

# PA SERIES LINEAR PNEUMATIC ACTUATORS

## INSTALLATION AND MAINTENANCE INSTRUCTIONS

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**ADCA***Trol*

## GENERAL INFORMATION

- These instructions must be carefully read before performing any work involving VALSTEAM ADCA products. Failure to observe these instructions may result in hazardous situations.
- These instructions describe the entire life cycle of the product. Keep them in a location that is accessible to every user and make these instructions available to every new owner of the product.
- Current regional and plant safety regulations must be considered and followed during installation, operation, and maintenance work.
- The images shown in these instructions are for illustration purposes only.
- For the problems that cannot be solved with the help of these instructions, please contact VALSTEAM ADCA or its representative.

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We reserve the right to change the design and material of this product without notice.

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# 1. SAFETY INFORMATION

## 1.1. Explanation of symbols



### DANGER

Hazardous situation which, if not avoided by applying the correct preventive measures, could result in fatal or serious injury and/or considerable damage to property.



### WARNING

Hazardous situation which, if not avoided by applying the correct preventive measures, could result in fatal or serious injury and/or considerable damage to property.



### CAUTION

Hazardous situation which, if not avoided by applying the correct preventive measures, could result in moderately severe or minor injury.



### NOTICE

Situation which, if not avoided, can result in property damage or product malfunction.



### NOTE

Indicates additional information, tips and recommendations.

## 1.2. Intended use

Refer to the markings on the device, such as nameplate and laser markings, Information Sheet (IS) and these Installation and Maintenance Instructions (IMI) to check that the product was designed for the intended use and meets the specifications used for sizing and selection. This includes checking application, material suitability, process medium, pressure and temperature as well as their respective limiting values.

VALSTEAM ADCA does not assume any responsibility for damage resulting from inappropriate use of the product, damage caused by external stresses or any other external factors. Correct installation of the product is the full responsibility of the contractor.

Inappropriate use of the product is any use other than the one described in this chapter. Inappropriate use also includes:

- Use of spare parts which are not genuine;
- Performance of maintenance work not described in these instructions;
- Use outside the limits defined by the accessories connected to the product.
- Unauthorized modifications to the product.

If the product is to be used for an application or with a fluid other than the one it was designed for, contact VALSTEAM ADCA.

### 1.3. Qualification of personnel

Handling, installation, operation and maintenance work must be carried out by fully trained and qualified personnel, capable of judging the work which they are assigned to perform and recognizing potentially hazardous situations. They should be trained to properly use this product according to these Installation and Maintenance Instructions.

Where a formal “Permits to Work” system is implemented in the plant it must be complied with.

### 1.4. Personal protective equipment

Personal protective equipment should always be worn during work in order to protect against hazards posed by e.g. the process medium, dangerous temperatures, noise, falling or projected objects, working at height. These equipment includes a helmet, safety glasses, safety harness, protective clothes, safety shoes, hearing protection, etc.



#### NOTE

Always assess whether you or others in your vicinity require any protective equipment. When in doubt check with the plant’s health & safety responsible personnel for details on required protective equipment.

### 1.5. The system

The complete system should be assessed as well as every action (e.g. closing of shut-off valves, disconnection of the power supply) to ensure this will not bring additional risk to personnel or property.

Dangerous actions that can result in a hazardous situation include isolation of protective devices such as safety valve, vents, vacuum relief valves, disconnection of electric safety devices, sensors and alarms.

## 1.6. ATEX

If the product is in the scope of the ATEX 2014/34/EU directive and as such bears the Ex marking, consult its specific Additional Instructions for use in Potentially Explosive Areas (IMI EX). In such cases, handling, installation, operation and maintenance work must only be performed by personnel qualified and authorized to work in potentially explosive areas.

## 1.7. General safety notes



### DANGER

#### RISK OF BURSTING IN THE ACTUATOR

Pneumatic actuators can be under pressure. Working above their operating limits or improper opening can lead to component bursting.

- Observe the maximum operating limits of the actuator and ensure the supply pressure respects these limits.
- Before performing maintenance work on the actuator, disconnect the signal pressure supply.



### WARNING

#### RISK OF HEARING LOSS

Depending on the operating conditions, the product may generate loud noises.

- Wear hearing protection when in the vicinity of the product.

#### RISK OF INJURY CAUSED BY UNDER TIGHTENED PRODUCT OR ITS COMPONENTS

Excessively low tightening torques may cause medium to escape and/or components to be projected at high speed which may result in a hazardous situation depending on its operating conditions.

- Do not loosen any screw while the equipment is pressurized.
- Observe the specified tightening torques on these Installation and Maintenance Instructions (IMI). If the relevant torque value is not mentioned contact VALSTEAM ADCA.



## CAUTION

### RISK OF CRUSHING INJURY DUE TO MOVING PARTS

The movement of the actuator stem during installation can crush hands and fingers.

- Keep hands and fingers away from the actuator stem and yoke while pressure supply is connected to the actuator. Make sure to depressurize the actuator from any remaining pressure.
- Before performing maintenance work on the actuator, disconnect the signal pressure supply.
- When performing work that requires signal pressure to be supplied to the actuator during specific steps, pay special care not to place hands and fingers between moving parts.
- If for some reason the actuator stem is stuck in mid stroke position carefully release compression force before touching the actuator stem or other potentially moving parts.

### RISK OF INJURY DUE TO IMPROPER HANDLING

Manual handling (e.g. lifting, carrying, pushing, pulling) of large and/or heavy products may result in personal injury.

- Assess the risk associated with the handling task.
- Use adequate handling methods and appropriate auxiliary handling equipment.

### RISK OF INJURY DUE TO PRELOADED SPRINGS

Assembled actuators have preloaded springs inside.

- Relieve spring compression evenly when disassembling the actuator. Two to four longer bolts are installed on actuators with higher spring compressions, loosen these bolts lastly and evenly.
- Do not work on the actuator while it is still installed on the control valve as a further spring compression is applied when assembling the actuator onto the control valve.
- Always follow the relevant maintenance instructions described in this document when opening the actuator.



## NOTICE

### RISK OF SPRING DAMAGE DUE TO EXCESSIVE COMPRESSION

Excessively compressing the actuator springs may result in permanent setting.

- Do not compress the actuator springs above the upper spring range or operating range value.
- If the actuator is to be fitted on a control valve without an integrated stroke limit, contact VALSTEAM ADCA.



## NOTICE

### RISK OF PRODUCT DAMAGE DUE TO EXCESSIVELY HIGH TIGHTENING TORQUES

High tightening torques may lead to premature wearing of product components.

- Observe the specified tightening torques on these Installation and Maintenance Instructions. If the relevant torque value is not mentioned contact VALSTEAM ADCA.

## 2. PRODUCT INFORMATION

The ADCATrol PA series of pneumatic actuators are multi-spring rolling diaphragm actuators and are designed to operate linear control valves, such as globe control valves. These actuators are suitable for modulating (throttling) and on/off service and are available in direct or reverse action versions depending on the desired fail safe (spring return) position.

### 2.1. Principle of operation

The main components of a pneumatic actuator are the two actuator covers (4, 24), diaphragm plate (13), diaphragm (14) and springs (17).

The signal pressure  $P_s$  is supplied to the actuator pressure chamber where it acts on the diaphragm (14) area  $A$  and creates a force  $F_a = P_s \cdot A$ . When this force is sufficient to counteract the one of the preloaded springs (17) located on the opposite side, the actuator stem (7) starts moving in the direction which compresses the springs. When the signal pressure reduces or air supply fails the resulting unbalancing of forces cause the actuator stem to move in the opposite direction.

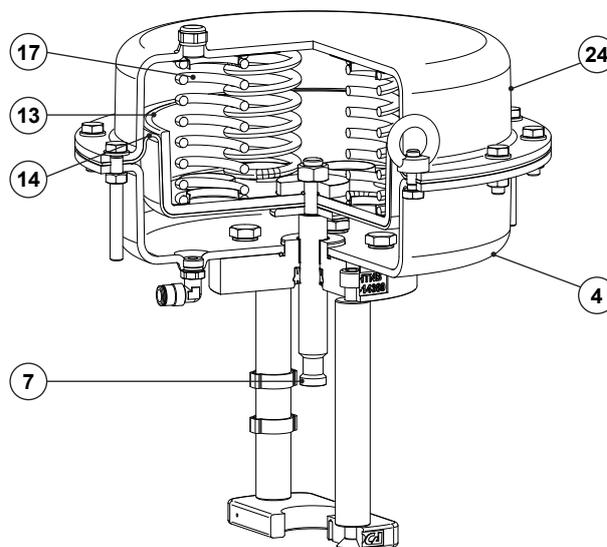


Fig. 1

The amount of pressure required to stroke the actuator between its rated travel positions is established by the spring range, which depends upon the spring quantity and force and the diaphragm effective area.

All ADCATrol PA series pneumatic actuators are single acting with spring return, which means they will move in the direction of their fail-safe position in case signal pressure reduces or fails. The direction of action is determined by how the springs and diaphragm plate are arranged in the actuator, and establishes the fail-safe position.

In actuators with direction of action “Air to open”, the signal pressure is connected to the bottom diaphragm cover and the “actuator stem extends by spring force” in case of failure. On the other hand, in actuators with direction of action “Air to close”, the signal pressure is connected to the upper diaphragm cover and the “actuator stem retracts by spring force” in case of failure. Actuator direction of action can be reversed.

Pneumatic actuators with handwheel can be operated manually in case of an emergency, when no signal pressure is available.

Some actuators can be fitted with a mechanically adjustable stroke limiter which allows adjustment of the actuator stroke by means of an adjustment screw.

## 2.2. Certification

These products has been specifically designed for use with gases, namely compressed air, which are in Group 2 of the European PED – 2013/68/EU Pressure Equipment Directive. Nonetheless, according to Article 1 paragraph 2 (j) of the said directive, these are not to be considered pressure equipment and are thus out of scope of the aforementioned directive.

These products are optionally available in an ATEX version, distinguishable by the additional EX Marking found on the device – see section 2.3 – Product identification. If that is the case the product complies with the requirements of the ATEX 2014/34/EU and as such bears the Ex marking, is CE marked and its specific Additional Instructions for use in Potentially Explosive Areas (IMI EX) must be consulted.

## 2.3. Product identification

The following items are indicated on the product nameplate or directly on its body:

- Manufacturer
- Actuator model (e.g. PA10i)
- Diaphragm area (e.g. 100 cm<sup>2</sup>)
- Direction of action (e.g. Air to close)
- Operating stroke (e.g. 20mm)
- Maximum supply pressure (e.g. 6 bar)
- Spring range (e.g. Sp. Range 0,2 to 1 bar)
- Operating range (e.g. 0,4 to 1,2 bar)
- Serial number and year of manufacturing (e.g. Reg. 17483/19)
- CE Marking (when applicable – see section 2.2 – Certification)
- EX Marking (when applicable e.g. EX h IIC T6 Gb – see section 2.2 – Certification).

## 2.4. Technical data

For technical data including dimensions, materials, limiting conditions and versions refer to the product respective Information Sheet (IS).

## 3. TRANSPORT, STORAGE AND PACKAGING

 **WARNING**

**RISK DUE TO FALLING LOADS**  
 Loads may tip or fall over resulting in damage to property, serious injury or death.

- Use suitable equipment when moving or lifting suspended loads.
- Make sure no one is standing below the suspended load.

 **CAUTION**

**RISK OF INJURY DUE TO IMPROPER HANDLING**  
 Manual handling (e.g. lifting, carrying, pushing, pulling) of large and/or heavy products may result in personal injury such as back injury.

- Assess the risk associated with the handling task.
- Use adequate handling methods and appropriate auxiliary handling equipment.

 **NOTICE**

**RISK OF PRODUCT DAMAGE DUE TO IMPROPER STORAGE**

- Do not remove any packaging or protective covers until immediately before installation at the site.
- Store the product in a solid base in a dry, cool and dust-free environment.
- Until its installation, protect it from the weather, dirt, corrosive atmospheres and other harmful influences.

**RISK OF PRODUCT DAMAGE DUE TO LONG TERM STORAGE**  
 Some product components may deteriorate with time (e.g. valve packings, seals).

- Do not store the product for more than 12 months.
- If for any reason the product must be stored for longer periods of time contact VALSTEAM ADCA.

Products are individually wrapped in plastic film, thermo shrinkable plastic and/or stored in a cardboard box as they leave VALSTEAM ADCA. Avoid removing packaging and any protective cover until immediately before installing the product at the site.

**i NOTE**

If the transport packaging has any shipping damage contact VALSTEAM ADCA or its representative.

Before storing and transporting the product protect it from impacts and mechanical damage, paying special care with sealing surfaces and other fragile parts. When transporting a large size actuator or when installing it onto a control valve, hook a double-leg sling into the lifting eyebolts fitted on the actuator, or alternatively place slings around the actuator lower case above the yoke. Use suitable lifting equipment such as a crane to lift the load.

When lifting the valve assembly (valve body and actuator) attach slings around the valve body capable of withstanding the entire weight and use these to lift the assembly. Slings on the actuator should still be fitted to prevent it from tilting.

**i NOTE**

If the corrosion protection (paint and other surface coatings) of the product is damaged during transport or other handling procedures repair it immediately.

## 4. INSTALLATION

Before performing any installation work, refer to section 1 – Safety information.

**! WARNING**

**RISK OF INJURY DUE TO INSUFFICIENT SUPPORT DURING INSTALLATION**

Insufficient support of the product during installation may cause it to fall and cause personal injury.

- Ensure the product is safely held in place during installation.
- Wear protective safety shoes.

**! NOTICE**

**RISK OF PRODUCT DAMAGE DUE TO STRESS**

The product is not intended to withstand external stresses that may be inducted by the system to which it is being connected to.

- Make sure that the connected pipe does not subject the body to any stress (forces or torques) during installation and operation.
- Do not use the product as an elevation point.



## NOTICE

### **RISK OF VALVE SEATING DAMAGE DUE TO IMPROPER ASSEMBLY**

Valve stem rotation during actuator assembly or tuning may damage the seating surface.

- Do not rotate the valve plug while it is seated.

### **RISK OF DIAPHRAGM DAMAGE DUE TO ACTUATOR STEM ROTATION**

- When the actuator is being mounted on the control valve do not allow the actuator stem to rotate as it may twist and damage the diaphragm.

## 4.1. Preparation for installation

Before installation, make sure the following conditions are met:

- The installation area has easy access and the device is to be installed in a position where operation and maintenance work can be performed safely.
- The product will be installed with proper support and free of any stresses that can be induced by the system. The necessary precautions are recommended during system design.
- Remove plastic film and other packaging, as well as protective covers.
- The product is not damaged.
- Make sure all the necessary materials and tools are readily available during installation work.
- Referring to this Installation and Maintenance Instructions (IMI), Information Sheet (IS) and nameplate, check that the product is suitable for the intended installation: temperature, medium, pressure, temperature, etc. – see section 1.2 – Intended use.
- Check any mounted pressure gauges and make sure they function properly.
- See separate Installation and Maintenance Instructions (IMI) for the control valve or other instrumentation such as valve positioners.
- The recommended installation position is with the control valve and actuator stem in the vertical position with the actuator pointing upwards. Horizontal installation without support is only permissible for lightweight actuators otherwise a means of support must be provided. When installing the actuator in the horizontal position with a yoke composed of two columns be sure these are above each other in the vertical plane.
- Ensure the control valve has been isolated from the line and the actuator is depressurized.
- An air filter regulator should be installed to ensure that the supply pressure does not exceed the maximum supply pressure indicated on the actuator. The air supply

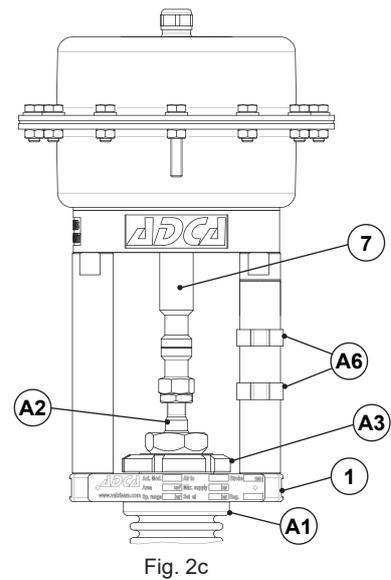
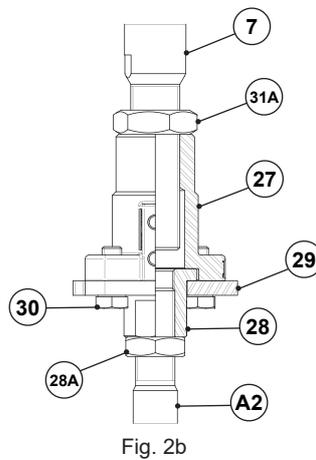
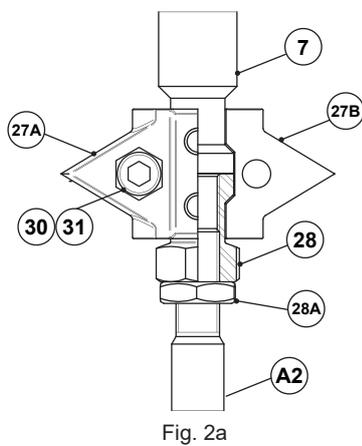
must be dry and free of oil.

- The air supply must only be fed to the pressure chamber which is opposite to the spring chamber. The vent plug must be left unrestricted.
- If the actuator is to be installed outdoors make sure e.g. rain water may not be allowed inside the actuator (sucked in) when stroking by providing the necessary means of protection. Mushroom type vent plugs are available, contact VALSTEAM ADCA.

ADCATrol control valves which are to be fitted with PA series pneumatic actuators are generally delivered with the actuator already mounted. When delivered separately proceed as follows to mount the actuator on the valve according with the following sections.

**i NOTE**

Assembly Drawings (AD) with assembly details and parts lists are available on request.



## 4.2. Mounting the “Air to open” actuator onto the valve

1. Proceed as follows if the actuator stem (7) design is similar to the one shown in Fig. 2a:
  - a. Fasten the lock nut (28A) and adaptor (28) onto the valve stem (A2) until the female thread of the adaptor is no longer visible.
2. Proceed as follows if the actuator stem (7) design is similar to the one shown in Fig. 2b:
  - a. Insert the securing flange (29) and fasten the lock nut (28A) and adaptor (28) onto the valve stem (A2) until the female thread of the adaptor is no longer

visible.

- b. Fasten the lock nut (31A) and coupling flange (27) onto the actuator stem (7) ensuring the coupling flange (27) is sufficiently threaded.
3. Manually push the valve stem (A2) downwards until the valve plug touches the seat.
4. Apply a signal pressure on the actuator which brings the actuator stem (7) to its mid-travel position (e.g. applying 1.5 bar control signal pressure on an actuator with a 1 to 2 bar spring range).
5. Carefully place the actuator yoke over the valve stem and lower it until the yoke flange (1) touches valve bonnet (A1) shoulders.
6. Align the actuator columns and secure the actuator with the actuator lock nut (A3) using a c-hook wrench and a soft faced hammer – see section 9.7 – Tightening torques.
7. Apply a signal pressure which corresponds to the lower spring range or operating range value (see note below).



#### NOTE

If the actuator and valve have different rated strokes, the spring range will have to be adapted to the actual valve travel (operating range).

#### Example:

DN 65 control valve with Ø50mm seat, 20mm stroke and a “Air to open” PA40 actuator with 30mm rated stroke and a 2 to 4 bar spring range.

The upper operating range of the actuator matches the upper spring range value (4 bar). The lower operating range is obtained as follows:

Subtract the upper spring range of 4 bar to the lower spring range of 2 bar which results in a signal pressure of 2 bar ( $4 - 2 = 2$  bar). Multiply it by the actual valve stroke of 20mm and then divide the result by the actuator rated stroke of 30mm [ $(2 \times 20) / 30 \approx 1,3$  bar]. Subtract this pressure to the upper spring range value of 4 bar to obtain the lower operating range value of 2,7 bar ( $4 - 1,3 = 2,7$  bar).

The operating range of the actuator is thus 2,7 to 4 bar, and should be written on the actuator nameplate in the “Operating range” blank space.

8. Proceed as follows if the actuator stem (7) design is similar to the one shown in Fig. 2a:
  - a. Manually adjust the adaptor (28) until it presses tightly against the actuator stem.

- b. Release the signal pressure.
  - c. Fit the two coupling halves (27A, 27B) and clamp them together, loosely tightening the two bolts (30) and nuts (31).
  - d. Tighten the lock nut (28A).
9. Proceed as follows if the actuator stem (7) design is similar to the one shown in Fig. 2b:
- a. Manually adjust the adaptor (28) until it presses tightly against the coupling flange (27).
  - b. Release the signal pressure.
  - c. Fix the securing flange (29) against the coupling flange (27), loosely tightening the four bolts (30).
  - d. Tighten the lock nuts (28A, 31A).
10. Operate the actuator through its full stroke range a couple of times to ensure alignment and tighten the bolts (30) tightly.
11. Check that the valve stem commences to move when the signal pressure matches the lower spring range or operating range value, and is fully open when the signal pressure matches the upper spring range or operating range value  $\pm 0.1$  bar.
12. Align the crimp clamps (A6) with the tip of the coupling (stroke indicator) at the end positions.

### 4.3. Mounting the “Air to close” actuator onto the valve

1. Proceed as follows if the actuator stem (7) design is similar to the one shown in Fig. 2a:
  - a. Fasten the lock nut (28A) and adaptor (28) onto the valve stem (A2) until the female thread of the adaptor is no longer visible.
2. Proceed as follows if the actuator stem (7) design is similar to the one shown in Fig. 2b:
  - a. Insert the securing flange (29) and fasten the lock nut (28A) and adaptor (28) onto the valve stem (A2) until the female thread of the adaptor is no longer visible.
  - b. Fasten the lock nut (31A) and coupling flange (27) onto the actuator stem (7) ensuring the coupling flange (27) is sufficiently threaded.
3. Manually push the valve stem (A2) downwards until the valve plug touches the seat.
4. Carefully place the actuator yoke over the valve stem and lower it until the yoke flange (1) touches valve bonnet (A1) shoulders.
5. Align the actuator columns and secure the actuator with the actuator lock nut (A3) using a c-hook wrench and a soft faced hammer – see section 9.7 – Tightening torques.

6. Apply a signal pressure which corresponds to the upper spring range or operating range value (see note below).



#### NOTE

If the actuator and valve have different rated strokes, the spring range will have to be adapted to the actual valve travel (operating range).

**Example:** DN65 control valve with Ø50mm seat, 20mm stroke and a “Air to close” PA40 actuator with 30mm rated stroke and 0,2 to 1 bar spring range. The upper operating range of the actuator matches the upper spring range value (1 bar). The lower operating range is obtained as follows:

Subtract the upper spring range of 1 bar to the lower spring range of 0,2 bar which results in a signal pressure of 0,8 bar ( $1 - 0,2 = 0,8$  bar). Multiply it by the actual valve stroke of 20mm and then divide the result by the actuator rated stroke of 30mm [ $(0,8 \times 20) / 30 \approx 0,55$  bar]. Add this pressure to the lower range value of 0,2 bar to obtain the lower operating range value of 0,75 bar ( $0,2 + 0,55 = 0,75$  bar).

The operating range of the actuator is thus 0,2 to 0,75 bar, and should be written on the actuator nameplate in the “Operating range” blank space.

7. Proceed as follows if the actuator stem (7) design is similar to the one shown in Fig. 2a:
  - a. Manually adjust the adaptor (28) until it presses tightly against the actuator stem.
  - b. Fit the two coupling halves (27A, 27B) and clamp them together, loosely tightening the two bolts (30) and nuts (31).
  - c. Tighten the lock nut (28A).
8. Proceed as follows if the actuator stem (7) design is similar to the one shown in Fig. 2b:
  - a. Manually adjust the adaptor (28) until it presses tightly against the coupling flange (27).
  - b. Fix the securing flange (29) against the coupling flange (27), loosely tightening the four bolts (30).
  - c. Tighten the lock nuts (28A, 31A).
9. Operate the actuator through its full stroke range a couple of times to ensure alignment and tighten the bolts (30) tightly, and align the crimp clamps (A6) with the tip of the coupling (stroke indicator) on the end positions.

10. Check that the valve stem commences to move when the signal pressure matches the lower spring range or operating range value, and is fully open when the signal pressure matches the upper spring range or operating range value  $\pm 0,1$  bar.
11. Align the crimp clamps (A6) with the tip of the coupling (stroke indicator) at the end positions.

## 5. START-UP

**Before performing the start-up procedure, refer to section 1 – Safety information.**

The start-up procedure must be followed every time the product is put back into service.

### 5.1. Preparation for start-up

Before starting up, make sure the following conditions are met:

- All works on the system have been completed.
- When required, warning notices are used to alert others that the system is starting up.
- The product is correctly installed – see section 4 – Installation.
- Referring to these Installation and Maintenance Instructions (IMI), Information Sheet (IS) and nameplate, check that the product is suitable for the intended installation: medium, pressure, temperature, etc. – see section 1.2 – Intended use.
- A safety check was performed by qualified personnel. Checking for leaks, structural damage and integrity of system components.

### 5.2. Start-up procedure

1. If e.g. a valve positioner, I/P converter or solenoid valve is installed on the control valve assembly reference should be made to their respective Installation and Maintenance Instructions (IMI) for connections and maximum supply pressure.
2. Apply the required supply pressure to ensure full stroke is possible. Do not exceed the maximum supply pressure written on the actuator.
3. Start-up the control valve referring to its respective Installation and Maintenance Instructions (IMI).
4. Check for any leaks on the actuator seals.
5. Check the actuator to ensure it is operating correctly.

### 5.3. Increasing the actuator thrust

The actuator closing force can only be increased in “Air to close” – “stem extends by spring force” – actuators and is only possible in actuators where the springs can be compressed additionally. Refer to the product respective Information Sheet (IS) for information on which models allow additional spring compression.

**Example:** The PA341 with 0,2 to 1 bar spring range allows an additional 25% spring compression, which means the spring range can be shifted by a maximum of 0,2 bar  $[(1 - 0,2) \times 0,25 = 0,2 \text{ bar}]$ .

Therefore, the operating range becomes 0,4 to 1,2 bar in case the extra additional 25% compression is applied. The new operating range of the actuator should be written on the actuator nameplate in the “Operating range” blank space.

### 5.4. Tuning the stroke limiter

1. Remove the cover (65).
2. Untighten the lock nut (67) and adjust the regulating screw (66) until the desired stroke limitation is achieved.
3. Retighten the lock nut (67) and fit the cover (65) back in place.

## 6. OPERATION

**Before operating the product refer to section 1 – Safety information.**

Immediately after completing the start-up procedure, the product is ready for operation.

### 6.1. Operating the handwheel

All ADCATrol PA series actuator handwheels are designed to act manually against the actuator springs and are immediately ready for use with no locking position. When turning the handwheel, the control valve position is independent of the signal pressure.



#### NOTICE

Do not operate the handwheel while the actuator is pressurized.



#### NOTE

The handwheel must be set in the neutral position to allow the actuator to move throughout its stroke range when supply pressure is switched on.

1. Proceed as follows for “Air to open” actuators:

- a. Turn the handwheel (54) counterclockwise to retract the actuator stem.
- b. Before resuming operation with the supply pressure switched on, return the actuator stem to the neutral position by rotating the handwheel (54) clockwise until reaching the end stop.

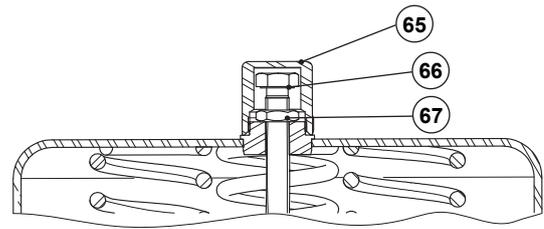


Fig. 3

2. Proceed as follows for “Air to close” actuators:

- a. Turn the handwheel (54) clockwise to extend the actuator stem.
- b. Before resuming operation with supply pressure switched on, return the actuator stem to the neutral position by rotating the handwheel (54) counterclockwise until reaching the end stop.

## 7. SHUTDOWN

Before performing the shutdown procedure, refer to section 1 – Safety information.

### 7.1. Shutdown procedure

1. Put the control valve out of operation, referring to its respective Installation and Maintenance Instructions (IMI).
2. If the actuator is to be removed from the valve - see section 9.1 - Removing the actuator from the valve; and section 3 - Transport, storage and packaging.
3. Switch off the pneumatic air supply and disconnect it from the actuator to depressurize it.

## 8. PARTS LIST

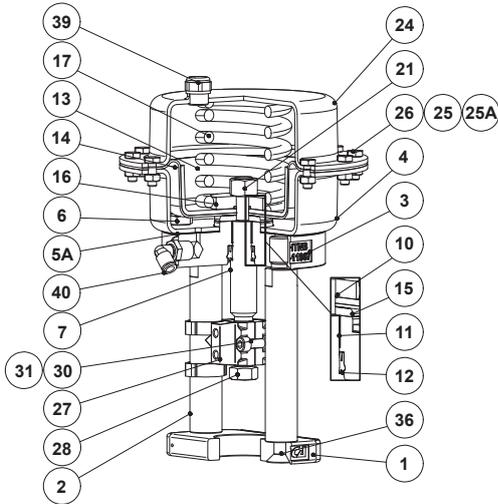


Fig. 4 - PA10

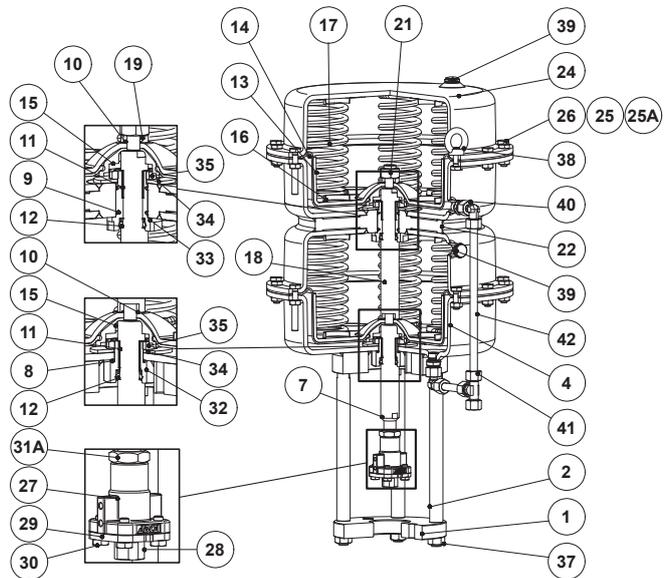


Fig. 7 - PA80D

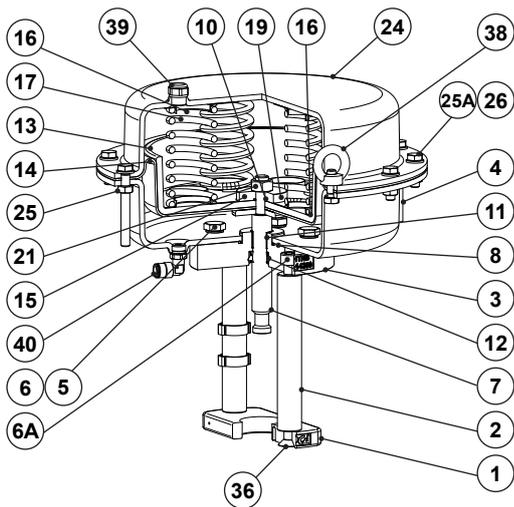


Fig. 5 - PA25 and PA40

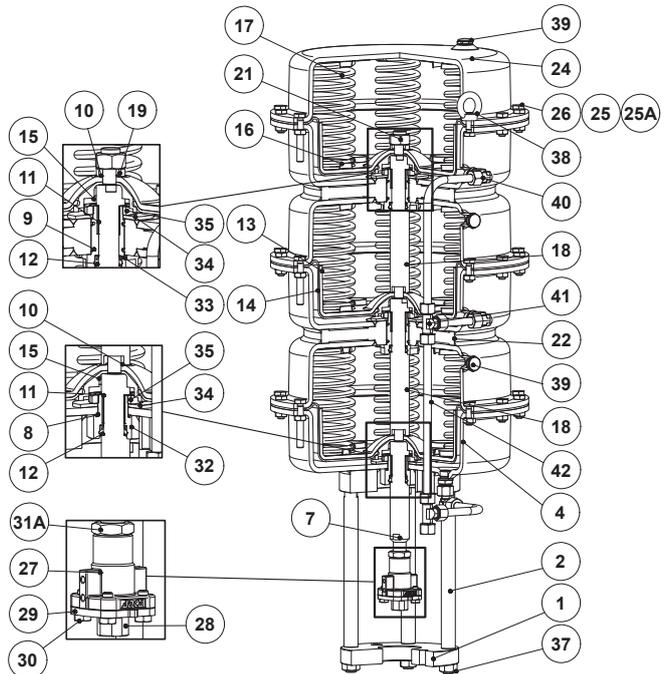


Fig. 8 - PA80T

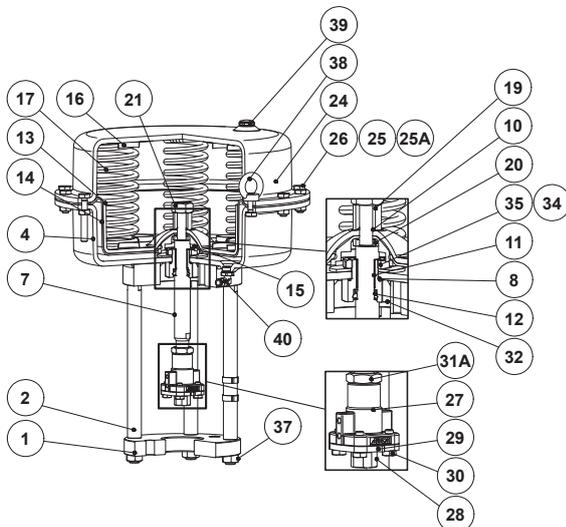


Fig. 6 - PA80

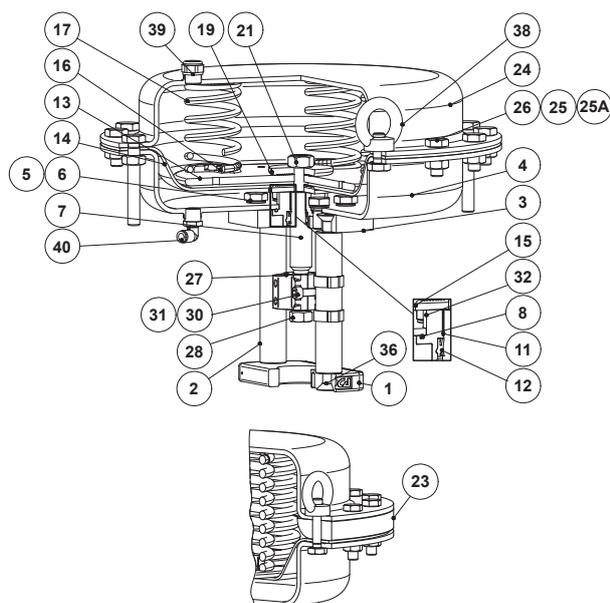


Fig. 9 - PA206, PA281, PA341 and PA436

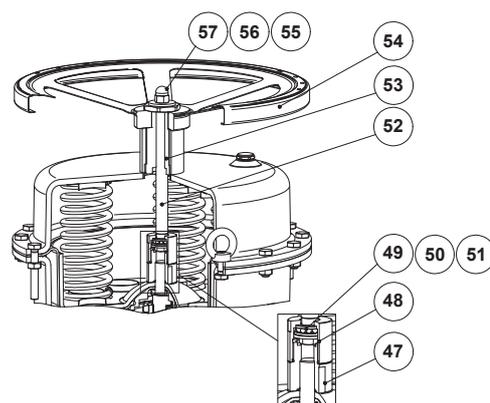


Fig. 10 - Top mounted handwheel

POS. N°	DESIGNATION	SPARE PARTS
1	Lower actuator flange	
2	Yoke columns	
3	Upper actuator flange	
4	Lower actuator cover	
5	Washers	
5A	Gasket	
6	Bolts	
6A	Bolts	
7	Actuator stem	
8	O-ring	X
9	O-ring	X
10	O-ring	X
11	Plain bearing	X
12	Seal ring	X
13	Diaphragm plate	
14	Diaphragm	X
15	Diaphragm disk	
16	Spring guide	
17	Springs	X
18	Intermediate actuator stem	
19	Spacer	
20	Spacer	
21	Nut	
22	Intermediate cover	
23	Cover spacer	
24	Upper actuator cover	
25	Nuts	
25A	Washers	
26	Bolts	

POS. N°	DESIGNATION	SPARE PARTS
27	Coupling / Travel indicator	
28	Adaptor	
29	Coupling flange	
30	Bolts	
31	Nuts	
31A	Nuts	
32	Stem guide	X
33	Intermediate stem guide	
34	Belleville washer	X
35	Stem guide lock nut	
36	Bolts	
37	Nuts	
38	Eyebolts	
39	Vent plug	
40	Fitting	
41	Compression fitting	
42	Tube	
47	Nut	
48	Nut	
49	Plain bearing	
50	Washer	
51	Bolt	
52	Stem	
53	Spindle	
54	Handwheel	
55	Washer	
56	Locknut	
57	Nut	

## 9. MAINTENANCE

Before performing a maintenance procedure, refer to section 1 – Safety information.

The product requires maintenance to ensure that it operates correctly and safely throughout its lifetime. Maintenance work should be performed in a planned manner at periodic intervals. These intervals must be defined by the operator according to the service conditions.

### 9.1. Removing the actuator from the valve

1. Apply a signal pressure on the actuator which brings the actuator stem (7) to its mid-travel position (e.g. applying 1,5 bar control signal pressure on an actuator with a 1 to 2 bar spring range).
2. Proceed as follows if the actuator stem (7) design is similar to the one shown in Fig. 2a:
  - a. Remove the two coupling halves (27A, 27B) by untightening and removing the two bolts (30) and nuts (31).
3. Proceed as follows if the actuator stem (7) design is similar to the one shown in Fig. 2b:
  - a. Loosen the securing flange (29) by untightening and removing the four bolts (30).
4. Loosen the lock nut (28A).
5. Unscrew the actuator lock nut (A3) using a c-hook wrench and a soft faced hammer.
6. Remove the actuator lock nut (A3) and actuator from the valve.
7. Switch off the pneumatic air supply and disconnect it from the actuator to depressurize it.

### 9.2. Maintenance procedure

1. Make sure all the necessary materials and tools are readily available during maintenance work.
2. Put the control valve out of operation, referring to its respective Installation and Maintenance Instructions (IMI).
3. Remove the actuator from the valve – see section 9.1 – Removing the actuator from the valve.
4. Perform the maintenance procedure – see the following sections.
5. Mount the actuator onto the valve – see section 4 – Installation.
6. Put the actuator back into operation – see section 5 – Start-up.

## 9.3. PA206, PA281, PA341 and PA436 actuators

### 9.3.1. Replacing the diaphragm on the “Air to open” actuator

1. Remove the bolts (26), nuts (25) and washers (25A) reducing the spring compression gradually. If the actuator is fitted with long bolts remove them last after all other bolts are removed. These should be lubricated with a suitable lubricant and loosened evenly and symmetrically.
2. Remove the upper actuator cover (24), cover spacer (23), if present, and springs (17). Pull the diaphragm assembly consisting of diaphragm plate (13), diaphragm (14) and actuator stem (7) carefully from the lower actuator cover (4) to avoid damage to the seal ring (12) and plain bearing (11).
3. Clamp the actuator stem (7) into a vise with soft jaws making sure not to damage the actuator stem finish.
4. Unscrew the nut (21), remove the spacer (19), diaphragm plate (13) and diaphragm (14).
5. Fit a new diaphragm by rotating it into the actuator stem (7) thread, followed by the diaphragm plate (13) and spacer (19).
6. Apply a thread locker such as Loctite 243 on the upper thread of the actuator stem. Tighten the nut (21) with the recommended torque – see section 9.7 – Tightening torques.
7. Remove the diaphragm assembly from the vise.
8. Apply a suitable lubricant to the actuator stem (7) and on the seal ring (12). Place the diaphragm assembly onto the lower actuator cover (4), making sure the sealing elements are not damaged.

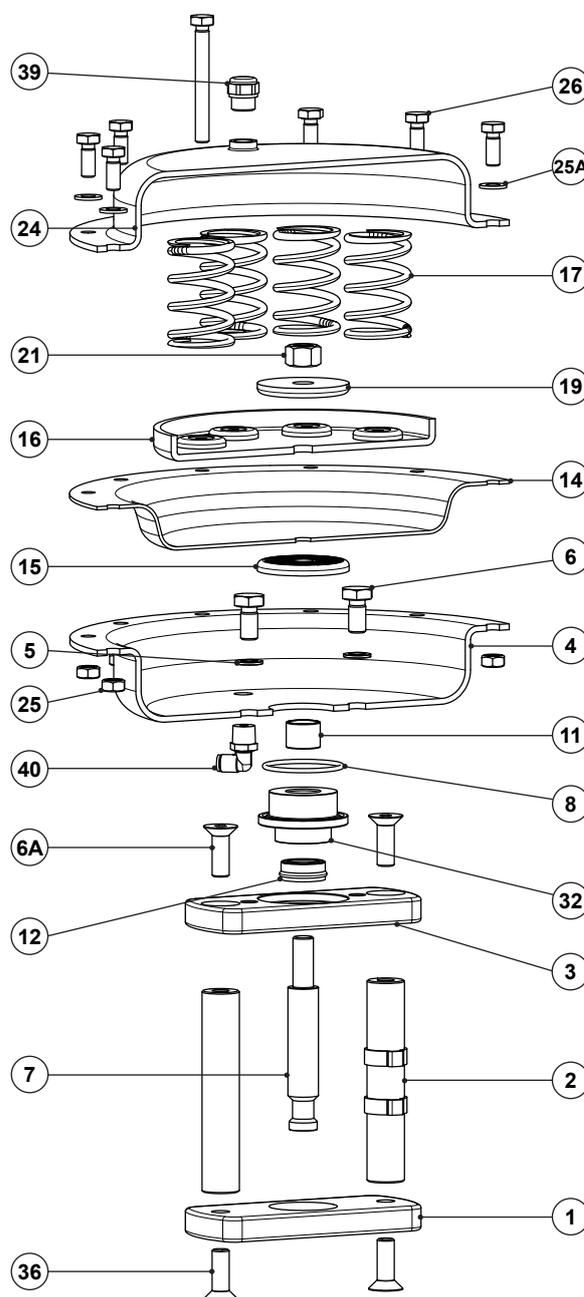


Fig. 11

9. Refit the springs (17) ensuring that these are in good conditions. Renew if necessary.
10. Place the cover spacer (23), if present, and the upper actuator cover (24) above the springs with the vent plug (39) aligned with the compressed air connection on the lower actuator cover (4). Ensure the springs are well centered along the circumference of the upper actuator cover (14).
11. Tighten the lower and upper actuator covers (4, 24) together using the bolts (26), nuts (25) and washers (25A) with the recommended torque – see section 9.7 – Tightening torques. Tighten evenly to avoid distortion.



#### NOTE

The washers (25A) are fitted from factory below the bolt heads to protect the paint or surface coating of the actuator covers as these are the ones threaded down while the nuts are fixed. When reassembling with manual tools place the washers (25A) on the opposite side, above the nuts (25).

### 9.3.2. Replacing the diaphragm on the “Air to close” actuator

1. Remove the bolts (26), nuts (25) and washers (25A) reducing the spring compression gradually. If the actuator is fitted with long bolts remove them last after all other bolts are removed. These should be lubricated with a suitable lubricant and loosened evenly and symmetrically.
2. Remove the upper actuator cover (24) and, if present, the cover spacer (23). Pull the diaphragm assembly consisting of diaphragm plate (13), diaphragm (14) and actuator stem (7) carefully from the lower actuator cover (4) to avoid damage to the seal ring (12) and plain bearing (11). Remove the springs (17).
3. Clamp the actuator stem (7) into a vise with soft jaws making sure not to damage the actuator stem finish.
4. Unscrew the nut (21), remove the diaphragm disk (15) and diaphragm (14).
5. Fit a new diaphragm by rotating it into the actuator stem (7) thread, followed by the diaphragm disk (15).
6. Apply a thread locker such as Loctite 243 on the upper thread of the actuator stem. Tighten the nut (21) with the recommended torque – see section 9.7 – Tightening torques.
7. Remove the diaphragm assembly from the vise.
8. Apply a suitable lubricant to the actuator stem (7) and on the seal ring (12).
9. Refit the springs (17) ensuring that these are in good conditions. Renew if necessary.
10. Place the diaphragm assembly onto the lower actuator cover (4), making sure the sealing elements are not damaged and the springs are correctly placed on the spring guides (16). Ensure the springs are well centered along the circumference of the lower actuator cover (4).
11. Place the cover spacer (23), if present, and the upper actuator cover (24) above the diaphragm assembly with the compressed air connection aligned with the vent plug (39) on the lower actuator cover (4).

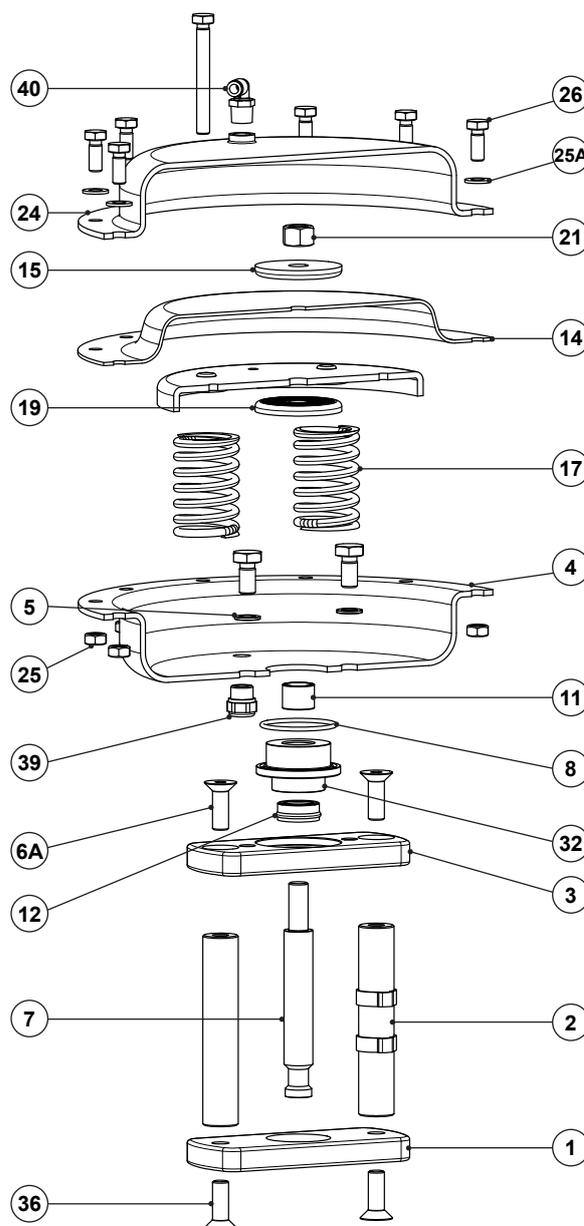


Fig. 12

12. Tighten the lower and upper actuator covers (4, 24) together using the bolts (26), nuts (25) and washers (25A) with the recommended torque – see section 9.7 – Tightening torques. Tighten evenly to avoid distortion.



#### NOTE

The washers (25A) are fitted from factory below the bolt heads to protect the paint or surface coating of the actuator covers as these are the ones threaded down while the nuts are fixed. When reassembling with manual tools place the washers (25A) on the opposite side, above the nuts (25).

### 9.3.3. Replacing the actuator stem seals

1. Follow steps 1 and 2 of section 9.3.1 (air to open) or 9.3.2 (air to close).
2. If only the seal ring (12) needs replacing proceed as follows:
  - a. Use a suitable tool to remove it from the stem guide (32) and fit a new seal ring.
3. If the seal ring (12), plain bearing (11) and O-ring (8) need replacing proceed as follows:
  - a. Remove the bolts (6), washers (5) and separate the lower actuator cover (4) from the upper actuator flange (3).
  - b. Remove the stem guide set which includes stem guide (32), plain bearing (11), seal ring (12) and O-ring (8) and replace.
  - c. Reassemble the lower actuator cover (4) on the upper actuator flange (3). Fit the washers (5) and the bolts (6) tightening with the recommended torque – see section 9.7 – Tightening torques.
4. Follow steps 8 through 12 of section 9.3.1 (air to open) or 9.3.2 (air to close).

### 9.3.4. Replacing the actuator springs



#### NOTE

When replacing the springs renew the complete set!

1. Follow steps 1 and 2 of section 9.3.1 (air to open) or 9.3.2 (air to close).
2. Replace the spring (17).
3. Follow steps 10 through 12 of section 9.3.1 (air to open) or 9.3.2 (air to close).

## 9.4. PA10, PA25 and PA40 actuators

### 9.4.1. Replacing the diaphragm on the “Air to open” actuator

1. Remove the bolts (26), nuts (25) and washers (25A) reducing the spring compression gradually. If the actuator is fitted with long bolts remove them last after all other bolts are removed. These should be lubricated with a suitable lubricant and loosened evenly and symmetrically.
2. Remove the upper actuator cover (24) and springs (17). On the PA25 and PA40 actuators remove the spring guides (16) as well. Pull the diaphragm assembly consisting of diaphragm plate (13), diaphragm (14) and actuator stem (7) carefully from the lower actuator cover (4) to avoid damage to the seal ring (12) and plain bearing (11).
3. Clamp the actuator stem (7) into a vise with soft jaws making sure not to damage the actuator stem finish.
4. Unscrew the nut (21), remove the spacer (19), O-ring (10), diaphragm plate (13) and diaphragm (14).
5. Fit a new diaphragm by rotating it into the actuator stem (7) thread, followed by the diaphragm plate (13), O-ring (10) and spacer (19).
6. Apply a thread locker such as Loctite 243 on the upper thread of the actuator stem. Tighten the nut (21) with the recommended torque – see section 9.7 – Tightening torques.
7. Remove the diaphragm assembly from the vise.
8. Apply a suitable lubricant to the actuator stem (7) and on the seal ring (12). Place the diaphragm assembly onto the lower actuator cover (4), making sure the sealing elements are

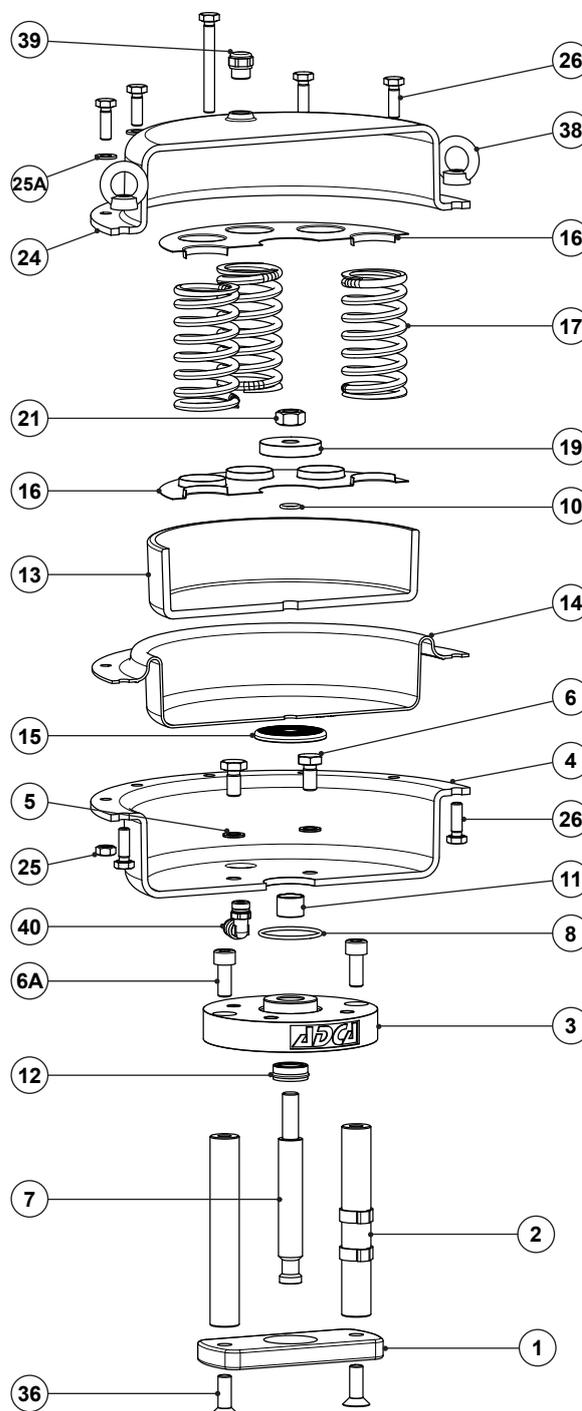


Fig. 13

not damaged.

9. Refit the spring guide (16), if any, and the springs (17), ensuring that these are in good conditions. Renew if necessary.
10. Place the upper actuator cover above the springs with the vent plug (39) aligned with the compressed air connection on the lower actuator cover (4). Ensure the springs are well centered along the circumference of the upper actuator cover (14). Ensure the compressed air connection on the upper actuator cover is aligned with a hole on the spring guide (16) as to avoid air flow restriction (PA25 and PA40 only).
11. Tighten the lower and upper actuator covers (4, 24) together using the bolts (26), nuts (25) and washers (25A) with the recommended torque – see section 9.7 – Tightening torques. Tighten evenly to avoid distortion.



of the lower actuator cover (4). Ensure the compressed air connection on the lower actuator cover (4) is aligned with a hole on the spring guide (16) as to avoid air flow restriction (PA25 and PA40 only).

11. Place the upper actuator cover above the diaphragm assembly with the compressed air connection aligned with the vent plug (39) on the lower actuator cover (4).
12. Tighten the lower and upper actuator covers (4, 24) together using the bolts (26), nuts (25) and washers (25A) with the recommended torque – see section 9.7 – Tightening torques. Tighten evenly to avoid distortion.



#### NOTE

The washers (25A) are fitted from factory below the bolt heads to protect the paint or surface coating of the actuator covers as these are the ones threaded down while the nuts are fixed. When reassembling with manual tools place the washers (25A) on the opposite side, above the nuts (25).

### 9.4.3. Replacing the actuator stem seals

1. Follow steps 1 and 2 of section 9.4.1 (air to open) or 9.4.2 (air to close).
2. If only the seal ring (12) needs replacing proceed as follows:
  - a. Use a suitable tool to remove it from the stem guide (32) and fit a new seal ring.
3. If the seal ring (12), plain bearing (11) and O-ring (8) need replacing proceed as follows:
  - a. Remove the bolts (6), washers (5) and separate the lower actuator cover (4) from the upper actuator flange (3).
  - b. Remove and replace the plain bearing (11) and seal ring (12). On the PA10 and PA25 replace the gasket (5A) and on the PA40 replace the O-ring (8).
  - c. Reassemble the lower actuator cover (4) on the upper actuator flange (3). Fit the washers (5) and the bolts (6) tightening with the recommended torque – see section 9.7 – Tightening torques.
4. Follow steps 8 through 12 of section 9.4.1 (air to open) or 9.4.2 (air to close).

### 9.4.4. Replacing the actuator springs



#### NOTE

When replacing the springs renew the complete set!

1. Follow steps 1 and 2 of section 9.4.1 (air to open) or 9.4.2 (air to close).
2. Replace the spring (17).
3. Follow steps 10 through 12 of section 9.4.1 (air to open) or 9.4.2 (air to close).



- (17), ensuring that these are in good conditions. Renew if necessary.
10. Place the upper actuator cover above the spring guides with the vent plug (39) aligned with the compressed air connection on the lower actuator cover (4). Ensure the springs are well centered along the circumference of the upper actuator cover (14). Ensure the compressed air connection on the upper actuator cover is aligned with a hole on the spring guide (16) as to avoid air flow restriction.
  11. Tighten the lower and upper actuator covers (4, 24) together using the bolts (26), nuts (25) and washers (25A) with the recommended torque – see section 9.7 – Tightening torques. Tighten evenly to avoid distortion.



#### NOTE

The washers (25A) are fitted from factory below the bolt heads to protect the paint or surface coating of the actuator covers as these are the ones threaded down while the nuts are fixed. When reassembling with manual tools place the washers (25A) on the opposite side, above the nuts (25).

### 9.5.2. Replacing the diaphragm on the “Air to close” actuator

1. Remove the bolts (26), nuts (25) and washers (25A) reducing the spring compression gradually. If the actuator is fitted with long bolts remove them last after all other bolts are removed. These should be lubricated with a suitable lubricant and loosened evenly and symmetrically.
2. Remove the upper actuator cover (24). Pull the diaphragm assembly consisting of diaphragm plate (13), diaphragm (14) and actuator stem (7) carefully from the lower actuator cover (4) to avoid damage to the seal ring (12) and plain bearing (11). Remove the springs (17) and spring guides (16).
3. Clamp the actuator stem (7) into a vise with soft jaws making sure not to damage the actuator stem finish.
4. Unscrew the nut (21) and remove spacer (20), O-ring (10), diaphragm disk (15) and diaphragm (14).
5. Fit a new diaphragm by rotating it into the actuator stem (7) thread, followed by the diaphragm disk (15), O-ring (10) and spacer (20).
6. Apply a thread locker such as Loctite 243 on the upper thread of the actuator stem. Tighten the nut (21) with the recommended torque – see section 9.7 – Tightening torques.
7. Remove the diaphragm assembly from the vise.
8. Apply a suitable lubricant to the actuator stem (7) and on the seal ring (12).
9. Refit the spring guide (16) and springs (17) ensuring that these are in good conditions. Renew if necessary.
10. Place the diaphragm assembly onto the lower actuator cover (4), making sure the sealing elements are not damaged

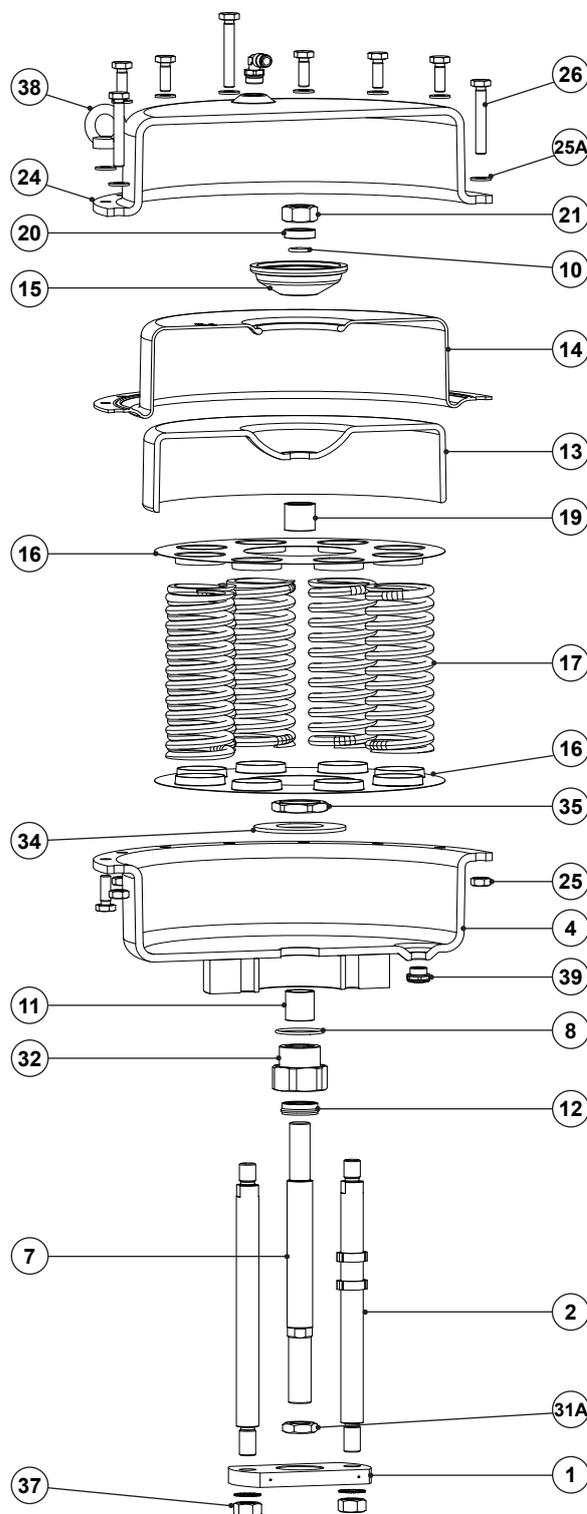


Fig. 16

and the springs are correctly placed on the spring guides (16). Ensure the springs are well centered along the circumference of the lower actuator cover (4). Ensure the compressed air connection on the lower actuator cover (4) is aligned with a hole on the spring guide (16) as to avoid air flow restriction.

11. Place the upper actuator cover above the diaphragm assembly with the compressed air connection aligned with the vent plug (39) on the lower actuator cover (4).
12. Tighten the lower and upper actuator covers (4, 24) together using the bolts (26), nuts (25) and washers (25A) with the recommended torque – see section 9.7 – Tightening torques. Tighten evenly to avoid distortion.

**i NOTE**

The washers (25A) are fitted from factory below the bolt heads to protect the paint or surface coating of the actuator covers as these are the ones threaded down while the nuts are fixed. When reassembling with manual tools place the washers (25A) on the opposite side, above the nuts (25).

### 9.5.3. Replacing the actuator stem seals

1. Follow steps 1 and 2 of section 9.5.1 (air to open) or 9.5.2 (air to close).
2. If only the seal ring (12) needs replacing proceed as follows:
  - b. Use a suitable tool to remove it from the stem guide (32) and fit a new seal ring.
3. If the seal ring (12), plain bearing (11) and O-ring (8) need replacing proceed as follows:
  - a. Unscrew the stem guide lock nut (35) and remove the belleville washer.
  - b. Push the stem guide (32) out of the center hole in the lower actuator cover (4).
  - c. Remove and replace the plain bearing (11), seal ring (12) and O-ring (8).
  - d. Install the stem guide (32) on the lower actuator cover (4). Fit a new belleville washer (34) and screw the stem guide lock nut (35), tightening with the recommended torque – see section 9.7 – Tightening torques.
4. Follow steps 8 through 12 of section 9.5.1 (air to open) or 9.5.2 (air to close).

### 9.5.4. Replacing the actuator springs



#### NOTE

When replacing the springs renew the complete set!

1. Follow steps 1 and 2 of section 9.5.1 (air to open) or 9.5.2 (air to close).
2. Replace the spring (17).
3. Follow steps 10 through 12 of section 9.5.1 (air to open) or 7.2 (air to close).

### 9.6. PA80D and PA80T actuators

Please consult the manufacturer for guiding on how to perform maintenance on PA80D and PA80T actuators.

### 9.7. Tightening torques

POS. N°	DESIGNATION	TORQUE (Nm)			
		M40 x 1,5	M40 x 1,5	M65 x 2	M80 x 2
A3	Actuator lock nut	100	120	180	250

POS. N°	DESIGNATION	TORQUE (Nm)				
		PA206	PA281 PA25 PA40	PA341	PA436	PA80 PA80D PA80T
6	Bolts	35	35	35	35	-
21, 15A	Nut	50	50	50	50	180
25, 26	Bolts and nuts	16	20	25	25	25
35	Stem guide lock nut	-	-	-	-	120

## 10. TROUBLESHOOTING

Before applying any corrective measure, refer to section 1 – Safety information.

If the malfunction cannot be solved with the help of the following table, contact VALSTEAM ADCA or its representative.

Malfunction	Possible cause	Corrective measure
<b>Stem does not move</b>	No signal pressure is being supplied to the actuator.	<ul style="list-style-type: none"> <li>Check the pneumatic air supply and fix.</li> </ul>
	The diaphragm is defected or torn.	<ul style="list-style-type: none"> <li>Replace the diaphragm.</li> </ul>
	Actuator stem was not returned to its neutral position in the case of an actuator equipped with handwheel.	<ul style="list-style-type: none"> <li>Return the actuator stem to its neutral position according with the instructions – see section 6.1 – Operating the handwheel.</li> </ul>
	Actuator is blocked.	<ul style="list-style-type: none"> <li>Unblock the actuator.</li> </ul>
	Mounted instrumentation and accessories (e.g. valve positioner, I/P converter, air filter regulator, solenoid valve, limit switches) do not work satisfactorily.	<ul style="list-style-type: none"> <li>Check the Installation and Maintenance instructions (IMI) of the mounted instrumentation and accessories.</li> <li>Test the actuator without accessories.</li> </ul>
<b>Actuator stem does not move throughout its full stroke range</b>	Insufficient signal pressure.	<ul style="list-style-type: none"> <li>Ensure the signal pressure is sufficient to stroke the actuator fully according to its respective spring range or operating range.</li> <li>Check for leakages.</li> </ul>
	Mounted instrumentation and accessories (e.g. valve positioner, I/P converter, air filter regulator, solenoid valve, limit switches) do not work satisfactorily.	<ul style="list-style-type: none"> <li>Check the Installation and Maintenance instructions (IMI) of the mounted instrumentation and accessories.</li> <li>Test the actuator without accessories.</li> </ul>
	The stroke limiter requires adjustment.	<ul style="list-style-type: none"> <li>Tune the stroke limiter – see section 5.2 - Tuning the stroke limiter.</li> </ul>

## 11. DISPOSAL

Once the product has reached the end of its working life, it should be sent for disposal in accordance with the prevailing national and local regulations.

Before disposal make sure that the product is clean and free from fluid residues.

During its disposal, pay special attention to rubbers, resins and polymer components (PVC, PTFE, PP, PVDF, FKM, NBR, etc.).

Do not dispose of components and hazardous substances together with household waste.

## 12. RETURNING PRODUCTS

Information regarding hazards and precautionary measures to be considered due to contaminating fluids and residues or mechanical damage that may represent a health, safety or environmental risk, must be provided in writing when returning products to VALSTEAM ADCA.



### WARNING

#### **RISK DUE TO PRESENCE OF HAZARDOUS RESIDUES ON RETURNED PRODUCTS**

Contaminated fluids and residues may represent an environmental risk, or risk to VALSTEAM ADCA personnel.

- Information regarding any hazards or precautionary measures to be considered must be provided in writing when returning products to VALSTEAM ADCA.
- Health and Safety information sheets relating to any substances identified as hazardous or potentially hazardous must be provided outside the packaging.
- Use Hazmat labels on the packaging.

### IMPORTANTE NOTE

Total or partial disregard of these Installation and Maintenance Instructions involves loss of any right to warranty.

The extent and warranty period are specified in the “General sales conditions”.