

### DESCRIPTION

The RIALT8000□□PL is a piloted regulator designed for use in distribution networks with medium to high inlet pressures. Consist of a pilot system with integral adjustable pre regulator (1) and the regulator block or body (2) where the servo motor is located, the regulation body is connected to the gas pipelines.

The RIALT8010□□PL versions include an optional Over-Pressure (OPSO) and/or Under-Pressure (UPSO) Shut-Off facility (3).

### MODELS

There is one exclusive regulator model with three different pilots that cover common pressure ranges for gas installations. The pilot system consists of a filter, a pre-pilot (or pre regulator) and a main pilot.

There is one filter model:

- FL-1 (with a max inlet pressure of 20 bar)

There is one pre-pilot model:

- PR-3 (with a max inlet pressure of 20 bar, outlet pressure  $0.7 \div 5$  bar)

There are three main pilot models:

- PL-1 (outlet pressure  $40 \div 100$  mbar)
- PL-3 (outlet pressure  $100 \div 1000$  mbar)
- PL-5 (outlet pressure  $1000 \div 4000$  mbar)

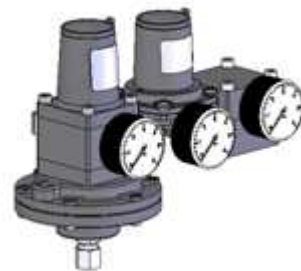
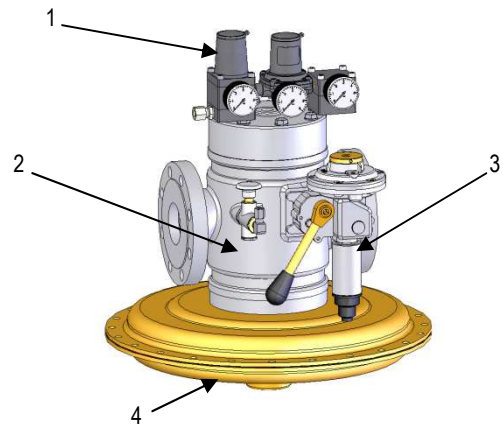
### CONNECTIONS

Model ALTON 8000A□PL is with 3" ANSI-150 flanges

Model ALTON 8000D□PL is with DN-80 PN-25 flanges

### ASSEMBLY (fig. 1)

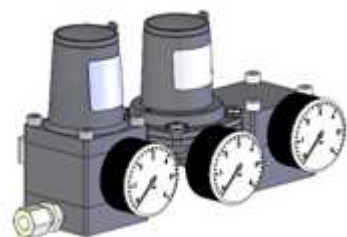
- Prior to installing the regulator, please verify the pressure and connection details required correspond with the information on the label (4).
- Assure that the fluid flows in the direction that the arrow indicates.
- Make the connection of the sense lines (6 & 7) to a straight pipeline, turbulence free, downstream the outlet of the regulator (at a distance of at least 5 times the diameter of the pipe). The sense line tube should have a minimum diameter of 10mm and should be totally exempted of any type of obstruction, valves and diameter reductions.
- The area of installation of the regulator should be adequate to allow maintenance labors and outlet pressure adjustments.
- The OPSO/UPSO Device (Optional) is mounted on the lateral section of the regulator. It monitors the downstream pressure independently of the main section of the regulator.



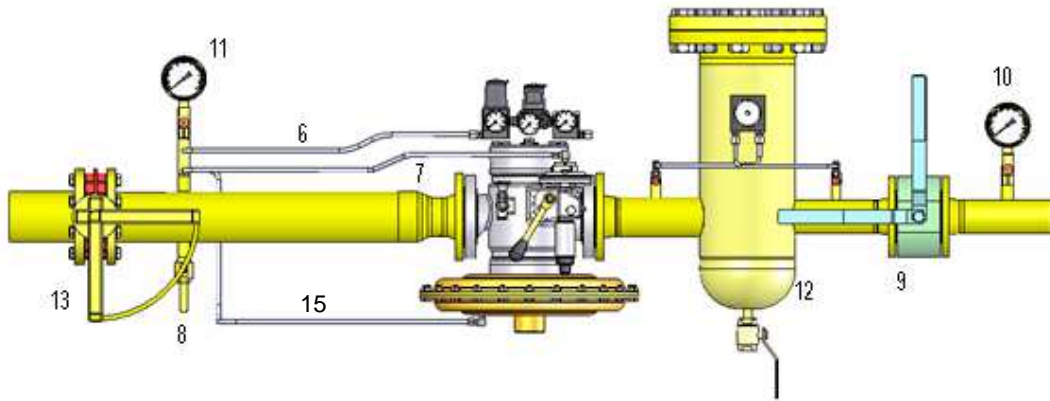
FL-1+PR-3+PL-1



FL-1+PR-3+PL-3



FL-1+PR-3+PL-5



## APPLICATIONS

These regulators are used for natural gas, manufactured gas, LGP, air or other type of gases which do not contain high concentration of benzene. The most important characteristics are:

- High precision, since AC2.5.
- "Fail to close" type, system that grant the equipment an extra security.
- Simple outlet pressure adjustment by replacing the pre-pilot and main pilot spring.
- Balanced type regulation and pilot orifice, which grants stability in the presence of inlet pressure variations.
- Small size in relation with the flow capacity.

## STARTUP PROCEDURE

- Open the bleed valve (8) to provide a slight flow of gas.
- Slightly and slowly, open the inlet valve (9), located upstream the regulator.
- Check that the inlet pressure (10) is correct.
- Verify that the outlet pressure (11) has stabilized.
- The main inlet valve (9), found at the inlet of the filter (12), can now be fully opened.
- Slowly open the outlet valve (13).
- If the regulator is fitted with an OPSO/UPSO, refer to OPSO/UPSO device manual (startup procedure section).
- If the regulator action is extremely slow, lightly increase the pressure of the pre-pilot.
- If the outlet pressure fluctuates, reduce the pressure of the pre-pilot.

## CAUSES OF ABNORMAL OPERATION

- Sense line of the pilot (7) or sense line of the regulator (6) not connected, blocked or leaking.
- Sense line of the pilot (7) or sense line of the regulator (6) may be of insufficient diameter, or connected at a location of turbulence in the pipeline.
- Pressure required is outside the range of the springs installed in the pre-pilot or pilot.
- Flow capacity requires exceeds regulator capacity.

If the pre-pilot does not close perfectly, this may be caused by:

- Orifice may be worn.
- O-ring may be worn.

If the pilot does not close perfectly, this may be caused by:

- A worn, damaged, or pitted Valve Seat Disc.

If regulator does not close perfectly, this may be caused by:

- A worn, damaged, or pitted Valve Seat Disc.
- Orifice may be worn.
- O-ring may be worn.
- Deterioration of the main or compensation diaphragms.

If the OPSO/UPSO does not close perfectly:

- Please refer to the Technical Data Sheet relevant to the OPSO/UPSO device concerned.

To avoid particle damage of the internal working parts of the regulator, it is necessary to install a filter (12) of not less than 5 microns prior to the regulator.

## ALTON 8000 □ □ PL Flow Chart

Kg 4328		Inlet Pressure (bar)										
		0.5	1	1.5	2.0	2.5	3.0	4.0	6.0	10.0	13.0	16.0
Outlet Pressure (mbar)	20	3028	4327	5410	6492	7574	8656	10820	15148	23804	30295	36787
	50	2975	4323	5410	6492	7574	8656	10820	15148	23804	30295	36787
	100	2871	4306	5410	6492	7574	8656	10820	15148	23804	30295	36787
	150	2746	4279	5410	6492	7574	8656	10820	15148	23804	30295	36787
	200	2597	4240	5410	6492	7574	8656	10820	15148	23804	30295	36787
	250	2419	4190	5410	6492	7574	8656	10820	15148	23804	30295	36787
	300	2207	4129	5406	6492	7574	8656	10820	15148	23804	30295	36787
	500	-	3748	5301	6492	7574	8656	10820	15148	23804	30295	36787
	700	-	3091	5047	6434	7574	8656	10820	15148	23804	30295	36787
	1000	-	-	4328	6121	7496	8656	10820	15148	23804	30295	36787
	1500	-	-	-	4839	6843	8381	10820	15148	23804	30295	36787
	2000	-	-	-	-	5301	7496	10601	15148	23804	30295	36787
	2500	-	-	-	-	-	5725	9917	15148	23804	30295	36787
	3000	-	-	-	-	-	-	8656	14993	23804	30295	36787
3500	-	-	-	-	-	-	-	14517	23804	30295	36787	
4000	-	-	-	-	-	-	-	13686	23804	30295	36787	

(n)m<sup>3</sup>/h natural gas

## CHANGING THE MOBILE ASSEMBLY BALANCING DEVICE

### Removal Procedure

- Close inlet Valve (9) and outlet Valve (13).
- Depressurize the inlet and outlet side of the regulator via purge valves (8 & 14).
- Disconnect the sense line (15) connected to the main diaphragm with a 19 mm open-end spanner.
- Remove screws (35) and open the inferior adjuster cover. Remove the spring (36).
- Remove the shell screw (37). Retire the main diaphragm (N).
- Remove connector screws (41) and the superior cover.
- Remove the clamping plate (42), the spring (43) and the axis (44).
- Remove the intermediate body (M) and the obturator guide (45).
- Replace the obturator (K).

### Assembly

- Invert the "Removal Procedure".

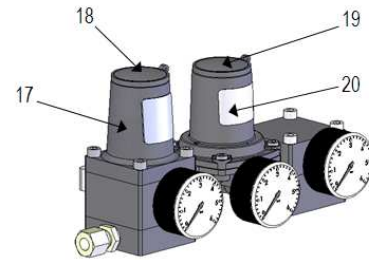
## ADJUSTMENT OF THE PILOT SYSTEM

The pilot system consists of a filter, a pre-pilot (20) and a main pilot (17).

The filter function is to prevent the passage of dirt to the pre-pilot and the pilot. This is achieved by an oversized filter element, to ensure a low speed in the filter while greatly extends the useful life of the filter element.

The pre-pilot function is to feed the pilot with constant pressure, even though the inlet pressure of the installation fluctuates.

The function of the pilot is to feed the regulation motor of the regulator maintaining the outlet pressure without fluctuation, independently from the demanded flow. It's important that the regulator is the adequate for the require flow.



## CHANGING THE REGULATION SPRINGS FORM THE PRE-PILOT OR PILOT

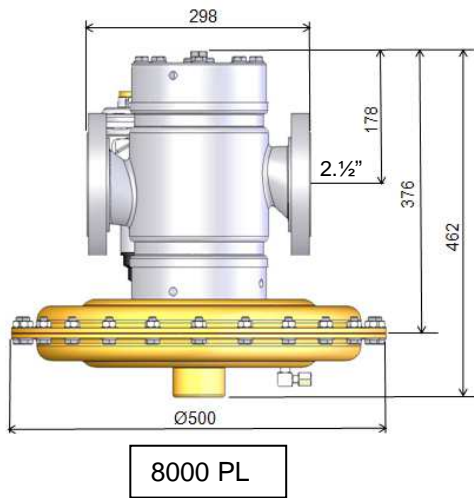
### Disassembly

- Close the inlet valve (9).
- Close the outlet valve (13).
- Depressurize the inlet part via purge valve (14) of the filter (12).
- Depressurize the outlet part via purge valve (8).
- Remove the cap (18 or 19) to access the regulation bolts (21 or 22).
- Wind the adjustment bolt (21 or 22) anti-clockwise, until all pressures is taken off, and remove the spring.

### Assembly

- Insert the spring of appropriate outlet pressure range.
- Re-assemble the main spring housing in reverse order to the above instructions.
- Please ensure only spring of appropriate size are fitted as failure to do so may cause regulator damage or failure.

## DIMENSIONS AND WEIGHTS



### Technical features of ALTON 8000□□PL

bpu	0.2 ÷ 20 bar	(inlet pressure range)
Ps	20 bar	(design pressure)
Pu	20 bar	(maximum inlet pressure)
Wd		(outlet pressure range)
ALTON 8000□□PL	20 ÷ 4000 mbar	
Wdo	40 ÷ 4000 mbar	(OPSO range)
Wdu	10 ÷ 2500 mbar	(UPSO range)
Ac	until 2.5%	(accuracy class)
Sg	until 10 %	(accuracy class)
T	-20°C ÷ 60°C	(working temperature)

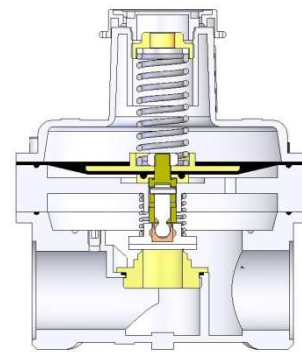
Inlet connection	3" ANSI-150 or DN-80 PN-25
Outlet connection	3" ANSI-150 or DN-80 PN-25
Connections position	Axial
Weight ALTON-8000□□PL	00.0 Kg
Weight ALTON-8010□□PL	00.0 Kg

## RELIEF VALVE

For installations ON-OFF, the output of the regulator should be sufficiently large lungs to absorb water hammer. It is recommended that lung mounted external relief valve capable of removing pressure peaks.

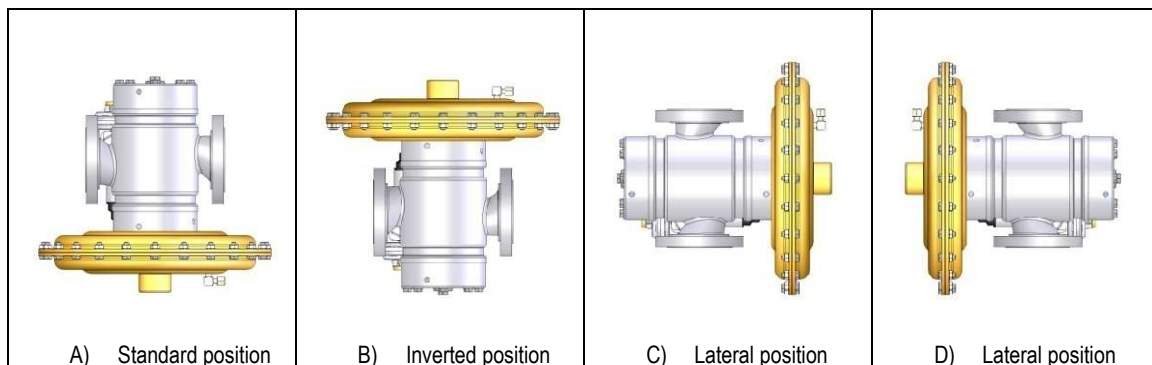
The quantity of gas released by pressure relief valve is related to the difference of inlet pressure and his calibrated. In the attached image is shown as an example, the relief valve VS 25 model. In which its operation is based on the confrontation of forces on both sides of the membrane.

On one side of the membrane, the gas pressure acts, on the opposite side and the spring force adjustment.



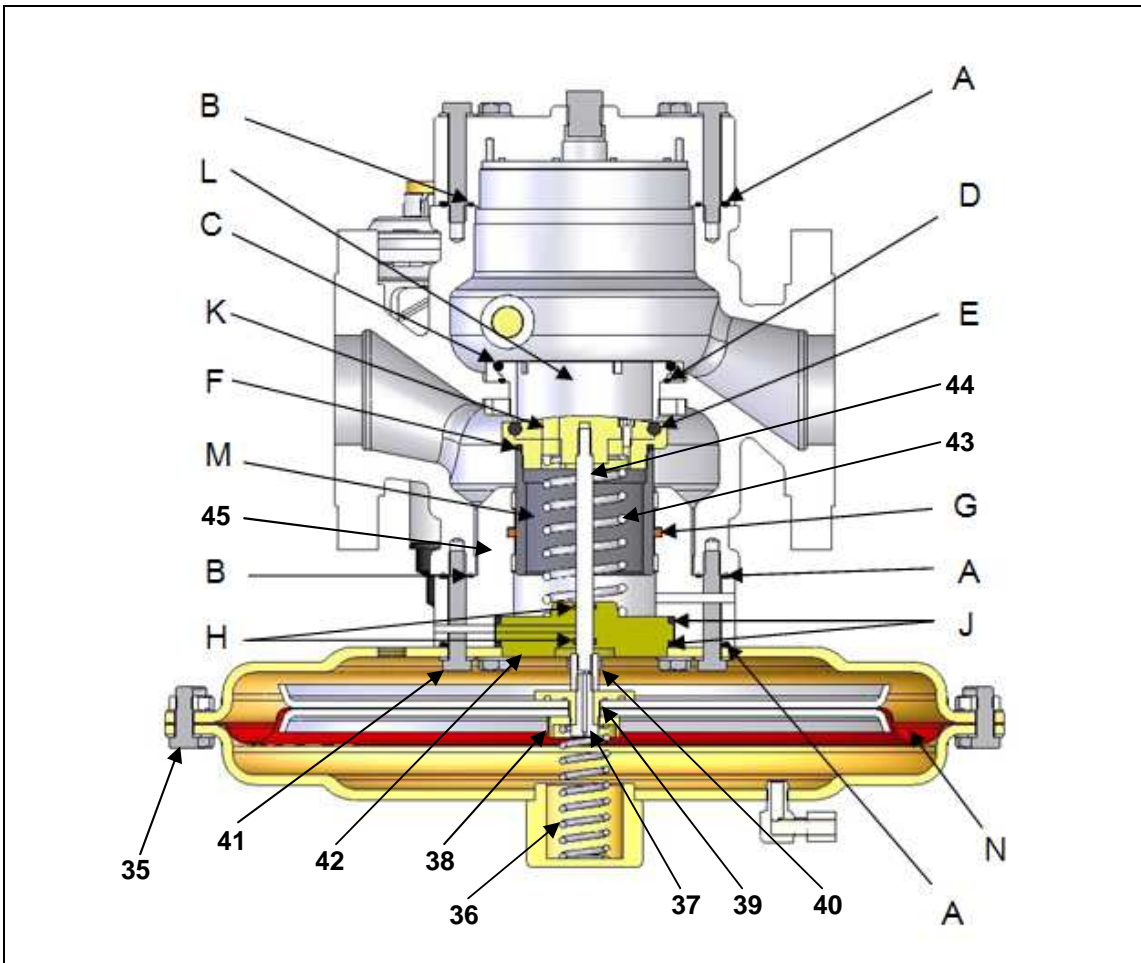
External relief valve VS-25

## MOUNTING POSITION

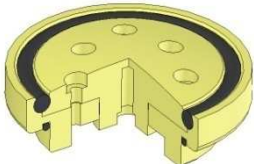

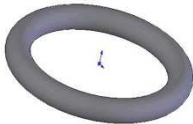

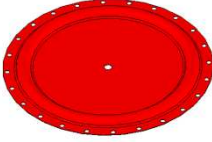


For correct operation, the regulator must be mounted according to the above figures; the first image (A) is the usual position of mounting. There should be enough space for the maintenance work.





**REGULATOR ALTON 8000□□PL SECTION**



**SPARE PARTS FOR ALTON 8000□□PL REGULATOR**

 <p>Obturator (K) Code ZM.1.00.1884 + ZM.1.00.3668</p>	 <p>Orifice (L) Code ZM.1.00.1880 + ZM1.00.1882</p>	 <p>Position      Code</p>
 <p>Guide Obturator (M) Code ZM.1.00.3678</p>	 <p>Diaphragm (N) Code ZM.1.00.13711</p>	<p>A      ZM.1.00.1829 B      ZM.1.00.1821 C      ZM.1.00.2011 D      ZM.1.00.2012 E      ZM.1.00.3676 F      ZM.1.00.2166 G      ZM.1.00.3677V H      ZM.1.00.0974V J      ZM.1.00.1824</p>

**TOOLS REQUIRED FOR THE MAINTAINANCE OF THE ALTON 8000□□PL REGULATOR**

 <p>O-ring Extractor</p>	 <p>Allen Key 2 - 4 - 5</p>	 <p>Tube Spanner 12-22-24-27-30</p>	 <p>Open-end Spanner 10-14-16-17-19 22-27-36-41</p>
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### FILTER FL-1

While the regulator is working check that the pressure loss does not exceed 0.2 bar. Otherwise proceed to replace the filter element.

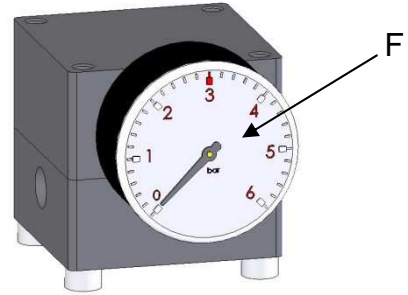
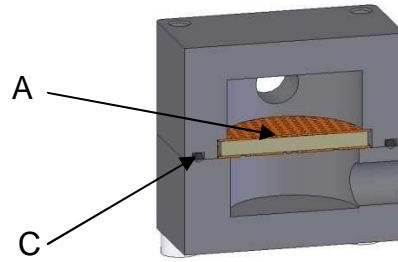
### FILTER REPLACEMENT

#### Disassembly




- Close the inlet valve (9).
- Close the outlet valve (13).
- Depressurize the inlet part via purge valve (14) of the filter (12).
- Depressurize the outlet part via purge valve (8).
- Remove the filter screws with a 5mm Allen key.
- Remove the filtration element (A) and clean the support grid.

#### Assembly

- Re-assembly the filter in reverse order to the above instructions, taking special attention with the O-ring seal (C).



### SPARE PARTS FOR THE FILTER FL-1

 Filtration element (A) Reference ZM.1.00.1319	 O ring (C) Reference ZM.1.00.1322	 Gauge (F) F. scale      Reference 0 - 4 bar      WI.1.05.0040 0 - 10 bar     WI.1.05.0100 0 - 16 bar     WI.1.05.0160 0 - 25 bar     WI.1.05.0250
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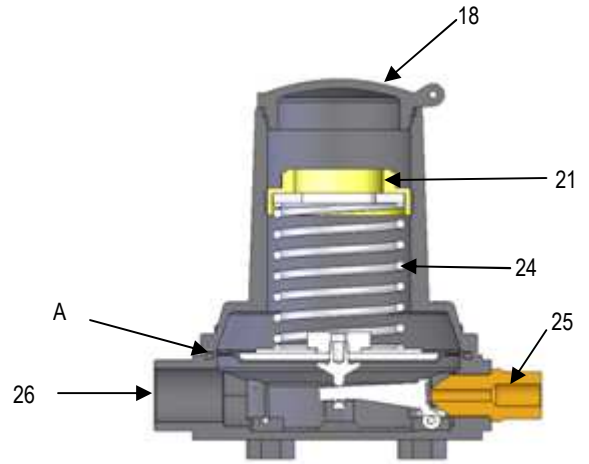
## PRE-PILOT PR-3

The pre-pilot pressure value should be adjusted 0.3 to 0.5 bar over the regulation pressure, for that the plastic cap (18) should be extracted and with a 22 mm tube spanner adjust the pressure turning the nut (21). Rotating it clockwise the pre-pilot pressure will increase, and anti-clockwise will decrease. We can control the pressure in the lateral gauge (F). Once the pressure is adjusted, assemble again the plastic cap (18)

The adjustment springs (24) of the pre-pilot have their own regulation range. In cases where the pre-pilot regulation pressure should vary significantly, the spring should be replaced.

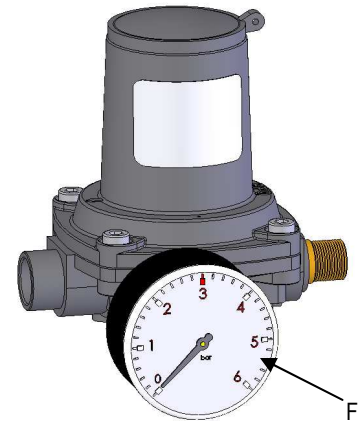
The inlet connection should be in position (25).

The outlet connection (pre-regulated pressure) position (26).



### PRE-PILOT PR-3 PRESSURE ADJUSTMENT SPRINGS

Spring Reference	Spring Color	Ext. Ø	L	Wire Ø	n° of turns	Spring Range (bar)
ZM330060351	Blue	30	60	3.5	8	0.7 ÷ 2.0
ZM330060371	Black	30	60	3.7	8	1.3 ÷ 2.5
ZM330060401	Purple	30	60	4.0	8	2.0 ÷ 4.0
M330060421	Silver	30	60	4.2	8	2.5 ÷ 5.0



### SPARE PARTS FOR THE PRE-PILOT PR-3

<p>Diaphragm (A) Code ZM.1.00.1300</p>	<p>O rings</p> <table border="0"> <tr> <td>Position</td> <td>Reference</td> </tr> <tr> <td>(C)</td> <td>ZM.1.00.1322</td> </tr> <tr> <td>(D)</td> <td>ZM.1.00.0712</td> </tr> <tr> <td>(E)</td> <td>ZM.1.00.1402</td> </tr> </table>	Position	Reference	(C)	ZM.1.00.1322	(D)	ZM.1.00.0712	(E)	ZM.1.00.1402	<p>Gauge (F)</p> <table border="0"> <tr> <td>F. scale</td> <td>Reference</td> </tr> <tr> <td>1.0 bar</td> <td>WI.1.05.0010</td> </tr> <tr> <td>1.6 bar</td> <td>WI.1.05.0016</td> </tr> <tr> <td>2.5 bar</td> <td>WI.1.05.0025</td> </tr> <tr> <td>4.0 bar</td> <td>WI.1.05.0040</td> </tr> <tr> <td>6.0 bar</td> <td>WI.1.05.0060</td> </tr> </table>	F. scale	Reference	1.0 bar	WI.1.05.0010	1.6 bar	WI.1.05.0016	2.5 bar	WI.1.05.0025	4.0 bar	WI.1.05.0040	6.0 bar	WI.1.05.0060
Position	Reference																					
(C)	ZM.1.00.1322																					
(D)	ZM.1.00.0712																					
(E)	ZM.1.00.1402																					
F. scale	Reference																					
1.0 bar	WI.1.05.0010																					
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2.5 bar	WI.1.05.0025																					
4.0 bar	WI.1.05.0040																					
6.0 bar	WI.1.05.0060																					

### TOOLS FOR PRE PILOT PR-3 MAINTAINANCE

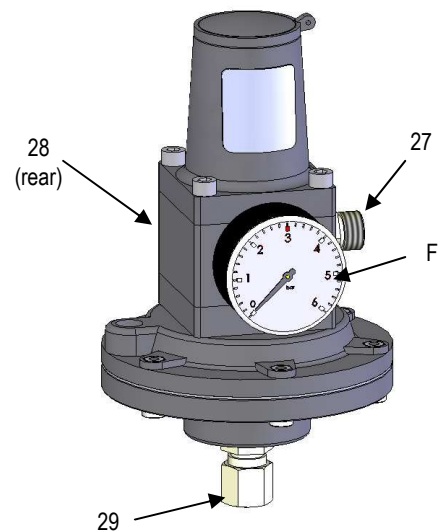
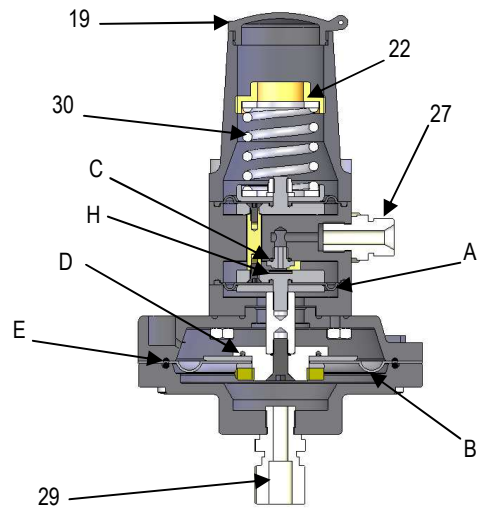
<p>Allen Key 3 - 5</p>	<p>O ring extractor</p>	<p>Open-end Spanner 14-19</p>	<p>Tube Spanner 10 - 22</p>
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## PILOT PL-1

The pilot PL-1 should have three connections. The feeding entrance (27) that should be connected to the pre-pilot exit (26). An exit to the motorization chamber (28) that is mounted in the opposite side of the main body to facilitate the installation (the out of service connections have a plastic cap), and the last connection in the lower part of the pilot (29) that should be connected downstream the regulator.

The pilot should be adjusted to the desired regulation pressure, to adjust the pressure remove the plastic cap (19) and with a 22 mm tube spanner adjust the pressure by rotating the nut (22). Rotating it clockwise the pressure will increase and anti-clockwise will decrease. The outlet pressure can be controlled with the gauge (F). Once the pressure is adjusted relocate the plastic cap (19).






The adjustment springs (30) of the pilot have their own regulation range. In cases where the pilot regulation pressure should vary significantly, the spring should be replaced.








### PILOT PL-1 PRESSURE ADJUSTMENT SPRINGS

Spring Reference	Spring Color	Ext. Ø	L	Wire Ø	n° of turns	Spring Range (mbar)
ZM3300600171	Red	30	60	1.7	5.5	40 ÷ 100

### SPARE PARTS FOR THE PILOT PL-1

 Diaphragm (A) Ref. ZM.1.00.1300	 Diaphragm (B) Ref. ZM.1.00.1156	 O rings Position Reference (C) ZM.1.00.1572 (D) ZM.1.00.0048 (E) ZM.1.00.0675	 Seat Disc (H) Ref. ZM.1.00.3108	 Gauge (F) F. scale Reference 160 Mbar WI.0.05.0160
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### TOOLS FOR PILOT PL-1 MAINTAINANCE

 Allen Key 3 - 5	 O ring extractor	 Open-end Spanner 14-19	 Tube Spanner 10 - 22	 Phillips Screwdriver
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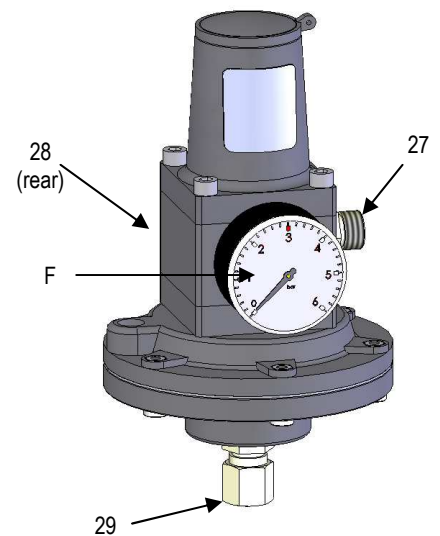
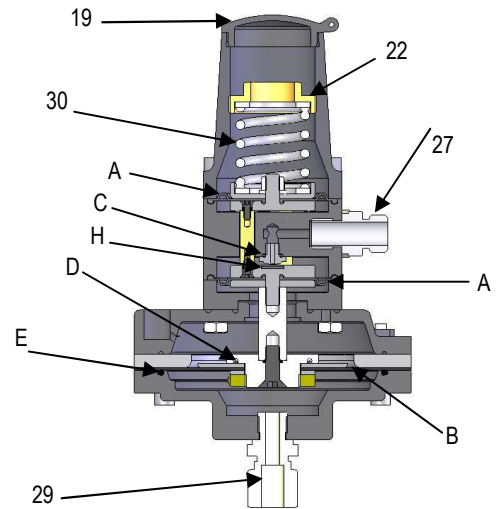


## PILOTO PL-3

The pilot PL-3 should have three connections. The feeding entrance (27) that should be connected to the pre-pilot exit (26). An exit to the motorization chamber (28) that is mounted in the opposite side of the main body to facilitate the installation (the out of service connections have a plastic cap), and the last connection in the lower part of the pilot (29) that should be connected downstream the regulator.

The pilot should be adjusted to the desired regulation pressure, to adjust the pressure remove the plastic cap (19) and with a 22 mm tube spanner adjust the pressure by rotating the nut (22). Rotating it clockwise the pressure will increase and anti-clockwise will decrease. The outlet pressure can be controlled with the gauge (F). Once the pressure is adjusted relocate the plastic cap (19).

The adjustment springs (30) of the pilot have their own regulation range. In cases where the pilot regulation pressure should vary significantly, the spring should be replaced.



**PILOTO PL-3 PRESSURE ADJUSTMENT SPRINGS**

Spring Reference	Spring Color	Ext. Ø	L	Wire Ø	n° of turns	Spring Range (mbar)
ZM330060221	Silver	30	60	2.2	6	100 ÷ 300
ZM330060251	Green	30	60	2.5	6.5	150 ÷ 400
ZM330060271	Red	30	60	2.7	7	200 ÷ 600
ZM330060301	White	30	60	3.0	7.5	400 ÷ 1000

**SPARE PARTS FOR THE PILOTO PL-3**

<p>Diaphragm (A) Ref. ZM.1.00.1300</p>	<p>Diaphragm (B) Ref. ZM.1.00.2966</p>	<p>O rings Position Reference (C) ZM.1.00.1572 (D) ZM.1.00.0048 (E) ZM.1.00.0675</p>	<p>Seat Disc (H) Ref. ZM.1.00.3108</p>	<p>Gauge (F) F. scale Reference 160 mbar WI.0.05.0160 250 mbar WI.0.05.0250 400 mbar WI.0.05.0400 600 mbar WI.0.05.0600 1.0 bar WI.1.05.0010 1.6 bar WI.1.05.0016</p>
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**TOOLS FOR PILOTO PL-3 MAINTAINANCE**

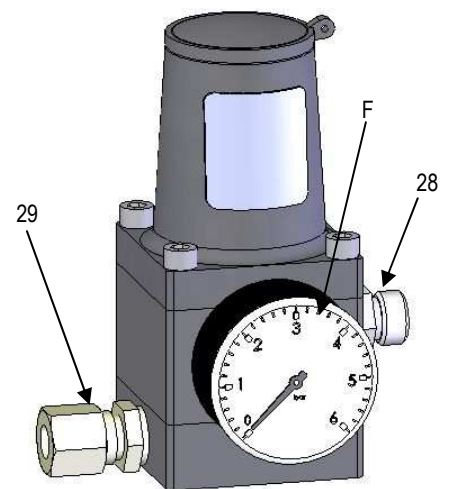
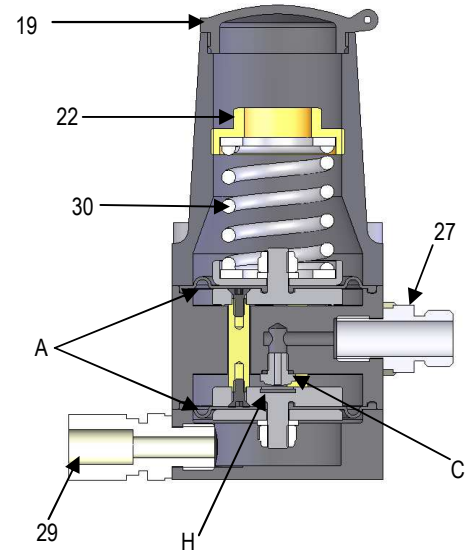
<p>Allen Key 3 - 5</p>	<p>O ring extractor</p>	<p>Open-end Spanner 14-19</p>	<p>Tube Spanner 10 - 22</p>	<p>Phillips Screwdriver</p>
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## PILOT PL-5

The pilot PL-5 should have three connections. The feeding entrance (27) that should be connected to the pre-pilot exit (26). An exit to the motorization chamber (28) that is mounted in the opposite side of the main body to facilitate the installation (the out of service connections have a plastic cap), and the last connection in the lower part of the pilot (29) that should be connected downstream the regulator.

The pilot should be adjusted to the desired regulation pressure, to adjust the pressure remove the plastic cap (19) and with a 22 mm tube spanner adjust the pressure by rotating the nut (22). Rotating it clockwise the pressure will increase and anti-clockwise will decrease. The outlet pressure can be controlled with the gauge (F). Once the pressure is adjusted relocate the plastic cap (19).

The adjustment springs (30) of the pilot have their own regulation range. In cases where the pilot regulation pressure should vary significantly, the spring should be replaced.



### PILOT PL-5 PRESSURE ADJUSTMENT SPRINGS

Spring Reference	Spring Color	Ext. Ø	L	Wire Ø	n° of turns	Spring Range (bar)
ZM330060351	Blue	30	60	3.5	8	0.7 ÷ 2.0
ZM330060371	Black	30	60	3.7	8	1.3 ÷ 2.5
ZM330060401	Purple	30	60	4.0	8	2.0 ÷ 4.0
ZM330060421	Nickel	30	60	4.2	8	2.5 ÷ 5.0

### SPARE PARTS FOR THE PILOT PL-5

<p>Diaphragm (A) Reference ZM.1.00.1300</p>	<p>Seat Disc (H) Reference ZM.1.00.3108</p>	<p>O rings (C) Reference ZM.1.00.1572</p>	<p>Gauge (F)</p> <table border="1"> <thead> <tr> <th>F. scale</th> <th>Reference</th> </tr> </thead> <tbody> <tr> <td>1.0 bar</td> <td>WI.1.05.0010</td> </tr> <tr> <td>1.6 bar</td> <td>WI.1.05.0016</td> </tr> <tr> <td>2.5 bar</td> <td>WI.1.05.0025</td> </tr> <tr> <td>4.0 bar</td> <td>WI.1.05.0040</td> </tr> <tr> <td>6.0 bar</td> <td>WI.1.05.0060</td> </tr> </tbody> </table>	F. scale	Reference	1.0 bar	WI.1.05.0010	1.6 bar	WI.1.05.0016	2.5 bar	WI.1.05.0025	4.0 bar	WI.1.05.0040	6.0 bar	WI.1.05.0060
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### TOOLS FOR PILOT PL-5 MAINTAINANCE

<p>Allen Key 3 - 5</p>	<p>O ring extractor</p>	<p>Open-end Spanner 14-19</p>	<p>Tube Spanner 10 - 22</p>	<p>Phillips Screwdriver</p>
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## SAFETY SHUT-OFF DEVICE (SAV)

The ALTON 8000□□PL regulator, is available with built-in safety valve (SAV) formed by the UPSO and the OPSO, with the code ALTON 8010□□PL.

### REGULATOR SETUP

#### Over pressure shut-off (OPSO)

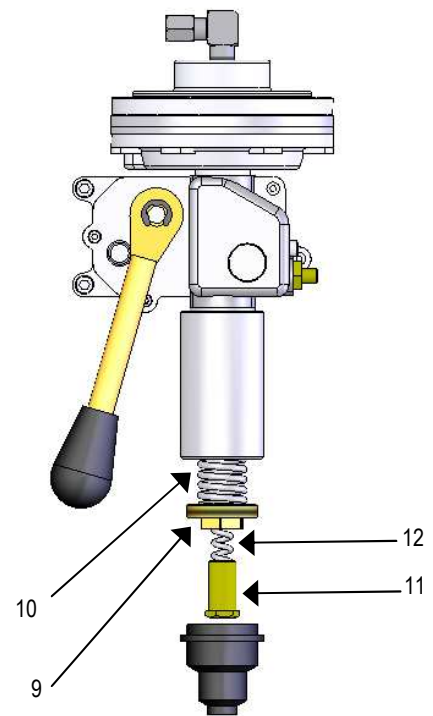
The two main elements used to set the over pressure shut-off are the screwed ring (9) and the OPSO spring (10). To increase the shut-off point to its maximum level, use a 22mm hexagonal tube spanner and turn the screwed ring (9) clockwise. Turning it in the opposite direction reduces the over pressure shut-off point.

The adjustment spring (10) has a defined range of pressures, so when the over pressure shut-off varies significantly the spring should be changed (see springs table).

#### Under pressure shut-off (UPSO)

The bolt (11) and the UPSO spring (12), are the elements used to set the under pressure shut-off. To reduce the shut-off point to its minimum level, use a 16mm hexagonal tube spanner to turn the bolt (11) anti-clockwise. Turning it in the opposite direction rises the under pressure shut-off point.

The adjustment spring (12) has a defined range of pressures, so when the under pressure shut-off varies significantly the spring should be changed (see springs table).



**WARNING!** It is potentially dangerous to manipulate a gas installation and its components. Therefore all start-up, adjustments and maintenance of the regulator must be carried out by duly authorized people with sufficient technical knowledge.

**SAFETY SHUT-OFF DEVICE (SAV) UPSO/OPSO ADJUSTMENT SPRINGS:**

**RI.VSA.8011**

**USPO ADJUSTMENT SPRINGS**

Spring code	Spring color	Ø Wire (mm)	Length (mm)	Ø Outside (mm)	Spring Range in kPa (mbar)

**OPSO ADJUSTMENT SPRINGS**

Spring code	Spring color	Ø Wire (mm)	Length (mm)	Ø Outside (mm)	Spring Range in kPa (mbar)

**RI.VSA.8012**

**USPO ADJUSTMENT SPRINGS**

Spring code	Spring color	Ø Wire (mm)	Length (mm)	Ø Outside (mm)	Spring Range in kPa (mbar)
ZM313055151A	Yellow	1.5	55	12	2 ÷ 9 (20 ÷ 90)
ZM312055201A	Blue	2	55	12.75	8 ÷ 30 (80 ÷ 300)

**OPSO ADJUSTMENT SPRINGS**

Spring code	Spring color	Ø Wire (mm)	Length (mm)	Ø Outside (mm)	Spring Range in kPa (mbar)
ZM330060201	Yellow	2	60	30	10 ÷ 18 (100 ÷ 180)
ZM330060221	Red	2.25	60	30	13 ÷ 25 (130 ÷ 250)
ZM330060251	Green	6.5	60	30	15 ÷ 34 (150 ÷ 340)
ZM330060271	Silver	2.75	60	30	20 ÷ 47 (200 ÷ 470)
ZM330060321	-	3.25	60	30	32 ÷ 75 (320 ÷ 750)

**RI.VSA.8013**

**USPO ADJUSTMENT SPRINGS**

Spring code	Spring color	Ø Wire (mm)	Length (mm)	Ø Outside (mm)	Spring Range in kPa (mbar)
ZM312055251A	Purple	2.5	55	12.75	7 ÷ 80 (70 ÷ 800)
ZM312055281A	Orange	2.8	55	12.30	20 ÷ 170 (200 ÷ 1700)

**OPSO ADJUSTMENT SPRINGS**

Spring code	Spring color	Ø Wire (mm)	Length (mm)	Ø Outside (mm)	Spring Range in kPa (mbar)
ZM330060351	Blue	3.5	60	30	35 ÷ 100 (350 ÷ 1000)
ZM330060371	Black	3.75	60	30	45 ÷ 130 (450 ÷ 1300)
ZM330060401	Purple	4.0	60	30	55 ÷ 170 (550 ÷ 1700)
ZM330060451	Orange	4.5	60	30	100 ÷ 300 (1000 ÷ 3000)
ZM330060481	Pink	4.8	60	30	150 ÷ 350 (1500 ÷ 3500)
ZM330060501	White	5.0	60	30	250 ÷ 580 (2500 ÷ 5800)