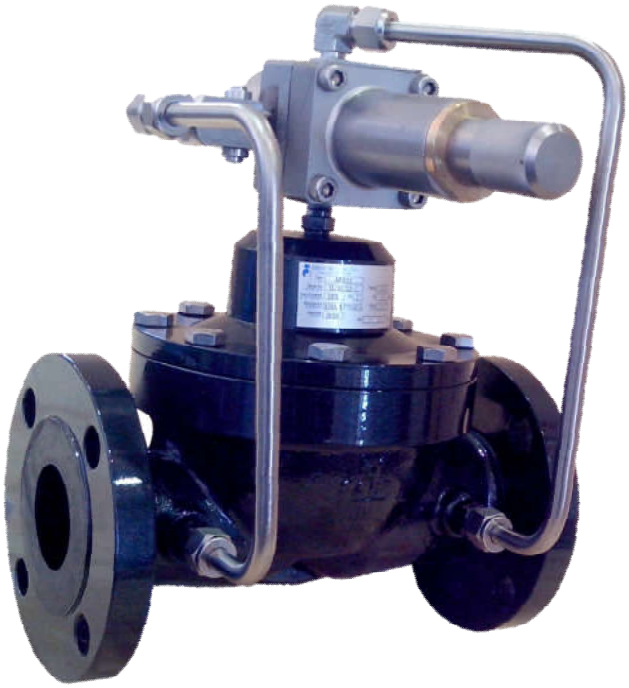
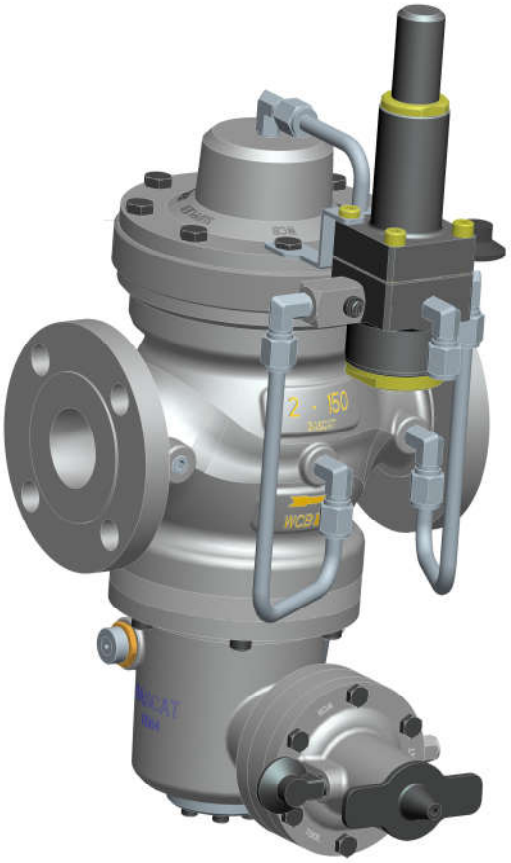
GASCAT

Installation, Operation & Maintenance Manual
Pressure Regulating Valve
Model ARGOS





GASCAT

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1.0 GENERAL WARNING

1.1 PRE-COMMISSIONING INSTRUCTIONS

It should be clearly understood that with these information hereby presented in the instructions for commissioning that follows, there is no intention to revenue or replace the instructions determined by any other organ or institute and should be done reference to the relevant Standards and/or recommendations existents over this subject.

Before any commissioning, it is understood that the execution of proper purification and cleanness procedures that shall be observed and all instructions about pressurization and standard of safety and health, should be strictly observed.

The valve suppliers recommendation, as for example, open slowly and open very slowly should 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:

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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 manual has the objective to provide information of operation, installation and maintenance about the pressure regulator model ARGOS manufactured by GASCAT.

2.2 DESCRIPTION

The pressure regulator model ARGOS is pilot operated type designed by Gascat engineering to assist different applications. It has large utilization in the Gas Distribution.

Outstanding by simplicity of operation and handling, facility of maintenance due of few internal parts and the relation cost-benefit.

2.3 SPECIFICATIONS

2.3.1 AVAILABLE CONFIGURATIONS

- Active / Monitor System
- Working Monitor System
- Flow Limiter by Orifice Plate

2.3.2 AVAILABLE CONNECTIONS

ND	FLANGE ASME B16.5	FLANGE DIN 2634 / 2635
1”	150#RF / 300#RF (Thread NPT Female only for 1’’)	PN 25 / PN 40
2”	150#RF / 300#RF	PN 25 / PN 40
3”	150#RF / 300#RF	PN 25 / PN 40
4”	150#RF / 300#RF	PN 25 / PN 40

Note: other diameters and connections should be previously consulted.

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”	13.5	420
2”	48	1500
3”	93	2900
4”	206	6400

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	ARGOS		ARGOS SSV	
	150#	300#	150#	300#
1”	11	11.5	-	-
2”	15	16	30	31
3”	28	29	43	44
4”	42	44	58	60

NOTE:
1) Approximate weights given in kilograms (Kg)
2) Consider the body in carbon steel SA-216 WCB

2.3.6 MAXIMUM WORK PRESSURE

150#	300#	PN 25	PN 40
19 bar	51 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 ARGOS can use three pilot models for pressure control G80, G30F or G32F. The table below presents the adjustment ranges of each model:

G80 PILOT		
SPRING COLOR	PART NUMBER	RANGE
WHITE	01.50.21G	60 - 220 mbar
BLACK	01.50.67	170 - 320 mbar
SILVER	01.50.21	230 - 400 mbar
GRAY	01.50.24	350 – 1100 mbar
G30F PILOT		
SPRING COLOR	PART NUMBER	RANGE
SILVER	01.49.61	0.7 - 2.8 bar
GREEN	01.49.65	2 - 5.5 bar
RED	01.49.34	4.5 – 14 bar
BROWN	01.49.33	7.0 - 18.3 bar
BLACK	01.49.59	14.0 - 32.0 bar
32F PILOT		
SPRING COLOR	PART NUMBER	RANGE
BLACK	01.49.59	14.0 - 36.6 bar

2.3.8 ACCURACY AND LOCK UP

Pressure Regulator:

AC up to 2.5%; SG up to 5%

2.3.9 – SLAM SHUT VALVE SPRING RANGE (SET-POINT)

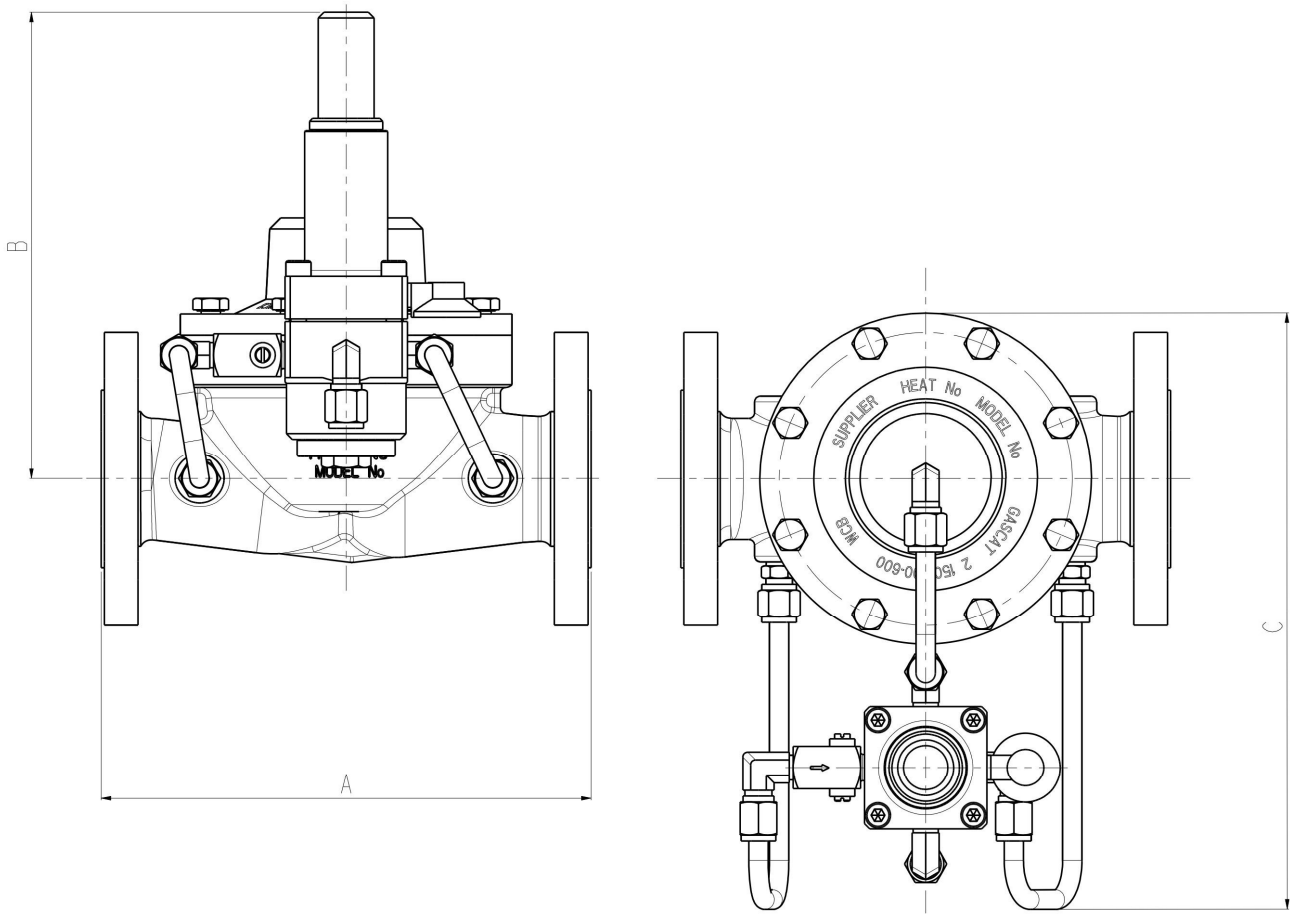
SSV – ACTUADOR H		
SPRING COLOR	**PART NUMBER**	**RANGE**
PURPLE	01.52.61	0.3 – 1.5 bar
RED	01.52.62	1.0 – 5.0 bar
YELLOW	01.51.54	4.0 – 11.0 bar
SSV – ACTUATOR PH		
SPRING COLOR	**PART NUMBER**	**RANGE**
BROWN	01.52.64	10.0 – 16.0 bar
ZINCATED	01.52.25	14.0 – 38.0 bar
WHITE	01.52.36	28.0 – 60.0 bar

2.3.10 – ACCURACY AND LOCK UP

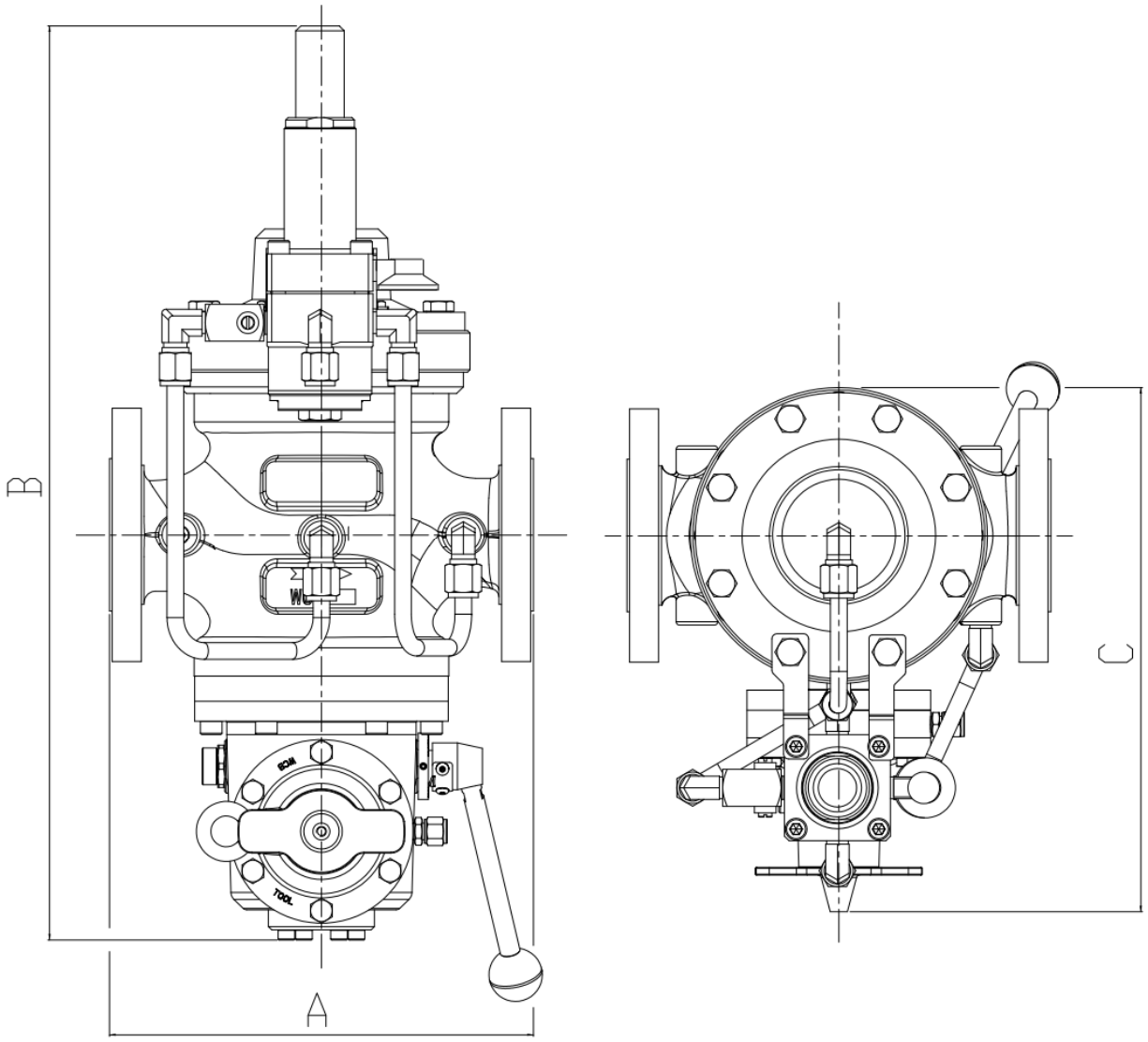
Pressure regulator: AC up to 2,5% / SG up to 5%

SSV: AG up to 5

2.3.11 PRESSURE REGULATOR DIMENSIONS



DIMENSIONS (mm)				
	A (RF)		B	C
ND	150# / PN16	300# / PN25, PN40	ANY CLASS	ANY CLASS
1”	184	197	222	230
2”	254	267	243	288
3”	298	317	318	340
4”	353	368	340	390
General Tolerance = ±2				



DIMENSIONS (mm)				
	A (RF)		B	C
ND	150# / PN16	300# / PN25, PN40	ANY CLASS	ANY CLASS
2”	254	267	550	300
3”	298	317	620	331
4”	353	368	703	410
General Tolerance = ±2				

3.0 - OPERATION PRINCIPLE

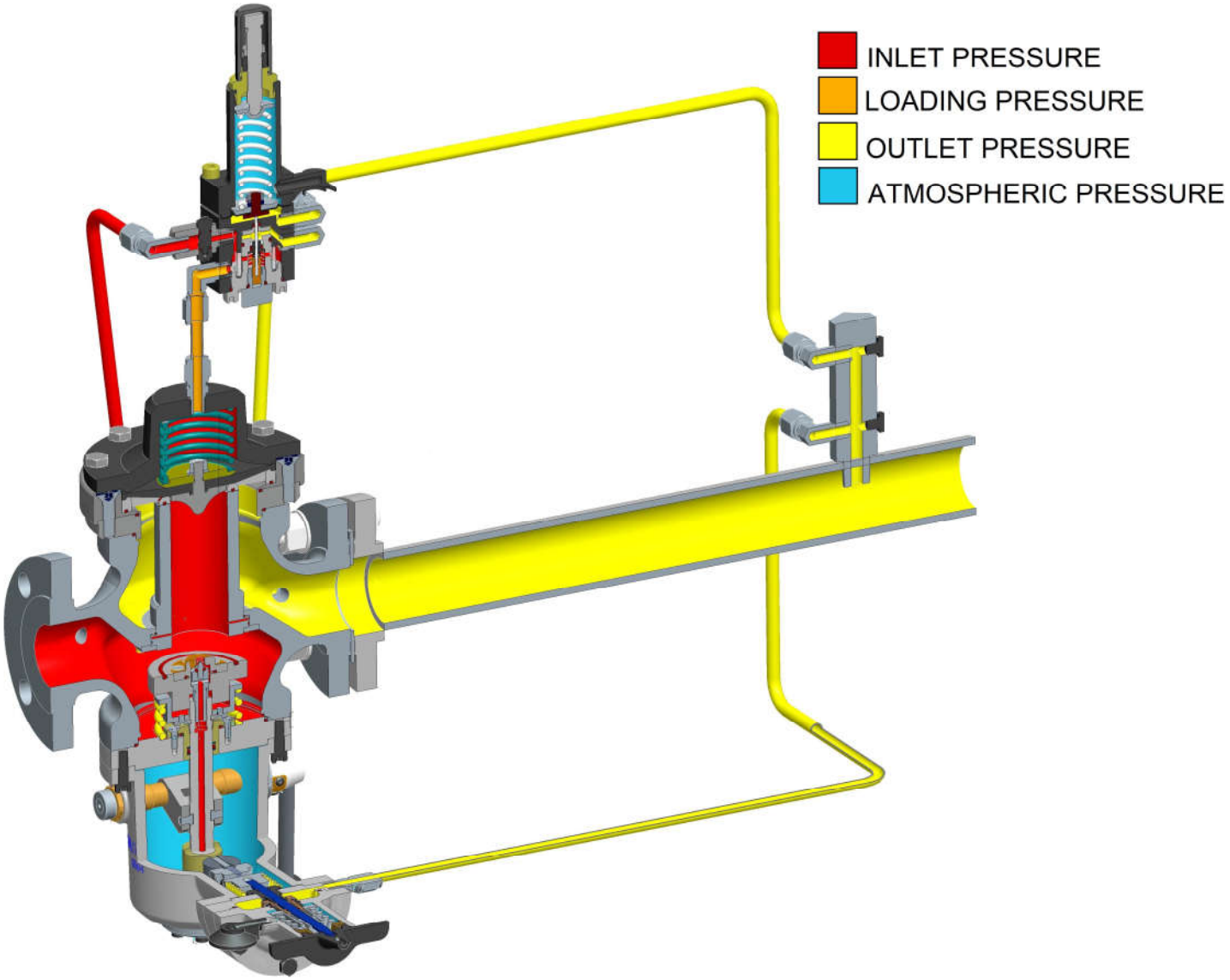
3.1 THE REGULATOR

The pressure regulator Argos works by principle of drop pressure in the upper chamber (diaphragm of main valve).

In the flow absence the pressure regulator stays close, because the pressure in the upper chamber of diaphragm (feed by the pilot), added to the spring force is superior to the pressure that acts below the diaphragm (inlet pressure).

The pilot, in this condition of flow absence, stays closed, because the outlet pressure added to obturator spring of pilot is superior to the regulating spring force, and moves the obturator set upward, against the pilot seat, closing the pilot gas passage.

In case of flow, the pressure in the sensing line start decreasing, causing the pilot opening because of the regulating spring of pilot added to the pressure under its diaphragm. In parallel, the discharge pressure also decreases. In this condition, occur the reducing of the pressure in the upper chamber of diaphragm of main valve. Then, the inlet pressure become superior to the spring force of main valve added to the pressure in the upper chamber of diaphragm of main valve, allowing that the main valve opens, releasing the gas to the process.



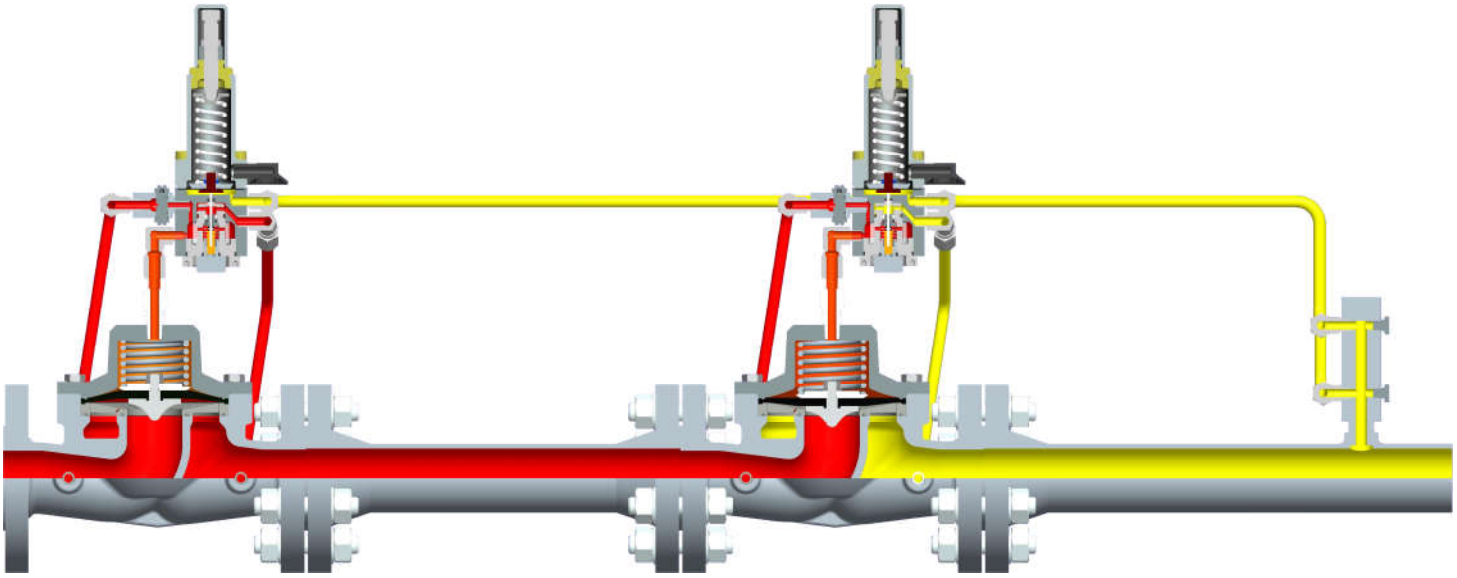
3.2 REGULATOR - ACTIVE / MONITOR SYSTEM

In the active / monitor system, the regulator working principle is similar then previously explained.

The upstream regulator (monitor) keeps in the open position, because the pilot sensing line monitors the active pressure regulator set point and, as its set point is lightly higher, the pilot keeps opened. The reason that this pilot stays opened is due of pressure under its diaphragm that added to the obturator spring that are lower than the regulating spring force that moves this obturator set downward opening the pilot.

With this, the pressure in the diaphragm upper chamber in the monitor regulator keeps lightly lower than the inlet pressure allowing the valve stays in the open position during normal process service conditions.

In case of active regulator fail that results in increase in outlet pressure, the pilot of monitor regulator start closing up to achieve the set point of this pilot, and then the monitor regulator can assume the control of pressure reduction in the system. From this moment, the working principle of this valve is similar then the active regulator.



The configuration of assemblage active / monitor is highly utilized in the gas distribution and transmission. This configuration is normally adopted when the difference between the inlet and outlet pressure is over than 16 bar and the strength pressure test in the pipe and other components upstream the regulator is inferior than the inlet pressure as specified, for example in the standard DIN EN 12186, in this case the objective of use of monitor regulator is to increase the system safety level.

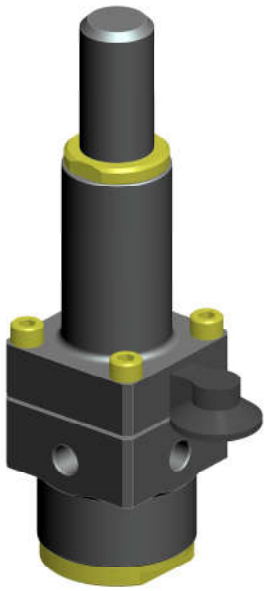
However, is important to remember that this is a recommendation of DIN EN 12186 and that there are other standards that specifies different conditions of use of active / monitor system.

The active / monitor system consists of utilization of two pressure regulators in series being one of them called active that will be in operation (regulating the pressure) under normal process service conditions and one monitor regulator that should stay totally open under normal process service conditions, and will assume the pressure regulating in case of active regulator fail.

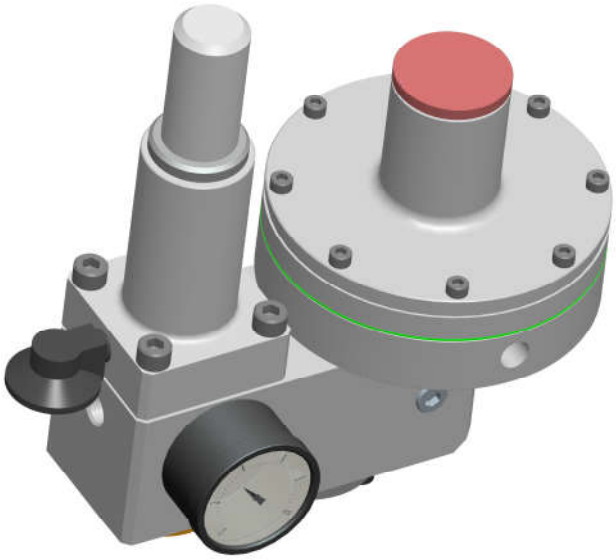
3.3 PILOTS

The pressure regulator model ARGOS manufacture by GASCAT use pilot model G80, G30F or G32F depending of the desired set-point.

This pilot is responsible by the control of feed pressure of main regulator actuator and by consequence of the pressure regulator aperture.



G30F/G32F PILOT



G80 PILOT

The set pressure of the G80 pre pilot It should be 0.8 bar more than the desired outlet pressure, for example if you want to adjust the valve in 0.5 bar, you must adjust your pre pilot in 1.3 bar. You can verify the pre pilot adjusted pressure in the pressure gauge connected to the pre pilot.

3.4 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 ARGOS 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.

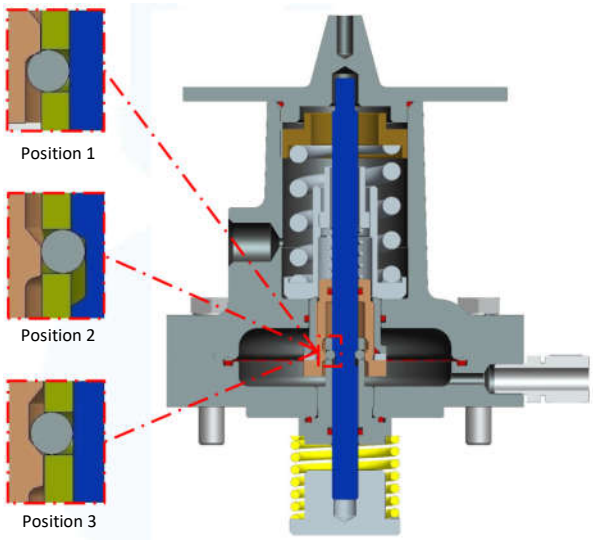
3.5 SECURITY SHUT-OFF VALVE

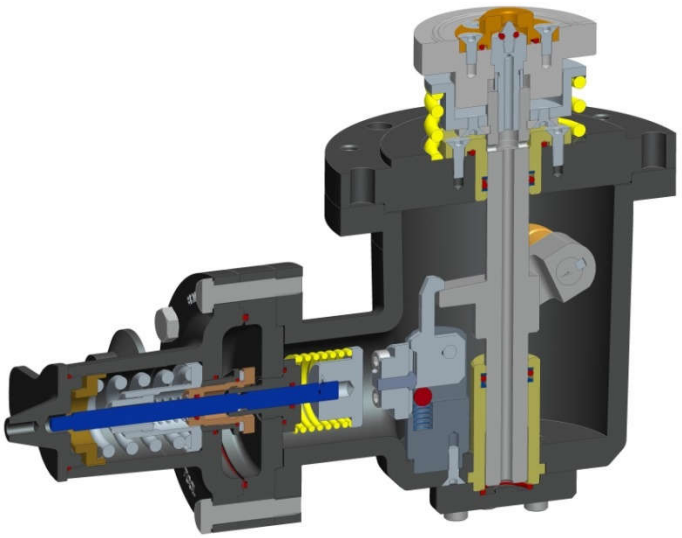
3.5.1 PH ACTUATOR & H ACTUATOR

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

3.5.2 – GENERAL RESET PROCEDURE

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

3.5.2.1 – 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.

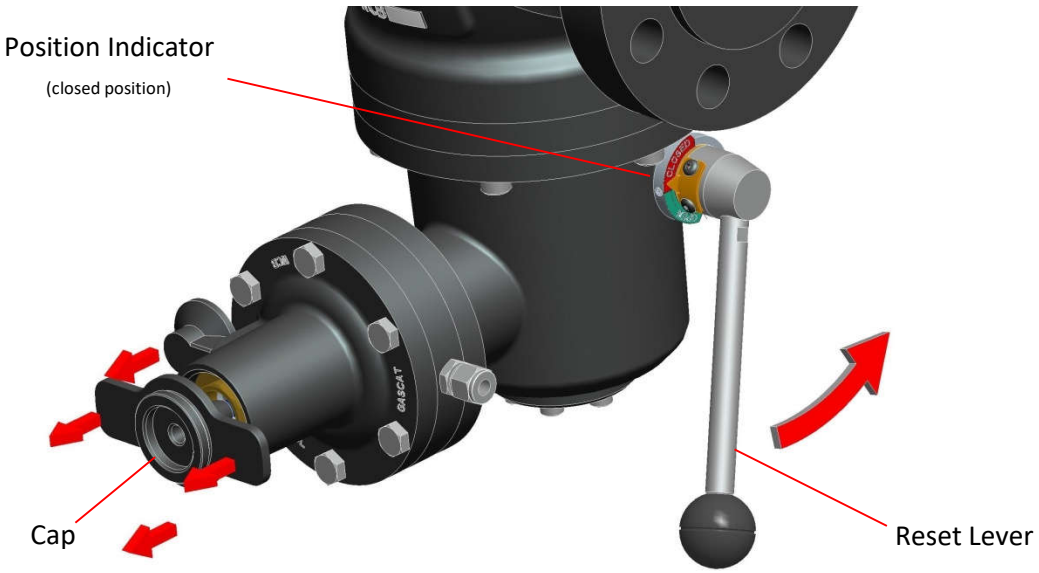
3.5.2.2 – PROCEDURE TO RESET VALVE IN CASE OF UNDER PRESSURE

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

3.5.3 – 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.



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.

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 proceed with installation it is necessary to verify if:

1) The equipment is with perfect conditions or have evidences of damage in function of handling during the transportation; in case of damage do not install it before contacting GASCAT.
2) The space foresee for access and installation of equipment is adequate, including future maintenance.
3) The installation was designed to support the charge (weight) of equipment.
4) The inlet and outlet connections where the regulator will be installed are perfectly aligned.
5) All sensing line needed in the pipe downstream the equipment were supplied and are respecting the recommended dimensions by the manufacturer.
6) It was foresee pressure gauge or other pressure indicator to allow correct setting during the commissioning and operation.
7) It was foresee venting line between the pressure regulator and first slam shut to assist the operator during the start up.
8) Flow direction of pressure regulator is in the adequate position.

4.4 SENSING LINE

The correct positioning of sensing line in the pipe is essential for correct working of pressure regulator, because of this install the sensing line of pilot distant of 5 times the nominal pipe diameter in a stretch free of obstruction, in a pipe size where the gas velocity do not exceed 25m/s (considering the lower outlet pressure and maximum flow).

To obtain better pneumatic signal, utilize tubings D.E ½" in stainless steel AISI 316 to connect the sensing line in the process.

In order to avoid accumulate particles and condensates in the sensing lines it is recommended to install it with inclination of 5%~10% to allow flow it to the main pipe.

Check the welded connections in the pipe to avoid it clogged, without any welding residue that can affect the pneumatic signal.

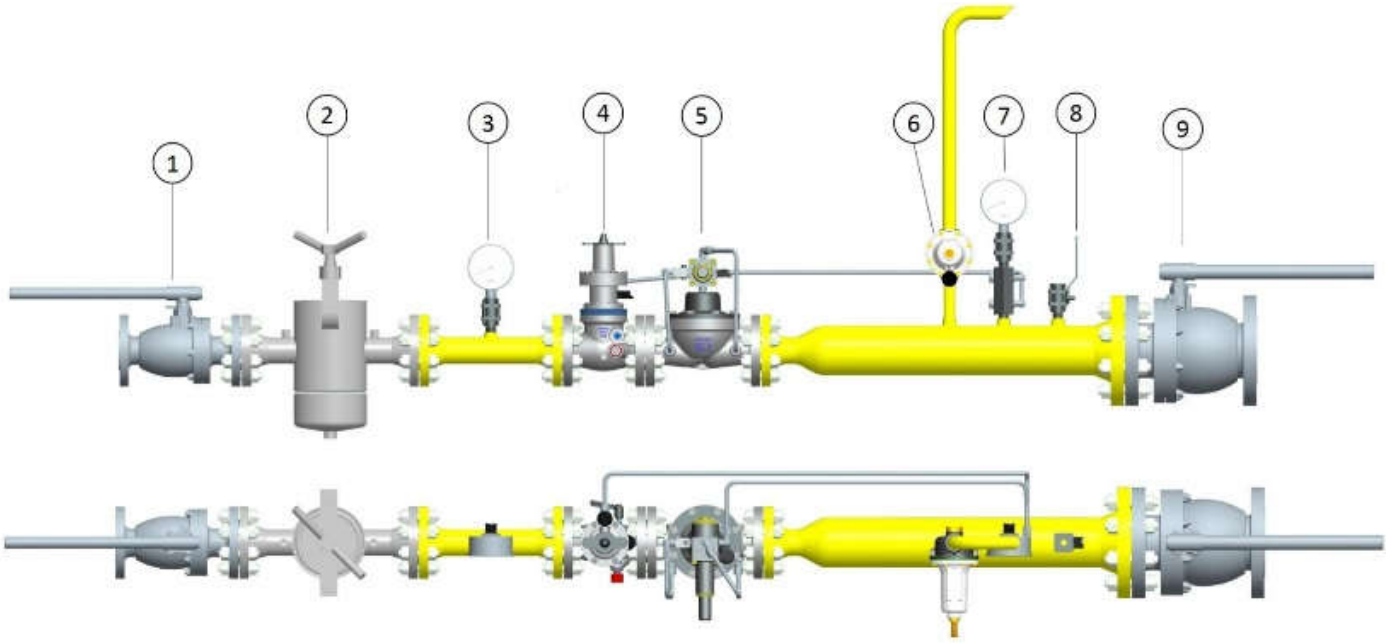
Do not install insulating valves in the sensing line of pressure regulators.

The pressure regulator model Argos needs only one connection to the process per valve, that is the sensing line of pilot, independently of system configuration (active / monitor, working monitor and only active regulator). Exception only for flow limiter that have two extra connections in the orifice plate.

The loading and discharge sensing lines are connected directly in the body.

4.5 RECOMMENDED INSTALLATION SCHEME

4.5.1 SINGLE REGULATOR

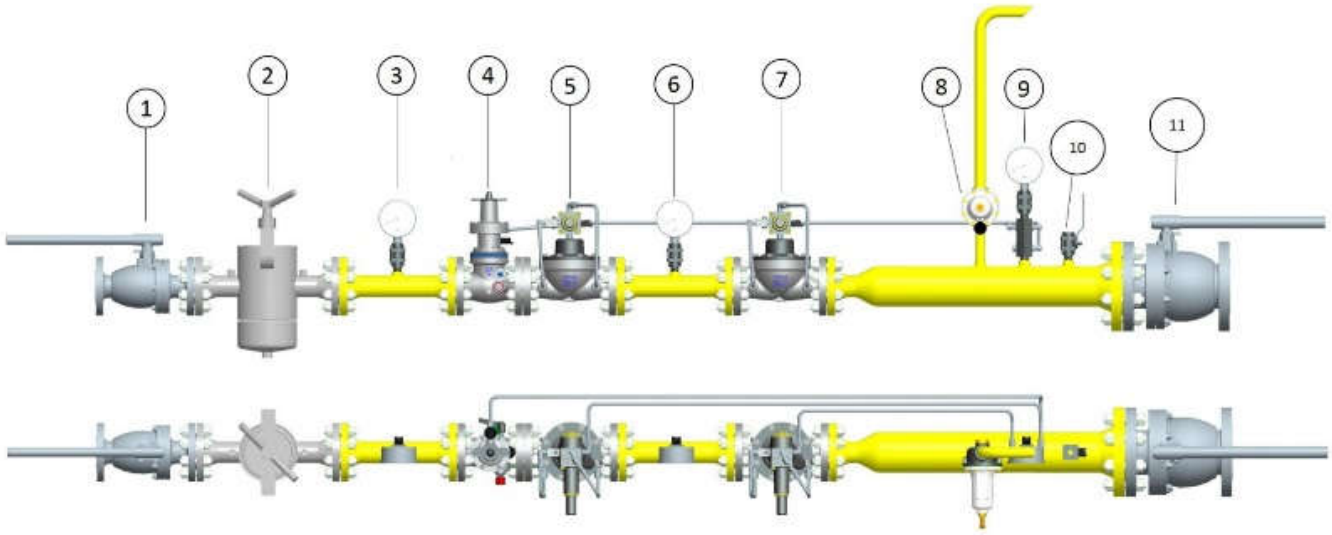


1 – Inlet ball valve (or similar)
2 – Cartridge filter Metrius with 5 micron
3 – Inlet pressure gauge
4 – Slam shut valve with fail close actuator model GIPS-FC
5 – Pressure regulator model ARGOS
6 – Partial pressure relief valve CH Relief
7 – Outlet pressure gauge
8 – Vent valve
9 – Outlet ball valve (or similar)

Notes:

1) The position of sensing line can be inferior than 5 times if the project of installation had been analised and approved by GASCAT engineering.
2) Other option of insllation is the utilization of a pipe in parallel to connect all sensing lines close of respective equipment. Some advantages of this configuration are:
    a. More practicity during maintenance.
    b. Pneumatic signal with better quality (stable).
    c. Reduction of damages in the tubings during maintenance and transport.

4.5.2 ACTIVE / MONITOR SYSTEM



1 – Inlet ball valve (or similar)
2 – Metrius cartridge Filter – 5 micron
3 – Inlet pressure gauge
4 – Slam shut valve with fail close actuator model GIPS-FC
5 – Monitor pressure regulator Argos
6 – Pressure gauge
7 – Active pressure regulator Argos
8 – Partial pressure relief valve model CH Relief
9 – Outlet pressure gauge
10 – Vent valve
11 – Outlet ball valve (or similar)

Notes:

1) The position of sensing line can be inferior than 5 times if the project of installation had been analised and approved by GASCAT engineering.
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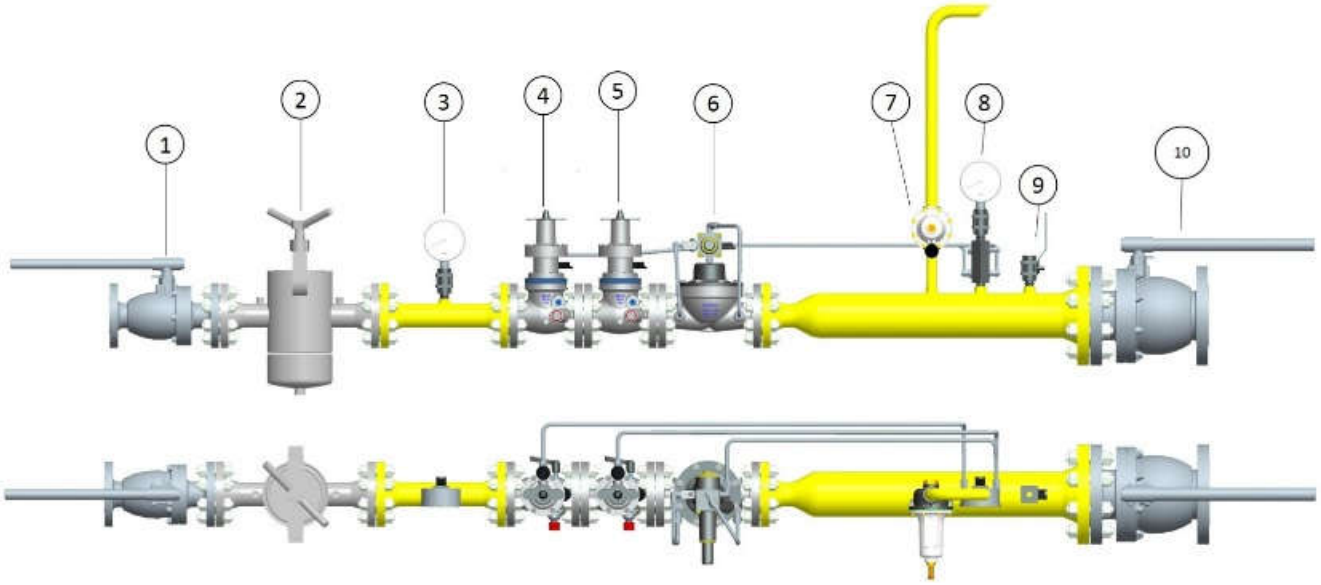
4.5.3 SYSTEM WITH TWO SSV AND ONE REGULATOR

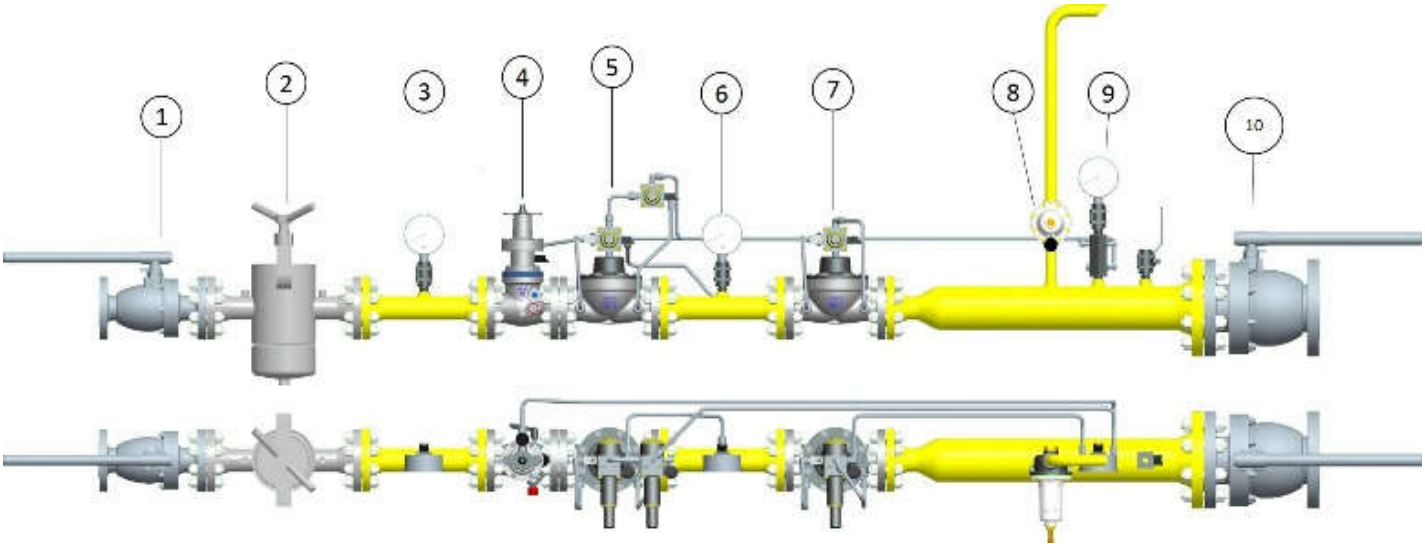


1 – Inlet ball valve (or similar)
2 – Metrius cartridge Filter – 5 micron
3 – Inlet pressure gauge
4 – Slam shut valve with fail close actuator model GIPS-FC
5 – Slam shut valve with fail close actuator model GIPS-FC
6 – Active pressure regulator model ARGOS
7 – Partial pressure relief valve model CH Relief
9 – Outlet pressure gauge
9 – Vent valve
10 – Outlet ball valve (or similar)

Notes:

1) The position of sensing line can be inferior than 5 times if the project of installation had been analised and approved by GASCAT engineering.
2) Other option of insllation is the utilization of a pipe in parallel to connect all sensing lines close of respective equipment. Some advantages of this configuration are:
    a. More practicity during maintenance.
    b. Pneumatic signal with better quality (stable).
    c. Reduction of damages in the tubings during maintenance and transport.

4.5.4 WORKING MONITOR SYSTEM



1 – Inlet ball valve (or similar)
2 – Metrius cartridge Filter – 5 micron
3 – Inlet pressure gauge
4 – Slam shut valve with fail close actautor model GIPS-FC
5 – Pressure regulator valve model ARGOS WORKING MONITOR (1st stage of pressure reduction)
6 – Pressure gauge
7 – Pressure regulator valve model ARGOS (2nd stage of pressure reduction)
8 – Partial pressure relief valve model CH Relief
9 – Pressure gauge
9 – Vent valve
10 – Outlet ball valve (or similar)

Notes:

1) The position of sensing line can be inferior than 5 times if the project of installation had been analised and approved by GASCAT engineering.
2) Other option of insllation is the utilization of a pipe in parallel to connect all sensing lines close of respective equipment. Some advantages of this configuration are:
    a. More practicity during maintenance.
    b. Pneumatic signal with better quality (stable).
    c. Reduction of damages in the tubings during maintenance and transport.

4.6 COMMISSIONING AND START-UP

4.6.1 GENERAL RECOMMENDATIONS

Before proceeding with the commissioning of equipment is important:

1) Verify if the equipment is correctly installed according to recommendations of this manual.
2) Close the inlet, outlet, by-pass valves, when applicable, of each stream.
3) Open the downstream vent valve of last regulator installed in the respective stream.
4) Certify that the Skid is depressurized.

ATTENTION:

* Under no hypotheses proceed with stream pressurization where the equipment is installed by downstream valve.

* Under no hypotheses proceed with depressurization of stream where the equipment is installed by the last valve located upstream the equipment, as filter drain, for example.

5) Verify if all connectors are properly installed before proceed with stream pressurization.
6) Verify if all equipment are installed adequate to the process conditions, through information provided in the equipment nameplate.
7) Verify if the SSV (slam shut valve) is closed.

The SSV are released to the field calibrated, however, because of transport conditions and handling of equipment its set point can be changed.

Then, it Gascat recommends to check the using external pneumatic source connected directly in the actuator, before proceeding the stream pressurization.
The regulator model Argos is not supplied adjusted. It tends to preserve the life time of internal parts. So that it is necessary to adjust the regulator prior to operation.

The configuration of Pressure Regulating Skid shall be according to DIN EN 12186 / NBR 12712 and other standards where it will be installed.

4.6.2 COMMISSIONING (SINGLE REGULATOR - STREAM)

Utilizing as reference the scheme showed in item 4.5.1, proceed with the descriptive indicate for commissioning of pressure regulator model ARGOS in a single stream, considering that all recommendations of item 4.6.1 were already observed.

The procedure considers the utilization of slam shut valve model GIPS-FC GASCAT as safety device.

1) Close the vent valve.
   As the slam shut valve is closed it is necessary to utilize the vent to simulate a low flow and then proceed with regulator adjustment before align the stream.
2) Verify if the regulating spring of pilot is with no charge (with no charge).
   Releasing the spring the valve will stay closed during pressurization.
3) Verify if the restrictor installed in the pilot inlet, loading sensing line, is opened between 30%~70%.
4) Open **SLOWL AND GRADUALLY** the inlet ball valve of Skid, or when the skid is adopted of by-pass in the ball valve utilize it to pressurize the stream.
5) As there is no pressure upstream the regulator the slam shut valve is blocked (fail close type). Keep the by-pass or push button (located in the SSV body) to pressurize the line between the slam shut valve and the pressure regulator.

6) Still pressing the by-pass or push button of slam shut valve; turn slowly the regulating screw of pilot of regulator in order to allow a low pressure. Utilize the gauge to check the pressure increase and adjust the regulator set point up to 20% of low set point of slam shut valve.
7) Since the actuator of slam shut valve is already pressurized release the by-pass or push button to reset the actuator.

8) Reset the obturator of slam shut valve using the respective lever.
9) Open the vent valve around 20% and check if set point keeps adjusted.
10) Turn the regulating screw clockwise to increase the outlet pressure to achieve desired set point.
11) If the pressure is oscillating use the restrictor.
12) Once the pressure is adjust open the vent valve and check the set point.

RECOMMENDED SET POINTS			
Main Regulator (PS)	Stand by Regulator	Relief Valve	SSV
0.7 – 5 bar	PS x 1,15	PS x 1,4	PS x 1,5
4.5 – 18 bar	PS x 1,10	PS x 1,2	PS x 1,3
14 – 36 bar	PS x 1,05	PS x 1,2	PS x 1,3

13) After adjusted the set point close the vent valve and check lock up of regulator.
14) Verify the leak in connectors and other fittings.
15) Open **SLOW AND GRADUALLY** the outlet ball valve to start the stream operation.
16) If necessary, make thin adjustment using the regulating spring of pilot.

4.6.3 STAND BY LINE ADJUSTMENT

When the pressure regulator is installed in a stand by line Gascat recommends to realize the same procedure of item 4.6.2, however the regulator set point shall be 15%~20% less than the regulator set point of working line.

After this step, open **SLOW AND GRADUALLY** the outlet ball valve to allow the outlet pressure of working stream equalize with the stand by line; the stand by regulator will remain closed.

To allow the stand by regulator assumes the pressure regulating, the respective pilot regulating spring shall be turned clockwise slowly up to achieve set point lightly over than the set point of working stream; in this case such regulator will open slowly and assumes the operation.

It is important that both regulators keep with difference of set point at least of 5%~10% avoiding over position of set point causing looping between the lines; it means that one regulator open, suddenly the other one, resulting in non-precision pressure regulating.

4.6.4 COMMISSIONING (ACTIVE MONITOR SYSTEM)

Utilizing as reference the assemblage scheme of item 4.5.2 let proceed with descriptive indicate for commissioning of ARGOS regulator in one stream where the configuration is the active / monitor system, considering the recommendations of item 4.6.1 were fully observed.
The procedure consider the slam shut valve model GIPS-FC GASCAT and ARGOS pressure regulator.

1) Close the vent valve.
As the ball valves are supposed to be closed, then utilize the vent valve to simulate a low flow and then proceed with set point adjustment.
2) With the line still depressurized press the regulating spring of pilot of active regulator and release completely the pilot spring of monitor regulator.
Releasing the regulating spring the monitor regulator will keep in the closed position and pressing the pilot spring of active regulator it will allow the regulator stays in open position when pressurized.
3) Verify if the restrictors installed in the inlet of pilot are opened around 30%~70%.
4) Open **SLOW AND GRADUALLY** the inlet ball valve or when there is a by-pass for such valve utilize it to pressurize the Skid.

5) As there is no pressure downstream the regulator the slam shut valve GIPS-FC will be closed. So that press the by-pass or push button in the slam shut valve to pressurize the line between the slam shut valve and the pressure regulator.
6) Still using the by-pass or push button of SSV, charge slowly the regulating spring of pilot in the monitor regulator in order to admit a small pressure downstream of both regulators. Utilize the gauge to check increase in pressure and adjust it at least 20% above of under pressure shut down.
7) As the SSV actuator will be pressure relase the by-pass or push button and reset the actuator.
8) Reset the obturator of GIPS-FC using the respective lever.
9) Open the vent valve around 20% and check if set point is still the same.
10) Turn the regulating screw clockwise of monitor regulator pilot to achieve the desired set point. Then the monitor regulator will start operating.
11) In case of outlet pressure variation check the restrictor installed in the inlet of pilot.
12) With the pressure stable open the vent valve and check the set point.
13) If the set point is correct, close the vent valve in order to check the lock up of monitor regulator.
14) With the set point of monitor regulator correct release slowly the regulating spring of active regulator counter-clockwise reducing the respective set point.
15) Adjust the active regulator set point at least 0.5 kgf/cm²g lower than the set point of monitor regulator in order to allow it to stay totally open in only the active regulator will keep working.
16) At this moment, the active regulator will work and the monitor regulator will be totally opened waiting for a possible failure of active one to work.
17) If the outlet pressure is oscillating, proceed a thin adjustment using the pilot restrictor.
18) With pressure stable open the vent valve and check the set point.
19) If the pressure is correct close the vent valve and check the lock up of active regulator.
20) While checking lock up a new simulation of stop in gas consumption by user, that is a normal condition and in this case, both valves shall close.
21) Check if there is any leak.
22) Open **SLOW AND GRADUALLY** the outlet ball valve to pressurize the line.
23) If necessary, proceed with thin pressure adjustment using pilot and restrictor installed on it.

4.6.5 STAND BY STREAM ADJUSTMENT (ACTIVE / MONITOR SYSTEM)

When the pressure regulator is installed in a stand by line with active / monitor configuration it is recommended that same procedure informed in item 4.6.4 had been done, however the set point of active regulator of stand by stream shall be adjusted around 15% – 20% lower than the set point of regulator of working stream.
Open **SLOW AND GRADUALLY** the outlet ball valve to allow the downstream pressure of regulator in the stand by stream equalize with the pressure of working stream; the stand by regulator will remain closed.
To make the regulator of stand by stream assumes the regulating turn clockwise the regulating spring of active regulator up to achieve the set point over than the working regulator; then the stand regulator will open and assume the operation.
It is important that both regulators keep with difference of set point at least of 5%~10% avoiding over position of set point causing looping between the lines; it means that one regulator open, suddenly the other one, resulting in non-precision pressure regulating.

SET POINTS RECOMMEDED TABLE				
Main Active Regulator (PS)	**Stand By Active Regulator**	**Monitor Regulator**	**Relief**	**SSV**
0.7 – 5 bar	PS x 0.9	PS x 1.15	PS x 1.4	PS x 1.5
4.5 - 18 bar	PS x 0.9	PS x 1.10	PS x 1.2	PS x 1.3
14 – 36 bar	PS x 0.95	PS x 1.05	PS x 1.2	PS x 1.3

Note: the values informed in the table above are recommendations based on good practices; however, the set points can be changed if previously consulted and approved by GASCAT Engineering.

4.6.6 COMMISSIONING (WORKING MONITOR SYSTEM)

Utilizing as reference the assemblage scheme presented on item 4.5.4 proceed with descriptive indicate for commissioning of ARGOS pressure regulators in a stream where the configuration is working monitor, considering that the recommendations realized in the item 4.6.1 were totally observed.
The procedure considers utilization of slam shut valve model GIPS-FC and pressure regulator model ARGOS.

1) Close the vent valve.
   As the ball valves of skid are closed utilize the vent valve to simulate a low flow and then proceed with adjustment of pressure regulator.
2) With the line still pressurized turn clockwise the regulating spring of pilot of second stage pressure regulator; and counter-clockwise the spring of override (extra) pilot of the regulator of first stage. It will make the regulator remain in the closed position.
3) Verify if the restrictor installed in the inlet of pilot is open around 30%~70%.
4) Open **SLOW AND GRADUALLY** the inlet ball valve or when the skid has by-pass utilize it to pressurize the line.
5) Since there is no pressure downstream the regulator the slam shut model GIPS-FC is closed. So that, press the by-pass or push button of slam shut valve to pressurize the line between the slam shut and pressure regulator.
6) Still using the by-pass or push button of SSV turn clockwise the regulating spring of monitor regulator to admit a small pressure downstream of both regulators. Use the pressure gauge to check it and adjust the regulator at least 20% above set point of under shut down of SSV.
7) As the actuator is already pressurized release the by-pass or push button and reset the actuator.
8) Reset the obturator of slam shut valve model GIPS-FC using the respective lever.
9) Open the vent valve 20% and check if the pressure is still the same.
10) Turning clockwise the regulating spring of override (extra) pilot of first stage pressure regulator to increase the set point up to desired value.
    In this case, only the first stage pressure regulator will be in operation.
11) In case of outlet pressure variation open or close the restrictor installed in the inlet of pilot.
12) Since the pressure is stable, open the vent valve and check the set point.
13) If the pressure is correct, close the vent valve and check lock up.
14) Since the set point was achieved turn counter-clockwise the regulating spring of pilot of second stage pressure regulator to allow it regulate the pressure.
15) Adjust set point of second stage pressure regulator at least 0.5 kgf/cm²g lower than override (extra) pilot of first stage pressure regulator to allow the regulator remain totally open and only the second stage pressure regulator works.
16) In case of outlet pressure variation open or close the restrictor installed in the inlet of pilot.
17) Since the pressure is stable, open the vent valve and check the set point.
18) If the pressure is correct, close the vent valve and check lock up.
19) Turn counter-clockwise the regulating spring of main pilot of first stage pressure regulator up to set point desired to allow such regulator assume the regulating pressure. In this moment, the pressure regulating skid will reduce the pressure in two stages.
20) Verify if there is any leak in the connectors and fittings.
21) Open **SLOW AND GRADUALLY** the outlet ball valve to pressurize the skid completely.
22) If necessary, proceed with thin pressure adjustment using pilot and restrictor installed on it.

4.6.7 LIST OF RECOMMENDED TOOLS

To carry out commissioning set point adjustments and start-up of the GASCAT's regulators model ARGOS 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" and 4"	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: sales@gascat.com.br

PROBLEM	CAUSE	CORRECTION
Non-good Working, Outlet Pressure Variation	Low Flow (less than 5% of maximum flow capacity).	Check operating conditions and reestablish the flow conditions to the equipment was sized.
	Sensing line wrong installed	Fix the sensing line installation as informed in this manual, or contact GASCAT engineering.
	Regulator response non compatible with the system	Adjust the restrictor installed in the inlet of pilot.
Direct Passge	Obturator or seat of pilot damaged	Check the obturator and seat integrity replace it or clean it if necessary.
	Diaphagm rupture of main valve	Check it and replace it.
	Sensing line damaged	Check sensing line integrity and replace it if necessary.
Outlet pressure dorp and/or insuficiente flow	Filter elemento clogged	Clean it or replace it.
	Lack of feed	Check if seat of pilot is blocked.
	Main diaphragm passage	Replace it.
Gas in the pilot vent	Diaphragm rupture	Replace it.

6.0 MAINTENANCE

It is essential to perform preventive maintenance of pressure regulators' model ARGOS 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 ARGOS containing the most likely items to wear with time; this list of components is given in this manual for users guiding.

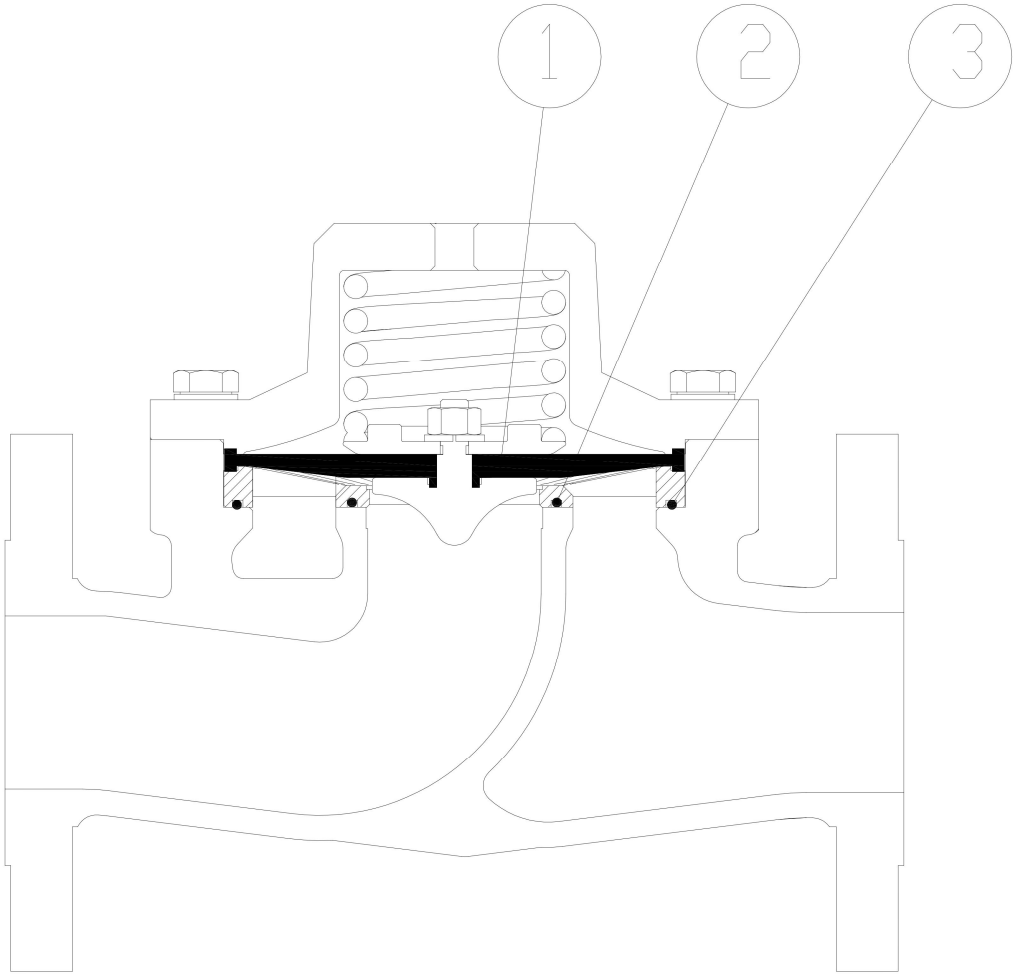
ATTENTION:

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.

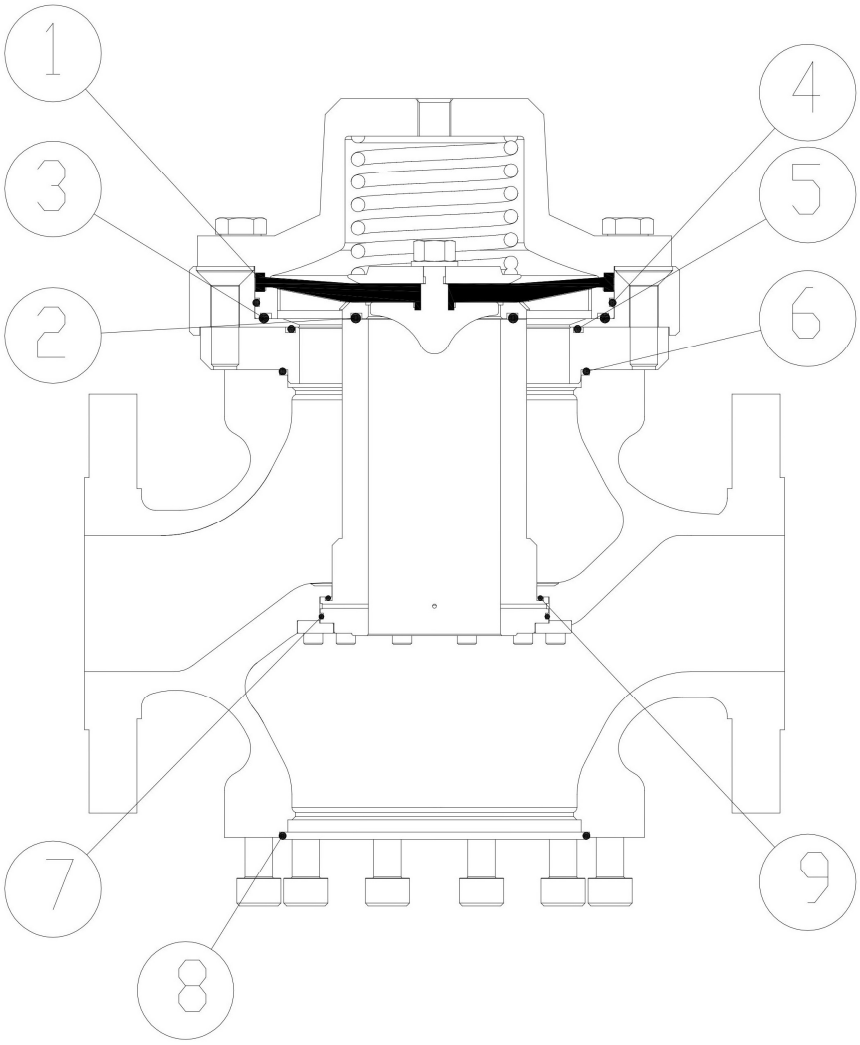
GASCAT takes no responsibility for the operation of equipment using non-original components.

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.

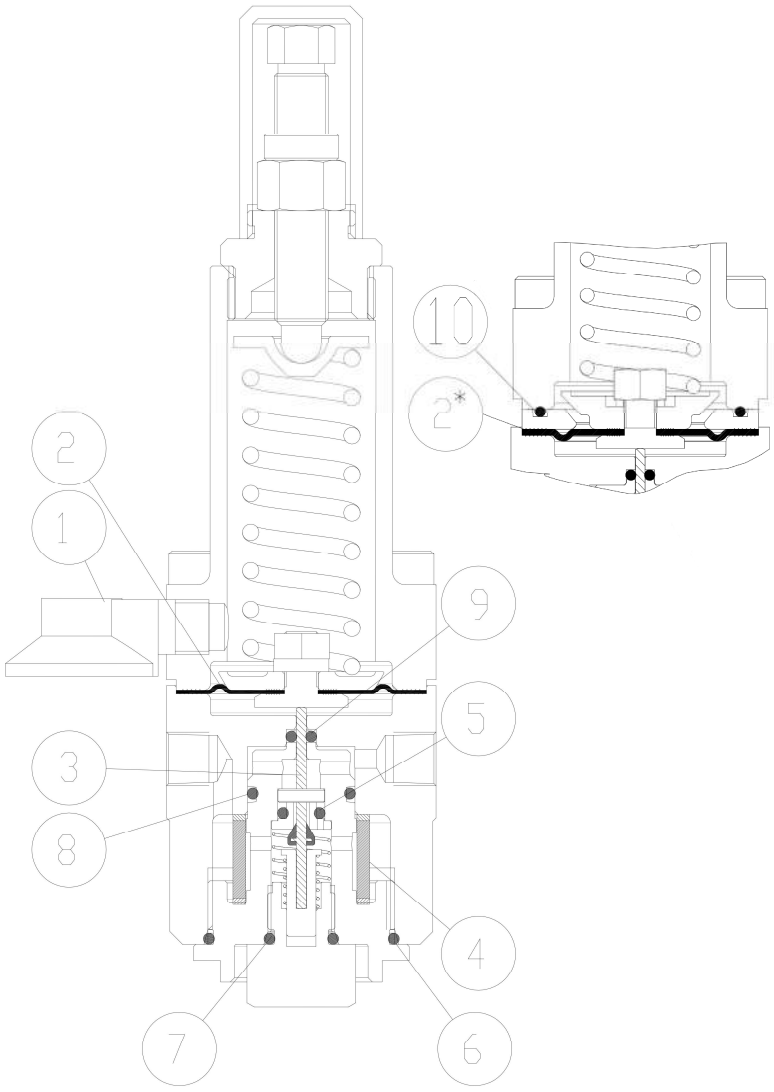
6.1 RECOMMENDED REPAIR PARTS AND KITS



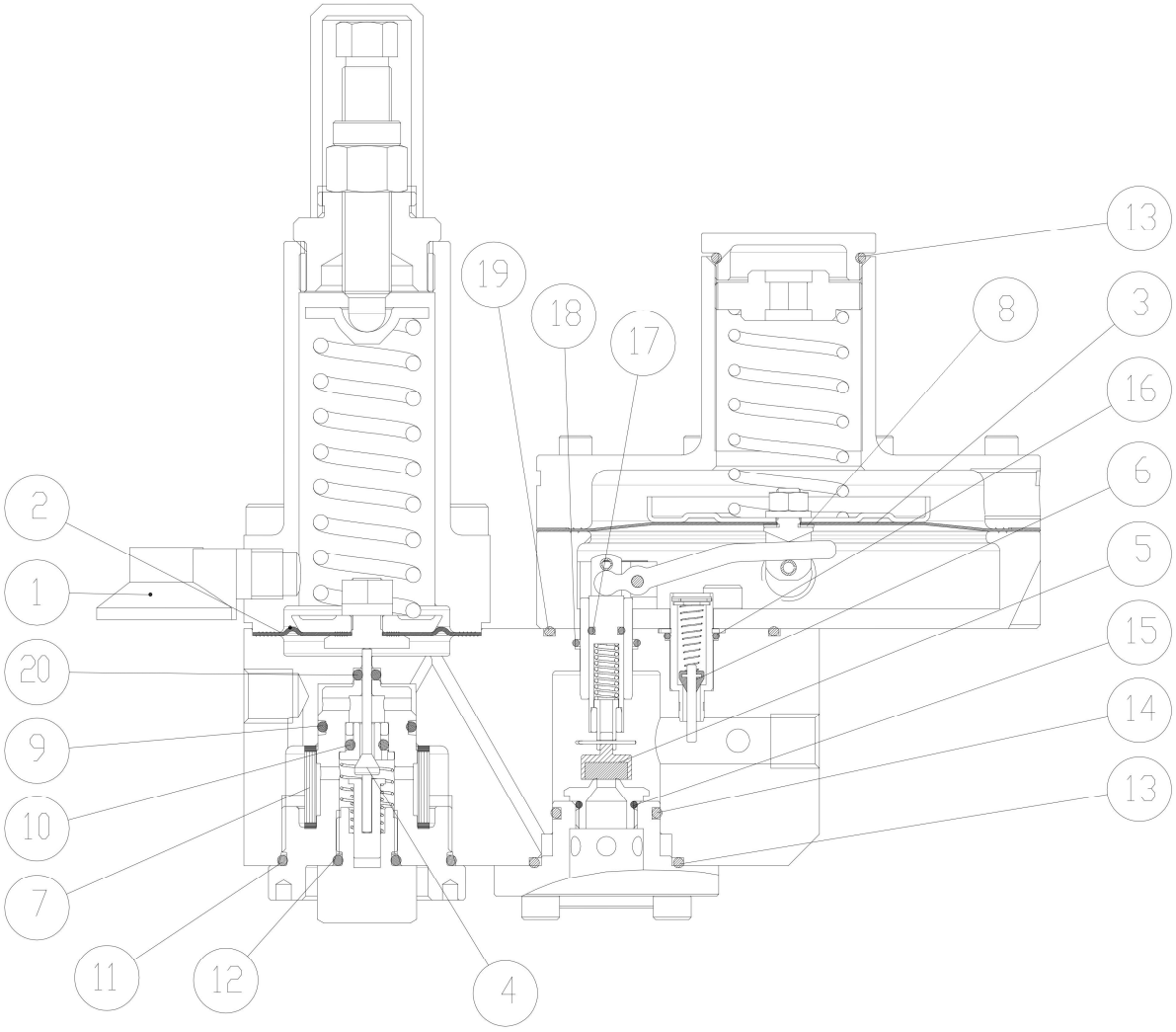
ARGOS		
POS.	DESCRIPTION	QTY
1	DIAPHRAGM	1
2	O'RING	1
3	O'RING	1



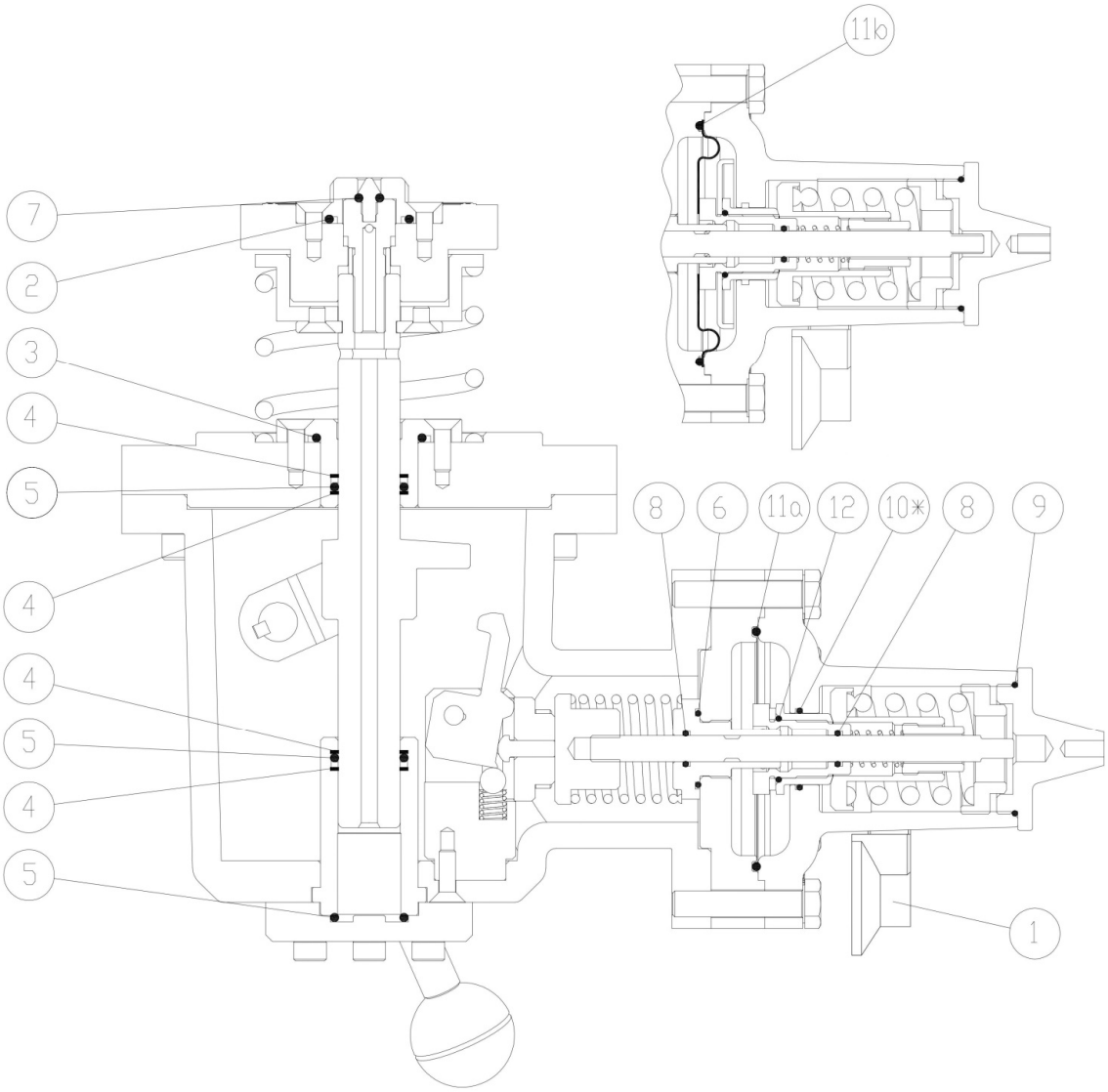
ARGOS SSV		
POS.	**DESCRIPTION**	**QTY**
1	DIAPHRAGM	1
2	O'RING	1
3	O'RING	1
4	O'RING	1
5	O'RING	1
6	O'RING	1
7	O'RING	1
8	O'RING	1
9	O'RING	1



G30F/G32F PILOT		
POS.	**DESCRIPTION**	**QTY**
1	RELIEF	1
2	DIAPHRAGM	1
3	SHUTTER	1
4	FILTER ELEMENT	1
5	O'RING	1
6	O'RING	1
7	O'RING	1
8	O'RING	1
9	O'RING	1



PILOT G-80					
POS.	**DESCRIPTION**	**QTY**	**POS.**	**DESCRIPTION**	**QTY**
1	RELIEF	2	11	O'RING	1
2	DIAPHRAGM	1	12	O'RING	1
3	DIAPHRAGM	1	13	O'RING	2
4	SHUTTER	1	14	O'RING	1
5	SHUTTER	1	15	O'RING	1
6	INTERNAL RELIEF	1	16	O'RING	1
7	FILTER ELEMENT	1	17	O'RING	1
8	GASKET	1	18	O'RING	1
9	O'RING	1	19	O'RING	1
10	O'RING	1	20	O'RING	1



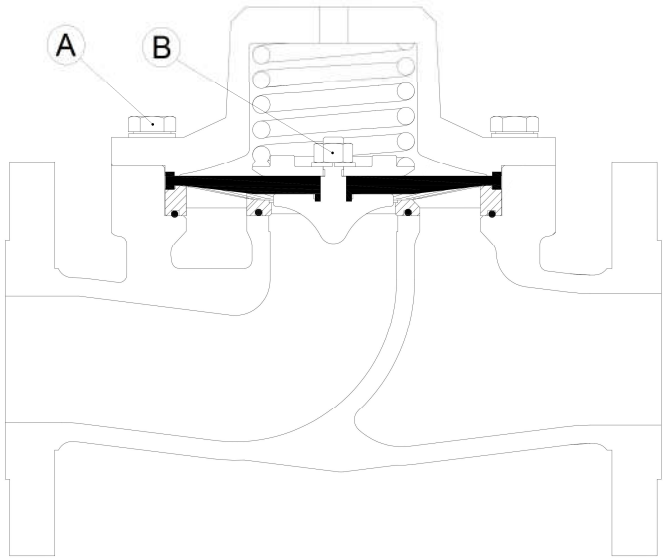
Actuator SSV					
POS.	**DESCRIPTION**	**QTY**	**POS.**	**DESCRIPTION**	**QTY**
1	RELIEF	1	8	O'RING	1
2	O`RING	1	9	O'RING	1
3	O`RING	1	10*	O'RING	2
4	PARBAK RING	1	11a	O`RING	1
5	O`RING	1	11b	DIAPHRAGM	1
6	O`RING	1	12	O'RING	1
7	O`RING	1	-	-	-

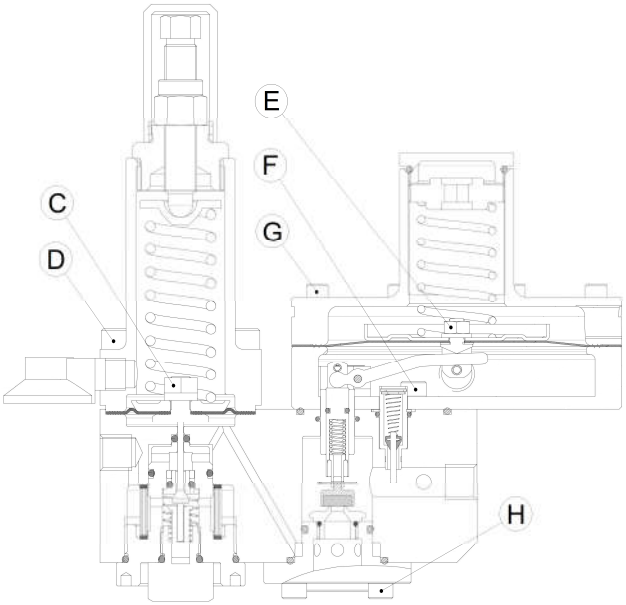
Note:
1) The item pos. 10 is not applicable to the H Actuator.
2) The item pos. 11a is just applicable to the PH version and the item 11b is just applicable to the H version.

6.2 RECOMMENDED TOQUES

When tightening fasteners arranged in a circular pattern, alternate the tightening of each fastener with the fastener directly across from it using a “star” criss-cross pattern for five times, until proper specified torque is achieved. Each time around, when all screws are tightened to the required torque, the diaphragm will compress a little until the plates are in direct, metal-to-metal, contact. It will take at least five times around before this happens. Only then will the applied torque on each screw remain at the required value.

The screws “C” and “D” is also applicable in G30F/G32F models.





ARGOS		
ND	Screw	Torque [lbf.ft]
1	A	23
	B	15
2	A	33
	B	15
3	A	38
	B	25
4	A	50
	B	30

Screw	Torque [lbf.ft]
C	15
D	15
E	10
F	10
G	5
H	10