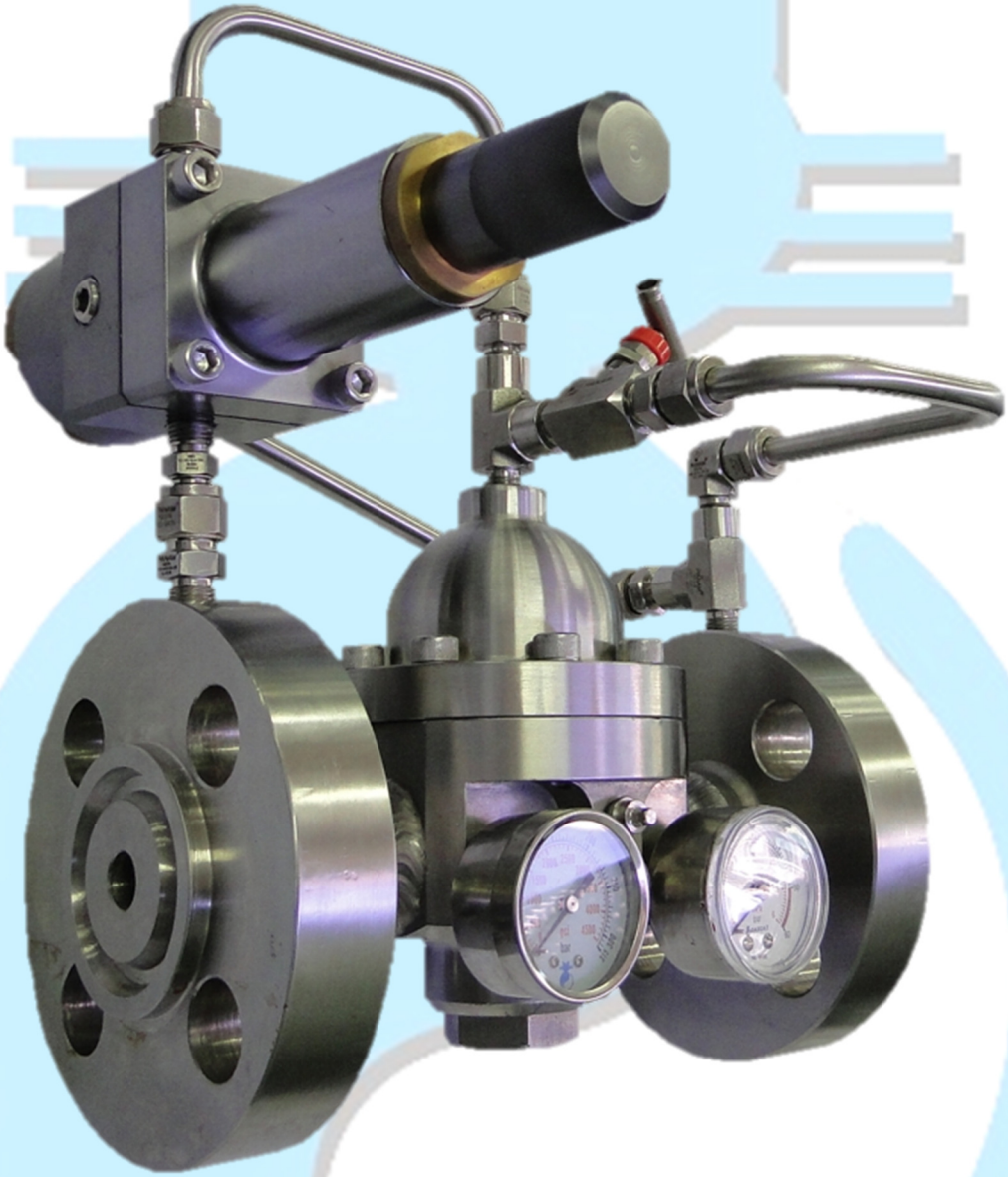
GASCAT

Installation, Maintenance and Operation Manual
Pressure Regulator Valve
Model DOMUS



GASCAT

INDEX

1.0 - GENERAL ADVERTSIMENT

1.1 – INSTRUCTIONS PRIOR COMMISSIONING

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 AND SAFETY

Regulators, valves and other pressurized components that contain toxic, flammable gases, or other dangerous products, are potentially dangerous if not operated and kept correctly. It is imperative that all users of such equipment had been adequately educated and oriented for the potential hazards and certified that the responsible personnel for the installation, test, commissioning, operation and maintenance of factory are competent to do this job. The instruction manuals are provide for orientation of users, but presume that they have a basic knowledge level. In case of any doubt or ambiguity that affect the correct procedure, ***GASCAT*** must be contacted in order to inform or offer the service and instruction. **DO NOT TAKE THE RISK.** The phone numbers and email for contact are described below:

Gascat Indústria e Comércio Ltda.
Rodovia SP 73, 1141 – Indaiatuba / São Paulo.
CEP 13347-990
Phone: +55 19 3936-9300
Fax: +55 19 3935-6009
Email: sales@gascat.com.br

The following commentaries, while not exaustive, provide orientation of possible hazard sources against the heath and safety.

1.2.1 – NOISE

Regulators, valves and other pressure regulators can generate high noise level, which can be prejudicial for people exposed for long period. The users should assure that adequate precautions was take in order to foresee security for the health of employees, according to the standards and recommendations.

1.2.2 – INSTALLATION

All the equipment, pipe and vessels are designed to support mechanical efforts as, for example, torch and bending moment, in addition to the internal pressure. However, all care shall be taken during the installation to avoid excess of charge that can cause damage when the system in operation. Excessive tensions can also be caused due of not support the pipe length that can be adequate supported by base frame.

All the pressure regulators, slam shut valves, relief valves etc, shall be installed with correct flow direction.

Sensing lines are important components of all control systems and it is essential that are correctly installed without insulating valves.

Sensing line shall be adequate support to reduce excessive vibration that can cause its rupture. It shall be positioned in order to avoid be used as foot or hand support. It shall be lightly inclined to allow liquid and condensate flow to the main pipe.

When necessary (in underground or buried installation) it shall be installed venting pipe with Ø ¼" NPT, positioned in the housing (spring or diaphragm) which shall be extended and positioned in a safety and ventilated place, with protected vent to avoid water and incepts block the way.

Auxiliary systems shall not be changed or modified without knowledge of process service conditions and permission of responsible staff.

1.2.3 – OPERATION

Depending on regulator type, the valve can be positioned totally open. Consequently, when in operation, the slam shut valve shall be opened slowly in order to the regulator assume its regulating position. If the valves are opened quickly, the upstream pressure can pass to downstream through the pressure regulator over pressurizing the main downstream pipe.

All the regulators shall operate with regulating spring specified by manufacture. It is specially important when operating relief and slam shut valve, since non correct spring can avoid the relief to open and slam shut to close.

It shall take precautions to avoid water in the venting ways.

1.2.4 – MAINTENANCE

Regulators and valves contain gases with pressure sometimes over than the atmospheric pressure. Before trying to investigate the problem or execute the maintenance service in the equipment it shall be safely depressurized. Beyond this, as the gases can be flammable, toxic, corrosive, it means, dangerous, it can be necessary to purge the installation using inert gas. Special precautions are necessary for operation with gases as oxygen or hydrochloric gas and the user shall be protected and the safety procedures implemented.

Eventually it is not enough to isolate the device of high pressure, since the high pressure can be retained in the isolating valves. Do not try to remove cover, plugs and similar, before device properly released. It is still prudent to consider that the gas in high pressure can be present during cover and plug removal.

Practically, all regulators use spiral springs. It is important to reduce the charge of spring. In some case it can contain some charge due of spring housing of device.

2.0 – INTRODUCTION

2.1 MANUAL SCOPE

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

2.2 DESCRIPTION

The pilot operated pressure regulator model DOMUS was designed by ***Gascat*** Engineering, in order to assist application where the pressure regulators shall resist to high pressure and provide high flow, as for example, the Decompression Stations of NG, and can operated in different process service conditions. It has large utilization in gas distribution.

Main characteristic is the operating simplicity and easy handling, quick maintenance and relation cost-benefit.

2.3 SPECIFICATIONS

2.3.1 AVAILABLE CONFIGURATIONS

- Active / Monitor System
- Working / Monitor System
- Simple Regulating

2.3.2 AVAILABLE CONNECTIONS

ND	CONNECTIONS
1” x 1”	Flanges 300#, 600#, 900#, 1500# or 2500# RTJ or RF
1” x 2”	Flanges 300#, 600#, 900#, 1500# or 2500# RTJ or RF
1” x 3”	Flanges 300#, 600#, 900#, 1500# or 2500# RTJ or RF
2” x 2”	Flanges 300#, 600#, 900#, 1500# or 2500# RTJ or RF
2” x 3”	Flanges 300#, 600#, 900#, 1500# or 2500# RTJ or RF
2” x 4”	Flanges 300#, 600#, 900#, 1500# or 2500# RTJ or RF

Note: For other diameters / connections, consult Gascat Sales Department.

2.3.3 TEMPERATURE LIMITS

Operating Temperature: -22℉ to 176℉ (-30℃ to 80℃).

Environment temperature: -22℉ to 176℉ (-30℃ to 80℃).

The temperature limits hereby informed or in any applicable standard shall not exceed under any hypotheses, under risk of equipment damage, installation security or of people involved.

2.3.4 FLOW COEFFICIENT

DN	KG
1” x 1”	52
1” x 2”	
1” x 3”	
2” x 2”	370
2” x 3”	
2” x 4”	

1) When sizing for active / monitor system shall consider restriction of 25% in KG of both valves.

2.3.5 MAXIMUM WORKING PRESSURE

MAXIMUM WORKING PRESSURE
250 bar

* Working pressure limited by flange class rating according to standard ASME B16.5

The pressure limits hereby informed or in any applicable standard shall not exceed under any hypotheses, under risk of equipment damage, installation security or of people involved.

2.3.6 ESTIMATE WEIGHTS (kg)

DN	600#	900#	1500#
1” x 1”	14	18	18
1” x 2”	18	26	26
1” x 3”	23	29	37

2” x 2”	32	44	44
2” x 3”	37	47	55
2” x 4”	46	56	66

2.3.7 SET POINT RANGE

The pressure regulator model DOMUS can utilize until four different model of pilots to control the pressure depending on the operating conditions: G30F, G32F, Corinox BP and Corinox.

PILOT G-30F		
SPRING COLOR	**P/N**	**RANGE**
Grey	01.49.61	14.5 – 36.2 psi (1.0 – 2.5 bar)
Green	01.49.65	29 – 65.3 psi (2.0 – 4.5 bar)
Red	01.49.64	65.3 – 203 psi (4.5 – 14 bar)
Brown	01.49.33	101.5 – 265.4 psi (7 – 18.3 bar)
Black	01.49.59	203 – 464 psi (14 – 32 bar)

PILOT G-32F		
SPRING COLOR	**P/N**	**RANGE**
Brown	01.49.33	203 – 522 psi (14,0 – 36,0 bar)
Black	01.49.59	406 – 913 psig (28 – 63 bar)

PILOT CORINOX BP		
SPRING COLOR	**P/N**	**RANGE**
Green	01.54.06	72.5 – 159.5 psi (5 – 11 bar)
Yellow	01.54.07	72.5 – 290 psi (5,0 – 20 bar)

PILOT CORINOX		
SPRING COLOR	**P/N**	**RANGE**
Green	01.54.06	261 – 1160 psi (18 – 80 bar)

2.3.8 SET POINT – PRE-REGULADOR

The pressure regulator model DOMUS when selected for application where the set point is lower than 290 psi (20 bar) and inlet pressure is over than 1450 psig (100 bar), simultaneously, its utilize pre-regulator model CORINOX.

PRE-REGULATOR CORINOX		
SPRING COLOR	**P/N**	**RANGE**
Green	01.54.06	261 – 1160 psi (18 – 80 bar)

2.3.9 ACCURACY AND LOCK UP

Accuracy Class - AC up to 2.5;

Lock Up - SG up to 5.

3.0 – WORKING PRINCIPLE

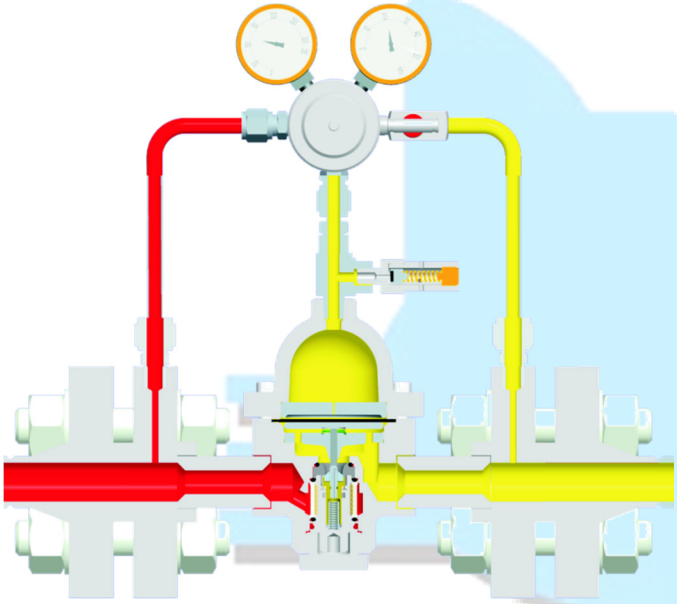
3.1 REGULATOR

The pressure regulator Domus works by principle of drop of outlet pressure that acts in the diaphragm lower chamber of main valve.

In the absence of flow the regulator remain closed, because the pressure under the diaphragm (outlet pressure) is the same of over the diaphragm, prevailing in the equilibrium of forces only the obturator spring that moves it upward closing the valve.

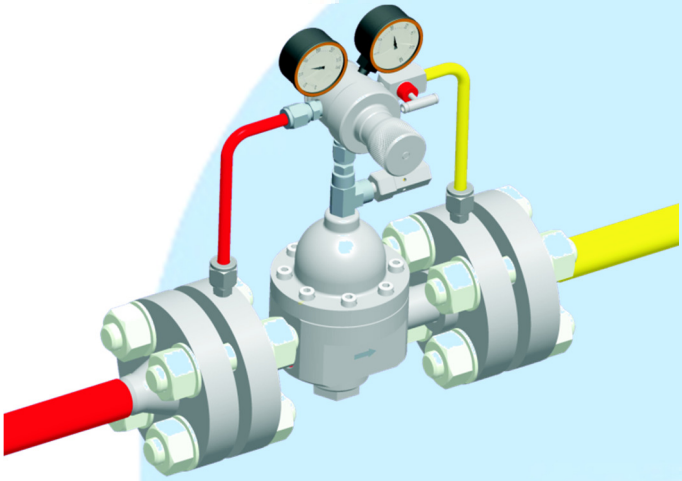
The pilot, in this condition of flow absence, remain closed, because the outlet pressure that acts under its diaphragm added to the obturator spring are higher than the regulating spring force (over the pilot diaphragm), and move the obturator set against the pilot seat, closing the pilot gas passage.

In case of gas consumption, the pressure in the sensing line starts decreasing, making the pilot to open since its regulating spring becomes superior than the obturator spring force added to the pressure under the diaphragm. In parallel, the outlet pressure under the diaphragm of main valve also decrease. In this condition, occur the regulator opening and beginning of the process of regulating pressure in the system.

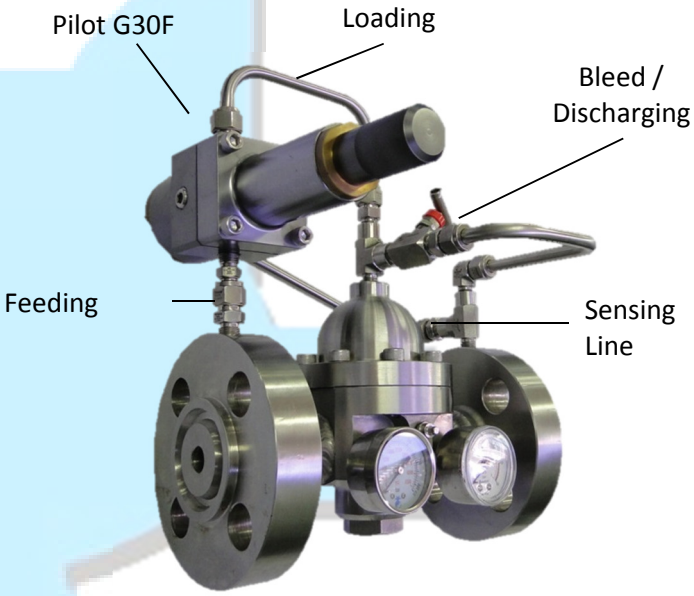


INLET PRESSURE

OUTLET PRESSURE



DOMUS (WITH CORINOX PILOT)



DOMUS ND 1" X 1"

3.2 PILOT (G30F & G32F)

The series of pilot G30F & G32F are simple diaphragm type.

It is responsible for exact loading pressure for the pressure regulator open or close, under normal operating conditions, based on equilibrium existence between the regulating spring force and the outlet pressure of sensing line.

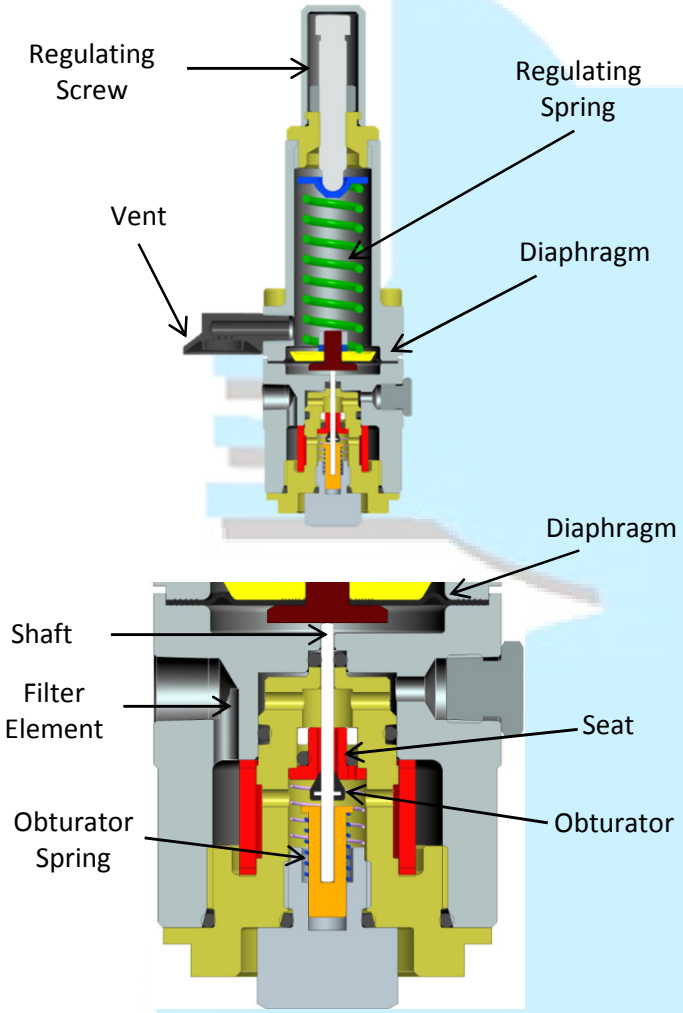
The pressure under the pilot diaphragm, outlet pressure regulator, forces the pilot diaphragm set upward. In this condition, the obturator shaft move upward due of obturator spring until contact the pilot seat, closing the pilot gas passage.

When there is gas consumption, this pressure under the diaphragm decrease and the regulating spring has enough force to move the shaft downward and open the pilot. Inthis condition, the pressure in the domo of main valve will be higher than the pressure under the diaphragm of main valve, and allow that the main valve open to feed the process gas demand.

The pilot series G30 & G32F is composed of internal filter element, which objective is to avoid that particles present in the process gas damage the obturator, seat of diaphragm set.

In case of damage in the obturator or pilot seat can occur a small gas passage resulting in increase in outlet pressure. Then, in case of pressure relief during absence of gas consumption or shutting down of slam shut valve these parts shall be inspected through inspection cover.

The pilot diaphragm rupture result in pressure equalization under and above the diaphragm, resulting in possible pilot opening, since the regulating spring force moves the diaphragm set downward to open the pilot.



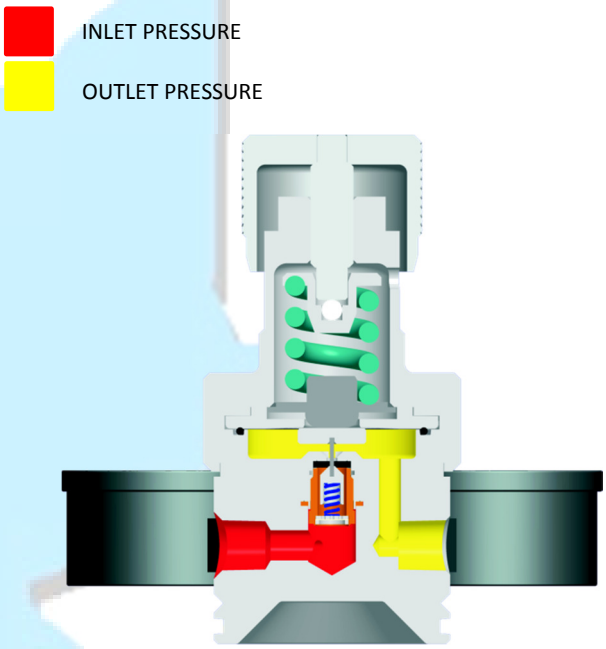
3.3 PILOT (CORINOX)

The pilot CORINOX is also simple diaphragm type.

It is responsible to feed the exact pressure for the pressure regulator open or close, under normal process service conditions, because of the equilibrium between the regulating spring force and the outlet pressure from sensing line.

It is normally utilized when the inlet pressure is over than 1450 psig (100 bar) and the outlet pressure over than 290 psig (20 bar).

The pressure under the pilot diaphragm, outlet pressure, moves the pilot diaphragm set upward. In this condition, the obturator shaft moves upward because of the obturator spring until contact with the pilot seat, closing the pilot gas passage.



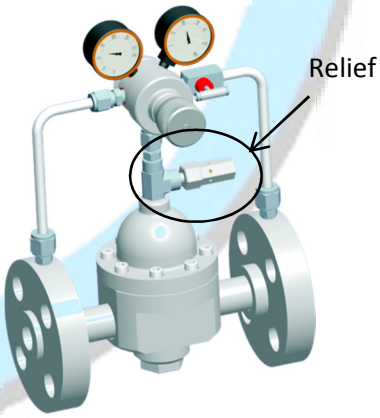
When there is gas consumption, the pressure under the diaphragm decrease and the regulating spring has enough force to move the shaft downward and open the pilot. In this condition, the pressure in the diaphragm upper chamber (feeding pressure) will be over than the pressure under the diaphragm of main valve, and allow the main valve open to feed the process gas demand.

In case of damage in the obturator or pilot seat it can occur small gas passage resulting in the increase in outlet pressure. Then, in case of pressure relief during gas absence or shutting down of slam shut valve, these parts can be damaged.

The pilot diaphragm rupture result in pressure equalization over and under the diaphragm, resulting in possible pilot opening, since the regulating spring force moves diaphragm set downward opening the pilot.

3.4 IN BUILT RELIEF VALVE

DOMUS is supplied with relief incorporated for domo cover protection when there is overpressure.



ATENTION:
The relief valve CAN NOT be adopted as a safety device for the system.

4.0 – INSTALLATION

4.1 FILTER

It is recommended the cartridge filter installation with filtration degree of 5 micra, as close as possible of regulator, without install flange to flange, because, the filter installed immediately upstream the regulator can cause turbulence disturbing the pressure regulating. The care with the filter installation is essential to the perfect operation of equipment, because eventual particles in the pipe can achieve the seat and obturator, damaging it causing direct gas passage.

4.2 CLEANING

Verify the cleaning of pipe before the valve installation. It is recommended to purge completely the line with nitrogen or air.

4.3 FLOW DIRECTION AND SYSTEM INTEGRITY

Before proceeding with equipment installation, it is necessary to verify if:

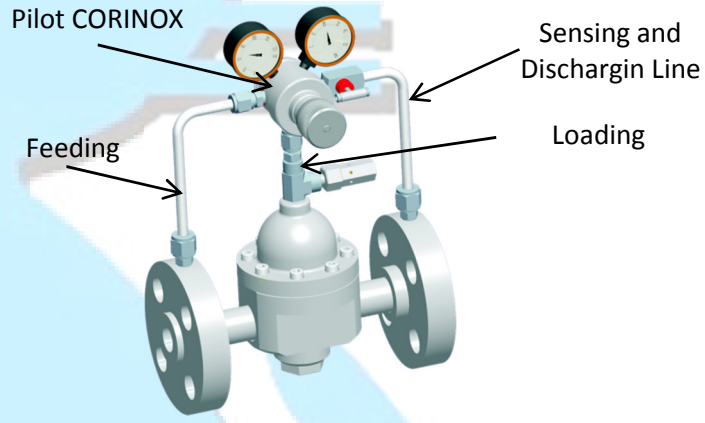
1) The equipment is in perfect conditions or have evidences of damages in function of transport; in case of some damages with installation contact GASCAT.
2) The space foresee for the access and installation of equipment is adequate; also for future maintenance.
3) The installation was designed to support the charge of equipment.
4) The connection of inlet and outlet where the regulator will be installed are perfectly aligned.
5) All sensing line necessary in the pipe downstream the equipment for were properly installed respecting the distance recommended.
6) It was foresee gauge manometer or other equipment to indicate pressure upstream and downstream to allow the adjustment of operation.
7) There is a vent line between the regulator and the first outlet ball valve to assist the technician during start-up.
8) Verify the flow direction in the body valve and check during the installation and attempt if is in the correct position.

4.4 SENSING LINE

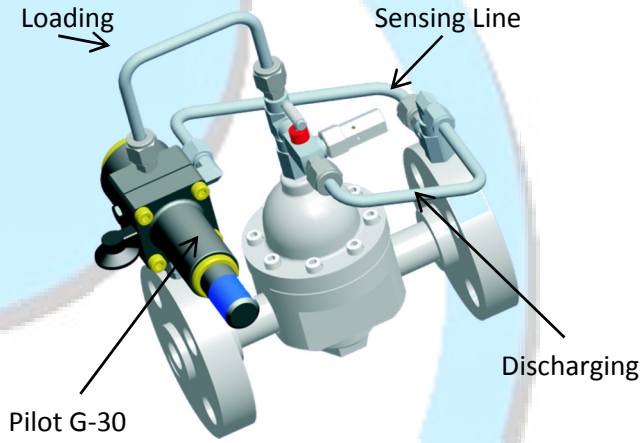
The correct position of sensing line is essential for a good performance of pressure regulator.

Do not install any type of blocking valve in the regulator sensing line.

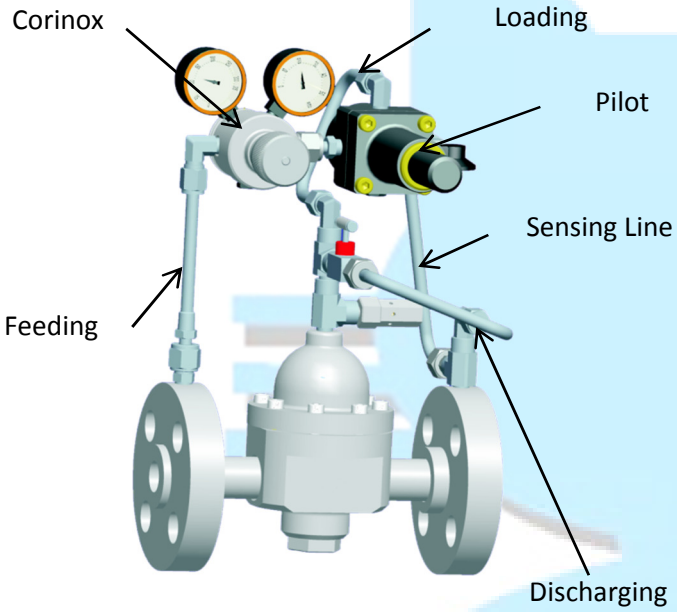
The pressure regulator model DOMUS was designed by GASCAT engineering in order that all connection are done in the own regulator, becoming not necessary install in the pipe having layout more compact. The loading line and discharging line are connected directly in the body valve.



DOMUS (PILOT CORINOX)



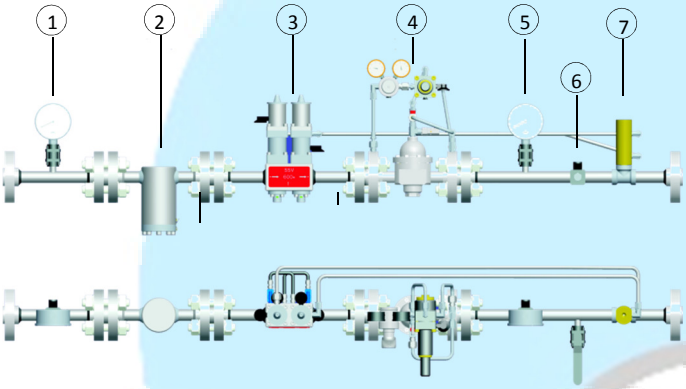
DOMUS (PILOTO G30F / G32F)



DOMUS (CORINOX + PILOT)

4.5 RECOMMENDED INSTALLATION SCHEME

4.5.1 UNIQUE REGULATOR



1 – Inlet pressure gauge
2 – Cartridge filter - 5 micra
3 – Slam shut valve model twin
4 – Pressure regulator valve model Domus.
5 – Outlet pressure gauge
6 – Vent
7 – Colector 5 ways (or similar device)

4.6 COMMISSIONING AND START-UP

4.6.1 GENERAL RECOMMENDATIONS

Before proceeding with commissioning of equipment, it is important always:

1) Verify if the equipment is properly installed according to the recommendations hereby described.
2) Close the blocking valves of inlet, outlet and by-pass, when application, of each stream.
3) Open the vent valve downstrem the last regulator in the respective stream.
4) Certify that the Skid is NOT pressurizeda.

ATENTION:

* Under none hypotheses proceed with the stream pressurization where the equipment is installed by the valve downstream the equipment.
* Under none hypotheses proceed with the stream pressurization where the equipment is installed by the valve upstream the equipment, as drain filer, for example.

5) Verify if all connectors are properly tight before proceed with stream pressurization.
6) Verify if all equipment installed are adequate to the operating conditions, based on nameplate data attached in each equipment.
7) Verify if SSV (slam shut valve) is in the closed position.

GASCAT SSV are supplied already adjusted, however, due of transport conditions and equipment handling it can be changed.
So that, it is recommended to verify the set-point of SSV using (for example) external pneumatic source directly in the actuator before proceed with stream pressurization.

DOMUS regulator is NOT supplied adjusted. It tends to preserve the life time of some internal parts. It means that the pressure regulator must be adjusted previously before operation.

4.6.2 COMMISSIONING

Utilizing as reference the assembly scheme presented in the item 4.5.1 proceed with the descriptive indicate for commissioning of DOMUS pressure regulator in a unique stream, considering that the recommendations in the item 4.6.1 of this manual were properly observed.

Such procedure considers the utilization of DOMUS with pre-regulator CORINOX and pilot G30F.

1) Close the vent valve.
   As the blocking valves of the stream are closed utilize the vent valve to similate a low flow and proceed with regulator adjusting before regulating the stream.
2) Verify if the regulating spring of pre-regulator and pilot is released (with no charge).
   Releasing the regulating spring assure that the regulator will remain closed when pressurized.
3) Reset the SSV (slam shut valve).
4) Open **SLOW AND GRADUALLY** the inlet block valve, or when there is a by-pass for the inlet valves in the Skid utilize it to pressurize the stream.
5) At this stage, the inlet pressure will achieve the regulator inlet, therefore it will remain closed and because of this no pressure downstream.
6) Adjust the pre-regulator turning clockwise the regulating spring. Assisted by the outlet pressure gauge in the pre-regulator CORINOX adjust the pressure 58 psi (4 bar) above the desired set point.
   For example, if the set point is 217 psig (15 bar) the pre-regulator shall adjust 275 psi (19 bar).
7) Adjust the pilot G30F – G32F turning clockwise the regulating spring. Do it slowly in order to admit low pressure downstream the pressure regulator; utilize the pressure gauge in the pipe checking the increase in pressure until the desired set point.
8) Open the vent valve around 20%, and verify if the pressure remain in the value adjusted.
9) Since the pressure is adjusted, open the vent valve ½" turn and verify the pressure regulating.
10) If the pressure is according to the desired set pint, close the vent valve slowly to check the regulator lock up. Make this procedure 3 times before proceeding to the next step.
11) With the line pressurized and the blocking valves closed verify if there is leak in the connectors and other fittings of the respective stream.
12) Open **SLOW AND GRADUALLY** the outlet blocking valve to release the stream for operation.

4.6.3 ADJUSTMENT OF RESERVE (BY-PASS) LINE

When the regulator is installed in a reserve (by-pass) line it is recommended to realize the same procedure informed in the item 4.6.2, however the set point of pressure regulator shall be adjusted 10% – 20% less than the set point of regulator of working stream.

After this, open **SLOW AND GRADUALLY** the outlet blocking valve then the downstream pressure of regulator equalize the reserve (by-pass) stream with the pressure of working stream; the by-pass regulator will remain closed.

To make the regulator in the reserve (by-pass) line assumes the regulating pressure of the system, turn clockwise the regulating spring, slowly, until the set point of this regulator achieve a value superior than the set point of regulator of working stream; in this case, the regulator in the reserve line will open slowly and assume the pressure regulating.

It is important that both regulators keep with difference in set point of at least 5% - 10%, avoiding over position in set point, resulting in looping between the two streams where while one regulator is working the other is trying and vice-versa.

Note: the values hereby informed are basic recommendations based on good practices, however the set points can be changed with previous consult and approval of GASCAT.

4.6.4 LIST OF RECOMMENDED TOOLS

For set point adjusting, commissioning and start up of pressure regulators model DOMUS it is necesary the combined tool of 19 mm for spring adjusting of pilot G30F & G32F.
The pre-regulator model CORINOX was designed allowing the set point adjustment manually without any kind of tool.

1 

2 

DOMUS regulator is supplied with connectors for sensing line of DN 10 mm, therefore it is recommended the utilization of combined tools 18mm and 19mm for sensing lines.

DN	1	2
1" & 2"	18mm, 19mm	1"

5.0 TROUBLE SHOOTING

In this section of this manual the objective is to clarify possible problems at field and respective causes.

The problems listed in this section can come from different situations, however, part of them is related to the gas conditions (particles), natural waste and fails during equipment operations.

It is important to keep in mind that the operation as well the maintenance of GASCAT equipment shall be realized by trained technicians, preferentially by ones trained by GASCAT instructors.

For training and qualification of operators and technicians, contact GASCAT to check details about it.

E-mails:
vendas@gascat.com.br
sales@gascat.com.br
Phone: +55-19-3936-9301.

PROBLEM	PROBABLE CAUSE	CORRECTION
Poor performance, Outlet pressure variation	Low Flow (lower than 5% of maximum flow capacity).	Check the operating conditions related to the sizing of regulator.
	Sensing line wrongly installed.	Change the sensing line position according to this manual or contact GASCAT for analyzes.
Direct passage	Obturator or seat of pilot damaged	Check obturator and seat conditions and replace or clean it.
	Broke or damaged sensing line	Check the condition of sensing line and replacing it if necessary.
Outlet pressure decreasing and/or flow insufficient	Filter elemento clogged	Clean or replace it.
	Lack of feeding	Check the pilot seat.
	Main diaphragm rupture	Replace it.
Vent of gas by pilot venting	Pilot diaphragm rupture	Replace it.

6.0 MAINTENANCE

The preventive maintenance of pressure regulators model DOMUS is essential for a good performance of equipment as well as has direct relation with the reliability of the system, avoiding problems of different origins.

The periodicity of these maintenances changes according to each installation, process service conditions and quality of gas; for example if the equipment is working with presence of contaminants as black powder, yellow powder, oil, condensates etc, certainly the period between maintenance will be lower.

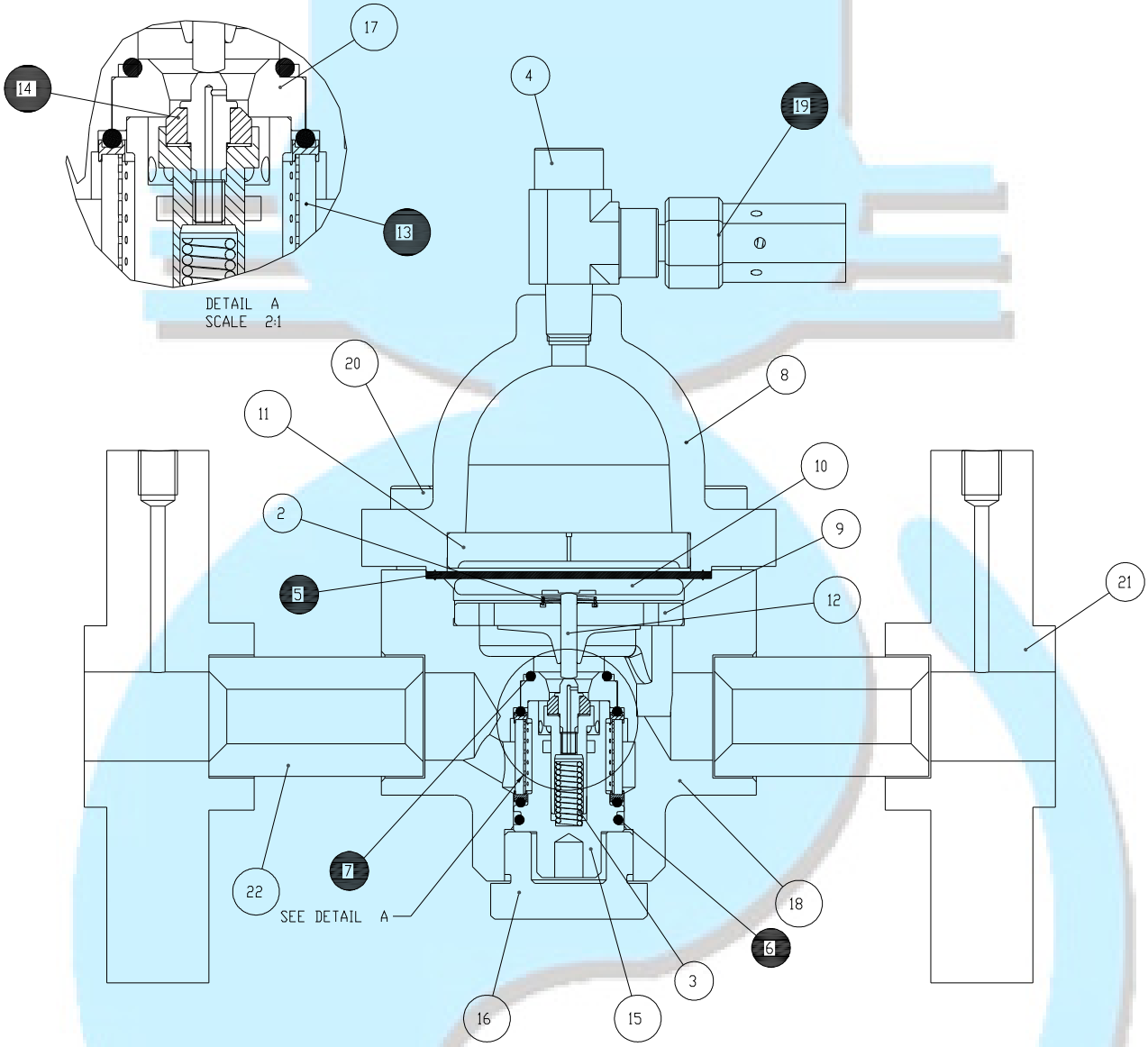
GASCAT has spare part kits composed of for most important parts of DOMUS pressure regulator. This list of components is in this manual for orientation.

The components of GASCAT pressure regulators are designed, manufactured and test with exclusivity by GASCAT in order to provide the best efficiency and security to the operation. The use of NON-GENUINE parts become the operation non-safety and can affect the process efficiency.
GASCAT is not responsible for equipment that work with NON-GENUINE components.

Before start the maintenance of GASCAT pressure regulator certify to have the correct spare part kit with original parts only provided by GASCAT, as well as this manual for instruction and reference to how proceed with safety and eficiente procedure during equipment maintenance.

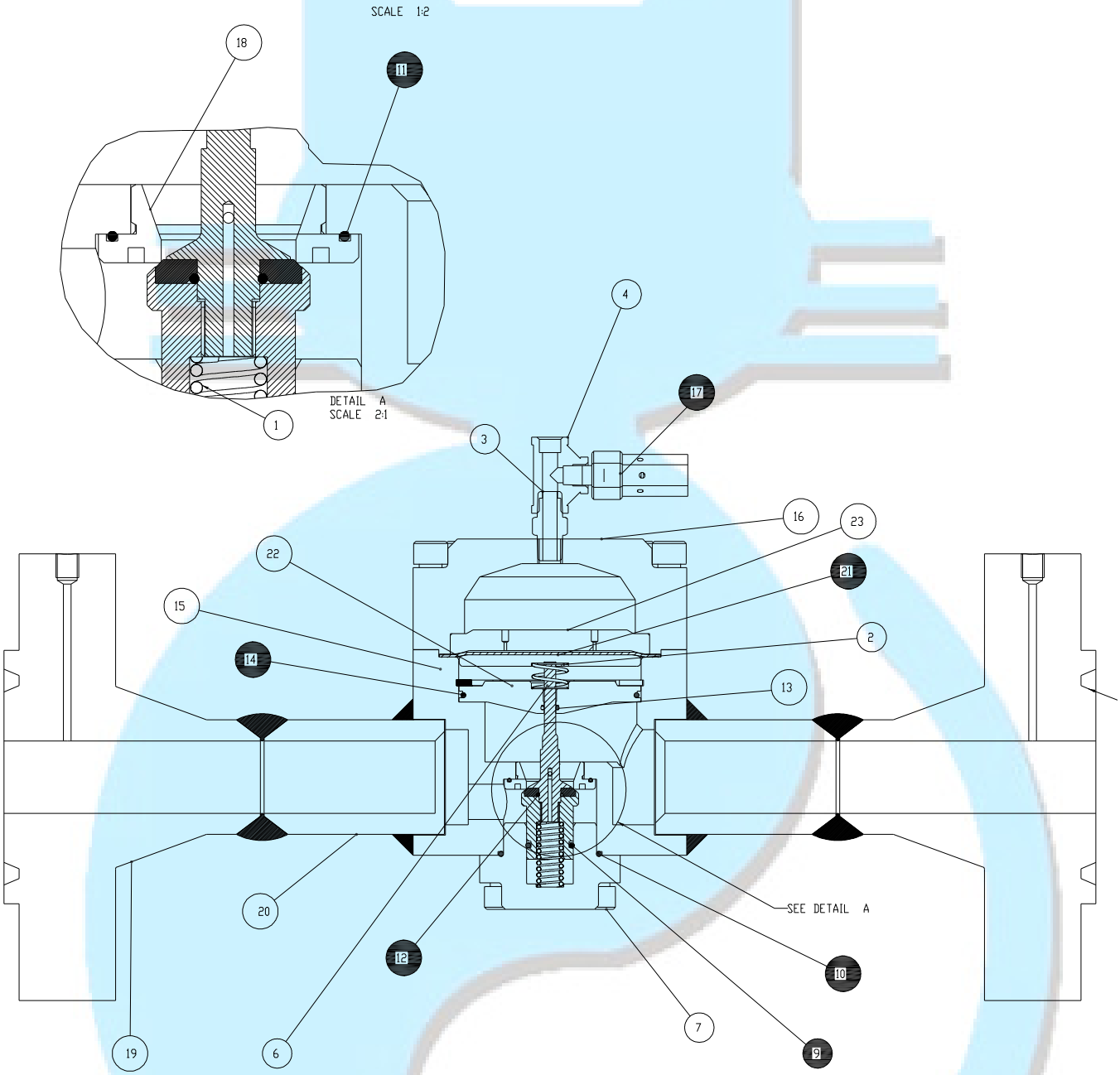
7.0 DRAWINGS / PARTS LIST

7.1 MAIN VALVE – DIAMETER 1”



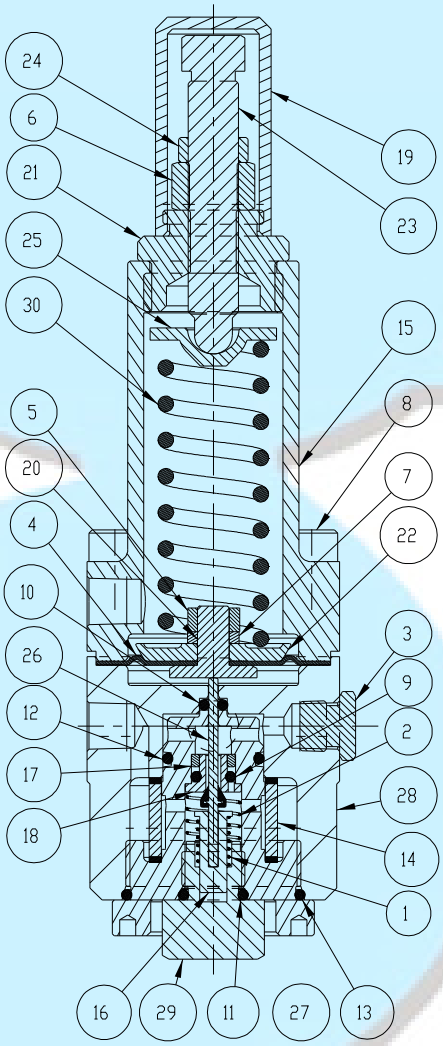
SPARE PART LIST - DOMUS 1”		
Position	**Description**	**Quanity**
5	Diaphragm	1
6	O’ring	1
7	O‘ring	1
13	Filter Element	1
14	Obturator	1
19	Relief valve	1

7.2 MAIN VALVE – DIAMETER 2”



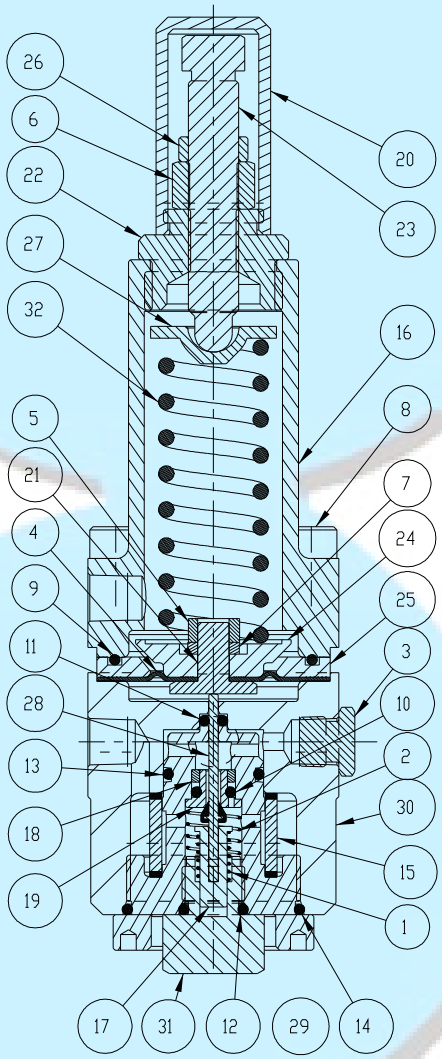
SPARE PART LIST - DOMUS 2”		
Position	**Description**	**Quantity**
9	O’ring	1
10	O’ring	1
11	O‘ring	1
12	Obturator	1
14	O’ring	1
17	Relief Valve	1
21	Diaphragm	1

7.3 PILOT G30F



SPARE PART LIST - PILOT G30F		
Position	**Description**	**Quantity**
4	Diaphragm	1
9	O'ring – Buna N	1
10	O'ring – Buna N	1
11	O'ring – Buna N	1
12	O'ring – Buna N	1
13	O'ring – Buna N	1
14	Filter Element	1
18	Seat	1
26	Obturator	1

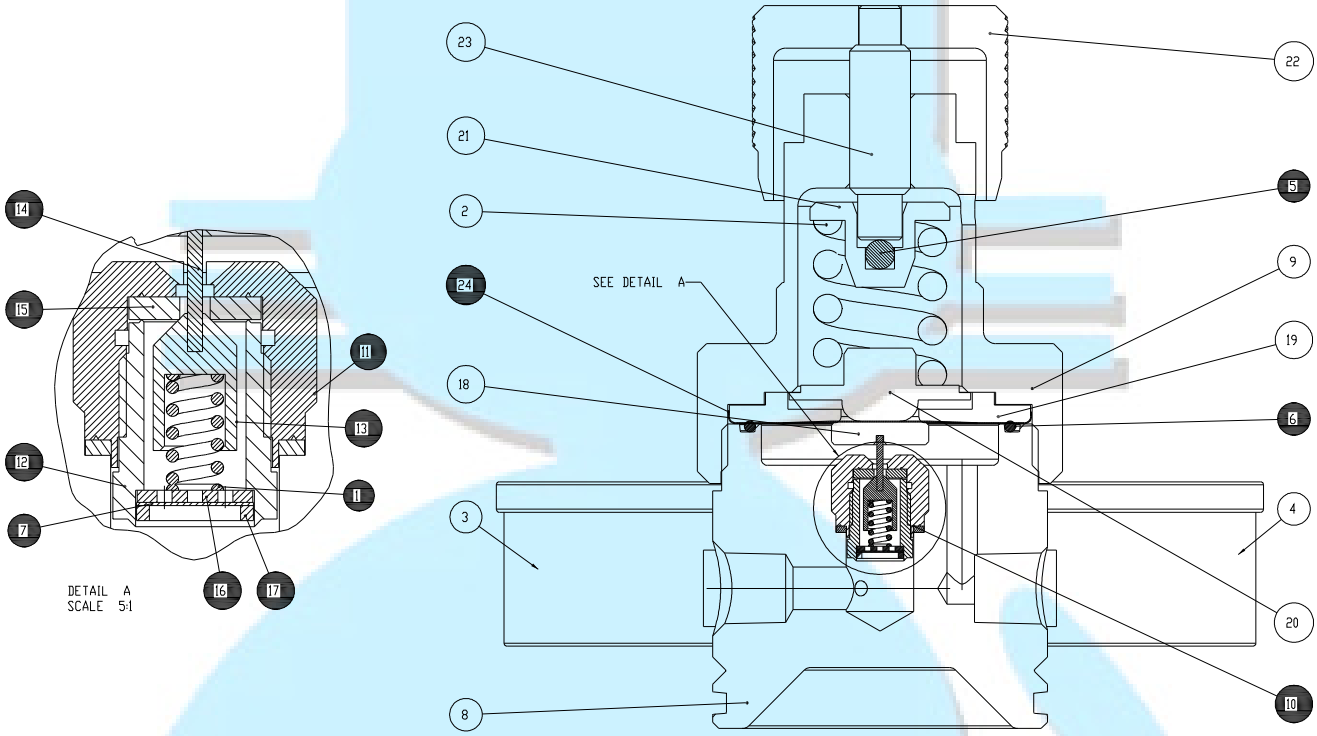
7.4 PILOT G32F



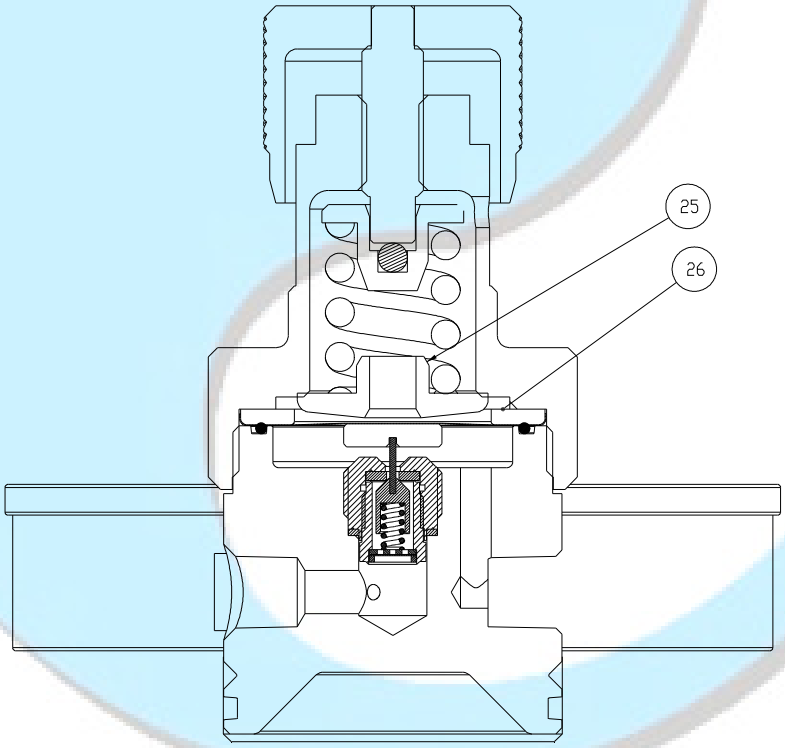
SPARE PART LIST - PILOT G32F		
Position	**Description**	**Quantity**
4	Diaphragm	1
9	O'ring – Buna N	1
10	O'ring – Buna N	1
11	O'ring – Buna N	1
12	O'ring – Buna N	1
13	O'ring – Buna N	1
14	O'ring – Buna N	1
15	Filter Element	1
19	Seat	1
28	Obturator	1

7.5 CORINOX / CORINOX BP

CORINOX



CORINOX BP



SPARE PART LIST - CORINOX & CORINOX BP		
Posição	**Descrição**	**Quantidade**
1	Return spring	1
5	Sphere	1
6	O'ring	1
7	Filter	1
11	Obturator Set	1
12		1
13		1
14	Shaft	1
15	Seat	1
16	Perforated ring	1
17	Ring	1
24	Diaphragm	1