

Series 3730 Type 3730-3 Electropneumatic Positioner



with HART® communication



Fig. 1 · Type 3730-3

HART 
COMMUNICATION PROTOCOL

Mounting and Operating Instructions

EB 8384-3 EN (1300-1612)

Firmware version 1.56

Edition February 2015



Ex
certified



Definitions of the signal words used in these instructions

DANGER!

indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

indicates a hazardous situation which, if not avoided, could result in death or serious injury.

NOTICE

indicates a property damage message.

Note: *Supplementary explanations, information and tips*

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Modifications of positioner firmware in comparison to previous versions	
Previous	New
1.00	1.10
	The HART protocol as per HART® specification Revision 5 is supported by default setting. The setting can be changed to HART® Revision 6 over TROVIS-VIEW. HART® tools as well as AMS or handheld communicators are currently not supported by the Revision 6 version.
	The following additional status messages were implemented: Code 76 - No emergency mode Code 77 - Program loading error Displays number of zero calibrations performed since the last initialization.
	For initialization of "AIR TO CLOSE" actuators, the direction of action (Code 7) is automatically set to increasing/decreasing.
	Code 3 , the activation period of the enabled configuration function was extended to 120 s.
1.10	1.20
	Electronics changed, no new functions added.
1.20	1.30
	New EXPERTplus diagnostics functions (Code 48) added Positioner in EXPERTplus version with extended diagnostics features.
	A running initialization can be canceled by pressing the rotary pushbutton.
	The position transmitter (Code 37) and solenoid valve (Code 45) options are automatically recognized.
1.30	1.40
	All EXPERTplus functions can be used over HART® communication in this firmware version and higher.
	The fault alarm contact is triggered by the condensed state of the positioner. It is always active when condensed state = "Maintenance alarm". If Code 32 is set to Yes: Also active with "Function check" condensed state If Code 33 is set to Yes: Also active with "Maintenance required/Maintenance demanded" condensed state
	The "Function check" condensed state is additionally set for Test A1, A2, fault alarm output and position transmitter.
	The min./max. values of the temperature monitoring can be reset.

Modifications of positioner firmware in comparison to previous versions	
Previous	New
1.40	1.41
	Internal modifications
1.41	1.42
	Internal modifications
1.42	1.51
	Setting can be performed at the positioner to determine whether the valve is to operate as a control valve or an on/off valve (see section 3.1)
	All EXPERTplus diagnostic functions are available in the positioner without having to activate them first (refer to EB 8389 EN on EXPERTplus valve diagnostics)
	Optional binary input with following actions: <ul style="list-style-type: none"> – Transfer switching state – Set local operation write protection – Switch between AUTO/MAN – Various diagnostic functions (refer to EB 8389 EN on EXPERTplus valve diagnostics).
	The pressure limit (Code 16) is no longer automatically set during initialization.
1.51	1.54
	Internal modifications
1.54	1.55
	Analog input x option to connect commercially available position sensors with a 4 to 20 mA signal (see section 3.1)
	Code 4: The setting for 300 mm has been added to the pin position
1.55	1.56
	Internal modifications

Note:

- The functions of **EXPERTplus** valve diagnostics are described in the *Mounting and Operating Instructions EB 8389 EN* (included on CD-ROM or available on our website).

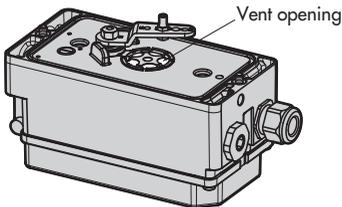
1 Important safety instructions

For your own safety, follow these instructions concerning the mounting, start-up and operation of the positioner:

- ▶ The positioner is to be mounted, started up or operated only by trained and experienced personnel familiar with the product.
According to these Mounting and Operating Instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
- ▶ Explosion-protected versions of this positioner may only be operated by personnel who have undergone special training or instructions or who are authorized to work on explosion-protected devices in hazardous areas. Refer to section 11.
- ▶ Any hazards that could be caused by the process medium, the operating pressure, the signal pressure or by moving parts of the control valve are to be prevented by means of the appropriate measures.
- ▶ If inadmissible motions or forces are produced in the actuator as a result of the supply pressure, the supply pressure must be restricted by means of a suitable supply pressure reducing station.

To avoid damage to any equipment, the following also applies:

- ▶ Do not operate the positioner with the back of the positioner/vent opening facing upwards.
The vent opening must not be sealed when the positioner is installed on site.



- ▶ Proper shipping and appropriate storage are assumed.
- ▶ Do not ground electric welding equipment near to the positioner.

Note: The device with a CE marking fulfills the requirements of the Directives 94/9/EC and 2004/108/EC.

The Declaration of Conformity is available on request.

3 Design and 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 control signal (reference variable w). The input signal received from a control system is compared to the travel or rotational angle of the control valve, and a pneumatic signal pressure (output variable y) is produced.

The positioner basically consists of an electrical travel sensor system (2), an analog i/p converter (6) with downstream air capacity

booster (7) and the electronic unit with a microcontroller (5).

The standard positioner is fitted with three binary contacts: A fault alarm output indicates a fault to a control station and two configurable software limit switches are used to indicate the end positions of the valve.

The position of the valve is transmitted as linear travel motion or angle of rotation via pick-up lever and travel sensor (2) to an analog PD controller (3). Simultaneously, an A/D converter (4) transmits the position of the valve to the microcontroller (5). The PD controller compares this actual position to the 4 to 20 mA DC control signal (reference

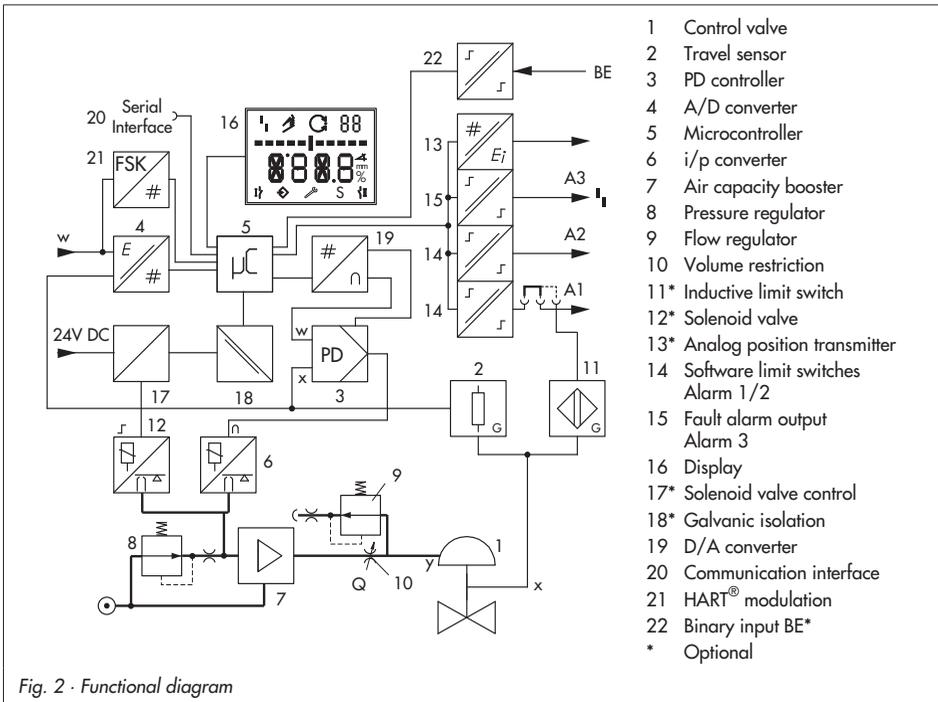


Fig. 2 · Functional diagram

variable) after it has been converted by the A/D converter (4). In case of a system deviation, the actuator is either vented or filled with more air. The supply air is supplied to the air capacity booster (7) and the pressure regulator (8). An intermediate flow regulator (9) with fixed settings is used to purge the positioner and also guarantees trouble-free operation of the air capacity booster. The output signal pressure supplied by the booster can be limited over the software. The volume restriction Q (10) is used to optimize the positioner by adapting it to the actuator size.

The extended EXPERTplus diagnostics are integrated into the positioner. It provides information on the positioner and generates diagnostic and status alarms, which allow faults to be pinpointed quickly.

The positioner is suitable for the following types of attachment using the corresponding accessories:

- ▶ Direct attachment to SAMSON Type 3277 Actuator: Section 4.1
- ▶ Attachment to actuators acc. to IEC 60534-6 (NAMUR): Section 4.2
- ▶ Attachment to Type 3510 Micro-flow Valve: Section 4.4
- ▶ Attachment to rotary actuators acc. to VDI/VDE 3845: Section 4.5

3.1 Additional equipment

Solenoid valve

If the operating voltage for the solenoid valve (12) fails, the supply pressure for the booster is vented to the atmosphere. As a result, the actuator is vented and the valve moves to the fail-safe position.

NOTICE

In manual mode (MAN), the manual set point is also reset to 0 %. A different manual set point must be entered again (Code 1).

Position transmitter

The position transmitter (13) is a two-wire transmitter and issues the travel sensor signal as a 4 to 20 mA signal processed by the microcontroller. Since this signal is issued independent of the positioner's input signal (min. current 3.8 mA), the actual travel/angle of rotation is controlled in real-time. Additionally, the position transmitter provides the possibility of signaling a positioner fault over a signal current of < 2.4 mA or > 21.6 mA.

Inductive limit switch

The rotary shaft of the positioner carries an adjustable tag which actuates the installed proximity switch. The optional inductive limit switch (11) is connected to A1, while the remaining software limit switch is connected to A2.

External position sensor

In this version, only the sensor is mounted to the control valve. The positioner is located separately from the valve.

The connection of x and y signals to the valve is established by cable and piping for air (only without inductive limit switch).

Analog input x

The **analog input x** option allows commercially available external linear or angle position sensors that use a 4 to 20 mA signal to be connected to the positioner. The analog input x is protected against reverse polarity and overload up to 24 V AC/DC. The positioner switches to open-loop operation (no closed-loop operation) as soon as the input signal falls below 2.5 mA.

Note on analog input x option:

Set the volume restriction Q to MIN SIDE for actuators with an air volume less than one liter. Refer to section 7.2.

Leakage sensor

By upgrading the positioner with a leakage sensor, it is possible to detect seat leakage when the valve is in the closed position.

Binary input

The positioner has an optional binary input. The following actions can be triggered by changing the edge state:

- ▶ **Transfer switching state** [default]
The switching state of the binary input is logged.
 - ▶ **Set local operation write protection**
Settings cannot be changed at the positioner while the binary input is active. The configuration enabled function in Code 3 is not active.
 - ▶ **Switch between AUTO/MAN**
The positioner changes from automatic mode  (AUTO) mode into manual mode  (MAN) and vice versa. No action is started if the positioner is in the fail-safe position (SAFE).
 - ▶ Various diagnostic functions (refer to EB 8389 EN on EXPERTplus valve diagnostics).
-

Note: *The optional binary input can only be configured using the TROVIS-VIEW software and over the DD parameters (refer to EB 8389 EN on EXPERTplus valve diagnostics).*

The default switching state is with an open switch.

3.2 Communication

The positioner is equipped with an interface for HART® protocol (Highway Addressable Remote Transducer) for communication purposes. Data are transmitted in a superimposed frequency (FSK = Frequency Shift Keying) on the existing signal loop for the 4 to 20 mA reference variable.

Either a HART® capable handheld communicator or a computer with FSK modem can be used to establish communication and operate the positioner.

Note: The HART® device revision as well as the indicating and operating modules supported by the Type 3730-3 Positioner can be found on the SAMSON website: (Product documentation > Positioners > Device versions > V 8384-3).

3.2.1 Configuration using TROVIS-VIEW software

Refer to Table 6 on page 51 for order numbers.

The positioner can be configured using the TROVIS-VIEW software.

The positioner is equipped for this purpose with an additional digital **SERIAL INTERFACE** to allow a computer to be connected over an adapter cable from the RS-232 or USB port of the computer to the positioner.

The TROVIS-VIEW software enables the user to easily set parameters in the positioner and view process parameters online.

Note: The TROVIS-VIEW software is a common operator interface for various smart SAMSON devices. The software together with a device-specific module allow the configuration and parameterization of the device.

The device-specific module for Type 3730-3 can be downloaded free of charge from the SAMSON website (Services > Software > TROVIS-VIEW).

Additional information on TROVIS-VIEW (e.g. system requirements) can be found on the SAMSON website and in the Data Sheet T 6661 EN.

3.3 Technical data

Type 3730-3 Positioner (technical data in test certificates also apply for explosion-protected devices)	
Travel, adjustable	Direct attachment to Type 3277 Actuator: 3.6 to 30 mm Attachment acc. to IEC 60534-6-1: 3.6 to 300 mm Attachment acc. to VDI/VDE 3847: 3.6 to 300 mm Rotary actuators: 24° to 100°
Travel range	Adjustable within the initialized travel/angle of rotation; travel can be restricted to $\frac{1}{5}$ at the maximum
Reference variable w	Signal range 4 to 20 mA, 2-wire unit, reverse polarity protection, min. span 4 mA, static destruction limit 100 mA
Minimum current	3.6 mA for display, 3.8 mA for operation
Load impedance	≤ 8.2 V (corresponding to 410 Ω at 20 mA)
Supply air	Supply pressure from 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 supply pressure, limitable to 1.4/2.4/3.7 ±0.2 bar via software
Characteristic, user-defined adjustable over operating software	Linear/equal percentage/reverse equal percentage/butterfly valve linear/ butterfly valve eq. percentage/rotary plug valve linear/rotary plug valve eq. percentage/segmented ball valve linear/segmented ball valve equal percentage Deviation from terminal-based conformity ≤ 1 %
Hysteresis	≤ 0.3 %
Sensitivity	≤ 0.1 %
Transit time	Separately adjustable over software up to 240 seconds for supply air and exhaust air
Direction of action	Reversible
Air consumption, steady state	Independent from supply pressure approx. 110 l _n /h
Air output capacity Actuator pressurized Actuator vented	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 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 in all versions -45 to +80 °C with metal cable gland -25 to +80 °C with inductive limit switches (SJ2-S1N) and metal cable gland Observe limits in test certificate for explosion-protected devices.
Influences	Temperature: ≤ 0.15 %/10 K Supply air: None Vibration: ≤ 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 mm ² wire cross-section
Degree of protection	IP 66/NEMA 4X

Type 3730-3 Positioner (technical data in test certificates also apply for explosion-protected devices)		
Use in safety-instrumented systems (SIL)		Observing the requirements of IEC 61508, the systematic capability of the control valve for emergency venting as a component in safety-instrumented systems is given.
Emergency shutdown at 0 mA set point and on using the optional solenoid valve		Use is possible on observing the requirements of IEC 61511 and the required hardware fault tolerance in safety-instrumented systems up to SIL 2 (single device/HFT = 0) and SIL 3 (redundant configuration/HFT = 1).
Explosion protection	ATEX Type 3730-31 Type 3730-38	II 2G Ex ia IIC T6, II 2D Ex tb IIIC T80°C IP66 II 3G Ex nA II T6, II 3G Ex ic IIC T6, II 3D Ex tc IIIC T80°C IP66
	CSA Type 3730-33	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
	FM Type 3730-33	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
	GOST Type 3730-31 Type 3730-38	1Ex ia IIC T6 Gb; 1Ex tb IIIC T80°C Db IP66 2Ex nA IIC T6 Gc; 2Ex ic IIC T6 Gc; 2Ex tc IIIC T80°C Dc IP66
	IECEx Type 3730-31	Ex ia IIC T6/T5/T4
	CCoE Type 3730-31	Ex ia IIC T6
	INMETRO Type 3730-3	Ex ia IIC T Gb
	KCS Type 3730-31	Ex ia IIC T6/T5/T4
	NEPSI Type 3730-31 Type 3730-38	Ex ia IIC T4~T6 Ga Ex nL IIC T4~T6 Gc; Ex nA IIC T4~T6 Gc
	Communication (local)	
Software requirements		TROVIS-VIEW with database module 3730-3
Communication (HART®)		HART® field communication protocol Impedance in the HART frequency range: receive 350 to 450 Ω, send: approx. 155 Ω
Software requirements (HART®)		For handheld communicator: device description for 3730-3, For 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); other integration options (e.g. AMS, PDM) available.
Binary contacts		
Two software limit switches, reverse polarity protection, floating, configurable switching characteristics, default settings as per table		
Signal status:	Without explosion protection:	Exp.-protected version:
No response:	Non-conducting	≤ 1.0 mA
Response:	Conductive (R = 348 Ω)	≥ 2.2 mA
One fault alarm contact, floating		
Signal status:	Without explosion protection:	Exp.-protected version:
No response/No alarm	Conductive (R = 348 Ω)	≥ 2.2 mA
Response/Fault alarm	Non-conducting	≤ 1.0 mA
For connection to	- Binary input of the PLC acc. to IEC 61131-2, P _{max} = 400 mW - NAMUR switching amplifier acc. to EN 60947-5-6	NAMUR switching amplifier acc. to EN 60947-5-6

Design and principle of operation

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 1.4581
External parts	Stainless steel 1.4571 and 1.4301
Cable gland	M20x1.5, black polyamide
Weight	Approx. 1.0 kg

Options for Type 3730-3 Positioner	
Solenoid valve · Approval acc. to IEC 61508/SIL	
Input	24 V DC reverse polarity protection, static destruction limit 40 V; Current consumption $I = \frac{U - 5.7 \text{ V}}{3840 \Omega}$ (corresponding to 4.8 mA at 24 V/114 mW)
Signal "0" no pick-up	≤ 12 V (emergency shutdown at 0 V)
Signal "1" safe pick-up	> 19 V
Service life	> 5 × 10 ⁶ switching cycles
K _V coefficient	0.15
Implementation in safety-relevant systems acc. to IEC 61508/SIL	Same as positioner pneumatics
Leakage sensor · Suitable for operation in hazardous areas	
Temperature range	-40 to +130 °C
Tightening torque	20 ± 5 Nm
Analog position transmitter Two-wire transmitter	
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	Same as positioner
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 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

Options for Type 3730-3 Positioner		
External position sensor		
Travel	Same as positioner	
Cable	10 m with M12x1 connector, designed for continuous flexing, flame retardant acc. to VDE 0472, resistant to oils, lubricants, coolants as well as other corrosive media	
Permissible ambient temperature	-60 to +105 °C · Limits specified in the EC Type Examination Certificate additionally apply for explosion-protected devices.	
Vibration immunity	Up to 10 g in the range between 10 and 2000 Hz	
Degree of protection	IP 67	
Binary input · Galvanically isolated · Switching behavior configured over software (e.g. TROVIS-VIEW, DTM)		
Active switching behavior (default setting)		
Connection	For external switch (floating contact) or relay contacts	
Electrical data	Open-circuit voltage when contact is open: max. 10 V, pulsed DC current, peak value 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)
Analog input x · Galvanically isolated · Input for externally measured valve position		
Input signal	4 to 20 mA · Reverse polarity protection · Minimum span 6.4 mA	
Electrical data	Compliance voltage at 20 mA: 6.0 V Impedance at 20 mA: 300 Ω Overload capacity: 24 V AC/DC	

4 Attachment to the control valve – Mounting parts and accessories

WARNING!

Attach the positioner, keeping the following sequence:

1. Mount the positioner on the control valve
2. Connect the supply air
3. Connect the electrical power
4. Perform the start-up settings

The positioner is suitable for the following types of attachment:

- ▶ Direct attachment to SAMSON Type 3277 Actuator
- ▶ Attachment to actuators according to IEC 60534-6 (NAMUR)
- ▶ Attachment to Type 3510 Micro-flow Valve
- ▶ Attachment to rotary actuators

NOTICE

Attach the positioner to the control valve, observing the following instructions to avoid damaging the positioner.

- Use only the mounting parts/accessories listed in the Tables 1 to 5 (pages 47 to 50) to mount the positioner. Observe the type of attachment.
- Observe the assignment between lever and pin position (see travel tables on page 19).

Lever and pin position

The positioner is adapted to the actuator and to the rated travel by the lever on the back of the positioner and the pin inserted into the lever.

The travel tables on page 19 show the maximum adjustment range at the positioner. The travel that can be implemented at the valve is additionally restricted by the selected fail-safe position and the required compression of the actuator springs.

The positioner is standard equipped with the lever **M** (pin position **35**).

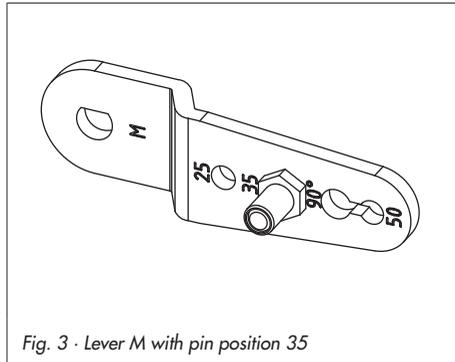


Fig. 3 · Lever M with pin position 35

Note: If the standard mounted lever M (pin position 35) is replaced, the newly mounted lever must be moved once all the way as far as it will go in both directions to adapt it to the internal measuring lever.

Travel tables

Note: The lever **M** is included in the scope of delivery.
Levers **S**, **L**, **XL** for attachment according to IEC 60534-6 (NAMUR) are available as accessories (see Table 3 on page 49).

Direct attachment to Type 3277-5 and Type 3277 Actuators

Actuator size [cm ²]	Rated travel [mm]	Adjustment range at positioner ¹⁾			Required lever	Assigned pin position
		Min.	Travel	Max.		
120	7.5	5.0	to	25.0	M	25
120/175/240/350	15	7.0	to	35.0	M	35
355/700/750	30	10.0	to	50.0	M	50

Attachment according to IEC 60534-6 (NAMUR)

SAMSON valves/Type 3271 Actuator		Adjustment range at positioner ¹⁾			Required lever	Assigned pin position
Actuator size [cm ²]	Rated travel [mm]	Other valves/actuators				
		min.	Travel	max.		
60 and 120 with Type 3510 Valve	7.5	3.6	to	18.0	S	17
120	7.5	5.0	to	25.0	M	25
120/175/240/350	15	7.0	to	35.0	M	35
700/750	7.5					
355/700/750	15 and 30	10.0	to	50.0	M	50
1000/1400/2800	30	14.0	to	70.0	L	70
1000/1400/2800	60	20.0	to	100.0	L	100
1400/2800	120	40.0	to	200.0	XL	200

Attachment to rotary actuators according to VDI/VDE 3845

Rotary actuators			Required lever	Assigned pin position
Min.	Opening angle	Max.		
24	to	100°	M	90°

¹⁾ The min./max. adjustment range is based on the **NOM (nominal range)** initialization mode

4.1 Direct attachment

4.1.1 Type 3277-5 Actuator

Refer to Table 1 on page 47 for the required mounting parts as well as the accessories.
Note the travel table on page 19.

Actuator with 120 cm²

Depending on the type of positioner attachment, the signal pressure is routed either left or right of the yoke through a bore to the actuator diaphragm. Depending on the fail-safe action of the actuator "actuator stem extends" or "actuator stem retracts" (valve closes or opens if the supply air fails), the switchover plate (9) must first be attached to the actuator yoke. Align the switchover plate with the corresponding symbol for left or right attachment according to the marking (view looking onto the switchover plate).

1. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges onto the positioner, making sure both seal rings (6.1) are seated properly.
2. Remove screw plug (4) on the back of the positioner and close the signal pressure output "Output 38" on the connecting plate (6) or on the pressure gauge bracket (7) with the stopper (5) included in the accessories.
3. Place follower clamp (3) on the actuator stem, align and screw tight so that the mounting screw is located in the groove of the actuator stem.
4. Mount cover plate (10) with narrow side of the cut-out opening (Fig. 4, left) pointing towards the signal pressure connec-

tion. Make sure that the bonded gasket (14) points towards the actuator yoke.

5. **15 mm travel:** Keep the follower pin (2) at lever **M** (1) on the back of the positioner in the pin position **35** (delivered state).

7.5 mm travel: Remove the follower pin (2) from the pin position **35**, reposition it in the bore for pin position **25** and screw tight.

6. Insert formed seal (15) into the groove of the positioner housing and the seal ring (10.1) on the back of the housing.
7. Place positioner on the cover plate (10) in such a manner that the follower pin (2) rests on the top of the follower clamp (3). Adjust the lever (1) correspondingly and open the positioner cover to hold the positioner shaft in position at the cap or the switch (Fig. 26).

The lever (1) must rest on the follower clamp with spring force.

Mount the positioner on the cover plate (10) using the two fixing screws.

Note for all types of attachment except for direct attachment to Type 3277-5: The signal pressure output at the back must be sealed using the screw plug (4, order no. 0180-1254) and the associated O-ring (order no. 0520-0412).

8. Mount cover (11) on the other side. Make sure that the vent plug points downwards when the control valve is installed to allow any condensed water that collects to drain off.

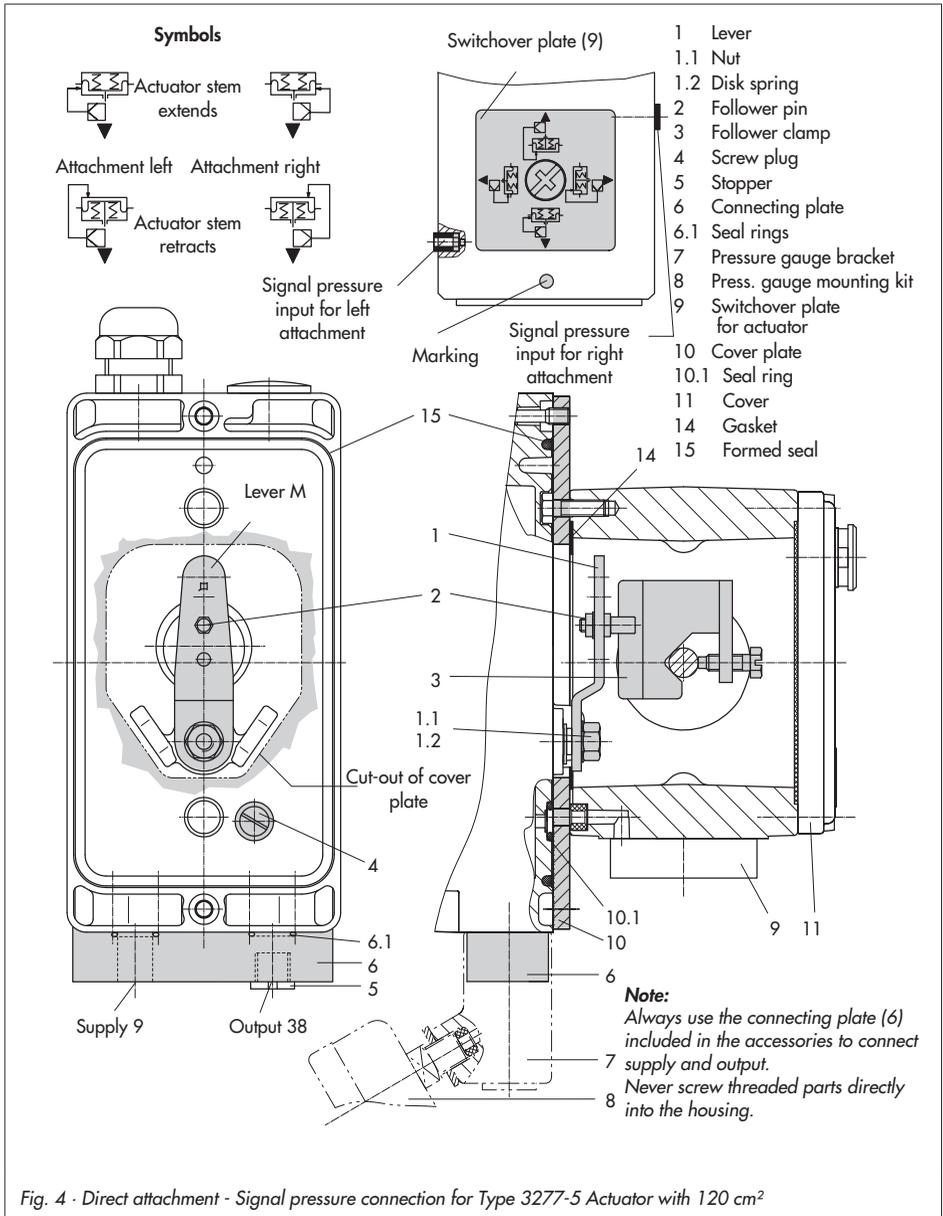


Fig. 4 - Direct attachment - Signal pressure connection for Type 3277-5 Actuator with 120 cm²

4.1.2 Type 3277 Actuator

Refer to Table 2 on page 48 or the required mounting parts as well as the accessories. Note the travel table on page 19.

Actuators with 175 to 750 cm²

Mount the positioner on the yoke as shown in Fig. 5. The signal pressure is routed to the actuator over the connection block (12), for actuators with fail-safe action "actuator stem extends" internally through a bore in the valve yoke and for "actuator stem retracts" through external piping.

Note: We recommend an external hook-up over the connecting plate or pressure gauge bracket when the special version down to $-55\text{ }^{\circ}\text{C}$ is used. The connection block is not suitable in this case.

1. Place follower clamp (3) on the actuator stem, align and screw tight so that the mounting screw is located in the groove of the actuator stem.
2. Mount cover plate (10) with narrow side of the cut-out opening (Fig. 5, on the left) pointing towards the signal pressure connection. Make sure that the bonded gasket (14) points towards the actuator yoke.
3. For actuators with 355/700/750 cm², remove the follower pin (2) at lever **M** (1) on the back of the positioner from pin position **35**, reposition it in the bore for pin position **50** and screw tight. For actuators 175, 240 and 350 cm² with 15 mm travel, the follower pin (2) remains in pin position **35**.
4. Insert formed seal (15) in the groove of the positioner casing.
5. Place positioner on the cover plate in such a manner that the follower pin (2) rests on the top of the follower clamp (3). Adjust the lever (1) correspondingly and open the positioner cover to hold the positioner shaft in position at the cap or the switch (Fig. 25). The lever (1) must rest on the follower clamp with spring force. Mount the positioner on the cover plate (10) using the two fixing screws.
6. Make sure that the tip of the gasket (16) projecting from the side of the connection block (12) is positioned above the actuator symbol that corresponds with the actuator with fail-safe action "actuator stem extends" or "actuator stem retracts." If necessary, remove the three fixing screws and the cover. Then reposition the gasket (16) turned by 180° . The previous version of the connection block (Fig. 5, bottom) requires the switch plate (13) to be turned such that the corresponding actuator symbol points to the marking.
7. Place the connection block (12) with the associated seal rings against the positioner and the actuator yoke. Screw it tight using the fixing screw (12.1). For actuators with fail-safe action "Actuator stem retracts", additionally remove the stopper (12.2) and fit on the external signal pressure piping.

- | | | | |
|------|----------------|------|---|
| 1 | Lever | 12 | Connection block |
| 1.1 | Nut | 12.1 | Screw |
| 1.2 | Disk spring | 12.2 | Stopper or connection for external piping |
| 2 | Follower pin | 13 | Switch plate |
| 3 | Follower clamp | 14 | Gasket |
| 10 | Cover plate | 15 | Formed seal |
| 11 | Cover | 16 | Gasket |
| 11.1 | Vent plug | | |

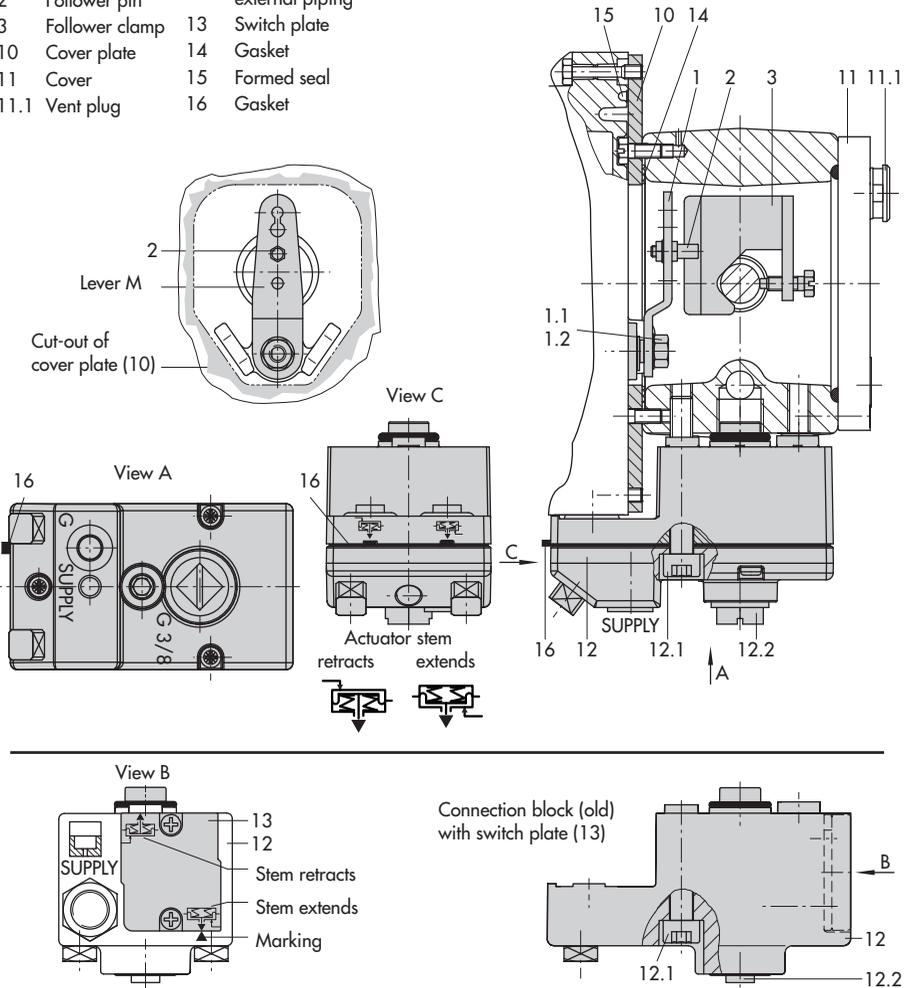


Fig. 5 - Direct attachment – Signal pressure connection for Type 3277 Actuator with 175 to 750 cm²

- Mount cover (11) on the other side. Make sure that the vent plug points downwards when the control valve is installed to allow any condensed water that collects to drain off.

4.2 Attachment according to IEC 60534-6 (NAMUR)

Refer to Table 3 on page 49 for the required mounting parts as well as the accessories. Note the travel table on page 19.

The positioner is attached to the control valve with a NAMUR bracket (10).

- Screw the two bolts (14) to the bracket (9.1) of the stem connector (9), place the follower plate (3) on top and use the screws (14.1) to tighten.

Actuator size 2800 cm² and 1400 cm² (120 mm travel):

- For a travel of 60 mm or smaller, screw the longer follower plate (3.1) directly to the stem connector (9).
 - For a travel exceeding 60 mm, mount the bracket (16) first and then the follower plate (3) to the bracket together with the bolts (14) and screws (14.1).
- Mount NAMUR bracket (10) to the control valve as follows:
 - For attachment to the NAMUR rib, use an M8 screw (11), washer, and toothed lock washer directly in the yoke bore.
 - For attachment to valves with rod-type yokes, use two U-bolts (15) around the yoke.

Align the NAMUR bracket (10) in such a way that the slot of the follower plate (3) is centrally aligned with the NAMUR bracket at mid valve travel.

- Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges (8) on the positioner, making sure both seal rings (6.1) are seated properly.
- Select required lever size (1) **M**, **L** or **XL** and pin position according to the actuator size and valve travels listed in the table on page 19. Should you require a pin position other than position **35** with the standard installed lever **M**, or require a lever size **L** or **XL**, proceed as follows:
- Screw the follower pin (2) in the assigned lever bore (pin position) as listed in the table. Only use the longer follower pin (2) included in the mounting kit.
- Place lever (1) on the positioner shaft and screw tight using the disk spring (1.2) and nut (1.1).

Note: If you have mounted a new lever (1), you must move it once all the way as far as it will go in both directions.

- Place positioner on the NAMUR bracket in such a manner that the follower pin (2) rests in the slot of the follower plate (3, 3.1). Adjust the lever (1) correspondingly. Screw the positioner to the NAMUR bracket using both its fixing screws.

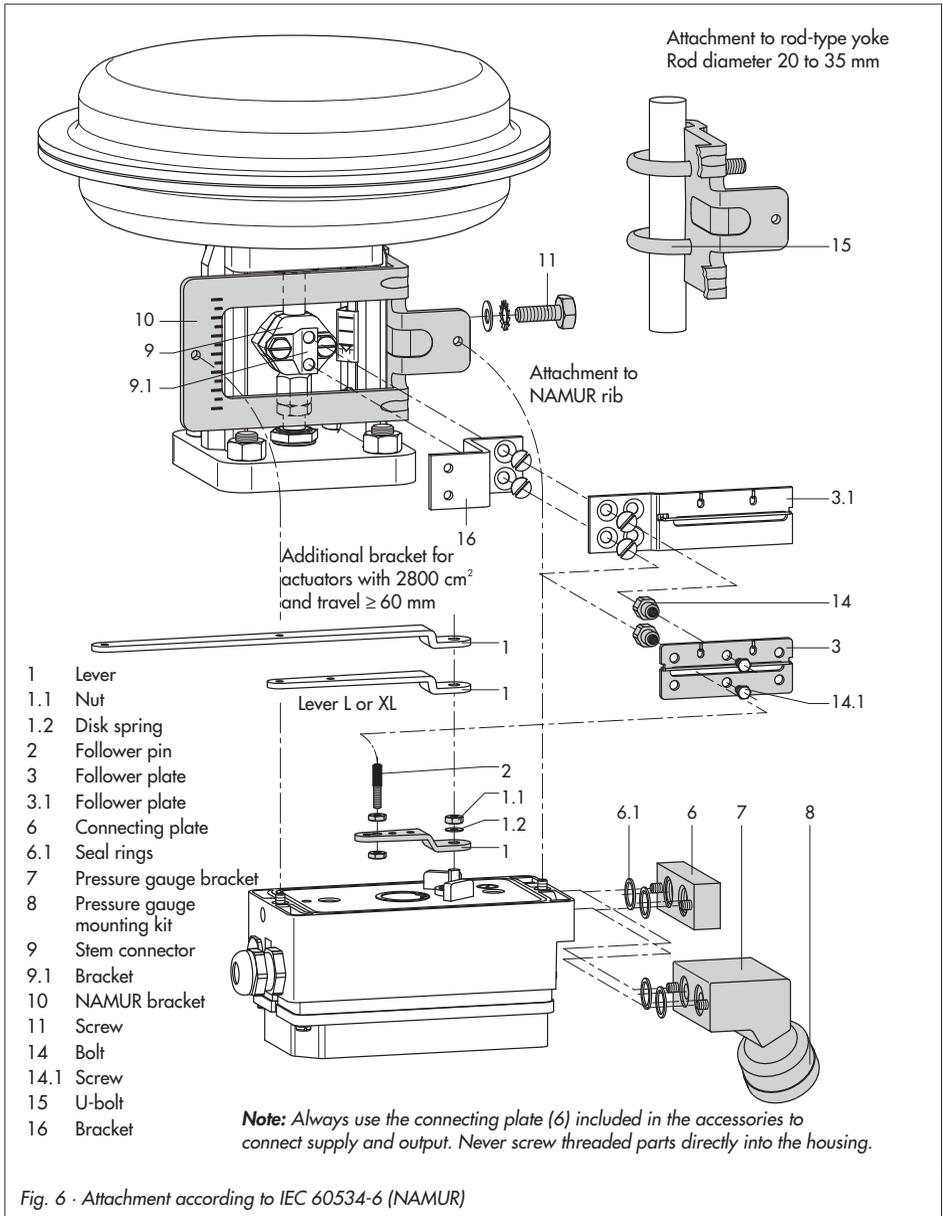


Fig. 6 - Attachment according to IEC 60534-6 (NAMUR)

4.3 Attachment according to VDI/VDE 3847

Type 3730-3xxxxxxx0x0060xx and Type 3730-3xxxxxxx0x0070xx Positioners with optional air purging of the actuator's spring chamber can be attached according to VDI/VDE 3847.

Type 3730-3xxxxxxx0x0000xx Positioner without optional air purging of the actuator's spring chamber can be attached according to VDI/VDE 3847.

This type of attachment allows the positioners to be replaced quickly while the process is running by blocking the air in the actuator.

The signal pressure can be blocked in the actuator by unscrewing the red retaining screw (20) and then turning the air blocker (19) on the bottom of the adapter block.

Attachment to Type 3277 Actuator (see Fig. 7)

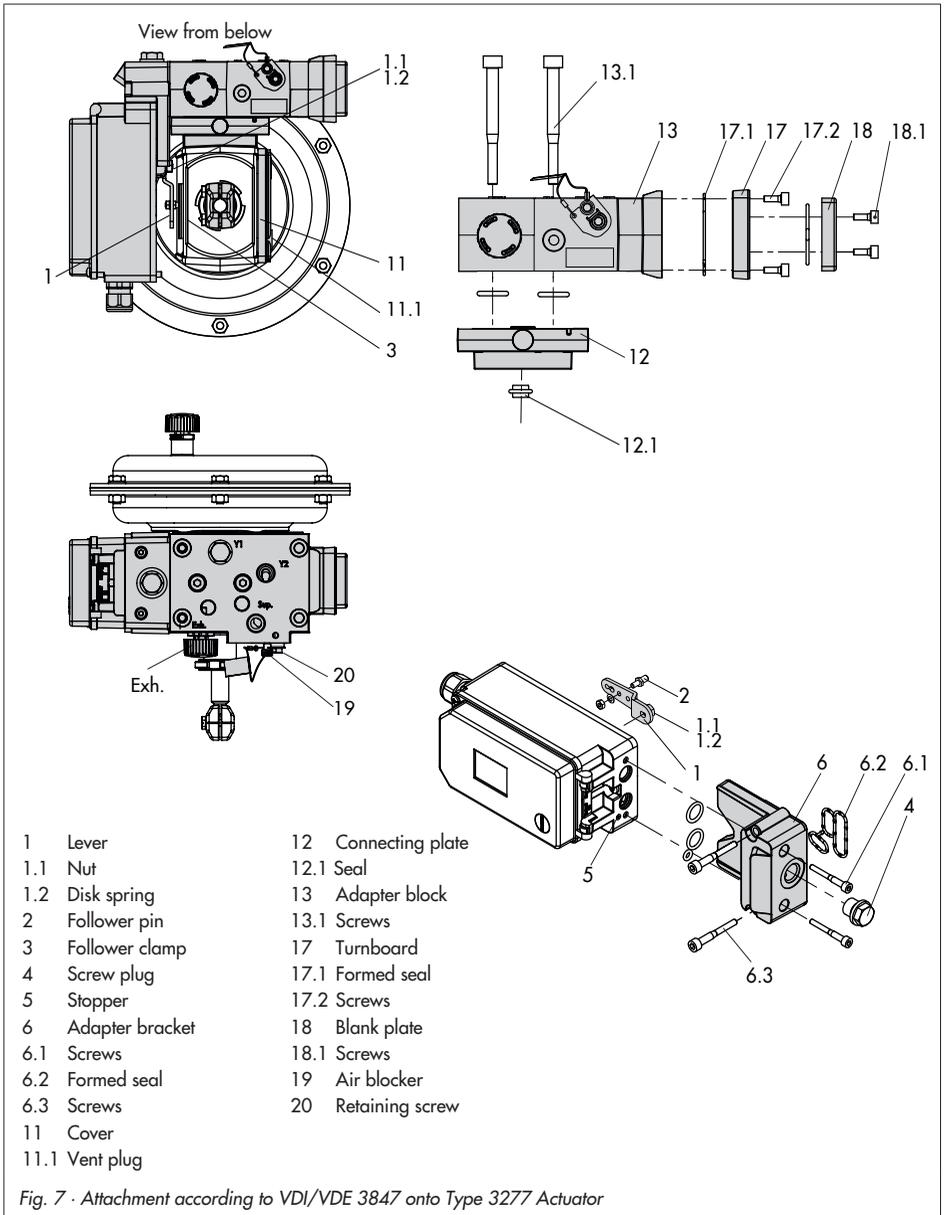
Refer to Table 4 on page 49 for the required mounting parts as well as the accessories.

Mount the positioner on the yoke as shown in Fig. 7. The signal pressure is routed to the actuator over the connecting plate (12), for actuators with fail-safe action "actuator stem extends" internally through a bore in the valve yoke and for "actuator stem retracts" through external piping.

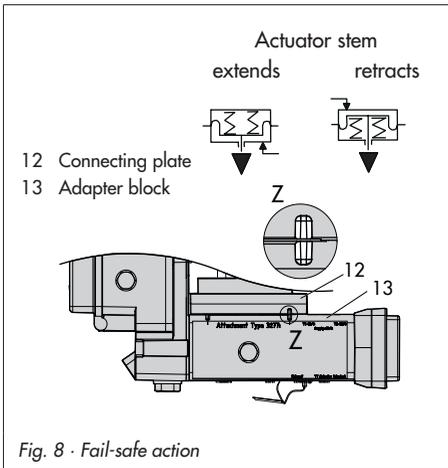
Only the Y1 port is required for positioner attachment. The Y2 port can be used for air purging of the spring chamber.

1. Place follower clamp (3) on the actuator stem, align and screw tight so that the mounting screw is located in the groove of the actuator stem.
2. Place the adapter bracket (6) on the positioner and mount using the screws (6.1). Make sure that the seals are correctly seated. For positioners **with air purging**, remove the stopper (5) before mounting the positioner.
For positioners **without air purging**, replace the screw plug (4) with a vent plug.
3. For actuators with 355/700/750 cm², remove the follower pin (2) at lever **M** (1) on the back of the positioner from pin position **35**, reposition it in the bore for pin position **50** and screw tight.
For actuators 175, 240 and 350 cm² with 15 mm travel, the follower pin (2) remains in pin position **35**.
4. Insert formed seal (6.2) in the groove of the adapter bracket.
5. Insert the formed seal (17.1) into the turnboard (17) and mount the turnboard to the adapter block (13) using the screws (17.2).
6. Mount the blank plate (18) to the turnboard (17) using the screws (18.1) Make sure that the seals are correctly seated.

Note: A solenoid valve can also be mounted in place of the blank plate (18). The orientation of the turnboard (17) determine the mounting position of the solenoid valve. Alternatively, a restrictor plate can be mounted (see AB 11 EN).



7. Insert screws (13.1) through the middle holes of the adapter block (13).
8. Place the connecting plate (12) together with the seal (12.1) onto the screws (13.1) corresponding to the fail-safe action "actuator stem extends" or "actuator stem retracts".
The fail-safe action that applies is determined by aligning the groove of the adapter block (13) with the groove of the connecting plate (12) (Fig. 8).



9. Mount the adapter block (13) together with the connecting plate (12) to the actuator using the screws (13.1).
10. Insert the vent plug (11.1) to the **Exh.** connection.
11. For fail-safe action "actuator stem extends", seal the Y1 port with a blanking plug.
For fail-safe action "actuator stem retracts", connect the Y1 port to the signal pressure connection of the actuator.

12. Place the positioner on the adapter block (13) in such a manner that the follower pin (2) rests on the top of the follower clamp (3). Adjust the lever (1) correspondingly and open the positioner cover to hold the positioner shaft in position at the cap or the switch (Fig. 25). The lever (1) must rest on the follower clamp with spring force.
Fasten the positioner to the adapter block (13) using the two fixing screws (6.3). Make sure the formed seal (6.2) is properly seated.
13. Mount cover (11) on the other side.
Make sure that the vent plug points downwards when the control valve is installed to allow any condensed water that collects to drain off.

Attachment to NAMUR rib (see Fig. 9)

Refer to Table 4 on page 49 for the required mounting parts as well as the accessories.

Note the travel table on page 19!

1. **Series 240 Valves, actuator size up to 1400-60 cm²:** Screw the two bolts (14) to the bracket of the stem connector or directly to the stem connector (depending on the version), place the follower plate (3) on top and use the screws (14.1) to fasten it.

Type 3251 Valve, 350 to 2800 cm²:

Screw the longer follower plate (3.1) to the bracket of the stem connector or directly to the stem connector (depending on the version).

Type 3254 Valve, 1400-120 to 2800 cm²:

Screw the two bolts (14) to the bracket (16). Fasten the bracket (16) onto the stem connector, place the follower plate (3) on top and use the screws (14.1) to fasten it.

Mount the positioner on the NAMUR rib as shown in Fig. 9.

2. For **attachment to the NAMUR rib**, fasten the NAMUR connection block (10) directly into the existing yoke bore using the screw and toothed lock washer (11). Align the marking on the NAMUR valve connection (on the side marked '1') to 50 % travel.

For **attachment to valves with rod-type yokes**, use two U-bolts (15) around the stem.

Fasten the NAMUR connection block

(10) directly into the existing yoke bore using the screw and toothed lock washer (11). Align the marking on the NAMUR connection block (on the side marked '1') to 50 % travel.

3. Place the adapter bracket (6) on the positioner and mount using the screws (6.1). Make sure that the seals are correctly seated. For positioners **with air purging**, remove the stopper (5) before mounting the positioner.
For positioners **without air purging**, replace the screw plug (4) with a vent plug.
4. Select required lever size (1) **M**, **L** or **XL** and pin position according to the actuator size and valve travels listed in the table on page 19.

Should you require a pin position other than position **35** with the standard installed lever **M**, or require a lever size **L** or **XL**, proceed as follows:

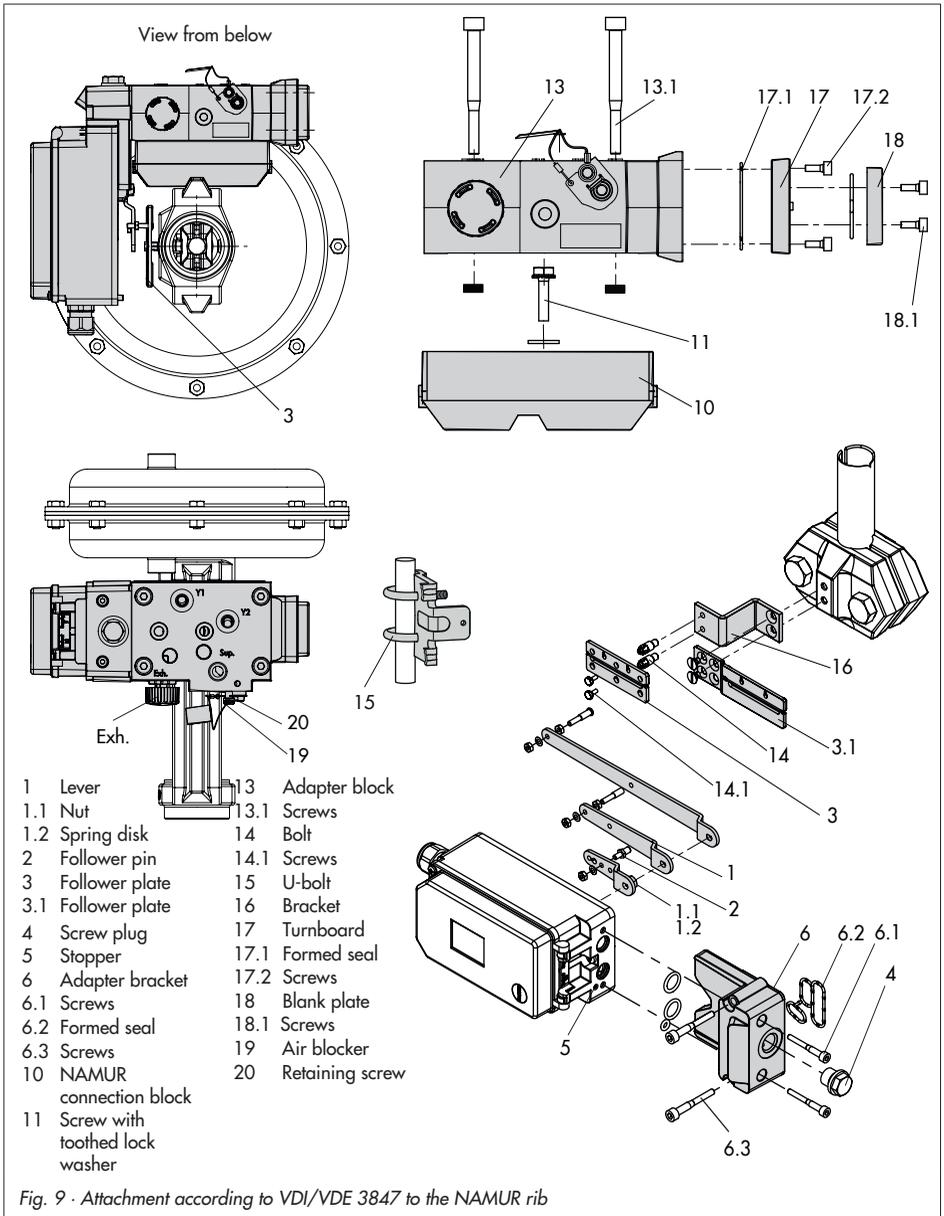
- Screw the follower pin (2) in the assigned lever bore (pin position) as listed in the table. Only use the longer follower pin (2) included in the mounting kit.
- Place lever (1) on the positioner shaft and screw tight using the disk spring (1.2) and nut (1.1).
- Move the lever once all the way as far as it will go in both directions.

5. Insert formed seal (6.2) in the groove of the adapter bracket.
6. Insert the formed seal (17.1) into the turnboard (17) and mount the turnboard to the adapter block (13) using the screws (17.2).
7. Mount the blank plate (18) to the turnboard (17) using the screws (18.1)
Make sure that the seals are correctly seated.

For double-acting actuators and actuators with air purging connect the Y2 port of the adapter block to the signal pressure connection of the second actuator chamber or spring chamber of the actuator.

Note: A solenoid valve can also be mounted in place of the blank plate (18). The orientation of the turnboard (17) determine the mounting position of the solenoid valve. Alternatively, a restrictor plate can be mounted (see AB 11 EN).

8. Mount the adapter block (13) to the NAMUR connection block using the screws (13.1).
9. Insert the vent plug (11.1) to the **Exh.** connection.
10. Place the positioner on the adapter block (13) in such a manner that the follower pin (2) rests on the top of the follower clamp (3). Adjust the lever (1) correspondingly.
Fasten the positioner to the adapter block (13) using the two fixing screws (6.3). Make sure the formed seal (6.2) is properly seated.
11. **For single-acting actuators without air purging** connect the Y1 port of the adapter block to the signal pressure connection of the actuator. Seal the Y2 port with a blanking plug.



4.4 Attachment to Type 3510 Micro-flow Valve

Refer to Table 3 on page 49 for the required mounting parts as well as the accessories. Note the travel table on page 19!

The positioner is attached to the valve yoke using a bracket.

1. Screw bracket (9.1) to the stem connector (9).
2. Fasten the two pins (9.2) to the bracket (9.1) on the stem connector. Mount the follower plate (3) and fasten it using the screws (9.3).
3. Mount the travel indication scale (accessories) to the outer side of the yoke using the hex screws (12.1), ensuring that the scale is aligned with the stem connector.
4. Fasten the hex bar (11) onto the outer side of yoke by screwing the M8 screws (11.1) directly into the holes on the yoke.
5. Fasten the bracket (10) to the hex bar (11) using the hex screw (10.1), washer and tooth lock washer.
6. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges (8) on the positioner, making sure both seal rings (6.1) are seated properly.
7. Unscrew the standard installed lever **M** (1) including follower pin (2) from the positioner shaft.
8. Take lever **S** (1) and screw follower pin (2) in the bore for pin position 17.
9. Place lever **S** on the positioner shaft and screw tight using the disk spring (1.2) and nut (1.1).

Move lever once all the way as far as it will go in both directions.

10. Place positioner on the bracket (10) in such a manner that the follower pin slides into the groove of the clamp (3). Adjust the lever (1) correspondingly. Screw the positioner to the bracket (10) using both its screws.

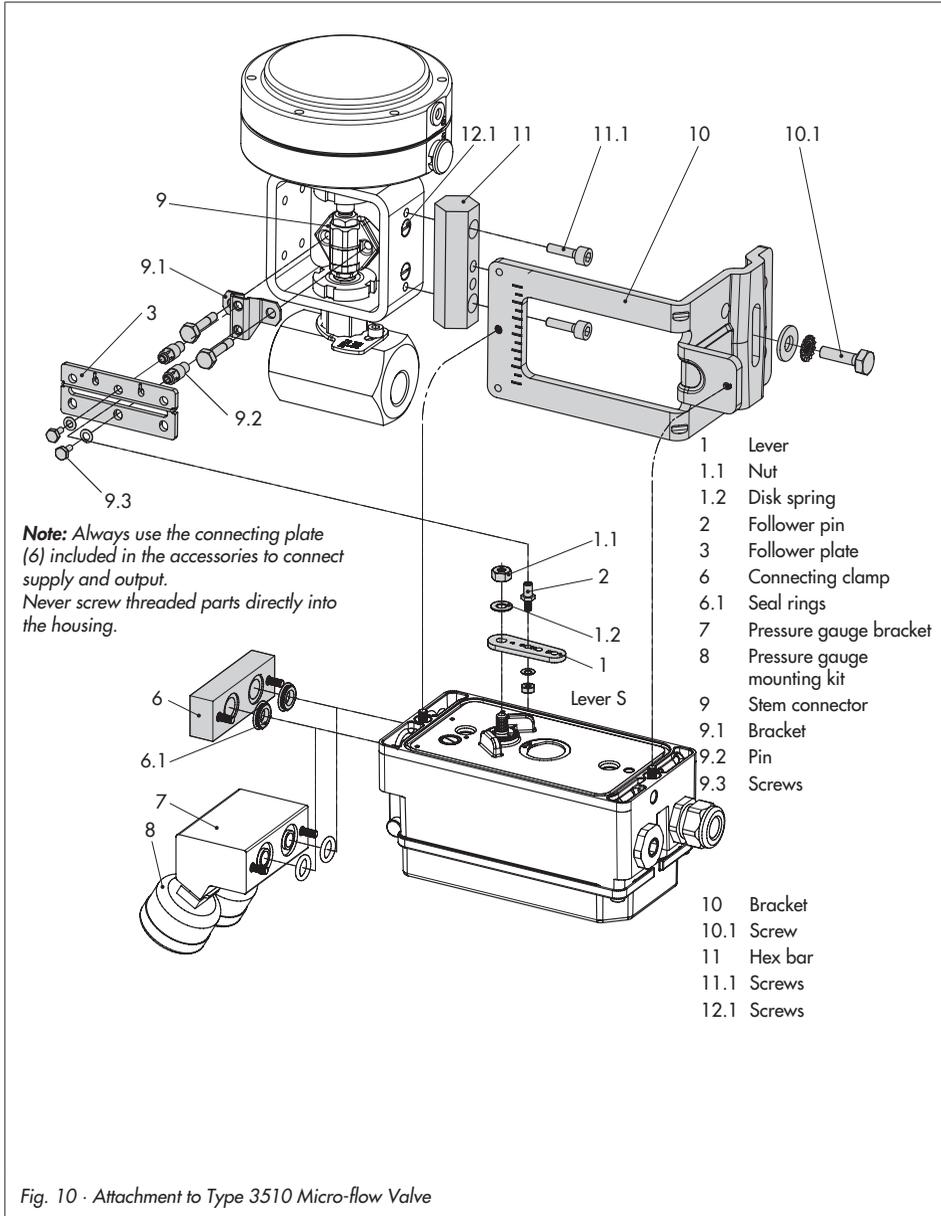


Fig. 10 · Attachment to Type 3510 Micro-flow Valve

4.5 Attachment to rotary actuators

Refer to Table 5 on page 50 for the required mounting parts as well as the accessories.
Note the travel table on page 19.

The positioner is mounted to the rotary actuator using two pairs of double brackets.

Prior to attaching the positioner to the SAMSON Type 3278 Rotary Actuator, mount the associated adapter (5) to the free end of the rotary actuator shaft.

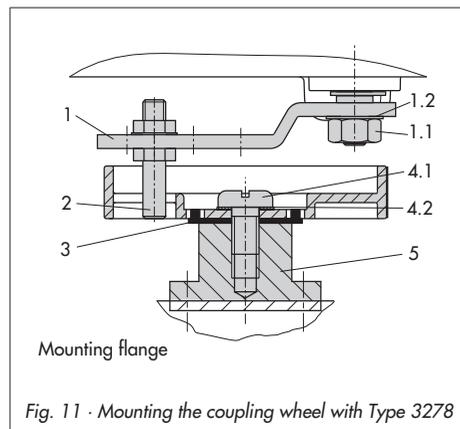
Note: On attaching the positioner as described below, it is imperative that the actuator's direction of rotation is observed.

1. Place follower clamp (3) on the slotted actuator shaft or the adapter (5).
2. Place coupling wheel (4) with flat side facing the actuator on the follower clamp (3). Refer to Fig. 12 to align the slot so that it matches the direction of rotation when the valve is in its closed position.
3. Screw coupling wheel and follower clamp tightly onto the actuator shaft using screw (4.1) and disk spring (4.2).
4. Screw the bottom pair of brackets (10.1) with the bends pointing either to the inside or to the outside (depending on the actuator size) to the actuator case. Position top pair of brackets (10) and screw tight.
5. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges to the positioner, making sure both

O-rings are seated properly.

For **double-acting**, springless rotary actuators, a reversing amplifier is required to attach the positioner to the actuator, see section 4.6.

6. Unscrew the standard follower pin (2) from the positioner's lever **M** (1). Use the metal follower pin (Ø5) included in the mounting kit and screw tight into the bore for pin position **90°**.
7. Place positioner on the top pair of brackets (10) and screw tight. Considering the actuator's direction of rotation, adjust lever (1) so that it engages in the slot of the coupling wheel (4) with its follower pin (see Fig. 12). It must be guaranteed that the lever (1) is parallel to the long side of the positioner when the actuator is at half its angle of rotation.
8. Stick scale plate (4.3) on the coupling wheel so that the arrow tip indicates the closed position, and it can be easily read when the valve is installed.



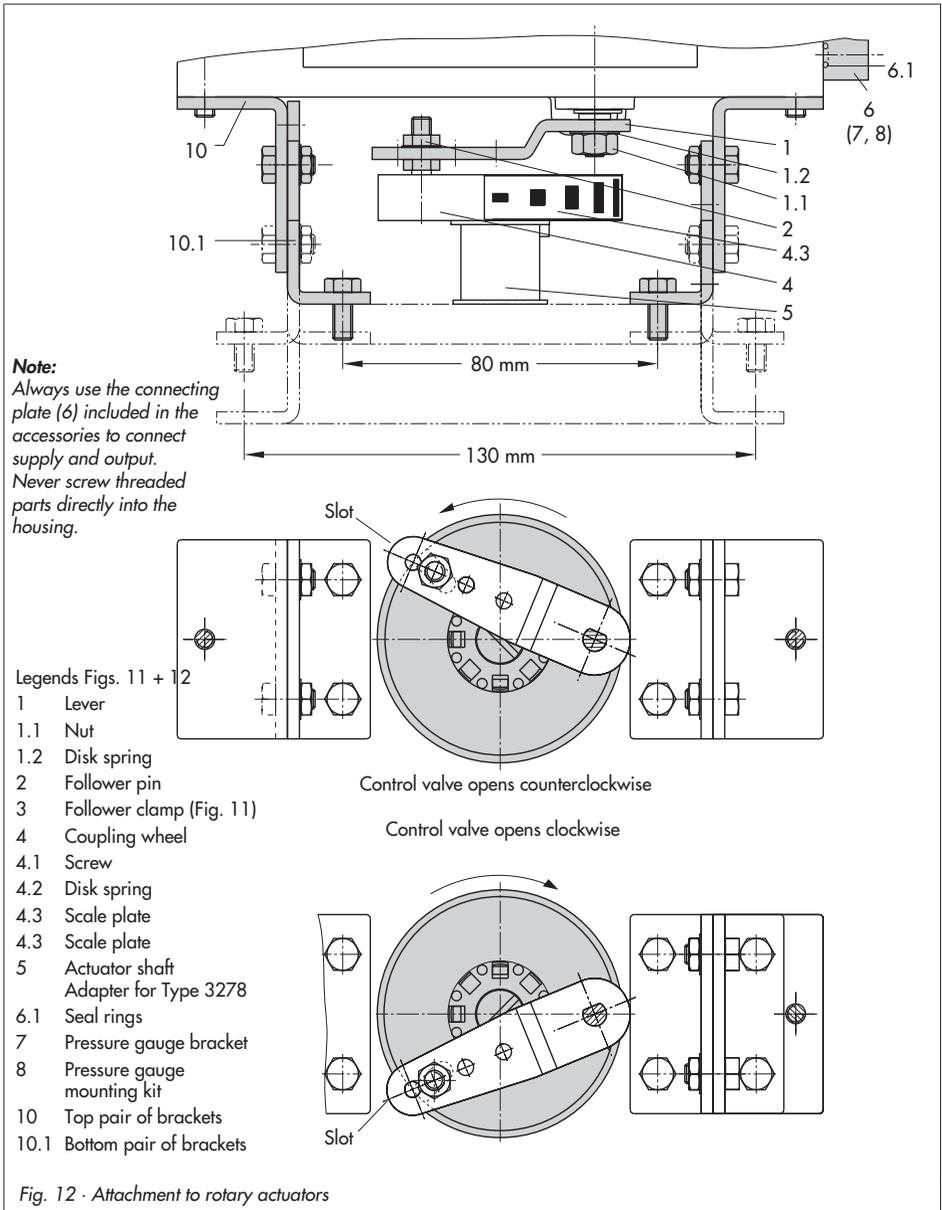


Fig. 12 · Attachment to rotary actuators

4.5.1 Heavy-duty version

Refer to Table 5 on page 50 for the required mounting parts as well as the accessories with their order numbers.

Both mounting kits contain all the necessary mounting parts. First select correct actuator size. Prepare actuator, and mount required adapter supplied by the actuator manufacturer, if necessary.

1. Mount the housing (10) onto the rotary actuator. In case of VDI/VDE attachment, place spacers (11) underneath, if necessary.
2. For **SAMSON Type 3278 and VETEC S160 Rotary Actuator**, screw the adapter (5) onto the free end of the shaft or place adapter (5.1) onto the shaft of the **VETEC R Actuator**.
Place adapter (3) onto **Type 3278, VETEC S160 and VETEC R Actuator**. For **VDI/VDE version**, this step depends on the actuator size.
3. Stick adhesive label (4.3) onto the coupling wheel in such a manner that the yellow part of the sticker is visible in the window of the housing when the valve is OPEN. Adhesive labels with explanatory symbols are enclosed and can be stuck on the housing, if required.
4. Screw tight coupling wheel (4) onto the slotted actuator shaft or adapter (3) using screw (4.1) and disk spring (4.2).
5. Undo the standard follower pin (2) on the lever M (1) of the positioner. Attach the follower pin (Ø 5) included in the mounting kit to pin position 90°.

6. If applicable, mount pressure gauge bracket (7) with pressure gauges or, in case G ¼ threaded connections are required, the connecting plate (6), making sure both seal rings (6.1) are seated properly.
For double-acting, springless rotary actuators, a reversing amplifier is required to attach the positioner to the actuator. Refer to section 4.6.
7. For actuators with a volume of less than 300 cm³, fit the screw-in restriction (order no.1400-6964) into the signal pressure output of the positioner (or the output of the pressure gauge bracket or connecting plate).
8. Place positioner on housing (10) and screw it tight. Considering the actuator's direction of rotation, align lever (1) so that it engages in the correct slot of the coupling wheel with its follower pin (Fig. 13).

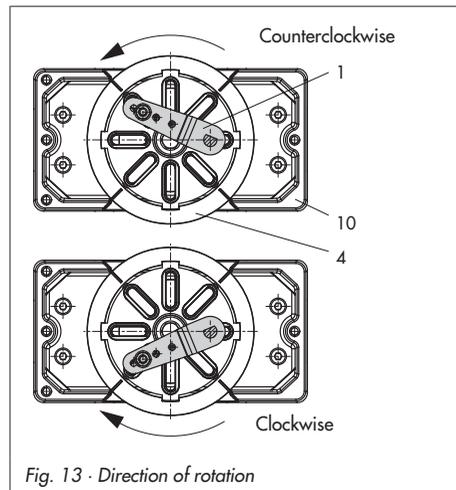
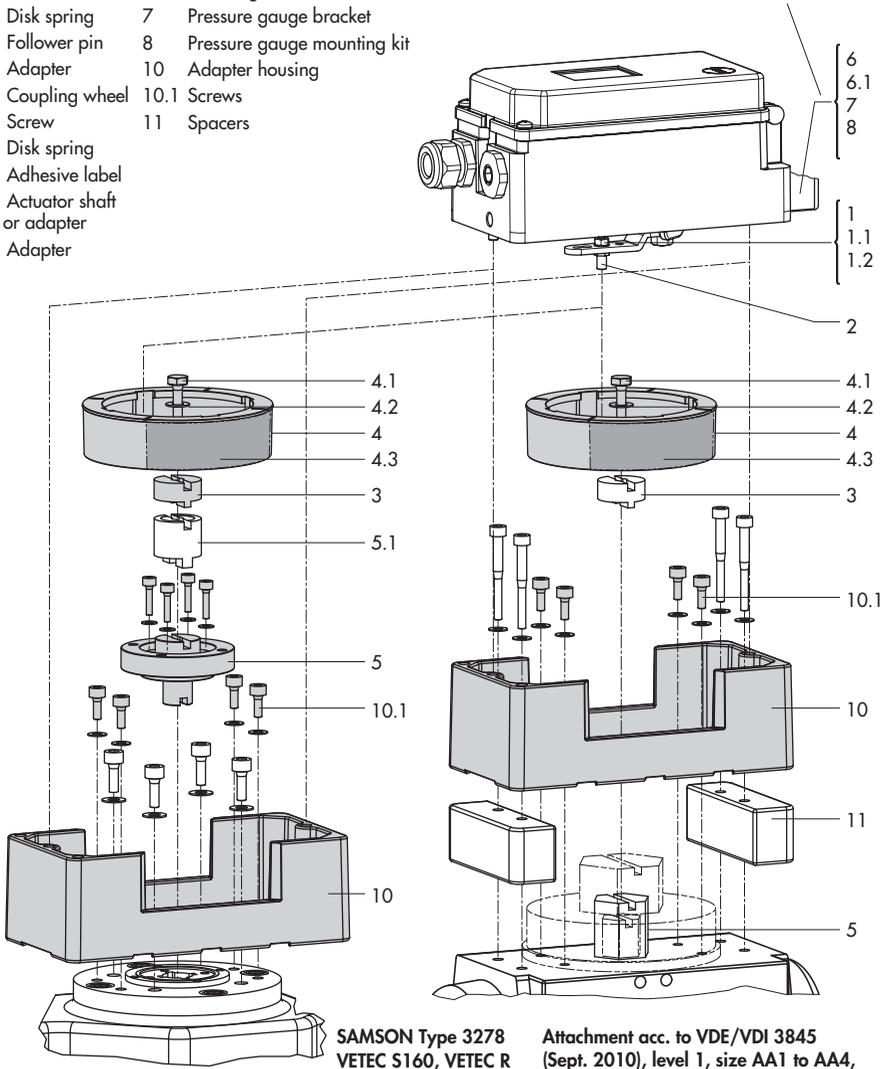


Fig. 13 · Direction of rotation

- | | |
|-----------------------------|-------------------------------------|
| 1 Lever | 6 Connecting plate (only for G 1/4) |
| 1.1 Nut | 6.1 Seal rings |
| 1.2 Disk spring | 7 Pressure gauge bracket |
| 2 Follower pin | 8 Pressure gauge mounting kit |
| 3 Adapter | 10 Adapter housing |
| 4 Coupling wheel | 10.1 Screws |
| 4.1 Screw | 11 Spacers |
| 4.2 Disk spring | |
| 4.3 Adhesive label | |
| 5 Actuator shaft or adapter | |
| 5.1 Adapter | |

Fit screw-in restriction into signal pressure output for actuators with < 300 cm³ volume



**SAMSON Type 3278
VETEC S160, VETEC R**

**Attachment acc. to VDE/VDI 3845
(Sept. 2010), level 1, size AA1 to AA4,
refer to section 15.1**

Fig. 14 · Attachment to rotary actuators (heavy-duty version)

4.6 Reversing amplifier for double-acting actuators

For the use with double-acting actuators, the positioner must be fitted with a reversing amplifier, e.g. the SAMSON Type 3710 Reversing Amplifier (see Mounting and Operating Instructions EB 8392 EN).

If a different reversing amplifier (item no. 1079-1118 or 1079-1119) is used, follow the mounting instructions described in section 4.6.1.

The following applies to all reversing amplifiers:

The output signal pressure of the positioner is supplied at the output **A₁** of the reversing amplifier. An opposing pressure, which equals the required supply pressure when added to the pressure at **A₁**, is applied at output **A₂**.

The rule **A₁ + A₂ = Z** applies.

A₁: Output **A₁** leading to the signal pressure connection at the actuator which opens the valve when the pressure increases

A₂: Output **A₂** leading to the signal pressure connection at the actuator which closes the valve when the pressure increases

- ▶ Set slide switch on positioner to **AIR TO OPEN**.

4.6.1 Reversing amplifier (1079-1118 or 1079-1119)

1. Mount the connecting plate (6) from the accessories in Table 5 to the positioner. Make sure that both O-rings (6.1) are seated correctly.
2. Thread the special nuts (1.3) from the accessories of the reversing amplifier into the boreholes of the connecting plate.
3. Insert the gasket (1.2) into the recess of the reversing amplifier and push both the hollowed special screws (1.1) into the connecting boreholes **A₁** and **Z**.
4. Place the reversing amplifier onto the connecting plate (6) and screw tight using both the special screws (1.1).
5. Use a screwdriver (8 mm wide) to screw the enclosed filters (1.6) into the connecting boreholes **A₁** and **Z**.

NOTICE

Do not unscrew the sealing plug (1.5) out of the reversing amplifier.

The rubber seal (1.4) is not required and can be removed when the sealing plug is used.

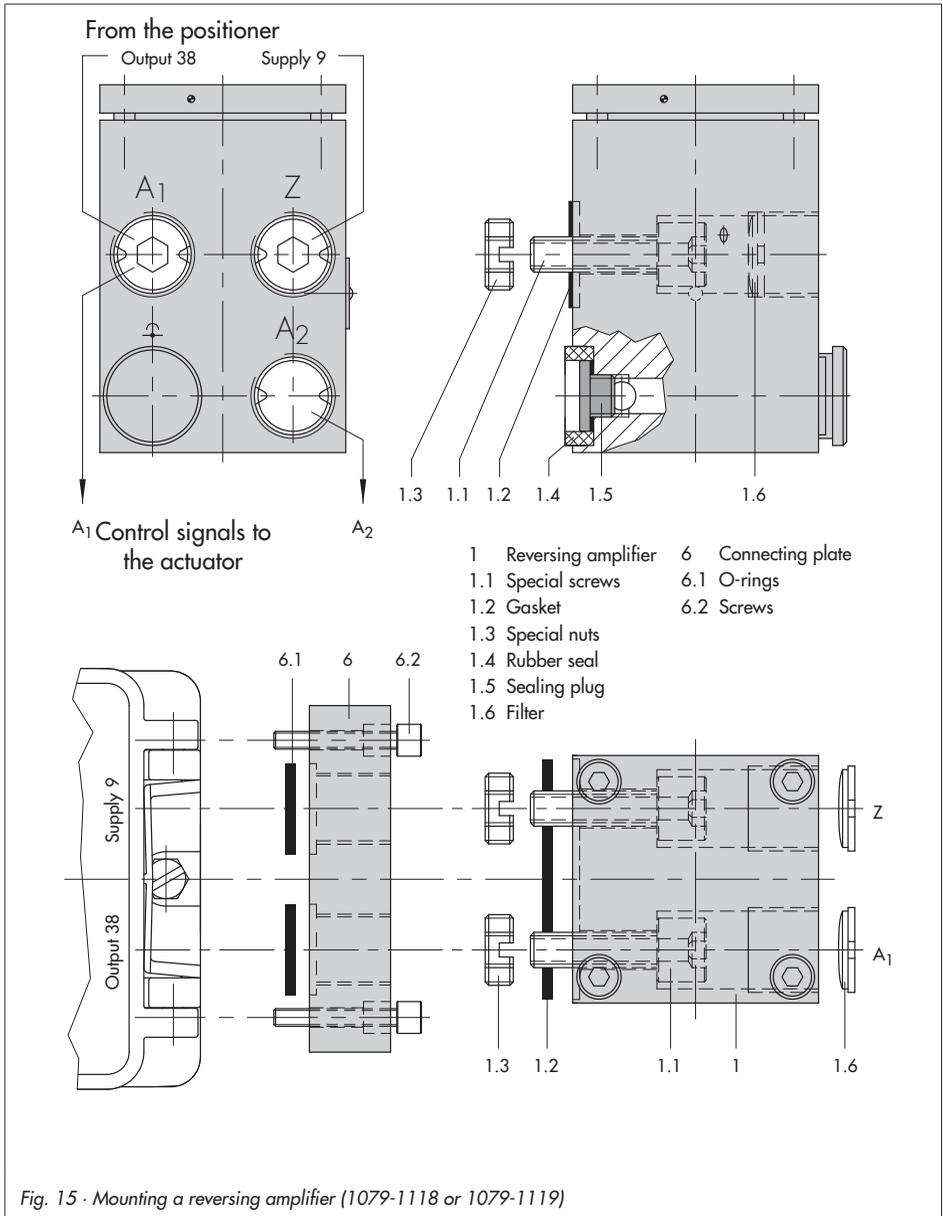
6. After the initialization is completed, set Code 16 (Pressure limit) to **No**.

Pressure gauge attachment

The mounting sequence shown in Fig. 15 remains unchanged. Screw a pressure gauge bracket onto the connections **A₁** and **Z**.

Pressure gauge	G ¼	1400-7106
bracket:	¼ NPT	1400-7107

Pressure gauges for supply air Z and output **A₁** as listed in Tables 1 to 4.



4.7 Attaching an external position sensor

Refer to Table 7 on p. 51 for the mounting parts as well as the accessories required.

In the positioner version with an external position sensor, the sensor placed in a separate housing is attached over a plate or bracket to the control valve. The travel pick-off corresponds to that of a standard device.

The positioner unit can be mounted as required to a wall or a pipe.

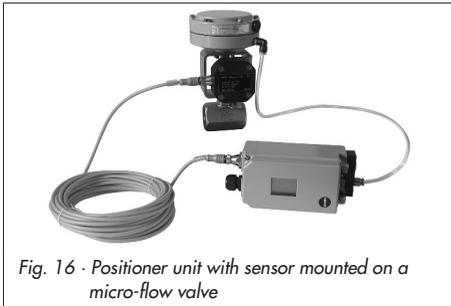


Fig. 16 · Positioner unit with sensor mounted on a micro-flow valve

For the pneumatic connection either a connecting plate (6) or a pressure gauge bracket (7) must be fixed to the housing, depending on the accessory chosen. Make sure the seal rings (6.1) are correctly inserted (see Fig. 6, bottom right).

For the electrical connection a 10 meter connecting lead with M12x1 connectors is included in the scope of delivery.

Note:

- In addition, the instructions in sections 5.1 and 5.2 apply for the pneumatic and electrical connection.

Operation and setting are described in sections 7 and 8.

- Since 2009, the back of the position sensor (20) is fitted with two pins acting as mechanical stops for the lever (1). If this position sensor is mounted using old mounting parts, two corresponding $\varnothing 8$ mm holes must be drilled into the mounting plate/bracket (21). A template is available for this purpose. Refer to Table 6 on page 51.

4.7.1 Mounting the position sensor with direct attachment

Type 3277-5 Actuator with 120 cm²

The signal pressure from the positioner is routed over the signal pressure connection of the connecting plate (9, Fig. 17 left) to the actuator diaphragm chamber. To proceed, first screw the connecting plate (9) included in the accessories onto the actuator yoke.

- ▶ Turn the connecting plate (9) so that the correct symbol for the fail-safe position "Actuator stem extends" or "Actuator stem retracts" is aligned with the marking (Fig. 17, below).
- ▶ Make sure that the gasket for the connecting plate (9) is correctly inserted.
- ▶ The connecting plate has boreholes with NPT and G threads.
Seal the threaded connection that is not used with the rubber seal and square plug.

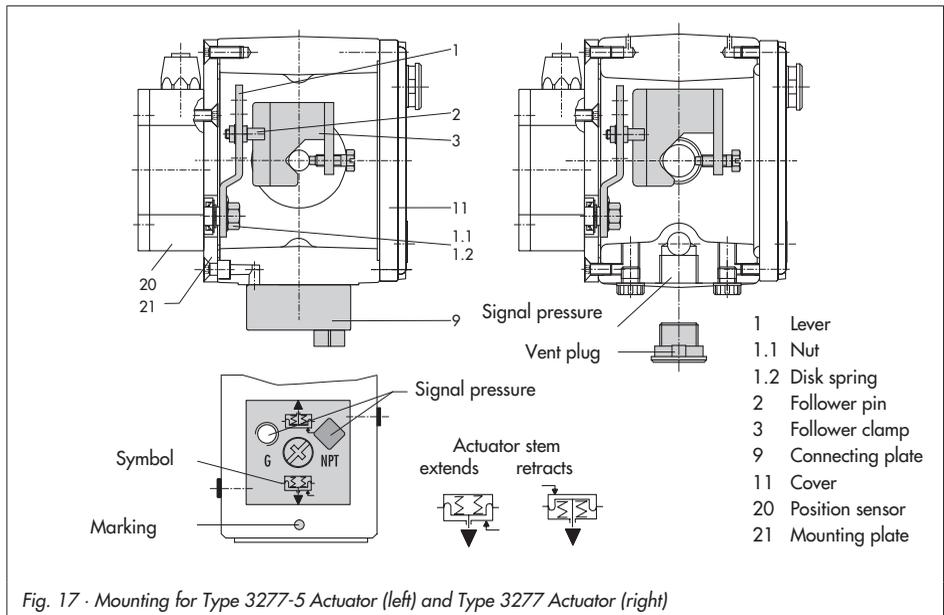
Type 3277 Actuator with 175 to 750 cm²:

The signal pressure is routed to the connection at the side of the actuator yoke for the

version "Actuator stem extends". For the fail-safe position "Actuator stem retracts" the connection on the top diaphragm case is used. The connection at the side of the yoke must be fitted with a venting plug (accessories).

Mounting the position sensor

- Place the lever (1) on the sensor in mid-position and hold it in place. Unthread the nut (1.1) and remove the lever together with the disk spring (1.2) from the sensor shaft.
- Screw the position sensor (20) onto the mounting plate (21).
- Depending on the actuator size and rated valve travel, determine the required lever and position of the follower
- Place the lever (1) and disk spring (1.2) on the sensor shaft. Place the lever (1) **in mid-position and hold it in place**. Screw on the nut (1.1).
- Place the follower clamp (3) on the actuator stem, align and fasten it, making sure that the fastening screw rests in the groove of the actuator stem.
- Place the mounting plate (21) together with the sensor onto the actuator yoke so that the follower pin (2) rests on the top



of the follower clamp (3). It must rest on it with spring force.

Screw tight the mounting plate (21) onto the actuator yoke using both fixing screws.

7. Mount cover (11) on the other side. Make sure that the vent plug points downwards when the control valve is installed to allow any condensed water that collects to drain off.

4.7.2 Mounting the position sensor with attachment according to IEC 60534-6

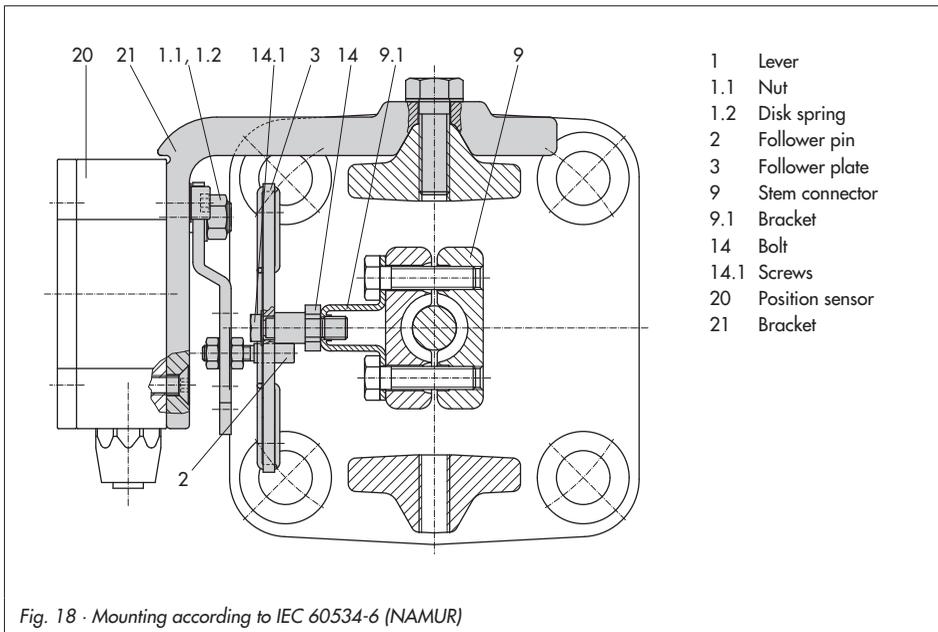
For the required mounting parts and the accessories, refer to Table 7 on page 51.

1. Place the lever (1) on the sensor in **mid-position** and **hold it in place**. Unthread the nut (1.1) and remove the lever together with the disk spring (1.2) from the sensor shaft.
2. Screw the position sensor (20) onto the bracket (21).

The standard attached lever **M** with the follower pin (2) at position **35** is designed for 120, 240 and 350 cm² actuators with 15 mm rated travel.

For other actuator sizes or travels, select the lever and pin position from the travel table on page 19. Lever **L** and **XL** are included in the mounting kit.

3. Place the lever (1) and disk spring (1.2) on the sensor shaft.



- Place the lever (1) **in mid-position** and **hold it in place**. Screw on the nut (1.1).
- Screw both bolts (14) to the bracket (9.1) of the stem connector (9). Attach the follower plate (3) and fix with the screws (14.1).
 - Place the bracket with the sensor at the NAMUR rib in such a manner that the follower pin (2) rests in the slot of the follower plate (3), then screw the bracket using its fixing screws onto the valve.

4.7.3 Mounting the position sensor to Type 3510 Micro-flow Valve

For the required mounting parts and the accessories, refer to Table 7 on page 51.

- Place the lever (1) **in mid-position** and **hold it in place**. Unscrew the nut (1.1)
- and remove the standard attached lever **M** (1) together with the disk spring (1.2) from the sensor shaft.
- Screw the position sensor (20) onto the bracket (21).
- Select the lever **S** (1) from the accessories and screw the follower pin (2) into the hole for pin position **17**. Place the lever (1) and disk spring (1.2) on the sensor shaft.
- Place the lever (1) in mid-position and hold it in place. Screw on the nut (1.1).
- Place the follower clamp (3) on the stem connector, align it at a right angle and screw tight.
- Position the bracket (21) with the position sensor on the valve yoke and screw tight, making sure the follower pin (2) slides into the groove of the follower clamp (3).

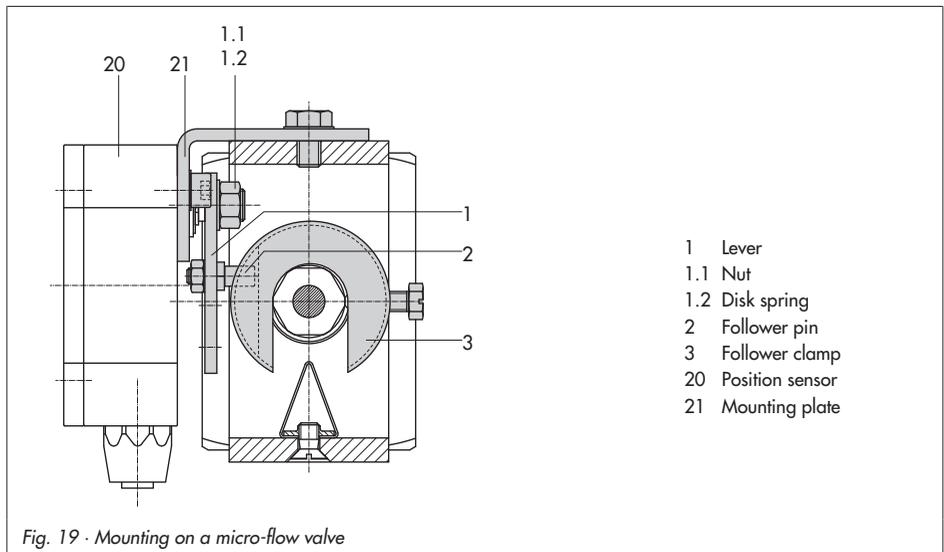


Fig. 19 · Mounting on a micro-flow valve

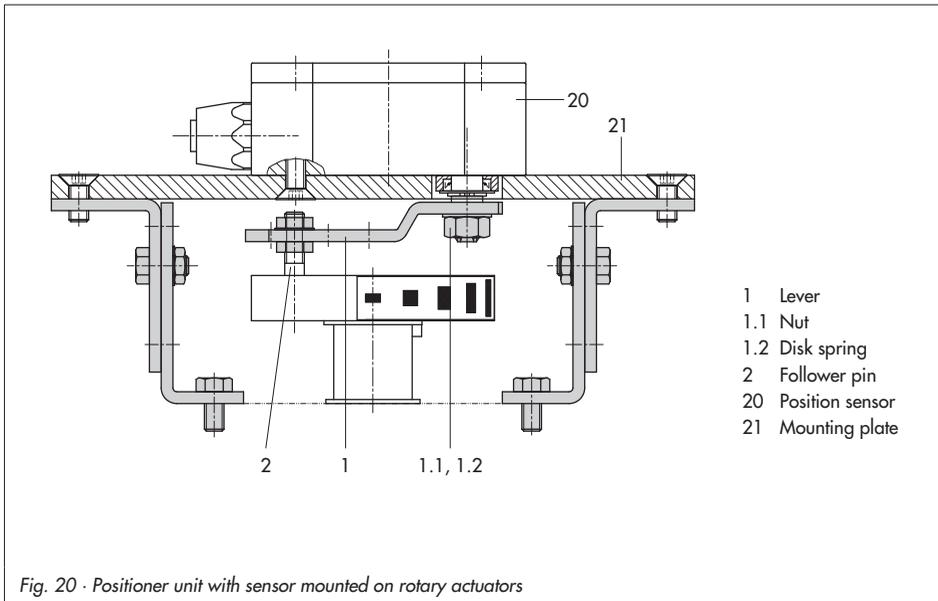
4.7.4 Mounting the position sensor to rotary actuators

For the required mounting parts and the accessories, refer to Table 7 on page 51.

1. Place the lever (1) **in mid-position** and **hold it in place**. Unscrew the nut (1.1) and remove the standard attached lever **M** (1) together with the disk spring (1.2) from the sensor shaft.
2. Screw the position sensor (20) onto the mounting plate (21).
3. Replace the follower pin (2) normally attached to the lever (1) with the metal follower pin ($\varnothing 5$) from the accessories and screw it into the hole for pin position 90° .

4. Place the lever (1) and disk spring (1.2) on the sensor shaft.
Place the lever (1) **in mid-position** and **hold it in place**. Screw on the nut (1.1).

Follow the instructions describing attachment to the standard positioner in section 4.5. Instead of the positioner, attach the position sensor (20) with its mounting plate (21).



4.8 Mounting the leakage sensor

Normally, the control valve is delivered with positioner and leakage sensor already mounted.

If the leakage sensor is mounted after the valve has been installed or it is mounted onto another control valve, proceed as described in following.

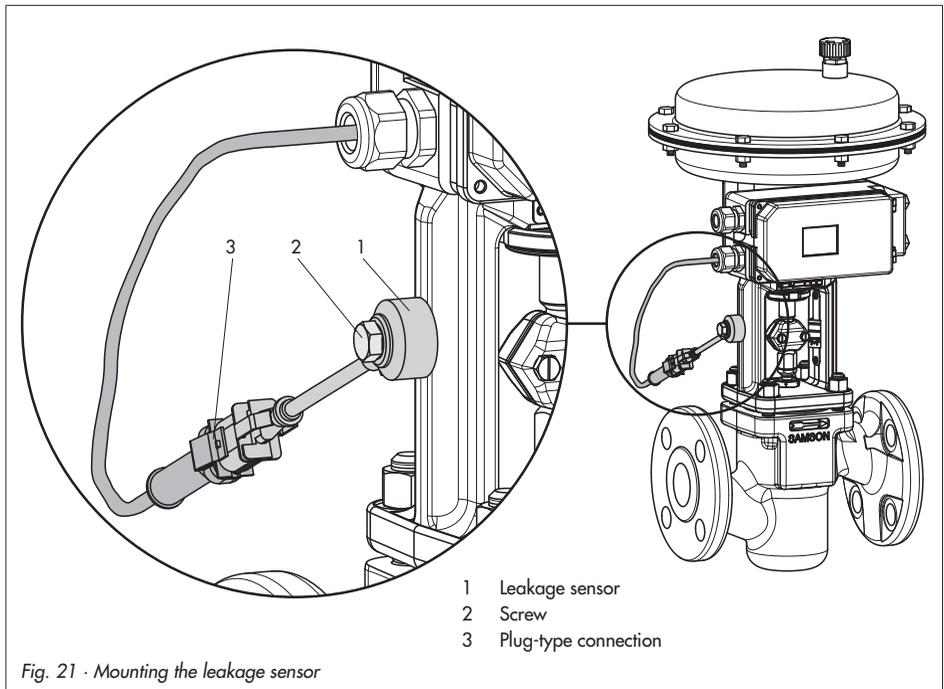
NOTICE

Fasten the leakage sensor using a torque of 20 ± 5 Nm.

The hole with M8 thread on the NAMUR rib should preferably be used to mount the sensor (Fig. 21).

Note: If the positioner was mounted directly onto the actuator (integral attachment), the NAMUR interfaces on either side of the valve yoke can be used to mount the leakage sensor.

The start-up of the leakage sensor is described in detail in the Operating Instructions EB 8389 EN on EXPERTplus Valve Diagnostics.



4.9 Attaching positioners with stainless steel housings

Positioners with stainless steel housings require mounting parts that are completely made of stainless steel or free of aluminum.

Note: *The pneumatic connecting plate and pressure gauge bracket are available in stainless steel (order numbers listed below). The Type 3710 Pneumatic Reversing Amplifier is also available in stainless steel.*

Connecting plate (stainless steel):	G ¼ ¼ NPT	1400-7476 1400-7477
Pressure gauge bracket (st. steel):	G ¼ ¼ NPT	1402-0265 1400-7108

The Tables 1 to 6 (pages 47 to 51) apply for attaching positioners with stainless steel housings with the following restrictions:

Direct attachment

All mounting kits from Tables 1 and 2 can be used. The connection block is not required. The stainless steel version of the pneumatic connecting plate routes the air internally to the actuator.

Attachment according to IEC 60534-6 (NAMUR rib or attachment to rod-type yokes)

All mounting kits from Table 3 can be used. Connecting plate in stainless steel.

Attachment to rotary actuators

All mounting kits from Table 4 can be used except for the heavy-duty version. Connecting plate in stainless steel.

4.10 Air purging function for single-acting actuators

The exhaust air from the positioner is diverted to the actuator spring chamber to provide corrosion protection inside the actuator. The following must be observed:

Direct attachment to Type 3277-5 (stem extends FA/stem retracts FE)

The air purging function is automatically provided.

Direct attachment to Type 3277, 240 to 700 cm²

FA: Remove the stopper 12.2 (Fig. 5 on page 23) at the connection block and make a pneumatic connection to the spring chamber on the vented side.

NOTICE

The method described does not apply to old connection blocks in powder-paint-coated aluminum.

In this case, follow the instructions for attachment described below in "Attachment acc. to IEC 60534-6 (NAMUR rib or attachment to rod-type yokes) and to rotary actuators".

FE: The air purging function is automatically provided.

Attachment acc. to IEC 60534-6 (NAMUR rib or attachment to rod-type yokes) and to rotary actuators

The positioner requires an additional port for the exhaust air that can be connected

over piping. An adapter available as an accessory is used for this purpose:

Threaded bushing G ¼	0310-2619
(M20 x 1.5): ¼ NPT	0310-2550

NOTICE

The adapter uses one of the M20 x 1.5 connections in the housing which means **just one cable gland can be installed.**

Should other valve accessories be used which vent the actuator (e.g. solenoid valve, volume booster, quick exhaust valve), this exhaust air must also be included in the purging function. The connection over the adapter at the positioner must be protected with a check valve, e.g. check valve G ¼ (order no. 8502-0597) mounted in the piping. Otherwise the pressure in the positioner housing would rise above the ambient pressure and damage the positioner when the exhausting components respond suddenly.

4.11 Mounting parts and accessories

Table 1 · Direct attachment to Type 3277-5 Actuator (Fig. 4)		Order no.	
Mounting parts	Standard version for actuators up to 120 cm ²	1400-7452	
	Version compatible with paint for actuators up to 120 cm ²	1402-0940	
Accessories for the actuator	Switchover plate old for Actuator Type 3277-5xxxxxx. 00 (old)	1400-6819	
	Switchover plate new for Actuator Type 3277-5xxxxxx. 01 (new)	1400-6822	
	Connecting plate new for Actuator Type 3277-5xxxxxx. 01 (new) ¹⁾ : G ⅝ and ⅜ NPT	1400-6823	
	Connecting plate old for Actuator Type 3277-5xxxxxx. 00 (old): G ⅝	1400-6820	
	Connecting plate old for Actuator Type 3277-5xxxxxx. 00 (old): ⅜ NPT	1400-6821	
Accessories for the positioner	Connecting plate (6)	G ¼	1400-7461
		¼ NPT	1400-7462
	Pressure gauge bracket (7)	G ¼	1400-7458
		¼ NPT	1400-7459
	Pressure gauge mounting kit (8) up to max. 6 bar (output and supply)	Stainless steel/brass	1400-6950
		Stainless steel/st. steel	1400-6951

¹⁾ Only new switchover and connecting plates can be used with new actuators (Index 01). Old and new plates are **not** interchangeable.

Table 2 · Direct attachment to Type 3277 (Fig. 5)		Order no.				
Mounting parts	Standard version for actuators with 175, 240, 350, 355, 700, 750 cm ²	1400-7453				
	Version compatible with paint for actuators with 175, 240, 350, 355, 700, 750 cm ²	1402-0941				
Accessories	Required piping with screw fitting – for "Actuator stem retracts" – with air purging of the top diaphragm chamber	175 cm ²	Steel	G ¼ / G ⅜	1402-0970	
				¼ NPT / ⅜ NPT	1402-0976	
			Stainl. steel	G ¼ / G ⅜	1402-0971	
				¼ NPT / ⅜ NPT	1402-0978	
			240 cm ²	Steel	G ¼ / G ⅜	1400-6444
					¼ NPT / ⅜ NPT	1402-0911
		Stainl. steel		G ¼ / G ⅜	1400-6445	
				¼ NPT / ⅜ NPT	1402-0912	
		350 cm ²		Steel	G ¼ / G ⅜	1400-6446
					¼ NPT / ⅜ NPT	1402-0913
			Stainl. steel	G ¼ / G ⅜	1400-6447	
				¼ NPT / ⅜ NPT	1402-0914	
			355 cm ²	Steel	G ¼ / G ⅜	1402-0972
					¼ NPT / ⅜ NPT	1402-0979
		Stainl. steel		G ¼ / G ⅜	1402-0973	
				¼ NPT / ⅜ NPT	1402-0980	
		700 cm ²		Steel	G ¼ / G ⅜	1400-6448
					¼ NPT / ⅜ NPT	1402-0915
			Stainl. steel	G ¼ / G ⅜	1400-6449	
				¼ NPT / ⅜ NPT	1402-0916	
			750 cm ²	Steel	G ¼ / G ⅜	1402-0974
					¼ NPT / ⅜ NPT	1402-0981
		Stainl. steel		G ¼ / G ⅜	1402-0975	
				¼ NPT / ⅜ NPT	1402-0982	
		Connection block with seals and screw		G ¼	1400-8819	
				¼ NPT	1400-8820	
		Pressure gauge mounting kit (8) up to max. 6 bar (output/supply)		Steel/brass	1400-6950	
				St. steel/St. steel	1400-6951	

Table 3 · Attachment to NAMUR ribs or control valves with rod-type yokes (20 to 35 mm rod diameter) according to IEC 60534-6 (Figs. 6 and 10)			Order no.
Travel in mm	Lever	For actuators	
7.5	S	Type 3271-5 Actuator with 60/120 cm ² on Type 3510 Valve (Fig. 10)	1402-0478
5 to 50	M ¹⁾	Actuators from other manufacturers and Type 3271 with 120 to 750 cm ²	1400-7454
14 to 100	L	Actuators from other manufacturers and Type 3271, versions 1000 and 1400-60	1400-7455
40 to 200	XL	Actuators from other manufacturers and Type 3271, versions 1400-120 and 2800 cm ² with 120 mm travel	1400-7456
30 or 60	L	Type 3271, versions 1400-120 and 2800 cm ² (30 or 60 mm travel)	1400-7466
		Mounting bracket for Emerson and Masoneilan linear actuators; a mounting kit acc. to IEC 60534-6 is necessary depending on the travel (see above)	1400-6771
		Valtek Type 25/50	1400-9554
Accessories	Connecting plate (6)	G ¼	1400-7461
		¼ NPT	1400-7462
	Pressure gauge bracket (7)	G ¼	1400-7458
		¼ NPT	1400-7459
	Pressure gauge mounting kit (8) up to max. 6 bar (output/supply)	St. st./Brass	1400-6950
		St. steel/St. st.	1400-6951

¹⁾ Lever M is mounted on the standard positioner (included in the scope of delivery)

Table 4 · Attachment according to VDI/VDE 3847 (Figs. 7 and 9)		Order no.
Type 3730-3xxxxxxxx0x0070xx Electropneumatic Positioner with VDI/VDE 3847 interface		
Mounting parts	Interface adapter	1402-0257
	Mounting kit for attachment to SAMSON Type 3277	1402-0868
	Mounting kit for attachment to SAMSON Type 3271 or non-SAMSON actuators	1402-0869
	Travel pick-off for valve travel up to 100 mm	1402-0177
	Travel pick-off for 100 to 200 mm valve travel (SAMSON Type 3271 only)	1402-0178

Table 5 · Attachment to rotary actuators (Figs. 11 and 12)			Order no.
Mounting parts	Attachment acc. to VDI/VDE 3845 (September 2010), refer to section 15.1 for details		
	Actuator surface corresponds to level 1		
	Size AA1 to AA4, version with CrNiMo steel bracket		1400-7448
	Size AA1 to AA4, heavy-duty version		1400-9244
	AA5, heavy-duty version (e.g. Air Torque 10 000)		1400-9542
	Bracket surface corresponds to level 2, heavy-duty version		1400-9526
	Attachment for rotary actuators with max. 180° angle of rotation, level 2		1400-8815 and 1400-9873
	Attachment for SAMSON Type 3278 with 160/320 cm ² , CrNiMo steel bracket		1400-7614
Accessories	Attachment for SAMSON Type 3278 with 160 cm ² and for VETEC Type S160, Type R and Type R, heavy-duty version		1400-9245
	Attachment for SAMSON Type 3278 with 320 cm ² and for VETEC Type S320, heavy-duty version		1400-5891 and 1400-9526
	Attachment to Camflex II		1400-9120
	Connecting plate (6)	G ½	1400-7461
		¼ NPT	1400-7462
	Pressure gauge bracket (7)	G ½	1400-7458
¼ NPT		1400-7459	
Pressure gauge mounting kit up to max. 6 bar (output/supply)	St. steel/brass	1400-6950	
	St. steel/st. steel	1400-6951	

Table 6 · General accessories			Order no.
Accessories	Pneumatic reversing amplifier for double-acting actuators		Type 3710
	Cable gland M20 x 1.5	Black plastic (6 to 12 mm clamping range)	8808-1011
		Blue plastic (6 to 12 mm clamping range)	8808-1012
		Nickel-plated brass (6 to 12 mm clamping range)	1890-4875
		Nickel-plated brass (10 to 14 mm clamping range)	1922-8395
		Stainless steel 1.4305 (8 to 14.5 mm clamping range)	8808-0160
	Adapter M20 x 1.5 to ½ NPT	Aluminum, powder paint coated	0310-2149
		Stainless steel	1400-7114
	Retrofit kit for inductive limit switch 1x SJ 2-SN		1400-7460
	Cover plate with list of parameters and operating instructions	German/English (standard)	1990-0761
English/Spanish		1990-3100	
English/French		1990-3142	

Table 6 - General accessories		Order no.
Accessories	TROVIS-VIEW with device module 3730-3	
	Serial interface adapter (SAMSON SSP interface - RS-232 port on computer)	1400-7700
	Isolated USB interface adapter (SAMSON SSP interface - USB port on computer) including TROVIS-VIEW CD-ROM	1400-9740

Table 7 - Attachment of external position sensor		Order no.	
Direct attachment	Template for mounting the position sensor on older mounting parts. See note on page 41.	1060-0784	
	Mounting parts for actuators with 120 cm ² see Fig. 17 left	1400-7472	
	Connecting plate (9, old) for Actuator Type 3277-5xxxxx.00	G 1/8	1400-6820
		1/8 NPT	1400-6821
	Connecting plate (new) for Actuator Type 3277-5xxxxx.01 (new) ¹⁾		1400-6823
Mounting parts for actuators with 240, 350, 355 and 700 cm ² , see Fig. 17 right		1400-7471	
NAMUR attachmt.	Mounting parts for attachment to NAMUR rib with lever L and XL, see Fig. 18	1400-7468	
Attachment to Type 3510 Micro-flow Valve	Mounting parts for Type 3271 Actuator with 60 cm ³ , see Fig. 19	1400-7469	
Attachment to rotary actuators	VDI/VDE 3845 (September 2010), refer to section 15.1 for details		
	Actuator surface area corresponds to level 1		
	Size AA1 to AA4 with follower clamp and coupling wheel, version with CrNiMo steel bracket, see Fig. 20	1400-7473	
	Size AA1 to AA4, heavy-duty version	1400-9384	
	Size AA5, heavy-duty version (e.g. Air Torque 10 000)	1400-9992	
	Bracket surface area corresponds to level 2, heavy-duty version	1400-9974	
	SAMSON Type 3278 with 160 cm ² (also for VETEC Type S160 and Type R), heavy-duty version	1400-9385	
	SAMSON Type 3278 with 320 cm ² and for VETEC Type S320, heavy-duty version	1400-5891 and 1400-9974	
Accessories for positioner	Connecting plate (6)	G 1/4	1400-7461
		1/4 NPT	1400-7462
	Pressure gauge bracket (7)	G 1/4	1400-7458
		1/4 NPT	1400-7459
	Pressure gauge mounting kit up to max. 6 bar (output/supply)	St. steel/brass	1400-6950
		St. steel/st. steel	1400-6951
Bracket to mount the positioner on a wall Note: The other fastening parts are to be provided at the site of installation as wall foundations vary from site to site.		0309-0111	

¹⁾ Only new switchover and connecting plates can be used with new actuators (Index 01). Old and new plates are **not** interchangeable.

5 Connections

WARNING!

Mount the positioner, keeping the following sequence:

1. Remove protective film from pneumatic connections.
2. Mount the positioner on the control valve
3. **Connect the supply air**
4. **Connect the electrical power**
5. Perform the start-up settings

The connection of the electrical auxiliary power may cause the actuator stem to move, depending on the operating mode.

Do not touch the actuator stem or obstruct it to avoid risk of injury to hands or fingers.

5.1 Pneumatic connections

NOTICE

Follow the instructions below to avoid damaging the positioner.

- *The threaded connections in the positioner housing are not designed for direct air connection!*
- *The screw fittings must be screwed into the connecting plate, the pressure gauge mounting block or the connection block from the accessories.*
The air connections are optionally designed as a bore with 1/4 NPT or G 1/4 thread. The customary fittings for metal and copper pipes or plastic hoses can be used.
- *The supply air must be dry and free from oil and dust. The maintenance instructions for upstream pressure reducing stations must be observed.*

Blow through all air pipes and hoses thoroughly prior to connecting them.

If the positioner is attached directly to the Type 3277 Actuator, the connection of the positioner's output pressure to the actuator is fixed. For attachment according to IEC 60534-6 (NAMUR), the signal pressure can be routed to either the top or bottom diaphragm chamber of the actuator, depending on the actuator's fail-safe action "Actuator stem extends" or "Actuator stem retracts".

For rotary actuators, the manufacturer's specifications for connection apply.

5.1.1 Signal pressure gauges

To monitor the supply air (Supply) and signal pressure (Output), we recommend that pressure gauges be attached (see accessories in Tables 1 to 5).

5.1.2 Supply pressure

The required supply air pressure depends on the bench range and the actuator's operating direction (fail-safe action).

The bench range is registered on the nameplate either as spring range or signal pressure range depending on the actuator. The direction of action is marked **FA** or **FE**, or by a symbol.

Actuator stem extends FA (Air to open)

Fail-safe position "Valve Closed"
(for globe and angle valves):

Required supply pressure = Upper bench range value + 0.2 bar, minimum 1.4 bar.

Actuator stem retracts FE (Air to close)

Fail-safe position "Valve Open"
(for globe and angle valves):

For tight-closing valves, the maximum signal pressure $p_{st_{max}}$ is roughly estimated as follows:

$$p_{st_{max}} = F + \frac{d^2 \cdot \pi \cdot \Delta p}{4 \cdot A} \text{ [bar]}$$

d = Seat diameter [cm]

Δp = Differential pressure across the valve
[bar]

A = Actuator diaphragm area [cm²]

If there are no specifications, calculate as follows:

Required supply pressure =
Upper bench range value + 1 bar.

5.1.3 Signal pressure (output)

The signal pressure at the output (Output 38) of the positioner can be limited to 1.4, 2.4 or 3.7 bar in Code 16.

The limitation is not activated [No] by default.

5.2 Electrical connections



DANGER!
Risk of electric shock and/or the formation of an explosive atmosphere!

- For electrical installation, observe the relevant electrotechnical regulations and the accident prevention regulations that apply in the country of use.
- The following regulations apply to mounting and installation in hazardous areas: EN 60079-14: 2008 **Explosive atmospheres – Part 14: Electrical installations design, selection and erection** (or VDE 0165 Part 1).

NOTICE

- Adhere to the terminal assignment! Switching the assignment of the electrical terminals may cause the explosion protection to become ineffective!
- Do not loosen enameled screws in or on the housing.
- The maximum permissible values specified in the national EC type examination certificates apply when interconnecting intrinsically safe electrical equipment (U_i or U_o ; I_i or I_o ; P_i or P_o ; C_i or C_o , and L_i or L_o).

Selecting cables and wires:

Observe **Clause 12 of EN 60079-14: 2008** when installing intrinsically safe circuits. The Subclause 12.2.2.7 applies when running multi-core cables containing more than one intrinsically safe circuit.

In particular, the radial thickness of the conductor insulation for common insulation materials, such as polyethylene, must have a minimum radial thickness of 0.2 mm.

The diameter of an individual wire in a fine-stranded conductor must not be smaller than 0.1 mm. Protect the conductor ends against splicing, e.g. by using wire-end ferrules.

When two separate cables are used for connection, an additional cable gland can be installed.

Seal cable entries left unused with plugs.

Devices used at ambient temperatures **below $-20\text{ }^{\circ}\text{C}$** must be fitted with metal cable glands.

Equipment for use in zone 2/zone 22

In equipment operated with type of protection Ex nA II (non-sparking equipment) according to EN 60079-15: 2003, circuits may be connected, interrupted or switched while energized only during installation, maintenance or repair.

Equipment connected to energy-limited circuits with type of protection Ex nL (energy-limited equipment) according to EN 60079-15: 2003 may be switched under normal operating conditions.

The maximum permissible values specified in the Statement of Conformity or its addenda apply when interconnecting the equipment with energy-limited circuits in type of protection Ex nL IIC.

Cable entries

The cable entry with M20 x 1.5 cable gland, 6 to 12 mm clamping range.

There is a second M20 x 1.5 threaded bore in the housing that can be used for additional connection, when required.

The screw terminals are designed for wire cross-sections of 0.2 to 2.5 mm². Tighten by at least 0.5 Nm.

The wires for the reference variable must be connected to the terminals 11 and 12 located in the housing. Only use a **current source**!

If the reference variable exceeds 22 mA, **OVERLOAD** appears on the display to warn the user.

NOTICE

The wrong connection of a voltage source of just around 7 V (or around 2 V when connected to the wrong pole) by mistake can damage the positioner.

In general, it is not necessary to connect the positioner to a bonding conductor. Should this be required, however, this conductor can be connected inside the device.

Depending on the version, the positioner is equipped with inductive limit switches and/or a solenoid valve.

The position transmitter is operated on a two-wire circuit. The usual supply voltage is 24 V DC. Considering the resistance of the supply leads, the voltage at the position transmitter terminals can be between 12 V and 30 V DC.

Refer to Fig. 22 or the label on the terminal strip for terminal assignment.

NOTICE

The minimum reference variable should not fall below 3.8 mA for operating the positioner.

Accessories:

Cable gland M20 x 1.5	Order no.
Black plastic (6 to 12 mm clamping range)	8808-1011
Blue plastic (6 to 12 mm clamping range)	8808-1012
Nickel-plated brass (6 to 12 mm clamping range)	1890-4875
Nickel-plated brass (10 to 14 mm clamping range)	1922-8395
Stainless steel 1.4305 (8 to 14.5 mm clamping range)	8808-0160

Adapter M20 x 1.5 to ½ NPT

Aluminum, powder paint coated	0310-2149
Stainless steel	1400-7114

5.2.1 Switching amplifiers

For operation of the limit switches, switching amplifiers must be connected in the output circuit. To ensure the operating reliability of the positioner, the amplifiers should comply with the limit values of the output circuits conforming to EN 60947-5-6.

If the positioner is to be installed in hazardous areas, the relevant regulations must be observed.

For applications in safe areas (non-hazardous areas), limit switches can be directly interconnected to the binary input of the PLC in accordance with IEC 61131. This applies to the standard operating range for digital inputs according to Clause 5.2.1.2 of IEC 61131-2 with the rated voltage of 24 V DC.

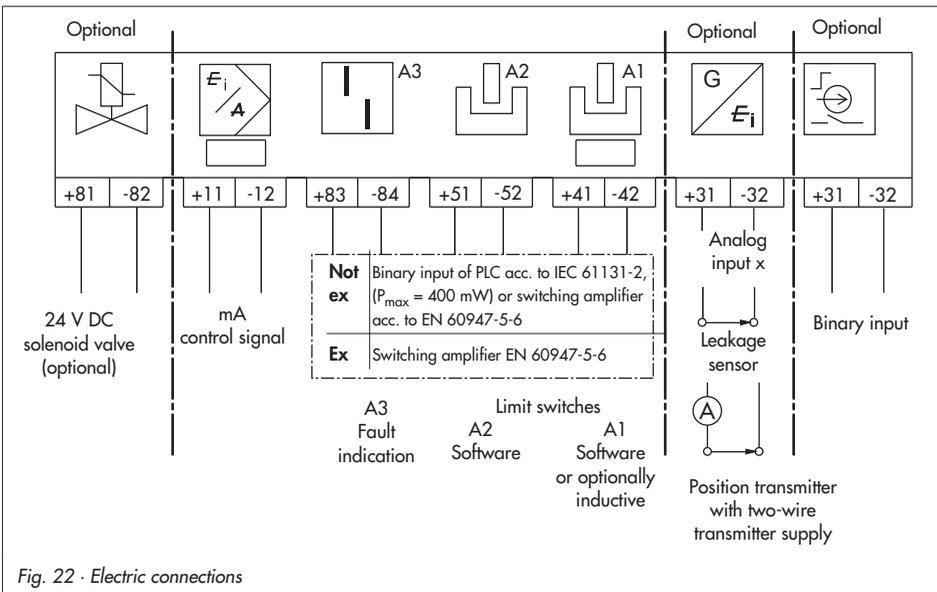


Fig. 22 · Electric connections

5.2.2 Establishing communication

Communication between PC and positioner (via FSK modem or handheld communicator, if necessary, using an isolation amplifier) is based on the HART protocol.

Type Viator FSK modem

RS 232	not ex.	Order no. 8812-0130
PCMCIA	not ex.	Order no. 8812-0131
USB	not ex.	Order no. 8812-0132

If the supply voltage of the controller or control station becomes too low because it has been reduced by the load in the circuit, an isolation amplifier is to be connected between controller and positioner (interfacing

as for positioner connected in hazardous areas, see Fig. 23).

If the positioner is used in hazardous areas, an explosion-protected isolation amplifier is to be used.

By means of the HART protocol, all control room and field devices connected in the loop are individually accessible through their address via point-to-point or standard bus (Multidrop).

Point-to-point:

The bus address/polling address must always be set to zero (0).

Standard bus (Multidrop):

In the standard bus (Multidrop) mode, the positioner follows the analog current signal

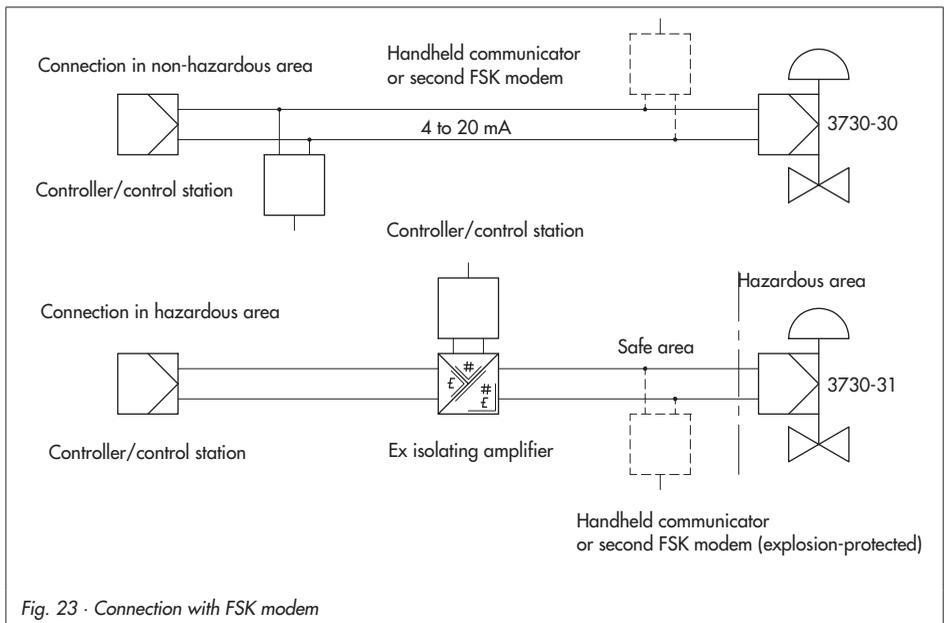


Fig. 23 · Connection with FSK modem

(reference variable) as for point-to-point communication. This operating mode is, for example, suitable for split-range operation of positioners (series connection). The bus address/polling address has to be within a range of 1 to 15.

Note:

Communication errors may occur when the process controller/control station output is not HART-compatible.

For adaptation, the Z box (order no. 1170-2374) can be installed between output and communication interface.

At the Z box a voltage of 330 mV is released (16.5 Ω at 20 mA).

Alternatively, a 250-Ω resistor can be connected in series and a 22-μF capacitor can be connected in parallel to the analog output. Note that in this case, the controller output load will increase.

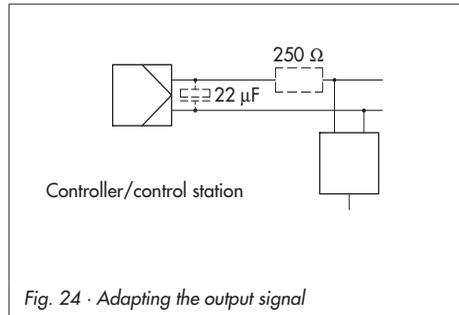


Fig. 24 · Adapting the output signal

6 Operator controls and readings

Rotary pushbutton

The rotary pushbutton is located underneath the front protective cover.

The positioner is operated on site using the rotary pushbutton:

Turn  to select codes and values.

Press  to confirm setting.

Slide switch AIR TO OPEN or AIR TO CLOSE

- ▶ AIR TO OPEN applies when the increasing signal pressure opens the valve
- ▶ AIR TO CLOSE applies when the increasing signal pressure closes the valve

The signal pressure is the air pressure at the output of the positioner which is transferred to the actuator.

For positioners with an attached reversing amplifier for double-acting rotary actuators (section 4.6): switch position AIR TO OPEN.

Volume restriction Q

The volume restriction is used to adapt the air delivery to the actuator size. Two fixed settings are possible depending on how the air is routed at the actuator:

- ▶ For actuators smaller than 240 cm² with a loading pressure connection at the side (Type 3271-5) → MIN SIDE.
- ▶ For a connection at the back (Type 3277-5), → MIN BACK.
- ▶ For actuators 240 cm² and larger, → MAX SIDE for a side connection and to MAX BACK for a connection at the back.

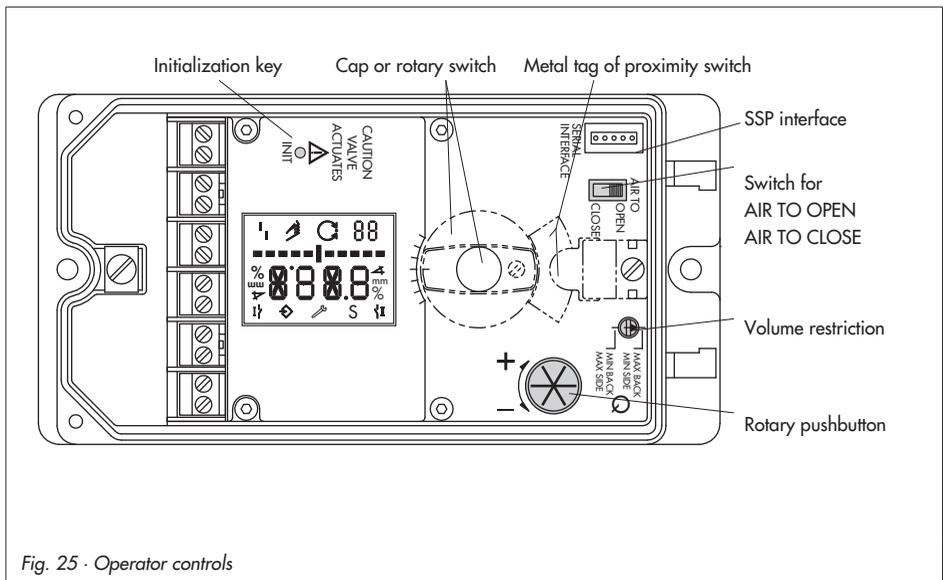


Fig. 25 · Operator controls

Readings on display

Icons appear on the display that are assigned to parameters, codes and functions.

Operating modes:

- ▶  **Manual mode (MAN)**, section 8.2.1
The positioner follows the manual set point (Code 1) instead of the mA signal.
 blinks: The positioner has not yet been initialized. Operation only possible over manual set point (Code 1).
- ▶  **Automatic mode (AUTO)**, section 8.2.1
The positioner is in closed-loop operation and follows the mA signal.
- ▶ **S – SAFE**, section 8.2.2
The positioner vents the output. The valve moves to the mechanical fail-safe position.

Bar elements:

In  manual and  automatic modes, the bars indicate the system deviation that depends on the sign (+/-) and the value. One bar element appears per 1 % system deviation.

If the device has not yet been initialized, the  icon blinks on the display and the lever position in degrees in relation to the longitudinal axis is indicated. One bar element corresponds to approximately a 5° angle of rotation.

If the fifth bar element blinks (reading > 30°), the permissible angle of rotation has been exceeded. Lever and pin position must be checked.

Status alarms

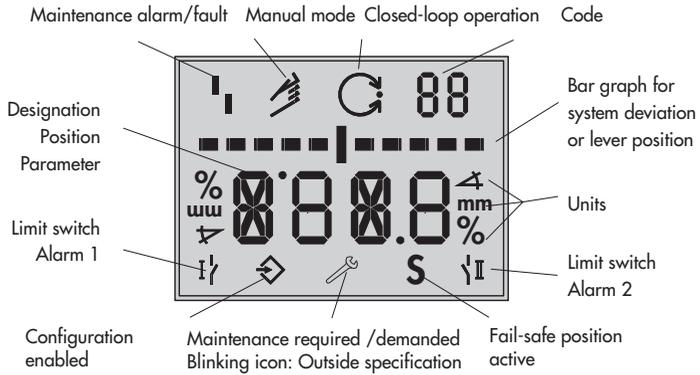
- ▶ : Maintenance alarm
- ▶ : Maintenance required/Maintenance demanded
- ▶  blinking: Outside specification

These icons indicate that an error has occurred.

A classified status can be assigned to each error. Classifications include “No message”, “Maintenance required”, “Maintenance demanded” and “Maintenance alarm”.

Configuration enabled

This indicates that the codes marked with an asterisk (*) in the code list (section 14) are enabled for configuration (see section 8.1).



AUTO	Automatic mode		
CL	Clockwise	↻	Increasing/increasing
CCL	Counterclockwise	↺	Increasing/decreasing
Err	Error		
ESC	Escape	⌚	blinking Emergency mode (see error code 62)
HI	$ix \geq 21.6 \text{ mA}$		
LO	$ix \leq 2.4 \text{ mA}$	⚡	blinking Not initialized
LOW	w too small		
MAN	Manual range	S	blinking Valve in mechanical fail-safe position
MAX	Maximum range		
No	Not available/ Not active		
NOM	Nominal travel		
OVERLOAD	$w > 22 \text{ mA}$		
RES	Reset		
RUN	Start		
SAFE	Fail-safe position		
SUB	Substitute calibration		
!ESinG	Test function active		
TunE	Initialization in progress		
YES	Available/Active		
ZP	Zero calibration		

Fig. 26 · Readings in display

6.1 Serial interface

The positioner must be supplied with at least 4 mA.

The positioner can be connected directly to the PC via the local serial interface and the serial interface adapter.

Use the TROVIS-VIEW software with 3730-3 device module installed. Refer to section for more details.

6.2 HART[®] communication

The positioner must be supplied with at least 4 mA current. The FSK modem must be connected in parallel to the current loop.

A DTM file (Device Type Manager) conforming to the Specification 1.2 is available for communication. This allows the device, for example, to be run with the PACTware operator interface. All the positioner's parameters are then accessible over the DTM and the operator interface.

For start-up and settings, proceed as described in section 7.1 to 7.4. Refer to the code list in section 14 for the parameters necessary for the operator interface.

NOTICE

The write access for HART[®] communication can be disabled over Code 47. You can only disable or enable this function locally at the positioner.

The write access is enabled by default. The on-site operation including the INIT key can be locked over HART[®] communication. The word "HART" then blinks on the display when Code 3 is selected. This locking function can only be disabled over HART[®] com-

munication. On-site operation is enabled by default.

Note:

In the case, complex functions are started in the positioner, which require a long calculation time or lead to a large quantity of data being stored in the volatile memory of the positioner, the alert "busy" is issued by the DTM file.

*This alert is **not a fault alarm** and can simply be confirmed.*

6.2.1 Dynamic HART[®] variables

The HART[®] specification defines four dynamic variables consisting of a value and an engineering unit. These variables can be assigned to device parameters as required. The universal HART[®] command 3 (universal command #3) reads the dynamic variables out of the device. This allows manufacturer-specific parameters to also be transferred using a universal command.

The dynamic variables of Type 3730-3 can be assigned as follows in the DD or TROVIS-VIEW [Settings > Operation unit]:

Assignment of dynamic HART [®] variables		
Variable	Meaning	Unit
Set point		%
Direction of action set point		%
Set point after transit time specification		%
Valve position		%
Set point deviation e		%
Absolute total valve travel		–
Binary input status	0 = Not active 1 = Active 255 = –/–	–
Internal solenoid valve/forced venting status	0 = De-energized 1 = Energized 2 = Not installed	–
Condensed state	0 = No message 1 = Maintenance required 2 = Maintenance demanded 3 = Failure 4 = Out of specification 7 = Function check	–
Temperature		°C
Sound pressure level (leakage sensor)		dB

7 Start-up – Settings

WARNING!

Attach the positioner, keeping the following sequence:

1. Remove protective film from pneumatic connections
2. Mount the positioner on the control valve
3. Connect the supply air
4. Connect the electrical power
5. **Perform the start-up settings**

Reading on display after connecting the electrical auxiliary power:

- ▶ **iESinG** runs across the display and then the fault alarm icon  appears and  blinks on the display when the positioner has **not yet been initialized**. The reading indicates the lever position in degrees in relation to the longitudinal axis.



Reading when the positioner has not yet been initialized

- ▶ If Code **0** appears on the display when a positioner has been **initialized**. The positioner is in the last active operating mode.

WARNING!

The actuator stem moves while the start-up settings are being performed. Do not touch the actuator stem or obstruct it to avoid risk of injury to hands or fingers.

NOTICE

Perform the start-up settings in the same sequence as listed (section 7.1 to section 7.6).

Note: The positioner performs a test in the start-up phase while following its automation task at the same time. During the start-up phase, operation on site is unrestricted, yet write access is limited.

7.1 Defining the valve closed position

To adapt the positioner to the operating direction of the actuator, set slide switch to AIR TO OPEN or AIR TO CLOSE .

- ▶ **AIR TO OPEN** = Signal pressure opens the valve, for fail-safe position: actuator stem extends/fail close
- ▶ **AIR TO CLOSE** = Signal pressure closes the valve, for fail-safe position: actuator stem retracts/fail open.

NOTICE

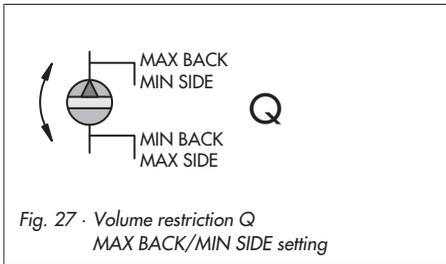
The **AIR TO OPEN (A+O)** setting always applies to double-acting actuators.

For checking purposes:

After successfully completing initialization, the positioner display should read 0 % when the valve is closed and 100 % when the valve is open. If this is not the case, change the slide switch position and re-initialize the positioner.

Note: The switch position is prompted prior to an initialization. After an initialization has been completed, changing the switch position does not have any effect on the operation of the positioner.

7.2 Setting the volume restriction Q



The volume restriction Q is used to adapt the air delivery to the size of the actuator:

- ▶ Actuators with a **transit time < 1 s**, e.g. linear actuators with an effective area smaller than 240 cm², require a restricted air flow rate (MIN).
- ▶ Actuators with a **transit time ≥ 1 s** do not require the air flow rate to be restricted (MAX).

The position of volume restriction Q also depends on how the signal pressure is routed at the actuator in **SAMSON actuators**:

- ▶ The “SIDE” position applies for actuators with a loading pressure connection at the side, e.g. Type 3271-5.
- ▶ The “BACK” position applies for actuators with a loading pressure connection at the back, e.g. in Type 3277-5.

- ▶ The “SIDE” restriction position always applies for actuators from other manufacturers.

Overview · Position of volume restriction Q*

Signal pressure	Transit time	< 1 s	≥ 1 s
	Connection at the side		MIN SIDE
Connection at the back		MIN BACK	MAX BACK

* Intermediate positions are not permitted.

NOTICE

The positioner needs to be initialized again after the position of the restriction has been changed.

7.3 Adapting the display

The data representation on the positioner display can be turned by 180° to adapt it to how the positioner is mounted.



Reading direction for right attachment of pneumatic connections



Reading direction for left attachment of pneumatic connections

If the displayed data appear upside down, proceed as follows:

Turn ⊗ → Code **2**

Press ⊗ → Code **2** blinks.

Turn  → Required direction

Press  to confirm reading direction.

7.4 Limiting the signal pressure

If the maximum actuator force may cause damage to the valve, the signal pressure must be limited.

Enable configuration at the positioner before activating the pressure limit function:

Note: If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.



Configuration enabled
Default: **No**

Turn  → Code **3**, display: **No**

Press  → Code **3** blinks.

Turn  → **YES**

Press  → display 

Limiting the signal pressure:



Pressure limit
Default: **No**

Turn  → Code **16**

Press  → Code **16** blinks.

Turn  until the required pressure limit (1.4/2.4/3.7 bar) appears.

Press  to confirm the pressure limit setting.

7.5 Checking the operating range of the positioner

To check the mechanical attachment and the proper functioning, the valve should be moved through the operating range of the positioner in the  manual operating mode with the manual reference variable.

Selecting manual operating mode:



Operating mode
Default **MAN**

Turn  → Code **0**

Press  → Code **0** blinks.

Turn  → **MAN**

Press . The positioner changes to the  manual operating mode.

Checking the operating range:



Manual reference variable
w (current angle of rotation
is indicated)

Turn  → Code **1**

Press  → Code **1** and  blink.

Turn  until the pressure in the positioner builds up, and the control valve moves to its final positions so that the travel/angle of rotation can be checked.

The angle of rotation on the back of the positioner is indicated. A horizontal lever (mid position) is equal to 0°.

To ensure the positioner is working properly, the outer bar elements may not blink while the valve is moving through the operating range.

Exit Code **1** by pressing the rotary pushbutton (⊕).

The permissible range has been exceeded when the displayed angle is greater than 30°, and the outer right or left bar element blinks.

The positioner changes to the fail-safe position (**SAFE**).

After canceling the fail-safe position (SAFE) (see section 8.2.2) it is **absolutely necessary** to **check** the lever and pin position as described in section 4.

WARNING!

To avoid personal injury or property damage caused by the supply air or electrical auxiliary power, disconnect the supply air and electrical auxiliary power before exchanging the lever or changing the pin position.

7.6 Initialization

WARNING!

During initialization, the control valve moves through its entire travel/angle of rotation range. Therefore, do not start the initialization procedure while a process is running, but only during start-up when all shut-off valves are closed.

Before starting initialization, check the maximum permissible signal pressure of the control valve. During initialization, the positioner issues an output signal pressure up to the maximum supply pressure supplied. If necessary, limit the signal pressure by connecting an upstream pressure reducing valve.

NOTICE

After the positioner has been mounted on to another actuator or its mounting location has been changed and prior to re-initializing the positioner, the positioner needs to be reset to its basic setting (default values). Refer to section 7.8.

During initialization the positioner adapts itself optimally to the friction conditions and the signal pressure demand of the control valve. The type and extent of self-adaptation depends on the set initialization mode:

- ▶ **MAX maximum range** (standard range)
Initialization mode for simple start-up of valves with two clearly defined mechanical end positions, e.g. three-way valves (see section 7.6.1)

- ▶ **NOM nominal range**
Initialization mode for all globe valves (see section 7.6.2)
- ▶ **MAN manually selected range**
Initialization mode for globe valves with an unknown nominal range (see section 7.6.3)
- ▶ **SUB substitute calibration** (emergency mode)
This mode allows a positioner to be replaced while the plant is running, with the least amount of disruption to the plant (see section 7.6.4)

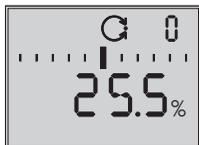
Note: For normal operation, simply start initialization by pressing the INIT key after mounting the positioner on the valve, defining the valve closed position and setting the volume restriction. The positioner only needs to work with its default settings. If necessary, perform a reset (see section 7.8).



Alternating displays
Initialization running
Icon depending on initial-
ization mode selected



Bar graph display
indicating the progress of
the initialization



Initialization successful,
positioner in automatic
operating mode

The time required for an initialization process depends on the transit time of the actuator and may take several minutes.

After a successful initialization, the positioner runs in closed-loop operation indicated by .

A malfunctioning leads to the process being canceled. The initialization error appears on the display according to how it has been classified by the condensed state. See section 8.3.

Note: Positioner with extended EXPERTplus diagnostics automatically start to plot the reference graphs (drive signal steady-state d1 and hysteresis d2) after initialization has been completed. **tEST d1** or **tEST d2** appear on the display in an alternating sequence. An error during the plotting of the reference graphs is indicated by Code **48 - h1** and Code **81**.

The positioner still works properly, even though the reference graph plotting has not been completed successfully.

Valve closed position AIR TO CLOSE

If the slide switch is set to AIR TO CLOSE, the positioner automatically switches to the direction of action increasing/decreasing (\nearrow/\searrow) on successful completion of initialization.

This results in the following assignment between reference variable and valve closed position:

Valve closed position	Direction of action	Valve Closed at Open at	
		Closed at	Open at
AIR TO OPEN	↗↗	0 %	100 %
AIR TO CLOSE	↘↘	100 %	0 %

The tight-closing function is activated.

NOTICE

Set Code 15 (final position w>) to 99 % for three-way valves.

Canceling an initialization process

The initialization procedure can be canceled while running by pressing the rotary pushbutton (⊗). **STOP** appears three seconds long and the positioner then changes to the fail-safe position (SAFE).

Exit the fail-safe position again over Code 0 (see section 8.2.2).

7.6.1 MAX – Initialization based on maximum range

The positioner determines travel/angle of rotation of the closing member from the CLOSED position to the opposite side and adopts this travel/angle of rotation as the operating range from 0 to 100 %.

Enable configuration:

Note: If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.



Default **No**

Turn ⊗ → Code 3, display: **No**

Press ⊗ → Code 3 blinks

Turn ⊗ → **YES**

Press ⊗, display ⊠

Select the initialization mode:



Initialization mode
Default **MAX**

Turn ⊗ → Code 6

Press ⊗

Turn ⊗ → **MAX**

Press ⊗ to confirm the **MAX** as the initialization mode.

Start initialization:

▶ Press INIT key to start initialization!

The nominal travel/angle of rotation is indicated in % after initialization. Code 5 (nominal range) remains locked. The parameters for travel/angle range start (Code 8) and travel/angle range end (Code 9) can also only be displayed and modified in %.

For a reading in mm/°, enter the pin position (Code 4).

Enter the pin position:



Pin position
Default **No**

Turn → Code **4**

Press , Code **4** blinks

Turn → Pin position on lever (see relevant section on attachment)

Press . The reading of the nominal range appears in mm/°.

7.6.2 NOM – Initialization based on nominal range

The calibrated sensor allows the effective valve travel to be set very accurately. During the initialization process, the positioner checks whether the control valve can move through the indicated nominal range (travel or angle) without collision.

If this is the case, the indicated nominal range is adopted with the limits of travel/angle range start (Code **8**) and travel/angle range end (Code **9**) as the operating range.

Note: The maximum possible travel must always be greater than the nominal travel entered. If this is not the case, initialization is interrupted (error alarm Code **52**) because the nominal travel is not achieved.

Enable configuration:

Note: If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.



Default **No**

Turn → Code **3**, display: **No**

Press , Code **3** blinks

Turn → **YES**

Press , display

Enter the pin position and nominal range:



Pin position
Default **No**



Nominal range
(locked with Code **4** = No)

Turn → Code **4**

Press , Code **4** blinks

Turn → Pin position on lever (see relevant section on attachment)

Press .

Turn → Code **5**

Press , Code **5** blinks

Turn  → Nominal travel/angle

Press .

Select the initialization mode:



Initialization mode
Default **MAX**

Turn  → Code **6**

Press , Code **6** blinks

Turn  → **NOM**

Press  to confirm the **NOM** as the initialization mode.

Start initialization:

▶ Press INIT key to start initialization!

Note: After initialization, check the direction of action and, if necessary, change it (Code 7).

7.6.3 MAN – Initialization based on a manually selected range

Before starting initialization, move the control valve manually to the OPEN position by turning  in small steps. The valve must move to the required valve position with a monotonically increasing signal pressure. The positioner calculates the differential travel/angle using the OPEN and CLOSED positions and adopts it as the operating range with limits of travel/angle range start

(Code **8**) and travel/angle range end (Code **9**).

Enable configuration:

Note: If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.



Default **No**

Turn  → Code **3**, display: **No**

Press , Code **3** blinks

Turn  → **YES**

Press , display 

Enter the pin position:



Pin position
Default **No**

Turn  → Code **4**

Press , Code **4** blinks

Turn  → Pin position on lever (see relevant section on attachment)

Press . The reading of the nominal range appears in mm/°.

Select the initialization mode:



Initialization mode
Default **MAX**

Turn → Code **6**

Press , Code **6** blinks

Turn → **MAN**

Press to confirm the **MAN** as the initialization mode.

Enter OPEN position:



Manual reference variable
(the current angle of rotation is displayed)

Turn → Code **0**

Press , Code **0** blinks

Turn → **MAN**

Press .

Turn → Code **1**

Press , Code **1** blinks

Turn until the valve reaches its OPEN position.

Press to confirm the OPEN position.

Start initialization:

▶ Press INIT key to start initialization!

7.6.4 SUB substitute calibration

A complete initialization procedure takes several minutes and requires the valve to move through its entire travel range several times. This initialization mode, however, is an emergency mode, in which the control parameters are estimated and not determined by an initialization procedure. As a result, a high level of accuracy cannot be expected. You should always select a different initialization mode if the plant allows it.

The **SUB** initialization mode is used to replace a positioner while the process is running. For this purpose, the control valve is usually fixed mechanically in a certain position, or pneumatically by means of a pressure signal which is routed to the actuator externally. The blocking position ensures that the plant continues to operate with this valve position.

By entering the blocking position (Code **35**), closing direction (Code **34**), pin position (Code **4**), nominal range (Code **5**) and direction of action (Code **7**), the positioner can calculate the positioner configuration.

NOTICE

Perform a reset before re-initializing the positioner if the substitute positioner has already been initialized. Refer to section 7.8.

Enable configuration:

Note: *If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.*



Default **No**

- Turn → Code **3**, display: **No**
- Press , Code **3** blinks
- Turn → **YES**
- Press , display

Enter the pin position and nominal range:



Default **No**



Nominal range
(locked with Code 4 = No)

- Turn → Code **4**
- Press , Code **4** blinks
- Turn → Pin position on lever (see relevant section on attachment)
- Press .
- Turn → Code **5**
- Press , Code **5** blinks
- Turn → Nominal travel/angle
- Press .

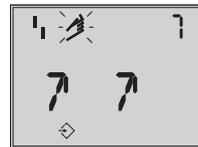
Select the initialization mode:



Initialization mode
Default **MAX**

- Turn → Code **6**
- Press , Code **6** blinks
- Turn → **SUB**
- Press to confirm the **SUB** as the initialization mode.

Enter the direction of action:



Default

- Turn → Code **7**
- Press , Code **7** blinks
- Turn → Direction of action (or)
- Press .

Deactivate travel limit:

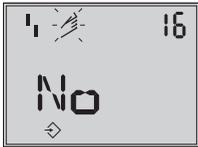


Default **100.0**

- Turn → Code **11**
- Press , Code **11** blinks
- Turn → **No**
- Press .

Change pressure limit and control parameters:

Note: Do not change the pressure limit (Code 16). Only change the control parameters K_P (Code 17) and T_V (Code 18) if the settings of the replaced positioner are known.



Pressure limit
Default **No**



K_P
Default 7



T_V
Default 2

Turn → Code **16/17/18**

Press , Code **16/17/18** blinks

Turn to set the control parameter selected.

Press to confirm the setting.

Enter closing direction and blocking position:



Closing direction
Direction of rotation causing the valve to move to the CLOSED position (view onto positioner display)
Default: CCL (counterclockwise)



Blocking position
Default: 0

Turn → Code **34**

Press , Code **34** blinks

Turn → Closing direction (CCL counterclockwise/CL clockwise)

Press .

Turn → Code **35**

Press , Code **35** blinks

Turn → Blocking position, e.g. 5 mm (read off at travel indicator scale of the blocked valve or measure with a ruler).

Press to confirm the setting.

Define the valve closed position:

- ▶ Set switch for **valve closed position** AIR TO OPEN or AIR TO CLOSE as described in section 7.1 on page 55.
- ▶ Set volume restriction as described in section 7.2 on page 65.

Start initialization:

- ▶ Press INIT key!
The operating mode is changed to **MAN**.
The blocking position is indicated.

Note: As initialization has not been carried out completely, the error code **76** (no emergency mode) and possibly also error code **57** (control loop) may appear on the display.

These alarms do not influence the positioner's readiness for operation.

Cancel the blocking position and change to automatic operating mode

For the positioner to follow its reference variable again, the blocking position must be canceled and the positioner must be set to  automatic operating mode as follows:

Turn  → Code **1**

Press , Code **1** and  blink

Turn  in order to move the valve slightly past the blocking position.

Press  to cancel mechanical blocking.

Turn  → Code **0**

Press , Code **0** blinks.

Turn  → **AUTO**

Press . The positioner switches to automatic operating mode. The current valve position is indicated in %.

Note: If the positioner shows a tendency to oscillate in automatic operating mode, the parameters K_p and T_V must be slightly cor-

rected. Proceed as follows:

Set T_V to 4 (Code **18**).

If the positioner still oscillates, the gain K_p (Code **17**) must be decreased until the positioner shows a stable behavior.

Zero point calibration

Finally, if process operations allow it, the zero point must be adjusted according to section 7.7.

7.7 Zero calibration

In case of discrepancies with the closing position of the valve, e.g. with soft-sealed plugs, it may become necessary to recalibrate the zero point.

We recommend re-initializing the positioner in case of deviations in the zero point over 5%.

NOTICE

The valve briefly moves from the current travel/angle of rotation position to the closed position.

Note: The positioner must be connected to the supply air to perform the zero calibration.

Enable configuration:

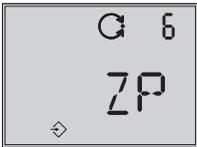
Turn  → Code **3**, display: **No**

Press , Code **3** blinks

Turn  → **YES**

Press , display 

Perform zero calibration:



Initialization mode
Default **MAX**

- Turn → Code **6**
- Press , Code **6** blinks
- Turn → **ZP**
- Press .

▶ **Press INIT key!**

Zero calibration is started, the positioner moves the control valve to the CLOSED position and readjusts the internal electrical zero point.

7.8 Reset to default values

This function resets all start-up and setting parameters as well all diagnosis data to the factory default values (see code list in section 14).

Enable configuration:

- Turn → Code **3**, display: **No**
- Press , Code **3** blinks
- Turn → **YES**
- Press , display

Reset start-up parameters:



Reset
Default **No**

- Turn → Code **36**, display: **••--••**
- Press , Code **36** blinks
- Turn → **Std**
- Press . All start-up parameters as well all diagnosis data are reset to their default values.

Note: Code **36 - diAG** allows just the diagnosis data (EXPERTplus) to be reset. Refer to EB 8389 EN on EXPERTplus valve diagnostics.

8 Operation

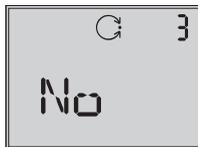
WARNING!

The actuator stem moves while the positioner is being operated.

Do not touch the actuator stem or obstruct it to avoid risk of injury to hands or fingers.

8.1 Enabling and selecting parameters

The codes which are marked with an asterisk (*) in section 14 on page 86 onwards must be enabled with Code 3 before the associated parameters can be configured as described below.



Code 3
Configuration
not enabled



Configuration
enabled

Turn → Code 3, display: **No**

Press , Code 3 blinks.

Change the setting of Code 3.

Turn → **YES**

Press , display:

The configuration is enabled.

You can now configure codes one after the other:

Turn and select the required code.

Press to access the selected code. The code number starts to blink.

Turn and select the setting.

Press to confirm the selected setting.

Note: If no settings are entered within 120 seconds, the enabled configuration function becomes invalid and the display changes to Code 0.

Cancel the setting:



Canceling the setting

To cancel a value before it is confirmed (by pressing) proceed as follows:

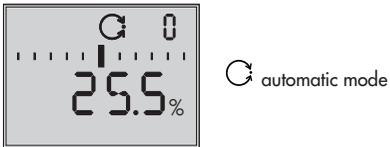
Turn → **ESC**

Press . The entered value is not adopted.

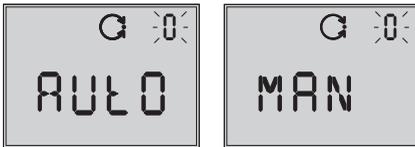
8.2 Operating modes

8.2.1 Automatic and manual modes

After initialization has been completed successfully, the positioner is in  automatic mode.



Switch to  manual operating mode



Turn  → Code 0

Press , display: **AUTO**, Code 0 blinks.

Turn  → **MAN**

Press  to switchover to  manual mode. The switchover is smooth since the manual mode starts up with the set point last used during automatic mode. The current position is displayed in %.

Adjust the manual reference variable



Turn  → Code 1

Press , Code 1 blinks.

Turn  until sufficient pressure has been built up in the positioner and the control valve moves to the required position.

Note: The positioner automatically returns to  manual mode with Code 0 if no settings are made within 120 seconds.

Switch to  automatic operating mode

Turn  → Code 0

Press , Code 0 blinks.

Turn  → **AUTO**

Press . The positioner changes to automatic operating mode.

8.2.2 Fail-safe position (SAFE)

If you want to move the valve to fail-safe position determined during start-up (see section 7.1), proceed as follows:



Turn  → Code **0**

Press , display: current operating mode (**AUTO** or **MAN**), Code **0** blinks.

Turn  → **SAFE**

Press , display: **S**.

The valve moves to the fail-safe position.

Once the positioner is initialized, the current valve position is indicated on the display in %.

Exit the fail-safe position

Turn  → Code **0**

Press , Code **0** blinks.

Turn  and select the required operating mode **AUTO** or **MAN**.

Press . The positioner switches to the operating mode selected.

8.3 Malfunction/maintenance alarm

All status and fault alarms are classified according to a status in the positioner. The default settings of the status classification are listed in the code list.

Note: The status classification can be changed in TROVIS-VIEW and over the parameters in the DD file. Refer to EB 8389 EN on EXPERTplus valve diagnostics.

To provide a better overview, the classified alarms are summarized in a condensed state according to NAMUR Recommendation NE 107. The following status alarms are available:

▶ Maintenance alarm

The positioner cannot perform its control task due to a functional fault in the device or in one of its peripherals or an initialization has not yet been successfully completed.

▶ Maintenance required

The positioner still performs its control task (with restrictions). A maintenance requirement or above average wear has been determined. The wear tolerance will soon be exhausted or is reducing at a faster rate than expected. Maintenance is necessary in the medium term.

▶ Maintenance demanded

The positioner still performs its control task (with restrictions). A maintenance demand or above average wear has been determined. The wear tolerance will soon be exhausted or is reducing at a

faster rate than expected. Maintenance is necessary in the short term.

▶ **Out of specification**

The positioner is operated outside specified operating conditions.

Note: If an event is assigned to the “No message” status, this event does not have any effect on the condensed state.

The condensed state appears on the display with the following icons:

Condensed state	Positioner display
Maintenance alarm	
Function check	Text, e.g. <i>tESing</i> , <i>TunE</i> or <i>tESi</i>
Maintenance required/ Maintenance demanded	
Out of specification	

If the positioner has not been initialized, the maintenance alarm icon () appears on the display as the positioner cannot follow its reference variable.

If fault alarms exist, the possible source of error is displayed in Code **49** onwards. In this case, **Err** appears on the display.

The cause and recommended action are listed in the code list (section 14).



Example
Error caused by pin
position

Fault alarm output

The “Maintenance alarm” as the condensed state causes the optional fault alarm output to be switched.

- ▶ The “Function check” condensed state can also switch the fault alarm contact in Code **32**.
- ▶ The “Maintenance required/demanded” condensed state can also switch the fault alarm contact in Code **33**.

8.3.1 Confirming error messages

Enable configuration:

Note: If no settings are entered within 120 seconds, the enabled configuration function becomes invalid.

Turn  → Code **3**, display: **No**

Press , Code **3** blinks

Turn  → **YES**

Press , display: 

Confirm error messages:

Turn  → Error code which you want to confirm.

Press  to confirm the error message.

9 Adjusting the limit switch

The positioner version with inductive limit switch has one adjustable tag (1) mounted on the shaft which operates the proximity switch (3).

For operation of the inductive limit switch, the corresponding switching amplifier (see section 5.2.1) must be connected to the output.

If the tag (1) is inside the field of the switch, the switch assumes a high resistance. If the tag is outside of the field, the switch assumes a low resistance.

Normally, the limit switch is adjusted such that it will provide a signal in both end positions of the valve. The switch, however, can also be adjusted to indicate intermediate valve positions.

The desired switching function, i.e. whether the output relay shall be picked up or released when the tag has entered the field, has to be determined, if necessary, at the switching amplifier.

Note:

The inductive limit switch replaces the software limit switch A1 with terminal assignment +41/-42.

Each switching position can optionally be set to indicate when the tag has entered the field, or when it has left the field.

The second software limit switch remains effective, the function of the software limit switch A1 is disabled.

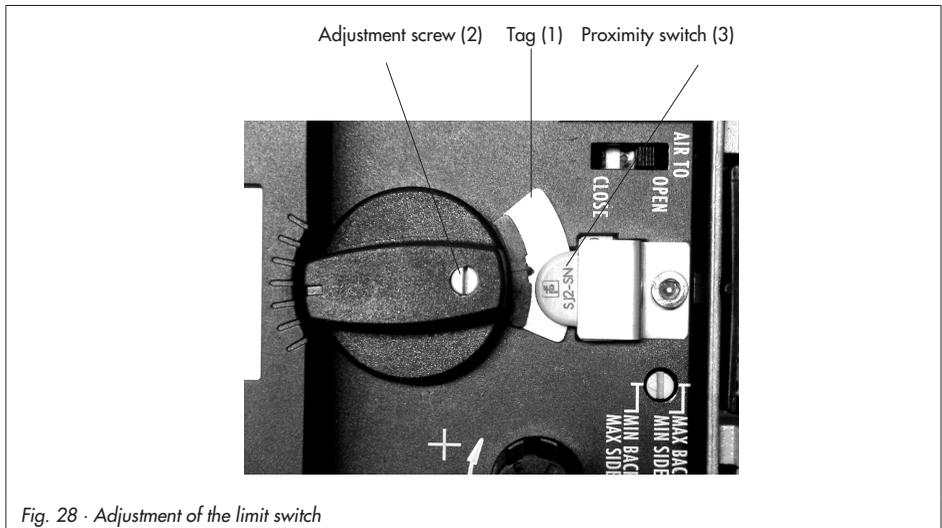


Fig. 28 · Adjustment of the limit switch

Software adaptation

Code **38** (inductive alarm is set to **YES**).
The inductive limit switch is connected to the terminals +41/-42.
The device is set up accordingly when delivered ex works SAMSON.

Setting the switching point:

NOTICE

During adjustment or testing, the switching point must always be approached from mid-position (50 %).

To ensure safe switching under any ambient conditions, the switching point should be adjusted to a value of approx. 5 % before the mechanical stop (OPEN – CLOSED).

For CLOSED position:

1. Initialize positioner.
2. Use the **MAN** function to move the positioner to 5 % (see LC display).
3. Adjust the tag using the yellow adjustment screw (2) until the tag enters or leaves the field and the switching amplifier responds. You can measure the switching voltage as an indicator.

Contact function:

- ▶ Tag leaving the field > contact is made
- ▶ Tag entering the field > contact is opened.

For OPEN position:

1. Initialize positioner.
2. Use the **MAN** function to move the positioner to 95 % (see LC display).
3. Adjust the tag (1) using the yellow adjustment screw (2) until the tag enters or leaves the field of the proximity switch (3).
You can measure the switching voltage as an indicator.

Contact function:

- ▶ Tag leaving the field > Contact is made.
- ▶ Tag entering the field > Contact is opened.

9.1 Retrofitting an inductive limit switch

Required retrofit kit:

Limit switch Order no. 1400-7460

Note: *The same requirements apply to retrofitting an inductive limit switch as to servicing the positioner. For explosion-protected devices, the requirements in section 11 need to be kept.*

Check the "Limit switch, inductive" box on the nameplate after retrofitting the limit switch.

Fig. 29

1. Take off the rotary pushbutton (3) and cap (1), unthread the five fixing screws (2) and lift off the plastic cover (9), **taking care not to damage the ribbon cable (between PCB and display).**

2. Use a knife to cut an opening at the marked location (4).
3. Push the connector (11) with cable through the opening and secure the proximity switch (7) on the cover with a dot of glue.
4. Remove the jumper (item no. 8801-2267) at the socket X7 of the top board and insert the cable connector (11).
5. Guide the cable in such a manner that the plastic cover can be placed back onto the positioner. Insert the fixing screws (2) and screw tight. Attach the clamping plate (8) onto the proximity switch.
6. Attach the rotary switch (5). Make sure the flattened side of the positioner shaft is turned so that the rotary switch (5) can be attached with the metal tag next to the proximity switch.
7. **Note:** On start-up of the positioner, set the option "inductive alarm" under Code **38** from **No** to **YES**.

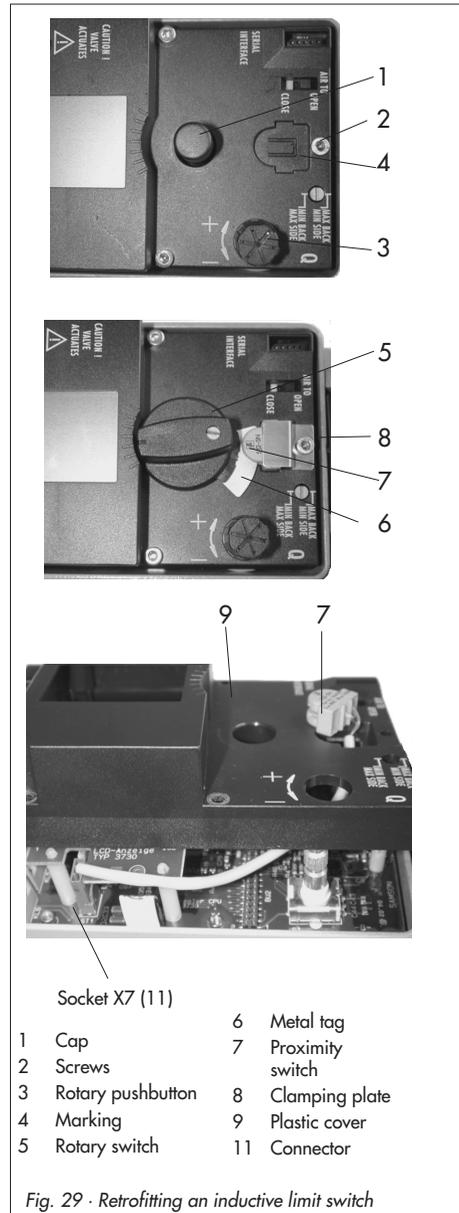


Fig. 29 · Retrofitting an inductive limit switch

10 Maintenance

The positioner does not require any maintenance.

There are filters with a 100 µm mesh size in the pneumatic connections for supply and output which can be removed and cleaned, if required.

The maintenance instructions of any upstream supply air pressure reducing stations must be observed.

11 Servicing explosion-protected devices

If a part of the device on which the explosion protection is based needs to be serviced, the device must not be put back into operation until a qualified inspector has assessed it according to explosion protection requirements, has issued an inspection certificate or given the device a mark of conformity.

Inspection by a qualified inspector is not required if the manufacturer performs a routine test on the device prior to putting it back into operation. The passing of the routine test must be documented by attaching a mark of conformity to the device. Replace explosion-protected components only by original, routine-tested components from the manufacturer.

Devices that have already been operated outside hazardous areas and are intended for future use inside hazardous areas must comply with the safety requirements placed

on serviced devices. Before being used inside hazardous areas, test the devices according to the specifications for servicing explosion-protected devices.

Read section 13 for maintenance, calibration and adjustment work inside and outside hazardous areas.

12 Firmware update (serial interface)

Firmware updates on positioners currently in operation can be performed as follows:

When updates are performed by a service employee appointed by SAMSON, the update is confirmed on the positioner by the test mark assigned by SAMSON's Quality Assurance.

In all other cases, only persons from the plant operator with written approval may perform updates. This person must confirm the update on the positioner.

Laptops and PCs connected to the power supply must use an additional safety barrier.

This does not apply to laptops in battery operation. In this case, it is assumed that a battery-powered laptop runs briefly for software programming or for testing purposes.

a) Updates outside the hazardous area:

Remove the positioners from the plant and update them outside the hazardous area.

b) Updates on site:

Updates on site are only permitted after the plant operator has presented a signed hot work permit.

After updating has been completed, add the current firmware to the nameplate; this can be done using labels.

13 Maintenance, calibration and work on equipment

The interconnection with intrinsically safe circuits to check or calibrate the apparatus must only be performed with intrinsically safe current/voltage calibrators and measuring instruments to rule out any damage to components relevant for explosion protection.

The maximum values for intrinsically safe circuits specified in the approvals must be kept.

14 Code list

Code no.	Parameter – Readings, values [default setting]	Description
Note: Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
0	Operating mode [MAN] Manual mode AUTO Automatic mode SAFE Fail-safe position ESC Escape	Switchover from automatic to manual mode is smooth. In fail-safe mode, S appears on the display. In MAN and AUTO mode, the system deviation is represented by the bar graph elements. When the positioner is initialized, the numerical display indicates the valve position or the angle of rotation in %, otherwise the position of the lever in relation to the central axis is displayed in degrees °.
1	Manual w 0 to 100 [0] % of the nominal range <i>Note: An on/off valve can be moved past 100 % of the nominal range (with the closed position for ATO) or below 0 % of the nominal range (with the closed position for ATC).</i>	Adjust the manual set point with the rotary pushbutton, the current travel/angle is displayed in % when the positioner is initialized, otherwise the position of the lever in relation to the central axis is indicated in degrees °. <i>Note: Can only be selected when Code 0 = MAN</i>
2	Reading direction [Normal] or upside down ESC	The reading direction of the display is turned by 180°.
3	Enable configuration [No] YES ESC	Enables the option to modify data (automatically deactivated when the rotary pushbutton has not been operated for 120 s.) HART blinks on the display when the on-site operation is locked. Codes marked with an asterisk (*) can only be read and not overwritten. Likewise, codes can only read over the SSP interface.

Code no.	Parameter – Readings, values [default setting]	Description																											
Note: Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.																													
4*	Pin position [No] 17, 25, 35, 50, 70, 100, 200, 300 mm 90° with rotary actuators ESC Note: If you select a pin position in Code 4 that is too small, the positioner switches to SAFE mode for reasons of safety	The follower pin must be inserted into the correct pin position according to the valve travel/angle of rotation. For initialization using NOM or SUB, this pin position must be entered. <table border="1" data-bbox="535 427 1005 703"> <thead> <tr> <th>Pin position</th> <th>Standard Code 4</th> <th>Adjustment range Code 5</th> </tr> </thead> <tbody> <tr> <td>17</td> <td>7.5</td> <td>3.6 to 17.7</td> </tr> <tr> <td>25</td> <td>7.5</td> <td>5.0 to 25.0</td> </tr> <tr> <td>35</td> <td>15.0</td> <td>7.0 to 35.4</td> </tr> <tr> <td>50</td> <td>30.0</td> <td>10.0 to 50.0</td> </tr> <tr> <td>70</td> <td>40.0</td> <td>14.0 to 70.7</td> </tr> <tr> <td>100</td> <td>60.0</td> <td>20.0 to 100.0</td> </tr> <tr> <td>200</td> <td>120.0</td> <td>40.0 to 200.0</td> </tr> <tr> <td>90°</td> <td>90.0</td> <td>24.0 to 100.0</td> </tr> </tbody> </table>	Pin position	Standard Code 4	Adjustment range Code 5	17	7.5	3.6 to 17.7	25	7.5	5.0 to 25.0	35	15.0	7.0 to 35.4	50	30.0	10.0 to 50.0	70	40.0	14.0 to 70.7	100	60.0	20.0 to 100.0	200	120.0	40.0 to 200.0	90°	90.0	24.0 to 100.0
Pin position	Standard Code 4	Adjustment range Code 5																											
17	7.5	3.6 to 17.7																											
25	7.5	5.0 to 25.0																											
35	15.0	7.0 to 35.4																											
50	30.0	10.0 to 50.0																											
70	40.0	14.0 to 70.7																											
100	60.0	20.0 to 100.0																											
200	120.0	40.0 to 200.0																											
90°	90.0	24.0 to 100.0																											
5*	Nominal range [15.0] mm or angle ° ESC	For initialization using NOM or SUB, the nominal travel/angle of rotation of the valve must be entered. The permissible adjustment range depends on the pin position according to the table for Code 4. After initialization has been successfully completed, the maximum nominal travel/angle reached on initialization is displayed.																											
6*	Init mode [MAX] NOM MAN SUB ZP ESC	Select the initialization mode MAX: Travel/angle of the closure member from the CLOSED position to the opposite stop in the actuator. NOM: Travel/angle of the closure member measured from the CLOSED position to the indicated OPEN position. MAN: Manually selected range SUB: Substitute calibration (without initialization) ZP: Zero calibration																											

Code no.	Parameter – Readings, values [default setting]	Description
Note: Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
7*	w/x [↗↗] increasing/increasing ↗↘ increasing/decreasing ESC	Direction of action of the reference variable w in relation to the travel/angle of rotation x Automatic adaptation: AIR TO OPEN: On completing initialization, the direction of action remains increasing/increasing (↗↗), a globe valve opens as the mA signal increases. AIR TO CLOSE: On completing initialization, the direction of action changes to increasing/decreasing (↗↘), a globe valve closes as the mA signal increases.
8*	Travel/angle range start (lower x-range value) 0.0 to 80.0 [0.0] % of the nominal range ESC Note: Specified in mm or angle ° provided Code 4 is set	Lower range value for the travel/angle of rotation in the nominal or operating range. The operating range is the actual travel/angle of the control valve and is limited by the lower x-range value (Code 8) and the upper x-range value (Code 9). Usually, the operating range and the nominal range are identical. The nominal range can be limited to the operating range by the lower and upper x-range values. Value is displayed or must be entered. The characteristic is adapted. See also the example in Code 9!
9*	Travel/angle range end (upper x-range value) 20.0 to 100.0 [100.0] % of the nominal range ESC Note: Specified in mm or angle ° provided Code 4 is set	Upper range value for the travel/angle of rotation in the nominal or operating range. Value is displayed or must be entered. The characteristic is adapted. Example: The operating range is modified, for example, to limit the range of a control valve which has been sized too large. For this function, the entire resolution range of the reference variable is converted to the new limits. 0 % on the display corresponds to the adjusted lower limit and 100 % to the adjusted upper limit.
10*	Travel/angle lower limit (lower x-limit) 0.0 to 49.9 % of the operating range [No], ESC	Limitation of the travel/angle of rotation downwards to the entered value, the characteristic is not adapted. The characteristic is not adapted to the reduced range. See also example in Code 11.

Code no.	Parameter – Readings, values [default setting]	Description
Note: Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
11*	Travel/angle upper limit (upper x-limit) 50.0 to 120.0 [100] % of the operating range No, ESC	Limitation of the travel/angle of rotation upwards to the entered value, the characteristic is not adapted. Example: In some applications, it is better to limit the valve travel, e.g. if a certain minimum medium flow is required or a maximum flow must not be reached. The lower limit must be adjusted with Code 10, and the upper limit with Code 11. If a tight-closing function has been set up, it has priority over the travel limitation! When set to No, the valve can be opened past the nominal travel with a reference variable outside of the 0 to 100 % range.
12*	w-start 0.0 to 75.0 [0.0] % of the reference variable range ESC	Lower range value of the applicable reference variable range must be smaller than the final value w-end, 0 % = 4 mA The reference variable range is the difference between w-end and w-start, and must be $\Delta w \geq 25\% = 4 \text{ mA}$. For an adjusted reference variable range of 0 to 100 % = 4 to 20 mA, the control valve must move through its entire operating range from 0 to 100 % travel/angle of rotation. In split-range operation , the valves operate with smaller reference variables. The control signal of the control unit to control two valves is divided such, for instance, that the valves move through their full travel/angle of rotation at only half the input signal (first valve set to 0 to 50 % = 4 to 12 mA and second valve set to 50 to 100 % = 12 to 20 mA reference variable).
13*	w-end 25.0 to 100.0 [100.0] % of the reference variable range ESC	Upper range value of the applicable reference variable range, must be greater than w-start. 100 % = 20 mA
14*	Reference variable range start (w-start) 0.0 to 49.9 [1.0] % of the span adjusted via Code 12/13 No, ESC	If w approaches the percentage adjusted at the final value that causes the valve to close, the actuator is immediately completely vented (with AIR TO OPEN) or filled with air (with AIR TO CLOSE). This action always lead to maximum tight-closing of the valve. Codes 14/15 have priority over Codes 8/9/10/11. Codes 21/22 have priority over Codes 14/15.

Code no.	Parameter – Readings, values [default setting]	Description
Note: Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
15*	Reference variable range end (w-end) 50.0 to 100.0 % of the span adjusted via Code 12/13 [No], ESC	If w approaches the percentage adjusted at the final value that causes the valve to open, the actuator is immediately completely filled with air (with AIR TO OPEN) or vented (with AIR TO CLOSE). This action always lead to the valve being completely opened. Codes 14/15 have priority over Codes 8/9/10/11. Codes 21/22 have priority over Codes 14/15. Example: Set the final position w > to 99 % for three-way valves.
16*	Pressure limit [No] 1.4 2.4 3.7 bar ESC	The signal pressure to the actuator can be limited in stages. After changing a pressure limit already set, the actuator must be vented once (e.g. by selecting the fail-safe position (SAFE) over Code 0). NOTICE <i>Do not activate the pressure limit for double-acting actuators with valve closed position AIR TO OPEN (AIO).</i>
17*	Proportional-action coefficient KP (step) 0 to 17 [7] ESC	Displaying or changing K_p Note on changing the K_p and T_V steps: During the initialization of the positioner, the K_p and T_V values are optimized. Should the positioner show a tendency for impermissibly high post-pulse oscillation due to additional interference, the K_p and T_V steps can be adapted after the initialization. For this, either the T_V step can be increased in increments until the desired response behavior is reached or, when the maximum value of 4 is reached, the K_p step can be decreased in increments. NOTICE <i>Changing the K_p step influences the system deviation.</i>
18*	Rate time TV (step) 1 [2] 3 4 No No, ESC	Displaying or changing T_V , see note under K_p step A change of the T_V step has no effect on the system deviation.

Code no.	Parameter – Readings, values [default setting]	Description
Note: Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
19*	Tolerance band 0.1 to 10.0 [5.0] % of the operating range ESC	Used for error monitoring Determination of the tolerance band in relation to the operating range. Associated lag time [30] s is a reset criterion. If a transit time is determined during initialization which is six times > 30 s, the six-fold transit time is accepted as the lag time.
20*	Characteristic 0 to 9 [0] ESC	Select the characteristic: 0 Linear 1 Equal percentage 2 Reverse equal percentage 3 SAMSON butterfly valve linear 4 SAMSON butterfly valve equal percentage 5 VETEC rotary plug valve linear 6 VETEC rotary plug valve equal percentage 7 Segmented ball valve linear 8 Segmented ball valve equal percentage 9 User-defined (defined over operating software) Note: The various characteristics are listed in the Appendix (section 16).
21*	Required transit time OPEN (w ramp open) 0 to 240 s [0] ESC	The time required to pass through the operating range when the valve opens. Limitation of the transit time (Code 21 and 22): For some applications it is recommendable to limit the transit time of the actuator to prevent it from engaging too fast in the running process. Code 21 has priority over Code 15. NOTICE The function is not activated when the fail-safe function or solenoid valve is triggered nor upon failure of the auxiliary power.
22*	Required transit time CLOSED (w ramp closed) [0] to 240 s ESC	The time required to pass through the operating range when the valve closes. Code 22 has priority over Code 14. NOTICE The function is not activated when the fail-safe function or solenoid valve is triggered nor upon failure of the auxiliary power.

Code no.	Parameter – Readings, values [default setting]	Description
Note: Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
23*	Total valve travel 0 to 99 · 10 ⁷ [0] Exponential reading from 9999 travel cycles onwards RES, ESC	Totaled double valve travel. Can be reset to 0 over Code 36 - Std. Note: The total valve travel is saved in a non-volatile memory after every 1000 double travel.
24*	LV total valve travel 1000 to 99 · 10 ⁷ [1 000 000] Exponential reading from 9999 travel cycles onwards ESC	Limit value of total valve travel. If the limit is exceeded,  and  icons appear on the display.
25*	Alarm mode 0 to 3 [2] ESC	Switching mode of software limit switches alarm A1 and A2 in responding state (when positioner has been initialized). 1) Explosion-protected version according to EN 60947-5-6 0: A1 ≥ 2.2 mA A2 ≤ 1.0 mA 1: A1 ≤ 1.0 mA A2 ≤ 1.0 mA 2: A1 ≥ 2.2 mA A2 ≥ 2.2 mA 3: A1 ≤ 1.0 mA A2 ≥ 2.2 mA 2) Version without explosion protection 0: A1 R = 348 Ω A2 Non-conducting 1: A1 Non-conducting A2 Non-conducting 2: A1 R = 348 Ω A2 R = 348 Ω 3: A1 Non-conducting A2 R = 348 Ω When a positioner has not been initialized, the software limit switches always register the signal as in the state of no response. If there is no mA signal at the terminals 11/12, the software limit switches both switch to ≤ 1.0 mA signal (Ex) or non-conducting (without explosion protection). Note: The fault alarm output always switches to ≤ 1.0 mA/ non-conducting in case of fault arises; it has ≥ 2.2 mA/ R = 348 Ω when there is no fault.

Code no.	Parameter – Readings, values [default setting]	Description
Note: Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
26*	Limit value A1 No 0.0 to 100.0 [2.0] % of the operating range ESC	Alarm A1 goes into the state of response when the value exceeds the limit. Displaying or changing the software limit value A1 in relation to the operating range. Setting has no effect when an inductive limit switch has been installed.
27*	Limit value A2 No 0.0 to 100.0 [98.0] % of the operating range ESC	Alarm A2 goes into the state of response when the value falls below the limit. Displaying or changing the software limit value A2 in relation to the operating range.
28*	Alarm test Reading direction: Standard Turned [No] [No] RUN 1 1 RUN RUN 2 2 RUN RUN 3 3 RUN ESC ESC	Testing the software limit switches alarm A1 and A2 in addition to the fault alarm contact A3. If the test is activated, the respective limit switches five times. RUN1/1 RUN: Software limit switch A1 to ≥ 2.2 mA RUN2/2 RUN: Software limit switch A2 to ≥ 2.2 mA RUN3/3 RUN: Fault alarm contact A3 to ≤ 1.0 mA
29*	Position transmitter x/ix³⁾ [↻] ↻ ESC	Operating direction of the position transmitter; indicates how the travel/angle position is assigned to the output signal i, based on the closed position. The operating range (see Code 8) of the valve is represented by the 4 to 20 mA signal. Values exceeding or falling below the limits 2.4 to 21.6 mA can be represented. When a positioner has not been initialized (reference variable less than 3.6 mA), the power consumption of the feedback signal is effective (current approx. 1.8 mA). When YES is set in Code 32, the position transmitter issues the value as per Code 30 during initialization or zero calibration. When NO is set in Code 32, 4 mA is issued during a running self-adaptation.

Code no.	Parameter – Readings, values [default setting]	Description
Note: Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
30*	Fault alarm ix ³⁾ [No] HI LO ESC	Used to select whether faults causing the fault alarm contact to switch should also be signaled by the position transmitter output and how they should be signaled HI ix = 21.6 ±0.1 mA or LO ix = 2.4 ±0.1 mA
31*	Position transmitter test ³⁾ -10.0 to 110.0 [default value is last indicated value of the position transmitter] % of the operating range ESC	Testing the position transmitter. Values can be entered in relation to the operating range. The current actual value is used in initialized positioners locally as the start value (bumpless changeover to the test mode). On testing over software, the entered simulation value is issued as the position feedback signal for 30 seconds.
³⁾ Analog position transmitter: Code 29/30/31 can only be selected if the position transmitter (optional) is installed.		
32*	Fault alarm with “Function check” condensed state [YES] · No ESC	YES: Fault alarm also with “Function check” condensed state No: “Function check” condensed state does not cause a fault alarm to be issued Note: <i>Regardless of the condensed state, the fault alarm output always switches when the error codes 57, 58, 60, 62 and 64 to 70, 76 are issued.</i>
33*	Fault alarm with “Maintenance alarm” or “Maintenance required” condensed state [YES] · No ESC	YES: Fault alarm only with “Maintenance alarm” condensed state and with “Maintenance required” condensed state No: Fault alarm only with “Maintenance alarm” condensed state Note: <i>Regardless of the condensed state, the fault alarm output always switches when the error codes 57, 58, 60, 62 and 64 to 70, 76 are issued.</i>
34*	Closing direction CL [CCL] ESC	CL: Clockwise, CCL: Counterclockwise Turning direction in which the valve is moved to the CLOSED position (view onto the rotary switch motion when the positioner cover is open). Needs only be entered in initialization mode SUB (Code 6).
35*	Blocking position [0] mm/° /% ESC	Entering the blocking position. Distance up to the CLOSED position. Note: <i>Only necessary in initialization mode SUB.</i>

Code no.	Parameter – Readings, values [default setting]	Description
Note: Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
36*	Reset [No] Std · diAG ESC	Std: Resets all parameters to default (factory setting) as well as the diagnosis data. After a reset, the positioner must be re-initialized. diAG: Resets diagnosis data only. Plotted reference graphs and logs remain unaffected. The positioner does not need to be re-initialized.
37	Position transmitter No · YES	Display only, indicates whether the position transmitter option is installed.
38*	Inductive alarm [No], YES, ESC	Indicates whether the inductive limit switch option is installed or not.
39	System deviation e info -99.9 to 999.9 %	Display only, indicates the deviation from the target position ($e = w - x$).
40	Transit time Open info 0 to 240 s [0]	Display only, minimum opening time determined during initialization.
41	Transit time Closed info 0 to 240 s [0]	Display only, minimum closing time determined during initialization.
42	Auto-w/manual-w info 0.0 to 100.0 % of the span 4 to 20 mA	Display only, Supplied automatic reference variable according to 4 to 20 mA
43	Firmware info Xxxx	Display only, indicates the positioner type and current firmware version in alternating sequence.
44	y info [0] to 100 % 0 P, MAX, ---	Display only. Indicates the control signal y in % based on the travel range determined on initialization MAX: The positioner builds up its maximum output pressure, see description in Code 14 and 15. 0 P: The positioner vents completely, see description in Code 14 and 15. ---: The positioner is not initialized.

Code no.	Parameter – Readings, values [default setting]	Description
Note: Codes with marked with an asterisk (*) must be enabled with Code 3 prior to configuration.		
45	Solenoid valve info YES HIGH/LOW No	Display only, indicates whether a solenoid valve is installed or not. If a voltage supply is connected at the terminals of the installed solenoid valve, <i>YES</i> and <i>HIGH</i> appear on the display in alternating sequence. If a voltage supply is not connected (actuator vented, fail-safe position indicated on the display by the S icon), <i>YES</i> and <i>LOW</i> appear on the display in alternating sequence.
46*	Bus address 0 to 63 [0] ESC	Select bus address
47*	Write protection HART YES, [No], ESC	When the write protection function is activated, device data can only be read, but not overwritten over HART® communication.
48* 49*	Diagnostics	Refer to EB 8389 EN on EXPERTplus Valve Diagnostics

Note: The error codes listed in following appear in the display corresponding to their status classification set over the condensed state (Maintenance required/Maintenance demanded: , Out of specification:  blinking, Maintenance alarm: ). If "No message" is assigned to the error code as the status classification, the error is not included in the condensed state. A status classification is assigned to every error code in the default setting. The status classification of error codes can also be changed as required using an operating software (e.g. TROVIS-VIEW).

Initialization errors

Error codes – Recommended action		Condensed state alarm active, when prompted, Err appears. When fault alarms exist, they are displayed here.
50	x > range	The value supplied by the measuring signal is either too high or too low, the measuring sensor is close to its mechanical limit. <ul style="list-style-type: none"> • Pin positioned incorrectly. • Bracket slipped in case of NAMUR attachment or positioner is not central. • Follower plate incorrectly attached.
	Status classification	[Maintenance required]
	Recommended action	Check attachment and pin position, set operating mode from SAFE to MAN and re-initialize the positioner.
51	$\Delta x < \text{range}$	The measuring span of the sensor is too low. <ul style="list-style-type: none"> • Pin positioned incorrectly. • Wrong lever. <p>A rotational angle smaller than 16° at the positioner shaft creates just an alarm. An angle below 9° leads to the initialization being canceled.</p>
	Status classification	[Maintenance required]
	Recommended action	Check attachment and re-initialize the positioner.
52	Attachment	<ul style="list-style-type: none"> • Positioner attachment incorrect. • Nominal travel/angle (Code 5) could not be achieved during initialization under NOM (no tolerance downwards permissible). • Mechanical or pneumatic fault, e.g. wrong lever selected or supply pressure too low to move to the required position.
	Status classification	[Maintenance required]
	Recommended action	Check attachment and supply pressure. Re-initialize the positioner. Under certain circumstances, it may be possible to check the maximum travel/angle by entering the actual pin position and then performing an initialization under MAX. After initialization has been completed, the Code 5 indicates the maximum achieved travel or angle.

Error codes – Recommended action		Condensed state alarm active, when prompted, Err appears. When fault alarms exist, they are displayed here.
53	Initialization time exceeded (Init time >)	The initialization routine lasts too long. <ul style="list-style-type: none"> • No pressure on the supply line or there is a leak. • Supply air failure during initialization.
	Status classification	[Maintenance required]
	Recommended action	Check attachment and supply pressure. Re-initialize the positioner.
54	Initialization - solenoid valve	1) A solenoid valve is installed (Code 45 = YES) and was not or not properly connected so that an actuator pressure could not be built up. The alarm is generated when you attempt to initialize the positioner. 2) If you attempt to initialize the device from the fail-safe position (SAFE).
	Status classification	[Maintenance required]
	Recommended action	Re. 1) Check connection and supply voltage of the forced venting Code 45 HIGH/LOW Re. 2) Set the MAN operating mode over Code 0 . Then initialize the positioner.
55	Transit time too short (transit time <)	The actuator positioning rates determined during the initialization are so short that the positioner cannot adapt itself optimally.
	Status classification	[Maintenance required]
	Recommended action	Check the volume restriction setting as described in section 7.2, re-initialize the positioner.
56	Pin position	Initialization was canceled because you are required to enter the pin position for the selected initialization modes NOM and Sub .
	Status classification	[Maintenance required]
	Recommended action	Enter pin position over Code 4 and nominal travel/angle over Code 5 . Re-initialize the positioner.

Operational errors

Error codes – Recommended action		Condensed state alarm active, when prompted, Err appears. When fault alarms exist, they are displayed here.
57	Control loop	Control loop error, the control valve does not react within the tolerable times of the controlled variable (tolerance band alarm Code 19). <ul style="list-style-type: none"> • Actuator mechanically blocked. • Attachment of the positioner subsequently shifted. • Supply pressure not sufficient.
	Status classification	[Maintenance required]
	Recommended action	Check attachment.
58	Zero point	Zero point incorrect. Error may arise when the mounting position/linkage of the positioner moves or when the valve seat trim is worn, especially with soft-sealed plugs.
	Status classification	[Maintenance required]
	Recommended action	Check valve and mounting of the positioner. If OK, perform a zero calibration over Code 6 (see section 7.7 on page 75). If the lever position on the back of the positioner has been changed (e.g. while exchanging the lever), move the lever as far as it will go in both directions to adapt it to the internal measuring lever.
59	Autocorrection	Should an error occur in the data range of the positioner, the self-monitoring function recognizes it and automatically corrects it.
	Status classification	[No message]
	Recommended action	Automatic
60	Fatal error	An error was detected in the data relevant for safety, autocorrection is not possible. This may be due to EMC disturbances. The positioner changes to the fail-safe position (SAFE).
	Status classification	Maintenance alarm (cannot be classified)
	Recommended action	Reset over Code 36 - Std. Re-initialize the positioner.

Hardware errors

Error codes – Recommended action		Condensed state alarm active, when prompted, Err appears. When fault alarms exist, they are displayed here.
62	x signal	<p>Determination of the measured data for the actuator has failed. Conductive plastic element is defective. The positioner continues to run in emergency mode, but should be replaced as soon as possible. The emergency mode on the display is indicated by a blinking closed-loop operation icon and 4 dashes instead of the position indication.</p> <p>Note on the closed-loop operation: If the measuring system has failed, the positioner is still in a reliable state. The positioner switches to emergency mode where the position cannot be accurately controlled anymore. However, the positioner continues operation according to its reference variable signal so that the process remains in a safe state.</p>
	Status classification	[Maintenance demanded]
	Recommended action	Return the positioner to SAMSON AG for repair.
63	w too small	<p>The reference variable is much smaller than 4 mA (0 %); occurs if the power source that drives the positioner does not comply with the standard. This state is indicated on the positioner display by a blinking LOW.</p>
	Recommended action	[No message]
	Remedy	<p>Check reference variable. If necessary, limit the current source downwards so that no values below 4 mA can be issued.</p>
64	i/p converter	The circuit of the i/p converter has been interrupted.
	Status classification	Maintenance alarm (cannot be classified)
	Recommended action	<p>Cannot be remedied. Return the positioner to SAMSON AG for repair.</p>

Error codes – Recommended action		Condensed state alarm active, when prompted, Err appears. When fault alarms exist, they are displayed here.
65	Hardware Additional message at the fault alarm input	Initialization key jammed (firmware version 1.51 and higher) A hardware error has occurred, the positioner changes to the fail-safe position (SAFE).
	Status classification	[Maintenance alarm]
	Recommended action	Confirm error and return to the automatic operating mode, or perform a reset and re-initialize the device. If this is not successful, return device to SAMSON AG for repair.
66	Data memory Additional message at the fault alarm input	The writing of data to the data memory does not work anymore, e.g. when the written data deviate from the read data. Valve moves to the fail-safe position.
	Status classification	Maintenance alarm (cannot be classified)
	Recommended action	Return the positioner to SAMSON AG for repair.
67	Test calculation Additional message at the fault alarm input	The hardware controller is monitored by means of a test calculation.
	Status classification	[Maintenance alarm]
	Recommended action	Confirm error. If this is not possible, return the positioner to SAMSON AG for repair.

Data errors

Error codes – Recommended action		Condensed state alarm active, when prompted, Err appears. When fault alarms exist, they are displayed here.
68	Control parameter Additional message at the fault alarm input	Control parameter error
	Status classification	[Maintenance required]
	Recommended action	Confirm error, perform reset and re-initialize the positioner.
69	Poti parameter Additional message at the fault alarm input	Parameter error of the digital potentiometer.
	Status classification	[Maintenance required]
	Recommended action	Confirm error, perform reset and re-initialize the positioner.
70	Calibration parameter Additional message at the fault alarm input	Error in the production calibration data. Subsequently, the device runs on default values.
	Status classification	[Maintenance required]
	Recommended action	Return the positioner to SAMSON AG for repair.
71	General parameters	Parameter errors that are not critical for the control.
	Status classification	[Maintenance required]
	Recommended action	Confirm error. Check and, if necessary, reset required parameters.
73	Internal device error 1	Internal device error
	Status classification	[Maintenance required]
	Recommended action	Return the positioner to SAMSON AG for repair.
74	HART parameters	Parameter errors that are not critical for the control.
	Status classification	[Maintenance required]
	Recommended action	Confirm error and perform reset.
75	Info parameters	Error in the info parameters that are not critical for the control.
	Status classification	[Maintenance required]
	Recommended action	Return the positioner to SAMSON AG for repair.

Error codes – Recommended action		Condensed state alarm active, when prompted, Err appears. When fault alarms exist, they are displayed here.
76	No emergency mode	The travel measuring system of the positioner has a self-monitoring function (see Code 62). An emergency mode (open-loop control) is not available for certain actuators, such as double-acting actuators. In this case, the positioner changes to the fail-safe position (SAFE) when a measuring error occurs. During the initialization, the positioner checks whether the actuator has such a function or not.
	Status classification	[No message]
	Recommended action	Merely information, confirm, if necessary. No further action necessary.
77	Program loading error Additional message at the fault alarm contact	When the positioner starts operation for the first time after the input signal has been applied, it carries out a self-test (tESinG runs across the display). If the positioner loads the wrong program, the valve moves to the fail-safe position. It is not possible to make the valve leave this fail-safe position again.
	Status classification	Maintenance alarm (cannot be classified)
	Recommended action	Interrupt current and restart positioner. Otherwise, return the positioner to SAMSON AG for repair.
78	Options parameter	Errors in options parameters
	Status classification	[Maintenance required]
	Recommended action	Return the positioner to SAMSON AG for repair.

Diagnosis errors

Error codes – Recommended action		Condensed state alarm active, when prompted, Err appears. When fault alarms exist, they are displayed here.
79	Extended diagnostics	Alarms are generated by the extended EXPERTplus diagnostics if EXPERTplus has been activated under Code 48
	Status classification	Maintenance required (cannot be classified)
80	Diagnostic parameters	Errors that are not critical for control.
	Status classification	Maintenance required (cannot be classified)
	Recommended action	Confirm error. Check and, if necessary, perform a new reference test
81	Reference graphs	An error occurred during plotting the reference graphs for drive signal y steady-state or drive signal y hysteresis. <ul style="list-style-type: none"> • Reference test was interrupted • Reference line for drive signal y steady-state or drive signal y hysteresis was not adopted. Fault alarms are saved in a non-volatile memory. They cannot be reset.
	Status classification	[Maintenance required]
	Recommended action	Check and, if necessary, perform a new reference test

15 Dimensions in mm

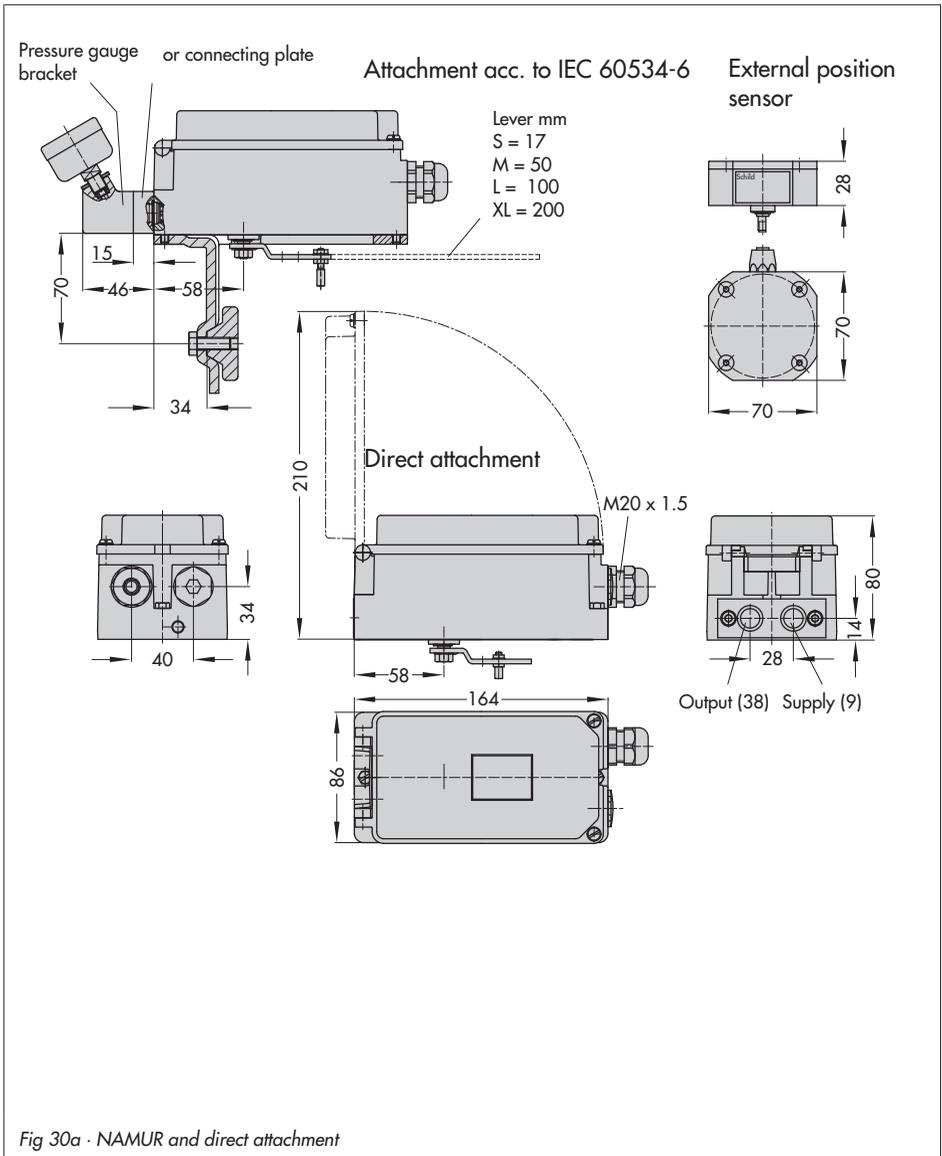
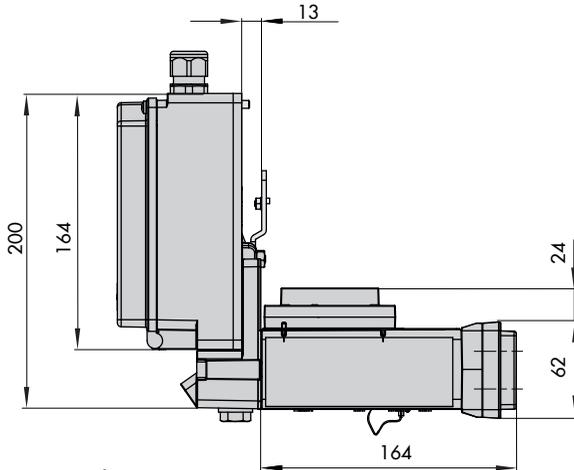


Fig 30a · NAMUR and direct attachment

Attachment according to VDI/VDE 3847
to Type 3277



Attachment according to
VDI/VDE 3847
on NAMUR rib

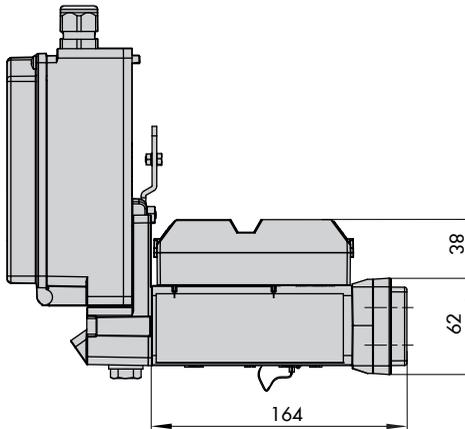
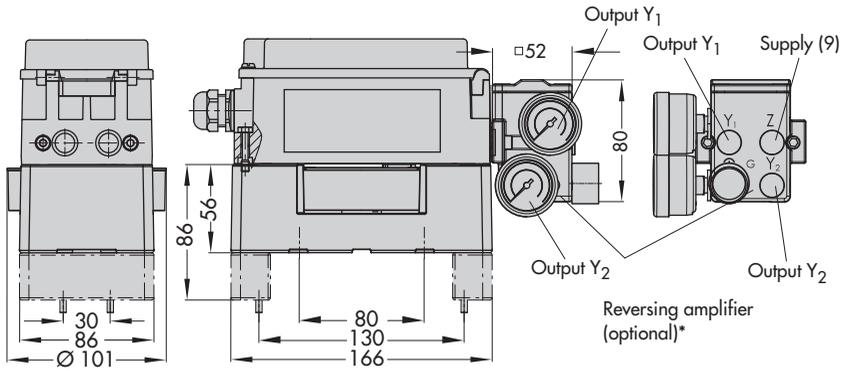
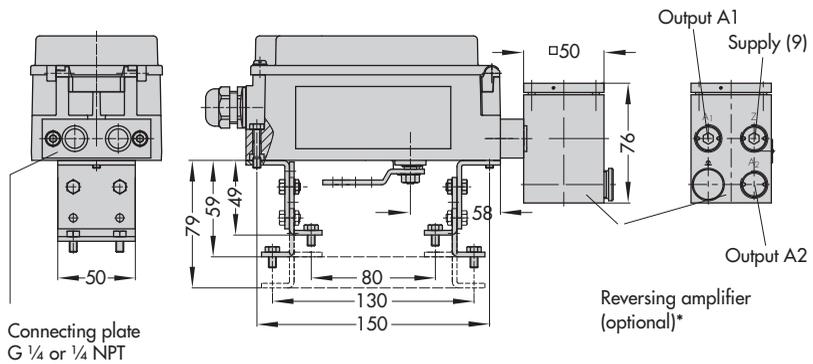


Fig. 30b · Attachment according to VDI/VDE 3847

Heavy-duty version



Light version

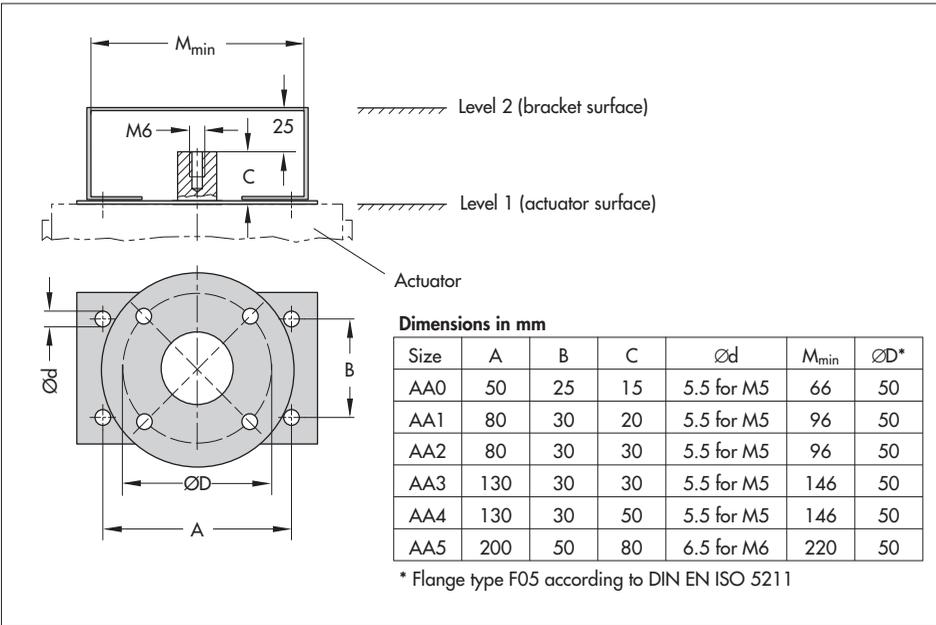


* Reversing amplifier

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

Fig. 30c · Attachment to rotary actuators VDI/VDE 3845 (Sept. 2010), level 1, size AA1 to AA4

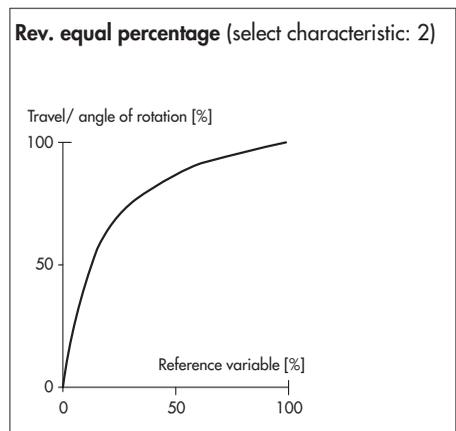
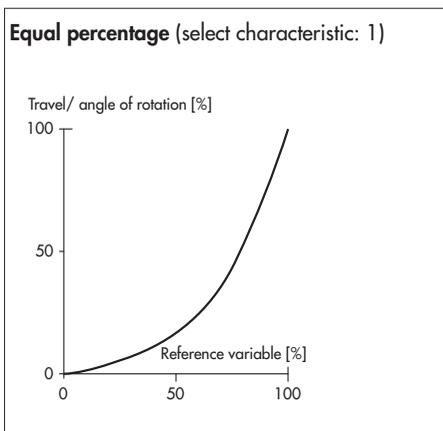
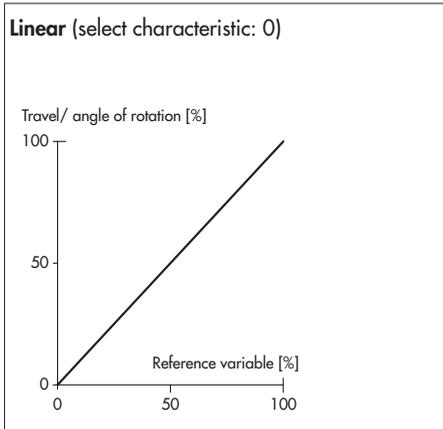
15.1 Fixing levels according to VDI/VDE 3845 (September 2010)



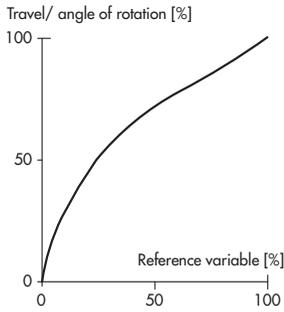
16 Valve characteristic selection

The characteristics that can be selected in Code **20** are shown in following **in graph form**.

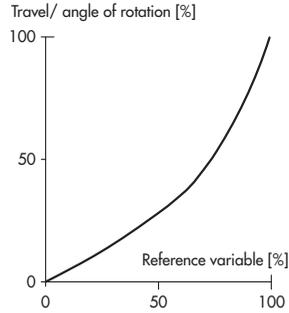
Note: A characteristic can only be defined (user-defined characteristic) using a workstation/ operating software (e.g. TROVIS-VIEW).



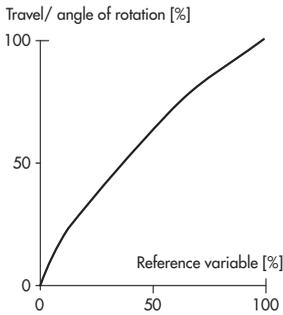
SAMSON butterfly valve linear
(select characteristic: 3)



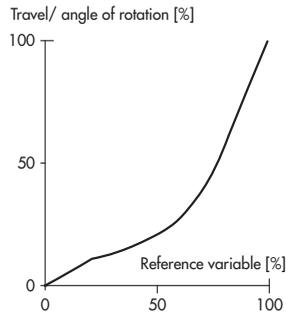
SAMSON butterfly valve equal percentage
(select characteristic: 4)



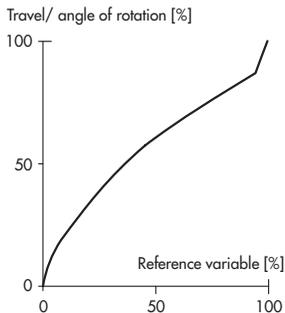
VETEC rotary plug valve linear
(select characteristic: 2)



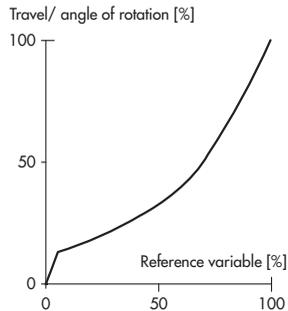
VETEC rotary plug valve equal percentage
(select characteristic: 6)



Segmented valve ball linear
(select characteristic: 7)



Segmented ball valve equal percentage
(select characteristic: 8)



TRANSLATION

Offenbach, 2005-11-21
 Contact:
 H. Biehl
 Tel. (069) 8306-210
 Fax. (069) 8306-716
 gerhard.biehl@vde.com

Our ref.
 479006-9010-0001/67325
 FG33/0hh/wah

Your ref.
 2005-11-08

P. Opl

Test report for Information of the Applicant

Testing of the Degree of Protection on enclosures of Type 3730 and Type 3731 Positioners

This test report contains the result of a single investigation carried out on the product submitted. A sample of this product was tested to found the accordance with the thereafter listed standards resp. parts of standards.

The test report does not entitle to use a VDE Certification mark and the "GS – geprüfte Sicherheit (test safety)" and does not refer to all VDE specifications applicable to the tested product.

This report may only be passed to a third party in its complete wording including this preamble and the date of issue.

Any publication or reproduction requires the prior written approval of the VDE Testing and Certification Institute.

1 Assignment

The samples described in 2 below were tested for compliance with the IP 66 degree of protection.

2 Samples

2.1 Type 3730 Positioner
 2.2 Type 3731 Positioner

3 Basis of assessment

DIN EN 60529/VDE 0470 Part 1/2000-09
 Degree of protection provided by enclosures (IP Code)
 German version EN 60529:1999+A1:2000

4 Execution of the tests

The dust test had already been carried out on the Type 3730 Positioner under the reference number: 479006-9010-0001/32752 and on the Type 3731 Positioner under the reference number: 479006-9010-0001/58985 with suction as per category I at the connecting enclosures of the positioners and solenoid valves. The under pressure was 2 hPa and the test lasted 8 hours.

5 Test results

The testing of the samples described in 2 above yielded the following results:

Protecting against access to hazardous parts and against ingress of solid foreign objects according to
 DIN EN 60529/VDE 0470 Part 1:2000-09
IP6X satisfied

Protecting against ingress of water according to
 DIN EN 60529/VDE 0470 Part 1:2000-09
IPX6 satisfied

The positioner enclosures in the versions submitted meet the requirements of IP 66 degree of protection.

There was no ingress of either dust or water.

VDE-Prüf- und Zertifizierungsinstitut

Fachgebiet FG33

(Signature)

(Signature)

Gerhard Biehl



IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification Scheme for Explosive Atmospheres

For rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.: IECEx PTB 0 50008 Issue No.: 0

Status: Current

Date of Issue: 2005-02-21 Page 1 of 3

Applicant: **SAMSON AG Mess- und Regeltechnik**
Weismuellerstrasse 3
D-60314 Frankfurt am Main
Germany

Electrical Apparatus: **HART capable positioner type 3730-31..**
Optional accessory:

Type of Protection: **General Requirements, Intrinsic Safety, Protection by Enclosure**

Marking: **Ex ia IIC T6/T5/T4
IP 54 and IP 65 T 80 ° C**

*Approved for use on behalf of the IECEx
Certification Body:*

Dr.-Ing. Ulrich Johannsmeyer

Position:

Department Head "Intrinsic Safety and Safety of Systems"

*Signature
(or printed version)*

Date:

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

Certificate issued by:

**Physikalisch-Technische
Bundesanstalt (PTB)**

Bundesallee 100
38116 Braunschweig
Germany



IECEx Certificate of Conformity

Certificate No.: IECEx PTB 05.0008

Date of Issue: 2005-02-21

Issue No.: 0

Page 2 of 3

Manufacturer: **SAMSON AG Mess- und Regeltechnik**
Weismuellerstrasse 3
D-60314 Frankfurt am Main
Germany

Manufacturing location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:

The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2000 Edition: 3.1	Electrical apparatus for explosive gas atmospheres - Part 0: General requirements
IEC 60079-11 : 1999 Edition: 4	Electrical apparatus for explosive gas atmospheres - Part 11: Intrinsic safety T
IEC 61241-1-1 : 1999 Edition: 2	Electrical apparatus for use in the presence of combustible dust - Part 1-1: Electrical apparatus protected by enclosures and surface temperature limitation - Specification for apparatus

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:

A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

IECEx ATR:
DE/PTB/05-005

File Reference:
B022174



IECEx Certificate of Conformity

Certificate No.: IECEx PTB 0 5.0008

Date of Issue: 2005-02-21

Issue No.: 0

Page 3 of 3

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

General description: The Model 3730-31 HART® capable Positioner is a single- or double-acting positioner with communication capability intended for attachment to pneumatic control valves or rotary actuators. The Positioner is of the self-balancing type and adapts itself automatically to the attached valve or actuator respectively. The positioner serves for matching valve stem positions (controlled variable x) with the control signal (reference variable W) in the 4-20mA range. Nominal travels of 3.6 to 200mm are possible with linear actuators, or angles of rotation of 24° to 100° with rotary actuators. Features: Simple attachment to current linear and rotary actuators with interface for SAMSON- direct attachment. NAMUR- rib; attachment to rod-type yoke acc. to IEC 60534-6-1. Any mounting position of the positioner. Options: Position indicator, software proximity switches, inductive proximity switch, forced routing function, fault alarm output, external displacement transducer and serial interface. In the ex version the fault alarm output, the software proximity switches and the inductive proximity switch are analysed by a NAMUR-switching amplifier according to EN 50227.

CONDITIONS OF CERTIFICATION: NO



TRANSLATION

EC TYPE EXAMINATION CERTIFICATION

- (1) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**
- (2) EC Type Examination Certificate Number

PTB 02 ATEX 2174

- (4) Equipment: HART® capable positioner Type 3730-31
- (5) Manufacturer: SAMSON AG Mess. und Regeltechnik
- (6) Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany
- (7) This equipment and any acceptable variation thereof are specified in the schedule to this certificate.
- (8) The Physikalisch-Technische Bundesanstalt, notified body number 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report

PTB Ex 02-223232.

- (9) The Essential Health and Safety Requirements are satisfied by compliance with

EN 50014: 1997 **EN 50020: 1994**

- (10) If the sign "y" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

EC Type Examination Certificate, without signature and seal are invalid.
This EC Type Examination Certificate is only valid when used in its original and unchanged form.
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig
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- (11) According to the Directive 94/9/EC, this EC TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of the equipment.

- (12) The marking of the equipment shall include the following:



Zertifizierungsstelle Explosionsschutz Braunschweig, 02. Dezember 2002
By order

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirktor

EC Type Examination Certificate, without signature and seal are invalid.
This EC Type Examination Certificate is only valid when used in its original and unchanged form.
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig
Page 2/6 P1832-3720.doc

(13) **Schedule**

(14) **EC TYPE EXAMINATION CERTIFICATE No. PTB 02 ATEX 2174**

(15) **Description of Equipment**

The HART® capable positioner Type 3730-31 is a single- or double-acting positioner with communication capability intended for attachment to all current linear or rotary actuators. It serves for adjusting valve stem position to the control signal.

In the 3730-31... version communication is according to the SSP (SAMSON Serial Interface Protocol) and the HART protocol.

The HART® capable positioner Type 3730-31 is a passive two-terminal network which may be connected to any certified intrinsically safe circuit, provided the permissible maximum values of U_i , I_i and P_i are not exceeded.

For instrument air non-combustible media are used.

The device is intended for use inside and outside of hazardous areas.

The correlation between temperature classification and permissible ambient temperature ranges are shown in the table below:

Temperature class	Permissible ambient temperature range
T6	-40 °C ... 60 °C
T5	-40 °C ... 70 °C
T4	-40 °C ... 80 °C

Electrical data

Signal circuit (terminals 11/12)
Type of protection: Intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit

Maximum values:

$U_i = 28 \text{ V}$

$I_i = 115 \text{ mA}$

$P_i = 1 \text{ W}$

$C_i = 5.3 \text{ nF}$, $L_i =$ negligible

Type of protection: Intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit

Maximum values:

$U_i = 20 \text{ V}$

$I_i = 60 \text{ mA}$

$P_i = 250 \text{ mW}$

$C_i = 5.3 \text{ nF}$, $L_i =$ negligible

Limit switch, inductive (terminals 41/42)
Type of protection: Intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit

Maximum values:

$U_i = 16 \text{ V}$

$I_i = 52 \text{ mA}$

$P_i = 169 \text{ mW}$

$C_i = 60 \text{ nF}$, $L_i = 200 \text{ } \mu\text{H}$, or

$U_i = 16 \text{ V}$

$I_i = 25 \text{ mA}$

$P_i = 64 \text{ mW}$

$C_i = 60 \text{ nF}$, $L_i = 200 \text{ } \mu\text{H}$

The correlation between temperature classification, permissible ambient temperature ranges and maximum short-circuit current for analysers is shown in the table below:

Temperature class	Permissible ambient temperature range	I_0 / P_0
T6	-40 °C ... 45 °C	52mA/169mW
T5	-40 °C ... 60 °C	
T4	-40 °C ... 75 °C	
T6	-40 °C ... 60 °C	25mA/64mW
T5	-40 °C ... 80 °C	
T4	-40 °C ... 80 °C	

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Fault alarm output
(terminals 83/84)

Type of protection: Intrinsic safety EEx ia IIC
only for connection to a certified intrinsically safe
circuit

Maximum values:

U₀ = 20 V
I₀ = 60 mA
P = 250 mW
C₀ = 5.3 nF, L₀ = negligible

Serial interface BU

Type of protection: Intrinsic safety EEx ia IIC

Maximum values:

U₀ = 7.88 V
I₀ = 61.8 mA
P₀ = 120 mW, Linear characteristic
C₀ = 0.65 µF, L₀ = 10 mH
only for connection to a certified
intrinsically safe circuit

U_i = 16 V
I_i = 23 mA
P_i = 64 mW
C_i = negligible,
L_i = negligible

For interconnecting the rules for interconnecting intrinsically safe circuit shall be
complied with.

External position sensor
(analog pcb, pins, p9, p10,
p11)

Type of protection: Intrinsic safety EEx ia IIC

Maximum values:

U₀ = 7.88 V
I₀ = 61.8 mA
P₀ = 120 mW, Linear characteristic
C₀ = 0.66 µF, L₀ = 10 mH
C_i = 730 nF, L_i = 370 µH

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PLB32-3730.doc

PTB

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

(16) Test Report: **PTB Ex.02-22323**

(17) **Special conditions for safe use**

Not applicable

(18) **Special Health and Safety Requirements**

In compliance with the standards specified above

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig, 02 December 2002

(Signature) (seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

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PLB32-3730.doc

TRANSLATION

ADDENDUM No.: 1

in compliance with Directive 94/9/EC Annex III Clause 6
to the EC Type Examination Certificate **PTB 02 ATEX 2174**

Equipment: Model 3730-31.. HART-capable Positioner
Marking:  II 2 G Ex ia IIC T6
Manufacturer: SAMSON AG
Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany

Description of the additions and modifications

In future the Model 3730-31... HART-capable Positioner is permitted to be manufactured also in compliance with the documents listed below.

The modem board will be modified and the optional "Forced Venting Function" will be added. The electrical data will be supplemented as follows:

Electrical data

Forced venting function
(terminal 81/82)
safe

Type of protection: Intrinsic safety Ex ia IIC
only for connection to a certified intrinsically
circuit

Maximum values:

U₀ = 28 V
I₀ = 11,5 mA
P₀ = 500 mW
L₀ = negligible
C₀ = 5,3 nF

EC Type Examination Certificates without signature and seal are invalid.
This EC Type Examination Certificate may only be reproduced in whole or without any changes, schedule included.
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Phb32-3730-31Add1.doc

Addendum No. 1 to the EX Type Examination Certificate PTB 02 ATEX 2174

All the other electrical data and particulars specified in the EC Type Examination Certificate apply unchanged also to this Addendum No. 1.

Test report: PTB EX 03-23171

Zertifizierungsstelle Explosionsschutz
By order Braunschweig, 18 June 2002

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirktor

EC Type Examination Certificates without signature and seal are invalid.
This EC Type Examination Certificate may only be reproduced in whole or without any changes, schedule included.
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Phb32-3730-31Add1.doc

A D D E N D U M N o. 2

in compliance with Directive 94/9/EC Annex III Clause 6
to the EC Type Examination Certificate PTB 02 ATEX 2174

Equipment: Model 3730-31... HART capable Positioner

Marking:  II 2G Ex ia IIC T6

Manufacturer: SAMSON AG

Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany

Description of the additions and modifications

The Model 3731-31... HART capable Positioner is permitted to be manufactured in future also in compliance with the documents specified in the attached test report PTB Ex.04-23430.

Attachment to pneumatic control valves or butterfly valves is either directly to the Series 3277 Actuators or by means of NAMUR adapter plates to actuators of conventional design.

The modifications relate to the internal and external design.

- a) The Model 3730-31... HART capable Positioner satisfies the requirements of EN 50281-1-1:1998 relating to electrical apparatus with protection provided by enclosures. According to this standard, the positioner shall be provided in addition with the following marking:
-  II 2D IP 65 T 80 °C
- b) The circuitry of the multifunction printed circuit board will be modified and the option "position indicator" will be added (version 3730...1...), the electrical data will be supplemented as follows:

EC Type Examination Certificate, without signature and seal are invalid.
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Plb32Add2.doc

Electrical data

Signal circuit Type of protection: Intrinsic safety EEx ia IIC
Only for connection a certified intrinsically safe circuit

Maximum values:
U_i = 28 V
I_i = 115 mA
P_i = 1 W
L_i negligible
C_i = 35 nF

Version 3730-1-1

Position indicator Type of protection: Intrinsic safety EEx ia IIC
(terminals 31/32) Only for connection a certified intrinsically safe circuit

Maximum values:
U_i = 28 V
I_i = 115 mA
P_i = 1 W
L_i negligible
C_i = 5.3 nF

All the other electrical data and information contained in the EC Type Examination Certificate apply unchanged also to this Addendum No. 2.

Test report: PTB Ex 04-23430

Zertifizierungsstelle Explosionsschutz Braunschweig, 16 February 2004
By order

(Signature) (Seal)

Dr. Ing. U. Gerlach

EC Type Examination Certificate, without signature and seal are invalid.
This EC Type Examination Certificate may only be reproduced in its entirety and without any changes, schedules included.
Errors or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

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Plb32Add2.doc

TRANSLATION

ADDENDUM No. 3

According to Directive 94/9/EC, Annex III Class 6
to the EC Type Examination Certificate PTB 04 ATEX 2174

Equipment: Model 3730-31 – HART Capable Positioner

Marking: II 2 G EEx ia IIC T 6 or II 2 IP 65 T 80 °C resp.

Manufacturer: SAMSON AG Mess- und Regeltechnik

Address: Weisenfelderstrasse 3
60514 Frankfurt am Main, Germany

Description of the additions and modifications

The Model 3730 - 31, HART Capable Positioner is permitted to be manufactured in the future also in compliance with the documents specified in the test records included in the test report.

The technical data are modified as follows:

Forced ventilation (terminals 8/182)
Type of protection: Intrinsic Safety EEx ia IIC only for connection to a certified intrinsically safe circuit

Maximum values:

- U_i = 28 V
- I_i = 115 mA
- C_i = 5,3 nF
- L_i negligible

Version 3730-1,1...1 (binary sensor)
Type of protection: Intrinsic Safety EEx ia II only for connection to a certified intrinsically safe circuit

Maximum values:

- U_i = 30 V
- I_i = 100 mA
- C_i = 56,3 nF
- L_i negligible

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PN025Add3.doc

Addendum No. 3 to the EC Type Examination Certificate PTB 04 ATEX 2174

Version 3730-1,1...1 (vibration sensor)

Type of protection: Intrinsic Safety EEx ia II only for connection to a certified intrinsically safe circuit

Maximum values:

- U_i = 30 V
- I_i = 100 mA
- C_i = 8,3 nF
- L_i negligible

All other electrical data and particulars specified in the EC Type Examination Certificate shall apply also to this Addendum No. 3.

Test report: PTB Ex 07-27063

Zertifizierungsstelle Explosionsschutz

By order

(Signature) (Seal)
Dr.-Ing. U. Johannsmeier
Director and Professor

Braunschweig, 10 September 2007

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PN025Add3.doc

4th ADDENDUM
 according to Directive 94/9/EC, Annex III, item 6
 to the EC Type Examination Certificate PTB 02 ATEX 2174

Device: Type 3730-31... HART[®]-capable Positioner
 Marking:  II 2G Ex ia IIC T6 or II 2D Ex ID A21 IP 65 T80 °C
 Manufacturer: SAMSON AG Mess- und Regeltechnik
 Address: Weismüllerstraße 3, 60314 Frankfurt am Main, Germany

Description of additions and modifications

In the future, the Type 3730-31... HART[®]-capable Positioner may also be manufactured according to the certification documents listed in the test report.
 The permissible ambient temperature range is extended.
 The editions of standards are updated.

The following table lists the relation between the temperature classes and the permissible ambient temperature ranges:

Temperature class	Permissible ambient temperature range
T6	-55 °C to 60 °C
T5	-55 °C to 70 °C
T4	-55 °C to 80 °C

Electric data

Signal current circuit..... in type of protection Ex ia IIC
 (terminals 11/12) For connection to a certified intrinsically safe current circuit only

Max. values:
 U_i = 28 V
 I_i = 115 mA
 P_i = 1 W
 L_i negligible
 C_i = 35 nF

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4th Addendum to the EC Type Examination Certificate PTB 02 ATEX 2174

Version 3730-1...I..... in type of protection Ex ia IIC
 Position transmitter..... For connection to a certified intrinsically safe current circuit only

Max. values:
 U_i = 28 V
 I_i = 115 mA
 L_i negligible
 C_i = 5,3 nF

Version 3730-1...I..... in type of protection Ex ia IIC
 (structure-borne sound sensor) For connection to a certified intrinsically safe current circuit only

Max. values:
 U_i = 30 V
 I_i = 100 mA
 L_i negligible
 C_i = 5,3 nF

Sensor connection (terminals 31/32)

Version 3730-1...I..... in type of protection Ex ia IIC
 (binary sensor) For connection to a certified intrinsically safe current circuit only

Max. values:
 U_i = 30 V
 I_i = 100 mA
 P_i = 1,250 mW
 L_i negligible
 C_i = 50,3 nF

Binary input (terminals 31/32)

Software limit switches..... in type of protection Ex ia IIC
 (terminals 41/42, 51/52) For connection to a certified intrinsically safe current circuit only

Max. values:
 U_i = 20 V
 I_i = 60 mA
 P_i = 250 mW
 L_i negligible
 C_i = 5,3 nF

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4th Addendum to the EC Type Examination Certificate PTB 02 ATEX 2174

Inductive limit switch..... in type of protection Ex, in IIC
 (terminals 4/142) For connection to a certified intrinsically safe
 current circuit only

Max. values:

U_i = 16 V
 I_i = 52 mA
 P_i = 169 mW
 L_i = 200 µH
 C_i = 60 nF

or

U_i = 16 V
 I_i = 25 mA
 P_i = 64 mW
 L_i = 200 µH
 C_i = 60 nF

The following table lists the relation between the temperature classes, the permissible ambient temperature ranges, the max. short-circuit currents and the max. capacity for evaluators:

Temperature class	Permissible ambient temperature range	I _{sp} /P _{sp}
T6	Up to 45 °C	
T5	-55 °C to 60 °C	52 mA / 69 mW
T4	Up to 75 °C	
T6	Up to 60 °C	
T5	-55 °C to 80 °C	25 mA / 64 mW
T4	Up to 80 °C	

Forced venting..... in type of protection Ex, in IIC
 (terminals 8/182) For connection to a certified intrinsically safe
 current circuit only

Max. values:

U_i = 28 V
 I_i = 115 mA
 L_i negligible
 C_i = 5.3 nF

4th Addendum to the EC Type Examination Certificate PTB 02 ATEX 2174

Fault indication output..... in type of protection Ex, in IIC
 (terminals 83/84) For connection to a certified intrinsically safe
 current circuit only

Max. values:

U_i = 20 V
 I_i = 60 mA
 P_i = 250 mW
 L_i negligible
 C_i = 5.3 nF

Serial interface..... in type of protection Ex, in IIC
 (programming socket BU1)

Max. values:

U₀ = 7.88 V
 I₀ = 61.8 mA
 P₀ = 120 mW
 Linear characteristic
 L₀ = 10 mH
 C₀ = 0.65 µF

or

For connection to a certified intrinsically safe
 current circuit only

Max. values:

U_i = 16 V
 I_i = 25 mA
 P_i = 64 mW
 L_i negligible
 C_i negligible

When interconnecting, the rules for interconnecting intrinsically safe current circuits are to be observed.

External position sensor..... in type of protection Ex, in IIC
 (analog PCB, pins p9, p10, p11)

Max. values:

U₀ = 7.88 V
 I₀ = 61.8 mA
 P₀ = 120 mW
 Linear characteristic

[Translation of German original]

Physikalisch-Technische Bundesanstalt
Braunschweig and Berlin

[PTB logo]

4th Addendum to the EC Type Examination Certificate PTB 02 ATEX 2174

La = 10 ml
 Co = 0,66 µF
 Li = 370 µH
 Ci = 730 nF

All other specifications for manufacture and operation mentioned in the statement of conformity are not affected by this addendum and remain valid without changes.

Referenced standards

EN 60079-0:2006 EN 60079-1:2007 EN 61241-0:2006 EN 61241-1:2004

Test report

PTB EX 08-28327

Certification Body for Explosion Protection
Oto

Braunschweig, 10 December 2008

(Signature: Johannsmeyer, stamp: Physikalisch-Technische Bundesanstalt 56)
 Dr.-Ing. U. Johannsmeyer
 Director and Professor

5. SUPPLEMENT
according to Directive 94/9/EC Annex III.6

to EC-TYPE-EXAMINATION CERTIFICATE PTB 02 ATEX 2174
(Translation)

Equipment: HART-capable positioner, type 3730-31...
 Marking:  II 2 G Ex ia IIC T6 or II 2 D Ex ID A21 IP65 T80 °C
 Manufacturer: SAMISON AG Mess- und Regletechnik
 Address: Weismüllerstr. 3
 60314 Frankfurt, Germany

Description of supplements and modifications
 In the future, the HART-capable positioner of type 3730-31... may also be manufactured according to the test documents listed in the test report.
 The state of the standards has been updated. Further modifications have not been made.
 The thermal and electrical maximum values are presented in summary.

For relationship between temperature class and permissible ranges of the ambient temperature, reference is made to the following table:

Temperature class	Permissible range of the ambient temperature
T6	-55 °C ... 80 °C
T5	-55 °C ... 70 °C
T4	-55 °C ... 40 °C

Electrical data
 Signal circuit.....type of protection Intrinsic Safety Ex ia IIC
 (terminals 11/12) only for connection to a certified intrinsically safe circuit
 Maximum values:
 U_i = 28 V
 I_i = 115 mA
 P_i = 1 W
 L_i negligibly low
 C_i = 35 nF

5. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 02 ATEX 2174

Type 3730-1,1
 Position indicator.....type of protection Intrinsic Safety Ex ia IIC
 (terminals 31/32) only for connection to a certified intrinsically safe circuit
 Maximum values:
 U_i = 28 V
 I_i = 115 mA
 L_i negligibly low
 C_i = 5,3 nF

Type 3730-1,1,1.....type of protection Intrinsic Safety Ex ia IIC
 (Structure-borne sound sensor) only for connection to a certified intrinsically safe circuit
 Sensor connection Maximum values:
 U_i = 30 V
 I_i = 100 mA
 L_i negligibly low
 C_i = 5,3 nF

Type 3730-1,1,1,1.....type of protection Intrinsic Safety Ex ia IIC
 (Binary sensor) only for connection to a certified intrinsically safe circuit
 Maximum values:
 U_i = 30 V
 I_i = 100 mA
 P_i = 250 mW
 L_i negligibly low
 C_i = 50,3 nF

Limit contacts, software.....type of protection Intrinsic Safety Ex ia IIC
 (terminals 41/42, 51/52) only for connection to a certified intrinsically safe circuit
 Maximum values:
 U_i = 20 V
 I_i = 60 mA
 P_i = 250 mW
 L_i negligibly low
 C_i = 5,3 nF

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

5. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 02 ATEX 2174

Limit contact, inductivetype of protection Intrinsic Safety Ex ia IIC
(terminals 4/142) only for connection to a certified intrinsically safe circuit

Maximum values:

- $U_i = 16$ V
- $I_i = 52$ mA
- $P_i = 169$ mW
- $L_i = 100$ μ H
- $C_i = 30$ nF

or

- $U_i = 16$ V
- $I_i = 25$ mA
- $P_i = 64$ mW
- $L_i = 100$ μ H
- $C_i = 30$ nF

For relationship between temperature class, permissible ranges of the ambient temperature, maximum short-circuit currents and maximum power for analyzing units, reference is made to the table:

Temperature class	Permissible range of the ambient temperature	I_b / P_o
T6	...45 °C	
T5	-55 °C ... 60 °C	52 mA / 169 mW
T4	... 75 °C	
T6	... 60 °C	
T5	-55 °C ... 60 °C	25 mA / 64 mW
T4	... 80 °C	

Forced venting,type of protection Intrinsic Safety Ex ia IIC
(terminals 8/182)

Maximum values:

- $U_i = 28$ V
- $I_i = 115$ mA
- L_i negligibly low
- $C_i = 5.3$ nF

Sheet 3/5

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Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

5. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 02 ATEX 2174

Fault signal output,type of protection Intrinsic Safety Ex ia IIC
(terminals 83/84) only for connection to a certified intrinsically safe circuit

Maximum values:

- $U_i = 20$ V
- $I_i = 60$ mA
- $P_i = 280$ mW
- L_i negligibly low
- $C_i = 5.3$ nF

Serial Interfacetype of protection Intrinsic Safety Ex ia IIC
(Programming socket)

Maximum values:

- $U_o = 7.88$ V
- $I_o = 61.8$ mA
- $P_o = 120$ mW
- linear characteristic
- $L_o = 10$ mH
- $C_o = 0.65$ μ F

or

only for connection to a certified intrinsically safe circuit

Maximum values:

- $U_i = 18$ V
- $I_i = 23$ mA
- $P_i = 64$ mW
- L_i negligibly low
- C_i negligibly low

When intrinsically safe circuits are interconnected the rules for the interconnection of intrinsically safe circuits shall be observed.

External position sensortype of protection Intrinsic Safety Ex ia IIC
(Analog-PCB, pins p9, p10, p11)

Maximum values:

- $U_o = 7.88$ V
- $I_o = 61$ mA
- $P_o = 120$ mW
- linear characteristic
- $L_o = 10$ mH
- $C_o = 0.65$ μ F
- $L_i = 370$ μ H
- $C_i = 730$ nF

Sheet 4/5

EC-type examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

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The notes for manufacture and operation and all further specifications of the EC-type examination certificate apply without changes.

The future marking reads:

 II 2 G Ex Ia IIC T6 Gb and II 2 D Ex tb IIIC T80 °C Db IP65

Applied standards

EN 60079-0:2009 EN 60079-11:2012

EN 60079-31:2009

Test report: PTB Ex 13-23133

Zertifizierungssektor Explosionsschutz
On behalf of PTB:


Dir.-Ing. U. Johannsmeyer
Direktor und Professor

Braunschweig, July 30, 2013



TRANSLATION

Statement of Conformity

- (1) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**
- (2) EC Type Examination, Certificate Number
- (3) **PTB 03 ATEX 2180 X**
- (4) Equipment: Model 3730-38 HART-capable Positioner
- (5) Manufacturer: SAMSON AG Mess- und Regeltechnik
- (6) Address: Weismüllerstr. 3., 60314 Frankfurt am Main, Germany
- (7) The equipment and any acceptable variation thereof are specified in the schedule to this certificate and the documents referred to therein.
- (8) The Physikalisch-Technische Bundesanstalt, notified body number 0102 according to Article 9 of the Council Directive 94/9/ of 23 March 1994, certifies that this equipment has been found to comply with the essential health and safety requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres specified in Annex II to the Directive.

The examination and test results are recorded in confidential report.

PTB Ex 03-23301

(9) The essential health and safety requirements are satisfied by compliance with

EN 50021 : 1999

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use as specified in the schedule to this certificate.

(11) In compliance with the Directive 94/9/EC this Statement of Conformity relates only to the design and construction of the equipment specified. Further requirements of this Directive apply to manufacture and marketing of this equipment.

Statements of Conformity without signature and seal are invalid.
This Statement of Conformity is subject to change.
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.



(12) The marking of the equipment shall include the following:



Zertifizierungsstelle Explosionschutz

By order

(Signature)

(Seal)

Dr.-Ing. U. Lohmannsmeyer
Regierungsdirktor

Braunschweig,

Statements of Conformity without signature and seal are invalid.
This Statement of Conformity is subject to change.
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

(13) **S c h e d u l e**

(14) **Statement of Conformity PTB 03 ATEX 21 80 X**

(15) **Description of Equipment**

The Model 3730-38... HART-capable Positioner is a single- or double-acting positioner with communication capability intended for attachment, to any current linear or rotary actuator. It serves for translating control signals into valve stem positions.

The Model 3730-38... version is capable of communicating according to the SSP and the HART protocol.

For instrument air non-combustible media are used.

The device is intended for use inside and outside of hazardous locations.

The correlation between temperature classification and permissible temperature ranges is shown in the table below.

Temperature class	Permissible ambient temperature range
T6	-40°C...60°C
T5	-40°C...70°C
T4	-40°C...80°C

Electrical data

Signal circuit (terminals 11/12)	Type of protection EEx nA II
Software limit switch (terminals 41/42, 51/52)	Type of protection EEx nA II
Inductive limit switch (terminals 41/42)	Type of protection EEx nA II
Forced venting function (terminals 81/82)	Type of protection EEx nA II
Fault alarm output (terminals 83/84)	Type of protection EEx nA II
Serial interface adapter	Type of protection EEx nA II
External position sensor (analog board, pins p9, p10, p11)	Type of protection EEx nA II

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Errors or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

(16) Test report **PTB Ex 03-29301**

(17) **Special conditions for safe use**

The signal circuit (terminals 11/12) shall be protected by a fuse installed outside of the hazardous location. This fuse shall comply with IEC 60127-2/II, 250 V F, or with IEC 60127-2/VI, 250 T, with a fuse nominal current of $I_n \leq 63$ mA.

The serial interface adapter shall be preceded in the Vcc connection by a fuse in compliance with IEC 60127-2/II, 250 V F, or with IEC 60127-2/VI, 250 T, with a fuse nominal current of $I_n \leq 40$ mA.

The serial interface adapter shall be installed outside the hazardous location.

The Model 3730-38... HART-capable Positioner shall be mounted in an enclosure providing at least Degree of Protection IP 54 in compliance with the IEC Publication 60529. This requirement applies also to cable entries and/or cable couplers..

The wiring shall be connected in such a manner that the connection facilities are not subjected to pull and/or twisting.

(18) **Basis health and safety requirements**

Are satisfied by compliance with the standard specified above.

Zertifizierungsstelle Explosionsschutz
By order

Braunschweig,

(Signature) (seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

PTB

**TRANSLATION
ADDENDUM No. 1**

to the Statement of conformity **PTB 03 ATEX 2180 X**

Equipment:

Model 3730-38... HART capable Positioner

Marking:



II 3G EEx nA II T6

Manufacturer:

SAWSON AG, Mess- und Regeltechnik

Address:

Weismüllerstr. 3, D-60314 Frankfurt, Germany

Description of the additions and modifications

The Model 3730-38...HART capable Positioner is permitted in future to be also to energy-limited circuits with type of protection EEx nL IIC T6.

The correlation between temperature classification and permissible temperature ranges is shown in the table below.

Temperature class	Permissible ambient temperature range
T6	-40°C ... 60°C
T5	-40°C ... 70°C
T4	-40°C ... 80°C

The electrical data will be supplemented as follows:

Electrical data

Signal circuit
(terminals 11/12)

Type of protection EEx nA II
or
EEx nL IIC

Maximum values
U_i = 30 V
I_i = 100 mA
P_i = 1 W

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C_i = 5.3 nF
I_i = negligible

Type of protection EEx nA II
or
EEx nL IIC

Maximum values
U_i = 30 V
I_i = 100 mA
P_i = 1 W

C_i = 5.3 nF
I_i = negligible

Type of protection EEx nA II
or
EEx nL IIC

Maximum values
U_i = 20 V
I_i = 52 mA
P_i = 169 mW

C_i = 60 nF
I_i = 100 µH

or

Maximum value
U_i = 20 V
I_i = 25 mA
P_i = 64 mW

C_i = 60 nF
I_i = 100 µH

The correlation between temperature classification, permissible ambient temperature ranges, maximum short-circuit current and maximum power for evaluation instruments is shown in the table below:

Temperature class	Permissible ambient temperature range	I _o / P _o
T6	45 °C	52mA/169mW
T5	-45 °C ... 60 °C	
T4	-45 °C ... 75 °C	25mA/64mW
T6	60 °C	
T5	-40 °C ... 80 °C	
T4	-40 °C ... 80 °C	

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Limit switch (software)
(terminale 41/42; 51/52)

Type of protection EEx nA II
or
EEx nL IIC
Maximum values
U_i = 20 V
I_i = 60 mA
P_i = 400 mW
C_i = 5.3 nF
L_i = negligible

Forced venting function
(terminale 81/82)

Type of protection EEx nA II
or
EEx nL IIC
Maximum values
U_i = 30 V
I_i = 100 mA

C_i = 5.3 nF
L_i = negligible

Fault alarm output
(terminale 83/84)

Type of protection EEx nA II
or
EEx nL IIC
Maximum values
U_i = 20 V
I_i = 60 mA
P_i = 400 mW

C_i = 5.3 nF
L_i = negligible

Serial interface

Type of protection EEx nA II
or
EEx nL IIC
Maximum values (active)
U_i = 7.88 V
I_i = 62 mA
P_i = 120 mW

C_i = 0.62 µF
L_i = 10 mH

Maximum values
U_i = 20 V
I_i = 23 mA
P_i = 64 mW

C_i = negligible
L_i = negligible

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External position sensor

Type of protection EEx nA II
or
EEx nL IIC
Maximum values (active)
U_i = 7.88 V
I_i = 61 mA
P_i = 120 mW
C_i = 0.66 µF
L_i = 10 mH

Maximum values
U_i = 20 V
I_i = 25 mA
P_i = 64 mW

C_i = 730 nF
L_i = 370 µH

The equipment is mounted in a metallic enclosure which ensures at least degree of protection IP 54.

The marking of the Model 3730-3B HART capable positioner is complemented as follows:

 II 3 G EEx nA II T6 or II 3 G EEx nL IIC T6
II 3 D IP 54 T 80 °C or II 3 D IP 65 T 80 °C

The special conditions are complemented as follows:

All the other data apply unaltered also to this Addendum No. 1

Test report: PTB Ex-05-25053

Zertifizierungsstelle Explosionsschutz
By order Braunschweig, 26 April 2005

(Signature) (Seal)
Dr. Ing. U. Johannsmeyer
Regierungsdirektor

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TRANSLATION

ADDITIONAL No. 2

to the Statement of Conformity PTB 03 ATEX 2180 X

Equipment: Model 3730-38... HART Capable Positioner

Marking:   II 3 G EEx nA II T6 or  II 3 G EEx nL II C T6 or
 II 3 D IP 54 T 80 °C or  II 3 D IP 65 T 80 °C

Manufacturer: SAMSON AG Mess- und Regeltechnik

Address: Weismüllerstraße 3
60314 Frankfurt am Main, Germany

Description of the additions and modifications

The Model 3730-38... HART Capable Positioner is permitted to be manufactured in the future also in compliance with the documents specified in the test records included in the test report.

The technical data are modified as follows:

Version 3730_8.....1
(binary sensor)

Binary input
(terminals 31/32)

Type of protection EEx nA II
or
EEx nL II C

Maximum values:
 U_i = 30 V
 I_i = 100 mA
 C_i = 56.3 nF
 L_i = negligible

Version 3730_8.....1
(vibration-sensor)

Sensor connection
(terminals 31/32)

Type of protection EEx nA II
or
EEx nL II C

Maximum values:
 U_i = 28 V
 I_i = 115 mA
 C_i = 5.3 nF
 L_i = negligible

Page 1 of 2

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PTBEx a 1042-06

Addendum No. 2 to the Statement of Conformity PTB 03 ATEX 2180 X

The special conditions and all the other particulars shall apply also to this Addendum No. 2

Test report: PTB Ex 07-27064

Zertifizierungsstelle Explosionschutz

By order

(Signature)
Dr.-Ing. U. Johannsmeier
Director and Professor

Braunschweig, 10 September 2007

PTBEx a 1042-06

Physikalisch-Technische Bundesanstalt – Bundesallee 100 – D-38116 Braunschweig

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T R A N S L A T I O N
(of German original)

3rd ADDENDUM
to Statement of Conformity PTB-03 ATEX 2180 X

Device: Type 3730-38... HART[®]-capable Positioner

Marking:  II 3G Ex nA II T6 or  II 3D Ex II A22 IP 65 T80 °C

Manufacturer: SAMSON AG Mess- und Regeltechnik
Address: Weismüllerstraße 3, 60314 Frankfurt am Main, Germany

Description of additions and modifications

In the frames the Type 3730-38... HART[®]-capable Positioner may also be manufactured according to the certification documents listed in the test report.

The permissible ambient temperature range is extended.

The editions of standards are updated.

The following table lists the relation between the temperature classes and the permissible ambient temperature ranges:

Temperature class	Permissible ambient temperature range
T6	-55 °C to 60 °C
T5	-55 °C to 70 °C
T4	-55 °C to 80 °C

Electric data

Signal current circuit: in type of protection Ex nA II
or Ex nL JIC

Max. values during operation:

- U_i = 30 V
- I_i = 100 mA
- P_i = 1 W
- C_i = 35 nF
- L_i negligible

Version 3730-38-1
Position indicator: in type of protection Ex nA II
or Ex nL JIC

Max. values during operation:

- U_i = 28 V
- I_i = 115 mA
- L_i Negligible

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PTBEx n A-Md3-L06

Version 3730-38...I..... in type of protection Ex nA II
(structure-borne sound sensor) or Ex nL JIC

Sensor commissioning (terminals 31/32)

Max. values during operation:

- U_i = 30 V
- I_i = 100 mA
- L_i negligible
- C_i = 3,5 nF

Version 3730-38...I..... in type of protection Ex nA II
(binary sensor) or Ex nL JIC

Binary input (terminals 31/32)

Max. values during operation:

- U_i = 30 V
- I_i = 100 mA
- P_i = 250 mW
- L_i negligible
- C_i = 56,3 nF

Inductive limit switch: in type of protection Ex nA II
(terminals 41/42) or Ex nL JIC

Max. values during operation:

- U_i = 20 V
- I_i = 52 mA
- P_i = 169 mW
- L_i = 200 µH
- C_i = 60 nF

or

- U_i = 20 V
- I_i = 2,5 mA
- P_i = 64 mW
- L_i = 200 µH
- C_i = 60 nF

The following table lists the relation between the temperature classes, the permissible ambient temperature ranges, the max. short-circuit currents and the max. capacity for evaluators:

Temperature class	Permissible ambient temperature range	I _{sc} /P _{sc}
T6	Up to 45 °C	52 mA/169 mW
T5	-55 °C to 60 °C	
T4	Up to 75 °C	25 mA/64 mW
T6	Up to 60 °C	
T5	-55 °C to 80 °C	
T4	Up to 80 °C	

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PTBEx n A-Md3-L06



Software limit switches..... in type of protection Ex nA II
(terminals 41/42, 51/52) or Ex nL IIC

Max. values during operation:

- U_i = 20 V
- I_i = 60 mA
- P_i = 400 mW
- C_i = 5.3 nF
- L_i negligible

Forced venting..... in type of protection Ex nA II
(terminals 81/82) or Ex nL IIC

Max. values during operation:

- U_i = 30 V
- I_i = 100 mA
- C_i = 5.3 nF
- L_i negligible

Fault indication output..... in type of protection Ex nA II
(terminals 83/84) or Ex nL IIC

Max. values during operation:

- U_i = 20 V
- I_i = 60 mA
- P_i = 60 mW
- C_i = 5.3 nF
- L_i negligible

Serial interface..... in type of protection Ex nA II
(programming socket BU) or Ex nL IIC

Max. values during operation (active):

- U_i = 7.88 V
- I_i = 62 mA
- P_i = 120 mW
- C_i = 0.65 nF
- L_i = 10 mH

Max. values during operation (passive):

- U_i = 20 V
- I_i = 25 mA
- P_i = 64 mW
- L_i negligible
- C_i negligible

Statements of Conformity with CE marking shall be filed. This Statement of Conformity may be reproduced only without changes. The results laid down in this test report are exclusively valid in the context and the technical document mentioned. Extracts or changes will require the approval of the Physikalisch-Technische Bundesanstalt.

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PTBEx a. 0463.doc



External position sensor..... in type of protection Ex nA II
(analog PCB, pins p9, p10, p11) or Ex nL IIC

Max. values during operation (active):

- U_i = 7.88 V
- I_i = 61 mA
- P_i = 120 mW
- C_i = 0.66 nF
- L_i = 10 mH

Max. values during operation (passive):

- U_i = 20 V
- I_i = 25 mA
- P_i = 64 mW
- L_i = 370 mH
- C_i = 730 nF

All other specifications mentioned in the statement of conformity are not affected by this addendum and remain valid without changes.

Special conditions

If the signal current circuit is connected to a current circuit in type of protection Ex nL IIC, it is not necessary to connect a fuse in series.

If the position transmitter current circuit is connected to a current circuit in type of protection Ex nA II, a fuse according to IEC 60127-2/VI, 250 V T with a rated current of max. I_N < 40 mA is to be connected in series. The fuse is to be installed outside the hazardous area. If the position transmitter current circuit is connected to a current circuit in type of protection Ex nL IIC, it is not necessary to connect a fuse in series.

The manufacturer must ensure and document that the housing of the device, including all cable entries, complies with degree of protection IP 54 or IP 65 according to EN 60529 depending on the kind of application.

Referenced standards: EN 60779-15:2005

Test report: PTB Ex 08-285238

Certification Body for Explosion Protection

Braunschweig, 10 December 2008

[Signature: Johannsmeyer, stamp: Physikalisch-Technische Bundesanstalt 56]

Dr.-Ing. U. Johannsmeyer
Director and Professor

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Physikalisch-Technische Bundesanstalt – Bundesallee 100 – D-38116 Braunschweig

PTBEx a. 0463.doc

Installation Manual for apparatus certified by CSA for use in hazardous locations.

Electrical rating of intrinsically safe apparatus, and apparatus for installation in hazardous locations.

Table 1: Maximum values

Circuit No.	Control signal	Position Indicator or Input (Binary function) or Solenoid valve [Percentage detection]	Forced venting function	Limit switches		Fault signal
				inductive	software	
1	11/12	31/32	5	3 and 4	3 and 4	6
Terminal No.	28V	28V	81/82	41/42 and 51/52	41/42 and 51/52	83/84
U _o or V _{max}	115mA	115mA	28V	16V	20V	20V
I _o or I _{max}	1W	500mW	115mA	25/52 mA	60mA	60mA
P _o or P _{max}	5.3nF (56.3nF) [5.3nF]	60nF	64/169mW	250mW	250mW	250mW
C _i	0.1µH	0.1µH	5.3nF (56.3nF) [5.3nF]	13.4nF	13.4nF	13.4nF
L _i	0µH	0µH	100µH	0µH	0µH	0µH

Circuit	Serial interface BU		External position sensor	
	Terminal	Connector	Analog pcb. pin p9, p10, p11	
U _o or V _{max}	16V	U _o or V _{cc}	7.88V	7.88V
I _o or I _{max}	25mA	I _o or I _{sc}	61.8mA	61mA
P _o or P _{max}	64mW	P _o	120mW	120mW
C _i	0nF	C _o	0.65µF	C _i =730nF
L _i	0µH	L _o	10mH	L _i =370µH

Notes: Entity parameters must meet the following requirements:

U_o or V_{cc} or V_i ≤ U_o or V_{max} / I_o or I_{sc} or I_i ≤ I_o or I_{max} / P_o or P_{max} ≤ P_o or P_{max}
 C_a ≥ C_i + C_{able} and L_a ≥ L_i + L_{able}

Table 2: CSA/FM – certified barrier parameters of circuit 2 and 5

Barrier	Supply barrier				Evaluation barrier			
	V _{oc}	R _{min}	I _{sc}	P _{max}	V _{oc}	R _{min}	I _{sc}	
circuit 2	≤28V	≥300Ω	≤115mA	≤1W	≤28V	≥28V	≤115mA	≤1W
circuit 5	≤28V	≥382Ω	≤115mA	≤500mW	≤28V	≥28V	≤115mA	≤500mW

Table 3: The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

Temperature class	Permissible ambient temperature range
T6	-40°C ... 60°C
T5	-40°C ... 70°C
T4	-40°C ... 80°C

Table 4: For the Model 3730 – 331 ... Positioner the correlation between temperature classification, permissible ambient temperature ranges and maximum short-circuit current is shown in the table below:

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	-40°C ... 45°C	52mA
T5	-40°C ... 60°C	52mA
T4	-40°C ... 75°C	52mA
T6	-40°C ... 60°C	25mA
T5	-40°C ... 80°C	25mA
T4	-40°C ... 80°C	25mA

Intrinsically safe if installed as specified in manufacturer's installation manual.

CSA- certified for hazardous locations

Ex ia IIC T6; Class I, Zone 0

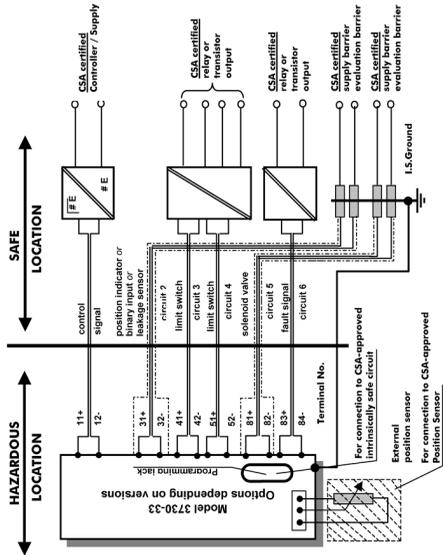
Class I, Div. 1, Groups A, B, C, D,

Class II Div. 1, Groups E, F + G; Class III.

Type 4 Enclosure

Notes:

- 1.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with CSA certified apparatus. For maximum values of I_a or V_{max} ; I_l or I_{max} ; P_l or P_{max} ; C and L_i of the various apparatus see Table 1 on page 1.
- 2.) For barrier selection see Table 2 on page 2.
- 3.) The installation must be in accordance with the C. E. C. Part 1.
- 4.) Use only supply wires suitable for 5°C above surrounding temperature.
- 5.) For CSA Certification, Safety Barrier must be CSA Certified and installed in accordance with C.E.C. Part 1. Each pair of I.S. wires must be protected by a shield that is grounded at the I.S. Ground. The shield must extend as close to the terminals as possible.



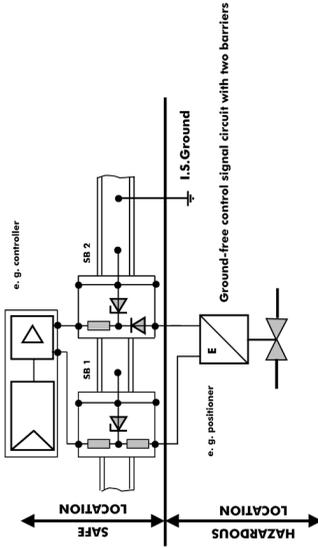
For the permissible maximum values for the intrinsically safe circuits 1, 3, 4 and 6 see Table 1
 For the permissible maximum values for the circuits 2 and 5 see Table 2
 Cable entry: M 20 x 1.5 or metal conduit according to drawing No. 1050 - 0539 T
 or 1050 - 0540 T

Revision Control Number: 1/ Jun. 2008

Addendum to EB 8384-3-EN

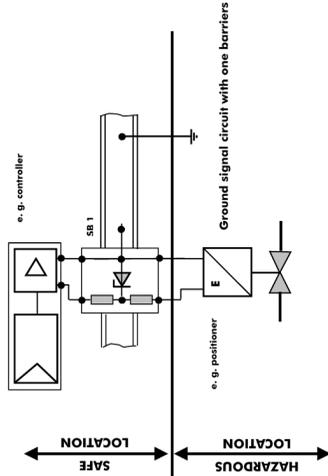
On interconnection to form ground-free signal circuits, only evaluation barriers must be installed in the return line. Correct polarity must be ensured.

Circuit diagram of a ground-free signal circuit:
 (position indicator and forced venting function)



In grounded signal circuits with only one barrier, the return line must be grounded or included in the potential equalization network of the system.

Circuit diagram of a grounded signal circuit:
 (position indicator and forced venting function)



Revision Control Number: 1/ Jun. 2008

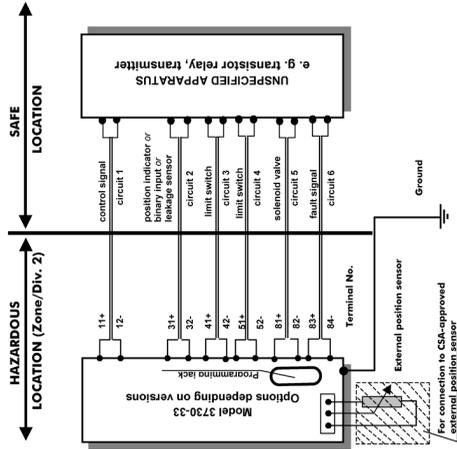
Addendum to EB 8384-3-EN

CSA- certified for hazardous locations

Class I, Zone 2
Class I, Division 2, Groups A, B, C, D,
Class II, Groups E, F + G; Class III.

Type 4 Enclosure

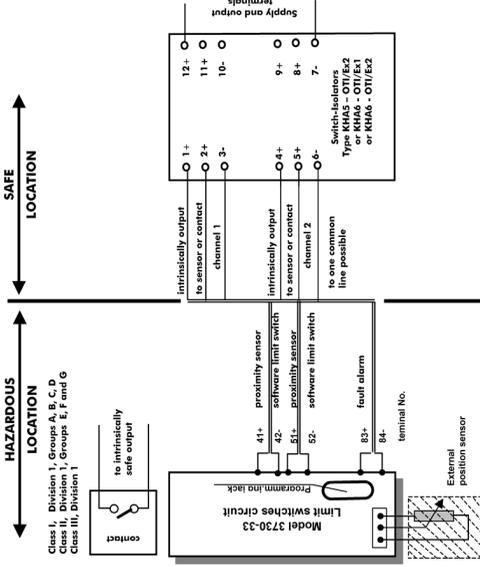
HART-capable positioner with position indicator, forced venting function (solenoid valve), fault signal and limit switches.



Notes:

- 1.) The installation must be in accordance with the Canadian Electrical Code, Part 1
- 2.) For the maximum values for the individual circuits see Table 1 and 2.
- 3.) Cable entry only rigid metal conduit according to drawing No. 1050-0539 T and 1050-0540 T

Installation drawing Control Relay KHA5-OTI/Ex2, KHA6-OTI/Ex1 or KHA6-OTI/Ex2 with Model SJ-b-N Proximity Sensors



maximum capacitance of each inductive sensor 60nF
 maximum inductance of each inductive sensor 200µH

The total series inductance and shunt capacitance of shield wiring shall be restricted to the following maximum values

Control Relay Terminal No.	Groups	L [mH]	C [µF]	VOC [V]	ISC [mA]
1-3, 2-3	A + B	94,8	1,27	↔	↔
4-6, 5-6	C	299	3,82	12,9	19,8
	D	744	10,2	↔	↔

Each pair of I.S. wires must be protected by a shield that is extended at the I.S. Ground. The shield must extend as close to the terminals as possible. Install per C.I.C. Part 11.

Installation Manual for apparatus approved by FM for use in hazardous locations.
Electrical rating of intrinsically safe apparatus, and apparatus for installation in hazardous locations.

Table 1: Maximum values

Circuit No.	Control signal	Position Indicator or Input (Binary Input) or [Leakage detection]	Forced venting function Solenoid valve	Limit switches		Fault signal
				inductive	software	
1		2	5	3 and 4	3 and 4	6
Terminal No.	11 / 12	31 / 32	81 / 82	41 / 42 and 51 / 52	41 / 42 and 51 / 52	83 / 84
U _o or V _{max}	28V	28V	28V	16V	20V	20V
I _o or I _{max}	115mA	115mA	115mA	25/52 mA	60mA	60mA
P _o or P _{max}	1W	1W	500mW	64/169mW	250mW	250mW
C _i	35nF	5.3nF [56.3nF]	5.3nF	60nF	13.4nF	13.4nF
L _i	0μH	0μH	0μH	100μH	0μH	0μH

Circuit	Serial interface BU		External position sensor	
	Terminal	Connector	Analog pcb, pin p9, p10, p11	
U _o or V _{max}	16V	U _o or V _{cc}	7.88V	U _o or V _{cc} 7.88V
I _o or I _{max}	25mA	I _o or I _{sc}	61.8mA	I _o or I _{sc} 61mA
P _o or P _{max}	64mW	P _o	120mW	P _o 120mW
C _i	0nF	C _o	0.66μF	C _o 0.66μF C _i =720nF
L _i	0μH	L _o	10mH	L _o 10mH L _i =370μH

Notes: Entity parameters shall meet the following requirements:

$$U_o \text{ or } V_{cc} \text{ or } V_i \leq U_i \text{ or } V_{max} / I_o \text{ or } I_{sc} \text{ or } I_i \leq I_i \text{ or } I_{max} / P_o \text{ or } P_{max} \leq P_i \text{ or } P_{max}$$

$$C_o \geq C_i + C_{cable} \text{ and } L_o \geq L_i + L_{cable}$$

Revision Control Number: 3 Jun. 08

Addendum to EB 8384-3EN

Table 2: FM / CSA – approved barrier parameters of circuit 2 and 5

Barrier	Supply barrier				Evaluation barrier			
	V _{oc}	R _{min}	I _{sc}	P _{max}	V _{oc}	R _{min}	I _{sc}	I _{sc}
circuit 2	528V	≥198Ω	≤115mA	≤1W	528V	528V	0mA	0mA
circuit 5	528V	≥392Ω	≤115mA	≤500mW	528V	528V	0mA	0mA

Table 3: The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

Temperature class	Permissible ambient temperature range
T6	60°C
T5	-40°C ≤ t _a ≤ 70°C
T4	80°C

Table 4: For the Model 3730 – 331 . . . Positioner the correlation between temperature classification, permissible ambient temperature ranges and maximum short-circuit current is shown in the table below:

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	45°C	
T5	-40°C ≤ t _a ≤ 60°C	52mA
T4	75°C	
T6	60°C	
T5	-40°C ≤ t _a ≤ 80°C	25mA
T4	80°C	

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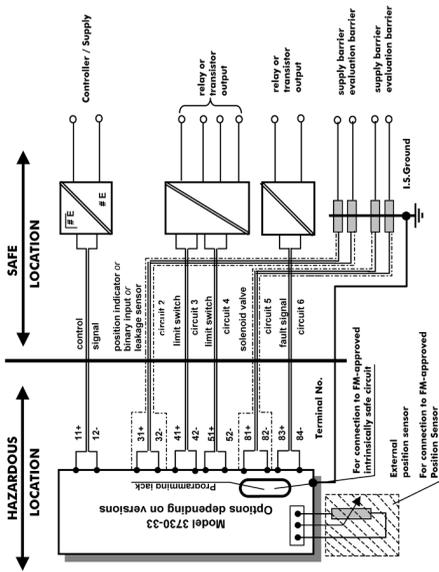
Intrinsically safe if installed as specified in manufacturer's installation manual.
 FM- approved for hazardous locations

Class I, Zone 0 A Ex ia IIC T6;
 Class I, II, III, Div. 1, Groups A, B, C, D, E, F + G;

NEMA 4X

Notes:

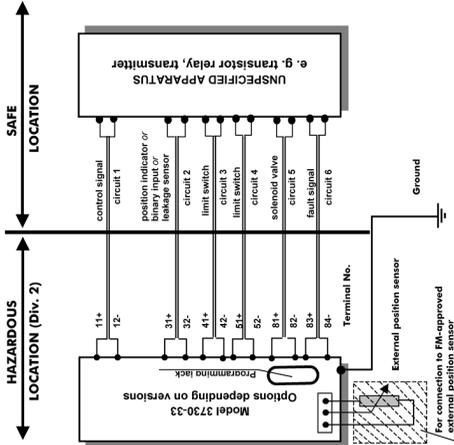
- 1.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with FM/CSA approved apparatus. For maximum values of U_i or V_{max}; If or I_{max}; P_i or P_{max}; G_i and U_i of the various apparatus see Table 1 on page 7.
- 2.) For barrier selection see Table 2 on page 8.
- 3.) The installation shall be in accordance with the National Electrical Code ANSI/NFPA 70 and ANSI/ISA RP 12.06.01.
- 4.) Use only supply wires suitable for 5°C above surrounding temperature.



For the permissible maximum values for the intrinsically safe circuits 1,3,4 and 6 see Table 1
 For the permissible barrier parameters for the circuits 2 and 5 see Table 2
 Cable entry M 20 x 1.5 or metal conduit according to drawing No. 1050 – 0539 T
 or 1050 – 0540 T

FM- approved for hazardous locations
 Class I, Division 2, Groups A, B, C, D,
 Class II, Division 2 Groups F + G.
 NEMA 4X

HART-capable positioner with position indicator or binary input or leakage detection, forced venting function (solenoid valve), fault signal and limit switches.



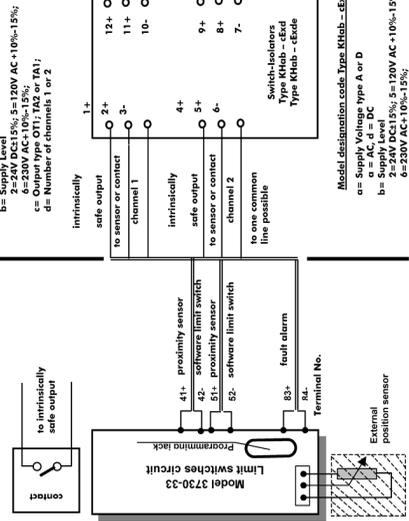
Notes:

- 1.) The installation shall be in accordance with the National Electrical Code ANSI/NFPA 70
- 2.) For the maximum values for the individual circuits see Table 1
 Cable entry only rigid metal conduit

Addendum Page 11
Installation drawing Control Relay KHab-cEx de Model 5J-b-N Proximity Sensors



Class I, Division 1, Groups A, B, C, D
 Class II, Division 1, Groups E, F and G
 Class III, Division 1



Model designation code Type KHab-...cExde
 a= Supply Voltage type A or D
 a = AC, d = DC
 b= Supply Level
 0= 24V DC±15%; 5= 120V AC±10%±15%;
 4= 230V AC±10%±15%;
 6= 230V AC±10%±15%;
 c= Output type RTA / RW1 / SS1 / SS2 / RS1 /
 RS2 / RS3
 d= Number of channels 1 or 2
 e= Power call designation, P, 2&P or 6&P
 (includes Model KH02-EB-PB Power Feed
 (Access) or Blank)

The total series inductance and shunt capacitance of shield wiring shall be restricted to the following maximum values

Control Relay Terminal No.	Groups	L [mH]	C [pF]	VOC [V]	ISC [mA]
1-3, 2-3	A + B	84,8	1,27	←	→
	C	299	3,82	12,9	19,8
4-6, 5-6	D	744	10,2	→	←



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