Series 3731

Electropneumatic Ex d Positioner Type 3731-5 with FOUNDATION™ fieldbus communication

Application
Positioner for attachment to pneumatic control valves
Travel: 3.6 to 200 mm  ·  Opening angle: 24° to 100°

The positioner is used to ensure a preselected assignment between the valve stem position (controlled variable x) and the control signal (reference variable w). It compares the reference variable cyclically transmitted over the FOUNDATION™ fieldbus network to the travel or opening angle of the control valve and produces the corresponding signal pressure output (output variable y).

The Type 3731-5 Positioner communicates according to FOUNDATION™ fieldbus specification with field devices, programmable logic controllers and process control systems. An integrated PID Function Block allows the control of required process variables directly in the field. The shift to distributed control reduces the number of control tasks to be performed by the higher-level automation system.

Other benefits provided by the smart positioner:

- Simple attachment to common linear actuators over SAMSON direct attachment interface, over NAMUR rib or to control valves with rod-type yokes according to IEC 60534-6-1 to rotary actuators according to VDI/VDE 3845
- Any desired mounting position
- Simple one-knob, menu-driven operation also in hazardous areas
- Variable, automatic start-up using four initialization modes
- LCD easy to read in any mounting position due to selectable reading direction
- Monitoring and diagnostics functions
- Extended diagnostis and partial stroke test in EXPERT+ version. Refer to Data Sheet T 8388 EN for more details.
- Control parameters can be changed online
- Automatic monitoring of zero point
- Two DI Blocks for analysis of binary input signals
- Calibrated travel sensor without gears susceptible to wear
- Permanent storage of all parameters in non-volatile EEPROM (protection against power failure)
- Adjustable output pressure limitation
- Adjustable tight-closing function
- Configurable with a PC over the SSP serial interface using the TROVIS-VIEW software

Additional options
The digital positioner functions can be optionally extended:
- Binary input
- Forced venting
Principle of operation

The electropneumatic positioner is attached to pneumatic control valves. It is used to assign the valve stem position (controlled variable x) to the input signal (reference variable w). The input signal received from a control system is compared to the travel or rotational angle of the control valve, and a pneumatic signal pressure (output variable y) is produced.

The positioner consists of a travel sensor system proportional to resistance, an analog i/p converter with a downstream air capacity booster and the electronics unit with microcontroller. When a deviation occurs, the actuator is filled with more air or vented. The signal pressure to the actuator can be limited by software to 1.4, 2.4 or 3.7 bar.

A constant air stream to the atmosphere is created by the flow regulator (9) with a fixed set point. The air stream is used to purge the inside of the housing as well as to optimize the air capacity booster. The i/p module (6) is supplied with a constant upstream pressure by the pressure regulator (8) to make it independent of the supply air pressure.

The positioner communicates and is powered via IEC 61158-2 transmission technology conforming to FOUNDATION™ fieldbus specification.

Operation

The positioner is operated using a user-friendly rotary pushbutton. The parameters are selected by turning the rotary pushbutton, pushing it activates the required setting. In the menu, all parameters are listed in one level, meaning there is no need to search in submenus. All parameters can be checked and changed on site.

All values are displayed on the LCD. The reading direction of the LCD can be rotated by 180° at the push of a button.

The closing direction of the control valve is indicated to the positioner. It assigns the CLOSED position of the control valve to the 0 % reading.

The initialization is started according to the (pre)set parameters. After initialization is completed, the positioner immediately starts closed-loop operation.

Configuration with TROVIS-VIEW

The SAMSON configuration software, TROVIS-VIEW, can be used to configure the positioner. For this purpose, the positioner is equipped with an additional digital interface to be connected to the RS-232 serial interface of a PC. TROVIS-VIEW adapts the positioner to any process requirements and allows the process to be checked online. The control valve is linked to the process over the FOUNDATION™ fieldbus network.

The PID Function Block integrated in the positioner can also be configured using TROVIS-VIEW. The Function Blocks are linked by the NI-FBUS Configurator or a corresponding process control system.

Legend

1 Control valve
2 Travel sensor
3 PD controller
4 IEC 61158-2 interface module
5 Microcontroller
6 i/p module
7 Air capacity booster
8 Pressure regulator
9 Flow regulator
16 LCD
17 Forced venting function (optional)
19 DA converter
20 Serial interface (SSP)
22 Rotary pushbutton
23 Binary input (optional)

Fig. 2 · Functional diagram of Type 3731-5 Positioner
### Table 1 - Technical data

#### Type 3731-5 FOUNDATION™ fieldbus Positioner (technical data in test certificates additionally apply for explosion-protected devices)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated travel</strong></td>
<td>Adjustable Direct attachment to Type 3277 Actuator 3.6 to 30 mm</td>
</tr>
<tr>
<td></td>
<td>Attachment according to IEC 60534-6 (NAMUR) 3.6 to 200 mm</td>
</tr>
<tr>
<td></td>
<td>Attachment to rotary actuators (VDI/VDE 3845) 24 to 100° opening angle</td>
</tr>
<tr>
<td><strong>Travel range</strong></td>
<td>adjustable Within the initialized travel/angle of rotation - Restricted to 1/5 at the maximum</td>
</tr>
<tr>
<td><strong>Bus connection</strong></td>
<td>Fieldbus interface IEC 61158-2, bus-powered</td>
</tr>
<tr>
<td></td>
<td>Physical Layer Class 113 (without explosion protection) 111 (explosion-protected version)</td>
</tr>
<tr>
<td></td>
<td>Field device acc. to FM 3610 entity and FISCO</td>
</tr>
</tbody>
</table>

#### Communication

**Local communication**  
SAMSON SSP interface and serial interface adapter

**Software requirements (SSP)**  
TROVIS-VIEW with database module 3731-5

**Fieldbus communication**  
Data transmission conforming to FOUNDATION™ fieldbus specification, Communication Profile Class: 31 PS, 32 L; Interoperability tested acc. to Interoperability System IST Rev. 4.6

**Permissible operating voltage**  
9 to 32 V DC - Power over bus line  
The limits in the EC Type Examination Certificate additionally apply for explosion-protected devices.

**Maximum operating current**  
15 mA

**Additional current in case of error**  
0 mA

**Supply air**  
1.4 to 6 bar (20 to 90 psi)  
Acc. to ISO 8573-1: 2004  
Particle size and density: Class 4 · Oil content: Class 3 · Humidity and water: Class 3  
Pressure dew point at least 10 K below the lowest expected ambient temperature

**Signal pressure (output)**  
0 bar up to capacity of supply pressure

**Characteristics**  
Linear/equal percentage/reverse equal percentage · User-defined (over operating software and communication) · Butterfly valve linear/equal percentage · Rotary plug valve linear/equal percentage · Segmented ball valve linear/equal percentage

**Hysteresis**  
≤ 0.3 %

**Sensitivity**  
≤ 0.1 %

**Direction of action**  
Reversible

**Air consumption**  
Independent of supply air <110 l/h

**Air output capacity**  
Actuator pressurized  
At Δp = 6 bar: 8.5 m³/h · At Δp = 1.4 bar: 3.0 m³/h · $K_{V,\text{max}}(20\,^\circ\text{C}) = 0.09$

Actuator vented  
At Δp = 6 bar:14.0 m³/h · At Δp = 1.4 bar: 4.5 m³/h · $K_{V,\text{max}}(20\,^\circ\text{C}) = 0.15$

**Permissible ambient temperature**  
-40 to +80 °C  
The limits in the test certificate additionally apply for explosion-protected devices.

**Influences**  

<table>
<thead>
<tr>
<th>Influence</th>
<th>Temperature</th>
<th>≤ 0.15 %/10 K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply air</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

**Vibrations**  
≤ 0.25 % up to 2000 Hz and 4 g acc. to IEC 770

**Electromagnetic compatibility**  
Complying with the requirements of EN 61 000-6-2, 61 000-6-3, EN 61326-1 and NAMUR Recommendation NE 21

**Electrical connections**  
Two threaded connections ½ NPT or optionally M20 x 1.5, screw terminals for 2.5 mm² wire cross-section

**Degree of protection**  
IP 66 / NEMA 4X

**Materials**

<table>
<thead>
<tr>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Die-cast aluminum EN AC-AlSi10Mg (Fe) (EN AC-43400) acc. to DIN 1706 Chromated and powder paint coated</td>
</tr>
<tr>
<td>External metal parts</td>
<td>Stainless steel 1.4571 and 1.4301</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 2.5 kg</td>
</tr>
</tbody>
</table>
Network and positioner configuration with NI-FBUS™ configurator
The positioner can also be configured over the NI-FBUS™ configurator from National Instruments. The NI-FBUS™ configurator can be used to perform the planning of the FOUNDATION™ fieldbus network. It also allows the use of PID Controller to allow the implementation of an independent control in the field.

Electrical and bus connection
The Type 3731-5 FOUNDATION™ fieldbus Positioner must be connected to bus segments conforming to IEC 61158-2. A shielded two-wire line is used for both supply power and data communication.

Positioner attachment
The Type 3731-5 FOUNDATION™ fieldbus Positioner can be attached directly to the Type 3277 Actuator with a connection block. In actuators with fail-safe action “Actuator stem extends” and Type 3277-5 Actuator (120 cm²), the signal pressure is transmitted over an internal bore in the actuator yoke to the actuator. In actuators with fail-safe action “Actuator stem retracts” and in actuators with effective diaphragm areas of 240 cm² or larger, the signal pressure is transmitted to the actuator over a ready-made external pipe connection.

Using the appropriate bracket, the positioner can also be attached according to IEC 60534-6 (NAMUR recommendation). The positioner can be mounted on any side of the control valve. A pair of universal brackets is used for the attachment to Type 3278 Rotary Actuators or other rotary actuators according to VDI/VDE 3845. The rotary motion of the actuator is transferred over a coupling wheel to the positioner. The characteristic is set over the software.
Dimensions in mm

Direct attachment

Pressure gauge bracket
½ NPT or G ¼
or connection plate
(only for G ¼)

Attachment acc. to IEC 60534-6 and NAMUR

Lever
S = 17 mm, M = 50 mm
L = 100 mm, XL = 200 mm

Attachment to rotary actuators

Output A1
Supply (9)

Reversing amplifier
¼ NPT or G ¼
Ordering text

FOUNDATION™ fieldbus Positioner Type 3731-5...
- With pneumatic connecting rail ISO 228/1-G ¼
- With/without pressure gauge for signal pressure indication
- Attachment to Type 3277 Actuator (120 to 700 cm²)
- Attachment according to IEC 60534-6-1 (NAMUR)
  travel: ... mm, stem diameter: ... mm, if applicable
- Attachment to Type 3278 Rotary Actuator (160 cm²)
- Attachment to rotary actuators acc. to VDI/VDE 3845
- Reversing amplifier for double-acting actuators with connection acc. to ISO 228/1 - G ¼ or ¼-18 NPT

Specifications subject to change without notice.