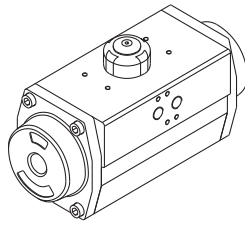


Series AP / APM Pneumatic Rotary Actuators Handbook

MAN-AP-01.06.16 Rev.01

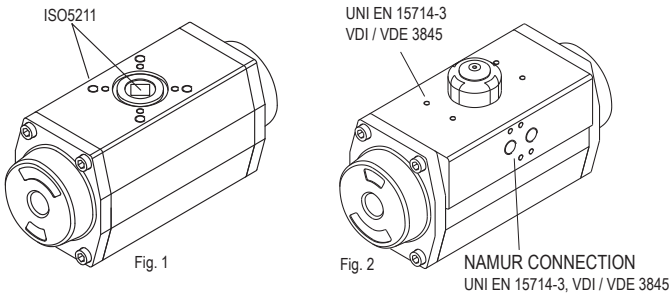


GENERAL DESCRIPTION OF THE ACTUATOR:

The pneumatic rotary actuators manufactured by SIRCA International series AP / APM double acting (DA) and spring return (SR) are actuators destined for use in the movement of butterfly and ball valves. The actuators' has a 1/4 turn stroke adjustment of 0°±5°+90°±5° for the APM version, while it is 0°+90°±3° for the standard AP version.

The actuator consists of a central unit with aluminium extruded rod. A cogged spindle is inserted into the unit, guided on plastic rings and with sealing o-ring. Two die casting piston racks guided on plastic clamps and slides, and fitted with o-ring for pneumatic seal, are inserted into the unit opposite each other making them engage on the axis. Everything is then closed with two die cast aluminium cylinder heads which have an o-ring washer for sealing. The spring return action is created by inserting springs in the two external chambers which, in the absence of air, bring the axis to its initial position, that is the valve.

The axis' holes and panel (Fig. 1) both comply with ISO5211 standard to allow it to be fitted on the valve's flange. In the upper part (Fig. 2) there are holes that comply with UNI EN 15714-3 (VDE/VDI 3845) standard to allow for the assembly of position controlling equipment (such as pneumatic, electro-pneumatic positioning devices, box micro, etc.). Holes have been created on the frontal part (Fig. 2) that comply with UNI EN 15714-3 (VDE/VDI 3845) standard of the "NAMUR" connection to fit the solenoid valve. The actuator is compact, light while still being resistant and reliable.



TECHNICA SPECIFICATION

Power supply pressure:

DA double acting version: 2 bar + 8 bar (29 psi + 116 psi)
 SR spring return version: 3 bar + 8 bar (44 psi + 116 psi) Max
 power supply pressure: 10 bar (145 psi)
 Warning: NEVER exceed the maximum pressure of power supply given above.

Supply media:

Dehumidified or lubricated air (Standard). The alternative is possible with non-corrosive gas or fluids ensuring that they are compatible with the materials (internal and lubricated parts) that make up the actuator. **DO NOT use gas or explosive fluids!** The max. size of the particle should not exceed 40µm (ISO 8573 Part1, Class5). In order to prevent condensation and/or solidifying of the water (ice, when the actuator is working below 0°C) the start-up fluid needs a dew point of -20°C or at least 10°C below room temperature (ISO 8573 Part1, Cat3).

Working temperature:

Standard version: -20°C + +80 °C (-4°F + +176 °F) seal in NBR (Buna-N)
 High temperature special version: +20°C + +145 °C (+68°F + +293 °F) seals in FKM (Viton)
 Low temperature special version: -50°C + +95 °C (-58°F + +203 °F) seals in VMQ (Silicon)
 (The special versions are supplied only on request)

Lubrication:

The actuators are supplied already lubricated for their lifespan under normal working conditions.

Connections for the power supply:

The puncturing for assembling the solenoid valves is made on the frontal part of the pneumatic actuator in line with the NAMUR interface and in compliance with UNI EN 15714-3 (VDE/VDI 3845) standard. The AP0 actuator has standard 1/8" GAS threaded connections. The AP1 and AP10 actuators have standard 1/4" GAS threaded connections. The AP12 actuator model has standard 1/2" GAS threaded connections. NPT thread connections can be had on request.

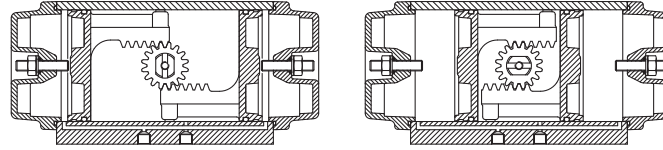
OPERATING PRINCIPLE:

Double acting actuator

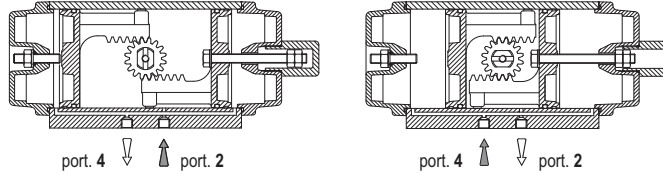
By letting air into the hole 2, the central chamber of the cylinder fills up and subsequently the pistons are moved outwards. The axis then rotates anti-clockwise allowing for the valve to open. Simultaneously, the air in the two external chambers is released from hole 4.

By blowing air into hole 4, the two external chambers fill up via a canalisation hole implemented along the extruded unit. The pressure forces the pistons inwards making the axis rotate clockwise and allowing the valve to close. Simultaneously, the air in the internal chamber is released from hole 2.

AP version



APM version

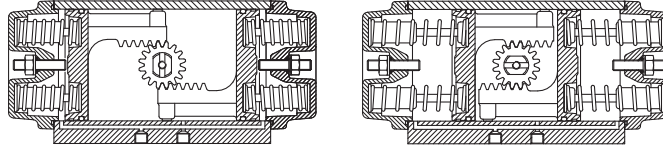


SR spring return actuator

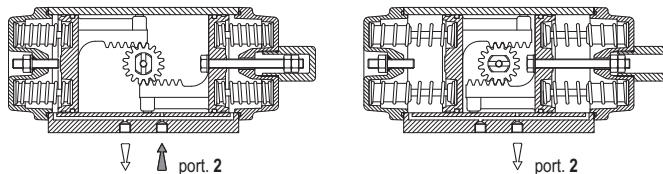
By letting air into the hole 2, the central chamber of the cylinder fills up and the pressure forces the pistons outwards. While the pistons are pushed outwards, the springs are compressed and the air in the two external chambers is released through hole 4. At this stage, the axis rotates anti-clockwise allowing for the valve to open.

By interrupting the power supply pressure, the springs intervene and spread out, moving the pistons inwards and rotating the axis clockwise, closing the valve and the actuator returns to its rest position (start). During this stage, the air inside the central chamber is released through hole 2.

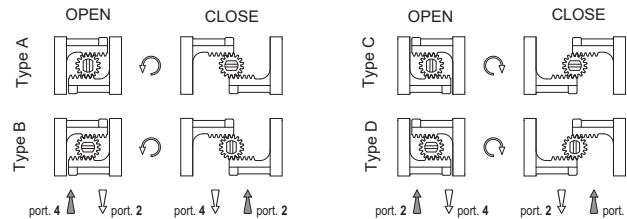
AP version



APM version



Mounting options



INSTALLATION GUIDELINES

Recommendations:

Sirca International S.p.A. will not be held responsible for injury to people, things or animals resulting from incorrect use of their product.

The actuators should only be installed by specialist technicians. This handbook should be read carefully before installation and before using the actuators. Before carrying out any installation or maintenance on the actuators, make sure they are disconnected from the pneumatic power supply. The AP and APM series actuators can be installed either internally or externally and can be fitted in any position. Any eye bolts on the actuators are designed to hold up only the weight of the actuator and NOT that of the actuator + valve (including other manoeuvring or position signalling devices). The user needs to arrange for insulation on the actuators if temperatures drop or rise above the ones shown on the label. If the actuators are installed outside, during the winter periods, if necessary, the user will need to suitably insulate the actuators in order to prevent the formation of ice both inside and outside. **In the case of spring return SR actuators, where a power supply hole remains free, we recommend the application of a filter to prevent dust or earth entering the cylinder's internal chamber.** We recommend the use of all the DPI devices and any movement tools in order to work in complete safety. If those entrusted with installation have any doubts, please feel free to consult our technical office at Sirca International S.p.A.

INSTALLATION GUIDELINES

Before assembling the actuator in the valve, carefully read the following:

- 1) Check that the inter-axle spacing and holes in the actuator correspond with those of the valve or readjustment injector test rig.
- 2) Check that the measurement and position of the panel on the actuator corresponds with the measurement and position of the valve axis or readjustment pivot.
- 3) Ensure that the valve is in the closed or open position (according to your needs) in order to have a correspondence between the threaded holes on the actuator and the valve holes.
- 4) If the valve is between the flanges, ensure that there is no pressure inside the piping as this would open and shut inadvertently its disc.
- 5) If the valve is not fitted between the flanges, once the actuator is fitted, take care not to interfere with the disc's range during the opening or closing manoeuvre. **The moving disc, especially at the closure stage, can cause serious injury.**

N.B. The single actuator is set up both for fitting on valves in longitudinal position as well as for fitting on valves in an orthogonal position. See diagram to the side.

Fitting the actuator on the valve, depending on how it is arranged, can be done directly (fig. 1A and 1B) or by using the specific injector test rig and readjustment pivot.

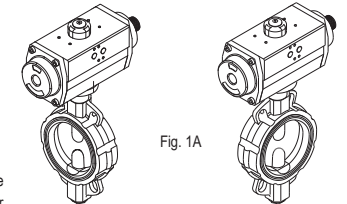


Fig. 1A

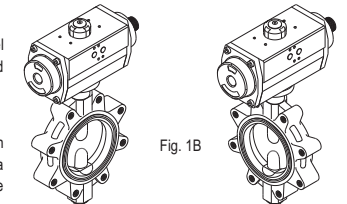


Fig. 1B

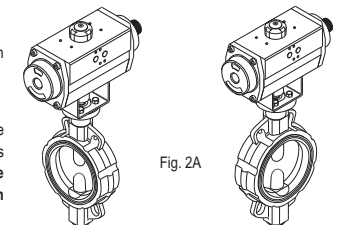


Fig. 2A

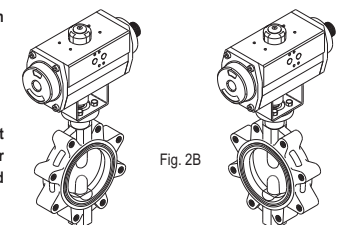


Fig. 2B

Proceed as follows to fit:

Case 1A and 1B direct fitting of the actuator on the valve:

After observing all the previous points, proceed as follows:

A) Position the actuator above the valve's attachment flange.

B) Insert the actuator's square or polygonal attachment into the panel on the valve's axis.

C) Bring the actuator down until it is completely resting on the surface of the valve's flange.

D) Line up the flange's through holes with the actuator's threaded holes, inserting the screws and manually screwing them in for a few threads.

E) At this point, tighten the screws without blocking them definitively and if possible, making two or three opening and closure manoeuvre in order to arrange everything.

F) If no problems arise, use appropriate tools to make a final tightening of the screws.

G) Proceed with adjustment in opening and closure (if necessary). See adjustment instruction, further on.

Case 2A and 2B assembly of the actuator on the valve with the aid of injector test rig and readjustment pivot.

A) Position the readjustment pivot in the specific square or polygonal slot on the actuator axis. If the actuator has a polygonal attachment check which position needs to be used.

B) Then position the injector test rig as shown in the diagram so that the pivot ends up inside it. The larger hole on the injector test rig must be on the actuator's side so that the pivot can pass inside.

C) After positioning the injector test rig in correspondence with the threaded holes, manually tighten the four screws.

D) Permanently tighten the four screws.

E) Take the whole block and bring it close to the valve axis.

F) Insert the eyelet of the readjustment pivot in the panel on the valve axis and bring everything down until the surface of the injector test rig touches against the surface of the valve flange.

G) Line up the through holes in the injector test rig with the through holes on the flange.

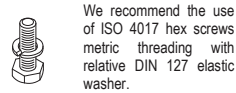
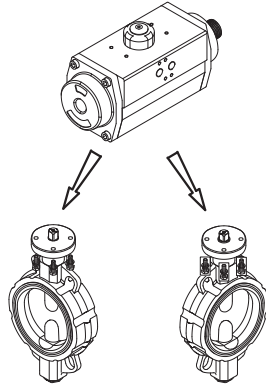
H) Manually insert the fastening screws into the holes, as shown.

I) Manually tighten the nuts to the screws, remembering to also include the elastic washers.

L) Once everything is in place, carry out a few opening and closure manoeuvres so that the whole unit settles down.

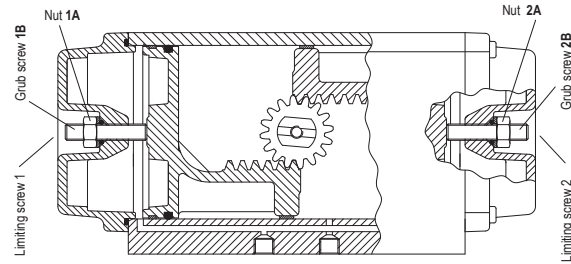
M) Permanently clamp the nuts. At the clamping stage, we recommend you use two wrenches, one which will hold the screw still and the other to tighten the nut.

N) Now move on to the disc adjustment stage when opening and closing, if necessary. See instructions below.



STROKE ADJUSTMENT OF THE AP series ACTUATOR single adjustment when closing (pistons towards the outside).

- A)** Open the valve, so that the actuator pistons go inwards. This operation is essential so that the limiter screws 1 and 2 do not come into contact with the pistons.
- B)** Unscrew nuts 1A and 2A on the limiter screws using a hex key wrench and turning them 4-5 times.
- C)** Using a specific Allen wrench, unscrew the respective threaded grub screws 1B and 2B for approximately 2-3 turns. Withdrawing the limiter screws will allow the pistons, at the closure stage, to complete a greater stroke and therefore send the disc to closure with a greater angle.
- D)** Carry out a closure manoeuvre of the disc and check its level of closure. If the position is not the one you require, re-open the disc and change the position of just one threaded grub screw, unscrewing it then tightening it again to obtain the required disc closure position. This position can be checked by sending the disc to closure.
- E)** After finding the required disc closure position, keep the disc in this position (pistons towards the outside). Unscrew even the opposite limiter grub screw until it reaches its mechanic stop against the piston.
- F)** After positioning the limiter grub screws, use a hex key wrench to block the respective nuts, ensuring that they are properly tightened.
- G)** Make a few opening and closing manoeuvres of the disc, checking that the level of closure is the one you require. If it is not, repeat points A to F.
- NOTE:** It is possible to adjust the entire stroke of the pistons from 0° to 90°, using the longer threaded grub screws. These threaded grub screws can be supplied when the order is placed or requested at a later date. We recommend you order these threaded grub screws from Sirca International's technical office.



ACTUATOR STROKE ADJUSTMENT APM series (double adjustment in closure and opening).

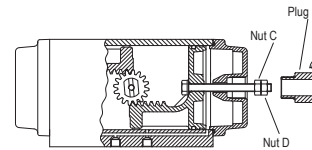
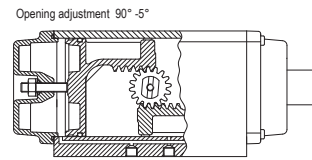
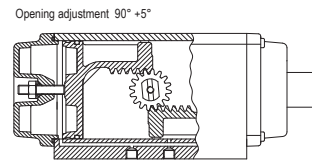
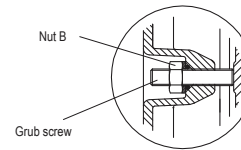
In order to adjust the opening of the valve disc (external actuator pistons) proceed as follows:

- A)** Send the valve to closure so that the limiter grub screw A is free to be tightened or unscrewed.
- B)** Unscrew nut B by turning it a few times.
- C)** By unscrewing the grub screw, the opening of the disc will be limited and an opening of less than 90° will be obtained.
- D)** By unscrewing the grub screw by a few turns, the opening of the disc will be increased and an opening of more than 90° will be obtained.
- E)** After screwing or unscrewing the grub screw depending on whether you wish a lesser or greater opening of the disc, check the opening position of the disc by powering the actuator and sending the valve to opening. If this is not the required position, repeat points A, C, D and E.
- F)** Once you have found the required position, leave the cylinder under pressure with the valve open. Screw and tighten nut B in order to block the threaded grub screw into the required position.

Warning: the standard adjustment in opening is ±5°; for different adjustments contact our Technical Office.

In order to adjust the closure of the valve disc (internal actuator pistons) proceed as follows:

- A)** Send the valve to opening so that the limiter nuts C and D are free to be tightened or unscrewed.



- C)** Fully unlock and unscrew the lock-nut D.

- D)** By unscrewing the C nut by a few turns, a greater closure of the disc from 0° up to +5° is achieved.

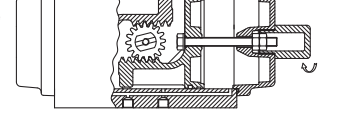
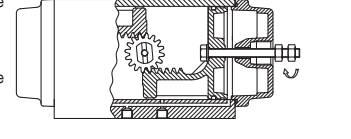
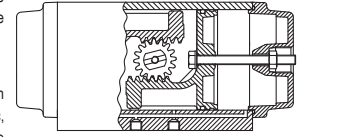
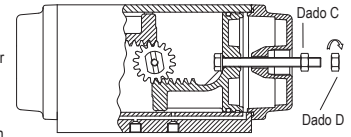
- E)** Closure is limited from 0°-5° by tightening the nut. In other words, as the threaded screw passes through the cylinder head, there is the possibility of limiting the closure for the entire stroke from 90° to 0°.

- F)** After screwing or unscrewing the nut depending on whether you wish a lesser or greater closure of the disc, check the opening position of the disc by powering the actuator and sending the valve to closure. If this is not the required position, repeat points D, E and F.

- G)** Once the required position has been found, send the valve to opening. Keeping nut C still, screw up nut D until

- Cap E reaches its mechanic stop against nut C. Clamp well the two nuts, taking care not to move nut C when clamping the lock-nut.

- H)** Fully re-screw on the knurled aluminium cap.



MAINTENANCE:

IMPORTANT: before carrying out maintenance, make sure the pneumatic actuator is not connected either to the supply media or to the electric power supply if fitted with solenoid valve or other devices.

NOTE: in order for the actuator to work properly and to ensure it lasts over time, Sirca International recommends a maintenance programme that should be implemented at least every 500,000 manoeuvres in order to check the wear status of both the o-rings and the clamps or plastic runners. If, during these controls, there are signs of advanced wear, we recommend you replace the worn parts as they will cause the actuator to work less efficiently. Obviously, the 500,000 manoeuvre check is only a recommendation and principally refers to usage of the actuator under "normal" conditions with a supply media properly filtered and a number of manoeuvres that is not too high. In the event that it is used under extreme, demanding conditions, we recommend you increase the controls and subsequently the maintenance operations.

SIRCA INTERNATIONAL S.p.A. recommends original spare parts and maintenance work carried out by qualified personnel. For maintenance, proceed as indicated following the exploded diagram of the actuator MAN-AP-00.2.14-AX2 (Annex 2) which can be requested from Sirca International's Technical Office or found on the website www.sircainternational.com.

- A)** Remove the screws pos.18 of the cylinder heads. We recommend you slacken the screws a little at a time, by rotating them
- B)** Remove the cylinder head pos. 3 and replace: B.1) the o-ring pos. 19
B.2) the o-ring pos. 15, unscrewing firstly the nut position 17 and then unscrewing the grub screw thread position 14
- C)** Unscrew the knurled aluminium cap pos. 24 and replace the o-ring pos. 25
- D)** With the pistons towards the outside, unscrew the lock-nut and the nut pos. 17
- E)** Remove the cylinder head pos. 3B after slackening and removing the screws pos. 18 replace the o-ring pos. 19
- F)** Rotate the axis anti-clockwise until the pistons stick out of the central unit, and replace on both pistons: F.1) the o-ring pos. 21 and the runner pos. 20
- G)** Remove the circlip 10 using suitable pliers (after having removed, if present, the cam or position index)
- H)** Remove the axis from the lower part of the unit by placing pressure on the upper part of the axis and replace: h1) the upper o-ring upper pos. 9 and the upper runner pos. 8
the lower o-ring pos. 7 and the lower runner pos. 6
- I)** Once all the pieces have been removed, clean the internal diameter of the unit, removing any dirt or anything else. Oil the whole surface of the unit again using a GREASE INF 1 silicon compound free lubricating Lithium grease.
- G)** Proceed with re-assembling all the parts following the opposite order from the dismantling one.

NOTE: before going ahead with the re-assembly of the parts, these need to be cleaned and greased again, just like the unit. Take care when inserting the pistons, paying attention to their cog wheel stage. Check that when the pistons are facing inwards, one against the other, the upper machine on the axis needs to be perpendicular to the actuator unit (see illustration in paragraph 2.1). If you encounter any problems contact the Technical Office at Sirca International S.p.A.