

## SH 3009 EN

Translation of original instructions



**Type 42-10 RS Check Valve (backflow protection)**  
Self-operated Regulators

## 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*

## Purpose of this manual

The Safety Manual SH 3009 contains information relevant for the use of the Type 42-10 RS Check Valve in plants with safety requirements <sup>1)</sup>. The safety manual is intended for planners, constructors and operators of process plants.

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### **!** NOTICE

#### ***Risk of malfunction due to incorrect mounting, connection or start-up of the device.***

- *Refer to Mounting and Operating Instructions EB 3009 for details on how to mount and start-up the device as well as perform any necessary maintenance work.*
  - *Observe the warnings and safety instructions written in the Mounting and Operating Instructions EB 3009.*
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## Further documentation

The documents listed below contain descriptions of the start-up, functioning and operation of the check valve. You can download these documents from the SAMSON website.

- ▶ T 3009: Data sheet for DIN version
- ▶ T 3010: Data sheet for ANSI version
- ▶ EB 3009: Mounting and operating instructions

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<sup>1)</sup> SIL is based on IEC 61508/61511 (Functional safety of electrical/electronic/programmable electronic safety-related systems) and cannot be applied to entirely mechanical equipment.

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# 1 Scope

## 1.1 General

The check valve is designed to protect nitrogen and compressed air networks against backflow from directly connected systems. It basically consists of a valve and an opening actuator with two diaphragms. Mounted control lines transmit the upstream and downstream pressures to the actuator. This actuator opens or closes the valve depending on the differential pressure.

## 1.2 Use

The Type 42-10 RS Check Valve has been used for over 25 years and is proven in use. It is suitable for backflow protection in process plants.

## 1.3 Versions and ordering data

All versions of the Type 42-10 RS Check Valve are suitable for backflow protection.

## 1.4 Mounting

The check valve is delivered as a ready-to-install unit without additional devices. It can be mounted into the pipeline without the need for any additional installation work.

## 2 Technical data

Type 2421 RS Valve												
Valve size	NPS	½	¾	1	–	1½	2	2½	3	4	–	6
	DN	15	20	25	32	40	50	65	80	100	125	150
C <sub>V</sub> and K <sub>VS</sub> coefficient	C <sub>V</sub>	4.5	7.5	9.4	–	37	37	60	94	145	–	330
	K <sub>VS</sub>	4	6.3	8	16	20	32	50	80	125	125	280
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 <sup>1)</sup> according to IEC 60534-4   ANSI/FCI 70-2	Leakage rate VI											
Max. permissible temperature												
With EPDM diaphragm in actuator	175 °F/80 °C for air, gases and water 430 °F/220 °C for steam with compensation chamber											
With FKM diaphragm in actuator	300 °F/150 °C for air and gases											
Conformity	<b>ERC</b>											
Type 2420 RS Actuator												
Actuator area	50 in <sup>2</sup> /320 cm <sup>2</sup>						100 in <sup>2</sup> /640 cm <sup>2</sup>					
Fixed differential pressure set point Δp	3 psi/0.2 bar											
Max. permissible temperature												
With EPDM diaphragm	175 °F/80 °C for air, gases and water 430 °F/220 °C for steam with compensation chamber											
With FKM diaphragm	300 °F/150 °C for air and gases											
Conformity	<b>ERC</b>											

<sup>1)</sup> Terms for control valve sizing according to IEC 60534 (ANSI/FCI 70-2): F<sub>L</sub> = 0.95, X<sub>T</sub> = 0.75

### 3 Safety-related functions

#### Preventing the medium from flowing back in the opposite direction than the specified flow direction

The check valve monitors the differential pressure across the valve. The valve is open provided the upstream pressure is greater than the downstream pressure by at least the differential pressure set point. It closes when the downstream pressure rises and reaches or exceeds the upstream pressure (event of emergency).

Fixed differential pressure set point $\Delta p$	3 psi   0.2 bar
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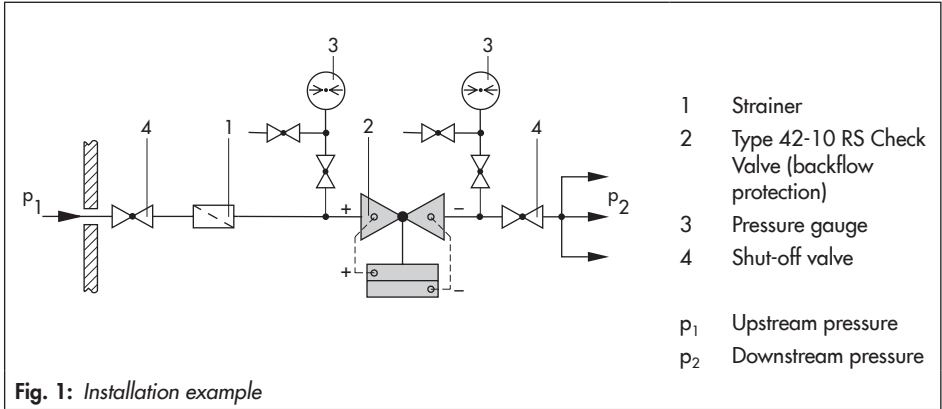


Fig. 1: Installation example

#### 3.1 Fail-safe action

In the event of emergency, the valve closes reliably to prevent backflow from the plant into the compressed air or nitrogen network.

#### 3.2 Protection against unauthorized changes to the configuration

The differential pressure set point decisive for the functioning is fixed and cannot be changed by the user.

### **i** Note concerning increased functional safety

The actuator with two diaphragms is fitted with a mechanical diaphragm rupture indicator. In the event of a diaphragm rupture, the pin in the diaphragm rupture indicator is 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 can be optionally mounted to the actuator to trigger an alarm.

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

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## 4 Installation and start-up

The check valve is installed and started up according to the mounting and operating instructions ► EB 3009.

## 5 Required conditions

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### **⚠** WARNING

**Risk of malfunction due to incorrect selection or wrong installation and operating conditions.**

→ Only use check valves in safety-instrumented systems if the necessary conditions in the plant are fulfilled.

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### 5.1 Selection

- In continuous operation, the maximum permissible constant operating pressure of 360 psi | 25 bar is not exceeded.
- The maximum permissible pressure of 650 psi | 45 bar acting on one side is not exceeded.
- The maximum permissible temperature is observed:
  - Actuator 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
  - Actuator with FPM diaphragm: 300 °F | 150 °C



## 5.2 Mechanical installation

- The check valve is installed correctly in a horizontal pipeline.
- The direction of flow corresponds to the direction indicated by the arrow on the body.
- The mounting position of the check valve meets the requirements:
  - The actuator faces downward.
- A strainer installed upstream in the flow pipe holds back any dirt or other foreign particles carried along by the medium.
- The two pressure gauges with sampling connection required for function testing are installed upstream and downstream of the check valve in the pipeline. See section 6.

## 5.3 Operation

- The check valve is only used in operating conditions that meet the specifications used for sizing at the ordering stage.

# 6 Proof testing (periodical testing)

The proof test interval and the extent of testing lie within the operator's responsibility. The operator must draw up a test plan, in which the proof tests and the interval between them are specified. We recommend summarizing the requirements of the proof test in a checklist.

### **⚠ WARNING**

***Risk of dangerous failure due to malfunction in the event of emergency.***

*A valve that does not shut off tightly indicates a malfunction when the downstream pressure rises and reaches the upstream pressure.*

- *Only use devices in safety-instrumented systems that have passed the proof test according to the test plan drawn up by the operator.*

Regularly check the safety-instrumented function of the entire SIS loop. The test intervals are determined, for example on calculating each single SIS loop in a plant ( $PFD_{avg}$ ).

### 6.1 Visual inspection to avoid systematic failure

To avoid systematic failure, inspect the check valve regularly. The frequency and the scope of the inspection lie within the operator's responsibility.

- Checking the diaphragm rupture indicator
- Checking the valve for external leakage of the medium, e.g. at the flanges

Take application-specific influences into account, such as:

- Corrosion (destruction primarily of metals due to chemical and physical processes)
- Material fatigue
- Aging (damage caused to organic materials, e.g. plastics or elastomers, by exposure to light and heat)
- Chemical attack (organic materials, e.g. plastics or elastomer, which swell, leach out or decompose due to exposure to chemicals)

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#### **NOTICE**

***Risk of malfunction due to the use of unauthorized parts.***

➔ *Only use original parts to replace worn parts.*

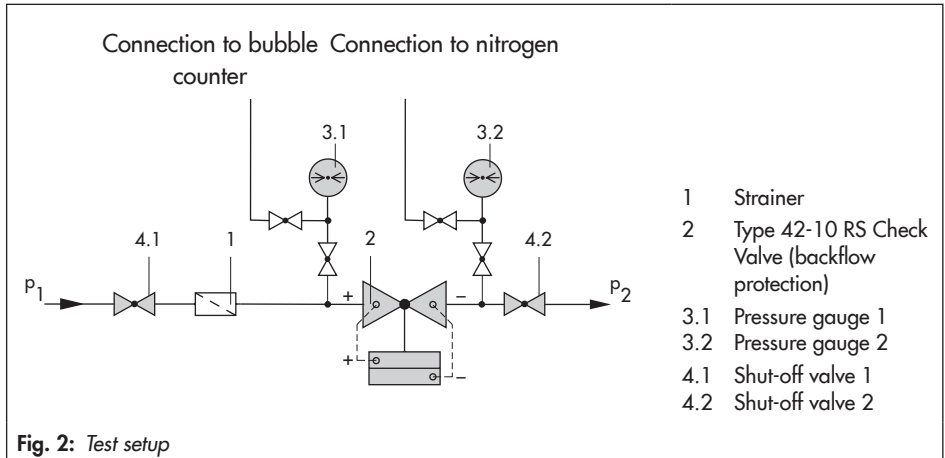
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### 6.2 Function testing

Regularly check the safety-instrumented function according to the test plan drawn up by the operator.

#### **Required accessories for testing:**

- Nitrogen cylinder with pressure reducing valve 200 bar
- Pneumatic input unit, e.g. SAMSON order no. 9932-2262
- Bubble counter



1. Depressurize and completely drain the plant section, in which the check valve is installed by closing shut-off valve (4.1).
2. Connect the pneumatic input unit and nitrogen cylinder with pressure reducing valve to the pressure gauge connection (3.2).
3. Apply 0.1 bar(g) test pressure to the pressure gauge connection (3.2).
4. Connect the bubble counter at pressure gauge connection (3.1).
5. Completely open the shut-off ball valve at 3.1 connection.
6. Slowly open the shut-off ball valve at 3.2 connection.
7. Watch the bubble counter. No bubbles should be visible when the 3.2 connection is completely open.

**i Note**

*The time until there are no bubbles depends on the volume of the pipeline.*

8. After completing the test, disconnect the nitrogen cylinder and bubble counter. Put the check valve back into operation (see ► EB 3009).

### 7 Repairs

Only perform the work on the check valve described in ► EB 3009.

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**! NOTICE**

***Safety-instrumented function will be impaired if repair work is performed incorrectly.***

→ *Only allow trained staff to perform service and repair work.*

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### 8 Safety-related data

The following MTBF data can be used for safety analysis.

MTBF <sub>total</sub>	920 years
MTBF <sub>dangerous</sub>	2640 years







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