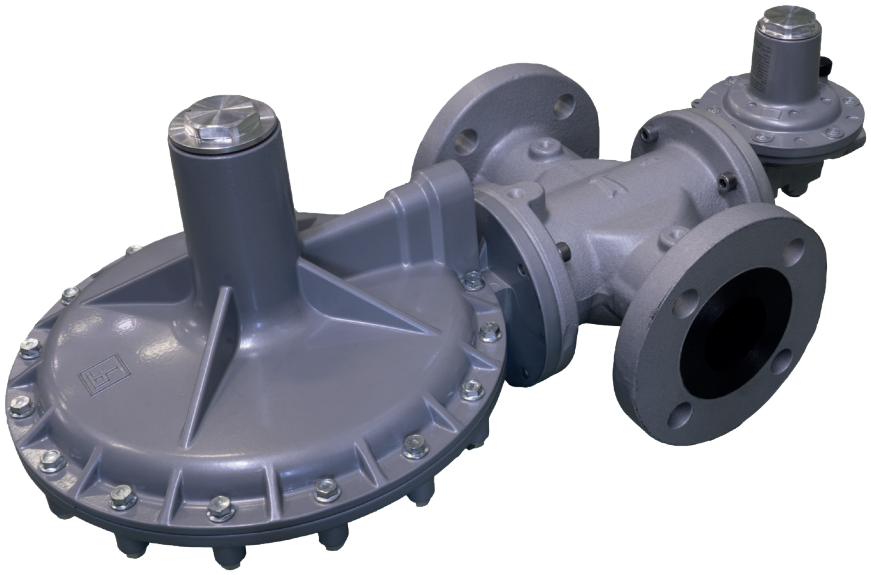
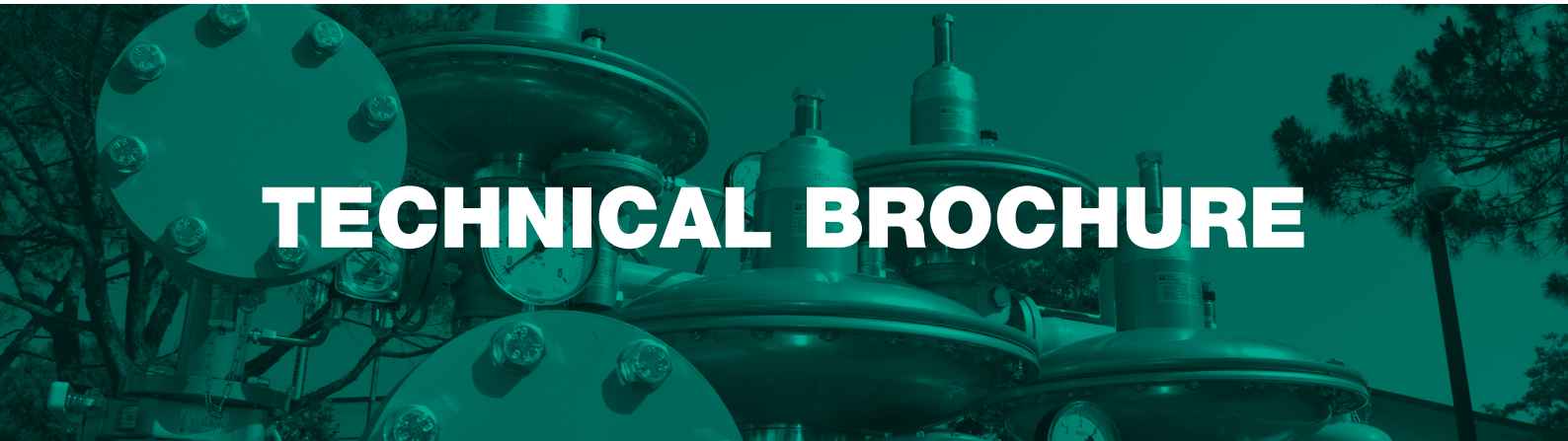
Pietro Fiorentini

Cirval CE

Medium - Low Pressure Gas Regulator





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cirvalCE_technicalbrochure_ENG_revC

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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.

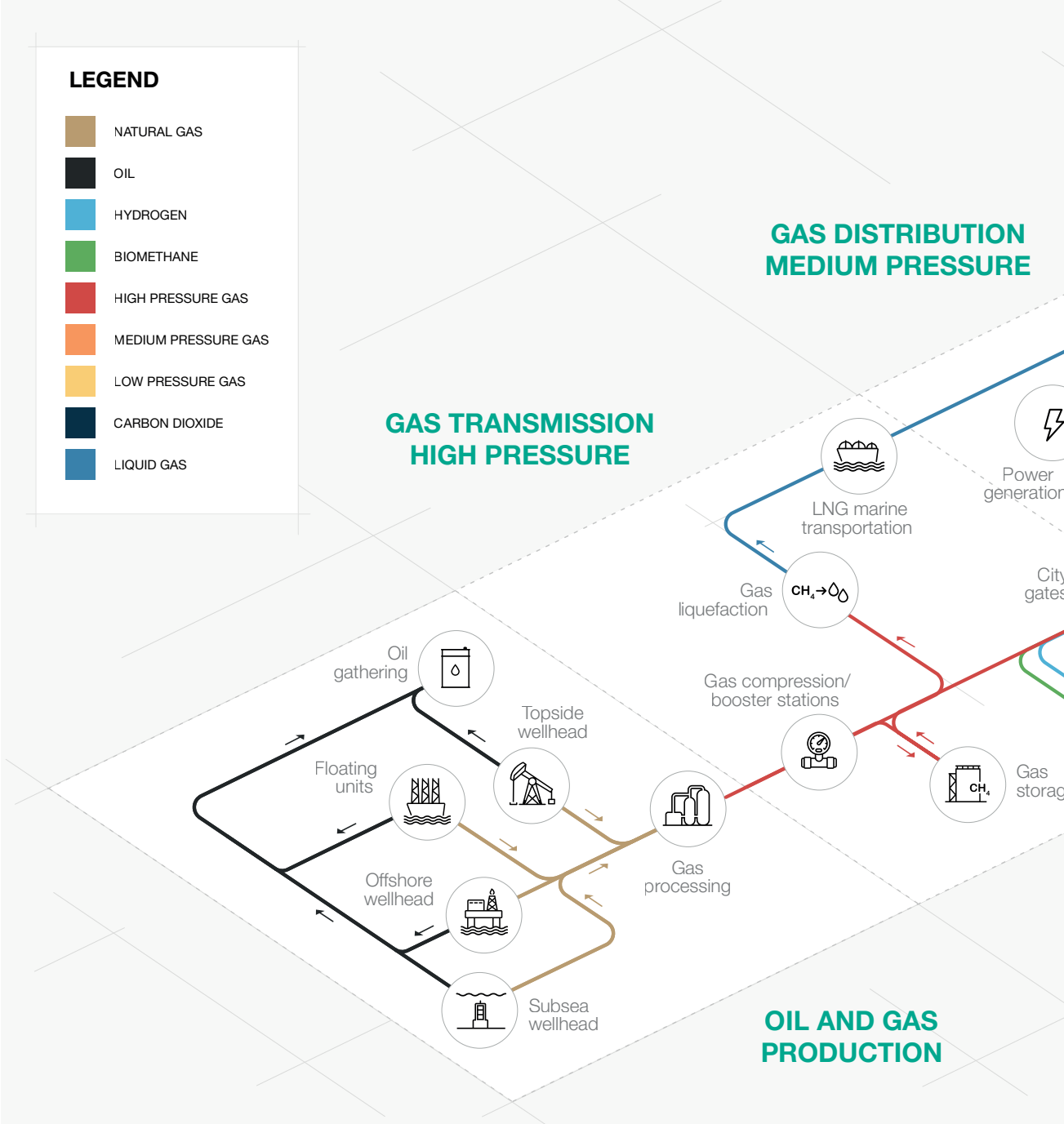
We are in constant evolution to meet our customers' highest expectations in terms of quality and reliability.

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

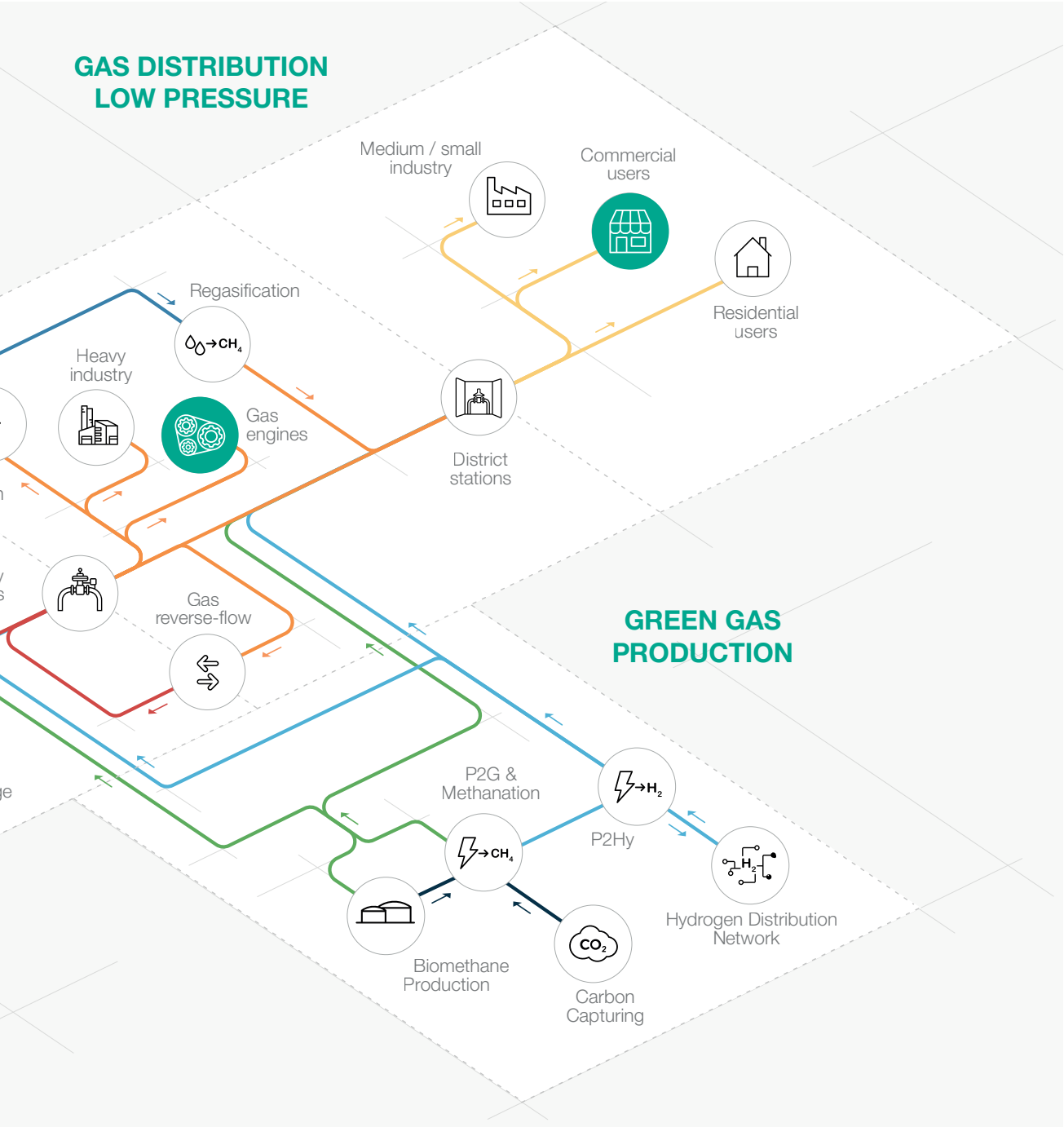


Figure 1 Area of Application Map

Introduction

The **Cirval CE** is a **lever-operated gas pressure regulator** controlled by a diaphragm and setting spring which controls the valve.

Mainly used for commercial applications.

It should to be used with previously filtered non-corrosive gases.

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

The Cirval CE is **Hydrogen Ready** for NG-H2 blending.

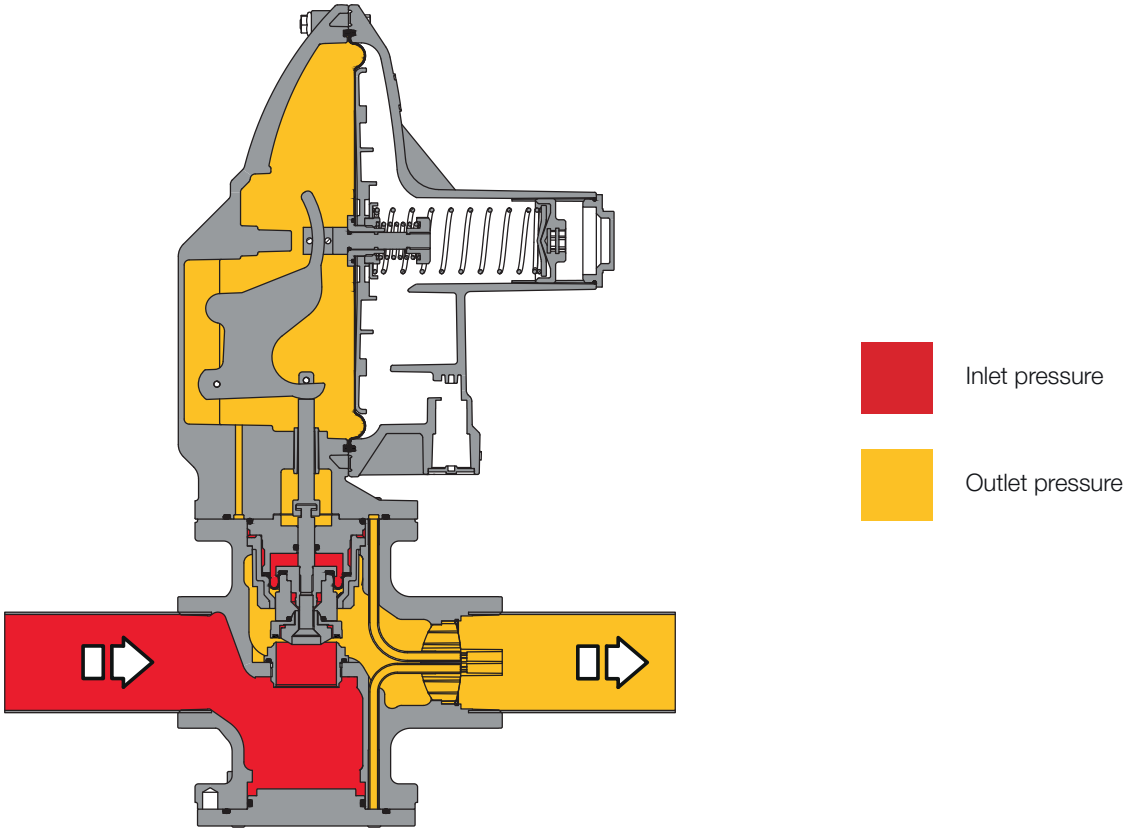


Figure 2 Cirval CE

Features and Calibration ranges

The Cirval CE is a lever-operated device for medium and low pressure with a unique dynamic balancing cartridge system which ensures an **outstanding turndown ratio** combined with an extremely **accurate outlet pressure control.**

A balanced pressure regulator is a pressure regulator where the delivery pressure accuracy 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.

The Cirval CE is available in two sizes: the Cirval CE 200 and the Cirval CE 300

This regulator should be used with previously filtered, non-corrosive gases in distribution networks as well as commercial 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.**

The modular design of the Cirval CE pressure regulators allows for retrofitting either a slam shut valve or Integral Full Monitor (IFM).

It is available both with internal and external sensing line.

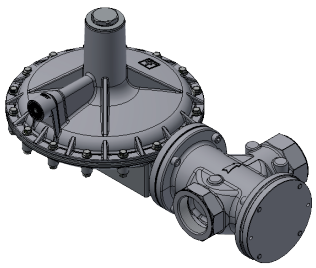


Figure 3 Cirval CE 300

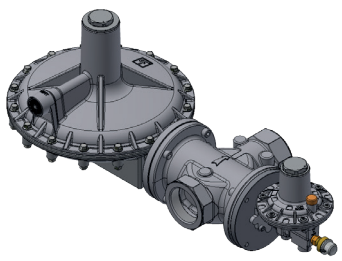


Figure 4 Cirval CE 300 with LA slam shut valve

Cirval CE competitive advantages

- Compact and simple design
- High accuracy
- Fail Open plug and seat regulator
- Balanced type
- Token IRV
- Top entry
- Easy maintenance
- Built-in accessories
- Biomethane compatible and 20% Hydrogen blending compatible. Higher blending available on request

Features

Features	Values	
Design pressure* (PS[1] / DP[2])	up to 860 kPa up to 8.6 bar	
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])	**Internal sensing line** from 13.8 kPa to 517 kPa from 138 mbar to 5.17 bar	**External sensing line** from 13.8 kPa to 861 kPa from 138 mbar to 8.6 bar
Range of downstream pressure (Wd[1])	from 1.4 kPa to 83 kPa from 14 mbar to 830 mbar	
Available accessories	LA Slam shut, IFM (Integral Full Monitor), built-in strainer	
Minimum operating differential pressure (Δp_{min} [1])	12 kPa | 120 mbar	
Accuracy class (AC[1])	up to 10	
Lock-up pressure class (SG[1])	up to 20	
Nominal size (DN[1,2])	DN 40 | 1-1/2"; DN 50 | 2"	
Orifice	Cirval CE 200: 3/4" Cirval CE 300: 1-1/2"	
Connections****	Cirval CE 200: 1-1/2" and 2" according to ISO 228-1, Cirval CE 300: 2" according to ISO 228-1 ; 2" PN16 / ANSI 150RF according to ANSI B16.5	

([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.
(**) 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.
(****) NOTE: For other types of connections, please contact our offices.

Table 1 Features

Materials and Approvals

Part	Material
Body	Ductile iron GS 400-18 ISO 1083
Cover	Die cast aluminum
Seat	Brass
Diaphragm	Nitrile rubber
Sealing ring	Nitrile

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 **Cirval CE** regulator is designed according to 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 class VIII according to ANSI/FCI 70-3.

EN 334 PED-CE

Design pressure by version

Design pressure (PS according to EN334)				
Version	Body		Slam shut	
	MPa	bar	MPa	bar
all versions	0.86	8.6	2.00	20

Table 3 Design pressure for body and slam shut

Design pressure (PS according to EN334)												
Parts	Control head											
	200BP		300BP		200MP		300MP		200TR		300TR	
	MPa	bar	MPa	bar	MPa	bar	MPa	bar	MPa	bar	MPa	bar
Covers	0.86	8.6	0.86	8.6	0.86	8.6	0.86	8.6	0.86	8.6	0.86	8.6
Diaphgragm	0.03	0.3	0.03	0.3	0.07	0.7	0.10	1	0.17	1.7	0.17	1.7
Max Diaphgragm Δp	0.02	0.2	0.02	0.2	0.05	0.5	0.07	0.7	0.11	1.1	0.11	1.1

Table 4 Design pressure for regulator's parts

General link to the calibration tables: **PRESS HERE** or use the QR code:

MAOP Maximum Allowable Operating Pressure (p_{umax} according to EN334)								
		Internal sensing line				External sensing line			
		200BP | 200MP | 200TR		300BP | 300MP | 300TR		200BP | 200MP | 200TR		300BP | 300MP | 300TR	
		MPa	bar	MPa	bar	MPa	bar	MPa	bar
WITH CE MARKING	all versions	0.52	5.2	0.52	5.2	0.86	8.6	0.86	8.6

Table 5 MAOP Maximum Allowable Operating Pressure with CE marking

Accessories

For the pressure regulators:

- Integral Full Monitor (IFM)
- Slam shut valve

Integral Full Monitor (IFM)

IFM is an overpressure protection device, which will take over a failing worker regulator. In this configuration the gas flows through the monitor first and then through the worker (or active) regulator.

The monitor regulator outlet pressure set-point shall be set higher than the worker to allow the monitor regulator to be in a wide open position during normal operation. With the Integral Full Monitor, the Cg valve coefficient is 5% lower than the corresponding version without. When the outlet pipe increases more than 1 diameter, installing an external sensing line is recommended to guarantee optimal performances.

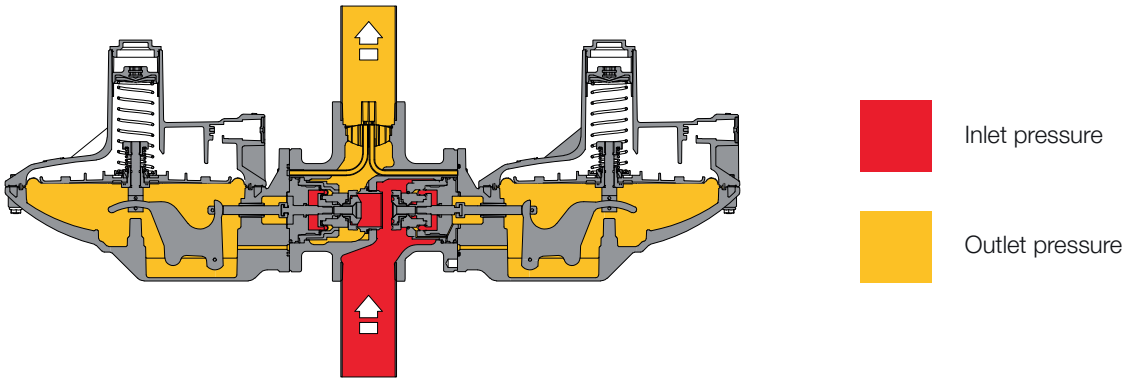


Figure 5 Cirval CE IFM

Integral Full Monitor (IFM) types and ranges				
Model	**Control head**	**Range Wh**		**Spring Table web link**
		kPa	**mbar**	
Cirval CE 200	BP	1.4 - 8.2	14 - 82	TT 1817
Cirval CE 200	MP	8 - 32.5	80 - 325	TT 1817
Cirval CE 200	TR	30 - 83	300 - 830	TT 1817
Cirval CE 300	BP	1.4 - 8.5	14 - 85	TT 1818
Cirval CE 300	MP	7.9 - 50.3	79 - 503	TT 1818
Cirval CE 300	TR	49.5 - 83	495 - 830	TT 1818

Table 6 Settings table

Slam Shut LA

The Cirval CE pressure regulator offers the possibility of installing an **incorporated LA slam shut valve** and this can be done either during the manufacturing process or be retrofited in the field. **Retrofitting the LA can be done without modifying** the pressure regulator body assembly.
With the built-in slam shut, the Cg valve coefficient 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
- Optional push button for tripping test
- Compact dimensions
- Easy maintenance
- Remote tripping option
- Limit switch option

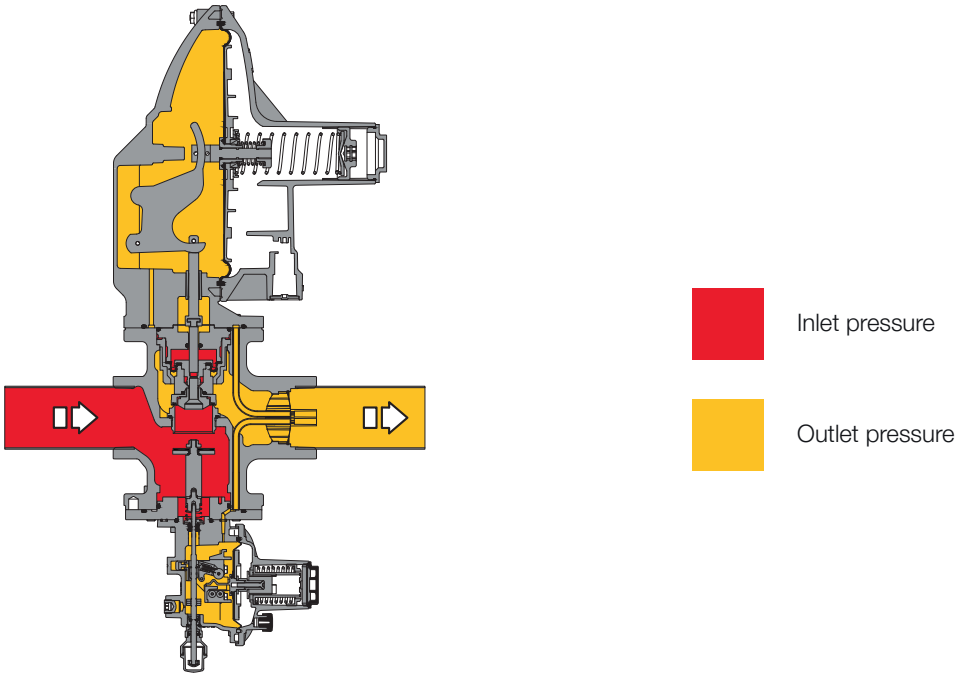


Figure 6 Cirval CE with LA

Pressure switch types and ranges					
SSV Type	**Model**	**Operation**	**Range Wh**		**Spring Table web link**
			kPa	**mbar**	
LA	BP	OPSO	3 - 18	30 - 180	TT 00214
		UPSO	0.6 - 6	6 - 60	
LA	MP	OPSO	14 - 45	140 - 450	TT 00214
		UPSO	1 - 24	10 - 240	
LA	TR	OPSO	25 - 550	250 - 5500	TT 00214
		UPSO	10 - 350	100 - 3500	

Table 7 Settings table

General link to the calibration tables: **PRESS HERE** or use the QR code:

In-line monitor

In-line monitor is an emergency pressure regulator that is usually upstream from the worker regulator, in an abnormal event, when the worker regulator is unable to maintain downstream pressure from exceeding the set point, the monitor will take over the worker regulator at a set point slightly higher. An external sensing line is required in upstream monitor configurations, and the internal sensing line will be plugged.

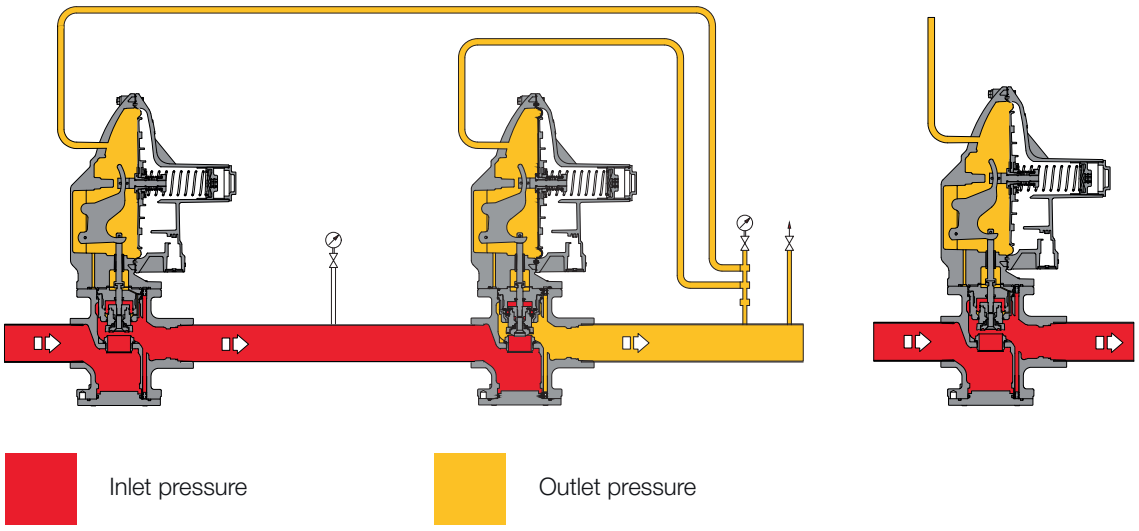


Figure 7 Cirval CE inline monitor

Balanced valve design (Figure 8 - Item 1)

The Cirval CE is a spring loaded, lever-operated regulator that incorporates a balanced cartridge design. The balancing piston allows an opposite force equal to the inlet pressure to be applied on the back side of the orifice's seat disk. This feature improves the accuracy of the outlet pressure setting as inlet pressure fluctuates and provides high turndown ratio across a wide flow range.

Integral strainer (Figure 8 - Item 2)

The Cirval CE is equipped with a removable internal 300 micron (50 U.S. mesh) strainer to prevent foreign particles, such as weld slag or PE shavings, to get stuck between the orifice and seat/disk thus preventing lockup. The purpose of the strainer is to provide protection to the Cirval CE and its optional accesories thus protecting the customers downstream piping system. The strainer can be easily accessed to be cleaned or replaced without removing the regulator body from the piping.

Token relief valve (Figure 8 - Item 3)

The Cirval CE has an optional token relief valve that discharges a small amount of gas into the atmosphere when the regulator exceeds the relief valve set point. Token relief valve cannot be used as overpressure protection device. However it can be activated or deactivated in the field, if necessary.

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, can prevent nuisance tripping of the slam shut valve.

Outlet pressure sensing (Figure 8 - Item 4)

The Cirval CE can sense downstream pressure internally (4a) or externally (4b). Internal sensing lines are fully independent between accessories to provide Independent control.

On internal sensing line version can be connected without plugging the internal sensing and use a secondary external sense line connected to the lower diaphragm case. For external sensing line version internal sensing line must be plugged

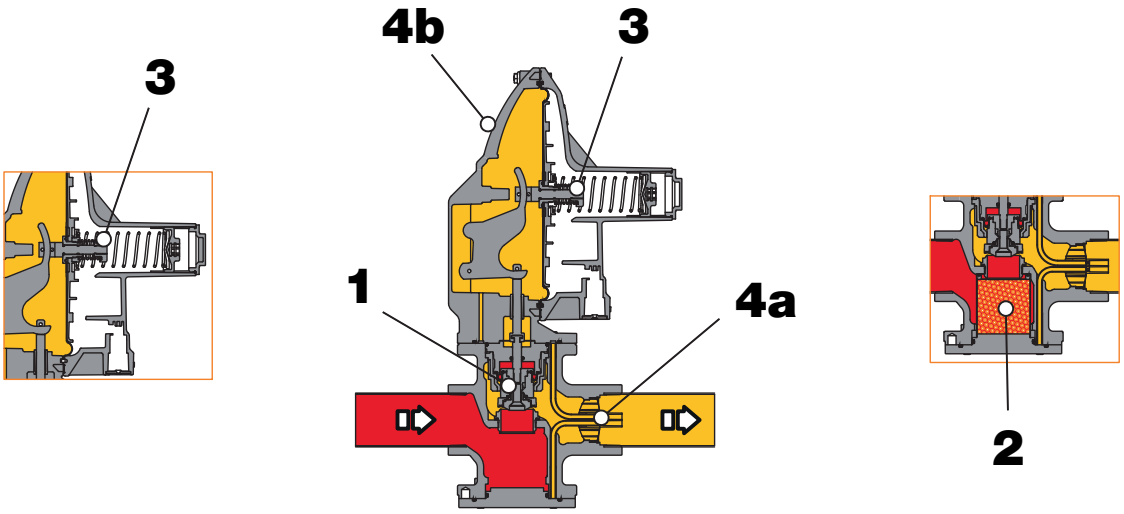


Figure 8 Cirval CE components location

Safety limitation

In case of a single regulator supplied without built-in overpressure protection device (SSV or IFM), the regulator shall be protected with a secondary means of overpressure protection.

The overpressure protection must be provided per code capable of limiting the downstream pressure to the system.

Weights and Dimensions

The Cirval CE

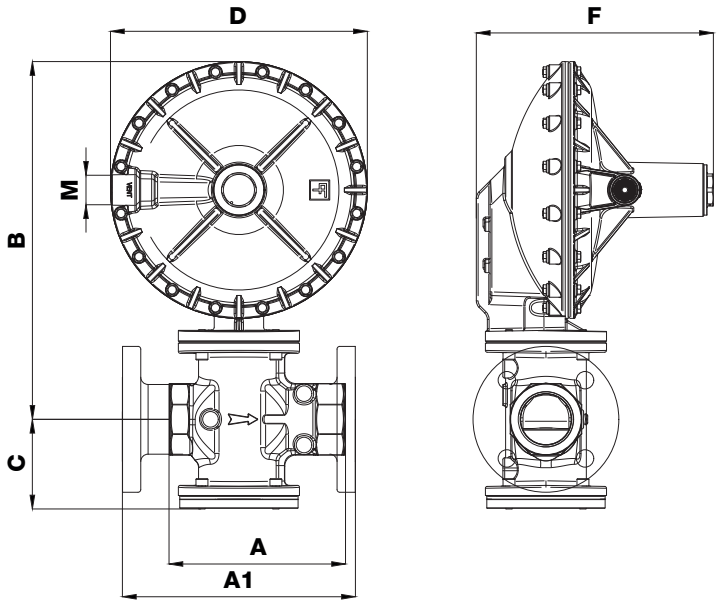


Figure 9 Cirval CE dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)				
Model	**Cirval CE 200**		**Cirval CE 300**	
	[mm]	inches	[mm]	inches
A	177	7.0”	193	7.6”
A1	-	-	254	10.0”
B	259	10.2”	391.2	15.4”
C	66	2.6”	99.1	3.9”
D	185.4	7.3”	279.4	11.0”
F	177.8	7.0”	256.5	10.1”
M	Rp 3/4”		Rp 3/4”	
Inlet*	1-1/2”; 2” GAS		2” GAS; 2” PN16/ANSI150RF	
Outlet*	1-1/2”; 2” GAS		2” GAS; 2” PN16/ANSI150RF	
Tubing Connections	Øe 10 x Øi 8 (on request imperial sizing)			
Weight	Kg	lbs	Kg	lbs
Threaded	5.4	11.9	11.8	26
Flanged	-	-	16	35.3
(*) NOTE: for other types of connections, please contact our offices.				

Table 8 Weights and dimensions

Cirval CE with IFM

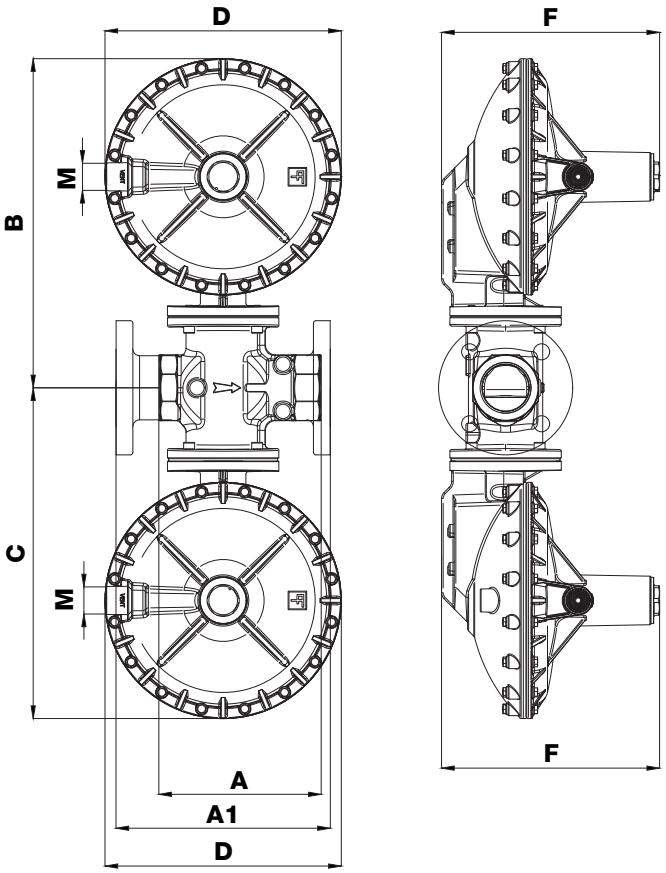


Figure 10 Cirval CE with IFM dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)				
Model	**Cirval CE 200**		**Cirval CE 300**	
	[mm]	inches	[mm]	inches
A	177	7.0”	193	7.6”
A1	-	-	254	10.0”
B	259	10.2”	391.2	15.4”
C	259	10.2”	391.2	15.4”
D	185.4	7.3”	279.4	11.0”
F	177.8	7.0”	256.5	10.1”
M	Rp 3/4”		Rp 3/4”	
Inlet*	1-1/2”; 2” GAS		2” GAS; 2” PN16/ANSI150RF	
Outlet*	1-1/2”; 2” GAS		2” GAS; 2” PN16/ANSI150RF	
Tubing Connections	Øe 10 x Øi 8 (on request imperial sizing)			
Weight	Kg	lbs	Kg	lbs
Threaded	7.1	13.6	16.8	37.3
Flanged	-	-	21	46.3
(*) NOTE: for other types of connections, please contact our offices.				

Table 9 Weights and dimensions

Cirval CE with LA

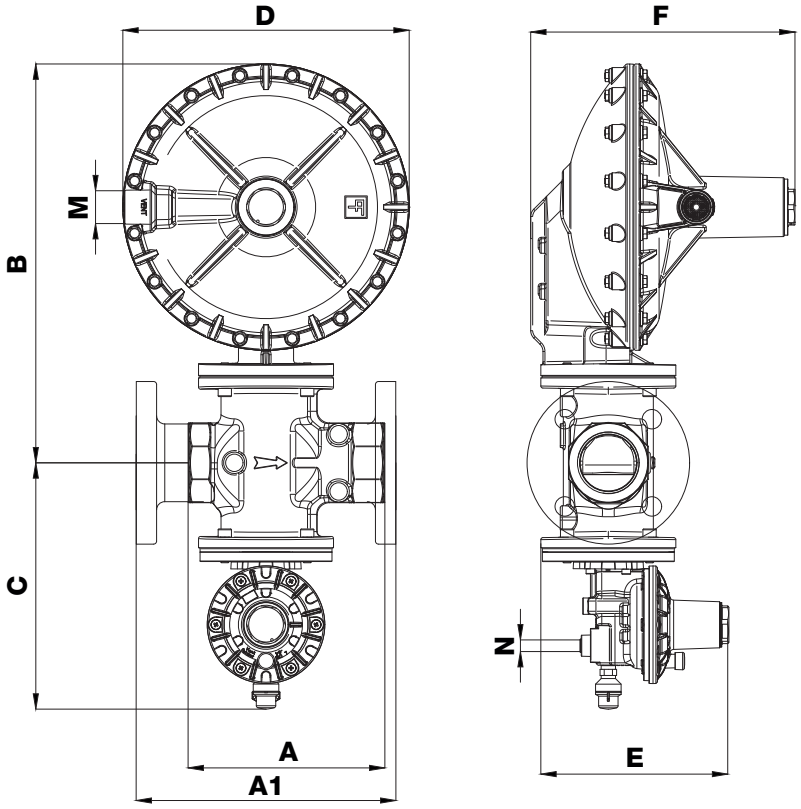


Figure 11 Cirval CE with LA dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)				
Model	**Cirval CE 200**		**Cirval CE 300**	
	[mm]	inches	[mm]	inches
A	177	7.0”	193	7.6”
A1	-	-	254	10.0”
B	259	10.2”	391.2	15.4”
C	208.3	8.2”	241.3	9.5”
D	185.4	7.3”	279.4	11.0”
E	165.1	6.5”	185.4	7.3”
F	177.8	7.0”	256.5	10.1”
M	Rp 3/4”		Rp 3/4”	
N	Rp 3/4”		Rp 3/4”	
Inlet*	1-1/2”; 2” GAS		2” GAS; 2” PN16/ANSI150RF	
Outlet*	1-1/2”; 2” GAS		2” GAS; 2” PN16/ANSI150RF	
Tubing Connections	Øe 10 x Øi 8 (on request imperial sizing)			
Weight	Kg	lbs	Kg	lbs
Threaded	6.4	14.1	12.8	28.2
Flanged	-	-	17	37.5
(*) NOTE: for other types of connections, please contact our offices.				

Table 10 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. Sizing is available through the on-line Pietro Fiorentini sizing program.

Flow rate coefficient		
Model	Cirval CE 200	Cirval CE 300
Cg	200	759
K1	89	96

Table 11 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 12)
T = gas temperature (°C)

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

S = relative density (refer to Table 12)
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 | 59 °F and at the declared relative density.		

Table 12 Correction Factor Fc

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

Nm^3/h reference conditions T= 0 °C; P= 1 barg | T= 32 °F; P= 14.5 psig
Stm^3/h reference conditions T= 15 °C; P= 1 barg | T= 59 °F; P= 14.5 psig

Table 13 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 may be calculated by 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

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

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

Flow capacity tables

Cirval 200 - DN 40 | AC 10

from 5 kPa | 50 mbar up to 50 kPa | 500 mbar

Cirval 200 - accuracy 10% ; AC10 according to EN334

Inlet pressure		Outlet pressure									
		5 kPa | 50 mbar		15 kPa | 150 mbar		25 kPa | 250 mbar		40 kPa | 400 mbar		50 kPa | 500 mbar	
kPa	barg	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
50	0.5	105	3800	105	3800	85	3100	145	5200	-	-
100	1	180	6400	170	6100	135	4800	190	6800	175	6200
150	1.5	230	8200	230	8200	180	6400	270	9600	245	8700
200	2	265	9400	275	9800	225	8000	335	11900	310	11000
300	3	280	9900	325	11500	300	10600	420	14900	400	14200
400	4	265	9400	335	11900	330	11700	425	15100	420	14900
500	5	260	9200	350	12400	370	13100	430	15200	440	15600

Cg = 200 K1= 89

Table 14 Cirval 200 - DN40 | AC10 flow rate

Cirval 200 - DN 50 | AC 10

from 5 kPa | 50 mbar up to 50 kPa | 500 mbar

Cirval 200 - accuracy 10% ; AC10 according to EN334

Inlet pressure		Outlet pressure									
		5 kPa | 50 mbar		15 kPa | 150 mbar		25 kPa | 250 mbar		40 kPa | 400 mbar		50 kPa | 500 mbar	
kPa	barg	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
50	0.5	115	4100	105	3800	85	3100	150	5300	-	-
100	1	180	6400	175	6200	145	5200	195	6900	180	6400
150	1.5	255	9100	255	9100	205	7300	280	9900	255	9100
200	2	300	10600	310	11000	255	9100	355	12600	325	11500
300	3	320	11400	350	12400	320	11400	455	16100	430	15200
400	4	305	10800	340	12100	340	12100	465	16500	455	16100
500	5	300	10600	360	12800	405	14400	470	16600	475	16800

Cg = 200 K1= 89

Table 15 Cirval 200 - DN50 | AC10 flow rate

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.

Cirval 300 - DN 50 | AC 10

from 5 kPa | 50 mbar up to 50 kPa | 500 mbar

Cirval 300 - accuracy 10% ; AC10 according to EN334

Inlet pressure		Outlet pressure									
		5 kPa | 50 mbar		15 kPa | 150 mbar		25 kPa | 250 mbar		40 kPa | 400 mbar		50 kPa | 500 mbar	
kPa	barg	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
50	0.5	300	10600	270	9600	280	9900	475	16800	-	-
100	1	450	15900	395	14000	400	14200	670	23700	690	24400
150	1.5	540	19100	505	17900	520	18400	785	27800	805	28500
200	2	610	21600	610	21600	615	21800	830	29400	850	30100
300	3	705	24900	755	26700	735	26000	830	29400	850	30100
400	4	705	24900	770	27200	765	27100	830	29400	850	30100
500	5	705	24900	770	27200	770	27200	830	29400	845	29900

Cg = 759 K1= 96

Table 16 Cirval 300 - DN50 | AC10 flow rate

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.

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.

Pietro Fiorentini

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