Self-operated Pressure Regulators

Type 2405 Pressure Reducing Valve

ANSI version

Application

Pressure reducing valve for set points from **0.075** to **150 psi** (5 mbar to 10 bar) · Valve size **NPS ½** to **2** [1] (DN 15 to 50) · Pressure rating **Class 125** to **300** (PN 16 to 40) · Suitable for gases at temperatures from **–5** to **+140 °F/32** to **300 °F** [2] (–20 to +60 °C/0 to +150 °C) [2]

This regulator is used to control the pressure of flammable gases used as a source of energy, e.g. in boilers, driers, vaporizers, heat exchangers or industrial ovens. Alternatively, it can control the compressed air supply in process engineering applications.

An additional application of the regulator is the pressure control of inert gas used for inerting or blanketing reaction or storage tanks to protect the product in the tank from oxidation, explosion or escaping. To achieve an economical consumption of the inert gas, its pressure must be controlled to always remain slightly higher than atmospheric pressure while the tank is being filled or emptied.

Special features

- Low-maintenance proportional regulators
- Compact regulator design providing excellent control accuracy
- Internal set point springs with set point adjustment using a nut on the actuator
- Spring-loaded, single-seated valve balanced by a balancing diaphragm
- External connection of a control line
- Meets strict emission requirements (TA Luft)
- Minimum leakage class IV
- Suitable for use as a vacuum breaker

Version

Valves in **NPS ½** to **2** (DN 15 to 50) · Flanged connections Soft-seated plug · Body made of cast iron A126B, cast steel A216 WCC or cast stainless steel A351 CF8M

Special versions

- Version with FDA-compliant materials for the food and pharmaceutical industries
- NACE version for sour gas applications
- Version with force limiter (for higher pressures across the operating diaphragm)

1) NPS ½ and ¾ not in Class 125
2) For unbalanced versions with FKM diaphragm and FKM soft seal

Fig. 1: *Type 2405 Pressure Reducing Valve*

- Actuator with seal and leakage line connection (also as vacuum breaker)
- Version with connected control line. Pressure tapped directly at the valve body

Principle of operation

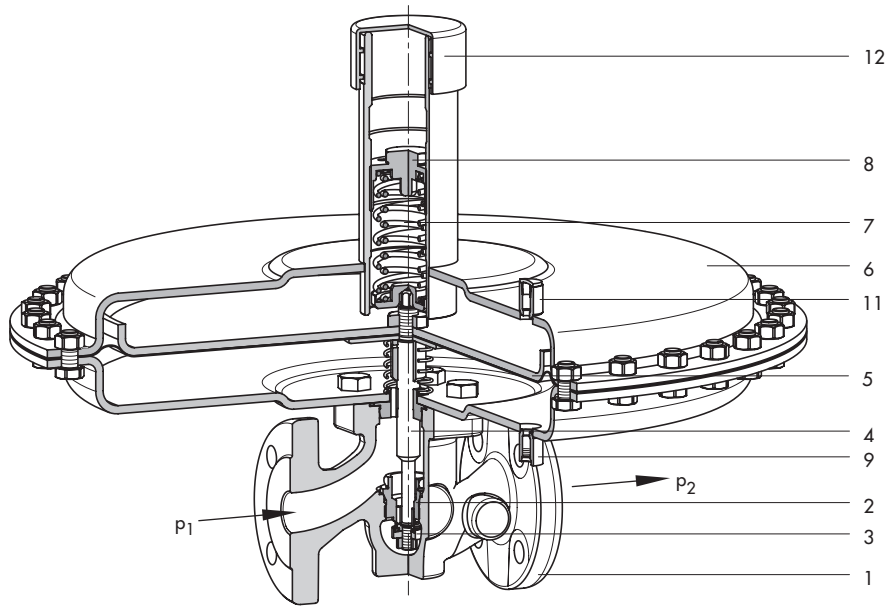
The medium flows through the valve in the direction indicated by the arrow. The position of the plug determines the flow rate across the area released between plug (3) and valve seat (2).

In the pressureless state (control line not connected and no pressure applied) the valve is opened by the force of the set point spring (7).

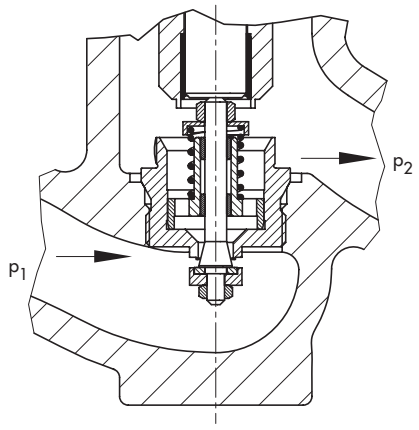
The downstream pressure p_2 to be controlled is tapped downstream of the valve and transmitted over the control line to the control line connection (9) on the actuator housing (6) where it is converted into a positioning force. This force is used to move the valve plug according to the force of the set point spring (7).

The spring force is adjustable at the set point nut (8). When the force resulting from the downstream pressure p_2 rises above the adjusted pressure set point, the valve closes proportionally to the change in pressure.

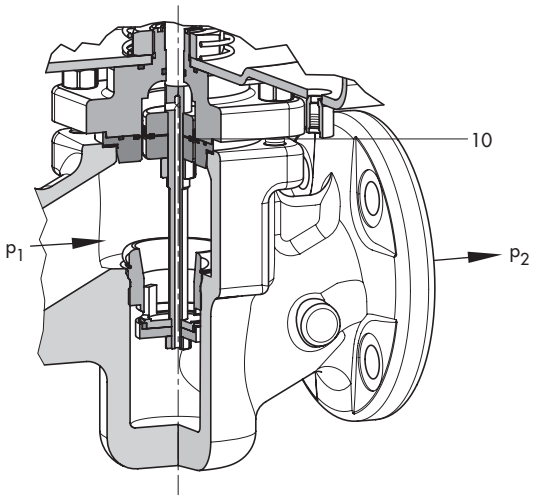
In the version with pressure balancing, the forces produced by the upstream and downstream pressures acting on the plug are eliminated by the balancing diaphragm (10). The plug is fully balanced.



Type 2405 **without** pressure balancing (C_V 2 to 5/K_{VS} 1.6 to 4) · Flow-to-open



Type 2405 **without** pressure balancing
(C_V 0.02 to 1.2/K_{VS} 0.016 to 1)
Flow-to-close design



Type 2405 **with** pressure balancing
(C_V 7.5 to 37/K_{VS} 6.3 to 32)

1	Valve body	6	Actuator housing	10	Balancing diaphragm
2	Valve seat	7	Set point spring	11	Leakage line connection (optional)
3	Plug	8	Set point adjuster		
4	Plug stem	9	Control line connection G ¼ – adapter G ¼ to ¼-18 NPT (order no.0230-3417) must be ordered separately –		
5	Operating diaphragm				

Fig. 2: *Functional diagram of Type 2405 Pressure Reducing Valve*

Table 1: *Technical data*

Valve size		**NPS ½** (DN 15)	**NPS ½** (DN 20)	**NPS 1** (DN 25)	**NPS 1½, 2** (DN 40, 50)
Nominal pressure (valve)		Class 125, Class 150, Class 300 · PN 16, PN 25, PN 40			
C_V coefficients	Standard	5	7.5	9.4	37
	Reduced C_V coefficients	0.02 · 0.05 · 0.12 0.3 · 0.5 1.2 · 2 · 3	0.02 · 0.05 · 0.12 0.3 · 0.5 · 1.2 · 2 3 · 5	0.02 · 0.05 · 0.12 0.3 · 0.5 · 1.2 · 2 3 · 5 · 7.5	2 · 3 · 5 · 7.5 9.4 · 20 · 23
K_{VS} coefficients	Standard	4	6.3	8	32
	Reduced K_{VS} coefficients	0.16 · 0.04 · 0.1 0.25 · 0.4 1 · 1.6 · 2.5	0.016 · 0.04 · 0.1 0.25 · 0.4 · 1 · 1.6 2.5 · 4	0.016 · 0.04 · 0.1 0.25 · 0.4 · 1 · 1.6 2.5 · 4 · 6.3	1.6 · 2.5 · 4 · 6.3 8 · 16 · 20
Max. permissible differential pressure		150 psi · 175 psi [1] (10 bar · 12 bar [1])			
Max. permissible temperature range (medium temperature)		–5 to +140 °F (+32 to +300 °F) [2] · –20 to +60 °C (0 to +150 °C) [2]			
Leakage class according to IEC 60534-4 or ANSI/ FCI 70-2		Soft-seated, minimum Class IV			
Compliance		CE · EAC			
Set point ranges		0.075 to 0.25 psi · 0.15 to 0.42 psi · 0.35 to 0.87 psi · 0.75 to 3 psi 1.5 to 8 psi · 3 to 15 psi · 10 to 37.5 psi · 30 to 75 psi · 65 to 145 psi			
		5 to 15 mbar · 10 to 30 mbar · 25 to 60 mbar · 50 to 200 mbar · 0.1 to 0.6 bar · 0.2 to 1 bar · 0.8 to 2.5 bar · 2 to 5 bar · 4.5 to 10 bar			
Max. permissible pressure at operating diaphragm	186 in² 1200 cm²	7 psi 0.5 bar			
	100 in² 640 cm²	14.5 psi 1 bar			
	50 in² 320 cm²	30 psi · 145 psi [3] 2 bar · 10 bar [3]			
	25 in² 160 cm²	45 psi · 240 psi [3] 3 bar · 16 bar [3]			
	12.5 in² 80 cm²	75 psi · 240 psi [3] 5 bar · 16 bar [3]			
	6 in² · 30 to 75 psi 40 cm² · 2 to 5 bar	145 psi · 240 psi [3] 10 bar · 16 bar [3]			
	6 in² · 65 to 150 psi 40 cm² · 4.5 to 10 bar	220 psi · 240 psi [3] 15 bar · 16 bar [3]			
Pressure balancing	C_V = 0.02 to 5 · K_{VS} = 0.016 to 4	Without balancing diaphragm			
	C_V = 7.5 to 37 · K_{VS} = 6.3 to 32	With balancing diaphragm			
Pressure tapping		External [4]			
Control line connection		G ¼ – with ¼ NPT adapter –			

1) Version with set points from 1.5 to 150 psi (0.1 to 10 bar)
2) For unbalanced versions with FKM diaphragm and FKM soft seal
3) Version with force limiter
4) Special version for set point ranges 10 to 37.5 psi (0.8 to 2.5 bar), 30 to 75 psi (2 to 5 bar), and 65 to 150 psi (4.5 to 10 bar): pressure tapping directly at the valve body (see photo in Special versions on page 1)

Table 2: *Materials · Material numbers according to ASTM and DIN EN*

Valve body	**A126B, A216 WCC**	**A351 CF8M**
Seat	316L	316L
Plug	316L	316L
Plug spring	1.4310 [1]	
Plug stem	316L	
Seal	EPDM · FKM · NBR	
Balancing diaphragm	EPDM · FKM · NBR	
Actuator housing	**1.0332**	**1.4301**
Operating diaphragm	EPDM · FKM · NBR	

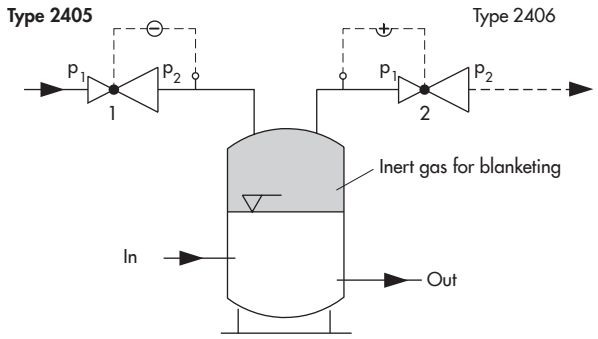
[1] Optional 316L (1.4404)

Installation

The regulator is preferably to be installed in horizontal pipelines:

- Actuator housing on top, actuator facing upwards
- The direction of flow must match the direction indicated by the arrow on the body.
- In applications in which the blanketing gas can liquefy, condensate may form in the control line, causing damage to the regulator. To allow condensate to run back into the tank, install the control line with an approximate 10 % slope to the pressure tapping point at the tank.
- Distance between the pressure tapping point and regulator min. 6 x NPS (6 x DN).

In exceptional cases, the regulator can also be installed in vertical pipelines with the direction of flow from the top (see ▶ EB 2520 for more details).

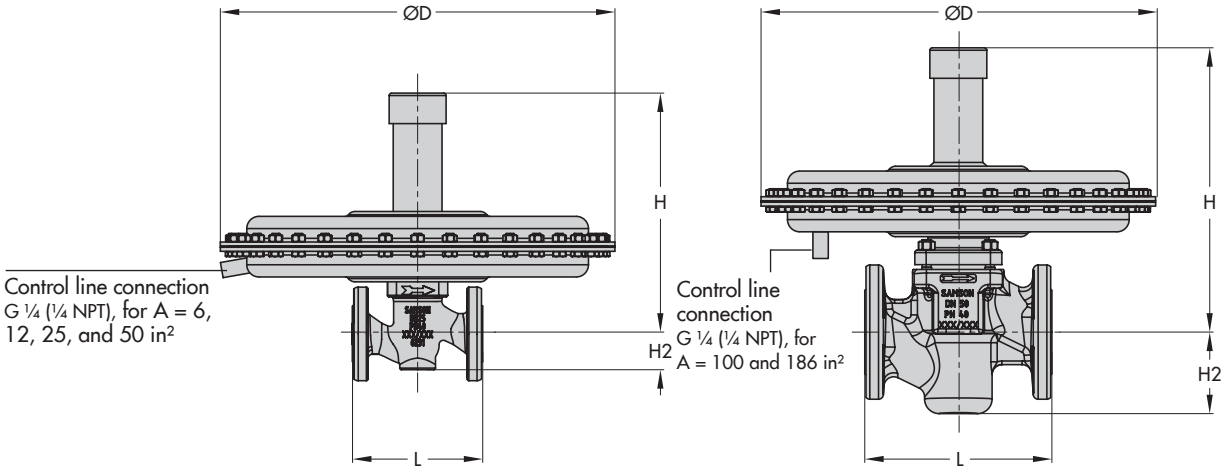


If the pressure p of the inert gas in the tank falls below the set point p_2 adjusted at the **Type 2405** Pressure Reducing Valve (1), it opens to allow more gas to enter the tank. The valve (1) closes again when the pressure p of the blanketing gas rises to the adjusted set point p2.

If the pressure is too high, the inert gas is vented off over the Type 2406 Excess Pressure Valve (2).

Fig. 3: *Sample application, Type 2405 used for tank blanketing*

Dimensions



The control line connection is turned by 90° in the drawing. The connection is normally located opposite the side with the arrow indicating the direction of flow.

An adapter G ¼ to ¼-18 NPT (order no. 0230-3417) must be ordered separately.

Fig. 4: *Dimensions of Type 2405*

Table 3: *Dimensions in inch/mm · Weights in lb/kg*

Valve size				**NPS ½** (DN 15)	**NPS ¾** (DN 20)	**NPS 1** (DN 25)	**NPS 1½** (DN 40)	**NPS 2** (DN 50)
Valve	Length L	Class 125	inch	–	–	7.3	8.8	10
			mm	–	–	184	222	254
		Class 150	inch	7.3	7.3	7.3	8.8	10
			mm	184	184	184	222	254
		Class 300	inch	7.5	7.6	7.8	9.3	10.5
			mm	191	194	197	235	267
		Height H2	inch	2.2			2.8	
			mm	55			72	
Set point range			**Valve with actuator · Dimensions and weights**					
0.075 to 0.25 psi 5 to 15 mbar	Height H		Without balancing	12.8″ (325 mm)			14.6″ (370 mm)	
			With balancing	13.9″ (352 mm)			14.9″ (377 mm)	
	Actuator			ØD = 19.3″ · 490 mm, A = 186 in² · 1200 cm²				
0.15 to 0.42 psi 10 to 30 mbar	Height H		Without balancing	12.6″ (318 mm)			14.4″ (366 mm)	
			With balancing	13.8″ (345 mm)			14.6″ (370 mm)	
	Actuator			ØD = 15″ · 380 mm, A = 100 in² · 640 cm²			ØD = 19.3″ · 490 mm, A = 186 in² · 1200 cm²	
0.35 to 0.87 psi 25 to 60 mbar	Height H		Without balancing	12.6″ (318 mm)			14.4″ (366 mm)	
			With balancing	13.8″ (345 mm)			14.6″ (370 mm)	
	Actuator			ØD = 11.2″ · 285 mm, A = 50 in² · 320 cm²			ØD = 15″ · 380 mm, A = 100 in² · 640 cm²	
0.75 to 3 psi 50 to 200 mbar	Height H		Without balancing	12.6″ (318 mm)			14.4″ (366 mm)	
			With balancing	13.8″ (345 mm)			14.6″ (370 mm)	
	Actuator			ØD = 11.2″ · 285 mm, A = 50 in² · 320 cm²				
1.5 to 8 psi 0.1 to 0.6 mbar	Height H		Without balancing	12.6″ (318 mm)			14.4″ (366 mm)	
			With balancing	13.8″ (345 mm)			14.6″ (370 mm)	
	Actuator			ØD = 11.2″ · 285 mm, A = 50 in² · 320 cm²				
3 to 15 psi 0.2 to 1 bar	Height H		Without balancing	12.6″ (318 mm)			14.4″ (366 mm)	
			With balancing	13.8″ (345 mm)			14.6″ (370 mm)	
	Actuator			ØD = 8.9″ · 225 mm, A = 25 in² · 160 cm²				
10 to 35 psi 0.8 to 2.5 bar	Height H		Without balancing	13″ (330 mm)			14.4″ (365 mm)	
			With balancing	14″ (356 mm)			14.6″ (369 mm)	
	Actuator			ØD = 6.7″ · 170 mm, A = 12 in² · 80 cm²				
30 to 75 psi 2 to 5 bar	Height H		Without balancing	13.2″ (333 mm)			14.5″ (368 mm)	
			With balancing	14.2″ (359 mm)			14.7″ (373 mm)	
	Actuator			ØD = 6.7″ · 170 mm, A = 6 in² · 40 cm²				
65 to 150 psi 4.5 to 10 bar	Height H		Without balancing	17.2″ (437 mm)			19.1″ (485 mm)	
			With balancing	18.3″ (463 mm)			19.3″ (489 mm)	
	Actuator			ØD = 6.7″ · 170 mm, A = 6 in² · 40 cm²				

Valve size		NPS ½ (DN 15)	NPS ¾ (DN 20)	NPS 1 (DN 25)	NPS 1½ (DN 40)	NPS 2 (DN 50)
0.075 to 0.25 psi 5 to 15 mbar	**Weight** [1] in lb and kg (approx.)	61.7 lb · 28 kg			88.2 lb · 40 kg	
0.15 to 0.42 psi 10 to 30 mbar		39.7 lb · 18 kg				
0.35 to 0.87 psi 25 to 60 mbar		30.9 lb · 14 kg			66.1 lb · 30 kg	
0.75 to 3 psi 50 to 200 mbar					57.3 lb · 26 kg	
1.5 to 8 psi 0.1 to 0.6 mbar						
3 to 15 psi 0.2 to 1 bar		22 lb · 10 kg			48.5 lb · 22 kg	
10 to 35 psi 0.8 to 2.5 bar		17.6 lb · 8 kg			44.1 lb · 20 kg	
30 to 75 psi 2 to 5 bar		17.6 lb · 8 kg			44.1 lb · 20 kg	
65 to 150 psi 4.5 to 10 bar		19.8 lb · 9 kg			46.3 lb · 21 kg	

1) Body made of A216 WCC and A351 CF8M: +10 %

Ordering text

Type 2405 Pressure Reducing Valve

Valve size NPS (DN) ..., set point range … psi (mbar/bar), C_V (K_{VS}) coefficient …,

Body material …, optionally, special version ...

Materials: plug seal ..., balancing diaphragm ..., operating diaphragm ...

Optionally, special version

Specifications subject to change without notice

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