

T 8484-3 EN

TROVIS 3730-3 Smart Positioner (HART®)



Application

Single-acting or double-acting positioner for attachment to pneumatic control valves.
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 positioner ensures a predetermined assignment of the valve position to the input signal. 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).

Special features

- High air capacity
- Simple attachment to all common linear and rotary actuators:
 - SAMSON direct attachment
 - NAMUR rib
 - Attachment to rod-type yokes according to IEC 60534-6-1
 - Attachment according to VDI/VDE 3847
 - Rotary actuator attachment according to VDI/VDE 3845
- Non-contact position sensing
- Plain-text display with NAMUR Recommendation NE 107 states and messages on the device
- Integrated diagnostic functions
- Simple one-knob, menu-driven operation
- LCD easy to read in any mounting position thanks to selectable reading direction
- Configurable with a computer over the SSP interface using the TROVIS-VIEW software
- Variable, automatic start-up with four different initialization modes
- Sub (substitution) initialization mode allows the positioner to be started up in case of emergency whilst the plant is running without having to change the valve position.
- All parameters saved in non-volatile EEPROM
- Two-wire system with a small electrical load of 465 Ω
- Adjustable tight-closing function
- Continuous zero monitoring



Fig. 1: TROVIS 3730-3 Electropneumatic Positioner

- Integrated temperature sensor and operating hours counter
- Self-diagnostics, messages as condensed state conforming to NAMUR Recommendation NE 107
- Integrated EXPERTplus diagnostics for control valves (▶ T 8389-3)
- Optional additional functions: position transmitter, inductive limit switches, software limit switches, forced venting function, binary input, binary output ¹⁾

¹⁾ Only in combination with limit switches

Design and principle of operation

The TROVIS 3730-3 Electropneumatic Positioner is mounted on pneumatic control valves and 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 opening angle of the control valve and issues a signal pressure for the pneumatic actuator.

The positioner mainly consists of a non-contact travel sensor system (2), pneumatics and the electronics with the microcontroller (4). The valve position is transmitted either as an angle of rotation or linear travel to the pick-up lever, from there to the travel sensor (2) and forwarded to the microcontroller (4). The PID algorithm in the microcontroller compares the valve position measured by the travel sensor (2) to the 4 to 20 mA DC control signal issued by the control system after it has been converted by the A/D converter (3).

In case of a set point deviation, the activation of the i/p module (7) is changed so that the actuator of the control valve (1) is pressurized or vented accordingly over the downstream booster (6). As a result, the closure member of the valve (e.g. plug) is moved to the position determined by the set point.

The positioner is operated by a rotary pushbutton (10) for menu navigation on the plain-text display (11).

The extended EXPERTplus diagnostics are integrated into the positioner. They provide information on the control valve and positioner and generate diagnostic and status messages, which allow faults to be pinpointed quickly.

Version

- **TROVIS 3730-3** · Electropneumatic positioner for control valves, HART® communication, on-site operation, local communication with SSP interface, EXPERTplus diagnostics

Optional modules

The optional additional functions of the TROVIS 3730-3 Positioner allows it to be adapted to specific requirements. The following additional functions are available:

- Position transmitter
- Inductive limit switches
- Software limit switches
- Forced venting
- Binary input
- Binary output (only in combination with limit switches)

If the positioner is ordered with additional functions, they are ready installed and connected upon delivery.

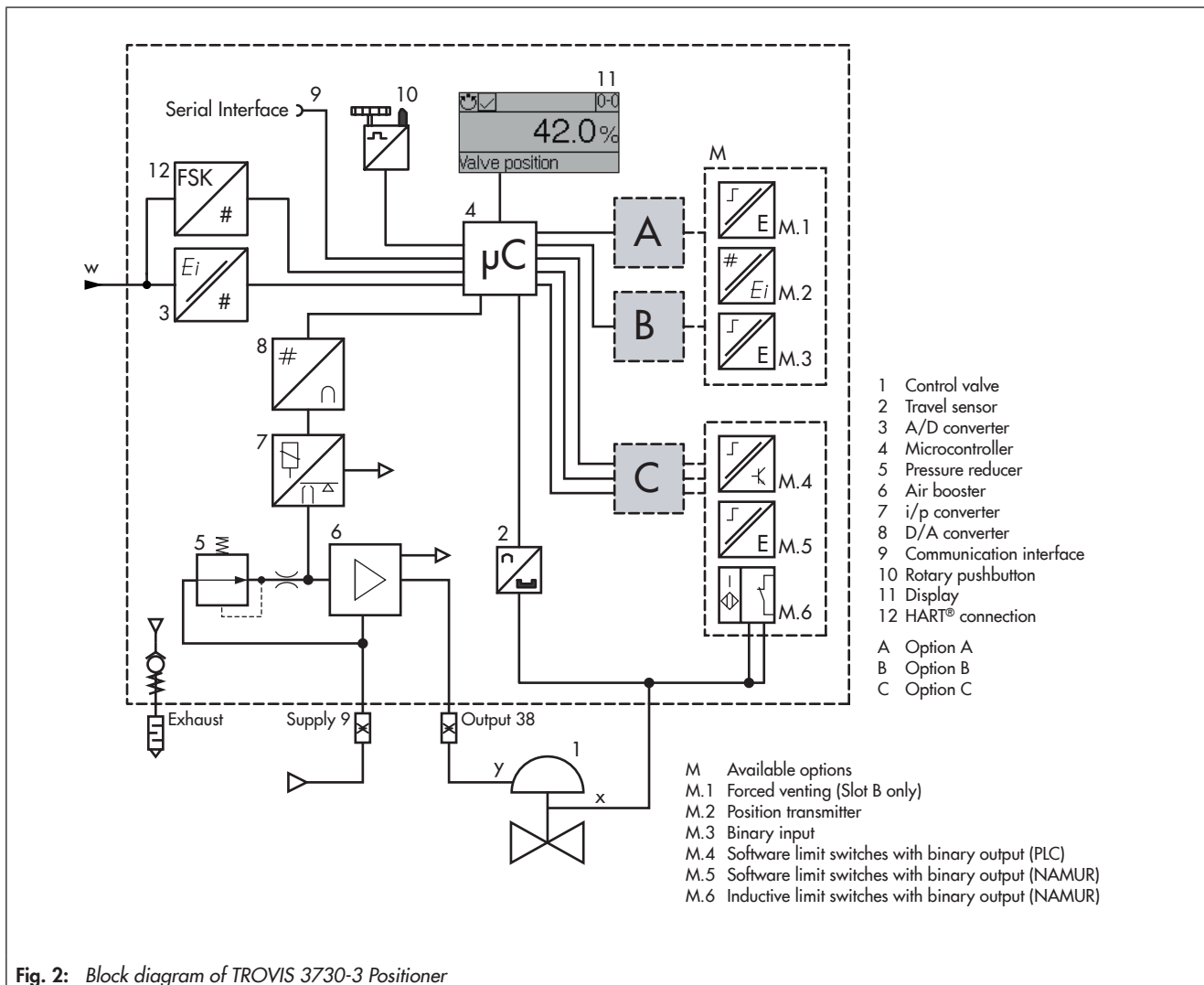






Fig. 2: Block diagram of TROVIS 3730-3 Positioner

Technical data · TROVIS 3730-3 Positioner

Travel	
Adjustable travel for	Direct attachment to Type 3277: 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: 24 to 100°
Travel range	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	40 V, internal current limit approx. 40 mA
Minimum current	3.75 mA for display/operation (HART® communication and configuration) 3.90 mA for pneumatic function
Load impedance	≤ 9.3 V (corresponds to 465 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 below the lowest ambient temperature to be expected
Hysteresis	≤ 0.3 %
Sensitivity	≤ 0.1 %
Characteristic	Linear/Equal percentage/Reverse equal percentage/SAMSON butterfly valve
Transit time	Exhaust and supply adjustable separately up to 240 s by software
Direction of action	Reversible
Air consumption, steady state	Independent of supply air, approx. 65 l _n /h
Air output capacity (when Δp = 6 bar)	
Actuator (supply)	8.5 m _n ³ /h · At Δp = 1.4 bar: 3.0 m _n ³ /h · K _{Vmax(20 °C)} = 0.09
Actuator (exhaust)	14.0 m _n ³ /h · At Δp = 1.4 bar: 4.5 m _n ³ /h · K _{Vmax(20 °C)} = 0.15
Environmental conditions and permissible temperatures	
Permissible environmental conditions according to EN 60721-3	
Storage	1K6 (relative humidity ≤ 95 %)
Transport	2K4
Operation	-20 to +85 °C: All versions -40 to +85 °C: With metal cable glands -55 to +85 °C: Low-temperature version with metal cable glands Observe the limits in the test certificate for explosion-protected versions.
Resistance to vibration	
Vibrations (sinusoidal)	According to DIN EN 60068-2-6: 0.15 mm, 10 to 60 Hz; 20 m/s ² , 60 to 500 Hz per axis 0.75 mm, 10 to 60 Hz; 100 m/s ² , 60 to 500 Hz per axis
Bumps (half sine)	According to DIN EN 60068-2-29: 150 m/s ² , 6 ms; 4000 bumps per axis
Noise	According to DIN EN 60068-2-64: 10 to 200 Hz: 1 (m/s ²) ² /Hz 200 to 500 Hz: 0.3 (m/s ²) ² /Hz 4 h/axis
Recommended continuous duty	≤ 20 m/s ²
Influences	
Temperature	≤ 0.15 %/10 K
Supply air	None
Requirements	
EMC	Complying with EN 61000-6-2, EN 61000-6-3, EN 61326-1 and NAMUR Recommendation NE 21
Degree of protection	IP 66/NEMA 4X
Electrical connections	
Cable glands	One M20x1.5 cable gland for 6 to 12 mm clamping range Second M20x1.5 threaded connection additionally available
Terminals	Screw terminals for 0.2 to 2.5 mm ² wire cross-section

Explosion protection	
ATEX, IECEx	Refer to Table 1
Materials	
Housing and cover	Die-cast aluminum EN AC-ALSi12(Fe) (EN AC-44300) acc. to DIN EN 1706, chromate and powder coating · Special version: stainless steel 1.4408
Window	Makrolon® 2807
Cable glands	Polyamide, nickel-plated brass, stainless steel 1.4305
Other external parts	Stainless steel: 1.4571 and 1.4301
Communication	
	TROVIS VIEW with SSP/HART® Revision 7
Weight	
	Aluminum housing: approx. 1.0 kg · Stainless steel housing: approx. 2.2 kg

Table 1: Summary of explosion protection approvals

	Certification			Type of protection/comments	
	Symbol	EU type examination certificate	Number Date		
TROVIS 3730-3-	-110	 EU type examination certificate	Number Date	BVS 18 ATEX E 044 X 2018-06-07	II 2G Ex ia IIC T6 Gb/ II 2D Ex ia IIIC T85 °C Db IP66
	-510	 EU type examination certificate	Number Date	BVS 18 ATEX E 044 X 2018-06-07	II 2D Ex tb IIIC T85 °C Db
	-810	 EU type examination certificate	Number Date	BVS 18 ATEX E 044 X 2018-06-07	II 3G Ex nA IIC T6 Gc/ II 3D Ex tb IIIC T85 °C Gb
	-850	 EU type examination certificate	Number Date	BVS 18 ATEX E 044 X 2018-06-07	II 3G Ex nA IIC T6 Gc
	-111	IECEx	Number Date	IECEx BVS 18.0035X 2018-07-27	Ex ia IIC T4/T6 Gb/ Ex ia IIIC T85 °C Db
	-511	IECEx	Number Date	IECEx BVS 18.0035X 2018-07-27	Ex tb IIIC T85 °C Db
	-811	IECEx	Number Date	IECEx BVS 18.0035X 2018-07-27	Ex tb IIIC T85 °C Db/ Ex nA IIC T4/T6 Gc
	-851	IECEx	Number Date	IECEx BVS 18.0035X 2018-07-27	Ex nA IIC T6 Gc
	-112	CCC Ex	Number Date Valid until	2020322307001518 2020-09-18 2025-09-17	Ex ia IIC T4/T6 Gb Ex iaD 21 T85
	-512	CCC Ex	Number Date Valid until	2020322307001518 2020-09-18 2025-09-17	Ex tD A21 IP66 T85°C
	-111	CCoE	Number Date Valid until	A/P/HQ/MH/104/6351 2019-12-18 2023-12-31	Ex ia IIC T4/T6 Gb Ex ia IIIC T85°C Db
	-113	EAC	Number Date Valid until	RU C-DE. HA65.B.00700/20 2020-08-19 2025-08-18	1Ex ia IIC T6...T4 Gb X Ex ia IIIC T85 °C Db X
	-115	INMETRO	No. Date Valid until	IEx 20.0090X 2021-01-11 2024-01-11	Ex ia IIC T4/T6 Gb Ex ia IIC T85°C Db
	-515	INMETRO	No. Date Valid until	IEx 20.0090X 2021-01-11 2024-01-11	Ex tb IIIC T85°C Db
	-855	INMETRO	No. Date Valid until	IEx 20.0090X 2021-01-11 2024-01-11	Ex nA IIC T4/T6 Gc

		Certification		Type of protection/comments
TROVIS 3730-3-	-114	KCS Korea	Number 21-KA4BO-0920 Date 2021-12-06 Valid until 2022-12-06	Ex ia IIC T6/T4
	-116	TR CMU 1055	Number ZETC/35/2021 Date 2021-07-26 Valid until 2024-07-25	II 2G Ex ia IIC T4/T6 Gb II 2D Ex ia IIIC T85 °C Db
	-516	TR CMU 1055	Number ZETC/35/2021 Date 2021-07-26 Valid until 2024-07-25	II 2D Ex tb IIIC T85 °C Db
	-816	TR CMU 1055	Number ZETC/35/2021 Date 2021-07-26 Valid until 2024-07-25	II 3G Ex nA IIC T4/T6 Gc II 2D Ex tb IIIC T85 °C Db
	-856	TR CMU 1055	Number ZETC/35/2021 Date 2021-07-26 Valid until 2024-07-25	II 3G Ex nA IIC T4/T6 Gc

Mounting the positioner

The positioner can be attached directly to the Type 3277 Actuator (240 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.

Operation

The positioner is operated using one proven, user-friendly rotary pushbutton: the various menu levels, parameters and values are selected by turning the button. By pressing the button, the required setting is activated. All parameters can be checked and changed on site.

All values are displayed on the plain-text display. The reading direction of the display can be rotated by 180°.

The initialization key activates initialization which is started according to the ready adjusted parameters (autotune). After initialization is completed, the positioner immediately starts closed-loop operation.

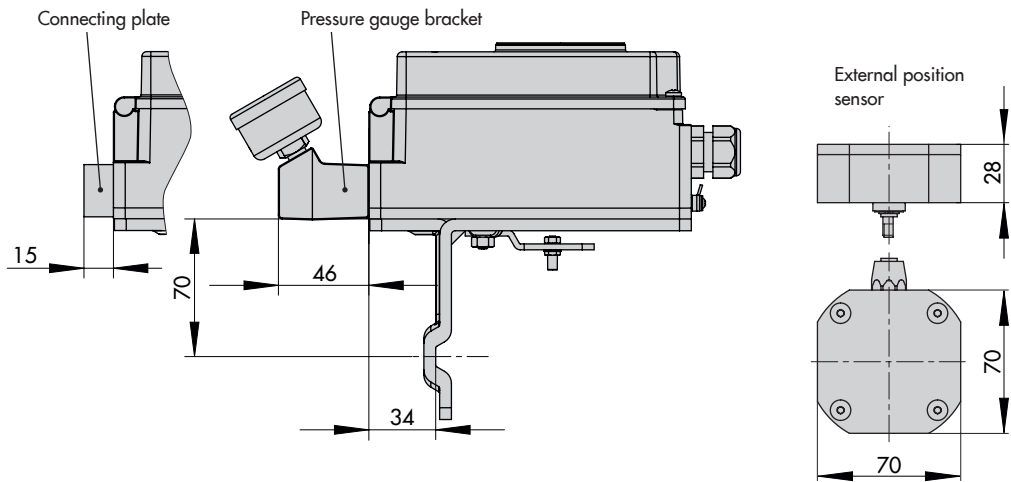
To configure the positioner with SAMSON's TROVIS-VIEW software, the positioner is equipped with an additional digital interface to be connected to the USB interface of a computer using an adapter.

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

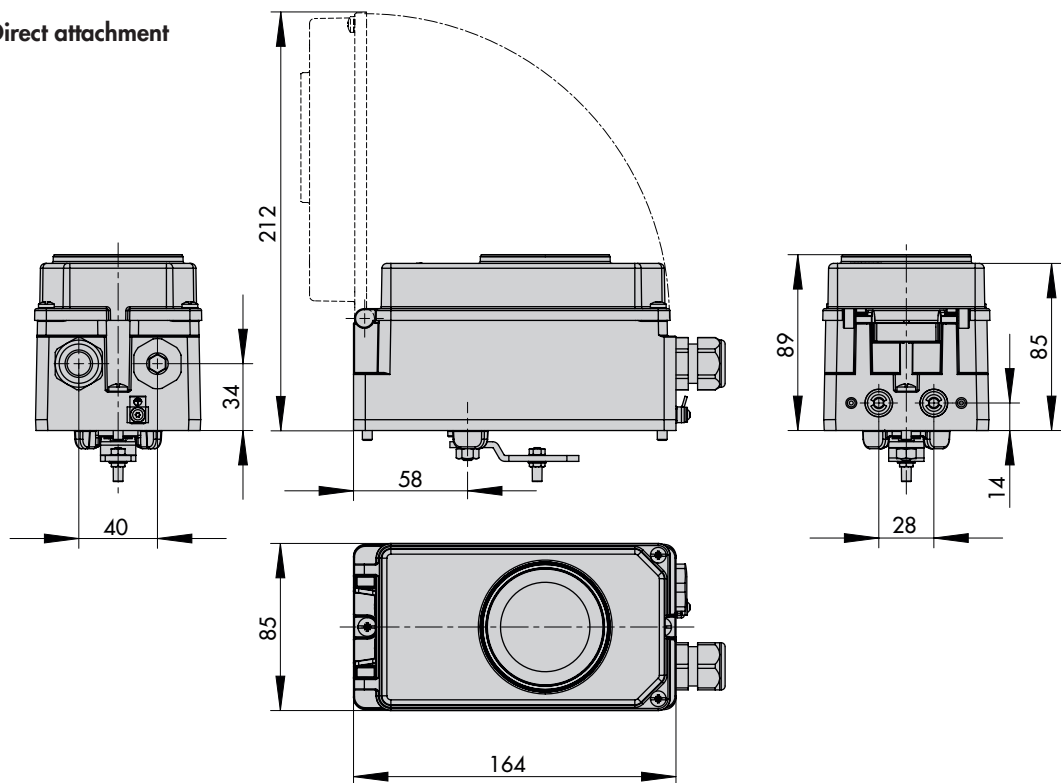
Technical data · Optional additional functions

Position transmitter		
Version	Two-wire system, galvanic isolation, reverse polarity protection, reversible direction of action	
Power supply	10 to 30 V DC	
Output signal	4 to 20 mA	
Error indication	2.4 or 21.6 mA	
No-load current	1.4 mA	
Static destruction limit	38 V DC · 30 V AC	
Software limit switches		
	NAMUR	PLC
Version	Galvanic isolation, reverse polarity protection, switching output acc. to EN 60947-5-6	Galvanic isolation, reverse polarity protection, binary input of a PLC acc. to EN 61131-2, $P_{\max} = 400 \text{ mW}$
Signal state	$\leq 1.0 \text{ mA}$ (non-conducting)	$R = 10 \text{ k}\Omega$ (non-conducting)
	$\geq 2.2 \text{ mA}$ (conducting)	$R = 348 \Omega$ (conducting)
Static destruction limit	32 V DC/24 V AC	16 V DC/50 mA
Binary output		
	NAMUR	PLC
Version	Galvanic isolation, reverse polarity protection, switching output acc. to EN 60947-5-6	Galvanic isolation, reverse polarity protection, binary input of a PLC acc. to EN 61131-2, $P_{\max} = 400 \text{ mW}$
Signal state	$\leq 1.0 \text{ mA}$ (non-conducting)	$R = 10 \text{ k}\Omega$ (non-conducting)
	$\geq 2.2 \text{ mA}$ (conducting)	$R = 348 \Omega$ (conducting)
Static destruction limit	32 V DC/24 V AC	32 V DC/50 mA
Inductive limit switches		
Version	For connection to switching amplifier according to EN 60947-5-6, SJ2-SN proximity switches, reverse polarity protection	
Measuring plate not detected	$\geq 3 \text{ mA}$	
Measuring plate detected	$\leq 1 \text{ mA}$	
Static destruction limit	20 V DC	
Permissible ambient temperature	-50 to +85 °C	
Binary input (switching behavior configured in TROVIS-VIEW software)		
Active switching behavior (default setting)		
Connection	For external switch (floating contact) or relay contact	
Open-circuit voltage	Max. 10 V (when contact is open)	
Current draw	Max. 100 mA (pulsed when contact is closed)	
Contact	Closed: $R < 20 \Omega$; open: $R > 400 \Omega$	
Passive switching behavior		
Connection	For externally applied DC voltage, reverse polarity protection	
Voltage input	0 to 30 V	
Static destruction limit	40 V DC	
Current draw	3.7 V at 24 mA	
Switching voltage	Closed: $< 1 \text{ V}$; open: $> 6 \text{ V}$	
Forced venting		
Version	Galvanic isolation, reverse polarity protection	
Voltage input	0 to 24 V DC	
Input resistance	$\geq 7 \text{ k}\Omega$	
Signal state	Active	$U_e < 11 \text{ V}$
	Not active	$U_e > 15 \text{ V}$
Static destruction limit	38 V DC/30 V AC	

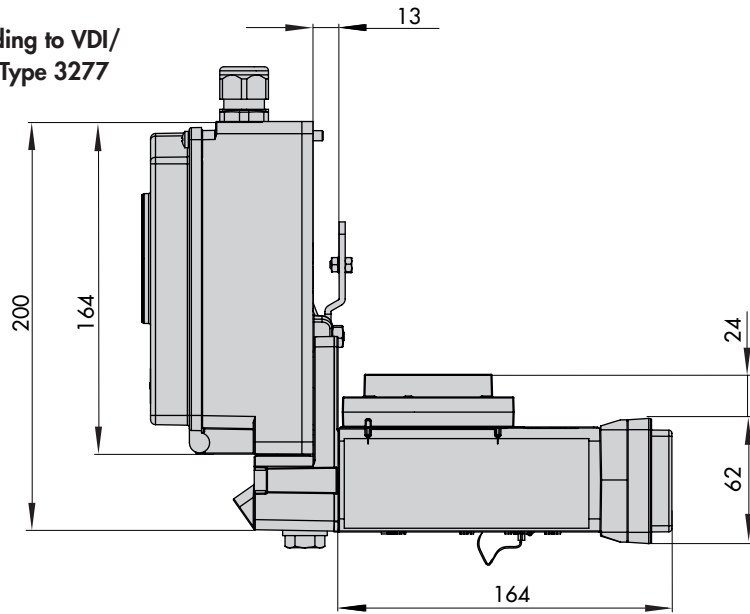
Attachment according to IEC 60534-6



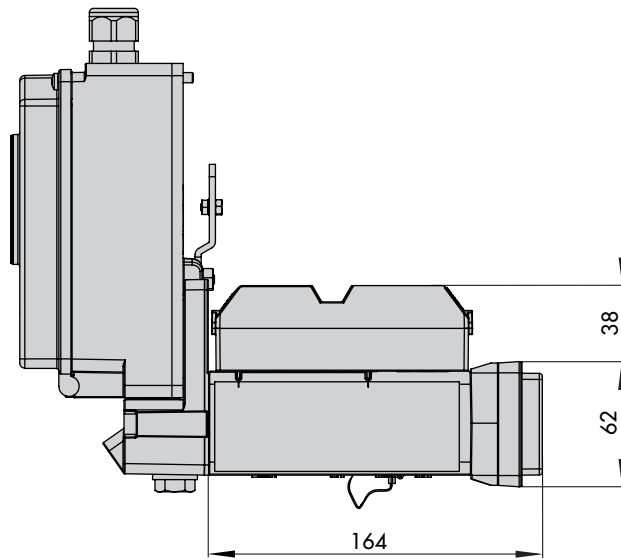
Direct attachment



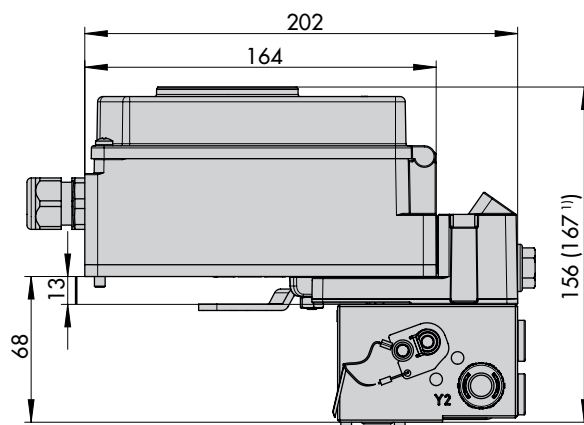
**Attachment according to VDI/
VDE 3847-1 onto Type 3277
Actuator**



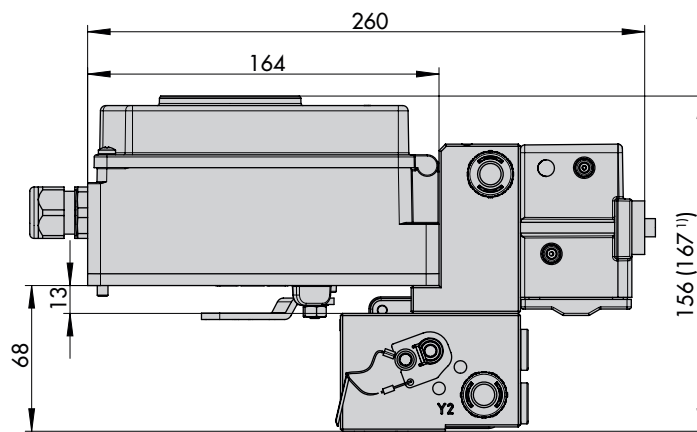
**Attachment according to VDI/
VDE 3847-1 to a NAMUR rib**



**Attachment according to VDI/VDE 3847-2
with single-acting actuator**

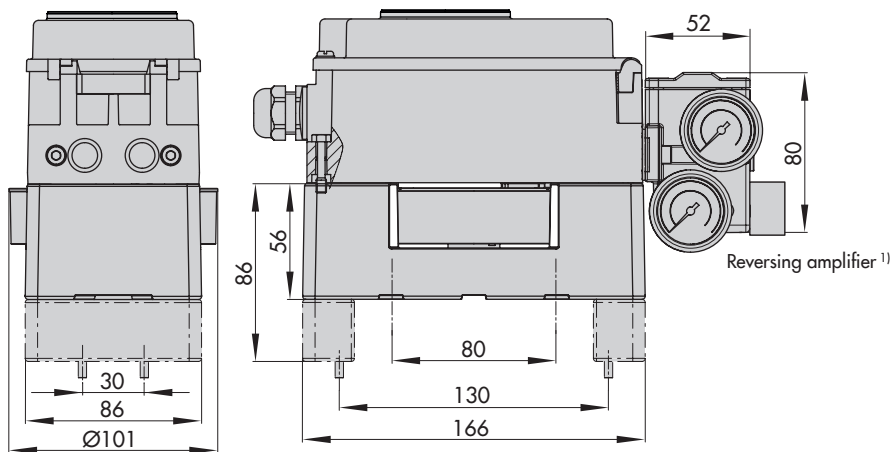


**Attachment according to VDI/VDE 3847-2
with double-acting actuator**

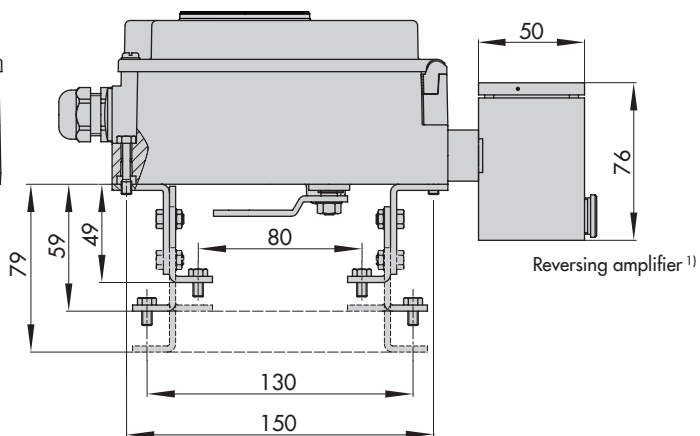


Attachment to rotary actuators according to VDI/VDE 3845

Heavy-duty version

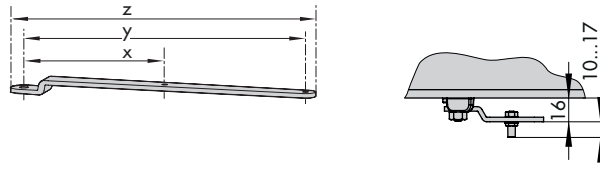


Light version



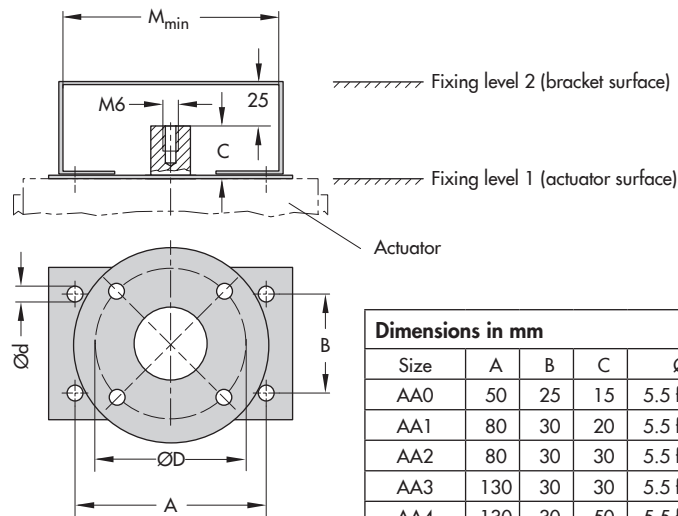
- ¹⁾ Reversing amplifier
 – Type 3710 (see drawing of heavy-duty version for dimensions)
 – 1079-1118/1079-1119, no longer available (see drawing of light version for dimensions)

Lever



Lever	x	y	z
M	25 mm	50 mm	66 mm
L	70 mm	100 mm	116 mm
XL	100 mm	200 mm	216 mm
XXL	200 mm	300 mm	316 mm

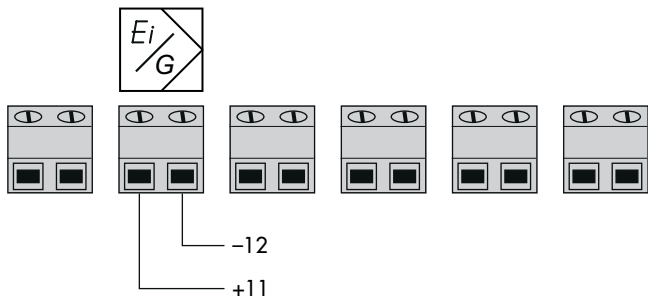
Fixing levels according to VDI/VDE 3845 (September 2010)



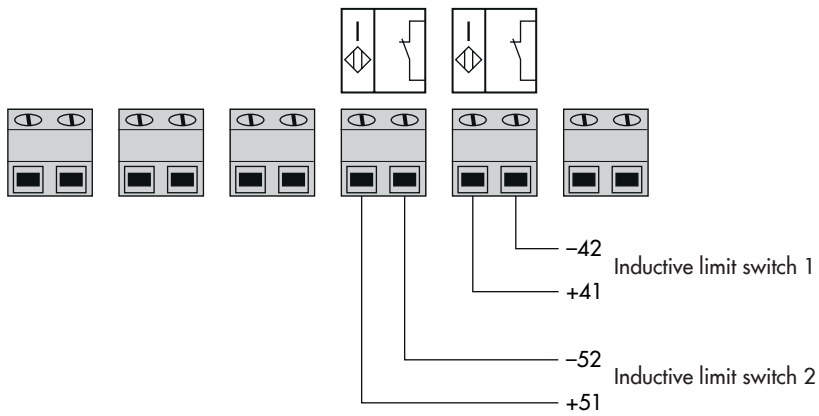
Dimensions in mm							
Size	A	B	C	Ød	M _{min}	D ¹⁾	
AA0	50	25	15	5.5 for M5	66	50	
AA1	80	30	20	5.5 for M5	96	50	
AA2	80	30	30	5.5 for M5	96	50	
AA3	130	30	30	5.5 for M5	146	50	
AA4	130	30	50	5.5 for M5	146	50	
AA5	200	50	80	6.5 for M6	220	50	

¹⁾ Flange type F05 acc. to DIN EN ISO 5211

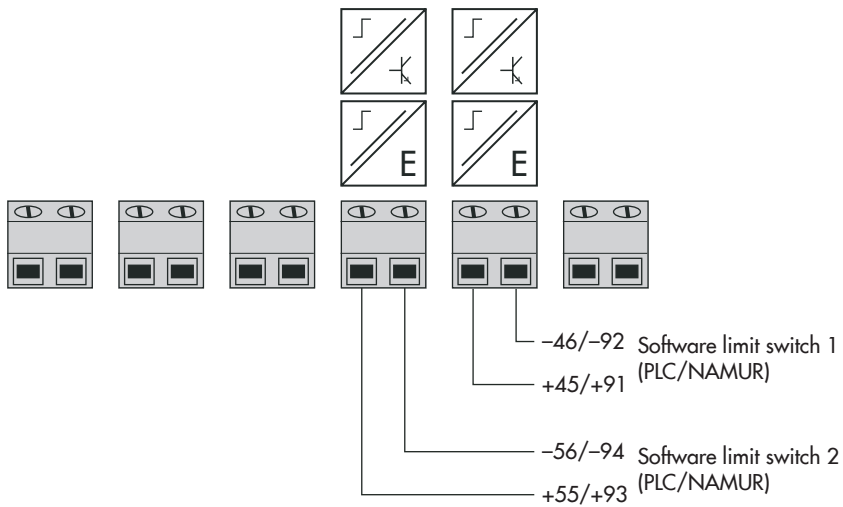
Electrical connection



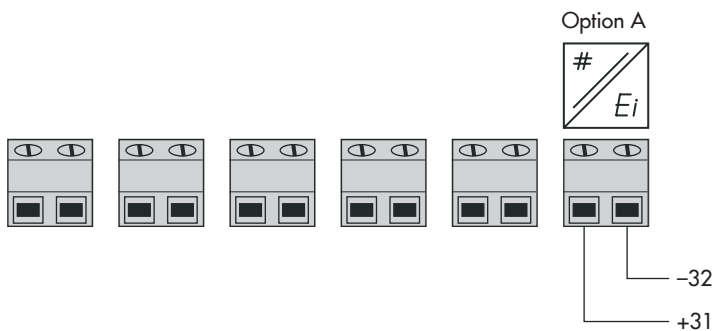
Connecting the mA control signal



Terminal assignment of inductive limit switches

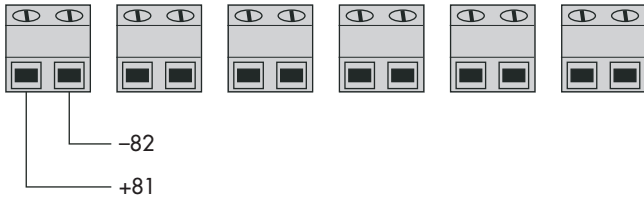


Terminal assignment of software limit switches



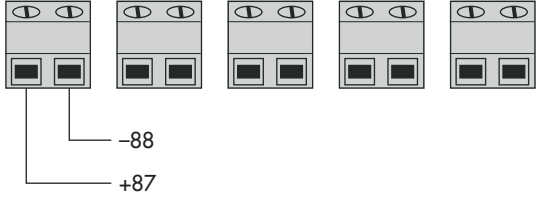
Terminal assignment of position transmitter

Option B

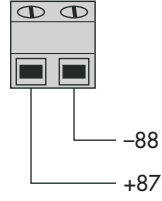


Terminal assignment of forced venting

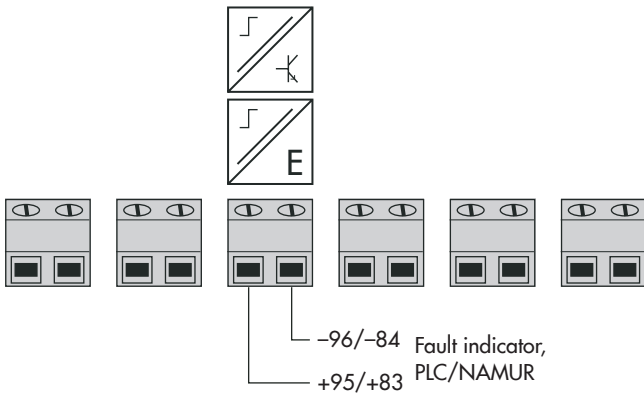
Option B



Option A



Terminal assignment of binary input



Terminal assignment of binary output (fault alarm output)

Article code

Positioner	TROVIS 3730-3-	x	x	x	0	x	x	x	x	x	0	x	x	0	x	x	x	x	1	0	x	x	x	x	x
With LCD, autotune, HART® communication																									
Explosion protection																									
Without		0	0	0																					
ATEX	II 2G Ex ia IIC T6 Gb/ II 2D Ex ia IIIC T85 °C Db IP66	1	1	0																					
	Ex db [ia] (with field barrier)	3	9	0																					
	II 2D Ex tb IIIC T85 °C Db	5	1	0																					
ATEX	II 3G Ex nA IIC T6 Gc/ II 3D Ex tb IIIC T85 °C Gb	8	1	0																					
	II 3G Ex nA IIC T6 Gc	8	5	0																					
	Ex ia IIC T4/T6 Gb/ Ex ia IIIC T85 °C Db	1	1	1																					
IECEX	Ex tb IIIC T85 °C Db	5	1	1																					
	Ex tb IIIC T85 °C Db/ Ex nA IIC T4/T6 Gc	8	1	1																					
	Ex nA IIC T6 Gc	8	5	1																					
CCC Ex	Ex ia IIC T4/T6 Gb Ex iaD 21 T85	1	1	2																					
	Ex tD A21 IP66 T85°C	5	1	2																					
CCoE	Ex ia IIC T4/T6 Gb Ex ia IIIC T85°C Db	1	1	1																					
	1 Ex ia IIC T6...T4 Gb X Ex ia IIIC T85 °C Db X	1	1	3																					
INMETRO	Ex ia IIC T4/T6 Gb Ex ia IIC T85°C Db	1	1	5																					
	Ex tb IIIC T85°C Db	5	1	5																					
	Ex nA IIC T4/T6 Gc	8	5	5																					
KCS Korea	Ex ia IIC T6/T4	1	1	4																					
TR CMU 1055	II 2G Ex ia IIC T4/T6 Gb II 2D Ex ia IIIC T85 °C Db	1	1	6																					
	II 2D Ex tb IIIC T85 °C Db	5	1	6																					
	II 3G Ex nA IIC T4/T6 Gc II 2D Ex tb IIIC T85 °C Db	8	1	6																					
	II 3G Ex nA IIC T4/T6 Gc	8	5	6																					
Option A																									
Without					0																				
Position transmitter 4 to 20 mA					1																				
Binary input 24 V DC					2																				
Option B																									
Without					0																				
Binary input 24 V DC					2																				
Forced venting					3																				
Option C																									
Without									0																
2x Software limit switches + binary output (PLC)		0	0	0					1																
2x Software limit switches + binary output (NAMUR) ¹⁾		x	x	x					2																
2x Inductive limit switches + Binary output (NAMUR); -50 to +85 °C									4																
Option D																									
Without																				0					
External travel sensor with M12x1 connector; with 10 m connecting cable																				1					
Prepared for external travel sensor with M12x1 connector																				2					

