

# ASSURED AUTOMATION





We Make **Valve Automation** Easy



INSTRUCTION MANUAL

## P Series SCOTCH-YOKE PART TURN PNEUMATIC ACTUATOR DAN 15 - DAN 1920 / SRN 15 - SRN 960

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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/UE 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 main-tenance and the instructions for disposal of products at the end of their life cycle for the pneumatic actuators:

Where provided, the actuators are CE marked in accordance with the applicable European Directives (ex. 2014/34/UE - ATEX).

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

## 1. GENERAL FEATURES

OMAL manufacture a wide range of part turn pneumatic actuators for valve remote control. The actuators are available on Double Acting "DA" and Spring Return "SR" versions.

- The principle of the actuator application is to open and close the connected valve, without the manual operation with lever or hand wheel, by means of an electric-pneumatic connection on remote control.

- Scotch – Yoke is a mechanical system that allows to transform the linear force into a rotary torque.

OMAL applies the scotch - yoke system for its actuator production to transfer the pistons linear force to a driving shaft torque. This system provides a long working life and best performance with the minimum energy consumption.

- OMAL Scotch-Yoke system with its oblique grooves produces a torque curve with the highest torque at the start opening operation in order to overcome the valve breakaway torque.

The maintenance should be done by OMAL trained personnel only.

This instruction manual contains important information regarding the OMAL Scotch-Yoke pneumatic actuator operation, installation, maintenance and storage.

Please read carefully before installation and keep it in a safe place for further reference.

## 2. WORKING CONDITIONS

### a. Construction

Standard OMAL actuators are suitable for indoor and outdoor installation. The laser marking or a printed label on the actuator body gives the actuator technical characteristics: type, size, operating pressure, output torque, operating temperature, flange connection, product code and production date.

### b. Motive energy

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  $-20\text{ }^{\circ}\text{C}$  or, to be at least,  $10\text{ }^{\circ}\text{C}$  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. Supply operating media pressure

The maximum supply pressure is  $8,4\text{ bar}$  (  $120\text{ psi}$  )

Nominal supply pressure is  $5,6\text{ bar}$  (  $80\text{ psi}$  ), working pressure range from  $2,5\text{ bar}$  (  $36\text{ psi}$  ) up to  $8,4\text{ bar}$  (  $120\text{ psi}$  ).

### d. Operating temperature

Actuator standard working temperature range form  $-20\text{ }^{\circ}\text{C}$  (  $-4\text{ }^{\circ}\text{F}$  ) to  $80\text{ }^{\circ}\text{C}$  (  $176\text{ }^{\circ}\text{F}$  )

For low and high temperature versions please contact OMAL.

For high humidity and low temperature application are recommended to use a supplementary protection ( e.g. screens , sheds or integral painting)

### e. Operating drive rotation

The part turn actuator rotation angle is nominally  $90^{\circ}$ . OMAL actuator provides a stroke of  $92^{\circ}$  rotation, from  $-1^{\circ}$  to  $91^{\circ}$  , with standard stroke adjustment of  $-10^{\circ}$ .

### f. Cycle time

The cycle time is dependent on different operating and installation factors such as the supply pressure, the flow capacity, the connection pipe size, the solenoid valve performance, the valve torque and characteristics, environmental temperature condition.

Actuator opening , closing and open/close cycle times (sec.).

Actuator size	0°-90° cycle time SEC	90°-0° cycle time SEC
DA15	0,04	0,04
DA30	0,06	0,07
DA45	0,08	0,09
DA60	0,10	0,10
DA106	0,12	0,13
DA120	0,15	0,15
DA180	0,20	0,21
DA240	0,28	0,25
DA360	0,38	0,36
DA480	0,46	0,4
DA720	0,64	0,59
DA960	0,81	0,73
DA1440	1,36	1,21
DA1920	1,59	1,44

Actuator size	0°-90° cycle time SEC	90°-0° cycle time SEC
SR15	0,13	0,09
SR30	0,14	0,10
SR53	0,20	0,17
SR60	0,25	0,22
SR90	0,31	0,33
SR120	0,40	0,37
SR180	0,58	0,44
SR240	0,65	0,53
SR360	0,96	0,72
SR480	1,16	0,90
SR720	1,65	1,49
SR960	2,60	2,14

The above time table is referred to a standard actuator working cycle at the following tests conditions :

Ambient temperature: 18°C – 25°C  
 Motive energy operating medium: compressed air at 5,6 bar  
 Nominal cycle: 90° in both directions  
 Load: free

DA actuators operate with solenoid valve 5/2 ISO 1-2. While the SR actuators with solenoid valve 3/2.  
 Time tested with Electronic Timer device.

NOTE: different working condition such as air pressure, piping connection, filters or solenoid valves, could change the timing of the operations.

**g. Lubrication**

The actuators are factory lubricated for the standard working condition life.  
 During maintenance and reassembling OMAL recommends to use TECNOLUBE SYNTHY POLYMER 402, or equivalents.

**h. Internal wear protection**

The cylinder is lapped to obtain a surface with fine roughness and is protected with 20 µm technical oxidation. The pistons slide supports are in P.T.F.E. or polyurethane only, no rubber in contact. The use of steel bearings on the Scotch-Yoke system ensures no play and low friction during operation

**i. External protection**

OMAL standard actuators are suitable for indoor and outdoor installation. The aluminium body is external protected form corrosion and wear with 20 µm technical oxidation. The cast aluminium end caps are polyester painted. Driving shaft and caps screws are in stainless steel.

For aggressive atmosphere and severe environmental condition select the required protection from the external finishes showed in our catalogue or contact directly our technical department.

**j. 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.

**k. Marking and classification**

All OMAL actuators bodies are marked with the Manufacturer name and address, the actuator Type code including the Series and

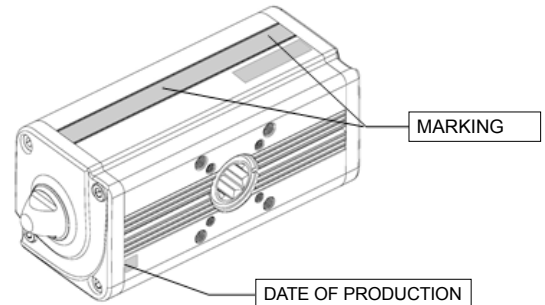
Size, and its range of Pressure and Temperatures working conditions and limits.

Marking EN15714-3:2009 point 6.1

- Name of the company in charge of marketing the product in the E.U.
- Address of the company in charge of marketing the product in the E.U.
- Model, operating pressure and temperature.
- Product code.
- Month and year of production
- Working pressures: nominal and maximum
- Standard flanging

Marking instructions where the temperature is different from the standard one:

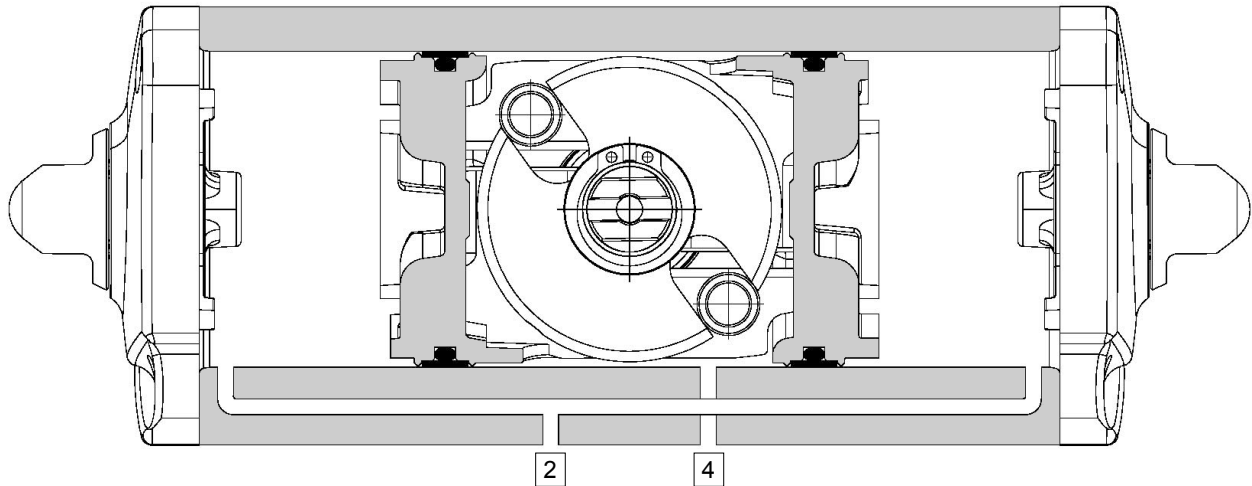
- low temperature version: T. min.= -50°C T. max=60°C
- high temperature version: T. min.= -20°C T. max=150°C



### 3. OPERATION AND ROTATION DIRECTION

#### a. Double Acting

The pistons of standard DA actuators are mounted as shown below. This provides the highest torque at the valve start opening for valve clockwise to close. The pistons are then in their outermost position and the end travel stops can be fine adjusted.

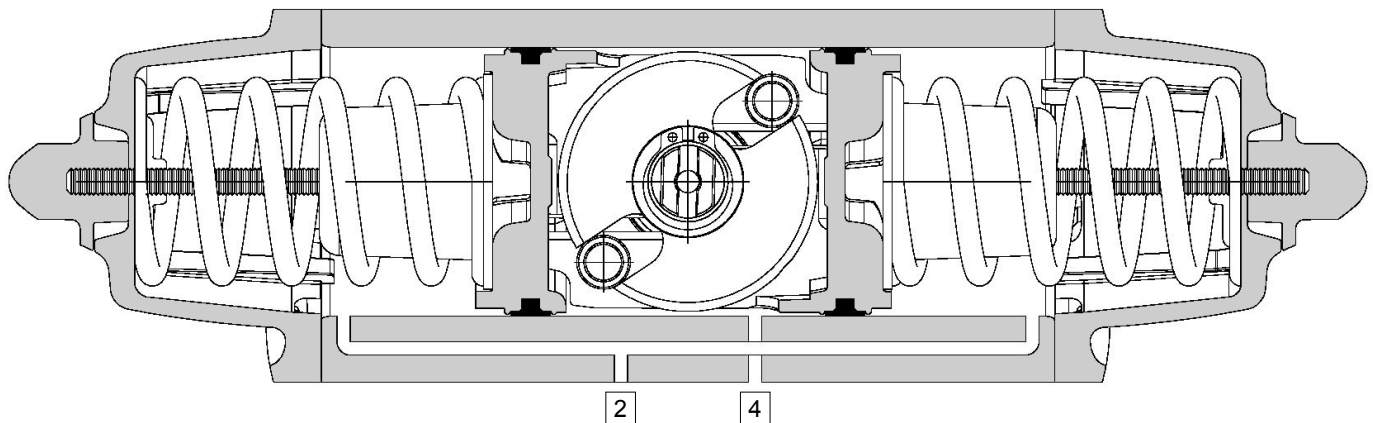


The port 2 is in connection with the cylinder side chambers, supplying the pressurised air in port 2 the standard Double Acting actuator drive shaft rotates counter clockwise to open, while the port 4 is in connection with the intermediate chamber and when pressurised the drive shaft rotates clockwise to close.

#### b. Single Acting, Spring Return fail to Close

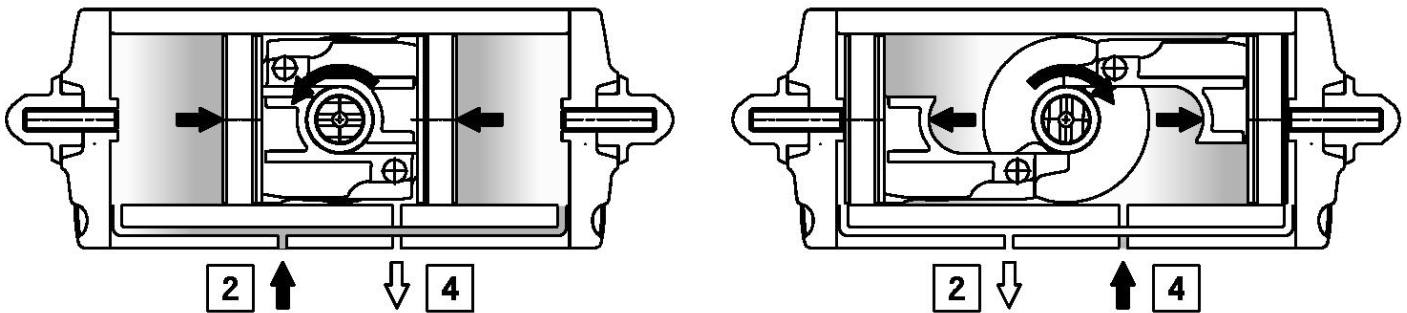
The pistons of standard SR actuators are mounted as shown below. Although spring force is diminished, the geometry of the mechanism provides a greater torque at the end of the spring stroke. When the actuator is in the valve open position, and the springs are fully compressed, the end of travel stops can be fine adjusted.

Caution. In order to avoid suction of dust or dirt inside of the actuator chambers during the spring action, install a filter on the port 2.

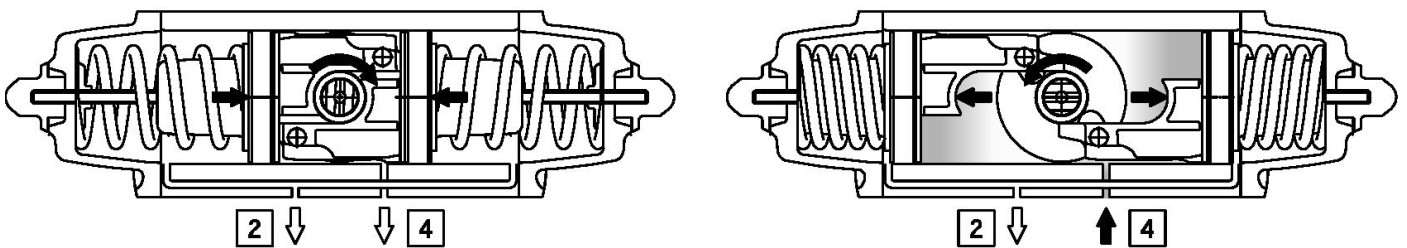


The port 4 is in connection with the intermediate chamber and when pressurised the drive shaft rotate counter clockwise to open.

**c. Double Acting operation cycle (DA)**



**d. Simple Acting Spring Return fail to close operation cycle (SR)**



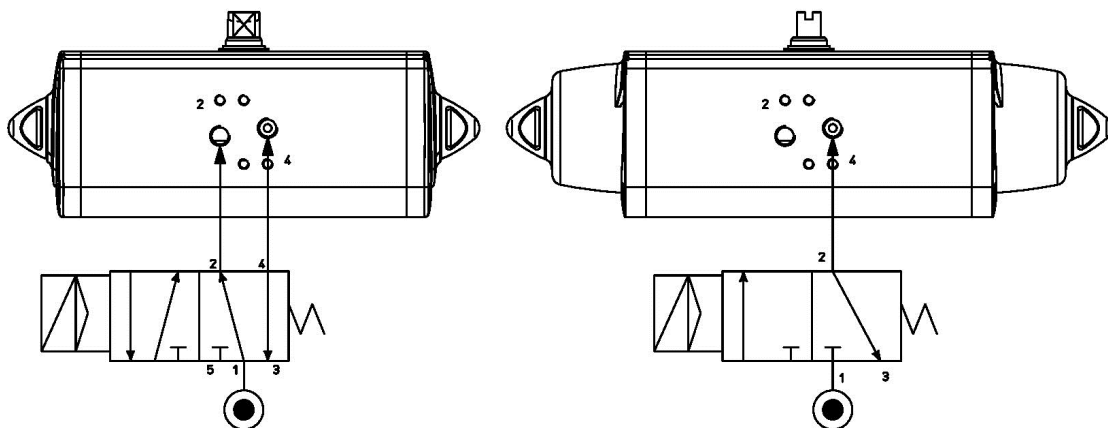
**Important.**

Special Double Acting version for flow dosing and Spring Return fail to open actuators with different piston positions have different rotation to close and to open: please follow their special instructions.

**-Connection schema**

Actuator operation functionality remote control should be done by means of direct solenoid valve connection to the actuator standard interface VDE/VDI 3845 NAMUR, or by means of pipes screwed on the ports marked with the numbers 2 and 4 and connected to a separate control cabinet.

Fig 3.1 – Typical air connection schema



**-Rotation direction.**

In accordance with the international standard ISO 5599-2 the actuator air ports connection position, location, orientation and form shall be clearly identified and marked with the numerate 2 and 4.

Standard Double Acting and Simple Acting Spring Return actuators shall be Clockwise ( CW ) direction to valve Close, and Counter Clockwise ( CCW ) direction to valve Open.

#### 4. SAFETY INFORMATION

- The actuator should be used within the pressure mentioned limits only, operating the actuator over the pressure limit will damage the internal actuator parts.
- Operating the actuator over or under the temperature limits will damage the internal and external parts.
- Operating the actuator in corrosive environments without the required external protection will damage the actuator.
- Before installation, service or maintenance verify that the actuator is not pressurised, disconnect the air lines and make sure that the air ports are vented
- Do not remove the end caps while the actuator is installed in the line, or while the actuator is under pressure.
- Do not disassemble the caps end spring cartridge, this operation should be done by OMAL trained personnel only, this operation could causes personal injury.
- Before mounting the actuator onto the valve make sure that the valve rotation is according with the actuator operating rotation, and the upper shaft slot orientation is also correct.
- Before installing the actuated valve do cycling test for a while to ensure the correct mechanical mounting and actuator/valve operations.
- The actuator installation shall be done according to and in observance with the local and national laws regulation.

OMAL cannot be responsible for any damage to people, animals or things due to an improper use of the product.



## 5. INSTALLATION INSTRUCTION

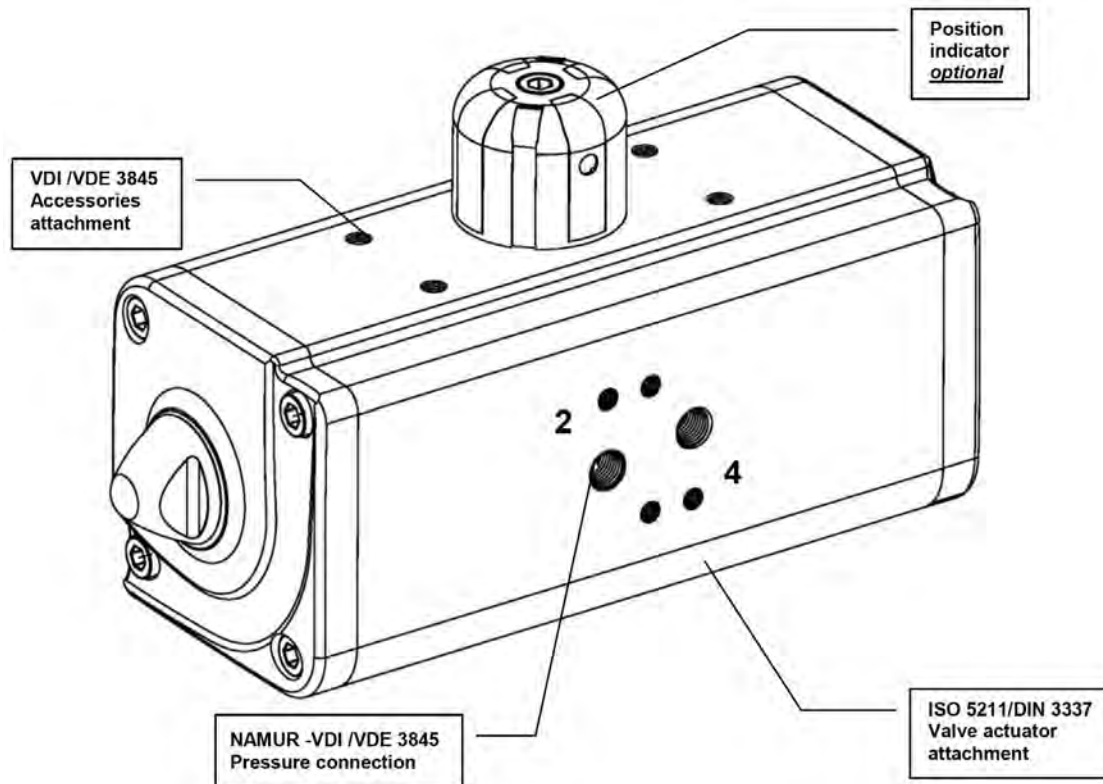
The principle of the actuator application is to open and close the connected part turn valve installed in a plant, without the manual operation, by remote control by means of an electric-pneumatic connection.

The normal sizing of actuators require a 20%-30% safety margin over the valve breakaway torque to handle valves. Plant design, chemical and physical flow characteristics and environmental condition could increase the safety factor to apply to actuator sizing. Before performing any installation operation, verify the actuator and valve conditions according to the safety notice above described. Moreover the utmost clearness is required during valve installation of the air supply connection to the actuator. All the connection parts such as reductions, joints, plates, brackets and equipment must be clean and dirty free.

Before assembling the actuator onto the valve make sure that both items are correctly oriented, depending upon which direction of rotation is required.

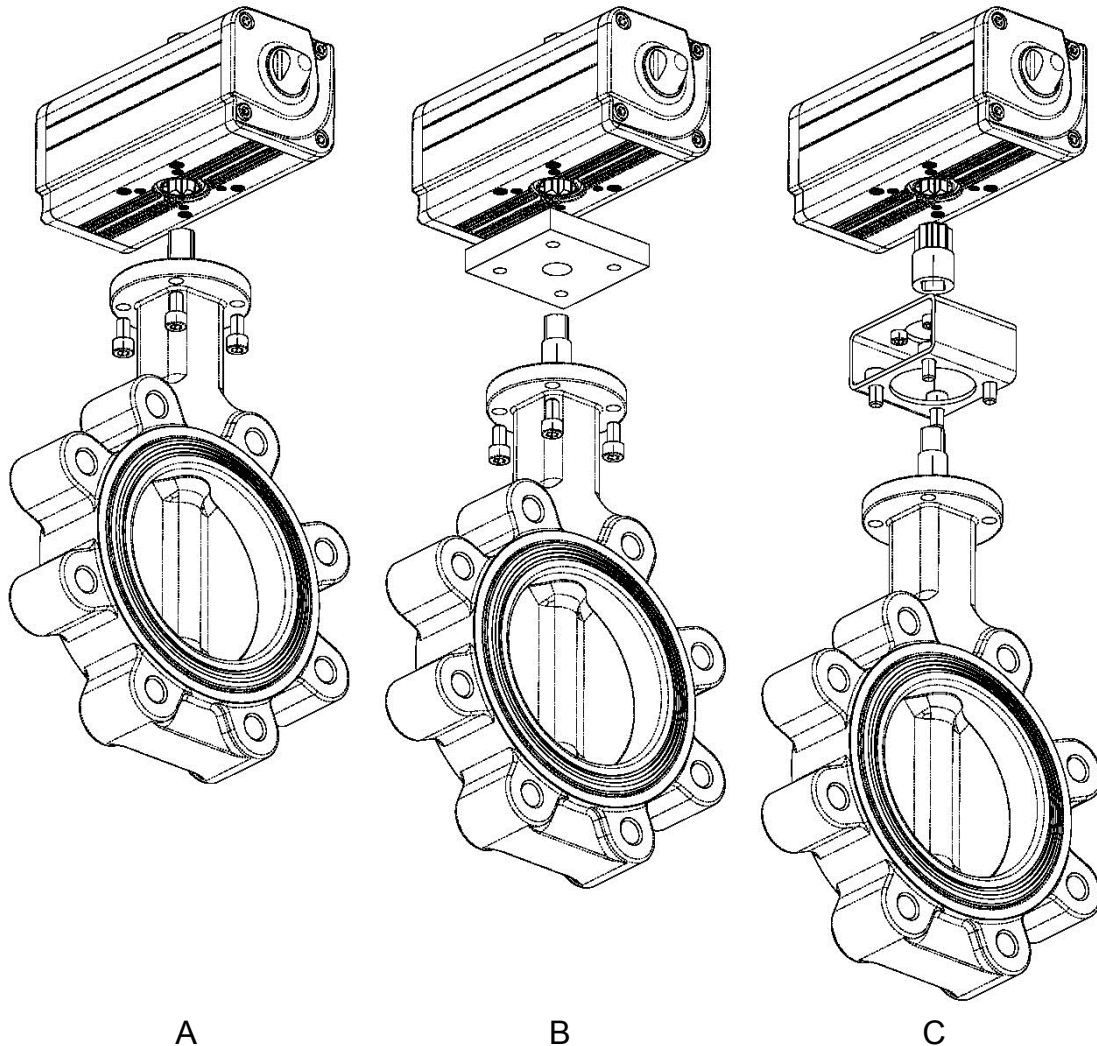
- Before starting the actuator installation, should be done a visual actuator control to verify its physical condition after transportation and storage.
- Control trough the shaft slot or caps the actuator position
- Read carefully the OMAL instruction sheet included in the cardboard box
- Read the actuator limits and performances marked on the actuator body to verify its suitability
- Remove the protection label stickers from the ports

Fig 5.1 – Actuator control



- Before fitting the actuator on the valve, clean the valve and the actuator from the dust and dirt.
- Verify the valve position, close or open, and the rotation direction.
- Verify the actuator position and rotation according with the valve requirement and operation, especially for Spring Return installation Fail to Close or Fail to Open.
- Spring Return Fail to Close actuators are always supplied in the close position.
- While Spring Return Fail to Open are always supplied in the open position.

Fig 5.2 – Valve/Actuator assembly: (A) direct-mount (B) plate-mount (C) bracket-mount.

**A) DIRECT MOUNTING**

Valve actuator Direct mounting is the best solution to avoid plays between valve stem and actuator drive shaft. For a direct mounting you should have the same standard flange connection on valve and actuator as well as the valve stem dimensions that fit perfectly with the actuator drive. Before installation please verify that the actuator and valve flange ISO connections are the same size; verify that the valve stem size and shape is suitable for direct mounting, if necessary use a drive reduction.

Fit the valve stem into the actuator drive shaft connection, and bolt together the two ISO flanges.

**B) MOUNTING PLATE CONNECTION**

In case direct mounting is not possible cause of little differences in actuator/valve flanges or drives sizes, mounting plates adapters with suitable flanges dimensions allows an easy connection living a sufficient space for the valve/actuator drive adapter.

**C) BRACKET & JOINT CONNECTION**

Whenever for technical reason the plant installation requires a distance between actuator and valve, or the valve flange and/or stem are not standard, and in any case, where the valve/actuator connection could not be possible, a bracket and joint is the right answer. The Bracket is a steel bridge that allows to connect the valve with its own flange connection in one side and with the suitable actuator connection onto the opposite side, living a space in between for a steel joint connection. The joint allows a drive connection between the actuator and the valve stem indispensable in case of stem key drive and flat head.

Chose the suitable flange bracket and the required joint connections to fix the actuator onto the valve very tight without any plays.

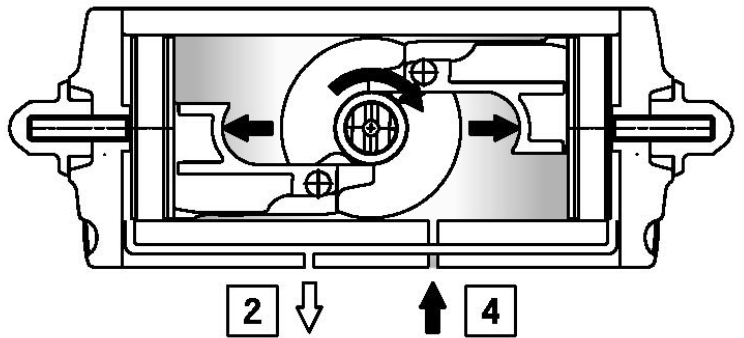
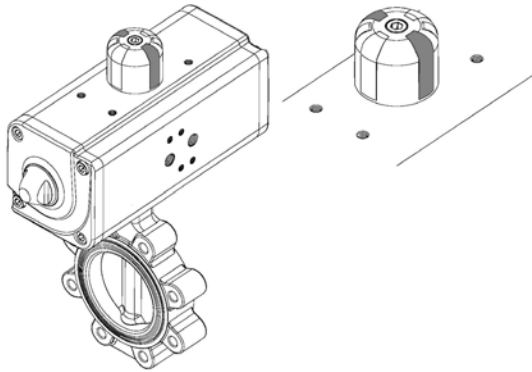
OMAL actuator with its draining channels system on the flange connection pattern is especially designed for valve direct mounting. This system allows to drop away any possible flow coming from the valve stem that with valve/actuator direct mounting could damage the actuator.

**Screw torque wrench setting**

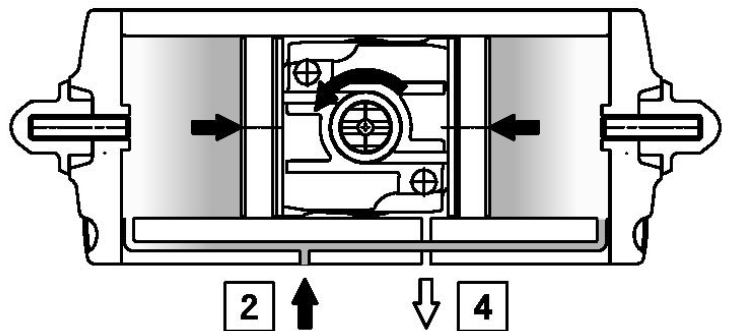
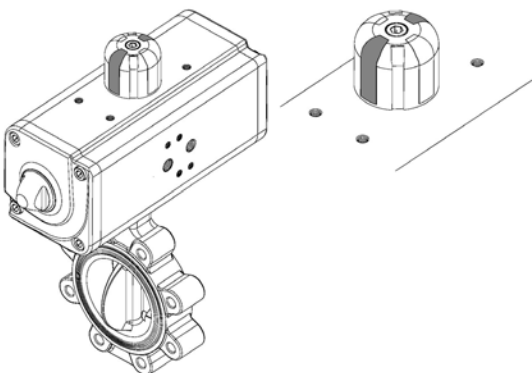
SIZE	TORQUE Nm
M5	5-6
M6	10-11
M8	20-23
M10	45-50
M12	80-85
M14	125-135
M16	190-200
M20	370-390

Fig 5.3 Actuator/Valve rotation control and mounting.

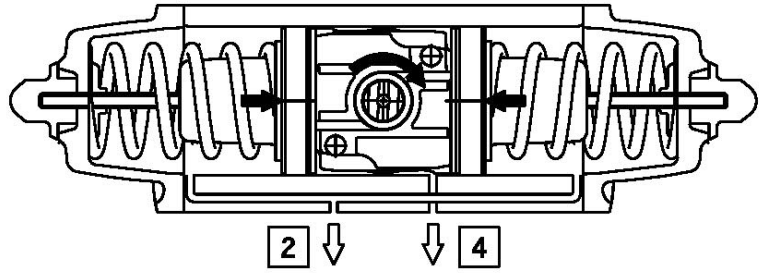
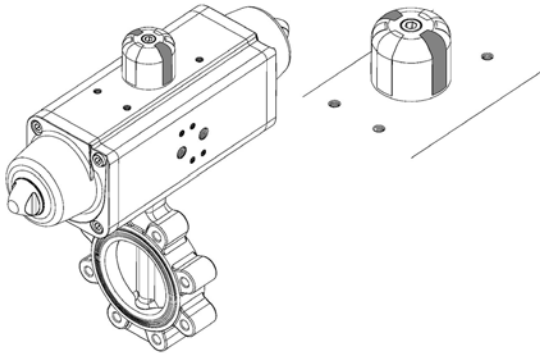
Type : DAN (Valve closed)



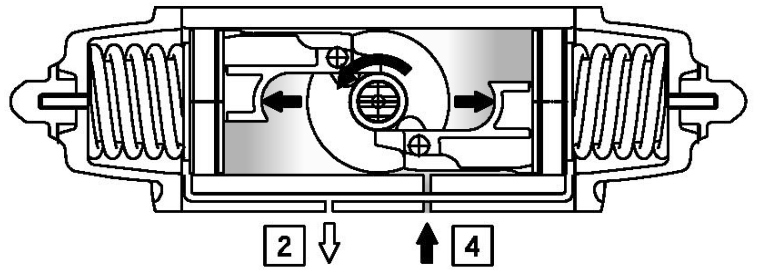
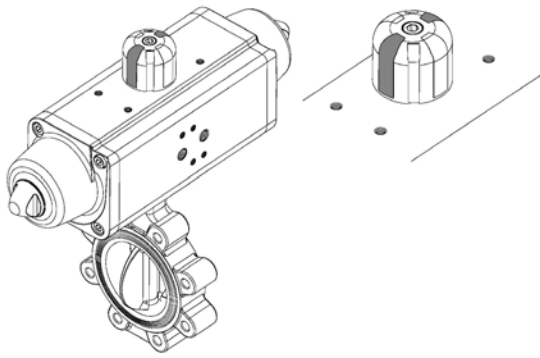
Type : DAN (Valve open)



Type : SRN (Valve closed)



Type : SRN (Valve open)



**Stroke adjustment.**

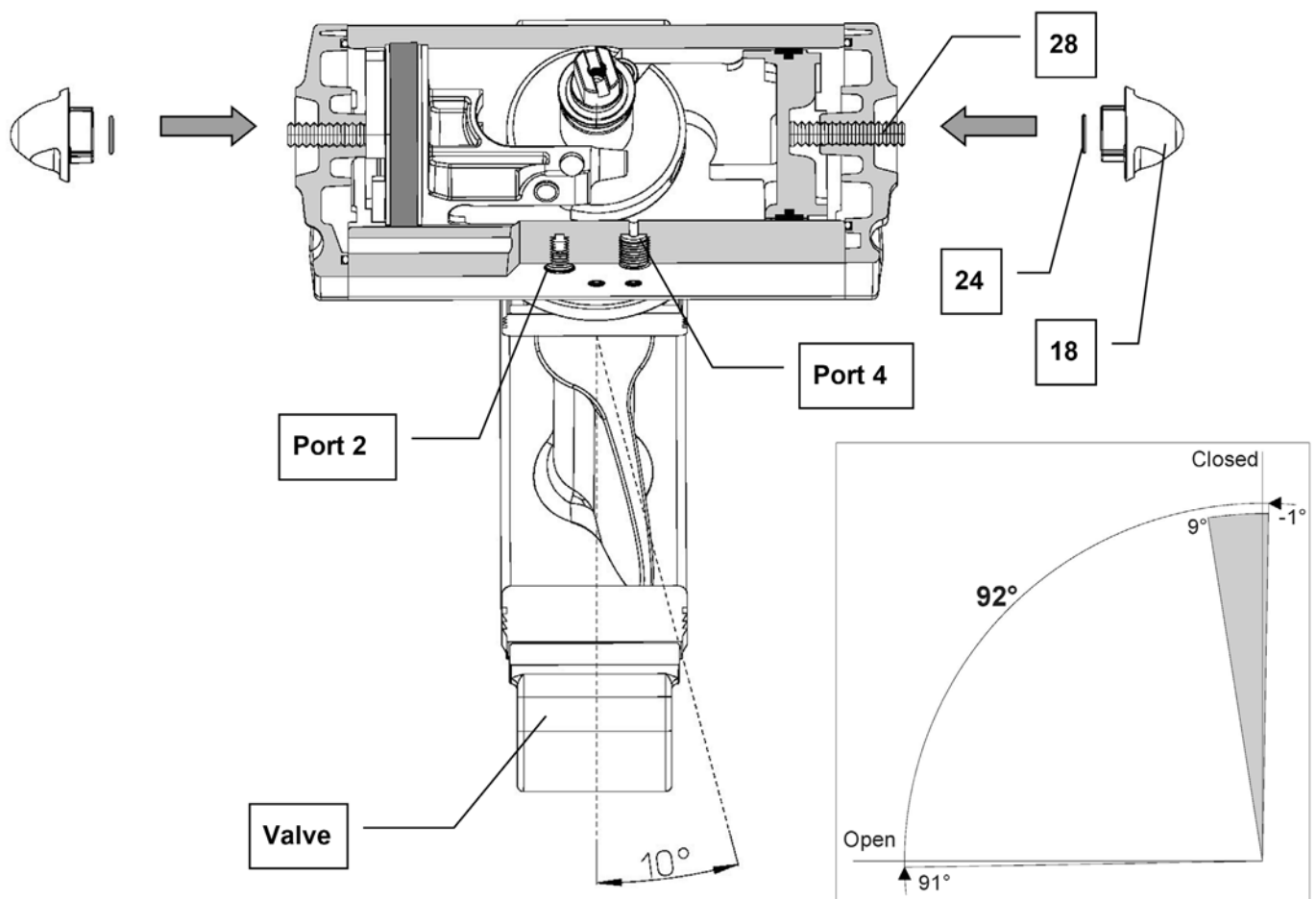
Both actuator versions, Double Acting and Spring Return, are provided as standard with 10° stroke adjustment.

**a. DAN instruction - Double Acting stroke adjustment. Close adjustment.**

The stroke adjustment on the actuator mounted on the valve should be done with the valve free of any flow pressure or friction impediments, in addition the actuator shall be disconnected from the air supply and equipment. This operation should be done with the valve/actuator held firmly in the pipeline or in a vice.

- Supply the air pressure to port 2 to open the valve, and to position the actuator pistons inward.
- Remove the cap nuts ( part N° 18 ) and its O-ring ( part N° 24 ).
- Screw in clockwise direction the screw adjustment ( part N° 28 ) in one actuator side only.
- Supply the air pressure to port 4 to close the valve and to position the pistons outward and against the adjustment screw, and check the valve close position.
- In case the valve position is not correct, repeat the operation from the beginning.
- In opposite situation, if, with the air supply in the port 4, the valve is not sufficiently closed, unscrew counter clockwise the adjustment screw ( part N° 28 ) backward counter clockwise until the required position has been found.
- Obtained the correct valve position, and with the air pressure to the port 4, screw the other adjustment screw up to piston pressing, in this way both adjustment screws are working to stop the pistons simultaneously.
- Tightly screw the cap nuts ( part N° 18 ) with its sealing O-ring ( part N° 24 ) on the end caps to hold the adjustment screws in desired position.
- The actuator is now ready to operate correctly.

OMAL standard stroke adjustment is max 10° , special longer screws are available on request.



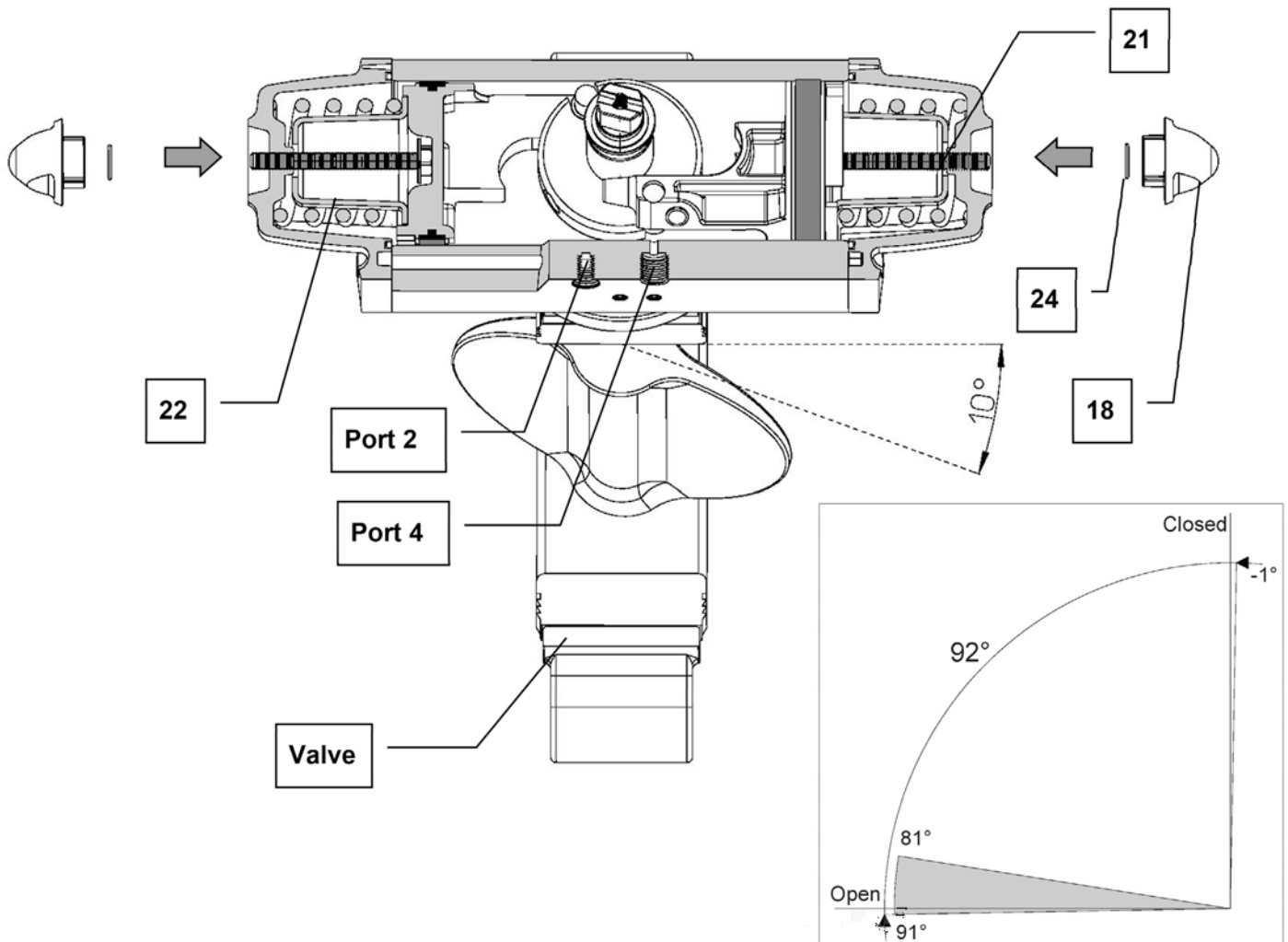
**b. SRN instruction - Single Acting Spring return Fail to Close stroke adjustment .**

**Open adjustment**

The stroke adjustment on the actuator mounted on the valve should be done with the valve free of any flow pressure or friction impediments, in addition the actuator shall be disconnected from air supply and equipment. This operation should be done with the valve/actuator held firmly in the pipeline or in a vice.

- Remove the cap nuts ( part N° 18 ) and its O-ring ( part N° 24 ).
- Screw, clockwise direction, the screw adjustment ( part N° 21 ) in one actuator side only.
- Supply air pressure to port 4, and due to the air pressure action the pistons moves to the outward position up to the limits determined by the adjustment screw on the piston head.
- Check the valve open position, if the valve is to much open repeat the operation from the beginning.
- In opposite case, valve not sufficiently open, with the air supply to the port 4, move the adjustment screw ( part N° 21 ) backward counter clockwise until the required position has been found.
- Obtained the correct valve position, and with the air pressure to the port 4, screw the other adjustment screw up to piston pressing, in this way both adjustment screws are working to stop the pistons simultaneously.
- With pressurised air supply, tightly screw the cap nuts ( part N° 18 ) with its sealing O-ring ( part N° 24 ) on the end caps to hold the adjustment screws in desired position.
- In this condition the actuator is ready to operate correctly.

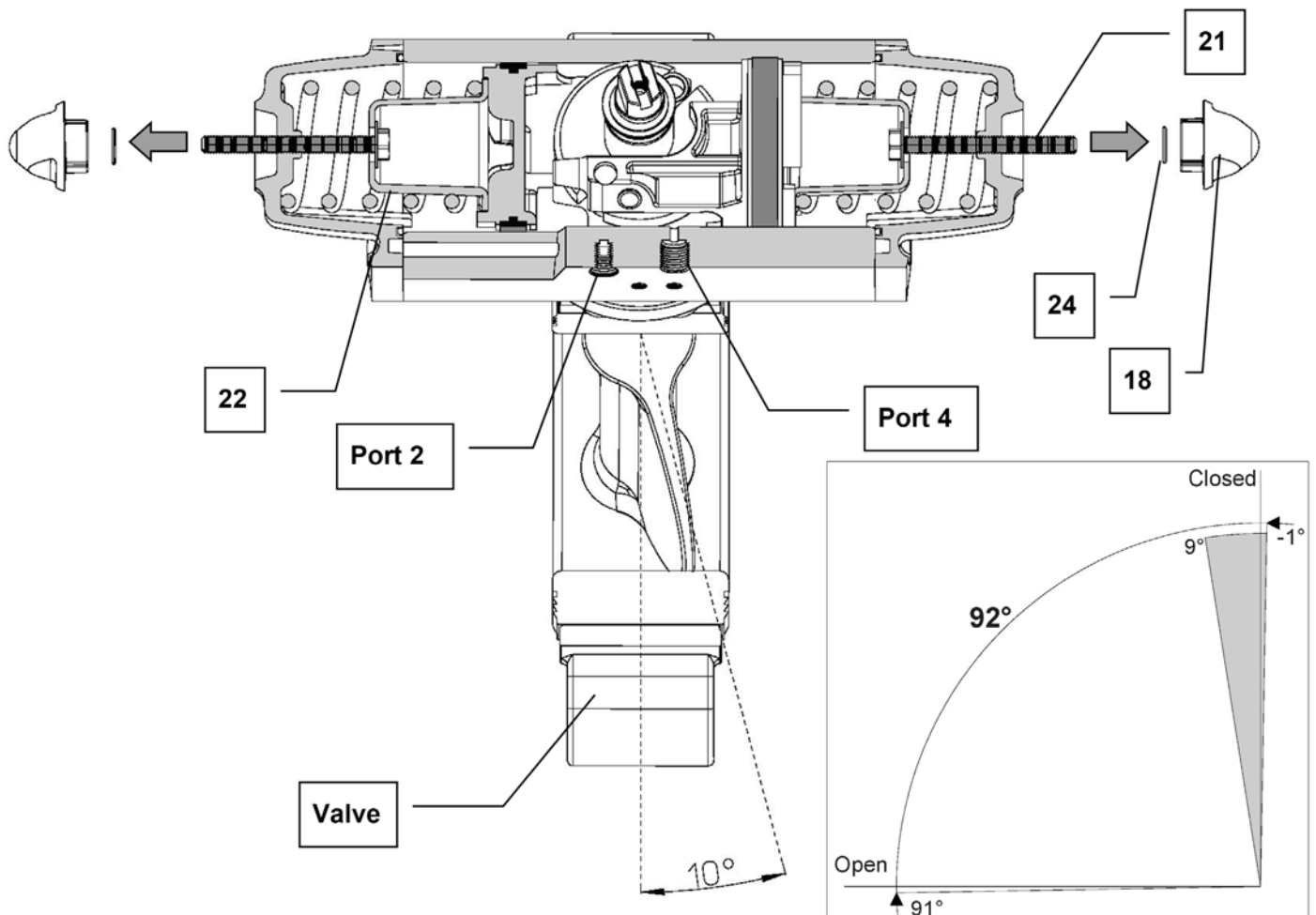
OMAL standard stroke adjustment is max 10° , special longer screws are available on request.



**Close adjustment**

The stroke adjustment on the actuator mounted on the valve should be done with the valve free of any flow pressure or friction impediments, in addition the actuator must be disconnected from air supply and equipment. This operation should be done with the valve/actuator well held in the pipeline or in a vice.

- Remove the cap nuts ( part N° 18 ) and its O-ring ( part N° 24 ).
- Supply the air pressure to port 4 to open the valve, and position the actuator pistons outward.
- Unscrew, counter clockwise direction, both screws in same measure ( part N° 21 ) .
- Stop to supply air pressure to port 4, and due to the spring action the pistons moves to the inward position up to the limits determinate to the adjustment screws on the spring caps ( part N° 22 ), **\*\*\*WARNING**
- Check the valve close position, if is over closed repeat the operation from the beginning until the desired valve closure position is achieved.
- In opposite case, with the valve to much open, with the air supply to the port 4, move both adjustment screws inward, clockwise in same measure.
- Without pressurised air supply, tighten the cap nuts ( part N° 18 ) with its sealing O-ring ( part N° 24 ) on the end caps to hold the adjustment screws in desired position.
- In this condition the actuator is ready to operate correctly.



**\*\*\*WARNING:** The Spring Return close adjustment is not a mechanical stop that act against the pistons travel or the shaft rotation, but the screws limits the spring travel and the pistons without any force standstills. In this condition the shaft is not stopped and theoretically could be moved to the total closing position , adjustments of closing and opening can not be performed both . OMAL standard stroke adjustment is max 10° , special longer screws are available on request.

This adjustment table represent the average drive variation angle  $\alpha$  for each full turn of the adjustment screw  $\beta$ .

For each 1° of drive variation  $\alpha$  1 the adjustment screw is to be rotate as  $\beta$  1.

\*The below table data is referred to the standard stroke adjustment only (10°).  
 For longer screw adjustment please contact technical commercial department.

ACTUATOR SIZE	ADJUSTMENT SCREW ROTATION ANGLE	SHAFT VARIATION ANGLE AFTER ADJUSTMENT	ADJUSTMENT SCREW ROTATION ANGLE	SHAFT VARIATION ANGLE AFTER ADJUSTMENT
	$\beta$	$\alpha$	$\beta$	$\alpha$
DA15	360°	3°34'	101°	1°
DA30	360°	2°54'	124°	1°
SR15	360°	3°7'	115°	1°
DA45	360°	2°43'	132°	1°
DA60	360°	2°18'	156°	1°
SR30	360°	2°26'	148°	1°
DA106	360°	1°55'	187°	1°
SR53	360°	2°	180°	1°
DA120	360°	1°50'	196°	1°
SR60	360°	2°	180°	1°
DA180	360°	2°14'	160°	1°
SR90	360°	2°14'	161°	1°
DA240	360°	2°	179°	1°
SR120	360°	1°54'	187°	1°
DA360	360°	1°45'	206°	1°
SR180	360°	1°40'	216°	1°
DA480	360°	1°49'	196°	1°
SR240	360°	1°54'	190°	1°
DA720	360°	1°37'	223°	1°
SR360	360°	1°45'	206°	1°
DA960	360°	1°28'	245°	1°
SR480	360°	1°57'	184°	1°
DA1440	360°	1°31'	237°	1°
SR720	360°	1°40'	216°	1°
DA1920	360°	1°28'	245°	1°
SR960	360°	1°33'	230°	1°



## 6. MATERIALS AND THEIR DURABILITY

Life time 20 years or number of cycles as per EN15714-3 2009 ( see table below ).

Nominal torque (a) Nm	Piston or vane actuator Minimum number of cycles (b)	Maximum stroking time for testing, based on 0-90° "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.** Based on EN ISO 5211.

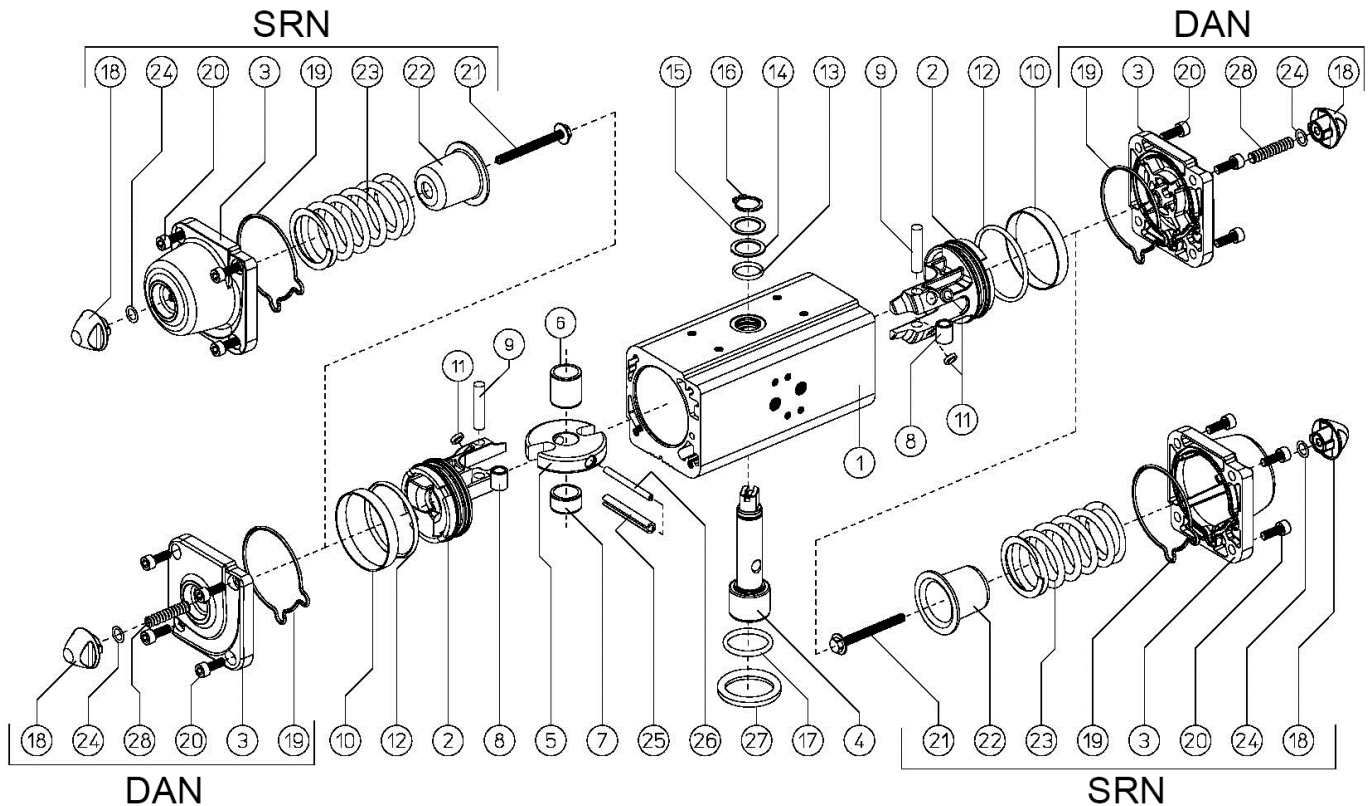
**b.** One cycle consists of nominal 90° angular travel in both directions (i.e. 90° to open + 90° to close). For angular travel other than 90°, the endurance shall be agreed between the purchaser and the manufacturer/supplier.

**c.** For thermoplastic actuators the minimum number of cycles shall be 250 000.

Should it be necessary to replace its pistons sealing, this operations must be done by OMAL trained people with proper tools, we recommend to return the actuator to OMAL where the actuator will be overhauled and than tested for a correct replacement. On request OMAL will be willing to provide its sealing Kits.

**WARNING:** OMAL declines any responsibility for the products repaired by third parties

Fig 6,1 Actuator components and material list.



POS.	DENOMINATION	Q.	MATERIALS	STANDARDS
1	Cylinder	1	Aluminium alloy	EN AW 6063 Anodized
2	Piston	2	Aluminium alloy	EN AB 46100
3	Cap	2	Aluminium alloy	EN AB46100 Painted
4	Shaft	1	Stainless steel	AISI 303 - DIN 1.4305
5	Scotch yoke	1	Steel alloy	UNI 90MnVCr8Ku - DIN 1.2842 Ardenered
6	Support bush	1	Acetalitic resin	
7	Shaft support	1	Acetalitic resin	
8	Bush	2	Steel alloy	UNI 110w4Ku - DIN 1.2516
9	Rotative sleeve	2	Steel alloy	UNI 6364A - DIN 6325
10*	Dynamic seal (piston)	2	Polyurethane	
11*	Piston's support	4	RPTFE-CF	
12*	Piston o-ring	2	Nitrilic rubber	
13	O-ring (upper sealing shaft )	1	FKM	
14	External support ring	1	Aluminium alloy	
15	Washer	1	Stainless steel	UNI 3653 - DIN 471
16	Seeger	1	Stainless steel	UNI 3653 - DIN 471
17	O-ring (low sealing shaft )	1	FKM	
18	Nut	1	Aluminium alloy	EN AB46100 Painted
19*	Cap o-ring	2	Nitrilic rubber	
20	Screw	8	Stainless steel	AISI 304 - DIN 1.4301
21	Spring loading screw	2	Steel	UNI 3740/65 8G Galvanized
22	Spring cap	2	Steel	DIN 1.0315 Galvanized
23	Spring	2	Steel	DIN 1.7102
24*	O-ring	2	Nitrilic rubber	
25	External elastic pin of the yoke	1	Steel	DIN 1481
26	Internal elastic pin of the yoke	1	Steel	DIN 1481
27	Centering ring	1	Aluminium alloy	DIN AlMgSiPb Anodized
28	Stroke adjustment screw	2	Stainless steel	AISI 304 - DIN 1.4301

\* Parts included in the spare parts kit.

**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

If the cap or piston seals need to be replaced, OMAL S.p.A. can supply a kit containing spare parts.

**WARNING:** The seals must be replaced by qualified personnel and with the appropriate tools. OMAL S.p.A. declines all responsibility for products that are repaired by third parties

**REPLACING THE SEALS**

**a) Disassembly**

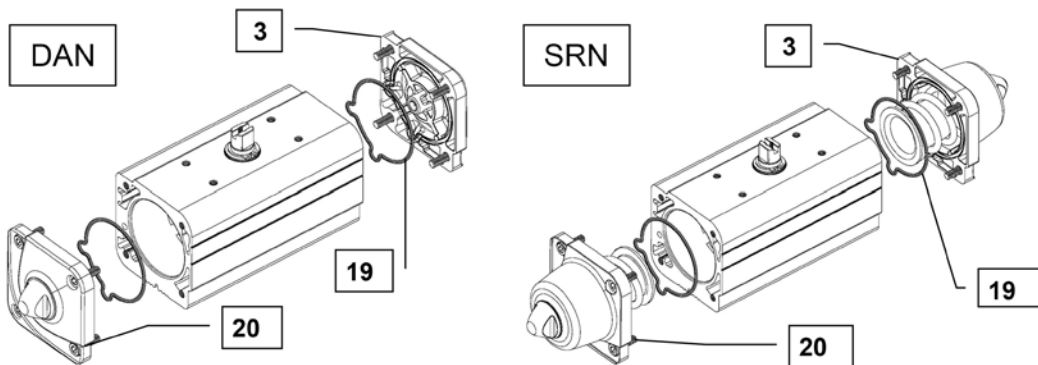
Actuator disassembly operation must be done with the actuator free from any pneumatic and electric connection and dismantled from the valve.

Verify that the actuator is air bag free, and the spring return actuator is completely in its springs rest position.

Check that the air port 2 and 4 are absolutely vented.

Use proper tools only.

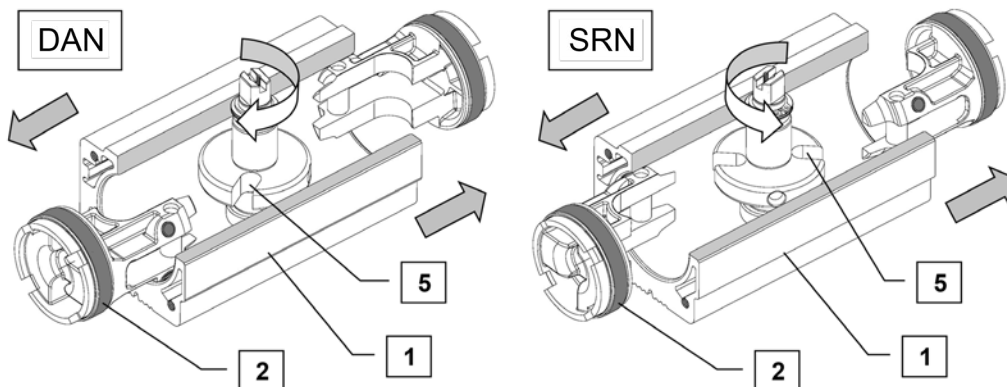
a.1) Loosen the end cap screws ( part N° 20 ) in cross sequence to remove the end caps ( part n° 3 ), in case of force on the screws that means that the actuator is still under air or spring action and the operation should be discontinued until the action is removed. The end caps contain a sealing O-ring ( part N° 19 ) on its seat that should be checked before replacement.



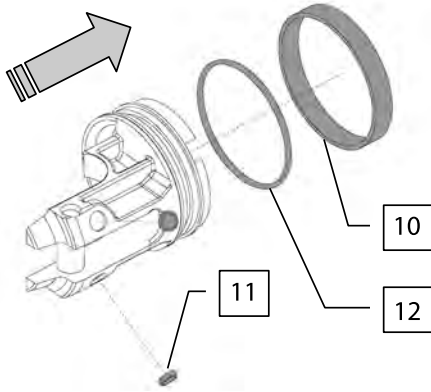
Caution.

The Spring Return end caps cartridges (Parts N° 3 + 18+24+19+23+22+21) are a safety device, where the preloaded spring is set to avoid the dangerous spring jumping. Do not release the screw ( part N° 21 ) to remove the spring from its seat, this operation must be done by OMAL technician only

a.2) B) Hold the actuator in the vice and rotate the drive shaft until the pistons ( part N° 2 ) are released from the scotch-yoke grooves ( part N° 5 ), then slip off the pistons from the cylinder ( part N° 1 ). Do not use compressed air to remove the pistons from the body, this operation could cause personal injuries.



a.3) The dynamic seal ( part N° 10 ), O-ring ( part N° 12 ) and supports ( part N° 11 ) should be checked before replacement. Do not use sharp tools to cut the dynamic seal and O-ring or remove the supports from the piston as this may cause furrows or marks.

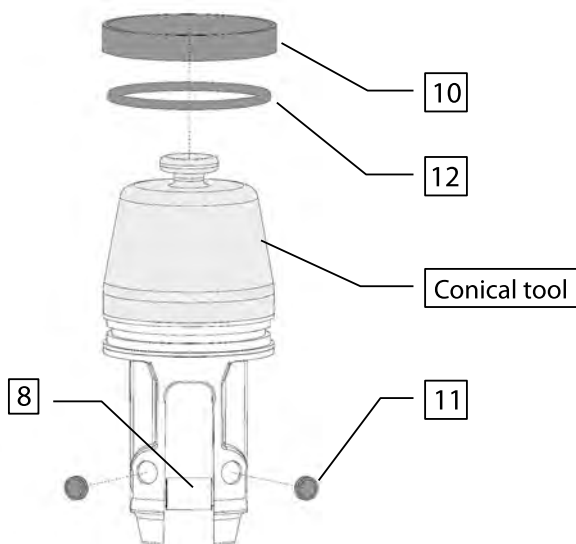


a.4) When the components are disassembled, they should be properly cleaned and wear checked prior to being greased and reassembled. In case the sealing parts are too much worn out use new parts from the spare parts kit.

**WARNING:** Due to OMAL scotch-yoke shaft blow-out security system the shaft disassembly operation must be carried out by OMAL technician only.

#### b) Assembly

b.1) O-ring ( part N° 12 ) and dynamic seal ( part N° 10 ) shall be greased and mounted onto the piston seat using a proper conical tool ( see the drawing ) that allows an easy and perfect slip-in of the items without any damages.



b.2) Push into its piston seats the P.T.F.E. supports ( part N° 11 ).

b.3) Grease the pistons ( part N° 2 ) on the replaced parts ( parts N° 10+11+12 ), and the piston bearings ( part N° 8 ).

b.4) Grease the internal cylinder surface ( part N° 1 ).

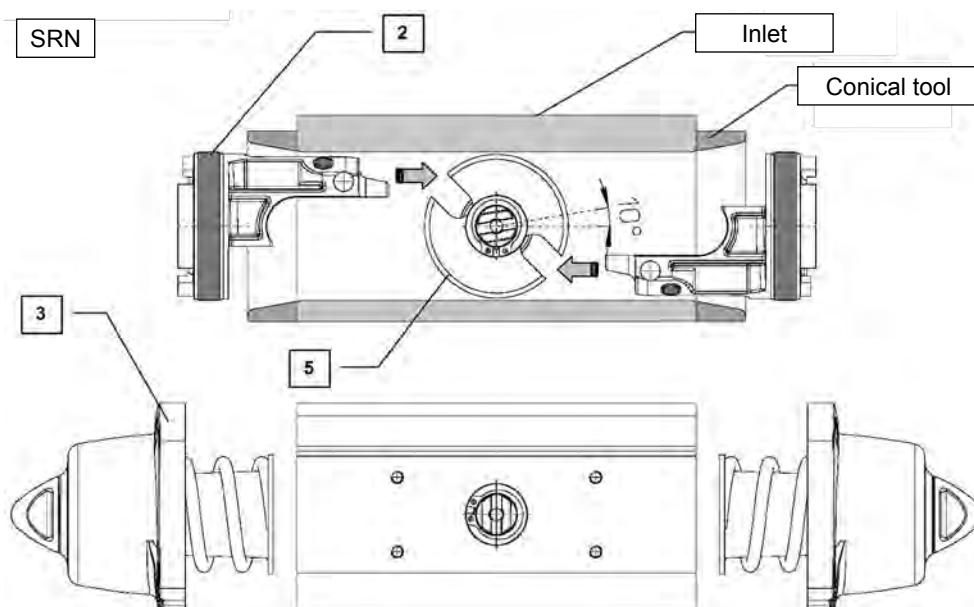
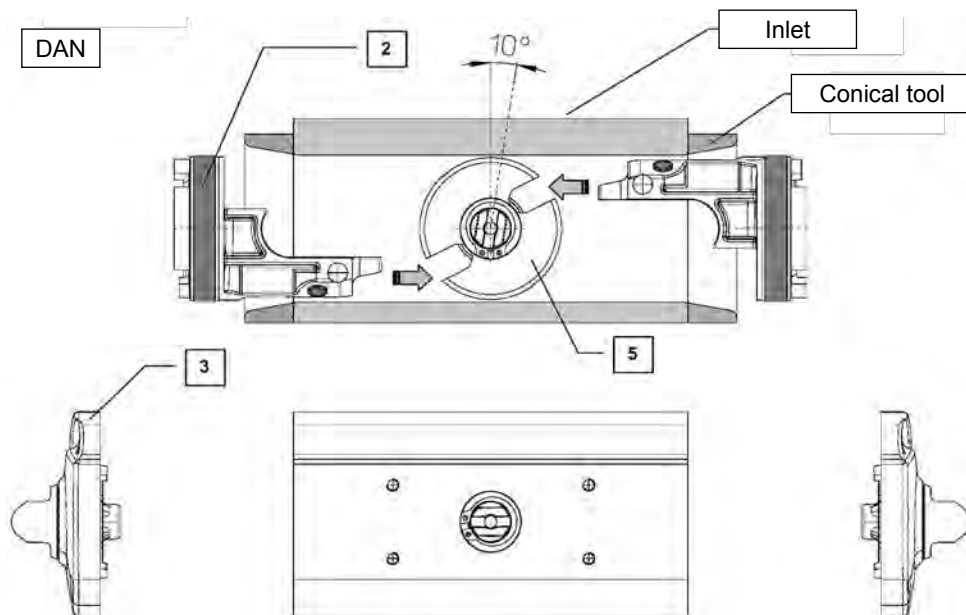
b.5) Position the scotch-yoke shaft ( part N° 5 ) in order to have the grooves in position for the pistons insertion and the right shaft required direction of rotation.

b.6) Insert the pistons ( part N°2 ), using a proper conical tool ( see the drawing ), in the scotch-yoke grooves ( part N° 5 ) and press simultaneously the two pistons inside of the cylinder ( part N° 1 ). The OMAL scotch-yoke system will avoid pistons misalignment. Holding the actuator on a vice rotate the shaft to verify the shaft rotation direction and the easy movement.

b.7) Replace the sealing O-ring ( part N° 19 ) on its caps seat ( part N° 3 ) and grease it. Fit the end caps to the body screwing the screws in cross ( part N° 20 ) .

NOTE: For the screw torque wrench setting see paragraph "5. INSTALLATION INSTRUCTION"

Holding the actuator in a vice, rotate the shaft to check the direction of rotation and its correct movement.



**8. SPECIAL VERSIONS**

OMAL manufactures and supplies special actuators versions for specific actuator use and environmental.

**a) External protections.**

All the standard version could be supply with different external protection according with the plant ambient working condition ( see OMAL catalogue or contact OMAL commercial team ).

**b) Stainless Steel Actuators**

For food and chemical plants OMAL manufacture a Stainless Steel version. The body and all the external part are made in stainless steel .

The rotary system is the same Scotch-Yoke used for the standard actuators.

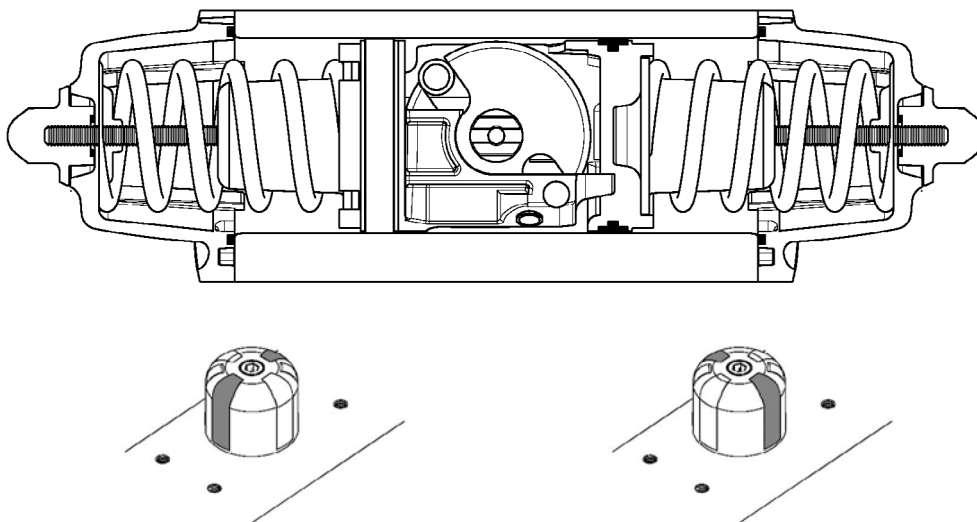
For the stainless steel actuators performances please refers to the standard actuators data tables.

**c) Simple Acting spring return Fail to Open.**

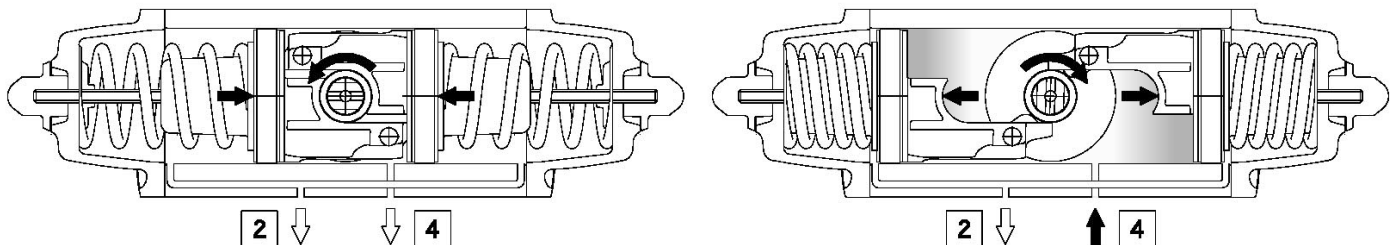
Spring Return Fail to Open actuators are required when in case of the pressurised air or electrical power supply are off the valve should be automatically opened.

In the fail to open actuators the pistons are inserted into the cylinder like the Double Acting version, and due to the spring force the actuator is Normally Open.

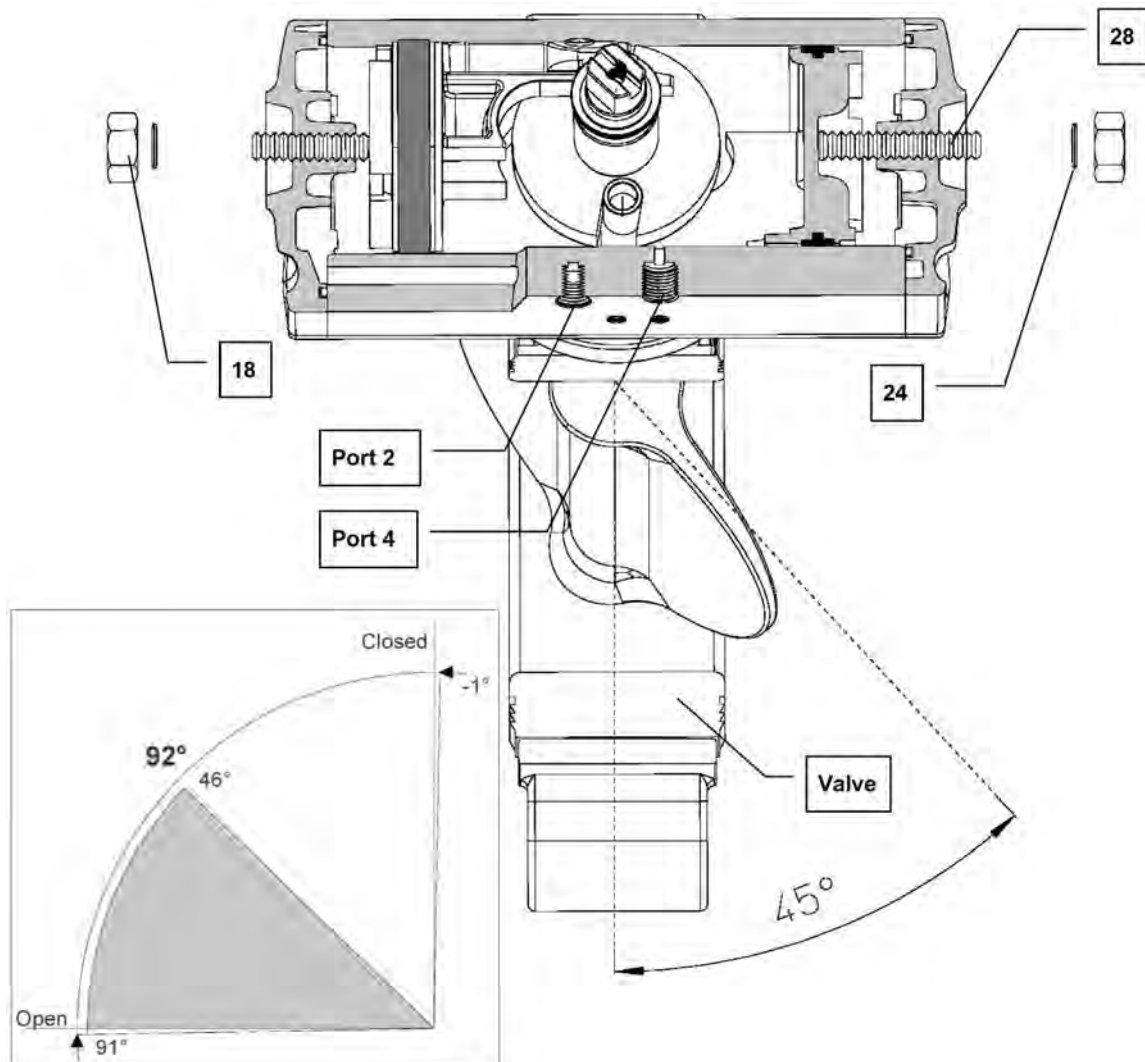
**WARNING:** Nominal torque and torque performances in Spring return Fail to Open version, due to its construction, are different from the Spring Return Fail to Close standard versions. For sizing and application please refer to OMAL technical department.



Simple Acting Spring Return fail to open operation cycle .



d) This double acting DAN special version, with the pistons rotated and extra long adjustment screws, limits the actuator/valve travel in the open position and is used when the valve should never be totally open, but limited up to 45% of its capacity.



**WARNING:** Double Acting (DAN) and Spring Return (SRN) special version develop different torque forces and before installation and maintenance please consult OMAL technical department for their technical data and torque diagrams.

**9. STORAGE**

The OMAL actuator has been packaged to provide protection during shipment, however, it can be damaged in transport. Prior to storage, inspect the actuator for shipping damage. Keep the actuators in their original packing box during storage. It is recommended to keep the actuators in a clean and dry environment at temperatures between -10°C and +60°C until ready for use.

The actuator has two air ports, which are closed by labels for prevent liquids or others material to entering in the actuator during storage.

If the actuators are to be stored for a long period of time before installation, it is recommended to stroke them periodically to prevent setting of the seals.

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

## 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 to the pneumatic line 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 sealing 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 and the valve stem	Check the connection elements 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 (aluminium/steel) can be restored as raw material;
- Seals/sealing elements (NBR, FKM, FVMQ...), 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).