

Self-operated Pressure Regulators



Pressure Reducing Valve Type 2405



Type 2405 Pressure Reducing Valve

Mounting and Operating Instructions

EB 2520 EN

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Definitions of the signal words used in these instructions

WARNING!

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Note: *Supplementary explanations, information and tips*

NOTICE

NOTICE indicates a property damage message.



General safety instructions

- ▶ *The regulators must be installed, started up and serviced by fully trained and qualified personnel only, observing the accepted industry codes and practices. Make sure employees or third persons are not exposed to any danger.
All safety instructions and warnings in these instructions, particularly those concerning installation, start-up and maintenance, must be observed.*
- ▶ *According to these Mounting and Operating Instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible hazards due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.*
- ▶ *The regulator complies with the requirements of the European Pressure Equipment Directive 97/23/EC. The declaration of conformity issued for a valve bearing the CE marking includes information on the applied conformity assessment procedure.
The declaration of conformity can be provided on request.*
- ▶ *For appropriate operation, make sure that the regulator is only used in applications where the operating pressure and temperatures do not exceed the operating values based on the sizing data submitted in the order.*
- ▶ *Note that the manufacturer does not assume any responsibility for damage caused by external forces or any other external factors.*
- ▶ *Any hazards which could be caused in the regulator by the process medium or operating pressure are to be prevented by means of appropriate measures.*
- ▶ *Proper shipping and appropriate storage are assumed.*

Note: *Non-electric valve versions which do not have a valve body lined with an insulating coating do not have their own potential ignition source according to the ignition risk assessment stipulated in EN 13463-1: 2001, section 5.2, even in the rare incident of an operating fault. Therefore, they **do not** fall within the scope of Directive 94/9/EC.*

1 Design and principle of operation

See Fig. 1 on page 5.

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

In the idle position (control line not connected or no pressure applied), the valve is opened by the force of the set point springs (7).

The downstream pressure p_2 to be controlled is tapped downstream of the regulator using an external control line. This pressure is transferred to the actuator housing (6) over the control line and is converted into a positioning force by the diaphragm plate with operating diaphragm (5). This force is used to move the plug stem (4) and the valve plug as a result, depending on the force of the set point springs (7). The spring force can be adjusted at the set point adjuster (8).

If the force resulting from the downstream pressure p_2 exceeds the spring force adjusted at the set point springs, the valve closes in proportion to the pressure change.

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

1.1 Process medium and field of application

The Type 2405 Pressure Reducing Valves are only suitable for controlling **gases** in the temperature range between **-20** and **+60 °C**.

2 Installation

See Fig. 1 on page 5.

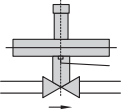
NOTICE

A strainer (SAMSON Type 2 NI) must be installed upstream of the regulator (see section 2.2).

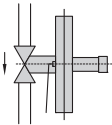
The regulator must be installed free of stress. If necessary, support the piping near the connections. However, do not attach supports to the valve or actuator.

2.1 Mounting positions

Standard installation – preferable –

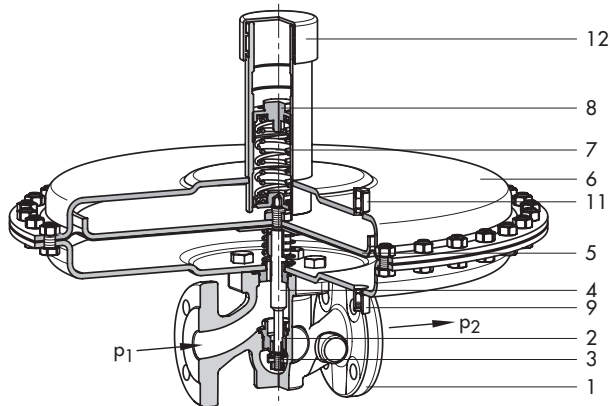
- Install the valve in a **horizontal pipeline**. The actuator with set point adjuster must **face upwards**. 
- Make sure the medium flows through the valve in the direction indicated by the arrow.
- Install the control line to the tapping point with an approx. 10 % slope to allow any condensing liquid to flow back into the vessel (tank) or pipe.

Other possible installations

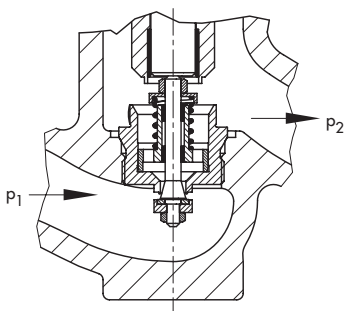
- Install the valve in a **vertical pipeline**. The actuator with set point adjuster must point **to the side**. 

Note: System deviations may occur in this mounting position.

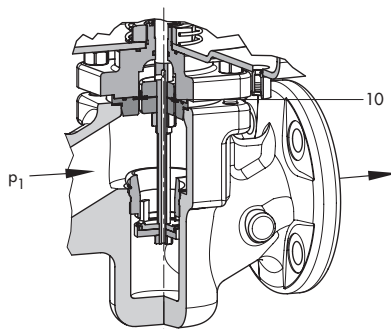
- The medium must flow from the top of the valve downwards.



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



Type 2405 **without** pressure balancing (K_{VS} 0.1 to 1) · Flow-to-close



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

- | | | | |
|---|--|----|--|
| 1 | Valve body | 7 | Set point spring(s) |
| 2 | Seat | 8 | Set point adjuster (adjusting screw SW 27) |
| 3 | Plug | 9 | Control line connection (G ¼ union for downstream pressure p2) |
| 4 | Plug stem | 10 | Balancing diaphragm |
| 5 | Diaphragm plate with operating diaphragm | 11 | Venting plug or leak-off connection (special version) |
| 6 | Actuator housing | 12 | Cap |

Fig. 1 · Functional diagrams

2.2 Strainer

The strainer must be installed upstream of the regulator (Fig. 2). Make sure the direction of medium flow corresponds with the direction indicated by the arrow on the strainer. The filter element must be suspended to hang downwards. Remember to leave enough space to remove it.

2.3 Shut-off valve

Install a hand-operated shut-off valve both upstream of the strainer and downstream of the regulator (see Fig. 2). This allows the plant to be shut down for cleaning and maintenance and when the plant is not used for longer periods of time.

2.4 Pressure gauge

To monitor the pressures in the plant, install a pressure gauge both upstream and downstream of the regulator (see Fig. 2).

2.5 Control line

Connection G $\frac{1}{4}$ is located at the actuator housing. A control line with an inside diameter of min. 6 mm (preferably 8 x 1 mm, steel or stainless steel pipe) must be provided at the site of installation.

The control line connection for pressure tapping must always be directly attached to the vessel (tank) because the medium is in the expanded state and no turbulence occurs at this point.

If the pressure is to be tapped at a straight pipeline section, the largest possible distance to the regulator must be kept (at least 6 x DN).

Connect the control line at the side or top of the horizontally running main pipeline. If possible, place the point of pressure tapping in a pipe expansion.

Install any pipe fittings (e.g. restrictions, bends, manifolds or branches), that may cause turbulence in the flow, sufficiently far away from the pressure tapping points (at least 6 x DN).

Note: *If the gas to be controlled is damp, condensate may collect in the control line which could damage the controller. Install the control line with an approx. 10 % slope to the pressure tapping point in the vessel (tank) or pipe to allow the condensate to flow back into the vessel.*

3 Operation

3.1 Start-up

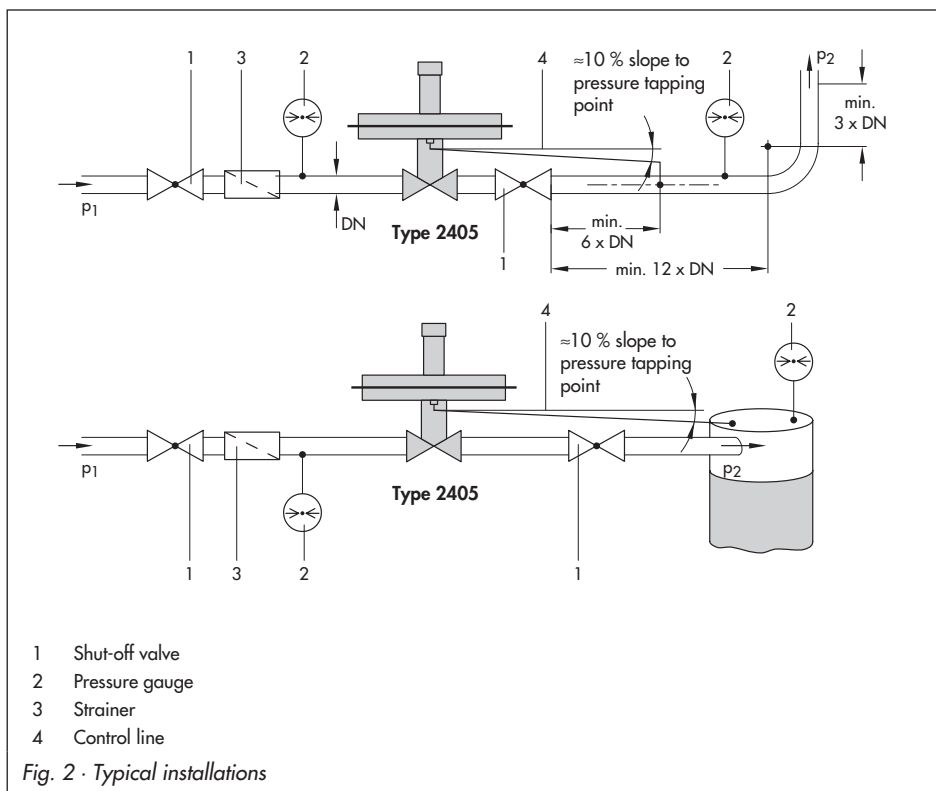
NOTICE

First start up the regulator after mounting all the components.

The control line must be free of dirt and the flow cross-section must be open.

Make sure the control line is correctly connected.

Open the shut-off valves **slowly** preferably starting from the return flow pipe side. Avoid pressure surges (hammering).



NOTICE

When testing the pressure of the plant with the regulator already installed, the nominal pressure (body) is permissible (see section 7). However, it is important that the maximum permissible pressure at the operating diaphragm is not exceeded. If this cannot be guaranteed, proceed as follows:

Unscrew the control line at the actuator and seal the open control line.

If pressure surges are to be expected during start-up or during operation, use a regulator with integrated force limiter (special version). See section 7 for pressure limits.

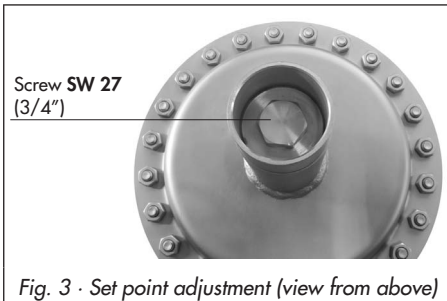
All plant components must be sized for the test pressure.

3.2 Set point adjustment

See Fig. 1 on page 5.

Adjust the required set point by tensioning the set point springs (7) at the set point adjuster (8).

- ▶ Remove cap (12).
- ▶ Use a socket wrench (SW 27) to turn the screw (8).
- ▶ Turn it clockwise to increase the set point pressure and counterclockwise to reduce the set point pressure.
- ▶ Screw back on cap (12).



3.3 Decommissioning

Close first the shut-off valve on the upstream side and then on the downstream side.

The pressure gauge (Fig. 2) installed on the downstream side on site allows the adjusted set point to be monitored.

4 Maintenance and troubleshooting

The regulators are maintenance free. Nevertheless, they are subject to natural wear, particularly at the seat, plug and operating diaphragm.

Depending on the operating conditions, the regulator needs to be checked at regular intervals to avoid possible malfunctions.

WARNING!

On performing any work on the regulator, make sure the relevant section of the pipeline is depressurized and, depending on the process medium, drained as well.

We recommend to remove the valve from the pipeline.

For high temperatures, allow the regulator to cool down to ambient temperature before starting any work on it.

Interrupt or shut off the control line to avoid any hazards which could be caused by moving parts.

As valves are not free of cavities, remember that residual process medium might still be contained in the valve.

4.1 Pressure fluctuations

NOTICE

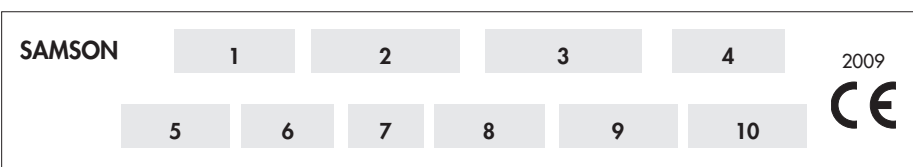
Pressure fluctuations (oscillations) could damage the regulator and plant. Therefore, they should not be allowed to occur or the reason for their occurrence must promptly be eliminated.

To eliminate any oscillations, the following measures may be helpful:

- ▶ Check the pressure tapping of the control line (see section 2.5). If need be, relocate the point of tapping.
- ▶ Screw SAMSON Venturi nozzle into the union for the control line connection (9) (item no. 1991-7114 for 1200/640 cm² or item no. 1991-7113 for 320/160 cm²).
- ▶ Check the sizing data used for the regulator. If necessary, change the Kvs coefficient, seat diameter or diaphragm area.

If faults cannot be remedied, contact SAMSON's After-Sales Service (see section 6).

5 Nameplate



The nameplate diagram shows the following layout:

- Top left: **SAMSON**
- Field 1: Type designation (2405)
- Field 2: Configuration ID (Var.-ID)
- Field 3: Order number or order date
- Field 4: K_{VS} coefficient
- Field 5: Set point range
- Field 6: Nominal size DN
- Field 7: Nominal pressure (body)
- Field 8: Max. inlet pressure (max. perm. pressure at the operating diaphragm)
- Field 9: Perm. temperature
- Field 10: Body material
- Top right: 2009
- Bottom right: CE mark

Explanations

1	Type designation (2405)	6	Nominal size DN
2	Configuration ID (Var.-ID)	7	Nominal pressure (body)
3	Order number or order date	8	Max. inlet pressure (max. perm. pressure at the operating diaphragm)
4	K_{VS} coefficient	9	Perm. temperature
5	Set point range	10	Body material

Fig. 4 · Nameplate

6 Customer service

Should any malfunctions or any defect occur, SAMSON's After-Sales Service is prepared to help you on site.

You can also send the defective regulator directly to your local SAMSON representative for repair. Addresses of SAMSON subsidiaries, agencies and service centers are listed in the product catalogs and in the Internet at www.samson.de.

To allow SAMSON to find the fault and to have an idea of the installation situation, specify the following details (refer to the nameplate):

- ▶ Type and nominal size of the valve
- ▶ Configuration ID (Var.-ID)
- ▶ Upstream and downstream pressure
- ▶ Temperature and control medium
- ▶ Minimum and maximum flow rate
- ▶ Has a strainer been installed?
- ▶ Sketch of the installation with exact position of regulator and all additional installed components (shut-off valves, pressure gauges, etc.).

7 Technical data

Table 1 · Technical data

Nominal size	DN 15 to 25	DN 32 to 50
Nominal pressure (body)	PN 16 · PN 25 · PN 40	
K_{VS} coefficients	0.1 · 0.25 · 0.4 · 1 · 1.6 · 2.5 4 · 6.3 · 8	6.3 · 8 · 16 · 20 · 32
Max. perm. upstream pressure	10 bar · 12 bar ¹⁾	
Max. perm. temperature range (medium temperature)	-20 to +60 °C ²⁾	
Leakage class acc. to IEC 60534-4	Soft-seated, minimum class IV	
Set point ranges ³⁾	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	
Max. perm. pressure at the operating diaphragm	1200 cm ² · 5 to 15 mbar · 10 to 30 mbar	1 bar
	640 cm ² · 10 to 30 mbar · 25 to 60 mbar	4 bar ($K_{VS} = 0.1$ to 1) · 2 bar ($K_{VS} = 1.6$ to 32)
	320 cm ² · 25 to 60 mbar · 50 to 200 mbar	8 bar ($K_{VS} = 0.1$ to 1) · 4 bar ($K_{VS} = 1.6$ to 32)
	320 cm ² · 0.1 to 0.6 bar	1.5 bar · 10 bar ⁴⁾
	160 cm ² · 0.2 to 1 bar	2.5 bar · 20 bar ⁴⁾
Pressure balancing	80 cm ² · 0.8 to 2.5 bar	5 bar · 20 bar ⁴⁾
	40 cm ² · 2 to 5 bar	10 bar · 20 bar ⁴⁾
Pressure tapping	$K_{VS} = 0.1$ to 4	Without balancing diaphragm
	$K_{VS} = 6.3$ to 32	With balancing diaphragm
Control line connection (threaded union)	External control line G ¼	

1) Version with set points from 0.1 to 5 bar

2) Higher and lower temperatures on request

3) Higher set point ranges on request

4) Version with force limiter

8 Dimensions and weights

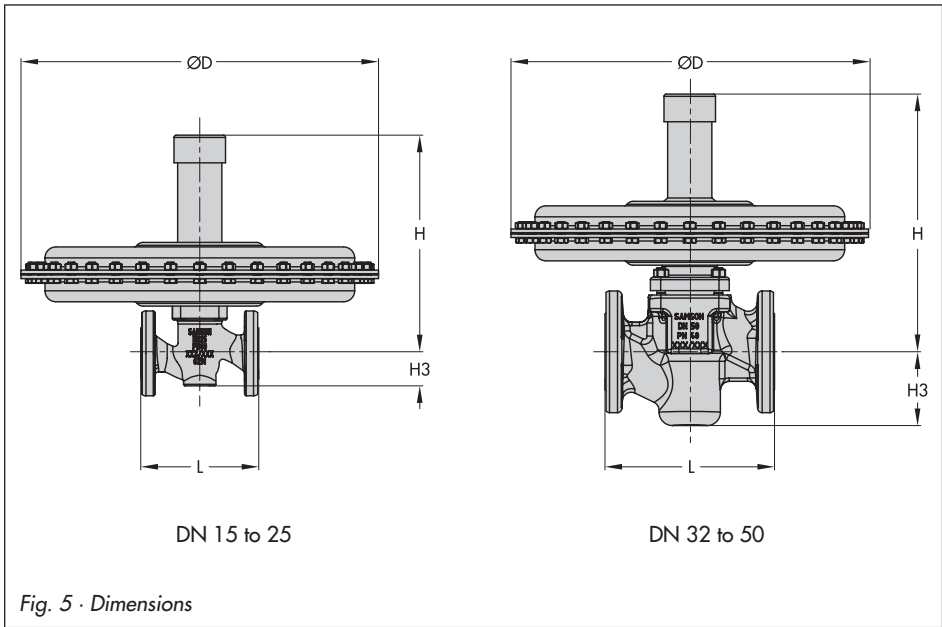


Table 2 · Dimensions in mm and weights in kg

Nominal size		DN	15	20	25	32	40	50
Valve	Length L		130	150	160	180	200	230
	Height H3	Other materials	55			72		
		Forged steel	53	–	70	–	92	98
Set point range								
5 to 15 mbar	Height H		330			365		
	Actuator		∅ D = 490, A = 1200 cm ²					
10 to 30 mbar	Height H		–			365		
	Actuator		–			∅ D = 490, A = 1200 cm ²		
10 to 30 mbar	Height H		325			–		
	Actuator		∅ D = 380, A = 640 cm ²			–		
25 to 60 mbar	Height H		–			360		
	Actuator		–			∅ D = 380, A = 640 cm ²		
25 to 60 mbar	Height H		325			–		
	Actuator		∅ D = 285, A = 640 cm ²			–		
50 to 200 mbar	Height H		325			360		
	Actuator		∅ D = 285, A = 320 cm ²					
0.1 to 0.6 bar	Height H		325			360		
	Actuator		∅ D = 285, A = 320 cm ²					
0.2 to 1 bar	Height H		325			360		
	Actuator		∅ D = 225, A = 160 cm ²					
0.8 to 2.5 bar	Height H		320			355		
	Actuator		∅ D = 170, A = 80 cm ²					
2 to 5 bar	Height H		320			355		
	Actuator		∅ D = 170, A = 40 cm ²					
5 to 15 mbar	Weight ¹⁾ in kg, approx.		28			40		
10 to 30 mbar			18					
25 to 60 mbar						30		
50 to 200 mbar			14			26		
0.1 to 0.6 bar								
0.2 to 1 bar			10			22		
0.8 to 2.5 bar			8			20		
2 to 5 bar			8			20		

¹⁾ Body made of cast steel 1.0619: +10 %



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