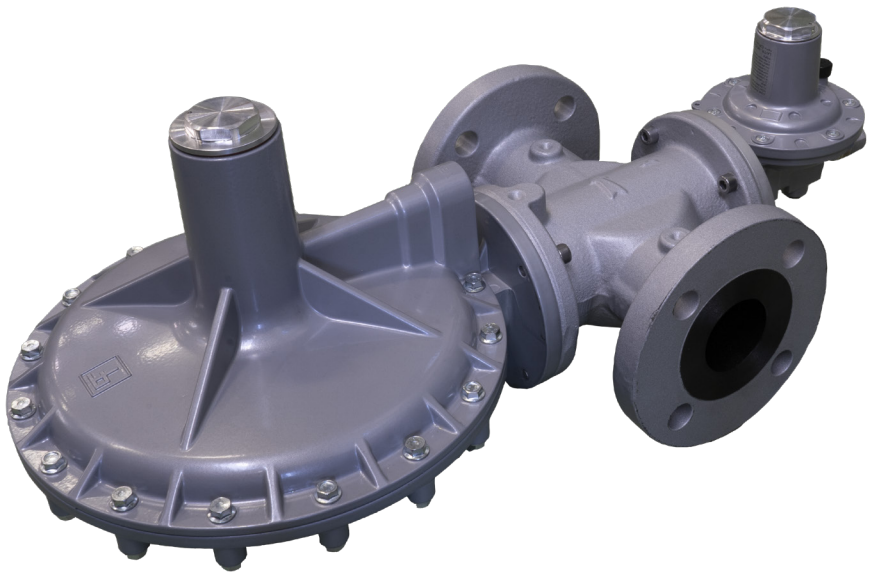
Pietro Fiorentini

Cirval

Medium - Low Pressure Gas Regulator



TECHNICAL BROCHURE

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cirval_technicalbrochure_USA_revF

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.

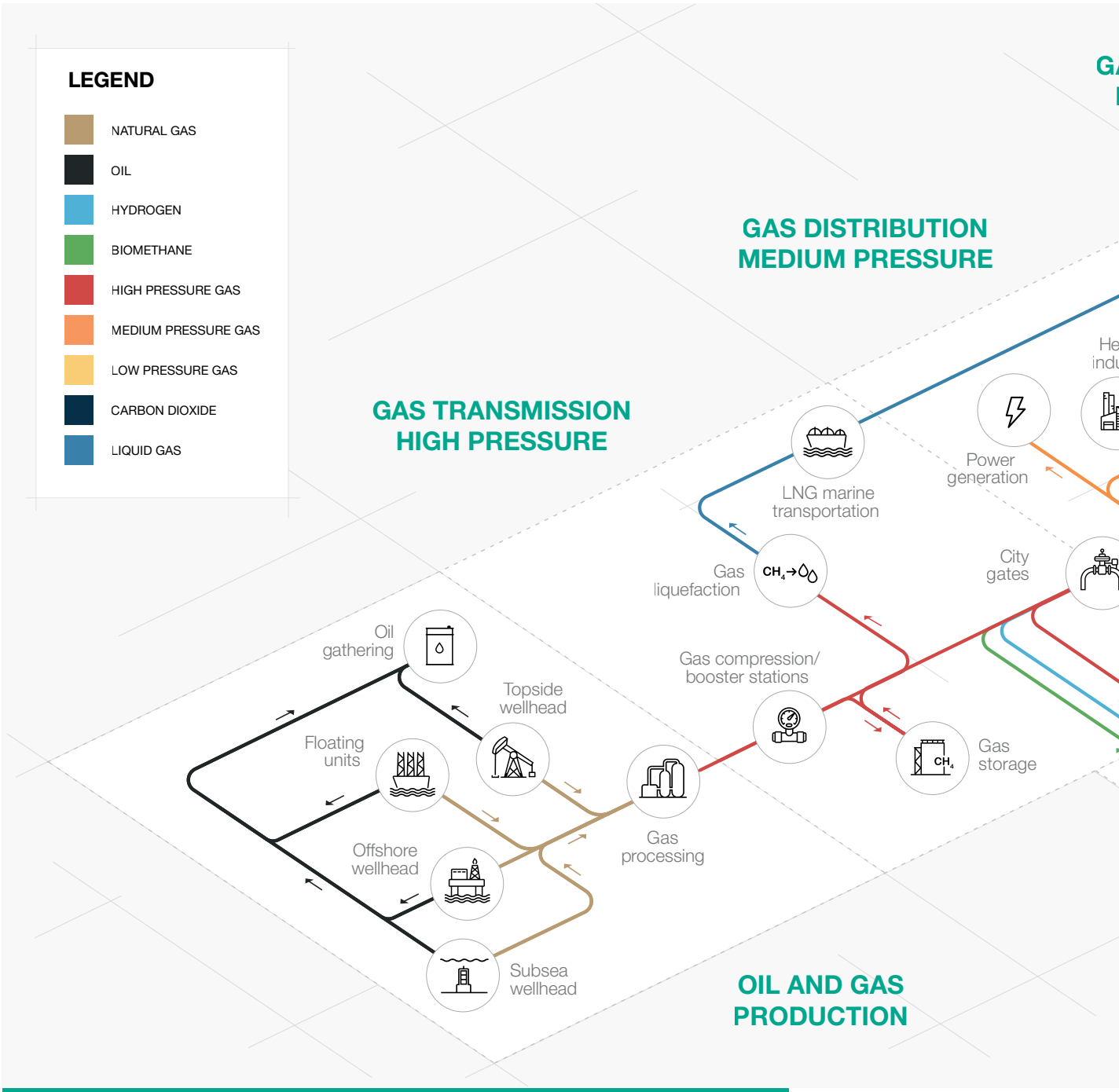
We are constantly evolving to meet our customers' highest expectations in terms of quality and reliability.

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



Green icon indicates the application where this product is suitable for

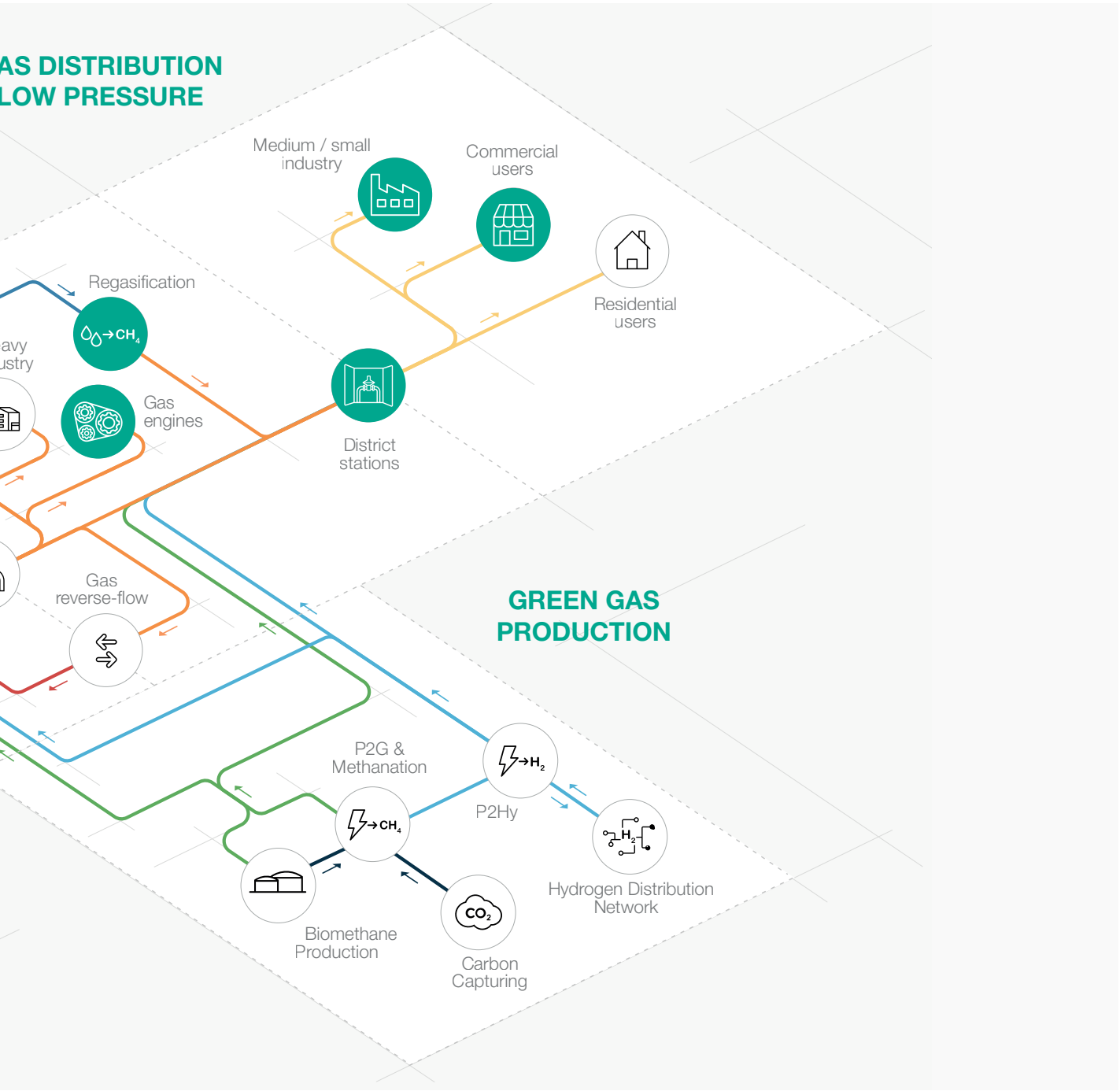


Figure 1 Area of Application Map

Introduction

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

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.

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

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

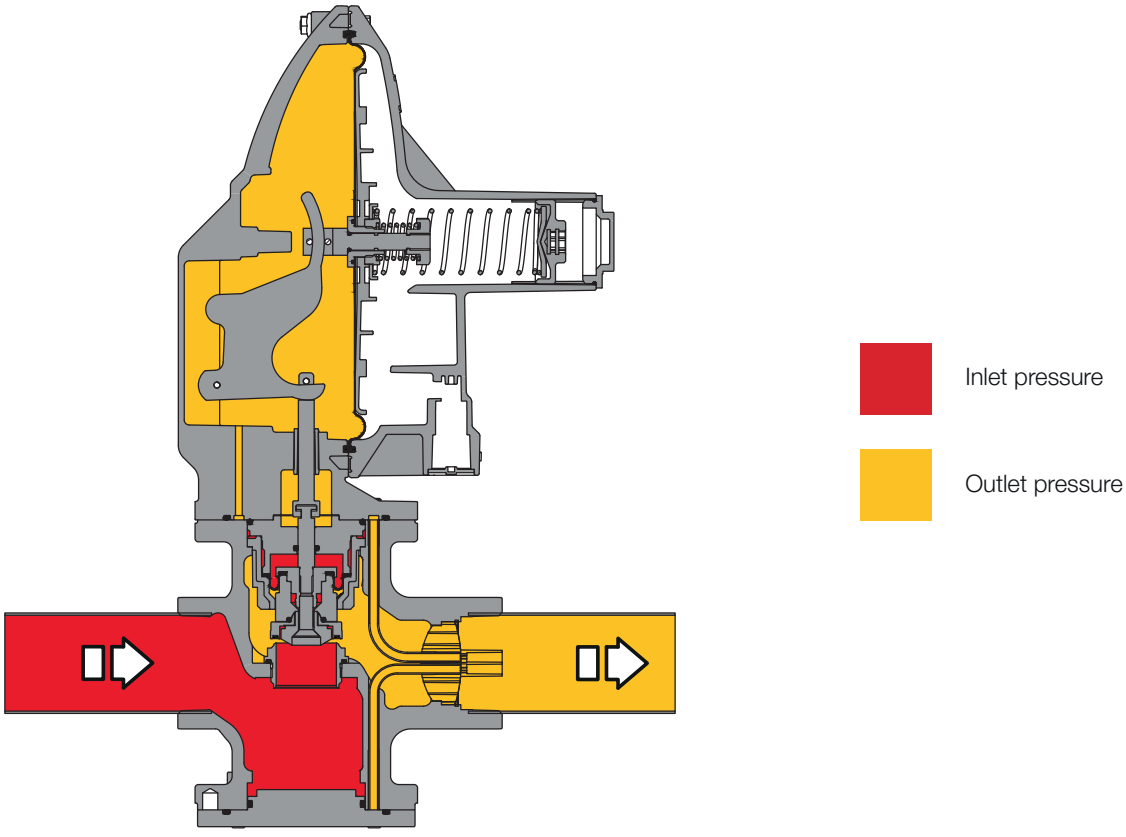


Figure 2 Cirval

Features and Calibration ranges

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

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

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

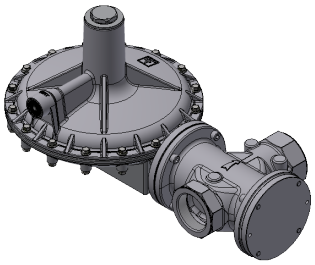


Figure 3 Cirval 300

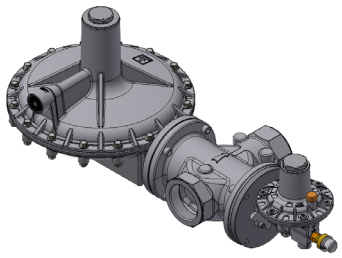


Figure 4 Cirval 300 with LA slam shut valve

Cirval 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 125 psig	
Ambient temperature* (TS[1])	**Standard version** from -20 °C to +65 °C from -4 °F to +150 °F	**Arctic version** from -29 °C to +65 °C from -20 °F to +150 °F
Inlet gas temperature*	**Standard version** from -20 °C to +60 °C from -4 °F to +140 °F	**Arctic version** from -20 °C to +60 °C from -4 °F to +140 °F
Inlet pressure (MAOP / p_{umax} [1])	from 13.8 kPa to 517 kPa from 2 psig to 75 psig	
Range of downstream pressure (Wd[1])	from 1.4 kPa to 82 kPa from 5.6“ w.c. to 12 psig	
Available accessories	LA Slam shut, IMD (Independent Monitoring Device), IFM (Integral Full Monitor), built-in strainer	
Minimum operating differential pressure (Δp_{min} [1])	12 kPa | 1.75 psig	
Accuracy class (AC[1])	up to 10	
Lock-up pressure class (SG[1])	up to 20	
Nominal size (DN[1,2])	DN 32 | 1-1/4”; DN 40 | 1-1/2”; DN 50 | 2”	
Orifice	Cirval 200: 3/4” Cirval 300: 1-1/2”	
Connections	Cirval 200: 1-1/4”, 1-1/2” and 2” NPT according to ANSI B1.20.1, Cirval 300: 2” NPT according to ANSI B1.20.1, 2” S.125FF according to ANSI B16.5 and Sliding 2” S.150RF for AU version	

([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	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** regulator is designed according to ANSI B109.4 and CSA 6.18 standards.
The regulator reacts in opening (Fail Open) according to EN 334.

Leakage class: bubble tight, better than class VIII according to ANSI/FCI 70-3.

ANSI B109.4 CSA 6.18

Design pressure by version

Design pressure (PS according to EN334)				
Version	Body		Slam shut	
	MPa	psig	MPa	psig
all versions	0.86	125	2.00	290

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	psig	MPa	psig	MPa	psig	MPa	psig	MPa	psig	MPa	psig
Covers	0.86	125	0.86	125	0.86	125	0.86	125	0.86	125	0.86	125
Diaphgragm	0.03	4.3	0.03	4.3	0.07	10.8	0.10	14	0.17	24	0.17	24
Max Diaphgragm Δp	0.02	2.9	0.02	2.9	0.05	7.2	0.07	10.1	0.11	15	0.11	15

Table 4 Design pressure for regulator's parts

Maximum allowable operating pressure

MAOP Maximum Allowable Operating Pressure (p_{umax} according to EN334)					
Version		Control head			
		200BP | 200MP | 200TR		300BP | 300MP | 300TR	
		MPa	psig	MPa	psig
WITHOUT CE MARKING	all versions	0.52	75	0.52	75

Table 5 MAOP Maximum Allowable Operating Pressure without CE marking

Springs ranges and control heads

Control heads pressure ranges				
	Control head BP	Control head MP	Control head TR	Spring Table web link
Model	kPa psig	kPa psig	kPa psig	
Cirval 200	1.4 - 10.3 0.2 - 1.5	9.6 - 36.5 1.4 - 5.3	35.8 - 82.7 5.2 - 12	TT 1817
Cirval 300	1.4 - 8.3 0.2 - 1.2	8 - 50.3 1.2 - 7.3	50 - 82.7 7.2 - 12	TT 1818

Table 6 Settings table

CIRVAL 200BP VERSION							
Pos.	Spring item code	Spring color	d	Lo	De	Spring range	
						Min.	Max.
1	US64470068GI	Yellow	2	110	34	1.4 kPa 5.6 “w.c.	2.5 kPa 10.0 “w.c.
	US64470024BI*	White	1.3	45	15		
2	US64470139NE	Black	2.2	115	34	2.3 kPa 9.2 “w.c.	4 kPa 16 “w.c.
	US64470024BI*	White	1.3	45	15		
3	US64470140MA	Brown	2.7	106	34	3.4 kPa 13.6 “w.c.	6.5 kPa 26 “w.c.
	US64470024BI*	White	1.3	45	15		
Pos.	Spring item code	Spring color	d	Lo	De	Spring range	
						Min.	Max.
4	US64470071GR	Grey	2.8	115	34	6.14 kPa 0.89 psig	10.3 kPa 1.50 psig
	US64470031RO*	Red	1.7	40	15		

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)
(*) NOTE: Internal relief valve spring for regulator set-point as stated in the Spring range column

Table 7 TT 1817 - Cirval 200BP version setting springs

CIRVAL 200MP VERSION							
Pos.	Spring item code	Spring color	d	Lo	De	Spring range	
						Min.	Max.
1	US64470141VE	Green	3.2	120	34	10 kPa 1.46 psig	16.5 kPa 2.39 psig
	US64470031RO*	Red	1.7	40	15		
2	US64470338BL	Blue	3.8	110	34	16.5 kPa 2.40 psig	36.5 kPa 5.29 psig
	US64470031RO*	Red	1.7	40	15		

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)
(*) NOTE: Internal relief valve spring for regulator set-point as stated in the Spring range column

Table 8 TT 1817 - Cirval 200MP version setting springs

CIRVAL 200TR VERSION							
Pos.	Spring item code	Spring color	d	Lo	De	Spring range	
						Min.	Max.
1	US64470144VI	Violet	5	100	34	36 kPa 5.22 psig	82.7 kPa 12 psig
	US64470031RO*	Red	1.7	40	15		

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)
(*) NOTE: Internal relief valve spring for regulator set-point as stated in the Spring range column

Table 9 TT 1817 - Cirval 200TR version setting springs

CIRVAL 300BP VERSION							
Pos.	Spring item code	Spring color	d	Lo	De	Spring range	
						Min.	Max.
1	US64470382NE	Black	2.5	160	39	1.4 kPa 5.6 “w.c.	2.9 kPa 11.6 “w.c.
	US2700525*	Orange	2	40	22		
2	US64470301GI	Yellow	2.8	145	39	2.7 kPa 10.8 “w.c.	4.2 kPa 16.8 “w.c.
	US2700645*	Red	2.3	40	22		
Pos.	Spring item code	Spring color	d	Lo	De	Spring range	
						Min.	Max.
3	US64470302VI	Violet	3.8	140	39	4.1 kPa 0.59 psig	8.3 kPa 1.20 psig
	US2700999*	Grey	3	37	22		

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)
(*) NOTE: Internal relief valve spring for regulator set-point as stated in the Spring range column

Table 10 TT 1818 - Cirval 300BP version setting springs

CIRVAL 300MP VERSION							
Pos.	Spring item code	Spring color	d	Lo	De	Spring range	
						Min.	Max.
1	US64470262AR	Orange	4.5	140	39	8 kPa 1.16 psig	16.5 kPa 2.39 psig
	US2700999*	Grey	3	37	22		
2	US64470398AZ	Light Blue	5	140	39	16.5 kPa 2.40 psig	28.9 kPa 4.20 psig
	US2700999*	Grey	3	37	22		
3	US64470408RO	Red	5.5	140	40	29 kPa 4.22 psig	50.3 kPa 7.29 psig
	US2700999*	Grey	3	37	22		

d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)
(*) NOTE: Internal relief valve spring for regulator set-point as stated in the Spring range column

Table 11 TT 1818 - Cirval 300MP version setting springs

CIRVAL 300TR VERSION							
Pos.	Spring item code	Spring color	d	Lo	De	Spring range	
						Min.	Max.
1	US64470398AZ	Light blue	5	140	39	49.9 kPa 7.25 psig	82.7 kPa 12 psig
	US2700999*	Grey	3	37	22		
d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm) **(*) NOTE:** Internal relief valve spring for regulator set-point as stated in the Spring range column							

Table 12 TT 1818 - Cirval 300TR version setting springs

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

Accessories

For the pressure regulators:

- Integral Full Monitor (IFM)
- Slam shut valve
- Independent Monitoring Device (IMD)

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.

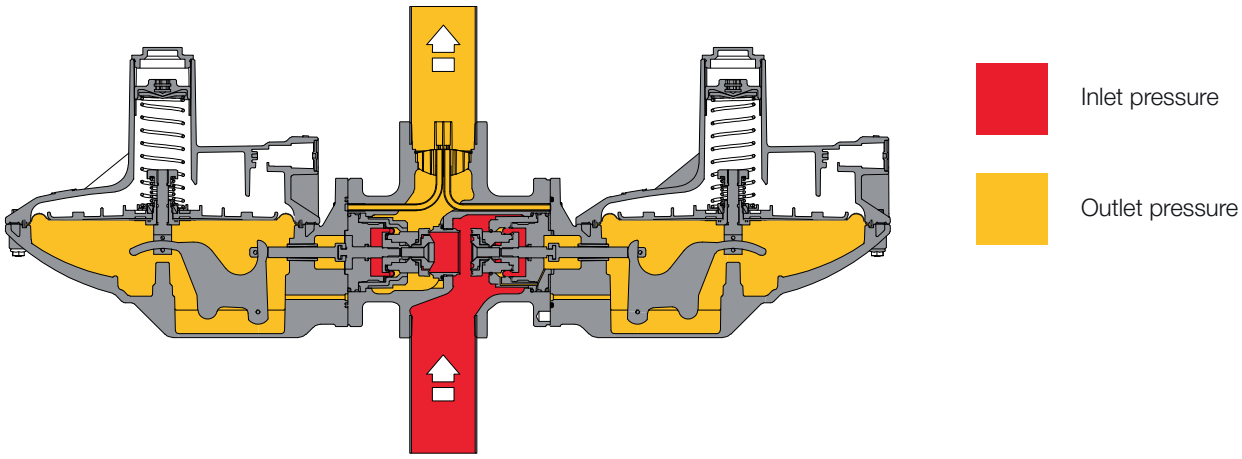


Figure 5 Cirval IFM

Pressure switch types and ranges				
Model	**Control head**	**Range Wh**		**Spring Table web link**
		kPa	**psig**	
Cirval 200	BP	1.5 - 8	0.22 - 1.16	TT 1817
Cirval 200	MP	8 - 32	1.16 - 4.64	TT 1817
Cirval 200	TR	32 - 83	4.64 - 12.04	TT 1817

Table 13 Settings table

CIRVAL 200BP VERSION							
Pos.	Spring item code	Spring color	d	Lo	De	Spring range	
						Min.	Max.
1	US64470139NE	Black	2.2	115	34	1.5 kPa 0.22 psig	2.6 kPa 0.38 psig
	US64470024BI	White	1.3	45	15		
2	US64470140MA	Brown	2.7	106	34	2.7 kPa 0.39 psig	5 kPa 0.73 psig
	US64470024BI	White	1.3	45	15		
3	US64470071GR	Grey	2.8	115	34	5.1 kPa 0.74 psig	8 kPa 1.16 psig
	US64470031RO	Red	1.7	40	15		
d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)							

Table 14 TT 1817 - Cirval 200BP version setting springs

CIRVAL 200MP VERSION							
Pos.	Spring item code	Spring color	d	Lo	De	Spring range	
						Min.	Max.
1	US64470141VE	Green	3.2	120	34	8.1 kPa 1.17 psig	14.7 kPa 2.13 psig
	US64470031RO	Red	1.7	40	15		
2	US64470338BL	Blue	3.8	110	34	14.8 kPa 2.15 psig	32.2 kPa 4.67 psig
	US64470031RO	Red	1.7	40	15		
d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)							

Table 15 TT 1817 - Cirval 200MP version setting springs

CIRVAL 200TR VERSION							
Pos.	Spring item code	Spring color	d	Lo	De	Spring range	
						Min.	Max.
1	US64470143BI	White	4.5	97	34	32 kPa 4.64 psig	55 kPa 7.98 psig
	US64470031RO	Red	1.7	40	15		
2	US64470144VI	Purple	5	100	100	55.1 kPa 7.99 psig	83 kPa 12.04 psig
	US64470031RO	Red	1.7	40	15		
d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)							

Table 16 TT 1817 - Cirval 200TR version setting springs

Slam Shut LA

The Cirval 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

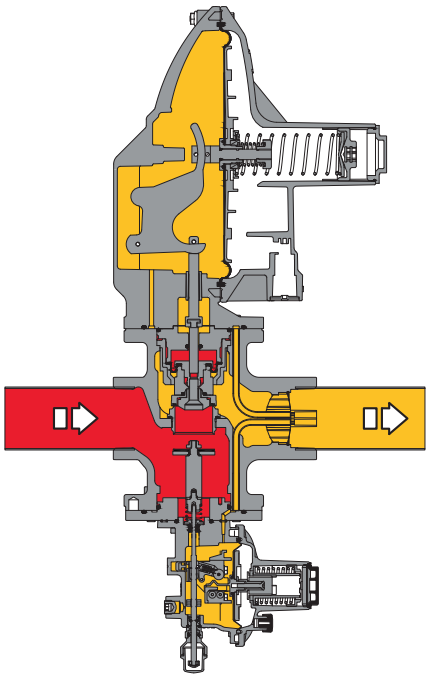


Figure 6 Cirval with LA

Pressure switch types and ranges					
SSV Type	**Model**	**Operation**	**Range Wh**		**Spring Table web link**
			kPa	**psig**	
LA	BP	OPSO	3 - 18	0.43 - 2.61	TT 00214
		UPSO	0.6 - 6	0.09 - 0.9	
LA	MP	OPSO	14 - 45	2 - 6.5	TT 00214
		UPSO	1 - 24	0.14 - 3.4	
LA	TR	OPSO	25 - 550	3.6 - 79	TT 00214
		UPSO	10 - 350	1.45 - 50	

Table 17 Settings table

Shut-off device model LA performance	
Worker set point	**Minimum suggested set-point**
1.7 kPa 7”w.c.	3.7 kPa 15”w.c.
13.7 kPa 2 psig	20.6 kPa 3 psig
34.4 kPa 5 psig	48.2 kPa 7 psig
68.9 kPa 10 psig	89.6 kPa 13 psig
Please see PF monitor and accesory setting sheet for precise settings.	

Table 18 Recommended slam shut settings

LA/BP "OPSO"							
Pos.	Spring part number	Spring color	d	Lo	De	Spring range	
						Min.	Max.
1	US64470112RO	Red	2.2	44	34	3 kPa 0.43 psig	4.9 kPa 0.71 psig
2	US64470115GR	Grey	2.8	42	34	4.9 kPa 0.72 psig	18 kPa 2.61 psig
d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)							

Table 19 TT 002014 - LA/BP "OPSO" setting springs

LA/BP "UPSO"							
Pos.	Spring part number	Spring color	d	Lo	De	Spring range	
						Min.	Max.
12	US64470024BI	White	1.3	45	15	0.55 kPa 0.08 psig	6 kPa 0.87 psig
d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)							

Table 20 TT 002014 - LA/BP "UPSO" setting springs

LA/MP "OPSO"							
Pos.	Spring part number	Spring color	d	Lo	De	Spring range	
						Min.	Max.
3	US64470115GR	Grey	2.8	42	34	14 kPa 2.03 psig	17.9 kPa 2.59 psig
4	US64470116GI	Yellow	3.2	40	34	18 kPa 2.61 psig	27.9 kPa 4.04 psig
5	US64470051BI	White	3.2	50	34	28 kPa 4.06 psig	45 kPa 6.52 psig
d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)							

Table 21 TT 002014 - LA/MP "OPSO" setting springs

LA/MP "UPSO"							
Pos.	Spring part number	Spring color	d	Lo	De	Spring range	
						Min.	Max.
13	US64470024BI	White	1.3	45	15	0.96 kPa 0.14 psig	5.9 kPa 0.85 psig
14	US64470038GI	Yellow	2	40	15	6 kPa 0.87 psig	24 kPa 3.48 psig
d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)							

Table 22 TT 002014 - LA/MP "UPSO" setting springs

LA/TR "OPSO"							
Pos.	Spring part number	Spring color	d	Lo	De	Spring range	
						Min.	Max.
6	64470116GI	Yellow	3.2	40	34	25 kPa 3.62 psig	54.9 kPa 7.96 psig
7	64470051BI	White	3.2	50	34	54.9 kPa 7.97 psig	84.9 kPa 12.31 psig
8	64470057BL	Blue	3.5	50	34	84.9 kPa 12.32 psig	139.9 kPa 20.29 psig
d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)							

Table 23 TT 002014 - LA/TR "OPSO" setting springs

LA/TR "UPSO"							
Pos.	Spring part number	Spring color	d	Lo	De	Spring range	
						Min.	Max.
15	US64470038GI	Yellow	2	40	15	10 kPa 1.45 psig	49.8 kPa 7.23 psig
16	US64470045MA	Brown	2.4	41	15.3	49.9 kPa 7.25 psig	99.8 kPa 14.48 psig
d = Wire Diameter (mm) **Lo** = Spring Length (mm) **De** = External Diameter (mm)							

Table 24 TT 002014 - LA/TR "UPSO"

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

Independent Monitoring Device (IMD)

The IMD is a rough cut monitor control overpressure protection safety device (OPP), which is designed to limit downstream pressure build-up in case of regulator failure. Example are lock-up failure, cut diaphragm or lever disconnect which can cause a catastrophic failure.

When a failure occurs, the IMD operates on the inlet side of the orifice to limit the downstream pressure. Since the IMD is a separate an independent monitoring device from the main regulator, it will function in the event of worker regulator's failure.

With the Independent Monitoring Device, the Cg valve coefficients is 10% lower than the corresponding version without, except for IMD-1 which has a maximum flow limitation (see table 21).

When the IMD is in operation or in lock-up, a small amount of gas will bleed continuously to the atmosphere through a small port in the IMD (less than 1 scfh). This generates an alert of regulator's abnormal condition.

Token relief valve is always disabled when using the IMD.

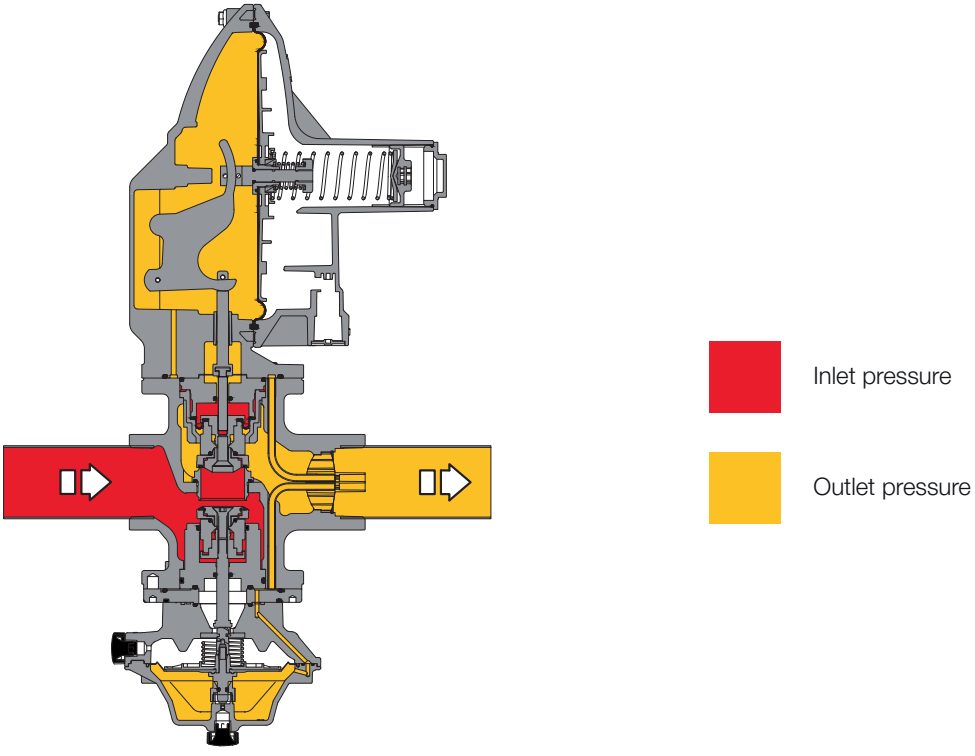


Figure 7 Cirval IMD

IMD performance						
Regulator set range	**IMD version**	**Maximum IMD peak activation pressure**	**IMD pressure control range***	**IMD lock-up pressure**	**IMD activated vent flow rate**	**Cg reduction/ maximum flow**
1.7 kPa 7”w.c.	IMD-1	6.2 kPa 0.9 psig	3.4 - 4.8 kPa 0.5 - 0.7 psig	6.2 kPa 0.9 psig	< 0.028 m^3/h < 1 cfh	10%; max flow 457 m^3/h 16000 scfh
1.7 - 6.8 kPa 7”w.c. - 1 psig	IMD-2	12.4 kPa 1.8 psig	8.2 - 11.7 kPa 1.2 - 1.7 psig	12.4 kPa 1.8 psig	< 0.028 m^3/h < 1 cfh	10 %
1.7 - 13.7 kPa 7”w.c. - 2 psig	IMD-5	26.8 kPa 3.9 psig	16.5 - 25.5 kpa 2.4 - 3.7 psig	26.8 kPa 3.9 psig	< 0.028 m^3/h < 1 cfh	10 %
1.7 - 34.4 kPa 7”w.c. - 5 psig	IMD-7	47.5 kPa 6.9 psig	37.9 - 44.8 kPa 5.5 - 6.5 psig	47.5 kPa 6.9 psig	< 0.028 m^3/h < 1 cfh	10 %
*depending on flow rate and inlet pressure						

Table 25 IMD performance table. Standard version and vent limited option

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.

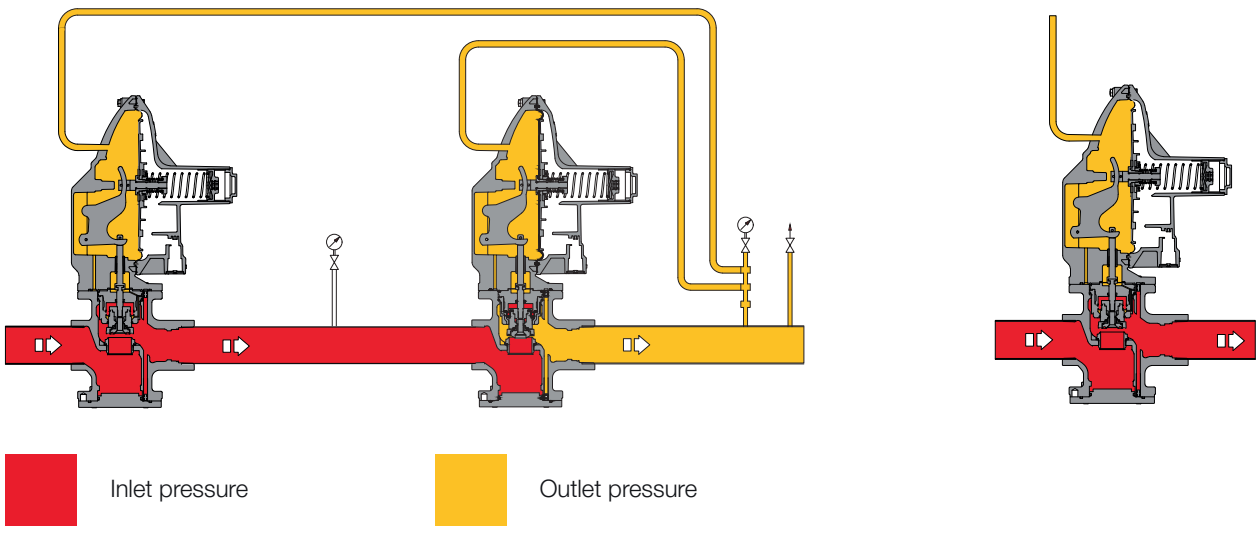


Figure 8 Cirval inline monitor

Balanced valve design (Fig. 8 - Item 1)

The Cirval 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 (Fig. 8 - Item 2)

The Cirval 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 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 (Fig. 8 - Item 3)

The Cirval 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 (Fig. 8 - Item 4)

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

External sensing 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 only, it is recommended to use the inline monitor version.

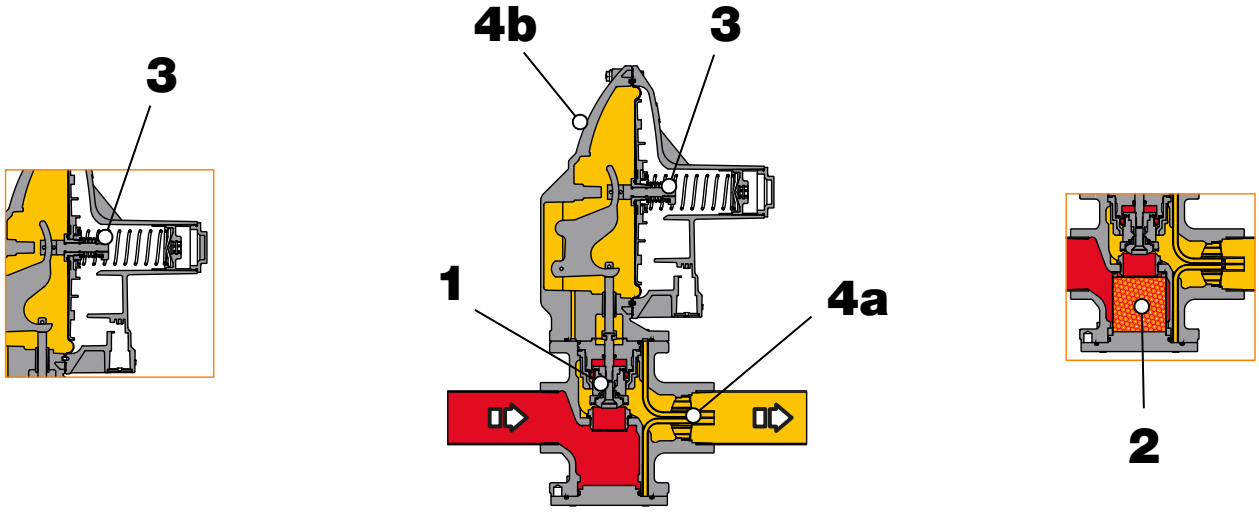


Figure 9 Cirval components location

Safety limitation

In case of a single regulator supplied without built-in overpressure protection device (SSV, IMD or IFM), the regulator shall be protected with a secondary means of overpressure protection per the DOT §192.740 and NFPA 54 5.9.3.1 standard.

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

Weights and Dimensions

The Circal

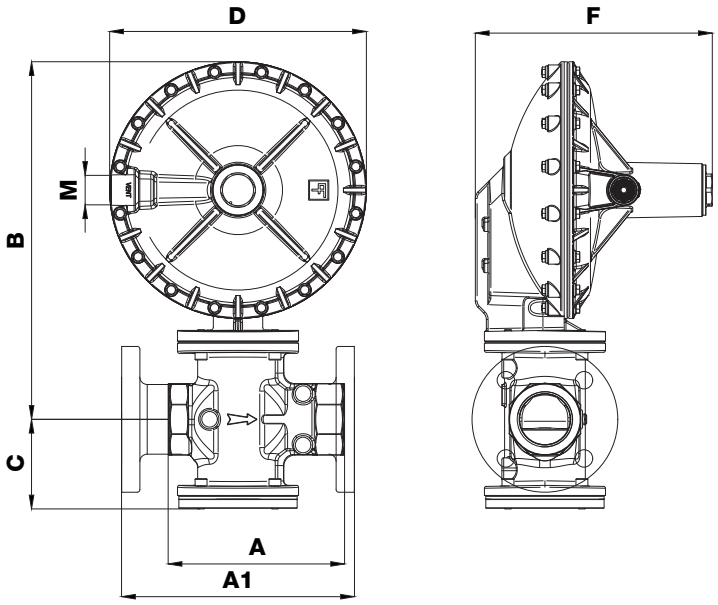


Figure 10 Circal dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)						
Model	**Circal 200**		**Circal 300**		**Circal 300 AU**	
	[mm]	inches	[mm]	inches	[mm]	inches
A	167.7	6.6”	193	7.6”	193	7.6”
A1	-	-	254	10.0”	267*	10,5”*
B	259	10.2”	391.2	15.4”	391.2	15.4”
C	66	2.6”	99.1	3.9”	99.1	3.9”
D	185.4	7.3”	279.4	11.0”	279.4	11.0”
F	177.8	7.0”	256.5	10.1”	256.5	10.1”
M	3/4” NPT		3/4” NPT		3/4” NPT	
Inlet	1-1/4”; 1-1/2”; 2” NPT		2” NPT; 2” S125FF		2” S150RF	
Outlet	1-1/4”; 1-1/2”; 2” NPT		2” NPT; 2” S125FF		2” S150RF	
Tubing Connections	1/4” NPT x 3/8” O.D. Tubing					
Weight	Kg	lbs	Kg	lbs	Kg	lbs
NPT	5.4	11.9	11.8	26	-	-
FF/RF	-	-	16	35.3	18	39.6
*sliding flanges with body connectors dual sealing guaranteed with o-ring and high integrity sealing compound.						

Table 26 Weights and dimensions

Cirval with IFM

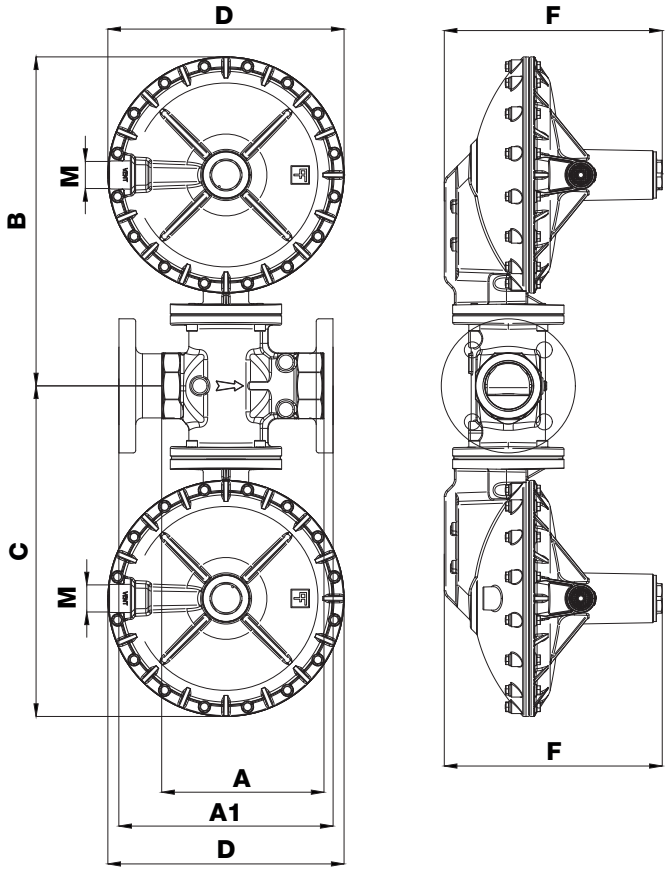


Figure 11 Cirval with IFM dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)						
Model	**Cirval 200**		**Cirval 300**		**Cirval 300 AU**	
	[mm]	inches	[mm]	inches	[mm]	inches
A	167.7	6.6”	193	7.6”	193	7.6”
A1	-	-	254	10.0”	267*	10,5”*
B	259	10.2”	391.2	15.4”	391.2	15.4”
C	259	10.2”	391.2	15.4”	391.2	15.4”
D	185.4	7.3”	279.4	11.0”	279.4	11.0”
F	177.8	7.0”	256.5	10.1”	256.5	10.1”
M	3/4” NPT		3/4” NPT		3/4” NPT	
Inlet	1-1/4”; 1-1/2”; 2” NPT		2” NPT; 2” S125FF		2” S150RF	
Outlet	1-1/4”; 1-1/2”; 2” NPT		2” NPT; 2” S125FF		2” S150RF	
Tubing Connections	1/4” NPT x 3/8” O.D. Tubing					
Weight	Kg	lbs	Kg	lbs	Kg	lbs
NPT	7.1	13.6	16.8	37.3	-	-
FF/RF	-	-	21	46.3	23	50.7
*sliding flanges with body connectors dual sealing guaranteed with o-ring and high integrity sealing compound.						

Table 27 Weights and dimensions

Cirval with LA

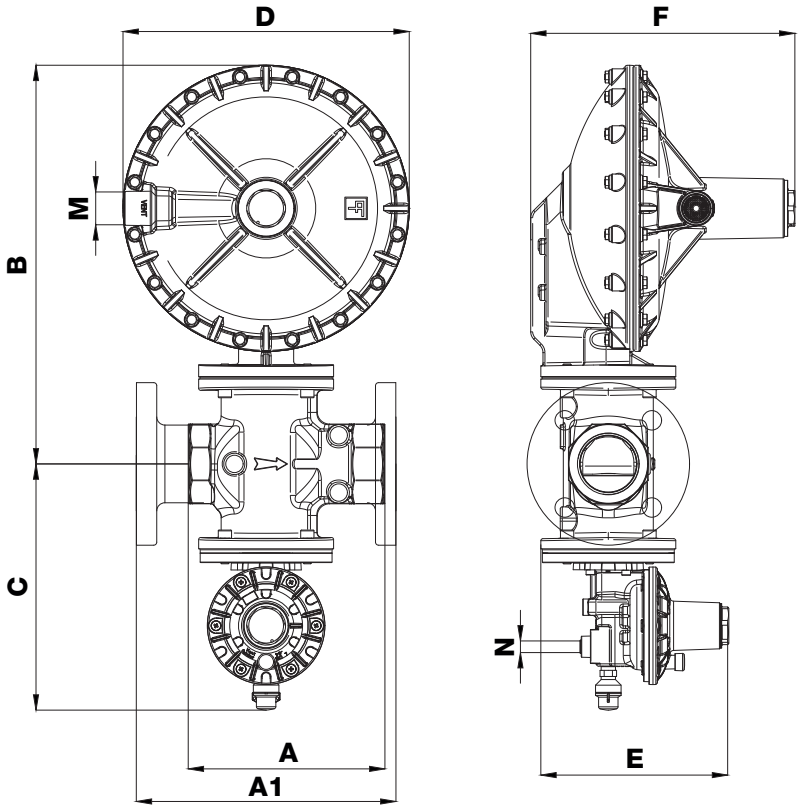


Figure 12 Cirval with LA dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)						
Model	**Cirval 200**		**Cirval 300**		**Cirval 300 AU**	
	[mm]	inches	[mm]	inches	[mm]	inches
A	167.7	6.6”	193	7.6”	193	7.6”
A1	-	-	254	10.0”	267*	10,5”*
B	259	10.2”	391.2	15.4”	391.2	15.4”
C	208.3	8.2”	241.3	9.5”	241.3	9.5”
D	185.4	7.3”	279.4	11.0”	279.4	11.0”
E	165.1	6.5”	185.4	7.3”	185.4	7.3”
F	177.8	7.0”	256.5	10.1”	256.5	10.1”
M	3/4” NPT		3/4” NPT		3/4” NPT	
N	1/4” NPT		1/4” NPT		1/4” NPT	
Inlet	1-1/4”; 1-1/2”; 2” NPT		2” NPT; 2” S125FF		2” S150RF	
Outlet	1-1/4”; 1-1/2”; 2” NPT		2” NPT; 2” S125FF		2” S150RF	
Tubing Connections	1/4” NPT x 3/8” O.D. Tubing					
Weight	Kg	lbs	Kg	lbs	Kg	lbs
NPT	6.4	14.1	12.8	28.2	-	-
FF/RF	-	-	17	37.5	19	42
*sliding flanges with body connectors dual sealing guaranteed with o-ring and high integrity sealing compound.						

Table 28 Weights and dimensions

Cirval with IMD

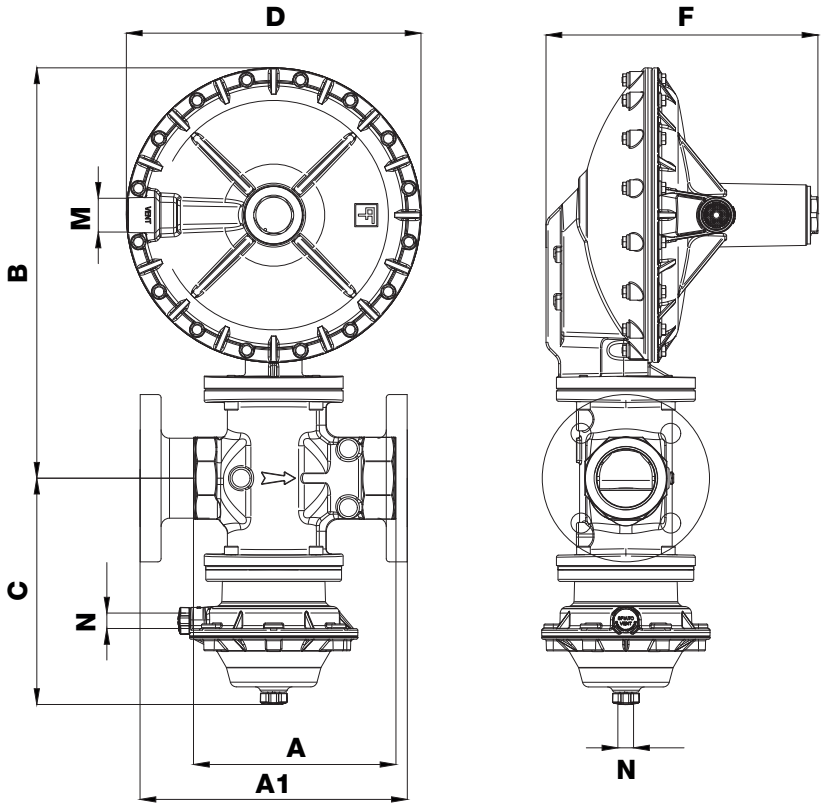


Figure 13 Cirval with IMD dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)						
Model	**Cirval 200**		**Cirval 300**		**Cirval 300 AU**	
	[mm]	inches	[mm]	inches	[mm]	inches
A	167.7	6.6”	193	7.6”	193	7.6”
A1	-	-	254	10.0”	267*	10,5”*
B	259	10.2”	391.2	15.4”	391.2	15.4”
C	165	6.5”	213	8.4”	213	8.4”
D	185.4	7.3”	279	11.0”	279	11.0”
F	177.8	7.0”	256.5	10.1”	256.5	10.1”
M	3/4” NPT		3/4” NPT		3/4” NPT	
N	1/4” NPT		1/4” NPT		1/4” NPT	
Inlet	1-1/4”; 1-1/2”; 2” NPT		2” NPT; 2” S125FF		2” S150RF	
Outlet	1-1/4”; 1-1/2”; 2” NPT		2” NPT; 2” S125FF		2” S150RF	
Tubing Connections	1/4” NPT x 3/8” O.D. Tubing					
Weight	Kg	lbs	Kg	lbs	Kg	lbs
NPT	6.6	14.6	13	28.7	-	-
FF/RF	-	-	17.2	37.9	19	42
*sliding flanges with body connectors dual sealing guaranteed with o-ring and high integrity sealing compound.						

Table 29 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 200	Cirval 300
Cg	200	759
K1	89	96

Table 30 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 31)
T = gas temperature (°C)

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

S = relative density (refer to Table 31)
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 31 Correction Factor Fc

Flow rate conversion
Stm^3/h x 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 32 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

Cirval 200 - DN 1-1/4”

from 1.74 kPa | 7” w.c. up to 68.9 kPa | 10 psig flow capacity table

Cirval flow rate (according to ANSI B 109.4)

Inlet pressure		Outlet pressure							
		droop +2/-1”w.c.		droop ±2”w.c.		droop ±1% ABS		droop ±1% ABS	
		1.74 kPa | 7” w.c.		3.5 kPa | 14” w.c.		6.9 kPa | 1 psig		34.5 kPa | 5 psig	
kPa	psig	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
13.8	2	59	2100	59	2100	-	-	-	-
34.5	5	71	2500	71	2500	71	2500	-	-
48.3	7	79	2800	79	2800	99	3500	-	-
68.9	10	99	3500	99	3500	122	4300	61	2150
103.4	15	156	5500	156	5500	170	6000	80	2825
172.4	25	198	7000	198	7000	234	8250	109	3850
275.8	40	241	8500	241	8500	297	10500	194	6850
413.7	60	198	7000	198	7000	297	10500	269	9500
499.9	72.5	198	7000	198	7000	297	10500	347	12250

CG = 200 K1= 89

Table 33 Cirval flow rate with outlet pressure from 1.74 kPa | 7” w.c. up to 34.5 kPa | 5 psig

Cirval flow rate

Inlet pressure		Outlet pressure			
		droop ±10% Gauge		droop ±10% Gauge	
		34.5 kPa | 5 psig		68.9 kPa | 10 psig	
kPa	psig	Stm³/h	Scfh	Stm³/h	Scfh
13.8	2	-	-	-	-
34.5	5	-	-	-	-
48.3	7	-	-	-	-
68.9	10	140	4950	-	-
103.4	15	184	6500	-	-
172.4	25	283	10000	184	6500
275.8	40	382	13500	297	10500
413.7	60	382	13500	382	13500
499.9	72.5	382	13500	425	15000

CG = 200 K1= 89

Table 34 Cirval flow rate with outlet pressure from 34.5 kPa | 5 psig up to 68.9 kPa | 10 psig

Cirval 200 - DN 1-1/2”

from 1.74 kPa | 7” w.c. up to 68.9 kPa | 10 psig

flow capacity table

Cirval flow rate (according to ANSI B 109.4)

Inlet pressure		Outlet pressure							
		droop +2/-1”w.c.		droop ±2”w.c.		droop ±1% ABS		droop ±1% ABS	
		1.74 kPa | 7” w.c.		3.5 kPa | 14” w.c.		6.9 kPa | 1 psig		34.5 kPa | 5 psig	
kPa	psig	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
13.8	2	68	2400	68	2400	-	-	-	-
34.5	5	79	2800	79	2800	79	2800	-	-
48.3	7	99	3500	99	3500	105	3700	-	-
68.9	10	119	4200	119	4200	127	4500	69	2450
103.4	15	184	6500	184	6500	184	6500	95	3350
172.4	25	241	8500	241	8500	269	9500	130	4600
275.8	40	241	8500	241	8500	340	12000	251	8850
413.7	60	198	7000	198	7000	340	12000	326	11500
499.9	72.5	198	7000	198	7000	340	12000	396	14000
CG = 200	K1= 89								

Table 35 Cirval flow rate with outlet pressure from 1.74 kPa | 7” w.c. up to kPa | 5 psig

Cirval flow rate

Inlet pressure		Outlet pressure			
		droop ±10% Gauge		droop ±10% Gauge	
		34.5 kPa | 5 psig		68.9 kPa | 10 psig	
kPa	psig	Stm³/h	Scfh	Stm³/h	Scfh
13.8	2	-	-	-	-
34.5	5	-	-	-	-
48.3	7	-	-	-	-
68.9	10	144	5100	-	-
103.4	15	198	7000	-	-
172.4	25	311	11000	198	7000
275.8	40	425	15000	311	11000
413.7	60	425	15000	425	15000
499.9	72.5	425	15000	481	17000
CG = 200	K1= 89				

Table 36 Cirval flow rate with outlet pressure from 34.5 kPa | 5 psig up to 68.9 kPa | 10 psig

Cirval 200 - DN 2”

from 1.74 kPa | 7” w.c. up to 68.9 kPa | 10 psig flow capacity table

Cirval flow rate (according to ANSI B 109.4)

Inlet pressure		Outlet pressure							
		droop +2/-1”w.c.		droop ±2”w.c.		droop ±1% ABS		droop ±1% ABS	
		1.74 kPa | 7” w.c.		3.5 kPa | 14” w.c.		6.9 kPa | 1 psig		34.5 kPa | 5 psig	
kPa	psig	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
13.8	2	71	2500	71	2500	-	-	-	-
34.5	5	85	3000	85	3000	85	3000	-	-
48.3	7	105	3700	109	3850	109	3850	-	-
68.9	10	130	4600	142	5000	142	5000	69	2450
103.4	15	184	6500	184	6500	184	6500	105	3700
172.4	25	255	9000	283	10000	297	10500	163	5750
275.8	40	255	9000	283	10000	368	13000	269	9500
413.7	60	227	8000	249	8800	368	13000	340	12000
499.9	72.5	227	8000	249	8800	368	13000	453	16000
CG = 200	K1= 89								

Table 37 Cirval flow rate with outlet pressure from 1.74 kPa | 7” w.c. up to kPa | 5 psig

Cirval flow rate

Inlet pressure		Outlet pressure			
		droop ±10% Gauge		droop ±10% Gauge	
		34.5 kPa | 5 psig		68.9 kPa | 10 psig	
kPa	psig	Stm³/h	Scfh	Stm³/h	Scfh
13.8	2	-	-	-	-
34.5	5	-	-	-	-
48.3	7	-	-	-	-
68.9	10	150	5300	-	-
103.4	15	205	7250	-	-
172.4	25	326	11500	204	7200
275.8	40	467	16500	326	11500
413.7	60	467	16500	439	15500
499.9	72.5	467	16500	496	17500
CG = 200	K1= 89				

Table 38 Cirval flow rate with outlet pressure from 34.5 kPa | 5 psig up to 68.9 kPa | 10 psig

Cirval 300 - DN 2”

from 1.74 kPa | 7” w.c. up to 68.9 kPa | 10 psig flow capacity table

Cirval flow rate (according to ANSI B 109.4)

Inlet pressure		Outlet pressure							
		droop +2/-1”w.c.		droop ±2”w.c.		droop ±1% ABS		droop ±1% ABS	
		1.74 kPa | 7” w.c.		3.5 kPa | 14” w.c.		6.9 kPa | 1 psig		34.5 kPa | 5 psig	
kPa	psig	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
13.8	2	198	7000	198	7000	-	-	-	-
34.5	5	241	8500	255	9000	255	9000	-	-
48.3	7	269	9500	283	10000	297	10500	-	-
68.9	10	354	12500	368	13000	368	13000	300	10600
103.4	15	425	15000	439	15500	481	17000	421	14850
172.4	25	481	17000	552	19500	609	21500	630	22250
275.8	40	538	19000	651	23000	772	27250	665	23500
413.7	60	708	25000	651	23000	772	27250	772	27250
499.9	72.5	708	25000	651	23000	772	27250	772	27250
CG = 759	K1= 96								

Table 39 Cirval flow rate with outlet pressure from 1.74 kPa | 7” w.c. up to kPa | 5 psig

Cirval flow rate

Inlet pressure		Outlet pressure			
		droop ±10% Gauge		droop ±10% Gauge	
		34.5 kPa | 5 psig		68.9 kPa | 10 psig	
kPa	psig	Stm³/h	Scfh	Stm³/h	Scfh
13.8	2	-	-	-	-
34.5	5	-	-	-	-
48.3	7	-	-	-	-
68.9	10	496	17500	-	-
103.4	15	708	25000	-	-
172.4	25	850	30000	708	25000
275.8	40	850	30000	850	30000
413.7	60	850	30000	850	30000
499.9	72.5	850	30000	850	30000
CG = 759	K1= 96				

Table 40 Cirval flow rate with outlet pressure from 34.5 kPa | 5 psig up to 68.9 kPa | 10 psig

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

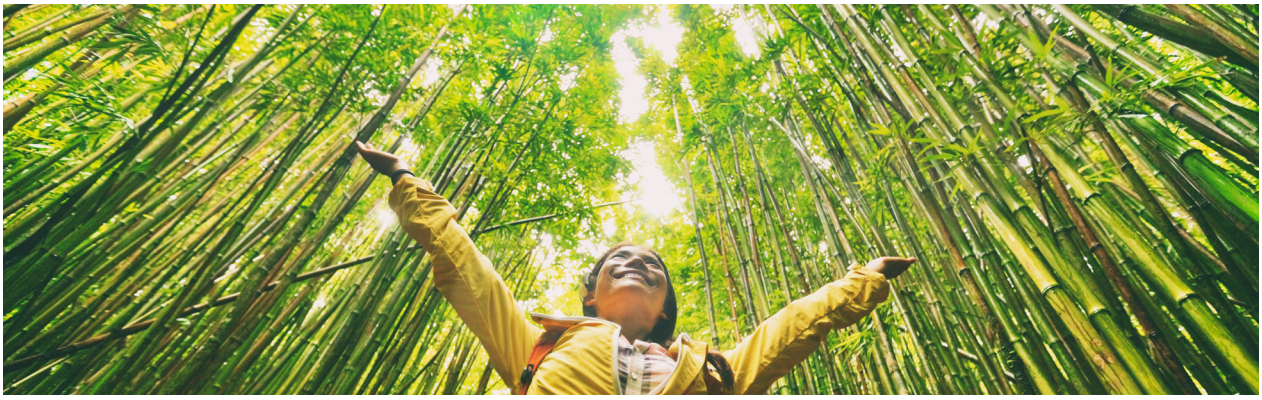
Pietro Fiorentini offers training services available for both experienced operators and new customers. The training is offered for all levels of our customers which can include one or all of the following: sizing of equipment, application, installation, operation, maintenance and is prepared according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

Pietro Fiorentini

TB0029USA

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to make changes without prior notice.

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