

Self-operated Pressure Regulators



Check Valve Type 42-10 RS (Backflow Prevention)



Type 42-10 RS Check Valve

Mounting and Operating Instructions

EB 3009 EN

Edition January 2007



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Note!

*The non-electric actuators and valve versions 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.*

For connection to the equipotential bonding system, observe the requirements specified in EN 60079-14: 1977 (VDE 0165 Part 1), section 6.3.



General safety instructions

- ▶ The regulators must be mounted, 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.
- ▶ The regulator complies with the requirements of the European Pressure Equipment Directive 97/23/EC. The Declaration of Conformity issued for devices bearing the CE marking includes information on the applied conformity assessment procedure and is available on request.
- ▶ To ensure appropriate use, only use the regulator in applications where the operating pressure and temperatures do not exceed the operating values specified in the order.
- ▶ Note that the manufacturer does not assume any responsibility for damage caused by external forces or any other external influences.
- ▶ 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.
- ▶ Make sure the regulator is shipped and stored properly.

Note!

- Make sure all the components for the regulator are mounted prior to start up. Check the control lines for correct connection prior to start-up.
- Allow the plant to fill up **slowly** on start-up.
- Prior to removing the regulator, make sure the relevant section of the plant has been depressurized and drained. Depending on the application, allow the valve to warm up or cool down before starting any work on it.
- Protect the regulator against frost if it is used to control freezing media. In cases where the regulator is installed in rooms not free of frost, it must be removed from the pipeline when the plant is shut down.

1 Design and principle of operation

– See Fig. 4 on rear flap –

The regulator controls the differential pressure to the set point adjusted and prevents backflow from directly connected systems. Observe the pressure and temperature limits on the nameplate.

The regulator is open, provided the upstream pressure is at least 0.2 bar greater than the downstream pressure. It closes automatically when the downstream pressure rises to or above the value of the upstream pressure.

The regulator basically consists of the valve (1) with seat and plug as well as the opening actuator (10) with two diaphragms (11).

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

At a differential pressure of 0.2 bar, the valve begins to open and at 0.35 bar the valve is completely open. At this point, the upstream pressure p_1 (compressed air or nitrogen network pressure) must be greater than the downstream pressure p_2 . The valve closes automatically when the downstream pressure rises to or above the value of the upstream pressure.

The valve plug with soft sealing is standard to ensure tight shut-off and to prevent backflow from the plant into the compressed air or nitrogen network.

The mounted control lines (14) transmit the high (+) pressure and low (-) pressure to the actuator.

The actuator with two diaphragms (11) offers increased safety and reliability of functions. The operating diaphragm for high pressure

(11.1) is connected to the valve inlet pressure, whereas the operating diaphragm for low pressure (11.2) is connected to the valve outlet pressure. There is a hole with a mechanical diaphragm rupture indication (12) in the intermediate ring located between the two diaphragms. The pressure of response of the diaphragm rupture indication is approximately 1.5 bar. If the diaphragm ruptures, the pressure between the diaphragms will increase and cause the pin of the diaphragm rupture indication to move outward until the red marking appears to indicate the diaphragm rupture. The undamaged operating diaphragm will then take over the function of the damaged operating diaphragm.

A pressure switch (15) can be optionally attached to the actuator to trigger an alarm.

Legend for Fig. 4 (rear fold) · Sectional diagram

- | | |
|------|---|
| 1 | Valve body |
| 2 | Seat |
| 3 | Plug |
| 4 | Plug stem |
| 5 | Threaded connection for actuator |
| 6 | Actuator stem |
| 7 | Diaphragm stem |
| 10 | Actuator housing |
| 10.1 | Intermediate ring |
| 11 | Two diaphragms |
| 11.1 | Operating diaphragm for high pressure |
| 11.2 | Operating diaphragm for low pressure |
| 12 | Diaphragm rupture indication |
| 13 | Set point spring(s) |
| 13.1 | Force limiting springs |
| 14 | Control line 8 x 1 mm |
| 15 | Pressure switch (option) |
| 16 | Housing screws (2 screws opposite each other – DN 15 to DN 25 only –) |
| 16.1 | Top housing screws |
| 16.2 | Bottom housing screws |
| 17 | Diaphragm plate nut (external) |
| 17.1 | Diaphragm plate nut (inside) |
| 18 | Distance bushing |

2 Installation

Choose the place of installation that allows you to freely access the regulator after the entire plant has been completed.

Note!

The valve must be installed free of stress. If necessary, support the pipe near the connecting flanges. However, do not attach the supports directly at the valve or actuator. Flush the pipeline thoroughly before installation.

To prevent any sealing parts, weld spatter or other foreign matter carried along by the process medium from impairing the proper functioning of the valve, in particular, tight shut-off, install a strainer (e.g. SAMSON Type 2 NI) upstream of the regulator.

2.1 Mounting position

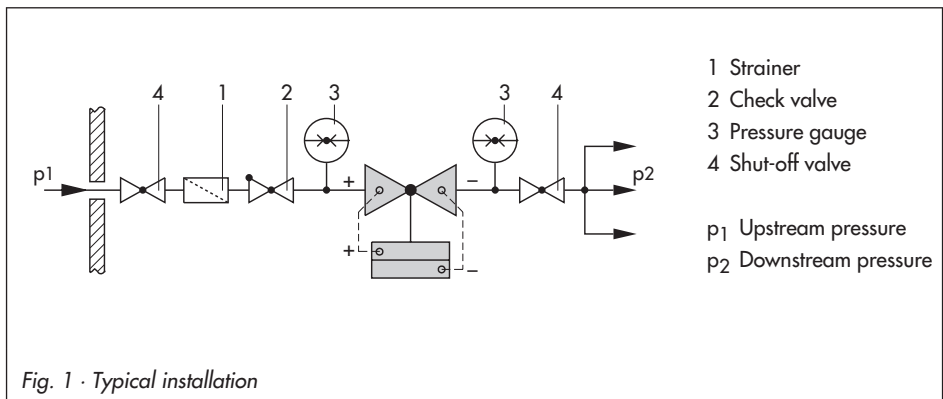
Install the regulator in a horizontal pipeline as illustrated in Fig. 1 with the actuator suspended downwards. Make sure the direction of flow corresponds with the arrow on the valve body.

2.2 Strainer

Make sure that the medium flow corresponds with the direction indicated by the arrow on the strainer body. Install the strainer with the filter element vertically suspended. Ensure that ample space is available to remove the filter.

2.3 Additional installation instructions

We recommend the installation of hand-operated shut-off valves both upstream of the strainer and downstream of the regulator. This allows the plant to be shut down for cleaning and maintenance routines or when it is not operated for extended periods. Install pressure gauges upstream and downstream of the valve to monitor the pressures prevailing in the plant.



3 Operation

3.1 Start-up

Open all the valves on the consumer side. Then open the shut-off valves **slowly**. Raise the plant pressure in steps of 5 bar. Wait several seconds after each rise in pressure before continuing.

Caution!

When pressure-testing the pipelines with the regulator installed, make sure the test pressure does not exceed 1.5 times the nominal pressure.

The maximum permissible pressure in actuator must not be exceeded.

In any case, the lowest pressure applies.

3.2 Set point adjustment

The regulator is delivered with the differential pressure set point fixed at 0.2 bar.

3.3 Decommissioning

Close the shut-off valves starting with flow pipe (high-pressure line) in any order.

4 Maintenance

The regulator is maintenance-free, but is subject to wear and tear, especially at the seat, plug and two diaphragms.

Depending on the application conditions that prevail, the regulator must be inspected at appropriately scheduled intervals to prevent any problems before they occur.

Detailed test instructions (1700-0336) are available on request.

Refer to Table 1 on page 8 for troubleshooting. Contact SAMSON if any problems cannot be remedied.

Proceed as described in section 4.1 when the diaphragm rupture indicator is triggered or when one of the diaphragms is defective.

Caution!

Prior to carrying out any work on the regulator, depressurize and drain the corresponding section of the plant.

First allow the relevant section of the plant to cool down in the case of high temperatures.

As valves are not free of cavities, there might still be residual medium in the valve.

4.1 Replacing the diaphragm

Note!

*We recommend replacing **both** diaphragms when the diaphragm rupture indicator is triggered or when one of the diaphragms is defective.*

– See **Fig. 4 on rear fold** –

The valve does not need to be removed from the pipeline to replace the diaphragms. After shutting off and draining the corresponding section of the plant, unscrew the control lines (14). To separate the actuator from the valve body (1), undo the coupling nut (5) and remove the diaphragm actuator (10).

How to proceed

Note!

Remove the actuator housing (10) together with the intermediate ring (10.1).

The installed set point springs (13) and force limiter springs (13.1) are still compressed. Unscrew first the short housing screws (16.1) and then the long screws (16.2) in an even manner.

1. Unthread screws (16.1) and lift the top part of the actuator housing off.
2. Unthread screws (16.2) and remove the intermediate ring (10.1) together with the two diaphragms (11.1/11.2), while pulling the diaphragm stem (7) off the bottom diaphragm housing.
3. Disassemble the double diaphragm (11) with the diaphragm plates enough to be able to replace the two diaphragms (11.1/11.2).
To do so, unthread top diaphragm plate nut (17), while holding the bottom diaphragm stem or opposite nut stationary with a suitable tool.
4. Lift off the top diaphragm plate and diaphragm (11.1) together with the bottom diaphragm plate. Pull out the distance bushing (18).
5. Unthread nut (17.1), while holding the stem stationary with a suitable tool. Replace bottom diaphragm (11.2).

Proceed in reverse order to reassemble.

Observe the tightening torques specified in Fig. 4!

Proceed as described in section 3.1 for start up.

4.1.1 Testing (in the workshop)

Detailed test instructions (1700-0336) are available on request.

Perform leakage and function tests after replacing the diaphragms.

To proceed, install the valve with actuator and control lines into a suitable setup that allows the test pressure to be applied.

Note!

Flow of direction: Arrow on body **A** ⇒ **B**

- a. **Internal leakage test (shut-off between seat and plug)** · Apply compressed air at 10 bar to port A (flow side)
Open port B

DN	15 to 25	32 to 50	65 to 100	125/150
Test pressure	p = 0.1 bar			
Leakage, max. l/h	30	60	100	200

- b. **External leakage test**

Apply compressed air at 10 bar to port A (flow side). Tightly seal port B (return flow side) · The valve body should no signs of leakage.

- c. **Function test**

Port A (flow side) · Increase test pressure to p = 0.3 bar ⇒ The plug should open

d. Backflow prevention function test

Apply pressure to port B (return flow side)
 · Check for leakage

DN	15 to 25	32 to 50	65 to 100	125/150
Test pressure	p = 0.1 bar ⇒ Bubble-tight			
	p = 10 bar ⇒ Bubble-tight			

Table 1 · Troubleshooting

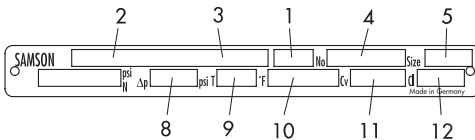
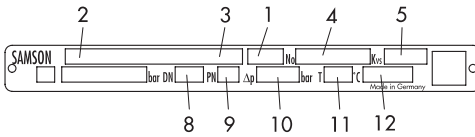
Problem	Possible cause	Solution
Valve does not fully open · Differential pressure rises above the adjusted set point	Insufficient pressure can be tapped on high-pressure side, connected to the actuator	Clean control line and screw fitting.
	Two diaphragms defective (see diaphragm rupture indicator)	Replace diaphragm (see section 4.1).
	Seat and plug worn due to deposits or foreign matter	Replace damaged parts or contact SAMSON.
	Strainer blocked up	Clean strainer filter.
	Valve sized too small	Recalculate K_{VS} coefficient and contact SAMSON.
Valve does not close · Differential pressure drops below the adjusted set point	Seat and plug damaged, meaning a tight shut-off is no longer possible	Remove valve from pipeline and clean parts. Contact SAMSON if still defective.
	Valve sized too big	Recalculate K_{VS} coefficient and contact SAMSON.
	Control line on low pressure side blocked	Clean control line and screw joint.
Jerky control performance	Increased friction, e.g. due to foreign matter lodged between seat and plug	Remove valve from pipeline and clean parts.
Control loop hunting	Valve sized too big	Recalculate K_{VS} coefficient and contact SAMSON.

5 Description of the nameplates

Both the valve and actuator have a nameplate.

Valve nameplates

DIN version



- 1 Valve type
- 2 Model number
- 3 Model number modification index
- 4 Order number or date
- 5 K_{V5} coefficient
- 8 Nominal size
- 9 Nominal pressure
- 10 Perm. differential pressure
- 11 Perm. temperature
- 12 Body material

ANSI version

- 5 Nominal size
- 8 Perm. differential pressure
- 9 Perm. temperature (°F)
- 10 Body material
- 11 C_V (K_{V5} × 1.17)
- 12 ANSI Class (pressure rating)

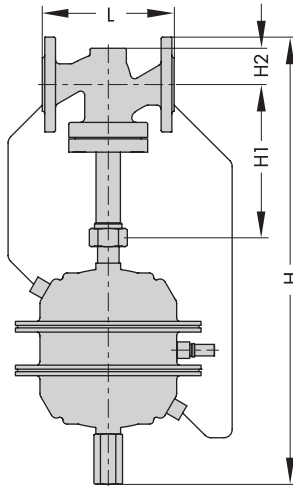
Actuator nameplate



- 1 Effective area DN/ANSI
- 2 Type
- 3 Var.-ID (configuration ID)
- 4 Diaphragm material
- 5 Year of production with CE marking
- 6 Max. perm. pressure p_{max} DN/ANSI
- 7 Nominal size of associated valve DN/ANSI
- 9 Set point range/Differential pressure

Fig. 2 · Nameplates

6 Dimensions and weights



Type 42-10 RS

Dimensions in mm and weights in kg

Nominal size DN	15	20	25	32	40	50	65	80	100	125	150	
Length L	130	150	160	180	200	230	290	310	350	400	480	
Height H1	225						300	355	460	590		
Height H2	Other materials			72			100	120	145	175		
	Forged steel			92			98	-	-	-	-	
Height H	550			600			800	830	1000			
Actuator	Ø D = 285 mm · A = 320 cm ²						Ø D = 390 mm · A = 640 cm ²					
Weight in kg	26	27	28	37	38	41	62	68	77	110	165	

Fig. 3 · Dimensions and weights

6.1 Technical data

Type 2421 RS Valve												
Nominal size	DN	15	20	25	32	40	50	65	80	100	125	150
K_{VS} coefficient		4	6.3	8	16	20	32	50	80	125	190	280
Max. operating pressure	25 bar											
Max. permissible pressure ¹⁾	45 bar											
Max. permissible temperature	Refer to nameplate											
Type 2420 RS Actuator												
Diaphragm area of actuator	320 cm ²						640 cm ²					
Differential pressure set point, fixed	0.2 bar											
Max. permissible temperature	Air and gases up to 80 °C											

¹⁾ When the backflow prevention function of the regulator responds, max. 45 bar may only exist on one side. If the operating pressure of 25 bar is exceeded, the regulator needs to be checked and, if necessary, any deformed parts replaced.

7 Customer inquiries

In case of inquiries, please submit the following details:

- ▶ Type, nominal size and set point range of the regulator
- ▶ Order number
- ▶ Model number of valve and actuator
- ▶ Inlet pressure and outlet pressure
- ▶ Process medium and its temperature
- ▶ Min. and max. flow rate
- ▶ Min. and max. medium temperature
- ▶ Sketch of the installation with exact position of regulator and all additional installed components (shut-off valves, pressure gauges, etc.).

Sectional diagram

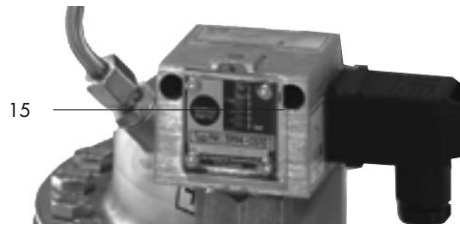
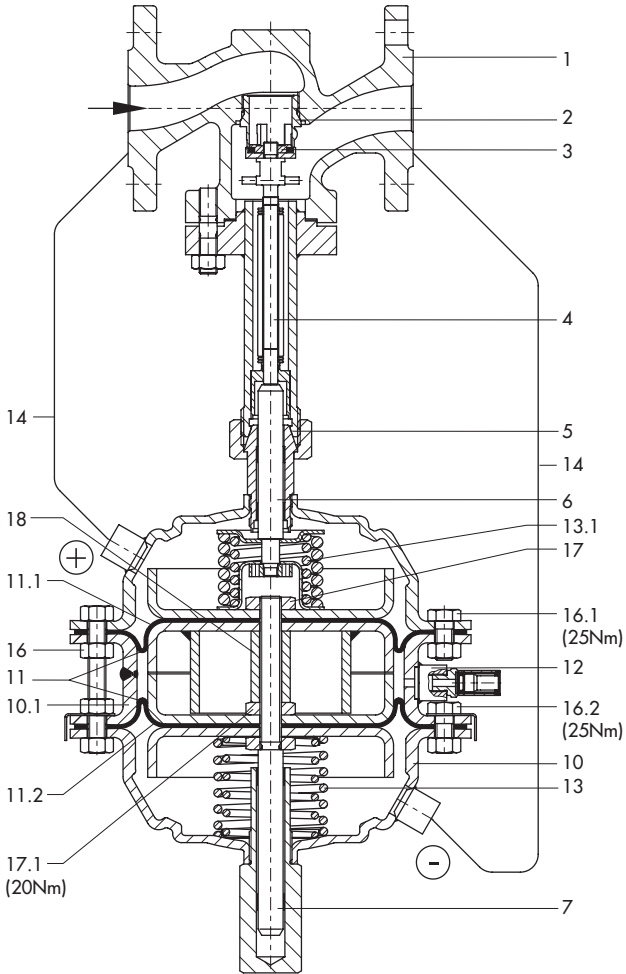


Fig. 4 · Sectional diagram



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S/Z 2008-04