

Application

Positioners for attachment to pneumatic control valves

Rated travel from 3.6 to 200 mm · Opening angle 24 to 100°

Smart, bus-powered field device complying with FOUNDATION™ fieldbus specifications based on IEC 61158-2 transmission technology. Integrated function blocks: PID process controller, analog output (AO), one binary input for DC voltage signals (DI1) or for connection of one floating contact (DI2).



The positioner ensures a predetermined assignment of the valve position (controlled variable x) to the input 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 process variables required 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 all common linear actuators with interface for SAMSON direct attachment, NAMUR rib or valves with rod-type yokes according to IEC 60534-6-1 or to rotary actuators according to VDI/VDE 3845
- Any desired mounting position of the positioner
- One-knob, menu-driven operation also in hazardous areas
- Variable, automatic start-up with four different initialization modes
- LCD easy to read in any mounted position due to selectable reading direction
- Monitoring and diagnostic functions
- Extended diagnostics and partial stroke testing in EXPERT+ version. Refer to Data Sheet ▶ T 8388 EN for more details.
- Online changing of control parameters
- Automatic zero monitoring
- Two DI function blocks to analyze binary input signals
- Calibrated travel sensor without gears susceptible to wear
- Permanent storage of all parameters (protected against power failure)
- Adjustable output pressure limitation
- Activatable tight-closing function
- Configurable with a PC over the SSP interface using the TROVIS-VIEW software

Additional options

The digital positioner functions can be optionally extended:

- Binary input
- Forced venting



Fig. 1: Type 3731-5 FOUNDATION™ fieldbus Positioner

Principle of operation

The positioner is mounted on pneumatic control valves and is used to assign the valve position (controlled variable x) to the control signal (reference variable w). The positioner compares the electric control signal of a control system to the travel or rotational angle of the control valve and issues a signal pressure (output variable y) for the pneumatic actuator.

The positioner mainly consists of an electric travel sensor system, an analog i/p module with a downstream air capacity booster and the electronics with the microcontroller.

When a system deviation occurs, the actuator is either vented or filled with air. The signal pressure supplied to the actuator can be limited by software or on site to 1.4, 2.4 or 3.7 bar.

The fixed flow regulator ensures a constant air flow to the atmosphere, which is used to flush the inside of the positioner housing and to optimize the air capacity booster. The i/p module is supplied with a constant upstream pressure by the pressure reducer to compensate for any fluctuations in the supply pressure.

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

Operation

A single rotary pushbutton facilitates operation. The parameters are selected by turning the rotary pushbutton, pushing it activates the required setting. 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°.

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 using 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 interface of a PC. TROVIS-VIEW adapts the positioner to any process requirements and allows the process to be checked while the process is running. 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 configuration of the network connections for the PID function block is made by the NI-FBUS Configurator or a corresponding digital process control system.

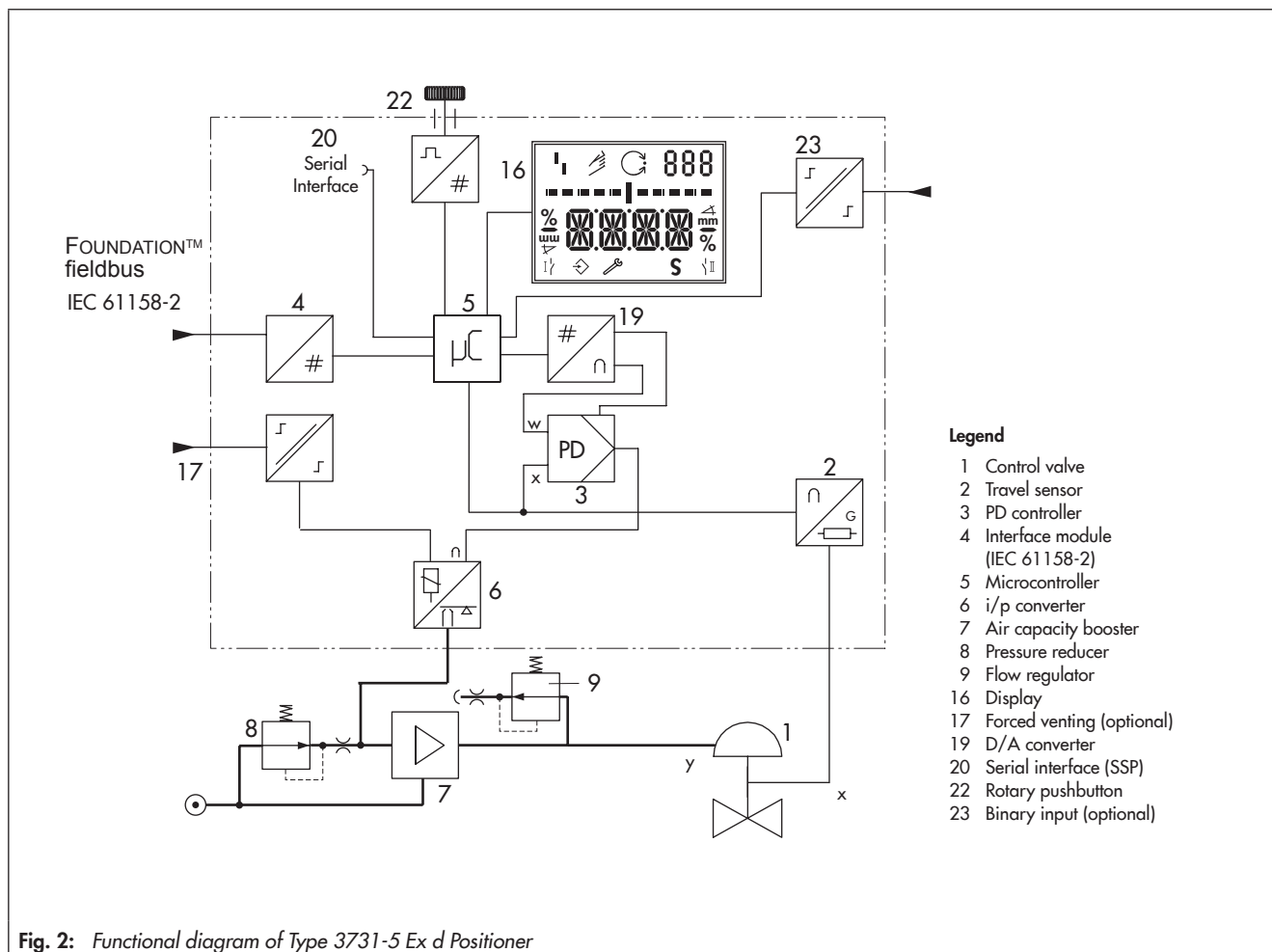


Fig. 2: Functional diagram of Type 3731-5 Ex d Positioner

Table 1: Technical data

Type 3731-5 Positioner with FOUNDATION™ fieldbus communication (technical data in test certificates additionally apply)		
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 Rotary actuators (VDI/VDE 3845): 24 to 100° opening angle
Travel range	Adjustable	Adjustable within the initialized travel/angle of rotation; travel can be restricted to 1/5 at the maximum
Bus connection		Fieldbus interface according to IEC 61158-2, bus-powered Physical Layer Class 113 (without explosion protection) 111 (explosion-protected version) Field device according to FM 3610 entity and FISCO
Communication		
Fieldbus		Data transmission conforming to FOUNDATION™ fieldbus specification Communication Profile Class: 31 PS, 32 L Interoperability tested according to Interoperability Test System (IST), revision 4.6
Execution times		AO FB: 20 ms DI FB: 40 ms PID: 60 ms
Local communication		SAMSON SSP interface and serial interface adapter Software requirements (SSP): TROVIS-VIEW with database module 3731-5
Permissible operating voltage		9 to 32 V DC · Powered over bus line The limits specified in the examination certificate additionally apply.
Maximum operating current		15 mA
Additional current in case of error		0 mA
Supply air	Supply air	1.4 to 6 bar/20 to 90 psi
	Air quality acc. to ISO 8573-1 (2004 edition)	Max. particle size and density: Class 4 · Oil content: Class 3 Moisture and water: Class 3 Pressure dew point: at least 10 K below the lowest ambient temperature to be expected
Signal pressure (output)		0 bar up to capacity of supply pressure
Characteristic		Linear/Equal percentage/Reverse equal percentage Butterfly valve, rotary plug valve or segmented ball valve: Linear/equal percentage User-defined: adjustable over operating software
	Deviation	≤ 1 %
Hysteresis		≤ 0.3 %
Sensitivity		≤ 0.1 %
Transit time		Up to 240 s separately adjustable for exhaust and supply air by software
Direction of action		Reversible
Air consumption		Independent of supply air approx. < 110 l _n /h
Air output capacity	Actuator filled with air	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 test certificate additionally apply.
Influences	Temperature	≤ 0.15 %/10 K
	Supply air	None
	Influence of vibrations	≤ 0.25 % up to 2000 Hz and 4 g according to IEC 770
Electromagnetic compatibility		Complying with EN 61000-6-2, EN 61000-6-3, EN 61326-1 and NAMUR Recommendation NE 21
Electrical connections		Two tapped holes ½ NPT or optionally M20 x 1.5 · Screw terminals for 2.5 mm ² wire cross-section
Degree of protection		IP 66/NEMA 4X
Materials		
Housing		Die-cast aluminum EN AC-ALSi10Mg (Fe) (EN AC-43400) acc. to DIN 1706 Chromated and powder paint coated
External metal parts		Stainless steel 1.4571 and 1.4301
Weight		Approx. 2.5 kg

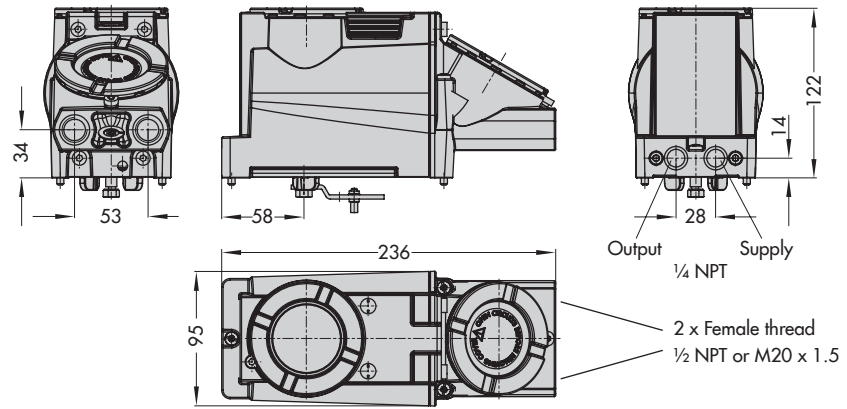
Options for Type 3731-5		
Binary input , galvanically isolated		
Connection	Terminals A-B Voltage input 0 to 30 V DC, reverse polarity protection	Terminals B-C for external floating contact
	Current consumption: 3.5 mA at 24 V	R < 100 Ω; contact load: 100 mA
	Static destruction limit 40 V	Static destruction limit 20 V/5.8 mA
	Signal "1" when U _e > 5 V Signal "0" when U _e < 3 V	
Forced venting , galvanically isolated		
Input	0 to 40 V DC/0 to 28 V AC, static destruction limit 45 V DC/32 V AC, input resistance ≥ 7 kΩ	
Signal	Fail-safe position with input voltage ≤ 3 V · Normal operation with input voltage > 5.5 V	

Explosion protection certificates

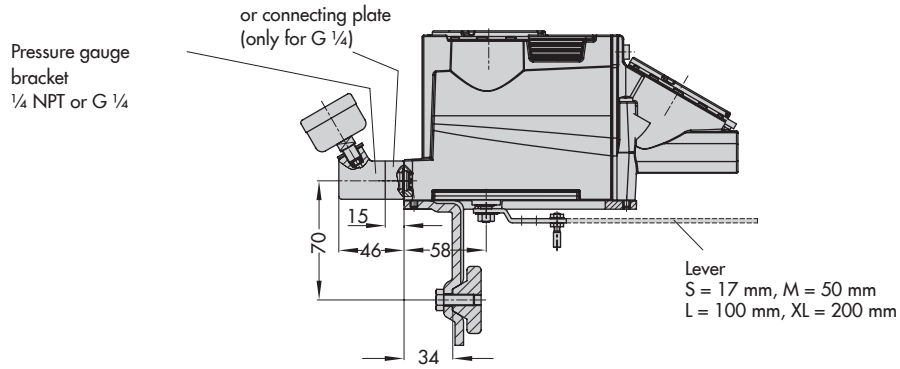
Type of approval	Certificate number	Date	Type of protection/comments	Type 3731
EC Type Examination Certificate	PTB 11 ATEX 1014 X	2001-03-01	II 2G Ex db IIC T6, II 2G Ex db eb IIC T6, II 2G Ex db [ia] IIC T6, II 2G Ex ia IIC T6 and II 2D Ex tb IIIC T80°C IP66	-521
First Addendum		2012-07-26	Addition: Binary input, forced venting	
EC Type Examination Certificate	PTB 05 ATEX 1058	2005-11-19	II 2G Ex d IIC T6 Gb; II 2G Ex de IIC T6 Gb; II 2D Ex tb IIIC IP65 T80°C	-521
First Addendum		2006-07-21	Addition: Degree of protection IP 66	
CSA	1709815	2005-10-04	Class I, Zone 1, Group IIB+H2 T4...T6; Class I, Div. 1+2, Groups B, C, D T4...T6; Class II, Div. 1, Groups E, F, G	-523
FM	3024956	2006-01-30	Class I, Div. 1+2, Groups B, C, D; Class I, Zone 1, Groups IIB+H2; Class I, Div. 1+2 Groups E, F, G; Class III	-523
GOST (valid until 2014-11-21)	POCC CE.B00019	2011-11-22	1Ex d IIC T6/T5/T4	-521
IECEX	IECEX PTB 11.0084X	2011-09-14	Ex d IIC T6, T5, T4 Gb; Ex d e IIC T6, T5, T4 Gb; Ex tb IIIC T80°C Db IP66	-521
INMETRO (valid until 2016-10-14)	IEx 13.0193X	2013-10-15	Ex d IIC T* Gb; Ex de IIC T* Gb; * see ambient temperature	-521
JIS approval (valid until 2015-09-11)	TC17747	2012-09-12	Ex d IIC T6	-527
KCS (valid until 2014-01-31)	13-KB4BO-0036	2015-01-31	Ex d IIC T6/T5/T4	-521
NEPSI (valid until 2016-01-23)	GYJ111266	2011-01-24	Ex d IIC T6~T4; Ex de IIC T6~T4	-521
STCC (valid until 2017-10-01)	No. 973	2012-09-20	1Ex d IIC T4...T6; 1Ex de IIC T4...T6	-521

Dimensions in mm

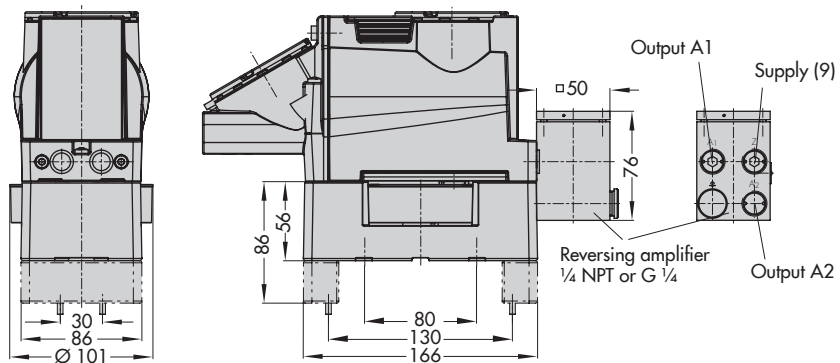
Direct attachment



Attachment according to IEC 60534-6 (NAMUR)



Attachment to rotary actuators



Article code

Positioner	Type	3	7	3	1	5	0	0	0	x	1	x	0	0	0
With LCD and autotune, FOUNDATION™ fieldbus															
Explosion protection															
ATEX: II 2G Ex db IIC T6, II 2G Ex db eb IIC T6, II 2G Ex db [ia] IIC T6, II 2G Ex ia IIC T6 and II 2D Ex tb IIIC T80°C IP66 and II 2G Ex d IIC T6 Gb; II 2G Ex de IIC T6 Gb; II 2D Ex tb IIIC IP65 T80°C	2	1													
FM/CSA: Class I, Div. 1+2, Groups B, C, D; Class I, Zone 1, Groups IIB+H2; Class I, Div. 1+2 Groups E, F, G; Class III/ Class I, Zone 1, Group IIB+H2 T4...T6; Class I, Div. 1+2, Groups B, C, D T4...T6; Class II, Div. 1, Groups E, F, G	2	3													
JIS: Ex d IIC T6	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 certificates															
Same as specified in table on explosion protection certificates									0						
IECEX: Ex d IIC T6, T5, T4 Gb; Ex d e IIC T6, T5, T4 Gb; Ex tb IIIC T80°C Db IP66	2	1							2						
GOST: 1Ex d IIC T6/T5/T4	2	1							3						
Special applications															
Without										0					
Version compatible with paint (IP 41/NEMA 1)										1					
Special version															
Without													0	0	0

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 entire FOUNDATION™ fieldbus network. It also allows the use of PID Controller in the positioner to implement a standalone loop in the field.

Electrical and bus connection

The Type 3731-5 Positioner with FOUNDATION™ fieldbus communication 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.

Mounting the positioner

The Type 3731-5 Positioner can be attached directly to the Type 3277 Actuator over a connection block. In actuators with fail-safe action "Actuator stem extends" and Type 3277-5 Actuator (120 cm²), the signal pressure is routed over an internal hole in the actuator yoke to the actuator. In actuators with effective diaphragm areas of 240 cm² or larger, the signal pressure is routed to the actuator over ready-made external piping.

Using the appropriate bracket, the positioner can also be attached according to IEC 60534-6-1 (NAMUR recommendation). The positioner can be mounted on either 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 to the positioner over a coupling wheel.

The characteristic is set over the software.

Ordering text

- Type 3731-5... Positioner
- With pneumatic connecting rail ISO 228/1-G ¼
- Without/with 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, if applicable, rod diameter: ... mm
- Attachment to Type 3278 Rotary Actuator (160 cm²)
- Attachment to rotary actuators acc. to VDI/VDE 3845
- Pneumatic 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



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