Series 3730
Type 3730-2 Electropneumatic Positioner

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**
Travel	**3.6 to 200 mm**
Opening angle	**24 to 100°**

CE Ex certified

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

Special features

- Simple attachment to all common linear and rotary actuators with interface for SAMSON direct attachment (Fig. 1), NAMUR rib (Fig. 2), 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
- Simple single-knob, menu-driven operation
- LCD easy to read in any mounted 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
- Permanent storage of all parameters in EEPROM (protected against power failure)
- Two-wire system with small electrical load between 300 and 350 Ω depending on version (see Table 1)
- Adjustable output pressure limitation
- Activatable tight-closing function
- Continuous monitoring of zero point
- Integrated temperature sensor and operating hours counter
- Two standard programmable 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 (▶ T 8389 EN) suitable for throttling and on/off valves and with additional partial stroke test for valves in safety-instrumented systems

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

Fig. 2: *Type 3730, attachment to NAMUR rib*

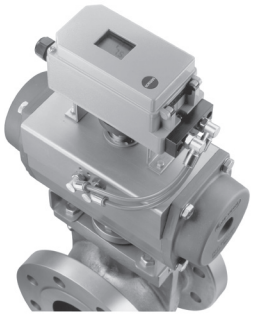


Fig. 3: *Type 3730, attachment according to VDI/VDE 3845*

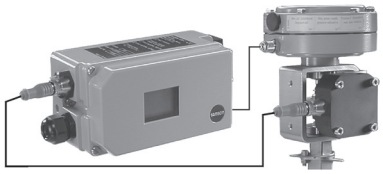


Fig. 4: *Type 3730 · External position sensor with Type 3510 Micro-flow Valve*

- Certified according to IEC 61508/SIL

Version

– **Type 3730-2** · Electropneumatic positioner with LCD, on-site operation, local communication with SSP interface, EXPERTplus diagnostics

Additional options

- Inductive limit switch with proximity switches
- Analog position transmitter with two-wire transmitter
- Forced venting function with solenoid valve
- Binary input
- External position sensor (Fig. 4)
- Analog input x
- Stainless steel housing
- Leakage sensor to monitor the seat leakage

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 (2), an analog i/p module with a downstream air capacity booster and the electronics with the microcontroller (5).

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 volume restriction that can be connected as necessary. The signal pressure to the actuator can be limited by software to 1.4, 2.4 or 3.7 bar.

A constant air stream with a fixed set point to the atmosphere is created by flow regulator (9) with a fixed set point. The i/p module (6) is supplied with a constant upstream pressure by the pressure reducer (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 rotary pushbutton, pushing it activates the required setting. In the menu, all parameters are listed in one level, eliminating the 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 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 the ready adjusted parameters (autotune). After initialization is completed, the positioner immediately starts closed-loop operation.

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

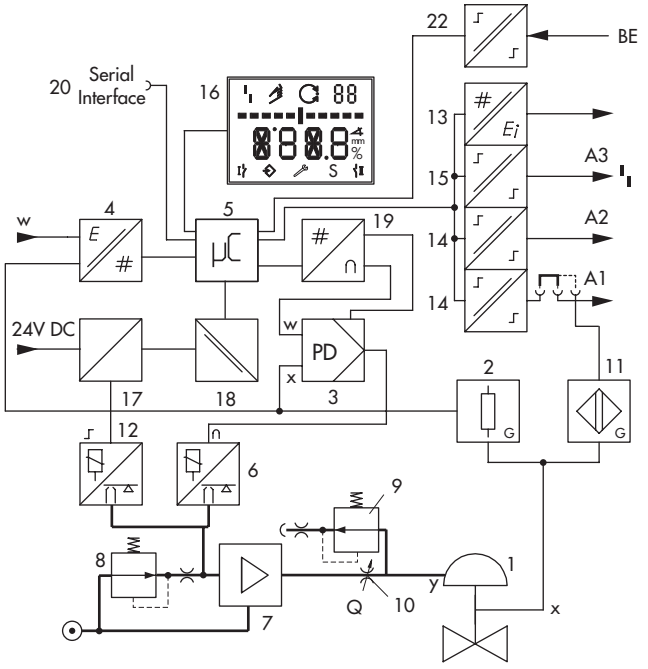


Fig. 5: *Functional diagram of Type 3730-2 Positioner*

1 Control valve
2 Travel sensor
3 Controller
4 A/D converter
5 Microcontroller
6 i/p module
7 Booster
8 Pressure reducer
9 Flow regulator
10 Volume restriction
11 Inductive limit switch (option)
12 Solenoid valve (option)
13 Position transmitter or binary input (option)
14 Software limit switches
15 Fault alarm output
16 LCD
17 Actuation of solenoid valve
18 Electrical isolation (option)
19 D/A converter
20 Communication interface
22 Binary input BE (option)

Table 1: *Technical data for Type 3730-2 Positioner*

Type 3730-2 Positioner		**Technical data in test certificates additionally apply to explosion-protected devices**	
Travel	Adjustable	Direct attachment to Type 3277 Actuator: 3.6 to 30 mm Attachment according to IEC 60534-6-1: 3.6 to 200 mm Rotary actuators: 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	
Reference variable w	Signal range	4 to 20 mA · Two-wire device, reverse polarity protection Minimum span 4 mA	
	Static destruction limit	100 mA	
Minimum current		3.6 mA for display · 3.8 mA for operation	
Load impedance		Without explosion protection: ≤ 6 V (corresponds to 300 Ω at 20 mA) Explosion-protected versions: ≤ 7 V (corresponds to 350 Ω at 20 mA)	
Supply air	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 · Pressure dew point: Class 3 or at least 10 K beneath 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 by software	
Characteristic	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	
Direction of action		Reversible	
Air consumption, steady state		Independent of supply air approx. 110 l_n/h	
Air output capacity	Actuator filled 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	
	Actuator vented	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 (all versions) · −45 to +80 °C with metal cable gland −25 to +80 °C with inductive limit switch (SJ2-S1N) and metal cable gland The limits in the test certificate additionally apply for explosion-protected versions	
Influences	Temperature	≤ 0.15 %/10 K	
	Supply air	None	
	Influence of vibrations	≤ 0.25 % up to 2000 Hz and 4 g according to IEC 770	
Electromagnetic compatibility		Complying with 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 mm² wire cross-section	
Degree of protection		IP 66 /NEMA 4X	
Use in safety-instrumented systems acc. to IEC 61508		Suitable for use in safety-instrumented systems up to SIL 2 (single device) and SIL 3 (with redundant configuration), emergency shutdown at a reference variable of 0 mA	
Explosion protection		See Table 2	
Communication (local)		SAMSON SSP interface and serial interface adapter	
Software requirements (SSP)		TROVIS-VIEW with database module 3730-2	
Binary contacts			
Two software limit switches with reverse polarity protection, configurable switching behavior, default settings according to table below			
Signal state	**Version**	**No explosion protection**	**Explosion-protected version**
	No response	Effectively non-conducting	≤ 1.2 mA
	Response	Conductive (R = 348 Ω)	≥ 2.1 mA
One fault alarm contact			
Signal state	**Version**	**No explosion protection**	**Explosion-protected version**
	No fault alarm	Conductive (R = 348 Ω)	≥ 2.1 mA
	Fault alarm	Effectively non-conducting	≤ 1.2 mA
For connection to		Binary input of a PLC acc. to IEC 61131-2 P_{max} = 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	M20x1.5, black polyamide
Weight	Approx. 1.0 kg
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 $I = \frac{U - 5.7\ V}{3840\ \Omega}$ (corresponding to 4.8 mA at 24 V/114 mW)
Signal '0' (no response)	≤ 12 V
Signal '1' (response)	> 19 V
Service life	> 5 x 10^6 switching cycles
K_V coefficient	0.15
Use in safety-instrumented systems acc. to IEC 61508/SIL	Same as positioner pneumatics
Analog position transmitter	Two-wire transmitter · Electrical isolation
Supply air	12 to 30 V DC · Reverse polarity protection · Static destruction limit 40 V
Output signal	4 to 20 mA
Operating direction	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 ±0.1 mA or 21.6 ±0.1 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 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 2000 Hz
Degree of protection	IP 67
Leakage sensor · Suitable for operation in hazardous areas	
Temperature range	–40 to +130 °C
Tightening torque	20 ±5 Nm
Binary input · 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
Electric data	Open-circuit voltage when contact is open: max. 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 Ω	ON switching state (default setting)
Contact – Open, R > 400 Ω	OFF switching state (default setting)
Passive switching behavior	
Connection	For externally applied DC voltage, reverse polarity protection
Electric data	3 to 30 V DC · Static destruction limit 40 V · Current consumption 3.7 mA at 24 V
Voltage	> 6 V: ON switching state (default setting) · < 1 V: OFF switching state (default setting)
Analog input x · Electrical isolation · Input for externally measured valve position	
Input signal	4 to 20 mA · Reverse polarity protection · Minimum span 6.4 mA
Electric data	Load impedance at 20 mA: 6.0 V · Impedance at 20 mA: 300 Ω · Overload capacity: 24 V AC/DC

Table 2: *Summary of explosion protection approvals*

Type of approval	Certificate number	Date	Type of protection/comments	Type 3730
EC Type Examination Certificate	PTB 00 ATEX 2158	2001-03-01	II 2G Ex ia IIC T6, II 2D Ex tb IIIC T80°C IP66	-21
First Addendum		2002-03-01	Revision: Circuit for position transmitter	
Second Addendum		2004-02-16	Revisions: Circuits of power supply board and multi-function board, position transmitter module – Addition: II 2D IP65 T80°C	
Third Addendum		2007-08-24	Revision: Electrical data for forced venting	
Fourth Addendum		2008-11-06	Additions: Structure-borne sound sensor, binary input	
Fifth Addendum		2013-08-19	Adaptation: Latest edition of standard	
Statement of Conformity	PTB 03 ATEX 2016 X	2003-03-07	II 3G Ex nA II T6, II 3G Ex ic IIC T6, II 3D Ex tc IIIC T80°C IP66	-28
First Addendum		2005-05-03	Addition: II 3G EEx nA II T6	
Second Addendum		2008-11-06	Additions: Structure-borne sound sensor, binary input	
Third Addendum		2013-08-16	Adaptation: Latest edition of standard	
CSA	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	-23
FM	ID 3012394	2002-10-30	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, Div.2, Groups F, G	-23
GOST (valid until 2015-02-27)	POCC DE.08. B00045	2009-02-26	0Ex ia IIC T6	-21
IECEx	IECEx PTB 05.0007	2005-02-21	Ex ia IIC T4/T5/T6; IP54 and IP65 T80°C	-21
CCoE (valid until 2017-01-27)	A/P/HQ/MH/104/1339	2012-01-27	Ex ia IIC T6	-21
INMETRO	On request			
JIS approval	On request			
KCS (valid until 2014-10-24)	11-KB4BO-0214	2011-10-24	Ex ia IIC T6/T5/T4	-21
NEPSI	On request			

The test certificates are included in the mounting and operating instructions or are available on request.

Refer to Data Sheet ▶ T 8359 EN for Ex d approvals of Type 3770 Field Barrier

Mounting the positioner

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 cm²), the signal pressure is routed over an internal hole in the actuator yoke to the actuator. In actuators with effective diaphragm areas of 240 cm² or larger, 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.

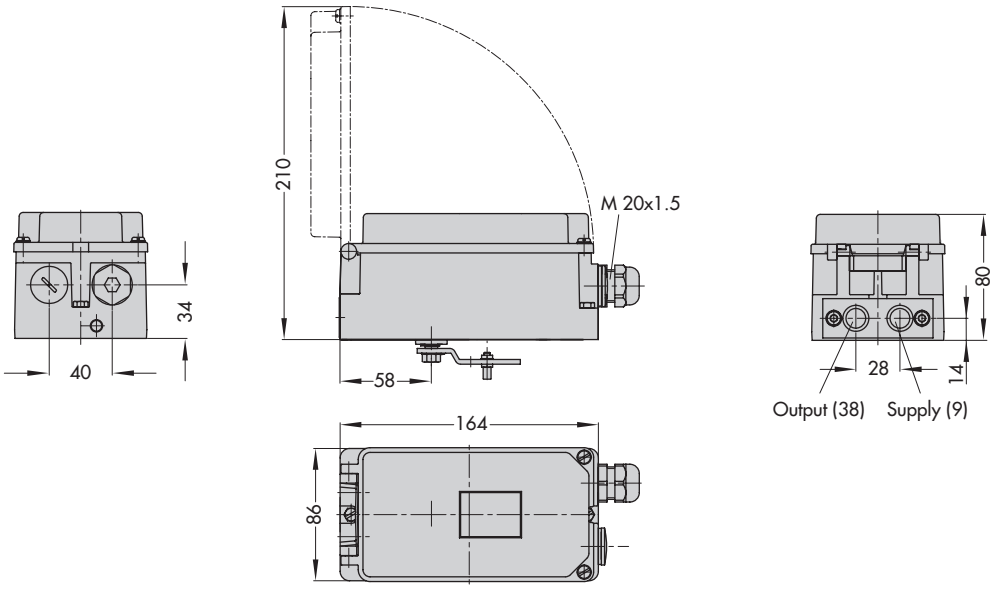
A pair of universal brackets is used for the attachment to Type 3278 Rotary Actuators or other rotary actuators according to VDI/VDE 3845. The rotary motion of the actuator is transferred to the positioner over a coupling wheel with scale.

Ordering text

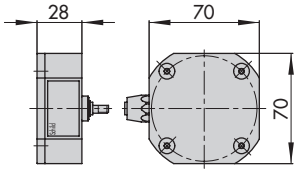
- Type 3730-2... Positioner
- Without pneumatic connecting rail (only when directly attached to Type 3277)
- With pneumatic connecting rail ISO 228/1-G ¼
- With pneumatic connecting rail ¼-18 NPT
- Without/with pressure gauge up to max. 6 bar
- Additional cover label with list of parameters and operating instructions in English/Spanish or English/French (standard version German/English)
- Attachment to Type 3277 Actuator (120 to 700 cm²)
- Attachment according to IEC 60534-6-1 (NAMUR)
- 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 according to ISO 228/1-G ¼ or ¼-18 NPT
- Adapter M20 x 1.5 to ½ NPT
- Metal cable gland
- Special version: housing made of CrNiMo steel

Dimensions in mm

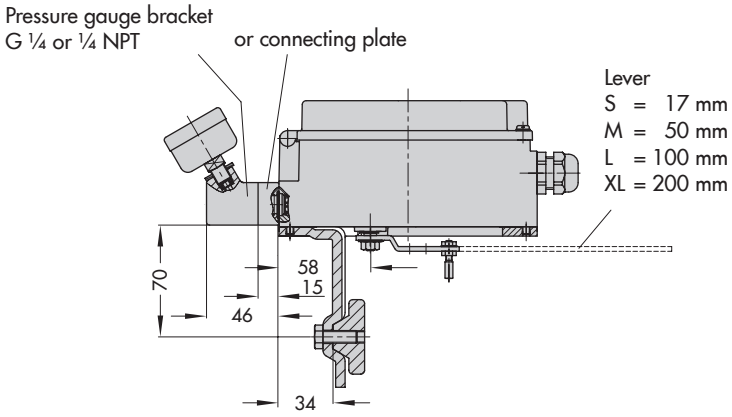
Direct attachment



External position sensor



NAMUR attachment

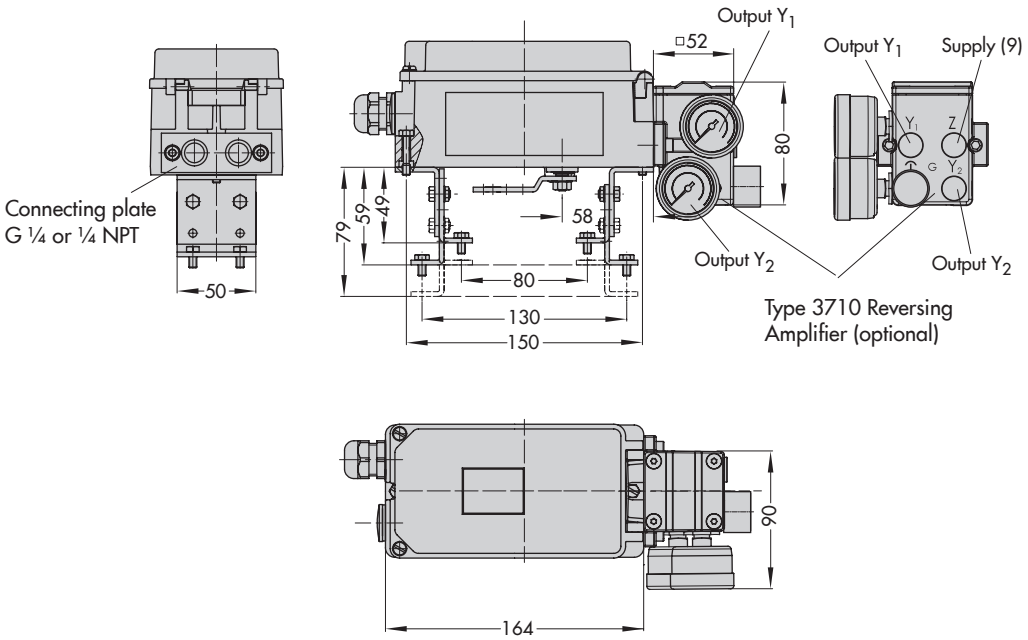


Attachment to rotary actuators acc. to VDI/ VDE 3845 (Sept. 2010)

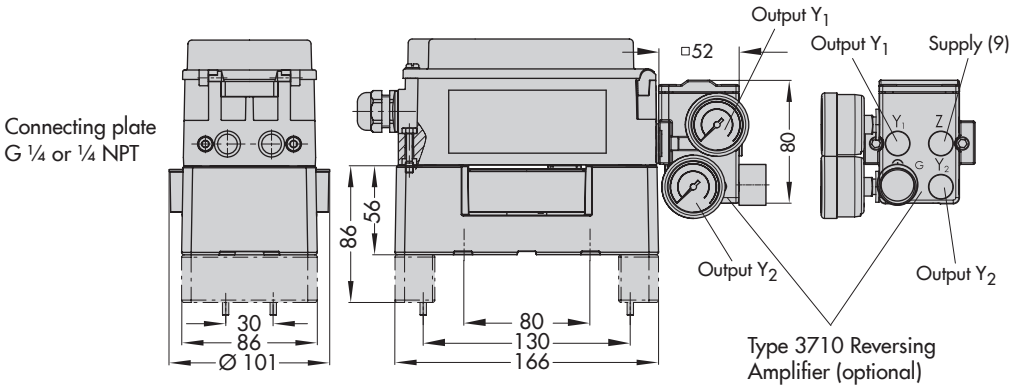
Fixing level 1
Size AA1 to AA4

Light version

Mounting unit
CrNiMo steel bracket



Heavy-duty version



Article code

Positioner	Type 3730-2	x	x	x	x	x	x	x	x	0	x	0	0	x	0	x	x
With LCD and autotune, 4 to 20 mA reference variable Two software limit switches, one fault alarm contact																	
Explosion protection																	
Without		0															
ATEX: II 2G Ex ia IIC T6, II 2D Ex tb IIIC T80°C IP66		1															
CSA/FM 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 Zone 0; Class I, II, Groups A–G; Class I, Zone 2; Class I, II, Div. 2, Groups A–G		3															
JIS: Ex ia IIC T6		7															
ATEX: II 3G Ex nA II T6, II 3G Ex ic IIC T6, II 3D Ex tc IIIC T80°C IP66		8															
Additional equipment																	
Inductive limit switch																	
Without			0														
SJ2-SN (NC contact)			1														
SJ2-S1N (NO contact)			2														
Solenoid valve SIL 4																	
Without				0													
With, 24 V DC				4													
Analog position transmitter																	
Without					0												
With					1				0								
External position sensor																	
Without						0											
With			0			1					0						
Prepared for connection			0			2											
Analog input x		0	0		0	3											
Leakage sensor																	
Without							0										
With							1										
Binary input																	
Without								0									
With					0			2									
Diagnostics																	
EXPERTplus									4								
Housing material																	
Aluminum (standard)											0						
Stainless steel 1.4581					0						1						
Special application																	
Without														0			
Device completely free of paint-impairing substances														1			
Exhaust air with ¼ NPT connection, back of housing sealed														2			
Special version																	
Without																0	0
IECEx: Ex ia IIC T4/T5/T6; IP54 and IP65 T80°C		1														1	2
GOST: 0Ex ia IIC T6		1														1	4

Specifications subject to change without notice

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