DATA SHEET

T 8384-4 EN

Type 3730-4 Electropneumatic Positioner

with PROFIBUS-PA communication · Series 3730

CE Ex certified

Anwendung

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 PROFIBUS-PA specifications based on IEC 61158-2 transmission technology

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The microprocessor-controlled positioner compares the set point cyclically transmitted over the PROFIBUS-PA network to the travel or opening angle of the control valve and issues a corresponding output signal pressure.

The Type 3730-4 Positioner communicates using PROFIBUS-PA specification according to IEC 61158 and IEC 61784 to exchange data with programmable logic controllers, automation systems and various engineering tools.

Special features

- PROFIBUS-PA Profile 3.01 certified positioner fulfilling all compulsory requirements of PROFIBUS-PA Profile 3.02
- Automatic ID adaptation according to PROFIBUS-PA Profile 3.02 to facilitate replacement of positioners with Profile 2.0 or 3.0 (e.g. Type 3785)
- Classified status alarms acc. to NAMUR Recommendation NE 107
- DTM file available to integrate the positioner into FDT/DTM in compliance with specification 1.2
- Simple attachment to all common linear and rotary actuators
  - SAMSON direct attachment (Fig. 1)
  - NAMUR rib (Fig. 2)
  - Attachment to rod-type yokes acc. 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)
- Single-knob, menu-driven operation
- Automatic start-up
- LCD easy to read in any mounted position due to selectable reading direction
- Integrated EXPERTplus diagnostics for control valves (▶ T 8389)
- Online changing of control parameters
- Automatic zero monitoring
- Calibrated travel sensor without gears susceptible to wear

Fig. 1: *Type 3730-4*
Direct attachment to Type 3277 Pneumatic Actuator

Fig. 2: *Type 3730-4*
Attachment according to NAMUR

Fig. 3: *Type 3730-4*
Attachment according to VDI/VDE 3845

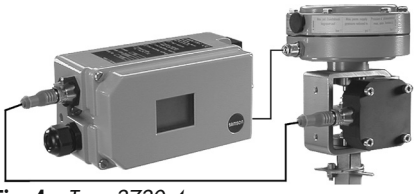


Fig. 4: *Type 3730-4*
External position sensor with Type 3510 Micro-flow Valve

- Permanent storage of all parameters (protected against power failure)
- Negligible influence of temperature and supply air
- Adjustable output pressure limitation
- Activatable tight-closing function
- Binary input for DC voltage signals

Additional options

Inductive limit contact with proximity switches

Integrated solenoid valve

Binary input for floating contact

– 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 (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 capacity 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. Using the software, the signal pressure to the actuator can be limited 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 PROFIBUS-PA specifications.

As a standard feature, the positioner comes with a binary input for DC voltage signals to signalize process information over the PROFIBUS-PA network.

Operation

A single rotary pushbutton facilitates operation. The parameters are selected by turning the rotary pushbutton, 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.

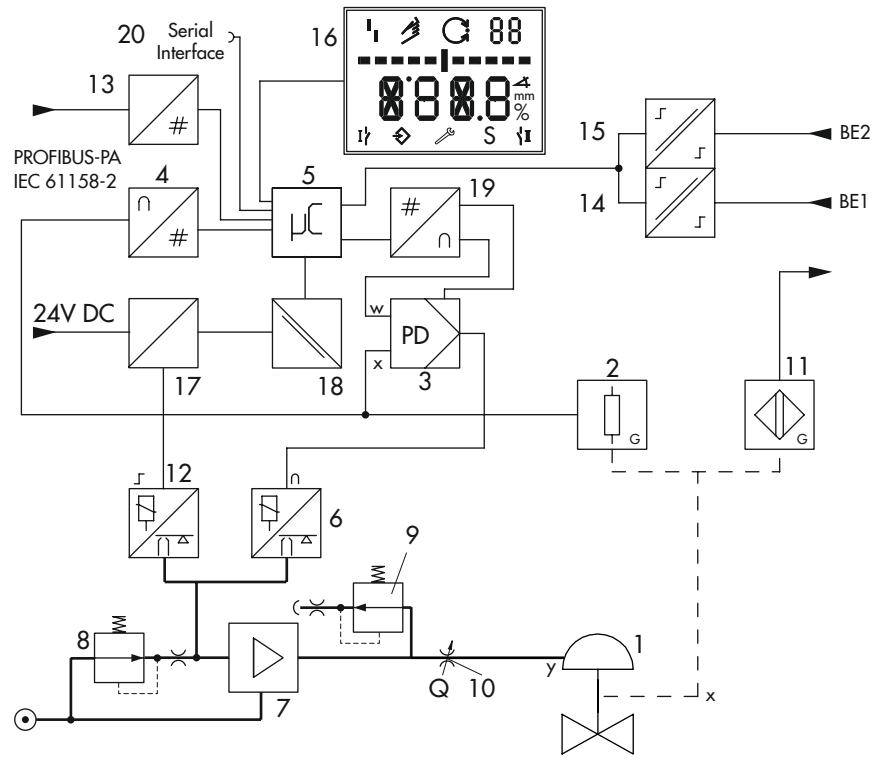
All values are displayed on the LCD. The reading direction of the LCD can be rotated by 180°.

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 while the process is running. The control valve is connected to the process over the PROFIBUS-PA network.



1	Control valve
2	Travel sensor
3	PD controller
4	A/D converter
5	Microcontroller
6	i/p converter
7	Air capacity booster
8	Pressure regulator
9	Flow regulator
10	Volume restriction
11*	Inductive limit contact
12*	Solenoid valve
13	IEC 61158-2 Interface module
14	Binary input 1 (voltage input)
15*	Binary input 2 (for floating contact)
16	Display
17*	Actuation of solenoid valve
18	Galvanic isolation
19	D/A converter
20	Serial interface (SSP)
*	Optional

Fig. 5: *Functional diagram of Type 3730-4 Positioner*

Table 1: *Technical data*

Type 3730-4 Positioner with PROFIBUS-PA communication Technical data in test certificates additionally apply to explosion-protected devices			
Valve 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 of the valve; travel can be restricted to 1/5 at the maximum.	
Bus connection		Fieldbus interface according to IEC 61158-2, bus-powered Field device according to FISCO (Fieldbus Intrinsically Safe Concept)	
Communication			
Fieldbus		Data transmission conforming to PROFIBUS-PA specification acc. to IEC 61158 and IEC 61784 Certified DTM file acc. to FDT specification 1.2, suitable for integrating the positioner into frame applications that support the FDT/DTM concept. Other integrations, e.g. into SIMATIC PDM using EDD	
Local Software requirements		SAMSON SSP interface and serial interface adapter TROVIS-VIEW with database module 3730-4	
Permissible voltage supply		9 to 32 V DC · Powered over bus line The limits in the type examination 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 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 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		–20 to +80 °C for all versions –45 to +80 °C with metal cable gland Observe the limits in the test certificate for explosion-protected versions.	
Influences	Temperature	≤0.15 %/10 K	
	Supply air	None	
	Effect of vibration	≤ 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 mm² wire cross-sections	
Degree of protection		IP 66/NEMA 4X	
Use in safety-instrumented systems (SIL) Emergency venting at 0 V set point and using optional solenoid valve		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. 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).	
Compliance		CE EAC	

Binary input 1	
Input	0 to 30 V DC with reverse polarity protection · Static destruction limit 40 V/5.8 mA · 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) acc. to DIN EN 1706 · Chromated and powder paint coated · Special version: stainless steel 1.4408
External parts	Stainless steel 1.4404/316L
Cable gland	M20x1.5, black polyamide
Weight	Approx. 1.0 kg

Options for Type 3730-4	
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 (emergency venting at 0 V)
Service life	> 5 x 10^6 switching cycles
Pepperl+Fuchs inductive limit contact	For connection to switching amplifier acc. to EN 60947-5-6
SJ2-SN proximity switch	Measuring plate not detected: ≥3 mA · Measuring plate detected: ≤1 mA
External position sensor	
Valve 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 Hz to 2 kHz
Degree of protection	IP 67

Table 2: *Explosion protection certificates*

Type		Certification			Type of protection/comments
3730	-41	(Ex) 1)	Number Date	PTB 04 ATEX 2109 11.05.2017	II 2G Ex ia IIC T6 Gb II 2D Ex ia III T80°C Db
		CCC Ex	Number Date Valid until	2020322307002425 18.09.2020 17.09.2025	Ex ia IIC T4 ~ T6 Gb
		CCoE	Number Date Valid until	A P HQ MH 104 1444 21.04.2018 20.04.2023	Ex ia IIC T6
		EAC Ex	Number Date Valid until	RU C-DE.HA65.B.00510/20 18.03.2020 18.03.2025	1Ex ia IIC T6/T5/T4 Gb X Ex tb IIIC T80 °C Db X
		IECEx	Number Date	IECEx PTB 06.0054 17.07.2017	Ex ia IIC T6…T4 Gb; Ex ia IIC T80°C Db
		TR CMU 1055	Number Date Valid until	ZETC/35/2021 26.07.2021 25.07.2024	II 2G Ex ia IIC T6...T4 Gb II 2D Ex ia IIIC T80 °C Db
	-43	**CSA**	Number Date	1675787 24.05.2017	Ex ia IIC T6, Class I, II, Div. 1, Groups A–G Ex nA II T6, Ex nL IIC T6; Class I, Div. 2, Groups A–D; Class II, Div. 1, Groups E–G Type 4 Enclosure
		FM	Number Date	3023605 15.03.2006	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
	-45	(Ex) 1)	Number Date	PTB 04 ATEX 2109 11.05.2017	II 2D Ex tb IIIC T80°C Db
		IECEx	Number Date	IECEx PTB 06.0054 17.07.2017	Ex tb IIIC T80°C Db
		TR CMU 1055	Number Date Valid until	ZETC/35/2021 26.07.2021 25.07.2024	II 2D Ex tb IIIC T80 °C Db
	-48	(Ex) 2)	Number Date	PTB 05 ATEX 2010 X 22.06.2017	II 3G Ex nA IIC T6 Gc II 3D Ex tc IIIC T80°C Dc
		CCC Ex	Number Date Valid until	2020322307002425 18.09.2020 17.09.2025	Ex ic IIC T4 ~ T6 Gc Ex nA IIC T4 ~ T6 Gc
		IECEx	Number Date	IECEx PTB 06.0054 17.07.2017	Ex nA IIC T6…T4 Gc; Ex tc IIIC T80°C Dc
		TR CMU 1055	Number Date Valid until	ZETC/35/2021 26.07.2021 25.07.2024	II 3G Ex ic nA IIC T6 Gc II 3D Ex tc IIIC T80 °C Dc IP66

1) EC type examination certificate
2) Statement of conformity

Electrical and bus connection

The Type 3730-4 Positioner with PROFIBUS-PA communication must be connected to bus segments complying with IEC 61158-2 requirements. 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 cm²) 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.

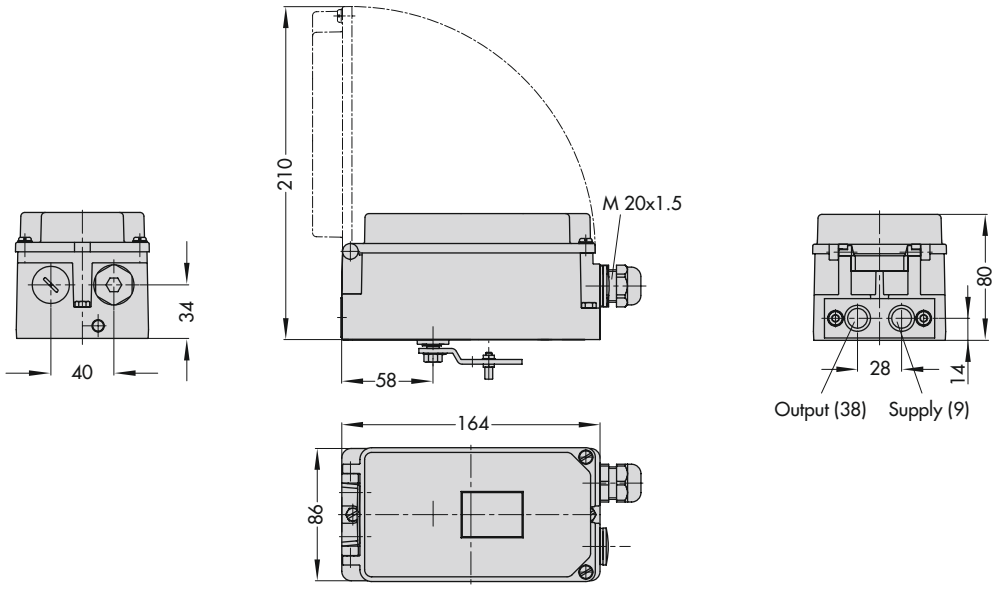
A pair of universal brackets is used for the attachment to Type 3278 Rotary Actuators or other rotary actuators according to VDI/VDE 3845. The rotary motion of the actuator is transferred to the positioner over a coupling wheel with travel indication.

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.

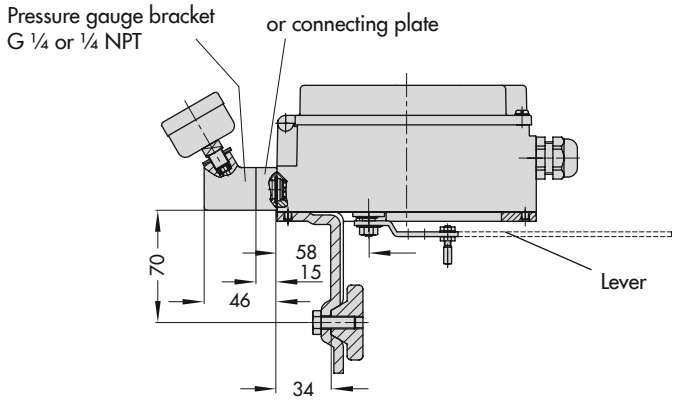
A reversing amplifier is necessary for double-acting, springless actuators for the second opposing signal pressure.

Dimensions in mm

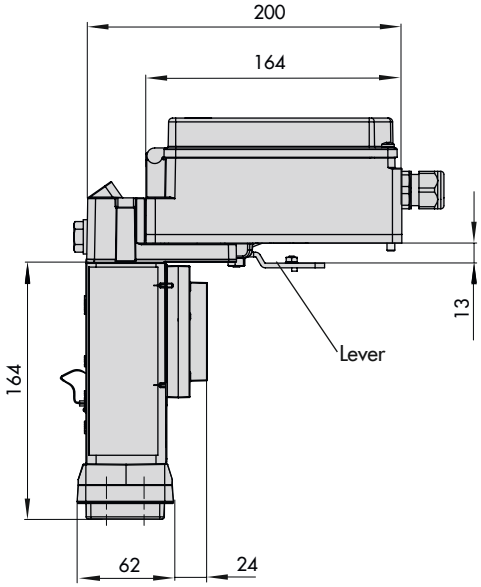
Direct attachment



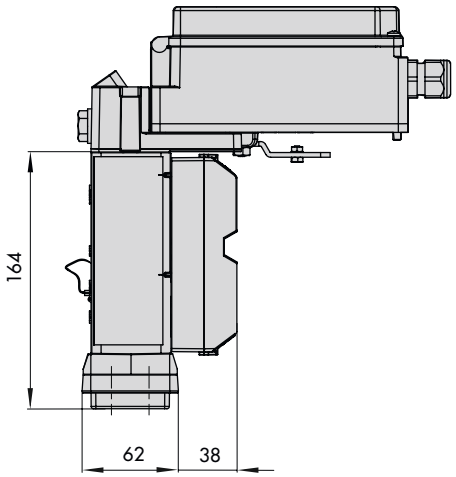
NAMUR attachment



Attachment according to VDI/VDE 3847

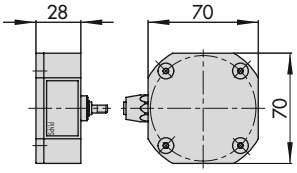


Attachment to SAMSON Type 3277



Attachment to NAMUR rib

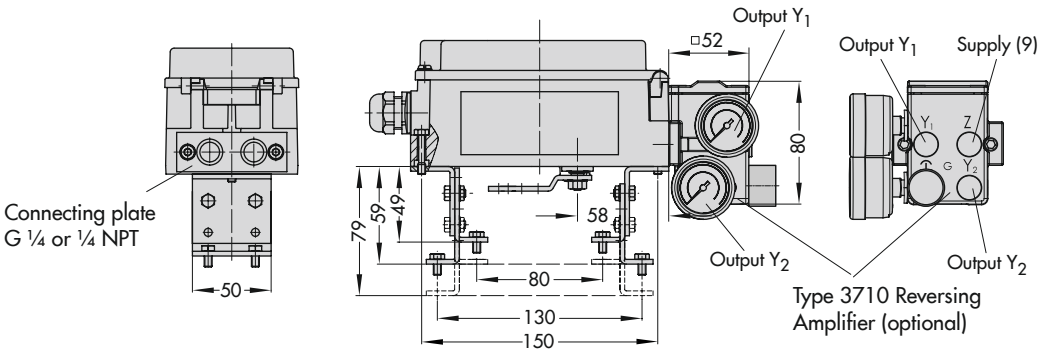
External position sensor



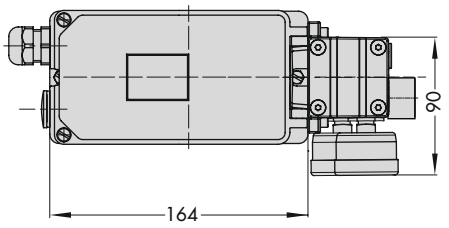
Attachment to rotary actuators

VDI/VDE 3845 (Sept. 2010)
Fixing level 1
Size AA1 to AA4

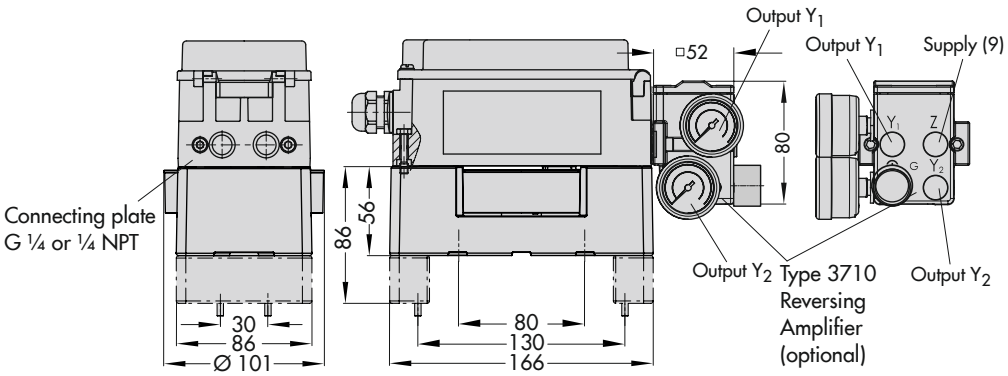
Light version



Mounting unit
CrNiMo steel bracket

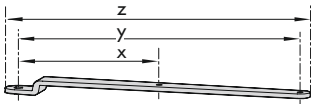


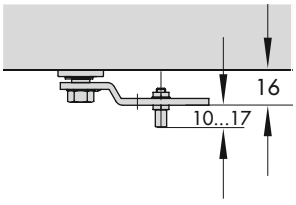
Heavy-duty version



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 3730-4... Positioner
- 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 (240 to 700 cm²)
  Attachment according to IEC 60534-6-1 (NAMUR)
- Valve travel: ... mm, if applicable, rod diameter: … mm
- Attachment according to VDI/VDE 3847
- Valve travel: ... mm, if applicable, rod diameter: … mm
- Attachment to Type 3278 Rotary Actuator (160/320 cm²), mounting unit with CrNiMo steel bracket or heavy-duty attachment
- Attachment to rotary actuators acc. to VDI/VDE 3845, mounting unit 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

Type 3730-4 Positioner		x	x	x	0	x	0	x	x	1	x	0	0	x	0	x	x
With LCD and autotune, PROFIBUS-PA																	
Explosion protection																	
Without		0															
ATEX	II 2G Ex ia IIC T6 Gb; II 2D Ex ia III T80°C Db	1															
CSA	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, Div.2, Groups A, B, C, D; Class II, Div.1, Groups E, F, G	3															
FM	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																
ATEX	II 2D Ex tb IIIC T80°C Db	5															
ATEX	II 3G Ex nA IIC T6 Gc; II 3D Ex tc IIIC T80°C Dc	8															
Additional equipment																	
Inductive limit contact																	
Without			0														
1 x SJ2-SN (NC contact)			1			0											
Solenoid valve																	
Without				0													
With, 24 V DC				4													
External position sensor																	
Without						0											
With			0	0		1		0				0					
Binary input																	
Without								0									
Floating contact						0		1									
Diagnostics																	
EXPERTplus									4								
Housing material																	
Aluminum (standard)											0						
Stainless steel						0					1						
Special application																	
Without														0			
Version compatible with paint														1			
Exhaust port with thread ¼-18 NPT			0	0		0		0						2			
With additional vent hole and VDI/VDE 3847 adapter, without travel pick-off parts														6			
With additional vent hole														7			
Special version																	
Without															0	0	0
IECEx	Ex ia IIC T6…T4 Gb; Ex ia IIC T80°C Db	1													0	1	2
IECEx	Ex tb IIIC T80°C Db	5													0	3	4
IECEx	Ex nA IIC T6…T4 Gc; Ex tc IIIC T80°C Dc	8													0	1	5
EAC	1Ex ia IIC T6/T5/T4 Gb X; Ex tb IIIC T80 °C Db X	1													0	1	4