The SRI986 Positioner is for operation of pneumatic valve actuators from control systems and electrical controllers with electric control signals. It is used to reduce the adverse effects of valve friction, for higher thrust and shorter positioning time.

**FEATURES**

- Independent adjustment of stroke range and zero
- Adjustable amplification and damping
- Split range up to 3-fold possible
- One version for 0 to 20 mA and 4 to 20 mA input
- Supply pressure up to 6 bar (90 psig)
- Low vibration effect in all directions
- Mounting according to IEC 534, part 6 (NAMUR)
- Rotation adapter for angles up to 120°

- Explosion protection:
  II 2 G Ex ib/ia IIB/IIC T4/T6 according ATEX or intrinsically safe according to FM and CSA
- EMC in accordance with international standards and laws (CE)
- Modular system of additional equipment
  - Limit switches
  - Position transmitter
  - Booster
  - Connection manifold

---

Repair and maintenance must be carried out by qualified personnel!
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1 GENERAL

The electro-pneumatic positioner is used for direct operation of pneumatic valve actuators by means of electrical controllers or control systems with an analog output signal of 0 to 20 mA or 4 to 20 mA or split ranges. Positioner and pneumatic actuator form a control loop with the command variable \( w \) (output signal \( y \) of the master controller), the correcting variable \( y_s \), and the stroke position \( x_s \) of the actuator.

In this manner disturbing influences such as gland friction and medium forces within the valve are compensated by the positioner.

In addition, the positioning force of the actuator can significantly be increased by an output pressure of max. 6 bar.

The electro-pneumatic positioner can be mounted on both diaphragm actuators and rotary actuators. For spring loaded actuators a single-acting positioner is used, whilst for actuators without spring loading a double-acting positioner is used. The double-acting positioner operates with two opposing control pressures.

Identification

The nameplate of the positioner is located at the side wall of the housing. Nameplates are in accordance with selected model. Examples:

Version without explosion protection

![Nameplate with explosion protection](image)

Version EEEx ib IIC T6

![Nameplate without explosion protection](image)

Version FM/CSA

![Nameplate with FM/CSA certification](image)
FUNCTION

The positioner operates according to the force comparison principle:
The input current signal \( w \) flows through moving coil 51, which is located in the field of a permanent magnet 52. The resultant force exerts a torque on the balance arm 53.
This leads to a change in the distance between nozzle 54 and cone 55 which results in a change in the back pressure at the nozzle. The Venturi 56, which is supplied with air, converts the back pressure into the pressure signal \( w' \) which is fed to the compensator 57.
An equilibrium of forces is set at balance arm 53 if the torque produced by moving coil 51 is equal to the torque reaction produced by compensator 57.
At the same time the pressure signal \( w' \) is passed to the input diaphragm 58. The stroke of the input diaphragm is transferred to the flapper lever 40. The resultant change in the distance between the nozzle 59 and the flapper 60 alters the back pressure at the nozzle. This pressure acts in a single-acting positioner on an amplifier 61. Its output pressure \( y \) results in a stroke movement of diaphragm actuator with spring resetting (see Fig. 2).
In the double-acting positioner this pressure acts on a double-acting amplifier 62, where opposed output pressures \( y_1 \) and \( y_2 \) cause a stroke movement in the diaphragm actuator without spring resetting (see Fig. 3).
The stroke movement is tapped at the actuator spindle 63 of the feedback lever 11 and transferred to the stroke factor lever 17.
The stroke factor lever 17 and the flapper lever 40 are connected by the range spring 43.
Equilibrium of forces is set at the flapper lever 40 if the torque produced at the input diaphragm 58 is equal to the torque reaction of the range spring 43 produced by the stroke setting. Thus an actuator setting proportional to the signal input is retained constantly.
A dynamic adaption to the actuator (sensitivity, stability) can be accomplished by the throttling screw 44 and the damping throttles 46, 47 and 48 in the double-acting positioner, the stroke range and zero point are set via the zero screw 41 and the stroke factor screw 42.
A rising or falling actuator pressure at rising input signal is set in the single-acting positioner by means of the changeover plate 13.

Fig. 2: Single-acting electro-pneumatic positioner

Fig. 3: Double-acting electro-pneumatic positioner
ADDITIONAL EQUIPMENT

The air output capacity can be significantly increased, and the positioning time shortened to 1/4 or 1/7, by means of an additional single-acting or double-acting volume booster.

By means of a total of five range springs the positioner can be matched to nearly all operating situations, such as up to 4-way (or with 4 to 20 mA up to 3-way) range subdivision, very high and very short strokes and angles of rotation or special cams. A standard range spring FES 628/1 is installed. Other range springs are available (see page 16)

For attachment to rotary actuators and rotary armatures an attachment-kit for rotary movement (Code EBZG-PN, -NN, -JN, -ZN) is required.

If ¼-NPT connections are desired, the connection manifolds Code LEXG-BN, -CN must be used. The connection manifold 2 Code LEXG-CN is required for piping up to 10 mm ∅, the connection manifold 3 Code LEXG-BN for up to 12 mm ∅.

The inductive limit switch assembly (Code P, Q, R, T, V, see page 23) enables position signaling, e.g. end position signaling.

The electrical position transmitter assembly (Code E or F, see page 26) converts the stroke or angle of rotation into an electrical standard signal 4 to 20 mA.
2 MOUNTING

2.1 Dimensions

2.1.1 Positioner

1 Screwed gland Pg 13.5 (line entry)
2 Dummy plug. Can be replaced with 1
3 Earth connection
4 Earth connection
5 Terminals (+/–) for signal input (w)

I Ø = Correcting variable 1 (Output)
II Ø = Correcting variable 2 (Output)
U = Supply air

6 Internal thread G 1/8 for output II (y2)
   (only on double-acting positioners)
7 Internal thread G 1/8 for supply air
8 Internal thread G 1/8 for output I (y1)
9 Feedback lever
10 Housing cover
   Screw on the housing cover in such a way
   that the air vent of the attached device
   faces downwards!

2.1.2 Booster, single-acting; Code VKXG-FN

For comments see opposite sheet.
2.1.3 Booster single-acting with increased air output; Code VKXG-HN

2.1.4 Booster double-acting Code VKXG-GN

2.1.5 Connection manifold Code LEXG-BN

2.1.6 Connection manifold Code LEXG-CN

2.1.7 Connection manifold with gauges Code LEXG-JN, -MN, -RN

1 Internal thread ¼-18 NPT for supply air
2 Internal thread (not used)
3 Internal thread ¼-18 NPT for output I
4 Internal thread ¼-18 NPT for output II
5 Internal thread ½-14 NPT for output I
6 Mounting screws SW17
7 Internal thread ¼-18 NPT for output II (Connection manifold Code M only)
8 Code LEXG-MN: gauge for output I
   Code LEXG-JN: without gauges
9 Code LEXG-MN: gauge for supply air
   Code LEXG-JN: gauge for output
10 Code LEXG-MN: gauge for output II
    Code LEXG-JN: gauge for supply air
2.2 Attachment kit for diaphragm actuators acc. to DIN IEC 534-6 (NAMUR)

The attachment kits include the following parts:

EBZG-KN:  
Mounting bracket 10  
Feedb. lever EBZG-AN  
Carrier bolt 12  
U-bolts 14

EBZG-HN:  
Mounting bracket 10  
Feedb. lever EBZG-AN  
Carrier bolt 12  
Mounting screw 19

2.2.1 Dimensions

Mounting bracket 10 Code G

Feedback lever 11 with compensating spring 16
Code EBZG-BN

Carrier bolt 12

2.2.2 Determination of mounting side

Single-acting diaphragm actuators

Check whether the actuator is in the safety position required by the process. (Does the actuator open or close with spring force?)
The mounting side is selected from the table below in accordance with the direction of action and the required direction of movement of the spindle for an increasing input signal.

<table>
<thead>
<tr>
<th>Actuator closes with spring force</th>
<th>Changeover plate setting</th>
<th>Actuator opens with spring force</th>
<th>Changeover plate setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Diagram of actuator positions" /></td>
<td><img src="image" alt="Diagram of changeover plate positions" /></td>
<td><img src="image" alt="Diagram of actuator positions" /></td>
<td><img src="image" alt="Diagram of changeover plate positions" /></td>
</tr>
</tbody>
</table>

The arrow indicates the direction of movement of the spindle at increasing input signal.

The direction of action of the input signal can be set on the changeover plate 13 (see page 31):

- **N** = Normal direction of action (increasing input signal produces increasing control pressure to the actuator)
- **U** = Reverse direction of action (increasing input signal produces decreasing control pressure to the actuator)

Double-acting diaphragm actuators

For double-acting positioners the changeover plate 13 always stays in the “N” setting. The assignment of the input signal to the direction of movement of the actuator spindle is determined by the selection of the mounting side of the positioner and the piping of the positioner outputs to the actuator:

If the actuator spindle is to ascend with an increasing input signal, output y1 is connected at top of the actuator and output y2 is connected at bottom. The positioner is mounted at the right-hand side.

If the actuator spindle is to retract with an increasing input signal, output y1 is connected at bottom and output y2 at top of the actuator. The positioner is mounted at the left-hand side.

The arrow indicates the direction of movement of the spindle with an increasing input signal.
2.2.3 Attachment to diaphragm actuators

Attachment of the positioner is made using the attachment kit for diaphragm actuators according to DIN IEC 534-6 at right or left-hand side of the actuator.

a) Screw the carrier bolt 12 into actuator coupling (see Fig. 12).

b) Screw mounting bracket 10 flush with the positioner with two M 6 socket head cap screws (5 mm A/F).

c) Fasten positioner with mounting bracket 10 to the diaphragm actuator.
For FOXBORO ECKARDT diaphragm actuators with cast yokes:
fasten mounting bracket 10 with screw 19 to the threaded hole in the cast yoke (see Fig. 10). This ensures that the feedback lever 11 is horizontal at 50 % stroke.
For diaphragm actuators with pillars:
fasten mounting bracket 10 with two U-bolts 14 to the pillar in such a manner that feedback lever 11 which is loosely attached to the shaft 15 of the positioner and the carrier bolt 12, is horizontal at 50 % stroke (see Fig. 11).

d) Set actuator to a 0 % stroke position.
Attach feedback lever 11 to shaft 15 of the positioner and carrier bolt 12 in such a manner that compensating spring 16 is above the carrier bolt 12 when the mounting side is on the right, or below the carrier bolt 12 when the mounting side is on left (see Fig. 9).
Align and lock carrier bolt.

e) Press stroke factor lever 17 against stop screw and create a frictional connection between the feedback lever 11 and shaft of the positioner by tightening hexagon cap screw (10 mm A/F) of feedback lever.

f) Connect positioner output \( y_1 \) to diaphragm actuator for single-acting diaphragm actuators and connect outputs \( y_1 \) and \( y_2 \) to diaphragm actuator for double-acting diaphragm actuators.

g) Set up electrical connections.

h) Connect supply air of min. 1.4 bar to max. 6 bar, but no more than the maximum permissible operating pressure of the diaphragm actuator.

i) Fasten housing cover in such a way that air vent of attached device faces downwards (see Mark ‘M’ in Fig. 12).
2.3 Attachment kit for rotary actuators

For attachment of the positioner to rotary actuators or rotary armatures an attachment kit is required. The linear cam enables sensing of rotation angles up to 120°, whereas the equal percentage and the inverse equal percentage cams sense rotation angles up to 90° (linear characteristic between 70° and 90°).

2.3.1 Version with shaft
(acc. to VDI/VDE 3845) Code EBZG-ZN

2.3.2 Version with flange Code EBZG-JN

Rotation angle max. 120°;
torque requirement 0.14 Nm
2.3.3 Version without flange
Code EBZG-NN, -PN

Adaptation of the actuator drive shaft and correct axial location required at site!

2.3.4 Housing dimensions of attachment kits for rotary actuators

For all versions
Code EBZG-NN

For version without flange
Code EBZG-PN
2.3.5 Attachment to rotary actuators

a) Remove the transparent cover plate from the housing of the attachment kit.

b) Mount the housing of the attachment kit on rotary actuator or armature; use mounting hardware supplied by the actuator manufacturer if necessary.

c) Move actuator into the desired starting position (rotation angle = 0°).

d) Mount cam 24 in accordance with the direction of rotation of the actuator (see Fig. 14). The linear cam is fastened to the actuator drive shaft in such a manner that the dimension x or y (Fig. 15) amounts 2 mm, whereas in case of equal percentage cam the dimension x is approx. 17.5 mm, and the dimension y is approx. 21.5 mm.

In case of inverse equal percentage cam the dimension x is approx. 18 mm, and the dimension y is approx. 23 mm.

When employing equal percentage and the inverse equal percentage cams, the range spring FES 627/1 must be installed in the positioner.

e) Fasten feedback lever 30 for the rotary actuator onto shaft 15 of positioner as shown in Fig. 16.

f) Mount positioner on housing of attachment kit. Attach spring 31 to feedback lever 30 and cam follower 32 against cam (see Fig. 17).
Screw positioner to housing of attachment kit. With the linear cam and the inverse equal percentage cam check whether mark 33 points to the center of the cam follower 32 (see Fig. 18); adjust if necessary.

With the equal percentage cam check whether the cam follower lies directly ahead of the start of the cam lobe; adjust if necessary.

g) Final mounting of feedback lever on shaft of positioner is performed at a stroke of 0 %, i.e. a rotation angle of 0°. First loosen 5 mm A/F Allen screw of feedback lever 30 through hole 34 (see Fig. 19), then press stroke factor lever 17 against stop screw 18 (see page 31) and tighten Allen screw firmly.

h) With single-acting actuators connect positioner output y₁ to actuator; with double-acting actuators connect y₁ and y₂ to actuator.
Connect chamber in which pressure is to built up with an increasing input signal to y₁.

i) Connect command variable w (input).

k) Connect supply air of min. 1.4 bar to max. 6 bar but do not exceed the maximum permissible operating pressure of the actuator.

Note!
If actuator moves to an end position, the mounting position of cam does not coincide with the direction of rotation of the actuator.
In this case install the cam 24 in the reverse position.

l) Attach pointer 35 on the headed screw in such a manner that 0° is indicated when the rotary actuator is in its starting position (w = 0).

m) Attach the transparent cover plate (see Fig. 20).

2.3.6 Reversing direction of rotation

Single-acting actuator:
move changeover plate (page 31, item 13) to 'U' setting and reverse cam 24.

Double-acting actuators:
exchange positioner outputs and reverse cam (see Fig. 15). The changeover plate (page 31, item 13) remains in 'N' setting.
3 ELECTRICAL CONNECTIONS

During installation, the installation requirements by DIN VDE 0100 and/or DIN VDE 0800, as well as locally applicable requirements must be observed.

In addition, the requirements of VDE 0165 must be observed for systems associated with hazardous areas.

Further important instructions are contained in page 22 (safety requirements, explosion protection).

If an earth connection or potential equalization are required, the appropriate connections must be set up for an internal earth connection 36 or an external earth connection 37.

The units must be operated in a stationary position.

The line (cable) is guided through a screwed gland 7 Pg 13.5. This is suitable for line diameters of 6 to 12 mm.

The electrical connections for the command variable w is made at the + and – screw terminals 38, which are suitable for wire cross-sections of up to 2.5 mm² (see Fig. 21).

Check polarity!

4 START-UP

Before commissioning electro-pneumatic positioners must be matched to the stroke and rotation angle of the actuator and to the input signal range.

The instruments can be connected to the 0 to 20 mA input signals, 4 to 20 mA input signals or split ranges without altering the basic adjustments.

The supply air connected should be min. 1.4 bar and max. 6 bar, but should not exceed the maximum operating pressure of the diaphragm actuator.

4.1 Setting the gain

The gain and thus the sensitivity of the positioner are set by means of the throttling screw 44 (see page 31). The throttling screw is screwed in all the way in the factory, i.e. it is set to maximum gain. This gain varies with the supply air pressure, as shown in the following table:

<table>
<thead>
<tr>
<th>Supply air</th>
<th>Single-acting positioner</th>
<th>Double-acting positioner</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4 bar</td>
<td>approx. 150</td>
<td>approx. 100</td>
</tr>
<tr>
<td>4 bar</td>
<td>approx. 90</td>
<td>approx. 150</td>
</tr>
<tr>
<td>6 bar</td>
<td>approx. 60</td>
<td>approx. 180</td>
</tr>
</tbody>
</table>

The linear gain is indicated. These values are based on the built-in range spring FES 628/1.

From this basic setting the gain can be matched to the dynamic requirements of the control system (counter-clockwise rotation of the throttling screw 44 results in less gain).

Note:

The zero point must be adjusted following each change of gain.

In order to ensure reliable pressure reduction in the actuator, the throttling screw 44 should not be opened beyond ¼ turn at 6 bar. A limiting screw 45 is therefore incorporated.

The basic setting at the factory permits a maximum opening of the throttling screw 44 of approx. 1 turn.
4.2 Setting of zero point and stroke
(see page 31)

Before commencing settings press the flapper lever 40 several times alternately to the left and right in order to align the flappers correctly.

a) Set the minimum value of the command variable w (start of stroke).

b) Turn zero screw 41 until actuator just begins to move from its end position.

Note:
In accordance with VDI/VDE 2174 a variation of the stroke range up to 2% is permissible in one of the two end positions. It is advisable to take advantage of this tolerance for the input signal range 0 to 20 mA by elevating the minimum value somewhat above 0 mA (approx. 0.1 mA; max. 0.4 mA). This will ensure that the actuator completely decompresses if necessary for safety reasons.

c) Set maximum value of the command variable w (end of stroke).

d) Turn the stroke factor screw 42 until actuator precisely reaches its end position:
   Right turn: decrease of travel
   Left turn: increase of travel

Recheck zero and stroke settings.

Note:
When stop screw 18 is correctly positioned and feedback lever is correctly mounted, there is no interaction between the adjustments of zero and stroke.

If the stroke cannot be adjusted with the installed spring, the correct spring can be approximately determined in accordance with the following criteria:

Upper end position requires softer spring with higher number of turns (for large strokes and “split-range”)

Lower end position requires harder spring with fewer turns (for shorter strokes and equal percentage cam)

There are 5 differently rated springs available for matching the stroke and input signal range. The particular spring required can be determined precisely via stroke factor Ux.

4.3 Setting the damping
(see page 31)

The air output capacity of the positioner can be reduced by means of the damping throttle 46. Double-acting positioners are equipped with a damping throttle 47 for correcting the variable y1 and a damping throttle 48 for correcting the variable y2. In its normal setting the damping throttle is approximately flush with the amplifier housing.

The air output capacity is reduced by a factor of approximately 2.5 when the damping throttle is turned completely in.

A reduction of the air output capacity should only be done for very small actuator volumes since the control system would otherwise be too slow.

Page 31, single-acting positioner:
Setting gain 44 and damping 46

Page 31, double-acting positioner:
Setting gain 44 and damping 47, 48

4.4 Subdivision of input range
(split range)

If several actuators are to be controlled by the same command variable and the complete stroke is to be executed in only one specific subrange of this command variable at a time, a positioner, the zero point and stroke range of which must be set to the desired sub-range of the command variable, must be provided for each actuator.

For actuation of several positioners by a master controller the positioners are connected in series.

Fig. 22: Example of 2-way split range

It should be noted that the permissible load of the controller may not be exceeded. The input resistance of the positioner at 20 °C is approx. 200 ohms.

Selection of the correct range spring can be made in accordance with the stroke factor range or the graph of the range springs (see page 17).
If the zero point has to be increased by more than 10 mA in case of multiple subdivision the adjustment must be made as follows: (see page 31)

a) Shut off supply air.
b) Remove tension from range spring 43 by turning zero screw 41.
c) Loosen hexagon cap screw (A/F 10) of feedback lever and turn stroke factor lever 17 away from stop screw 18. This applies pretension to range spring 43. In this position retighten hexagon cap screw of feedback lever.
d) Connect supply air.
e) Set the minimum value of command variable w (start of stroke).
f) Turn zero screw 41, until the actuator begins to move from its end position. If this is not possible, the pretension of the range spring must be increased as described in c).
g) Set maximum value of command variable w (end of stroke).
h) Turn stroke factor screw 42 until the actuator precisely reaches its end position.

Note!
With this setting the zero point and stroke range are mutually dependent. Settings e) to h) must therefore be repeated as often as necessary until both settings are correct. Furthermore it should be noted that the deflection of the stroke factor lever 17 from the starting position may not exceed a maximum of 39°, since the stroke factor lever might otherwise hit the housing cover before reaching its end value.

4.5 Determination of rotation angle factor \( U_\varphi \)

In conjunction with the attachment kit for rotary actuators (Code P, M, J, Z, R) the rotation angle factor \( U_\varphi \) can be determined as follows:

\[
U_\varphi = \frac{\varphi}{\Delta w} = \frac{\text{Rotation angle}}{\text{Input signal range (mA)}}
\]

The rotation angle factors \( U_\varphi \) of the individual range springs are stated in the following table.

The rotation angles are also taken into account in the graph of the range springs (see page 31).

4.6 Determination of stroke factor \( U_x \)

The stroke factor \( U_x \) is the ratio of the entire range of the output variable (stroke \( x \)) to the entire range of the input variable (command variable \( w \)).

For FOXBORO ECKARDT diaphragm actuators PA200 to PA700/702:

\[
U_x = \frac{x}{\Delta w} = \frac{\text{Stroke in mm}}{\text{Input signal range in mA}}
\]

For FOXBORO ECKARDT diaphragm actuators (1500 cm²) and actuators of other manufacturers \( (I_o = 117.5 \text{ mm}^2) \):

\[
U_x = \frac{x}{\Delta w} \times \frac{I_o}{I_s}
\]

\( I_o = \) Feedback lever length in mm \( (\text{for FOXBORO ECKARDT actuator 1500 cm}^2: I_o = 122.5 \text{ mm}) \)

The stroke factor can be used to determine for each application whether or with which spring the desired setting can be made.

Five different range springs are available for matching to the stroke and input signal range.

<table>
<thead>
<tr>
<th>Range spring</th>
<th>Cam 1)</th>
<th>Stroke factor range</th>
<th>Cam 1)</th>
<th>Stroke factor range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ident No.</td>
<td>old ID</td>
<td>Colour</td>
<td></td>
<td>Stroke factor range</td>
</tr>
<tr>
<td>1</td>
<td>420 493 013</td>
<td>FES 627/1</td>
<td>yellow</td>
<td>1.7 ... 4.7 (max. 7.0)</td>
</tr>
<tr>
<td>2</td>
<td>420 494 019</td>
<td>FES 628/1</td>
<td>green</td>
<td>3.5 ... 9.5 (max. 14.0)</td>
</tr>
<tr>
<td>3</td>
<td>502 558 017</td>
<td>FES 612/1</td>
<td>- whitout -</td>
<td>5.8 ... 14.5 (max. 21.75)</td>
</tr>
<tr>
<td>4</td>
<td>420 496 011</td>
<td>FES 715/1</td>
<td>gray</td>
<td>8.4 ... 21.5 (max. 32.75)</td>
</tr>
<tr>
<td>5</td>
<td>420 495 014</td>
<td>FES 629/1</td>
<td>blue</td>
<td>11.5 ... 27.5 (max. 41.5)</td>
</tr>
</tbody>
</table>

1) For equal percentage and inverse equal percentage cams the rotation angle factors are a function of their corresponding rotation angles.
2) Included in FESG-FN (Ident-Nr. 420 496 011)
3) Included in FESG-FN (Ident-Nr. 420 497 011)
4.6.1 Stroke factor ranges of the range springs
The stroke factor \( U_x \) determined as described above should lie within the ranges of the respective range springs indicated in the following table, as close as possible to the lower value.

4.6.2 Characteristics of the range springs
The stroke \( x_o \) is based on the FOXBORO ECKARDT standard feedback lever \( l_o=117.5 \text{ mm} \).

Fig. 23: Feedback lever
If another length \( l_s \) is used, the actual stroke \( x_s \) must be converted to stroke \( x_o \):

\[
x_o = \frac{117.5 \cdot x_s}{l_s} \quad \text{[mm]}
\]

Selection of measuring spring and setting of measuring span
Determination of suitable spring for split range:

a) Enter desired setpoint value \( w \) for travel start in the diagram field.

b) Determine \( x_o \) if \( l_s \) unequal 117.5 mm.

c) Enter intersection \( w/x_o \).

d) Connect points determined at a) and c). This results in a straight line.

e) If the straight line does not run through the origin, move this parallel here.

f) Use the spring the characteristic line (a) of which is located directly below the presently determined characteristic line.

Example (shown in graph)
Split range operation

Valve 1:
\[
\begin{align*}
\text{w} &= 0 \ldots 10 \text{ mA} \\
x_s &= 30 \text{ mm (stroke range)} \\
l_s &= 140 \text{ mm} \\
x_o &= \frac{117.5 \cdot 30}{140} = 25.2 \text{ mm}
\end{align*}
\]

Intersection \( w = 10 \text{ mA} \) with \( x_o = 25.2 \text{ mm} \) \( \rightarrow S_1 \)

Selected: Spring 4 (FES 715/1) because the characteristic curve based on the beginning of the determined straight line located directly below.

Valve 2:
\[
\begin{align*}
\text{w} &= 10 \ldots 20 \text{ mA} \\
x_s &= 50 \text{ mm (stroke range)} \\
l_s &= 140 \text{ mm} \\
x_o &= \frac{117.5 \cdot 50}{140} = 42 \text{ mm}
\end{align*}
\]

Intersection \( w = 20 \text{ mA} \) with \( x_o = 42 \text{ mm} \) \( \rightarrow S_2 \)

Selected: Spring 5 (FES 629/1) because the characteristic curve based on the beginning of the determined straight line located directly below.

1) \( l_o = \) FOXBORO ECKARDT standard feedback effective length
2) For feedback effective length \( l_s = 117.5 \text{ mm} \) and \( \Delta w = 20 \text{ mA} \)
3) Theoretical value
5 MAINTENANCE

5.1 Basic Adjustment of Single-acting Positioner (pneumatic part)

Basic setting is only necessary after dismantling the device or changing modules.
All the settings for adapting the positioner to the actuator are described in page 14 (start-up).

Note:
If alterations were made to the I-p converter 65 (see Fig. 30), this must also be adjusted (see page 20).

The following tools are required for basic adjustment:
screwdriver
1 open-end spanner 7 mm A/F
1 feeler 0.6 mm
1 test gauge 1.6 bar
1 DC signal generator

The feedback lever must be detached from the shaft of positioner if adjustment is done in the attached state.

For the following adjustments see pages 30 and 31.

a) Set changeover plate 13 to “N”.
b) Turn throttling screw 44 to the right as far as possible (maximum boost).
c) Unhook range spring 43 from flapper lever 40.
d) Check whether the flappers 60 are concentric with the nozzles 59. If not, align booster 61. The fastening screws of the booster are accessible after removing the I-p converter (see 5.3.1).
e) Push flapper lever 40 alternately to the left and right several times to align the ball-guided flappers parallel to the nozzles.
f) Push flapper lever 40 to the left. By turning the hexagonal rod 66 7 mm A/F set the distance between the right-hand nozzle and the right-hand flapper to approx. 0.6 mm with the aid of a feeler. Then fasten the hexagonal rod tight.
g) Connect the positioner as shown in the test circuit, fig. 24, preset supply air to 1.4 bar.
h) Press flapper lever 40 to the left. If the output y does not rise to supply air pressure, there are leaks or the flapper is not correctly positioned (repeat ‘e’).
i) Hook range spring 43 into flapper lever and preset DC signal w = 10 mA. Proceed as follows to make zero setting independent of the stroke setting:
k) Press stroke factor lever 17 against stop screw 18.
l) Set a large stroke factor (approx. 2 mm in front of top stop) with stroke factor screw 42.
m) Set zero screw 41 so that the output pressure y = approx. 0.6 bar and note this value.
n) Set a small stroke factor (approx. 2 mm in front of bottom stop) with the stroke factor screw. The output pressure y may not change by more than ±150 mbar in relation to setting m).
o) The stop screw 18 should be adjusted in case of greater deviations. Repeat settings l) to n) after every adjustment of the stop screw 18 until the deviation is less than ±150 mbar.
p) Secure stop screw 18 with varnish. Put changeover plate 13 back in its original position. Reinstall positioner or reattach the feedback lever to positioner shaft.

See page 14 for start-up.

Fig. 24: Test circuit for single acting positioner
5.2 Basic Adjustment of the Double acting Positioner (pneumatic part)

Basic setting is only necessary after dismantling the device or changing modules. All settings for adapting the positioner to the actuator are described in page 14 (start-up).

Note:
If alterations were made to the I-p converter 65 (see Fig. 30), this must also be adjusted (see page 20).

The following tools are required for basic adjustment:
- screwdriver
- 1 open-end spanner 7 mm A/F
- 1 feeler 0.6 mm
- 2 test gauges 6 bar
- 1 DC signal generator

The feedback lever must be detached from the shaft of the positioner if adjustment is done in the attached mode.

For the following adjustments see pages 30 and 31.

- a) Leave changeover plate 13 set to “N”.
- b) Turn throttling screw 44 to the right as far as possible (maximum boost).
- c) Unhook range spring 43 from flapper lever 40.
- d) Check whether flappers 60 are concentric with nozzles 59. If not, align booster 61. The fastening screws of the booster are accessible after removing I-p converter (see 5.3.1).
- e) Push flapper lever 40 alternately to the left and right several times to align ball-guided flappers parallel to nozzles.
- f) Push flapper lever 40 to the left. By turning the hexagonal rod 66 7 mm A/F set the distance between the right-hand nozzle and the right-hand flapper to approx. 0.6 mm with the aid of a feeler. Then fasten hexagonal rod tight.
- g) Connect positioner as shown in the test circuit, fig. 25, preset supply air to 6 bar.
- h) Press flapper lever 40 to the right and left. The pressures $y_1$ and $y_2$ must change in opposition between 0 and supply air pressure.
- i) Hook range spring 43 into flapper lever and preset DC signal $w = 10$ mA.
- j) Set zero screw 41 so that pressures $y_1$ and $y_2$ are equal.
- k) Set adjustment screw 67 so that pressures $y_1$ and $y_2$ are set to approx. 4.2 bar (70% of the supply air pressure). Repeat settings k) and l) alternately if necessary.
- m) Preset 1.4 bar supply air.
  Set zero screw 41 so that pressures $y_1$ and $y_2$ are equal. They should be approx. 0.7 bar (50% of the supply air pressure) (check measurement only).

Proceed as follows to make the zero setting independent of the stroke setting:
- n) Press stroke factor 17 lever against the stop screw 18.
- o) Set a large stroke factor (approx. 2 mm in front of the top stop) with the stroke factor screw 42.
- p) Set the zero screw 41 so that output pressures $y_1$ and $y_2$ are equal.
- q) Set a small stroke factor (approx. 2 mm in front of the bottom stop) with the stroke factor screw. The output pressures $y_1$ and $y_2$ may not change by more than $\pm 150$ mbar in relation to setting p).
- s) The stop screw 18 should be adjusted in case of greater deviations. Repeat settings o) to q) after every adjustment of stop screw 18 until the deviation is less than $\pm 150$ mbar.
- t) Secure stop screw 18 with varnish. Reinstall the positioner or reattach the feedback lever to positioner shaft.

See page 14 for start-up.
5.3 Checking and Adjusting I-p Converter

(see also page 31)

Note:
Press the flapper lever 40 to the left to check whether a prevailing malfunction was caused by the I-p converter or by the pneumatic part. If the output pressure \( y_1 \) rises to the supply air pressure, the malfunction should be looked for in the I-p converter.

5.3.1 Removal of I-p converter (see Fig. 30)
a) Unscrew housing cover 68.
b) Unscrew shaft 69 with the 5 mm A/F Allen key (turn to left), unhook range screw 43 and remove stroke factor lever 17.
c) Unscrew 4 cylinder head screws 70 and remove air vent plate 71.
d) Unscrew the two Allen screws 72 (3 mm A/F) and remove the I-p converter 65.

5.3.2 Check and adjust I-p converter
(see Fig. 28)
An adapter is required for checking and adjusting the I-p converter which can be done by yourself as shown in Fig. 26.
The following tools are required:
screwdriver, 3 and 5 mm A/F Allen keys, 1 test gauge 0 to 1.4 bar, 1 DC signal generator 0 to 20 mA, supply air 1.4 ± 0.1 bar.
a) Connect the I-p converter to the adapter, Fig. 26 and wire as shown in Fig. 27.
b) Preset supply air 1.4 ± 0.1 bar.
c) The test gauge must read 0.18 to 0.19 bar at current signal 0 mA. Otherwise set the adjustment lever 73 so that this value is indicated. If this is not possible, remove the Venturi 56 (see Fig. 29) and clean it.
d) Increase the current signal slowly from 0 to 20 mA. The test gauge reading must change proportionately to the current signal.

<table>
<thead>
<tr>
<th>Current signal</th>
<th>Test gauge reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 mA</td>
<td>0.18 ... 0.19 bar</td>
</tr>
<tr>
<td>20 mA</td>
<td>approx. 1 bar</td>
</tr>
</tbody>
</table>

If these values are not achieved, there is a defect and the I-p converter should be replaced or the positioner returned to the manufacturer for repair.

5.3.3 Clean the Venturi (see Fig. 29)
a) Remove I-p converter
b) Unscrew two screws 74, remove the cover plate 75 and Venturi 56.
c) Clean the Venturi 56 with compressed air and a brush.
d) Reinsert the Venturi. Tighten the two screws 74 equally. If the base plate 76 has also been dismantled, take care that the 3 O-rings and the filter are correctly positioned.
e) Check I-p converter and adjust, if necessary.

5.3.4 Insert I-p converter and assemble the device
(see Fig. 30)
a) Attach the I-p converter 65. Make sure that the electric lead is located along the bottom of the I-p converter in the appropriate channel and that both O-rings are in place.
b) Screw on air vent plate 71. Put the electric lead 77 around the shaft of the positioner 69 in such a way that the functioning of the I-p converter is not impaired.
c) Hook in range spring 43 and screw shaft 69 to stroke factor lever 17.
d) Screw on the housing cover 68 so that the air vent of the attached device faces downwards.

Note:
Basic adjustment and re-start-up (see page 14) are necessary after dismantling the device or after replacing components or modules.
Fig. 26: Test adapter for I-p converter

Fig. 27: Test circuit for I-p converter

Fig. 28: Adjustment of the I-p converter

Fig. 29: Removal of the Venturi

Fig. 30: Removal and reassembly of the I-p converter 65 and the booster 61
5.4 Cleaning throttles

a) Remove the limiting screw 45.

b) Remove the throttling screw 44 from the limiting screw from below.

c) Clean the throttling screw 44 in a solvent (e.g. benzene) and then carefully blow through. Cleaning in an ultrasonic bath is better still.

d) Screw in throttling screw 44 completely again to its stop (clockwise).

e) Screw in limiting screw 45 completely to its stop (clockwise), then unscrew by approx. one half turn counterclockwise.

f) Secure the limiting screw 45 with sealing paint.

6 BOOSTER REPLACEMENT

a) Remove I-p converter.

b) Unscrew the booster 61 from the air vent plate.

c) Screw on the new booster.

   To exchange a single-acting booster by a double-acting one, you have to unscrew the sealing screw 78 first. Remember the O-rings between the booster 61 and the air vent plate (single-acting positioner four O-rings, double-acting positioner six O-rings).

   Before tightening the mounting bolts align booster 61 in such a manner that the flappers 60 are concentrically opposite the nozzles 59.

d) Insert I-p converter and assemble the device.

7 SAFETY REQUIREMENTS

7.1 Accident prevention

This device complies with the regulations for the prevention of accidents Power-Driven Work Aids (VBG 5) of October 1st, 1985.

7.2 Electrical safety

7.2.1 General requirements

This device fulfils the requirements stipulated in IEC 1010-1, Class III equipment.

When the housing is open, repair and maintenance operations must always be carried out by service personnel if any power sources are connected to the device.

The device contains no built-in fuses. Protection against shock must be provided in the system for Class I equipment.

7.2.2 Regulations for Connection

The device is to be used according to its purpose and is to be connected in compliance with its connection plan (see section 3). The locally effective national directives for electrical installations are to be observed, e.g. in the Federal Republic of Germany DIN VDE 0100 resp. DIN VDE 0800.

The device may be connected to extra low voltage circuits the insulation of which against hazardous voltages (e.g. 220 V mains) at least meets the requirements for basic insulation.

Before connection of other leads and during operation the protective conductor must be connected to the appropriate terminal.

If the connected circuits fulfill the requirements stipulated in IEC 348 relating to the safety extra low voltage, the device may be operated without a protective conductor (Class III equipment).

7.3 Explosion protection

(only if ordered specifically)

The setup regulations VDE 0165 or the ElexV or the corresponding national setup regulations must be observed when setting up.

Attention!

Observe the corresponding national requirements for repairing explosion-protected devices.

The following applies to the Federal Republic of Germany: Repairs on parts on which the explosion protection depends must either be done by the manufacturer or must be checked by an authorized expert and approved by his test mark or a certificate.

7.4 EMC and CE

For references pertaining to electro-magnetic compatibility EMC and regarding CE certification see product specifications PSS EVE0102 A-(en).
8 Option “Limit switch”

The limit switches are additional equipment either installed in the factory or up-dated. They are constructed either with inductive switches or micro switches and signal exceeding or deceeding of a stroke or rotating movement of actuators.

8.1 Method of operation

Stroke or rotation angles of the actuators are transferred to the control vanes via a deviating mechanism to the control vanes which either dampen an oscillator circuit or switch a mechanical contact depending on the version.

The inductive limit switches are supplied with power via a separately mounted switch amplifier. The current signal is transferred into a switch output.

In the three-wire version an integrated switch amplifier supplies a switch signal; direction of reaction PNP closing function.

The current signal is transferred into a switch output.

8.2 Electrical connection

Grounding conductor connection following installation in the SRI986 - see page 14.

8.3 Arrangement of Connection

The connection cable is guided through the cable gland 12 Pg 13.5 (cable diameter 6...12 mm) and connected to terminal bar 6.

The terminals are tied up as follows:

2-wire technique 3-wire technique micro switch

The terminals are suited for cable cross-sections of up to 2.5 mm² (fine-strand).

8.4 Start-up

The switching functions may be freely selected and set.

The control vanes may be adjusted as desired in order to reach the wanted switching behavior. The illustration here shows the four basic settings and adjoining the respective switch behavior (gray=immersed vane).

The examples are based on the following setting:

Mounting left=feedback level right; transmission is selected so that at stroke x from 0 to 100% the guidance shaft travels through a rotary angle of 180°. Illustrated in resting position x = 0%.

2-wire technique: if control vane is immersed the initiator power circuit becomes high-ohmic.

3-wire technique: if control vane is immersed the contact is closed against plus.

Micro switch: Contact opens during passing of the control vanes.
8.5 Setting Limit Values

The switching points are dependent on the setting of the control vanes 21, on the settings of the probes A and B and on the ratio setting.

To set the control vanes loosen the screw 22 on the drive shaft and align the control vanes in accordance with the illustrations on page 23. During loosening and/or tightening this screw hold control vanes tightly to avoid damaging pinion and tooth segment.

Adjust the probes as follows:

a) Move the actuator to the position to be signalled
b) Loosen locking screw 23 and adjust the switching points by turning adjustment screws 24.
c) Then retighten locking screws.

To set the transformation the ratio of the rotation angle of the control vanes can be set continuously by turning the spindle screw 25 of the adapter. Turn clockwise to increase the ratio and counter-clockwise to reduce it.

Screw on housing cover with the air vent facing downwards when the device is mounted.

8.6 Maintenance

No maintenance is required.

8.7 Safety requirements

see page 29
8.8 Subsequent installation or exchange

For subsequent installation there are kits available in appropriate versions - see PSS EVE0102A. Safety measures indicated in page 29 are to be absolutely observed!

Installation:

a) Screw on adapter 1:
   Unscrew bottom screw 2. Fit adapter 1, then screw in the screw again and tighten slightly. Hold adjusting device 3 firmly in position and unscrew top screw 4. Install adapter 1 and tighten the screw again. Tighten screws 2 and 4.

b) Screw in the two hexagonal bolts 5 (SW 8):
   Long hexagonal bolt on the left, short hexagonal bolt on the right.

c) Screw mounting plate 9 to the two hexagonal bolts 5 with the two screws 10 (if necessary, adjust the adjusting devices so that the right-hand mounting hole is accessible). Be careful to ensure that the driving pin of the adapter engages in the slot in the gear segment.

d) Screw the two bolts 11 into the female threads to secure the housing cover. When the positioner is installed, these will be the female threads in the top left-hand corner and in the bottom right-hand corner.

e) Secure cable fitting 12 and screw 13 plug to frame 14 with the enclosed nuts. Fit the frame with the rubber seal facing the positioner and cable fitting 12 at the terminals.

f) Screw on the housing cover with the air vent facing downwards when the device is mounted.

The kit includes the following parts:

1. Adapter for transferring the rotary movement to the control vane
2. Hexagonal bolts for mounting plate
3. Mounting plate with probes, adjusting devices, terminals
4. Bolts for housing cover
5. Cable fitting
6. Screw plug
7. Frame with sealing
9 Option “El. Position Transmitter”

The electrical position transmitter is additional equipment either installed in the factory or updated. It converts the stroke or rotary movement of an actuator into an electrical standard signal 4 ... 20 mA.

9.1 Function

The stroke or rotary angle of an actuator are transmitted to the position controller with a built-in electrical position converter via control lever. The angle setting is converted proportionately into a voltage with a potentiometer. This voltage is the converted into the electric standard signal 4 ... 20 mA. Adaption to the stroke of the actuator takes place internally. The start and end of the measuring range are set via 2 push buttons.

9.2 Electrical Connections

Grounding cable connection following installation in the SRI986 - see page 14.

9.3 Connection layout

The cable is inserted through the M20 x 1.5 cable gland 12 (suitable for lead diameters 6 ... 12 mm) and is connected at the terminal block 6.

The terminals are suitable for wire cross-sections of up to 2.5 mm².

The terminals are connected as follows:

- 31 Auxiliary energy (+)
- K2 Uninterrupted signal current measurement with a low resistance ampmeter (Ri ≤ 10 Ohm)
- 32 Auxiliary energy (-)
- K4 Protective earth connection

The power supply (U_s = 12 ... 36 V DC) originates from the signal circuit in two wire connection.

The maximum permissible load impedance R_{Bmax} is calculated with the following equation:

\[ R_{Bmax} = \frac{(U_s - 12 V)}{0.02 A} \text{ [Ohm]} \]

U_s = Supply voltage in V

Position converter

Connected device (e.g. recorder, controller, etc.)

9.4 Maintenance

No maintenance is required.
9.5 Setting and Start Up of position transmitter 4 ... 20 mA

The electronic connection of the position transmitter must be assured. Both LEDs are then light up.

**Adjusting the start of the measuring range (4 mA)**

a) Move the actuator to the starting position.

b) Press push button S1 "Config Output 4 mA" longer than 2 seconds. During this time LED 1 lights up. After 2 seconds both LEDs are light up again, the value for 4 mA is stored.

**Adjusting the end of the measuring range (20 mA)**

a) Move the actuator to the end position.

b) Press push button S2 "Config Output 20 mA" longer than 2 seconds. During this time LED 2 lights up. After 2 seconds both LEDs are light up again, the value is stored.

**Random adjustment of the current values at the end points**

a) Move the actuator to the end position, where you want to adjust the current.

b) Press both buttons simultaneously for about 2 seconds. Then both LEDs are alternating flashing in a slow frequency.

c) With push button S1 "Config Output 4 mA" the output current value can be decreased and with push button S2 "Config Output 20 mA" the output current value can be increased. Pressing the buttons for a short moment results in a small change and pressing the button for a longer time results in a fast mode for a bigger change. The value of the current can be freely decreased between about 3.3 and increased up to 22.5 mA.

d) Without any additional manipulations of the push buttons the new value is automatically saved. After a few seconds, the device returns into the normal operating mode, indicated by both LEDs that are then light up again.

---

**Trouble Shooting of the position transmitter**

The components of the position transmitter are under constant surveillance by the installed micro controller. Errors are detected and indicated when both LEDs are off or both LEDs are parallel flashing at a fast frequency.

In the event of a fatal error, e.g. potentiometer not connected, an output current of more then 24 mA will be shown in addition to the error indication given by the LEDs (fast flashing).

In this case check the following:

a) if the potentiometer is correctly connected to the electronic board.

b) if the potentiometer is within its working span.

When both LEDs are off, the supply voltage should be checked (minimum tension, polarity).
9.6 Subsequent installation or exchange

For subsequent installation there are kits available, see PSS EVE0102A. Safety measures indicated in page 29 are to be absolutely observed!

Kit components:

1. Driver plate for transmitting the rotary motion
2. Support Ø 7 mm for converter plate
3. Converter plate with 2 fillister head screws 10 and one lock washer 20
4. Support for cover
5. Cable screw connection
6. Screw plug
7. Frame with rubber seal

Installation:

a) Unscrew lower screw 2 of stroke factor adjustment facility 3.

b) Position driver plate 1, turning screw 2 again and tighten gently.

c) Hold the stroke factor adjustment unit together manually and remove upper screw 4. Swivel in driver plate and return screw. Tighten screws 2 and 4.

d) Screw in the 2 supports 5 Ø 7 mm as follows: Longer support left, shorter support right.

e) Secure converter plate 9 with screws 10 and a lockwasher 20 (left screw) to the two supports so that the pin on the driver plate 1 engages into the slot on the tooth segment.

f) Screw two supports 11 into the female thread for securing the cover. In installation position, these are the female threads in the top left corner and in the bottom right corner.

g) Secure cable screw connection 12 and screw plug 13 to frame 14 using the nuts supplied. Position the frame so that the rubber seal faces towards the position controller and so that the cable screw connection 12 is next to the terminals.

h) Screw on cover 15 so that the ventilation slot is at the bottom when the unit is attached.
10 SAFETY REQUIREMENTS FOR OPTIONS

Repair and maintenance operations with open housing may only be performed by qualified personnel if any voltage sources are connected to the device.

The units must be used for their intended purpose and connected in accordance with the connection diagram. The locally valid national regulations relating to setting up electrical systems must be followed, e.g. in the Federal Republic of Germany DIN VDE 0100 and DIN VDE 0800.

Device may be grounded upon requirement.

The protective measures provided in the units can become ineffective if the unit is not used in accordance with the operation instructions.

Regulations for Position transmitter

The attachment of the position transmitter with the Id No. EW 420 661 054 and EW 420 661 063 to the positioner is to be regarded as a modification to an explosion-protected unit and is therefore permissible only in accordance with the national legal regulations. The technical design of the kit is the same as that of the certified version of positioners with a built-in option electrical position transmitter.

The following applies to the Federal Republic of Germany: In accordance with §9 ElexV, the attachment must be certified by an approved expert.

Regulations for inductive Limit Switch

This device fulfills the requirements stipulated in IEC 1010-1, Class III equipment.

The units may only be operated with safety extra-low voltage SELV oder SELV(E) (functional extra-low voltage with protective separation).

Regulations for subsequent installation

The attachment of the inductive limit switch to the positioner is to be regarded as a modification to an explosion-protected unit and is therefore permissible only in accordance with the national legal regulations. The technical design of the kit is the same as that of the certified version of a positioner with a built-in option inductive limit switch Type BIB663 + BIB633 K, PTB-Nr. Ex-87.B.2010.

The following applies to the Federal Republic of Germany: The attachment must be certified by an approved expert as a modification in accordance with §9 ElexV.

Regulations for Limit Switch with Micro Switches

This device fulfills the requirements stipulated in IEC 1010-1, Class II equipment, Contamination level 2 and over voltage category II.
## 11 TROUBLESHOOTING

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible causes</th>
<th>Remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator does not react to the applied input signal nor to a change</td>
<td>Pneumatic connections switched</td>
<td>check connections</td>
</tr>
<tr>
<td></td>
<td>Electrical connections switched</td>
<td>reverse electrical connections</td>
</tr>
<tr>
<td></td>
<td>feedback lever loose</td>
<td>tighten feedback lever</td>
</tr>
<tr>
<td></td>
<td>Positioner mounted on the wrong side</td>
<td>check mounting side see table section 2.2.2</td>
</tr>
<tr>
<td></td>
<td>changeover plate in the wrong position</td>
<td>check position see table in section 2.2.2</td>
</tr>
<tr>
<td></td>
<td>booster defective</td>
<td>Change booster (see page 6)</td>
</tr>
<tr>
<td></td>
<td>I-P converter defective</td>
<td>See note in section 5.3 and proceed accordingly</td>
</tr>
<tr>
<td>Output pressure does not reach full value</td>
<td>supply pressure too low</td>
<td>check supply air</td>
</tr>
<tr>
<td></td>
<td>flappers not parallel to nozzles</td>
<td>align flappers (see 5.1 d, e bzw. 5.2 d, e)</td>
</tr>
<tr>
<td></td>
<td>pre-throttle in booster blocked</td>
<td>clean throttle (see 5.4)</td>
</tr>
<tr>
<td></td>
<td>I-P converter defective</td>
<td>see note in section 5.3 and proceed accordingly</td>
</tr>
<tr>
<td></td>
<td>filter in supply connection blocked</td>
<td>change filter</td>
</tr>
<tr>
<td>Actuator runs to the end position</td>
<td>positioner mounted on wrong side</td>
<td>check mounting side see table in section 2.2.2</td>
</tr>
<tr>
<td></td>
<td>feedback lever</td>
<td>tighten feedback lever</td>
</tr>
<tr>
<td></td>
<td>Pneumatic connections switched (double-acting version)</td>
<td>check connections</td>
</tr>
<tr>
<td></td>
<td>electrical connections switched</td>
<td>reverse electrical connections</td>
</tr>
<tr>
<td>Unstable behavior - positioner circuit oscillates</td>
<td>boost too high</td>
<td>reduce boost (see 4.1)</td>
</tr>
<tr>
<td></td>
<td>gland friction on valve too great</td>
<td>loosen gland slightly or renew</td>
</tr>
<tr>
<td></td>
<td>for piston actuators: static friction on cylinder too great</td>
<td>reduce boost (see 4.1)</td>
</tr>
<tr>
<td>Stroke range cannot be set</td>
<td>range spring unsuitable</td>
<td>change range spring (see 4.5 or 4.6)</td>
</tr>
<tr>
<td></td>
<td>positioner does not exhaust pressure</td>
<td>check supply air (max. 6 bar)</td>
</tr>
<tr>
<td></td>
<td>completely</td>
<td>check boost (see 4.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>adjust distance between nozzle and flapper</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(see 5.1 e, f bzw. 5.2 e, f)</td>
</tr>
</tbody>
</table>

**Detail: Nozzles/ flappers system**

59 60 40 66 60 59
Single-acting Positioner SRI986

Double-acting Positioner SRI986