

INSTALLATION – OPERATION – MAINTENANCE MANUAL

ITEMS 0500 – 0501 – **0510** – 0550 – 0551 HYDRAULIC CYLINDERS

ITEMS 0570 – 0571 – 0575 – 0576 PNEUMATIC CYLINDERS



CONTENTS

1. Overview

1.1 Type of products

1.2 Key of symbols

1.3 Marking and certifications

2. Handling

3. Installation

4. Assembly diagrams

5. Size – materials – operating conditions

6. Limits of use

7. Maintenance

7.1 Ordinary maintenance

7.2 Extraordinary maintenance – kit gaskets replacement – stem replacement

8. Storage

9. Decommissioning

10. List of components

1. Overview

Single-acting and double-acting hydraulic cylinders and double-acting pneumatic cylinders to be used specifically on linear-motion piston gate valves.

1.1 Type of products

ART. 0500 - ART. 0501

Single-acting hydraulic cylinder, opening with oil, closing with gas spring

ART. 0510

Single-acting hydraulic cylinder, opening with oil, closing with extension spring

ART. 0550

Double-acting hydraulic cylinder with floating piston

ART. 0551

Double-acting hydraulic cylinder with non-floating piston

ART. 0570 – ART. 0575

Double-acting pneumatic cylinder

ART. 0571 – ART. 0576

Magnetic double-acting pneumatic cylinder

1.2 Key of symbols



this symbol draws attention to additional information and/or instructions to be followed in the event that the cylinder or the cylinder-gate valve unit is employed in potentially explosive atmospheres.



this symbol draws attention to important information and/or instructions to prevent serious injuries to the operator and/or serious damages to the system and the environment.

1.3 Marking and certifications

1.3.1 Pressure Equipment Directive (97/23/EC)

Hydraulic cylinders are considered pressure vessels, thus they are subject to the Pressure Equipment Directive (97/23/EC). The applicable conformity assessment table is table 4, "vessels referred to in Article 3, Section 1, letter a, point 2, second indent". It refers to "vessels for liquids having a steam pressure at the maximum allowable temperature of not more than 0,5 bar above normal atmospheric pressure (1.013 mbar), within the following limits:

for fluids in Group 2 with a pressure PS greater than 10 bar and a product PS and V greater than 10 000 bar/L or with a pressure PS greater than 1 000 bar.

In particular, these cylinders are subject to Article 3, Section 3, thus they are not required to be CE marked.

The pneumatic cylinders are considered pressure vessels thus they are subject to the Pressure Equipment Directive (97/23/EC). The applicable conformity assessment table is table 2, "vessels referred to in Article 3, Section 1, letter a, point 1, second indent". It refers to vessels for "gases, gases dissolved under pressure, vapours and also those liquids whose vapour pressure at the maximum allowable temperature is greater than 0,5 bar above normal atmospheric pressure (1 013 mbar) within the following limits:

for fluids in Group 2, with a volume greater than 1 L and a product PS and V greater than 50 bar-L, or with a pressure PS greater than 1 000 bar.

In particular, these cylinders are subject to Article 3, Section 3, thus they are not required to be CE marked.

1.3.2 Machinery Directive (2006/42/EC)

Hydraulic or pneumatic actuators are not considered machinery, thus they are not subject to Directive 2006/42/EC.

1.3.3 ATEX Directive (94/9/EC) (currently waiting for approval, available from January 2016)

⚡ The hydraulic cylinders items 0500-0501-0550-0551, the pneumatic cylinders items 0570-0575 and the pneumatic cylinders 0571-0576 can be supplied, upon request, in Atex version thus fit to meet the requirements of Directive 94/9/EC for protection against explosion.

The reference framework is the following:

EN 13463-1 "Non-electrical equipment for use in potentially explosive atmospheres – basic method and requirements"

EN 13463-5 "Non-electrical equipment for use in potentially explosive atmospheres – protection by constructional safety"

The Atex cylinders bear the following marking:



Thus cylinders are:

- certified for use on equipment of **Group II, category 2**
- certified for use in the **GAS zones 1 and 2** and in the **DUST zones 21 and 22** (dust)
- Temperature class: **TX** resulting from the room temperature or the temperature of the operating fluid because the cylinders are not provided with internal heat sources.

The **1370** number identifies the Notified Body (Bureau Veritas Italia S.p.A.) the **T.F. 0090** Metaltecnica technical file has been filed with; the following number is the registration receipt issued by the Notified Body.

2. Handling

The indications below must be followed when handling the products:

- Use personal protective equipment (gloves, safety glasses, safety shoes, etc.)
- Handle cylinders with care to prevent impacts and damages.

3. Installation

The indications below must be followed during installation:

- Check the cylinder for overall integrity.
- Remove the plastic caps only when connecting to the hydraulic and pneumatic lines to prevent foreign matter from entering the cylinder.
- Should the cylinder be varnished, protect the threaded parts (manifold connecting to the gate valve), labels and escape filters, if there are any.
- After installing the cylinders on the gate valve, unloaded opening and closing cycles must be carried out before the commissioning of the gate valves.
- ⚠ The closing force of the cylinder item 0510 can be adjusted by rotating the top threaded rod through a ch14 wrench. Make sure that the cylinder is disconnected from the hydraulic line before adjusting. Do not preload the spring excessively in order to avoid a too high closing force which may cause the wedge to be blocked within the seat of the gate valve.
- ⚠ Before disassembling the cylinder from the gate valve/the system, to repair or replace it, the electrical, pneumatic and hydraulic supplies must be disconnected, thus releasing the pressure of the lines and the cylinder.
- Do not remove the sensors when the cylinder is under pressure.

In the event the cylinder is used in potentially explosive atmospheres, follow the indications below:

- ⚠ Consider whether the cylinder is suitable to the hazard zone in which it will be installed (see Directive 99/92/EC).
- ⚠ Additional electric, mechanical, magnetic equipment can be applied exclusively when they are compliant with the Atex Directive and provided with declaration of conformity and a classification suitable to the area in which they will be installed.
- ⚠ Remember that the maximum surface temperature does not depend on the cylinder, instead it depends on the operating conditions such as the temperature of the process fluid used, temperature of the environment, external heat sources.
- ⚠ Do not disassemble the cylinder close to heat sources which, through radiation, conduction or convection, may heat the cylinder and increase its surface temperature above the minimum ignition temperature of the potential explosive atmosphere.
- ⚠ Earth the cylinder and/or the cylinder-gate valve unit. Atex gate valves are provided with a connection point (screw + terminal) an electric cable will be connected to, thus working as a conduit and discharging any possible electrostatic currents in the system.
- ⚠ Before disassembling the cylinder or the gate valve-cylinder unit, check that there is electrical continuity between the two tubes.
- ⚠ During installation, maintenance and disassemble, avoid mechanical impacts, which may cause sparks.

4. Assembly diagrams

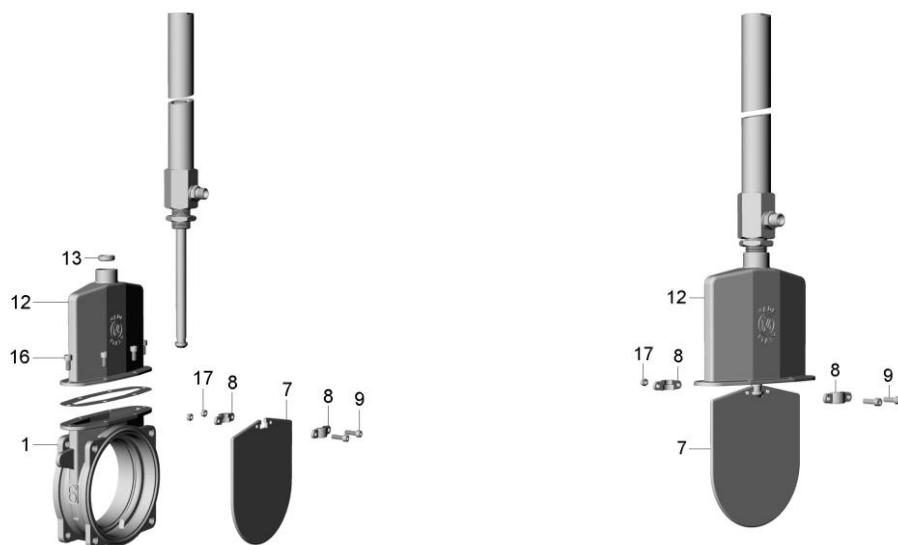
The assembly procedure of actuators on gate valve might change according to the kind of gate valve the cylinder is going to be assembled on. Detailed assembly diagrams for each kind of gate valve can be requested to Metaltecnica's technical office.

Listed below are examples of the following assembly diagrams:

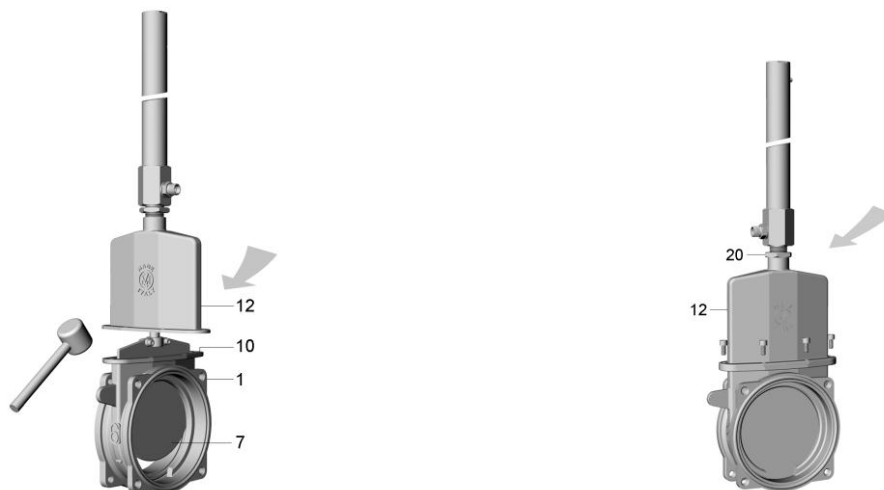
- Assembly diagram of the knife-gate valve –hydraulic cylinder item 0500
- Assembly diagram of the knife-gate valve – pneumatic cylinder item 0570

4.1 Knife-gate valve assembly procedure – cylinder items 0500 – 0501

The procedure below allows assembling a cylinder item 0500 on a disassembled gate valve (suitable for cylinders) and a knife provided separately.



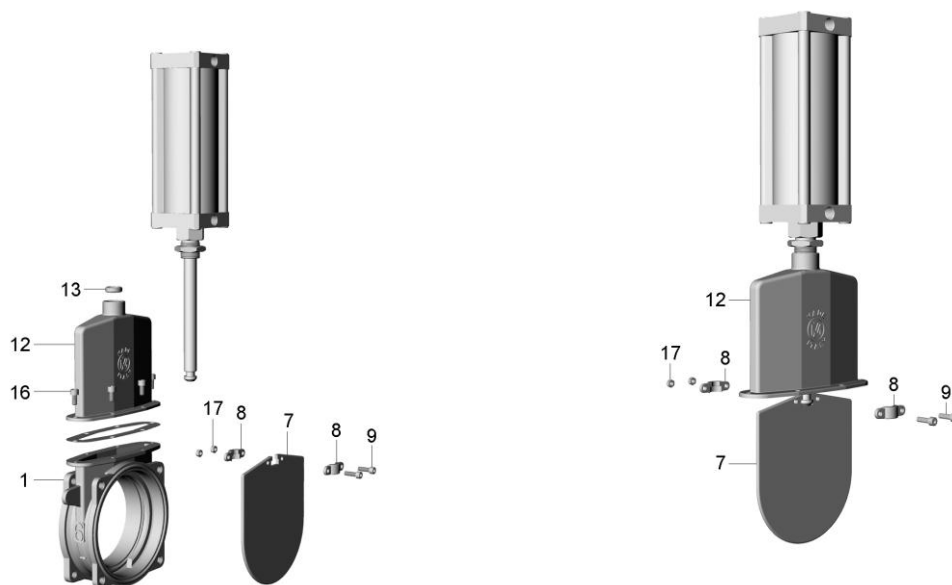
- Unscrew the screws (16) and remove the cylinder head (12) from the cylinder bore (1)
- Disassemble the stem-fastening clamp (8) from the knife (7) by unscrewing the screws (9) from the nuts (17)
- Insert the gasket (13) (only 1 ring) in the top seat of the head (12)
- Screw the cylinder to the head by 8-10 mm.
- Insert the stem terminal of the cylinder in the T slot nut of the knife (7) and fasten the two elements through a fastening clamp (8), screws (9) and nuts (17).



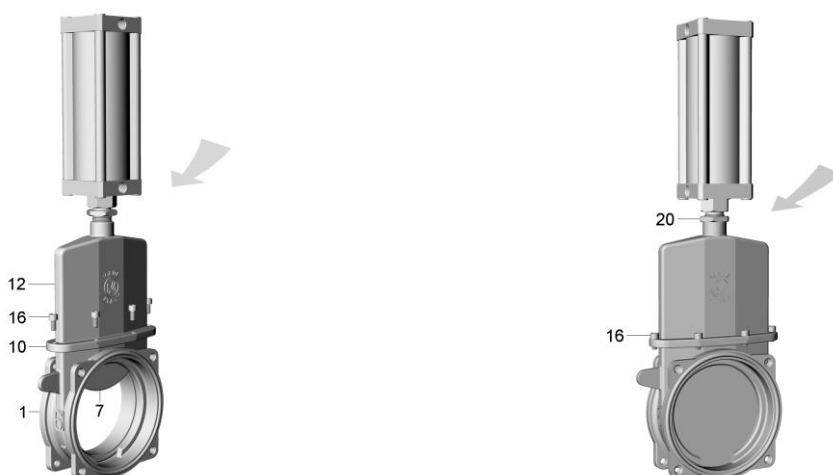
- Position the gasket (10) on the top part of the bore (1) and then insert manually, as much as possible, the knife (7) within the bore.
- Rotate the head by 90° in order to leave the two sides of the knife (7) uncovered.
- By using a mallet, hit the two sides of the knife alternatively until fully inserting it within the bore.
- Rotate the head (12) and center it with the bore, then partially screw the screws (16) to the bore (1) in order to avoid fastening the head on the bore itself.
- Screw the cylinder to the head and avoid pressing the gasket too much. To obtain a correct sealing, screw the cylinder manually until it reaches the gasket and then rotate again by 90° with an allen wrench. Pressing the gasket too much may block the movement of the stem.
- Screw the screws (16) several times and alternatively until they stop, thus allowing the components to be correctly fastened.
- Fasten the cylinder to the head by unscrewing the ring (20) until it stops against the head.
- Connect the cylinder to the hydraulic line and make some opening and closing cycles before installing the gate valve.

4.2 Knife-gate valve assembly procedure – cylinder item 0550 – 0570 – 0571 – 0575 – 0576

The procedure below allows assembling cylinders items 0550 – 0570 (and their variations) on a disassembled gate valve (suitable for cylinders), with a knife provided separately.



- a) Unscrew the screws (16) and remove the head (12) from the bore (1)
- b) Disassemble the bar-fastening clamp (8) from the knife (7) by unscrewing the screws (9) from the nuts (17)
- c) Insert the gasket (13) (only 1 ring) in the top seat of the head (12).
- d) Remove the stem from the cylinder completely and then screw the cylinder to the head (12) by 8-10 mm.
- e) Insert the stem terminal of the cylinder in the T slot nut of the knife (7) and fasten the two elements through a fastening clamp (8), screws (9) and nuts (17).



- f) Put the gasket (10) on the top part of the bore (1) and then insert manually, as much as possible, the knife (7) within the bore.
- g) Push towards the bore the head and the cylinder unit until the head fully (or almost fully) stops against the bore. In this stage, the stem of the cylinder will return within the cylinder, thus facilitating the procedure.
- h) Screw the screws (16) partially to the bore (1) in order to avoid blocking the head (12) in the bore itself.
- i) Screw the cylinder to the head and avoid pressing the gasket too much. To obtain a correct sealing, screw the cylinder manually until it reaches the gasket and then rotate again by 90° with an allen wrench. Pressing the gasket too much may block the movement of the stem.
- j) Screw the screws (16) several times and alternatively until they stop, thus allowing the components to be correctly fastened.
- k) Fasten the cylinder to the head by unscrewing the ring (20) until it stops against the head.

- l) Connect the cylinder to the hydraulic line (item 0550) or to the pneumatic line (item 0570) and make some opening and closing cycles before installing the gate valve.

5. Size - materials – operating conditions

The technical information on the overall sizes and the material used are available in the company catalogue or on our web-site www.metaltecnicazanolo.com. The technical data sheets for each item can be requested to the Metaltecnica's technical office.

The hydraulic cylinders must comply with the following operating conditions:

Items	0500 – 0501 – 0510 – 0550 – 0551
Maximum operating pressure	20 Mpa – 200 bar – 2.900 PSI
Room temperature	-20°C ÷ +80°C
Fluid temperature	-20°C ÷ +70°C
Maximum frequency	4 Hz
Maximum speed	≤1m/s
Type of fluid	Hydraulic oil
Suggested viscosity	15 ÷ 100 mm ² /s
Degree of contamination pursuant to ISO 4406	ISO 19/17/14
Ideal capacity when operating	Max 30 l/min
Suggested sprint preload (for the 0510 item)*	mm 50

* The closing force of the cylinder item 0510 can be adjusted by rotating the top threaded rod through a ch14 wrench. Make sure that the cylinder is disconnected from the hydraulic line before adjusting. Do not preload the spring excessively in order to avoid a too high closing force which may cause the wedge to be blocked within the seat of the gate valve.

The pneumatic cylinders must comply with the following operating conditions:

Items	0570 – 0571 – 0575 – 0576
Maximum operating pressure	1 Mpa – 10 bar – 145 PSI
Room temperature	-20°C ÷ +80°C
Fluid temperature	-20°C ÷ +70°C
Maximum frequency	4 Hz
Maximum speed	≤ 1m/s
Type of fluid	Dry and lubricated air




6. Limits of use

- Cylinders cannot be used under pressure and temperature conditions other than those indicated in the previous point.
- Cylinders cannot be used in submersible devices.
- “Atex” cylinders can be used in the explosive atmospheres indicated in the paragraph 1.3.2 exclusively when installed on Metaltecnica gate valves provided with “Atex” certification. Any other use is prohibited.
- “Atex” cylinders cannot be used in explosive atmospheres other than those indicated in paragraph 1.3.2.

7. Maintenance

Cylinders only require few and simple maintenance procedures, which must be carried out by qualified operators using proper personal protective equipment.

7.1 Ordinary maintenance

- Check the hydraulic actuators periodically for signs of oil leaks and check the area connecting the cylinder with the gate valve for signs of leaks. Check the amount of oil leaks through the escape filter of the spring cylinder (item 0510); oil leaks are supposed to be occasional, continuous/constant oil leaks are indicative of the gasket wearing, thus the gasket must be replaced.
-  When necessary, clean the external surfaces of the actuators using a damp cloth, thus preventing dust from accumulating. Do not clean using compressed air, thus preventing potentially dangerous dust from being scattered into the surrounding atmosphere.
-  Check monthly the external condition of the gate valve-cylinder unit and make sure that no part has been eaten by rug. In this case, replace the eaten parts immediately.
-  Check monthly the integrity of the connections to the earthing terminals of the “Atex” cylinders.

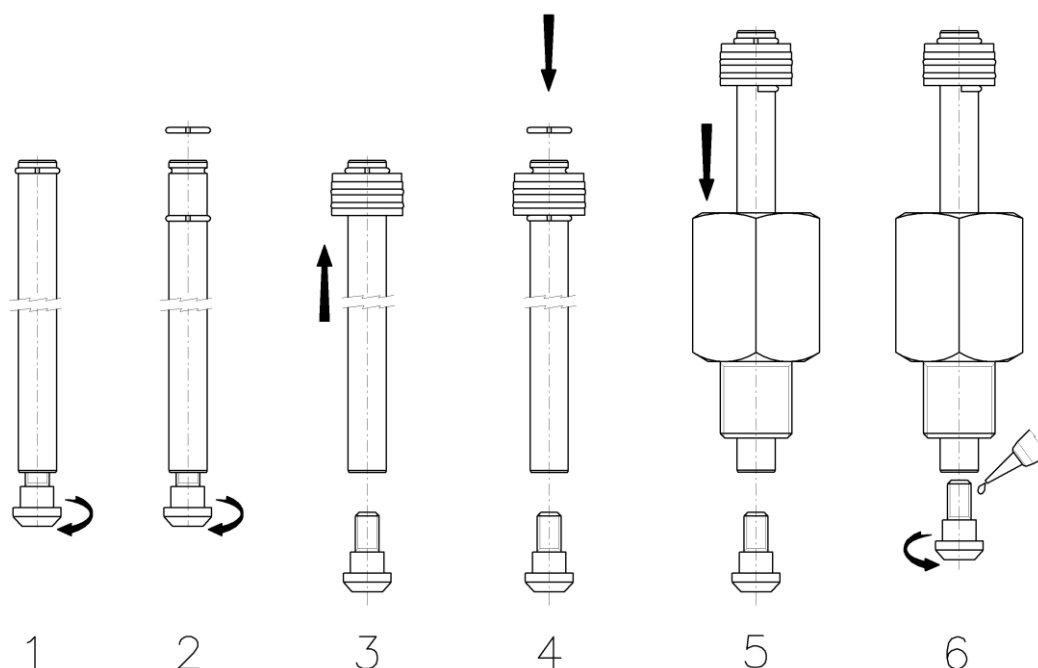
7.2 Extraordinary maintenance - kit gaskets replacement – bar replacement

The main extraordinary maintenance procedure of the actuators are kit gaskets replacement and stem replacement.

7.2.1 Kit gaskets replacement procedure for 0500 – 0501 – 0510 – 0550 – 0551 items

- a) Vise the cylinder by sealing the hexagonal part of the manifold.
- b) *The following procedure only applies to item 0510:* rotate anti-clockwise the threaded bar through a CH14 wrench until it stops in order to discharge the extension spring completely. Rotate the spring to disconnect the terminal with hook from the connecting nipples and then remove it upwards. Remove the threaded bar by extracting it upwards.
- c) Unscrew the external tube from the hexagonal manifold by using a wrench with rollers to avoid damages to the tube. Remove the tube and the gas capsule (items 0500 – 0501)
- d) Remove the stop ring located at the end of the stem through a suitable plier. Do not expand the stop ring excessively to avoid deforming the ring permanently. If necessary, replace the stop ring too.
- e) Extract the components located on the stem upwards and extract the stem from the lower side of the hexagonal manifold.
- f) Remove the damaged gaskets, clean all the parts carefully, replace the gaskets and then assemble the cylinder by following the procedure in reverse order.

7.2.2 (Ø16) stem replacing procedure for 0500 – 0510 – 0550 – 0551 items.



The stem of the cylinders items 0500 – 0510 – 0550 - 0551 is made by two pieces (stem + terminal) and, as a spare part, it is supplied with a pre-assembled stop ring to facilitate the replacing procedure.

Figure 1 shows the stem for items 0500 – 0510 – 0550, including only one stop ring at the top end. Figure 2 shows the stem for item 0551, including an assembled bottom stop ring and a disassembled top stop ring.

In order to replace the stem, follow the instructions below:

- a) Disassemble the cylinder according to the procedure shown in paragraph 7.2.1 and if necessary, replace the gaskets kit.
- b) Unscrew the terminal of the spare stem (figure 1 - figure 2).
- c) Insert the specific sealing assembly (see data sheet) from below on the stem of the cylinders items 0500 – 0510 – 0550 (figure 3) or from the top for article 0551 (figure 4). Assemble the top stop ring for item 0551 and then insert the stem through the hexagonal manifold while paying attention not to damage the sealing gaskets inside the manifold (figure 5).
- d) Check that the threaded part of the terminal and the corresponding threaded part of the stem are completely clean and dry. Put an adequate quantity of high strength anaerobic adhesive (as, for example, LOXEAL® 86-21) to the threaded terminal and screw it to the bar (figure 6) completely and vehemently. Re-assemble the cylinder and wait for the adhesive to be completely hardened before the cylinder commissioning.

8. Storage

When storing before installing or in the event of long-term storage, it is recommended to store the cylinders in a cool (maximum 40°C), well-ventilated place, away from direct sunlight or other heat sources and keep it dry.

9. Decommissioning

Before being decommissioned, cylinders must be disassembled from the system following the procedure below:

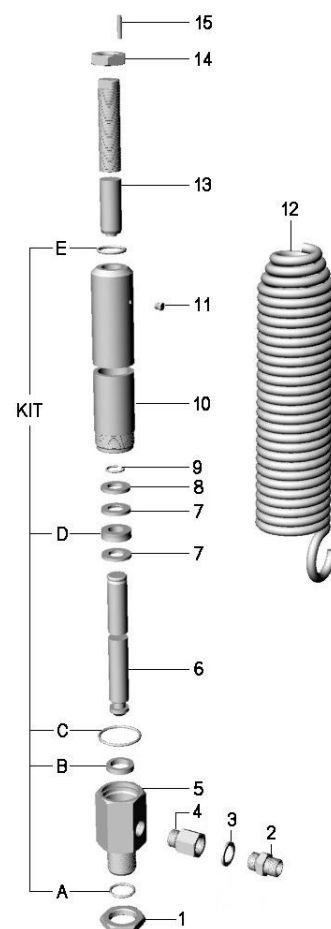
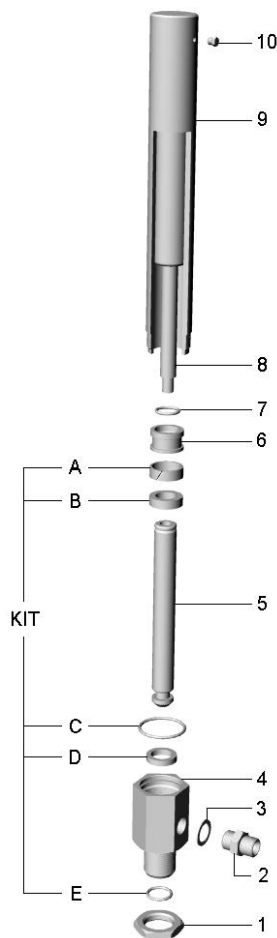
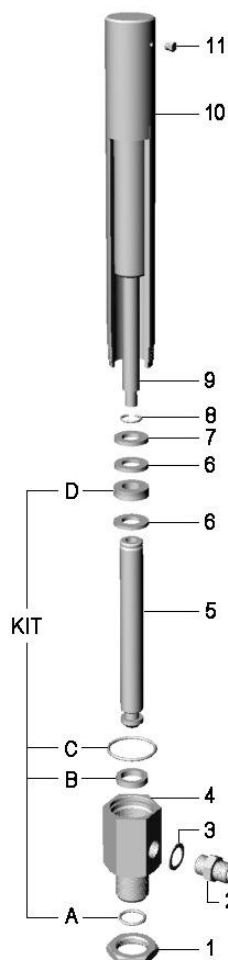
- Open the gate valve and empty the tubes it is assembled on.
- Disconnect the actuator from the pneumatic or the hydraulic lines
- Disassemble the actuator from the gate valve by using suitable personal protective equipment (gloves, safety glasses, safety shoes, etc.)
- Clean the gate valve in order to avoid leaks of the treated fluid which may cause damages to persons, property and environment. For the same reason, the hydraulic oil of the hydraulic cylinder, if there is one, must be carefully removed.
- After the cleaning, recyclable materials (metal parts, plastic parts) must be separated from special waste (hydraulic oil, P.T.F.E. gaskets, rubber parts, etc.) according to the local existing law.



The scrapping of assembled and not cleaned cylinders can cause emissions and damages to the environment

10. List of components

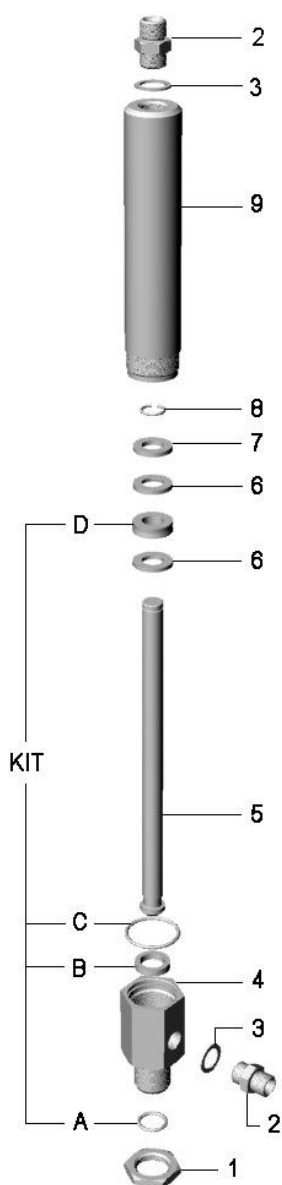
Below an example of a generic the list of components for each type of cylinder. Any other detail is contained in the specific data sheets, which can be requested to the Metaltecnica's technical office.



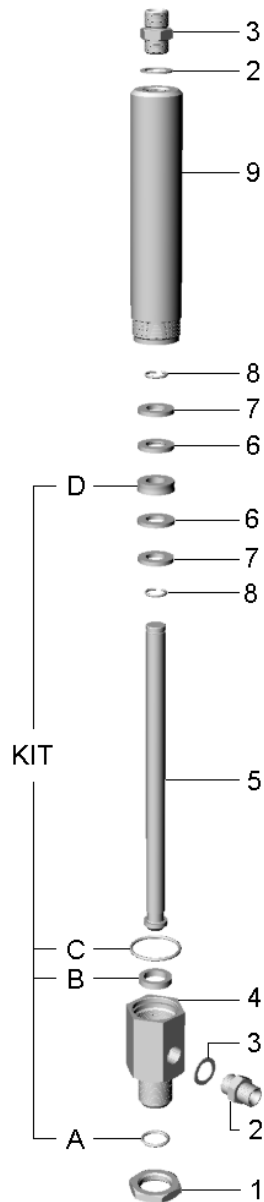
Cylinder item 0500	
Pos.	Name
1	ring
2	nipples
3	seal ring
4	manifold
5	stem
6	back up ring
7	washer
8	stop ring
9	gas capsule
10	capsule tube
11	drain plug
kit	gasket kit

Cylinder item 0501	
Pos.	Name
1	ring
2	nipples
3	seal ring
4	manifold
5	stem
6	piston
7	stop ring
8	gas capsule
9	capsule tube
10	drain plug
kit	gasket kit

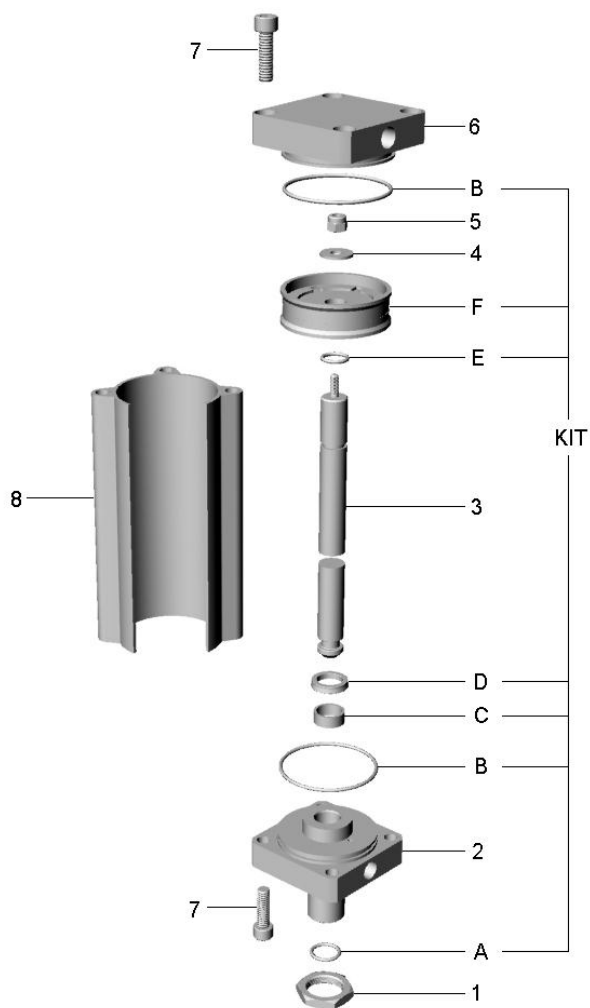
Cylinder item 0551	
Pos.	Name
1	ring
2	nipples
3	seal ring
4	connecting nipples
5	manifold
6	stem
7	back up ring
8	washer
9	stop ring
10	tube (cylinder)
11	drain filter
12	spring
13	threaded bar
14	nut
15	spring pin
kit	gasket kit



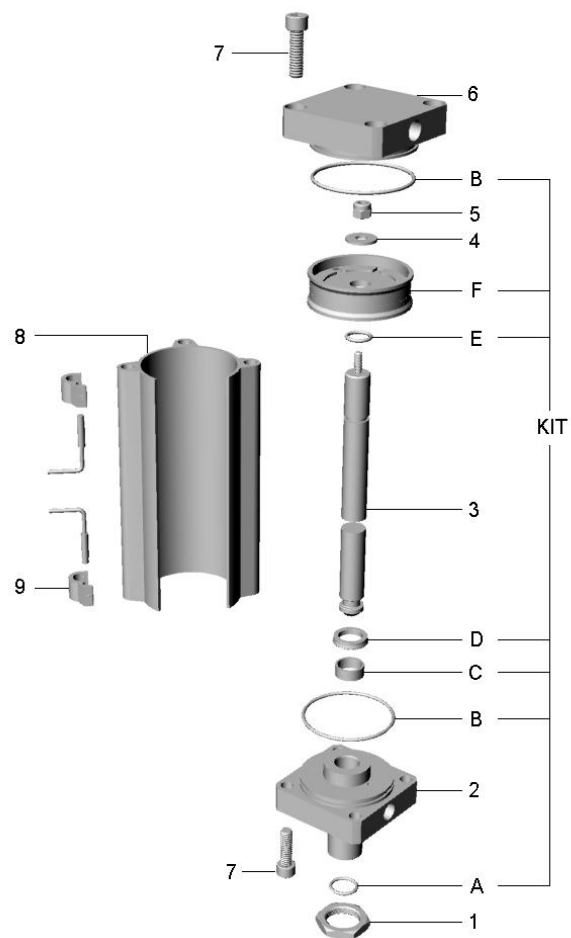
Cylinder item 0550	
Pos.	Name
1	ring
2	nipples
3	seal ring
4	manifold
5	stem
6	back up ring
7	washer
8	stop ring
9	tube (cylinder)
kit	gasket kit



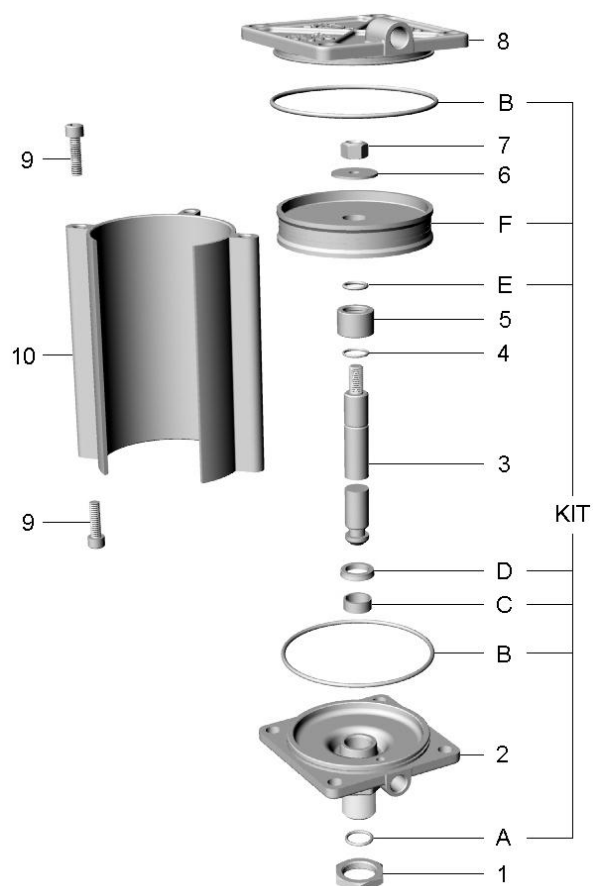
Cylinder item 0551	
Pos.	Name
1	ring
2	nipples
3	seal ring
4	manifold
5	stem
6	back up ring
7	washer
8	stop ring
9	tube (cylinder)
kit	gasket kit



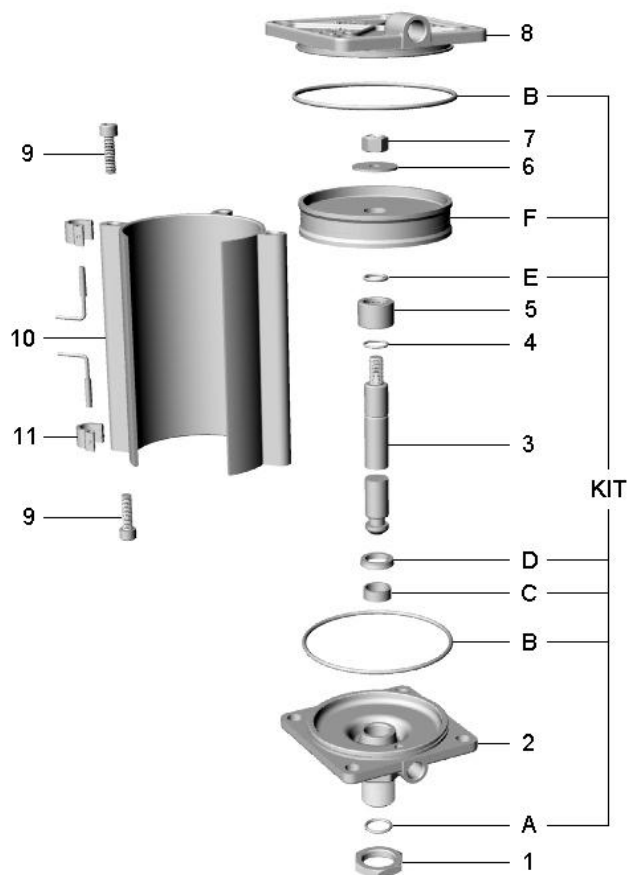
Cylinder item 0570	
Pos.	Name
1	ring
2	head
3	stem
4	washer
5	Triblock nut
6	cover
7	socket head cap screw
8	tube (cylinder)
kit	gasket kit



Cylinder item 0576	
Pos.	Name
1	ring
2	head
3	stem
4	washer
5	Triblock nut
6	cover
7	socket head cap screw
8	tube (cylinder)
9	magnetic sensors kit
kit	gasket kit



Cylinder item 0575	
Pos.	Name
1	ring
2	head
3	stem
4	Spring ring
5	spacer
6	washer
7	Triblock nut
8	cover
9	socket head cap screw
10	tube (cylinder)
kit	gasket kit



Cylinder item 0576	
Pos.	Name
1	ring
2	head
3	stem
4	Spring ring
5	spacer
6	washer
7	Triblock nut
8	cover
9	socket head cap screw
10	tube (cylinder)
11	magnetic sensors kit
kit	gasket kit