

# rotork®

GB

## GTE Series

### Pneumatic rack and pinion actuators

#### Installation, Operation and Maintenance Manual

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#### 1. INTRODUCTION

The GTE range is a large range of pneumatic rack and pinion actuators designed for installation on fluid control valves, such as ball valves, butterfly valves, etc. and fed with compressed air, possibly lubricated.

The **double limit stop** GTE series with adjustment of the rotation both in opening and in closing directions are manufactured to operate with a maximum pressure of 8 bar, and tested for an operational life per codes of EN 15714.

The greasing performed during manufacture guarantees correct lubrication of the actuators for operation cycles listed in EN15714-3 at a minimum.

The actuators are designed to operate in the pressure range 2.5 to 8 bar (36 to 116 psig) and are offered in two styles:

- DOUBLE-ACTING: Available with rotation of 90°
- SPRING-RETURN: Available with rotation of 90°

The DOUBLE-ACTING and SPRING-RETURN actuators can easily be converted to the other configuration by insertion or removal of the spring-return cartridges.

#### 2. STORAGE

All actuators are factory lubricated.

The actuator ports are plugged to prevent liquids or other materials from entering the actuator during shipment. If the actuators have to be stored for a long period of time before installation, the units should be stroked periodically to prevent the seals from setting.

**(Note: the plugs must be removed in order to stroke actuators). Storage should be indoors and the units should be protected against humidity and other harmful elements.**

#### 3. OPERATION CHARACTERISTICS

The GTE series actuators have simple operational characteristics: (see **Figures 1A-1B-1C-1D** and **1E-1F-1G-1H**)

- Port A (2) is connected to the interior cavity between the pistons
- Port B (4) is connected to the end caps cavity directing the airflow into the end caps area

The pistons of GTE actuators have, as standard, a polygonal bottom female key, that allows assembling on valve stems, or coupling, with square key at 45° or at 90° indifferently.

The ports are NAMUR standard, for easy solenoid valve connection, directly on the bodies of size 50 through size 210.

##### AIR-TO-AIR ACTUATORS

The normally **closed** position for the actuator is achieved by pressurizing port **B** and allowing air to exhaust through port **A**, as in **Figures 1.A** and **1.C**.

The normally **open** position is achieved by inverting the pressurization from **B** to **A** and the exhaust from **A** to **B**, the position for the actuator pinion will rotate in the clockwise or counter clockwise direction, as in **Figures 1.B** and **1.D**.

##### SPRING-RETURN ACTUATORS

For spring-return actuators, the **open** position is achieved with pressure on port **A** and exhaust connected to port **B**. If air failure occurs, the springs will close the actuator satisfying the conditions shown in **Figures 1.E** and **1.G**.

Although the actuators typically operate counter clockwise (CCW) to open and clockwise (CW) to close, it is possible to reverse this style of operation.

**Figures 1.F** and **1.H** show the same spring-return actuator with the piston orientation changed to convert the actuator from a fail clockwise to a fail counter clockwise unit (as described in Section 8: FCCW to FCW conversion).

#### 4. ACTUATOR INSTALLATION

GTE actuators are designed for easy installation. The actuators come with one or more ISO 5211 (DIN 3337) standard bottom mounting patterns, selected according to product model and output torque, for direct assembly on to the valve or to a coupling.

On the top face of GTE actuators there is a NAMUR standard mounting pattern for easy installation of accessories for position indication and/or control devices (Microswitches box, Positioners, etc., see **Figure 3**).

##### FOR ACTUATORS INSTALLATION PLEASE FOLLOW THESE STEPS:

- Insert the valve stem directly into the actuator pinion, or through the coupling if necessary, to check for proper fit.

**NOTE: If the actuator is an AIR-TO-AIR type, verify whether the pinion is in the normal position, or in the necessary position to achieve closing of the valve.**

- Ensure the valve is in normal position before proceeding. **Figure 3** shows the correct normal position of all actuators (including spring-return types with FCW, **assembly A** and FCCW **assembly C**, applications).
- Install the mounting bracket onto the valve and hand-tighten all fasteners. **Be sure not to fully torque bolts until the entire assembly is correctly aligned and installed.**
- Place the coupling on the valve stem, if necessary, and the position actuator on mounting brackets. Align valve and actuator assembly so as to eliminate shear force on system.

Rotate the actuator towards the open direction as regards to the valve (normally CCW) until all torsional play is eliminated in the closing direction. This sets the correct closing valve position in relation to the actuator closing position (piston close to piston, see **Figures 1A** and **1C**). Now tighten all assembly fasteners to appropriate torque specification given in **Table 3**.

- Actuate the unit pneumatically several times to ensure the coupling is not binding. If the unit does not function properly, disassemble the fixings and actuator coupling, and repeat steps from **4.1** through **4.5**. If problems persist contact your local Rotork representative.
- After all mounting procedures are completed, it is necessary to set travel stops, to ensure correct rotation.

<b> NEVER ADJUST TRAVEL STOP SCREWS WHILE PRESSURE IS PRESENT INSIDE THE ACTUATOR</b>
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- External travel stops, placed on the side of the actuator body, allow for a range of approximately -5° to +5° compared to the open and close positions. If a larger range is necessary, consult Rotork directly for information on extended limit stop screws. Loosen both sealing nuts. Torque travel stops until they contact the travel stop block. Be sure not to alter the valve and actuator position while setting the travel stops. Torque the sealing nuts until secure. Re-test actuator to assure that there are no leaks.

##### 5. DISASSEMBLY PROCEDURE

- Refer to **Figure 10** for component details and recommended spare parts.
- Disconnect all electrical and air supplies from the actuator.

<b> CAUTION: NEVER DISASSEMBLE AN ACTUATOR THAT IS UNDER PRESSURE</b>
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- Remove the actuator from its mounting bracket and coupling (when present). Disassemble accessories such as: limit switches, micro switches box and positioner (if present), and place in a clean environment.
- Loosen both sealing nuts on the travel stop screw, and loosen the travel stop screw. Remove the eight screws which fix the end caps and remove the caps.
- Remove O-rings from the end caps. **NOTE:** unless actuator has not been in service it will be better to replace the O-ring set. (See **Table 2A**)
- Rotate the pinion in the counter-clockwise direction (NOTE: if unit is a FCCW, assembly C, rotation will be in the opposite (clockwise) direction) until pistons are far enough from cylinder to be removed by hand (See **Figure 5**). If the pistons are too difficult to remove by hand, it is acceptable to use a pair of pliers to assist in their removal. **(NOTE: be sure not to scar the piston surface).** Remove both pistons, noting their orientation, to ensure they will be replaced in the same orientation during reassembly.

<b> CAUTION: NEVER USE COMPRESSED AIR TO PULL OUT THE PISTONS FROM THE ACTUATOR BODY</b>
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- Remove the snap ring and washers from the top of the pinion. Place the actuator between two blocks of wood so that the pinion is free to be removed through the bottom of the actuator body. Using a rubber mallet, lightly tap the top of the pinion. When the pinion is loose from the body remove the pinion through the bottom (See **Figure 5**). The O-rings and guide kits are listed in **Table 2A** and **2B**.

##### 6. ASSEMBLY PROCEDURE

- Inspect all wear surfaces for excessive wear or possible damage.
- Make sure all metallic parts are clean and free of any damage (nicks or burrs).
- Lubricate the inside bore of the cylinder body, O-rings seals, pistons and pinion wear surfaces with Shell Gadus V5 V25Q 2.5 grease, suitable for use from -50°C through +130°C.

<b> CAUTION: BE SURE THAT ALL PARTS ARE STILL WITHIN THE FACTORY-SET TOLERANCES BEFORE ASSEMBLY</b>
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**NOTE: All O-rings should be replaced as a matter of service policy if the actuator has been in service.**

- Install wear surface skates and bearings on the pistons and pinion, and install O-rings on the pistons, pinions and end caps.
- Insert a travel stop block into the actuator body. Insert the pinion into the body through the travel stop block. Install the pinion washer and snap ring (Seeger ring).
- Insert pistons into the cylinder body until the pistons begin to mesh with the pinion. Make sure that the pistons are symmetrically placed inside the cylinder body. **Figure 4** shows the pistons at the mating, symmetrical position. **This is very important.** If the pistons are not tracking properly, remove and reinsert them. **NOTE: Be sure that tooth engagement is even on both pistons.**
- Apply equal pressure on each piston until they are fully engaged with the pinion. Rotate the pinion until the actuator is fully closed.
- Check the top of pinion for correct orientation. If the indicator-drive milling is perpendicular to the cylinder body then proceed to the next part 6.9. If the pinion is incorrectly positioned, then proceed to part 6.8b.
- 8b** Turn the actuator up on its side. Rotate the pinion counter-clockwise until both pistons disengage from pinion. Rotate the pinion with a wrench to the correct position. Apply light pressure to the pistons until pinion and pistons engage. Close the actuator and check for correct pinion orientation, as in **Section 6**. (Repeat this step as many times as necessary to get the correct orientation).
- For spring-return actuators, insert cartridge springs. (For information on loading of springs refer to **Section 7**).
- Engage travel stop screws into the body, being sure to position them in the correct position, tighten the nut. **NOTE: Torque screws in alternating order to ensure that the O-ring seats properly.**
- End cap screws should be torqued, in alternating order, to the factory standard. Refer to below table 3 for correct bolt torque specifications.

<b> CAUTION: NEVER SUPPLY COMPRESSED AIR TO THE ACTUATOR BEFORE CHECKING THAT THE PINION IS FIXED BY SNAP RING (SEEGER RING) AND END CAPS COMPLETELY CLOSED WITH TIGHTENED SCREWS</b>
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- Pressurize the right port on the actuator body to test for air leaks. Leaks can occur around the pinion and between end caps and body mating surfaces. If an air leak is found near the end cap, remove end cap and check for proper O-ring seating. If the O-ring appears to be in good condition, repeat the step 6.11. Pressurize the left port on the actuator body to test for pinion air leaks. If an air leak develops near the pinion and body mating areas, remove the pinion from the body, as described in step 5.6, taking care that the pistons do not change position inside the actuator body during this operation. Inspect the upper and/or lower pinion O-rings for leaks. If the O-rings appear to be in good condition, check for burrs in the O-ring grooves. Clean very well and reinsert the O-rings into their seats. Insert the pinion into the actuator body in the same orientation as before, taking care not to move the pistons. If the pistons are moved, repeat steps from point 6.5. Install the pinion washer and snap ring. Start the test again as described in this section. If the problems persist contact your local Rotork representative.

#### 7. CARTRIDGE SPRINGS INSTALLATION

GTE actuators have the unique ability to be easily converted in the field from a DOUBLE-ACTING to a SPRING-RETURN actuator type, or vice versa, by changing the spring configuration inside the end caps.

The actuators can accept between 2 and 6 cartridge springs in each end cap. The number of cartridge springs loaded into the actuator affects the amount of torque the actuator will be able to generate during the closing and opening portions of the cycle.

Review sections **11**, **12** and **13** on actuator sizing, for correct procedures in selecting spring combinations.

- Drive the actuator in closed position (See **Figures 1.E** and **1.G**).
- Remove the eight screws which fix the end caps and remove the caps.
- Fix the number of cartridge springs to put into **each** cap, insert them according to **Table 4** and **Figure 7**.
- When reassembling the end caps take care not to overtighten them. looking at the O-ring, be sure to place end caps with A on the top and B on the bottom. (see **Figures 6** and **8**).

#### 8. FCW TO FCCW CONVERSION

GTE actuators typically come from the factory as Fail Clockwise (FCW) units, that is **Assembly A**, that allows infact FCW operation.

In the event that the need of the actuator changes from FCW to a Fail Counter Clockwise (FCCW) actuator, that is **Assembly C**, actuators can easily be field converted to this configuration in **Figure 9**

- Remove end caps, pistons and the pinion as described in the disassembly procedure (Section 5). Prior to reassembly, rotate both pistons 180° along the long axis of the piston (See **Figure 9**).
- Upon rotation of pistons, reassembly can be accomplished by following the instructions in Section 6, Parts 6.1 to 6.12 of this manual.

<b>REMEMBER: IN CASE OF SPRING-RETURN TYPE, RE-INSERT CARTRIDGE SPRINGS BEFORE END CAPS ASSEMBLING ACCORDING TO SPRING ORIENTATION CHART (TABLE 4) REPLACE CARTRIDGE SPRINGS IF NECESSARY</b>
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- After this procedure has been accomplished, you should be able to put air into the right air port and move the actuator to the normal position (if the actuator is not already in the normal position).

When air is placed in the left port, the actuator rotates in the clockwise direction first and then in the counter clockwise direction when returning to its normal position.

Logically, in the case of SPRING-RETURN type, the return to normal position (by counter-clockwise rotation) will occur when the air is put to the exhaust instead of the left air port.

##### 9. ACTUATOR SIZING

Prior to actuator sizing, it is important to get certain information. Important data required:

- Torque required to open the valve
- Torque required to close the valve
- Actuator air pressure
- Differential pressure of Valve/Damper

Obtaining the above information allows you to properly and effectively size a SPRING-RETURN actuator. (**NOTE:** DOUBLE-ACTING actuators have a constant torque throughout their entire stroke).

When determining the air supply pressure it is important that you use the minimum air pressure that the actuator will experience and not the average air supply pressure.

If an actuator is supplied with a lower air pressure than it is sized for, failure or improper performance can occur.

##### 10. AIR-TO-AIR ACTUATORS

- Select the largest torque (opening or closing torque) and increase that number by 10%. (**NOTE:** Adding 10% is done to ensure an acceptable margin of safety). The data published in the sizing table (contact Rotork for help) indicates the **average** capacity for that given pressure and allows the correct actuator size to be chosen.

##### 11. SPRING-RETURN ACTUATOR

- Increase both your valve closing torque and your valve opening torque by 20%. (Again this will provide an acceptable margin of safety).
- Using the SPRING-RETURN actuators sizing table (contact Rotork for help), look in the column that corresponds to the supply pressure you have selected. Move down the chart until you have found a torque which is larger than the torque determined for your application. After you have found the correct value, move across the table horizontally to determine the correct actuator. (See **example calculations in Table 5**)

<b>NOTE: THE VALVE CLOSING TORQUE CORRESPONDS TO THE SPRINGS 0° COLUMN AND THE VALVE OPENING TORQUE CORRESPONDS TO THE ACTUATOR AIR PRESSURE COLUMN (contact Rotork for help)</b>
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##### 12. ACTUATOR CYCLE TIME

- Table 6** indicates the time required for GTE series double-acting actuators to complete a full open-close cycle at an inlet pressure of 5.5 Bar (80 psig) and no load.

##### 13. DANGEROUS AREAS (See Table 7)

<b> WARNING: Local laws and codes must be followed when using actuators in an explosive area</b>
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##### CONNECTIONS

The actuator must be installed through a threaded connection in compliance with ISO 228 (G), easily recognisable by the stamped number 2 under the gas connection for the open position and number 4 above the gas connection for the closed position.

##### GAS LEAK FROM AN O-RING SEAL

Plants have valve type taps with an emergency sphere that shut-off the gas supply. Check the state of the O-ring once a year in higher risk areas. Before using a non-neutral gas other than compressed air or nitrogen as a pressure source, please consult Rotork for the suitability of the gas source.

##### EARTHING (Ignition due to static electricity)

The actuator valve must be reinforced with set screws to ensure that the metal parts of the equipment must be grounded.

##### CHECKS AND MAINTENANCE OF ACTUATORS

###### DOUBLE-ACTING ACTUATOR:

This actuator requires no extraordinary maintenance, but read the instruction manual carefully if the actuator needs to be opened in order to replace the O-rings.

###### SPRING-RETURN ACTUATOR:

Spring cartridge:

The return springs are made in steel and subsequently rustproofed with polyester dust varnish, however this varnish might get ruined and the springs could become rusty and break. Check the state of the springs after about 500,000 operations and in higher risk areas check once a year and replace if rusty.

Dust inside the actuator:

The frequency of cleaning inside the actuator depends on how dusty the atmosphere is. The actuator sucks in external air when closing and expels air on opening, so part of the dust is expelled, however, once a year check the state of the washers and the grease and replace them if necessary. For further information or to order spare parts, contact your nearest Rotork agent or the factory itself. (Note: when ordering always specify the temperature range indicated on the label so as to receive the correct replacement kit.)

In dust-filled environments, fill the chambers of the springs (entrance No. 4) through a tube that is designed to draw air in from a protected zone.

<b> NEVER DISMANTLE AN ACTUATOR WHILE IT IS STILL PRESSURISED</b>
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- End caps must be screwed tight with the special screws (see tightening torque values in Table 3)
- Washers and connections must be replaced with components identical to those supplied by the manufacturer in order to guarantee continued protection
- Surfaces coming into contact with O-rings must not be used for work and only washers supplied by the manufacturer must be used. These surfaces must be kept clean at all times

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## GTE 系列

### 气动齿轮齿条执行器

安装操作和维护手册

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#### 1. 简介

GTE气动齿轮齿条执行器, 由压缩空气驱动, 可应用于各种流体控制阀门, 如球阀, 蝶阀等。执行器最高使用压力为8巴, 并依据EN15714规范进行了使用寿命测试。全系列执行器提供双限位调节功能, 即开位置及关闭位置皆可调节。

执行器出厂时已充分润滑以保证最少可以完成EN15714-3中要求的操作循环次数。

执行器设计工作压力范围为2.5至8巴 (36至116磅/平方英尺), 有两种作用形式, 分别为:

- 双重作用: 可旋转90°。
- 弹簧复位: 可旋转90°。

双重作用和弹簧复位执行器可以通过插入或移除弹簧复位弹簧轻松互相切换。

#### 2. 存储

所有执行器出厂时已充分润滑, 为防止液体或其他异物在运输过程中进入执行器, 执行器气孔在出厂时由保护套封堵。如果执行器需要在长期使用前存放, 需定期动作行程以防止密封件损坏。**(注意: 执行器动作前, 必须移除保护套)。室内存储, 并确保保护装置免受潮湿和其他有害元素的影响。**

#### 3. 操作特性

执行器具有简单的操作特性: (见图**1A-1B-1C-1D**和**1E-1F-1G-1H**)

- 端口A (2) 连接到活塞之间的内腔
- 端口B (4) 连接到端盖空腔, 引导气流进入端盖区域。

执行器的齿轮轴标配双方头驱动件, 可以在阀杆或联轴器上组装, 方形键处于45°或90°, 无差异。

标准Namur气源端口, 电磁阀可直接安装于执行器缸体上。

##### 双作用执行器

向端口B通入压缩空气, 并让空气从端口A排出, 执行器运动到关闭位置如图1.A和1.C所示。

反之, 若向端口A通入压缩空气, 从端口B排气, 齿轮轴将沿顺时针或逆时针旋转, 并打开执行器, 如图1.B和1.D所示。

##### 弹簧复位执行器

向端口A通入压缩空气, 从端口B排气, 执行器位于打开位置。一旦端口A气源切断, 执行器将在弹簧力的作用下动作至关闭位置, 如图1.E和1.G所示。

通常, 执行器操作方式设定为逆时针方向打开, 顺时针方向关闭, 但也可以反向设置动作模式。

图1.F和1.H显示了相同的弹簧复位执行器, 活塞方向发生了变化, 将执行器从顺时针复位替换为逆时针复位。(如第8.0节: FCCW到FCW的转换所述)。

#### 4. 执行器安装

执行器的设计易于安装。执行器配有一组或两组ISO 5211 (DIN 3337) 标准底部安装法兰孔, 根据产品类型及输出扭矩选择, 以便直接组装到要驱动的阀门或联轴器上。


在执行器的顶部上有一组标准Namur安装孔, 便于安装位置测量和/或控制设备的附件 (微动开关盒、定位器等, 见图3)。

**对于执行器的安装, 请遵循以下步骤:**

- 将阀杆直接插入执行器齿轮轴, 或在必要时通过联轴器插入, 以检查是否正确安装。

**注意: 如果执行器是双作用气动型, 检查齿轮轴是否处于正常位置, 或者更确切地说, 是否处于关闭阀门所需的位置。**

- 继续操作前, 确保阀门处于正常位置。图3描述了所有执行器的正常位置 (包括带FCW的弹簧复位类型装配方式 A 和 FCCW 装配方式C)。
- 将安装支架安装到阀门上, 并用手拧紧所有紧固件。确保在整个组件正确对齐和安装之前, 不完全拧紧螺栓。
- 如有必要, 将联轴器放置在阀杆上, 并将执行器放置在安装支架上。对齐阀门和执行器组件, 以消除系统上的剪切力。确保消除关闭方向上的所有扭转间隙, 以确认执行器位于正确的关闭阀位置 (活塞靠近活塞, 见图1A和1C), 然后按照表3中的扭矩完全拧紧螺栓。
- 执行器通气, 并开关数次, 已确定活塞无卡滞。如果执行器不能正常工作, 则拆卸工具和执行器联轴器, 并重复4.1至4.5的步骤。如果问题仍然存在, 请联系您当地的Rotork代表。
- 完成所有安装程序后, 必须设置限位螺钉, 以确保执行器开完位置符合现场需求。


<b> 注意: 切勿调整行程限位螺钉</b>
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- 与打开和关闭位置相比, 位于执行器主体的限位调节范围约为-5°至+5°。如果需要更大的调节范围, 请直接咨询Rotork人员以获取信息。


松开两个锁紧螺母, 扭限位螺钉, 直到它们接触到挡块。调节限位螺钉时, 确保不要改变阀门和执行器的位置。拧紧锁紧螺母。重新测试执行器, 以确保没有泄漏。

#### 5. 拆卸程序

- 有关组件详细信息和推荐的备件, 请参见图 10。
- 断开执行器的所有电气和空气供应。

<b> 注意: 切勿拆卸带有气压的执行器</b>
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- 从安装支架和联轴器上拆下执行器 (如有)。拆卸附件, 如: 限位开关、微动开关盒和定位器 (如有), 并将其放在干净的环境。
- 松开限位螺钉上的两个锁紧螺母, 然后松开限位螺钉。拆下固定端盖的/八个螺钉, 然后拆下端盖。
- 从端盖上拆下O型圈。注: 除非执行器尚未投入使用, 否则最好更换O型圈组件。(见表2A)
- 逆时针方向旋转齿轮轴 (注意: 如果装置是FCCW, 组装C, 则旋转方向相反), 直到活塞离气缸足够远, 可以手动移除。如果活塞难以用手拆卸, 可以使用一把钳子来帮助拆卸。**(注意: 一定不要在活塞表面留下疤痕)**。拆下两个活塞, 注意它们的方向, 以便在重新组装过程中以相同的方向安装活塞。

<b> 注意: 切勿使用压缩空气将活塞从执行器主体中拔出</b>
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- 从齿轮轴顶部拆下卡环和垫圈。将执行器放置在两块木板之间, 以便齿轮轴可以通过执行器主体的底部自由拆卸。用橡胶锤轻轻敲击齿轮轴的顶部。当齿轮轴从主体上松动时, 从底部拆下齿轮轴 (见图5)。表2A和2B中列出了O型环和导向套件。



## 6. 装配程序

- 检查所有磨损表面是否过度磨损或损坏
- 确保所有金属零件清洁,无任何划痕或毛刺。
- 用Shell Gadus S5 V25Q 2.5润滑油润滑缸体内孔、O型圈阀座、活塞和齿轮轮的接触表面,润滑油适用温度范围为-50°C至+130°C。

**注意: 在检查前确保所有零件仍在工厂设定的公差范围内**

**注意: 如果执行器已投入使用,则应根据服务政策更换所有O型圈。**

- 在活塞和齿轮轴上安装活塞盖板和支撑环,并在活塞、齿轮轴和端盖上安装O型圈。
- 将挡块插入执行器主体。通过挡块将齿轮轴插入缸体。安装齿轮轴垫片和卡环。
- 将活塞插入气缸体,直到活塞开始与齿轮轴啮合。确保活塞对称放置在缸体内部。在图4中,我们可以看到活塞处于配合位置,并且是对称的,这一点非常重要。事实上,如果活塞没有放置正确位置,请将其拆下并重新插入。**注意: 确保两个活塞上的齿啮合均匀。**
- 对每个活塞施加相等的压力,直到它们与齿轮轴完全啮合。旋转齿轮轴,直到执行器完全关闭。
- 检查齿轮轴顶部的方向是否正确。如果指示器垂直于缸体,则继续进行下一部分6.9。如果齿轮轴的位置不正确,则继续执行第 6.8b 部分。
- 将执行器侧翻。逆时针旋转齿轮轴,直到两个活塞都与齿轮轴替换为齿轮轴分离。用扳手将齿轮轴旋转到正确的位置。对活塞施加轻微压力,直到齿轮轴和活塞啮合。关闭执行器并检查齿轮轴方向是否正确,如第6节所述。(根据需要进行多次重复此步骤,以获得正确的方向)。
- 如果是弹簧复位执行器,插入弹簧组件。(有关弹簧负载的信息,请参阅第7.0节)。
- 将限位螺钉拧到阀体内,确保将其放置在正确的位置。拧紧螺母。**注意: 交替扭紧螺钉,以确保O型圈正确就位。**
- 端盖螺钉应按照工厂标准交替锁紧。有关正确的螺栓扭矩规格,请参阅下表。

**注意: 在检查并确认小齿轮替换为齿轮轴已用卡环 (SEGER) 固定以及端盖螺钉完全关闭之前,切勿向执行器提供压缩空气**

- 对执行器主体上的右气口加压,以测试空气泄漏,齿轮轴周围以及端盖和阀体配合面之间可能发生泄漏。如果在端盖附近发现空气泄漏,拆下端盖并检查O型圈是否正确就位。如果O型圈状况良好,则重复步骤6.11。对执行器的左侧气口加压,以测试齿轮轴是否漏气。如果齿轮轴和阀体配合区域附近发生泄漏,则将齿轮轴从阀体内拆下,如第5.6点所示。在此操作期间,注意活塞不要在执行器阀体内改变位置。检查发现泄漏的上部和/或下部齿轮轴O型圈。如果O型圈状况良好,检查O型圈槽中是否有毛刺。清洁到位,然后将O型圈重新装入安装槽中,将齿轮轴按与之前相同的方向插入执行器本体,注意不要移动活塞。如果移动活塞,则重复第 6.5 点中的步骤,安装齿轮轴垫片和卡环。按照本节所述重新进行测试。如果问题仍然存在,请联系当地的Rotork代表。

## 7. 筒装弹簧安装

可以通过轻易改变端盖内的弹簧配置,将双作用执行器现场转换为弹簧复位执行器类型,反之亦然。执行器的每个端盖可容纳 2 至 6 个弹簧。放入执行器中的弹簧的数量会影响执行器在关闭和打开的输出扭矩。查看关于执行器选型的第11、12和13节,了解选择弹簧组件的正确安装程序。

- 在关闭位置驱动执行器 (见图1.E和1.G)。
- 拆除固定端盖的八个螺钉,然后拆除端盖。
- 根据表4和图7,依据弹簧的数量,将弹簧放入活塞的对应位置。
- 重新组装端盖时,注意不要将其翻转。观察O型圈,确保将端盖放置在顶部, A位于顶部, B位于底部 (见图6和图8)。

## 8. FCW到FCW的转换

执行器通常以失效顺时针复位 (FCW) 装置的形式出厂,装配方式A,允许实际FCW操作。如果执行器的需求从FCW变为失效逆时针复位 (FCCW) 执行器,装配方式C,则执行器可以很容易地现场转换为图9中的这种配置。

- 按照拆解程序中的说明拆下端盖、活塞和齿轮轴。(见第5.0节)。在重新组装之前,将两个活塞沿活塞长轴旋转180°。(见图9)。活塞旋转后,可按照手册第6.0节第6.1至6.12部分中的重新组装说明进行重新组装。

**注意: 如果是弹簧复位型,则需要在端盖组装前按照表4装入弹簧.如果有必要,更换弹簧。**

- 完成此程序后,将执行器应已转换为失效逆时针复位 (FCCW) 模式,并在通气后移动到正常位置。(如果执行器尚未处于正常位置) 当压缩空气进入左端气口时,执行器沿顺时针方向旋转,返回到其正常位置时沿逆时针方向旋转。从逻辑上讲,在弹簧复位类型的情况下,当空气从左侧进气口排出时,将通过逆时针旋转返回正常位置。

## 9. 执行器选型

在进行尺寸选型之前,获取某些信息非常重要。要获取的关键数字如下:

- 打开阀门所需的扭矩
- 关闭阀门所需的扭矩
- 执行器气压
- 阀门/阻尼器的压差

获得上述信息可以使您正确有效地确定弹簧复位执行器的尺寸。(注意: 双作用执行器在其整个行程中具有恒定的扭矩)。在确定供气压力时,重要的是使用执行器的最小气压,而不是平均供气压力。如果执行器气压低于额定压力,则可能发生故障或性能不当。

## 10. 双作用气动执行器

- 选择最大扭矩 (打开或关闭扭矩),然后将该数字增加10%。(注意: 添加10%是为了确保可接受的安全系数)。尺寸表中公布的数据表明了给定压力的平均扭矩(联系Rotork获得帮助),选择正确的执行器尺寸的依据。

## 11. 弹簧复位执行器

- 将阀门关闭扭矩和阀门打开扭矩增加20%。(同样,这将提供一个可接受的安全系数)。
- 使用弹簧复位执行器尺寸表,查看与您选择的供应压力相对应的列(联系Rotork获得帮助)。向下移动图表找到扭矩,直到其大于您需要的扭矩。找到正确的值后,水平移动表格以确定正确的执行器。(见示例表5)

**注意: 阀门关闭扭矩对应于弹簧O'列, 阀门打开扭矩对应于执行器气压列(联系Rotork获得帮助)**

## 12. 执行器循环时间

- 在表6中指出了GTE系列双作用执行器,在进口压力为5.5 Bar (80 psig) 时,无负载状态下,完成一整个开-关-循环行程所需的时间。

## 13. 危险区域 (见表7)

**警告: 当执行器应用于爆炸性环境时,请遵循相应的法律法规。**

连接

执行器通过符合ISO 228 (G) 的螺纹连接进行安装,通过气体连接下方的冲压数字2 (对于打开位置) 和气体连接上方的冲压数字4 (对于关闭位置)。

O型密封圈的气体泄漏

工厂必须使用球阀以在紧急情况下切断气源。大约500000次操作后,检查O型圈环的状态。在高风险地区,每年检查一次。在使用除压缩空气,氮气以外的其他非中性气体作为压力源时,请咨询Rotork气源的适用性。

接地 (静电引起的点火)

执行器阀门必须用固定螺钉加固,以保证设备金属部件必须接地。

执行器的检查和维护

双作用式执行器:

该执行器不需要特别维护,但如果需要打开以更换O型圈,请仔细阅读说明书。

单作用式执行器:

弹簧: 复位弹簧由钢制成,随后用聚酯防尘漆进行防锈处理,但这种清漆可能会被破坏,弹簧可能会生锈和断裂。在大约500000次操作后检查弹簧的状态,在高风险地区,每年检查一次,如果生锈则更换。

执行器内部的灰尘: 执行器内部的清洁频率取决于大气中的灰尘含量。执行器在关闭时吸入外部空气,在打开时排出空气,因此会排出部分灰尘,但每年检查一次垫圈和润滑油的状态,必要时进行更换。欲了解更多信息或订购备件,请联系离您最近的Rotork代理商或工厂。(注意: 订购时,务必指定标签上指示的温度范围,以便收到正确的更换零件)。在充满灰尘的环境中,可在气孔4外接气管,用以将干净的气源引入执行器。

**切勿在执行器仍处于加压状态时拆卸**

- 端盖必须用专用螺钉拧紧 (参见表3手册中的两个拧紧螺钉)
- 必须使用与制造商提供的部件相同的部件更换垫圈和连接件,以保证持续保护。
- 与O型圈接触的表面不得划伤,只能使用制造商提供的垫圈。这些表面必须始终保持清洁。

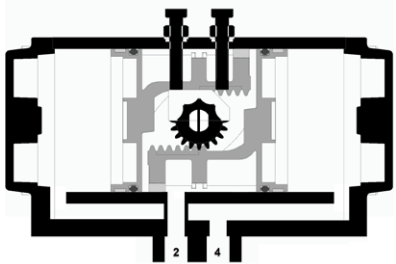
## Double-acting Actuators / 双作用式执行器

Fig. / 图 1A - 1B - 1C - 1D

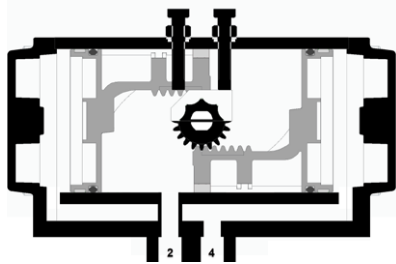
Sectioned top view of the double-acting GTE actuators, closing clockwise, **assembly A** (Fig. 1A) and closing anti-clockwise **assembly C** (Fig. 1C)

双作用式执行器的工作示意图。顺时针关闭,装配方式A (图1A) 和逆时针关闭,装配方式C (图1C)

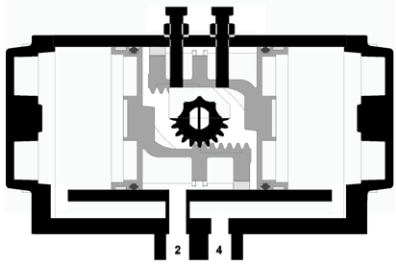
**Assembly A = closing clockwise / 装配方式 A=顺时针关闭**



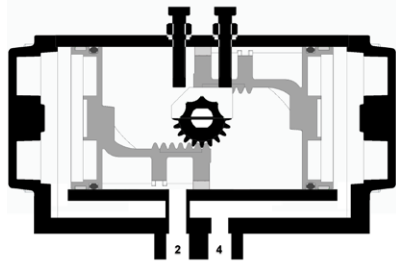
1A Closed / 关闭



1B Open / 打开



1C Closed / 关闭



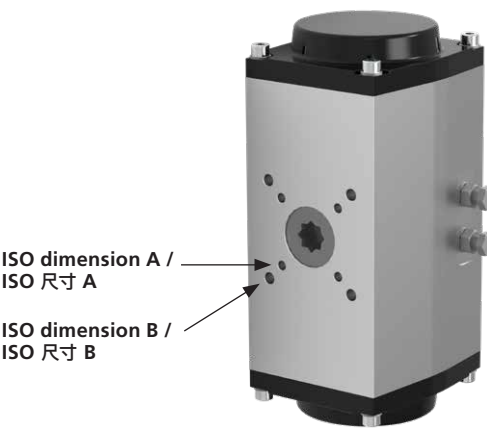
1D Open / 打开

**Assembly C = closing anti-clockwise / 装配方式 C=逆时针关闭**

Fig. / 图 2

Lower view of the GTE actuator with assembly holes complying with ISO standard.

GTE执行器与阀门相连接的标准ISO法兰孔示意图。



ISO dimension A / ISO 尺寸 A

ISO dimension B / ISO 尺寸 B

Fig. / 图 3

Upper view of the GTE actuator with assembly holes complying with ISO standard.

GTE执行器标准ISO附件联接孔示意图。



(VDI VDE 3845) 终端运行套件、开关盒和定位器的装配区

Fig. / 图 4

The figure shows an actuator with pinion rotated until the pistons are disengaged from the toothing of the pinion.

图中所示为执行器,齿轮轴旋转至与活塞齿条分离位置的示意图。

Fig. / 图 5

The figure shows how to remove the pinion from the lower part of the actuator.

该图显示了如何将齿轮轴从执行器的下部拆下。

Fig. / 图 6, 8

The figure shows the interior of the end cap and how to assemble it on the body of the Actuator, with part A facing upwards and part B facing downwards. **Warning: the Actuator will not work if end caps are fitted upside-down.**

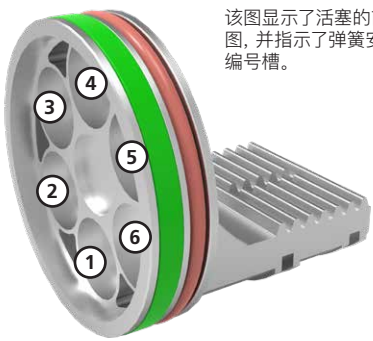
该图显示了端盖的内部以及如何将其组装到执行器的主体上,方向A朝上,方向B朝下。**警告: 如果端盖倒置安装,执行器将无法工作。**



Fig. / 图 7

The figure shows the front view of the piston and indicates the numbered slots for the spring cartridges.

该图显示了活塞的前视图,并指示了弹簧安装的编号槽。



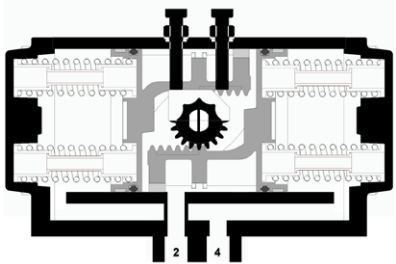
## Spring-return Actuators / 单作用式执行器

Fig. / 图 1E - 1F - 1G - 1H

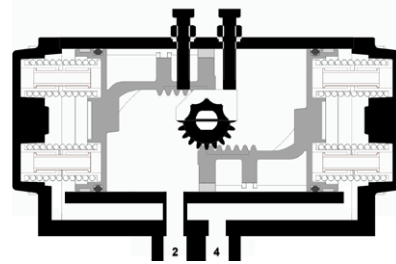
Sectioned top view of the spring-return actuators, closing clockwise, **assembly A** (Fig. 1E) and closing anti-clockwise **assembly C** (Fig. 1G)

单作用式执行器的工作示意图。顺时针关闭,装配方式A (图1E) 和逆时针关闭,装配方式C (图1G)

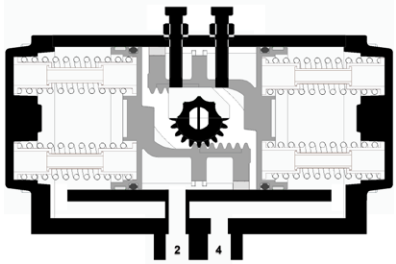
**Assembly A = closing clockwise / 装配方式 A=顺时针关闭**



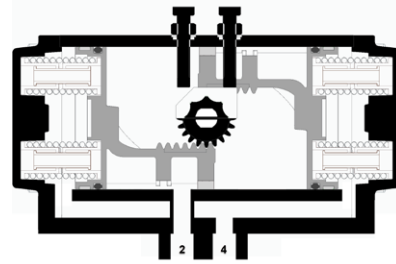
1E Closed / 关闭



1F Open / 打开



1G Closed / 关闭



1H Open / 打开

**Assembly C = closing anti-clockwise / 装配方式 C=逆时针关闭**

Fig. / 图 9

Rotate the piston in **Fig. 9a** closing clockwise to the position indicated in **Fig. 9b** to obtain anticlockwise closure (**Assembly C**)

将图9a中的活塞顺时针旋转至图9b所示的位置,以实现逆时针关闭 (**装配方式C**)

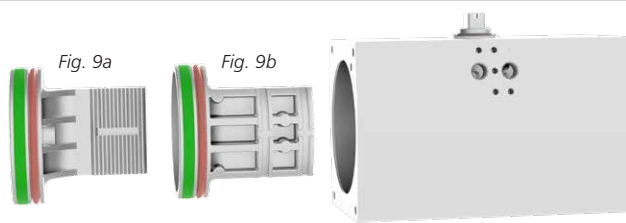
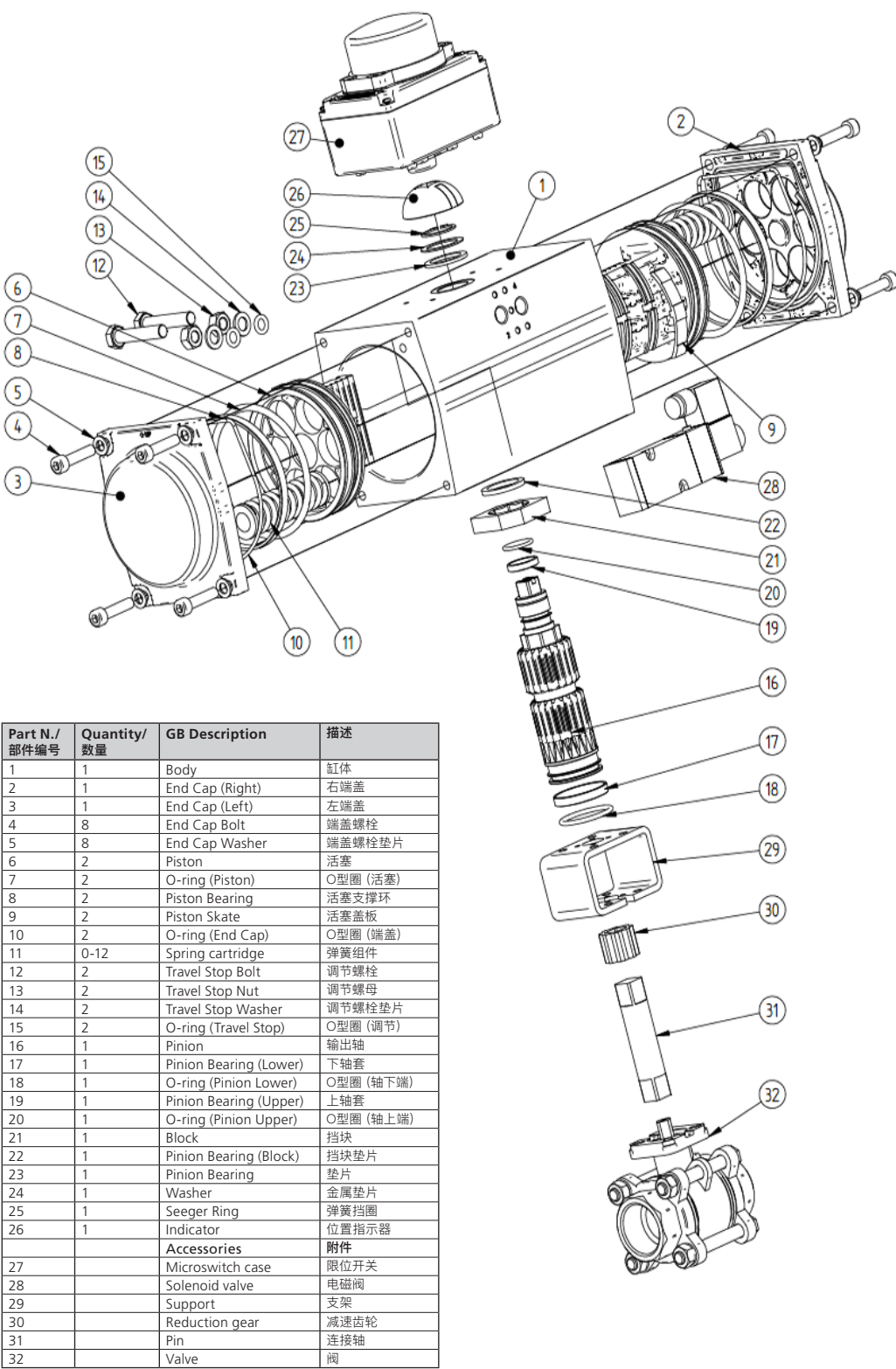


Fig. / 图 10



Part N./ 部件编号	Quantity/ 数量	GB Description	描述
1	1	Body	缸体
2	1	End Cap (Right)	右端盖
3	1	End Cap (Left)	左端盖
4	8	End Cap Bolt	端盖螺栓
5	8	End Cap Washer	端盖螺栓垫片
6	2	Piston	活塞
7	2	O-ring (Piston)	O型圈 (活塞)
8	2	Piston Bearing	活塞支撑环
9	2	Piston Skate	活塞盖板
10	2	O-ring (End Cap)	O型圈 (端盖)
11	0-12	Spring cartridge	弹簧组件
12	2	Travel Stop Bolt	调节螺栓
13	2	Travel Stop Nut	调节螺母
14	2	Travel Stop Washer	调节螺栓垫片
15	2	O-ring (Travel Stop)	O型圈 (调节)
16	1	Pinion	输出轴
17	1	Pinion Bearing (Lower)	下轴套
18	1	O-ring (Pinion Lower)	O型圈 (轴下端)
19	1	Pinion Bearing (Upper)	上轴套
20	1	O-ring (Pinion Upper)	O型圈 (轴上端)
21	1	Block	挡块
22	1	Pinion Bearing (Block)	挡块垫片
23	1	Pinion Bearing	轴衬片
24	1	Washer	金属垫片
25	1	Seeger Ring	弹簧挡圈
26	1	Indicator	位置指示器
Accessories 附件			
27		Microswitch case	限位开关
28		Solenoid valve	电磁阀
29		Support	支架
30		Reduction gear	减速齿轮
31		Pin	连接销
32		Valve	阀