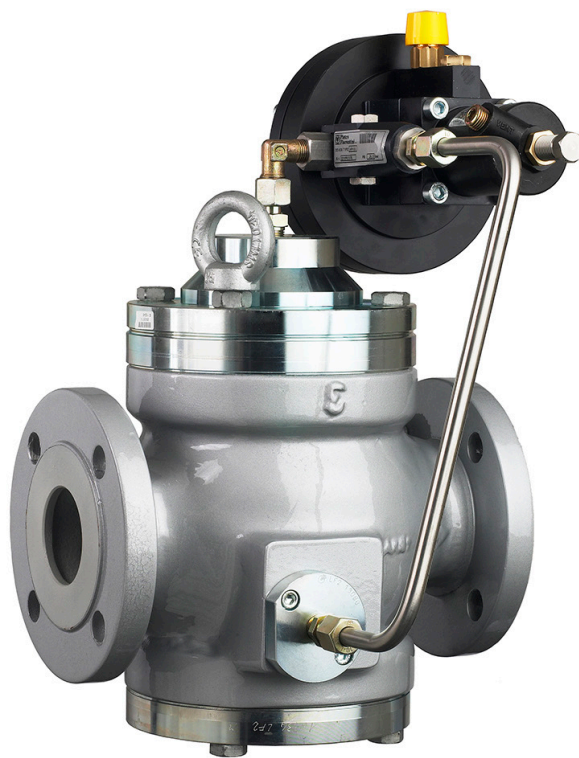


# Aperval

Medium Low Pressure Gas Regulator



**TECHNICAL BROCHURE**

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to make changes without prior notice.

aperval\_technicalbrochure\_ENG\_revD

**[www.fiorentini.com](http://www.fiorentini.com)**

# 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

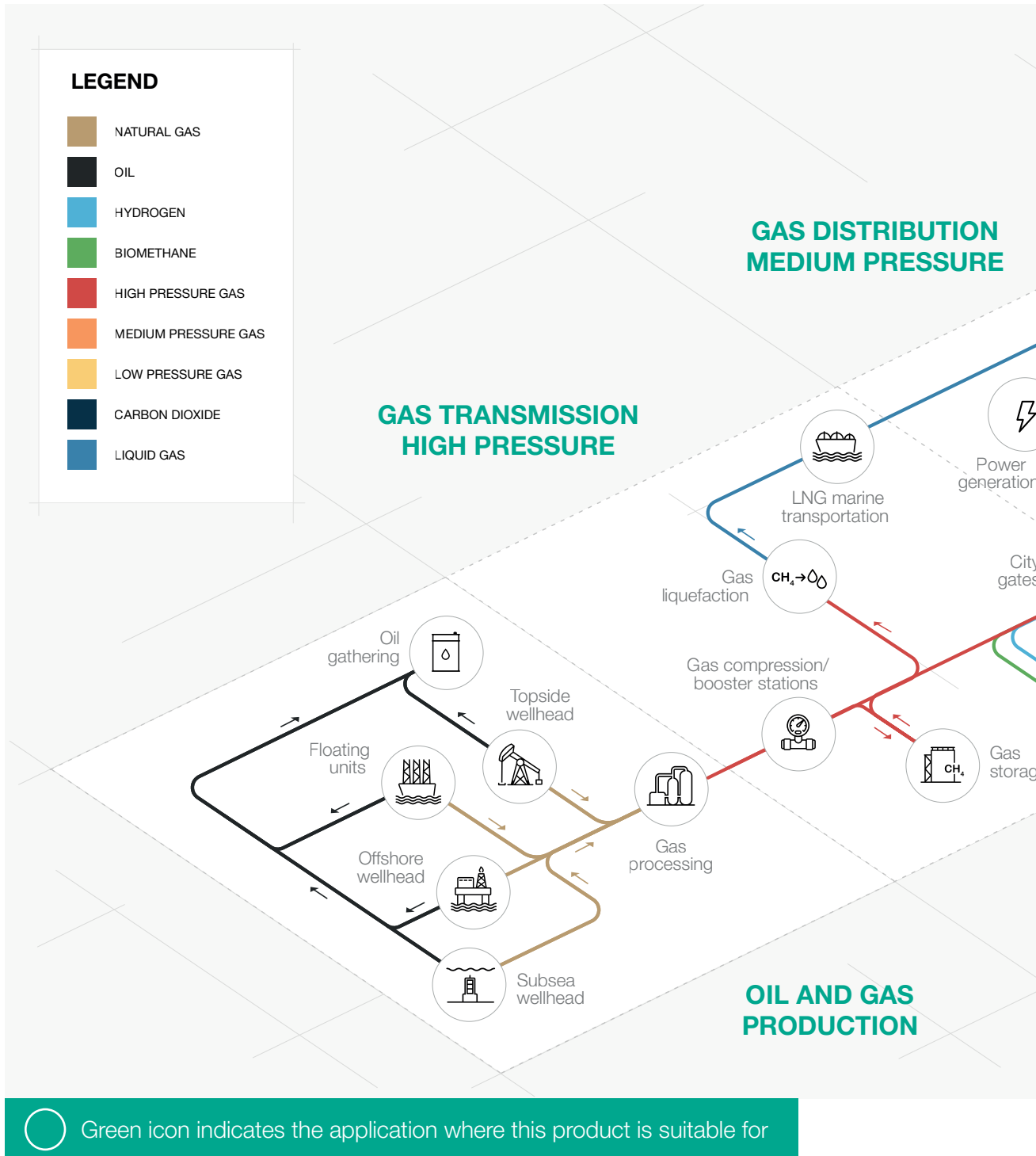


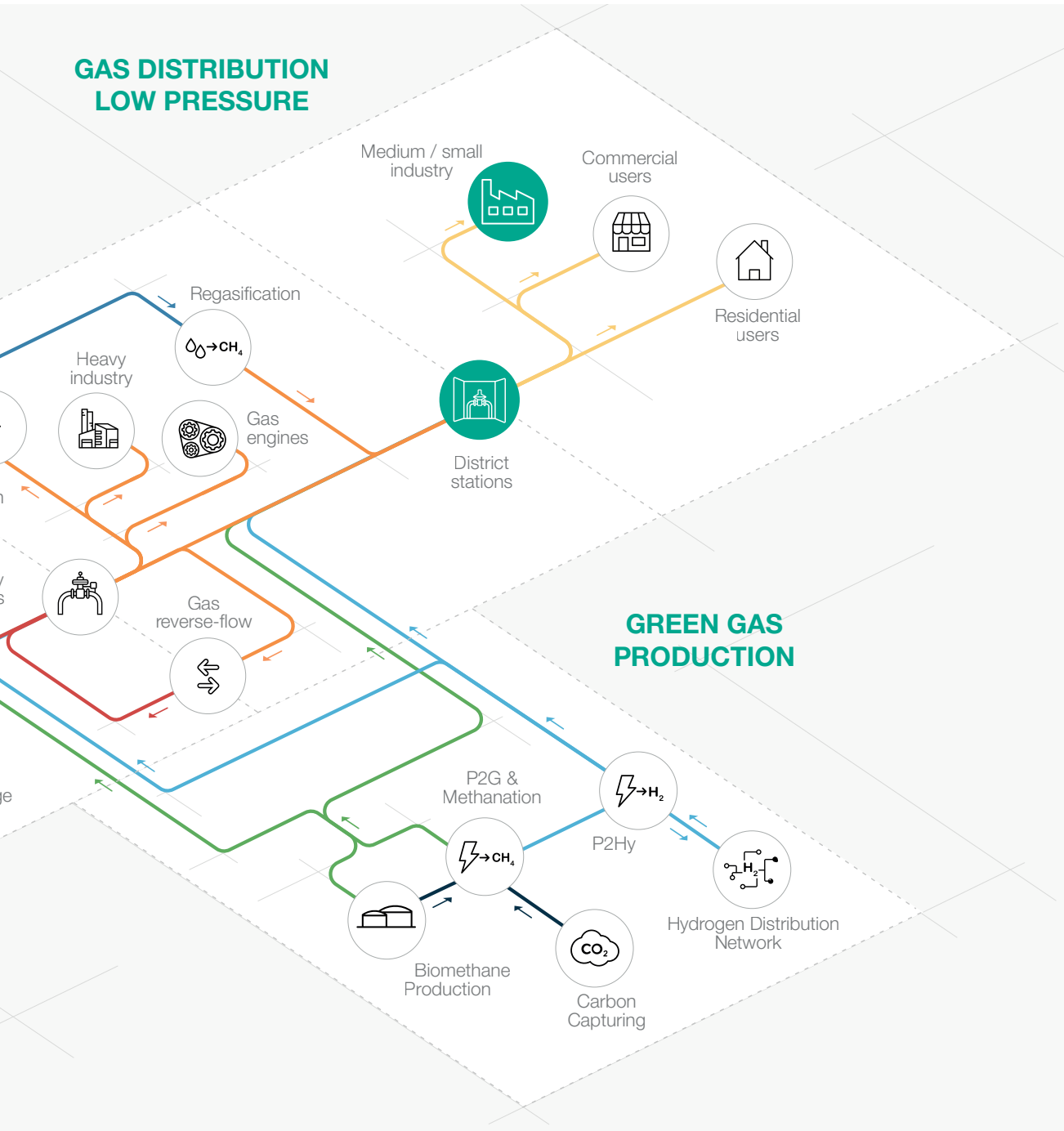
Experience since 1940



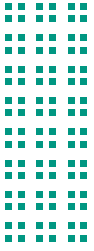
We operate in over 100 countries

# Area of Application





**Figure 1** Area of Application Map

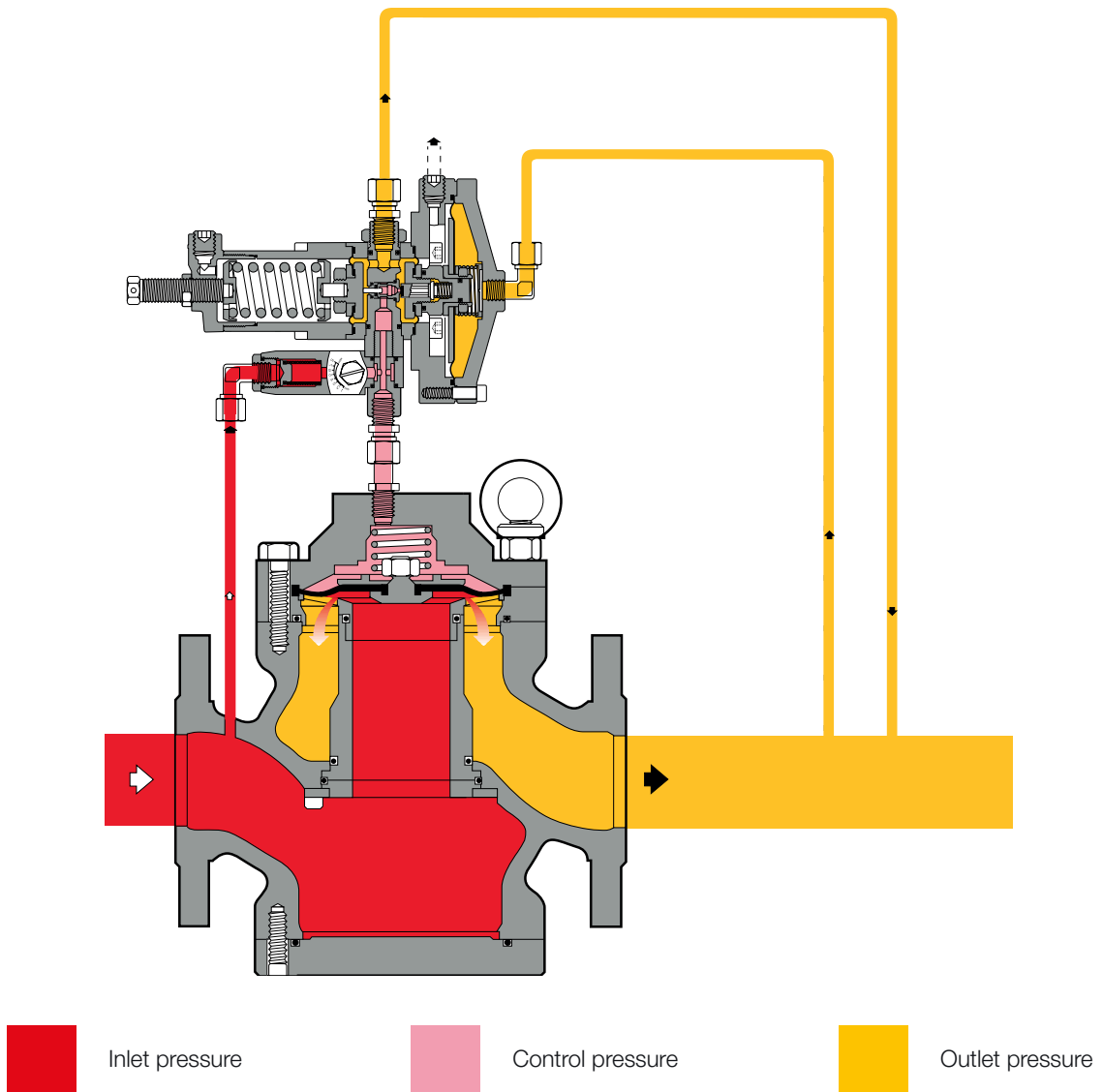


# Introduction

**Aperval** is one of the **pilot-operating 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 medium and low pressure natural gas distribution networks.

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



**Figure 2** Aperval

# Features and Calibration ranges

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

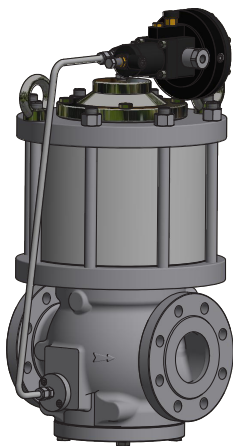
A balanced pressure regulator it is a pressure regulator where delivery pressure accuracy it is not affected by the fluctuation of the inlet pressure and flow during its operation. Therefore, a balance pressure regulator can have a single orifice for all pressure and flow operating conditions.

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

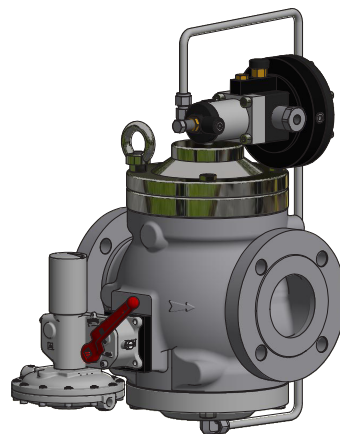
It is a **truly top entry design** which allows an **easy maintenance** of parts directly in the field **without removing the body from the pipework**.

Set point adjustment of the regulator is operated via a pilot unit used to load and unload the bleeding pressure from the top chamber.

The modular design of Aperval pressure regulators allows retrofitting of an emergency monitor PM/182, slam shut SA and/or silencer DB/93 model on the same body.



**Figure 3** Aperval with silencer DB/93



**Figure 4** Aperval with slam shut SA



## Aperval competitive advantages



Balanced type



Top Entry



Operate with low differential pressure



Easy maintenance



High accuracy



Low noise



High turn-down ratio



Built-in accessories



Built-in pilot filter



Biomethane compatible and 10% Hydrogen blending compatible. Higher blending available on request

## Features

Features	Values
Design pressure* (PS <sup>1</sup> / DP <sup>2</sup> )	up to 2.5 MPa up to 25 barg
Ambient temperature* (TS <sup>1</sup> )**	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 <sub>u</sub> <sup>max 1</sup> )	from 0.05 to 2.5 MPa from 0.5 to 25 barg
Range of downstream pressure (Wd <sup>1</sup> )	from 0.0005 to 0.95 MPa from 0.005 to 9.5 barg
Available accessories	DB Silencer, Slam shut SA, PM/182 Monitor
Minimum operating differential pressure (Δp <sub>min</sub> <sup>1</sup> )	0.045 MPa 0.45 barg
Accuracy class (AC <sup>1</sup> )	up to 5   up to 1% absolute (depending on working conditions)
Lock-up pressure class (SG <sup>1</sup> )	up to 10
Nominal size (DN <sup>1,2</sup> )	DN 25   1"; DN 50   2" DN 65   2" 1/2; DN 80   3"; DN 100   4"
Connections	Class 150 RF according to ASME B16.5 and PN16, 25 according to ISO 7005

(<sup>1</sup>) according to EN334 standard

(<sup>2</sup>) 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.

(\*\*) NOTE: Stated temperature range is the operating range for which the equipment's mechanical resistance and leakage rate are guaranteed. Some body materials, if multiple choices are available, may not be suitable for all the available versions shown.

(\*\*\*) NOTE: Stated temperature range is the range for which the equipment's full performance, including accuracy and lock-up are guaranteed. Some body materials, if multiple choices are available, may not be suitable for all the available versions shown.

**Table 1** Features



# Materials and Approvals

Part	Material
Body	Cast steel ASTM A216 WCB for all sizes Ductile iron GS 400-18 ISO 1083 for all sizes
Cover	Rolled or forged carbon steel
Seat	Technopolymer
Diaphragm	Vulcanized rubber
Sealing ring	Nitrile rubber
Compression fittings	According to DIN 2353 in zinc-plated carbon steel. 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

**Aperval** regulator is designed according to the European standard EN 334.  
The regulator reacts in opening (Fail Open) according to EN 334.

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



EN 334



PED-CE



# Pilot ranges and types

Type	Model	Operation	Range Wh		Spring Table web link
			KPa	mbarg	
Main pilot	301/.	Manual	0.5 - 10	5 - 100	<a href="#">TT 1037</a>
Main pilot	301/.TR	Manual	10 - 200	100 - 2000	<a href="#">TT 1037</a>

Type	Model	Operation	Range Wh		Spring Table web link
			MPa	barg	
Main pilot	302/.	Manual	0.08 - 0.95	0.8 - 9.5	<a href="#">TT 653</a>

**Table 3** Settings Table

Pilot adjustment	
Pilot type .../A	Manual setting
Pilot type .../D	Electric remote setting control
Pilot type .../CS	Pneumatic remote setting control
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 comes complete 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.

Pressure drop through the adjustable AR100 restrictor shall 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.

# Accessories

## For the pressure regulators:

- Cg limiter
- Silencer
- Slam shut valve
- Monitor

## For the pilot circuit:

- Supplementary filter CF14 or CF14/D

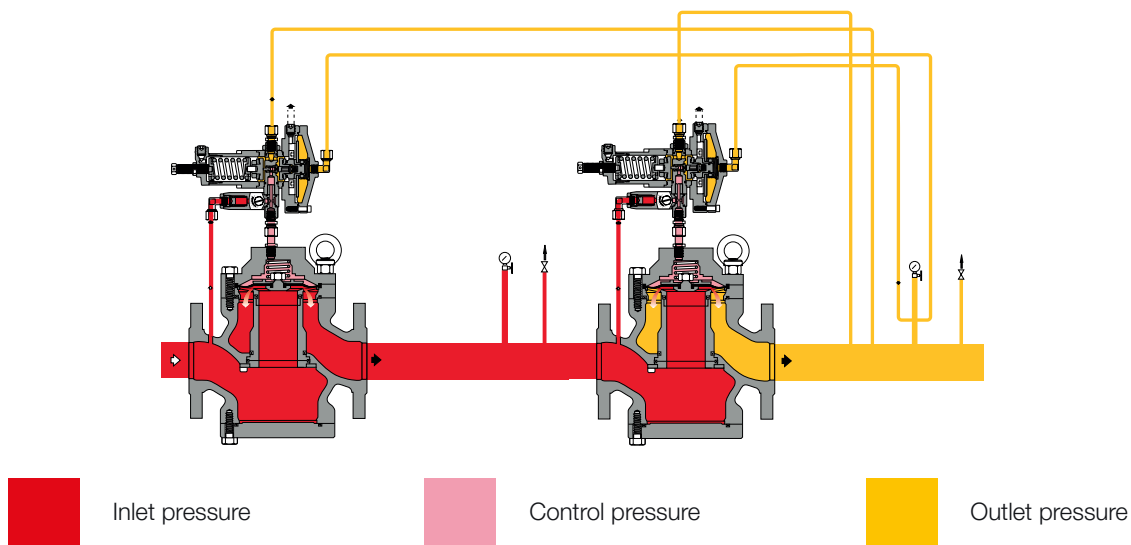
## In-line Monitor

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 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 5** Aperval with In-line monitor setup



## Monitor PM/182

**This emergency regulator (monitor) is directly integrated** onto the body of the main regulator. Both pressure regulators, therefore, use the same valve body, although they have independent actuators, pilots and valve seats.







The monitor is normally in fully open position during normal operation of the active regulator and takes over on in the event of its failure.

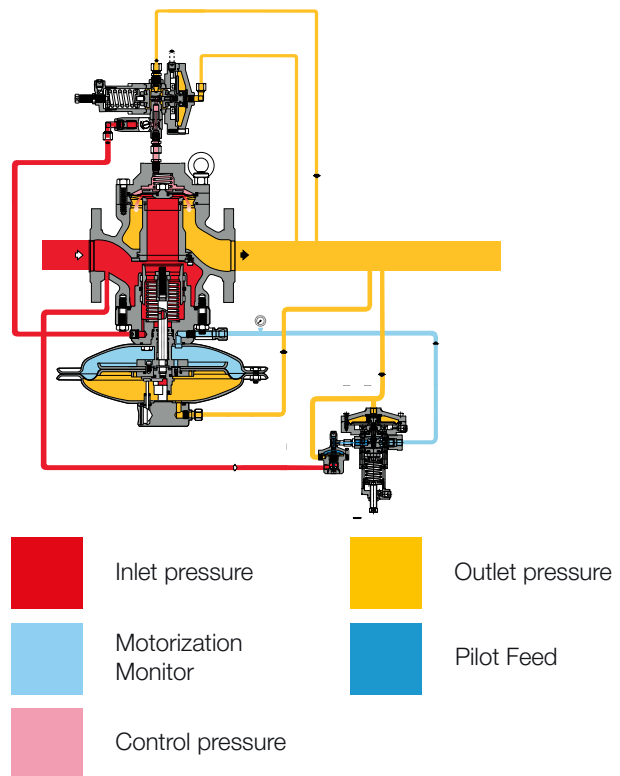
The operational characteristics of the PM/182 monitor are the same as for the Reval 182 regulator (refer to that specific catalogue)

The Cg coefficients of regulator having an incorporated monitor is 5% lower than those for standard version.

This solution allows the construction of reduction pressure lines with compact dimensions.

Another great advantage offered by the incorporated monitor regulator is that **it can be installed at any time**, even on an existing regulator, **without major changes to the pipework.**

-  Compact dimensions
-  Completely independent
-  "Fail to close" action
-  Built-in pilot filter
-  Visual opening indicator
-  Easy maintenance
-  Limit switch option
-  Accelerator option



**Figure 6** Aperval with PM/182

Type	Model	Operation	Range Wh		Spring Table web link
			kPa	mbarg	
Main pilot	201/A	Manual	0.7 - 58	7 - 580	<a href="#">TT 475</a>
Main pilot	204/A	Manual	20 - 1.2	200 - 12000	<a href="#">TT 433</a>

**Table 5** Settings table

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

**Table 6** Pilot adjustment table

The monitor regulator can be equipped with an additional pilot called “accelerator” to enable a quick response time during the monitor take over. According to PED the accelerator is required on the monitor when acting as a safety accessory.

Type	Model	Operation	Range Wh		Spring Table web link
			MPa	barg	
Accelerator	V/25 BP	Manual	0.0015 – 0.02	0.015 – 0.2	<a href="#">TT 00601</a>
Accelerator	V/25 MP	Manual	0.02 – 0.06	0.2 – 0.6	<a href="#">TT 00601</a>
Accelerator	M/A	Manual	0.03 - 2	0.3 - 20	<a href="#">TT 354</a>

**Table 7** Accelerator adjustment table

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





## Silencer DB

Whenever certain noise limit is desired, an additional silencer allows to considerably reduce the noise level (dBA).

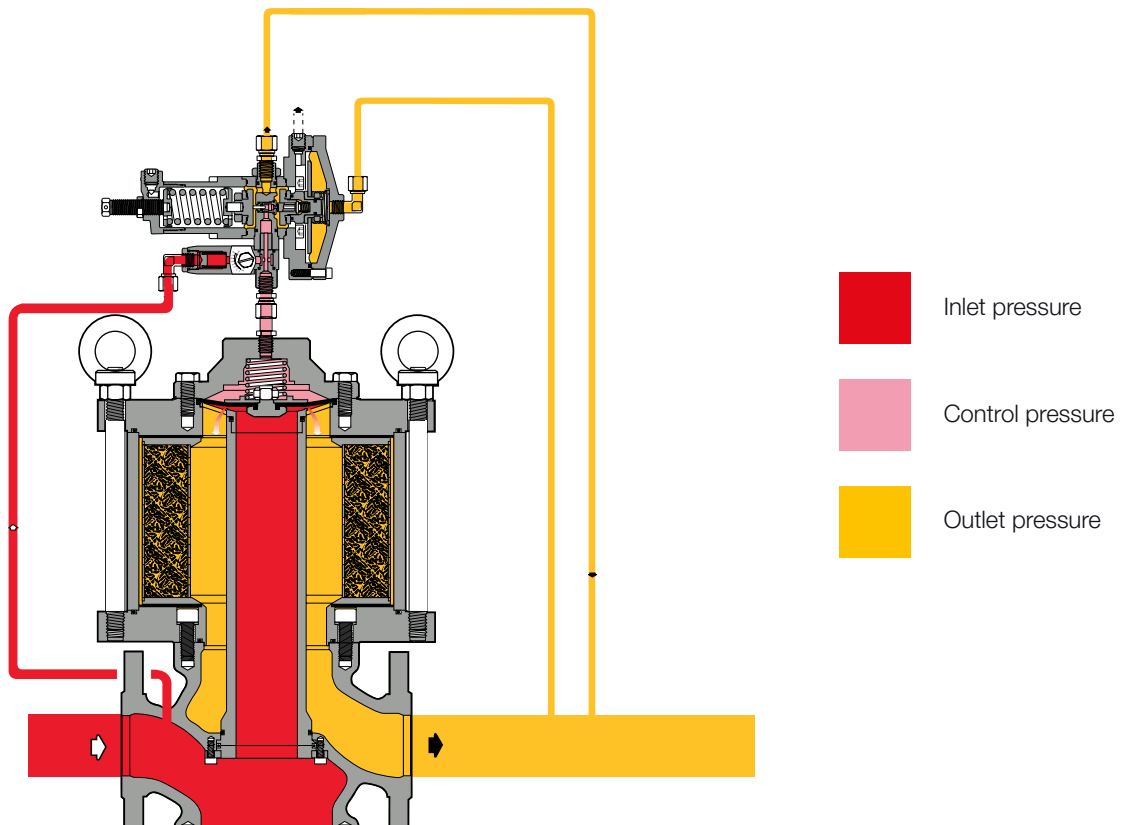
The Aperval pressure regulator can be supplied with an **incorporated silencer** in either the standard version or version with incorporated slam shut or monitor regulator.

The high efficiency rely to the fact that noise absorption takes place at the same point where the noise is generated, thus preventing its propagation.

With the built-in silencer, the  $C_g$  valve coefficient is 5% lower than the corresponding version without.

Given the modular arrangement of the regulator, the silencer may be retrofitted to both standard Aperval version as well as those with incorporated slam shut or monitor, **without the need to modify the main piping.**

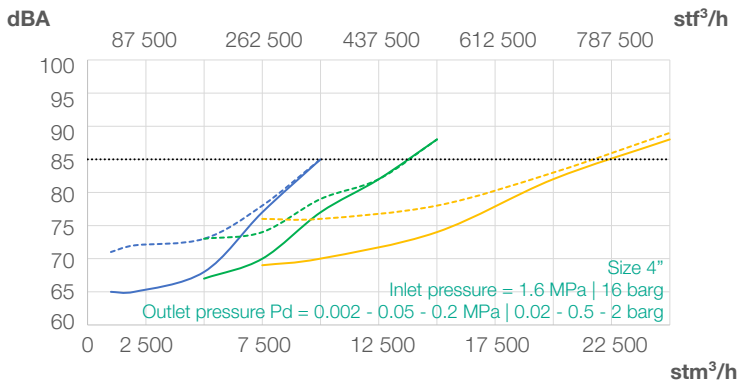
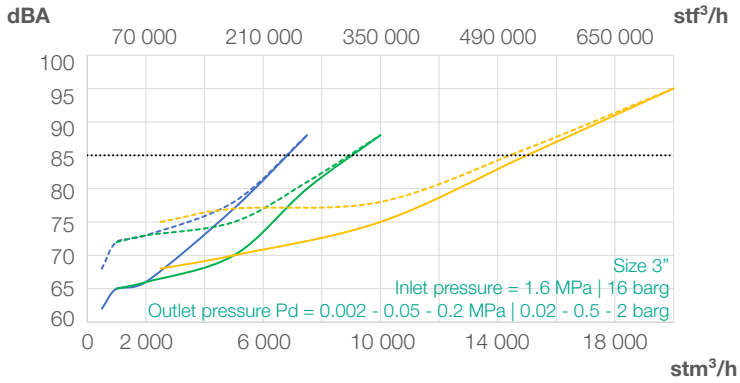
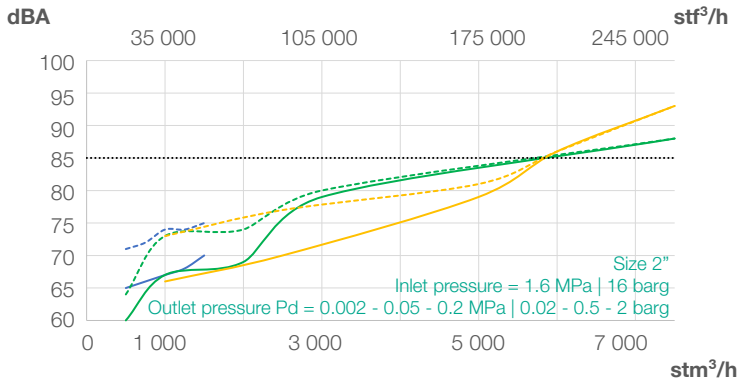
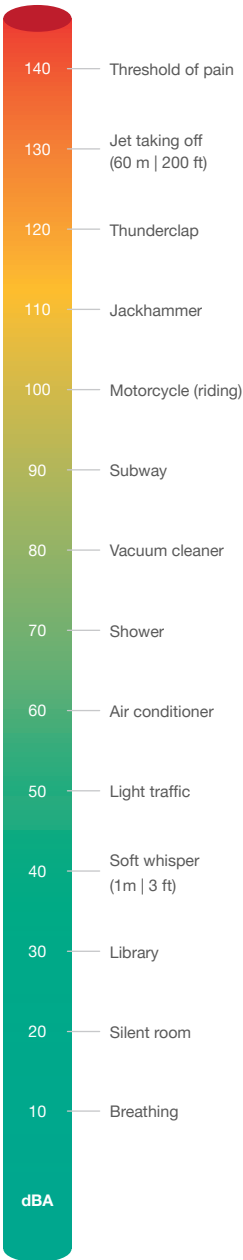
Pressure reduction and control operate the same manner as standard version.



**Figure 7** Aperval with Silencer DB

Below charts represents the silencer effectiveness based on some common reference conditions for 2", 3" and 4". For actual calculations at specific desired conditions please refer to the online sizing tool or contact your closest Pietro Fiorentini representative.

- Pd 0.002 MPa | 0.02 barg NO Silencer
- Pd 0.002 MPa | 0.02 barg DB
- Pd 0.05 MPa | 0.5 barg NO SILENCER
- Pd 0.05 MPa | 0.5 barg DB
- Pd 0.2 MPa | 2 barg NO Silencer
- Pd 0.2 MPa | 2 barg DB
- ..... Recommended noise limit (85 dBA at 1 mt | 3 feet)



**Chart 1** Aperval's silencer efficiency charts



## Slam shut SA









The Aperval pressure regulator offers the possibility of installing an **incorporated slam shut valve SA** and this can be done either during the manufacturing process or be retrofitted in the field.

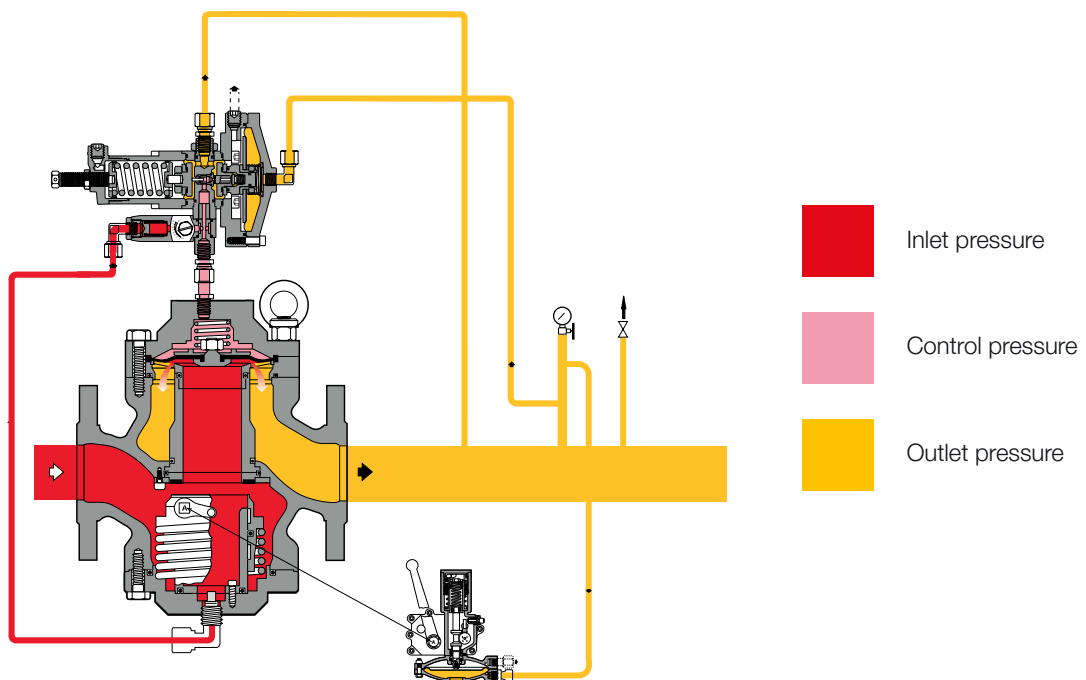
SA is available for all sizes.

**Retrofitting can be done without modifying** the pressure regulator assembly.

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:

-  Over Pressure Shut-Off
-  Under Pressure Shut-Off
-  Internal by-pass
-  Push button for tripping test
-  Compact dimensions
-  Easy maintenance
-  Remote tripping option
-  Limit switch option



**Figure 8** Aperval with SA



Pressure switch types and ranges					
SSV Type	Model	Operation	Range Wh		Spring Table web link
			KPa	mbarg	
SA	91	OPSO	2.5 - 110	25 - 1100	<a href="#">TT 1381</a>
		UPSO	1 - 90	10 - 900	
SA	92	OPSO	70 - 500	700 - 5000	<a href="#">TT 1381</a>
		UPSO	25 - 301	250 - 3010	
SSV Type	Model	Operation	Range Wh		Spring Table web link
			MPa	barg	
SA	93	OPSO	0.3 - 1.33	3 - 13.3	<a href="#">TT 1381</a>
		UPSO	0.08 - 0.77	0.8 - 7.7	

**Table 8** Setting table



# Weights and Dimensions

## Aperval

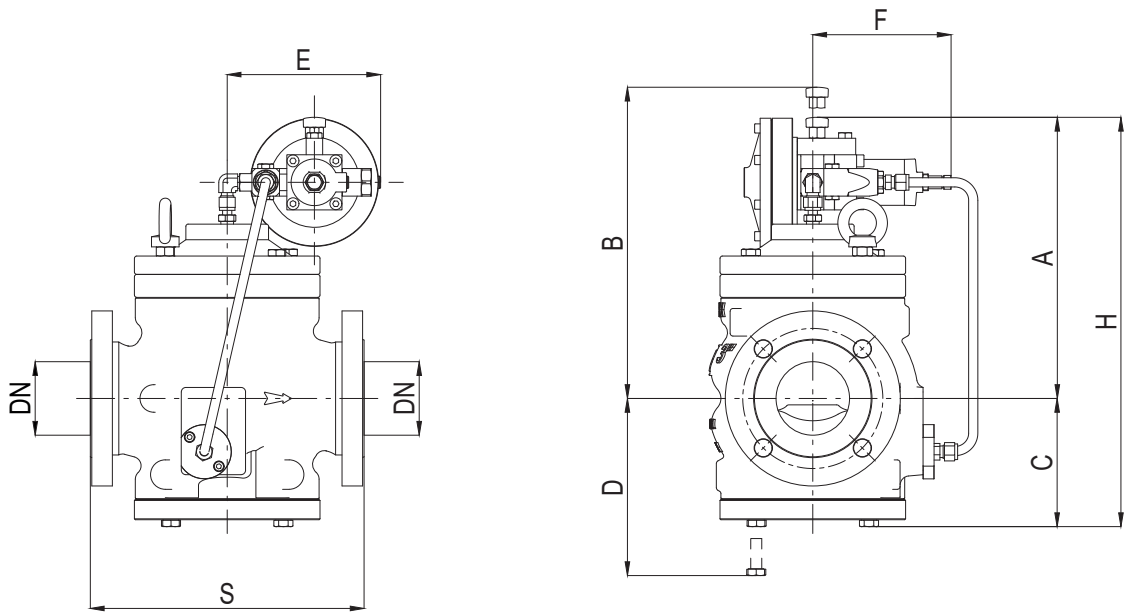


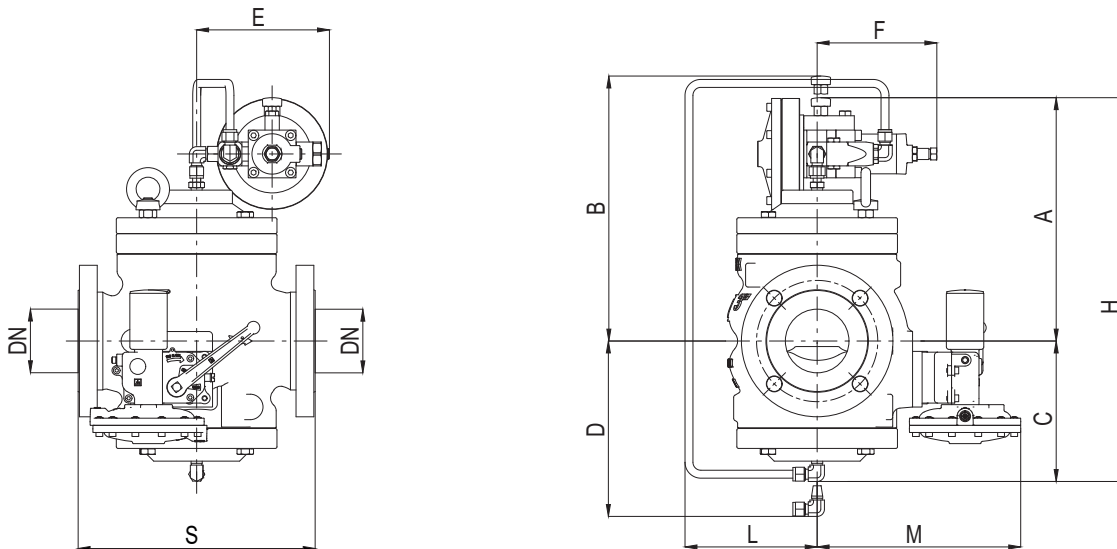
Figure 9 Aperval dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)					
	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches
Size (DN)	25   1"	50   2"	65   2" 1/2	80   3"	100   4"
S - ANSI 150/PN16	183   7.20"	254   10"	276   10.87"	298   11.73"	352   13.86"
A	282   11.1"	313   12.32"	341   13.43"	346   13.62"	429   16.89"
B	292   11.47"	323   12.72"	351   13.82"	356   14.02"	439   19.28"
C	88   3.46"	120   4.73"	133   5.24"	142   5.59"	180   7.09"
D	118   4.64"	155   6.10"	168   6.61"	182   7.16"	230   9.05"
E	178   7.01"	178   7.01"	178   7.01"	178   7.01"	178   7.01"
F	160   6.3"	160   6.3"	160   6.3"	160   6.3"	160   6.3"
G	115   4.53"	115   4.53"	115   4.53"	115   4.53"	115   4.53"
H	370   14.57"	433   17.05"	474   18.66"	488   19.21"	950   37.40"
Tubing connections	Øe 10 x Øi 8 (on request imperial sizing)				

Weight	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs
ANSI 150/PN 16	20   44	34   75	45   99	57   126	110   243

Table 9 Weights and dimensions

## Aperval + SA



**Figure 10** Aperval + SA dimensions

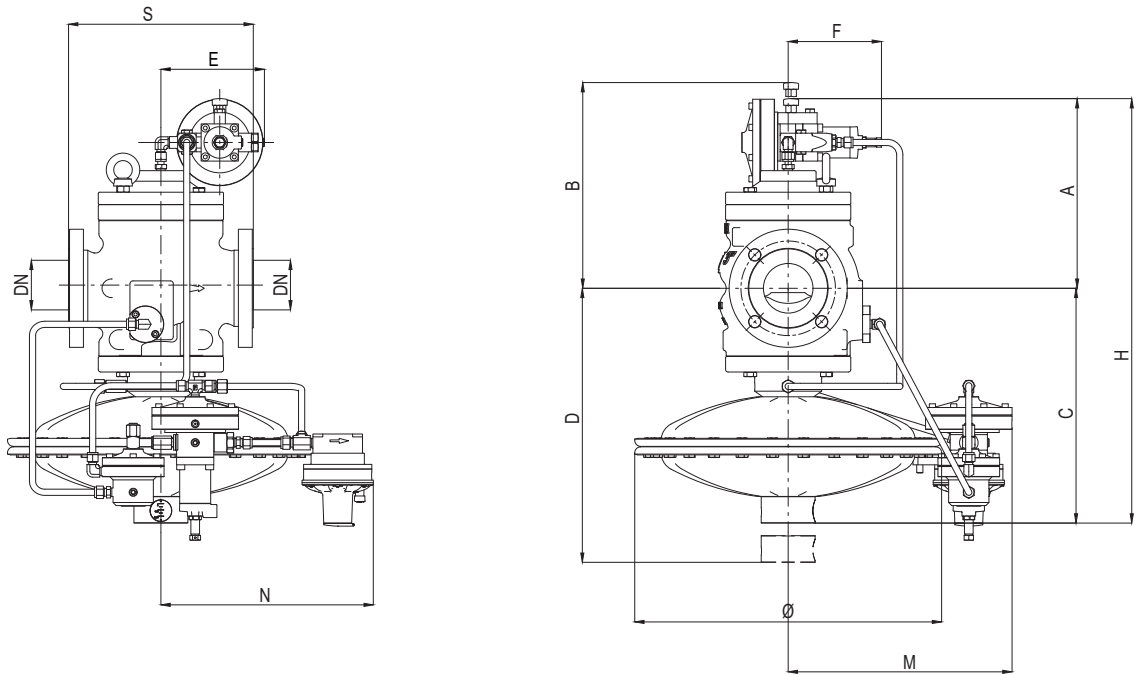
**Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)**

	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches
Size (DN)	25   1"	50   2"	65   2" 1/2	80   3"	100   4"
S - ANSI 150/PN16	183   7.20"	254   10"	276   10.87"	298   11.73"	352   13.86"
A	292   11.47"	323   12.72"	351   13.82"	356   14.02"	439   19.28"
B	292   11.47"	323   12.72"	351   13.82"	356   14.02"	439   19.28"
C	145   5.71"	161   6.34"	178   7.01"	185   7.28"	205   8.07"
D	212   8.35"	255   10.04"	292   11.50"	322   12.68"	330   12.99"
E	178   7.01"	178   7.01"	178   7.01"	178   7.01"	178   7.01"
F	160   6.30"	160   6.30"	160   6.30"	160   6.30"	160   6.30"
H	427   16.81"	474   18.66"	519   20.43"	531   20.91"	833   32.80"
L	98   3.86"	146   5.75"	146   5.75"	146   5.75"	146   5.75"
M	194   7.64"	219   8.62"	322   12.68"	246   9.69"	263   10.35"
N	125   4.92"	125   4.92"	125   4.92"	130   5.12"	130   5.12"
Tubing connections	Øe 10 x Øi 8 (on request imperial sizing)				

Weight	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs
ANSI 150/PN 16	22   48	35   77	46   101	59   130	113   249

**Table 10** Weights and dimensions

# Aperval + PM/182

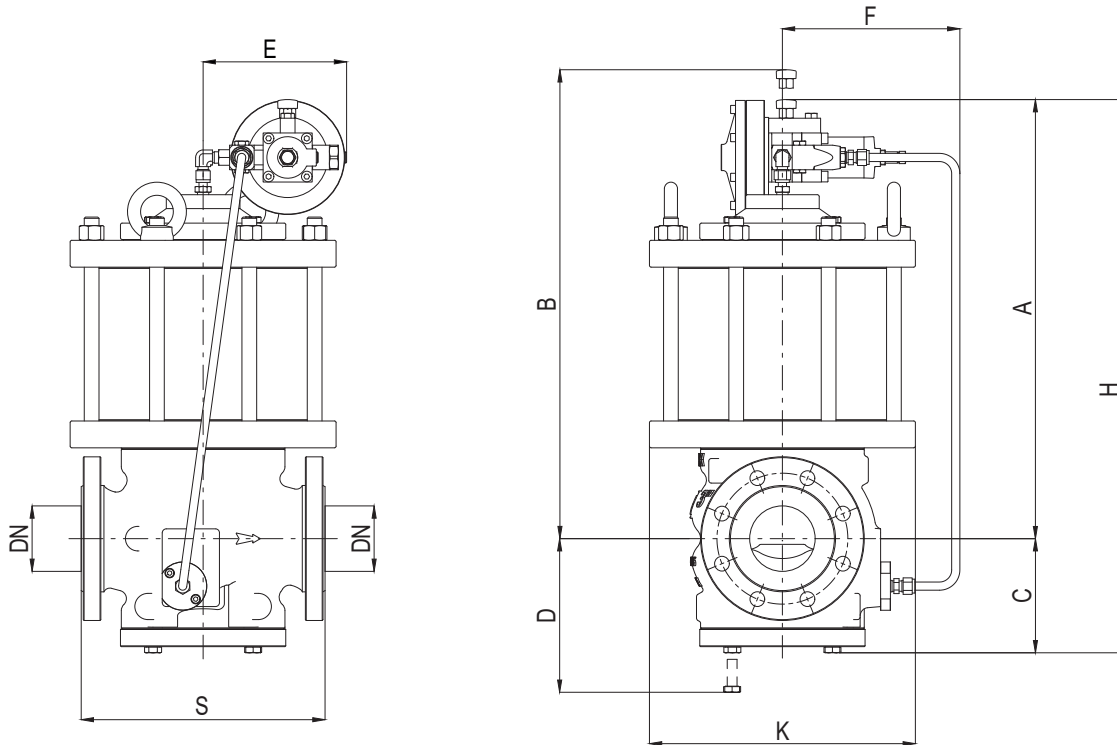


**Figure 11** Aperval + PM/182 dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)					
	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches
Size (DN)	25   1"	50   2"	65   2" 1/2	80   3"	100   4"
S - ANSI 150/PN16	183   7.20"	254   10"	276   10.87"	298   11.73"	352   13.86"
Ø	375   14.76"	375   14.76"	495   19.49"	495   19.49"	495   19.49"
A	282   11.1"	313   12.32"	341   13.43"	346   13.62"	429   16.89"
B	292   11.47"	323   12.72"	351   13.82"	356   14.02"	439   19.28"
C	269   10.59"	300   11.81"	374   14.73"	379   14.92"	414   16.30"
D	329   12.95"	385   15.16"	474   18.66"	484   19.05"	537   21.14"
E	178   7.01"	178   7.01"	178   7.01"	178   7.01"	178   7.01"
F	160   6.3"	160   6.3"	160   6.3"	160   6.3"	160   6.3"
H	551   21.69"	613   24.13"	715   28.15"	725   28.54"	843   33.19"
M	300   11.81"	300   11.81"	350   13.78"	350   13.78"	350   13.78"
N	306   12.05"	306   12.05"	310   12.20"	310   12.20"	310   12.20"
Tubing connections	Øe 10 x Øi 8 (on request imperial sizing)				
Weight	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs
ANSI 150/PN 16	41   90	69   152	72   159	87   192	110   243

**Table 11** Weights and dimensions

## Aperval + DB/93



**Figure 12** Aperval + DB/93 dimensions

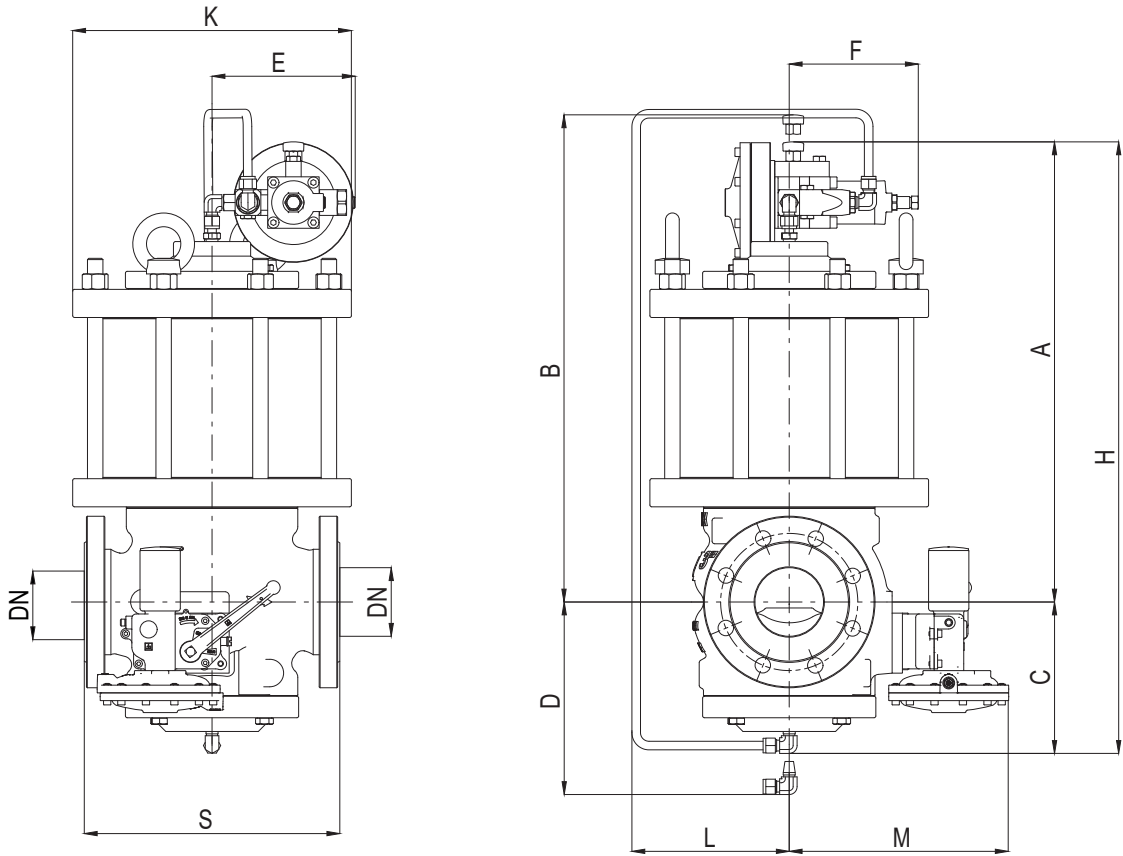
Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)					
	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches
Size (DN)	25   1"	50   2"	65   2" 1/2	80   3"	100   4"
S - ANSI 150/PN16	183   7.20"	254   10"	276   10.87"	298   11.73"	352   13.86"
A	449   17.68"	507   19.96"	577   22.72"	601   23.66"	760   29.92"
B	459   18.07"	517   20.35"	587   23.11"	611   24.05"	688   27.09"
C	88   3.46"	120   4.73"	133   5.24"	142   5.59"	180   7.09"
D	118   4.65"	155   6.10"	168   6.61"	182   7.17"	230   9.06"
E	178   7.01"	178   7.01"	178   7.01"	178   7.01"	178   7.01"
F	120   4.72"	158   6.22"	173   6.81"	175   6.89"	205   8.07"
H	537   21.14"	627   24.69"	710   27.95"	743   29.25"	940   37.01"
K	220   8.66"	295   11.61"	325   12.80"	330   12.99"	390   15.35"
Tube connections	Øe 10 x Øi 8 (on request imperial sizing)				

Weight	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs
ANSI 150/PN 16	44   97	84   185	88   194	112   247	178   392

**Table 12** Weights and dimensions

# Aperval + DB/93 + SA

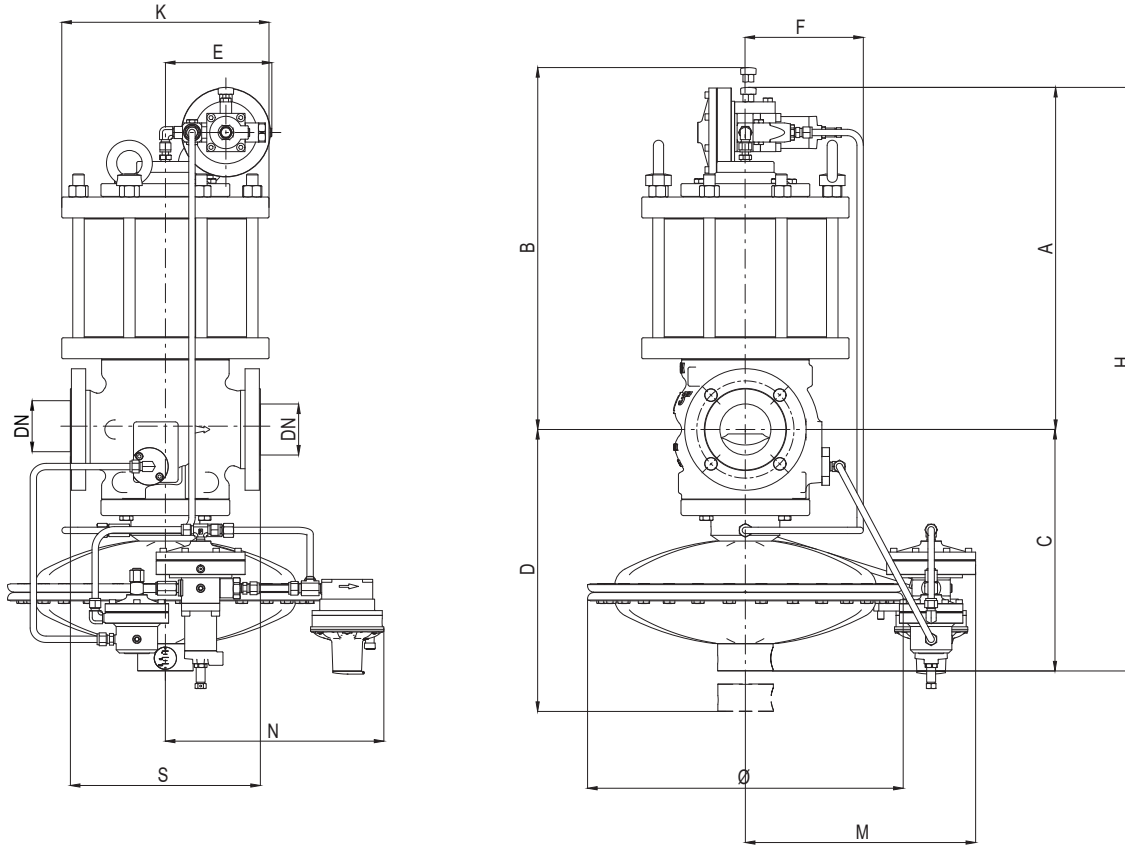


**Figure 13** Aperval + DB/93 + SA dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)					
	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches
Size (DN)	25   1"	50   2"	65   2" 1/2	80   3"	100   4"
S - ANSI 150/PN16	183   7.20"	254   10"	276   10.87"	298   11.73"	352   13.86"
A	449   17.68"	507   19.96"	577   22.72"	601   23.66"	760   29.92"
B	459   18.07"	517   20.35"	587   23.11"	611   24.05"	688   27.09"
C	145   5.71"	161   6.34"	178   7.01"	185   7.28"	205   8.07"
D	212   8.35"	255   10.04"	292   11.50"	322   12.68"	330   12.99"
E	178   7.01"	178   7.01"	178   7.01"	178   7.01"	178   7.01"
F	160   6.3"	160   6.3"	160   6.3"	160   6.3"	160   6.3"
H	594   23.39"	668   26.30"	755   29.72"	786   30.94"	1164   45.83"
L	98   3.86"	146   5.75"	146   5.75"	146   5.75"	146   5.75"
M	194   7.64"	219   8.62"	322   12.68"	246   9.69"	263   10.35"
K	220   8.66"	295   11.61"	325   12.80"	330   12.99"	390   15.35"
Tubing connections	Øe 10 x Øi 8 (on request imperial sizing)				
Weight	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs
ANSI 150/PN 16	66   145	119   262	134   295	171   377	291   641

**Table 13** Weights and dimensions

## Aperval + DB/93 + PM/182



**Figure 14** Aperval + DB/93 + PM/182 dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)					
	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches	[mm]   inches
Size (DN)	25   1"	50   2"	65   2" 1/2	80   3"	100   4"
S - ANSI 150/PN16	183   7.20"	254   10"	276   10.87"	298   11.73"	352   13.86"
Ø	375   14.76"	375   14.76"	495   19.49"	495   19.49"	495   19.49"
A	449   17.68"	507   19.96"	577   22.72"	601   23.66"	760   29.92"
B	459   18.07"	517   20.35"	587   23.11"	611   24.05"	688   27.09"
C	269   10.59"	300   11.81"	374   14.72"	379   14.92"	414   16.30"
D	329   12.95"	385   15.16"	474   18.66"	484   19.05"	537   21.14"
E	178   7.01"	178   7.01"	178   7.01"	178   7.01"	178   7.01"
F	120   4.72"	158   6.22"	173   6.81"	175   6.89"	205   8.07"
H	718   28.27"	807   31.77"	951   37.44"	980   38.58"	1174   46.22"
M	300   11.81"	300   11.81"	350   13.78"	350   13.78"	350   13.78"
N	306   12.05"	306   12.05"	310   12.21"	310   12.21"	310   12.21"
K	220   8.66"	295   11.61"	325   12.80"	330   12.99"	390   15.35"
Tube connections	Øe 10 x Øi 8 (on request imperial sizing)				
Weight	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs	Kg   lbs
ANSI 150/PN 16	85   187	153   337	160   353	199   439	288   635

**Table 14** 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.

Flow rate coefficient					
Nominal size	25	50	65	80	100
Inches	1"	2"	2" 1/2	3"	4"
Cg	584	1978	3530	4525	6719
K1	90	101	101	101	101

**Table 15** 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 16)  
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 16** Correction factor Fc

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

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

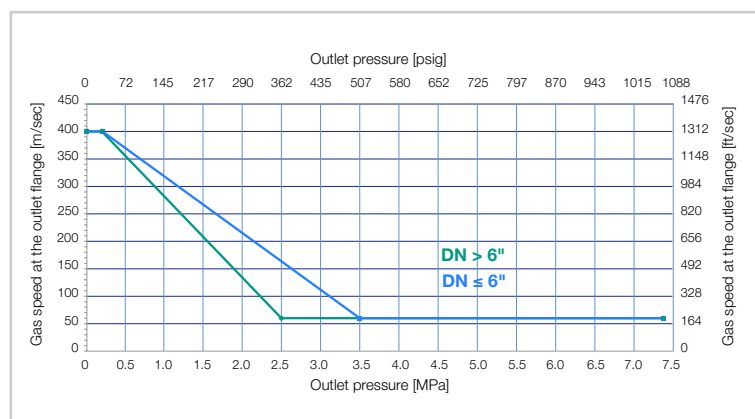
**Table 17** Flow rate conversion

### CAUTION:

In order to get optimal performance, to avoid premature erosion phenomena and to limit noise emissions, it is recommended to check 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:

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

V = gas speed in m/s  
Q = gas flow rate in Stm<sup>3</sup>/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 15).

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

Q = flow rate in Stm<sup>3</sup>/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)

$$Q = 0.526 \times C_g \times P_u \times \sin \left( K_1 \times \sqrt{\frac{P_u - P_d}{P_u}} \right)$$

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

$$Q = 0.526 \times C_g \times P_u$$

- **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: (Pu < 2 x Pd)

$$C_g = \frac{Q}{0.526 \times P_u \times \sin \left( K_1 \times \sqrt{\frac{P_u - P_d}{P_u}} \right)}$$

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

$$C_g = \frac{Q}{0.526 \times P_u}$$

NOTE: The sin value is understood to be DEG.



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