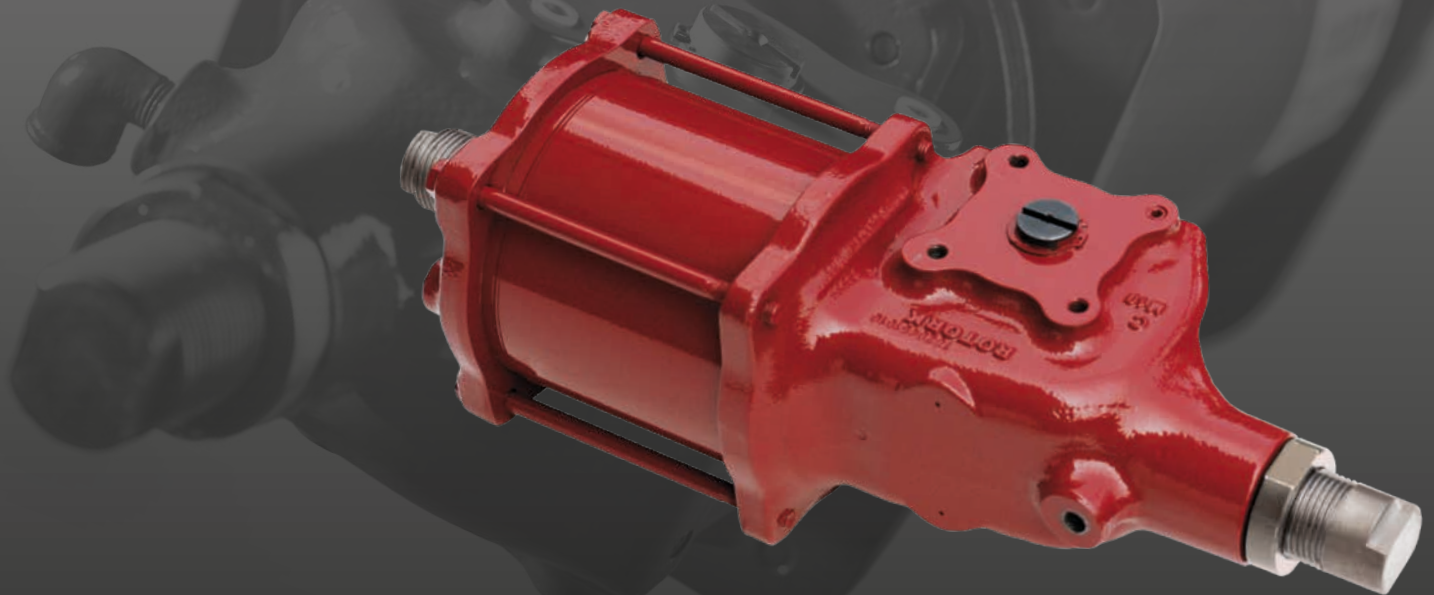


rotork®

Keeping the World Flowing
for Future Generations

CP range
Pneumatic actuator



Installation, commissioning and maintenance manual

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Single effect size 055/065



Single effect size 035/045



Double effect

This manual contains important safety information. Please ensure it is thoroughly 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 maintenance aspects and instructions specific for the CP range actuators. General information on Rotork actuators are described in the user manual, delivered separately.

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



Generic danger



Hand crush/pinch point



Electrocution



Explosive material

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 the United Kingdom have been designed, built and tested according to the quality control system, in compliance with the EN ISO 9001:2015 standard and with the following regulations/directive.

- 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 (EX)
- 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 CP actuator single- and double-acting (CP/S and CP/D).

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 CP range actuators have been specifically developed to automate quarter-turn valves, such as ball valves, butterfly valves or plug valves installed on pipelines for oil & gas transport and distribution.

⚠ 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 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 >85 dB during operation (RES_05). |
| 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). (This risk is applicable only for actuators provided with remote control panel). |
| Preventive measures | Assure that the actuator cannot be operated remotely. Prior to starting, remove the pneumatic supply, vent all pressure vessels, and remove electrical power. |
| Risk | Presence of moving parts (centre body, valve adapter) (RES_04) |
| Preventive measures | Do not perform start-up or test the actuator if the cylinder tube is removed. |

4. Health and safety

| | |
|---------------------|--|
| 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. |
| Preventive measures | Foresee periodic maintenance procedure to verify tightening. |
| 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. |

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 actuator has no internal heat source. Maximum actuator temperature is near the environmental or exercise fluid temperature, whichever is the greater. Normal operating temperature is about -30 to +100 °C (-22 to +212 °F). 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.

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

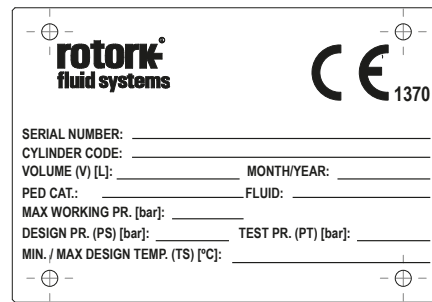


Fig 5.2 Actuator PED label

Label removal is not allowed.

6. Operating limits

Temperature: -30 to +100 °C (-22 to +212 °F)
for standard applications
-20 to +100 °C (-4 to +212 °F)
for PED applications
-40 to +100 °C (-40 to +212 °F)
for low temperature application
-60 to +100 °C (-76 to +212 °F)
for ultra-low temperature application

Design pressure: Up to 12 barg. Other design pressure,
available upon request.

Operating pressure: Up to design pressure.

⚠ Do not use the equipment outside its operating limits. Verify operating limits on the nameplate.

Prevent external surface temperature to reach the ignition point in potentially explosive environments.

The actuator surface temperature is strictly dependent on the temperature of the process fluid used and by the irradiation's conditions. The end-user has to check the surface temperature of the assembly, so that this cannot go over the minimum gas ignition's temperature, which classifies the area with the explosion's risk.

Dust and debris accumulated on the actuator will slow down its cooling and contribute to the increase of its external temperature.

6.1 Allowed fluid types

The pneumatic actuator is designed to be operated with gas, instrument air with particles filtering $\leq 40 \mu\text{m}$ (Class 7 according ISO 8573-1, Table 1), pressure dew point $\leq -20 \text{ °C}$ (-4 °F) or, to be at least, 10 °C below the ambient temperature (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.

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 |
| RECOMMENDED TIGHTENING TORQUE EXCEPTIONS | | |
| ACTUATOR TIE RODS (AND CYLINDER FLANGE TO HOUSING CP055 / 065 ONLY) | | |
| M16 (CP055) | 130 | 96 |
| M16 (CP065) | 180 | 133 |

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
- For lifting purposes, use only suitable lifting tools
- 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
- 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.

7.2 Lifting instructions

NOTE: Indication of weight, centre of gravity, lifting points are reported within specific project documentation.

For actuator orientation different from the horizontal one please consult project specific documentation before lifting.

- Prior to lifting the actuator, remove electrical power and vent all pressure vessels (if present)
- Place the textile eye slings as shown in Fig 7.1

⚠ The actuator must remain horizontal; balance the load.

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



Fig 7.1 Lifting

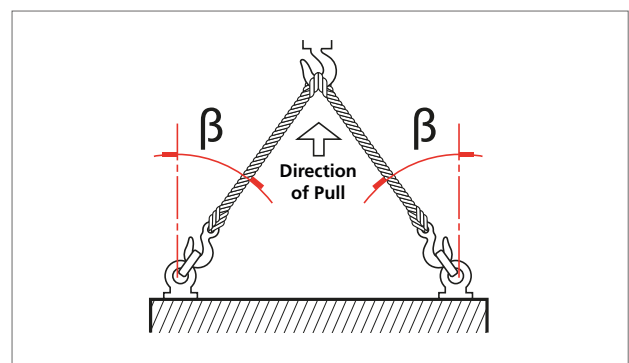


Fig 7.2 Lifting angle

8. Storage

Rotork 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
- Store in a dry, well-aired place. Avoid long-term direct exposure to sunlight
- Keep the actuator on its shipping pallet until installation

⚠ Never put the actuator directly on the ground.

- Protect the valve coupling area (adapter flange and coupling joint, etc.) 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 packaging only at the installation time.

⚠ Actuator vent ports must be protected with polyethylene sheet to prevent water ingress during storage.

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
- Store in a dry, well-aired place. Avoid long-term direct exposure to sunlight
- Stroke the actuator every 12 months:
 - Cycle the actuator (using 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
 - Cycle the actuator fitted with the hydraulic manual override by means of the hand pumps for 4 complete strokes
 - Disconnect the pipeline gas 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


Before proceeding, read and understand the health and safety information.

NOTE: The 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 actuator nameplate.**

- The centreline of the cylinder is usually aligned to 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 pipeline gas power to the actuator must be free from contaminants and debris. Ensure 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 pipeline gas connections. Tighten as required

10.2 Instructions

The assembling can be performed by:

- Mounting directly using the actuator housing flange with threaded holes
- Using an adapter and a coupling joint between the actuator and the valve


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 centre body or 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 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
- If the assembly is done using an adapter and a coupling joint, assemble the coupling joint onto the valve stem before proceeding with the assembly of the actuator
- 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.**

 **Attention: Do not pressurise the actuator/valve adapter.**

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

11. 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.

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

- Cut off the electrical power supply
- Cut off the pneumatic supply
- Remove the supply pipes from the actuator
- Release any pressure from the control group
- 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



Fig 11.1 Actuator/valve assembling example

12. Operation

The following instructions must be followed and integrated into the 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 pipeline gas 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.

⚠ Do not operate the actuator without the protection guards installed.

12.1 Description

The CP/S series actuators are pneumatic single-acting, spring-return actuators. The compact and efficient design yields surprisingly high torques even at low pressures. The design concepts found in Rotork's large, heavy-duty actuators has been applied to the CP range, which brings heavy-duty actuator qualities to small, quarter-turn actuators.

The CP/S series can be assembled in the fail to close or fail to open version and can be fitted with an emergency manual override suitable to operate the actuator in the event of fluid supply failure.

This device can be of mechanical screw type operated using a wrench or a handwheel.

The main components of CP/S actuators are shown in Fig 12.1, Fig 12.2 and Fig 12.3.

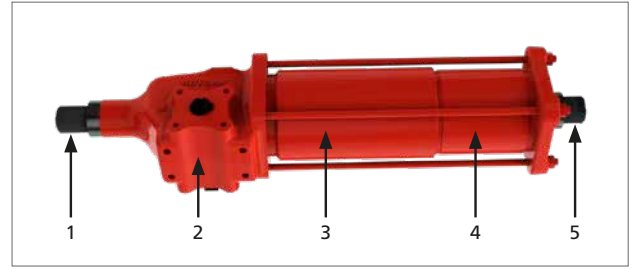


Fig 12.1 CPIS (055-065) main components

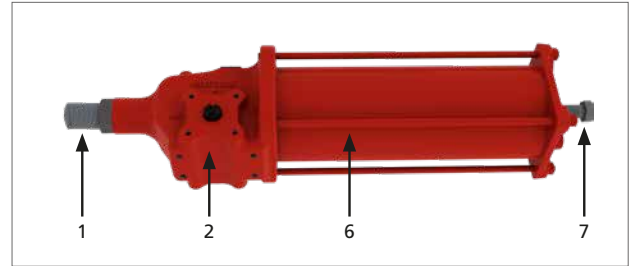


Fig 12.2 CPIS (035-045) main components

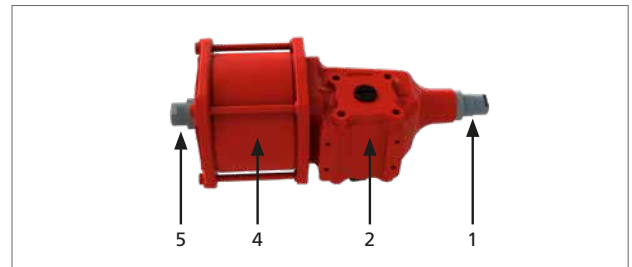


Fig 12.3 CPID main components

Table 1: CPIS parts list

| IT | DESCRIPTION | QTY |
|----|--------------------------------|-----|
| 1 | Mechanical stop bolt | 1 |
| 2 | Centre body | 1 |
| 3 | Spring cartridge (055-065) | 1 |
| 4 | Cylinder tube (055-065) | 1 |
| 5 | Mechanical stop bolt (055-065) | 1 |
| 6 | Cylinder tube (035-045) | 1 |
| 7 | Stop screw (035-045) | 1 |

Table 2: CPID parts list

| IT | DESCRIPTION | QTY |
|----|----------------------|-----|
| 1 | Mechanical stop bolt | 1 |
| 2 | Centre body | 1 |
| 4 | Cylinder tube | 1 |
| 5 | Mechanical stop bolt | 1 |

12. Operation

Main components of a CP actuator are:

- A scotch-yoke mechanism made of ductile iron, which transforms the linear movement of the pneumatic cylinder and of the spring (for single-acting actuator) into a rotary movement suitable for operating quarter turn valves, such as ball valves, butterfly valves or plug valves

The scotch-yoke mechanism in symmetric execution is inside a weatherproof housing, made of ductile iron

The carbon steel axial bar is provided with Nitreg treatment (for CP055 and CP065) or chromium-plated (for CP035 and CP045) and supported by bushing made of bronze and Teflon to ensure minimum friction and long service

The Nitreg process provides increased surface hardness, reduced surface roughness as well as extremely high resistance to corrosion

- A pneumatic cylinder, made of carbon steel

The cylinder tube is Nickel-plated internally

The piston is made of carbon steel with a dynamic floating seal

The dynamic seals of the cylinder are specifically designed to enable the use of the actuator without lubrication

- The spring, within the cartridge (only for 055-065 size) is contained by the piston and piston rod thus eliminating the possibility of inadvertent release of spring force

The design also allows access to the piston seal without the disassembly of the spring cartridge

- Two mechanical stop bolts are located in the end flange of the pneumatic cylinder and in the housing to ensure accurate angular stroke adjustment
- A mechanical visual position indicator directly connected to the valve stem that shows the position of the valve all along the actuator stroke

Upon request, CP/S series actuators can be equipped with additional accessories (limit switches box, positioner, position transmitter, etc.)

Use only control devices supplied by Rotork.

12.2 Operating description

Please refer to the operating diagram supplied for the specific actuator.

In case of use of CP/D actuators in SIL applications the system integrator must fulfill all requirements reported in Section 11.2.11 of standard IEC61511-1.

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

12.3 Manual override

The CP series can be fitted with an emergency manual override suitable to operate the actuator in the event of fluid supply failure.

⚠ A maximum operating time of the manual override of 24 hours, for maintenance or testing, is recommended.

NOTE: The use of manual override is not recommended in SIL applications. If it is necessary, strictly follow instructions reported in the following paragraphs.

The manual override is mechanical type.

For CP series actuator the manual override consists of a jackscrew device controlled by a wrench (M type) or handwheel (MH type).

⚠ Before operating the mechanical manual override, ensure that the cylinder is not pressurised and that the actuator is in the fail position, then proceed as indicated in the following paragraphs.

⚠ Before re-starting the actuator with air supply, rotate the jackscrew again so as to set the actuator in its original position.

After each use, verify that the manual override has been disengaged before returning to remote operation.

12. Operation

12.3.1 Fail to close, single-acting actuator

- Rotate the jackscrew with a wrench or with a handwheel, counter-clockwise, to open the valve

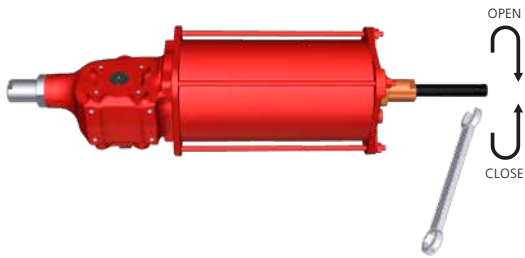


Fig 12.4 "Fail to close" actuator with manual override „M" type

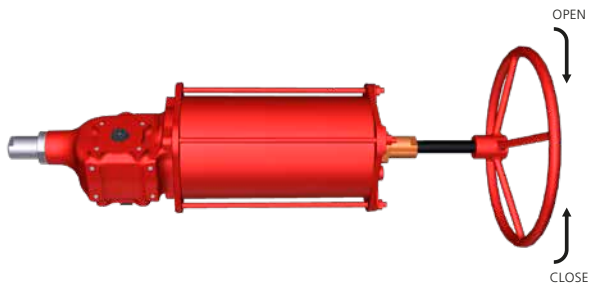


Fig 12.5 "Fail to close" actuator with manual override „MH" type

12.3.2 Fail to open, single-acting actuator

- Rotate the jackscrew with a wrench or with a handwheel, clockwise, to close the valve



Fig 12.6 "Fail to open" actuator with manual override „M" type

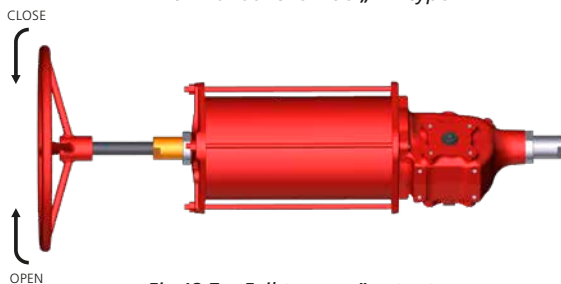


Fig 12.7 "Fail to open" actuator with manual override „MH" type

12.3.3 Opening operation for double-acting actuator

- Rotate the jackscrew with a wrench or with a handwheel, counter-clockwise, to open the valve

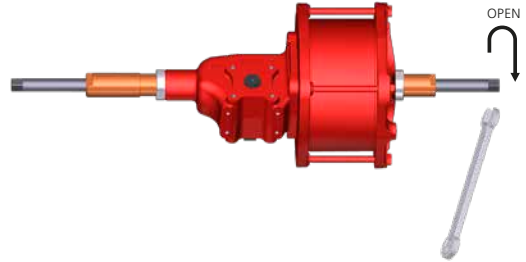


Fig 12.8 Opening operation for CPID with manual override „M" type

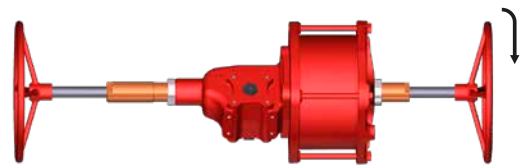


Fig 12.9 Opening operation for CPID with manual override „MH" type

12.3.4 Closing operation for double-acting actuator

- Rotate the jackscrew with a wrench or with a handwheel, clockwise to close the valve

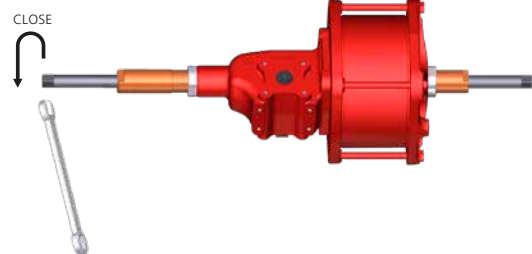


Fig 12.10 Closing operation for CPID with manual override „M" type

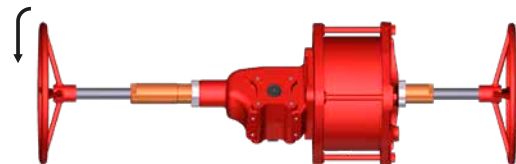


Fig 12.11 Closing operation for CPID with manual override „MH" type

Clean the jackscrew regularly and grease it afterwards. Use recommended grease.

12. Operation

12.4 Angular stroke setting

⚠️ Certain valves incorporate their own stops. For such valves, it is recommended that the actuator stop bolt positions coincide with the valve stop position.

Contact the valve manufacturer to set the valve mechanical stops.

⚠️ An incorrect setting of angular stroke could cause damages to the actuator, valve and/or to personnel.

12.4.1 Single-acting actuator, cylinder stop bolt setting (size 055-065)

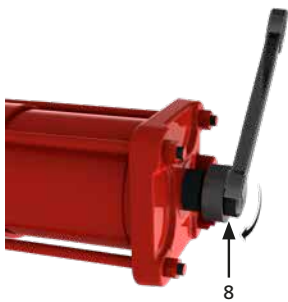
Perform the following operations as first setting.

Adjust the stop bolt located in the end flange of the cylinder as follows:

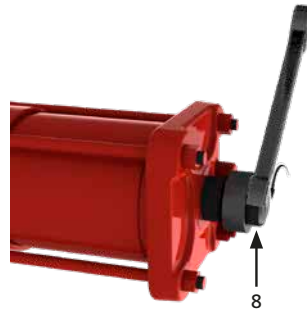
- A. Verify the absence of pressure
- B. Loosen stop nut (7) and O-ring (6)
- C. Screw the stop bolt until the stop position is reached
- D. Slowly pressurise the cylinder to detach the stop bolt from the piston



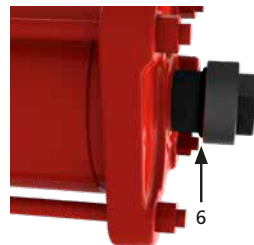
- E. To increase angular stroke, rotate the stop bolt (8) anti-clockwise
- F. Remove pressure
- G. Verify the newly obtained angular position with one stroke
- H. Repeat operations A to F, until the desired angle is obtained



- I. To decrease angular stroke, rotate the stop bolt (8) clockwise
- J. Remove pressure
- K. Verify the newly obtained angular position with one stroke
- L. Repeat operations A to D and I to J, until the desired angle is obtained



- M. Re-position O-ring (6) between flange and stop nut (7)



- N. Hold stop bolt (8) with a wrench and carefully tighten nut (7)



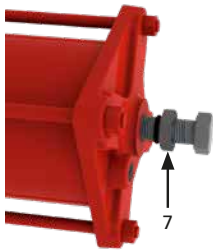
12. Operation

12.4.2 Single-acting actuator, cylinder stop bolt setting (size 035-045)

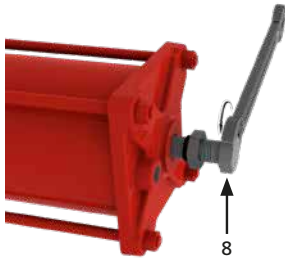
Perform the following operations as first setting.

Adjust the stop bolt located in the end flange of the cylinder as follows:

- A. Verify the absence of pressure
- B. Loosen stop nut (7) and O-ring (6)
- C. Screw the stop bolt until stop
- D. Slowly pressurise the cylinder to detach the stop bolt from the piston



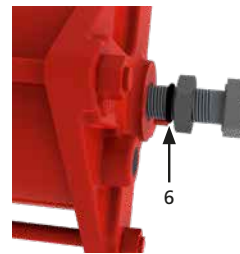
- E. To increase angular stroke, rotate the stop screw (8) anti-clockwise
- F. Remove pressure
- G. Verify the newly obtained angular position with one stroke
- H. Repeat operations A to F, until the desired angle is obtained



- I. To decrease angular stroke, rotate the stop screw (8) clockwise
- J. Remove pressure
- K. Verify the newly obtained angular position with one stroke
- L. Repeat operations A to D and I to J, until the desired angle is obtained



- M. Re-position O-ring (6) between flange and stop nut (7)



- N. Hold stop screw (8) with a wrench and carefully tighten nut (7)



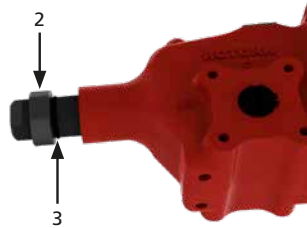
12. Operation

12.4.3 Single-acting actuator, centre body stop bolt setting (size 035-045-055-065)

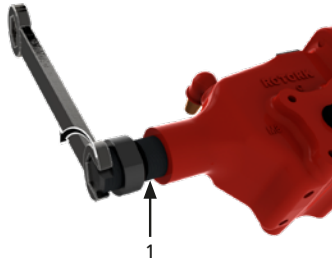
Perform this setting after having set the stop bolt on the cylinder.

Adjust stop bolt (1) screwed into the housing, as follows:

- O. Pressurise the cylinder until reaching the fully open position, and verify the actuator stroke stop
- P. Depressurise the cylinder to adjust the angular stroke setting
- Q. Loosen stop nut (2) and O-ring (3)



- R. To increase angular stroke, rotate the stop bolt (1) anti-clockwise



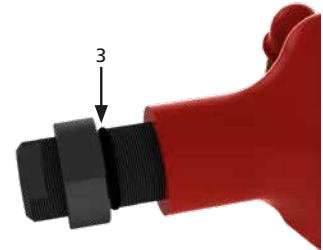
- S. To decrease angular stroke, rotate the stop bolt (1) clockwise



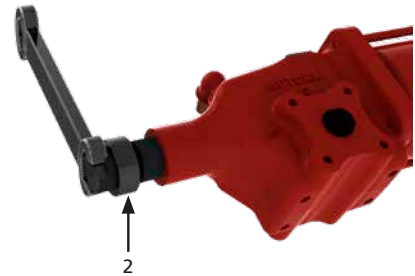
- T. Verify the newly obtained angular position with one closing stroke

- U. Repeat this operation until the desired angle is obtained

- V. Re-position O-ring (3) between flange and stop nut (2)



- W. Hold stop bolt (1) with a wrench and carefully tighten nut (2)



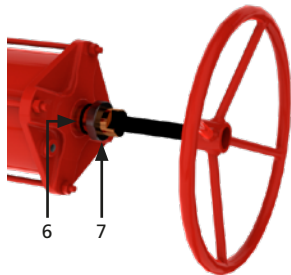
12. Operation

12.4.4 Single-acting actuator with MH type manual override, cylinder stop bolt setting

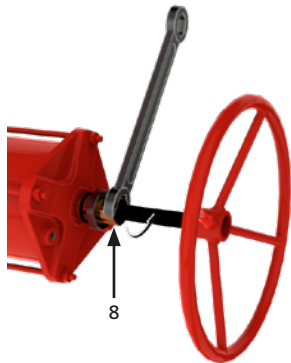
Perform the following operations as first setting.

Adjust the stop bolt located in the end flange of the cylinder as follows:

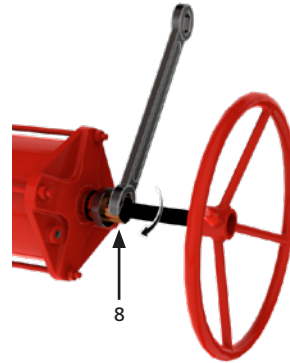
- A. Verify the absence of pressure
- B. Verify the handwheel is fully retracted
- C. Loosen stop nut (7) and O-ring (6)
- D. Screw the stop bolt until stop
- E. Slowly pressurise the cylinder to detach the stop bolt from the piston



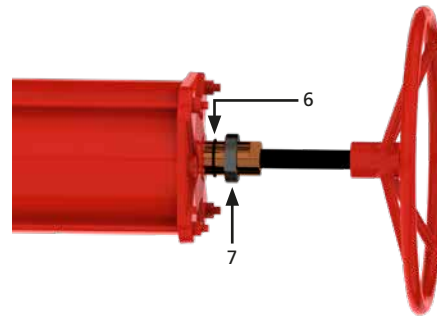
- F. To increase angular stroke, rotate the stop bolt (8) anti-clockwise
- G. Remove pressure
- H. Verify the newly obtained angular position with one stroke
- I. Repeat operations A to G, until the desired angle is obtained



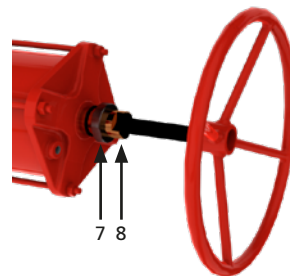
- J. To decrease angular stroke, rotate the stop bolt (8) clockwise
- K. Remove pressure
- L. Verify the newly obtained angular position with one stroke
- M. Repeat operations A to E and J to K, until the desired angle is obtained



- N. Re-position O-ring (6) between flange and stop nut (7)



- O. Hold stop bolt (8) with a wrench and carefully tighten nut (7)

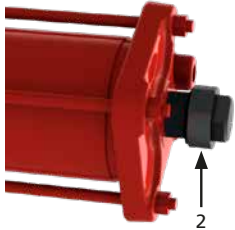


12. Operation

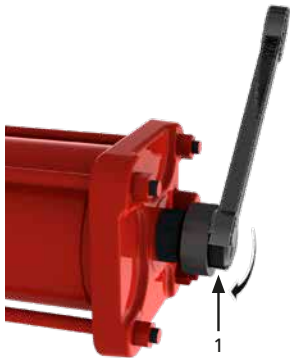
12.4.5 Cylinder stop bolt setting (double-acting actuator)

Adjust stop bolt (1) screwed into the end flange, as follows:

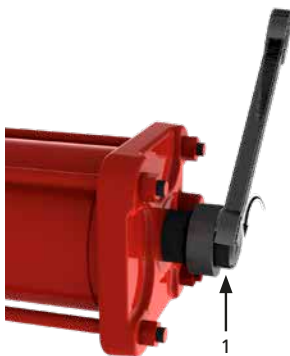
1. Pressurise the cylinder from the end flange side until the actuator reaches the fully open position, and verify the actuator stroke stop
2. Pressurise the cylinder from the second port side to detach the stop bolt from the housing
3. Loosen stop nut (2)



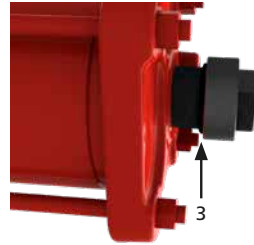
4. To increase angular stroke, rotate the stop bolt (1) anti-clockwise



5. To decrease angular stroke, rotate the stop bolt (1) clockwise



6. Verify the newly obtained angular position with one closing stroke
7. Repeat this operation until the desired angle is obtained
8. Ensure O-ring (3) is correctly positioned



9. Hold stop bolt (1) with a wrench and tighten nut (2)

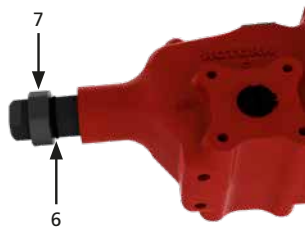


12. Operation

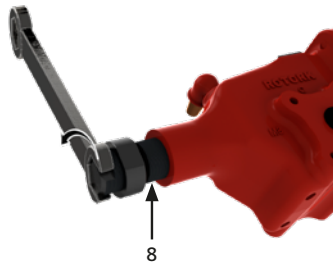
12.4.6 Centre body stop bolt setting (double-acting actuator)

Adjust stop bolt (8) screwed into the housing, as follows:

1. Pressurise the cylinder from the second port until reaching the fully stroke end position, and verify the actuator stroke stop
2. Pressurise the cylinder from the end flange side to detach the stop bolt from the piston
3. Loosen stop nut (7) and O-ring (6)



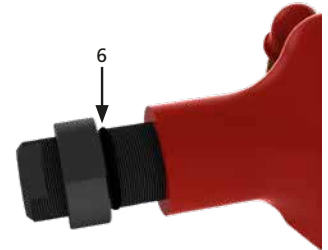
4. To increase angular stroke, rotate the stop bolt (8) anti-clockwise



5. To decrease angular stroke, rotate the stop bolt (8) clockwise.



6. Verify the newly obtained angular position with one closing stroke.
7. Repeat this operation until the desired angle is obtained.
8. Re-position O-ring (6) between flange and stop nut (7)



9. Hold stop bolt (8) with a wrench and tighten nut (7).



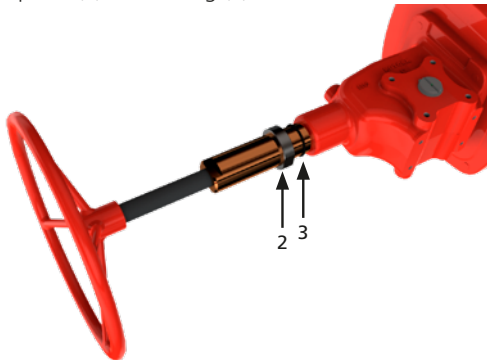
12. Operation

12.4.7 Double-acting actuator with MH manual override, centre body stop bolt setting (size 035-045-055-065).

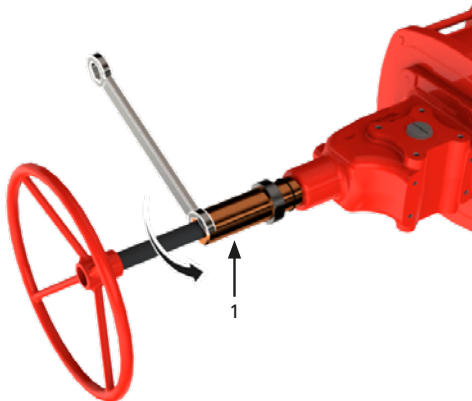
Perform this setting after having set the stop bolt on the cylinder.

Adjust stop bolt (1) screwed into the housing, as follows:

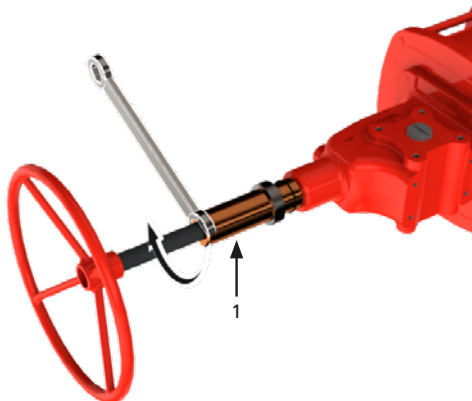
- A. Pressurise the cylinder until reaching the fully open position, and verify the actuator stroke stop
- B. Depressurise the cylinder to adjust the angular stroke setting
- C. Loosen stop nut (2) and O-ring (3)



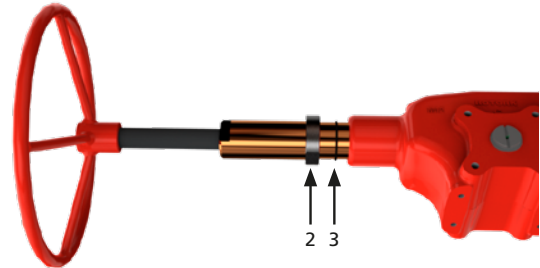
- D. To increase angular stroke, rotate the stop bolt (1) anti-clockwise



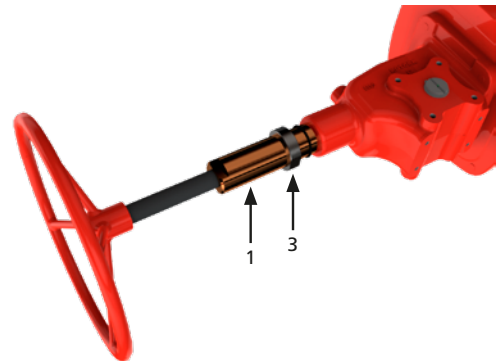
- E. To decrease angular stroke, rotate the stop bolt (1) clockwise



- F. Verify the newly obtained angular position with one closing stroke
- G. Repeat this operation until the desired angle is obtained
- H. Re-position the O-ring (3) between the flange and stop nut (2)



- I. Hold stop bolt (1) with a wrench and carefully tighten nut (2)



12. Operation

12.5 Pneumatic 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.

12.6 Pneumatic connections

Preliminary operations:

1. Verify sizes of pipes and fittings according to applicable plant specifications
2. Clean the inside of the connection pipes by washing them with a suitable detergent and by blowing air into them
3. 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 with the applicable operating diagram, please refer to specific job specification for details.

⚠ Do not feed a single-acting actuator from the spring container side after having removed the exhaust silencer, especially if the line valve is blocked.

⚠ If actuator is provided of spool, avoid spool pressurisation.

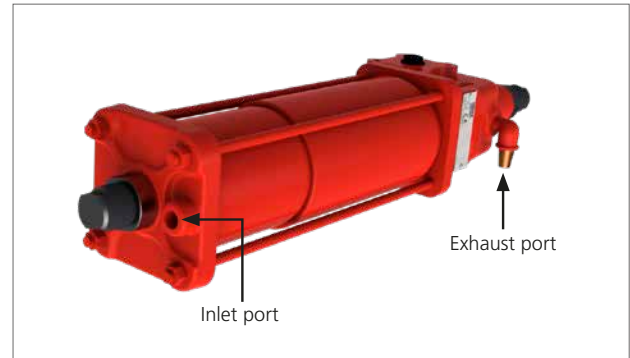


Fig 12.12 Inlet exhaust port for single-acting actuator

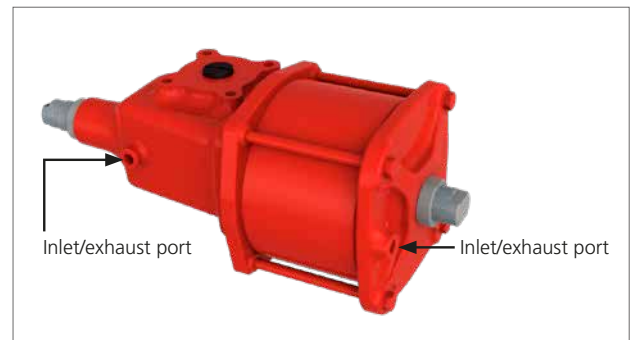


Fig 12.13 Inlet exhaust port for double-acting actuator (except for CPD-065)

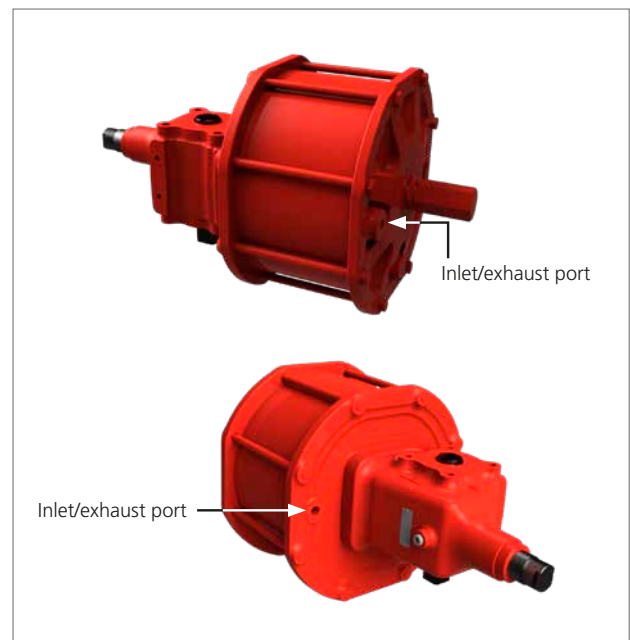





Fig 12.14 Inlet exhaust port for double-acting actuator CPD-065

12. Operation

12.7 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 power supply
- 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 in 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 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

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

12.8 Start up

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

- Medium 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
- 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.**

13. Dismantling and disposal

Prior to dismantling the actuator, check if any of its parts are still under pressure.

For single-acting actuator

 **The spring cartridge module could contain potential energy due to compressed elastic elements.**

 **Grease and oil must be disposed of safely in accordance with the local environmental laws and regulations.**

- Dismount the actuator, separate and divide the various parts and components according to the type of material
- 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 specialised disposal sites

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 | <ul style="list-style-type: none"> Fault of pipeline valve | <ul style="list-style-type: none"> Consult the valve manufacturer's documentation |
| 2 | Incorrect indication of valve position | <ul style="list-style-type: none"> Incorrect signal from limit switches | <ul style="list-style-type: none"> Check limit switches position (see job specific documentation and limit switch box manufacturer's documentation) |
| 3 | Incorrect movement | <ul style="list-style-type: none"> Irregular supply of operating medium | <ul style="list-style-type: none"> Verify the supply pressure and adjust as necessary |
| | | <ul style="list-style-type: none"> Worn parts | <ul style="list-style-type: none"> Contact Rotork customer service |
| | | <ul style="list-style-type: none"> Fault in control panel equipment (if present) | <ul style="list-style-type: none"> Contact Rotork customer service |
| | | <ul style="list-style-type: none"> Fault of pipeline valve | <ul style="list-style-type: none"> Consult the valve manufacturer's documentation |
| 4 | Valve stroke not fully completed | <ul style="list-style-type: none"> Insufficient gas flow | <ul style="list-style-type: none"> Increase gas supply flow |
| | | <ul style="list-style-type: none"> Incorrect assembly between actuator and valve | <ul style="list-style-type: none"> Reassemble the actuator to the valve (Section 10) |
| | | <ul style="list-style-type: none"> Valve blocked | <ul style="list-style-type: none"> Consult the valve manufacturer's documentation |
| | | <ul style="list-style-type: none"> Stop bolts wrong setting | <ul style="list-style-type: none"> Adjust stop bolt setting according to angular stroke setting (Section 12.4) |
| 5 | Leakages | <ul style="list-style-type: none"> Stop bolts wrong setting | <ul style="list-style-type: none"> Adjust stop bolt setting according to angular stroke setting (Section 12.4) |
| | | <ul style="list-style-type: none"> Worn seals | <ul style="list-style-type: none"> Replace seals according to PM-CP2-005, PM-CP2-006, PM-CP2-007 (Section 16) |
| 6 | Actuator moves too fast | <ul style="list-style-type: none"> No pressure on pipeline | <ul style="list-style-type: none"> Restore pipeline pressure |
| | | <ul style="list-style-type: none"> Supply pressure greater than allowed range values | <ul style="list-style-type: none"> Verify the supply pressure and adjust as necessary |
| 7 | Actuator moves too slow | <ul style="list-style-type: none"> Fault on pipeline valve (valve hardened) | <ul style="list-style-type: none"> Consult the valve manufacturer's documentation |
| | | <ul style="list-style-type: none"> Supply pressure lower than allowed range values | <ul style="list-style-type: none"> Verify the supply pressure and adjust as necessary |
| | | <ul style="list-style-type: none"> Possible internal undue friction | <ul style="list-style-type: none"> Contact Rotork customer service |
| 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"> Replace seals according to PM-CP2-005, PM-CP2-006, PM-CP2-007 (Section 16) |

For other problems, please contact Rotork.

16. Periodic maintenance

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

⚠ Remove pressure before proceeding with maintenance operations, discharge any accumulators or tanks (if present), except where otherwise indicated.

Periodic maintenance schedule

| MAINTENANCE ACTIVITY | PERIODICITY | | REFERENCE |
|--|-------------|-------|---------------------|
| | Months | Years | |
| Visual check of external components and control groups | 6* | * | |
| Verify welding. In case of anomalies contact Rotork | 6* | * | |
| Check pneumatic connections for leaks. Tighten pipe fittings as required | - | 1* | |
| Cleaning | - | 1* | PM-CP2-001 Page 26 |
| Visual check of painting. Verify absence of damages. Repair if necessary according to painting specification | - | 1* | |
| Functional test | - | 1* | PM-CP2 -002 Page 27 |
| Functional test by manual override | - | 1* | PM-CP2 -003 Page 28 |
| Check electrical components (if present) and grounding connections | - | 1* | PM-CP2 -004 Page 29 |
| Cylinder seals replacement (single-acting actuator size 035-045) | - | 5* | PM-CP2-005 Page 30 |
| Cylinder seals replacement (single-acting actuator size 055-065) | - | 5* | PM-CP2-006 Page 34 |
| Cylinder seals replacement (double-acting actuator) | - | 5* | PM-CP2-007 Page 38 |

(*) 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.

Corrective maintenance task



In case of fault, according to details in Section 15, the following operations could be executed by the end user.

| MAINTENANCE ACTIVITY | REFERENCE |
|-------------------------------|--------------------|
| Actuator fail mode converting | CM-CP2-001 Page 41 |



16. Periodic maintenance

| PM-CP2-001 | | Page: 1/1 |
|---|---|-----------|
| Component: Single-acting actuator (035-045-055-065 size) double-acting actuator | Task: Cleaning | |
| Equipment, tools, materials: Air compressor Project documentation (design and operating pressure values) | Warnings:  | |
| Preliminary operations: | | |
| Description:  Remove electric and pneumatic supply before proceeding. 1. Remove dust from actuator external surface by dust rag and 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, so as to prevent potential explosion hazards. Prevent electrostatic charges in potentially explosive areas. | | |



16. Periodic maintenance

| PM-CP2 -002 | | Page: 1/1 |
|---|--|-----------|
| Component: Single-acting actuator (035-045-055-065 size) double-acting 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 supply to perform the following test. <ol style="list-style-type: none">1. Operate the actuator2. Perform the stroke several times by local and remote (if applicable) control <p> Actuator could exhaust medium supply in the atmosphere during normal operation. Wear PPE including breathing device in function of type of medium supply used.</p> <ol style="list-style-type: none">3. Verify actuator is correctly working4. Note the stroke time(s)5. Verify stroke time(s) are as required <p>In case of stroke times out of required range refer to Troubleshooting ID 4, 5 (Section 15) to restore.</p> | | |



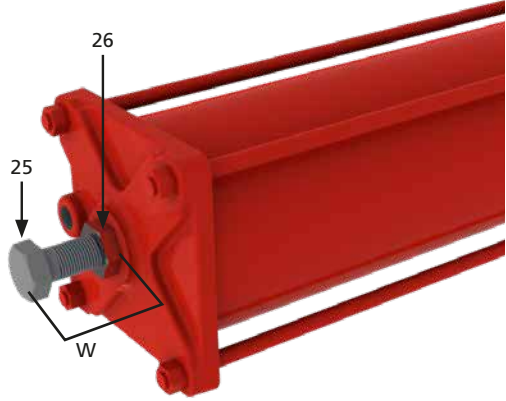

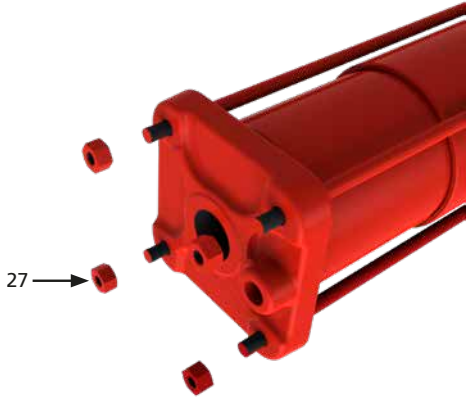
16. Periodic maintenance

| PM-CP2 -003 | | Page: 1/1 |
|--|--|-----------|
| Component: Mechanical manual override | Task: Manual override functional test | |
| Equipment, tools, materials: Project documentation | Warnings:  | |
| Preliminary operations: | | |
| Description: | | |
| Opening operation | | |
| <ol style="list-style-type: none">1. Verify the actuator is not in the completely open position2. Move the mechanical manual override according to manual override instructions (Section 12.3) to bring the actuator in the open position3. Verify the actuator reaches the fully open position | | |
| Closing operation | | |
| <ol style="list-style-type: none">1. Verify the actuator is not in the completely closed position2. Move the mechanical manual override according to manual override instructions (Section 12.3) to bring the actuator in the close position3. Verify the actuator reaches the fully closed position | | |
|  Before re-starting the actuator with air supply, rotate the jackscrew again so as to set the actuator in its original position. After each use, verify that the manual override has been disengaged before returning to remote operation. | | |


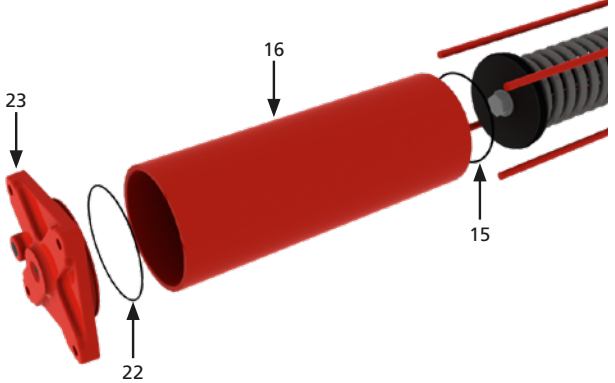
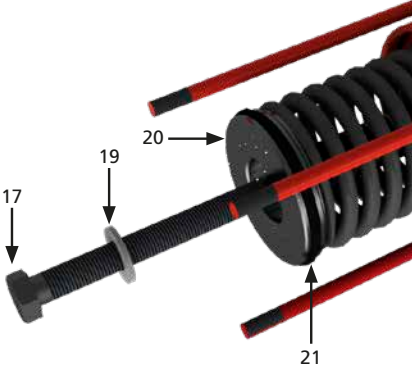
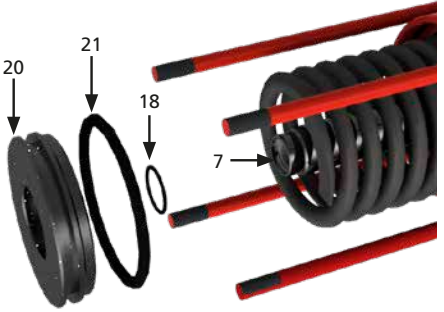
16. Periodic maintenance

| PM-CP2 -004 | | Page: 1/1 |
|---|--|-----------|
| Component: Electrical components (if present) | Task: Check electrical components (if present) and grounding connections | |
| Equipment, tools, materials: Project documentation | Warnings:  | |
| Preliminary operations: | | |
| Description:  Switch off electric power supply before working on electrical devices. Read and follow the safety precautions reported in the manufacturer's maintenance manual. Risk of temporary modification of the component protection. Use only antistatic clothes. <ol style="list-style-type: none">1. Remove cover from electric components2. Check electric device components3. Verify tightness of terminal blocks4. Verify absence of humidity and oxidation5. Check cable gland seals6. Verify grounding connection and restore if necessary | | |


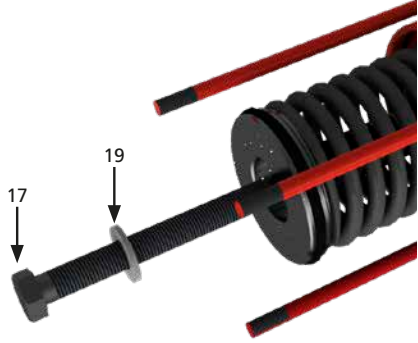
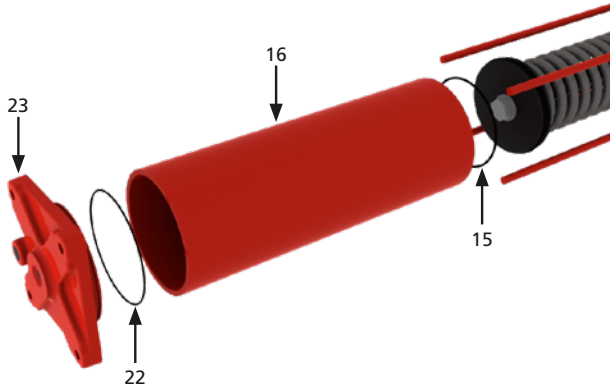
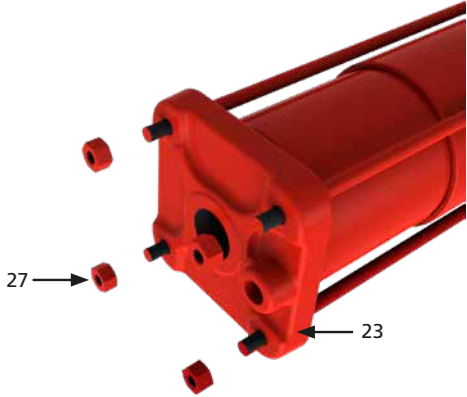
16. Periodic maintenance

| | | PM-CP2-005 | Page: 1/4 |
|--|--|---|-----------|
| Component: Single-acting actuator (035-045 size) | | Task: Cylinder seals replacement | |
| Equipment, tools, materials: Spare seals Wrench Lifting tools Project documentation | | Warnings:  | |
| Preliminary operations: Removal from valve | | | |
| Description:  Cut-off power supply and electric power supply (if present) before performing any operation. | | | |
| Preliminary actions | | | |
| <ol style="list-style-type: none"> 1. Remove actuator from valve (Section 11) 2. Position the actuator on a workbench (if possible) or in a stable position and in a clean and closed area 3. Remove any control equipment (if present). Refer to the project specific documentation 4. Remove pneumatic pipes | | | |
| 5. Measure length (W) | |  | |
| <ol style="list-style-type: none"> 6. Hold stop bolt (25) with a wrench and loosen stop nut (26) 7. Fully unscrew stop bolt (25) <p>If the stop bolt is hard to unscrew, pressurise the cylinder and unscrew the stop bolt by 3-4 turns.</p> <p>Depressurise the cylinder; check if the stop bolt turns freely. If necessary, repeat the operation.</p>  Do not unscrew the stop bolt completely while the cylinder is pressurised. | | | |
| 8. Unscrew nuts (27) | | | |
| | |  | |


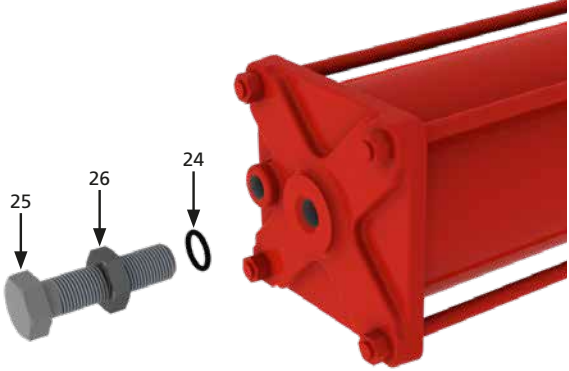
16. Periodic maintenance

| PM-CP2-005 | | Page: 2/4 |
|--|---|-----------|
| Component: Single-acting actuator (035-045 size) | Task: Cylinder seals replacement | |
| Equipment, tools, materials: Spare seals Wrench Lifting tools Project documentation | Warnings:  | |
| Preliminary operations: Removal from valve | | |
| <p>9. Remove end flange (23), O-ring (22 and 15) and cylinder tube (16)</p> <p>⚠ Spring is pre-compressed. With spring fully extended some spring force is still exerted against the piston.</p> |  | |
| <p>10. Unscrew piston retaining bolt carefully (17) and washer (19)</p> <p>⚠ If the threaded bushing is damaged and/or does not remain fixed to the axial bar, stop the maintenance procedure, reassemble the end flange and contact Rotork.</p> <p>11. Remove the piston slightly (20) with piston seal (21). Pay attention to the spring that may remain slightly compressed</p> <p>12. Clean O-ring grooves carefully and all sealing surfaces</p> <p>13. All the removed parts should be thoroughly cleaned, inspected and de-burred as necessary</p> <p>14. Replace O-rings and lubricate them with a grease film</p> <p>15. Lubricate with a grease film all moving parts</p> |  | |
| <p>16. Install piston (20) with piston seal (21) and O-ring (18) on axial bar (7)</p> <p>⚠ While disassembling the piston, carefully unscrew the piston retaining bolt (17). The piston will automatically follow the bolt during the movement. If not, lightly hit the piston with a suitable tool until the piston joins the bolt. Then proceed with the piston disassembly. Remove the piston carefully. Pay attention to the spring that may remain slightly compressed.</p> |  | |


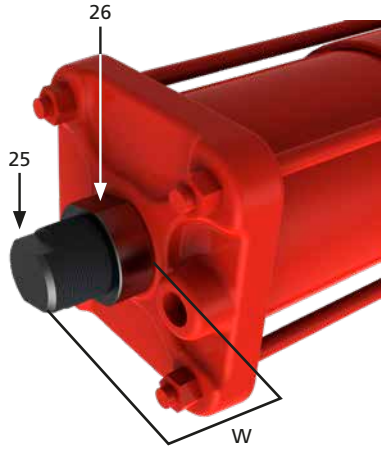
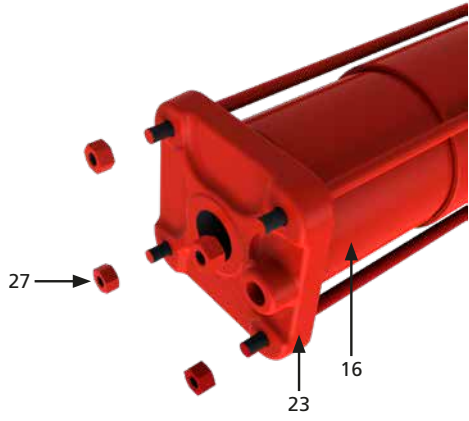
16. Periodic maintenance

| PM-CP2-005 | | Page: 3/4 |
|--|---|-----------|
| Component: Single-acting actuator (035-045 size) | Task: Cylinder seals replacement | |
| Equipment, tools, materials: Spare seals Wrench Lifting tools Project documentation | Warnings:  | |
| Preliminary operations: Removal from valve | | |
| <p>17. Install washer (19) and screw bolt (17)</p> <p>⚠ Pay attention to the spring that may remain slightly compressed.</p> |  | |
| <p>18. Install cylinder tube (16) with O-ring (15) and (22)</p> |  | |
| <p>19. Install end flange (23)</p> <p>20. Tighten nuts (27) to the recommended tightening torque following a cross bolt torque tightening sequence</p> |  | |


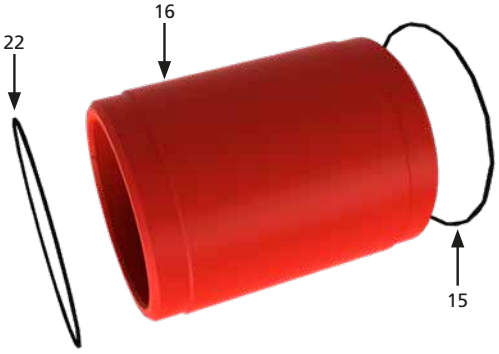
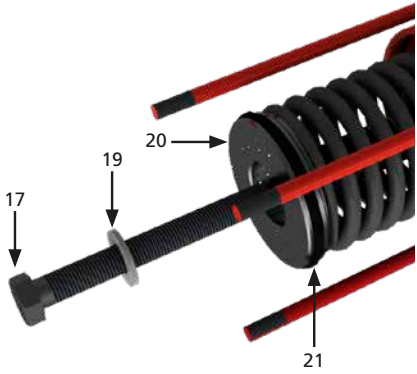
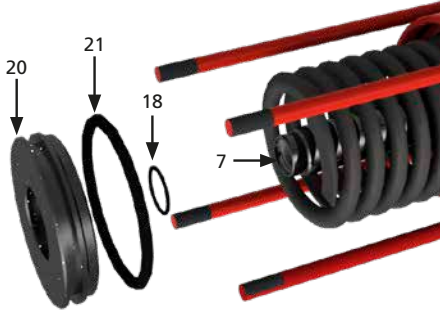
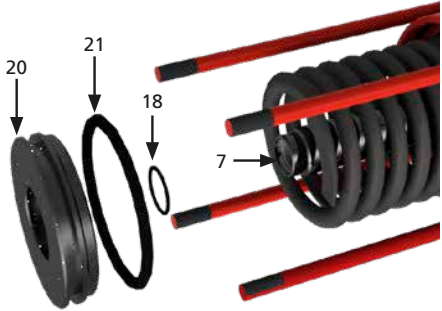
16. Periodic maintenance

| | | PM-CP2-005 | Page: 4/4 |
|--|---|------------|-----------|
| Component: Single-acting actuator (035-045 size) | Task: Cylinder seals replacement | | |
| Equipment, tools, materials: Spare seals Wrench Lifting tools Project documentation | Warnings:  | | |
| Preliminary operations: Removal from valve | | | |
| 21. Install the O-ring (24) 22. Screw stop bolt (25) until reaching length „W“ 23. Hold stop bolt (25) with a wrench and tighten nut (26) |  | | |
| 24. Re-assemble components on the actuator 25. Connect the pneumatic supply and cycle the actuator several times 26. Verify absence of leakages 27. Verify painted parts and restore if necessary | | | |


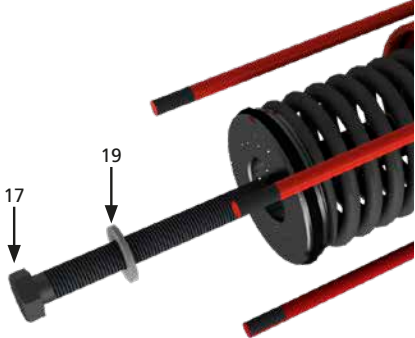
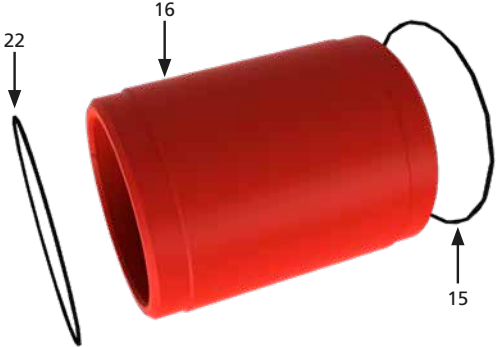
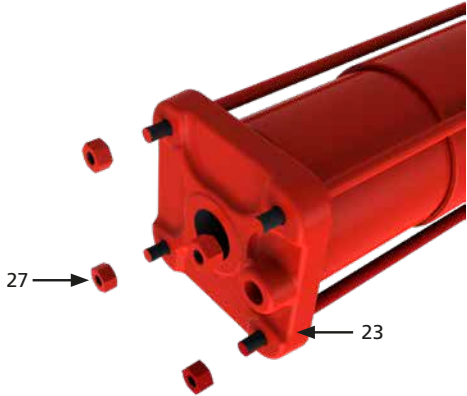
16. Periodic maintenance

| PM-CP2-006 | | Page: 1/4 |
|---|---|-----------|
| Component: Single-acting actuator (055-065 size) | Task: Cylinder seals replacement | |
| Equipment, tools, materials: Spare seals Wrench Lifting tools Project documentation | Warnings:  | |
| Preliminary operations: Removal from valve | | |
| Description: | | |
| <p>⚠ Cut-off power supply and electric power supply (if present) before performing any operation.</p> <p>Preliminary actions</p> <ol style="list-style-type: none"> 1. Remove actuator from valve (Section 11) 2. Position the actuator on a workbench (if possible) or in a stable position and in a clean and closed area 3. Remove any control equipment (if present). Refer to the project specific documentation 4. Remove pneumatic pipes | | |
| 5. Measure length (W) | | |
| <ol style="list-style-type: none"> 6. Hold stop bolt (25) with a wrench and loosen stop nut (26) 7. Fully unscrew stop bolt (25) <p>If the stop bolt is hard to unscrew, pressurise the cylinder and unscrew the stop bolt by 3-4 turns.</p> <p>Depressurise the cylinder; check if the stop bolt turns freely. If necessary, repeat the operation.</p> <p>⚠ Do not unscrew the stop bolt completely while the cylinder is pressurised.</p> |  | |
| <ol style="list-style-type: none"> 8. Unscrew nuts (27) 9. Remove end flange (23), O-ring (22 and 15) and cylinder tube (16) <p>⚠ Spring is pre-compressed. With spring fully extended some spring force is still exerted against the piston.</p> |  | |


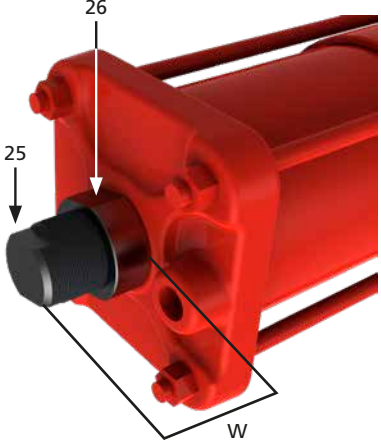
16. Periodic maintenance

| | | PM-CP2-006 | Page: 2/4 |
|--|--|---|-----------|
| Component: Single-acting actuator (055-065 size) | | Task: Cylinder seals replacement | |
| Equipment, tools, materials: Spare seals Wrench Lifting tools Project documentation | | Warnings:  | |
| Preliminary operations: Removal from valve | | | |
| 10. Remove end flange (23), O-ring (22 and 15) and cylinder tube (16) ⚠ Spring is pre-compressed. With spring fully extended some spring force is still exerted against the piston. | |  | |
| 11. Unscrew the piston retaining bolt carefully (17) and washer (19) 12. Remove the piston slightly (20) with piston seal (21). Pay attention to the spring that may remain slightly compressed ⚠ If the threaded bushing is damaged and/or does not remain fixed to the axial bar, stop the maintenance procedure, reassemble the end flange and contact Rotork. | |  | |
| 13. Remove O-rings (15, 18, 21, 22, 24) 14. Clean O-ring grooves carefully and all sealing surfaces 15. All the removed parts should be thoroughly cleaned, inspected and de-burred as necessary 16. Replace the O-rings and lubricate them with a grease film 17. Lubricate with a grease film all moving parts | |  | |
| 18. Install piston (20) with piston seal (21) and O-ring (18) on axial bar (7) ⚠ While disassembling the piston, carefully unscrew piston retaining bolt (17). The piston will automatically follow the bolt during the movement. If not, lightly hit the piston with a suitable tool until the piston joins the bolt. Then proceed with the piston disassembly. Remove the piston carefully. Pay attention to the spring that may remain slightly compressed. | |  | |




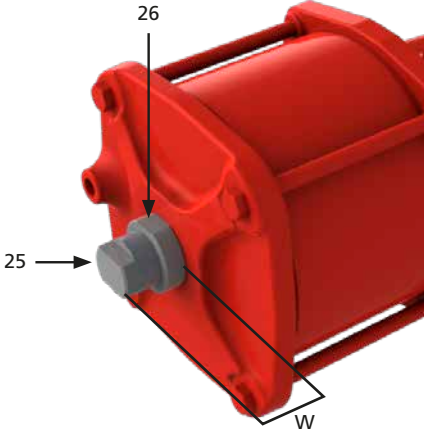
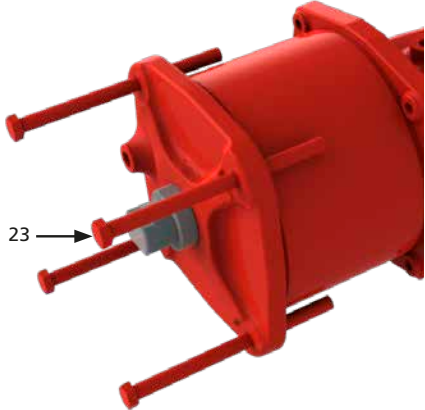
16. Periodic maintenance

| PM-CP2-006 | | Page: 3/4 |
|---|---|-----------|
| Component: Single-acting actuator (055-065 size) | Task: Cylinder seals replacement | |
| Equipment, tools, materials: Spare seals Wrench Lifting tools Project documentation | Warnings:  | |
| Preliminary operations: Removal from valve | | |
| 19. Install washer (19) and screw bolt (17) |  | |
| 20. Install cylinder tube (16) with O-ring (22) and (15) |  | |
| 21. Install end flange (23) 22. Tighten nuts (27) to the recommended tightening torque following a cross bolt torque tightening sequence |  | |

16. Periodic maintenance

| PM-CP2-006 | | Page: 4/4 |
|--|---|-----------|
| Component: Single-Acting actuator (055-065 size) | Task: Cylinder seals replacement | |
| Equipment, tools, materials: Spare seals Wrench Lifting tools Project documentation | Warnings:  | |
| Preliminary operations: Removal from valve | | |
| 23. Screw stop bolt (25) until reaching length „W“ 24. Hold stop bolt (25) with a wrench and tighten nut (26) |  | |
| 25. Re-assemble components on actuator 26. Connect pneumatic supply and cycle the actuator several times 27. Verify absence of leakages 28. Verify painted parts and restore if necessary | | |


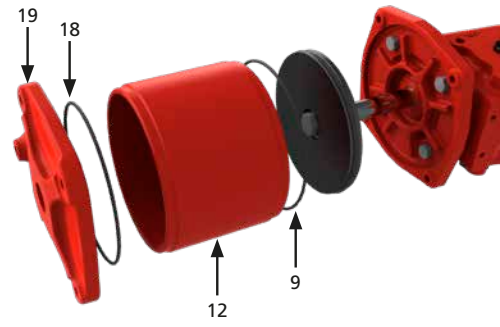
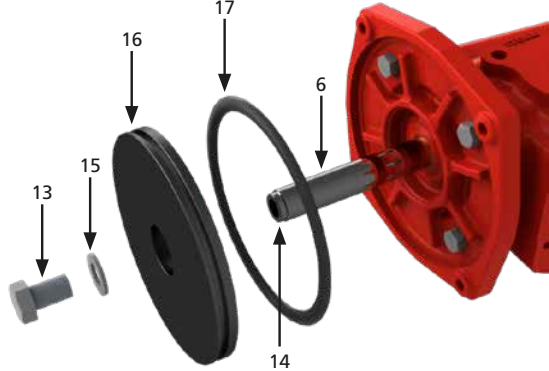
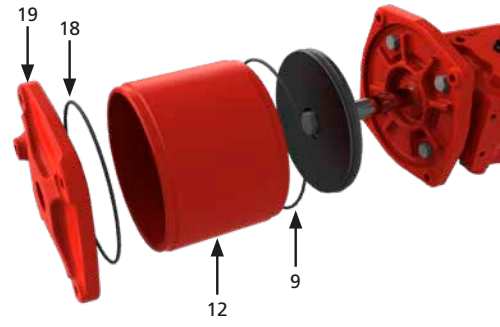
16. Periodic maintenance

| PM-CP2-007 | | Page: 1/3 |
|--|---|-----------|
| Component: Double-acting actuator | Task: Cylinder seals replacement | |
| Equipment, tools, materials: Spare seals Wrench Lifting tools Project documentation | Warnings:  | |
| Preliminary operations: Removal from valve | | |
| Description:  Cut-off power supply and electric power supply (if present) before performing any operation. | | |
| Preliminary actions | | |
| <ol style="list-style-type: none"> 1. Remove actuator from valve (Section 11) 2. Position the actuator on a workbench (if possible) or in a stable position and in a clean and closed area 3. Remove any control equipment (if present). Refer to the project specific documentation 4. Remove pneumatic pipes | | |
| 5. Measure length (W) | | |
| <ol style="list-style-type: none"> 6. Hold stop bolt (25) with a wrench and loosen stop nut (26) 7. Fully unscrew stop bolt (25)  Do not unscrew the stop bolt completely while the cylinder is pressurised. |  | |
| 8. Unscrew nuts (27) |  | |


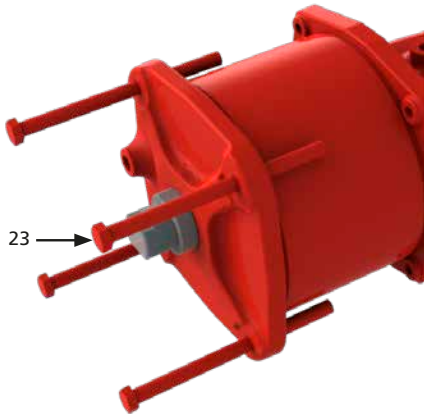
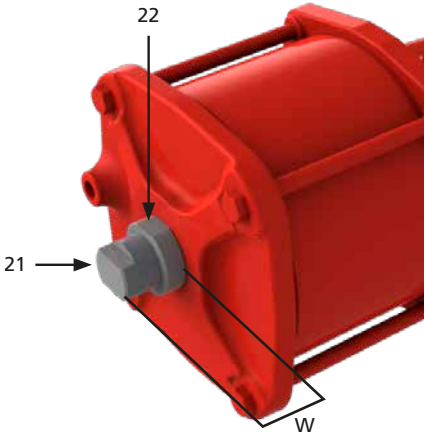
16. Periodic maintenance

PM-CP2-007



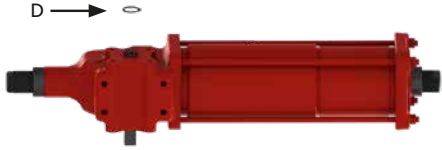
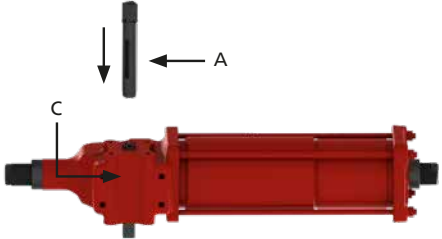
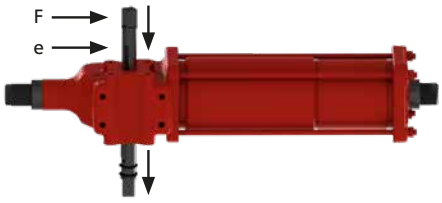

Page: 2/3

| | |
|---|---|
| <p>Component: Double-acting actuator</p> | <p>Task: Cylinder seals replacement</p> |
| <p>Equipment, tools, materials: Spare seals Wrench Lifting tools Project documentation</p> | <p>Warnings:</p>  |
| <p>Preliminary operations: Removal from valve</p> | |
| <p>9. Remove end flange (19), O-ring (18), cylinder tube (12) and O-ring (9)</p> |  |
| <p>10. Unscrew piston retaining bolt carefully (13) and washer (15) 11. Remove piston (16) slightly with piston seal (17) and O-ring (14) 12. Clean O-rings grooves carefully and all sealing surfaces 13. All the removed parts should be thoroughly cleaned, inspected and de-burred as necessary 14. Replace O-rings and lubricate them with a grease film 15. Lubricate with a grease film all moving parts 16. Install piston on the axial bar (6) 17. Install washer (15) and tighten bolt (13)</p> |  |
| <p>18. Install cylinder tube (12), O-ring (9) O-ring (18) and end flange (19)</p> |  |

16. Periodic maintenance

| | | PM-CP2-007 | Page: 3/3 |
|--|---|------------|-----------|
| Component: Double-acting actuator | Task: Cylinder seals replacement | | |
| Equipment, tools, materials: Spare seals Wrench Lifting tools Project documentation | Warnings:  | | |
| Preliminary operations: Removal from valve | | | |
| 19. Tighten nuts (23) to the recommended tightening torque following a cross bolt torque tightening sequence |  | | |
| 20. Screw stop bolt (21) until reaching length „W” 21. Hold stop bolt (21) with a wrench and tighten nut (22) |  | | |
| 22. Re-assemble components on the actuator 23. Connect the pneumatic supply and cycle the actuator several times 24. Verify absence of leakages 25. Verify painted parts and restore if necessary | | | |

16. Periodic maintenance

| | | CM-CP2-001 | Page: 1/1 |
|---|--|---|-----------|
| Component: Single-acting actuator (035-045-055-065 size) | | Task: Fail mode converting | |
| Equipment, tools, materials: Assembled output shaft (including key and spring) Rubber hammer | | Warnings:  | |
| Preliminary operations: Removal from valve | | | |
| Description: | | | |
| <p> Remove electric and pneumatic supply before proceeding.</p> <ol style="list-style-type: none"> Position the actuator on a workbench (if possible) or in a stable position and in a clean and closed area Ensure the actuator is in the fail position, at end of the spring stroke, spring relaxed Remove the limit switch box and its support bracket, if any Remove the control panel if any | | | |
| <ol style="list-style-type: none"> Remove retaining ring (D) Lubricate the new shaft with a grease film |  | | |
| <ol style="list-style-type: none"> Place new shaft (A) Assemble the new shaft with the parallel square head rotated by 180° in the yoke (C) With a rubber hammer hit the new shaft, pushing out the old shaft from the yoke |  | | |
| <ol style="list-style-type: none"> Insert new spring (E) and key (F) Act on the shaft until it is completely inserted <p>Note: During the shaft insertion, verify that it is correctly engaged and locked.</p> |  | | |
| <ol style="list-style-type: none"> Rotate the actuator by 180° and reassemble retaining ring (D) |  | | |

17. Part list

Single-acting actuator (size 035-045)

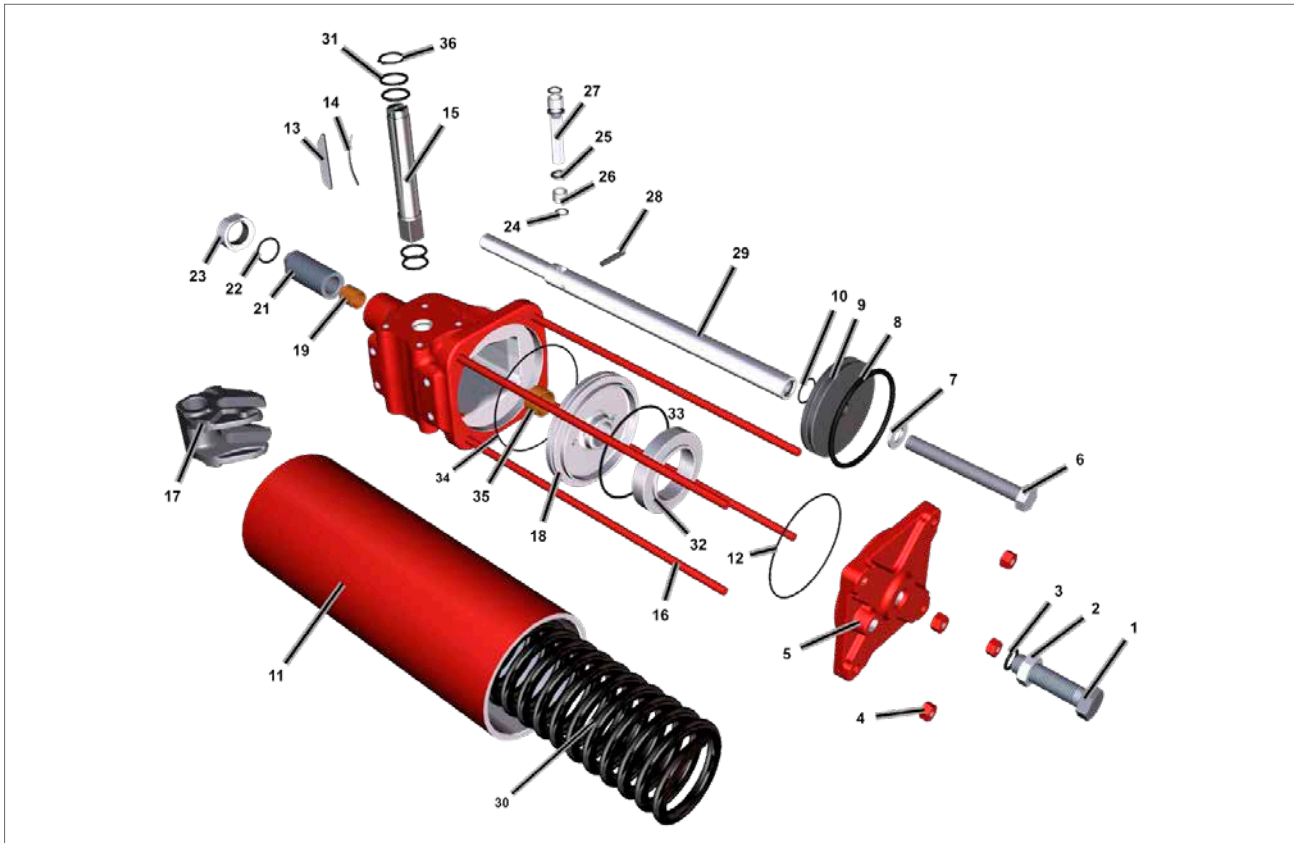


Fig 17.1 Single-acting actuator (size 035-045) with adapter disk

| ITEM | DESCRIPTION | QTY |
|------|-----------------------|-----|
| 1 | Stop screw-end flange | 1 |
| 2 | Stop nut | 1 |
| 3 | O-ring | ● 1 |
| 4 | Hex nut | 4 |
| 5 | End flange | 1 |
| 6 | Hex socket bolt | 1 |
| 7 | Washer | 1 |
| 8 | O-ring | ● 1 |
| 9 | Piston | 1 |
| 10 | O-ring | ● 1 |
| 11 | Cylinder tube | 1 |
| 12 | O-ring | 1 |
| 13 | Key | 1 |
| 14 | Slotted spring | 1 |
| 15 | Output shaft | 1 |
| 16 | Tie rod | 4 |
| 17 | Scotch yoke | 1 |
| 18 | Adapter disk | 1 |

| ITEM | DESCRIPTION | QTY |
|------|-------------------------|-----|
| 19 | Sliding bushing | 1 |
| 20 | Centre body | 1 |
| 21 | Stop bolt - Centre body | 1 |
| 22 | O-ring | ● 1 |
| 23 | Stop nut | 1 |
| 24 | Snap ring | 2 |
| 25 | Shoulder washer | 2 |
| 26 | Bushing | 2 |
| 27 | Yoke pin | 1 |
| 28 | Elastic pin | 1 |
| 29 | Axial bar | 1 |
| 30 | Spring | 1 |
| 31 | O-ring | ● 4 |
| 32 | Spacer (if present)) | 1 |
| 33 | O-ring | ● 1 |
| 34 | O-ring | ● 1 |
| 35 | Sliding bushing | 1 |
| 36 | Retaining ring | 1 |

● Recommended spare part

17. Part list

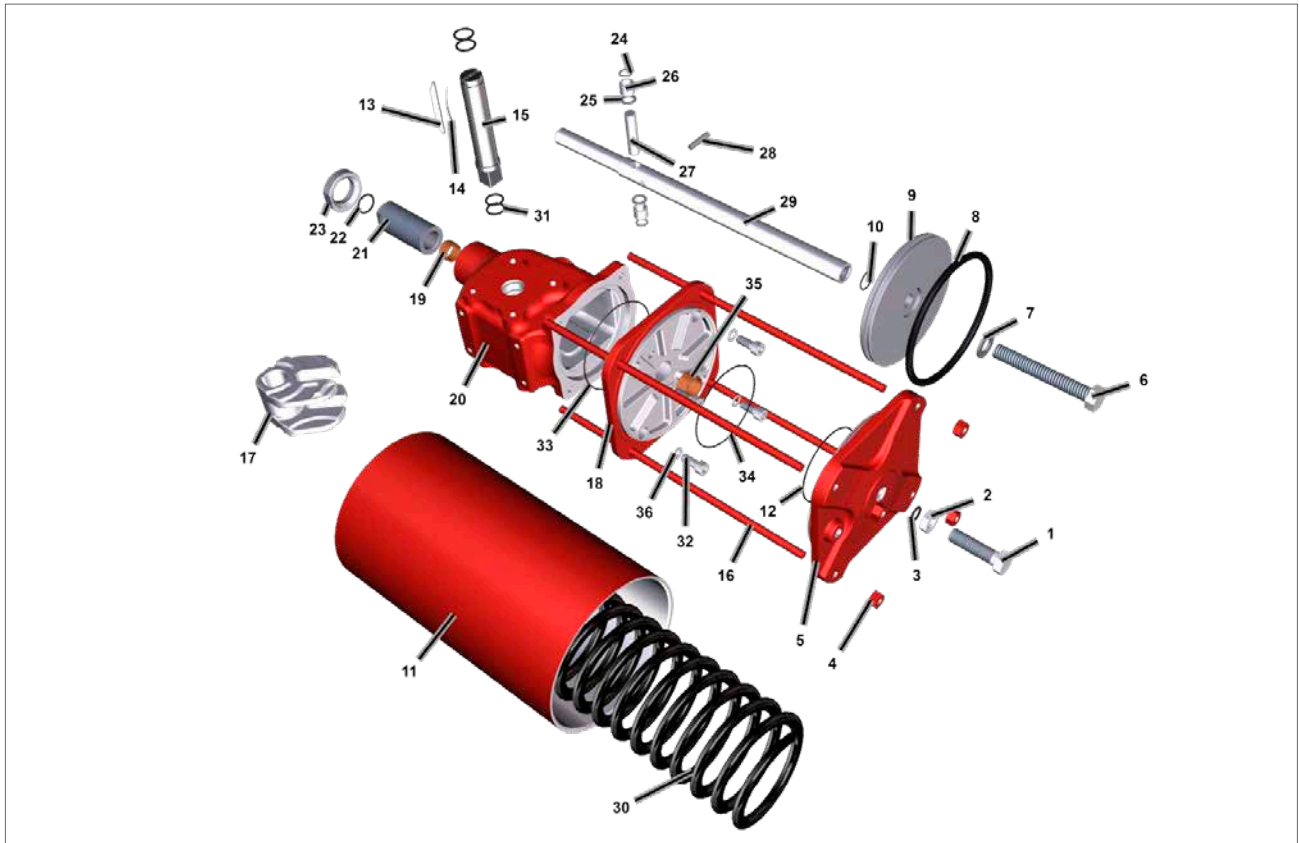


Fig 17.2 Single-acting actuator (size 035-045) with adapter flange

| ITEM | DESCRIPTION | QTY |
|------|-----------------------|-----|
| 1 | Stop screw-end flange | 1 |
| 2 | Stop nut | 1 |
| 3 | O-ring ● | 1 |
| 4 | Hex nut | 4 |
| 5 | End flange | 1 |
| 6 | Hex socket bolt | 1 |
| 7 | Washer | 1 |
| 8 | O-ring ● | 1 |
| 9 | Piston | 1 |
| 10 | O-ring ● | 1 |
| 11 | Cylinder tube | 1 |
| 12 | O-ring ● | 1 |
| 13 | Key | 1 |
| 14 | Slotted spring | 1 |
| 15 | Output shaft | 1 |
| 16 | Tie rod | 4 |
| 17 | Scotch yoke | 1 |
| 18 | Adapter flange | 1 |
| 19 | Sliding bushing | 1 |

| ITEM | DESCRIPTION | QTY |
|------|-------------------------|-----|
| 20 | Centre body | 1 |
| 21 | Stop bolt - Centre body | 1 |
| 22 | O-ring ● | 1 |
| 23 | Stop nut | 1 |
| 24 | Snap ring | 2 |
| 25 | Shoulder washer | 2 |
| 26 | Bushing | 2 |
| 27 | Yoke pin | 1 |
| 28 | Elastic pin | 1 |
| 29 | Axial bar | 1 |
| 30 | Spring | 1 |
| 31 | O-ring ● | 4 |
| 32 | Hex socket bolt | 4 |
| 33 | O-ring ● | 1 |
| 34 | O-ring ● | 1 |
| 35 | Sliding bushing | 1 |
| 36 | Seal washer | 4 |
| 37 | Retaining ring | 1 |

● Recommended spare part

17. Part list

Single-acting actuator (size 055-065)

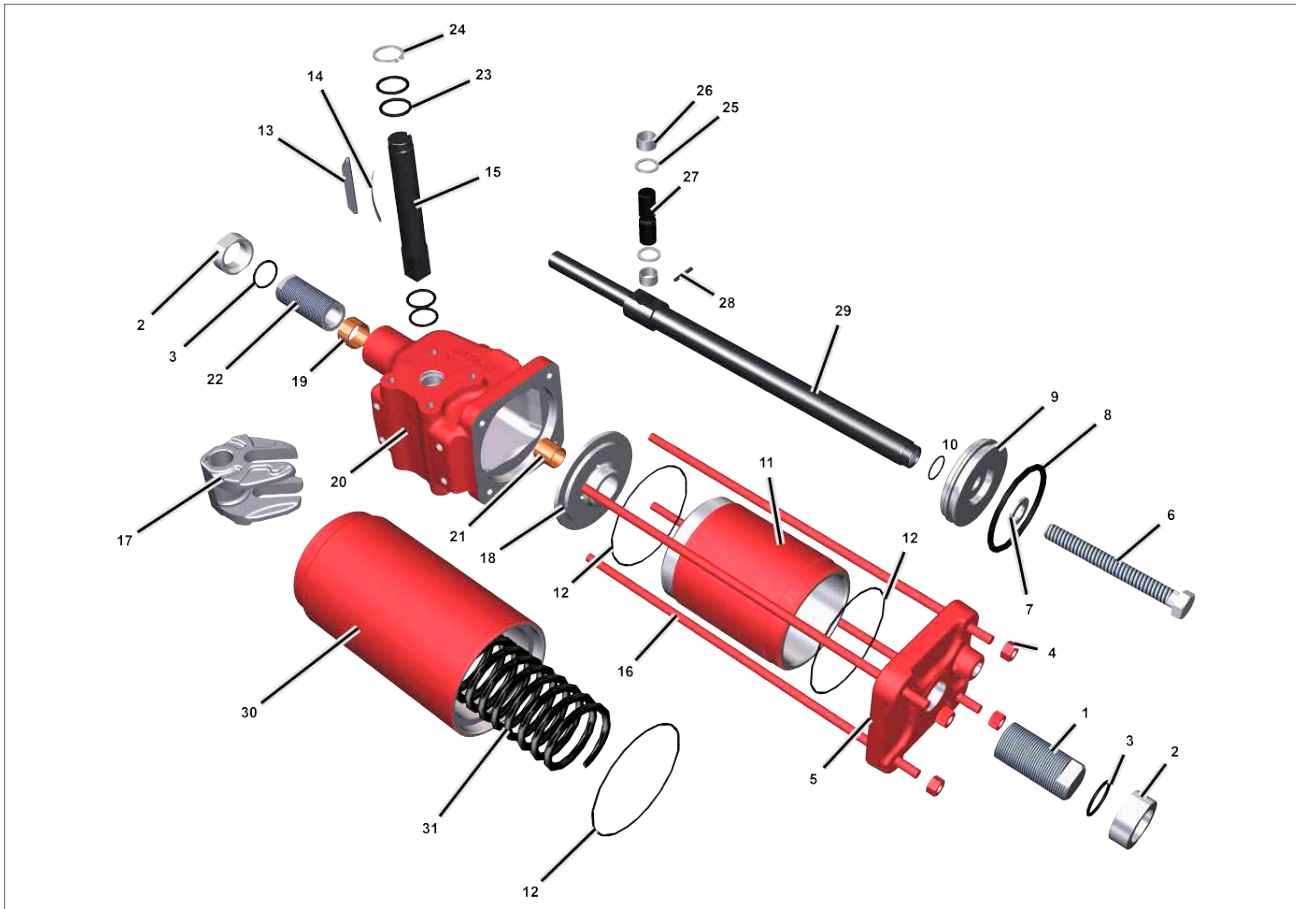


Fig 17.3 Single-acting actuator (size 055-065) with adapter plate

| ITEM | DESCRIPTION | QTY |
|------|----------------------|-----|
| 1 | Stop bolt-end flange | 1 |
| 2 | Stop nut | 2 |
| 3 | O-ring | ● 2 |
| 4 | Hex nut | 4 |
| 5 | End flange | 1 |
| 6 | Hex socket bolt | 1 |
| 7 | Washer | 1 |
| 8 | O-ring | ● 1 |
| 9 | Piston | 1 |
| 10 | O-ring | ● 1 |
| 11 | Cylinder tube | 1 |
| 12 | O-ring | ● 3 |
| 13 | Key | 1 |
| 14 | Slotted spring | 1 |
| 15 | Output shaft | 1 |
| 16 | Tie rod | 4 |

| ITEM | DESCRIPTION | QTY |
|------|-------------------------|-----|
| 17 | Scotch yoke | 1 |
| 18 | Adapter plate | 1 |
| 19 | Sliding bushing | 1 |
| 20 | Centre body | 1 |
| 21 | Sliding bushing | 1 |
| 22 | Stop bolt - Centre body | 1 |
| 23 | O-ring | ● 4 |
| 24 | Back-up ring | 1 |
| 25 | Shoulder washer | 2 |
| 26 | Sliding bushing | 2 |
| 27 | Yoke pin | 1 |
| 28 | Elastic pin | 1 |
| 29 | Axial bar | 1 |
| 30 | Spring cartridge | 1 |
| 31 | Spring | 1 |

● Recommended spare part

17. Part list

Double-acting actuator

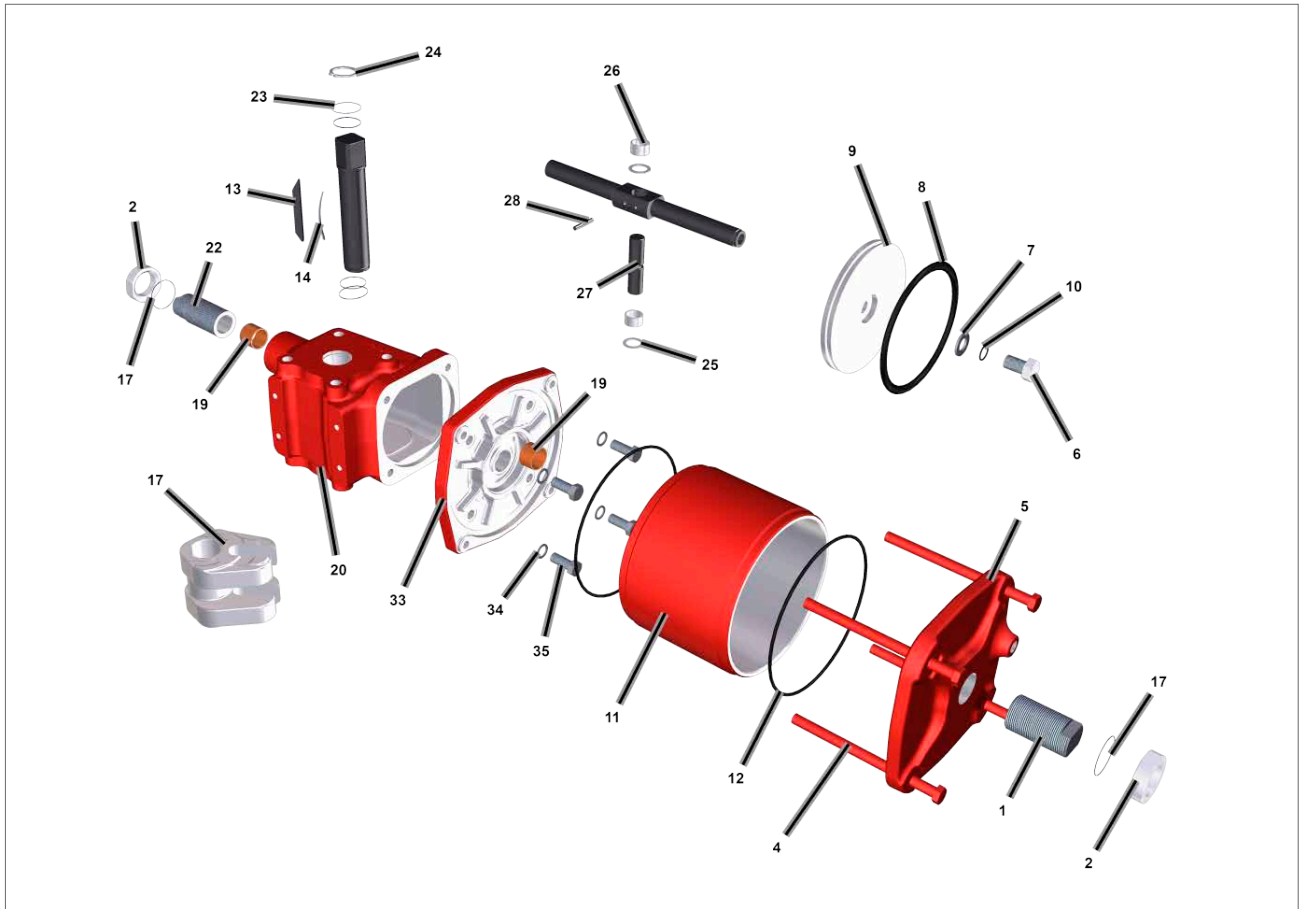


Fig 17.4 Double-acting actuator

| ITEM | DESCRIPTION | QTY |
|------|----------------------|-----|
| 1 | Stop bolt-end flange | 1 |
| 2 | Stop nut | 2 |
| 3 | O-ring | ● 2 |
| 4 | Hex socket bolt | 4 |
| 5 | End flange | 1 |
| 6 | Hex socket bolt | 1 |
| 7 | Washer | 1 |
| 8 | O-ring | ● 1 |
| 9 | Piston | 1 |
| 10 | O-ring | ● 1 |
| 11 | Cylinder tube | 1 |
| 12 | O-ring | ● 2 |
| 13 | Key | 1 |
| 14 | Slotted spring | 1 |
| 15 | Output shaft | 1 |
| 17 | Scotch yoke | 1 |

| ITEM | DESCRIPTION | QTY |
|------|-------------------------|-----|
| 19 | Sliding bushing | 1 |
| 20 | Centre body | 1 |
| 21 | Sliding bushing | 1 |
| 22 | Stop bolt – centre body | 1 |
| 23 | O-ring | ● 4 |
| 24 | Backup ring | 1 |
| 25 | Shoulder washer | 2 |
| 26 | Sliding bushing | 2 |
| 27 | Yoke pin | 1 |
| 28 | Elastic pin | 1 |
| 29 | Axial bar | 1 |
| 32 | O-ring | ● 1 |
| 33 | Adapter flange | 1 |
| 34 | Seal washer | 4 |
| 35 | Hex socket bolt | 4 |

● Recommended spare part

17. Part list

Mechanical manual override M-MH

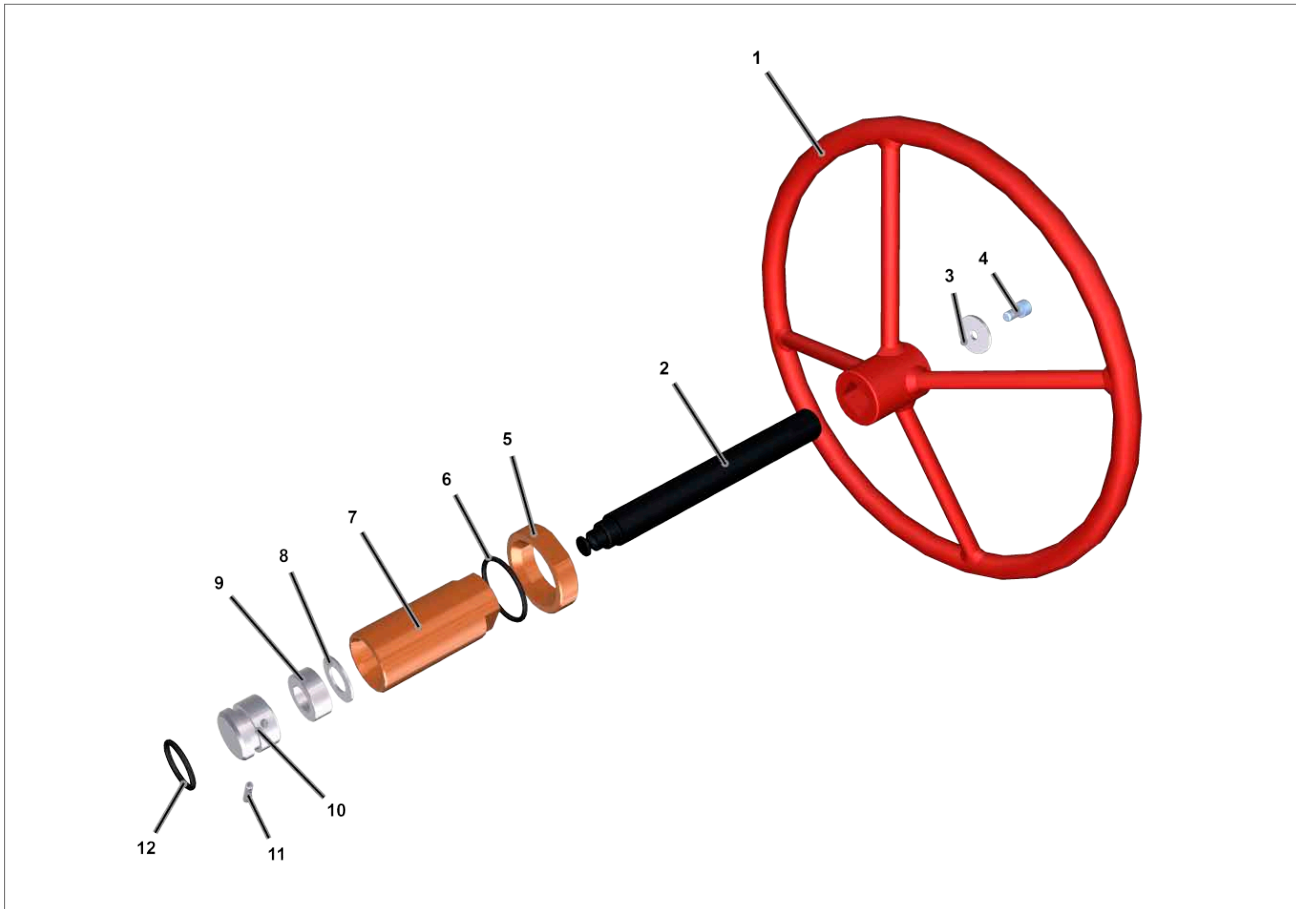


Fig 17.5 Mechanical manual override MHD

| ITEM | DESCRIPTION | QTY |
|------|--------------------|------|
| 1 | Handwheel | 1 |
| 2 | Jackscrew | 1(*) |
| 3 | Washer | 1 |
| 4 | Screw | 1 |
| 5 | Nut | 1 |
| 6 | O-ring | ● 1 |
| 7 | Setting dowel | 1 |
| 8 | Washer | 1 |
| 9 | Bearing | 1 |
| 10 | Front plate | 1 |
| 11 | Slotted spring pin | 1 |
| 12 | O-ring | ● 1 |

● Recommended spare part

(*) = Left threaded jackscrew for fail to close actuator
 Right threaded jackscrew for fail to open actuator

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 for Rotork scotch yoke actuators are shown below. If an alternative was specified and/or supplied, please refer to the job specific documentation.

18.1 Grease

Lubricate mechanical sliding components of the scotch yoke actuators, output shaft, bushing, manual override and all seals, using the following grease or equivalent:

| | |
|---|-------------------|
| Manufacturer: | SHELL |
| Trade name: | GADUS S5 V25Q |
| NLGI grade: | 2.5 |
| Colour: | Clear brown |
| Penetration, density, viscosity Viscosity of oil at 40 °C (104 °F) (ASTM D445): Viscosity of oil at 100 °C (212 °F) (ASTM D445): | 25 cST 4.8 cST |
| Temperature drop point (IP396): | 180 °C (356 °F) |

| QUANTITY OF GREASE IN HOUSING | |
|-------------------------------|----------|
| Centre body size | Qty (kg) |
| 035 | 0.06 |
| 045 | 0.06 |
| 055 | 0.08 |
| 065 | 0.08 |

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PUB013-015-00
Issue 05/24

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