

# Self-operated Pressure Regulators

## Type 2405 Pressure Reducing Valve



### Application

Pressure reducing valve for set points from **5 mbar** to **10 bar**  
Nominal size **DN 15** to **50** · Nominal pressure **PN 16** to **40**  
Suitable for gases at temperatures from **-20** to **+60 °C** (0 to **+150 °C**)<sup>1)</sup>



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

Valve DN 15 to 50 · Flanged connections · Soft-seated plug  
Body made of cast iron EN-GJL-250, spheroidal graphite iron EN-GJS-400-18-LT, cast steel 1.0619, forged steel 1.4571 or CrNiMo steel 1.4408

### Special versions

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

<sup>1)</sup> For unbalanced versions with FKM diaphragm or 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



### Ordering text

#### Type 2405 Pressure Reducing Valve

Nominal size DN ..., set point range ... mbar (bar),  $K_{VS}$  ...,  
Body material ..., optionally, special version ...  
Materials: plug sealing ..., balancing diaphragm ...,  
operating diaphragm ...

### 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).

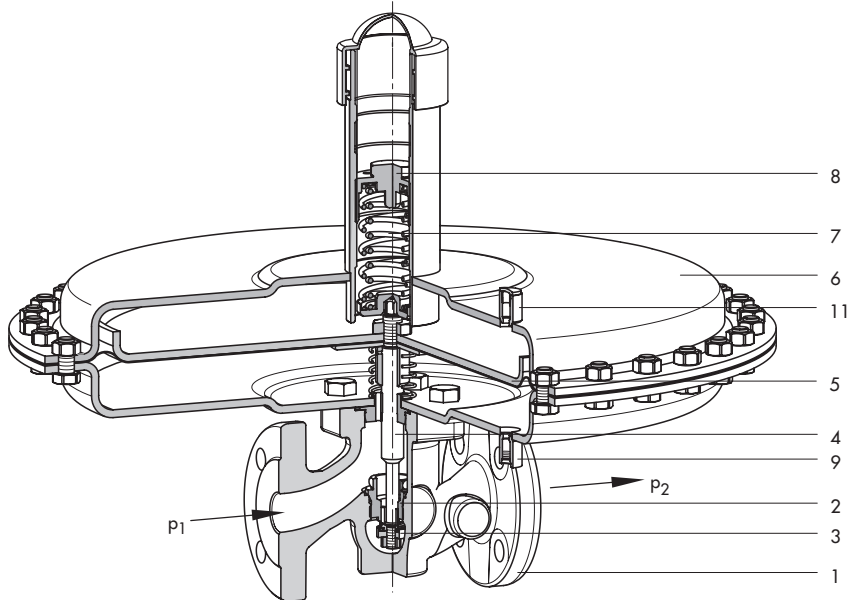
In the pressureless state (control line not connected and no pressure applied) the valve is opened by the force of the set point spring (7).

The downstream pressure  $p_2$  to be controlled is tapped downstream of the valve and transmitted over the control line to the actuator where it is converted into a positioning force. This

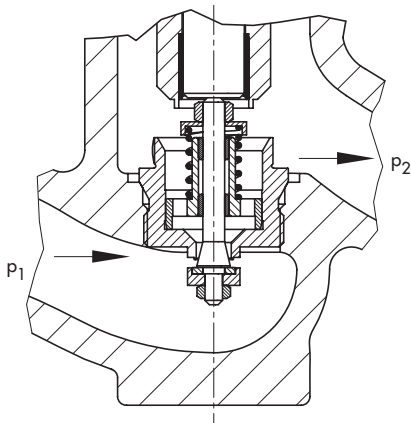
force is used to move the valve plug according to the force of the set point spring (7).

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

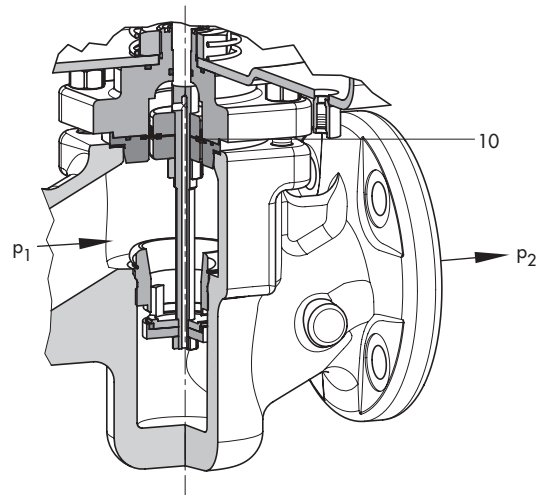
In the version with pressure balancing, the forces produced by the upstream and downstream pressures acting on the plug are eliminated by the balancing diaphragm (10). The plug is fully balanced.



Type 2405 **without** pressure balancing ( $K_{VS}$  1.6 to 4) · Flow-to-open



Type 2405 **without** pressure balancing ( $K_{VS}$  0.016 to 1)  
Flow-to-close



Type 2405 **with** pressure balancing ( $K_{VS}$  6.3 to 32)

- |              |                       |                                       |
|--------------|-----------------------|---------------------------------------|
| 1 Valve body | 5 Operating diaphragm | 9 Control line connection G 1/4       |
| 2 Valve seat | 6 Actuator housing    | 10 Balancing diaphragm                |
| 3 Plug       | 7 Set point spring    | 11 Leakage line connection (optional) |
| 4 Plug stem  | 8 Set point adjuster  |                                       |

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

**Table 1: Technical data**

Nominal size		DN 15	DN 20	DN 25	DN 32	DN 40	DN 50
Nominal pressure (valve)		PN 16 · PN 25 · PN 40					
K <sub>VS</sub> coefficients	Standard	4	6.3	8	16	20	32
	Reduced K <sub>VS</sub> coefficients	0.016 · 0.04	0.016 · 0.04	0.016 · 0.04	1.6 · 2.5 · 4	1.6 · 2.5 · 4	1.6 · 2.5 · 4
		0.1 · 0.25	0.1 · 0.25	0.1 · 0.25	6.3 · 8	6.3 · 8 · 16	6.3 · 8 · 16
		0.4 · 1 1.6 · 2.5	0.4 · 1 · 1.6 2.5 · 4	0.4 · 1 · 1.6 2.5 · 4 · 6.3			1.6 · 2.5 · 4 6.3 · 8 · 16 20
Max. permissible differential pressure		10 bar · 12 bar <sup>1)</sup>					
Max. permissible temperature range (medium temperature)		-20 to +60 °C (0 to +150 °C) <sup>2)</sup>					
Leakage class according to IEC 60534-4		Soft-seated, minimum Class IV					
Compliance		<b>CE · ENEC</b>					
Set point ranges		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	1200 cm <sup>2</sup>	0.5 bar					
	640 cm <sup>2</sup>	1 bar					
	320 cm <sup>2</sup>	2 bar · 10 bar <sup>3)</sup>					
	160 cm <sup>2</sup>	3 bar · 16 bar <sup>3)</sup>					
	80 cm <sup>2</sup>	5 bar · 16 bar <sup>3)</sup>					
	40 cm <sup>2</sup> · 2 to 5 bar 40 cm <sup>2</sup> · 4.5 to 10 bar	10 bar · 16 bar <sup>3)</sup> 15 bar · 16 bar <sup>3)</sup>					
Pressure balancing	K <sub>VS</sub> = 0.016 to 4	Without balancing diaphragm					
	K <sub>VS</sub> = 6.3 to 32	With balancing diaphragm					
Pressure tapping		External <sup>4)</sup>					
Control line connection		G ¼					

<sup>1)</sup> Version with set points from 0.1 to 10 bar

<sup>2)</sup> For unbalanced versions with FKM diaphragm or FKM soft seal

<sup>3)</sup> Version with force limiter

<sup>4)</sup> Special version for set point ranges 0.8 to 2.5 bar, 2 to 5 bar, and 4.5 to 10 bar: pressure tapping directly at the valve body (see photo in section on special versions on page 1)

**Table 2: Materials**

Valve body	EN-GJL-250, EN-GJS-400-18-LT, 1.0619	1.4408, 1.4571
Seat	1.4404	1.4404
Plug	1.4404	1.4404
Plug spring	1.4310 <sup>1)</sup>	
Plug stem	1.4404	
Seal	EPDM · FKM · NBR	

Balancing diaphragm	EPDM · FKM · NBR	
<b>Actuator housing</b>	<b>1.0332</b>	<b>1.4301</b>
Operating diaphragm	EPDM · FKM · NBR	

<sup>5)</sup> Only with K<sub>VS</sub> = 0.1 to 1

## Installation

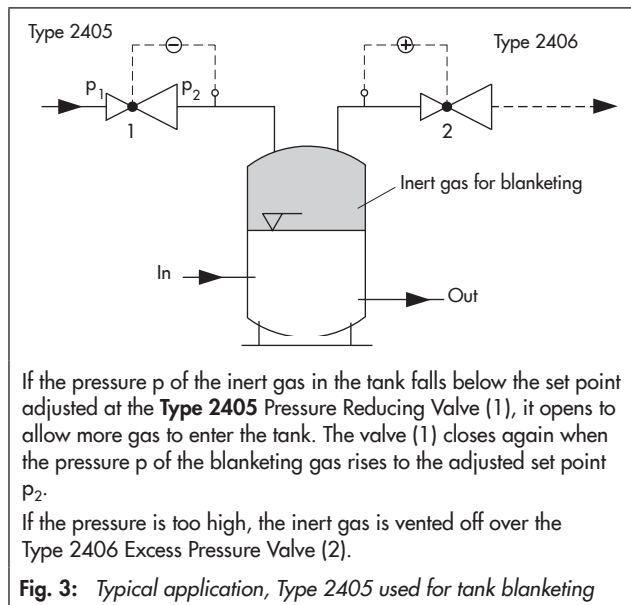
The regulator is preferably to be installed in horizontal pipelines

- Actuator housing on top, actuator facing upwards
- 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.  $6 \times \text{DN}$



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).

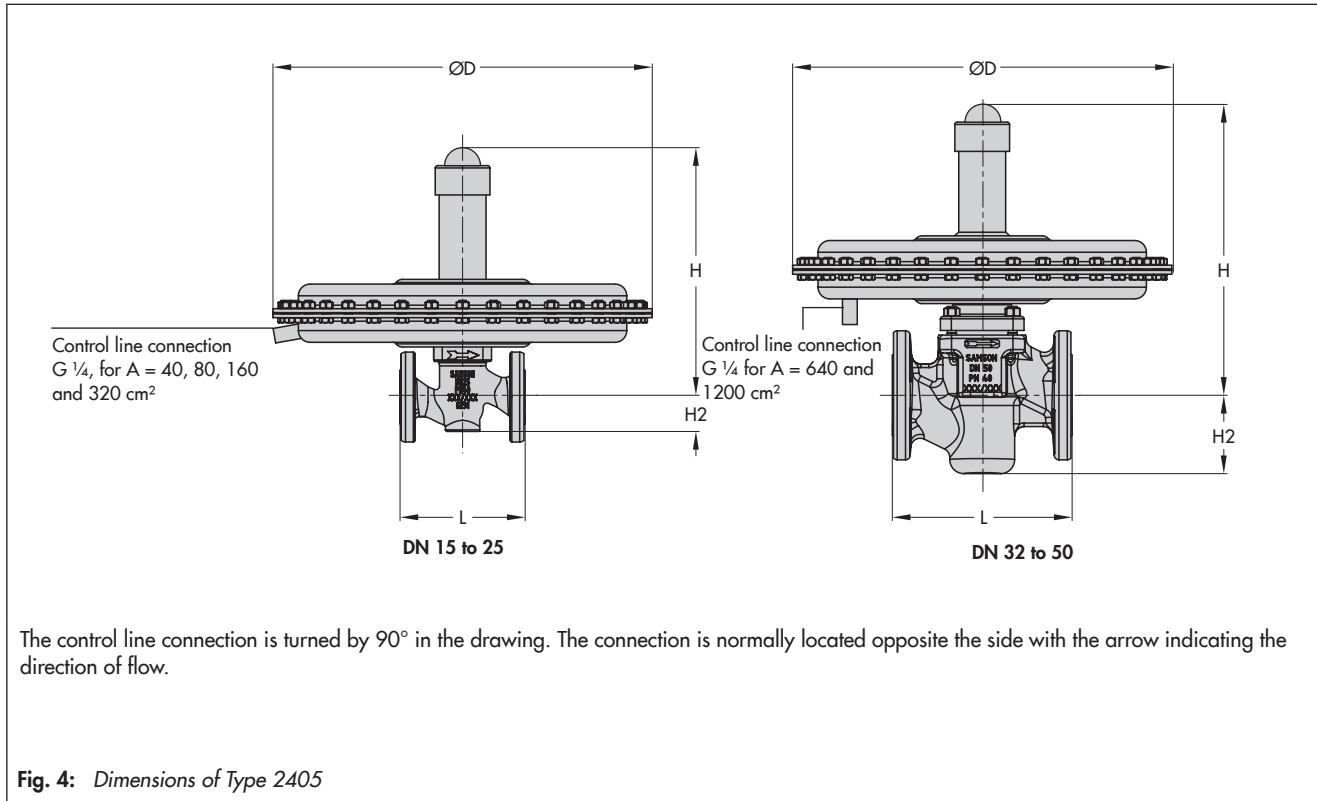


If the pressure  $p$  of the inert gas in the tank falls below the set point adjusted at the **Type 2405** Pressure Reducing Valve (1), it opens to allow more gas to enter the tank. The valve (1) closes again when the pressure  $p$  of the blanketing gas rises to the adjusted set point  $p_2$ .

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

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

## Dimensions



**Fig. 4:** Dimensions of Type 2405

**Table 3: Dimensions in mm and weights in kg**

Nominal size		DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	
Overall length L		130 mm	150 mm	160 mm	180 mm	200 mm	230 mm	
Height H2		Forged steel	53 mm	–	70 mm	–	92 mm	98 mm
		Other materials	44 mm			72 mm		
Set point range	5 to 15 mbar	Height H	Without balancing		325 mm		370 mm	
		Height H	With balancing		352 mm		377 mm	
	Actuator		ØD = 490 mm, A = 1200 cm <sup>2</sup>					
	10 to 30 mbar	Height H	Without balancing		318 mm		366 mm	
		Height H	With balancing		345 mm		370 mm	
	Actuator		ØD = 380 mm, A = 640 cm <sup>2</sup>			ØD = 490 mm, A = 1200 cm <sup>2</sup>		
	25 to 60 mbar	Height H	Without balancing		318 mm		366 mm	
		Height H	With balancing		345 mm		370 mm	
	Actuator		ØD = 285 mm, A = 320 cm <sup>2</sup>			ØD = 380 mm, A = 640 cm <sup>2</sup>		
	50 to 200 mbar	Height H	Without balancing		318 mm		366 mm	
		Height H	With balancing		345 mm		370 mm	
	Actuator		ØD = 285 mm, A = 320 cm <sup>2</sup>					
	0.1 to 0.6 bar	Height H	Without balancing		318 mm		366 mm	
		Height H	With balancing		345 mm		370 mm	
	Actuator		ØD = 285 mm, A = 320 cm <sup>2</sup>					
	0.2 to 1 bar	Height H	Without balancing		318 mm		366 mm	
		Height H	With balancing		345 mm		370 mm	
	Actuator		ØD = 225 mm, A = 160 cm <sup>2</sup>					
	0.8 to 2.5 bar	Height H	Without balancing		330 mm		365 mm	
		Height H	With balancing		356 mm		369 mm	
	Actuator		ØD = 170 mm, A = 80 cm <sup>2</sup>					
	2 to 5 bar	Height H	Without balancing		333 mm		368 mm	
		Height H	With balancing		359 mm		373 mm	
	Actuator		ØD = 170 mm, A = 40 cm <sup>2</sup>					
4.5 to 10 bar	Height H	Without balancing		437 mm		485 mm		
	Height H	With balancing		463 mm		489 mm		
Actuator		ØD = 170 mm, A = 40 cm <sup>2</sup>						
<b>Weight <sup>1)</sup> in kg (approx.)</b>								
Set point range	5 to 15 mbar		28 kg			40 kg		
	10 to 30 mbar		18 kg			40 kg		
	25 to 60 mbar		14 kg			30 kg		
	50 to 200 mbar		14 kg			26 kg		
	0.1 to 0.6 bar		14 kg			26 kg		
	0.2 to 1 bar		10 kg			22 kg		
	0.8 to 2.5 bar		8 kg			20 kg		
	2 to 5 bar		8 kg			20 kg		
4.5 to 10 bar		9 kg			21 kg			

<sup>1)</sup> Body made of cast steel 1.0619: +10 %

Specifications subject to change without notice



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