

# USER MANUAL

## Pneumatic actuator - AL 77-200

Manufacturer: Rotork, Sweden Original type: RC

### Type and Design

DA = Double Acting. Actuator with pneumatic operation in both directions.

SR = Spring Return. Actuator with spring return.

RC 210, 230, 250 and 270 have 1 piston.

RC 220, 240, 260, 265 and 280 have 2 pistons.

### Operating Medium

If the operating medium is instrument air, it shall be dust and oil-free. Accepted operating medium: Non-dangerous fluids (group 2 according to directive 97/23/EC). The dew point shall be equal to  $-20^{\circ}\text{C}$  or, at least,  $10^{\circ}\text{C}$  below the ambient temperature. The maximum particle size must not exceed  $40\text{ }\mu\text{m}$ . The exhaust air must pass through a filter silencer before it is let out into the workshop.

### The Application of the Scotch Yoke Construction

The Scotch Yoke of the RC200 actuators has canted slots. Thus the actuator can be given different function depending on how the pistons are mounted in the actuator. The pistons are mounted according to Fig.1, page 2, or Fig.1a, in order to achieve the following functions.

According to Fig.1:

DA-Actuator with adjustable closed valve position (clockwise end of travel).

SRF-Actuator with spring opening (counter clockwise direction), adjustable "closed" valve position (clockwise end of travel).

According to Fig.1a:

DAAO-Actuator with adjustable open valve position (counter clockwise end of travel).

SR-Actuator with spring closing (clockwise direction), adjustable "open" valve position (counter clockwise end of travel).

The possibility to turn the pistons can be used in several ways in order to suit the actuators to the customer's requirements.

### WARNING!

RC actuators must only be used as actuators on valves. Levers, racks and similar cannot be used to transmit movement without protective equipment. Pinch risk in the valve opening when test trimming non-installed valves.

### Manual Operation

#### WARNING!

It is very risky to try to operate the actuator manually by using the key grip on the driving shaft. The accumulated energy inside the actuator may instantaneously be set free.

The actuator can be equipped with handwheel for manual operation, RC-M1. Other methods on request.

#### WARNING!

All manual operations must be carried out with a vented actuator.

### Installation and Adjustment

All types of actuators can be mounted in various positions, e.y. vertical or horizontal. When mounting on a valve, ensure that the actuator shaft and the valve stem are centered, and that a play of 0,5-1 mm exists between shaft and driving bush depending on actuator size. Ensure especially that actuator and driving bush are mounted correctly in relation to each other, considering that the actuator shaft has an octagonal hole and that a faulty mounting of  $45^{\circ}$  is possible. This naturally also applies to direct mounting on a valve. The guide ring (37) can be dismantled when not in use. After mounting, it may be necessary to adjust the turning angle of the actuator.

#### Tightening torques for lock nuts on page 6.

As mentioned previously, the DA actuators can, as standard, be adjusted in "closed" valve position and the SR actuators in "open" position. The adjustment occurs by loosening the lock nut on the end plate, after which the set screw is turned clockwise for reduced and anti-clockwise for increased rotary motion. The adjustment degree is  $\pm 3^{\circ}$ . RC220, 240, 260 and 280 have two adjustment screws.

**It is important that both screws are in contact with the piston in question.**

The actuator is supplied with an indicator on the driving shaft. The indicator can be mounted in 2 optional positions for different valve functions, mounting directions, etc.

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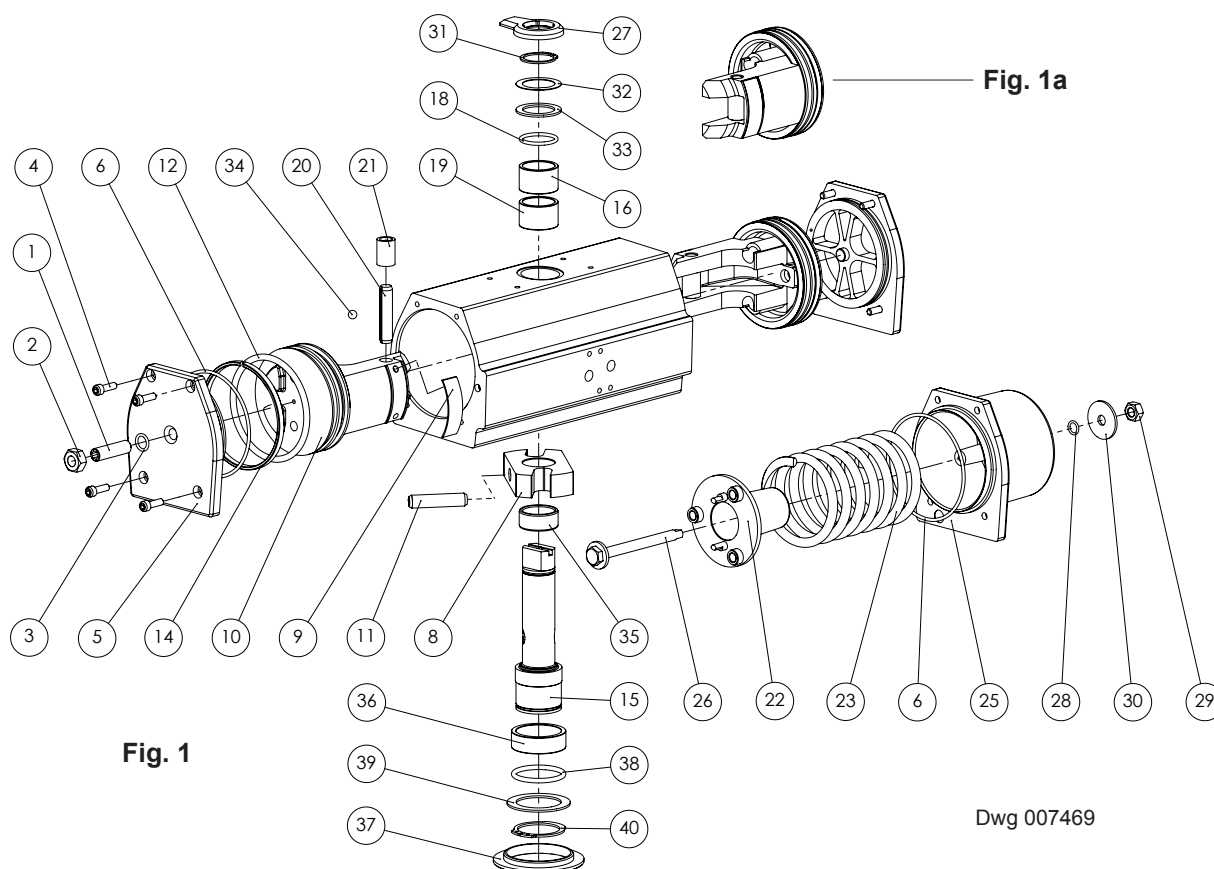


Fig. 1

Dwg 007469

### Service of RC210-280

#### WARNING!

Before dismantling, check that the compressed air and possible power supply are disconnected.  
Dismantling of SR unit, see instruction on page 5.  
Dismantling of SR unit with manual operation unit type M1, see instruction on page 4.

#### Exchange of Piston Sealings and Support Elements

1. Please read the warning above!
2. Dismantle the actuator from the console.
3. Dismantle the end plates (5) or the spring houses (25).
4. Fasten the actuator shaft between soft jaws in a vice and turn the actuator until the pistons reach the cylinder end. Then place a few rods in the holes on the outside of one piston. By pressing together and pulling these rods simultaneously, the piston is dismantled from the cylinder.
5. If the piston O-ring (12) is worn, it must be replaced.
6. Replace the support band (14) if it is worn.
7. Replace the support element (9) if it is worn.
8. Grease the cylinder surface with a grease according to the lubrication list on page 6.
9. Fit piston/s correctly positioned, see "The Application of the Scotch Yoke construction".
10. Fit the end plate/s or spring pack/s and adjust the shaft turning angle.

#### Exchange of Shaft Sealings and Support Washers

The O-rings (18) and (38) and the support washers (33) and (39) can easily be replaced as below.

1. Please read the warning on the left!
2. Dismantle the actuator from the console.
3. Dismantle the retaining rings (31) and (40) around the shaft.
4. Dismantle the worn details.
5. Fit the new O-rings (18) and (38).
6. Fit new washers under the retaining rings.
7. Use a grease according to the lubrication list on page 6 when mounting.
8. Fit the new retaining rings.
9. **Check that the retaining rings are tightly fitted without play in their grooves.**

#### Exchange of Shaft Bearings

The bearings (16) and (36) and also the support ring (19) on the RC210-240 can easily be replaced when the pistons and shaft sealings are dismantled as above. For larger actuators, please contact the supplier.

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### Material Table for RC210-280

Part No	Description	Number DA	Number SR	Material	Surface treatment
1	Adjusting screw <sup>1</sup>	1	-	Size 210–260: Stainless steel Others: Steel	- Zinc plated
2	Lock nut <sup>1</sup>	1	-	Size 210–260: Stainless steel Others: Steel	- Zinc plated
3	O-ring <sup>1,6</sup>	1	-	Nitrile	-
4	Screw	8-16	8-16	Size 210–260: Stainless steel Others: Steel	- Zinc plated
5	End plate with centre hole <sup>1</sup>	1	-	Aluminium	Powder coated
6	O-ring <sup>6</sup>	2	2	Nitrile	-
7	Cylinder	1	1	Aluminium	Anodized
8	Scotch Yoke	1	1	Steel	-
9	Support element <sup>1,6</sup>	1	1	POM	-
10	Piston <sup>1</sup>	1	1	Aluminium	-
11	Roll pin, double <sup>2,3</sup>	1	1	Spring steel	-
12	O-ring <sup>1,6</sup>	1	1	Nitrile	-
14	Support band <sup>1,6</sup>	1	1	Polymer material	-
15	Driving shaft	1	1	Size 210–260: Stainless steel Others: Steel	- Zinc plated, yellow chromated
16	Bearing, upper	1	1	Polymer material	-
17	End plate without centre hole <sup>4</sup>	1	1	Aluminium	Powder coated
18	O-ring, upper <sup>6</sup>	1	1	Nitrile	-
19	Support ring, upper	1	1	Polymer material	-
20	Piston pin <sup>1</sup>	1	1	Steel	-
21	Piston roller <sup>1</sup>	1	1	Steel	-
22	Spring guide <sup>1</sup>	-	1	Aluminium	-
23	Spring, external <sup>1</sup>	-	1	Alloyed spring steel	Corrosion protected
24	Spring, internal <sup>1,5</sup>	-	1	Alloyed spring steel	Corrosion protected
25	Spring housing <sup>1</sup>	-	1	Aluminium	Powder coated
26	Pre-tensioning screw <sup>1</sup>	-	1	Size 210–260: Stainless steel Others: Steel	- Zinc plated
27	Indicator	1	1	Polymer material	-
28	O-ring <sup>1,6</sup>	-	1	Nitrile	-
29	Lock nut <sup>1</sup>	-	1	Size 210–260: Stainless steel Others: Steel	- Zinc plated
30	Marking washer <sup>1</sup>	-	1	Aluminium	Anodized
31	Retaining ring, upper <sup>6</sup>	1	1	Spring steel	Corrosion protected
32	Middle washer <sup>6</sup>	1	1	Stainless steel	-
33	Support washer, upper <sup>6</sup>	1	1	Polymer material, chemically resistant	-
34	Sealing <sup>1</sup>	1	1	Size 210–240: Stainless steel Others: Nitrile	- -
35	Support ring, lower	1	1	Polymer material	-
36	Bearing, lower	1	1	Polymer material	-
37	Guide ring	1	1	Polymer material	-
38	O-ring, lower <sup>6</sup>	1	1	Nitrile	-
39	Support washer, lower <sup>6</sup>	1	1	Polymer material, chemically resistant	-
40	Retaining ring, lower <sup>6</sup>	1	1	Spring steel	Corrosion protected

1) For actuator sizes 220, 240, 260 and 280: The double amount of details. 2) RC240 has triple roll pins. 3) RC270–280 have a slotted pin in steel.

4) Not in the picture! Do not exist for sizes 220, 240, 260 and 280. 5) Only for sizes 270 and 280, not in the picture. 6) Included in seal kit.

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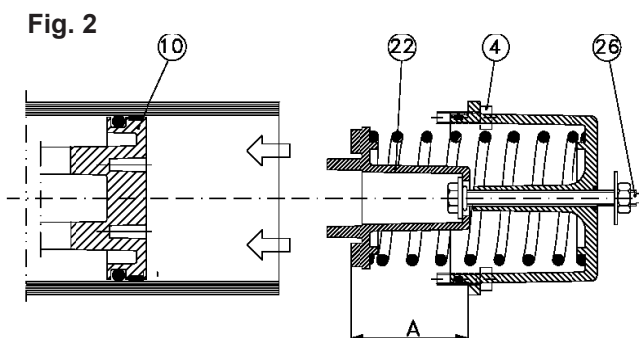
Manufacturer: Rotork, Sweden Original type: RC

### Converting to SR Actuators

All DA actuators can be changed into SR actuators by adding spring conversion kits according to the following instruction:

1. Please read the warning on page 2!
2. Dismantle the end plates. (The description is for RC220, 240, 260 and 280 which have two pistons).
3. Dismantle the pistons. See text under "Exchange of piston sealings and support elements".
4. Mount the pistons according to figure 1 on page 2.
5. Check that the spring is correctly pre-tensioned according to table 1 and figure 2.
6. The spring guide (22) is centered towards the piston with the aid of 2 pins.
7. The SR units on sizes 230–280 must be turned so that one of the three support points lies between the bosses on the piston (10).
8. Mount the SR unit when the pistons are in their innermost position.
9. Put the screws (4) in place. When tightening the screws, the spring force is transmitted from the tensioning screw (26) to these screws.
10. The turning angle of the actuator is adjusted with the tensioning screw (26).

**Tightening torques according to table on page 6.**



Adjustment is made with screw (26).

**Table 1**

RC200-SR actuator	A
RC210-220	41
RC230-240	62
RC250-260	87
RC270-280	137

### Instructions for Dismantling of RC200-SR Actuators with Manual Operation Unit Type M1

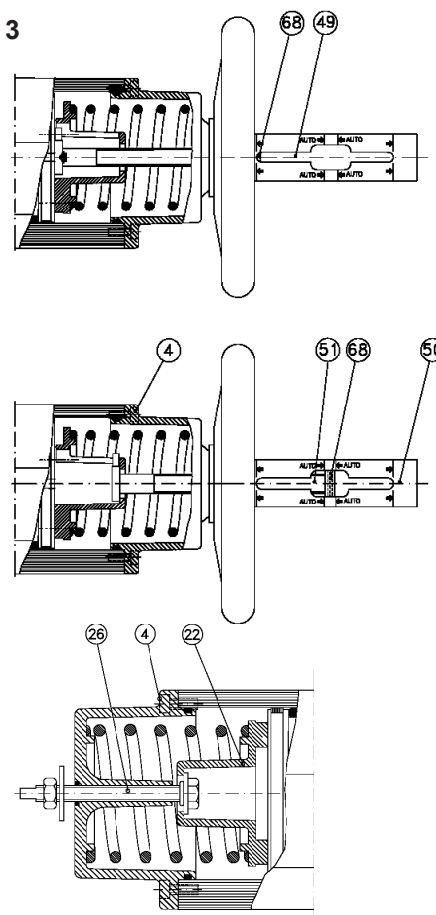
#### WARNING!

Do not remove the protective tube (50) and handwheel from the spring housing as long as the springs are tensioned. This procedure must be followed for safe dismantling of pre-tensioned spring housings.

1. The actuator must be pressureless.
2. Check that the springs can press the piston back into its starting position according to figure 3.  
The upper shaft journal must not be oblique.
3. Disconnect possible power supply.
4. Turn the handwheel so that the threaded stem (51) moves toward the actuator until it stops and the yellow marker (68) can just barely be seen in the plastic tube (49).
5. For sizes RC220, 240, 260 and 280 (i.e. actuators with two pistons): adjust the tensioning screw (26) in the opposite spring housing anti-clockwise until it lies against the spring guide (22). Dismantle the spring housing by loosening the screws (4).
6. For all sizes: then turn the handwheel until there is resistance and the yellow marker (68) can be seen within the "AUTO" position.
7. Dismantle the spring housing of the manual override by loosening the retaining screws (4) and turning the handwheel several turns in the direction which gives the least resistance.

Dismantling must be carried out in the above order with the utmost care. In the case of the slightest uncertainty - contact the supplier.

**Fig. 3**



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## Pneumatic actuator - AL 77-200

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### Instructions for Dismantling of RC200-SR Actuators

RC 210, 230, 250 and 270

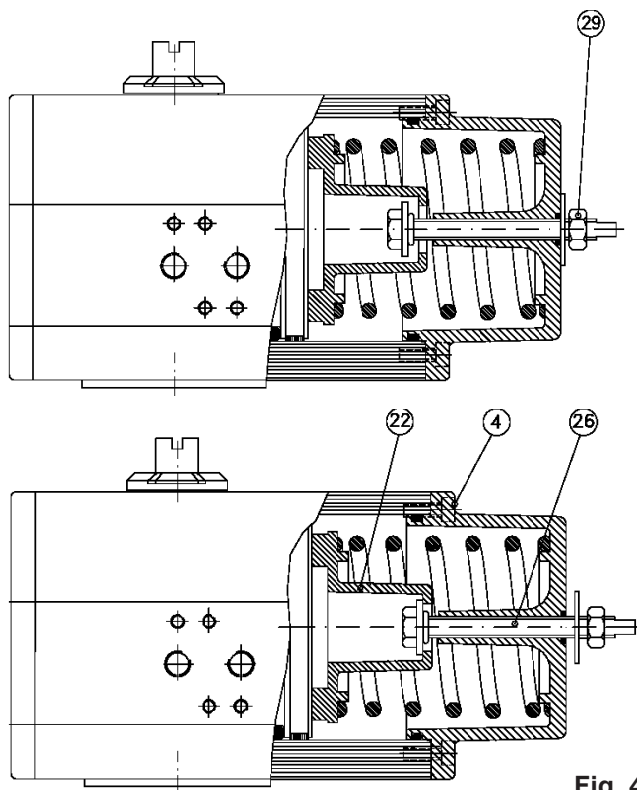


Fig. 4

#### WARNING!

The procedure below must be followed for safe dismantling of pretensioned spring housings.

1. The actuator must be pressureless.
2. Check that the springs can press the piston into starting position according to figure 4.
3. Disconnect all possible power supply.
4. Loosen the lock nut (29).
5. Turn the tensioning screw (26) anti-clockwise until it lies lightly against the spring guide (22).
6. Dismantle the spring housing by loosening the screws (4).
7. Dismantling must be carried out with the utmost care. In the case of the slightest uncertainty - contact the supplier.

RC 220, 240, 260 and 280

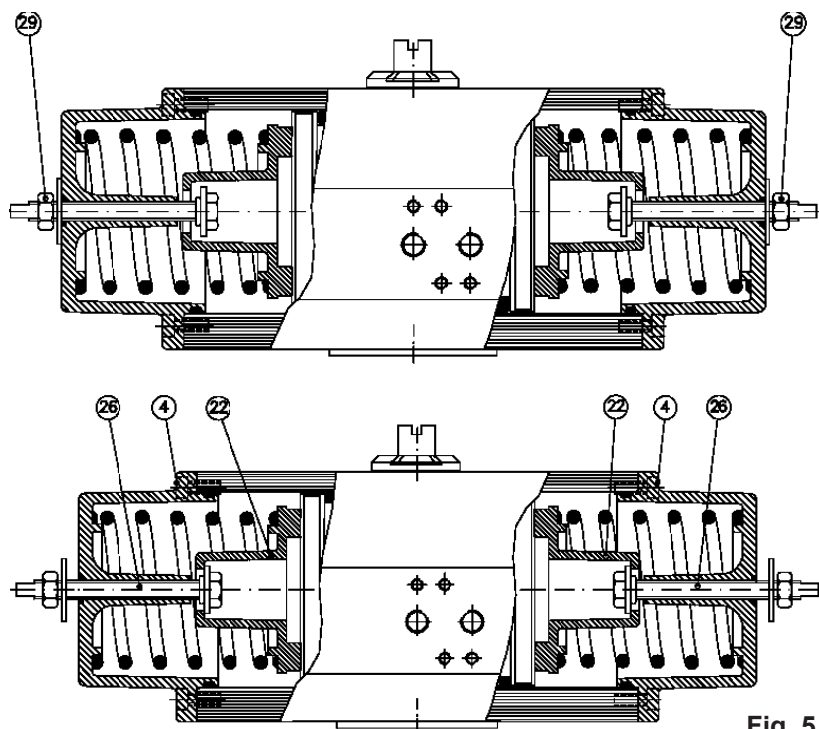


Fig. 5

#### WARNING!

The procedure below must be followed for safe dismantling of pretensioned spring housings.

1. The actuator must be pressureless.
2. Check that the springs can press the piston into starting position according to figure 5.
3. Disconnect all possible power supply.
4. Loosen the lock nuts (29).
5. Turn both spring tensioning screws (26) clockwise until they lie lightly against the spring guides (22).
6. Turn the left spring tensioning screw (26) anti-clockwise until it lies lightly against the spring guide (22) and dismantle the left spring housing by loosening the screws (4).
7. Dismantle the right spring housing in the same manner as the left one.
8. Dismantling must be carried out with the utmost care. In the case of the slightest uncertainty - contact the supplier.



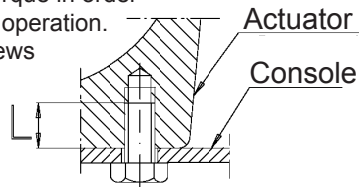
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### Tightening Torques for Screws and Lock Nuts

The actuators must be screwed onto the console with the correct tightening torque in order to remain stable during operation. Please use as long screws as possible without the threads grounding.



"L" is the screw length according to drawing.

### Tightening Torques

Actuator	Screw (4)	Lock nut DA (2)	Lock nut SR (29)
RC210-220	4	17	7
RC230-240	4	33	17
RC250-260	17	90	33
RC265	23 17 <sup>1</sup>	55	55
RC270-280	76 55 <sup>1</sup>	120	120

1) Tightening torque with Stainless steel screw. A2 70 quality.

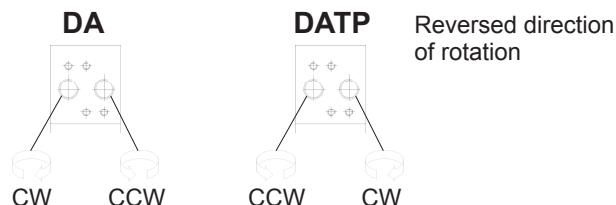
Resistance class min. 8.8. Lightly oiled screws.

### Tightening Torques in Nm

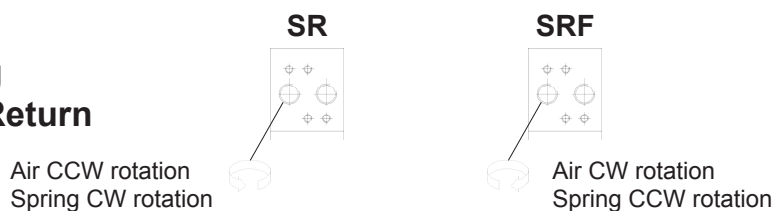
Actuator	DIN flange	Thread	L max (mm)	Screw length (mm)									
				8	10	12	14	16	18	20	24	28	32
RC210-220	F05	M6	11	8,8	9,2	-	-	-	-	-	-	-	-
RC210-220	F07	M8	14	-	21	23	23	-	-	-	-	-	-
RC230-240	F07	M8	14	-	21	23	23	-	-	-	-	-	-
RC230-240	F10	M10	17	-	-	40	45	45	-	-	-	-	-
RC250-260	F10	M10	17	-	-	40	45	45	-	-	-	-	-
RC250-260	F12	M12	21	-	-	-	60	70	75	75	-	-	-
RC265	F12	M12	21	-	-	-	60	70	75	75	-	-	-
RC270	F14	M16	25	-	-	-	-	125	140	155	185	-	-
RC270	170x110	M16	25	-	-	-	-	125	140	155	185	-	-
RC280	F12	M12	25	-	-	-	-	70	75	75	75	-	-
RC280	F16	M20	32	-	-	-	-	-	-	-	280	330	360
RC280	F25	M16	25	-	-	-	-	125	140	155	185	-	-

### Air Connections

#### Double Acting



#### Single Acting with Spring Return



### Lubrication

RC actuators are permanently lubricated and additional lubrication is normally not required. However, for actuators performing 100,000 operation cycles or more under very heavy load, an oil mist lubrication is recommended.

Oil mist lubrication requires a mineral oil type ISO VG32 according to DIN 51524HLP for usage in temperature range -10 to +70 °C. Oil mist lubricator must be set at lowest possible value. Commenced oil mist lubrication must continue.

If the actuator is equipped with pneumatic or electropneumatic positioner, oil mist must not be used.

### Recommended Lubrication Grease

Cylinder bore and drive shaft with shaft sealings	Grease
RC200 Standard	Klübersynth AR 34-402
RC200 high temp	Klübertemp HM 83-402
RC200 low temp	Klüber Isoflex Topas NCA 52

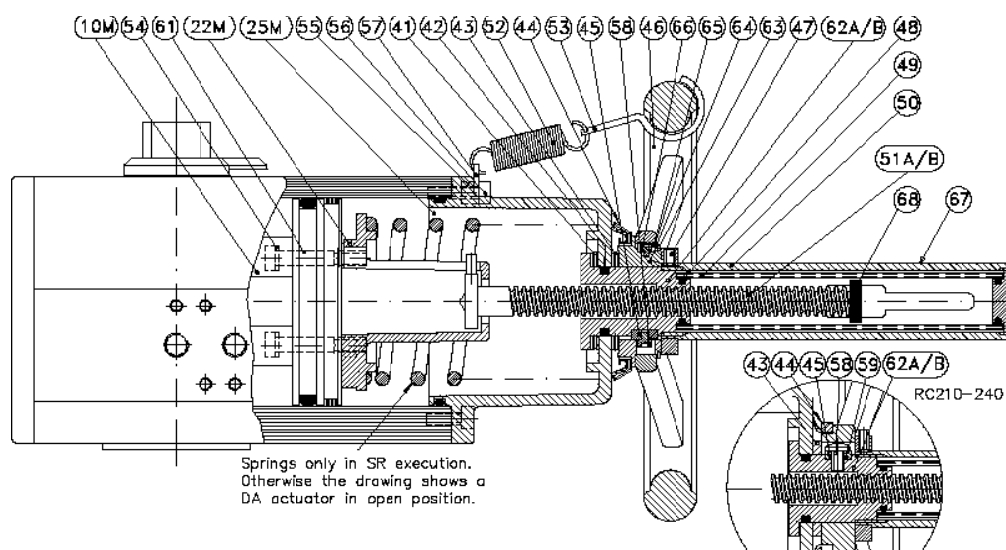
Piston roller (21) + bearing	Grease
All RC200	Cargo Red Grease

Oil mist lubrication and grease containing polyglycole, ester or other aggressive additives shall be avoided.

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### Material Table for RC210-280 M1

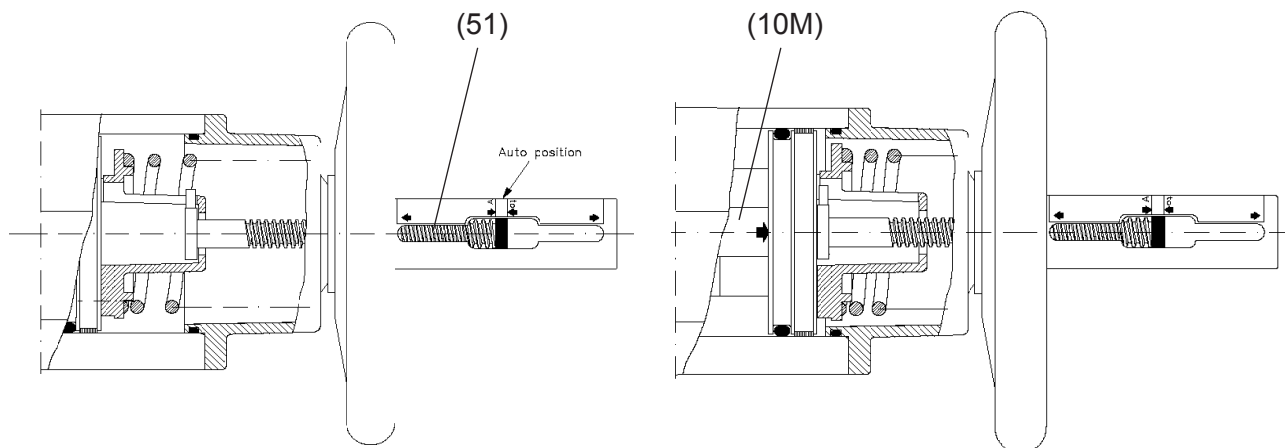
Part No	Description	Number	Material	Surface treatment
10M	Piston M	1	Aluminium	-
22M	Spring guide M	1	Aluminium	-
25M	Spring housing M	1	Aluminium	Powder coated
41	Needle roller bearing RC250-280	1	Ball bearing steel	-
42	O-ring	1	Nitrile	-
43	Needle roller bearing RC250-280	1	Ball bearing steel	-
43	Slide bearing RC210-240	1	Bronze	-
44	Cuff sealing	1	Nitrile/Steel	Zinc plated
45	Key	2	Steel	-
46	Handwheel	1	Aluminium RC280: Steel	Anodized Powder coated
47	Set screw	1	Stainless steel	-
48	O-ring	1	Nitrile	-
49	Tube, transparent	1	Acrylic Plastic	-
50	Protecting tube	1	Aluminium	Anodized
51A	Stem, DA (right threaded)	2	Steel	-
51B	Stem, SR (left threaded)	1	Steel	-
52	Spring	1	Stainless spring steel	-
53	Locking hook	1	Stainless steel	-
54	Tredo-sealing	2	Nitrile/Steel	Zinc plated
55	Spacer, RC210-260	1	Stainless steel	-
56	Screw, RC210-260	1	Stainless steel	-
57	Spring Holder	1	Stainless steel	-
58	Screw	1	Steel	Zinc plated
59	O-ring, RC210-240	1	Nitrile	-
61	Screw	2	Steel	Zinc plated
62A	Stem nut, DA (right threaded)	1	RC210-240: Brass	-
			RC250-280: Ductile iron	Zinc plated
62B	Stem nut, SR (left threaded)	1	RC210-240: Brass	-
			RC250-280: Ductile iron	Zinc plated
63	Retaining ring, RC250-280	1	Steel	Corrosion protected
64	Handwheel bushing, RC250-280	2	Aluminium	Anodized
65	Key	1	Steel	-
66	Screw, RC250-280	1	Steel	Zinc plated
67	Label	1	Polymer material	-
68	Indication ring	1	Polymer material, yellow	-

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### Function RC-M1

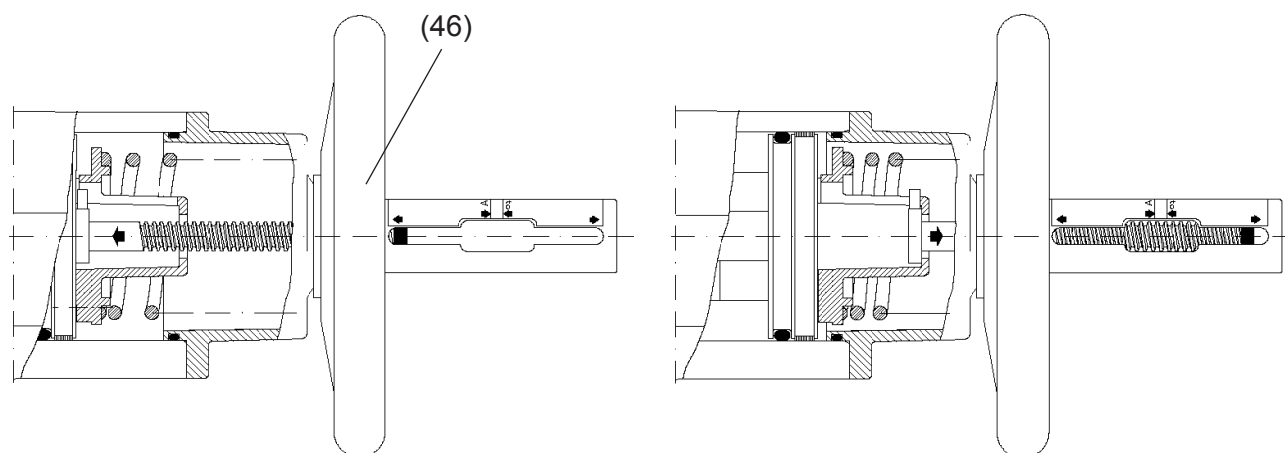


#### Neutral Position

With the stem (51) in Auto position, the piston (10M) can move freely and the actuator can be operated pneumatically. The picture shows a double acting actuator, DA, in "open" position or a single acting actuator, SR, in "closed" position.

#### End Position Adjustments

M1 in Auto position works as an end position stop.  
DA: Adjustment of closed valve position.  
SR: Adjustment of open valve position.  
Adjustment degree:  $+3^\circ$  /  $-90^\circ$  in relation to the end position.



#### Manual Operation

DA: The handwheel (46) is turned anti-clockwise. The stem (51) and piston (10M) are pressed inwards. The valve opens.  
SR: The handwheel is turned clockwise. The stem and piston are pressed inwards. The valve closes.

#### Manual Operation

DA: The handwheel is turned clockwise. The stem and piston are drawn outwards. The valve closes.  
SR: The handwheel is turned anti-clockwise. The stem and piston are drawn outwards. The valve opens.

The actuator (15) shaft is thus turned in the same direction as the handwheel.  
When the actuator has been operated manually, a return to the Auto position must take place before remote operation can be performed again.  
On dismantling the manual operation housing (25M), the actuator **must** first be ventilated, for SR actuators the stem (51) **must** also be in Auto position.

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