

## T 2520 EN

### Type 2405 Pressure Reducing Valve Self-operated Pressure Regulators



#### Application

Pressure reducing valve for set points from **5 mbar** to **10 bar** · Valve size **DN 15** to **50** · Pressure rating **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 set point adjuster on the actuator
- Spring-loaded, single-seated valve balanced by a balancing diaphragm
- External connection of a control line
- Fulfills strict fugitive emission requirements
- 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, cast stainless steel 1.4408 or forged stainless steel 1.4404

<sup>1)</sup> For unbalanced versions with FKM diaphragm and FKM soft seal



Fig. 1: Type 2405 Pressure Reducing Valve

#### 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)
- 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 regulator in the direction indicated by the arrow. The position of the plug determines the flow rate across the area released between plug (3) and seat (2).

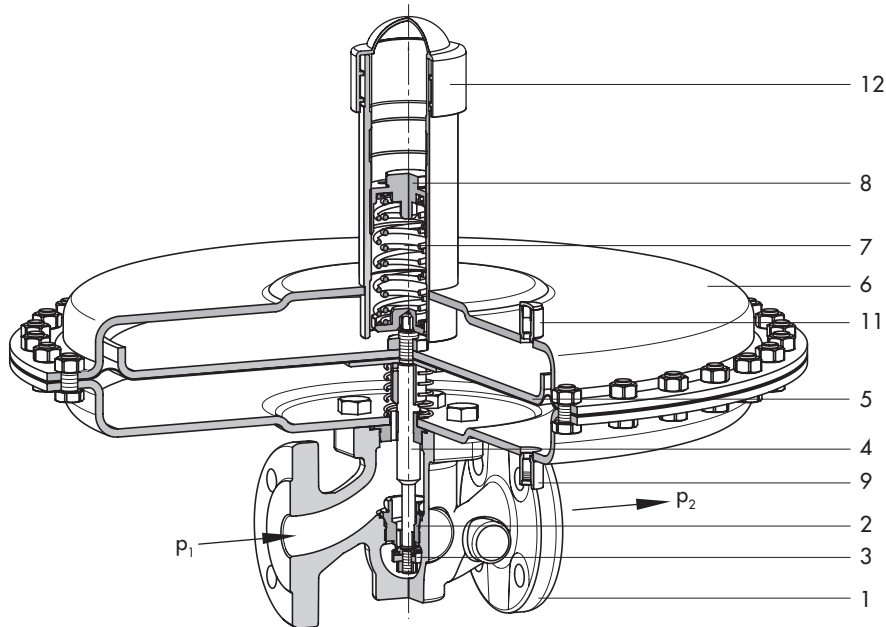
In the pressureless state (control line not connected and no pressure applied) the valve is opened by the force of the set point spring (7).

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

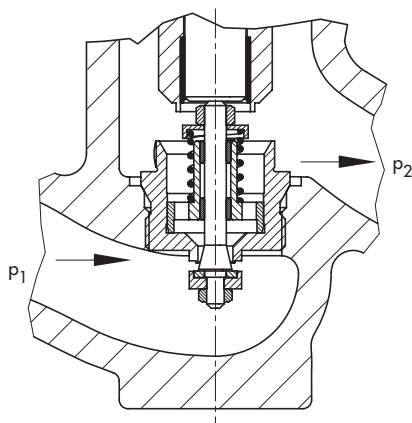
is converted into a positioning force. This force is used to move the valve plug according to the force of the set point spring (7).

The spring force can be adjusted at the set point adjuster (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.

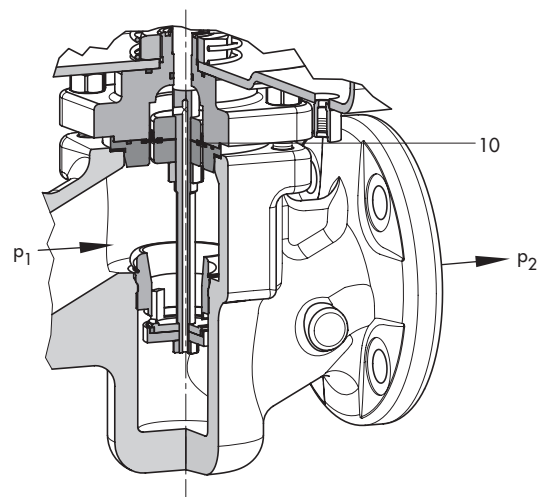
In the version with pressure balancing, the forces produced by the upstream and downstream pressures acting on the plug are eliminated by the balancing diaphragm (10). The plug is fully balanced.



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



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



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

- |              |                       |                                       |
|--------------|-----------------------|---------------------------------------|
| 1 Valve body | 5 Operating diaphragm | 9 Control line connection G ¼         |
| 2 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  | 12 Cap                                |

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

**Table 1: Technical data**

Valve size		DN 15	DN 20	DN 25	DN 32	DN 40	DN 50
Pressure rating (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 0.1 · 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	1.6 · 2.5 4 · 6.3 8 · 16	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					
Conformity		CE · UK · EAC					
Set point ranges		5 to 15 mbar <sup>5)</sup> · 10 to 30 mbar <sup>5)</sup> · 25 to 60 mbar <sup>5)</sup> · 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	10 bar · 16 bar <sup>3)</sup>					
	40 cm <sup>2</sup> · 4.5 to 10 bar	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					

1) Version with set points from 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 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 Special versions on page 1)

5) The set point range cannot be combined with the following K<sub>VS</sub> coefficients: 16 · 20 · 32

**Table 2: Materials**

Valve body	Cast iron EN-GJL-250 Spheroidal graphite iron EN-GJS-400-18-LT Cast steel 1.0619	Cast stainless steel 1.4408 Forged stainless steel 1.4404
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	

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

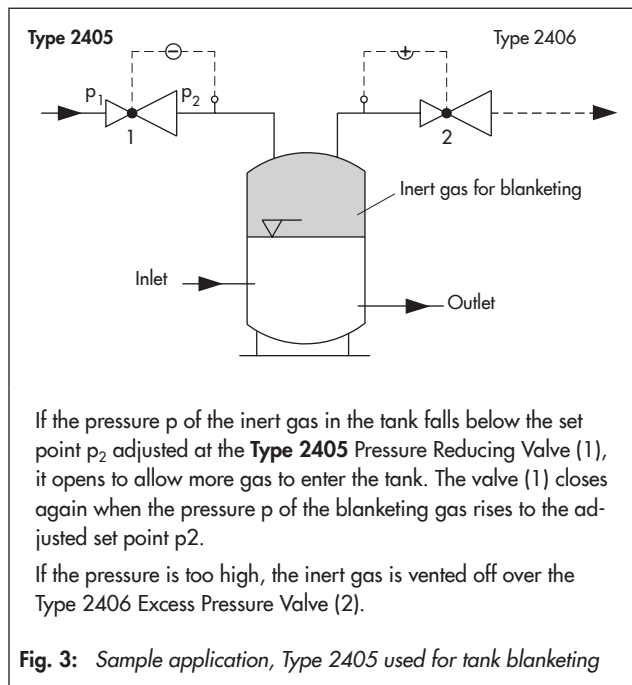
## Installation

The regulator is preferably to be installed in horizontal pipelines:

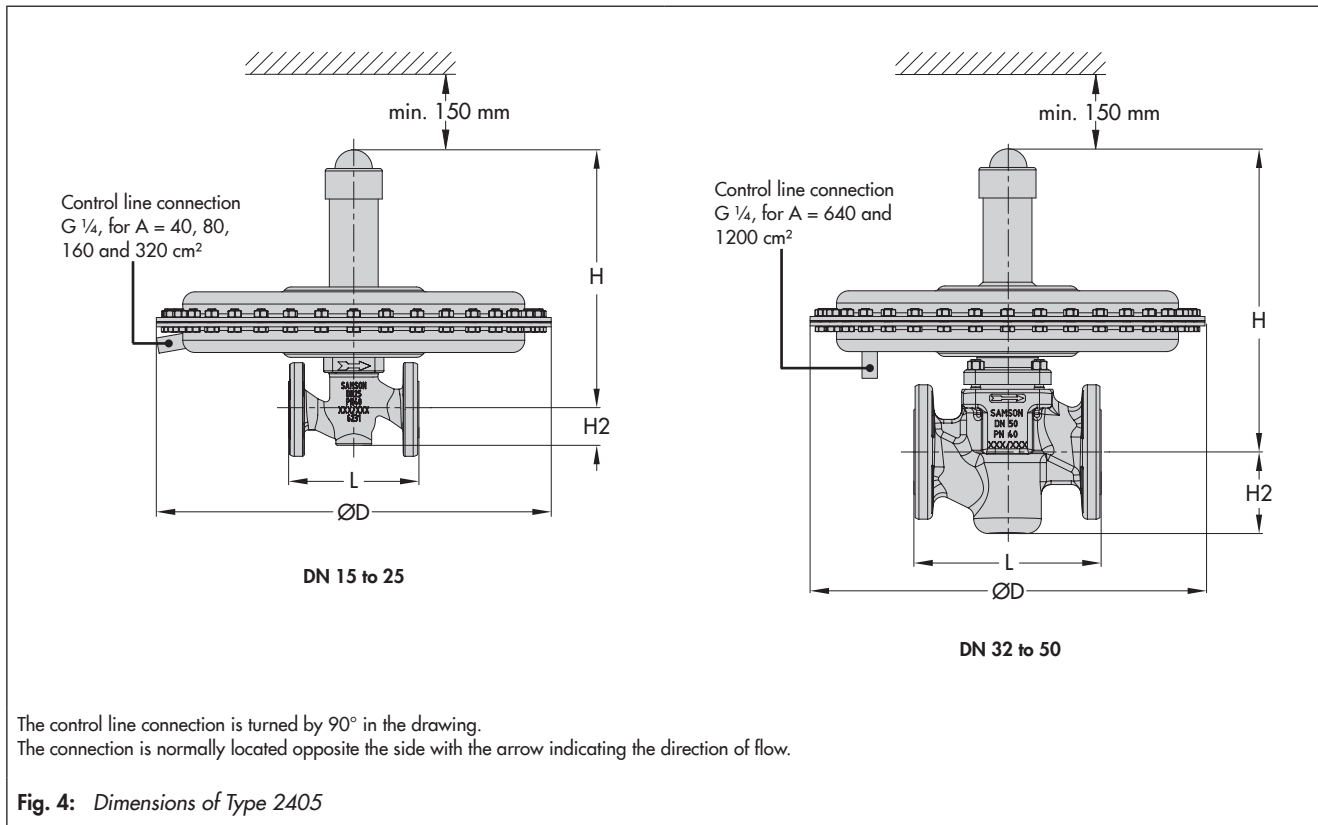
- Actuator housing on top, actuator facing upwards
- The direction of flow must match the direction indicated by the arrow on the body.
- In applications in which the blanketing gas can liquefy, condensate may form in the control line, causing damage to the regulator. To allow condensate to run back 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.  $6 \times DN$



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).



## Dimensions



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

Valve size		DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	
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		
5 to 15 mbar	Height H	Without balancing	325 mm		370 mm			
		With balancing	352 mm		–			
Actuator		ØD = 485 mm, A = 1200 cm <sup>2</sup>						
10 to 30 mbar	Height H	Without balancing	318 mm		366 mm			
		With balancing	345 mm		–			
Actuator		ØD = 380 mm, A = 640 cm <sup>2</sup>			ØD = 485 mm, A = 1200 cm <sup>2</sup>			
25 to 60 mbar	Height H	Without balancing	318 mm		366 mm			
		With balancing	345 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			
		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			
		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			
		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			
		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			
		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			
		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 %

**Ordering text****Type 2405 Pressure Reducing Valve**

Valve size DN ..., set point range ... mbar (bar)

$K_{VS}$  ..., body material ..., optionally, special version ...

Materials:

Plug seal ..., balancing diaphragm ..., operating diaphragm

...