

# 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-calibrating, automatic adaptation to valve and actuator.

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



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

## Special features

- Simple attachment to common linear and rotary actuators with SAMSON direct attachment interface (Fig. 1), NAMUR rib (Fig. 2), valves with rod-type yokes acc. to IEC 60534-6-1 or rotary actuators acc. 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
- 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
- All parameters saved in EEPROM (protection against power failure)
- Two-wire system with a small electrical load between 300  $\Omega$  and 410  $\Omega$  depending on the version (see Table 1)
- Adjustable output pressure limitation
- Tight-closing function can be activated
- Continuous monitoring of zero point
- Integrated temperature sensor and operating hours counter
- Two standard configurable position alarms
- Self-diagnostics; alarms as condensed state conforming to NAMUR Recommendation NE 107, issued over a fault alarm contact or optional analog position transmitter
- Integrated EXPERTplus diagnostics (see T 8389 EN), suitable for valves for throttling and on/off service with additional partial stroke test for valves in safety-related applications
- Certified according to IEC 61508/SIL



## Versions

- **Type 3730-2** · Electropneumatic positioner with LCD, operable on site, local communication using SSP interface, EXPERTplus diagnostics
- **Type 3730-3** · Positioner as above, additionally with HART® communication
- **Type 3731 Ex d Positioner** · As above, additionally with HART® communication · See Data Sheet T 8387-3 EN

### Additional options

- Inductive limit switch with proximity switch
- Analog position transmitter with two-wire transmitter
- Forced venting function with solenoid valve
- Binary input
- External position sensor (Fig. 4)
- Stainless steel housing

### Principle of operation

The electropneumatic positioner is mounted on pneumatic control valves. It is used to assign the valve stem position (controlled variable  $x$ ) to the input signal (reference variable  $w$ ). The input signal received from a control system is compared to the travel or opening angle of the control valve and an output 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 volume 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 using a user-friendly rotary pushbutton. The parameters are selected by turning the knob, pushing it activates the required settings. In the menu, all parameters are listed in one level, meaning there is no need to search through submenus. All parameters can be checked and changed on site.

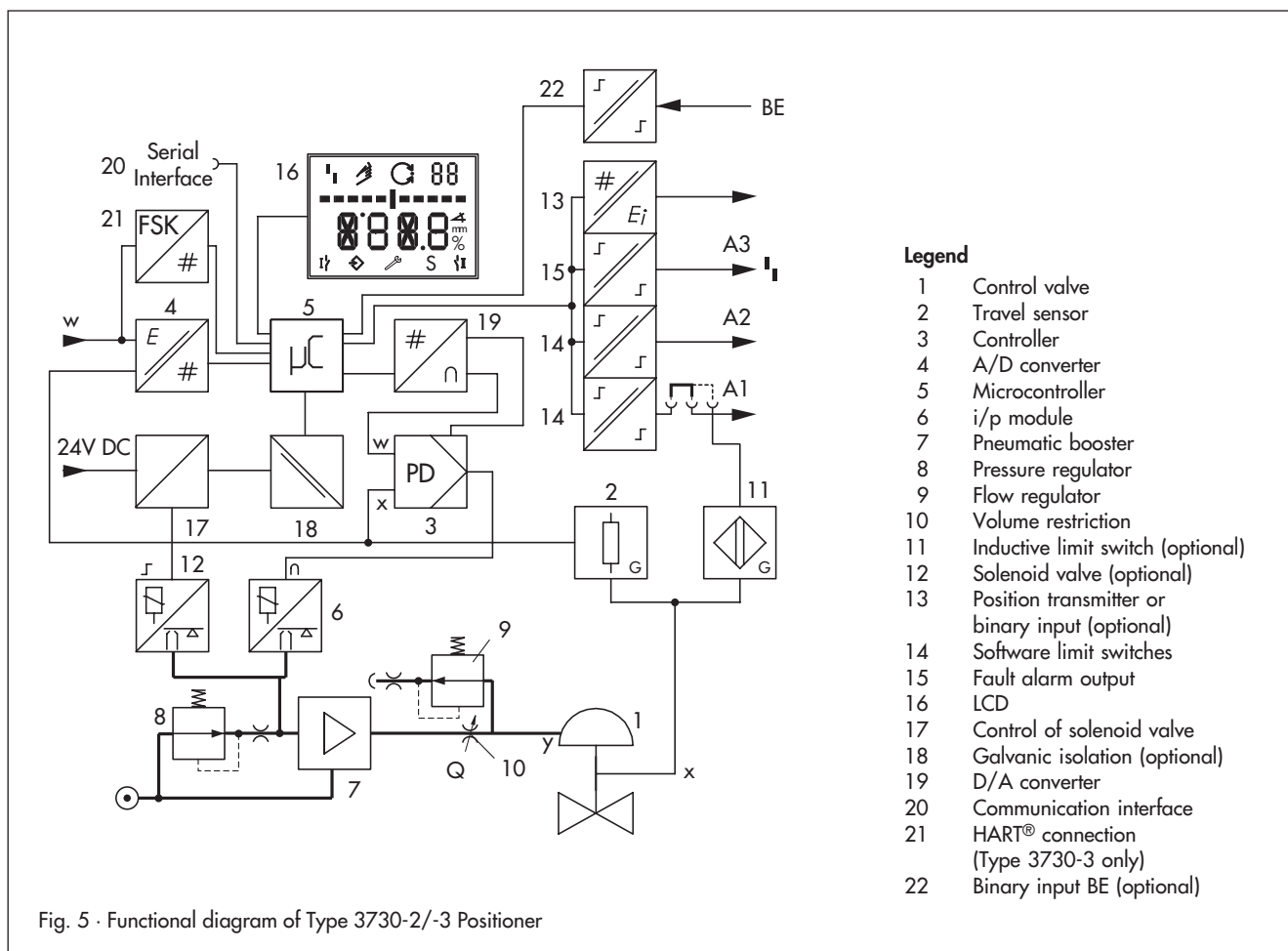
All values are displayed on the LCD. The reading direction of the LCD can be rotated by 180° at the push of a button.

The closing direction of the control valve is indicated to the positioner by the slide 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 (pre)set parameters (autotune). After initialization has been completed, the positioner immediately starts closed-loop operation.

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

Additionally, all parameters of the Type 3730-3 Positioner can be accessed using HART® communication.



**Table 1 · Technical data for Type 3730 Positioner**

<b>Common data for Type 3730-... Positioner (technical data in test certificates additionally apply for explosion-protected devices)</b>			
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 initialized travel/opening angle · Can be restricted to maximally 1/5	
Reference variable w	Signal range	4 to 20 mA · Two-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 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 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 ± 0.2 bar using 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 <sub>n</sub> /h		
Air output capacity	Actuator pressurized	At Δp = 6 bar: 8.5 m <sub>n</sub> <sup>3</sup> /h · At Δp = 1.4 bar: 3.0 m <sub>n</sub> <sup>3</sup> /h · K <sub>Vmax</sub> (20 °C) = 0.09	
	Actuator vented	At Δp = 6 bar: 14.0 m <sub>n</sub> <sup>3</sup> /h · At Δp = 1.4 bar: 4.5 m <sub>n</sub> <sup>3</sup> /h · K <sub>Vmax</sub> (20 °C) = 0.15	
Permissible ambient temperature	-20 to +80 °C for all versions · -45 to +80 °C with metal cable gland -25 to +80 °C with inductive limit switch (SJ2-S1N) and metal cable gland Limits in test certificate additionally apply for explosion-protected devices.		
Influences	Temperature	≤ 0.15 %/10 K	
	Supply air	None	
	Vibrations	≤ 0.25 % up to 2000 Hz and 4 g acc. to IEC 770	
Electromagnetic compatibility	Complying with the requirements of EN 61000-6-2, EN 61000-6-3, EN 61326-1 and NAMUR Recommendation NE 21		
Electrical connections	One M20x1.5 cable gland for 6 to 12 mm clamping range · Second M20x1.5 threaded connection additionally available · 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 in compliance with IEC 61508	Suitable for use in safety-relevant applications up to SIL 2 (single device) and SIL 3 (with redundant configuration), emergency shutdown at a reference variable of 0 mA.		
<b>Explosion protection</b>			
ATEX, IECEx, FM/CSA etc.	See summary of explosion protection certificates		
<b>Binary contacts</b>			
Two software limit switches with reverse polarity protection, configurable switching behavior, default settings according to table below			
Signal status	Version	<b>Without explosion protection</b>	<b>With explosion protection</b>
	No response	Effectively non-conducting	≤ 1.2 mA
	Response	Conductive (R = 348 Ω)	≥ 2.1 mA
One fault alarm contact			
Signal status	Version	<b>Without explosion protection</b>	<b>With explosion protection</b>
	No alarm	Conductive (R = 348 Ω)	≥ 2.1 mA
	Alarm	Effectively non-conducting	≤ 1.2 mA
To be connected to	Binary input of a PLC acc. to IEC 61131-2, P <sub>max</sub> = 400 mW or for connection to NAMUR switching amplifier acc. to EN 60947-5-6		NAMUR switching amplifier acc. to EN 60947-5-6

Materials	
Housing	Die-cast aluminum EN AC-ALSi12(Fe) (EN AC-44300) acc. to DIN EN 1706 · Chromated and powder paint coated · Special version in stainless steel 1.4581
External parts	Stainless steel 1.4571 and 1.4301
Cable gland	Polyamide, black, M20 x 1.5
Weight	Approx. 1.0 kg
Additional data for Type 3730-2	
Load impedance	Without explosion protection: $\leq 6 \text{ V}$ (corresponds to $300 \Omega$ at 20 mA)      With explosion protection: $\leq 7 \text{ V}$ (corresponds to $350 \Omega$ at 20 mA)
Communication (local)	SAMSON SSP interface and serial interface adapter
Software requirements (SSP)	TROVIS-VIEW with database module 3730-2
Additional data for Type 3730-3	
Load impedance	$\leq 8.2 \text{ V}$ (corresponds to $410 \Omega$ 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 450 $\Omega$ · Sending approx. 115 $\Omega$
Software requirements (HART®)	Handheld communicator
	PC
Device description for Type 3730-3 DTM file acc. to Specification 1.2, suitable for integrating the positioner into frame applications that support the FDT/DTM concept (e.g. PACTware); other integration options (e.g. AMS, PDM) available	

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

Solenoid valve · Approval acc. to IEC 61508/SIL	
Input	24 V DC · Electrical isolation and reverse polarity protection · Static destruction limit 40 V Current consumption $I = \frac{U - 5.7 \text{ V}}{3840 \Omega}$ (corresponds to 4.8 mA at 24 V/114 mW)
Signal "0" no pick-up	$\leq 15 \text{ V}$
Signal "1" safe pick-up	$> 19 \text{ V}$
Service life	$> 5 \times 10^6$ switching cycles
Use in safety-related systems in compliance with IEC 61508/SIL	Same as positioner pneumatics
Analog position transmitter	
Power supply	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
Other influences	Same as positioner
Fault alarm	Issued as status current $2.4 \pm 0.1 \text{ mA}$ or $21.6 \pm 0.1 \text{ mA}$
Inductive limit switch	
For connection to switching amplifier acc. to EN 60947-5-6. Can be used in combination with a software limit switch.	
SJ2-SN proximity switch	NAMUR NC contact
SJ2-S1N proximity switch	NAMUR NO contact
External position sensor	
Travel	Same as Type 3730 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 devices.
Immunity to vibration	Up to 10 g in the range of 10 to 2000 Hz
Degree of protection	IP 67

<b>Binary input</b> · Electrical isolation · Switching behavior configured over software (e.g. TROVIS-VIEW, DTM)	
Active switching behavior (default setting)	
Connection	For external switch (floating contact) or relay contact
Electrical data	Open-circuit voltage when contact is open: 10 V Pulsed DC current reaching peak value of 100 mA and RMS value of 0.01 mA when contact is closed
Contact	Closed, $R < 20 \Omega$ "On" switching state (default setting)
	Open, $R > 400 \Omega$ "Off" switching state (default setting)
Passive switching behavior	
Connection	For externally applied DC voltage, reverse polarity protection
Electrical data	3 to 30 V · Destruction limit 40 V · Current draw 3.7 mA at 24 V
Voltage	$> 6 \text{ V}$ "On" switching state (default setting)
	$< 1 \text{ V}$ "Off" switching state (default setting)

### Summary of explosion protection certificates

Type of approval	Certificate number	Date	Type of protection/Comments
<b>Type 3730-2 Positioner</b>			
EC Type Examination Certificate First Addendum Second Addendum Third Addendum Fourth Addendum	PTB 00 ATEX 2158	2001-03-01 2002-03-01 2004-02-16 2007-08-24 2008-11-06	⊗ II 2 G EEx ia IIC T6 Position transmitter ⊗ II 2 D IP 65 T 80 °C, Zone 21 dust, device index .01 Electrical data for forced venting altered Electrical data, structure-borne sound sensor and binary input added
Statement of Conformity First Addendum Second Addendum	PTB 03 ATEX 2016 X	2003-03-07 2005-05-03 2008-11-06	⊗ II 3 G EEx nA II T6; Zone 2; Type 3730-28 II 3 G EEx nL IIC T6; II 3 D IP 54/IP 65 T 80 °C Electrical data, structure-borne sound sensor and binary input added
IECEX	IECEX PTB 05.0007	2005-02-21	Ex ia IIC T6/T5/T4; IP 54 and IP 65 T 80 °C; Type 3730-21.9...
GOST approval	B02637	2009-02-26	0 Ex ia IIC T6 X, valid until 2012-02-26; Type 3730-21
FM approval  Revision	ID 3012394	2002-10-30  2004-02-04	Intrinsically safe, Class I, II, III; Div. 1, Group A, B, C, D, E, F, G; Class I, Zone 0, AEx ia IIC T6; Non-incendive, Class I, Div. 2, Group A, B, C, D; NEMA Type 4; Type 3730-23 Div. 2 Gr. F and G
CSA approval	1330129	2009-02-19	Ex ia IIC T6, Class I, Zone 0; Class I, II, Groups A, B, C, D, E, F, G; Class I, Zone 2; Class I, II, Div. 2, Groups A, B, C, D, E, F, G
JIS approval	TC18159	2010-11-26	Ex ia IIC T6; valid until 2013-11-25; Type 3730-27
NEPSI	GYJ091012	2009-01-20	Ex ia IIC T4...T6; valid until 2014-01-19; Type 3730-21
CCoE	A/P/HQ/MH/104/1339	2007-04-20	EEx ia IIC T6; Zone 1; Type 3730-21
INMETRO	2004EC02CP029-3	2010-05-10	BR - Ex ia T4...T6; valid until 2012-05-10; Type 3730-21
<b>Type 3730-3 Positioner</b>			
EC Type Examination Certificate First Addendum Second Addendum Third Addendum Fourth Addendum	PTB 02 ATEX 2174	2002-11-15 2003-06-18 2004-02-16 2007-09-10 2008-12-10	⊗ II 2 G EEx ia IIC T6; without position transmitter Forced fail-safe venting function ⊗ II 2 D IP 65 T 80 °C, Zone 21 dust, model index .01 Binary input. Electrical data for forced venting altered Ambient temperature range extended
IECEX	IECEX PTB 05.0008	2005-02-21	Ex ia IIC T6/T5/T4; IP 54 and IP 65 T 80 °C; Type 3730-31.9...
GOST approval	POCC DE.05.B03115	2010-09-27	1 Ex ia IIC T6 X; DIP A21 Ta 80 °C, IP 66 Ex nA II T6, Ex nL IIC T6; DIP A22 Ta 80 °C, IP 66 valid until 2013-09-27; Type 3730-31, Type 3730-38
NEPSI approval	GYJ071189	2007-07-26	Ex ia IIC T6; valid until 2012-07-25; Type 3730-31
	GYJ071190 X		Ex nA II T4...T6; Ex nL IIC T4...T6; valid until 2012-07-25; Type 3730-38
Statement of Conformity First Addendum Second Addendum Third Addendum	PTB 03 ATEX 2180 X	2003-09-30 2005-04-26 2007-09-10 2008-12-10	⊗ II 3 G EEx nA II T6; Zone 2; Type 3730-38 II 3 G EEx nL IIC T6; II 3 D IP 65 T 80 °C; Zone 22 Electrical data, structure-borne sound sensor and binary input added Permissible ambient temperature range extended
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

Type of approval	Certificate number	Date	Type of protection/Comments
FM approval	3012394	2008-11-30	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; Type 3730-33
CSA approval	1330129	2009-02-19	Ex ia IIC T6; Class I, Zone 0; Class I, Groups A, B, C, D Class II, Groups E, F, G; Class I, Zone 2; Class I, Div. 2, Groups A, B, C, D Class II, Div. 2, Groups E, F, G; Type 3730-33
CCoE	A/P/HQ/MH/104/1105	2011-01-27	Ex ia IIC T6, Zone 1; valid until 2016-01-26; Type 3730-31
INMETRO	2004EC02CP030	2010-05-15	BR - Ex ia T4...T6; valid until 2012-05-10; Type 3730-31

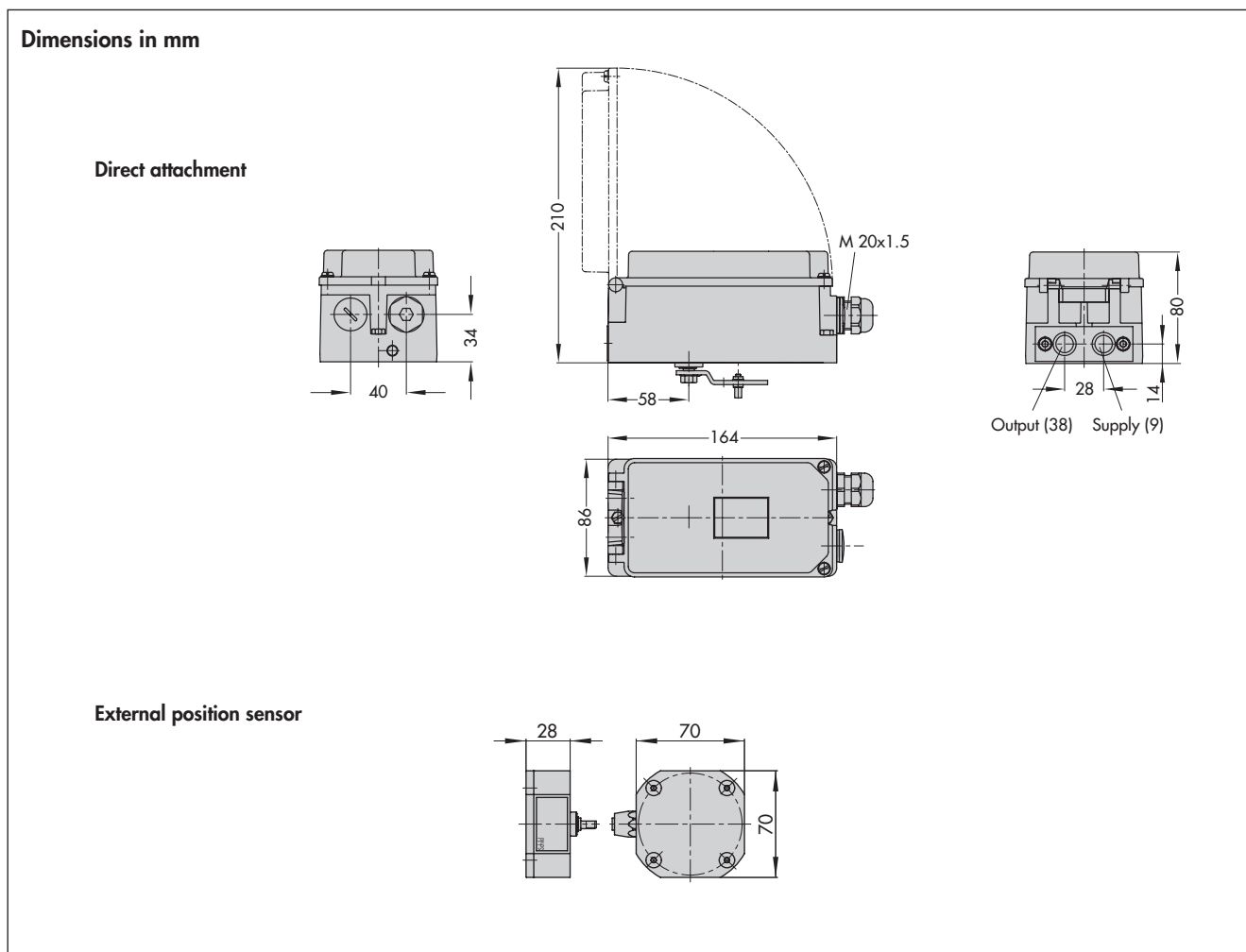
The test certificates are included in the mounting and operating instructions or are available on request.  
Refer to Data Sheet T 8379 EN for EEx d certificates for the Type 3770 Field Barrier.

### Positioner attachment

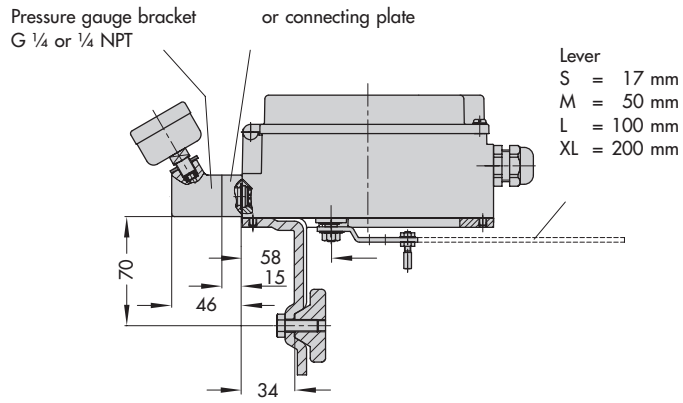
The Type 3730 Electropneumatic Positioner can be attached directly to the Type 3277 Actuator over a connection block. In actuators with fail-safe action "Actuator stem extends" and Type 3277-5 Actuator (120 cm<sup>2</sup>), the signal pressure is routed over an internal bore in the actuator yoke to the actuator. In actuators with fail-safe action "Actuator stem retracts" and in actuators with effective diaphragm areas of 240 cm<sup>2</sup> or larger, the signal pressure is routed to the actuator over ready-made external piping.

Using a 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 to the positioner over a coupling wheel.



**NAMUR attachment**



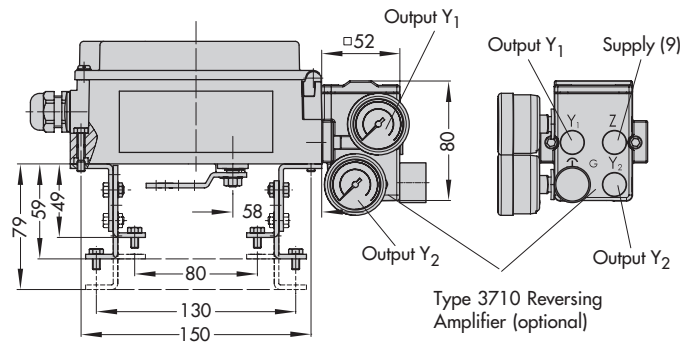
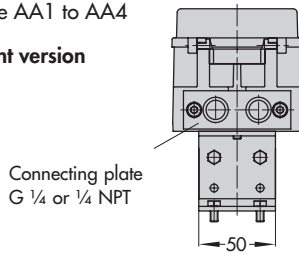
**Attachment to rotary actuators**

VDI/VDE 3865 (Sept. 2010)

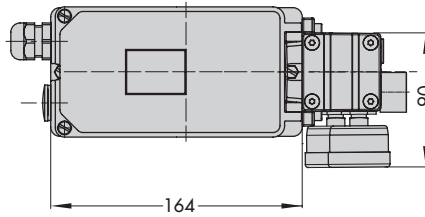
Fixing level 1

Size AA1 to AA4

**Light version**

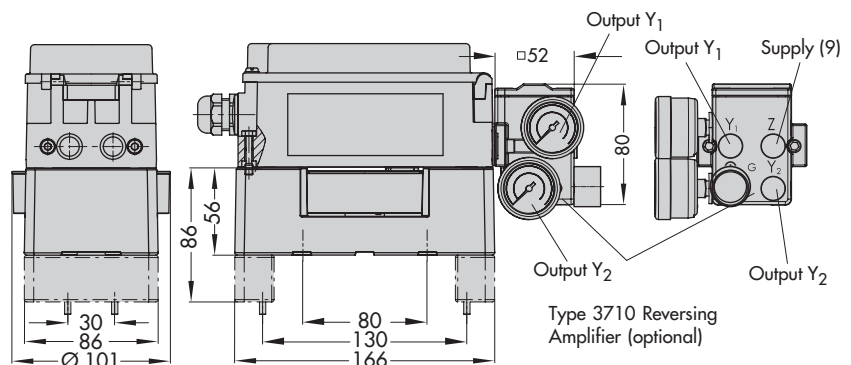


Mounting unit  
CrNiMo steel bracket



**Heavy-duty version**

Connecting plate  
G ¼ or ¼ NPT



## Article code

Positioner	Type 3730-	x	x	x	x	x	x	0	x	x	0	x	0	0	x	0	x	x
With LCD and autotune, 4 to 20 mA reference variable 2 software limit switches, one fault alarm contact	2																	
With LCD and autotune, HART® communication, 4 to 20 mA, 2 software limit switches, one fault alarm contact	3																	
<b>Explosion protection</b>																		
Without	0																	
⊕ II 2 G EEx ia IIC T6 and																		
⊕ II 2 D IP 65 T 80 °C acc. to ATEX	1																	
CSA/FM intrinsically safe/non incendive	3																	
⊕ II 3 G EEx nA/nL II T6 and ⊕ II 3D IP 65 T 80 °C	8																	
<b>Additional equipment</b>																		
Inductive limit switch																		
Without		0																
SJ2-SN		1																
SJ2-S1N		2																
Solenoid valve																		
Without			0															
With, 24 V DC			4															
Position transmitter																		
Without				0														
With				1		0												
External position sensor																		
Without					0													
With		0			1					0								
Binary input																		
Without						0												
With					0	2												
<b>Diagnostics</b>																		
EXPERTplus									4									
<b>Housing material</b>																		
Aluminum (standard)											0							
Stainless steel 1.4581						0					1							
<b>Special application</b>																		
None																0		
Device completely free of paint-impairing substances																1		
Exhaust air port with ¼-18 NPT thread, back of housing sealed																2		
<b>Special version</b>																		
None																	0	0
IECEX		1															1	2
GOST approval Ex ia		1															1	4
GOST approval Ex nA/nL		8															2	0

## Ordering text

Type 3730-x... Positioner

- Without pneumatic connecting rail (only for direct attachment to Type 3277 Actuator)
- 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
- Additional cover label 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 60534-6-1 (NAMUR)  
Travel: ... mm; if applicable, stem 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 M20 x 1.5 to ½ NPT
- Metal cable gland
- Special version with CrNiMo steel housing

