

Application

Positioners for attachment to pneumatic control valves

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

Smart, bus-powered field device conforming to FOUNDATION™ fieldbus specification based on IEC 61158-2 transmission technology

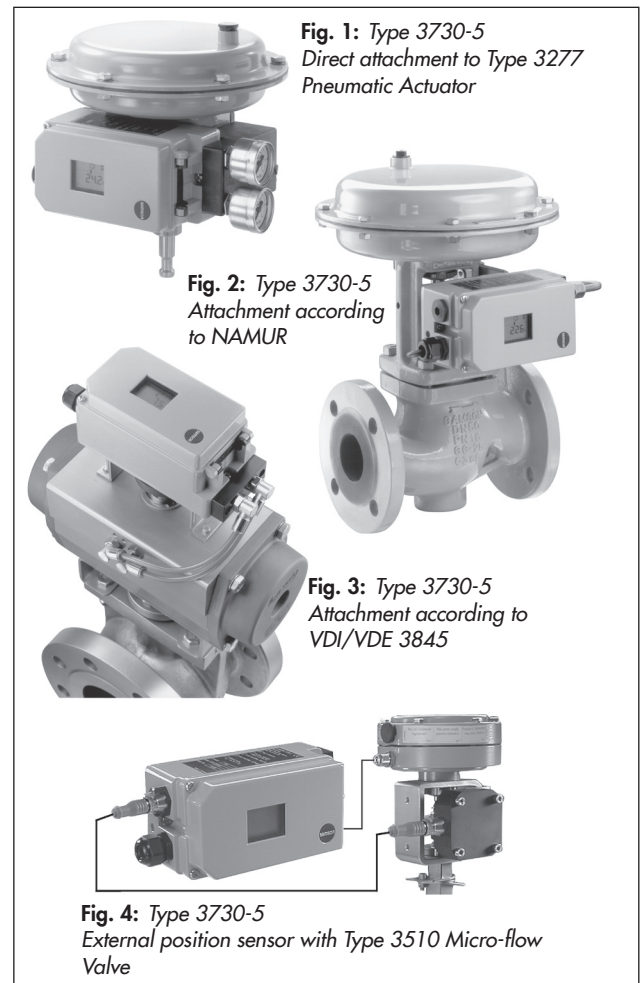


The microprocessor-controlled positioner compares the reference variable cyclically transmitted over the FOUNDATION™ fieldbus network to the travel or opening angle of the control valve and issues a corresponding output signal pressure.

The Type 3730-5 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. The Link Master Capability allows autonomous closed control loops to be set up in the field.

Special features

- Integrated function blocks: 1 PID Control (PID), 1 Analog Output (AO), 1 Multiple Analog Output (MAO), 1 Multiple Analog Input (MAI), 2 Discrete Outputs (DO), 2 Discrete Inputs (DI)
- Link Master Capability
- DO function blocks for discrete analysis of the reference variable for on/off valves and to start/execute diverse functions (e.g. start partial stroke test)
- Two DI function blocks to analyze binary input signals
- Simple attachment to all common linear actuators with interface for SAMSON direct attachment (Fig. 1), NAMUR rib (Fig. 2) or valves with rod-type yokes according to IEC 60534-6-1 or to rotary actuators according to VDI/VDE 3845 (Fig. 3)
- Any desired mounting position of the positioner
- Single-knob, menu-driven operation
- Automatic start-up
- LCD easy to read in any mounted position due to selectable reading direction
- Integrated EXPERTplus diagnostics (▶ T 8389 EN) suitable for throttling and on/off valves and with additional partial stroke test for valves in safety-instrumented systems
- Classified status alarms acc. to NAMUR NE 107
- Online changing of control parameters
- Automatic zero monitoring
- Calibrated travel sensor without gears susceptible to wear
- Permanent storage of parameters (protected against power failure)



- Adjustable output pressure limitation
- Activatable tight-closing function
- Binary input for DC voltage signals
- Certified according to IEC 61508/SIL

Additional options

- Inductive limit switch with proximity switches
- Integrated solenoid valve
- Binary input for floating contact
- Leakage sensor
- External position sensor (Fig. 4)
- Stainless steel housing

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. If necessary, the signal pressure change can be slowed down with a Q-restriction that can be connected as necessary. 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 regulator 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.

As a standard feature, the positioner comes with a binary input used to signalize process information over the FOUNDATION™ fieldbus network.

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 by setting the DIP switch "Air to open/Air to close". It assigns the CLOSED position of the control valve to the 0 % reading.

The INIT key activates initialization which is started according to the ready adjusted 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 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 configuration of the network connections for the PID Function Block is made by the NI-FBUS Configurator or a corresponding digital process control system.

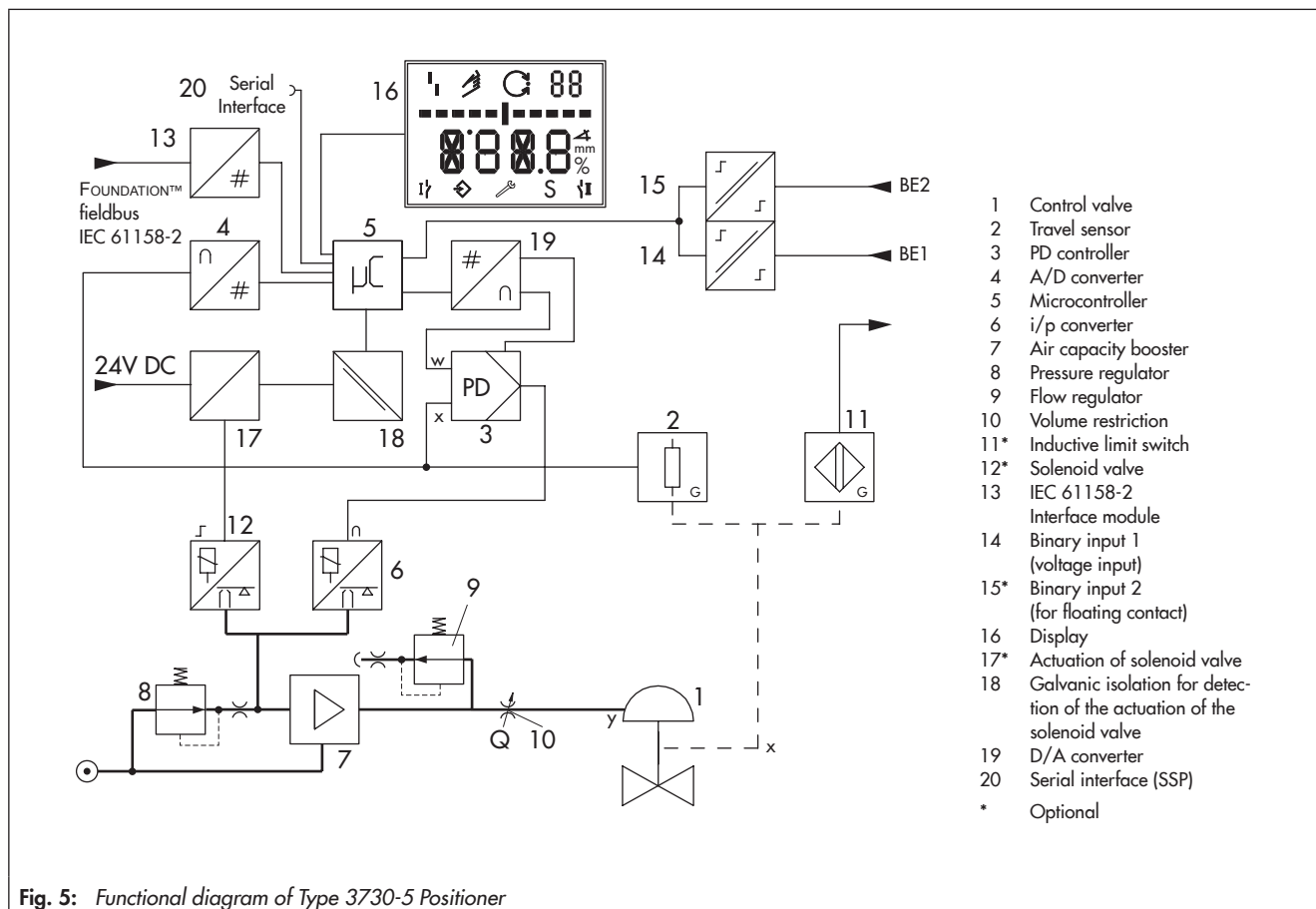


Table 1: Technical data

Type 3730-5 Positioner with FOUNDATION™ fieldbus communication 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 (NAMUR): 3.6 to 200 mm
		Attachment to rotary actuators acc. to VDI/VDE 3845: 24 to 100°
Travel range	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, FISCO and FNICO
Communication	Fieldbus	Data transmission conforming to FOUNDATION™ fieldbus specification Communication Profile Class: 31 PS, 32 L Interoperability tested according to ITK 5.2 Baud rate: 31.25 kbit/s, twisted pair as physical layer, H1 compliance
	Execution times	PID FB: 20 ms DI FB: 20 ms MAI FB: 50 ms IS FB: 30 ms AO FB: 30 ms DO FB: 30 ms MAO FB: 50 ms
	Local	SAMSON SSP interface and serial interface adapter Software requirements: TROVIS-VIEW with database module 3730-5
Permissible operating voltage		9 to 32 V DC · Powered over bus line The limits in the test certificate additionally apply for explosion-protected versions
Maximum operating current		15 mA
Additional current in case of error		0 mA
Supply air		1.4 to 7 bar (20 to 105 psi) · Air quality acc. to ISO 8573-1: 2001 Max. 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 ambient temperature to be expected
Signal pressure (output)		0 bar up to the capacity of the supply pressure
Characteristic		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 approx. < 110 l _n /h
Air output capacity	to fill the actuator 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
	to vent the actuator	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		-45 to +80 °C · -25 to +80 °C with inductive limit switch (SJ2-S1N) The limits in the test certificate additionally apply for explosion-protected versions
Influences	Temperature	≤ 0.15 %/10 K
	Supply air	None
	Vibrations	≤ 0.25 % up to 2 kHz and 4 g according to IEC 770
EMC		Complying with EN 61000-6-2, EN 61000-6-3, EN 61326-1 and NAMUR Recommendation NE 21
Electrical connections		One M20 x 1.5 cable gland for 6 to 12 mm clamping range · Second M20x1.5 threaded connection additionally exists · Screw terminals for 0.2 to 2.5 mm ² wire cross-sections
Degree of protection		IP 66 /NEMA 4X
Use in safety-instrumented systems (SIL)		Observing the requirements of IEC 61508, the systematic capability of the control valve for emergency venting as a component in safety-instrumented systems is given.
		Use is possible on observing the requirements of IEC 61511 and the required hardware fault tolerance in safety-instrumented systems up to SIL 2 (single device/HFT = 0) and SIL 3 (redundant configuration/HFT = 1).
Binary input 1		
Input		0 to 30 V DC with reverse polarity protection · Static destruction limit 40 V · Current consumption 3.5 mA at 24 V, galvanic isolation
Signal		Signal '1' at U _e > 5 V · Signal '0' at U _e < 3 V
Materials		
Housing		Die-cast aluminum EN AC-ALSi12(Fe) (EN AC-44300) according to DIN EN 1706 · Chromated and powder-varnish coated · Special version in stainless steel 1.4581
External parts		Stainless steel 1.4571 and 1.4301

Cable gland	Nickel-plated brass, M20 x 1.5
Weight	Approx. 1.0 kg
Options for Type 3730-5	
Binary input 2 for floating contact	
Switching input	R < 100 Ω · Contact load 100 mA · Static destruction limit 20 V/5.8 mA · Galvanic isolation
Solenoid valve · Approval acc. to IEC 61508/SIL	
Input	24 V DC · Reverse polarity protection · Static destruction limit 40 V Power consumption: $I = \frac{U - 5.7 V}{3840 \Omega}$ (corresponding to 4.8 mA at 24 V/114 mW)
Signal	Signal '0' no pick-up ≤ 12 V · Signal '1' safe pick-up > 19 V
Service life	> 5 x 10 ⁶ switching cycles
Use in safety-instrumented systems (SIL)	Same as positioner pneumatics
Leakage sensor · Suitable for operation in hazardous areas	
Temperature range	-40 to +130 °C
Tightening torque	20 ± 5 Nm
Inductive limit switch	
For connection to switching amplifier acc. to EN 60947-5-6	
SJ2-SN proximity switch	NAMUR NC contact
SJ2-S1N proximity switch	NAMUR NO contact
External position sensor	
Travel	Same as positioner
Cable	10 m · Flexible and durable · With M12x1 connector · Flame-retardant acc. to VDE 0472 Resistant to oils, lubricants and coolants as well as other aggressive media
Permissible ambient temperature	-60 to +105 °C · The limits in the test certificate additionally apply for explosion-protected versions
Immunity to vibration	Up to 10 g in the range of 10 to 2 kHz
Degree of protection	IP 67

Summary of explosion protection approvals

Type of approval	Certificate number	Date	Remarks	Type 3730
EC Type Examination Certificate	PTB 04 ATEX 2109	2004-10-25	II 2G Ex ia IIC T6 II 2D Ex tb IIIC T80°C IP66*	-51
First Addendum		2006-07-13	Adaption: Bus connection circuit, PCB layout	
Second Addendum		2007-08-24	Adaption: Electrical data for forced venting	
Statement of Conformity	PTB 05 ATEX 2010 X	2005-02-16	II 3G Ex nA II T6 II 3G Ex ic IIC T6* II 3D Ex tc IIIC T80°C IP66*	-58
First Addendum		2006-07-13	Adaption: Bus connection circuit, PCB layout	
CSA	1675804	2006-06-01	Ex ia IIC T6; Class I, II, Div.1, Groups A, B, C, D, E, F, G; Ex nA II T6; Ex nL IIC T6; Class I, II, Div.2, Groups A, B, C, D, E, F, G; Class II, Div.1, Groups E, F, D Type 4 Enclosure	-53
FM	3023605	2006-03-15	Class I, Zone 0 AEx ia IIC; Class I, II, III, Div.1, Groups A, B, C, D, E, F, G; Class I, Div.2, Groups A, B, C, D; Class II, Div.2, Groups F, G Type NEMA 4X	-53
GOST (valid until 2015-02-27)	POCC DE.05.B00045	2012-02-28	1Ex ia IIC T6	-51
IECEX	IECEX PTB 06.0054	2006-02-11	Ex ia IIC T6	-51
CCoE	On request			
INMETRO	On request			
KCS (valid until 2014-11-10)	11-KB4BO-0255	2011-10-11	Ex ia IIC T6/T5/T4	-51
NEPSI	GYJ111267	2011-01-24	Ex ia IIC T6	-51
(valid until 2016-01-23)	GYJ111268	2011-01-24	Ex nA II T6/Ex nL IIC T6	-58
STCC (valid until 2017-10-01)	972		0Ex ia IIC T6X; 2Ex s II T6X	

* Designation according to the EN 60079 standard series

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 and the implementation of autonomous closed control loops in the field.

Electrical and bus connection

The Type 3730-5 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.

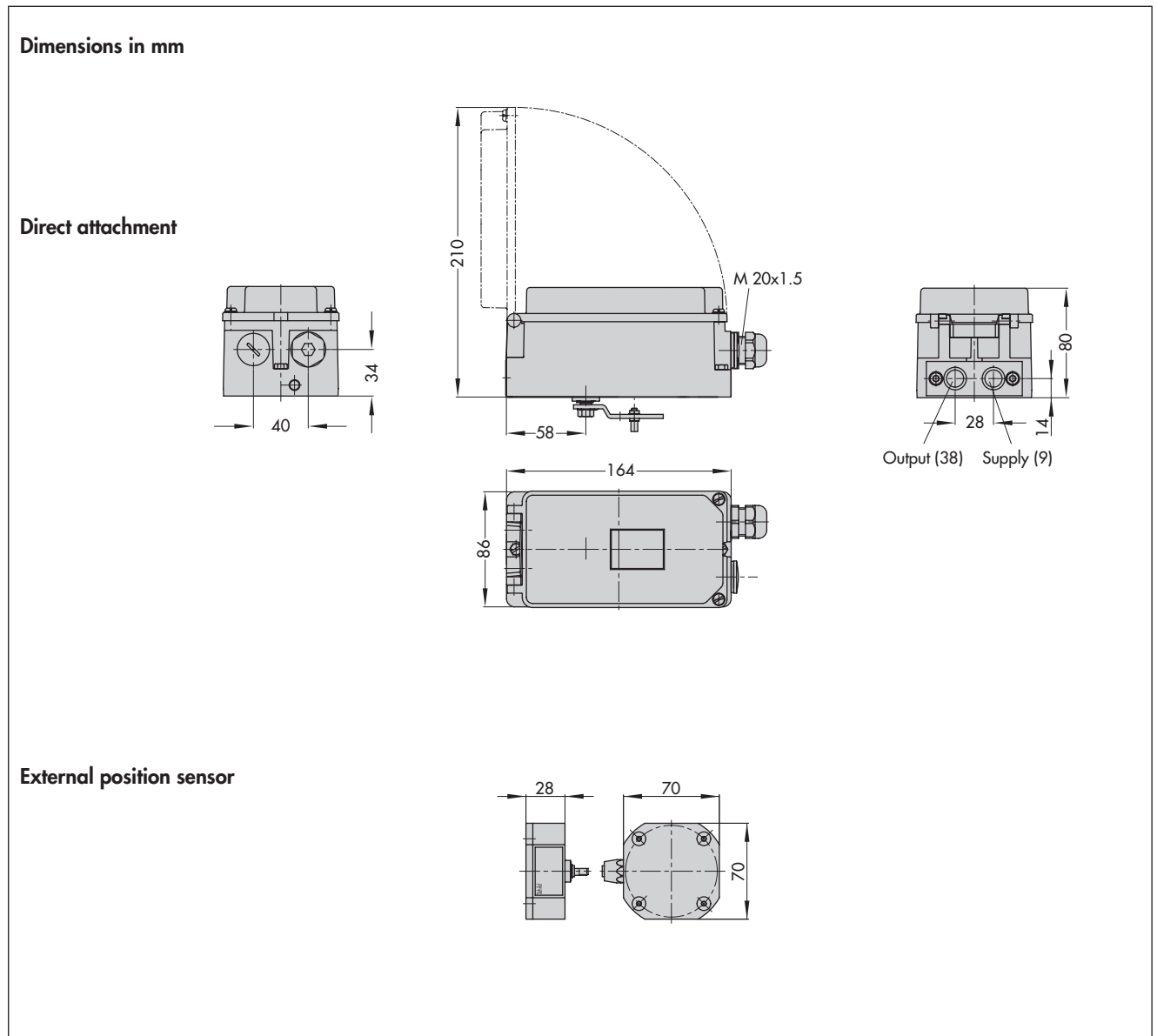
Mounting the positioner

The Type 3730-5 Positioner with FOUNDATION™ fieldbus communication can be attached directly to the Type 3277 Actuator by using 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 a hole inside 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.

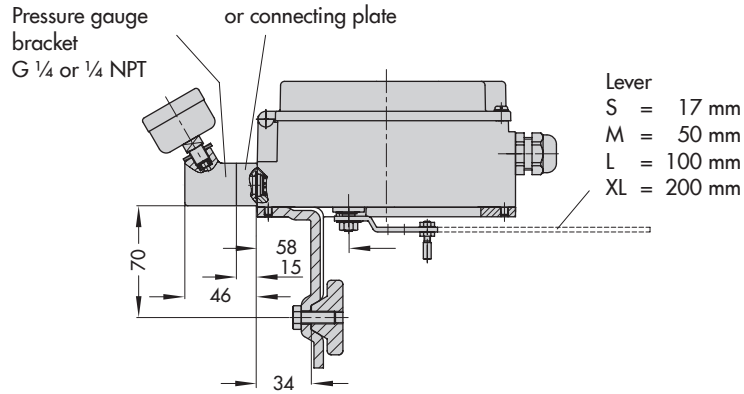
Using the appropriate bracket, the positioner can also be attached according to IEC 60534-6-1 (NAMUR recommendation). The positioner can be mounted on either side of the control valve.

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.

A reversing amplifier is necessary for double-acting, springless actuators for the second opposing signal pressure.



NAMUR attachment



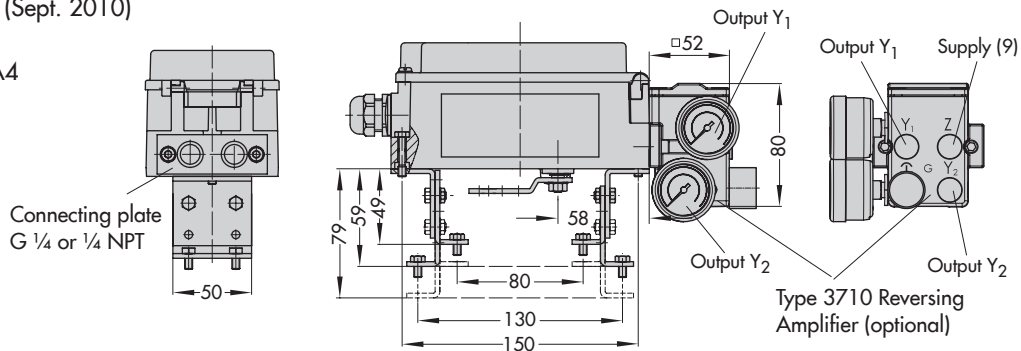
Attachment to rotary actuators

VDI/VDE 3845 (Sept. 2010)

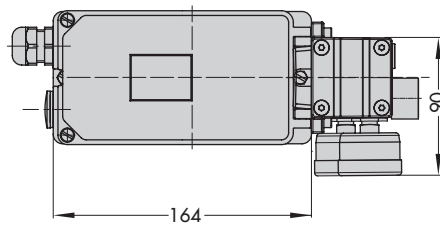
Fixing level 1

Size AA1 to AA4

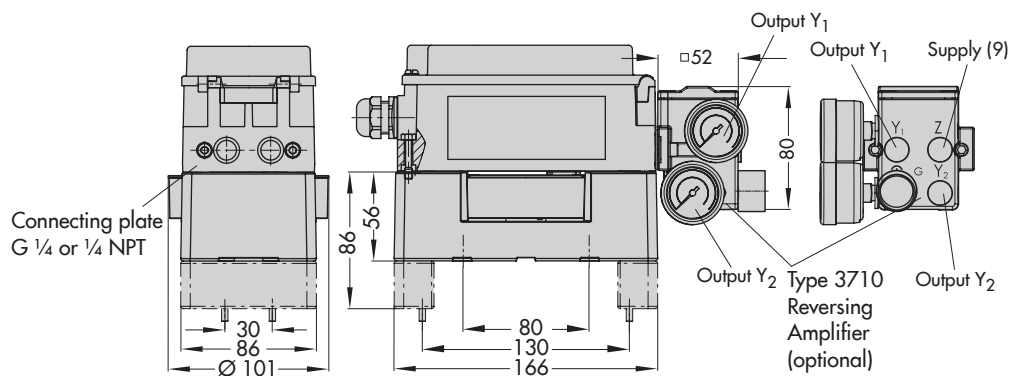
Light version



Mounting unit
CrNiMo steel bracket



Heavy-duty version



Article code

Positioner	Type 3730-5	x	x	x	0	x	x	x	x	0	x	0	0	x	0	x	x
With LCD and autotune, FOUNDATION™ fieldbus																	
Explosion protection																	
Without	0																
ATEX: II 2G Ex ia IIC T6; II 2D Ex tb IIIC T80°C IP66	1																
CSA/FM:	3																
Class I, Zone 0 AEx ia IIC; Class I, II, III, Div.1, Groups A-G; Class I, Div.2, Groups A-D; Class II, Div.2, Groups F, G/ Ex ia IIC T6; Class I, II, Div.1, Groups A-G; Ex nA II T6; Ex nL IIC T6; Class I, II, Div.2, Groups A-G; Class II, Div.1, Groups E-D																	
ATEX: II 3G Ex nA II T6; II 3G Ex ic IIC T6, II 3D tc IIIC T80°C IP66	8																
Additional equipment																	
Inductive limit switch																	
Without	0																
1 x SJ2-SN (NC contact)	1																
1 x SJ2-S1N (NO contact)	2																
Solenoid valve																	
Without				0													
With, 24 V DC				4													
External position sensor																	
Without					0												
With		0	0		1		0			0							
Leakage sensor, FF device revision 2																	
Without							0										
With							1										
Binary input																	
Without									0								
Floating contact					0			1									
Diagnostics																	
EXPERT (standard), FF device revision 1										1							
EXPERT+ (extended diagnostics), FF device revision 1										2							
EXPERTplus (extended diagnostics), FF device revision 2										4							
Housing material																	
Aluminum (standard)											0						
Stainless steel 1.4581					0						1						
Special application																	
Without														0			
Version compatible with paint														1			
Exhaust air port with 1/4-18 NPT thread, back of positioner sealed		0	0		0		0							2			
Special version																	
Without															0	0	0
NEPSI: Ex ia IIC T6	1														0	0	9
NEPSI: Ex nA II T6, Ex nL IIC T6	8														0	1	0
IECEX: Ex ia IIC T6	1														0	1	2
GOST: 1Ex ia IIC T6	1														0	1	4

Ordering text

Type 3730-5 Positioner with FOUNDATION™ fieldbus communication

- SAMSON direct attachment
- Attachment according to NAMUR
- Attachment to rotary actuator
- Without/with pressure gauge up to max. 6 bar
- Explosion protection
- Limit switch
- Leakage sensor
- Solenoid valve
- Binary input for floating contact

Specifications subject to change without notice



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