SM-5221-A

INSTRUCTION MANUAL

FOR

SELEX ROTARY

RRC·RRC (SWITCH)

Please read this operation manual carefully before using this product, particularly the section describing safety.

Retain this operation manual with the product for further consultation whenever necessary.

CKD Corporation

For Safety Use

To use this product safely, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (to the level pursuant to JIS B 8370 Pneumatic System Rules).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, read this operation manual carefully for proper operation.

Observe the cautions on handling described in this manual, as well as the following instructions :

⚠ Precautions

- Before performing an overhaul inspection on the actuator, deactivate residual pressure completely.
- While the actuator is operating, do not step into or place hands in the driving mechanism.
- To prevent an electric shock, do not touch the electric wiring connections (exposed live parts) of the actuator equipped with a solenoid valve or switch.
  Perform an overhaul inspection with the power off. Also, do not touch these live parts with wet hands.

Thank you very much for purchasing CKD products. Please read through the followings carefully in order to use the products effectively.

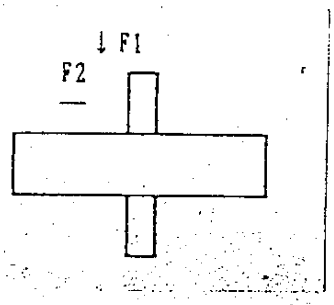
1. SPECIFICATION

Model No. / Item	RRC-8	RRC-32	RRC-63
Operating system	Rack pinion type		
Fluid	Compressed air		
Withstand pressure	1.6 MPa		
Working pressure range	0.1 - 1.0 MPa		
Fluid temperature range	-10 - 60°C (shall not freeze)		
Ambient temperature range	-10 - 60°C		
Lubrication	Not needed (or use turbine oil class-1, ISO VG32)		
Effective torque (at pressure: 0.5MPa)	0.7 N·m	3.1 N·m	5.6 N·m
Cushion system	Rubber cushion	Air cushion	
Permissible absorbed energy	0.05 J	0.21 J	0.41 J
Connecting pipe size	Rc 1/8		
Max. oscillating angle	90°, 180°, 270°		

Note 1: See to it that the working pressure is over 0.3 MPa when using RRC-8 at maximum oscillating angle.
Note 2: The max. oscillating angle tolerance is +1° - +8°. Angle adjuster is available as option.
Note 3: See to it that the load applied to the shaft is below the level mentioned in the Table below.
Note 4: Selex Rotary can be installed with a cylinder switch.

Unit: N

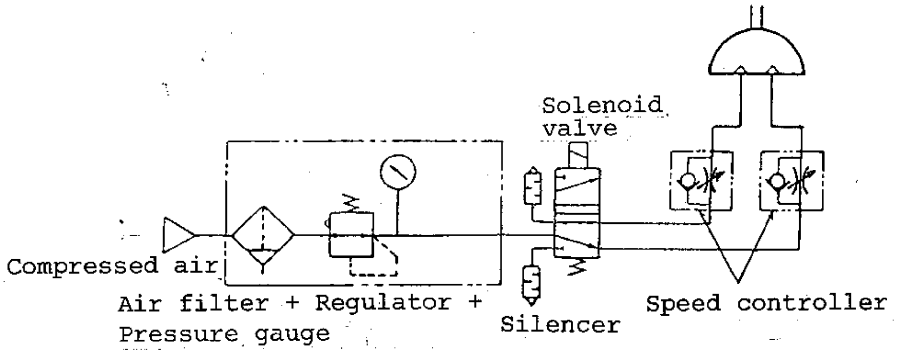
Model No. / Load direction	RRC-8	RRC-32	RRC-63
Thrust load F1	9.8	39.2	58.8
Radial load F2	19.6	78.4	117.6



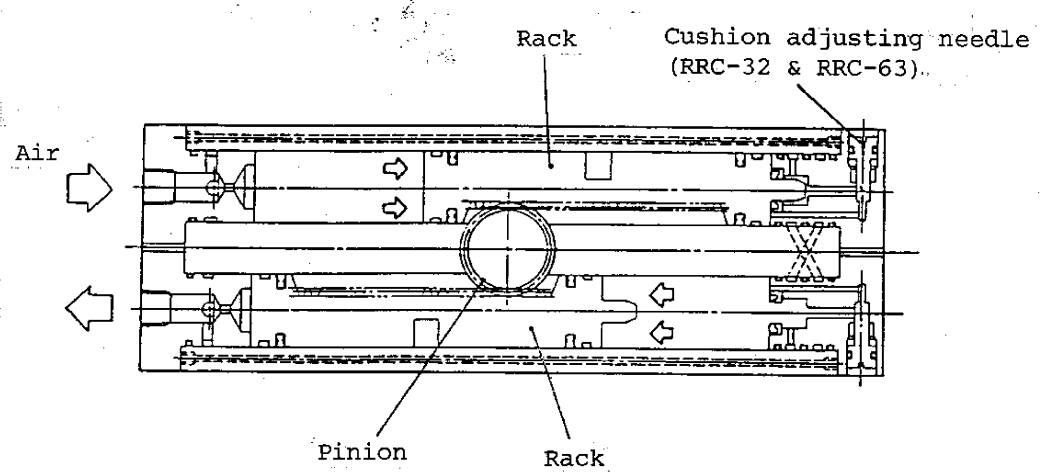
2. BASIC CIRCUIT DIAGRAM & EXPLANATION OF FUNCTIONS

2-1 Basic circuit diagram for Selex Rotary (non-lubricating type):

The general basic circuit diagram is given below.



2-2 Explanation of RRC Function



Selex Rotary is a rack pinion type rotary actuator. It conveys the reciprocating motion of the rack, corresponding to the straight cylinder piston, to the pinion, converts the motion into rotary motion to achieve oscillating motion of the output shaft.

The generated torque is calculated by multiplying the pinion radius with the thrust generated by the rack pinion. Being double rack piston type, the Selex Rotary generates double thrust. This conception of design is reflected on the thin and flat shape. Furthermore, the double rack piston system ensures stable stop position by eliminating the generation of backlash which can not be

prevented in the ordinary rack pinion system.
The cushion mechanism on oscillating end enables smooth stop within the range of permissible kinetic energy.
The cushion can be adjusted since the RRC-8 is equipped with built-in rubber cushion and the RRC-32 & RRC-63 with air cushion.

3. FLUID

3-1 Use clean and less-moist compressed air, passed through the air filter; discharge the drain accumulated in the filter periodically.

3-2 Intrusion of compressor oil carbide (carbon or tarry substance) into the circuit causes the solenoid valve and Selex Rotary to malfunction.

3-3 The Selex Rotary is non-lubricating type. However, use turbine oil class-1 ISO VG32 when/if you want to lubricate; refrain from using spindle oil.

4. PIPING

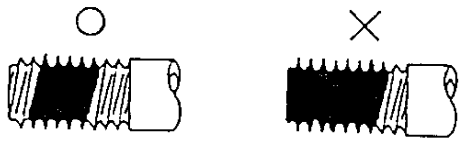
4-1 Use corrosion resisting tubes such as zinc plated tubes, nylon tubes, rubber tubes, etc. for carrying out piping down the filter.

4-2 Install the filter preferably the solenoid valve in order to eliminate the rust, foreign substance and drain in the pipe.

4-3 Observe the effective thread for the thread length of gas pipe, and carry out chamfering approximately half pitch from the thread (screw) end.

4-4 Carry out air blowing before piping in order to eliminate foreign substance and chip in the pipe.

4-5 Take care when winding sealing tape or/and applying sealing agent so that the sealing tape or/and the sealing agent may not intrude into the circuit.



4-6 After piping check the joints by using soap water for leakage.

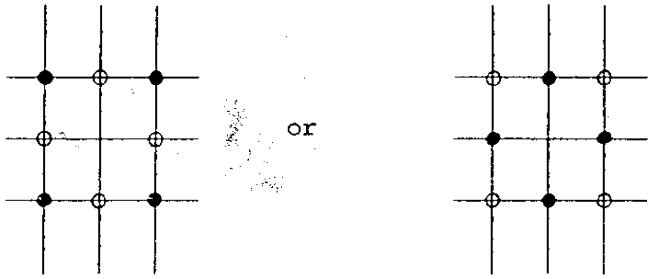
5. INSTALLATION

5-1 The ambient temperature range for the Selex Rotary is -10° - 60°C. Take care so that the fluid may not get frozen when using at temperature below 0°C.

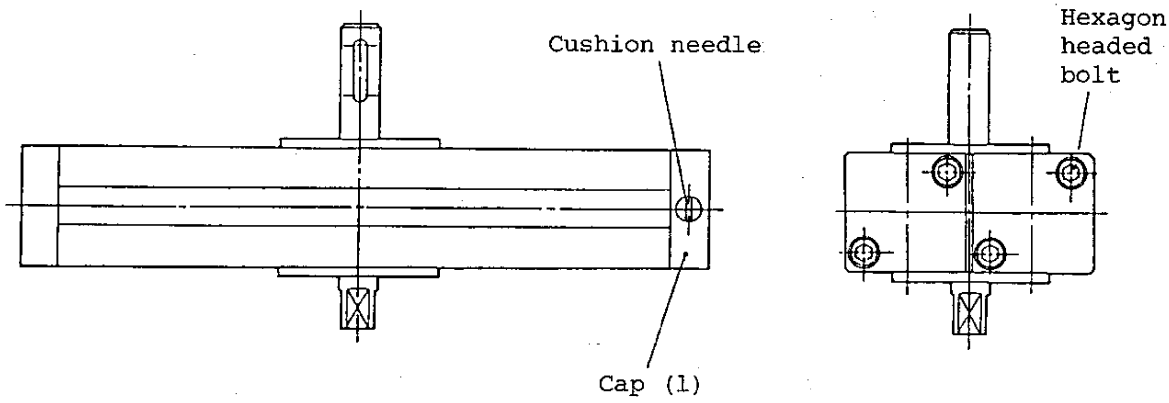
5-2 See to it that the load applied to the shaft is below the level mentioned on page 1.

5-3 When connecting the shaft and the oscillating load with coupling, etc., take care so that the shaft center may not deflect.

5-4 Eight pieces of fixing screw holes are provided in each plate (sheet). Use four pieces as shown in the figure below.



5-5 Set the cushion adjusting needle of RRC-32 or RRC-63 to an easy and arbitary position by changing the position of cap ⑪ by loosening hexagon socket bolt ⑮.



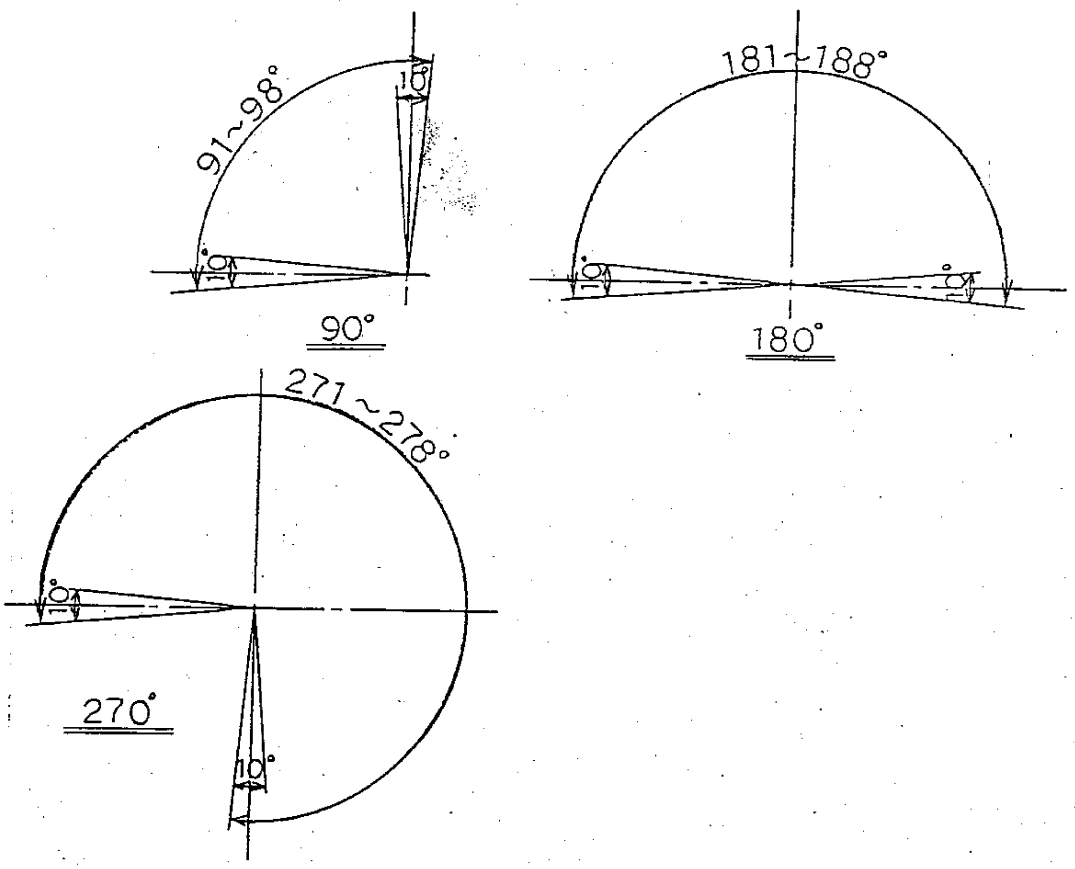
6. CAUTIONS FOR OPTIONAL PARTS

6-1 Angle adjuster:

The Selex Rotary has the following series of angle; 90°, 180° and 270°, each having the maximum tolerance for oscillating angle of +1° - +8°.

The angle adjuster is used for angle adjustment when correct angle setting beyond the angle tolerance is needed.

In this case, the angle adjustment range at one side is 10° at the cost of cushion mechanism to some extent.



The permissible absorbed energy for angle adjustment at one side = 10°C is given below:

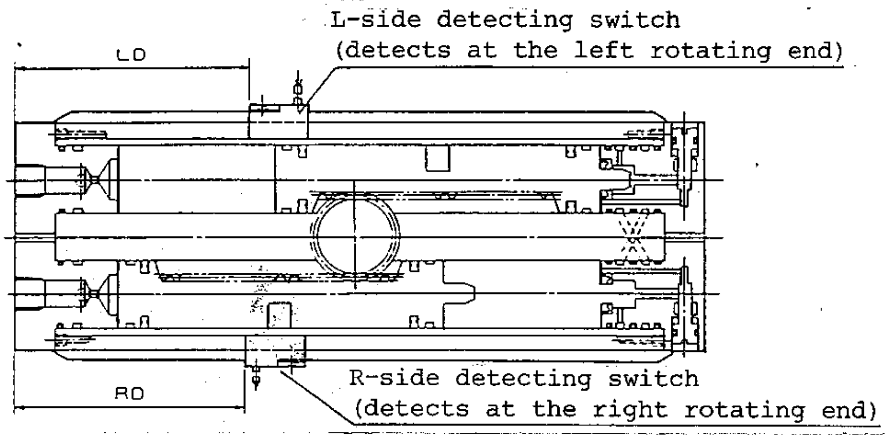
Model No.	Permissible absorbed energy
RRC-8	0.02 J
RRC-32	0.06 J
RRC-63	0.13 J

6-2 Switch:

The Selex Rotary is, by standard, equipped with magnet at the piston unit. Switches can be installed by selecting their types even after the purchase of the standard Selex Rotary.

(A) Switch installing positions

(a) Install the switches to the positions shown in the figure below.



Switch model No.	Contactless switch (N3C, N5C)		Contact switch (R1C, R5C)	
	Switch installing position		Switch installing position	
	R-side detection, RD (mm)	L-side detection, LD (mm)	R-side detection, RD (mm)	L-side detection, LD (mm)
RRC-8- 90	35	31	26	32
180	39	35	29	35
270	43	39	34	40
RRC-32-90	59	55	49	55
180	69	65	59	65
270	78	74	68	74
RRC-63-90	67	63	57	63
180	78	74	68	74
270	89	85	79	85

Detection of rotating end:

Install the switches to R and L detecting dimensions RD and LD in order to activate the switches at maximum sensitive positions.

Detecting during rotation:

Fix the shear to the detecting position, and move the switch in parallel with the actuator groove, then the center position between the first detecting point of the switch and the point detected when the switch is moved reversely shall be the maximum sensitive position of the switch, and therefore, the switch installing position.

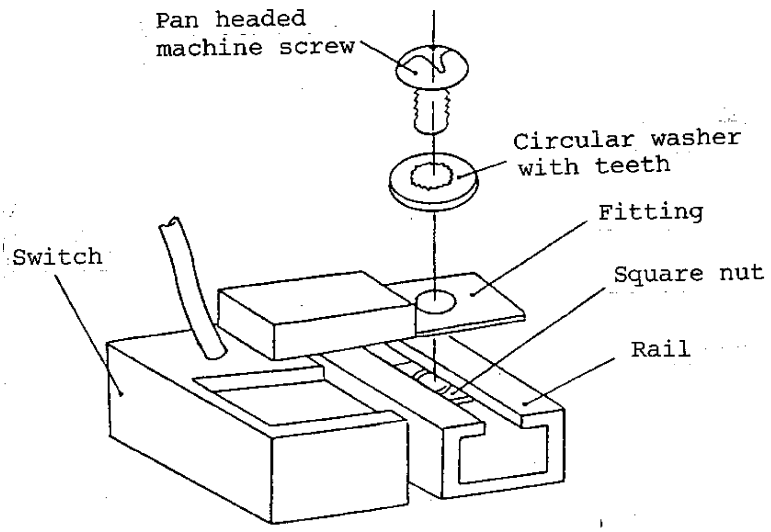
Note: Change in switch installing position:
When installing the contactless switches and contact switches RRC-32, 63, -180 and 270, and the RRC-8-270 contactless switches, one at each of the R and L side rotating end, the switches can be installed on the same sheet (face).

(b) In some models the switches can be installed on the same face. However, the switches must be installed one each at the oscillating end on both L and R sides.

O: Installation on the same face
X: Installation on different faces

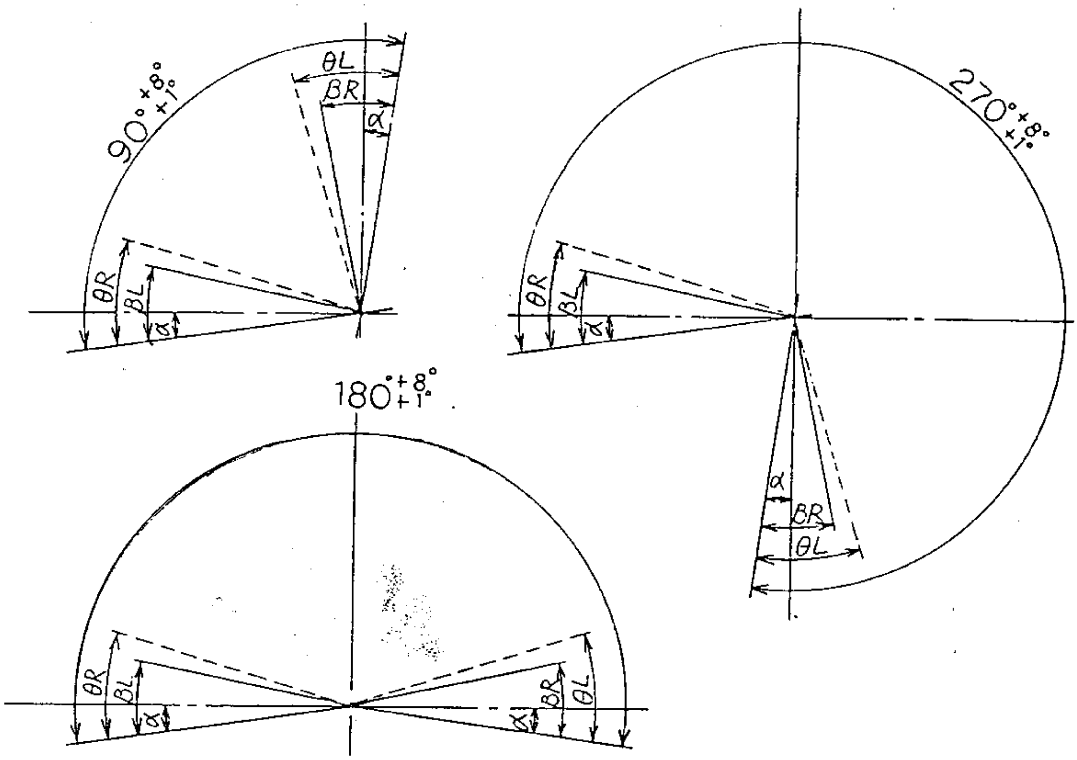
	90°		180°		270°	
	N-type	R-type	N-type	R-type	N-type	R-type
RRC-8	X	X	X	X	O	X
RRC-32	X	X	O	O	O	O
RRC-63	X	X	O	O	O	O

(B) Switch installing method:



The criterion for the tightening torque of pan headed machine screw is 5 - 7 kgf-cm. Loosen slightly for shifting.

(C) The operating range of the switch is as follows. Take particular care when detecting the center position.



(Contactless switches N3C, N5C and contact switches R1C & R5C)

Oscillation angle / Mark / Model No.	90°, 180°, 270°				
	α	βL	βR	θR	θL
RRC-8	0 - 8°	35°	35°	55°	55°
RRC-32	0 - 8°	20°	20°	25°	25°
RRC-63	0 - 8°	20°	20°	25°	25°

(Marks)

α: Over-angle range including estimated oscillating angle tolerance (°)

βL: Max. angle when the switch turns to ON at left rotating end (°)

βR: Max. angle when the switch turns to ON at right rotating end (°)

OL: Max. angle when the switch turns to OFF after reversing to the left from ON position of the right rotating end (°)

θR: Max. angle when the switch turns to OFF after reversing to the right from ON position of the left rotating end (°)

7. OPERATION

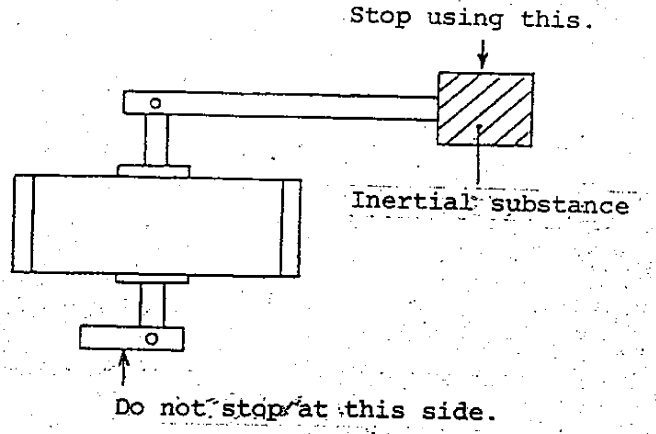
7-1 The feed pressure to Selex Rotary is 0,1 ~ 1,0 MPa . Hence, use within the above pressure range. However, see to it that the operating pressure is over 0,3MPa when using the RRC-8 type at max. oscillating angle.

7-2 The cushion is adjusted for no-load at the time of delivery; use the cushion needle for adjusting the cushion in compliance with the load. The cushion works better when the needle (RRC-32 and RRC-63) is closed (turned clockwise). However, use a buffer when the kinetic energy is larger than the value in Table 1, such as when load is large and the speed is high.

Table 1 Cushion Characteristics

Model No.	Permissible absorbed energy (J)
RRC-8	0,05
RRC-32	0,21
RRC-63	0,41

7-3 When bringing the machine to a forcible stop in the range where cushion does not work, stop directly by means of the oscillating load. Stopping the machine indirectly with the shaft on the opposite side may cause damage to the shaft.



7-4 Adjust the oscillating speed by installing a speed controller as shown in the basic circuit diagram on page 1.

8. PERIODICAL INSPECTION (CHECK)

8-1 Carry out periodical inspections once or twice every year in order to upkeep the Selex Rotary to the optimum operating state.

8-2 Items of inspection

(a) Check the fixing bolts of the main body and the fixing screws in the shaft connecting sections for slackening.

(b) Check to see that the machine functions smoothly.

(c) Check the changes in oscillating speed and cycle time.

(d) Check for external or/and internal leakage.

(e) Check the function of the cushion.

(f) Check the oscillating angle for any abnormality.

Check the above items, and should some trouble be found, see the "Troubleshooting" in item 9.

Note: Carry out additional tightening if the bolts and screws are found to be slackened.

9. TROUBLESHOOTING

Trouble	Cause	Countermeasure
Does not function.	No pressure or inadequate pressure	Supply proper pressure source.
	Signal is not transmitted to the directional control valve.	Correct the control circuit.
	Absence of installation center	Correct the installation.
	Broken piston packing.	Replace the piston packing.
Does not function smoothly.	Speed is below the lowest speed limit.	Ease the load variation.
	Absence of installation center	Correct the installation.
	Exertion of lateral load	See to it that the lateral load is within the specified level.
		Correct the installation.
	Excessive load	Raise the pressure.
		Make selection of proper model No.
	Speed control valve has meter-in circuit.	Change the installation direction of the speed control valve (for meter-out circuit.)
Breakage/ deformation	Impact force due to high speed operation.	Slow down the speed.
		Reduce the load.
		Use more sophisticated cushion mechanism (external cushion mechanism).
	Exertion of lateral load.	Correct the installation, and see to it that the lateral load is within the specified level.

10. MAINTENANCE

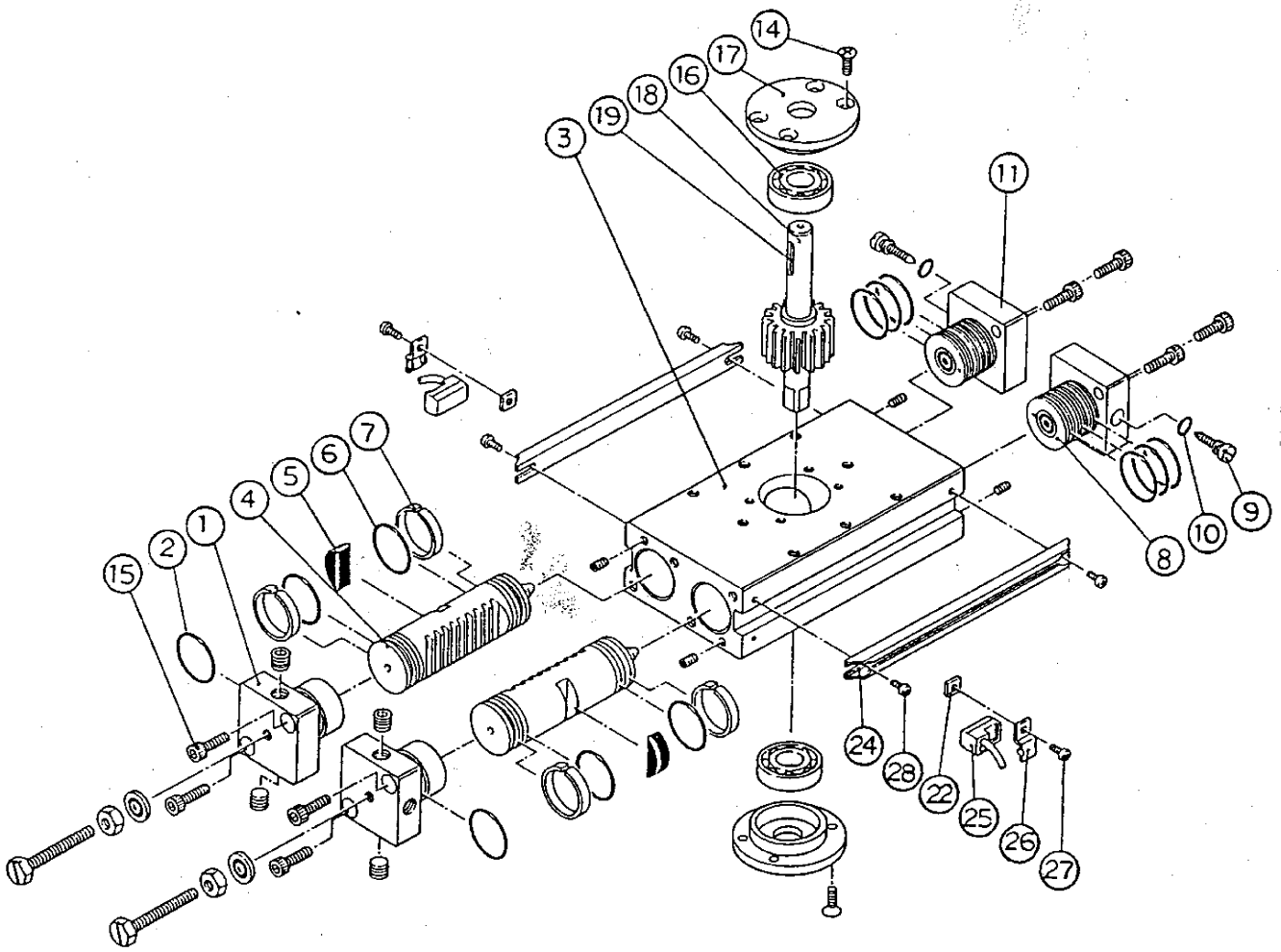
Carry out repairing in the following process should air leakage, etc. occur.

10-1 Get the following tools ready for disassembly

Tools for disassembly

Tool name	Quantity	Place of use (part name)	Model No.
Phillips screw-driver (nominal No. 2)	1	⑭	8, 32, 63
Hexagonal wrench key (nominal No. 3)	1	⑮	8, 32
Hexagonal wrench key (nominal No. 4)	1	⑮	63

10-2 Refer to the following diagram for disassembly.



Part No.	Part name	Material	Remark
1	Cap (2)	A6063	
2	Cap gasket	NBR	
3	Body	A6063	
4	Piston	SUS303	
5	Magnet	DPM-2	
6	Piston packing	NBR	
7	Wear ring	POM	
8	Cushion packing	NBR	Excluding RRC-8
9	Needle	C3604	Excluding RRC-8
10	Needle gasket	NBR	Excluding RRC-8
11	Cap (1)	A6063	
14	Cross recessed oval counter-sunk screw	SWRM	JIS B1111
15	Hex. socket head cap screw	SCM435	JIS B1176

Part No.	Part name	Material	Remark
16	Bearing		
17	Cover	A2011	
18	Shaft	SCM435	
19	Key	S45C	
22	Plate nut	SS41	
24	Switch fixing rail	A6063	
25	Switch		
26	Switch fitted	SUS310	
27	Cross recessed pan-headed machine screw	SWRM	JIS B1111
28	Cross-recessed pan-headed machine screw	SWRM	JIS B1111

10-3 Carry out check of the following items.

(a) Scratch on the piston sliding inner surface of the body

(b) Scratch and wear of the piston surface

(c) Scratch and wear of the wear ring

(d) Play in the shaft key way and the key

(e) Scratch and wear of packings of sliding units and gaskets (piston packing, cushion packing and needle gasket)

10-4 The followings are the expendable parts. Specify the kit No. when placing order.

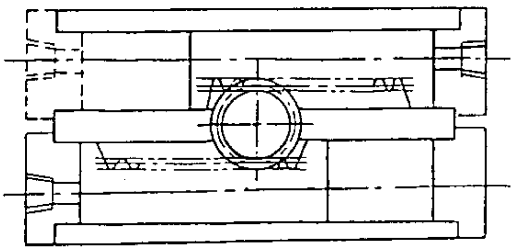
Part No. & Part Name		2	6	7	8	10
Model No.	Kit No.	Cap gasket	Piston packing	Wear ring	Cushion packing	Needle gasket
RRC-8	RRC-8K	AS568-013	PSD-15	F4-130745	—	—
RRC-32	RRC-32K	AS568-016	PSD-20	F4-125610	CP-6	JIS B2401 P-5
RRC-63	RRC-63K	AS568-019	PSD-25	F4-130731	CP-6	JIS B2401 P-5

10-5 Reassembly after disassembly

(a) Assembly of expendable parts:
Apply grease (grease with lithium soap radical) before assembling the expendable parts such as packings, gaskets, etc.
(Ex.: Daphni Colonex No. 1 of Idemitsu Kosan)

(b) Combination of piston (rack) and shaft (pinion)

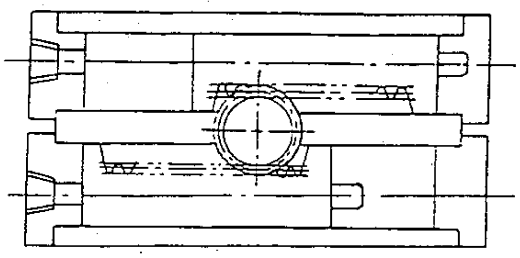
(b-1) For RRC-8 type:



Fit one side of cap (2) to cap (1), and insert the shaft, with the pistons pressed toward cap (2).

The piston position can be slightly shifted for the combination of rack and pinion.

(b-2) For RRC-32 type and RRC-63 type:

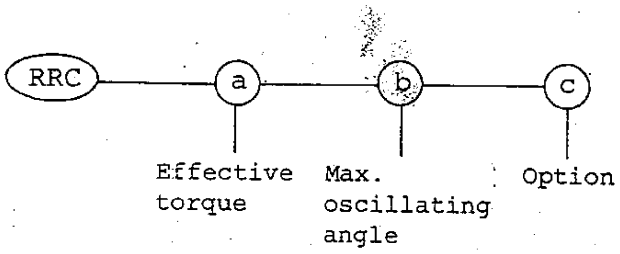


Insert the shaft, with the pistons pressed left and right towards caps (1 and 2).

In this case also, the piston position can be slightly shifted for the combination of rack and pinion.

11. MODEL NO. INDICATING METHOD

Use the following model No. indicating method when placing order.



ⓐ Effective torque		ⓑ Max. oscillating angle		ⓒ Option	
8	0.7 N·m	90	90°	No mark	No option
32	3.1 N·m	180	180°	A	Angle adjuster
63	5.6 N·m	270	270°		