

# HYDROGEN DEVELOPMENTS

Solution  
through  
innovation



## Hydrogen Solution

Today the world is clamming for less carbon trough the atmosphere and solutions which will save the planet future. For this reason, the **green hydrogen** as combustibile is a total reality. Decarbonizing the planet is one of the goals that countries around the world have set for 2050, many countries are working on legislations with subsidies with public and private investment to encourage the use of renewable energy in place of traditional fossil fuels . To achieve this, decarbonizing the production with an element like hydrogen, giving rise to green hydrogen, is one of the keys to reduce CO<sub>2</sub> emissions.

The **green hydrogen** is touted as a solution to provide energy with fewer emissions. Not only can green hydrogen power buildings, but it can replace coal and gas in industry with a smaller carbon footprint.

## GASCAT with its 40 years of experience in Hydrogen Pressure Regulation

The GASCAT have made specific investments in assembly and testing facilities, clean rooms for assembly, laboratory with test benches, equipments and high productivity machines in order to create a dedicated H<sub>2</sub> division.

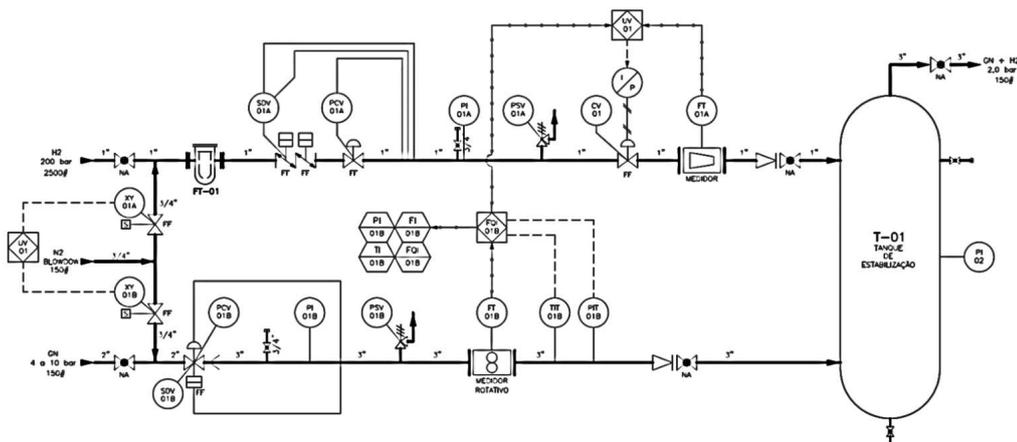
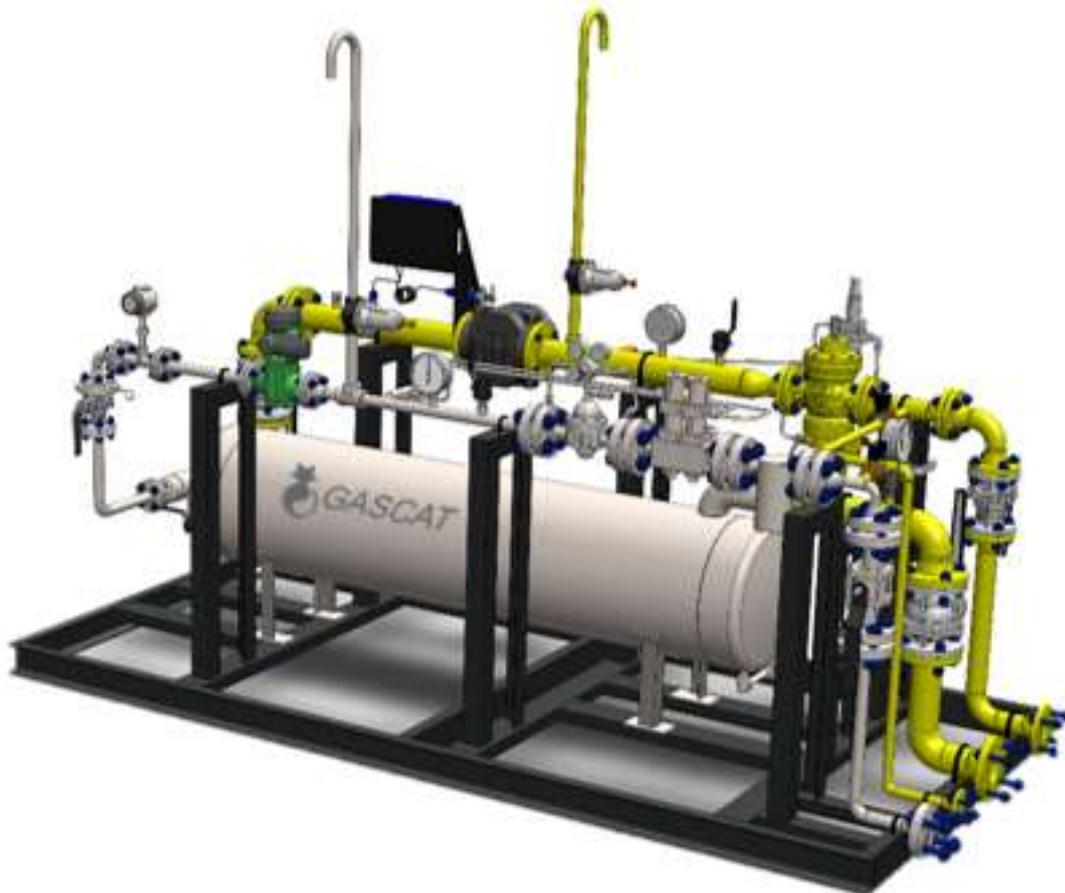
These investments allows GASCAT the flexibility to produce Hydrogen Pressure Regulators and Security Shut-off Valves called **“Green Line Products”** in allusion of “Green Hydrogen” both in small batches and in large series and assure sustainable prices for the development of the H<sub>2</sub> in the wide world market.



## Natural gas & Hydrogen Blending

The Hydrogen applications are growing up, and especially in the first part of their path, it will have to work together with traditional natural gas transmission and distribution grids.

Depending on various factors, end users may need several degrees of blending, starting with 2% up to the complete hydrogen composition (100%). The GASCAT can provide tailor designed station for blending and injection, from low pressure districts up to high pressure transmission networks and industrial applications with the specific hydrogen products.

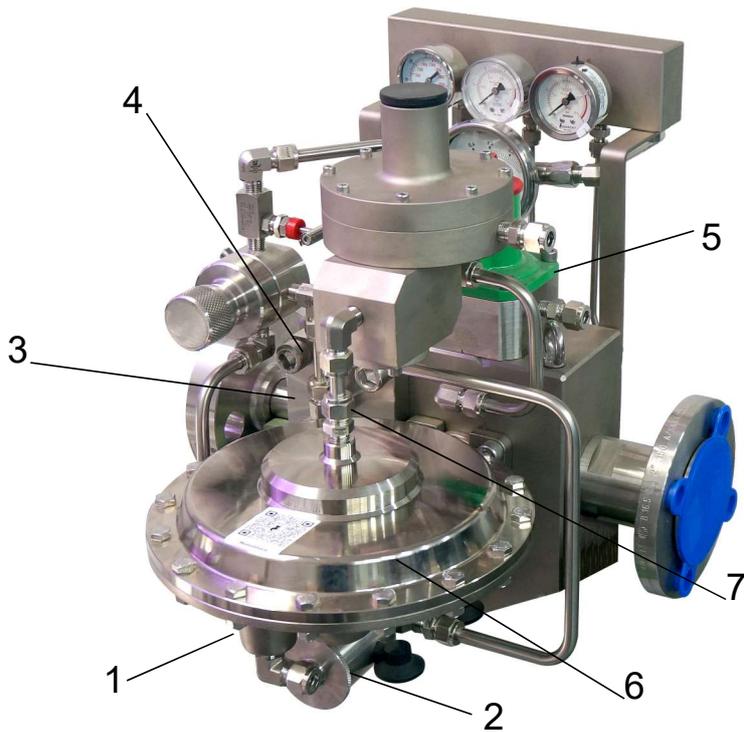


### OPERATION LIMITS

Maximum Inlet Pressure	450 bar (Hydrogen Line)
	20 bar (Natural Gas Line)
Outlet Pressure Range	20 mbar ~ 3 bar
Temperature Range	-20°C ~ +60°C (*)

## HYDROGENESIS

The HYDROGENESIS station have been designed to attend all new necessities of Hydrogen Pressures Control with its whole security associated following EN 12186 in only one and small unit of forged stainless steel 316 L. Our very experienced designers and operational people leads the company in total harmony resulting on this incomparable product design with unparalleled performance and much less carbon footprint system.



1. High pressure filter model AV;
2. High pressure double (or single) Slam Shut-off valve model TWIN;
3. High pressure regulator model DOMUS
4. High pressure partial relief valve model VS
5. Low pressure slam shut-off valve model GIPS
6. Low pressure regulator model ATHOS
7. Low pressure rpartial relief valve model VSL

The HYDROGENESIS body is manufactured from cold rolled stainless steel 316 L and hydrostatically tested up to 600 bar. All the devices above are coming from pressure regulators and security shutoff valves with more than 30 years in field operation, so the HYDROGENESIS is totally reliable.

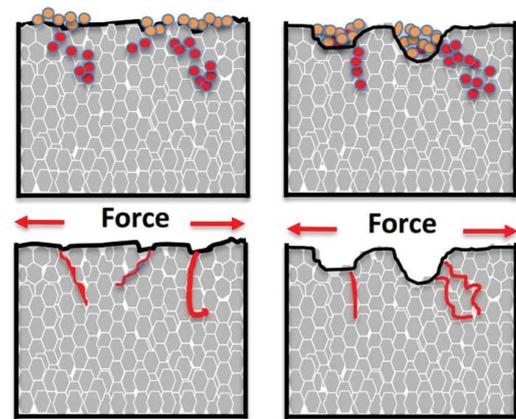
OPERATION LIMITS	
Maximum Inlet Pressure	400 bar
Outlet Pressure Range	20 mbar ~ 2000 mbar
Temperature Range	-40°C ~ +90°C (*)
AC - Acuraccy Class	Up to 2.5%
SG - Lock Up	Up to 5%

COMPONENT	MATERIAL
Body	Stainless Steel 316L
Bottom Cover	Stainless Steel 316L
Top Cover	Stainless Steel 316L
Internals	Stainless Steel 316L
Elastomers	BUNA-N (STD) FKM (Optional)

*Note: For other material option, consult our Sales Department.*

## Common issues when working with hydrogen

'Materials of pressure regulators construction to be compatible with hydrogen have been discussed frequently. The potential hazards of hydrogen embrittlement and stress corrosion cracking in some high-strength metallic materials are issues that cannot be ignored.



## Metallic Materials for Pressure Regulators

- Pressure regulator or valves for pressures above 5 MPa or 50 bar, only austenitic stainless steels from series 300. We normally use AISI 316 or AISI 316L but can be used AISI304 as well.
- Pressure regulators or valves for pressures below 5 MPa or 50 bar, still use austenitic stainless Steels in the majority of cases but carbon steel normalized by heat treatment is accepted for this pressure range
- Pressure regulators or valves for pressures below 1 MPa or 10 bar carbon steel or even ductile iron can be used but good engineering practices ask for ferritization heat treatment for the ductile iron.

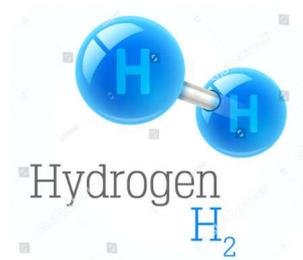
## Sealing and diaphragms material

The performance of existing sealing technology is an area likely to cause some challenges during the process of converting existing infrastructure.

Hydrogen has a much smaller molecular size than natural gas so commonly used sealing materials and technologies may no longer be suitable for use. The correct selection of polymeric sealing materials will represent a particular challenge with a requirement for a temperature range of -40°C to 85°C . Blistering and rapid gas decompression are also potential seal performance issues associated with gases of small molecular size such as hydrogen. The high pressure gas is able to permeate into the seal material and then destructively expand as the system pressure reduces.

Therefore the material selected by GASCAT for pressure regulators or valves for pressures above 5 MPa (50 bar), the high performance PU or UHMW are the better ones to be used.

Pressure regulators or Valves for pressures below 5MPa (50 bar) EPDM is the better but also BUNA N can be used.





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GASCAT policy is one of continuous improvement and development. The Company reserves the right to change specifications and introduce improved designs without previous notice.