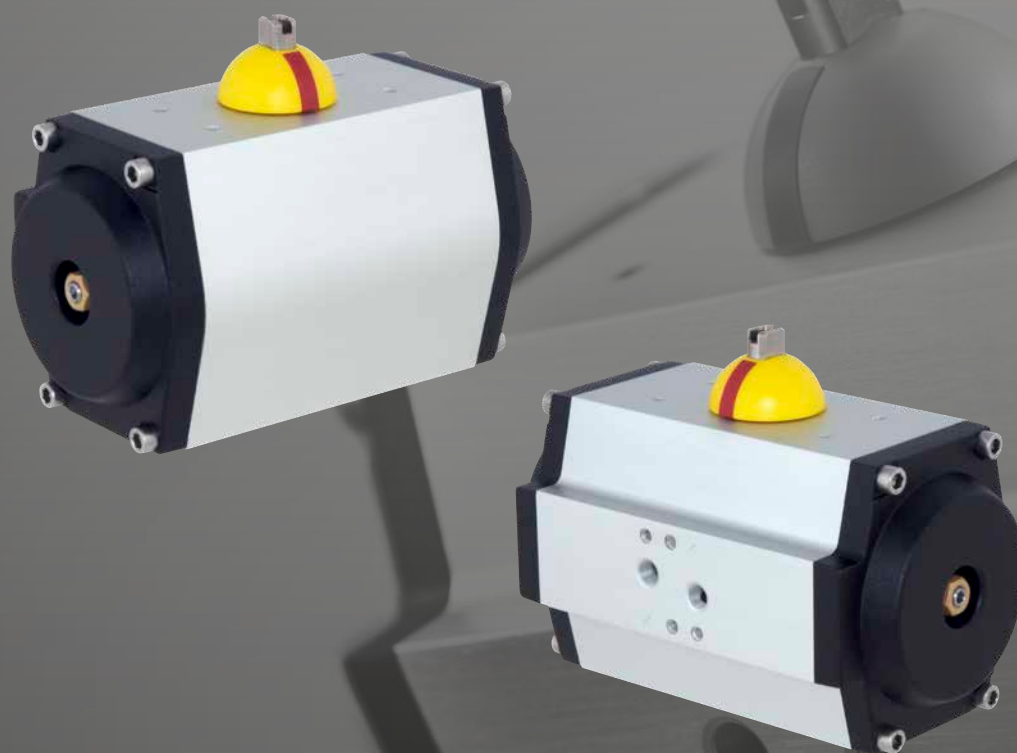


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Keeping the World Flowing
for Future Generations

GT and GTS Range

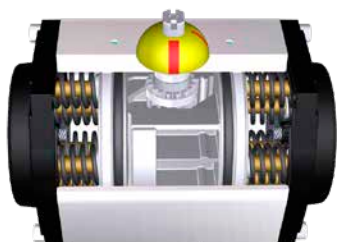
Pneumatic Actuator
Single-Acting and Double-Acting Configuration



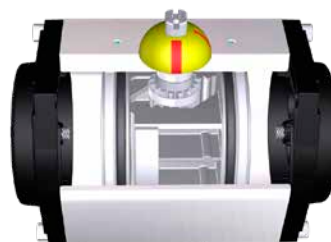
Installation, Commissioning and Maintenance Manual

Contents

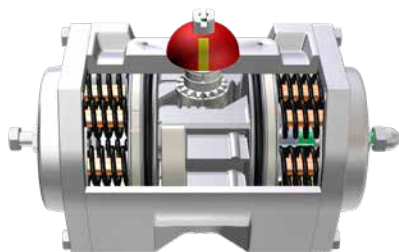
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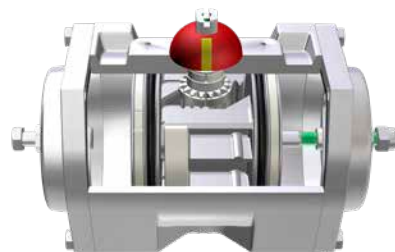
GT single-acting actuator



GT double-acting actuator



GTS single-acting actuator



GTS double-acting actuator

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.

Due to wide variation in the terminal numbering of actuator products, actual wiring of this device should follow the print supplied with the unit.

1. Introduction

This manual covers maintenance aspects and instructions specific to GT and GTS range actuators. General information on Rotork actuators are described in the User Manual, delivered separately.

Procedures described in this manual apply to GT and GTS range actuators. Internal components are the same for GT and GTS actuators, therefore only images of GT actuators are included in this manual. GT actuators have an aluminium enclosure. GTS actuators have a stainless steel enclosure.

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:

E-mail: rfs.international@rotork.com

Rotork, Via Padre Jacques Hamel, 138B, Porcari,
Lucca, 55016, IT. Tel: +39 0583-222-1

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

2. Standards and Regulations

Actuators destined for European member states have been designed, built and tested according to the Quality Control System, in compliance with the EN ISO 9001:2015 standard and with the following regulations/directives.

- 2006/42/EC: Machinery Directive
- 2014/34/EU: Directive for safety equipment and systems to be used in potentially explosive atmospheres (ATEX)
- ISO 80079-36: Non-electrical equipment for explosive atmospheres – Basic method and requirements
- ISO 80079-37: Non-electrical equipment for explosive atmospheres – Non-electrical type of protection construction safety "c", control of ignition sources "b", liquid immersion "k".

3. General Information

This manual is produced to enable a competent user to install, operate and maintain single and double-acting GT and GTS actuators.

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

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

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


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

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

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

Appropriate Usage

Rotork GT and GTS actuators have been specifically developed to motorize part 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 manual.

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

4.5 Mechanical Risks

Risk	Uncontrolled movement (remote operation) (RES_03) (This risk is applicable only for actuators provided with control panel).
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 (center 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 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 manual and contact Rotork.

4.6 Magnetic Risks

Risk	Risk of magnetic field/disturbance and exothermic reactions.
Preventive measure	The end user shall assure that actuator and its components are installed far from magnetic field, electro-magnetic field, radioactive source, electroacoustic transducer which could modify its behaviour.

(This mitigation is applicable only for actuators provided with control panel).

Avoid maintenance operations with acid/basic solutions.

5. Labels and Nameplates

The following label is applied externally to the each Actuator:



Fig 5.1 Actuator label

In case of ATEX and/or EAC certifications the following labels will be also applied:

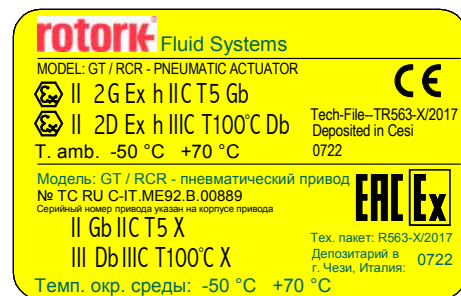


Fig 5.2 Actuator ATEX/EAC label for standard temperature (-50°C<T<+70°C)



Fig 5.3 Actuator ATEX/EAC label for high temperature (-15°C<T<+160°C)

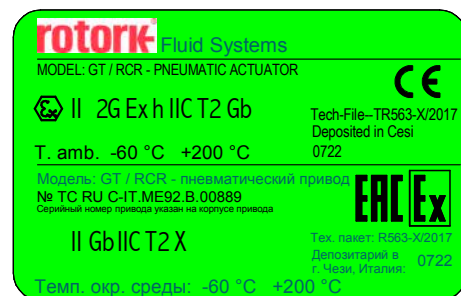


Fig 5.4 Actuator ATEX/EAC label for low temperature (-60°C<T<+200°C)

Label removal is not allowed.

6. Operating Limits

Temperature: -50 °C to +70 °C (-58 °F to +158 °F)
NBR o-ring, Delrin Guide
-15 °C to +160 °C (+5 °F to +320 °F)
Viton o-ring, IXEF Guide
-60 °C to +200 °C (-76 °F to +352 °F)
Silicon o-ring, PTFE Guide

Operating pressure: 2 to 10 bar (compressed air)

Operating pressure: 2 to 5 bar (methane, ethane, propane, butane)

⚠ Do not use the equipment outside its operating limits.

It is critical that external surface temperature does not reach or exceed the ignition temperature of potentially explosive atmospheres when installed in these locations.

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 exceed 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

GT and GTS pneumatic actuators are designed to be operated with Gas, Instrument air filtered PNEURO/ISO class 4; if not differently specified in specific project documentation.

⚠ Do not use the actuator in presence of naked flames.

6.2 Expected Lifetime

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

6.3 Tightening Torque Chart

Actuator size	Screw size	Torque (Nm) min-max		Stop nut (Nm)
43	M4	2	6	2
52-63	M5	4	8	2
75-83-92	M6	7	13	3
110-118	M8	9	30	4.5
127	M8	12	30	8
143-160	M10	25	40	8
190-210	M12	50	60	13
253-254-255	M14	85	110	20
300	M14	80	110	30

7. Handling and Lifting

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

GT and GTS actuators are supplied packed in cardboard boxes suitable for normal handling.

⚠ Handle the actuator with care.

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 estimated separately for a safe and correct lifting
- Avoid pulls or abrupt movements during lifting. Avoid pushing the load
- During lifting operations, do not handle the slings and/or the actuator

⚠ Do not step underneath suspended load.

7.2 Lifting Instructions

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

Consult project specific documentation before lifting.

- Prior to lifting the actuator, remove electrical power and vent all pressure vessels (if present)
- GT actuators up to size 160 can be manually lifted
- GTS actuators up to size 127 can be manually lifted
- Larger actuator sizes must be lifted using lifting eyes installed on the top side of the actuator

⚠ The actuator must remain horizontal; balance the load.

- Angle β must be between 0° and 45° as shown opposite



Fig 7.1 Lifting (size 190)

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 shipping pallet until installation

⚠ Never put the actuator directly on the ground.

- Actuator must be positioned upwards
- Protect against adverse weather conditions, covering the actuators with appropriate polyethylene sheets
- Check the actuator condition every 6 months and verify the above protection measures remain in place

⚠ Remove package only when required for installation.

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:

- Storage should be indoors and the units should be protected against humidity and other harmful elements
- Store in a dry, well-aired place. Avoid long-term direct exposure to sunlight
- Replace the plastic plugs with metal plugs
- 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 mechanical manual override or hydraulic manual override by means of the override for 4 complete strokes
 - Disconnect the pneumatic and electric (if present) supply from the actuator, and carefully close all the threaded connections of the actuator
- Remove electrical component 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 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 Hazardous Area classification of the actuator is compatible with the plant zoning. Refer to actuator nameplate.

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

10.2 Instructions

Actuator to valve attachment can be performed by:

- Mounting directly using the actuator housing bottom flange drilling
- Using an adapter and a coupling joint between the actuator and the valve

Actuator bottom flange drilling is in accordance to ISO 5211 (DIN 3337) standard.



Fig 10.1 Actuator bottom connections

Each pinion, as standard, is provided with a female key ISO 5211 double square, allowing direct mating to the valve stem, or coupling.

Optional valve interfaces are ISO 5211 single square parallel, ISO 5211 single square diagonal and double D.

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 (refer to PUB110-001 for metric and PUB110-002 for imperial)
- Actuator is supplied in the fail position (for single-acting). Set the valve in the right position according to the actuator fail position. Check the position of the actuator by means of the position indicator on the body or on the limit switch box (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
- Inspect, clean and apply grease on the coupling hole (valve side of coupling joint)
- Lubricate the valve stem with oil or grease, to facilitate assembling

Lift the actuator according to instructions in section 7.

- If possible, place the valve stem in a vertical position to facilitate assembly – in this case the actuator must be lifted while the coupling flange is kept in the horizontal position
- If a direct mounting is applied, insert the valve stem directly into the actuator pinion
- If the assembly uses an adapter and a coupling joint, assemble the coupling joint onto the valve stem before proceeding with mounting 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 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, please refer to the Tightening Torque Chart, section 6.3

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

⚠️ Attention: Do not pressurize the actuator/ valve adapter.

10. Installation on Valve

10.3 Assembly Configurations

Different orientations of pinion and pistons are identified as follows:



Fig 10.2 Assembly A – Clockwise to close actuators, upper shaft perpendicular to body

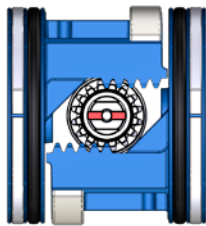


Fig 10.3 Assembly B – Clockwise to close actuators, upper shaft parallel to body

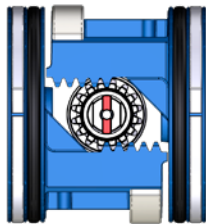


Fig 10.4 Assembly C – Counter-clockwise to close actuators, upper shaft perpendicular to body

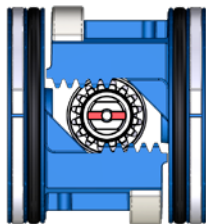


Fig 10.5 Assembly D – Counter-clockwise to close actuators, upper shaft parallel to body

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 customer service.

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

- Isolate electrical power supply
- Isolate pneumatic/hydraulic supply
- Release any pressure from the control group
- Remove the supply pipes from the actuator
- Remove control and signal lines from electric components (if any)
- Sling the actuator in line with the instructions given in section 7
- Unscrew bolts or 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 program when installing and using Rotork products. Read and save all instructions prior to installing, operating and servicing this product.

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

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

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

GT and GTS actuators are a rack and pinion design, available in both double-acting and single-acting (spring-return) configurations.

The rack and pinion design assures constant torque, strength and reduced overall dimensions. All double-acting actuators can be easily field converted to spring-return type by inserting the correct number of spring cartridges to the double-acting configuration without changing the existing end caps. This eliminates bulky housing extensions and saves weight and space.

For 90° execution, specially designed and patented preloaded self-containing spring cartridges are completely contained assuring safe installation and removal. For 120°-180° action the springs are free.

Standard action is 90°, 120°, 135°, 180° and 240°. Customised angles are available, as well as three position versions.

Table 1: GT and GTS double-acting main components

IT	DESCRIPTION	QTY
1	Mechanical stop bolt	1
2	Body	1
3	End cap	2
4	Pinion	1
5	Rack	2
6	Spring cartridge	*
7	Mechanical stop bolt	1

(*) Model dependant

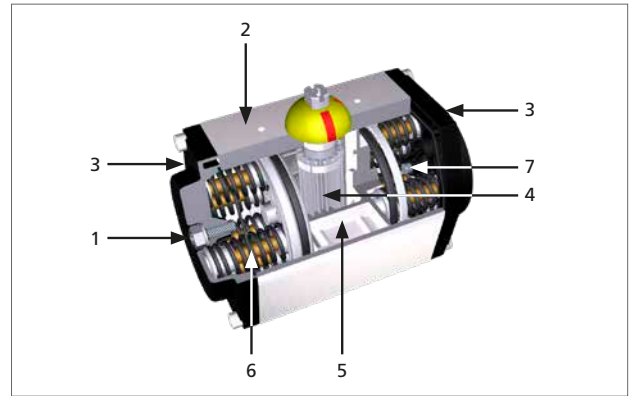


Fig 12.1 GT spring-return main components

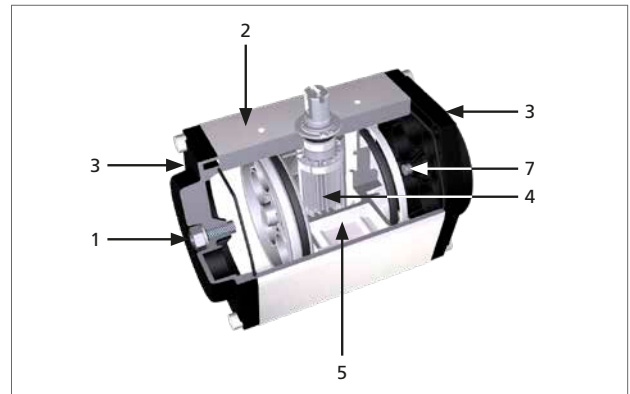


Fig 12.2 GT double-acting main components

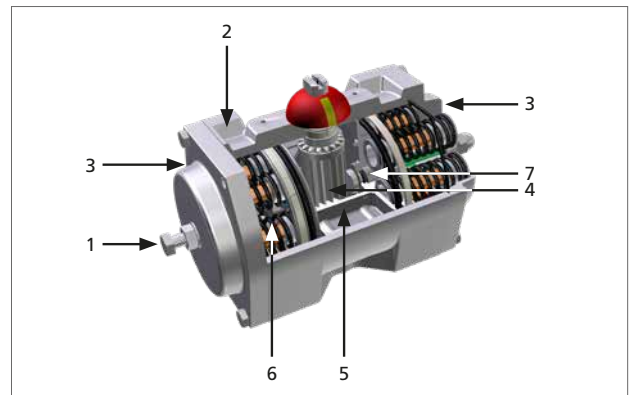


Fig 12.3 GTS spring-return main components

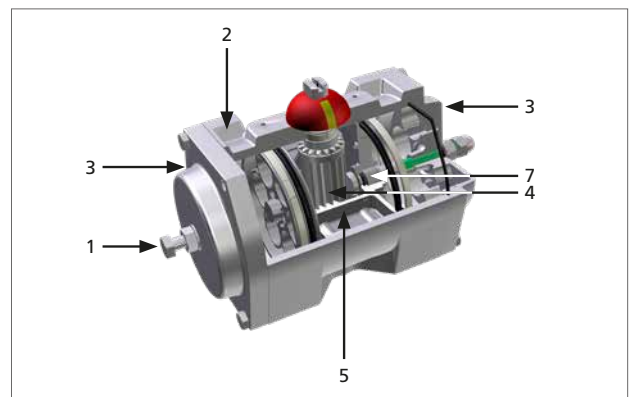


Fig 12.4 GT double-acting main components

12. Operation

12.2 Single and Double Limit Stop

GT Actuators can be provided in 2 versions: single and double limit stop.

The **single limit stop** is provided with 2 identical mechanical stop bolts installed in the end caps and allows adjustment of the open stroke of a clockwise to close (close stroke of an anti-clockwise to close) actuator. Adjustability is $\pm 5^\circ$.

The **double limit stop** is provided with 2 different mechanical stop bolts installed in the end caps and allows the adjustment of both travel directions. Adjustability is $\pm 5^\circ$ on the open stroke of a clockwise to close (close stroke of an anticlockwise to close) actuator and $-25^\circ/+5^\circ$ on the close stroke of a clockwise to close (open stroke of an anticlockwise to close) actuator.

GTS actuators are always supplied with double limit stop.

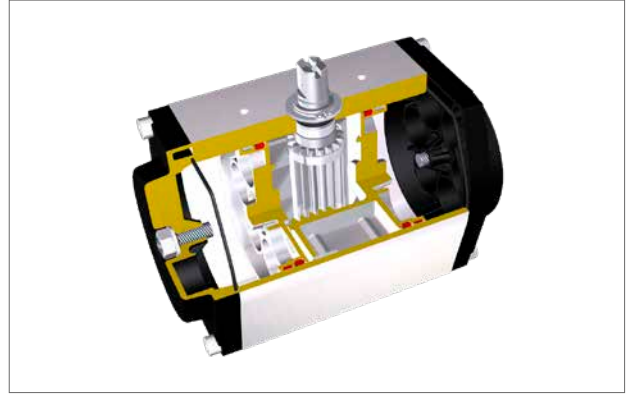


Fig 12.5 GT single limit stop

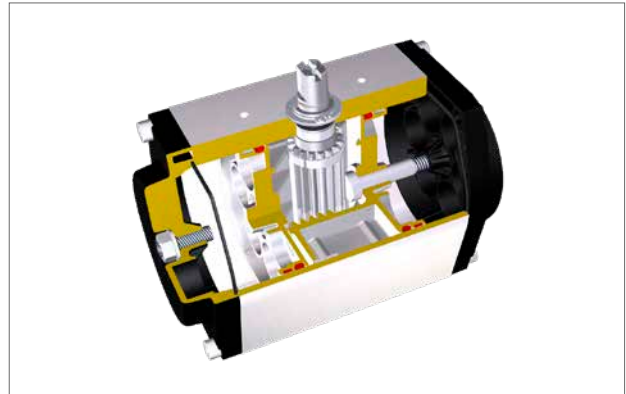


Fig 12.6 GT double limit stop

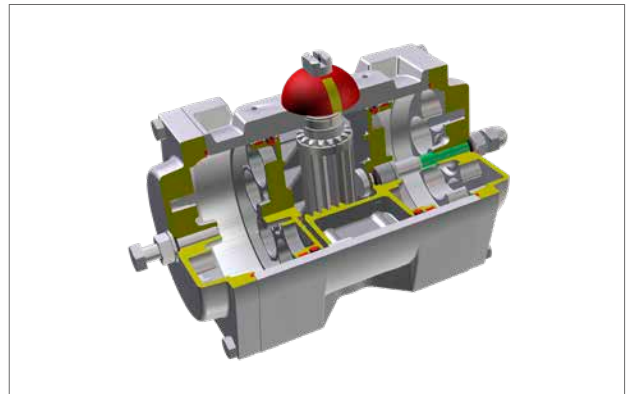


Fig 12.7 GTS double limit stop

12. Operation

12.3 Angular Stroke Setting

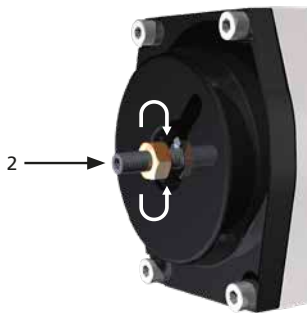
GT single and double-acting actuator, cylinder stop bolt setting

Perform the following operations as first setting.

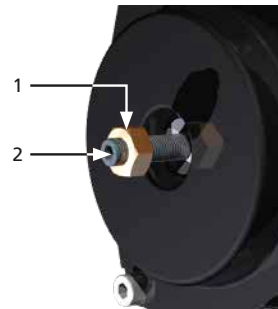
Adjust the stop bolt located in the end flange of the cylinder as follows:



- A. Verify the absence of pressure
- B. Loosen stop nut (1) with a suitable spanner



- C. With the help of a suitable size Allen (hex.) Key, rotate the stop bolt (2) clockwise to increase (counter-clockwise to decrease) the angular stroke
Verify the newly obtained angular position with one stroke
- D. Repeat operations A to C, until the desired angle is obtained



- E. Hold the stop bolt (2) with a Allen (hex.) key and carefully tighten the stop nut (1)
- F. Repeat the operation for the other stop bolt



The above procedure applies to both single limit stop and double limit stop.

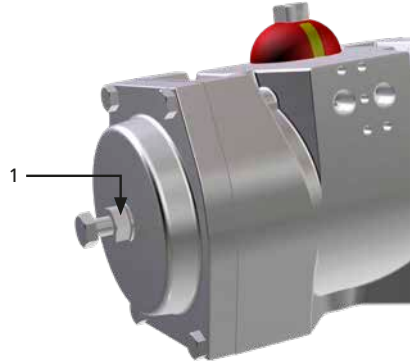
⚠ In case of double limit stop, before starting the procedure to adjust the stop bolt for $-25^{\circ}/+5^{\circ}$ (identifiable from the bronze colour stop nut), make sure the stop bolt is not against the pinion to avoid a stick slip movement.

12. Operation

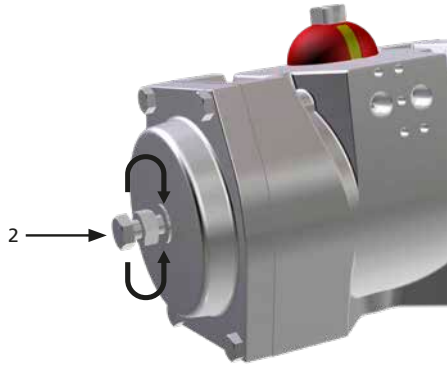
GTS single and double acting actuator, cylinder stop bolt setting

Perform the following operations as first setting.

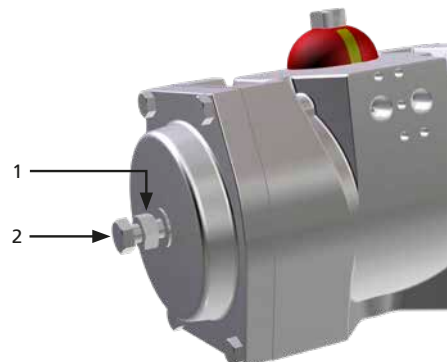
Adjust the stop bolt located in the end flange of the cylinder as follows:



- A. Verify the absence of pressure
- B. Loosen stop nut (1) with a suitable spanner

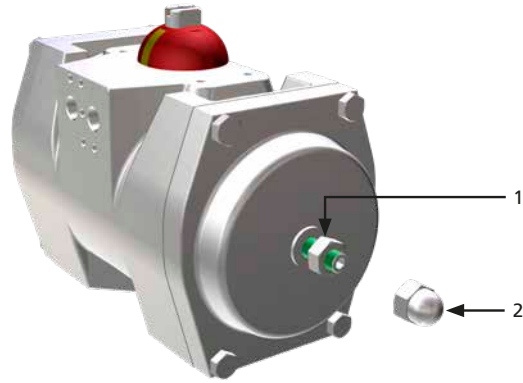


- C. With the help of a suitable spanner, rotate the stop bolt (2) clockwise to increase (counter-clockwise to decrease) the angular stroke
- Verify the newly obtained angular position with one stroke
- D. Repeat operations A to C, until the desired angle is obtained

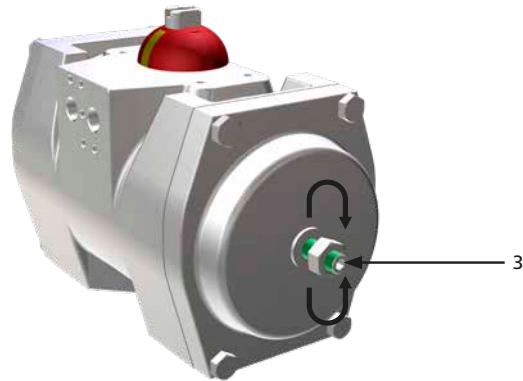


- E. Hold the stop bolt (2) with a spanner and carefully tighten the stop nut (1)

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



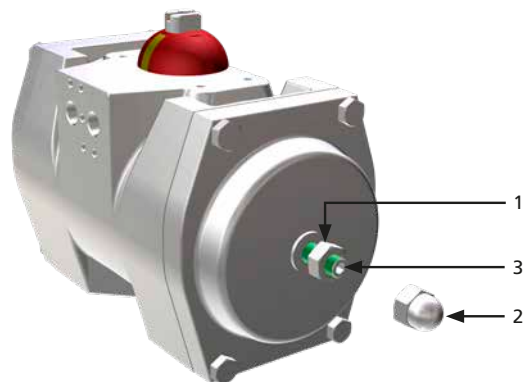
- A. Verify the absence of pressure
- B. Remove blind nut (2)
- C. Loosen stop nut (1) with a suitable spanner



- D. With the help of suitable size Allen (hex.) key, rotate the stop bolt (3) clockwise to increase (counter-clockwise to decrease) the angular stroke

Verify the newly obtained angular position with one stroke

- E. Repeat operations A to D, until the desired angle is obtained



- F. Hold the stop bolt (3) with an Allen (hex.) key and carefully tighten the stop nut (1)
- G. Fasten the blind (2) nut back on the stop bolt (3)

12. Operation

12.4 Pneumatic Supply

Verify allowed supply pressure range on actuator label.

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

12.5 Pneumatic Connections

Preliminary Operations

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

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

⚠ Depending upon the control circuit design, pneumatic actuators may exhaust the supply gas into the atmosphere during normal operation. This may present an unacceptable hazard.

Port 2 is connected to the inboard side of the pistons.

Port 4 is connected to the outboard side of the pistons.

Single-Acting actuators

Pressurising port 2 will move the pistons out. When port 2 is depressurised, spring force will move the pistons in. Venting is through port 2. Port 4 is not to be pressurised on spring-return actuators.

Double-Acting actuators

Pressurising port 2 will force the pistons out until they reach the travel stops. Venting is through port 4.

Pressurising port 4 will force the pistons in until they reach the travel stops (if fitted). Venting is through port 2.

The direction of pinion rotation is determined by the assembly configuration described in section 10.3.

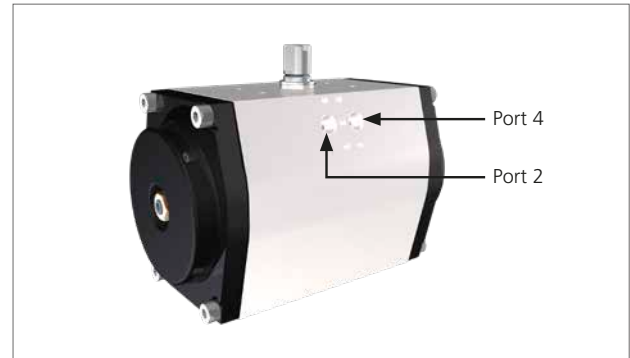


Fig 12.8 Inlet port for Single-Acting actuator

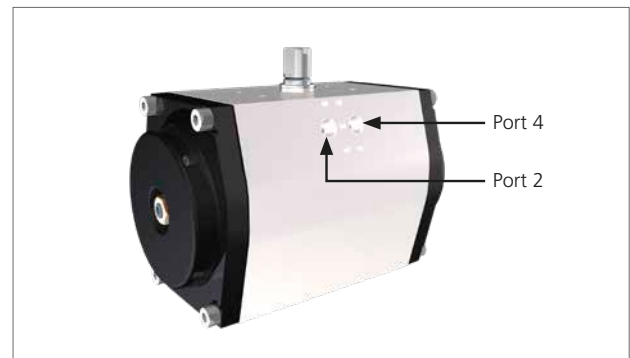




Fig 12.9 Inlet / Exhaust port for Double-Acting actuator

12. Operation

12.6 Electrical Connections


 **Check electrical component 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 explosion-proof cables
- The cable glands must be tightened in the threaded inlets, to guarantee the waterproof and explosion proof protection
- Cable gland sealing should be installed correctly to prevent water or debris ingress to the electrical enclosure
- The size of the electric supply cable must be suitable for the electrical power required
- 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
- Unused entries must have metal blanking plugs installed 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.**

12.7 Start Up

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

- Medium supply pressure is as prescribed
- The power supply to electrical components (solenoid valves coils, limit switches, pressure switches, etc.) are within specification
- Actuator controls such as remote control, local control, emergency control, etc. 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 or adjust sealing
- The painted parts have not been damaged during transport, assembly or storage operations. Otherwise adequately repair the damaged parts following the applicable painting specifications
- Actuator and all additional equipment 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. End user shall indicate and maintain the grounding connections on the actuator.**


13. Dismantling and Disposal

Prior to dismantling the actuator, ensure no parts are still under pressure.

For Single-Acting Actuator

 The spring cartridge module contains potential energy due to compressed elastic elements.

After removing the spring cartridge from the center body, the spring cartridge must be returned to the manufacturer's plant, upon agreement with Rotork Fluid System.

 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 components according to the type of material
- Dispose steel, cast iron and aluminium alloy components as metal scraps
- Dispose rubber, PVC, resins, etc. separately, in accordance with national and regional regulations
- Electrical components are to be separately disposed of on specialized disposal sites

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 the best service in the world. Contact your local Rotork representative or the factory direct at the address on the nameplate, quoting the actuator type and serial number.

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

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 manufacture'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
		<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 manufacture'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"> Perform assembly according to section 10
		<ul style="list-style-type: none"> Valve blocked 	<ul style="list-style-type: none"> Consult the valve manufacture's documentation
		<ul style="list-style-type: none"> Stop bolts wrong setting 	<ul style="list-style-type: none"> Adjust stop bolt setting following instructions in section 12.3
5	Leakages	<ul style="list-style-type: none"> Stop bolts wrong setting 	<ul style="list-style-type: none"> Adjust stop bolt setting following instructions in section 12.3
		<ul style="list-style-type: none"> Worn seals 	<ul style="list-style-type: none"> Replace seals according instructions reported in PM-GT-005/006
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 manufacture'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 instructions reported in PM-GT-005/006

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:

⚠ 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*	*	
Breather cleaning	6*	*	
Check pneumatic connections for leaks. Tighten pipe fittings as required	-	1*	
Cleaning	-	1*	PM-GT-001
Visual check of paint coating. Verify absence of damage. Repair if necessary according to painting specification	-	1*	
Functional test	-	1*	PM-GT-002
Functional test by Manual Override	-	1*	
Check electrical components (if applicable) and grounding connections	-	1*	PM-GT-004
Check threaded connections (bolts, studs and nuts) with valve. If necessary tighten to the recommended torque, in accordance with the size and the characteristics of the fastener material installed by the Customer		1*	
Single stop actuator pneumatic cylinder seals replacement (Spring-Return and Double-Acting Actuator)	-	5*	PM-GT-005
Double stop actuator pneumatic cylinder seals replacement (Spring-Return and Double-Acting Actuator)	-	5*	PM-GT-006




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

Corrective Maintenance Task


In case of fault, according to section 15, the following operations could be executed by the End User.

MAINTENANCE ACTIVITY	REFERENCE
Single limit stop actuator fail mode converting	CM-GT-001
Double limit stop actuator fail mode converting	CM-GT-002



16. Periodic Maintenance

PM-GT-001		Page: 1/1
Component: Single-Acting actuator Double-Acting actuator	Task: Cleaning	
Equipment, Tools, Materials: Damp cloth 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 with a damp 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.		


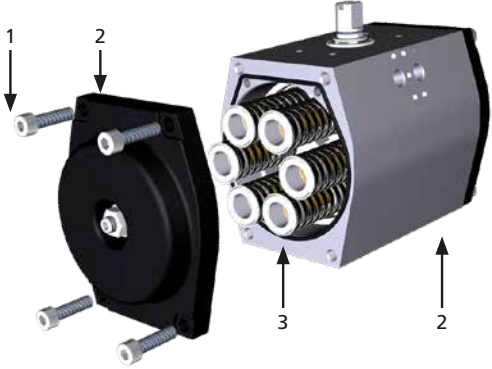
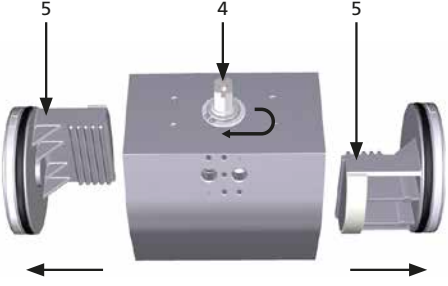
16. Periodic Maintenance

PM-GT-002		Page: 1/1
Component: Single-Acting actuator Double-Acting actuator	Task: Functional test	
Equipment, Tools, Materials: Chronometer/timer 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 to the atmosphere during normal operation. Wear appropriate PPD including breathing device.</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		


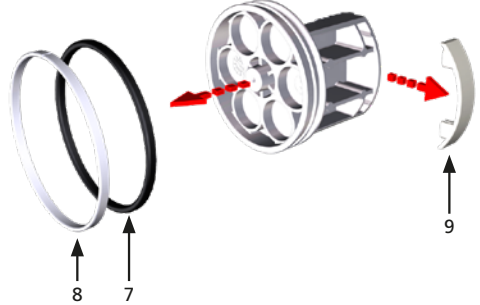
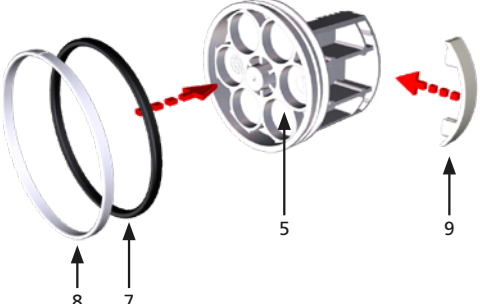
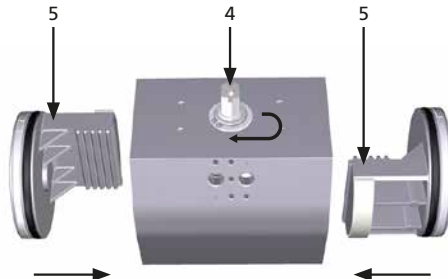
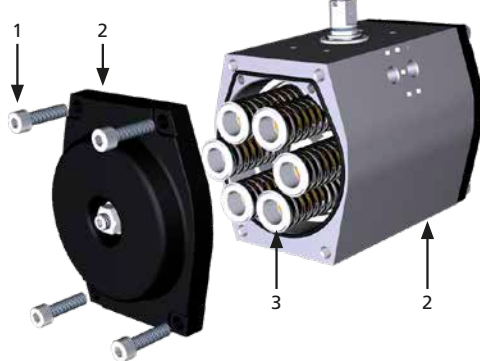
16. Periodic Maintenance

PM-GT-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:		
<p> Isolate electrical 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.</p> <p>Use only antistatic clothes.</p> <ol style="list-style-type: none"> 1. Remove cover from electric components 2. Check electric device components 3. Verify tightness of terminal blocks 4. Verify absence of humidity and oxidation 5. Check cable gland seals 6. Verify grounding connection and restore if necessary 		




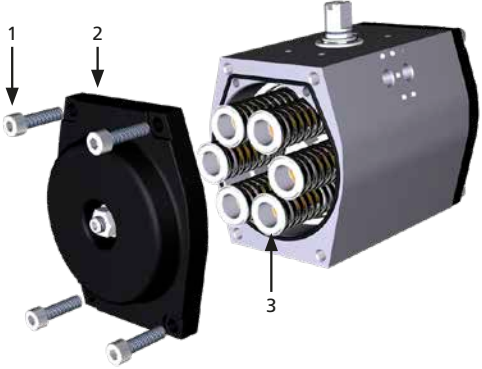
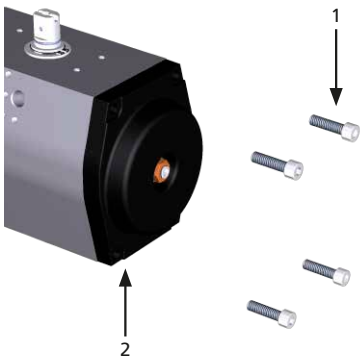
16. Periodic Maintenance

PM-GT-005		Page: 1/2
<p>Component: Single limit stop actuator pneumatic cylinder seals replacement (Spring-Return and Double-Acting Actuator) – GT actuators only</p>	<p>Task: Pneumatic 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>Description:</p>		
<p>Note: the following instructions apply both to Single-Acting and Double-Acting actuators unless otherwise specified.</p>		
<p>⚠ Isolate pneumatic and electrical supply (if present) before performing any operation.</p>		
<p>Preliminary actions</p>		
<ol style="list-style-type: none"> 1. Remove any pressure 2. Remove electric supply 3. Remove actuator from valve 4. Position the actuator on a workbench (if possible) or in a stable position in a clean and closed area 5. Remove any control equipment (if present). Refer to the project specific documentation 6. Remove pneumatic pipes 		
<ol style="list-style-type: none"> 7. With an Allen (hex.) key remove the 4 screws (1) from the end cap (2) 8. Remove end caps (2) 9. Remove springs (3), if present <p>⚠ Springs are pre-loaded. Do not stand in front of either end flange during disassembly operations.</p>		
<ol style="list-style-type: none"> 10. With the help of a Key-wrench, rotate the pinion shaft (4) to extrude the 2 pistons (5) 		


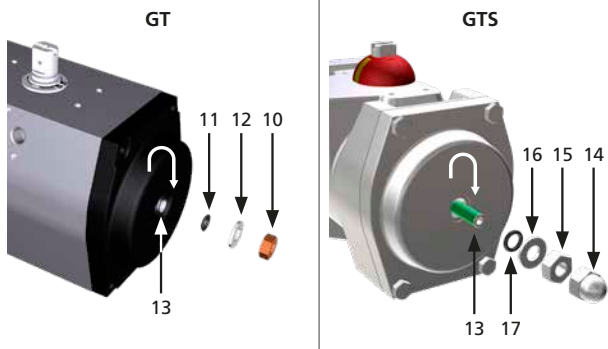
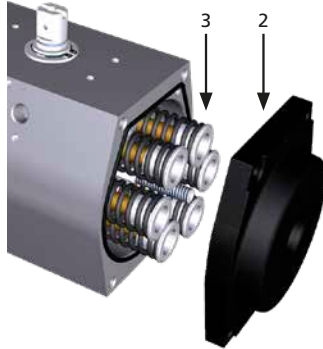
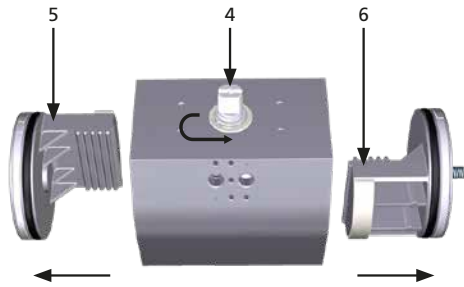
16. Periodic Maintenance

PM-GT-005		Page: 2/2
<p>Component: Single limit stop actuator pneumatic cylinder seals replacement (Spring-Return and Double-Acting Actuator)</p>	<p>Task: Pneumatic 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>11. Remove o-ring (7) and guide belt (8) 12. Remove sliding guide (9)</p>		
<p>13. Carefully clean piston (5) o-ring grooves and all sealing surfaces 14. Replace o-rings (7) and lubricate with a grease layer 15. Replace guide belt (8) and sliding guide (9) 16. Repeat operations 11 to 15 for the other piston (5)</p>		
<p>17. Reinstall pistons (5) – be careful to respect 0° position and fail action</p>		
<p>18. Reinstall (3) springs, if present 19. Reinstall end caps (2) and tighten screws (1) – refer to section 6.3</p> <p>⚠ Springs are pre-loaded. Do not stand in front of either end flange during disassembly operations.</p>		



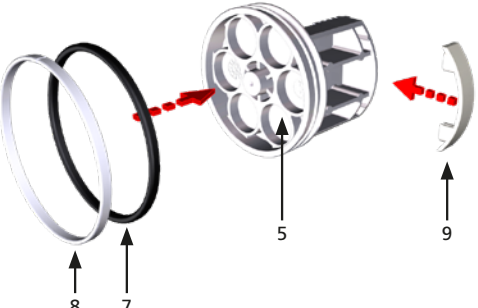

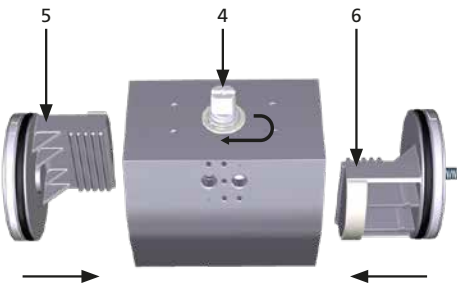
16. Periodic Maintenance

		PM-GT-006	Page: 1/4
Component: Double limit stop actuator pneumatic cylinder seals replacement (Spring-Return and Double-Acting Actuator) – GT and GTS actuators		Task: Pneumatic cylinder seals replacement	
Equipment, Tools, Materials: Spare seals Wrench Lifting tools Project documentation		Warnings: 	
Preliminary Operations: Removal from Valve			
Description: Note: the following instructions apply both to Single-Acting and Double-Acting actuators unless otherwise specified.  Isolate pneumatic and electrical supply (if present) before performing any operation.			
Preliminary actions <ol style="list-style-type: none"> 1. Remove any pressure 2. Remove electric supply 3. Remove actuator from valve 4. Position the actuator on a workbench (if possible) or in a stable position in a clean and closed area 5. Remove any control equipment (if present). Refer to the project specific documentation 6. Remove pneumatic pipes 			
<ol style="list-style-type: none"> 7. With an Allen (hex.) key remove the 4 screws (1) from the end cap (2) 8. Remove end cap (2) 9. Remove springs (3), if present  Springs are pre-loaded. Do not stand in front of either end flange during disassembly operations.			
<ol style="list-style-type: none"> 10. With an Allen (hex.) key remove the 4 screws (1) from the other end cap (2) 			


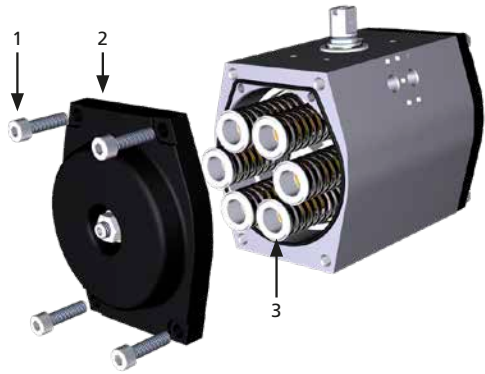
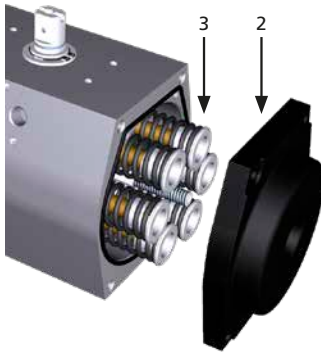
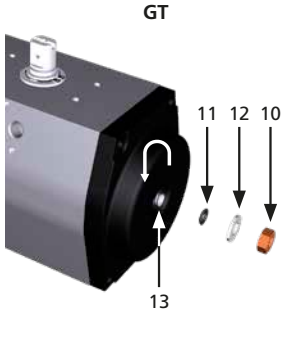
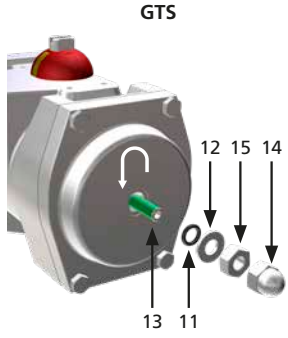
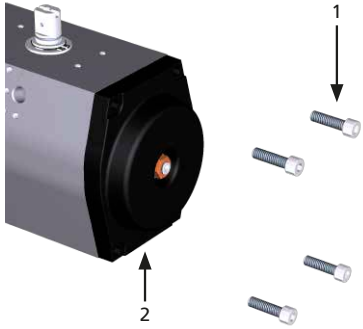
16. Periodic Maintenance

PM-GT-006		Page: 2/4
Component: Double limit stop actuator pneumatic cylinder seals replacement (Spring-Return and Double-Acting Actuator) – GT and GTS actuators		Task: Pneumatic cylinder seals replacement
Equipment, Tools, Materials: Spare seals Wrench Lifting tools Project documentation		Warnings: 
Preliminary Operations: Removal from Valve		
11. GT: Loosen the nut (10) with a socket wrench then remove washer (12) and O-ring (11) GTS: Loosen the blind nut (14) and nut (15) then remove washer (16) and O-ring (17) 12. Using an Allen (hex.) key rotate the stop bolt (13) clockwise all the way in		
13. Remove the end cap (2) 14. Remove the springs (3), if present ⚠ Springs are pre-loaded. Do not stand in front of either end flange during disassembly operations.		
15. With the help of a Key-wrench, rotate the pinion shaft (4) to extrude the 2 pistons (5) and (6)		


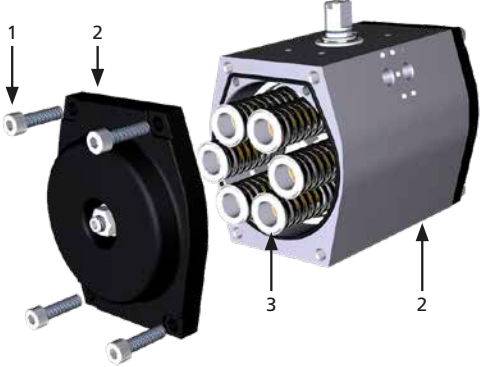
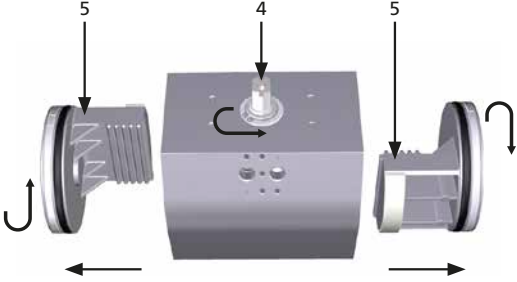
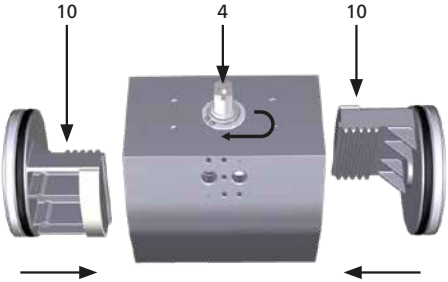
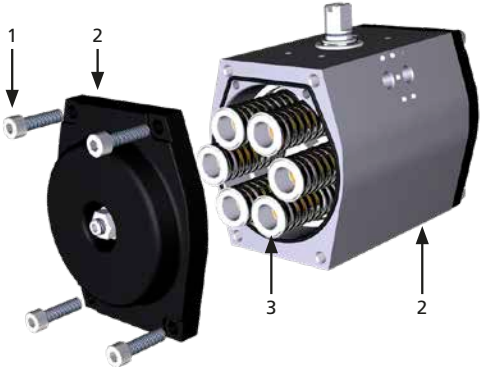
16. Periodic Maintenance

		PM-GT-006	Page: 3/4
Component: Double limit stop actuator pneumatic cylinder seals replacement (Spring-Return and Double-Acting Actuator) – GT and GTS actuators		Task: Pneumatic cylinder seals replacement	
Equipment, Tools, Materials: Spare seals Wrench Lifting tools Project documentation		Warnings: 	
Preliminary Operations: Removal from Valve			
<p>16. Remove o-ring (7) and guide belt (8)</p> <p>17. Remove sliding guide (9)</p>			
<p>18. Carefully clean pistons (5) o-ring grooves and all sealing surfaces</p> <p>19. Replace o-rings (7) and lubricate with a grease layer</p> <p>20. Replace guide belt (8) and sliding guide (9)</p> <p>21. Repeat operations 11 to 15 for the other piston (6)</p>			
<p>22. Remove stop bolt (13) from piston (6)</p> <p>23. Remove o-ring (6)</p> <p>24. Clean the o-ring (6) groove</p> <p>25. Replace o-ring (6) and lubricate with a grease layer</p> <p>26. Pull stop bolt (13) back in place</p>			
<p>27. Reinstall pistons (5) and (6) – be careful to respect 0° position and fail action</p>			


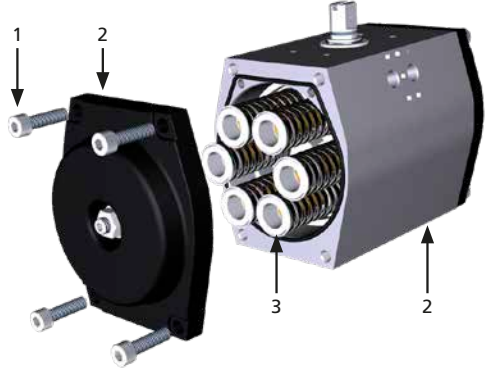
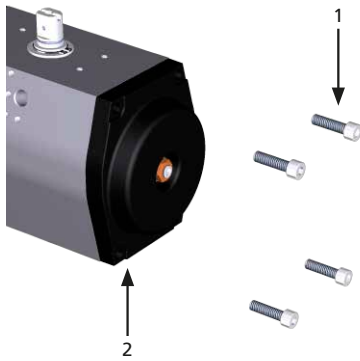

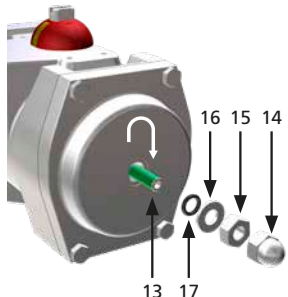
16. Periodic Maintenance

PM-GT-006		Page: 4/4
Component: Double limit stop actuator pneumatic cylinder seals replacement (Spring-Return and Double-Acting Actuator) – GT and GTS actuators	Task: Pneumatic cylinder seals replacement	
Equipment, Tools, Materials: Spare seals Wrench Lifting tools Project documentation	Warnings: 	
Preliminary Operations: Removal from Valve		
28. Reinstall (3) springs, if present 29. Reinstall end cap (2) and tighten screws (1) – refer to section 6.3		
30. Reinstall (3) springs, if present 31. Insert the end cap (2)		
32. Using an Allen (hex.) key rotate the stop bolt (13) anti-clockwise all the way back 33. Replace o-ring (11) 34. Reinstall washer (12) 35. GT: Fasten the nut (10) with a socket wrench GTS: Fasten the blind nut (14) and nut (15) with a socket wrench		
36. With an Allen (hex.) key fasten the 4 screws (1) in the end cap (2)		


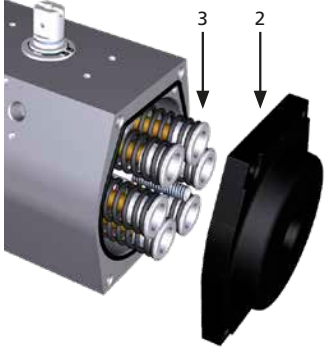
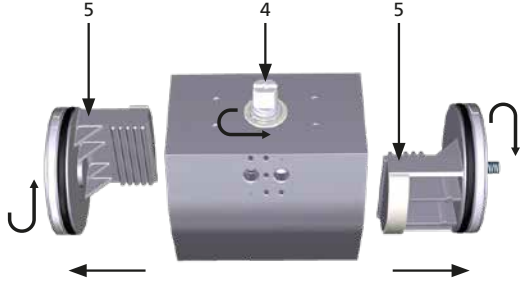
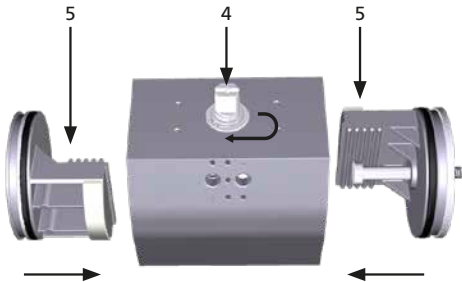
16. Periodic Maintenance

CM-GT-001		Page: 1/1
<p>Component: Single limit stop Spring-Return and Double-Acting actuator – GT actuators only</p>	<p>Task: Fail mode converting</p>	
<p>Equipment, Tools, Materials: Wrench Lifting tools Project documentation</p>	<p>Warnings:</p> 	
<p>Preliminary Operations: Removal from Valve</p>		
<ol style="list-style-type: none"> 1. With an Allen (hex.) key remove the 4 screws (1) from the end cap (2) 2. Remove end cap (2) 3. Remove springs (3), if present <p>⚠ Springs are pre-loaded. Do not stand in front of either end flange during disassembly operations.</p>		
<ol style="list-style-type: none"> 4. Turn the shaft (4) to help removal of the pistons (5) 5. Rotate pistons 180° 		
<ol style="list-style-type: none"> 6. Reinstall pistons, be careful to perfectly match the pinion tooth to keep the original pinion position 		
<ol style="list-style-type: none"> 7. Reinstall (3) springs, if present 8. Reinstall end cap (2) and tighten screws (1) – refer to section 6.3 		


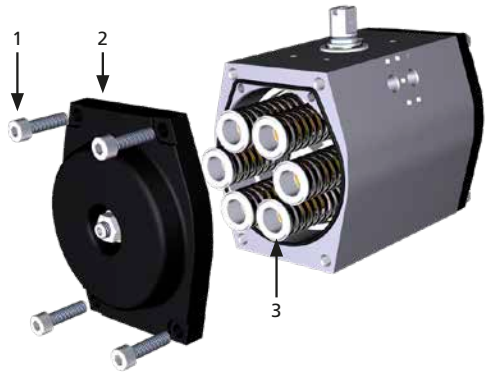
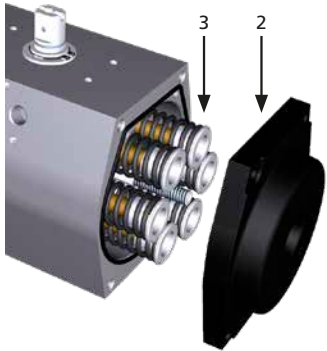
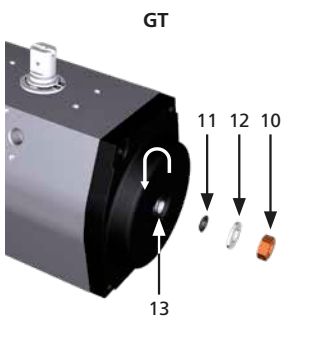
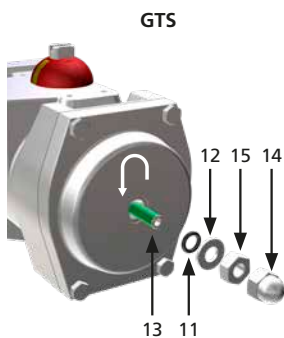
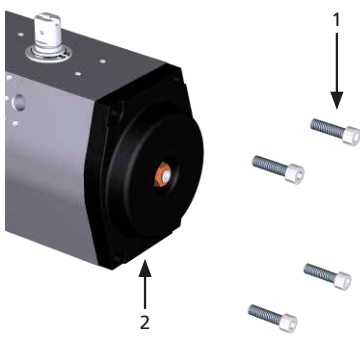
16. Periodic Maintenance

CM-GT-002		Page: 1/3
Component: Double limit stop Spring-Return and Double-Acting actuator – GT and GTS actuators	Task: Fail mode converting	
Equipment, Tools, Materials: Wrench Lifting tools Project documentation	Warnings: 	
Preliminary Operations: Removal from Valve		
<ol style="list-style-type: none"> 1. With an Allen (hex.) key remove the 4 screws (1) from the end cap (2) 2. Remove end cap (2) 3. Remove springs (3), if present <p>⚠ Springs are pre-loaded. Do not stand in front of either end flange during disassembly operations.</p>		
<ol style="list-style-type: none"> 4. With an Allen (hex.) key remove the 4 screws (1) from the other end cap (2) 		
<ol style="list-style-type: none"> 5. GT: Loosen the nut (10) with a socket wrench then remove washer (12) and O-ring (11) GTS: Loosen the blind nut (14) and nut (15) then remove washer (16) and O-ring (17) 6. Using an Allen (hex.) key rotate the stop bolt (13) clockwise all the way in 	<p>GT</p> 	<p>GTS</p> 

16. Periodic Maintenance

		CM-GT-002	Page: 2/3
Component: Double limit stop Spring-Return and Double-Acting actuator – GT and GTS actuators		Task: Fail mode converting	
Equipment, Tools, Materials: Wrench Lifting tools Project documentation		Warnings: 	
Preliminary Operations: Removal from Valve			
7. Remove the end cap (2) 8. Remove the springs (3), if present ⚠ Springs are pre-loaded. Do not stand in front of either end flange during disassembly operations.			
9. Turn the shaft (4) to help removal of pistons (5) 10. Rotate pistons 180°			
11. Reinstall pistons, be careful to perfectly match the pinion tooth to keep the original pinion position.			

16. Periodic Maintenance

CM-GT-002		Page: 3/3
Component: Double limit stop Spring-Return and Double-Acting actuator – GT and GTS actuators	Task: Fail mode converting	
Equipment, Tools, Materials: Wrench Lifting tools Project documentation	Warnings: 	
Preliminary Operations: Removal from Valve		
12. Reinstall (3) springs, if present 13. Reinstall end cap (2) and tighten screws (1) – refer to section 6.3		
14. Reinstall (3) springs, if present 15. Insert the end cap (2)		
16. Using an Allen (hex.) key rotate the stop bolt (13) anti-clockwise all the way back 17. Replace o-ring (11) 18. Reinstall washer (12) 19. GT: Fasten the nut (10) with a socket wrench GTS: Fasten the blind nut (14) and nut (15) with a socket wrench	GT 	GTS 
20. With an Allen (hex.) key fasten the 4 screws (1) in the end cap (2)		

17. Part List

Single Stop GT Actuator

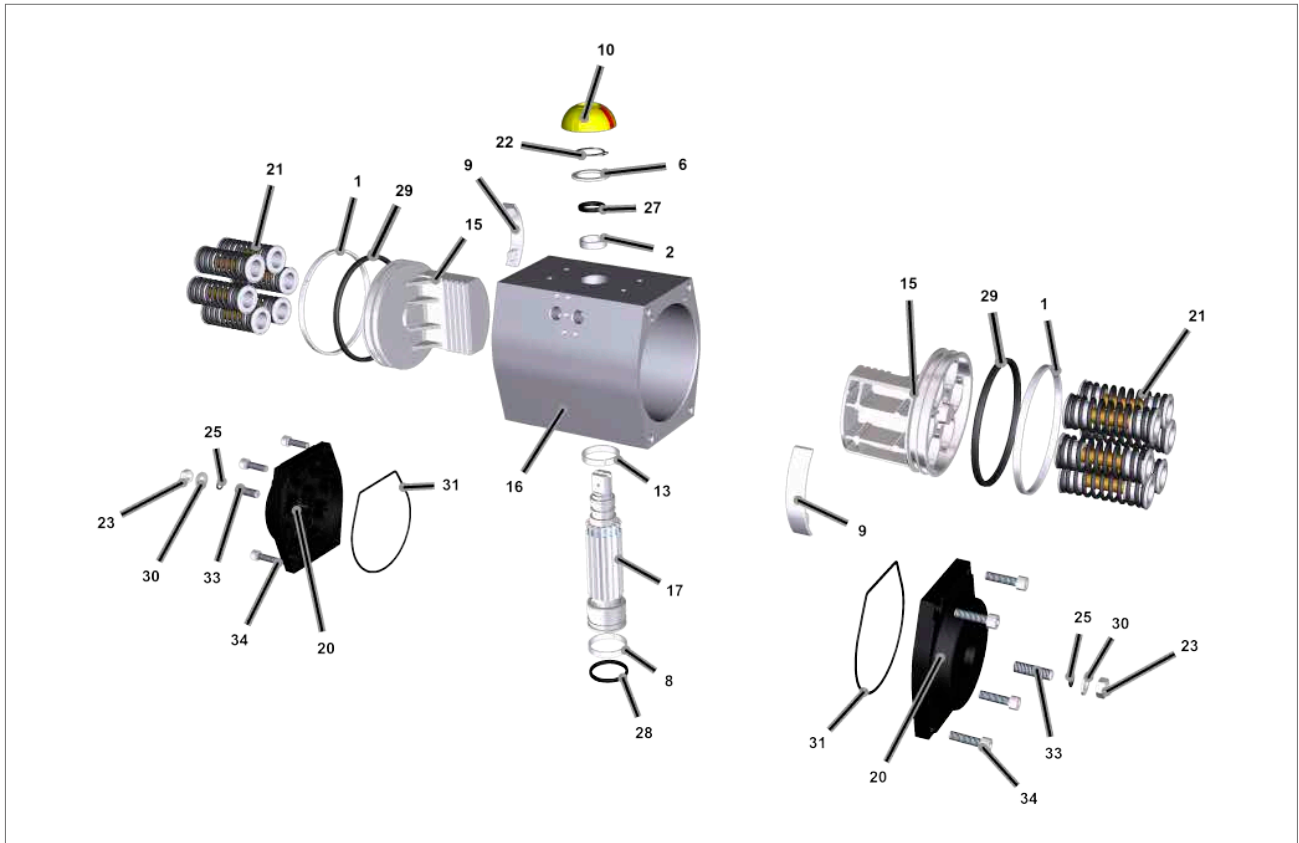


Fig 17.1 Single Stop GT Actuator

ITEM	DESCRIPTION		QTY
1	Piston guide belt	●	2
2	Pinion upper washer		1
6	Pinion upper bearing		1
8	Pinion bottom washer		2
9	Piston sliding guide	●	2
10	Position indicator		1
13	Anti-blow-out ring		1
15	Pistons		2
16	Actuator body		1
17	Pinion		1
20	Body end caps		2

● Recommended spare part

ITEM	DESCRIPTION		QTY
21	Spring cartridge		Model dependant
22	Circlip		1
23	Nut		2
25	Stop bolt o-ring	●	2
27	Upper pinion o-ring	●	1
28	Bottom pinion o-ring	●	1
29	Piston o-ring	●	2
30	Washer		2
31	End cap o-ring	●	2
33	Stop bolt		2
34	Screws		8

17. Part List

Double Stop GT Actuator

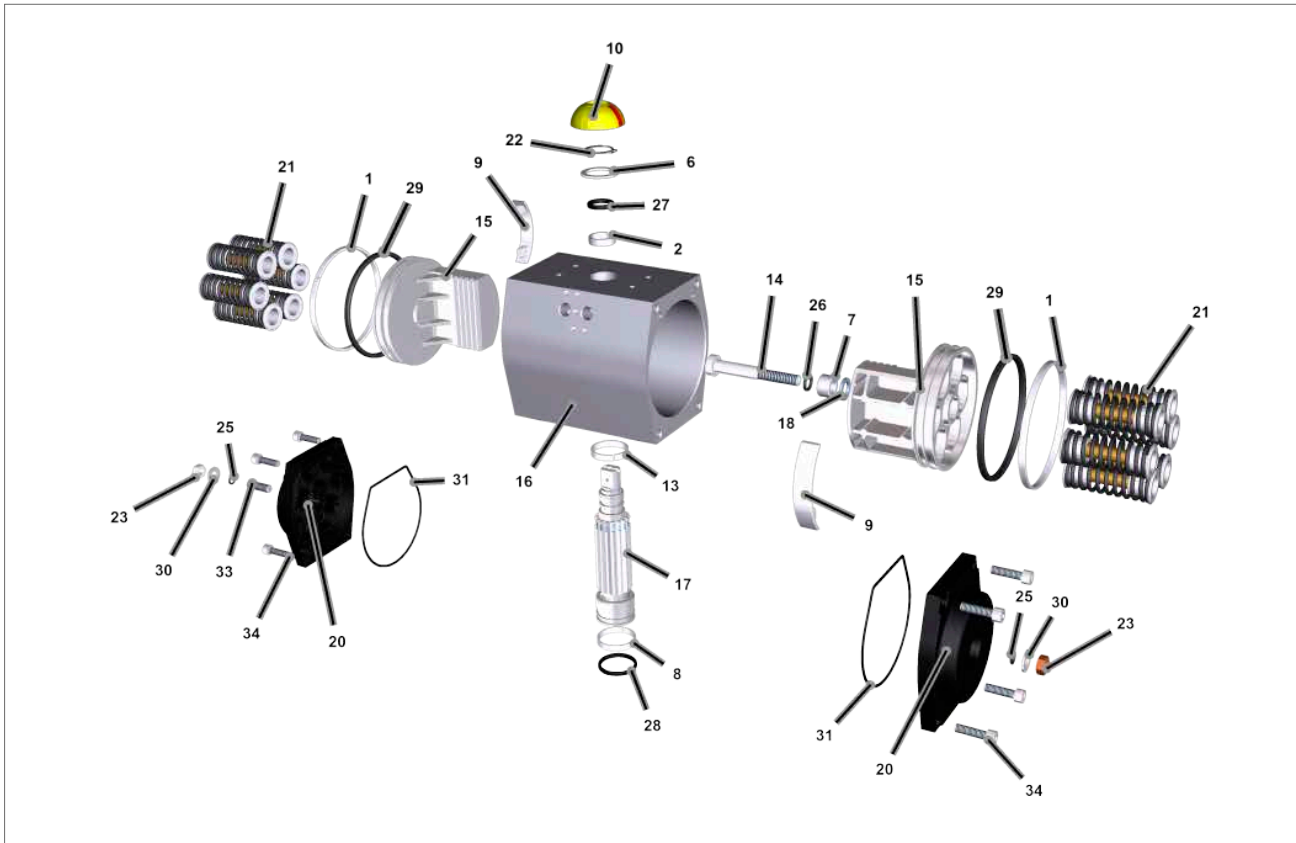


Fig 17.2 Double Stop GT Actuator

ITEM	DESCRIPTION		QTY
1	Piston Guide Belt	●	2
2	Pinion upper washer		1
6	Pinion upper bearing		1
7	Guiding bush		1
8	Pinion bottom washer		2
9	Piston sliding guide	●	2
10	Position indicator		1
13	Anti-blow-out ring		1
14	Stop bolt		1
15	Pistons		2
16	Actuator body		1
17	Pinion		1
18	Washer		1

● Recommended spare part

ITEM	DESCRIPTION		QTY
20	Body end caps		2
21	Spring cartridge		Model dependant
22	Circlip		1
23	Nut		2
25	Stop bolt o-ring	●	2
26	O-ring	●	1
27	Upper pinion o-ring	●	1
28	Bottom pinion o-ring	●	1
29	Piston o-ring	●	2
30	Washer		2
31	End cap o-ring	●	2
33	Stop bolt		2
34	Screws		8

17. Part List

Double Stop GTS Actuator

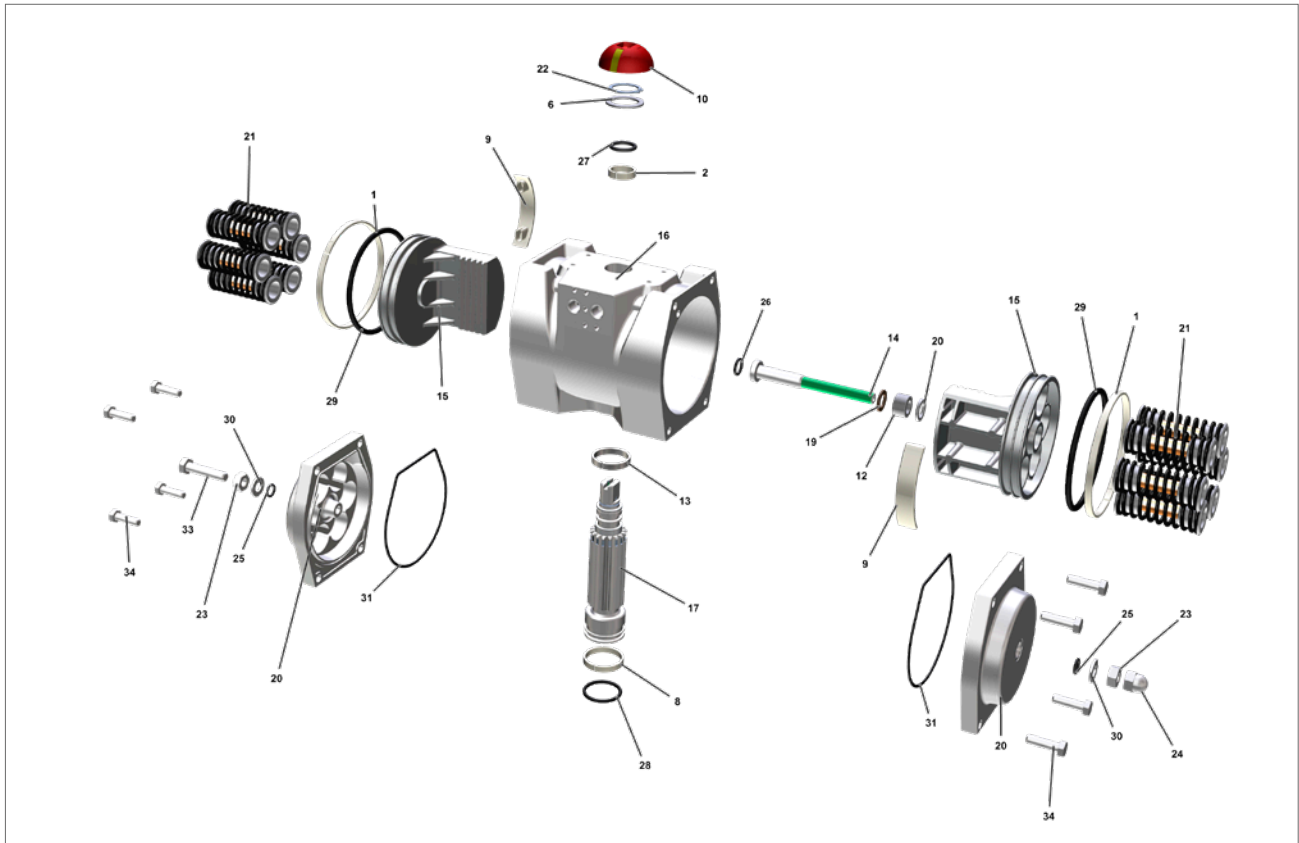


Fig 17.3 Double Stop GTS Actuator

ITEM	DESCRIPTION		QTY
1	Piston Guide Belt	●	2
2	Pinion upper washer		1
6	Pinion upper bearing		1
7	Guiding bush		1
8	Pinion bottom washer		2
9	Piston sliding guide	●	2
10	Position indicator		1
13	Anti-blow-out ring		1
14	Stop bolt		1
15	Pistons		2
16	Actuator body		1
17	Pinion		1
18	Washer		1
20	Body end caps		2

ITEM	DESCRIPTION		QTY
21	Spring cartridge		Model dependant
22	Circlip		1
23	Nut		2
24	Blind nut	●	1
25	Stop bolt o-ring	●	2
26	O-ring	●	1
27	Upper pinion o-ring	●	1
28	Bottom pinion o-ring	●	1
29	Piston o-ring	●	2
30	Washer		2
31	End cap o-ring	●	2
33	Stop bolt		2
34	Screws		8

● Recommended spare part

18. Grease Specification

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

18.1 Grease

Lubricate mechanical components and cylinders of actuators using the following grease or equivalent for temperature range $-50^{\circ} < T < +140^{\circ} \text{C}$.

Manufacturer:	BEICHEM Lubrication Technology
Trade name:	BERULUBE FR 16
Colour: Base Oil Solid Lubricant Thickener	Beige Polyalphaolefin Microfine PTFE powder Special lithium soap
Worked penetration (ISO 2137): Viscosity of oil at 40 °C (104 °F) (DIN 51 562):	265-295 mm ¹⁰ 32 mm ² /s
Service temperature: Drop point (IP 396):	-50 to 140 °C (-58 to 284 °F) ≥190
Corrosion test on Copper (24h\100 °C)	1 (DIN51 881)
Oxidation stability (100h\99 °C)	0.2 bar (DIN51 805)

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