Series 3730

Electropneumatic Positioner Type 3730-6 with HART® communication and pressure sensors

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 various 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 of 440 Ω
- 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 8388 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
- Pressure sensors to monitor the supply air and signal pressure

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

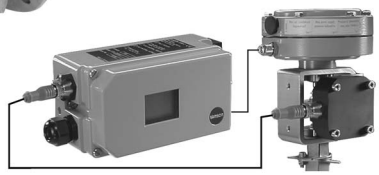


Fig. 4 · Type 3730, external position sensor with Type 3510 Micro-flow Valve

Versions

– **Type 3730-6** · Electropneumatic positioner with LCD, HART® communication, operable on site, local communication using SSP interface, EXPERTplus diagnostics, pressure sensors to monitor the supply air and signal pressure

Additional options

– Inductive limit switch with proximity switch
– Analog position transmitter with two-wire transmitter
– Electronically activated forced venting

– Solenoid valve with parallel forced venting
– Binary input
– External position sensor (Fig. 4)
– Stainless steel housing
– Leakage sensor to monitor the seat leakage

Principle of operation

The electropneumatic positioner is attached to 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 between 1.4 and 7.0 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 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.

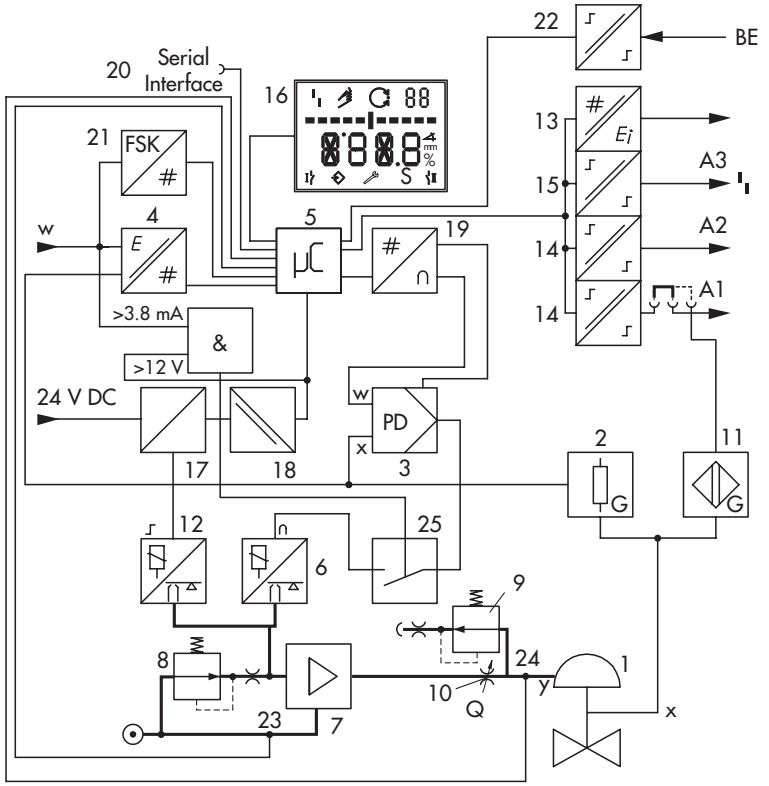
All values are displayed on the LCD. The reading direction of the LCD can be rotated by 180° at the push of a button.

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 3730-6 Positioner can be accessed using HART® communication.



Legend

1	Control valve
2	Travel sensor
3	PD controller
4	A/D converter
5	Microcontroller
6	i/p module
7	Air capacity booster
8	Pressure regulator
9	Flow regulator
10	Volume restriction
11	Inductive limit switch (optional)
12	Solenoid valve (optional)
13	Analog position transmitter or binary input (optional)
14	Software limit switches A1/A2
15	Fault alarm output A3
16	LCD
17	Control of solenoid valve (optional)
19	D/A converter
20	Communication interface
21	HART® modulation
22	Binary input BE (optional)
23	Pressure sensor for supply air p_s
24	Pressure sensor for signal air p_{out}
25	Forced venting (optional)

Fig. 5 · Functional diagram of Type 3730-6 Positioner

Table 1 · Technical data

Type 3730-6 Positioner		
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	30 V
Minimum current		3.6 mA for display · ≤ 3.8 mA for operation
Load impedance		≤ 8.8 V (corresponding to 440 Ω at 20 mA)
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 supply pressure · Limitable between 1.4 and 7.0 bar by software
Characteristics	Adjustable	Linear, equal percentage, reverse equal percentage, user-defined (by software) Butterfly, rotary plug and segmented ball valves: 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_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 · –45 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 %/10 K
	Supply air	None
	Vibrations	≤ 0.25 % up to 2000 Hz and 4 g acc. 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 M20 x 1.5 cable gland for 6 to 12 mm clamping range · Additional second M20 x 1.5 threaded hole · Screw terminals for 0.2 to 2.5 mm² wire cross-section
Degree of protection		IP 66 / NEMA 4X
Use in safety-instrumented systems in compliance with IEC 61508/SIL		**Suitable for use in safety-instrumented systems up to SIL 2** – triggered by the set point, emergency venting at ≤ 3.8 mA – by the optional forced venting, emergency venting at ≤ 12 V **Suitable for use in safety-instrumented systems up to SIL 3** The current circuit of the set point and the forced venting must both be operated in a safety-related system
Communication	Local	SAMSON SSP interface and serial interface adapter Software requirement (SSP): TROVIS-VIEW with database module 3730-6
	HART®	HART® field communication protocol Impedance in the HART frequency range: receive 350 to 450 Ω, send: approx. 155 Ω Software requirements (handheld communicator): device description for Type 3730-6 Software requirements (PC): DTM file acc. to Specification 1.2, suitable for integrating the positioner in frame applications that supports the FDT/DTM concept (e.g. PACTware)
Software requirements (HART®)	Handheld communicator	Device description for Type 3730-6
	PC	DTM file acc. to Specification 1.2, suitable for integrating the positioner in frame applications that supports the FDT/DTM concept (e.g. PACTware)
Explosion protection		
ATEX, IECEx, GOST		See summary of explosion protection certificates

Binary contacts		
Two software limit switches with reverse polarity protection, configurable switching behavior, default settings according to table below		
Signal status	No response	≤ 1.2 mA
	Response	≥ 2.1 mA
One fault alarm contact, floating		
Signal status	No response/No alarm	≥ 2.1 mA
	Response/Fault alarm	≤ 1.2 mA
To be connected to		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

Table 1a · Options for Type 3730-6 Positioner

Electronic forced venting· 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 pick-up	≤ 12 V
Signal "1" safe pick-up	> 19 V
Use in safety-instrumented systems in compliance with IEC 61508/SIL	**Suitable for use in safety-instrumented systems up to SIL 2** – triggered by the set point, emergency venting at ≤ 3.8 mA – by the optional forced venting, emergency venting at ≤ 12 V **Suitable for use in safety-instrumented systems up to SIL 3** The current circuit of the set point and the forced venting must both be operated in a safety-related system
Solenoid valve · 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 pick-up	≤ 12 V
Signal "1" safe pick-up	> 19 V
Service life	> 5 x 10^6 switching cycles
Use in safety-instrumented systems in compliance with IEC 61508/SIL	**Suitable for use in safety-instrumented systems up to SIL 2** – triggered by the set point, emergency venting at ≤ 3.8 mA – by the optional forced venting, emergency venting at ≤ 12 V **Suitable for use in safety-instrumented systems up to SIL 3** The current circuit of the set point and the forced venting must both be operated in a safety-related system
Analog position transmitter	Two-wire transmitter · Galvanically isolated
Supply voltage	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 and HF influence or other influences	Same as positioner
Fault indication	Can be issued with current signal 2.4 ±0.1 mA or 21.6 ±0.1 mA
Inductive limit switch	
Type SJ 2SN Proximity Switch	For connection to switching amplifier acc. to EN 60947-5-6. Can be used in combination with a software limit switch.

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 EC Type Examination 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
Binary input · Electrical isolation · Switching behavior configured over software		
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 < 50 Ω	"On" switching state (default setting)
	Open, R > 400 Ω	"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 V	"On" switching state (default setting)
	< 1 V	"Off" switching state (default setting)

Summary of explosion protection certificates

Type of approval	Certificate number	Date	Type of protection/Comments
EC Type Examination Certificate	PTB 10 ATEX 2007	2010-08-18	⟨Ex⟩ II 2 G Ex ia IIC/IIB T6; Type 3730-6-110/-210 II 2G Ex d [ia] IIC/IIB T6; with Type 3770 Field Barrier II 2 D Ex tD A21 IP 6 T 80 °C
Statement of Conformity	PTB 10 ATEX 2008 X	2010-08-18	⟨Ex⟩ II 3 G Ex nA II T6; Zone 2; Type 3730-6-810 II 3G Ex nL IIC/IIB T6 II 3D Ex tD A22 IP 66 T 80 °C; Zone 22 dust
IECEx	IECEx PTB 10.0057	2010-12-10	Ex ia IIC/IIB T6 and Ex tD A21 IP66 T 80 °C; Type 3730-6-111 Ex d[ia] IIC/IIB T6 and Ex tD A21 IP66 T 80 °C; Type 3730-6-211
	IECEx PTB 10.0058X	2010-12-10	Ex nA II T6 or Ex nL IIC/IIB T6 or Ex tD A22 IP66 T 80 °C; Type 3730-6-811
GOST approval			1 Ex ia IIC T4...T6 X / DIP A21 T_A80 °C Ex nA II / Ex nL IIC T4...T6 X / DIP A22 T_A80 °C

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 (240 to 700 cm²) over a connection block.

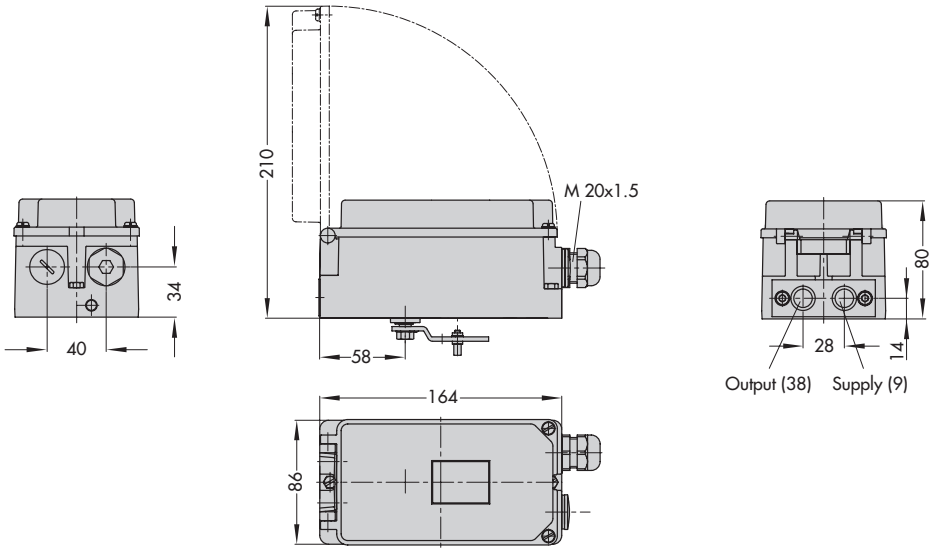
In actuators with fail-safe action "Actuator stem extends", the signal pressure is routed over an internal bore in the actuator yoke to the actuator. In actuators with fail-safe action "Actuator stem retracts", the signal pressure is routed to the actuator over ready-made external piping.

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.

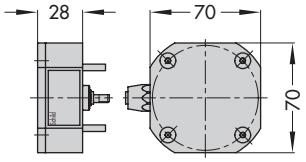
A pair of universal brackets is used for the attachment to Type 3278 Rotary Actuators or other rotary actuators according to VDI/VDE 3845. The rotary motion of the actuator is transferred to the positioner over a coupling wheel with position reading.

Dimensions in mm

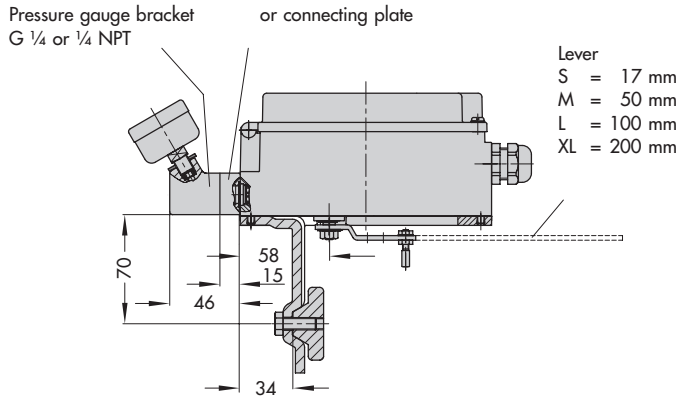
Direct attachment



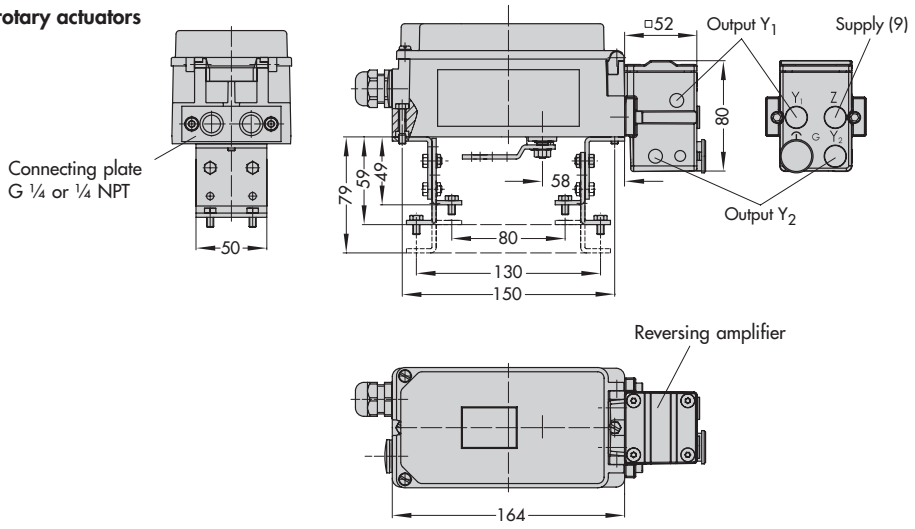
External position sensor



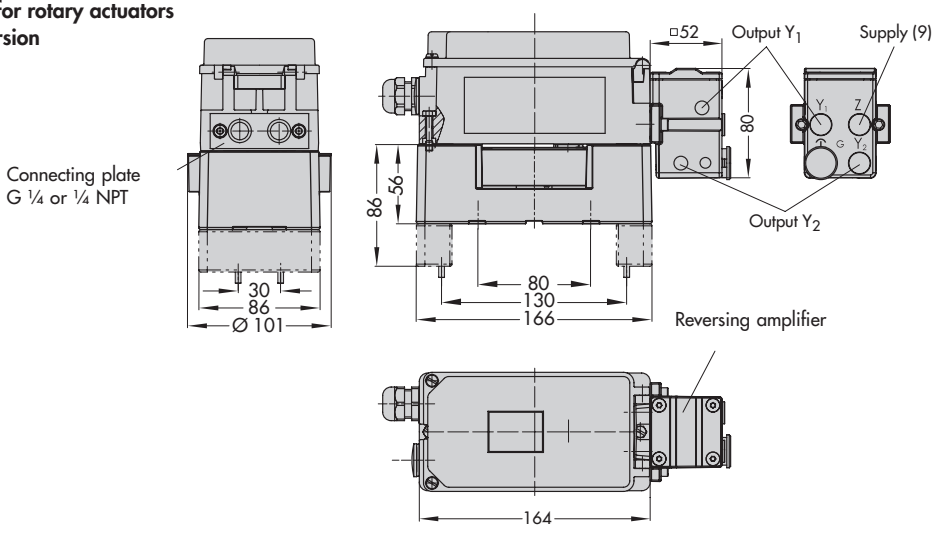
NAMUR attachment



Attachment to rotary actuators
VDI/VDE 3865
Fixing level 2



Mounting unit for rotary actuators
Heavy-duty version



Article code

Positioner	Type 3730-6	x	x	x	x	x	x	x	0	0	x	0	x	0	0
With HART® communication and pressure sensors															
Explosion protection															
⟨Ex⟩ II 2 G Ex ia IIC T6 / II 2 D Ex tD A21 IP66 T80 °C acc. to ATEX		1	1	0											
Ex ia IIC/IIB T6 / Ex tD A21 IP 66 T 80 °C IECEx		1	1	1											
1 Ex ia IIC T4…T6 X / DIP A21 T_A80 °C GOST		1	1	3											
⟨Ex⟩ II 3 G Ex nA II T6 / II 3 G Ex nL IIC T6 / II 3 D Ex tD A22 IP 66 T 80 °C acc. to ATEX		8	1	0											
Ex nA II T6 / Ex nL IIC/IIB T6 / Ex tD A22 IP 66 T 80 °C IECEx		8	1	1											
Ex nA II / Ex nL IIC T4…T6 X / DIP A22 T_A80 °C GOST		8	1	3											
Additional equipment (optional)															
Inductive limit switch															
Without					0										
Type SJ2-SN					1				0						
Venting function															
Without						0									
Solenoid valve, 24 V DC						1									
Forced venting, 24 V DC						2									
Further equipment															
Without							0								
Position transmitter							1								
Leakage sensor							2	0							
Binary input							3								
External position sensor															
Without								0							
Including 10 m connecting cable								1			1				
Prepared for connection, without sensor								2							
Housing material															
Aluminum (standard)											1				
Stainless steel 1.4581											2				
Special application															
None													0		
Device completely free of paint-impairing substances													1		
Exhaust air connection with ¼-18 NPT thread, back of housing sealed													2		
Attachment according to VDI/VDE 3847													6		

Ordering text

Type 3730-6… 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 plate with list of parameters and operating instructions in English/Spanish or English/French (standard version in German/English)
- Attachment to Type 3277 Actuator (240 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 according 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

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