



*Fig. 1*  
*Type 3372-04xx*  
*Pneumatic Actuator*



*Fig. 2*  
*V 2001-IP Control Valve*  
*Type 3372-0511/0531 Electropneumatic*  
*Actuator with Type 3321 Valve*

## Mounting and Operating Instructions

**EB 8313 EN**

Edition February 2004

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- ▶ *Assembly, start-up, and operation of the device may only be performed by trained and experienced personnel familiar with this product. According to these mounting and operating instructions, trained personnel is referred to as individuals who are able to judge the work they are assigned to and recognize possible hazards due to their specialized training, their knowledge and experience as well as their knowledge of the relevant standards. Explosion-protected versions of this device may only be operated by personnel who have undergone special training or instructions or who are authorized to work on explosion-protected devices in hazardous areas.*
- ▶ *Any hazards which could be caused at the valve by the process medium, the operating pressure, the signal pressure or moving parts are to be prevented by means of the appropriate measures. If inadmissible motions or forces are produced in the pneumatic actuator as a result of an excessive supply pressure, this must be restricted by means of a suitable pressure reducing station.*
- ▶ *The springs in the actuator housing are pretensioned. Therefore, the diaphragm actuator may only be opened with special tools by the manufacturer.*
- ▶ *Proper shipping and appropriate storage are assumed.*
- ▶ **Note!** *The device with a CE marking fulfils the requirements of the Directives 94/9/EC (ATEX) and 89/336/EEC (EMC). The declaration of conformity can be viewed and downloaded on the Internet at <http://www.samson.de>.*

### 1 Design and principle of operation

The actuators are designed for attachment to Series V 2001 Valves (Type 3321, Type 3323, Type 3531, Type 3535, Type 3214 (DN 65 to 100) and Type 3260 (DN 65 and 80).

The actuators basically consist of two diaphragm cases, a rolling diaphragm and springs.

The electropneumatic actuators are additionally equipped with an i/p converter and a pneumatic control system for control operation. For actuators with fail-safe position "Actuator stem extends", the converter and the control system are mounted in the lower diaphragm case, and for versions "Actuator stem retracts", in the upper diaphragm case.

The signal pressure creates a force which acts on the diaphragm. The springs installed in the diaphragm chamber oppose this force, thus ensuring compensation.

When the signal pressure fails, the springs installed either in the top or bottom diaphragm chamber determine the actuator's operating direction and **fail-safe position**.

#### **Actuator stem extends:**

Upon signal pressure failure, the actuator stem extends and closes the valve (globe valve).

#### **Actuator stem retracts:**

Upon signal pressure failure, the actuator stem retracts and opens the valve (globe valve).

#### **Electropneumatic actuators**

The electric control signal issued by the controller as reference variable ranging from 4 to 20 mA is transmitted to the i/p converter

where it is converted into a proportional pressure signal.

The pressure signal creates a force that acts on the measuring diaphragm (11). This force is then compared with the force of the measuring spring (13). The movement of the measuring diaphragm is transmitted via the lever (12) to the force switch (15), and finally a corresponding signal pressure is produced.

Changes in the input signal or the valve position cause a change in the actuator stem position, corresponding to the reference variable.

#### **Tight-closing function:**

The electropneumatic actuator is either fully vented or fully pressurized whenever the reference variable exceeds or falls below a certain preset value.

#### **Type 3372: "Actuator stem extends"**

includes a switch-off function that is activated when the switching point of 4.08 mA is not reached. The actuator will be fully vented. In globe valves, the actuator springs will close the valve.

In three-way valves, port **B** is closed when the valve is used for mixing service and port **A** is closed when the valve is used for diverting service.

#### **Type 3372: "Actuator stem retracts"**

includes a switch-on function that is activated when the switching point of 19.92 mA is exceeded. The actuator will be pressurized, causing a globe valve to close tightly.

In three-way valves, port **B** is closed when the valve is used for mixing service and port **A** is closed when the valve is used for diverting service.

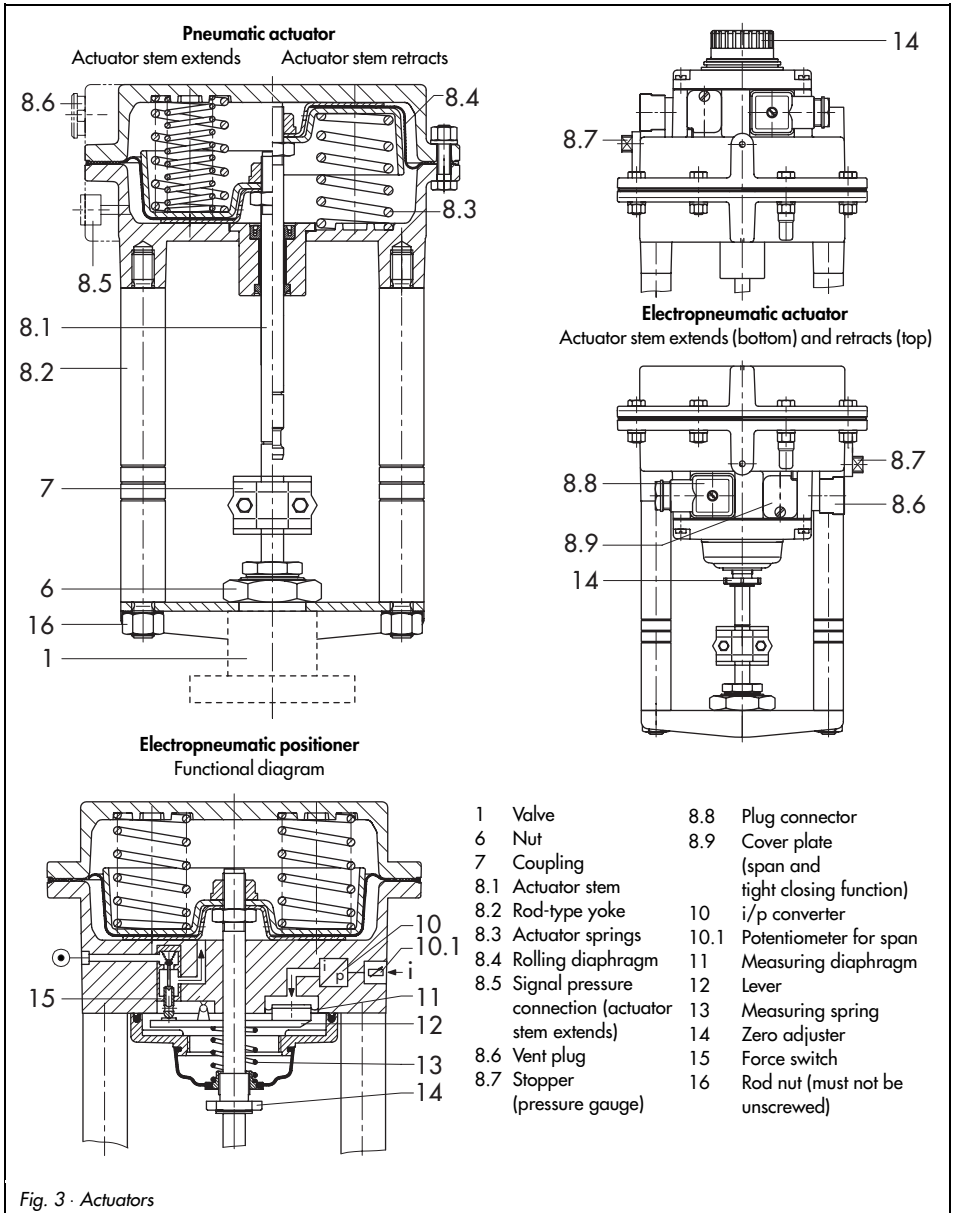


Fig. 3 · Actuators

## 1.1 Technical data

Actuator	Pneumatic actuator for V 2001-P		Electropneumatic actuator for V 2001-IP	
Fail-safe position	Type 3372			
Actuator stem ext. (FA)	- 0411	- 0431	- (0/1)511	- (0/1)531
Actuator stem retr. (FE)	- 0421	- 0441	- (0/1)521	- (0/1)541
Rated travel	15	15 (12, 6)	15	15
Bench range	FA FE	2.1...3.3 0.4...1.4	1.4...2.3 1.4...2.3	2.1...3.3 0.4...1.4
Supply pressure	Max. 6 bar	Max. 4 bar	Max. 6 bar	Max. 4 bar
Reference variable			4 to 20 mA, min. current 3.6 mA Load impedance ≤ 6 V (300 Ω for 20 mA)	
Span adjustment			With potentiometer, 25 % of the travel range	
Operating direction			Increasing/increasing, fixed	
Characteristic			Linear, deviation of ≤ 2 % when adjusted to fixed value	
Hysteresis			≤ 1 %	
Variable position			≤ 7 %	
Tight-closing function (deactivation via jumper)			FA: switched off at ≤ 4.08 mA, FE: switched on at ≥ 19.92 mA Differential gap: 0.09 mA	
Air consumption in steady state			When w = 100 %: 6 bar ≤ 200 l <sub>n</sub> /h 4 bar ≤ 160 l <sub>n</sub> /h	
Temperature range	-35 to 90 °C		-30 to 70 °C	
Degree of protection			IP 54 <sup>1)</sup> Explosion protection EEx ia II C T5 optional	
Weight	3.3 kg		3.7 kg	
<b>Limit switch</b>				
Explosion protection	Explosion-proof enclosure EEx d II CT6 according to PTB No. Ex-79/1016			
Load	AC voltage: 250 V / 5 A		DC voltage: 250 V / 0.4 A	
Perm. ambient temp.	-20 to +60 °C			
Degree of protection	IP 66			
Weight approx. kg	0.4			

<sup>1)</sup> IP 65 if the vent plug is replaced by a filter check valve (order no. 1790-7408).

## 2 Attachment to valve

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### **Note!**

Pressurize actuators with fail-safe position "**Actuator stem extends**" before attaching them to a valve to allow the actuator stem to retract slightly.

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Should no signal pressure or, for electro-pneumatic actuators, should also no electric control signal be available during the mounting procedure, tighten the hexagon nut (6) against the force of the preloaded springs using a hexagonal wrench with width across flats SW 36.

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### **Caution!**

*Under no circumstances must the rod nuts of the rod-type yoke be unscrewed.*

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Actuators with fail-safe position "**Actuator stem retracts**" only require to be pressurized for attaching the stem connector. The reason for this is that in three-way valves, for example, the plug stem might not reach the actuator stem after being pulled out of the valve body. If this is the case, the top diaphragm chamber must be pressurized until the plug stem and actuator stem come into contact so that the stem connector can be mounted.

For electropneumatic actuators, a signal pressure can be applied to the pressure gauge connection, however, the stopper (8.7, Fig. 3 top) must be removed first.

## Attachment using signal pressure or mA control signal

1. **For the pneumatic actuator**, apply a pressure of approx. 3 bar to the lateral signal pressure connection (8.5) located at the bottom diaphragm chamber.  
**For the electropneumatic actuator**, apply a pressure of approx. 3 bar to the "Supply" connection and additionally connect a control signal of approx. 10 mA to retract the actuator stem.
2. Remove the hexagon nut (6) from the valve bonnet and place the actuator with its stem retracted by means of the signal pressure on the valve bonnet.
3. Make sure the actuator is in the proper position and secure the hexagon nut (SW 36) applying a tightening torque of min. 150 Nm.
4. Pull up plug stem (3) until it contacts the actuator stem.
5. Attach the stem connector pieces to each stem and screw tight using the fastening screws.

## 3 Connections

### 3.1 Pneumatic connections

The air connections of the pneumatic actuator are tapped holes with G1/8 thread, whereas the electropneumatic actuator has tapped holes with G1/4 thread. The customary male connections for metal pipes or plastic hoses can be used.

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**Important!** *The supply air must be dry, oil and dust free. You are required to strictly observe the maintenance instructions for upstream reducing stations. Thoroughly purge the air pipes prior to installation.*

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The required supply pressure depends on the bench range and the operating direction (fail-safe position) of the actuator. The bench range is written on the nameplate, the operating direction is indicated by **FA** or **FE**, or by the respective symbol.

#### Pneumatic actuator:

- ▶ For "Actuator stem extends", connect the signal pressure to the bottom diaphragm chamber and for "Actuator stem retracts" to the top diaphragm chamber. The connection not used must be sealed with a vent plug.

#### Electropneumatic actuator:

- ▶ Connect the supply air to the "Supply" connection.

#### Actuator stem extends (FA):

(Types 3372-x51x and 3372-x53x Actuators)

#### Fail-safe position "Valve closed"

(for globe and angle valves)

Required supply pressure =  
upper bench range value + 0.5 bar.

#### Actuator stem retracts (FE):

(Types 3372-x52x and 3372-x54x Actuators)

#### Fail-safe position "Valve open"

(for globe and angle valves)

The signal pressure must be sufficiently high so that the control valve closes tightly even against the upstream system pressure.

For the required supply pressure for a tight-closing valve, refer to the mounting and operating instructions of the respective valve, or roughly calculate as follows, using the maximum signal pressure  $p_{st_{max}}$ :

$$p_{st_{max}} = F + \frac{d^2 \cdot \pi \cdot \Delta p}{4 \cdot A} \quad [\text{bar}]$$

$d$  = Seat diameter [cm]

$\Delta p$  = Differential pressure across the valve [bar]

$A$  = Actuator area [cm<sup>2</sup>]

$F$  = Upper bench range value of actuator

#### If nothing is indicated, proceed as follows:

Required supply pressure =  
upper bench range value + 1 bar

#### Signal pressure display:

To monitor the signal pressure, a pressure gauge with G1/8 thread can be screwed into the diaphragm chamber in place of the stopper (8.7).

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**Caution!** *In case you need to deactivate the control valve, you must switch off the reference variable. Note that it is not enough to disconnect the supply air.*

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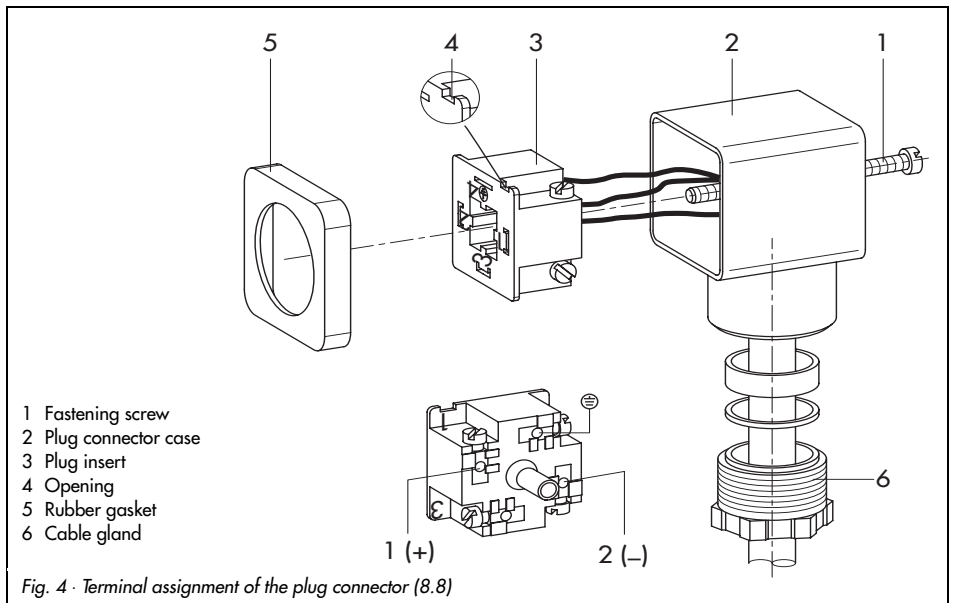
### 3.2 Electrical connection

(Electropneumatic actuator only)

1. Unthread the fastening screw (1) of the plug connector and remove the plug connector from the female connector on the actuator housing.

**Note!** Do not remove the female connector from the actuator housing. Correct ground connection can only be guaranteed when it is in its original position.

2. Pull the fastening screw (1) out of the plug connector and remove the rubber gasket (5).
3. Lever the plug insert (3) out of the plug connector case (2) at the opening (4) using a screw driver.
4. Connect the wires transmitting the control signal via the cable gland (6) of the plug connector case to the terminals of the insert which are marked 1 (+), 2 (-) and to its ground terminal. Secure them with screws.
5. Reinstall the insert (3) in the plug connector case. Be sure that the cable gland (6) points to the desired direction (the plug connector case can be turned by 90° around the insert to point to all four directions).
6. Put on the rubber gasket (5).
7. Plug the plug connector back in the actuator housing and secure with fastening screw (1).



## 4 Checking – adjusting zero and span

(Electropneumatic actuator only)

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### **Note!**

*Make adjustments on the mounted valve only!*

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Zero and span are adjusted to determine the starting point and the upper range value of the actuator.

When the control signal (reference variable) issued by the controller changes from 4 to 20 mA, the control valve must correspondingly pass through its entire travel range from 0 to 100 %.

Zero adjustment is always based on the closed position of the control valve.

Assuming a globe valve (closed fail-safe position) combined with Type 3372-(0/1)511 or 3372-(0/1)531 Actuator with fail-safe position "Actuator stem extends", zero (starting point) must be adjusted to 4 mA and the upper range value to 20 mA.

Whereas assuming a globe valve (open fail-safe position) combined with Type 3372-(0/1)521 or Type 3372-(0/1)541 Actuator with fail-safe position "Actuator stem retracts", zero must be adjusted to 20 mA and the upper range value to 4 mA.

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### **Important!**

*Zero and span of the electropneumatic actuator are adjusted to rated travel by the manufacturer.*

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We recommend, however, that you check zero after the actuator has been attached to the valve. Proceed as described below:

1. Connect an ammeter to the control signal input and apply compressed air to the "Supply" input.
2. Loosen the fastening screw and push the cover plate (8.9) aside.
3. Pull the jumper from the pins to deactivate the tight-closing function.

Zero is adjusted on the adjuster (14) and the upper range value on the potentiometer for span (10.1).

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### **Important!**

*Any span adjustment results in a shift of zero. Therefore, the zero point must be readjusted after span adjustment.*

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## 4.1 Adjusting actuators with fail-safe position "Actuator stem extends"

### Zero point (starting point)

1. Use an ammeter to adjust the input signal to 4 mA.
2. Turn zero adjuster (14) until the plug stem just begins to move from its rest position.
3. Switch off the input signal and then slowly increase it again. Check if the plug stem begins to move at  $4(+0.1)$  mA.
4. Correct any deviations via the zero adjuster (14).  
Turning clockwise causes the valve to leave its rest position earlier, whereas turning counterclockwise delays the valve leaving its rest position.

### Upper range value

5. After you have adjusted the starting point, use the ammeter to increase the input signal to 20 mA. When reaching the upper range value of  $20(-0.1)$  mA, the plug stem must have passed through its entire rated travel range of 100 %.
6. Adjust the potentiometer for span (10.1) until the upper range value is correct. Turning clockwise increases the travel, turning counterclockwise reduces the travel.
7. After correction, switch off the input signal and slowly increase it again. First check the starting point (4 mA), then the upper range value (20 mA).
8. Repeat the correction procedure until both values are correct.
9. Plug jumper on the pins again to activate the tight-closing function.

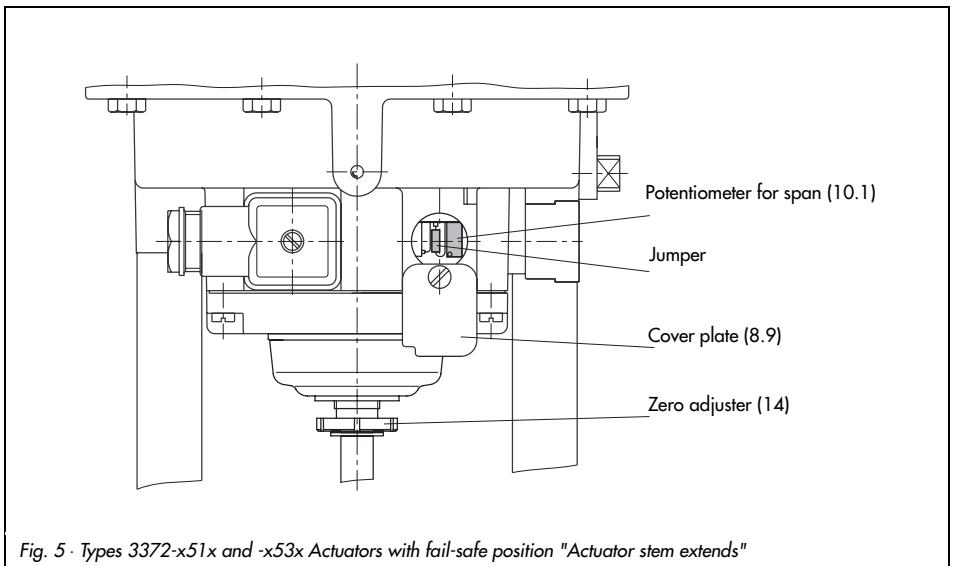


Fig. 5 - Types 3372-x51x and -x53x Actuators with fail-safe position "Actuator stem extends"

## 4.2 Adjusting actuators with fail-safe position "Actuator stem retracts"

### Zero point (starting point)

1. Use ammeter to adjust the input signal to 20 mA.
2. Remove the protective cap and turn the zero adjuster (14) until the plug stem just begins to move from its rest position.
3. Increase the input signal and slowly reduce it again to 20 mA. Check if the plug stem begins to move at 20 mA.
4. Correct any deviations via the zero adjuster (14).  
Turning counterclockwise causes the valve to move from its rest position with delay, whereas turning clockwise causes the valve to move earlier.

### Upper range value

5. Having completed adjustment of the starting point, use the ammeter to adjust the input signal to 4 mA. After having reached the upper range value of 4 mA, the plug stem must pass through its entire rated travel range of 100 %.
6. Adjust the potentiometer for span (10.1) until the upper range value is correct. Turning clockwise increases the travel, and turning counterclockwise reduces the travel.
7. After correction, increase the input signal again. First check the starting point (20 mA), then the upper range value (4 mA).
8. Put the protective cap back over the zero adjuster.
9. Plug the jumper on the pins again to activate the tight-closing function.

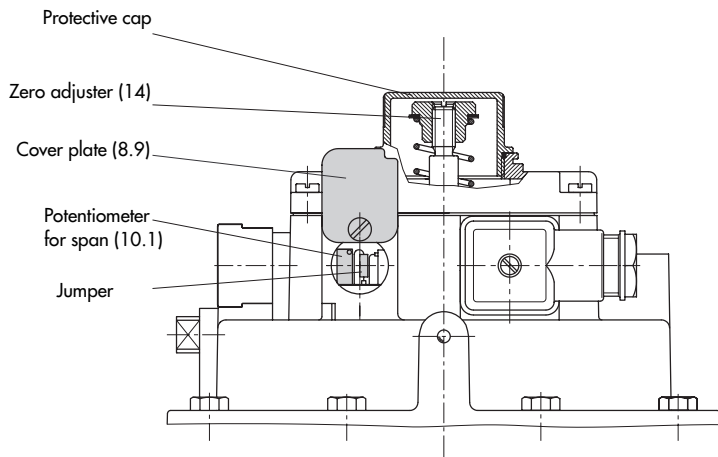


Fig. 6 · Types 3372-x52x and -x54x Actuators with fail-safe position "Actuator stem retracts"

## 5 Activating and deactivating the tight-closing function

The electronic switch-off and switch-on system integrated in the actuator ensures tight closing of the control valve whenever the switching point is exceeded or not reached.

### Actuator stem extends:

Should the electric control signal (reference variable) fall below the switching point of  $4.08 \text{ mA} \pm 0.09 \text{ mA}$  differential gap, the actuator will be fully vented to close a connected globe valve.

### Actuator stem retracts:

Should the electric control signal (reference variable) exceed the switching point of  $19.92 \text{ mA} \pm 0.09 \text{ mA}$  differential gap, the pneumatic output will be fully pressurized to close a connected globe valve.

**The tight-closing function will be activated when the jumper is plugged in. Removing the jumper deactivates this function.**

## 6 Version with limit switch - adjustment

1. Loosen stem connectors on the valve and exchange front connector for a clamped connector (from the accessories).
2. Move the control valve to the switching position in which the contact is to be made.
3. Position clamping plate on the rod-type yoke and shift plate until the lever rests on the stem connector clamp. Align clamping plate and screw tight.
4. Establish electrical connection according to the label on the clamping plate as follows:  
Black (BK)/blue (BU) > contact open and black (BK)/brown (BN) > contact made (closed).
5. Go below and exceed the desired switching position. Use the adjustment screw to set the exact switching point.

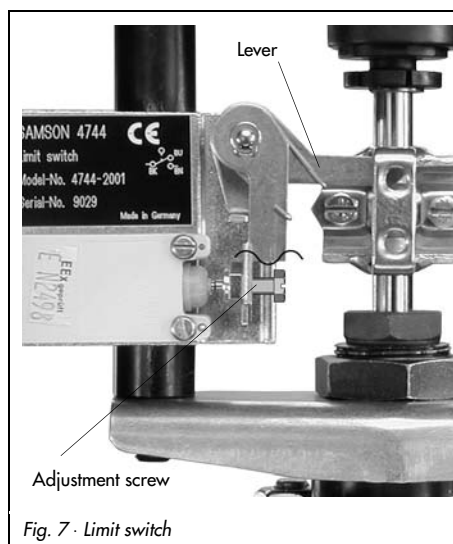


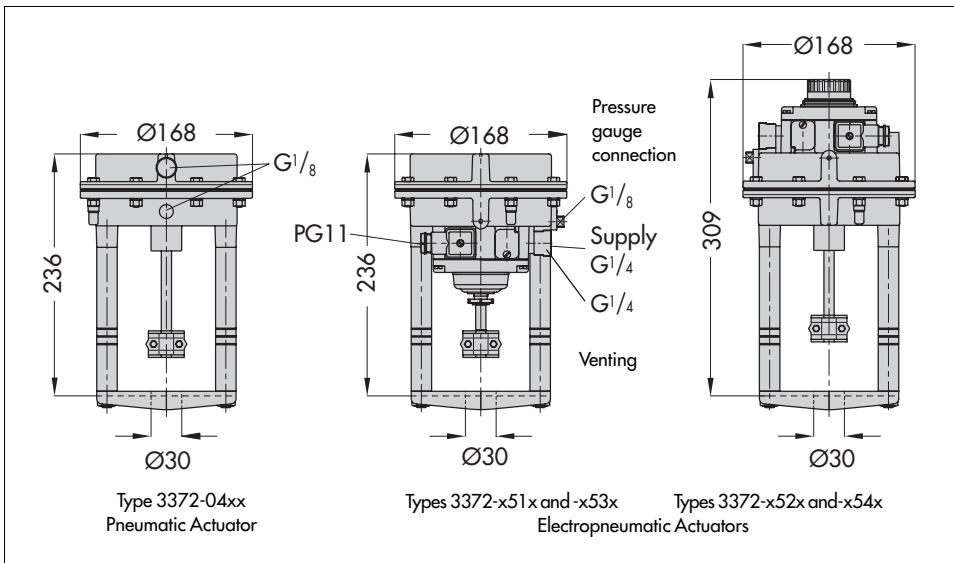
Fig. 7 · Limit switch

## 7 Customer inquiries

If you have any inquiries, submit the following details:

- ▶ Type designation
- ▶ Bench range (signal pressure range) of the actuator

### Dimensions in mm



## TRANSLATION

### EC TYPE EXAMINATION CERTIFICATION

- (1) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**
- (2) EC Type Examination Certificate Number

#### PTB 02 ATEX 2078

- (4) Equipment: Model 4763-1... 1/P Positioner
- (5) Manufacturer: SAMSON AG, Mess- und Regeltechnik
- (6) Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany
- (7) This equipment and any acceptable variations thereof are specified in the schedule to this certificate.

(8) The Physikalisch-Technische Bundesanstalt, notified body number 0102, in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment complies with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres as specified in Annex II to the Directive.

The examination and test results are recorded in confidential report  
**PTB-Ex 02-22054.**

- (9) The Essential Health and Safety Requirements are satisfied by compliance with  
**EN 50014: 1997+A1 +A2**      **EN 50020: 1994**
- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) According to the Directive 94/9/EC, this EC TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of the equipment.

EC Type Examination Certificates without signature and seal are invalid.  
This EC Type Examination Certificate may only be reproduced in its entirety and without any changes, schedule included.  
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

(12) The marking of the equipment shall include the following:



Zertifizierungsstelle Explosionsschutz      Braunschweig, 19. July 2002  
By order

(Signature)      (Seal)

Dr. Ing. U. Johannsmeyer  
Regierungsdirigktor

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## Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

(13)

### Schedule

(14) **EC TYPE EXAMINATION CERTIFICATE No. PTB 02 ATEX 2078**

(15) **Description of Equipment**

The Model 4763-1...1/P Positioner is intended for attachment to pneumatic control valves. It serves for converting control signals of (0)...20 mA or 1...5 mA from a controlling system into a pneumatic actuating pressure of 6 bar max. For auxiliary power non-combustible media are used.

The I/p converter circuit is a passive two-terminal network which may be connected to any certified intrinsically safe circuit, provided the permissible maximum values of U<sub>i</sub> and P<sub>i</sub> are not exceeded.

The device is intended for use inside and outside of hazardous locations.

The correlation between version, temperature classification, permissible ambient temperature ranges and maximum short-circuit currents is shown in the table below.

#### Version 4763-1...1, with Model 6109 I/P Module

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	-45 °C... 60 °C	
T5	-45 °C... 70 °C	85 mA
T4	-45 °C... 80 °C	
T5	-45 °C... 70 °C	100 mA
T4	-45 °C... 80 °C	

#### Version 4763-1...2, with Model 6112 I/P Module

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	-45 °C... 60 °C	85 mA or
T5	-45 °C... 70 °C	100 mA
T4	-45 °C... 80 °C	120 mA

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## PTB

### Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

#### Electrical data

Signal circuit  
(terminals 11/12)

Type of protection: Intrinsic safety EEx ia IIC  
only for connection to a certified  
intrinsically safe circuit

#### Maximum values:

U<sub>i</sub> = 28 V  
I<sub>i</sub> = 110 mA or 85 mA  
P<sub>i</sub> = 0.7 W

or  
U<sub>i</sub> = 25 V  
I<sub>i</sub> = 120 mA  
P<sub>i</sub> = 0.7 W  
C<sub>i</sub> = negligible  
L<sub>i</sub> = negligible

(16) **Test Report PTB Ex 02-22054**

(17) **Special conditions for safe use**

None

(18) **Essential Health and Safety Requirements**

In compliance with the standards specified above.

Zertifizierungsstelle Explosionsschutz

By order

Braunschweig, 19. July 2002

(Signature) (seal)

Dr. Ing. U. Johannsmeyer  
Regierungsdirektor







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**EB 8313 EN**

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