RRC

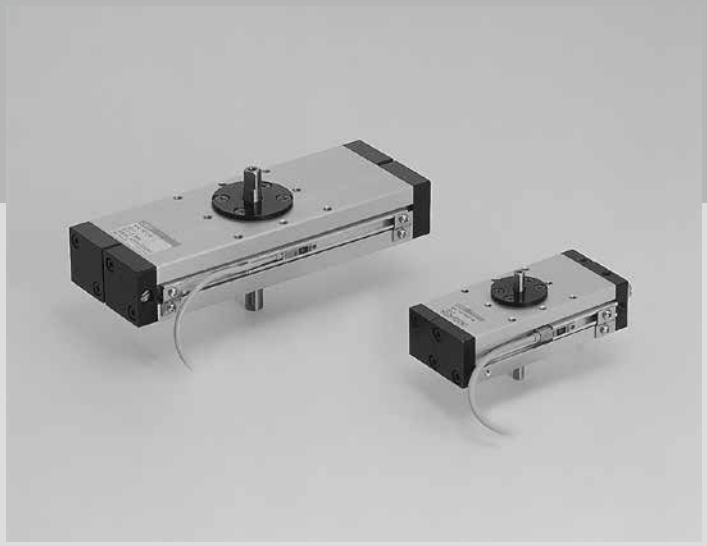
Rotary actuator

Oscillation/rotation drive

Size 8/32/63

Overview

This is a compact rack and pinion rotary actuator. Torque: 0.7, 3.1, 5.6 N·m



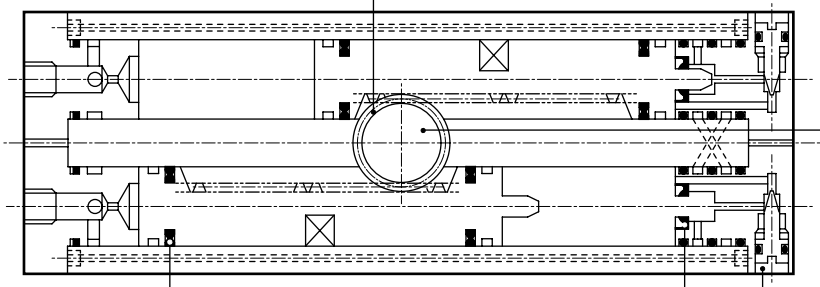
CONTENTS

Variation	Model No. JIS symbol	Size	Effective torque (0.5 MPa) (N·m)	Max. oscillating angle (°)	
				90	
Rack and pinion	RRC 	8	0.7	●	
		32	3.1		
		63	5.6		

Product introduction

● Max. oscillating angle 270°
Torques of 0.7, 3.1, 5.6 N·m (working pressure 0.5 MPa) and oscillating angles of 90°, 180°, 270°, are included in the series.
Select the ideal model for your application.

● Space saving
Compact and thin design permits installation in a narrow space.



● Stable torque/long service life
Uses a unique mechanism combining two linear cylinders with rack and pinion gears. Torque is stable even at low pressure, and internal/external leakages are the same as that of the linear cylinder. Furthermore, long service life is achieved.

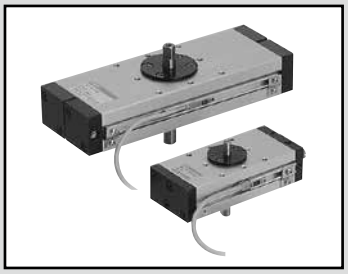
● Cushion needle direction can be changed
RRC-32 and 63 only are 3-directional.

● No lubrication
No-lubrication usage is possible.
Total operation costs will be reduced.

● Cushion provided as standard
Rubber cushion or air cushion is provided as standard.

●: Standard, ◎: Option, ○: Made to order, : Not available

Max. oscillating angle (°)			Option		Switch	Page
			Adjustable angle	Copper and PTFE free		
	180	270	A	P6		
	●	●	◎	◎	◎	1286



Rotary actuator Rack & pinion

RRC Series

- Size: 8/32/63
- Oscillating angle: 90°/180°/270°

JIS symbol

RoHS CAD

Specifications

Item		RRC		
Size		8	32	63
Effective torque*1 N·m		0.7	3.1	5.6
Actuation		Rack and pinion mechanism		
Working fluid		Compressed air		
Max. working pressure MPa		1.0 (≈150 psi, 10 bar)		
Min. working pressure*2 MPa		0.1 (≈15 psi, 1 bar)		
Proof pressure MPa		1.6 (≈230 psi, 16 bar)		
Ambient temperature °C		-10 (14°F) to 60 (140°F) (no freezing)		
Port size		Rc1/8		
Oscillating angle tolerance °		90^{+8}_{+1}, 180^{+8}_{+1}, 270^{+8}_{+1}		
Cushion		Rubber cushion	Air cushion	
Effective cushion length mm		-	4.8	5.8
Allowable absorbed energy J		0.05	0.21	0.41
Volumetric capacity cm^3	90°	3	12	22
	180°	6	24	44
	270°	9	36	66
Lubrication		Not required (use turbine oil ISO VG32 if necessary for lubrication)		

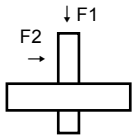
*1 : Effective torque value is at working pressure 0.5 MPa.
*2 : When using RRC-8 with max. oscillating angle, the working pressure is to be 0.3 MPa and over.
*3 : Adjustable angle is available as an option. Refer to page 1291.

Max. load

Use the load applied to the shaft at the values below or less.

Unit: N

Model No. / Load direction	RRC-8	RRC-32	RRC-63
Thrust load F1	9.8	39.2	58.8
Radial load F2	19.6	78.4	117.6



Switch specifications

● 1-color/2-color display

Item	Proximity 2-wire	Proximity 2-wire			Proximity 3-wire				Reed 2-wire						
	T1H/ T1V	T2H/ T2V	T2YH/ T2YV	T2WH/ T2WV	T3H/ T3V	T3PH/ T3PV	T3YH/ T3YV	T3WH/ T3WV	T0H/T0V		T5H/T5V		T8H/T8V		
Applications	For programmable controller, relay, compact solenoid valve	Dedicated for programmable controller			For programmable controller, relay				For programmable controller, relay		For programmable controller, relay, IC circuit (no indicator lamp), serial connection		For programmable controller, relay		
Output method	-				NPN output	PNP output	NPN output	NPN output	-						
Pwr. supp. V.	-				10 to 28 VDC				-						
Load voltage	85 to 265 VAC	10 to 30 VDC		24 VDC ±10%	30 VDC or less				12/24 VDC	100/110 VAC	5/12/24 VDC	100/110 VAC	12/24 VDC	110 VAC	220 VAC
Load current	5 to 100 mA	5 to 20 mA (*3)			100 mA or less		50 mA or less		5 to 50 mA	7 to 20 mA	50 mA or less	20 mA or less	5 to 50 mA	7 to 20 mA	7 to 10 mA
Indicator lamp	LED (Lit when ON)	LED (Lit when ON)	Red/green LED (Lit when ON)	Red/green LED (Lit when ON)	LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)	Red/green LED (Lit when ON)	LED (Lit when ON)		Without indicator lamp		LED (Lit when ON)		
Leakage current	≤1 mA at 100 VAC, ≤2 mA at 200 VAC	1 mA or less			10 μA or less				0 mA						
Weight g	1 m: 33	1 m:18	1 m: 33	1 m:18	1 m:18		1 m: 33	1 m:18	1 m:18				1 m: 33		
	3 m: 87	3 m:49	3 m: 87	3 m:49	3 m:49		3 m: 87	3 m:49	3 m:49				3 m: 87		
	5 m:142	5 m:80	5 m:142	5 m:80	5 m:80		5 m:142	5 m:80	5 m:80				5 m:142		

*1 : Refer to Ending Page 1 for detailed switch specifications and dimensions.
*2 : Switches other than the above models, such as switches with connectors, are also available. Refer to Ending Page 1.
*3 : The max. load current is 20 mA at 25°C. The current is lower than 20 mA if the operating ambient temperature around the switch is higher than 25°C. (5 to 10 mA at 60°C)

Cylinder weight

Unit: kg

Oscillating angle / Model No.	90°	180°	270°	Switch weight (per 1 pc.)	Switch mounting bracket 90°	180°	270°
RRC-8	0.39	0.43	0.49	Refer to the weight in the switch specifications.	0.005		
RRC-32	1.02	1.23	1.45		0.011	0.013	0.015
RRC-63	1.68	2.03	2.37		0.012	0.014	0.016

(Example) Product weight of RRC-8-90-T2H-D

Body weight..... 0.39 kg
Switch weight ..... 0.018 2 pcs. = 0.036 kg
Switch mounting bracket weight.... 0.005 2 pcs. = 0.010 kg
Product weight ..... 0.39 kg + 0.036 kg + 0.010 kg = 0.436 kg

How to order

Without switch (built-in magnet for switch)

RRC - 8 - 90 ——— A

With switch (built-in magnet for switch)

RRC - 8 - 90 - T2H - R - A

Ⓐ Size

Ⓑ Max. oscillating angle

Ⓒ Switch model No.
* indicates the lead wire length.

Ⓓ Switch quantity

Ⓔ Option

Code	Description
Ⓐ Size	
Model No.	**Effective torque**
8	0.7 [N·m]
32	3.1 [N·m]
63	5.6 [N·m]
Ⓑ Max. oscillating angle	
90	90°
180	180°
270	270°

Ⓒ Switch model No.

Axial lead wire	Radial lead wire	Contact	Voltage AC	Voltage DC	Indicator	Lead wire
T0H*	**T0V***	Reed	●	●	1-color display	2-wire
T5H*	**T5V***		●	●	Without indicator lamp	
T8H*	**T8V***		●	●	1-color display	
T1H*	**T1V***	Proximity	●		1-color display	2-wire
T2H*	**T2V***			●		3-wire
T3H*	**T3V***			●		
T2WH*	**T2WV***			●	2-color display	2-wire
T2YH*	**T2YV***			●		2-wire
T3WH*	**T3WV***			●		3-wire
T3YH*	**T3YV***			●		3-wire
T3PH*	**T3PV***			●	1-color display	3-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	
A	Adjustable angle
P6	Copper and PTFE free

[Example of model No.]

RRC-8-90-T2H-R-A

Model: Rotary actuator rack & pinion

Ⓐ Size : 8
Ⓑ Max. oscillating angle : 90°
Ⓒ Switch model No. : Proximity T2H switch, lead wire 1 m
Ⓓ Switch quantity : With clockwise rotation detection 1 piece
Ⓔ Option : Adjustable angle

How to order switch

● Switch body + mounting bracket set (including rail)

RRC - T2H* - 8 - 90
Ⓒ Ⓐ Ⓑ

Switch model No. (Item Ⓒ above) | Size (Item Ⓐ above) | Max. oscillating angle (Item Ⓑ above)

● Switch body only

SW - T2H*

Switch model No. (Item Ⓒ above)

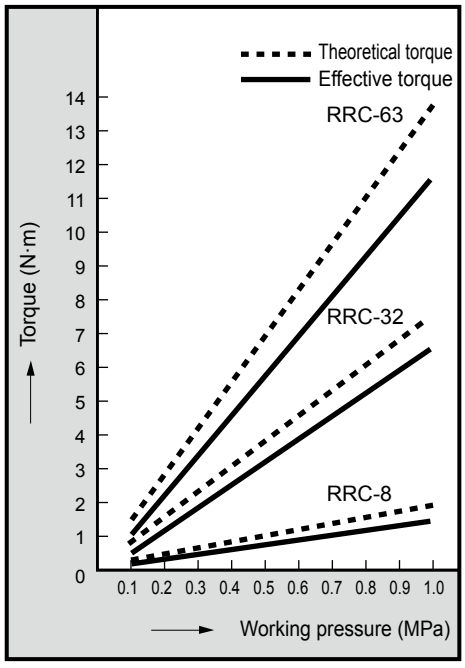
● Mounting bracket set (including rail)

RRC - T - 8 - 90

Bracket

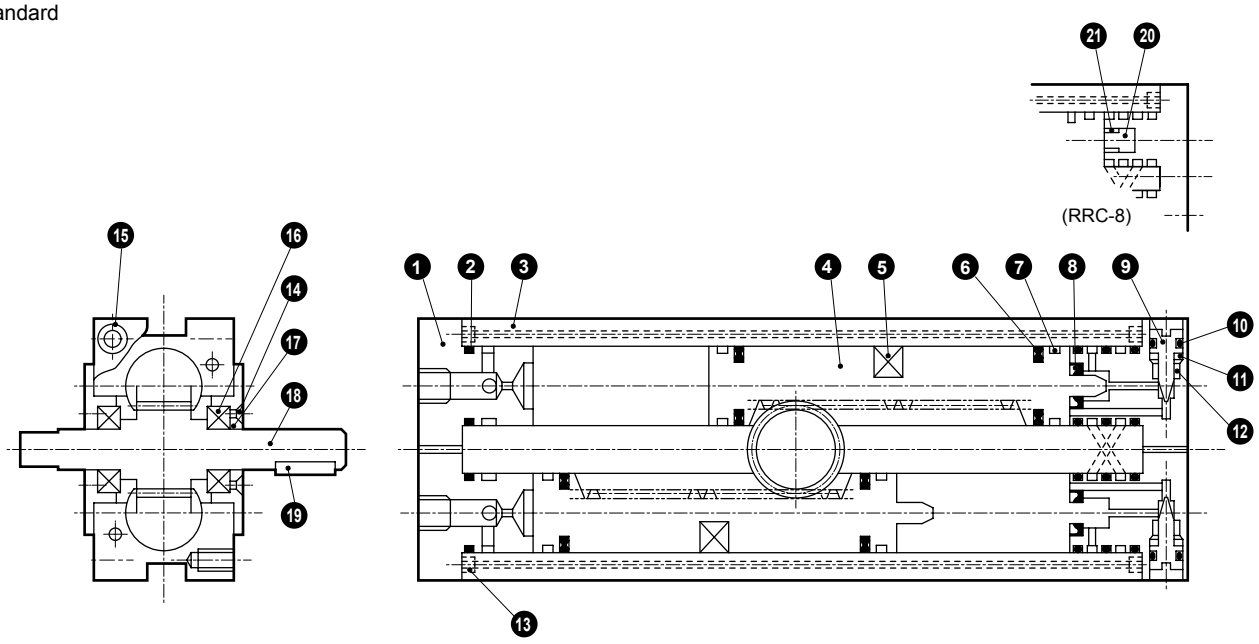
Size (Item Ⓐ above) | Max. oscillating angle (Item Ⓑ above)

Torque

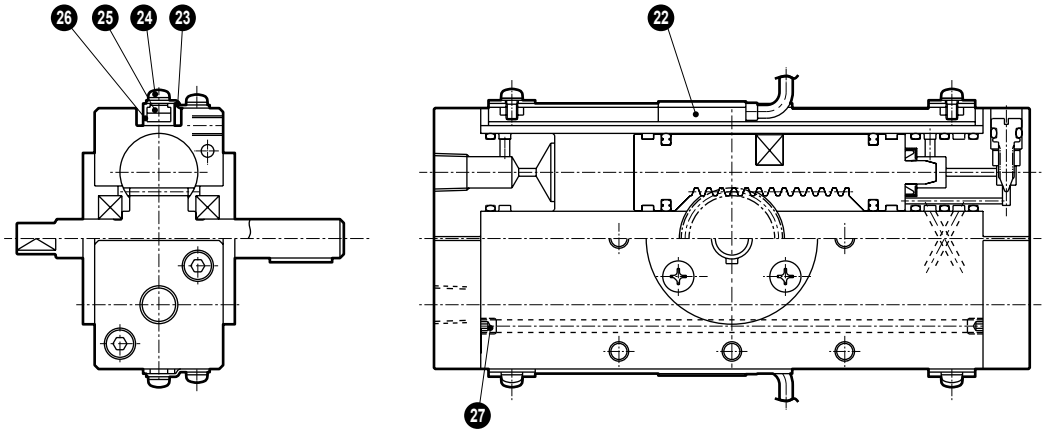


Internal structure and parts list

● Standard



● With switch



No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Cap (2)	Aluminum alloy		16	Bearing	——	
2	Cap gasket	Nitrile rubber		17	Cover	Aluminum alloy	
3	Body	Aluminum alloy		18	Shaft	Steel	
4	Piston	Stainless steel		19	Key	Steel	
5	Magnet	Plastic		20	Cushion rubber	Urethane rubber	RRC-8 only
6	Piston packing	Nitrile rubber		21	DU bush	——	RRC-8 only
7	Wear ring	Acetal resin		22	Switch	——	
8	Cushion packing	Nitrile rubber	Excluding RRC-8	23	Stop plate	Stainless steel	
9	Needle	Copper alloy	Excluding RRC-8	24	Phillips pan head machine screw/captive washer	Steel	
10	Needle gasket	Nitrile rubber	Excluding RRC-8	25	Fixing nut	Stainless steel	
11	Cap (1)	Aluminum alloy		26	Switch rail	Aluminum alloy	
12	U nut	Steel	Excluding RRC-8	27	Hexagon socket set screw	Steel	
13	Hexagon socket set screw	Alloy steel					
14	Phillips flat head machine screw	Steel					
15	Hexagon socket head cap screw	Alloy steel					

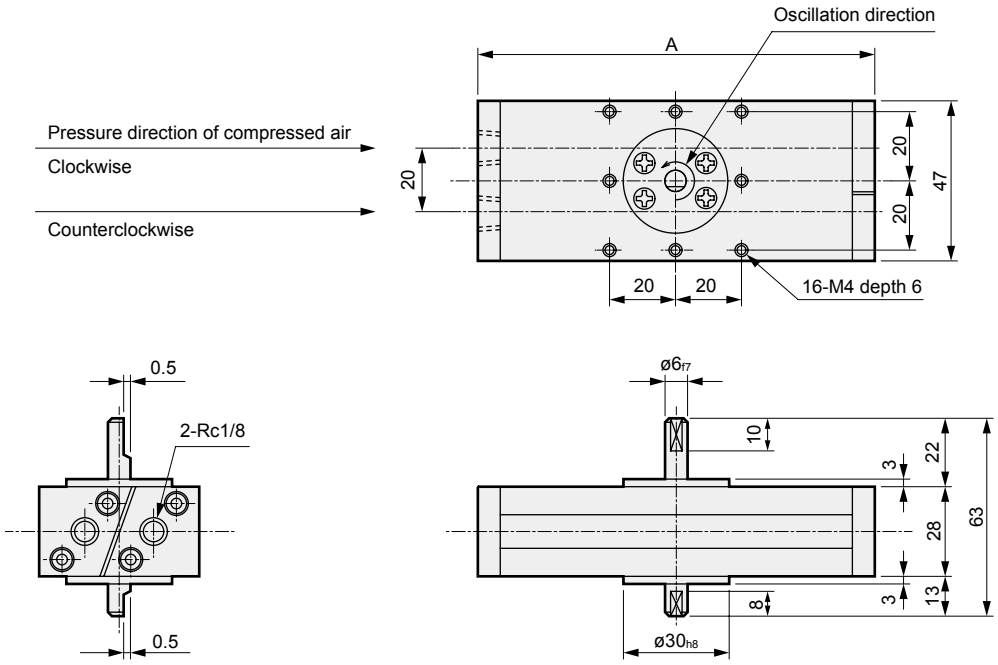
Repair parts list

Model No.	Kit No.	Repair parts No.
RRC-8	RRC-8K	❷ ❻ ❼
RRC-32	RRC-32K	❷ ❻ ❼ ❽ ❿
RRC-63	RRC-63K	

Note: Specify the kit No. when placing an order.

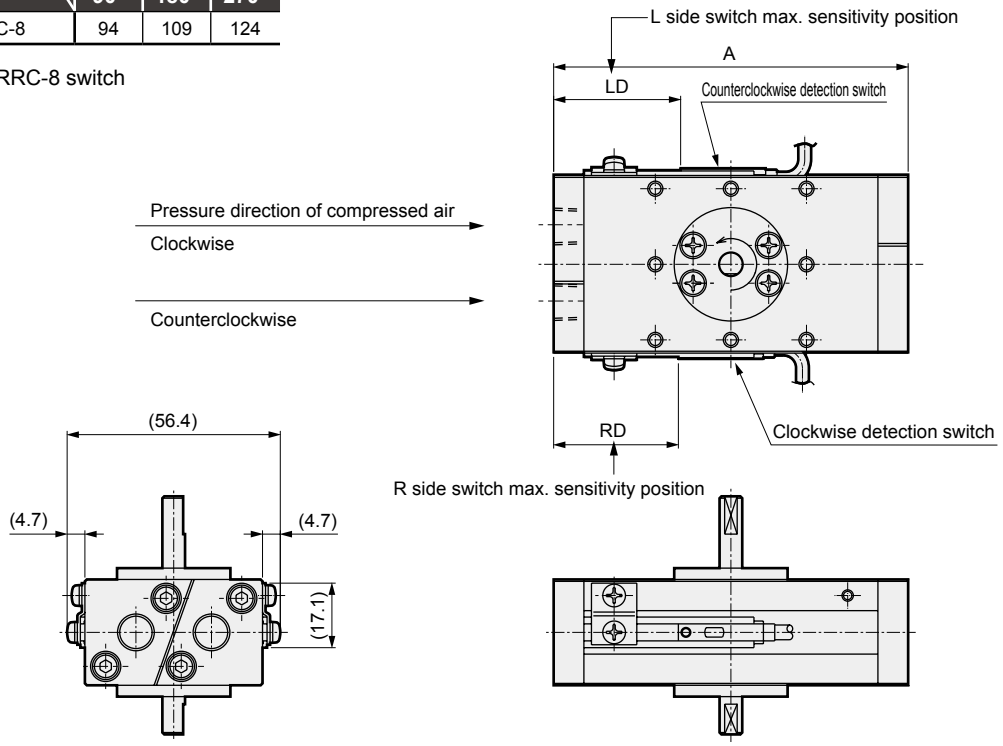
Dimensions

● RRC-8



Code / Model No.	A		
	Oscillating angle		
	90°	180°	270°
RRC-8	94	109	124

● With RRC-8 switch



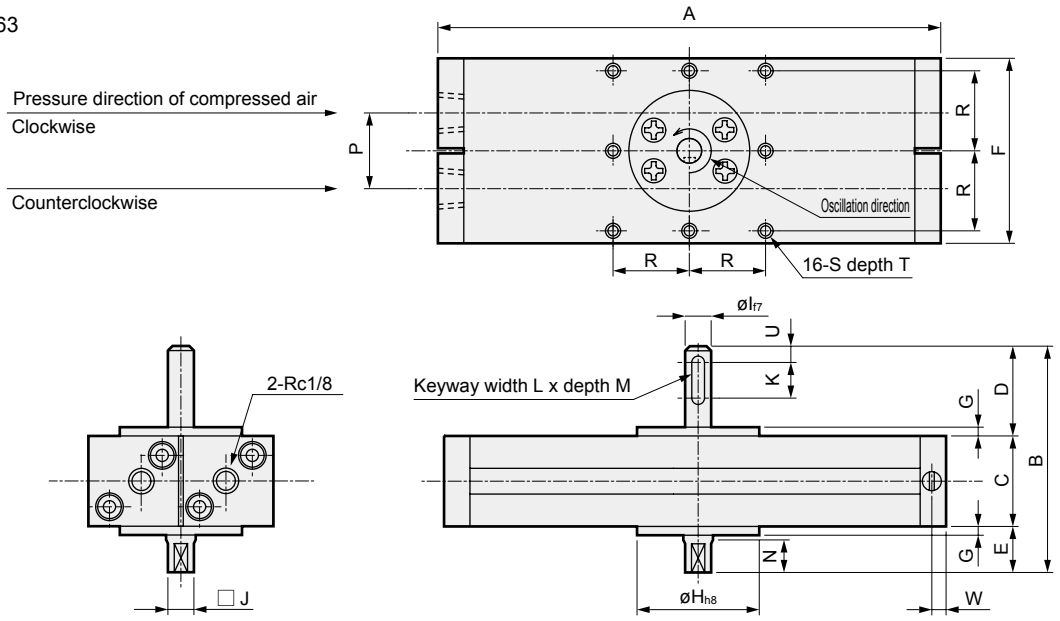
Code / Model No.	A			RD																	
	Oscillating angle			T1*			T2*/T3*			T0*/T5*			T8*			T2Y*/T3Y*			T2W*/T3W*		
				Oscillating angle			Oscillating angle			Oscillating angle			Oscillating angle			Oscillating angle			Oscillating angle		
	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°
RRC-8	94	109	124	31	36	40	33	37	41	30	37	41	24	31	35	31	36	40	34	39	43

Code / Model No.	LD																				
	T1*			T2*/T3*			T0*/T5*			T8*			T2Y*/T3Y*			T2W*/T3W*					
	Oscillating angle			Oscillating angle			Oscillating angle			Oscillating angle			Oscillating angle			Oscillating angle					
	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°	90°	180°	270°			
RRC-8	31	36	40	33	37	41	30	37	41	24	31	35	31	36	40	34	39	43			

Note: Dimensions other than the above are the same as the type without switch.

Dimensions CAD

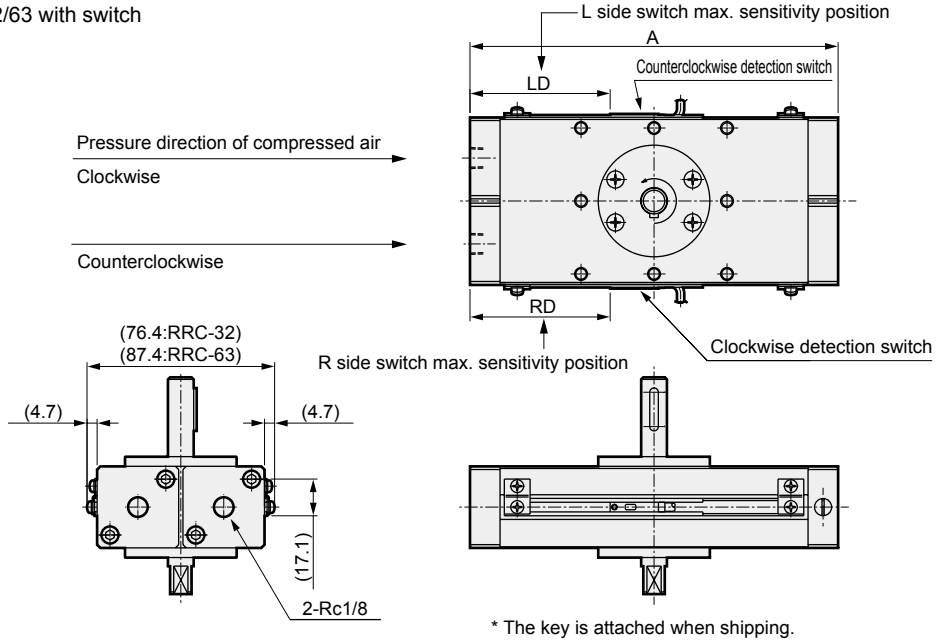
● RRC-32/63



* The key is attached when shipping.

Code / Model No.	A Oscillating angle 90°	A Oscillating angle 180°	A Oscillating angle 270°	B	C	D	E	F	G	H	I	J	K	L	M	N	P	R	S	T	U	W
RRC-32	153	191	229	84	33	31	20	67	3	44	10	8	13	3	1.8	10	34	29	M5	8	4.5	6
RRC-63	172	216	260	101	38	41.5	21.5	78	4.5	52	12	10	16	4	2.5	13	40	34	M6	9	7	7

● RRC-32/63 with switch



* The key is attached when shipping.

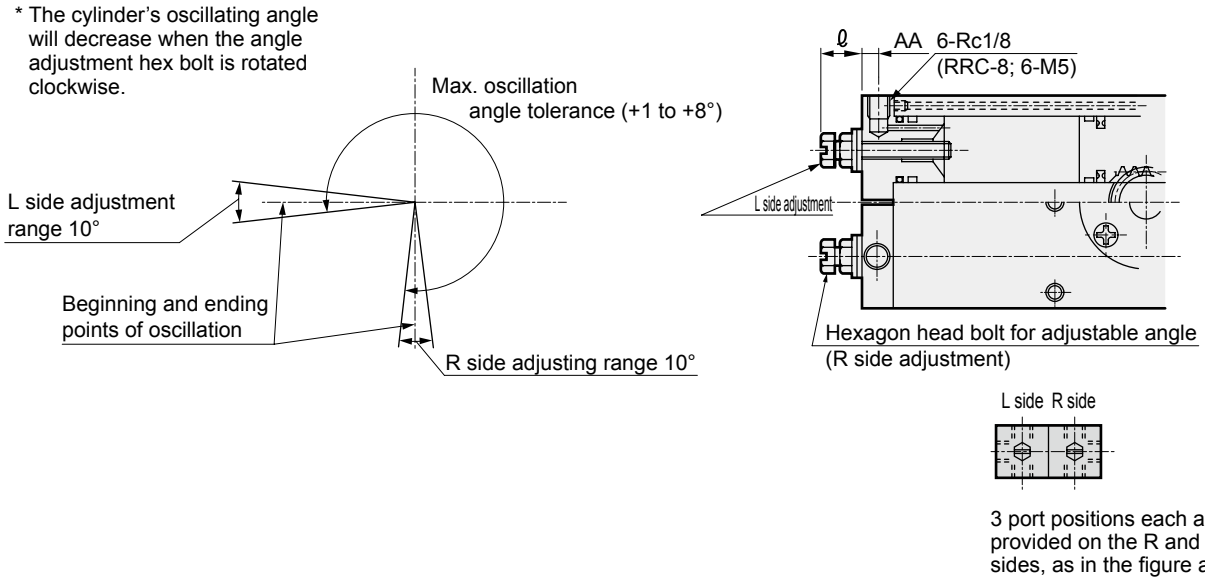
Code / Model No.	A Oscillating angle 90°	A Oscillating angle 180°	A Oscillating angle 270°	RD T1* Oscillating angle 90°	RD T1* Oscillating angle 180°	RD T1* Oscillating angle 270°	RD T2*/T3* Oscillating angle 90°	RD T2*/T3* Oscillating angle 180°	RD T2*/T3* Oscillating angle 270°	RD T0*/T5* Oscillating angle 90°	RD T0*/T5* Oscillating angle 180°	RD T0*/T5* Oscillating angle 270°	RD T8* Oscillating angle 90°	RD T8* Oscillating angle 180°	RD T8* Oscillating angle 270°	RD T2Y*/T3Y* Oscillating angle 90°	RD T2Y*/T3Y* Oscillating angle 180°	RD T2Y*/T3Y* Oscillating angle 270°	RD T2W*/T3W* Oscillating angle 90°	RD T2W*/T3W* Oscillating angle 180°	RD T2W*/T3W* Oscillating angle 270°
RRC-32	153	191	229	56	66	75	58	67	77	57	67	76	51	61	70	56	66	75	59	69	78
RRC-63	172	216	260	64	75	86	65	76	87	65	76	87	59	70	81	64	75	86	67	78	89

Code / Model No.	LD T1* Oscillating angle 90°	LD T1* Oscillating angle 180°	LD T1* Oscillating angle 270°	LD T2*/T3* Oscillating angle 90°	LD T2*/T3* Oscillating angle 180°	LD T2*/T3* Oscillating angle 270°	LD T0*/T5* Oscillating angle 90°	LD T0*/T5* Oscillating angle 180°	LD T0*/T5* Oscillating angle 270°	LD T8* Oscillating angle 90°	LD T8* Oscillating angle 180°	LD T8* Oscillating angle 270°	LD T2Y*/T3Y* Oscillating angle 90°	LD T2Y*/T3Y* Oscillating angle 180°	LD T2Y*/T3Y* Oscillating angle 270°	LD T2W*/T3W* Oscillating angle 90°	LD T2W*/T3W* Oscillating angle 180°	LD T2W*/T3W* Oscillating angle 270°
RRC-32	56	66	75	58	67	77	57	67	76	51	61	70	56	66	75	59	69	78
RRC-63	64	75	86	65	76	87	65	76	87	59	70	81	64	75	86	67	78	89

Note: Dimensions other than the above are the same as the type without switch.

Dimensions: Option

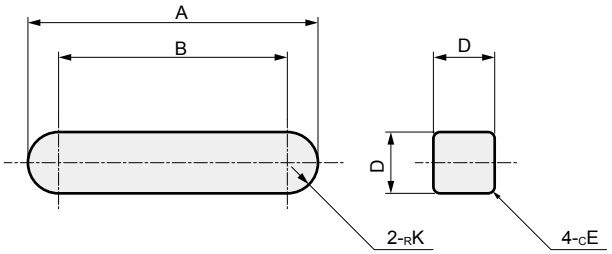
● Adjustable angle



3 port positions each are provided on the R and L sides, as in the figure above.

Code / Model No.	ℓ MIN	ℓ MAX	AA	Allowable absorbed energy J (For adjustable angle single 10°)	Hexagon head bolt dimension for adjustable angle (Common for R and L)
RRC-8	10.7	11.5	4	0.02	M5×0.5
RRC-32	13.4	15.5	6	0.06	M6×0.75
RRC-63	13.5	16.0	7	0.13	M6×0.75

● Key dimensional drawing



Code / Model No.	A	B	K	D	E
RRC-32	$16^{0}_{-0.18}$	13	1.5	$3^{0}_{-0.025}$	0.2
RRC-63	$20^{0}_{-0.21}$	16	2	$4^{0}_{-0.030}$	0.2

Selection guide of rotary actuator

Step 1 Oscillating time check

Use an oscillating time within the specified range of the table below. Unit: S

Oscillating angle (degree) / Model No.	90	180	270
RRC-8	0.015 to 0.151	0.030 to 0.302	0.045 to 0.452
RRC-32	0.038 to 0.377	0.075 to 0.754	0.113 to 1.131
RRC-63	0.073 to 0.440	0.147 to 0.880	0.220 to 1.320

* The oscillating time in the table is the time for the oscillating to end after movement begins.

Step 2 Size selection

● When simple static pushing force is required for clamp, etc.

Static load

(1) Determine the working pressure. P(MPa)
(2) Determine the required force. F(N)
(3) Length of arm from rotary actuator is determined. ℓ(m)

➡ Calculation of required torque

$T = F\ell$ (N·m)

➡ Determine size of rotary actuator according to output torque graph.

● To move load

Resistance load

When applying force (resistance load) including frictional force, gravity or other external forces.
(1) Determine the working pressure. P(MPa)
(2) Determine the required force. F_R(N)
(3) Length of arm from rotary actuator is determined. ℓ(m)

➡ Calculation of resistance torque

$T_R = K \times F_R \times \ell$ (N·m)

K: Slack coefficient
If no load fluctuation K = 2
If load fluctuates K = 5
(When resistance torque caused by gravity operates)
If load fluctuates when K < 5, the change in angular speed increases.

Inertia load

When the object is rotated.
(1) Oscillating angle/oscillating time and working pressure are determined.
Oscillating angle θ (rad)
Oscillating time t(s)
Working pressure P(MPa)
90°=1.5708(rad)
180°=3.1416(rad)
270°=4.7124(rad)
(2) Calculate the load moment of the inertia according to the load shape and weight. Refer to moment of inertia table for the calculation formula.
I (kg·m^2)
(3) Calculate the max. angular acceleration speed.

$\alpha = \frac{2\theta}{t^2}$ (rad/s^2)

θ: Oscillating angle (rad)
t: Oscillating time (s)

➡ Calculation of acceleration torque

$T_A = 5 \times I \times \alpha$ (N·m)

T_A is the required torque to accelerate inertia load until set speed.

⬆

Required torque $T = T_R + T_A$

➡ Determine size of rotary actuator according to output torque graph.

Step 3 Check of allowable energy

When using an inertial load, keep the load energy lower than the rotary actuator's allowable energy.

(1) Angular speed at oscillation edge $\omega = \frac{2\theta}{t}$ (rad/s)

θ: Oscillating angle (rad) t: Oscillating time (s)

(2) Calculation of load inertia energy

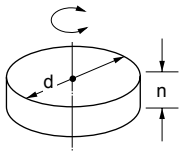
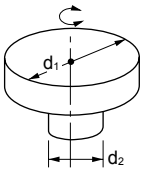
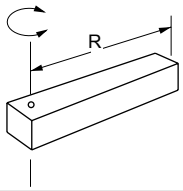
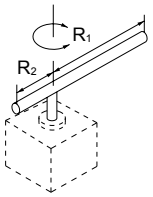
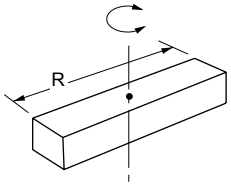
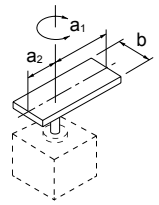
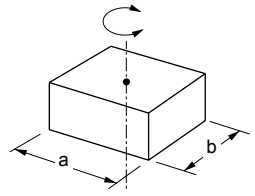
$E = \frac{1}{2} \times I \times \omega^2$ (J)

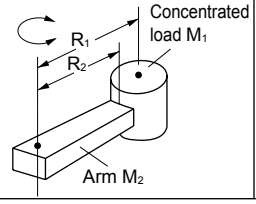
I: Load moment of inertia (kg·m^2)

(3) Confirm that the load inertia energy E is equal to or less than the allowable energy of the rotary actuator.
When exceeding the allowable energy, an external shock absorber, etc., will be required.

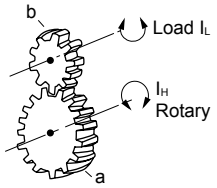
Figure for moment of inertia calculation

● When rotary shaft passes through the workpiece

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
Thin rod		● Bar length R_1, R_2 ● Weight M_1, M_2	$I = \frac{M_1/R_1^2}{3} + \frac{M_2/R_2^2}{3}$	$\frac{R_1^2+R_2^2}{3}$	● Mounting direction is horizontal ● Oscillating time changes when the mounting direction is vertical
Bar (center of rotation at center of gravity)		● Bar length R(m) ● Weight M(kg)	$I = \frac{MR^2}{12}$	$\frac{R^2}{12}$	● No mounting direction
Thin rectangle plate (rectangular parallelepiped)		● Plate length a_1, a_2 ● Side length b ● Weight M_1, M_2	$I = \frac{M_1}{12}(4a_1^2+b^2) = \frac{M_2}{12}(4a_2^2+b^2)$	$\frac{(4a_1^2+b^2)+(4a_2^2+b^2)}{12}$	● Mounting direction is horizontal ● Oscillating time changes when the mounting direction is vertical
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(m) ● 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 side (tooth number) a, Load side (tooth number) b ● Load moment of inertia 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.

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 rack and pinion mechanism RRC Series

Design/selection

⚠ 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 oscillating angle repeatability is required, directly stop external load.
The initial oscillating angle may change even with products provided with adjustable angles.

■ If the axial load (thrust load) on the shaft exceeds the allowable value, faulty operation could occur. Therefore, do not apply a load in excess of the allowable value. If this is unavoidable, use a structure with a thrust bearing as shown in Fig.1.

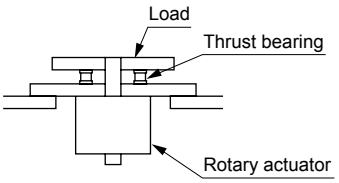


Fig. 1

■ Avoid applying bending (radial) load exceeding the allowable value onto the shaft end, or faulty operation could occur.
When unavoidable, use a mechanism transmitting only rotation as shown in Fig. 2.
When connecting the shaft end and load at any position in the oscillation range, use flexible couplings, etc., that will not twist off to prevent the shaft from breaking and bearings from wearing or seizing.

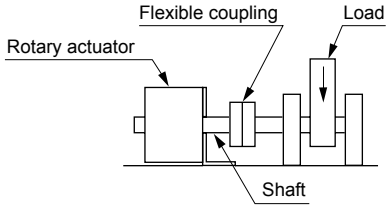


Fig. 2 Radial load

■ 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.

■ If the load weight is large and oscillation speed is high, large inertia could be generated and allowable absorbed energy exceeded, possibly damaging the rotary actuator.
Install a shock absorber to absorb inertia.

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

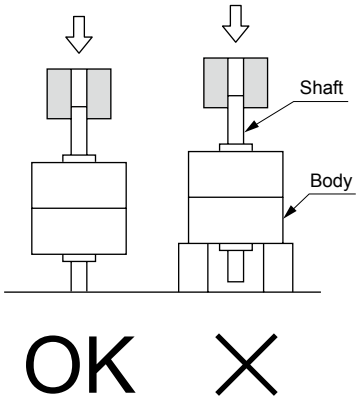


Fig. 3

■ Prevent seizing at rotating sections.
Apply grease to rotating sections (pins, etc.) to prevent seizing.

■ The retention torque of the oscillating end is about half that of the effective torque, so a load factor of 50% or less should be used.

■ Generally, select the model so that the output torque is twice or more than that required by load.
The RRC Series uses a double piston, so if the oscillating angle is adjusted by the stopper bolt, torque at the oscillation end will be half the effective torque.

■ Even if the required torque load is low during oscillation motion, the load inertia may lead to actuator damage. Upon consideration of moment of inertia, kinetic energy and oscillating time, be sure to use with the allowable energy or less.

Mounting, installation and adjustment

⚠CAUTION

■ 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.

■ Do not loosen the angle adjustment hexagon bolt beyond the adjusting range.
Loosening more than the adjusting range may cause the angle adjustment bolt to fall out, potentially causing bodily injury or damage to the workpiece/device/equipment.
The cylinder's oscillating angle will decrease when the angle adjustment hexagon bolt is rotated clockwise.

■ Observe steps (1) to (5) when adjusting the angle. If adjustments are not made this way, the seal washer will be damaged after one or two adjustments.

[Angle adjustment procedure]

(1) First loosen the hexagon nut as shown in Fig.1.

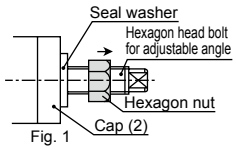


Fig. 1

(2) Second, remove the seal washer cap (2) by hand to reach the state shown in Fig. 2.

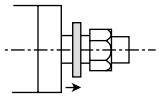


Fig. 2

(3) Turn the angle adjustment hexagon bolt, hexagon nut, and seal washer together as shown in Fig.3, and adjust the angle. Check that the rubber section of the seal washer does not bite into the thread part.

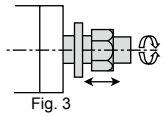


Fig. 3

(4) After adjusting the angle, move the seal washer near to the cap (2) by hand as shown in Fig. 4.

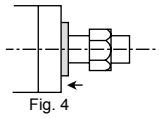


Fig. 4

(5) Tighten securely with the hexagon nut as shown in Fig. 5. Check that the rubber section of the seal washer does not bite into the thread part.

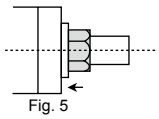


Fig. 5

■ Securely tighten the hexagon nut after adjusting the angle. If not adequately tightened, the hex nut could loosen in the course of usage, resulting in external leakage.