Diaphragm Pneumatic actuators

Diaphragms from 240 to 2800 cm²
Strokes from 15 to 120 mm

SA 30 P, 50 P, 70 P,
77 P, 80 P, 90 P, 98 P

Application

For driving of control final elements, destined to operation mainly together with SP series ASCA control valves.

Main characteristics

- Reduced height, saves space;
- Several command pressure ranges by means of variation of the quantities and protension of the springs;
- Changing of pressure range and inversion of command action without demanding special tools or aditional componentes;
- Executions with hand driving on the top or side.

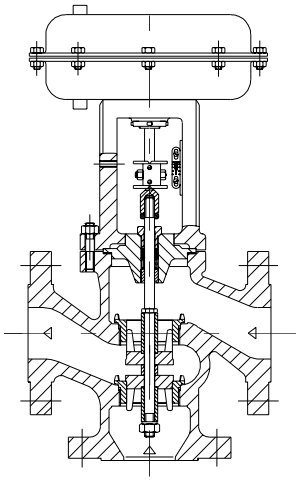
Presentations

They are basically composed of the upper and lower casings, of the diaphragm, springs and stems. They are supplied with "Closed spring" or "opening spring" command action. The inversion of the command does not require additional components. Generally they operate with the following control final elements:
- Straight passage control valves ASCA series SP type A;
- Three way control valves ASCA series SP type K.

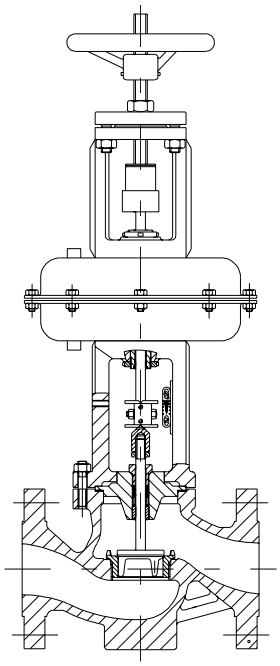
Executions

- Simple actuator (pic. 1) provide with diaphragm with effective area of 240, 350, 700, 1400 cm².
- Simple actuator with hand driving device SA 20 M, 21 M on the top (pic. 2). The combinations of the devices with the respective actuators are on the board “Hand driving devices”.
- Double actuator (pic. 3) provide with 2 diaphragms with effective area of 700 cm² each one.

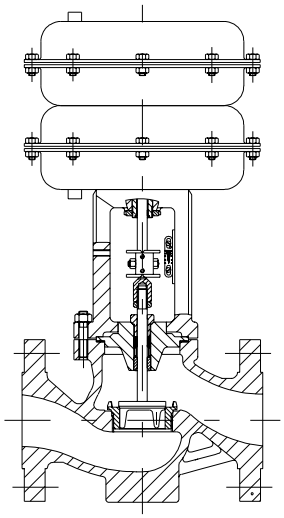
Special executions for fluids of liquid commands (for example, water or oil), under consultation.



Pic. 1 - Simple pneumatic actuator **SA 50 P** with control valve SP 11 K



Pic. 2 - Simple pneumatic actuator **SA 70 P** with hand driving device SA 21 M on the top and control valve SP 15 A



Pic. 3 - Double pneumatic actuator **SA 77 P** with control valve SP 15 A

Technical competence, materials and connections

Admissible maximum command pressure	6 bar / 85 psig
Admissible temperatures	In continuous operation: - 35 °C / - 31 °F a 90 °C / 194 °F
Hysteresis of valve and actuator with diaphragm from 240 to 2800 cm²	Maximum 5% of the command pressure range
Actuators SA type P	
Diaphragm	NBR (Reinforced nitrilic rubber)
Stem	Stainless steel ASTM A 182 Gr. F 304
Retainer	Stainlees and nitrilic rubber
Springs	Steel for springs SAE - 1070 / 1080
Casings	Carbon steel ASTM A 570 Gr. C
Manual drive devices	
Wheel	Cast iron ASTM A 126 Gr. B
Cover	Cast nodular iron ASTM A 395
Threaded stem	Stainless steel ASTM A 182 Gr. F 304

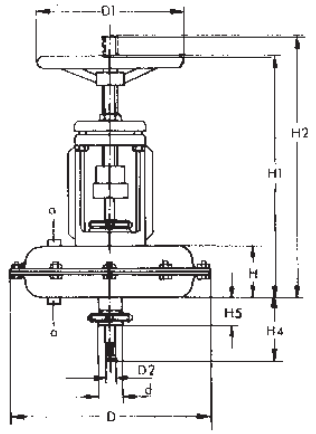
* Lower or higher temperatures, under consultation.

Measures and weights

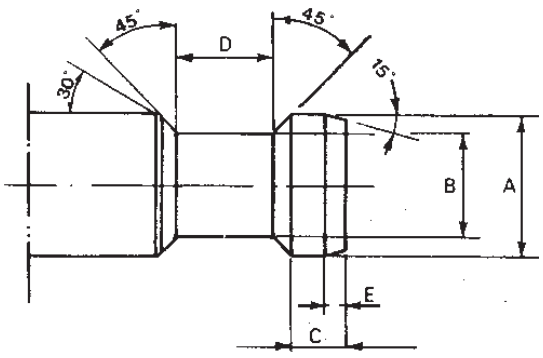
Model	Effective diaphragm area in cm²	Measures in mm											Approx. weight (kg)
		H	H_1	H_2	H_3	H_4 Closed valve	H_5	ϕ D	ϕ D_1	ϕ D_2	ϕ d Thread	α Thread BSP	Without han driver
Simple actuators - without and with hand driving													
SA 30 P	240	62	300	345	-	75	43	240	180	10	M30 x 1,5	1/4"	5
SA 50 P	350	82	320	365				280	250	16		3/8"	8
SA 70 P	700	134	430	515		90		390					22
SA 80 P	1400	197		535	675	165	54	532		22	M60 x 1,5		70
SA 90 P	2100	373	770	960	-	315	92	672	-	40	M100 x 2	1"	280
SA 98 P	2800	366	760	955				770					350
Double actuator - only without hand driving device													
SA 77 P	2 x 700	292	-	-	-	90	43	390	-	16	M30 x 1,5	3/8"	58

Actuator stem tip (pic. 5)

Measures in mm	Diaphragm effective area in cm²					
	240	350	700	1400	2100	2800
A	10	16		22	40	
B	7,5	11,5		16	25	
C	5			8,5	19,5	
D	6,5	10		15,5	28	
E	2			3,5		



Pic. 4 -Simple actuator Sa type P with SA 20 M, 21 M



Pic. 5 - Actuator stem tip

Installation

The coupling connects the actuator stem with the shutter stem of a control valve or of another final control element.
Once the SA type P is mounted in the control element, the protension of the springs can be setted (see Technical Competence and Materials), setting the height of the coupling nut.
The pic. 4 shows an actuator with hand driving device SA 20 M, 21M mounted in the upper casing of the diaphragm. In normal operation, the actuator stems and hand driving device are not coupled to the threaded stem. When the counter nut is freed, the final control element can be manually driven by the wheel, turning it against the spring forces.

Operation

Simple actuator, without and with hand driving devices (Pic. 7 and 8)

The command presure P_c provides a force ($F = P_c . A$) acting on a effective area of the diaphragm, and compensated by the actuator springs. Since the stroke is proportional to the command pressure P_c the amount of springs and their protension define the command pressure range and nominal stroke. The command action of the actuator stem depends on the location of the springs and the connection with the air feeding piping.

Double actuator (pic. 9)

This actuator consists of two series mounted diaphragm. The command pressure P_c provides the force $F_T = 2 . (P_c . A)$ on the effective areas A of the diaphragm. This force corresponds to double force provided on the simple actuator. Because of this, the double actuators SA 77 P are appropriate to control high pressure differentials, when the disired command pressure range is narrow or the available air feeding pressure is restricted.

Command action

The SA type P pneumatic actuators can be supplied in two versions:
"CLOSED SPRING" ACTUATOR - The springs displace the stem downwards; the connection of the air feeding piping on the lower diaphragm casing.
"OPENING SPRING" ACTUATOR - The springs displace the stem upwards; the connection of the air feeding piping is on the upper diaphragm casing.

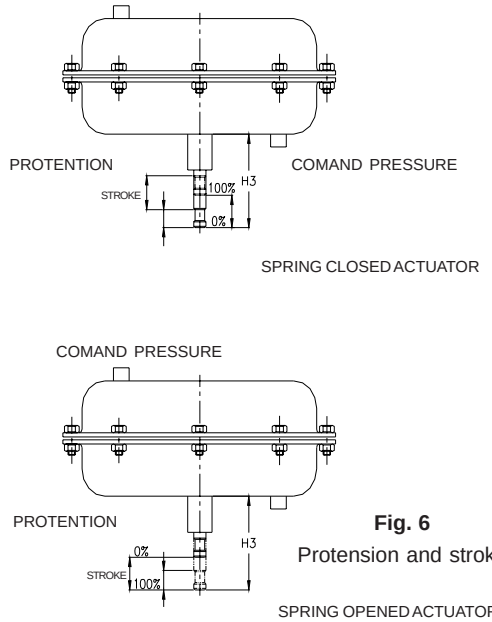


Fig. 6
Protension and stroke

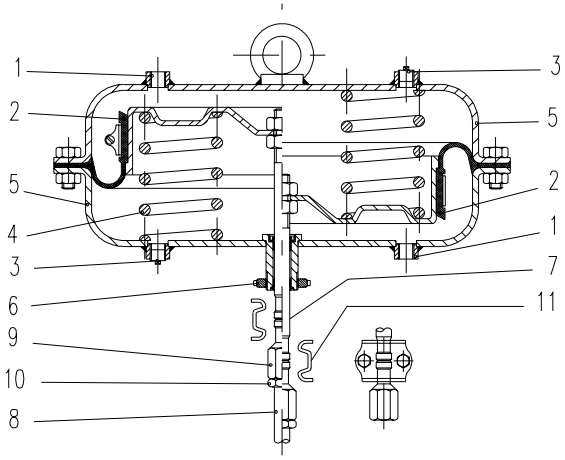


Fig. 7 -Simple actuator SA type P (right side of the diaphragm with additional springs)

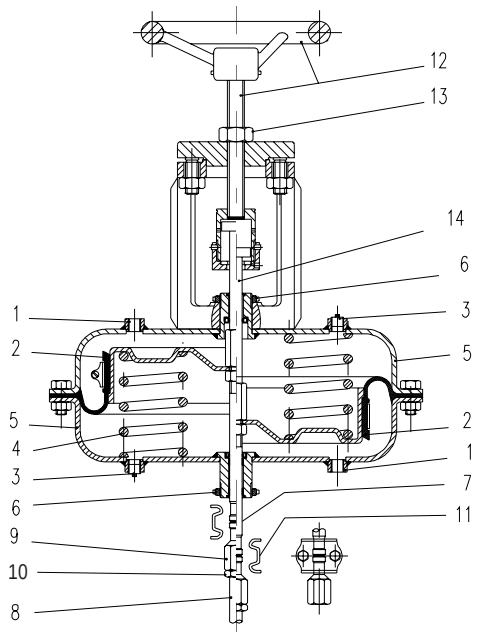


Fig. 8 - Simple actuator SA type P with hand driving devicel SA 20 M, 21 M

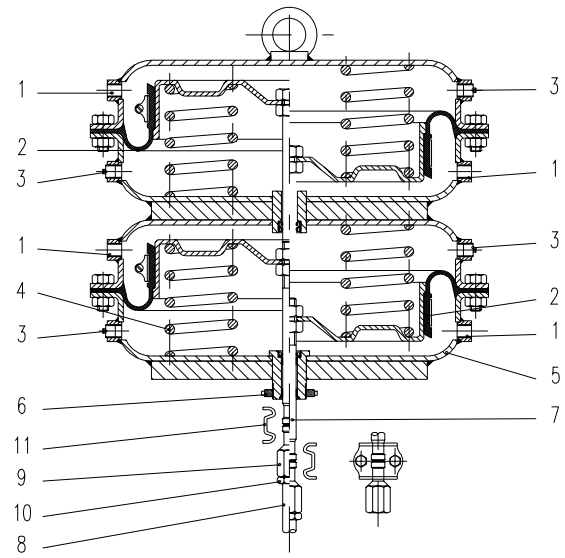


Fig. 9 - Double actuator SA 77 P

Components

Nº	Description	Quant.
1	Connection for air feeding piping	1
2	Diaphragm	1*
3	Dearation	1
4	Springs	**
5	Casings (upper and lower)	2
6	Nut	1
7	Actuator stem	1
Control valve		
8	Valve shutter stem	1
9	Valve coupling nut	1
10	Counter nut	1
11	Valve coupling with stroke indicator	1
Hand Driving device		
12	Hand wheel with threaded stem	1
13	Counter nut of the hand wheel stem	1
14	Stem for hand driving	1

* Recommended spare parts.
** The spring quantity depends on the effective area of the diaphragm and the command pressure range.

Hand driving devices

Combinations with the respective SA type P actuators

Device	SA 20 M	SA 21 M
Position	On the top	On the top
Stroke available in mm	30	30
For actuators	SA 30 P, 50 P	SA 70 P

Command pressure ranges

All the indicated pressures are manometric and expressed in bar.
The values in the gray columns correspond to the application with nominal stroke and usual command pressure range. With the corresponding command pressure elevation, the maximum specified stroke is reached.
The command pressure ranges in the white column are valid only for the nominal stroke and springs with additional maximum pro-tension. In these conditions, the specified maximum stroke can not be reached.

Command pressure ranges

Actuator Model	Diaphragm area cm²	Nominal stroke mm	Stroke volume dm³	Command pressure ranges (bar) Springs number 3		6		12		18		24		30		Aditional protension** %	Max. stroke mm
SA 30 P	240	15	0,36	0,2 ... 1	0,3 ... 1,1	0,4 ... 2	0,6 ... 2,2	0,6 ... 3	0,9 ... 3,3	0,7 ... 3,5	1,05 ... 3,85	-	-	-	-	12,5	17
SA 50 P	350	15	0,53	0,2 ... 1	0,4 ... 1,2	0,4 ... 2	0,8 ... 2,4	0,6 ... 3	1,2 ... 3,6	0,7 ... 3,5	1,4 ... 4,2	-	-	-	-	-	24
			*	0,45 ... 0,7	-	0,9 ... 1,4	-	1,4 ... 2,3	1,6 ... 2,5	1,6 ... 2,9	2,0 ... 3,3	1,7 ... 3,2	2,1 ... 3,6	-	-	-	
SA 70 P	700	30	2,1	0,2 ... 1	0,4 ... 1,2	0,4 ... 2	0,8 ... 2,4	0,6 ... 3	1,2 ... 3,6	0,7 ... 3,5	1,4 ... 4,2	-	-	-	-	25	40
			*	0,35 ... 0,45	-	0,7 ... 0,9	-	1,3 ... 1,8	1,45 ... 1,95	1,7 ... 2,6	2,0 ... 2,9	1,9 ... 3,3	2,4 ... 3,8	2,0 ... 3,6	2,5 ... 4,1		
SA 80 P	1400	60	8,3	-	-	0,2 ... 1	0,4 ... 1,2	0,4 ... 2	0,8 ... 2,4	0,5 ... 2,5	1 ... 3	-	-	-	-		80
			*	-	-	-	-	-	-	1,1 ... 2,4	1,4 ... 2,7	1,3 ... 2,8	1,7 ... 3,2	-	-		
SA 90 P	2100	120	24,9	-	-	0,2 ... 1	0,4 ... 1,2	0,4 ... 2	0,8 ... 2,4	0,5 ... 2,5	0,5 ... 2,5	-	-	-	-		160
SA 98 P	2800	120	33	-	-	0,2 ... 1	0,4 ... 1,2	0,4 ... 2	0,8 ... 2,4	1 ... 3	1 ... 3	-	-	-	-		
				Double actuator													
SA 77 P	2 x 700	30	4,2	0,2 ... 1	0,4 ... 1,2	0,4 ... 2	0,8 ... 2,4	0,6 ... 3	-	-	-	-	-	-	-	25	40
			*	0,35 ... 0,45	-	0,7 ... 0,9	-	1,3 ... 1,8	1,45 ... 1,95	1,7 ... 2,6	2 ... 2,9	-	-	-	-		

* The values indicated in this line are applicable only to actuators with special springs

** Aditional protention (only together with the valve) in % of the stroke, respectively, of the command pressure range

Data for sizing

ASCA will make pleasure the sizing.
For this purpose must be supplied:

- Model of the control valve;
- Nominal diameter;
- Nominal pressure;
- Admissible differential pressure;
- Command pressure
- Command action ("closed spring" or "open spring")

Standard specification

Pneumatic actuator
Model SA ..... P from ASCA
According to prospect PR-05.70.60-I
Execution .....(simple, with SA ..... M or double)
Command pressure range.....
Command action ..... ("closed spring" or "open spring")

Control

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