Translation of original instructions

Type 42-10 RS Check Valve (backflow protection)

Self-operated Regulators

Edition April 2019
Note on these mounting and operating instructions

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices.

➔ For the safe and proper use of these instructions, read them carefully and keep them for later reference.

➔ If you have any questions about these instructions, contact SAMSON’s After-sales Service Department (aftersalesservice@samson.de).

The mounting and operating instructions for the devices are included in the scope of delivery. The latest documentation is available on our website at www.samson.de > Service & Support > Downloads > Documentation.

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

ℹ️ Note
Additional information

☀️ Tip
Recommended action
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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 2014/34/EU.

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 saturated steam, nitrogen and compressed air networks against backflow from directly connected systems.

- Differential pressure set point
  \[ \Delta p = 0.2 \text{ bar} \cdot 0.3 \text{ bar} \cdot 3 \text{ psi} \cdot 5 \text{ psi} \]

- Valve sizes DN 15 to 250/NPS ½ to 10

- Pressure rating PN 25 · 40/
  Class 150 · 300

- Compressed air and nitrogen up to 80 °C · 150 °C/175 °F · 300 °F

- Saturated steam with compensation chamber up to 220 °C/430 °F

- Liquids up to 80 °C/175 °F

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.

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).

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1) DN 200 and 250/NPS 8 and 10 version
2) Version with FKM diaphragm
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 \(p_1\) 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 medium supply 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 upstream 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 indicator (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 (18) can be optionally mounted to the actuator to trigger an alarm.

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\(^1\) DN 200 and 250/NPS 8 and 10 version
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.

4.1 Mounting position

The regulators are supplied ready for connection.

- Install the regulator in a horizontal pipeline.

- 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 weather conditions (temperature, humidity).

Protect the regulator against frost if it is used to control freezing media. Heat the regulator.

4.2 Compensation chamber for steam

The mounting position of the compensation chamber is indicated by an adhesive label on the chamber itself as well as by an arrow and the word ”top” stamped on the top of the chamber.

![Diagram of a compensation chamber for steam]

Fig. 2: Sample application

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
This mounting position must be adhered to; otherwise the safe functioning of the regulator cannot be guaranteed.

### 4.3 Strainer

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).

- Do not use the strainer to permanently filter the process medium.
- 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.

### 4.4 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.

### 4.5 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.

- For steam applications, make sure that the pipelines are dry. Moisture will damage the inside of the valve.
- Ensure that all valves downstream of the regulator are open.
- Open the shut-off valves preferably starting from the downstream of valve. Slowly open the valves in small steps waiting a few minutes in between.
- 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.

5.1.1 Regulation of steam

Unscrew filler plug (20, width across flats 13) on the compensation chamber. Use the included plastic funnel or a jug to pour in water until it starts to overflow. Screw the filler plug back in and tighten it (25 Nm). The regulator is now ready for operation. Open the hand-operated shut-off valves slowly to prevent water hammer.

5.1.2 Regulation of liquids

To start up the regulator, open shut-off valves slowly.

5.2 Set point adjustment

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. It closes automatically when the downstream pressure rises to or above the value of the upstream pressure.

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.
### Table 1: Troubleshooting

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

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

6.1 Tests
Detailed test instructions ▶ SH 3009
They 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.

7 After-sales service
Contact SAMSON’s After-sales Service department for support concerning service or repair work or when malfunctions or defects arise.

E-mail address
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, 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 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.)
8 Nameplates

Nameplates are attached to the valve and the actuator.

**Valve nameplate**

**DIN version**

```
SAMSON
DN psi
Made in Germany
```

**ANSI version**

```
SAMSON
Size ANSI
Made in Germany
```

**Actuator nameplate**

```
SAMSON
Pmax psi
Made in Germany
```

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**Valve**

1. Valve type
2. Model number
3. Configuration ID
4. Order number or date
5. \( K_v \) coefficient
6. Valve size
7. Nominal pressure
8. Perm. differential pressure in bar
9. Perm. temperature in °C
10. 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 (\( K_v \times 1.17 \))
12. Class (pressure rating)

**Actuator**

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

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**Fig. 3: Nameplates**
9 Dimensions

Fig. 4: Dimensions

Table 2: Dimensions and weights · DIN version

<table>
<thead>
<tr>
<th>Valve size DN</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>32</th>
<th>40</th>
<th>50</th>
<th>65</th>
<th>80</th>
<th>100</th>
<th>125</th>
<th>150</th>
<th>200</th>
<th>250</th>
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</thead>
<tbody>
<tr>
<td>Length L</td>
<td>130</td>
<td>150</td>
<td>160</td>
<td>180</td>
<td>200</td>
<td>230</td>
<td>290</td>
<td>310</td>
<td>350</td>
<td>400</td>
<td>480</td>
<td>600</td>
<td>730</td>
</tr>
<tr>
<td>Height H1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>225</td>
<td>300</td>
<td>355</td>
<td>460</td>
<td>590</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>Height H2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>100</td>
<td>120</td>
<td>145</td>
<td>175</td>
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<td>Other materials</td>
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<td>100</td>
<td>120</td>
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<tr>
<td>Forged steel</td>
<td>53</td>
<td>–</td>
<td>70</td>
<td>–</td>
<td>92</td>
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<tr>
<td>Height H</td>
<td>550</td>
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<td>800</td>
<td>830</td>
<td>1000</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Actuator</td>
<td>ØD = 285 mm · A = 320 cm²</td>
<td>ØD = 390 mm · A = 640 cm²</td>
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### Table 3: Dimensions and weights · ANSI version

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<td>260</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actuator</td>
<td>ANSI</td>
<td>ØD = 11.2&quot; · A = 50 in²</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DIN</td>
<td>ØD = 285 mm · A = 320 cm²</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
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<td>Weight, approx.</td>
<td>Class 150</td>
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<td>26</td>
<td>26.5</td>
<td>28</td>
<td>35.5</td>
<td>39.5</td>
<td>59.5</td>
<td>65.5</td>
<td>75</td>
<td>165</td>
<td>405</td>
</tr>
<tr>
<td>Class 300</td>
<td>lb</td>
<td>60</td>
<td>61</td>
<td>65</td>
<td>82</td>
<td>91</td>
<td>137</td>
<td>151</td>
<td>173</td>
<td>376</td>
<td>900</td>
<td>1040</td>
</tr>
<tr>
<td></td>
<td>kg</td>
<td>27</td>
<td>27.5</td>
<td>29.5</td>
<td>37</td>
<td>41.5</td>
<td>62</td>
<td>68.5</td>
<td>78.5</td>
<td>170.5</td>
<td>410</td>
<td>470</td>
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</tbody>
</table>
### Technical data

**10 Technical data**

#### Type 2421 RS Valve

<table>
<thead>
<tr>
<th>Valve size</th>
<th>NPS</th>
<th>⅛</th>
<th>⅜</th>
<th>⅝</th>
<th>1</th>
<th>1¼</th>
<th>1½</th>
<th>2</th>
<th>2¼</th>
<th>3</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>32</td>
<td>40</td>
<td>50</td>
<td>65</td>
<td>80</td>
<td>100</td>
<td>125</td>
<td>150</td>
<td>200</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>CV and KVS coefficient</td>
<td>C_V</td>
<td>4.5</td>
<td>7.5</td>
<td>9.4</td>
<td>-</td>
<td>37</td>
<td>37</td>
<td>60</td>
<td>94</td>
<td>145</td>
<td>-</td>
<td>330</td>
<td>490</td>
<td>585</td>
</tr>
<tr>
<td></td>
<td>K_VS</td>
<td>4</td>
<td>6.3</td>
<td>8</td>
<td>16</td>
<td>20</td>
<td>32</td>
<td>50</td>
<td>80</td>
<td>125</td>
<td>125</td>
<td>280</td>
<td>420</td>
<td>500</td>
</tr>
</tbody>
</table>

**Pressure rating**

<table>
<thead>
<tr>
<th>Max. constant operating pressure</th>
<th>Class 150 or 300/PN 25 or 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. perm. pressure acting on one side</td>
<td>360 psi/25 bar</td>
</tr>
<tr>
<td>Leakage class 1) according to IEC 60534-4 (ANSI/FCI 70-2)</td>
<td>650 psi/45 bar</td>
</tr>
<tr>
<td>Max. permissible temperature</td>
<td>Leakage class VI</td>
</tr>
<tr>
<td>With EPDM diaphragm in actuator</td>
<td>175 °F/80 °C for air, gases and water</td>
</tr>
<tr>
<td></td>
<td>430 °F/220 °C for steam with compensation chamber</td>
</tr>
<tr>
<td>With FKM diaphragm in actuator</td>
<td>300 °F/150 °C for air and gases</td>
</tr>
</tbody>
</table>

**Compliance**

<table>
<thead>
<tr>
<th>Type 2420 RS Actuator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator area</td>
</tr>
<tr>
<td>Fixed differential pressure set point Δp</td>
</tr>
<tr>
<td>NPS ½ to 6/DN 15 to 150</td>
</tr>
<tr>
<td>NPS 8 and 10/DN 200 and 250</td>
</tr>
<tr>
<td>Max. permissible temperature</td>
</tr>
<tr>
<td>With EPDM diaphragm</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>With FKM diaphragm</td>
</tr>
</tbody>
</table>

**Compliance**

### Terms

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