

HP 100

Low Pressure Gas Regulator



TECHNICAL BROCHURE

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hp100_technicalbrochure_ENG_revB

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Who we are

We are a global organization that specializes in designing and manufacturing technologically advanced solutions for natural gas treatment, transmission and distribution systems.

We are the ideal partner for operators in the Oil & Gas sector, with a business solutions that span the whole natural gas chain.

We are constantly evolving to meet our customers' highest expectations in terms of quality and reliability.

Our aim is to be a step ahead of the competition, with customized technologies and an after-sale service program undertaken with the highest level of professionalism.



Pietro Fiorentini advantages



Localised technical support



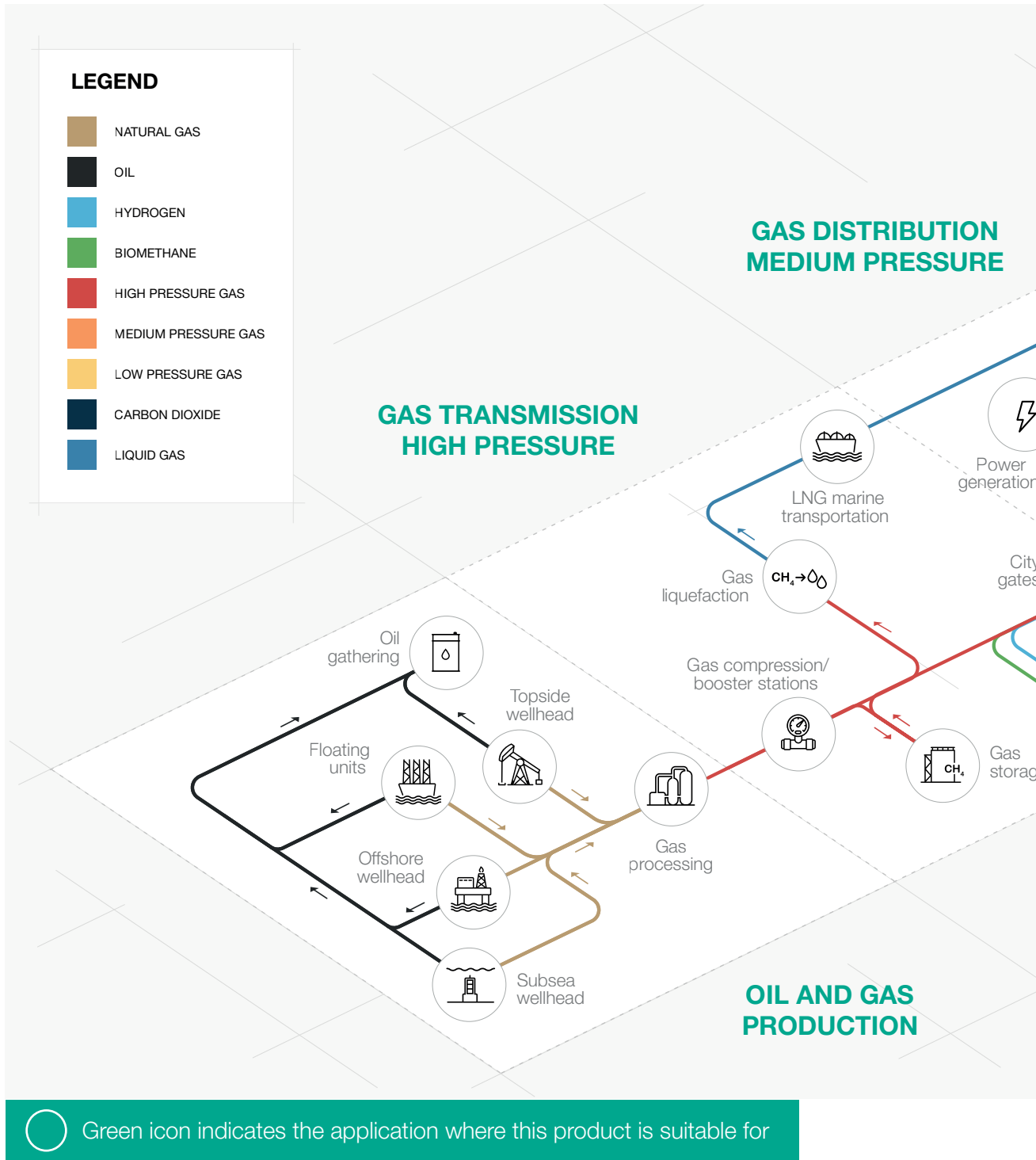
Experience since 1940



Operating in over 100 countries



Area of Application



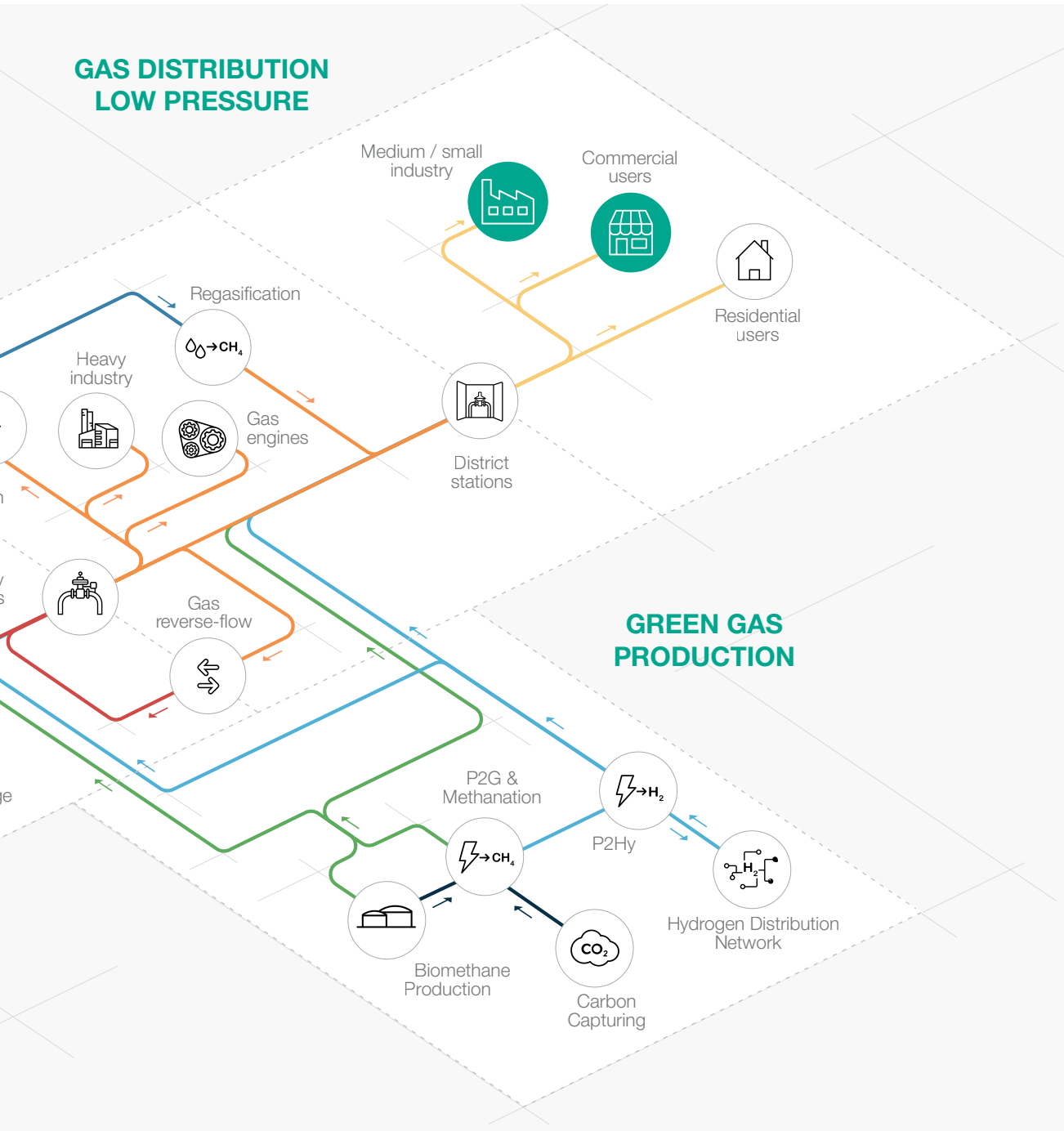


Figure 1 Area of Application Map



Introduction

The **HP 100** by Pietro Fiorentini is a **spring loaded** gas pressure regulator controlled by a diaphragm and contrasting regulated spring action.

Mainly used for medium and low pressure natural gas distribution networks, as well as commercial and industrial applications.

It should to be used with previously filtered non-corrosive gases and it has available a specific version for liquefied petroleum gas (LPG).

According to the European Standard EN 334, it is classified as **Fail Open**.

The HP 100 is **Hydrogen Ready** for NG-H2 blending.

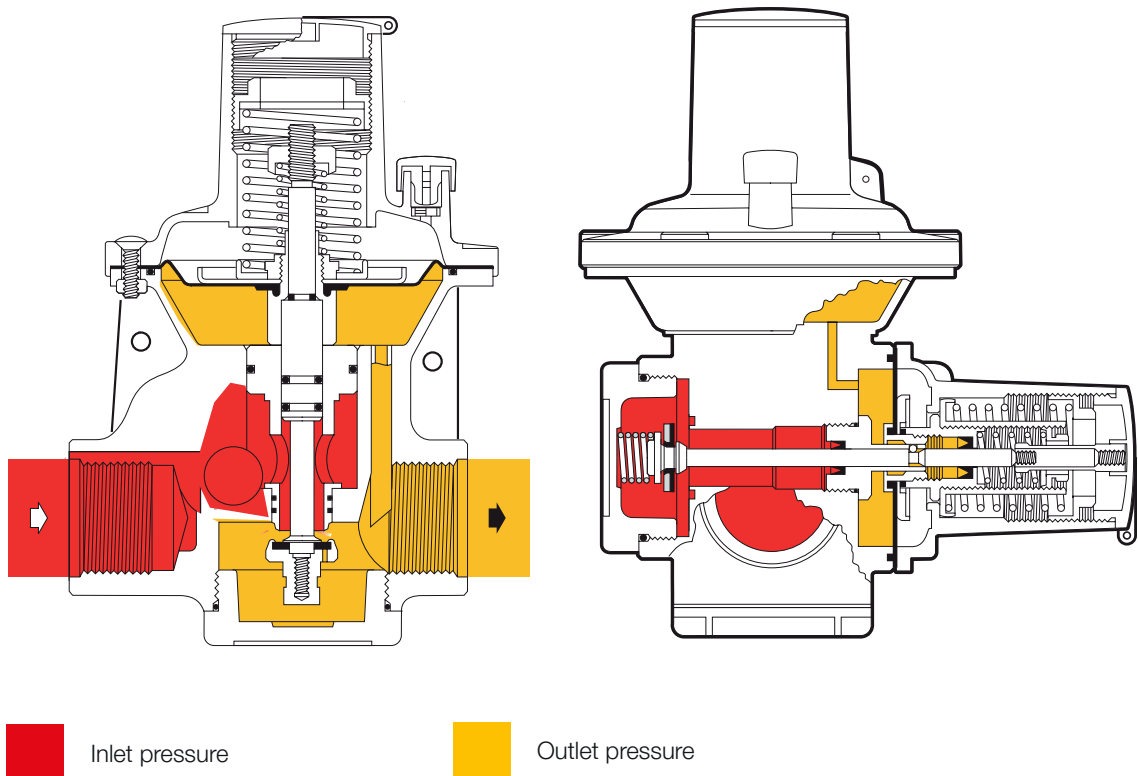


Figure 2 HP 100

Features and Calibration ranges

The **HP 100** is a **spring loaded** device for medium and low pressure with a unique **dynamic balancing system** which ensures an **outstanding turndown ratio** combined with an extremely **accurate outlet pressure control**.

A balanced pressure regulator it is a pressure regulator where delivery pressure accuracy is not affected by the fluctuation of the inlet pressure and flow during its operation. Therefore, a balanced pressure regulator can have a single orifice for all pressure and flow operating conditions.

This regulator is suitable for use with previously filtered, non-corrosive gases and distribution networks as well as high load industrial applications.

It is a **truly top entry design** which allows an **easy maintenance** of parts directly in the field **without removing the body from the pipework**.

Set point adjustment of the regulator is operated via a spring located in the top chamber.

The modular design of the HP 100 pressure regulators allows to install built-in slam shut valve.



HP 100 competitive advantages



Balanced type



Top Entry



Operates with high differential pressure



Easy maintenance



High accuracy



Built-in accessories



Fail Open



Biomethane compatible and 20% Hydrogen blending compatible. Higher blending available on request

Features

| Features | Values | |
|---|---|-----------|
| Design pressure* (PS ¹ / DP ²) | up to 2 MPa up to 20 barg | |
| Ambient temperature* (TS ¹) | from -20 °C to +60 °C from -4 °F to +140 °F | |
| Inlet gas temperature* | from -20 °C to +60 °C from -4 °F to +140 °F | |
| Inlet pressure (MAOP / p _{umax} ¹) | from 0.1 MPa to 2 MPa from 1 bar to 20 barg | |
| Range of downstream pressure (Wd ¹) | from 30 to 80 kPa for AP, from 80 to 450 kPa for AP TR from 300 to 800 mbar for AP, from 800 to 4500 mbar for AP TR | |
| Available accessories | Relief valve, slam shut (SSV can not be retrofitted after purchase) | |
| Minimum operating differential pressure (Δp _{min} ¹) | 0.05 MPa 0.5 bar | |
| Accuracy class (AC ¹) | up to 10 (AC 5 available on request) | |
| Lock-up pressure class (SG ¹) | up to 10 | |
| Nominal size (DN ^{1,2}) | inline version | 1"x1" |
| | 90° version | 1"x1" 1/2 |
| Connections | Threaded EN 10226-1 (for all version), NPT ASME B1.20.1 (for inline version only), custom fittings available on request | |
| ⁽¹⁾ according to EN334 standard ⁽²⁾ according to ISO 23555-1 standard ^(*) NOTE: Different functional features and/or extended temperature ranges may be available on request. Stated inlet gas temperature range is the maximum for which the equipment's full performance, including accuracy is guaranteed. Product may have a different pressure or temperature ranges according to the version and/or installed accessories. | | |

Table 1 Features

Materials and Approvals

| Part | Material |
|---------------------|---|
| Body | Aluminium |
| Cover | Aluminium |
| External treatments | High resistance dust polyurethane coating |

NOTE: The materials indicated above refer to the standard models. Different materials can be provided according to specific needs.

Table 2 Materials

Construction Standards and Approvals

The **HP 100** regulators are designed according to the European standard EN 334. The regulator reacts in opening (Fail Opening) according to EN 334.

The product is certified according to European Directive 2014/68/EU (PED). Leakage class: bubble tight, better than class VIII according to ANSI/FCI 70-3.



EN 334



PED-CE



Springs ranges and control heads

| Control heads pressure ranges | | | |
|-------------------------------|----------------------|------------------------|-------------------------|
| | Control head AP | Control head AP TR | Spring Table web link |
| Model | kPa mbar | kPa mbar | |
| HP 100 | 30 ÷ 80 300 ÷ 800 | 80 ÷ 450 800 ÷ 4500 | T-00104 |

Table 3 Settings table

General link to the calibration tables: [PRESS HERE](#) or use the QR code:



Accessories

For the pressure regulators:

- Slam shut valve
- Relief valve

Monitor configuration

The in-line monitor is generally installed upstream of the active regulator. Although the function of the monitor regulator is different, the two regulators are virtually identical from the point of view of their mechanical components. The only difference is that monitor is set at a higher pressure than active regulator. The Cg coefficients of the worker regulator with an in-line monitor is the same, but during worker regulator sizing it shall be considered the differential pressure drop generated by the fully open in-line monitor. As a practice, to incorporate this effect a Cg reduction of 20% of the worker regulator can be applied.

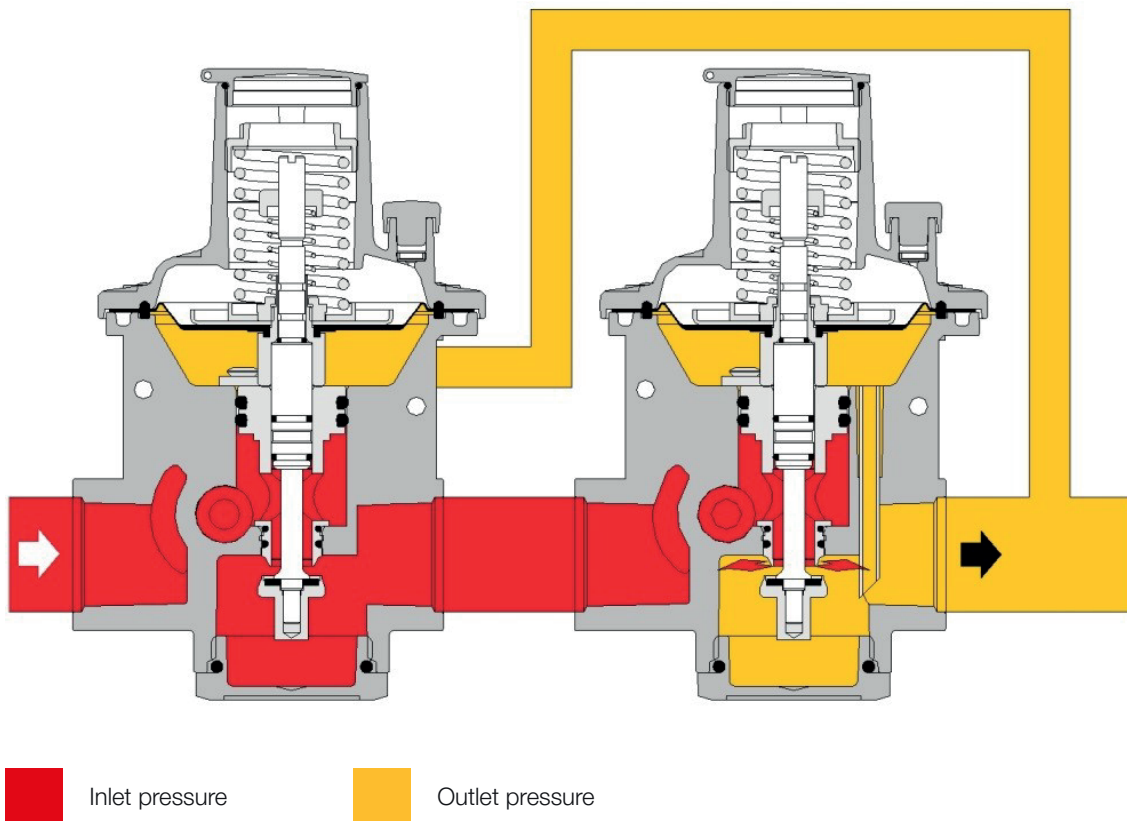


Figure 3 HP 100 in-line monitor








Slam Shut

The HP 100 pressure regulator offers the possibility of installing an **incorporated slam shut valve during the manufacturing process.**

For HP 100/B with the built-in slam shut, the Cg valve coefficients is 5% lower than the corresponding version without.

The main characteristics of this device are:

-  OPSO Overpressure Shut-Off
-  UPSO Underpressure Shut-Off
-  Internal by-pass
-  Compact dimensions
-  Easy maintenance

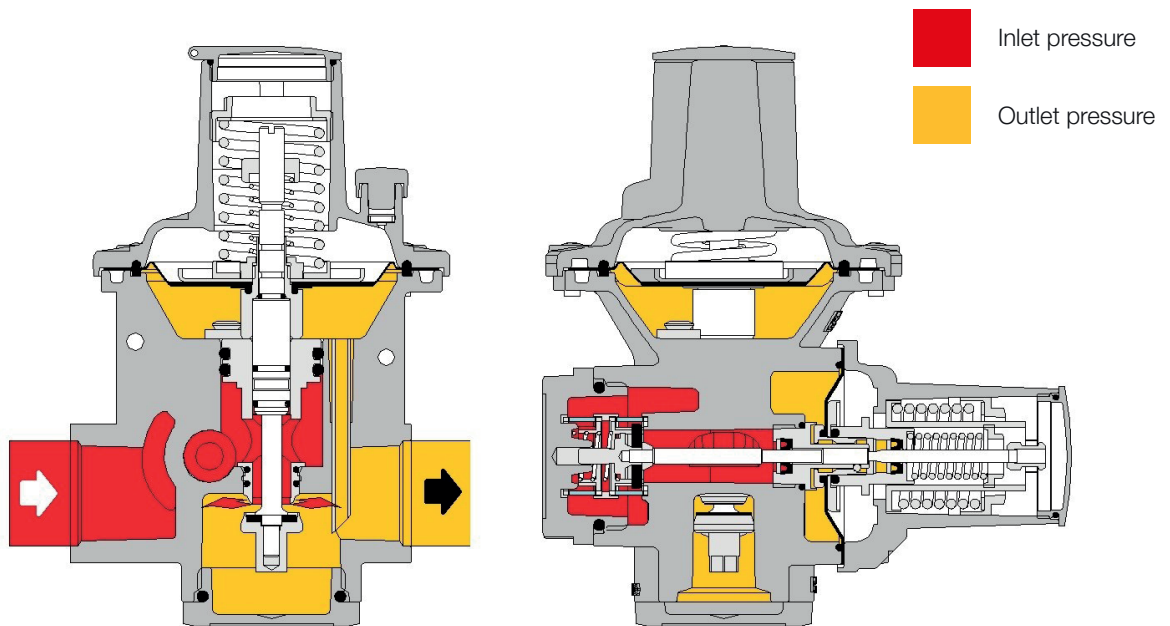


Figure 4 HP 100/B

| Pressure switch types and ranges | | | | | |
|----------------------------------|-------|-----------|----------|------------|-----------------------|
| SSV Type | Model | Operation | Range Wh | | Spring Table web link |
| | | | KPa | mbarg | |
| B | - | OPSO | 45 - 70 | 450 - 7000 | T-00104 |
| | | UPSO | 10 - 300 | 100 - 3000 | |

Table 4 Settings table

Integral strainer (Item 1)

The HP 100 is equipped with internal 100 micron strainer to prevent foreign particles, such as weld slag or PE shavings, to get stucked between orifice and seat/disk thus preventing lockup.

Futhermore, the strainer provides protection to all integral accessories as well as downstream customer's assets.

Token relief valve (Item 2)

The HP 100 has an optional token relief valve that discharges a small volume of gas to the atmosphere when the regulator exceeds the relief valve set point. Token relief valve cannot be used as overpressure protection device.

During no-flow conditions, thermal expansion of the gas can cause downstream static pressure to build up. The token relief valve will prevent downstream pressure from rising, and if equipped, prevent nuisance tripping of the slam shut valve.

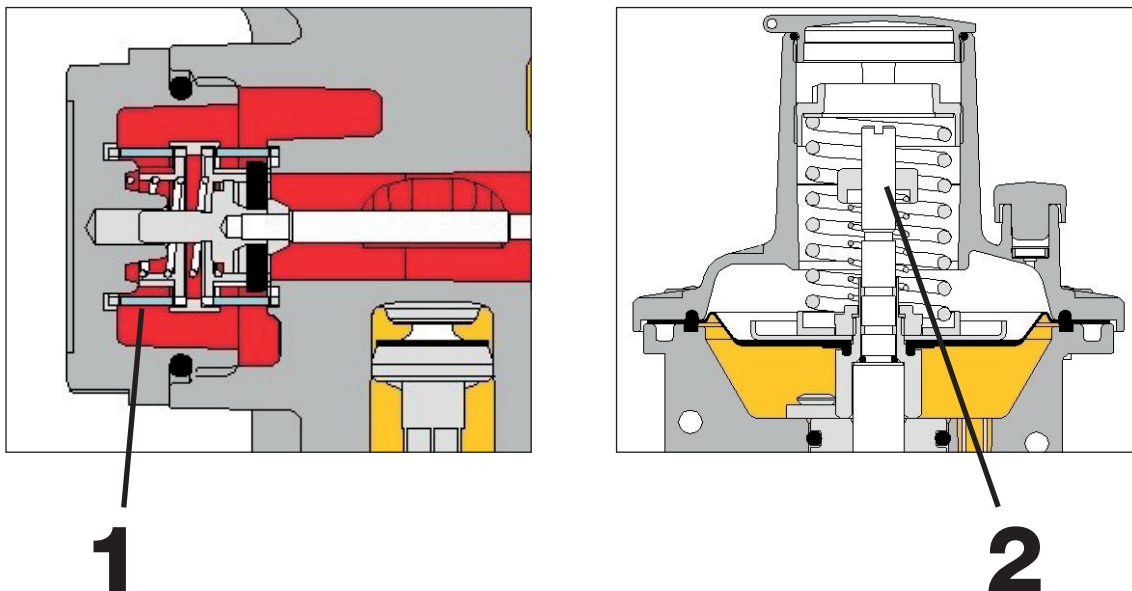


Figure 5 HP 100 components location



Weights and Dimensions

HP 100

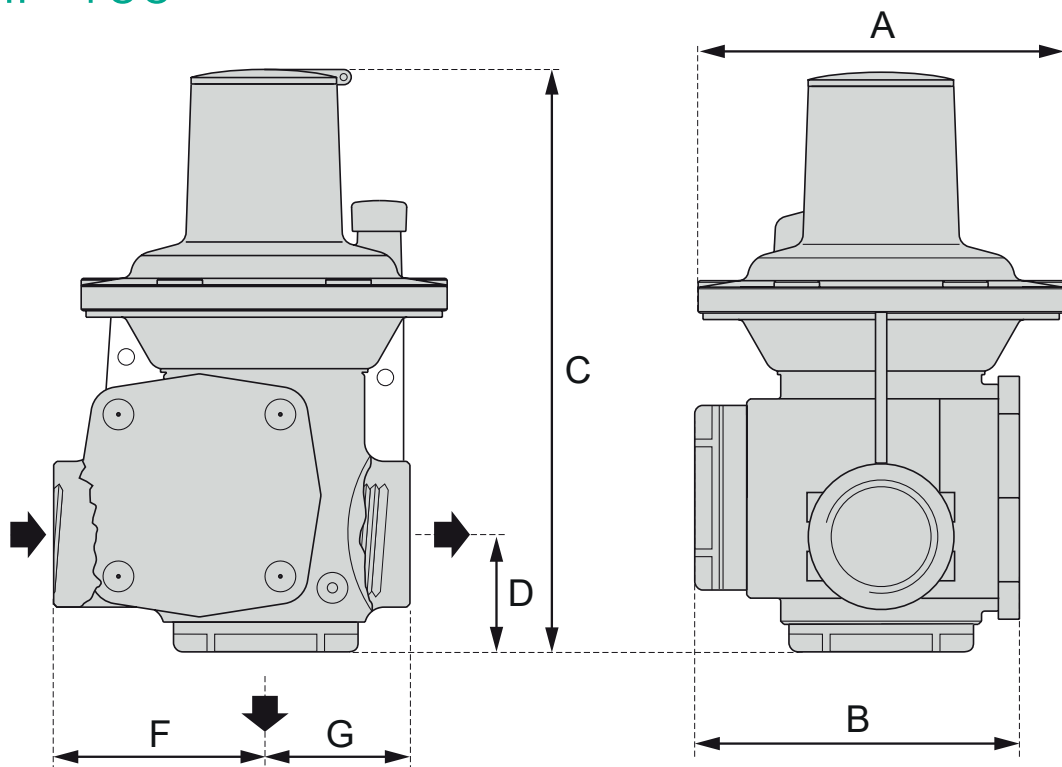


Figure 6 HP 100 dimensions

| Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative) | | |
|---|------|--------|
| | [mm] | inches |
| A | Ø115 | Ø4.5" |
| B | 102 | 4.0" |
| C | 187 | 7.4" |
| D | 43 | 1.7" |
| E | 110 | 4.3" |
| F | 65 | 2.6" |
| G | 45 | 1.8" |
| Weight | | |
| Regulator | Kg | lbs |
| Regulator | 1.7 | 3.7 |
| Regulator + DN25 flange | 3.2 | 7.1 |
| Regulator + DN40 flange (inlet) + DN50 flange (outlet) | 5.9 | 13.0 |

Table 5 Weights and dimensions

HP 100/B

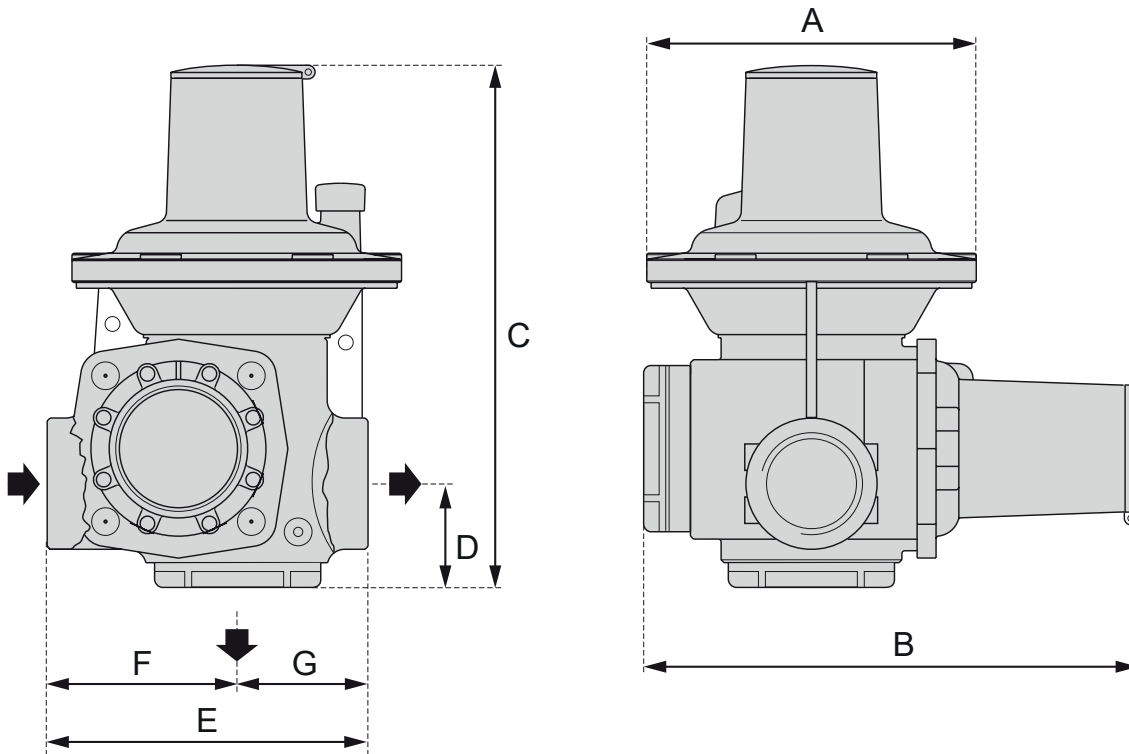


Figure 7 HP 100/B dimensions

| Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative) | | |
|---|------|--------|
| | [mm] | inches |
| A | Ø115 | Ø4.5" |
| B | 172 | 6.8" |
| C | 187 | 7.4" |
| D | 43 | 1.7" |
| E | 110 | 4.3" |
| F | 65 | 2.6" |
| G | 45 | 1.8" |
| Weight | | |
| Regulator | Kg | lbs |
| Regulator + DN25 flange | 1.9 | 4.2 |
| Regulator + DN40 flange (inlet) + DN50 flange (outlet) | 3.5 | 7.7 |
| | 6.1 | 13.4 |

Table 6 Weights and dimensions



Sizing and Cg

In general, the choice of a regulator is made based on the calculation of the flow rate determined by the use of formulae using the flow rate coefficients (Cg) and the form factor (K1) as indicated by the EN 334 standard. Sizing is available through the on-line Pietro Fiorentini sizing program.

| Flow rate coefficient | | |
|-----------------------|---------|-------------|
| Nominal size | 25 | 25 x 40 |
| Inches | 1" x 1" | 1" x 1" 1/2 |
| Cg | 95 | 95 |
| K1 | 110 | 100 |

Table 7 Flow rate coefficient

For sizing [PRESS HERE](#) or use the QR code:



Note: In case you do not have the proper credentials to access, feel free to contact your closest Pietro Fiorentini representative.

In general the on-line sizing considers multiple variables as the regulator is installed in a system, enabling a better and multiperspective approach to the sizing.

For different gases, and for natural gas with a different relative density other than 0.61 (compared to air), the correction coefficients from the following formula shall be applied.

$$F_c = \sqrt{\frac{175.8}{S \times (273.16 + T)}}$$

S = relative density (refer to Table 8)
T = gas temperature (°C)

$$F_c = \sqrt{\frac{316.44}{S \times (459.67 + T)}}$$

S = relative density (refer to Table 8)
T = gas temperature (°F)

| Correction Factor Fc | | |
|----------------------|--------------------|----------------------|
| Gas Type | Relative Density S | Correction Factor Fc |
| Air | 1.00 | 0.78 |
| Propane | 1.53 | 0.63 |
| Butane | 2.00 | 0.55 |
| Nitrogen | 0.97 | 0.79 |
| Oxygen | 1.14 | 0.73 |
| Carbon Dioxide | 1.52 | 0.63 |

Note: the table shows the Fc correction factors valid for Gas, calculated at a temperature of 15°C and at the declared relative density.

Table 8 Correction Factor Fc

| Flow rate conversion |
|---|
| $\text{Stm}^3/\text{h} \times 0.94795 = \text{Nm}^3/\text{h}$ |

Nm³/h reference conditions:

T= 0 °C; P= 1 barg | T= 32 °F; P= 14.5 psig

Stm³/h reference conditions:

T= 15 °C; P= 1 barg | T= 59 °F; P= 14.5 psig

Table 9 Flow rate conversion

CAUTION:

In order to get optimal performance, to avoid premature wear on the regulators components, and to limit noise emissions, it is recommended to check the gas speed and its compliance with local practice and regulations. The gas speed at the outlet flange of the regulator which be calculated by the following formula:

$$V = 345.92 \times \frac{Q}{\text{DN}^2} \times \frac{1 - 0.002 \times \text{Pd}}{1 + \text{Pd}}$$

$$V = 0.0498 \times \frac{Q}{\text{DN}^2} \times \frac{14.504 - 0.002 \times \text{Pd}}{14.504 + \text{Pd}}$$

V = gas speed in m/s

Q = gas flow rate in Stm³/h

DN = nominal size of regular in mm

Pd = outlet pressure in barg

V = gas speed in ft/s

Q = gas flow rate in Scfh

DN = nominal size of regular in inches

Pd = outlet pressure in psi



Flow capacity tables

HP 100 AP - DN 1"

From 30 kPa [300 mbarg] to 80 kPa [800 mbarg]

HP 100 AP - (accuracy 10% ; AC10 according to EN334)

| Inlet pressure | | Outlet pressure | | | | | | | | | |
|----------------|------|---------------------|------|---------------------|------|---------------------|------|---------------------|------|---------------------|------|
| | | 30 kPa / 300 mbarg | | 40 kPa / 400 mbarg | | 50 kPa / 500 mbarg | | 60 kPa / 600 mbarg | | 80 kPa / 800 mbarg | |
| MPa | barg | Stm ³ /h | Scfh | Stm ³ /h | Scfh | Stm ³ /h | Scfh | Stm ³ /h | Scfh | Stm ³ /h | Scfh |
| 0.05 | 0.5 | 30 | 1100 | - | - | - | - | - | - | - | - |
| 0.10 | 1.0 | 55 | 2000 | 58 | 2100 | 55 | 2000 | 52 | 1900 | 45 | 1600 |
| 0.20 | 2.0 | 98 | 3500 | 113 | 4000 | 114 | 4100 | 116 | 4100 | 120 | 4300 |
| 0.50 | 5.0 | 159 | 5700 | 161 | 5700 | 166 | 5900 | 170 | 6100 | 179 | 6400 |
| 1.00 | 10.0 | 158 | 5600 | 161 | 5700 | 165 | 5900 | 170 | 6100 | 178 | 6300 |
| 1.50 | 15.0 | 158 | 5600 | 160 | 5700 | 164 | 5800 | 169 | 6000 | 178 | 6300 |
| 2.00 | 20.0 | 157 | 5600 | 159 | 5700 | 164 | 5800 | 168 | 6000 | 177 | 6300 |

Cg = 95 K1=110

Table 10 HP 100 AP flow rate with outlet pressure from 30 kPa [300 mbarg] to 80 kPa [800 mbarg]

HP 100 AP TR - DN 1"

From 80 kPa [800 mbarg] to 0.4 MPa [4 barg]

HP 100 TR - (accuracy 10% ; AC10 according to EN334)

| Inlet pressure | | Outlet pressure | | | | | | | | | |
|----------------|------|---------------------|------|---------------------|------|---------------------|------|---------------------|------|---------------------|------|
| | | 80 kPa / 800 mbarg | | 0.1 MPa / 1 barg | | 0.2 MPa / 2 barg | | 0.3 MPa / 3 barg | | 0.4 MPa / 4 barg | |
| MPa | barg | Stm ³ /h | Scfh | Stm ³ /h | Scfh | Stm ³ /h | Scfh | Stm ³ /h | Scfh | Stm ³ /h | Scfh |
| 0.08 | 0.8 | - | - | - | - | - | - | - | - | - | - |
| 0.10 | 1.0 | 40 | 1500 | - | - | - | - | - | - | - | - |
| 0.20 | 2.0 | 96 | 3400 | 88 | 3200 | - | - | - | - | - | - |
| 0.50 | 5.0 | 239 | 8500 | 236 | 8400 | 214 | 7600 | 172 | 6100 | 117 | 4200 |
| 1.00 | 10.0 | 238 | 8500 | 238 | 8500 | 248 | 8800 | 258 | 9200 | 258 | 9200 |
| 1.50 | 15.0 | 237 | 8400 | 237 | 8400 | 247 | 8800 | 257 | 9100 | 257 | 9100 |
| 2.00 | 20.0 | 236 | 8400 | 236 | 8400 | 246 | 8700 | 256 | 9100 | 256 | 9100 |

Cg = 95 K1= 110

Table 11 HP 100 AP TR flow rate with outlet pressure from 80 kPa [800 mbarg] to 0.4 MPa [4 barg]

Note: Recommended max flow rate are considering multiple factors such as: extend the regulator's life, mitigate the erosion/vibrations for high velocity and to minimize the noise emission.

Remark: all capacity stated are considering a stand alone regulator. In case of incorporated accessories a reduction of flow shall be considered.



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