Pietro Fiorentini

Aperflux 101

High Medium Pressure Gas Regulator

TECHNICAL BROCHURE

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aperflux101_technicalbrochure_ENG_revA

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Who we are

We are a global organization specialized 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 offer that goes across the whole natural gas chain.

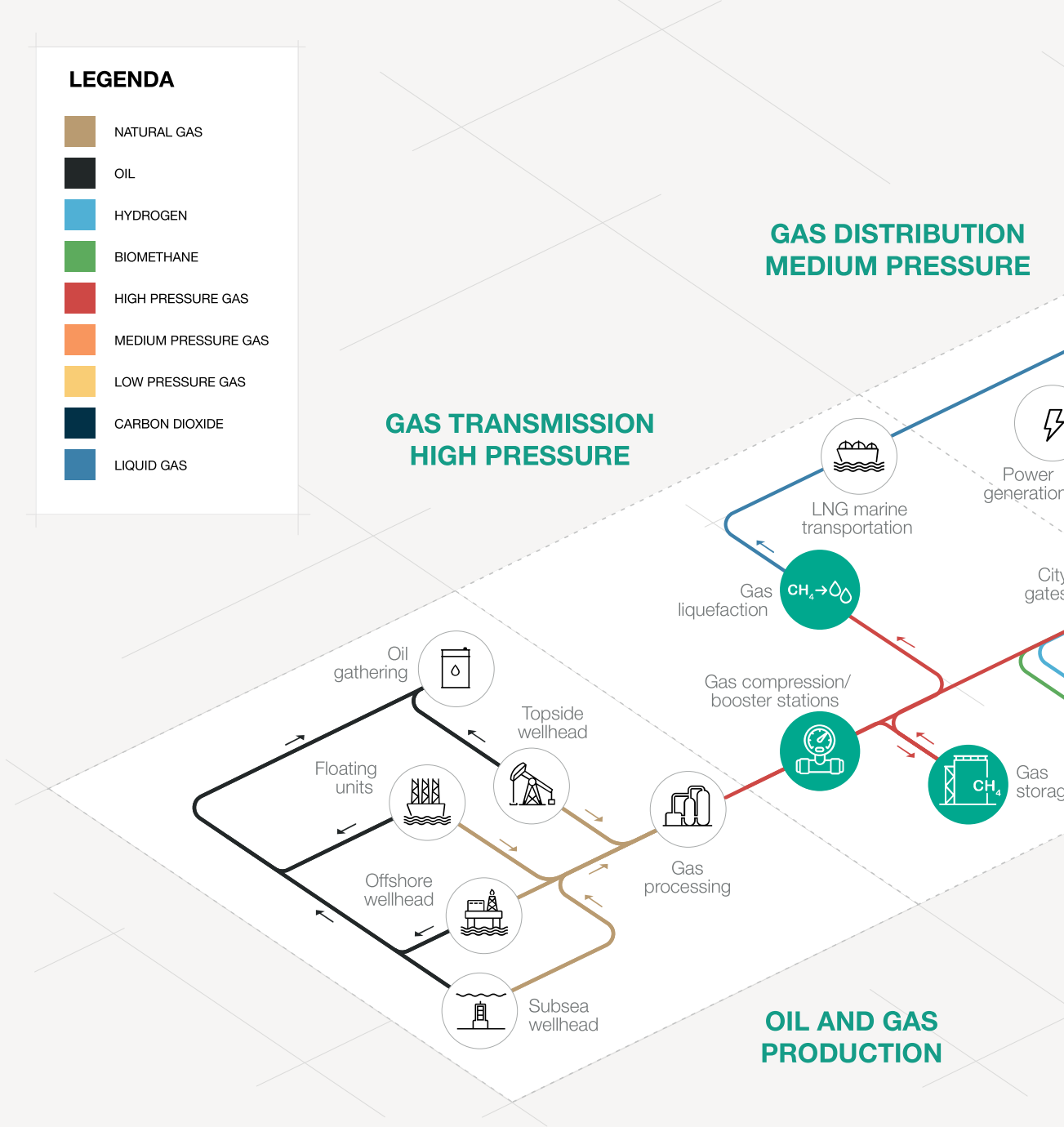
We are in constant evolution to meet our customers' highest expectations in terms of quality and reliability.

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

Pietro Fiorentini advantages

- Localised technical support
- Experience since 1940
- We operate in over 100 countries

Area of Application



Green icon indicates the application where this product is suitable for

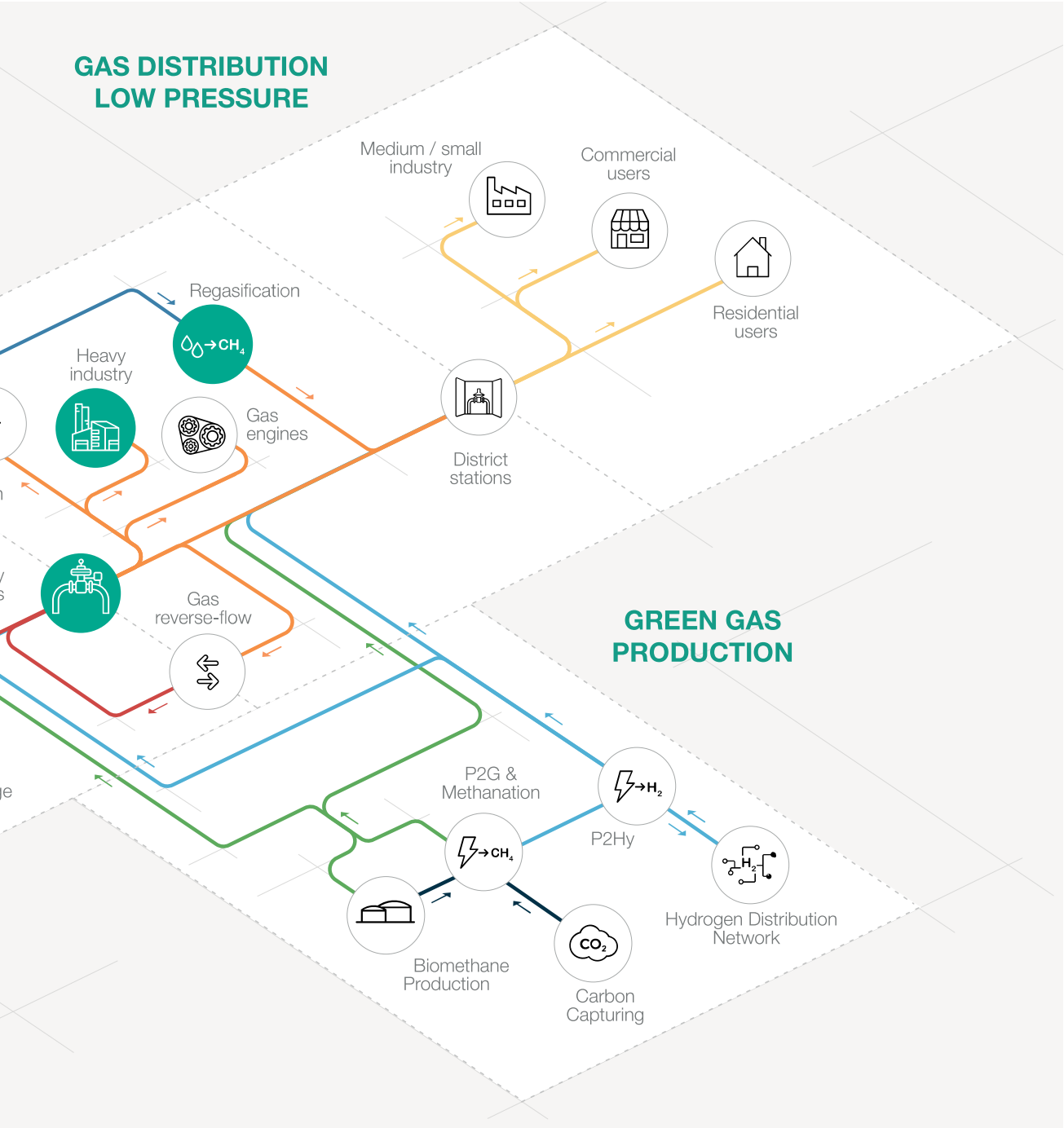


Figure 1 Area of Application Map

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.**

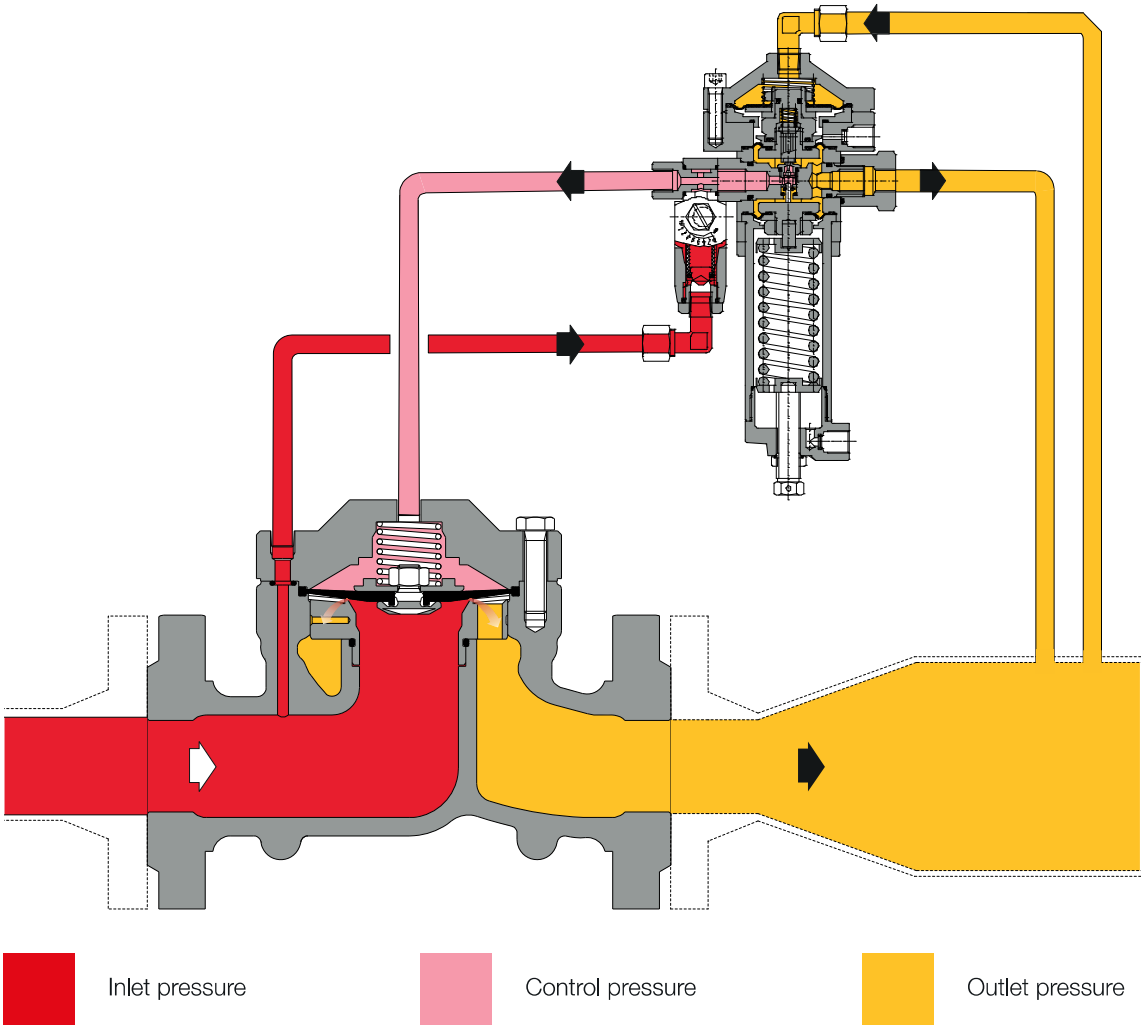


Figure 2 Aperflux 101

Features and Calibration ranges

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.

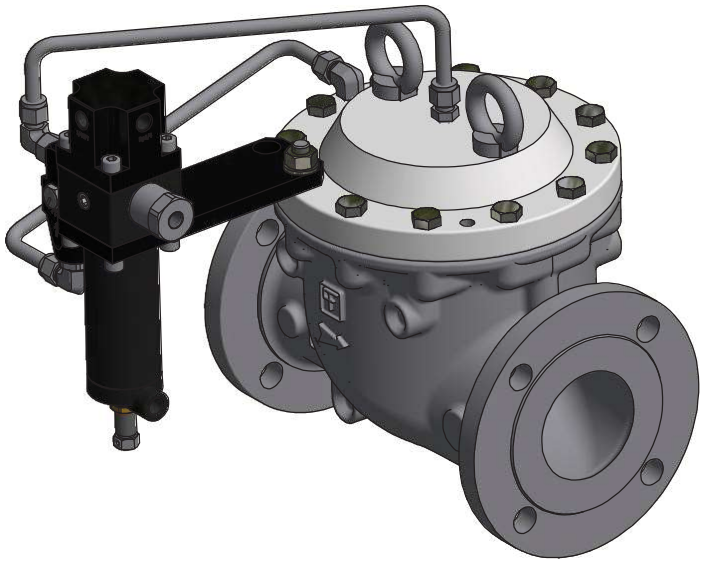


Figure 3 Aperflux 101

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Aperflux 101 competitive advantages

- Compact and simple design
- High turn-down ratio (1:500)
- 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*	up to 8.5 MPa up to 85 barg
Ambient temperature*	from -20 °C to +60 °C from -4 °F to +140 °F
Inlet gas temperature range*	from -20 °C to +60 °C from -4 °F to +140 °F
Inlet pressure range bpu	from 0.18 to 8.5 MPa from 1.8 to 85 barg
Range of downstream pressure Wd	0.08 ÷ 7.4 MPa 0.8 ÷ 74 barg
Available Accessories	none
Minimum differential pressure	0.1 MPa - recommended > 0.2 MPa 1 barg - recommended > 2 barg
Accuracy class AC	up to 2.5 (depending on working conditions)
Lock-up pressure class SG	up to 10 (depending on working conditions)
Nominal dimensions DN	DN 50 / 2"; DN 80 / 3" ; DN 100 / 4";
Connections*	Class 300/600 RF / RTJ according to ANSI B 16.5
(*) REMARK: Different functional features and/or extended temperature ranges available on request. Stated temperature ranges are the maximum for which the equipment's full performance, including accuracy, are fulfilled. Standard product may have a narrower range.	

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
REMARK: 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 ranges and type

Type	Model	Operation	Range Wh		Spring Table web link
			MPa	barg	
Main pilot	302/A	Manual	0.08 - 0.95	0.8 - 9.5	TT 653
Main pilot	304/A	Manual	0.7 - 4.3	7 - 43	TT 653
Main pilot	305/A	Manual	2 - 6	20 - 60	TT 653
Main pilot	307/A	Manual	4.1 - 7.4	41 - 74	TT 1146

Table 3 Settings table

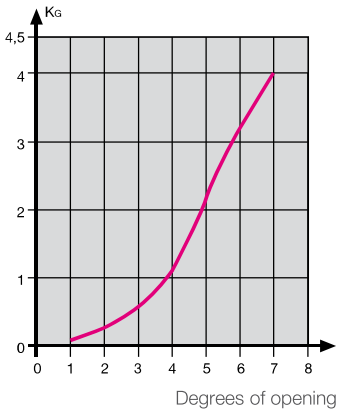
Types of pilot adjustment	
Pilot type .../A	Manual setting
Pilot type .../D	Electric remote control setting
Pilot type .../CS	Pneumatic remote control setting
Pilot type .../FIO	Smart unit for remote setting, monitoring, flow limitation

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 (0.2 barg) at the minimum opening flow of the regulator and about 0.1 MPa (1 barg) at the maximum opening flow of the regulator main diaphragm.



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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 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 the monitor is set at a higher pressure than active 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 practise to incorporate this effect, a 20% reduction of the Active regulator's Cg value can be applied.

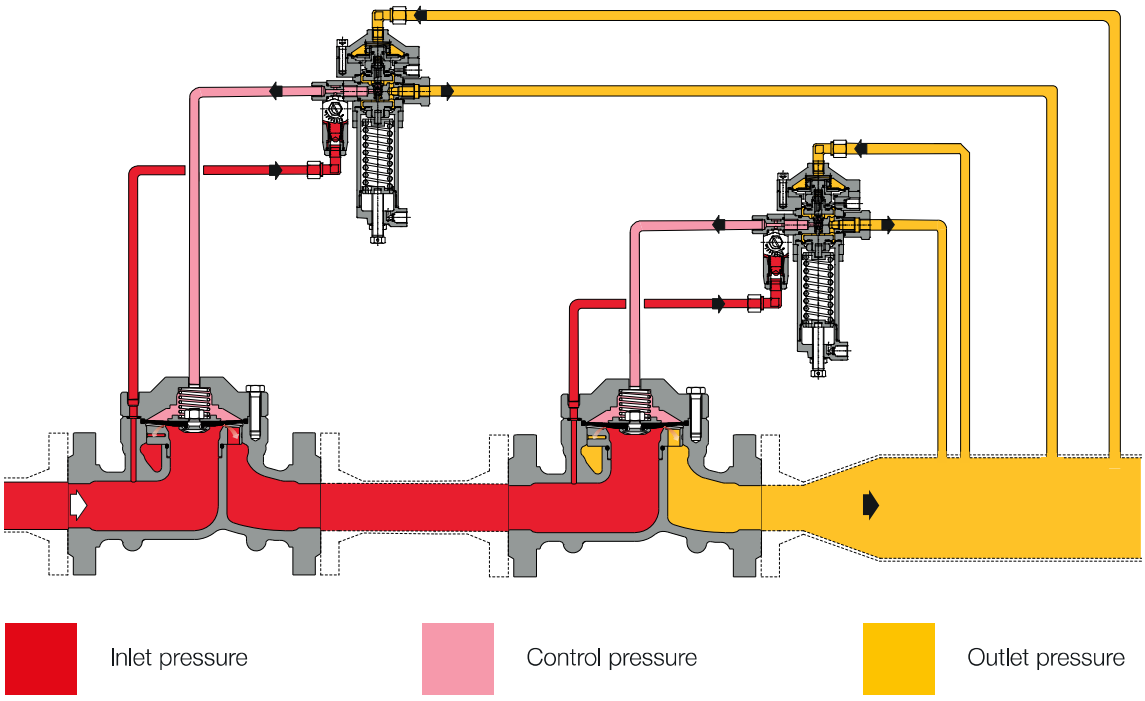

Figure 4 Aperflux 101 with In-line monitor setup

Weights and Dimensions

Aperflux 101

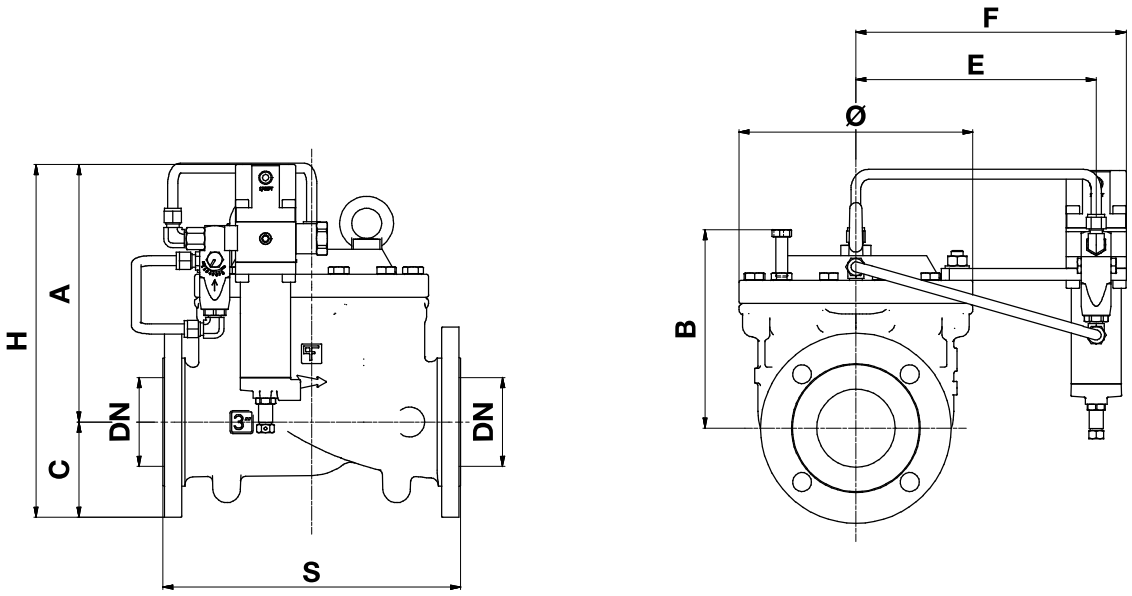

Figure 5 Aperflux 101 dimensions

Weights and Dimensions			
	[mm] | inches	[mm] | inches	[mm] | inches
Size	50 | 2”	80 | 3”	100 | 4”
S - ANSI 300	267 | 10.51”	317 | 12.48”	368 | 14.49”
S - ANSI 600	286 | 11.26”	336 | 13.23”	394 | 15.51”
Ø	167 | 6.57”	265 | 10.43”	290 | 11.42”
A	270 | 10.63”	290 | 11.42”	349 | 13.74”
B	183 | 7.20”	200 | 7.87”	280 | 11.02”
C	78 | 3.07”	100 | 3.94”	126 | 4.96”
E	203 | 7.99”	240 | 9.45”	230 | 9.06”
F	255 | 10.04”	290 | 11.42”	312 | 12.28”
H	348 | 13.70”	390 | 15,35”	475 | 18.70”
Tubing Connections	Øe 10 x Øi 8 (on request imperial sizing)		

Weight	Kg | lbs	Kg | lbs	Kg | lbs
ANSI 300	24.5 | 540	47 | 104	92 | 203
ANSI 600	26.5 | 584	51 | 112	102 | 225

Table 5 Weights and dimensions

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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.

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

Table 6 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 (refere to table 7)
T = gas temperature (°C)

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 7 Correction Factor Fc

Flow rate conversion
Stm^3/h x 0.94795 = Nm^3/h

Table 8 Flow rate conversion

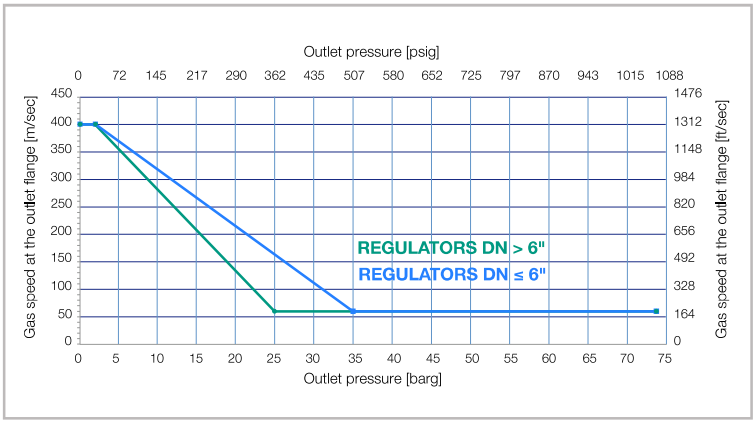
Nm^3/h reference conditions T= 0 °C; P= 1 barg
Stm^3/h reference conditions T= 15 °C; P= 1 barg

CAUTION:

In order to get optimal performance, to avoid premature erosion phenomena and to limit noise emissions, it is recommended to check that the gas speed at the outlet flange does not exceed the values of the graph below. 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 Stm^3/h
DN = nominal size of regular in mm
Pd = outlet pressure in barg



Sizing of regulators is usually made based on valve Cg value (table 6).

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

Q = flow rate in Stm^3/h
Pu = inlet pressure in bar (abs)
Pd = outlet pressure in bar (abs).

- **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: (Pu < 2 x Pd)

$$Q = 0.526 \times Cg \times Pu \times \sin\left(K1 \times \sqrt{\frac{Pu - Pd}{Pu}}\right)$$

- **A-2** in critical conditions: (Pu ≥ 2 x Pd)

$$Q = 0.526 \times Cg \times Pu$$

- **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: (Pu < 2xPd)

$$Cg = \frac{Q}{0.526 \times Pu \times \sin\left(K1 \times \sqrt{\frac{Pu - Pd}{Pu}}\right)}$$

- **B-2** in critical conditions (Pu ≥ 2 x Pd)

$$Cg = \frac{Q}{0.526 \times Pu}$$

NOTE: The sin value is understood to be DEG.

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