

T 8384-6S EN

TROVIS SAFE 3730-6 Electropneumatic Positioner

with HART® communication and pressure sensors · Series 3730

TROVIS SAFE



Application

Single-acting or double-acting positioner for attachment to pneumatic control valves in safety-instrumented systems. Self-calibrating, automatic adaptation to valve and actuator.

Set point	4 to 20 mA
Valve travel	3.6 to 300 mm
Opening angle	24 to 100°

The discrete analysis of the set point is performed in automatic mode. The positioner moves the valve to the operating point or fail-safe position depending on the adjustable limits. An automated partial stroke test is started when the set point is between the predefined upper and lower test limits.

Special features

- Certified according to IEC 61508/SIL
- Preset parameters for on/off valves in safety-instrumented systems
- Integrated EXPERTplus diagnostics with partial stroke test for valves in safety-instrumented systems ▶ T 8389-1S
- Fault alarm output for alarms generated by the EXPERTplus valve diagnostics
- Pressure sensors to monitor the supply air and signal pressure
- Simple attachment to all common linear and rotary actuators
 - SAMSON direct attachment
 - NAMUR rib
 - Attachment to rod-type yokes acc. to IEC 60534-6-1
 - Attachment according to VDI/VDE 3847
 - Rotary actuator attachment acc. to VDI/VDE 3845
- Any desired mounting position of the positioner (but not suspended)
- 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
- Permanent storage of all parameters in EEPROM (protected against power failure)



Fig. 1: TROVIS SAFE 3730-6



Fig. 2: TROVIS SAFE 3730-6
Mounted on a rotary actuator

- Two-wire system with a small electrical load of 460 Ω
- 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

Versions

- **TROVIS SAFE 3730-6** · SIL-certified positioner for on/off valves, HART® communication, on-site operation, local communication with SSP interface, EXPERTplus diagnostics, pressure sensors to monitor the supply air and signal pressure
- **Type 3730-6** · Electropneumatic positioner for control valves, HART® communication, on-site operation, local communication with SSP interface, EXPERTplus diagnostics, pressure sensors to monitor the supply air and signal pressure ▶ T 8384-6
- **Type 3730-3** · Electropneumatic positioner same as Type 3730-6, without pressure sensors (see Data Sheet ▶ T 8384-3)

Additional options

- Inductive limit contact with proximity switches
- Analog position transmitter with two-wire transmitter
- Electronically activated forced venting
- Solenoid valve with parallel forced venting
- Binary input
- External position sensor (Fig. 3)
- 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 (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 (2), an analog i/p module with a downstream air capacity booster and the electronics with the microcontroller (5).

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 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.

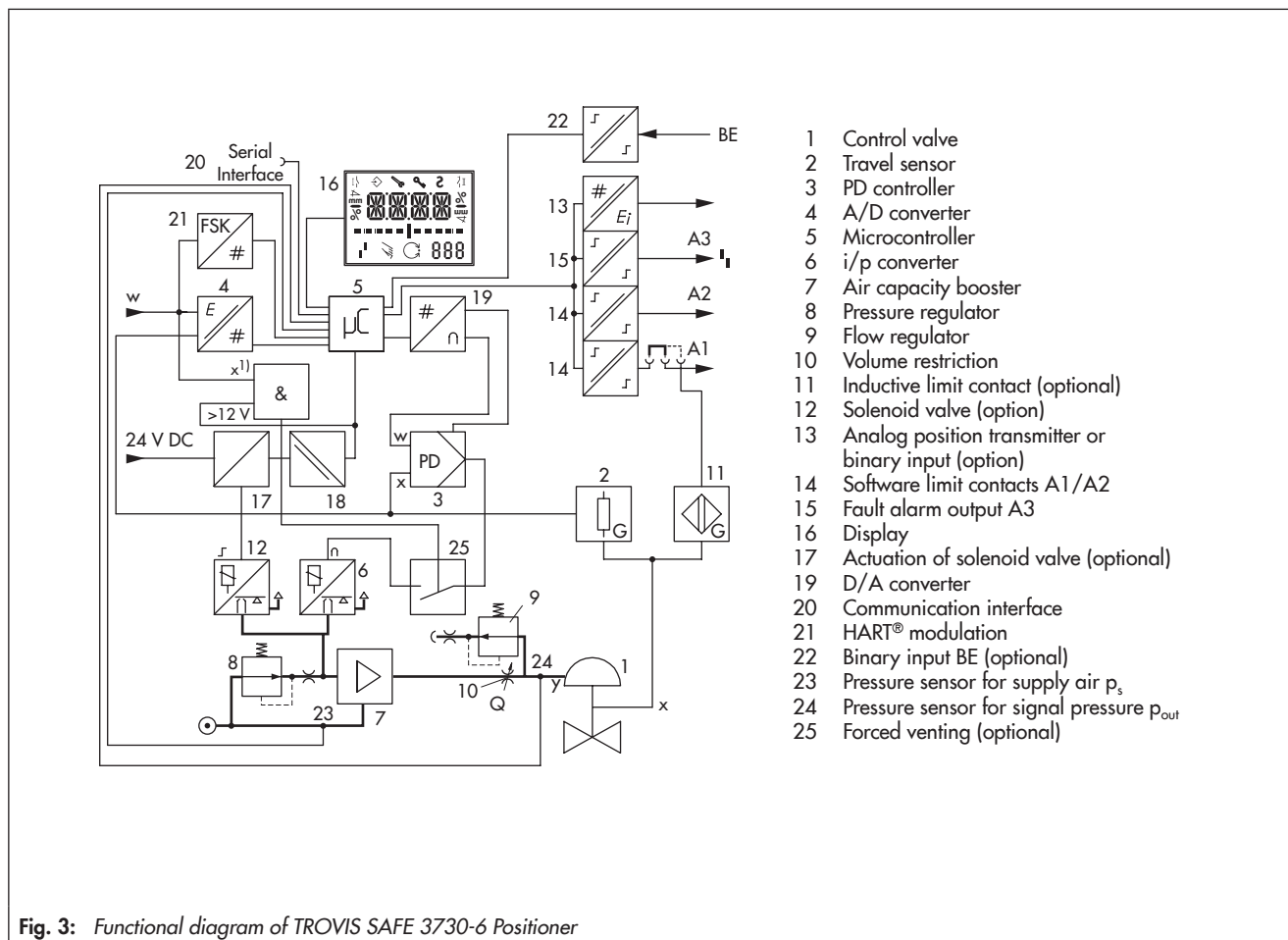



Fig. 3: Functional diagram of TROVIS SAFE 3730-6 Positioner

Table 1: Technical data

TROVIS SAFE 3730-6 Positioner (technical data in test certificate 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.
Set point w	Signal range	4 to 20 mA · Two-wire device, reverse polarity protection · Minimum span 4 mA
	Static destruction limit	30 V
Minimum current		3.6 mA for display · Emergency venting at ≤3.8 mA or ≤4.4 mA depending on version
Load impedance		≤ 9.2 V (corresponding to 460 Ω at 20 mA)
Supply air		1.4 to 7 bar (20 to 105 psi)
	Air quality ISO 8573-1 (edition 2001-02)	Maximum 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 between 1.4 and 7.0 bar by software
Characteristic	Adjustable	Linear/equal percentage/reverse equal percentage User-defined (over operator software) Butterfly valve, rotary plug valve and segmented ball valve: Linear/equal percentage
	Deviation	≤1 %
Hysteresis		≤0.3 %
Sensitivity		≤0.1 %
Transit time		Venting or filling with air adjustable separately up to 240 s by software
Direction of action		Reversible
Air consumption, steady state		Independent of supply air approx. 110 l _n /h
Air output ca- 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 (all versions) -45 to +80 °C with metal cable gland The limits in the type examination certificate additionally apply for explosion-protected versions.
Influences	Temperature	≤0.15 %/10 K
	Supply air	None
	Effect of vibration	≤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 M20 x 1.5 cable gland for 6 to 12 mm clamping range · Second M20 x 1.5 threaded connection additionally exists · Screw terminals for 0.2 to 2.5 mm ² wire cross-sections
Degree of protection		IP 66/NEMA 4X
Certified according to IEC 61508/SIL		Suitable for use in safety-instrumented systems up to SIL 2 (single device/HFT = 0) and SIL 3 (redundant configuration/HFT = 1) according to IEC 61511. <ul style="list-style-type: none"> Triggered by the set point, emergency venting depending on positioner version at ≤3.8 mA or ≤4.4 mA By the optional solenoid valve, emergency venting at 0 V By the optional forced venting, emergency venting at <12 V
Communication (local)		SAMSON SSP interface and serial interface adapter, software requirements (SSP): TROVIS-VIEW with database module 3730-6
Communication (HART®)		HART® field communication protocol Impedance in HART® frequency range: Receiving 350 to 450 Ω · Sending approx. 115 Ω
Software re- quirements (HART®)	For handheld communi- cator	Device description for TROVIS SAFE 3730-6
	For PC	DTM file according to specification 1.2, suitable for integrating the device into frame applications that support the use of FDT/DTM (e.g. PACTware)
Compliance		
Explosion protection		
ATEX, IECEx, ...		See table for explosion protection certificates





Binary contacts		
Two software limit contacts, reverse polarity protection, floating, configurable switching characteristics (default settings in table below)		
Signal state	No response	≤1.0 mA
	Response	≥2.2 mA
One fault alarm contact, floating		
Signal state	No response/no fault	≥2.2 mA
	Response/fault alarm	≤1.0 mA
For connection 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: stainless steel 1.4408	
External parts	Stainless steel 1.4404/316L	
Cable gland	M20 x 1.5, black polyamide	
Weight	Approx. 1.0 kg · Special version in stainless steel: 2.2 kg	

Table 2: Options for TROVIS SAFE 3730-6 Positioner

Electronic forced venting · Approval according to IEC 61508/SIL	
Input	24 V DC · Galvanically isolated and reverse polarity protection · Static destruction limit 40 V Power consumption: $I = \frac{U - 5.7 V}{3.84 k\Omega}$ (corresponding to 4.8 mA at 24 V/114 mW)
Signal '0' (no response)	<12 V (emergency venting at 12 V)
Signal '1' (response)	> 19 V
Solenoid valve · Approval acc. to IEC 61508/SIL	
Input	24 V DC · Reverse polarity protection · Static destruction limit 40 V Power consumption: $I = \frac{U - 5.7 V}{3.84 k\Omega}$ (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 ⁶ switching cycles
Analog position transmitter	
Auxiliary power	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	Can be issued as current signal 2.4 ±0.1 mA or 21.6 ±0.1 mA
Leakage sensor · Suitable for operation in hazardous areas	
Temperature range	-40 to +130 °C
Tightening torque	20 ±5 Nm
Pepperl+Fuchs inductive limit contact	
For connection to switching amplifier acc. to EN 60947-5-6, Can be used in combination with a software limit contact.	
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	-40 to +90 °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	IP 67
Binary input · Galvanic isolation · Switching behavior configured over software	
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, $R < 20 \Omega$ 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
Electric data	3 to 30 V · 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)

Summary of explosion protection certificates for TROVIS SAFE 3730-6 Positioner

TROVIS SAFE	Certificate			Type of protection/comments	
3730-6	-110	 EC Type Examination Certificate	Number Date	PTB 10 ATEX 2007 2020-01-20	II 2 G Ex ia IIC T6 Gb II 2 D Ex ia IIIC T80 °C Db
	-111	IECEX	Number Date	IECEX PTB 10.0057 2020-09-17	Ex ia IIIC T80 °C Db Ex ia IIC T8 Gb
	-112	CCC Ex	Number	2020032230703192	Ex ia IIC T4 ~ T6 Gb, Ex iaD 21 T80 Ex tD A21 IP66 T80 °C
			Date	2020-11-09	
			Valid until	2025-11-08	
	-112	NEPSI	Number	GYJ17.1406X	Ex ia IIC T4~T6 Ga Ex iaD 20 T80
			Date	2017-11-21	
			Valid until	2022-11-20	
	-113	EAC	Number Date Valid until	RU C-DE.AA87.B.01278 2018-11-30 2023-11-29	1Ex ia IIC T6/T5/T4 Gb X; Ex tb III T80 °C Db X, IP66
	-130	FM	Number Date	3012394 2014-11-05	IS / Class I,II,III / Div. 1 / Gr. ABCDEFG AEx ia IIC / Class I / Zone 0 NI / Class I / Div. 2 / Gr. ABCD S / Class II / Div. 2 / Gr. FG Enclosure Type 4X
	-131	CSA	Number Date	2682094 2017-05-24	Ex ia IIC T4/T5/T6; Class I, Zone 0; Class I, Groups A,B,C,and D; Class II Groups E,F and G; Class III; Type 4 Enclosure
	-210	 EC Type Examination Certificate	Number Date	PTB 10 ATEX 2007 2020-01-20	II 2 G Ex d[ia] IIC T6 Gb II 2 D Ex tb IIIC T80 °C Db
	-211	IECEX	Number Date	IECEX PTB 10.0057 2020-09-17	Ex db[ia] IIC T6 Gb Ex tb IIIC T80 °C Db
	-213	EAC	Number Date Valid until	RU C-DE.AA87.B.01278 2018-11-30 2023-11-29	1Ex d[ia Ga] IIC T6/T5/T4 Gb X; Ex tb IIIC T80 °C Db X, IP66
	-510	 EC Type Examination Certificate	Number Date	PTB 10 ATEX 2007 2020-01-20	II 2 D Ex tb IIIC T80 °C Db
	-511	IECEX	Number Date	IECEX PTB 10.0057 2020-09-17	Ex tb IIIC T80°C Db
	-810	 Statement of Conformity	Number Date	PTB 10 ATEX 2008 X 2010-08-18	II 3G Ex nA ic IIC T6 Gc; II 3D Ex tc IIIC T80°C Dc IP66
	-811	IECEX	Number Date	IECEX PTB 10.0058X 2010-12-10	Ex nA IIC T6 Ex nL IIC T6 Ex tD A22 IP66 T80 °C
	-812	NEPSI	Number Date Valid until	GYJ17.1407X 2017-11-21 2022-11-20	Ex ic IIC T4~T6 Gc; Ex nA IIC T4~T6 Gc; Ex tD A22 IP66 T80°C
-813	EAC	Number Date Valid until	RU C-DE.AA87.B.01278 2018-11-30 2023-11-29	Ex nA IIC T6/T5/T4 Gc X; Ex ic IIC T6/T5/T4 Gc X; Ex tc IIIC T80°C Dc X, IP66	

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

Operation

The positioner is operated with a user-friendly rotary pushbutton. The parameters are selected by turning the knob, pushing it activates the required setting. In the menu, all parameters are listed in one level, eliminating the need to search in sub-menus. 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 or USB interface of a PC.

Additionally, all parameters of the TROVIS SAFE 3730-6 Positioner can be accessed using HART® communication.

Mounting the positioner

The TROVIS SAFE 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

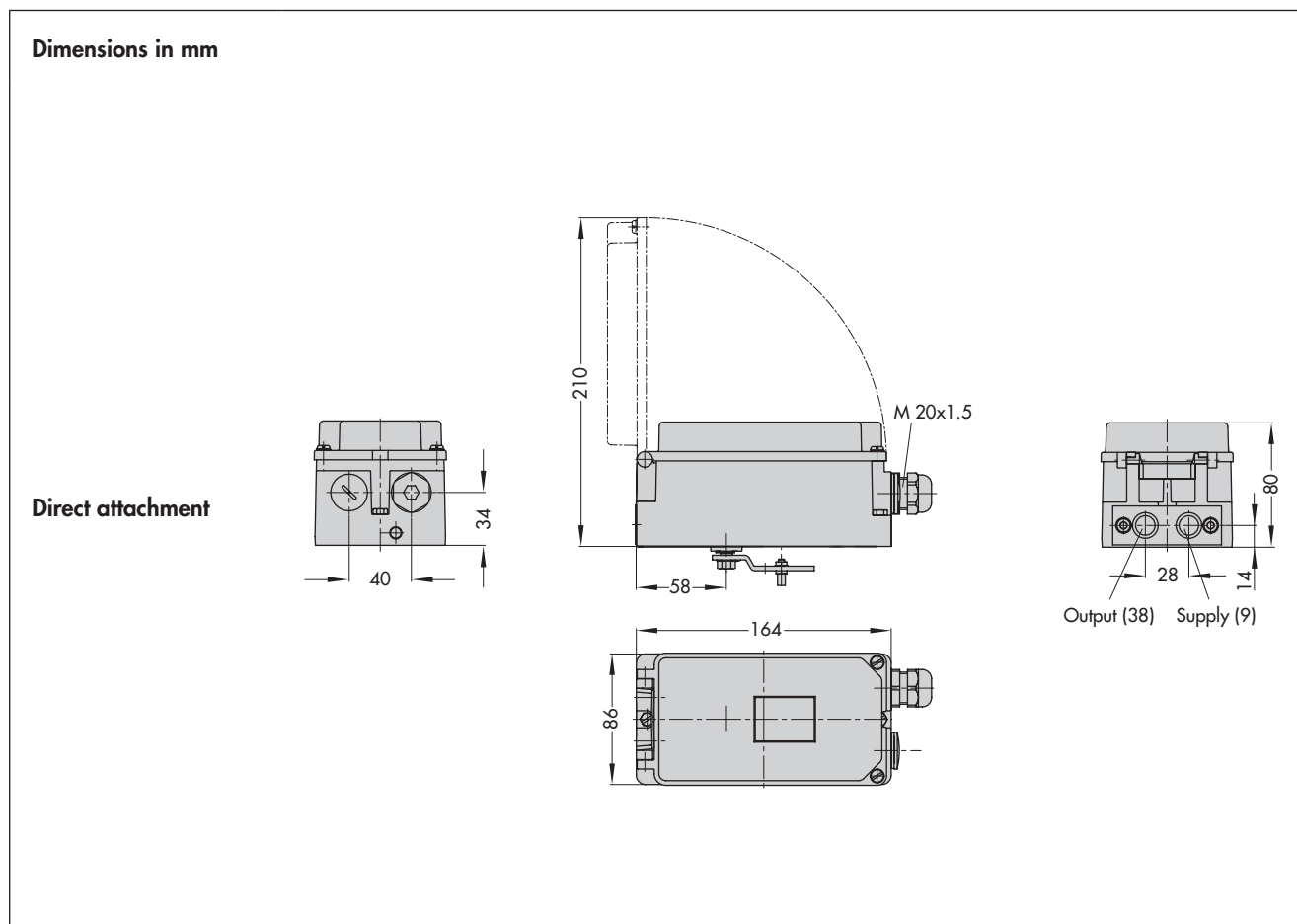
internal hole in the actuator yoke to the actuator. In actuators with "actuator stem retracts" fail-safe action, the signal pressure is routed to the actuator over ready-made external piping.

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.

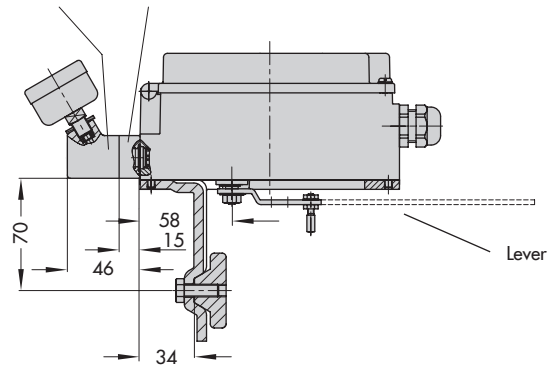
A reversing amplifier is necessary for double-acting, springless actuators for the second opposing signal pressure.



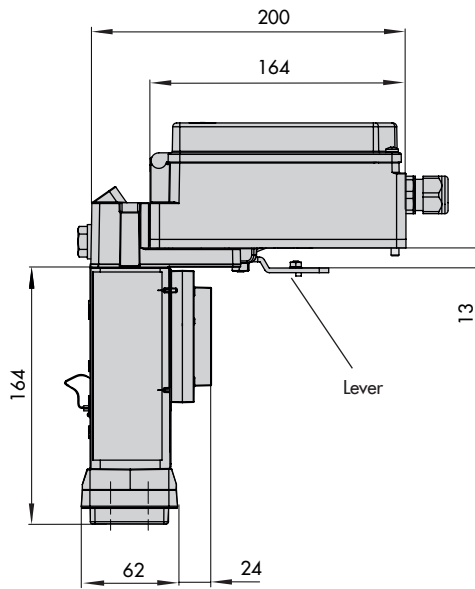
NAMUR attachment

Pressure gauge bracket
G 1/4 or 1/4 NPT

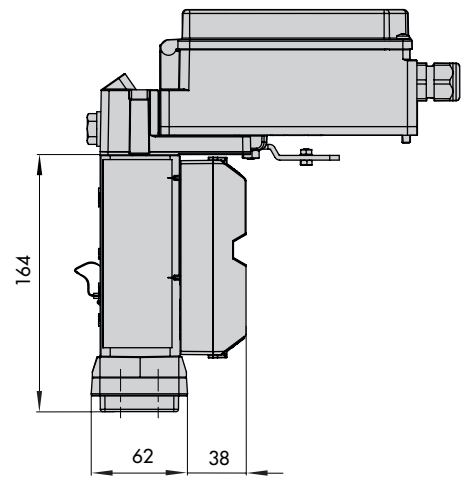
or connecting plate



Attachment according to VDI/VDE 3847

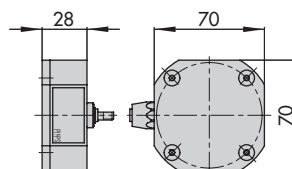


Attachment to SAMSON
Type 3277



Attachment to NAMUR rib

External position sensor



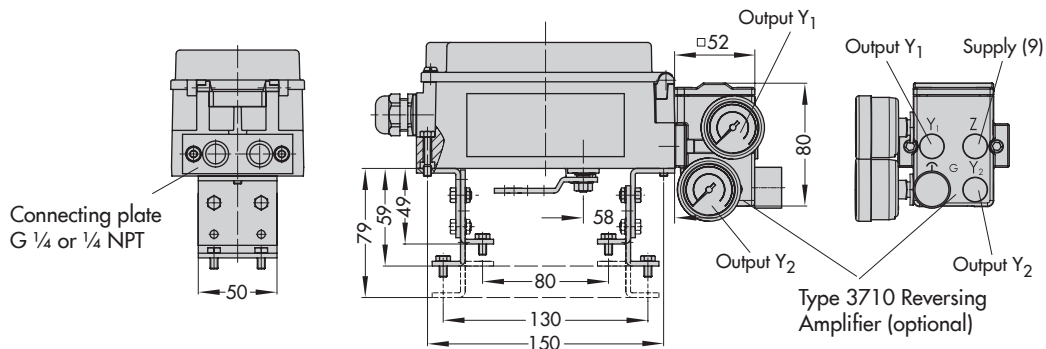
Attachment to rotary actuators

VDI/VDE 3845 (Sept. 2010)

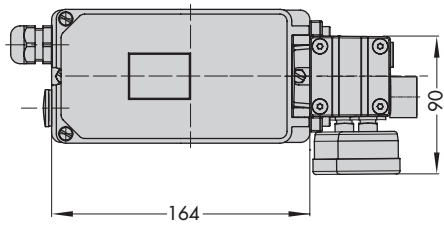
Fixing level 1

Size AA1 to AA4

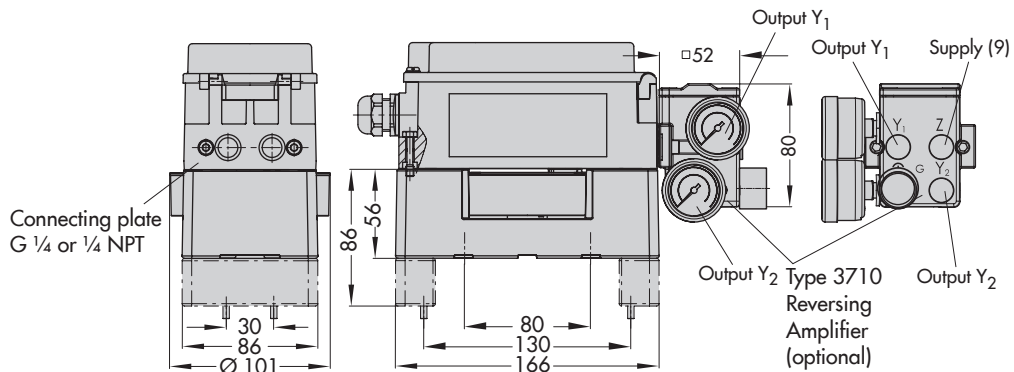
Light version



Mounting unit
CrNiMo steel bracket

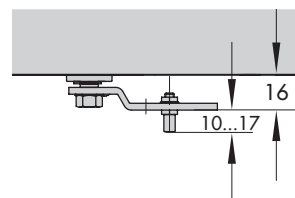
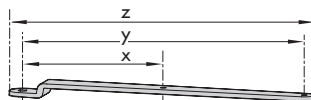


Heavy-duty version



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

TROVIS SAFE 3730-6... 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 (175 to 750 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 at-
tachment
- Attachment to rotary actuators acc. to VDI/VDE 3845,
mounting unit with CrNiMo steel bracket or heavy-duty at-
tachment
- 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	TROVIS SAFE 3730-6	x	x	x	x	x	x	x	0	x	x	0	x	0	0
with HART® communication and pressure sensors															
Explosion protection															
Without		0	0	0											
ATEX II 2 G Ex ia IIC T6 Gb; II 2 D Ex ia IIIC T80 °C Db		1	1	0											
IECEX Ex ia IIIC T80 °C Db; Ex ia IIC T8 Gb		1	1	1											
EAC 1Ex ia IIC T6/T5/T4 Gb X; Ex tb III T80 °C Db X, IP66		1	1	3											
FM IS / Class I,II,III / Div. 1 / Gr. ABCDEFG; AEx ia IIC / Class I / Zone 0 NI / Class I / Div. 2 / Gr. ABCD; S / Class II / Div. 2 / Gr. FG		1	3	0											
CSA Ex ia IIC T4/T5/T6; Class I, Zone 0; Class I, Groups A,B,C,and D; Class II Groups E,F and G; Class III; Type 4 Enclosure		1	3	1											
ATEX II 3G Ex nA ic IIC T6 Gc; II 3D Ex tc IIIC T80°C Dc IP66		8	1	0											
IECEX Ex nA IIC T6; Ex nL IIC T6; Ex tD A22 IP66 T80 °C		8	1	1											
EAC Ex nA IIC T6/T5/T4 Gc X; Ex ic IIC T6/T5/T4 Gc X; Ex tc IIIC T80°C Dc X, IP66		8	1	3											
Option (additional equipment)															
Inductive limit contact															
Without					0										
SJ2-SN (NC contact)					1			0							
Venting function															
Without						0									
Solenoid valve, 24 V DC						1									
Forced venting, 24 V DC						2									
Additional equipment															
Without								0							
Position transmitter								1							
Leakage sensor (including cable and fixing screw)								2	0						
Binary input								3							
External position sensor															
Without									0						
With, including 10 m connecting cable									1			1			
Prepared for connection, without sensor									2						
Function															
TROVIS SAFE (on/off valves)															
										5					
Emergency shutdown															
3.8 mA											0				
4.4 mA											1				
Housing material															
Aluminum (standard)												1			
Stainless steel												2			
Special applications															
Without															0
Version compatible with paint															1
Exhaust air port with ¼-18 NPT thread, back of positioner sealed															2
With additional vent hole and VDI/VDE 3847 adapter, without travel pick-off parts															6
With additional vent hole															7

