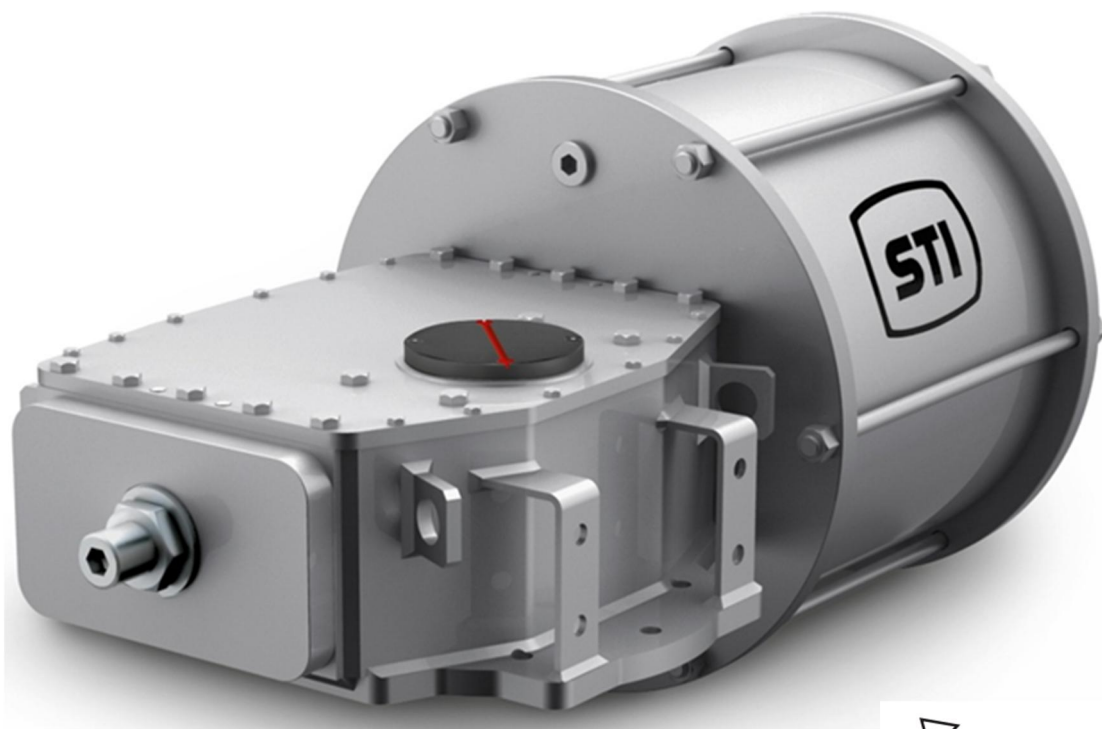



# Quarter turn pneumatic actuator RTQ Series Double acting version type RTQ

INSTRUCTION MANUAL 5200



  
*Engineering  
GREAT Solutions*

<b>Date</b>	<b>Revision</b>	<b>Description</b>	<b>Author</b>	<b>Approved</b>
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*STI S.r.l has taken every care in collecting and verifying the documentation contained in this Instruction Manual. The information herein contained are reserved property of STI S.r.l.*


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# 1 GENERAL INFORMATION

## 1.1 General Warnings

	<p><b>Important</b></p> <p><b>This Instruction Manual is an integral part of the machine, it should be carefully read before carrying out any operation and it should be kept for future references. This Instruction Manual covers the RTQ actuators in the base version without any accessories and/or control panel.</b></p> <p><b>In case accessories and/or control panel are foreseen mounted on the actuator an additional Section to this Instruction Manual will be attached to the specific actuator.</b></p> <p><b>This Instruction Manual is realized in accordance with the Directive 2006/42/CE. When the actuators are used for safety application with required SIL level (IEC 61508) please refer also to the specific safety manual.</b></p>
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## 1.2 Generalities

**STI S.r.l.** actuators are conceived, manufactured and controlled according to the Quality Control System in compliance with EN ISO 9001 International Standard.

## 1.3 Manufacturer

With respect to Machinery Directive 2006/42/EC the Manufacturer of the described RTQ actuator series, is **STI S.r.l.** as specified on the machinery label.

STI S.r.l. Via Dei Caravaggi 15  
 24040 Levate (BG) Italy  
 Tel. +39 035 2928.2  
 Fax +39 035 2928.247  
[imisti.sales@imi-critical.com](mailto:imisti.sales@imi-critical.com)

## 1.4 Terms and conditions

**STI S.r.l.** guarantees each single product to be free from defects and to conform to current goods specifications. The warranty period is one year from the date of installation by the first user, or eighteen months from the date of shipment to the first user, whichever occurs first.

The warranty does not cover special products or components not covered by warranty in their turn by subcontractors. No warranty is given for products which have been subject to improper storage, improper installation, misuse, or corrosion, or which have been modified or repaired by unauthorised personnel. Repair work due to improper use will be charged at standard rates.

## 1.5 Manufacturer's Liability

**STI S.r.l.** declines all liability in the event of:

- use of the actuator in contravention of local safety at work legislation
- incorrect installation, disregard or incorrect application of the instructions provided on the actuator nameplate and in this manual
- modifications without STI's authorisation
- work done on the unit by unqualified or unsuitable persons.

## 1.6 Applicable Standards and Directives

### 1.6.1 General Standards

- EN ISO 12100:2010: Safety of machinery - General principles for design.  
Risk assessment and risk reduction.
- IEC 61508-1/7 (Ed. 2010)
- IEC 61511-1 (Ed. 2016)

### 1.6.2 European Directives (mandatory only for installations in EU Countries)

- 2006/42/EC Machinery Directive.
- 2014/68/EU Pressure Equipments Directive (PED)
- 2014/35/EU Directive for Low Voltage Equipment (LV)\*\*
- 2014/30/EU Directive relating to the Electromagnetic Compatibility (EMC)\*\*
- 2014/34/EU Directive concerning equipment for use in potentially explosive atmospheres (ATEX)

\*\* Applicable only when electrical control panel is supplied integrate with the actuator

## 1.7 Symbology Used (EN ISO 7010)

### 1.7.1 Signs of warning

Be careful where these symbols are shown.



GENERAL DANGER



DANGER POWER SUPPLY



CRUSHING HAZARD

They indicate a potentially hazardous situation and they warn that a lack of strict observance **MAY RESULT CAUSE** of serious injury, death or long-term risks for the health of exposed persons.

### 1.7.2 Signs of obligation



General obligation (with the possible supplementary signboard)



Must wear protective clothing.



Obligation to wear protective footwear.



Is required to wear a helmet.



Is required to protect the eyes.



Obligation to protect your hearing.

## 2 DEVICE DESCRIPTION

### 2.1 General Description

RTQ double acting pneumatic low-pressure actuators, are suitable for the operation of quarter turn valves (ball valves, butterfly valves, plug valves) for ON-OFF and modulating heavy-duty service

The actuator is made up of a weatherproof scotch yoke mechanism transforming the linear movement of the pneumatic cylinder (on closing or opening) into the rotary movement, which is necessary for valve operation. The travel stroke of the yoke is adjustable between -4 deg / +4 deg at both ends by means of the external mechanical stops arranged into the side-wall of the mechanism body and into the end flange of the pneumatic cylinder.

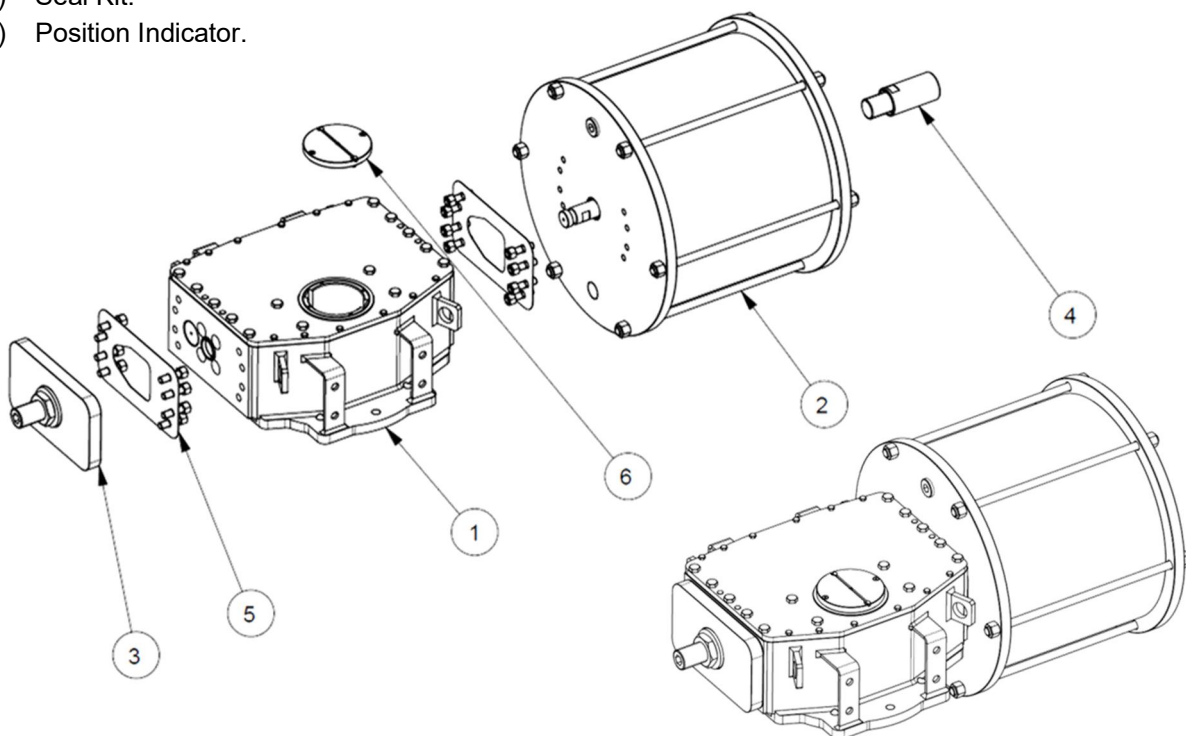
Scotch yoke mechanism centerbody cover is machined to provide the assembly pattern for any required accessories (i.e. positioner, signaling limit switches, position transducer, etc.) by means of proper matching units. The above mentioned accessories are operated by the actuator drive sleeve.

Actuator centerbody bottom wall is machined with threaded holes to allow actuator mounting on top of valve top-work either directly or, when required, with the interposition of an adaptor flange or a mounting bracket.

### 2.2 Identification of the Main Parts

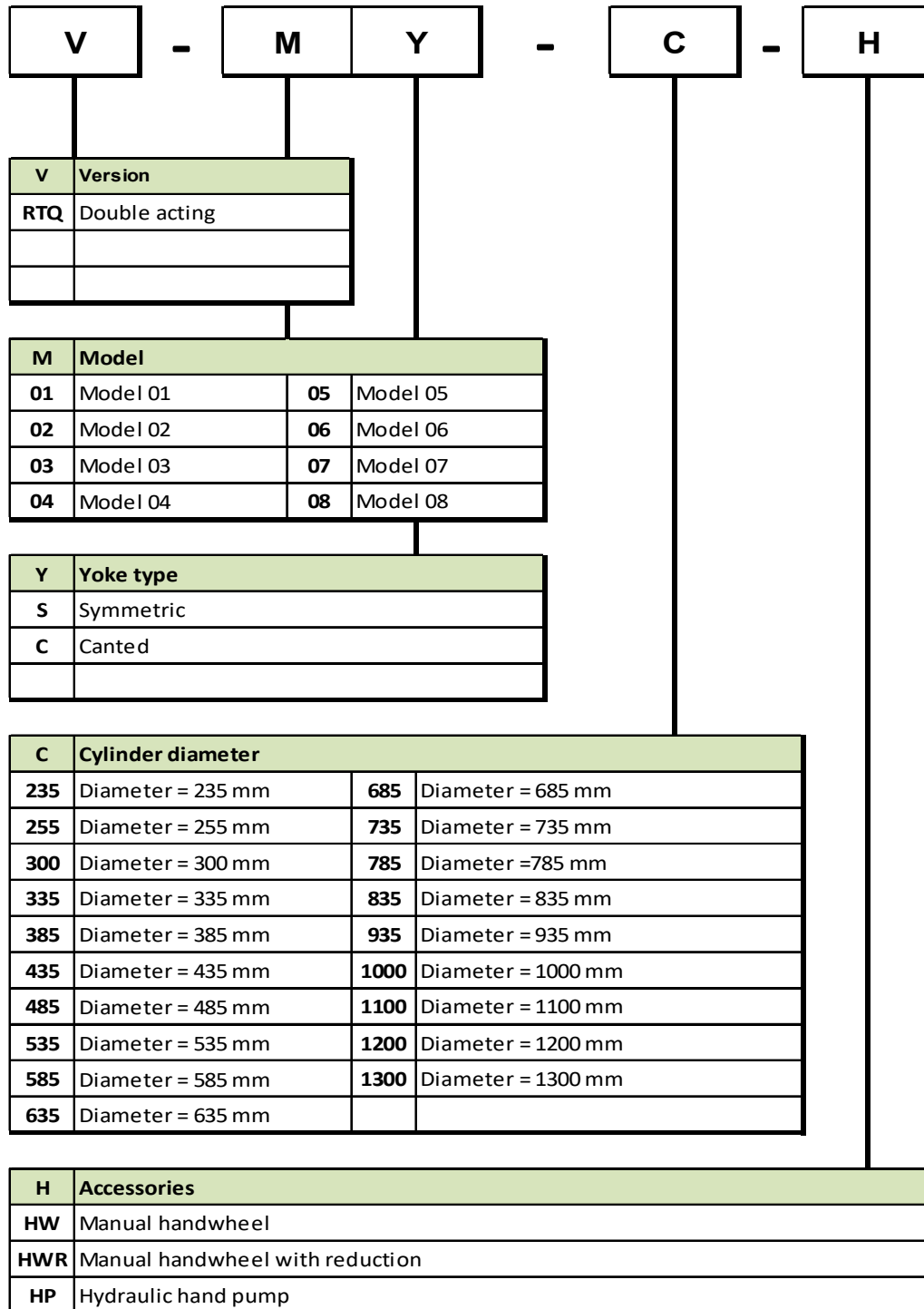
The RTQ actuator is composed by the following main parts:

- 1) Scotch yoke mechanism.
- 2) Pneumatic cylinder.
- 3) Stop settings screw kit.
- 4) Stopper screw assembly.
- 5) Seal Kit.
- 6) Position Indicator.



*Fig. 1: Main parts for RTQ actuator series*

## 2.3 Actuator coding description








### 3 TECHNICAL DATA


DATA	
Supply medium <sup>(1)</sup>	Air, Nitrogen or Sweet Gas
Operating temperature ranges	General applications (outside EU Countries): Standard: -30°C +100°C Optional: -60°C +100°C (*)  PED applications (within EU Countries): Standard: -20°C +100°C Optional: -50°C +100°C (*) (* for SIL applications T° amb. min ≥ -40°C
Cylinder design pressure	12 bar
Operating pressure range	Data are available on actuator nameplate (depending on customer requirements and specifications.)
Max operating torque (MOT)	RTQ 01 Series up to 12.000 Nm RTQ 02 Series up to 22.000 Nm RTQ 03 Series up to 40.000 Nm RTQ 04 Series up to 70.000 Nm RTQ 05 Series up to 125.000 Nm RTQ 06 Series up to 220.000 Nm RTQ 07 Series up to 400.000 Nm RTQ 08 Series up to 600.000 Nm
Applications	On-Off Modulating service (on request)

- (1) Recommended quality of air at the inlet port of pneumatic cylinder according to ISO 8573-1 (Ed. 2010):
- Solid particle Class 7 (particle size ≤ 40 µm, concentration ≤ 10 mg/m<sup>3</sup>)
  - Humidity Class 3 (pressure dew point ≤ -20°C)
  - Oil Class 4 (concentration total oil ≤ 5 mg/m<sup>3</sup>)
- Contractor shall specify the quality of the supply medium considering the above recommendation.


### 4 NAMEPLATE

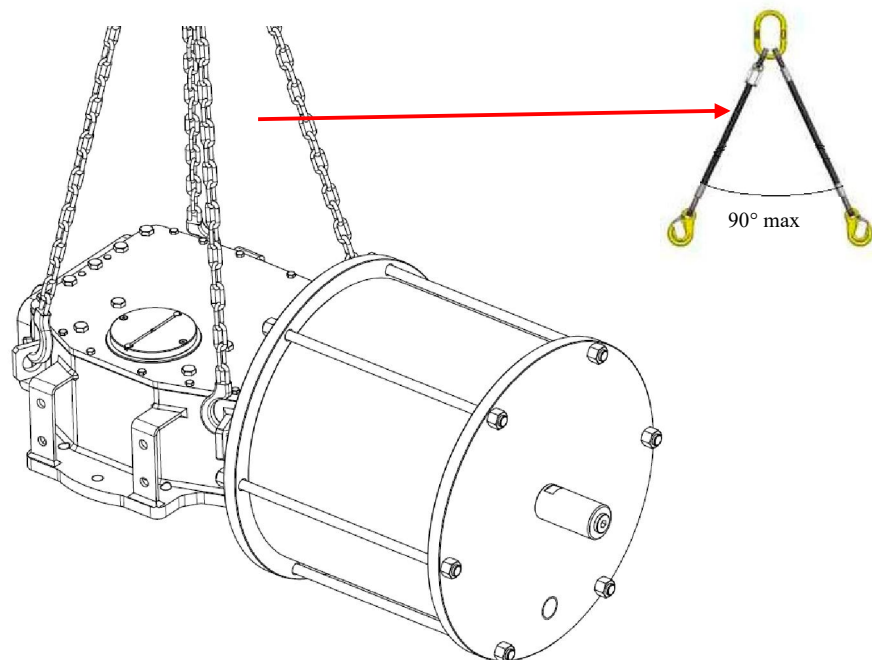
 STI s.r.l. Via Dei Caravaggi 15 - 24040 LEVATE (BG)-ITALY www.imi-critical.com - FAX +39 035 2928247			
 II 2 GD		Ref. INERIS <input type="text"/>	
Ex h II <input type="checkbox"/> T4 Gb / Ex h III C T135°C Db		Certificate IECEx INE 19.0024	
Order	<input type="text"/>	Serial N°	<input type="text"/>
Model	<input type="text"/>	Year	<input type="text"/>
Rated Torque	<input type="text"/> Nm	Max. allowable Pressure	<input type="text"/> bar
Pressure Range	min <input type="text"/> / max <input type="text"/> bar	Fluid	<input type="text"/>
Temp. Range	min <input type="text"/> / max <input type="text"/> °C	Valve TAG	<input type="text"/>
Degree of Protection IP66/67H according to IEC/EN 60529			

## 5 RECEPTION

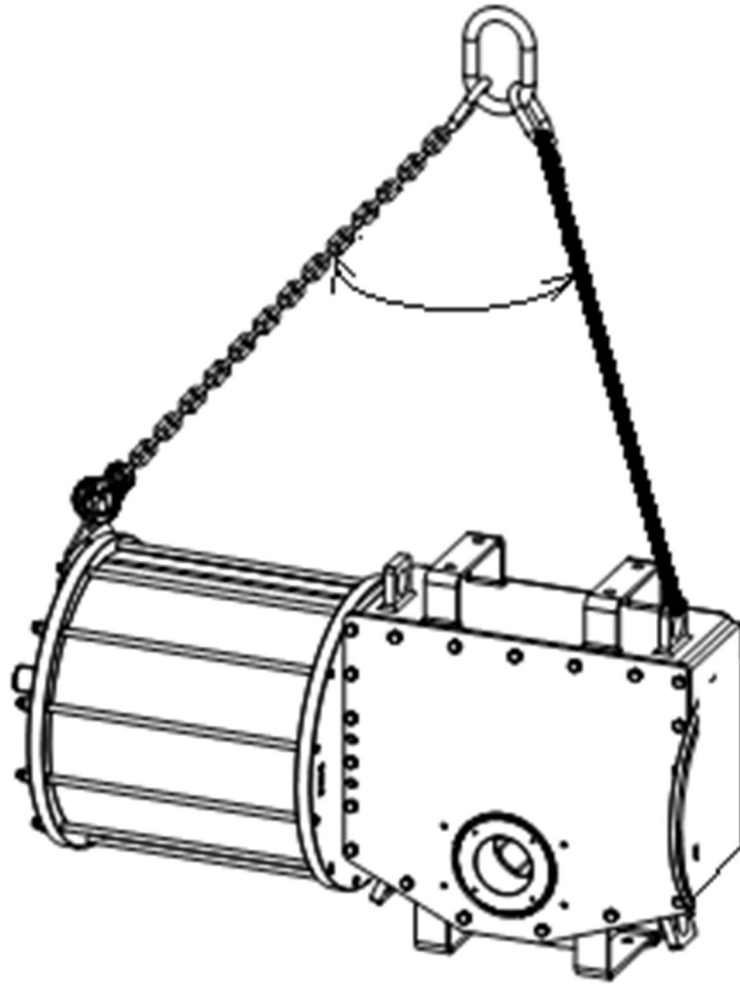
<b>Important</b> 	<p><b>Not performing the following procedures will invalidate the product guarantee.</b></p>
---	--

### 5.1 Lifting and Handling

<b>Warning</b> 	<p>The lifting and handling must be made by qualified staff and in compliance with the laws and provisions in force.</p> <p>Depending on the installation position, lift the actuator as shown in Figure 2a or 2b, taking care that the maximum opening angle between the chains remains below 90°.</p> <p><b>The lifting points are appropriate for the lifting of the actuator alone and not for the valve + actuator assembly.</b></p> <p>Avoid that during the handling, the actuator passes above the staff.</p> <p>The actuator should be handled with appropriate lifting means considering the mass of actuator.</p> <p>The mass is reported on the delivery bill and on the overall-dimensions drawings furnished with the documents accompanying the actuator.</p> <p>In case the information regarding the mass is missing consult <a href="http://www.imi-critical.com">www.imi-critical.com</a> for base actuators or ask this information at <a href="mailto:imisti.sales@imi-critical.com">imisti.sales@imi-critical.com</a>.</p>
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*Fig. 2a – Lifting points for RTQ actuator series for lifting with vertical stem condition*



*Fig. 2b – Lifting points for RTQ actuator series for lifting with horizontal stem condition*

## 5.2 Check at the reception

- Check that the model, the serial number of the actuator and the technical data reported on the identification nameplate correspond with those of order confirmation (Sect. 4).
- Check that the actuator is equipped with the fittings as provided for by order confirmation.
- Check that the actuator was not damaged during transportation: if necessary, renovate the painting according to the specification reported on the order confirmation.
- If the actuator is received already assembled with the valve, its settings have already been made at the factory.
- If the actuator is delivered separately from the valve, it is necessary to perform the setting after the assembling on the valve according to the next paragraph 7.2.

### 5.3 Storage

All the actuators RTQ leave the factory in perfect condition. Performances of each unit are guaranteed by individual test and data reported on a specific test certificate issued for each unit.

In order to maintain these characteristics until the RTQ actuator is installed on site, proper attention must be observed for preservation during the storage period.

If the actuator needs storage, before installation follow these steps:


- Place it on a wood surface pallet or on metallic support, so that they are not in direct contact with the ground, in order not to deteriorate the area of valve coupling, later it must be packed with appropriate covering.
- Make sure that plastic plugs are present on the pneumatic and electrical connections (if present).
- Check that the limit switch box (if any) is properly closed.

If the storage is long-term or outdoor:

- Keep the actuator protected from direct weather or ambient conditions using suitable means.
- If the entries should remain exposed to the ambient, replace plastic plugs of pneumatic and electrical connections (if any) with metal plugs that guarantee perfect tightness.

### 5.4 Requirements of Stability


- Conditions in which the machinery meets the requirement of stability during use, transportation, assembly, dismantling when out of service, testing or foreseeable breakdowns, are shown in Figures.2a and 2b.
- The actuator must be put, with extreme caution, in a right position on a plane surface and with adapted capacity to the load to support.


<p><b>Warning</b></p> 	<p><b>Do not use the eye bolts of the actuator for lifting the valve-actuator package.</b></p>
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### 5.5 Interface document and dimensional drawing

Pneumatic diagrams, wiring diagrams, dimensional drawing, instruction manual and safety manual (when request) are furnished with document accompanying the actuator.

## 6 INSTALLATION

<p><b>Warning</b></p> 	<p>It is assumed that the installation, setting, commissioning, are carried out by qualified personnel and checked by responsible Specialists.</p> <p>Same instructions apply both for installation of the actuator on the valve in the workshop and in the field.</p>
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<p><b>Warning</b></p> 	<p>Before proceeding with installation, the following instructions must be respected:</p> <ul style="list-style-type: none"> <li>- use always wear protective gloves, footwears, clothing, high visibility jacket, eyewear and any other protective device prescribed by the Local Rules depending on the working conditions;</li> <li>- use the lifting point foreseen on the actuator to move the actuator: if different instructions are not well specified the lifting points foreseen on the actuator must be used only to move the actuator;</li> <li>- check with your supervisor or Plant Safety Responsible for any additional measures that must be taken to protect against process media.</li> </ul>
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### 6.1 Checks to be performed before installation

If the RTQ actuator is purchased separately, proceed as follows before assembling it onto the valve:

- Check that the coupling dimensions of the actuator/coupling block flange and stem meet the specified coupling dimensions.
- Prepare the necessary tools for the assembly and setting of the unit.
- Check that the outer surface of the actuator is free from dust and dirt.
- Clean the actuator flange and remove anything that might prevent a perfect adherence to the actuator/coupling block flange and joint especially all traces of grease.

### 6.2 Assembling of the actuator on the valve

The actuator can be assembled on top of the valve flange either by using the actuator-housing flange with threaded holes, or by the interposition of a proper mounting hardware.

The actuator drive sleeve is generally connected to the valve stem by an insert bush or a stem extension.

The assembly position of the actuator, with reference to the valve, must comply with the plant requirements (cylinder axis parallel or perpendicular to the pipeline axis).

To assemble the actuator onto the valve proceeds as follows:

- Move the valve and the actuator to their fails position
- If an insert bush or stem extension for the connection to the valve is supplied separately, assemble it onto the valve stem and fasten it by tightening the proper stop dowels.
- Connect a sling to the support points of the actuator and lift it: make sure the sling is suitable for the actuator weight
- Lower the actuator onto the valve in such a way that the insert bush, assembled on the valve stem, enters the actuator drive sleeve; this coupling must take place without forcing and only with the weight of the actuator.
- When the insert bush has entered the actuator drive sleeve, check the holes / pin of the valve flange meet the actuator holes and pin, otherwise rotate the mounting bracket to obtain a right assembling.

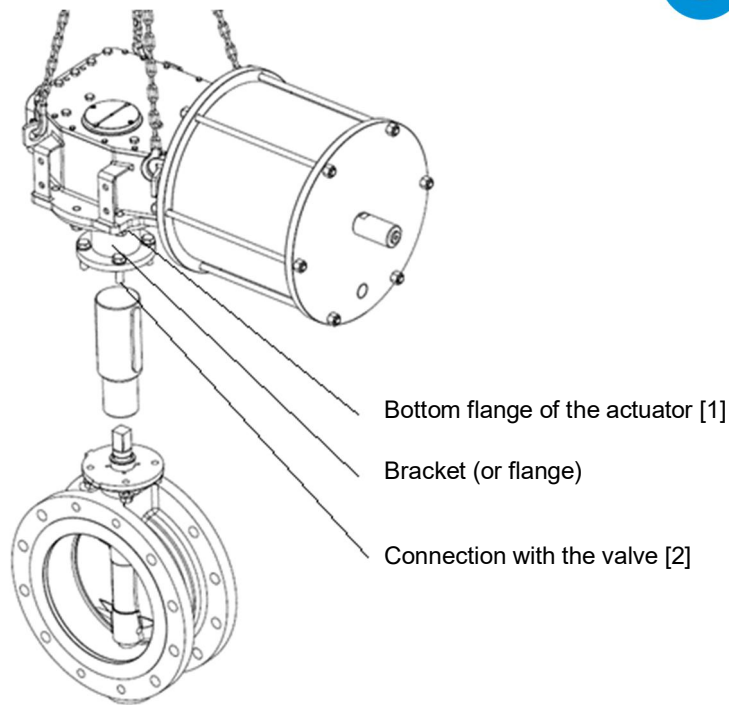


Fig. 3 – Assembling of the actuator on the valve


<b>Important</b> 	<p>To guarantee the correct transmission of torque from the actuator to valve stem without phenomena of slip it is important to:</p> <ul style="list-style-type: none"> <li>- remove any trace of oil and/or grease from the mating surfaces of actuator and bracket (or flange) [1] and from bracket (or flange) and valve flange [2].</li> <li>- tighten the bolts fixing the bracket (or flange) to the bottom flange of the actuator with the torque specified into the following Table 1.</li> <li>- tighten the bolts fixing the bracket (or flange) to the bottom flange of the actuator with the torque specified into the following Table 2, provided that the valve maker verifies and guarantees the correct transmission of required valve torque.</li> </ul>
---	---

Table 1


Actuator	ISO 5211 flange	Bolts	Tightening torque (Nm) <sup>(1)</sup>
RTQ-01	F25	8 x M16	180
RTQ-02	F30	8 x M20	340
RTQ-03	F35	8 x M30	800
RTQ-04	F40	8 x M36	1.800
RTQ-05	F48	12 x M36	1.800
RTQ-06	F60	20 x M36	1.800
RTQ-07	F60	20 x M36	2.200
RTQ-08	F80	20 x M42	3.000

Table 2

Bolts	Tightening torque (Nm) <sup>(1)</sup>	Bolts	Tightening torque (Nm) <sup>(1)</sup>
M10	40	M36	1.800
M12	70	M42	3.000
M16	180		
M20	340		
M24	550		
M27	700		
M30	800		
M33	1.200		


(1) The torque values in Tables 1 and 2 have been calculated considering the standard bolting made in Carbon Steel according to ASTM A320 grade L7/ASTM A193 grade B7 for bolts/screws and ASTM A194 grade 4 for the nuts. Alternative bolting in Stainless Steel are permitted i.e. ASTM A193 B8M (Class 2 or 2C) for bolts/screws and ASTM A194 grade 8M for the nuts, provided that yield strength of bolts/screws is not less than 450 MPa.

### 6.3 Pneumatic Connections

<p><b>Warning</b></p> 	<p>Check that the values of pneumatic supply available are compatible with those reported on the identification plate of the actuator.</p> <p>Use pipes and connections appropriate as for type, rating, material and dimensions.</p> <p>The connection should be made by qualified staff.</p>
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- Properly deburr the ends of rigid pipes.
- Properly clean the interior of pipes sending through them plenty of the supply fluid used in the system.
- Mould and fasten the connection pipes so that no irregular strains at entries or loosening of threaded connections occur.
- Make the connections according to the operating diagram.
- Check the absence of leakages from pneumatic connections. If necessary tighten the nuts of the pipe-fittings.

### 6.4 Electrical Connections (If any)


<p><b>Warning</b></p> 	<p>Before carrying out electrical connections, switch off any power and control lines.</p> <p>Use components appropriate as for type, material and dimensions.</p> <p>The connections should be made by qualified staff.</p>
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- Introduce connection cables.
- Make the connections in compliance with applicable wiring diagrams on the documentation supplied.
- Screw the cable gland.
- Replace the plastic plugs of unused entries with metal plugs.

### 6.5 Earth connection

If the earth connection is not guaranteed through mechanical parts on which the actuator is mounted, it is necessary ensure a directly earth connection using the provided heart point of the actuator.

## 6.6 Disassembling

<b>Warning</b>	<b>Before starting the disassembly operations it is mandatory to disconnect the pneumatic power and to exhaust the cylinder and any other pressure retaining component mounted on the actuator.</b>
	<p>Before removing the screws between actuator and valve or adaptor flange or mounting bracket, the actuator should be connected with appropriate lifting means. Depending on mounting position lift the actuator as shown in Fig.2a or 2b. The lifting points are appropriate for handling the actuator alone and <u>not for the valve + actuator assembly</u>. During the disassembling take care that the mounting coupling block is fix on the valve stem to avoid any dangerous situation.</p>

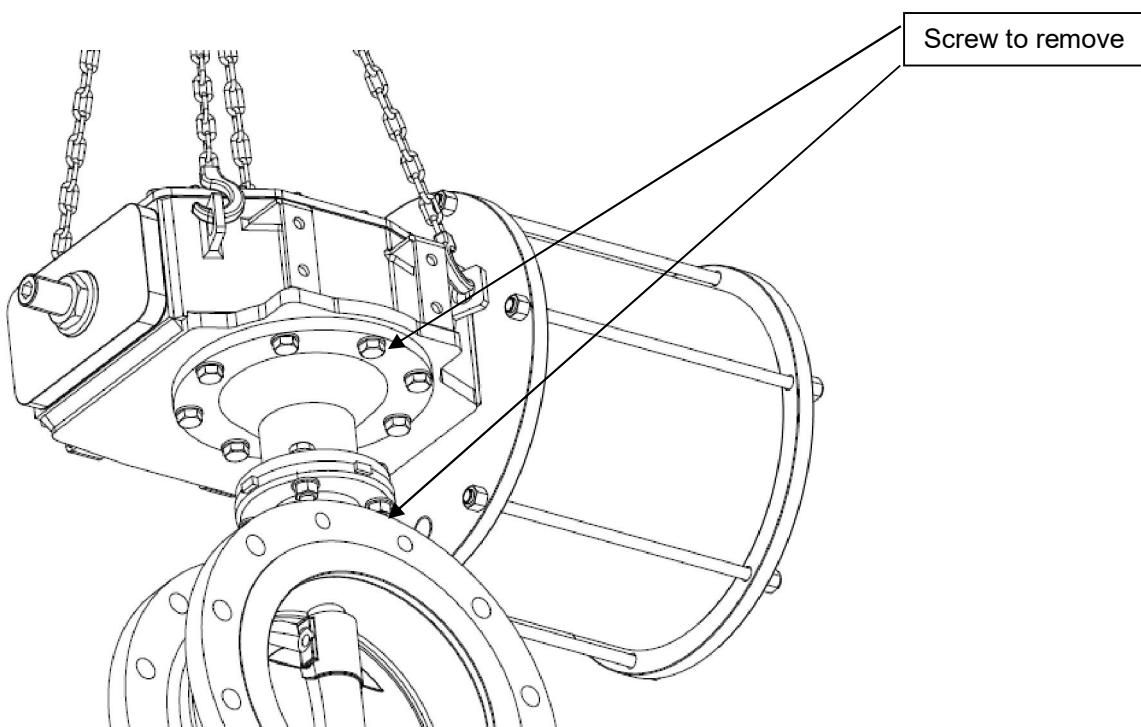


Fig. 4 – Disassembling of the actuator from the valve



## 7 OPERATION AND USE

### 7.1 Operation description

The RTQ series is pneumatic actuator designed for on-off and control service and is applicable over a wide range of pressure, temperatures and environments.

The scotch yoke mechanism converts the linear motion of pneumatic piston into valve rotation by the actuator shaft.

Depending which chamber of cylinder is pressurized, the valve either opens or closes.


The symmetric scotch yoke mechanism generates high torque at start (0° degree) and the end (90° degree) of the valve stroke, typically valve torque figure of ball valve. The canted scotch yoke mechanism generates very high torque when valve is closed, typically valve torque figure of butterfly valve.

### 7.2 Intended use

**The machinery covered in this Instruction Manual is single acting pneumatic low pressure RTQ actuator series designed to operate a quarter turn industrial valve (ball valves, butterfly valves, plug valves, dampers,...) for ON-OFF or modulating heavy duty service.**

This RTQ actuator is produced by **STI srl** [Manufacturer] and identified by a label with a product designation code. **STI srl** will not be liable for any possible damage or physical injury resulting from use in other than the designated applications or by lack of care during installation, operation, adjustment and maintenance of the machine. Such risks lie entirely with the user. Depending on the specific working conditions, additional precautions may be requested. Considering that **STI srl** has no direct control over particular applications, operation or maintenance conditions, it is the operator's responsibility to comply with all applicable safety rules. Please inform **STI srl** urgently if you face unsafe situations not described in this Instruction Manual. It is the sole responsibility of the operator to ensure that the local health and safety regulations are adhered to. RTQ actuator is designed in accordance with the applicable International Rules and Specifications, but the following Regulations must be observed in any case:

- the general and safety regulations
- the plant specific regulations and requirements
- the proper use of personal and protective devices (glasses, clothing, gloves, etc)
- the proper use of tools, lifting and transport equipment.

<p><b>Warning</b></p> 	<p><b>It is strictly forbidden to use the RTQ actuators series for purpose or application other than those for which it was designed and as specified in this Manual.</b></p>
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### 7.3 Reasonably foreseeable misuse

A short list of reasonably foreseeable misuse:


- Installation in ambient with not planned conditions: i.e. climatic conditions different from the specified conditions;
- Insert incorrect fluid into the system;
- Supply pressure out of required range;
- Lifting of the actuator with valve through eye bolts.

### 7.4 Operating limits

Operating conditions are described in paragraph 3, the nameplate fastened on the actuator contains the main actuator operating condition for the specified application.

<p><b>Warning</b></p> 	<p>It is severely forbidden to use the actuator under conditions other than those provided on the nameplate.</p>
---	--

### 7.5 Residual Risks

<p><b>Warning</b></p> 	<p>The actuator has parts under pressure. Use the due caution. Use individual protections provided for by the laws and provisions in force.</p>
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- Risk due to movements of loads during load displacements, assemblage and maintenance servicing.
- Electrical risk due to an incorrect application of the instruction.
- Crushing during assemblage and maintenance servicing.
- Extreme metal temperature at high (over than 80°C) or very low values as consequence of ambient temperature as to be considered as a risk of person injury in case of contact.
- Emissions of hazardous substances where natural gas is used as motive energy.

## 8 Instructions for the operator

### 8.1 Start Up

During the start-up of the actuator, proceed as follows:

- Check that the pressure and quality of the air supply (filtering degree, dehydration) are as prescribed.
- Check that the feed voltage values of the electric components (solenoid valve coils, micro-switches, pressure switches, etc.) are as prescribed.
- Check that the actuator controls work properly (remote control, local control, emergency controls, etc.)
- Check that the required remote signals (valve position, air pressure, etc.) are correct.
- Check that the setting of the components of the actuator control unit (pressure regulator, pressure switches, flow control valves, etc.) meet the plant requirements.
- Check that there are not leak in the pneumatic connections. If necessary tighten the nuts of the pipe fittings.
- Remove all rust and, in accordance with the applicable painting specifications, repair paint-coat that has been damaged during transport, storage or assembly.

## 8.2 Stroke adjustment

### Important



It is assumed that the following instructions are executed in the workshop using air as the power fluid. Instructions are applicable when the actuator is already installed on the valve.

It is important that the mechanical stops of the actuator (and not those of the valve) stop the rotary stroke at both extreme valve positions (fully open and fully closed), except when different configuration is required by the type of the valve (i.e.: eccentric butterfly valves,...).

**The setting of the open/closed valve position is performed by adjusting the setting screws foreseen into the end flange of the cylinder and on the side wall of the scotch yoke mechanism (see Fig. 5 and Fig. 6) following the instructions listed here below.**

For the adjustment of the travel stop screw in the end flange of the pneumatic cylinder proceed as follows (Fig.5):

- Loosen the plug (4.4) from the travel stop protection (4.2) keeping the latter locked with a proper wrench key.
- Adjust the valve stroke screw/unscrew the travel stop screw (4.1)
- After detected the right position, tight the travel stop protection (4.2) against the cylinder end flange keeping the stopper screw (4.1) locked Screw the plug (4.4) into the travel stop protection (4.2).

For the open position adjustment on the travel stop located into the actuator centerbody side-wall proceed as follows (Fig.6):

- Loosen the nut (3.3) from the travel stop screw (3.2) keeping the latter locked with a proper wrench key.
- Adjust the valve stroke screw/unscrew the travel stop screw (3.2)
- After detected the right position, tight the nut (3.3) keeping the travel stop screw (3.2) locked.

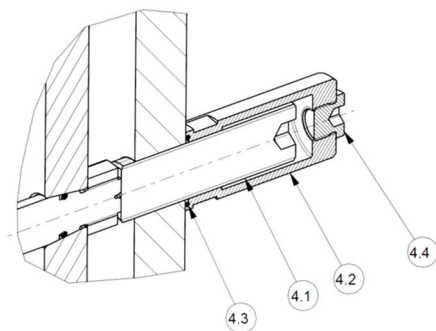


Fig. 5 – Stroke adjustment

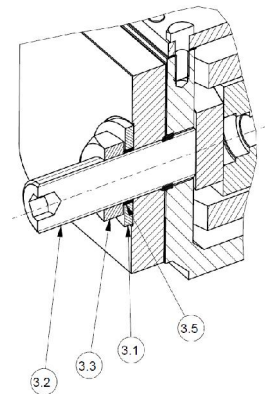


Fig. 6 – Stroke adjustment




Operate the actuator with pneumatic supply to check that the actuator moves properly and that there are no leakages

## 8.3 Manual Override

When requested, a manual override to move the actuator in case of lack of pneumatic pressure is supplied as an integral part of the actuator itself.

For the double acting actuators Series RTQ the manual override is based on cylinder with hydraulic hand pump type HP.

<b>Important</b>	<p><b>Position of the valve and position of the manual override in relation to the actuator availability <b>MUST</b> be always known.</b></p>
	<p><b>The following paragraph 7.3.1 provides the information to enable the operator to know the position of the manual override.</b></p>
	<p><b>Position of the valve is provided by the local indicator described at paragraph 2.2 item 6).</b></p>

### 8.3.1 Indication of position of the manual override type HP

For this type of Manual Override a specific **Instruction Manual 2094** is available.

By means a selector lever it is possible to select LOCAL or REMOTE operation. (see Figure 7)

When lever of the local selector is in LOCAL position, identified by a specific label fixed on device, the manual override HP is engaged, consequently the actuator cannot be operated by remote inhibiting its safety function. To restore the automatic function the selector lever must be rotated 90° clockwise towards the position identified by the label REMOTE.

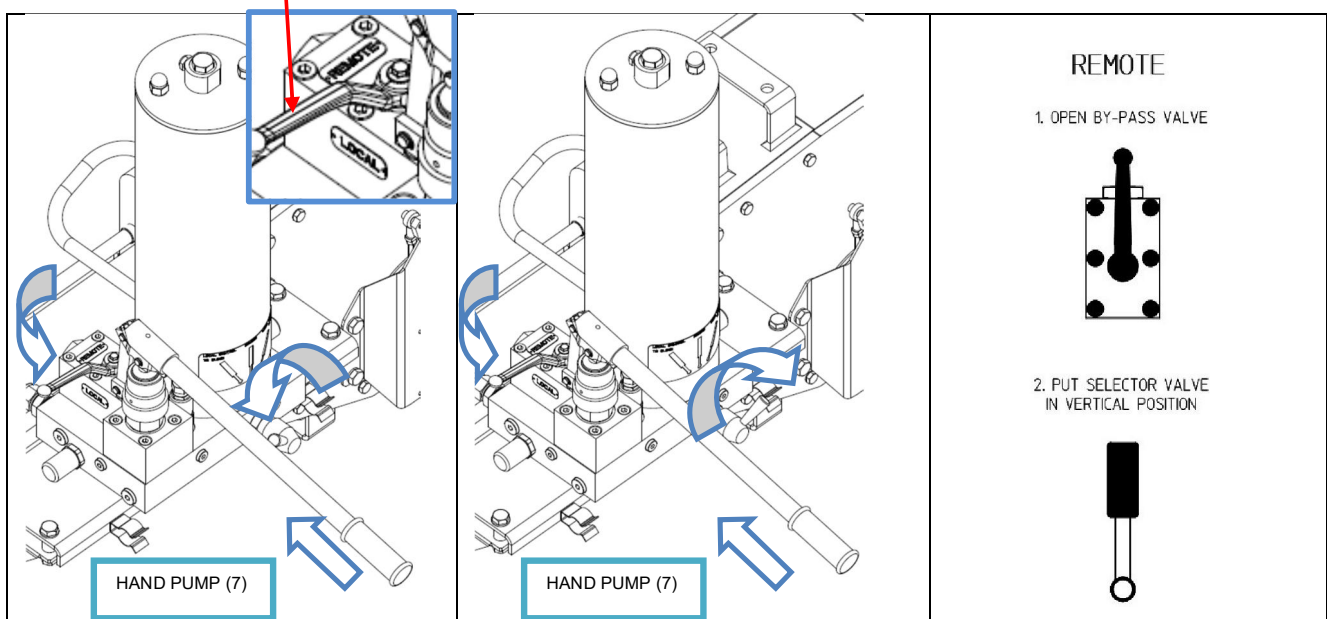


Fig. 7 – HP device

### **8.3.2 Restoring automatic operation**


In addition to the basic instructions enclosed in the specific **Instruction Manual 2094**, the following steps, after the restoring of automatic operation, are recommended for actuators used in **SIL applications**:

- restore the supply pressure inside the actuator's cylinder;
- operate the actuator with supply pressure;
- by exhausting the supply pressure check that the actuator is able to reach the fully closed position, in case of fail close actuator, or the fully open position in case of fail open actuator. It is possible to verify the correctness of the fully stroked position by checking the position indicator or limit switches, if fitted.
- In case the actuator is not able to reach fully stroke, verify the position of manual override following the instructions enclosed in the specific Instruction Manuals.

## 9 MAINTENANCE

### 9.1 Service limit


**Design life** prior to actuator replacement is **30 years**; the validity of this life is subject to periodic inspection as per next paragraph 8.2 and special maintenance as per next paragraph 8.3, if necessary.


<p><b>Important</b></p> 	<p><b>At the end of design life the actuator can be scrapped or can be totally refurbished: this decision must be taken by Plant Responsible considering the general condition of the actuator.</b></p> <p><b>In case of refurbishment all the seals and other components made in soft materials, grease and all other parts subject to wear like bushes and sliding blocks must be changed. All other parts, with special attention to the spring cartridge, that shows significant signs of corrosion must be replaced.</b></p> <p><b>At the end of this activity the actuator must be completely repainted.</b></p>
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### 9.2 Periodic Inspections

Inspect the general conditions at regular intervals: recommended frequency of inspection is one time every two years, but this frequency could be changed depending on the installation and working conditions.

- Check that the actuator operates the valve correctly and with the required operating times. If the actuator operation is very infrequent, carry out a few opening and closing operations with all the existing controls (remote control, local control, emergency controls, etc.), if this is allowed by the conditions of the plant.
- Check that the signals to the remote control desk are correct.
- Check that the pneumatic supply pressure value is within the required range.
- If there is an air filter on the actuator, bleed the condense water accumulated in the cup by opening the drain cock. Disassemble the cup periodically and wash it with soap and water; disassemble the filter: if this is made up of a sintered cartridge, wash it with nitrate solvent and blow through with air. If the filter is made of cellulose, it must be replaced when clogged.
- Check that the external components of the actuator are in good conditions.
- Check all the paint-coat of the actuator. If some areas are damaged, repair the paint-coat according to the applicable specification.
- Check that there is no leak in the pneumatic connections. If necessary, tighten the nuts of the pipe-fittings.

<p><b>Warning</b></p> 	<p><b>Take care that a build-up of dust or dirt on the actuator can inhibit cooling and contribute to increase surface temperature. The user should plan and provide for a periodic cleaning/maintenance program that will maintain the external surface of the actuator free from excessive layer of dust.</b></p>
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<p><b>Important</b></p> 	<p>Use only STI original spare parts. STI cannot accept responsibility for any damages that occur from using spare parts or fastening materials from other manufacturers.</p> <p>If STI products (i.e. gasket, O-ring, etc) have been on store for longer periods check these for corrosion or deterioration before using these products.</p>
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### 9.3 Special maintenance


Under normal working and environmental condition, the actuator doesn't need special maintenance.

It is however recommended to inspect the actuator every **six years**.

If leaks in the pneumatic cylinder, or a malfunction in the mechanical components are found, the actuator must be disassembled and seals and/or any other damaged parts must be replaced.

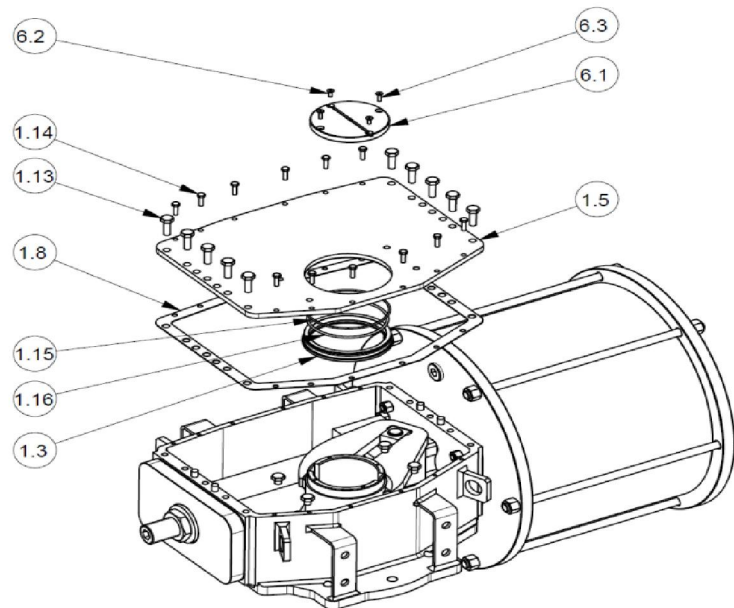
<p><b>Important</b></p> 	<p>In order to correctly schedule the special maintenance activities, the following aspects must be considered:</p> <ul style="list-style-type: none"> <li>- replacement of seals of the cylinder can be done in field without removing the actuator from the valve;</li> <li>- replacement of tie rod of the cylinder can be done in field without removing the actuator from the valve;</li> <li>- replacement of seals or mechanical part in the scotch yoke mechanism requires the removing of the actuator from the valve and disassemble it in workshop;</li> </ul>
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<p><b>Warning</b></p> 	<p>Before performing any maintenance activity use always wear protective gloves, footwears, clothing, high visibility jacket, eyewear and any other protective device prescribed by the Local Rules depending on the working conditions.</p>
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<p><b>Warning</b></p> 	<p>Before proceeding with any maintenance operation the following instructions must be respected:</p> <ul style="list-style-type: none"> <li>- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve</li> <li>- Close the pneumatic feed line and exhaust the pressure from the actuator cylinder and from the control unit, to ensure safety of maintenance staff.</li> </ul>
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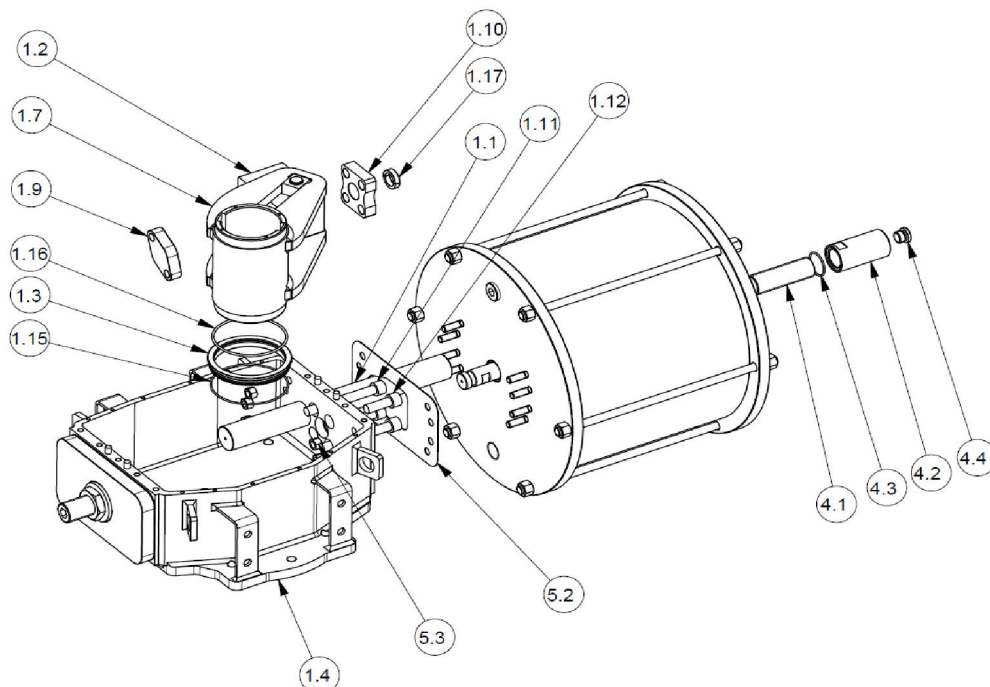


### 9.3.1 Scotch yoke Mechanism seals replacement



*Fig. 8 – Scotch yoke mechanism seals replacement*

To replace the cover gasket (1.8) under the cover (1.5), remove the position indicator (6.1, 6.2, 6.3) and all the screws (1.13, 1.14) fixing the cover. Before replace the cover gasket clean the housing and cover.



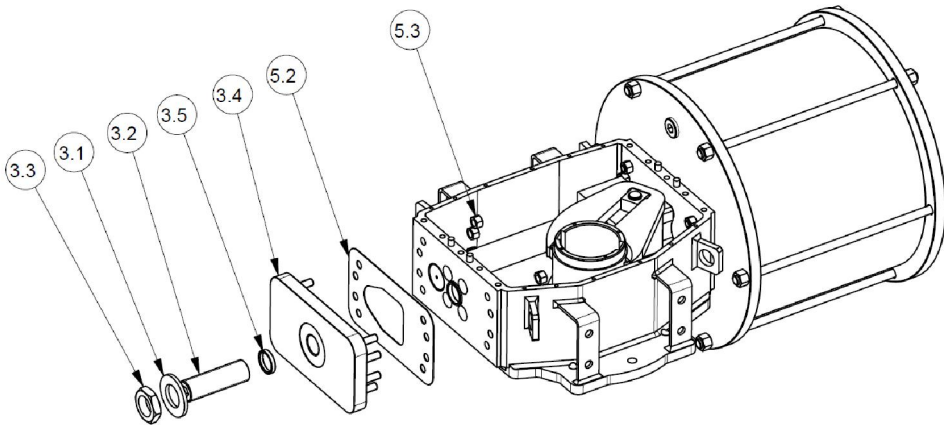
*Fig. 9 – Scotch yoke mechanism seals replacement.*

After removing the cover (Fig.9) disassemble the bushing (1.3) and replace the O-ring (1.15, 1.16). Once perform these actions is possible to remove the gasket between housing (1) and cylinder (2) (Fig.1). Remove the fixing nut (5.3) on the cylinder side, remove the screw (1.11, 1.12) to disengage the guide block from cylinder taking the schotch yoke in intermediate position (45°), disengage the 2 off half rings (1.17) from

flange (1.10), remove the cylinder (2) and replace the gasket (5.2), before replace cylinder clean the surface of housing and cylinder head flange.

At these point is possible replace the O-ring on the bottom of the scotch yoke.

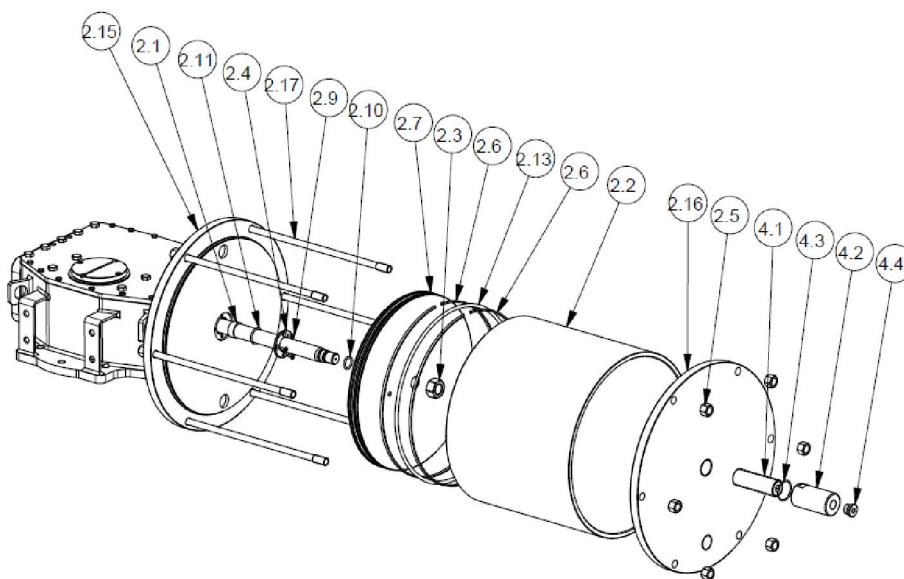
Remove the guide bar (1.1) extract the scotch yoke (1.7) and guide block (1.2) disassemble the bushing (1.3) and replace the O-ring (1.15, 1.16).



*Fig. 10 – Scotch yoke mechanism seals replacement*

To replace the gasket between actuator and stop settings screw kit, once the cover (1.5) has been removed, is necessary remove the fixing nut (5.3) on the side without cylinder, remove the screw, remove flange (3.4) and replace the gasket (5.2), before replace flange and kit stopper clean the surface of housing and flange (3.4).

### **9.3.2 Pneumatic cylinder seals replacement.**



*Fig. 11 – Pneumatic cylinder seals replacement*

It is possible to completely disassemble the cylinder without disconnecting it from the actuator body in order to replace the seals.

Remove the nuts (2.5) from tie rods, remove the end flange (2.16) after that replace the o-ring (2.12) from the seal groove.

Disassemble the cylinder tube (2.2) to replace the sliding guide (2.6) and o-ring (2.13) from the seal groove and the o-ring (2.12) on the head flange (2.15).

Remove the nut (2.3) from the piston rod (2.14), remove the piston (2.7) and the O-ring (2.10).

Unscrew the screw (2.9), disassemble the flange (2.4) and replace the O-ring (2.11).

Remove travel stop protection (4.2) if necessary replace o-ring (4.3).

Before re-assemble clean all seal grooves carefully and lubricate them with protective oil or grease film.

It is possible to disassemble and replace seals of pneumatic cylinder disconnecting it from the actuator body in order to bring in a safe area.

## 9.4 Repairs

When needed, repair must only be carried out with Manufacturer's original spare parts.

Original spare parts must be required to the Manufacturer with reference to the item numbers shown in the next Section 10.

To ensure that right spare is provided, **serial number** printed on the RTQ series label must be specified when spares are ordered.

## 9.5 Reassembling

### 9.5.1 Pneumatic cylinder re-assembling.

Carefully clean the inside of the tube and check that the entire surface, particularly that of the bevels, is not damaged. Lubricate with a protective oil or grease film the tube internal surface and the bevels at the ends. Lubricate every seal grooves taking care there are not damages on seal surfaces.

Slide the spacer/cylinder tube onto the piston taking care not to damage the o-ring: the tube bevel has to smoothly compress the piston seal ring; take care also not to damage the head flange O-ring.


Assemble the end flange by centering it on the inside diameter of the tube, taking care not to damage the O-ring.

Assemble the nuts (please refer to cylinder sectional dwg.) onto the tie rods. Tighten the nuts to the recommended torque as per Table 1 in sec. 5.6.2, alternating between opposite corners.

### 9.5.2 Actuator re-assembling

Assemble the pneumatic cylinder to the housing tightening, with recommended torque table, the screw between cylinder and housing. Replace o-ring at the bottom of the housing making attention there are not dirty or damage on the seal surface, put the bushing on its seat. Re-assemble scotch yoke and guiding block, make a generous coating of grease on the contact surfaces of yoke and the bushings, assemble the guide bar and close the assemble the plug to close the guide bar. Tighten the screw between cylinder piston rod and guiding block, with recommended torque, using a wrench. Assemble the o-ring, the cover gasket and the cover with all screw.

Recommended tighten torque as per Table 2 in Section 6.2.

	<p><b>Important</b></p> <p>After maintenance operations carry out a few actuator operations to check that its STROKING is regular and that there is no leak through the seals and fittings.</p>
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## 10 Actuator Lubrication

RTQ actuators do not need lubrication during their life.


However, if during special maintenance operations it is necessary to replace the grease, the following products are recommended.

### 10.1 Scotch yoke mechanism (see Paragraph 12.1)

**Molykote G-4700 grease produced by Dow Corning**

### 10.2 Double acting pneumatic cylinder (see Paragraph 12.2)

**Rheosil 500 F oil produced by Nye Lubricant, Inc.**

<p><b>Important</b></p> 	<p>The above products cover the full range of temperatures from <math>-60^{\circ}\text{C}</math> up to <math>+100^{\circ}\text{C}</math>.</p> <p>Equivalent products can be used provided that they have the same characteristics and the same range of compatibility with elastomeric and plastic components.</p>
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## 11 TROUBLESHOOTING

Event	Possible cause	Remedy
Actuator doesn't work properly	Lack of pneumatic supply	Check supply line
	Defective main valve	Consult valve manufacturer documentation
	Failure of the control group	Call STI s.r.l. - Customer Care Dept.
Actuator too slow	Low supply pressure	Adjust supply pressure
	Incorrect speed control settings	Adjust speed controls to increase flow
	Exhaust port blocked	Remove and clean the exhaust port silencers and replace
	Wear of the main valve	Consult valve manufacturer documentation
Actuator too fast	High supply pressure	Reset
	Incorrect speed control settings	Adjust speed controls to decrease flow
Leakages on pneumatic circuits	Deterioration and/or damage to gaskets and or loosed fittings	Tightness loosed fittings Call STI s.r.l. - Customer Care Dept..
	Damage to fittings	Call STI s.r.l. - Customer Care Dept.
Leakages on pneumatic cylinder	Damage to seals	Replace cylinder seals
Incorrect position of the valve	Wrong adjustment of mechanical stops	Re-adjust setting
	Wrong electric limit switches indication.	Re-adjust setting

## 12 PARTS LIST GENERAL ASSEMBLY

This section includes the drawings and parts lists of each component and subassembly of RTQ series.



**Important:** When ordering spare parts, please indicate the serial number embossed on the actuator nameplate.

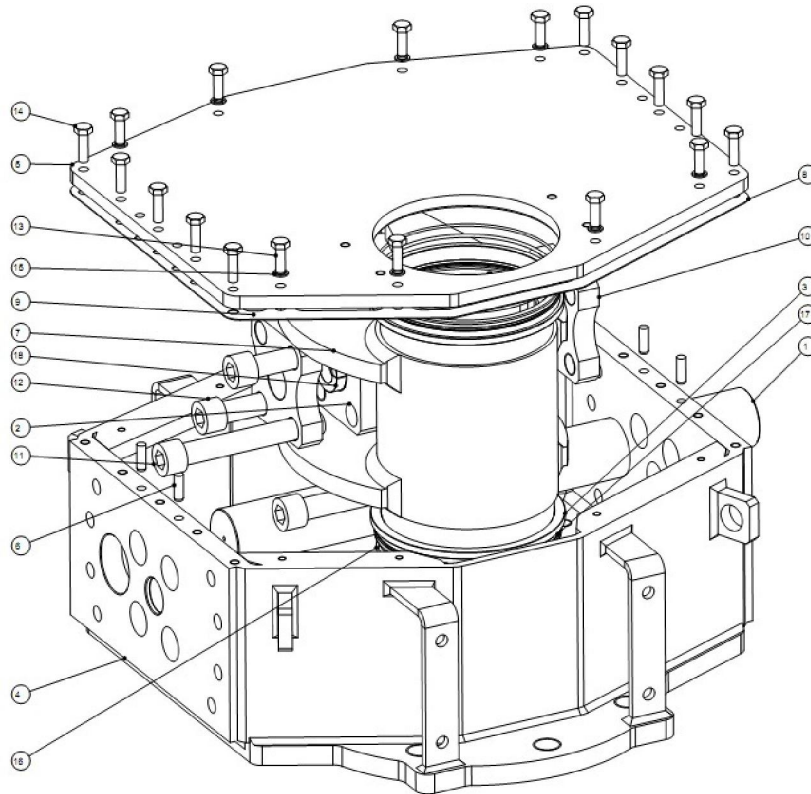


**Important:** When ordering spare parts, please refer to the spare part kit on the attached drawings.



**Important:** When ordering spare parts, use ONLY original STI spare parts.

## 12.1 Scotch yoke mechanism



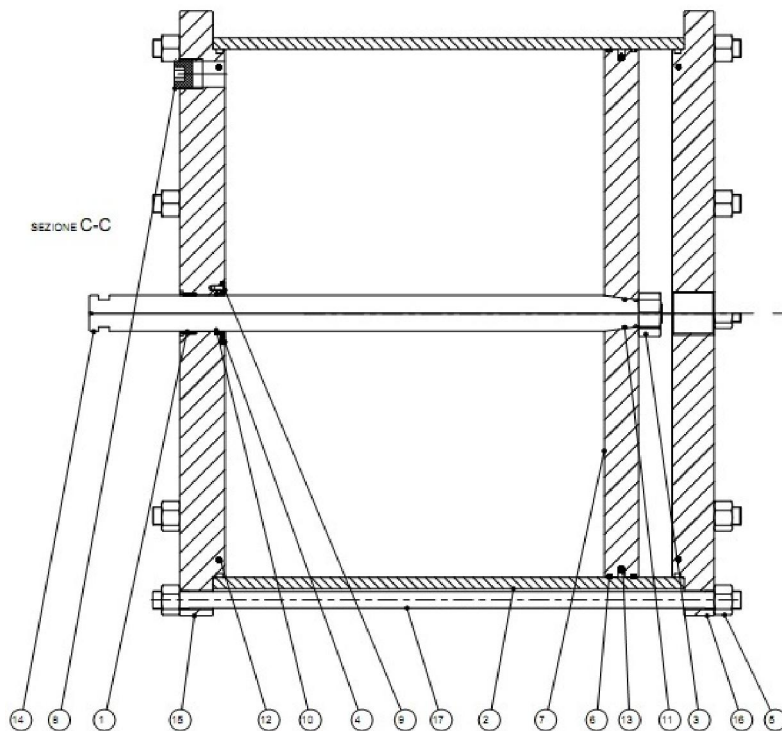
**Scotch yoke mechanism part list**

Item	Description	Qty	Material	Spare Parts
1	Guide Bar	1	Alloy steel	
2	Guide block	1	Carbon steel	
3	Scotch yoke bushing	2	Bronze	
4	Housing	1	Carbon steel	
5	Cover	1	Carbon steel	
6	Cylinder pin	4	Alloy steel	
7	Scotch yoke	1	Carbon steel	
8	Cover gasket	1	Fiber	#
9	Plate	1	Carbon steel	
10	Plate	1	Carbon steel	
11	Screw	2	Carbon steel	
12	Screw	2	Carbon steel	
13	Screw	(**)	Carbon steel	
14	Screw	10	Carbon steel	
15	Seal washer	(**)	Carbon steel+NBR	
16	O-ring	2	NBR (*)	#
17	O-ring	2	NBR (*)	#
18	Half ring	2	Alloy steel	

(\*) NBR standard material for temperature range from -30°C up to +100°C.

(\*\*) Quantity depends on the model.

## 12.2 Double acting pneumatic cylinder



**Double acting pneumatic cylinder part list**

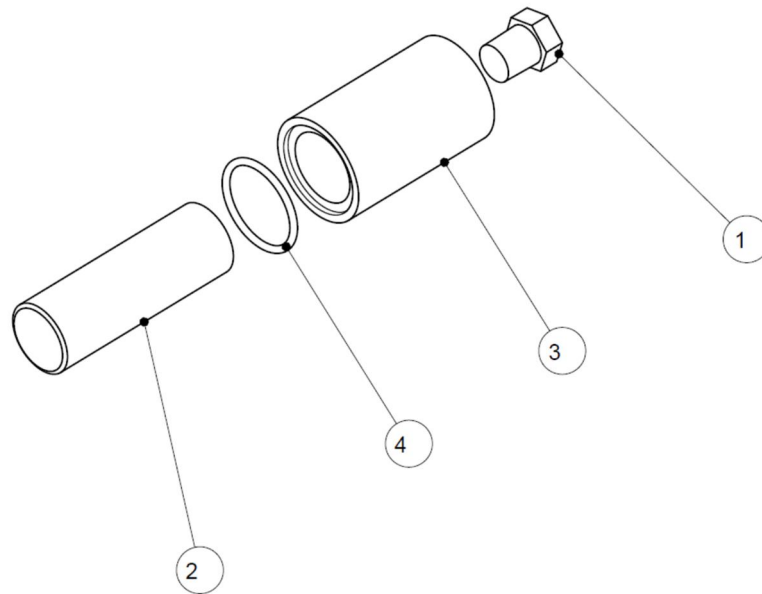
Item	Description	Qty	Material	Spare Parts
1	Bushing	1	Steel/Bronze/PTFE	
2	Cylinder tube	1	Carbon steel	
3	Nut	1	Carbon steel	
4	Flange	1	Carbon steel	
5	Nut	(**)	Carbon steel	
6	Sliding guide	2	PTFE	#
7	Piston	1	Carbon steel	
8	Plug	1	Carbon steel	
9	Screw	4	Carbon steel	
10	O-ring	1	NBR (*)	#
11	O-ring	1	NBR (*)	#
12	O-ring	2	NBR (*)	#
13	O-ring	1	NBR (*)	#
14	Stem	1	Alloy steel	
15	Head flange	1	Carbon steel	
16	End Flange	1	Carbon steel	
17	Tie rods	(**)	Alloy steel	

(\*) NBR standard material for temperature range from -30°C up to +100°C.

(\*\*) Quantity depends on the model.



### 12.3 Stop protection assembly for cylinder

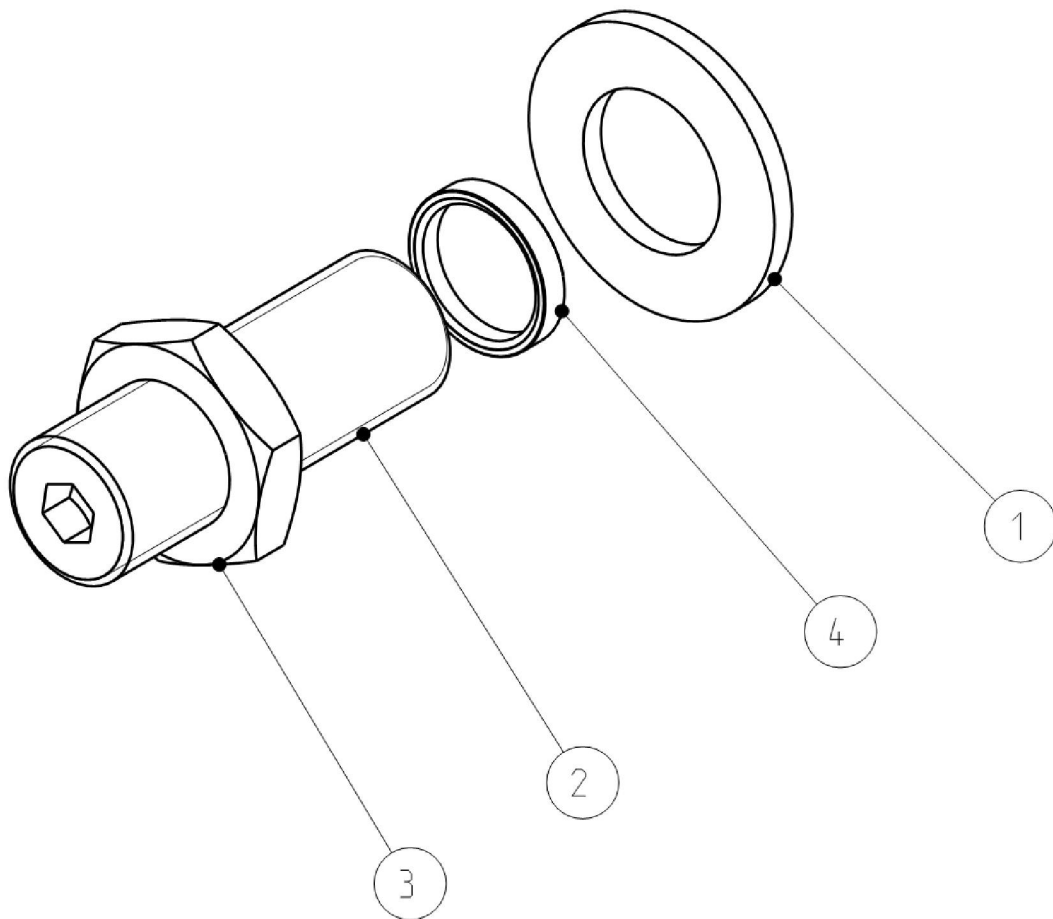


**Stop protection assembly part list**

Item	Description	Qty	Material	Spare Parts
1	Plug	1	Carbon steel	
2	Travel stop screw	1	Carbon steel	
3	Travel stop protection	1	Carbon steel	
4	O-ring	1	NBR (*)	#

(\*) NBR standard material for temperature range from -30°C up to +100°C.

## 12.4 Stopper assembly for housing side wall



**Stopper assembly part list**

Item	Description	Qty	Material	Spare Parts
1	Protection Washer	1	Stainless Steel	
2	Setting screw	1	Stainless steel	
3	Nut	1	Stainless steel	
4	Sealing washer	1	Elastomer	#

## 13 SPARE PARTS



### Spare part kit for double acting actuator RTQ series

General references for the recommended spare parts are shown in the tables of Section 12.

Individual kit, including all the recommended spares, can be ordered directly to STI srl provided that serial number of the actuator or specific purchasing order for the original actuator is indicated in the request.


## 14 DECOMMISSIONING


### Disposal and recycling

	<p><b>Warning:</b> Before disassembling actuator it is necessary to intercept the pneumatic connection to discharge pneumatic cylinder and control unit o the atmosphere. If present discharge also the pressure from back-up tank.</p>
	<p><b>Warning:</b> Refer to section 5.1 and section 5.4 to lifting and storage procedure</p> <p><b>Warning:</b> If the actuator can be operated, put the actuator in fail safe position and unscrew totally the stopper screw.</p> <p><b>Warning:</b> The demolition of actuator parts should be made from specialized personnel.</p>

Before starting a large area should be created around the actuator so to allow any kind of movement without problems of further risks created by work site.

Subject	Hazardous	Recyclable	Disposal
Metals	No	Yes	Use licensed recyclers
Plastics	No	Yes	Use specialist recyclers
Rubber (seals and o-rings)	Yes	No	May require special treatment before disposal, use specialist waste disposal companies
Oil and grease	Yes	Yes	May require special treatment before disposal, use specialist waste disposal companies
Electric and Electronic equipment	Yes	Yes	Use specialist recyclers

	<p><b>Warning:</b> Do not re-use parts or components which appear to be in good condition after they have been checked or replaced by qualified personnel and declared unsuitable for use.</p>
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	<p><b>Important:</b> In all cases check local authority regulation before disposal.</p>
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## 15 Declaration of Incorporation

	<p><b>DICHIARAZIONE DI INCORPORAZIONE</b>  <small>(ai sensi dell'allegato II B della Direttiva Macchine 2006/42/CE)</small></p> <p><b>DECLARATION OF INCORPORATION</b>  <small>(in accordance with EC Machinery Directive 2006/42/EC Annex II Section B)</small></p>	
---	--	---

La Sottoscritta **STI S.r.l.** con sede in Via Dei Caravaggi, 15 – 24040 Levate (BG) – ITALIA dichiara, in qualità di costruttore sotto la propria responsabilità, che la quasi-macchina qui identificata:

*We, STI S.r.l. based in Via Dei Caravaggi, 15 – 24040 Levate (BG) – ITALY, hereby declares, as the manufacturer under its sole responsibility, that the partly completed machinery here below identified:*

**Denominazione Generica/Generic Denomination:** Quarter Turn Pneumatic Actuator Series RT  
**Tipi/Types:** RTC; RTCS; RTQ; RTQS; RTM; RTMS

- rispetta i seguenti RES della Direttiva 2006/42/CE/*complies with the following EHSRs of Directive 2006/42/EC* : 1.1.1 - 1.1.2 - 1.1.3 - 1.1.5 - 1.2.1 - 1.2.2 - 1.3.1 - 1.3.2 - 1.3.4 - 1.3.7 - 1.3.8 - 1.4.1 - 1.5.1 - 1.5.2 - 1.5.3 - 1.5.4 - 1.5.5 - 1.5.6 - 1.5.7 - 1.5.13 - 1.6.1 - 1.7.1 - 1.7.2 - 1.7.3 - 1.7.4
- è destinata ad essere incorporata/assemblata in un'altra macchina, quasi-macchine o apparecchi.  
*is intended to be incorporated into a completed machinery or assembled with other partly completed machinery or equipment.*
- non può essere messa in servizio prima che la macchina finale in cui sarà incorporata o con cui verrà assemblata sia stata dichiarata conforme alle disposizioni della direttiva 2006/42/CE.  
*must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of Machinery Directive 2006/42/EC.*
- è conforme alle prescrizioni della/*complies with the requirements of:*
  - Direttiva bassa tensione (DBT) 2014/35/UE, solo per il materiale conforme installato  
*Low Voltage Directive (LVD) 2014/35/EU, only for compliant material installed*
  - Direttiva compatibilità elettromagnetica (EMC) 2014/30/UE per i componenti elettrici-elettronici presenti e delle disposizioni nazionali di attuazione / *Electromagnetic Compatibility Directive (EMC) 2014/30/UE for the electrical-electronic components present and of National requirement of implementation*
  - Norme UNI EN ISO 12100:2010, CEI EN 60204-1:2006/AC:2010 relativamente solo ai RES applicati  
*Harmonised standards EN ISO 12100:2010, EN 60204-1:2006/AC:2010 only referred to EHSRs applied*

La documentazione tecnica pertinente è stata compilata in conformità dell'allegato VII B:  
 persona autorizzata alla costituzione: STI srl c/o STI srl Via Dei Caravaggi 15 – 24040 Levate (BG) Italia  
*The relevant technical documentation is compiled in accordance with the provisions of part B of Annex VII:  
 person authorised to compile: STI srl at STI srl Via Dei Caravaggi 15 – 24040 Levate (BG) Italia.*

Informazioni pertinenti riguardanti la quasi-macchina saranno trasmesse, in risposta ad una motivata richiesta, alle Autorità Nazionali. *The relevant information concerning the partly completed machinery will be transmitted, in response to a motivated request, to the National Authorities.*

Il modello, il numero di matricola, l'anno di costruzione, i dati del costruttore sono riportati sulla targa fissata alla quasi-macchina. *The model, serial number, year of manufacture, the manufacturer's data are shown on the nameplate attached to the partly completed machinery.*

Levate, 13 Ottobre 2016

L'Amministratore Delegato  
 Roberto Bertossi



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