

Electropneumatic Positioner

Type 3730-2 and Type 3730-3 with HART communication



Application

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

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



The positioner ensures a preset assignment of the valve stem position (controlled variable) and the electric input signal (reference variable). It compares the control signal received from a controller to the travel or rotational angle of the control valve and issues a pneumatic signal pressure as output variable.

Special features

- Simple attachment to common linear and rotary actuators over SAMSON direct attachment interface (Fig. 1), over NAMUR rib (Fig. 2) or to control 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
- Simple one-knob, menu-driven operation
- LCD easy to read in any mounting position due to selectable reading direction
- Ex d connection using Type 3770 Field Barrier (T 8379 EN)
- Configurable with a PC via the SSP serial 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
- Using the initialization mode "Sub" (Substitution), the positioner can 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 non-volatile EEPROM (protection against power failure)
- Two-wire system with a small electrical load between 300 and 410 Ω depending on the version (see Table 1)
- Adjustable output pressure limitation
- Adjustable tight-closing function
- Constant monitoring of zero point
- Temperature sensor and operating hours counter integrated
- Two configurable position alarms as standard
- Self diagnostics; alarm messages indicated by fault alarm contact or optional analog position transmitter
- Extended diagnostics in Expert+ version, detailed documentation available in Data Sheet T 8388 EN.

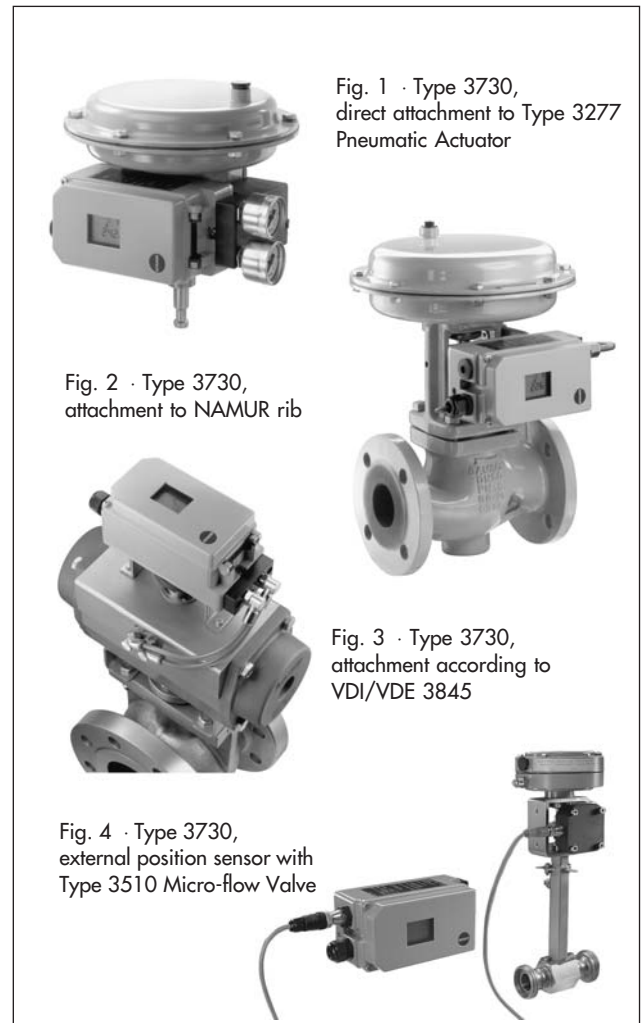


Fig. 1 · Type 3730, direct attachment to Type 3277 Pneumatic Actuator

Fig. 2 · Type 3730, attachment to NAMUR rib

Fig. 3 · Type 3730, attachment according to VDI/VDE 3845

Fig. 4 · Type 3730, external position sensor with Type 3510 Micro-flow Valve

Versions

Electropneumatic positioners with LCD, operable on site, local communication with SSP interface, EXPERT diagnostics

- **Type 3730-2 Expert** · Positioner with diagnostic functions
- **Type 3730-2 Expert+** · Positioner with extended diagnostic functions
- **Type 3730-3 Expert** · Positioner with additional communication with HART protocol, diagnostic functions
- **Type 3730-3 Expert+** · Positioner with additional communication with HART protocol, extended diagnostic functions

Additional equipment (optional)

- Inductive limit switch with proximity switch
- Analog position transmitter with two-wire transmitter
- Forced fail-safe venting function with solenoid valve
- External position sensor (Fig. 4)

Principle of operation

The electropneumatic positioner is attached to pneumatic control valves. It is used to assign the valve stem position (reference 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 an electric travel sensor system (2), an analog i/p converter with a downstream booster and the electronics unit with microcontroller (5).

When a deviation occurs, the actuator is pressurized or vented. If required, the changes in the signal pressure can be slowed down by a connectable Q restriction. 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 case 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.

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

The INIT key activates initialization which is started according to the (pre)set parameters. After initialization is completed, the positioner immediately starts control operation.

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.

The Type 3730-3 Positioner additionally allows access to all parameters over HART communication.

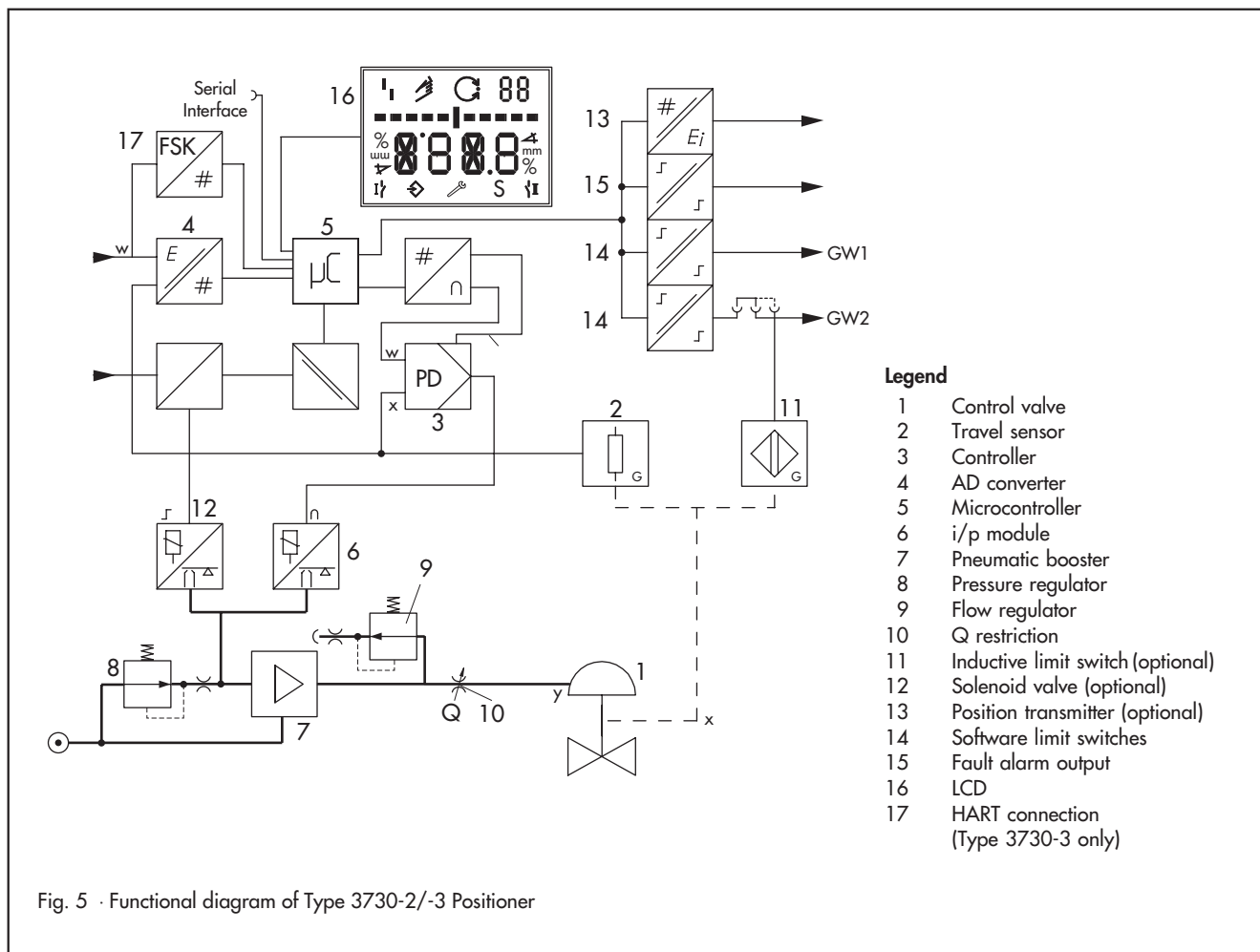


Fig. 5 · Functional diagram of Type 3730-2/-3 Positioner

Table 1 Technical data for Type 3730 Positioner

Common data for Type 3730-... Positioner			
Rated travel, adjustable	Direct attachment to Type 3277 Actuator: 3.6 to 30 mm Attachment acc. to IEC 60 534-6-1: 3.6 to 200 mm Attachment to rotary actuators: 24° to 100° opening angle		
Travel range	adjustable	Within the rated travel · Maximum ratio 1 : 5	
Reference variable w	Signal range	4 to 20 mA · 2-wire device with reverse polarity protection · Minimum span 4 mA	
	Static destruction limit	100 mA	
Minimum current	3.6 mA for display · 3.8 mA for operation		
Supply air	Supply pressure	1.4 to 6 bar (20 to 90 psi)	
	Air quality acc. to ISO 8573-1	Max. particle size and density: Class 4 · Oil content: Class 3 Pressure dew point: Class 3	
Signal pressure (output)	0 bar up to supply pressure · Limitable to 1.4 bar/2.4 bar/3.7 bar ± 0.2 bar via software		
Characteristics	adjustable	Linear/equal percentage/reverse equal percentage User-defined (over operating software and communication) Butterfly valve, rotary plug valve and segmented ball valve: Linear/equal percentage	
	Deviation	≤ 1 %	
Hysteresis	≤ 0.3 %		
Sensitivity	≤ 0.1 %		
Transit time	Up to 240 s separately adjustable for exhaust and supply air via software		
Direction of action	Reversible		
Air consumption, steady-state	Independent of supply air approx. 110 l _n /h		
Air output capacity	Actuator pressurized	At Δp = 6 bar: ≥ 8.5 m ³ /h · At Δp = 1.4 bar: ≥ 3.0 m ³ /h · K _{Vmax} (20 °C) = 0.09	
	Actuator vented	At Δp = 6 bar: ≥ 14.0 m ³ /h · At Δp = 1.4 bar: ≥ 4.5 m ³ /h · K _{Vmax} (20 °C) = 0.15	
Permissible ambient temperature	-20 to +80 °C · -40 to +80 °C with metal cable gland The limits in the EC Type Examination Certificate additionally apply for explosion-protected devices.		
Influences	Temperature	≤ 0.15 %	
	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		
Degree of protection	IP 65		
Binary contacts			
		1 fault alarm contact 2 software limit switches with configurable limit values, with reverse polarity protection	
Signal status	Version	Without explosion protection	Explosion-protected
	No response	Conductive (R = 348 Ω)	≥ 2.1 mA
	Response	Non-conducting	≤ 1.2 mA
Operating voltage	For connection to binary input of the PLC acc. to EN 61131, P _{max} = 400 mW or for connection to NAMUR switching amplifier acc. to EN 60 947-5-6		Only for connection to NAMUR signal converter acc. to EN 60 957-5-6
Materials			
Housing	Die-cast aluminum GD AlSi12 acc. to DIN 1725 (3.2582) · Chromated and powder paint coated Special version CrNiMo 1.4581		
External parts	Stainless steel 1.4571 and 1.4301		
Cable gland	M20 x 1.5, black polyamide		
Weight	Approx. 1.0 kg		
Additional data for Type 3730-2			
Load impedance	Without explosion protection: ≤ 6 V (corresponding to 300 Ω at 20 mA)		Explosion-protected version: ≤ 7 V (corresponding to 350 Ω at 20 mA)
Communication (local)	SAMSON SSP interface and Serial interface adapter		

Software requirements (SSP)	TROVIS-VIEW with database module 3730-2	
Explosion protection	Type of protection $\text{Ex II 2 G EEx ia IIC T6}$ and $\text{Ex II 2 D IP 65 T 80 }^\circ\text{C}$ or $\text{Ex II 3 G EEx nA II T6}$	
Additional data for Type 3730-3		
Load impedance	$\leq 8.2 \text{ V}$ (corresponding to 410Ω at 20 mA)	
Communication (local)	SAMSON SSP interface and serial interface adapter	
Software requirements (SSP)	TROVIS-VIEW with database module 3730-3	
Communication (HART)	HART® field communication protocol Impedance in HART frequency range: Receiving 350 to 450Ω · Sending approx. 115Ω	
Software requirements (HART)	For hand-held communicator	Device Description for Type 3730-3
	For PC	DTM file according to specification 1.2, suitable for integrating the positioner in frame applications that support the FDT/DTM concept (e.g. PACTware); other integrations (e.g. AMS, PDM) are available
Explosion protection	Type of protection $\text{Ex II 2 G EEx ia IIC T6}$ and $\text{Ex II 2 D IP 65 T 80 }^\circ\text{C}$ or $\text{Ex II 3 G EEx nA II T6}$	

Table 1a Options for Type 3730-2 and Type 3730-3 Positioners

Solenoid valve · SIL 4 approval acc. to IEC 61508	
Input	24 V DC · Reverse polarity protection · Static destruction limit 40 V Current consumption $I = \frac{U - 5.6 \text{ V}}{4020 \Omega}$ (corresponding to 4.5 mA at 24 V)
Signal "0" no pick-up	$\leq 15 \text{ V}$
Signal "1" safe pick-up	$> 19 \text{ V}$
Service life	$> 2 \times 10^7$ switching cycles
Implementation in safety-relevant systems in compliance with IEC 61508	Probability of failure on demand of safety functions $\text{PFD} < 2.8 \times 10^7$ for a confidence level of 95 %. The safe failure fraction (SFF) according to Table A1 in IEC 61508-2 is greater or equal to 0.99. The valves are therefore suitable for implementation in safety-related systems with a hardware fault tolerance of 1 or 2 up to and including SIL 4.
Analog position transmitter	
Auxiliary power	12 to 30 V DC · Reverse polarity protection · Static destruction limit 40 V
Output signal	4 to 20 mA
Direction of action	Reversible
Operating range	-10 to $+114 \%$
Characteristic	Linear
Hysteresis	Same as positioner
High-frequency influence	Same as positioner
Ripple content of the output signal	0.6 % at 28 Hz/IEC 381 T1
Other influences	Same as positioner
Fault message	Issued by means of a status current $< 3.8 \text{ mA}$ or $> 20.5 \text{ mA}$
Inductive limit switch	
Type SJ 2SN Proximity switch	For connection to isolating switch amplifier acc. to EN 60 947-5-6. Can be used in combination with a software limit switch.
External position sensor	
Rated travel	Same as Type 3730 Positioner
Cable	Max. 10 m · Flexible and durable · With M12x1 connector · Flame-retardant acc. VDE 0472 · Resistant to oils, lubricants, and coolants as well as other aggressive media
Permissible ambient temperature	-40 to $+105 \text{ }^\circ\text{C}$
Immunity to vibration	Up to 10 g in the range of 5 to 2000 Hz
Degree of protection	IP 67

Explosion protection certificates

Type of approval	Certificate number	Date	Type of protection/Comments
Type 3730-2 Positioner			
EC Type Examination Certificate First Addendum Second Addendum	PTB 00 ATEX 2158	2001-03-01 2002-03-01 2004-02-16	⊕ II 2 G EEx ia IIC T6 Position transmitter ⊕ II 2 D IP 65 T 80 °C, Zone 21 dust, device index .01
Statement of Conformity	PTB 03 ATEX 2016 X	2003-03-07	⊕ II 3 G EEx nA II T6; Zone 2; Type 3730-28
JIS approval	C16679		Ex ia IIC T6; Type 3730-27
GOST approval	2002.C299	2002-12-26	1 Ex ia IIC T6 X, valid until 2008-01-01
FM approval	ID 3012394	2002-10-30	Cl. I, II, III; Div. 1, Gr. A, B, C, D, E, F, G; Cl. I, Zone 0, AEx ia IIC T6; Cl. I, Div. 2, Gr. A, B, C, D; NEMA Type 4; Type 3730-23
CSA approval	1330129	2003-03-17	Ex ia IIC T6, Cl. I, Zone 0; Cl. I, Gr. A, B, C, D; Cl. II, Gr. E, F, G; Cl. I, Div. 2, Gr. A, B, C, D; Cl. II, Div. 2, Gr. E, F, G; Type 4 Enclosure; Type 3730-23
	1500997	2004-03-05	Revision to 1330129
SIL 4 acc. to IEC 61508	V 60 2004 T1	2004-07-05	Test report by TÜV Rheinland, valid until July 2009
Type 3730-3 Positioner			
EC Type Examination Certificate First Addendum Second Addendum	PTB 00 ATEX 2174	2002-11-15 2003-06-18 2004-02-16	⊕ II 2 G EEx ia IIC T6 Forced fail-safe venting function ⊕ II D IP 65 T 80 °C, Zone 21 dust, device index .01, Position transmitter
Statement of Conformity	PTB 03 ATEX 2180 X	2003-09-30	⊕ II 3 G EEx nA II T6; Zone 2; Type 3730-38
EC Type Examination Certificate	PTB 03 ATEX 2211 X	2003-10-22	⊕ II 2 G EEx d ia IIC T6; Type 3730-39 with Type 3770-1 Field Barrier
NEPSI approval	GYJ04133	2004-02-27	Ex ia IIC T4 ... T6; valid until 2007-02-27; Type 3730-31
	GYJ04134	2004-02-27	Ex nA II T4 ... T6; valid until 2007-02-27; Type 3730-38
FM approval	ID 3018702	2004-02-02	Cl. I, II, III; Div. 1, Gr. A, B, C, D, E, F, G; Cl. I, Zone 0, AEx ia IIC T6; Cl. I; Div. 2, Gr. A, B, C, D; NEMA Type 4; Type 3730-33
CSA approval	1508990	2004-03-05	Ex ia IIC T6; Cl. I, Zone 0 Cl. I, Gr. A, B, C, D; Type 4 Enclosure Cl. II, Gr. E, F, G Cl. I, Div. 2, Gr. A, B, C, D Cl. II, Div. 2, Gr. E, F, G; Type 3730-33
SIL 4 acc. to IEC 61508	V 60 2004 T1	2004-07-05	Test report by TÜV Rheinland, valid until July 2009

The test certificates are included in the mounting and operating instructions and are available on request. Refer to Data Sheet T 8379 EN for EEx d certificates for the Type 3770 Field Barrier.

Positioner attachment

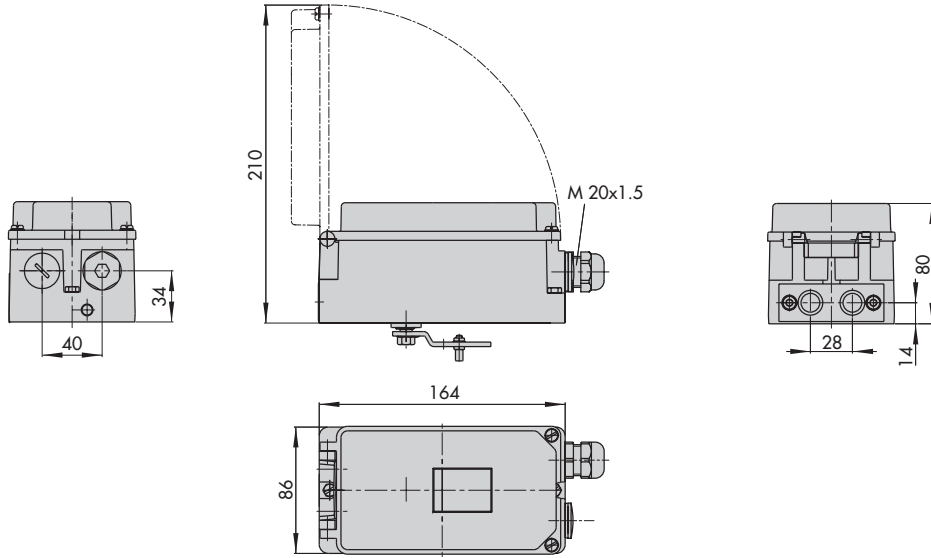
The Type 3730 Electropneumatic Positioner can be attached directly to the Type 3277 Actuator with a connection block. In actuators with fail-safe action "Actuator stem extends" and Type 3277-5 Actuator (120 cm²), the signal pressure is transmitted over an internal bore in the actuator yoke to the actuator. 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 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 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.

Dimensions in mm

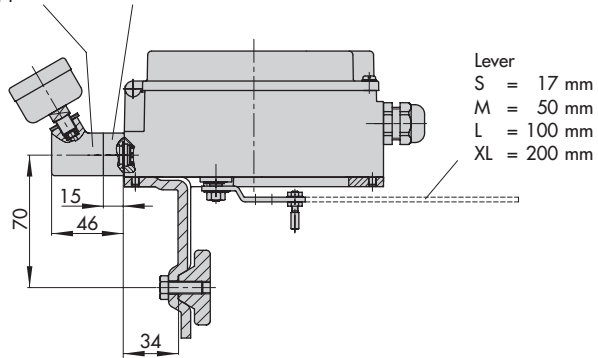
Direct attachment



NAMUR attachment

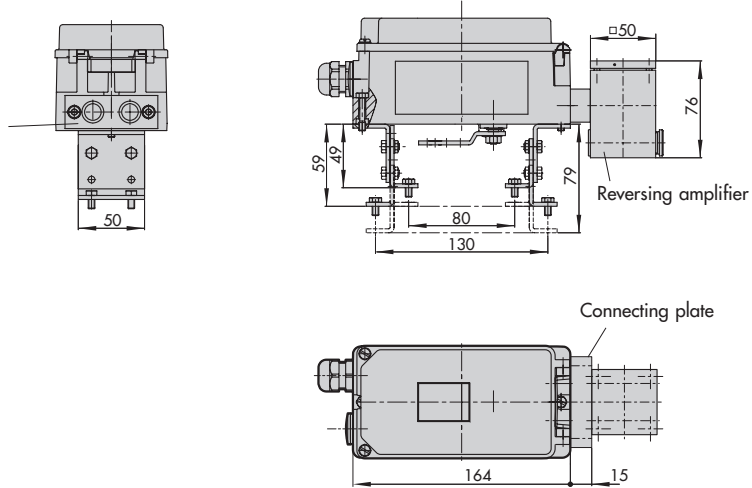
Pressure gauge bracket
G 1/4 or 1/4 NPT

or connecting plate



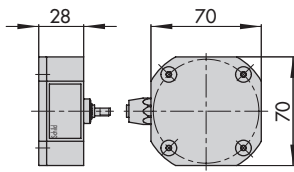
Attachment to rotary actuators

Connecting plate
G 1/4 or 1/4 NPT

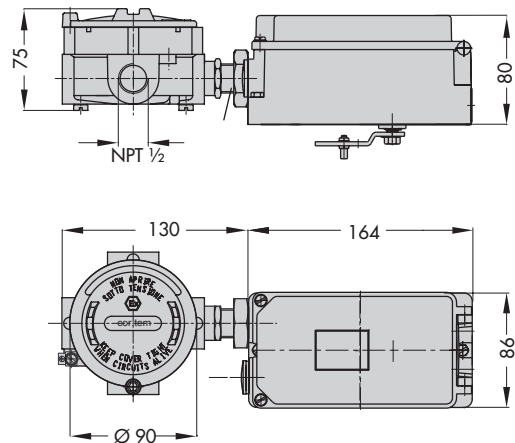


Dimensions in mm

External position sensor



Type 3730 Ex d Positioner with Type 3770 Field Barrier



Ordering text

Type 3730-x... Positioner

- Without pneumatic connection (only for direct attachment to Type 3277 Actuator)
- With pneumatic connection ISO 228/1-G 1/4
- With pneumatic connection 1/4-18 NPT
- Without/with pressure gauge for signal pressure indication
- Additional cover plate with list of parameters and operating instructions in English/Spanish or English/French (standard version in German/English)
- Attachment to Type 3277 Actuator (120 to 700 cm²)
- Attachment according to IEC 60 534-6-1 (NAMUR)
Travel: ... mm, if applicable, stem diameter: ... mm
- Attachment to Type 3278 Rotary Actuator (160/320 cm²)
- Attachment to rotary actuators acc. to VDI/VDE 3845
- Pneumatic reversing amplifier for double-acting actuators with connection interface acc. to ISO 228/1 - G 1/4 or 1/4-18 NPT
- Adapter M20 x 1.5 to 1/2 NPT
- Metal cable gland
- Special version with CrNiMo steel housing

Model and order numbers

Positioner	Type 3730-	x	x	x	x	x	x	x	0	0	x	0	x
Version with LCD													
4 ... 20 mA	2												
4 ... 20 mA with HART communication	3												
Explosion protection		x	x	x	x	x	x	0	0	x	0	x	
Without (SPS version)	0												
⊕ II 2 G EEx ia IIC T6 and													
⊕ II 2 D IP 65 T 80 °C acc. ATEX	1												
CSA/FM intrinsically safe	3												
⊕ II 3 G EEx nA II T6 acc. ATEX	8												
Additional equipment		x	x	x	x	x	x	0	0	x	0	x	
Inductive limit switch													
Without	0												
Type SJ2-SN	1												
Solenoid valve													
Without								0					
With, 24 V DC								4					
Position transmitter													
Without								0					
With								1					
External position sensor										0			
Without										0			
With								0	1			0	
Diagnostics		x	x	x	x	x	x	0	0	x	0	x	
Expert (standard)												1	
Expert+ (extended)												2	
Housing material		x	x	x	x	x	x	0	0	x	0	x	
Aluminum (standard)													0
Stainless steel 1.4581										0			1

Specifications subject to change without notice.



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