Self-operated Regulators

Type 42-10 RS Check Valve (backflow protection)

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Mounting and Operating Instructions

EB 3009 EN

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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

1 General safety instructions

- The device must 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.
- To ensure appropriate use, only use the device in applications where the operating pressure and temperatures do not exceed the specifications used for sizing the device 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 control 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.

For connection to the equipotential bonding system, observe the requirements specified in section 6.3 of EN 60079-14: 2011 (VDE 0165 Part 1).

2 Process medium and scope of application

Designed to protect nitrogen and compressed air networks against backflow from directly connected systems.

Differential pressure set point **Δp = 0.2 bar/0.3 bar** [1] **(3 psi/5 psi)** [1] · Valve size **DN 15 to 250 (NPS ½ to 10)** · Pressure rating **PN 25** and **40 (Class 150** and **300)** · Compressed air and nitrogen up to **80 °C/150 °C** [2] **(175 °F/300 °F)** [2]

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1) DN 200 and 250 version (NPS 8 and 10)
2) Version with FPM (FKM) diaphragm

2.1 Transportation and storage

The device must be carefully handled, transported and stored. Protect the regulator against adverse influences, such as dirt, moisture or frost, during storage and transportation.

When regulators are too heavy to be lifted by hand, fasten the lifting sling to a suitable place on the valve body.

WARNING!
Incorrectly attached lifting slings or supports.
Risk of injury and property damage due to valve falling.
Securely fasten slings or supports to the valve body and secure against slipping.

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3 Design and principle of operation

See Fig. 1 on page 7.

The regulator prevents flowback 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 (0.3 psi) 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 (2) and plug (3) 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 over the cross-sectional area released between the plug and seat (2).

At a differential pressure of 0.2 bar/ 3.0 bar [1] (3 psi/5 psi) [1], the valve begins to open; at 0.35 bar/0.55 bar (5 psi/7 psi), 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 regulator closes automatically when the downstream pressure rises to or above the value of the upstream pressure. The standard plug is soft-seated 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 upstream and downstream pressures 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 input pressure, whereas the operating diaphragm for downstream pressure (11.2) is connected to the valve output pressure. A bore with a mechanical diaphragm rupture indication (12) is located in the intermediate ring located between the two diaphragms. The pressure of response of the diaphragm rupture indication is approximately 1.5 bar (22 psi). In the event of a diaphragm rupture, the pressure in the space between the two operating diaphragm starts to increase. This causes the pin in the diaphragm rupture indicator to be pushed outwards and a red ring appears, indicating the diaphragm rupture. The intact operating diaphragm takes on the control task of the ruptured diaphragm.

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

[1] DN 200 and 250 version (NPS 8 and 10)

1 Valve body
2 Seat
3 Plug
4 Plug stem
5 Threaded connection for diaphragm actuator
6 Actuator stem
7 Diaphragm stem
10 Actuator housing
11 Two diaphragms
11.1 Operating diaphragm for upstream pressure
11.2 Operating diaphragm for downstream pressure
12 Diaphragm rupture indicator
13 Set point springs
14 Control line 8x1 mm
15 Pressure switch (optional)
16 Housing bolts (two long bolts opposite each other, DN 15 to 25|NPS ½ to 1 only)
16.1 Top housing bolts
16.2 Bottom housing bolts
17 Diaphragm plate nut (outer)
17.1 Diaphragm plate nut (inner)
18 Spacer bushing

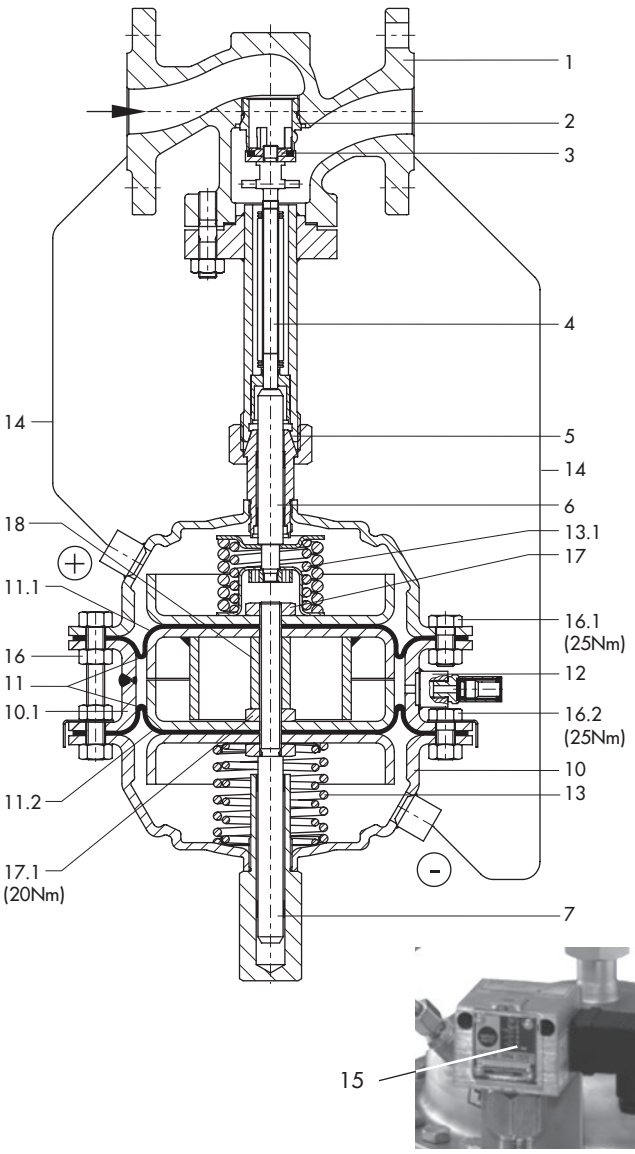


Fig. 1: *Functional diagram · DN 15 to 150 (NPS ½ to 6)*

4 Installation

See Fig. 1 on page 7.

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

➔ Install the regulator free of stress. If necessary, support the pipeline near to the connecting flanges. Do not attach supports directly to the valve or actuator.

➔ Install a strainer (e.g. SAMSON Type 2 N/2 NI) upstream of the regulator to prevent any sealing parts, weld spatter, and other impurities carried along by the process medium impairing the proper functioning of the valve, above all the tight shut-off.

➔ The flow of direction must correspond with the direction indicated by the arrow on the valve body.

➔ DN 15 to 150 (NPS ½ to 6): **actuator** facing **downward** (see Fig. 1 and Fig. 4).

DN 200 to 250 (NPS 8 to 10): **actuator** facing **upward** (see Fig. 4).

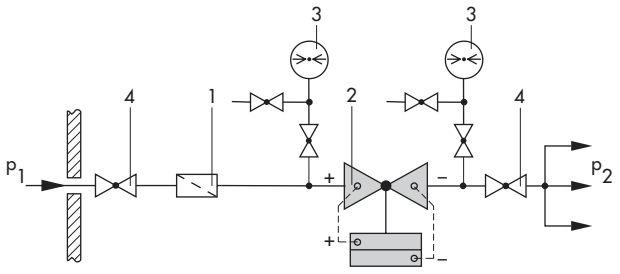
NOTICE

Possible malfunction and damage due to adverse effects of weather conditions (temperature, humidity). Protect the regulator against frost if it is used to control freezing media. Heat the regulator.

4.1 Mounting position

The regulators are supplied ready for connection.

➔ Install the regulator in a horizontal pipeline.



1 Strainer
2 Type 42-10 RS Check Valve (backflow protection)
3 Pressure gauge
4 Shut-off valve

p_1 Upstream pressure
p_2 Downstream pressure

Fig. 2: *Sample application*

4.2 Strainer (filter)

A strainer installed upstream in the flow pipe holds back any dirt or other foreign particles carried along by the medium. For example, the SAMSON Type 2 N/2 NI Strainer is suitable (▶ T 1010).

➔ Install a strainer upstream of the regulator.

➔ The flow of direction must correspond with the direction indicated by the arrow on the valve body.

➔ The filter element must be installed to hang downward.

Tip:
Remember to leave enough space to remove the filter element for cleaning.

4.3 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.

4.4 Pressure gauge

Install a pressure gauge both upstream and downstream of the regulator to monitor the pressures prevailing in the plant.

5 Operation

5.1 Start-up

Note:
First start up the regulator after mounting all parts.

➔ Ensure that all valves downstream of the regulator are open.

➔ Slowly open the shut-off valves in small steps waiting a few minutes in between, preferably starting from the downstream side.

➔ Raise the plant pressure in steps of 5 bar (70 psi).

➔ Wait several seconds after each rise in pressure before continuing.

NOTICE
The test pressure must not exceed the nominal pressure of the valve by 1.5 times on testing the pressure of the plant when the regulator is already installed.
The pressure must not exceed the maximum permissible constant operating pressure or pressure acting on one side (see section 10).
The lowest pressure always applies and restricts the maximum test pressure.

5.2 Adjusting the set point

The user cannot adjust the set point.
The regulator is delivered with a ready adjusted set point of 0.2 bar|3 psi (DN 15 to 150|NPS ½ to 6) or 0.3 bar|5 psi (DN 200 and 250|NPS 8 and 10) and has been tested.
The regulator is open, provided the upstream pressure is greater than the downstream pressure by at least the ready adjusted set point.

5.3 Decommissioning

Close the shut-off valves starting from the flow pipe side.

6 Maintenance

The regulators do not require any maintenance. Nevertheless, they are subject to natural wear, particularly at the seat, plug, and two diaphragms.
Depending on the operating conditions, check the regulator regularly to detect and rectify possible malfunctions at an early stage.
If a diaphragm rupture is indicated and the operating diaphragm is defective, SAMSON's After-Sales Service department can assist you.

WARNING!
Before performing any work on the regulator, make sure the relevant plant section has been depressurized and, depending on the process medium, drained. We recommend removing the valve from the pipeline. Depending on the field of application, allow the valve to cool down or heat up to reach ambient temperature before starting any work on it. Disconnect or shut off the control line. As valves are not free of cavities, remember that residual process medium might still be contained in the valve.

Details on faults and how to remedy them can be found in Table 1.

6.1 Testing

Detailed test instructions (SD 1700-0336-EN) are available on request which describe testing in the workshop and in the installed state. The maintenance intervals depend on the intervals between regular testing and the scope of the testing. A five-year interval has proven suitable under normal operating and ambient conditions. We recommend replacing parts subject to wear on performing this maintenance work.

Table 1: *Troubleshooting*

Malfunction	Possible reasons	Recommended action
The valve does not fully open. The differential pressure exceeds the set point.	Insufficient upstream pressure pulses on the actuator diaphragm.	Clean the control line and the screw joint with restriction.
	Two diaphragms defective (check the diaphragm rupture indicator).	Replace operating diaphragms.
	Seat and plug worn down by deposits or foreign particles.	Replace damaged parts or contact SAMSON's After-sales Service department.
	Strainer blocked.	Clean strainer.
	Valve too small.	Recalculate K_{VS} coefficient and contact SAMSON.
The valve does not close. The differential pressure drops below the set point.	Seat and plug damaged impairing tight shut-off.	Remove valve from the pipeline and clean parts. Contact SAMSON's After-sales Service department if the regulator is defective.
	Valve too large.	Recalculate K_{VS} coefficient and contact SAMSON.
	Control line downstream of valve blocked.	Clean the control line and the screw joint with restriction.
Jerky control response.	Increased friction, e.g. due to foreign particles between seat and plug.	Remove valve from the pipeline and clean parts.
Control loop hunts.	Valve too large.	Recalculate K_{VS} coefficient and contact SAMSON.

If faults cannot be remedied following the recommended action in the table, contact SAMSON (see section 7).

7 Customer inquiries

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

E-mail

SAMSON's After-sales Service department: aftersalesservice@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:

- Device type and nominal size
- Order number/date and product number
- Configuration ID
- Upstream and downstream pressure
- Medium temperature and process medium
- Min. and max. flow rate in m^3/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.)

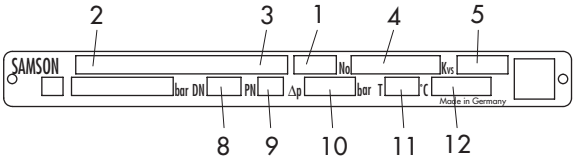
Note:
Conversion from chromate coating to iridescent passivation
We at SAMSON are converting the surface treatment of passivated steel parts in our production. As a result, you may receive a device assembled from parts that have been subjected to different surface treatment methods. This means that the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

8 Nameplates

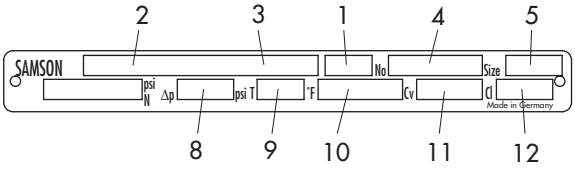
Nameplates are attached to the valve and the actuator.

Valve nameplate

DIN version



ANSI version



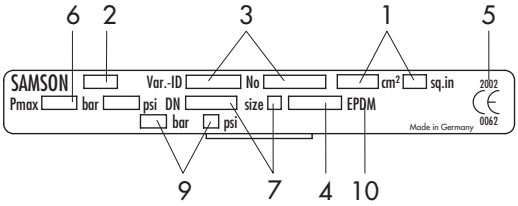
Valve

1 Valve type
2 Model number
3 Configuration ID
4 Order number or date
5 K_{VS} coefficient
8 Nominal size
9 Pressure rating
10 Perm. differential pressure in bar
11 Perm. temperature in °C
12 Body material

ANSI version

5 Valve size
8 Perm. differential pressure in psi
9 Perm. temperature in °F
10 Body material
11 C_V coefficient (K_{VS} x 1.17)
12 ANSI Class (pressure rating)

Actuator nameplate

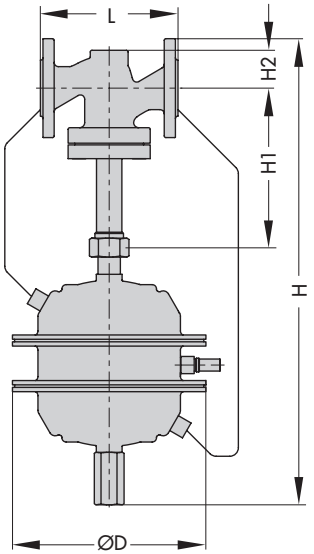


Actuator

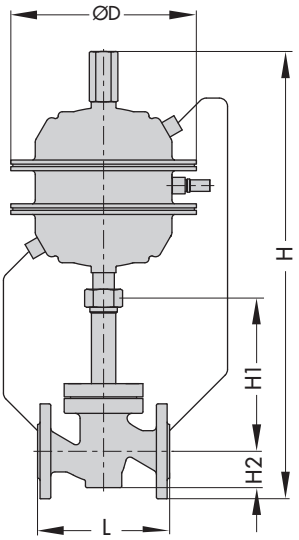
1 Actuator area (DIN/ANSI)
2 Type
3 Configuration ID
4 ID number
5 Year with CE marking
6 Max. perm. pressure p_{max} (DIN/ANSI)
7 Associated valve; valve size (DIN/ANSI)
9 Set point range (DIN/ANSI)
10 Diaphragm material

Fig. 3: *Nameplates*

9 Dimensions



Type 42-10 RS
NPS ½ to 6|DN 15 to 150



Type 42-10 RS
NPS 8 and 10|DN 200 and 250

Fig. 4: *Dimensions*

DIN version

Table 2: *Dimensions and weights*

Nominal size DN		15	20	25	32	40	50	65	80	100	125	150	200	250
Length L		130	150	160	180	200	230	290	310	350	400	480	600	730
Height H1		225						300		355	460	590	730	
Height H2	Other materials	55			72			100		120	145	175	260	
	Forged steel	53	–	70	–	92	98	–	–	–	–	–	–	
Height H		550			600			800		830	1000		1144	
Actuator		ØD = 285 mm · A = 320 cm²						ØD = 390 mm · A = 640 cm²						
Weight, approx. kg		26	26.5	28	35	35.5	39.5	59.5	65.5	75	110	165	410	470

ANSI version

Table 3: *Dimensions and weights*

Valve size		NPS	½	¾	1	1½	2	2½	3	4	6	8	10
		DN	15	20	25	40	50	65	80	100	150	200	250
Length L	Class 150	inch	7.25			8.75	10	10.9	11.75	13.9	17.75	21.4	26.5
		mm	184			222	254	276	298	352	451	543	673
	Class 300	inch	7.5	7.6	7.75	9.25	10.5	11.5	12.5	14.5	18.6	22.4	27.9
		mm	191	194	197	235	267	292	318	368	473	568	708
Height H		inch	19.7			23.6		31.5		32.7	39.4	44.9	
		mm	550			600		800		830	1000	1144	
Height H1		inch	8.6					11.8		14	23.2	28.7	
		mm	225					300		355	590	730	
Height H2		inch	1.8			2.8		3.9		4.5	6.9	10.2	
		mm	45			72		98		113	175	260	
Actuator		ANSI	ØD = 11.2″ · A = 50 in²					ØD = 15.4″ · A = 100 in²					
		DIN	ØD = 285 mm · A = 320 cm²					ØD = 390 mm · A = 640 cm²					
Weight, approx.	Class 150	lb	57	58	62	78	87	131	144	165	360	893	1025
		kg	26	26.5	28	35.5	39.5	59.5	65.5	75	165	405	465
	Class 300	lb	60	61	65	82	91	137	151	173	376	900	1040
		kg	27	27.5	29.5	37	41.5	62	68.5	78.5	170.5	410	470

10 Technical data

Type 2421 RS Valve														
Valve size	**NPS**	**½**	**¾**	**1**	**–**	**1½**	**2**	**2½**	**3**	**4**	**–**	**6**	**8**	**10**
	DN	**15**	**20**	**25**	**32**	**40**	**50**	**65**	**80**	**100**	**125**	**150**	**200**	**250**
C_V and K_{VS} coefficient	C_V	4.5	7.5	9.4	–	37	37	60	94	145	–	330	490	585
	K_{VS}	4	6.3	8	16	20	32	50	80	125	125	280	420	500
Pressure rating		Class 150/300 | PN 25/40												
Max. constant operating pressure		360 psi | 25 bar												
Max. perm. pressure acting on one side		650 psi | 45 bar												
Leakage class [1] according to IEC 60534-4 or ANSI/FCI 70-2		Leakage class VI												
Max. perm. temperature														
With EPDM diaphragm in actuator		175 °F | 80 °C for air and gases · 300 °F | 150 °C for water 430 °F | 220 °C for steam with compensation chamber												
With FPM diaphragm in actuator		300 °F | 150 °C												
Compliance		EAC												
Type 2420 RS Actuator														
Actuator area		50 in² | 320 cm²						100 in² | 640 cm²						
Fixed differential pressure set point Δp														
NPS ½ to 6 | DN 15 to 150		3 psi | 0.2 bar												
NPS 8 and 10 | DN 200 and 250		5 psi | 0.3 bar												
Max. permissible temperature														
With EPDM diaphragm		175 °F | 80 °C for air and gases · 300 °F | 150 °C for water 430 °F | 220 °C for steam with compensation chamber												
With FPM diaphragm		300 °F | 150 °C												
Compliance		EAC												

[1] Terms for control valve sizing according to IEC 60534 (ANSI/FCI 70-2): $F_L = 0.95$, $X_T = 0.75$

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