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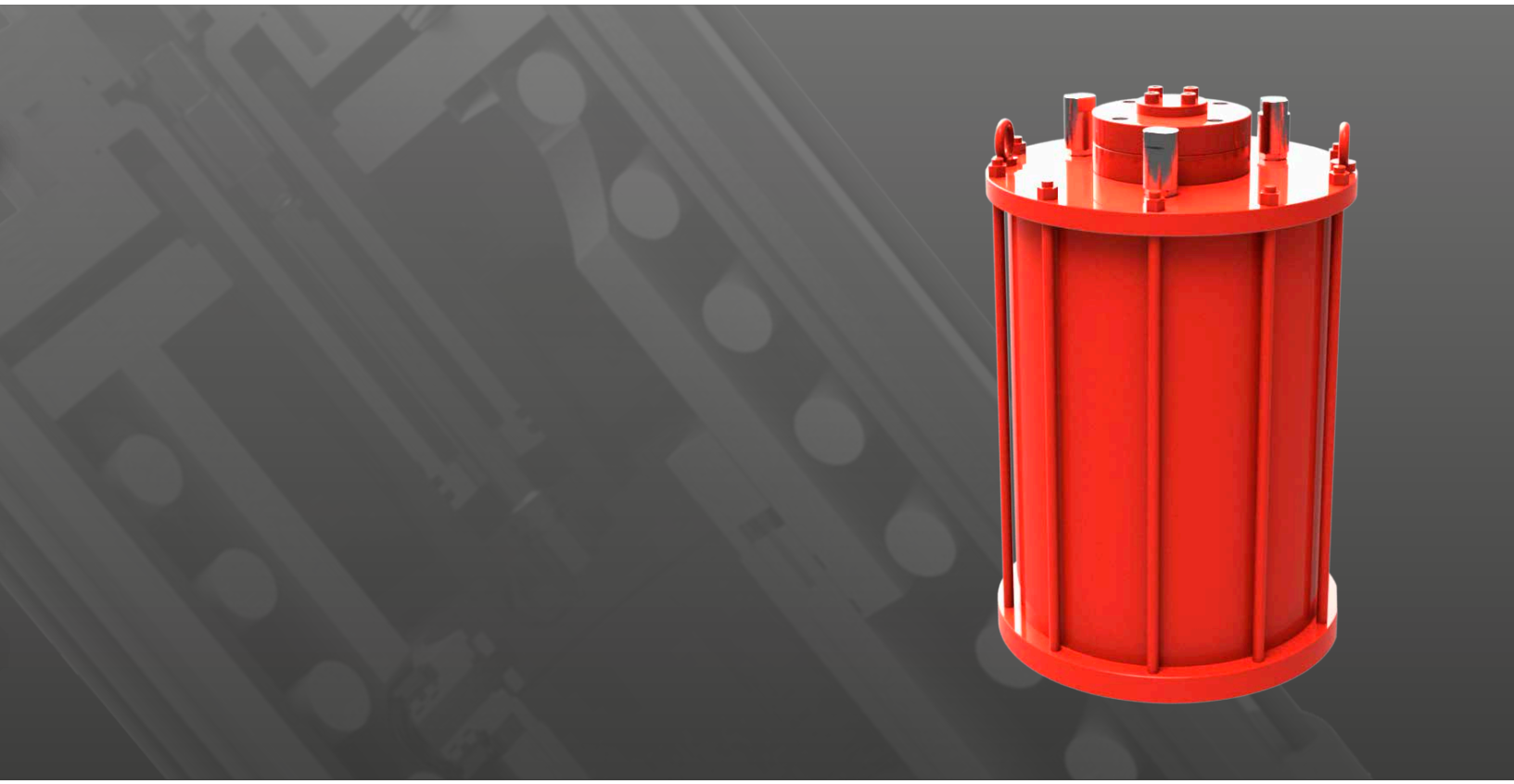
Keeping the World Flowing
for Future Generations

CQH range

Hydraulic compact actuator
Single spring version – single effect



Installation, commissioning and maintenance manual

Contents

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

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

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

1. Introduction

This manual covers the hydraulic compact spring return actuator range.

The compact actuator (single spring configuration) is available in two different versions:

- Type A CQH actuator
- Type B CQH actuator

Type A actuator is characterised 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.

The operating principles and characteristics of Type A and Type B versions of the compact actuator are identical. Consequently, only one type of actuator is represented for parts of this manual that apply to both versions without any differences.

Differences between the two versions are clearly specified only where necessary. In the area at risk of explosion, only use the devices approved for use in those areas. These devices are labelled with an EX type label.

In this manual, warning indications are represented by icons, according to ISO 7010 safety signs:


Generic danger


Hand crush/pinch point


Electrocution


Explosive material


Substances toxic for the environment (terrestrial or aquatic) or which could have harmful, long-term effects

Customer Service

For technical assistance, please contact Rotork Customer Service:

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2. Standards and regulations

Actuators destined for European member states and for the United Kingdom have been designed, built and tested according to the quality control system, in compliance with the EN ISO 9001:2015 and with the following regulations/ directives and standards:

- 2006/42/EC: Machinery Directive (MD)
- S.I. 2008 No. 1597: The Supply of Machinery (Safety) Regulations 2008
- 2014/68/EU: Pressure Equipment Directive (PED)
- S.I. 2016 No.1105: Pressure Equipment (Safety) Regulations 2016 (PE(S)R)
- 2014/34/EU: Directive for safety equipment and systems to be used in potentially explosive atmospheres (ATEX)
- S.I. 2016 No. 1107: The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016
- 2014/30/EU: Electromagnetic Compatibility Directive (EMC)
- S.I. 2016 No. 1091: Electromagnetic Compatibility Regulations 2016
- BS EN ISO 12100: Machinery Safety Directive
- BS EN 60079-14: Explosive atmospheres – Part 14: Electrical installations design, selection and erection
- BS EN 1127-1: Explosive atmospheres – Explosion prevention and protection – Basic concepts and methodology
- BS EN ISO 80079-36: Non Electrical equipment for explosive atmospheres – Basic methods and requirements
- BS EN ISO 80079-37: Non-electrical equipment for explosive atmospheres – Non-electrical type of protection construction safety “c”, control of ignition “b”, liquid immersion “k”
- IEC 60079-46: Explosive atmospheres – Part 46: Equipment assemblies
- BS EN ISO 7010: Safety Signals
- BS EN 13445: Unfired Pressure Vessel

3. General information

This manual is produced to enable a competent user to install, operate and maintain the Rotork hydraulic compact actuator (CQH).

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

Maintenance and operation must 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 must 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 can 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 must be familiar with their responsibilities under any statutory provisions relating to the health and safety of their workplace.

Operators must always wear appropriate Personal Protective Equipment (PPE) in line with the existing plant regulations.

Appropriate usage

Rotork CQH actuators have been specifically developed with a helical mechanism that transforms linear piston motion into quarter-turn valve stem rotation to operate various valve types and sizes.

⚠ Improper use can damage the equipment or cause dangerous situations for health and safety. Rotork 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.

⚠ Hazardous area usage: Only use devices approved for hazardous area use. These devices will have an EX type label fixed to them. Before installation and operation in a potentially explosive atmosphere, read and follow the information and instructions on the EX label and any additional EX instructions in the documentation received with the device.

4. Health and safety

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

4.1 Residual risks

Residual risks resulting from equipment risk evaluation performed by Rotork.

4.2 Thermal risks

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

4.3 Noise

Risk	Noise <70 dB during operation (RES_07).
Preventive measures	Operators should wear ear protections. Operators should not stand near the equipment during operation.

4.4 Health risks

Risk	Pressurised 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 utilised) (RES_06).
Preventive measures	Operators must use PPE and any other equipment (breathing apparatus) based on the type of supply medium.

4.5 Mechanical risks

Risk:	Uncontrolled movement (remote operation) (RES_03).
Preventive measures:	Assure that the actuator cannot 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 this manual and contact Rotork.

4. Health and safety *continued*

Risk:	Presence of potential energy (RES_10) during dismantling.
Preventive measures	Do not disassemble the actuator during dismantling. Follow instructions in this manual and contact Rotork.

4.6 Vibration risks

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

5. Labels and nameplates

The following label is applied externally to the actuator:

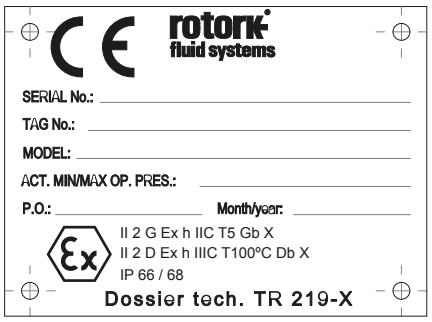


Fig 5.1 Actuator label

EX Type of protection: constructional safety "c".

T5 temperature class is provided even if the actuator has no internal heat source. The maximum actuator temperature is near the environmental or exercise fluid temperature, whichever is the greater. The normal operating temperature is about -30 to +100 °C. The temperature range is specified within the project-specific technical documentation. Special applications outside of this range are available upon request.

EX 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: IP68 allows submersion of one metre for 72 hours.

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

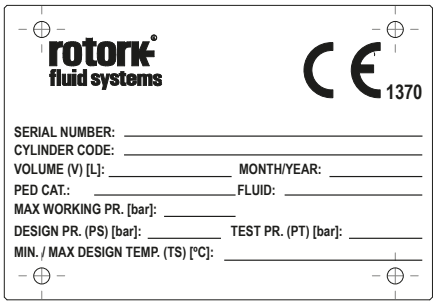


Fig 5.2 Actuator PED label

The label may not be removed.

6. Operating limits

Temperature: -30 to +100 °C for standard applications
-20 to +100 °C for PED applications
Design pressure: 210 barg

⚠ **Do not use the equipment outside its operating limits.**

6.1 Allowed fluid types

Hydraulic oil with ISO 4406 class 17/15/12 as minimum cleanliness level; if not differently specified in project-specific documentation.

6.2 Expected lifetime

The expected lifetime is at least 25 years, in normal service conditions and with planned maintenance.

6.3 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

⚠ **This tightening torque table is not applicable to Section 10.2. When installing actuator on the valve, tighten bolts or 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.**

7. Handling and 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.

7.1 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 hydraulic 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 evaluated 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.

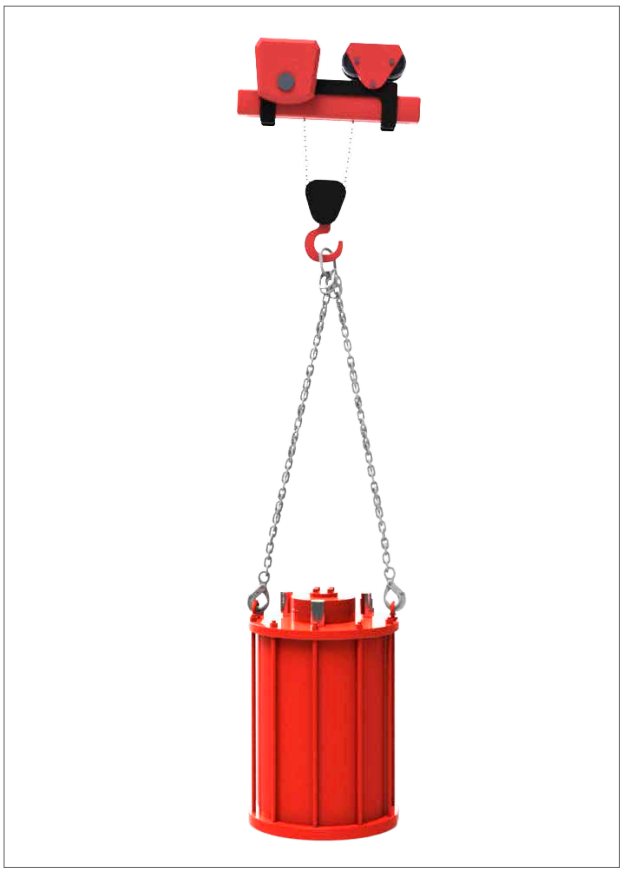


Fig 7.1 Lifting (single-acting actuator up to size 130)

7.2 Lifting instructions

Note: Indication of weight, centre of gravity, lifting points are reported within project-specific 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 7.1

⚠ The actuator must remain vertical; balance the load.

- Angle β must be between 0° and 45° as shown in Figure 7.2

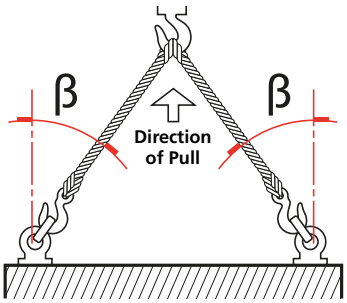


Fig 7.2 Lifting angle

7. Handling and lifting *continued*

The actuator can be lifted and installed horizontally, 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 the bottom and end flanges
- 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 7.4

⚠ **The actuator must remain horizontal; balance the load.**

- Angle β must between 0° and 45° as shown in Figure 7.2

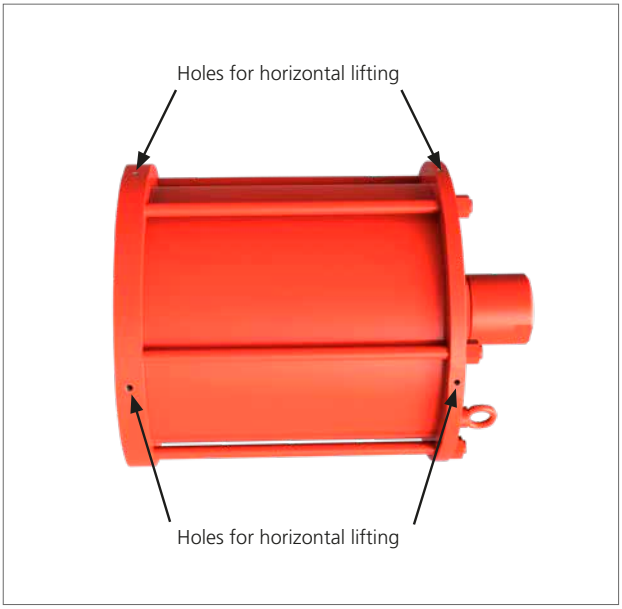


Fig 7.3 Holes for horinzontal lifting

Fig 7.4 Horizontal lifting

8. Storage

Rotork actuators have been fully tested before leaving the factory.

In order to keep the actuator in good condition until installation, the following measures are recommended, as a minimum:

- Check the presence and assembling of dust plugs
- Keep the actuator on its 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 six months and verify the above protection measures remain in place

⚠ **Remove packaging only at the installation time.**

9. 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 using nominated hydraulic mineral oil with ISO 4406, CLASS 17/15/12 as minimum cleanliness level:
    - Connect the hydraulic supply and electric power (if present) to the actuator, according to the proper operating and wiring diagrams as specified in the documentation of the specific project

    IMPORTANT – The hydraulic power unit, the hydraulic pipe and the fitting used for operating the actuator must be flushed and cleaned to ISO 4406 Class 17/15/12 prior to connecting to the actuator.

    - Cycle the actuator 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 five times
    - Disconnect the hydraulic 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

10. Installation on valve and earthing

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

Note: The pipeline valve should be properly secured prior to performing the 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 for any additional information.

10.1 Preliminary actions

⚠ Verify the EX classification of the actuator is compatible with the plant zoning. Refer to the actuator nameplate. The end user shall guarantee the valve earthing and the equal voltage potential between the valve and the actuator.

- The centreline of the cylinder is usually aligned with the centreline of the associated pipework
- 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 hydraulic supply to the actuator must be free from contaminants and debris. Ensure that tubing runs are adequately fastened and supported to minimise repetitive stress induced by the dynamics of the pipeline
- Ensure there are no leaks from any hydraulic connections. Tighten as required

10.2 Instructions

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

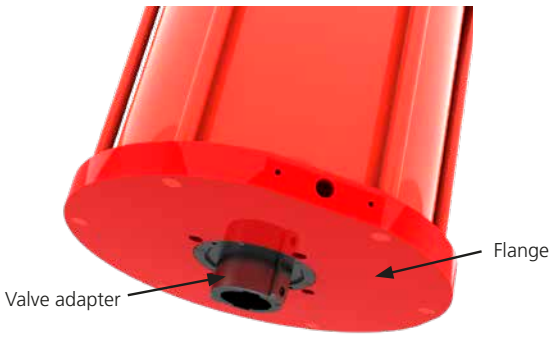


Fig 10.1 Valve adapter – particular

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

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 valve and actuator coupling flanges, removing anything that might prevent electrical connection and adherence to the actuator flange interface: grease and paint residuals must be completely removed, if present
- Lubricate the valve stem with oil or grease, to facilitate assembling
- Lift the actuator according to Handling and Lifting instructions (Section 7)
- 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 paintwork and repair, if necessary, according to the painting specification.

⚠ Attention: End user should verify the electrical correctness of coupling, performing a standard continuity test between actuator and valve.

10. Installation on valve and earthing *continued*

Fig 10.2 Actuator installation on valve

11. Removal from valve

The end user is responsible for 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 Customer Service.**

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

- Cut off the electrical power supply
- Cut off the hydraulic supply
- Release any pressure from the control group
- Remove the supply pipes from the actuator
- Remove the control and signal lines from electric components (if any)
- Sling the actuator in line with handling and lifting instructions (Section 7)
- Unscrew the bolts or the nuts from the stud bolts fixing the actuator to the valve
- Lift and remove the actuator from the valve

12. Operation

The following instructions must be followed and integrated into end-user safety programme 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 hydraulic 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.

12.1 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 spring driving flange. 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 hydraulic cylinder is telescopic and internal to the container.

The main components of the compact spring return actuator are shown in Figure 12.1.

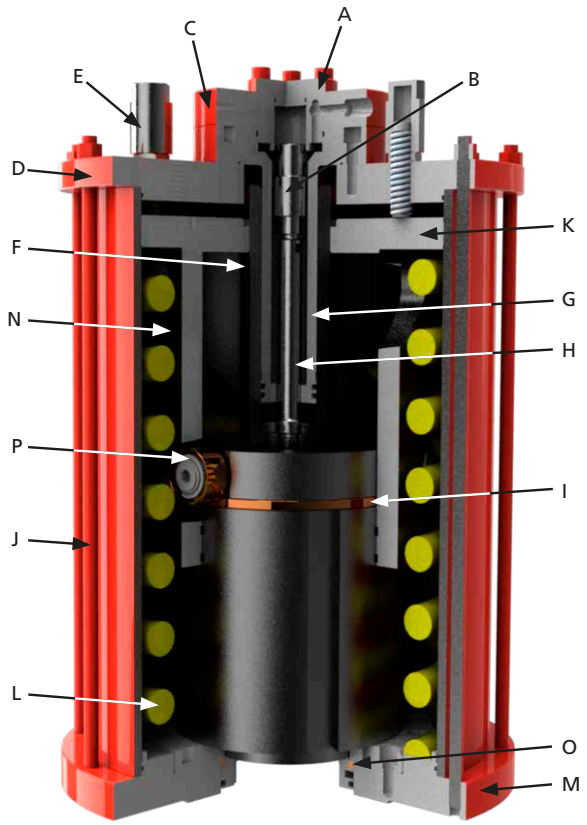


Fig 12.1 Hydraulic compact spring return actuator part description

A	Closure plate
B	Lower stop bolt
C	Hydraulic supply inlet
D	End flange
E	Upper stop bolts
F	Cylinder tube
G	Hydraulic piston
H	Piston rod
I	Upper bushing
J	Tie rod
K	Spring driving flange
L	Spring
M	Head flange
N	Mechanism
O	Lower bushing
P	Rotating pin group

12.2 Angular stroke regulation

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

⚠ Do not use the actuator outside 90° ±5°.

The compact actuator is fitted with three groups of upper mechanical stop bolts and one lower stop bolt for the stroke regulation in both directions. Stop bolts are located into the end flange (see Figure 12.2).

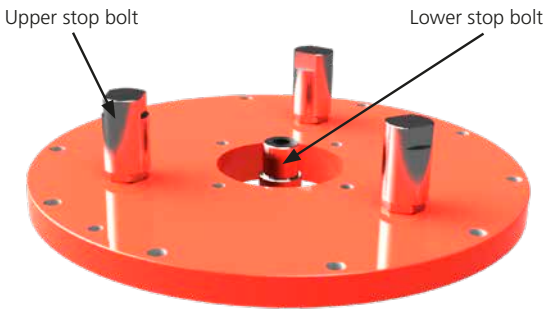


Fig 12.2 Stop bolt location

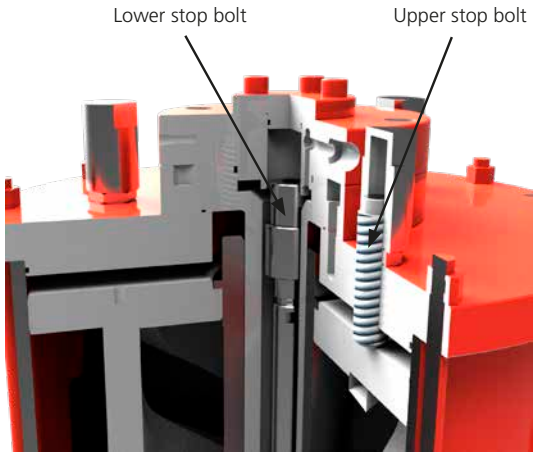


Fig 12.3 Stop bolt particular

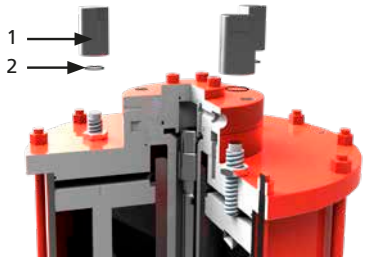
12.2.1 Upper stop bolt setting

⚠ Before proceeding with the regulation, remove all hydraulic connections. There is a possible loss of hydraulic oil.

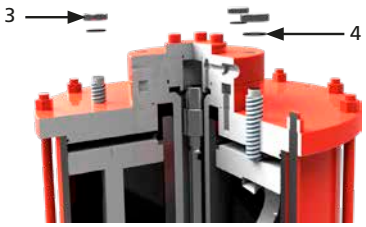
The operator should wear proper personal protective equipment.

Note: Tools to be used must be cleaned with ISO 4406 class 17/15/12 as minimum cleanliness level.

Unscrew and remove each end cap (1) with relative O-ring (2). Use a proper tool to perform the operation. End caps are provided with a key grip to facilitate screwing/unscrewing.



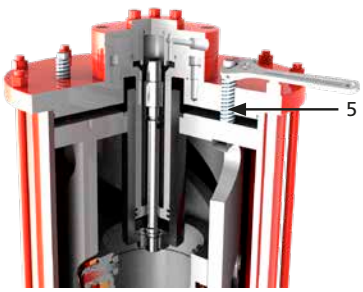
Hold the stop bolt with a wrench and loosen the stop nut (3) Change the O-ring (4) in case of damages. Pressurise the cylinder to detach the stop bolt from the driving flange.



To ensure that all stop bolts are at the same height, first unscrew all stop bolts to the same height and then start regulating each stop bolt one turn at time.

To reduce the actuator stroke, screw the stop bolt (5).

To increase the actuator stroke, unscrew the stop bolt (5).

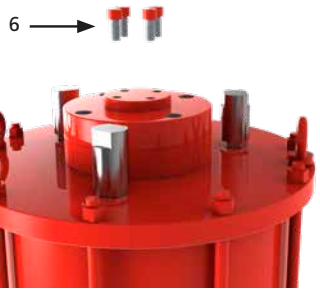


Perform an actuator stroke to verify the end position. Adjust the upper stop bolt again, if necessary.

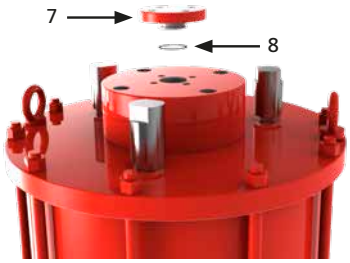
12.2.2 Lower stop bolt setting

To regulate the lower stop bolt:

Unscrew and remove the hex socket bolts (6). Use a proper tool to perform the operation.

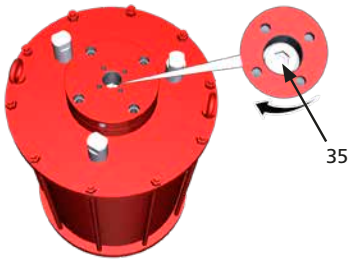


Remove the closure flange (7) with the O-ring (8).

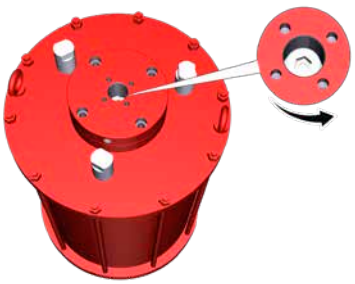


Use an Allen key of the correct size to regulate the lower stop bolt.

Screw the lower stop bolt (35) to reduce stroke.



Unscrew the lower stop (35) bolt to increase the stroke.



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

12.3 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.

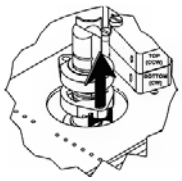
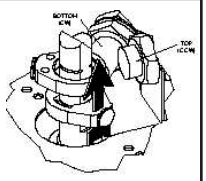
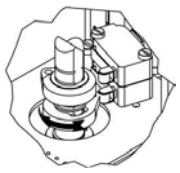
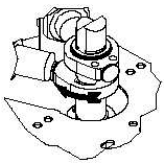
The limit switches must be set so that they are actuated slightly before the actuator angular stroke mechanical stop positions.

⚠ Before performing any operation on the electric components, read and follow the safety precautions reported in the manufacturer's maintenance manual. There is a risk of temporary modification of the component protection.

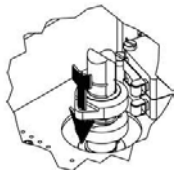
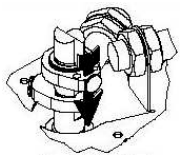
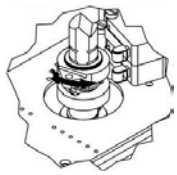
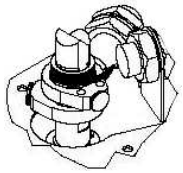
⚠ Switch off the power supply prior to removing the cover from the limit switch box.

- 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 three 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.

Fig 12.4 Typical limit switch box

The limit switch box could be different according to project-specific requirements. Refer to project-specific documentation for further details.

The 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.

⚠ Installation of any accessory on the bare actuator must preserve the actuator ingress protection level.

⚠ Installation must be performed according to IEC 60079-14 and the end user must follow special conditions for safe use detailed in document PUB010-046.

12.4 Hydraulic power supply

Verify the allowed supply pressure range on the actuator label.

⚠ **Verify the medium composition. Contact Rotork to check the compatibility with the supply medium.**

12.5 Hydraulic connections

Preliminary operations

- Verify the 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 flushing them up to ISO4406 CLASSS 17/15/12 level
- 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 hydraulic power source in accordance with the applicable operating diagram, please refer to job-specific documentation for details.**

Refer to the job-specific operating diagram for specific application configuration.

Fig 12.5 Inlet/drain port for single acting actuator

Fig 12.6 Breathing port

12.6 Electrical connections

⚠ Check electrical components' supply voltage, before start-up.

⚠ Access to live electrical conductors is forbidden in hazardous areas, unless done under a special permit. Otherwise, all power should be isolated and the unit moved to a non-hazardous area for repair.

⚠ Prevent electrostatic charges in potentially explosive areas.

Electrical connection can be performed as follows:

- Remove the 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 explosionproof cables
- The cable glands must be tightened into the threaded inlets, to guarantee the waterproof and explosionproof protection
- Pay attention to the correct installation of the O-rings of the cable glands to prevent water and debris infiltration into 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

⚠ Actuator and electrical components must be protected from electrical sparks, lightning, magnetic or electro-magnetic fields, at user's care.

⚠ Installation must be performed according to IEC 60079-14 and the end user must follow special conditions for safe use detailed in document PUB010-046.

12.7 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
- Hydraulic 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 parts work as expected
- 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 end user shall indicate and maintain the grounding connections on the actuator.

13. Dismantling and disposal

⚠ Remove power supply pressure before removing and disassembling the equipment.

⚠ Collect grease and oil during dismounting to avoid disposal of pollutants into the environment. Dispose the material according to the local environmental laws and regulations.

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 must be separately disposed of on specialised disposal sites.

⚠ The actuator cannot be disassembled by the end user. It must be returned to the manufacturer's plant, upon agreement with Rotork.

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

14. 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 one of the highest levels of service in the flow control industry. Contact your local Rotork representative or the factory directly 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.

15. Troubleshooting

ID	FAILURE	POSSIBLE CAUSES	CORRECTIVE MEASURES
1	Incorrect valve position	• Fault of pipeline valve	• Consult the valve manufacturer's documentation
2	Incorrect indication of valve position	• Incorrect signal from limit switches	• Check the limit switches' position (Section 12)
3	Incorrect movement	• Irregular supply of operating medium	• Verify the supply pressure and adjust as necessary
		• Worn parts	• Contact Rotork
		• Fault in control panel equipment (if present)	• Contact Rotork Customer Service
		• Fault of pipeline valve	• Consult the valve manufacturer's documentation
4	Valve stroke not fully completed	• Insufficient hydraulic flow	• Increase the hydraulic flow supply
		• Incorrect assembly between the actuator and valve	• Perform assembling according to "Installation on valve and earthing" (Section 10)
		• Valve blocked	• Consult the valve manufacturer's documentation
		• Stop bolts wrong setting	• Adjust the stop bolt setting following instructions in "Angular stroke regulation" (Section 12.2)
5	Leakages	• Stop bolts wrong setting	• Adjust the stop bolt setting following instructions in "Angular stroke regulation" (Section 12.2)
		• Worn seals	• Replace the turning flange seal (Refer to **PM-CQH-003** and afterwards, replace cylinder seals (Refer to **PM-CQH-004**). **Attention:** Do not perform **PM-CQH-003** and **PM-CQH-004** in parallel.
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 manufacturer's documentation
		• Supply pressure lower than allowed range values	• Verify the supply pressure and adjust as necessary
		• Possible internal undue friction	• Contact Rotork Customer Service
8	Loss of power	• Inadequate supply pressure	• 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.
		• Leakage from cylinder	• Replace the turning flange seal (Refer to **PM-CQH-003** and afterwards, replace cylinder seals (Refer to **PM-CQH-004**). **Attention:** Do not perform **PM-CQH-003** and **PM-CQH-004** in parallel.

For other problems, please contact Rotork Customer Service.

16. Periodic maintenance

Rotork 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-CQH-001
Visual check of painting. Verify absence of damages. Repair if necessary according to painting specification.	-	1*	
Functional test.	-	1*	PM-CQH-002
Check electrical components and grounding connections.	-	1*	
Turning flange seals replacement.	-	4*	PM-CQH-003
Cylinder seals replacement.	-	4*	PM-CQH-004

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

For SIL applications refer to the safety manual.

	PM-CQH-001	Page: 1/1
Component: Actuator	**Task:** Cleaning	
Equipment, Tools, Materials: Air compressor Project documentation (Design and operating pressure values)	**Warnings:** 	
Preliminary Operations:		
Description: ⚠ **Remove the power supply before proceeding.** 1. Remove dust from external surfaces by blowing air **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, to prevent potential explosion hazards.** **Prevent electrostatic charges in potentially explosive areas.**		

	PM-CQH-002	Page: 1/1
Component: Actuator	**Task:** Functional test	
Equipment, Tools, Materials: Chronometer Project documentation (required stroke times)	**Warnings:** 	
Preliminary Operations:		
Description: **NOTE: The actuator must be connected to the hydraulic power supply to perform the following test.** 1. Operate the actuator 2. Perform one closing stroke and one opening stroke 3. Verify the actuator's movement is smooth and linear 4. Verify that the stroke time(s) are as required In case of stroke times being outside the required range refer to Troubleshooting ID 3 (Section 15) for solutions. In case of problems contact Rotork Customer Service.		

	PM-CQH-003	Page: 1/1
Component: Actuator	**Task:** Cylinder seals replacement – turning flange	
Equipment, Tools, Materials: Lifting equipment Spare parts	**Warnings:** 	
Preliminary Operations: Removal from valve		

Description:

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

Remove actuator from the valve (Section 11).
The task shall be executed in a workshop in a clean area, free of dust.
Position the actuator on a workbench.
The 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 the tie rods or any other part of the cylinder group are disassembled or unscrewed.

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

Seals substitution:

- Unscrew the hex socket bolt (14)
- Remove the turning flange (15)
- Remove the O-ring (16)
- Carefully clean the seal's 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 a horizontal position, reinstall the enclosure flange (15) with the O-ring (16)
- Reinstall and tighten the 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 hydraulic 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

	PM-CQH-004	Page: 1/2
Component: Actuator	**Task:** Cylinder seals replacement – piston seals	
Equipment, Tools, Materials: Lifting equipment Spare parts	**Warnings:** 	
Preliminary Operations: Removal from valve, PM-CQH-003		

Description:

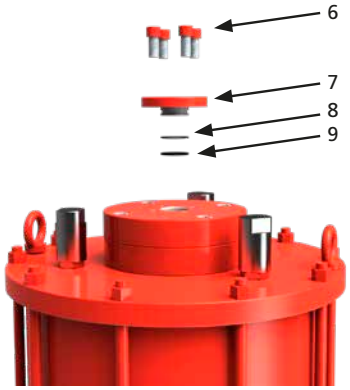
⚠ **Cut-off power supply and electric power supply (if present) before performing any operation.**

Remove the actuator from the valve (Section 11).
The task shall be executed in a workshop in a clean area, free of dust.
Position the actuator on a workbench.
The actuator must be in its safety position, spring relaxed.
Before executing this procedure verify connecting screws (14) are correctly assembled and tightened on turning flange.

Removal of the hydraulic cylinder:
Ensure that the turning flange is correctly assembled and tightened before proceeding.

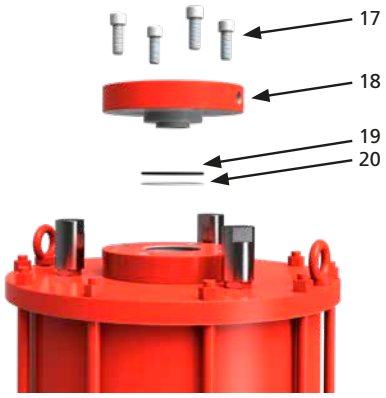
The actuator must be in vertical position.

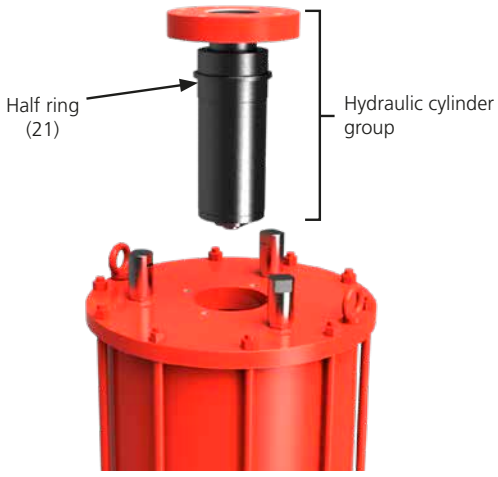
- Unscrew completely the upper mechanical stop bolts
- Unscrew the hex socket bolt (6)
- Remove the closure flange (7)
- Remove and replace the O-ring (8) with the back-up ring (9)



- Unscrew the hex socket bolt (17)
- Lift the supply inlet flange (18)
- Remove and replace the O-ring (19) with the back-up ring (20)
- Lift and remove the hydraulic cylinder group

Note: Pay attention to the half ring during the hydraulic cylinder group removal.





	PM-CQH-004 | Page: 2/2
Component: Actuator	**Task:** Cylinder seals replacement – Piston seals
Equipment, Tools, Materials: Lifting equipment Spare parts	**Warnings:** 
Preliminary Operations: Removal from valve, PM-CQH-003	

Description:

Cylinder dismounting:
The cylinder dismounting shall be executed in a workshop in a clean area, free of dust.

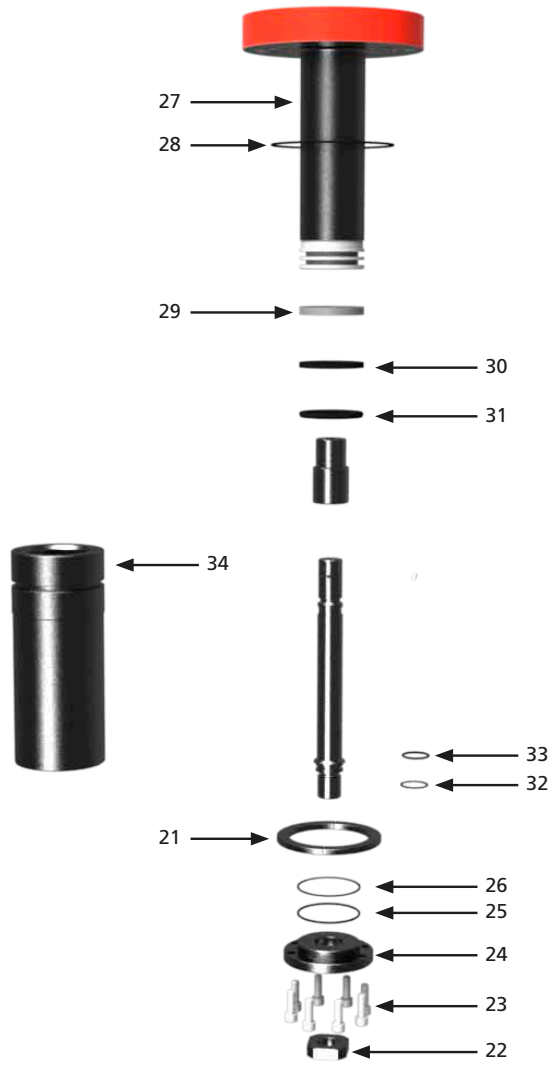
- Remove half-ring (21)
- Unscrew and remove nut (22)
- Unscrew hex socket bolt (23)
- Remove hydraulic cylinder flange (24)
- Remove and replace O-ring (25) and back-up ring (26)
- Remove hydraulic cylinder tube (34)
- Lift and remove hydraulic piston (27)
- Remove and replace O-ring (28)
- Remove and replace sliding ring (29) and piston seals (30), (31)
- Remove and replace rod seal (32) and back-up ring (33)

Seals substitution:
- Carefully clean the seal's groove
- All the removed parts should be thoroughly cleaned, inspected and de-burred as necessary
- Replace all the seals and lubricate them with a grease film
- Lubricate all sliding parts with a recommended grease film

Reassembly:
- Reassemble the cylinder following previous indications
- Reinstall the hydraulic cylinder group on actuator
- Reinstall the supply inlet flange
- Reinstall the closure flange

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 hydraulic 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 whether 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



17. Part list

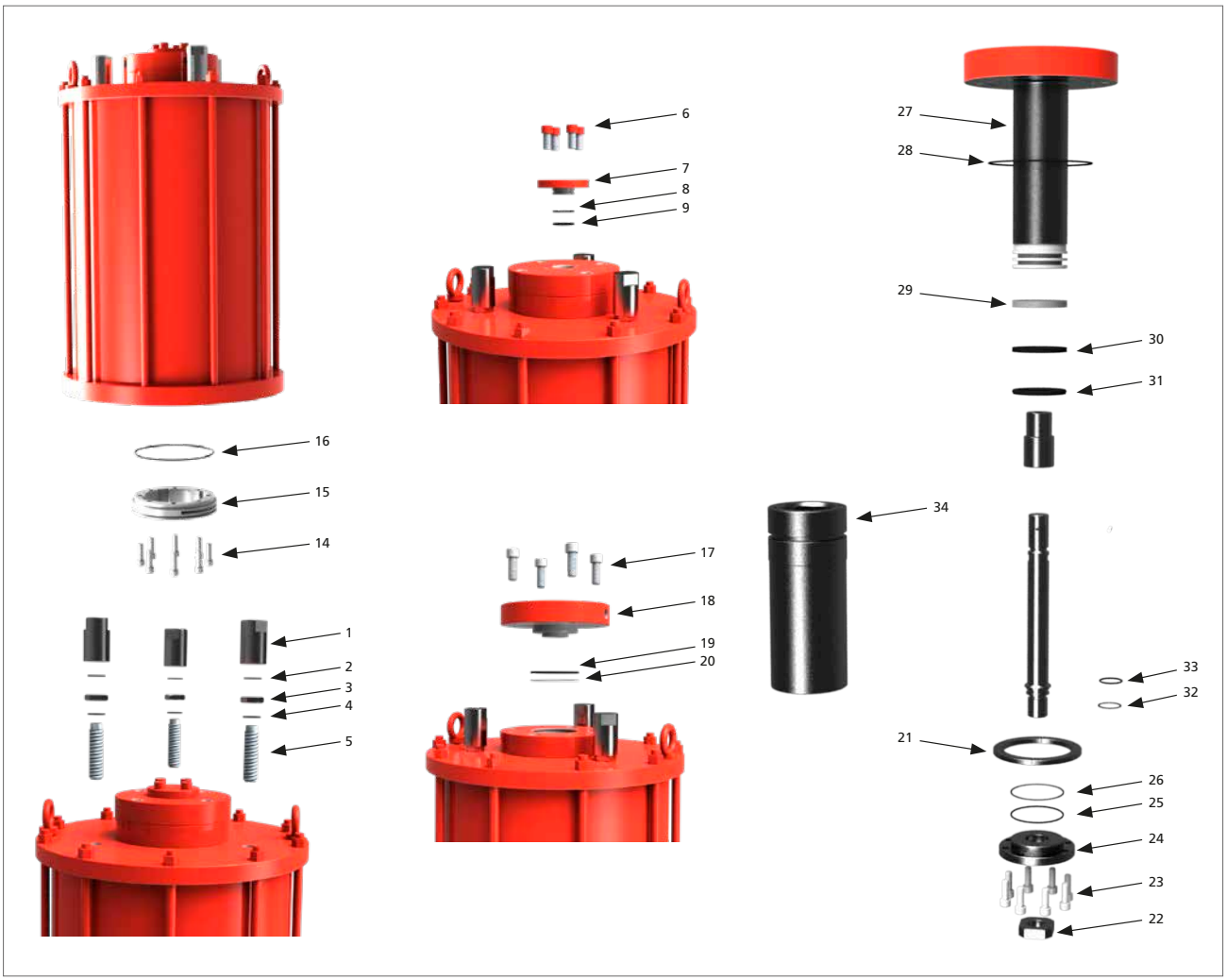


Fig 17.1 Hydraulic actuator single effect (Type A) – particular 1

ITEM	DESCRIPTION	MATERIAL	QTY
1	Cap nut	Alloy steel	1
2	O-ring	Buna-N ●	1
3	Stop ring	Alloy steel	1
4	O-ring	Buna-N ●	1
5	Upper stop bolt	Alloy steel ●	1
6	Hex bolt	Carbon steel	4
7	Closure flange	Carbon steel	1
8	O-ring	Buna-N ●	1
9	Back-up ring	Buna-N ●	1
14	Hex socket bolt	Carbon steel	8
15	Turning flange	Carbon steel	1
16	O-ring	Buna-N ●	1
17	Hex socket bolt	Carbon steel	4
18	Inlet supply flange	Carbon steel	1
19	O-ring	Buna-N ●	1
20	Back-up ring	Buna-N ●	1

ITEM	DESCRIPTION	MATERIAL	QTY
21	Half ring	Carbon steel	1
22	Nut	Carbon steel	1
23	Hex socket bolt	Carbon steel	8
24	Hydraulic cylinder flange	Carbon steel	1
25	O-ring	Buna-N ●	1
26	Back-up ring	Buna-N ●	1
27	Hydraulic piston	Carbon steel	1
28	O-ring	Buna-N ●	1
29	Sliding ring (L=245mm)	Bronze ●	1
30	Aq seal	Buna-N ●	1
31	Step seal	Buna-N ●	1
32	O-ring	Buna-N ●	1
33	Back-up ring	Buna-N ●	1
34	Hydraulic cylinder tube	Carbon steel	1
35	Lower stop bolt	Alloy steel	1
36	Piston rod	Alloy steel	1

● Recommended spare part

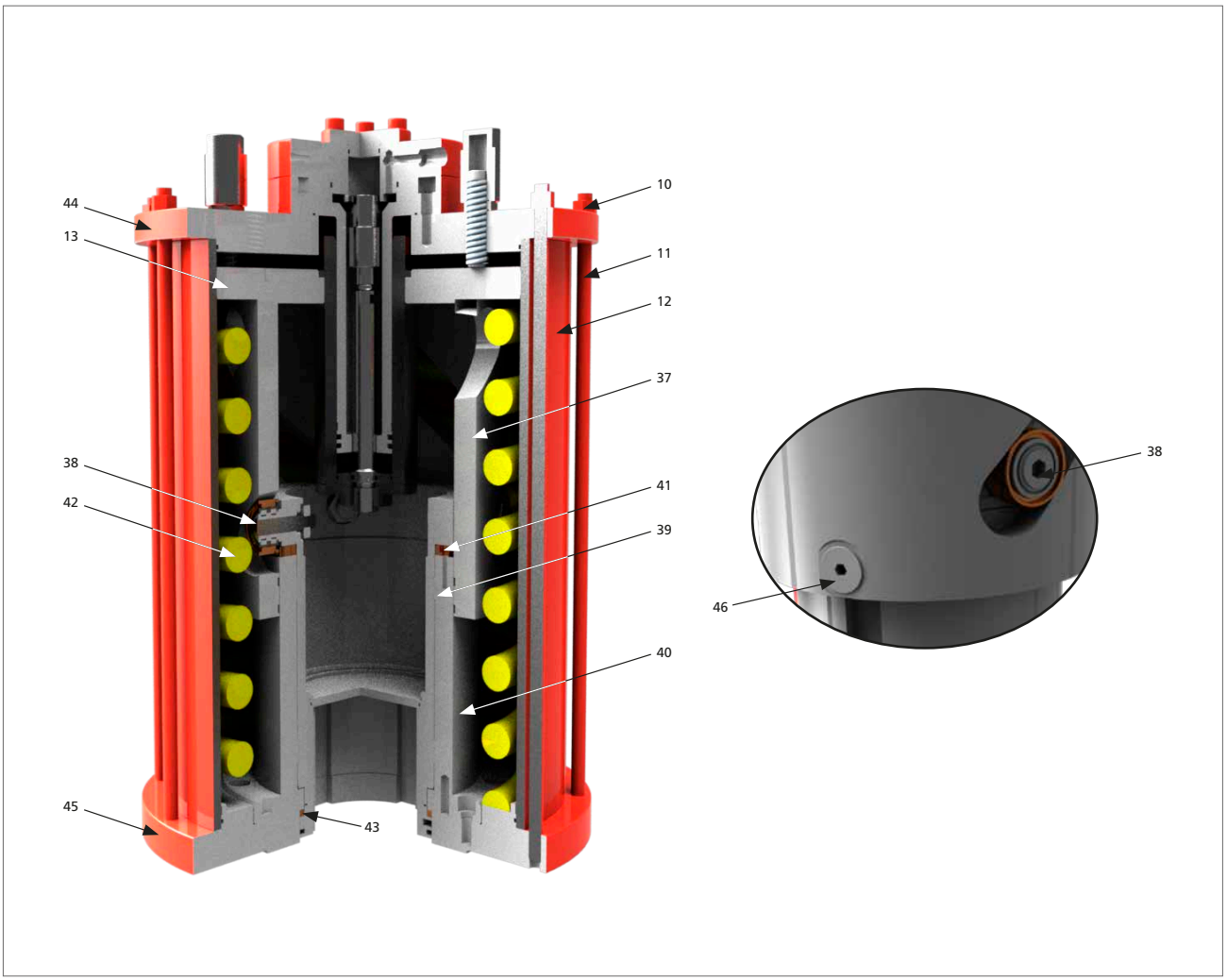


Fig 17.2 Hydraulic actuator single effect (Type A) – particular 2

ITEM	DESCRIPTION	MATERIAL	QTY
10	Nut	Carbon steel	10
11	Tie rod	Carbon steel	10
12	Cylinder tube	Carbon steel	1
37	Mechanism	Carbon steel	1
38	Rotating pin group	–	3
39	Torque tube	Carbon steel	1
40	Vertical slot tube	Carbon steel	1
41	Upper bushing	Copper	1
42	Spring	Spring steel	1
43	Lower bushing	Copper	1
44	End flange	Carbon steel	1
45	Head flange	Carbon steel	1
46	Sliding pin group	Carbon steel	3

18. Grease and 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 compact actuators are shown below. If an alternative was specified and/or supplied, please refer to the job-specific documentation.

18.1 Grease

Lubricate seals, seal grooves and internal cylinder tube using the following grease or equivalent for temperature range -30 to +100 °C (-22 to +212 °F).

Manufacturer:	Dow Corning Corporation
Trade name: **Colour:**	MOLIKOTE® P40 Clear brown
Unworked penetration (ISO 2137): **Viscosity of oil at 40 °C (104 °F) (DIN 51 562):**	310-350 mm/10 360 mm^2/s
Service temperature: **Drop point (ISO 2176):**	-40 to 230 °C (-40 to 446 °F) None
Four ball tester **Weld load (Din 51 350 pt.4)** **Wear scar under 800N load (Din 51 350 pt.5)**	 3000 N 0.94 mm
Coefficient of friction [1] **Screw test - µ thread** **Screw test - µ head**	 0.16 0.08

1. Coefficient of friction in bolted connection, M12x1.75, 8.8, on blackened surface.

This is the standard grease specification for Rotork compact actuators working at temperatures between -30 and +100 °C (-22 to +212 °F). An alternative may have been specified for your application. Please refer to the job specific documentation.

18.2 Hydraulic oil

This is the standard oil specification for Rotork hydraulic manual override and hydraulic cylinders working at temperature between -20 to +100 °C (-4 to +212 °F) for ATEX and non-ATEX application.

Manufacturer:	MOBIL
Trade Name:	DTE 10 EXCEL 32
ISO viscosity grade:	32
Viscosity, ASTM D 445 **cSt @ 40 °C (104 °F)** **cSt @ 100 °C (212 °F)**	 32.7 6.63
Viscosity index, ASTM D 2270	164
Brookfield viscosity ASTM D 2983, cP @ -20 °C (-4 °F)	1090
Brookfield viscosity ASTM D 2983 cP @ -30 °C (-22 °F)	3360
Brookfield viscosity ASTM D 2983 cP @ -40 °C (-40 °F)	14240
Tapered roller bearing (CEC L-45-A-99), %viscosity loss	5
Density 15 °C (59 °F), ASTM D 4052, kg/L	0.8468
Copper strip corrosion, ASTM D 130, 3 hrs @ 100 °C (212 °F)	1B
Rust characteristics, ASTM D 665B	Pass
FZG gear test, DIN 51534, fail stage	12
Pour point, ASTM D 97	-54 °C (-65 °F)
Flash point, ASTM D 92	250 °C (482 °F)
Foam sequence I, II, III, ASTM D 892, ml	20/0
Dielectric strength, ASTM D877, kV	49
Acute aquatic toxicity (LC-50, OECD 203)	Pass

This is the standard oil specification for Rotork hydraulic manual override and hydraulic cylinders working at temperature between -40 to +100 °C (-40 to +212 °F) for ATEX and non-ATEX application.

Manufacturer:	MOBIL
Trade name:	DTE 10 EXCEL 15
ISO viscosity grade:	15
Viscosity, ASTM D 445 **cSt @ 40 °C (104 °F)** **cSt @ 100 °C (212 °F)**	 15.8 4.07
Viscosity index, ASTM D 2270	158
Brookfield viscosity ASTM D 2983 cP @ -40 °C (-40 °F)	2620
Tapered roller bearing (CEC L-45-A-99), %viscosity loss	5
Density 15 °C (59 °F), ASTM D 4052, kg/L	0.8375
Copper strip corrosion, ASTM D 130, 3 hrs @ 100 °C (212 °F)	1B
Pour point, ASTM D 97	-54 °C (-65 °F)
Flash point, ASTM D 92	182 °C (360 °F)
Foam sequence I, II, III, ASTM D 892, ml	20/0
Dielectric strength, ASTM D877, kV	45
Acute aquatic toxicity (LC-50, OECD 203)	Pass

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