RV3*

Rotary actuator with vane mechanism

Torque size 0.12 to 206 N·m

Overview

Excellent durability with an incorporated switch is achieved. Vane rotary actuator with a wide variety of torque sizes.

Features

Enhanced series

A 270° oscillating angle has been added to the compact rotary actuator, increasing the freedom of system design.

High torque and space saving

High torque and space savings are realized by adding a double vane to the compact rotary actuator.

Easy-to-use oscillating origin

The oscillating origin can be selected from 45° or 90°, increasing the options for equipment installation. (Excluding sizes 30 and higher and 270° oscillating angle)

Variable oscillating angle added to series

This new addition is an angle adjusting with a stopper and fine adjusting screw that allow free angle setting from 30° to the max. oscillating angle, contributing to higher machine/equipment precision. (Excluding sizes 1 and 50 and over)

Usable in high temperatures

The ambient temperature can be set between -5 and 80°C if dry air which has been passed through an air dryer to remove moisture from the air is used. (Excluding switch sizes 30 and over)

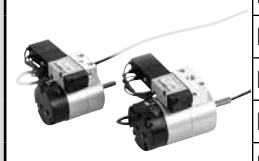
CONTENTS

Series variation

Rotary actuator (with vane mechanism) RV3* Series

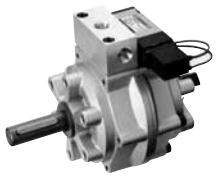
● Compact (RV3*1 to RV3*30)

●: Standard, ◎: Option, : Not available

Variation	Model No.		Vane	Effective torque (0.5 MPa) (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		RV3S1	Single	0.12	●		●	●			◎	◎	◎		1338
		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}$10	Single	0.98	●		●	●		●		◎	◎		1350
		RV3D$^{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		RV3SA3	Single	0.31			● (30 to 180° variable)			●		◎	◎		1354
		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*800)

●: Standard, ◎: Option, : Not available

Variation	Model No.		Vane	Effective torque (0.5 MPa) (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		RV3S50	Single	4.7	●		●	●	●	●		◎	◎	◎	1364
		RV3D50	Double	10.1	●	●				●		◎	◎	◎	
		RV3S150	Single	14.7	●		●	●	●	●		◎	◎	◎	
		RV3D150	Double	34.3	●	●				●		◎	◎	◎	
		RV3S300	Single	27.9	●		●	●	●	●			◎	◎	
		RV3D300	Double	66.6	●	●				●			◎	◎	
		RV3S800	Single	102	●		●	●	●	●			◎	◎	
		RV3D800	Double	206	●	●				●			◎	◎	
With valve		RV3S$^{V}_{W}$50	Single	4.7	●		●	●	●	●		◎	◎	◎	1372
		RV3D$^{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		RV3SH50	Single	4.7	●		●	●	●	●		◎	◎	◎	1378
		RV3DH50	Double	10.1	●	●				●		◎	◎	◎	
		RV3SH150	Single	14.7	●		●	●	●	●		◎	◎	◎	
		RV3DH150	Double	34.3	●	●				●		◎	◎	◎	
		RV3SH300	Single	27.9	●		●	●	●	●			◎	◎	
		RV3DH300	Double	66.6	●	●				●			◎	◎	
		RV3SH800	Single	102	●		●	●	●	●			◎	◎	
		RV3DH800	Double	206	●	●				●			◎	◎	
Shock absorber		RVC50			●	●	●	●	●		—	—	—	—	1382
		RVC150			●	●	●	●	●		—	—	—	—	
		RVC300			●	●	●	●	●		—	—	—	—	

Compact rotary actuator with vane mechanism/standard

RV3$^{S}_{D}$ Series

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

JIS symbol 

Specifications

● Single vane mechanism

Item		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 (≈100 psi, 7 bar)									1.0 (≈150 psi, 10 bar)					
Min. working pressure	MPa	0.2 (≈29 psi, 2 bar)														
Proof pressure	MPa	1.05 (≈150 psi, 10.5 bar)									1.5 (≈220 psi, 15 bar)					
Ambient temperature	°C	-5 (23°F) to 80 (176°F) *3												-5 (23°F) to 60 (140°F)		
Port size		M5												Rc1/8		
Oscillating angle tolerance	°	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	°	45, 90		45	45, 90		45	45, 90		45	45, 90		45	45		
Allowable absorbed energy *1	mJ	0.6			1.5			3			15			25		
Max. operating frequency *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
Switch unit weight	kg	-			0.04			0.04			0.05			0.05		
Lubrication		Not required (use turbine oil class 1 ISO VG32 if necessary for lubrication)														

● Double vane mechanism

Item		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 (≈100 psi, 7 bar)			1.0 (≈150 psi, 10 bar)	
Min. working pressure	MPa	0.2 (≈29 psi, 2 bar)				
Proof pressure	MPa	1.05 (≈150 psi, 10.5 bar)			1.5 (≈220 psi, 15 bar)	
Ambient temperature	°C	-5 (23°F) to 80 (176°F) *3				-5 (23°F) to 60 (140°F)
Port size		M5				Rc1/8
Oscillating angle tolerance	°	90^{+4}_{0}				90^{+3}_{0}
Oscillating origin	°	45				
Allowable absorbed energy *1	mJ	0.6	1.5	3	15	25
Max. operating frequency *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
Switch unit weight	kg	-	0.04	0.04	0.05	0.05
Lubrication		Not required (use turbine oil ISO VG32 if necessary for lubrication)				

*1 : Calculate the allowable energy with allowable inertia energy of the shaft of the rotary actuator as follows.
(Allowable energy) ≥ $1/2I\omega^2 \times 10^3$ (refer to page 1398 for details.)
*2 : The max. operating frequency is at a supply pressure of 0.5 MPa [without load].
*3 : 5 to 60°C when switch is provided.
*4 : A key is attached with the rotary actuator with keyway.
*5 : Contact CKD for products other than standard specifications.

Switch specifications

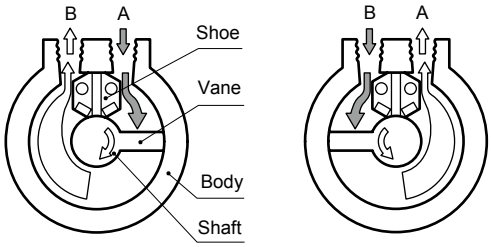
Item	Proximity switch
	SR-* (-U)
Applications	For programmable controller/relay/IC circuit/compact solenoid valve
Output method	NPN output
Power supply voltage	5 VDC to 30 VDC
Load voltage/current	5 to 30 VDC, 200 mA or less
Current consumption	20 mA or less with 24 VDC
Internal voltage drop	1.5 V or less
Indicator lamp	LED (Lit when ON)
Leakage current	10 μA or less
Lead wire length	1 m (oil resistant vinyl cabtyre cable 4-conductor 0.2 mm^2)
Shock resistance	490 m/s^2
Insulation resistance	100 MΩ or more with 500 V megger
Withstand voltage	No failure after 1 minute of 1,000 VAC application.
Ambient temperature	5 to 60°C
Degree of protection	IEC standards IP67, JIS C0920 (water tight)

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

Operational principle

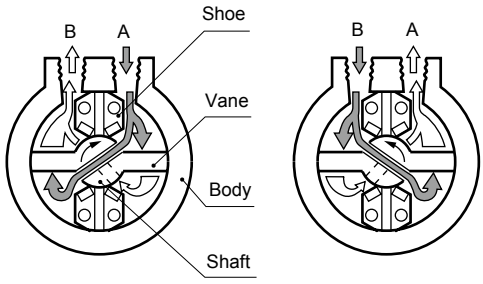
● Single vane

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



● Double vane

1. Configured with two vanes sliding on the internal body surface, integrated shaft, and two shoes (stoppers).
2. Air from port A pushes vane, goes through passage in shaft, pushes another vane, turns shaft, and finally generates torque.
3. Rotates in the same way as the single vane.



How to order

● Compact rotary actuator (standard) RV3*

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

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

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

Code	Description	Single vane mechanism RV3S	Double vane mechanism RV3D
Ⓒ Oscillating angle			
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										
Nominal size		**1**	**3**	**10**	**20**	**30**	**1**	**3**	**10**	**20**	**30**
Blank	Without switch	●	●	●	●	●	●	●	●	●	●
SR	With axial lead wire switch		●	●	●	●		●	●	●	●
SR-U	With radial lead wire 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	●	●	●	●	●	●	●	●	●	●

Precautions for model No. selection

*1 : The type with switch is not available for the axial port position direction "S".
*2 : The mounting bracket (FA, LS) is attached at shipment. Refer to pages 1348 and 1349 for dimensions.

[Example of model No.]

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 : With radial lead wire switch
Ⓕ Option : With flange bracket

● How to order switch unit

RV3S - SR-3 - 90 - 45 - U

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

Code	Description
Ⓐ Model	
SR-3	Applicable actuator: RV3$^{S}_{D}$3
SR-10	Applicable actuator: RV3$^{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 direction	
Blank	With axial lead wire switch
U	With radial lead wire switch

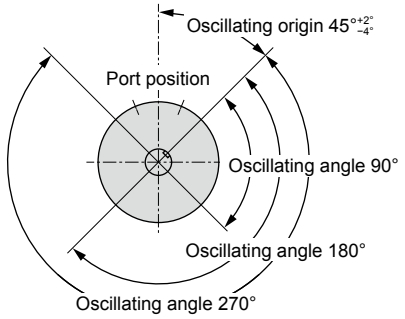
[Example of model No.]

RV3S-SR-3-90-45-U

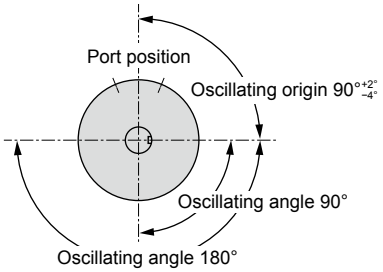
Model: Switch unit
Ⓐ Model : For RV3S3
Ⓑ Oscillating angle : 90°
Ⓒ Oscillating origin : 45°
Ⓓ Lead wire outlet direction : Radial lead wire

Oscillating origin position

● Oscillating origin 45°
RV3$^{S}_{D}$1 to 30



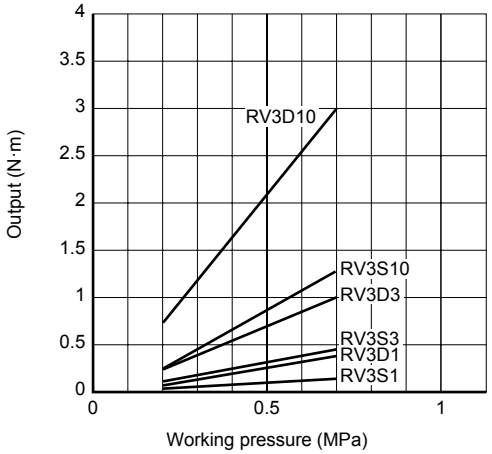
● Oscillating origin 90°
RV3S1 to 20



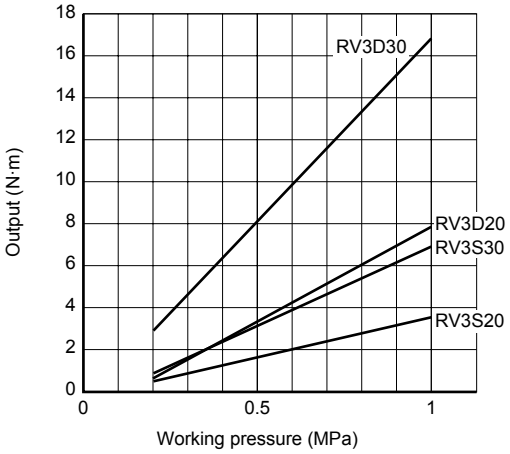
*1 : Tolerance of oscillating origin is based on mounting screw position.
*2 : Deflection of torsion angle between keyway on longer axis side (or cut plane) and square on shorter axis side within 1.5°.

Output characteristics graph (effective torque)

● RV3$^{S}_{D}$1 to 10



● RV3$^{S}_{D}$20, 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

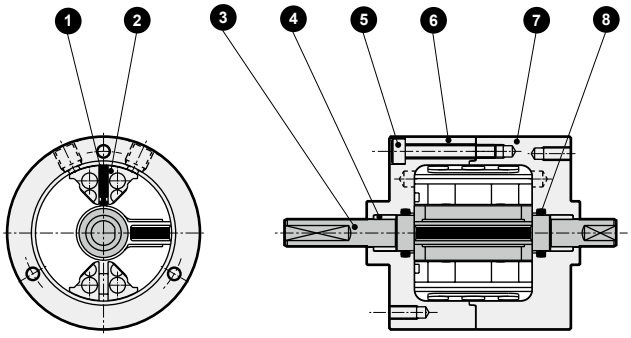
1. Use oscillating time taking the ranges in the table below as a guide.

Compact rotary actuator

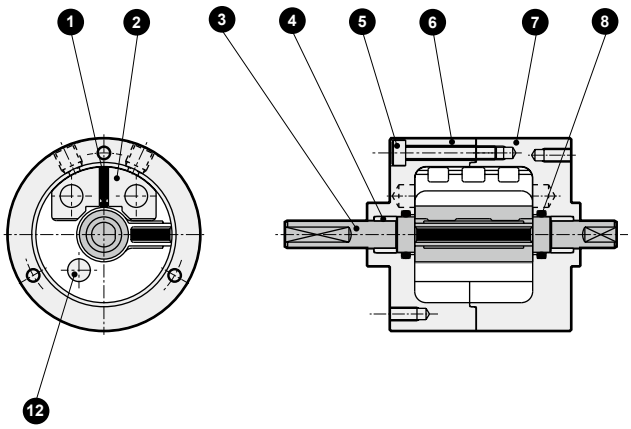
Model No.	Oscillating angle		
	90°	180°	270°
RV3 $^{S}_{D}$1	0.03 to 0.3	0.06 to 0.6	0.09 to 0.9
RV3 $^{S}_{D}$3	0.04 to 0.8	0.08 to 1.6	0.12 to 2.4
RV3 $^{S}_{D}$10	0.045 to 0.9	0.09 to 1.8	0.135 to 2.7
RV3 $^{S}_{D}$20	0.05 to 1.0	0.10 to 2	0.15 to 3
RV3 $^{S}_{D}$30	0.07 to 0.7	0.14 to 1.4	0.21 to 2.1

Internal structure and parts list

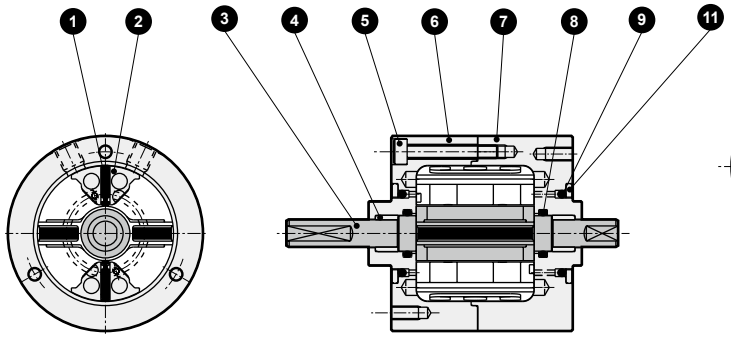
● RV3S1 to 30
Oscillating origin: 45°



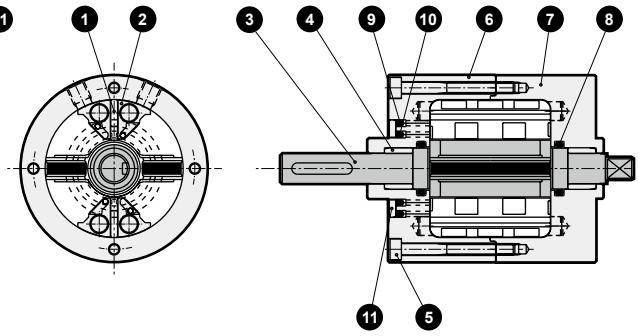
● RV3S1 to 30
Oscillating origin: 90°



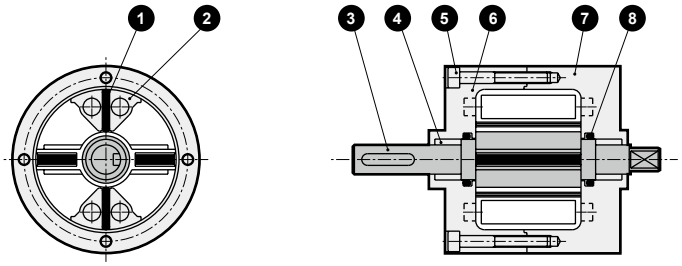
● RV3D1 to 10



● RV3D20



● RV3D30



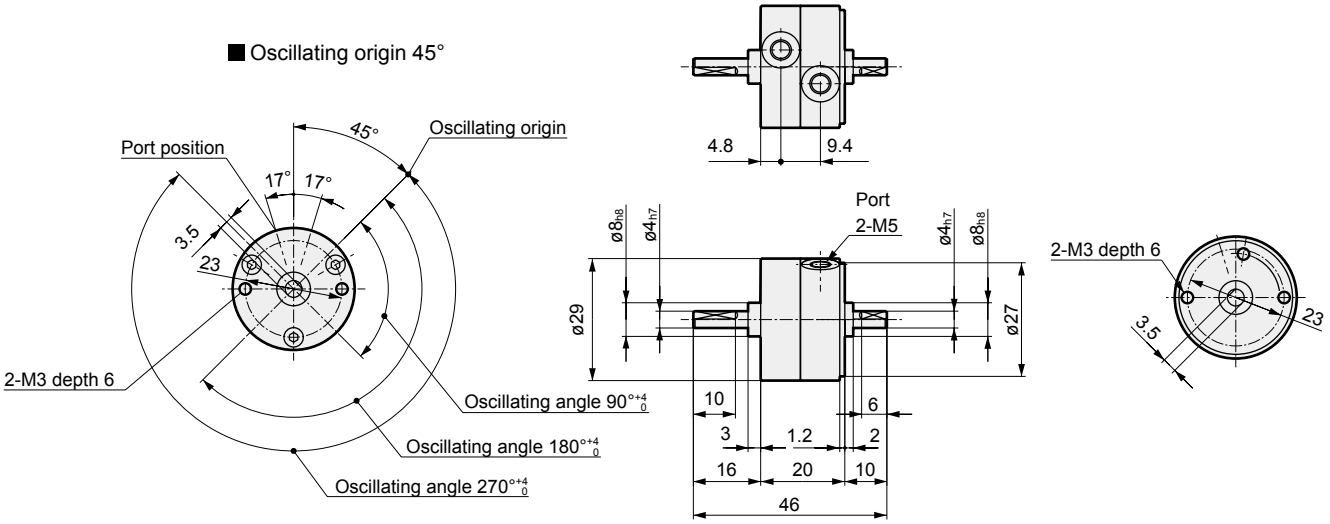
No.	Part name	Material	No.	Part name	Material
1	Shoe sealant	Nitrile rubber	7	Body B	Aluminum alloy
2	Shoe	Resin	8	O-ring	Nitrile rubber
3	Vane shaft	Steel + resin + nitrile rubber	9	O-ring	Nitrile rubber
4	Bearing	Sintering oil impregnated material	10	O-ring	Nitrile rubber
5	Mounting bolt	Steel	11	Plate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

Refer to page 1393 for the repair parts list.

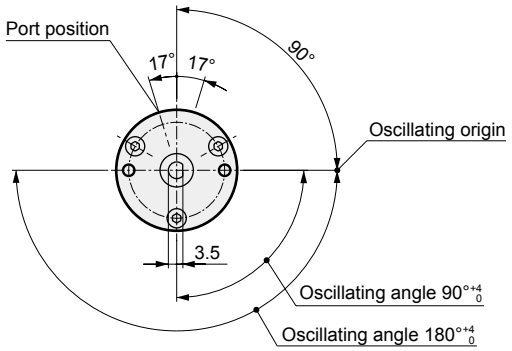
Dimensions CAD

● RV3$^{S}_{D}$1

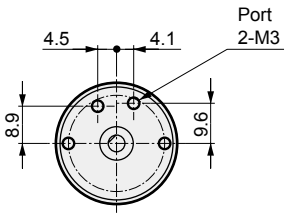
■ Oscillating origin 45°



■ Oscillating origin 90°



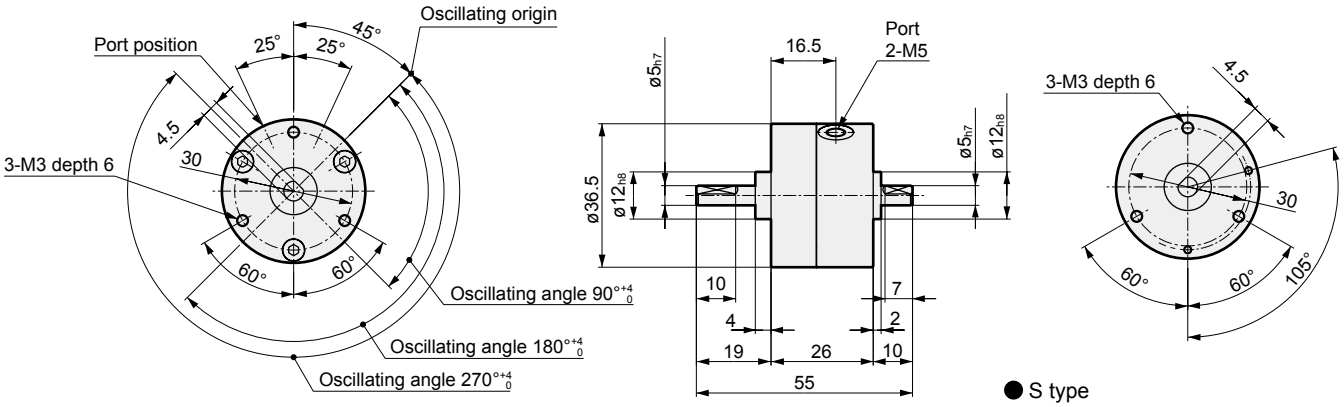
● S type
(Axial port position)



Dimensions

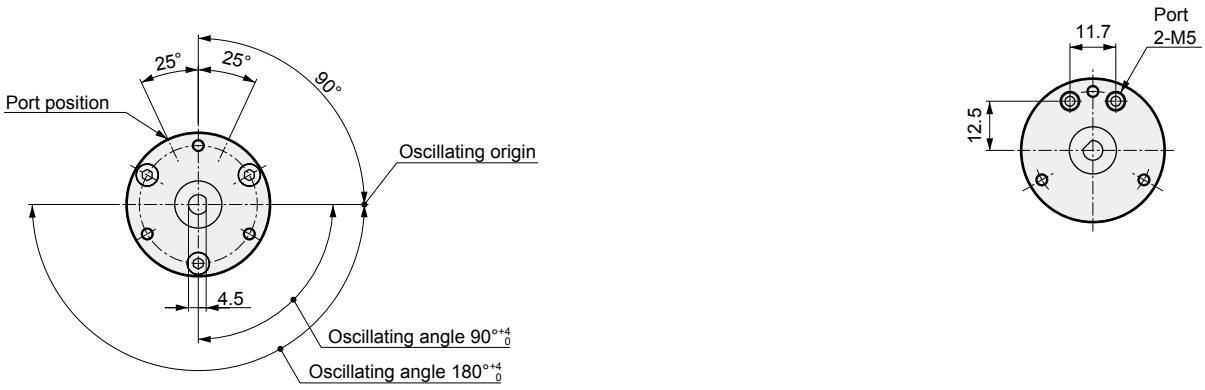
● RV3 S D 3 CAD

■ Oscillating origin 45°



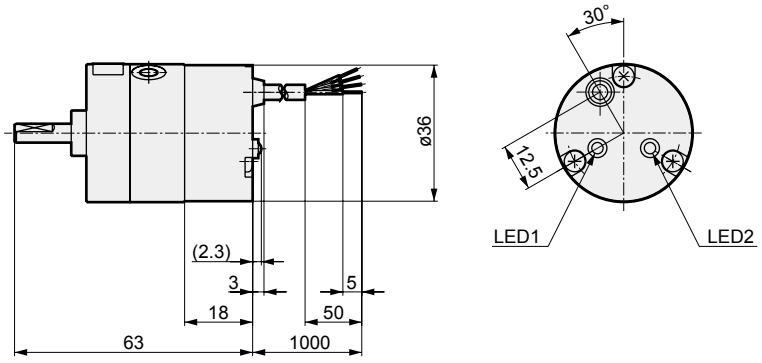
● S type
(Axial port position)

■ Oscillating origin 90°

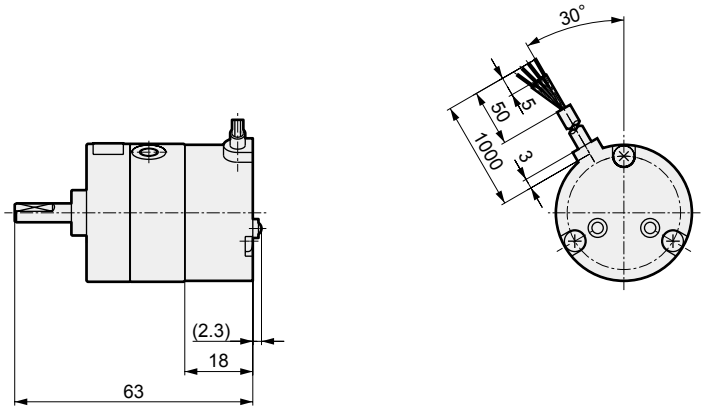


● RV3 S D 3-*-SR(U)

■ Axial lead wire



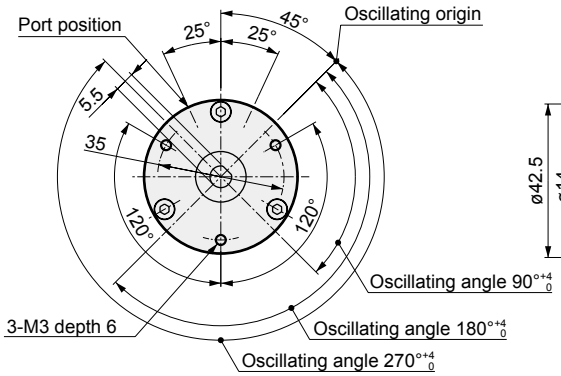
■ Radial lead wire

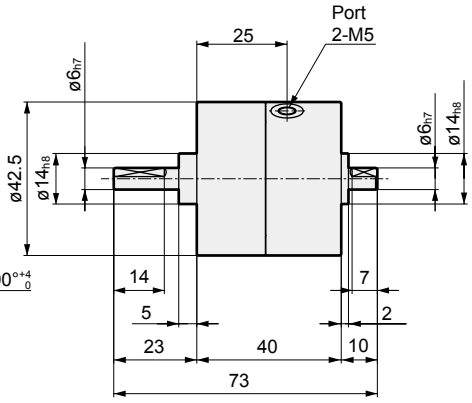


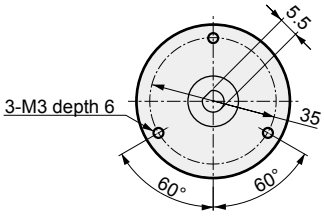
Dimensions

● RV3$^{S}_{D}$10 CAD

■ Oscillating origin 45°

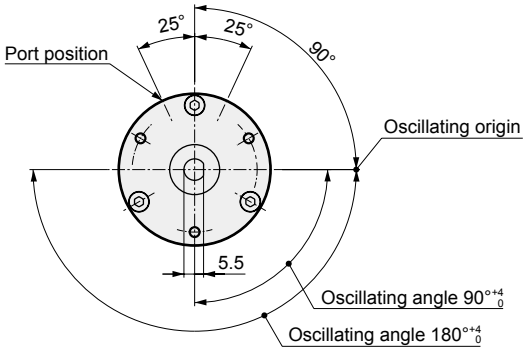


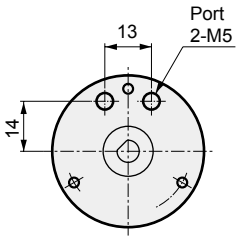




● S type
(Axial port position)

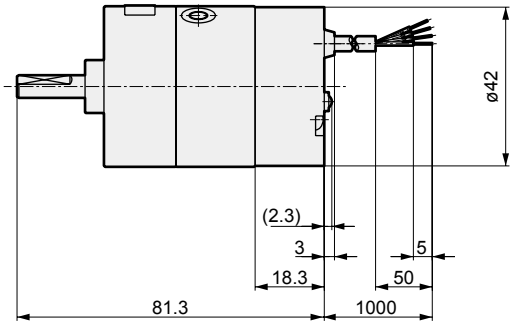
■ Oscillating origin 90°

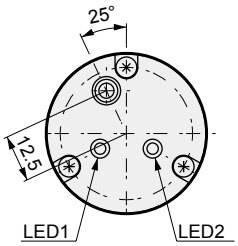




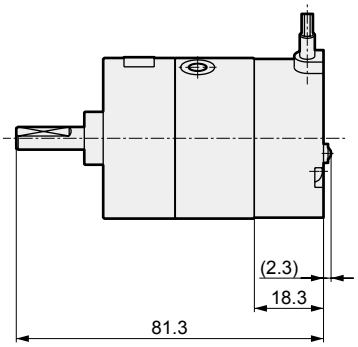
● RV3$^{S}_{D}$10-*-SR(U)

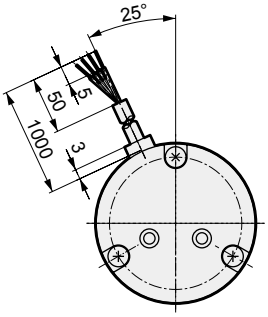
■ Axial lead wire





■ Radial lead wire

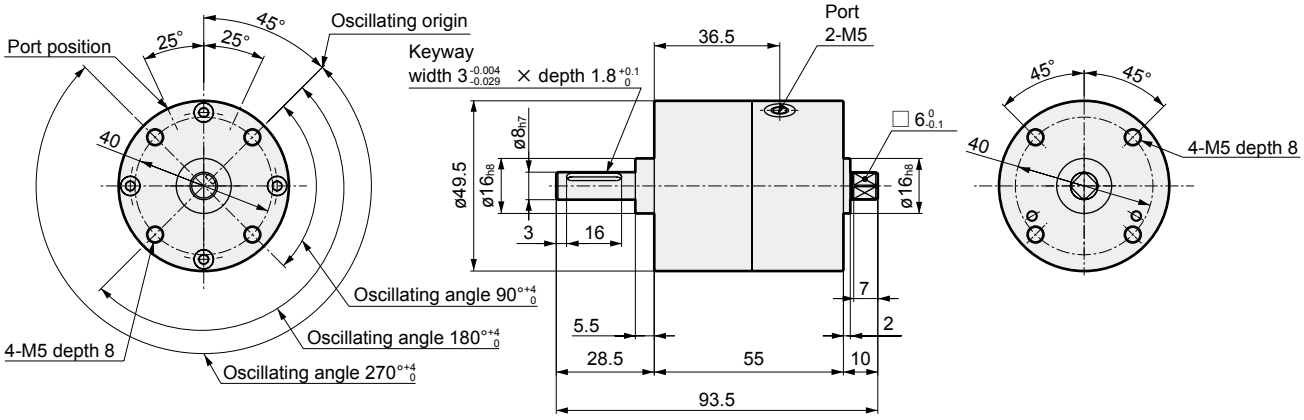




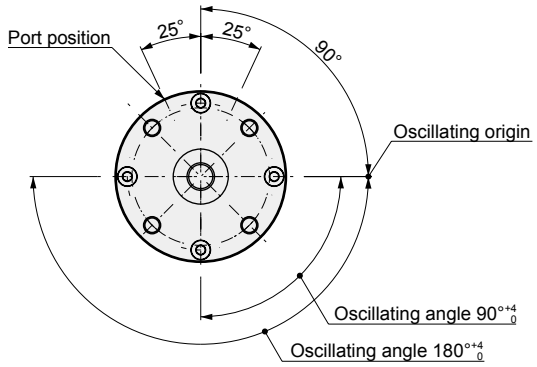
Dimensions

● RV3$^{S}_{D}$20 CAD

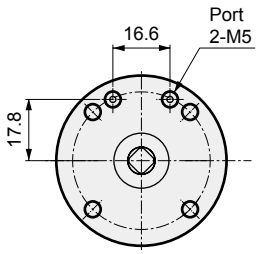
■ Oscillating origin 45°



■ Oscillating origin 90°

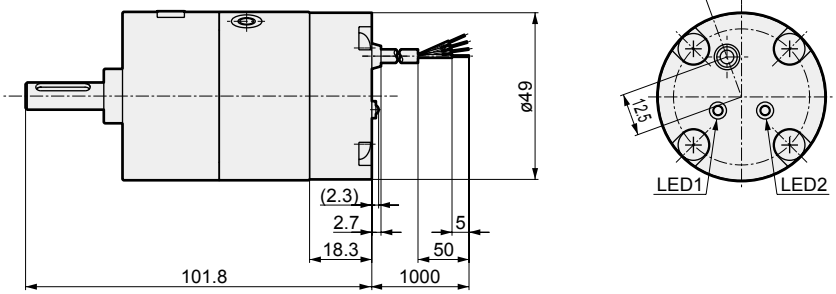


● S type
(Axial port position)

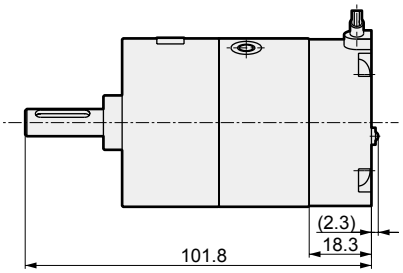


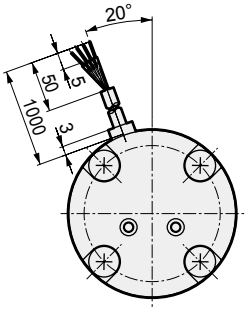
● RV3$^{S}_{D}$20-*-SR(U)

■ Axial lead wire



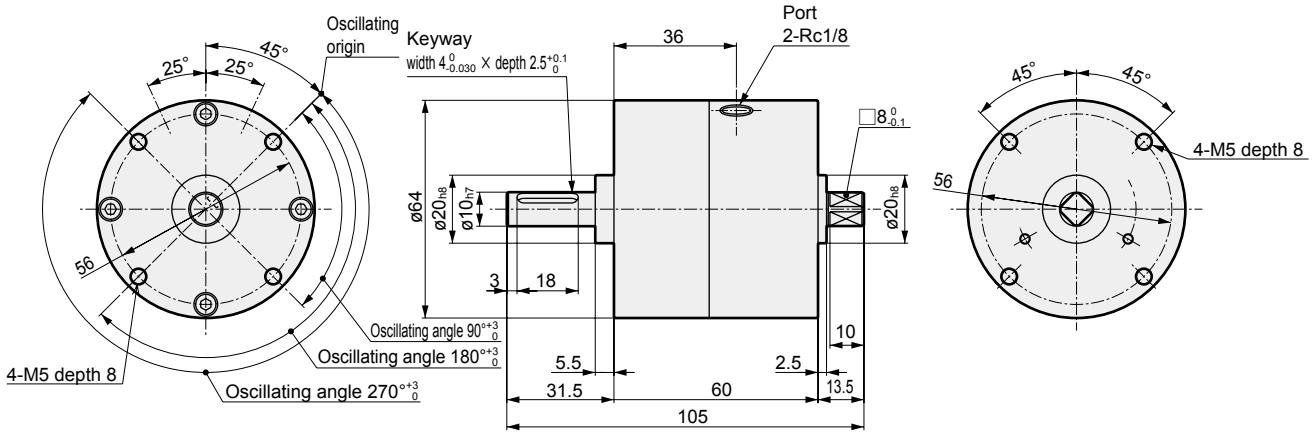
■ Radial lead wire





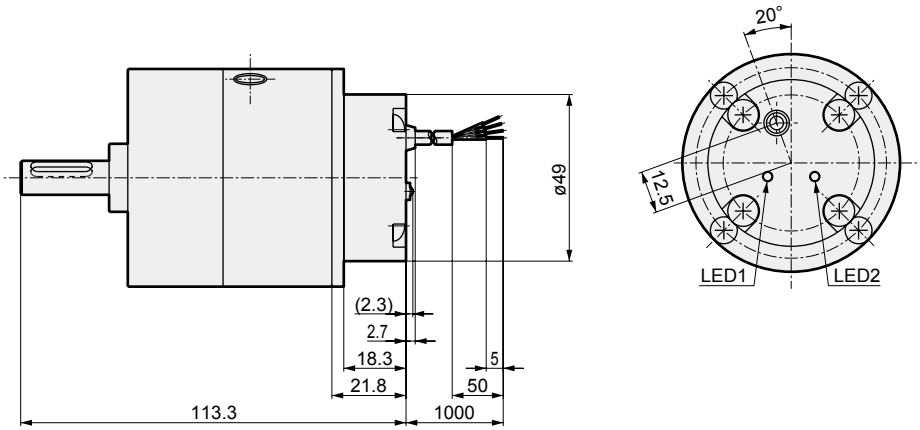
Dimensions

● RV3 S D 30 CAD

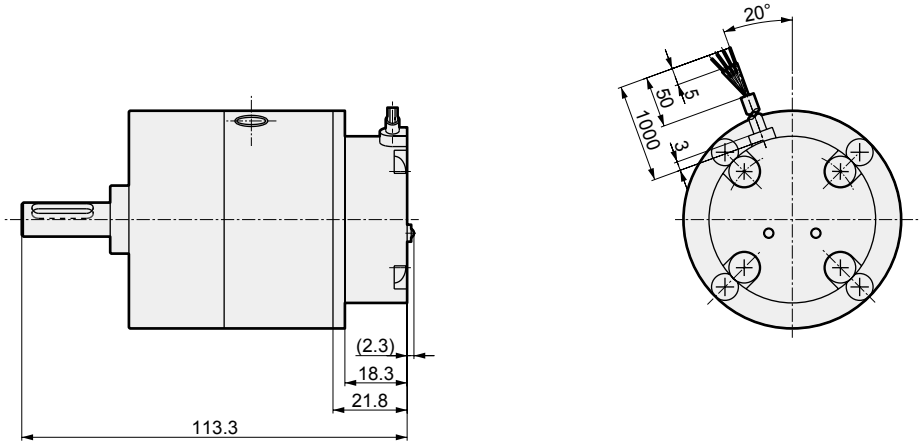


● RV3 S D 30-*-SR(U)

■ Axial lead wire



■ Radial lead wire



Options/accessories

Flange bracket/foot bracket

How to order

● Flange bracket

Model – FA

Flange bracket

Model	Compatibility
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

● Foot bracket

Model – LS

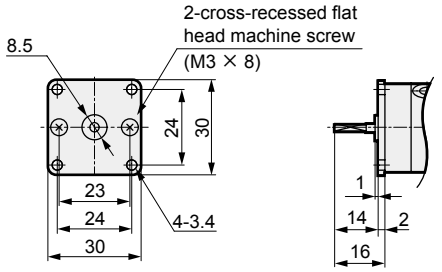
Foot bracket

Model	Compatibility
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

Dimensions

● RVS1-FA

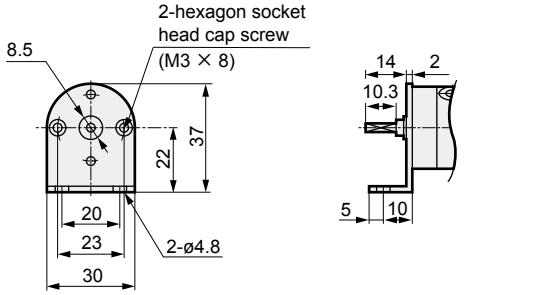
Material: Steel
Zinc chromate treatment



Weight: 0.01 kg

● RVS1-LS

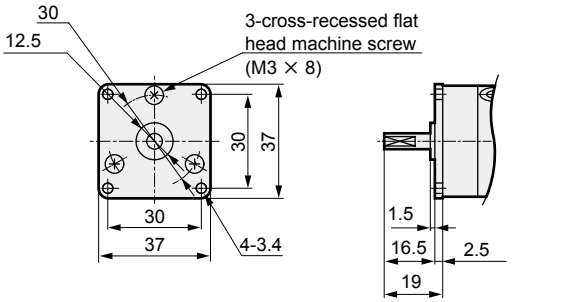
Material: Steel
Zinc chromate treatment



Weight: 0.02 kg

● RVS3-FA

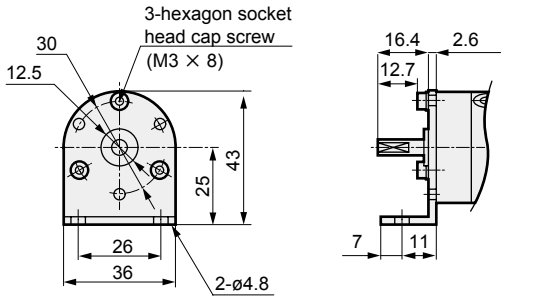
Material: Steel
Zinc chromate treatment



Weight: 0.03 kg

● RVS3-LS

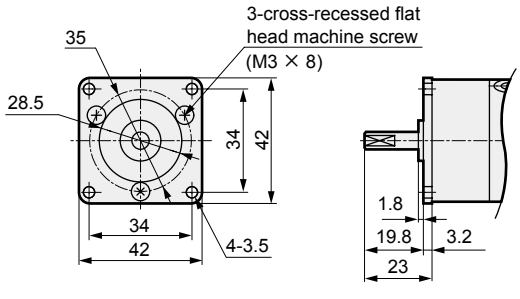
Material: Steel
Zinc chromate treatment



Weight: 0.04 kg

● RVS10-FA

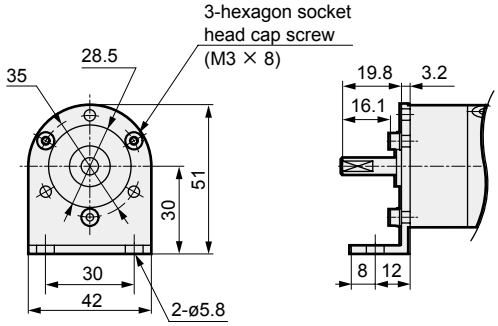
Material: Steel
Zinc chromate treatment



Weight: 0.03 kg

● RVS10-LS

Material: Steel
Zinc chromate treatment

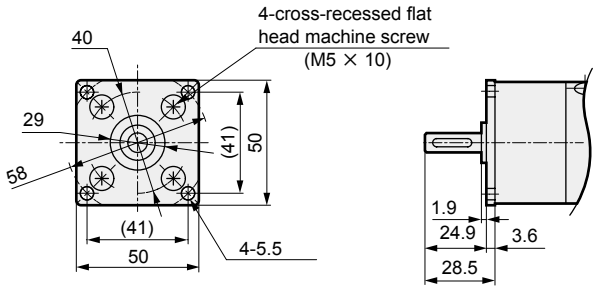


Weight: 0.05 kg

Flange bracket/foot bracket dimensions

● RVS20-FA

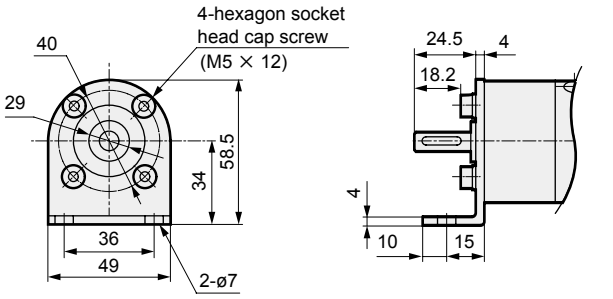
Material: Steel
Zinc chromate treatment



Weight: 0.05 kg

● RVS20-LS

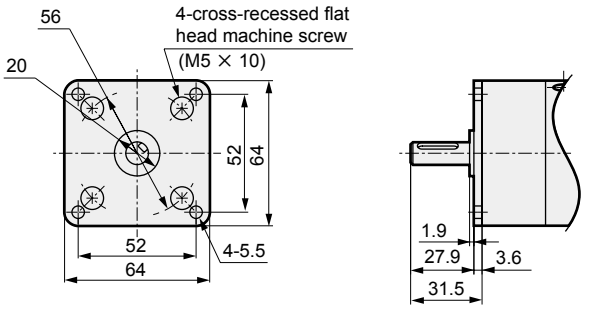
Material: Steel
Zinc chromate treatment



Weight: 0.09 kg

● RVS30-FA

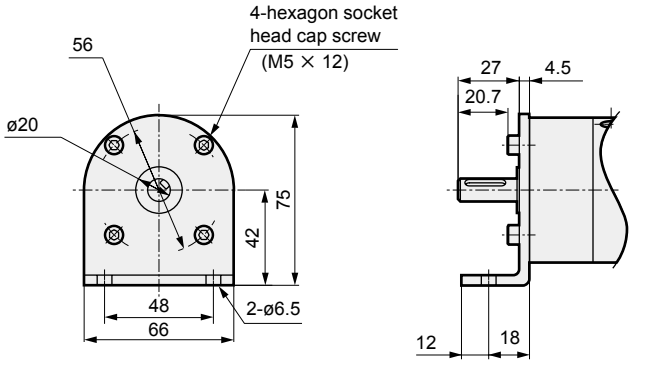
Material: Steel
Zinc chromate treatment



Weight: 0.10 kg

● RVS30-LS

Material: Steel
Zinc chromate treatment



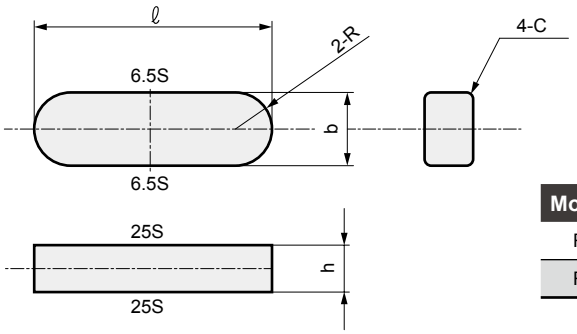
Weight: 0.19 kg

Key

Dimensions

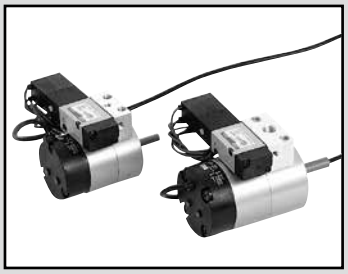
The following keys are attached with the rotary actuator with keyway.

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



Unit: mm

Model No.	Nominal 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



Compact rotary actuator with vane mechanism/with valve

RV3$^{S\,V}_{DW}$ Series

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

JIS symbol 

RoHS CAD

Specifications

● Single vane mechanism

Item		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 (≈100 psi, 7 bar)								
Min. working pressure	MPa	0.2 (≈29 psi, 2 bar)								
Proof pressure	MPa	1.05 (≈150 psi, 10.5 bar)								
Ambient temperature	°C	-5 (23°F) to 50 (122°F) *3								
Port size		M5			Rc1/8					
Oscillating angle tolerance	°	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	°	45, 90		45	45, 90		45	45		
Allowable absorbed energy *1	mJ	3			15			25		
Max. operating frequency *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
Switch unit weight	kg	0.04			0.05			0.05		
Lubrication		Not required (use turbine oil ISO VG32 if necessary for lubrication)								

● Double vane mechanism

Item		RV3D$^{V}_{W}$		
Size		10	20	30
Effective torque *1	N·m	2.11	3.88	7.70
Actuation		Double vane		
Working fluid		Compressed air		
Max. working pressure	MPa	0.7 (≈100 psi, 7 bar)		
Min. working pressure	MPa	0.2 (≈29 psi, 2 bar)		
Proof pressure	MPa	1.05 (≈150 psi, 10.5 bar)		
Ambient temperature	°C	-5 (23°F) to 50 (122°F) *3		
Port size		M5	Rc1/8	
Oscillating angle tolerance	°	90^{+4}_{0}		90^{+3}_{0}
Oscillating origin	°	45		
Allowable absorbed energy *1	mJ	3	15	25
Max. operating frequency *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
Switch unit weight	kg	0.04	0.05	0.05
Lubrication		Not required (use turbine oil ISO VG32 if necessary for lubrication)		

*1 : Calculate the allowable energy with allowable inertia energy of the shaft of the rotary actuator as follows.
(Allowable energy) ≥ $1/2I\omega^2 \times 10^3$ (refer to page 1398 for details.)
*2 : The max. operating frequency is at a supply pressure of 0.5 MPa [without load].
*3 : 5 to 50°C when switch is provided.
*4 : A key is attached with the rotary actuator with keyway.
*5 : Contact CKD for products other than standard specifications.

Valve specifications

Item		Specifications (4KB1 Series)		
Rated voltage	V	100 VAC(50/60 Hz)	200 VAC(50/60 Hz)	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%		
Thermal class		Class B molded coil		

*1 : 100 VAC and 200 VAC are available with 110 VAC and 220 VAC (60 Hz).
*2 : Refer to “Pneumatic Valves (CB-023SA)” for details on valves.

Switch specifications

Item	Proximity switch
	SR-*(-U)
Applications	For programmable controller/relay/IC circuit/compact solenoid valve
Output method	NPN output
Power supply voltage	5 VDC to 30 VDC
Load voltage/current	5 to 30 VDC, 200 mA or less
Current consumption	20 mA or less with 24 VDC
Internal voltage drop	1.5 V or less
Indicator lamp	LED (Lit when ON)
Leakage current	10 μA or less
Lead wire length	1 m (oil resistant vinyl cabtyre cable 4-conductor 0.2 mm^2)
Shock resistance	490 m/s^2
Insulation resistance	100 MΩ or more with 500 V megger
Withstand voltage	No failure after 1 minute of 1,000 VAC application.
Ambient temperature	5 to 60°C
Degree of protection	IEC standards IP67, JIS C0920 (water tight)

* mark indicates a 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
Ⓗ Option (*1)

Code	Description	Ⓐ Model No. Single vane mechanism RV3S	Ⓐ Model No. Double vane mechanism RV3D
Ⓑ Valve			
V	Single solenoid	●	●
W	Double solenoid	●	●
Ⓒ Nominal size			
10	Effective torque 0.5 MPa	0.98 N·m	2.11 N·m
20		1.70 N·m	3.88 N·m
30		3.19 N·m	7.7 N·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°)	●	●				

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

Precautions for model No. selection

*1: The mounting bracket (FA, LS) is attached at shipment. Refer to pages 1348 and 1349 for dimensions.

[Example of model No.]

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 : With radial lead wire switch
Ⓗ Option : With foot bracket

● How to order switch unit

RV3S - SR-10 - 90 - 45 - U

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

Code	Description
Ⓐ Model	
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°	●	●	●	

Code	Description
Ⓓ Lead wire direction	
Blank	With axial lead wire switch
U	With radial lead wire switch

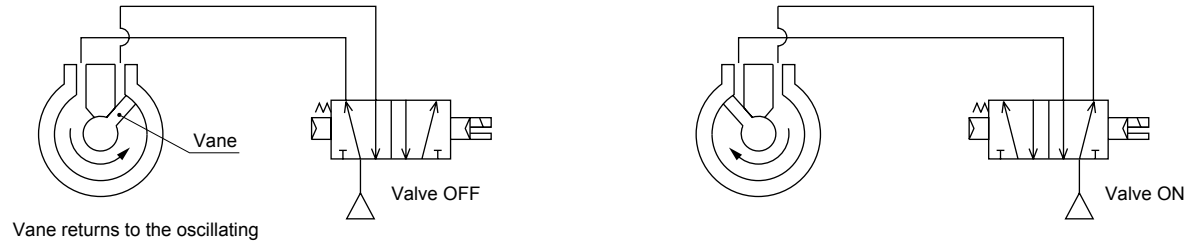
[Example of model No.]

RV3S-SR-10-90-45-U

Model: Switch unit

Ⓐ Model : For RV3S10
Ⓑ Oscillating angle : 90°
Ⓒ Oscillating origin : 45°
Ⓓ Lead wire direction : Radial lead wire

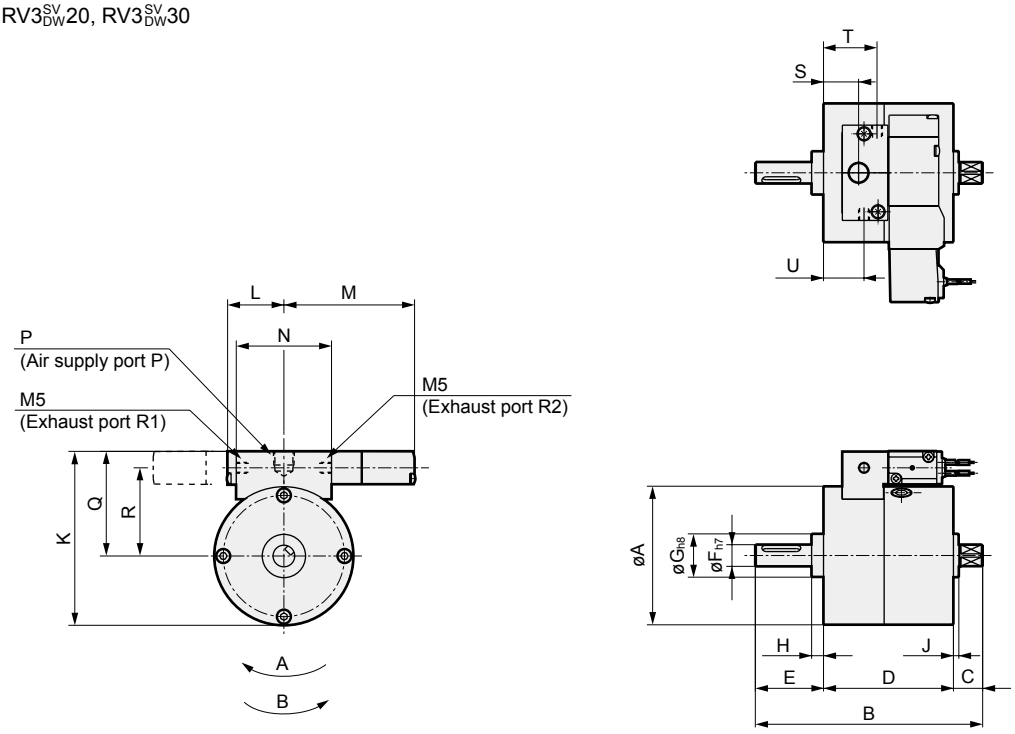
Operational principle



Vane returns to the oscillating origin when the 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 1349 for the key dimensions.
* The detailed dimensions for each body follow RV3$^{S}_{D}$10, RV3$^{S}_{D}$20 and RV3$^{S}_{D}$30.

Code / 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	16.2	24.7	18.7

Compact rotary actuator with vane mechanism/angle variable

RV3$^{S}_{D}$A Series

- Torque size: 3/10/20/30
- Oscillating angle: Angle specification

JIS symbol

RoHS CAD

Specifications

● Single vane mechanism

Item		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 (≈100 psi, 7 bar)		1.0 (≈150 psi, 10 bar)	
Min. working pressure	MPa	0.2 (≈29 psi, 2 bar)			
Proof pressure	MPa	1.05 (≈150 psi, 10.5 bar)		1.5 (≈220 psi, 15 bar)	
Ambient temperature	°C	-5 (23°F) to 80 (176°F) *4			-5 (23°F) to 60 (140°F)
Port size		M5			Rc1/8
Oscillating angle setting range	°	30 to 180			30 to 270
Oscillating origin	°	90			45
Allowable absorbed energy *2	mJ	1	2	3	7
Max. operating frequency *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
Switch unit weight	kg	0.06	0.06	0.07	0.07
Lubrication		Not required (use turbine oil ISO VG32 if necessary for lubrication)			

● Double vane mechanism

Item		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 (≈100 psi, 7 bar)		1.0 (≈150 psi, 10 bar)	
Min. working pressure	MPa	0.2 (≈29 psi, 2 bar)			
Proof pressure	MPa	1.05 (≈150 psi, 10.5 bar)		1.5 (≈220 psi, 15 bar)	
Ambient temperature	°C	-5 (23°F) to 80 (176°F) *4			-5 (23°F) to 60 (140°F)
Port size		M5			Rc1/8
Oscillating angle setting range	°	30 to 90			
Oscillating origin	°	45			
Allowable absorbed energy *2	mJ	1	2	3	7
Max. operating frequency *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
Switch unit weight	kg	0.06	0.06	0.07	0.07
Lubrication		Not required (use turbine oil ISO VG32 if necessary for lubrication)			

1 : The allowable absorbed energy differs from the compact rotary actuator RV3 Series.
*2 : Calculate the allowable energy with allowable inertia energy of the shaft of the rotary actuator as follows.
(Allowable energy) ≥ $1/2I\omega^2 \times 10^3$ (refer to page 1398 for details.)
*3 : The max. operating frequency is at a supply pressure of 0.5 MPa [without load].
*4 : 5 to 60°C when switch is provided.
*5 : A key is attached with the rotary actuator with keyway.
*6 : Contact CKD for products other than standard specifications.

External stopper specifications

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

Item	Proximity switch
	FR-*(-U)
Applications	Programmable controller, relay, IC circuit
Output method	NPN output
Power supply voltage	5 VDC to 30 VDC
Load voltage	5 VDC to 30 VDC
Load current	5 mA to 200 mA
Current consumption	24 VDC: 20 mA or less, 12 VDC: 10 mA or less, 5 VDC: 4 mA or less
Internal voltage drop	1.5V or less
Indicator lamp	LED (Lit when ON)
Leakage current	10 μA or less
Lead wire length	1.0 m (oil resistant black 3-conductor cable)
Shock resistance	490 m/s^2
Insulation resistance	100 MΩ or more with 500 V megger
Withstand voltage	No failure after 1 minute of 1,500 VAC application.
Ambient temperature	5 to 60°C
Degree of protection	IEC standards IP67, JIS C0920 (water tight)

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

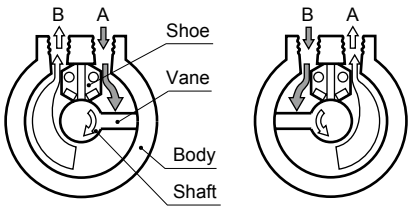
Operational principle

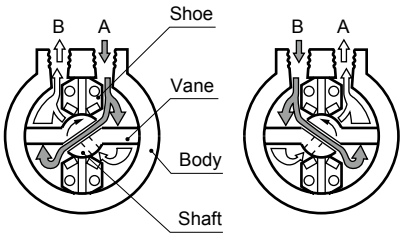
● Single vane

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

● Double vane

1. Configured with two vanes sliding on the internal body surface, integrated shaft, and two shoes (stoppers).
2. Air from port A pushes vane, goes through passage in shaft, pushes another vane, turns shaft, and finally generates torque.
3. Rotates in the same way as the single vane.





How to order

● Compact rotary actuator (angle variable) RV3*A

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

Ⓐ Model No.
Ⓑ Nominal size
Ⓒ Oscillating angle *1, *2
Ⓓ Oscillating origin
Ⓔ Switch model *3, *4
Ⓕ Options *5, *6

Code	Description	Ⓐ Model No. Single vane mechanism RV3SA	Ⓐ Model No. Double vane mechanism RV3DA
Ⓑ Nominal size			
3	Effective torque 0.5 MPa	0.31 N·m	0.71 N·m
10		0.98 N·m	2.11 N·m
20		1.70 N·m	3.88 N·m
30		3.19 N·m	7.70 N·m
Ⓒ Oscillating angle			
0	Without angle specification	●	●
Needed angle	With angle specification	●	●

Ⓓ Oscillating origin									
Nominal size		**3**	**10**	**20**	**30**	**3**	**10**	**20**	**30**
45	45°				●	●	●	●	●
90	90°	●	●	●					

Ⓔ Switch			
Blank	Without switch	●	●
FR	With axial lead wire switch	●	●
FR-U	With radial lead wire switch	●	●

Ⓕ Option			
Blank	No option	●	●
FA	With flange bracket	●	●
LS	With foot bracket	●	●
K	With protective cover	●	●

⚠ Precautions for model No. selection

*1 : If "Without angle setting" is selected, a reference point stopper is mounted and an angle setting stopper is attached. Mount the stopper if necessary.
*2 : Since the required angle is set to an approximate angle from the oscillating origin, always adjust the final angle with the fine adjust screw before starting use.
*3 : Two switches are attached.
*4 : If the type with switch is selected, a switch unit is attached at shipment. Adjust the external stopper and then install the switch.
*5 : If the type with switch is selected, the "K" protective cover cannot be selected.
*6 : The mounting bracket (FA, LS) is attached at shipment. Refer to pages 1348 and 1349 for dimensions.

[Example of model No.]

RV3SA3-0-45-FR-FA

Model: Compact rotary actuator angle variable

Ⓐ Model No. : RV3SA
Ⓑ Size : 3
Ⓒ Oscillating angle : Without angle specification
Ⓓ Oscillating origin : 90°
Ⓔ Switch : With axial lead wire switch
Ⓕ Option : With flange bracket

● How to order switch unit

RV3S - FR-3 - U

Ⓐ Model
Ⓑ Lead wire direction

Code	Description
Ⓐ Model	
FR-3	Applicable actuator: RV3SDA3
FR-10	Applicable actuator: RV3SDA10
FR-20	Applicable actuator: RV3SDA20
FR-30	Applicable actuator: RV3SDA30
Ⓑ Lead wire direction	
Blank	With axial lead wire switch
U	With radial lead wire switch

[Example of model No.]

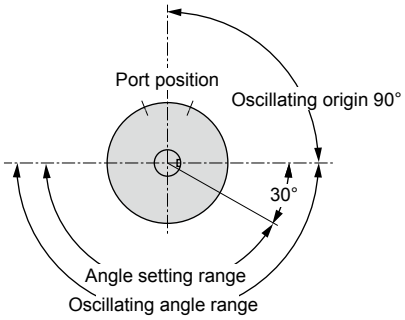
RV3S-FR-3-U

Model: Switch unit angle variable

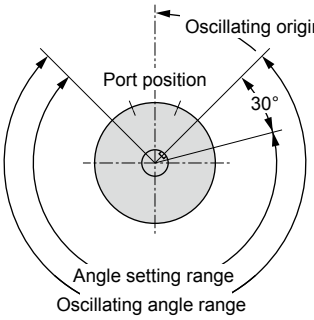
Ⓐ Model : For RV3SA3
Ⓑ Lead wire direction : Radial lead wire

Oscillating origin position

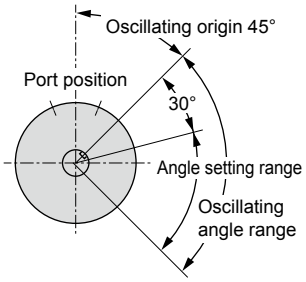
● Oscillating origin 90°
RV3SA3 to 20



● Oscillating origin 45°
RV3SA30



RV3DA3 to 30

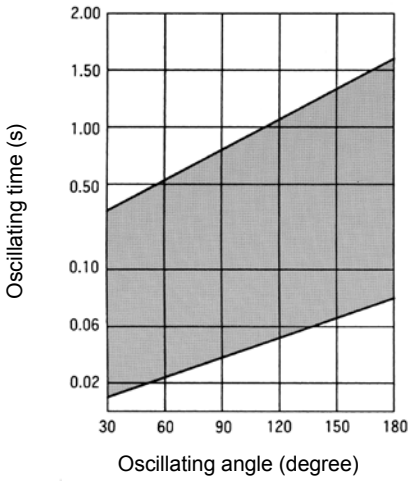


*1 : Tolerance of oscillating origin is based on set screw position.

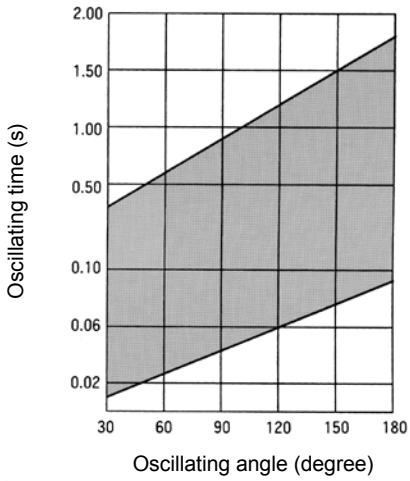
Oscillating time setting

1. Use an oscillating time within the specified range of the table below. If this range is exceeded, smooth operation cannot be obtained due to stick slip, etc.

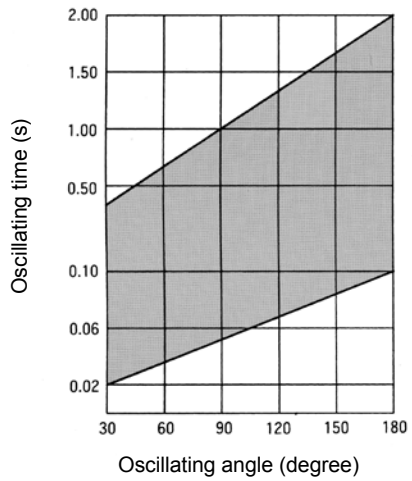
● RV3SDA3



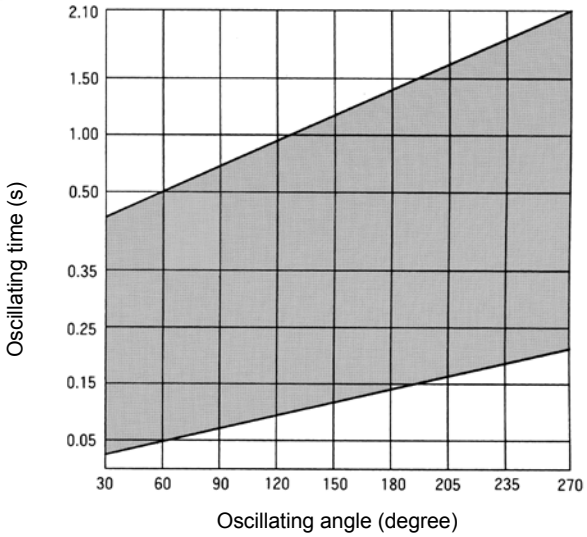
● RV3SDA10



● RV3SDA20

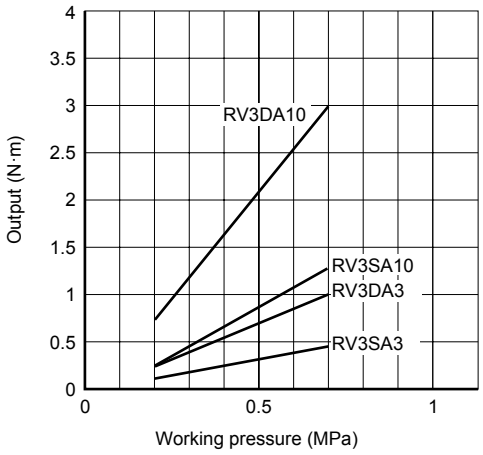


● RV3SDA30

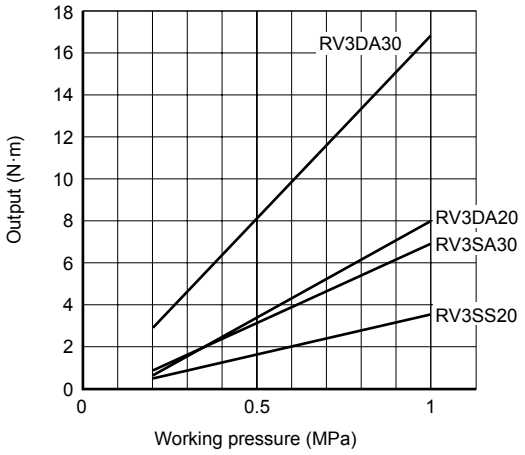


Output table (effective torque)

● RV3 S D A3 to 10



● RV3 S D A20, 30



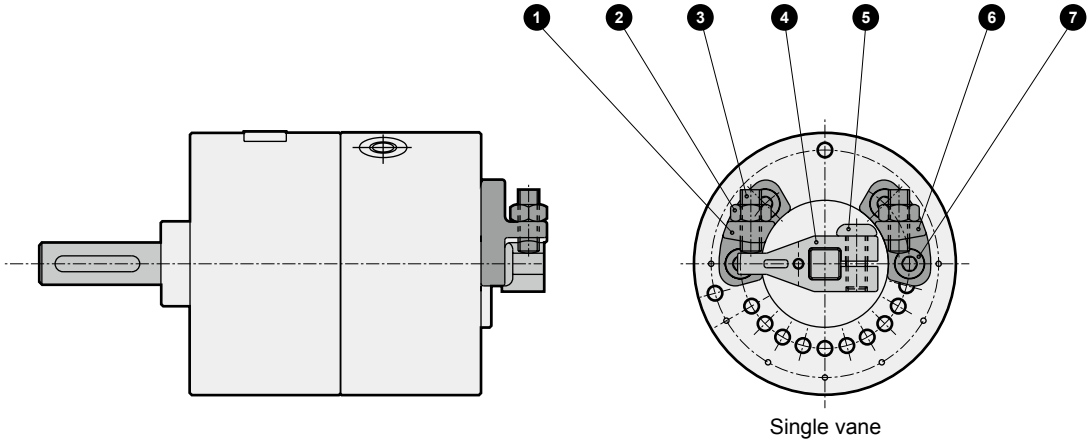
Output table (effective torque)

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

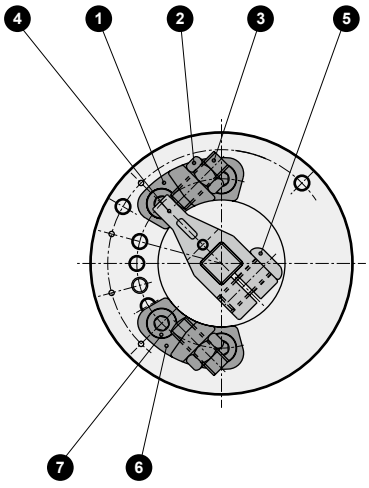
Internal structure and parts list

● RV3SA*



Single vane

● RV3SDA*



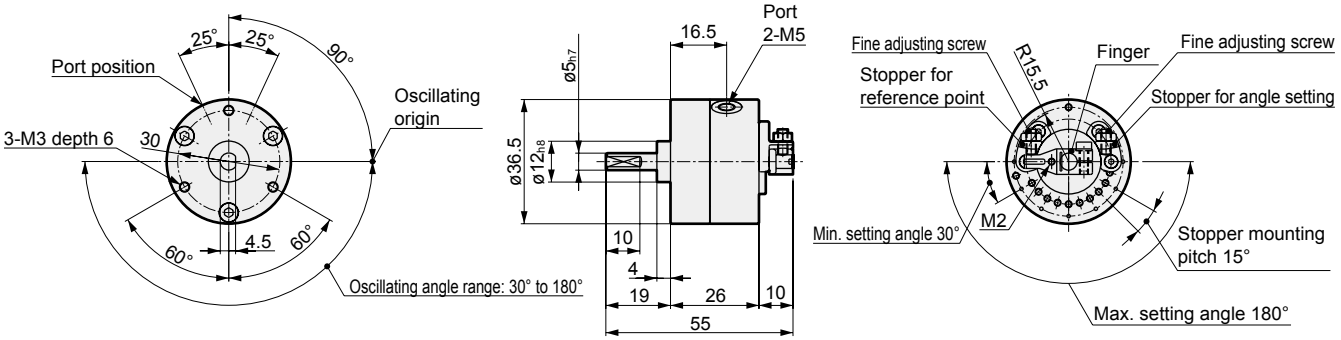
Double vane

* The internal structure of the rotary actuator body is the same as the compact rotary actuator RV3$^{S}_{D}$.
Refer to page 1342 for details.

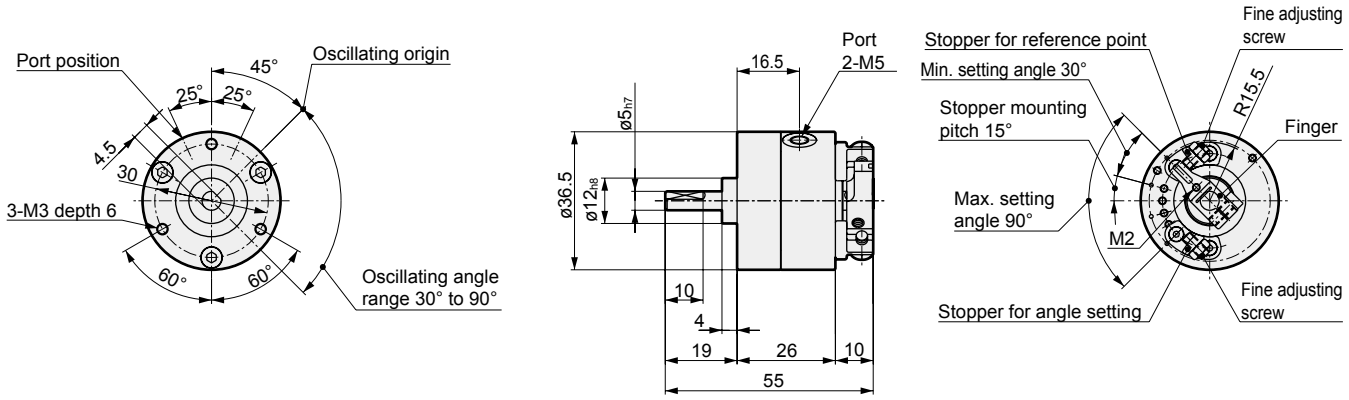
No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Stopper L	Steel	Reference point	5	Finger mounting bolt	Steel	
2	Lock nut	Steel		6	Stopper R	Steel	Angle setting
3	Fine adjusting screw	Steel		7	Stopper mounting bolt	Steel	
4	Finger	Steel					

Dimensions

● RV3SA3 CAD

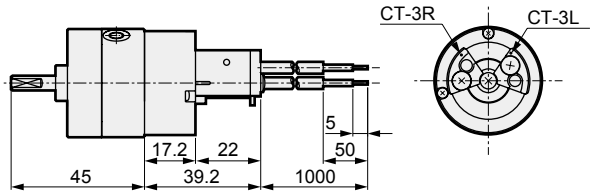


● RV3DA3

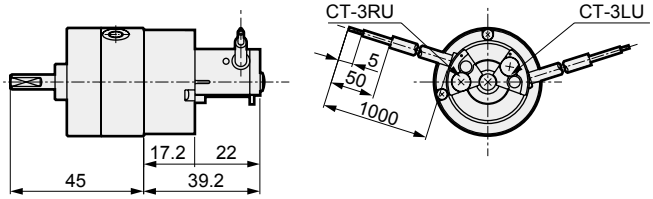


● RV3 S D A3-*-FR(U)

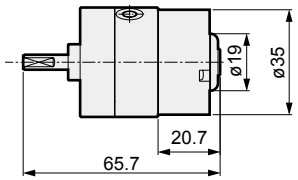
■ Axial lead wire



■ Radial lead wire

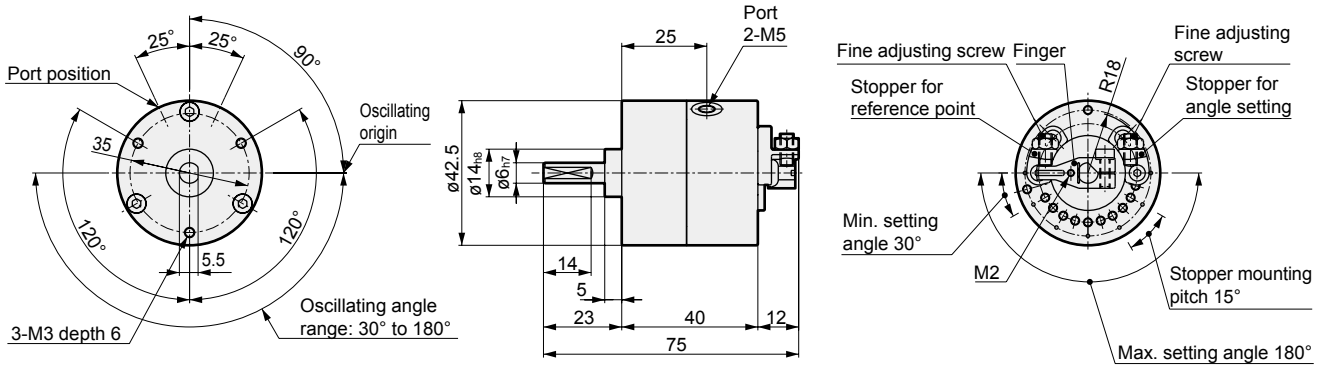


● RV3 S D A3-*-K (with protective cover)

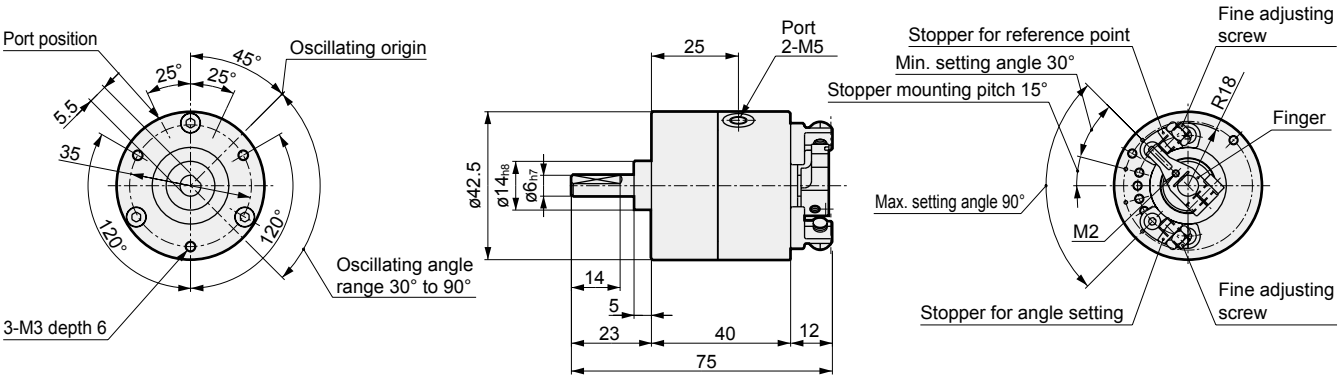


Dimensions

● RV3SA10

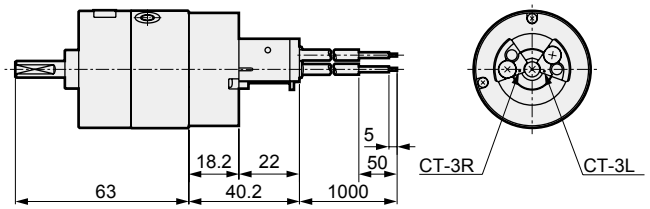


● RV3DA10

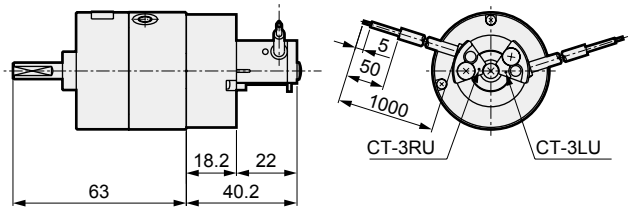


● RV3$^{S}_{D}$A10-*-FR(U)

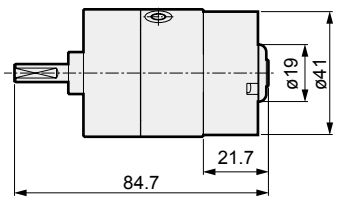
■ Axial lead wire



■ Radial lead wire

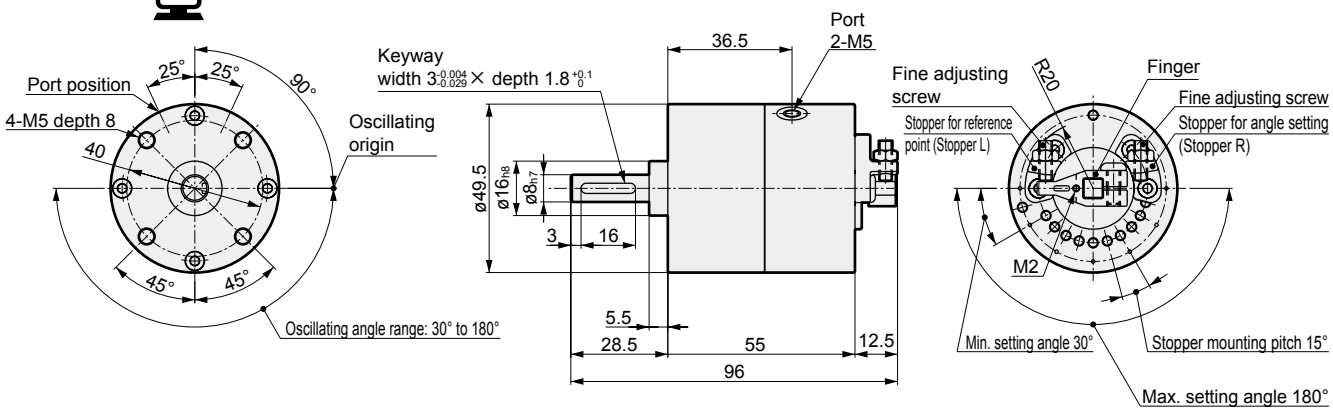


● RV3$^{S}_{D}$A10-*-K (with protective cover)



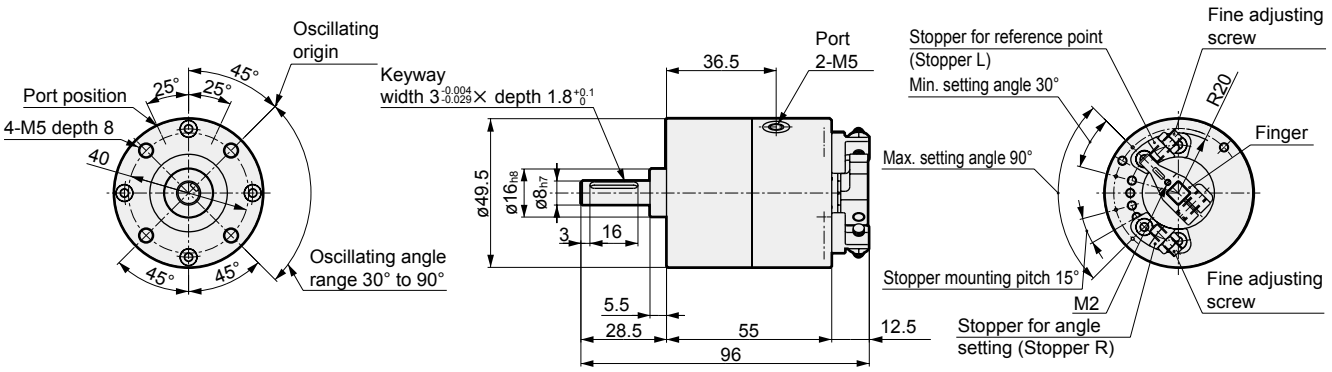
Dimensions

● RV3SA20



* The key is attached. Refer to page 1349 for the key dimensions.

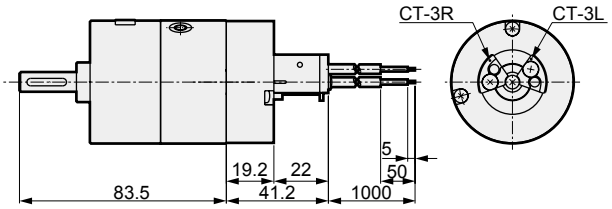
● RV3DA20



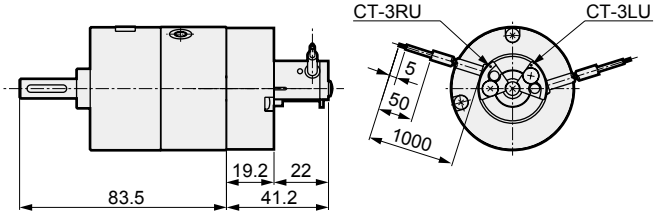
* The key is attached. Refer to page 1349 for the key dimensions.

● RV3 S D A20-*-FR(U)

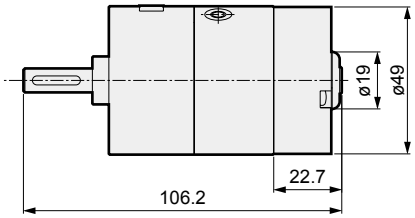
■ Axial lead wire



■ Radial lead wire

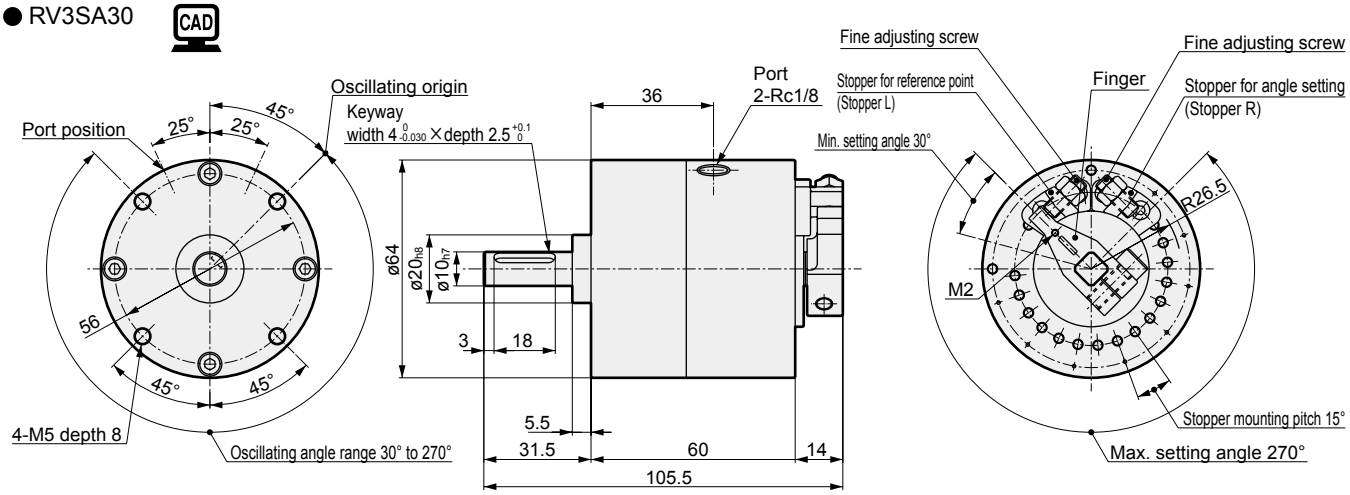


● RV3 S D A20-*-K (with protective cover)



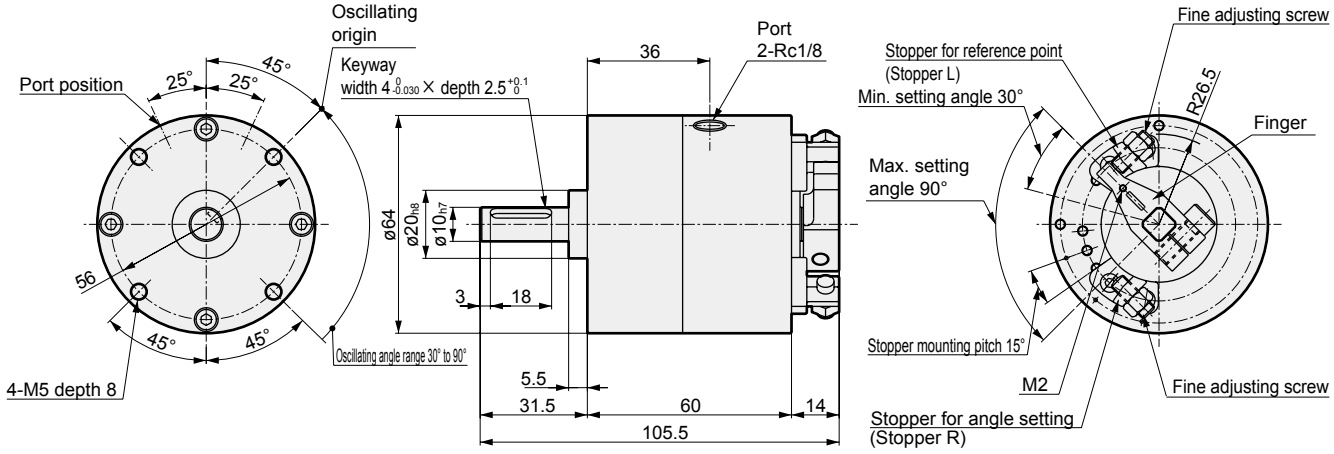
Dimensions

● RV3SA30 CAD



* The key is attached. Refer to page 1349 for the key dimensions.

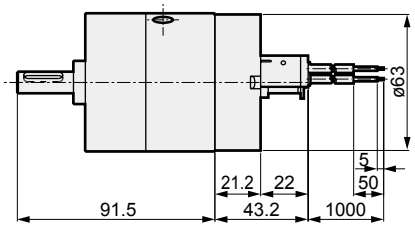
● RV3DA30

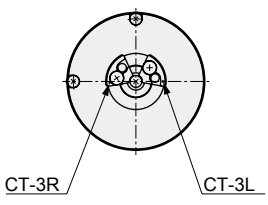


* The key is attached. Refer to page 1349 for the key dimensions.

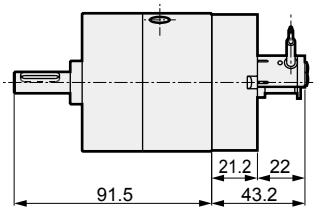
● RV3$^{S}_{D}$A30-*-FR(U)

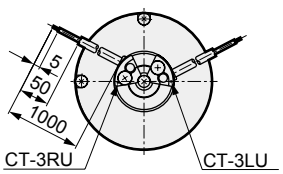
■ Axial lead wire



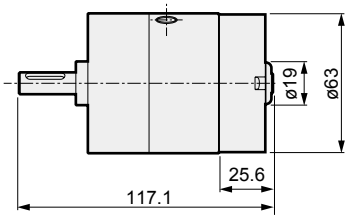


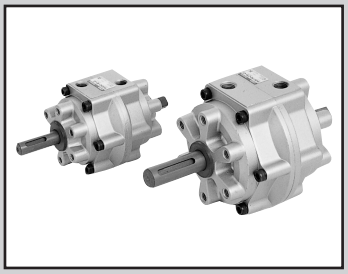
■ Radial lead wire





● RV3$^{S}_{D}$A30-*-K (with protective cover)





Large rotary actuator Vane mechanism/standard

RV3$^{S}_{D}$ Series

- Torque size: 50/150/300/800
- Oscillating angle: 90°/100°/180°/270°/280°

JIS symbol 

Specifications

● Single vane mechanism

Item	Single vane mechanism RV3S															
Size	50				150				300				800			
Effective torque N·m	4.7				14.7				27.9				102			
Actuation	Single vane															
Working fluid	Compressed air															
Max. working pressure MPa	1.0 (≈150 psi, 10 bar)															
Min. working pressure MPa	0.2 (≈29 psi, 2 bar) *1															
Proof pressure MPa	1.5 (≈220 psi, 15 bar)															
Ambient temperature °C	5 (41°F) to 60 (140°F)															
Port size	Rc1/8				Rc1/4				Rc3/8				Rc1/2			
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 $^{+3}_{0}$	180 $^{+3}_{0}$	270 $^{+3}_{0}$	280 $^{+3}_{0}$
Oscillating origin Degree	45			40	45			40	45			40	45			40
Allowable absorbed energy *2 mJ	49				225				1078				3820			
Max. operating freq *3 cycle/min	180	90	60		120	80	50		90	60	40		70	45	30	
Volumetric capacity cm^3	51		61	62	146		179	185	244	283	352	365	754	869	1036	1046
Allowable L-shaped load N	588				1176				1960				4900			
Allowable thrust load N	44.1				88.2				147				490			
Weight kg	0.82	0.79	0.73	0.7	2.0	1.9	1.7	1.6	3.7			3.6	12.7	12.2	11.2	11.0
Switch unit weight kg *6 Without shock absorber	0.1				0.14				0.18				0.28			
Switch unit weight kg *6 With shock absorber 90°	0.16				0.27				0.50				2.9			
Switch unit weight kg *6 With shock absorber 100°	0.15				0.26				0.49				2.8			
Switch unit weight kg *6 With shock absorber 180°	0.16				0.27				0.50				2.9			
Switch unit weight kg *6 With shock absorber 270°	0.14				0.23				0.41				2.7			
Switch unit weight kg *6 With shock absorber 280°	0.14				0.22				0.39				2.6			
Lubrication	Not required (use turbine oil class 1 ISO VG32 if necessary for lubrication)															

● Double vane mechanism

Item	Double vane mechanism RV3D								
Size	50		150		300		800		
Effective torque N·m	10.1		34.3		66.6		206		
Actuation	Double vane								
Working fluid	Compressed air								
Max. working pressure MPa	1.0 (≈150 psi, 10 bar)								
Min. working pressure MPa	0.2 (≈29 psi, 2 bar) *1								
Proof pressure MPa	1.5 (≈220 psi, 15 bar)								
Ambient temperature °C	5 (41°F) to 60 (140°F)								
Port size	Rc1/8		Rc1/4		Rc3/8		Rc1/2		
Oscillating angle tolerance Degree	90 $^{+3}_{0}$	100 $^{+3}_{0}$	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	
Allowable absorbed energy *2 mJ	49		225		1078		3820		
Max. operating frequency *3 cycle/min	180		120		90		90	70	
Volumetric capacity cm^3	42	43	127	123	244	271	754	774	
Allowable L-shaped loadN	588		1176		1960		4900		
Allowable thrust load N	44.1		88.2		147		490		
Weight kg	0.82	0.8	2.0	1.9	4.3	4.1	12.7	12.5	
Switch unit weight kg *6 Without shock absorber	0.1		0.14		0.18		0.28		
Switch unit weight kg *6 With shock absorber 90°	0.16		0.27		0.50		2.9		
Switch unit weight kg *6 With shock absorber 100°	0.15		0.26		0.49		2.8		
Switch unit weight kg *6 With shock absorber 180°	0.16		0.27		0.50		2.9		
Switch unit weight kg *6 With shock absorber 270°	0.14		0.23		0.41		2.7		
Switch unit weight kg *6 With shock absorber 280°	0.14		0.22		0.39		2.6		
Lubrication	Not required (use turbine oil ISO VG32 if necessary for lubrication)								

*1 : The min. working pressure is 0.3 MPa when the optional shock absorber is selected.

*2 : Calculate the allowable energy with allowable inertia energy of the shaft of the rotary actuator as follows. [Allowable energy] ≥ (1/2) x I x ω^2 x 10^3 (refer to page 1398 for details).
If the formula above is not satisfied, problems such as broken shafts may be caused.

*3 : The max. operating frequency is at a supply pressure of 0.5 MPa [without load].

*4 : A key is attached with the rotary actuator with keyway.

*5 : Contact CKD for products other than standard specifications.

*6 : The switch unit weight is the weight of two switches.

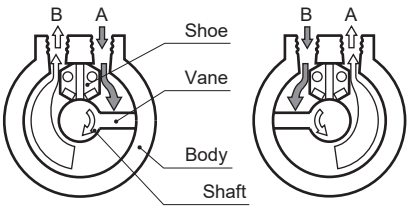
Switch specifications

Item	Proximity 2-wire	Proximity 3-wire	Reed 2-wire	
	M2V	M3V	MOV	M5V
Applications	Dedicated for programmable controller	For programmable controller, relay, IC circuit, compact solenoid valve	For programmable controller, relay	For programmable controller, relay, IC circuit (without indicator lamp), serial connection
Output method	———	NPN output	———	
Power supply voltage	———	4.5 to 28 VDC	———	
Load voltage/current	10 to 30 VDC, 5 to 30 mA	30 VDC or less, 100 mA or less	5 to 50 mA with 12/24 VDC, 7 to 20 mA with 110 VAC	50 mA or less with 5/12/24 VDC, 20 mA or less with 110 VAC
Indicator	LED (Lit when ON)		LED (Lit when ON)	No indicator lamp
Leakage current	1 mA or less	10 μA or less	0 mA	
Weight g	1 m:22 3 m:57 5 m:93			

Operational principle

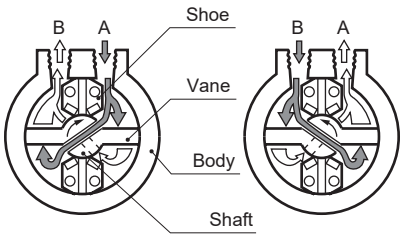
● Single vane

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



● Double vane

1. Configured with two vanes sliding on the internal body surface, integrated shaft, and two shoes (stoppers).
2. Air from port A pushes vane, goes through passage in shaft, pushes another vane, turns shaft, and finally generates torque.
3. Rotates in the same way as the single vane.



How to order

● Large rotary actuator (standard) RV3*

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

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

Ⓐ Model No.		Single vane mechanism	Double vane mechanism
Code	Description	RV3S	RV3D
Ⓑ Nominal size			
50	Effective torque 0.5 MPa	4.7 N·m	10.1 N·m
150		14.7 N·m	34.3 N·m
300		27.9 N·m	66.6 N·m
800		102 N·m	206 N·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			
L-shaped lead wire	-	-	-
M2V*	Proximity, DC, 1-color LED, 2-wire	●	●
M3V*	Proximity, DC, 1-color LED, 3-wire	●	●
M0V*	Reed, AC/DC, 1-color LED, 2-wire	●	●
M5V*	Reed, AC/DC, No indicator lamp, 2-wire	●	●
* Lead wire length			
Blank	1 m (standard)	●	●
3	3 m (option)	●	●
5	5 m (option)	●	●
Ⓕ Switch quantity			
R	With clockwise rotation detection 1 piece	●	●
L	With counterclockwise rotation detection 1 piece	●	●
D	2	●	●

Ⓖ Option		Nominal size	50	150	300	800	50	150	300	800
Blank	No option		●	●	●	●	●	●	●	●
FA	With flange bracket		●	●			●	●		
LS	With foot bracket		●	●	●	●	●	●	●	●
C	With shock absorber		●	●	●	●	●	●	●	●

Precautions for model No. selection

*1:Refer to the table below for the relation of the oscillating angle and oscillating origin. Relation of oscillating angle and oscillating origin

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

*2 : The mounting bracket (FA, LS) is included at shipment. Refer to page 1371 for dimensions.
*3 : Refer to page 1382 for shock absorber (C).
*4 : The switch cannot be installed with the oscillating angle 280 shock absorber.

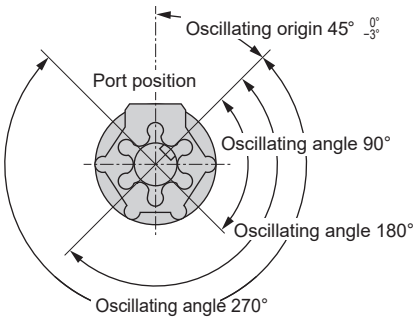
[Example of model No.]

RV3S50-90-45-M2V-D-C

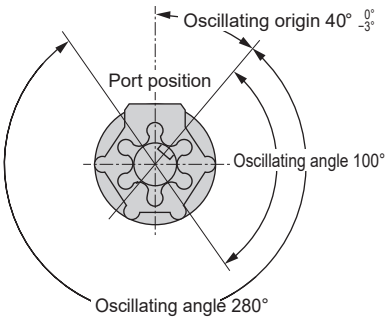
Model: Large rotary actuator
Ⓐ Model No. : RV3S
Ⓑ Size : 50
Ⓒ Oscillating angle : 90°
Ⓓ Oscillating origin : 45°
Ⓔ Switch : M2V switch, lead wire length 1 m
Ⓕ Switch quantity : With clockwise rotation detection 1 piece
Ⓖ Option : With shock absorber

Oscillating origin position

● Oscillating origin 45° RV3*50 to 800



● Oscillating origin 40° RV3*50 to 800



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

How to order switch unit

Switch unit

RVU50 - C - 90 - M2V - R

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

Code	Description
Ⓐ Model	
RVU50	Applicable actuator: RV3S/D50
RVU150	Applicable actuator: RV3S/D150
RVU300	Applicable actuator: RV3S/D300
RVU800	Applicable actuator: RV3S/D800
Ⓑ Unit	
Blank	Standard products
C	With shock absorber
Ⓒ Oscillating angle	
90	90°
100	100°
180	180°
270	270°
280	280° ("C" (for shock absorber) cannot be selected.)
Ⓓ Switch model No.	
M2V*	Prox. / 1-color LED / 2-wire
M3V*	Prox. / 1-color LED / 3-wire
M0V*	Reed / No indicator lamp / 2-wire
M5V*	Reed / No indicator lamp / 2-wire
*** Lead wire length**	
Blank	1 m (standard)
3	3 m (option)
5	5 m (option)
Ⓔ Switch quantity	
R	With clockwise rotation detection 1 piece
L	With counterclockwise rotation detection 1 piece
D	2

⚠ Precautions for model No. selection

Note: When the type for shock absorber is selected, the shock absorber body must be purchased separately.

[Example of model No.]

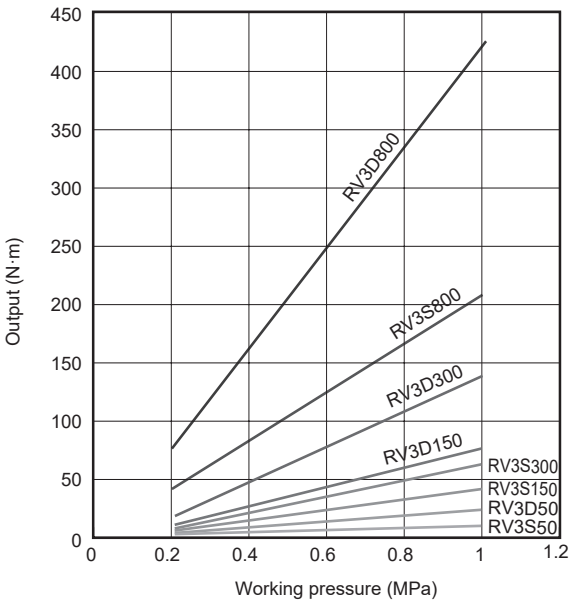
RVU50-C-90-M2V-R

Model: Switch unit

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

Output characteristics graph (effective torque)

● RV3 S D 50/150/300/800



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
	RV3S800	37.8	59.1	81	102	123	144	166	186	205
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
	RV3D800	77.4	120	161	206	247	288	332	371	411

Oscillating time setting

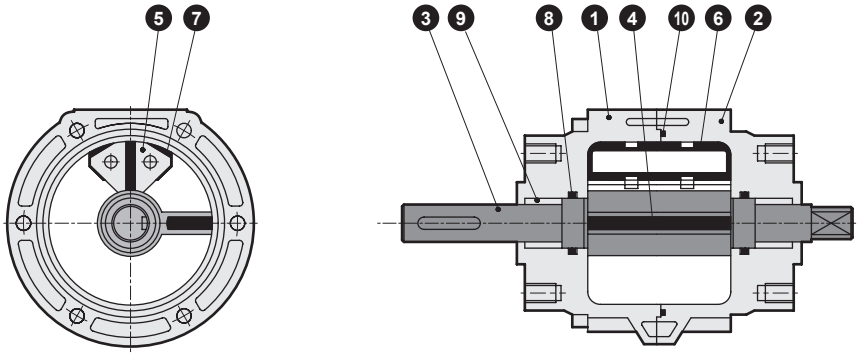
1. Use an oscillating time within the specified range of the table below. If this range is exceeded, smooth operation cannot be obtained due to stick slip, etc.

(s)

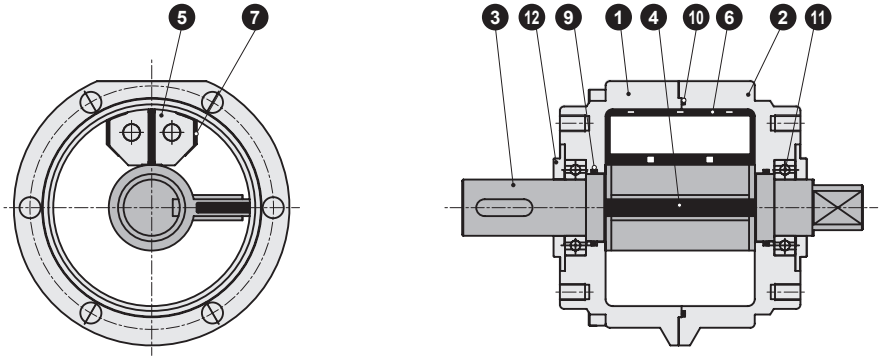
Model No.	Oscillating angle				
	90°	100°	180°	270°	280°
RV3 S D 50	0.08 to 0.8	0.09 to 0.9	0.16 to 1.6	0.24 to 2.4	0.25 to 2.5
RV3 S D 150	0.12 to 1.2	0.13 to 1.3	0.24 to 2.4	0.36 to 3.6	0.37 to 3.7
RV3 S D 300	0.16 to 1.6	0.17 to 1.7	0.32 to 3.2	0.48 to 4.8	0.49 to 4.9
RV3*800	0.22 to 2.2	0.24 to 2.4	0.44 to 4.4	0.66 to 6.6	0.68 to 6.8

Internal structure and parts list

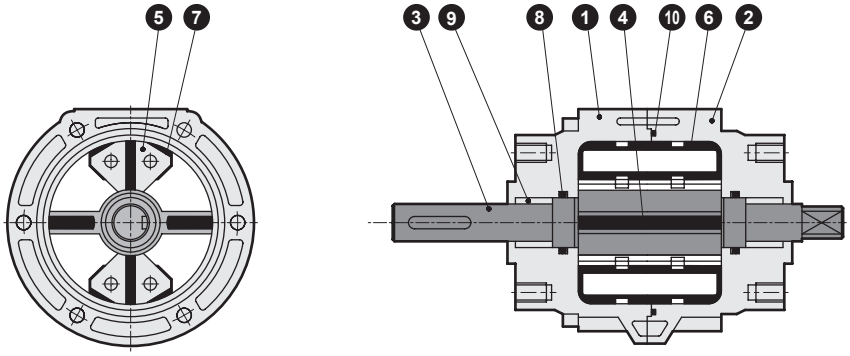
● RV3S50/150/300



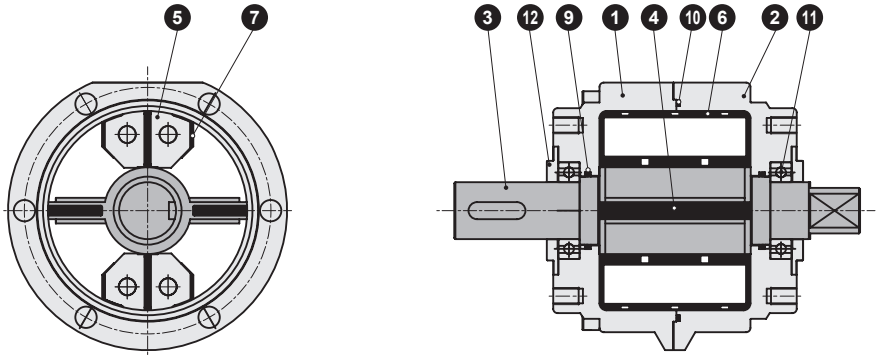
● RV3S800/RV3SH800



● RV3D50/150/300



● RV3D800/RV3DH800

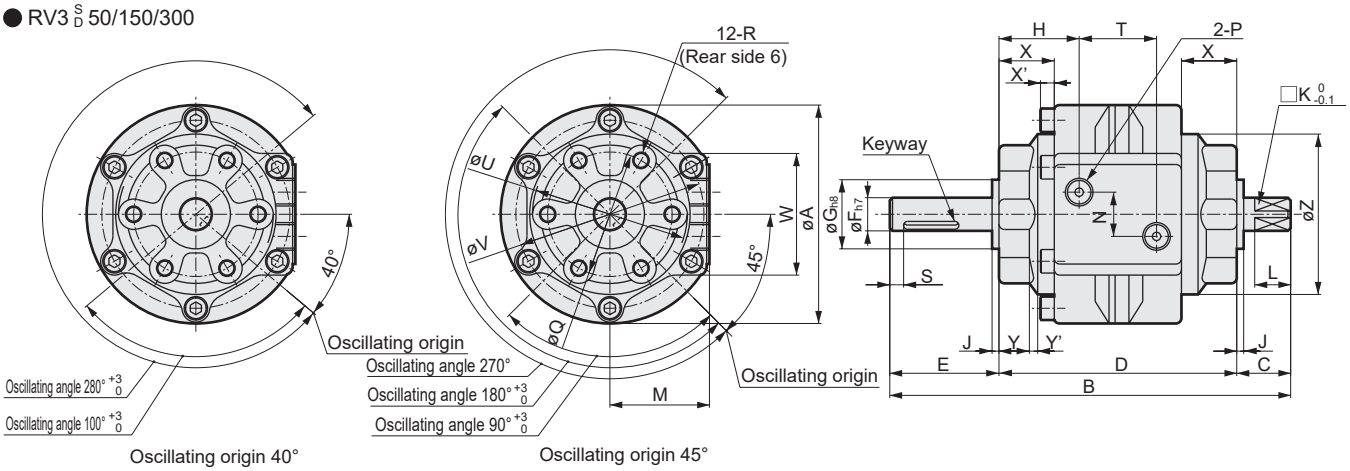


No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Body A	Aluminum casting		7	Damper	Resin	
2	Body B	Aluminum casting		8	O-ring	Nitrile rubber	
3	Vane shaft	Steel		9	Bearing	Sintering oil impregnated material	
4	Vane seal (vane shaft)	Nitrile rubber		10	O-ring	Nitrile rubber	
5	Shoe	Zinc alloy die-casting		11	Bearing	Steel	
6	Shoe sealant	Nitrile rubber		12	Cover plate	Steel	

Note: The vane seal and vane shaft are integrated.
Refer to page 1393 for the repair parts list.

Dimensions CAD

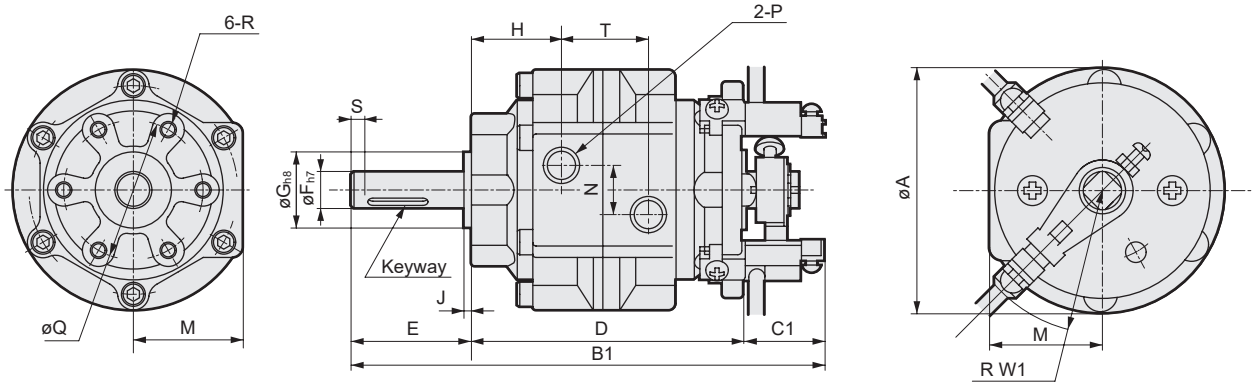
● RV3 S D 50/150/300



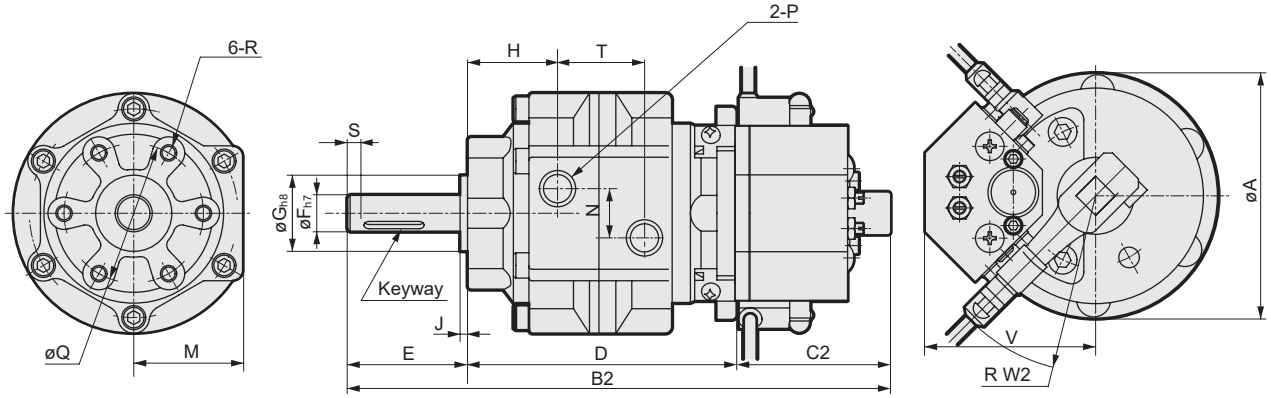
* The key is attached. Refer to page 1371 for the key dimensions.

Code / Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	Key groove W x D x L	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

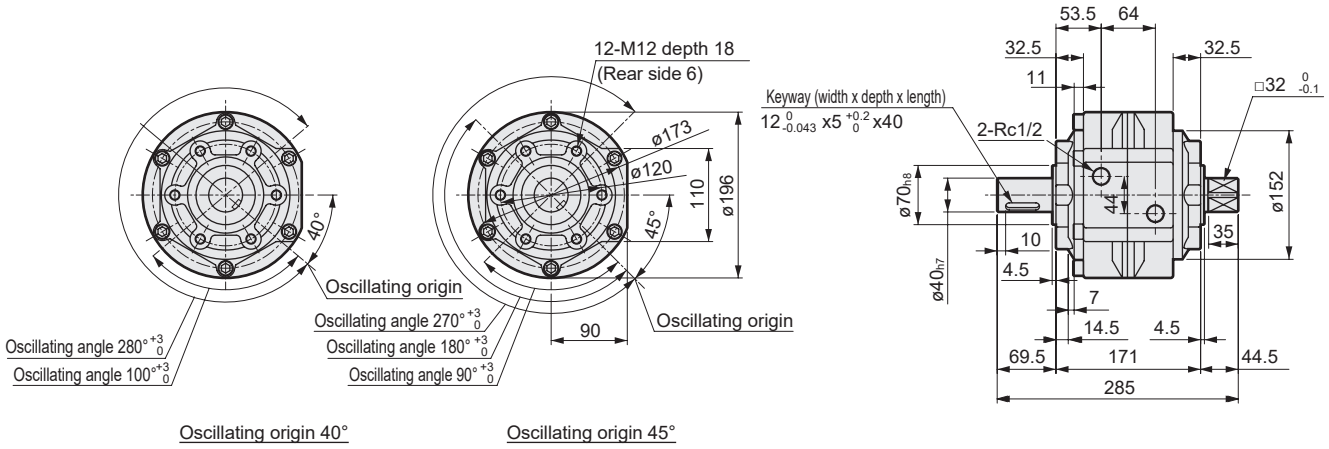


* The key is attached. Refer to page 1371 for the key dimensions.

Code / Model No.	A	B1	B2	C1	C2	D	E	F	G	H	J	M	N	P	Q	R	S	T	V	W1	W2	Keyway W x D x L
RV3 S D 50	79	157.2	177.2	30.5	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	188.2	214.2	30.5	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	221.7	253.7	30.5	62.5	126.2	65	25	45	41.5	3.5	66	32	Rc3/8	80	M10 Depth 15	5	42	95	69	88	7x4x40

Dimensions

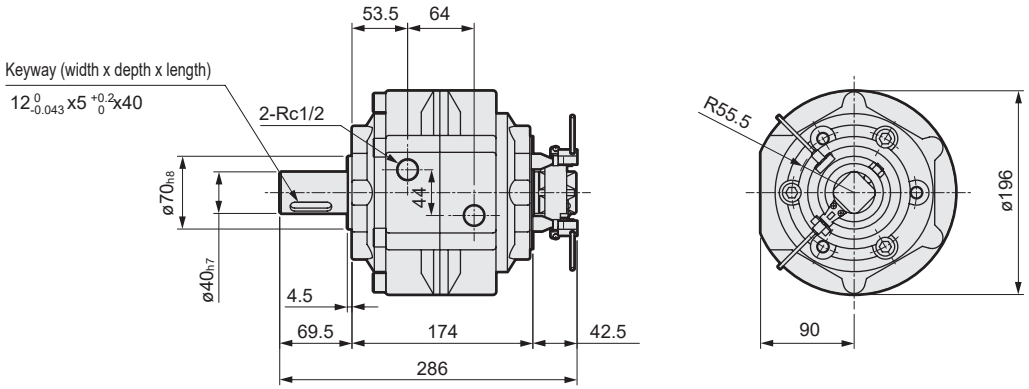
● RV3 S D 800



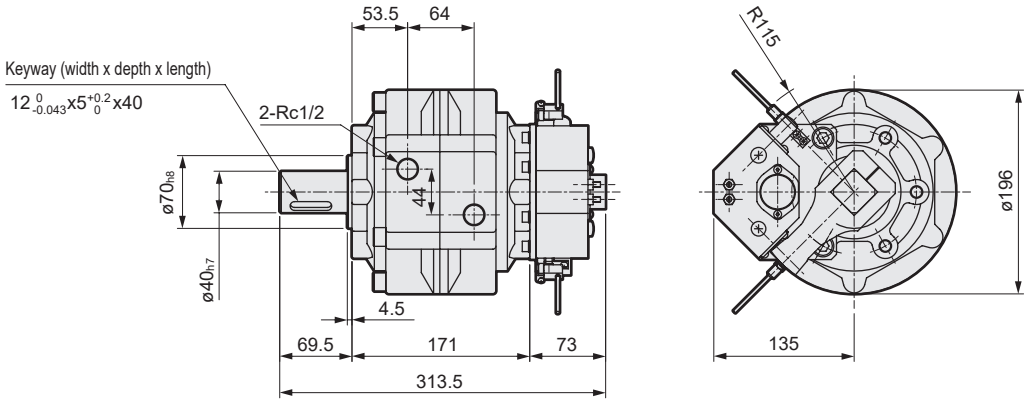
Oscillating origin 40°

Oscillating origin 45°

● With switch



● With switch, shock absorber



Options/accessories

Flange bracket/foot bracket

How to order

● Flange bracket

Model – FA

Flange bracket

Model	Compatibility
RVS50	RV3$^{S}_{D}$ 50
RVS150	RV3$^{S}_{D}$ 150

● Foot bracket

Model – LS

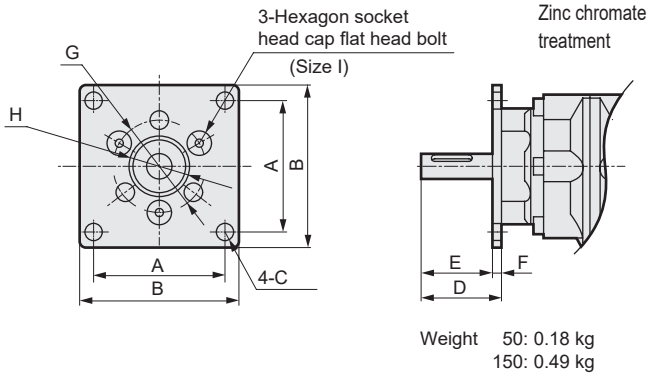
Foot bracket

Model	Compatibility
RVS50	RV3$^{S}_{D}$ 50
RVS150	RV3$^{S}_{D}$ 150
RVS300	RV3$^{S}_{D}$ 300
RVS800	RV3$^{S}_{D}$ 800

Dimensions

● RVS $^{50}_{150}$-FA *2

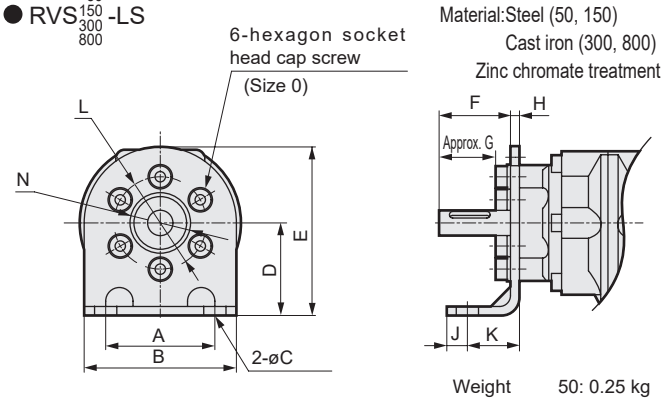
Material:Steel
Zinc chromate treatment



Weight 50: 0.18 kg
150: 0.49 kg

● RVS $^{50}_{150}_{300}_{800}$-LS

Material:Steel (50, 150)
Cast iron (300, 800)
Zinc chromate treatment



Weight 50: 0.25 kg
150: 1.05 kg
300: 1.73 kg
800: 3.9 kg

Note) Foot bracket is 60.ĩt can be installed rotating at a time.

Model	A	B	C	D	E	F	G	H	I
RV*50	64	80	7	39.5	35	4.5	45	30	M 6 x 12
RV*150	88	110	9	53.5	47.5	6	70	37	M 8 x 12

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

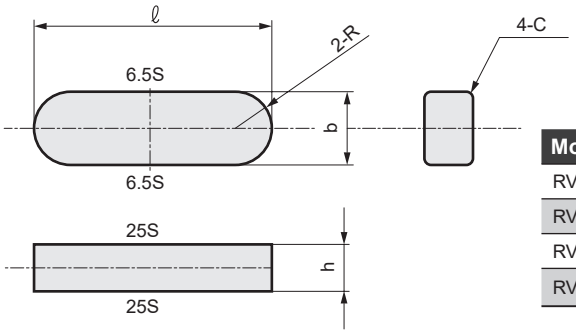
Model	A	B	C	D	E	F	G	H	J	K	L	N	O
RV*50	55	75	11	45	82.5	35	27.5	4.5	10	25	45	30	M 6 x 12
RV*150	80	110	13	65	115	43.5	33.5	10	12	28	70	37	M 8 x 22
RV*300	100	140	15	80	135	53	40.5	12	13	32	80	52	M 10 x 28
RV*800	140	200	15	110	200	54.5	39.5	15	15	35	120	75	M 12 x 35

Key

Dimensions

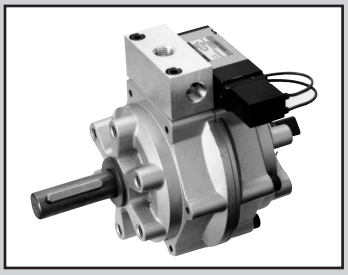
The following keys are attached with the rotary actuator with keyway.

● JIS B1301 parallel key b x h x ℓ double round S45CS45C



Unit: mm

Model No.	Nominal key	b	h	ℓ	C	R
RV3*50	4 x 4 x 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 x 5 x 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 x 7 x 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
RV3*800	12 x 8 x 40	12 $^{0}_{-0.043}$	8 $^{0}_{-0.09}$	40 $^{0}_{-0.25}$	0.40 to 0.60	6



Large rotary actuator vane mechanism/with valve

RV3 SV DW Series

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

RoHS CAD

Specifications

Item	Single vane mechanism RV3SV/RV3SW												Double vane mechanism RV3DV/RV3DW					
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																	
Max. working pressure MPa	0.7 (≈100 psi, 7 bar)																	
Min. working pressure MPa	0.2 (≈29 psi, 2 bar)																	*1
Proof pressure MPa	1.05 (≈150 psi, 10.5 bar)																	
Ambient temperature °C	5 (41°F) to 50 (122°F)																	
Port size (suction)	Rc1/8				Rc1/4				Rc3/8				Rc1/8		Rc1/4		Rc3/8	
Port size (exhaust)	M5				Rc1/4								M5		Rc1/4			
Oscillating angle tolerance °	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 °	45			40	45			40	45			40	45	40	45	40	45	40
Allowable absorbed energy *2 mJ	49				225				1078				49		225		1078	
Max. operating frequency *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 L-shaped loadN	588				1176				1960				588		1176		1960	
Allowable thrust load N	44.1				88.2				147				44.1		88.2		147	
Incorporated solenoid valve	4KB119/4KB129				4KB219/4KB229								4KB119/4KB129		4KB219/4KB229			
Weight kg	0.9		0.84	0.81	2.2		2.0	1.9	4.1			4.0	0.93	0.91	2.3	2.2	4.7	4.5
Switch unit weight kg *6 Without shock absorber	0.1				0.14				0.18				0.1		0.14		0.18	
With shock absorber 90°	0.16				0.27				0.58				0.16		0.27		0.50	
With shock absorber 100°	0.15				0.26				0.49				0.15		0.26		0.49	
With shock absorber 180°	0.16				0.27				0.50				0.16		0.27		0.50	
With shock absorber 270°	0.14				0.23				0.41				0.14		0.23		0.41	
With shock absorber 280°	0.14				0.22				0.39				0.14		0.22		0.39	
Lubrication	Not required (use turbine oil class 1 ISO VG32 if necessary for lubrication)												Not required (use turbine oil ISO VG32 if necessary for lubrication)					

*1 : The min. working pressure is 0.3 MPa when the optional shock absorber is selected.

*2 : Calculate the allowable energy with allowable inertia energy of the shaft of the rotary actuator as follows. [Allowable energy] ≥ (1/2) x I x ω^2 x 10^3 (refer to page 1398 for details). If the formula at left is not satisfied, problems such as broken shafts may be caused.

*3 : The max. operating frequency is at a supply pressure of 0.5 MPa [without load].

*4 : A key is attached with the rotary actuator with keyway.

*5 : Contact CKD for products other than standard specifications.

*6 : The switch unit weight is the weight of two switches.

Valve specifications

Item	Specifications (4KB2 Series) *2		
Rated voltage *1 V	100 VAC (50/60 Hz)	200 VAC (50/60 Hz)	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%		
Thermal class	Class B molded coil		

*1 : 100 VAC and 200 VAC are available with 110 VAC and 220 VAC (60 Hz).
*2 : Refer to page 1351 for the specifications of the 4KB1 Series.
*3 : Refer to “Pneumatic Valves (CB-023SA)” for details on valves.

Switch specifications

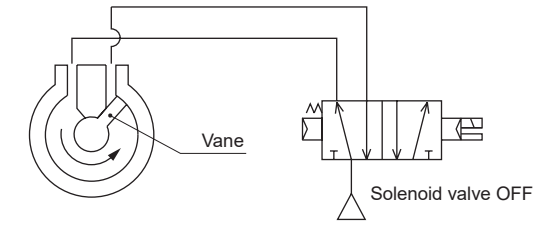
Item	Proximity 2-wire	Proximity 3-wire
	M2V	M3V
Applications	Dedicated for programmable controller	Programmable controller, relay, IC circuit, small solenoid valve
Output method	———	NPN output
Power supply voltage	———	4.5 to 28 VDC
Load voltage/current	10 to 30 VDC, 5 to 30 mA	30 VDC or less, 100 mA or less
Indicator	LED (Lit when ON)	
Leakage current	1 mA or less	10 μA or less
Weight g	1 m:22 3 m:57 5 m:93	

Item	Reed 2-wire	
	M0V	M5V
Applications	For programmable controller, relay	Programmable controller, relay, IC circuit (without indicator lamp), serial connection
Load voltage/current	5 to 50 mA with 12/24 VDC, 7 to 20 mA with 110 VAC	50 mA or less with 5/12/24 VDC, 20 mA or less with 110 VAC
Indicator	LED (Lit when ON)	No indicator lamp
Leakage current	0 mA	
Weight g	1 m:22 3 m:57 5 m:93	

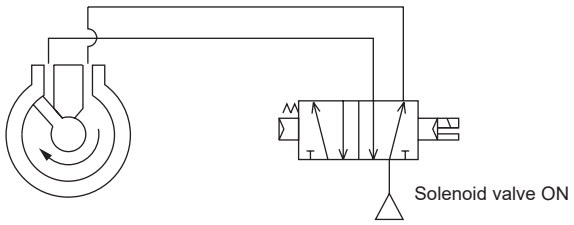
* M0 switch can be used for 24 VAC and 48 VAC within load current range of 7 to 20 mA.

Operational principle

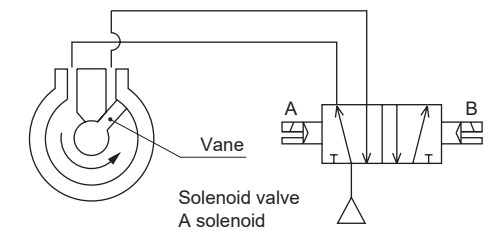
(1) Single solenoid



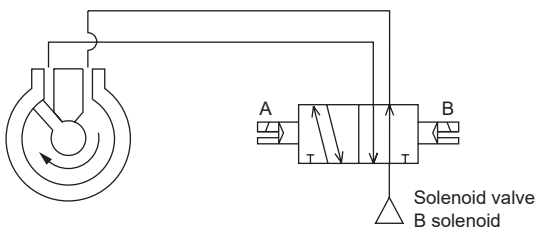
Vane returns to the oscillating origin when the solenoid valve turns OFF.



(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 valve maintains the self-hold state when both the A solenoid and B solenoid are OFF.

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 *1
Ⓕ Valve voltage
Ⓖ Switch
Ⓗ Switch quantity
Ⓘ Option *2, * 3, *4

Code	Description	Ⓐ Model No. Single vane mechanism RV3S	Ⓐ Model No. Double vane mechanism RV3D
Ⓑ Valve			
V	Single solenoid	●	●
W	Double solenoid	●	●
Ⓒ Nominal size			
50	Effective torque 0.5 MPa	4.7 N·m	10.1 N·m
150		14.7 N·m	34.3 N·m
300		27.9 N·m	66.6 N·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			

L-shaped lead wire	Contact	Voltage AC	Voltage DC	Indicator	Lead wire	-	-
M2V*	Proximity		●	1-color LED	2-wire	●	●
M3V*			●		3-wire	●	●
M0V*	Reed	●	●		2-wire	●	●
M5V*		●	●	no indicator lamp		●	●

* Lead wire length			
Blank	1 m (standard)	●	●
3	3 m (option)	●	●
5	5 m (option)	●	●
Ⓗ Switch quantity			
R	With clockwise rotation detection 1 piece	●	●
L	With counterclockwise rotation detection 1 piece	●	●
D	2	●	●

Ⓘ Option

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

Precautions for model No. selection

*1 : Refer to the table below for the relation of the oscillating angle and oscillating origin.

Relation of oscillating angle and oscillating origin

Ⓔ Oscillating origin / Ⓓ Oscillating angle	40°	45°
90°		●
100°	●	
180°		●
270°		●
280°	●	

*2 : The mounting bracket (FA, LS) is included at shipment. Refer to page 1371 for dimensions.

*3 : Refer to page 1382 for shock absorber (C).

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

[Example of model No.]

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 : M2V switch, lead wire length 1 m
Ⓗ Switch quantity : With clockwise rotation detection 1 piece
Ⓘ Option : With shock absorber

How to order switch unit

RVU50 - C - 90 - M2V - R

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

Code	Description
Ⓐ Model	
RVU50	Applicable actuator: RV3S/D50
RVU150	Applicable actuator: RV3S/D150
RVU300	Applicable actuator: RV3S/D300
Ⓑ Unit	
Blank	Standard products
C	With shock absorber
Ⓒ Oscillating angle	
90	90°
100	100°
180	180°
270	270°
280	280° (“C” (with shock absorber) cannot be selected.)

Ⓓ Switch model No.

L-shaped lead wire	Contact	Voltage AC	Voltage DC	Indicator	Lead wire
M2V*	Prox.		●	1-color LED	2-wire
M3V*	Prox.		●	1-color LED	3-wire
M0V*	Reed	●	●	1-color LED	2-wire
M5V*	Reed	●	●	No indicator lamp	2-wire

*** Lead wire length**	
Blank	1 m (standard)
3	3 m (option)
5	5 m (option)
Ⓔ Switch quantity	
R	With clockwise rotation detection 1 piece
L	With counterclockwise rotation detection 1 piece
D	2

⚠Precautions for model No. selection

Note: When the type for shock absorber is selected, the shock absorber body must be purchased separately.

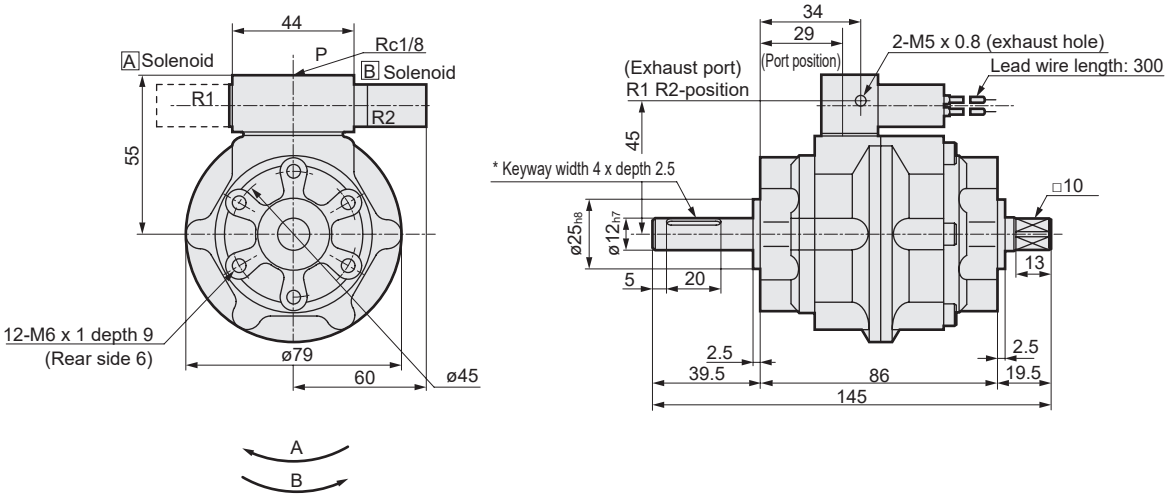
[Example of model No.]

RVU50-C-90-M2V-R

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

Dimensions CAD

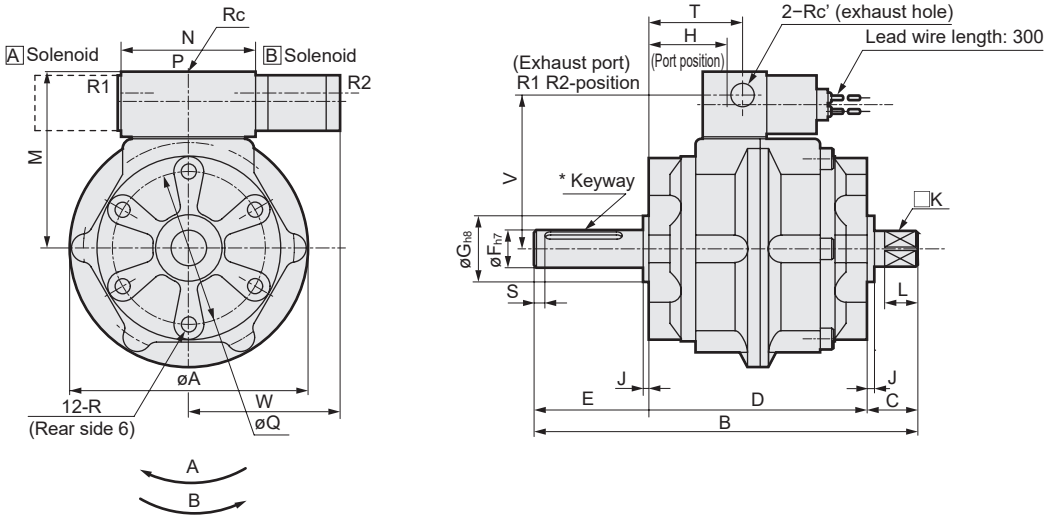
● RV3$^{SV}_{DW}$50



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 1371 for the key dimensions.

● RV3 $^{SV}_{DW}$150/300

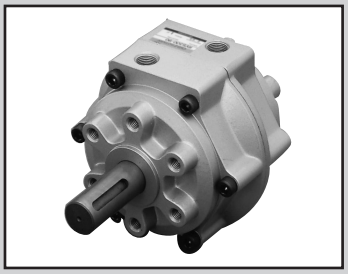


Single solenoid	Double solenoid
ON → A direction	B solenoid ON → A direction
OFF → B direction	A solenoid ON → B direction

* The key is attached. Refer to page 1371 for the key dimensions.

Code / Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	Rc	Rc'	Q	R	S	T	V	W	Key groove W x D x L
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	5x3x36
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	7x4x40

MEMO



Large rotary actuator low hydraulic

RV3$^{S}_{D}$H Series

- Torque size: 50/150/300/800
- Oscillating angle: 90°/100°/180°/270°/280°

JIS symbol

Specifications

Item	RV3SH/RV3DH			
Size	50	150	300	800
Working fluid	Hydraulic fluid			
Max. working pressure MPa	1.0 (≈150 psi, 10 bar)			
Min. working pressure MPa	0.2 (≈29 psi, 2 bar) *1			
Proof pressure MPa	1.5 (≈220 psi, 15 bar)			
Ambient temperature °C	5 (41°F) to 60 (140°F)			

*1 : The min. working pressure is 0.3 MPa when the optional shock absorber is selected.
*2 : Use hydraulic fluid of JIS turbine oil type 1 ISO VG32 or equivalent viscosity for lubricant. However, note that some are inapplicable with flame-resistant hydraulic oil.
Hydraulic fluid of viscosity 40 mm²/s (40 cSt) is recommended at working oil temperature.
For oil, use Fuji Kosan/Fukkol Hydrol x 22 or equivalent oil such as MITSUBISHI/Diamond Power Fluid 18, Showa-Shell/SHELL Tellus Oil 22, ESSO/Univis J26, Mobile DTE22, Cosmohydro HV22, JX Nippon Oil & Energy Corporation/Highlandwide 22 or Idemitsu/Daphne Super Hydro 22 WR.
*3 : For information about weight, refer to the weight of the standard large rotary actuator with a vane mechanism (page 1364).

Switch specifications

Item	Proximity 2-wire	Proximity 3-wire
	M2V	M3V
Applications	Dedicated for programmable controller	For programmable controller, relay, IC circuit, compact solenoid valve
Output method	———	NPN output
Power supply voltage	———	4.5 to 28 VDC
Load voltage/current	10 to 30 VDC, 5 to 30 mA	30 VDC or less, 100 mA or less
Indicator	LED (Lit when ON)	
Leakage current	1 mA or less	10 μA or less
Weight g	1 m:22 3 m:57 5 m:93	

Item	Reed 2-wire	
	MOV	M5V
Applications	For programmable controller, relay	Programmable controller, relay, IC circuit (without indicator lamp), serial connection
Load voltage/current	5 to 50 mA with 12/24 VDC, 7 to 20 mA with 110 VAC	50 mA or less with 5/12/24 VDC, 20 mA or less with 110 VAC
Indicator	LED (Lit when ON)	No indicator lamp
Leakage current	0 mA	
Weight g	1 m:22 3 m:57 5 m:93	

* M0 switch can be used for 24 VAC and 48 VAC within load current range of 7 to 20 mA.
*1 : Refer to Ending Page 1 for other switch specifications.

Min. oscillating time

Unit: S

Item		RV3*H50	RV3*H150	RV3*H300	RV3*H800	Vane number
Oscillating angle	90°	0.3	0.4	0.4	0.7	Single vane
	180°	0.5	0.7	0.7	1.3	
	270°	0.7	0.9	1.0	1.8	
	280°	0.7	1.0	1.0	1.8	
	90°	0.6	1.3	1.9	2.4	Double vane
	100°	0.7	1.4	2.1	2.6	

Structure

● Basic structure is exactly the same as the pneumatic.

Item		RV3*H50	RV3*H150	RV3*H300	RV3*H800
Port size		Rc1/8	Rc1/4	Rc3/8	Rc1/2
Orifice size	Low hydraulic specs	ø7	ø9.5	ø13	ø16
	Pneumatic	ø2.8	ø4	ø4.5	ø6

Note: The double vane is the same as the pneumatic, as shaft orifice diameter cannot be changed.

● Volumetric capacity

Rotary actuator						
Model No.	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	—	—	—	
RV3SH800	754	-	869	1036	1046	Rc1/2
RV3DH800	754	754	-	-	-	

How to order

● Large rotary actuator (low hydraulic) RV3*H

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

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

Code	Description	Ⓐ Model No. Single vane mechanism RV3SH	Ⓐ Model No. Double vane mechanism RV3DH
Ⓑ Nominal size			
50	Effective torque 0.5 MPa	4.7 N·m	10.1 N·m
150		14.7 N·m	34.3 N·m
300		27.9 N·m	66.6 N·m
800		102 N·m	206 N·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			
M2V*	L-shaped lead wire, Proximity, AC: , DC: •, 1-color LED, 2-wire	●	●
M3V*	L-shaped lead wire, Proximity, AC: , DC: •, 1-color LED, 3-wire	●	●
M0V*	L-shaped lead wire, Reed, AC: •, DC: •, 1-color LED, 2-wire	●	●
M5V*	L-shaped lead wire, Reed, AC: •, DC: •, No indicator lamp, 2-wire	●	●
* Lead wire length			
Blank	1 m (standard)	●	●
3	3 m (option)	●	●
5	5 m (option)	●	●
Ⓕ Switch quantity			
R	With clockwise rotation detection 1 piece	●	●
L	With counterclockwise rotation detection 1 piece	●	●
D	2	●	●

Ⓖ Option

Nominal size		50	150	300	800	50	150	300	800
Blank	No option	●	●	●	●	●	●	●	●
FA	With flange bracket	●	●			●	●		
LS	With foot bracket	●	●	●	●	●	●	●	●
C	With shock absorber	●	●	●	●	●	●	●	●

⚠ Precautions for model No. selection

*1 : Refer to the table below for the relation of the oscillating angle and oscillating origin.

Relation of oscillating angle and oscillating origin

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

*2 : The mounting bracket (FA, LS) is included at shipment. Refer to page 1371 for dimensions.

*3 : Refer to page 1382 for shock absorber (C).

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

[Example of model No.]

RV3SH50-90-45-M2V-D-C

Model: Large rotary actuator low hydraulic

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

How to order switch unit

RVU50 - C - 90 - M2V - R

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

Code	Description
Ⓐ Model	
RVU50	Applicable actuator: RV3S/D50
RVU150	Applicable actuator: RV3S/D150
RVU300	Applicable actuator: RV3S/D300
RVU800	Applicable actuator: RV3S/D800
Ⓑ Unit	
Blank	Standard products
C	With shock absorber
Ⓒ Oscillating angle	
90	90°
100	100°
180	180°
270	270°
280	280° (“C” (for shock absorber) cannot be selected.)
Ⓓ Switch model No.	
M2V*	Prox. / 1-color LED	2-wire
M3V*	Prox. / 1-color LED	3-wire
M0V*	Reed / No indicator lamp	2-wire
M5V*	Reed / No indicator lamp	2-wire
*** Lead wire length**	
Blank	1 m (standard)
3	3 m (option)
5	5 m (option)
Ⓔ Switch quantity	
R	With clockwise rotation detection 1 piece
L	With counterclockwise rotation detection 1 piece
D	2

⚠ Precautions for model No. selection

Note: When the type for shock absorber is selected, the shock absorber body must be purchased separately.

[Example of model No.]

RVU50-C-90-M2V-R

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

Dimensions

Dimensions are the same as the large rotary actuator vane mechanism/standard RV3 S D Series. Refer to page 1369.

Shock absorber

RVC Series

- Torque size: 50/150/300/800
- Absorbed energy: 2.9/9.8/19.6/58.8 J

RoHS CAD

Specifications

Descriptions		RVC			
Size		50	150	300	800
Load range	kg/m^2	0.098	0.294	0.588	1.961
Allowable absorbed energy	J	2.9	9.8	19.6	58.8
Max. colliding angular speed	rad/s	14.8	13.0	11.3	9.6
Maximum energy capacity per minute*1	J/min	20	72	140	350
Ambient temperature	°C	5 to 50			
Absorbing angle (one side)	rad	0.19	0.20	0.24	0.26
Weight	kg	0.24	0.42	0.78	1.62
Jaw weight kg	90°	0.07	0.15	0.36	1.0
	100°	0.07	0.14	0.35	1.0
	180°	0.07	0.15	0.37	1.0
	270°	0.05	0.11	0.28	0.8
	280°	0.05	0.10	0.25	0.7

*1: Energy capacity per minute = absorbed energy x n times/min n: No. of times lever contacts cushion piston
*2: When using with the shock absorber, set the rotary actuator's working pressure to 0.3 MPa and over.

How to order

Body

RVC50

Model	Applicable rotary actuator
RVC50	RV3*50
RVC150	RV3*150
RVC300	RV3*300
RVC800	RV3*800 (without switch) *1

*1:The shock absorber for RV3*800 (with switch) is as follows:
When the oscillating origin is 40°: RVU800-A1-C-40
For oscillating origin 45°: RVU800-A1-C-45

● Lever for shock absorber

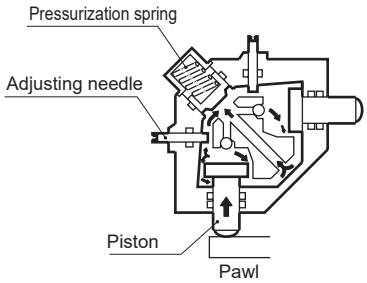
RVC50 - 90 - T

Ⓐ Model
Ⓑ Oscillating angle
Ⓒ Part (lever)

Code	Description
Ⓐ Model	
RVC50	For RV3*50
RVC150	For RV3*150
RVC300	For RV3*300
RVC800	For RV3*800
Ⓑ Oscillating angle	
90	90°
100	100°
180	180°
270	270°
280	280°
Ⓒ Part (lever)	
T	Lever for shock absorber

Operational principle

When the lever installed on the rotary actuator shaft hits the piston, the generated energy is converted to pressure (hydraulic pressure) on the back of the piston.
This pressure energy becomes the thermal energy when it passes through the gap between the piston and cylinder bore and then the adjustment needle part, and is released into the air from the body surface. It will be consumed before the piston stops at the stroke end. The piston on the opposite side is pressurized by the spring force and returns to the origin.



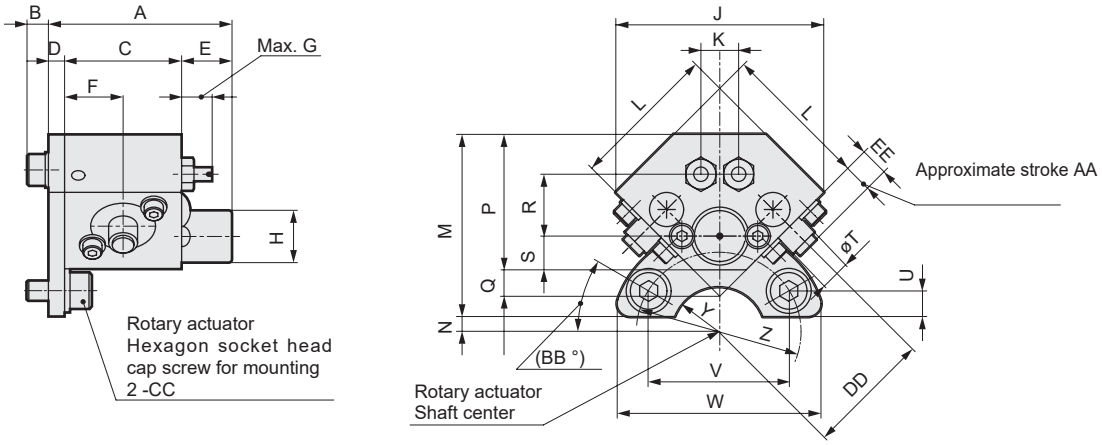
Impact energy

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 colliding angular speed is within the range...
$\omega_0 \approx 1.2\omega$
ω_0: Colliding angular speed°(rad/s)
ω: Average angular speed°(rad/s)
3. Obtain collision energy from the load and colliding angular speed.
$E_1 = 1/2I\omega_0^2$
I: Moment of inertia (kg·m^2)
ω_0: Colliding angular speed (rad/s)
4. Obtain the energy generated by the torque of the rotary actuator.
$E_2 = 1/2T\theta'$
T: Torque of rotary actuator (N·m)
θ': Shock absorber absorbing angle (per side) (rad)
5. Confirm that E_1+E_2 is less than the max. absorbed energy.
6. Obtain energy per minute from frequency.
$E_m = (E_1+E_2)xn$
n: No. of times lever contacts cushion piston.
Confirm that Em is less than or equal to the max. energy per minute.

Dimensions (RVC 50/150/300)

(Unit: mm)

● RVC 50/150/300

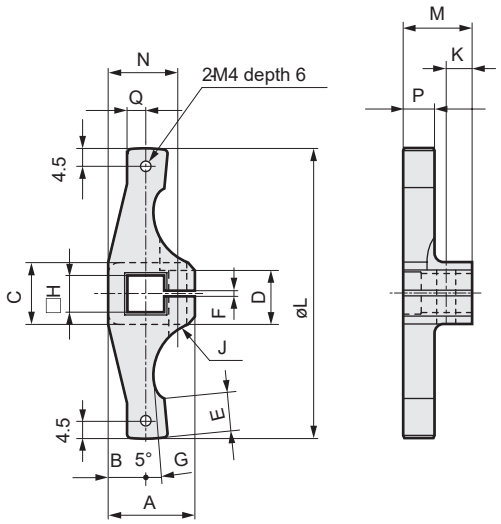


Note: Figure shows mounted lever for 270°.

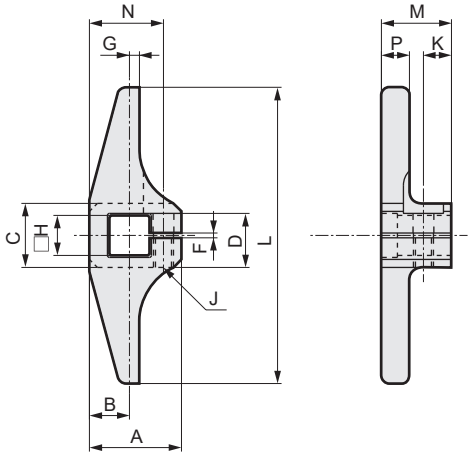
Code / Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	Y	Z	AA	BB	CC	DD	EE
RVC50	50.5	6	32	4.5	14	16	8.5	14.4	56.6	9.9	40	50	4	37	7.1	17	9.2	8	7.2	39	56	12.5	ø45	6.5	30	M 6 x 12ℓ	34	8
RVC150	56.5	7.2	36	4.5	16	18	8.5	18.4	70.7	11.3	50	62	9.5	49	8.4	25.5	11.4	10	8	60.6	80	15	ø70	10	30	M 8 x 16ℓ	46	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	22.5	ø80	15	30	M 10 x 20ℓ	62	18

Lever for shock absorber dimensions

● Oscillating angle 90° (oscillating origin 45°)



● Oscillating angle 100° (oscillating origin 40°)



Material: S50C or equivalent

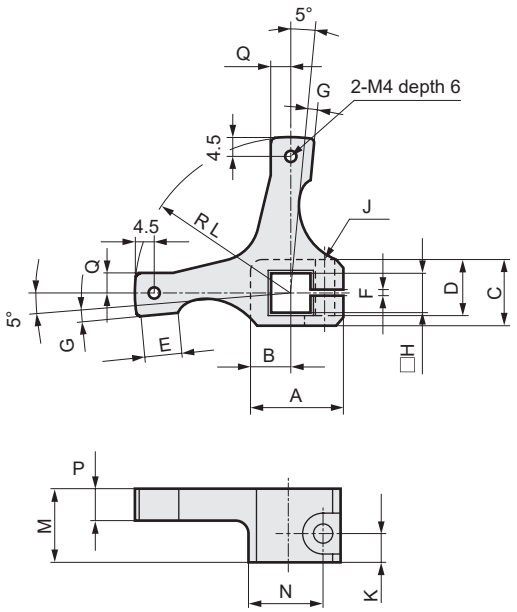
Code / Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
RVC50 -90-T	23	10	16	13.7	10	1.2	2.5	10	M5	7	76	18	18.5	8	5
RVC150-90-T	28	12	24	19.5	12	1.2	3.9	13	M6	7.5	102	20	23	10	5
RVC300-90-T	40	18	35	30.5	14	1.2	5.4	19	M8	9	136	23.5	33.5	12	9

Material: S50C or equivalent

Code / 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

Lever for shock absorber dimensions (RVC 50/150/300)

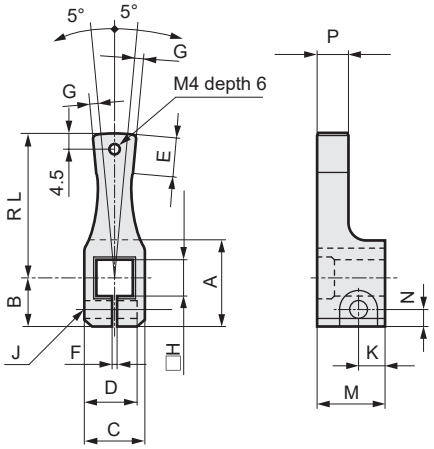
● Oscillating angle 180° (oscillating origin 45°)



Material: S50C or equivalent

Code / 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

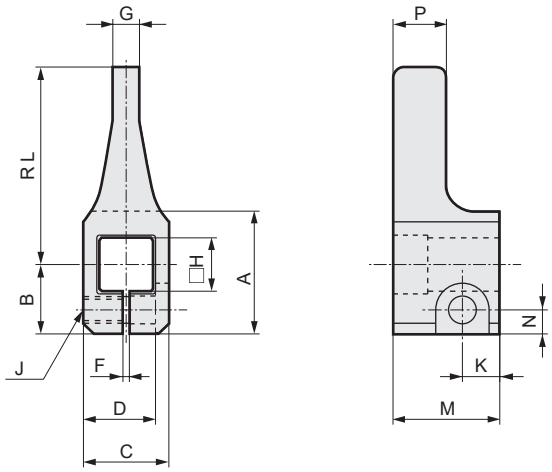
● Oscillating angle 270° (oscillating origin 45°)



Material: SCM435 or equivalent

Code / 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

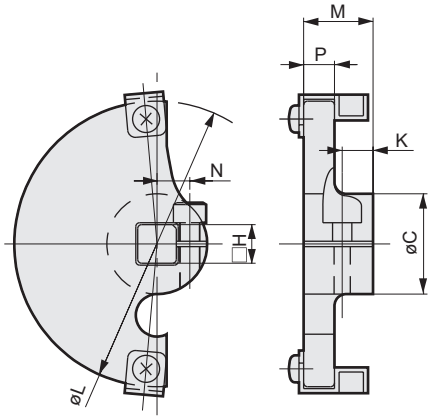
● Oscillating angle 280° (oscillating origin 40°)



Material: S50C or equivalent

Code / 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)



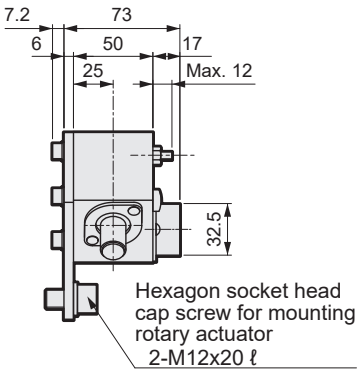
Material: S50C or equivalent

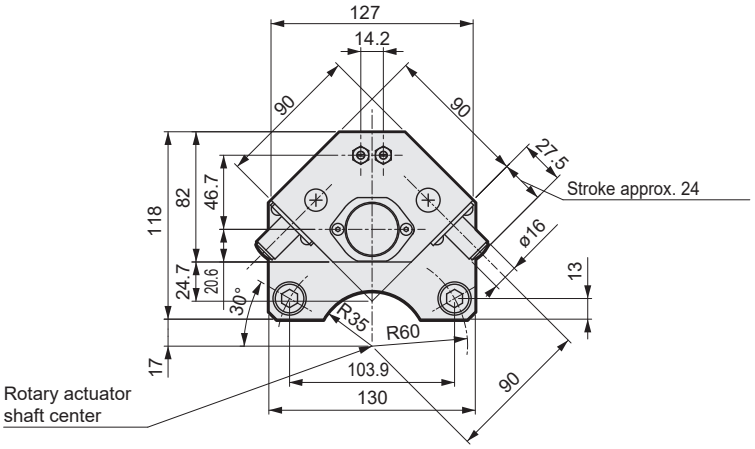
Code / Model No.	C	H	K	L	M	N	P
RVU50-100-A1-C	26	10	8	74	18	8.5	8
RVU150-100-A1-C	32	13	9	102	20	11	10
RVU300-100-A1-C	48	19	11	136	23.5	15	12

Note) Model No. with options such as switch, valve, and shock absorber, etc., is listed on pages 1395 and 1396.

Dimensions (RVC800)

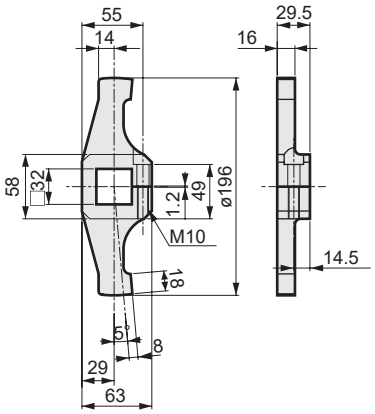
● RVC800



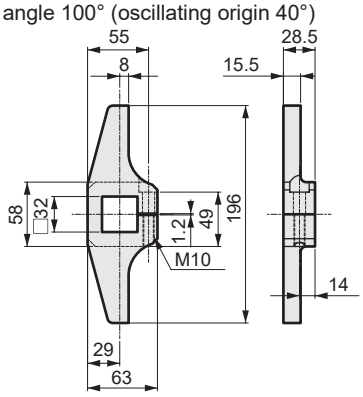


Lever for shock absorber dimensions (RVC800)

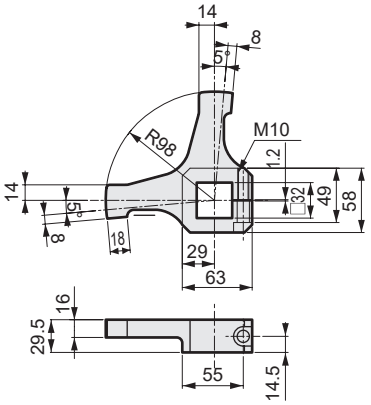
● Oscillating angle 90° (oscillating origin 45°)



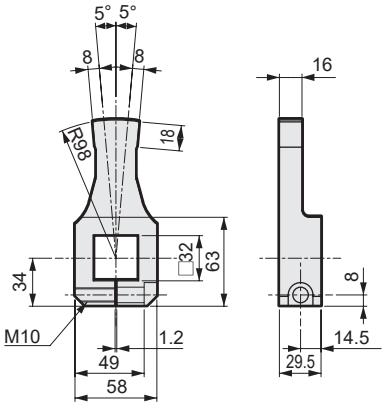
● Oscillating angle 100° (oscillating origin 40°)



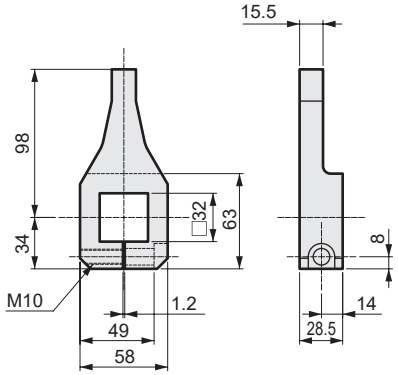
● Oscillating angle 180° (oscillating origin 45°)



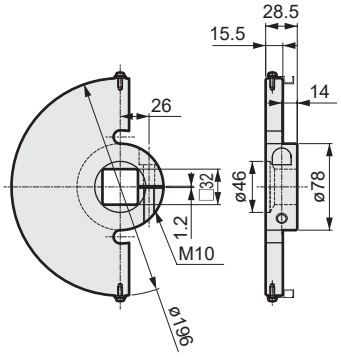
● Oscillating angle 270° (oscillating origin 45°)



● Oscillating angle 280° (oscillating origin 40°)



● Oscillating angle 100° (with magnet)



Switch unit: Compact standard with valve
Specifications

Item	Proximity switch
	SR-*(-U)
Applications	For programmable controller/relay/IC circuit/compact solenoid valve
Power supply voltage	5 VDC to 30 VDC
Load voltage/current	5 to 30 VDC, 200 mA or less
Current consumption	20 mA or less with 24 VDC
Internal voltage drop	1.5V or less
Indicator	LED (Lit when ON)
Leakage current	10 μA or less
Lead wire length	1 m (oil resistant vinyl cabtyre cable 4-conductor 0.2 mm^2)
Shock resistance	490 m/s^2
Insulation resistance	100 MΩ or more with 500 V megger
Withstand voltage	No failure after 1 minute of 1,000 VAC application.
Ambient temperature	5 to 60°C
Degree of protection	IEC standards IP67, JIS C0920 (water tight)

* 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 direction

Code	Description
Ⓐ Model	
SR-3	Applicable actuator: RV$^{S}_{D}$33
SR-10	Applicable actuator: RV$^{S}_{D}$310
SR-20	Applicable actuator: RV$^{S}_{D}$320
SR-30	Applicable actuator: RV$^{S}_{D}$330
Ⓑ 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 direction	
Blank	With straight lead wire switch
U	With L-shaped lead wire switch

⚠ Precautions for model No. selection

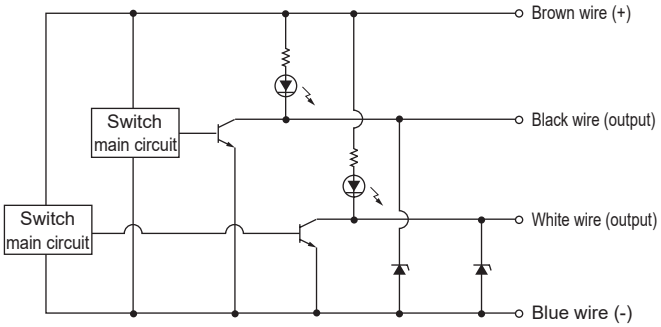
*1 : The type with switch is not available for the axial port position direction “S”.

[Example of model No.]

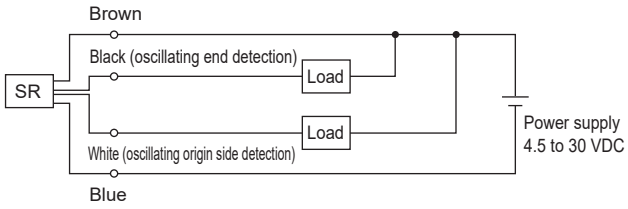
RV3S-SR-3-90-45-U

Model: Switch unit
ⒶModel : For RV3S3
ⒷOscillating angle : 90°
ⒸOscillating origin : 45°
ⒹLead wire direction : L-shaped lead wire

Switch internal wiring diagram

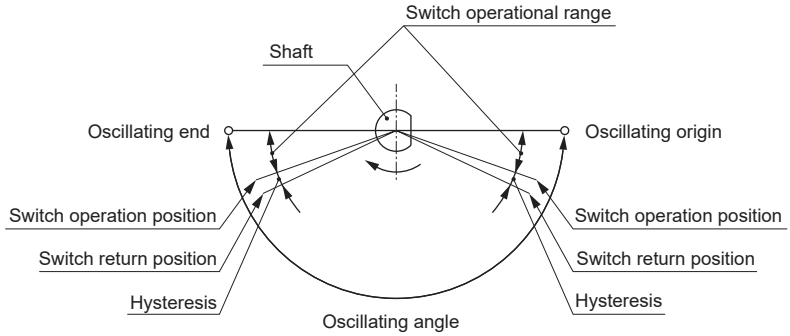


Switch wiring procedure



Note: Use same power supply for switch and load.

Hysteresis and operational range of switch



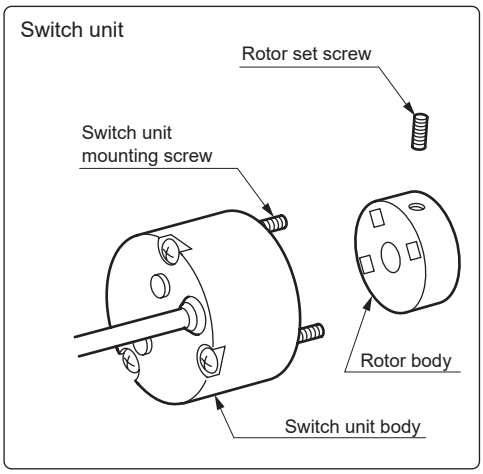
Rotary actuator body	Operational range	Hysteresis
RV3$^{S}_{D}$-3	15°±7°	3° or less
RV3$^{S}_{D}$-10		
RV3$^{S}_{D}$-20		

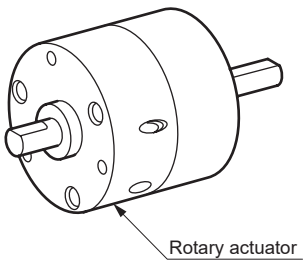
The switch is fixed, and the position cannot be adjusted.

Switch unit configurations

Configurations

- Rotor set screw
- Rotor body
- Switch unit mounting screw
- Switch unit body





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

Switch unit: Compact oscillating angle variable Specifications

Item	Proximity switch
	FR-*(-U)
Applications	Programmable controller, relay, IC circuit
Power supply voltage	5 VDC to 30 VDC
Load voltage	5 VDC to 30 VDC
Load current	5 mA to 200 mA
Current consumption	24 VDC: 20 mA or less, 12 VDC: 10 mA or less, 5 VDC: 4 mA or less
Internal voltage drop	1.5 V or less
Indicator	LED (Lit when ON)
Leakage current	10 μA or less
Lead wire length	1.0 m (oil resistant black 3-conductor cable)
Shock resistance	490 m/s^2
Insulation resistance	100 MΩ or more with 500 V megger
Withstand voltage	No failure after 1 minute of 1,500 VAC application.
Ambient temperature	5 to 60°C
Degree of protection	IEC standards IP67, JIS C0920 (water tight)

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

Hysteresis of switch and operational range

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

How to order

● Switch unit

RV3S - FR-3 - U

Ⓐ Model

Ⓑ Lead wire direction

Code	Description
Ⓐ 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 direction	
Blank	With straight lead wire switch
U	With L-shaped lead wire switch

[Example of model No.]

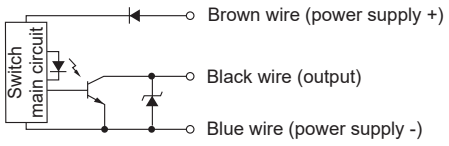
RV3S-FR-3-U

Model: Switch unit angle variable

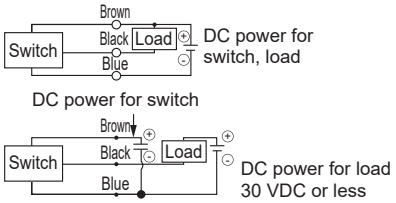
Ⓐ Model : For RV3SA3

Ⓑ Lead wire direction : L-shaped lead wire

Switch internal wiring diagram



Switch wiring procedure

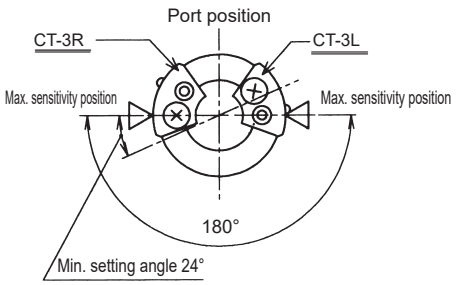


Oscillating angle and switch mounting position

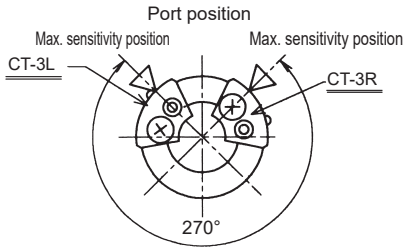
● When the oscillating angle variable RV3*A Series with switch is selected, the switch unit is attached with the product. Install and adjust the angle setting stopper at the set angle, and then install the switch with the following combination.

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

● Mounting the switch unit body

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

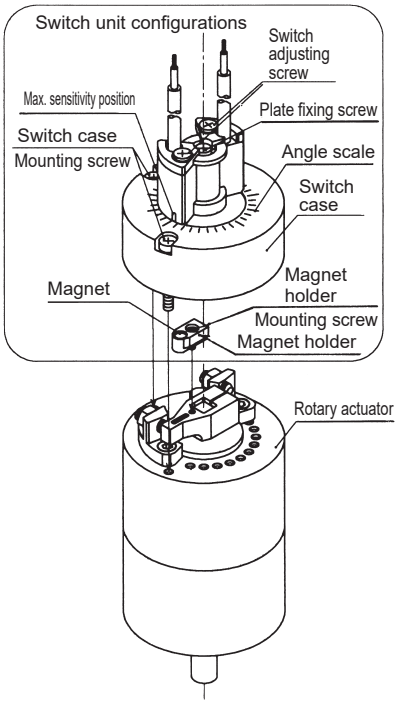
Model No.	Tightening torque (N·m)
For RV3$^{S}_{D}$A3	0.06 to 0.2
For RV3$^{S}_{D}$A10	0.1 to 0.2
For RV3$^{S}_{D}$A20	0.2 to 0.3
For RV3$^{S}_{D}$A30	

● Switch position adjustment

Loosen the switch adjust screw, set the switch's max. 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 50 N·cm. Since the angle scale is a guide, confirm that the LED turns ON when making the final adjustment.

● Switch replacement

Remove the switch adjusting screw and plate fixing screw, and then replace the switch. When fixing, clamp with a force of 40 to 50 N·cm. Assemble the switch following the removal steps in reverse, and always adjust the switch position.



Large switch unit: Standard/with valve/low hydraulic

Specifications

Item	Proximity 2-wire	Proximity 3-wire	Reed 2-wire	
	M2V	M3V	M0V	M5V
Applications	Dedicated for programmable controller	For programmable controller,relay, IC circuit, compact solenoid valve	For programmable controller, relay	For programmable controller, relay, IC circuit (without indicator lamp), serial connection
Power supply voltage	——	4.5 to 28 VDC	——	
Load voltage/current	10 to 30 VDC, 5 to 30 mA	30 VDC or less, 100 mA or less	5 to 50 mA with 12/24 VDC, 7 to 20 mA with 110 VAC	50 mA or less with 5/12/24 VDC, 20 mA or less with 110 VAC
Current consumption	——	At 24 VDC 10 mA or less (when ON)	——	
Internal voltage drop	4 V or less	0.5 V or less	2.4 V or less	0 V
Indicator	LED (Lit when ON)			No indicator lamp
Leakage current	1 mA or less	10 μA or less	0 mA	
Lead wire length	1 m {Oil resistant vinyl cabtyre cable 2-conductor 0.2 mm²}	1 m {Oil resistant vinyl cabtyre cable 3-conductor 0.15 mm²}	1 m {Oil resistant vinyl cabtyre cable 2-conductor 0.2 mm²}	
Shock resistance	980 m/s²		294 m/s²	
Insulation resistance	100 MΩ and over with 500 VDC megger			
Withstand voltage	No failure after 1 minute of 1,000 VAC application.			
Ambient temperature	-10 to +60°C			
Degree of protection	IEC Standard IP67, JIS C0920 (water-tight), oil resistance			
Weight g	1 m:22 3 m:57 5 m:93			

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

How to order

Switch unit

RVU50 - C - 90 - M2V - R

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

Code	Description
Ⓐ Model	
RVU50	Applicable actuator: RV3S/D50
RVU150	Applicable actuator: RV3S/D150
RVU300	Applicable actuator: RV3S/D300
RVU800	Applicable actuator: RV3S/D800
Ⓑ Unit	
Blank	Standard products
C	With shock absorber
Ⓒ Oscillating angle	
90	90°
100	100°
180	180°
270	270°
280	280° (“C” (with shock absorber) cannot be selected.)

Ⓓ Switch model No.

L-shaped lead wire	Contact	Voltage AC	Voltage DC	Indicator	Lead wire
M2V*	Prox.		●	1-color LED	2-wire
M3V*	Prox.		●	1-color LED	3-wire
M0V*	Reed	●	●	1-color LED	2-wire
M5V*	Reed	●	●	No indicator lamp	2-wire

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

Ⓔ Switch quantity	
R	With clockwise rotation detection 1 piece
L	With counterclockwise rotation detection 1 piece
D	2

⚠Precautions for model No. selection

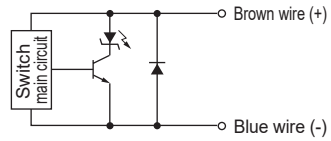
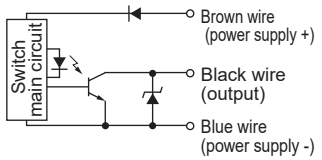
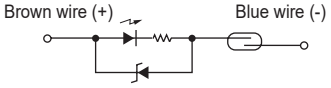
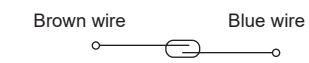
Note: When the type for shock absorber is selected, the shock absorber body must be purchased separately.

[Example of model No.]

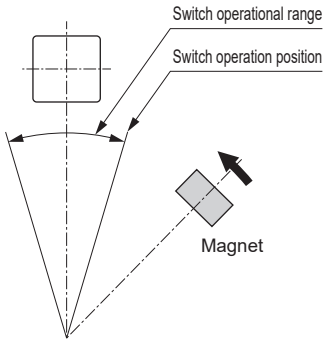
RVU50-C-90-M2V-R

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

Switch internal circuit diagram

M2V	M3V	M0V	M5V
			

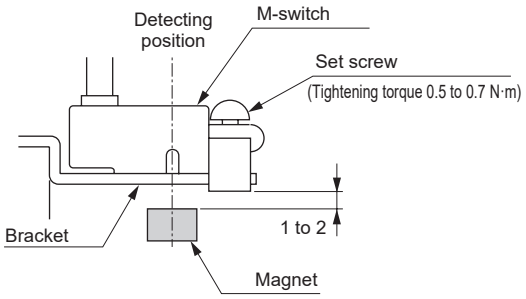
Operational range of switch



Item / 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°
RV3S800, RV3D800	Approx. 25°	Approx. 15°

Switch adjustment method

When installing the switch unit afterwards, if the clearance between the switch and magnet exceeds the range on the following drawing, adjust the clearance with a bending bracket.

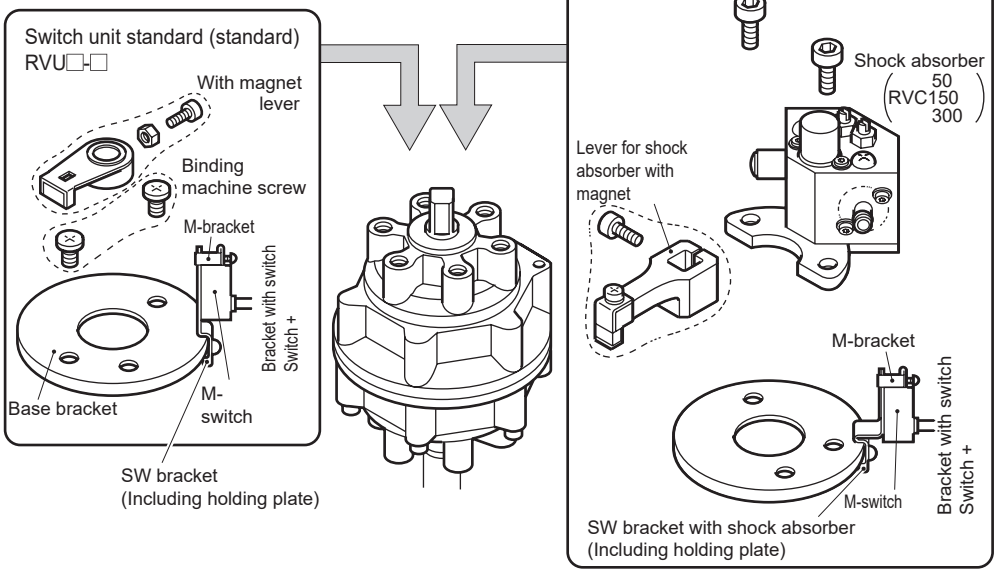


Switch unit configurations

● RVU 50/150/300

Switch unit (standard) Configurations
Lever with magnet
Lever
Boss
Magnet
Pan head machine screw
Nut
Base bracket
Base bracket
Binding machine screw
Mounting bracket for M-switch
M-switch mounting band
Mounting bracket
Cross-recessed pan head machine screw
Switch mounting bracket
LS bracket
Holder
Pan head machine screw
Spring washer
M-switch

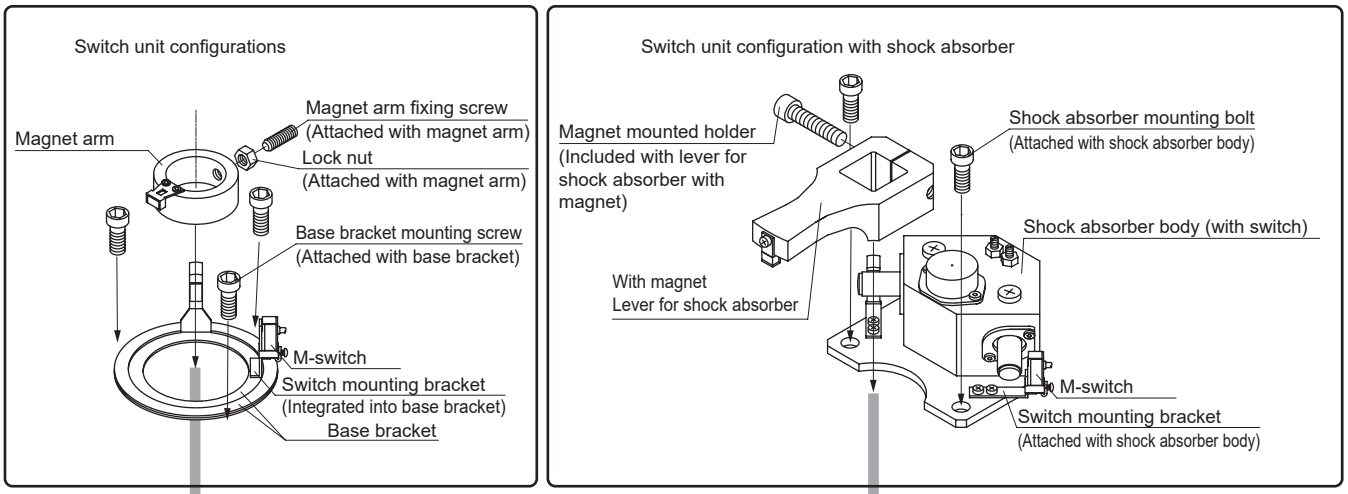
Rotary actuator with switch



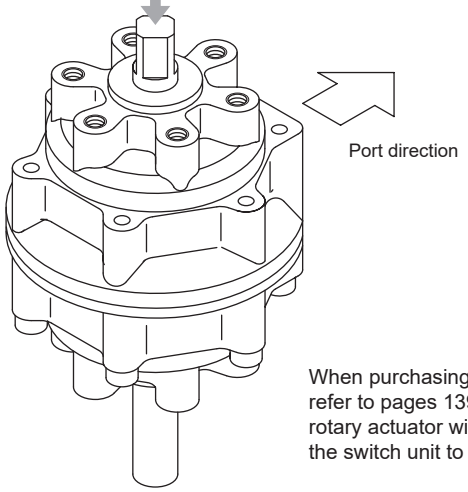
Switch unit (With shock absorber) Configurations
With magnet
Lever for shock absorber
Lever
Magnet
Magnet holder
Hexagon socket head cap screw
Pan head machine screw
Spring washer
Base bracket
Base bracket
Mounting bracket for M-switch
M-switch installation band
Mounting bracket
Cross-recessed pan head machine screw
With shock absorber
Switch mounting bracket
LS bracket
Holder
Pan head machine screw
Spring washer
M-switch

(Note) Shock absorber body is not included in switch unit. (Refer to page 1382 for model No. of shock absorber.)

● RVU800



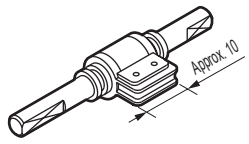
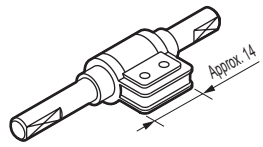
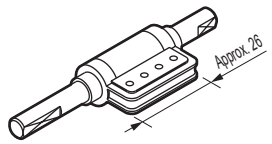
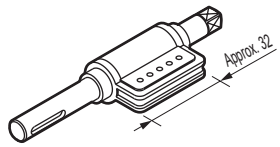
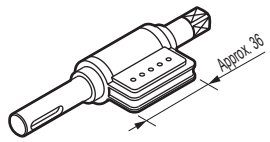
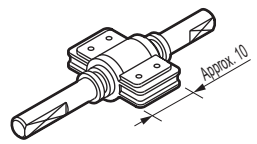
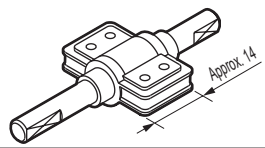
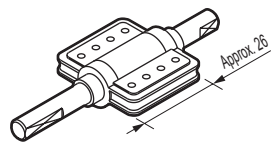
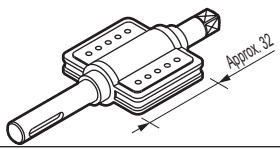
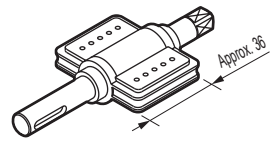
(Note)Shock absorber body is not included in switch unit. (Refer to page 1382 for model No. of shock absorber.)



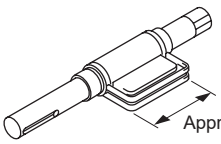
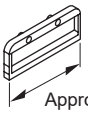
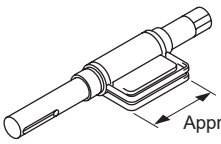
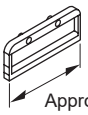
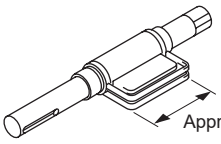
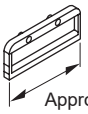
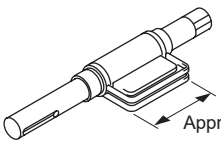
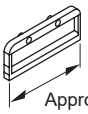
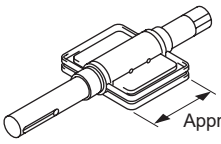
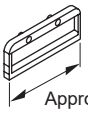
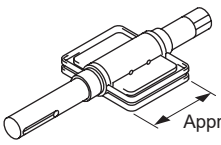
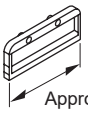
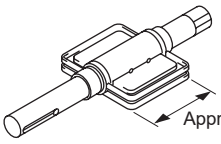
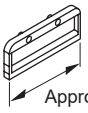
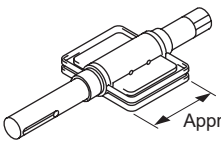
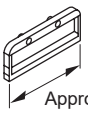
When purchasing switch other than standard switch unit, refer to pages 1395 and 1396 for repair parts kit. The rotary actuator with switch can be assembled by attaching the switch unit to the rotary actuator without switch.

Repair parts list

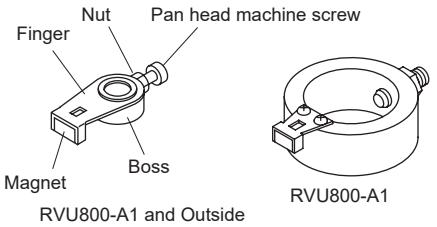
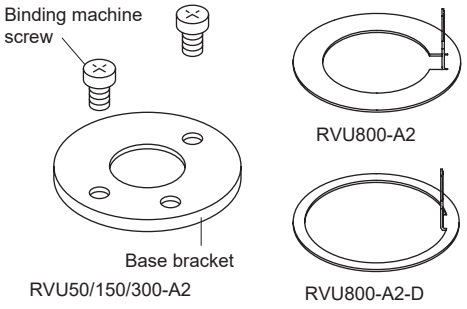
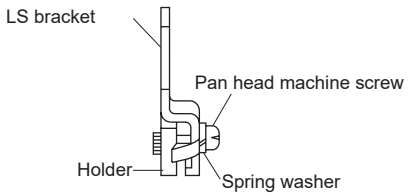
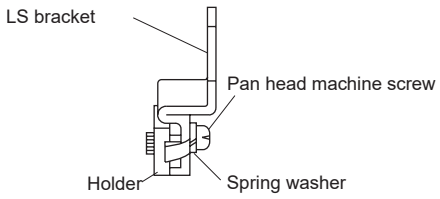
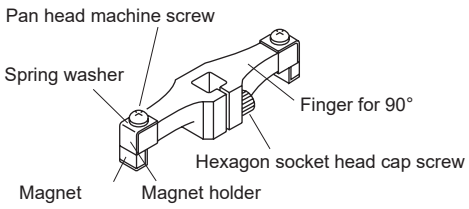
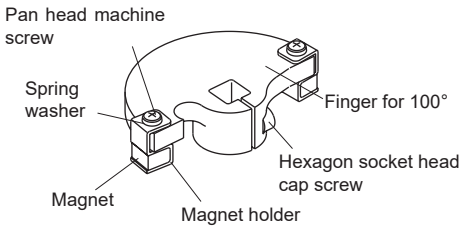
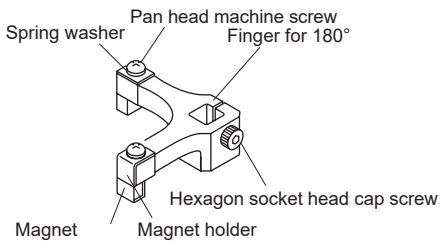
● Compact rotary actuator

No./part name / Model	No. / Kit No. / Product	3 Vane shaft	1 Shoe sealant	8 O-ring (2 pcs. each)
RV3S1	RV3S1-K			ø1xø3.8(WxID)
RV3S3	RV3S3-K			ø1.42xø6.8
RV3S10	RV3S10-K			ø1.5xø8
RV3S20	RV3S20-K			ø2xø10.5
RV3S30	RV3S30-K			P-14
RV3D1	RV3D1-K			ø1xø3.8(WxID)
RV3D3	RV3D3-K			ø1.42xø6.8
RV3D10	RV3D10-K			ø1.5xø8
RV3D20	RV3D20-K			ø2xø10.5
RV3D30	RV3D30-K			P-14

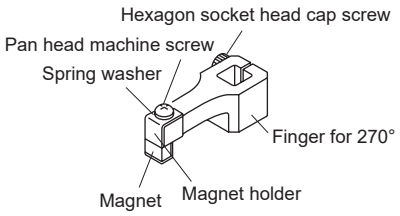
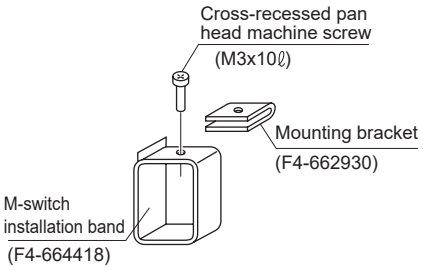
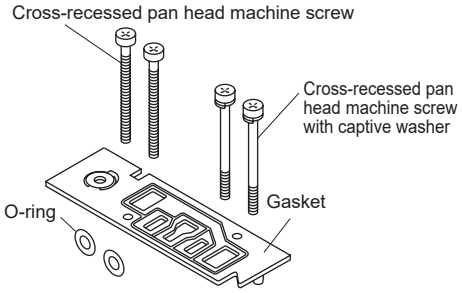
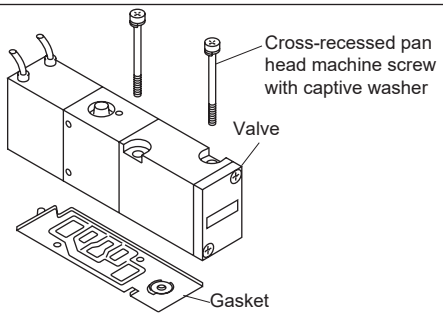
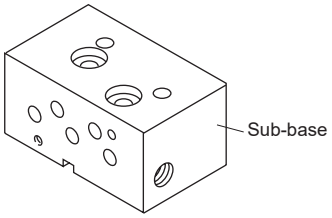
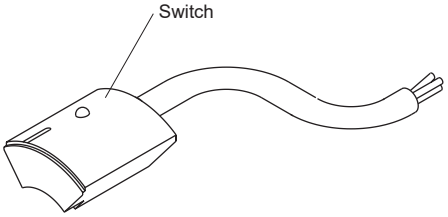
● Large rotary actuator

No./part name / Part No. / Product	Kit No.	4	6	8	10
Model		Vane shaft	Shoe sealant	O-ring (2 pcs. each)	O-ring
RV3S50	**RVS50-K**	 Approx. 46	 Approx. 46	P-16	ø1.8xø56.2
RV3S150	**RVS150-K**	 Approx. 60	 Approx. 60	P-22	ø1.9xø82
RV3S300	**RVS300-K**	 Approx. 71	 Approx. 71	P-31	ø3xø105
RV3S800	**RVS800-K**	 Approx. 107	 Approx. 107	P-48	ø3.1xø150
RV3D50	**RVD50-K**	 Approx. 46	 Approx. 46	P-16	ø1.8xø56.2
RV3D150	**RVD150-K**	 Approx. 60	 Approx. 60	P-22	ø1.9xø82
RV3D300	**RVD300-K**	 Approx. 71	 Approx. 71	P-31	ø3xø105
RV3D800	**RVD800-K**	 Approx. 107	 Approx. 107	P-48	ø3.1xø150

Repair parts kit

Part name	Kit No.	Appearance	Part name	Quantity
Lever with magnet	● **RVU50-A1** **RVU150-A1** **RVU300-A1** **RVU800-A1**		Lever Boss Magnet Pan head machine screw Nut	1 1 1 1 1
Base bracket	● **RVU50-A2** **RVU150-A2** **RVU300-A2** **RVU800-A2** *1 **RVU800-A2-D** *2 *1 with 1 switch *2 In the case of the second type with two switches, refer to page 1392 for configuration with switches.		Base bracket Binding machine screw	1 2 *3 *3 3 pcs for RVU800-A2, without RVU800-A2-D
Switch mounting 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
Lever for shock absorber with magnet (Dimensions Refer to page 1384 for the type without switch.)	● **RVU50-90-A1-C** **RVU150-90-A1-C** **RVU300-90-A1-C** **RVU800-90-A1-C**		Lever Magnet Magnet holder Hexagon socket head cap screw Pan head machine screw Spring washer	1 2 2 1 2 2
	● **RVU50-100-A1-C** **RVU150-100-A1-C** **RVU300-100-A1-C** **RVU800-100-A1-C**			
	● **RVU50-180-A1-C** **RVU150-180-A1-C** **RVU300-180-A1-C** **RVU800-180-A1-C**			

Repair parts kit

Part name	Kit No.	Appearance	Part name	Quantity
Lever for shock absorber with magnet (The lever for the 280° shock absorber with magnet is not available.)	● RVU50-270-A1-C RVU150-270-A1-C RVU300-270-A1-C RVU800-270-A1-C (For information about types without switch and dimensions refer to page 1384.)		Lever Magnet Magnet holder Hexagon socket head cap screw Pan head machine screw Spring washer	1 1 1 1 1 1
M-bracket SW	● RVU-00-A1		M-switch installation band Mounting bracket Cross-recessed pan head machine screw	1 1 1
Packing seal screw kit	● RVU10-B1 RVU20-B1 RVU30-B1 RVU50-B1 RVU150-B1 RVU300-B1		O-ring Gasket Cross-recessed pan head machine screw Cross-recessed pan head machine screw with captive washer	2 1 2 2
Valve kit	● RVU□ □- □-B2 10 20 30 50 150 300 1: 100 VAC 2: 200 VAC 3: 24 VDC V :Single solenoid W :Double solenoid		Valve Cross-recessed pan head machine screw with captive washer Gasket	1 2 1
Sub-base	● RV3U10-B3 RV3U20-B3 RV3U30-B3 RV3U50-B3 RV3U150-B3 RV3U300-B3		Sub-base	1
Angle variable switch	● RV3U-CT-□ 3R :For right mounting 3L :For left mounting 3RU :L-shaped lead wire For right mounting 3LU :L-shaped lead wire For left mounting		Switch	1

Rotary actuator selection method

Select based on the following 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

Selection method is roughly categorized into three 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 pushing force is required for clamp, etc.

$T_S = F_S \times L$

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 force including frictional force, gravity or other external force 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)
When the object is rotated

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

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 figure for moment of inertia calculation on page 1399 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
	RV3S800	37.8	59.1	81	102	123	144	166	186	205
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
	RV3D800	77.4	120	161	206	247	288	332	371	411

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 adjusting range.

Compact rotary actuator (s)

Model No.	Oscillating angle		
	90°	180°	270°
RV3$^{S}_{D}$1	0.03 to 0.6	0.06 to 1.2	0.09 to 1.8
RV3$^{S}_{D}$3	0.04 to 0.8	0.08 to 1.6	0.12 to 2.4
RV3$^{S}_{D}$10	0.045 to 0.9	0.09 to 1.8	0.135 to 2.7
RV3$^{S}_{D}$20	0.05 to 1.0	0.10 to 2	0.15 to 3
RV3$^{S}_{D}$30	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°
RV3$^{S}_{D}$50	0.08 to 0.8	0.09 to 0.9	0.16 to 1.6	0.24 to 2.4	0.25 to 2.5
RV3$^{S}_{D}$150	0.12 to 1.2	0.13 to 1.3	0.24 to 2.4	0.36 to 3.6	0.37 to 3.7
RV3$^{S}_{D}$300	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
RV3*800	0.22 to 2.2	0.24 to 2.4	0.44 to 4.4	0.66 to 6.6	0.68 to 6.8

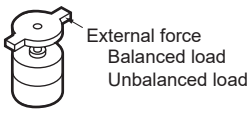
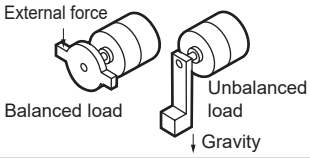
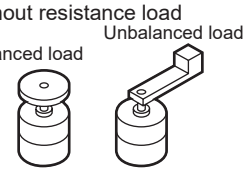
* Refer to page 1357 for the oscillating time of the angle variable.

STEP 3 Allowable energy confirmation

When using an inertial load, if the load's kinetic 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.

$E = (1/2) \times I \times \omega_0^2 \times 10^3$
$\omega_0 \approx 1.2 \times \omega$
$\omega = \theta / t$

E : Kinetic energy (mJ)
I : Moment of inertia (kg·m^2)
ω_0 : Colliding angular speed (rad/s)
ω : Average angular speed (rad/s)
θ : Oscillating angle (rad)
t : Oscillating time (s)

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

Refer to the figure for moment of inertia calculation on page 1399 and calculate the moment of inertia.

Selection method for shock absorber for rotary

STEP 1 Allowable energy confirmation

↓

STEP 2 Shock absorber performance confirmation

STEP 1 Allowable energy confirmation

Find the load's kinetic energy. 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 of Rotary actuator selection method.

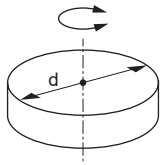
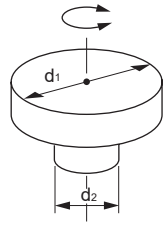
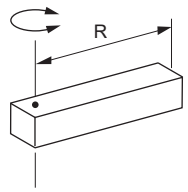
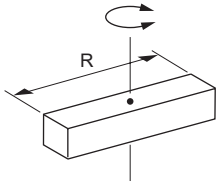
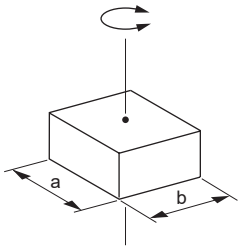
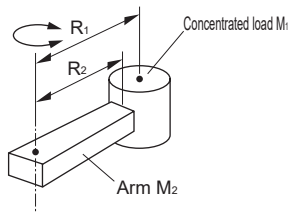
STEP 2 Shock absorber performance confirmation

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.

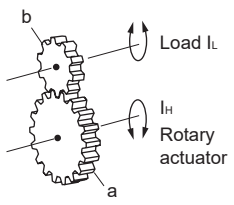
$E = E_1 + E_2$
$E_1 = (1/2) \times I \times \omega_0^2$
$\omega_0 \approx 1.2 \times \omega$
$\omega = \theta / t$
$E_2 = (1/2) \times T \times \theta'$
$E_m = E \times n$

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·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 : Operating frequency (time/min)

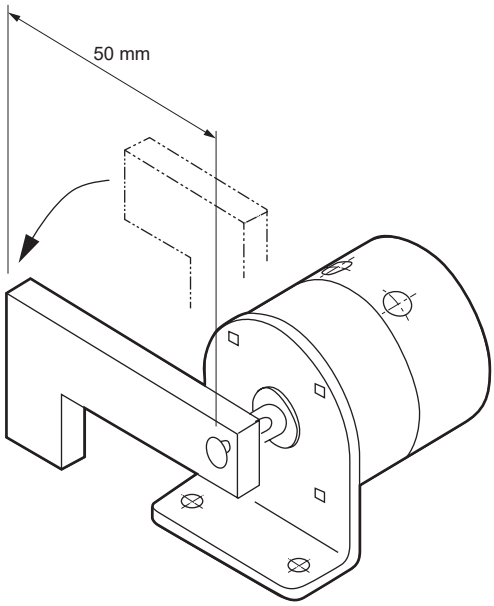
Calculating moment of inertia

Shape	Sketch	Requirements	Moment of inertia I kg·m²	Radius of rotation	K_1^2	Remarks
Dial plate		● Diameter d(m) ● Weight M(kg)	$I=\frac{Md^2}{8}$	$\frac{d^2}{8}$		● No mounting direction ● For sliding use, contact CKD.
Circular stepped plate		● 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 when the d_2 section is extremely small compared to the d_1 section
Bar (center of rotation at end)		● Bar length R(m) ● Weight M(kg)	$I=\frac{MR^2}{3}$	$\frac{R^2}{3}$		● Mounting direction is horizontal ● Oscillating time changes when the mounting direction is vertical
Bar (center of rotation at CG)		● Bar length R(m) ● Weight M(kg)	$I=\frac{MR^2}{12}$	$\frac{R^2}{12}$		● No mounting direction
Rectangular parallelepiped		● Side length a(m) b(m) ● Weight M(kg)	$I=\frac{M}{12}(a^2+b^2)$	$\frac{a^2+b^2}{12}$		● No mounting direction ● For sliding use, contact CKD.
Concentrated load		● Shape of concentrated load ● Length to center of gravity of concentrated load R_1 ● Arm length R_2(m) ● Concentrated load weight M_1(kg) ● Arm weight M_2(kg)	$I=M_1(R_1^2+K_1^2)+\frac{M_2R_2^2}{3}$	Calculate K_1^2 according to shape of concentrated load		● Mounting direction is horizontal ● When M_2 is extremely small compared to M_1, it may be calculated as $M_2 = 0$

How to convert load J_L to rotary actuator shaft rotation when using with gear

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

Selection example 1 Clamp



[Operation conditions]

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

STEP 1 Size (torque) selection

Calculate the torque required for the static torque.

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

$T_S = 20 \times 0.05 = 1.0$ N·m

RV3S20-90 temporarily selected from required torque

STEP 2 Oscillating time confirmation

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

If the operation time is 0.3 seconds for 90°,
it is OK since the RV3S20-90 oscillating time
adjusting range is 0.05 to 1.0.
Proceed to the next step.

STEP 3 Allowable energy confirmation

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

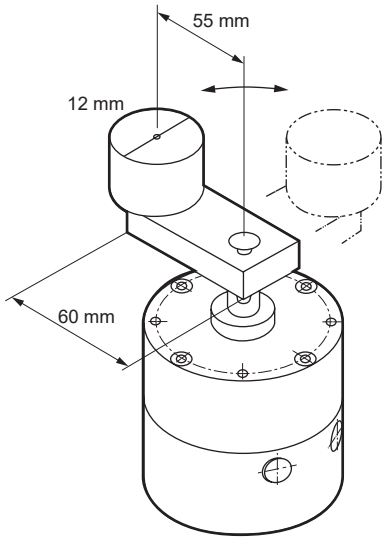
Calculate the moment of inertia I for the clamp lever.
[Bar (center of rotation at end)]
$I = MxR^2/3 = 0.1 \times 0.05^2/3$
$= 0.0000833$ kg·m^2
Calculate colliding angular speed ω_0.
$\theta = 90° = \pi/2$(rad)
$t = 0.3$ s
$\omega = \theta/t = (\pi/2)/0.3 = 5.236$(rad/s)
$\omega_0 = 1.2 \times \omega = 6.283$ (rad/s)

Therefore, kinetic energy (E) is

$E = (1/2) \times 8.33 \times 10^{-5} \times 6.283^2 \times 10^3$
$= 1.64$ (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	0.5 MPa
Oscillating angle	90°
Oscillating time	0.2 s
Bar length	60 mm
Bar weight	0.1 kg
Distance to dial plate	55 mm
Diameter of dial plate	12 mm
Dial plate weight	0.12 kg

STEP 1 Size (torque) selection

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

$$I=M_1(R_1^2+K_1^2)+M_2R_2^2/3$$
$$=0.12x(0.055^2+(0.012^2/8))$$
$$+0.1x0.06^2/3$$
$$=4.85x10^{-4}$$

Then calculate the angular speed $\dot{\omega}$.
From conditions
θ $=90°=\pi/2(rad)$
t $=0.2$ s
$\dot{\omega}$ $=\theta/t^2=(\pi/2)/0.2^2$
$=39.27$ (rad/s^2)
Thus, the inertial torque (T_A) is,
$T_A=5x4.85x10^{-4}x39.27$
$= 0.095$ (N·m)

RV3S3-90 temporarily selected from inertial torque

STEP 2 Oscillating time confirmation

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

If the operation time is 0.2 seconds for 90°,
it is OK since the RV3S3-90 oscillating time
adjusting range is 0.04 to 0.8.
Proceed to the next step.

STEP 3 Allowable energy confirmation

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

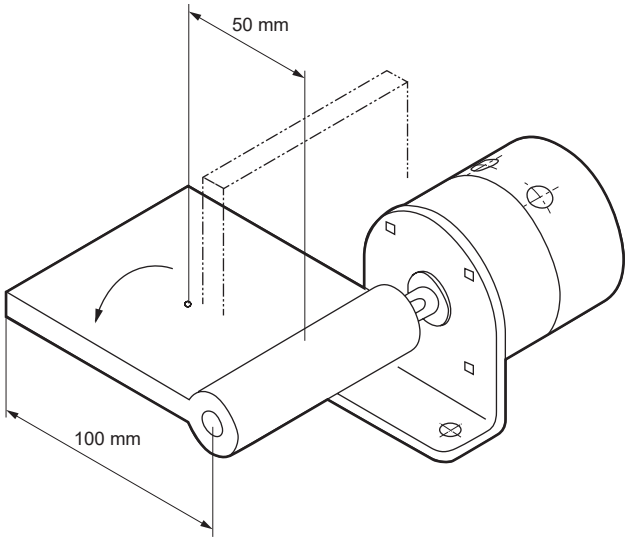
Calculate colliding angular speed ω_0 according to the conditions.
θ $=90°=\pi/2(rad)$
t $=0.2$ s
ω $=\theta/t=(\pi/2)/0.2$
$=7.854$ (rad/s)
$\omega_0 = 1.2 \times \omega = 1.2 \times 7.854 = 9.425$ (rad/s)

Therefore, kinetic energy (E) is

$E=(1/2)x4.85x10^{-4}x9.425^2x10^3$
$=21.54$ (mJ)

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

Selection example 3 When plate-shaped load is applied with rotary shaft horizontal



[Operation conditions]

Pressure	0.5 MPa
Oscillating angle	90°
Oscillating time	0.15 s
Plate length	100 mm
Plate weight	1.5 kg
Distance to center of gravity	50 mm
Operating frequency	5 cycle/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]
Since the resistance torque varies according to the rotation, calculate the max. value.
F_R = gravity = 1.5 x 9.8 = 14.7 N
R = distance to the center of gravity: 0.050 mm

T_R = 5 x 14.7 x 0.05 = 3.675 N·m ...(1)

[Inertial torque]
Bar (center of rotation at end)
$I = 1.5 \times 0.1^2 / 3 = 0.005$ (kg·m^2)
From conditions
θ =90°=π/2(rad)
t =0.15 s
$\dot{\omega}$ =θ/t^2=(π/2)/0.15s^2
=69.8 (rad/s2)
Thus, the inertial torque (T_A) is,
T_A =5x0.005x109.1
= 1.745 (N·m) .....(2)
When the resistance torque and inertial torque are added,
$T = T_R + T_A = 3.675 + 1.745 = 5.420$ (N·m)

RV3S150-90 temporarily selected from required torque

STEP 2 Oscillating time confirmation

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

If the operation time is 0.15 seconds for 90°,
it is OK since the RV3S150-90 oscillating time adjusting range is 0.12 to 1.2.
Proceed to the next step.

STEP 3 Allowable energy confirmation

Calculate the kinetic energy, and confirm that it is within the allowable energy value.
Calculate colliding angular speed according to the conditions.
θ =90°=π/2(rad)
t =0.15s
ω =θ/t=(π/2)/0.15
=10.47 (rad/s)
ω_0 = 1.2 x ω = 1.2 x 10.47 = 12.57 (rad/s)
Therefore, kinetic energy (E) is
E =(1/2)x0.005x12.57^{2}x10^3
=395 (mJ)
Since the allowable energy is exceeded, consider a shock absorber

Shock absorber review

Shock absorber STEP 1 Allowable energy confirmation

Since the rotary actuator's allowable energy is exceeded, confirm the shock absorber's capability in the next step.

Shock absorber STEP 2 Confirmation of shock absorber performance

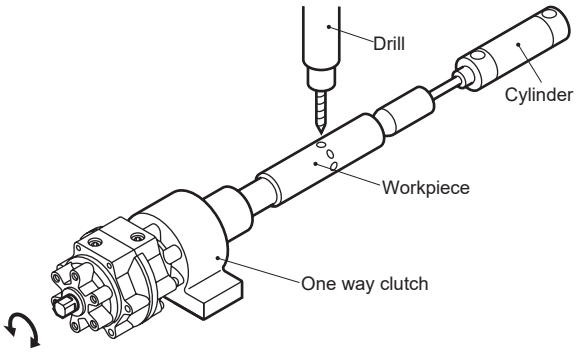
Colliding angular speed
ω_0 =12.6 (rad/S)
Kinetic energy
E1 =(1/2)x0.005x12.6^2=0.395(J)
Torque at 0.5 MPa of RV3S150: 14.7 (N·m)
Absorbing angle of shock absorber: 0.2 (rad)
Thrust energy
E2 =(1/2)x14.7x0.2=1.47(J)
Thus, the collision energy (E) is
E = E1 + E2 = 0.395 + 1.47 ≈ 1.86 (J)

Energy per minute (Em)
Em =1.86x5=9.32(J)

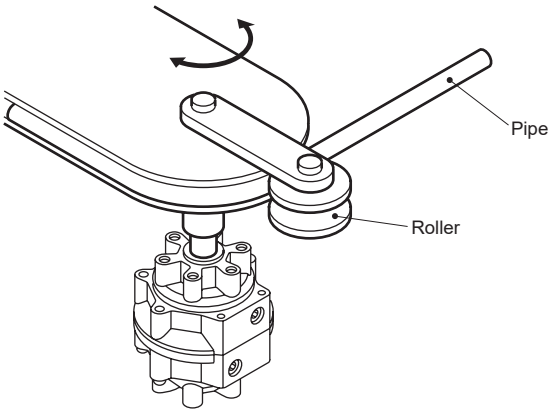
Since all the shock absorber's specification values are satisfied, the RV3S150 with shock absorber can be selected.

Applications

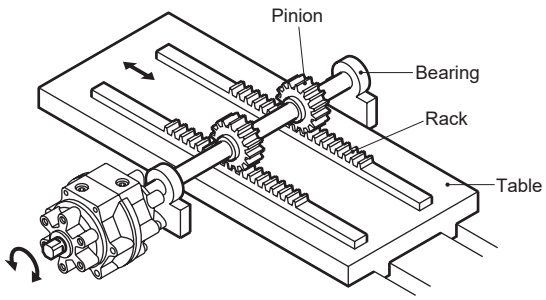
● Boring device (pitch feeding by one way clutch)



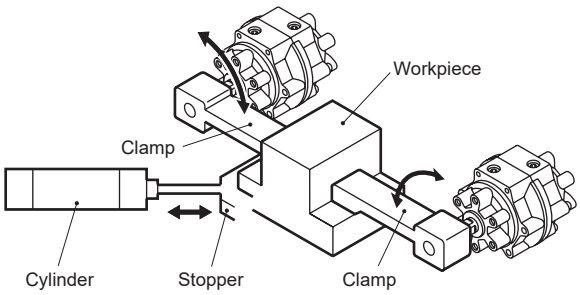
● Pipe bender



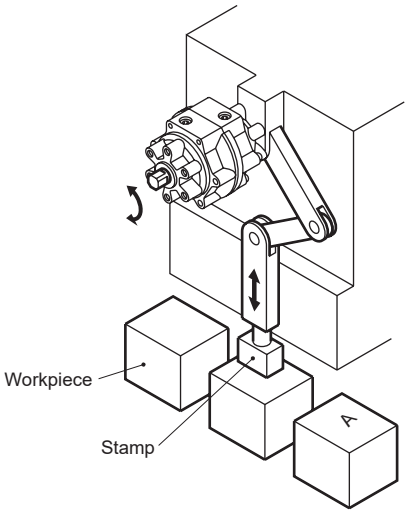
● Table reciprocating device



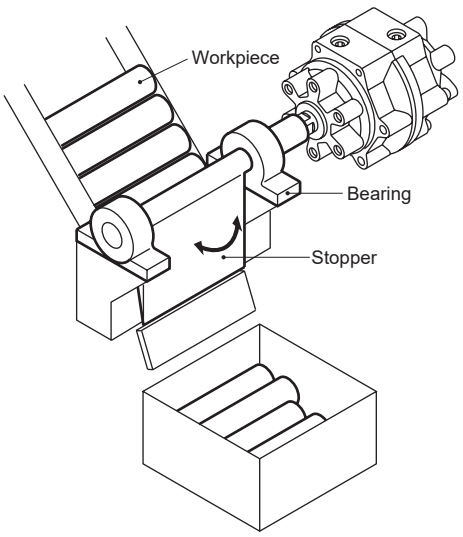
● Clamp device



● Stamp device

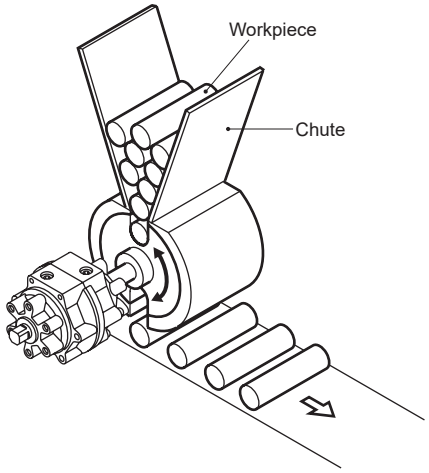


● Stopper of parts feeder

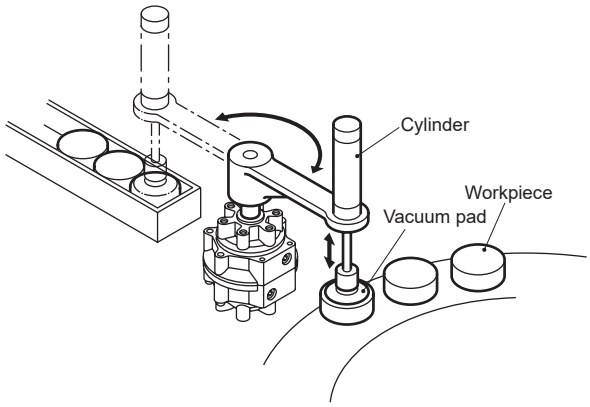


Applications

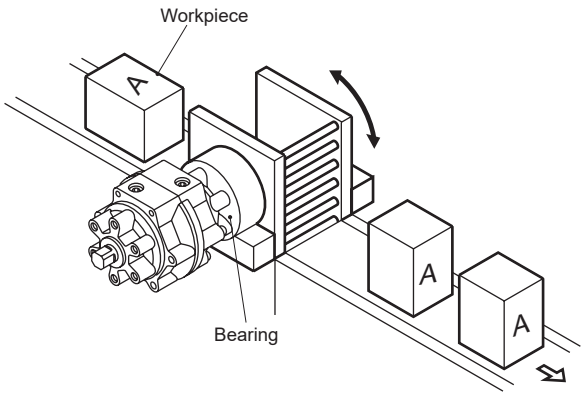
● Part feeder



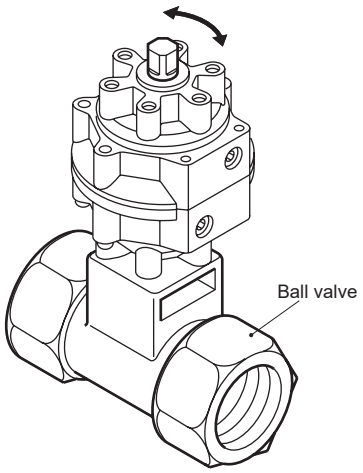
● Part feeder



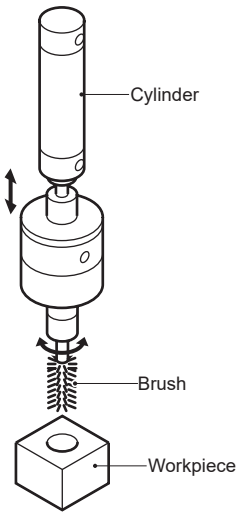
● Reverse rotation (90°) device



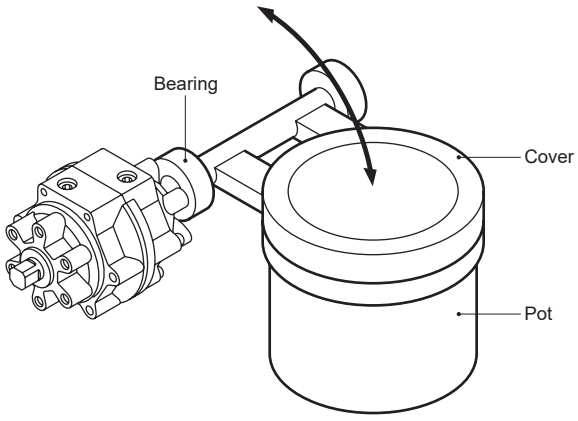
● Ball valve open/close



● Washing device for holed parts



● Cover open/close mechanism



Pneumatic components

Safety Precautions

Be sure to read this section before use.
Refer to Intro Page 73 for general information of the cylinder, and to Intro Page 80 for general information of the cylinder switch.

Product-specific cautions: Rotary actuator vane RV3* Series

Design/selection

1. Common

⚠WARNING

■ Do not brake or hold the product by trapping it with pneumatic pressure.
If no stopping device is provided outside the product and braking is applied partway in the stroke by sealing air in with directional control valves, the stopped position may not be maintained because of air leakage, possibly resulting in injury to the operator or damage to devices or equipment.

■ Consider load fluctuation, rising/lowering operation and changes in frictional resistance for safe design.
Rotary actuator operation speed may increase, causing bodily injury or damage to workpiece/device/equipment.

■ Do not use the rotary actuator as a shock absorbing structure.
If abnormal pressure is applied or if air leaks, the deceleration effect will be lost, and physical or property damage may result.

■ Be sure to tighten very securely in order to prevent the fixed parts or connected sections from loosening.
Always use a secure tightening method when the operating frequency is high or when using the high rotor at places with high levels of vibration.

■ Rotary actuator modification
Do not modify the rotary actuator.

⚠CAUTION

■ Do not apply torque exceeding rated output externally to the product.
If force exceeding rated output is applied, the product could be damaged.

■ If repeatability is required for the oscillating angle, provide an external stopper to directly stop the load.
Stopping using the stopper equipped with the rotary actuator may cause the initial oscillation angle settings to change.

■ Always use the rotary actuator within the specified oscillation time range.
Use in low-speed areas less than this range will prevent smooth movement because of the stick-slip phenomenon.

■ Install a speed controller in order to control the oscillation speed of the rotary actuator.
Adjust the speed gradually from the low speed to the required speed.

■ Precautions for rotary actuator switch
Take care when using multiple rotary actuators in proximity.
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. Rotary actuators should be designed at intervals of 40 mm or more. (Follow the allowable interval shown on each rotary actuator.)

In the mid-oscillation angle position, pay attention to the ON time of the switch.
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.
In this case,

$$V = \frac{\text{Operational range of switch (degrees)}}{\text{Load operation time (ms)}} \times 1000 \text{ (degree/s)}$$

is the oscillation speed.

Mounting, installation and adjustment

1. Common

⚠WARNING

■ When adjusting the angle by supplying pressure, do not rotate the device too much in advance.
When adjusting while supplying pressure, the device could rotate and drop during adjustment, depending on how it is oriented, possibly resulting in operator, component, or device injury or damage.

■ Confirm that the device operates 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.

■ When coating
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.
Moreover, do not remove, peel off or paint over 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.
Rotating more than is required may cause a dangerous situation.

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

■ Secure sufficient space for maintenance and inspection.

■ An axial load (thrust load) on the vane shaft may cause faulty operation to occur. Therefore, do not apply such loads. If this is unavoidable, use a structure with a thrust bearing as shown in Fig.1.

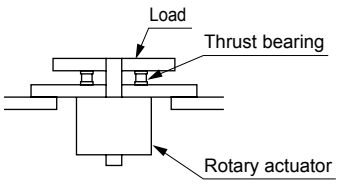


Fig. 1

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

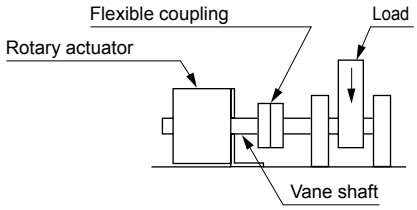


Fig. 2 Radial load

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

⚠CAUTION

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

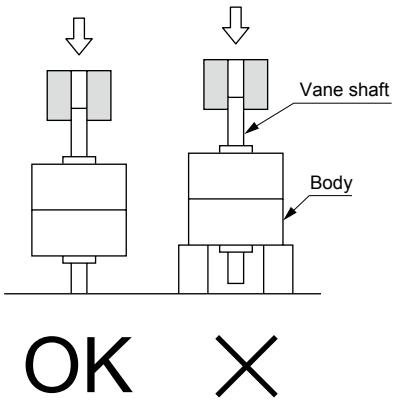


Fig. 3

■ Do not wipe items showing the model number, such as the nameplate, with organic solvents.
This may erase the display.

■ Do not put feet directly onto shaft or devices mounted onto shaft.
Climbing directly onto the shaft could damage the bearings, etc.

■ If the load weight is large and oscillation is fast, the resulting shocks due to the inertial energy may exceed those that can be absorbed, possibly damaging the rotary actuator.
Install a shock absorber to absorb inertia.

Mounting, installation and adjustment

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

⚠WARNING

■ Do not loosen the angle adjustment screws outside of the adjusting range for variable oscillation angle rotary actuators.

Loosening beyond the adjusting range may cause the angle adjustment screw to fall out, potentially causing bodily injury or damage to the workpiece/device/equipment.

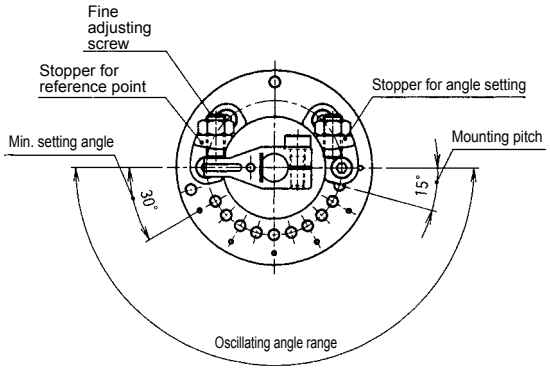
⚠CAUTION

■ Stopper

- Operate the rotary actuator only after installing a stopper to serve both as a reference point stopper and angle setting device.
- When the stopper is set to the oscillating origin or max. oscillating angle, if set to the positive side beyond the adjusting range, the vane could hit the internal stopper and cause damage. Always adjust the angle so that the finger stops at the external stopper.
- The reference point stopper is fixed in position and cannot be moved.

■ Structure of the variable oscillating angle mechanism

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 finger attached to the shaft contacts the stopper. The position can be finely adjusted with the adjust screw provided on the stopper.



■ Oscillating angle settings

For non-specified setting angles (standard)

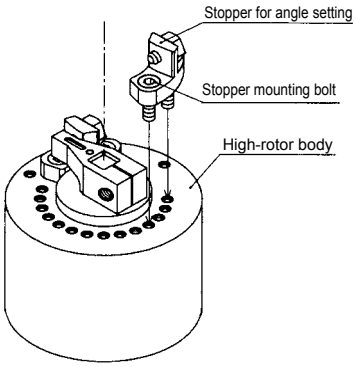
The reference point stopper is fixed and the angle setting stopper is attached at shipment. Accordingly, the angle setting stopper must be installed at a position to achieve the desired angle for use.

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

If the angle setting is specified (made to order)

The reference point and angle setting stoppers are installed at the designated angle at shipment.

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



■ Oscillating angle setting method

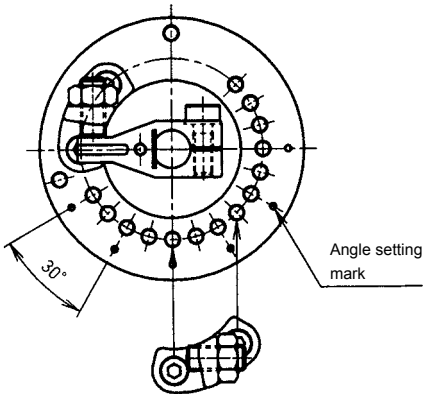
If the setting angle is an integer multiple of the stopper's installation pitch (15°)

(1) Install the stopper in the appropriate position to set the angle by mounting to the relevant tapped hole. When installing the stopper, use the 30° pitch angle setting mark provided near the tap hole as a guide.

Setting angle

Model No.	Setting angle (installation pitch in multiples of 15°)
RV3$^{S}_{D}$A3 RV3$^{S}_{D}$A10 RV3$^{S}_{D}$A20	30°, 45°, 60°, 75°, 90°, 105°, 120°, 135°, 150°, 165°, 180°
RV3$^{S}_{D}$A30	30°, 45°, 60°, 75°, 90°, 105°, 120°, 135°, 150°, 165°, 180°, 195°, 210°, 225°, 240°, 255°, 270°

Example for the 90° case



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

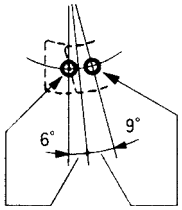
Adjustable angle width

Stopper fine adjustment range for reference point	±3° *1
Stopper fine adjustment range for angle setting	-9° to +6°
Stopper fine adjustment range for angle setting at max. setting angle	-9° to +3° *2

*1 : RV3DA3 is -1° to +3°
*2 : RV3DA3 is -9° to +1°

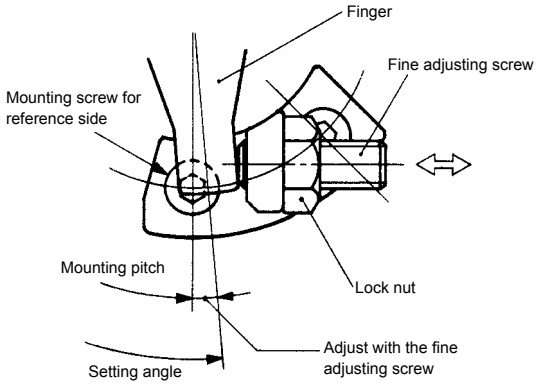
If the setting angle is between integer multiples of the stopper's installation pitch (15°)

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



Mount so that the reference position is the front 6° range of the stopper mounting pitch (15°) for the front mounting screw, and the back 9° range for the back mounting screw.

(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

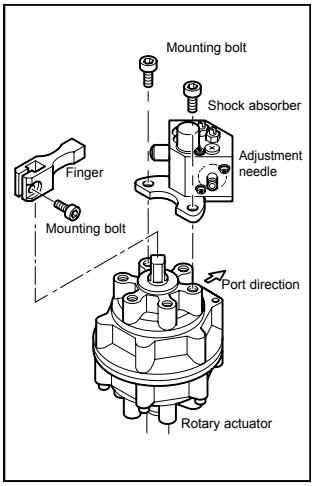
⚠WARNING

■ Precautions for shock absorber handling

- Do not loosen or disassemble any parts other than the adjustment needle. Doing so may lead to oil leakage.
- The hex nut at the base of the adjustment needle is not a locking nut, so do not turn it. Otherwise, oil leakage may result.
- Do not use the product where the product is exposed to dust or cuttings or may come in contact with liquids such as water, oil, etc. This may lead to reduced durability or failure.

⚠CAUTION

■ Mounting the shock absorber Mounting figure



1. Use the mounting holes on the body to mount the shock absorber and install onto the square shaft of the rotary actuator.
2. Install so that the shock absorber is above the rotary actuator port. Check that the shock absorber has been mounted securely.
3. The finger of the shock absorber can now be installed, but check that the rotary actuator shaft is positioned at the oscillating origin. (Refer to the oscillating origin position)
4. When at the oscillating origin, the shock absorber fingers contact the shock absorber piston and will not engage. Turn the square shaft counterclockwise to where the fingers engage.
5. The shock absorber cannot be used as a stopper.

Use/maintenance

1. Common

⚠CAUTION

■ This rotary actuator is a no-lubrication actuator.

The actuator can be lubricated, but once it has been oiled, it must be maintained in an lubricated state. There are times that the lubricant applied in advance may be washed off due to oiling, stopping partway may result in malfunction.
Use Class 1 turbine oil (non-additive) ISO VG32 for lubrication.
Never use other oils (spindle oil, machine oil, etc.). They could damage the seal section.
Recommended lubricants are indicated in the table below. Use this as a reference.

Manufacturer	Name
IDEMITSU KOSAN CO., LTD.	DIANA FRESIA S-32
FUJIKOSAN CO., LTD.	Fukkol Turbine 32
MITSUBISHI OIL CO., LTD.	Mitsubishi Turbine Oil 32
SHOWA SHELL SEKIYU CO., LTD.	SHELL VITREA 32
MITSUI & CO., LTD.	Mitsui Turbine Oil 32
JAPAN ENERGY CO., LTD.	Turbine 32
JAPAN OIL. CO., LTD.	Turbine Oil 32
Cosmo Oil Co., Ltd.	Cosmo Turbine 32
EXXON MOBIL CO., LTD.	STANOL 43N
KYGNUS SEKIYU K. K.	Turbine Oil 32

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

■ The stopping angle is set by touching the fine adjusting screw of each stopper with the finger.

Stopping angle accuracy does not include wear due to operation. If the stopping angle changes due to wear, recalibrate using the fine adjusting screws.