

RELIEF VALVES

Type VS- FL



VS-FL Relief Valves

Relief Valves

This series of axial flow relief valves was designed to meet a wide range of applications.

Large appreciation from worldwide customers is a guarantee of the reliability and versatility of this product.

The main features are as follows:

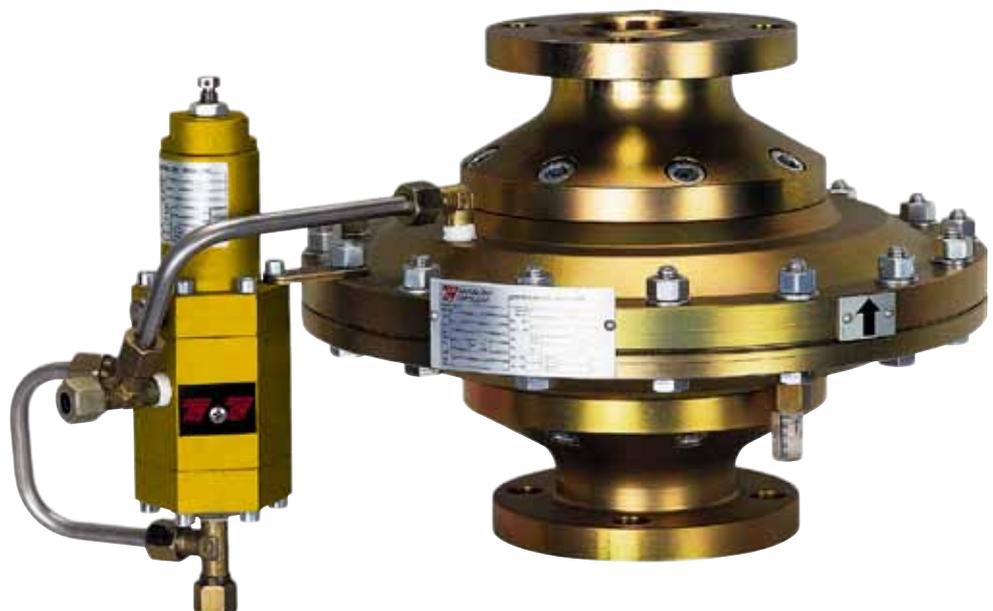
- *Counterbalanced shutter*
- *Full strength diaphragm*
- *Low number of parts*
- *Modularity design*
- *Reduced dimensions*
- *Easy Installation*

Available Versions

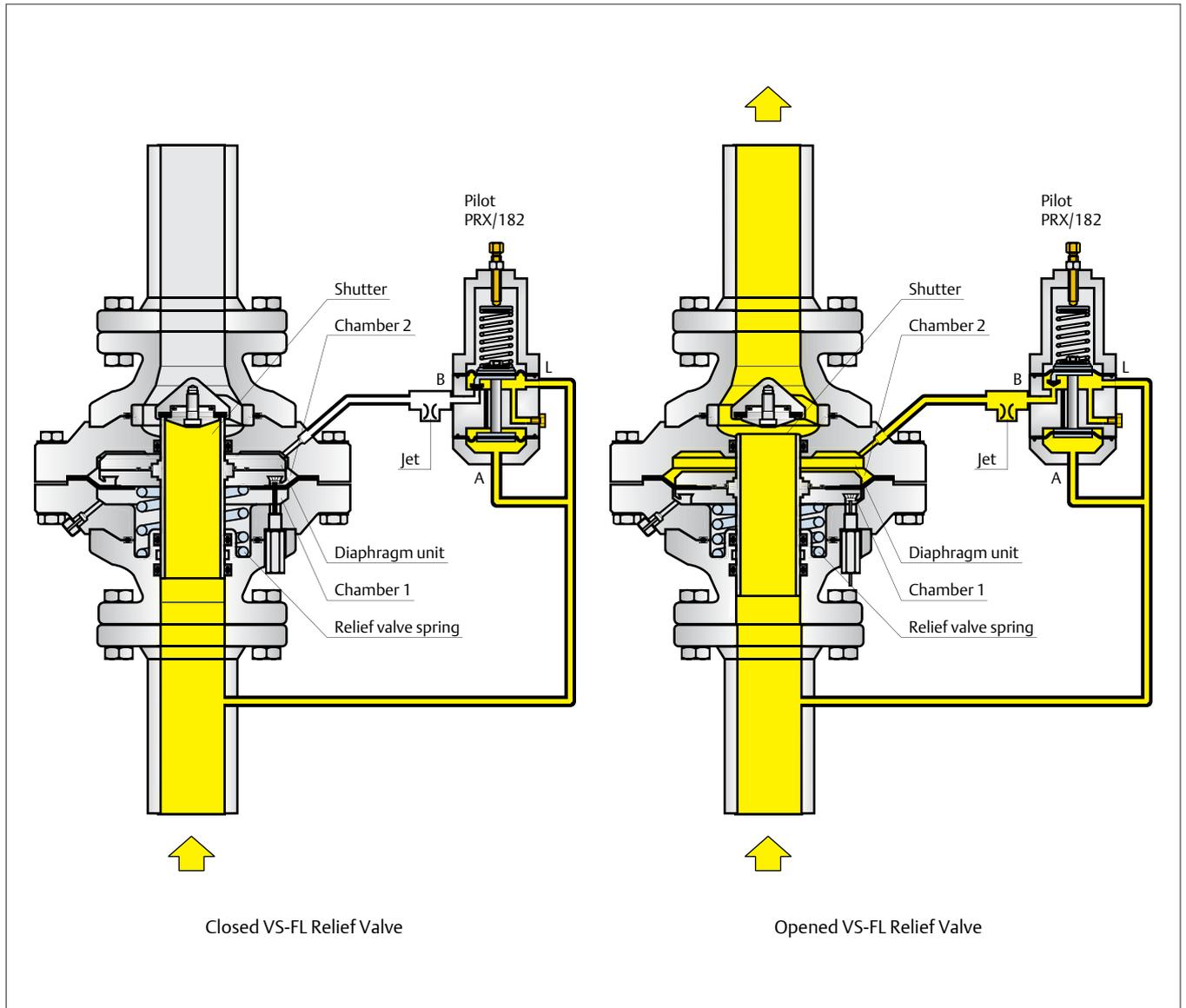
VS-FL-BP : For low and mid pressure applications. Pilot PRX/182.

VS-FL : For mid and high pressure applications. Pilot PRX/182 or PRX-AP/182.

Also available version with type SR silencer.



Operation



The diaphragm unit (permanently connected to the shutter) divides the relief valve actuator into two chambers.

The chamber 1 is connected to the atmospheric pressure, chamber 2 is connected to the pilot.

In normal working conditions the two chambers are not containing pressure and the relief valve spring acts on the diaphragm unit and closes the shutter.

If the line pressure exceeds the pilot set point, the pilot allows the gas to flow from the line to chamber 2.

The shutter moves to its open position when the force produced by gas pressure acting on the diaphragm unit becomes greater than the load of the relief valve spring.

Once the excess gas is released and line pressure returns to normal working conditions, the pilot stops the pressure flow, Chamber 2 is no longer being fed, it is emptied through the jet.

The diaphragm unit is pushed upward by the relief valve spring and the shutter moves to its closed position.

VS-FL Relief Valves

Features

Applications

VS-FL relief valves are used in reduction, distribution and conveying stations of suitably filtered natural gas.

They can also be used for air, propane, butane, LPG, city gas, nitrogen, carbon dioxide and hydrogen.

Technical Features

Flange rating PN 16 - ANSI 150

Allowable pressure	PS : up to 20 bar
Inlet pressure range	b_{pu} : 0.2 to 20 bar
Set range	W_d : 0.5 to 19.3 bar

Flange rating ANSI 300/600

Allowable pressure	PS : up to 100 bar
Inlet pressure range	b_{pu} : 1 to 100 bar
Set range	W_d : 1 to 80 bar

Functional Features

Accuracy class AC : up to $\pm 1\%$

Flanged connections

Identical Inlet and outlet : DN 25 - 40 - 50 - 65 - 80 - 100 - 150 - 200*

(*) DN 200 BP version is not available.

Temperature

Standard version
Working -10 °C +60 °C

Low temperature version
Working -20 °C +60 °C

Materials

Flanges and covers	Carbon steel
Diaphragms	Fabric NBR+PVC/Nitrile rubber
Pads	NBR Nitrile rubber (FKM available on request)

Calculation Procedures

Symbols

- Q = Natural gas flow rate in Stm³/h
- P1 = Absolute inlet pressure in bar
- P2 = Absolute outlet pressure in bar
- C_g = Flow rate coefficient
- C1 = Body shape factor
- d = Relative density of the gas

Flow Coefficients

DN		VS-FL-BP / VS-FL	VS-FL-BP-SR / VS-FL-SR
25	C _g	590	580
	C1	32.1	33.4
40	C _g	1400	1350
	C1	28	28
50	C _g	2300	2200
	C1	32.6	33.7
65	C _g	3500	3350
	C1	29	29
80	C _g	5200	5000
	C1	32.1	33
100	C _g	8000	7400
	C1	32.1	32.7
150	C _g	20300	17800
	C1	27.6	29.8
200	C _g	30900	-
	C1	28.6	-

Flow Rate Q

Sub-critical state with: $P2 > \frac{P1}{2}$

$$Q = 0.525 \cdot C_g \cdot P1 \cdot \text{sine} \left(\frac{3417}{C1} \cdot \sqrt{\frac{P1-P2}{P1}} \right)^\circ$$

N.B. the sine argument is expressed in sexagesimal degree

Critical state with: $P2 \leq \frac{P1}{2}$

$$Q = 0.525 \cdot C_g \cdot P1$$

For other gases with different densities, the flow rate calculated with the above formulas must be multiplied by the correction factor:

$$F = \sqrt{\frac{0.6}{d}}$$

Gas	Relative Density d	Factor F
Air	1	0.78
City gas	0.44	1.17
Butane	2.01	0.55
Propane	1.53	0.63
Nitrogen	0.97	0.79
Carbon dioxide	1.52	0.63
Hydrogen	0.07	2.93

VS-FL Relief Valves

DN Sizes

Calculate the required C_g with the following formula:

Sub-critical with: $P_2 > \frac{P_1}{2}$

$$C_g = \frac{Q}{0.525 \cdot P_1 \cdot \sin \left(\frac{3417}{C_1} \cdot \sqrt{\frac{P_1 - P_2}{P_1}} \right)^\circ}$$

N.B. The sine argument is expressed in sexagesimal degree

Critical state with: $P_2 \leq \frac{P_1}{2}$

$$C_g = \frac{Q}{0.525 \cdot P_1}$$

N.B. The above formulas apply to natural gas flow rate only. If the flow rate value (Q) refers to other gasses, divide it by the correction factor F.

Select the diameter of the relief valve with C_g higher than calculated value.

After finding the DN of the relief valve, check that gas speed on the seat does not exceed 120 m/sec, using the following formula:

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

- V = Velocity (m/s)
- 345.92 = Numerical constant
- Q = Flow rate under standard conditions (Stm³/h)
- DN = Regulator nominal diameter (mm)
- P_u = Inlet pressure in relative value (bar)

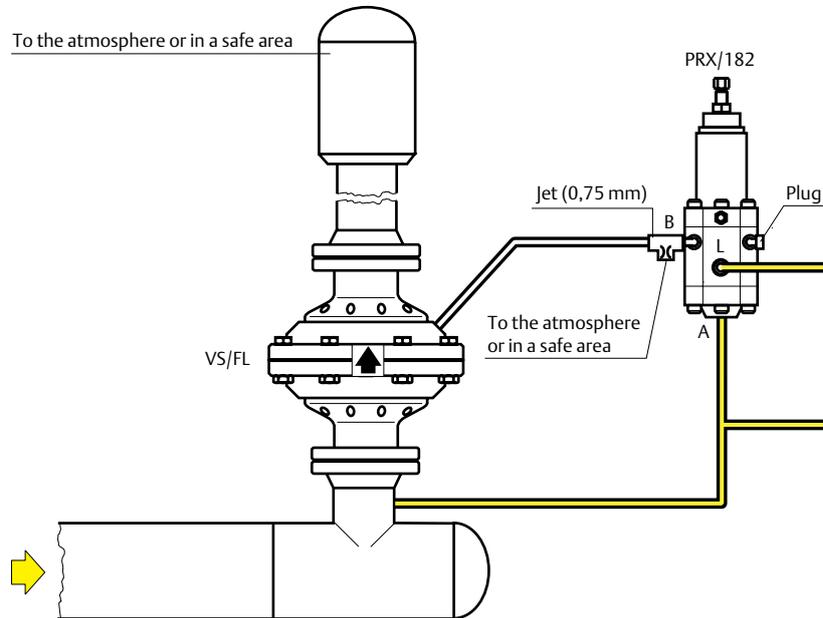
Pilots

VS-FL relief valves are equipped with the PRX/ series pilots.

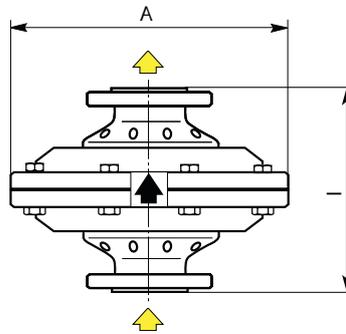
Model	Allowable Pressure PS (bar)	Set Range W _d (bar)	Body and Covers Material
PRX/182	100	0.5 - 40	Steel
PRX-AP/182		30 - 80	
N.B.: 1/4" NPT female threaded connections			



Examples of Connections



Overall Dimensions (mm) and Weights (kg)



DN	Dimensions				Weights	
	Face to Face - I		A			
	PN 16 - ANSI 150	ANSI 300 - ANSI 600	PN 16 - ANSI 150	ANSI 300 - ANSI 600	PN 16 - ANSI 150	ANSI 300 - ANSI 600
	VS-FL-BP	VS-FL	VS-FL-BP	VS-FL	VS-FL-BP	VS-FL
25	184	210	285	225	24	31
40	222	251	306	265	37	47
50	254	286	335	287	48	60
65	276	311	370	355	68	88
80	298	337	400	400	83	148
100	352	394	450	480	105	201
150	451	508	590	610	255	480
200*	-	610	-	653	-	620

N.B.: (*) ANSI 300 I = 568 - 1/4" NPT female threaded connections

Natural Gas Technologies

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Natural Gas Technologies

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