

Self-operated Pressure Regulators



Type 2405 Pressure Reducing Valve



Type 2405 Pressure Reducing Valve

Mounting and Operating Instructions

EB 2520 EN

Edition September 2015



Definition of signal words



DANGER!

Hazardous situations which, if not avoided, will result in death or serious injury



WARNING!

Hazardous situations which, if not avoided, could result in death or serious injury



NOTICE

Property damage message or malfunction



Note:

Additional information



Tip:

Recommended action

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1 General safety instructions

- The regulator is to be mounted, started up or serviced by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. Make sure employees or third persons are not exposed to any danger.
- All safety instructions and warnings given in these mounting and operating instructions, particularly those concerning installation, start-up and maintenance, must be strictly 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 dangers 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 2014/68/EU. The declaration of conformity issued for a regulator bearing the CE marking includes information on the applied conformity assessment procedure. The declaration of conformity can be provided on request.
- To ensure appropriate use, only use the regulator in applications where the operating pressure and temperatures do not exceed the specifications used for sizing the regulator at the ordering stage.
- The manufacturer does not assume any responsibility for damage caused by external forces or any other external factors.
- Any hazards that could be caused in the regulator by the process medium, operating pressure or by moving parts are to be prevented by taking appropriate precautions.
- Proper transport, storage, installation, operation and maintenance are assumed.

Note: Non-electric valve versions whose bodies are not lined with an insulating material coating do not have their own potential ignition source according to the risk assessment stipulated in EN 13463-1: 2009, section 5.2, even in the rare incident of an operating fault. Therefore, such valve versions do not fall within the scope of Directive 94/9/EC.

2 Design and principle of operation

See Fig. 1 on page 6.

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 pressureless state (control line not connected and 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 ¹⁾ 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 depending on the force of the set point springs (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 spring force adjusted at the set point springs, 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.

2.1 Process medium and scope of application

Type 2405 Pressure Reducing Valve to control gases within the temperature range from -20 to $+60$ °C (0 to $+150$ °C)²⁾ · Set points from 5 mbar to 10 bar · Nominal size DN 15 to 50 · PN 16 to 40 · Flanged connections



WARNING!

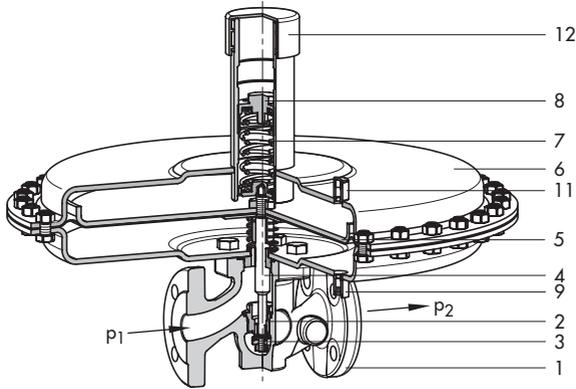
Uncontrolled excess pressure in the plant.

Risk of personal injury or property damage.

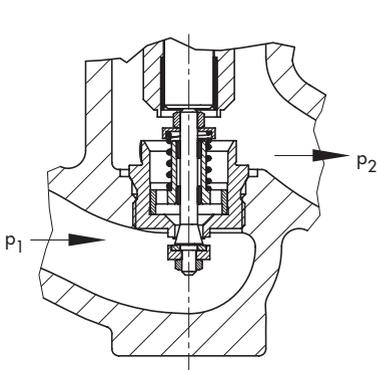
A suitable overpressure protection must be installed on site in the plant section.

¹⁾ Special version with 0.8 to 2.5 bar, 2 to 5 bar and 4.5 to 10 bar: pressure tapping **directly** at the valve

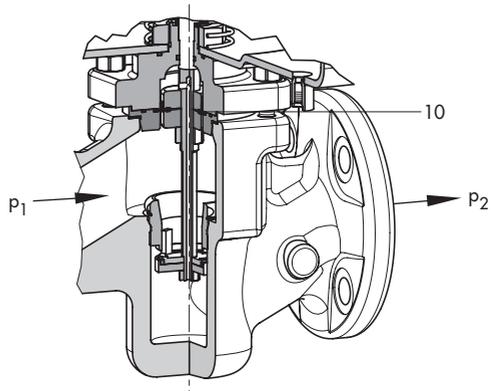
²⁾ For unbalanced versions with FPM diaphragm and FPM soft seal



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 | 7 Set point spring |
| 2 Seat | 8 Set point adjuster (screw SW 27) |
| 3 Plug | 9 Control line connection, G ¼ fitting |
| 4 Plug stem | 10 Balancing diaphragm |
| 5 Diaphragm plate with operating diaphragm | 11 Leakage line connection (special version), G ¼ fitting |
| 6 Actuator housing | 12 Cap |

Fig. 1: Functional diagram of Type 2405 Pressure Reducing Valve

3 Installation

See Fig. 1 on page 6.

Choose a place of installation that allows you to freely access the regulator (especially the set point adjuster) even after the entire plant has been completed.

The type and dimensions of the pipeline and tank connections must suit the regulator being installed. The flow of direction in the pipe section must correspond with the direction indicated by the arrow on the regulator.

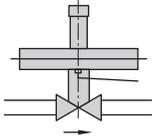
Observe the following instructions:

- Flush the pipeline thoroughly before installing the regulator to ensure that any sealing parts, weld spatter and other impurities carried along by the process medium do not impair the proper functioning of the valve, above all the tight shut-off. Ensure that there is no liquid, e.g. condensed water, inside the regulator. If necessary, blow out the connecting parts with clean compressed air.
- Install a strainer (e.g. SAMSON Type 2 NI) upstream of the regulator (see section 3.2).
- Make sure the regulator is installed free of stress. If necessary, support the pipeline near to the connecting flanges. Do not attach supports directly to the valve or actuator.
- Protect the regulator from icing up when controlling media that can freeze. Remove the regulator from the pipeline when the plant is shut down if the regulator is not installed areas free from frost.

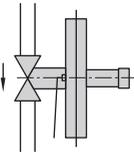
3.1 Mounting positions

The regulator must be installed correctly using the correct mounting position.

Installation (preferable)

- Install the regulator in a horizontal pipeline. The actuator housing with set point adjuster must face upwards. 
- The medium must flow through the valve in the direction indicated by the arrow on the valve body.
- Install the control line to the tapping point with an approx. 10 % slope to allow any condensing liquid to flow back into the tank or pipe.

Other possible installation

Install the regulator in a vertical pipeline. The actuator housing with set point adjuster must point to the side. 



Note:

System deviations may occur in this mounting position.

- The medium must flow in the direction indicated by the arrow from the top of the valve downwards.

3.2 Strainer

Install the strainer upstream of the regulator (see Fig. 2). The direction of flow must correspond to the arrow on the body. The filter element must be installed to hang downwards when the strainer is installed in a horizontal pipeline. Remember to leave enough space to remove the filter element.



Note:

Check the strainer at regular intervals and clean it, if necessary.

3.3 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.

3.4 Pressure gauge

Install a pressure gauge both upstream and downstream of the regulator to monitor the pressures prevailing in the plant (see Fig. 2).

3.5 Control line

G ¼ fitting on the actuator housing. Route control line on site preferably using a 8x1 mm (stainless) steel pipe (with min. 6 mm inside diameter).

Always connect the control line connection for pressure tapping (see Fig. 2) directly to the tank or vessel as the medium is in the ex-

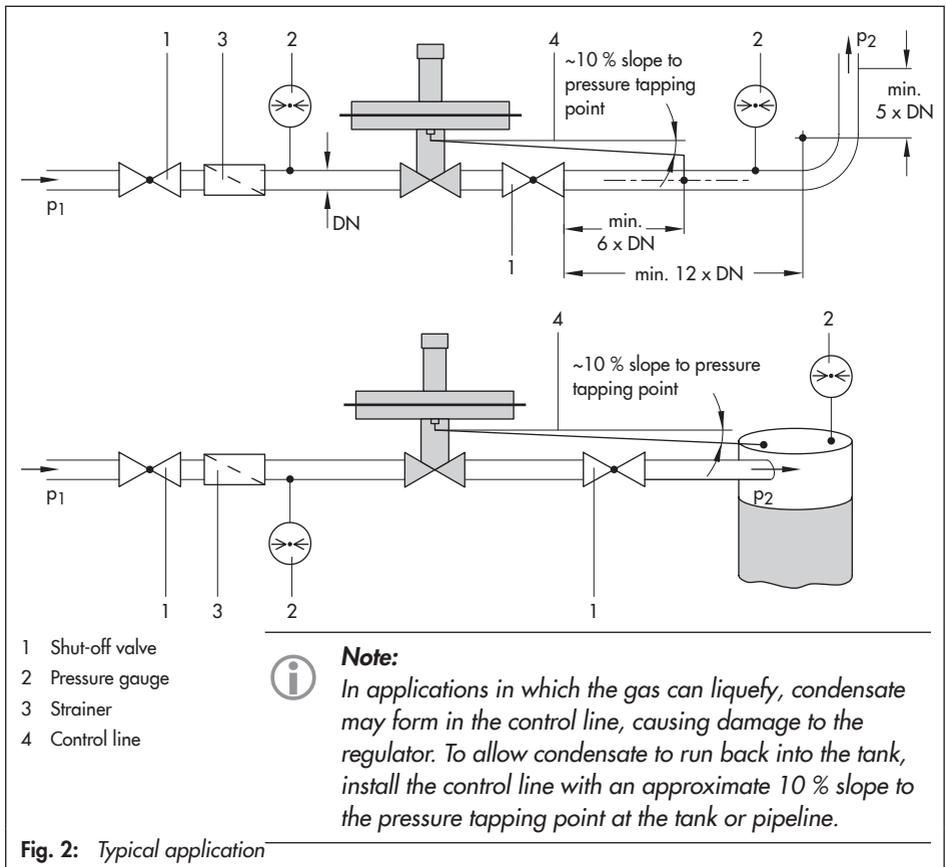
panded state and no turbulence occurs at this point.

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 on 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 control line connection (at least 6 x DN).

Regulators in special versions (set point range 0.8 to 2.5 bar, 2 to 5 bar and 4.5 to 10 bar) are supplied with the control line already connected to the valve body (direct pressure tapping).





NOTICE!

A pressure test of the plant with the regulator already installed is only permissible up to the nominal pressure of the valve (see section 9). The maximum permissible pressure at the operating diaphragm must not be exceeded during this test. 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 9.

All plant components must be designed for the test pressure.

3.6 Leakage line connection

The regulator in the special version is delivered with a leakage line connection. In this version, the opening to the set point adjustment is additionally sealed by a cap.

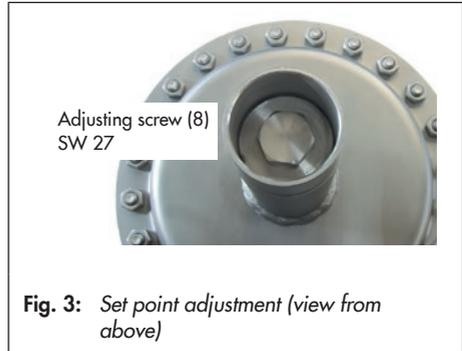
Connect the leakage line to the G ¼ female thread fitting on top of the actuator housing.



In the event of a defective diaphragm (diaphragm rupture) in the actuator, any process medium that escapes can be fed through a pipe to a safe location.

4.2 Adjusting the set point

The regulator in the delivered state does not have a defined set point pressure. The set point spring is released of tension. The set point must be adjusted on starting up the plant.



Adjust the required set point (see Fig. 3) by tensioning the set point springs (7) at the set point adjuster (8) using a suitable socket wrench (width across flats 27).

- Remove the cap (12).
- Use a socket wrench (SW 27) to turn the screw (8).
- Turn the screw clockwise (↻) to **increase** the set point pressure (the downstream pressure rises). Turn it counterclockwise (↺) to **reduce** the set point pressure (the downstream pressure falls).

NOTICE!
Set point adjuster screwed too tight. The regulator is blocked and the medium flow through it is restricted. Pressure regulation is no longer possible.

4 Operation

4.1 Start-up

See Fig. 1 on page 6.

First start up the regulator after mounting all parts.

Make sure the control line is correctly connected, free of contamination and the cross-sectional area of flow open.

Open the shut-off valves slowly preferably starting from the upstream side. Afterwards, open all the valves on the consumer side (downstream of the regulator). Avoid pressure surges.

sible.

Only screw the set point adjuster up to the point where the spring tension can still be felt.

- Remount the cap (12).

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

4.3 Decommissioning

Preferably close first the shut-off valve on the upstream side of the valve and then on the downstream side of the valve.

5 Maintenance and troubleshooting

See Fig. 1 on page 6.

The regulators do not require any maintenance. Nevertheless, they are subject to natural wear, particularly at the seat, plug and operating diaphragm.

As a result, it is necessary to check the proper functioning of the regulator at defined intervals depending on the operating conditions to detect and remove possible malfunctions.



WARNING!

Performing work on pressurized or hot plant sections!

Hot process medium can escape uncontrolled on dismantling the regulator. Risk of scalding!

Allow the regulator to cool down before depressurizing and draining it and remove it from the pipeline!

5.1 Pressure fluctuations



NOTICE!

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

$A = 320$ or 160 cm^2 .

- Check the sizing data used for the regulator. If necessary, change the K_{VS} coefficient, seat diameter or diaphragm area.

If faults cannot be remedied, contact SAMSON (see section 7).

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

- Check the pressure tapping of the control line (see section 3.5). If need be, relocate the point of tapping.
- Screw SAMSON Venturi nozzle into the fitting for the control line connection (9): order no. 1991-7114 for $A = 1200$ or 640 cm^2 ; order no. 1991-7113 for

6 Nameplate

The nameplate consists of the following fields:

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

Other elements on the nameplate include the SAMSON logo, the year 2012, and the CE mark.

Explanations

1 Type designation (2405)	6 Nominal size DN
2 Configuration ID (Var.-ID)	7 Nominal pressure (valve)
3 Order number or 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

7 Customer service

Contact SAMSON's After-sales Service department for support concerning maintenance or repair work or when malfunctions or defects arise.

E-mail: aftersaleservice@samson.de

Addresses of SAMSON AG and its subsidiaries

The addresses of SAMSON AG, its subsidiaries, representatives and service facilities worldwide can be found on the SAMSON website (▶ www.samson.de) in all SAMSON product catalogs or on the back of these Mounting and Operating Instructions.

To assist diagnosis and in case of an unclear mounting situation, specify the following details (see section 6):

- Type and nominal size of the valve
- Configuration ID (Var.-ID)
- Upstream and downstream pressure
- Temperature and process medium
- Min. and max. flow rate in m³/h
- Is a strainer installed?
- Installation drawing showing the exact location of the regulator and all the additionally installed components (shut-off valves, pressure gauge, etc.)



Note:

Conversion from chromate coating to iridescent passivation

We at SAMSON are converting the surface treatment of passivated steel parts in our production. As a result, you may receive a device assembled from parts that have been subjected to different surface treatment methods. This means that the surfaces of some parts show different reflections. Parts can have an iridescent yellow or silver color. This has no effect on corrosion protection.

For further information go to ▶ www.samson.de/chrome-en.html

8 Dimensions and weights

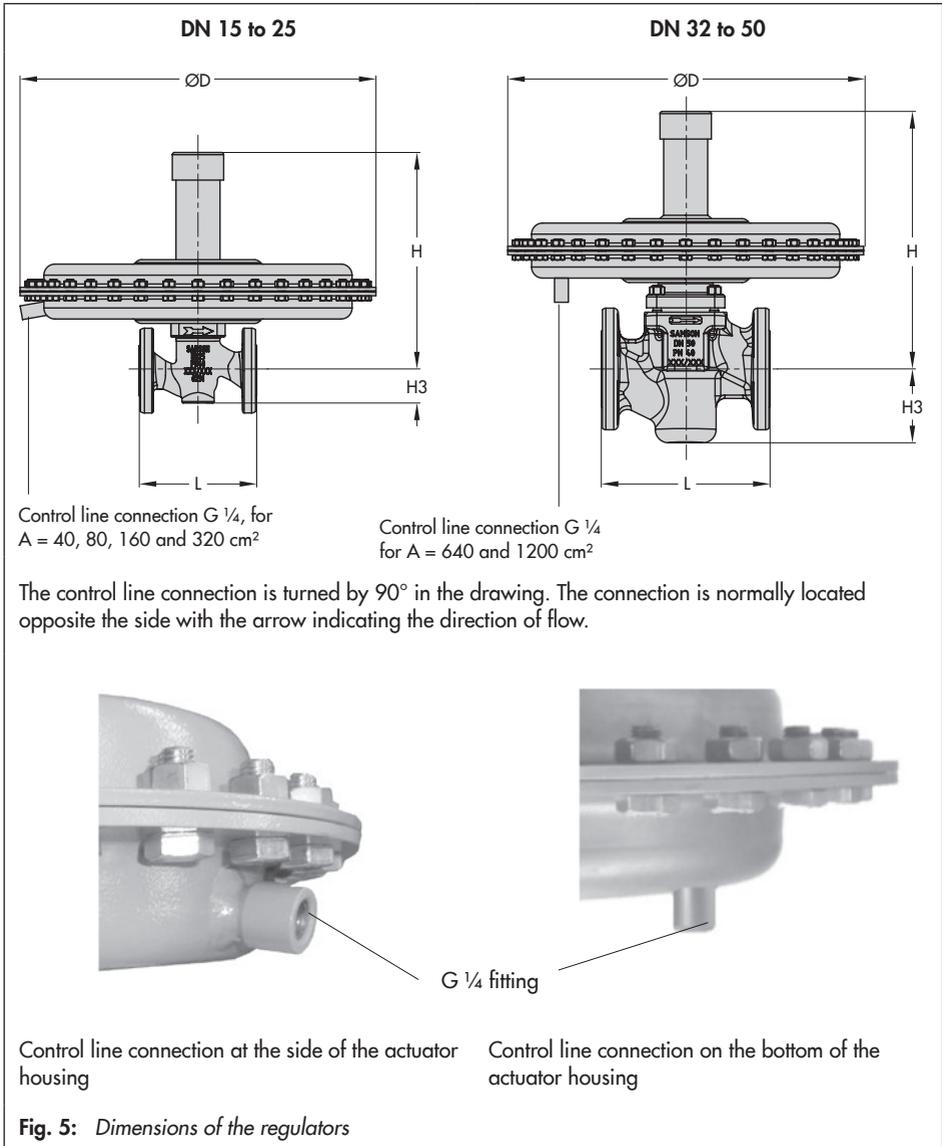


Table 1: Dimensions in mm and weights in kg

Nominal size		DN 15	DN 20	DN 25	DN 32	DN 40	DN 50
Valve	Length L	130 mm	150 mm	160 mm	180 mm	200 mm	230 mm
	Height H3	Other materials		55 mm		72 mm	
		Forged steel		53 mm	–	70 mm	–
Set point range	Dimensions · Valve with actuator						
5 to 15 mbar	Height H	330 mm			365 mm		
	Actuator	ØD = 490 mm, A = 1200 cm ²					
10 to 30 mbar	Height H	325 mm			365 mm		
	Actuator	ØD = 380, A = 640 cm ²		ØD = 490 mm, A = 1200 cm ²			
25 to 60 mbar	Height H	325 mm			360 mm		
	Actuator	ØD = 285 mm, A = 320 cm ²		ØD = 380 mm, A = 640 cm ²			
50 to 200 mbar	Height H	325 mm			360 mm		
	Actuator	ØD = 285 mm, A = 320 cm ²					
0.1 to 0.6 bar	Height H	325 mm			360 mm		
	Actuator	ØD = 285 mm, A = 320 cm ²					
0.2 to 1 bar	Height H	325 mm			360 mm		
	Actuator	ØD = 225 mm, A = 160 cm ²					
0.8 to 2.5 bar	Height H	320 mm			355 mm		
	Actuator	ØD = 170 mm, A = 80 cm ²					
2 to 5 bar	Height H	320 mm			355 mm		
	Actuator	ØD = 170 mm, A = 40 cm ²					
4.5 to 10 bar	Height H	420 mm			480 mm		
	Actuator	ØD = 170 mm, A = 40 cm ²					
Weights							
5 to 15 mbar	Weight ¹⁾ , approx.	28 kg			40 kg		
10 to 30 mbar		18 kg			30 kg		
25 to 60 mbar		14 kg			26 kg		
50 to 200 mbar		10 kg			22 kg		
0.1 to 0.6 bar		8 kg			20 kg		
0.2 to 1 bar		8 kg			20 kg		
0.8 to 2.5 bar		8 kg			20 kg		
2 to 5 bar		9 kg			21 kg		
4.5 to 10 bar							

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

9 Technical data

Table 2: Technical data

Nominal size	DN 15	DN 20	DN 25	DN 32 to 50
Nominal pressure (valve)	PN 16 · PN 25 · PN 40			
K _{VS} coefficients	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	0.016 · 0.04 0.1 · 0.25 0.4 · 1 · 1.6 2.5 · 4 · 6.3 8	1.6 · 2.5 · 4 6.3 · 8 · 16 20 · 32
Max. permissible upstream pressure	10 bar · 12 bar ¹⁾			
Max. permissible temperature range (medium temperature)	-20 to +60 °C (0 to 150 °C) ²⁾			
Leakage class according to IEC 60534-4	Soft-seated, minimum Class IV			
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. perm. pressure at 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 ³⁾		
	160 cm ² · 0.2 to 1 bar	2.5 bar · 16 bar ³⁾		
	80 cm ² · 0.8 to 2.5 bar	5 bar · 16 bar ³⁾		
	40 cm ² · 2 to 5 bar	10 bar · 16 bar ³⁾		
Pressure balancing	K _{VS} = 0.016 to 4	Without balancing diaphragm		
	K _{VS} = 6.3 to 32	With balancing diaphragm		
Pressure tapping	External ⁴⁾			
Control line connection (threaded fitting)	G ¼			

¹⁾ Version with set points from 0.1 to 10 bar

²⁾ For unbalanced versions with FPM diaphragm and FPM 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 section 3.5)



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