

**Electric Actuators**  
**Type 5801 (Rotary Actuator)**  
**Type 5802 (Linear Actuator)**

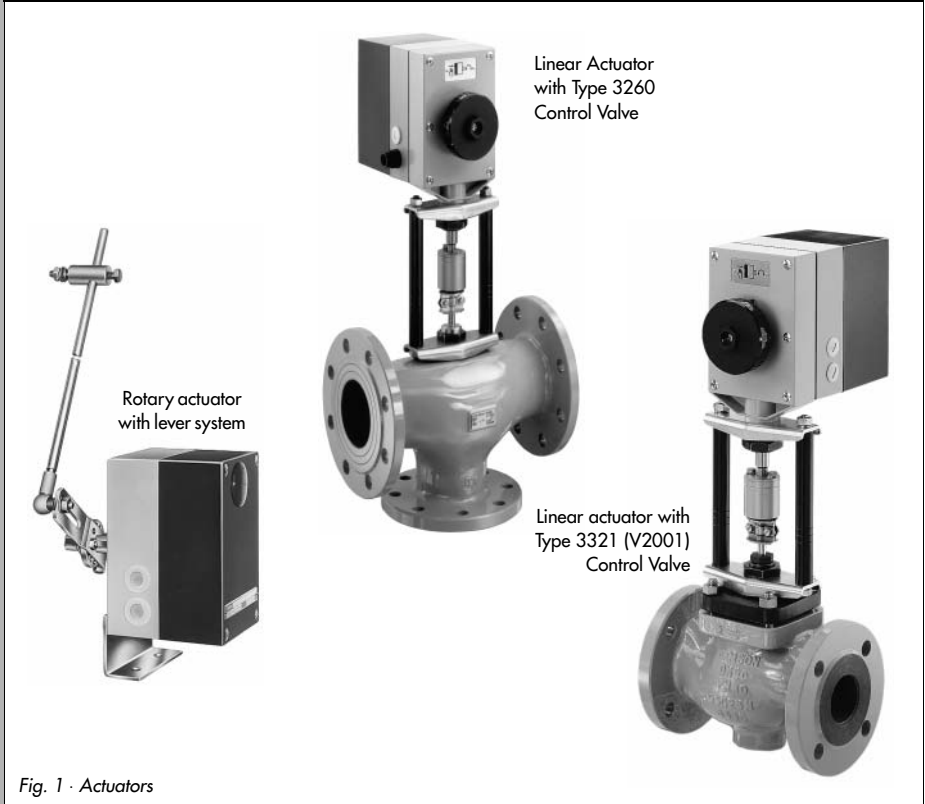


Fig. 1 · Actuators

**Mounting and  
operating instructions**

**EB 5801 EN**

Edition May 2000

Contents	Page
<b>Technical data</b> . . . . .	<b>3</b>
<b>1. Design and principle of operation</b> . . . . .	<b>4</b>
1.1 Type 5801 Rotary Actuator . . . . .	4
1.2 Type 5802 Linear Actuator . . . . .	4
1.3 Additional electrical equipment . . . . .	4
<b>2. Installation</b> . . . . .	<b>6</b>
2.1 Attaching Type 580 to vents . . . . .	6
2.2 Attaching Type 5802 to valves . . . . .	6
<b>3. Electrical connections</b> . . . . .	<b>8</b>
<b>4. Manual override</b> . . . . .	<b>9</b>
<b>5. Adjusting additional electrical equipment</b> . . . . .	<b>9</b>
5.1 Limit switches . . . . .	10
5.1.1 Motor limit switches . . . . .	10
5.1.2 Additional limit switch . . . . .	10
5.2 Potentiometers . . . . .	10
5.3 Positioners . . . . .	12
<b>6. Dimensions in mm</b> . . . . .	<b>15</b>



*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 persons 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 relevant standards.*

*Any hazards which could be caused by the process medium and moving parts of the control valve must be prevented by means of appropriate measures.*

*Proper shipping and appropriate storage are assumed.*

*These actuators have been designed for use in electrical power installations. For wiring and maintenance, you are required to observe the relevant safety regulations. Only use power interruption devices which are protected against unintentional reconnection of the power supply.*

*Take special care when making adjustments on live parts.*

*Do not remove any covers!*

## Technical data

<b>Actuator with manual override</b>	Type	5801-4		5802-4	
Transit time for nominal angle/rated travel	s	280	170	280	170
Nominal torque	Nm	34	22.5	—	—
Nominal thrust	kN	—	—	1.8	1.2
Nominal angle/rated travel		120°		30 mm	
Electrical connection		24, 110 or 230 V; 50 Hz			
Power consumption		5 VA			
Permissible ambient temperature		0 to 50 °C			
Permissible storage temperature		-25 to +70 °C			
Degree of protection		IP 54 according to DIN 40 050			
Weight, approx.		2		3.5	
<b>Additional electrical equipment</b>					
<b>Limit switch</b>		Maximum 3 individually adjustable limit switches Permissible load 250 V AC, 5A			
<b>Potentiometer</b>		0 to 1000 Ω, (0 to 800 Ω at rated travel) Permissible load 0.5 W			
<b>Positioner</b>		Same power supply as actuator			
Control signal (input)		4 to 20 mA, 0 to 20 mA		0 to 10 V DC, 2 to 10 V DC	
Zero shift		0 to 100 %			
Variation of range		30 to 100 %			
Feedback signal (output)		4(0) to 20 mA, R <sub>i</sub> ≤ 200 Ω		0(2) to 10 V, R <sub>i</sub> ≥ 2 kΩ	

### 1. Design and principle of operation

The design of the actuators is based on the modular assembly principle. This allows combination of different final control elements as well as different control loops and chains.

The actuators can be equipped with accessories such as limit switches and potentiometers to influence open and closed loop systems as the control task requires.

In addition, the actuator can be supplied with a positioner to enable processing of standardized electric signals ranging from 4 (0) to 20 mA or 0 to 10 V.

#### 1.1 Type 5801 Rotary Actuator

The rotary actuator is equipped with a reversible permanent magnet-type synchronous motor. The rotary motion of the motor (2) is transmitted to the output shaft (8) via a maintenance-free gearing (3) and a coupling (4).

The lever system connected to the shaft is used, e.g. to actuate vents or louvers.

#### 1.2 Type 5802 Linear Actuator

The installation of a linear gearing (5) converts the Type 5801 Rotary Actuator into the Type 5802 Linear Actuator. The rotary motion of the gearing (3) is converted into a linear motion via the rack-and-pinion mechanism (6, 7).

The spring clutch (11) of the linear actuator permits to switch off the motor force-dependent when the valve is in closed position.

### 1.3 Additional electrical equipment

The following devices are, when requested in the order, installed under the protective cover by the manufacturer.

#### Electric limit switches

The rotary motion of the shaft releases a contact in the microswitch via an adjustable cam.

#### Potentiometers

The potentiometers are installed on a mounting board and activated via a toothed wheel. Transmission via double pinion ensures that the rated travels 15 and 30 mm both have the same angle of rotation.

#### Positioners

Positioners compare signals of 4(0) to 20 mA or 0(2) to 10 V issued by an electric control system with the position of a potentiometer which is proportional to the travel. The output signal issued by a positioner is a three-step signal.

#### Manual override

To provide the option of manual override, a release linkage is installed under the cover. This linkage can be activated from the outside via a pushbutton (1).

When depressing the pushbutton, the coupling between the motor and the output shaft is disengaged. The actuator can now be adjusted manually via the linkage (rotary actuator) or via the handwheel.

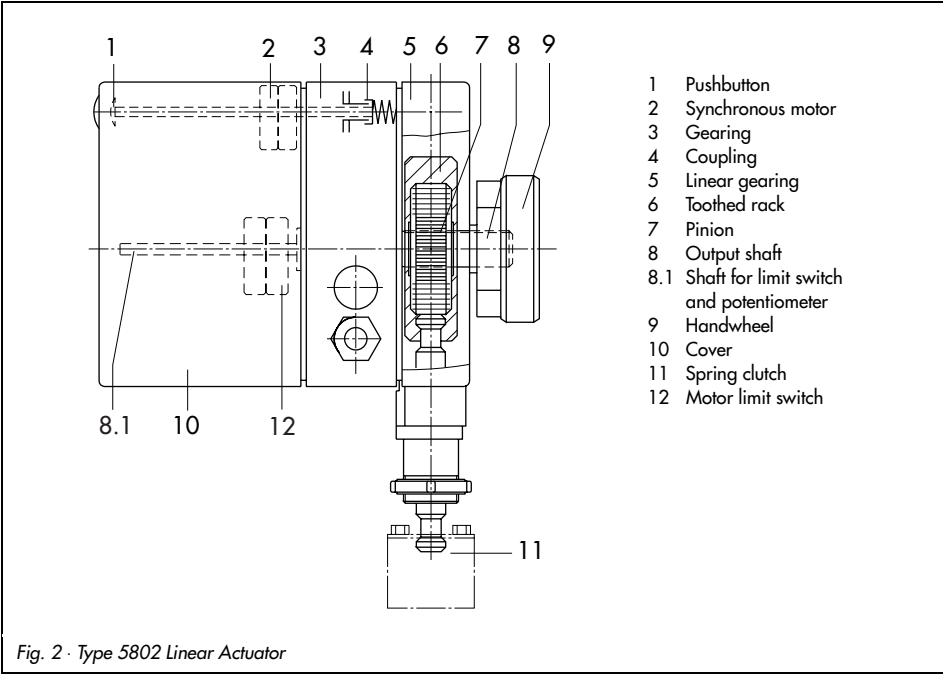


Fig. 2 · Type 5802 Linear Actuator

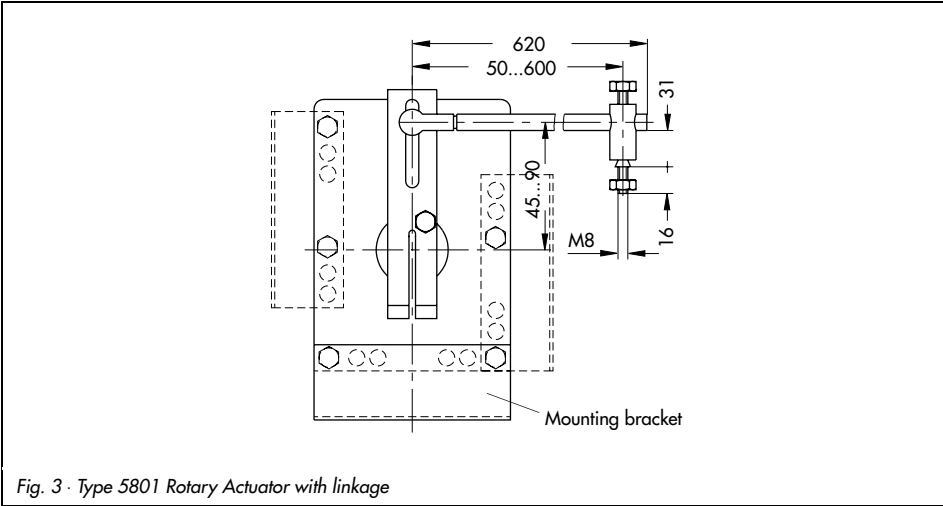


Fig. 3 · Type 5801 Rotary Actuator with linkage

## 2. Installation

### 2.1 Attaching Type 5801 to vents

The attachment of the rotary actuator to vents depends on the task to be performed and how the actuator can be mechanically connected with the vents.

The rotary actuator can be mounted in any position. Thanks to the adjustable levers, the lever system can be adapted to the desired motion and position of the vents.

### 2.2 Attaching Type 5802 to valves

**Valve series V2001** (DN 15 to 80)  
and **series 3260** (DN 65 and 80)

The rod-type yoke (2.1) and the actuator with the spring clutch are delivered already assembled together. Proceed as described below to mount them on the valve:

1. Remove the nut (13) from the valve.
2. Slightly retract the actuator stem (4) using the handwheel.  
Place the actuator with rod-type yoke (2.1) on the valve and tighten with nut (13, SW 36). Observe minimum tightening torque of 150 Nm.
3. Pull up plug stem (8) until it touches the actuator stem.  
Attach the clamps (12) included in the accessories and secure with mounting screws.
4. Adjust motor limit switch as described in chapter 5.1.1.

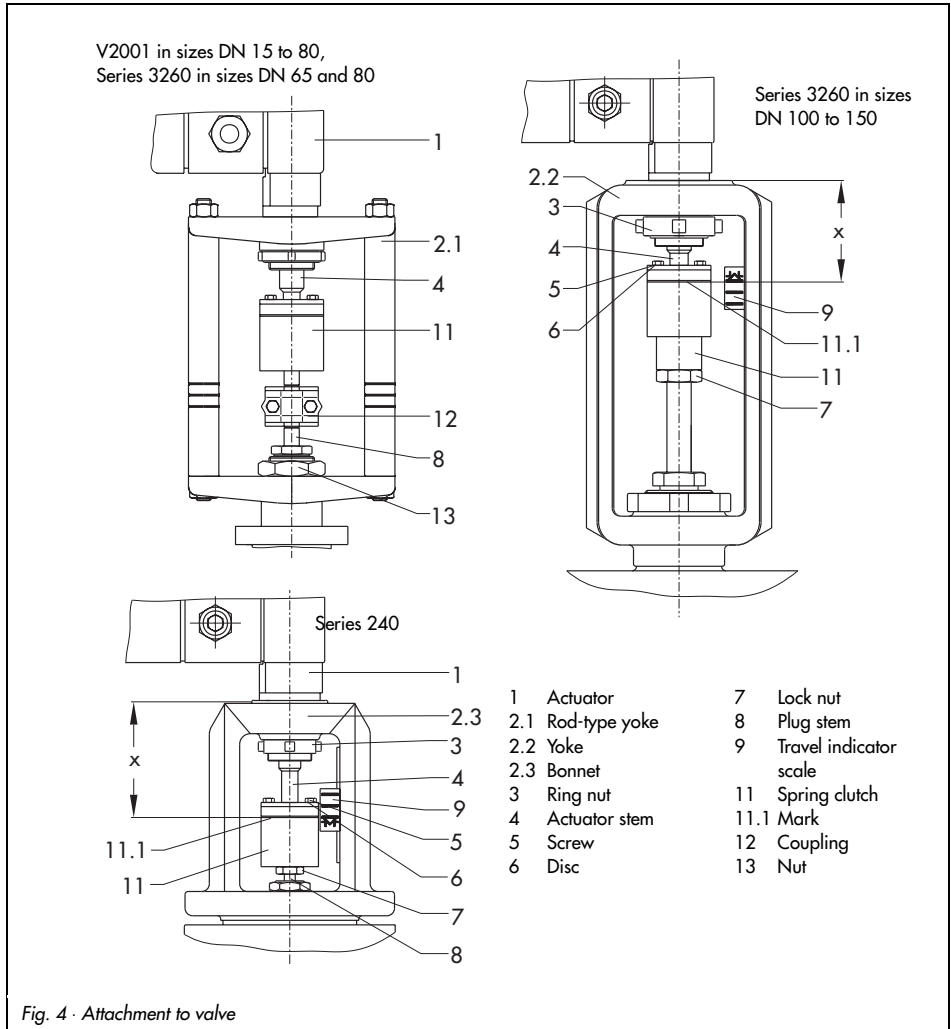
### Series 3260 (DN 100 to 150)

1. Pull the plug stem upward as far as it will go and hold it in position.
  2. First screw the lock nut (7) and then the spring clutch (11) on the plug stem.  
Adjust the distance  $x$  to 60 mm between the top edge of the yoke (2.2) and the mark (11.1) on the spring clutch.  
Secure this position with lock nut.
- ▶ Continue performing steps 3 to 8!

### Series 240:

1. Press the plug stem downward to close the valve.
2. First screw the lock nut (7) and then the spring clutch (11) on the plug stem.  
Adjust the distance  $x$  to 75 mm (for DN 100 and larger  $x = 90$  mm) between the top edge of the yoke (2.2) and the mark (11.1) on the spring clutch. Secure this position with lock nut (7).
3. Slightly loosen one of the spring clutch screws (5) and remove the other one.
4. Shift the disc (6) to allow the headpiece of the actuator stem (4) to be inserted into the disc.
5. Retract the actuator stem (4) using either the handwheel or the motor.
6. Place the actuator on the yoke and secure with ring nut (3).
7. Pass the actuator stem (4) through the bore in spring clutch, put the disc (6) back to its original position and tighten with screws (5).
8. Loosen the clamping plate and align the travel indicator scale (9) with the mark on the spring clutch.

Adjust the limit switches as described in chapter 5.1.



### 3. Electrical connections



When installing the electric lines, you are required to observe the regulations governing electrical power plant installations according to DIN VDE 0100 as well as the regulations of your power supply company.

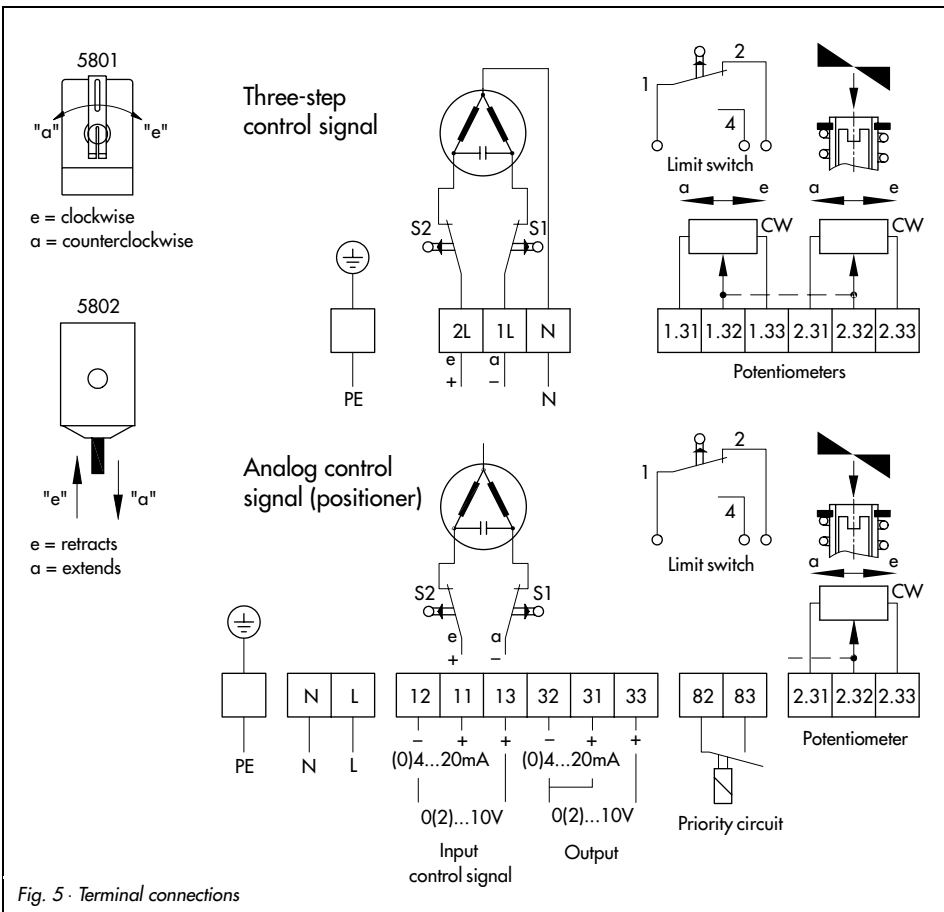


Fig. 5. Terminal connections



**Caution!**

Disconnect voltage before you connect the power supply. Only use power interruption devices that are protected against unintentional reconnection of the power supply. Especially for 24-V/ 50-Hz actuators, you are required to install electric lines with sufficiently large conductor cross-sections so that the permissible voltage allowance of  $\pm 10\%$  is not exceeded.

To install the electrical connections, proceed as described in the circuit diagram label stuck on the cover. As an additional reference, the terminal connections are depicted in Fig. 5.

For the cable entries you may install up to 4 screw joints on the housing.

Connect the grounding conductor to the separate terminal on the mounting bracket of the PCB.

## 4. Manual operation

Depress the pushbutton on the housing cover and keep it pressed down.

Turn at the linkage (rotary actuator), or turn the handwheel (linear actuator) until the desired position is reached.

Release the pushbutton.

## 5. Adjusting additional electrical equipment

The actuator comes equipped with additional electrical equipment when requested in the order.

The arrangement of limit switches and potentiometers on the shaft (8.1, Fig. 2) is indicated in the Table below and must be kept, even when exchanged later.

Position	5	4	3	2	1
Installation position on the shaft can be occupied by:	S	S	S	occupied	
	W	S	S		
		W	S		
			W		

Starting from the bottom of the housing, the installation positions **1** and **2** on the shaft are occupied by motor limit switches.

**S** = Limit switch

**W** = Potentiometer, board with optionally 1 or 2 potentiometers

Versions with positioner require 1 potentiometer to be reserved for position transmission to the positioner.

The additional electrical equipment can be accessed by unthreading the four mounting screws and removing the black plastic cover.



Connect voltage to make adjustments!

### 5.1 Limit switches

The limit switches occupying the installation position 1 and 2 are assigned to specific functions and serve as motor limit switches. Depending on the version of the valve, they must be adjusted to closing or opening direction.

#### **Important:**

When adjusting the limit switches, the cam (4) must be screwed to the shaft in such a position that the spindle (3) can be easily accessed to enable adjustment of the desired switching point.

If necessary, loosen the mounting screw (5) and turn the cam as needed.

#### 5.1.1 Motor limit switches

##### **For actuators with three-step output signal**

For analog output signal (see chapter 5.3 for version with positioner).

##### **Adjust limit switch to closing direction**

(force-dependent)

Limit switch in position 1 for Series 240 and V2001 Globe Valves.

In position 2 for Type 3260.

With three-way valves (mixing or diverting valve), the limit switch to be selected depends on whether port A or B must be closed.

1. Use motor to move the valve to its end position.
2. Adjust cam disc (1) and spindle (3) until the limit switch switches off the motor. Turn the spindle further by 1/2 turn in the same direction.
3. Check to make certain that the switch-off function of the limit switch operates

properly. The operating range of the spring clutch is approx. 1 mm.

##### **Adjust limit switch to opening direction**

(travel-dependent)

Limit switch in position 2 for Series 240 and V2001 Valves.

In position 1 for Type 3260.

Adjust the limit switch via the cam disc so that the motor switches off when the rated travel is reached.

#### 5.1.2 Additional limit switch

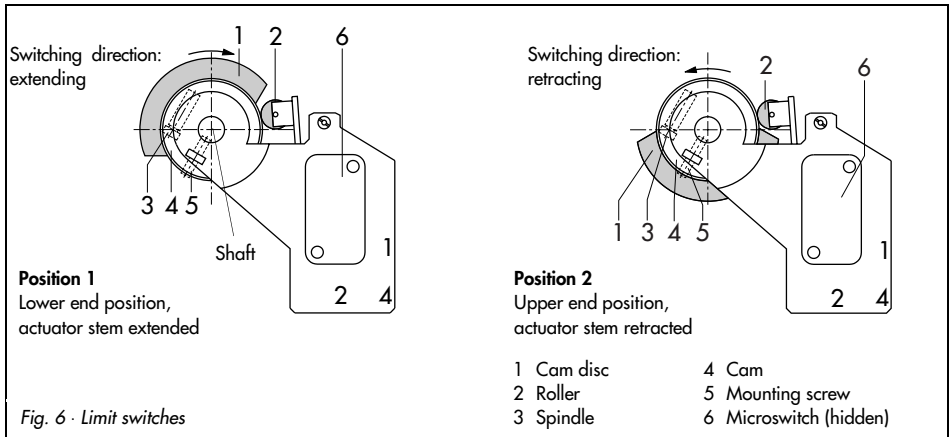
1. Use the motor or handwheel to move the valve to the position where contact is to be made.
2. Turn the spindle (3) until the cam disc (1) releases the switching contact of the microswitch via the roller (3).

### 5.2 Potentiometers

The potentiometers must be installed in the mounting board (13) bore (H 15 or H 30) which is assigned to the appropriate rated travel, either 15 or 30 mm.

If this is not the case, e.g. when mounted on a different control valve, the position of the potentiometer must be changed as described below:

1. Unthread lateral mounting screw (8) and remove the driving toothed wheel (7) from the shaft.
2. Unthread the mounting screw (11) of the potentiometer and lift off its toothed wheel piece (sliding clutch).
3. Unthread nut and reposition potentiometer (14) to the appropriate bore.

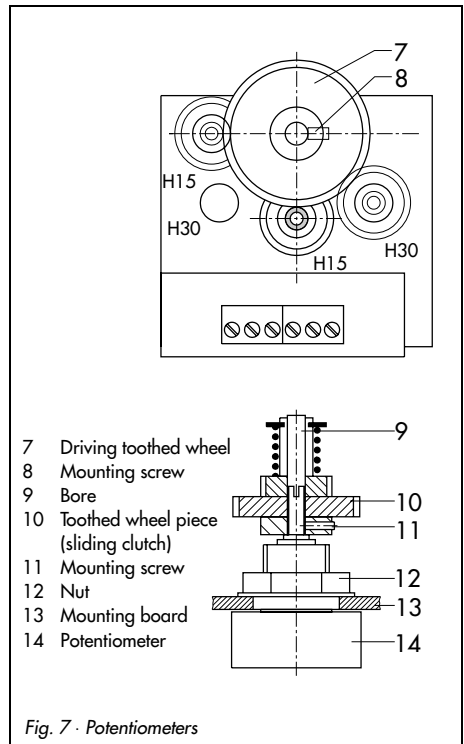


If necessary, screw off the mounting board first.

4. Screw together the potentiometer, hexagon head nut and tooth washer. Plug on toothed wheel piece (10) and screw together with lateral mounting screw (11).
5. Plug driving toothed wheel (7) on the shaft and screw tight as soon as it engages in the toothed wheel piece of the potentiometer.

**Zero adjustment:**

1. Use the motor or handwheel to move the valve to the desired end position and connect an ohmmeter.
2. Hold the toothed wheels and insert the screwdriver in the 3 mm bore (9) of the sliding clutch.
3. Adjust the resistance value by turning the potentiometer shaft with the screwdriver.



### 5.3 Positioners

The reference variable activating the actuator is a load-independent dc or dc voltage signal.

The reference variable, usually in the range from 4 to 20 (0 to 20) mA or 2 to 10 (0 to 10) V, must be assigned to the travel of the control valve (Fig. 8 left).

In split-range operation, the control valves operate on smaller reference variables. The controller signal used to activate two control valves is divided in such a way that the valves pass through full travel at one half of the input signal range (e.g. first valve adjusted to 4 to 12 mA, and second one to 12 to 20 mA (Fig. 8 right).

### Adjusters

The adjusters are installed in the protective cover of the electronics unit (Fig. 9).

The serial switch **Sw** contains the switches Sw 1 to 4 which are assigned to the following functions:

#### Priority circuit → Sw 1

When an external contact connected to the terminals 82 and 83 is closed, the following function is available:

Sw 1 ON → Actuator stem retracts

Sw 1 OFF → Actuator stem extends

When the contact is opened, the controller signal determines the valve position again.

#### Operating direction → Sw 2

Sw 2 ON <> Actuator stem extends with increasing reference variable.

Sw 2 OFF >> Actuator stem retracts with increasing reference variable.

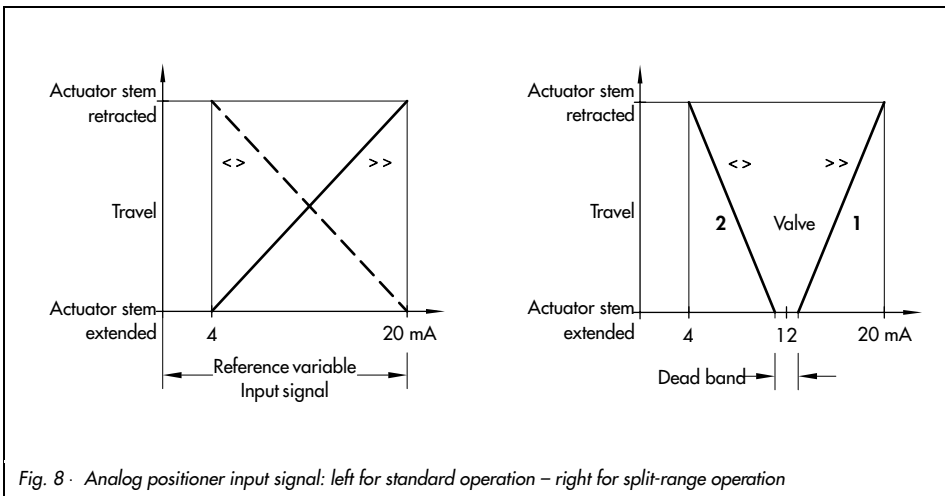


Fig. 8 · Analog positioner input signal: left for standard operation – right for split-range operation

### Output signal → Sw 3 and 4

Depending on the connection at the terminals 31, 32 and 33,

Sw 3 and 4 ON → 4 to 20 mA or 2 to 10 V

Sw 3 and 4 OFF → 0 to 20 mA or 0 to 10 V

**Important:** Both switches Sw 3 and Sw 4 must have the same position!

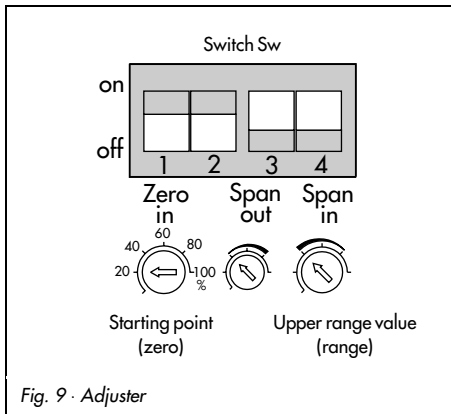


Fig. 9 · Adjuster

### Adjustments on the control valve

The following description refers to a globe valve being closed when the actuator stem extends and to a three-way valve closing tightly on both sides.



*Disconnect voltage to make adjustments!*

### Presetting:

Both operating directions, i.e. actuator stem retracts (>>) and actuator stem extends (<<) with increasing reference variable, require presetting. The motor limit switch for lower end position (position 1) as well as the potentiometer assigned to the positioner need to be preset.

1. First check whether the potentiometer is positioned in the appropriate bore. For 15 mm rated travel, the small toothed wheel must be engaged in the driving toothed wheel. For 30 mm rated travel, the big toothed wheel must be engaged in the driving toothed wheel. If necessary, reposition as described in chapter 5.2.
2. Manually move the valve to its lower end position until the plug stops (actuator stem extended). For rotary actuators, turn accordingly to the left limit stop (when looking onto the actuator shaft).

### Adjust limit switch for lower end position

(position 1, Fig. 6 left):

1. Adjust the cam disc (1) and spindle (3) until the switching contact is released by the roller (2). Then turn the spindle back by one turn.
2. Hold the toothed wheels of the potentiometer in their position and turn the potentiometer shaft via a screwdriver counterclockwise until it stops (Fig. 8).
3. Put the isolating switch on the connection PCB (next to the terminal socket for N and L) to **OFF**. Now, the controller signal is disconnected from the actuator motor.

### Adjustment with a selected reference variable, e.g. 4 to 20 mA

1. Adjust the switches **Sw 3** and **Sw 4** to preselect the output signal for position transmission.
2. Connect an ammeter or voltmeter for position transmission to the terminals 31, 32, 33.
3. Connect an appropriate current or voltage supply (or a controller) to the input signal (reference variable) terminals.

#### **Important:**

When making these adjustments, always start with the operating direction >> (actuator stem retracts with increasing reference variable), even when you require the operating direction <>.

4. For operating direction >>, put the switch **Sw 2** to OFF.
5. **Zero** – Turn adjuster counterclockwise until it stops.  
**Span<sub>in</sub>** – Turn adjuster to mid-position (mark).



6. Connect voltage!

7. Adjust input signal current to a slightly increased lower range value of 4.2 mA.
8. Turn zero adjuster from its end position very slowly clockwise until the LED is turned off. (This causes the maximum closing force to be achieved).
9. Manually move the valve to the upper end position (actuator stem retracted). For rotary actuators, adjust accordingly

to the right limit stop (when looking onto the actuator shaft).

### Adjust limit switch for upper end position:

(position 2, Fig. 6 left)

1. Adjust the cam disc and spindle until the switching contact is released. Then turn the spindle back by one turn.
2. **Span<sub>out</sub>** – Turn adjuster until the ammeter for position transmission shows an output signal of 20 mA or 20 V.
3. Adjust the input signal current to a slightly decreased upper range value of 19.8 mA.
4. **Span<sub>in</sub>** – Turn adjuster counterclockwise until it stops, then slowly turn clockwise until the LED is turned off (for opening position of a globe valve). Carefully continue to turn in the same direction until the LED is turned on again (for closed position of the 2nd port of a three-way valve). This causes the maximum tight shut-off forces to be achieved.
5. Put **isolating switch to ON**, if adjusted **operating direction >>** is to be maintained.  
Leave the isolating switch on OFF if the **operating direction** is to be **changed to <>**.  
To obtain operating direction <>, put the switch **Sw 2** to **ON**.
6. **Zero** – Turn adjuster clockwise until it stops (100 %).
7. Adjust the input signal current to the lower range value of 4.2 mA.
8. **Zero** – Turn adjuster very slowly counterclockwise until the LED is turned off (for opening position of a globe valve), carefully continue to turn in the same di-

rection until the LED is turned on again (closed position of the 2nd port of a three-way valve). This allows the maximum shut-off forces to be achieved.

**Do not change the position of the other adjuster anymore!**

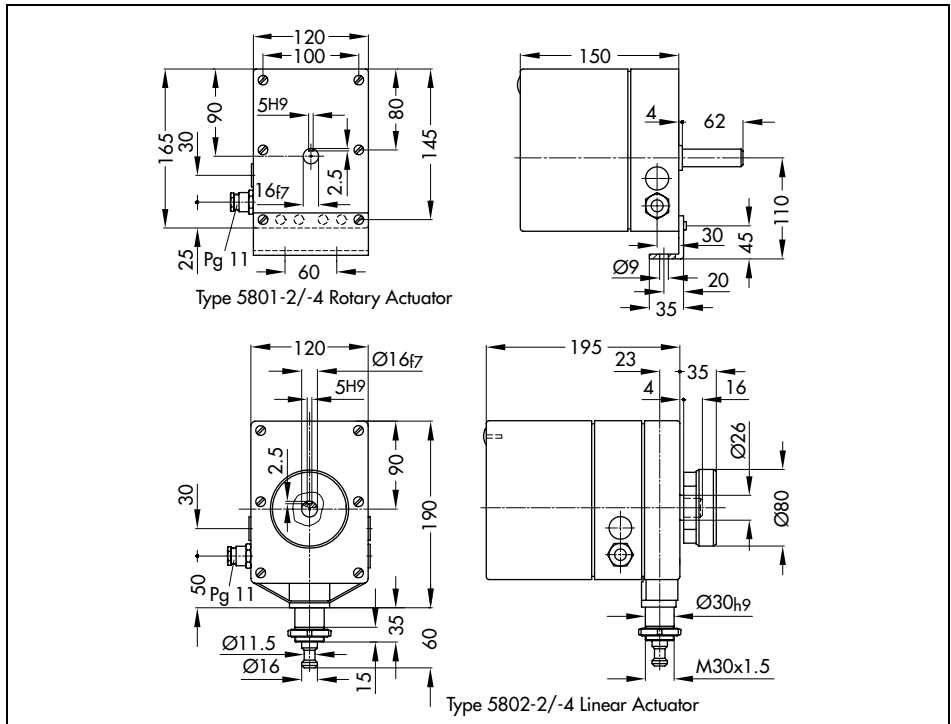
- Put isolating switch to ON.

**NOTE on split-range operation:**

To avoid any overlapping when adjusting the control valves, you should allow for a dead band of, e.g.  $\pm 1$  mA (Fig. 8 right).

In our example on page 12, valve 1 is adjusted to operate between 12.5 and 20 mA, and valve 2 between 4 and 11.5 mA. Voltage input signals require analogous adjustment.

**6. Dimensions in mm**





SAMSON AG · MESS- UND REGELTECHNIK  
Weismüllerstraße 3 · D-60314 Frankfurt am Main  
Phone (0 69) 4 00 90 · Fax (0 69) 4 00 95 07  
Internet: <http://www.samson.de>

**EB 5801 EN**

S/C 2000-06