

Series 3731

Type 3731-3 Electropneumatic Ex d Positioner with HART® communication



Application

Single-acting or double-acting Ex d positioner for attachment to pneumatic control valves. Self-calibrating, automatic adaptation to valve and actuator.

Reference variable	4 to 20 mA
Travels	3.6 to 200 mm
Opening angle	24 to 100°



The positioner ensures a predetermined assignment of the valve position (controlled variable x) to the input signal (reference variable w). It compares the input signal received from a control system to the travel or rotational angle of the control valve and issues a corresponding output signal pressure (output variable y).

Special features

- Simple attachment to all common linear and rotary 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
- Simple one-knob, menu-driven operation also in hazardous areas
- LCD easy to read in any mounted position due to selectable reading direction
- Configurable with a PC over the SSP interface using the TROVIS-VIEW software
- Variable, automatic start-up with four different initialization modes
- Preset parameters - only values deviating from the standard need to be adjusted
- Calibrated travel sensor without gears susceptible to wear
- Sub initialization mode (substitution) allows the positioner to be started up in case of emergency whilst the plant is running without the valve moving through the whole travel range
- Permanent storage of all parameters in EEPROM (protected against power failure)
- Two-wire system with a small electrical load of 450 Ω at 20 mA
- Adjustable output pressure limitation
- Activatable tight-closing function
- Continuous monitoring of zero point
- Integrated temperature sensor and operating hours counter
- Self-diagnostics; messages according to NAMUR Recommendation NE 107, optionally issued by an analog position transmitter



Fig. 1: Type 3731-3 Electropneumatic Ex d Positioner with HART® communication

- Integrated EXPERTplus diagnostics (► T 8389 EN)
- Certified according to IEC 61508/SIL Emergency shutdown at 0 mA or 3.85 mA

Versions

Electropneumatic positioner with LCD, on-site operation, local communication with SSP interface, diagnostics

- **Type 3731-3 EXPERTplus** · Positioner, communication with HART® protocol, diagnostics

Additional options

- Binary contact, output acc. to NAMUR (EN 60947-5-6) or directly to PLC, configurable as a limit switch or fault alarm output
- Binary input
- Analog position transmitter with two-wire transmitter
- Forced venting (solenoid valve function)

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 (2), an analog i/p converter with a downstream air capacity booster and the electronics with the microcontroller (5).

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

A constant air stream with a fixed set point to the atmosphere is created by flow regulator (9) with a fixed set point. The i/p converter (6) is supplied with a constant upstream pressure by the pressure reducer (8) to make it independent of the supply air pressure.

Operation also in hazardous areas

The rotary pushbutton and display are accessible without having to open the positioner housing. As result, the positioner is still fully operable under hazardous area conditions.

The positioner is operated with a user-friendly rotary pushbutton. The parameters are selected by turning the button, pushing it activates the required setting. In the menu, all parameters are listed in one level, eliminating the 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°.

To configure the positioner with SAMSON's TROVIS-VIEW software, the positioner is equipped with an additional digital interface to be connected to the RS-232 interface of a PC.

All parameters can be accessed using HART® communication.

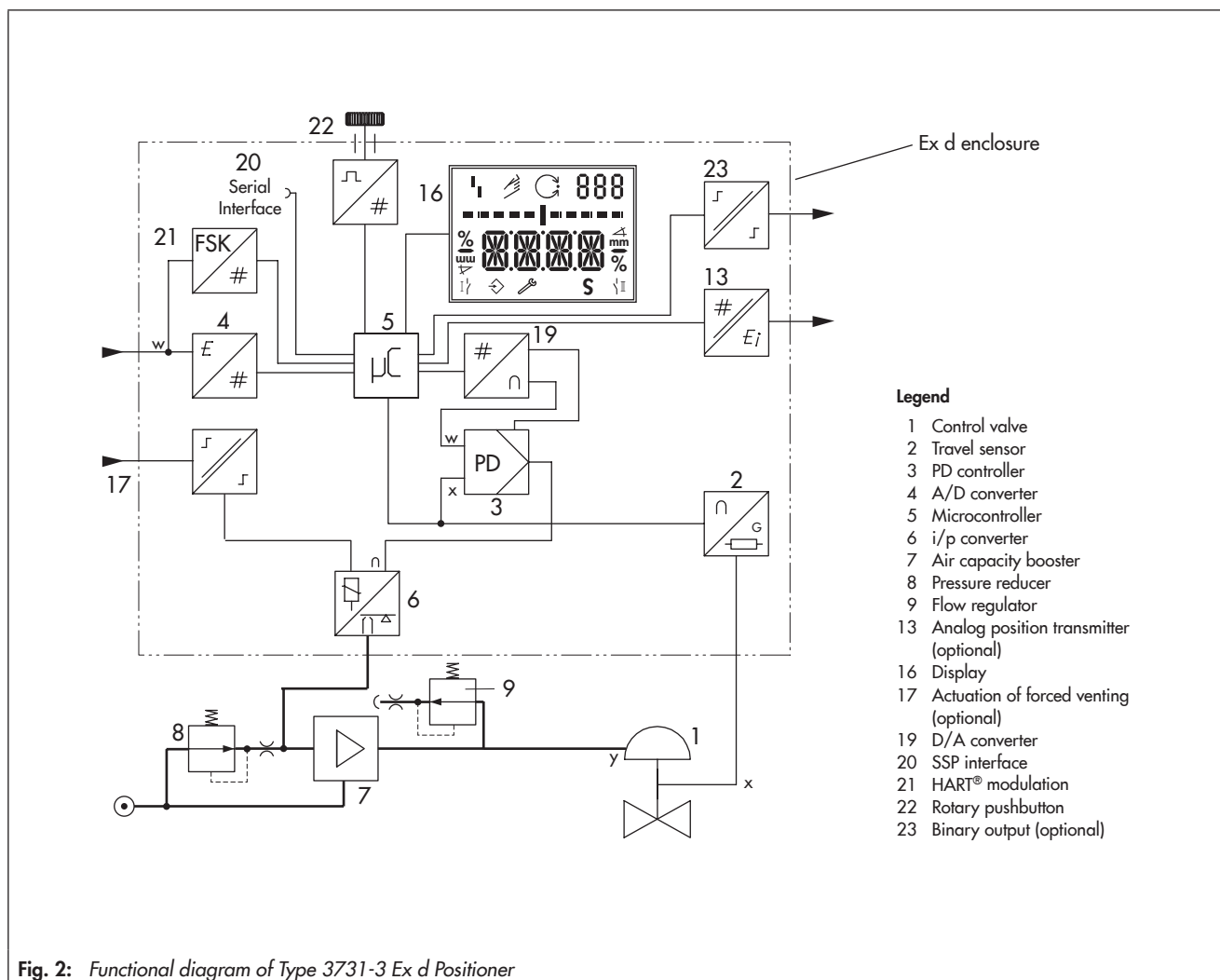


Table 1: Technical data

Type 3731-3 Positioner (technical data in test certificates additionally apply to explosion-protected devices)		
Rated travel	Adjustable	Direct attachment to Type 3277 Actuator: 3.6 to 30 mm Attachment according to IEC 60534-6-1: 3.6 to 200 mm Rotary actuators: 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
Reference variable w	Signal range	4 to 20 mA · Two-wire device, polarity insensitive · Minimum span 4 mA
	Static destruction limit	40 V · Internal current limit 60 mA
Use in safety-instrumented systems acc. to IEC 61508		Suitable for use in safety-instrumented systems up to SIL 2 (single device) and SIL 3 (with redundant configuration) Type 3731-3xxxxx1...: Emergency shutdown at a reference variable ≤ 3.85 mA
Minimum current		3.6 mA for display · 3.8 mA for operation Load impedance ≤ 9 V corresponding to 450 Ω at 20 mA
Communication		
Local communication		SAMSON SSP interface and serial interface adapter
Software requirements (SSP)		TROVIS-VIEW with database module 3731-3
HART® communication		HART® field communication protocol Impedance in HART® frequency range: Receiving approx. 455 Ω · Sending approx. 185 Ω
Software requirements (HART®)	For handheld communicator	Device description for Type 3731-3
	For PC	DTM file certified according to specification 1.2, suitable for integrating the device into frame applications that support the use of FDT/DTM (e.g. PACTware); Integration into AMS™ Suite possible
Supply air	Supply air	1.4 to 6 bar/20 to 90 psi
	Air quality acc. to ISO 8573-1 (2004 edition)	Maximum particle size and density: Class 4 · Oil content: Class 3 Pressure dew point: Class 3 or at least 10 K below the lowest ambient temperature to be expected
Signal pressure (output)		0 bar up to the capacity of the supply pressure · Can be limited to 1.4 bar/2.4 bar/3.7 bar \pm 0.2 bar by software
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	Steady state	Independent of supply air approx. 110 l_n/h
Air output capacity	Actuator filled with air	At $\Delta p = 6$ bar: 8.5 m_n^3/h · At $\Delta p = 1.4$ bar: 3.0 m_n^3/h · $K_{vmax(20^\circ C)} = 0.09$
	Actuator vented	At $\Delta p = 6$ bar: 14.0 m_n^3/h · At $\Delta p = 1.4$ bar: 4.5 m_n^3/h · $K_{vmax(20^\circ C)} = 0.15$
Permissible ambient temperature		-40 to +80 °C The limits in the test certificate additionally apply.
Influences	Temperature	≤ 0.2 %/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 1/2 NPT or optionally M20 x 1.5 · Screw terminals for 2.5 mm ² wire cross-section
Degree of protection		IP 66/NEMA 4X
Explosion protection		
		See table on explosion protection certificates, page 5

Materials		
Housing	Die-cast aluminum EN AC-ALSi10Mg (Fe) (EN AC-43400) acc. to DIN 1706 Chromated and powder paint coated	
External parts	Stainless steel 1.4301/1.4305/1.4310	
Weight	Approx. 2.5 kg	
Optional binary output	Software limit switch or fault alarm output galvanically isolated, optionally NAMUR (EN 60947-5-6) or PLC	
Signal state	Terminals B-C Switching output AC/DC (PLC)	Terminals A-B
	Conducting/residual voltage < 1.7 V	Non-conducting/≥ 2.1 mA
	Non-conducting/high resistance, I < 100 µA	Conducting/≤ 1.2 mA
Power supply	Switching capacity: 40 V DC/28 V AC/0.3 A Static destruction limit: 45 V DC/32 V AC/0.4 A	Only for connection to NAMUR switching amplifier acc. to EN 60947-5-6
Optional binary input	Galvanically isolated · Configurable switching behavior	
Active switching behavior		
Connection	For external switch (floating contact)	
Electric data	Open-circuit voltage when contact is open: max. 10 V Pulsed DC current reaching peak value of 100 mA	
Contact	Closed	ON switching state
	Open	OFF switching state
Passive switching behavior		
Connection	For externally applied DC voltage, reverse polarity protection	
Electric data	0 to 24 V, static destruction limit 40 V, input resistance 6.5 kΩ	
Voltage	> 6 V	ON switching state
	< 4 V	OFF switching state
Optional forced venting	galvanic isolation	
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
Optional analog position transmitter	Two-wire transmitter	
Power supply	11 to 35 V DC, reverse polarity protection, static destruction limit 45 V DC	
Output signal	4 to 20 mA	
Operating direction	Reversible	
Operating range	-1.25 to 103 % of the travel range, corresponding to 3.8 to 20.5 mA Optionally also for fault alarm indication over 2.4 or 21.6 mA acc. to NAMUR Recommendation NE 43	
Characteristic	Linear	
Hysteresis and high-frequency influence	Same as positioner	
Other influences	Same as positioner	

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	-321
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	-321
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	-323
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	-323
GOST (valid until 2014-11-21)	POCC CE.B00019	2011-11-22	1Ex d IIC T6/T5/T4	-321
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	-321
INMETRO (valid until 2016-10-14)	IEEx 13.0193X	2013-10-15	Ex d IIC T* Gb; Ex de IIC T* Gb; * see ambient temperature	-321
JIS approval (valid until 2015-09-11)	TC17747	2012-09-12	Ex d IIC T6	-327
KCS (valid until 2014-01-31)	13-KB4BO-0036	2015-01-31	Ex d IIC T6/T5/T4	-321
NEPSI (valid until 2016-01-23)	GYJ111266	2011-01-24	Ex d IIC T6~T4; Ex de IIC T6~T4	-321
STCC (valid until 2017-10-01)	No. 973	2012-09-20	1Ex d IIC T4...T6; 1Ex de IIC T4...T6	-321

Mounting the positioner

The Type 3731-3 Positioner can be attached directly to the Type 3277 Actuator, to control valves with cast yokes or rod-type yokes according to IEC 60534-6 (NAMUR) or to rotary actuators according to VDI/VDE 3845.

Required mounting parts and accessories are listed in the Mounting and Operating Instructions ► EB 8387-3.

Direct attachment

The 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 fail-safe action "Actuator stem retracts" and in actuators with effective diaphragm areas of 240 cm² or larger, the signal pressure is routed to the actuator over ready-made external piping.

Attachment according to IEC 60534-6 (NAMUR)

Using a NAMUR bracket, the positioner can also be attached to the yoke of control valves according to IEC 60534-6 (NAMUR recommendation). The positioner can be mounted on either side of the control valve.

Attachment to rotary actuators

The positioner must be fitted with an adapter housing and spacers to attach it to rotary actuators according to VDI/VDE 3845. Another common mounting kit suitable for SAMSON Type 3278 Rotary Actuator and VETEC Types S160 and R Actuators is available.

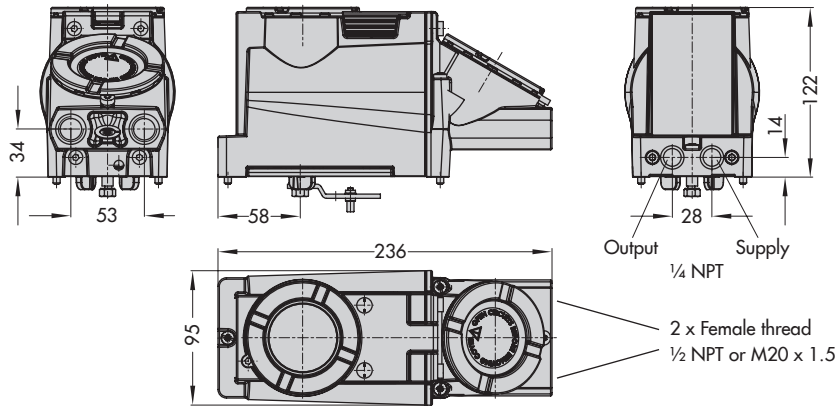
Ordering text

Type 3731-3... Positioner

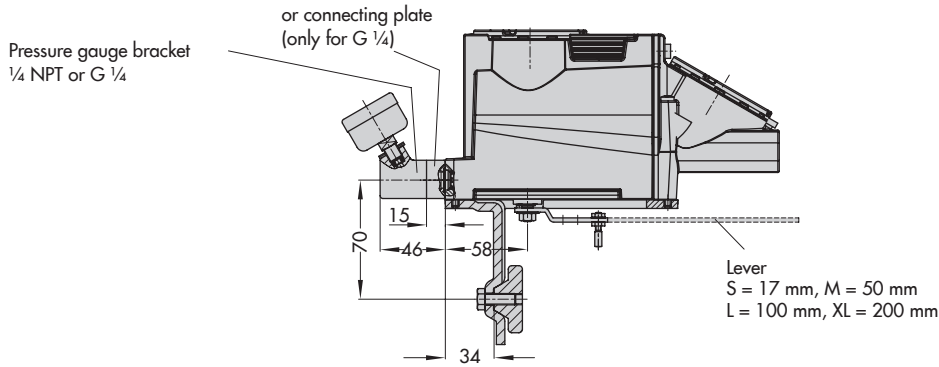
- With pneumatic connecting rail ISO 228/1-G ¼
- Without/with pressure gauge for signal pressure indication
- Attachment to Type 3277 Actuator (240 to 700 cm²)
- Attachment according to IEC 60534-6-1 (NAMUR)
- Travel: ... mm, if applicable, rod diameter: ... mm
- Attachment to Type 3278 Rotary Actuator (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

Dimensions in mm

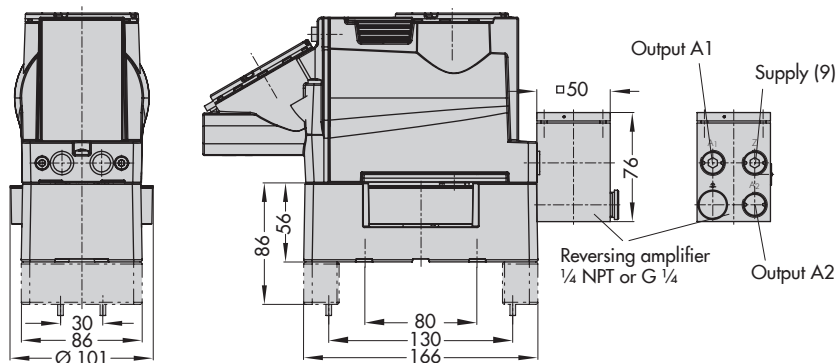
Direct attachment



Attachment according to IEC 60534-6 and NAMUR



Attachment to rotary actuators



Article code

Positioner	Type 3731-	3	x	x	x	x	x	x	x	0	0	x	1	x	0	0	0	
4 to 20 mA, HART® communication, LCD and autotune																		
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													
Position transmitter				0	1													
Binary input				0	3													
Forced venting				0	5													
Binary output (NAMUR/PLC)				0	6													
Diagnostics																		
EXPERTplus							4											
Electrical threaded connections																		
2x M20 x 1.5								1										
2x ½ NPT								2										
Shutdown behavior																		
Emergency shutdown at 0 mA (no longer available)									0									
Emergency shutdown at 3.85 mA									1									
Explosion protection certificates																		
Same as specified in table on explosion protection certificates												0						
NEPSI: Ex d IIC T6~T4; Ex de IIC T6~T4	2	1										1						
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

Specifications subject to change without notice



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T 8387-3 EN

2014-02-06