

# ASSURED AUTOMATION





We Make **Valve Automation** Easy



INSTRUCTION MANUAL

## **P Series** **SCOTCH-YOKE PART TURN PNEUMATIC ACTUATOR** **PD08**

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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 Instruction 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.

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

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 for valve drive and remote control.

- 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.

The maintenance must be carried out by OMAL SpA or by qualified personnel.

This manual contains important information regarding the use, maintenance and storage of OMAL S.p.A. actuators. Please read it carefully before installation and use of the product and keep it in a safe place for future reference.

## 2) WORKING 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 4).

### 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 µm (ISO 8573-1, Class 5).

### c – Operating pressure

The maximum operating pressure is 8,4 bar (120 psi)

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 available 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 90° rotation.

### 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 valve torque and its characteristics and the room temperature.

DOUBLE ACTING ACTUATOR - OPEN CLOSED TIMING - with SOLENOID VALVE NAMUR 5/2 1/4" TEMPI DI APERT. CHIUS. - ATTUATORI DOPPIO EFFETTO - con ELETTROVALVOLA NAMUR 5/2 1/4"	
<b>Test conditions</b>	<b>Condizioni di prova</b>
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
<b>Control</b>	<b>Controllo</b>
3/2 - 5/2 solenoid valve monostable Namur	Elettrovalvola 3/2 - 5/2 monostabile NAMUR
Pneumatic connections: 1/4" gas	Connessioni pneumatiche: 1/4" gas.
Bore diameter: 1/4" - exhaust 1/4"	Diametro passaggio: 1/4" - scarico 1/4"
Flow capacity: 675 NI/min (at Δp.1 bar)	Portata: 675 NI/min (con Δp.1 bar)
<b>Instruments for testing</b>	<b>Strumenti di misura</b>
Digital chronometer controlled by proximity switches	Cronometro digitale e fincorsa di prossimità

A SOLENOID VALVE NAMUR 5/2 1/4" - Elettrovalvola Namur 5/2 1/4"				
A+B 5/2 1/4" SOLENOID V. NAMUR+1/4" QUICK EXHAUST - Elettrov. Namur 5/2 1/4"+scar. Rapido 1/4"				
time in seconds	A		A+B	
	OPEN 5.6 bar	CLOSED 5.6 bar	OPEN 5.6 bar	CLOSED 5.6 bar
(1) DA 8	0.05	0.05	No improvement of the standard time. Nessun miglioramento dei tempi standard	



**Note:** the previous image is of generic representational nature; different working conditions such as: air pressure, pipe connections, filters and valves, may change the maneuver timing.

**g - Lubrication**

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 acetal resin. The use of steel bushes on the Scotch yoke system reduce backlash and confer very low friction sliding during operation.

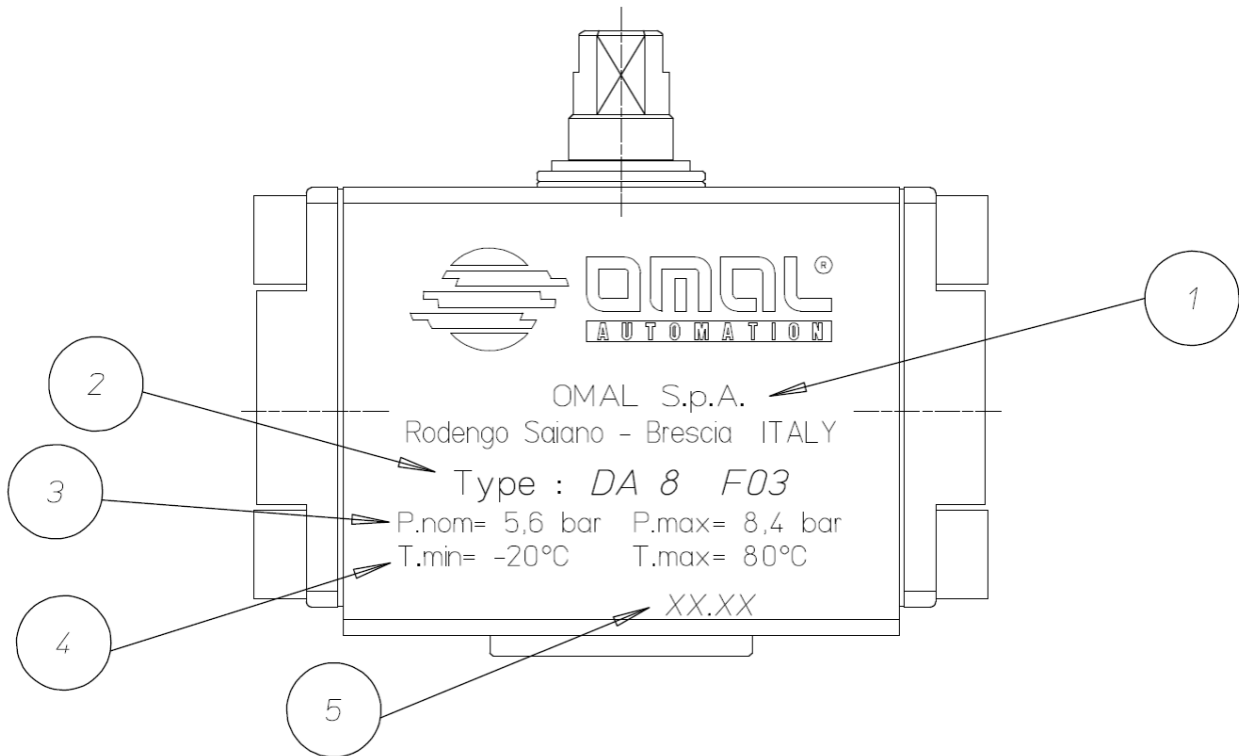
**j – External protection**

The actuators are suitable both for indoor and outdoor installations. The aluminum body is protected against corrosion by an oxidation treatment which is 20 µm thick; the caps are varnished with polyester based powder varnish; the screws of the caps 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 by a suitable varnishing treatment.

**k – Marking and classification**

The bodies of the OMAL S.p.A. actuators show, by means of laser marking or label: the logo and address of the manufacturer, the code or the serial number, the size, the output torque, the working pressure and the maximum working temperature and the production date.



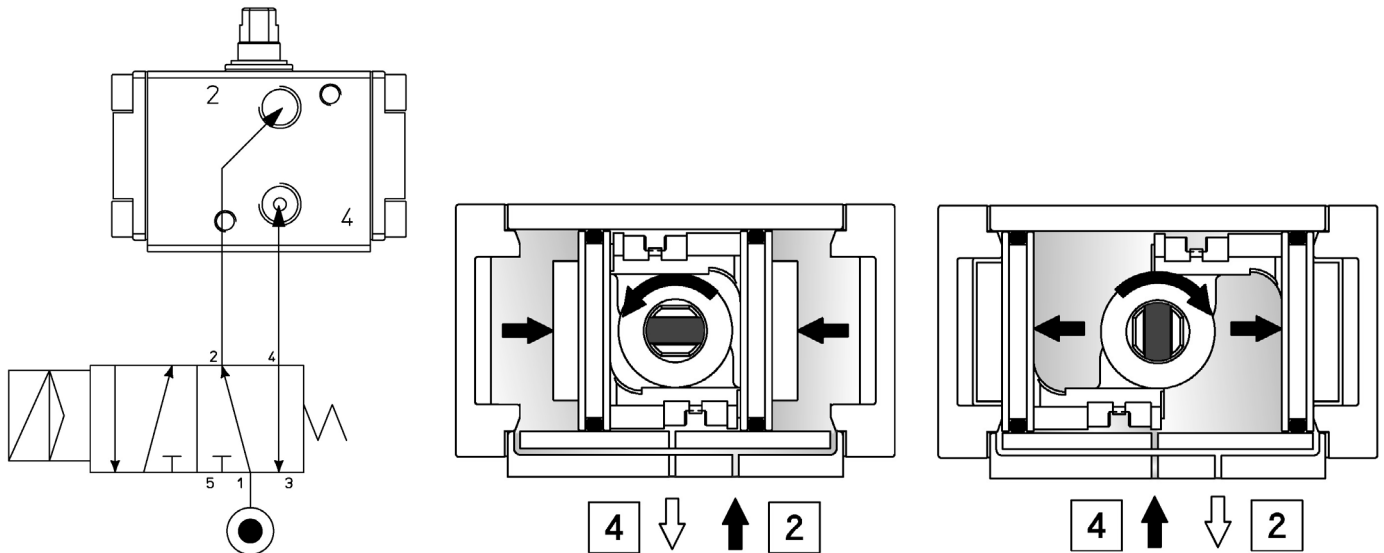
- 1 – Logo and address of the manufacturer
- 2 – Product code including the “DA” series, the nominal torque “8” Nm and the flange type “F03”
- 3 – Nominal Pressure and Maximum working Pressure
- 4 – Minimum and maximum working temperature
- 5 – Production date code

### 3) OPERATION AND ROTATION DIRECTION

#### 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 counter-clockwise direction.

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



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

#### Positioning and rotation direction of the actuator

The positioning and the rotation direction of the actuator, to ensure a maximum opening torque, must be in accordance with the EN ISO 5211 standard.

### 4) SAFETY INSTRUCTIONS

- 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, corrosive environments may damage it.
- 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 pressurized.
- Before mounting the actuator on the valve, make sure that the rotation of one is in line with the rotation of the other, and that the position of the shaft slit is correct.
- Before installing the actuated valve, carry out a few 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 Directive 2014/34/EU ATEX, read the additional instructions for the use in explosive atmospheres, supplied together with the product.

## 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.

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 needed rotation direction.

- Before installation, visually check that the conditions of the actuator are good, since it's been transported and stored.
- Verify, through the shaft slot or covers, the position of the actuator.
- 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.

### Assembly 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 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 case 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) Bracket and connection joint.

Where, for technical installation reasons and due to 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 a 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.

Tightening torque of the screws

Size: M5

Torque Nm: 5-6

## 6) MATERIALS AND THEIR DURABILITY

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

Nominal torque (a) Nm	Least number of cycles expected for the pistons and the cylinder (b)	Minimum cycle time from 0-90 ° in seconds "s"
≤125	500 000 (c)	3
≤1000	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 – according to the EN ISO 5211 standard.

b – A cycle is composed 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  $\approx$  5,5 bar supply and according to the test procedure described in attachment A of the EN 15714-3 standard.

Should it be necessary to replace the piston seals, the operation must be carried out by OMAL S.p.A. or anyway by qualified personnel and with the appropriate tools: it is advisable to return the actuator to OMAL S.p.A., which will be checked and tested before returning it.

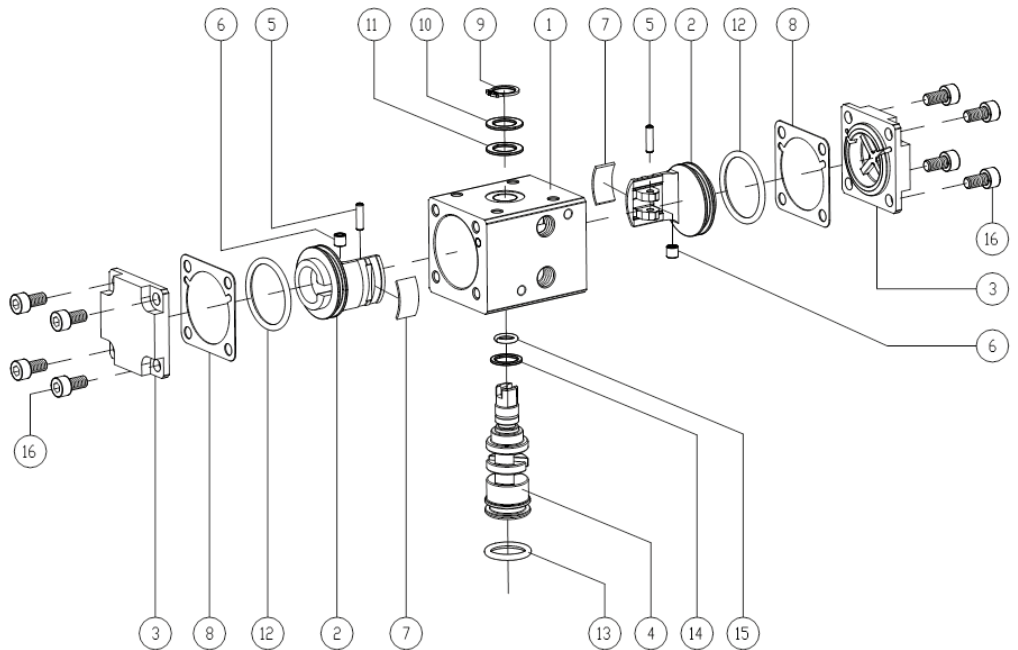
OMAL S.p.A. can supply, upon request a kit with spare seals.

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

### COMPONENTS LIST

POS	DENOMINATION
1	Cylinder
2	Piston
3	Cap
4	Shaft
5	Pin
6	Bush
7*	Roller
8*	Cap sealing
9*	Seeger
10*	Washer
11*	Support ring
12*	O-ring
13*	O-ring
14*	Internal support ring
15*	O-ring
16	Screws

Parts included in the spare parts kit – CODE: KGD10010





**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.

If the cap or piston seals need to be replaced, OMAL SpA can supply a kit with spare parts.

**WARNING**

The seals must be replaced by qualified personnel and with the appropriate tools

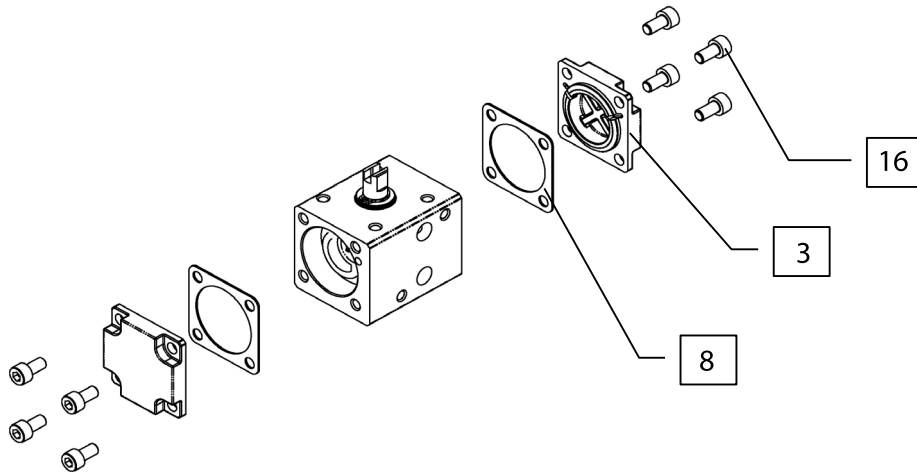
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**Replacing the seals**

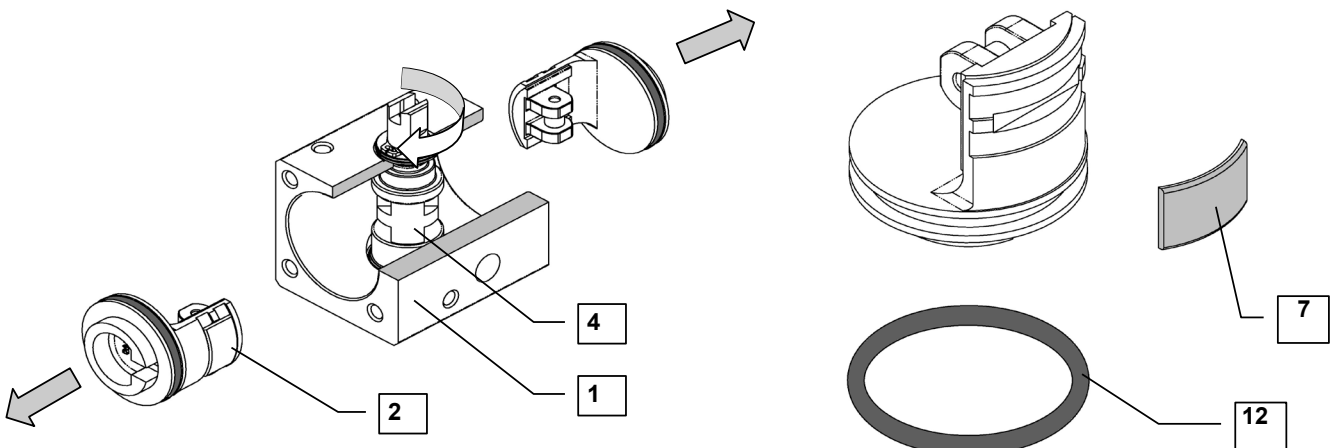
**a) Disassembly**

The disassembly operations must be performed when the actuator is disconnected from all the electric and pneumatic connections and from the valve. Verify that there is no pressure in the actuator. Check that the ports 2 and 4 are free. Use appropriate tools only.

a. Loosen the cap screws (ref.16) crosswise and remove the caps (ref.3) and replace the seal (ref.8).



b. Keep the actuator blocked with a clamp while turning the stem until the pistons (ref.2) are not released from the grooved housing on the shaft (ref.4), therefore slide out the pistons from the cylinder (ref.1). Do not use compressed air to remove the pistons from the cylinder, for it may cause injuries.



c. The O-rings (ref.12) and the rollers (Ref.7) are to be checked before replacing them. Do not use sharp tools to remove the O-rings and the rollers from the piston for they could get scratched or damaged.

d. The disassembled parts must be carefully cleaned and checked before being greased and reassembled. If the seals are worn out, they are to be replaced with new ones from the spare parts Kit.

**b) Assembly**

a. The O-rings (ref.12) will have to be mounted on the piston by using a tapered tool that will allow to make them slide easily into their position. Push the acetal resin rollers (ref.7) into their position, on the piston.

b. Grease the piston (ref.2) and its parts (ref.7and12)

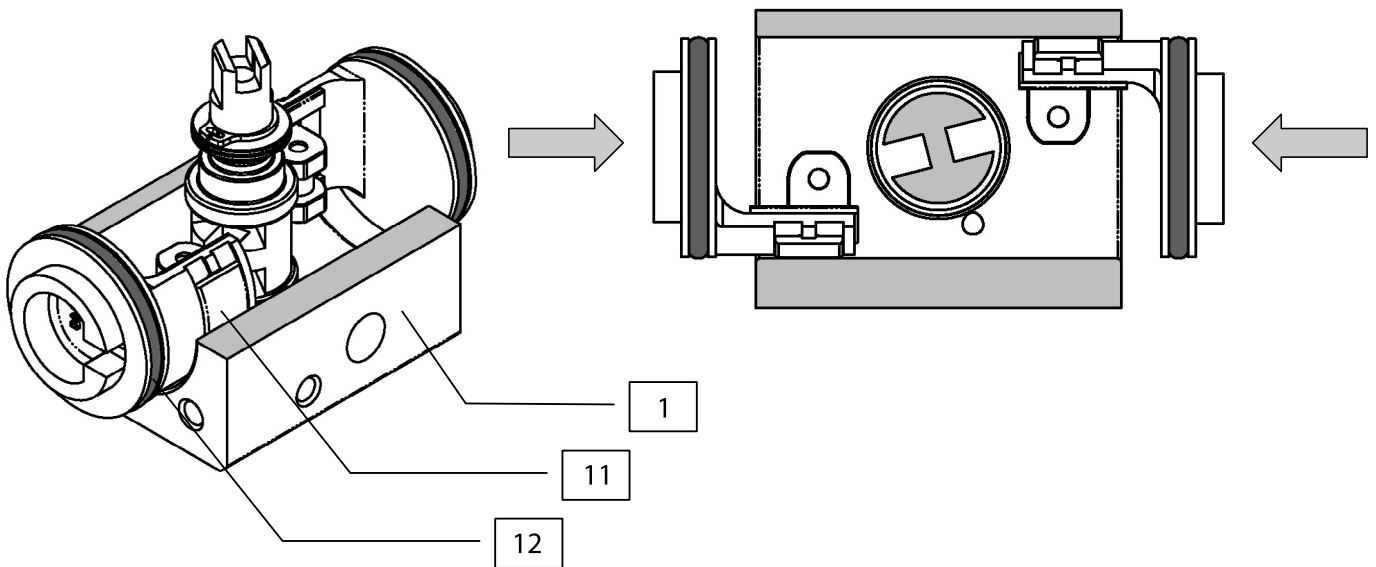
c. Grease the internal surface of the cylinder (ref.1)

d. Place the shaft (ref.4) so that its grooves are in the correct position to receive the pistons and also have the right rotation direction.

e. Insert the pistons (ref.2) in the wedges (ref.4) and push them in the cylinder simultaneously (ref.1). The OMAL S.p.A. Scotch yoke system, will prevent the misalignment of the pistons.

f. Reposition the seals (ref.8) in the caps (ref.3) and grease them. Fix the caps to the body by tightening the screws in a crosswise sequence (ref.16).

g. Apply, to the screws, the tightening torque pointed out in paragraph 5.



**8) SPECIAL VERSION**

OMAL S.p.A. produces and supplies also special versions of its actuators, for the use in conditions of low temperature (-50°C) and high temperature (+150°C), for application in explosive atmosphere environments (  $\text{CE} \text{ Ex}$  II 2 GD TX X) and others for specific purposes.

**9) STORAGE**

The OMAL S.p.A. actuators are properly packaged for protection during the dispatch, but they could still get damaged 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 properly
	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 supply hole and the valve stem	Check the connection and 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 marking of conformity:

- 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).