

Aperflux 101

High - Medium Pressure Gas Regulator



TECHNICAL BROCHURE

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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



Localized technical support

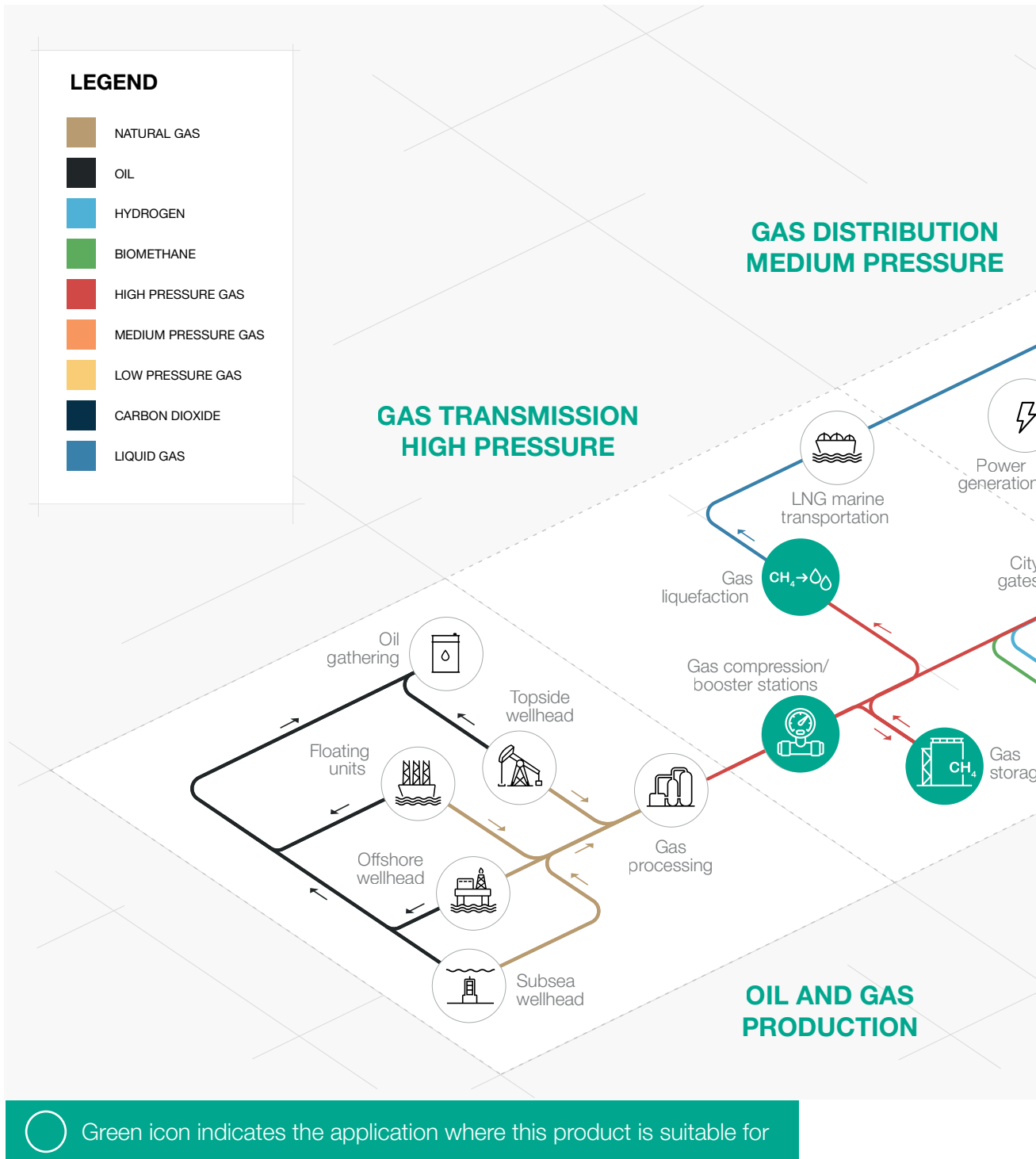


Experience since 1940



Operating in over 100 countries

Area of Application



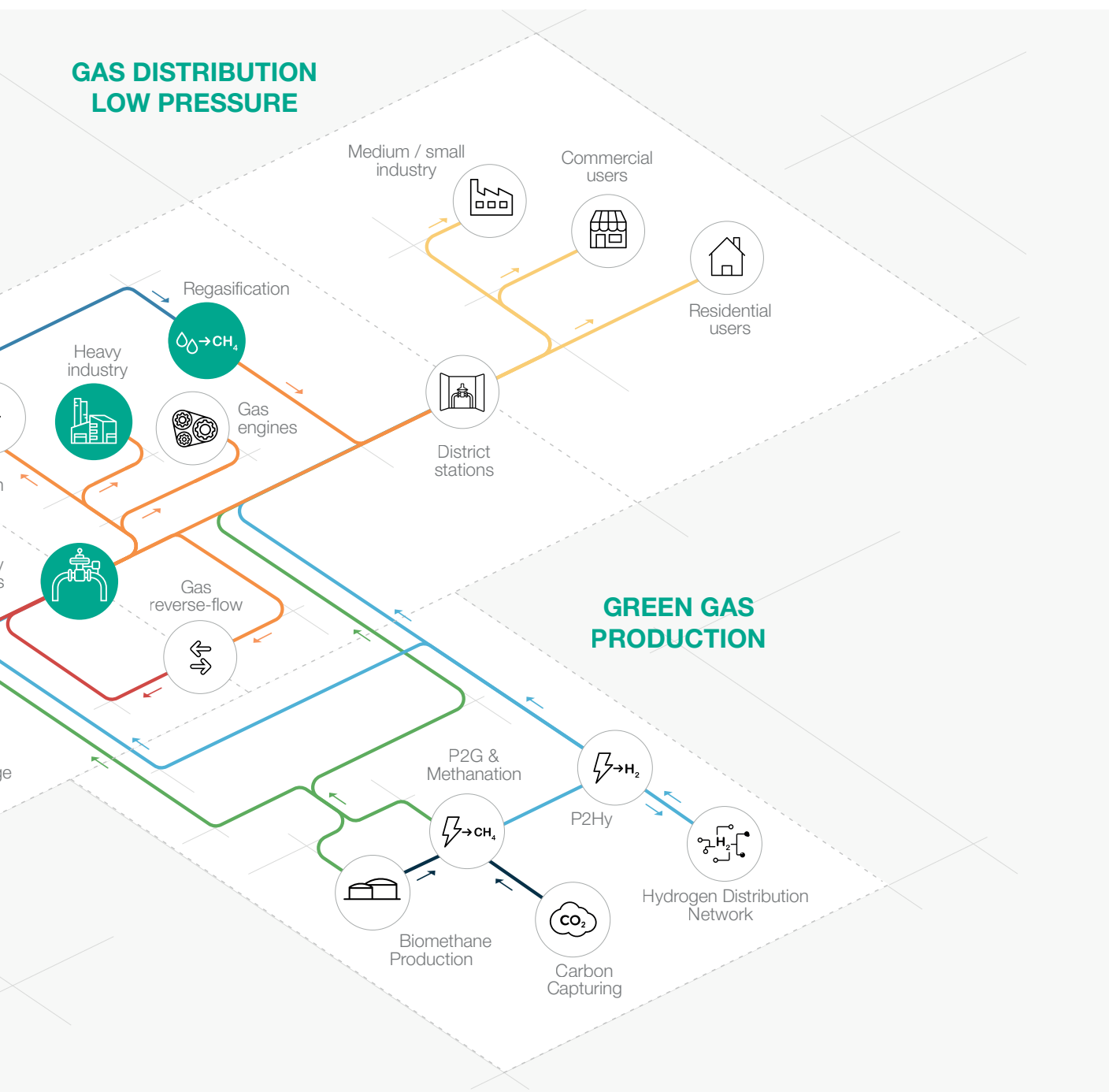


Figure 1 Area of application map

Introduction

Aperflux 101 is one of the **pilot-operated gas pressure regulators** designed and manufactured by Pietro Fiorentini.

This device is suitable for use with previously filtered non-corrosive gases, and it is mainly used for high-pressure transmission systems and for medium pressure natural gas distribution networks.

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

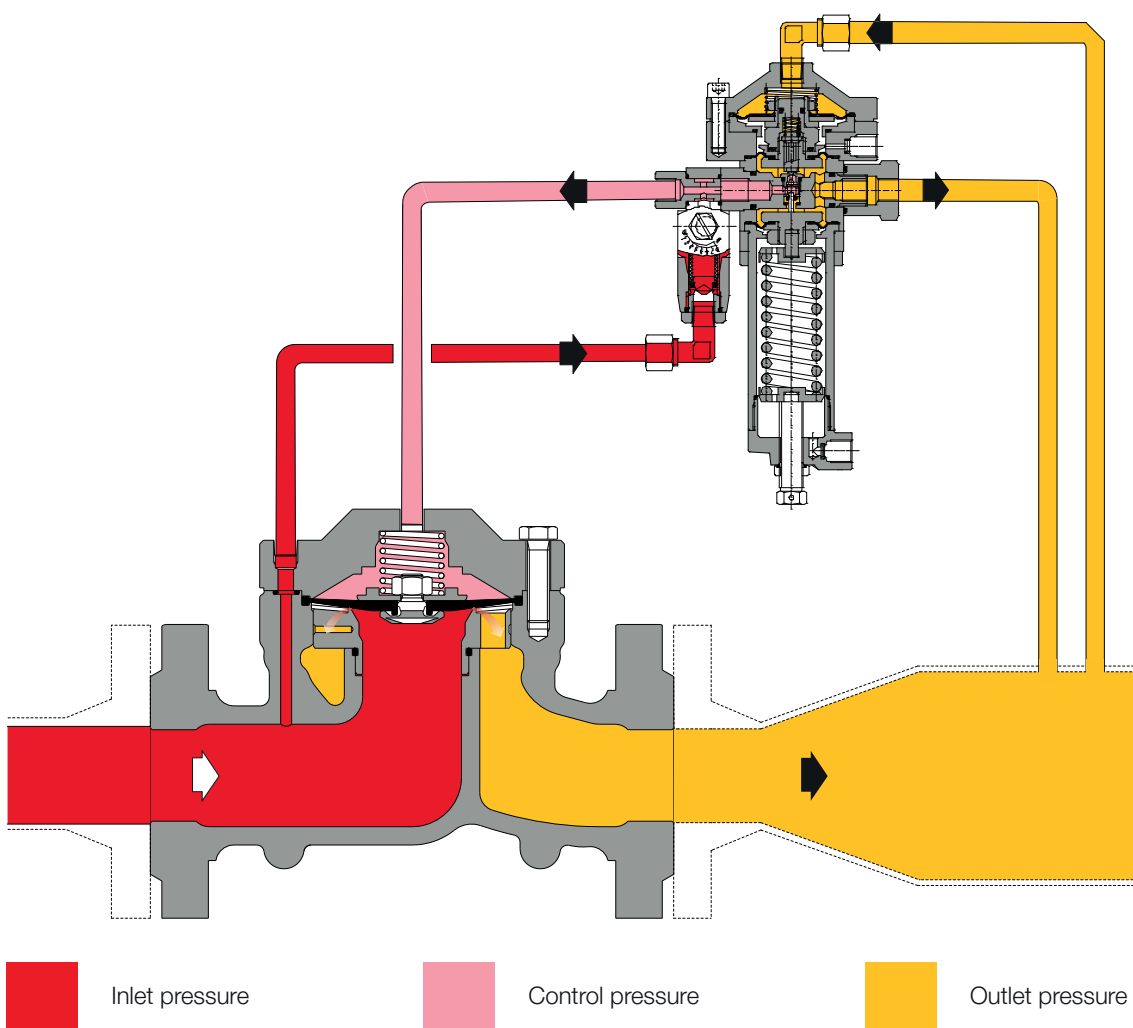


Figure 2 Aperflux 101

Features

Aperflux 101 is a **pilot-operated** device for high pressure and medium pressure with a unique **dynamic balancing system** which ensures an **outstanding turn down ratio** combined with an extremely **accurate outlet pressure control**.

Aperflux 101 is a balanced pressure regulator. This means that the controlled outlet pressure is not affected by variations in the inlet pressure and flow during its operation. Therefore a balanced regulator can have a single-size orifice for all pressure and flow conditions.

This regulator is suitable for use with previously filtered, non corrosive gases, in natural gas transmission and distribution networks as well as high load industrial application.

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 achieved via a pilot, loading and unloading the pressure in the Aperflux upper diaphragm chamber.

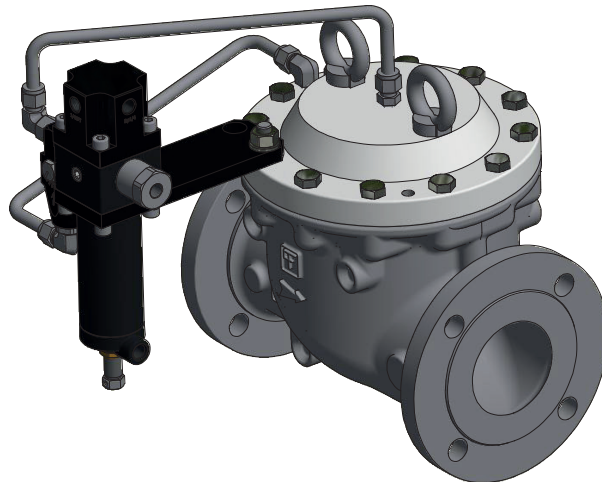


Figure 3 Aperflux 101



Aperflux 101 competitive advantages



Compact and simple design



High turn-down ratio



Low noise



Top Entry



Easy maintenance



Balanced type



Biomethane compatible and available with specific versions for full Hydrogen or blending

Features

Features	Values	
Design pressure* (PS ¹ / DP ²)	up to 8.5 MPa up to 1232 psig	
Operating ambient temperature* (TS ¹)	Standard version from -10 °C to +65 °C from +14 °F to +150 °F	Arctic version from -40 °C to +65 °C from -40 °F to +150 °F
Permissible gas temperature*	Standard version from -10 °C to +60 °C from +14 °F to +140 °F	Arctic version from -20 °C to +60 °C from -4 °F to +140 °F
Inlet pressure range bpu (MAOP / p _{umax} ¹)	from 0.18 to 8.5 MPa from 26.1 to 1232 psig	
Range of downstream pressure (Wd ¹)	0.08 ÷ 7.4 MPa 11.6 ÷ 1073 psig	
Available accessories	none	
Minimum differential pressure (Δp _{min} ¹)	0.1 MPa - recommended > 0.2 MPa 14.5 psig - recommended > 29 psig	
Accuracy class	up to 2.5% gauge (depending on working conditions)	
Lock-up pressure class	up to 10% gauge (depending on working conditions)	
Nominal dimensions (DN ¹⁻²)	DN 50 2"; DN 80 3" ; DN 100 4";	
Connections*	Class 300/600 RF / RTJ according to ANSI B 16.5	

(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	Cast steel ASTM A352 LCC for rating 300 and 600
Cover	Rolled or forged carbon steel A350 LF2
Seat	Stainless steel
Diaphragm	Vulcanized rubber
Sealing ring	Nitrile rubber
Compression fittings	Stainless steel on request

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

Aperflux 101 regulator is designed according to European standard EN 334. According to EN 334 the regulator reacts in opening (Fail Open).

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



EN 334



PED-CE

Pilot models and ranges

Type	Model	Operation	Range Wh		Spring Table web link
			MPa	psig	
Main pilot	302/A	Manual	0.08 - 0.95	11.6 - 138	TT 653
Main pilot	304/A	Manual	0.7 - 4.3	101 - 623	TT 653
Main pilot	305/A	Manual	2 - 6	290 - 870	TT 653
Main pilot	307/A	Manual	4.1 - 7.4	595 - 1073	TT 1146

Table 3 Settings table

Types of pilot adjustment	
Pilot type .../A	Manual setting
Pilot type .../D	Electric remote control setting
Pilot type .../CS	Pneumatic remote control setting
Pilot type .../FIO	Smart unit for remote setting, monitoring, flow limitation

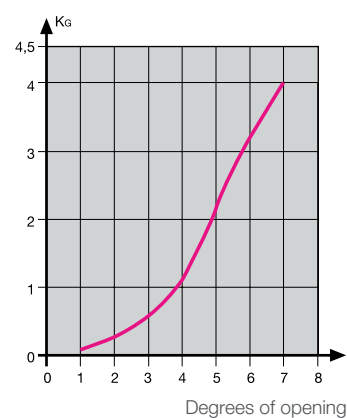
Table 4 Pilot adjustment table

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



The pilot system is equipped with an adjustable AR100 restrictor. The flow rate of the pilot system is controlled by the bleed rate through the AR100 restrictor which influences the response time of the regulator.

It is necessary to consider that pressure drop through the adjustable AR100 restrictor should be about 0.02 MPa (2.9 psig) at the minimum opening flow of the regulator and about 0.1 MPa (14.5 psig) at the maximum opening flow of the regulator main diaphragm.



PILOT 302/A

Spring part number	Spring color	d	Lo	De	Spring range (psig)	
					Min.	Max.
US2701800	Yellow	4.5	100	35	11.6	16.0
US2702080	Orange	5	100	35	16.0	31.9
US2702290	Red	5.5	100	35	31.9	50.8
US2702460	Green	6	100	35	50.8	81.2
US2702660	Black	6.5	100	35	81.2	105.9
US 2702820	Blue	7	100	35	105.9	137.8

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Table 5 TT 653 - PILOT 302/A setting springs

PILOT 304/A

Spring part number	Spring color	d	Lo	De	Spring range (psig)	
					Min.	Max.
US2702460	Green	6	100	35	101.5	188.6
US2702660	Black	6.5	100	35	188.6	246.6
US2702820	Blue	7	100	35	246.6	464.1
US2703045	Brown	7.5	100	35	464.1	623.6

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Table 6 TT 653 - PILOT 304/A setting springs

PILOT 305/A

Spring part number	Spring color	d	Lo	De	Spring range (psig)	
					Min.	Max.
US2702820	Blue	7	100	35	290.1	478.6
US2703045	Brown	7.5	100	35	478.6	609.1
US2703224	Grey	8	100	35	609.1	870.2

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Table 7 TT 653 - PILOT 305/A setting springs

PILOT 307/A

Spring part number	Spring color	d	Lo	De	Spring range (psig)	
					Min.	Max.
US2703224	Grey	8	100	35	594.6	1073.2

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)

Table 8 TT 1146 - PILOT 307/A setting springs

Accessories

For the pressure regulators:

- Cg limiter

For the pilot circuit:

- Heating cable for preheating pilot circuit
- Electrical heater PPH200
- Supplementary filter CF14 or CF14/D

In-line Monitor

The in-line monitor is generally installed upstream of the worker 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 the monitor is set at a higher pressure than worker regulator.

The Cg coefficient of the active regulator is the same, however during the sizing process, the differential pressure drop generated by the fully open in-line monitor shall be considered. As a general practice to incorporate this effect, a 20% reduction of the worker regulator's Cg value can be applied.

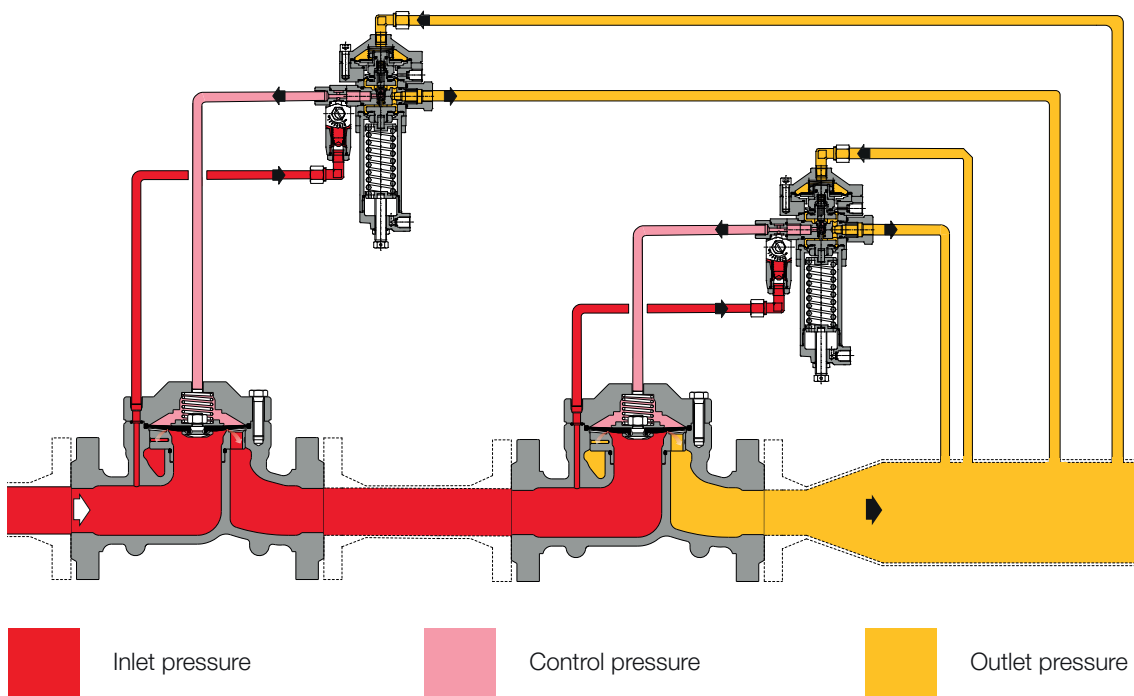


Figure 4 Aperflux 101 with In-line monitor setup

Weights and Dimensions

Aperflux 101

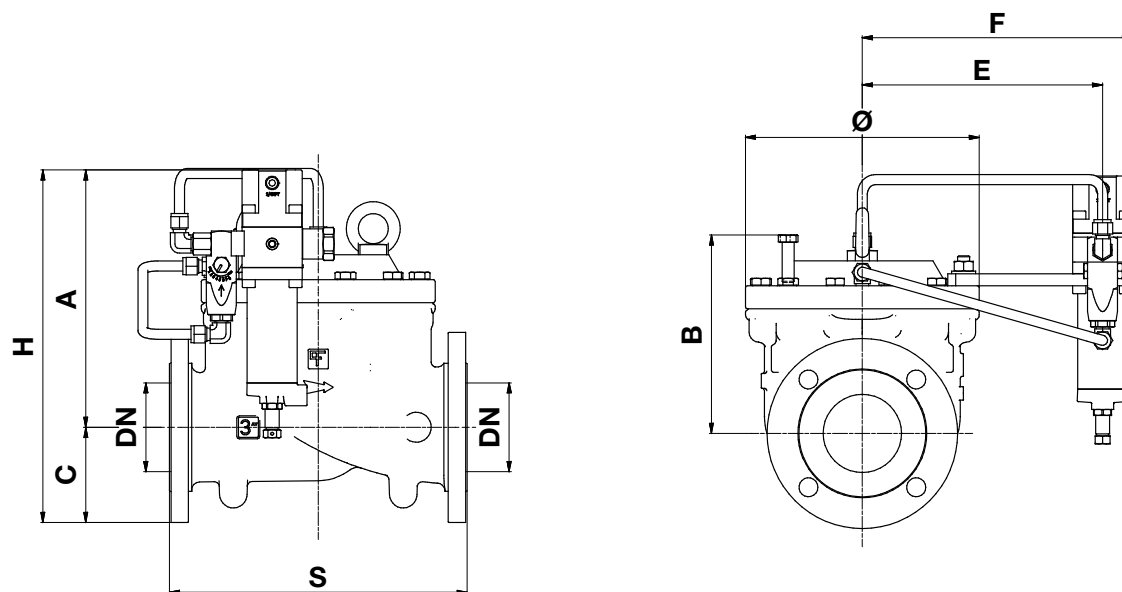


Figure 5 Aperflux 101 dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)						
Size (DN) - [mm]	50		80		100	
Size (DN) - inches	2"		3"		4"	
	[mm]	inches	[mm]	inches	[mm]	inches
S - ANSI 300	267	0.52"	317	2.48"	368	14.49"
S - ANSI 600	286	1.25"	336	3.25"	394	15.52"
Ø	167	6.6"	265	10.4"	290	11.4"
A	270	10.6"	290	11.4"	349	13.7"
B	183	7.2"	200	7.9"	280	11.0"
C	78	3.1"	100	3.9"	126	5.0"
E	203	8.0"	240	9.4"	230	9.1"
F	255	10.0"	290	11.4"	312	12.3"
H	348	13.7"	390	15.4"	475	18.7"
Tubing Connections	1/4" NPT					
Weight	Kg	lbs	Kg	lbs	Kg	lbs
ANSI 300	24.5	54.0	47	103.6	92	202.8
ANSI 600	26.5	58.4	51	112.4	102	224.9

Table 9 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 using the flow rate coefficients (Cg) and the form factor (K1) as indicated by the EN 334 standard.

Flow rate coefficient			
Nominal size	50	80	100
Inches	2"	3"	4"
Cg	1682	4200	7217
K1	103	108	105

Table 10 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 online 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 11)
T = gas temperature (°C)

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

S = relative density (refer to Table 11)
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 11 Correction Factor Fc

Flow rate conversion

Stm³/h x 0.94795 = Nm³/h

Nm³/h reference conditions T= 0 °C; P= 1 barg

Stm³/h reference conditions T= 15 °C; P= 1 barg

Table 12 Flow rate conversion

CAUTION:

In order to get optimal performance, to avoid premature erosion phenomena 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 may be calculated by means of the following formula:

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

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

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

V = gas speed in ft/s
Q = gas flow rate in Scfh
DN = nominal size of regular in inches
Pd = outlet pressure in psi



Sizing of regulators is usually made based on valve Cg value (Table 10).

Flow rates at fully open position and various operating conditions are related by the following formulae where:

Q = flow rate in Scf/h

Pu = inlet pressure in psia

Pd = outlet pressure in psia

- **A** > when the Cg value of the regulator is known, as well as Pu and Pd, the flow rate can be calculated as follows:

- **A-1** in sub critical conditions: ($P_u < 2 \times P_d$)

$$Q = 0.216 \times C_g \times P_u \times \sin \left(K_1 \times \sqrt{\frac{P_u - P_d}{P_u}} \right)$$

- **A-2** in critical conditions: ($P_u \geq 2 \times P_d$)

$$Q = 0.216 \times C_g \times P_u$$

- **B** > vice versa, when the values of Pu, Pd and Q are known, the Cg value, and hence the regulator size, may be calculated using:

- **B-1** in sub-critical conditions: ($P_u < 2 \times P_d$)

$$C_g = \frac{Q}{0.216 \times P_u \times \sin \left(K_1 \times \sqrt{\frac{P_u - P_d}{P_u}} \right)}$$

- **B-2** in critical conditions ($P_u \geq 2 \times P_d$)

$$C_g = \frac{Q}{0.216 \times P_u}$$

NOTE: The sin value is understood to be DEG.

Customer Centricity

Customer centricity is a way of running your business — implementing a perfect customer experience at each stage of the pipeline. Pietro Fiorentini is one of the main Italian international company with high focus on product and service quality.

The main strategy is to create a stable, long-term relationship, putting the customer's needs first. Lean management and customer centricity are used to improve and maintain the highest level of customer experience.



Support

Pietro Fiorentini's top priority is to provide support to the client in all phases of project development, during installation, start up and operation. Pietro Fiorentini has developed a highly standardized Intervention-Management-System (IMS), which helps to facilitate the entire process and putting the customer at the forefront of every decision in our process while manufacturing or developing a product to help improve the product and service. With our IMS business model many services are available remotely, avoiding long waiting times, improving service, and avoiding unnecessary expenses.



Training

Pietro Fiorentini offers training services available for both experienced operators and new customers. The training is offered for all levels of our customers which can include one or all of the following: sizing of equipment, application, installation, operation, maintenance and is prepared according to the level of use and the customer's need.



Customer Relation Management (CRM)

The service and care of our customers are one of the main missions and vision of Pietro Fiorentini. For this reason, Pietro Fiorentini has enhanced the customer relation management system. This enables us to track every opportunity and request from our customers into one single information point and allows us to coordinate information allowing us to give the customer improved service.



Sustainability

Here at Pietro Fiorentini, we believe in a world capable of improvement through technology and solutions that can shape a more sustainable future. That is why respect for people, society and the environment form the cornerstones of our strategy.



Our commitment to the world of tomorrow

While in the past we limited ourselves to providing products, systems and services for the Oil & Gas sector, today we want to broaden our horizons and create technologies and solutions for a digital and sustainable world. We have a particular focus on renewable energy projects to help make the most of our planet's resources and create a future in which the younger generations can grow and prosper.

The time has come to understand how and why we operate now.





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