# Series 42 Self-operated Regulators

# Type 42-10 RS Check Valve (backflow protection)

**ANSI version**

## Application

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

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

The regulator prevents flowback from directly connected systems.

The regulator is opened when the upstream pressure is at least 3 psi/5 psi [1] (0.2 bar/0.3 bar) greater than the downstream pressure. It is closed automatically when the downstream pressure rises to or above the value of the upstream pressure.

The regulator closes reliably to prevent backflow from the plant into the compressed air or nitrogen network. The soft-seated plug and seat trim complies with leakage class VI.

## Special features

- Low-noise, medium-controlled proportional regulators requiring little maintenance
- In the event of a diaphragm rupture, the undamaged operating diaphragm takes over the function of the damaged diaphragm
- Reliable functioning even in the event of a power failure or when other instruments in the control circuit malfunction
- Diaphragm rupture indicator
- Fixed set point
- Regulators delivered ready-to-install without supplementary devices, meaning no additional installations or start-ups are necessary
- Low purchase and installation costs
- Valve body optionally made of cast steel A216 WCC or cast stainless steel A351 CF8M
- All wetted parts are free of non-ferrous metal
- External adjustment not possible
- Backflow only leads to a minimum amount of leakage (leakage class VI) due to the soft-seated plug
- An increasing backpressure supports tight shut-off of the valve

**Fig. 1:** *Type 42-10 RS Check Valve (backflow protection)*

## Versions

### Check valve in supply pipelines

**Type 42-10 RS** · Class 150 and 300 · Type 2421 RS Valve, NPS ½ to 10 (DN 15 to 250) · Type 2420 RS Actuator with two diaphragms · Set point fixed at 3 psi (0.2 bar) or 5 psi [1] (0.3 bar) · Special version in stainless steel · Version suitable for steam on request · Version for deionized water on request

**Optional:** Diaphragm rupture indication with pressure switch · Fittings and diaphragm rupture indicator made of Monel

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

**Principle of operation**

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). The valve is closed by the springs in the normal position.

At a differential pressure of 3 psi/5 psi [1] (0.2 bar/3.0 bar), the valve begins to open; at 5 psi/7 psi (0.35 bar/0.55 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.

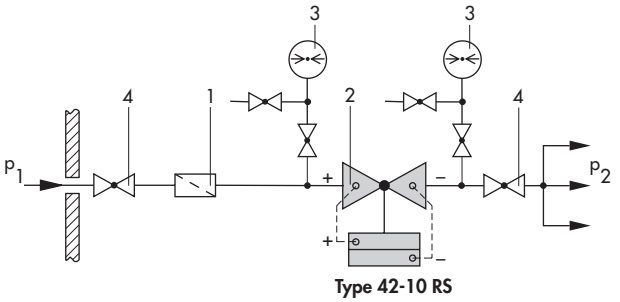
The actuator with two diaphragms (11) offers increased safety and reliability of functions. The operating diaphragm for high pressure (11.1) is connected to the valve input pressure, whereas the operating diaphragm for low pressure (11.2) is connected to the valve output pressure. There is a bore with 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 22 psi (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 then takes over the function of the damaged operating diaphragm.

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

If a diaphragm rupture is indicated, we recommend replacing both diaphragms.

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

**Typical application**

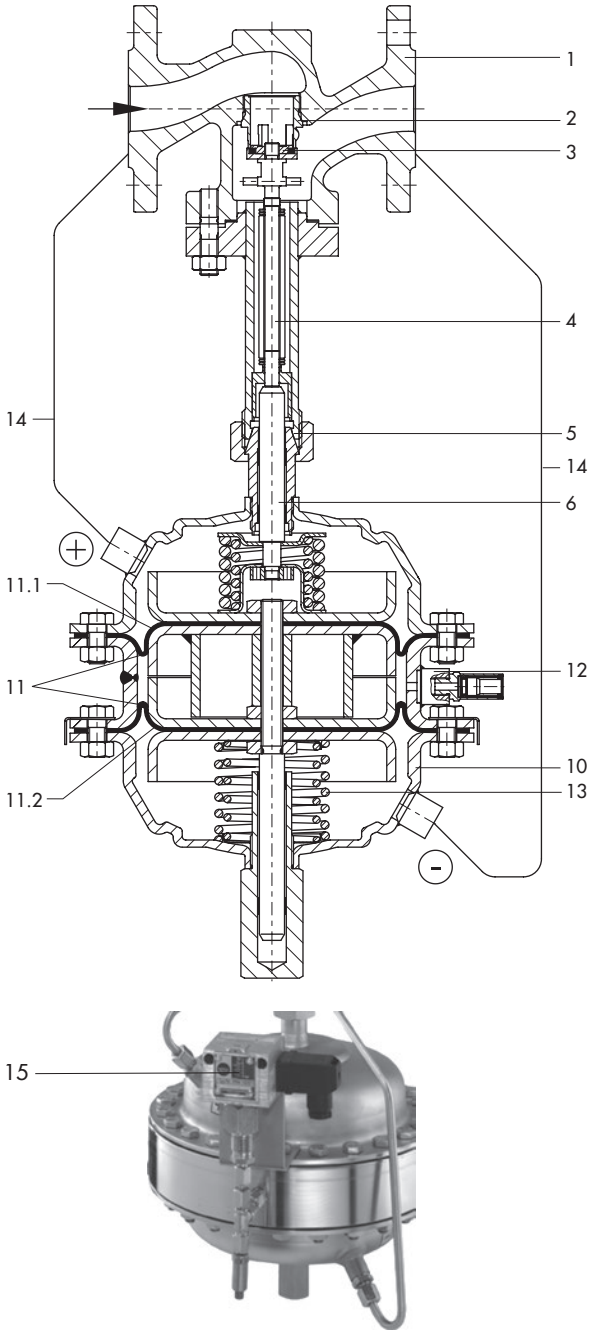



**Type 42-10 RS**

1 Strainer
2 Check valve (backflow protection)
3 Pressure gauge
4 Shut-off valve

$p_1$ Upstream pressure
$p_2$ Downstream pressure

**Fig. 2:** *Typical application*




1 Valve body
2 Seat
3 Plug
4 Plug stem
5 Coupling nut (to connect diaphragm actuator)
6 Actuator stem
10 Actuator housing
11 Two diaphragms
11.1 Operating diaphragm for high pressure
11.2 Operating diaphragm for low pressure
12 Diaphragm rupture indicator
13 Set point springs
14 Control line 0.3″x0.04″ (8x1 mm)
15 Pressure switch (optional)

**Fig. 3:** *Functional diagram*

**Table 1:** *Technical data*

| **Type 2421 RS Valve** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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** |
| $C_V$ and $K_{VS}$ coefficient | $C_V$ | 4.5 | 7.5 | 9.4 | 23 | 37 | 60 | 94 | 145 | 330 | 490 | 585 |
| | $K_{VS}$ | 4 | 6.3 | 8 | 20 | 32 | 50 | 80 | 125 | 280 | 420 | 500 |
| Pressure rating | | Class 150 or 300 (PN 25 or 40) | | | | | | | | | | |
| Max. constant operating pressure | | 360 psi (25 bar) | | | | | | | | | | |
| Max. perm. pressure acting on one side | | 650 psi (45 bar) | | | | | | | | | | |
| Leakage class according to ANSI/FCI 70-2 [1] | | Leakage class VI | | | | | | | | | | |
| Max. permissible temperature<br>with EPDM diaphragm in actuator<br>with FPM diaphragm in actuator | | 175 °F (80 °C) for air and gases · 300 °F (150 °C) for water<br>430 °F (220 °C) for steam with compensation chamber<br>300 °F (150 °C) | | | | | | | | | | |
| Compliance | | EAC | | | | | | | | | | |
| **Type 2420 RS Actuator** | | | | | | | | | | | | |
| Actuator area | | 50 in² (320 cm²) | | | | | 100 in² (640 cm²) | | | | | |
| Differential pressure set point Δp, fixed<br>NPS ½ to 6<br>NPS 8 and 10 | | 3 psi · 0.2 bar<br>5 psi · 0.3 bar | | | | | | | | | | |
| Max. permissible temperature<br>with EPDM diaphragm<br>with FPM diaphragm | | 175 °F (80 °C) for air and gases · 300 °F (150 °C) for water<br>430 °F (220 °C) for steam with compensation chamber<br>300 °F (150 °C) | | | | | | | | | | |
| Compliance | | EAC | | | | | | | | | | |

[1] Terms for control valve sizing according to IEC 60534: $F_L = 0.95$, $X_T = 0.75$

**Table 2:** *Materials· Material numbers according to DIN EN*

| **Type 2421 RS Valve** | | | | |
|---|---|---|---|---|
| **Pressure rating** | **Class 150** | **Class 300** | **Class 150** | **Class 300** |
| Valve body | Cast steel A216 WCC | | Cast stainless steel A351 CF8M | |
| Seat and plug | Stainless steel 1.4404 with EPDM soft seal | | | |
| Plug stem | Stainless steel 1.4301 | | | |
| Bottom section | Stainless steel A479 316L/1.4404 · S30400/1.4301 | | | |
| Body gasket | novatec® PREMIUM | | | |
| **Type 2420 RS Actuator** | | | | |
| Diaphragm cases | Sheet steel DD11 | | Stainless steel 1.4301 | |
| Diaphragm | EPDM with fabric reinforcement · FPM | | | |
| Guide bushing | DU bushing | | PTFE bushing | |
| Distance piece | Sheet steel DD11 | | Stainless steel 1.4301 | |
| Coupling pin | Stainless steel 1.4301 | | | |
| Seals | EPDM · FPM | | | |

**Installation**

The regulator is delivered ready for installation.

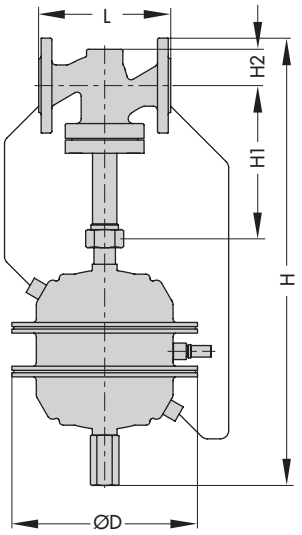
The following points must be observed:

– Install the valves in horizontal pipelines free of stress with the actuator suspended downwards (or facing upwards with NPS 8 and 10/DN 200 and 250; see Fig. 4).

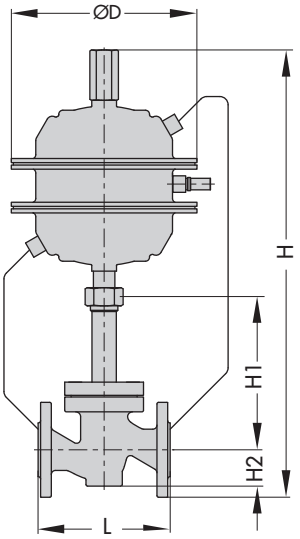
– Direction of flow must match the direction indicated by the arrow on the body.

– Install a strainer upstream of the valve.

**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)**

**Dimensions in mm 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 |

**Fig. 4:** *Dimensions*

**Ordering text**

**Type 42-10 RS** Check Valve (= Valve 4210 RS + Actuator 2420 RS + Mounting unit M 4210 RS)

Set point fixed at 3 psi (0.2 bar) with NPS ½ to 6

Set point fixed at 5 psi (0.3 bar) with NPS 8 and 10

NPS (DN) …

Body material …, Class …

Special version

**Table 3:** *Flow rates for Type 2421 RS Valve*

**Table 3.1:** *Flow rates for* ***nitrogen***

**5 psi pressure drop across the valve**

| **Valve size NPS** | ½ | ¾ | **1** | **1½** | **2** | **2½** | **3** | **4** | **6** |
|---|---|---|---|---|---|---|---|---|---|
| **$C_V$ coefficient** | 4.5 | 7.5 | 9.4 | 23 | 37 | 60 | 94 | 145 | 330 |
| **Input pressure $p_1$** (gauge) in psi | **Maximum flow rate** of **nitrogen** (x$10^3$ SCFH) at **70 °F** | | | | | | | | |
| **75** | 4.99 | 8.32 | 10.4 | 25.5 | 41 | 66.6 | 104 | 137 | 366 |
| **125** | 6.29 | 10.5 | 13.1 | 32.2 | 51.7 | 83.9 | 131 | 173 | 461 |
| **275** | 9.15 | 15.2 | 19.1 | 46.7 | 75.2 | 122 | 191 | 252 | 671 |
| **300** | 9.54 | 15.9 | 19.9 | 48.7 | 78.4 | 127 | 199 | 260 | 699 |
| **350** | 10.3 | 17.1 | 21.5 | 52.5 | 84.5 | 137 | 215 | 283 | 754 |

**10 psi pressure drop across the valve**

| **Valve size NPS** | ½ | ¾ | **1** | **1½** | **2** | **2½** | **3** | **4** | **6** |
|---|---|---|---|---|---|---|---|---|---|
| **$C_V$ coefficient** | 4.5 | 7.5 | 9.4 | 23 | 37 | 60 | 94 | 145 | 330 |
| **Inlet pressure $p_1$** (gauge) in psi | **Maximum flow rate** of **nitrogen** (x$10^3$ SCFH) at **70 °F** | | | | | | | | |
| **75** | 6.86 | 11.4 | 14.3 | 35.1 | 56.4 | 91.5 | 143 | 189 | 503 |
| **125** | 8.74 | 14.6 | 18.3 | 44.7 | 71.9 | 117 | 183 | 240 | 641 |
| **275** | 12.8 | 21.4 | 26.8 | 65.5 | 105 | 171 | 268 | 350 | 940 |
| **300** | 13.4 | 22.3 | 28 | 68.4 | 110 | 178 | 280 | 365 | 981 |
| **350** | 14.4 | 24.1 | 30.2 | 73.8 | 119 | 193 | 302 | 397 | 1059 |

**15 psi pressure drop across the valve**

| **Valve size NPS** | ½ | ¾ | **1** | **1½** | **2** | **2½** | **3** | **4** | **6** |
|---|---|---|---|---|---|---|---|---|---|
| **$C_V$ coefficient** | 4.5 | 7.5 | 9.4 | 23 | 37 | 60 | 94 | 145 | 330 |
| **Inlet pressure $p_1$** (gauge) in psi | **Maximum flow rate** of **nitrogen** (x$10^3$ SCFH) at **70 °F** | | | | | | | | |
| **75** | 8.16 | 13.6 | 17.1 | 41.7 | 67.1 | 109 | 171 | 225 | 599 |
| **125** | 10.5 | 17.5 | 22 | 53.7 | 86.4 | 140 | 220 | 289 | 771 |
| **275** | 15.6 | 26 | 32.5 | 79.6 | 128 | 208 | 325 | 429 | 1142 |
| **300** | 16.3 | 27.1 | 34 | 83.1 | 134 | 217 | 340 | 448 | 1193 |
| **350** | 17.6 | 29.3 | 36.7 | 89.8 | 144 | 234 | 367 | 484 | 1288 |

**Table 3.2:** *Flow rate set points for* ***air***

**5 psi pressure drop across the valve**

| **Valve size** **NPS** | ½ | ¾ | **1** | **1½** | **2** | **2½** | **3** | **4** | **6** |
|---|---|---|---|---|---|---|---|---|---|
| **$C_V$ coefficient** | 4.5 | 7.5 | 9.4 | 23 | 37 | 60 | 94 | 145 | 330 |
| **Inlet pressure $p_1$** (gauge) in psi | **Maximum flow rate** of **air** (x$10^3$ SCFH) at **70 °F** | | | | | | | | |
| **75** | 4.92 | 7.97 | 10.3 | 25.2 | 40.5 | 65.7 | 103 | 134 | 361 |
| **125** | 6.21 | 10.1 | 13 | 31.8 | 51.1 | 82.9 | 129.8 | 168 | 456 |
| **275** | 9.05 | 14.6 | 18.9 | 46.2 | 74.4 | 121 | 189 | 245 | 663 |
| **300** | 9.43 | 15.3 | 19.7 | 48.2 | 77.6 | 126 | 197 | 256 | 692 |
| **350** | 10.2 | 16.5 | 21.3 | 52 | 83.7 | 136 | 213 | 276 | 746 |

**10 psi pressure drop across the valve**

| **Valve size** **NPS** | ½ | ¾ | 1 | 1½ | 2 | 2½ | 3 | 4 | 6 |
|---|---|---|---|---|---|---|---|---|---|
| **$C_V$ coefficient** | 4.5 | 7.5 | 9.4 | 23 | 37 | 60 | 94 | 145 | 330 |
| **Inlet pressure $p_1$** (gauge) in psi | **Maximum flow rate** of **air** (x$10^3$ SCFH) at **70 °F** | | | | | | | | |
| **75** | 6.77 | 11 | 14.2 | 34.6 | 55.7 | 90.4 | 142 | 184 | 497 |
| **125** | 8.63 | 14 | 18 | 44.1 | 71 | 115 | 180 | 234 | 633 |
| **275** | 12.7 | 20.5 | 26.5 | 64.9 | 104 | 169 | 265 | 344 | 931 |
| **300** | 13.2 | 21.4 | 27.7 | 67.7 | 109 | 177 | 278 | 359 | 971 |
| **350** | 14.3 | 23.1 | 29.9 | 73.1 | 118 | 191 | 299 | 388 | 1049 |

**15 psi pressure drop across the valve**

| **Valve size** **NPS** | ½ | ¾ | **1** | **1½** | **2** | **2½** | **3** | **4** | **6** |
|---|---|---|---|---|---|---|---|---|---|
| **$C_V$ coefficient** | 4.5 | 7.5 | 9.4 | 23 | 37 | 60 | 94 | 145 | 330 |
| **Inlet pressure $p_1$** (gauge) in psi | **Maximum flow rate** of **air** (x$10^3$ SCFH) at **70 °F** | | | | | | | | |
| **75** | 8.06 | 13.3 | 16.8 | 41.2 | 66.3 | 107.6 | 168 | 219 | 591 |
| **125** | 10.4 | 16.8 | 21.7 | 53.1 | 85.4 | 138 | 217 | 282 | 762 |
| **275** | 15.4 | 25 | 32.2 | 78.8 | 127 | 205 | 322 | 418 | 1130 |
| **300** | 16.1 | 26 | 33.6 | 82.3 | 132 | 215 | 336 | 437 | 1180 |
| **350** | 17.4 | 28.2 | 36.4 | 89 | 143 | 232 | 364 | 472 | 1276 |

Specifications subject to change without notice

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