

HATHOR

**Underground Compact Installation for Pressure Regulation
Less Fugitive Emission**



GASCAT

INTRODUCTION

It is a solution for urban areas since the installation is underground and landscape remains totally unaffected. It is a underground compact but complete installation with filter/ active regulator/ monitor(optional)/ security all together in a small cartridge.

Hathor is a completely self-contained pressure reduction module for both above and underground installations. Designed on the principle of easy maintenance and long life product with low cost maintenance Hathors have a proven track record mainly at Brazil South Gas Companies.

The working parts are contained in a removable cartridge housed in Stainless Steel Body AISI 304 or AISI 316 (Vessel) which is installed underground (or above) into the gas mains.

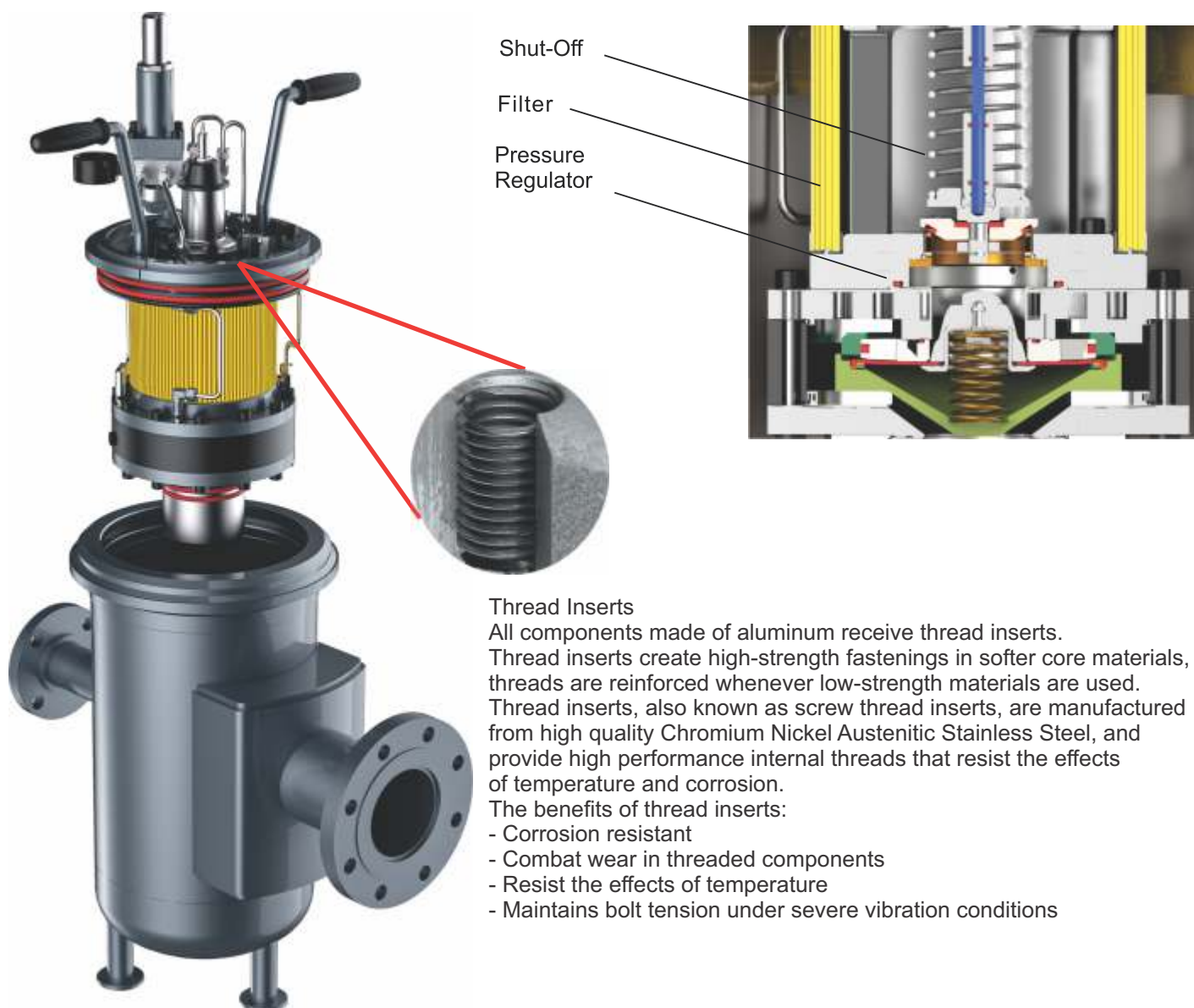
Above Ground is a "Vent Stack" which contains vent pipes for atmospheric reference pressure and the relief valve together with the necessary instrumental and reference points and provision for others electronic devices like EVCs.

The Hathors have single access point for maintenance with no special tools at all.

The Cartridges have a light weight allowing one man lifting them. Example Hathor cartridge 2" x 4" or 2" x 6" weight is 21 Kg. All cartridges are totally interchangeable and nno sensors tubing outside the vessel.

FEATURES

1. Underground and non confined area
 2. Totally vandal proof wtih many kinds of tamper-proof security screws
 3. Low noise level, much loss noise than above ground station
 4. Very easy maintenance "one man" and "one key" due to the interchangebity cartridge units
- The cartridge can be changed with 12 minutes
5. Water proof stations due to higher performance seals



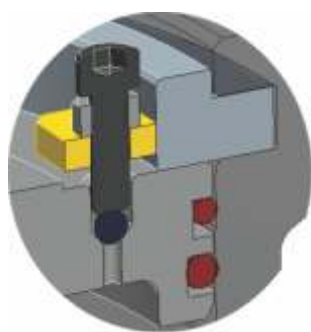
MAIN CHARACTERISTICS

Filter Element

Available in 20 to 5 microns, the filter element is designed for filtering solids in the gas stream using pleated cartridges whose design and construction offers maximum filtering area and a large capacity to hold and accumulate filtered solids. Operating at high efficiency and low pressure drop, it provides excellent protection for the system, minimizing maintenance and extending equipment life.

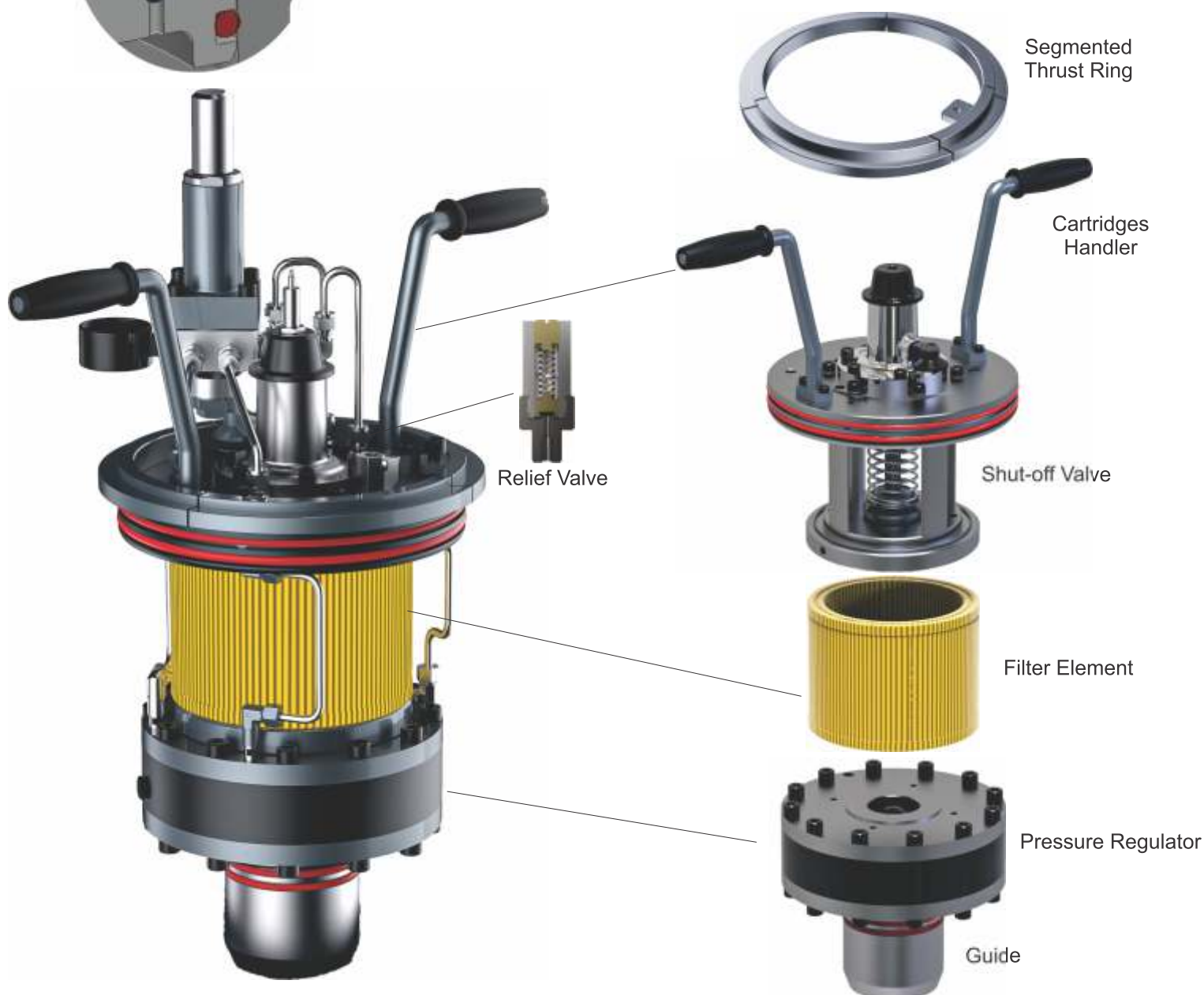
Slam shut off valve incorporated

It has the function to shut gas flow in order to protect the gas supply line from unwanted increase in working pressure. It also has the function of spring to close (fail close), that is, it shut flow in case of rupture of the valve sensing element (diaphragm), or also in case of interruption of the gas supply or with the sharp decrease or interruption of the gas line sensing. With this function (factory set only) the shut-off valve meets the requirements of EN 14382. Hathor's built-in quick-release valves (<1s), completely free for leakage, have manual reset, wide adjustment range and easy installation and operation.



Safety Device.

This pin must be unlighted in order to remove the segmented metal O-ring. Without remove this pin it is not possible take the segmented metal out. In case reminiscent Gas inside the vessel the ball will lift and Gas start to scape to atmosphere.



Pressure Regulator

The pressure regulator model ARGOS WA was developed by GASCAT to applications in natural gas or other non corrosive gases, approved by DVGW EN 334.

This new axial flow regulator was designed to avoid high pulsation problems met in the most of high flow regulators when they work with very low flow.

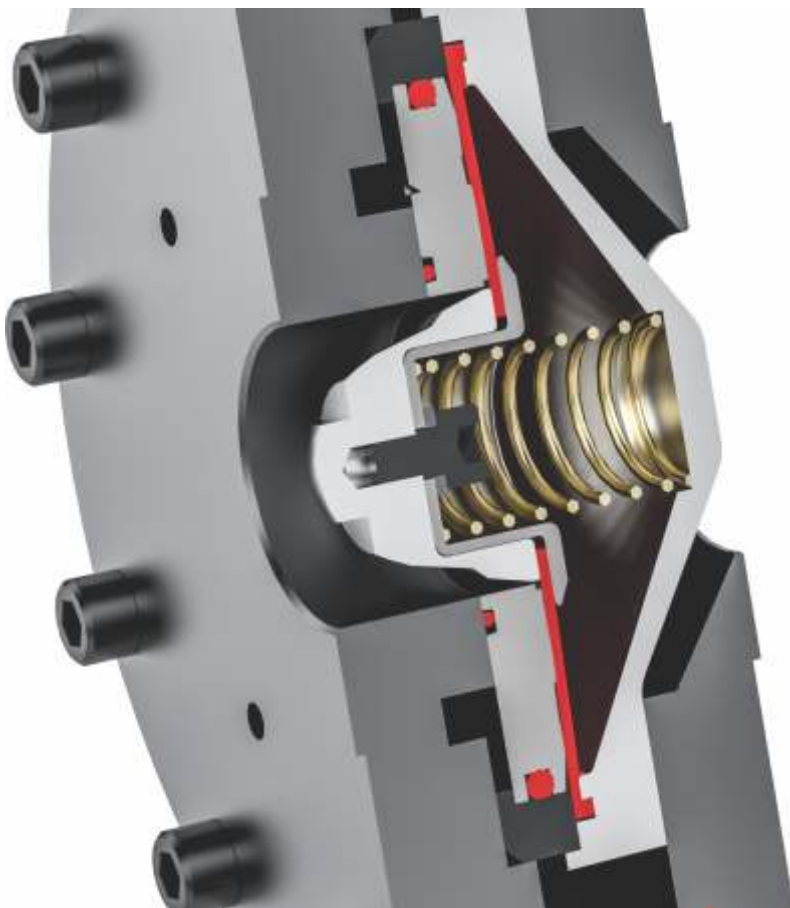
Grid And Flow Directioned

These components were developed by GASCAT to obtain high abrasion resistance. It works reducing the kinetic energy of the particles in suspension in the gas, directioning them for the valve seat, minimizing the contact of these particles with the valve diaphragm and seat seal, guaranteeing larger useful life of those components.

The ARGOS Axial regulator uses grids in anodized aluminium that presents several advantages, such as

- Possibility to use grid flow channels passages extremely narrow in order to avoid the excessive entrance of the diaphragm rubber in those channels, consequently increasing diaphragm life and enable the equipment operation with larger differential pressure. Uniform seal profile, enabling larger accuracy in the closing pressure values.

The hard anodization allows superficial hardness reach of 40 to 50 HCR against 20 to 30 HCR common in other materials as stainless steel, which increase considerably the useful life of this component.



Cross section WA Regulator

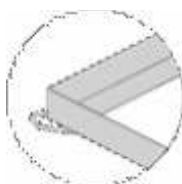


Hard anodized aluminum Grid

Hinged & Locked Access Cover

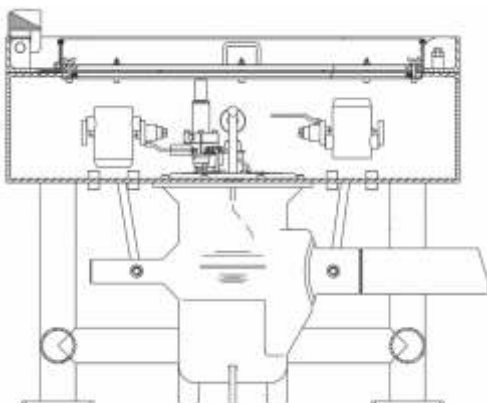
Access Cover must always be carried out in accordance with DIN EN 124, Group 4, coverage class D 400.

It must be secured and locked against unauthorized opening.



Standard Frame

- Frame is bedded directly to the top of the chamber.
- Supplied with corner lugs to enhance adhesion to bedding mortar.



Intermediate coverage of the control equipment room:

- When it is necessary to protect the different functional units against water and contamination and / or
- When the comparator room of several functional units must be ventilated together by means of a collecting pipe.

Intermediate coverage must meet at least the following conditions:

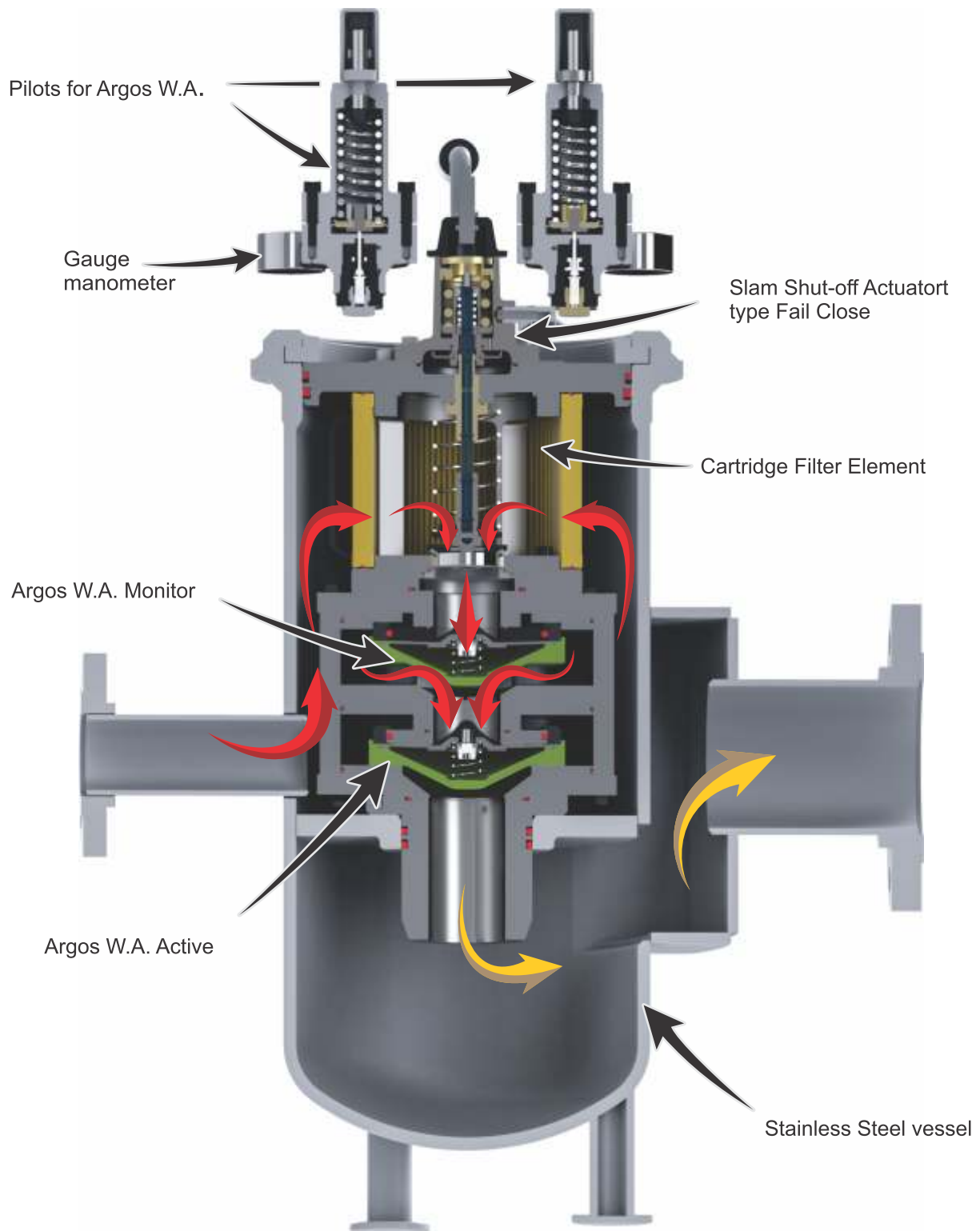
- Tightness against a 0.5m water column
- Sufficient ventilation of the room under the intermediate cover

ACTIVE / MONITOR SYSTEM

In the active / monitor system, the working principle of the regulators are the same as explained on the previous page.

The upstream regulator (the monitor) stays in the open position because the pressure set point on its pilot is higher than the pilot on the active regulator. Both regulators sense the downstream pressure, and if the active regulator is operating properly, the monitors' pilot will never be satisfied, causing the monitor valve to open fully.

If a failure in the active regulator occurs causing an increase in the downstream pressure, the pilot on the monitor will sense this and start to close the monitor valve as the downstream pressure reaches its set point. The monitor will then become the active regulator until repairs are made.



HATHOR ABOVE GROUND - AG

Derived from Buried Module the Pressure Regulating Module HATHOR -AG assembled in Skid utilizes the same technology and know-how, keeping the national and international success in applications with Natural Gas Distributors.

The main advantage of HATHOR - AG Module is the interchangeability that allows quick change of internals and compact design that results in less space necessary for installation.

Assembled with pilot operated pressure regulator the HATHOR -AG Module has excellent accuracy and high flow capacity.

HATHOR - AG COMPONENTS

ITEM	MODEL
PRESSURE REGULATOR	ARGOS W.A.
SLAM SHUT ACTUATOR	FC - FAIL CLOSE
FILTER ELEMENT	CARTRIDGE TYPE

TECHNICAL DATA

DIAMETERS	2" - 4"
OUTLET PRESURE RANGE	0.1 - 36.6 bar
MAX. INLET PRESSURE	51 bar

CONFIGURATION & LAYOUT

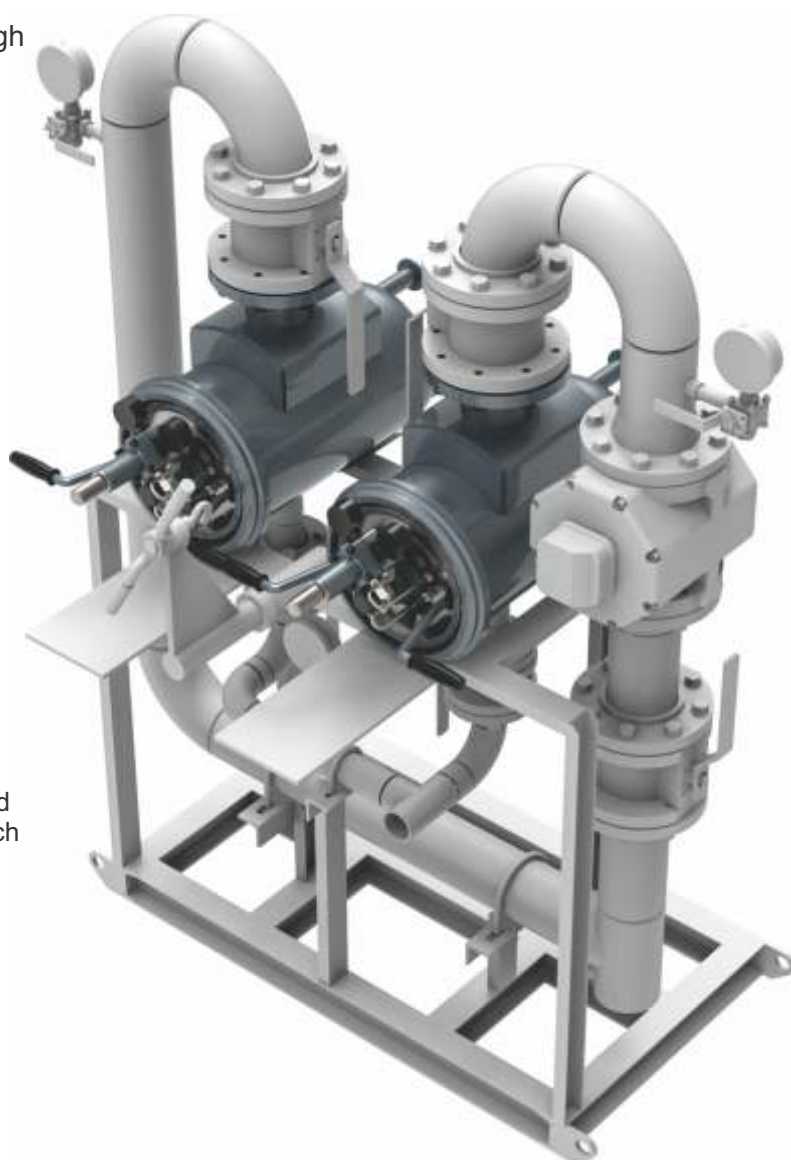
The configuration and layout of HATHOR - AG Module Skid allows several layouts adjusting it to available space in each installation.

Through internal components adapting the module can be supplied with active / monitor system, double stream and others.

Other stations accessories as flow meters, transmitters (pressure, temperature) can be included if necessary.

REGULATING MODULE INTERCHANGE ABILITY

The interchangeability of HATHOR -AG Pressure Regulating Module is the main feature and advantage comparing with any other similar equipment. The quick change of regulating cartridge results in less maintenance time beyond less gas supply interruption.



Cartridge and Material features

COMPONENT	MATERIAL
Body	Aluminium 6351-T6 Hard Anodized 12 µm (STD) Carbon Steel - ASTM A516 GR.70 (Optional)
Cover	Aluminium 6351-T6 Hard Anodized 12 µm (STD) Carbon Steel - ASTM A516 GR.70 (Optional)
Internals	Aluminium 6351-T6 Hard Anodized 12 µm (STD) Stainless Steel AISI 304(Optional)
Grid	Aluminium 6351-T6 Hard Anodized 12 µm (STD)
Elastomers	BUNA - N (STD) FKM (Optional)

OPERATION LIMITS

Maximum inlet pressure	51 bar
Outlet pressure range	12 mbar ~ 36.6 bar
Temperature Range	-20°C ~ +60°C (*)
Accuracy Class (AC) Lock-Up (SG) Slam Shut Accuracy Group (AG)	Up to ± 2.5% Up to ± 5% Up to ± 1%

Note: Gascat should be consulted for temperatures different than mentioned above.

CONNECTION	ND
Flange ANSI B16.5 150# / 300# PN 16 - 40	1" a 12"

SPRING RANGE (bar)

SPRING RANGES	SPRING COLOR	PILOT
12 ~ 25 mbar	RED	G80 / G52
20 ~ 60 mbar	YELLOW	
45 ~ 85 mbar	BLUE	
60 ~ 220 mbar	WHITE	
170 ~ 320 mbar	BLACK	
230 ~ 400 mbar	SILVER	
350 ~ 1100 mbar	GREY	
1050 ~ 2500 mbar	BROWN	
0.7 ~ 2.8 bar	SILVER	G30F
2 ~ 5.5 bar	GREEN	
4,5 ~ 14 bar	RED	
7 ~ 18.3 bar	BROWN	
14 ~ 32 bar	BLACK	
14 ~ 36.6 bar	BLACK	G32F

Note: For differential pressure less than 2.0 bar use the G52 pilot

Shut-Off

The shut-off are installed in pressure regulating in order to protect the pipe line or the gas equipments and all downstream instruments from an unexpected over pressure or also in case of gas source interruption or even in case of rupture of it's own tubing's. With under pressure blocking (it is adjusted in Gascat plant) the shut-off matches the requirements of EN 14382 standard.

The shut-off is very fast disengaging, less than 1s and totally bubble tight; they are totally manually reset and due to it's design, have a very low pressure drop with a wide range of set pressures. They are easy to install and accept any position even upside down.

Due to its design the set pressure are not affected by the inlet pressure variation (EN 14382 class A).

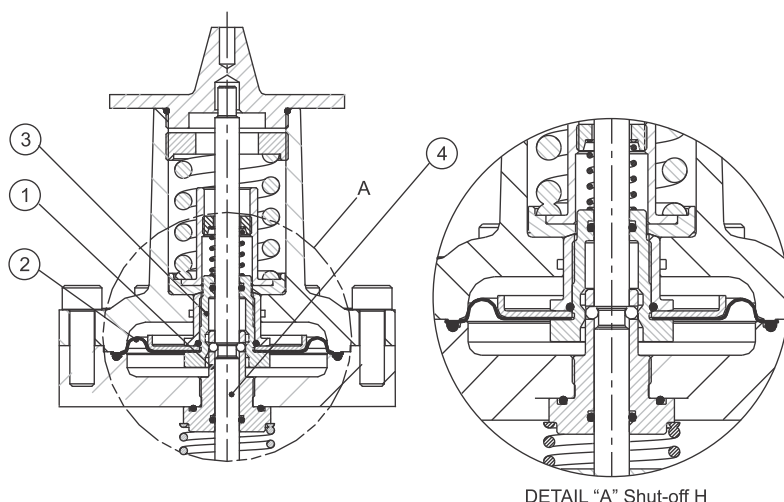
The shut-off have an actuator with spheres holder (1) accomplish connected to the sensor element (2) and this one is sensitive to the downstream pressure. For the following cases:

- downstream increase pressure beyond the set limit,
- diaphragm rupture,
- sensing tubings ruptures,
- downstream pressure bellow the set limit, as per the sense of any above case under the sensor

element the tripping bush (3) moves to the release position with the ball mechanism disengaging the valve stem (4) to close the control element.

After normal external control pressure

has been restored the valve must be manually reset to the open position to able the reset the upstream and downstream pressures must be equalized by an integral push button type which eliminate the need of a separate bypass (avoiding leaks). This push button is at the closed position valve.



DETAIL "A" Shut-off H

TECHNICAL CHARACTERISTICS		
SPRING RANGE	SPRING COLOR	MODEL
25 ~ 50 mbar	GREEN	Shut-off L
45 ~ 160 mbar	BLACK	
150 ~ 260 mbar	BLUE	
0.2 ~ 0.5 bar	GREY	Shut-off H
0.5 ~ 1.3 bar	PURPLE	
1 ~ 5 bar	RED	
4 ~ 11 bar	YELLOW	Shut-off PH
10 ~ 16 bar	BROWN	
14 ~ 38 bar	ZINCATED	
28 ~ 60 bar	WHITE	

SIZING

The sizing of ARGOS WA regulator is done based in the considerations as follow:

- definition according to inlet and outlet pressure if it is a critic or sub-critic flow;
- conversion based on correction factor the flow value found if the process fluid is different of natural gas;
- limitation of use of pressure regulator when the flow capacity is approximately 90%.

And is calculated utilizing the equations below , where:

Q = Flow in Nm³/h;

P₁ = Inlet pressure in bar absolute;

P₂ = Outlet pressure in bar absolute;

KG = Regulator flow coefficient.

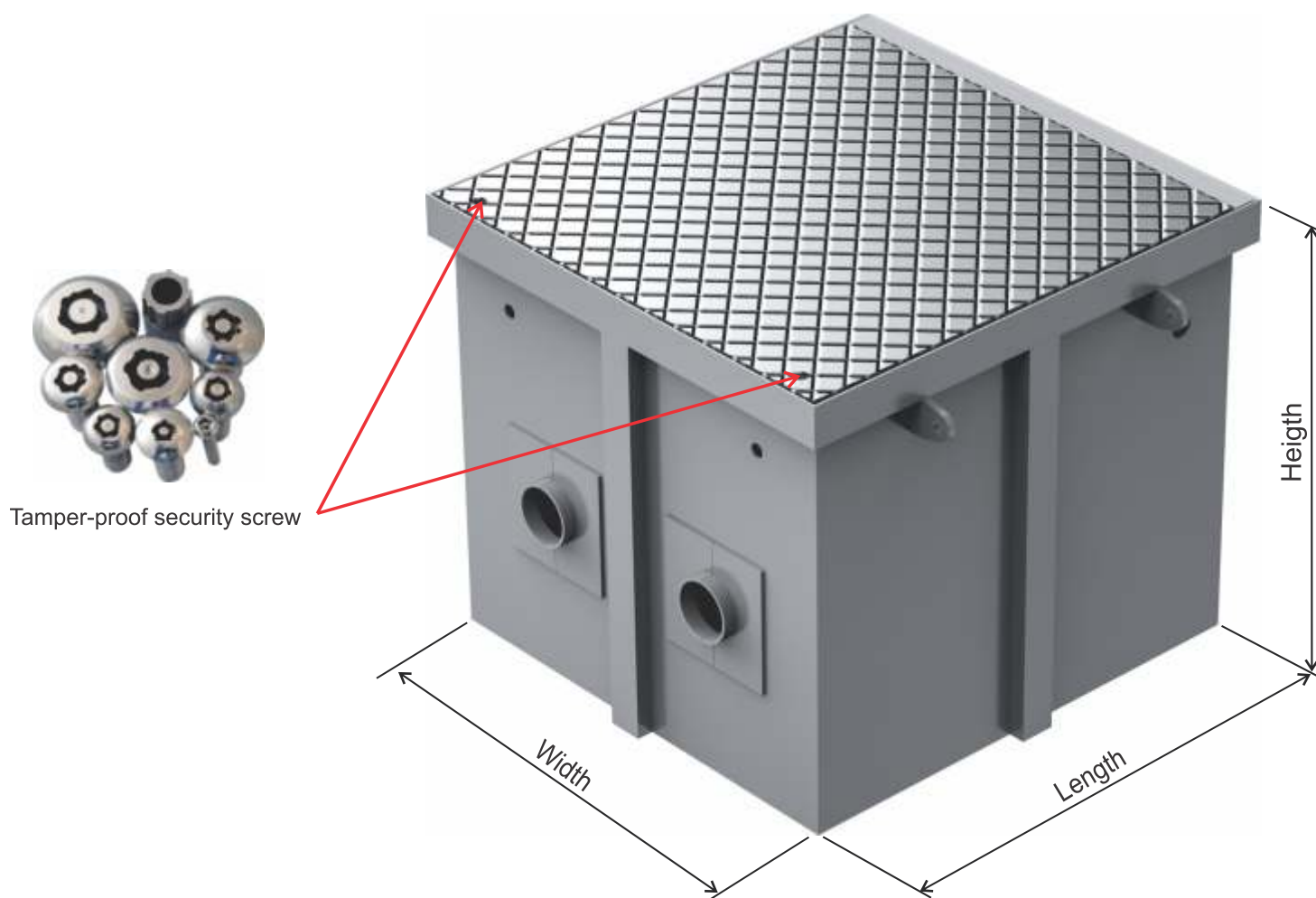
SUB-CRITICAL FLOW
$P_2 / P_1 \geq 0.53$
$Q = KG \times \sqrt{P_2 \times (P_1 - P_2)}$

CRITICAL FLOW
$P_2 / P_1 < 0.53$
$Q = (KG \times P_1) / 2$



BURIED BOX DIMENSIONS (mm)

ND	LENGHT	WIDTH	HEIGHT
2" x 4"	1140	1090	950
2" x 6"	1140	1090	950
3" x 6"	1360	1240	1050
3" x 8"	1360	1240	1050
4" x 8"	1530	1370	1130
4" x 12"	1530	1370	1130



Gascat Indústria e Comércio Ltda.

Rodovia SP 73, nº 1141 - Distrito Industrial

Indaiatuba - SP - Brasil - CEP 13.347-390

Phone: +55 (19) 3936-9300

vendas@gascat.com.br



Sales Representative

www.gascat.com.br

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