GASCAT

Installation, Operation & Maintenance Manual
Pressure Regulating Valve
Model URANO FA/FF

GASCAT

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1.0 GENERAL WARNING

1.1 PRE-COMMISSIONING INSTRUCTIONS

It should rest clearly understood that the information presented in these Commissioning Instructions is not intended to revoke or replace instructions determined by any competent body, and reference shall be made to the relevant Standards and/or to existing recommendations on the subject.

Before commissioning, the execution of appropriate "Cleaning and Purification Procedures" is implied.

Furthermore, all instructions on "Pressurization" and the "Work Standards on Health and Safety" must be

strictly met.

Valves' manufacturers recommendations, such as "open slowly" or "open very slowly" must be strictly observed.

1.2 HEALTH & SAFETY

Regulators, valves and other pressurized components that contain toxic gases, flammable or other hazardous products, are potentially dangerous if not operated and maintained correctly. It is mandatory that all users of this equipment are properly educated and guided on potential dangers, and get assured that the personnel responsible for their installation, testing, commissioning, operation, and the plant maintenance are competent to perform these tasks. Instruction manuals are provided for the operators' guidance, but it is assumed that they have a basic level of knowledge. If there are any questions or ambiguities that affect the proper procedures ask ***Gascat*** Ind. e Com. Ltda., who will be pleased to advise or provide the relevant service or instruction. **TAKE NO RISKS.** Our phone, fax and e-mail numbers are the following:

Gascat Indústria e Comércio Ltda.
Rodovia SP 73, 1141 - Indaiatuba / São Paulo.
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The items that follow, although not exhaustive, provide guidance on possible sources of danger to health and safety.

1.2.1 NOISE

Regulators, valves and pressure reducers can generate high levels of noise, which may be harmful to persons exposed to them for long periods. Users should ensure that adequate precautions are taken in order to provide health safety to employees and/or to third parties according to the Standards and recommendations in force.

1.2.2 INSTALLATION

All equipment, piping and vessels are designed to withstand mechanical stress, such as torque and bending moments in addition to internal pressure. However, maximum care must be taken during installation, not to impose excessive stress, which may cause cracks that may result in a serious break when the regulator is put into operation. Excessive stress can also be caused because the valve cannot sustain piping stretches, which require adequate support.

All regulators, shutoff valves, relief valves, etc., must be installed with the correct flow direction.

Impulse lines are important components of any control system, and their proper installation is essential, with no isolation valves.

Impulse lines shall be properly supported to reduce excessive vibration, which may cause fatigue rupture. They shall also be positioned so that they cannot serve as hand or footrest. Impulse lines should be slightly inclined so that liquid and condensates drain towards the main pipe.

When necessary (in underground facilities or indoor area) a ventilation pipe shall be installed from the threaded hole (Ø¼" NPT), found in the valve bell or in the diaphragm housing, and extended to a safe and ventilated location, with the vent output protected to prevent it from inlet of rain water and insects that can obstruct ventilation.

Auxiliary systems shall not be changed or modified without knowledge of the operating conditions and the responsible personnel permission.

1.2.3 OPERATION

Depending on the regulator type, its valve may be positioned fully open. Consequently, when putting a regulator in operation the shutoff valves shall be opened slowly, so that the regulator valve can assume its regulating position. If the shutoff valves are quickly opened, the upstream pressure can pass through the regulator and over-pressurize the downstream section of the main line.

All regulators, etc. shall operate with the regulation spring specified by the manufacturer. This is particularly important when operating relief valves or shutoff valves, since incorrect springs may prevent a relief valve to open and a shutoff valve to close.

Precautions shall be taken to prevent water inlet through breathing and ventilation openings.

1.2.4 MAINTENANCE

Regulators and valves contain gases under pressure, sometimes at a much higher pressure than the atmospheric pressure. Before attempting to investigate a problem, or perform maintenance work on an equipment, it must be safely depressurized. Furthermore, as many gases may be flammable, toxic, corrosive, or hazardous, it may be necessary to purge the system with an inert gas, such as nitrogen. Special precautions are required for operation with gases such as oxygen or hydrogen chloride, and the user must ensure that proper procedures are implemented.

Eventually, it is not enough to isolate the high-pressure device, since high pressure can be retained downstream of the isolation valves. Do not try to remove caps, plugs, etc, before the device is properly released. Even so, it is wise to consider that high-pressure gas may be trapped when removing covers and plugs.

Most regulators use spiral springs as the charging device. It is important to reduce these springs loading by moving their pressing plates backwards as much as possible. In some cases, the spring may contain some residual load, even when it is relaxed to the limits of its housing.

2.0 INTRODUCTION

2.1 SCOPE

This instruction manual intends to provide information on the installation, operation and maintenance of pressure regulators model “URANO”, manufactured by GASCAT.

2.2 DESCRIPTION

The pilot operated pressure regulator model URANO was developed by ***Gascat***’s Engineering in order to meet the most varied applications. It can operate in various operating conditions; however, it is particularly suited to situations that require high flow associated with high inlet pressure, typically found in natural gas transport and custody transfer in city gates. The pressure regulator model URANO can operate with a maximum inlet pressure of 150 kgf/cm² and outlet pressures from 1.0 to 80.0 kgf/cm².

GASCAT’s pressure regulator model URANO of has the CE seal (product identification nº: EC - 0085BU0263) and tests certificate carried out in the DVGW (Deutscher Verein des Gas und Wasserfaches e.V. - Technisch-wissenschaftlicher Verein) laboratory confirming its efficiency and compliance with DIN EN 334 (Gas pressure regulators for inlet pressures up to 100 bar) and PED 68/2014/EU, the DVGW certificates and reports are available for consultation at GASCAT. If any of these documents is required for your application, please contact our Head office in Indaiatuba and request the necessary copies.

2.3 SPECIFICATIONS

2.3.1 AVAILABLE CONFIGURATIONS

URANO SO: Pilot-operated pressure regulator, spring to open.

URANO SC: Pilot-operated pressure regulator, spring to close.

The URANO pressure regulators are classified as SO and SC according to the directions given in DIN EN 334 for fail condition.

2.3.2 AVAILABLE CONNECTIONS

ND	ASME B16.5 FLANGES	DIN 2634 / 2635 FLANGES
1”	150#RF / 300#RF / 600#RF or RTJ / 900#RF or RTJ	PN 25 / PN 40
2”	150#RF / 300#RF / 600#RF or RTJ / 900#RF or RTJ	PN 25 / PN 40
3”	150#RF / 300#RF / 600#RF or RTJ / 900#RF or RTJ	PN 25 / PN 40
4”	150#RF / 300#RF / 600#RF or RTJ / 900#RF or RTJ	PN 25 / PN 40
6”	150#RF / 300#RF / 600#RF or RTJ / 900#RF or RTJ	PN 25 / PN 40
8”	150#RF / 300#RF / 600#RF or RTJ / 900#RF or RTJ	PN 25 / PN 40

2.3.3 TEMPERATURE LIMITS

Operation temperature: -20°C to 60°C

Room temperature: -20°C to 60°C

The temperature limits given in this manual or in any applicable standard shall not be exceeded under any circumstances, under risk of damage to the equipment, to the installation safety, and to the people involved in the operation.

2.3.4 COEFFICIENT OF FLOW (Cv)

ND	Cv	KG
1”	15	440
2”	63	1950
3”	123	3800
4”	220	6850
6”	486	15080
8”	900	28250

NOTE:
1) We suggest considering a 20% safety margin on the calculated value.
2) When dimensioning an active-monitor system consider a 25% restriction in the CV/KG of both valves.

2.3.5 WEIGHTS

ND	150#	300#	600#	900#
1”	24	26	30	34
2”	95	100	112	128
3”	99	105	130	149
4”	185	195	215	247
6”	475	500	570	655
8”	570	600	690	793

NOTE:
1) Approximate weights given in kilograms (Kg)
2) Consider the body in carbon steel SA-216 WCB
3) For exact weight contact GASCAT for weight confirmation of the chosen model.
4) For models with integrate SSV, to add 12Kg in the weight.

2.3.6 MAXIMUM WORK PRESSURE

150#	300#	600#	900#	PN 25	PN 40
19 bar	51 bar	100 bar	150 bar	25 bar	40 bar

The pressure limits given in this manual or in any applicable standard shall not be exceeded under any circumstances, under risk of damage to the equipment, to the installation safety, and to people involved in the operation.

2.3.7 SET POINT PRESSURES

Pressure regulators model URANO use two pilot models for pressure control called G-40 and G-42. The table below presents the adjustment ranges of each model:

PILOT G-40		
SPRING COLOR	PART NUMBER	RANGE
RED	01.51.94A	25.0 - 50.0 bar
YELLOW	01.51.94	47.0 - 80.0 bar

PILOT G-42		
SPRING COLOR	PART NUMBER	RANGE
GREEN	01.49.65	1.0 - 4.5 bar
GREY	01.49.64	4.5 - 12.0 bar
BROWN	01.49.33	11.0 - 17.0 bar
RED	01.51.94A	16.0 - 30.0 bar

2.3.8 SLAM SHUT VALVE SPRING RANGE (SET-POINT)

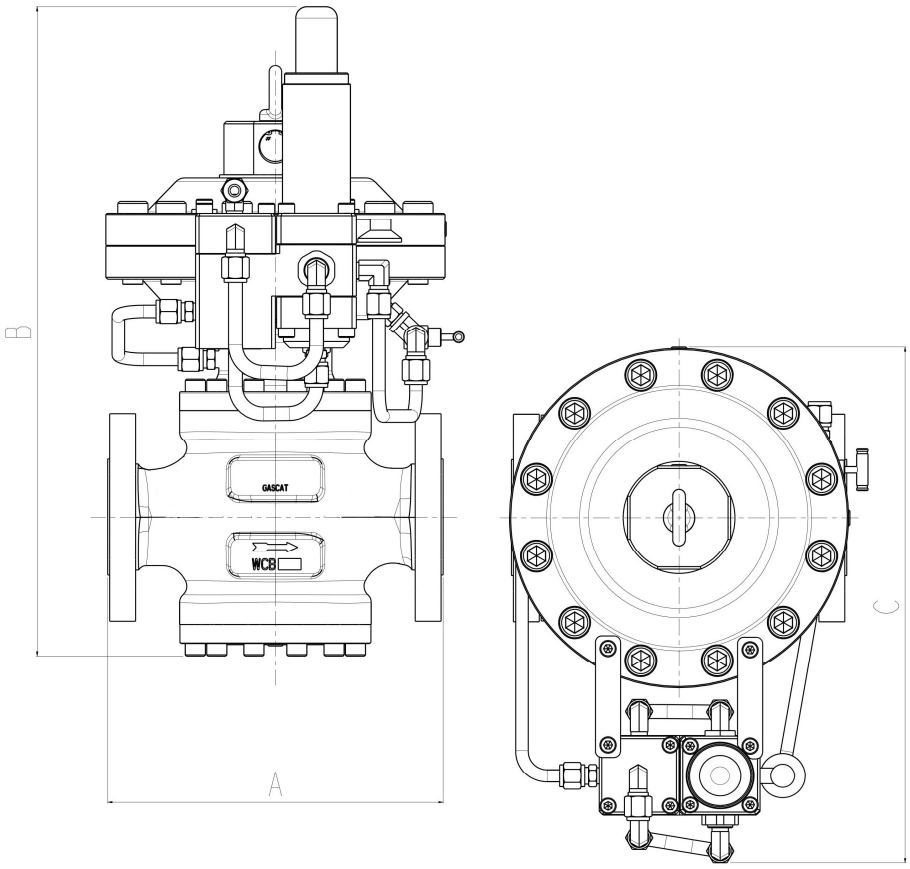
PILOT G-42		
SPRING COLOR	PART NUMBER	RANGE
RED	01.52.62	1.0 – 6.0 Bar
YELLOW	01.52.54	4.0 – 11.0 bar
BROWN	01.52.64	10.0 - 16.0 bar
DICHROMATE	01.52.25	14.0 - 38.0 bar
WHITE	01.52.36	28.0 - 60.0 bar

2.3.9 ACCURACY AND LOCK UP

Pressure Regulator: AC up to 1% / SG up to 5%.

SSV: AG up to 5%

2.3.10 PRESSURE REGULATOR DIMENSIONS



DIMENSIONS (mm)						
	A (RF)				B*	C
ND	150# / PN16	300# / PN25, PN40	600#	900#	ANY CLASS	ANY CLASS
1”	184	197	-	-	476	412
2”	254	267	268	-	516	412
3”	298	318	337	381	620	478
4”	352	368	394	-	698	504
6”	451	473	508	-	931	697
8”	543	568	610	-	1117	731
General Tolerance = ±2						

*Note: To regulator with shut-off version the dimension “B” will be → B + 143mm.

3.0 - OPERATION PRINCIPLE

3.1 REGULATOR SPRING TO CLOSE (FAIL CLOSE)

During pressure absence, shutter (A) is kept in closed position by the shutting spring (B), which keeps it pressed against the soft seat (C). It stands out that even when subject to pressure, upstream pressure variations have no influence on the shutter position, due to the balancing of the forces acting on the same, as well as on the actuator shaft (D) that is also balanced.

When the inlet piping is pressurized, gas passes through the filter element (E) and reaches the booster (F), which reduces the pressure to a convenient value near to the outlet pressure and delivers the same to pilot (G). The pilot compares the gas feeding pressure with the outlet pressure, sensed by the pilot diaphragm (H), and controls the flow to be injected under the main regulator diaphragm (L).

If a decrease in downstream pressure occurs (due to an increased consumption or a drop of the upstream pressure) an imbalance between the spring (I) force on the pilot (H) diaphragm and the force generated by the outlet pressure under this same diaphragm, drives the pilot (K) shutter to a larger aperture, therefore, causing a pressure increase under the main regulator (L) diaphragm, which combined with downstream pressure drop, which actuates on the main regulator diaphragm and in the opposite side of the pilot pressure thereon, will determines the displacement of the shutter (A) upwards, thereby increasing the passage and restoring the set point.

When the pre-regulated pressure begins to increase, it makes the pilot (K) shutter to reduce the aperture. The increased pressure, which actuated under the regulator (L) diaphragm, flows through the Bleed (M) restriction (adjustable) that discharges the same downstream. The strength of the closing spring of the main regulator (B) plus the decrease of the pilot pressure cause a downward displacement of the main shutter (A), making the pressure to return to the preset value.

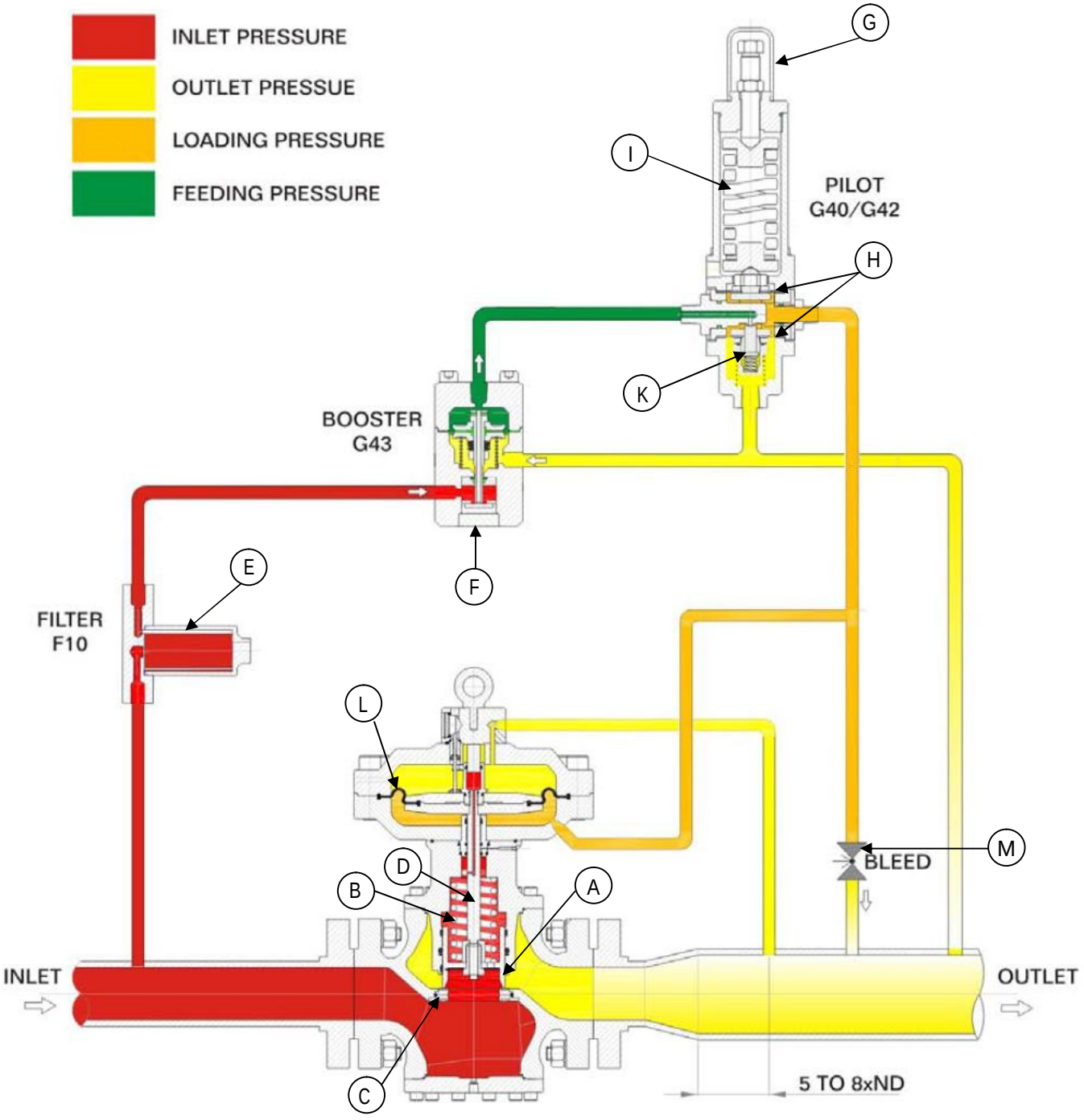


FIGURE 1 - URANO FAIL CLOSE

3.2 REGULATOR SPRING TO OPEN (FAIL OPEN)

During pressure absence, shutter (A) is kept in the open position by the main regulator (B) spring, which keeps it away from the gasket (C). It stands out that even when subject to pressure, upstream pressure variations have no influence on the shutter position, due to the balancing of the forces acting on the same, as well as on the actuator shaft (D) that is also balanced.

When the inlet piping is pressurized, gas passes through the filter element and reaches the pre-regulator (booster) (F), which reduces the pressure to a convenient value near to the outlet pressure value and delivers the same to pilot (G). It is important to note that unlike to the URANO FAIL CLOSE regulator, the pressure provided by the booster is injected also directly in the diaphragm upper chamber. This is necessary for the regulator to close under normal operating conditions, since the main regulator spring is pressing the shutter for it to stay in the open position.

The pilot compares the output pressure sensed by the diaphragm (H) and controls the flow to be injected under the main regulator (L) diaphragm to open the valve.

If a decrease in the downstream pressure occurs (due to an increased consumption or a drop of the upstream pressure) an imbalance between the spring (I) force on the pilot diaphragm (H) and the force generated by the outlet pressure under this same diaphragm, drives the pilot (K) shutter to a larger aperture, therefore, causing a pressure increase under the main regulator (L) diaphragm, determining the displacement of the shutter (A) upwards, thereby increasing the passage and restoring the set point pressure.

When the setup pressure begins to increase, it requires the pilot (K) shutter to reduce the aperture. The higher pressure that operated under the regulator (G) diaphragm flows through the Bleed (M) restriction (adjustable) that discharges the same downstream, thereby causing the pressure to actuate on the diaphragm to be larger than the combined pilot force and spring force, moving the shutter down and shutting the main valve.

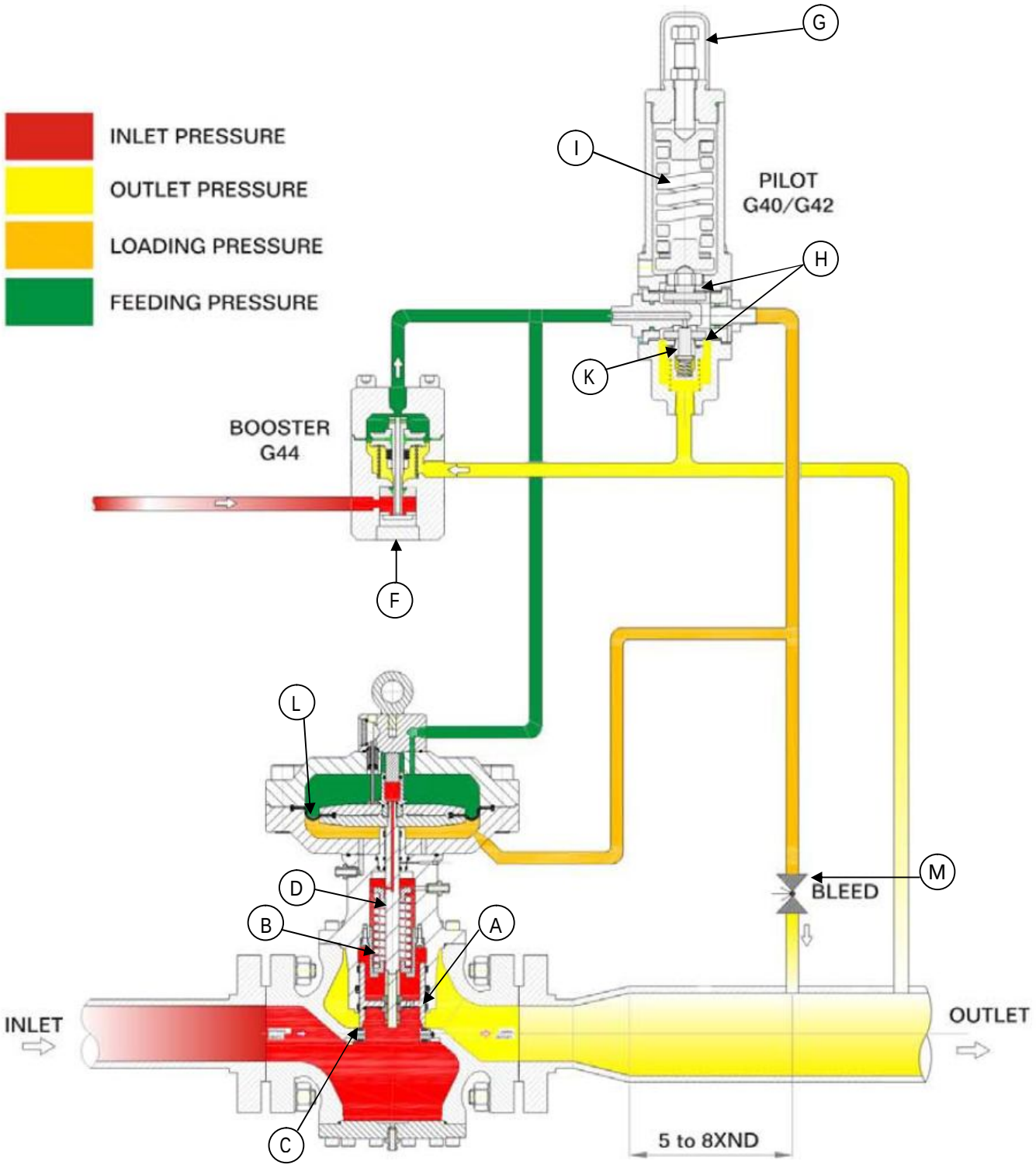


FIGURE 2 - URANO FAIL OPEN

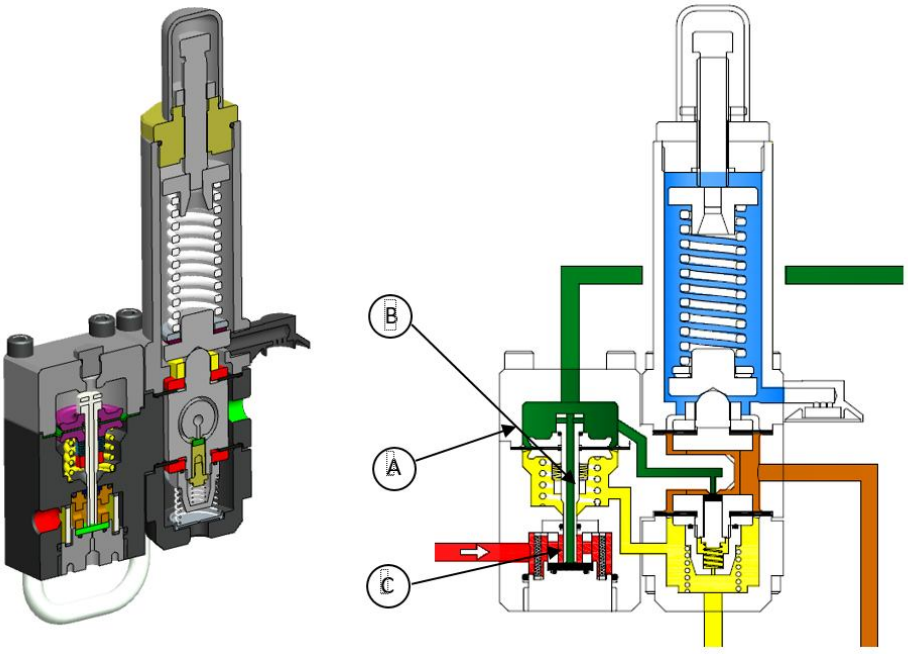
3.3 BOOSTER (G-43 & G-44)

The Booster is nothing more than a pre-regulator that automatically adjusts the process conditions as a function of the input pressure and output pressure with the purpose of reducing the pilot inlet pressure, allowing the pilot to operate in a milder condition, thus eliminating any chance of interference on the regulator piloting by the input pressure variation.

The use of a pre-regulator, or booster, is recommended only for applications where the pressure differential exceeds 4.0 bar.

Booster models G-43 and G-44 are designed to keep the pilot input pressure set 1 to 2 bar above the desired set point, e.g.: if we are adjusting the pressure regulator to 20 bar, the booster will be applying to the pilot a pressure of 21 to 22 bar.

Booster models G-43 and G-44 have a similar operation principle, although bearing construction differences, with different internal parts. This differentiation is necessary for one to be able to operate FA pressure control valves and the other for use with FF regulators. With pressure regulator valves model Urano, pre-regulators model G-43 are used in the assemblies with valves FF and G-44 in assemblies with FA valves.



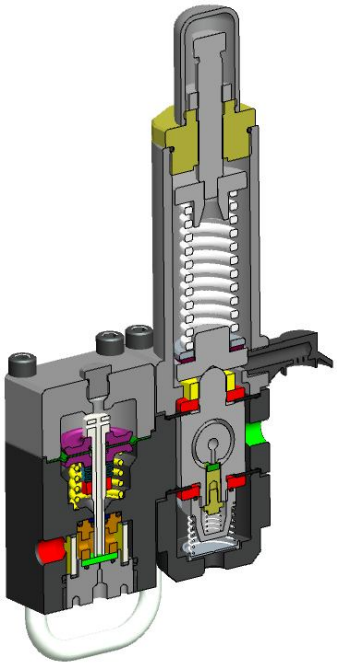
Typically, boosters G-43 & G-44 have three connections to the process. These are represented by the red line in the figure above, from the regulator inlet and loaded with the inlet pressure; the yellow line is the output pressure of the main regulator, also called sensor pick-up, and is responsible for actuating on the booster diaphragm (A), moving the shaft (B) away from the gasket (C), thus allowing the passage of gas from the regulator input at a pressure 1 to 2 Kgf/cm² above the set point pressure of the main regulator, which by its turn is represented by the green color and is the pick-up that will follow to the Pilot.

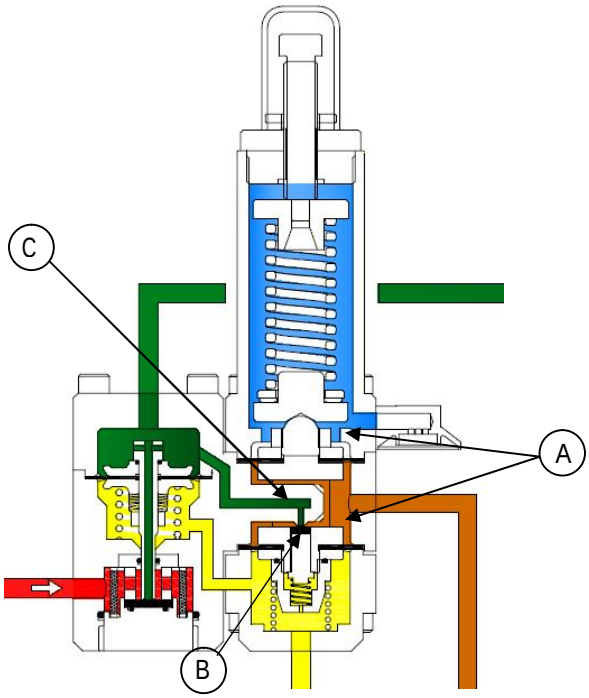
Attention: In some assemblies, the booster can be integrated into the pilot; this change is merely ergonomic to reduce space, component count and ease of operation. However, it is important to note that the operating principle is exactly the same as given above.

3.4 PILOTS (G-40 & G-42)

The dual diaphragm pilot series G-40 and G-42 can achieve much higher regulation accuracies than other pilots due to their construction characteristics.

Pilots are responsible for sending the exact loading pressure for pressure regulating valves to open or close under normal process conditions by the balance between the regulation spring force and the outlet pressure from the sensor pick-up.





The green line represents the pressure from the booster or pre-regulator, the yellow line is the regulator output pressure (sensor pick-up) and is responsible for displacing the diaphragm assembly (A) up or down, causing the pilot shutter (B) to leave the seat (C) thus allowing the inlet pressure reduction and sending the gas at an appropriate pressure to load the main valve causing the valve to open or close according to the process conditions.

3.5 FILTERS

The GASCAT pilot blocks, consisting of a pilot and pre-regulator always have a mechanical barrier against solid impurities; this barrier comprises a polypropylene filter element of 10-micra filtration grade.

This barrier is intended to prevent that solid contaminants contained within the pipework can clog or damage the internal parts of pre-regulator and of the pilot. **However, it is important to note that this filter does not replace the filtration system that shall be provided in preliminary steps to pressure regulating to leave the fluid clean and according to correct operating conditions.** This filter is designed to serve as the last barrier to solid contaminants.

The Urano pressure regulators can be provided with an F-10 filter mounted in separate from the pilot unit, or in a compact version, with the filter element already coupled to the pre-regulator.

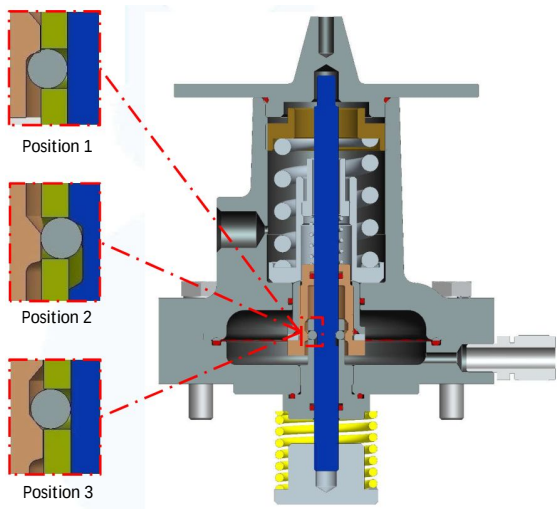
3.6 SECURITY SHUT-OFF VALVE

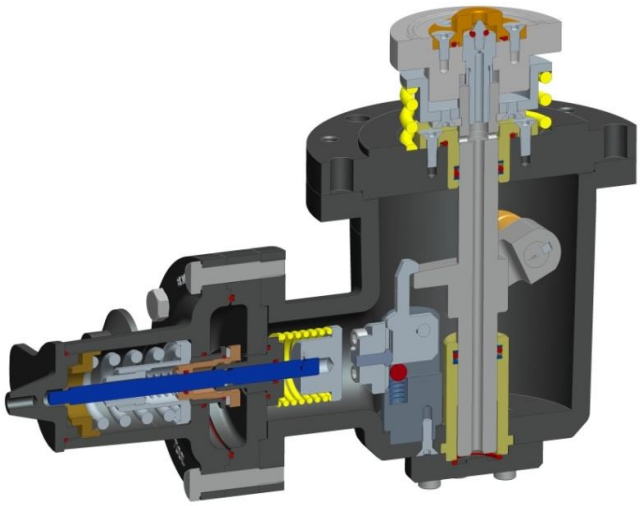
3.6.1 ACTUATOR PH & H ACTUATOR

The slam shut valve has two actuators models, one with a diaphragm (for pressures 1.0 – 11.0 bar) and other with a piston (for pressures 10.0 – 60.0 bar).

Mechanism consists in a shaft (stem) and spheres collar monitoring the outlet pressure. In case of outlet pressure increase or decrease, the external bush will move up or move down, allowing the spheres running out of channel and the main shaft moves according to the force exerted by closing spring to close the valve against the seat, shutting downs the gas totally tight (see the picture with the two conditions).

After reestablishing to the normal service condition operation it is necessary to reset manually the slam shut valve.





- Position 1: Shutting by increase pressure
- Position 2: Balanced mechanism
- Position 3: Shutting by decrease pressure

3.6.2 – GENERAL RESET PROCEDURE

To reset the valve to the open position (ready to work), the sensing line should be connected in the actuator chamber .

3.6.2.1 – PROCEDURE TO RESET VALVE IN CASE OF OVER PRESSURE

1. Adjust the pressure of sensing line around 10-15% below under the set-point.
2. Use the by-pass valve to equalize the internal pressure of the valve.
3. Pull up the actuator stem until the upper position using the cap.

3.6.2.2 – PROCEDURE TO RESET VALVE IN CASE OF UNDER PRESSURE

1. Adjust the pressure of sensing line around 10-15% above the over set-point.
2. Use the by-pass valve to equalize the internal pressure of the valve.
3. Pull up the actuator stem until the upper position using the cap

3.6.3 – SHUT-OFF RESET & INTEGRATED BYPASS PROCEDURE

To reset the shut-off, it is necessary to equalize the pressure before and after the shutter. However it is necessary to use the integrated bypass in the reset lever. See below how to proceed:

When there is a lock, the position indicator will be indicated in closed position (according the picture). Then it is necessary to use the cap screwing it to pull up the shaft (according the picture). After connecting the cap in the actuator stem, the user should pull up the cap and to move the reset lever at the same time (according the picture). The reset lever will move 20% of course, there is a resistance (because the differential pressure between the inlet pressure and the outlet pressure) until the pressure before and after the shutter to be the same.

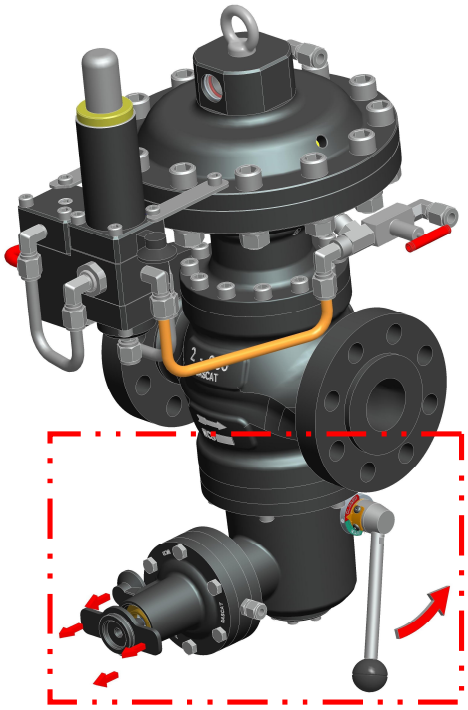


Figure 1

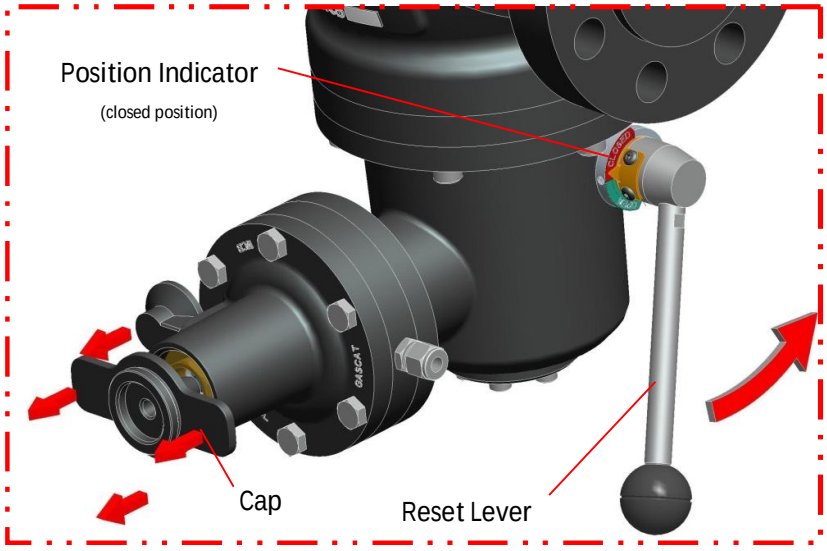


Figure 2

The SSV is supplied in the closed position and with the actuator of under pressure blocking disarmed. The springs for over and under pressure blocking are adjusted in Gascat.

3.7 ACTIVE MONITOR ASSEMBLY

The so-called active monitor installation configuration is largely used in natural gas distribution and transmission. This configuration is usually adopted when the difference between the inlet pressure and the outlet pressure is greater than 16 bar and the downstream piping stress test pressure, and the stress pressure of the other components downstream of the regulator is smaller than the specified inlet pressure, for example, as given in DIN EN 12186. In this case, the objective of the monitor regulator use is to increase the safety level of the station.

However, it is worth remembering that this is the recommendation of the DIN EN 12186 Standard, but other standards specify different conditions for using the active monitor system.

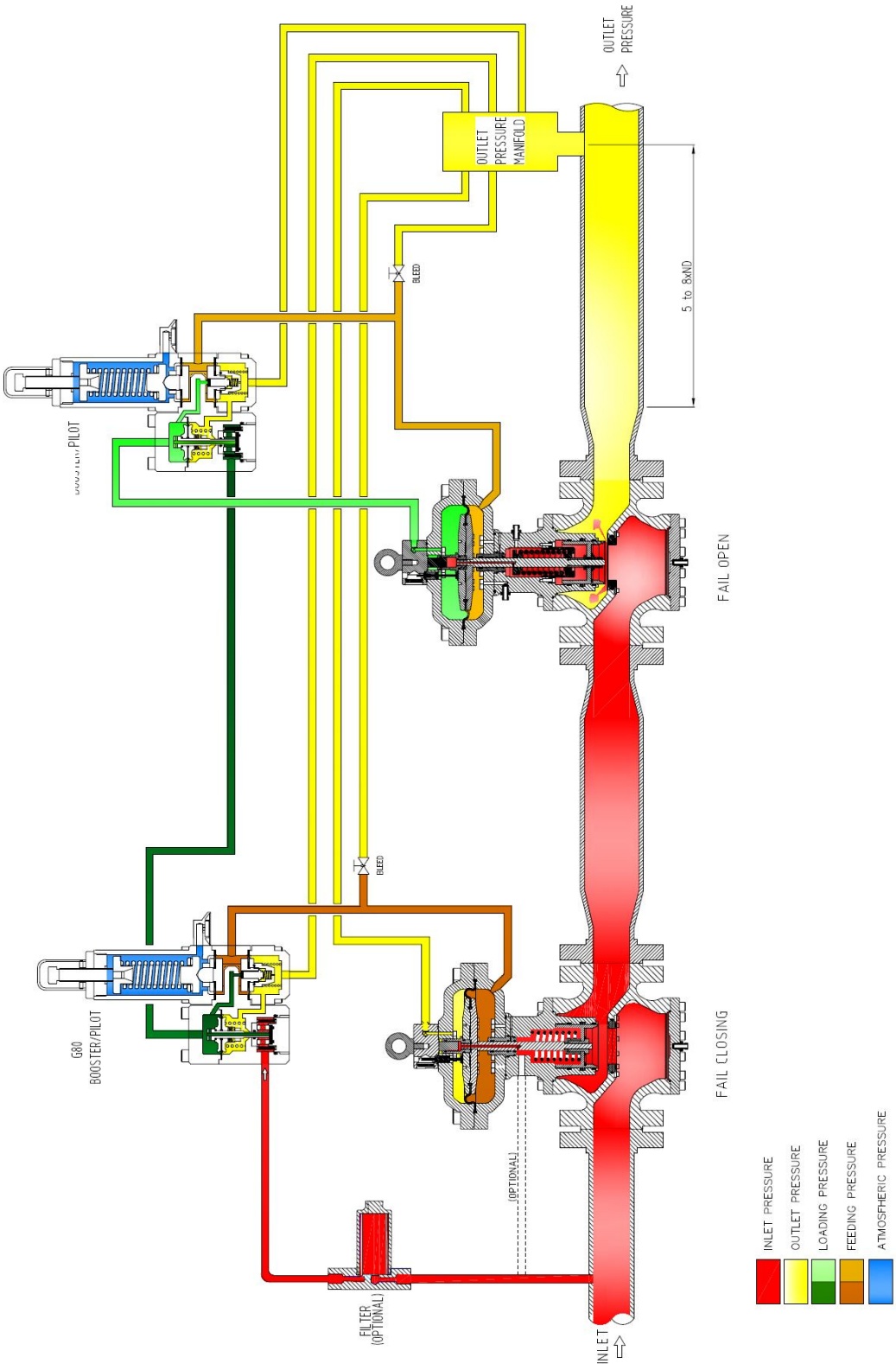
The active monitor system uses two pressure regulators in series, with one of them called active, which will be in operation (regulating) under normal processing conditions and shall be of the SO (FA) type, and the other, an SC (FF) monitor, shall remain fully open during normal operation and will only assume regulation in case of the active regulator failure.

As already mentioned in this manual, is important to bear in mind that the classification as FA or FF is given exclusively by the main valve diaphragm fail, and lack of power for the shutter operation, according to DIN EN 334, however, it is quite possible that the regulator FA, for example, fails closed due to some other condition unforeseen in the process. See below some fail positions of regulators URANO SC and URANO OS as a function of possible situations in the field:

SITUATION	URANO SC (FF)		URANO SO (FA)	
	FAIL OPEN	FAIL CLOSED	FAIL OPEN	FAIL CLOSED
MAIN VALVE DIAPHRAGM FAILURE		X	X	
PILOT DIAPHRAGM FAILURE	X		X	
DIRT BETWEEN THE SHUTTER AND THE MAIN VALVE SEAT	X		X	
DIRT BETWEEN THE SHUTTER AND THE PILOT SEAT	X		X	
MAIN SHAFT LOCKED	X	X	X	X
SENSOR PICK-UP BREACH	X		X	
OBSTRUCTION OF THE PILOT SEAT		X		X
BOOSTER DIAPHRAGM FAILURE	X		X	

URANO regulators operate in the active monitor system exactly as described in items 3.1 and 3.2 of this manual, but as can be seen in the previous scheme the sensor pick-up of the SC (FF) controller is downstream of the active regulator SO (FA) and its set point must be adjusted to a slightly higher pressure than the set point of the active regulator (5%-10% depending on the application).

Therefore, during normal operation conditions, the monitor regulator will be completely open while the active regulator is in operation. If any fail occurs in the active regulator, and pressure starts to increase, the monitor regulator will start to operate.



ACTIVE MONITOR ASSEMBLY

4.0 - INSTALLATION

4.1 FILTER

We recommend the installation of a cartridge type filter, with 5 micra filtration degree, as close to the regulator inlet as possible, without being joined flange to flange, because the filter installed immediately upstream of the regulator may produce turbulence and cause disturbance in the pressure control of the regulator. Care in filter installation is essential for the regulator proper operation, as any existing particles in the pipe may take lodge between the seat and the shutter, damaging them and causing feedthrough.

4.2 CLEANING

Check the pipe cleaning before valve installation. We advise a complete purge of the line with nitrogen or compressed air.

4.3 FLOW DIRECTION AND SYSTEM INTEGRITY

Before starting the equipment installation, it is necessary to check if:

1) The equipment is in perfect conditions, or it has evidence of damage during transportation. If so, do not proceed with the installation and contact GASCAT.

2) The space provided for access and installation of the equipment is adequate for future maintenance.

3) The installation is designed to support the load applied by the equipment.

4) The inlet and outlet connections, where the pressure regulator shall be installed, are perfectly aligned.

5) All necessary pressure-sensing pick-ups, downstream of the equipment pipeline, were provided respecting the dimensions recommended by the manufacturer.

6) A pressure gauge, or any other pressure-measuring device, was foreseen for the upstream and downstream of the equipment to allow for the correct setting up at the operation start-up.

7) A vent line was planned between the regulator and the first outlet shut-off valve to assist the operator during start-up.

8) Check the flow direction marked on the body of the pressure-regulating valve and pay attention at the time of its installation so that it is properly positioned.

4.4 IMPULSE PICK-UP

The correct positioning of the impulse pick-up in the pipeline is essential for proper operation of the pressure regulator valve. Therefore, install the pilot impulse pick-up downstream of the regulator at a minimum distance of 5 times the nominal pipe diameter, in a pipe span free of obstruction with a pipe diameter where the gas outflow does not exceed the maximum speed of 25 m/s (considering the smallest outlet pressure and the maximum flow rate).

To obtain a better pneumatic signal use tubing in stainless steel AISI 316 with ½" OD to connect the regulator pick-ups to the process.

To prevent dirt and condensates accumulation in impulse pick-ups, we recommend that their installation shall have a 5% to 10% slope towards the pipe connector.

Pay attention to connections welded to the pipe, they must be fully unobstructed, without any welding residue that can interfere with the pneumatic signal.

It is not must be installed blocking valves in any types in the sense line.

No kind of blocking valves shall be installed in pressure regulators impulse outlets.

Each pressure regulator model Urano SC (FF) needs three process connections: one directly to the actuator on the diaphragm, one that will be connected directly below the pilot and a third one that will be used to unload the actuator under the diaphragm.

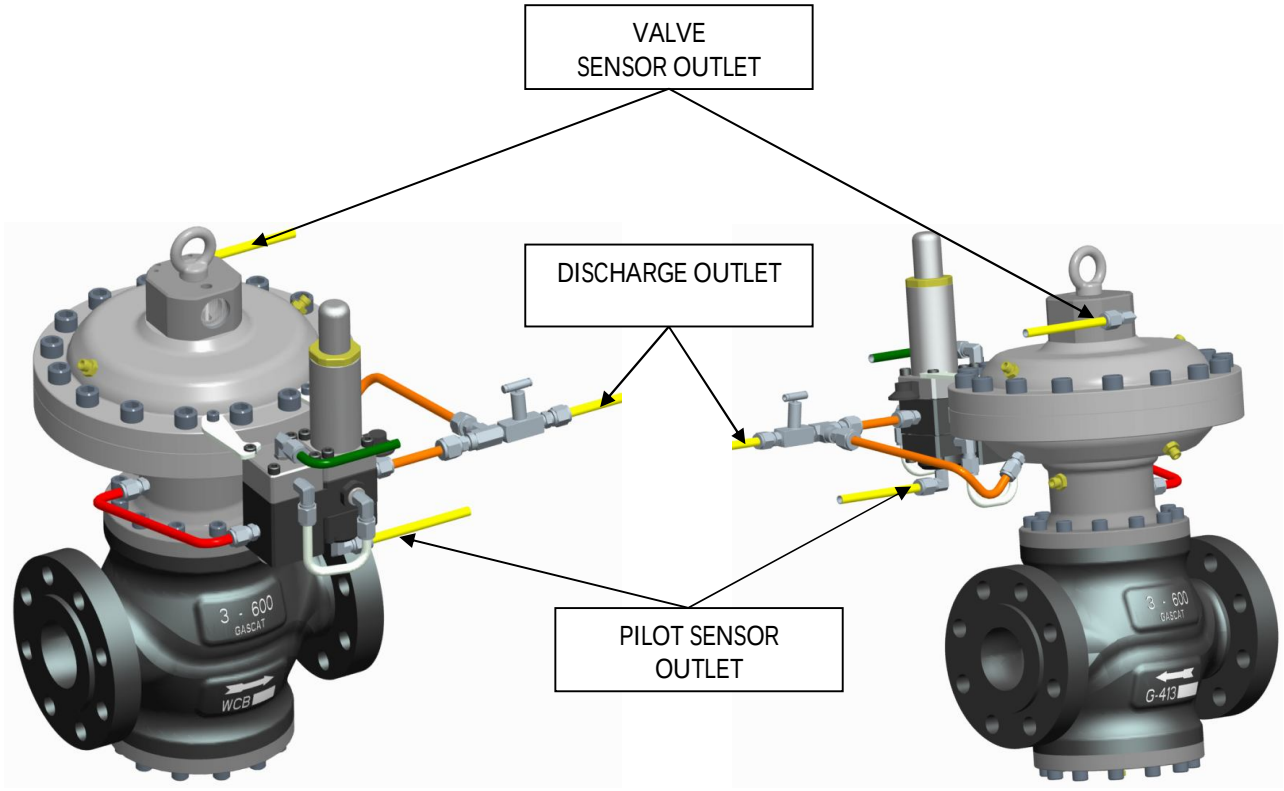
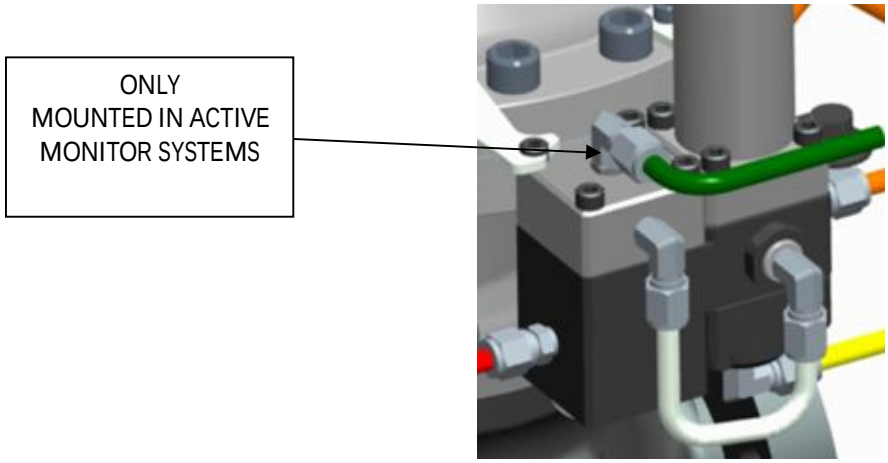


IMAGE OF URANO FF

For valves model URANO SC (FF) assembled to operate in active monitor systems, the booster is shipped with an extra connector for this outlet to be connected to the booster input of the active pressure control valve, therefore providing feed to the active valve booster.When the URANO SC (FF) valve is mounted to operate in a system with only one pressure reduction stage this outlet is provided sealed by a plug and should not be used.



Each pressure regulator model URANO SO (FA) requires two connections to the process: one directly below the pilot and a second that will serve for unloading the actuator under the diaphragm.

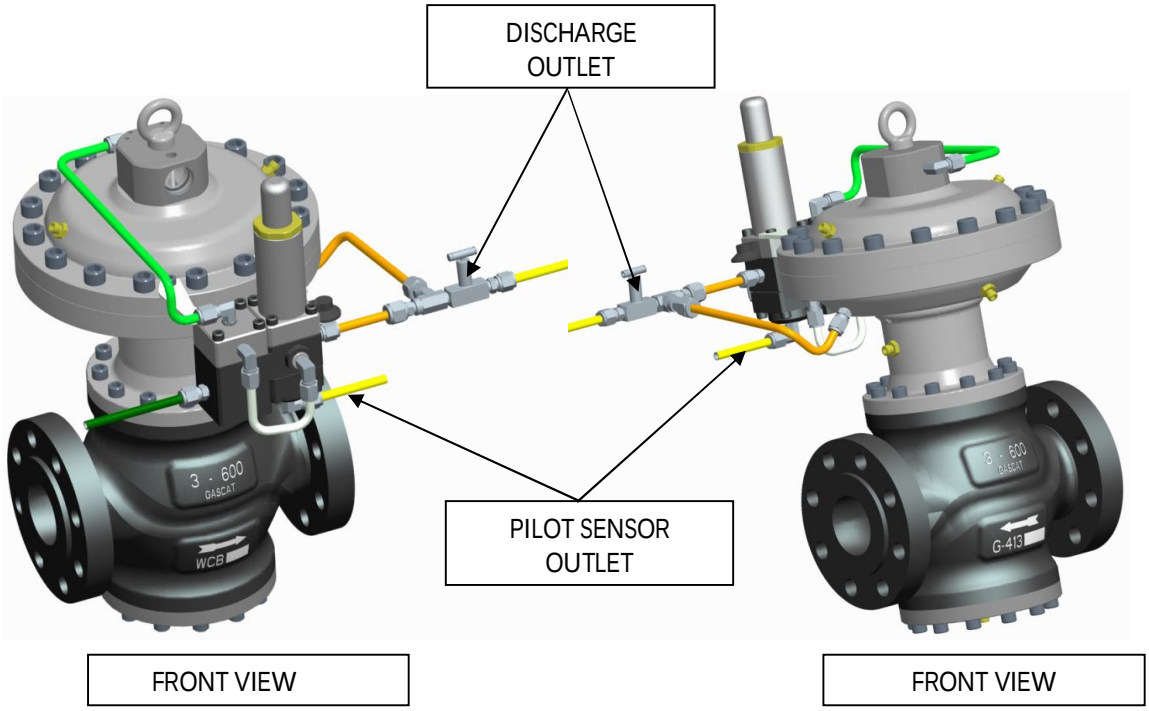
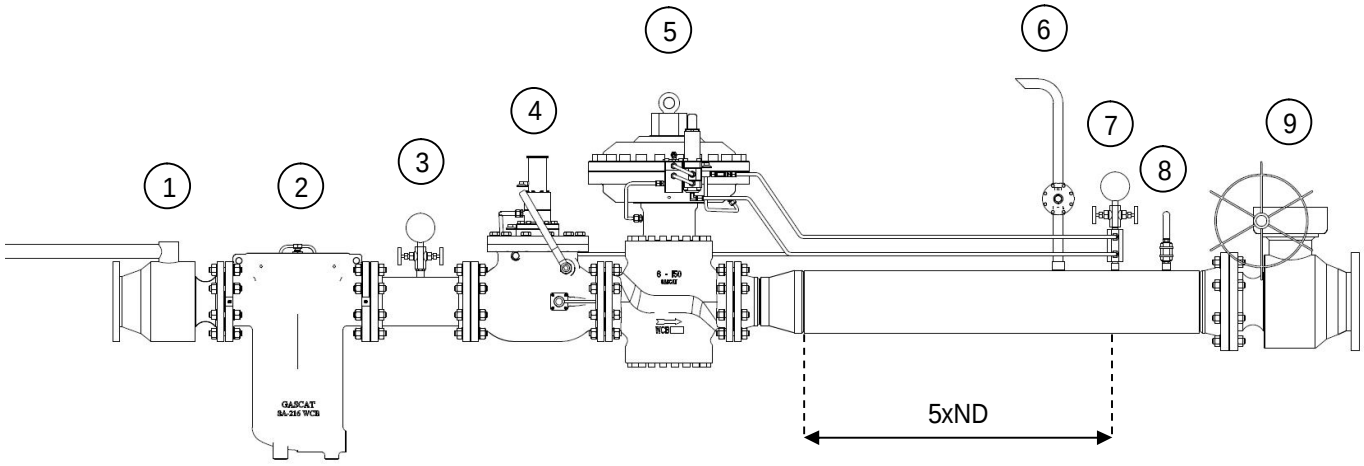


IMAGE OF URANO FA

4.5 RECOMMENDED INSTALLATION SCHEME

4.5.1 SINGLE REGULATOR



1 - Inlet blocking valve.

2 - Cartridge type filter of 5 micra filtration degree

3 - Inlet pressure gauge + 2-way manifold

4 - Automatic overpressure Slam Shut Valve (SSV)

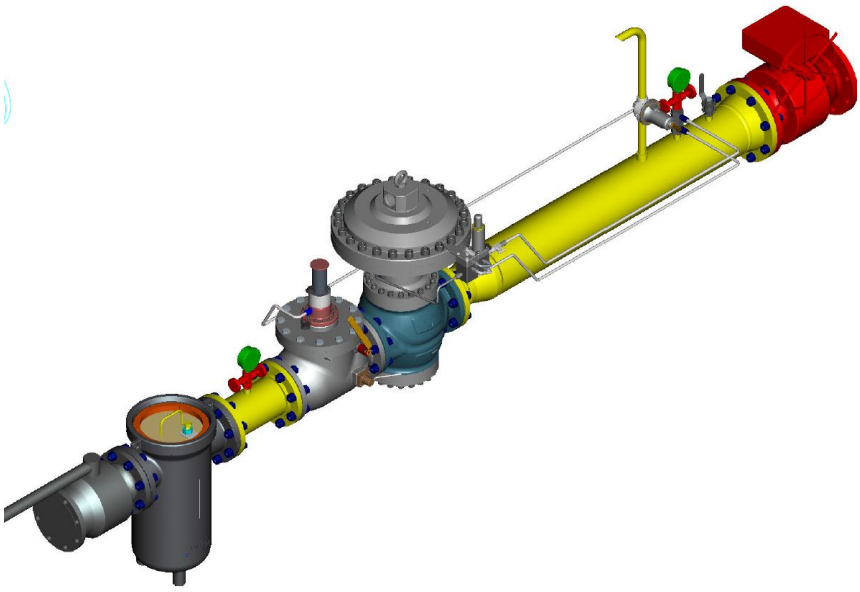
5 - Pressure regulating valve model URANO GASCAT

6 - Partial relief valve

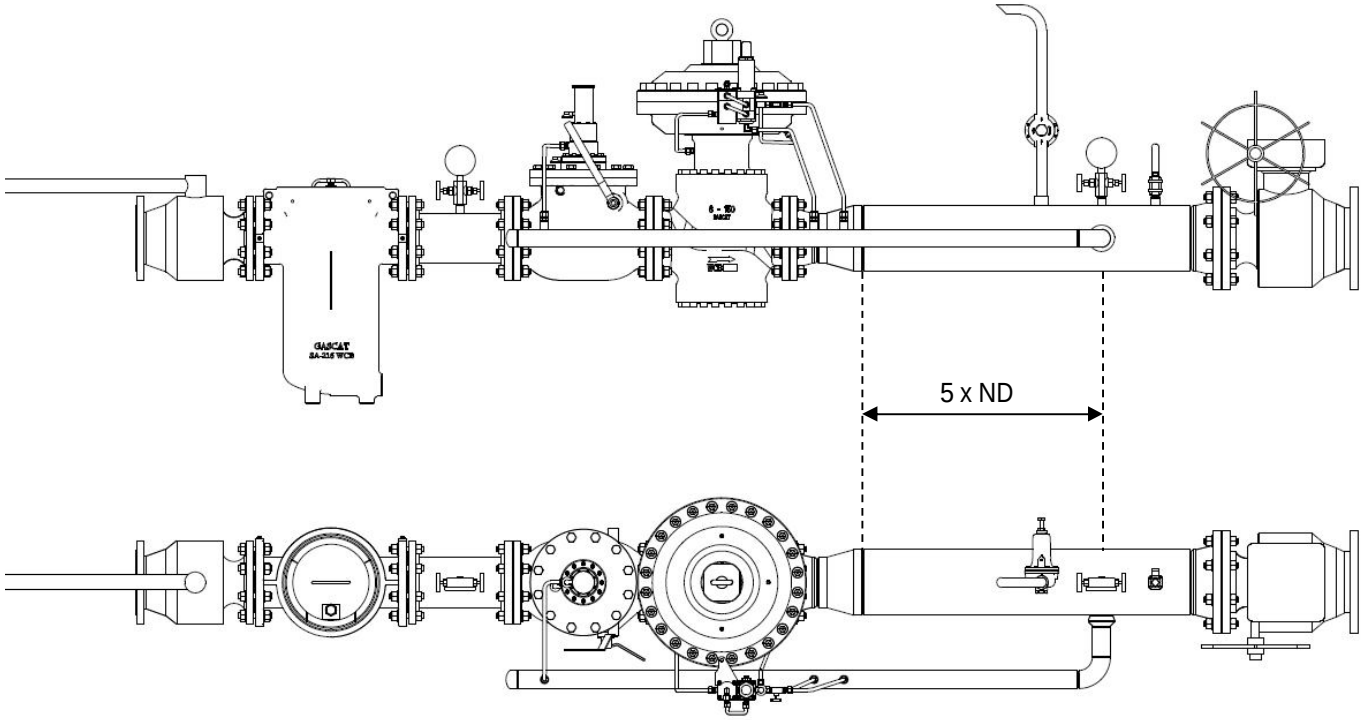
7 - Outlet pressure gauge + 2-way manifold

8 - Vent valve

9- Outlet shut-off valve



Note: The position indicated for the sensor pick-up may be less than 5D if the installation project is analyzed and approved by GASCAT's engineering.

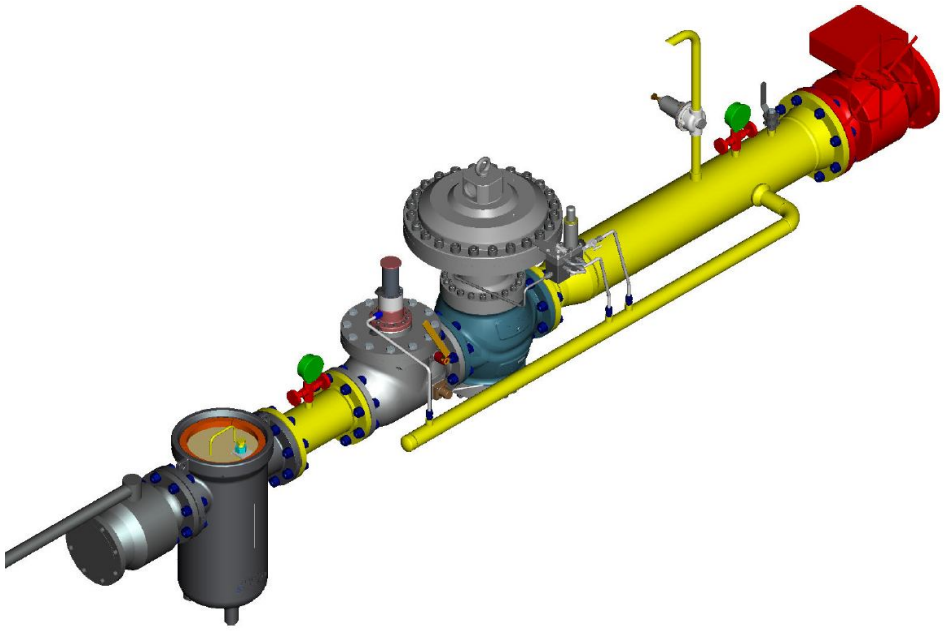


Another recommended installation option is to use a pneumatic lung to connect sensor pick-ups taken near the equipment. Among the advantages of adopting this configuration can be mentioned:

1) Easier maintenance.

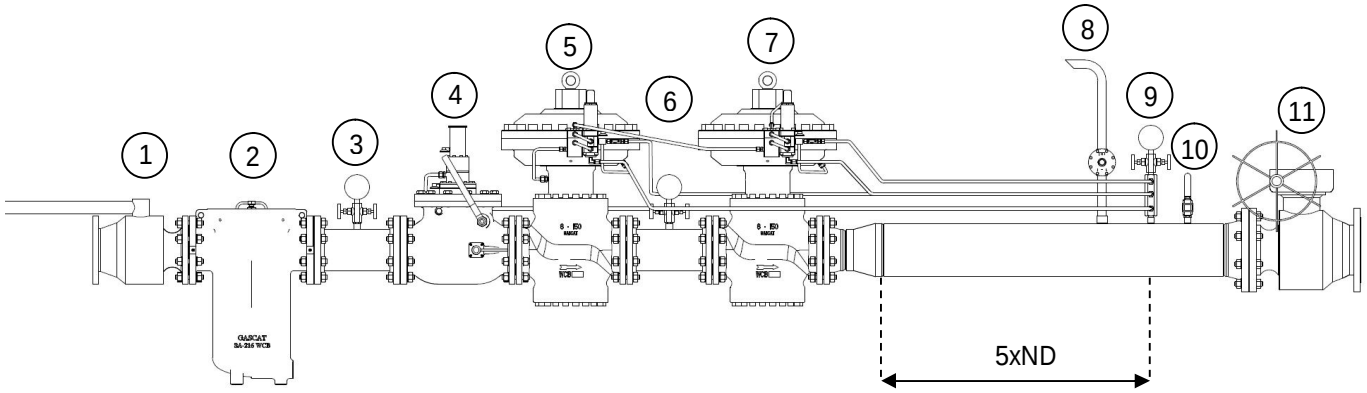
2) Better quality (stability) of the pneumatic signal.

3) Reduced damage to tubing during maintenance and transportation.



Note: The position indicated for the lung pick-up may be less than 5D if the installation project is analyzed and approved by GASCAT's engineering.

4.5.2 ACTIVE MONITOR SYSTEM



1 - Inlet blocking valve.

2 - Cartridge type filter of 5 micra filtration degree

3 - Inlet pressure gauge + 2-way manifold

4 - Automatic overpressure Slam Shut Valve (SSV)

5 - Pressure regulating valve model URANO MONITOR

6 - Intermediary pressure gauge + 2-way manifold

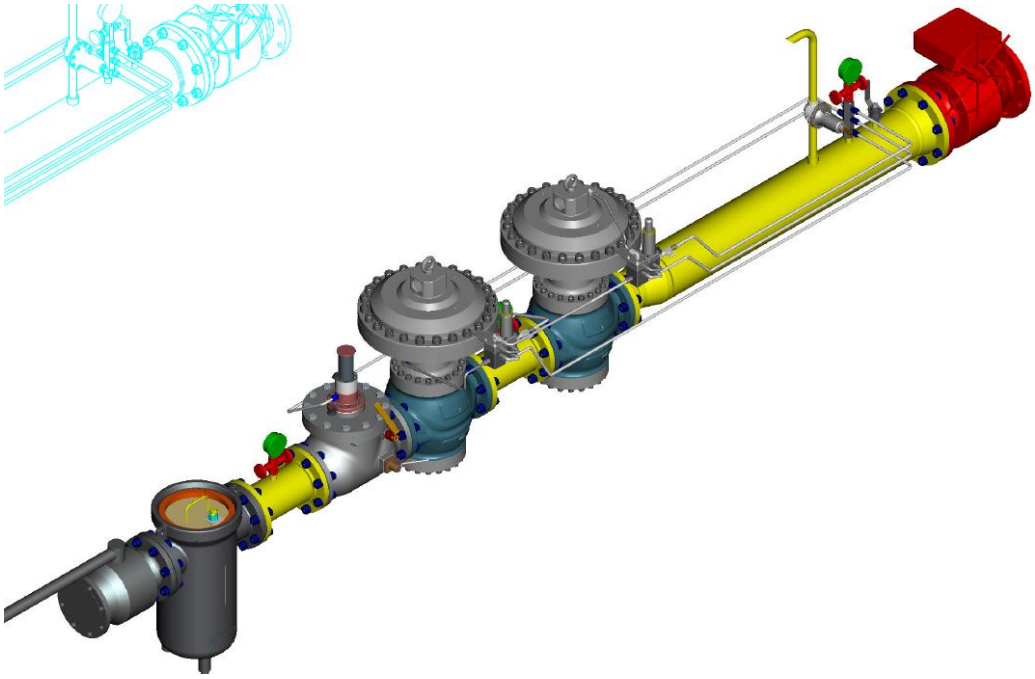
7 - Pressure regulating valve URANO ACTIVE

8 - Partial relief valve

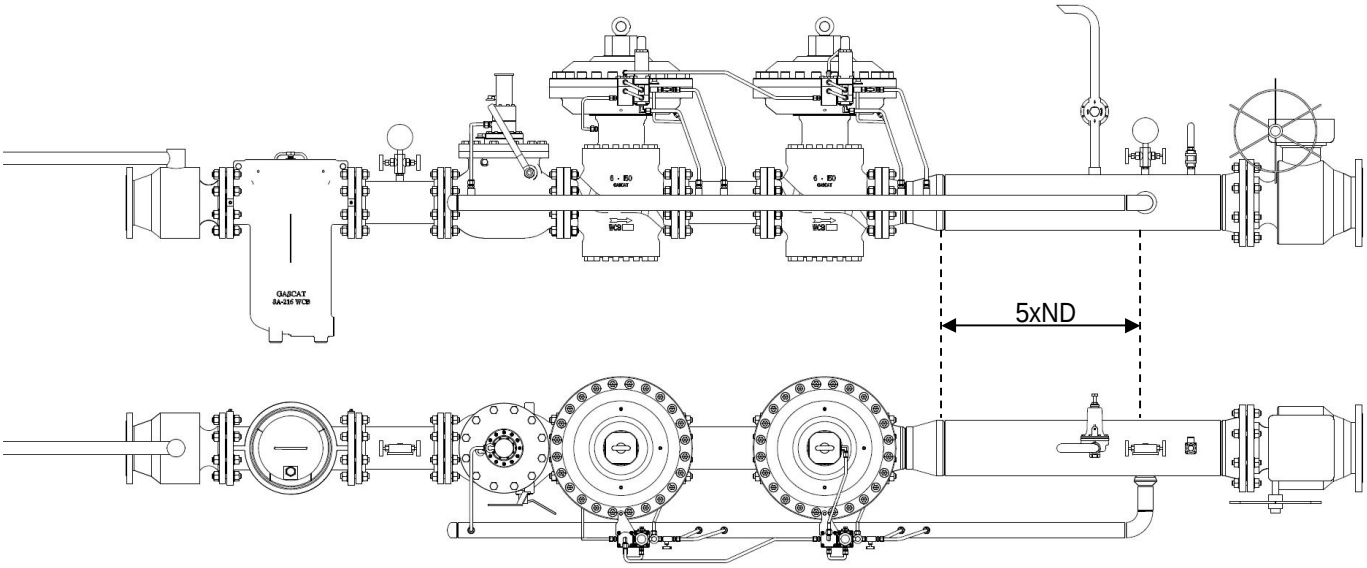
9 - Outlet pressure gauge + 2-way manifold

10 - Vent valve

11 Outlet shut-off valve



Note: The position indicated for the sensor pick-up may be less than 5D if the installation project is analyzed and approved by GASCAT's engineering.

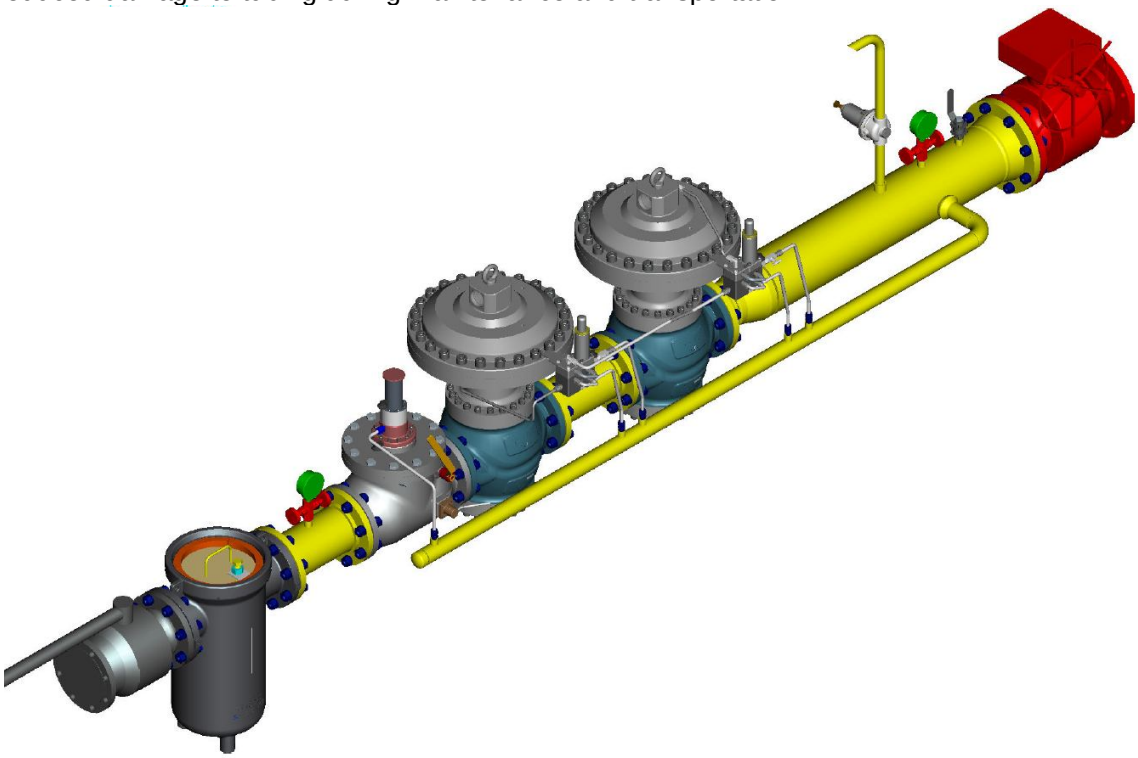


Another recommended installation option is to use a pneumatic lung to connect sensor pick-ups taken near the equipment. Among the advantages of adopting this configuration can be mentioned:

1) Easier maintenance.

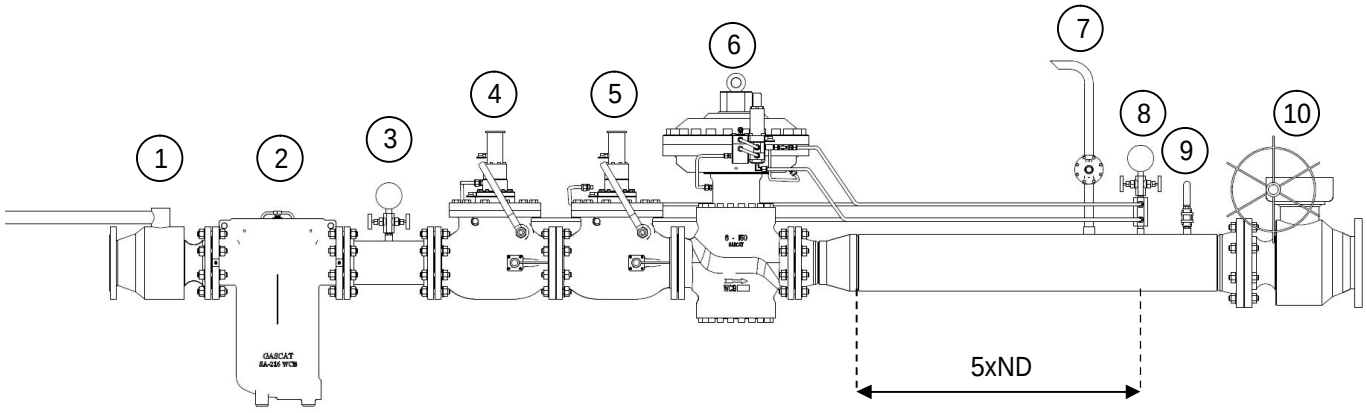
2) Better quality (stability) of the pneumatic signal.

3) Reduced damage to tubing during maintenance and transportation.



Note: The position indicated for the sensor pick-up may be less than 5D if the installation project is analyzed and approved by GASCAT's engineering.

4.5.3 TWO SSV AND ONE FF REGULATOR



1 - Inlet blocking valve.

2 - Cartridge type filter of 5 micra filtration degree

3 - Inlet pressure gauge + 2-way manifold

4 - Automatic overpressure Slam Shut Valve (SSV)

5 - Automatic overpressure Slam Shut Valve (SSV)

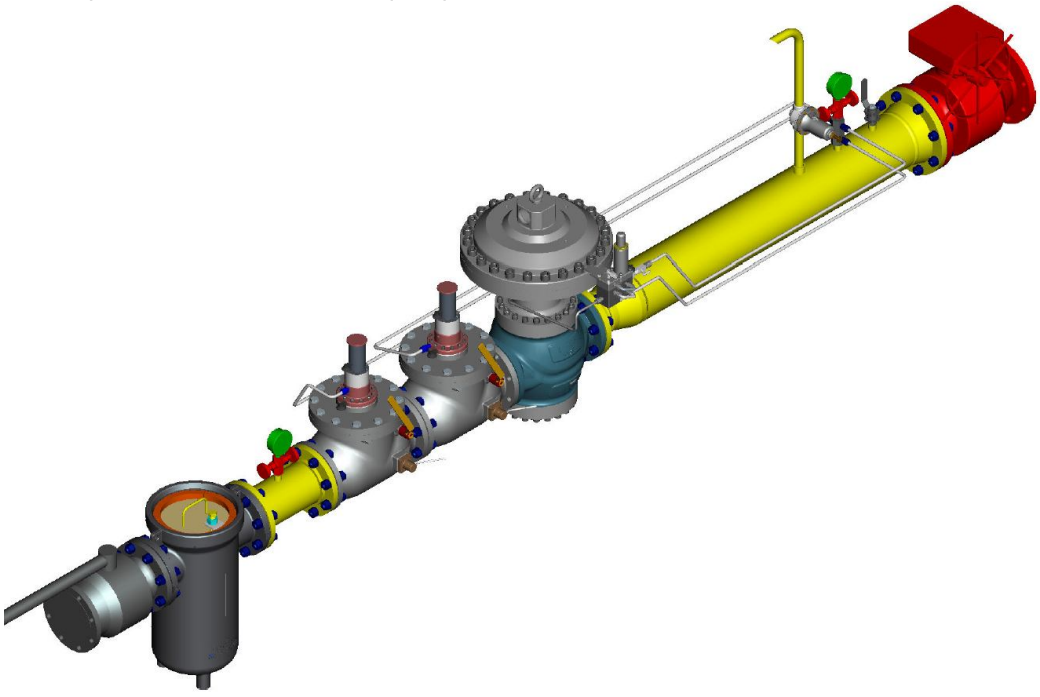
6 - Pressure regulating valve URANO

7 - Partial relief valve

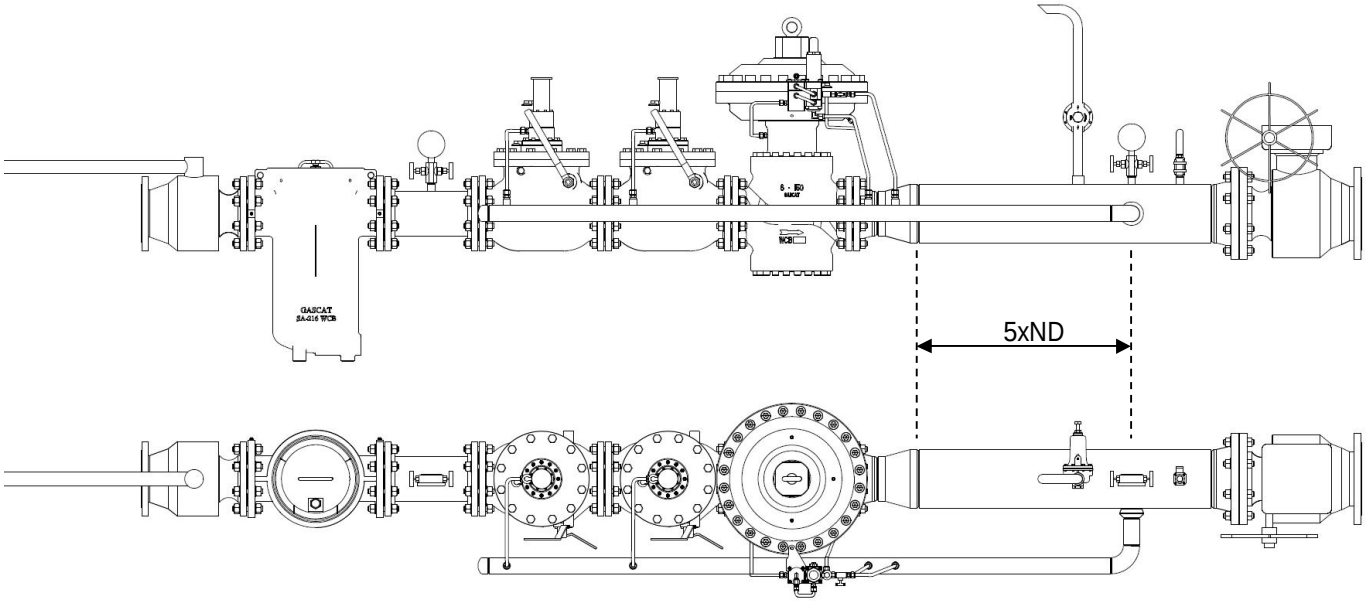
8 - Outlet pressure gauge + 2-way manifold

9 - Vent valve

10 - Outlet shut-off valve



Note: The position indicated for the sensor pick-up may be less than 5D if the installation project is analyzed and approved by GASCAT's engineering.

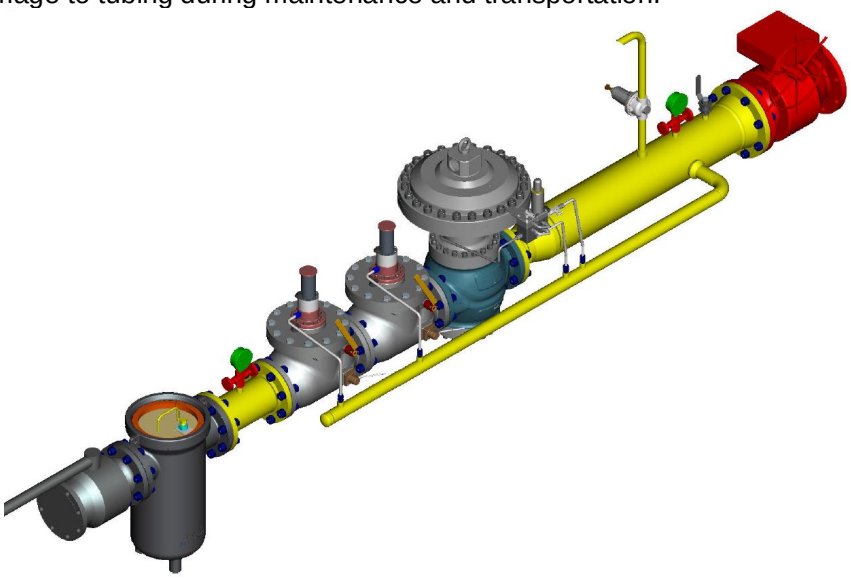


Another recommended installation option is to use a lung to connect sensor pick-ups taken near the equipment. Among the advantages of adopting this configuration can be mentioned:

1) Easier maintenance.

2) Better quality (stability) of the pneumatic signal.

3) Reduced damage to tubing during maintenance and transportation.



Note: The position indicated for the lung pick-up may be less than 5D if the installation project is analyzed and approved by GASCAT's engineering.

4.6 COMMISSIONING AND START-UP

4.6.1 GENERAL RECOMMENDATIONS

Always, before proceeding with the equipment commissioning it is important to:

1) Check if the equipment is properly installed according to the recommendations of item 4.3 of this manual.

2) Shut the blocking valves of the inlet, output and bypass (if applicable)

3) Open vent valve downstream of the last pressure regulator installed on the span.

4) Make sure that the station is depressurized.

ATTENTION:

* Under no circumstances proceed with pressurization of the span where the equipment is installed by the downstream valve of the equipment.

* Under no circumstances proceed with the depressurization of the span where the equipment is installed by the valve located upstream of the equipment, such as the filter drain.

5) Check if all connectors are properly secured in the station before starting pressurization of the span.

6) Check if the installed equipment has suitable operating conditions, using the information available on the nameplate attached to the equipment.

7) Make sure that the SSV is in the shut position.

ATTENTION:

GASCAT's SSV are sent to the field already calibrated, however, depending on transport conditions and the equipment handling the valve may have its set point changed.

Therefore, we recommend that you check the SSV set point with the help of an external air supply directly connected to the actuator, before proceeding with the pressurization of the span.

Model URANO valves are not sent to the field with adjusted set points; this measure tends to preserve the life of the equipment internals. Therefore, after receiving a pressure regulator valve model URANO, remember that you must perform the set point adjustment before

The pressure reducing station setting shall be in accordance with the DIN EN 12186 / NBR 12712 standards and all other regulations in force in the region where it will operate.

4.6.2 COMMISSIONING (SINGLE REGULATOR SPAN)

Using, as a reference, the assembly scheme presented in item 4.5.1, proceed to the description on commissioning of the regulator model URANO for a simple regulation span, considering that the recommendations made in section 4.6.1 of this manual have been properly observed.

The referred to procedure considers the use of valves model GIPS-FC GASCAT as safety device.

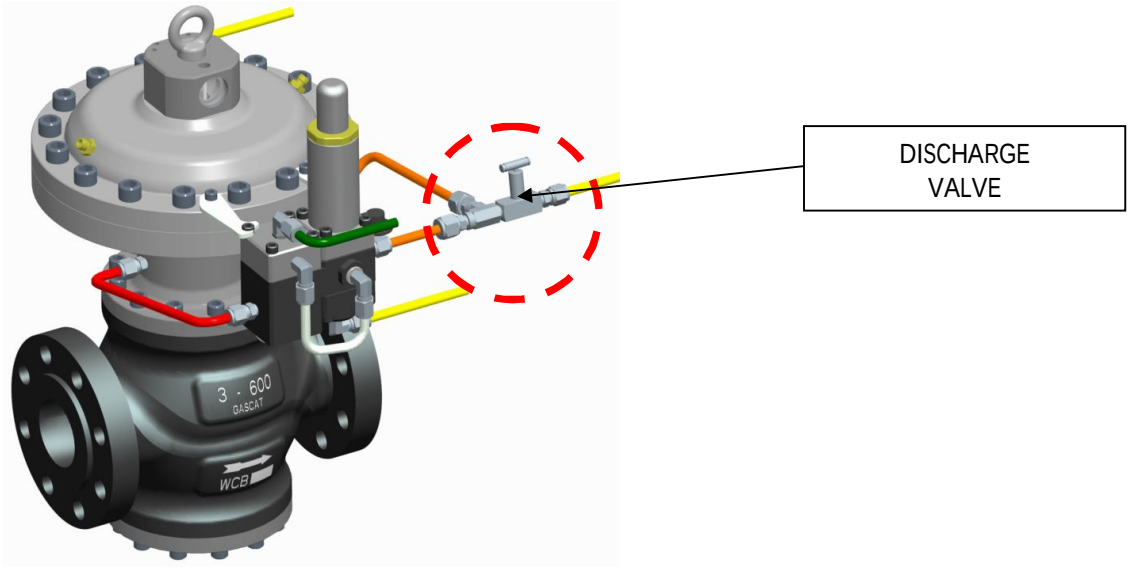
1) Shut-off the vent valve.

   As the line shut-off valves are closed, we will use the vent valve to simulate a small flow and so proceed with the regulator adjustment before aligning the span.

2) Check if the pilot regulation spring is properly relieved (discharged).

   Relieving the regulation spring we ensure that the valve will remain in the closed position when pressurized.

3) Check if the discharge valve (needle valve) is open by 1/8 of a turn.



4) **SLOW AND GRADUALLY** open the inlet shut-off valve, or when the station is provided with a by-pass of the shut-off valve use the same to perform pressurization.

5) Since there is no pressure downstream of the regulator, the blocking valve model GIPS-FC will be in the closed position, hence keep the bypass valve located at the side of the SSV pressed to pressurize the span between the same and the pressure regulator.

6) Still pressing the SSV bypass valve, proceed by applying a light load in the pilot regulation spring in order to admit a small pressure downstream of the regulator valve, use a pressure gauge to monitor this pressure rise and leave the pressure adjusted to a value at least 20% above the low set point pressure of the SSV.

7) Once the SSV actuator is already pressurized, you may release the by-pass valve, and proceed by resetting the SSV actuator.

8) Reset the shutter of the GIPS-FC shut-off valve, using the reset lever.

9) Open the vent valve to 20%, check whether the pressure will continue at the preset value.

10) Using a 7/8" combination spanner turn the adjustment screw clockwise to increase the output pressure up to the desired setpoint value.

11) If the pressure is oscillating, perform a fine adjustment by opening or closing the discharge valve.

12) Once the pressure has stabilized, open the vent valve by one-half turn and check the adjustment accuracy.

13) Once the pressure regulation agrees with the desired value, you shall close the vent valve and check the valve lock-up.

14) Check for leaks in connectors and other pressure regulator connections of the span.

15) **SLOW AND GRADUALLY** open the output shutoff valve to apply a load to the span.

16) If necessary, fine-tune the regulated pressure through the pilot regulation spring.

4.6.3 THE BACK-UP LINE SET-UP

When the regulator is installed in a back-up line, we recommend that the procedure given in 4.6.2 be repeated, but this pressure regulator setpoint should be adjusted for a pressure 15% - 20% lower than the set point of the valve in operation.

After doing so, open **SLOW AND GRADUALLY** the outlet shut-off valve so that the downstream pressure of the back-up span regulator equalizes with the pressure already in operation. The back-up regulator will remain shut.

To make the regulator of the reserve span assume regulation, slowly press the regulation spring clockwise until the set point of the regulator reaches a value higher than the set point of the line in operation, thus the reserve regulator will open slowly and assume operation.

It is important that the two regulators remain with a set point difference of at least 5% - 10%, so that there is no set point overlap causing a competition between the two lines, i.e., at one instant one regulator opens, at another instant the reserve regulator opens, promoting inaccuracy in regulation.

TABLE OF RECOMMENDED SET POINTS

MAIN REGULATOR SET POINT (PS)	BACK-UP REGULATOR SET POINT	PSV SET POINT	SSV SET POINT
2.5 - 5.0 bar	PS x 1.150	PS x 1.400	PS x 1.500
5.0 - 12.0 bar	PS x 1.050	PS x 1.200	PS x 1.300
12.0 - 20.0 bar	PS x 1.025	PS x 1.200	PS x 1.300
20.0 - 80.0 bar	PS x 1.025	PS x 1.150	PS x 1.250

Note: The values given in this table are recommended as the best practices, but it is not forbidden the use different set point ranges upon review and approval by GASCAT.

4.6.4 COMMISSIONING (ACTIVE MONITOR SYSTEM)

Using as reference the assembly scheme presented in item 4.5.2, we shall proceed to the description for commissioning the regulator model URANO in a span where the active monitor configuration is adopted, considering that the recommendations made in section 4.6.1 of this manual have been properly observed.

The referred to procedure considers the use of valves model GIPS-FC GASCAT and pressure regulator model URANO SC (FF) GASCAT as safety devices.

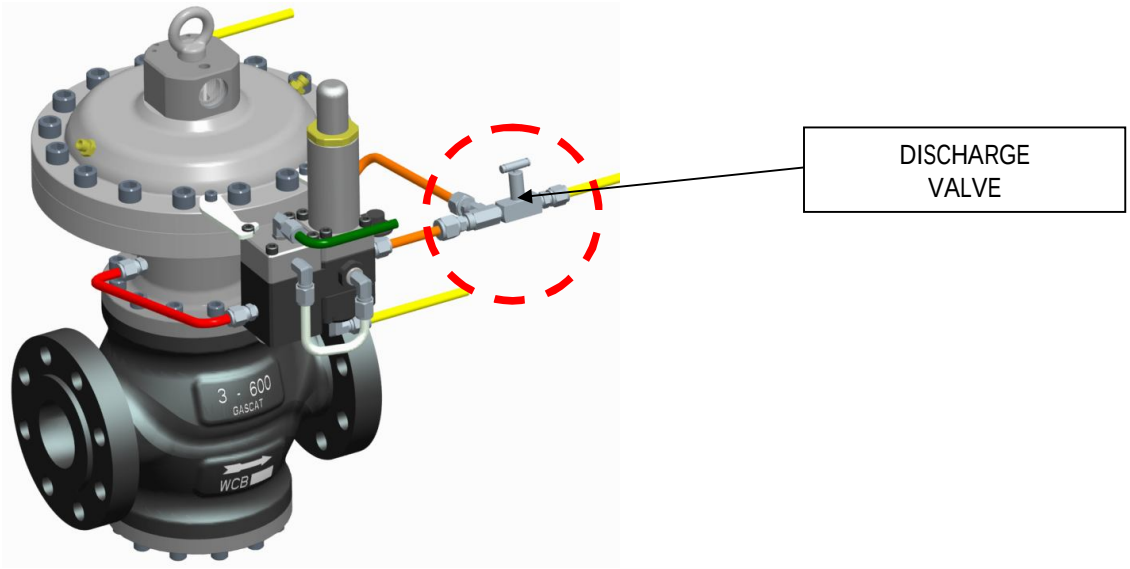
1) Shut-off the vent valve.

   As the line shut-off valves are closed, we will use the vent valve to simulate a small flow and so proceed with the regulator adjustment before aligning the span.

2) With the line still depressurized, press the pilot spring of the Active pressure regulator valve and completely relieve the pilot spring of the regulating valve in the Monitor function of the span.

   Relieving the regulation spring ensures that the monitor valve will remain in the closed position and pressing the spring of the regulation valve into the active function ensures that the same will remain open when pressurized.

3) Check if the discharge valve (needle valve) of the active and monitor valves are open by 1/8 of a turn.



4) **SLOW AND GRADUALLY** open the inlet shut-off valve, or when the station is provided with a by-pass of the shut-off valve use the same to perform pressurization.

5) Since there is no pressure downstream of the regulator, the blocking valve model GIPS-FC will be in the closed position, hence keep the bypass valve located on the side of the SSV pressed to pressurize the span between the same and the pressure regulator.

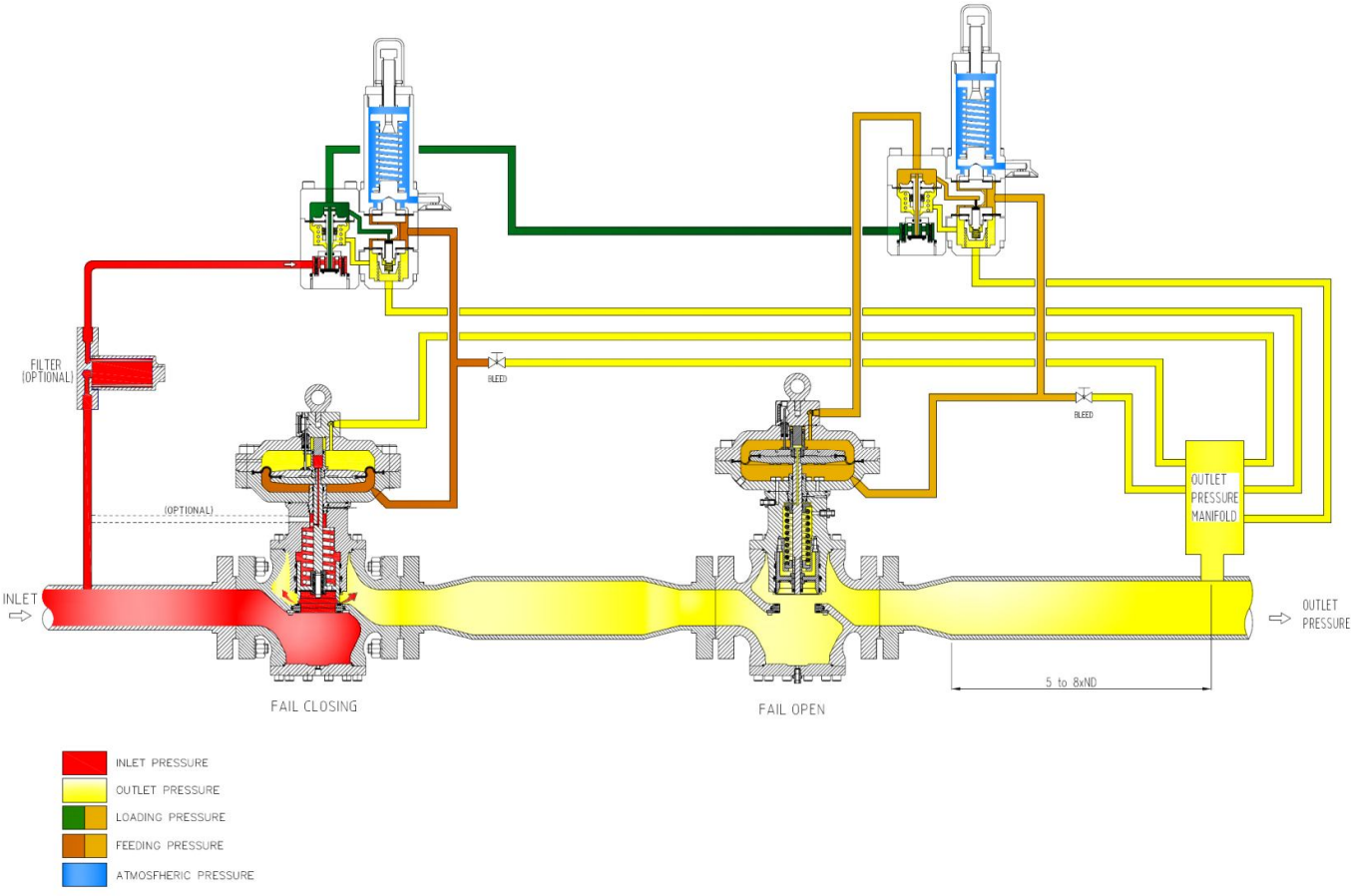
6) Still pressing the SSV bypass valve, proceed by applying a light load onto the pilot regulation spring in order to admit a small pressure downstream of the regulator valve, use a pressure gauge to monitor this pressure rise and leave the pressure adjusted to a value at least 20% above the low set point pressure of the SSV.

7) Once the SSV actuator is already pressurized, you may release the by-pass valve, and proceed by resetting the SSV actuator.

8) Reset the shutter of the GIPS-FC security shut-off valve, using the reset lever.

9) Open the vent valve to 20%, check whether the pressure will continue at the preset value.

10) Using a 7/8" combination spanner turn the adjusting screw of the monitor valve clockwise to increase the output pressure up to the desired value setpoint. Hence, only the monitor regulator is in operation, and the system will behave as shown in the diagram below:



11) If the pressure is oscillating, perform a fine adjustment by opening or closing the discharge valve.

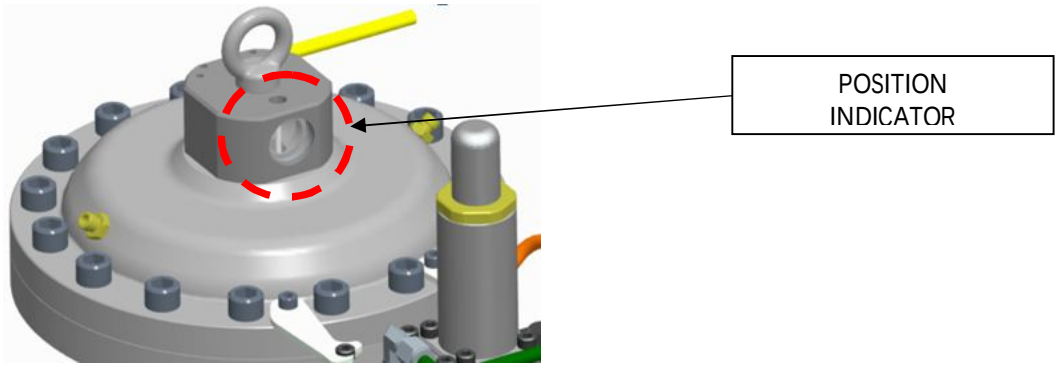
12) Once the pressure has stabilized, open the vent valve by one-half turn and check the adjustment accuracy.

13) Once the pressure regulation agrees with the desired value, you shall close the vent valve and check the valve lock-up.

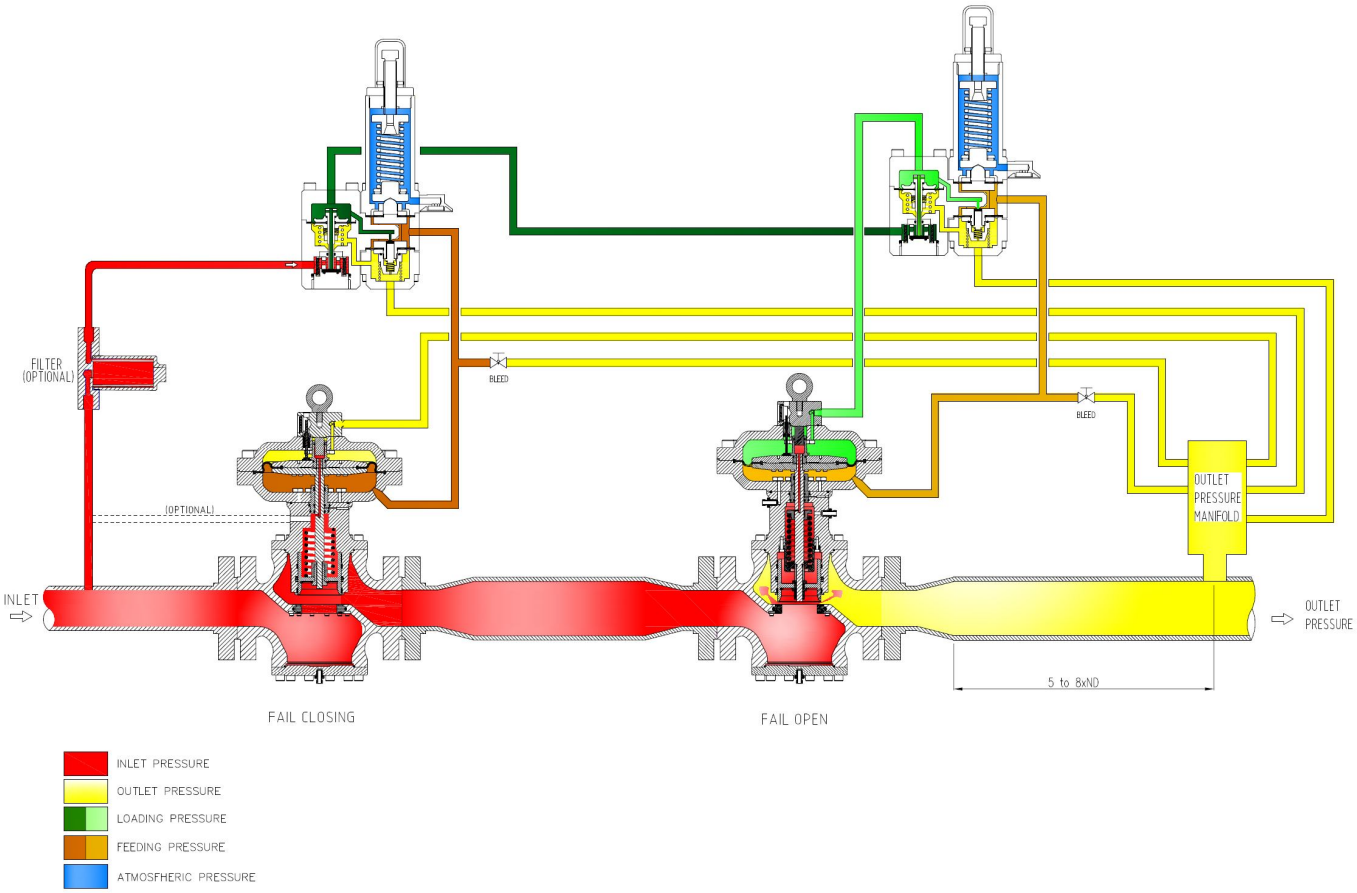
14) Once the monitor valve setpoint has been reached, start to slowly unload (release) the pilot spring of the active valve by turning the adjustment screw counter-clockwise. This will reduce the setpoint of this regulator.

15) Adjust the setpoint of the active regulator to a pressure, at least, 0.5 Kgf/cm² below the monitor valve setpoint to enable the span monitor valve to remain fully open, with only the active valve remaining in operation.

16) It can be checked that the monitor valve is fully open and active valve regulating in the local position indicator, located at the actuator top.



17) Now the active valve is in operation and the monitor is fully open awaiting a possible failure by the active valve to start operation, as given below:

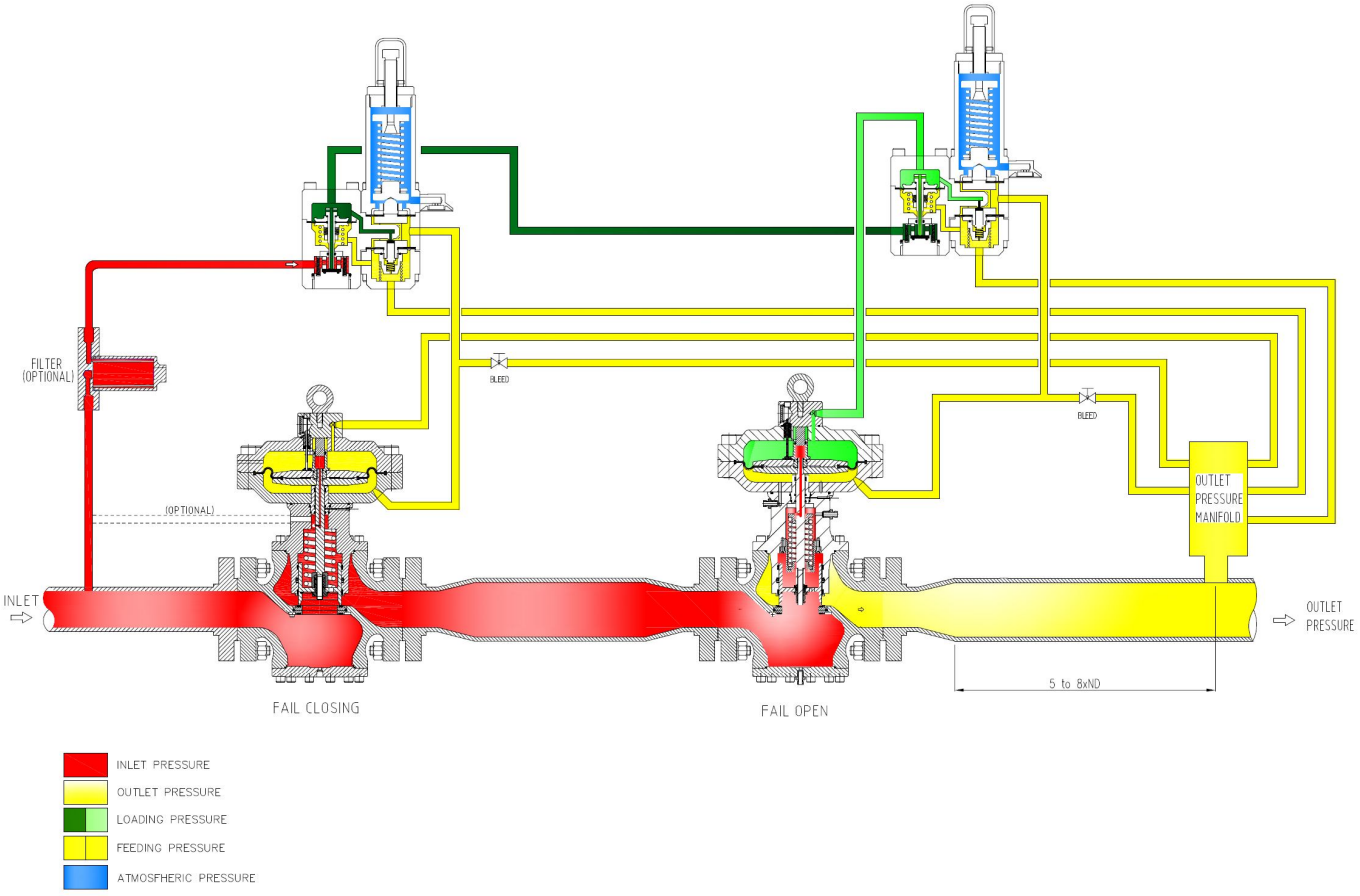


18) If the pressure is oscillating, perform a fine adjustment by opening or closing the discharge valve.

19) Once the pressure has stabilized, open the vent valve by one-half turn and check the adjustment accuracy.

20) Once the pressure regulation agrees with the desired value, you shall close the vent valve and check the valve lock-up.

21) While we are testing the lock-up of the active valve, we recreate a scenario similar to a consumption stop by the end customer, which is a normal process condition and, in such a case, the two valves shall be closed as shown below:



22) It is important to note that in an active monitor system the span closing pressure will be always given by the monitor regulator, because as we can see in the diagram above monitor regulator unloading outlet will be coupled to the outlet downstream of the active valve. Thus, the pilot of the monitor valve will remain open until it receives the corresponding pneumatic signal to close; this pneumatic signal will be equivalent to the monitor valve closing pressure.

23) Check for leaks in connectors and the pressure regulator connections of the span.

24) **SLOW AND GRADUALLY** open the output shutoff valve to apply a load to the span.

25) If necessary, fine-tune the regulated pressure through the pilot regulation spring.

4.6.5 BACK-UP LINE SETUP (ACTIVE-MONITOR)

When the regulator is installed in a back-up line in a ACTIVE MONITOR configuration, we recommend that the procedure given in 4.6.4 be repeated, but the active pressure regulator setpoint of the backup span shall be adjusted for a pressure 15% - 20% lower than the setpoint of the valve in operation.

After doing so, open **SLOW AND GRADUALLY** the outlet shut-off valve so that the downstream pressure of the back-up stretch regulator equalizes with the pressure already in operation. The back-up regulator will remain shut.

To make the regulator of the reserve span assume regulation, slowly press the regulation spring of the active regulating valve in the clockwise direction until the set point of this regulator reaches a value higher than the set point of the line in operation, thus the reserve regulator will open slowly and assume the operation.

It is important that the two regulators remain with a set point difference of at least 5% - 10%, so that there is no set point overlap causing a competition between the two lines, i.e., at one instant one regulator opens, at another instant the reserve regulator opens, promoting inaccuracy in regulation.

TABLE OF RECOMMENDED SET POINTS

MAIN ACTIVE REGULATOR SET POINT (PS)	BACK-UP OF ACTIVE REGULATOR SET POINT	MONITOR REGULATOR SET POINT	PSV SET POINT	SSV SET POINT
2.5 - 5.0 bar	PS x 0.9	PS x 1.150	PS x 1.400	PS x 1.500
5.0 - 12.0 bar	PS x 0.95	PS x 1.050	PS x 1.200	PS x 1.300
12.0 - 20.0 bar	PS x 0.95	PS x 1.025	PS x 1.200	PS x 1.300
20.0 - 80.0 bar	PS x 0.97	PS x 1.025	PS x 1.150	PS x 1.250

Note: The values given in this table are recommended as the best practices, but it is not forbidden the use different set point ranges upon review and approval by GASCAT.

4.6.6 LIST OF RECOMMENDED TOOLS

To carry out commissioning set point adjustments and start-up of the GASCAT's regulators model URANO it is required only the use of a 7/8" combination spanner for setting up the pilot's adjustment springs.

1

2

Valves model URANO are supplied with connectors for ½" ND tubbing in sensor pick-ups, so we still recommend the use of 19mm and 13/16"combination spanners for fixing sensor pick-ups to the process line.

ND	1	2
1",2",3",4",6", and 8"	19 mm, 7/8" and 13/16"	1"

5.0 TROUBLE SHOOTING

This section of the manual aims to evidence eventual troubles that may occur in the field to their causes.

The problems listed in this section may derive from different situations, but most of them are related to the gas conditions (impurities), natural wear, and fault during the equipment operation.

It is important to keep in mind that the operation and maintenance of GASCAT equipment should only be performed by highly skilled and trained personnel, preferably by teams trained by GASCAT's instructors.

For training and qualification of operators and technicians, please, contact GASCAT through the e-mails below, to check on their availability.

E-mail: vendas@gascat.com.br / sales@gascat.com.br

URANO		
PROBLEM	**PROBABLE CAUSE**	**CORRECTIVE MEASURES**
Malfunctioning, Output pressure oscillation	Low flow rate (smaller than 5% of maximum flow).	Check the operating conditions and restore the flow rate conditions to the standards for which the equipment was designed.
	Poorly localized impulse pick-up.	Adjust the position of the impulse pick-up as referred to in this manual, or contact GASCAT for an engineering analysis.
	Regulator speed of response incompatible with the system.	Adjust the discharge valve (needle valve).
Feedthrough passage or regulator locked in the open position	Main regulator shutter (pos 48 SC; pos 57 SO) locked	Check the shutter and anti-friction rings conditions. Replace or clean them as required (a minimum quantity of grease should be applied in the assembly of these components, preferably using molybdenum bisulfite grease).

	Broken or damaged impulse line	Check the impulse line status and replace it, if necessary.
	Damaged seat (pos 44 SO; pos 38 SC) or occurrence of particles between the shutter and the seat.	Perform cleaning and check of the seat status, if it has no apparent marks of damage proceed with the assembly and check the lock-up, replace if damaged.
	Rupture of the main diaphragm (pos 3) of the FA valve (Spring to open)	Replace the main diaphragm
Decrease of output pressure and/or insufficient flow rate	Dirt on the filter	Provide the filter cleaning or replacing of the filtering element.
	No feed	1) Check for shutter booster locking (pos 7 G-43/ pos15 G-44) 2) Check if the pilot seat (pos 3) is blocked.
	Passage in the main diaphragm (pos 4) Regulator FF (Spring to close)	Replace the main diaphragm (pos 4)
Gas escape though the vent of the pilot cover	Rupture of the diaphragm (pos 19)	Replace the diaphragm.
Gas escape though the booster gasket holder	Rupture of the booster gasket (pos 4 G44/ pos 6 G43)	Replace the gasket.

6.0 MAINTENANCE

It is essential to perform preventive maintenance of pressure regulators' model URANO for proper operation of the equipment over time, and it is directly related to the reliability of the pressure control system, avoiding operating problems to the user.

The frequency of maintenance varies considerably according to the installation, operating conditions and the quality of the fluid in question, for example, if the equipment is subject to a large presence of contaminants such as black powder, yellow powder, oil, condensate, etc. certainly the service intervals should be shorter.

GASCAT has standard repair kits for each component of the pressure regulator model URANO containing the most likely items to wear with time; this list of components is given in this manual for users guiding.

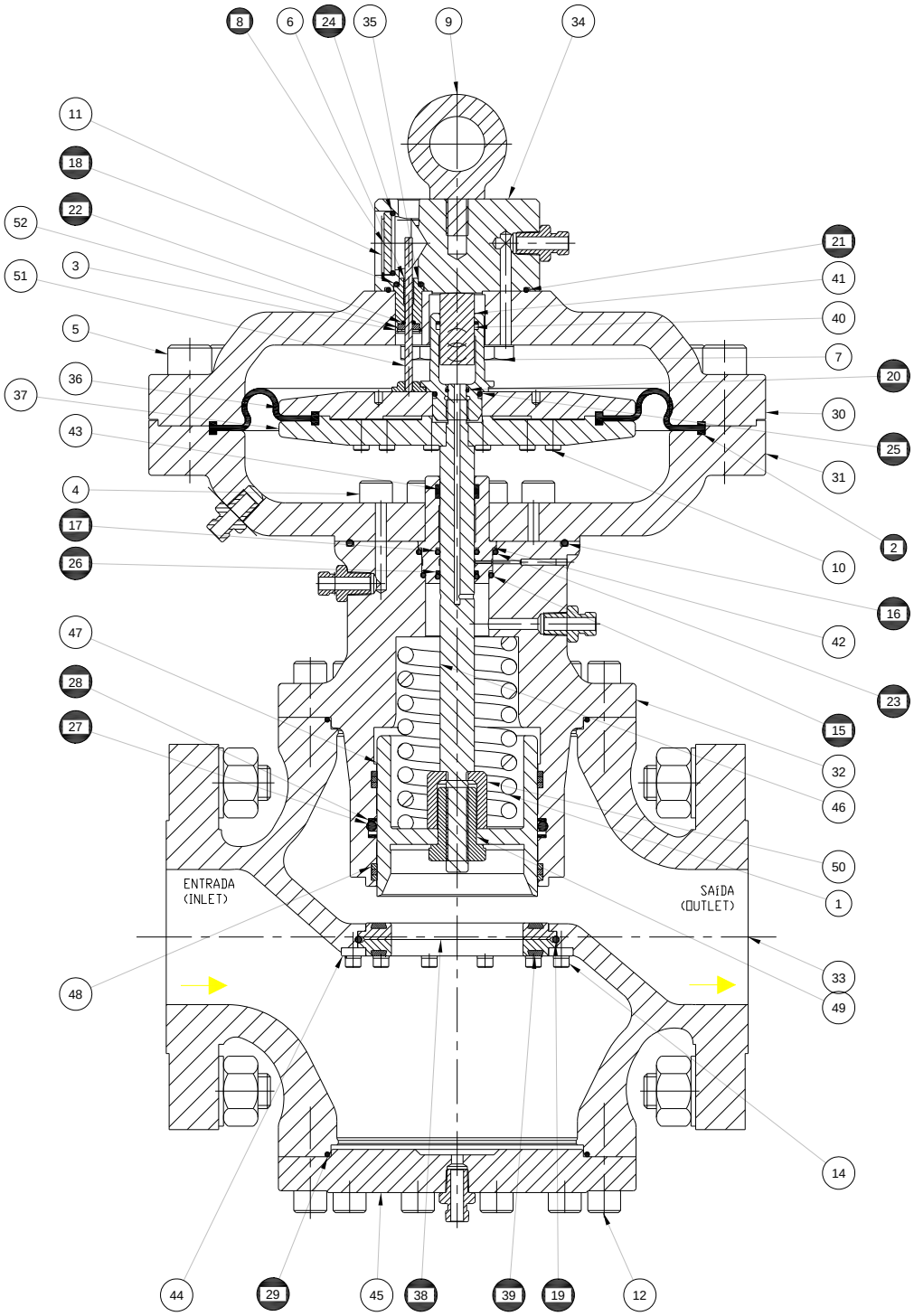
ATTENTION:

GASCAT's pressure regulator valves components are developed, manufactured and tested exclusively by GASCAT to provide the highest efficiency and safety of operation. Non-using GASCAT's original components make the operation unsafe and compromise the process efficiency.

GASCAT takes no responsibility for the operation of equipment using

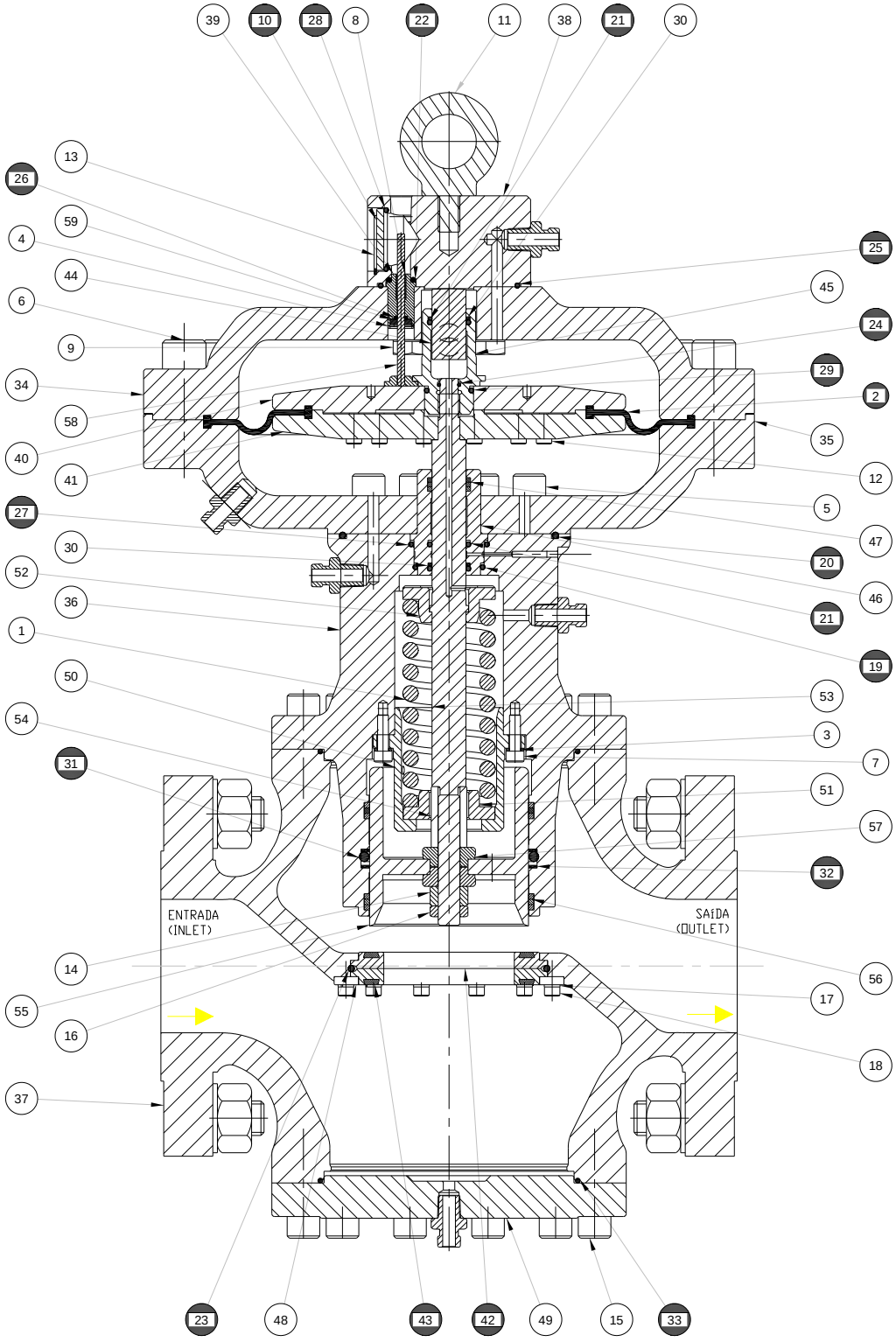
Before starting maintenance of GASCAT's pressure regulators, you shall always assure yourself to have a replacement kit with original GASCAT parts, as well as this instruction manual for reference of how to work safely and efficiently during the equipment maintenance.

6.1 RECOMMENDED REPAIR PARTS AND KITS



URANO SC (FF)

POS.	DESCRIPTION	URANO SC (FF) ND					
		1"	2"	3"	4"	6"	8"
2	DIAPHRAGM	1	1	1	1	1	1
8	VIEWER	1	1	1	1	1	1
15	O-RING	1	1	1	1	1	1
16	O-RING	1	1	1	1	1	1
17	O-RING	2	2	2	2	2	2
18	O-RING	1	1	1	1	1	1
19	O-RING	1	1	1	1	1	1
20	O-RING	1	1	1	1	1	1
21	O-RING	1	1	1	1	1	1
22	O-RING	1	1	1	1	1	1
23	O-RING	1	1	1	1	1	1
24	O-RING	1	1	1	1	1	1
25	O-RING	1	1	1	1	1	1
26	O-RING	2	2	2	2	2	2
27	O-RING	1	1	1	1	1	1
28	PARBACK RING	2	2	2	2	2	2
29	O-RING	2	2	2	2	2	2
38	SHUTTER	1	1	1	1	1	1
39	SHUTTER	1	1	1	1	1	1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ENTRADA
(INLET)
SAÍDA
(OUTLET)
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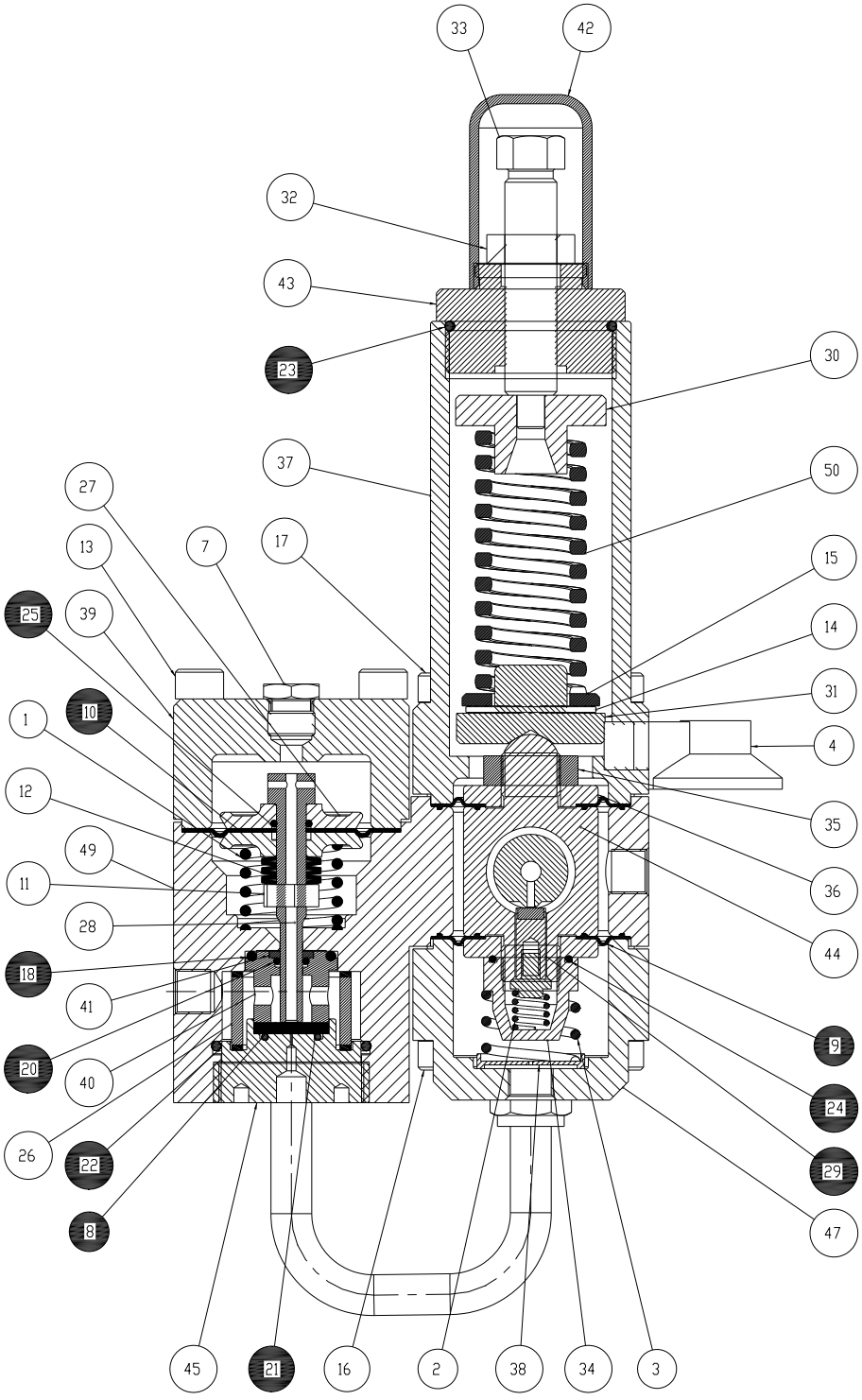
URANO SO (FO)

POS.	DESCRIPTION	URANO SO (FA) ND 1"	2"	3"	4"	6"	8"
2	DIAPHRAGM	1	1	1	1	1	1
10	VIEWER	1	1	1	1	1	1
19	O-RING	1	1	1	1	1	1
20	O-RING	1	1	1	1	1	1
21	O-RING	3	3	3	3	3	3
22	O-RING	1	1	1	1	1	1
23	O-RING	1	1	1	1	1	1
24	O-RING	1	1	1	1	1	1
25	O-RING	1	1	1	1	1	1
26	O-RING	1	1	1	1	1	1
27	O-RING	1	1	1	1	1	1
28	O-RING	1	1	1	1	1	1
29	O-RING	1	1	1	1	1	1
31	O-RING	1	1	1	1	1	1
32	O-RING	2	2	2	2	2	2
33	O-RING	2	2	2	2	2	2
42	SHUTTER	1	1	1	1	1	1
43	SHUTTER	1	1	1	1	1	1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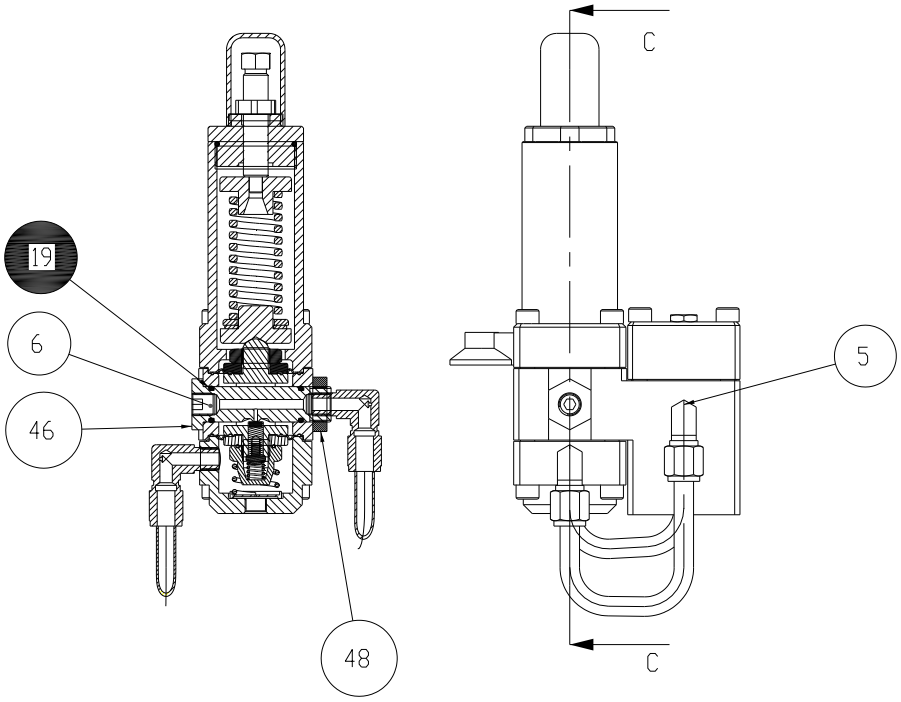
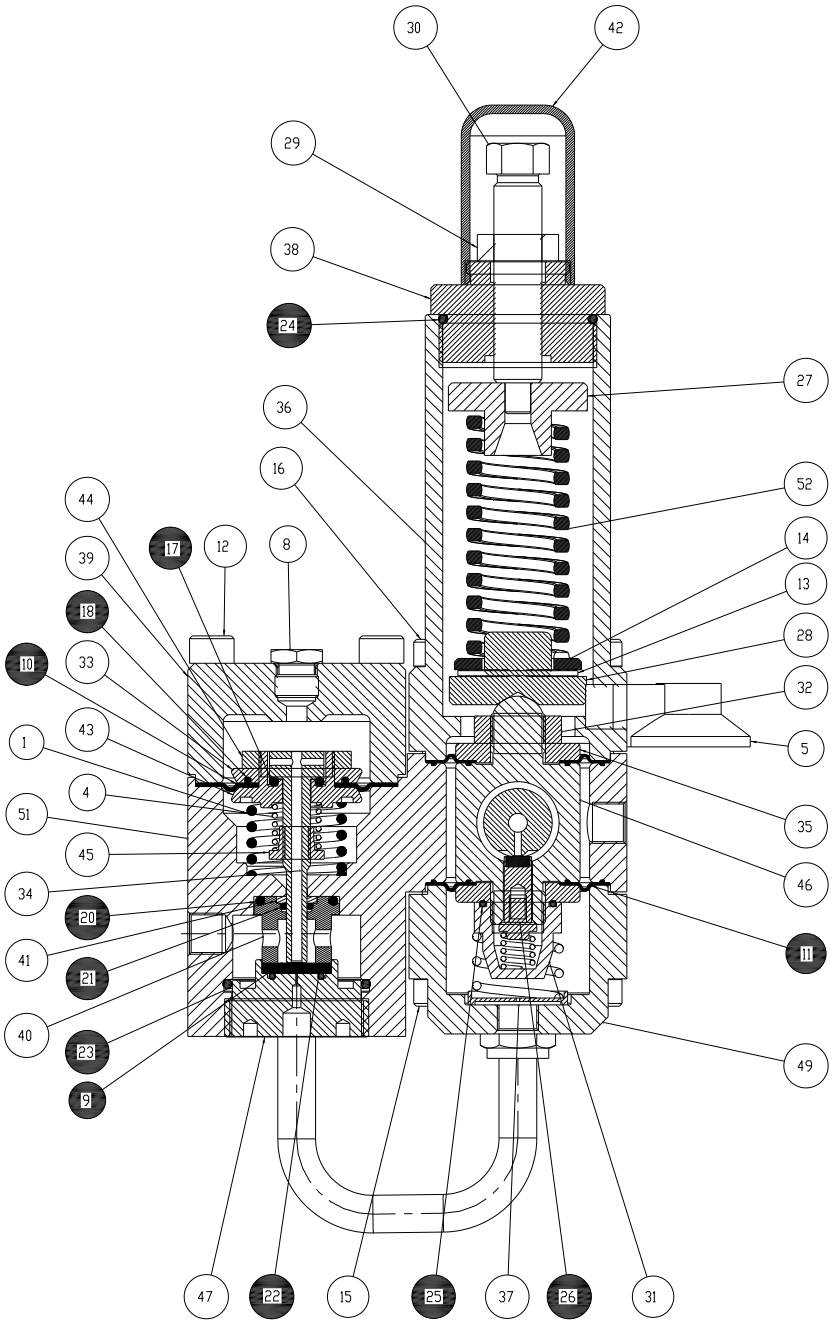
BOOSTER G-43 + PILOT G-42/40

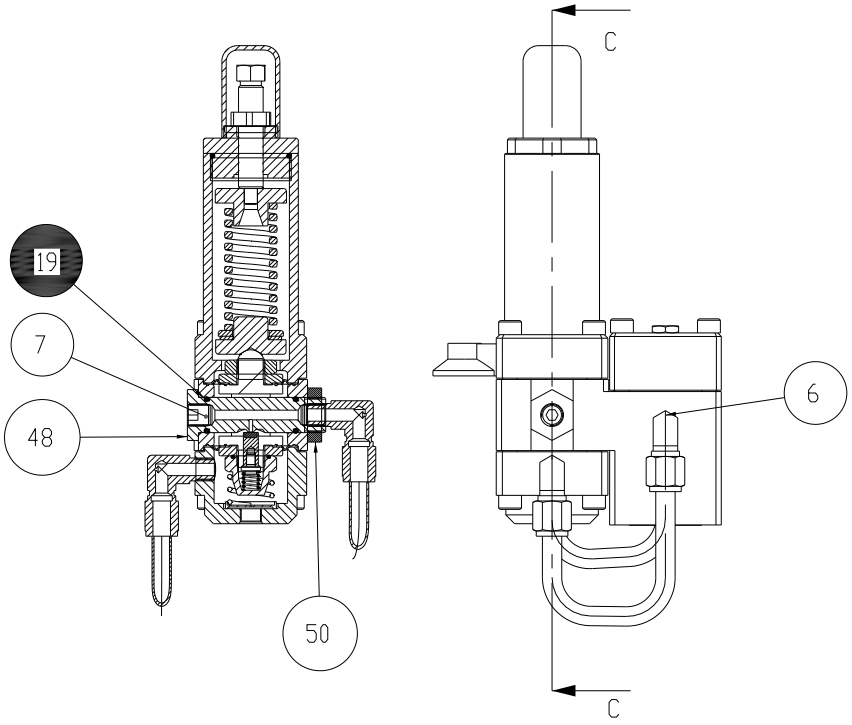


BOOSTER G-43		
POS.	DESCRIPTION	QTY
8	GASKET	1
10	DIAPHRAGM	1
18	O-RING	1
20	O-RING	1
21	O-RING	1
22	O-RING	1
25	O-RING	1

PILOT G-40/42		
POS.	DESCRIPTION	QTY
9	DIAPHRAGM	2
19	O-RING	2
23	O-RING	1
24	O-RING	1
29	SHUTTER	1

BOOSTER G-43 + PILOT G-42/40

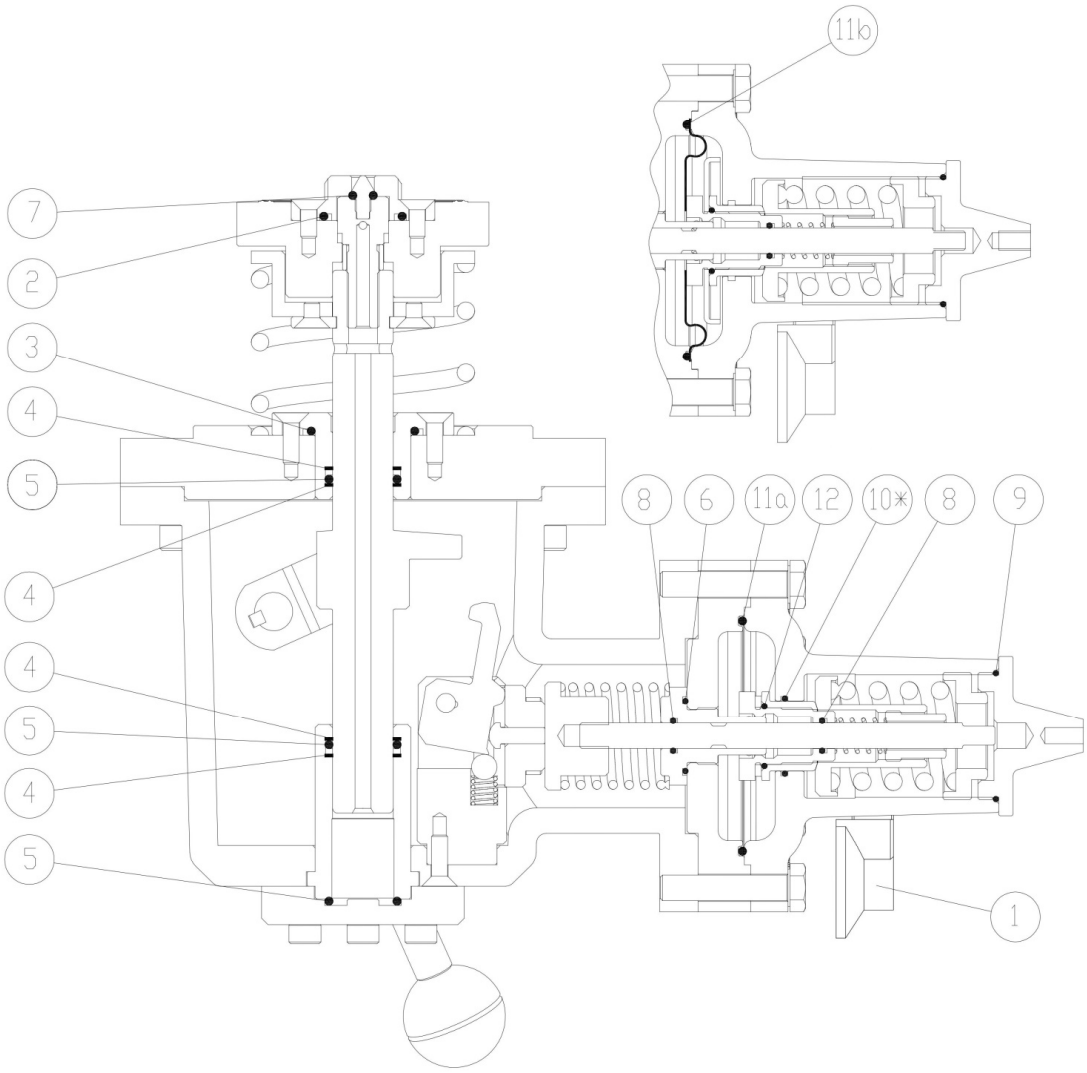




BOOSTER G-44 + PILOT G-42/40

BOOSTER G-44		
POS.	DESCRIPTION	QTY
9	GASKET	1
10	DIAPHRAGM	1
17	O-RING	1
18	O-RING	1
20	O-RING	1
21	O-RING	1
22	O-RING	1
23	O-RING	1

PILOT G-40/42		
POS.	DESCRIPTION	QTY
11	DIAPHRAGM	2
19	O-RING	2
24	O-RING	1
25	O-RING	1
26	SHUTTER	1



Actuator SSV					
POS.	DESCRIPTION	QTY	POS.	DESCRIPTION	QTY
1	RELIEF	1	8	O'RING	1
2	O`RING	1	9	O'RING	1
3	O`RING	1	10*	O'RING	2
4	PARBAK RING	1	11a	O`RING	1
5	O`RING	1	11b	DIAPHRAGM	1
6	O`RING	1	12	O'RING	1
7	O`RING	1	-	-	-

Note:
1) The item pos. 10 is not applicable to the H Actuator.
2) The item pos. 11a is just applicable to the PH version and the item 11b is just applicable to the H version.

6.2 PROCEDURE FOR URANO SC (FF) REGULATOR DISASSEMBLY

1) Before proceeding with the equipment disassembly, check if all the conditions set out in item 4.6.1 of this manual have been observed.

2) Under no circumstances start the equipment disassembly if it is pressurized.

The disassembly procedure given below refers to the components' positions shown in the diagram of section 6.0 of this manual.

3) Remove the pilot block and all connectors connected to the main valve.

4) Proceed by removing the screws (pos 5)

5) Remove the top cover of the actuator (pos 30)

6) Remove the indicator pin (pos 51)

7) Release the diaphragm assembly. To facilitate this task proceed as follows:

7.1) Fix one single screw of the cover (item 5) in the bottom cover of the actuator (pos 31) and position one hook spanner to the right of this screw, locking its hooks into the holes of the upper diaphragm plate, as shown in the illustration:

7.2) With a combination spanner remove the upper guide sleeve (pos 41) as illustrated below:

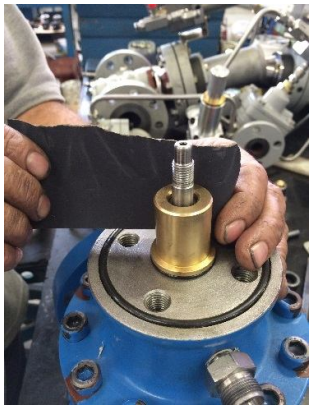

7.3) Remove the diaphragm assembly.


Note: Notice that the main valve diaphragm of the regulator model URANO is molded, and the convex surface tends to remain with its face upwards in this assembly, because the higher pressure is applied in the lower chamber of the actuator.

8) Release the screws (pos 10) of the diaphragm lower plate (pos 37), thus freeing the diaphragm (pos 2).


9) Release the screws (pos 4) and remove the bottom cover of the actuator (pos 31).

10) Pull the actuator guide bushing (pos 42). In order to facilitate this activity use a fine sandpaper as illustrated below:



11) Remove the screws of the intermediate (pos 12) and release the intermediate (pos 32).

12) Remove the closing spring (pos 1)

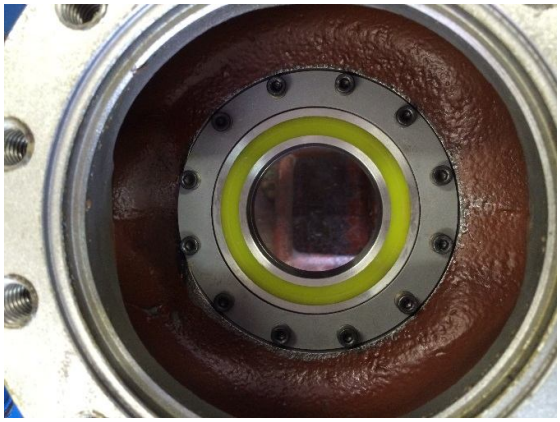
13) Remove the piston (pos 47) releasing the piston sleeve (pos 49)

14) To remove the seat start by releasing the body bottom cover (pos 45) removing its screws (pos 12).

15) Remove the screws (pos 14) and release the shutter (pos 38).

Note: The regulator model URANO of classes 150#, 300# and 600# are supplied with two shutters, the one in use has the gasket facing the piston, and the other is kept as a backup with the gasket facing the opposing part as shown in the illustration below:

BODY TOP VIEW



BODY BOTTOM VIEW

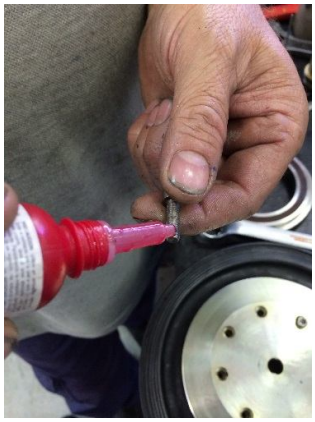
6.3 PROCEDURE FOR REGULATOR URANO SC (FF) ASSEMBLY

To perform the assembly of the URANO regulator, just follow the steps given in item 6.1 in reverse order, but some observations may help the task:

1) To install the indicator pin (item 51) it is advised first to position the same on the guide pin (item 6) before closing the top cover as illustrated below:

2) Remember to lubricate the O-rings with a thin layer of grease during the valve assembly process, as well as the rod, the piston and the static parts to reduce friction between these components.

3) During screws (pos 13) bolting on the diaphragm plate, use a chemical thread locker in order to improve parts fixing.



6.4 PROCEDURE FOR THE URANO SO (FO) REGULATOR DISASSEMBLY

1) Before proceeding with the equipment disassembly, check if all the conditions set out in item 4.6.1 of this manual have been observed.

2) Under no circumstances start the equipment disassembly if it is pressurized.

The disassembly procedure given below refers to the components' positions shown in the diagram of section 6.0 of this manual.

3) Remove the pilot block and all connectors connected to the main valve.

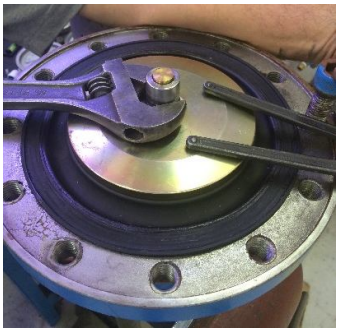
4) Proceed by removing the screws (pos 6)

5) Remove the top cover of the actuator (pos 34)

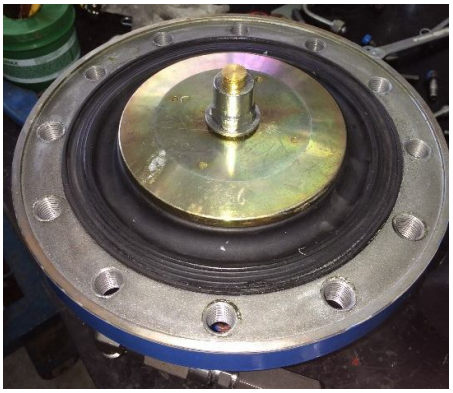
6) Remove the indicator pin (pos 58)

7) Release the diaphragm assembly. To facilitate this task proceed as follows:

7.1) Fix one single screw of the cover (pos 3) in the bottom cover of the actuator (pos 29) and position one hook spanner to the right of this screw, locking its hooks into the holes of the upper diaphragm plate, as shown in the illustration:



7.2) With a combination spanner remove the upper guide sleeve (pos 45) as illustrated below:



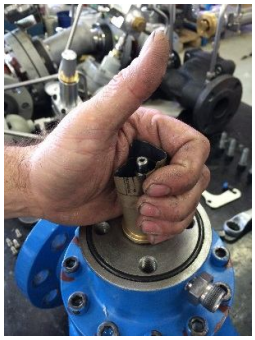
7.3) Remove the diaphragm assembly.

Note: Notice that the main valve diaphragm of the regulator model URANO is molded, and the convex surface tends to remain with its face downwards in this assembly, because the higher pressure is applied in the upper chamber of the actuator.

8) Release the screws (pos 12) of the diaphragm lower plate (pos 41), thus freeing the diaphragm (pos 2).

9) Release the screws (pos 5) and remove the bottom cover of the actuator (pos 35).

10) Pull the actuator guide bushing (pos 46). In order to facilitate this activity use a fine sandpaper as illustrated below:


11) Now we will proceed by releasing of the shutter assembly and the seat. To do this we recommend that the valve body is rotated so that the bottom cover (Item 49) faces up to facilitate the process, but if the valve is installed in a line and for some reason cannot be removed from the same, the procedure will be the same, but with the lower cover facing down.

12) Remove the screws of the intermediate (pos 15) and release the intermediate (pos 36).

13) Remove the piston locks (pos 16 ,14 and 57)

14) Remove the piston or shutter (pos 55); as you can see the shutter is fully retracted in the intermediate (pos 36), thus, to facilitate removal without damaging the piston it is important to proceed as follows:

14.1) Using a needle-nose pliers position the same in the piston holes (pos 55) and pull it while making a rotational movement.

14.2) By the action of time and contaminants' accumulation that may occur in the piston area, reducing lubrication and consequently the piston stroke (pos 55), we suggest another way to remove

the piston, which might be convenient during the process disassembly: The pistons of URANO regulator models of ND 2" to 8" have two threaded holes that allow fixing screws or threaded eyelets, as given in the table below:

URANO ND	PISTON THREAD
2”	M8 x 1.25
3”	M10 x 1.5
4”	M14 x 2.0
6”	M18 x 2.0
8”	M22 x 2.25

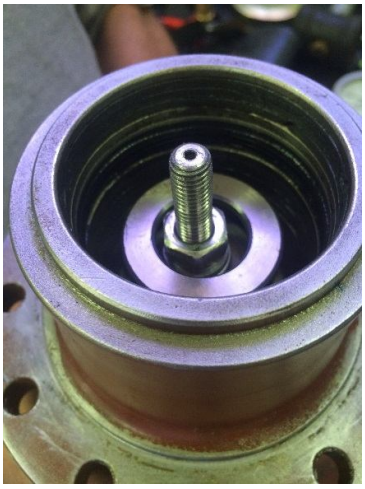
Screw 2 bolts in the threaded holes and with the help of a combination spanner or Allen key, pull and twist the piston simultaneously to remove it.

15) Remove the lock (pos 57) and the stop (pos 54)

16) To assist in the removal of the spring (pos 1), which is tensioned by the presser (pos 50), proceed as follows:

16.1) Position the shutter (pos 57) two locks upside down on the shaft (pos 53) as illustrated below:

16.2) Install the nut (pos 14) in the shaft over the locks (pos 57) and press the opening spring (pos 1) until the stop (pos 50) becomes free from the spring action.



17) Proceed with the disassembly of the spring stop (pos 50) by releasing the screws (pos 7).

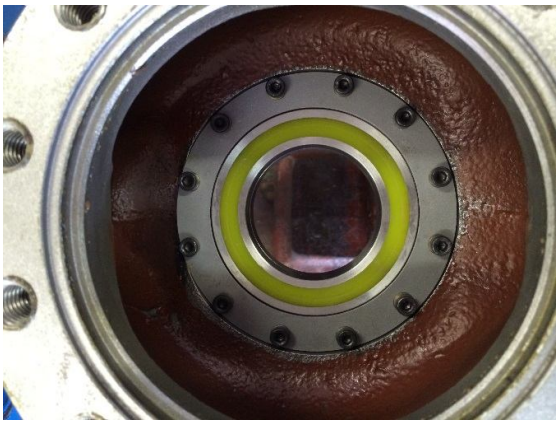
18) Release the entire assembly and remove the opening spring (pos 1)

19) To remove the seat, start by releasing the body bottom cover (pos 49) removing its screws (pos 15).

20) Remove the screws (pos 18) and release the shutter (pos 42/43).

Note: The regulator model URANO of classes 150#, 300# and 600# are supplied with two shutters, the one in use has the gasket facing the piston, and the other is kept as a backup with the gasket facing the opposing part as shown in the illustration below:

BODY TOP VIEW



BODY BOTTOM VIEW

6.5 PROCEDURE FOR URANO SO (FO) REGULATOR ASSEMBLY

To perform the assembly of the URANO SO (FO) regulator, follow the steps informed in the disassembly procedure in inverse order, starting with the seat assembly.

6.6 PROCEDURE FOR THE PILOT G-40/42 DISASSEMBLY

1) Before proceeding with the equipment disassembly, check if all the conditions set out in item 4.6.1 of this manual have been observed.

2) Under no circumstances start the equipment disassembly if it is pressurized.

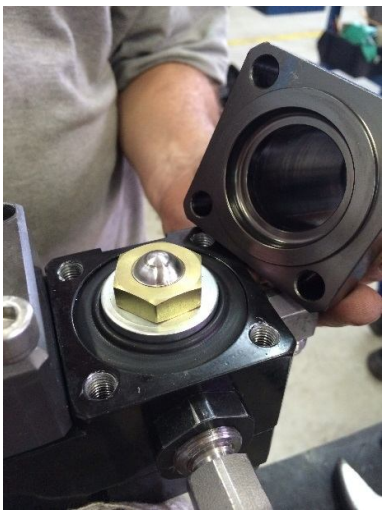
The disassembly procedure given below refers to the components' positions shown in the diagram of section 6.0 of this manual.

3) Discharge the pilot regulation spring by turning the adjustment screw (pos 33/30) counterclockwise.

4) Remove the guide of the adjusting screw (pos 43/38)

5) Remove the regulation spring (pos 50/52)

6) Remove the screws (pos 17/16) and release the top cover (pos 37/36).

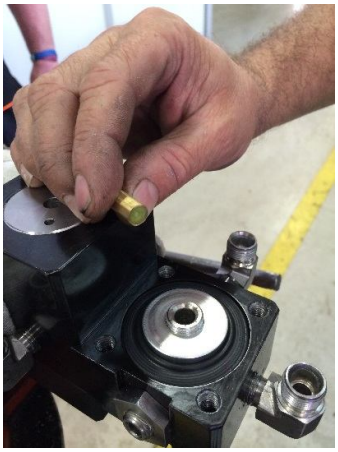


7) Turn the pilot block so that the bottom of the pilot faces up, release the screws (pos 16/15) and remove the bottom cover (pos 47/49)

8) Remove the spring and the base (pos 38/37)

9) Remove the bushing (pos 34/31) and the shutter spring.

10) Remove the shutter (pos 29/26)



11) Remove the diaphragm plate and the lower diaphragm (pos 9/11), turn the pilot block to the initial position and proceed by dismantling the bushing (pos 35/32).

12) Remove the diaphragm plate (pos 36/35) and the upper diaphragm (pos 9/11),

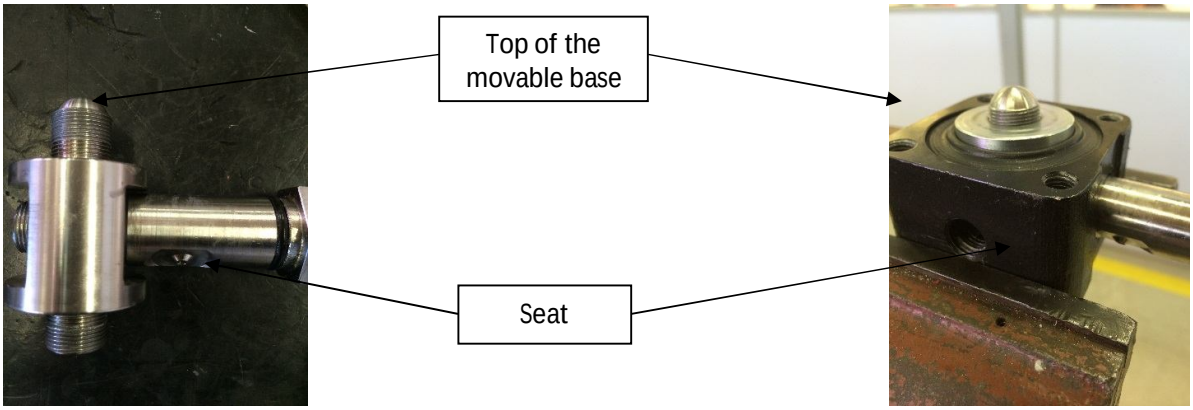
13) Remove the nut (pos 48/50), release the seat (pos 46/48) and the block (pos 44/46)



6.7 PROCEDURE FOR THE PILOT G-40/42 ASSEMBLY

To perform the assembly of the G-42 pilot, just follow the steps of the disassembly procedure in inverse order starting with the seat assembly, but we shall make two observations on two specific points that must be examined closely during the pilot reassembly.

1) Pay attention to the seat (pos 46/48) and the movable base (pos 44/46) assembly, the seat hole shall always be installed in the position opposite to the threaded pin of the movable base, as illustrated below, otherwise the seat will not match the shutter (pos 29/26).

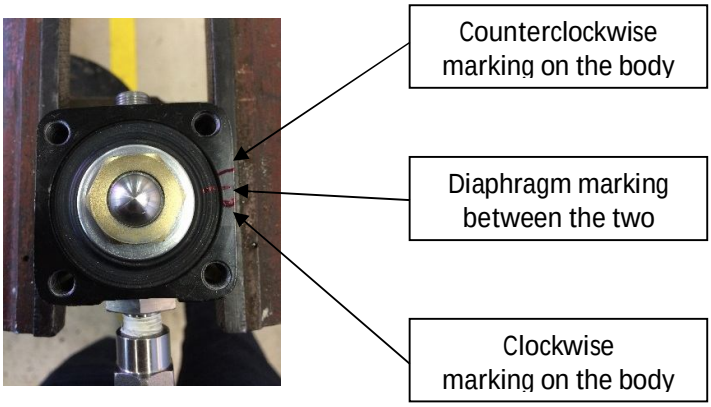


2) After mounting the seat (pos 46/48) in the movable base (item 44/46) it is necessary to leave the seat perfectly aligned with the movable base hole in order to avoid that it comes into contact with the walls of the movable base during operation. The proper procedure for performing this alignment is:

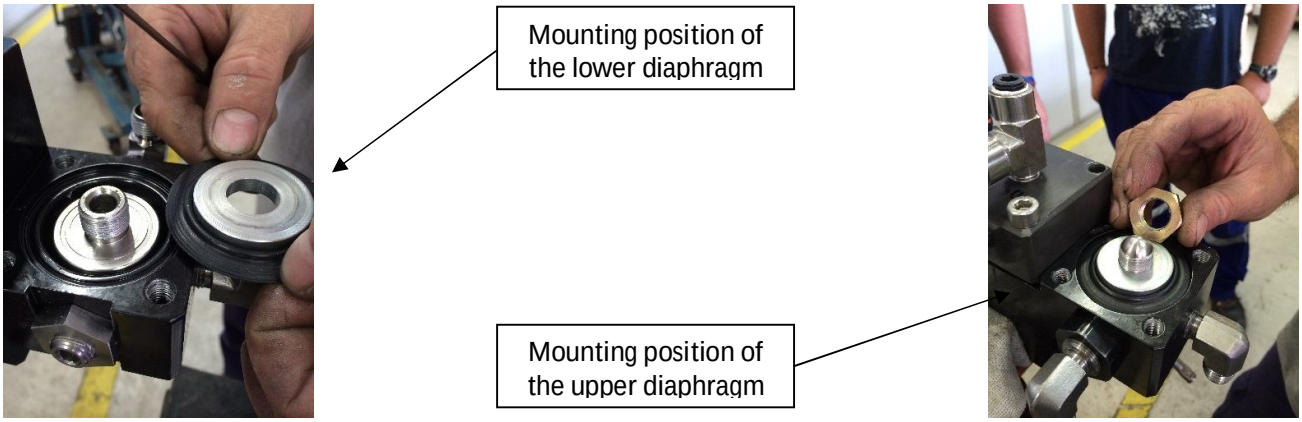
2.1) After mounting the seat (pos 46/48) on the body (pos 49/51) mount the lower and top diaphragm assembly and lock with the nut (pos 35/32) and diaphragm the support (pos 36/35).

2.2) With the assembled unit, turn the movable base (pos 44/46) clockwise until it touches the seat (pos 46/48). With a pen make a mark on the diaphragm and the body, then turn the movable base again, in the counterclockwise direction until it touches the seat (pos 46/48), make a mark on the body following

the marking already made on the diaphragm (pos 9.11); position the marking made on the diaphragm between the two markings on the body, thus we can assume that the seat is centralized.



3) The diaphragms (pos 9/11) of the G-42 pilot are molded, therefore, they have a correct mounting position that must be observed when mounting the pilot, as follows:



The diaphragms of model G-40 pilots are flat, so the mounting position is indifferent to the operation.

6.8 PROCEDURE FOR THE G-43 BOOSTER (PRE-REGULATOR) DISASSEMBLY

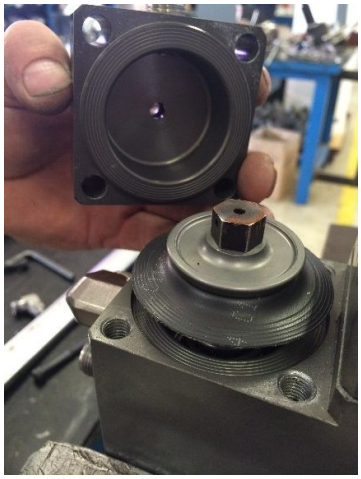
1) Before proceeding with the equipment disassembly, check if all the conditions set out in item 4.6.1 of this manual have been observed.

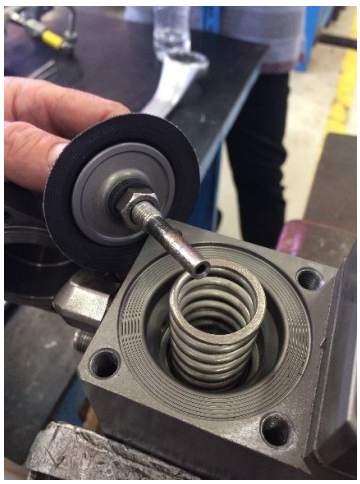
2) Under no circumstances start the equipment disassembly if it is pressurized.

The disassembly procedure given below refers to the components' positions shown in the diagram of section 6.0 of this manual.

3) Release the cover screws (pos 13), use an Allen key to push the whole diaphragm assembly down simultaneously through the booster top outlet, in order to facilitate the operation and prevent damage to the diaphragm.

4) Remove the cover (pos 39) and the diaphragm assembly (pos 28).





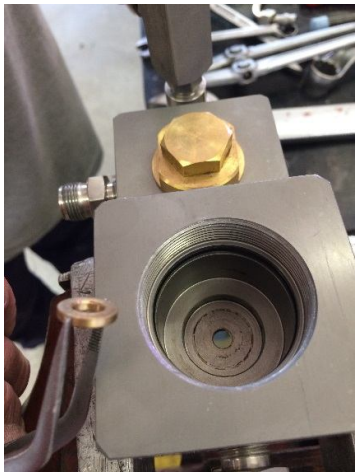
5) Lock the shaft (pos 28), release the nut (pos 11), remove the disc springs (pos 12) and the lower diaphragm plate (pos 27) to release the diaphragm (pos 10).



6) Now we will dismantle the bottom part of the booster. To do this, it is ideal to rotate the same so that the bottom faces upwards, proceed by removing the gasket holder (pos 45).


7) Remove the filter element (pos 26) and release the gasket (pos 8) of the gasket holder (pos 45) and its respective O-ring (pos 21).

8) Remove the shaft guide (pos 40) and the thrust bushing (pos 41)



6.9 PROCEDURE FOR THE G-43 BOOSTER (PRE-REGULATOR) ASSEMBLY

To perform the assembly of the G-43 booster, just follow the steps of the disassembly procedure in inverse order starting with the seat assembly, but we shall make some observations on specific points that must be examined closely during the booster reassembly:

1) During assembly of the diaphragm assembly to the shaft (pos 28) it is necessary to perform the plate springs (pos 12) assembly. In the total, there are 6 pieces and their arrangement must be made as shown below:

2) After assembly of all booster internals, when the same is to be shut by installing the cover and screws (pos 13), we recommend that during the screws' tightening the diaphragm assembly shall be pushed with an Allen key through the cover upper outlet (pos 7) so that the diaphragm can be properly fixed between the cover and the booster body.

6.10 PROCEDURE FOR THE G-44 BOOSTER (PRE-REGULATOR) DISASSEMBLY

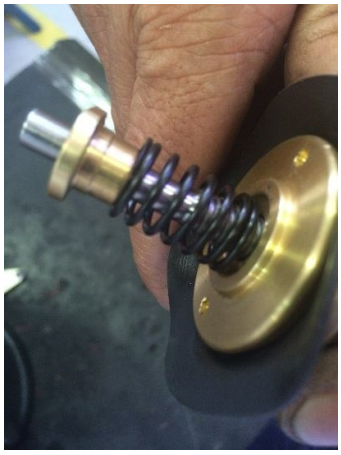
1) Before proceeding with the equipment disassembly, check if all the conditions set out in item 4.6.1 of this manual have been observed.

2) Under no circumstances start the equipment disassembly if it is pressurized.

The disassembly procedure given below refers to the components' positions shown in the diagram of section 6.0 of this manual.

3) Release the cover screws (pos 12), use an Allen key to push the whole diaphragm assembly down simultaneously through the booster top outlet, in order to facilitate the operation and prevent damage to the diaphragm.

4) Remove the diaphragm assembly + shaft (Item 34), release the latch of the relief spring (pos 45) and remove the relief spring (pos 4).



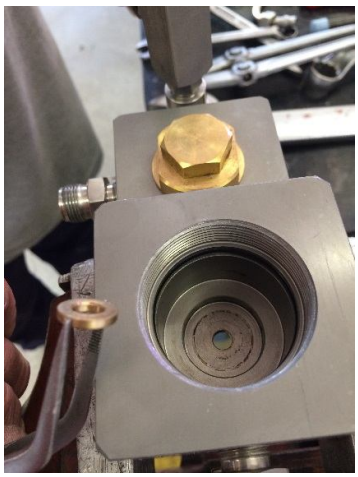
5) Remove the booster shaft (pos 34)

6) Release the diaphragm (item 10) by loosening the plate of the lower diaphragm (pos 43).

7) Now we will dismantle the bottom part of the booster. To do this, it is ideal to rotate the same so that the bottom faces upwards, proceed by removing the gasket holder (pos 47).

8) Release the gasket (pos 9) of the gasket holder (pos 47) and its respective O-ring (pos 22).

9) Remove the shaft guide (pos 40) and the thrust bushing (pos 41)

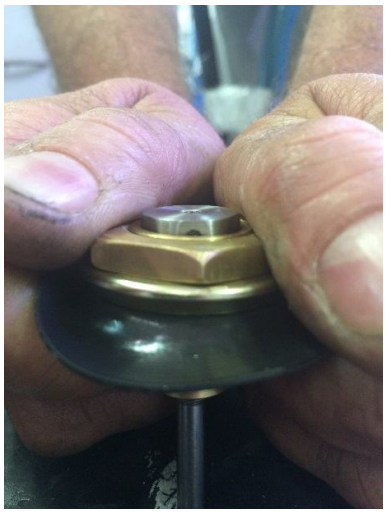


6.11 PROCEDURE FOR THE G-44 BOOSTER (PRE-REGULATOR) ASSEMBLY

To perform the assembly of the G-44 booster, just follow the steps of the disassembly procedure in inverse order starting with the seat assembly, but we shall make some observations on specific points that must be examined closely during the booster reassembly:

3) The booster model G-44 is only used in assemblies of the Urano SO (FO) and has a distinctive main valve connection scheme. For this reason, it is necessary to use an internal relief device to prevent rupture of both diaphragms, of the booster and of the main operating valve, due to the high differential pressure.

This internal relief is adjusted by the spring (pos 4) compression during assembly of the diaphragm set onto the shaft (pos 34), therefore, during assembly it is important to pay attention to this spring adjustment. GASCAT recommends a distance of 14.4 to 14.5 mm from the lower diaphragm plate (pos 43), but if the operator does not have means to carry out this measurement in the field, we recommend a visual adjustment to be made so that only half of the shaft holes (pos 34) remain visible when pressing the diaphragm assembly, as shown in the image below:



4) After assembly of all internals of the booster, when the same is to be shut by installing the cover and screws (pos 12), we recommend that during the screws' tightening the diaphragm assembly shall be pushed with an Allen key through the cover upper outlet (pos 8) so that the diaphragm can be properly fixed between the cover and the booster body.

TOOLS	DIMENSIONS
COMBINATION SPANNER	5/8”,3/4”, 1”, 1-1/8”, 2”, 13mm
ALLEN KEY	6mm, 1/4"
HOOK SPANNER	---