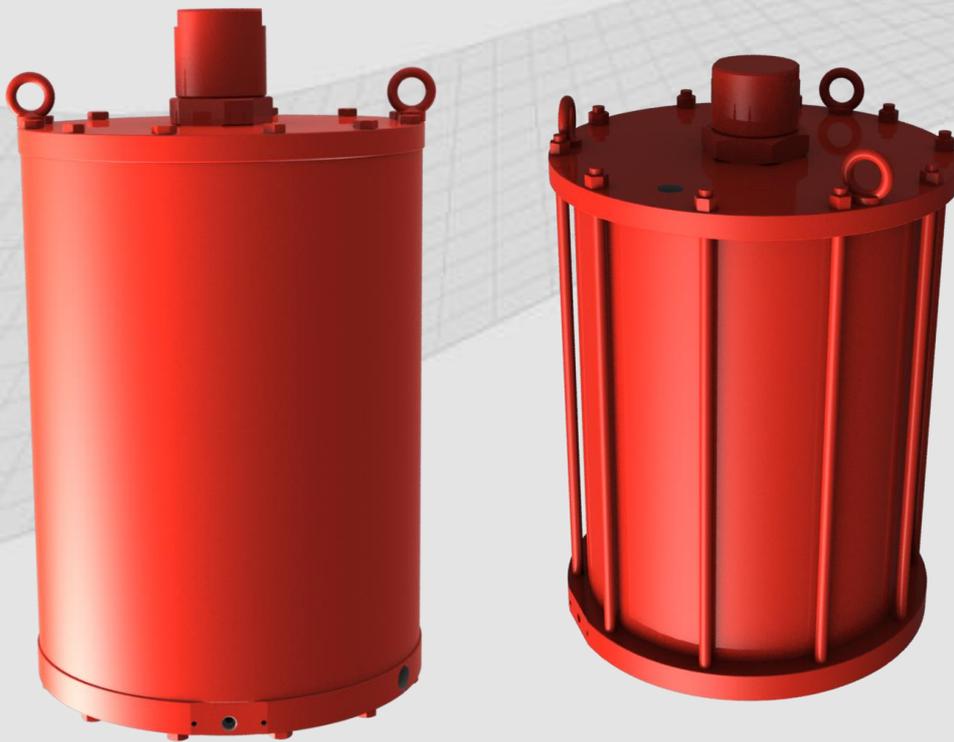


***PNEUMATIC COMPACT
ACTUATOR (CQP)***

Single Spring Version & Double Acting



Installation, Commissioning & Maintenance
Manual

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This manual contains important safety information. Please ensure it is thoroughly read and understood before installing, operating or maintaining the equipment.

Rotork Fluid Systems reserves the right to modify, amend and improve this manual without notice.

Rotork Fluid Systems is not responsible for damage or injury caused by the failure to observe the instructions contained herein.

Introduction

This manual covers the Pneumatic Compact Spring Return Actuator (single Spring configuration) Range and Double Effect Actuator range.

The Compact Actuator (single spring configuration and double effect) can be available in two different versions:

- Type A CQP Actuator
- Type B CQP Actuator

TYPE A Actuator is characterized by the presence of external tie rods.

TYPE B actuator is provided with threaded flanges screwed to the cylinder tube, instead of external tie rods.

For what concern the operating principle and characteristics, Type A and Type B versions of the Compact actuator are identical. According to that reason only one type of actuator is represented for parts of this manual that apply to both versions without any differences.

Differences between two versions are clearly specified only where necessary.

In this manual, warning indications are represented by icons, according to ISO 7010 Safety Signs:



Generic Danger



Hand Crush / Pinch Point



Electrocution



Explosive Material

- EN 61241-14: Installations and maintenance electrical devices in the areas with the dust risk explosion.
- UNI EN ISO 7010: Safety Signals.

CUSTOMER SERVICE

For technical assistance, please contact the Rotork Fluid Systems Customer Service:

E-mail: [rfs.international@rotork.com](mailto: rfs.international@rotork.com)

Rotork Fluid Systems, Tassignano, Lucca, IT tel: +39 0583 9306447

Rotork plc, Brassmill Lane, Bath, UK. Tel +44 (0)1225 733200

STANDARDS & REGULATIONS

Actuators destined for European member states have been designed, built and tested according to the Quality Control System, in compliance with the EN ISO 9001:2008 standard and with the following regulations/directive.

- 2006/42/EC: Machinery Directive.
- 97/23/EC: Pressure Equipment Directive (PED) (if applicable).
- 94/9/EC: Directive for safety equipment and systems to be used in potentially explosive atmospheres (ATEX).
- 2004 /108/EC: Electromagnetic Compatibility Directive.
- EN ISO 12100: Safety of machinery -- General principles for design -- Risk assessment and risk reduction.
- EN 60079-14: Explosive atmospheres - Part 14: Electrical installations design, selection and erection.
- EN 13463-1: Non - electrical equipment intended for use in potentially explosive atmospheres.
- EN 1127-1: Explosive atmospheres – Explosion prevention and protection.
- EN 13463-5: Non electrical equipment for use in potentially explosive atmospheres.

General Information

This manual is produced to enable a competent user to install, operate and maintain the Rotork Fluid Systems Pneumatic Compact Actuator (CQP).

The mechanical installation should be carried out as outlined in this manual and also in accordance with any relevant national standard codes of practice.

Maintenance and operation should be carried out in accordance with the National Legislation and Statutory Provisions relating to the safe use of this equipment, applicable to the site of installation.

Any inspection or repair in a Hazardous Area should not be undertaken unless it conforms to National Legislation and Statutory Provisions relating to the specific Hazardous Area.

Only Rotork approved replacement parts should be used. Under no circumstances should any modification or alteration be carried out on the equipment, as this could invalidate the conditions under which its certification was granted.

Only trained and experienced operators should be allowed to install, maintain and repair Rotork Actuators. Work undertaken must be carried out in accordance with instructions in this manual. The user and those persons working on this equipment should be familiar with their responsibilities under any statutory provisions relating to the Health and Safety of their workplace.

Operators should always wear appropriate Personal Protection Devices (PPDs) in line with the existing plant regulations.

APPROPRIATE USAGE

Rotork Pneumatic Compact Actuator is a new concept device which transforms the linear input into a rotatory movement to operate various valve types of various dimensions.



Improper use can damage the equipment or cause dangerous situations for health and safety. Rotork Fluid Systems declines any responsibility for damage to people and/or objects resulting from the use of the equipment for applications different from those described in the present manual.

Health & Safety



Before installing the equipment, verify it is suitable for the intended application. If unsure consult Rotork Fluid Systems.

RESIDUAL RISKS

Residual risks resulting from equipment risk evaluation performed by Rotork Fluid Systems.

THERMAL RISKS

Risk Hot/Cold surface during normal operation (RES_01).
Preventive measures Operators should wear protective gloves.

NOISE

Risk Noise >85 dB during operation (RES_05).
Preventive measures Operators should wear ear protections.
Operators should not stand near the equipment during operation.

HEALTH RISKS

Risk Pressurized fluid ejection during normal operation (RES_02).
Preventive measures All fittings must be properly sealed. All fixing clamps must be correctly tightened and sealed.
Risk Risk of intoxication (according to the type of medium utilized) (RES_06).
Preventive measures Operators must use P.P.Ds and any other equipment (breathing apparatus) based on the type of supply medium.

MECHANICAL RISKS

Risk: Uncontrolled movement (remote operation) (RES_03).
Preventive measures: Assure that the actuator can not be operated remotely. Prior to starting, remove pneumatic supply, vent all pressure vessels, and remove electrical power.
Risk Presence of moving parts (Mechanism, in the valve adapter) (RES_04)
Preventive measures Do not perform start-up or test the actuator if the cylinder tube is removed.
Risk: Loss of stability with possible parts projection (RES_08).
Preventive measures Do not disassemble the actuator in case of malfunctioning. Follow instructions in the present manual and contact Rotork Fluid Systems.
Risk: Presence of potential energy (RES_10) during dismantling.
Preventive measures Do not disassemble the actuator during dismantling. Follow instructions in the present manual and contact Rotork Fluid Systems.

VIBRATION RISKS

Risk: Vibration risk (RES_11).
Preventive measures: Foresee periodic maintenance procedure to verify tightening.

Labels & Nameplates

The following label is applied externally to the Actuator:

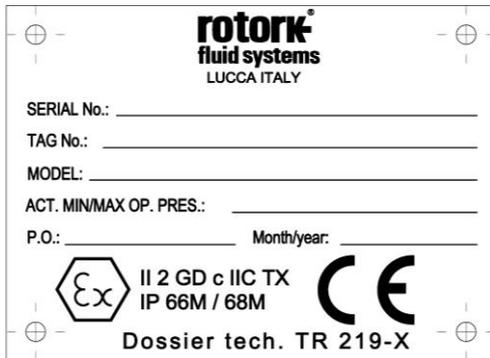


Figure 1: Actuator label

The TX surface temperature class is not provided since the actuator has not internal heat source. Maximum actuator temperature is near the environmental or exercise fluid temperature, whichever is the greater. Normal operating temperature is about -30°C to +100°C. Temperature range is specified within the project specific technical documentation. Special applications out of previous range are available upon request.

ATEX plate does not indicate the maximum environmental and/or exercise fluid temperature; this information is reported within the project specific technical documentation

IP grade protection: IPX8M is related to submersion of 1 meter for 72 hours.

For CE (PED) marked actuator the following label is used:

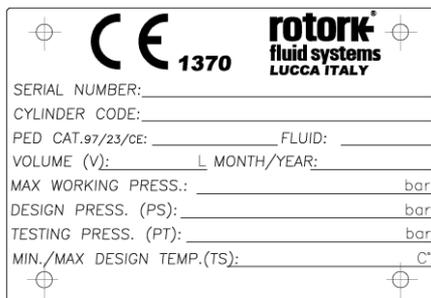


Figure 2: Actuator PED label

It is not allowed to remove the label.

OPERATING LIMITS

Temperature: -30°C and +100°C for standard applications
-20°C to +100°C for PED applications

Design pressure: 12 barg



Do not use the equipment outside its operating limits

ALLOWED FLUID TYPES

The pneumatic actuator is designed to be operated with dry air or dry, sweet natural gas with particles filtering $\leq 40 \mu\text{m}$ (Class 7 according ISO 8573-1, table 1), pressure dew point $\leq -20^\circ\text{C}$ (Class 3 according ISO 8573-1, table 2), total concentration of oil $\leq 5 \text{ mg/m}^3$ (Class 4, according ISO 8573-1, table 3); if not differently specified in specific project documentation

EXPECTED LIFETIME

Expected Lifetime greater than 25 years, in normal service conditions and with planned maintenance.

TIGHTENING TORQUE CHART

RECOMMENDED TIGHTENING TORQUE (Class 8.8 bolts)		
Bolt size	NM	FT. LBS
M6	8.5	6
M8	20	15
M10	40	30
M12	55	40
M14	110	81
M16	220	162
M20	430	317
M22	425	313
M24	585	431
M27	785	579
M30	1250	921
M33	1400	1030
M36	1750	1290

Handling & Lifting



Only trained and experienced personnel should handle/lift the actuator.

The actuator is supplied packed on pallets suitable for normal handling.



Handle the actuator with care.
Never stack pallets.

LIFTING RECOMMENDATIONS

- The lifting device and the sling must be suitably rated for the actuator weight and dimensions.
- Do not use damaged sling(s).
- The sling must not be shortened with knots or bolts or any other makeshift device.
- Do not use pneumatic piping or electric cabling for lifting purposes.
- Do not drill holes, weld eye bolts or add any other type of lifting device on the actuator external surface.
- Do not lift the actuator and valve combination with the actuator lifting lugs. Only lift the actuator/valve assembly using the valve lifting lugs.
- Every assembly must be estimated separately for a safe and correct lifting.
- Avoid pulls or abrupt movements during lifting. Avoid pushing the load.
- During lifting operations, do not handle the slings and/or the actuator.



Do not step underneath suspended load.

LIFTING INSTRUCTIONS

Note: Indication of Weight, Center of gravity, lifting points are reported within specific project documentation. Consult the project specific documentation before lifting.

- Prior to lifting the actuator, remove electrical power and vent all pressure vessels (if present).
- Hook a double chain sling on the lifting lugs as shown in Figure 3.



The actuator must remain vertical; balance the load.

- Angle β must be between 0° and 45° as shown in Figure 4.



Figure 3: Vertical Lifting

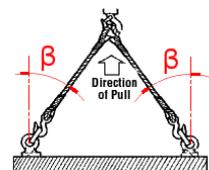


Figure 4: Lifting angle

Actuator can be lifted and installed also in horizontal position, according to the valve and pipeline installation.

To lift the actuator in horizontal mode:

- Remove the two plugs on threaded holes, that will be used for lifting, on bottom and end flange.

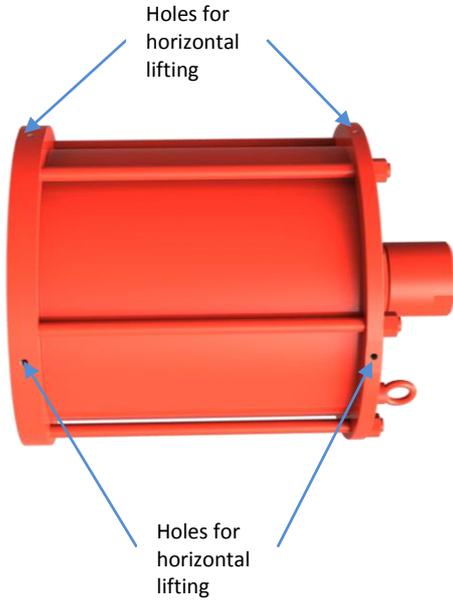


Figure 5: Holes for horizontal lifting

- Install two lifting lugs of proper dimensions on opposite threaded holes on bottom and end flange (lifting lugs are not provided with the actuator)
- Hook a double chain sling on the lifting lugs as shown in Figure 6



The actuator must remain horizontal; balance the load.

- Angle β must be between 0° and 45° as shown in Figure 4



Figure 6: Horizontal lifting

Storage

Rotork Fluid Systems actuators have been fully tested before leaving the factory.

In order to keep the actuator in good condition until installation, at least, the following measures are recommended:

- Check presence and assembling of dust plugs.
- Keep the actuator on shipping pallet until installation.



Never put the actuator directly on the ground.

- Protect the valve coupling area (adapter flange) with rust preventive oil e.g. Mobilarma LT or equivalent.
- Protect against weather action, covering the actuators with appropriate polyethylene sheets.
- Check the actuator condition every 6 months and verify the above protection measures remain in place.



Remove package only at the installation time.

Long Term Storage

If long term storage is necessary, further operations must be carried out to maintain the actuator in a good working condition:

- Replace the plastic plugs with metal plugs.
- Stroke the actuator every 12-months:
 - Cycle the actuator (filtered, dehydrated air) to the working pressure indicated on the name plate.
 - Cycle the actuator with all the existing controls (i.e. two complete strokes - one open, one closed) at least 5 times.
 - Disconnect the pneumatic and electric (if present) supply from the actuator, and carefully close all the threaded connections of the actuator.
- Remove electrical components covers (if present) to ensure control terminals are clean and free from oxidation and humidity. Reassemble the covers.
- In case of storage for over 12 months prior to installation, it is recommended to operate the actuator to verify correct operation.

Installation on valve

Before proceeding, read and follow out the Health and Safety information.

Note: The pipeline valve should be properly secured prior to perform following operations according to instructions provided by the Valve's Manufacturer.



Prior to performing any operations check the operating drawings and TAG numbers. Consult Rotork Fluid Systems for any additional information.

PRELIMINARY ACTIONS



Verify the ATEX classification of the actuator is compatible with the plant zoning. Refer to actuator nameplate.

- The centreline of the cylinder is usually aligned to the centreline of the associated pipe work.
- Ensure all fasteners are adequately tightened, to avoid loosening during operation, taking into account the vibrations induced by the dynamics of the pipeline.
- Piping used to provide pneumatic supply to the actuator must be free from contaminants and debris. Ensure tubing runs are adequately fastened and supported to minimize repetitive stress induced by the dynamics of the pipeline.
- Ensure there are no leaks from any pneumatic connections. Tighten as required.

INSTRUCTIONS

The assembling can be performed by direct mounting using the actuator housing flange with threaded holes and valve adapter.

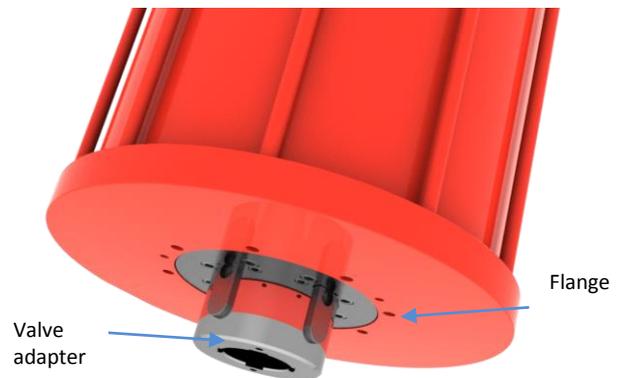


Figure 7: Valve adapter- particular (Type A actuator)

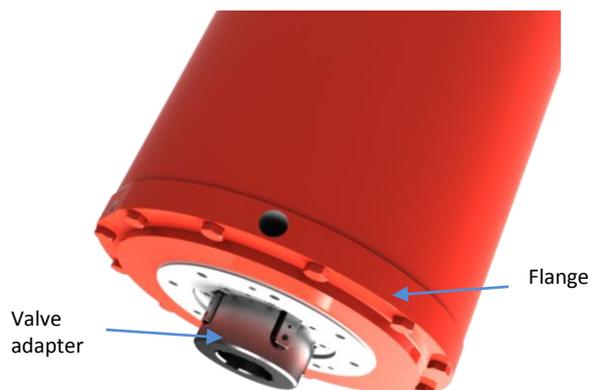


Figure 8: Valve adapter- particular (Type B actuator)

The assembly position of the actuator must be in accordance with the actuator design, plant requirements and the valve model.

In order to assemble the actuator onto the valve, proceed as follows:

- Verify the coupling dimensions of the valve flange and stem; they must meet the actuator coupling dimensions.
- Set the valve in the closed position. The actuator is supplied in the closed position. Check the position of the actuator

by means of the position indicator on the limit switch (if present).

- Clean the coupling flange of the valve and remove anything that might prevent adherence to the actuator flange. Grease shall be completely removed.
- Lubricate the valve stem with oil or grease, to facilitate assembling.

Lift the actuator according instructions reported in paragraph Handling & Lifting page 6.

- If possible, place the valve stem in a vertical position to facilitate assembling - in this case the actuator must be lifted while the coupling flange is kept in the horizontal position.
- Align the actuator adapter flange grooves according to valve coupling stem
- Do not exert any force while lowering the actuator onto the valve.

Installation must be performed by qualified personnel.



Hands must be kept away from the coupling area.

- Fix the actuator to the valve by means of threaded connections (bolts, stud bolts and nuts).
- Tighten the bolts or the nuts of the connecting stud bolts to the correct torque, in accordance with the size and material characteristics of the bolts installed by the Customer.



Support the actuator until fully installed and fixing bolts are correctly tightened.

- Check for possible damage to the paint-work and repair if necessary, according to painting specification.

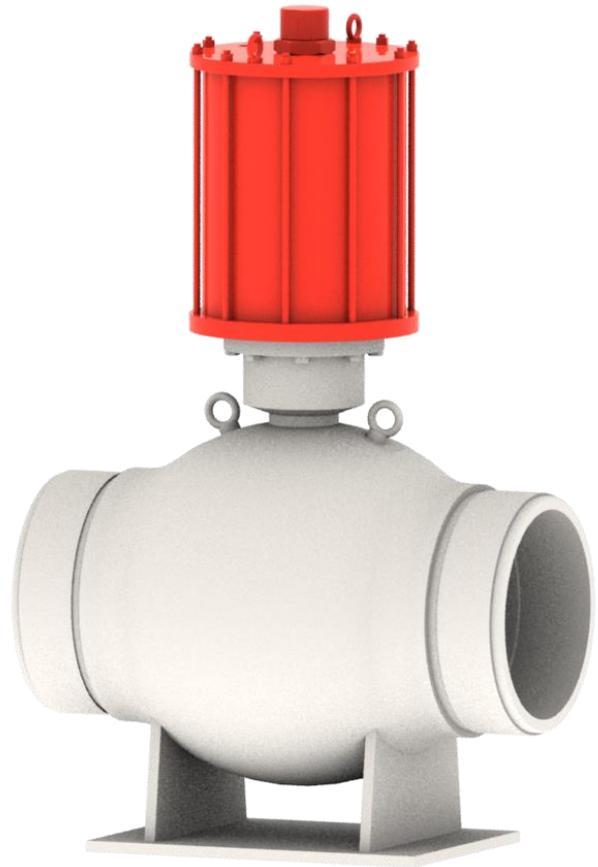


Figure 9: Actuator Installation on valve

Removal from valve

The End user is in charge of removing the actuator from the valve.



Removal shall be performed only by qualified staff, wearing/using appropriate personal protection devices.



Do not remove the actuator if the valve is blocked in the intermediate position. Contact Rotork Fluid Systems Customer Service.

In order to disassemble the actuator from the valve, proceed as follows:

- Cut off electrical power supply.
- Cut off pneumatic supply.
- Remove the supply pipes from the actuator.
- Release any pressure from the control group.
- Remove control and signal lines from electric components (if any).
- Sling the actuator in line with the instructions given in par. Handling & Lifting , page 6.
- Unscrew the bolts or the nuts from the stud bolts fixing the actuator to the valve.
- Lift and remove the actuator from the valve.

Operation

The following instructions must be followed and integrated into End User safety program when installing and using Rotork products. Read and save all instructions prior to installing, operating and servicing this product.

Follow all warnings, cautions and instructions marked on and supplied with the product.

Install equipment as specified in Rotork installation instructions and as per applicable local and national codes of practice. Connect all products to the proper pneumatic sources.

When replacement parts are required, ensure that the qualified service technician uses only replacement parts specified by Rotork.

Substitutions will invalidate any hazardous area certification and may result in fire, electrical shock, other hazards or improper operation.

DESCRIPTION

The actuator consists of a cylindrical body containing a guide tube with vertical grooves connected to the bottom flange and a tube with helical grooves connected to the pneumatic piston. The transformation of linear movement into a rotary quarter turn motion is performed by combining one set of pin and one set of key movements. The pins are positioned within the helical slots of the tube with helical grooves and fixed on upper part of the drive shaft. The pins transmit a rotary movement to the drive shaft by moving along the helical slots of tube that is moving vertically due to pneumatic piston thrust. A set of keys, fixed on lower part of tube with helical grooves, move along linear slots on the tube with vertical grooves allowing the drive shaft to transmit the rotary movement to the valve whilst preventing any rotation by the actuator piston.

The main components of the Compact Spring Return Actuator are shown in Figure 10, Figure 11 for type A actuators Figure 12 and Figure 13, for type B actuators.

The main components of the Compact Double Effect Actuator are shown in Figure 1.

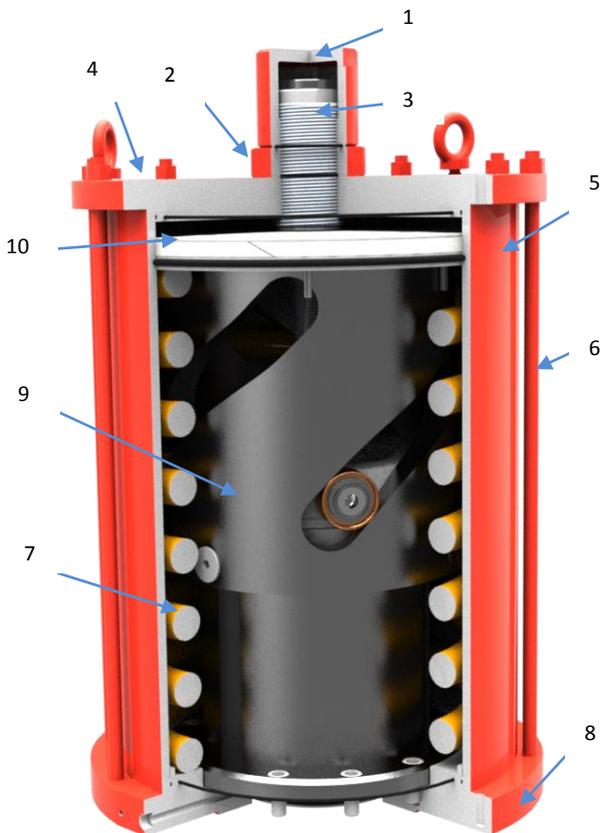


Figure 10: Pneumatic Compact Spring Return Actuator – Type A: external tie rods Parts Description

1	End Cap
2	Stop nut
3	Upper stop bolt
4	End Flange
5	Cylinder tube
6	Tie rod
7	Spring
8	Head flange
9	Mechanism
10	Piston

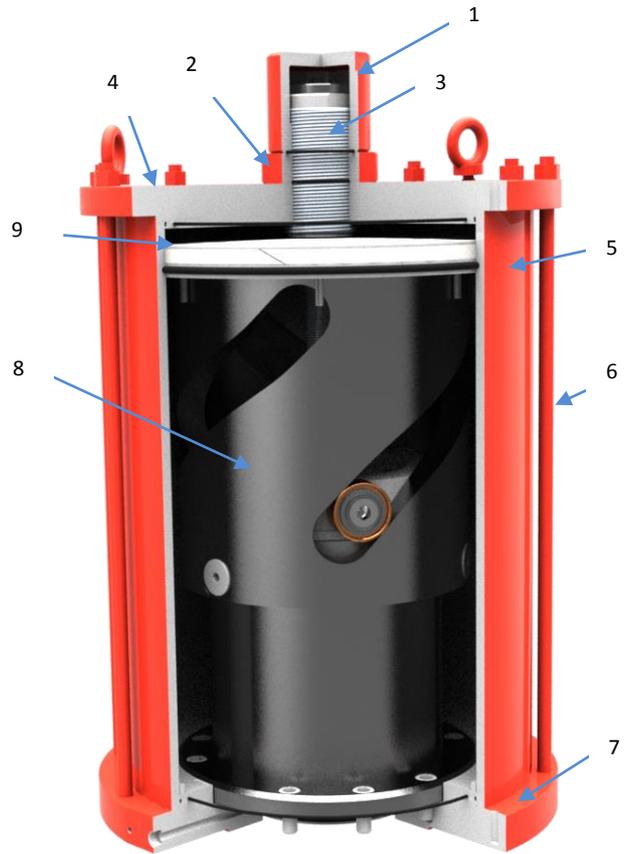


Figure 11: Pneumatic Compact Double Effect Actuator – Type A: external tie rods part Description

1	End Cap
2	Stop nut
3	Upper stop bolt
4	End Flange
5	Cylinder tube
6	Tie rod
7	Head flange
8	Mechanism
9	Piston

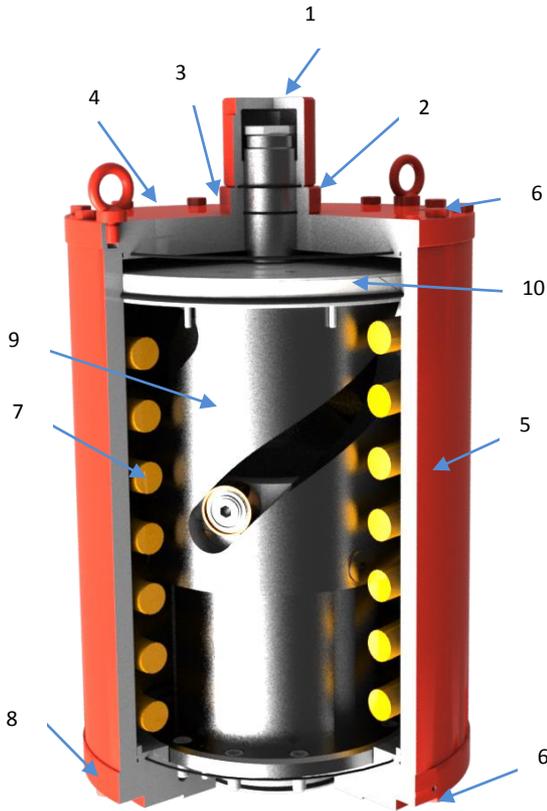


Figure 12: Pneumatic Compact Spring Return Actuator – Type B:
Threaded flanges Parts Description

1	End Cap
2	Stop nut
3	Upper stop bolt
4	End Flange
5	Cylinder tube
6	Screws
7	Spring
8	Head flange
9	Mechanism
10	Piston

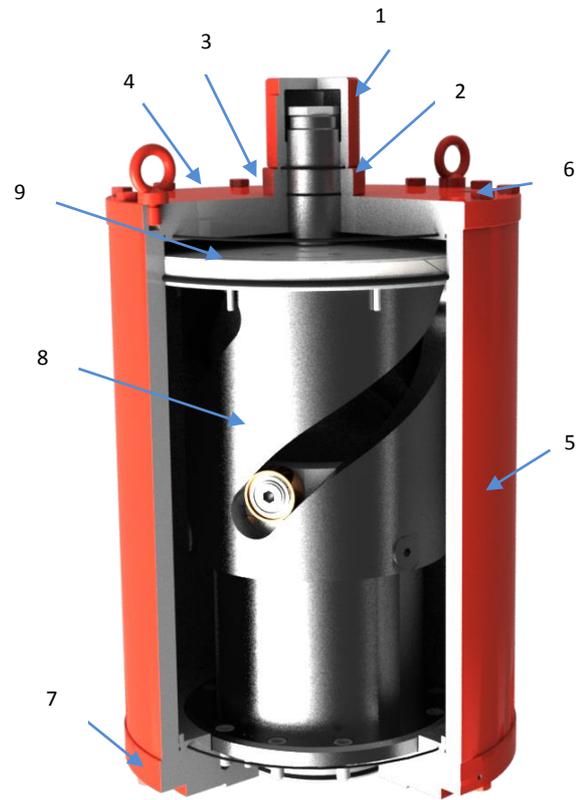


Figure 13: Pneumatic Compact Double Effect Actuator – Type B:
Threaded flanges Parts Description

1	End Cap
2	Stop nut
3	Upper stop bolt
4	End Flange
5	Cylinder tube
6	Screws
7	Head flange
8	Mechanism
9	Piston

ANGULAR STROKE REGULATION



Certain valve incorporate their own stops, for this valves the actuator stops positions should coincide with the valve stop position.



Do not use the actuator outside $90^\circ \pm 5^\circ$.

Compact actuator is fitted with two Stop bolts for the stroke regulation in both directions. Stop bolts are both located into the End I

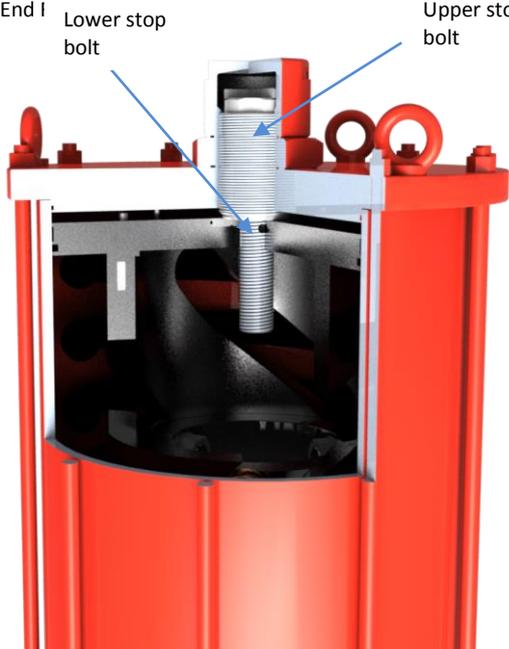


Figure 14: Stop bolt particular

Upper Stop bolt setting

To regulate the Upper stop bolt:

Unscrew and remove End Cap (1). Use a proper toll to perform the operation. End Cap is provided with a key grip to facilitate screwing/unscrewing .



Loosen Stop nut (2). Slowly pressurize the cylinder to detach the stop bolt from the piston.

To reduce the actuator stroke, screw stop bolt (3)



To increase the actuator stroke, unscrew stop bolt (3)



Perform an actuator stroke to verify end position. Adjust upper stop bolt again, if necessary.



During the upper stop bolt regulation, pay attention to do not screw completely the stop bolt. Ensure that a minimum number of threads (L) remains screwed.

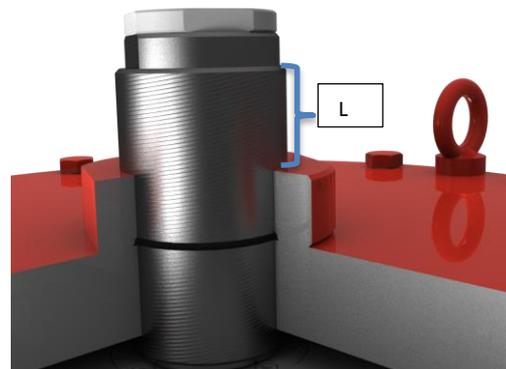


Figure 15: Upper stop bolt regulation: minimum number of threads

The minimum number of threads is specific for each actuator size. Refer to job documentation for detailed indication.

Lower Stop bolt setting

To regulate the Lower stop bolt:

<p>Unscrew and remove End Cap (1). Use a proper tool to perform the operation. End Cap is provided with a key grip to facilitate screwing/unscrewing.</p>	
<p>Verify Stop nut (2) is correctly tightened</p>	
<p>Remove the closure cap (if present)</p>	
<p>Use an Allen key of proper dimension to regulate the lower stop bolt</p>	
<p>Screw the lower stop bolt to reduce stroke</p>	
<p>Unscrew the lower stop bolt to increase the stroke</p>	
<p>Perform an actuator stroke to verify end position. Adjust lower stop bolt again, if necessary.</p>	

LIMIT SWITCH SETTING

In case the actuator is provided with limit switches, their setting should be done by the user during the actuator testing operations on the valve.

The limit switches must be set so that they are actuated slightly earlier than the actuator angular stroke is stopped by the mechanical stops.



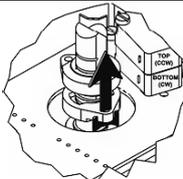
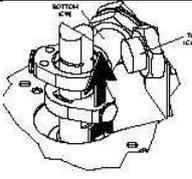
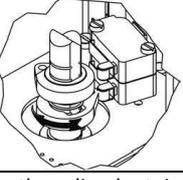
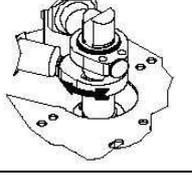
Before performing any operation on electric components, read and follow the safety precautions reported in the Manufacturer's Maintenance Manual. Risk of temporary modification of the component protection.



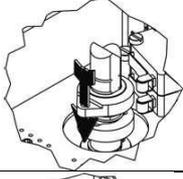
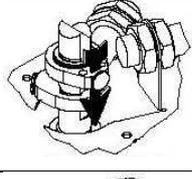
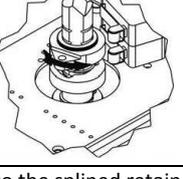
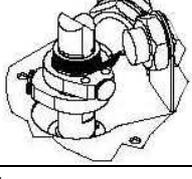
Switch off the power supply prior to removing cover from the limit switch box.

- Remove the box cover.

Closing limit switch

Instruction	Mechanically operated Limit Switches	Proximity limit switches
Place the actuator/valve in the fully closed position		
Disengage the close limit cam.		
Rotate the close limit cam until the closing switch is active.		
Engage the cam into the splined retainer		

Opening limit switch

Instruction	Mechanically operated Limit Switches	Proximity limit switches
Place the actuator/valve in the fully open position		
Disengage the open limit cam.		
Rotate the open limit cam until the opening switch is active.		
Engage the cam into the splined retainer		

Note: Where 3 or more limit switches are fitted, move the actuator to the extra signaling position(s) and set the cams for each location.

- Cycle the valve CLOSED and OPEN several times to ensure proper calibration.
- Reassemble the box cover, verifying the cover seal is correctly positioned.
- Turn the cover shaft manually, aligning it to the switch box shaft, and engage it.
- Verify if the position indicator correctly indicates the valve position.
- Reconnect power supplies.

For more information refer to the limit switch manufacturer's literature.



Figure 16: Typical limit switch box

Limit Switch Box could be different according to project specific requirements. Refer to project specific documentation for further details.

Limit switch Box could require support structure to be connected to the actuator; this can be different according to project specific requirements. Refer to project specific documentation for further details.

PNEUMATIC POWER SUPPLY

Verify allowed supply pressure range on actuator label.



Verify medium composition. Contact Rotork Fluid Systems to check the compatibility with the supply medium.

PNEUMATIC CONNECTIONS

Preliminary Operations

- Verify sizes of pipes and fittings according to applicable plant specifications.
- Clean the inside of the connection pipes by washing them with a suitable detergent and by blowing air into them.
- The connecting pipes must be properly shaped and fixed to prevent stress or loosening of threaded connections.

Note: For tapered-thread fluid connections, apply a thin layer of thread sealing product (Loctite 577 or equivalent) to ensure a good seal.



Connect the pneumatic power source in accordance to the applicable operating diagram, please refer to specific job for details.

Inlet port/Exhaust port



Figure 17: Inlet/Exhaust port (Type A)

Inlet port/Exhaust port

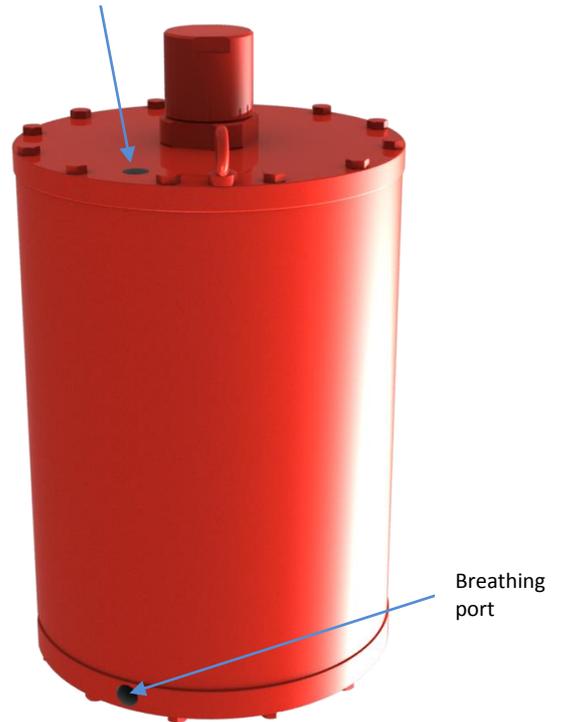


Figure 19: Inlet/Exhaust port and Breathing port (Type B)

Refer to specific operating diagram for specific application configuration.

Breathing port

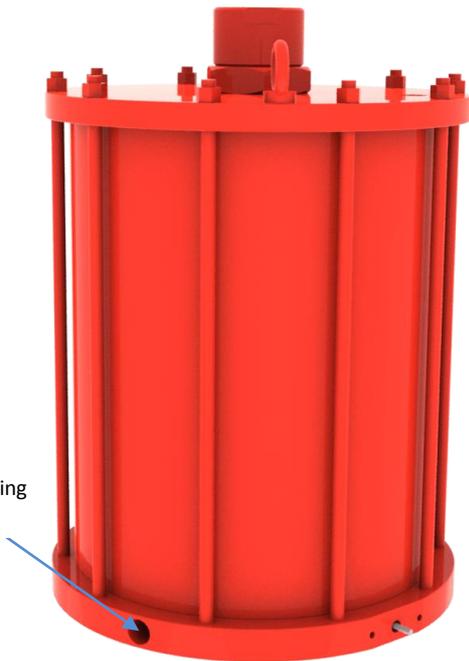


Figure 18: Breathing port (Type A)

ELECTRICAL CONNECTIONS



Check electrical components supply voltage, before start-up.

Electrical connection can be performed as follows:

- Remove power supply.
- Remove the covers of the electric components.
- Remove the plastic protection plugs from the cable entries.
- Use only appropriately certified reduction fittings, cable glands, fittings and explosion-proof cables.
- The cable glands must be tightened in the threaded inlets, to guarantee the waterproof and explosion proof protection.
- Pay attention to the correct installation of the O-rings of the cable glands to prevent water and debris infiltration inside electric components.
- The size of the electric supply cable must suit the electric power demand.
- Insert the connection cables through cable glands and perform assembly according to the cable gland manufacturer's instructions.
- Connect the cable wires to the terminal blocks in accordance with the applicable wiring diagram.
- Electric connections must be made by using rigid conduits and trailing cables to prevent mechanical stresses in the cable entries.
- On the unused entries of the junction box, replace the plastic plugs with approved metal plugs, in order to guarantee sealing and to comply with explosion safety protection codes.
- Assemble the covers of the electric components, paying attention to seals.
- Once connections have been completed, check electrical components functionality.

START UP

During the start-up of the actuator, it is necessary to check if:

- Supply pressure is as prescribed.
- The feed voltage values of electrical components (solenoid valves coils, limit switches, pressure switches etc., if applicable) are as prescribed.
- Actuator controls such as remote control, local control, emergency control etc. (if applicable) work properly.
- Input remote signals are correct.
- The setting of control unit components is according to the plant requirements.
- Pneumatic connections show no leakage. If necessary, tighten fittings.
- The painted parts have not been damaged during transport, assembling or storage operations. On the contrary, after having removed rust, repair the damaged parts following the applicable painting specifications.
- Actuator and all of its parties work as expected. Perform, at least, one functional complete stroke (open/close)
- Operating time is in accordance with requirements.



The End user must guarantee equal voltage potential between the valve and the actuator and provide appropriate grounding. The final user shall indicate and maintain the grounding connections

on the actuator.

Dismantling & Disposal



Remove power supply pressure before removing and disassembling the equipment.

Disassemble only control panel equipment (if present) and dismantle according to the following:

- Dispose of the pieces of steel, cast iron and aluminum alloys as metal scraps.
- Dispose of the rubber, PVC, resins etc. separately, in accordance with the existing national and regional regulations.
- Electric components are to be separately disposed of on specialized disposal sites.



Single Acting Actuator contain spring potential energy.



Actuator cannot be disassembled by the End User. Actuator has to be returned to the manufacturer's plant, upon agreement with Rotork Fluid Systems.

Actuators manufactured after 1993 year do not contain asbestos or its by-products.

Rotork Sales and Service

If your Rotork actuator has been correctly installed and sealed, it will give years of trouble-free service. Should you require technical assistance or spares, Rotork guarantees the best service in the world. Contact your local Rotork representative or the factory direct at the address on the nameplate, quoting the actuator type and serial number.

Some actuators have a special spare parts list. Refer to the project specific documentation for further details

Troubleshooting

ID	FAILURE	POSSIBLE CAUSES	CORRECTIVE MEASURES
1	Incorrect valve position	- Fault of pipeline valve	- Consult the valve manufacture's documentation.
2	Incorrect indication of valve position	- Incorrect signal from limit switches	- Check limit switches position (see page 13)
3	Incorrect movement	- Irregular supply of operating medium	- Verify the supply pressure and adjust as necessary.
		- Worn parts.	- Contact Rotork Fluid Systems.
		- Fault in control panel equipment (if present)	- Contact Rotork Fluid Systems Customer Service.
		- Fault of pipeline valve	- Consult the valve manufacture's documentation.
4	Valve stroke not fully completed	- Insufficient gas flow	- Increase gas supply flow
		- Incorrect assembly between actuator and valve	- Perform assembling according to par. "Installation on valve", page 8
		- Valve blocked	- Consult the valve manufacture's documentation.
		- Stop bolts wrong setting	- Adjust stop bolt setting following instructions in par. Angular Stroke regulation, page 13
5	Leakages	- Stop bolts wrong setting	- Adjust stop bolt setting following instructions in par. Angular Stroke regulation, page 13
		- Worn seals	- (Type A actuator) Replace turning flange seal (Refer to PM-CQP-003) and after replace piston seals (Refer to PM-CQP-004). Attention: Do not perform PM-CQP-003 and PM-CQP-004 contemporary. - (Type B actuator) Replace turning flange seal (Refer to PM-CQP-005) and after replace piston seals (Refer to PM-CQP-006). Attention: Do not perform PM-CQP-005 and PM-CQP-006 contemporary.
6	Actuator moves too fast	- No pressure on pipeline	- Restore pipeline pressure
		- Supply pressure greater than allowed range values	- Verify the supply pressure and adjust as necessary
7	Actuator moves too slow	- Fault on pipeline valve (valve hardened)	- Consult the valve manufacture's documentation.
		- Supply pressure lower than allowed range values	- Verify the supply pressure and adjust as necessary
		- Possible internal undue friction	- Contact Rotork Fluid Systems Customer Service.

ID	FAILURE	POSSIBLE CAUSES	CORRECTIVE MEASURES
8	Loss of power	<ul style="list-style-type: none"> - Inadequate supply pressure 	<ul style="list-style-type: none"> - Ensure that the supply pressure is above the minimum operating pressure of the actuator and that the output torque produced at supply pressure exceeds the required valve torque.
		<ul style="list-style-type: none"> - Leakage from cylinder 	<ul style="list-style-type: none"> - (Type A actuator) Replace turning flange seal (Refer to PM-CQP-003) and after replace piston seals (Refer to PM-CQP-004). Attention: Do not perform PM-CQP-003 and PM-CQP-004 contemporary. - (Type B actuator) Replace turning flange seal (Refer to PM-CQP-005) and after replace piston seals (Refer to PM-CQP-006). Attention: Do not perform PM-CQP-005 and PM-CQP-006 contemporary.

For other problems, please contact Rotork Fluid Systems Customer Service.

Periodic Maintenance

Rotork Fluid Systems recommends performing the following checks to help comply with the rules and regulations of the country of final installation:

Periodic Maintenance Schedule

Maintenance Activity	Periodicity		Reference
	Months	Years	
Visual check of external components and control groups.	6*	*	
Check pneumatic connections for leaks. Tighten pipe fittings as required.	-	1*	
Cleaning	-	1*	PM-CQP-001
Visual check of painting. Verify absence of damages. Repair if necessary according to painting specification..	-	1*	
Functional test	-	1*	PM-CQP-002
Check electrical components and grounding connections.	-	1*	
Turning flange seals replacement (Type A actuator)	-	4*	PM-CQP-003
Cylinder seals replacement (Type A actuator)	-	4*	PM-CQP-004
Turning flange seals replacement (Type B actuator)	-	4*	PM-CQP-005
Cylinder seals replacement (Type B actuator)	-	4*	PM-CQP-006

(*) The time between maintenance tasks will vary depending on the medium and service conditions. Refer to End User Plant Preventive Maintenance Program for specific task periodicity.

For SIL applications refer to Safety Manual.

	PM-CQP-001	Page:1/1
Item: Actuator	Task: Cleaning	
Equipment, Tools, Materials: Air Compressor Project documentation (Design and Operating pressure values)	Warnings:   	
Preliminary Operations:		
Description:		
 <p>Remove pneumatic supply before proceeding.</p> <ol style="list-style-type: none"> 1. Remove dust from external surfaces by blowing air. 		
 <p>Do not polish/rub non metal surfaces with a dry cloth. The tools and cleaning procedures must not produce sparks or create adverse conditions in the environment during maintenance operations, so as to prevent potential explosion hazards.</p> <p>Prevent electrostatic charges in potentially explosive areas.</p>		

Item: Actuator	Task: Functional test
Equipment, Tools, Materials: Chronometer Project documentation (required stroke times)	Warnings: 
Preliminary Operations:	
Description: Note: Actuator must be connected to the pneumatic power supply to perform the following test. <ol style="list-style-type: none"> 1. Operate the actuator 2. Perform one closing stroke and one opening stroke 3. Verify actuator's movement is smooth and linear. 4. Verify stroke time(s) are as required.  Actuator discharges medium gas during normal operation. Pay attention during test. Do not stand near exhaust port. In case of stroke times out of required range refer to Troubleshooting ID 3, page 19, for solutions. In case of problems contact Rotork Fluid Systems Customer Service	

Item: Actuator (Type A)

Task: Cylinder seals replacement- Turning flange

Equipment, Tools, Materials:Lifting equipments
Spare parts**Warnings:****Preliminary Operations:**

Removal from valve, PM-CQP-003

Description:

Cut-off power supply and electric power supply (if present) before performing any operation.

Remove the actuator from valve, according to instructions in par. Removal from valve, page 10.

Task shall be executed in a workshop in a clean area, free of dust.

Position the actuator on a workbench.

Actuator must be in its safety position, spring relaxed (in case of single effect).

Disassembly of turning flange.

Before proceeding with the following operation ensure that the cylinder group is completely assembled.

Don't execute the following operation if tie rods or any other part of the cylinder group are disassembled or unscrewed.

- Place the actuator on a proper bench in horizontal position.

Seals substitution

- Unscrew hex socket bolt (14).
- Remove turning flange (15).
- Remove O-ring (16).
- Carefully clean the seals groove.
- All the removed parts should be thoroughly cleaned, inspected and de-burred as necessary.
- Replace all the mentioned seals and lubricate them with a grease film.

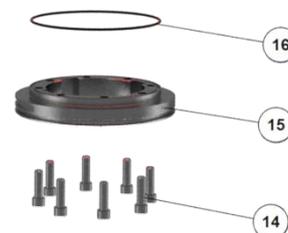
Reassembly

- With the actuator in horizontal position, reinstall turning flange (15) with O-ring (16).
- Reinstall and tighten hex socket bolt (14) according to the recommended torque and following a "cross bolt torque tightening" sequence.

Final testing

The actuator must be tested.

- Place the actuator in a stable position, e.g. on a workbench.
- Connect the pneumatic supply to the actuator and cycle the actuator several times, in order to check if it works smoothly and if there are any leakages through the seals.
- Check if the painted parts have been damaged during disassembly and/or reassembly. If necessary, repaint them in accordance with the applicable painting specifications.



Item: Actuator (Type A)

Task: Cylinder seals replacement- Piston seals

Equipment, Tools, Materials:Lifting equipments
Spare parts**Warnings:****Preliminary Operations:**

Removal from valve, PM-CQP-003

Description:

Cut-off power supply and electric power supply (if present) before performing any operation.

Remove the actuator from valve, according to instructions in par. Removal from valve, page 10.

Task shall be executed in a workshop in a clean area, free of dust.

Position the actuator on a workbench.

Actuator must be in its safety position, spring relaxed (in case of single effect).

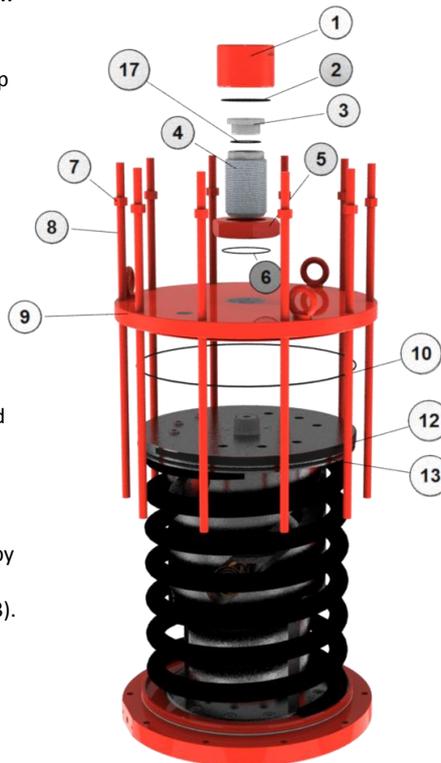
Before executing this procedure verify connecting screws (14) are correctly assembled and tightened on enclosure flange.

Disassembly of the stop bolt

Ensure that the turning flange is correctly assembled and tightened before proceeding.

The actuator must be in vertical position.

- Hold the stop nut with a wrench, then unscrew and remove cap nut (1).
- Remove O-ring (2).
- Measure the distance between the upper stop bolt and the end flange (2) surface. This measure will be useful during re-installation.
- Hold upper stop bolt (4) with a wrench and unscrew locking nut (5)
- Remove O-ring (6).
- Unscrew and remove stopper plug (3)
- Remove O-ring (17)
- Remove upper stop bolt (4).

**Disassembly of cylinder**

Ensure that the turning flange is correctly assembled and tightened before proceeding.

The actuator must be in vertical position.

- Unscrew hex socket bolt (7).
- Unscrew tie rods (8).
- Lift the end flange (9) and cylinder tube (11) by means of the lifting lugs.
- Remove piston sliding ring (12) and O-ring (13).
- If O-ring (10) is damaged, replace it.

Seals substitution

- Carefully clean the seals groove.
- All the removed parts should be thoroughly cleaned, inspected and de-burred as necessary.
- Replace all the mentioned seals and lubricate them with a grease film.
- Lubricate all sliding parts with a recommended grease film.

-----Procedure follows on next page-----

Item: Actuator (Type A)

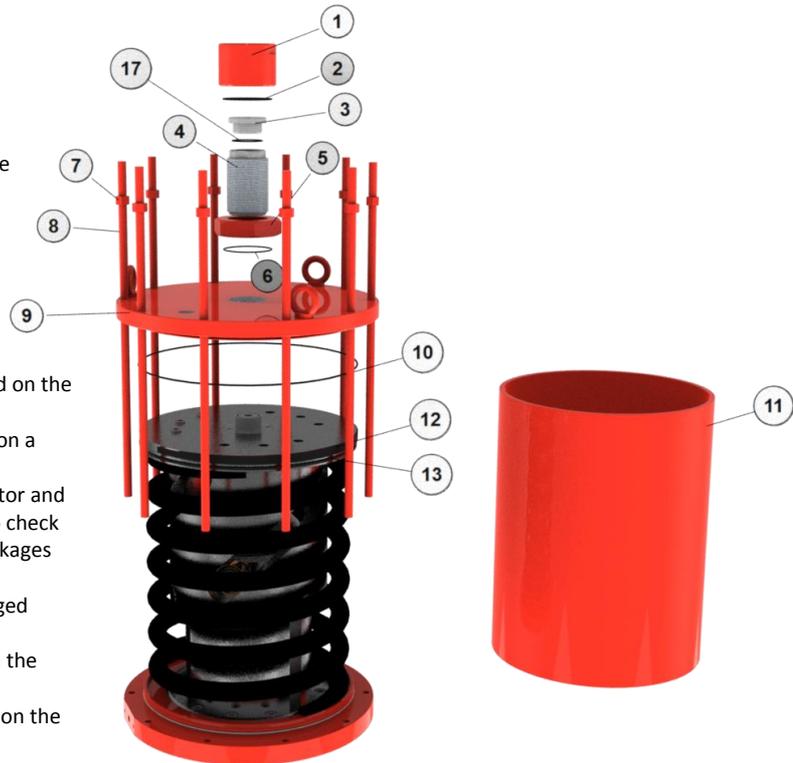
Task: Cylinder seals replacement- Piston seals

Equipment, Tools, Materials:Lifting equipments
Spare parts**Warnings:****Preliminary Operations:**

Removal from valve, PM-CQP-003

Description (Following)**Reassembly**

- Reinstall cylinder tube (11).
- Position end flange (9) with O-ring (10).
- Reinstall Tie rods (8) and tighten according to the recommended torque, following a "cross bolt torque tightening" sequence.
- Install upper stop bolt (4) according distance measured before
- Replace O-ring (17) and install stopper plug (3)
- Install lock nut (5) with O-ring (6)
- Screw end cap (1) with O-ring (2)

**Final testing**

The actuator must be tested before it is assembled on the valve.

- Place the actuator in a stable position, e.g. on a workbench.
- Connect the pneumatic supply to the actuator and cycle the actuator several times, in order to check if it works smoothly and if there are any leakages through the seals.
- Check if the painted parts have been damaged during disassembly and/or reassembly. If necessary, repaint them in accordance with the applicable painting specifications.
- The actuator is now ready to be assembled on the valve.

Item: Actuator (Type B)

Task: Cylinder seals replacement- Turning flange

Equipment, Tools, Materials:Lifting equipments
Spare parts**Warnings:****Preliminary Operations:**

Removal from valve, PM-CQP-003

Description:

Cut-off power supply and electric power supply (if present) before performing any operation.

Remove the actuator from valve, according to instructions in par. Removal from valve, page 10.

Task shall be executed in a workshop in a clean area, free of dust. Position the actuator on a workbench.

Actuator must be in its safety position, spring relaxed (in case of single effect).

Disassembly of turning flange.

Before proceeding with the following operation ensure that the cylinder group is completely assembled.

Don't execute the following operation if head flange's screws, end flanges's screws or any other part of the cylinder group are disassembled or unscrewed.

- Place the actuator on a proper bench in horizontal position.

Seals substitution

- Unscrew hex socket bolt (14).
- Remove turning flange (15) using suitable lifting devices.
- Remove O-ring (16).
- Carefully clean the seals groove.
- All the removed parts should be thoroughly cleaned, inspected and de-burred as necessary.
- Replace all the mentioned seals and lubricate them with a grease film.

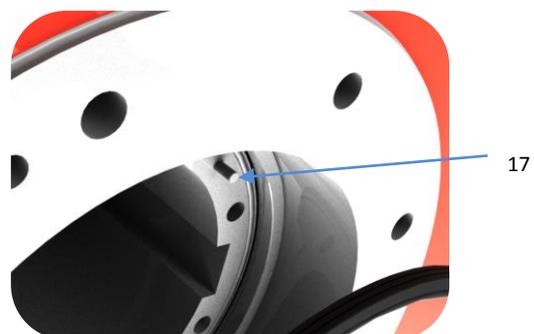
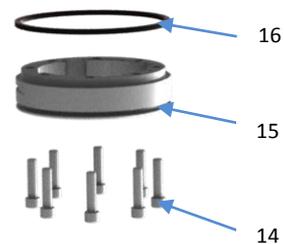
Reassembly

- With the actuator in horizontal position, reinstall turning flange (15) with O-ring (16), using pin (17) as reference point for flange centering.
- Reinstall and tighten hex socket bolt (14) according to the recommended torque and following a "cross bolt torque tightening" sequence.

Final testing

The actuator must be tested.

- Place the actuator in a stable position, e.g. on a workbench.
- Connect the pneumatic supply to the actuator and cycle the actuator several times, in order to check if it works smoothly and if there are any leakages through the seals.
- Check if the painted parts have been damaged during disassembly and/or reassembly. If necessary, repaint them in accordance with the applicable painting specifications.



Item: Actuator (Type B)

Task: Cylinder seals replacement- Piston seals

Equipment, Tools, Materials:

Lifting equipments

Spare parts

Warnings:**Preliminary Operations:**

Removal from valve, PM-CQP-003

Description:

Cut-off power supply and electric power supply (if present) before performing any operation.

Remove the actuator from valve, according to instructions in par. Removal from valve, page 10.

Task shall be executed in a workshop in a clean area, free of dust.

Position the actuator on a workbench.

Actuator must be in its safety position, spring relaxed (in case of single effect).

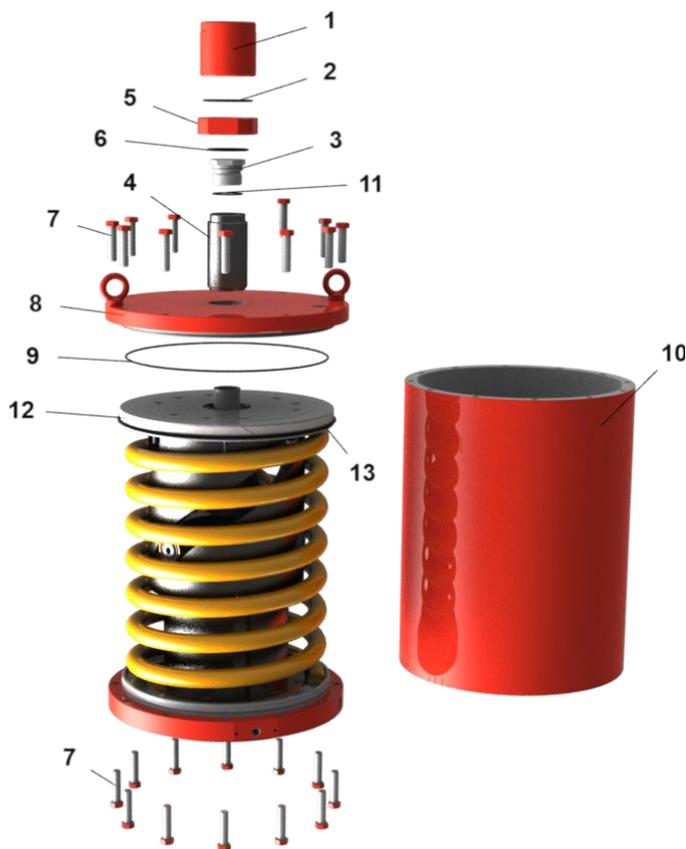
Before executing this procedure verify connecting screws (14) are correctly assembled and tightened on turning flange.

Disassembly of the stop bolt

Ensure that the turning flange is correctly assembled and tightened before proceeding.

The actuator must be in vertical position.

- Hold the stop nut with a wrench, then unscrew and remove cap nut (1).
- Remove O-ring (2).
- Measure the distance between the upper stop bolt and the end flange (2) surface. This measure will be useful during re-installation.
- Hold upper stop bolt (4) with a wrench and unscrew locking nut (5)
- Remove O-ring (6).
- Unscrew and remove stopper plug (3).
- Remove O-ring (11)
- Remove upper stop bolt (4).

**Disassembly of cylinder**

- Gradually unscrew hex socket bolt (7) of end flange (8), following a cross-bolt unscrewing scheme.
- Lift the end flange (8) by means of the lifting lugs.
- Gradually unscrew hex socket bolt (7) of head flange (1), following a cross-bolt unscrewing scheme.
- Carefully remove cylinder tube (10) by means of proper lifting tools.
- Remove piston sliding ring (12) and O-ring (13).
- If O-ring (9) is damaged, replace it.

Seals substitution

- Carefully clean the seals groove.
- All the removed parts should be thoroughly cleaned, inspected and de-burred as necessary.
- Replace all the mentioned seals and lubricate them with a grease film.
- Lubricate all sliding parts with a recommended grease film.

-----Procedure follows on next page-----

Item: Actuator (Type B)

Task: Cylinder seals replacement- Piston seals

Equipment, Tools, Materials:Lifting equipments
Spare parts**Warnings:****Preliminary Operations:**

Removal from valve, PM-CQP-003

Description (follow)**Reassembly**

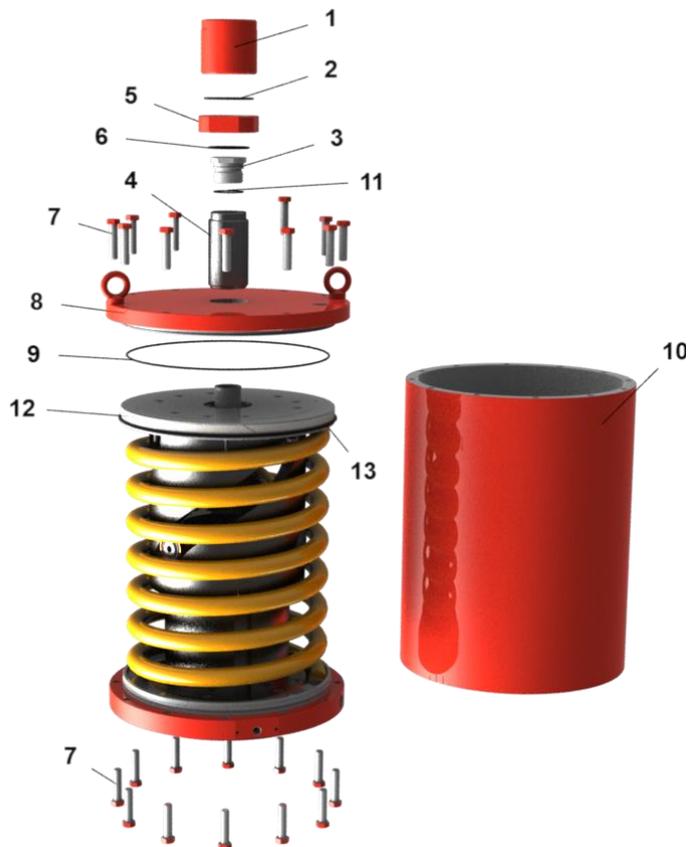
- Replace sliding ring (12) and O-ring (13)
- Reinstall cylinder tube (10).
- Position end flange (8) with O-ring (9).
- Reinstall screws (7) and tighten according to the recommended torque, following a “cross bolt torque tightening” sequence.
- Install upper stop bolt (4) according distance measured before.
- Replace O-ring (11) and install stopper plug (3)
- Install lock nut (5) with O-ring (6)
- Screw end cap (1) with O-ring (2)

Final testing

The actuator must be tested before it is assembled on the valve.

- Place the actuator in a stable position, e.g. on a workbench.
- Connect the pneumatic supply to the actuator and cycle the actuator several times, in order to check if it works smoothly and if there are any leakages through the seals.
- Check if the painted parts have been damaged during disassembly and/or reassembly. If necessary, repaint them in accordance with the applicable painting specifications.

The actuator is now ready to be assembled on the valve.



Part List

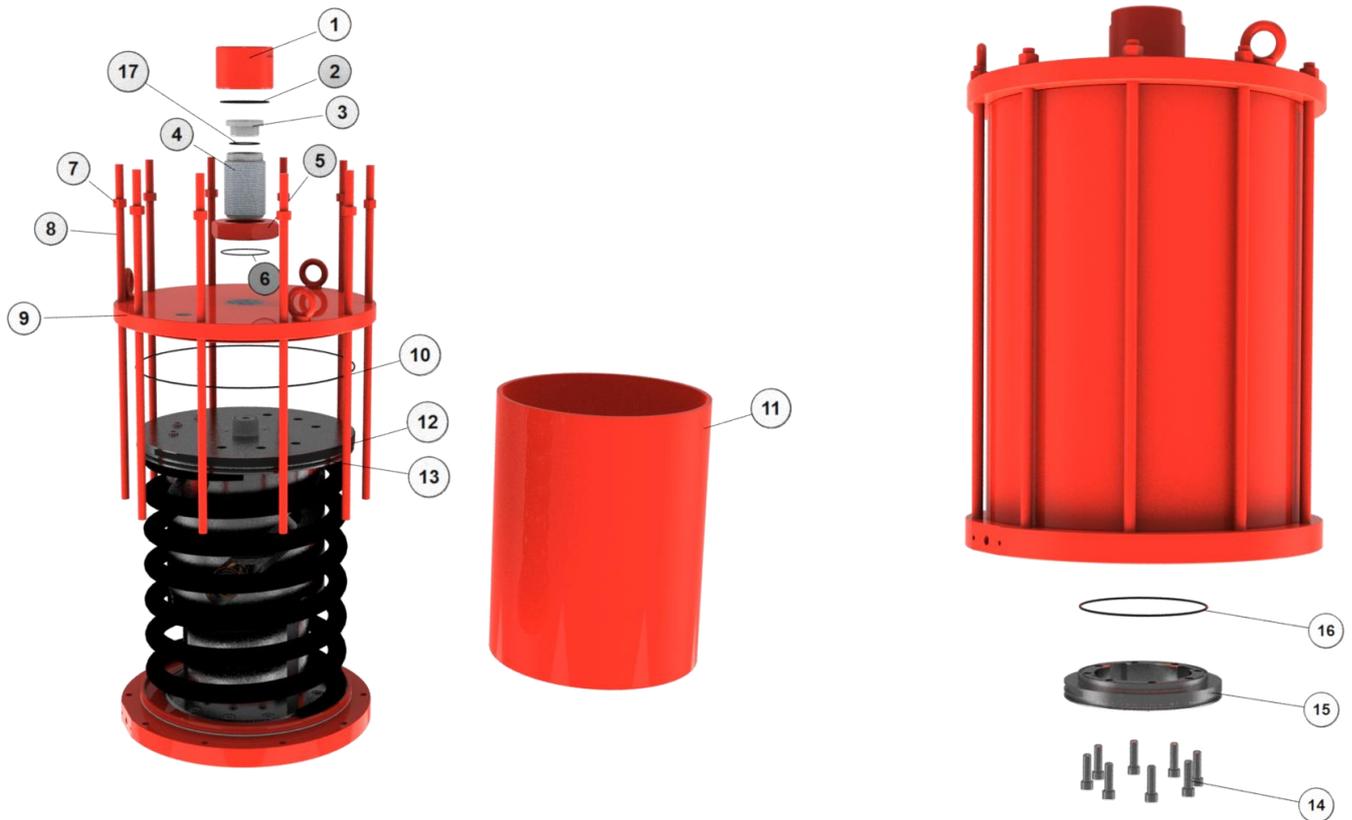


Figure 20: Part List Pneumatic Actuator Single effect, Single Spring configuration, Type A

Item	Description	Material	Qty	Item	Description	Material	Qty
1	Cap Nut	Alloy steel	1	12	Sliding Ring	PTFE+ Buna-N	1 ●
2	O-ring	Buna-N	1 ●	13	O-ring	Buna-N	1 ●
3	Stopper plug	Carbon steel	1	14	Hex socket bolt	Stainless steel	8
4	Upper stop bolt	Alloy steel	1	15	Turning flange	Carbon steel	1
5	Stop nut	Buna-N	1 ●	16	O-ring	Buna-N	1 ●
6	O-ring	Carbon steel	1	17	O-ring	Buna-N	1 ●
7	Hex bolt (*)	Carbon steel	10				
8	Tie rod (*)	Carbon steel	10				
9	End flange	Carbon steel	1				
10	O-ring	Buna-N	1 ●				
11	Pneumatic Cylinder	Carbon steel (Nickel plated)					

● = Recommended spare

(*) Number of tie rods and hex bolts could be different for each specific project, refer to project's documentation

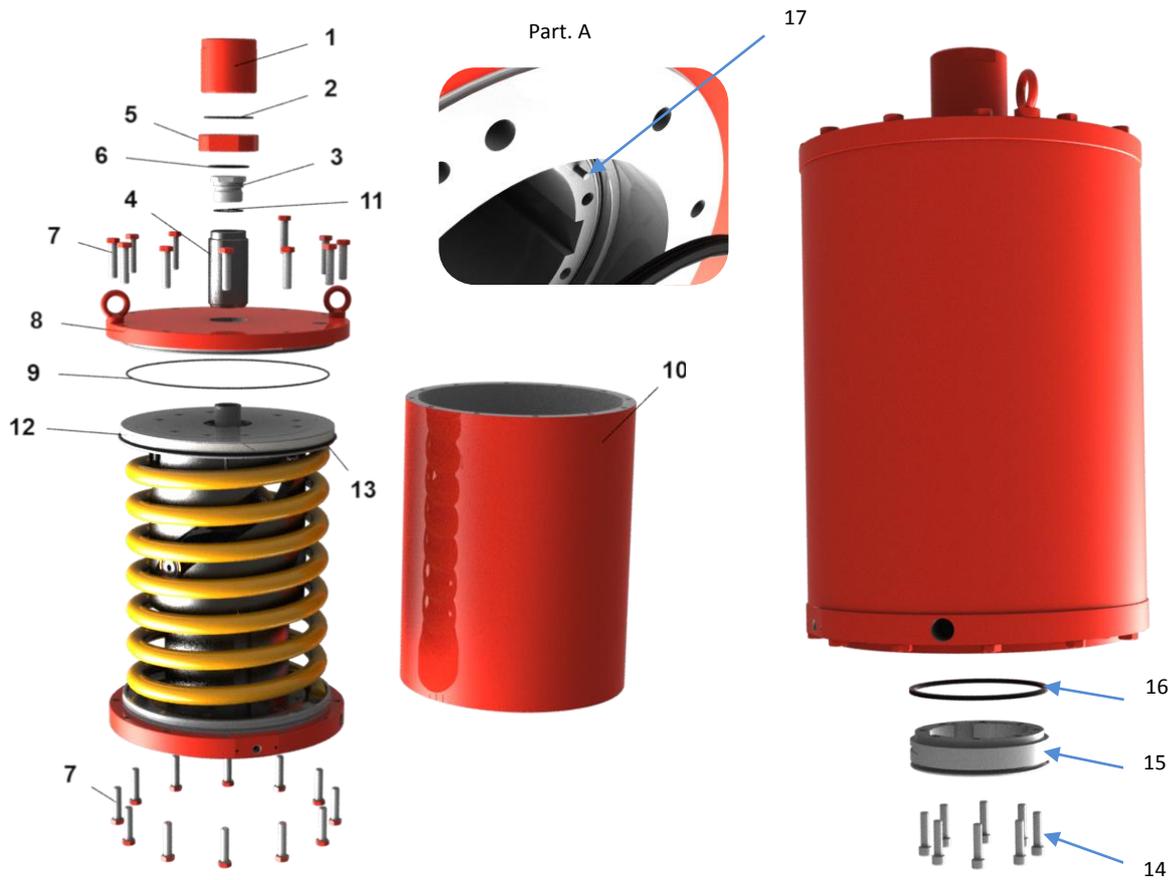


Figure 21: Part List Pneumatic Actuator Single effect, Single Spring configuration, Type A

Item	Description	Material	Qty	Item	Description	Material	Qty
1	Cap Nut	Alloy steel	1	12	Sliding Ring	PTFE+ Buna-N	1 ●
2	O-ring	Buna-N	1 ●	13	O-ring	Buna-N	1 ●
3	Stopper plug	Carbon steel	1	14	Hex socket bolt	Stainless steel	8
4	Upper stop bolt	Alloy steel	1	15	Turning flange	Carbon steel	1
5	Stop nut	Buna-N	1 ●	16	O-ring	Buna-N	1 ●
6	O-ring	Carbon steel	1	17	Pin	Carbon steel	1
7	Hex bolt (*)	Carbon steel	24				
8	End flange	Carbon steel					
9	O-ring	Buna-N	1 ●				
10	Pneumatic Cylinder	Carbon steel (Nickel plated)	1				
11	O-ring	Buna-N	1 ●				

● = Recommended spare

(*) Number of screws could be different for each specific project, refer to project's documentation

Grease & Hydraulic Oil Specification

In general, there is no need to lubricate the actuator because its mechanism is lubricated -for life. The standard grease and oil for Rotork Fluid Systems compact actuators are shown below. If an alternative was specified and/or supplied, please refer to the job specific documentation.

GREASE

The following grease is recommended for lubrication of seals, seals grooves and internal cylinder tube for maintenance purposes.

Manufacturer		LUBRITALIA
Trade Name		LUBRO GREASE L 00
Color	Visual	BROWN
Base Oil Type		MINERAL
Base Oil Viscosity at 40°C	DIN 51 562	150 mm ² /s
Soap Type		LITHIUM
Soap %	Calculated	4
Worked Penetration, 60 Double Strokes		ISO 2137
Dropping Point		ISO 2176
Copper Strip Corrosion, 24 hrs @ 100°C		DIN51 811
		1B

This is the standard grease specification for Rotork Fluid Systems compact actuators working at temperatures between -30°C/+100°C. An alternative may have been specified for your application. Please refer to the job specific documentation.

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Redefining Flow Control



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A full listing of our worldwide sales and service network is available on our website.

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