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°

Smart, bus-powered field unit conforming to FOUNDATION™ Fieldbus specification based on IEC 61158-2 transmission technology. Integrated Function Blocks: PID Process Controller, AO Analog Output, one binary input for DC voltage signals (DI1) or for connection of one floating contact (DI2).

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:

- Easy 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 commissioning using four initialization modes
- LCD easy to read in any mounting position due to selectable reading direction
- Monitoring and diagnostics functions
- Extended diagnostics 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

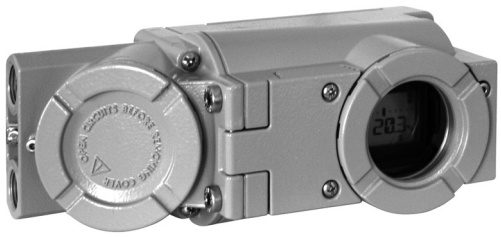


Fig. 1 · Type 3731-5 FOUNDATION™ Fieldbus Positioner

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 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 with a user-friendly rotary pushbutton. The parameters are selected by turning the knob, 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.

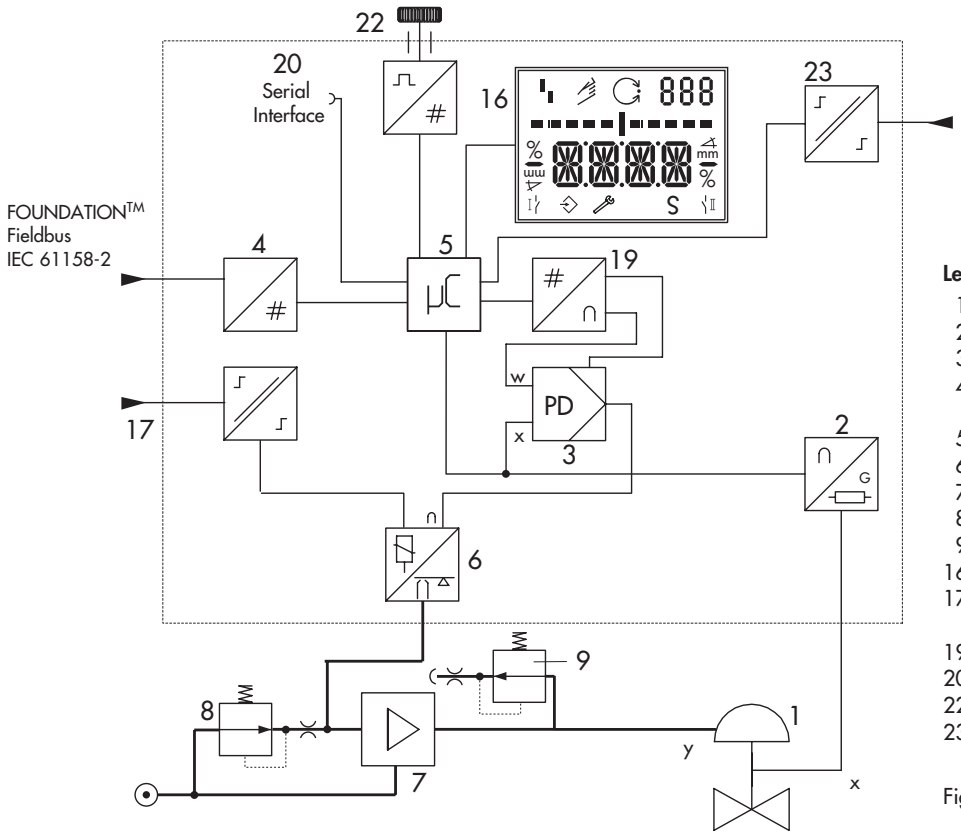
The closing direction of the control valve is indicated to the positioner. It assigns the CLOSED position of the control valve to the 0 % reading.

The initialization is started according to the (pre)set parameters. After initialization is completed, the positioner immediately starts control 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 likewise 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		
Rated travel	adjustable	Direct attachment to Type 3277 Actuator 3.6 to 30 mm
		Attachment according to IEC 60534-6 (NAMUR) 3.6 to 200 mm
		Attachment to rotary actuators (VDI/VDE 3845) 24 to 100° opening angle
Travel range	adjustable	Within the initialized travel/angle of rotation · Restricted to 1/5 at the maximum
Bus connection		Fieldbus interface as per IEC 61158-2, bus-powered Physical Layer Class 113 (without explosion protection) 111 (explosion-protected version) Field device acc. to FM 3610 entity and FISCO
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	Supply air Air quality	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 Deviation from characteristic ≤ 1 %
Hysteresis		≤ 0.3 %
Sensitivity		≤ 0.1 %
Direction of action		Reversible
Air consumption		Independent of supply air <110 l_n/h
Air output capacity	Actuator pressurized	At Δp = 6 bar: 8.5 m_n^3/h · At Δp = 1.4 bar: 3.0 m_n^3/h · $K_{Vmax(20\ °C)}$ = 0.09
	Actuator vented	At Δp = 6 bar:14.0 m_n^3/h · At Δp = 1.4 bar: 4.5 m_n^3/h · $K_{Vmax(20\ °C)}$ = 0.15
Permissible ambient temperature		–40 to +80 °C The limits in the EC Type Examination Certificate additionally apply for explosion-protected devices.
Influences	Temperature	≤ 0.15 %/10 K
	Supply air	None
	Vibrations	≤ 0.25 % up to 2000 Hz and 4 g acc. to IEC 770
Electromagnetic compatibility		Conforming to requirements in EN 61 000-6-2, 61 000-6-3 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		
Housing		Die-cast aluminum EN AC-AlSi10Mg (Fe) (EN AC-44300) acc. to DIN 1706 Chromated and powder paint coated
External metal parts		Stainless steel 1.4571 and 1.4301
Weight		Approx. 2.5 kg

Options for Type 3731-5		
Binary input, galvanically isolated		
Connection	Terminals A-B Voltage input 0 to 30 V DC, reverse polarity protection	Terminals B-C for external floating contact
Input	Current consumption: 3.5 mA at 24 V	R < 100 Ω; contact load: 100 mA
	Static destruction limit: 40 V	Static destruction limit: 20 V / 5.8 mA
	Signal "1" when Ue > 5 V Signal "0" when Ue < 3 V	
Forced venting, galvanically isolated		
Input	0 to 40 V DC / 0 to 28 V AC, static destruction level 45 V DC / 32 V AC, input resistance ≥ 7 kΩ	
Signal	Fail-safe position with an input voltage ≤ 3 V · Normal operation at an input voltage > 5 V	

Explosion protection certificates

Type of approval	Certificate number	Date	Comments
EC Type Examination Certificate	PTB 05 ATEX 1058	2005-07-19	⟨Ex⟩II 2 G EEx d IIC T6 ⟨Ex⟩ II 2 G EEx de IIC T6
	First Addendum	2006-07-21	⟨Ex⟩ II 2 D IP 66 T 80 °C
FM approval	3024956	2006-01-30	XP/I/1/BCD/T4 Ta=80 °C, T5 Ta=70 °C, T6 Ta=60 °C; Type 4X/IP 66 XP/I/1/IIB+H_2/T4 Ta=80 °C, T5 Ta=70 °C, T6 Ta=60 °C; Type 4X/IP 66 DIP/II, III/1/EFG/T4 Ta=80 °C, T5 Ta=70 °C, T6 Ta=60 °C; Type 4X/IP 66 Class I, Division 1 and 2, Groups B, C, D Class II and III, Division 1 and 2, Groups E, F, G Class I, Zone 1, IIB+H_2; Type 4X/IP 66
CSA approval	1709815	2005-10-04	Class I, Division 1 and 2, Groups B, C, D, T6...T4 Class II, Division 1 and 2, Groups E, F, G; Class III Class I, Zone 1, Group IIB+H_2, T6...T4; Type 4X/IP 66
IECEx approval	IECEx PTB 06.0041	2006-05-10	Ex d IIC IP 65 T 80 °C
JIS approval	TC17747	2006-09-12	Ex d IIC T6

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

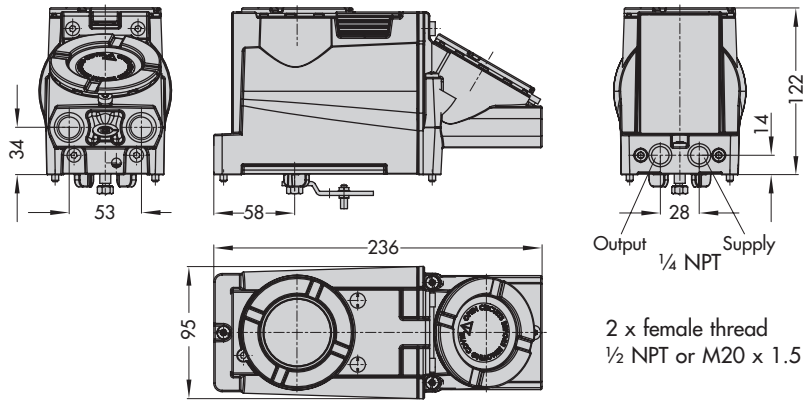
The Type 3731-5 FOUNDATION™ Fieldbus Positioner can be attached directly to the Type 3277 Actuator with a connection block. In actuators with fail-safe action "Actuator stem extends" and Type 3277-5 Actuator (120 cm²), the signal pressure is transmitted over an internal bore in the actuator yoke to the 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.

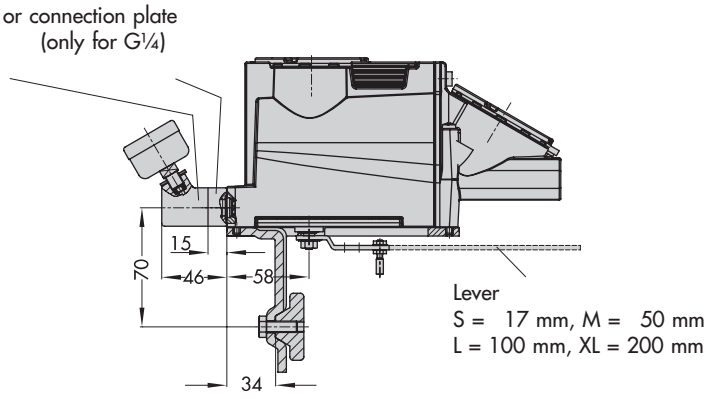
Dimensions in mm

Direct attachment

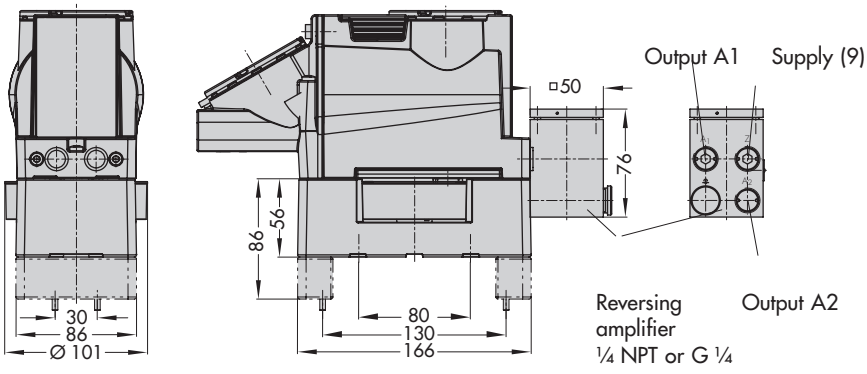


2 x female thread
½ NPT or M20 x 1.5

Attachment acc. to IEC 60534-6 and NAMUR



Attachment to rotary actuators



Article code

Positioner	**Type 3731-**	**5**	x	x	x	x	x	x	0	0	0	x	0	x	0	0	0
With LC display, autotune, FOUNDATION™ Fieldbus																	
Explosion protection																	
II 2 G EEx d IIC T6/EEx de IIC T6/II 2 D IP 65 T 80 °C acc. to ATEX			2	1													
Ex d acc. to FM/CSA			2	3													
Ex d acc. to JIS			2	7													
Options																	
Without					0	0											
Binary input					0	3											
Forced venting					0	5											
Diagnostics																	
EXPERT							1										
EXPERT+							2										
Electrical threaded connections																	
2x M20 x 1.5								1									
2x ½ NPT								2									
Explosion protection approvals																	
As specified in Explosion protection												0					
IECEx												2					
Special applications																	
Without														0			
Positioner compatible with paint (IP 41/NEMA 1)														1			
Special version																	
None															0	0	0

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.

SAMSON AG · MESS- UND REGELTECHNIK
Weismüllerstraße 3 · 60314 Frankfurt am Main · Germany
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507
Internet: http://www.samson.de