

## T 8384-5 EN

### Type 3730-5 Electropneumatic Positioner

With FOUNDATION™ fieldbus communication · Series 3730



#### Application

Positioners for attachment to pneumatic control valves

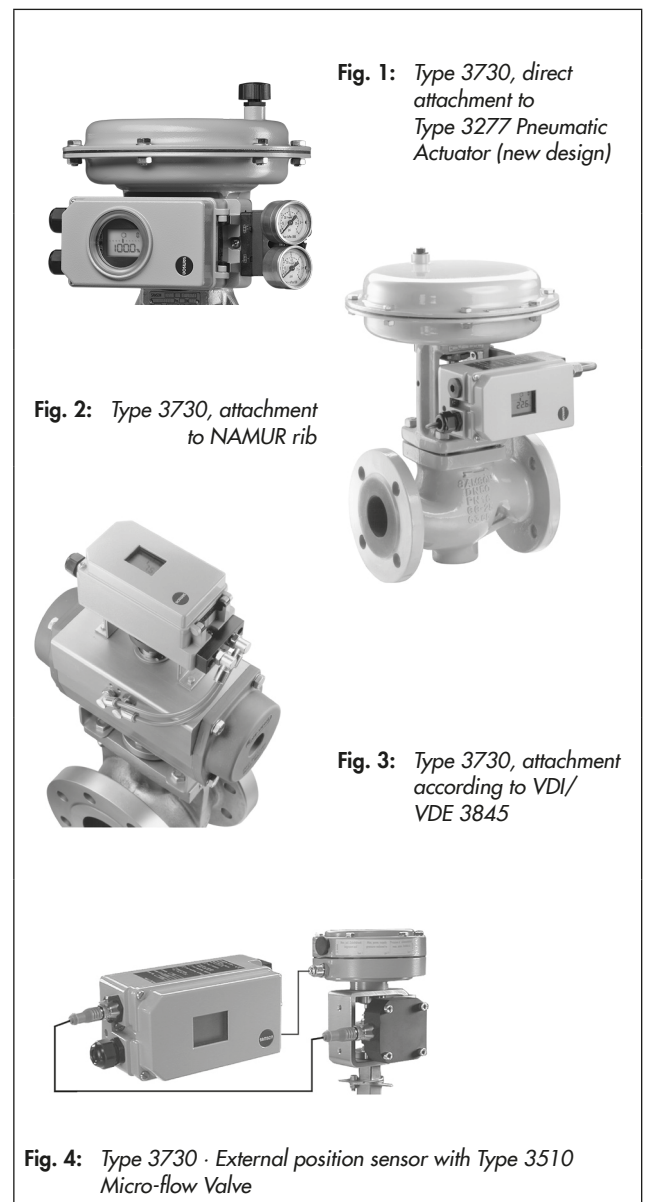
**Valve travel from 3.6 to 300 mm · Opening angle 24 to 100°**

Smart, bus-powered field device complying with FOUNDATION™ fieldbus specifications 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 to start/execute diverse functions (e.g. start the data logger)
- Two DI function blocks to analyze binary input signals
- Simple attachment to all common linear and rotary actuators
  - SAMSON direct attachment (Fig. 1)
  - NAMUR rib (Fig. 2)
  - Attachment to rod-type yokes according to IEC 60534-6-1
  - Attachment according to VDI/VDE 3847
  - Rotary actuator attachment according to VDI/VDE 3845 (Fig. 3)
- Any desired mounting position of the positioner (but not suspended)
- One-knob, menu-driven operation
- Automatic start-up
- LCD easy to read in any mounting position thanks to selectable reading direction



- Integrated EXPERTplus diagnostics for control valves (▶ T 8389)
- Classified status messages according to NAMUR Recommendation NE 107
- Online changing of control parameters
- Automatic zero monitoring
- Calibrated travel sensor without gears susceptible to wear
- Non-volatile storage of parameters (protected against power failure)
- Adjustable output pressure limitation
- Adjustable tight-closing function
- Binary input for DC voltage signals

#### 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 used to assign the valve position (controlled variable  $x$ ) to the control signal (set point  $w$ ). 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 booster and the electronics with the microcontroller. When a set point

deviation occurs, the actuator is either vented or filled with air. If necessary, the signal pressure change can be slowed down with a volume 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 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.

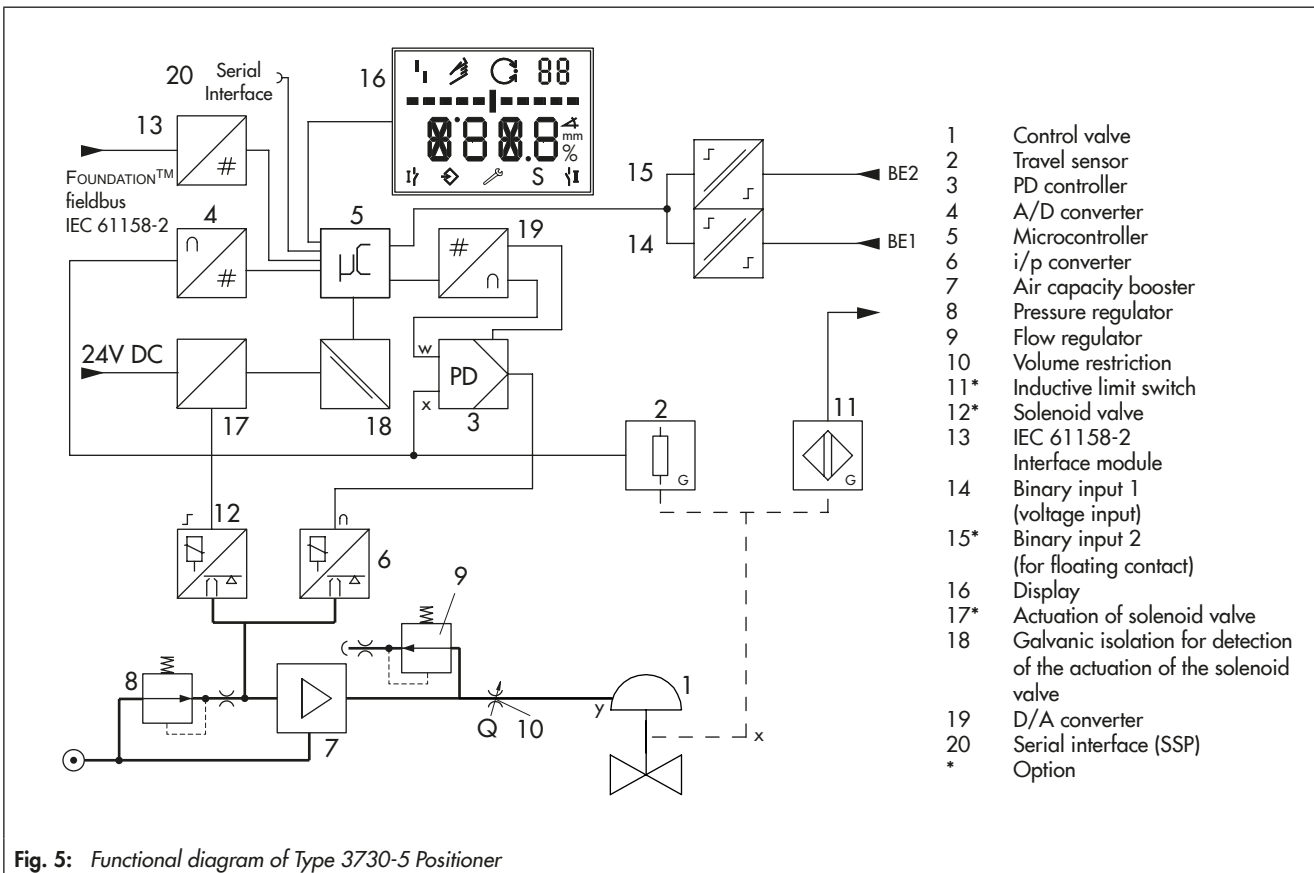


Fig. 5: Functional diagram of Type 3730-5 Positioner




**Table 1: Technical data**

<b>Type 3730-5 Positioner</b>		
<b>The listed technical data for the explosion-protected devices may be further restricted by the limits specified in the test certificates.</b>		
Rated travel, adjustable	Direct attachment to Type 3277 Actuator: 3.6 to 30 mm Attachment according to IEC 60534-6 (NAMUR): 3.6 to 300 mm Attachment according to VDI/VDE 3847: 3.6 to 300 mm Attachment to 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) and 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 Interoperability Test Kit (ITK) 6.2.0
	Execution times	AO FB: 30 ms    DI FB: 20 ms    PID: 40 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 by bus line Observe the limits in the test certificate for explosion-protected versions.	
Maximum operating current	15 mA	
Additional current in case of error	0 mA	
Supply	Supply air	1.4 to 7 bar (20 to 105 psi)
	Air quality acc. to ISO 8573-1	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 the supply pressure · Can be limited to 1.4/2.4/3.7 bar ±0.2 bar by software	
Characteristic	Linear/Equal percentage/Reverse equal percentage User-defined (over operating software and communication) Butterfly valve, rotary plug valve or 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 <math>< 110 I_n/h</math>	
Air output capacity	(supply)	At $\Delta p = 6$ bar: $8.5 \text{ m}_n^3/h$ · At $\Delta p = 1.4$ bar: $3.0 \text{ m}_n^3/h$ · $K_{V_{\max}(20^\circ\text{C})} = 0.09$
	(exhaust)	At $\Delta p = 6$ bar: $14.0 \text{ m}_n^3/h$ · At $\Delta p = 1.4$ bar: $4.5 \text{ m}_n^3/h$ · $K_{V_{\max}(20^\circ\text{C})} = 0.15$
Permissible ambient temperature	-20 to +80 °C    All versions -45 to +80 °C    With metal cable gland -55 to +80 °C    Special version for low temperatures with metal cable gland (Type 3730-5xxxxxxxx0x02x0xx)  The temperature limits for the explosion-protected devices may be further restricted by the limits specified in the test certificates.	
Influences	Temperature	≤0.15 %/10 K
	Supply	None
	Effect of vibration	≤0.25 % up to 2000 Hz 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	
Explosion protection	See Summary of explosion protection approvals	
Electrical connections	One M20x1.5 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 <sup>2</sup> 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 pilot valve for emergency venting as a component in safety-instrumented systems is given.	
Emergency venting at 0 V or over the optional solenoid valve	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 BI1		
Input	0 to 30 V DC · Reverse polarity protection · Static destruction limit 40 V Current consumption 3.5 mA at 24 V, galvanic isolation	
Signal	Signal '1' at $U_e > 5 \text{ V}$ · Signal '0' at $U_e < 3 \text{ V}$	

<b>Type 3730-5 Positioner</b>	
The listed technical data for the explosion-protected devices may be further restricted by the limits specified in the test certificates.	
Materials	
Housing	Die-cast aluminum EN AC-ALSi12(Fe) (EN AC-44300) acc. to DIN EN 1706 chromate and powder coating · Special version: stainless steel 1.4408
External parts	Stainless steel 1.4404/316L
Cable gland	M20x1.5, black polyamide
Weight	Approx. 1.0 kg · Special version in stainless steel: 2.2 kg
Conformity	<b>CE</b>

<b>Binary input BI2 for floating contact</b>	
Switching input	R < 100 Ω · Contact load 100 mA · Static destruction limit 20 V/5.8 mA Galvanic isolation
<b>Solenoid valve</b> · Approval acc. to IEC 61508/SIL	
Input	24 V DC · Reverse polarity protection · Static destruction limit 40 V Current consumption $I = \frac{U - 5.7 V}{3840 \Omega}$ (corresponding to 4.8 mA at 24 V/114 mW)
Signal '0' (no response)	<12 V (emergency venting at 0 V)
Signal '1' (response)	>19 V
Service life	>5 x 10 <sup>6</sup> switching cycles
K <sub>v</sub> coefficient	0.15
<b>Inductive limit switch by Pepperl+Fuchs</b>	
SJ2-SN proximity switch	For connection to switching amplifier acc. to EN 60947-5-6 Measuring plate not detected: ≥3 mA · Measuring plate detected: ≤1 mA
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 with a fixed connection between positioner and position sensor · 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 2000 Hz
Degree of protection	IP67
<b>Leakage sensor</b> · Suitable for operation in hazardous areas	
Temperature range	-40 to +130 °C
Tightening torque	20 ±5 Nm

**Table 2:** Summary of explosion protection approvals

		Certification		Type of protection	
Type 3730	-51	 EU type examination certificate	Number Date	PTB 04 ATEX 2109 2017-05-11	II 2G Ex ia IIC T6 Gb II 2D Ex ia III T80°C Db II 2D Ex tb IIIC T80°C Db
	-55	 EU type examination certificate	Number Date	PTB 04 ATEX 2109 2017-05-11	II 2G Ex ia IIC T6 Gb II 2D Ex ia III T80°C Db II 2D Ex tb IIIC T80°C Db
	-58	 Statement of conformity	Number Date	PTB 05 ATEX 2010 X 2017-06-22	II 3G Ex nA IIC T6 Gc, II 3D Ex tc IIIC T80°C Dc
	-51	<b>IECEX</b>	Number Date	IECEX PTB 06.0054X 2017-07-17	Ex ia IIC T6...T4 Gb Ex ia IIIC T80°C Db
	55	<b>IECEX</b>	Number Date	IECEX PTB 06.0054X 2017-07-17	Ex tb IIIC T80°C Db
	-58	<b>IECEX</b>	Number Date	IECEX PTB 06.0054X 2017-07-17	Ex nA IIC T6...T4 Gc Ex tc IIIC T80 °C Dc
	-5	<b>CCoE</b>	Number Date Valid until	A P HQ MH 104 7593 2023-05-25 2027-12-31	Ex ia IIC T6...T4 Gb

		Certification		Type of protection	
Type 3730	-51	CCC Ex	Number Date Valid until	2020322307002425 2024-08-05 2025-09-28	Ex ia IIC T4...T6 Gb Ex ia IIIC T80 °C Db
	-58	CCC Ex	Number Date Valid until	2020322307002425 2024-08-05 2025-09-28	Ex ec IIC T6 Gc
	-53	CSA	Number Date	1675804 2017-05-23	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, G; Class III Type 4 Enclosure
	-51	EAC	Number Date Valid until	RU C-DE.HA65.B.00510/20 2020-03-18 2025-03-18	1Ex ia IIC T6/T5/T4 Gb X Ex tb IIIC T80 °C Db X
	-53	FM	Number	3023605	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
			Date	2006-03-15	
	-51	INMETRO	Number Date Valid until	IEx 22.0025X 2022-11-22 2028-11-21	Ex ia IIC T4...T6 Gb Ex ia IIIC T80 °C Db
	-58	INMETRO	Number Date Valid until	IEx 22.0025X 2022-11-22 2028-11-21	Ex ec IIC T4...T6 Gc Ex tc IIIC T80 °C Dc
	-51	KCS Korea	Number Date Valid until	11-KB4BO-0225 2011-11-10 2024-11-10	Ex ia IIC T6/T5/T4
	-51	NEPSI	Number Date Valid until	GYJ24.1293X 2024-11-05 2029-11-04	Ex ia IIC T4...T6 Gb Ex ia IIIC T80 °C Db
	-58	NEPSI	Number Date Valid until	GYJ24.1293X 2024-11-05 2029-11-04	Ex ec IIC T6 Gc
	-51	TR CMU	Number Date Valid until	ZETC/35/2021 2021-07-26 2024-07-25	II 2G Ex ia IIC T6...T4 Gb II 2D Ex ia IIIC T80 °C Db
	-55	TR CMU	Number Date Valid until	ZETC/35/2021 2021-07-26 2024-07-25	II 2D Ex tb IIIC T80 °C Db
	-58	TR CMU	Number Date Valid until	ZETC/35/2021 2021-07-26 2024-07-25	II 3G Ex ic nA IIC T6 Gc II 3D Ex tc IIIC T80 °C Dc IP66

### 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 computer. 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.

### 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 autonomous control 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 Electropneumatic Positioner can be attached directly to the Type 3277 Actuator (175 to 750 cm<sup>2</sup>) over a connection block. In actuators with "actuator stem extends" fail-safe action, the signal pressure is routed over an internal hole in the actuator yoke to the actuator. In actuators with "actuator stem retracts" fail-safe action, 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.

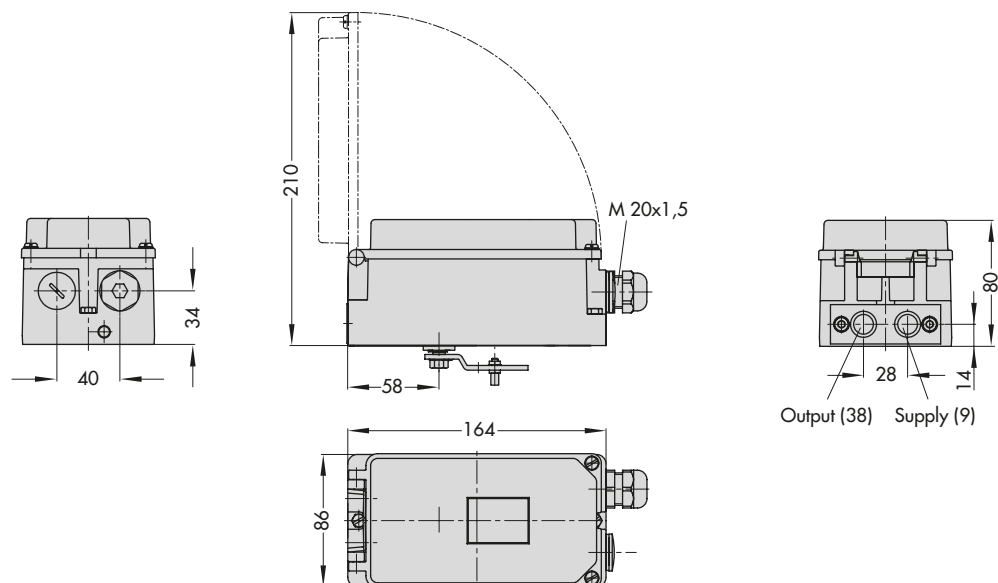
A pair of universal brackets is used for the attachment to Type 3278 Rotary Actuators or other rotary actuators according to VDI/VDE 3845. The rotary motion of the actuator is transferred to the positioner over a coupling wheel with travel indication.

A special version of the positioner allows it to be attached according to VDI/VDE 3847. This type of attachment allows the positioner to be replaced quickly while the process is running by blocking the air in the actuator. The positioner can be attached directly to the Type 3277 Actuator using an adapter bracket or adapter block. Alternatively, it can be attached to the NAMUR rib of a control valve using an additional NAMUR connection block.

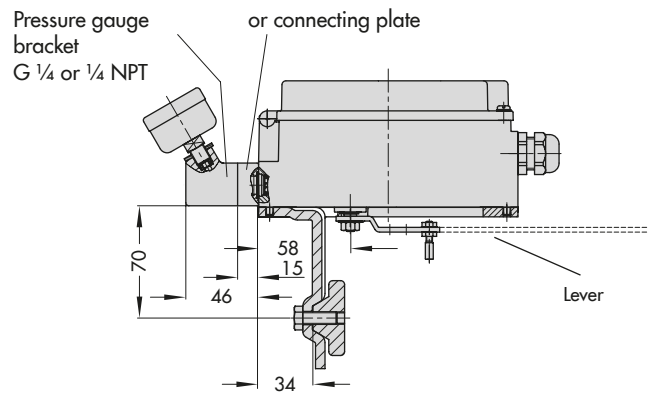
A reversing amplifier is necessary for double-acting, springless actuators for the second opposing signal pressure.

### Dimensions in mm

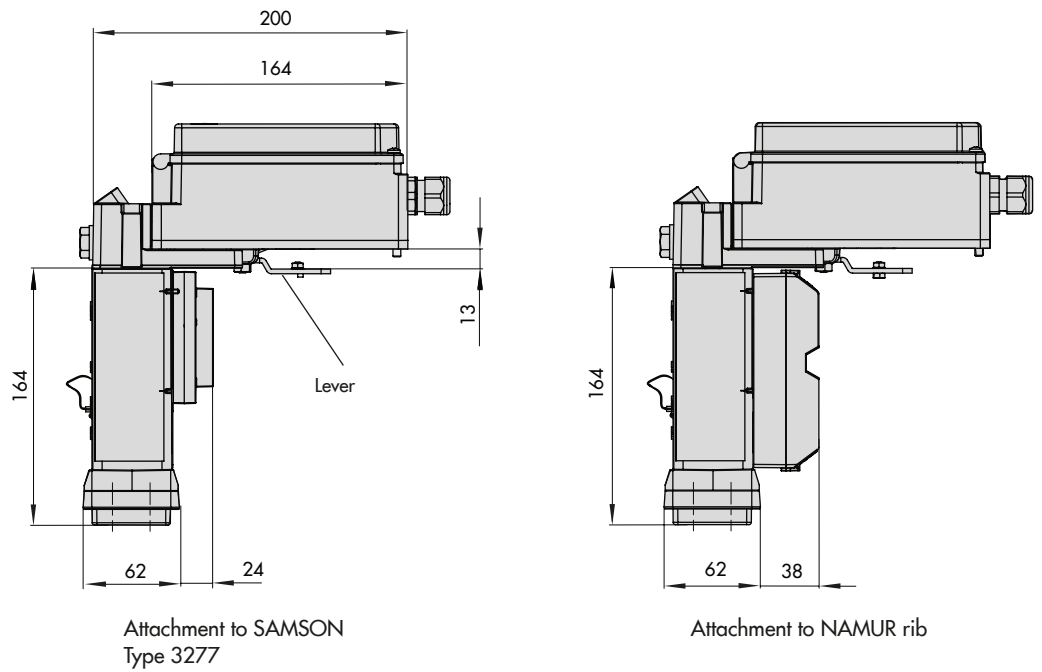
#### Direct attachment



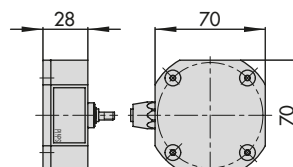
**NAMUR attachment**



**Attachment according to VDI/VDE 3847**



**External position sensor**



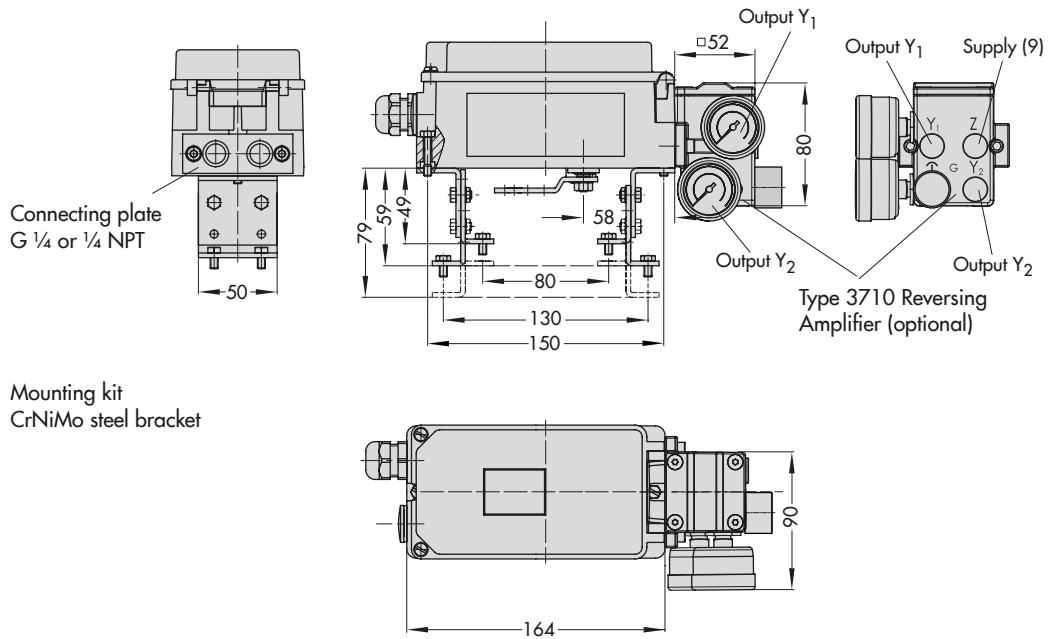
## Attachment to rotary actuators

VDI/VDE 3845 (Sept. 2010)

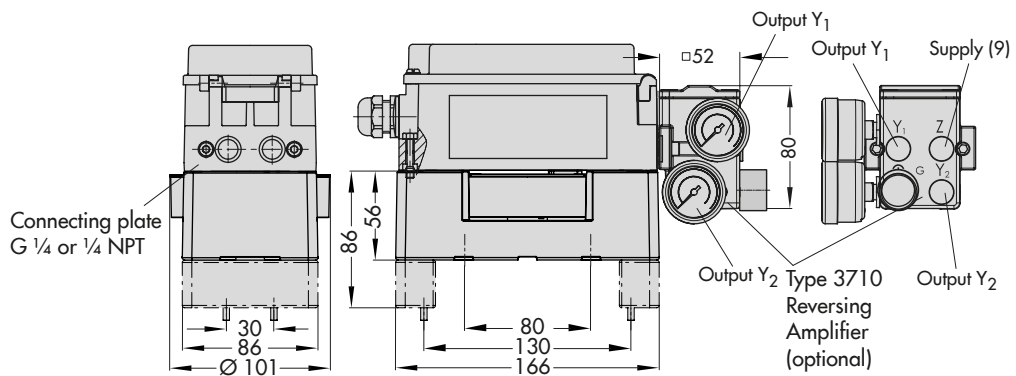
Fixing level 1

Size AA1 to AA4

### Light version

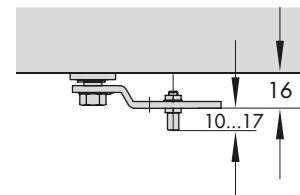
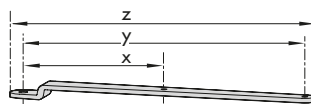


### Heavy-duty version



### Lever

Lever	x	y	z
S	17 mm	25 mm	33 mm
M	25 mm	50 mm	66 mm
L	70 mm	100 mm	116 mm
XL	100 mm	200 mm	216 mm





## Ordering text

Type 3730-5... Positioner with FOUNDATION™ fieldbus communication

- Without pneumatic connecting rail  
(only when directly attached to Type 3277)
- With pneumatic connecting rail ISO 228/1-G ¼
- With pneumatic connecting rail ¼-18 NPT
- Without/with pressure gauge up to max. 6 bar
- Attachment to Type 3277 Actuator (175 to 750 cm<sup>2</sup>)
- Attachment acc. to IEC 60534-6-1 (NAMUR)  
Valve travel: ... mm, if applicable, stem diameter: ... mm
- Attachment acc. to VDI/VDE 3847  
Valve travel: ... mm, if applicable, stem diameter: ... mm
- Attachment to Type 3278 Rotary Actuator (160/320 cm<sup>2</sup>),  
mounting kit with CrNiMo steel bracket or heavy-duty attachment
- Attachment to rotary actuators acc. to VDI/VDE 3845,  
mounting kit with CrNiMo steel bracket or heavy-duty attachment
- Pneumatic reversing amplifier for double-acting actuators  
with connection acc. to ISO 228/1-G ¼ or ¼-18 NPT
- Adapter M20x1.5 to ½ NPT
- Metal cable gland
- Special version: housing made of CrNiMo steel

**Article code**

Positioner	Type 3730-5	x	x	x	0	x	x	x	0	x	0	0	x	0	x	x	
With LCD and autotune, FOUNDATION™ fieldbus																	
<b>Explosion protection</b>																	
Without		0													0	0	0
<b>ATEX</b>	II 2G Ex ia IIC T6 Gb; II 2D Ex ia III T80°C Db	1													0	0	0
<b>ATEX</b>	II 2D Ex tb IIIC T80°C Db	5													0	0	0
<b>ATEX</b>	II 3G Ex nA IIC T6 Gc, II 3D Ex tc IIIC T80°C Dc	8													0	0	0
<b>IECEX</b>	Ex ia IIC T6...T4 Gb; Ex ia IIIC T80°C Db	1													0	1	2
<b>IECEX</b>	Ex nA IIC T6...T4 Gc; Ex tc IIIC T80°C Dc	8													0	1	3
<b>CCC Ex</b>	Ex ia IIC T4...T6 Gb; Ex ia IIIC T80 °C Db	1													0	0	9
<b>CCC Ex</b>	Ex ia IIC T4...T6 Gb; Ex ia IIIC T80 °C Db	8													0	1	0
<b>CCoE</b>	Ex ia IIC T6...T4 Gb	1															
<b>CSA</b>	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–G; Class III	3													0	0	0
<b>EAC</b>	1Ex ia IIC T6/T5/T4 Gb X, Ex tb IIIC T80 °C Db X	1													0	1	4
<b>FM</b>	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																
<b>INMETRO</b>	Ex ia IIC T4...T6 Gb; Ex ia IIIC T80 °C Db	1													0	3	1
<b>INMETRO</b>	Ex ec IIC T4...T6 Gc; Ex tc IIIC T80 °C Dc	8															
<b>KCS</b>	Ex ia IIC T6/T5/T4	1													0	2	9
<b>NEPSI</b>	Ex ia IIC T4...T6 Gb; Ex ia IIIC T80°C Db	1															
<b>NEPSI</b>	Ex ec IIC T6 Gc	8															
<b>TR CMU</b>	II 2G Ex ia IIC T6...T4 Gb; II 2D Ex ia IIIC T80 °C Db	1													0	4	3
<b>TR CMU</b>	II 2D Ex tb IIIC T80 °C Db	5															
<b>TR CMU</b>	II 3G Ex ic nA IIC T6 Gc; II 3D Ex tc IIIC T80 °C Dc IP66	8															
<b>Additional equipment</b>																	
Inductive limit switch		Without	0														
		SJ2-SN (NC contact)	1														
Solenoid valve		Without	0														
		With, 24 V DC	4														
External position sensor		Without			0												
		With	0		1	0		0									
Leakage sensor		Without			0												
		With			1												
Binary input		Without			0												
		Floating contact			0	1											
<b>Diagnostics</b>																	
EXPERTplus								4									
<b>Housing material</b>																	
Aluminum (standard)										0							
Stainless steel 1.4408					0					1							
<b>Special applications</b>																	
Without															0		
Device compatible with paint															1		
Exhaust air port with 1/4-18 NPT thread, back of positioner sealed			0	0	0	0									2		
Attachment according to VDI/VDE 3847 including interface															6		
Attachment according to VDI/VDE 3847 prepared for interface															7		
<b>Special version</b>																	
Without															0	0	0