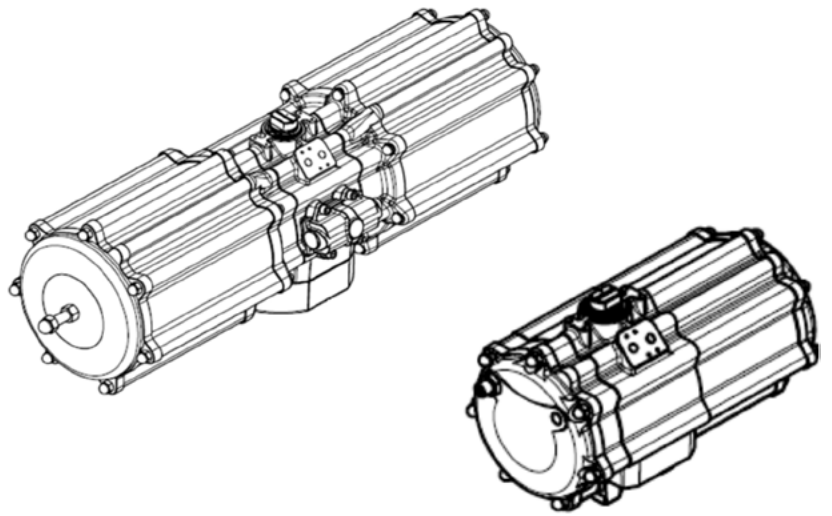
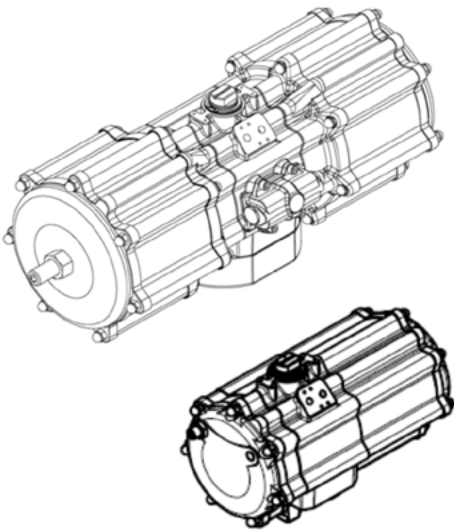


“DA” DOUBLE ACTING VERSION







“SR” SPRING RETURN VERSION

INSTRUCTION MANUAL



SCOTCH-YOKE PART TURN PNEUMATIC ACTUATOR
DA2880 - DA8000 - SR1440 - SR4000

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 **Environmentally friendly:** under the green leaf icon you can find the instructions for a correct and environmentally friendly handling of the product.

OMAL S.p.A. reserves the right to change, at any time, the features and data of its own products, to better improve the quality and the duration of said products.

FOREWORD

The present User's Installation and Maintenance Manual has been edited in conformity with:
 2006/42/EC Directive "Machinery";
 2014/34/EU Directive "Equipment and protection systems designated to be used in potentially explosive atmospheres" (ATEX).
 The following standards/technical specifications also apply:
 EN 15714-3:2009 Industrial valves: Actuators – Pneumatic part-turn actuators for industrial valves.
 IEC 61508:2010-1/7 Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 1:7
 UNI CEN/TS 764-6:2005 Pressure equipment Part 6: Operating instructions structure and contents.

Below you will find the safety instructions, the minimum information for storage / warehousing, the installation, the commissioning, the maintenance and the instructions for disposal of products at the end of their life cycle for the following pneumatic actuators:

A) DOUBLE ACTING PNEUMATIC ACTUATORE SERIES DA2880-DA3840-DA5760-DA8000

B) SPRING RETURN PNEUMATIC ACTUATORE SERIES SR1440-SR1920-SR2880-SR4000

Where provided, the actuators are marked in accordance with the applicable EX regulations.

OMAL S.p.A. disclaims any liability for damage caused by improper use, even if partial, respect to the information contained in this manual.

1) GENERAL FEATURES

OMAL S.p.A. produces a wide range of pneumatic actuators, with “Scotch yoke” mechanism, for valve drive and remote control. Such actuators are available both in the double acting “DA” version and in the Spring Return “SR” version.

The use of an actuator is based on the principle of opening and closing the valve connected to it, without manual operations by means of levers or hand-wheels, but through an electro-pneumatic remote command.

The “Scotch yoke” mechanism is a mechanical system designed to transform the linear force into a torsion-type force.

OMAL S.p.A. uses this system, when producing its actuators, to transfer the linear force of the pistons to the movement of the valve shaft.

This system provides a long life for the actuator and the best performance, with the least energy consumption.

The OMAL S.p.A. Scotch yoke system has a torque curve that makes the maximum torque available right at the breakaway of the valve, the initial opening moment.

2) OPERATION CONDITIONS

a. Structure.

The OMAL S.p.A. actuators can be used both for indoor and outdoor installations. The technical characteristics such as: the type, the size, the maximum operating pressure, the torque supplied, the maximum operating temperature, the flange type, the serial and production number, are laser engraved on the actuator body (see drawing on page 6).

b. Supply fluid

The operating media should be dry and filtered compressed air not necessarily lubricated or inert gases compatible with internal actuator parts and lubricants.

The operating medium shall have a dew point equal to -20 °C or, to be at least, 10 °C below the ambient temperature (ISO 8573-1, Class 3). The maximum particle size shall not exceed $40\text{ }\mu\text{m}$ (ISO 8573-1, Class 5).

c. Operation pressure.

The maximum operating pressure is 8,4 bar (120 psi), 7 bar (100 psi) for the DA8000.

The nominal operating pressure is that which can be found on the plate or on the actuator directly.

d. Operating temperature.

The operating temperature can be found on the plate and can vary according to the types of seals that are being used. The OMAL S.p.A. actuators work within a temperature range that goes from -20 °C (-4 °F) to 80 °C (176 °F); there are also versions that can be used with low or high temperature (paragraph 8).

e. Stroke of the actuators.

The OMAL S.p.A. actuators are produced for a standard stroke of a 91 ° rotation; an adjustment that reduces the stroke by 10 ° (in the closed valve position) is available upon request.

f. Opening and closing rates.

The cycle rate depends on different factors such as the supply pressure, the capacity, the connection sizes, the characteristics of the solenoid valves, the room temperature, the valve torque and its characteristics. The rates in the following charts relate to the actuator only and have been recorded with the help of the limit switches located on the actuator shaft. The rates are therefore exactly what is required by the actuator for a 90 ° rotation, counting from the instant that the movement begins until the end of the stroke.

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| DOUBLE ACTING ACTUATOR - OPEN CLOSED TIMING - with SOLENOID VALVE NAMUR 2 TEMPI DI APERT. CHIUS. - ATTUATORI DOPPIO EFFETTO - con ELETTRIVALVOLA NAMUR 2 | |
|---|--|
| Test conditions | Condizioni di prova |
| Actuators tested are representative of production | Attuatori rappresentativi della produzione |
| Test temperature: +18 ° C +25 ° C | Temperatura ambiente di prova: +18°C +25°C |
| Load: no load | Carico: nessun carico |
| Control fluid: compressed air at 0.56MPa / 5.6bar | Fluido di comando: aria compressa a 5.6bar |
| Nominal cycle: 90 ° in both directions | Ciclo nominale: 90° in entrambe le direzioni |
| Control | Controllo |
| 3/2 - 5/2 solenoid/spring or solenoid/solenoid function | 3/2 - 5/2 funzione elettrov./ molla o elettrov./ elettrov. |
| Pneumatic connections: 1/2" gas | Connessioni pneumatiche: 1/2" gas. |
| Bore diameter: 1/2" - exhaust 1/2" | Diametro passaggio: 1/2" - scarico 1/2" |
| Flow capacity: 3534 NI/min (at Δp.1 bar) | Portata: 3534 NI/min (con Δp.1 bar) |
| Instruments for testing | Strumenti di misura |
| Digital chronometer controlled by proximity switches | Cronometro digitale e finecorsa di prossimità |

A SOLENOID VALVE NAMUR 2 - Elettrovalvola Namur 2

| time in seconds | A | |
|-----------------|----------|---------|
| | OPEN | CLOSED |
| SIZE CODE | 5.6 bar | 5.6 bar |
| DA 2880 | 1.77 | 1.41 |
| DA 3840 | 2.09 | 1.68 |
| DA 5760 | 3.12 | 2.52 |
| DA 8000 | 3.91 | 3.40 |

A ER8187C2 (24V)



Note: different working conditions such as: air pressure, the sizes of pipe connection, of the filters and of the solenoid valves, may change the maneuver timing.

| SPRING RETURN ACTUATOR -OPEN CLOSED TIMING - with SOLENOID VALVE NAMUR 2 TEMPI DI APERT. CHIUS. - ATTUATORI SEMPLICE EFFETTO - con ELETTROVALVOLA NAMUR 2 | |
|--|--|
| Test conditions | Condizioni di prova |
| Actuators tested are representative of production | Attuatori rappresentativi della produzione |
| Test temperature: +18 °C +25 °C | Temperatura ambiente di prova: +18 °C +25 °C |
| Load: no load | Carico: nessun carico |
| Control fluid: compressed air at 0.56MPa / 5.6bar | Fluido di comando: aria compressa a 5.6bar |
| Nominal cycle: 90 ° in both directions | Ciclo nominale: 90 ° in entrambe le direzioni |
| Control | Controllo |
| 3/2 - 5/2 solenoid/spring or solenoid/solenoid function | 3/2 - 5/2 funzione elettrov./ molla o elettrov./ elettrov. |
| Pneumatic connections: 1/2" gas | Connessioni pneumatiche: 1/2"gas. |
| Bore diameter: 1/2" - exhaust 1/2" | Diametro passaggio: 1/2" - scarico 1/2" |
| Flow capacity: 3534 NI/min (at Δp.1 bar) | Portata: 3534 NI/min (con Δp.1 bar) |
| Instruments for testing | Strumenti di misura |
| Digital chronometer controlled by proximity switches | Cronometro digitale e finecorsa di prossimità |

A SOLENOID VALVE NAMUR 2 - Elettrovalvola Namur 2

| time in seconds | A | |
|-----------------|------------------------|-------------------------|
| | OPEN <i>5.6 bar</i> | CLOSED <i>spring</i> |
| SR 1440 | 1.37 | 1.40 |
| SR 1920 | 1.62 | 2.03 |
| SR 2880 | 2.17 | 2.42 |
| SR 4000 | 3.83 | 3.97 |



A ER8187C2 (24V)

Note: different working conditions such as: air pressure, size of fitting connections, filters and solenoid valves can change the operating times.

g. Lubrification.

The actuators are lubricated, for normal working conditions, in the company. For maintenance or reassembly operations, OMAL S.p.A. recommends the use of a lubricant such as TECNOLUBE SYNTHY POLYMER 402 or equivalent.

h. Functional Safety

The OMAL S.p.A. pneumatic actuators are also suitable for installations which require high level of functional reliability, up to SIL3, in compliance with the IEC 61508 standard.

i. Wear protection of internal components

The cylinder is electrolysis nickel plated internally, in order to reduce roughness of the surface to a minimum value and is protected with an oxidation treatment which is 20µm thick. The guides of the pistons are made of acetalic resin. The use of steel bushes on the Scotch yoke system reduce backlash and confer very low friction sliding during operation.

j. External protection

The actuators are suitable both for indoors and outdoors. The aluminum body and the caps are protected against corrosion by an oxidation treatment which is 20 µm thick; the shaft and cap screws are made of stainless steel.

This generally allows to meet the C4 safety class, for applications that require it, according to the standard EN 15714-3 section 4.4.3. For applications in environments with aggressive type atmospheres that require a higher protection level than C4, the actuator must be protected with a suitable varnishing treatment.

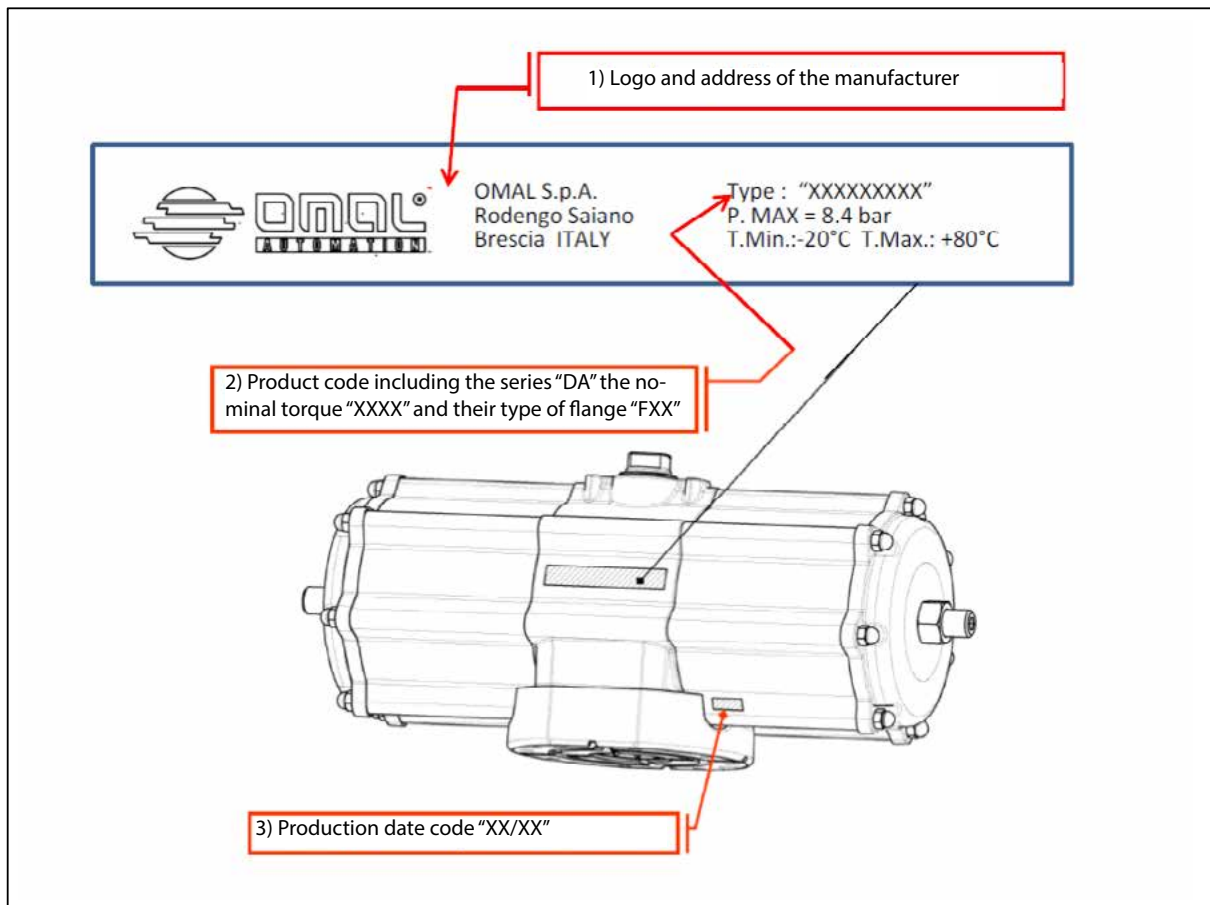
k. Marking and classification

The bodies of the OMAL S.p.A. actuators are marked, by means of laser engraving or a label, with the manufacturer's logo and address, the code or the serial number, the size, the output torque, the working pressure and the maximum working temperature and the production date.

Marking of versions where the temperature is different from the standard one:

low temperature version: T. min.= -50°C T. max=60°C

high temperature version: T. min.= -20°C T. max=150°C

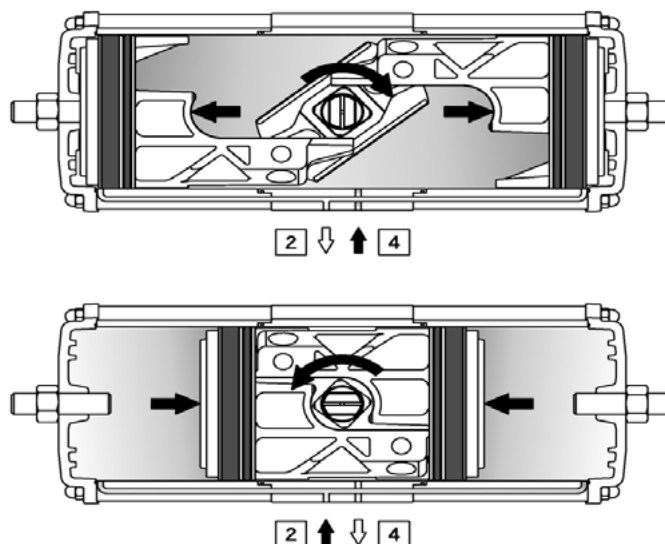


3) OPERATION AND ROTATION DIRECTION

a. Double acting.

The actuator pistons are mounted as shown in the figure below. This provides the maximum torque at the beginning of valve opening, for valves that close in a clockwise direction.

Port 2 is in connection with the side chambers of the cylinder, by pressurizing such connection of a standard double-acting actuator DA, the shaft rotates counter-clockwise to open, while port 4 is connected with the intermediate chamber and when pressurized, the drive shaft rotates clockwise to close.

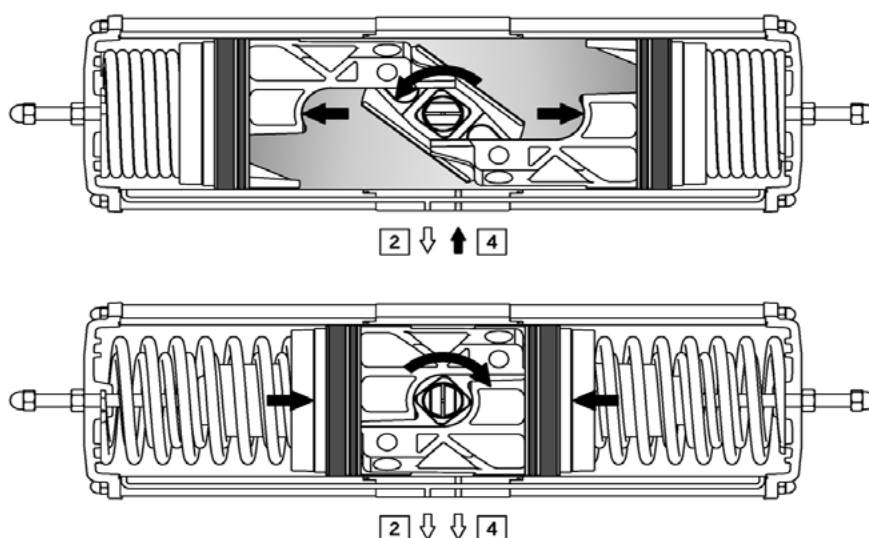


b. Spring return - normally closed

The pistons of the SR type actuators are mounted as shown in the figure below.

Caution. Install a filter on connection 2, in order to prevent the access of dust or dirt inside the actuator chambers, during the spring action.

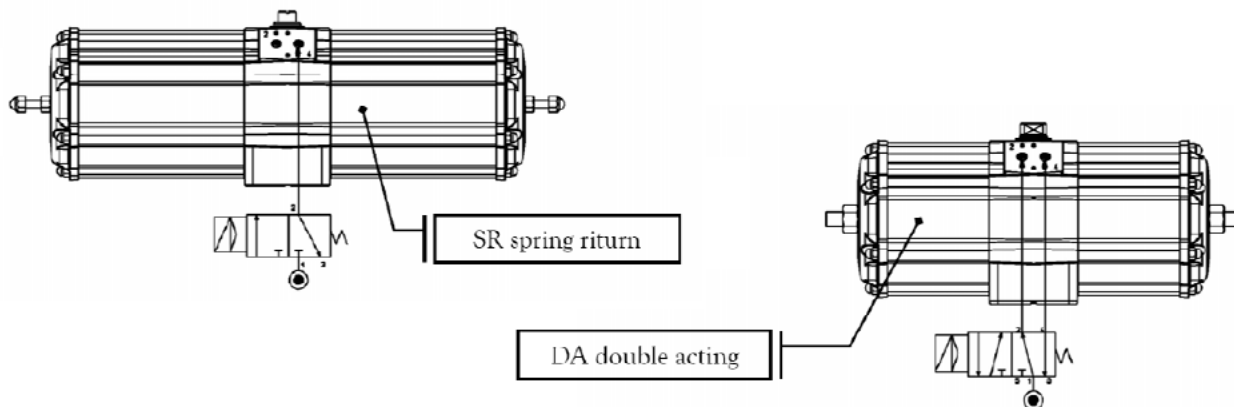
The remote control functionality of the actuators must be done through a direct connection with solenoid valves and the EN15714-3 - NAMUR (VDI / VDE 3845) standard interface or with pipes screwed on the ports marked with the numbers 2 and 4.




TYPICAL CONNECTION LAYOUT

Actuator positioning and rotation direction

The positioning and the rotation direction of the actuator, to ensure a maximum opening torque, must be in conformity with the standard EN 15714-3 point 4.5.4 and the valve coupling according to the EN ISO 5211 standard.



4) SAFETY INFORMATION

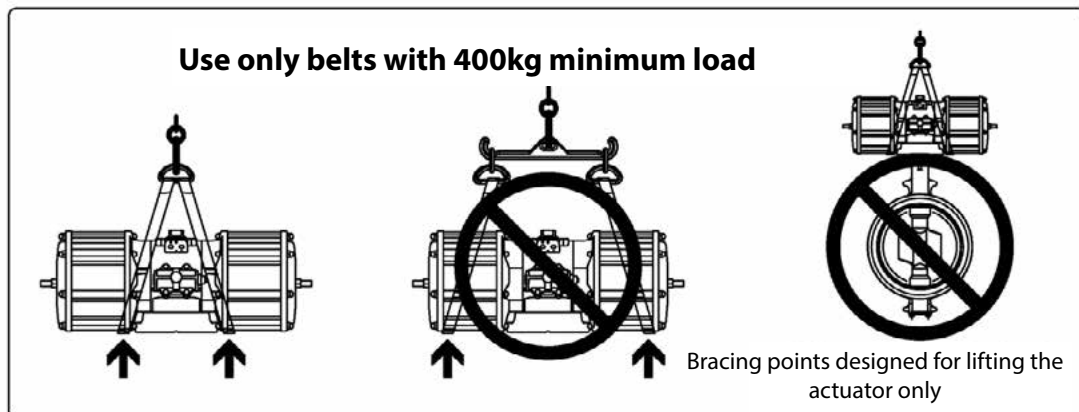
- The actuator must be used within the specified pressure limits; operation beyond these limits may damage the internal parts of the actuator.
- The actuator operation out of the range of temperatures indicated could damage its internal or external parts.
- Using the actuator, without the due external protection, may damage it in corrosive environments.
- Before the installation, repair or maintenance be sure that the actuator is not pressurized, disconnect the air lines and verify that they have vented.
- Do not remove the caps when the actuator is installed online or while it's still pressurized.
- Do not remove the spring cap, this operation may be carried out by qualified personnel only; such operation could cause personal injuries.
- Before installing the actuator on the valve be sure that the rotation of one is in phase with the rotation of the other and that the shaft slit position is correct.
- Before installing the actuated valve, carry out a few dry cycles in order to check the proper fitting between valve and actuator.
- Carry out the installation in compliance with the national local regulations and laws.
- Before installing a pneumatic actuator bearing the marking  in accordance with EX regulations, carefully read the additional instructions, supplied together with the product, regarding the use in explosive atmospheres.

5) INSTALLATION INSTRUCTIONS

The installation of an actuator allows to open and close a valve, which is installed in a system, without manual operation, by means of an electric-pneumatic remote control.

The normal sizing of the actuators requires to consider an appropriate safety margin for the breakaway torque which is necessary for the valve to operate properly. The plant project, physical or chemical characteristics of the fluids, special environmental conditions, may require an increase of the safety factor to be applied to the sizing.

To lift the actuator without damaging it, see the below image.



Prior to installation verify that valve and actuator comply with the safety standards described above. Utmost cleanliness is required when connecting the air supply to the actuator. All parts of the plant, reductions, joints, plates, brackets and equipment must be thoroughly cleaned. Before mounting the actuator on the valve be sure that both elements are correctly oriented, depending on the rotation direction needed.

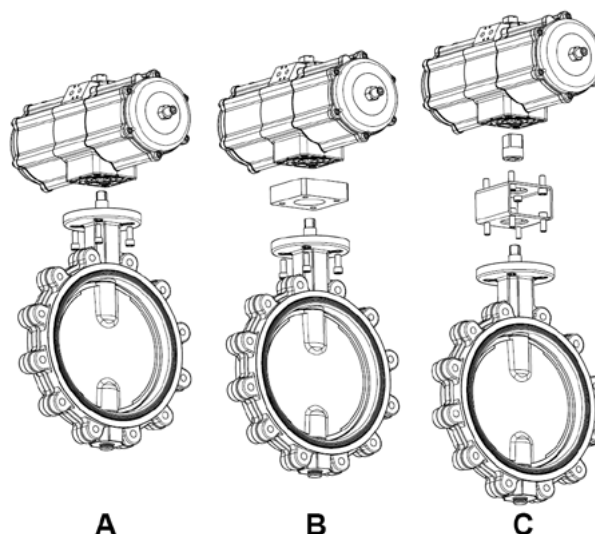
- Before installation, visually check that the conditions of the actuator are good, since it's been transported and stored.
- Carefully read the OMAL S.p.A. instructions contained in the cardboard box.
- Verify performance and limits found on the actuator body to see whether it's suitable for the application or not.
- Remove the plastic protective covers from the ports and insert whichever filters as pointed out in paragraph 2.
- Prior to mounting the actuator on the valve, clean both from dust and dirt.
- Verify the valve position, closed or open, and the rotation direction.
- Verify the actuator position and the rotation direction based on the valve, especially for the installation of the SR version "normally closed" and "normally open".
- The SR versions "normally closed" are always supplied in the closed position.
- The SR versions "normally open" are always supplied in the open position.

Assembly of Valve/Actuator:

A) DIRECT INSTALLATION

The direct installation of valve and actuator is the best way in order to avoid backlash between the valve stem and the actuator shaft. For direct installation, there should be the same standard flange connection both on the valve and on the actuator, and the dimensions of the valve stem should fit perfectly with those of the actuator shaft. Before installation, please check that the actuator and the valve both have ISO flanges of the same size, also check that the dimensions of the valve stem and its shape are suitable for direct mounting: use a reduction if necessary.

Mount the valve stem in the housing on the actuator shaft and bolt the two ISO flanges together.



B) INSTALLATION WITH CONNECTION PLATE

In the cases where a direct installation is not possible, due to small differences between the actuator and valve flanges and/or shafts, it's possible to carry out the installation with a connection plate for easy positioning and of appropriate sizing.

C) ASSEMBLY WITH A BRACKET AND CONNECTION JOINT

Where, for technical installation reasons and due the system, a certain distance is required between the valve and actuator, or the flanges and the valve stem are not standard, or where direct installation is not possible, the right solution is given by a bracket and a connecting joint. The bracket is a steel bridge that allows to connect the valve on one side and the appropriate connection for the actuator on the opposite side, leaving the space for a steel joint. The joint allows the transmission of the torque between the actuator and the valve and is essential in the case of stem drives with keys.

Choose a joint that is appropriate for the flange and the right connections for bolting the actuator on the valve without backlash.

WARNING

The OMAL S.p.A. actuators, with their drainage system in the flange connection area, have been designed especially for valve direct mounting.

This system prevents any damage to the actuator due to possible fluid dripping from the valve stem.

Tightening torque of the screws

| SIZE | TORQUE Nm |
|------|-----------|
| M10 | 45-50 |
| M12 | 80-85 |
| M14 | 125-135 |
| M16 | 190-200 |
| M20 | 370-390 |

Stroke adjustment

Both actuator versions, spring return and double acting, can have a stroke adjustment.

See the below instructions:

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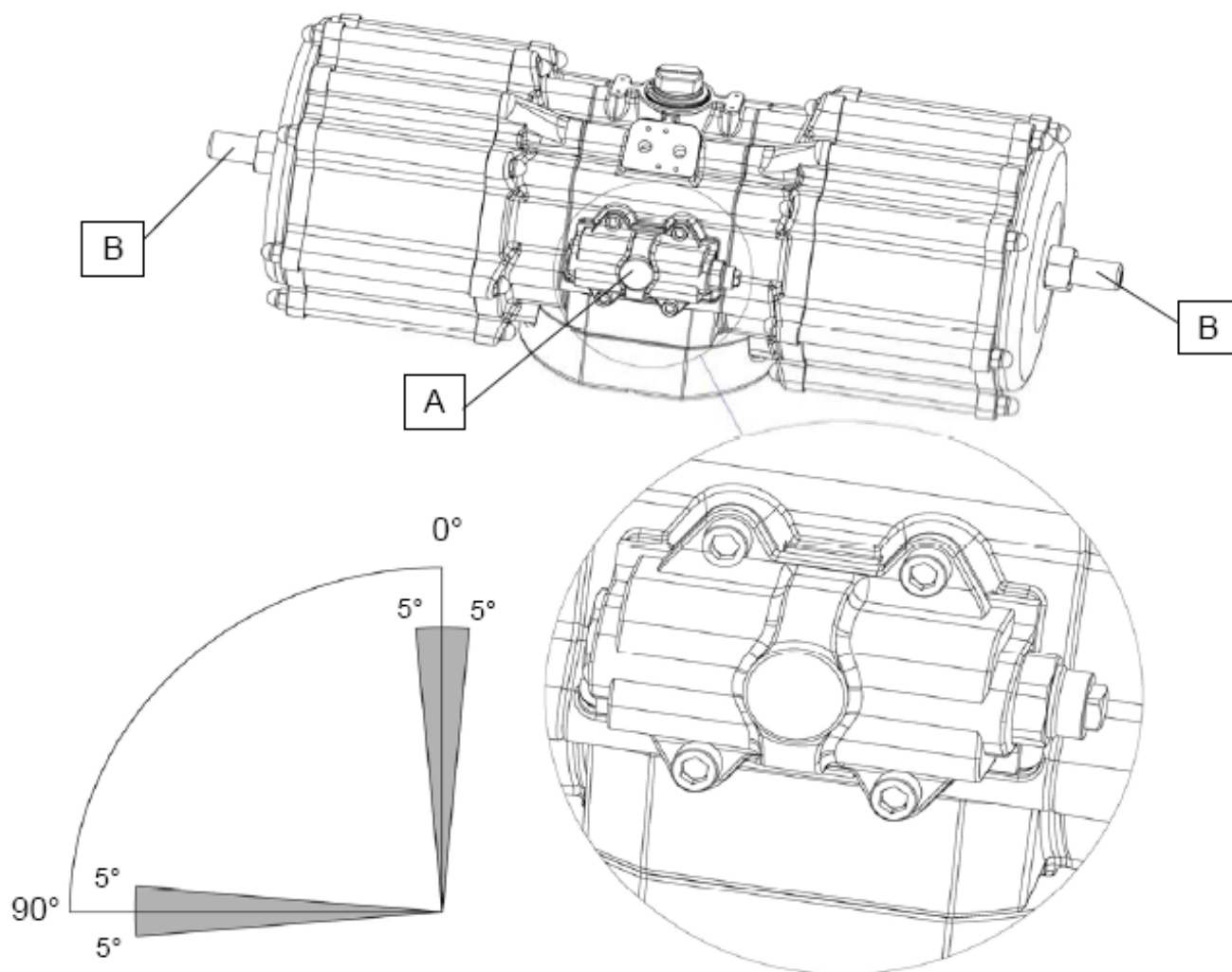
Actuators DA3840 - DA5760 - DA8000

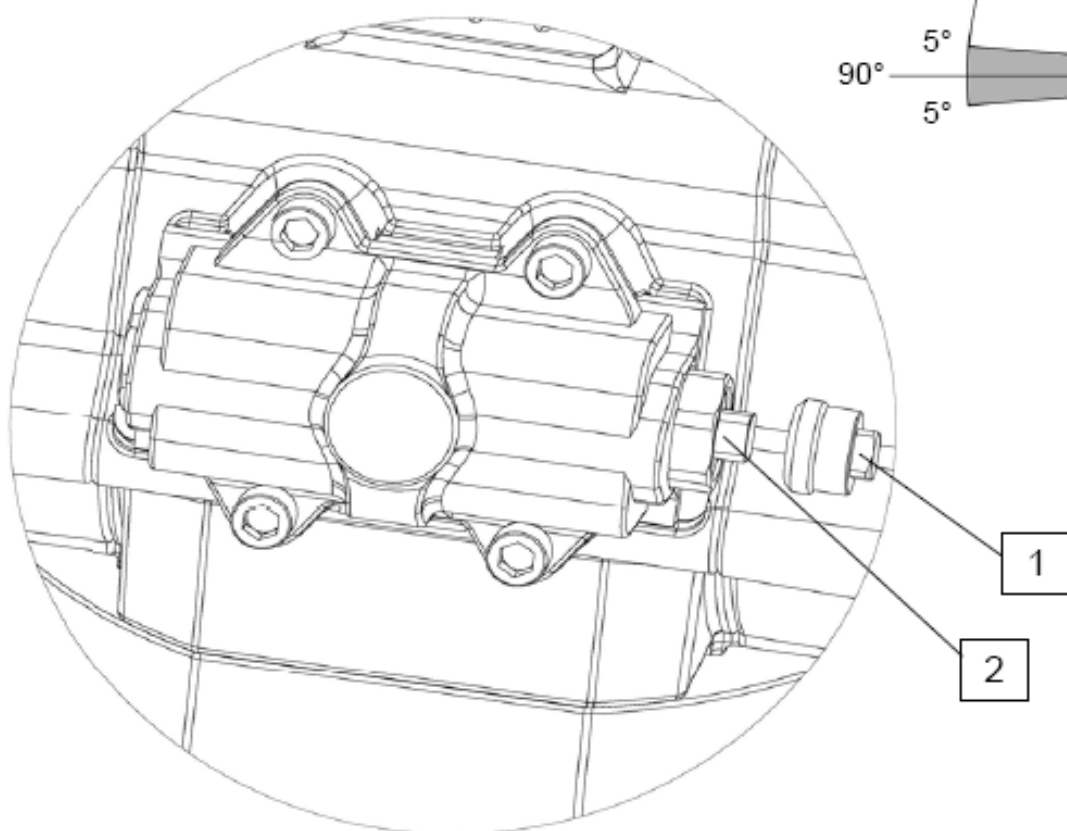
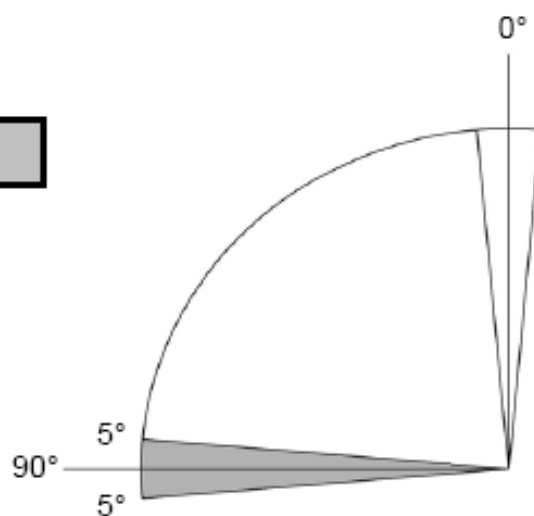
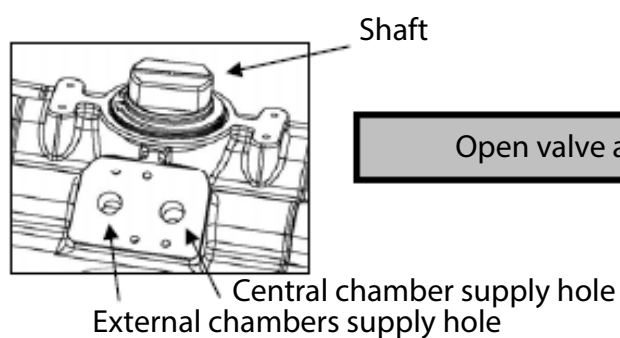
FOREWORD

The adjustment of the actuator is possible in both open and closed positions.
 By operating on the adjusting center block (A) the opening can be adjusted, while the closing can be adjusted by turning the two screws (B)

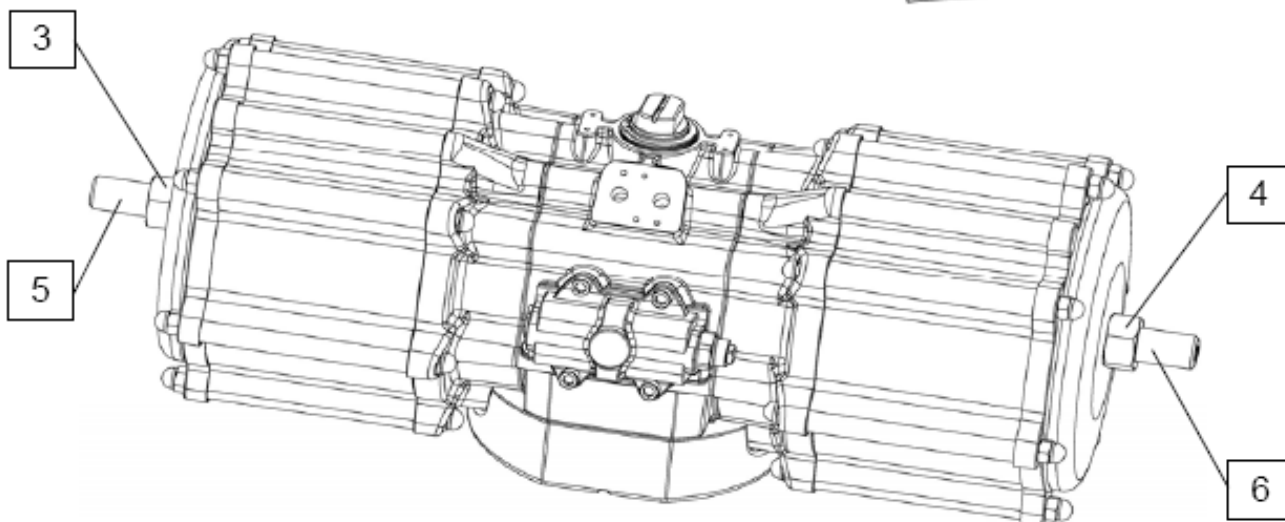
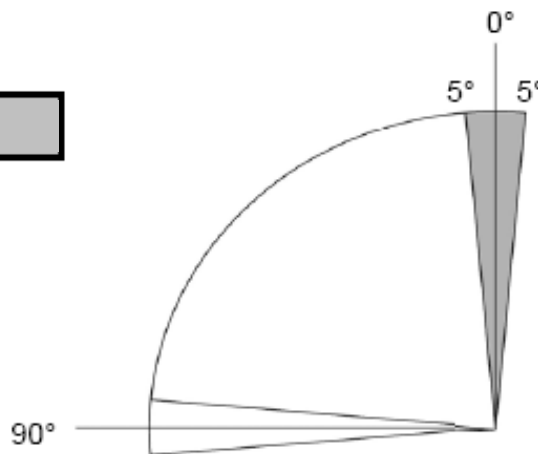
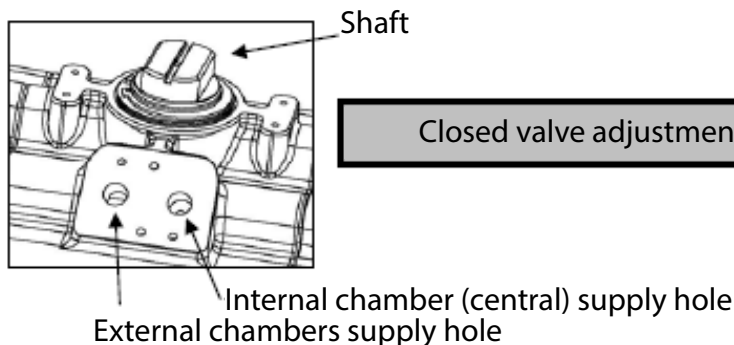
ATTENTION

Any type of adjustment must always be carried out when the actuator chambers are not pressurized.
 The chambers can be pressurized, to check the adjustment, only when the center block (A) and the side screws (B) are correctly tightened.
 The actuator is provided with a standard adjustment of 0° closed, 90° open.
 The actuator is to be lined up with the pipeline





- 1) Make sure that both chambers are pressurized
- 2) Unscrew the protection cap completely
- 3) Rotate the screw (2) in a clockwise direction if you want to increase the opening angle, in a counter-clockwise direction if you want to decrease such angle
- 4) Put cap back on and tighten it (1) making sure that also the screws and the side nuts are tightened correctly
- 5) Power up the actuator and operate it
- 6) Verify that the adjustment obtained is the desired one, otherwise repeat the operations from step 1.



- 1) Make sure that both chambers are not pressurized
- 2) Loosen the lock nuts (3 and 4)
- 3) Rotate the screws (5-6) in a clockwise direction if you want to decrease the closing angle, in a counter-clockwise direction if you want to increase such angle (both screws must be rotated of the same amount)
- 4) Tighten the nuts (3-4)
- 5) Pressurize the internal chamber with the least pressure enough for the movement of the internal pistons (it can be seen precisely from the shaft rotation)
- 6) Verify that the adjustment obtained is the desired one, otherwise repeat the operations from step 1.
- 7) Keep the actuator internal chamber pressurized.
- 8) Loosen the lock nuts (3-4)
- 9) Verify that both screws (5-6) lean on the internal piston, they will be hard to rotate, if that is not so, tighten the loose screw (clockwise) until it touches the piston
- 10) Tighten the nuts (3-4)
- 11) Power up the actuator and operate it
- 12) Verify that the adjustment obtained is the desired one, otherwise repeat the operations from step 1.

ACTUATOR DA 2880

The adjustment of the actuator is possible in both open and closed positions.

It can be adjusted by turning the side screws (A-B)

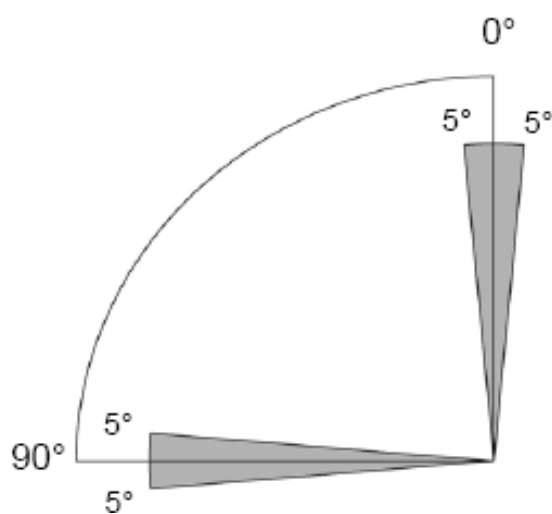
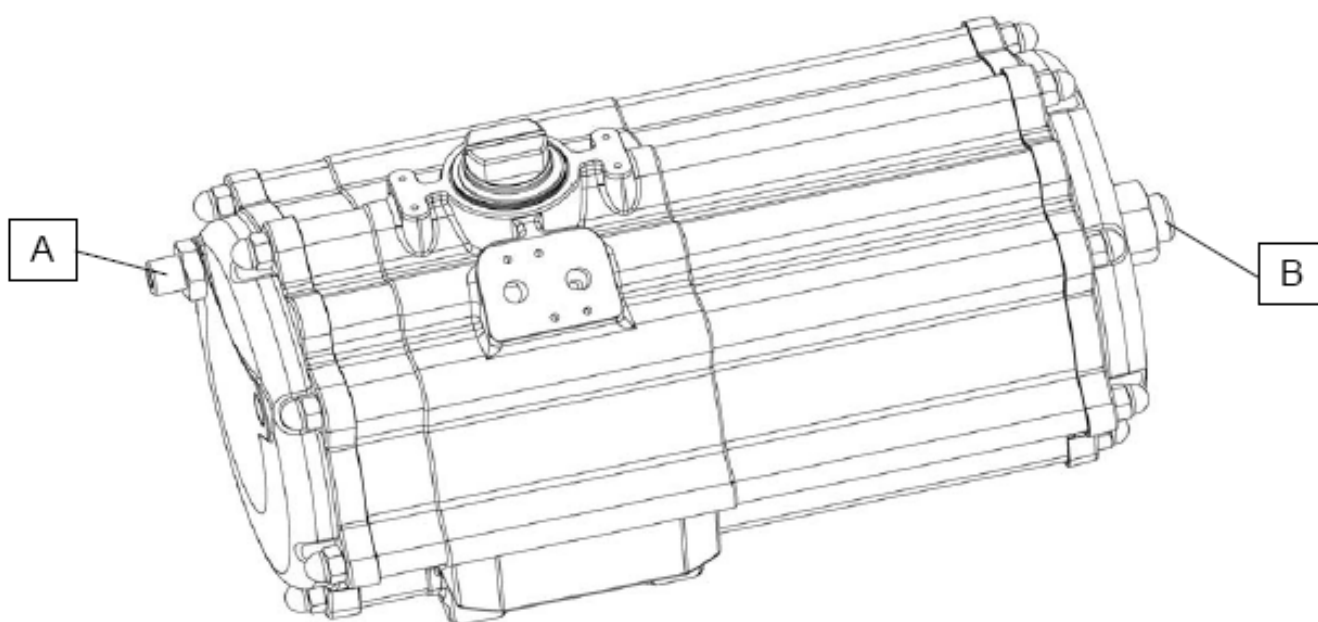
ATTENTION

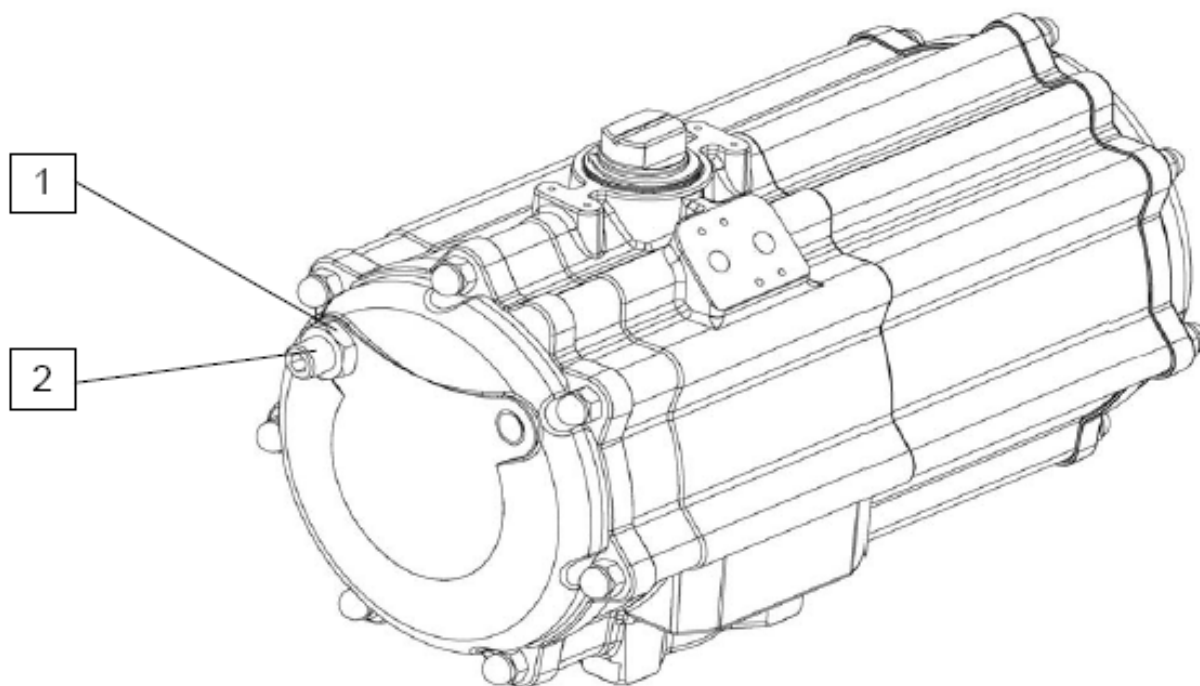
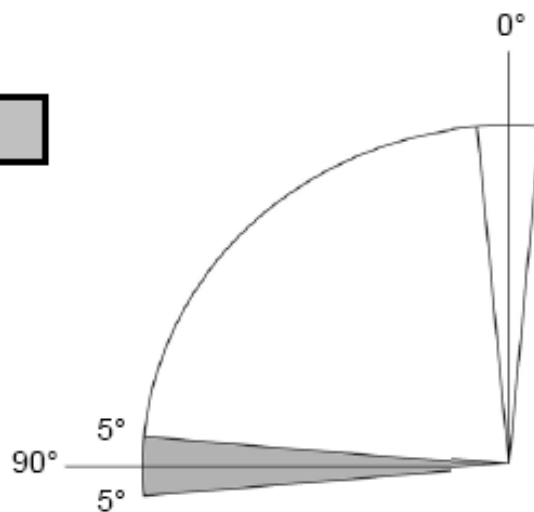
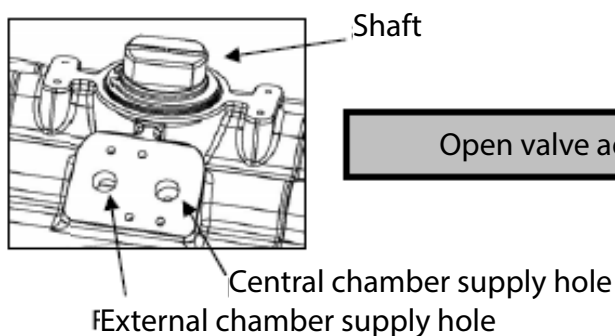
Any type of adjustment must always be carried out when the actuator chambers are not pressurized

The chambers can be pressurized, to check the adjustment, only when the side screws are correctly tightened.

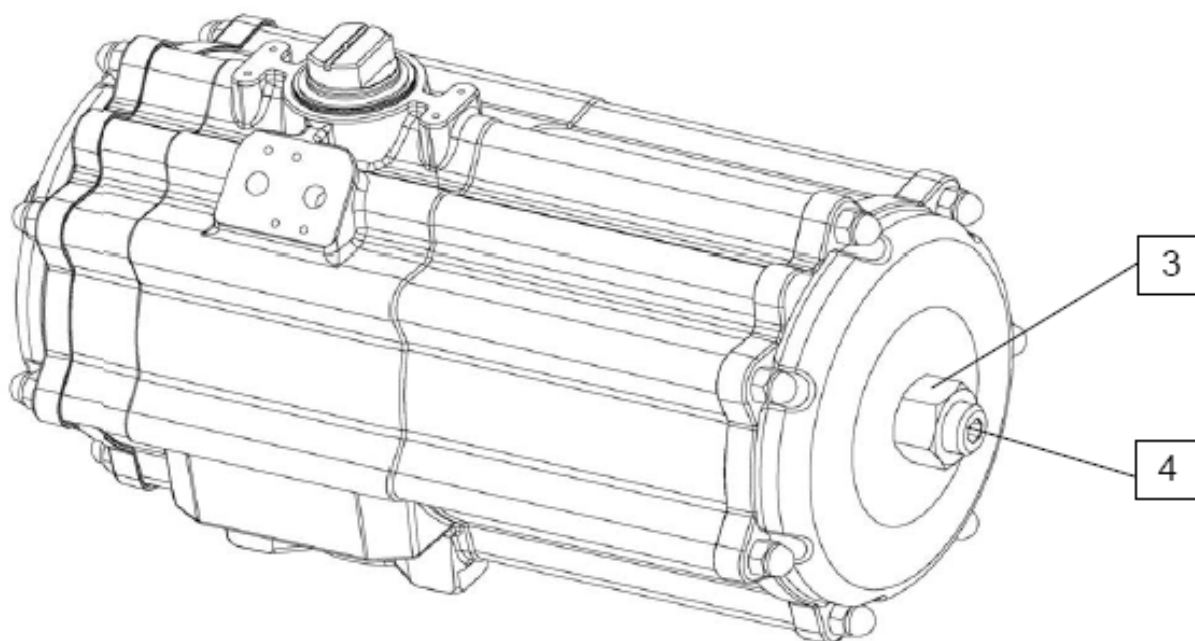
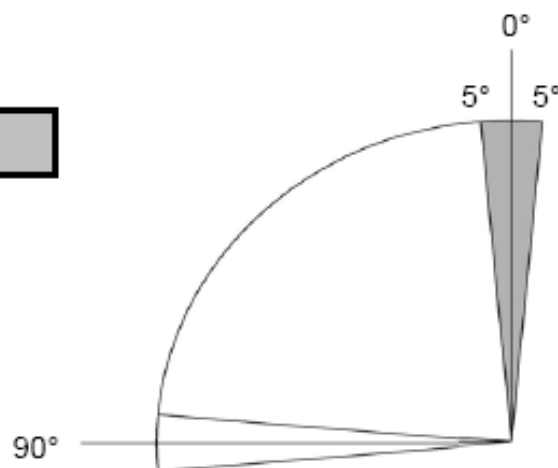
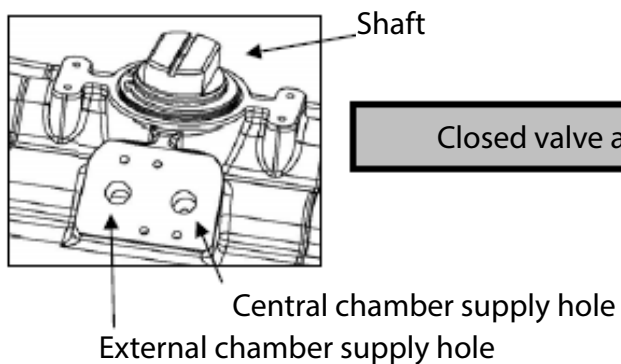
The actuator is provided with a standard adjustment of 0° closed, 90° open.

The actuator is to be lined up with the pipeline.





- 1) Make sure that both chambers are not pressurized
- 2) Loosen the lock nut (1)
- 3) Rotate the screw (2) clockwise to decrease the opening angle, in a counter clockwise direction to increase such angle
- 4) Tighten the lock nut
- 5) Power up the actuator and operate it
- 6) Verify that the adjustment obtained is the desired one, otherwise repeat the operations from step 1.



- 1) Make sure that both chambers are not pressurized
- 2) Loosen the lock nut (3)
- 3) Rotate the screw (4) clockwise to decrease the closing angle, in a counter clockwise direction to increase such angle
- 4) Tighten the lock nut (3)
- 5) Power up the actuator and operate it
- 6) Verify that the adjustment obtained is the desired one, otherwise repeat the operations from step 1.

ACTUATORS SR1920 - SR2880 - SR4000

FOREWORD

The adjustment of the actuator is possible in both open and closed positions.

By operating on the adjusting center block (A) the closing can be adjusted, while the opening can be adjusted by turning the two screws (B).

ATTENTION

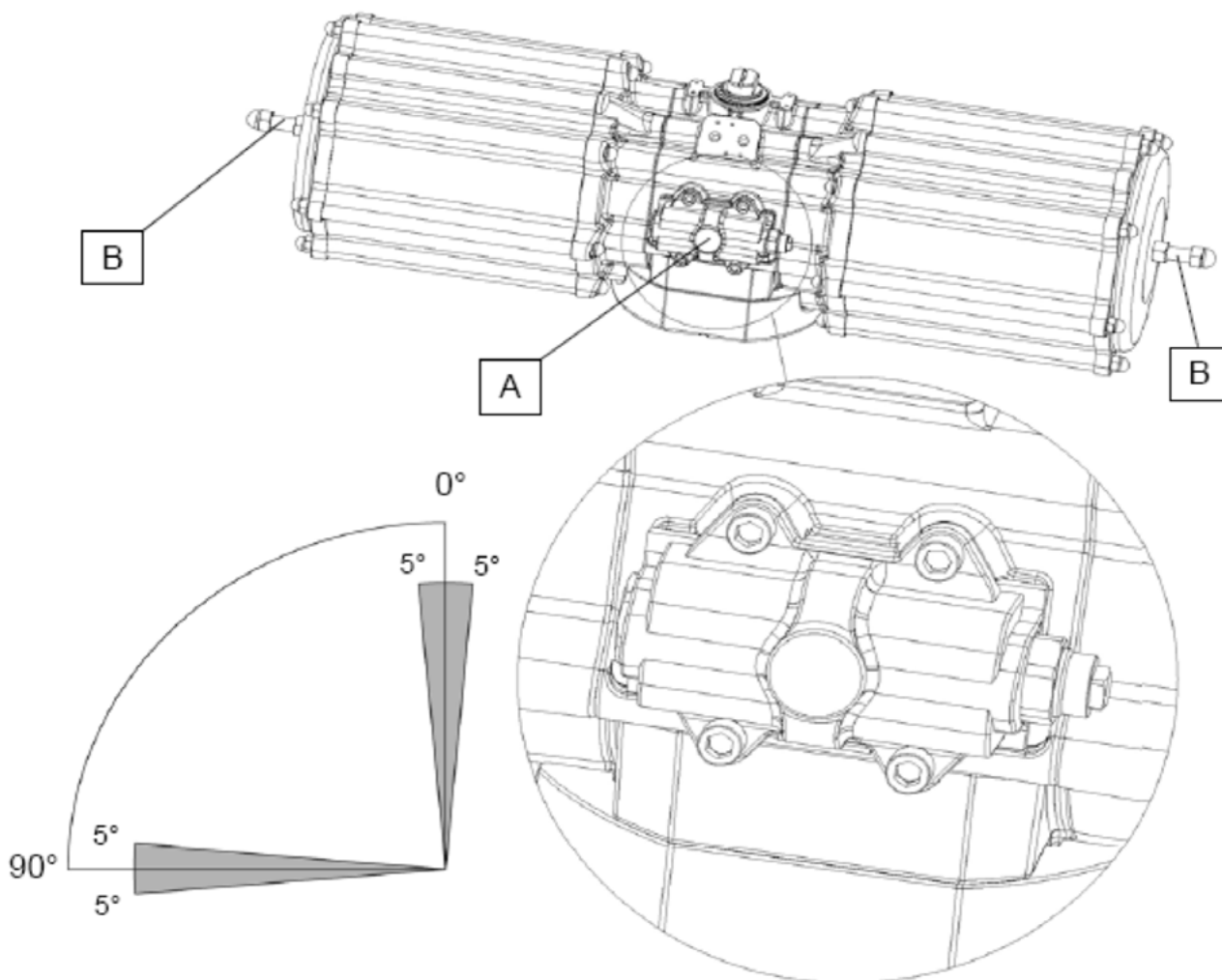
The adjustment and checking must always be carried with low pressure (the least pressure enough for the movement)

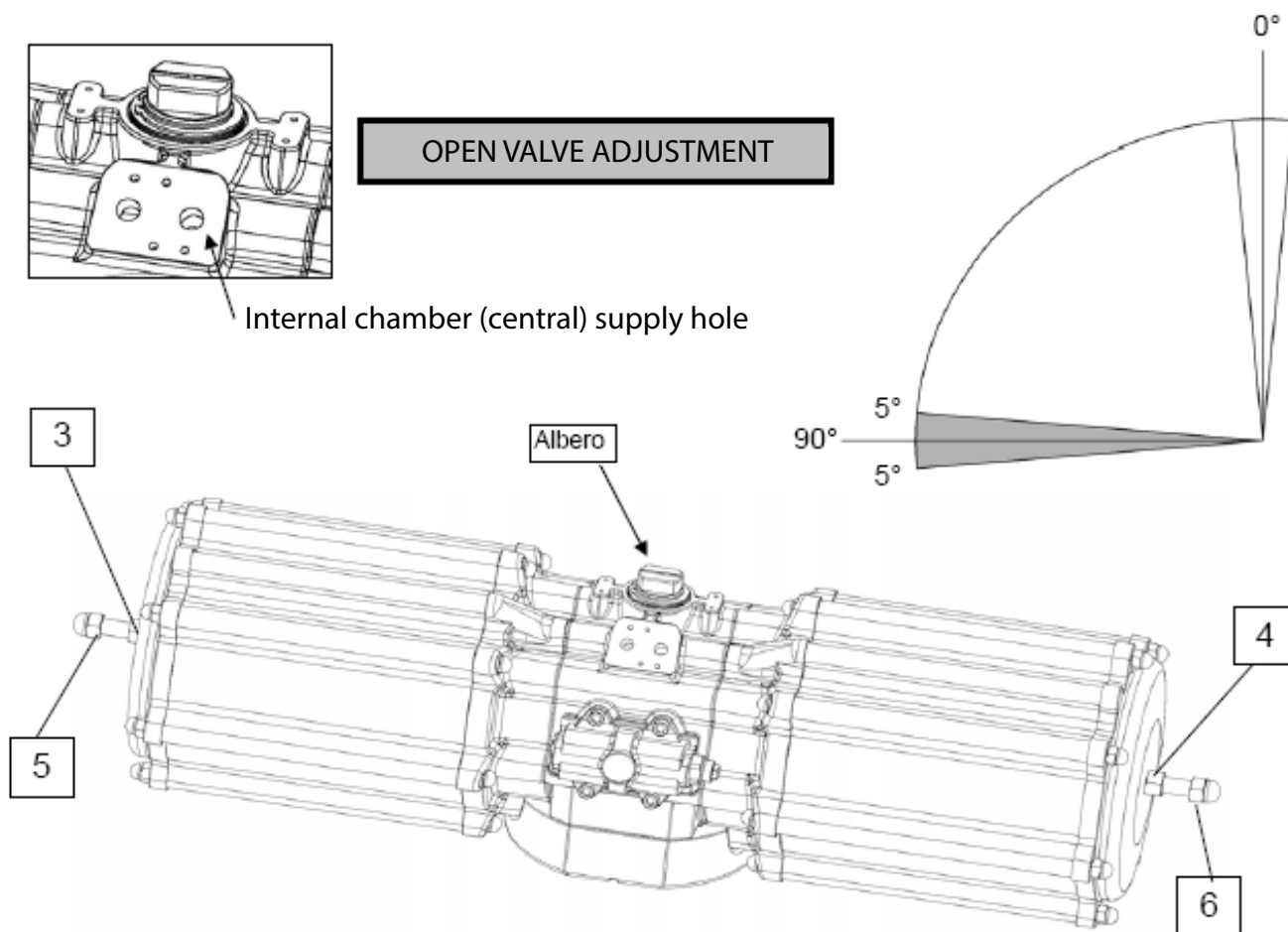
The chambers can be pressurized, to check the adjustment, only when the center block (A) and the side screws (B) are correctly tightened.

The actuator is provided with a standard adjustment of 0° closed, 90° open.

The actuator is to be lined up with the pipeline

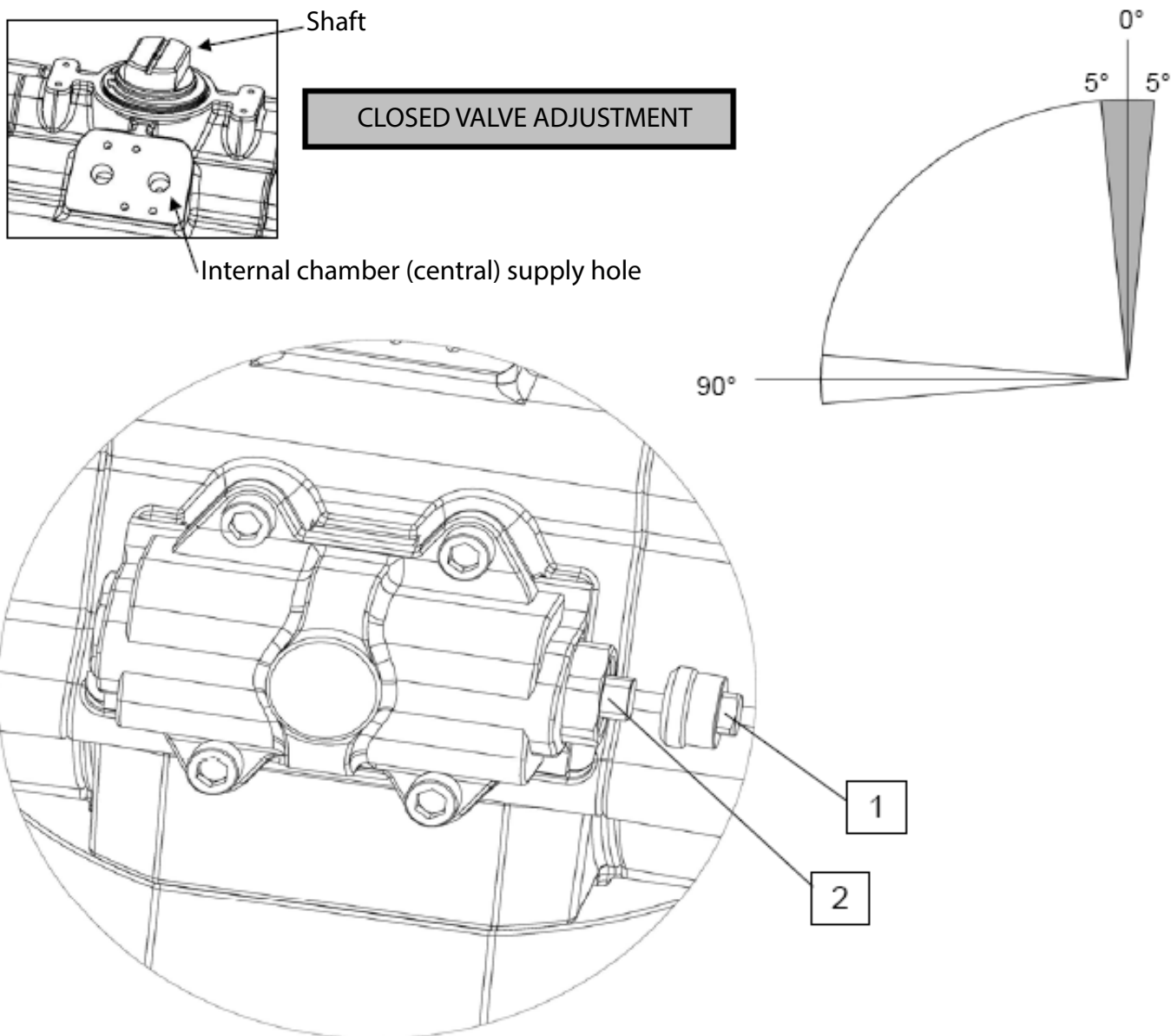
NOTE: WARNING: NEVER UNCREW THE "COMPRESSED SPRINGS" COVER SCREWS DANGER FOR THE OPERATOR





- 1) Make sure that both chambers are not pressurized
- 2) Loosen the lock nuts(3-4)
- 3) Rotate the screws (5-6) in a clockwise direction if you want to decrease the opening angle, in a counter-clockwise direction if you want to increase such angle (both screws must be rotated of the same amount)
- 4) Tighten the lock nuts (3-4)
- 5) Pressurize the internal chamber with the least pressure enough for the movement of the internal pistons (it can be seen precisely from the shaft rotation)
- 6) Verify that the adjustment obtained is the desired one (open valve), otherwise repeat the operations from step 1.
- 7) Keep the actuator internal chamber pressurized,
- 8) Loosen the lock nuts(3-4)
- 9) Verify that both screws (5-6) lean on the internal piston, they will be hard to rotate, if that is not so, tighten the loose screw (clockwise) until it touches the piston.
- 10) Tighten the lock nuts(3-4)
- 11) Power up the actuator with the nominal pressure and operate it.
- 12) Verify that the adjustment obtained is the desired one, otherwise repeat the operations from step 1.

NOTE: WARNING: NEVER UNCREW THE "COMPRESSED SPRINGS" COVER SCREWS DANGER FOR THE OPERATOR.



- 1) Pressurize the internal chamber (central) with the least pressure enough for the movement of the internal pistons (it can be noticed from the outside due to the partial rotation of the shaft)
- 2) Unscrew the safety cap completely (1)
- 3) Rotate the screw (2) in a clockwise direction if you want to increase the closing angle, in a counter-clockwise direction if you want to decrease such angle.
- 4) Reset the cap
- 5) Remove the pressure from the internal chamber
- 6) Verify that the adjustment obtained is the desired one, otherwise repeat the operations from step 1.

ACTUATOR SR1440**FOREWORD**

The adjustment of the actuator is possible in both open and closed positions.

By turning the side grub screw (A) the closing can be adjusted, while the opening can be adjusted by turning the side screw.

ATTENTION

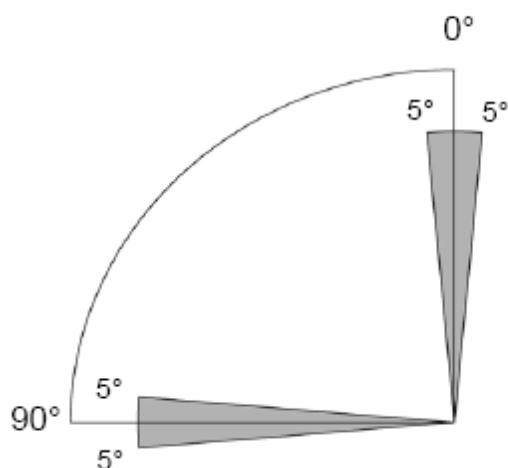
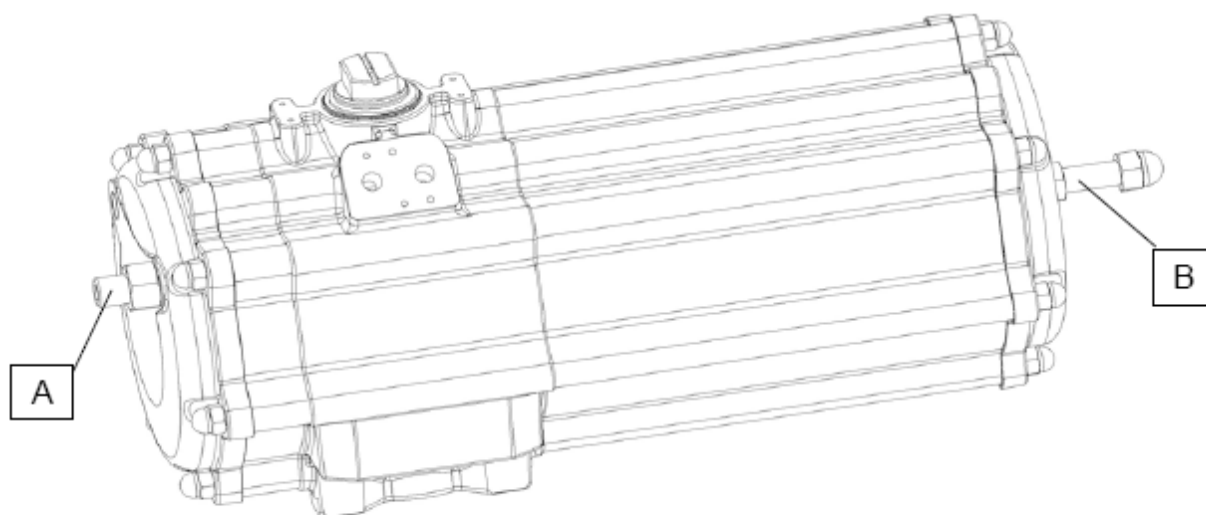
The adjustment and checking must always be carried with low pressure (the least pressure enough for the movement)

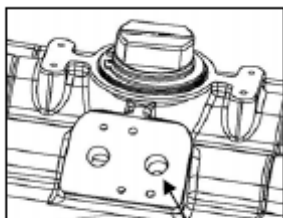
The chambers can be pressurized, to check the adjustment, only when the side screws are correctly tightened.

The actuator is provided with a standard adjustment of 0° closed, 90° open.

The actuator is to be lined up with the pipeline.

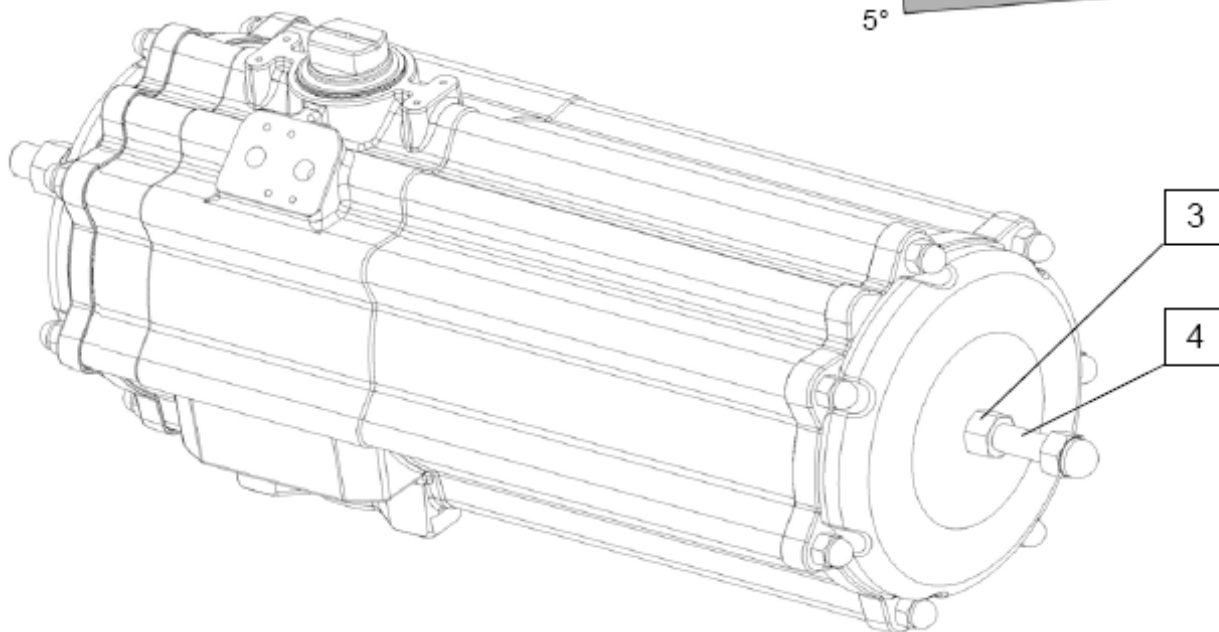
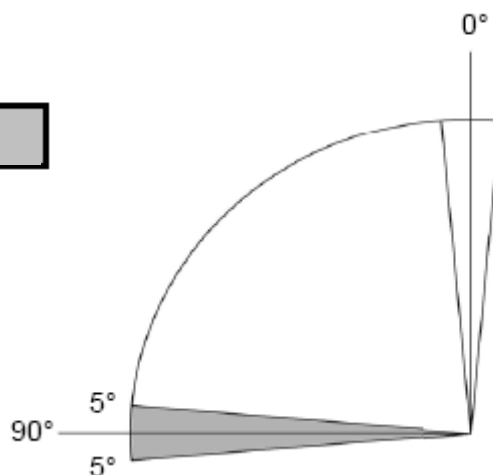
NOTE: WARNING: NEVER UNCREW THE "COMPRESSED SPRINGS" COVER SCREWS DANGER FOR THE OPERATOR.





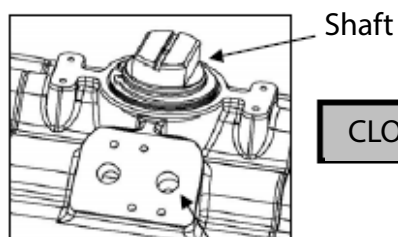
OPEN VALVE ADJUSTMENT

Internal chamber (central) supply hole



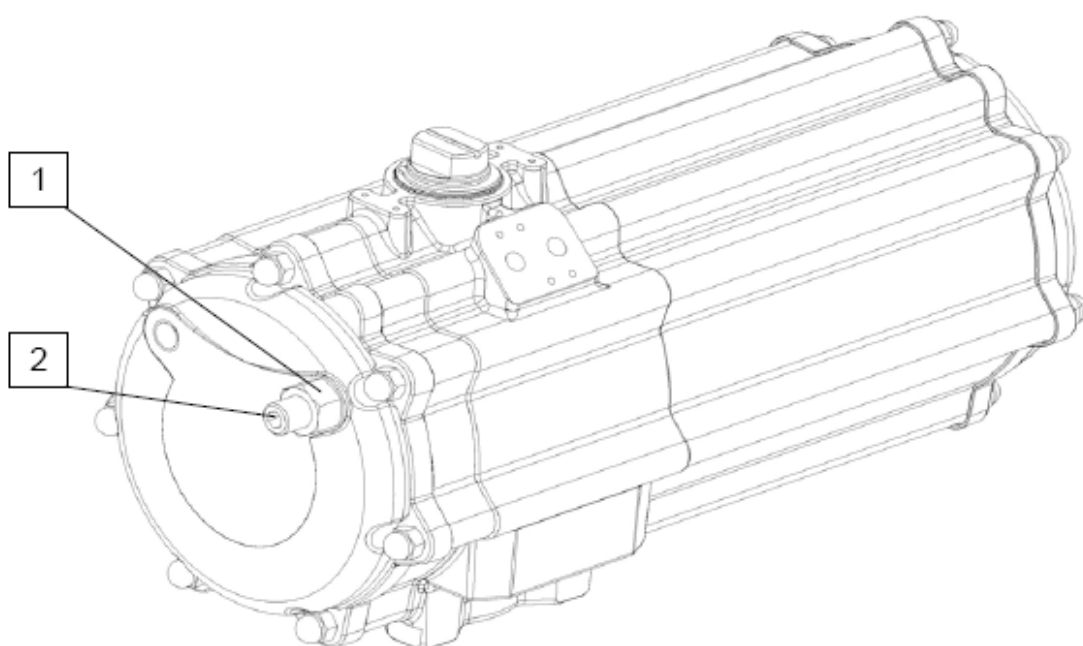
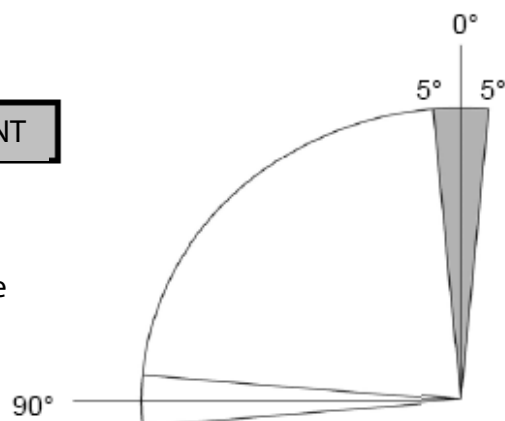
- 1) Make sure that both chambers are not pressurized
- 2) Loosen the lock nut (3)
- 3) Rotate the screw (4) in a clockwise direction to decrease the opening angle and in a counter clockwise direction to increase such angle
- 4) Tighten the lock nut (3)
- 5) Pressurize the internal chamber with the least pressure enough for the movement of the internal piston (it can be noticed from the outside due to the partial rotation of the shaft)
- 6) Verify that the adjustment obtained is the desired one, otherwise repeat the operations from step 1.

NOTE: WARNING: NEVER UNCREW THE "COMPRESSED SPRINGS" COVER SCREWS DANGER FOR THE OPERATOR.



CLOSED VALVE ADJUSTMENT

Internal chamber (central) supply hole



- 1) Pressurize the internal chamber with the least pressure enough for the movement of the internal piston (it can be noticed from the outside due to the partial rotation of the shaft)
- 2) Loosen the lock nut (1)
- 3) Rotate the screw (2) in a clockwise direction to decrease the closing angle and in a counter clockwise direction to increase such angle.
- 4) Tighten the lock nut (1)
- 5) Remove the power
- 6) Verify that the adjustment obtained is the desired one, otherwise repeat the operations from step 1.

6) MATERIALS AND THEIR DURABILITY

The OMAL S.p.A. actuators are designed to have minimal maintenance-free resistance, in accordance with EN 15714-3, as shown in the following table:

| Nominal Torque (a) Nm | Least number of cycles expected for pistons and cylinder (b) | Least cycle rate from 0-90° in seconds "s" |
|--------------------------|---|---|
| ≤125 | 500 000 (c) | 3 |
| ≤1 000 | 500 000 | 5 |
| ≤2 000 | 250 000 | 8 |
| ≤8 000 | 100 000 | 15 |
| ≤32 000 | 25 000 | 20 |
| ≤63 000 | 10 000 | 30 |
| ≤125 000 | 5 000 | 45 |
| ≤250 000 | 2 500 | 60 |

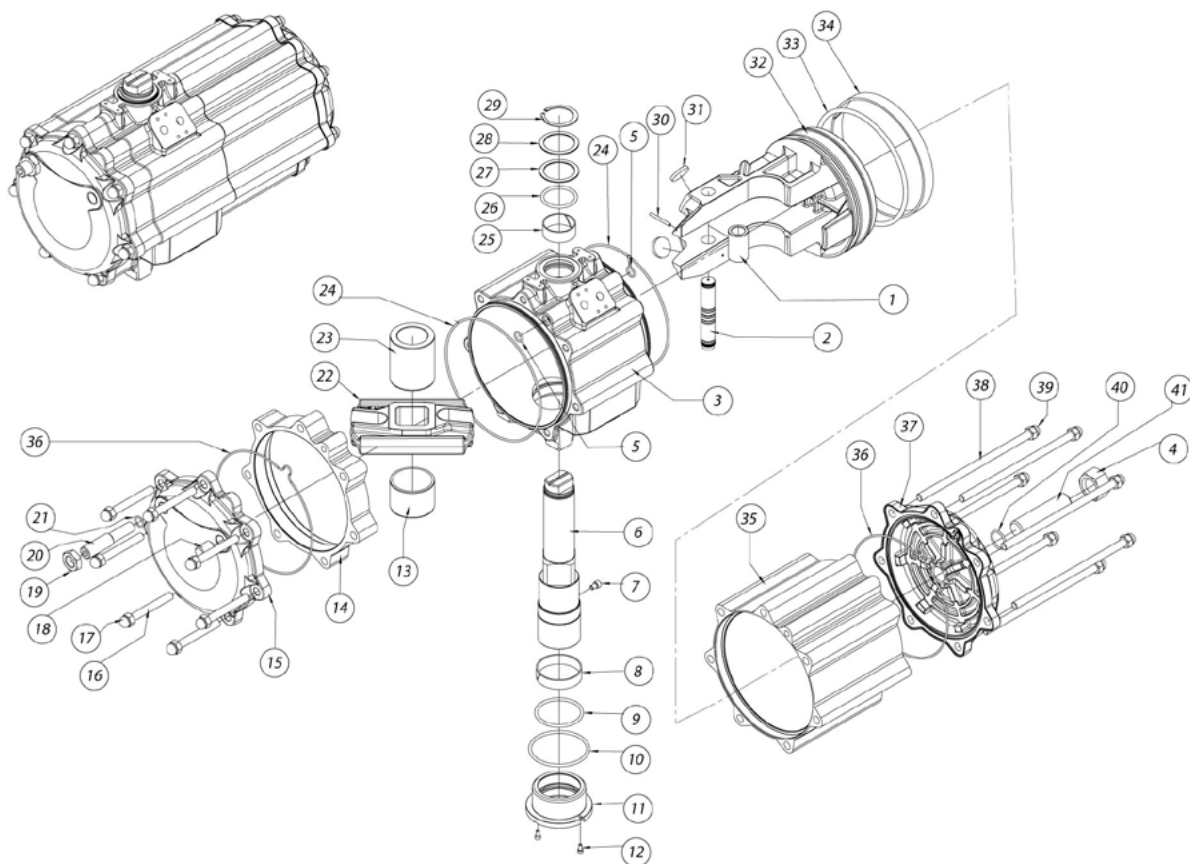
a on the basis of EN ISO 5211.

b a cycle is made up of nominal 90° in both directions (90° to open + 90° to close). For values other than 90 ° as working angle, the duration is to be arranged between the manufacturer and the user.

c For thermoplastic actuators, the least number of cycles is 250 000.

Note: Values based on a load of at least 60% of the stroke torque at 0,55 MPa \cong 5,5 bar supply and according to the test procedure described in attachment A of the EN 15714-3 standard.

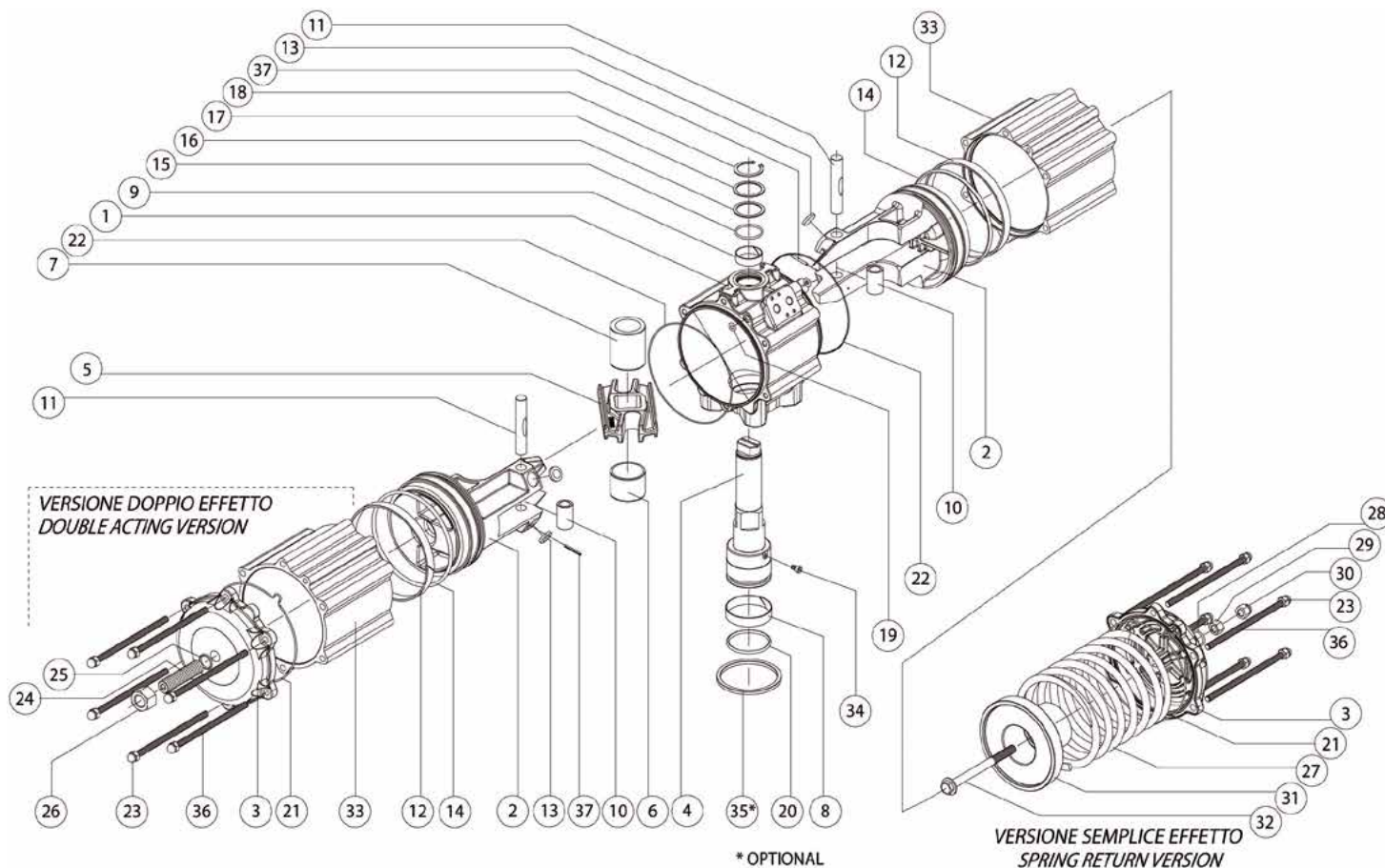
COMPONENTS OF DOUBLE ACTING PNEUMATIC ACTUATOR SIZE: DA2880



MATERIALS

| Pos | Description | Pos | Description |
|-----|-----------------------|-----|-----------------------|
| 1 | Description | 22 | Yoke Scotch yoke |
| 2 | Steel bush | 23 | Shaft bearing/support |
| 3 | Steel pin | 24 | O-ring |
| 4 | Body | 25 | Upper support |
| 5 | Nut | 26 | O-ring |
| 6 | O-ring | 27 | External support ring |
| 7 | Shaft | 28 | Washer |
| 8 | Screw | 29 | Seeger |
| 9 | Lower support | 30 | Spring pin |
| 10 | O-ring | 31 | Disks |
| 11 | O-ring | 32 | Piston |
| 12 | Lower support bushing | 33 | O-ring |
| 13 | Screw for bush | 34 | Bearing (piston head) |
| 14 | Shaft bearing | 35 | Side cylinder |
| 15 | Shim | 36 | O-ring |
| 16 | Cap | 37 | Cap |
| 17 | Assembly screw | 38 | Assembly screw |
| 18 | Cap nut | 39 | Cap nut |
| 19 | Screw (Cap) | 40 | O-ring |
| 20 | Nut | 41 | Adjustment screw |
| 21 | Adjustment screw | | |

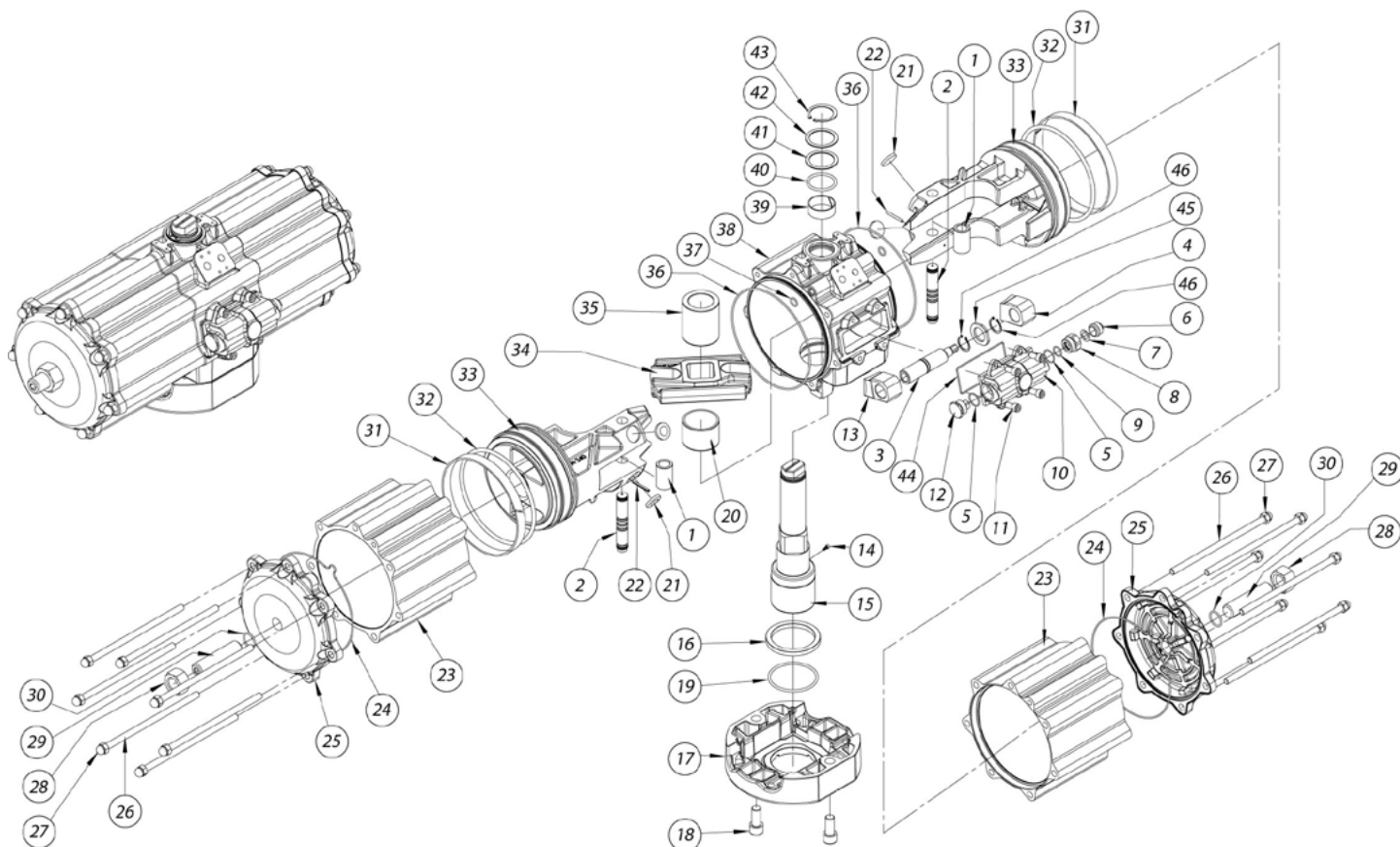
COMPONENTS OF DOUBLE ACTING PNEUMATIC ACTUATOR SIZE : DA3840-SR1920



MATERIALS

| Pos | Description | Pos | Description |
|-----|-----------------------|-----|----------------------|
| 1 | Cylinder | 20 | Lower shaft O-ring |
| 2 | Piston | 21 | Cap O-ring |
| 3 | Cap | 22 | O-ring Body-cylinder |
| 4 | Shaft | 23 | Cap nut |
| 5 | Yoke | 24 | Adjustment screw |
| 6 | Shaft bearing | 25 | Screw O-ring |
| 7 | Shaft bearing/support | 26 | Nut |
| 8 | Lower support band | 27 | Spring |
| 9 | Upper support band | 28 | Adjustment O-ring |
| 10 | Steel bush | 29 | Nut |
| 11 | Steel pin | 30 | Cap nut |
| 12 | Bearing (piston head) | 31 | Spring container |
| 13 | Support disk | 32 | Spring screw |
| 14 | Piston O-ring | 33 | Side Cylinder |
| 15 | Upper shaft O-ring | 34 | Screw |
| 16 | External support ring | 35* | Centering ring |
| 17 | Washer | 36 | Assembly screw |
| 18 | Seeger | 37 | Spring pin |
| 19 | Air pipe O-ring | | |

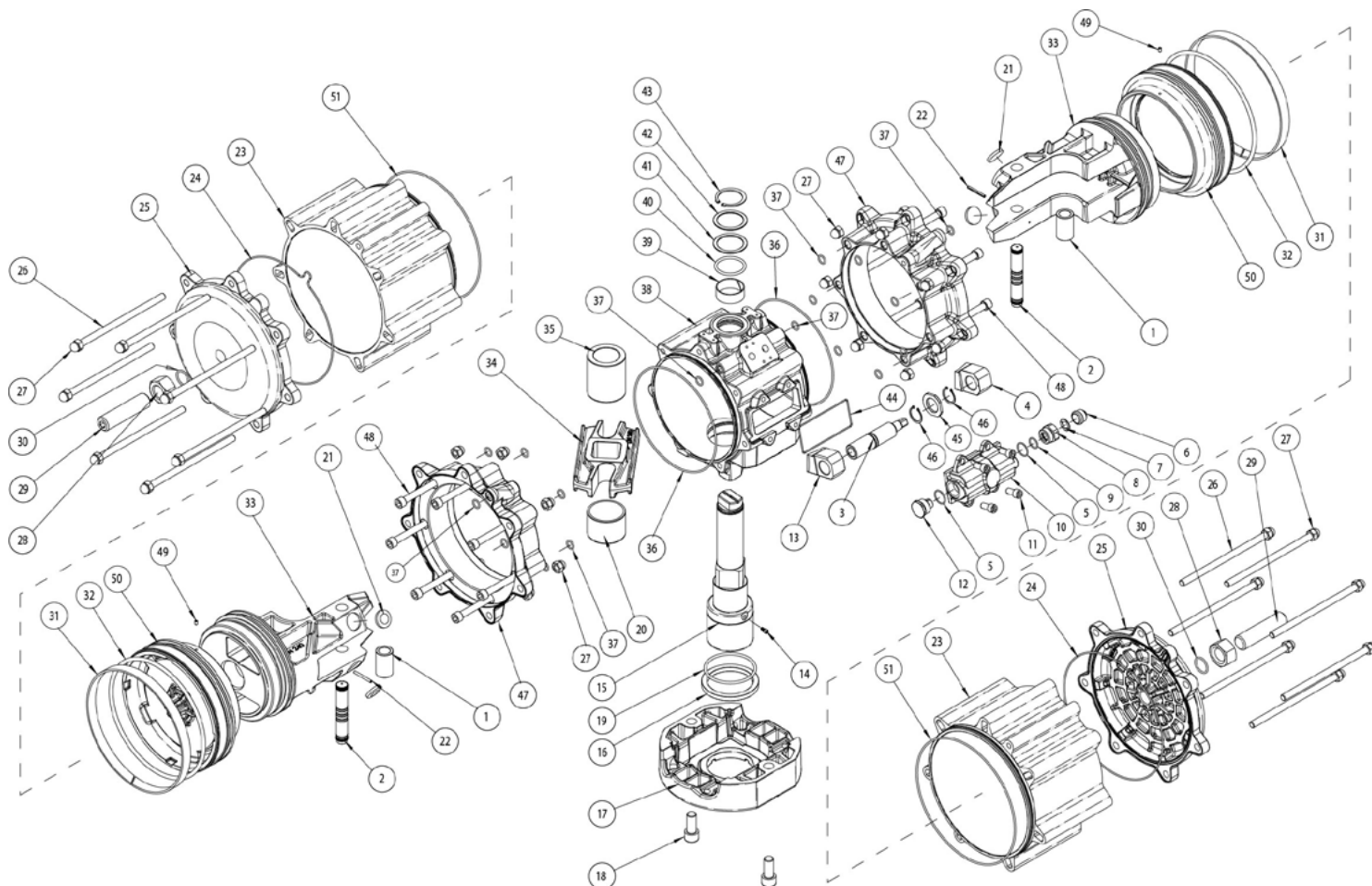
COMPONENTS OF DOUBLE ACTING PNEUMATIC ACTUATOR SIZE: DA5760



MATERIALS

| Pos | Description | Pos | Description | Pos | Description |
|-----|----------------------|-----|-----------------------|-----|-----------------------|
| 1 | Steel bush | 17 | Interface F25 | 33 | Piston |
| 2 | Steel pin | 18 | Interface screw | 34 | Yoke |
| 3 | Adjustment screw | 19 | O-ring | 35 | Shaft bearing/support |
| 4 | Left stop | 20 | Shaft bearing | 36 | O-ring |
| 5 | O-ring | 21 | Disks | 37 | O-ring |
| 6 | Protection cap | 22 | Spring pin | 38 | Body |
| 7 | Anti-rotation washer | 23 | Side Cylinder | 39 | Upper support |
| 8 | Metal ring | 24 | Cap O-ring | 40 | O-ring |
| 9 | O-ring | 25 | Cap | 41 | External support ring |
| 10 | Adjustment carter | 26 | Assembly screw | 42 | Shim washer |
| 11 | Carter screw | 27 | Cap nut | 43 | Seeger |
| 12 | Metal ring | 28 | Nut | 44 | Carter seal |
| 13 | Right stop | 29 | Adjustment screw | 45 | Washer |
| 14 | Screw | 30 | O-ring | 46 | Seeger |
| 15 | Shaft | 31 | Bearing (piston head) | | |
| 16 | Lower support | 32 | Piston O-ring | | |

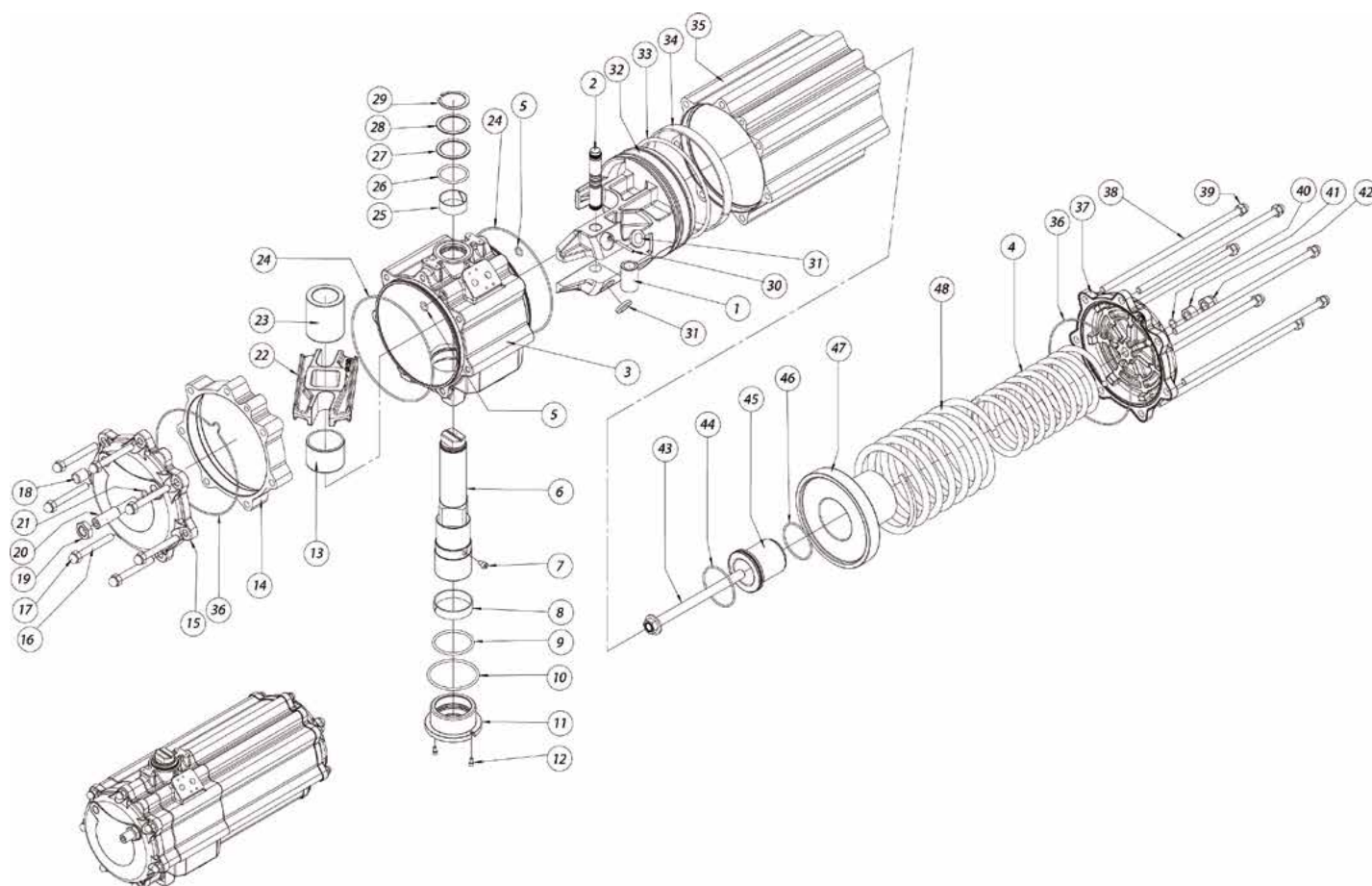
COMPONENTS OF DOUBLE ACTING PNEUMATIC ACTUATOR SIZE: DA8000



MATERIALS

| Pos | Description | Pos | Description | Pos | Description |
|-----|----------------------|-----|-----------------------|-----|---------------------------|
| 1 | Steel bush | 18 | Interface screw | 35 | Shaft bearing/support |
| 2 | Steel pin | 19 | O-ring | 36 | O-ring |
| 3 | Adjustment screw | 20 | Shaft bearing | 37 | O-ring |
| 4 | Left stop | 21 | Disks | 38 | Body |
| 5 | O-ring | 22 | Spring pin | 39 | Upper support |
| 6 | Protection cap | 23 | Side Cylinder | 40 | O-ring |
| 7 | Anti-rotation washer | 24 | O-ring Cap | 41 | External support ring |
| 8 | Metal ring | 25 | Cap | 42 | Shim washer |
| 9 | O-ring | 26 | Assembly screw | 43 | Seeger |
| 10 | Adjustment carter | 27 | Cap nut | 44 | Carter gasket |
| 11 | Carter screw | 28 | Nut | 45 | Support bearing |
| 12 | Metal ring | 29 | Adjustment screw | 46 | Seeger |
| 13 | Right stop | 30 | O-ring | 47 | Cylinder reduction flange |
| 14 | Screw | 31 | Bearing (piston head) | 48 | Flange screws |
| 15 | Shaft | 32 | Piston O-ring | 49 | Grub screw |
| 16 | Lower support | 33 | Piston | 50 | Piston reduction flange |
| 17 | Interface F25 | 34 | Yoke | 51 | O-ring |

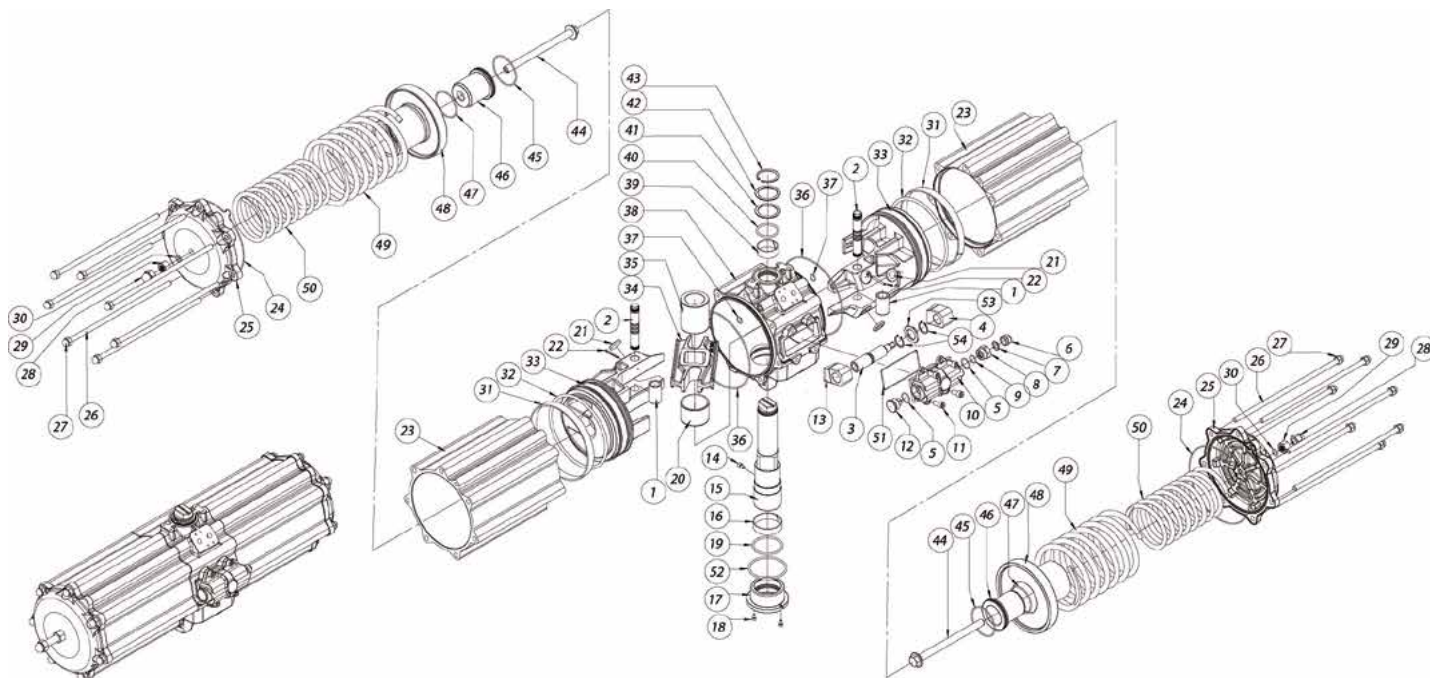
COMPONENTS OF SPRING RETURN PNEUMATIC ACTUATOR SIZE: SR1440



MATERIALS

| Pos | Description | Pos | Description | Pos | Description |
|-----|-----------------------|-----|-----------------------|-----|------------------------|
| 1 | Steel bush | 17 | Cap nut | 33 | O-ring |
| 2 | Steel pin | 18 | Grub screw (cap) | 34 | Bearing (piston head) |
| 3 | Body | 19 | Nut | 35 | Side Cylinder |
| 4 | Internal spring | 20 | Adjustment screw | 36 | O-ring |
| 5 | O-ring | 21 | O-ring | 37 | Cap |
| 6 | Shaft | 22 | Yoke | 38 | Cap screw |
| 7 | Screw | 23 | Shaft bearing/support | 39 | Cap nut |
| 8 | Lower support | 24 | O-ring | 40 | O-ring |
| 9 | O-ring | 25 | Upper support | 41 | Nut |
| 10 | O-ring | 26 | O-ring | 42 | Cap nut |
| 11 | Lower support bushing | 27 | External support ring | 43 | Spring pre-load screw |
| 12 | Bush screw | 28 | Washer | 44 | O-ring |
| 13 | Shaft bearing | 29 | Seeger | 45 | Small spring container |
| 14 | Shim | 30 | Spring pin | 46 | O-ring |
| 15 | Cap | 31 | Disks | 47 | Large spring container |
| 16 | Assembly screw | 32 | Piston | 48 | External spring |

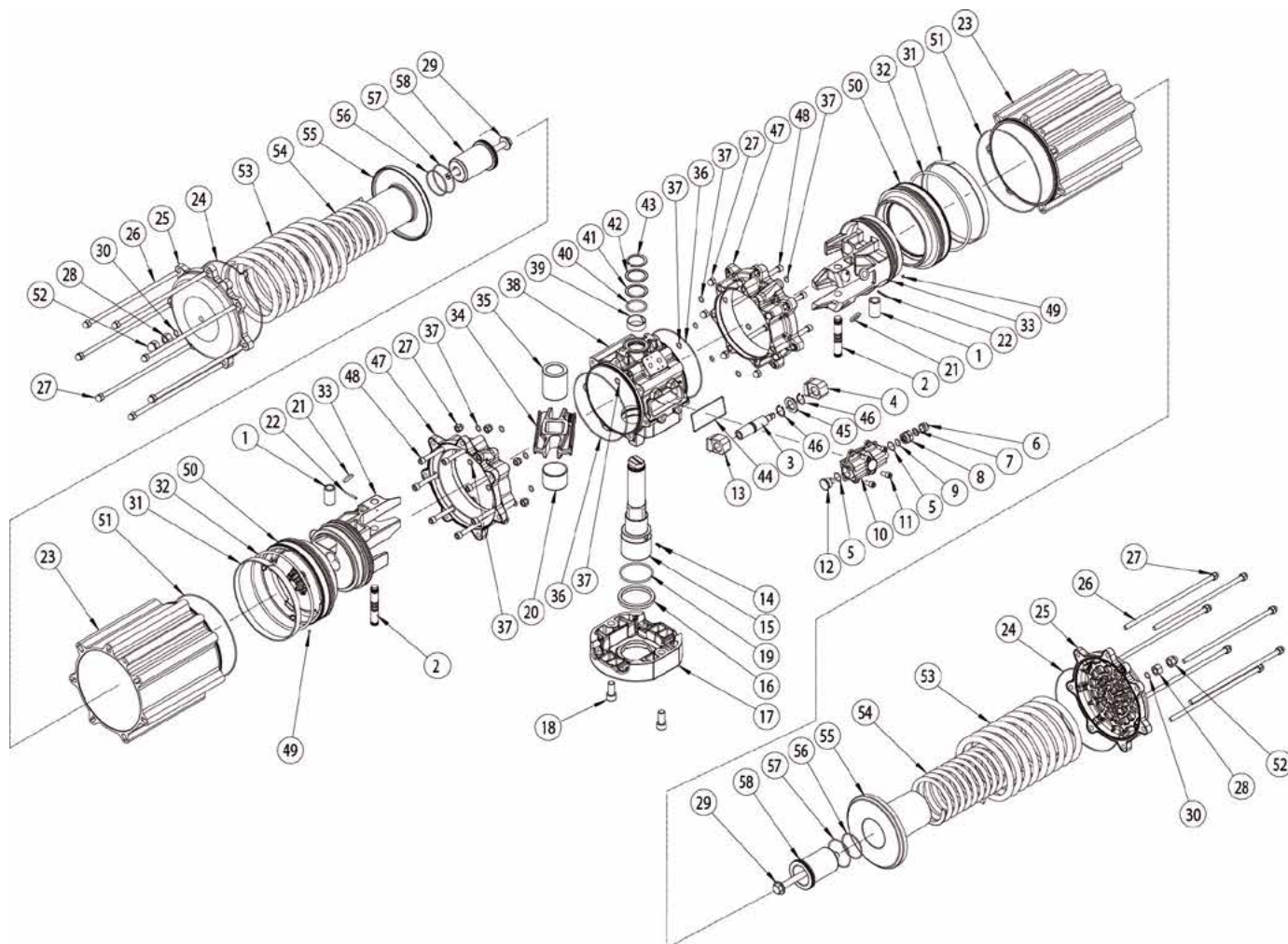
COMPONENTS OF SPRING RETURN PNEUMATIC ACTUATOR SIZE: SR2880



MATERIALS

| Pos | Description | Pos | Description | Pos | Description |
|-----|----------------------|-----|-----------------------|-----|------------------------|
| 1 | Steel bush | 19 | O-ring | 37 | O-ring |
| 2 | Steel pin | 20 | Shaft bearing | 38 | Body |
| 3 | Adjustment screw | 21 | Bearing Disks | 39 | Upper support |
| 4 | Left stop | 22 | Spring pin | 40 | O-ring |
| 5 | O-ring | 23 | Side Cylinder | 41 | External support ring |
| 6 | Protection cap | 24 | O-ring Cap O-ring | 42 | Washer |
| 7 | Anti-rotation washer | 25 | Cap | 43 | Seeger |
| 8 | Metal ring | 26 | Assembly screw | 44 | Spring screw |
| 9 | O-ring | 27 | Cap nut | 45 | O-ring |
| 10 | Adjustment carter | 28 | Cap nut | 46 | Small spring container |
| 11 | Carter screw | 29 | Nut | 47 | O-ring |
| 12 | Metal ring | 30 | O-ring | 48 | Large spring container |
| 13 | Right stop | 31 | Bearing (piston head) | 49 | External spring |
| 14 | Screw | 32 | Piston O-ring | 50 | Internal spring |
| 15 | Shaft | 33 | Piston | 51 | Carter gasket |
| 16 | Lower support | 34 | Yoke | 52 | O-ring |
| 17 | Lower support bush | 35 | Shaft bearing/support | 53 | Washer |
| 18 | Bush screw | 36 | O-ring | 54 | Seeger |

COMPONENTS OF SPRING RETURN PNEUMATIC ACTUATOR SIZE: SR4000



MATERIALS

| Pos | Description | Pos | Description | Pos | Description |
|-----|----------------------|-----|-----------------------|-----|---------------------------|
| 1 | Steel bush | 21 | Disks | 41 | External support ring |
| 2 | Steel pin | 22 | Spring pin | 42 | Washer |
| 3 | Adjustment screw | 23 | Side cylinder | 43 | Seeger |
| 4 | Left stop screw | 24 | O-ring Cap | 44 | Carter seal |
| 5 | O-ring | 25 | Cap | 45 | Washer |
| 6 | Protection cap | 26 | Assembly screw | 46 | Seeger |
| 7 | Anti-rotation washer | 27 | Cap nut | 47 | Cylinder reduction flange |
| 8 | Metal ring | 28 | Nut | 48 | Flange screws |
| 9 | O-ring | 29 | Spring pre-load screw | 49 | Screw |
| 10 | Adjustment carter | 30 | O-ring | 50 | Piston reduction flange |
| 11 | Carter screw | 31 | Bearing (piston head) | 51 | O-ring |
| 12 | Metal ring | 32 | Piston O-ring | 52 | Cap nut |
| 13 | Right stop screw | 33 | Piston | 53 | External spring |
| 14 | Screw | 34 | Yoke | 54 | Internal spring |
| 15 | Shaft | 35 | Shaft bearing/support | 55 | Large spring container |
| 16 | Lower support | 36 | O-ring | 56 | O-ring |
| 17 | Interface F25 | 37 | O-ring | 57 | O-ring |
| 18 | Interface screw | 38 | Body | 58 | Small spring container |
| 19 | O-ring | 39 | Upper support | | |
| 20 | Sliding bush | 40 | O-ring | | |


7) MAINTENANCE

The OMAL SpA actuator, when installed and used properly, does not require maintenance, under normal use, as it's provided with sufficient lubrication for standard duration.

Send the actuator directly to OMAL S.p.A. for inspection or extraordinary maintenance

OMAL S.p.A. declines all responsibility for products that are repaired by third parties

8) SPECIAL VERSIONS

OMAL S.p.A. produces and supplies also special versions of its actuators, for applications in low temperature conditions (-50°C) and high temperature (+150°C), for the use in explosive atmosphere environments ( II 2 GD TX X) and for other specific uses.

a. External protection.

All versions can be supplied with a different external protection according to the environmental conditions of the system (for the choice, consult the OMAL S.p.A. catalogue or contact the commercial department).

b. Stainless steel version

For plants of the food industry or chemical sector, OMAL SpA produces a stainless steel version. The body and all external parts are made of stainless steel AISI316.

c. Normally open spring return version

The normally open spring return version is required in the cases where if there should be a pressure or power failure, the valve must absolutely remain open. In this version the pistons are inserted in the cylinder like the ones for the double acting version, the strength of the springs makes the actuator normally open.

ATTENTION

The performance of the normally open Spring Return version, compared to the normally closed Spring Return one, are very different due to the production differences. For the sizing and choice please contact the OMAL S.p.A. technical department.

9) STORAGE

The OMAL S.p.A. actuators are properly packaged for protection during the dispatch, but they could still get damaged accidentally during transportation. Before storing them verify that they have not been damaged during the transportation. Keep actuators in the package when storing.

Choose clean sites for storage, not excessively humid and with temperatures between -10 and +60°C. If the products are to be stored for long periods of time, it is best not to remove them from their protective packaging.

The actuators have two air ports, plugged with plastic caps, in order to avoid that liquids or other may enter through during the storage. If the items will be in storage for a long period of time before installation, it is recommended to maneuver them periodically in order to avoid that the seals get damaged.

Store the actuators indoors to protect them from dust and moisture.

10) TROUBLESHOOTING

| POTENTIAL EFFECT OF FAILURE | POTENTIAL CAUSE OF FAILURE | SOLUTION |
|--|---|--|
| Loss or reduction of the supplied torque | Lack of supply | Verify that the actuator has been connected correctly |
| | Air supply not enough to produce the required torque | Verify that the supply pressure value corresponds to the functioning requirements (See actuator data plate). |
| | Air leakage from the seals | Verify that the screws are completely tightened |
| Leaks from the stem upper or lower seals | Stem O-ring seal damaged | Contact OMAL S.p.A. for repair |
| | Damages on the body | |
| | Shaft damaged | |
| Leakage from cylinder caps | Seals damaged | Replace the seals (see "Maintenance" chapter) |
| Leakage from the ports after maneuver | Piston seal damaged | Replace the piston seals (see "Maintenance" chapter) |
| | Cylinder body damaged | Contact OMAL S.p.A. for repair |
| Insufficient rotation angle | Increase of valve maneuver torque | Verify the valve release torque and possibly replace with a new one |
| | Air supply not enough to produce the required torque | Increase the air supply |
| | Mechanical stop (if there) not duly adjusted | Adjust the stops by increasing the stroke |
| | Wrong connection between the actuator hole and the valve stem | Check the connection and the size of the adapter between the valve and the actuator |

11) DISPOSAL OF PRODUCTS AT THE END OF THEIR LIFE CYCLE

The OMAL products are designed so that when they are at the end of their life cycle they can be completely disassembled, separating the different materials for the proper disposal and/or recovery. All materials have been selected in order to ensure minimal environmental impact, health and safety of personnel during their installation and maintenance, provided that, during use, they are not contaminated by hazardous substances.

The personnel in charge of the product disposal/recovery, must be qualified and equipped with appropriate personal protective equipment (PPE), according to the product size and the type of service for which the device was intended. The management of waste generated during the installation, maintenance or due to the product disposal, is governed by the rules in force in the country where the product is installed, in any case, the following are general guidelines:

- The metal components (aluminum/steel) can be restored as raw material;
- Seals/sealing elements (PTFE, PEEK, NBR, EPDM, FKM ...), as contaminated by fluids from other materials and lubrication, must be disposed of.
- The packaging materials that come with the product, should be transferred to the differentiated collection system available in the country.

12) DECLARATION OF CONFORMITY

The OMAL S.p.A. actuators have been designed, manufactured and tested to meet the requirements of the following European standards and are marked, where provided, with the relative CE conformity marking:

- 2006/42/EC Directive "Machinery";
- 2014/34/EU Directive "Equipment and protective systems intended for use in potentially explosive atmospheres" (ATEX).
- Regulation (EC) No 1907/2006 and successive Concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)

ADDENDUM TO THE USER'S MANUAL AND OPERATING INSTRUCTIONS FOR UK MARKET**UKCA REGULATIONS COMPLIANCE**

The following UK standards are applied to the products for UK market:

| | |
|---|--|
| U.K. Regulation S.I. 2016 No. 1107 | The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016 |
| U.K. Regulation S.I. 2019 No. 696 (Schedule 25) | Amendment of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016 |
| U.K. Regulation S.I. 2008 No. 1597 | The Supply of Machinery (Safety) Regulations 2008 (as amended)* |

*OMAL S.p.A. declares that the products are in CONFORMITY with the essential safety requirements of the of the above-mentioned Regulations, providing that declared performance and use/installation instructions are observed.