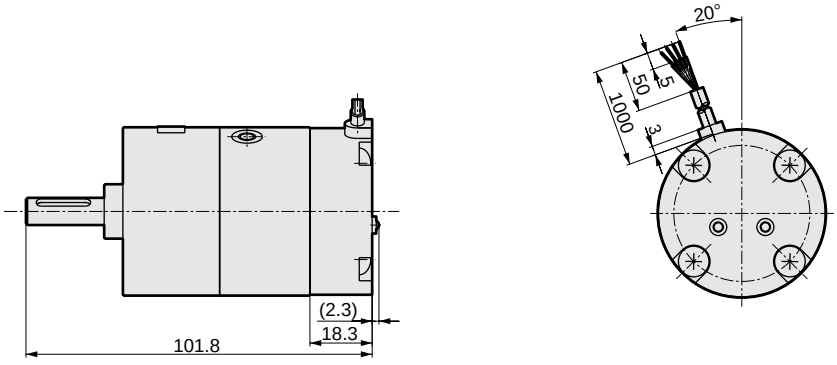


● RV3S/D20-*-SR (U)

■ Axial lead wire

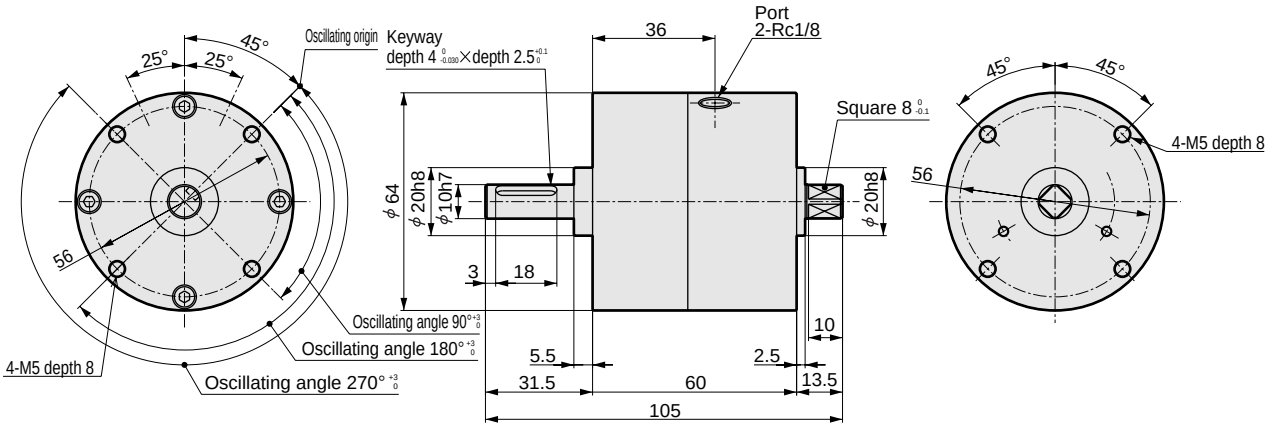


■ Radial lead wire



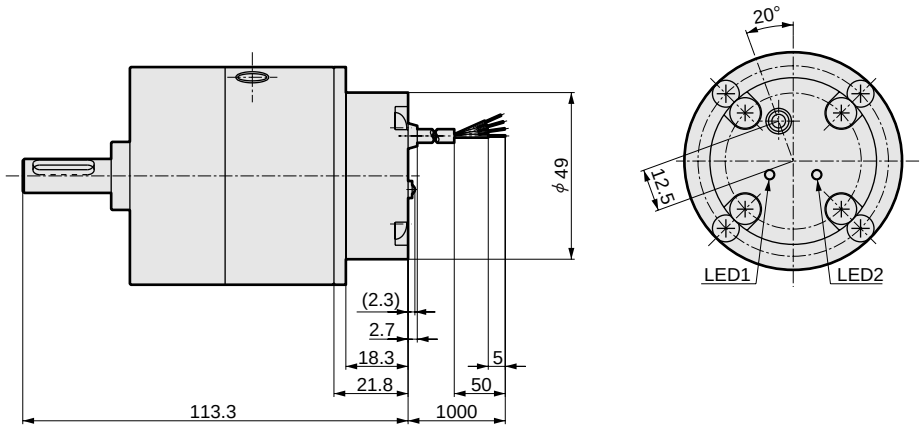
Dimensions

● RV3$^{S}_{D}$30 CAD

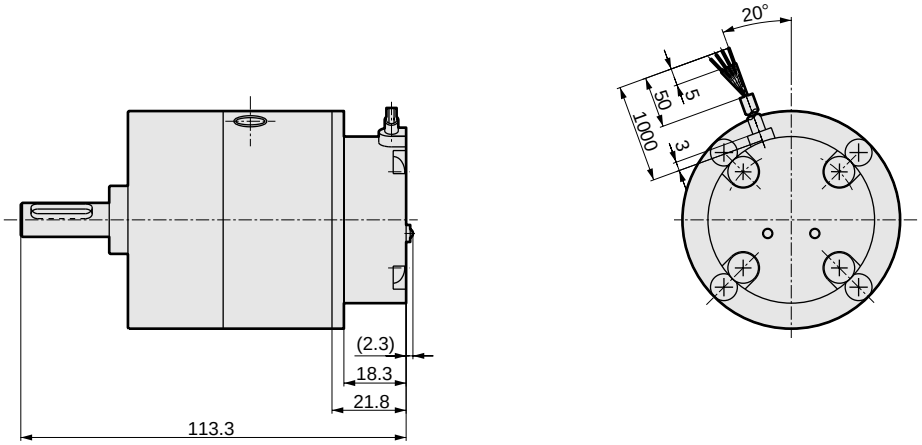


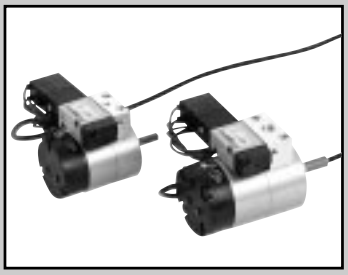
● RV3$^{S}_{D}$30-*-SR (U)

■ Axial lead wire



■ Radial lead wire





Compact rotary actuator with vane mechanism, with valve

RV3$^{SV}_{DW}$ Series

- Torque: 10, 20, 30
- Oscillating angle: 90°, 180°, 270°

JIS symbol

RoHS CAD

Specifications

● Single vane mechanism

Descriptions		RV3S$^{V}_{W}$								
Size		10			20			30		
Effective torque	N·m	0.98			1.70			3.19		
Actuation		Single vane								
Working fluid		Compressed air								
Max. working pressure	MPa	0.7								
Min. working pressure	MPa	0.2								
Withstanding pressure	MPa	1.05								
Ambient temperature	°C	-5 to 50 Note 3								
Port size		M5			Rc1/8					
Oscillating angle tolerance	degree	90^{+4}_{0}	180^{+4}_{0}	270^{+4}_{0}	90^{+4}_{0}	180^{+4}_{0}	270^{+4}_{0}	90^{+3}_{0}	180^{+3}_{0}	270^{+3}_{0}
Oscillating origin	degree	45, 90		45	45, 90		45	45		
Allowable energy absorption Note 1	mJ	3			15			25		
Maximum cycle rate Note 2	cycle/min	240	150	90	210	120	84	180	90	60
Volumetric capacity	cm^3	9.8		12	17		21	37		43
Allowable radial load	N	50			300			400		
Allowable thrust load	N	4			25			30		
Weight	kg	0.28			0.37			0.59		0.58
Lubrication		Not required (when lubricating, use turbine oil ISO VG32.)								

● Double vane mechanism

Descriptions		RV3D$^{V}_{W}$					
Size		10		20		30	
Effective torque Note 1	N·m	2.11		3.88		7.70	
Actuation		Double vane					
Working fluid		Compressed air					
Max. working pressure	MPa	0.7					
Min. working pressure	MPa	0.2					
Withstanding pressure	MPa	1.05					
Ambient temperature	°C	-5 to 50 Note 3					
Port size		M5		Rc1/8			
Oscillating angle tolerance	degree	90^{+4}_{0}				90^{+3}_{0}	
Oscillating origin	degree	45					
Allowable energy absorption Note 1	mJ	3		15		25	
Maximum cycle rate Note 2	cycle/min	240		210		180	
Volumetric capacity	cm^3	8.1		15		34	
Allowable radial load	N	50		300		400	
Allowable thrust load	N	4		25		30	
Weight	kg	0.28		0.38		0.60	
Lubrication		Not required (when lubricating, use turbine oil ISO VG32.)					

Note 1: Calculate allowable energy with allowable inertia energy of shaft of rotary actuator as following.
Allowable energy≧1/2Iω^2 ×10^3 (refer to Page 121 for detail.)
Note 2: The maximum working frequency is at supply pressure 0.5MPa <in no load state>.
Note 3: 5 to 60°C when switch is provided.
Note 4: A key is enclosed with the rotary actuator with keyway.
Note 5: Consult with CKD for products other than standard specifications.

Valve specifications

Descriptions	Specifications (4KB1 Series)		
Rated voltage V	100 VAC (50/60Hz)	200 VAC (50/60Hz)	24 VDC
Starting current A	0.056/0.044	0.034/0.026	0.075
Holding current A	0.028/0.022	0.017/0.013	
Power consumption W	1.8/1.4	2.1/1.6	1.8
Voltage fluctuation range	±10%		
Insulation class	Class B molded coil		

Note 1: 100 VAC and 200 VAC are available with 110 VAC and 220 VAC(60Hz).
Note 2: Refer to "Pneumatic Valve (BC-23SA)" for detail on valve.

Switch specifications

Descriptions	Proximity switch
	SR-* (-U)
Applications	Programmable controller, relay, IC circuit, small solenoid valve
Power voltage	5 to 30 VDC
Load voltage and current	5 to 30 VDC and 200mA or less
Current consumption	20mA or less with 24 VDC
Internal voltage drop	1.5V or less
Light	LED (ON lighting)
Leakage current	10μA or less
Lead wire length	1m (oil resistant vinyl cabtire cable 4-conductor 0.2mm^2)
Maximum shock resistance	490m/s^2
Insulation resistance	100MΩ and over with 500V mega
Withstand voltage	No failure when 1000 VAC is applied for one minute
Ambient temperature	5 to 60°C
Protective structure	IEC standards IP67, JIS C0920 (water tight type)

* indicates rotary actuator size. (10, 20, 30)

How to order

● Compact rotary actuator (with valve) RV3*$^{V}_{W}$

RV3S V 10 - 90 - 45 - 1 - SR-U - LS

Ⓐ Model no.
Ⓑ Valve
Ⓒ Nominal size
Ⓓ Oscillating angle
Ⓔ Oscillating origin
Ⓕ Valve voltage
Ⓖ Switch type
Ⓗ Option (Note 1)

Symbol	Descriptions	Ⓐ Model no. Single vane mechanism: RV3S	Ⓐ Model no. Double vane mechanism: RV3D
Ⓑ Valve			
V	Single solenoid	●	●
W	Double solenoid	●	●
Ⓒ Nominal size			
10	Effective torque 0.5MPa	0.98N·m	2.11N·m
20		1.70N·m	3.88N·m
30		3.19N·m	7.7N·m
Ⓓ Oscillating angle			
90	90°	●	●
180	180°	●	
270	270°	●	

Ⓔ Oscillating origin

Nominal size		10	20	30	10	20	30
45	45°	●	●	●	●	●	●
90	90° (excluding oscillating angle 270°)	●	●				

Ⓕ Valve voltage			
1	100 VAC	●	●
2	200 VAC	●	●
3	24 VDC	●	●
Ⓖ Switch type			
Blank	Without switch	●	●
SR	Axial lead wire with switch	●	●
SR-U	Radial lead wire with switch	●	●
Ⓗ Option			
Blank	No option	●	●
FA	With flange bracket	●	●
LS	With foot bracket	●	●

⚠ Note on model no. selection

Note 1: The mounting bracket (FA and LS) is attached when shipping.
Refer to Page 104 for dimensions.

<Example of model number>
RV3SV10-90-45-1-SR-U-LS
Model: Compact rotary actuator with valve
Ⓐ Model no. : RV3S
Ⓑ Valve : Single solenoid
Ⓒ Size :10
Ⓓ Oscillating angle: 90°
Ⓔ Oscillating origin: 45°
Ⓕ Valve voltage : 100 VAC
Ⓖ Switch type : Radial lead wire with switch
Ⓗ Option : With foot bracket

● How to order switch unit

RV3S - SR-10 - 90 - 45 - U

Ⓐ Model
Ⓑ Oscillating angle
Ⓒ Oscillating origin
Ⓓ Lead wire outlet direction

Symbol	Descriptions
Ⓐ Model	
SR-10	Applicable actuator: RV3$^{S}_{D}$10
SR-20	Applicable actuator: RV3$^{S}_{D}$20
SR-30	Applicable actuator: RV3$^{S}_{D}$30
Ⓑ Oscillating angle	
90	90°
180	180°
270	270°

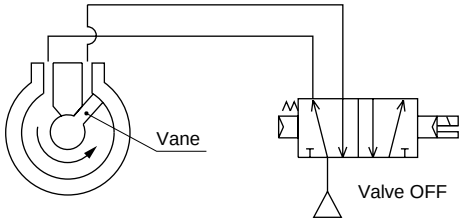
Ⓒ Oscillating origin

Model		SR-3	SR-10	SR-20	SR-30
45	45°	●	●	●	●
90	90°	●	●	●	

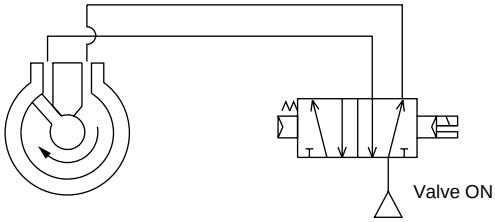
Ⓓ Lead wire outlet direction	
Blank	Axial lead wire with switch
U	Radial lead wire with switch

<Example of model number>
RV3S-SR-10-90-45-U
Model: Switch unit
Ⓐ Model : RV3S10
Ⓑ Oscillating angle :90°
Ⓒ Oscillating origin :45°
Ⓓ Lead wire outlet direction
: Radial lead wire

Operational principle



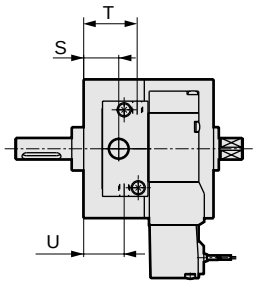
Vane returns to oscillating origin, when solenoid valve turns off.

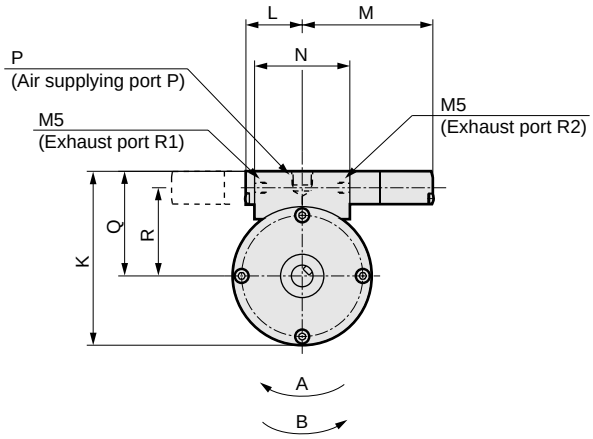


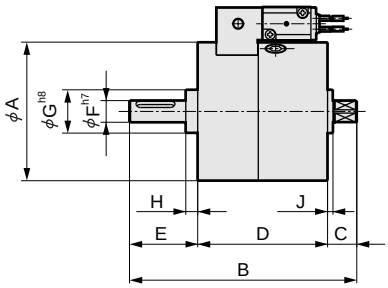
Dimensions

CAD

● RV3$^{SV}_{DW}$10, RV3$^{SV}_{DW}$20, RV3$^{SV}_{DW}$30







Single solenoid	Double solenoid
ON→ A direction	B solenoid ON → A direction
OFF→ B direction	A solenoid ON → B direction

* The key is attached. Refer to Page 105 for the key dimensions.
* The detailed dimensions for each main section follow RV3S D10, RV3S D20 and RV3S D30.

Symbol / Model no.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U
RV3$^{SV}_{DW}$10	42.5	73	10	40	23	6	14	5	2	58.3	26	60	35	M5	37	29.5	13.6	13.6	13.6
RV3$^{SV}_{DW}$20	49.5	93.5	10	55	28.5	8	16	5.5	2	65.2	26	60	37	Rc1/8	40.4	32.9	16.2	23.2	23.2
RV3$^{SV}_{DW}$30	64	105	13.5	60	31.5	10	20	5.5	2.5	80	26	60	44	Rc1/8	48	40.5	10.2	24.7	18.7

Compact rotary actuator with vane mechanism angle variable type

RV3SDA Series

- Torque: 3, 10, 20, 30
- Oscillating angle: Angle assignment

JIS symbol

Specifications

● Single vane mechanism

Descriptions		RV3SA			
Size		3	10	20	30
Effective torque	N·m	0.31	0.98	1.70	3.19
Actuation		Single vane			
Working fluid		Compressed air			
Max. working pressure	MPa	0.7		1.0	
Min. working pressure	MPa	0.2			
Withstanding pressure	MPa	1.05		1.5	
Ambient temperature	°C	-5 to 80 Note 4			-5 to 60
Port size		M5			Rc1/8
Oscillating angle setting range	degree	30 to 180			30 to 270
Oscillating origin	degree	90			45
Allowable energy absorption Note 2	mJ	1	2	3	7
Maximum cycle rate Note 3	cycle/min	150	150	120	90
Volumetric capacity	cm^3	3.3	9.8	18	43
Allowable radial load	N	40	50	300	400
Allowable thrust load	N	4.0		25	30
Weight	kg	0.085	0.17	0.28	0.51
Lubrication		Not required (when lubricating, use turbine oil ISO VG32.)			

● Double vane mechanism

Descriptions		RV3DA			
Size		3	10	20	30
Effective torque	N·m	0.71	2.11	3.88	7.7
Actuation		Double vane			
Working fluid		Compressed air			
Max. working pressure	MPa	0.7		1.0	
Min. working pressure	MPa	0.2			
Withstanding pressure	MPa	1.05		1.5	
Ambient temperature	°C	-5 to 80 Note 4			-5 to 60
Port size		M5			Rc1/8
Oscillating angle setting range	degree	30 to 90			
Oscillating origin	degree	45			
Allowable energy absorption Note 2	mJ	1	2	3	7
Maximum cycle rate Note 3	cycle/min	240	240	180	180
Volumetric capacity	cm^3	2.8	8.1	15	34
Allowable radial load	N	40	50	300	400
Allowable thrust load	N	4.0		25	30
Weight	kg	0.087	0.18	0.29	0.53
Lubrication		Not required (when lubricating, use turbine oil ISO VG32.)			

Note 1: The allowable energy absorption differs from the compact rotary actuator RV3* Series.
Note 2: Calculate allowable energy with allowable inertia energy of shaft of rotary actuator as following.
Allowable energy ≧ $1/2I\omega^2 \times 10^3$ (refer to Page 121 for detail.)
Note 3: The maximum working frequency is at supply pressure 0.5MPa <in no load state>.
Note 4: 5 to 60°C when switch is provided.
Note 5: A key is enclosed with the rotary actuator with keyway.
Note 6: Consult CKD for products other than standard specifications.

External stopper specifications

Descriptions		RV3SA3	RV3SA10	RV3SA20	RV3SA30	RV3DA3	RV3DA10	RV3DA20	RV3DA30
Min. setting angle	degree	30							
Max. setting angle	degree	180			270	90			
Angle setting pitch	degree	15							
Stopper fine adjustment range for angle setting	degree	-9 to + 6							
Stopper fine adjustment range for reference point	degree	±3				-1 to + 3	±3		
Stopper fine adjustment range for angle setting at max. setting angle	degree	-9 to + 6			-9 to + 3	-9 to + 1	-9 to + 3		

Oscillating angle setting range and oscillating origin

Model no.		Oscillating angle setting range	Oscillating origin
Single vane	RV3SA3	30 to 180°	90°
	RV3SA10		
	RV3SA20		
	RV3SA30	30 to 270°	45°
Double vane	RV3DA3	30 to 90°	45°
	RV3DA10		
	RV3DA20		
	RV3DA30		

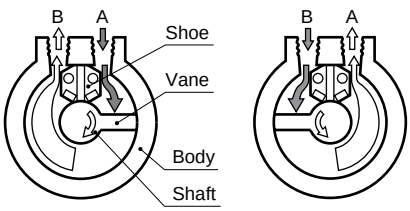
Switch specifications

Descriptions	Proximity switch
	FR-* (-U)
Applications	Programable controller, reray, IC circuit
Power voltage	5 to 30 VDC
Load voltage	5 to 30 VDC
Load current range	5mA to 200mA
Current consumption	20mA or less with 24 VDC 10mA or less with 12 VDC 4mA or less with 5 VDC
Internal voltage drop	1.5V or less
Light	LED (ON lighting)
Leakage current	10 μA or less
Lead wire length	1.0m (Oil-proof black 3-core cord)
Max. shock resistance	490m/s²
Insulation resistance	100MΩ and over with 500V mega
Withstand voltage	No failure when 1500 VAC is applied for one minute
Ambient temperature	5 to 60°C
Protective structure	IEC standards IP67, JIS C0920 (water tight type)

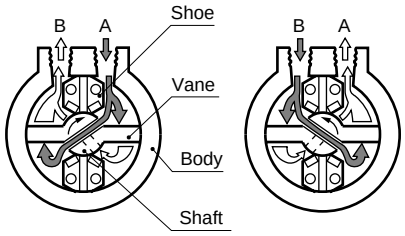
* mark indicates a rotary actuator size. (3, 10, 20, 30)

Operational principle

● Single vane
1. Configured with vane sliding inside of body, shaft, and shoe (stopper).
2. Air from port A pushes vane rotates shaft, and generates torque.
3. Air in opposite room is exhausted from port B, and shaft rotates clockwise.
4. Vane stops when it contacts to shoe.
5. Air supply from port B causes counterclockwise rotation in the same manner.



● Double vane
1. Configured with two vanes sliding inside of body, integrated shaft, and shoe (stopper).
2. Air from port A pushes vane, and goes through passage in shaft, pushes another vane, turns shaft, and finally generates torque.
3. Rotating in the same manner of single vane.



How to order

● Compact rotary actuator (angle variable type) RV3*A

RV3SA 3 - 0 - 90 - FR-U - FA

Ⓐ Model no.
Ⓑ Nominal size
Ⓒ Oscillating angle
Note 1, Note 2
Ⓓ Oscillating origin
Ⓔ Switch type
Note 3, Note 4
Ⓕ Option
Note 5, Note 6

Symbol	Descriptions	Ⓐ Model no. Single vane mechanism: RV3SA	Ⓐ Model no. Double vane mechanism: RV3DA
Ⓑ Nominal size			
3	Effective torque 0.5MPa	0.31N·m	0.71N·m
10		0.98N·m	2.11N·m
20		1.70N·m	3.88N·m
30		3.19N·m	7.70N·m
Ⓒ Oscillating angle			
0	Without angle assignment	●	●
Desired angle	With angle assignment	●	●

Ⓓ Oscillating origin

Nominal size		3	10	20	30	3	10	20	30
45	45°				●	●	●	●	●
90	90°	●	●	●					

Symbol	Descriptions		
Ⓔ Switch type			
Blank	Without switch	●	●
FR	Axial lead wire with switch	●	●
FR-U	Radial lead wire with switch	●	●
Ⓕ Option			
Blank	No option	●	●
FA	With flange bracket	●	●
LS	With foot bracket	●	●
K	With protective cover	●	●

⚠ Note on model no. selection

Note 1: If "Without angle assignment" is selected, the reference point stopper will be mounted and the angle setting stopper will be enclosed. Mount the stopper if necessary.
Note 2: The required angle is set to the approximate angle from the oscillation origin, so always adjust the final angle with the fine adjust screw before starting use.
Note 3: Two switches are enclosed.
Note 4: If the type with switch is selected, the switch unit will be enclosed with the shipped product. Adjust the external stopper and then install the switch.
Note 5: If the type with switch is selected, the "K" protective cover cannot be selected.
Note 6: The mounting bracket (FA and LS) is attached when shipping. Refer to Page 104 for dimensions.

<Example of model number>

RV3SA3-0-45-FR-FA

Model: Compact rotary actuator angle variable type
Ⓐ Model no. : RV3SA
Ⓑ Size : 3
Ⓒ Oscillating angle : Without angle assignment
Ⓓ Oscillating origin : 90°
Ⓔ Switch type : Axial lead wire with switch
Ⓕ Option : With flange bracket

● How to order switch unit

RV3S - FR-3 - U

Ⓐ Model
Ⓑ Lead wire outlet direction

Symbol	Descriptions
Ⓐ Model	
FR-3	Applicable actuator: RV3SDA3
FR-10	Applicable actuator: RV3SDA10
FR-20	Applicable actuator: RV3SDA20
FR-30	Applicable actuator: RV3SDA30
Ⓑ Lead wire outlet direction	
Blank	Axial lead wire with switch
U	Radial lead wire with switch

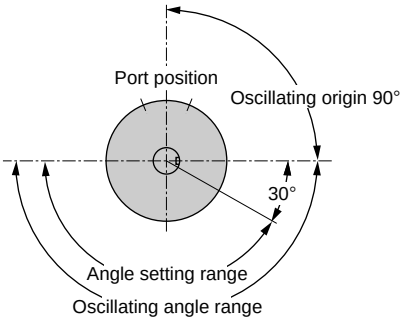
<Example of model number>

RV3S-FR-3-U

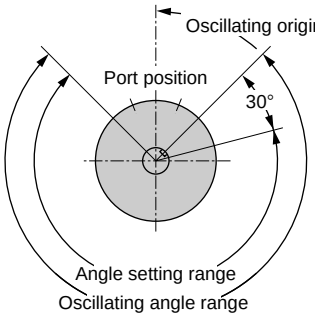
Model: Switch unit angle variable type
Ⓐ Model : RV3SA3
Ⓑ Lead wire outlet direction
: Radial lead wire

Oscillating origin position

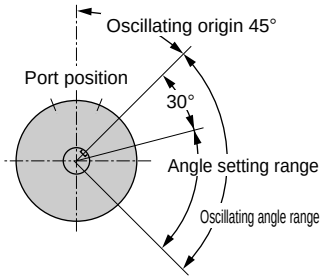
● Oscillating origin 90°
RV3SA3 to 20



● Oscillating origin 45°
RV3SA30



RV3DA3 to 30

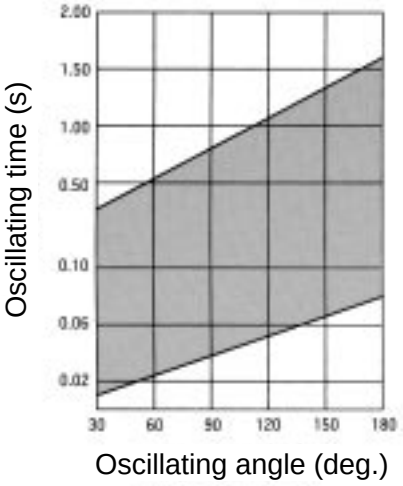


Note 1: Tolerance of oscillating origin is based on set screw position.

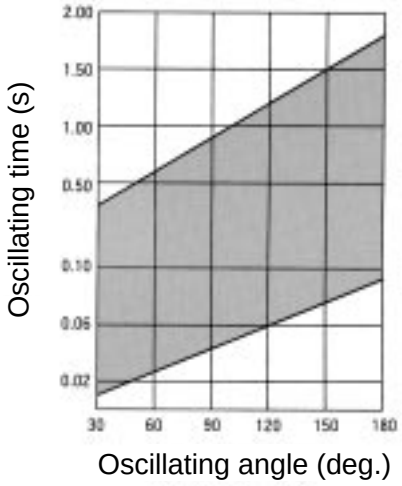
Oscillating time setting

1. Use oscillating time within range of below table. If used with exceeding this range, smooth operation can not be obtained due to stick and slip, etc.

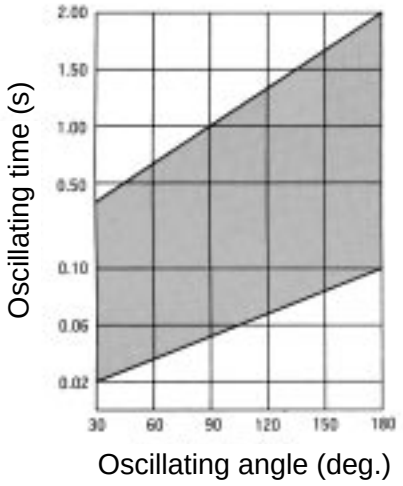
● RV3SDA3



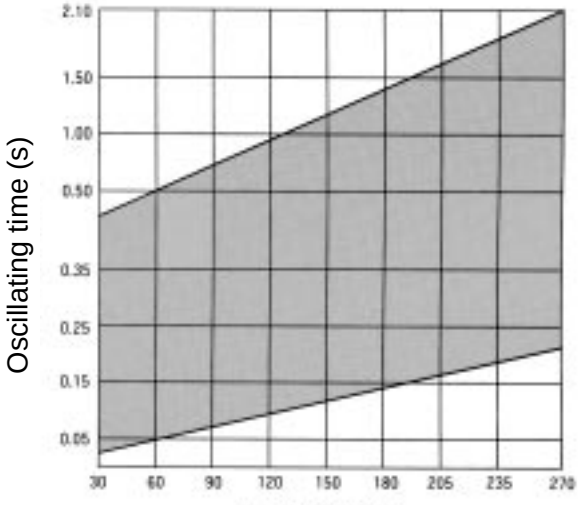
● RV3SDA10



● RV3SDA20

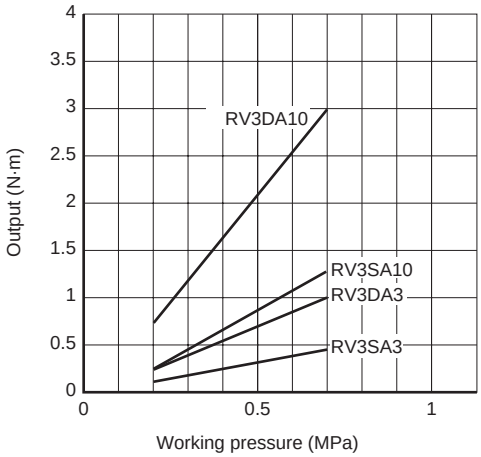


● RV3SDA30

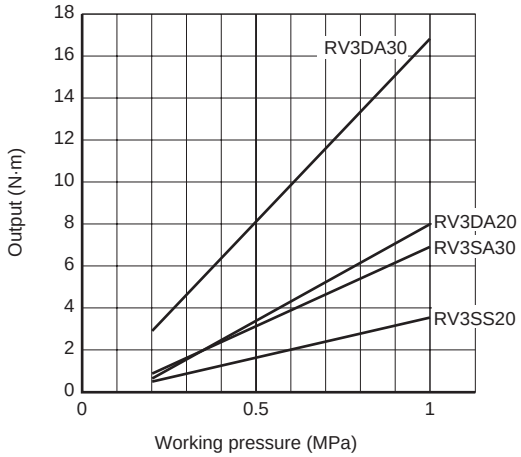


Output table (effective torque)

●RV3SDA3 to 10



●RV3SDA20, 30

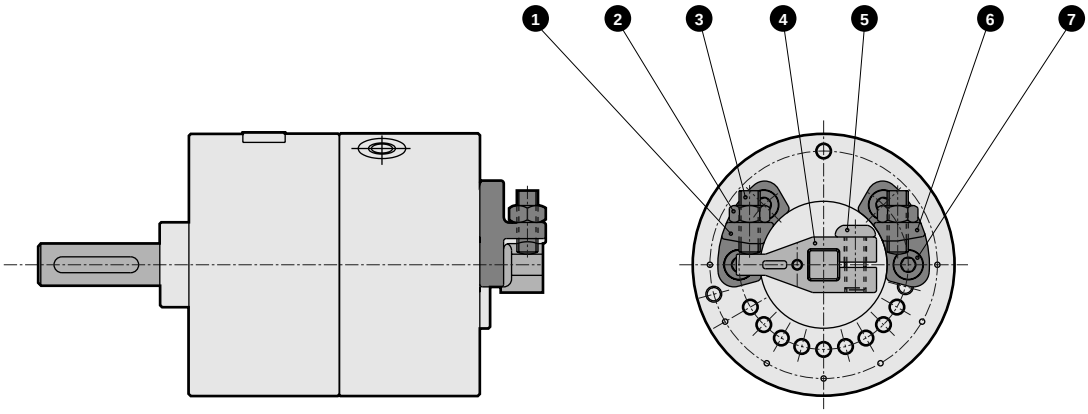


Output table (effective torque) Unit: N·m

Working pressure (MPa) / Model no.		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Single vane	RV3SA3	0.1	0.17	0.24	0.31	0.38	0.45	-	-	-
	RV3SA10	0.35	0.56	0.75	0.98	1.2	1.39	-	-	-
	RV3SA20	0.59	0.95	1.33	1.7	2.1	2.49	2.87	3.26	3.68
	RV3SA30	1.1	1.8	2.5	3.19	4.1	4.8	5.8	6.5	7.2
Double vane	RV3DA3	0.25	0.39	0.54	0.71	0.86	1.01	-	-	-
	RV3DA10	0.76	1.17	1.62	2.11	2.54	3.03	-	-	-
	RV3DA20	1.4	2.22	3.06	3.88	4.7	5.53	6.33	7.17	8.07
	RV3DA30	2.7	4.4	6	7.7	9.5	11.2	12.99	14.8	16.6

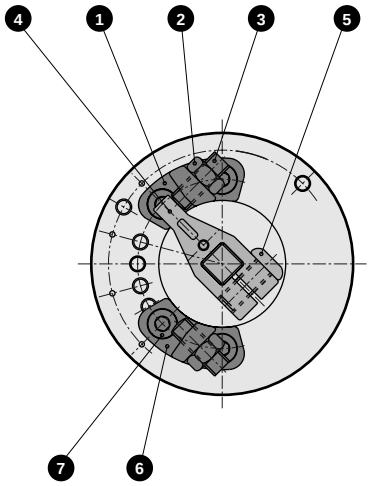
Internal structure and parts list

● RV3SA*



Single vane

● RV3SDA*



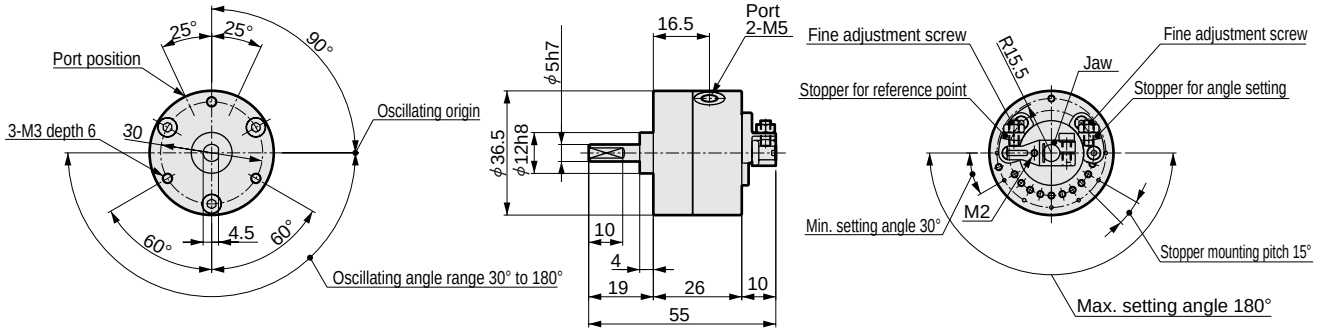
Double vane

* The internal structure of the rotary actuator is the same as the compact rotary actuator RV3SD.
Refer to Page 68 for details.

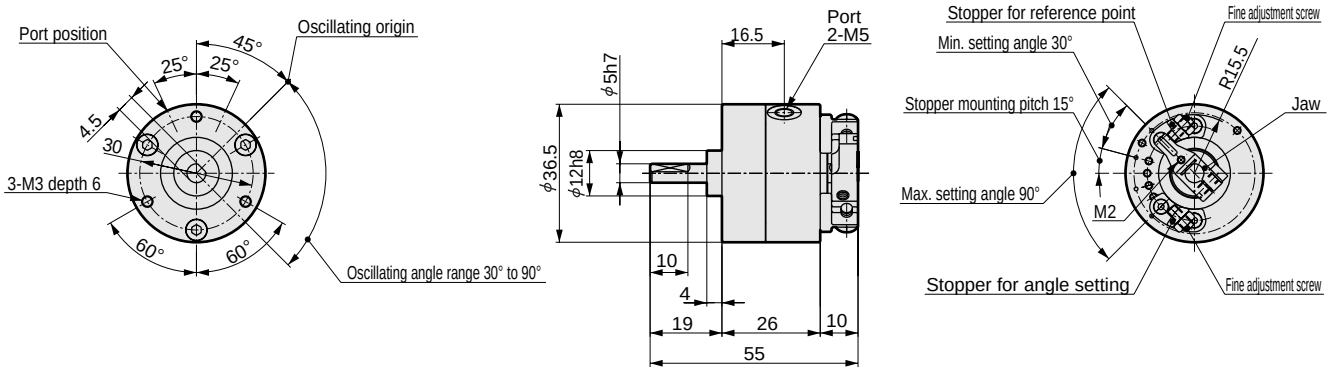
No.	Parts name	Material	Remarks	No.	Parts name	Material	Remarks
1	Stopper L	Steel	Reference point	5	Jaw mounting bolt	Steel	
2	Lock nut	Steel		6	Stopper R	Steel	Angle setting
3	Fine adjustment screw	Steel		7	Stopper mounting bolt	Steel	
4	Jaw	Steel					

Dimensions

● RV3SA3

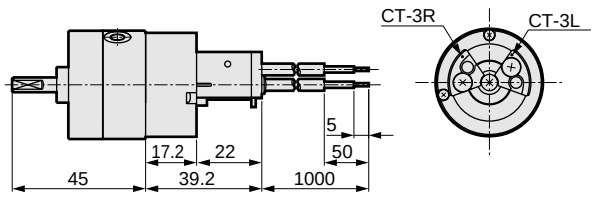


● RV3DA3

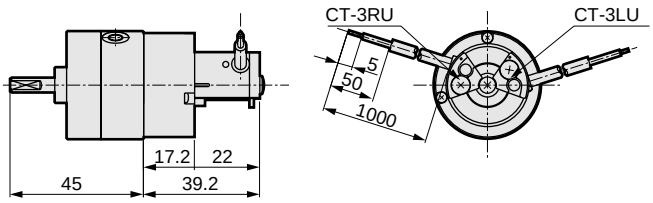


● RV3SDA3-*-FR (U)

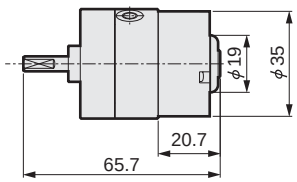
■ Axial lead wire



■ Radial lead wire

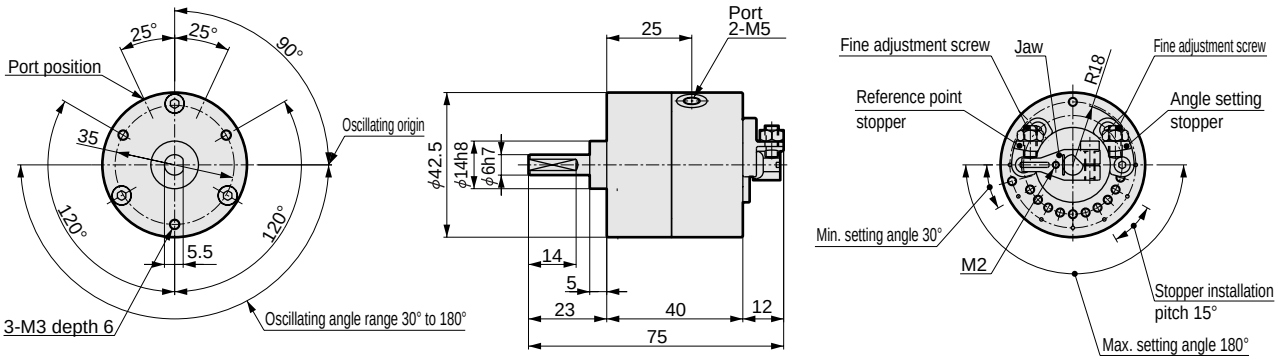


● RV3SDA3-*-K (with protective cover)

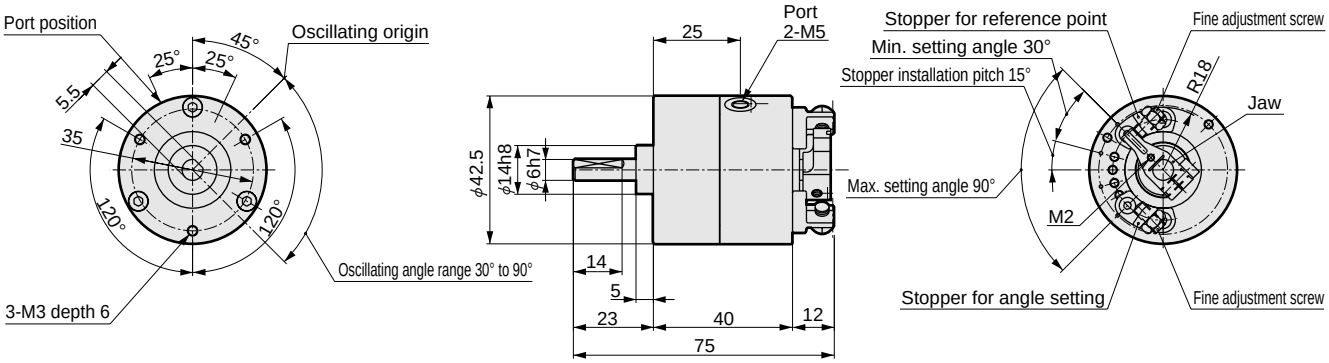


Dimensions

● RV3SA10

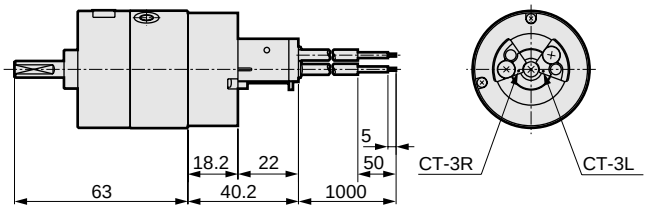


● RV3DA10

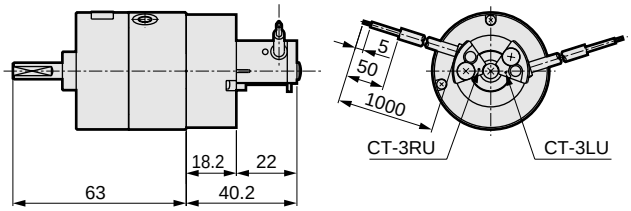


● RV3SDA10-*-FR (U)

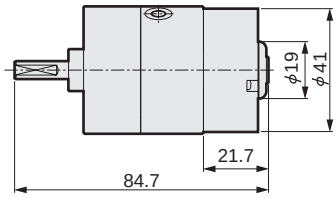
■ Axial lead wire



■ Radial lead wire

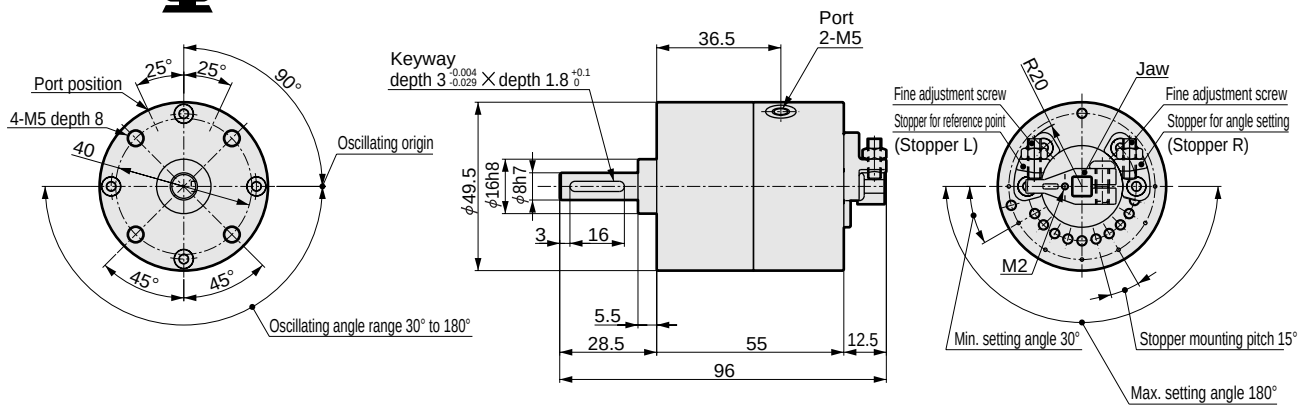


● RV3SDA10-*-K (with protective cover)



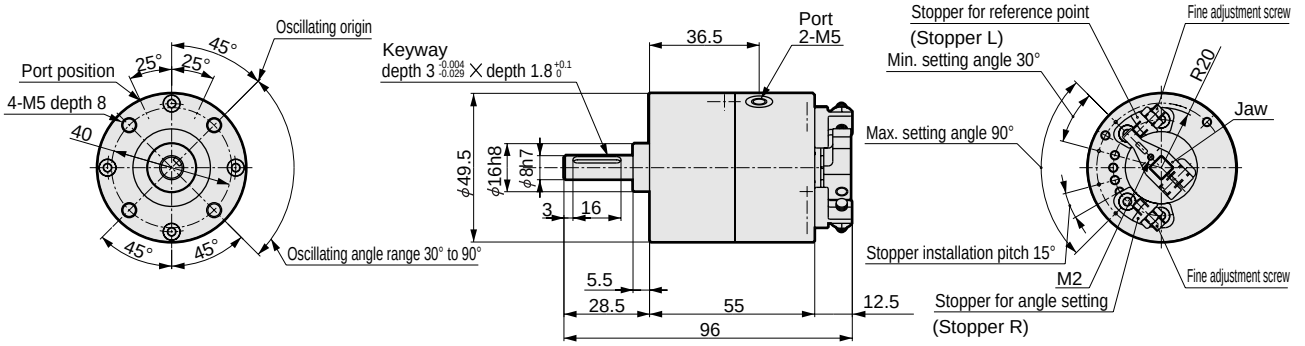
Dimensions

● RV3SA20



* The key is attached. Refer to Page 105 for the key dimensions.

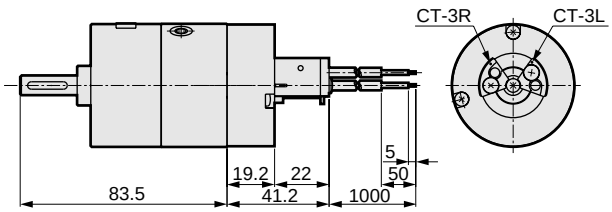
● RV3DA20



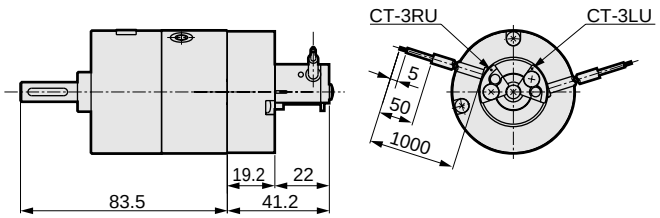
* The key is attached. Refer to Page 105 for the key dimensions.

● RV3SDA20-*-FR (U)

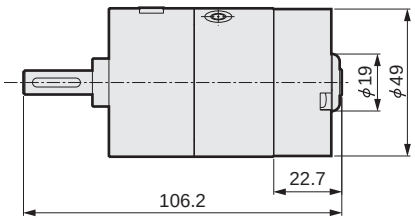
■ Axial lead wire



■ Radial lead wire

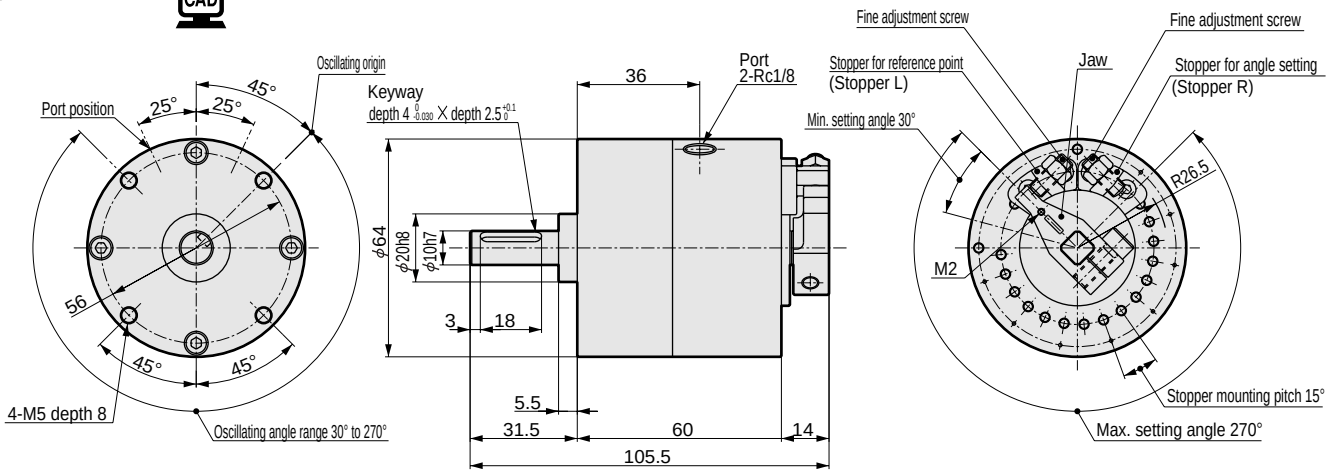


● RV3SDA20-*-K (with protective cover)



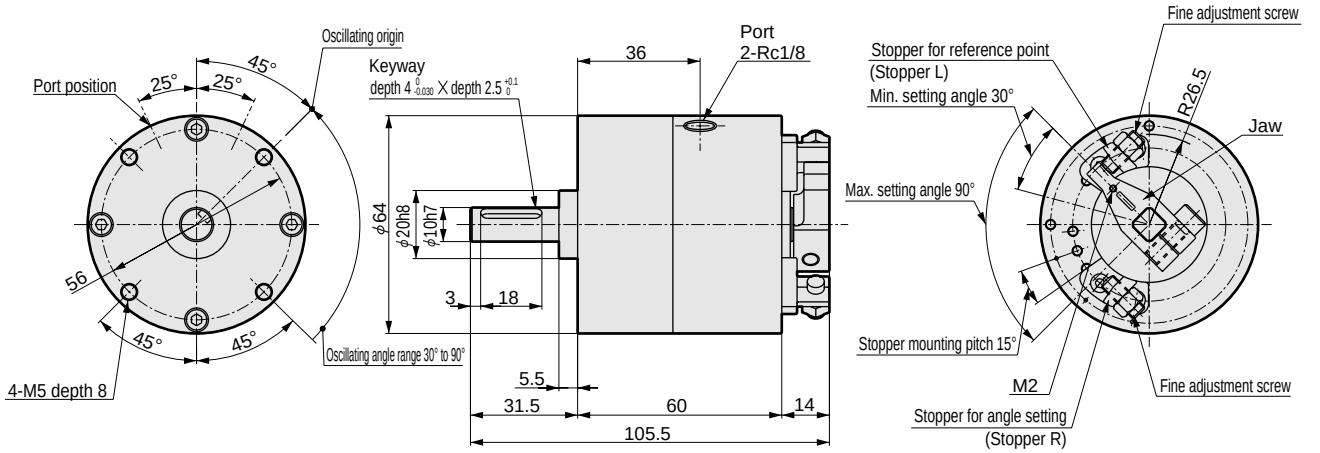
Dimensions

● RV3SA30



* The key is attached. Refer to Page 105 for the key dimensions.

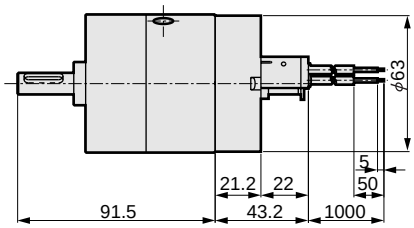
● RV3DA30

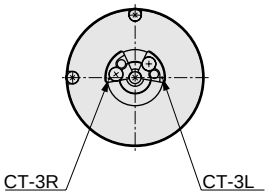


* The key is attached. Refer to Page 105 for the key dimensions.

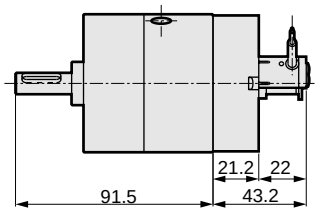
● RV3SDA30-*-FR (U)

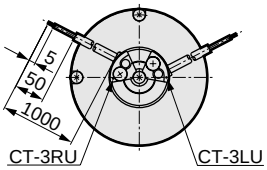
■ Axial lead wire



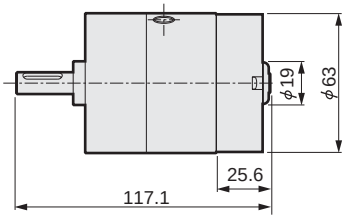


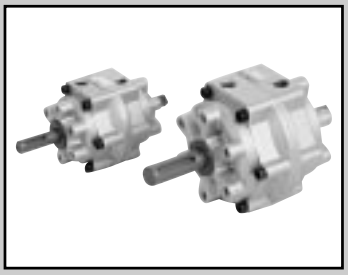
■ Radial lead wire





● RV3SDA30-*-K (with protective cover)





Large rotary actuator vane mechanism standard type

RV3S/D Series

- Torque: 50, 150, 300
- Oscillating angle: 90°, 100°, 180°, 270°, 280°

JIS symbol

RoHS CAD

Specifications

Descriptions	Single vane mechanism RV3S												Double vane mechanism RV3D					
Size	50				150				300				50		150		300	
Effective torque N·m	4.7				14.7				27.9				10.1		34.3		66.6	
Actuation	Single vane												Double vane					
Working fluid	Compressed air												Compressed air					
Max. working pressure MPa	1.0												1.0					
Min. working pressure MPa	0.2											Note 1	0.2					Note 1
Withstanding pressure MPa	1.5												1.5					
Ambient temperature ℃	5 to 60												5 to 60					
Port size	Rc1/8				Rc1/4				Rc3/8				Rc1/8		Rc1/4		Rc3/8	
Oscillating angle tolerance degree	90^{+3}_{0}	180^{+3}_{0}	270^{+3}_{0}	280^{+3}_{0}	90^{+3}_{0}	180^{+3}_{0}	270^{+3}_{0}	280^{+3}_{0}	90^{+3}_{0}	180^{+3}_{0}	270^{+3}_{0}	280^{+3}_{0}	90^{+3}_{0}	100^{+3}_{0}	90^{+3}_{0}	100^{+3}_{0}	90^{+3}_{0}	100^{+3}_{0}
Oscillating origin degree	45			40	45			40	45			40	45	40	45	40	45	40
Allowable energy absorption Note 2 mJ	49				225				1078				49		225		1078	
Maximum cycle rate Note 3 cycle/min	180	90	60		120	80	50		90	60	40		180		120		90	
Volumetric capacity cm^3	51		61	62	146		179	185	244	283	352	365	42	43	127	123	244	271
Allowable radial load N	588				1176				1960				588		1176		1960	
Allowable thrust load N	44.1				88.2				147				44.1		88.2		147	
Weight kg	0.82	0.79	0.73	0.7	2.0	1.9	1.7	1.6	3.7			3.6	0.82	0.8	2.0	1.9	4.3	4.1
Lubrication	Not required (when lubricating, use turbine oil Class 1 ISO VG32.)												Not required (when lubricating, use turbine oil ISO VG32.)					

Note 1: The minimum working pressure is 0.3MPa when the optional shock absorber is selected.
Note 2: Calculate allowable energy with allowable inertia energy of shaft of rotary actuator as following.
(Allowable energy) $\geqq 1/2 I\omega^2 \times 10^3$ (Refer to Page 121 for detail.)
If formula above is not satisfied, problems such as shaft broken may be caused.
Note 3: The maximum working frequency is at supply pressure 0.5MPa <in no load state>.
Note 4: A key is enclosed with the rotary actuator with keyway.
Note 5: Consult with CKD for products other than standard specifications.

Switch specifications

Descriptions	Proximity 2 wire	Proximity 3 wire
	M2V	M3V
Applications	Programmable controller	Programmable controller, relay, IC circuit, small solenoid valve
Output method	—	NPN output
Power voltage	—	4.5 to 28 VDC
Load voltage/current	10 to 30 VDC, 5 to 30mA	30 VDC or less, 200mA or less
Light	LED (ON lighting)	
Leakage current	1mA or less	10μA or less

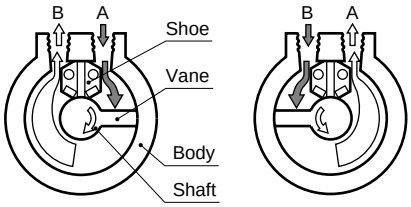
Descriptions	Reed 2 wire	
	M0V	M5V
Applications	Programmable controller, relay	Programmable controller, reray, IC circuit (no light), serial connection
Load voltage/current	5 to 50mA at 12/24VDC, 7 to 20mA at 110VAC	50mA or less at 5/12/24VDC, 20mA or less at 110VAC
Light	LED (ON lighting)	no light
Leakage current	0mA	

* M0 switch can be used for 24VAC and 48VAC within load current range of 7 to 20mA.

Operational principle

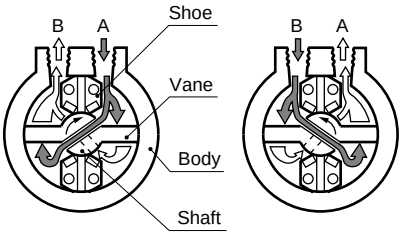
● Single vane

1. Configured with vane sliding inside of body, shaft, and shoe (stopper).
2. Air from port A pushes vane rotates shaft, and generates torque.
3. Air in opposite room is exhausted from port B, and shaft rotates clockwise.
4. Vane stops when it contacts to shoe.
5. Air supply from port B causes counterclockwise rotation in the same manner.



● Double vane

1. Configured with two vanes sliding inside of body, integrated shaft, and shoe (stopper).
2. Air from port A pushes vane, and goes through passage in shaft, pushes another vane, turns shaft, and finally generates torque.
3. Rotating in the same manner of single vane.



How to order

● Large rotary actuator (standard type) RV3*

RV3S 50 - 90 - 45 - M2V - R - C

Ⓐ Model no.
Ⓑ Nominal size
Ⓒ Oscillating angle
Ⓓ Oscillating origin Note 1
Ⓔ Switch type
Ⓕ Switch quantity
Ⓖ Option Note 2, Note 3 Note 4

Symbol	Descriptions	Ⓐ Model no. Single vane mechanism RV3S	Ⓐ Model no. Double vane mechanism RV3D
Ⓑ Nominal size			
50	Effective torque 0.5MPa	4.7N·m	10.1N·m
150		14.7N·m	34.3N·m
300		27.9N·m	66.6N·m
Ⓒ Oscillating angle			
90	90°	●	●
100	100°		●
180	180°	●	
270	270°	●	
280	280° (The type with switch is not available when the shock absorber is selected.)	●	
Ⓓ Oscillating origin			
40	40°	●	●
45	45°	●	●
Ⓔ Switch type			
Blank	Without switch	●	●
M2V*	Proximity, 1 color indicator type, 2-wire	●	●
M3V*	Proximity, 1 color indicator type, 3-wire	●	●
M0V*	Reed, 1 color indicator type, 2-wire	●	●
M5V*	Reed, no light, 2-wire	●	●
*Lead wire length			
Blank	1m (standard)	●	●
3	3m (option)	●	●
5	5m (option)	●	●
Ⓕ Switch quantity			
R	With clockwise rotation detection 1 piece	●	●
L	With counterclockwise rotation detection 1 piece	●	●
D	Two	●	●

Ⓖ Option

Nominal size		50	150	300	50	150	300
Blank	No option	●	●	●	●	●	●
FA	With flange bracket	●	●		●	●	
LS	With foot bracket	●	●	●	●	●	●
C	With shock absorber	●	●	●	●	●	●

⚠ Note on model no. selection

Note 1: Refer to below table for the relevant of the oscillating angle and oscillating origin.

Relevant of oscillating angle and oscillating origin

Ⓒ Oscillating angle \ Ⓓ Oscillating origin	40°	45°
90°		●
100°	●	
180°		●
270°		●
280°	●	

Note 2: The mounting bracket (FA and LS) is attached when shipping. Refer to Page 104 for dimensions.
Note 3: Refer to Page 106 for shock absorber (C).
Note 4: The switch cannot be installed with the oscillating angle 280 shock absorber.

<Example of model number>

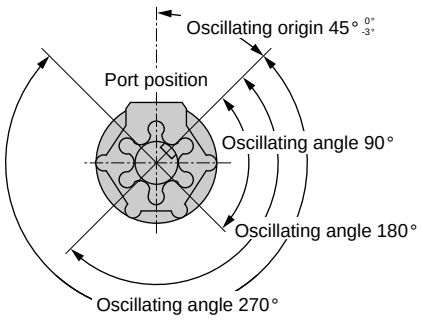
RV3S50-90-45-M2V-D-C

Model: Large rotary actuator

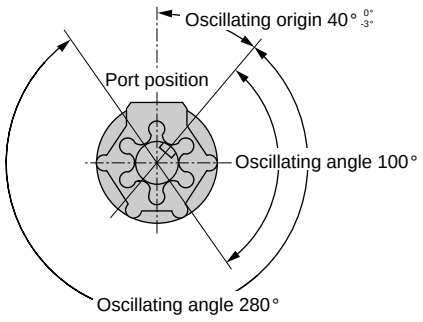
Ⓐ Model no. : RV3S
Ⓑ Size : 50
Ⓒ Oscillating angle : 90°
Ⓓ Oscillating origin : 45°
Ⓔ Switch type : M2V switch, lead wire length 1m
Ⓕ Switch quantity : Clockwise rotation detection 1 piece
Ⓖ Option : With shock absorber

Oscillating origin position

● Oscillating origin 45°
RV3*50 to 300



● Oscillating origin 40°
RV3*50 to 300



Note 1: If the type with switch is selected, the switch unit will be enclosed with the shipped product. Adjust the external stopper and then install the switch.
Note 2: Deflection of torsion angle between keyway on longer axis side (or cut plane) and square on shorter axis side to be within 1.5°.

How to order switch unit

Switch unit

RVU50 - C - 90 - M2V - R

Ⓐ Model

Ⓑ Unit type

Ⓒ Oscillating angle

Ⓓ Switch model no.

Ⓔ Switch quantity

Symbol	Descriptions
Ⓐ Model	
RVU50	Applicable actuator: RV3S/D50
RVU150	Applicable actuator: RV3S/D150
RVU300	Applicable actuator: RV3S/D300
Ⓑ Unit type	
Blank	Standard products
C	With shock absorber
Ⓒ Oscillating angle	
90	90
100	100°
180	180°
270	270°
280	280° ("C" (for shock absorber installation) cannot be selected.)

Ⓓ Switch model no.			
M2V*	Proximity	1 color indicator type	2-wire
M3V*			3-wire
M0V*	Reed		2-wire
M5V*		no light	

***Lead wire length**	
Blank	1m (standard)
3	3m (option)
5	5m (option)

Ⓔ Switch quantity	
R	With clockwise rotation detection 1 piece
L	With counterclockwise rotation detection 1 piece
D	Two

⚠ Note on model no. selection

Note: When selecting the type for shock absorber, the shock absorber unit must be purchased separately.

<Example of model number>

RVU50-C-90-M2V-R

Model: Switch unit

Ⓐ Model: RV3S/D50

Ⓑ Unit type: With shock absorber

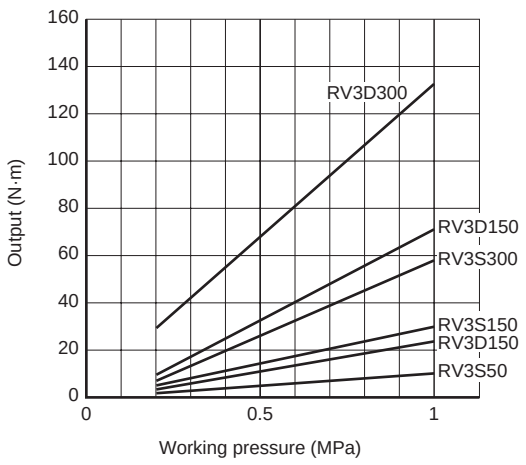
Ⓒ Oscillating angle: 90°

Ⓓ Switch model no.: M2V switch, lead wire length 1m

Ⓔ Switch quantity: Clockwise rotation detection 1 piece

Output characteristics graph (effective torque)

● RV3S/D50/150/300



Output table (effective torque) Unit: N·m

Working pressure (MPa) / Model no.		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Single vane	RV3S50	1.25	2.59	3.69	4.79	5.9	7	8.29	9.5	10.6
	RV3S150	5.5	8.5	11.5	15	18	21	24	27.3	30.5
	RV3S300	10.5	16.5	22.5	28.5	34.5	40.5	46	51.8	57.5
Double vane	RV3D50	3.3	5.79	8.29	10.4	12.8	15.1	17.6	20.1	22.5
	RV3D150	12.5	19	27	35	41.5	48	55	62	69
	RV3D300	25.5	39	54	68	83	97	110	124	137

Oscillating time setting

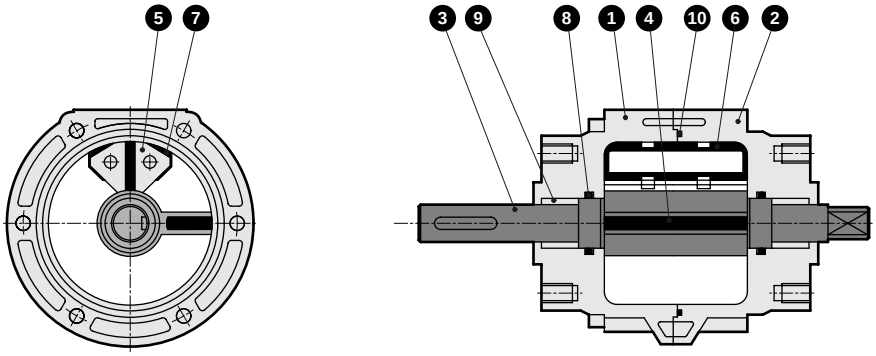
1. Use oscillating time within range of below table. If used with exceeding this range, smooth operation can not be obtained due to stick and slip, etc.

(s)

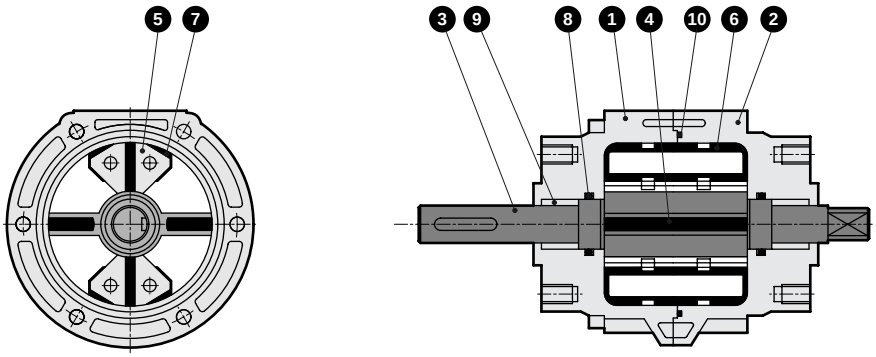
Model no.	Oscillating angle				
	90°	100°	180°	270°	280°
RV3S/D50	0.08 to 0.8	0.09 to 0.9	0.16 to 1.6	0.24 to 2.4	0.25 to 2.5
RV3S/D150	0.12 to 1.2	0.13 to 1.3	0.24 to 2.4	0.36 to 3.6	0.37 to 3.7
RV3S/D300	0.16 to 1.6	0.17 to 1.7	0.32 to 3.2	0.48 to 4.8	0.49 to 4.9

Internal structure and parts list

● RV3S50/150/300



● RV3D50/150/300

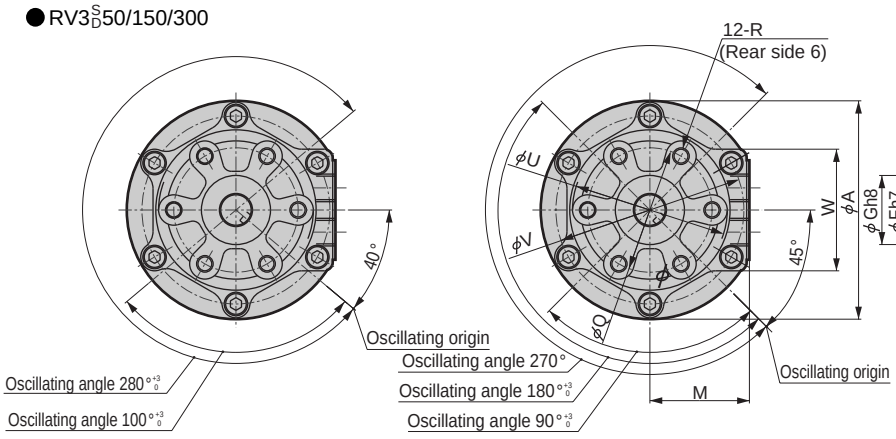


No.	Parts name	Material	Remarks	No.	Parts name	Material	Remarks
1	Body A	Aluminum alloy die-casting		6	Shoe sealant	Nitrile rubber	
2	Body B	Aluminum alloy die-casting		7	Damper	Resin	
3	Vane shaft	Steel		8	O ring	Nitrile rubber	
4	Vane sealant (vane shaft)	Nitrile rubber		9	Bearing	Sintering oil impregnated material	
5	Shoe	Zinc alloy die-casting		10	O ring	Nitrile rubber	

Refer to page 116 for the repair parts list.

Dimensions

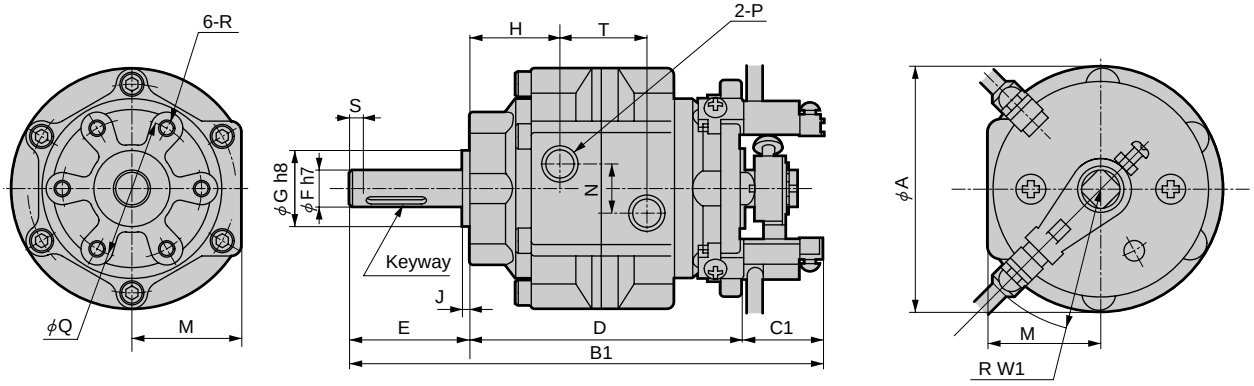
● RV3S/D50/150/300



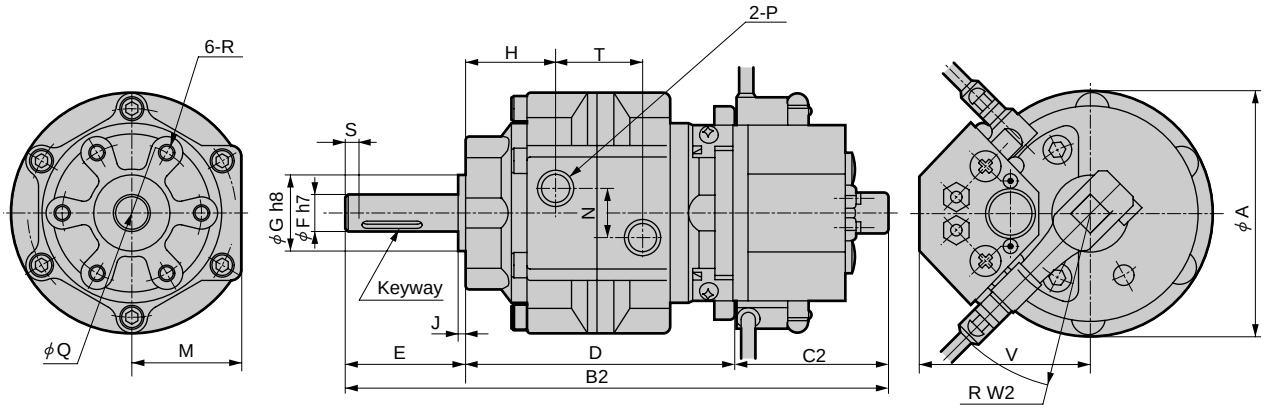
* The key is attached. Refer to Page 105 for the key dimensions.

Symbol / Model no.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	Keyway Width X Depth X Length	U	W	V	Z	X	X'	Y	Y'
RV3 S/D 50	79	145	19.5	86	39.5	12	25	29	2.5	10	13	36	16	Rc1/8	45	M6 depth 9	5	28	4X2.5X20	57	44	68	58	20	5	11	3
RV3 S/D 150	110	180	23.5	103	53.5	17	30	34.5	3	13	16	51	24	Rc1/4	70	M8 depth 12	5	34	5X3X36	85	61	97	85.2	23.5	6	10.5	5
RV3 S/D 300	141.5	220	30	125	65	25	45	41.5	3.5	19	22	66	32	Rc3/8	80	M10 depth 15	5	42	7X4X40	98.5	78	125	110	27.5	8	13	4.5

● With switch

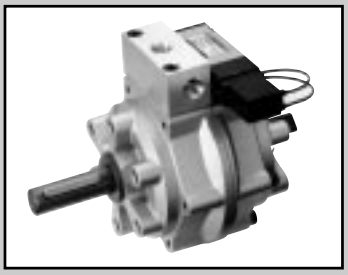


● With switch, shock absorber



* The key is attached. Refer to Page 105 for the key dimensions.

Symbol / Model no.	A	B1	B2	C1	C2	D	E	F	G	H	J	M	N	P	Q	R	S	T	V	W1	W2	Keyway Width X Depth X Length
RV3 S/D 50	79	157.7	177.2	31	50.5	87.2	39.5	12	25	29	2.5	36	16	Rc1/8	45	M6 depth 9	5	28	54	47	58	4X2.5X20
RV3 S/D 150	110	188.7	214.2	31	56.5	104.2	53.5	17	30	34.5	3	51	24	Rc1/4	70	M8 depth 12	5	34	71.5	61	72	5X3X36
RV3 S/D 300	141.5	222.2	253.7	31	62.5	126.2	65	25	45	41.5	3.5	66	32	Rc3/8	80	M10 depth 15	5	42	96	69	88	7X4X40



Large rotary actuator vane mechanism, with valve

RV3SV/DW Series

- Torque: 50, 150, 300
- Oscillating angle: 90°, 100°, 180°, 270°, 280°

JIS symbol

RoHS CAD

Specifications

● Single vane mechanism

Descriptions	RV3SV/RV3SW											
Size	50			150				300				
Effective torque N·m	4.7			14.7				27.9				
Actuation	Single vane											
Working fluid	Compressed air											
Max. working pressure MPa	0.7											
Min. working pressure MPa	0.2 Note 1											
Withstanding pressure MPa	1.05											
Ambient temperature ℃	5 to 50											
Port size (intake)	Rc1/8			Rc1/4				Rc3/8				
Port size (exhaust)	M5			Rc1/4								
Oscillating angle tolerance degree	90^{+3}_{0}	180^{+3}_{0}	270^{+3}_{0}	280^{+3}_{0}	90^{+3}_{0}	180^{+3}_{0}	270^{+3}_{0}	280^{+3}_{0}	90^{+3}_{0}	180^{+3}_{0}	270^{+3}_{0}	280^{+3}_{0}
Oscillating origin degree	45			40	45			40	45			40
Allowable energy absorption Note 2 mJ	49				225				1078			
Maximum cycle rate Note 3 cycle/min	180	90	60		120	80	50		90	60	40	
Volumetric capacity cm^3	51		61	62	146		179	185	244	283	352	365
Allowable radial load N	588				1176				1960			
Allowable thrust load N	44.1				88.2				147			
Incorporated solenoid valve	4KB119/4KB129				4KB219/4KB229							
Weight kg	0.9		0.84	0.81	2.2		2.0	1.9	4.1			4.0
Lubrication	Not required (when lubricating, use turbine oil Class 1 ISO VG32.)											

● Double vane mechanism

Descriptions	RV3DV/RV3DW											
Size	50			150				300				
Effective torque N·m	10.1			34.3				66.6				
Actuation	Double vane											
Working fluid	Compressed air											
Max. working pressure MPa	0.7											
Min. working pressure MPa	0.2 Note 1											
Withstanding pressure MPa	1.05											
Ambient temperature ℃	5 to 50											
Port size (intake)	Rc1/8			Rc1/4				Rc3/8				
Port size (exhaust)	M5			Rc1/4								
Oscillating angle tolerance degree	90^{+3}_{+0}	100^{+3}_{+0}			90^{+3}_{+0}	100^{+3}_{+0}			90^{+3}_{+0}	100^{+3}_{+0}		
Oscillating origin degree	45	40			45	40			45	40		
Allowable energy absorption Note 2 mJ	49				225				1078			
Maximum cycle rate Note 3 cycle/min	180				120				90			
Volumetric capacity cm^3	42	43			127	123			244	271		
Allowable radial load N	588				1176				1960			
Allowable thrust load N	44.1				88.2				147			
Incorporated solenoid valve	4KB119/4KB129				4KB219/4KB229							
Weight kg	0.93	0.91			2.3	2.2			4.7	4.5		
Lubrication	Not required (when lubricating, use turbine oil ISO VG32.)											

Note 1: The minimum working pressure is 0.3MPa when the optional shock absorber is selected.

Note 2: Calculate allowable energy with allowable inertia energy of shaft of rotary actuator as following. (Allowable energy) $\geqq 2I\omega^2 \times 10^3$ (Refer to Page 121 for detail.) If left formula is not satisfied, problems such as shaft broken may be caused.

Note 3: The maximum working frequency is at supply pressure 0.5MPa <in no load state>.

Note 4: A key is enclosed with the rotary actuator with keyway.

Note 5: Consult with CKD for products other than standard specifications.

Valve specifications

Descriptions	Specifications (4KB2 Series) Note 2		
Rated voltage Note 1 V	100 VAC (50/60Hz)	200 VAC (50/60Hz)	24 VDC
Starting current A	0.056/0.044	0.028/0.022	0.075
Holding current A	0.028/0.022	0.014/0.011	
Power consumption W	1.8/1.4		1.8
Voltage fluctuation range	±10%		
Insulation class	Class B molded coil		

Note 1: 100 VAC and 200 VAC are available with 110 VAC and 220 VAC(60Hz).
Note 2: Refer to page 75 for the specifications of 4KB1 Series.
Note 3: Refer ro "Pneumatic Valves (No. CB-23SA)" for detail on valve.

Switch specifications

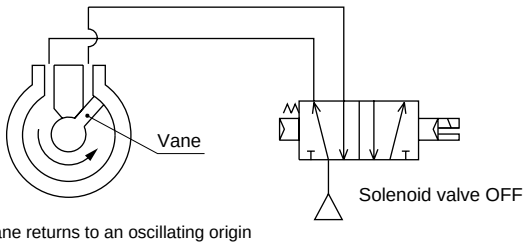
Descriptions	Proximity 2 wire	Proximity 3 wire
	M2V	M3V
Applications	Programmable controller	Programmable controller, relay, IC circuit, small solenoid valve
Output method	-	NPN output
Power voltage	-	4.5 to 28 VDC
Load voltage/current	10 to 30 VDC, 5 to 30mA	30 VDC or less, 200mA or less
Light	LED (ON lighting)	
Leakage current	1mA or less	10 μA or less

Descriptions	Reed 2 wire	
	M0V	M5V
Applications	Programmable controller, relay	Programmable controller, reray, IC circuit (no light), serial connection
Load voltage/current	5 to 50mA with 12/24 VDC 7 to 20mA with 110 VAC	50mA or less with 5/12/24 VDC 20mA or less with 110 VAC
Light	LED (ON lighting)	no light
Leakage current	0mA	

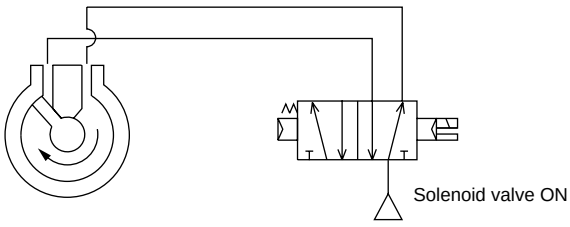
* M0 switch can be used for 24VAC and 48VAC within load current range of 7 to 20mA.

Operational principle

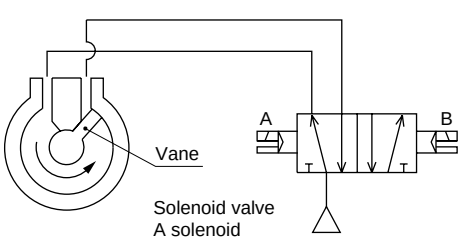
(1) Single solenoid



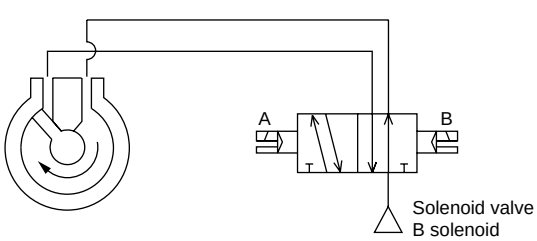
Vane returns to an oscillating origin position during a solenoid valve OFF.



(2) Double solenoid



When the solenoid valve A solenoid is ON, the vane returns to the oscillating origin position.



When the solenoid valve B solenoid is ON, the vane moves in the oscillating direction.

The double solenoid type solenoid valve maintains the self-hold state when both the A solenoid and B solenoid are OFF. However, the valve must be energized while the vane is moving.

How to order

● Large rotary actuator (with valve) RV3*$^{V}_{W}$

RV3S V 150 - 90 - 45 - 1 - M2V - R - C

Ⓐ Model no.
Ⓑ Valve
Ⓒ Nominal size
Ⓓ Oscillating angle
Ⓔ Oscillating origin Note 1
Ⓕ Valve voltage
Ⓖ Switch type
Ⓗ Switch quantity
Ⓘ Option Note 2, Note 3 Note 4

Symbol	Descriptions	Ⓐ Model no. Single vane mechanism RV3S	Ⓐ Model no. Double vane mechanism RV3D
Ⓑ Valve			
V	Single solenoid	●	●
W	Double solenoid	●	●
Ⓒ Nominal size			
50	Effective torque 0.5MPa	4.7N·m	10.1N·m
150		14.7N·m	34.3N·m
300		27.9N·m	66.6N·m
Ⓓ Oscillating angle			
90	90°	●	●
100	100°		●
180	180°	●	
270	270°	●	
280	280° (The type with switch is not available when the shock absorber is selected.)	●	
Ⓔ Oscillating origin			
40	40°	●	●
45	45°	●	●
Ⓕ Valve voltage			
1	100 VAC	●	●
2	200 VAC	●	●
3	24 VDC	●	●
Ⓖ Switch type			
Blank	Without switch	●	●
M2V*	Proximity, 1 color indicator type, 2-wire	●	●
M3V*	Proximity, 1 color indicator type, 3-wire	●	●
M0V*	Reed, 2-wire	●	●
M5V*	Reed, no light, 2-wire	●	●
*Lead wire length			
Blank	1m (standard)	●	●
3	3m (option)	●	●
5	5m (option)	●	●
Ⓗ Switch quantity			
R	With clockwise rotation detection 1 piece	●	●
L	With counterclockwise detection 1 piece	●	●
D	Two	●	●

Ⓘ Option

Symbol	Descriptions	50	150	300	50	150	300
	Nominal size						
Blank	No option	●	●	●	●	●	●
FA	With flange bracket	●	●		●	●	
LS	With foot bracket	●	●	●	●	●	●
C	With shock absorber	●	●	●	●	●	●

⚠ Note on model no. selection

Note 1: Refer to below table for the relevant of the oscillating angle and oscillating origin.

Relevant of oscillating angle and oscillating origin

Ⓒ Oscillating angle \ Ⓓ Oscillating origin	40°	45°
90°		●
100°	●	
180°		●
270°		●
280°	●	

Note 2: The mounting bracket (FA and LS) is attached when shipping. Refer to Page 104 for dimensions.

Note 3: Refer to Page 106 for shock absorber (C).

Note 4: The switch cannot be installed with the oscillating angle 280 shock absorber.

<Example of model number>

RV3SV150-90-45-M2V-R-C

Model: Large rotary actuator with valve

Ⓐ Model no. : RV3S
Ⓑ Valve : Single solenoid
Ⓒ Size : 150
Ⓓ Oscillating angle : 90°
Ⓔ Oscillating origin : 45°
Ⓕ Valve voltage : 100 VAC
Ⓖ Switch type : M2V switch, lead wire length 1m
Ⓗ Switch quantity : With clockwise rotation detection 1 piece
Ⓘ Option : With shock absorber

How to order switch unit

RVU50 - C - 90 - M2V - R

Ⓐ Model
Ⓑ Unit type
Ⓒ Oscillating angle
Ⓓ Switch model no.
Ⓔ Switch quantity

Symbol	Descriptions
Ⓐ Model	
RVU50	Applicable actuator: RV3S/D50
RVU150	Applicable actuator: RV3S/D150
RVU300	Applicable actuator: RV3S/D300
Ⓑ Unit type	
Blank	Standard products
C	With shock absorber
Ⓒ Oscillating angle	
90	90°
100	100°
180	180°
270	270°
280	280° ("C" (for shock absorber installation) cannot be selected.)
Ⓓ Switch model no.	
M2V*	Proximity, 1 color indicator type, 2-wire
M3V*	Proximity, 1 color indicator type, 3-wire
M0V*	Reed, 2-wire
M5V*	Reed, no light, 2-wire
***Lead wire length**	
Blank	1m (standard)
3	3m (option)
5	5m (option)
Ⓔ Switch quantity	
R	With clockwise rotation detection 1 piece
L	With counterclockwise detection 1 piece
D	Two

⚠ Note on model no. selection

Note: When selecting the type for shock absorber, the shock absorber unit must be purchased separately.

<Example of model number>

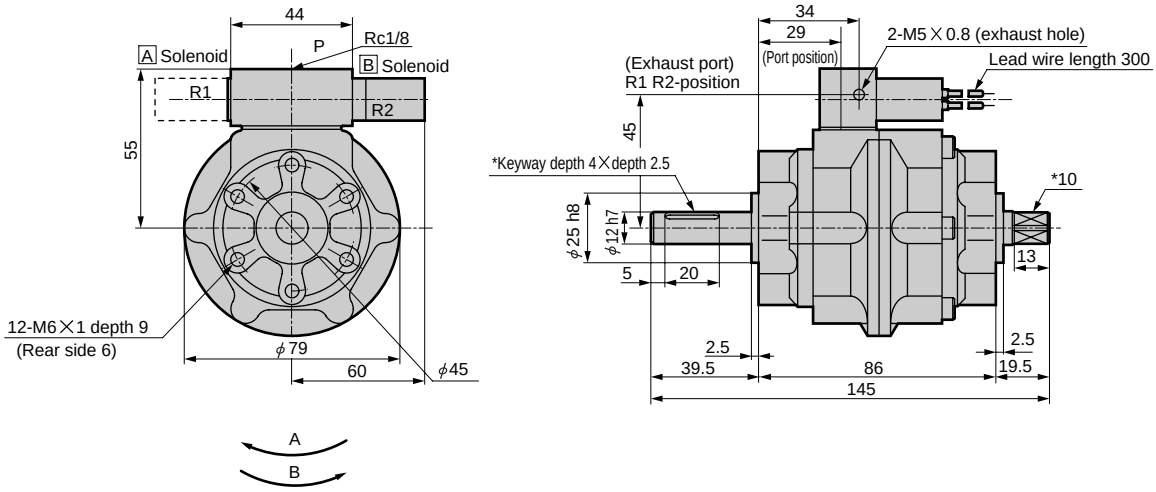
RVU50-C-90-M2V-R

Model: Switch unit
Ⓐ Model: RV3S/D50
Ⓑ Unit type: With shock absorber
Ⓒ Oscillating angle: 90°
Ⓓ Switch model no.: M2V switch, lead wire length 1m
Ⓔ Switch quantity: Clockwise rotation detection 1 piece

Dimensions

CAD

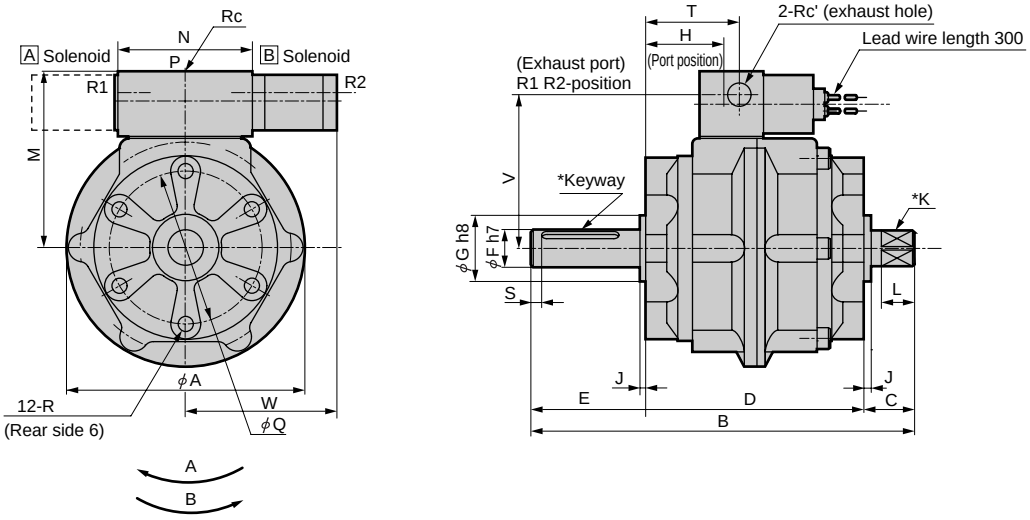
●RV3 SV DW 50



Single solenoid	Double solenoid
ON → A direction	B solenoid ON → A direction
OFF → B direction	A solenoid ON → B direction

* The key is attached. Refer to Page 105 for the key dimensions.

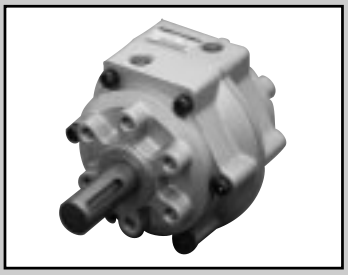
●RV3 SV DW 150/300



Single solenoid	Double solenoid
ON → A direction	B solenoid ON → A direction
OFF → B direction	A solenoid ON → B direction

* The key is attached. Refer to Page 105 for the key dimensions.

Symbol / Model no.	A	B	C	D	E	F	G	H	J	K	L	M	N	Rc	Rc'	Q	R	S	T	V	W	Keyway Width×Depth×Length
RV3*V150	110	180	23.5	103	53.5	17	30	36	3	13	16	79	62	1/4	1/4	70	M8 depth 12	5	41	65	70	5×3×36
RV3*V300	141.5	220	30	125	65	25	45	47.5	3.5	19	22	95	72	3/8	1/4	80	M10 depth 15	5	50.5	80	70	7×4×40



Large rotary actuator low hydraulic type

RV3SDH Series

- Torque: 50, 150, 300
- Oscillating angle: 90°, 100°, 180°, 270°, 280°

JIS symbol

RoHS CAD

Specifications

Descriptions	RV3SH/RV3DH		
Size	50	150	300
Working fluid	Hydraulic fluid		
Max. working pressure MPa	1.0		
Min. working pressure MPa	0.2		Note 1
Withstanding pressure MPa	1.5		
Ambient temperature ℃	5 to 60		

Note 1: The minimum working pressure is 0.3MPa when the optional shock absorber is selected.
Note 2: Use hydraulic fluid of JIS turbin oil Class 1 ISOVG32 or equivalent viscosity for lubricant. However, note on inapplicable one in flame resistant oil.
Hydraulic fluid of viscosity 40mm²/s (40cSt) is recommended at working oil temperature.
Use oil Fuji-kosan / Fukkol hydrol×22 or equivalent oil such as, MITSUBISHI / Diamond power fluid 18, Showa-Shell / SHELL Tellus oil 22, ESSO / Univis J26, Mobile DTE22, Cosmohydro HV22, Nippon oil corp. / highland-wide 22 and Idemitsu / Daphne super hydro 22 WR.

Switch specifications

Descriptions	Proximity 2 wire	Proximity 3 wire
	M2V	M3V
Applications	Programmable controller	Programmable controller, relay, IC circuit, small solenoid valve
Output method	—	NPN output
Power voltage	—	4.5 to 28 VDC
Load voltage/current	10 to 30 VDC, 5 to 30mA	30 VDC or less, 200mA or less
Light	LED (ON lighting)	
Leakage current	1mA or less	10 μA or less

Descriptions	Reed 2 wire	
	MOV	M5V
Applications	Programmable controller, relay	Programmable controller, reray, IC circuit (no light), serial connection
Load voltage/current	5 to 50mA at 12/24VDC, 7 to 20mA at 110VAC	50mA or less at 5/12/24VDC, 20mA or less at 110VAC
Light	LED (ON lighting)	no light
Leakage current	0mA	

* M0 switch can be used for 24VAC and 48VAC within load current range of 7 to 20mA.

Min. oscillating time

Unit: S

Descriptions		RV3*H50	RV3*H150	RV3*H300	Vane number
Oscillating angle	90°	0.3	0.4	0.4	Single vane
	180°	0.5	0.7	0.7	
	270°	0.7	0.9	1.0	
	280°	0.7	1.0	1.0	
	90°	0.6	1.3	1.9	Double vane
	100°	0.7	1.4	2.1	

Structure

●A basic structure is as pneumatic and same completely.

Descriptions		RV3*H50	RV3*H150	RV3*H300
Port size		Rc1/8	Rc1/4	Rc3/8
Orifice	Low hydraulic specifications	ϕ7	ϕ9.5	ϕ13
	Pneumatic	ϕ2.8	ϕ4	ϕ4.5

Note: If double vane, as same as pneumatics, since orifice of shaft is not changed.

●Volumetric capacity

Rotary actuator						
Series	Volumetric capacity (cm^3)					Port size
	90°	100°	180°	270°	280°	
RV3SH50	51	-	51	61	62	Rc1/8
RV3DH50	42	43	-	-	-	
RV3SH150	146	-	146	179	185	Rc1/4
RV3DH150	127	123	-	-	-	
RV3SH300	244	-	283	352	365	Rc3/8
RV3DH300	244	271	-	-	-	

How to order

● Large rotary actuator (low hydraulic type) RV3*H

RV3SH 50 - 90 - 45 - M2V - R - C

Ⓐ Model no.
Ⓑ Nominal size
Ⓒ Oscillating angle
Ⓓ Oscillating origin
Note 1
Ⓔ Switch type
Ⓕ Switch quantity
Ⓖ Option
Note 2, Note 3
Note 4

Symbol	Descriptions	Ⓐ Model no. Single vane mechanism	Ⓐ Model no. Double vane mechanism
		RV3SH	RV3DH
Ⓑ Nominal size			
50	Effective torque 0.5MPa	4.7N·m	10.1N·m
150		14.7N·m	34.3N·m
300		27.9N·m	66.6N·m
Ⓒ Oscillating angle			
90	90°	●	●
100	100°		●
180	180°	●	
270	270°	●	
280	280° (The type with switch is not available when the shock absorber is selected.)	●	
Ⓓ Oscillating origin			
40	40°	●	●
45	45°	●	●
Ⓔ Switch type			
Blank	Without switch	●	●
M2V*	Proximity, 1 color indicator type, 2-wire	●	●
M3V*	Proximity, 1 color indicator type, 3-wire	●	●
M0V*	Reed, 1 color indicator type, 2-wire	●	●
M5V*	Reed, no light, 2-wire	●	●
*Lead wire length			
Blank	1m (standard)	●	●
3	3m (option)	●	●
5	5m (option)	●	●
Ⓕ Switch quantity			
R	With clockwise rotation detection 1 piece	●	●
L	With counterclockwise detection 1 piece	●	●
D	Two	●	●

Ⓖ Option

Nominal size		50	150	300	50	150	3000
Blank	No option	●	●	●	●	●	●
FA	With flange bracket	●	●		●	●	
LS	With foot bracket	●	●	●	●	●	●
C	With shock absorber	●	●	●	●	●	●

⚠ Note on model no. selection

Note 1: Refer to below table for the relevant of the oscillating angle and oscillating origin.

Relevant of oscillating angle and oscillating origin

Ⓒ Oscillating angle \ Ⓓ Oscillating origin	40°	45°
90°		●
100°	●	
180°		●
270°		●
280°	●	

Note 2: The mounting bracket (FA and LS) is attached when shipping. Refer to Page 104 for dimensions.

Note 3: Refer to Page 106 for shock absorber (C).

Note 4: The switch cannot be installed with the oscillating angle 280 shock absorber.

<Example of model number>

RV3SH50-90-45-M2V-D-C

Model: Large rotary actuator low hydraulic type

Ⓐ Model no. : RV3SH
Ⓑ Size : 50
Ⓒ Oscillating angle : 90°
Ⓓ Oscillating origin : 45°
Ⓔ Switch type : M2V switch, lead wire length 1m
Ⓕ Switch quantity : With clockwise rotation detection 1 piece
Ⓖ Option : With shock absorber

How to order switch unit

RVU50 - C - 90 - M2V - R

Ⓐ Model
Ⓑ Unit type
Ⓒ Oscillating angle
Ⓓ Switch model no.
Ⓔ Switch quantity

Symbol	Descriptions
Ⓐ Model	
RVU50	Applicable actuator: RV3S/D50
RVU150	Applicable actuator: RV3S/D150
RVU300	Applicable actuator: RV3S/D300
Ⓑ Unit type	
Blank	Standard products
C	With shock absorber
Ⓒ Oscillating angle	
90	90°
100	100°
180	180°
270	270°
280	280° ("C" (for shock absorber installation) cannot be selected.)

Ⓓ Switch model no.			
M2V*	Proximity	1 color indicator type	2-wire
M3V*			3-wire
M0V*	Reed		2-wire
M5V*		no light	

*Lead wire length	
Blank	1m (standard)
3	3m (option)
5	5m (option)

Ⓔ Switch quantity	
R	With clockwise rotation detection 1 piece
L	With counterclockwise detection 1 piece
D	Two

⚠Note on model no. selection

Note: When selecting the type for shock absorber, the shock absorber unit must be purchased separately.

<Example of model number>

RVU50-C-90-M2V-R

Model: Switch unit
Ⓐ Model: RV3S/D50
Ⓑ Unit type: With shock absorber
Ⓒ Oscillating angle: 90°
Ⓓ Switch model no.: M2V switch, lead wire length 1m
Ⓔ Switch quantity: Clockwise rotation detection 1 piece

Dimensions

It is the same as the large rotary actuator vane mechanism/standard type RV3SD Series. Refer to page 93.

Option and accessory

Flange and foot bracket

How to order

● Flange bracket

Model – FA

Flange bracket

Model	Applicable model
RVS1	RV3$^{S}_{D}$1
RVS3	RV3$^{S}_{D}$3
RVS10	RV3$^{S}_{D}$10
RVS20	RV3$^{S}_{D}$20
RVS30	RV3$^{S}_{D}$30
RVS50	RV3$^{S}_{D}$50
RVS150	RV3$^{S}_{D}$150

● Foot bracket

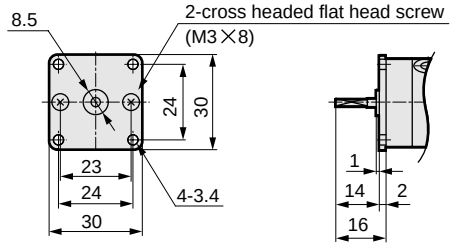
Model – LS

Foot bracket

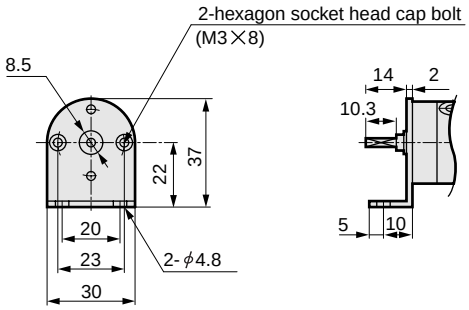
Model	Applicable model
RVS1	RV3$^{S}_{D}$1
RVS3	RV3$^{S}_{D}$3
RVS10	RV3$^{S}_{D}$10
RVS20	RV3$^{S}_{D}$20
RVS30	RV3$^{S}_{D}$30
RVS50	RV3$^{S}_{D}$50
RVS150	RV3$^{S}_{D}$150
RVS300	RV3$^{S}_{D}$300

Dimensions

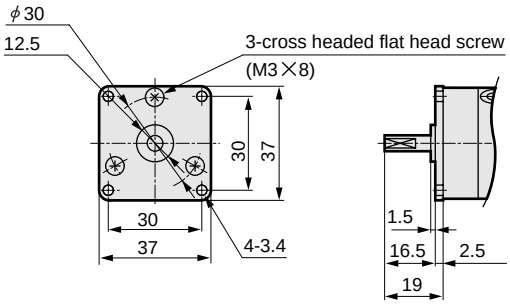
● RVS1-FA



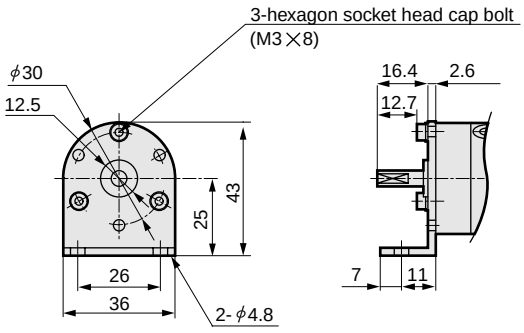
● RVS1-LS



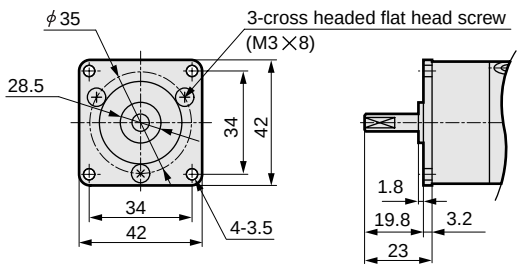
● RVS3-FA



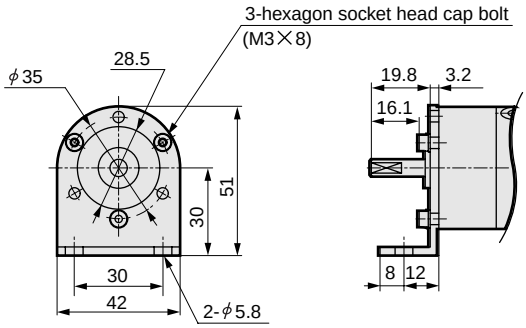
● RVS3-LS



● RVS10-FA

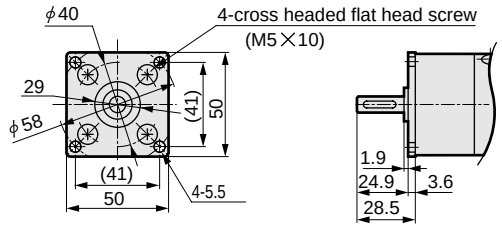


● RVS10-LS

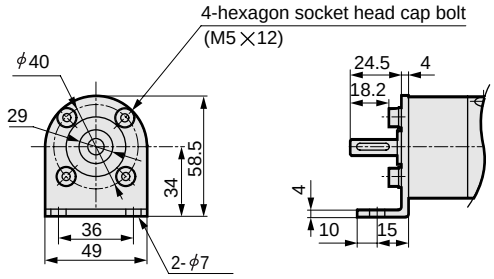


Flange bracket, foot bracket dimensions

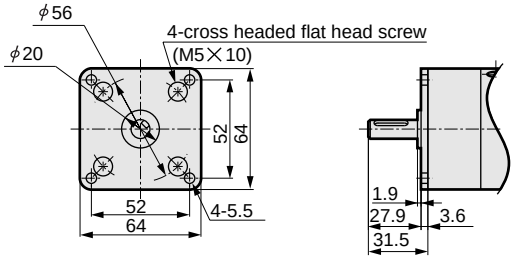
● RVS20-FA



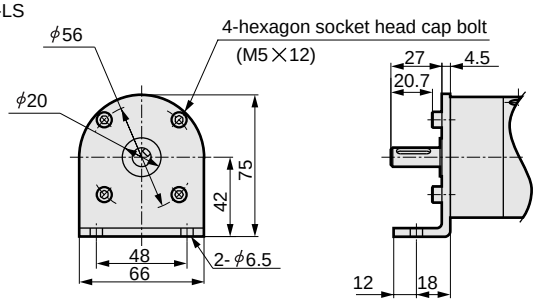
● RVS20-LS



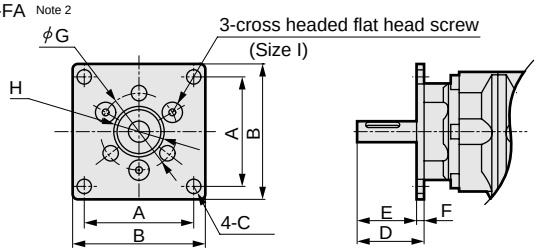
● RVS30-FA



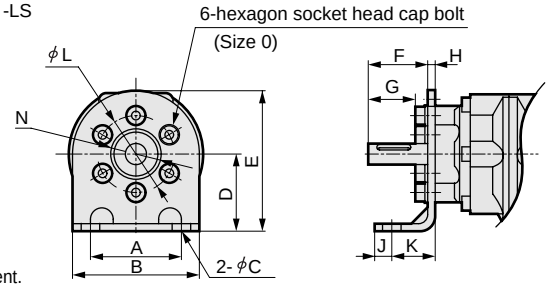
● RVS30-LS



● RVS$^{50}_{150}$-FA Note 2



● RVS $^{50}_{150}_{300}$-LS



Note) Foot bracket can be installed with rotating per 60° increment.

Model	A	B	C	D	E	F	G	H	I
RV*50	64	80	7	39.5	35	4.5	45	30	M6×12
RV*150	88	110	9	53.5	47.5	6	70	37	M8×12

Model	A	B	C	D	E	F	G	H	J	K	L	N	O
RV*50	55	75	11	45	82.5	35	27.5	4.5	10	25	45	30	M6×12
RV*150	80	110	13	65	115	43.5	33.5	10	12	28	70	37	M8×22
RV*300	100	140	15	80	135	53	40.5	12	13	32	80	52	M10×28

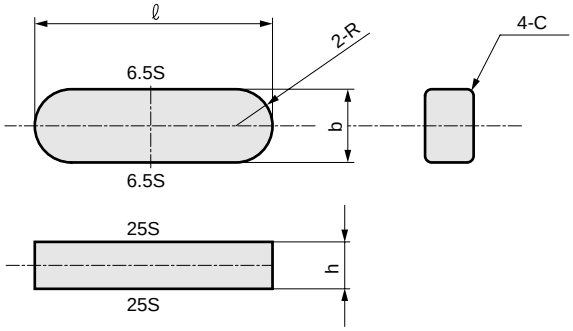
Note 1: One bracket and mounting bolt (required quantity) are delivered.
Note 2: Flange bracket is not available for RV*300.

Key

Dimensions

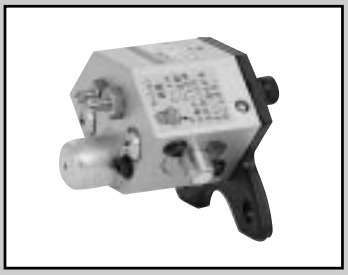
The rotary actuator of the type with keyway attaches each following key.

● JIS B1301 parallel key b×h×ℓ double round S45C



Unit: mm

Model no.	Norminal key	b	h	ℓ	C	R
RV3*20	3×3×16	$3^{\ 0}_{-0.025}$	$3^{\ 0}_{-0.025}$	$16^{\ 0}_{-0.18}$	0.16 to 0.25 (R0.16 to 0.25)	1.5
RV3*30	4×4×18	$4^{\ 0}_{-0.03}$	$4^{\ 0}_{-0.03}$	$18^{\ 0}_{-0.18}$	0.16 to 0.25 (R0.16 to 0.25)	2
RV3*50	4×4×20	$4^{\ 0}_{-0.03}$	$4^{\ 0}_{-0.03}$	$20^{\ 0}_{-0.21}$	0.16 to 0.25 (R0.16 to 0.25)	2
RV3*150	5×5×36	$5^{\ 0}_{-0.03}$	$5^{\ 0}_{-0.03}$	$36^{\ 0}_{-0.25}$	0.25 to 0.40 (R0.25 to 0.40)	2.5
RV3*300	7×7×40	$7^{\ 0}_{-0.036}$	$7^{\ 0}_{-0.036}$	$40^{\ 0}_{-0.25}$	0.25 to 0.40 (R0.25 to 0.40)	3.5



Shock absorber

RVC Series

- Torque: 50, 150, 300
- Absorbed energy: 2.9, 9.8, 19.6J

RoHS CAD

Specifications

Descriptions		RVC		
Size		50	150	300
Load range	kg·m²	0.098	0.294	0.588
Allowable energy absorption	J	2.9	9.8	19.6
Max. colliding angular speed	rad/s	14.8	13.0	11.3
Maximum energy capacity per minute Note 1	J/min	20	72	140
Ambient temperature	℃	5 to 50		
Absorbing angle (single)	rad	0.19	0.20	0.24
Weight	kg	0.24	0.42	0.78

Note 1: Energy capacity per minute = absorption energy×n times/min n: No. of times jaws contact cushion piston
Note 2: When using with the shock absorber, set the rotary actuator's working pressure to 0.3Mpa and over.

How to order

Body

RVC50

Model	Applicable rotary actuator
RVC50	RV3*50
RVC150	RV3*150
RVC300	RV3*300

● Jaw for shock absorber

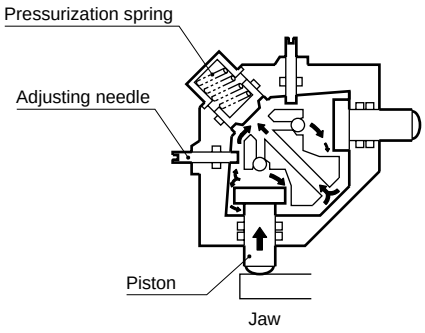
RVC50 - 90 - T

Ⓐ Model
Ⓑ Oscillating angle
Ⓒ Part (jaw)

Symbol	Descriptions
Ⓐ Model	
RVC50	RV3*50
RVC150	RV3*150
RVC300	RV3*300
Ⓑ Oscillating angle	
90	90°
100	100°
180	180°
270	270°
280	280°
Ⓒ Part (jaw)	
T	Jaw for shock absorber

Operational principle

If jaws installed on the rotary actuator shaft collide with the piston, action is converted to hydraulic pressure on the back of the piston that becomes thermal energy when it passes through the gap between the piston and cylinder inner diameter and the adjustment needle. It is radiated from the main device surface and consumed when the piston stops at the stroke end. The piston on the side is pressurized by the spring force and returns to the origin.



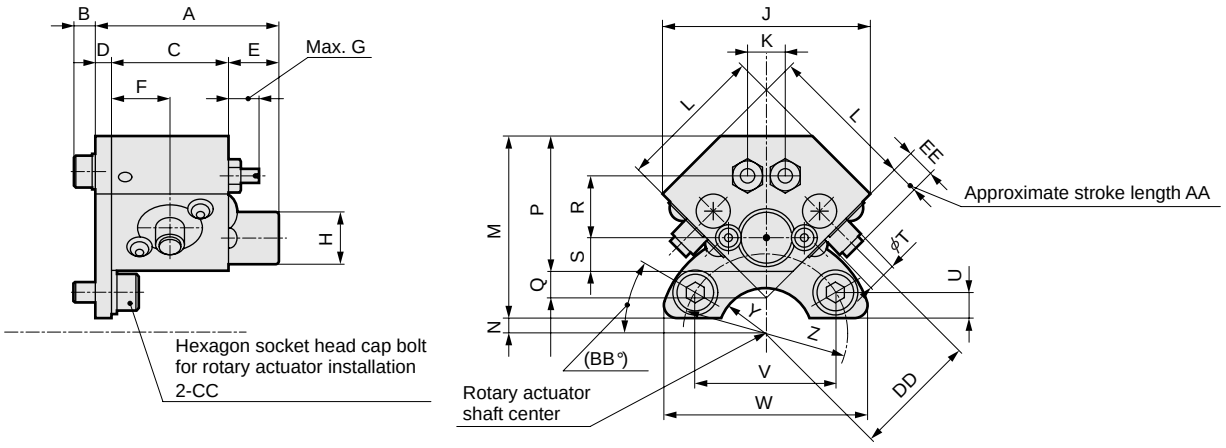
Shock energy

1. Obtain the moment of inertia from the size of the load, and confirm that it is within the load range.
2. Check that the collision angle speed is within the range.
   $\omega_0 \fallingdotseq 1.2\omega$
   ω_0: Collision angle (rad/s)
   ω : Average angle speed (rad/s)
3. Obtain collision energy from the load and collision angle speed.
   $E_1 = 1/2 I \omega_0^2$
   I : Moment of inertia (kg·m²)
   ω_0: Collision angle (rad/s)
4. Obtain energy generated by the rotary actuator torque.
   $E_2 = 1/2 T \theta'$
   T : Torque of rotary actuator (N·m)
   θ': Shock absorber absorption angle (per side) (rad)
5. Confirm that $E_1 + E_2$ is less than the maximum absorption energy.
6. Obtain energy per minute from frequency.
   $E_m = (E_1 + E_2) \times n$
   n: No. of times jaws contact cushion piston.
   Confirm that Em is less than the maximum energy per minute.

Dimensions

(Unit: mm)

● RVC50/150/300

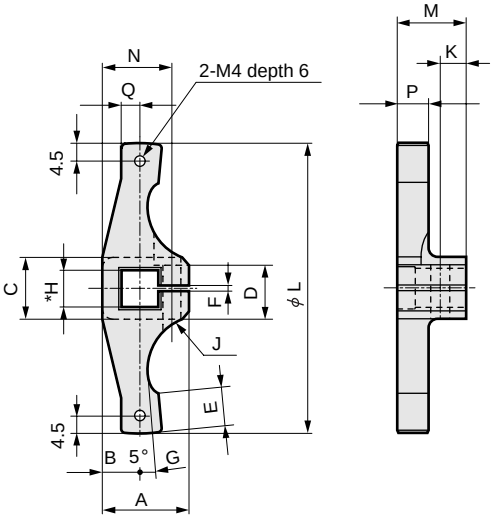


Note: Figure shows one mounting jaw for 270°.

Symbol / Model no.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	Y	Z	AA	BB	CC	DD	EE
RVC50	50.5	6	32	4.5	14	16	8.5	14.4	56.6	9.9	40	50	4	37	7.1	17	9.2	8	7.2	39	56	R12.5	R45	6.5	30	M6×12ℓ	34	8
RVC150	56.5	7.2	36	4.5	16	18	8.5	18.4	70.7	11.3	50	62	9.5	49	8.4	25.5	11.4	10	8	60.6	80	R15	R70	10	30	M8×16ℓ	46	12
RVC300	62.5	7.2	42	4.5	16	21	12	22.5	91.9	12.7	65	87	8	61	14.2	33.2	14.1	12	12	69.2	95	R22.5	R80	15	30	M10×20ℓ	62	18

Jaw for shock absorber dimensions

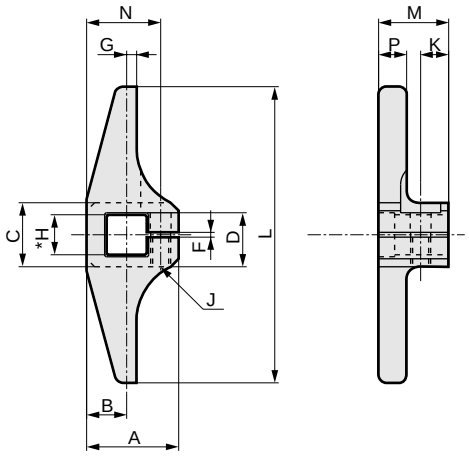
● Oscillating angle 90° (oscillating origin 45°)



Material: S50C or equivalent

Symbol / Model no.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
RVC50 -90-T	23	10	16	13.7	10	1.2	2.5	10	M5	7	76	18	18.5	8	5
RVC150-90-T	28	12	24	19.5	12	1.2	3.9	13	M6	7.5	102	20	23	10	5
RVC300-90-T	40	18	35	30.5	14	1.2	5.4	19	M8	9	136	23.5	33.5	12	9

● Oscillating angle 100° (oscillating origin 40°)

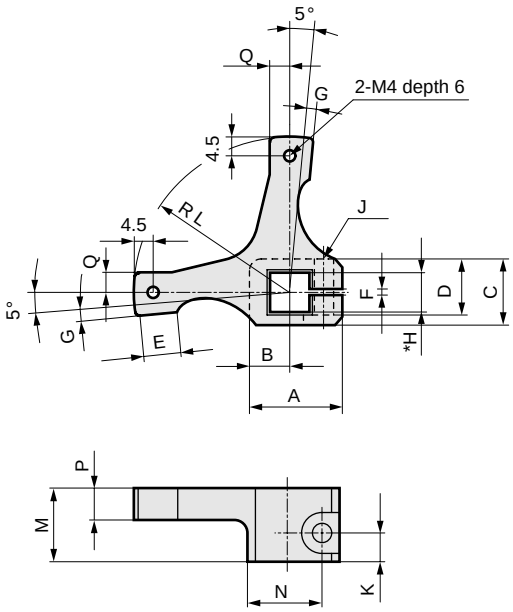


Material: S50C or equivalent

Symbol / Model no.	A	B	C	D	F	G	H	J	K	L	M	N	P
RVC50 -100-T	23	10	16	13.5	1.2	2.5	10	M5	7	74	17.5	18.5	7
RVC150-100-T	28	12	24	19.5	1.2	4	13	M6	9	102	20	23	10
RVC300-100-T	40	18	35	30.5	1.2	5.5	19	M8	11	136	23.5	33.5	12

Jaw for shock absorber dimensions

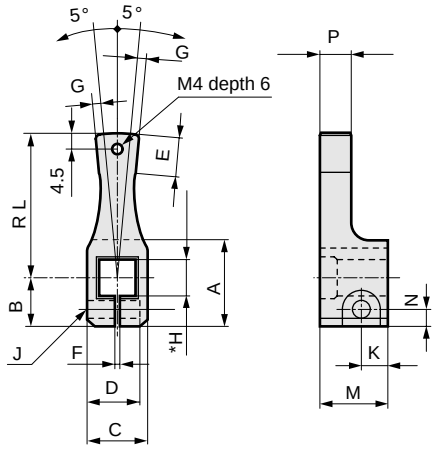
● Oscillating angle 180° (oscillating origin 45°)



Material: S50C or equivalent

Symbol / Model no.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
RVC50 -180-T	23	10	16	13.7	10	1.2	2.5	10	M5	7	38	18	18.5	8	5
RVC150-180-T	28	12	24	19.5	12	1.2	3.9	13	M6	9	51	20	23	10	5
RVC300-180-T	40	18	35	30.5	14	1.2	5.4	19	M8	11	68	23.5	33.5	12	9

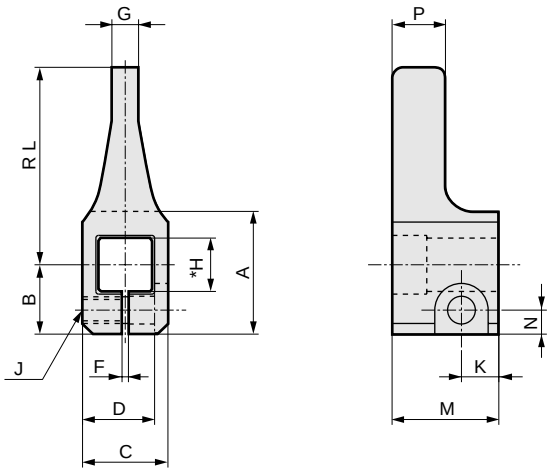
● Oscillating angle 270° (oscillating origin 45°)



Material: SCM435 or equivalent

Symbol / Model no.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
RVC50 -270-T	23	13	16	13.7	10	1.2	2.6	10	M5	7	38	18	4.5	8
RVC150-270-T	28	16	24	19.5	12	1.2	4	13	M6	9	51	20	5	10
RVC300-270-T	40	22	35	30.5	14	1.2	5.5	19	M8	11	68	23.5	6.5	12

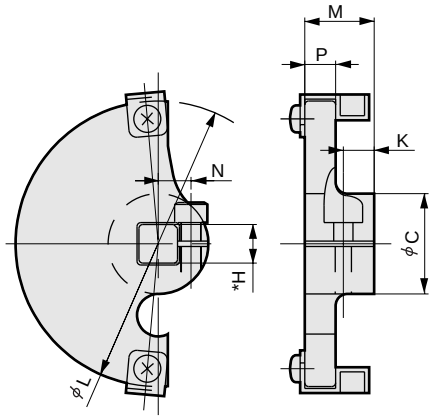
● Oscillating angle 280° (oscillating origin 40°)



Material: S50C or equivalent

Symbol / Model no.	A	B	C	D	F	G	H	J	K	L	M	N	P
RVC50 -280-T	23	13	16	13.5	1.2	5	10	M5	7	37	20	4.5	10
RVC150-280-T	28	16	24	19.5	1.2	8	13	M6	9	51	20	5	10
RVC300-280-T	40	22	35	30.5	1.2	11	19	M8	11	68	24	6.5	12.5

● Oscillating angle 100° (with magnet)



Material: S50C or equivalent

Symbol / Model no.	C	H	K	L	M	N	P
RVU50-100-A1-C	26	10	8	74	18	8.5	8
RVU150-100-A1-C	32	13	9	102	20	11	10

Refer to RVC300-100-T dimensions for RVU300-100-A1-C.

Note) Model no. with options such as switch, valve and shock absorber, etc. is listed on pages 118 to 119.

Switch unit: Compact type standard with valve

Specifications

Descriptions	Proximity switch
	SR-* (-U)
Applications	Programmable controller, relay, IC circuit, small solenoid valve
Power voltage	5 to 30 VDC
Load voltage/current	5 to 30 VDC, 200mA or less
Current consumption	20mA or less with 24 VDC
Internal voltage drop	1.5V or less
Light	LED (ON lighting)
Leakage current	10 μA or less
Lead wire length	1m (oil resistant vinyl cabtire cable, 4-conductor 0.2mm^2)
Maximum shock resistance	490m/s^2
Insulation resistance	100MΩ and over with 500V mega
Withstand voltage	No failure when 1000 VAC is applied for one minute
Ambient temperature	5 to 60℃
Protective structure	IEC standards IP67, JIS C0920 (water tight type)

*mark indicates a rotary actuator size. (3, 10, 20)

How to order

● How to order switch unit

RV3S - SR-3 - 90 - 45 - U

Ⓐ Model
Ⓑ Oscillating angle
Ⓒ Oscillating origin
Ⓓ Lead wire outlet direction

⚠ Note on model no. selection

Note 1: The type with switch is not available for the port position axial direction "S".

<Example of model number>

RV3S-SR-3-90-45-U

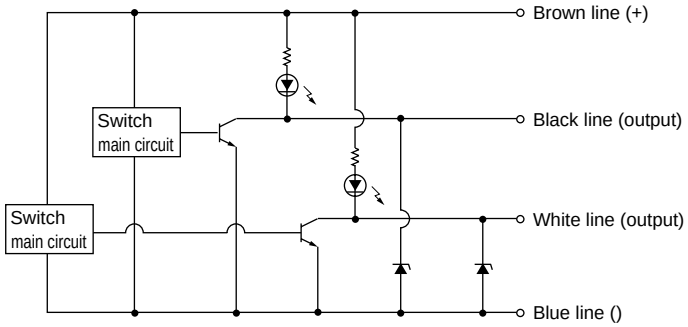
Model: Switch unit
Ⓐ Model : RV3S3
Ⓑ Oscillating angle : 90°
Ⓒ Oscillating origin : 45°
Ⓓ Lead wire outlet direction : Radial lead wire

Symbol	Descriptions
Ⓐ Model	
SR-3	Applicable actuator: RV3S3
SR-10	Applicable actuator: RV3S10
SR-20	Applicable actuator: RV3S20
SR-30	Applicable actuator: RV3S30
Ⓑ Oscillating angle	
90	90°
180	180°
270	270°
Ⓒ Oscillating origin	

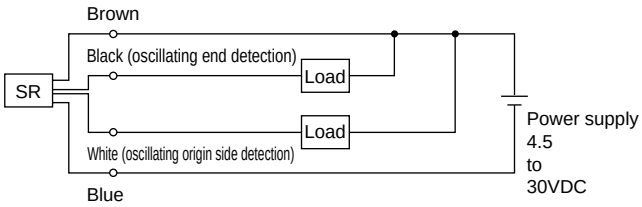
Model		SR-3	SR-10	SR-20	SR-30
45	45°	●	●	●	●
90	90°	●	●	●	

Ⓓ Lead wire outlet direction	
Blank	Axial lead wire with switch
U	Radial lead wire with switch

Switch internal wiring diagram

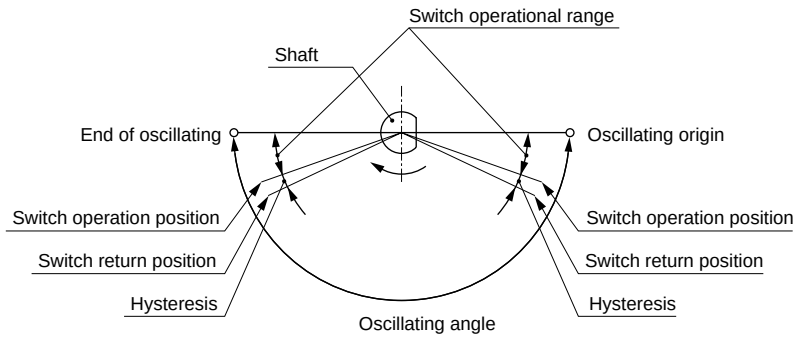


Switch wiring procedure



Note: Use same power supply for switch and load.

Hysteresis and operational range of switch

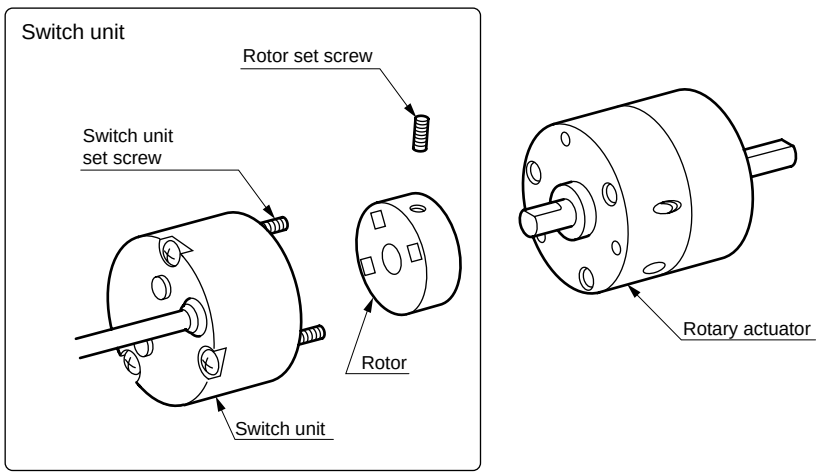


Rotary actuator	Operational range	Hysteresis
RV3$^{S}_{D}$-3	15°±7°	3° or less
RV3$^{S}_{D}$-10		
RV3$^{S}_{D}$-20		

Switches are fixed type, and it can not adjust a position.

Switch unit configurations

Configurations
- Rotor set screw
- Rotor
- Switch unit set screw
- Switch unit



* Switch unit can be installed onto rotary actuator without switch.
RV3S1 with switch is not available.

Switch unit: Compact oscillating angle variable types

Specifications

Descriptions	Proximity switch FR-* (-U)
Applications	Programable controller, reray, IC circuit
Power voltage	5 to 30 VDC
Load voltage	5 to 30 VDC
Load current range	5mA to 200mA
Current consumption	20mA or less with 24 VDC 10mA or less with 12 VDC 4mA or less with 5 VDC
Internal voltage drop	1.5V or less
Light	LED (ON lighting)
Leakage current	10 μA or less
Lead wire length	1.0m (oil resistance black conductor 3 code)
Maximum shock resistance	490m/s^2
Insulation resistance	100MΩ and over with 500V mega
Withstand voltage	No failure when 1500 VAC is applied for one minute
Ambient temperature	5 to 60℃
Protective structure	IEC standards IP67, JIS C0920 (water tight type)

* mark indicates a rotary actuator size. (3, 10, 20, 30)

Hysteresis of switch and operational range

Switch type	Operational range	Hysteresis
CT-3	23°± 7°	Approx. 2°

How to order

● Switch unit

RV3S - FR-3 - U

Ⓐ Model

Ⓑ Lead wire outlet direction

Symbol	Descriptions
Ⓐ Model	
FR-3	Applicable actuator: RV3^S_DA3
FR-10	Applicable actuator: RV3^S_DA10
FR-20	Applicable actuator: RV3^S_DA20
FR-30	Applicable actuator: RV3^S_DA30
Ⓑ Lead wire outlet direction	
Blank	Without switch
U	Radial lead wire with switch

<Example of model number>

RV3S-FR-3-U

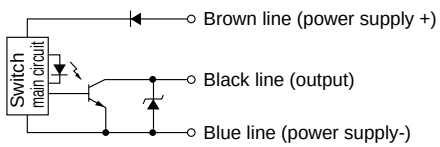
Model: Switch unit angle variable type

Ⓐ Model : RV3SA3

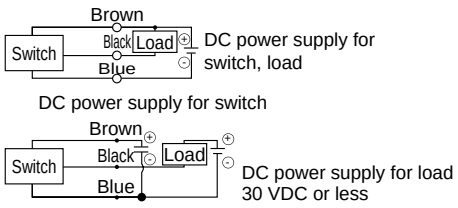
Ⓑ Lead wire outlet direction

: Radial lead wire

Switch internal wiring diagram



Switch wiring procedure

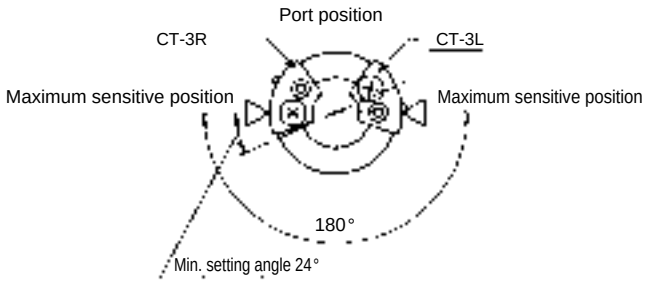


Oscillating angle and switch installation position

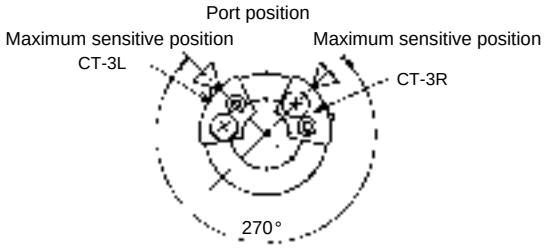
● When selecting the oscillating angle variable type RV3*A Series with switch, the switch unit is enclosed with the product. Install and adjust the angle setting stopper at the set angle, and then install the switch with the following combination.

Oscillating angle	Switch combination
30° to 186°	Combination A
187° to 270°	Combination B

Combination A



Combination B



Switch unit assembly and switch adjustment method

● Installing the switch unit

Install the switch onto the rotary actuator body using the switch case mounting screw. Refer to below table for the tightening torque.

Model no.	Tightening torque (N·m)
RV3$^{S}_{D}$A3	0.06 to 0.2
RV3$^{S}_{D}$A10	0.1 to 0.2
RV3$^{S}_{D}$A20	0.2 to 0.3
RV3$^{S}_{D}$A30	

● Switch position adjustment

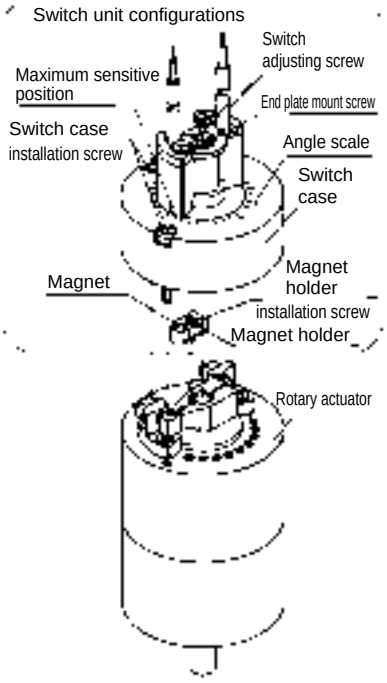
Loosen the switch adjust screw, set the switch's maximum sensitivity position to the angle scale which corresponds to the rotary actuator's set angle, and then fix the switch. Tighten with a tightening torque of 40 to 50N·cm. The angle scale is a guide, so confirm that the LED turns ON when making the final adjustment.

● Switch change

Remove the switch adjusting screw and plate fixing screw, and then replace the switch.

Assemble the switch following the removal steps in reverse, and always adjust the switch position.

Switch unit configurations



Large switch unit: Standard type/with valve, low hydraulic type

Specifications

Descriptions	Proximity 2 wire	Proximity 3 wire	Reed 2 wire	
	M2V	M3V	M0V	M5V
Applications	Programmable controller	Programmable controller, relay, IC circuit, small solenoid valve	Programmable controller, relay	Programmable controller, reray, IC circuit (no light), serial connection
Power voltage	–	4.5 to 28 VDC	–	
Load voltage/current	10 to 30 VDC, 5 to 30mA	30 VDC or less, 200mA or less	5 to 50mA at 12/24 VDC, 7 to 20mA at 110 VAC	50mA or less with 5/12/24 VDC 20mA or less at 110 VAC
Current consumption	–	10mA or less at DC24 (when turned ON)	–	
Internal voltage drop	4V or less	0.5V or less	2.4V or less	0V
Light	LED (ON lighting)			no light
Leakage current	1mA or less	10 μA or less	0mA	
Lead wire length	1m {Oil resistant vinyl cabtire cable 2 code 0.2mm²}	1m {Oil resistant vinyl cabtire cable 3 code 0.15mm²}	1m {Oil resistant vinyl cabtire cable 2 code 0.2mm²}	
Maximum shock resistance	980m/s²		294m/s²	
Insulation resistance	100MΩ and over at 500 VDC mega			
Withstand voltage	No failure when 1000 VAC is applied for one minute			
Ambient temperature range	-10 to + 60℃			
Protective structure	IEC standards IP67, JIS C0920 (water tight type), oil resistance			

* M0 switch can be used for 24VAC and 48VAC within load current range of 7 to 20mA.

How to order

Switch unit

RVU50 - C - 90 - M2V - R

Ⓐ Model

Ⓑ Unit type

Ⓒ Oscillating angle

Ⓓ Switch model no.

Ⓔ Switch quantity

Symbol	Descriptions
Ⓐ Model	
RVU50	Applicable actuator: RV3S/D50
RVU150	Applicable actuator: RV3S/D150
RVU300	Applicable actuator: RV3S/D300
Ⓑ Unit type	
Blank	Standard products
C	With shock absorber
Ⓒ Oscillating angle	
90	90°
100	100°
180	180°
270	270°
280	280° ("C" (for shock absorber installation) cannot be selected.)
Ⓓ Switch model no.	
M2V*	Proximity, 1 color indicator type, 2-wire
M3V*	Proximity, 1 color indicator type, 3-wire
M0V*	Reed, 1 color indicator type, 2-wire
M5V*	Reed, no light, 2-wire
***Lead wire length**	
Blank	1m (standard)
3	3m (option)
5	5m (option)
Ⓔ Switch quantity	
R	With clockwise rotation detection 1 piece
L	With counterclockwise detection 1 piece
D	Two

⚠ Note on model no. selection

Note: When selecting the type for shock absorber, the shock absorber unit must be purchased separately.

<Example of model number>

RVU50-C-90-M2V-R

Model: Switch unit

Ⓐ Model: RV3S/D50

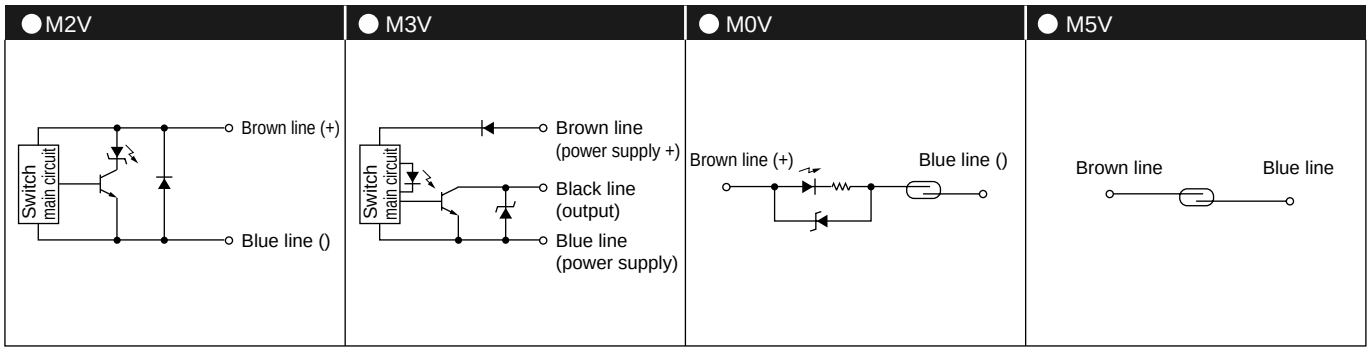
Ⓑ Unit type: With shock absorber

Ⓒ Oscillating angle: 90°

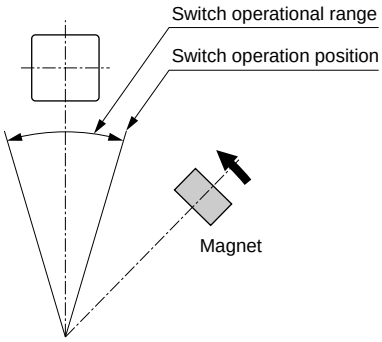
Ⓓ Switch model no.: M2V switch, lead wire length 1m

Ⓔ Switch quantity: Clockwise rotation detection 1 piece

Switch internal circuit diagram



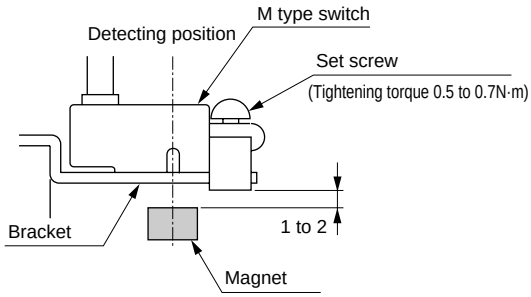
Operational range of switch



Descriptions / Model no.	Operational range M2V, M3V	Operational range M0V, M5V
RV3S50, RV3D50	Approx. 40°	Approx. 25°
RV3S150, RV3D150	Approx. 25°	Approx. 15°
RV3S300, RV3D300	Approx. 25°	Approx. 15°

Switch adjustment method

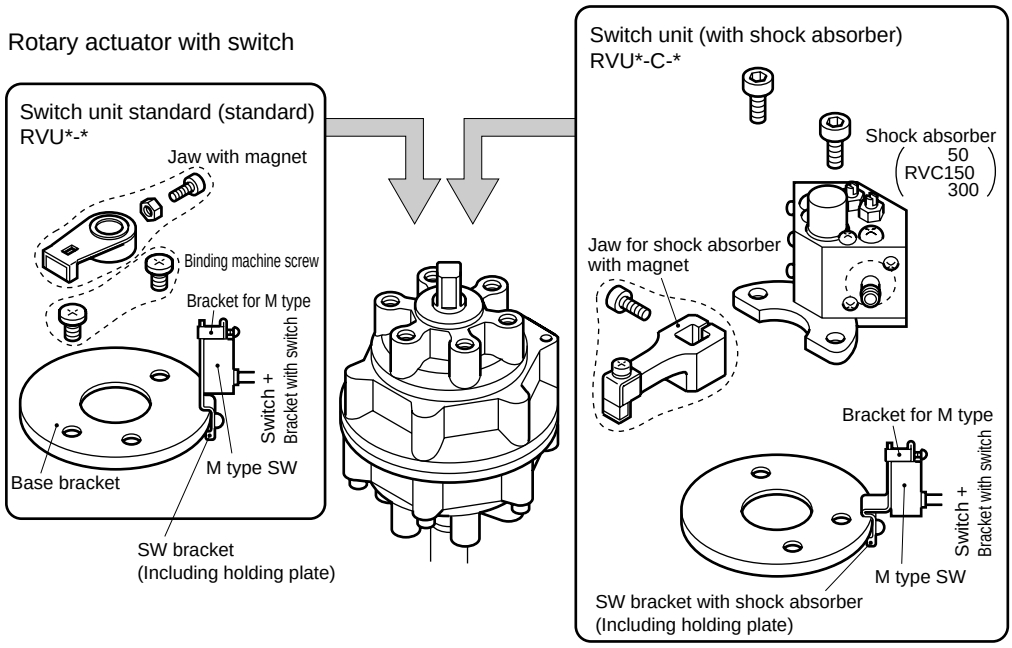
When installing switch unit later, if clearance between switch and magnet are exceeding the range on the following drawing, adjust the clearance with bending bracket.



Switch unit configurations

Switch unit (Standard) configurations
Jaw with magnet
Jaw
Boss
Magnet
Pan head machine screw
Nut
Base bracket
Base bracket
Binding machine screw
Bracket for M type switch
Installation band for M type switch
Bracket
Cross headed pan
Switch bracket
LS bracket
Holder
Pan head machine screw
Spring washer
M type switch

Rotary actuator with switch



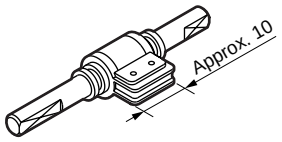
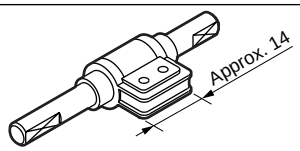
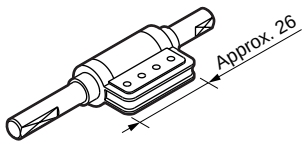
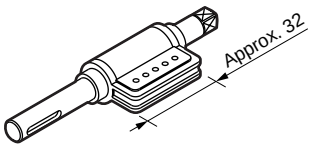
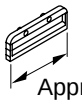
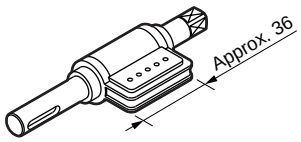
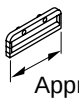
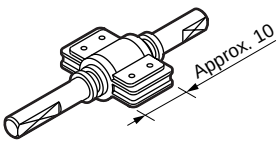
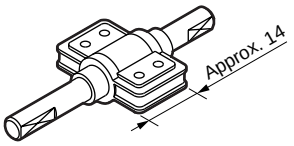
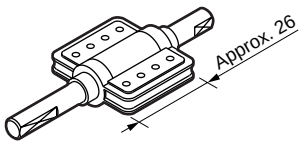
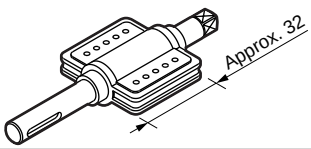
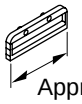
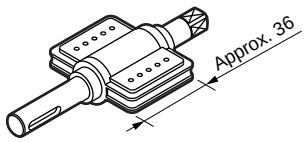
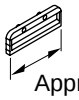
Switch unit (With shock absorber) configurations
Jaw for shock absorber with magnet
Jaw
Magnet
Magnet holder
Hexagon socket head cap bolt
Pan head machine screw
Spring washer
Base bracket
Base bracket
Bracket for M type switch
Installation band for M type switch
Bracket
Cross headed pan
Switch mounting bracket for shock absorber installation
LS bracket
Holder
Pan head machine screw
Spring washer
M type switch

(Note) Shock absorber is not included in switch unit.
(Refer to page 106 for model no. of shock absorber.)

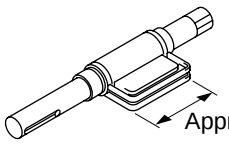
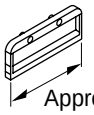
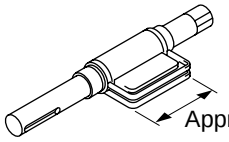
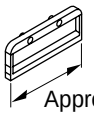
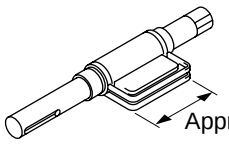
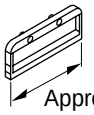
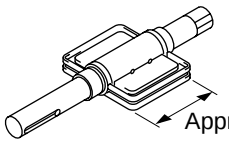
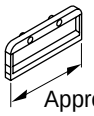
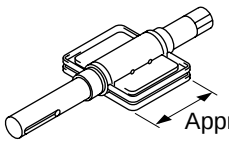
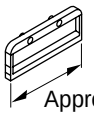
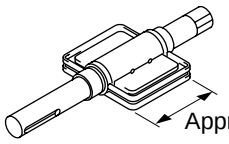
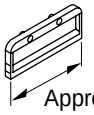
When purchasing switch other than standard switch unit, refer to pages 118 to 119 for repair parts kit.
The rotary actuator with switch can be assembled by attaching the switch unit to the rotary actuator without switch.

Repair parts list

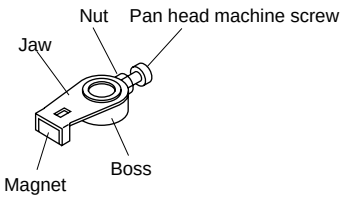
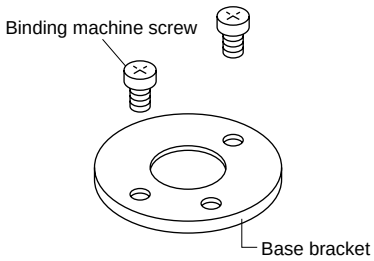
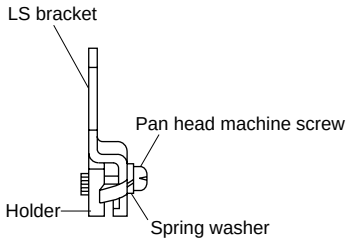
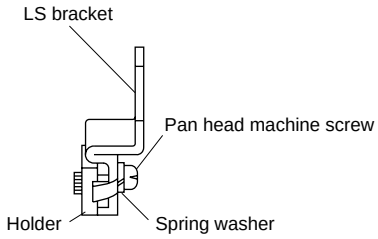
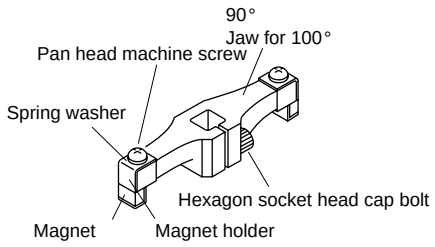
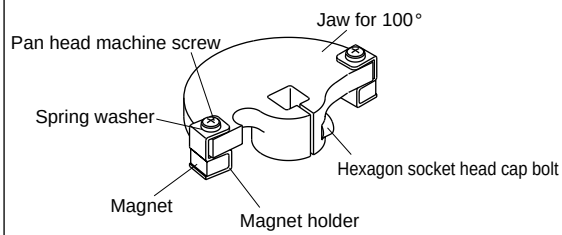
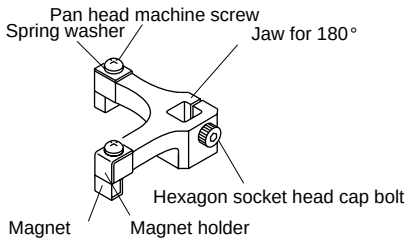
● Compact rotary actuator

No./part name / Model	No. / Kit No. / Part name	3 Vane shaft	1 Shoe sealant	8 O ring (each 2 pcs.)
RV3S1	RV3S1-K			ϕ1×ϕ3.8 (W×ID)
RV3S3	RV3S3-K			ϕ1.42×ϕ6.8
RV3S10	RV3S10-K			ϕ1.5×ϕ8
RV3S20	RV3S20-K			ϕ2×ϕ10.5
RV3S30	RV3S30-K			P-14
RV3D1	RV3D1-K			ϕ1×ϕ3.8 (W×ID)
RV3D3	RV3D3-K			ϕ1.42×ϕ6.8
RV3D10	RV3D10-K			ϕ1.5×ϕ8
RV3D20	RV3D20-K			ϕ2×ϕ10.5
RV3D30	RV3D30-K			P-14

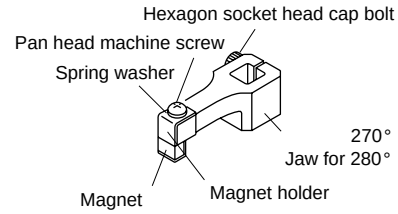
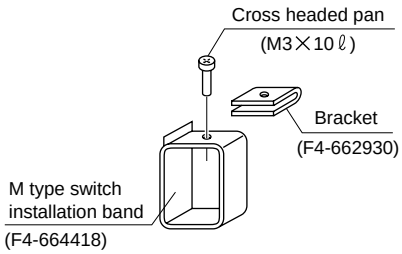
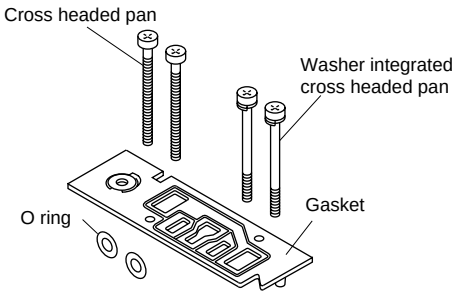
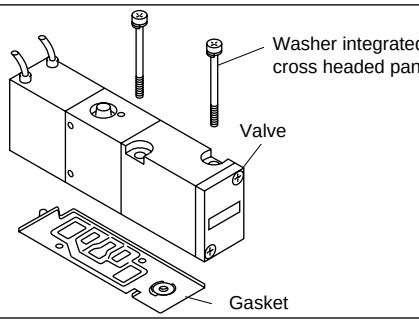
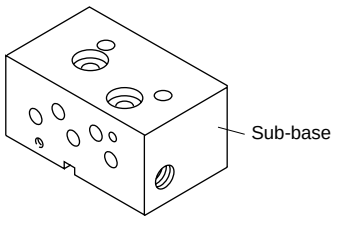
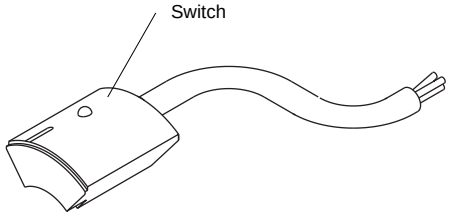
● Large rotary actuator

No. and part name / Model	No. / Kit No.	4 / Vane shaft	6 / Shoe sealant	8 / O ring (each 2 pcs.)	10 / O ring
RV3S50	RVS50-K	 Approx. 46	 Approx. 46	P-16	φ1.8×φ56.2
RV3S150	RVS150-K	 Approx. 60	 Approx. 60	P-22	φ1.9×φ82
RV3S300	RVS300-K	 Approx. 71	 Approx. 71	P-31	φ3 ×φ105
RV3D50	RVD50-K	 Approx. 46	 Approx. 46	P-16	φ1.8×φ56.2
RV3D150	RVD150-K	 Approx. 60	 Approx. 60	P-22	φ1.9×φ82
RV3D300	RVD300-K	 Approx. 71	 Approx. 71	P-31	φ3 ×φ105

Repair parts kit

Part name	Kit No.	Appearance	Part name	Quantity
Jaw with magnet	● RVU50-A1 RVU150-A1 RVU300-A1		Jaw Boss Magnet Pan head machine screw Nut	1 1 1 1 1
Base bracket	● RVU50-A2 RVU150-A2 RVU300-A2		Base bracket Binding machine screw	1 2
Switch bracket	● RVU50-A3 RVU150-A3 RVU300-A3		LS bracket Holder Pan head machine screw Spring washer	1 1 1 1
Switch mounting bracket for shock absorber installation	● RVU50-A3-C RVU150-A3-C RVU300-A3-C		LS bracket Holder Pan head machine screw Spring washer	1 1 1 1
Jaw for shock absorber with magbet (Refer to page 109 for dimensions of the types without switch.)	● RVU50-90-A1-C RVU150-90-A1-C RVU300-90-A1-C		Jaw Magnet Magnet holder Hexagon socket head cap bolt Pan head machine screw Spring washer	1 2 2 1 2 2
	● RVU50-100-A1-C RVU150-100-A1-C RVU300-100-A1-C			
	● RVU50-180-A1-C RVU150-180-A1-C RVU300-180-A1-C			

Repair parts kit

Part name	Kit No.	Appearance	Part name	Quantity
Jaw for shock absorber with magnet The jaw for the 280° shock absorber with magnet is not available.	● RVU50-270-A1-C RVU150-270-A1-C RVU300-270-A1-C Refer to page 109 for dimensions of the types without switch.		Jaw Magnet Magnet holder Hexagon socket head cap bolt Pan head machine screw Spring washer	1 1 1 1 1 1
Bracket for M type SW	● RVU-00-A1		M type SW installation band Bracket Cross headed pan	1 1 1
Packing seal screw kit	● RVU10-B1 RVU20-B1 RVU30-B1 RVU50-B1 RVU150-B1 RVU300-B1		O ring Gasket Cross headed pan Washer integrated cross headed Pan head machine screw	2 1 2 2
Valve kit	● RVU * * - * -B2 10 20 30 50 1: 100 VAC 150 2: 200 VAC 300 3: 24 VDC V : Single solenoid W : Double solenoid		Valve Washer integrated cross headed Pan head machine screw Gasket	1 2 1
Sub-base	● RV3U10-B3 RV3U20-B3 RV3U30-B3 RV3U50-B3 RV3U150-B3 RV3U300-B3		Sub-base	1
Angle variable type switch	● RV3U-CT- * 3R : Right installation 3L : Left installation 3RU : Radial lead wire for right installation 3LU : Radial lead wire for left installation		Switch	1

Rotary actuator selection method

Select based on the followig procedures.

STEP 1 Size (torque) selection
(1) Static load
(2) Resistance load
(3) Inertia load

↓

STEP 2 Oscillating time confirmation

↓

STEP 3 Allowable energy confirmation

STEP 1 Size (torque) selection

The torque is largely divided into three types according to the type of load.
In each case, the required torque must be calculated. If the load is a compound load, add each torque to calculate the required torque.
Refer to the output table (effective torque table) and select the required torque size according to the working pressure.

(1) Static load (T_S)
When static pressure force is required, such as for clamp

$T_S = F_S \times L$

T_S: Required torque (N·m)
F_S: Required force (N)
L : Length from center of rotation to pressure cone apex (m)

(2) Resistance load (T_R)
When friction force, gravity, or other external force (resistance load) is applied.

$T_R = K \times F_R \times L$

T_R : Required torque (N·m)
K : Slack coefficient when load does not fluctuate K=2
when load fluctuates K=5
F_R : Required force (N)
L : Length from center of rotation to pressure cone apex (m)

(3) Inertia load (T_A)
To rotate an object

$T_A = 5 \times I \times \dot{\omega}$
$\dot{\omega} = \theta / t^2$

T_A : Required torque (N·m)
I : Moment of inertia (kg·m^2)
$\dot{\omega}$: Angular acceleration (rad/s^2)
θ : Oscillating angle (rad)
t : Oscillating time (s)

Refer to the drawings for calculating the moment of inertia on page 123 and calculate the moment of inertia.

Output table (effective torque) Unit: N·m

Working pressure (MPa) / Model no.		0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Single vane	RV3S1	-	0.07	0.10	0.12	0.15	0.18	-	-	-
	RV3S3	0.1	0.17	0.24	0.31	0.38	0.45	-	-	-
	RV3S10	0.35	0.56	0.75	0.98	1.2	1.39	-	-	-
	RV3S20	0.59	0.95	1.33	1.7	2.1	2.49	2.87	3.26	3.68
	RV3S30	1.1	1.8	2.5	3.19	4.1	4.8	5.8	6.5	7.2
	RV3S50	1.25	2.59	3.69	4.79	5.9	7	8.29	9.5	10.6
	RV3S150	5.5	8.5	11.5	15	18	21	24	27.3	30.5
	RV3S300	10.5	16.5	22.5	28.5	34.5	40.5	46	51.8	57.5
Double vane	RV3D1	-	0.16	0.22	0.27	0.34	0.41	-	-	-
	RV3D3	0.25	0.39	0.54	0.71	0.86	1.01	-	-	-
	RV3D10	0.76	1.17	1.62	2.11	2.54	3.03	-	-	-
	RV3D20	1.4	2.22	3.06	3.88	4.17	5.53	6.38	7.17	8.07
	RV3D30	2.7	4.4	6	7.7	9.5	11.2	12.99	14.8	16.6
	RV3D50	3.3	5.79	8.29	10.4	12.8	15.1	17.6	20.1	22.5
	RV3D150	12.5	19	27	35	41.5	48	55	62	69
	RV3D300	25.5	39	54	68	83	97	110	124	137

STEP 2 Oscillating time confirmation

If the oscillating time is set outside of the specified range, the actuator's operation may become unstable, or the actuator could be damaged. Always set the oscillating time within the specified oscillating time adjustment range.

Compact rotary actuator (s)

Model no.	Oscillating angle		
	90°	180°	270°
RV3S1	0.03 to 0.6	0.06 to 1.2	0.09 to 1.8
RV3S3	0.04 to 0.8	0.08 to 1.6	0.12 to 2.4
RV3S10	0.045 to 0.9	0.09 to 1.8	0.135 to 2.7
RV3S20	0.05 to 1.0	0.10 to 2	0.15 to 3
RV3S30	0.07 to 0.7	0.14 to 1.4	0.21 to 2.1

Large rotary actuator (s)

Model no.	Oscillating angle				
	90°	100°	180°	270°	280°
RV3S50	0.08 to 0.8	0.09 to 0.9	0.16 to 1.6	0.24 to 2.4	0.25 to 2.5
RV3S150	0.12 to 1.2	0.13 to 1.3	0.24 to 2.4	0.36 to 3.6	0.37 to 3.7
RV3S300	0.16 to 1.6	0.17 to 1.7	0.32 to 3.2	0.48 to 4.8	0.49 to 4.9

*Refer to Page 81 for the oscillating time of the angle variable type.

STEP 3 Allowable energy confirmation

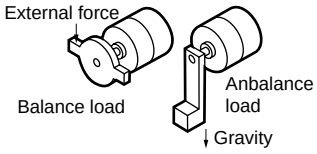
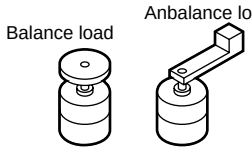
When using an inertial load, if the load's dynamic energy exceeds the allowable value at the oscillating end, the actuator could be damaged. Calculate the energy with the following formula and set it so it is within the allowable value.
If the energy is too large, absorb the energy with a shock absorber, etc.

$$E=1/2 \times I \times \omega^2 \times 10^3$$
$$\omega = \theta / t$$

E : Kinetic energy (mJ)
I : Moment of inertia (kg·m^2)

ω : Angular speed (rad/s)
θ : Oscillating angle (rad)
t : Oscillating time (s)

Refer to the drawings for calculating the moment of inertia on page 123 and calculate the moment of inertia.

Calculation of resistance torque	Horizontal load	Vertical load
Required	With resistance load	With resistance load 
Not required	Without resistance load 	Without resistance load

Selection method for shock absorber for rotary

STEP 1 Allowable energy confirmation

↓

STEP 2 Shock absorber performance confirmation

STEP 1 Allowable energy confirmation

Obtain load inertia. If the value exceeds the rotary actuator with the vane mechanism's tolerable energy, install a shock absorber that complies with the rotary actuator.
Refer to STEP 3 on page 121 for how to select the load's kinetic energy

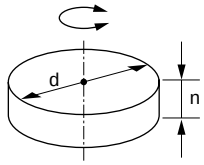
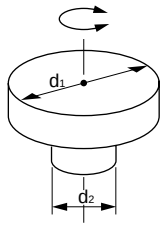
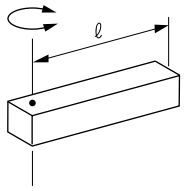
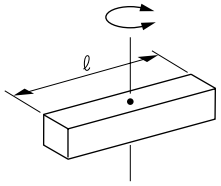
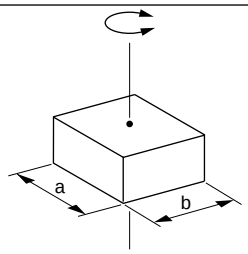
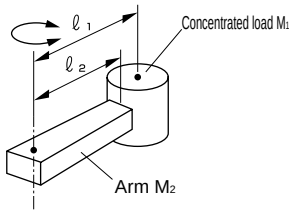
STEP 2 Shock absorber performance confirmation

If the load's collision energy exceeds the allowable value at the oscillating end, the shock absorber could be damaged.
Calculate the energy with the following formula and set it so it is within the allowable value.
If the energy is too large, consider using a separate shock absorber with large absorption performance.

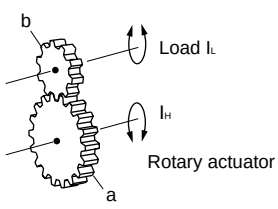
$E = E_1 + E_2$
$E_1 = 1/2 \times I \times \omega_0^2$
$\omega_0 \fallingdotseq 1.2 \times \omega$
$\omega = \theta / t$
$E_2 = 1/2 \times T \times \theta'$
$E_m = E \times n$

E : Colliding energy (J)
E_1 : Kinetic energy (J)
E_2 : Thrust energy (J)
ω_0 : Colliding angular speed (rad/s)
ω : Average angular speed (rad/s)
I : Moment of inertia ($kg \cdot m^2$)
θ : Oscillating angle (rad)
θ' : Absorbing angle of shock absorber (rad)
t : Oscillating time (s)
T : Torque of rotary actuator (N·m)
E_m : Energy per minute (J/min)
n : Cycle rate (time/min)

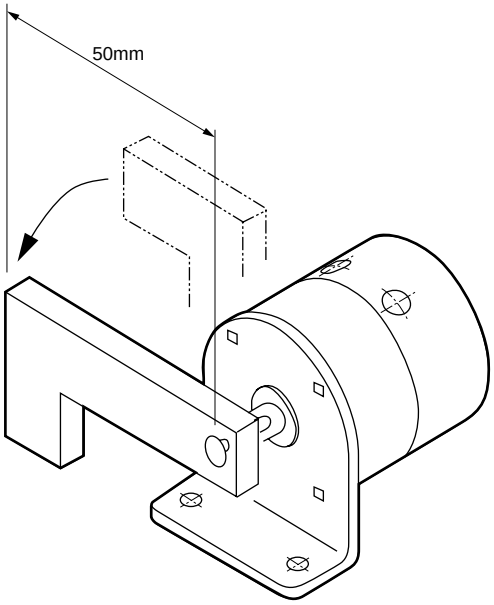
Calculation of moment of inertia

Shape	Sketch	Requirements	Moment of inertia I kg/m²	Radius of gyration	K_1^2	Remarks
Dial plate		● Diameter d (m) ● Weight M (kg)	$I = \frac{Md^2}{8}$	$\frac{d^2}{8}$		● No installation direction ● When using with sliding, consult with CKD
Dial plate with step		● Diameter d_1 (m) d_2 (m) ● Weight d_1 section M_1 (kg) d_2 section M_2 (kg)	$I = \frac{1}{8}(M_1d_1^2+M_2d_2^2)$	$\frac{d_1^2+d_2^2}{8}$		● Ignore if d_2 section is extremely small comparing to d_1 section
Bar (center of rotation is an end)		● Bar length ℓ (m) ● Weight M (kg)	$I = \frac{M\ell^2}{3}$	$\frac{\ell^2}{3}$		● The installation direction is horizontal ● If an installation direction is vertical, oscillating time varies
Bar (center of rotation is center of gravity)		● Bar length ℓ (m) ● Weight M (kg)	$I = \frac{M\ell^2}{12}$	$\frac{\ell^2}{12}$		● No installation direction
Rectangular parallelepiped		● Length of side a (m) b (m) ● Weight M (kg)	$I = \frac{M}{12}(a^2+b^2)$	$\frac{a^2+b^2}{12}$		● No installation direction ● When using with sliding, consult with CKD
Concentrated load		● Shape of concentrated load ● Length to center of gravity of concentrated load ℓ_1 ● Arm length ℓ_2(m) ● Concentrated load weight M_1(kg) ● Arm weight M_2(kg)	$I=M_1(\ell_1^2+K_1^2)+\frac{M_2\ell_2^2}{3}$	Calculate K_1^2 according to shape of concentrated load		● The installation direction is horizontal ● If M_2 is extremely small comparing to M_1, may be calculated as $M_2 = 0$

When using with gear, how to convert load JL to rotary actuator shaft rotation

Gear		● Gear Rotary side (the tooth number) a Load side (the tooth number) b ● Load inertia Moment N·m	Load moment of inertia of rotary actuator shaft rotation $I_H=\left(\frac{a}{b}\right)^2 I_L$			● When shape of gear is increasing, gear moment of inertia should be considered.

Selection example 1 Clamp



<Operation conditions>

Pressure	0.5MPa
Oscillating angle	90°
Oscillating time	0.3s
Clamp lever weight	0.1kg
Clamping force	20N
Clamp position	50mm

STEP 1 Size (torque) selection

Calculate the torque required for the static torque.

F_S = clamping force: 20N
L = clamp position: 0.050m

$T_S = 20 \times 0.05 = 1.0 N \cdot m$ RV3S20-90 temporary selected from required torque

STEP 2 Oscillating time confirmation

Make sure that the oscillating time in the working conditions is within the specified value.

The operation time is 0.3 seconds for 90°
and is OK since the RV3S20-90 oscillating
time adjustment range is 0.05 to 1.0.
Proceed to the next step.

STEP 3 Allowable energy confirmation

Calculate the dynamic energy, and confirm that it is within the allowable energy value.

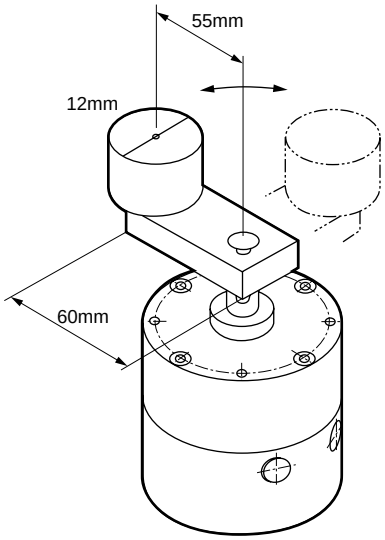
Calculate the moment of inertia I for the clamp lever.
<Bar (rotation center is at the end)>
$I = M \times L^2/3 = 0.1 \times 0.05^2/3$
$= 0.0000833 \quad kg \cdot m^2$
Calculate the average angle speed ω.
$\theta = 90° = \pi/2 (rad)$
$t = 0.3s$
$\omega = \theta/t = (\pi/2)/0.3 = 5.236 (rad/s)$

Thus, the dynamic energy (E),

$E = 1/2 \times 8.33 \times 10^{-5} \times 5.236^2 \times 10^3$
$= 1.14 \quad (mJ)$

The allowable energy is satisfied, so the RV3S20-90 can be selected.

Selection example 2 When there is a disc-shaped load at end of bar



<Operation conditions>

Pressure	0.5MPa
Oscillating angle	90°
Oscillating time	0.2s
Bar length	60mm
Bar weight	0.1kg
Distance to th plate	55mm
Diameter of dial plate	12mm
Plate weight	0.12kg

STEP 1 Size (torque) selection

Since this is an inertial load, calculate the moment of inertia.

$I = M_1(l_1^2+K_1^2)+M_2l_2^2/3$
$=0.12\times(0.055^2+(0.012^2/8))$
$+0.1\times 0.06^2/3$
$=4.85\times10^{-4}$

Next, calculate the angle speed $\dot{\omega}$.
On conditions
θ =90°= π /2(rad)
t =0.2s
$\dot{\omega} = \theta/t^2=(\pi/2)/0.2^2$
=39. 27 (rad/s^2)
Thus, the inertial torque (T_A) is,
$T_A=5\times4.85\times10^{-4}\times39.27$
=0.095 (N·m)

RV3S3-90 temporary selected from inertial torque

STEP 2 Oscillating time confirmation

Make sure that the oscillating time in the working conditions is within the specified value.

The operation time is 0.2 seconds for 90°
and is OK since the RV3S3-90 oscillating time
adjustment range is 0.04 to 0.8.
Proceed to the next step.

STEP 3 Allowable energy confirmation

Calculate the dynamic energy, and confirm that it is within the allowable energy value.

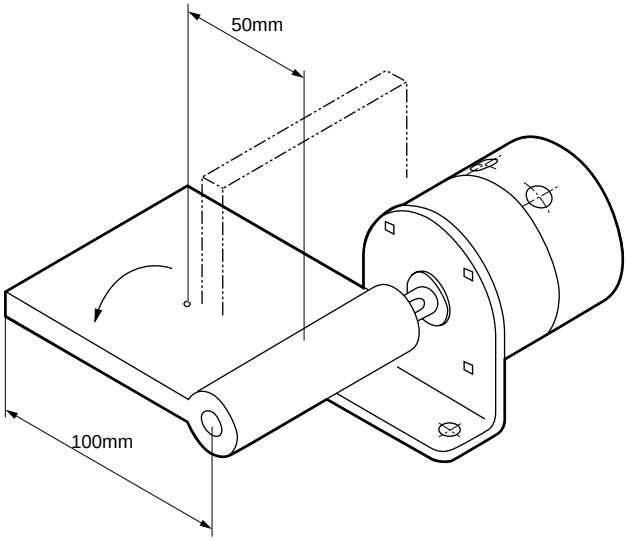
On conditions
θ =90°= π /2(rad)
t =0.2s
$\omega = \theta/t=(\pi/2)/0.2$
=7.854 (rad/s)

Thus, the dynamic energy (E),

$E =1/2\times4.85\times10^{-4}$
$\times7.854^2\times10^3$
=14.96 (mJ)

The allowable energy is exceeded, so select the RV3S50 and install an external shock absorber.

Selection example 3 When rotating shaft is horizontal plate-shaped load



<Operation conditions>

Pressure	0.5MPa
Oscillating angle	90°
Oscillating time	0.12s
Plate length	100mm
Plate weight	1.5kg
Distance to the center of gravity	50mm
Cycle rate	5 times/min.

STEP 1 Size (torque) selection

This is a gravitational resistance load and inertial load, so calculate the resistance torque (TR) and inertial torque (TA).

<Resistance torque>
The resistance torque varies according to the rotation so calculate the maximum value.
F_R = gravity = 1.5×
L = distance to the gravity: 0.050mm

T_R=5×14.7×0.05=3.675 N·m · · · ①

(Inertial torque)
Bar (center of rotation is an end.)
I =1.5×0.1^2/3=0.005 (kg·m^2)
On conditions
θ =90°=π/2(rad)
t =0.12s
·ω = θ/t^2=(π/2)/0.12^2
=109.1 (rad/s2)
Thus, the inertial torque (TA) is,
T_A=5×0.005×109.1
=2.727 (N·m) · · · · · · · · ②
When the resistance torque and inertial torque are added,
T =T_R+T_A=3.675+2.727=6.402 (N·m)

RV3S150-90 temporally selected from required torque

STEP 2 Oscillating time confirmation

Make sure that the oscillating time in the working conditions is within the specified value.

The operation time is 0.12 seconds for 90°
and is OK since the RV3S150-90 oscillating time adjustment range is 0.12 to 1.2.
Proceed to the next step.

STEP 3 Allowable energy confirmation

Calculate the dynamic energy, and confirm that it is within the allowable energy value.
On conditions
θ =90°=π/2(rad)
t =0.12s
$\omega = \theta/t = (\pi/2)/0.12$
=13.09 (rad/s)
Thus, the dynamic energy (E),
E =1/2×0.005
$\times 13.09^2 \times 10^3$
=428 (mJ)
The allowable energy is exceeded, so consider a shock absorber

Shock absorber review

Shock absorber **STEP 1** Allowable energy confirmation

The allowable energy is exceeded, so confirm the shock absorber in the next step.

Shock absorber **STEP 2** Confirmation of shock absorber performance

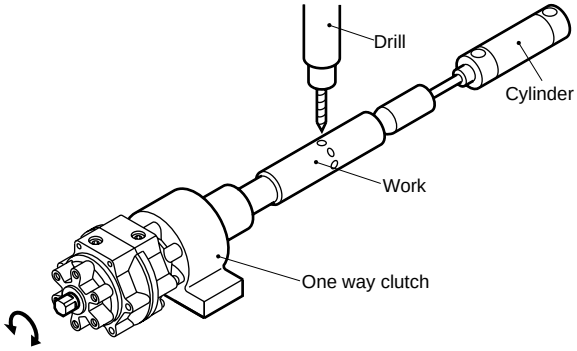
Colliding angular speed
$\omega 0 = 1.2 \times \omega = 1.2 \times 13.09 = 15.7$ (rad/S)
Kinetic energy
$E1 = 1/2 \times 0.005 \times 15.7^2 = 0.617$ (J)
Torque at 0.5MPa of RV3S150: 14.7 (N·m)
Absorbing angle: 0.2 of shock absorber (rad)
Thrust energy
$E2 = 1/2 \times 14.7 \times 0.2 = 1.47$ (J)
Thus, the collision energy (E) is
$E = E1 + E2 = 0.617 + 1.47 \fallingdotseq 2.09$ (J)

Energy per minuit (Em)
$Em = 2.09 \times 5 = 10.4$ (J)

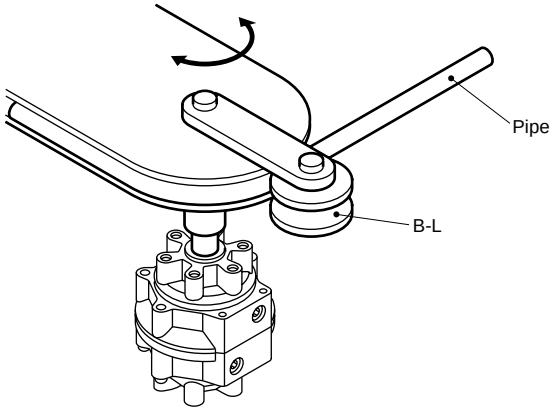
All of the shock absorber specified values are satisfied, so the RV3S150 with shock absorber can be selected.

Applications

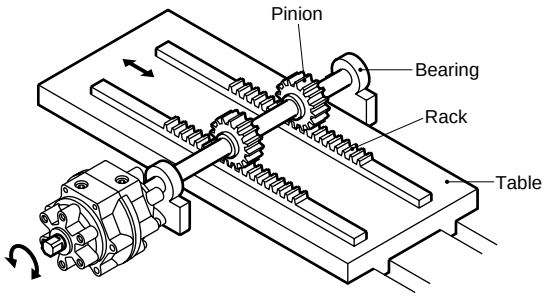
● Boring device (pitch feeding by one way clutch)



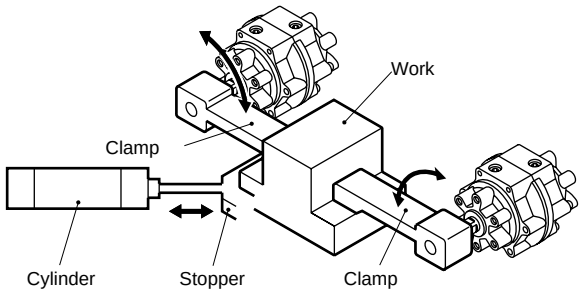
● Pipe vender



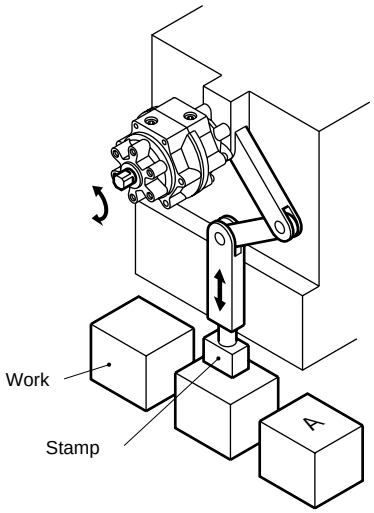
● Table reciprocating device



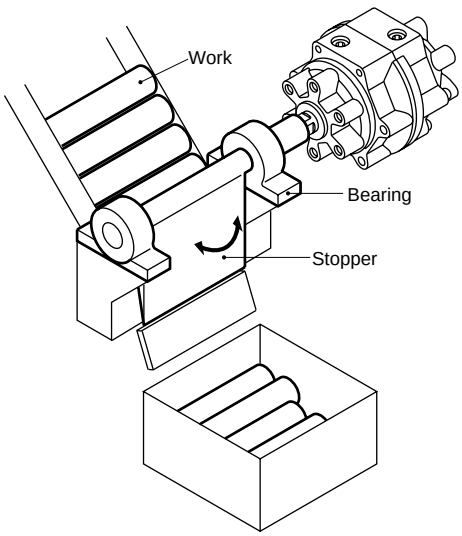
● Clamp device



● Stamp device

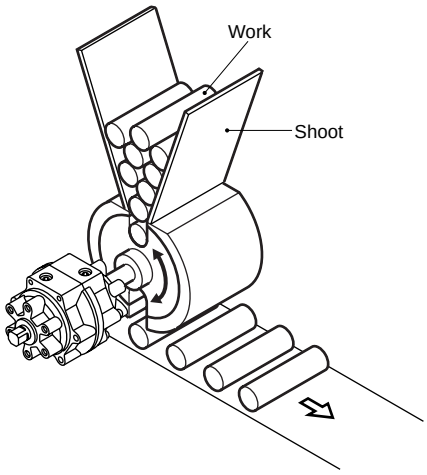


● Stopper of parts feeder

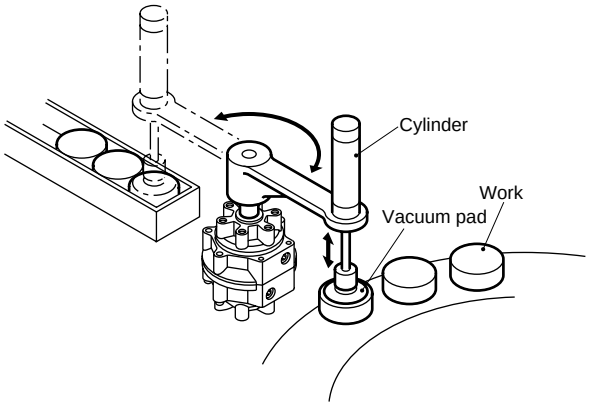


Applications

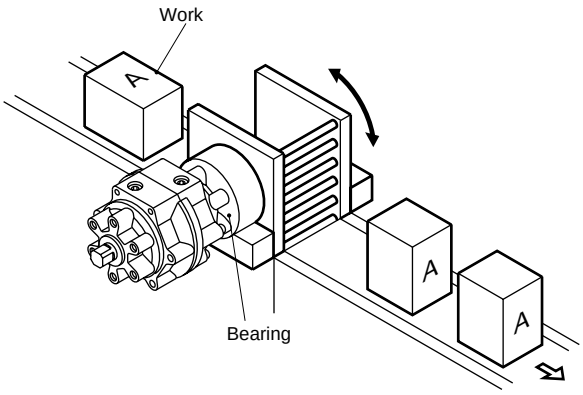
● Parts feeder



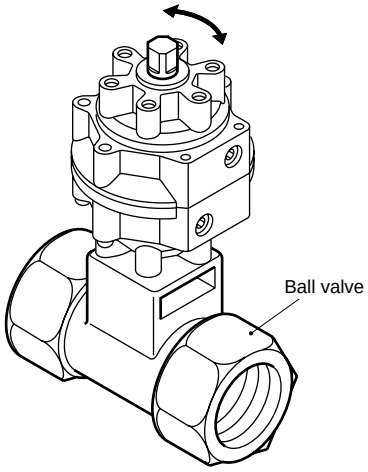
● Parts feeder



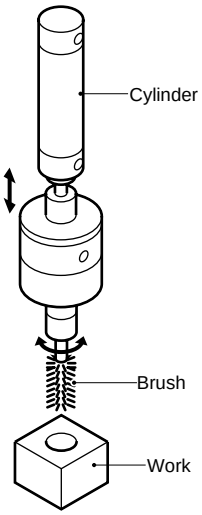
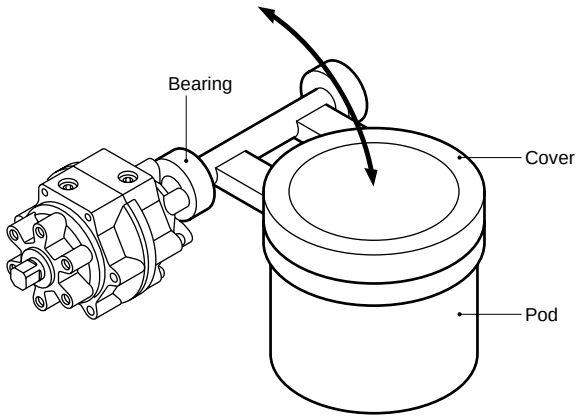
● Reverse rotation (90°) device



● Open and close of ball valve



● Washing device of holed part



● Open and close device of cover